



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