Hints and Kinks from Abroad

Edited by Doug DeMaw,* W1FB

Pat Hawker's monthly column in Radio Communications, *"Technical Topics," contains some really great data. Here are a few of the gems from past issues of the Radio Society of Great Britain (RSGB) journal.*

MOSFET SSB Adaptor

The March 1978 "Technical Topics" column included an item from Lionel Sear, G3PPT, about a combined product detector/oscillator arrangement that he had found suitable for use in a direct-conversion receiver. He explained that this had stemmed from an item in *Elektor* (combined July/August 1977 issue, page 72) where a 455-kHz version formed the basis of a MOSFET ssb adaptor intended for use with any hf receivers not already fitted with a product detector or BFO. The original circuit is shown in Fig. 1 although, of course, it could be adapted for use at other intermediate frequencies.

It is noted in *Elektor* that self-oscillating product detectors tend to force the oscillator into resonance with the incoming signal, but that the dual-gate MOSFET appears to be reasonably free of this vice. However, by increasing the signal applied to the adaptor, this forced resonance effect can be used deliberately to achieve synchronous demodulation of a-m signals over about a ± 1-kHz range. The oscillator arrangement is based on the Clapp configuration.

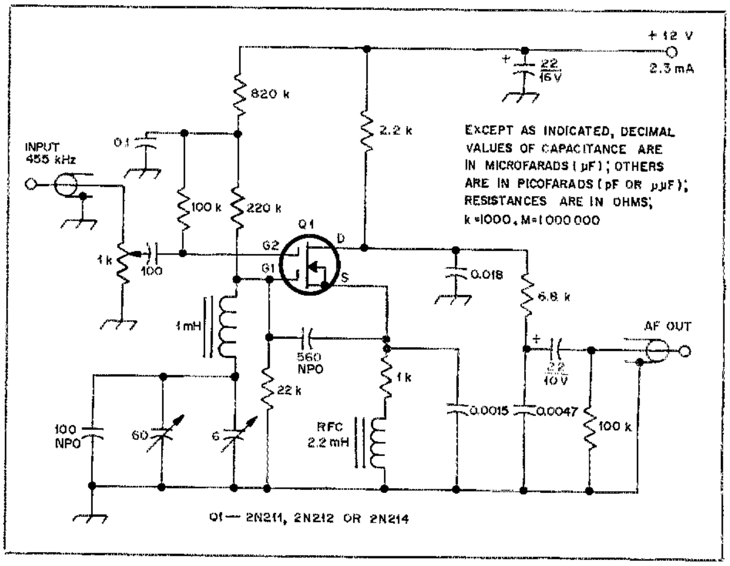

Fig. 1 — MOSFET ssb adaptor featuring combined product detector/oscillator circuit described in *Elektor*.

Matching Coaxial Cables

Wyn Mainwaring, G8AWT, has made effective use of a novel technique for matching different coaxial cables or curing socket-to-cable problems. Although as indicated later, I am not sure whether this is as easy to implement as an alternative idea that was drawn to the attention of readers by G3KYH in "Technical Topics," October 1971, and subsequently has been included in several editions of *ART*. But first let G8AWT explain his technique. He writes:

"Much radio equipment is built to professional standards, including 50-Ω impedance coaxial feeds, of which there are many (and an expensive range of inter-series connectors). The well-established BNC devices are ample for the power levels found in amateur radio and they are usable to 10 GHz; it is small and positive in a quick connection with no threads to cross or bind.

"However, older gear is more likely to have 75-Ω outlets or feed impedance, via a B-L connector. The nickel-plated versions of B-L are a better long-term proposition than the more common aluminum-bodied plug, mating with a nickel or cadmium-plated socket. It depends on a firm push "home" to minimize dielectric air-gap and to ensure reflection-free connection at very high frequencies.

"How can we join the two systems? A λ/4 coaxial matching transformer (taking into account the velocity factor of the cable) can provide the answer if this can be made by using a solid polyethylene cable of an impedance that is the geometric mean of 75/50-Ω systems, i.e., 61 Ω, or in terms of solid polyethylene cables, 67 pF, 100 pF and 82 pF per meter-length of cable. But how can we make a 61-Ω length of cable?

"This can be done without disturbing the inner part or cutting the outer conductor of a piece of single-cored UR43 (or the flex-cored UR76) as follows: Start with the cable correctly terminated at one end with a 50-Ω BNC connector. Then, carefully strip the black PVC sheath from a good λ/4 length at the other end (68 in. [1.7 m] for 28 MHz, 28 in. [0.7 m] for 70 MHz, 13-1/2-in. [343 mm] for 144 MHz; etc.); the outer shield can then be pushed back like a sausage skin to reveal the solid polyethylene dielectric. Next, some readily available plumbers' PTFE pipe-thread tape (0.06 mm thick seems a common type) is lap-wound over the length of polyethylene, forming two layers from the braid toward the free end, then returning toward the braid, forming a three-layer lap, totalling five layers over the polyethylene. It is this taped length that forms the new-impedance cable, an overall diameter of 3.5 mm being needed for this mixed dielectric length of cable.

"The braid now needs to be eased back over the taped section resulting in a shrinkage of about four percent. As much care as possible should be exercised in replacing the braid smoothly and keeping it in place with adhesive PVC tape, which can be multilayered to bring the diameter up to a convenient size for the B-L plug at the 75-Ω matching end, or for accepting a larger PVC tube (from some domestic fringe-type cable) which may be sealed from the weather with Bostick no. 1 or PVX adhesive."

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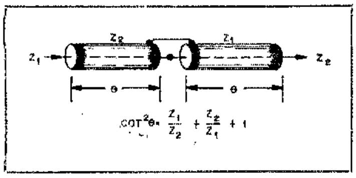

Fig. 2 — Transmission-line transformer used to provide a simple means of matching 50-Ω and 75-Ω coaxial cables.

G8AWT sent along a short length of modified cable showing that it makes up into a very neat arrangement with the $\lambda/4$ matching section built into the cable.

However, the alternative technique suggested in 1971 by G3KYH and based on an article in *Electronic Engineering* (April 1962) is shown in Fig. 2. This permits any two cables of different impedance to be matched together by using appropriate lengths of the cables as shown, thereby avoiding the need for a cable at the geometric mean impedance. G3KYH simplified the original formula to that shown and noted that "for a 50/75-Ω transformer this works out to an electrical length of 29.3° for each section of cable. The physical length must of course take into account the velocity factor of the cables (typically about 0.66-0.80)."

Versatile Calibrator

"Technical Topics," November 1976, showed how the 7490 IC decade divider can, by variation of connections, function as a divide-by-n device, where n is any integer from 2 to 10. An interesting example of how this facility can be put to very practical use is to be found in a handy crystal calibrator designed by G8JKL and G8ISY. This provides marker points for use up to vhf at intervals of 1 MHz, 100 kHz and then the option of either 10- or 12.5-kHz markers.

G8JKL writes: "Since operation on fixed channels has become the vogue on vhf and I use a tunable receiver, the need for something better, in the way of crystal calibrators, than the original band-edge marker soon became apparent. To this end the TTL calibrator shown in Fig. 3 was designed by G8ISY and me. The switching allows netting on to the fm channels which are 25 kHz apart by arranging the second 7490 to divide by either 8 or 10. The unit can be built on Veroboard and conveniently fits into a tobacco box together with three no. 8 cells making a 'jam' fit."

Frame Receiving Antenna

On several occasions we have mentioned briefly the use of simple frame antennas, with single-turn coupling coils, for DX reception of medium-wave broadcast or 1.8-MHz stations. Each time inquiries have been received seeking further constructional details, although these are not particularly critical. As such a design has recently appeared in *Electronics Australia* (October 1976), the opportunity is taken of reproducing it (Fig. 4).

About 100 feet (30.4 m) of plastic-covered wire (about no. 22) should be used for the main winding. This should be wound to a whole number of turns; if it will not tune to 1.8 MHz with seven turns, take one off and try again. Coaxial cable (75 Ω) can be used instead of 300-Ω balanced line to the receiver, but aim at making the windings and general construction as symmetrical as possible, since the depth of the rejection null depends on the electrical balance. Tune in signals on the receiver, peaking the antenna tuning control and adjusting direction of loop for maximum pickup or for maximum rejection of interference. QST

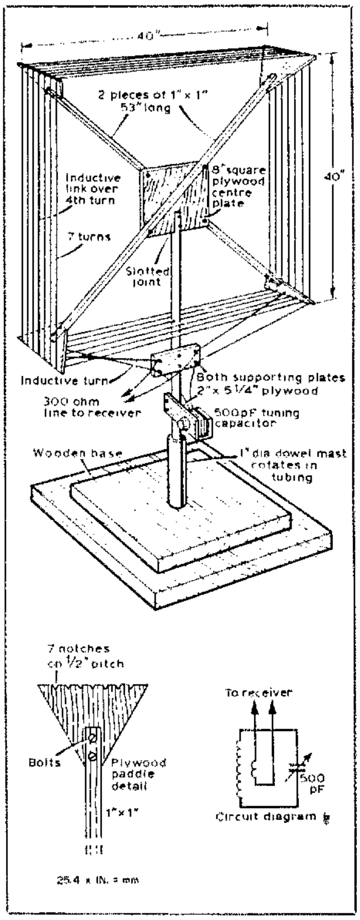

Fig. 4 — Constructional details of loop antenna for operation on medium waves and/or 1.8 MHz and capable of providing deep null on interfering signals (*Electronics Australia*).

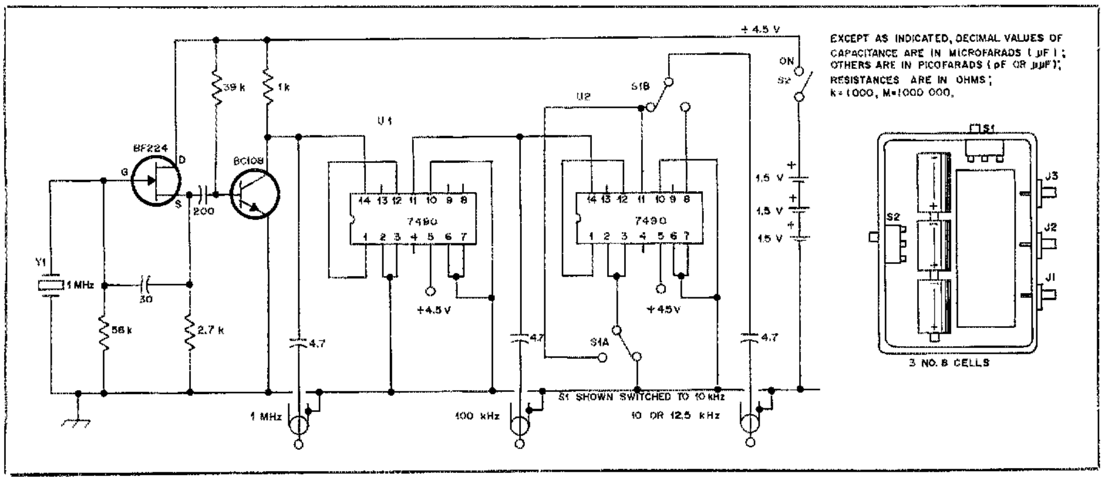

Fig. 3 — The versatile calibrator providing switchable 10- or 12.5-kHz markers.