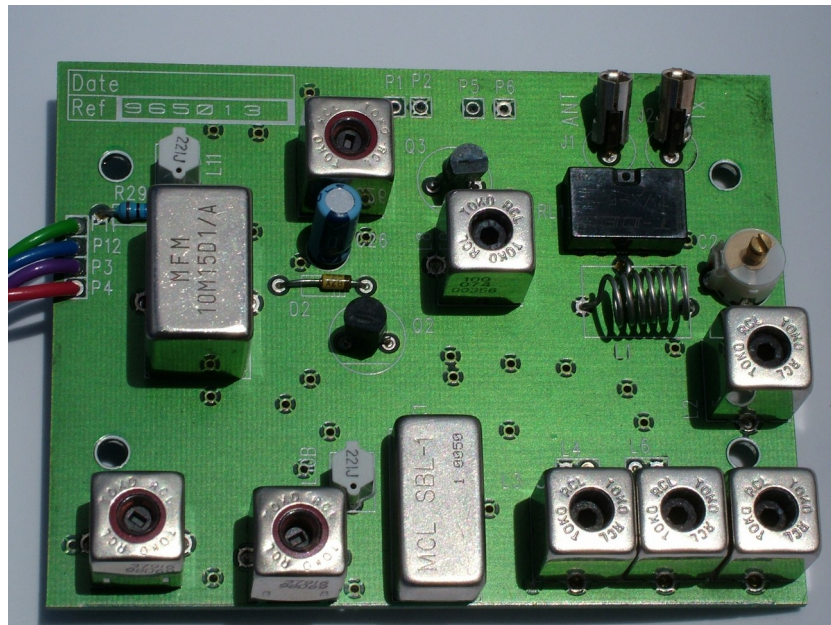


Replacement Front End for IC271A/E/H - Late Version RPCB271ub

a product produced by Mutek circa 1995



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 [latefrontendIC271.pdf](#).

Specification

Typical performance data for a transceiver fitted with a RPCB271ub.

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.

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

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	NOT covered by this manual. CAD design. L shaped board.	1989
*RPCB271ub Iss.2	NOT covered by this manual. No information.	?????
RPCB271ub Iss.2b	Rectangular pcb, not L shaped like all earlier boards	1995

* Denotes not covered by this manual.

Kit List

The kit of parts supplied with the RPCB217ub is listed below.

Description	IC271 A/E	IC271 H
RPBC271ub board	1 off	1 off
Red coded coaxial cable	1 off	0 off
White coded coaxial cable	1 off	1 off
Black coded coaxial cable	1 off	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	6 off
Folded aluminium display screen shield	1 off	1 off
Cable tie	2 off	4 off
Self-adhesive foam rubber	1 off *	
50R terminating plug	0 off	1 off
47k resistor	1 off	0 off
330n or 220n capacitor	1 off	
100p (n10) capacitor	1 off	0 off
10M resistor	1 off	1 off

CE Certification Certificate



Certificate of Conformity

Product: RPCB 271
 Issue : 2b
 Date : 17/10/95

Specifications Applied : ETSI DE/RES-09016 (Draft)
 : BS EN 50081-1
 : BS EN 50082-1

Approvals Authority : muTek limited
 Address as on front cover

Approved By : Mr M D Dorsett, Director (previos owner)
 Signature :

Approvals Reference : mut27195

Introduction

Thank you for buying Mutek's RPBC271ub transceiver optimised preamplifier for your Icom IC271 A/E/H series transceiver. 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 RPCB271ub.

A low loss relay is used to replace the lossy diode antenna change over switch. This is followed by a low noise amplifier and high performance band pass filter. The mixer is a double balanced diode ring mixer which is properly terminated to minimise spurious products.

The mixer is driven by a jfet buffer amplifier to ensure adequate local oscillator (LO) drive. The mixer is then followed by a low noise high dynamic range IF amplifier which drives an 8 pole crystal monolithic filter. This has adequate bandwidth for FM and will provide reasonable selectivity at 12.5KHz offset. Following the filter is an AGC amplifier. The IF is then reinserted into the original receiver.

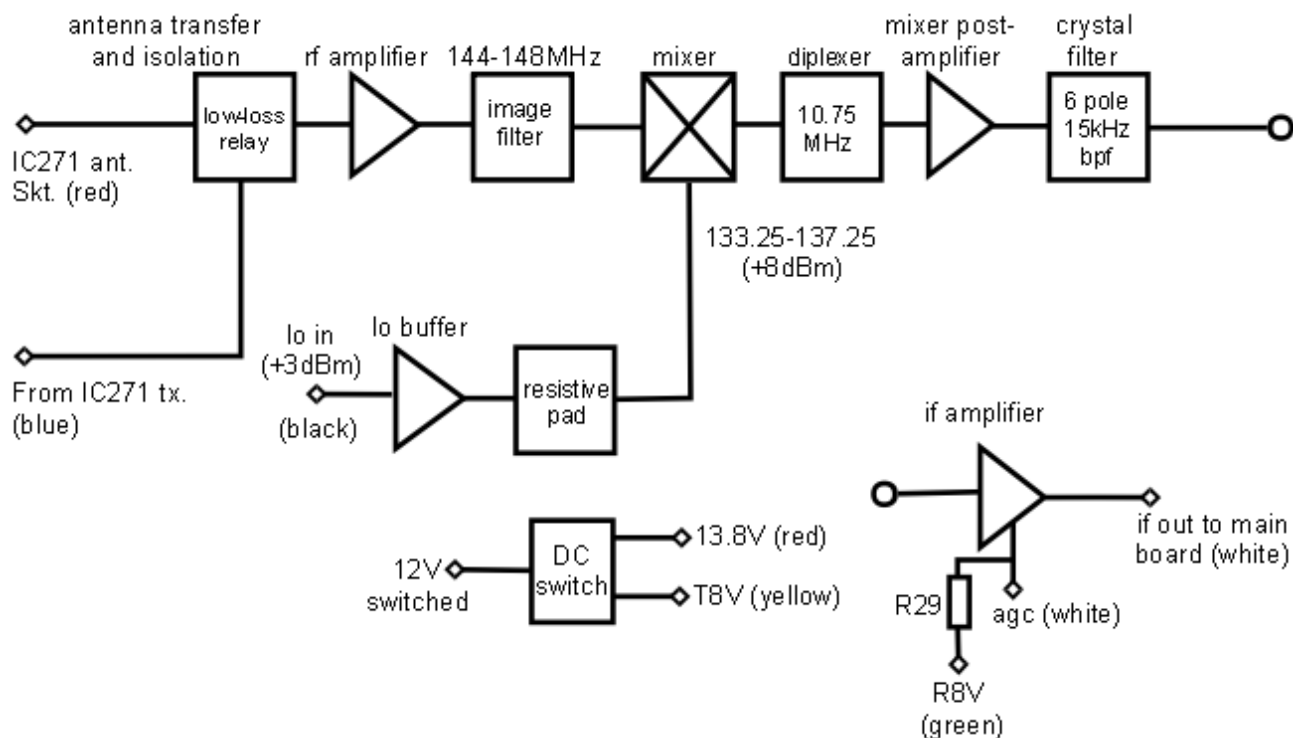


Figure 1: RPCB271ub Block Diagram

Installation Notes

The RPCB271ub is mounted in the space provided for Icom's optional preamplifier. If this is fitted it will not be required after the modification. 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.

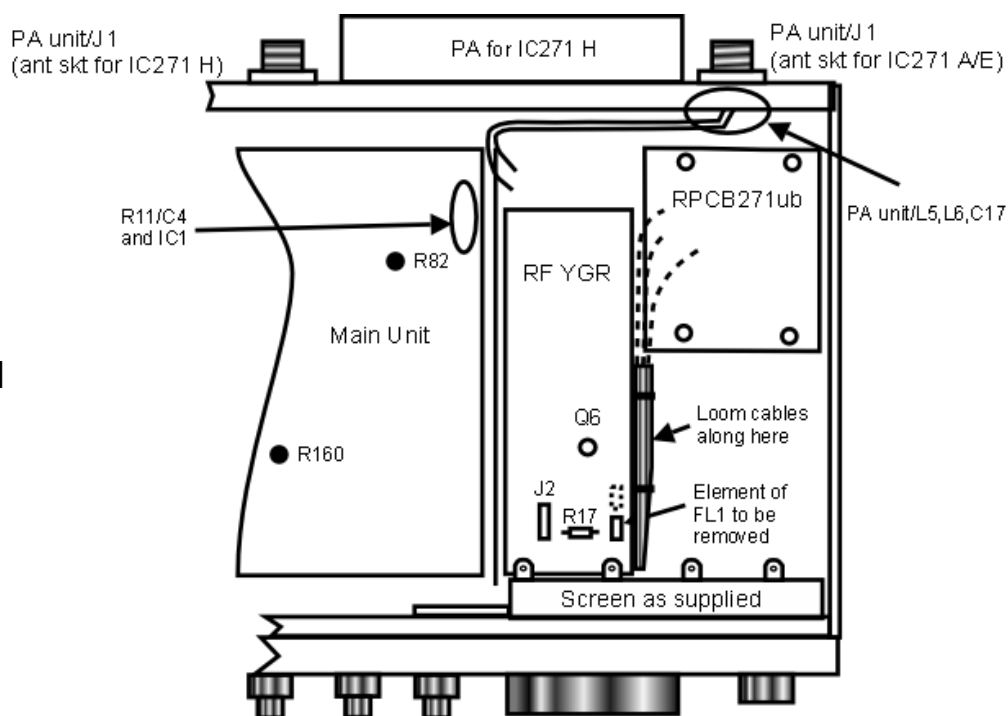
In the following installation instructions we refer to Icom's component designations thus: board/component designation e.g. RF YGR/D2. which refers to diode number D2 on board RF YGR. Coaxial cable marker colours in our cable kit are in parentheses thus (red/white) and dc supply and control line colours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

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

If any difficulties are encountered please get in touch with Mutek - we want to make sure that you are happy with our products. E-mail is usually the best medium. Likewise, if you have any constructive criticisms, please let us know. Thanks.

BEWARE: there may be wiring colour changes during the life of this board.

Detailed Installation

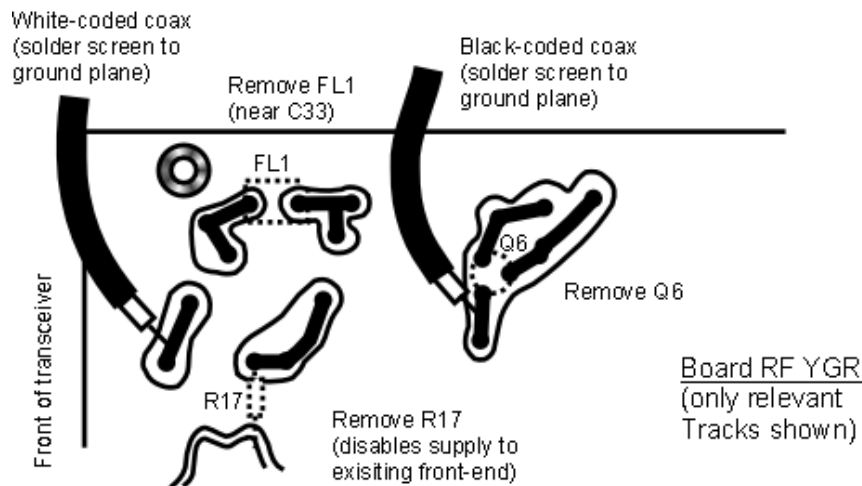


**Figure 2: IC271
Layout**

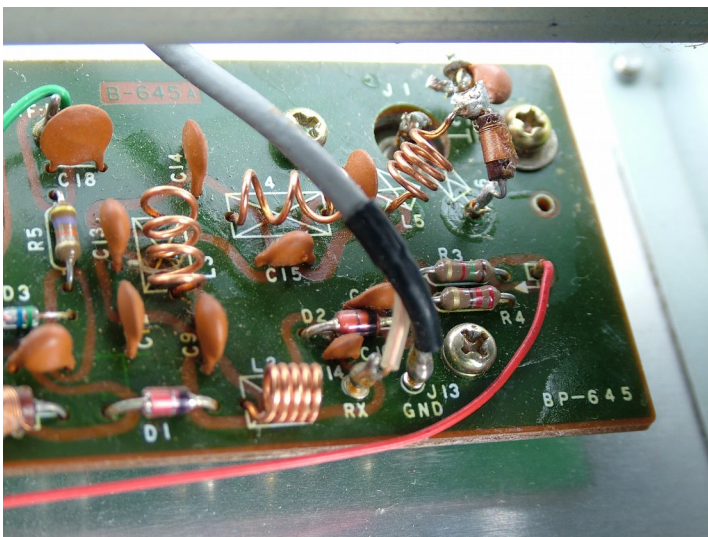
- 1) Disconnect the transceiver from external power sources, remove the antenna and any other external connections.
- 2) Cover removal:
IC271 A/E: Remove the top cover of the IC271.

IC271 H: Remove top and bottom cover. Locate the tone burst unit (B-915) on the top side of the transceiver. Remove the connections at the ends of the flying leads. These are connectors *logic unit/J7*, and *main unit/J12*, near the crystal filter in the centre of the board. Remove the 4 screws securing the board. Carefully lift away the board guiding the leads and connectors clear of the transceiver. On the underside of the transceiver locate the space intended for the optional interface unit (see ICOM manual). Using two of the screws and spacers mount the tone burst unit by the two tapped holes nearest the terminal unit. Relocate the leads and connections from the tone-burst unit. Secure the loose lead to *logic Unit/J7* to the top of the PLL unit plate with a small piece of insulating tape. Replace the bottom cover.

- 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 (part no. BP644), 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.
- 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.

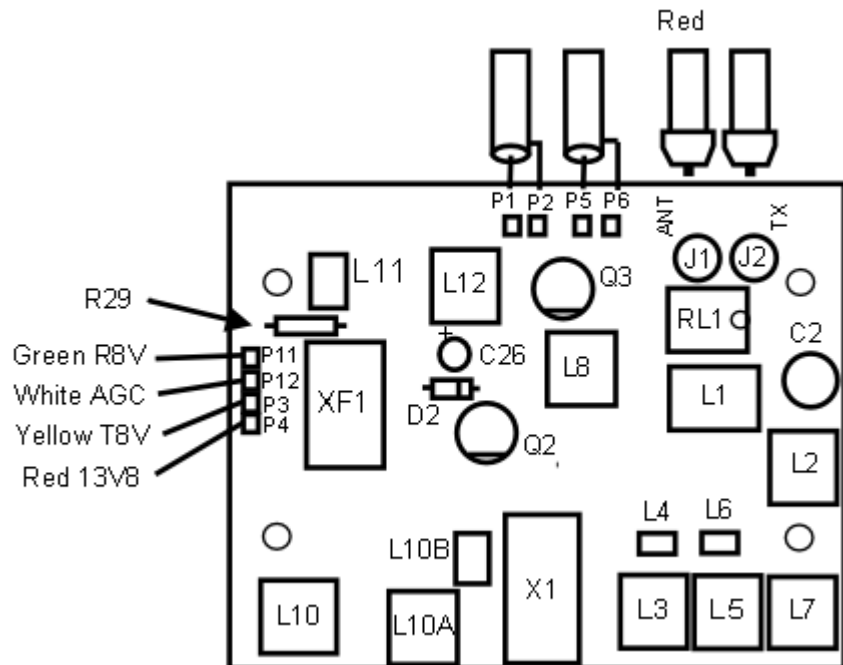
Figure 3: Connections to Main Unit

- 6) Strip the ends of the white and black coaxial cables and solder them to the tracks indicated on Fig.3 - 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 screw 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 bend the screen slightly to obtain a good contact/firm fit. 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).
- 8) **ICOM271 A/E only:** See Fig.2 and Fig.4. Locate PA unit/J1, the antenna socket. Carefully remove the leads of PA Unit components L5, L6 and C17 from J1. Solder the free ends of these components together about 3mm away from the antenna socket centre pin. De-solder the old receive cable from the pins on the PA unit board. Solder this cable to the junction of L5/L6/C17 (the centre) and the braid to the solder tag.

**Figure 4: FT271 PA unit, antenna connector J1**

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

Figure 5: RPCB271ub Connections



WARNING: during the issue of this board there appears to have been some variation on instructions re the colour of the wiring. BE CAREFUL!

- 9) **ICOM271 A/E only:** Solder the red coded coax cable to PA Unit/J1. The core connects to the centre pin of the socket and the screen to the solder tag. Take care not to create a short. This forms the new ANT cable for RPCB271ub.
- 10) Carefully solder the white and black coded coax cables to the RPCB271ub as shown in Fig.5. Also solder the single red, yellow, green and white wires to the RPCB271ub as shown on Fig.5. Install the RPCB271ub in the transceiver with the M6 screws provided.

10.1 ICOM 271H only: Insert the 50R terminating plug into the socket marked TX (J2) on RPCB271ub.

- 11) Antenna connection.

ICOM271 A/E only: Plug the red coded coax cable into the ANT (J1) socket on the RPCB271ub.

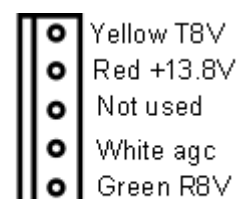
ICOM 271 H only: Remove plug RF YGR/J4 and insert this in the socket marked ANT (J1) on the RPCB271ub.

- 12) **ICOM271 A/E only:** Plug the grey coax into the socket marked TX (J2)

- 13) Solder the red, yellow, green and white wires to the connector RF YGR/J2 as per diagram adjacent. Note that one pin is not used.

- 14) Check your wiring very carefully, double check if necessary.

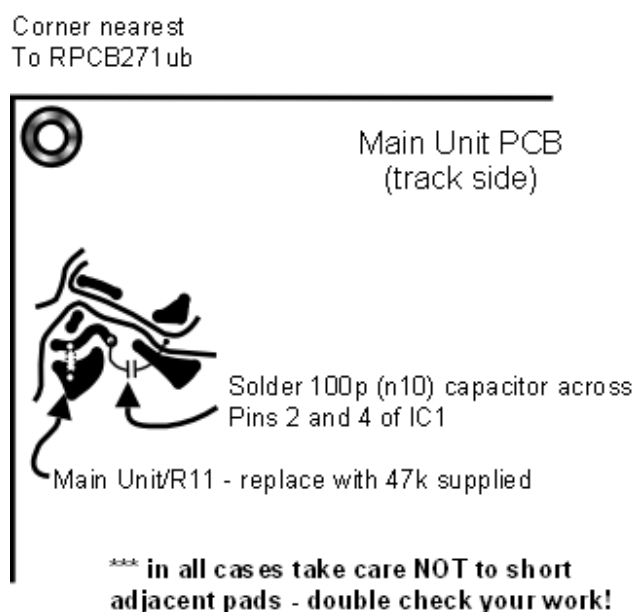
- 15) Use the cable ties to secure cables to the RF YGR board - see Fig.2.



To front of transceiver

- 16) **ICOM271 A/E only:** Locate main unit PCB. If part no. (near centre of board) is B-643 A (look carefully as A may not be in white writing) then continue with this step. If not jump to step 17. (all transceivers imported up to May/June 1984 should have this designation). For immunity from rf feedback problems it is necessary to change a component and add an additional decoupling capacitor.
- 16.1 Remove free socket Main Unit/J3 and the five machine screws securing the board to the chassis. Now study Fig.6 of these instructions. This board will fold over but be careful of wiring - remove other jumpers if you feel it is necessary.
 - 16.2 Locate Main Unit/IC1 - the microphone preamplifier IC. Solder the 100p (n10) capacitor supplied across pins 2 and 4 of IC1 on the track side.
 - 16.3 Locate Main Unit/R11 - replace with 47k provided.
 - 16.4 Carefully replace main unit pcb, securing with the five screws and reconnect Main Unit/J3.

Figure 6: RF Immunity Modification



- 17) Connect a power source and, preferably, a dummy load to the transceiver.
- 18) 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 (a small click). If nothing happens check your wiring.
- 19) Turn the mic gain towards maximum and advance the RF power control. Whistle into the mic and observe rf output. With the RF power and mic gain controls at maximum, adjust Main unit/R82 (Fig.2) until the power falls slightly. This is the correct point for operation on ssb.
- 20) If necessary, adjust the s-meter zero with Main Unit/R160, transceiver set in receive USB mode).
- 21) 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 10M Ω and can be effectively reduced in value by putting an additional resistor in parallel. A 10M Ω resistor is included in the kit of parts for this purpose.

Table 1: Component Listing

Ref.	Value	Ref.	Value	Ref.	Value	Ref.	Value	Ref.	Value
R1	100R	R18	82k	C1	?	C18	1n0	L8	100-074
R2	82k	R19	39k	C2	2/10p	C19	1n0	L9	u47
R3	39k	R20	39k	C3	10n	C20	1n0	L10	KACS4 520
R4	10R	R21	39R	C4	8p2	C21	10n	L11	22uH
R5	120R	R22	1k5	C5	1p8	C22	10n	L12	KACS4 520
R6	10R	R23	1k5	C6	1n0	C23	1n0		
R7	4R7	R24	10R	C7	1n0	C24	10n	D1	1N4148
R8	4R7	R25	3k3	C8	1p8	C25	10n	D2	7V5 zener
R9	270R	R26	1M0	C9	4p7	C26	1u0	Q1	BF988
R10	180R	R27	39k	C10	3p9			Q2	PNP
R11	180R	R28	100R	C11	3p9	L1	Coil	Q3	J310
R12	27R	R29	10M	C12	4p7	L2	100-074	Q4	BF961
R13	10R	R30	1M0	C13	1p8	L3	100-075	Q5	BF961
R14	47R			C14	3p9	L4	10nH	X1	SBL-1
R15	1k5	RL1	12V relay	C15	3p9	L5	100-074	XF1	10.75M
R16	1k5			C16	1n0	L6	10nH	FX1	F.B.
R17	1M0			C17	1n0	L7	100-075	FX2	F.B.

Figure 7: Circuit Diagram

