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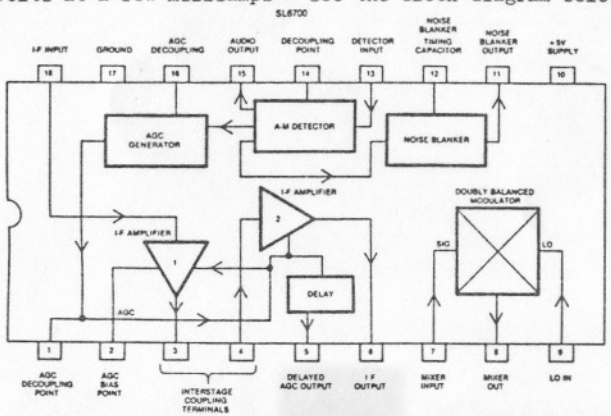
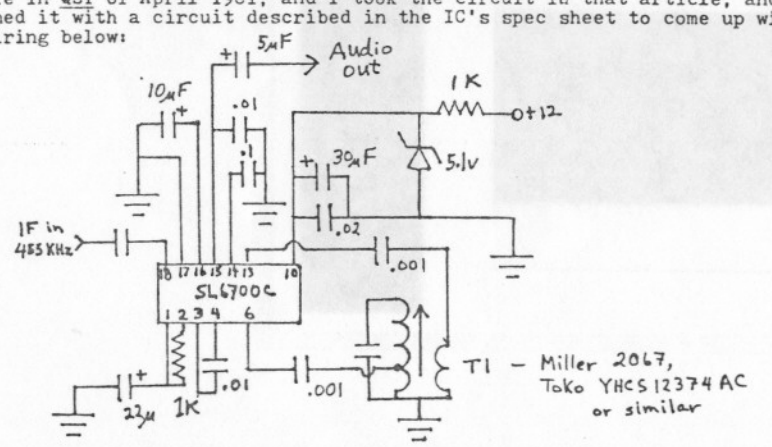
The Plessey SL6700 IF/detector IC by NHP

The Plessey SL6700C IC contains a two stage IF amplifier with AGC, and an AM detector, as well as a noise blanker and double balanced modulator which can be used as a mixer, product detector or linear amplifier. All this in an 18 pin DIP which needs a power supply voltage of just 5 volts at a few milliamps---see the block diagram below:



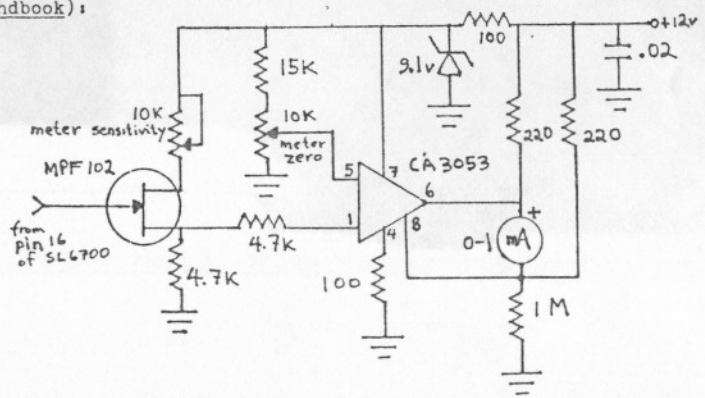
Sounds like the answer to a receiver designer's prayer, and to a large degree it is. The SL6700 was featured in a receiver description article in QST of April 1981, and I took the circuit in that article, and combined it with a circuit described in the IC's spec sheet to come up with the wiring below:



Although the manufacturer claims a possible gain of over 90 dB (!) from IF input to audio output in this IC, I didn't need all that gain. So I ignored the balanced modulator in the IC, which can be used as a linear amplifier if all possible gain is desired at one IF frequency (this device can also be used in a dual conversion mode). Such a large amount of amplification points to a difficulty in using ICs such as this one. You have to wire the circuit very carefully with short lead lengths, and the circuit must be placed inside a metal box to avoid picking up and detecting signals from nearby transmitters---a one centimeter wire stub at pin 18 yielded all my locals at good volume. I mounted the IC and its peripheral components on a PC board and fitted it inside an aluminum mini-box with shielded leads for IF input and audio output and have heard no signals other than the desired 455 kHz ones, and have had no evidence of instability. Supply voltage should be no more than 7 volts, and 4.5 v is optimum, so go easy on the voltage supply. IF input impedance of the IC is given as 3 kΩ which makes it a good match for use with many of the 455 kHz IF filters available today. If you are going to use the IC with higher impedances (such as found in a tube radio) a source follower or similar matching device will be needed.

One problem noted by the QST article was that the IC "locked up" with a strong signal as input, i.e. the AGC action outdid itself and almost entirely suppressed the signal. If a good bit of amplification is used between the antenna and the SL6700, this problem could be quite irritating, as the IC could "lock up" on semi-locals. I reduced the recommended AGC decoupling capacitor at pin 16 from 100 uF to 10 uF (as shown in the above circuit) and this substitution solved the problem for the most part. The audio output lacks bass response if this capacitor is lower than 5 uF however. Reduction in the value of the bypass capacitor at pin 1 also seems possible. Keep gain down before the SL6700!

The SL6700 circuit described above can be used in place of the ZN414 IF amp/detector IC used in the "Crudley-Bathbrush 26" described in DXM of Mar. 7/81 (IRCA reprint M24). Simply connect the IF filter output terminal to the input capacitor of the SL6700, and run the audio output of the IC to the top terminal of the audio gain control--but shield the circuit from at least the antenna input of the radio. As it stands, the S-meter circuit of the "C-B 26" is not suitable for the SL6700, so the circuit below can be substituted (it's from the 1976 Radio Amateur's Handbook):



The "meter zero" trimpot is used to set the meter at zero when no signal is coming in, while the "meter sensitivity" trimpot sets the meter at its maximum reading when you local is tuned in.

I found the combination of the SL6700 and the above S-meter circuit more satisfactory than the ZN414/741 combo in the original "C-B 26". AGC action was a great deal better than the ZN414's on strong signals (though RF attenuation still needed to be increased for locals), and audio quality was superior on all signals; better bass response and crisper treble--much easier to listen to. Audio output lacked the pure volume of the ZN414, but the audio amplifier made up any deficiency. The S-meter was also an improvement, as it showed shallow nulls on locals, yet was useful for direction finding on weak signals. In fact, I was impressed enough to transfer the IF amp/detector/S-meter set-up to my main homebrew receiver which uses tubes in the front end. The warm-up of the tubes in the receiver introduces variations in the S-meter circuit through component heating, but the problem is not serious once the temperature has stabilized.

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Are there any problems with the SL6700? Well, I would prefer an AGC action that could be switched off, but I haven't figured that out using this IC. Using two ICs with the AGC loop running between the ICs might be one way to go, but instability could be a problem without any AGC. A schematic diagram of the internal workings of the device might help, but then again it might be too complex for the poor old brain to master. I suspect the AGC is audio derived, and it does have some problems handling heavy SAHs on a channel, so that the audio is not quite so readable as it might be on a stock TRF for example. Certainly, a more versatile IF amplifier/detector strip than that provided by the SL6700 would be possible to construct, but it would use a great many more components and involve much more work. The SL6700 circuit uses few components, takes up very little space, has a low power requirement, and provides plenty of gain as well as good audio fidelity. It's very useful in simple homebrew radios, and could be used in place of the IF/detector strips of some portable radios to provide greater gain, and to allow one to make the most of the interference rejection qualities of the better IF filters when they are used in such portables.