SERVICE MANUAL

DNT 40FM

radio technic RT852

ICOM ICB 1050

JWR M2

CB to 10mtr

CONVERSION DETAILS

Icom ICB1050 and JWR M2

These rigs use an MC145106P programmable PLL frequency synthesis IC to control the VCO frequency. A 10.24 crystal feeds the IC to provide a reference frequency of 10 kHz. Two more crystals provide references of 16.50625 MHz for RX and 16.96125 for TX.

The VCO output is divided in the IC according to the binary code supplied by the channel switch (see chart). It is a relatively simple matter to convert the operating frequencies of the rig once you know that each increment of "1" in the code will increase the frequency by 10 kHz.

If you compare the standard binary codes with those required to produce the range 29.30 to 29.69 MHz you will note that pins 10 and 11 must be held high: pin 17 is unchanged and can remain connected to the channel switch: pin 16 requires an invertor in the line from the channel switch (except when repeater shift during TX is required). Finally, pins 12, 13, 14 and 15 bear no obvious relationship but, in fact, there is an increase of 1 0 1 0 for 10 metre operation (or an increase of 1 0 0 0 for repeater shift).

Incrementing by this amount can be performed by a "4008" 4 bit binary adder IC. The inversion of pin 16 can be done with a "4077" quad exclusive NOR IC, with gates left over for additional functions.

Since repeater shift will be required only on the top channels, we can prevent accidental out-of-band TX by reverting to normal operation (even if repeater shift is switched on) by detecting the switch codes on the green and blue wires. If either of these is high, repeater shift is inhibited.

As an aid to setting-up, a spare gate can be used to drive an LED when the Lock Detect output from the PLL IC is high. This gives a visual indication that the VCO adjustment is correct. Once the VCO has been adjusted, the LED gate connection can be removed from pin 8 of the PLL IC and connected to point "X" to indicate when repeater shift is actually happening. The LED can be fitted permanently in the front panel of the rig.

The repeater shift wire is taken from point "S", via a switch, to pin 4 on the mic socket.

Note that the violet wire from the channel switch must be disconnected and pins 10 and 11 linked to pin 1 of the PLL IC. The brown and the pink wires are left in place.

T202, the VCO coil, is adjacent to the PLL IC and its core must be freed from wax (carefully !) and unscrewed until the VCO locks on RX (pin 8 will be high). Adjust the VCO similarly for TX and ensure that it remains in lock for channels 1 and 40 on TX and RX. The VCO core can then be rewaxed. Little or no output will be evident on TX until you adjust T209, T301, T303 and T307. To optimise RX sensitivity adjust T101 and T102.

If you check the frequency you will find an error which can be corrected by adjusting CT202 for TX and CT201 on RX. To increase the deviation, rotate RV303 clockwise.

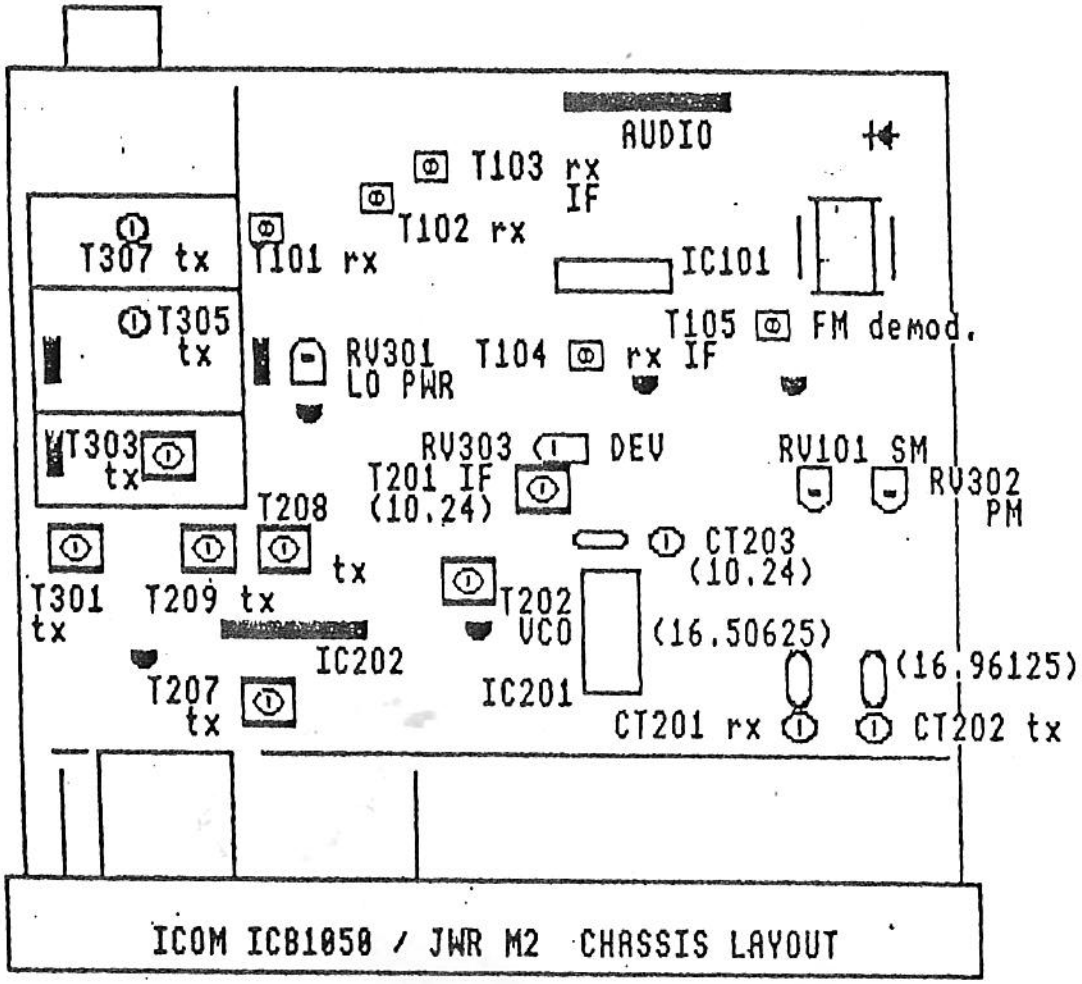
NOTES:

The RF gain varies with the squelch setting. If you remove the diode from beneath the board you might find operation more satisfactory.

T101 has a nasty habit of going open-circuit, making the rig extremely deaf, to say the least! Replace it with a Toko 113CN2K159DZ from CIRKIT.

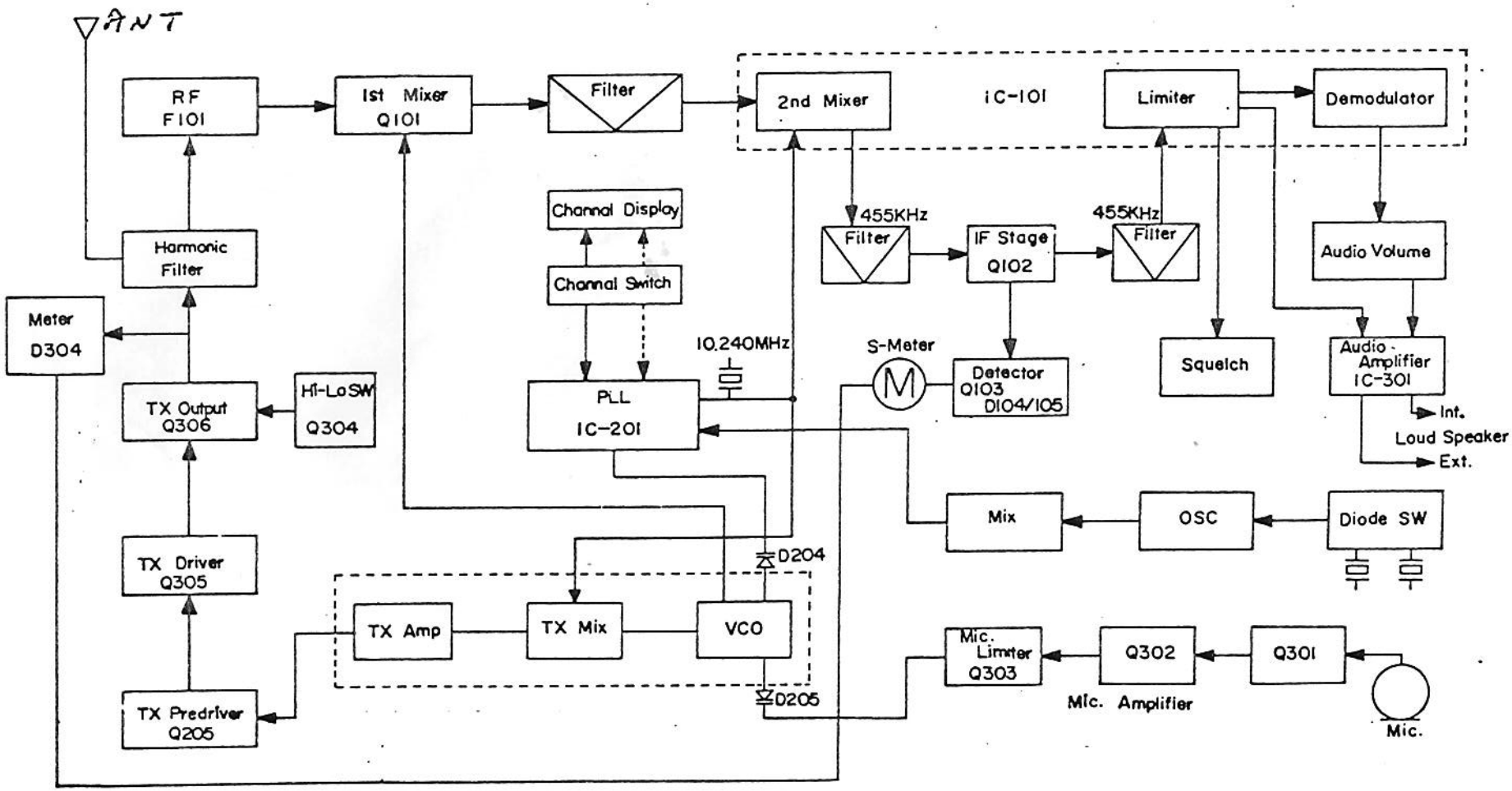
Replace C103 (100pF) with 33pF and C106 (22pF) with 10pF and retune to improve receiver performance.

Replace CF101 with a 10.695 crystal filter from P.R. Golledge to improve I.F. selectivity.



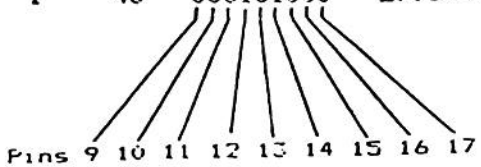
ICOM ICB1050 / JWR M2 CHASSIS LAYOUT

BLOCK DIAGRAM



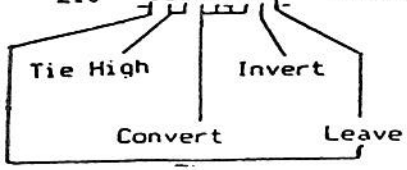
Standard

CHAN			
40	79	001001111	27.99125
39	78	001001110	27.98125
38	77	001001101	27.97125
37	76	001001100	27.96125
36	75	001001011	27.95125
35	74	001001010	27.94125
34	73	001001001	27.93125
33	72	001001000	27.92125
32	71	001000111	27.91125
31	70	001000110	27.90125
30	69	001000101	27.89125
29	68	001000100	27.88125
28	67	001000011	27.87125
27	66	001000010	27.86125
26	65	001000001	27.85125
25	64	001000000	27.84125
24	63	000111111	27.83125
23	62	000111110	27.82125
22	61	000111101	27.81125
21	60	000111100	27.80125
20	59	000111011	27.79125
19	58	000111010	27.78125
18	57	000111001	27.77125
17	56	000111000	27.76125
16	55	000110111	27.75125
15	54	000110110	27.74125
14	53	000110101	27.73125
13	52	000110100	27.72125
12	51	000110011	27.71125
11	50	000110010	27.70125
10	49	000110001	27.69125
9	48	000110000	27.68125
8	47	000101111	27.67125
7	46	000101110	27.66125
6	45	000101101	27.65125
5	44	000101100	27.64125
4	43	000101011	27.63125
3	42	000101010	27.62125
2	41	000101001	27.61125
1	40	000101000	27.60125



10 metre

249	011111001	29.69
248	011111000	29.68
247	011110111	29.67
246	011110110	29.66
245	011110101	29.65
244	011110100	29.64
243	011110011	29.63
242	011110010	29.62
241	011110001	29.61
240	011110000	29.6
239	011101111	29.59
238	011101110	29.58
237	011101101	29.57
236	011101100	29.56
235	011101011	29.55
234	011101010	29.54
233	011101001	29.53
232	011101000	29.52
231	011100111	29.51
230	011100110	29.5
229	011100101	29.49
228	011100100	29.48
227	011100011	29.47
226	011100010	29.46
225	011100001	29.45
224	011100000	29.44
223	011011111	29.43
222	011011110	29.42
221	011011101	29.41
220	011011100	29.40
219	011011011	29.39
218	011011010	29.38
217	011011001	29.37
216	011011000	29.36
215	011010111	29.35
214	011010110	29.34
213	011010101	29.33
212	011010100	29.32
211	011010011	29.31
210	011010010	29.30

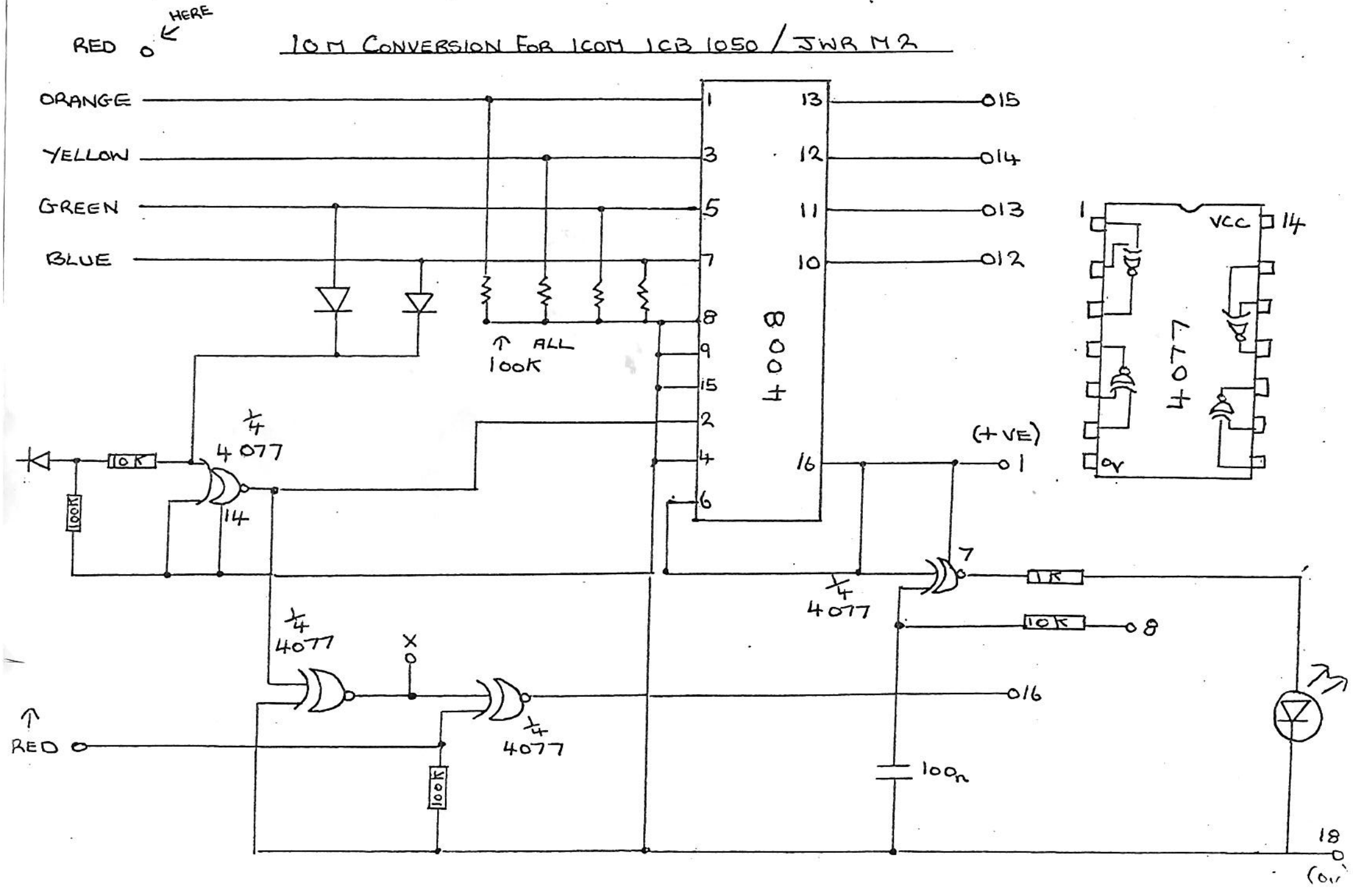


TX only Repeater

239	011101111	29.59
238	011101110	29.58
237	011101101	29.57
236	011101100	29.56
235	011101011	29.55
234	011101010	29.54
233	011101001	29.53
232	011101000	29.52
231	011100111	29.51
230	011100110	29.5
229	011100101	29.49
228	011100100	29.48
227	011100011	29.47
226	011100010	29.46
225	011100001	29.45
224	011100000	29.44

Icom ICB1050 and JWR M2

10M CONVERSION FOR ICOM ICB 1050 / JWR M2



THE SIMPLE METHOD

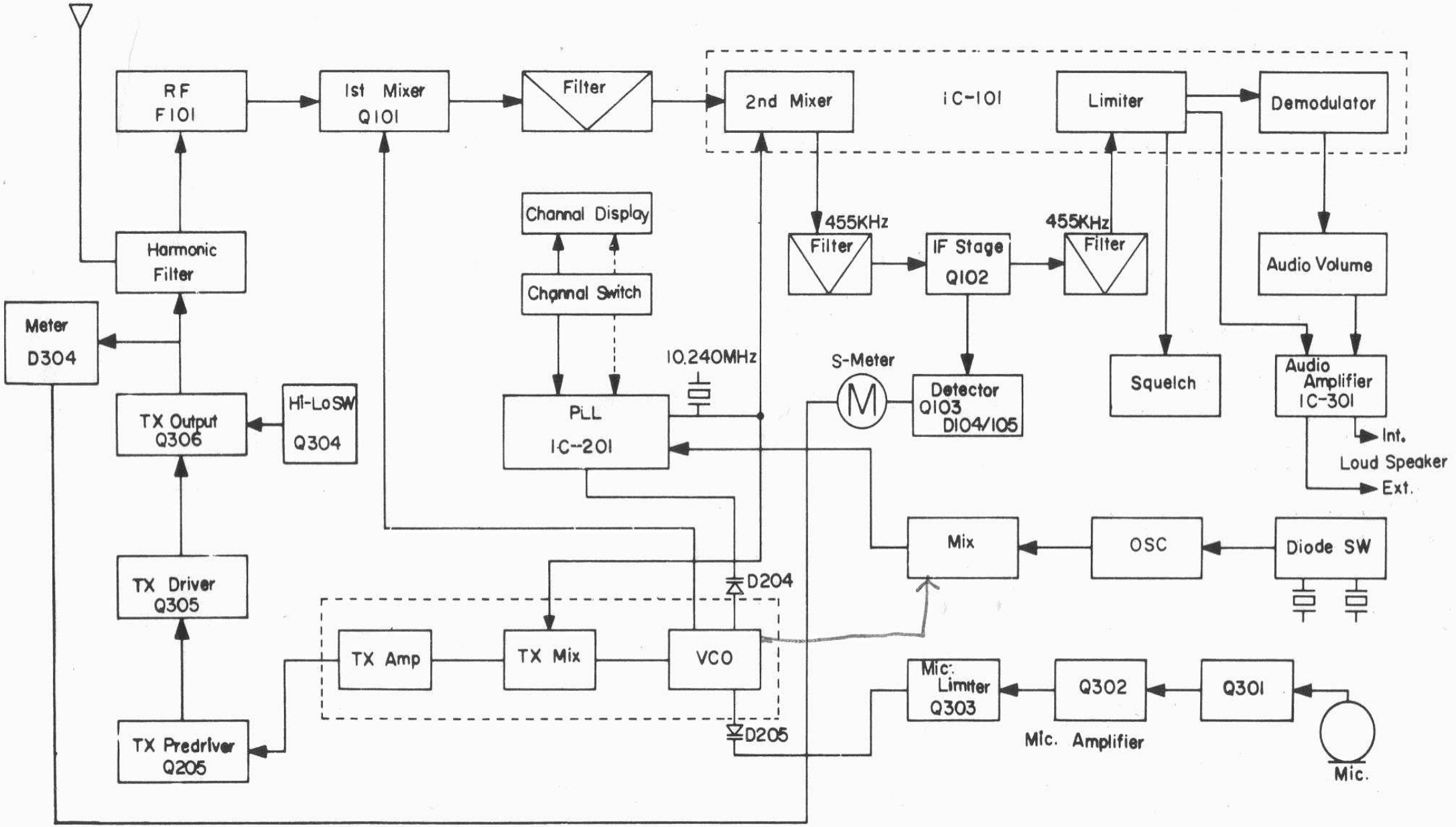
CONNECT TOGETHER THE SOLDER PADS OF PINS 10,11,12 ON THE MC 145106 PLL IC,VIA A 10K RESISTOR CONNECT THE COMBINED PINS TO PIN 1 OF THE SAME CHIP WHICH HAS A PERMANENT VOLTAGE. THIS WILL NOW ALLOW THE SET TO BE RETUNED TO OPERATE IN THE 29MHz RANGE. WITH CHANNEL 25 BEING 29.600.

TO INCREASE COVERAGE DOWNWARDS FROM CHANNEL 25 THE GREEN LEAD FROM PIN 13 MUST BE DISCONNECTED AND DISCARDED, UNSOLDER THE VIOLET LEAD FROM PIN 11 AND TRANSFER TO VACANT HOLE AT PIN 13.THIS WILL ALLOW 10KHz STEPS FROM CHANNEL 40 TO 9, BETWEEN 1 AND 9 THE CHANNELS WILL DUPLICATE AND CAN BE IGNORED AS THEY ARE ALREADY COVERED.

RETUNING OF THE SET WILL BE NEEDED.T202 IS THE VCO CAN,T209,301,303 AND 307 OPERATE THE TX STRIP WHILE T101 AND T102 COVER RECEIVE.SLIGHT OFFSET ON THE FREQUENCY CAN BE CURED BY CT202 ON TX AND CT201 ON RX.

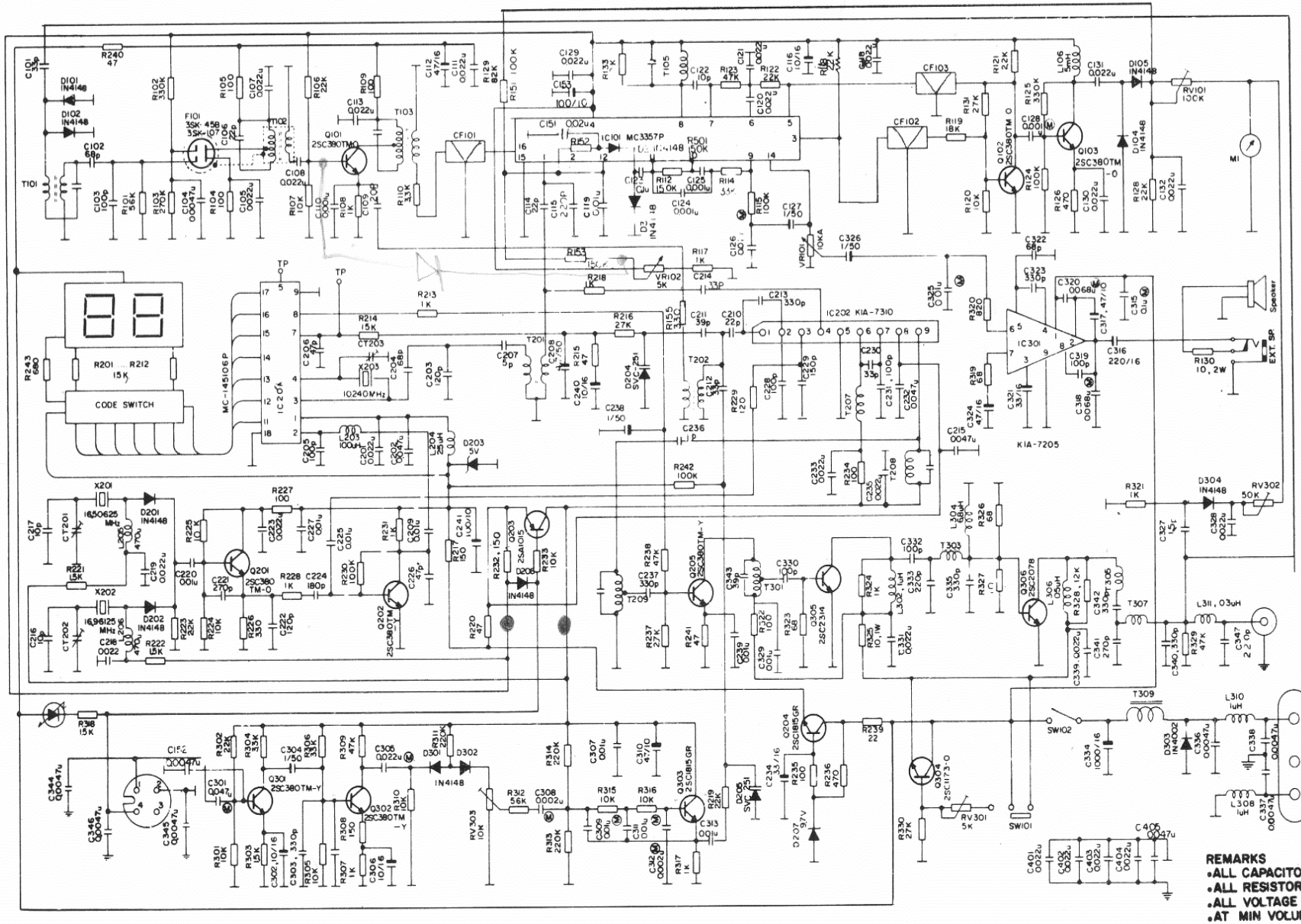
REPEATER SHIFT CAN BE OBTAINED BY SWITCHING A 16.861 CRYSTAL IN PLACE OF THE 16.961 IN THE TX MODE.

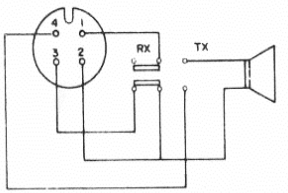
BLOCK DIAGRAM



Icom 1050

SCHEMATIC DIAGRAM





SCHEMATIC DIAGRAM

REMARKS
- ALL CAPACITOR IN FARAD
- ALL RESISTOR IN OHM
- ALL VOLTAGE MEASUREMENT AGAINST GROUND
- AT MIN VOLUME AND SQUELCH

PARTS LIST

Symbol No.	Description
IC101	IC MC-3357P
IC201	IC MC-145106P/LC-7137
IC202	IC KIA-7310/AB-103/TA -7310
IC301	IC KIA-7205CP/TA-7205CP
Q101	2SC 380TM
Q102	2SC 380TM
Q103	2SC 380TM
Q201	2SC 380TM
Q202	2SC 380TM
Q203	2SA 1015Y
Q204	2SC 1815GR
Q205	2SC 380TM
Q301	2SC 1815GR
Q302	2SC 1815GR
Q303	2SC 1815GR
Q304	2SC 1173-O
Q305	2SC 2314-F
Q306	2SC 2078D/2SC-1306
F101	3SK-45B/3SK-107
D101	Diode IS2473/IN4148
D102	Diode IS2473/IN4148
D103	Diode IS2473/IN4148
D104	Diode IS2473/IN4148
D105	Diode IS2473/IN4148
D201	Diode IS2473/IN4148
D202	Diode IS2473/IN4148
D203	Zener Diode GZA5.1, 5V 500mw
D204	SVC-251
D205	SVC-251
D206	Diode IS2473/IN4148
D207	Zener Diode GZA10, 9.7V 500mw
D301	Diode IS2473/IN4148
D302	Diode IS2473/IN4148
D303	Diode IN4002/10DI/DS 135E/30DI
D304	Diode IS2473/IN4148
CF101	Ceramic Filter SFE10.7 MS2(RED)
CF102	Ceramic Filter CFU455G2
CF103	Ceramic Filter CFU455G2
CT201	Trimer 20PF 6.5φ/5φ
CT202	Trimer 20PF 6.5φ/5φ
CT203	Trimer 20PF 6.5φ/5φ
X201	Crystal 16.50625MHZ
X202	Crystal 16.96125MHZ
X203	Crystal 10.240MHZ
	LED Lamp 3φRed
	LED Display UL-2231 Green
	ANT.Connector W/Washer
	Earphone Jack W/Washer 3.5φ
	Speaker 8 ohm 3" 2W
	Meter 240 Micro Ampere
VR101	Volume 10Kohm (SW)
VR102	Volume 5Kohm
T309	Choke Transformer EI-19
SW101	Slide Switch 2P2C KSA-221E

Symbol No.	Description
	Rotary Switch GPS-0372
	Microphone W/Connector
	Plug Assy 500 ohm Dynamic
	Nut Locker
	Silicon Grease
	Wax Micro 3Kg/GA
	Power Cord W/Fuse Holder
	Foam Flux
	PCB Main
	PCB Switch
	PCB LED
	Empire Tube 1φ
	Empire Tube 2φ
	Binding Tube
	Jump Wire 0.6φ
T101	IFT 7mm 27MHZ A
T102	IFT 7mm 27MHZ B
T103	IFT 7mm 10.7MHZ
T105	IFT 7mm 455KHZ B
T201	IFT 10mm 10.240MHZ
T202	IFT 10mm 16MHZ VCO
T207	IFT 10mm TX27MHZ A
T208	IFT 10mm TX27MHZ B
T209	IFT 10mm TX27MHZ C
T301	IFT 10mm TX27MHZ D
T303	IFT 10mm TX27MHZE
T305	IFT 10mm TX27MHZ F
T307	IFT 10mm TX27MHZ G
L106	Microinductor 5.6mH
L203	Microinductor 100μH
L204	Microinductor 22μH
L205	Microinductor 470μH
L206	Microinductor 470μH
L302	Choke Coil A 2.2μH
L304	Microinductor 6.8μH
L306	Choke Coil B 0.3μH
L308	Choke Coil C 0.51μH
L310	Choke Coil D 0.51μH
L311	Spring Coil 0.26μH
RV101	Semi Fixed R100KB 8φ
RV301	Semi Fixed R5KB 8φ
RV302	Semi Fixed R50KB 8φ
RV303	Semi Fixed R10KB 8φ
R101	Carbon R56KΩ
R102	Carbon R330KΩ
R103	Carbon R270KΩ
R104	Carbon R100Ω
R105	Carbon R100Ω
R106	Carbon R22KΩ
R107	Carbon R10KΩ
R108	Carbon R1KΩ
R109	Carbon R100Ω
R110	Carbon R3.3KΩ
R112	Carbon R150KΩ
R115	Carbon R100KΩ
R117	Carbon R1KΩ Straight
R118	Carbon 2.2KΩ
R119	Carbon R1.8KΩ
R120	Carbon R10KΩ

Symbol No.	Description
R121	Carbon R2.2KΩ
R122	Carbon R2.2KΩ
R123	Carbon R47KΩ
R124	Carbon R100KΩ
R125	Carbon R330KΩ
R126	Carbon R470Ω
R128	Carbon R22KΩ
R130	Metal Oxide R10Ω/2W
R131	Carbon R27KΩ
R133	Carbon R10KΩ
R201	Carbon R1.5KΩ
R202	Carbon R1.5KΩ
R203	Carbon R1.5KΩ
R204	Carbon R1.5KΩ
R205	Carbon R1.5KΩ
R206	Carbon R1.5KΩ
R207	Carbon R1.5KΩ
R208	Carbon R1.5KΩ
R209	Carbon R1.5KΩ
R210	Carbon R1.5KΩ
R211	Carbon R1.5KΩ
R212	Carbon R1.5KΩ
R213	Carbon R1KΩ
R214	Carbon R1.5KΩ
R215	Carbon R47Ω
R216	Carbon R27KΩ
R217	Carbon R150Ω
R218	Carbon R1KΩ
R219	Carbon R22KΩ
R220	Carobn R47Ω
R221	Carbon R1.5KΩ
R222	Carbon R1.5KΩ
R223	Carbon R2.2KΩ
R224	Carbon R10KΩ
R225	Carbon R10KΩ
R226	Carbon R330Ω
R227	Carbon R100Ω
R228	Carbon R1KΩ
R229	Carbon R120Ω
R230	Carbon R100KΩ
R231	Carbon R1KΩ
R232	Carbon R150Ω
R233	Carbon R10KΩ
R234	Carbon R100Ω
R235	Carbon R100Ω
R236	Carbon R470Ω
R237	Carbon R2.7KΩ
R238	Carbon R4.7KΩ
R239	Carbon R22Ω
R240	Carbon R47Ω
R241	Carbon R47Ω
R242	Carbon R100KΩ
R243	Carbon R680Ω
R301	Carbon R10KΩ
R302	Carbon R22KΩ
R303	Carbon R1.5KΩ
R304	Carbon R3.3KΩ
R305	Carbon R10KΩ
R306	Carbon R33KΩ
R307	Carbon R1KΩ

Symbol No.	Description
R308	Carbon R150Ω
R309	Carbon R4.7KΩ
R310	Carbon R10KΩ
R311	Carbon R220KΩ
R312	Carbon R56KΩ
R313	Carbon R220KΩ
R314	Carbon R220KΩ
R315	Carbon R10KΩ
R316	Carbon R10KΩ
R317	Carbon R1KΩ
R318	Carbon R1.5KΩ
R319	Carbon R68Ω
R320	Carbon R820Ω
R321	Carbon R1KΩ
R322	Carbon R100Ω
R323	Carbon R68Ω
R324	Carbon R1KΩ
R325	Metal Oxide R10Ω/1W
R326	Carbon R68Ω
R327	Carbon R10 Ω
R328	Carbon R1.2K
R329	Carbon R47K
R330	Carbon R2.7K
C101	Ceramic Condenser 33pf
C102	Ceramic Condenser 68pf
C103	Ceramic Condenser 100pf
C104	Ceramic Condenser 0.0047μf
C105	Ceramic Condenser 0.022μf
C106	Ceramic Condenser 22pf
C107	Ceramic Condenser 0.022μf
C108	Ceramic Condenser 0.022μf
C109	Ceramic Condenser 20pf
C110	Ceramic Condenser 0.001μf
C111	Ceramic Condenser 0.022μf
C112	Elyt Cap. 47μf/16WV
C113	Ceramic Cap. 0.022μf
C114	Ceramic Cap. 22pf
C115	Ceramic Cap. 220pf
C116	Elyt Cap. 10μf/16WV
C118	Ceramic Cap. 0.022μf
C119	Ceramic Cap. 0.01μf
C120	Ceramic Cap. 0.022μf
C121	Ceramic Cap. 0.022μf
C122	Ceramic Cap. 10pf CH
C123	Ceramic Cap. 0.1μf
C124	Ceramic Cap. 0.001μf
C125	Ceramic Cap. 0.001μf
C126	Mylar Cap. 0.0022μf
C127	Elyt Cap. 1μf/50WV
C128	Mylar Cap. 0.001μf
C129	Ceramic Cap. 0.022μf
C130	Ceramic Cap. 0.022μf
C131	Ceramic Cap. 0.022μf
C132	Ceramic Cap. 0.022μf
C201	Ceramic Cap. 0.047μf
C202	Ceramic Cap. 0.022μf
C203	Ceramic Cap. 120pf
C204	Ceramic Cap. 68pf
C205	Ceramic Cap. 100pf
C206	Ceramic Cap. 47pf

Symbol No.	Description
C207	Ceramic Cap. 5pf CH
C208	Elyt Cap. 4.7 μf/50WV
C209	Ceramic Cap 0.01μf
C210	Ceramic Cap 22pf CH
C211	Ceramic Cap 39pf CH
C212	Ceramic Cap 33pf CH
C213	Ceramic Cap 330pf
C214	Ceramic Cap 33 pf
C215	Ceramic Cap 0.047μf
C216	Ceramic Cap 10pf CH
C217	Ceramic Cap 10pf CH
C218	Ceramic Cap 0.022μf
C219	Ceramic Cap 0.022μ
C220	Ceramic Cap 0.01μf
C221	Ceramic Cap 270pf
C222	Ceramic Cap 120pf CH
C223	Ceramic Cap 0.022μf
C224	Creamic Cap 180pf
C225	Creamic Cap 0.01μf
C226	Creamic Cap 47pf
C227	Creamic Cap 0.01μf
C228	Creamic Cap 100pf
C229	Creamic Cap 150pf
C230	Creamic Cap 330pf
C231	Creamic Cap 100pf
C232	Creamic Cap 0.047μf
C233	Creamic Cap 0.022μf
C234	Elyt Cap 33μf/16WV
C235	Ceramic Cap 0.022μf
C236	Ceramic Cap 1pf CH
C237	Ceramic Cap 330pf
C238	Elyt Cap. 1μf/50WV
C239	Ceramic Cap 0.01μf
C240	Elyt Cap. 10μf/16WV
C241	Elyt Cap. 100μf/10WV
C301	Mylar Cap. 0.047μf
C302	Elyt Cap. 10μf/16WV
C303	Ceramic Cap. 330pf
C304	Elyt Cap. 1μf/50WV
C305	Mylar Cap. 0.022μf
C306	Elyt Cap. 10μf/16WV
C307	Ceramic Cap. 0.01μf
C308	Mylar Cap. 0.0022μf
C309	Mylar Cap. 0.01μf
C310	Elyt Cap 47μf/10WV
C311	Mylar Cap. 0.01μf
C312	Mylar Cap. 0.0022μf
C313	Ceramic Cap. 0.01μf
C315	Mylar Cap 0.1μf
C316	Elyt Cap 220μf/16WV
C317	Elyt Cap 47μf/10WV
C318	Mylar Cap 0.068μf
C319	Ceramic Cap 100pf
C320	Mylar Cap 0.068μf
C321	Elyt Cap 33μf/16WV
C322	Ceramic Cap. 68pf
C323	Ceramic Cap. 330pf
C324	Elyt Cap 4.7μf/16WV
C325	Mylar Cap 0.01μf
C326	Elyt Cap 1μf/50WV

Symbol No.	Description
C327	Ceramic Cap 1pf CH
C328	Ceramic Cap 0.022μf
C329	Ceramic Cap 0.01μf
C330	Ceramic Cap 100pf
C331	Ceramic Cap 0.022μf
C332	Ceramic Cap 100pf
C333	Ceramic Cap 220pf
C334	Elyt Cap 1000μf/16WV
C335	Ceramic Cap 330pf
C336	Ceramic Cap 0.0047μf
C337	Ceramic Cap 0.0047μf
C338	Ceramic Cap 0.0047μf
C339	Ceramic Cap 0.022μf
C340	Mica Cap 330pf
C341	Mica Cap 270pf
C342	Ceramic Cap 330pf
C343	Ceramic Cap 39pf
C344	Ceramic Cap 0.0047μf
C345	Ceramic Cap 0.0047μf
C346	Ceramic Cap 0.0047μf
C347	Mica Cap 220pf
C401	Ceramic Cap 0.022μf
C402	Ceramic Cap 0.022μf
C403	Ceramic Cap 0.022μf
C404	Ceramic Cap 0.022μf
	Front Bezel
	CH-Knob
	VR-Knob
	Front Chassis
	CH-Sel. Bracket
	Main Chassis
	Top Cabinet
	Bottom Cabinet
	Mounting Bracket
	Mounting Screw
	Front Name Plate
	LED Lamp Holder
	LED Filter
	Speaker Felt
	SW. Felt
	Mic. Hanger
	M.P.T. Name Plate
	Speaker Mounting Bracket
	Meter Cushion
	Rubber Washer
	Eye Let
	Owner Manual
	Styrol Foam
	Display Box
	Master Carton Box
	Poly Bag A
	Poly Bag B
	Poly Bag C
	Poly Bag D
	Silicagel
	Vinyl Tape
	P.P Band
	Band Clamper
	I.C. Heat Sinker
	Tr. Heat Sinker

Symbol No.	Description
	Shield Plate A
	Shield Plate B
	Mica. Plate
	Cabinet Cushion
	I Cable Tag
	Pan Head Tapping Screw A
	Pan Head Tapping Screw B
	Pan Head Tapping Screw C
	Pan head Tapping Screw D
	Pan Head Tapping Screw E
	Pan Head Tapping Screw F
	Pan Head Screw A
	Pan Head Screw B
C405	Ceramic Cap 0.047μf

Symbol No.	Description
	Pan Head Screw C
	Pan Head Screw D
	Flat Head Screw
	Hex Nut
D401	Diode IS2473/IN4148
R151	Carbon R100KΩ
R152	Carbon R680KΩ
R153	Carbon R150KΩ
R155	Carbon R330Ω
R501	Carbon R150KΩ
C151	Ceramic Cap. 0.02μf
C152	Ceramic Cap. 0.0047μf
C153	Elyt Cap100μf/10WV

DNT Circuit Description

The circuit of the DNT (also Radiotechnic RT852) rig and the component layout is provided.

The heart of any modern multi-channel CB radio is the voltage controlled oscillator (VCO). An unusual feature of the DNT is that it has TWO VCOs, one for RX and one for TX operation. Another unusual feature is its use of an MC145106P PLL synthesiser IC instead of a modern fixed N-code type. Consequently there is some scope for adding extra channels, albeit with some difficulty.

The TX VCO comprises Q5, L6, C34 and C36, plus bias resistors and decoupling capacitors. D6 is a variable capacitor diode whose capacitance is controlled by the voltage from pin 7 of the IC. As with all VCOs of this basic design, the frequency range can be extended by decreasing the value of the coupling capacitor C36. It would also be necessary to decrease the value of C119 in the RX VCO circuit.

The TX VCO output is taken directly from Q5 emitter to the RF preamp, Q23, where the frequency is doubled then amplified by the RF driver and output stages. The TX VCO runs at around 13.9 MHz. Its output also feeds Q6, Q7 then Q8 where it mixes with the output from the TX crystal oscillator. One of the frequencies resulting from this mixing is around 2.3 MHz (13.9-11.68) and returns via Q9 buffer stage to pin 2 of the IC. If this frequency matches the internally generated reference frequency in the IC (determined by the "N" codes selected by the channel switch) pin 8 goes high and transmission is allowed. Should the frequencies not match, the IC will alter the voltage supplied to D5 by pin 7 until the downmix frequency is correct. (Note that testing the voltage on pin 8 provides a simple means of determining whether the VCO frequency is correct.)

The RX VCO works in exactly the same manner but, because the RX crystal is 15.23 MHz, the output frequency of the VCO must be higher for the Downmix frequency to remain the same as that for TX. The RX VCO frequency will be around 17.1 MHz (27.8-10.695) and feeds the RX mixer transistor, Q2. The VCO frequency mixes with the received frequency to produce 10.695 which is allowed through the filter and passed through the Intermediate Frequency and demodulator IC. Note that a 10.695 oscillator held near to the rig would pass a signal through the I.F. stages to give a reading on the "S" meter, even if the VCO were not working - this is an extremely useful check to make on any rig which is not receiving since it can either eliminate or disclose a fault in the I.F. stages. Another useful check to make is to measure the voltage on pin 7 of the MC145106P. This voltage should alter in steps of about 0.06v as the channel selector is turned. If it does and if pin 8 is "high", then the VCO section is definitely working properly and the fault lies elsewhere. Do these checks for both RX and TX. Note that it is possible to make the rig transmit (albeit off-frequency) by connecting the junction of R57 and R58 to positive. This "enables" the Lock-Detect circuit. If the VCO is working at all, then an output should be produced, provided that the RF stages are adjusted correctly.

With any "dead" rig (lights up but nothing else) it is wise to check the supply voltages (Q13 and D11 form an AVR in the DNT) and the crystal oscillator(s). In the DNT, the RX oscillator is powered only during RX and the TX oscillator receives power only when the TX line is held low. The 10.24 works all the time, of course.

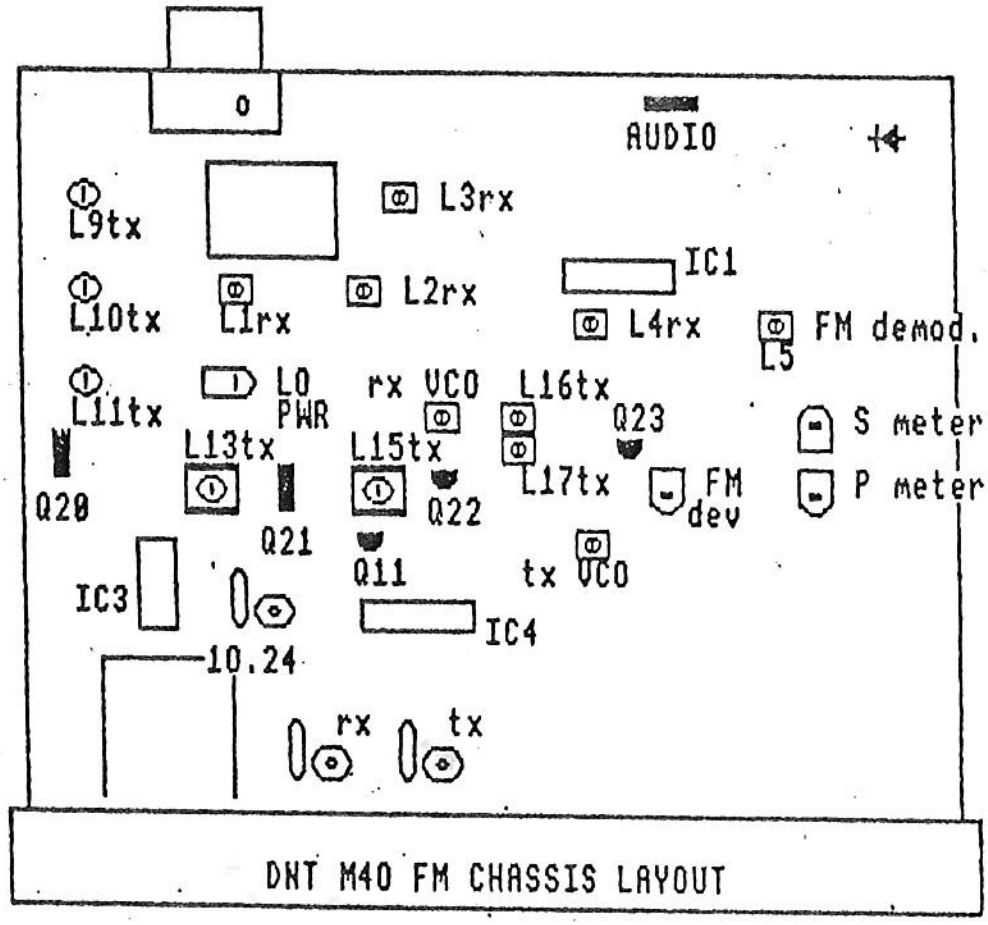
You will notice that there is a third varactor diode, D6. This diode capacitance is varied by a voltage from the microphone amplifier transistors, Q17, 18 and 19 to produce frequency modulation during TX. D12 and 13 perform a clipping operation to limit the maximum deviation which is set by R84.

For those of you who are interested in modification I had better mention that my explanation of the VCO operation was oversimplified. In fact the downmix frequency for TX is NOT the same as that for RX. To achieve the correct frequencies pin 9 is pulled high during TX and pin 6 is pulled low. Pin 9, high, adds 128 to the "N" code and pin 6 low changes the reference frequency from 10kHz to 5kHz. This has to be done because, you will remember, the TX VCO output is doubled. The 5kHz steps thus become 10kHz steps in the RF output to give the correct channel spacing. Just for the record, the N codes for channel 1 are 168 RX and 168+256 TX. This is an extremely complicated way to use the MC145106P. Other rigs achieve the same object more simply.

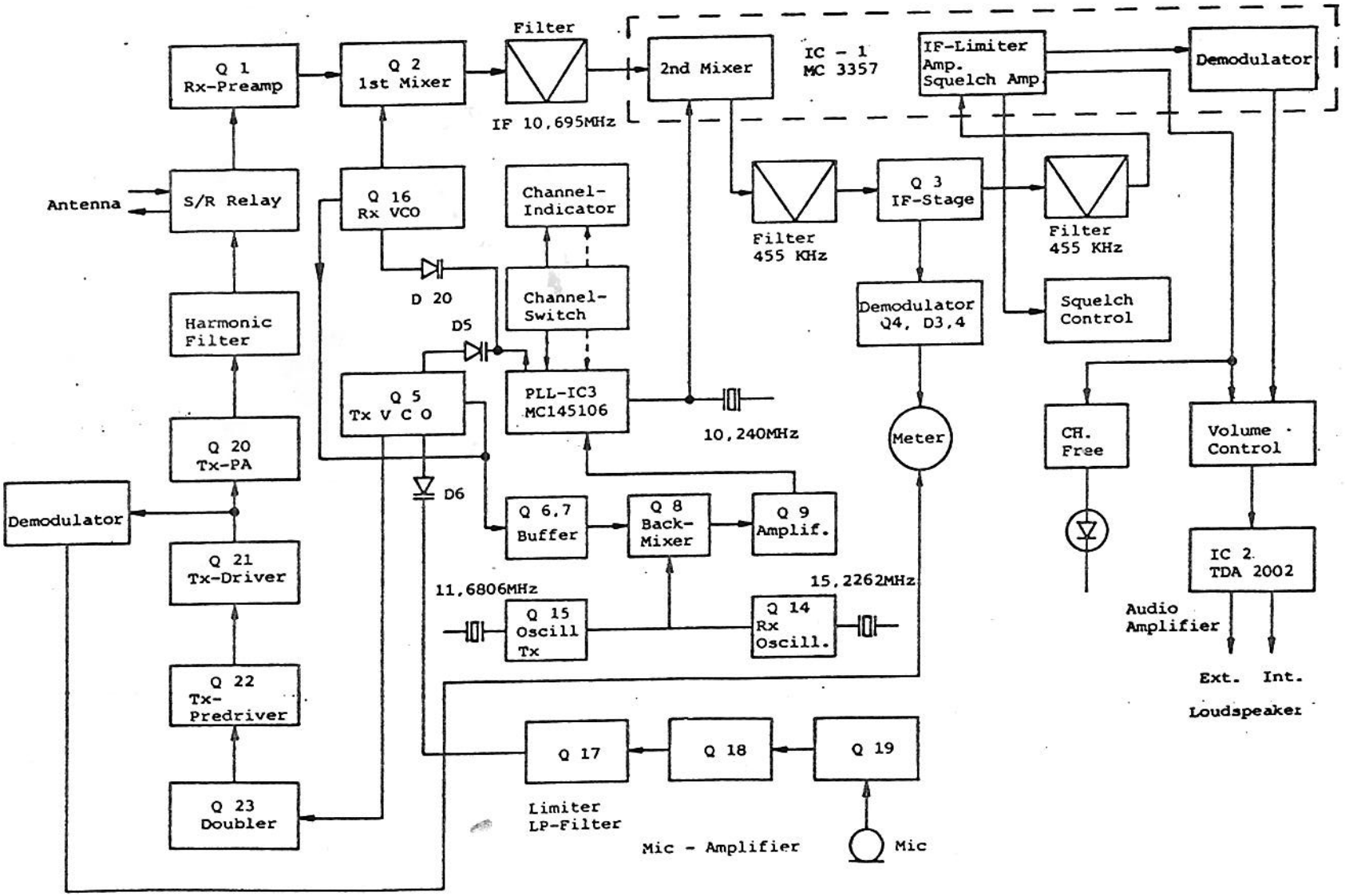
A very interesting effect is obtained by swapping the tracks to pins 11 and 12. Put a frequency counter on and try it !

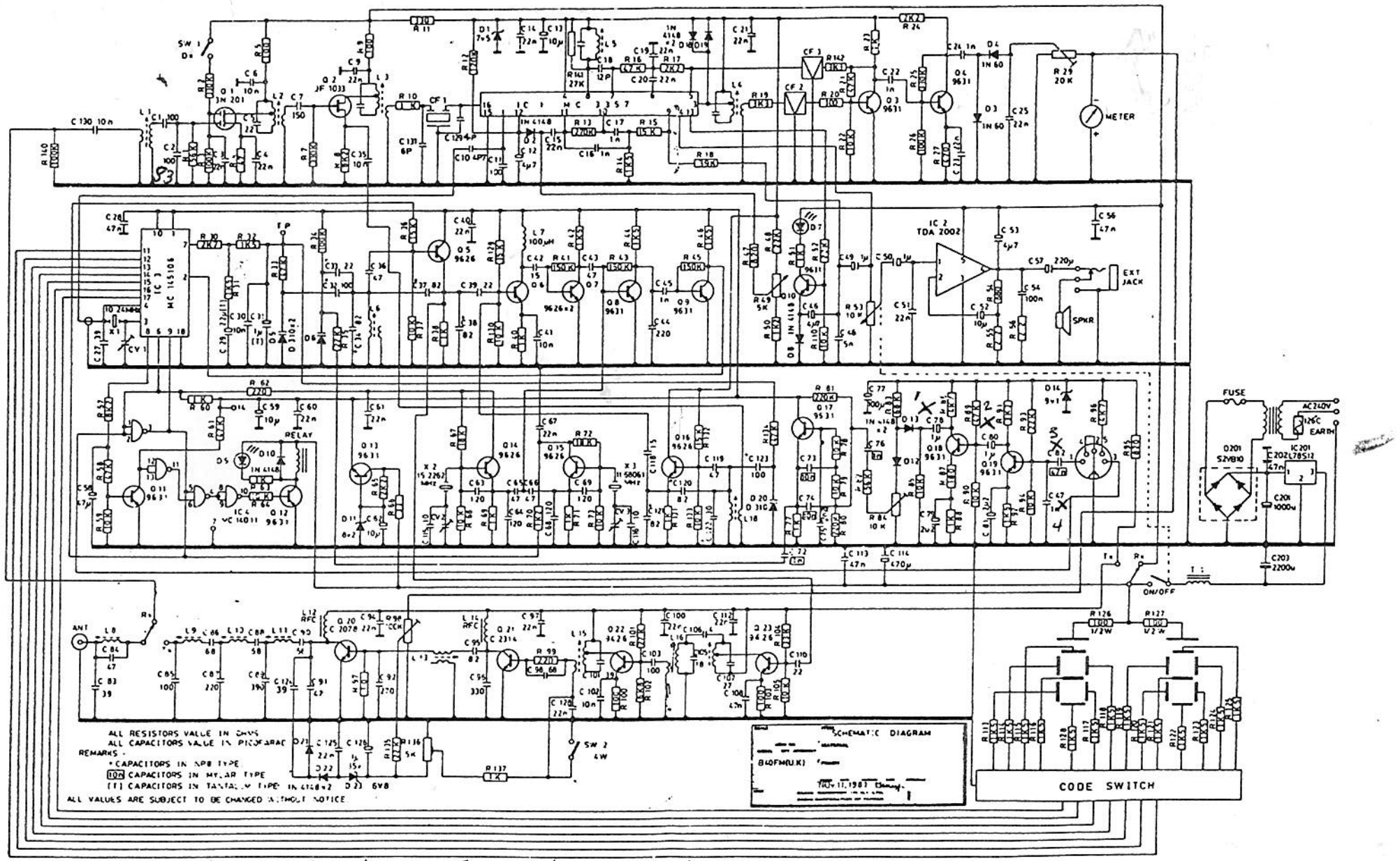
The DNT suffers from odd effects, often caused by maladjustment of the screwcores. It is particularly sensitive to the settings of the tx VCO inductor, L16 and L17. Effects such as reported "breaking up of transmission" on the top or bottom channels: transmit relay clacking in and out, and similar. It is important to ensure that the VCO is stable during TX (use low power) before tuning the TX coils. A high SWR can show up wrong adjustment where the rig might work OK on a dummy load.

Finally, note that the DNT board suffers badly from dry joints. Most of the faults you will come across will be caused by poor soldering but note, also, that ALL the RF transistors Q20, 21, 22 and 23 tend to go faulty. The audio IC, too, is poorly "heatsinked" and tends to blow.


AUDIO
L9tx
L3rx
IC1
L10tx
L1rx
L2rx
L4rx
FM demod.
L5
L11tx
LO
PWR
rx VCO
L16tx
Q23
S meter
L13tx
L15tx
L17tx
FM
dev
P meter
Q20
Q21
Q22
Q11
tx VCO
IC3
IC4
10.24
rx
tx
DNT M40 FM CHASSIS LAYOUT

BLOCK DIAGRAM





Change C2 to 33pF
Change C5 to 10pF
Change C1 68pF

Change 1X & 2X To .22 C78 C80
Remove X4 C47
Remove 3X. Change To .1 & 3K9. C82.

SCHEMATIC DIAGRAM B 40 FM

PARTS SUBJECT TO CHANGE WITHOUT NOTICE

DNT frequency calculations

TX Switched pins		Fixed pin	channel switch codes							divide ratio	
*	256	128	64	32	16	8	4	2	1		← Binary Multiplie
6	9	10	11	12	13	14	15	16	17		← MC145106P pin Nc
1	0	1	0	1	0	1	0	0	0	=168	- channel 1 RX
0	1	1	0	1	0	1	0	0	0	=424	- channel 1 TX

* Pin 6 determines internal reference frequency. 1= 0.01 MHz for RX
2= 0.005 MHz for TX

These are derived by dividing the 10.24 MHz crystal input by 1024 or by 2048 inside the MC145106P.

RX crystal (Fxrx) = 15.2262 MHz
TX crystal (Fxtx) = 11.68061 MHz
IF frequency (FI) = 10.695 MHz

The difference between the crystal and the VCO frequency is the Difference frequency (Fdrx, Fdtx), = divide ratio x internal reference.

Fdrx = 168 x 0.01 = 1.68 MHz
Fdtx = 424 x 0.005 = 2.12 MHz

chan 1 RX = Fxrx + Fdrx + FI
= 15.2262 + 1.68 + 10.695
= 27.60121 (VCO = 16.9062)

chan 1 TX = 2x(Fxtx + Fdtx)
= 2x(11.68061 + 2.12)
= 27.60122 (VCO = 13.8006)

---

10 metre Conversion

We want chan 1 to be 29.30 MHz:-

chan 1 RX = Fxrx + Fdrx + FI
29.30 = 15.2262 + Fdrx + 10.695
Fdrx = 3.38

Divide ratio = 3.38/0.01 = 338
and, similarly, for chan 40 = 377

chan 1 TX = 2x(Fxtx + Fdtx)
29.30 = 2x(11.68061 + Fdtx)
Fdtx = 2.97

Divide ratio = 2.97/0.005 = 594
and, similarly, for chan 40 = 633

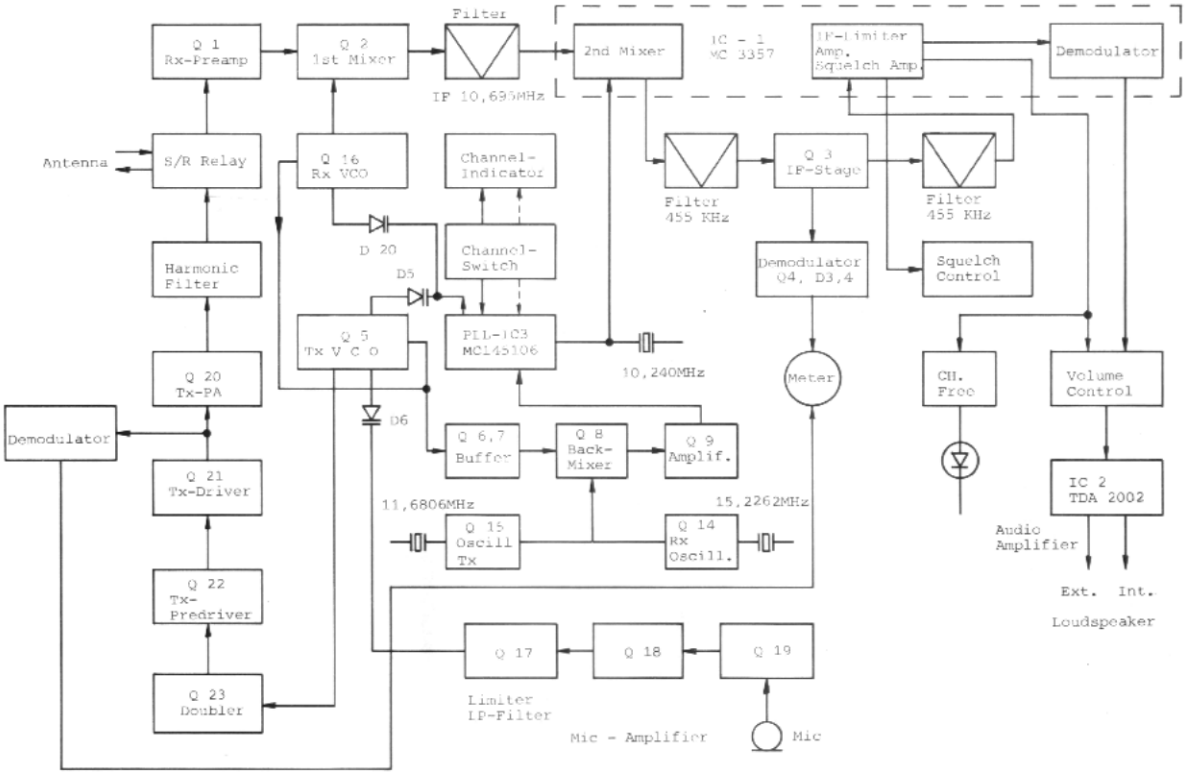
CLEARLY, THE MC145106P CAN'T PROVIDE SUCH LARGE DIVIDE RATIOS FOR TX.

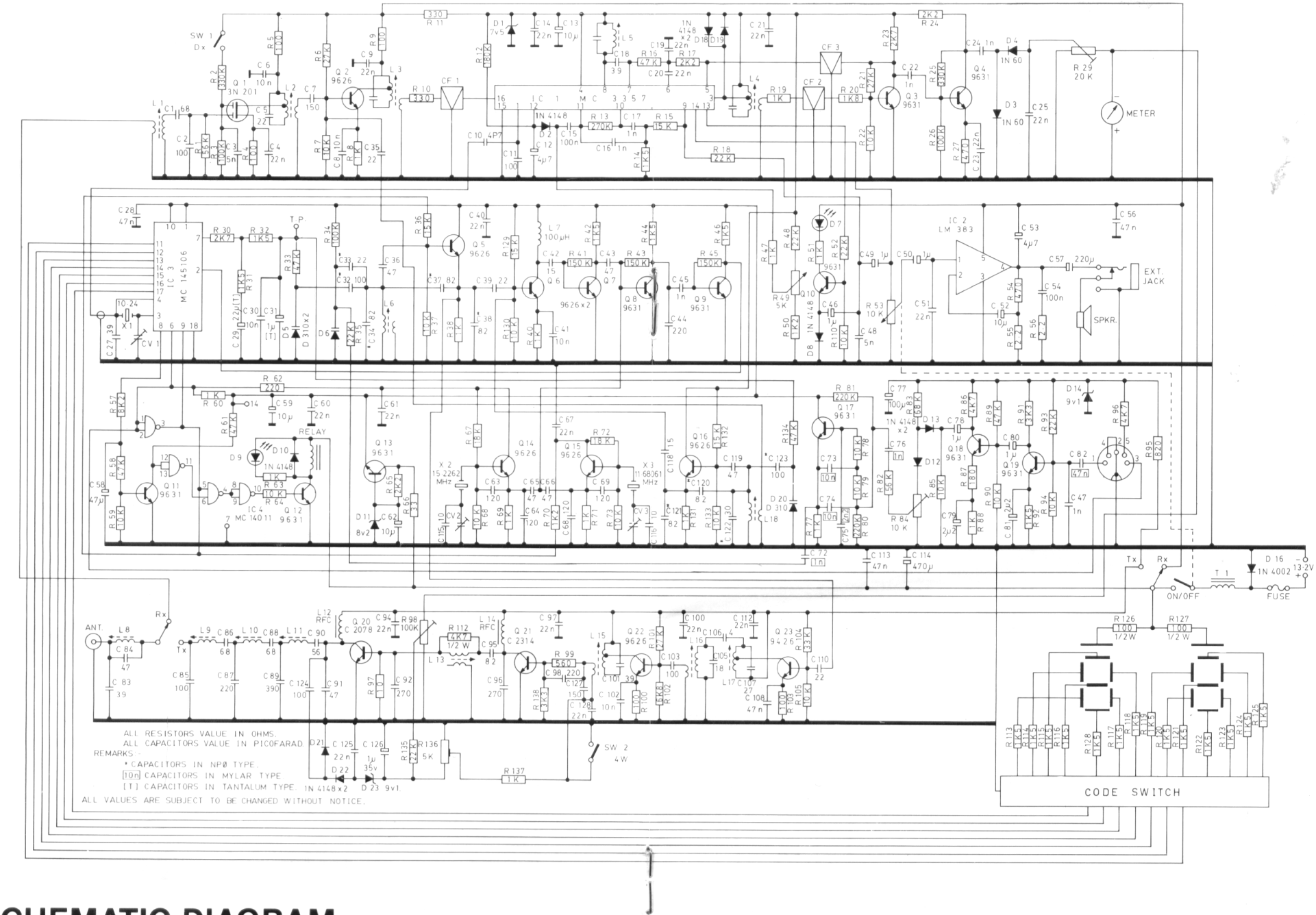
An alternative method is to change both RX and TX crystals:-

chan 1 RX = Fxrx + Fdrx + FI
29.30 = Fxrx + 1.68 + 10.695
Fxrx = 16.925 MHz crystal (VCO = 18.605 MHz)

chan 1 TX = 2x(Fxtx + Fdtx)
29.30 = 2x(Fxtx + 2.12)
Fxtx = 12.530 MHz crystal (VCO = 14.650 MHz)

BLOCK DIAGRAM

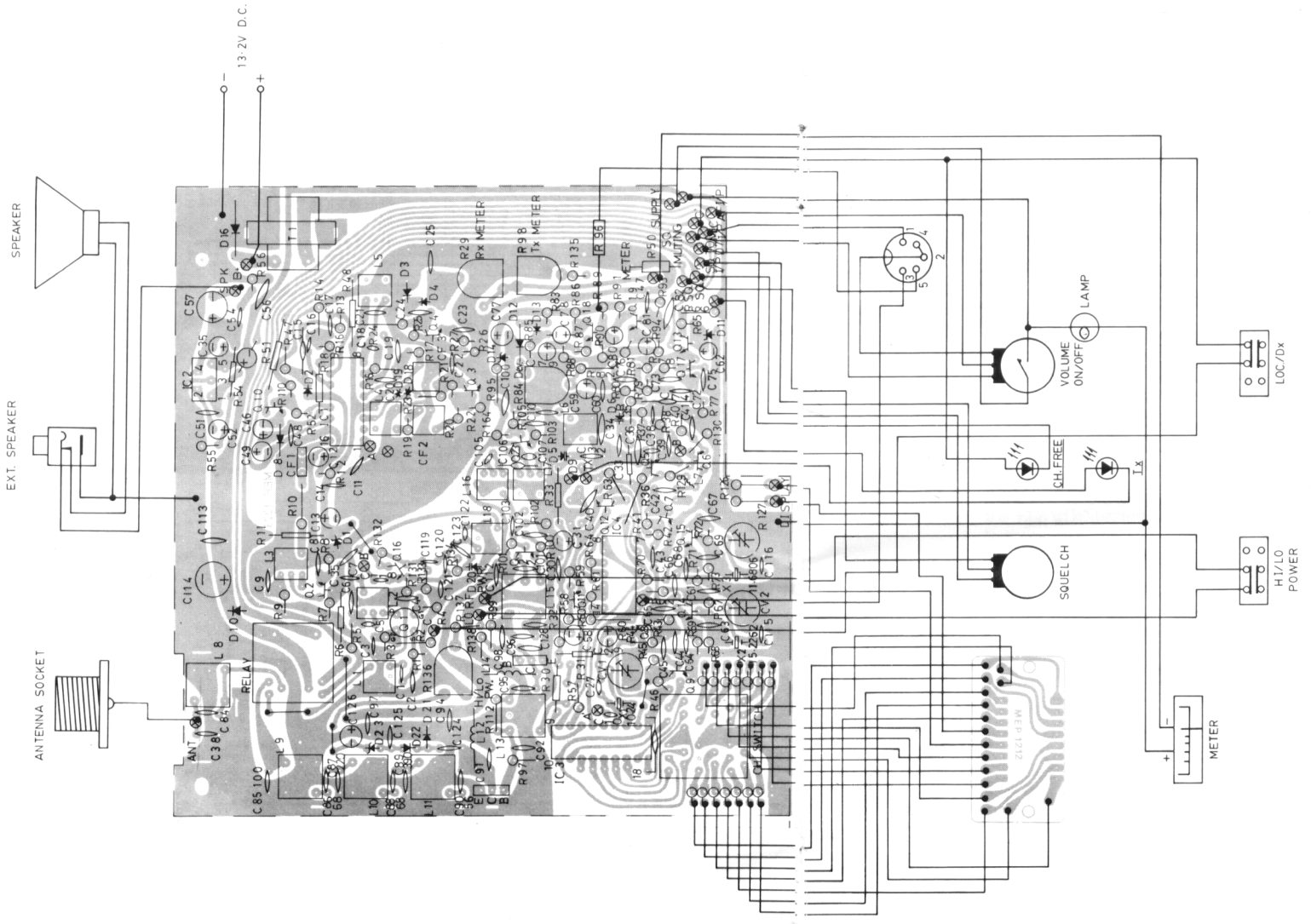




SCHEMATIC DIAGRAM

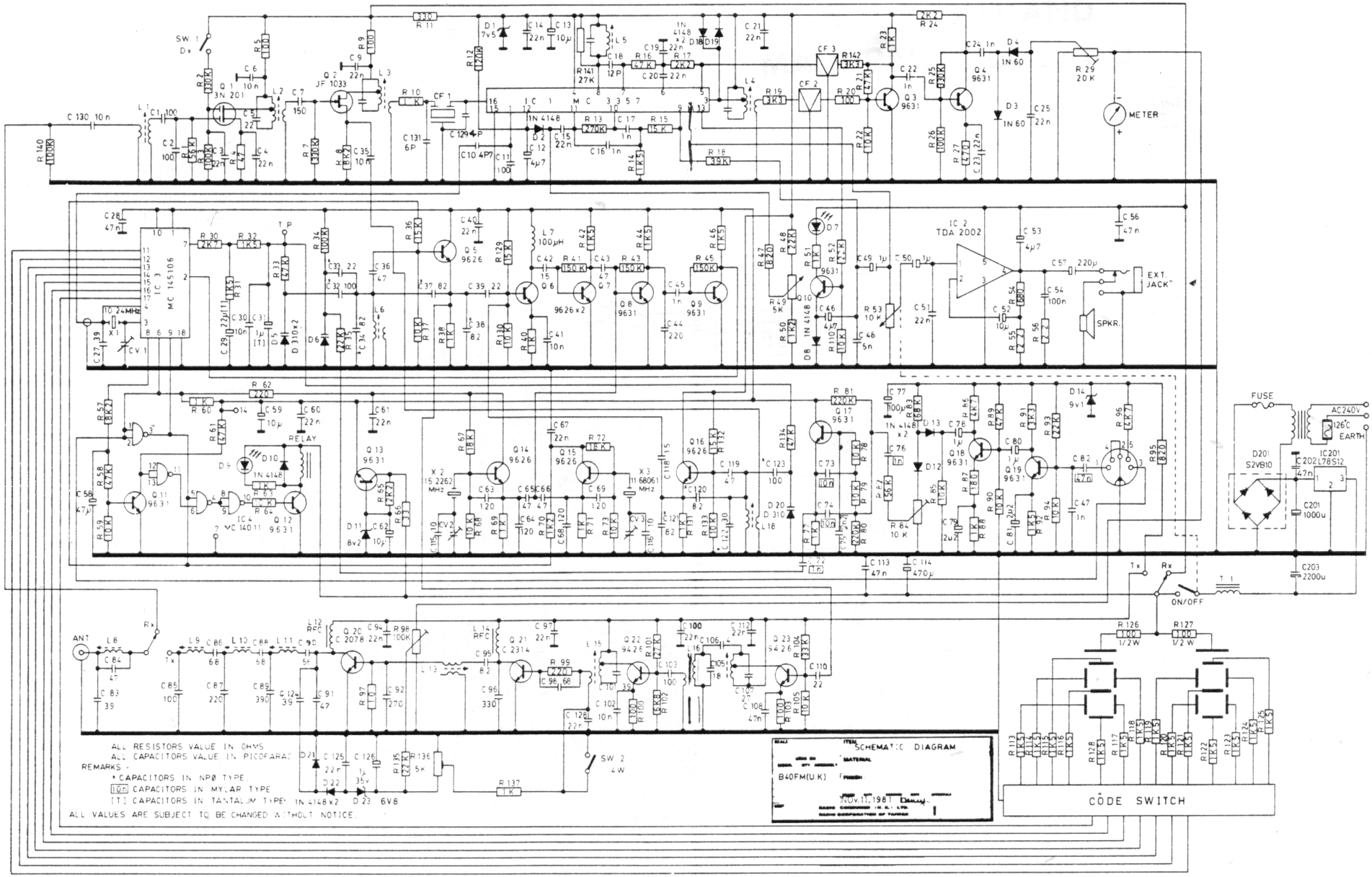
PARTS SUBJECT TO CHANGE WITHOUT NOTICE

P.C.B. LAYOUT AND MAIN PARTS LOCATION



PART LIST

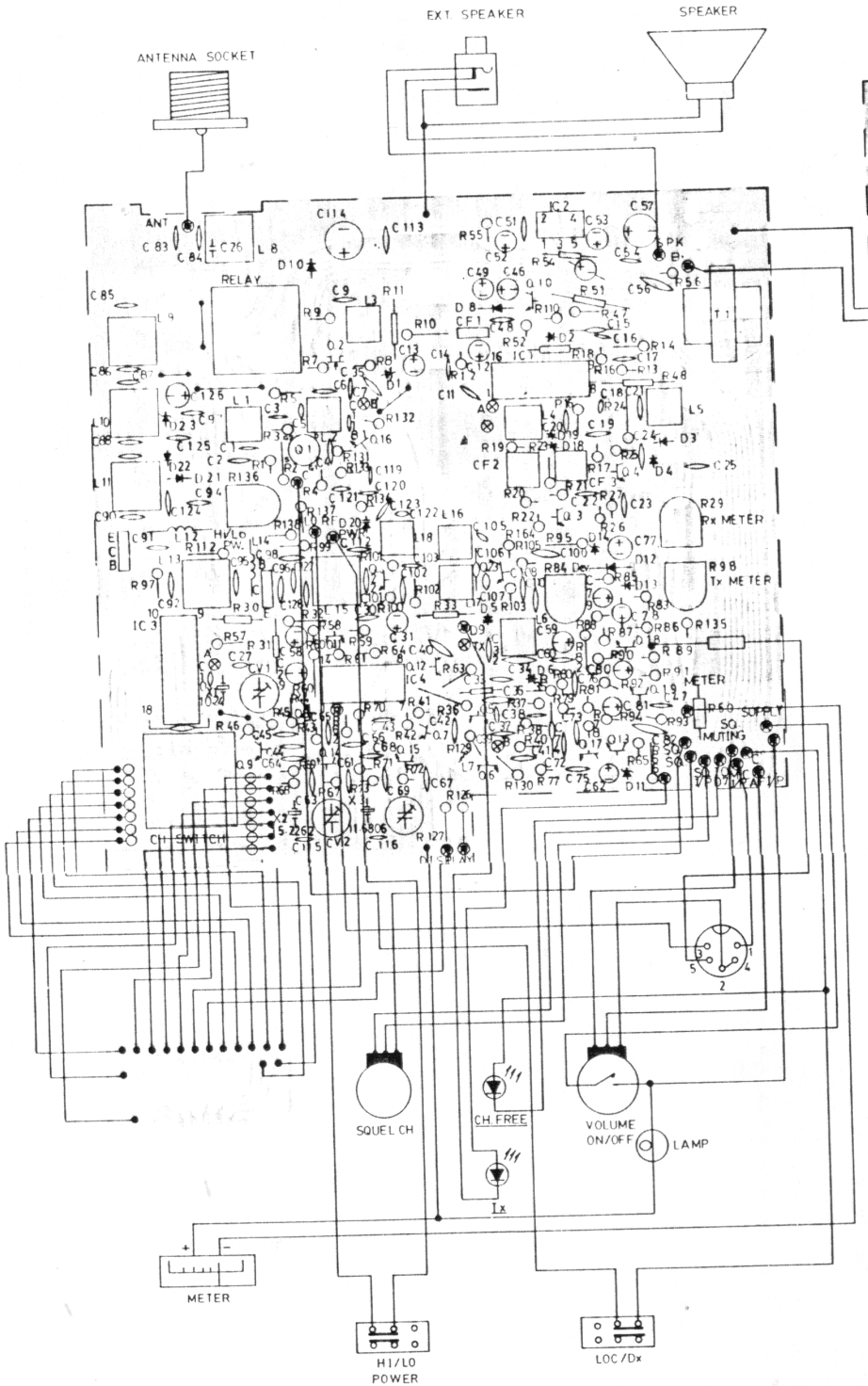
PART NAME	TYPE/LOCATION	PART NO.
IC-IF	IC1-MC3357P (Motorola)	IC 123
IC-AF	IC2-TDA 2002 (TFK, SGS, NEC)	IC 125, 126, 132
IC-PLL	IC3-MC145106 (Motorola)	IC 138
IC-T/R Switch	IC4-MC4011	IC 134
Transistor RF	3N201 Q1 Rx-Preamp.	XS 271
Transistor RF	MPS 9426 Q23	XS 268
Transistor RF	MPS9626 Q2, 5, 6, 7, 14, 15, 16, 22	XS 272
Transistor AF	MPS9631 Q3, 4, 8, 9, 10, 11, 12, 13 17, 18, 19	XS 269
Transistor RF Driver	2SC2314 Q21	XS 277
Transistor RF PA	2SC2078 Q20	XS 278
Diode, Si	1N4148 D2, 8, 10, 12, 13, 18, 19, 21, 22	DS 103
Diode, Ge	1N60 D3, 4	DG 14
Diode, Zener	ZD7.5 D1	DZ 34
Diode, Zener	ZD8.2 D11	DZ 5
Diode, Zener	ZD9.1 D14, 23	DZ 33
Diode, Varicap	D310 ITT D5, 6, 20	DS 123
LED, Red	D9	LED 103
LED, Green	D7	LED 105
LED, Display	Channel	ECD 115
Crystal	10, 240 MHz Ch. steps	XT 007
Crystal	11, 6806 MHz Tx	XT 017
Crystal	15, 2262 MHz Rx	XT 018
Filter, Ceramic	CF1, SFE 10, 7	CF 004
Filter, Ceramic	CF2/3 CFU455G	CF 003
Trimmer Cond.	CV1, 2, 3	CTA 5
T/R Relay	SW Tx-Rx	LCH 108
S-Meter	Field Strength / RF Output	EM 105
Switch, Channel	40 Channels SW3	SW 240
Switch, Dx-Loc	SW1	SW 132
Switch, Lo-Hi	SW2	SW 132
Squelch Control	5K ohm R49	RV 195
Volume Control-on/off Switch	10K ohm R53	RV 193
Pre-set Resistor	Field Strength 20K R29	RV 188
Pre-set Resistor	RF Output 100K R98	RV 190
Pre-set Resistor	Lo Output Adj. 5K R136	RV 197
Pre-set Resistor	Mod. Deviation 10K R84	RV 145
Coil	Rx Antenna L1	7 FM 06
Coil	Rx Preamp RF L2	7 FM 07
Coil	10,695 MHz IF L3	7 FM 08
Coil	455 KHz IF L4	7 AM 07
Coil	455 KHz Discriminator L5	7 AM 10
Coil	VCO L6	7 FM 06
Coil	Tx Doubler L16, 17	7 FM 07
Coil	Tx Predriver L15	TAS 93
Coil	Tx Driver L13	TAS 93
Coil	Harmonic Filter L9, 10, 11	TAS 98
Coil	Trap Filter L8	TAS 97
RFC	Tx Driver L12	LCH 106
RFC	Tx PA L14	LCH 106
Choke	DC Supply T1	LCH 107
Socket	Ext. Speaker 3.5mm	MEJ 106
Loud Speaker	8 ohm, 75mm, 0.5W	LS 133
Heat Sink	RF-PA	MES 1038
Front Panel		MDC 1192-5
Cabinet Top		MDC 1177
Cabinet Bottom	With Speaker Grill	MDC 1178
Knob	Channel Switch	MDK 1221
Knob	Volume, Squelch	MDK 1222
Microphone	Complete	CM 105-1, CM 108-1
Mounting Bracket		MSB 1285
Mounting Screws		MSS 1076



SCHEMATIC DIAGRAM B 40 FM

PARTS SUBJECT TO CHANGE WITHOUT NOTICE

P.C.B. LAYOUT AND MAIN PARTS LOCATION



B 40 FM(UK) WIRING DIAGRAM