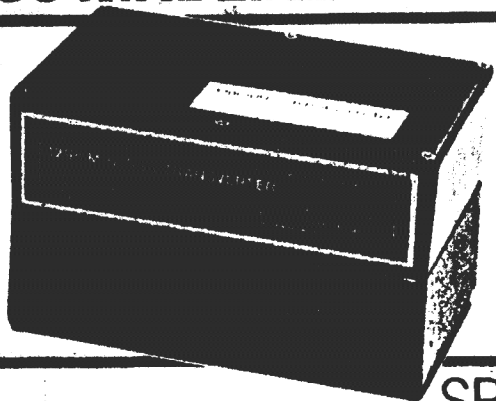


MICROWAVE MODULES LTD

1296 MHz LINEAR TRANSVERTER: MMT 1296/144



- ★ RECEIVE CONVERTER INCLUDES A TWO STAGE LOW-NOISE MICROSTRIP PREAMPLIFIER CONSTRUCTED ON TEFLON PCB AND HOUSED IN A SEPARATE INTERNAL ENCLOSURE
- ★ EXTENSIVE FILTERING ENSURES EXCELLENT OUT OF BAND SIGNAL REJECTION
- ★ 1.3 WATTS TRANSMIT OUTPUT POWER
- ★ BUILT-IN PIN DIODE AERIAL CHANGEOVER RELAY
- ★ RF VOX PROVIDES AUTOMATIC OPERATION
- ★ HIGHLY STABLE ZENER DIODE CONTROLLED 96 MHz OSCILLATOR
- ★ 13.8 v DC OPERATION

SPECIFICATION

GENERAL

Frequency coverage	: 1296-1298 MHz
Input frequency range	: 144-146 MHz
DC power requirements	: 13.8 v at 0.5 A
RF connectors	: 'N' type antenna socket, all others 50 ohm BNC
Power connector	: 5 pin DIN socket
Size	: 187 x 120 x 106 mm (7 ³ / ₈ x 4 ³ / ₄ x 4 ¹ / ₄)
Weight	: 1.8 Kg (4 lb.)

TRANSMIT SECTION

Input impedance	: 50 ohm
Input modes	: SSB, FM, AM or CW
Input required for full output	: 5 - 500 mW or 10 watts with supplied 15 dB attenuator
Power output	: 1.3 watts continuous rating
Output impedance	: 50 ohm
Level of spurious outputs	: Better than -40 dB.

LOCAL OSCILLATOR

Local oscillator frequency	: 96 MHz
Maximum error at 1296 MHz	: ± 6 KHz

RECEIVE SECTION

Overall converter gain	: 25 dB typical
Noise figure	: 2.9 dB maximum
Input impedance	: 50 ohm
IF output impedance	: 50 ohm

DESCRIPTION

This 1296 MHz solid-state linear transverter, MMT1296/144 is intended for use with a 144 MHz transceiver to produce a high reliability transceive capability at 1296 MHz.

The inclusion of an RF vox network minimises the necessary connections to the drive source, and will automatically switch the transverter into the transmit mode when 144 MHz drive is applied.

The transverter incorporates two main sections: (1) MMK1296/144, low-noise receive converter incorporating MMA1296 low-noise preamplifier, and (2) a low distortion transmit converter and power amplifier module. This modular construction technique ensures excellent electrical and mechanical stability, and the unit is ideal for all types of communication, particularly where a high degree of stability, sensitivity and linearity are of prime importance. The transverter is enclosed in a dual compartment case, and all circuitry is constructed on high quality glass-fibre printed circuit board, with the exception of the preamplifier which is constructed on TEFLON PCB. The high power linear amplifier stage is housed in a separate internal compartment.

Oscillator Chain

A zener diode controlled crystal oscillator at 96MHz using a high stability 5th overtone quartz crystal provides a high degree of accuracy and stability for the transverter. Multiplication of the oscillator signal is achieved by two doubler stages which produce a signal at 384 MHz. This signal is then filtered by a conventional high Q filter and is amplified before the final local oscillator injection is achieved in a BFR34a tripler stage. The final injection (12 times the 96 MHz oscillator), is fed into a printed multi-section, side-coupled filter which gives a purity of local oscillator injection to the mixers of -50dB.

Receive Converter

Incoming 1296 MHz signals are fed to a two stage microstrip preamplifier, housed in an internal diecast enclosure. The first RF amplifier stage utilises a low-noise NEC silicon transistor, with accurately controlled DC conditions and microwave matching to ensure the very low-noise figure inherent in this converter. This signal is then fed through a multi-section, half-wave, side-coupled microstrip filter, before further amplification is achieved by the BFR34a second RF amplifier stage. This two stage preamplifier is constructed on TEFLON PCB. The output from the preamplifier is then passed to a printed quadrature hybrid mixer, incorporating a pair of low-noise Schottky diodes, and IF gain is achieved by the inclusion of a MOSFET IF amplifier stage.

Transmit Converter

Incoming 144 MHz drive to the transverter is attenuated via the supplied 15 dB attenuator. This attenuated signal (400 mW approx.) is fed into an on-board variable attenuator, and is then mixed with the 1152 MHz local oscillator injection in a balanced mixer utilising a pair of BFR34a transistors, to produce the wanted signal of 1296 MHz. This signal is then amplified by two linear stages, before further amplification in the power amplifier compartment.

Power Amplifier Compartment.

This linear amplifier uses a highly rugged and well proven silicon transistor which produces a highly reliable continuous output power of 1.3 watts. Printed stripline techniques are utilised and aerial changeover is achieved by a PIN diode quarter-wave relay. This type of changeover relay has many advantages over a conventional type, the most important being its low insertion loss of less than 0.5 dB.

For independent operation, the receive converter may alternatively be connected without the use of the internal PIN diode changeover relay.

UNIT DESCRIPTION

This solid state linear transverter, MMT1296/144, is intended for use with a 144 MHz transceiver to produce a high reliability transceive capability at 1296 MHz.

When used in conjunction with such a transceiver, this transverter will allow any 144 MHz SSB, FM, AM or CW equipment to be used at 1296 MHz.

The transverter is supplied with a 15 dB attenuator unit, WHICH MUST BE CONNECTED TO THE AERIAL SOCKET OF YOUR 144 MHz TRANSCEIVER IN BOTH TRANSMIT AND RECEIVE MODES, AT ALL TIMES.

MAXIMUM RECOMMENDED POWER LEVELS TO BE FED INTO THIS ATTENUATOR ARE AS FOLLOWS:—

10 WATTS CONTINUOUS (FM)

15 WATTS INTERMITTENT (SSB)

PLEASE TAKE EXTREME CARE TO AVOID OVERLOADING THE INPUT OF THE TRANSVERTER.

The inclusion of an RF vox network minimises the necessary connections to the drive source, and will automatically switch the transverter into the transmit mode when 144 MHz drive is applied. For further details, refer to page 5.

The incorporation of a low noise receive converter and a low distortion transmit converter makes the unit ideal for all types of communication, particularly where a high degree of stability, sensitivity and linearity are of prime importance.

The unit is housed in a highly durable black die-cast enclosure. The high power linear amplifier stages are housed in a separate internal compartment, thus ensuring excellent electrical and thermal stability.

The low noise 2 stage microstrip preamplifier is also enclosed in a separate internal compartment, and is constructed on Teflon p.c.b.

X11



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L23
L26

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2N4401

2TX300 BC387

2.

TRANSCEIVER

For transceiver operation at 1296 MHz this socket should be connected to the aerial socket of the existing 144 MHz transceiver via the supplied 15 dB attenuator. Attenuated incoming 144 MHz RF power is sampled by the RF VOX network, which enables the appropriate connection to the receive or transmit section of the transverter to the existing 144 MHz transceiver. On receive this socket provides access to the receive converter, thus allowing incoming 1296 MHz signals to be converted to 144 MHz.

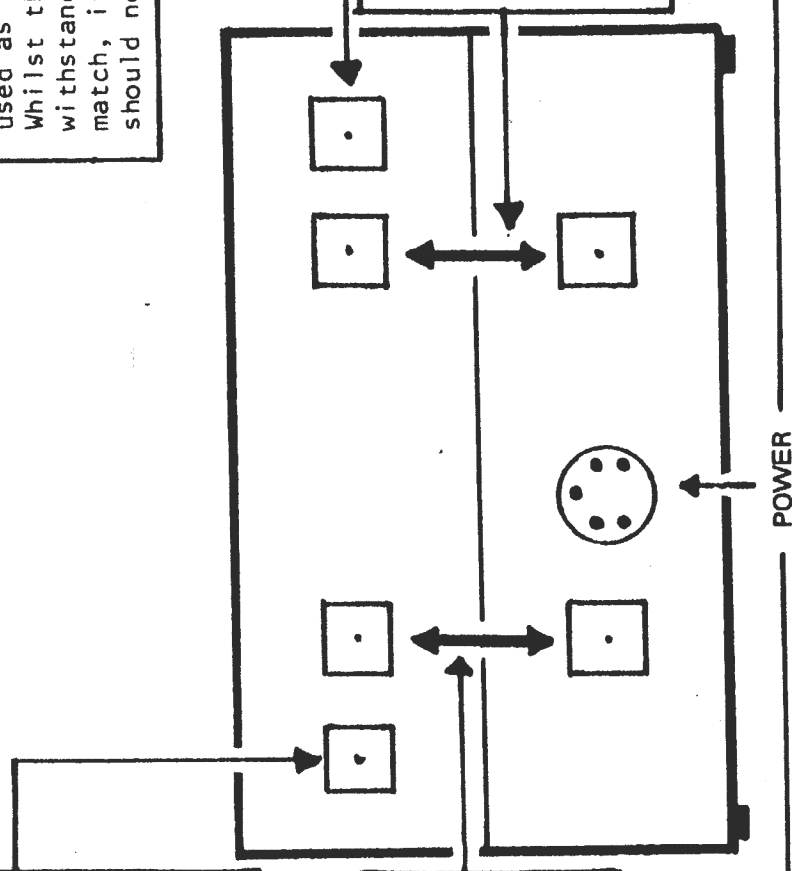
This coaxial link connects the receive converter to the internal RF VOX changer, to provide "one socket" operation. By removing this coax link, the receive converter output (at the socket marked, IF OUTPUT) may be accessed for connection to an alternative 144 MHz receiver.

SOCKET FUNCTIONS

1296 MHz ANTENNA

As supplied, the transverter is wired for transceive operation, and this socket is used as the common 1296 MHz input/output. Whilst the P.A. transistor is able to withstand a considerable degree of mismatch, it is recommended that the SWR should not exceed 2:1

This coaxial link connects the receive converter to the internal aerial c/o relay, to provide "one-socket" operation. By removing this coax link, the receive converter input (at the socket marked "1296 MHz RECEIVE INPUT") may be accessed for connection to an alternative aerial or aerial c/o system.



This socket carries all the DC functions of the transverter.

When looking at the socket as pictured below connections are as follows -

PIN1 -T/R

External control of the switching is available at PIN1 (marked T/R), and the application of an earth this pin will switch the transverter into the transmit mode. The current drawn from this pin, relative to earth is 1 mA.

PIN2 - NO CONNECTION

PIN3 - NEGATIVE (EARTH)

This line should be connected to the negative side of the supply, and earth.

PIN4 - NO CONNECTION

PIN5 - POSITIVE (+13.8v)

This line should be connected to +13.8 Volts, in both receive and transmit modes.



SYSTEM CONSIDERATIONS

INPUT ATTENUATOR

This transverter is supplied with an external 15dB attenuator which allows the transverter to be used with a 144 MHz transceiver having an output power of 10 watts.

However, by leaving the attenuator out of circuit the transverter may be driven from a low power transceiver, in which case the input level needed to give full output power is 300 mW.

TRANSMIT/RECEIVE SWITCHING

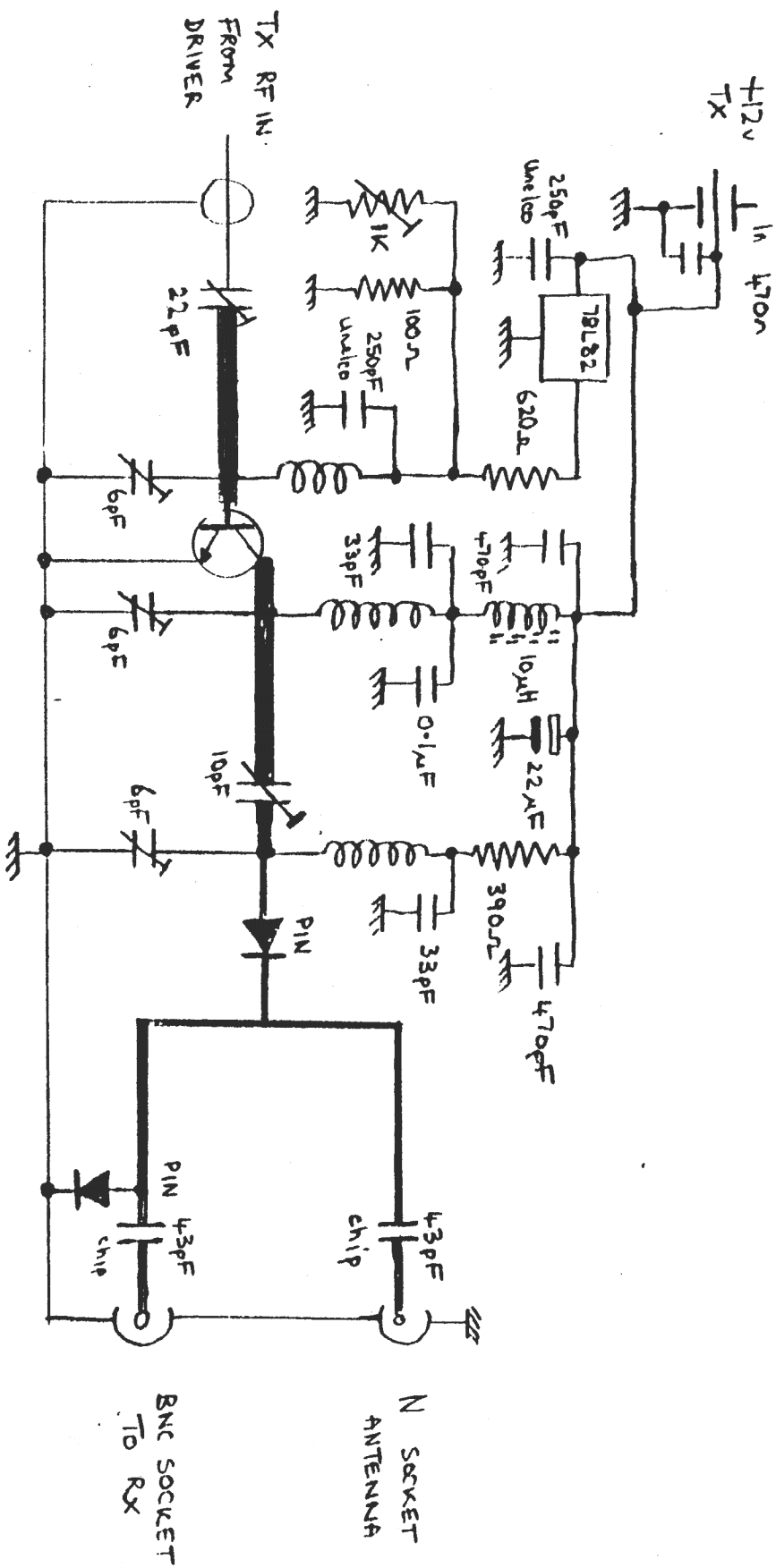
Grounding pin 1 of the 5 pin DIN power socket will switch the transverter into the transmit mode.

This may be achieved by connection to your transceiver switching circuitry. Alternatively, in the absence of this connection, the transverter will be switched into the transmit mode when 144 MHz drive is applied, by means of internal RF COX circuitry.

However, we would recommend that the RF VOX is used only in circumstances where the transverter is used remotely from the transceiver, or when the transceiver does not have a suitable switching facility.

WARNING

- (a) DO NOT REVERSE THE POLARITY OF THE POWER SUPPLY - SEVERE DAMAGE MAY RESULT
 - (b) DO NOT EXCEED A VSWR OF 2:1
 - (c) DO NOT, UNDER ANY CIRCUMSTANCES, RUN THE TRANSVERTER WITHOUT A SUITABLE LOAD CONNECTED
 - (d) DO NOT EXCEED 14 VOLTS DC TO THE TRANSVERTER, OTHERWISE OVERHEATING WILL ENSUE
 - (e) DO NOT EXCEED AN INPUT DRIVE LEVEL OF 10 WATTS TO THE TRANSVERTER FOR SUSTAINED PERIODS
 - (f) DO NOT ALLOW RF POWER TO BE FED INTO THE SOCKET MARKED 'IF INPUT' AS THIS WILL DAMAGE THE RECEIVE MIXER
 - (g) DO NOT OPERATE THE TRANSVERTER WITHOUT THE 15dB ATTENUATOR BETWEEN THE TRANSCEIVER AND THE TRANSVERTER
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(MRF58T) 5D1005

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(PA. SECTION OF MM1296)

Issue 1

10/80 Drawn by RCW

