

LOW-COST TEST EQUIPMENT THAT YOU CAN BUY ON EBAY

May 10, 2017

Steve Dick, K1RF

Why do hams need test equipment?

- Good for fixing problems around the shack and at field events
- An absolute necessity for the amateur radio home-brewer or kit-builder. The more complex the project, the more sophisticated the test equipment required.
- Helps hams learn troubleshooting skills by “hands-on” problem solving.

Some Typical Amateur Radio test equipment

- ⦿ Digital multimeter/probes
- ⦿ Antenna Analyzer
- ⦿ Power meter
- ⦿ Test Leads
- ⦿ Digital Oscilloscope
- ⦿ Lab power supplies
- ⦿ Inductance/capacitance (L/C) meter
- ⦿ Dummy load
- ⦿ SWR bridge
- ⦿ RF Signal Generator
- ⦿ Frequency counter
- ⦿ For serious homebrewers: Spectrum analyzer with tracking generator
- ⦿ Build and repair equipment (soldering/desoldering, magnifiers, fixtures, solder, flux, SMT solder paste, etc)

For some things, commercial equipment is the best solution but for other things, inexpensive EBAY test equipment can be a better solution.

Why buy test equipment on EBAY?

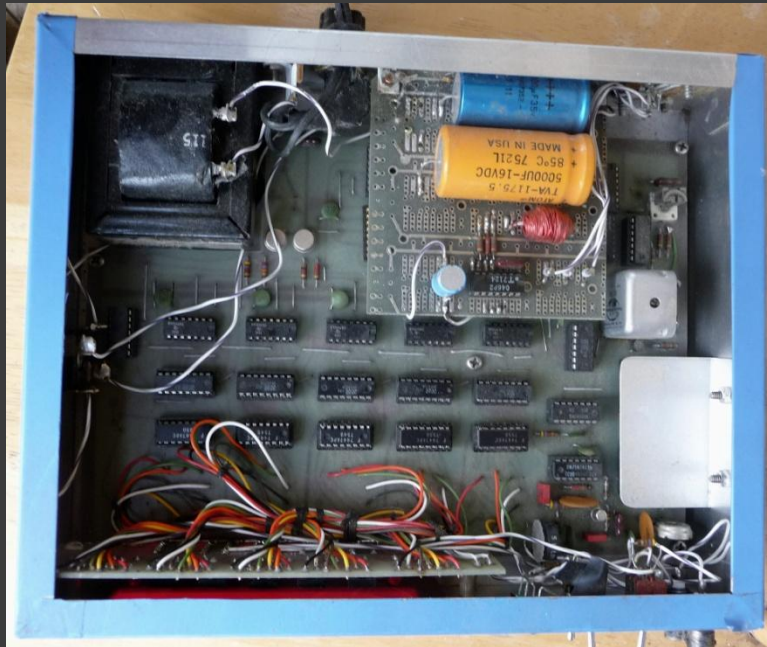
- ⦿ Ready-made. Does not require assembly of kits
- ⦿ Lots of equipment is available with incredibly high performance at low cost. Good bang for the buck.
- ⦿ Eliminates the need for “lucky finds” at hamfests
- ⦿ Equipment is available that you just can’t find at hamfests
- ⦿ Often a fraction of the cost of commercial test equipment with acceptable performance

EBAY Cautions

- ⦿ It's a wasteland out there – be careful which vendors you use
- ⦿ Shoot for vendors with >99.5% favorable rating or top rated plus vendors
- ⦿ Recommend buying from those with a lot of purchases of the item. You are better off paying slightly higher price from a reliable vendor
- ⦿ Some have free shipping, some don't. Sometimes the non-free shipping has the best price
- ⦿ Be patient – items shipped from China typically take several weeks to come. There are some U.S. distributors but they tend to have higher prices for faster delivery.
- ⦿ There are a lot of counterfeit parts or reject parts sold on EBAY, or used in circuit cards. That's another reason to stick with reliable vendors

“A modern VHF Frequency Counter”

73 Magazine, May, July, Sept 1972 by Peter Stark K2OAW



Basic Parts Cost:

Basic counter, PCB, ICs, Readouts \$65

VHF Prescaler: \$25

TCXO \$25

Total Cost: \$115

Less power supply

Total cost in today's dollars: \$446

Performance:

5 digit readout

Basic counter: Up to 20 MHz. 1Hz resolution

With prescaler: up to 200 MHz, 10Hz resolution

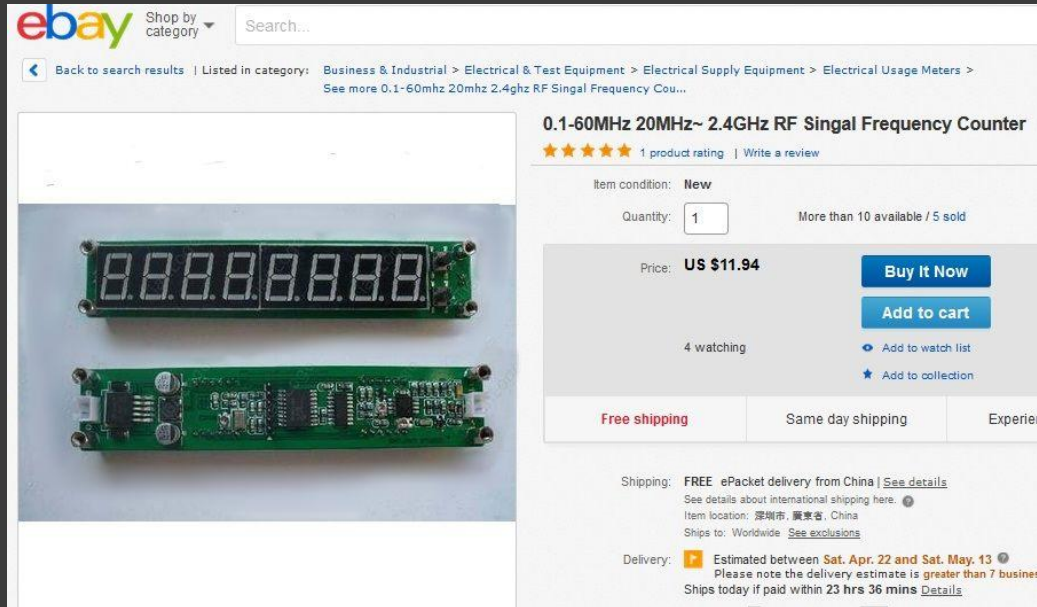
P.C. board 7" X 10"



Labor intensive to build

1972 Frequency Counter 5 digit, 200Mhz, \$446 in today's dollars.
A commercial Keysight 53220A, 1-350MHz costs ~\$2500 today.

45 years later: EBAY frequency Counter Module



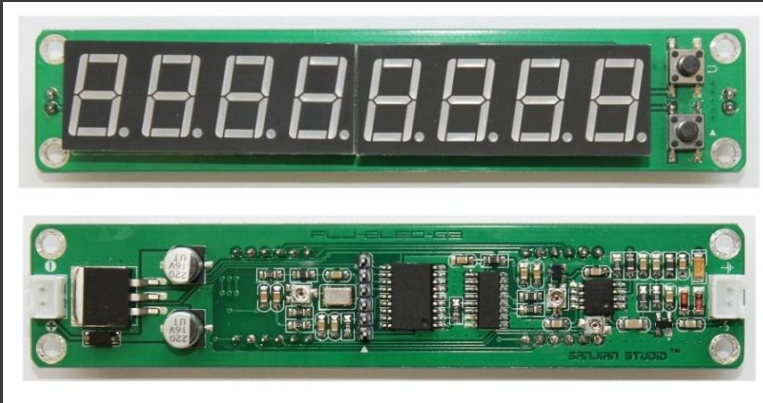
Choice of red,
green, or blue LED
displays.



Operating manual at: http://www.zl2pd.com/files/PLJ-8LED_Manual_Translation_EN.pdf
3D printed case files available at:
<http://www.zl2pd.com/8digitCounterBox.html>

**EBAY Frequency Counter 8 digit, 0.1MHz-2.4GHz, \$11.94! 37X
cheaper than 1972 counter, ready built, much higher performance**

Frequency Counter Module Overview

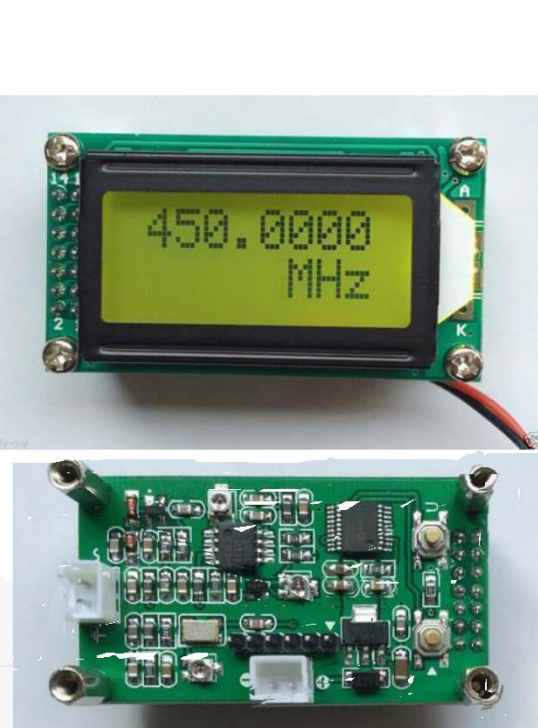


- Microchip PIC16F648A based
- 13 MHz TCXO (2.5 ppm)
- Can be used with I.F. offset
- Resolution:
 - 100Hz (0.01 sec gate time)
 - 10Hz (0.1 sec gate time)
 - 1Hz (1.0 sec gate time)
- D.C. input power 9-15V
w/reverse polarity protection

- Notes:
- Power input is reverse polarity protected
- Full specs available in operating manual translated to English by zl2pd.
- The provided R.F cable color coding is reverse of normal conventions (red=ground, black= input)
- Input sensitivity <60mV P-P, 0.1-60MHz. Sensitivity drops off rapidly above 450 MHz with prescaler

Another Recommended Frequency Counter Module

See more 1 MHz 1.1 GHz RF Frequency Counter Tester Digi...



1 MHz ~ 1.1 GHz RF Frequency Counter Tester Digital LED METER FOR Ham Radio
★★★★★ 7 product ratings

Item condition: **New**

Quantity: More than 10 available / **250 sold**

Price: **US \$11.91** [Buy It Now](#) [Add to cart](#)

Qualifies for: ☐ **1 yr protection** from Assurant - \$0.99

176 watching [Add to watch list](#) [Add to collection](#)

250 sold Same day shipping Free shipping

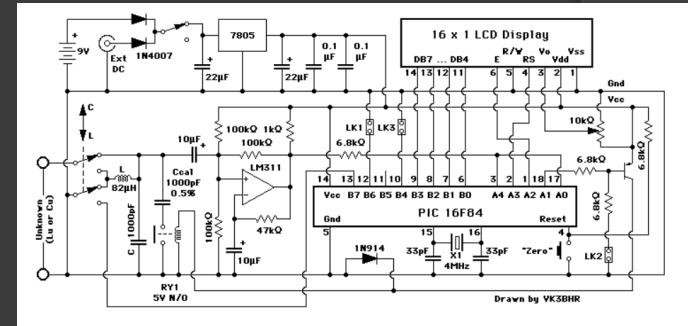
Shipping: **FREE** ePacket delivery from Hong Kong | [See details](#)
See details about international shipping here. [See details](#)
Item location: Hong Kong, Hong Kong
Ships to: Worldwide [See exclusions](#)

Seller information
[kiss_buy](#) (36965)
99.4% Positive feedback
[Follow this seller](#)
Visit store: [kiss_buymiss](#)
[See other items](#)

- Similar specs to previous counter but physically smaller
- LCD display instead of LED display
- Good for incorporation into homebrew rigs for frequency readout

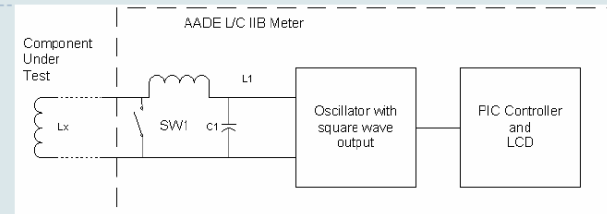
L-C meters

- AADE was the standard (\$99.95 kit, \$129.95 assembled, \$6.00 S&H.) No longer available. Owner passed away.



Simplified Theory of Operation

- ▶ At start-up, SW1 (a relay under control of the PIC) is closed. C1 is a known value, and the oscillator's frequency is measured by the PIC. Since C1 and frequency are known, the firmware calculates L1. This is frequency f1.
- ▶ When an inductive component, Lx, is tested, it is, in effect, in series with L1. This reduces the frequency. The frequency measured with the unknown Lx in series with L1 is frequency f2.
- ▶ The measurement frequency depends upon the value of Lx and is always below 750 KHz.

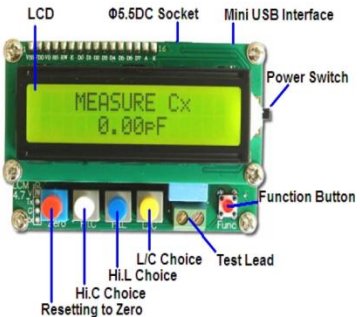


- ▶ From the known values of L_1 , C_1 , f_1 and f_2 , the value of L_x can be computed.
- ▶ A similar technique is used to measure unknown capacitance C_x . It is placed in parallel with C_1 , and the resonant circuit is comprised of L_1 , C_1 and C_x .
- ▶ From knowledge of f_1 , f_2 (with C_x connected), L_1 and C_1 , C_x 's value can be computed.
- ▶ The measurement frequency depends upon the value of C_x but is always below 750 KHz

Courtesy Clifton Labs

Recommended EBAY LC Meters

(basically AADE clones)



Digital LC100-A LCD High Precision Inductance Capacitance L/C Meter Tester


\$15.53
Buy It Now

From China

363 sold


Top Rated Plus

Labels: LCD, Ø5.5DC Socket, Mini USB Interface, Power Switch, Function Button, L/C Choice, Hi.L Choice, Hi.C Choice Resetting to Zero, Test Lead



Least expensive
With clip leads,
USB cable for power,
No case
The LC100-A is more full
featured than the LC100-S.
Get the LC-100-A
\$15.53

[Manual](#)



LC200A Inductance Inductor Capacitance Capacitor L/C Multimeter Meter Tester

★ ★ ★ ★ ★ 18 product ratings

Item condition: New
Sale ends in: 09h 52m 40s
Quantity: 1 6 available / 192 sold

Was: US \$34.43
You save: \$5.16 (15% off)
Price: **US \$29.27**

Buy It Now
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Make Offer

Best Offer: 62 watching
Add to watch list
Add to collection

192 sold Free shipping More than 96% sold

Shipping: FREE *Packet delivery from China | See details
Delivery: Estimated between Sat, Apr. 22 and Sat, May. 13
Payments: PayPal, Visa, MasterCard, American Express

Seller information: flyxy2015 (18326) 98.7% Positive feedback
Follow this seller
Visit store: Fly Technology Co Ltd
See other items

LEARN HOW TO EARN \$30 BACK
As a customer needs if you are approved for a new eBay Extra MasterCard account.

Similar to LC-100A
but comes with case
and banana jacks
\$29.97

[Manual](#)

These meters represents a bargain, providing good accuracy of both inductance and capacitance for most hobby and semi-professional use.

Recommended EBAY LC meters

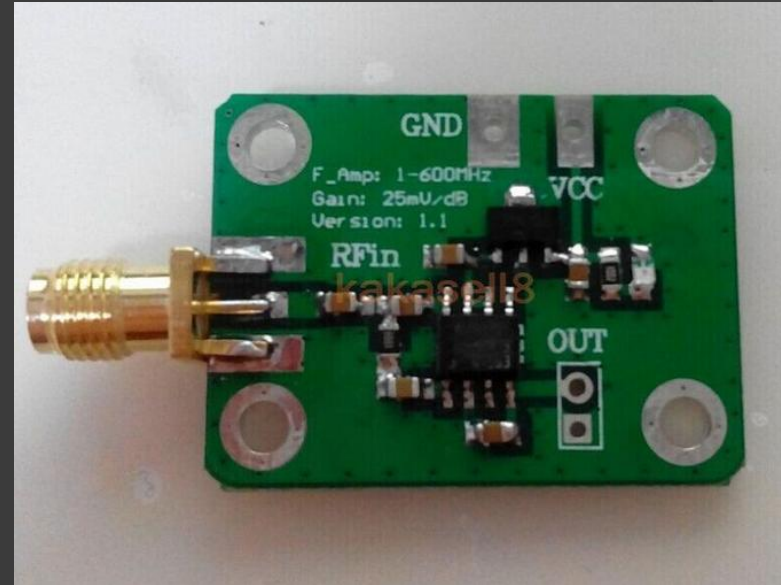
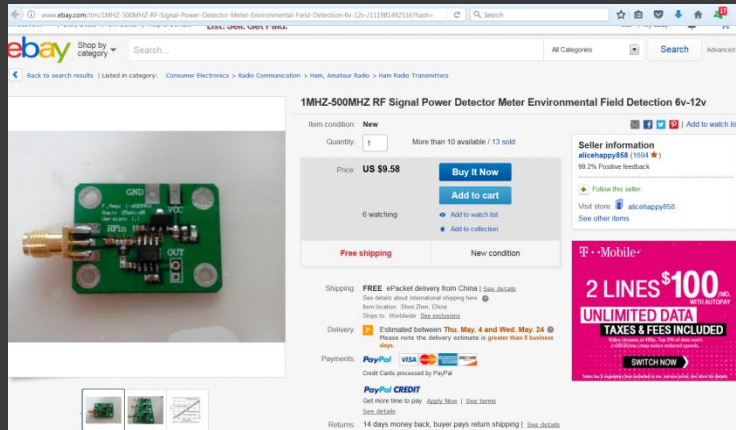
Specifications

- Model: LC100-A:
Supply power: +5v ,mini USB interface
- model: LC200A:
Supply power: +5v ,miniUSB interface ,4pcs AA battery
- Specifications:
Measurement accuracy: 1%
Capacitance measuring range: 0.01 pF - 10uF (The minimum resolution: 0.01 pF)
Inductance measuring range: 0.001 uH - 100mH
Big inductance measuring range: 0.001 mH - 100H (The minimum resolution: 0.001uH)
Big capacitance range: 1-100uF
Test frequency range: L/C about 500KHZ/Big inductance 500HZ
Effective display digits: 4 digits

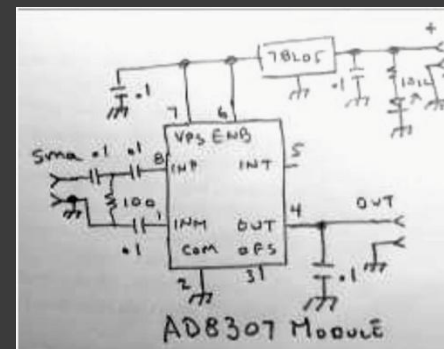
EBAY LC Meters - Notes

- ⦿ Zero (calibrate) just before measurement. Calibrate often for multiple measurements such as for L or C matching
- ⦿ Increasing Inaccuracy for low inductance values ($< \sim 500\text{nH}$) and low capacitance values ($\sim 10\text{pF}$) due to low measurement frequency $\sim 750\text{KHz}$
- ⦿ Be careful in accepting inductance values of coils with frequency-dependent (and amplitude dependent) permeability, such as most ferrites.
- ⦿ Measures effective inductance, not actual inductance, where distributed capacitance is significant.
- ⦿ For best accuracy when measuring low inductance devices, do not use flexible test leads
- ⦿ You can measure test frequency by pushing the rightmost button (depending on version of software used)

RF Power Detector Module



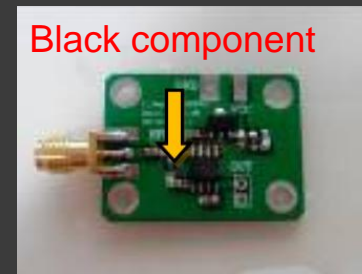
- Operating frequency 1-500 MHz
- Measured power: -74dBm to +18 dBm
- Output voltage range: 0-2.5V
- Detector slope: 25mV/dBm
- Input Impedance 50 ohms
- Supply voltage 6-15V



A bargain at \$9.58 for an AD8307-based power meter! The AD8307 alone costs \$13.14 new. This board includes the difficult to solder AD8307 plus regulator.

EBAY RF Power detector notes

- The input terminating resistor may be 100 ohms instead of 50 ohms. Measure it with an ohmmeter. If it is 100 ohms, parallel a 100 ohm 0805 SMD resistor and verify the parallel combination is 50 ohms. Or just replace with 50 ohms.
- This board does not have output buffering. A circuit with output buffering is shown in June 2001 QST article by W7ZOI, "[Simple RF Power Measurement](#)". The PHSNA yahoo group sells a PC board for an updated version of the W7ZOI circuit.
- With calibration from a known source and attenuators, very accurate power measurements can be performed. See the W7ZOI article and PHSNA files. Microsoft Excel can be used to generate a very accurate curve fit (order 6 polynomial) to a unique device output voltage vs power in.



Low cost digital multi-meter

category

[Back to search results](#) | Listed in category: [Business & Industrial](#) > [Electrical & Test Equipment](#) > [Test, Measurement & Inspection](#) > [Test Meters & Detectors](#) > [Electric Circuit & Multimeters](#) > [Multimeters](#) > See more Cen-Tech Digital 7 Function Multimeter 98025

CEN-TECH 7 FUNCTION DIGITAL MULTIMETER -TESTER with 9 VOLT BATTERY INCLUDED

★★★★★ 58 product ratings

Item condition: **New**

Price: **US \$5.99**

[Buy It Now](#)

[Add to cart](#)

Qualifies for: ☐ 1 yr protection from Assurant - \$0.99

[Add to watch list](#)

[Add to collection](#)

Free shipping Experienced seller New condition

Shipping: **FAST 'N FREE**
On or before **Mon. Apr. 24** to 06851
Item location: Lansing, Michigan, United States
Ships to: United States [See exclusions](#)

Payments: **PayPal**
Credit Cards processed by PayPal

PayPal CREDIT
Get more time to pay. [Apply Now](#) | [See Terms](#)
[See details](#)

Get low monthly payments | [Get instant funding](#)

Returns: 14 days money back, buyer pays return shipping | [See details](#)


Guarantee: **ebay** MONEY BACK GUARANTEE | [See details](#)

Seller information
cantstopshopping (22000 ★)
100% Positive feedback

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[See other items](#)



Good basic “throw away” digital multi-meter for <\$5.99. Also sold by Harbor Freight – sometimes given away for free when you buy something else!

Low cost digital multi-meter specs

- ⦿ Specifications:
 - AC volts 200-750V
 - DC volts 200mV-1000V
 - AC/DC current 200mA-10A
 - Resistance: 200-200K ohms
 - Diode voltage drop test
 - Loaded battery test for 1.5V and 9V batteries.
 - Transistor hfe test
- ⦿ Notes:
 - Has on-off switch which helps life of rotary switch when power off
 - Lowest AC volts is 200V scale
 - Current measurement limited to 200 mA
 - Runs on 9V battery which is expensive.
 - Loses accuracy when 9V battery drops too low but display still works
 - Some complaints of cheaply made leads. The plug ends are too short to fully engage the meter's sockets
- ⦿ Manual available on Harbor Freight website [here](#)

This suits the average ham's basic troubleshooting needs. But sometimes you need a more professional DMM. Get the meter that fits your needs.

25 MHz dual channel DDS Arbitrary waveform function generator

www.ebay.com/itm/25MHz-Dual-channel-DDS-Arbitrary-Waveform-Function-Signal-Generator-Counter-Kit-/351825634

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Back to search results | Listed in category: Business & Industrial > Electrical & Test Equipment > Test, Measurement & Inspection > Signal Sources & Conditioning > Other Signal Sources > See more 25mhz Dual-channel DDS Arbitrary Waveform Func...

BUY 1, GET 1 AT 5% OFF (add 2 to cart) See all eligible items

25MHz Dual-channel DDS Arbitrary Waveform Function Signal Generator Counter Kit
> Lowest Price > 200MSa/s > High Precision > Thanks
25 viewed per day ★★★★★ 26 product ratings

Item condition: New

Quantity: 1 More than 10 available / 405 sold

Price: **US \$54.99**

Buy It Now

Add to cart

348 watching

[Add to watch list](#)

[Add to collection](#)

405 sold Free shipping Experienced seller

Shipping: **FREE** ePacket delivery from China | See details
See details about international shipping here.

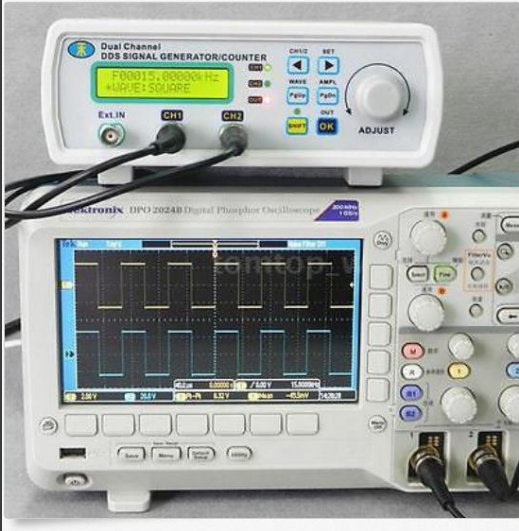
Seller information
tomtop_w (409556) me
98.3% Positive feedback

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Visit store: [TOMTOP Store](#)

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[Add to watch list](#)



A real bargain at \$54.99 for a DDS-based dual output accurate, stable signal generator with high output, adjustable amplitudes, up to 25 MHz

25 MHz dual channel DDS Arbitrary waveform function generator specs

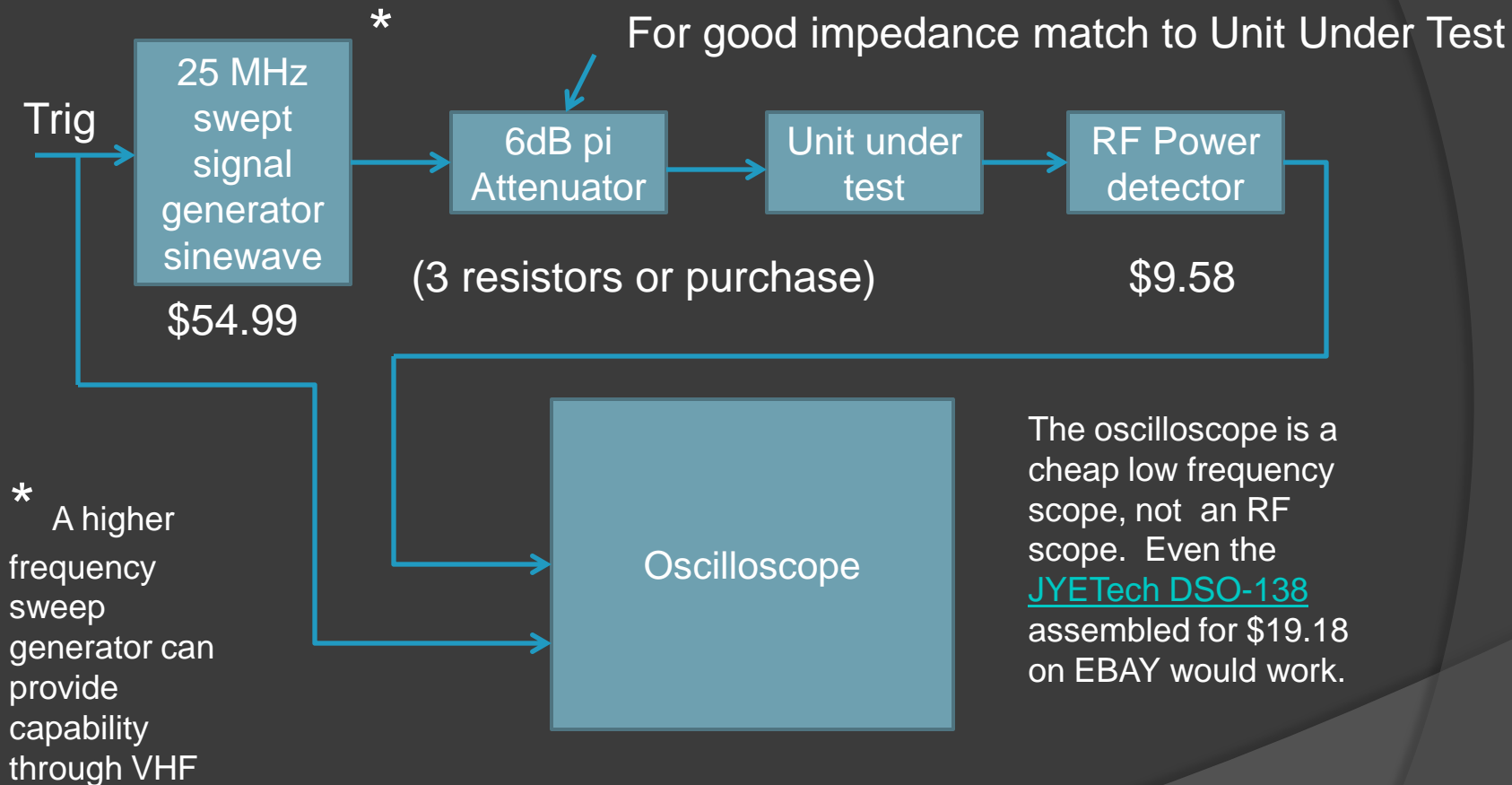
Features:
 Can output arbitrary waveforms and conventional function waveforms (sine/triangle/square/sawtooth wave and TTL signal).
 All functions are digitally controlled, precise and stable.
 Dual-channel output, can work in sync, phase difference is adjustable.
 With linear sweep (up to 999s) and logarithmic frequency sweep functions.
 Signal of both channels has built-in sophisticated 20dB attenuator in order to reach the minimum amplitude resolution 1mV.
 With 120% \pm 120% DC bias function.
 4 TTL outputs (phase difference is adjustable).
 Has a frequency measurement, period measurement, positive and negative pulse width measurement, duty cycle measurements and counting function.
 With USB interface, after the connection with PC, the PC can be used to control the instrument.

Specifications:

| Project | Parameters | Value |
|-----------------------|---|---|
| Key Features | Waveform Types | Sine/Triangle/Square/Lifting sawtooth Wave, CMOS Digital Signal Wave and Arbitrary Waveform |
| | Frequency Range | 0.01Hz~6MHz |
| | Output Modulation | 0.01Hz~6MHz |
| | Waveform Length | 2048Points |
| | Sampling Rate | 200MS/s |
| | Waveform Amplitude Resolution | 12 Bits |
| | The Min. Frequency Resolution | 10mHz |
| | Frequency Error | $\pm 5 \times 10^{-6}$ (-6) |
| | Frequency Stability | $\pm 1 \times 10^{-6}$ (-6) |
| | Amplitude Range (Peak to Peak) | 5mVp-p~20Vp-p |
| Sine Wave | Output Impedance | 50 Ω ($\pm 10\%$) |
| | Amplitude Resolution | 1mVp-p (-20dB Attenuation) |
| | Offset Range | -120%~120% (The ratio of bias voltage and signal amplitude) |
| | Bias Resolution | 1% |
| | Phase Range | 0~359° |
| | Phase Resolution | 1° |
| | Harmonic Amplitude System | 40dBc (<1MHz), 35dBc (1MHz~20MHz) |
| | Distortion | $\pm 0.8\%$ (20Hz~20KHz) |
| | Lifting Along Time | ± 20 ns |
| | Overshoot | $\pm 10\%$ |
| Square Wave | Duty Cycle Adjustment Range | 9%~99.9% |
| | Lifting Along Time | ± 20 ns |
| | Low Level | ± 0.3 V |
| | High Level | 1V~7.5V |
| | Quantity | 16 |
| | Memory Depth/Group | 1KB/16 |
| | Scan Mode | Linear Sweep, Log Sweep |
| | Scan Time | 1s~999s |
| | Scan Range | It is determined by the sweep parameter settings |
| | Frequency Measuring Range | GATE-TIME=10S 0.1Hz - 60MHz GATE-TIME=1S 1Hz - 60MHz GATE-TIME=0.1S 10Hz - 60MHz GATE-TIME=0.01S 100Hz - 60MHz |
| External Measurements | Input Voltage Range | 0.5Vp-p~20Vp-p |
| | Counting Range | 0~4294967295 |
| | Counting | Manually |
| | Positive and Negative Pulse Width Measurement | 10ns Resolution, the Max. Measurable 10s |
| | Periodic Measurement | 20ns Resolution, the Max. Measurable 20s |
| | Duty Cycle Measurement | 0.1% Resolution, Measuring Range from 0.1%~99.9% |
| | Source Selection | 1. Ext. IN input (AC Signal) ; 2. TTL-IN input (Digital Signal) |
| | Quantity | 10 |
| | Location | MO-M9 |
| | Interface Mode | using USB to Serial interface |
| Interface | Communication Rate | 87600bps |
| | Protocol | Using the Command Line, the Agreement Public |
| | Power Supply | DC |
| | General | |
| | Size | 19.5 * 17.5 * 7cm / 7.67 * 6.9 * 2.75in |
| | Weight | 542g / 19.12oz |
| | Package Size | 24 * 21 * 9.5cm / 9.45 * 8.3 * 3.74in (L * W * H) |
| | Package Weight | 986g / 34.76oz |
| | Package List | E0782-26 |

- Up to 25 MHz sinewaves, sweepable linear or log
- Arbitrary waveform generator up to 6 MHz!!
- High level adjustable outputs
- Built-in frequency counter
- Pulse trains 1-99% duty cycle
- Programmable TTL outputs

An inexpensive spectrum analyzer for testing homebrew filters, etc



This setup can be enhanced with a [return loss bridge](#) for return loss and SWR measurements for \$7.00 + \$5.00 shipping

Inexpensive return loss bridge

The screenshot shows an eBay product page for an "RF bridge 0.5-3000 mHz, VNA Return Loss VSWR SWR reflection bridge antenna". The item is a green printed circuit board (PCB) with a central black component and two gold-colored SMA connectors. The listing includes a main image and four smaller thumbnail images showing different views of the board. The price is listed as US \$7.00, and there are 226 sold units. The seller is "60dbmcom" with a 100% positive feedback rating. The shipping cost is \$5.00. The listing also shows the item condition as "New", the quantity as 1, and the best offer as "Make Offer". The seller information section includes a "Top Rated Plus" badge and a "Follow this seller" button. The bottom of the page shows a Windows taskbar with various application icons and the system clock indicating 4:15 PM on 5/2/2017.

RF bridge 0.5-3000 mHz, VNA Return Loss VSWR SWR reflection bridge antenna

★★★★★ 4 product ratings

Item condition: **New**

Quantity: More than 10 available / 226 sold

Price: **US \$7.00** [Buy another](#) [Add to cart](#)

Best Offer: [Make Offer](#)

128 watching [Add to watch list](#) [Add to collection](#)

A seller you've bought from 226 sold More than 94% sold

Shipping: **\$5.00** Economy Shipping from outside US | [See details](#)
See details about international shipping here. [See details](#)
Item location: EU, Ukraine
Ships to: Worldwide [See exclusions](#)

Delivery: Estimated between **Tue. May. 16** and **Fri. May. 26** [See details](#)
Please note the delivery estimate is greater than 8 business days.

Payments: [PayPal](#) [VISA](#) [MasterCard](#) [Discover](#) [American Express](#)
Credit Cards processed by PayPal

[PayPal CREDIT](#)
Get more time to pay [Apply Now](#) | [See terms](#)

Seller information
60dbmcom (193 ★)
100% Positive feedback
[Follow this seller](#)
[See other items](#)

Top Rated Plus

Useable 0.5-3000 MHz, ~45dB directivity up to 50 MHz, 28dB directivity at 1000 MHz, \$7.00 + \$5.00 shipping

Network analyzer for serious experimenter/homebrewer

ebay Shop by category Search... All Categories Search Advanced

Back to search results | Listed in category: Consumer Electronics > Radio Communication > Parts & Accessories > Other Radio Communication Accs

NWT500 0.1MHz-550MHz USB Sweep analyzer+ attenuator+ SWR bridge+ SMA Cable

13 viewed per day

Item condition: **New**
Sale ends in: 02d 19h 38m

Quantity: 7 available / 62 sold

Was: US \$181.23
You save: \$27.18 (15% off)
Price: **US \$154.05**

[Buy It Now](#)
[Add to cart](#)

Best Offer:
76 watching
[Add to watch list](#)
[Add to collection](#)

[Make Offer](#)

62 sold More than 89% sold Free shipping



Shipping: **FREE** ePacket delivery from China | [See details](#)
See details about international shipping here.
Item location: Guangzhou, China
Ships to: Worldwide [See exclusions](#)

Delivery: Estimated between **Thu. Apr. 27 and Thu. May. 18**
Please note the delivery estimate is greater than 6 business days

Seller information
flyxy2015 (16940) ★
98.7% Positive feedback
[Follow this seller](#)
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**UP TO 70% OFF
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\$154.05 0.1 to 550 MHz 1Hz freq steps, USB sweep analyzer 50dB dynamic range, + attenuator + Ret Loss bridge + SMA cable + power supply

Network analyzer for serious experimenter/homebrewer –cont'd



Note – should be mounted in a chassis, not supplied

Low cost GPS module

An Arduino Controlled GPS Corrected VFO

A VFO that provides 1 to 112.5 MHz signals on two independent outputs. Use it as a stand alone unit or with a GPS receiver to improve frequency accuracy. UTC and six digit grid square locations are also displayed in the GPS Mode

This project began with the purchase of an Si5351A clock generator breakout board for less than \$8 from Adafruit Industries. Designed as a substitute for crystal oscillator clocks, it features three output ports for frequencies between 8 kHz and 160 MHz. Although the board is specified for a wider bandwidth, this project is limited to 1 through 112.5 MHz.

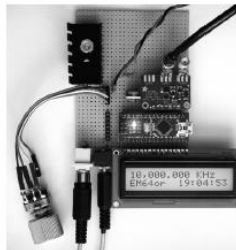


Figure 1 — I constructed the VFO on a piece of perfboard. The heatsink shown at the top left corner of the board is for the 7805 voltage regulator. The regulator is not required for the basic non-GPS configuration of the Si5351 VFO project, if used without the display backlight. The VFO output signals connect to the CLK1 and CLK2 connectors at the edge of the Si5351 board. The Arduino Nano is between the Si5351 board and the display board. At the bottom left of the perfboard are the GPS connections. Also note the rotary encoder to the left side of the perfboard. The pushbutton switches were not included on this version of the VFO.

Figure 1 shows my project, built on a piece of perfboard. The Si5351 board is the top board on the right side of the perfboard. Just below that is the Arduino Nano board I used to control the oscillator. This version uses a rotary encoder to set the operating frequency. You can see the encoder off the left side of the board. Figure 2 shows a completed unit, packaged in a plastic project box. The Resolution, Band Select, and Reset pushbuttons are on the right, just below the rotary encoder.

The Si5351A board does have limitations. Although it is a highly capable and stable board, the output is a square wave with odd harmonic frequencies present in the output. The square wave output does make

a good source for some mixers. Phase noise is also higher than other popular programmable signal sources. A quick search of the Internet will yield a wealth of data concerning the performance of the Si5351A IC. Builders are urged to consider phase noise and crosstalk limitations before using this IC in their project.

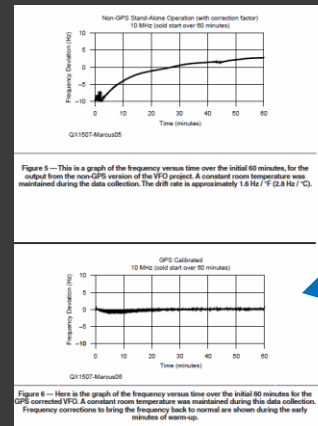
A simplified version of the VFO can be built without the GPS module. Figure 3 shows the circuit for this configuration. Figure 4 shows the schematic diagram for the complete circuit, with GPS module, rotary encoder and pushbuttons.

Unlike a GPS disciplined oscillator (GDO) using a phased lock loop (PLL), this project uses a GPS 1 pulse per second (pps)



Figure 2 — Here is a completed VFO project, housed in a plastic project box. The Resolution, Band Select, and Reset pushbutton controls are located just below the rotary encoder.

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Or get a simple kit from QRP labs for \$23.00 for a more sensitive GPS with larger patch antenna

1pps signal from GPS to arduino stabilizes frequency to fraction of a hz

An \$11.00 EBAY GPS module can be used as the basis of a low cost GPS corrected Arduino-based 1-112.5MHz VFO

EBAY soldering iron

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- Well, not exactly EBAY but Banggood, which ships from U.S. warehouse.
- Also available on EBAY at a higher price from China.
- 60 watts, adjustable temperature, with five screw-in tips.
- Use it to replace faulty components found with other test equipment

At \$13.55 + free shipping, a decent 60 watt adjustable temperature iron with tips

Summary:

- EBAY is a great source for cost-effective test equipment for the amateur radio operator
- Much useful test equipment available on EBAY cannot normally be found at hamfests
- Much test equipment on EBAY can do the job of more costly professional test equipment but budget priced for amateur radio operator use