M36-1-1

An LED S-meter for the "TRF" 12-656

by Derek Claridge

With the LM3915 LED Dot Display Driver IC available at Radio Shack, it seemed like a good idea to try to construct an S-meter for my 12-656 TRF. This IC can drive 10 LED's, one at a time; as the input signal to the IC increases by 3 dB, the next LED down the line lights up. A 30 dB signal variation can thus be indicated with the device. This hardly rivals an S-meter on a good communications receiver, but then the TRF is not an R-7A.

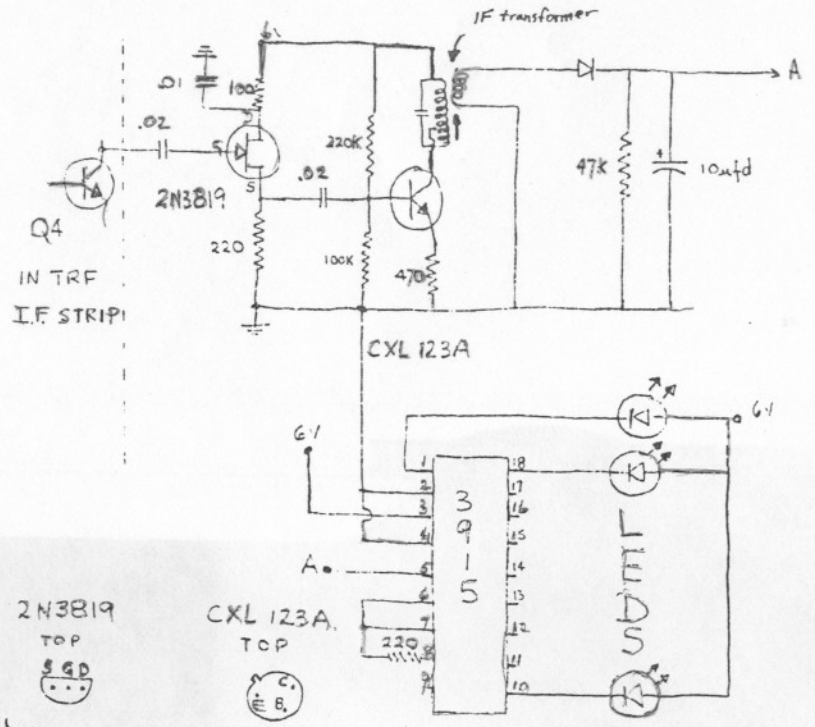
The real problem arose in interfacing the 3915 circuit with the TRF. I had originally approached the problem from the idea of using an op-amp to amplify the DC generated by the AVC circuit. When I found that I only had from 0 to 0.7 volts, and this with a BIG antenna and the local tuned in, it didn't seem too feasible. Most of the signals were barely distinguishable from each other as far as AVC voltage levels went. Perhaps another club member would like to take this approach and follow it through.

So I then approached the problem by sampling the IF signal, amplifying it, and rectifying it to provide sufficient drive for the 3915. At first I had difficulty rectifying the amplified IF signal. After that was accomplished the next hurdle was non-linearity in the gain of the amplifier/rectifier combinations. That was overcome by the introduction of an old IF transformer from a junked transistor radio.

Then there was the fun of matching the available signal to the input of the 3915 chip. That was approached very scientifically, complete with a all the formulae. After that failed, I put two variable pots in place and started cranking until I got what I wanted! Again, empirical method triumphs over pure science!! Anyway, there is an honest 30 dB range on the LEDs and that seems quite sufficient for this type of operation. Incidentally, the CXL 123A transistor I used is simply a Westinghouse general substitute for a small-signal NPN transistor, such as the 2N3904 and many others.

The entire circuit was now placed on a perfboard mounted behind the AC cord compartment of the radio. The cord had been removed as it wasn't being used, and there's room now for a PCIM177 display as well as the S-meter circuit. The 10 LED's are mounted on the front of the radio, spaced evenly from the bottom to the top of the speaker "grille", the highest one indicating the strongest signal. The radio is tuned to the strongest local, and the IF transformer is adjusted so that 1.6 VDC is present at point "A" on the schematic on the next page. Make sure the batteries of the radio are fresh when you make this adjustment. Speaking of batteries, this circuit

draws about 26 mA, even without any LED switched on. You might want to place an on-off switch in the 6 Volt line to conserve the batteries.



Voltages at A, 0.05 - 1.6 VDC --- 30 dB range.

The I.F. transformer is used to set the maximum signal levels for the display.

T.R.F. 12-656

LED "S METER"

MAY 31 1983

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The radio now indicates relative signal strengths and nulls on locals, semi-locals, and the more powerful clear channels. The null indication is quite useful on nearby stations which simply cannot be nulled by ear alone, as the AVC keeps the volume constant until the station is quite deeply nulled. The S-meter does not indicate on DX signals, but these can be nulled by ear as the TRF's AVC action is minimal on weaker signals. Also, the LED's switching on and off can cause a "whooshing" sound on weak signals, but this interference is generally not a problem when tuning to stations strong enough to fire the first LED.

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...the next article first appeared in the CIDX Messenger: