air test

USER REPORTS ON SETS AND SUNDRIES

MICROWAVE MODULES MMT 1296/144 TRANSVERTER

If the cut and thrust, contest-crammed h.f. bands have failed to stimulate your interest and 24GHz seems just beyond your horizon at the moment, why not contemplate operation at 23cm?

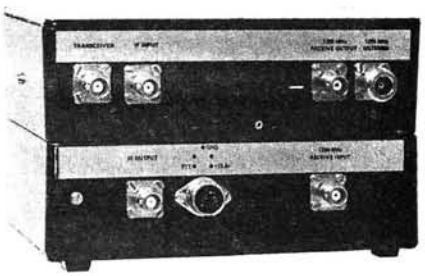
Microwave Modules, renowned for their range of r.f. products, produce the MMT 1296/144 transverter which, when used in conjunction with a 2m multi-mode transceiver, provides a ready means of access to the lowest of the amateur microwave bands.

The transverter is an all solid-state, linear device and will provide 1·3W of r.f. in the range 1296 to 1298MHz, for an input 144MHz drive level of approximately 400mW.

A Zener diode controlled crystal oscillator, running at 96MHz using a 5th overtone high stability quartz crystal, provides the basis of a highly accurate and stable local oscillator source. A pair of frequency doubler stages produce a signal at 384MHz which is then passed to a conventional high *Q* filter, before being amplified and tripled to the transceive local oscillator frequency of 1152MHz. A printed multi-section side-coupled filter reduces the unwanted products of the preceeding ×12 multiplication stages to −50dB, before application to the stripline quadrature mixer.

Signals from the antenna system are fed to the receive converter section of the transverter via an N type socket. A two-stage, signal frequency, microstrip pre-amplifier, housed in its own diecast enclosure, provides gain before the first r.f. amplifier, a low noise NEC silicon transistor. Accurately controlled d.c. conditions and microwave matching techniques ensure a very low inherent noise figure front end. Microwave Modules quote a maximum noise figure of 2·9dB and typical overall gain of 25dB.

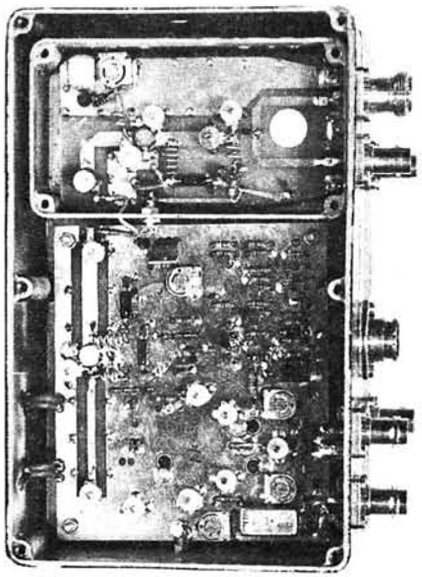
The received signal is routed through a multi-section, λ/2 side-coupled microstrip filter to a BFR34a, second r.f. amplifier. The amplified signal frequency r.f. is subsequently applied to one of the ports of the hybrid mixer, which incorporates a pair of low-noise Schottky diodes. The 144MHz output



of the mixer stage then passes via dual gate MOSFET amplifier stages to the i.f. b.n.c. OUTPUT port.

The transmission path starts with 2m drive applied to the b.n.c. TRANSCEIVER socket. A 15dB, π section, in-line attenuator is provided with the transverter to allow drive levels of up to 10W; approximately 400mW being required to achieve the full rated 1296MHz output.

From the TRANSCEIVER port the 2m input signal is passed through an on-board variable attenuator, before being applied to a discrete balanced mixer stage, formed by a pair of BFR34a devices, to produce the wanted signal at 1296MHz. Two stages of linear amplification follow the mixer before application to the separate, diecast box mounted, p.a. compartment.



The linear final p.a. stage features a rugged, well proven, silicon transistor to obtain a continuously rated r.f. output of 1·3W. Printed stripline techniques are used with antenna changeover switching accomplished by a *pin* diode λ/4 relay, which has an insertion loss of under 0·5dB.

To allow independent operation of the receive converter b.n.c. sockets are provided on the front panel, together with coaxial jumper links. Constructional layout consists of a pair of 195 × 115 × 55mm, black enamelled, diecast enclosures, mounted back-to-back; 12V d.c. and p.t.t. line "hard switching" is routed via a five pin DIN socket. RF VOX is provided as a standard feature; indicators on the unit illuminate on TRANSMIT and whilst power is applied.

Internal construction follows the usual Microwave Modules "compartmentalised" technique and proves to be very satisfactory from both the r.f. and mechanical viewpoint. All components are readily accessible for servicing and are mainly mounted on high quality glass fibre and Teflon p.c.b.s.

Operation

The review sample MMT 1296/144 has been put to good use over the last six months, principally by fellow microwave enthusiast and *PW* contributor, Nick Foot G8MCQ.

Initial operation occurred during the 1981 v.h.f. NFD from Bulbarrow Hill, YK19a, 11km West of Blandford in Dorset, using the callsign G4GTH/P. The transverter was first used to drive a home brewed 15W p.a. stage, consisting of two 2C39 valves. The p.a. output was fed to a single G3JVL, quad loop Yagi at 12m a.g.l. via a length of RG8U cable (estimated 3dB cable loss). An additional relay was found to be required in the antenna path to prevent r.f. leakage into the receive converter. When operating the unit barefoot no problems of this nature were encountered.

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The station check log lists many contacts, including a 5/9 exchange with G3XDY/P in AM67f, a distance of 283km. As is usually the case, rain occurred during the evening and the outboard p.a. stage slowly decomposed due to the combined effects of a cathode to grid short and flash-over of the h.t. supply! (G4GTH/P was located in a tent). Further contacts were made using the, still fully operational, barefoot transverter, s.s.b. being superseded at one point when our own G4LFM pounded the key during the early hours.

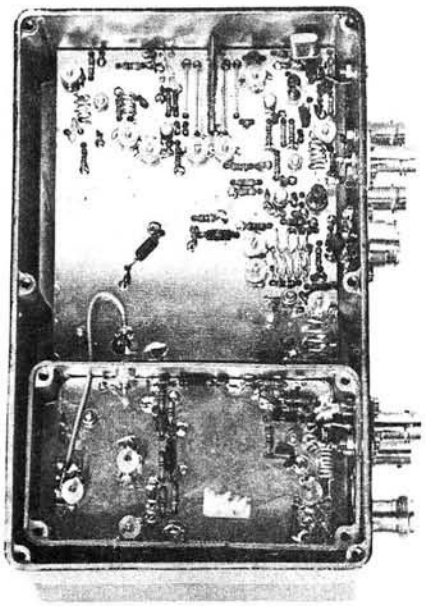
From his home QTH in Poole, 30m a.s.l., using a single quad loop Yagi at 10m a.g.l., Nick has since had a considerable number of 1296MHz contacts. The Martlesham Heath beacon, GB3BPO on 1296·830MHz is normally audible over what is by any standards a fair distance. During periods of lift Nick comments that only the relatively low occupancy of the band limits DX operations, propagation effects bear a close resemblance to the lower v.h.f./u.h.f. bands, and lifts occur with surprising regularity.

In flat conditions contacts are readily made over seemingly obstructed paths, once again showing the characteristics of 70cm and most definitely not just "line of sight".

With such a short wavelength at 1296MHz (23cm), antenna systems possessing high gain become mechanically manageable, parabolic dishes are a practical proposition and finding favour for e.m.e. use.

Maybe 1982 will see the long overdue increase in use of our lowest microwave band. See you there.

JOHN M. FELL.



1296 BEACONS (UK)

GB3NWK	AL51b	1296·810MHz
GB3BPO	AM77j	1296·830MHz
GB3AND	ZL63b	1296·870MHz
GB3DUN	ZL08e	1296·890MHz
GB3IOW	ZK34a	1296·900MHz
GB3CLE	YM48h	1296·910MHz
GB3LEL	ZM24j	1296·920MHz
GB3MLE	ZN32b	1296·930MHz
GB3EDN	YP04g	1296·990MHz

Thanks to **Microwave Modules, Brookfield Drive, Aintree, Liverpool L9 7AN. Tel: 051 523 4011,** for the loan of the review model MMT 1296/144 which is available at £184.00 direct from MM or their approved distributors.

Passport To Amateur Radio-8

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The circuit is inherently insensitive to amplitude variations and provides good rejection of a.m. signals and noise.

AF Amplifier

The receiver a.f. stage is usually quite conventional and would normally provide sufficient power output to drive a small loudspeaker or headphones.

Converters

A converter is basically a self-contained frequency changer stage which can be used ahead of the receiver to allow it to tune a different frequency range. For example a two metre converter would convert the 144-146MHz input to, say 28-30MHz output for reception on a receiver capable of tuning these frequencies. A block diagram of a 2-metre converter is shown in Fig. 79. Note that here the oscillator frequency is fixed and the receiver is used as a "tuneable i.f.".

Construction

If you are a budding transmitter or receiver constructor, please remember that the circuits appearing in this series are typical examples with typical component values; they are not presented as tried and tested, ready-to-build designs. Layout, component lead length etc., greatly influence r.f. circuits, so if you are just itching to build something, stick to a fully detailed design, at least for your first attempt.

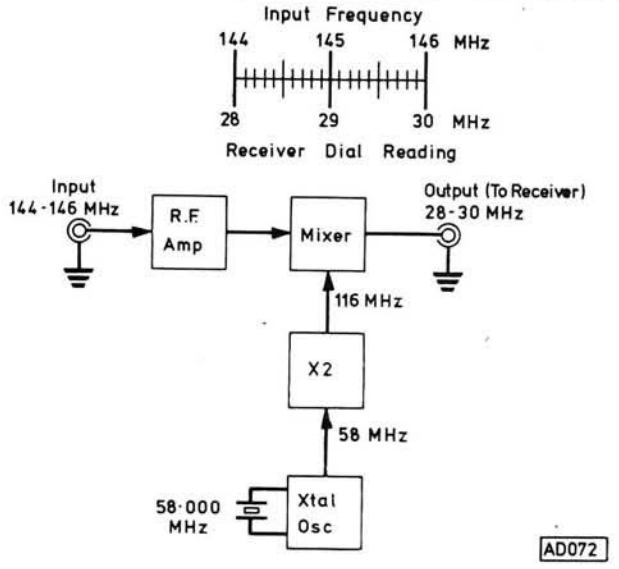

Fig. 79: Block diagram of a 2-metre converter, and how the input frequency and receiver dial reading are related

Next month we will look at the topics of propagation and antennas.