

## S.E.R. FAQ **NotTaR of Television Sets** : **Test equipment**

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## Test equipment

Don't start with the electronic test equipment, start with some analytical thinking. Your powers of observation (and a little experience) will make a good start. Your built in senses and that stuff between your ears represents the most important test equipment you have.

However, some test equipment will be needed:

- **Multimeter (DMM or VOM)** - This is essential for checking of power supply voltages and voltages on the pins of ICs or other components - service literature like the Sams' Photofacts described elsewhere in this document include voltage measurements at nearly every circuit tie point for properly functioning equipment. The multimeter will also be used to check components like transistors, resistors, and capacitors for correct value and for shorts or opens. You do not need a fancy instrument. A basic DMM - as long as it is reliable - will suffice for most troubleshooting. If you want one that will last for many years, go with a Fluke. However, even the mid range DMMs from Radio Shack have proven to be reliable and of acceptable accuracy. For some kinds of measurements - to deduce trends for example - an analog VOM is preferred (though some DMMs have a bar graph scale which almost as good).
- **Oscilloscope** - While many problems can be dealt with using just a multimeter, a 'scope will be essential as you get more into advanced troubleshooting. Basic requirements are: dual trace, 10-20 MHz minimum vertical bandwidth, delayed sweep desirable but not essential. A good set of proper 10X/1X probes. Higher vertical bandwidth is desirable but most consumer electronics work can be done with a 10 MHz scope. A storage scope or digital scope might be desirable for certain tasks but is by no means essential for basic troubleshooting.

I would recommend a good used Tektronix (Tek) or Hewlett Packard (HP) scope over a new scope of almost any other brand. You will usually get more scope for your money and these things last almost forever. Until recently, my 'good' scope was the militarized version (AN/USM-281A) of the HP180 lab scope. It has a dual channel 50 MHz vertical plugin and a delayed sweep horizontal plugin. I have seen these going for under \$300 from surplus outfits. For a little more money, you can get a Tek 465 or 465B (newer version but similar specifications) 100 Mhz scope (\$200 to \$600, sometimes cheaper on eBay or elsewhere but there is more risk than buying from a reputable dealer). I have now acquired a Tek 465B and that's what I use mostly these days. The HP-180 is still fine but I couldn't pass up a really good deal. :) The Tek 465/B or other similar model will suffice for all but the most demanding (read: RF or high speed digital) repairs.

- **A video signal source** - both RF and baseband (RCA jacks). Unless you are troubleshooting tuner or video/audio input problems, either one will suffice. RF sources include a pair of rabbit ears or an outdoor antenna, a cable connection, or a VCR with a working RF modulator. This

will be more convenient than an antenna connection and will permit you to control the program material. In fact, making some test tapes using a camcorder or video camera to record static test patterns will allow you full control of what is being displayed and for how long.

- Color bar/dot/crosshatch signal generator. This is a useful piece of equipment if you are doing a lot of TV or monitor repair and need to perform CRT convergence and chroma adjustments. However, there are alternatives that are almost as good: a VHS recording of these test patterns will work for TVs. A PC programmed to output a suitable set of test patterns will be fine for monitors (and TVs if you can set up the video card to produce an NTSC/PAL signal. This can be put through a VCR to generate the RF (Channel 3/4) input to your TV if it does not have direct video inputs (RCA jacks).

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