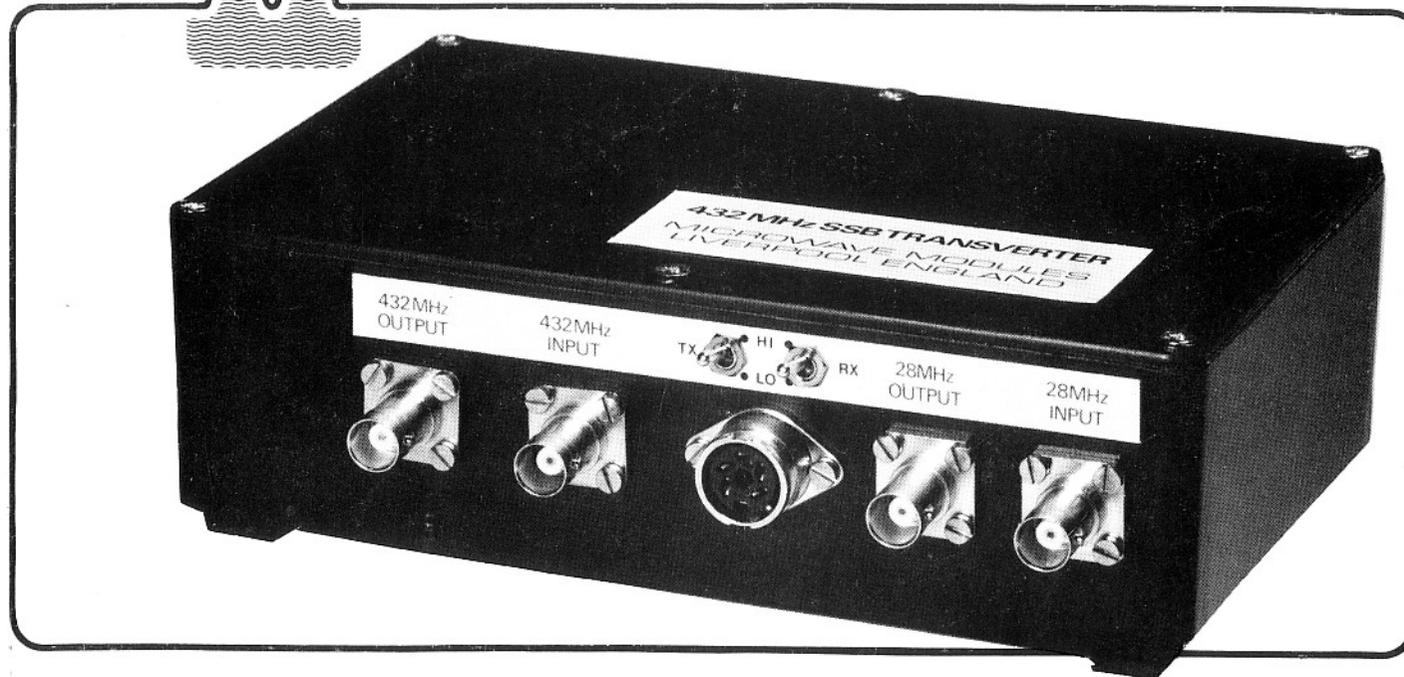




MICROWAVE MODULES LTD



**432 MHz LINEAR TRANSVERTER  
MMT 432/28-S**



## INTRODUCTION

This high performance solid state 432 MHz transverter is intended for use with 28 MHz SSB, FM, AM or CW equipment.

Please read this instruction book carefully to get the full benefit from your MMT 432/28-S.

### CONTENTS

|                           |     |     |     |     |     |     |     |     |     |      |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| UNIT DESCRIPTION          | ... | ... | ... | ... | ... | ... | ... | ... | ... | 2    |
| SPECIFICATION             | ... | ... | ... | ... | ... | ... | ... | ... | ... | 3, 4 |
| SOCKET CONNECTIONS        | ... | ... | ... | ... | ... | ... | ... | ... | ... | 5, 6 |
| FREQUENCY RANGE SELECTION | ... | ... | ... | ... | ... | ... | ... | ... | ... | 7    |
| BLOCK DIAGRAM...          | ... | ... | ... | ... | ... | ... | ... | ... | ... | 8    |
| SYSTEM CONSIDERATIONS     | ... | ... | ... | ... | ... | ... | ... | ... | ... | 9    |
| WARNING                   | ... | ... | ... | ... | ... | ... | ... | ... | ... | 10   |



## UNIT DESCRIPTION

This 432 MHz solid state linear transverter is intended for use with a 28 MHz transceiver to produce a high reliability transceive capability for satellite or terrestrial communication.

The unit has two ranges, 432—434 MHz and 434—436 MHz, each for an I.F. of 28—30 MHz. The appropriate range is selected by the two toggles switches, located directly above the D.C. power socket. This facility has been included to enable the transverter to be used for communication via satellite.

**Further details of this facility appear on page 7.**

Should the transverter be used remotely from the transceiver, an RF VOX network is included which will switch the transverter into the transmit mode when 28 MHz RF drive is applied.

**Further details of this facility appear on page 9.**

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 diecast case and all circuitry is constructed on high quality glass-fibre printed circuit board. The high power linear amplifier stages are housed in a separate internal compartment, thus ensuring excellent electrical and thermal stability.

A wide range of applications is offered by this MMT432/28-S transverter, which by virtue of its linear mode of operation will enable 28 MHz SSB, FM, AM or CW equipment to be used at 432 MHz.



## SPECIFICATION

### GENERAL

|                       |   |   |
|-----------------------|---|---|
| FREQUENCY COVERAGE    | : | 432 – 434 MHz. LOW RANGE<br>434 – 436 MHz. HIGH RANGE (OSCAR) |
| SELECTABLE OFFSET     | : | 2 MHz.  |
| INPUT FREQUENCY RANGE | : | 28 – 30 MHz.  |
| DC POWER REQUIREMENTS | : | 11 – 13.8 VOLTS. 12.5 VOLTS NOMINAL.                          |
| CURRENT CONSUMPTION   | : | 2.1 AMPS PEAK   |
| RF CONNECTORS         | : | 50 OHM BNC SOCKETS  |
| POWER CONNECTOR       | : | 5 PIN DIN SOCKET  |
| SIZE                  | : | 187 x 120 x 53 mm   |
| WEIGHT                | : | 900 grams.  |

### RECEIVE SECTION

|                                |   |                |
|--------------------------------|---|----------------|
| OVERALL CONVERTER GAIN         | : | 30dB TYPICAL   |
| OVERALL CONVERTER NOISE FIGURE | : | 3dB MAXIMUM    |
| INPUT IMPEDANCE                | : | 50 OHM         |
| IF OUTPUT IMPEDANCE            | : | 50 OHM         |
| QUIESCENT RECEIVE CURRENT      | : | 100 mA TYPICAL |



## SPECIFICATION

### TRANSMIT SECTION

|                             |   |   |
|-----------------------------|---|---|
| INPUT IMPEDANCE             | : | 50 OHM  |
| INPUT MODES                 | : | SSB, FM, AM or CW                                     |
| INPUT DRIVE FOR FULL OUTPUT | : | 1mW to 750mW by means of<br>VARIABLE INPUT ATTENUATOR |
| POWER OUTPUT                | : | 10 WATTS CONTINUOUS RATING                            |
| OUTPUT IMPEDANCE            | : | 50 OHM  |
| RELATIVE 404/406 MHz OUTPUT | : | BETTER THAN -65dB                                     |
| OTHER SPURIOUS OUTPUTS      | : | BETTER THAN -65dB                                     |
| QUIESCENT TRANSMIT CURRENT  | : | 250 mA.   |

### LOCAL OSCILLATOR

|                                       |   |             |
|---------------------------------------|---|-------------|
| MAXIMUM FREQUENCY ERROR AT 432 MHz    | : | $\pm 5$ KHz |
| TYPICAL DRIFT AT 432 MHz              | : | 2 KHz/HOUR  |
| FREQUENCY SENSITIVITY (11-13.8 VOLTS) | : | 50 Hz       |
| OSCILLATOR FREQUENCY 432 - 434 MHz    | : | 101 MHz     |
| OSCILLATOR FREQUENCY 434 - 436 MHz    | : | 101.5 MHz   |



## SOCKET FUNCTIONS

### 432 MHz INPUT

As supplied, this socket is not connected, since for transceive operation the receive input is routed through the socket marked "432 MHz OUTPUT". However, should external changeover be required see page 9.

### 432 MHz OUTPUT

As supplied, the transverter is wired for transceive operation, and this socket is used as the common 432 MHz input/output. Whilst the PA transistors are able to withstand a considerable degree of mismatch, it is recommended that the SWR should not exceed 2 : 1.

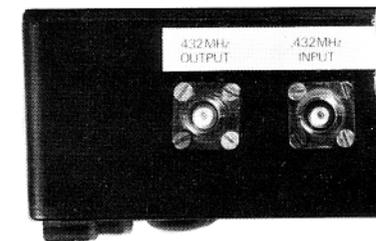
This socket carries all the DC functions of the transverter.

**CARE SHOULD BE TAKEN TO AVOID REVERSE POLARITY, WHICH MAY RESULT IN SEVERE DAMAGE TO THE UNIT.**

When looking at the socket as pictured below, connections are as follows:—

**PIN 1—SWITCHING T/R**

External control of the transmit/receive switching is available on this pin. The application of an earth to this pin will switch the transverter into the transmit mode. The current drawn to earth from this pin is 1mA.



## SOCKET FUNCTIONS

### POWER

PIN 2—NO CONNECTION

PIN 3—NEGATIVE (E)

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

PIN 4—NO CONNECTION

PIN 5—POSITIVE (+ 12V)

This line should be connected to + 12 volts in both receive and transmit modes.

### 28 MHz OUTPUT

The output from this socket should be connected to the aerial of your transceiver.

**PLEASE ENSURE WHEN IN THE TRANSMIT MODE THAT NO POWER IS FED FROM YOUR TRANSCEIVER INTO THIS SOCKET, OTHERWISE SERIOUS DAMAGE WILL ENSUE.**

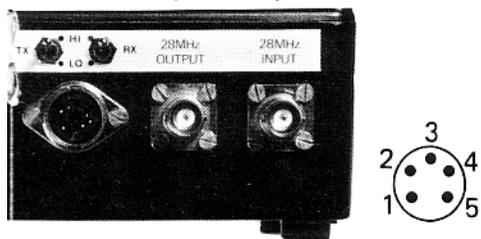
### 28 MHz INPUT

#### IMPORTANT:

**DO NOT EXCEED 500 mW INPUT TO THIS SOCKET.**

This is the RF input to the transverter and should be driven from the low level socket of your existing 28 MHz transceiver. The required drive level for full output is variable between 1mW and 750mW, and may be adjusted in accordance with the instructions on page 9.

As supplied the transverter is pre-set for 500mW input.





## FREQUENCY RANGE SELECTION

This transverter covers the two ranges, 432–434 MHz (LOW) and 434–436 MHz (HIGH). For either range the transverter will work in conjunction with a transceiver operating on the range 28–30 MHz.

As shown in the function table below, the transverter can be operated in the simplex mode on the range 432–434 MHz using Function 1.

In Function 4, the transverter covers the range 434–436 MHz on both transmit and receive, and this is the recommended function when the transverter is being used for communication via satellite.

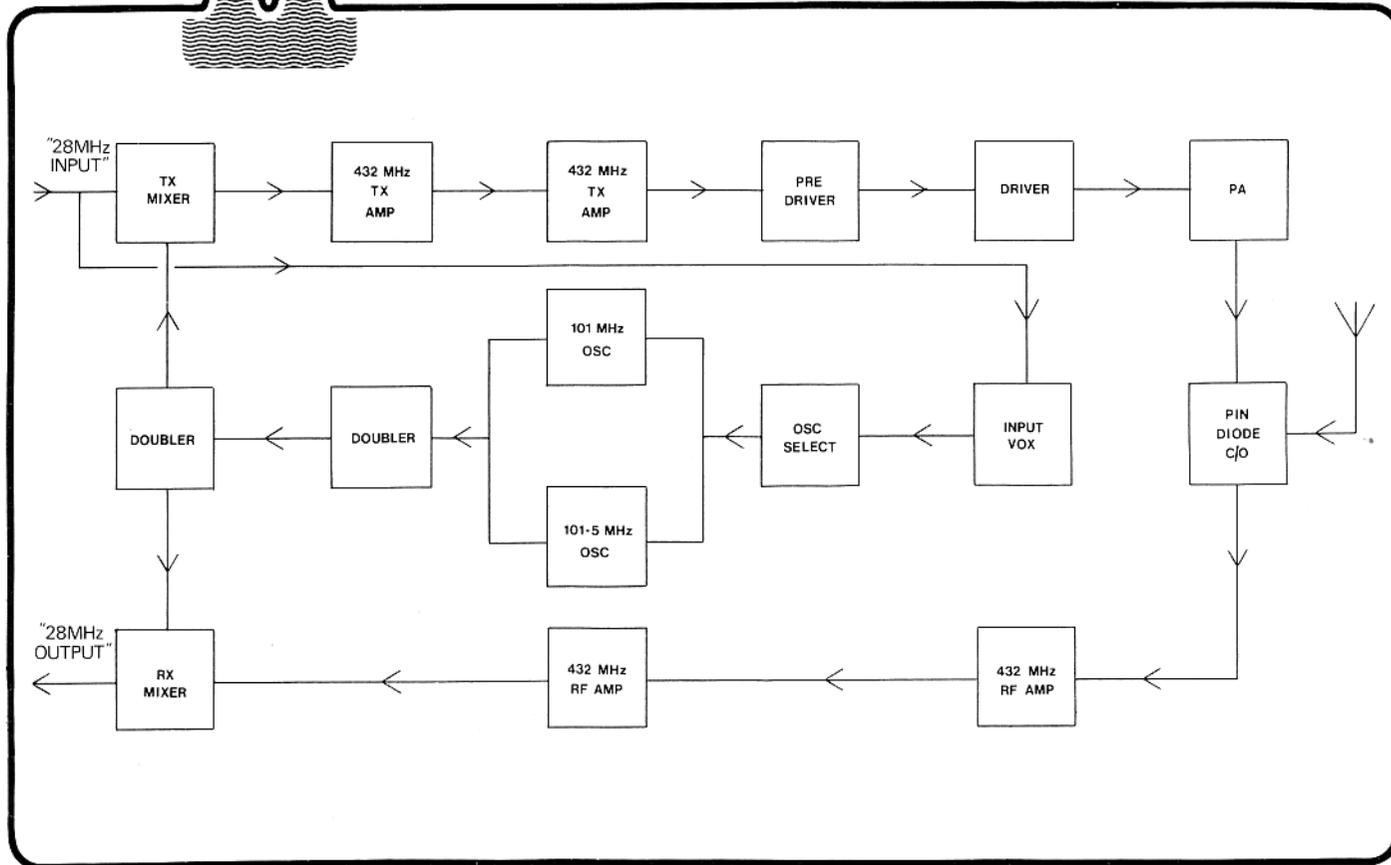
These functions are selected by the two small toggle switches located directly above the D.C. power socket.

### THE FUNCTIONS AVAILABLE ARE:

| <b>FUNCTION 1:<br/>NORMAL MODE</b> | <b>FUNCTION 2:</b>    | <b>FUNCTION 3:</b>    | <b>FUNCTION 4:<br/>SATELLITE MODE</b> |
|------------------------------------|-----------------------|-----------------------|---------------------------------------|
| TX : LOW<br>RX : LOW               | TX : LOW<br>TX : HIGH | TX : HIGH<br>RX : LOW | TX : HIGH<br>RX : HIGH                |



# BLOCK DIAGRAM





## SYSTEM CONSIDERATIONS

### INPUT ATTENUATOR

The input sensitivity potentiometer in the transverter exists to attenuate the 28 MHz input drive down to a suitable level to give a linear output power of 10 watts. Adjustment can be made to this potentiometer to enable a drive level in the range 5-750 mW to be used for a linear output power of 10 watts. On removing the main lid a small pre-set potentiometer can be seen located on the main printed circuit board, halfway along the side remote from the PA compartment. To increase the sensitivity, which has been pre-set for 500 mW, rotate the slider of the potentiometer clockwise until the transverter just draws a maximum DC current when driven by a 28 MHz carrier wave. In addition to the range available from this attenuator it is possible by linking the 2 pins near to the pre-set potentiometer, to increase the sensitivity even further to allow operation with equipment having an output level of less than 5 mW. The range now available from the pre-set potentiometer is 1-100 mW. After these pins have been linked, the adjustment procedure described above should be carried out.

### 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 28 MHz drive is applied, by means of internal RF VOX 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.

### SEPARATE 432 MHz RECEIVE INPUT

Reference is made on page 5 to this input, which can be connected to give permanent access to the 432 MHz receive converter input, independently of the internal PIN diode changeover relay. On the side of the screened PA compartment will be seen several coloured feedthroughs. The second feedthrough from the socket panel face (marked with a painted dot) carries the receive input. The wire from this feedthrough should be disconnected, and a length of wire should be connected between the existing terminal pin on the main printed circuit board and the centre pin of the BNC socket marked "432 MHz INPUT".



## WARNING

- (a) **DO NOT REVERSE THE POLARITY OF THE POWER SUPPLY – SEVERE DAMAGE WILL RESULT.**
- (b) **DO NOT EXCEED AN SWR OF 2 : 1.**
- (c) **DO NOT UNDER ANY CIRCUMSTANCES RUN THE TRANSVERTER WITHOUT A SUITABLE LOAD CONNECTED.**
- (d) **DO NOT EXCEED 13.8 VOLTS DC SUPPLY TO THE TRANSVERTER, OTHERWISE OVERHEATING WILL ENSUE.**
- (e) **DO NOT EXCEED AN INPUT DRIVE LEVEL OF ½ WATT TO THE TRANSVERTER FOR SUSTAINED PERIODS.**
- (f) **DO NOT ALLOW RF POWER TO BE FED INTO THE SOCKET MARKED "28 MHz OUTPUT", AS THIS WILL DAMAGE THE RECEIVE MIXER.**



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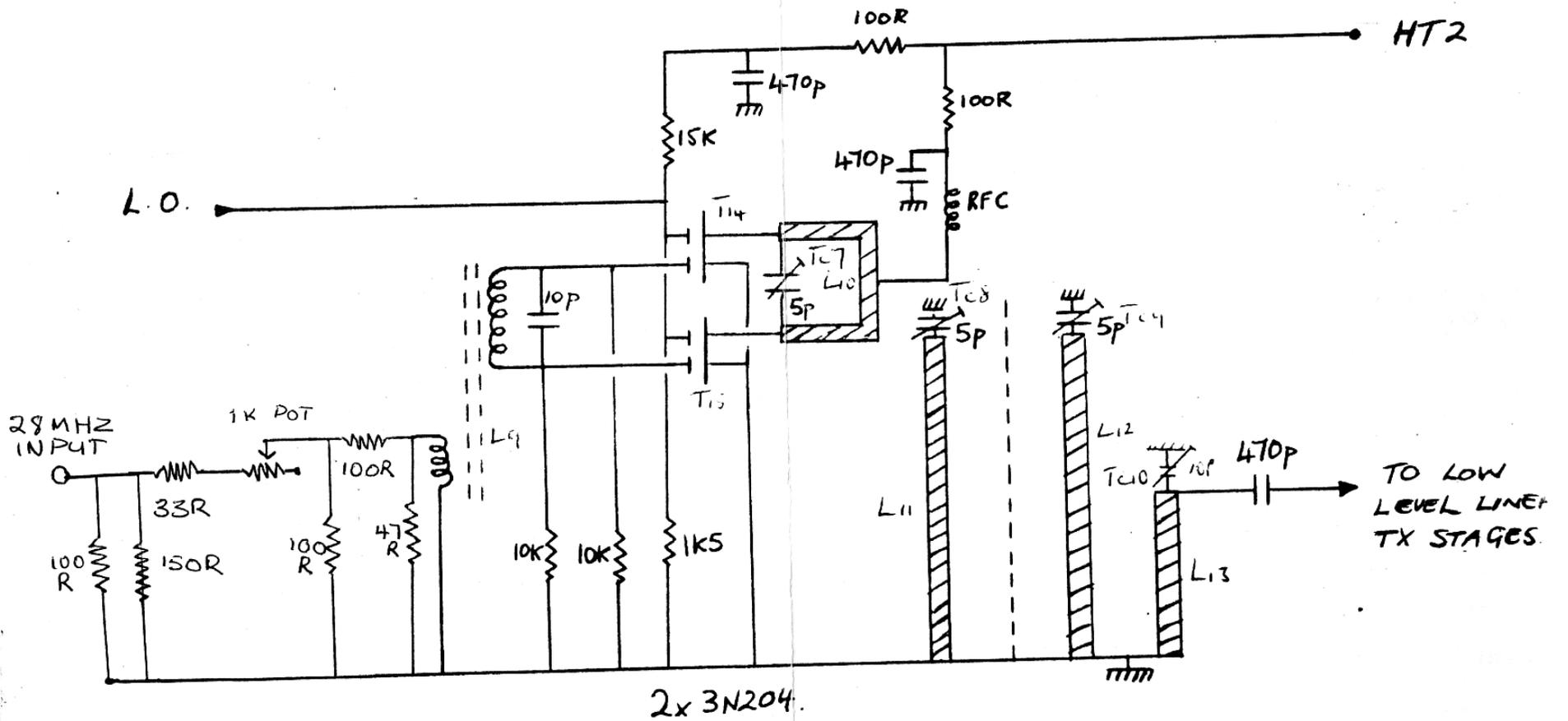
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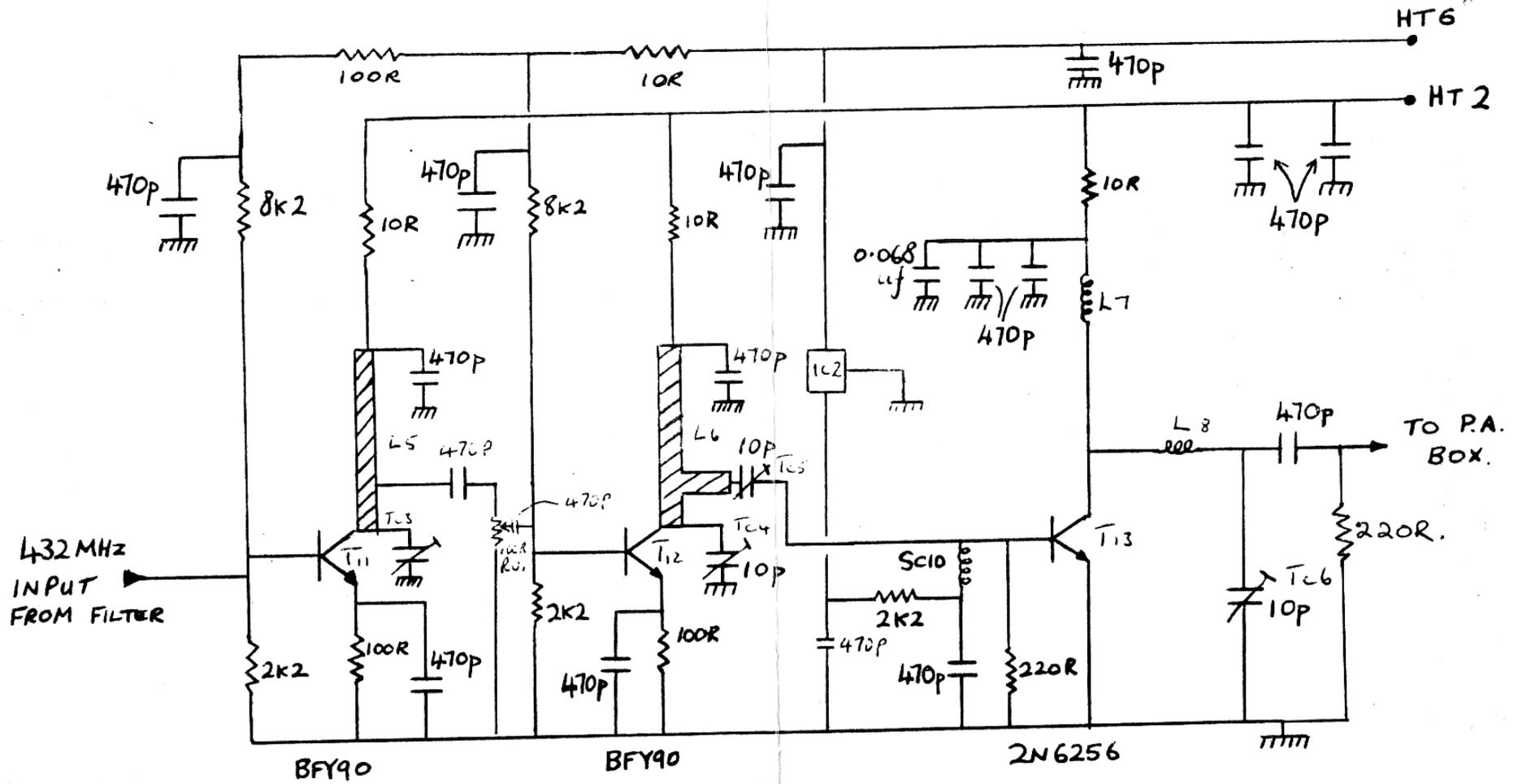
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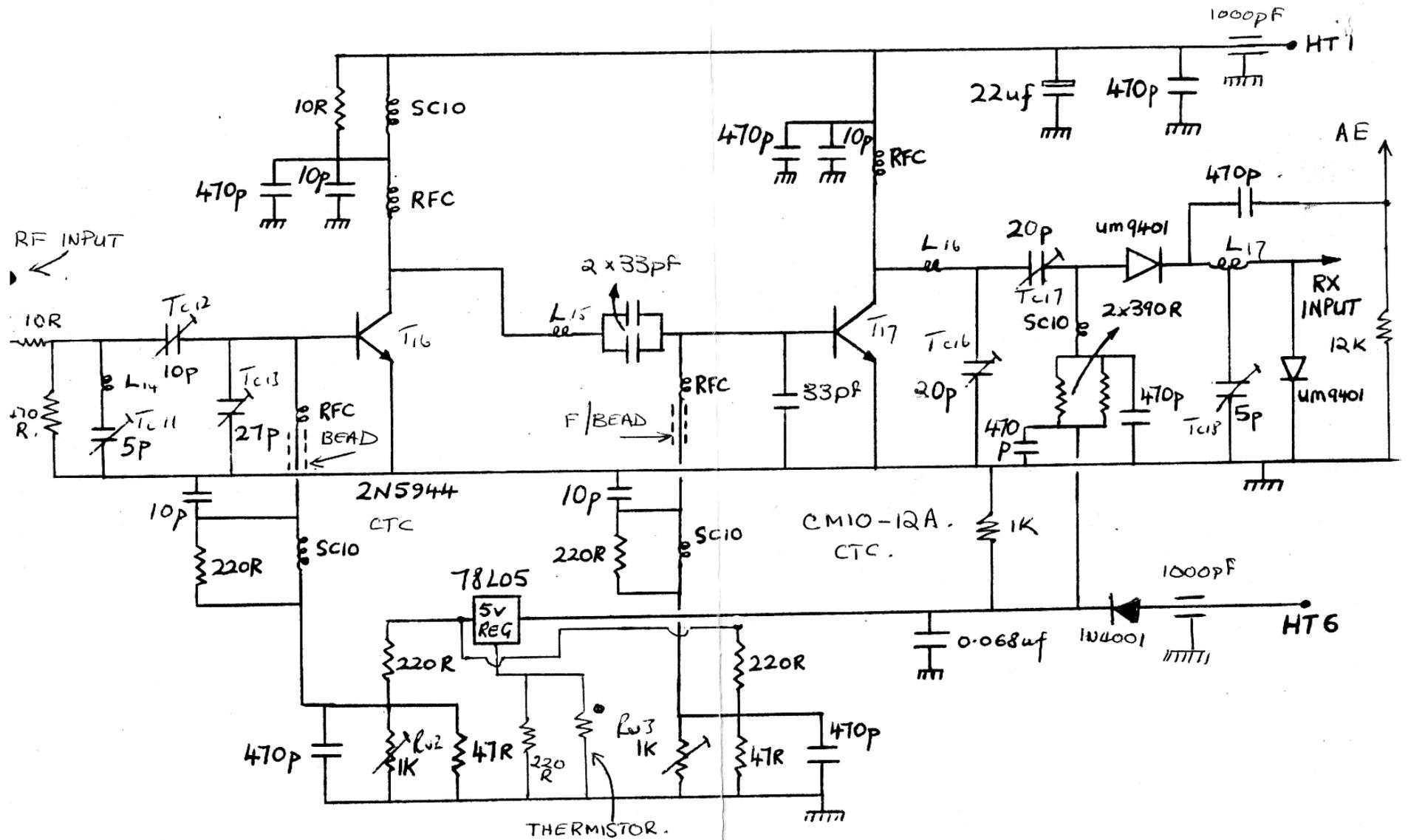




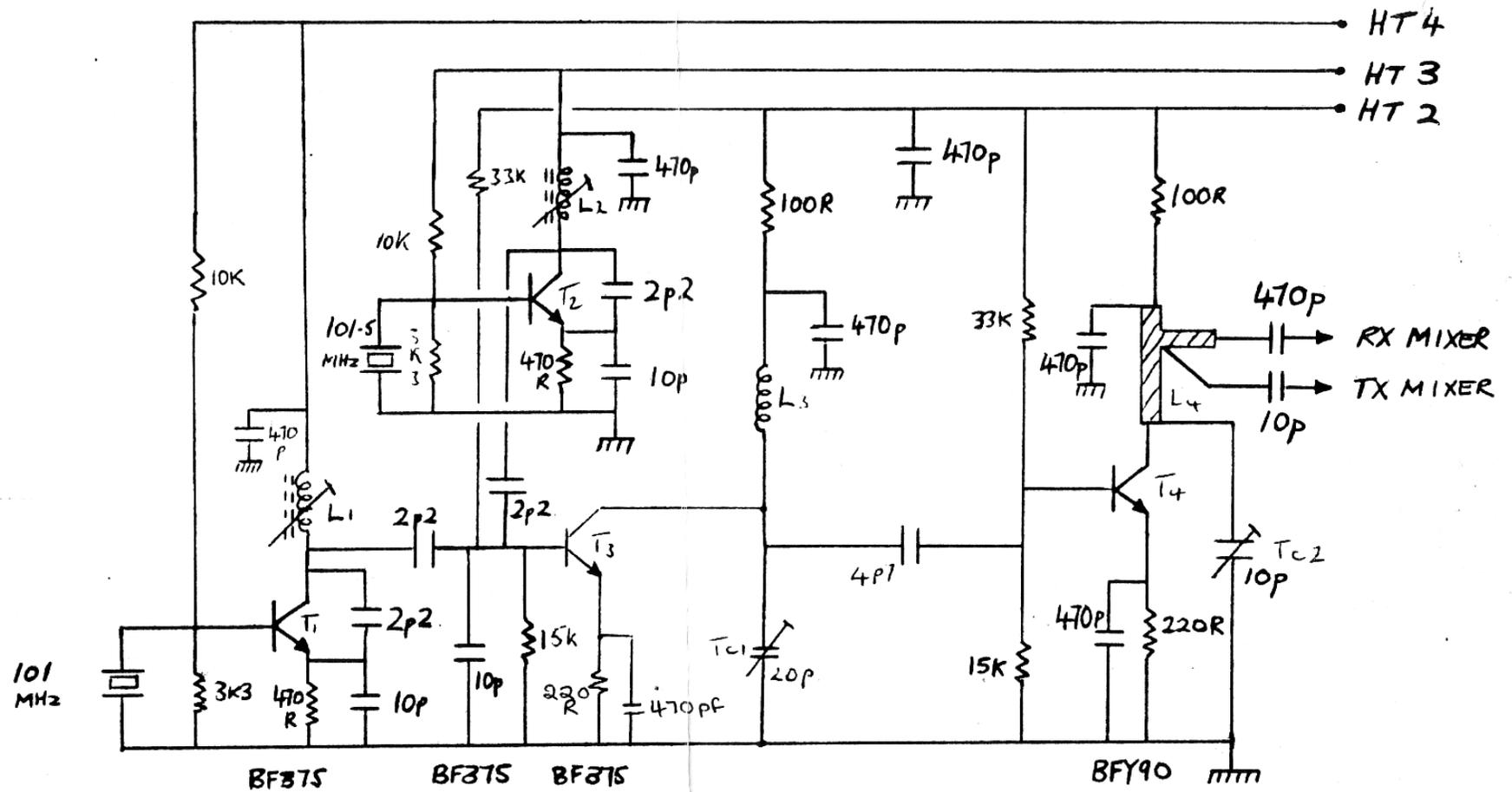
MMT 432/28 S : TRANSMIT MIXER STAGE.



MMT 432/28 S : LOW LEVEL LINEAR TX STAGES.



MMT432/28 S : P.A. BOX.



MMT432/28 S : OSCILLATOR + MULTIPLIER STAGES.

REVISED 27/7 DPF.