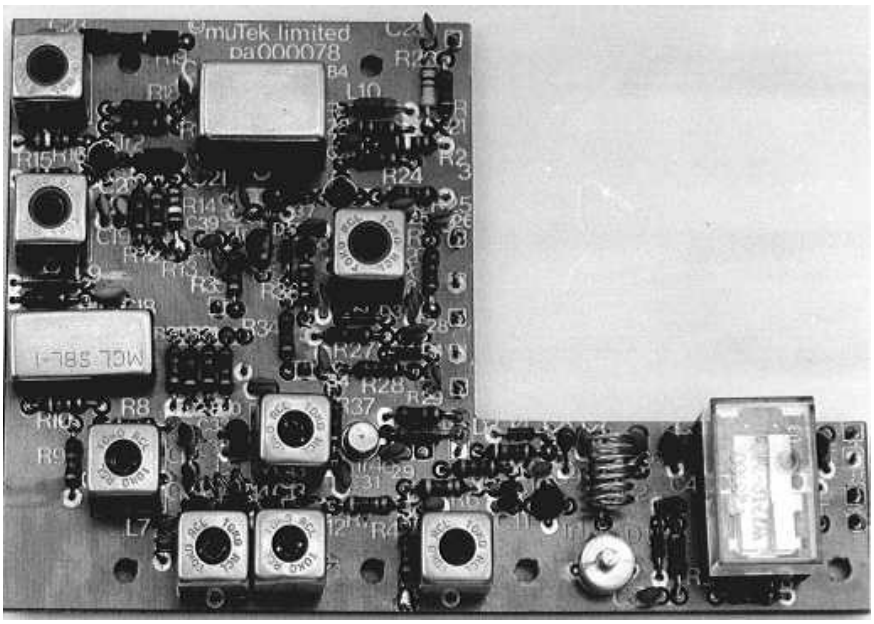
Edition 1

Replacement Front End for IC271A/E - Mid Version RPCB271ub

a product produced by Mutek circa 1989-95



Manual compiled by Clive Smith, GM4FZH for general circulation

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Compilers Note

This manual has been put together and designated Edition 1. The information has been obtained from various sources, including past owners and the Internet; **I cannot vouch for the accuracy of this information.** It is not intended to produce an updated version of this manual, if additional information becomes available it maybe provided as an addendum.

The products produced by Mutek were of high quality and many are still in service. However, please remember that this product came on to the market some 20-30 years ago and must now be regarded as obsolete.

The units described herein have been supplied in different versions which may mean some changes to component values and types. I have no further information.

This manual has no copyright but I would be grateful that if it is used the source is acknowledged. Please let me know if you have further details that would help with this or any other Mutek product.

****** PLEASE NOTE: ******

The information contained herein is provided in good faith and I will not be responsible for any outcomes arising from the use of it. I have put it together for use by the amateur radio fraternity.

The list of other manuals can be found on my website www.gm4fzh.co.uk or the Mutek Facebook group as they become available. I have no association with the firm Mutek and this manual has been produced at my own expense and without any payment.

If anyone has further information I can make the amendments or I can supply the original document which was written using LibreOffice v6.0.7.3 under Ubuntu. It was then converted to a .pdf format.

Clive Smith, GM4FZH, Jan 2021

The filename of this document is ***midfrontendIC271.pdf***.

Specification

Noise Figure	2.2dB
Image rejection	85dB
Intermodulation free dynamic range	92dB*
Gain compression	125dB**

*level of one signal in equal two tone pair, with respect to (wrt) noise floor required to generate 3rd order imp at 0dB s/n at 100kHz offset.

** level of interfering signal wrt noise floor required to produce 3dB gain compression of -76dBm signal at 100kHz offset.

History of the PCB

After some research, the history of this pcb appears to be as follows, EOE.

PCB Type	**Notes**	**Approx. date of issue**
*pa00-078:i1-9'83 (early RPCB271ub)	NOT covered by this manual. Very early pcbs. Standard components. L shaped board.	**Up to about Feb 1984**
*pa00-078: Iss02.4/84 (early RPCB271ub)	NOT covered by this manual. Standard components. L shaped board.	**After about April 1984**
RPCB271ub Iss.1	**CAD design. L shaped board.**	**1989**
RPCB271ub Iss.2	**No information.**	**?????**
*RPCB271ub Iss.2b	NOT covered by this manual. Rectangular pcb, not L shaped like all earlier boards	1995

* Denotes not covered by this manual.

Kit List

This is the kit of parts supplied with the RPCB217ub. Please note that since the kit of parts is common to both fitting to the IC271A/E and the high power IC271H transceivers, there may be some components surplus to requirements. These are marked by an *.

RPBC271ub board	1 off
Red coded coaxial cable	1 off
White coded coaxial cable	1 off
Black coded coaxial cable	1 off
White and green leads with free socket	1 off
Red and yellow leads with free socket	1 off
M3 x 6mm machine screws	6 off
Folded aluminium display screen shield	1 off
Nylon locking cable straps	2 off
Self-adhesive foam rubber	1 off *
51R resistor	1 off *
47k resistor	1 off
330n or 220n capacitor	1 off
n10/n120 capacitor	1 off
10M resistor	1 off

No Instructions for IC271H

No instructions appear to have been produced for IC271H for this version of the the pcb. You may find the instructions for the IC271H included in a later manual useful.

Tools Required

The following tools are required for installation:

Soldering iron
Solder sucker
Cross point screwdriver
Flat blade screwdriver
Small pair of pliers
Side cutters

Introduction

Mutek's RPBC271ub is an optimised preamplifier for your Icom IC271 A/E series transceivers (not sure if this applies to IC271H). It is a development of Mutek's outstandingly successful RPCB144ub and RPCB251ub front-end board for the FT221/225 and IC211/251 transceivers and offers a combination of excellent sensitivity combined with superb dynamic performance. This ensures that external noise sources provide the ultimate limitation to receiver sensitivity in terrestrial communications, whilst minimizing the effects of strong signals.

There are usually two reasons for the less than adequate sensitivity of modern transceivers. Firstly, the receiver designer must balance strong signal handling against sensitivity. With the devices currently available and at the prices the manufacturer is prepared to pay, the balance usually comes out around 4 - 6dB noise figure and a 50 - 70dB dynamic range. The second point is that a typical economy is to use diode switching instead of an electromechanical relay. These diode switches are also usually run at low currents to save battery power and this inevitably leads to a greater insertion loss, often up to 4 dB. Hence it is not unusual for the noise figure to exceed 8dB.

At 144 MHz sky noise limits the maximum useable sensitivity of a receiver used for terrestrial communications to about 2dB noise figure (This corresponds to about 0.05uV for 10dB s+n/n ratio in ssb bandwidths). Lower noise figures can be obtained but will not let you hear any more. However, there is an advantage to using a low noise preamplifier to improve the sensitivity of a transceiver - it reduces the gain required to achieve the desired effect and hence does not degrade the dynamic range as much.

Circuit Description

Fig.1 shows the block diagram of the RPCB217ub. A power relay, broadband matched for high performance at vhf replaces Icom's lossy diode antenna changeover circuitry. This is followed by a very low noise silicon mosfet amplifier and high performance bandpass image filter. The mixer is a properly terminated class-1 diode ring mixer, which is pumped by a high current low-noise jfet power buffer amplifier which not only ensures adequate drive for the mixer, but also sufficient output via a resistive pad to drive Icom's transmit mixer.

A simple diplexer terminates the if port of the ring mixer: with the large difference between the local oscillator and if frequencies this is entirely adequate. The diplexer also matches the input of a mosfet amplifier operated at high drain current, using a combination of 'noiseless' and dissipative feedback for excellent linearity, which then drives the crystal filter.

The if crystal filter is a six-pole monolithic unit with adequate bandwidth for fm, whilst not being too wide when acting as an ssb roofing filter. Following the filter a conventional mosfet if amplifier drives the output diode switch which steers the transmit and receive if signals.

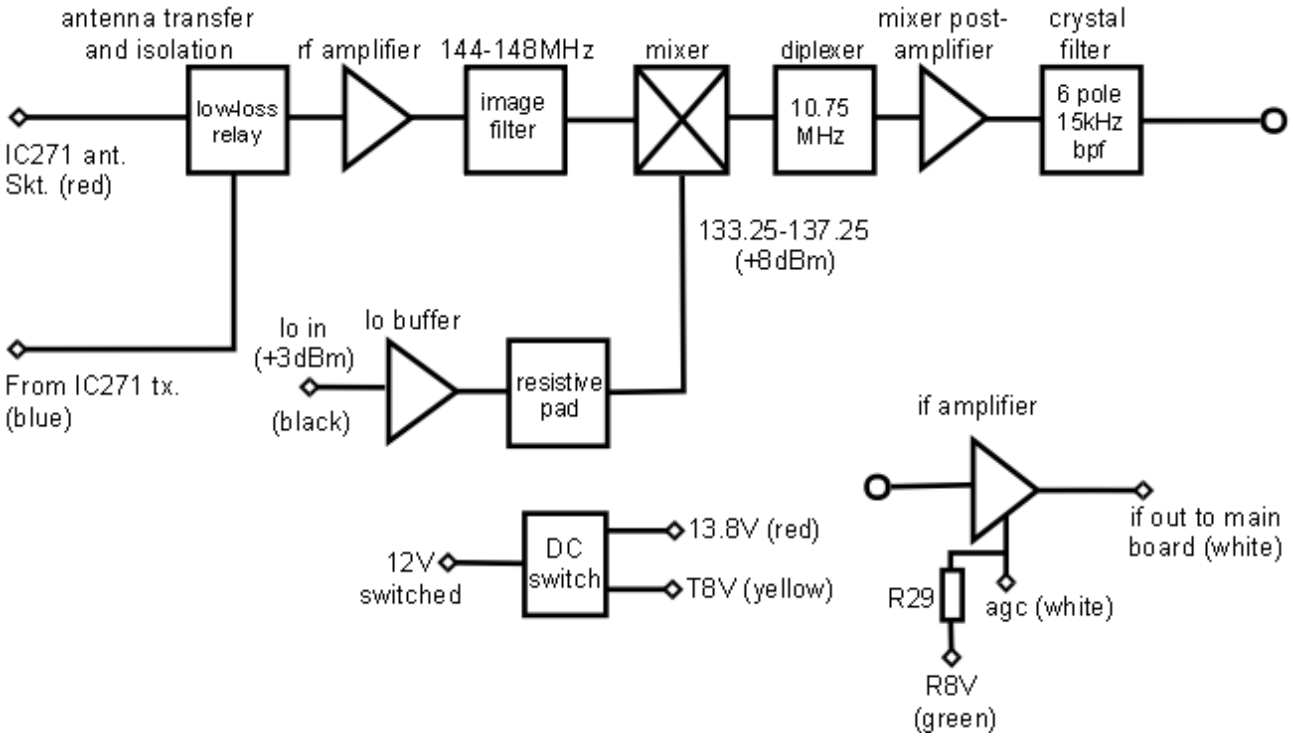


Figure 1: RPCB271ub Block Diagram

Installation Notes

The RPCB271ub is mounted in the space provided for Icom's optional preamplifier. Most connections to the transceiver are made using plugs and sockets forming part of the cable kit supplied.

Prior to attempting installation of the RPCB271ub it is very strongly recommended that you study very carefully the following instructions and familiarize yourself thoroughly with the relevant parts of the IC271 manual. If, after this, you are at all unsure of your abilities, we recommend that you employ the services of a competent technician to perform the installation; we cannot accept any responsibility for damage caused by incorrect or unskilled installation.

In the following installation instructions we refer to Icom's component designations thus: board/component designation e.g. RF YGR/D2. which refers to diode number D2 on board RF YGR. Coaxial cable marker colours in our cable kit are in parentheses thus (red/white) and dc supply and control line colours are in slashes thus /yellow/.

Have you read through all these instructions and the relevant parts in Icom's manual?

BEWARE: there may be wiring colour changes between the early and later boards !

Detailed Installation

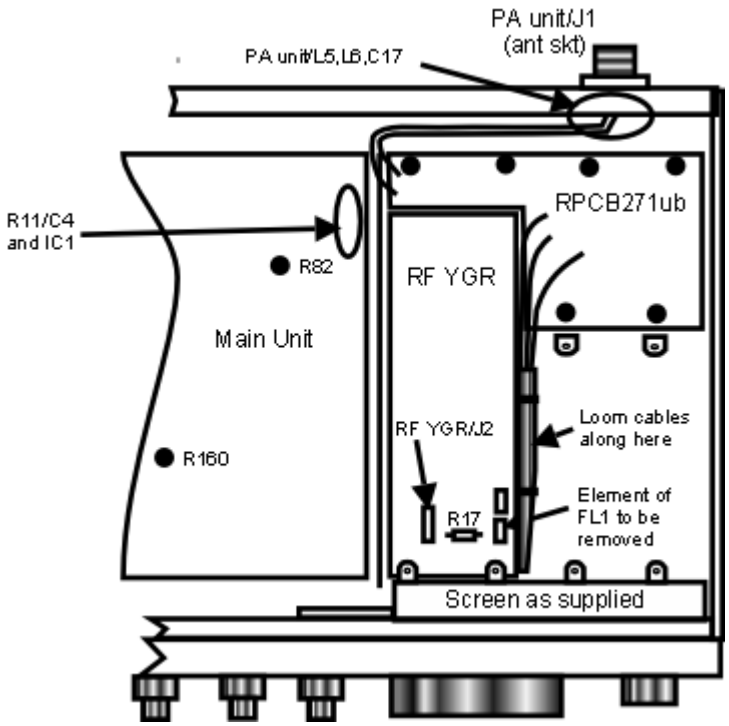
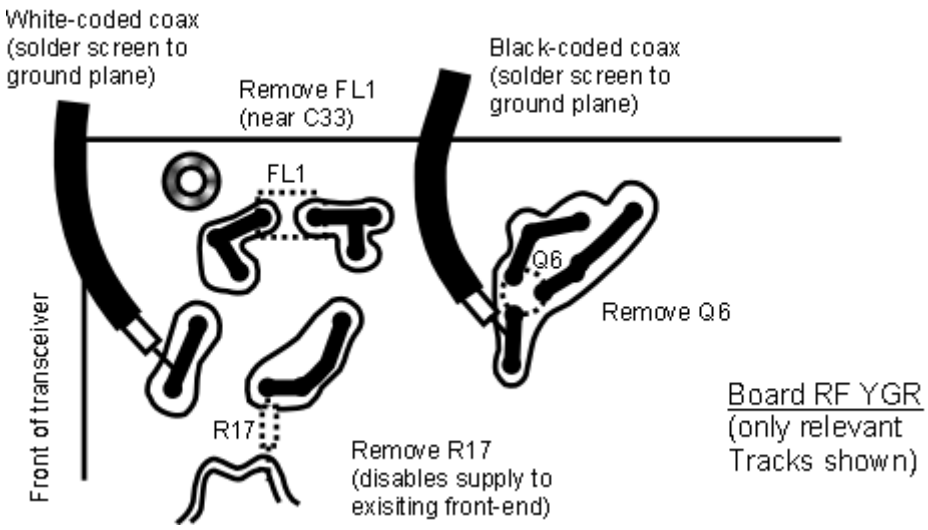


Figure 2: IC271 Layout

1) Disconnect the transceiver from external power sources, remove the antenna and any other external connections.
2) Remove the top cover of the IC271.
3) If fitted, carefully remove the plastic coated foil "screen" shielding from the display board.
4) Remove the four screws securing the RF YGR board, disconnect all plugs and sockets to this board - making a note from where they all came. Lift the board clear of the transceiver. See Fig.2.

Figure 3: Connections to Main Unit



5) Using a solder sucker (if available), carefully remove resistor RF YGR/R17, transistor RF YGR/Q6 and the element of the filter RF YGR/FL1 nearest the capacitor RF YGR/C33. See Figs.2 and 3.
6) Referring to Fig.3, solder the shorter stripped ends of the (white) and (black) coaxial cables to the tracks indicated - take care not to leave solder bridges or wisps of wire etc. Solder the braids to the ground plane. Lead the cables away neatly to the side of board RF YGR and re-install the board. Leave off for the moment the two screws nearest the front of the transceiver.
7) Mount the aluminium screen supplied with the RPCB271ub over the display board. To do this it will be necessary to remove the M3 machine screws securing the speech synthesiser (if fitted) and to slacken the countersunk machine screws holding the plastic front panel trim in position. The screen then slips between the trim and the pressed steel frame - if it is not a tight fit then distort the angle of the screen bend to make it so. The machine screws should then be replaced and tightened firmly, including those securing the RF YGR board. (Spare M3 machine screws are provided for transceivers not fitted with the optional speech processor board).

Figure 4: FT271 PA unit, antenna connector J1

Showing components L5, L6 and C17 soldered together and about 3mm from centre pin of J1

8) See Fig.2 and Fig.4. Locate PA unit/J1, the antenna socket. Carefully remove the leads of PA Unit/L5, PA Unit/L6 and PA Unit/C17 from PA Unit/J1. Solder the free ends of these components together about 3mm away from the antenna socket centre pin.
9) Solder the cables supplied with the RPCB217ub to the solder pins on the RPCB217ub as shown on Fig.5. Solder the free ends of the white and black coaxial cables as shown on the same figure.
10) Install carefully the RPCB217ub in the transceiver with the M3 machine screws and shake-proof washers provided. Ensure screws are firmly tightened down.
11) Solder the centre conductor of tyhe (red) coax cable to the centre pin of PA unit/J1 - the antenna socket. Solder the braid of this cable to the adjacent solder tag.
12) Solder the centre conductor of the (blue) coax cable to the junction of the three components described in step 8 and Fig.4. Solder the braid to the same solder tag as in step 11.
13) Mate the free socket on the /white/ and /green/ leads with the two pins of RF YGR/J2 nearest the front panel of the transceiver,

a) early version

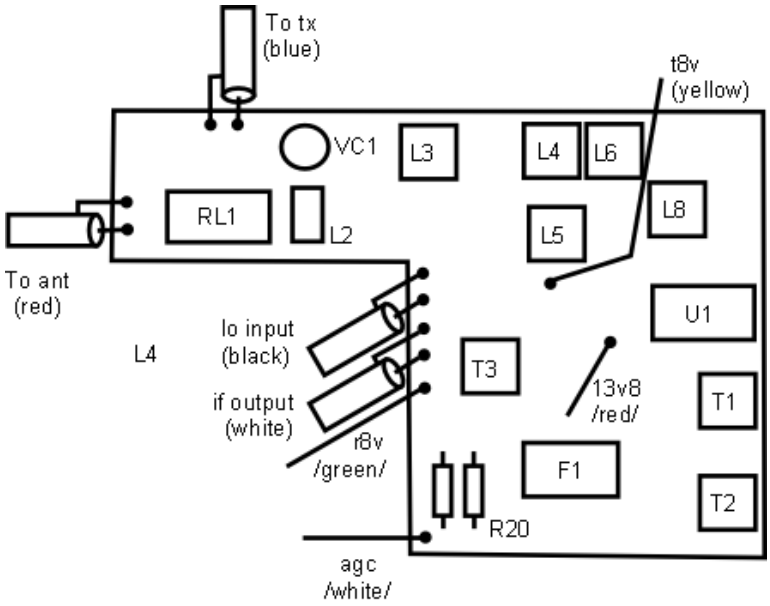
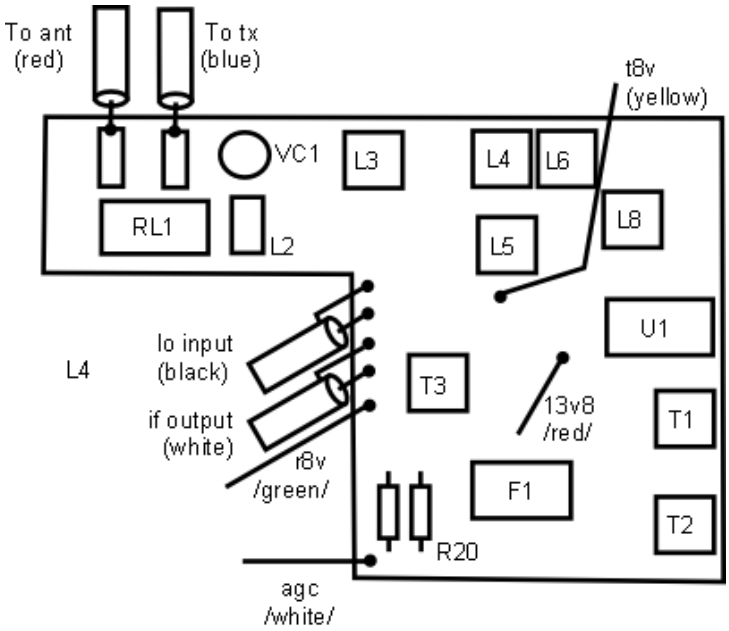


Figure 5: RPCB271ub Connections

b) later version



NOTE: Some discrepancies have been found with wiring colours between different sets of instructions.

14) Mate the free socket on the /red/ and /yellow/ leads with the two pins of RF YGR/J2 furthest from the front panel of the transceiver. This will leave one pin free in the centre of RF YGR/ J2 - don't worry!
15) Check your wiring carefully, and then check it again.
16) With the cable ties supplied, neatly loom the wires and coax cables you have just installed alongside RF YGR. See Fig.1.
17) Locate main unit PCB. If part no. (near centre of board) is B-643 A then continue with this step. If not jump to step 18. (all transceivers imported up to May/June 1984 should have this

designation). For good transmit audio and immunity from rf feedback problems it is necessary to change two components and add an additional decoupling capacitor to the input of Icom's microphone preamplifier IC on the main unit pcb.

1. Remove free socket Main Unit/J3 and the five machine screws securing the board to the chassis. Now study Fig.6 of these instructions.
2. Locate Main Unit/IC1 - the microphone preamplifier IC. Solder the 100p (n10) capacitor supplied across pins 2 and 4 on the track side.
3. Locate Main Unit/C4 - replace with 330n OR place 220n in parallel across it.
4. Locate Main Unit/R11 - replace with 47k provided.
5. Carefully replace main unit pcb, securing with the five screws and reconnect Main Unit/J3.

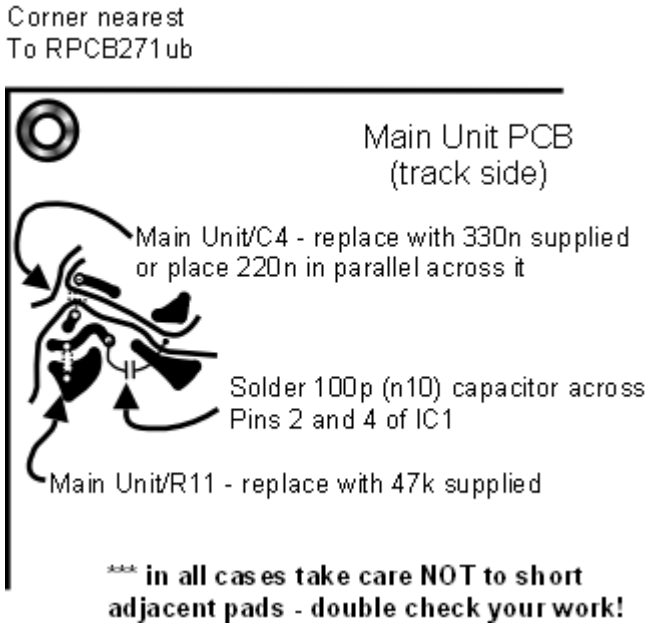


Figure 6: Transmit Audio Modifications

18) Connect a power source and an antenna (or preferably a dummy load) to the transceiver.

19) With the usb mode selected and mic gain and rf power controls set to minimum (fully anti-clockwise), put the transceiver into the transmit mode. Observe the action of the antenna change-over relay on the RPCB271ub. In the transmit mode the relay should be in its non-energised state. If nothing happens check your wiring.

20) Turn the mic gain to maximum while adjusting Main Unit/R82 until the indicated power output falls slightly. Then reduce the mic gain to the point where the indicated power output just begins to fall. This ism the correct point for operation on ssb.

21) If necessary, adjust the s-meter zero with Main Unit/R160.

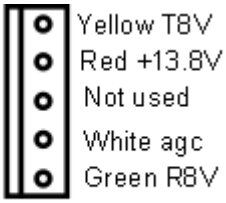
22) Connect your antenna and tune around the band. Signals should be heard (providing there is activity!). If all seems well, then replace the top cover of the transceiver ensuring that the machine screws securing it are well tightened. Due to the amount of rf radiated from the transceiver display (particularly in earlier models), adequate tightening of the screws is necessary to ensure that the sensitivity of the transceiver is not degraded by this interference.

AGC Time Constant

With some Icom 271 transceivers, fitting of the RPCB271ub may cause the agc to appear to 'hang-up' after having been hit by a strong signal. If this is the case, then R20 on the RPCB271ub should be reduced in value - see Fig.5 for its location. R20 is normally 10MΩ and can be effectively reduced in value by putting an additional resistor in parallel. A 10MΩ resistor is included in the kit of parts for this purpose.

Instruction Update

In 1991 there was an instruction up date as follows and concerns the single coloured wires yellow, red, green and white. These are now to be soldered to RF YGR/J2.



To front of transceiver

1) Place a black sleeve over the end of the wire
2) Strip 3mm from end of wire

Solder carefully to RF YGR/J2 as per figure adjacent. Allow to cool before pushing sleeve over connection.

Figure 7: Circuit Diagram

NOTE: No further details have been found for the circuit diagram and component listings of any pcbs covered by this manual. It maybe that the components are the same but **BEWARE**. The diagram below is that of the early pcbs.