MM2001 RTTY Converter Review

By Peter Metcalfe G8DCZ

EIGTH, HI HI I HAD TROUBLE THINKING ABOUT THAT ONE, THE BIG WEBE
IS
THE FT-ONE THROUGH A TRANSVERTER , I ALSO .AVE 70 CMS MOIULE.WE.
L I V
PUST SAY IT IS NICE TO HEAR YOU ON THE RTY AND I XAM PLEASEI T:
BE YO.R
FIRST CONTACT, I THINK IT WAS YOU WHO CA.LLED FOR PETED EAB.IES
C..
I THINK HE WILL BEON IN A SHORT WHILE.

One cannot help but notice that over the past few years RTTY has increased in popularity, especially among newly licensed amateurs on the 2m band. Basically there are three ways to 'get going' in this mode, all three requiring some form of terminal unit (TU) to convert the signal into two separate tones. The difference comes with the display device:

1. The old tried and tested teleprinter, of which the most popular tends to be the Creed models *7B* and *7E*. This method has the advantage that the hardware is fairly cheap and readily available. However, there are problems in that teleprinters are very noisy and space consuming and therefore, this method is usually confined to the 'bottom of the garden' shack.

2. Microcomputer decoding and display, which is a most attractive method gaining in popularity over the past few years due to the availability of cheap 'personal' computers eg. *ZX81, UK101, PET* etc. As more and more of these machines find their way into the radio shack, amateurs are beginning to see their TU and some form of interface is available, all that is needed is a software package. This could be self-written (cost £0 but the time taken could be expensive!) or bought for many of the more popular machines. Another offshoot of this method is the use of ASCII code rather than BAUDOT or AMTOR and experimentation with higher data rates than the usual 45.5 baud. (Incidentally, the term 'BAUDOT' or sometimes 'MURRAY' are normally used, but strictly speaking it should be 'CCITT No. 2' — I think I'll stick to BAUDOT!')

3. As a result of (2), many manufacturers are now producing self-contained microprocessor-controlled devices which contain the TU and software (usually in an EPROM). All that is needed to complete the station is a rig, a conventional TV (or a VDU for better results) and a power supply. This

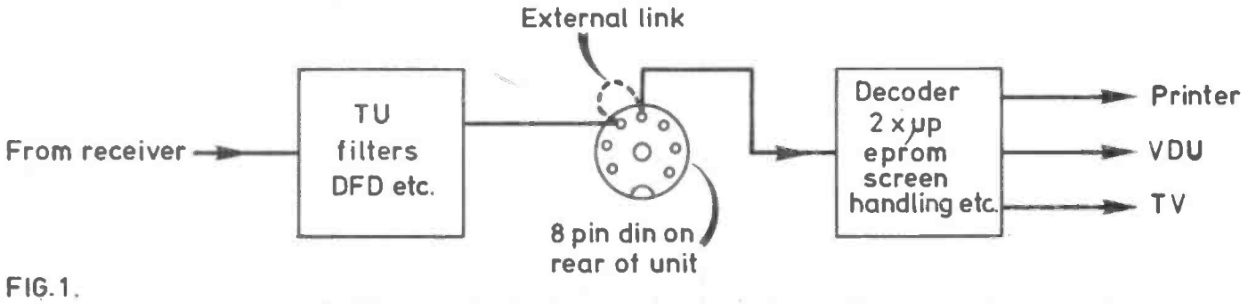
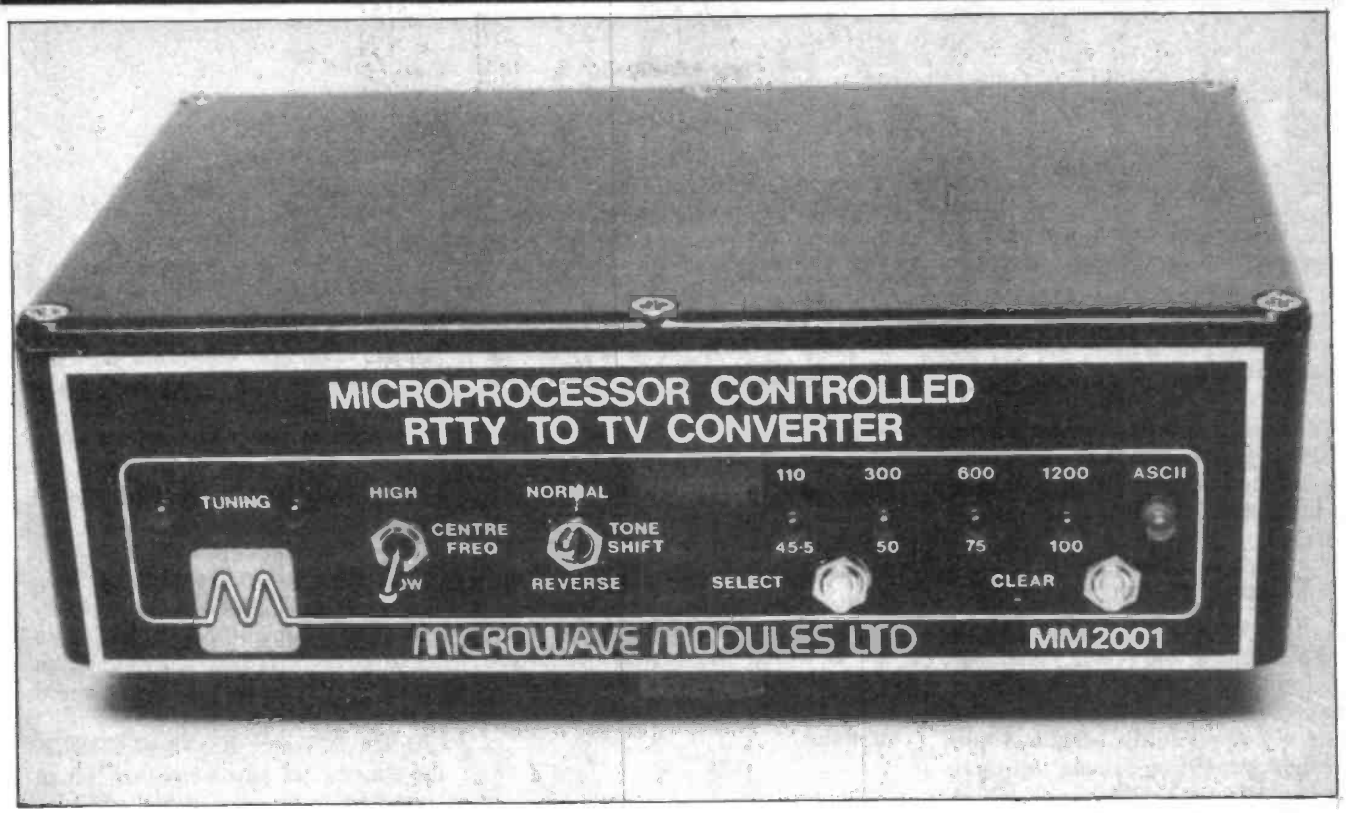


FIG.1.



The Microwave Modules *MM2001* RTTY receive converter can cope with most standards, but carries a price tag of £189.

method gives all the advantages of the second method without the programming or construction problems although it does tend to be rather expensive. (Up comes the old argument of 'black box' versus home construction!)

One such device in the third category is the Microwave Modules *MM2001* which is a receive only RTTY to TV converter at just under £200. (The companion *MM4001* at around £300 gives transmit capabilities also, when coupled to a suitable keyboard.

What you get for your money

The *2001* is constructed in a very rugged-looking 7¾" by 4¾" by 2" by 2" die-cast box and caters for virtually all the speeds likely to be encountered on the air ie. BAUDOT 45.5, 50, 75 and 100 baud and ASCII 110, 300, 600 and 1200 baud. The different speeds are selected by a single push button on the front panel, which steps sequentially through the modes, and are displayed by a group of five LEDs. Tone frequencies and shifts are selected by a pair of toggle switches and the options available are shown in Table 1. A 'clear' button does as its name suggests and it is recommended that this be pressed on initial switch-on. The front panel is completed by a pair of 'tuning' LEDs which indicate 'mark' and 'space' tones.

On the rear panel are three phono sockets for connection to a TV (UHF out on channel 35), composite video (labelled VIDEO OUT) and 'audio in' from the receiver. A five pin DIN socket accepts 9-12.5V DC at around 700mA along with a second audio input paralleled with the phone socket. A 25 pin 'D' connector is provided for connection to Centronics-compatible parallel ASCII printers (ie. 7 data bits, positive acknowledge and negative strobe lines). The rear panel socket line-up is completed by an eight pin DIN socket which, for normal operation, must have the supplied plug inserted. This socket makes it possible to separate the two main parts of the unit so that one can try out homebrew TU's or decoders (see **Fig. 1**).

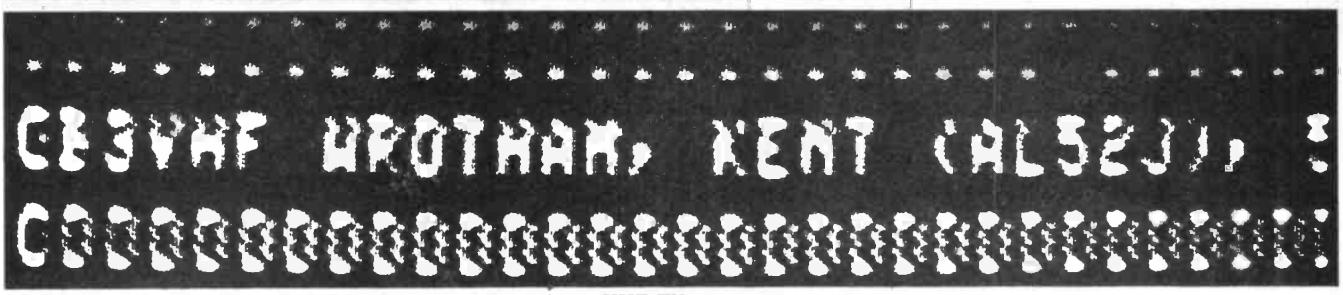
Black characters on a white background or the reverse are available from the unit. Also a 'case control' switch, when 'on' and the unit is receiving BAUDOT code, forces a letter shift after fifteen consecutive figure shifted characters (useful when decoding noisy signals where a letter shift code could be easily missed). Some rather crafty software ensures that overprinting, e.g. due to missing carriage return or line feed in BAUDOT, never occurs.

Open the box

Disappointingly, on opening the box, one is confronted by a single socketed EPROM mounted on the solder side of a printed circuit board. However, the removal of four nuts gives access to the works and very nice it looks too! Two high quality plated-through-hole fibreglass boards, mounted with component sides facing, contain an impressive mixture of linear, TTL and CMOS ICs.

The top board contains two processors, a 6802 (forerunner to the 6502 and a very powerful device) and a 96821 (presumably for screen control etc?). Five LM348's (quad op-amps) along with a sprinkling of digital ICs form the frequency discriminator. Also there are 74LS244's (octal tri-state buffers) for the printer output.

The bottom board boasts a standard UHF modulator, two 2114's (ie. 1K by 4 bit memory chips) for the screen memory, providing 16 lines of 64 characters, and a host of



RTTY identification from GB3VHF beacon. Photo from UHF TV receiver.

associated logic. Throughout the design there is scope for expansion ie. space and decoding exists for 2732 EPROMS instead of the current 2716 and there are many vacant IC pads. The same boards are obviously used in the *4001* transmit/ receive version.

Operating impressions

One word of warning when using this unit is that it is not designed for the quick 'lash up'. As the information sheets advise, all leads must be very thoroughly screened and the box lid screwed down tightly or else excessive QRM is experienced. This also means that the TV/VDU should be situated well away from the rig/aerial feeder. However bearing this in mind, the picture quality is acceptable on a standard UHF set and is perfectly readable even when using a 6" portable (although the black on white option did produce some rather distracting vertical dark lines between character slots). For the best results a VDU should be used and then the picture produced is excellent.

On 2m FM the unit performed very well, although one or two minor irritations were found. A good noise-free signal of at least S2 is needed, otherwise rubbish is generated, and the audio input required to drive the unit is rather high. If you want to monitor the tones while decoding, the level is ear shattering! Initially a little trouble was experienced with selecting the mode and speeds, but with practice this becomes second nature. However, I found that the speed select push button could have done with a little more 'de-bouncing', as it occasionally stepped twice. With so much going on when initialising a contact, especially on HF or 2m SSB, this can lead to confusion and frayed tempers! I also feel that rather more band pass or even lowpass filtering of the signal would be helpful as any noise (eg. FM hiss or more notably HF noise) on the signal causes rubbish to be displayed. On the subject of 'rubbish' in the BAUDOT mode, noise or an unrecognised code produces a stream of full stops or commas. This can be confusing as many RTTY operators punctuate QSOs with a string of full stops. Perhaps some more appropriate character could be programmed as the 'invalid' code eg. ■ or an inverse 'E'. A better solution might be to have software error traps and not display anything.

Tuning

When trying to decode HF RTTY considerable practice and patience is needed. The points mentioned above together with problems in tuning the receiver to produce the correct tones make it a very difficult task. Eventually one becomes accustomed to the correct sound and can tune in by ear approximately. The so-called tuning LEDs (one for mark and one for space) are practically useless and it becomes more of a hit and miss process. For HF reception I was using an old *KW2000 (without the mods — I really must read that series!)* and found that its stability, while being what I would consider adequate for the reception of SSB, was not really good enough for this unit. Speeds higher than 45.5 baud and high speed ASCII were practically impossible to resolve consistently. *I found exactly the same tuning difficulty experienced by Peter Metcalfe when using the unit with my synthesised transceiver, stability 10's of Hz/hour. — Ed.* To be fair to Microwave Modules, they do warn you of this albeit for a different reason!

"At 300,600 and 1200 baud ASCII the purity of the received tones becomes more and more critical. Therefore it is essential that the receiver in use is of sufficient quality so as not to alter the audio quality which could result in corrupt copy".

Generally the unit, although having a few drawbacks, provides a quick and easy (if not cheap) way of listening to RTTY. For VHF work, especially FM, it is quite adequate for beginners. However, I feel that one would soon want to dabble in a homebrew TU for better results and here the unit can provide a ready-built decoder of excellent quality. The construction is sound and the information sheets, while being a little skimpy, do provide sufficient information to get going. ●

Table 1

Digital frequency discriminator settings

MARK TONE (Hz)	*SPACE TONE (Hz)*	*SHIFT (Hz)*
1445	1275	170
1275	1445	170
1700	1275	425
1275	1700	425
2125	1275	850
1275	2125	850
2400	1200	1200
1200	2400	1200