MMT432/28 Instruction Book

432MHz LINEAR TRANSVERTER

MICROWAVE MODULES LTD
ENGLAND

INTRODUCTION

This unit is a high performance solid state 432 MHz transverter for use in SSB, FW, AM and CW modes.

Please read this instruction book carefully to get the full benefit from your MMT432/28.

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 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 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

Input impedance	:	50 ohm
Input modes	:	SSB, FM, AM or CW
Input required for full output	:	500 mW or 5 mW (selectable input attenuator)
Power output	:	10 watts continuous rating
Output impedance	:	50 ohm
Relative 404 MHz output	:	Better than — 65 dB
Other spurious outputs	:	Better than — 65 dB

Receive Section

Overall converter gain	:	30 dB typical
Overall converter noise figure	:	3 dB maximum
Input impedance	:	50 ohm
IF output impedance	:	50 ohm

Transmit Section

Frequency coverage	:	432–434 MHz
DC power requirements	:	11–13 volts (12 volts nominal)
Current consumption	:	180 mA quiescent 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

Local Oscillator

Maximum frequency offset at 432 MHz	:	± 5 KHz
Typical drift at 432 MHz	:	2 KHz/hour
Frequency sensitivity over voltage range 11–13v	:	50 Hz

SOCKET FUNCTIONS

432 MHz INPUT

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 6.

POWER

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)

This line should be grounded to select the transmit mode, which may be achieved by connection to your transceiver switching. The current drawn from this pin, relative to earth, is 30 mA.

PIN 2 — NO CONNECTION

PIN 3 — NEGATIVE (E)

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

PIN 4 — NO CONNECTION

PIN 5 — POSITIVE (+ 12 V)

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

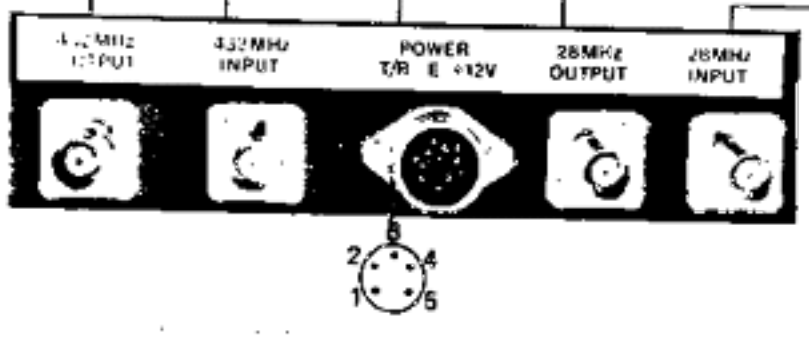
28 MHz OUTPUT

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

PLEASE ENSURE WHEN IN THE TRANSMIT MODE NO POWER IS FED OUT OF YOUR TRANSCEIVER AERIAL SOCKET, OTHERWISE SERIOUS DAMAGE WILL ENSUE.

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 P. A. transistors are able to withstand a considerable degree of mismatch, it is recommended that the SWR should not exceed 2 : 1



28 MHz INPUT

IMPORTANT: DO NOT EXCEED ½ WATT INPUT TO THIS SOCKET

This is the RF input to the transverter and should be driven from the low level socket of your existing transceiver. The input level is selectable for either ½ watt or 5 mW but is pre-set for ½ watt input as supplied. To select the 5 mW drive level, see page 6.

Circuit Description

CRYSTAL OSCILLATOR AND MULTIPLIER STAGES

Incoming 432 MHz signals are passed through the PIN diode aerial change-over relay to the first RF amplifier, which uses a BFR34A silicon low noise transistor. This first RF amplifier stage achieves the quoted low noise figure of 3.0 dB and feeds the second RF amplifier incorporating a BFY90 transistor. This amplified signal is then fed to gate 1 of the 3N204 mixer MOSFET, which combines the 404 MHz local oscillator injection with the 432 MHz incoming signal to produce the intermediate frequency of 28 MHz. Printed strip-line techniques are used throughout and considerable selectivity is obtained in the high-Q IF output transformer.

RECEIVE CONVERTER

A zener-controlled crystal oscillator using a high-stability 5th overtone crystal at 101 MHz provides a high degree of accuracy and frequency stability for the transverter. The output from the oscillator is fed into a grounded-base doubler stage producing 202 MHz, which is then in turn fed into the final multiplier stage, using a BFY90 transistor, to produce 404 MHz. This stage operates in class C to achieve high efficiency in order to drive both the receive and transmit mixers.

TRANSMIT CONVERTER

The incoming 28 MHz signal is fed into the transverter via a selectable on-board input attenuator. The required level is then fed into a balanced dual-gate MOSFET mixer, incorporating 2 RCA 3N204 MOSFETS, and is then mixed with the 404 MHz local oscillator to produce the 432 MHz required frequency. High-Q circuitry is used in this area to filter out the local oscillator, and to ensure a spurious-free output signal. This low-level signal is then fed through two amplifier stages consisting of BFY90 transistors running in class B, and then to the 2N6256 pre-driver stage, which produces approximately 200 mW in class B.

POWER AMPLIFIER COMPARTMENT

This 2 stage linear amplifier uses the latest state of the art devices, which produce a highly reliable continuous power output of in excess of 10 watts. Biasing is provided for these stages from a zener diode regulation network. Printed strip-line circuitry is used for all UHF tuned circuits on this board, with the exception of those inductances associated with the PIN diode aerial changeover relay which are conventional high-Q inductances. This PIN diode switch has many advantages over a conventional relay, the most important being its low insertion loss of lower than 0.2 dB.

System Considerations

INPUT ATTENUATOR

The input attenuator in the transverter exists to attenuate the ½ watt 28 MHz drive down to a suitable level for use in the first balanced mixer. Adjustment can be made to this attenuator to enable a drive level of 5 milliwatts to be used. On removing the main lid, two small terminal pins will be seen on the side of the main printed circuit board, furthest from the PA compartment. To increase the input sensitivity to 5 mW these terminals should be bridged.

SEPARATE 432 MHz RECEIVE INPUT

Reference is made on page 3 to this input, which can be connected to give permanent access to the 432 MHz receive converter input independently of the internal PIN diode change-over relay. On the side of the PA screened 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 printed circuit board and the centre of the 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 VOLTS DC SUPPLY TO THE TRANSVERTER, OTHERWISE OVERHEATING WILL ENSUE.

e) **DO NOT** EXCEED AN INPUT DRIVE LEVEL OF ½ WATT TO THE TRANSVERTER, OTHERWISE THE BALANCED MIXERS MAY BE DAMAGED

f) **DO NOT** ALLOW RF FROM YOUR TRANSCEIVER TO BE FED INTO THE "28 MHz OUTPUT" SOCKET, AS THIS WILL DAMAGE THE RECEIVE MIXER.

A PRODUCT OF
MICROWAVE MODULES LIMITED

Brookfield Drive,
Aintree, Liverpool L9 7AN
England.
Tel: 051-523 4011
Cables: Microwave Liverpool

Directors: R. B. PORTER, B.Eng. R. A. BUTTERFIELD, B.Sc.

Registered No. 966284 England

Bankers: Barclays Bank, Haywoods Branch, Liverpool.

Account No.: 00800388

Giro Account: 883 4158

Cable Address: Microwave, Liverpool.

Registered Office and Factory:

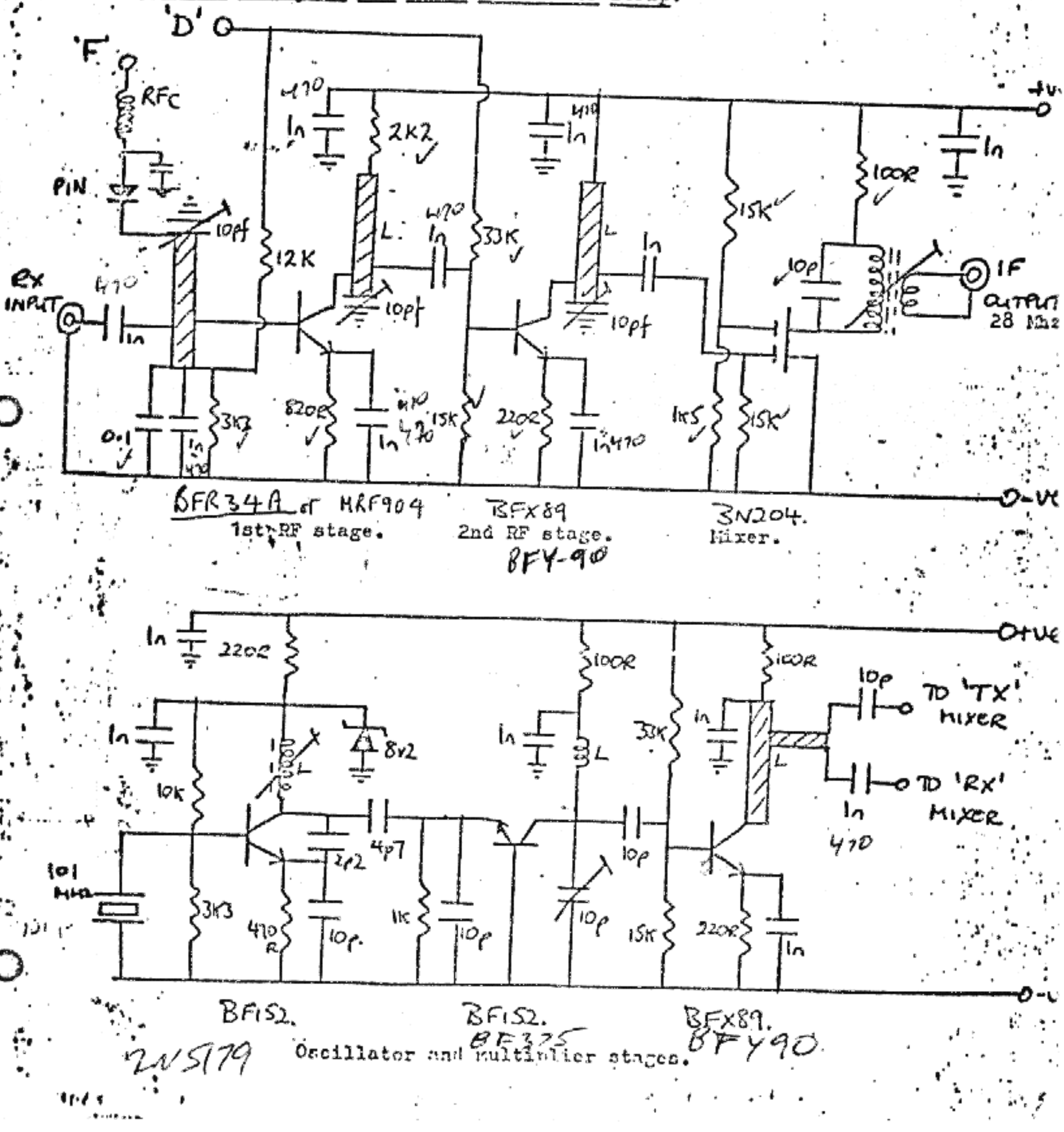
BROOKFIELD DRIVE
AINTREE
LIVERPOOL, L9 7AN
ENGLAND
Tel. 051-523 4011

Our Ref. Your Ref.

Date FEBRUARY 1976.

MMT 432 70cms transverter.

Receive converter and local oscillator strip.



RADIO CONSULTANTS and MANUFACTURERS

Directors: R. B. PORTER. B.Eng. R. A. BUTTERFIELD. B.Sc.

Registered No. 866284 England

Bankers: Barclays Bank, Heywoods Branch, Liverpool.

Account No.: 00600598

Giro Account: 883 4159

Cable Address: Microwave, Liverpool.

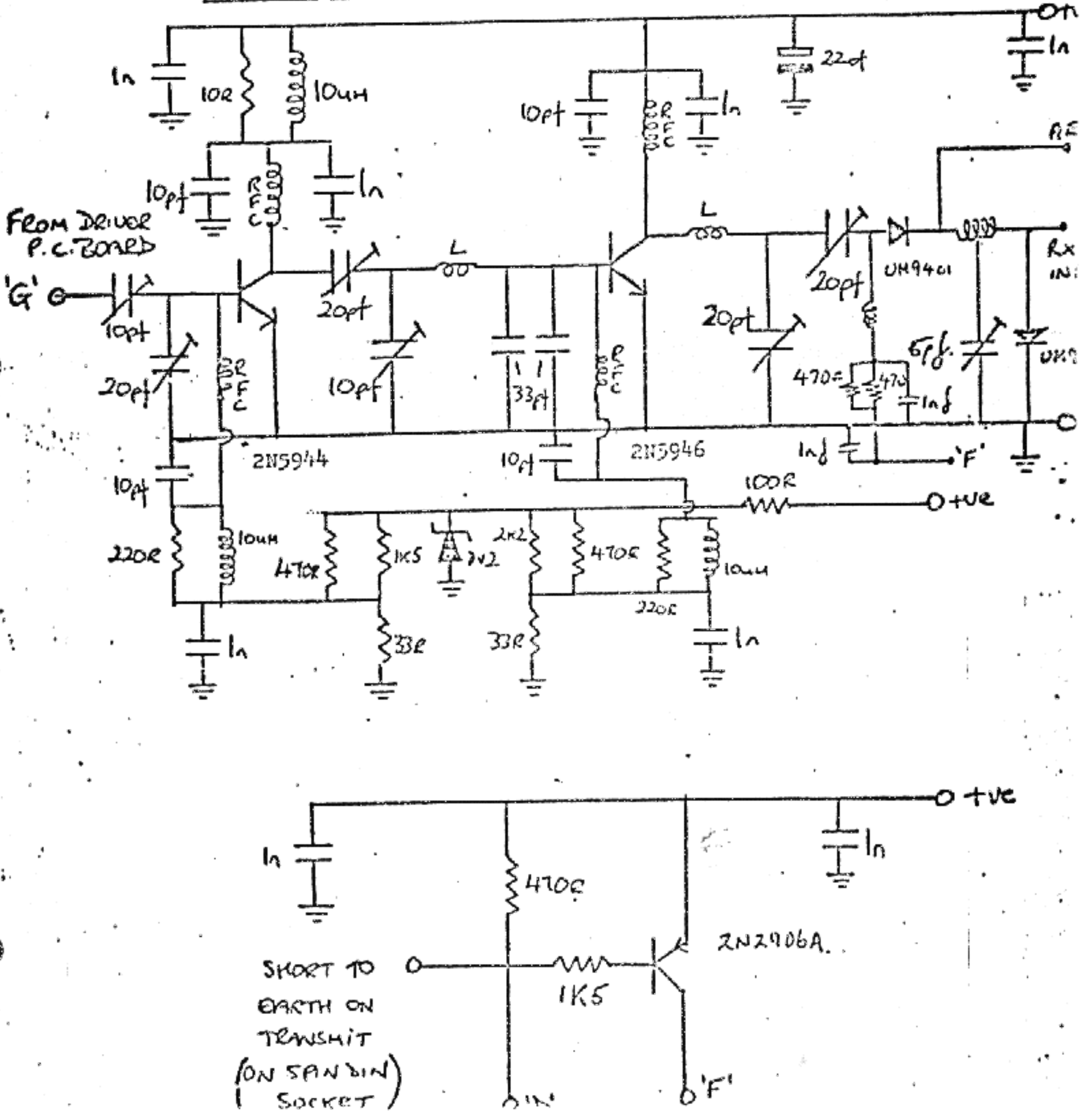
Registered Office and Factory:

BROOKFIELD DRIVE
AINTREE
LIVERPOOL, L9 7AN
ENGLAND
Tel. 051-523 4011

Our Ref. Your Ref.

Date FEBRUARY 1976.

MMT 432 70 cms transverter PA box and switching circuitry.



RADIO CONSULTANTS and MANUFACTURERS

Directors: R. B. PORTER, B.Eng. R. A. BUTTERFIELD, B.Sc.

Registered No. 886284 England

Bankers: Barclays Bank, Heywoods Branch, Liverpool.

Account No.: 00600696

Giro Account: 583 4159

Cable Address: Microwave, Liverpool.

Registered Office and Factory:

BROOKFIELD DRIVE
AINTREE
LIVERPOOL, L9 7AN
ENGLAND
Tel. 051-523 4011

Our Ref. Your Ref.

Date FEBRUARY 1976.

MMT 432 70 cms transverter.
Transmit balanced mixer and low power amplifier stages.