

**SERVICE MANUAL  
FOR  
BSR230 SERIES**

2007-03-22 10:00:00

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**NOKIA**

### 3. SPECIFICATION

#### 3-1 General

Mode of operation	:	Duplex system with two antennas
Frequency range	:	VHF Version A 136-155MHz Version B 146-174MHz Version D 224-235MHz VHF Version C 400-440MHz Version D 440-470MHz Version E 470-512MHz Version F 480-520MHz
Number of channels	:	Up to 128 synthesis programmed channels
Switchable channel bandwidth	:	3MHz
Channel spacing	:	Narrow-band 12.5kHz Wide-band 20, 25 or 30kHz
Duplex TX/RX frequency separation	:	0.5MHz minimum
Duty cycle	:	Tx : Rx : WAIT 1min : 3min : 5 min
Antenna impedance	:	50 ohms
Environmental conditions	:	Ambient temperature -30°C to +50°C Relative humidity 95% at +35°C
Dimensions and weight	:	Transceiver Unit 442 mm width 192 mm height 150 mm depth 10 kg

3-2 Transmitter

RF power output : 25-50 watts (standard)

Maximum frequency deviation : Narrow-band  $\pm 2.5\text{kHz}$   
Wide-band  $\pm 5\text{kHz}$

Oscillation system : Direct PLL synthesizer system

Type of crystal unit : TCXO

Frequency stability :  $\pm 2.5\text{kHz}$  with wide band,  $\pm 1\text{kHz}$  with Narrow band.

Frequency response : Within +1, -3dB of 6dB/octave pre-emphasis from 0.3 to 3kHz, 1kHz reference

Signal to noise ratio : More than 50dB at 1kHz 70% modulation

Modulation distortion : Less than 3% at 1kHz 70% modulation

Spurious and harmonics : More than 70dB down below rated power

AF input : -8dBm  $\pm 3\text{dB}/600\text{ ohms}$

3-3 Receiver

Receiving system : Double conversion superheterodyne

Intermediate frequency : 1st IF 21.6MHz  
2nd IF 455kHz

Frequency stability :  $\pm 2.5\text{kHz}$  with wide band,  $\pm 1\text{kHz}$  with narrow band..

Sensitivity : Less than 1 $\mu\text{V}$  emf. for 20dB noise quieting  
Less than 0.70 $\mu\text{V}$  for 12dB SINAD

Squelch sensitivity : Less than 0.50 $\mu\text{V}$

Modulation acceptance :  $\pm 7.0\text{kHz}$  for wide band, 3.5kHz for narrow band.

Selectivity : More than 70dB at 25kHz point, 60dB at 12.5kHz point.

Blocking : More than 90dB at  $\pm 1\text{MHz}$  point

Intermodulation : More than 70dB

Spurious responses : More than 80dB<sup>†</sup>

AF response : Within +1, -3dB of 6dB/octave  
de-emphasis from 0.3 to 3kHz, 1kHz  
reference

AF output : More than 2 watts into 4 ohm load for  
local control  
0dBm ±3dB for remote control

AF distortion : Less than 5% at 1kHz 70% modulation

Signal to noise ratio : More than 50dB at 1kHz 70% modulation

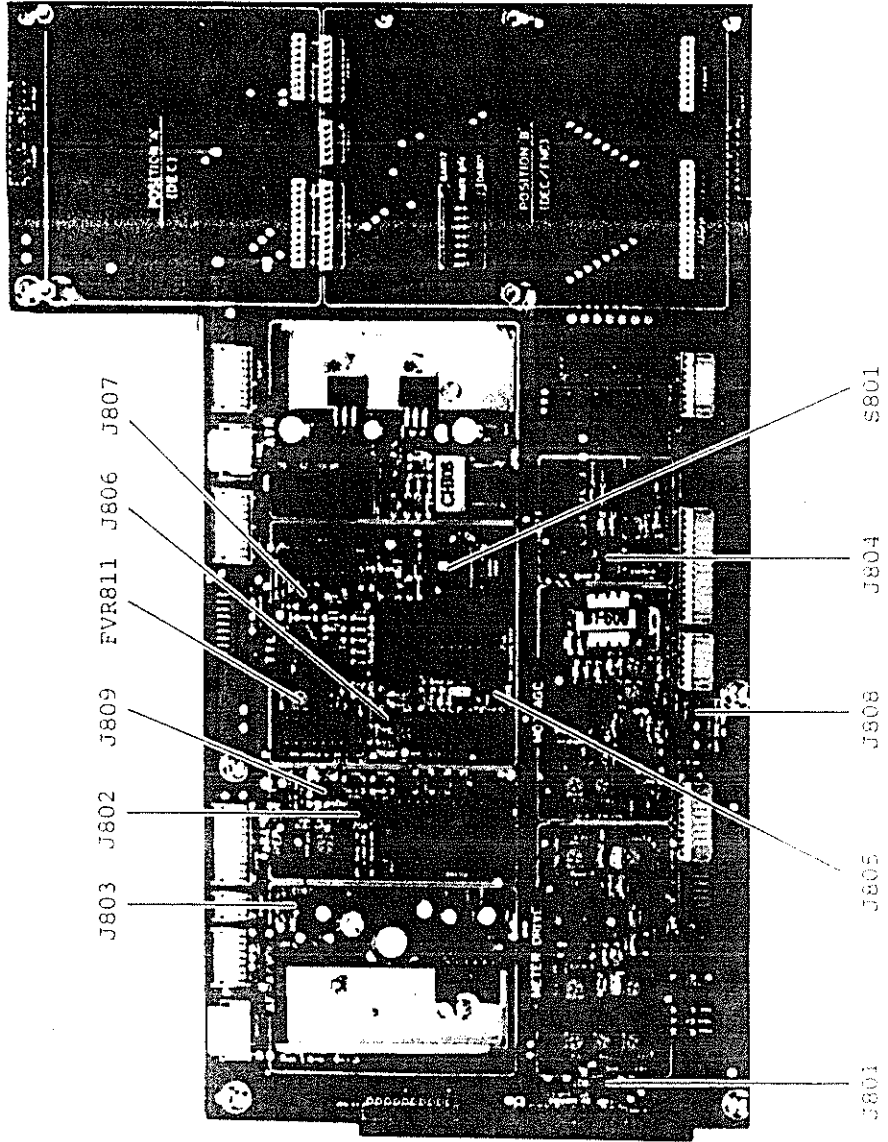
3-4 Power Supply

Power source : 13.6V DC ±20% negative ground.

Power consumption : 

	<u>Operation</u>	<u>DC</u>
Standby		0.7A
Receiving		1A
Transmitting		
at 5W		2.5A
at 10W		3.5A
at 25W		6A
at 50W		12A

4. Jumpering Positions on Terminal Unit PCB



a) J801 AUD10 CUT-OFF

To decide whether receiver output is cut-off or kept alive in transmitting periods.

ON : Audio CUT-OFF in TX period. (Simplex base station)

OFF : Audio kept alive in TX period. (Duplex base or repeater station)

b) J802 BASE/REPEATER CONTROL

To control Base/Repeater mode control relay. With jumper ON, relay operates to become Repeater mode. Jumper should remain uninserted to operate the Base/Repeater function externally.

In repeater mode, the following functions become effective:

Press control function due to SQL OUT.

"REPEATER" INDICATOR glows.

Transfer of receiver output (0dBm) to repeating modulation.

Transfer of the Variable Squelch Circuit to the internal semi-fixed setting.

Function of the Press Delay Circuit becomes effective.

c) J803 SP ON/OFF

To turn ON/OFF SP within BRS. Set to SP ON usually.

ON : SP ON

OFF : SP OFF

d) J804 HPF

Where BRS mounts Tone Squelch PCB, 10-QCT(A), or Tone Panel, this HPF jumper is to eliminate DISC output tone component.

A-side : When 10-QCT(A) or Tone Panel is mounted.

B-side : When no Tone Squelch PCB is mounted (THROUGH).

e) J805 TTL TIME STEP

This jumper is to arrange the step time setting when KG110 is operated by the TTL (Transmitter Time Limiter) circuit.

ON : 1 STEP = 30 seconds

OFF : 1 STEP = 15 seconds

Incidentally, TTL steps can freely be varied in sixteen (0 to 9 plus A to F) steps with DIP SW, S801. In other words, 30 x 15 = 450 seconds max. (7 min. 30 sec.) for J805 "ON". 15 x 15 = 225 seconds (3 min. 45 sec.) for J805 "OFF". At step "0", TTL time becomes "0"- i.e., "no TTL".

f) J806 TTL MODE

This jumper is to select either of the two alternatives:

Whether one press-to-talk time, for instance, should be taken as TTL TIME or one conversation time should be taken as TTL TIME.

The latter case is effective only when 10-5T(D) 5-TONE DECODER for Repeater Press Key is installed in KG110.

ON : 1 STEP TTL MODE

OFF : INTEGRATION TTL MODE

g) J807 PRESS DELAY CONTROL

This jumper is to hold (or extend) a transmission time interval by an optionally preset time at the termination of conversation in repeating periods.

ON : PRESS DELAY

OFF : NO DELAY

In case of "ON", the time can be set to 20 seconds, max., with FVR811 (without steps). (Usually set to  $9 \pm 1$  seconds before shipment.)

h) J808 PRESS SW CONTROL

To prevent all transmitting functions from being controlled by the microphone press-to-talk signal, when a particular TTL mode is set with PCB (option) or a function such as 10-5T(A) Encoder/Decoder having a call signal is provided.

ON : Mic press-to-talk SW only is effective (no other options)

OFF : 10-5T(A) or special TTL is installed.

i) J809 JUMPER FOR COMMUNITY REPEATER OPERATION

Where BSR operates as a community repeater with the addition of Tone Panel (option), this jumper is to prevent BSR from becoming TX mode merely because of signal reception. The microphone press-to-talk function works irrespective of this jumpering.

ON : When operated as a normal repeater (i.e., without Tone Panel), or, when operated with 10-QCT(D)/10-5T(D).

OFF : When Tone Panel is used for Community Repeater.





## 5. CIRCUIT DESCRIPTION

### 5-1 PLL Section

The 12.00MHz output frequency from the RX-UNIT-mounted reference oscillator (TCXO) is divided into 1:16 to obtain the 750kHz strobe signal to become the reference frequency division input and the frequency division data input to the PLL IC (MC145146).

In order to share the reference frequency between TX and RX, the 750kHz strobe signal is received from RX UNIT with the TX UNIT.

The 750kHz strobe signal is counted up by IC and its data output becomes the data latch address signals for the EP-ROM and PLL IC.

The PLL IC (MC145146) needs 29-bit data for one frequency. The data is divided into eight sets each of 4 bits and they are applied in parallel to the PLL IC.

Therefore, the frequency-determining data are input in eight addresses for each RX channel or TX channel as regards the addresses of the EP-ROM.

Since the one-address data is input to the PLL IC as short a time interval as  $1/750\text{kHz}$ , data recognition for the input of one frequency data is accomplished within as brief a time as  $1 \times 8/750\text{kHz}$ .

Furthermore, since the data is being refreshed at all times, the data can easily be altered with the same timing, even when the channel is changed.

Also, since the transmit and receive data are written into separate EP-ROMs, write-in operation, or programming, is feasible, even if the transmit and receive frequencies are different from each other.

Since the reference frequency division ratio can also be designated by ROM, division ratios ranging 3 to 4,096 of 750kHz are theoretically feasible. Be sure to adopt either 6.25kHz, 10kHz or 12.5kHz as the reference.

The RF signal from VCO is frequency-divided into 1:64 before application to PLL IC and further, undergoes frequency division according to the ROM data and phase comparison with the reference frequency.

The phase difference signal passes through the low-pass filter to become a DC voltage to control the oscillation frequency of VCO.

#### 5-2 VCO Section

This section incorporates oscillation circuits independently incorporated in TX and RX units. Whereas Q201 (RX VCO) is for use with RX 1st local oscillator (LO) (F-21.6MHz), Q401 (TX VCO) is to initiate oscillations at the transmit frequency.

These two VCOs when used for a simplex base station are switched over by means of a press-to-talk switch, but they operate simultaneously when used for a duplex base station.

Control for either alternative is enabled by Jumper J801 in the terminal board.

Either oscillator output is amplified by the buffer amplifier IC PC1651 to become the input signal to amplifier Transistor 2SC2753 and a part of the prescaler IC  $\mu$ PB571C. The RX LO signal is amplified by Q202 to cause the 1st mixer DBM-1 to drive.

The transmit signal is amplified by Q402 and the amplified signal becomes the input signal to the TX section. The PLL circuit when unlocked causes Q203 and Q204 in case of RX section or Q403, Q404 in case of TX Section to operate, thereby turning "OFF" the TX output.

5-3 RX Section

The RF input signal incoming from the antenna passes through the bandpass filter (BPF-1) in succession to undergo amplification by Q1. The amplified signal passes through the bandpass filter (BPF-2) to be applied as the input to the DBM-1 (diode, double-balanced mixer).

The DBM-1 is to mix the amplified RF signal with the 1st local oscillator (LO) signal to develop the 1st IF signal at 21.6MHz as its mixed output.

The output signal is further amplified by Q102, followed by still further amplification by Q103 after the initially amplified signal being applied to the crystal filter (XF101). The finally amplified signal is applied to IC107 as its input. At IC107, the 1st IF signal at 21.6MHz is converted into 455kHz through the 2nd mixer. The 455kHz signal passes through the 455kHz ceramic filter (CF101) to obtain an AF signal via the limiting amplifier and discriminating circuit.

The AF signal is then separated into the audio signal and the noise signal necessary for squelch control.

The audio signal passes through the lowpass filter IC108 (1/2), the delay circuit consisting of Q106, Q107, and IC109, the lowpass filter Q108, and the highpass filter of IC110 (1/2), the integrating circuit of IC110 (1/2), and the squelch gate circuit Q111 in succession to undergo 0dBm power amplification by IC111. The BTL 0dBm signal is applied to the Final Power Amp TA7252.

The squelch noise signal undergoes amplification by IC107 and IC108 (1/2) and detection by DC, to become a DC signal.

The DC signal passes through the switching circuit consisting of IC107 and Q104 to obtain the SQL OUT signal.

#### 5-4 TX Section

The RF signal from VCO is amplified by Transistors Q301, Q302 to serve as power for driving the RF power amplifier module. The amplified RF signal, on the other hand, becomes a signal for driving the DRIVE meter. The signal amplified by the module is further amplified by the final-stage RF power amplifier consisting of the stripline to become the RF power output ranging from 50W to 60W.

The output is radiated from the antenna via the low-pass filter and combining network.

Part of the module output undergoes detection and DC amplification for feeding back to the 1-stage amplifier to become a control signal for the output power.

Even if the antenna is mismatched, reflected waves can be detected, causing the module input power to decrease and the module to be protected from damage.

The transceiver unit is equipped with a heatsink for sufficiently dissipate generated heat. This enables a consecutive 24-hour transmission capability.

The detected control signal is amplified to become a power alarm and a SWR alarm. The power alarm operates on reaching one-half the rated power, while the SWR alarm operates when the ANTENNA is open or shorted. No sooner than the two alarms work, LED (D606) glows "red".

#### 5-5 Modulator Section

An audio signal produced by a human voice radiated to the MIC undergoes amplification by the ALC (Automatic Level Control) amplifier IC 1803 (M51304) and IC804 (NJM4556).

Standard input level to the MIC is rated at 1kHz, -34dBm, while that in case of remote control is rated at 1kHz, -8dBm.

The amplified audio signal passes through the preemphasis circuit consisting of C356 and R346 before it is amplitude-limited by the limiting amplifier IC309 (1/2). The amplitude-limited signal passes through the lowpass filter consisting of L310 and L311 to become a modulating signal to be applied to the gate of TX VCO FET (Q401).

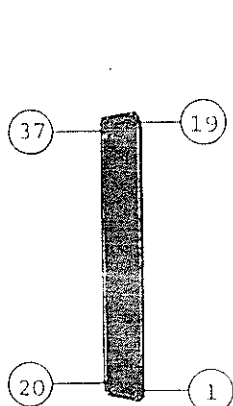
## 5-6 Description of Remote Control

### 5-6-1 37-Pin D-SUB Connector for Remote Control

Provided on the rear panel of BSR radio, the 37-PIN D-SUB CONNECTOR has 37 pins whose functions are as follows:

(36) (37) 13.6V DC

(18) , (19) , (7) GND



Rear Side View

(23)  
(22)  
(21)  
(20)  
(1)  
(2)  
(3)  
(4)

A1 }  
A2 }  
A3 } For CH  
A4 } DATA  
A5 }  
A6 }  
A7 }

ROM DATA ... 5V voltage emerges on this pin after ER-ROM is programmed.

<p>CH1 is preceded by all "0's". CH128 is preceded by all "1's". "0" = open or 0V "1" = 5V to 13.6V</p>
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- ⑧ REMOTE ... When controlled externally from line interface unit. This PIN is grounded. When this signal is grounded, all of POW SW, SQL CONTROL, and CH can only be controlled from remote control side
- ⑨ BUSY ... 8V voltage emerges on this pin during receive period. 0V emerges when BSR is in standby status.
- ⑩ VOL (-) ... Volume control common.
- ⑪ VOL ... For volume control use. Use type 10K-B Volume.
- ⑫ SQL ... For SQL control use. Use type 10K-B Volume
- ⑬ , ⑭ AF OUT ... To obtain RX 0dBm output. A -6dBm output is available between either 13 or 14 pin and GND.
- ⑮ PRESS ... When grounded, BSR radio operates in TX mode.
- ⑯ SP ... An AF output of either 4W/4Ω or 2W/8Ω at max. is available.
- ⑳ , ㉑ , ㉒ ... No connection.

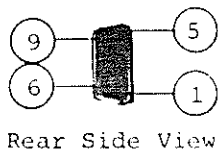
- ③① AUX 1 ... No connection.
- ③② TX ALARM ... This signal is used as a TX alarm. The TX alarm signal voltage ranges from 5 to 6 volts when TX power is reduced to one-half or ANTENNA is open or shorted.
- ③③ , ③④ MODULATION INPUT ... Standard modulation input is 1kHz, -8dBm.
- ③⑤ POW SWITCH ... To operate POW SWITCH on a REMOTE CONTROL basis. When grounded, BSR power switch turns "ON".

Note: All other pins are not used in BSR.



5-6-2 9-Pin D-SUB Connector for Tone Panel

Provided on the rear panel of KG110, the 9-Pin D-SUB Connector has nine pins whose functions are as follows:



- ① +13.6V DC is available.
- ② No connection.
- ③ Not used.
- ④ No connection.
- ⑤ PRESS ... When grounded, BSR is placed in TX mode.
- ⑥ No connection.
- ⑦ } GND
- ⑧ }
- ⑨ Not used.

## 6. MAINTENANCE INSTRUCTIONS

### 6-1 General

The Base Station Radio, BSR has been designed to ensure a high degree of reliability over a long trouble-free service life without maintenance efforts.

However, occasional inspections and adjustments are required to maintain the radio in the optimal conditions.

### 6-2 Necessary Tools and Measuring Equipment

It is recommended that the undermentioned measuring equipment and maintenance tools be properly stored in your maintenance shop for ready use:

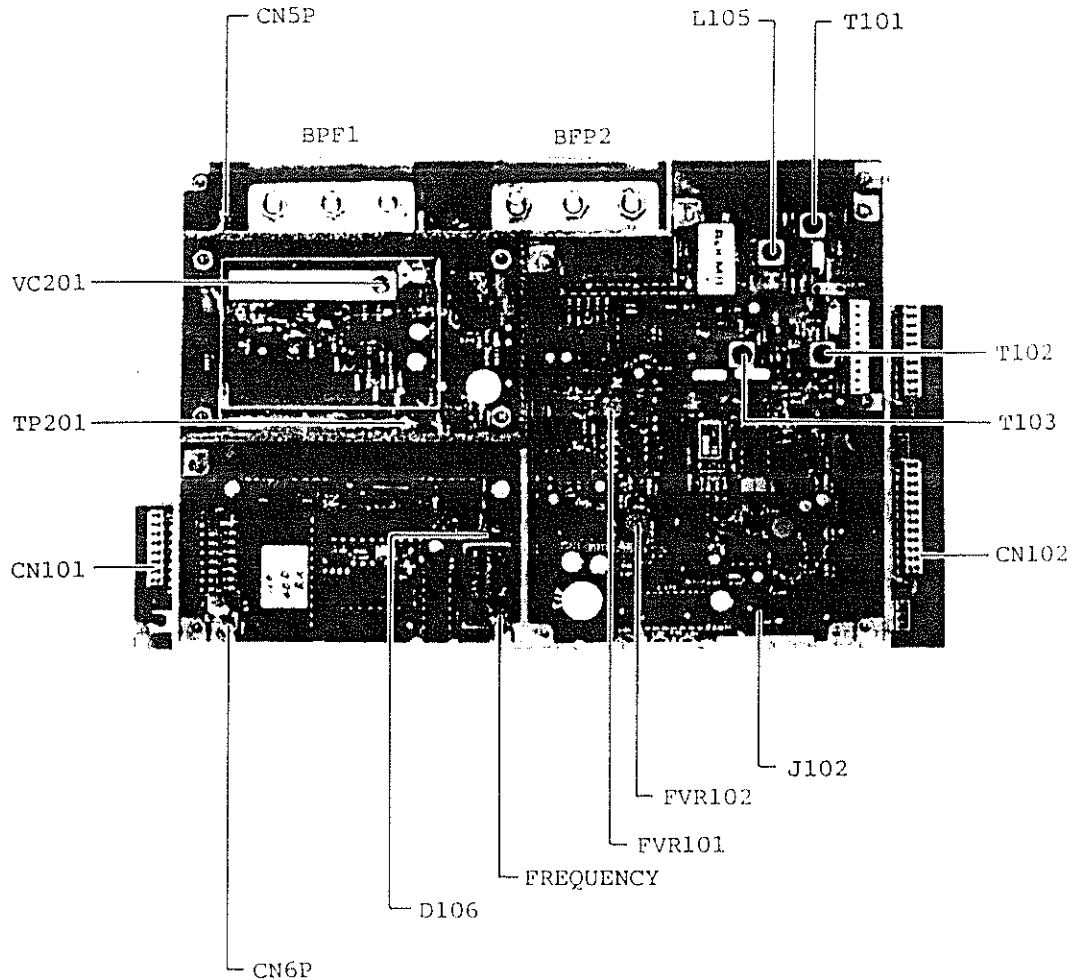
1. Circuit Tester
2. RF Power Meter
3. High Impedance Voltmeter
4. AF Generator (600 ohms, 100 through 10,000 Hz)
5. Linear Detector
6. Distortion Meter/Level Meter
7. Directional Coupler
8. Standard Signal Generator
9. Frequency Counter
10. Spectrum Analyzer

6-3 Precautions in Inspection and Adjustment

1. Always use standard-tip screwdrivers that best fit core slots in adjustment. Be very slow and cautious in turning the cores.
2. In adjusting the VCO, never turn trimmer capacitors or cores with an ordinary screwdriver. Be sure to use an RF screwdrivers. Otherwise, adjustments may result in failure due to the effect of stray capacitances.
3. Keep all measuring instruments well calibrated at all times for availability of accurate measurements.

6-4

6-4-1 RX VCO/PLL Adjustment



RX MAIN UNIT

- (1) Connect a Voltmeter to TP201 and adjust VC201 to read 3V on the Voltmeter.
  
- (2) Adjust the trimmer in TCXO to obtain an output frequency of 750kHz from CN6P. (No need for adjustment at the site, if the frequency tolerances of the TCXO remain within  $\pm 1$ ppm at room temperature.)

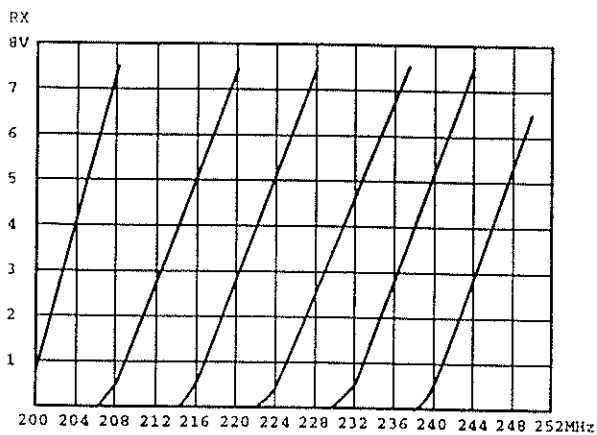
PRECAUTIONS:

The radio performs trouble-free operation within the VCO voltage range, 1 to 5V, as read on a voltmeter connected to TP201.

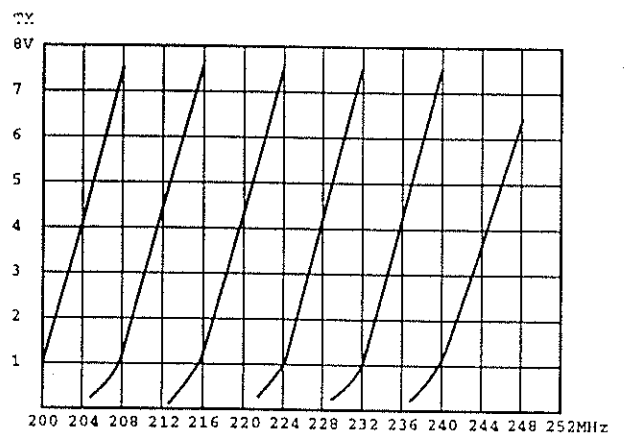
Adjust trimmer capacitor to read 3V (mid-position) on the voltmeter in case of single channel.

In case of multichannel, verify VCO voltages for the lowest and the highest frequencies and perform centering so that all fall between 1 and 5V. IF VCO is unlocked in this case, LED (D106) should glow.

Be sure to refer to the RX/TX characteristic curve in adjusting VCO.



RX FREQ - VCO VOLTAGE



TX FREQ - VCO VOLTAGE

6-4-2 Adjustment of RX Section

In adjusting the RX Unit singly (without being fixed in BSR), exercise care for the following:

- o J102 turned "ON" Be sure to turn it "OFF" before installing in BSR.
- o Connect a 10k $\Omega$  PULL DOWN resistor array to CN101.

(1) RF Stage Adjustment

Adjust BPF1 and BPF2 for maximum sensitivity points (with a screwdriver).

A better result can be obtained by measurement using a tracking generator.

Note: Where the BSR operates as a base station with a wide RX bandwidth, notify us in advance a wider bandwidth BPF you desire. As shipped from the factory, a standard 3MHz bandwidth BPF is mounted.

(2) IF Stage Adjustment

(1) L105 and T101: Adjust to sensitivity maxima.

(2) T102 and T103: Adjust to SINAD sensitivity maxima, with 1kHz, 70% MOD signal applied to Antenna.

(3) AF Stage Adjustment

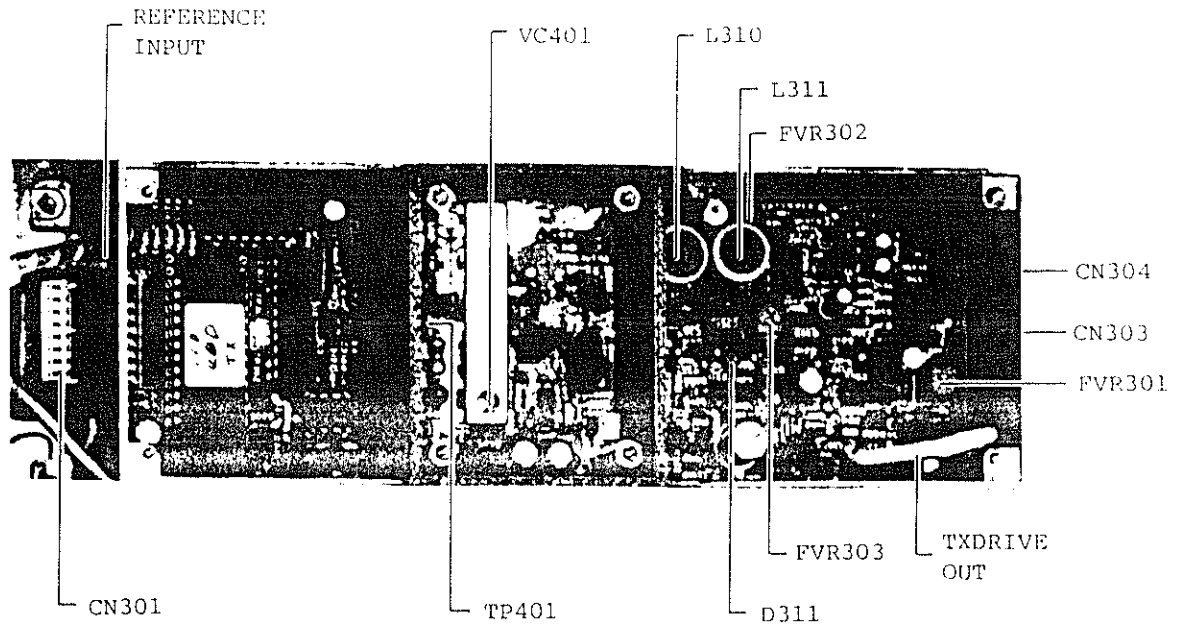
A BTL (Balanced Transformer Line) output obtains from IC111 (NJM2073) as the AF output. The AF output is usually measured with a transformer connected. In the absence of a transformer, adjust between the one-side line and GND.

With a 1kHz 70% modulation signal from a SG applied as input to CN5P, adjust FVR102 so as to make the output level between (8) and (9) of CN102 equal to 0dBm, or adjust FVR102 to obtain -6dBm between (8) or (9) and GND.

(4) RX 3kHz Frequency Response Adjustment

Apply a 1kHz 20% modulation signal from a SG to CN5P, calibrate the receive output level to 0dB, raise the modulation frequency to 3kHz, 20% modulation, and adjust FVR101 to obtain the receive output level of  $-9.5 \pm 0.5$ dB.

6-4-3 TX VCO/PLL Adjustment



- (1) Connect a Voltmeter to TP401 and adjust VC401 to read 3V.
- (2) TCXO for the reference frequency generation is not provided in TX unit; connect RX unit or apply a 750kHz 4 to 8Vp-p signal to the PLL.

PRECAUTIONS:

The radio performs trouble-free operation within the VCO voltage range, 1 to 5V, as read on a voltmeter connected to TP401.

Adjust trimmer capacitor to read 3V (mid-position) on the voltmeter in case of single channel.

In case of multichannel, verify VCO voltages for the lowest and the highest frequencies and perform centering so that all fall between 1 and 5V. If VCO is unlocked in this case, LED (D311) should glow.

#### 6-4-4 TX Main Unit Adjustment

In adjusting TX Unit singly (without being fixed in BSR), exercise care for the following:

- o Connect a 10k $\Omega$  PULL DOWN resistor array to CN301.
- o Apply a REFERENCE 750kHz signal.

##### (1) DRIVE Output Adjustment

Connect a power meter to TX DRIVE output and adjust FVR301 to read 200  $\pm$ 10mW.

##### (2) MODULATION Adjustment (Install TX Unit on the BSR)

Apply a 1kHz, -34dBm signal from an Audio Generator to MIC connector and adjust FVR303 for a 70% modulation.

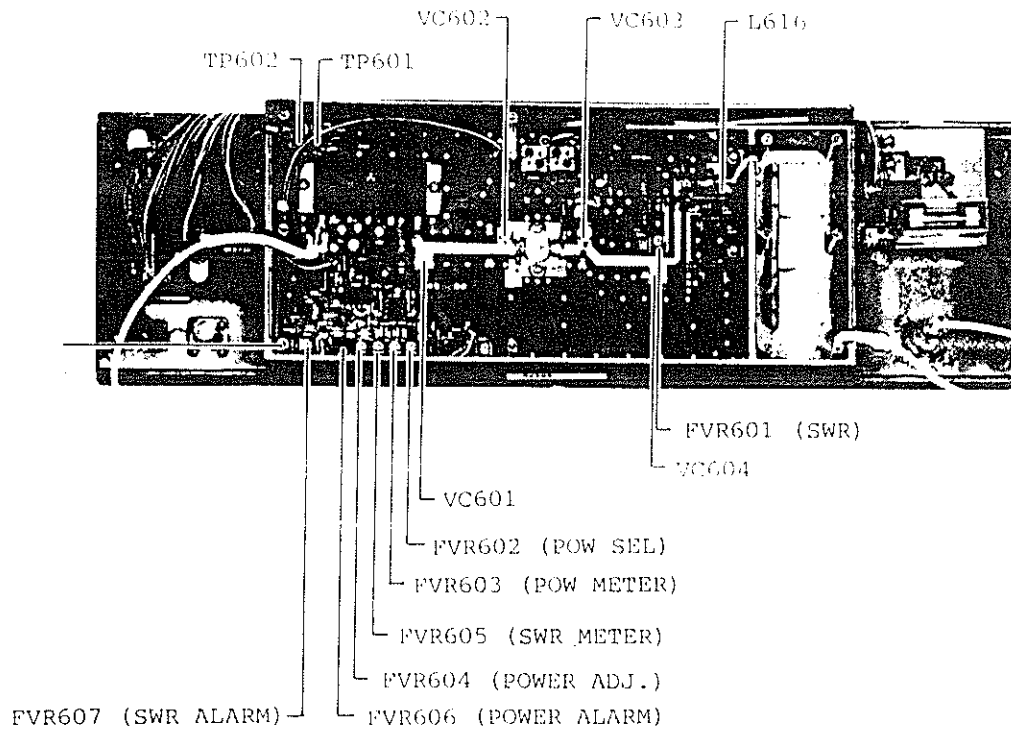
Then, raise the input level to 1kHz, -14dBm and adjust FVR302 for a maximum deviation. Repeat this procedure a few times.

##### (3) Adjustment of TX Frequency Response

Adjust L310 and L311 for a +9.5  $\pm$ 1dB deviation when a REFERENCE 1kHz, 20% modulation signal is varied to a 3kHz, 20% modulation signal.



6-4-5 PA Unit Adjustment



(1) POWER Adjustment

Maximize POWER with FVR604 and take a balancing in turning between VC601 - VC604 for an in-band output in excess of 50W.

Then, fix VC601 - VC604 in position to manipulate them no more. Finally, adjust FVR604 to obtain the rated output of 50W.

(2) SWR Adjustment

Adjust FVR601 to minimize the L616 line voltage as read on a voltmeter.

(3) SWR ALARM Adjustment

LED (D006) should remain unlit for the rated power, as a rule. Adjust FVR607 to provide a visual alarm when ANTENNA is open or shorted.

(4) POWER ALARM Adjustment

With FVR604 set to obtain one-half the rated power, adjust FVR606 to cause LED (D606) to glow under this condition. After adjustment, be sure to restore FVR604 to the initial rated power position.

(5) POWER METER Adjustment

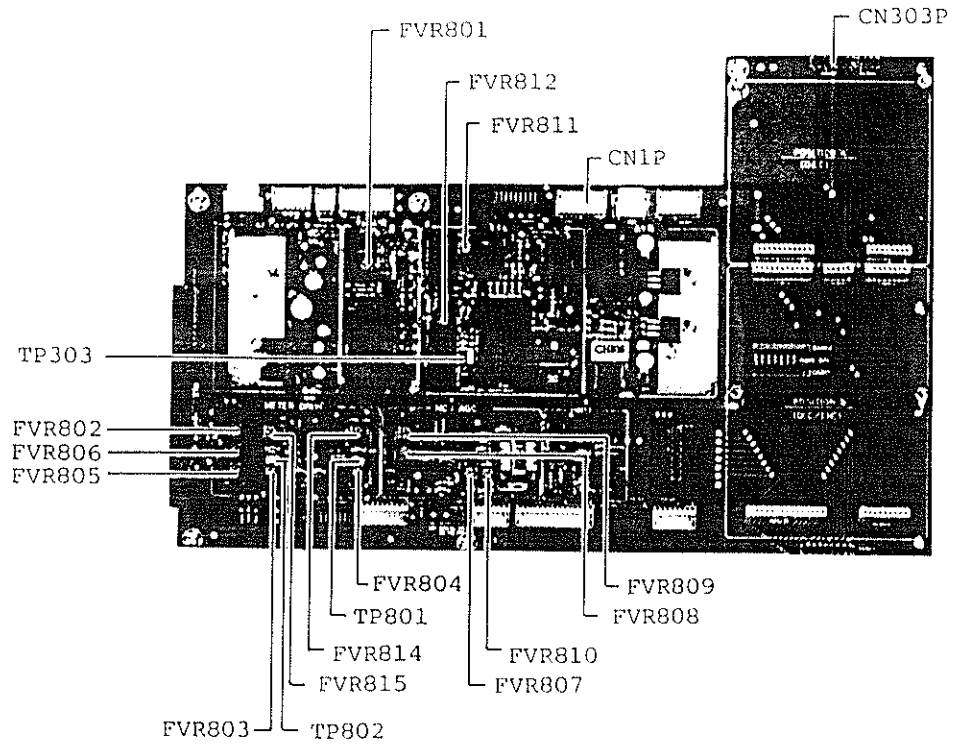
Adjust FVR603 to obtain TP601 voltage of 5.5V under rated power output conditions.

(6) SWR METER Adjustment

Adjust FVR605 to obtain TP602 voltage of 1.3V for rated power and TP602 voltage of 7.3V when ANTENNA is open.

Note: Items (2), (3), (4), (5), and (6) have been adjusted at the factory before shipment. No need for readjustment at the site, unless a trouble occurs

6-4-6 Terminal Unit Adjustment



Terminal Unit is designed not only for overall interconnections of TX Unit, RX Unit, and PA Unit, but also for incorporating functional facilities. Installed on the board which are not used in this model.

(1) Repeater Squelch Level Setting

Adjust FVR801 so that SQL opens at the specified SINAD ratio of 12dB.

(2) Modulation AGC Unit

With the MIC input set at 1kHz, -34dBm, adjust FVR807 to obtain a -8dBm output level from pins (1) and (2) of connector CN303. Then, raise MIC input level to 1kHz, -14dBm and adjust FVR809 to obtain an output level of +2dBm.

(REPEATER MODULATION Adjustment)

Apply a 1kHz, 70% modulation, 40dB $\mu$ V signal from a SG as input and adjust FVR808 to obtain a 70% modulation.

(3) MODULATION Adjustment

Apply a 1kHz, -8dBm signal as input to pins (6) and (7) of CN1P or pins (33) and (34) of D-SUB connector and adjust FVR810 to obtain a 3.5kHz deviation.

Adjustments (1), (2) and (3) have been finished at the factory before shipment. NO need for further adjustments at the site, if no trouble occurs.

6-5 Voltage Chart

(1) RX UNIT, PLL

REF.	DESCRIPTION	FUNCTION	BASE	EMITTER	COLLECTOR
Q101	2SC3358		0.79 V	0 V	6.9 V
Q103	2SC2669		2.3 V	1.6 V	6.6 V
Q104	2SC2458	SQ OPEN	0.67 V	0 V	0 V
		TIGHT	0 V	0 V	8.0 V
Q105	RN2202	SQ OPEN	1.1 V	8.0 V	8.0 V
		TIGHT	8.0 V	8.0 V	0 V
Q106	2SA1048		7.0 V	6.6 V	3.4 V
Q107	2SA1048		7.0 V	6.6 V	3.4 V
Q108	2SC2458		3.9 V	3.3 V	7.9 V
Q109	2SA950	J801 OFF	7.3 V	8.0 V	7.9 V
		J801 ON PRESS	8.0 V	8.0 V	0 V
Q110	RN2202	J801 OFF	8.0 V	8.0 V	7.3 V
		J801 ON PRESS	0.73 V	8.0 V	8.0 V
Q112	RN2202	RX	7.9 V	8.0 V	0 V
		RX UNLOCK	0.85V	8.0 V	8.0 V

REF.	DESCRIPTION	FUNCTION	GATE	SOURCE	DRAIN
Q102	2SK152		0.77 V	0 V	7.4 V
Q111	2SK184	MONITOR ON	4.5 V	4.0 V	4.0 V
		OFF	1.3 V	4.0 V	2.0 V

REF.	DESCRIPTION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IC107	TK10420	7.9 V	7.2 V	7.4 V	7.9 V	1.1 V	1.1 V	1.2 V	7.9 V
		(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
		3.7 V	2.0 V	2.0 V	0.92 V	0 V	0.66 V	0 V	2.1 V

REF.	DESCRIPTION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IC104	μPB571C	5.1 V	2.4 V	0 V	0 V	3.9 V	5.6 V	1.13 V	1.16 V
IC108	NJM4558D	3.7 V	3.7 V	3.7 V	0 V	4.3 V	4.3 V	4.3 V	8.0 V
IC109	MN3207	0 V	3.9 V	4.3 V	7.4 V	7.9 V	3.9 V	5.6 V	5.6 V
IC110	NJM4558D	4.0 V	4.0 V	3.76 V	0 V	4.0 V	4.0 V	4.0 V	8.0 V
IC111	NJM2073	3.7 V	8.0 V	3.7 V	0 V	0.6 V	0 V	0 V	0.6 V
IC116	MN3102	7.9 V	3.9 V	0 V	3.9 V	3.8 V	4.0 V	3.7 V	7.4 V

REF.	DESCRIPTION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
IC115	TA7303	1.84 V	1.87 V	0.37 V	0.5 V	0 V	2.75 V	0 V	0 V	7.9 V

(2) RX UNIT, VCO

REF.	DESCRIPTION	FUNCTION	BASE	EMITTER	COLLECTOR
Q202	2SC2753	J801 OFF RX	1.83 V	1.1 V	7.95 V
		J801 ON TX	0 V	0 V	0 V
Q203	2SA1048	RX	7.25 V	8.0 V	7.93 V
		TX	8.0 V	8.0 V	0 V
Q204	RN2202	RX	8.0 V	8.0 V	7.25 V
		TX	1.4 V	8.0 V	8.0 V
Q205	2SA1048	RX	6.6 V	7.34 V	7.3 V
		TX	6.9 V	7.46 V	0 V
Q206	RN2202	RX	7.3 V	7.34 V	0 V
		TX	0.72 V	7.46 V	7.45 V
Q207	2SC3623	RX	8.0 V	7.34 V	8.0 V
		TX	8.0 V	7.46 V	8.0 V
Q208	2SC2458	RX	5.6 V	4.9 V	8.0 V
		TX	5.6 V	4.9 V	8.0 V

REF.	DESCRIPTION	FUNCTION	GATE	SOURCE	DRAIN
Q201	2SK508	RX	0 V	2.2 V	7.3 V
		TX	0 V	0 V	0 V

REF.	DESCRIPTION	①	②	③	④
IC201	μPC1651	4.9 V	0.85 V	0 V	3.5 V

(3) TX UNIT, PLL/VCO

REF.	DESCRIPTION	FUNCTION	BASE	EMITTER	COLLECTOR
Q301	2SC2644		0.5 V	0.35 V	7.9 V
Q302	2SC2131		-0.72 V	0 V	7.1 V
Q303	2SB1019		12.5 V	13.1 V	8.5 V
Q304	RN2202	TX	8.1 V	8.1 V	0 V
		TX UNLOCK	1.8 V	8.1 V	8.0 V
Q305	RN2202	RX	8.1 V	8.1 V	0 V
		TX	0.74 V	8.1 V	8.1 V
Q306	RN1202	RX	0 V	0 V	7.4 V
		TX	8.1 V	0 V	0 V

REF.	DESCRIPTION	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
IC304	μPB571C	5.0 V	2.2 V	0 V	0 V	3.8 V	5.5 V	0 V	0 V
IC309	NJM4556D	4.5 V	4.5 V	4.5 V	0 V	4.4 V	4.4 V	4.4 V	8 V

REF.	DESCRIPTION	(1)	(2)	(3)
IC308	M5236L	11.3 V	0 V	1.23 V

REF.	DESCRIPTION	FUNCTION	BASE	EMITTER	COLLECTOR
Q402	2SC2753	RX	0 V	0 V	0 V
		TX	1.8 V	1.12 V	8.0 V
Q403	2SA1048	RX	8.1 V	8.1 V	0 V
		TX	7.3 V	8.1 V	8 V
Q404	RN2202	RX	0.86 V	8.1 V	8.1 V
		TX	8.1 V	8.1 V	7.3 V
Q405	2SA1048	RX	7.7 V	7.7 V	0 V
		TX	7.4 V	6.7 V	7.4 V
Q406	2SC3623	RX	8.1 V	7.7 V	8.1 V
		TX	8.1 V	7.4 V	8.1 V
Q407	2SC2458	RX	5.5 V	4.8 V	8.1 V
		TX	5.5 V	4.8 V	8.1 V

REF.	DESCRIPTION	FUNCTION	GATE	SOURCE	DRAIN
Q401	SST310	RX	0 V	0 V	0 V
		TX	0 V	2.6 V	7.3 V

REF.	DESCRIPTION	(1)	(2)	(3)	(4)
IC401	μPC1651	4.8 V	0.79 V	0 V	3.3 V

(4) TERMINAL/CONTROL UNIT

REF.	DESCRIPTION	FUNCTION	BASE	EMITTER	COLLECTOR
Q801	2SC2458	POW. SW. OFF	0 V	0 V	13.8 V
		ON	0.77 V	0 V	0.15 V
Q802	RN2202	RX	13.6 V	13.7 V	0 V
		TX	0.76 V	13.1 V	13.1 V
Q803	RN2202	BASE	0 V	5.0 V	5.0 V
		REP.	5.0 V	5.0 V	0 V
Q804	RN2202	BASE	5.0 V	5.0 V	0 V
		REP.	0 V	5.0 V	5.0 V
Q805	2SC2458	BASE	2.2 V	1.8 V	4.8 V
		AT REP. MODE	0 V	0 V	4.8 V
		DURING REPEATING	1.2 V	0.57 V	0.58 V
Q806	RN2202	RX	5.0 V	5.0 V	0 V
		TX	0.54 V	5.0 V	5.0 V
Q807	2SC3623	RX	0 V	0 V	13.5 V
		J807 OFF, NO DELAY	0.68 V	0 V	0.16 V
		ON PRESS DELAY	0.66 V	0 V	0.34 V

REF.	DESCRIPTION	FUNCTION	①	②	③	④	⑤	⑥	⑦	⑧
IC803	M51304L		8.0 V	0 V	0 V	1.35 V	2.9 V	1.3 V	0 V	0 V
IC804	NJM4556		4.3 V	4.3 V	4.3 V	0 V	4.3 V	4.3 V	4.3 V	8.0 V
IC811	NJM555		0 V	5.0 V	0 V	0 V	3.35 V	0 V	0 V	5.0 V
IC812	NJM4558	RX	5.5 V	4.1 V	4.1 V	0 V	4.1 V	4.4 V	1.3 V	8.0 V
		TX	1.3 V	4.7 V	4.1 V	0 V	4.1 V	4.1 V	5.5 V	8.0 V
IC814	TA7252		1.4 V	1.4 V	6.8 V	0 V	6.7 V	13.0 V	13.7 V	
IC815	NJM4558		4.4 V	4.4 V	4.4 V	0 V	4.0 V	4.0 V	4.0 V	8.0 V

REF.	DESCRIPTION	FUNCTION	①	②	③	④	⑤	⑥	⑦	⑧	⑨
IC813	AN5733	VOLUME MIN.	4.3 V	4.4 V	8.0 V	3.1 V	3.5 V	2.4 V	0 V	2.5 V	3.0 V
		VOLUME MAX.	1.25 V	4.4 V	8.0 V	3.1 V	3.5 V	2.4 V	0 V	2.5 V	3.3 V



## (5) TX PA

REF.	DESCRIPTION	FUNCTION	BASE	EMITTER	COLLECTOR
Q603	2SB1019	50W	12.6 V	13.3 V	9.0 V
		MAX.	12.4 V	13.1 V	13.0 V
Q604	2SA1382	50W	12.56 V	13.3 V	13.2 V
		MAX.	12.4 V	13.1 V	13.1 V
Q605	2SC2120	50W	0.83 V	0.20 V	12.0 V
		MAX.	2.1 V	1.47 V	7.8 V

REF.	DESCRIPTION	FUNCTION	①	②	③	④	⑤	⑥	⑦	⑧
IC602	NJM4558	50W	5.5 V	1.64 V	1.62 V	0 V	2.2 V	2.9 V	1.4 V	8.0 V
		MAX.	6.45 V	1.75 V	1.73 V	0 V	2.5 V	2.9 V	1.4 V	8.0 V
		ANT.OPEN	5.2 V	1.7 V	1.7 V	0 V	7.1 V	3.7 V	7.3 V	8.0 V
IC603	NJM4556	50W	2.7 V	4.7 V	4.7 V	0 V				8.0 V
		MAX.	7.2 V	5.4 V	7.2 V	0 V				8.0 V
		ANT.OPEN	7.3 V	4.6 V	4.8 V	0 V				8.0 V
IC604	NJM4558	50W	1.3 V	3.0 V	2.2 V	0 V	3.5 V	4.7 V	1.3 V	8.0 V
		MAX.	1.3 V	3.0 V	2.45 V	0 V	3.5 V	5.3 V	1.3 V	8.0 V
		ANT.OPEN	6.7 V	3.0 V	7.0 V	0 V	3.5 V	4.6 V	1.3 V	8.0 V

7. EP-ROM PROGRAM METHOD

7-1 Calculating the "Reference Division Rate" Address Data

REFERENCE DIVISION RATE "R"

The Reference Division Rate must always be calculated for both the transmit and the receive frequencies.

The 12.000MHz TCXO output signal is divided by 16 (by the divider, IC101) to provide a 750kHz Reference Frequency. This Reference Frequency is sampled and divided by the "Reference Division Rate" to determine the channel spacing, e.g. 12.000MHz/16 = 750kHz then 750kHz/(Channel Spacing) = Reference Frequency as follows:

<u>Channel Spacings</u>	<u>Calculations</u>	<u>Ref. Div. Rate "R"</u>
25kHz	750kHz/25kHz	= 30
12.5kHz	750kHz/12.5kHz	= 60
10kHz	750kHz/10kHz	= 75
6.25kHz	750kHz/6.25kHz	= 120
5kHz	750kHz/5kHz	= 150

Next it is necessary to determine the address information by referring to the attached "A - D CONVERSION LIST".

e.g. 12.5kHz channel spacing

= Reference Division Rate "R"

$$= \frac{60}{\downarrow} \\ \sqrt{c \ 3 \ 0}$$

7-2 Calculating the Transmit and Receive Address Data

It is necessary to calculate the following information for each transmit and receive frequencies required. TX and RX allow two TX and RX data to be written respectively into their EP-ROMs.

(Note: The receive frequency is the 1st local oscillator frequency.)

D = Basic Division Rate

d = Prescaler Division Rate

N = Number of Complete Divisions

R = Remainder of the Basic Division Rate

(a) "D" Calculation

"D" is obtained by dividing the frequency required by the channel spacing required.

(b) "d" Calculation

"d" is the prescaler division rate, and it is fixed at 64.

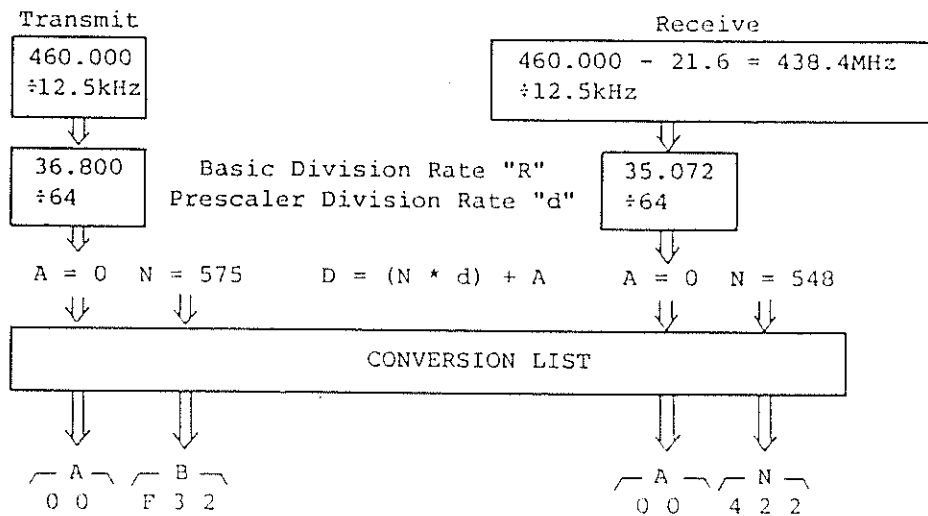
(c) "N" and "A" Calculation

"N" and "A" are calculated using the following equation:

$$D = (N * d) + A$$

(d) Example Calculation

Channel #1 460.000MHz, Simplex, 25kHz Channel Spacing



7-3 Relations between Addresses and Data

With BSR, TX and RX units each contain one EP-ROM. As a result, TX data and RX data only are written into TX and RX, respectively.

(Example) CH1 = 460MHz

		TX ADDRESS																
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Channel #1/#2 address		CH1								CH2								
Buffer input data		TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)		
Channel #3/#4 address		00	00	01	03	02	0C	03	00	FF	FF	FF	FF	FF	FF	FF	FF	
Buffer input data		10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	
Channel #5/#6 address		CH3								CH4								
Buffer input data		TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)	TX(A)	TX(N)	TX(R)		
Channel #99 address		FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	
Channel #99 address																		
Buffer input data		310	311	312	313	314	315	316	317	318	319	31A	31B	31C	31D	31E	31F	
Buffer input data		TX(A)	TX(N)	TX(R)														
		FF	FF	FF	FF	FF	FF	FF										

		RX ADDRESS																
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
Channel #1/#2 address		CH1								CH2								
Buffer input data		RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)		
Channel #3/#4 address		00	00	04	02	02	0C	03	00	FF	FF	FF	FF	FF	FF	FF	FF	
Buffer input data		10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	
Channel #5/#6 address		CH3								CH4								
Buffer input data		RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)	RX(A)	RX(N)	RX(R)		
Channel #99 address		FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	
Channel #99 address																		
Buffer input data		20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	
Buffer input data		RX(A)	RX(N)	RX(R)														
		FF	FF	FF	FF	FF	FF	FF										

Note: An FF data input, though applied to the ROM in programming the ROM, fails to be written into it.

CONVERSION LIST II

No.	Code	No.	Code	No.	Code	No.	Code	No.	Code	No.	Code	No.	Code	No.	Code
1	1 0	76	C 4	151	7 9	226	2 E	301	D 2 1	376	B 7 1	451	3 C 1	526	E 0 2
2	2 0	77	D 4	152	B 9	227	J E	302	E 2 1	377	9 7 1	452	4 C 1	527	F 0 2
3	3 0	78	E 4	153	9 9	228	4 E	303	F 2 1	378	A 7 1	453	5 C 1	528	0 1 2
4	4 0	79	F 4	154	A 9	229	5 E	304	G 2 1	379	B 7 1	454	6 C 1	529	1 1 2
5	5 0	80	0 5	155	B 9	230	6 E	305	1 J 1	380	C 7 1	455	7 C 1	530	2 1 2
6	6 0	81	1 5	156	C 9	231	7 E	306	2 J 1	381	D 7 1	456	8 C 1	531	3 1 2
7	7 0	82	2 5	157	D 9	232	8 E	307	3 J 1	382	E 7 1	457	9 C 1	532	4 1 2
8	8 0	83	3 5	158	E 9	233	9 E	308	4 J 1	383	F 7 1	458	A C 1	533	5 1 2
9	9 0	84	4 5	159	F 9	234	A E	309	5 J 1	384	G 7 1	459	B C 1	534	6 1 2
10	A 0	85	5 5	160	0 A	235	B E	310	6 J 1	385	1 B 1	460	C C 1	535	7 1 2
11	0 0	86	6 5	161	1 A	236	C E	311	7 J 1	386	2 B 1	461	D C 1	536	8 1 2
12	C 0	87	7 5	162	2 A	237	D E	312	8 J 1	387	3 B 1	462	E C 1	537	9 1 2
13	0 0	88	8 5	163	3 A	238	E E	313	9 J 1	388	4 B 1	463	F C 1	538	A 1 2
14	E 0	89	9 5	164	4 A	239	F E	314	A J 1	389	5 B 1	464	G C 1	539	0 1 2
15	F 0	90	A 5	165	5 A	240	0 F	315	B J 1	390	6 B 1	465	1 D 1	540	C 1 2
16	0 1	91	B 5	166	6 A	241	1 F	316	C J 1	391	7 B 1	466	2 D 1	541	0 1 2
17	1 1	92	C 5	167	7 A	242	2 F	317	D J 1	392	8 B 1	467	3 D 1	542	C 1 2
18	2 1	93	D 5	168	8 A	243	3 F	318	E J 1	393	9 B 1	468	4 D 1	543	F 1 2
19	3 1	94	E 5	169	9 A	244	4 F	319	F J 1	394	A B 1	469	5 D 1	544	0 2 2
20	4 1	95	F 5	170	A A	245	5 F	320	0 4 1	395	B B 1	470	6 D 1	545	1 2 2
21	5 1	96	0 6	171	B A	246	6 F	321	1 4 1	396	C B 1	471	7 D 1	546	2 2 2
22	6 1	97	1 6	172	C A	247	7 F	322	2 4 1	397	D B 1	472	8 D 1	547	3 2 2
23	7 1	98	2 6	173	D A	248	8 F	323	3 4 1	398	E B 1	473	9 D 1	548	4 2 2
24	8 1	99	3 6	174	E A	249	9 F	324	4 4 1	399	F B 1	474	A D 1	549	5 2 2
25	9 1	100	4 6	175	F A	250	A F	325	5 4 1	400	0 9 1	475	B D 1	550	6 2 2
26	A 1	101	5 6	176	0 B	251	B F	326	6 4 1	401	1 9 1	476	C D 1	551	7 2 2
27	B 1	102	6 6	177	1 B	252	C F	327	7 4 1	402	2 9 1	477	D D 1	552	8 2 2
28	C 1	103	7 6	178	2 B	253	D F	328	8 4 1	403	3 9 1	478	E D 1	553	9 2 2
29	D 1	104	8 6	179	3 B	254	E F	329	9 4 1	404	4 9 1	479	F D 1	554	A 2 2
30	E 1	105	9 6	180	4 B	255	F F	330	A 4 1	405	5 9 1	480	0 E 1	555	B 2 2
31	F 1	106	A 6	181	5 B	256	0 0 1	331	B 4 1	406	6 9 1	481	1 E 1	556	C 2 2
32	0 2	107	B 6	182	6 B	257	1 0 1	332	C 4 1	407	7 9 1	482	2 E 1	557	D 2 2
33	1 2	108	C 6	183	7 B	258	2 0 1	333	D 4 1	408	8 9 1	483	3 E 1	558	E 2 2
34	2 2	109	D 6	184	8 B	259	3 0 1	334	E 4 1	409	9 9 1	484	4 E 1	559	F 2 2
35	3 2	110	E 6	185	9 B	260	4 0 1	335	F 4 1	410	A 9 1	485	5 E 1	560	0 3 2
36	4 2	111	F 6	186	A B	261	5 0 1	336	0 5 1	411	B 9 1	486	6 E 1	561	1 3 2
37	5 2	112	0 7	187	B B	262	6 0 1	337	1 5 1	412	C 9 1	487	7 E 1	562	2 3 2
38	6 2	113	1 7	188	C B	263	7 0 1	338	2 5 1	413	D 9 1	488	8 E 1	563	3 3 2
39	7 2	114	2 7	189	0 B	264	8 0 1	339	3 5 1	414	E 9 1	489	9 E 1	564	4 3 2
40	8 2	115	3 7	190	E B	265	9 0 1	340	4 5 1	415	F 9 1	490	A E 1	565	5 3 2
41	9 2	116	4 7	191	F B	266	A 0 1	341	5 5 1	416	0 A 1	491	B E 1	566	6 3 2
42	A 2	117	5 7	192	0 C	267	B 0 1	342	6 5 1	417	1 A 1	492	C E 1	567	7 3 2
43	B 2	118	6 7	193	1 C	268	C 0 1	343	7 5 1	418	2 A 1	493	D E 1	568	8 3 2
44	C 2	119	7 7	194	2 C	269	0 0 1	344	8 5 1	419	3 A 1	494	E E 1	569	9 3 2
45	D 2	120	8 7	195	3 C	270	E 0 1	345	9 5 1	420	4 A 1	495	F E 1	570	A 3 2
46	E 2	121	9 7	196	4 C	271	F 0 1	346	A 5 1	421	5 A 1	496	0 F 1	571	B 3 2
47	F 2	122	A 7	197	5 C	272	0 1 1	347	0 5 1	422	6 A 1	497	1 F 1	572	C 3 2
48	0 3	123	B 7	198	6 C	273	1 1 1	348	C 5 1	423	7 A 1	498	2 F 1	573	D 3 2
49	1 3	124	C 7	199	7 C	274	2 1 1	349	0 5 1	424	8 A 1	499	3 F 1	574	E 3 2
50	2 3	125	D 7	200	8 C	275	3 1 1	350	E 5 1	425	9 A 1	500	4 F 1	575	F 3 2
51	3 3	126	E 7	201	9 C	276	4 1 1	351	F 5 1	426	A A 1	501	5 F 1	576	0 4 2
52	4 3	127	F 7	202	A C	277	5 1 1	352	0 6 1	427	B A 1	502	6 F 1	577	1 4 2
53	5 3	128	0 8	203	B C	278	6 1 1	353	1 6 1	428	C A 1	503	7 F 1	578	2 4 2
54	6 3	129	1 8	204	C C	279	7 1 1	354	2 6 1	429	D A 1	504	8 F 1	579	3 4 2
55	7 3	130	2 8	205	D C	280	8 1 1	355	3 6 1	430	E A 1	505	9 F 1	580	4 4 2
56	8 3	131	3 8	206	E C	281	9 1 1	356	4 6 1	431	F A 1	506	A F 1	581	5 4 2
57	9 3	132	4 8	207	F C	282	A 1 1	357	5 6 1	432	0 B 1	507	B F 1	582	6 4 2
58	A 3	133	5 8	208	0 D	283	B 1 1	358	6 6 1	433	1 B 1	508	C F 1	583	7 4 2
59	B 3	134	6 8	209	1 D	284	C 1 1	359	7 6 1	434	2 B 1	509	D F 1	584	8 4 2
60	C 3	135	7 8	210	2 D	285	D 1 1	360	8 6 1	435	3 B 1	510	E F 1	585	9 4 2
61	D 3	136	8 8	211	3 D	286	E 1 1	361	9 6 1	436	4 B 1	511	F F 1	586	A 4 2
62	E 3	137	9 8	212	4 D	287	F 1 1	362	A 6 1	437	5 B 1	512	0 0 2	587	0 4 2
63	F 3	138	A 8	213	5 D	288	0 2 1	363	9 6 1	438	6 B 1	513	1 0 2	588	C 4 2
64	0 4	139	B 8	214	6 D	289	1 2 1	364	0 6 1	439	7 B 1	514	2 0 2	589	0 4 2
65	1 4	140	C 8	215	7 D	290	2 2 1	365	0 6 1	440	8 B 1	515	3 0 2	590	E 4 2
66	2 4	141	D 8	216	8 D	291	3 2 1	366	E 6 1	441	9 B 1	516	4 0 2	591	F 4 2
67	3 4	142	E 8	217	9 D	292	4 2 1	367	F 6 1	442	A B 1	517	5 0 2	592	0 5 2
68	4 4	143	F 8	218	A D	293	5 2 1	368	0 7 1	443	B B 1	518	6 0 2	593	1 5 2
69	5 4	144	0 9	219	B D	294	6 2 1	369	1 7 1	444	C B 1	519	7 0 2	594	2 5 2
70	6 4	145	1 9	220	C D	295	7 2 1	370	2 7 1	445	D B 1	520	8 0 2	595	3 5 2
71	7 4	146	2 9	221	0 0	296	8 2 1	371	3 7 1	446	E B 1	521	9 0 2	596	4 5 2
72	8 4	147	3 9	222	C 0	297	9 2 1	372	4 7 1	447	F B 1	522	A 0 2	597	5 5 2
73	9 4	148	4 9	223	F 0	298	A 2 1	373	5 7 1	448	0 C 1	523	B 0 2	598	6 5 2
74	A 4	149	5 9	224	0 E	299	B 2 1	374	6 7 1	449	1 C 1	524	C 0 2	599	7 5 2
75	B 4	150	6 9	225	1 E	300	C 2 1	375	7 7 1	450	2 C 1	525	D 0 2	600	8 5 2

0-75

76-150

151-225

226-300

301-375

376-450

451-525

526-600

CONVERSION LIST (2)

No.	Code	No.	Code	No.	Code	No.	Code	No.	Code	No.	Code
601	9 5 2	676	4 A 2	751	F E 2	826	A 3 3	901	5 8 3	976	0 0 3
602	A 5 2	677	5 A 2	752	O F 2	827	B 3 3	902	6 8 3	977	1 0 3
603	B 5 2	678	6 A 2	753	1 F 2	828	C 3 3	903	7 8 3	978	2 0 3
604	C 5 2	679	7 A 2	754	2 F 2	829	D 3 3	904	8 8 3	979	3 0 3
605	U 5 2	680	0 A 2	755	3 F 2	830	E 3 3	905	9 8 3	980	4 0 3
606	C 5 2	681	9 A 2	756	4 F 2	831	F 3 3	906	A 8 3	981	5 0 3
607	F 5 2	682	A A 2	757	5 F 2	832	0 4 3	907	B 8 3	982	6 0 3
608	0 6 2	683	B A 2	758	6 F 2	833	1 4 3	908	C 8 3	983	7 0 3
609	1 6 2	684	C A 2	759	7 F 2	834	2 4 3	909	D 8 3	984	8 0 3
610	2 6 2	685	0 A 2	760	8 F 2	835	3 4 3	910	E 8 3	985	9 0 3
611	3 6 2	686	E A 2	761	9 F 2	836	4 4 3	911	F 8 3	986	A 0 3
612	4 6 2	687	F A 2	762	A F 2	837	5 4 3	912	0 9 3	987	B 0 3
613	5 6 2	688	0 B 2	763	B F 2	838	6 4 3	913	1 9 3	988	C 0 3
614	6 6 2	689	1 B 2	764	C F 2	839	7 4 3	914	2 9 3	989	0 0 3
615	7 6 2	690	2 B 2	765	D F 2	840	8 4 3	915	3 9 3	990	E 0 3
616	8 6 2	691	3 B 2	766	E F 2	841	9 4 3	916	4 9 3	991	F 0 3
617	9 6 2	692	4 B 2	767	F F 2	842	A 4 3	917	5 9 3	992	0 E 3
618	A 6 2	693	5 B 2	768	0 0 3	843	B 4 3	918	6 9 3	993	1 E 3
619	0 6 2	694	6 B 2	769	1 0 3	844	C 4 3	919	7 9 3	994	2 E 3
620	C 6 2	695	7 B 2	770	2 0 3	845	D 4 3	920	8 9 3	995	3 E 3
621	0 6 2	696	8 B 2	771	3 0 3	846	E 4 3	921	9 9 3	996	4 E 3
622	E 6 2	697	9 B 2	772	4 0 3	847	F 4 3	922	A 9 3	997	5 E 3
623	F 6 2	698	A B 2	773	5 0 3	848	0 5 3	923	B 9 3	998	6 E 3
624	0 7 2	699	0 B 2	774	6 0 3	849	1 5 3	924	C 9 3	999	7 E 3
625	1 7 2	700	C B 2	775	7 0 3	850	2 5 3	925	0 9 3	1000	8 E 3
626	2 7 2	701	0 B 2	776	8 0 3	851	3 5 3	926	E 9 3		
627	3 7 2	702	E 0 2	777	9 0 3	852	4 5 3	927	F 9 3		
628	4 7 2	703	F B 2	778	A 0 3	853	5 5 3	928	0 A 3		
629	5 7 2	704	0 C 2	779	B 0 3	854	6 5 3	929	1 A 3		
630	6 7 2	705	1 C 2	780	C 0 3	855	7 5 3	930	2 A 3		
631	7 7 2	706	2 C 2	781	0 0 3	856	8 5 3	931	J A 3		
632	8 7 2	707	3 C 2	782	E 0 3	857	9 5 3	932	4 A 3		
633	9 7 2	708	4 C 2	783	F 0 3	858	A 5 3	933	5 A 3		
634	A 7 2	709	5 C 2	784	0 1 3	859	B 5 3	934	6 A 3		
635	B 7 2	710	6 C 2	785	1 1 3	860	C 5 3	935	7 A 3		
636	C 7 2	711	7 C 2	786	2 1 3	861	D 5 3	936	B A 3		
637	D 7 2	712	8 C 2	787	3 1 3	862	E 5 3	937	9 A 3		
638	E 7 2	713	9 C 2	788	4 1 3	863	F 5 3	938	A A 3		
639	F 7 2	714	A C 2	789	5 1 3	864	0 6 3	939	0 A 3		
640	0 8 2	715	0 C 2	790	6 1 3	865	1 6 3	940	C A 3		
641	1 8 2	716	C C 2	791	7 1 3	866	2 6 3	941	D A 3		
642	2 8 2	717	D C 2	792	8 1 3	867	3 6 3	942	E A 3		
643	3 8 2	718	E C 2	793	9 1 3	868	4 6 3	943	F A 3		
644	4 8 2	719	F C 2	794	A 1 3	869	5 6 3	944	0 B 3		
645	5 8 2	720	0 D 2	795	B 1 3	870	6 6 3	945	1 B 3		
646	6 8 2	721	1 D 2	796	C 1 3	871	7 6 3	946	2 B 3		
647	7 8 2	722	2 D 2	797	0 1 3	872	8 6 3	947	3 B 3		
648	8 0 2	723	3 D 2	798	E 1 3	873	9 6 3	948	4 B 3		
649	9 8 2	724	4 D 2	799	F 1 3	874	A 6 3	949	5 B 3		
650	A 8 2	725	5 D 2	800	0 2 3	875	B 6 3	950	6 B 3		
651	0 8 2	726	6 D 2	801	1 2 3	876	C 6 3	951	7 B 3		
652	C 8 2	727	7 D 2	802	2 2 3	877	D 6 3	952	8 B 3		
653	0 8 2	728	8 D 2	803	3 2 3	878	E 6 3	953	9 B 3		
654	E 8 2	729	9 D 2	804	4 2 3	879	F 6 3	954	A 0 3		
655	F 8 2	730	A D 2	805	5 2 3	880	0 7 3	955	B 0 3		
656	0 9 2	731	B D 2	806	6 2 3	881	1 7 3	956	C 0 3		
657	1 9 2	732	C D 2	807	7 2 3	882	2 7 3	957	D 0 3		
658	2 9 2	733	0 0 2	808	8 2 3	883	3 7 3	958	E 0 3		
659	3 9 2	734	E 0 2	809	9 2 3	884	4 7 3	959	F 0 3		
660	4 9 2	735	F 0 2	810	A 2 3	885	5 7 3	960	0 C 3		
661	5 9 2	736	0 E 2	811	0 2 3	886	6 7 3	961	1 C 3		
662	6 9 2	737	1 E 2	812	C 2 3	887	7 7 3	962	2 C 3		
663	7 9 2	738	2 E 2	813	D 2 3	888	0 7 3	963	3 C 3		
664	8 9 2	739	3 E 2	814	E 2 3	889	9 7 3	964	4 C 3		
665	9 9 2	740	4 E 2	815	F 2 3	890	A 7 3	965	5 C 3		
666	A 9 2	741	5 E 2	816	0 3 3	891	0 7 3	966	6 C 3		
667	0 9 2	742	6 E 2	817	1 3 3	892	C 7 3	967	7 C 3		
668	C 9 2	743	7 E 2	818	2 3 3	893	D 7 3	968	8 C 3		
669	0 9 2	744	8 E 2	819	3 3 3	894	E 7 3	969	9 C 3		
670	E 9 2	745	9 E 2	820	4 3 3	895	F 7 3	970	A C 3		
671	F 9 2	746	A E 2	821	5 3 3	896	0 8 3	971	0 C 3		
672	0 A 2	747	D E 2	822	6 3 3	897	1 0 3	972	C C 3		
673	1 A 2	748	C E 2	823	7 3 3	898	2 8 3	973	D C 3		
674	2 A 2	749	D E 2	824	8 3 3	899	3 8 3	974	E C 3		
675	3 A 2	750	E E 2	825	9 3 3	900	4 8 3	975	F C 3		
601-675		676-750		751-825		826-900		901-975		976-1000	







-- VHF TX PROGRAM --								-- VHF RX PROGRAM --								-- VHF TX PROGRAM --								-- VHF RX PROGRAM --									
F (MHz)								F (MHz)								F (MHz)								F (MHz)									
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7		
S	9	A	B	C	D	E	F	S	9	A	B	C	D	E	F	S	9	A	B	C	D	E	F	S	9	A	B	C	D	E	F		
226.9500	0C	02	0B	01	01	00	0E	01	0C	02	00	00	01	00	0E	01	07	02	01	00	01	00	0E	01	08	02	01	00	01	00	0E	01	
226.9625	0D	02	0B	01	01	00	0E	01	0D	02	00	00	01	00	0E	01	08	02	01	00	01	00	0E	01	09	02	01	00	01	00	0E	01	
226.9750	0E	02	0B	01	01	00	0E	01	0E	02	00	00	01	00	0E	01	09	02	01	00	01	00	0E	01	0A	02	01	00	01	00	0E	01	
226.9875	0F	02	0B	01	01	00	0E	01	0F	02	00	00	01	00	0E	01	0A	02	01	00	01	00	0E	01	0B	02	01	00	01	00	0E	01	
227.0000	00	03	0B	01	01	00	0E	01	00	03	00	00	01	00	0E	01	0B	02	01	00	01	00	0E	01	0C	02	01	00	01	00	0E	01	
227.0125	01	03	0B	01	01	00	0E	01	01	03	00	00	01	00	0E	01	0C	02	01	00	01	00	0E	01	0D	02	01	00	01	00	0E	01	
227.0250	02	03	0B	01	01	00	0E	01	02	03	00	00	01	00	0E	01	0D	02	01	00	01	00	0E	01	0E	02	01	00	01	00	0E	01	
227.0375	03	03	0B	01	01	00	0E	01	03	03	00	00	01	00	0E	01	0E	02	01	00	01	00	0E	01	0F	02	01	00	01	00	0E	01	
227.0500	04	03	0B	01	01	00	0E	01	04	03	00	00	01	00	0E	01	0F	02	01	00	01	00	0E	01	00	03	01	00	01	00	0E	01	
227.0625	05	03	0B	01	01	00	0E	01	05	03	00	00	01	00	0E	01	00	03	01	00	01	00	0E	01	01	03	01	00	01	00	0E	01	
227.0750	06	03	0B	01	01	00	0E	01	06	03	00	00	01	00	0E	01	227.8125	01	03	0C	01	01	00	0E	01	02	03	01	00	01	00	0E	01
227.0875	07	03	0B	01	01	00	0E	01	07	03	00	00	01	00	0E	01	227.8250	02	03	0C	01	01	00	0E	01	03	03	01	00	01	00	0E	01
227.1000	08	03	0B	01	01	00	0E	01	08	03	00	00	01	00	0E	01	227.8375	03	03	0C	01	01	00	0E	01	04	03	01	00	01	00	0E	01
227.1125	09	03	0B	01	01	00	0E	01	09	03	00	00	01	00	0E	01	227.8500	04	03	0C	01	01	00	0E	01	05	03	01	00	01	00	0E	01
227.1250	0A	03	0B	01	01	00	0E	01	0A	03	00	00	01	00	0E	01	227.8625	05	03	0C	01	01	00	0E	01	06	03	01	00	01	00	0E	01
227.1375	0B	03	0B	01	01	00	0E	01	0B	03	00	00	01	00	0E	01	227.8750	06	03	0C	01	01	00	0E	01	07	03	01	00	01	00	0E	01
227.1500	0C	03	0B	01	01	00	0E	01	0C	03	00	00	01	00	0E	01	227.8875	07	03	0C	01	01	00	0E	01	08	03	01	00	01	00	0E	01
227.1625	0D	03	0B	01	01	00	0E	01	0D	03	00	00	01	00	0E	01	227.9000	08	03	0C	01	01	00	0E	01	09	03	01	00	01	00	0E	01
227.1750	0E	03	0B	01	01	00	0E	01	0E	03	00	00	01	00	0E	01	227.9125	09	03	0C	01	01	00	0E	01	0A	03	01	00	01	00	0E	01
227.1875	0F	03	0B	01	01	00	0E	01	0F	03	00	00	01	00	0E	01	227.9250	0A	03	0C	01	01	00	0E	01	0B	03	01	00	01	00	0E	01
227.2000	00	00	0C	01	01	00	0E	01	00	00	01	00	01	00	0E	01	227.9375	0B	03	0C	01	01	00	0E	01	0C	03	01	00	01	00	0E	01
227.2125	01	00	0C	01	01	00	0E	01	01	00	01	00	01	00	0E	01	227.9500	0C	03	0C	01	01	00	0E	01	0D	03	01	00	01	00	0E	01
227.2250	02	00	0C	01	01	00	0E	01	02	00	01	00	01	00	0E	01	227.9625	0D	03	0C	01	01	00	0E	01	0E	03	01	00	01	00	0E	01
227.2375	03	00	0C	01	01	00	0E	01	03	00	01	00	01	00	0E	01	227.9750	0E	03	0C	01	01	00	0E	01	0F	03	01	00	01	00	0E	01
227.2500	04	00	0C	01	01	00	0E	01	04	00	01	00	01	00	0E	01	227.9875	0F	03	0C	01	01	00	0E	01	00	00	02	00	01	00	0E	01
227.2625	05	00	0C	01	01	00	0E	01	05	00	01	00	01	00	0E	01	228.0000	00	00	0D	01	01	00	0E	01	01	00	02	00	01	00	0E	01
227.2750	06	00	0C	01	01	00	0E	01	06	00	01	00	01	00	0E	01	228.0125	01	00	0D	01	01	00	0E	01	02	00	02	00	01	00	0E	01
227.2875	07	00	0C	01	01	00	0E	01	07	00	01	00	01	00	0E	01	228.0250	02	00	0D	01	01	00	0E	01	03	00	02	00	01	00	0E	01
227.3000	08	00	0C	01	01	00	0E	01	08	00	01	00	01	00	0E	01	228.0375	03	00	0D	01	01	00	0E	01	04	00	02	00	01	00	0E	01
227.3125	09	00	0C	01	01	00	0E	01	09	00	01	00	01	00	0E	01	228.0500	04	00	0D	01	01	00	0E	01	05	00	02	00	01	00	0E	01
227.3250	0A	00	0C	01	01	00	0E	01	0A	00	01	00	01	00	0E	01	228.0625	05	00	0D	01	01	00	0E	01	06	00	02	00	01	00	0E	01
227.3375	0B	00	0C	01	01	00	0E	01	0B	00	01	00	01	00	0E	01	228.0750	06	00	0D	01	01	00	0E	01	07	00	02	00	01	00	0E	01
227.3500	0C	00	0C	01	01	00	0E	01	0C	00	01	00	01	00	0E	01	228.0875	07	00	0D	01	01	00	0E	01	08	00	02	00	01	00	0E	01
227.3625	0D	00	0C	01	01	00	0E	01	0D	00	01	00	01	00	0E	01	228.1000	08	00	0D	01	01	00	0E	01	09	00	02	00	01	00	0E	01
227.3750	0E	00	0C	01	01	00	0E	01	0E	00	01	00	01	00	0E	01	228.1125	09	00	0D	01	01	00	0E	01	0A	00	02	00	01	00	0E	01
227.3875	0F	00	0C	01	01	00	0E	01	0F	00	01	00	01	00	0E	01	228.1250	0A	00	0D	01	01	00	0E	01	0B	00	02	00	01	00	0E	01
227.4000	00	01	0C	01	01	00	0E	01	00	01	01	00	01	00	0E	01	228.1375	0B	00	0D	01	01	00	0E	01	0C	00	02	00	01	00	0E	01
227.4125	01	01	0C	01	01	00	0E	01	01	01	01	00	01	00	0E	01	228.1500	0C	00	0D	01	01	00	0E	01	0D	00	02	00	01	00	0E	01
227.4250	02	01	0C	01	01	00	0E	01	02	01	01	00	01	00	0E	01	228.1625	0D	00	0D	01	01	00	0E	01	0E	00	02	00	01	00	0E	01
227.4375	03	01	0C	01	01	00	0E	01	03	01	01	00	01	00	0E	01	228.1750	0E	00	0D	01	01	00	0E	01	0F	00	02	00	01	00	0E	01
227.4500	04	01	0C	01	01	00	0E	01	04	01	01	00	01	00	0E	01	228.1875	0F	00	0D	01	01	00	0E	01	00	01	02	00	01	00	0E	01
227.4625	05	01	0C	01	01	00	0E	01	05	01	01	00	01	00	0E	01	228.2000	00	01	0D	01	01	00	0E	01	01	01	02	00	01	00	0E	01
227.4750	06	01	0C	01	01	00	0E	01	06	01	01	00	01	00	0E	01	228.2125	01	01	0D	01	01	00	0E	01	02	01	02	00	01	00	0E	01
227.4875	07	01	0C	01	01	00	0E	01	07	01	01	00	01	00	0E	01	228.2250	02	01	0D	01	01	00	0E	01	03	01	02	00	01	00	0E	01
227.5000	08	01	0C	01	01	00	0E	01	08	01	01	00	01	00	0E	01	228.2375	03	01	0D	01	01	00	0E	01	04	01	02	00	01	00	0E	01
227.5125	09	01	0C	01	01	00	0E	01	09	01	01	00	01	00	0E	01	228.2500	04	01	0D	01	01	00	0E	01	05	01	02	00	01	00	0E	01
227.5250	0A	01	0C	01	01	00	0E	01	0A	01	01	00	01	00	0E	01	228.2625	05	01	0D	01	01	00	0E	01	06	01	02	00	01	00		



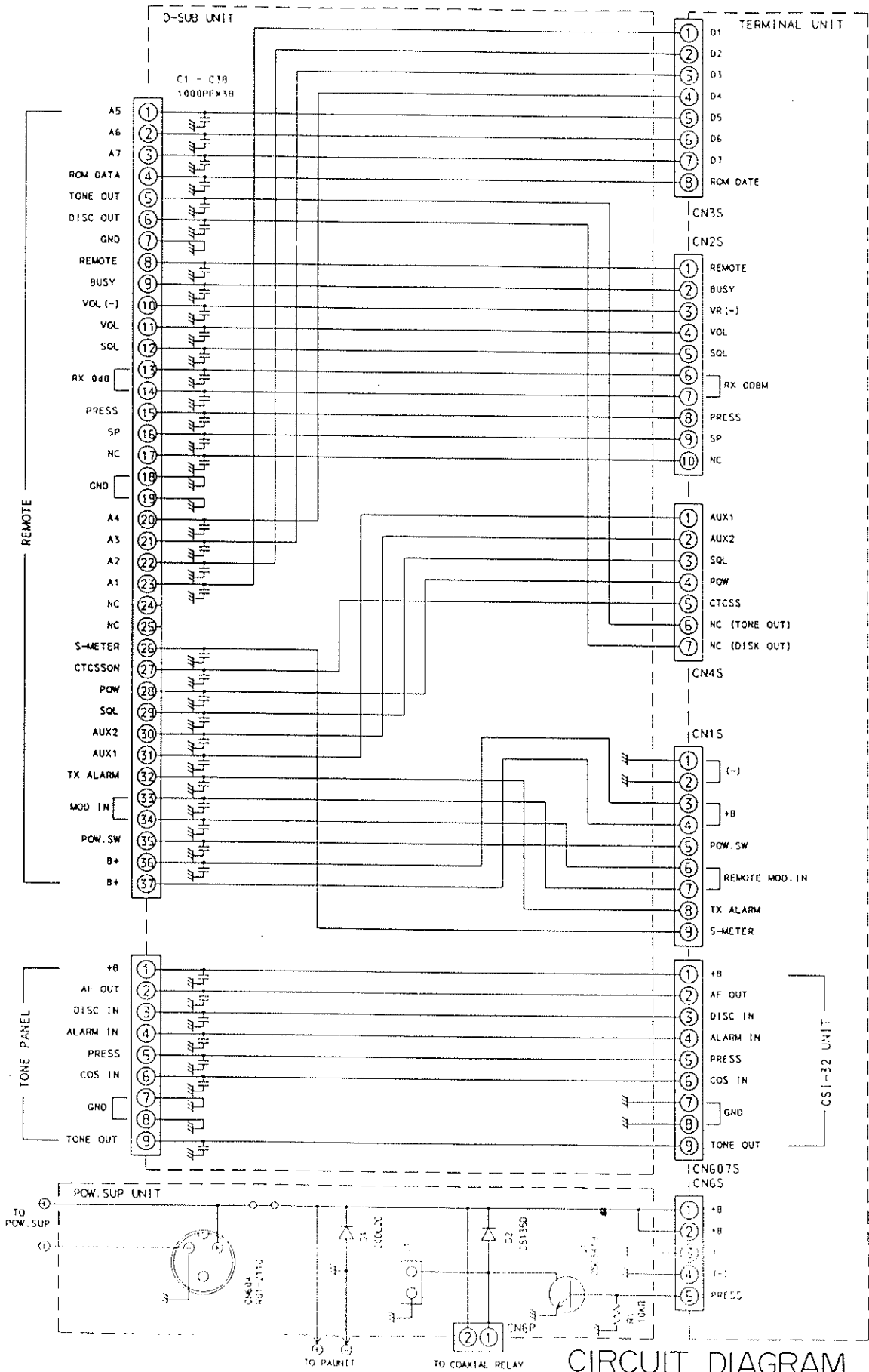
--- VHF TX PROGRAM ---								--- VHF RX PROGRAM ---								--- VHF TX PROGRAM ---								--- VHF RX PROGRAM ---									
F (MHz)	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	F (MHz)	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
	8	9	A	B	C	D	E	F	8	9	A	B	C	D	E	F		8	9	A	B	C	D	E	F	8	9	A	B	C	D	E	F
229.9000	08	01	0F	01	01	00	0E	01	08	01	04	00	01	00	0E	01	230.6375	03	01	00	02	01	00	0E	01	03	01	05	00	01	00	0E	01
229.9125	09	01	0F	01	01	00	0E	01	09	01	04	00	01	00	0E	01	230.6500	04	01	00	02	01	00	0E	01	04	01	05	00	01	00	0E	01
229.9250	0A	01	0F	01	01	00	0E	01	0A	01	04	00	01	00	0E	01	230.6625	05	01	00	02	01	00	0E	01	05	01	05	00	01	00	0E	01
229.9375	0B	01	0F	01	01	00	0E	01	0B	01	04	00	01	00	0E	01	230.6750	06	01	00	02	01	00	0E	01	06	01	05	00	01	00	0E	01
229.9500	0C	01	0F	01	01	00	0E	01	0C	01	04	00	01	00	0E	01	230.6875	07	01	00	02	01	00	0E	01	07	01	05	00	01	00	0E	01
229.9625	0D	01	0F	01	01	00	0E	01	0D	01	04	00	01	00	0E	01	230.7000	08	01	00	02	01	00	0E	01	08	01	05	00	01	00	0E	01
229.9750	0E	01	0F	01	01	00	0E	01	0E	01	04	00	01	00	0E	01	230.7125	09	01	00	02	01	00	0E	01	09	01	05	00	01	00	0E	01
229.9875	0F	01	0F	01	01	00	0E	01	0F	01	04	00	01	00	0E	01	230.7250	0A	01	00	02	01	00	0E	01	0A	01	05	00	01	00	0E	01
230.0000	00	02	0F	01	01	00	0E	01	00	02	04	00	01	00	0E	01	230.7375	0B	01	00	02	01	00	0E	01	0B	01	05	00	01	00	0E	01
230.0125	01	02	0F	01	01	00	0E	01	01	02	04	00	01	00	0E	01	230.7500	0C	01	00	02	01	00	0E	01	0C	01	05	00	01	00	0E	01
230.0250	02	02	0F	01	01	00	0E	01	02	02	04	00	01	00	0E	01	230.7625	0D	01	00	02	01	00	0E	01	0D	01	05	00	01	00	0E	01
230.0375	03	02	0F	01	01	00	0E	01	03	02	04	00	01	00	0E	01	230.7750	0E	01	00	02	01	00	0E	01	0E	01	05	00	01	00	0E	01
230.0500	04	02	0F	01	01	00	0E	01	04	02	04	00	01	00	0E	01	230.7875	0F	01	00	02	01	00	0E	01	0F	01	05	00	01	00	0E	01
230.0625	05	02	0F	01	01	00	0E	01	05	02	04	00	01	00	0E	01	230.8000	00	02	00	02	01	00	0E	01	00	02	05	00	01	00	0E	01
230.0750	06	02	0F	01	01	00	0E	01	06	02	04	00	01	00	0E	01	230.8125	01	02	00	02	01	00	0E	01	01	02	05	00	01	00	0E	01
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230.1125	09	02	0F	01	01	00	0E	01	09	02	04	00	01	00	0E	01	230.8500	04	02	00	02	01	00	0E	01	04	02	05	00	01	00	0E	01
230.1250	0A	02	0F	01	01	00	0E	01	0A	02	04	00	01	00	0E	01	230.8625	05	02	00	02	01	00	0E	01	05	02	05	00	01	00	0E	01
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230.2500	04	03	0F	01	01	00	0E	01	04	03	04	00	01	00	0E	01	230.9875	0F	02	00	02	01	00	0E	01	0F	02	05	00	01	00	0E	01
230.2625	05	03	0F	01	01	00	0E	01	05	03	04	00	01	00	0E	01	231.0000	00	03	00	02	01	00	0E	01	00	03	05	00	01	00	0E	01
230.2750	06	03	0F	01	01	00	0E	01	06	03	04	00	01	00	0E	01	231.0125	01	03	00	02	01	00	0E	01	01	03	05	00	01	00	0E	01
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230.3000	08	03	0F	01	01	00	0E	01	08	03	04	00	01	00	0E	01	231.0375	03	03	00	02	01	00	0E	01	03	03	05	00	01	00	0E	01
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230.4125	01	00	00	02	01	00	0E	01	01	00	05	00	01	00	0E	01	231.1500	0C	03	00	02	01	00	0E	01	0C	03	05	00	01	00	0E	01
230.4250	02	00	00	02	01	00	0E	01	02	00	05	00	01	00	0E	01	231.1625	0D	03	00	02	01	00	0E	01	0D	03	05	00	01	00	0E	01
230.4375	03	00	00	02	01	00	0E	01	03	00	05	00	01	00	0E	01	231.1750	0E	03	00	02	01	00	0E	01	0E	03	05	00	01	00	0E	01
230.4500	04	00	00	02	01	00	0E	01	04	00	05	00	01	00	0E	01	231.1875	0F	03	00	02	01	00	0E	01	0F	03	05	00	01	00	0E	01
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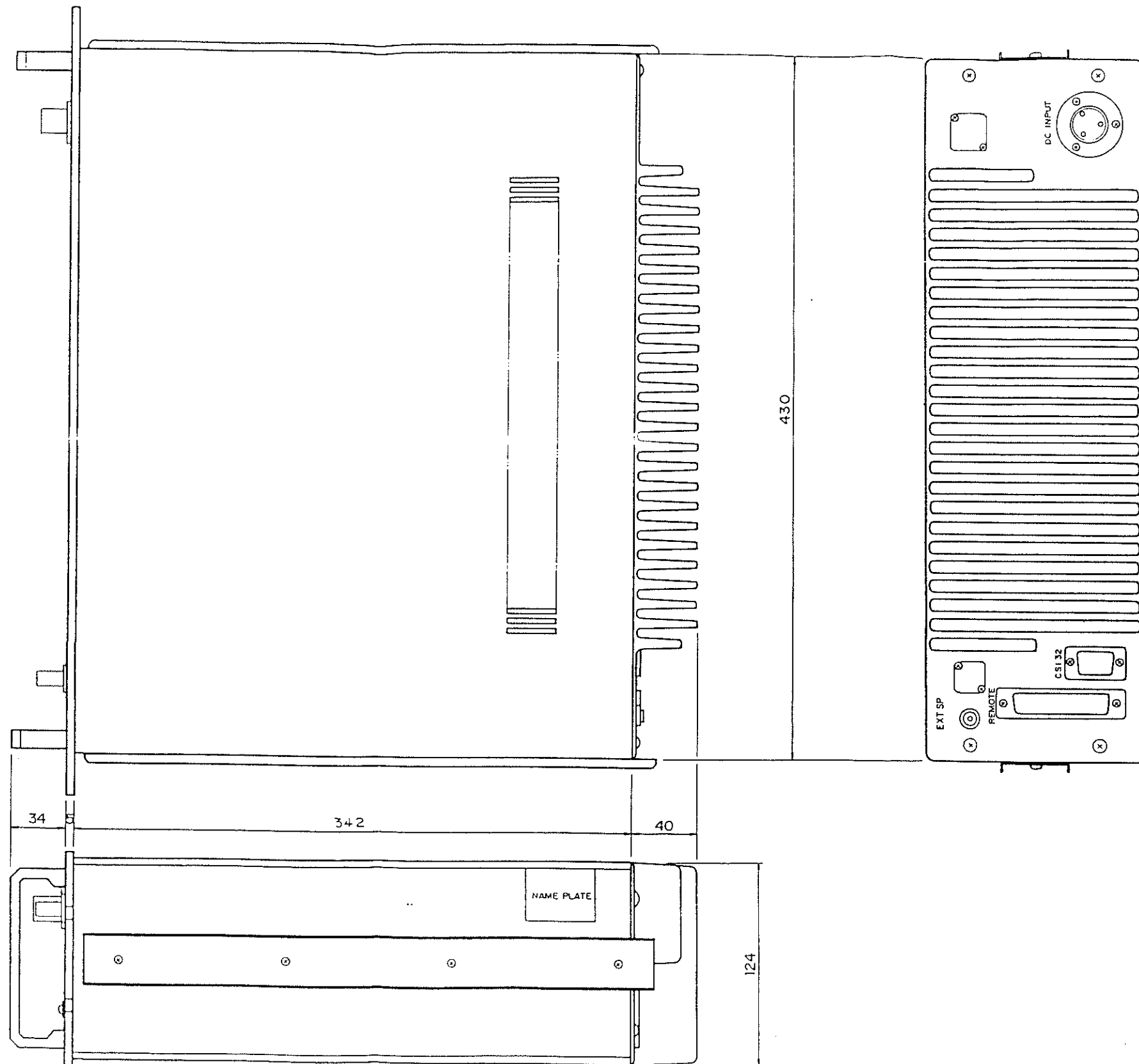
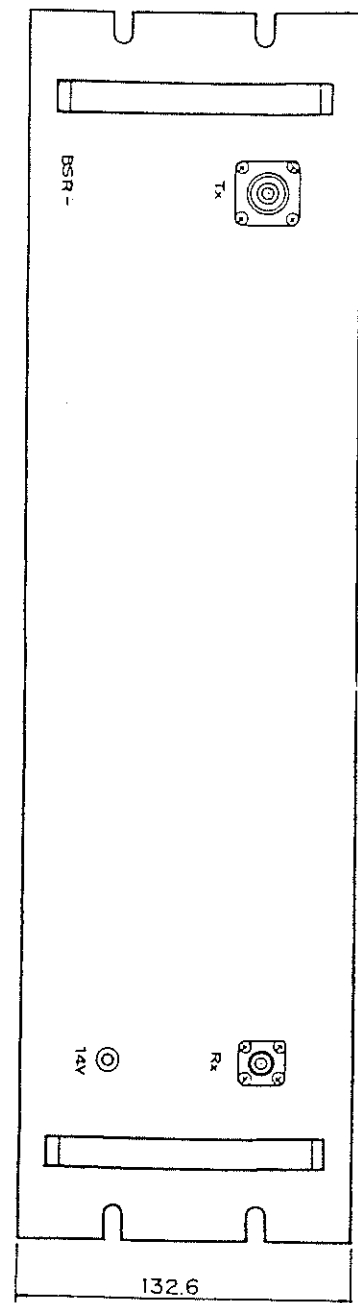
F (MHz)	-- VHF TX PROGRAM --							-- VHF RX PROGRAM --								
	0 8	1 9	2 A	3 B	4 C	5 D	6 E	7 F	0 8	1 9	2 A	3 B	4 C	5 D	6 E	7 F
234.3250	0A	03	04	02	01	00	0E	01	0A	03	09	00	01	00	0E	01
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234.3500	0C	03	04	02	01	00	0E	01	0C	03	09	00	01	00	0E	01
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234.4125	01	00	05	02	01	00	0E	01	01	00	0A	00	01	00	0E	01
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234.4500	04	00	05	02	01	00	0E	01	04	00	0A	00	01	00	0E	01
234.4625	05	00	05	02	01	00	0E	01	05	00	0A	00	01	00	0E	01
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234.5125	09	00	05	02	01	00	0E	01	09	00	0A	00	01	00	0E	01
234.5250	0A	00	05	02	01	00	0E	01	0A	00	0A	00	01	00	0E	01
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234.6000	00	01	05	02	01	00	0E	01	00	01	0A	00	01	00	0E	01
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234.6875	07	01	05	02	01	00	0E	01	07	01	0A	00	01	00	0E	01
234.7000	08	01	05	02	01	00	0E	01	08	01	0A	00	01	00	0E	01
234.7125	09	01	05	02	01	00	0E	01	09	01	0A	00	01	00	0E	01
234.7250	0A	01	05	02	01	00	0E	01	0A	01	0A	00	01	00	0E	01
234.7375	0B	01	05	02	01	00	0E	01	0B	01	0A	00	01	00	0E	01
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234.7875	0F	01	05	02	01	00	0E	01	0F	01	0A	00	01	00	0E	01
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234.8125	01	02	05	02	01	00	0E	01	01	02	0A	00	01	00	0E	01
234.8250	02	02	05	02	01	00	0E	01	02	02	0A	00	01	00	0E	01
234.8375	03	02	05	02	01	00	0E	01	03	02	0A	00	01	00	0E	01
234.8500	04	02	05	02	01	00	0E	01	04	02	0A	00	01	00	0E	01
234.8625	05	02	05	02	01	00	0E	01	05	02	0A	00	01	00	0E	01
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234.8875	07	02	05	02	01	00	0E	01	07	02	0A	00	01	00	0E	01
234.9000	08	02	05	02	01	00	0E	01	08	02	0A	00	01	00	0E	01
234.9125	09	02	05	02	01	00	0E	01	09	02	0A	00	01	00	0E	01
234.9250	0A	02	05	02	01	00	0E	01	0A	02	0A	00	01	00	0E	01
234.9375	0B	02	05	02	01	00	0E	01	0B	02	0A	00	01	00	0E	01
234.9500	0C	02	05	02	01	00	0E	01	0C	02	0A	00	01	00	0E	01
234.9625	0D	02	05	02	01	00	0E	01	0D	02	0A	00	01	00	0E	01
234.9750	0E	02	05	02	01	00	0E	01	0E	02	0A	00	01	00	0E	01
234.9875	0F	02	05	02	01	00	0E	01	0F	02	0A	00	01	00	0E	01
235.0000	00	03	05	02	01	00	0E	01	00	03	0A	00	01	00	0E	01
235.0125	01	03	05	02	01	00	0E	01	01	03	0A	00	01	00	0E	01
235.0250	02	03	05	02	01	00	0E	01	02	03	0A	00	01	00	0E	01
235.0375	03	03	05	02	01	00	0E	01	03	03	0A	00	01	00	0E	01
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TECHNICAL DRAWINGS



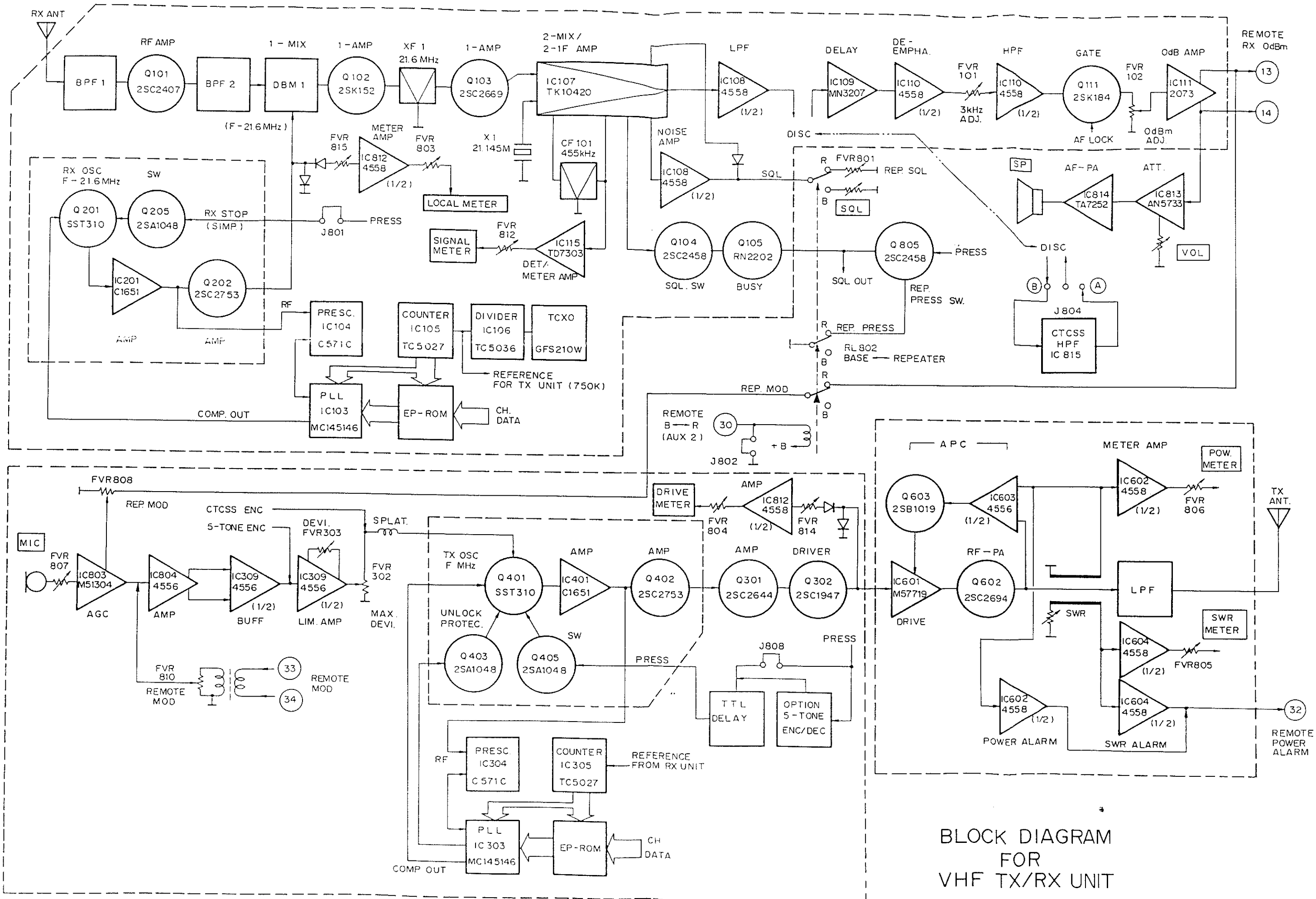
CIRCUIT DIAGRAM  
FOR  
BSR-230 D-SUB/POW. SUP UNIT



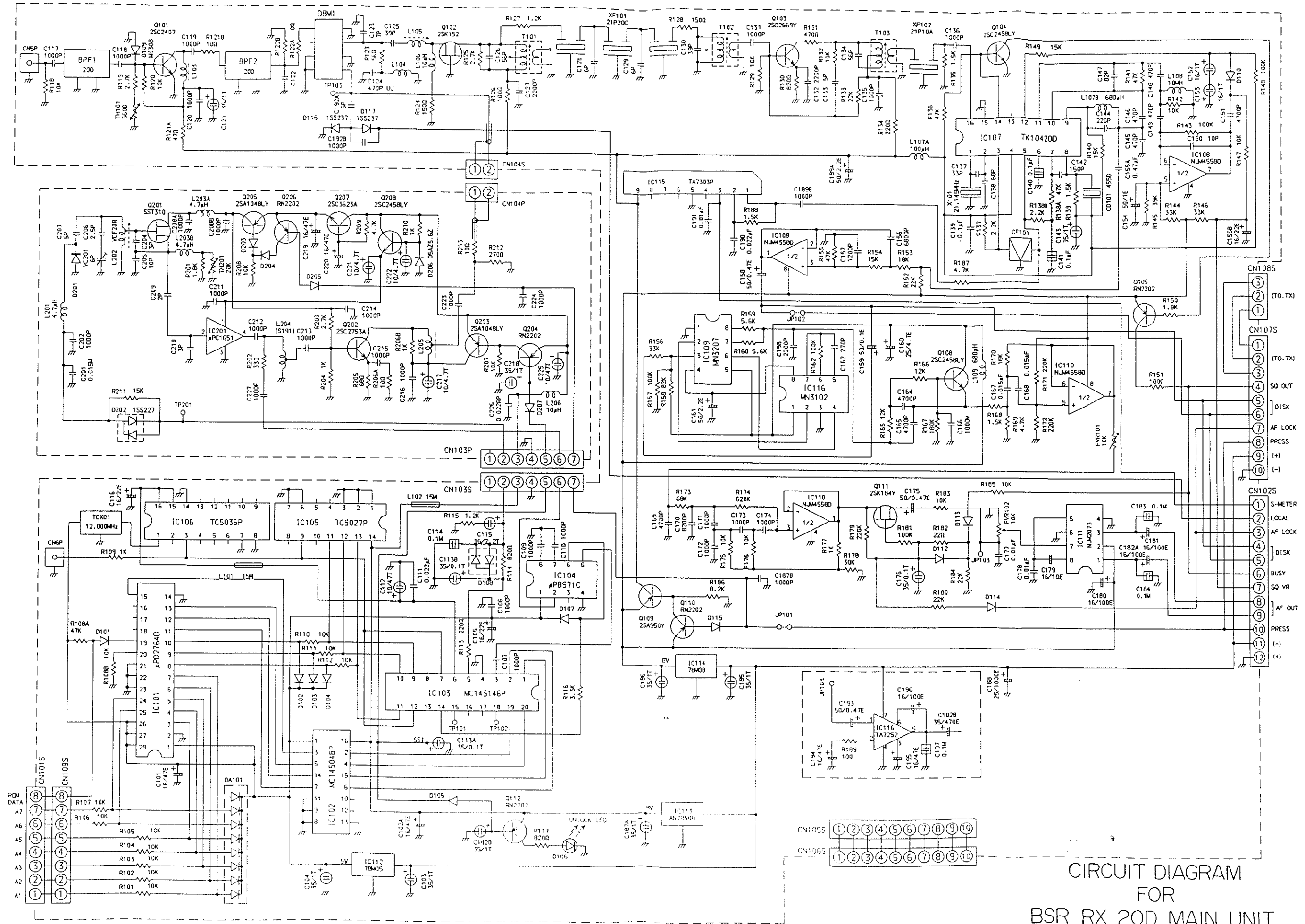


UNIT mm

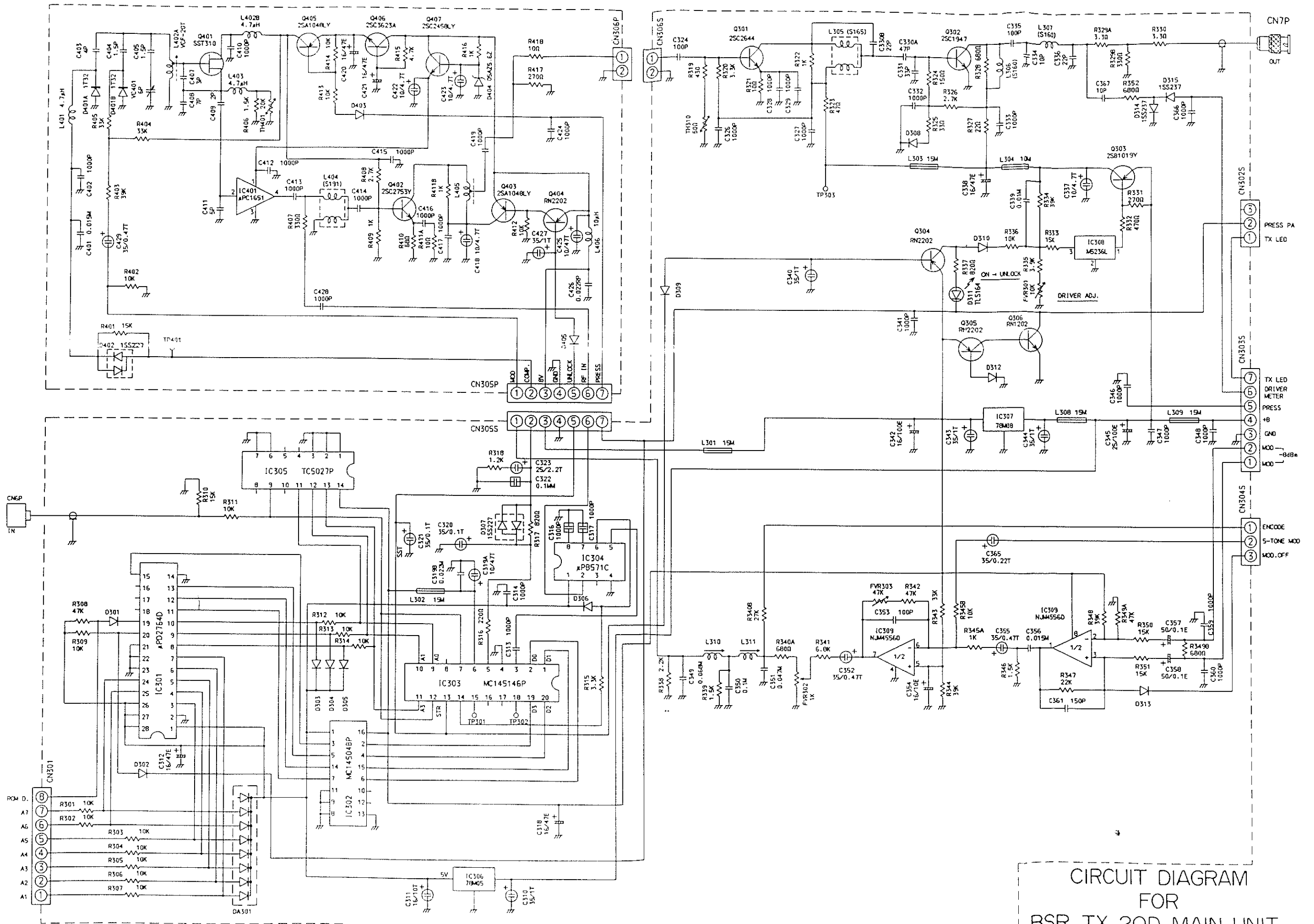
OUTLINE DRAWING  
FOR  
BSR TX/RX UNIT



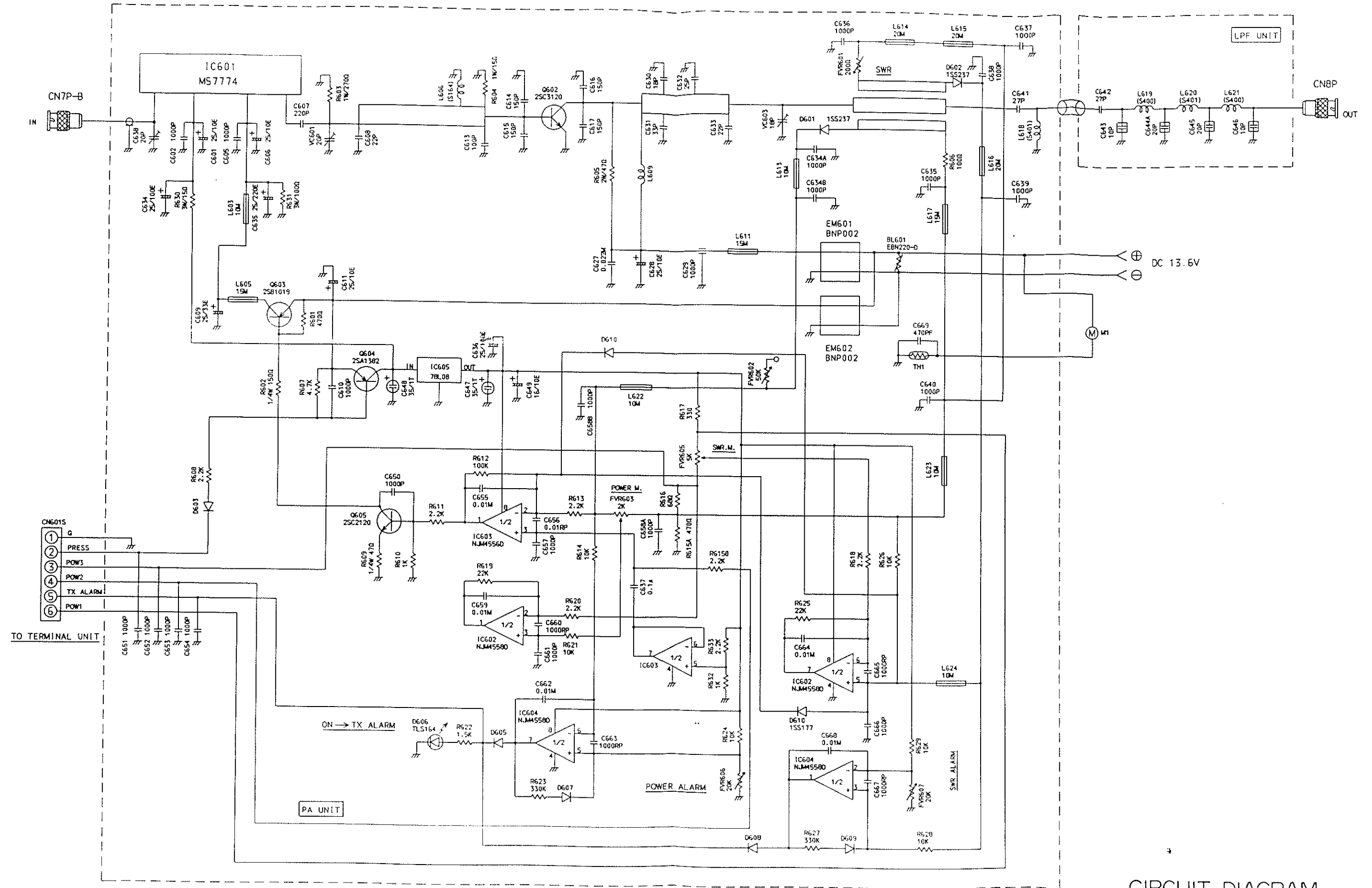
BLOCK DIAGRAM FOR VHF TX/RX UNIT



CIRCUIT DIAGRAM  
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BSR RX 200 MAIN UNIT

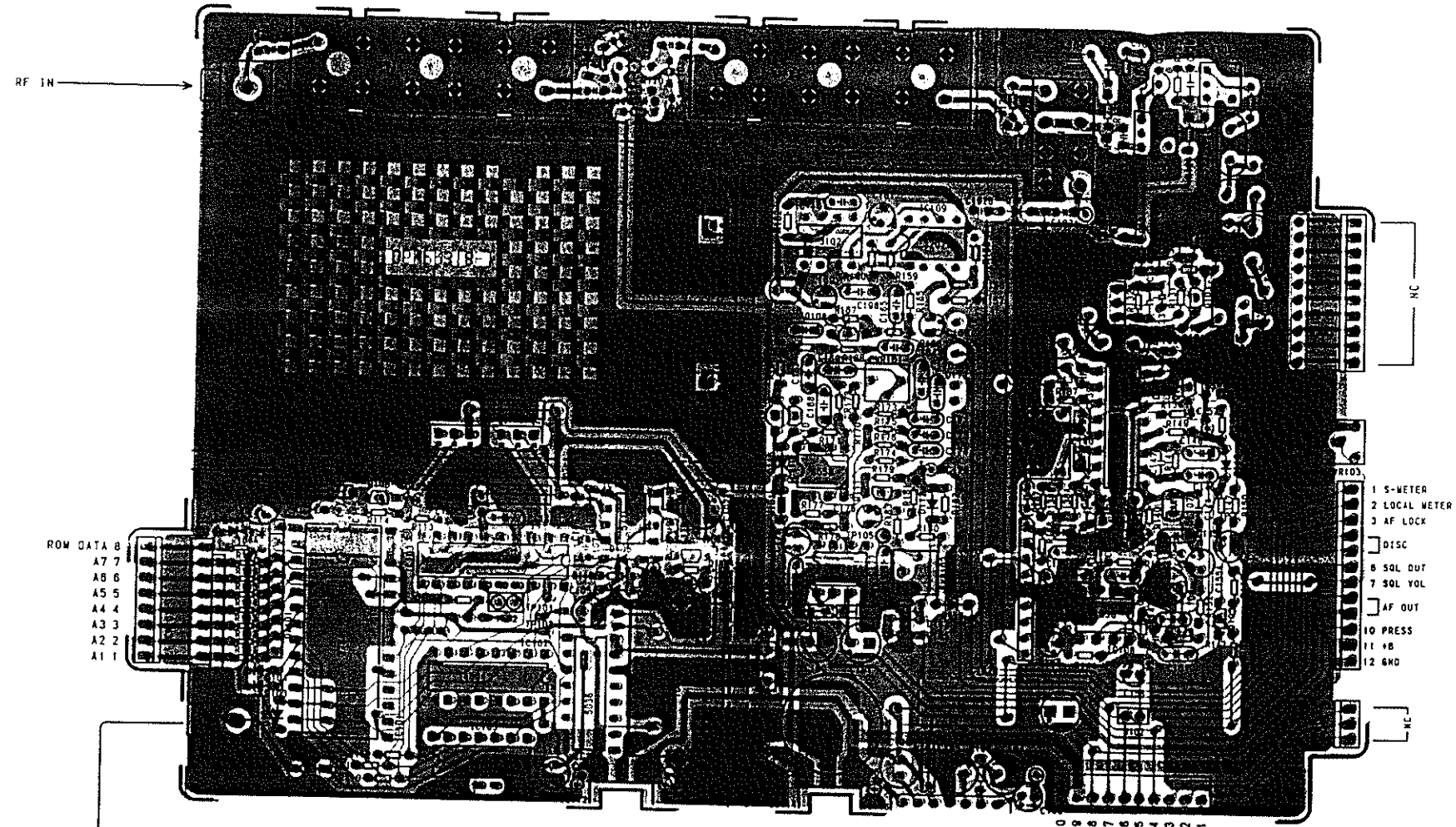


CIRCUIT DIAGRAM  
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 BSR TX 20D MAIN UNIT

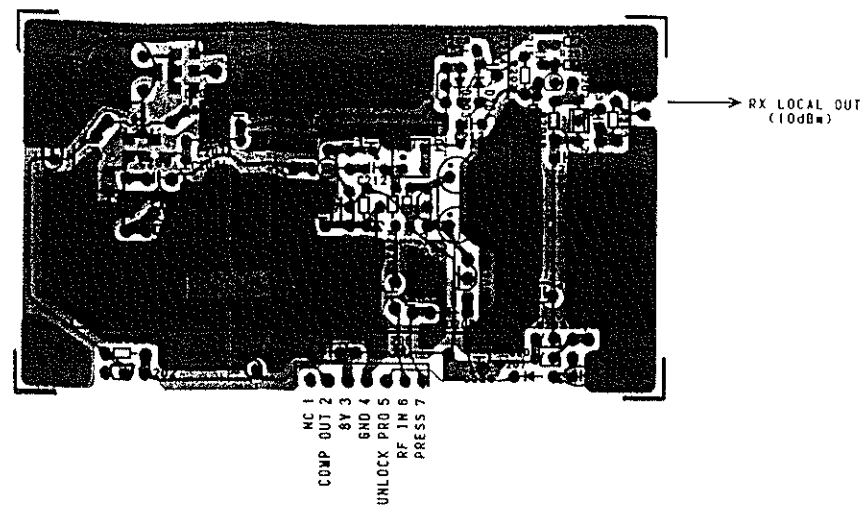


CIRCUIT DIAGRAM  
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BSR 20D PA UNIT

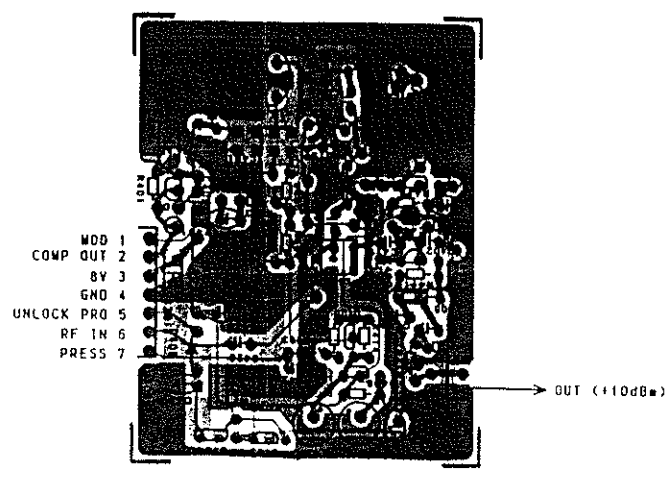
RX MAIN UNIT



RX VCO UNIT

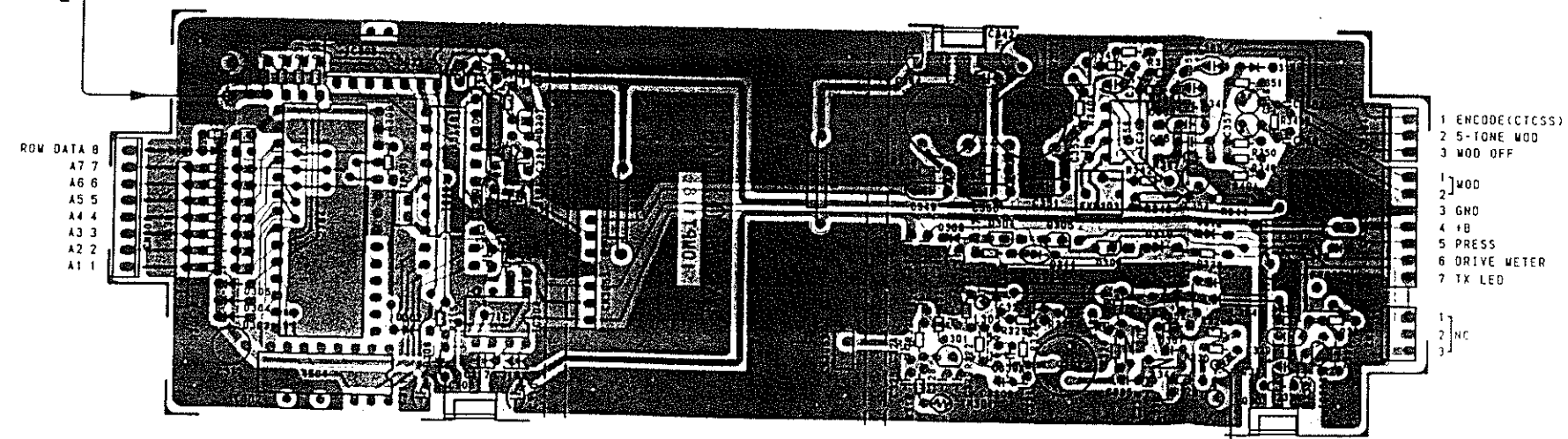


TX VCO UNIT



06MPR318-1  
TOP SIDE PATTERN

TX MAIN UNIT



COMPONENT LAYOUT  
FOR  
BSR VHF TX/RX UNIT







MODEL : BSR-230N

CODE : BSR-230N

UNIT : VHF RX MAIN

NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1		RFC220D-3.33	BPF101-02	2
2	IC	UPC78M05H	IC112	1
3	PP CON	UPZ 270PF	C162	1
4	PP CON	UPZ 470PF	C145-46,48,49	4
5	CAPACITOR TANT	UST104F	C113A	1
6	FET	2SK152	Q102	1
7	7-PIN SOCKET	3024-07CH	CN103S	1
8	10-PIN SOCKET	3024-10CH	CN105S,07S	2
9	IC	AN78N08	IC113	1
10	IC EP ROM	MBM2764	IC101	1
11	IC	MC14504BCP	IC102	1
12	IC	MC145146P2	IC103	1
13	IC	MN3102	IC116	1
14	IC	MN3207	IC109	1
15	IC	NJM2073D	IC111	1
16	IC	NJM4558D	IC108,10	2
17	IC	TA7303P	IC115	1
18	IC	TC5027BP	IC105	1
19	IC	TC5036AP	IC106	1
20	IC	TK10420D	IC107	1
21	IC	UPB571C	IC104	1
22	IC	UPC78M08H	IC114	1
23	TRANSISTOR	RN2202	Q105,10,12	3
24	LED	TLS164	D106	1
25	TRANSISTOR	2SA950-Y	Q109	1
26	TRANSISTOR	2SC2407	Q101	1
27	TRANSISTOR	2SC2458(L)-Y	Q104,08	2
28	TRANSISTOR	2SC2669-Y	Q103	1
29	TRANSISTOR	2SK184Y	Q111	1
30	DIODE	MI308-01	D109	1
31	DIODE ARRAY	NAL 8CS-1	DA101	1
32	DIODE	1SS132	D101-05,07,10, 12-15	11
33	DIODE	1SS227	D108,11	2
34	DIODE	1SS237	D116,17	2
35	DISCRIMINATOR	CDB455C7	CD101	1
36	CERAMIC FILTER	CFG455G	CF101	1
37	TCXO	GFS210W	TCX01	1
38	BALANCED MIXER	M-8	DBM101	1
39	CRYSTAL	21.145MHZ	X101	1
40	CRYSTAL FILTER	21P08C/3	XF101	1

MODEL : BSR-230N		CODE : BSR-230N		UNIT : VHF RX MAIN	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY	
41	CRYSTAL FILTER	21P10A	XF102	1	
42	COIL	#1053	T101,03	2	
43	COIL	#1054	L105	1	
44	COIL	#1058	T102	1	
45	CHOKE BEAD	BC-2	L103	1	
46	COIL	G02 10MH	L108	1	
47	MICRO INDUCTOR	LAL03NA100K	L106	1	
48	MICRO INDUCTOR	LAL03NA101K	L107A	1	
49	COIL	M2-680UH	L107B,09	2	
50	COIL LEAD CHOK	15M(LN0009)	L101-102	2	
51	COIL	4A-S235	L104	1	
52	CAPACITOR CERA	DD104B102K50	C106-07,117-20,31, 36,92B	9	
53	CAPACITOR CERA	DD104CH050C50	C192A	1	
54	CAPACITOR CERA	DD104CH070D50	C123	1	
55	CAPACITOR CERA	DD104CH100D50	C150,28-29 (NARROW)	3	
56	CAPACITOR CERA	DD104RH050C50	C133	1	
57	CAPACITOR CERA	DD105CH330J50	C137	1	
58	CAPACITOR CERA	DD105RH390J50	C125,30	2	
59	CAPACITOR CERA	DD106B222K50	C127,32,35	3	
60	CAPACITOR CERA	DD106RH560J50	C126,34	2	
61	CAPACITOR CERA	DD107CH680J50	C138	1	
62	CAPACITOR CERA	DD107CH820J50	C147	1	
63	CAPACITOR CERA	DD107SL221J50	C144	1	
64	CAPACITOR CERA	DD109CH151J50	C142	1	
65	CAPACITOR CERA	DD112UJ471J50	C124	1	
66	CAPACITOR TANT	ECSF 1AE 476	C112	1	
67	CAPACITOR TANT	ECSF 1CE 225	C161	1	
68	CAPACITOR TANT	ECSF 1EE 225	C115	1	
69	CAPACITOR TANT	ECSF 1VE 104	C113B,76	2	
70	CAPACITOR TANT	ECSF 1VE 105	C102B,03-04,21,43, 85,86,87A,52,53	10	
71	CAPACITOR ELEC	KMA16VB-100	C180-81,82A	3	
72	CAPACITOR ELEC	KMA16VB-22	C105,16,55B	3	
73	CAPACITOR ELEC	KMA16VB-47	C101,2A	2	
74	CAPACITOR ELEC	KMA25VB-4R7	C160	1	
75	CAPACITOR ELEC	KMA50VB-R1	C159	1	
76	CAPACITOR ELEC	KMA50VB-R47	C158,75	2	
77	CAPACITOR ELEC	KMA50VB-1	C154	1	
78	CAPACITOR ELEC	KMA50VB-2R2	C189A	1	
79	CAPACITOR ELEC	KRG25VB-1000	C188	1	
80	CAPACITOR ELEC	SME16VB-10BP	C179	1	

MODEL : BSR-230N		CODE : BSR-230N		UNIT : VHF RX MAIN	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY	
81	CAPACITOR ELEC	SME50VB-R47BP	C155A	1	
82	CAPACITOR MYLA	AMZ50V102K	C166,71-74,87B,89B	7	
83	CAPACITOR MYLA	AMZ50V103K	C177-78,91	3	
84	CAPACITOR MYLA	AMZ50V122K	C157	1	
85	CAPACITOR MYLA	AMZ50V153K	C167-68	2	
86	CAPACITOR MYLA	AMZ50V223K	C111,90	2	
87	CAPACITOR MYLA	AMZ50V472K	C151,64-65,69	4	
88	CAPACITOR MYLA	AMZ50V682K	C156	1	
89	CAPACITOR MYLA	AMZ50V822K	C170	1	
90	CAPACITOR MONO	B32529-0104-J	C114,83-84	3	
91	CAPACITOR MONO	RPE131R102K50	C109-10	2	
92	CAPACITOR MONO	RPE131R104K50	C139-41	3	
93	RESISTOR CARBO	RD16B 1.2K	R115,27	2	
94	RESISTOR CARBO	RD16B 1.5K	R135,88	2	
95	RESISTOR CARBO	RD16B 1.8K	R150	1	
96	RESISTOR CARBO	RD16B 1K	R109,77	2	
97	RESISTOR CARBO	RD16B 10	R212B (ON THE OTHER SIDE)	1	
98	RESISTOR CARBO	RD16B 10K	R101,R102,R103, R104,R105,R106, R107,R108B,R110,R111, R112,R118,R129,R132, R142,R147,R175,R176,R183, R185	23	
99	RESISTOR CARBO	RD16B 100	R126,51	2	
100	RESISTOR CARBO	RD16B 100K	R143,48,81	3	
101	RESISTOR CARBO	RD16B 12K	R165-66	2	
102	RESISTOR CARBO	RD16B 15K	R120,R140,R149,R154	4	
103	RESISTOR CARBO	RD16B 150	R124,28	2	
104	RESISTOR CARBO	RD16B 18K	R153,70	2	
105	RESISTOR CARBO	RD16B 180K	R167	1	
106	RESISTOR CARBO	RD16B 2.2K	R137,38B	2	
107	RESISTOR CARBO	RD16B 2.4K	R139 (NARROW)	1	
108	RESISTOR CARBO	RD16B 2.7K	R119,25	2	
109	RESISTOR CARBO	RD16B 22	R182	1	
110	RESISTOR CARBO	RD16B 22K	R133,52,80,84	4	
111	RESISTOR CARBO	RD16B 220	R113,34	2	
112	RESISTOR CARBO	RD16B 220K	R171-72,79	3	
113	RESISTOR CARBO	RD16B 3.3K	R116	1	
114	RESISTOR CARBO	RD16B 30K	R178	1	
115	RESISTOR CARBO	RD16B 33K	R144,R146,R156	3	

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF RX MAIN	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
116	RESISTOR CARBO	RD16B 39K	R145	1
117	RESISTOR CARBO	RD16B 4.7K	R187	1
118	RESISTOR CARBO	RD16B 47	R121A	1
119	RESISTOR CORBO	RD16B 47K	R108A,R136,R138A, R141,R155	5
120	RESISTOR CARBO	RD16B 470	R131	1
121	RESISTOR CARBO	RD16B 5.6K	R159,R160	2
122	RESISTOR CARBO	RD16B 56	R123	1
123	RESISTOR CARBO	RD16B 620K	R174	1
124	RESISTOR CARBO	RD16B 68K	R173	1
125	RESISTOR CARBO	RD16B 8.2K	R186	1
126	RESISTOR CARBO	RD16B 82K	R158	1
127	RESISTOR CARBO	RD16B 820	R114,17,30	3
128	RESISTOR CARBO	RD16S 0	JP101,R122A	3
129	RESISTOR SEMI	GF06P 10K	FVR101-02	2
130	THERMISTER	360D-5	TH101	1
131	CONNECTOR	AXS202811		1
132	CONNECTOR	DSP01-002-430G	JP102S	1
133	CONNECTOR	DSP02-002-431G	JP102	1
134	WIRE SHIELD	EMR-15-MST		
135	TEST POINT	LC-2-S(ORN)	TP103	1
136	CONNECTOR COAX	SM551	CN5S,6S	2
137	COAXIAL CABLE	06-0.8D		1
138	CONNECTOR	3022-02A	TP101	1
139		3024-02CH	CN104S	1
140	CONNECTOR	5124-08BHPB	CN101S	1
141	CONNECTOR	5124-10BHPB	CN106S	1
142	CONNECTOR	5124-12BHPB	CN102S	1
143	P.C.B.	06MPR318		1
144	LABEL RX UNIT	4A10-1295		1
145	SHASSIS RX UNI	2A10-0105		1
146	COVER RX UNIT	3A10-0320		1
147	SCREW BIND	BD-2.6X5		12
148	NUT	NT-2.6PAI		2
149	SCREW OVAL	OV-2.6X8		12
150	WASHER SPRING	SW-2.6PAI		2

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF TX MAIN	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1	UPC78M05H	IC	IC306	1
2	UST104F	CAPACITOR TANT	C321	1
3	3024-07CH	7-PIN SOCKET	CN305S	1
4	MBM2764	IC EP ROM	IC301	1
5	MC14504BCP	IC	IC302	1
6	MC145146P2	IC	IC303	1
7	M5237L	IC	IC308	1
8	NJM4556D	IC	IC309	1
9	TC5027BP	IC	IC305	1
10	UPB571C	IC	IC304	1
11	UPC78M08H	IC	IC307	1
12	RN1202	TRANSISTOR	Q306	1
13	RN2202	TRANSISTOR	Q304-05	2
14	TLS164	LED	D311	1
15	2SB1019-Y	TRANSISTOR	Q303	1
16	2SC1947-01	TRANSISTOR	Q302	1
17	2SC2644-Y	TRANSISTOR	Q301	1
18	NAL 8CS-1	DIODE ARRAY	DA301	1
19	1SS132	DIODE	D301-06,08-10, 12-13	11
20	1SS227	DIODE	D307	1
21	1SS237	DIODE	D314-15	2
22	10M(LN0018)	COIL LEAD CHOK	L304	1
23	12VXA 68MH	COIL VALIABLE	L310-11	2
24	15M(LN0009)	COIL LEAD CHOK	L301-03,08-09	5
25	4A-S160	COIL	L306-07	2
26	4A-S165	COIL	L305	1
27	DD104B101K50	CAPACITOR CERA	C324,35,53	3
28	DD104B102K50	CAPACITOR CERA	C313-14,26-29,22, 33	15
29	DD104CH100D50	CAPACITOR CERA	C334,67	2
30	DD104SL220J50	CAPACITOR CERA	C336,30B	2
31	DD104SL330J50	CAPACITOR CERA	C331	1
32	DD104SL470J50	CAPACITOR CERA	C330A	1
33	DD106SL151J50	CAPACITOR CERA	C361	1
34	ECSF 1AE 475	CAPACITOR TANT	C337	1
35	ECSF 1AE 476	CAPACITOR TANT	C319A	1
36	ECSF ICE 106	CAPACITOR TANT	C311	1
37	ECSF 1EE 225	CAPACITOR TANT	C323	1
38	ECSF 1VE 104	CAPACITOR TANT	C320	1
39	ECSF 1VE 105	CAPACITOR TANT	C310,40,43-44	4
40	ECSF 1VE 224	CAPACITOR TANT	C365	1

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF TX MAIN	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
41	ECSF 1VE 474	CAPACITOR TANT	C352,55	2
42	KMA16VB-10	CAPACITOR ELEC	C354	1
43	KMA16VB-100	CAPACITOR ELEC	C342	1
44	KMA16VB-47	CAPACITOR ELEC	C312,18,38	3
45	KMA50VB-R1	CAPACITOR ELEC	C357-58	2
46	KME25VB-100	CAPACITOR ELEC	C345	1
47	AMZ50V103K	CAPACITOR MYLA	C339	1
48	AMZ50V104K	CAPACITOR MYLA	C350	1
49	AMZ50V153K	CAPACITOR MYLA	C356	1
50	AMZ50V223K	CAPACITOR MYLA	C319B	1
51	AMZ50V473K	CAPACITOR MYLA	C351	1
52	AMZ50V683K	CAPACITOR MYLA	C349	1
53	B32529-0104-J	CAPACITOR MONO	C322	1
54	RPE131R102K50	CAPACITOR MONO	C316-17	2
55	RD16B 1.2K	RESISTOR CARBON	R318	1
56	RD16B 1.5K	RESISTOR CARBON	R339,46	2
57	RD16B 1K	RESISTOR CARBON	R322,45A	2
58	RD16B 10	RESISTOR CARBON	R321	1
59	RD16B 10K	RESISTOR CARBON	R301-07,09,11, 12-14,36,45B	14
60	RD16B 15K	RESISTOR CARBON	R310,33,50-51	4
61	RD16B 150	RESISTOR CARBON	R324	1
62	RD16B 2.2K	RESISTOR CARBON	R338	1
63	RD16B 2.7K	RESISTOR CARBON	R326	1
64	RD16B 22	RESISTOR CARBON	R327	1
65	RD16B 22K	RESISTOR CARBON	R347	1
66	RD16B 220	RESISTOR CARBON	R316	1
67	RD16B 27K	RESISTOR CARBON	R340B	1
68	RD16B 270	RESISTOR CARBON	R331	1
69	RD16B 3.3	RESISTOR CARBON	R329A,30	2
70	RD16B 3.3K	RESISTOR CARBON	R315,20	2
71	RD16B 3.9K	RESISTOR CARBON	R335	1
72	RD16B 33	RESISTOR CARBON	R325	1
73	RD16B 39K	RESISTOR CARBON	R334,48	2
74	RD16B 390	RESISTOR CARBON	R329B	1
75	RD16B430	RESISTOR CARBON	R319	1
76	RD16B 47	RESISTOR CARBON	R323	1
77	RD16B 47K	RESISTOR CARBON	R308,42,49A	3
78	RD16B 470	RESISTOR CARBON	R332	1
79	RD16B 6.8K	RESISTOR CARBON	R341	1
80	RD16B 680K	RESISTOR CARBON	R328,40A,49B,52	4

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF TX MAIN	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
81	RD16B 820	RESISTOR CARBON	R317,37	2
82	GP06P 1K	RESISTOR SEMI	FVR302	1
83	GP06P 10K	RESISTOR SEMI	FVR301	1
84	GF06P 50K	RESISTOR SEMI	FVR303	1
85	RN14S 33K	RESISTOR METAL	R343	1
86	RN14S 39K	RESISTOR METAL	R344	1
87	50D-5	THERMISTER	TH301	1
88	AXS202811	CONNECTOR		1
89	EMR-15-MST	WIRE SHILED		
90	LC-2-S (ORN)	TEST POIN		1
91	106-TCH-1.5D	WIRE COAXIAL	CN6P	1
92	3022-02A	CONNECTOR	TP301-02	1
93	3024-02CH	CONNECTOR	CN306S	1
94	4A-S383	WIRE COAXIAL	CN7P	1
95	5124-03BHPB	CONNECTOR	CN304S	1
96	5124-07BHPB	CONNECTOR	CN303S	1
97	5124-08BHPB	CONNECTOR	CN301S	1
98	10MPT118	P.C.B.		1
99	4A10-1296	LABEL TX UNIT		1
100	2A10-0104	CHASSIS TX UNIT		1
101	3A10-0321	COVER TX UNIT		1
102	BD-2.6 X 5	SCREW BIND		8
103	NT-2.6PAI	NUT		3
104	OV-2.6 X 10	SCREW OVAL		1
105	OV-2.6 X 8	SCREW OVAL		10
106	SW-2.6PAI	WASHER SPRING		3

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF RX VCO	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1	IC	UPC1651G	IC201	1
2	TRANSISTOR	RN2202	Q204,06	2
3	TRANSISTOR	SST310	Q201	1
4	TRANSISTOR	2SA1048 (L) -Y	Q203,05	2
5	TRANSISTOR	2SC2458 (L) -Y	Q208	1
6	TRANSISTOR	2SC2753-Y	Q202	1
7	TRANSISTOR	2SC3623A	Q207	1
8	DIODE ZENER	MTZ5.6B	D206	1
9	DIODE	1SS132	D203-05,07	4
10	DIODE	1SS227	D202	1
11	DIODE VARICAP	1T32	D201	1
12	MICRO INDUCTOR	LAL03NA4R7K	L201,03A/B	3
13	MICRO INDUCTOR	LAL04NA100K	L206	1
14	COIL	4A-S191	L204	1
15	COIL	4A-S192	L205	1
16	COIL	4A-S392	L202	1
17	CAPACITOR CERA	DD104B102K50	C202,8A/B,11-16 23,24,27	12
18	CAPACITOR CERA	DD104RH050C50	C210	1
19	CAPACITOR CERA	DD104RK020C50	C209	1
20	CHIP CAPACITOR	GRM40RH050C50PT	C207	1
21	CHIP CAPACITOR	GRM40RH100D50PT	C205	1
22	CHIP CAPACITOR	GRM40RH2R5C50PT	C206	1
23	CHIP CAPACITOR	GRM40RJ030C50PT	C204	1
24	CAPACITOR TANT	ECSF 1AE 475	C217,21,22	3
25	CAPACITOR TANT	ECSF 1AE 476	C225	1
26	CAPACITOR TANT	ECSF 1VE 105	C218	1
27	CAPACITOR ELEC	KMA16VB-47	C219-20	2
28	CAPACITOR MYLA	AMZ50V153K	C201	1
29	CAPACITOR TRIM	CV05A0601	VC201	1
30	CAPACITOR MONO	RPE131R223K50	C226	1
31	RESISTOR CARBO	RD16B 1.8K	R201	1
32	RESISTOR CARBO	RD16B 1K	R204,06B,10	3
33	RESISTOR CARBO	RD16B 10	R206A,13	2
34	RESISTOR CARBO	RD16B 10K	R207-08	2
35	RESISTOR CARBO	RD16B 15K	R211	1
36	RESISTOR CARBO	RD16B 2.7K	R203	1
37	RESISTOR CARBO	RD16B 270	R212	1
38	RESISTOR CARBO	RD16B 330	R202	1
39	RESISTOR CARBO	RD16B 4.7K	*R209	1
40	RESISTOR CARBO	RD16B 68	R205	1



MODEL : BSR-230N

CODE : BSR-230N

UNIT : VHF RX VCO

NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
41	THERMISTER	TD5-320DH	TH201	1
42	TEST POINT	LC-2-S (BRN)	TP201	1
43	CONNECTOR	SB-02P-HVQ-B	CN104P	1
44	CONNECTOR	SB-07P-HVQ-B	CN103P	1
45	P.C.B.	06VCVR318		1
46	MAT	4A10-1041		1
47	MAT	4A10-1273		1
48	VCO FRAME	4A10-1038		1
49	VCO COVER	4A10-1039		1
50	STUD-110	4A10-1267		4
51	SCREW SEMS	SE-2.6X5		1

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF TX VCO	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1	UPC1651G	IC	IC401	1
2	RN2202	TRANSISTOR	Q404	1
3	SST310	TRANSISTOR	Q401	1
4	2SA1048(L)-Y	TRANSISTOR	Q403,05	2
5	2SC2458(L)-Y	TRANSISTOR	Q407	1
6	2SC2753-Y	TRANSISTOR	Q402	1
7	2SC3623A	TRANSISTOR	Q406	1
8	MTZJ5.6B	DIODE ZENER	D404	1
9	1SS132	DIODE	D403,05	2
10	1SS227	DIODE	D402	1
11	1T32	DIODE VARICAP	D401A/B	2
12	LAL03NA4R7K	MICRO INDUCTOR	L401,02B,03	3
13	LAL04NA100K	MICRO INDUCTOR	L406	1
14	4A-S191	COIL	L404	1
15	4A-S192	COIL	L405	1
16	4A-S393	COIL	L402A	1
17	DD104B102K50	CAPACITOR SERA	C402,10,12-17, 19,24,28	11
18	DD104RH050C50	CAPACITOR CERA	C411	1
19	DD104RK020C50	CAPACITOR CERA	C409	1
20	GRM40RH040C50PT	CHIP CAPACITOR	C403	1
21	GMR40RH070D50PT	CHIP CAPACITOR	C408	1
22	GMR40RH1R5C50PT	CHIP CAPACITOR	C404-05	2
23	GRM40RJ030C50PT	CHIP CAPACITOR	C407	1
24	ECSF 1AE 475	CAPACITOR TANT	C418,22-23	3
25	ECSF 1AE 476	CAPACITOR TANT	C425	1
26	ECSF 1VE 105	CAPACITOR TANT	C427	1
27	ECSF 1VE 474	CAPACITOR TANT	C429	1
28	KMA16VB-47	CAPACITOR ELEC	C420-21	2
29	AMZ50V153K	CAPACITOR MYLA	C401	1
30	CV05A0601	CAPACITOR TRIM	VC401	1
31	RPE131R223K50	CAPACITOR MONO	C426	1
32	RD16B 1.5K	RESISTOR CARBON	R406	1
33	RD16B 1K	RESISTOR CARBON	R409,11B,16	3
34	RD16B 10	RESISTOR CARBON	R411A,18	2
35	RD16B 10K	RESISTOR CARBON	R402,12-14	4
36	RD16B 15K	RESISTOR CARBON	R401	1
37	RD16B 2.7K	RESISTOR CARBON	R408	1
38	RD16B 270	RESISTOR CARBON	R417	1
39	RD16B 33K	RESISTOR CARBON	R404-05	2
40	RD16B 330	RESISTOR CARBON	R407	1

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF TX VCO	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
41	RD16B 39K	RESISTOR CARBON	R403	1
42	RD16B 4.7K	RESISTOR CARBON	R415	1
43	RD16B 68	RESISTOR CARBON	R410	1
44	TD5-320DH	THERMISTER	TH401	1
45	LC-2-S(BRN)	TEST POINT	TP401	1
46	SB-02P-HVQ-B	CONNECTOR	CN306P	1
47	SB-07P-HVQ-B	CONNECTOR	CN305P	1
48	06CVT318	P.C.B.		1
49	4A10-1274	MAT		1
50	4A10-1267	SUTD-110		4

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF PA	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1	BARISTER	EBN220-D	BL601	1
2	IC	NJM78L08A	IC605	1
3	RESISTOR METAL	RSMF1B 15	R604	1
4	RESISTOR METAL	RSMF2B 47		1
5	RESISTOR METAL	RSMF3B 15	L601	1
6	BATT CONNECTER	R01-2111	CN604P	1
7	CAPACITOR TRIM	TC-8 22P	VC601,C669	2
8		TC809-2/18PF	VC603	1
9	CAPACITOR THRO	1HB340YE102PDA05	C629	1
10	TRANSISTOR	2SC2694-01	Q602	1
11	POWER MODULE	M57774	IC601	1
12	IC	NJM4556D	IC603	1
13	IC	NJM4558D	IC602,04	2
14	LED	TLS164	D606	1
15	TRANSISTOR	2SA1382 (C)	Q604	1
16	TRANSISTOR	2SB1019-Y	Q603	1
17	TRANSISTOR	2SC2120-Y	Q605	1
18	TRANSISTOR	2SC3419-Y	Q1	1
19	DIODE	DS135D	D604	1
20	DIODE	DS135D	D2	1
21	DIODE	1SS132	D603,05,07-09	5
22	DIODE	1SS237	D601-02	2
23	DIODE	20DL2C41	D1	1
24	DIODE ELIMINAT	BNP002-02	EM601-02	2
25	RELAY	CX-530D	CN9S	
26	FERRITE CORE	OP4-10-2H		4
27	COIL LEAD CHOK	10M(LN0018)	L601,03,13,22-24	5
28	COIL LEAD CHOK	15M(LN0009)	L605,11,17	3
29	COIL LEAD CHOK	20M(LN0010)	L614-16	3
30	COIL	4A-S163	L609	1
31	COIL	4A-S364	L606 (CORE)	1
32	COIL	4A-S400	L619,21	2
33	COIL	4A-S401	L618,20	2
34	CAPACITOR CERA	DD104B102K50	C1-C38	38
35	CAPACITOR CERA	DD104B102K50	C602,5,10,34A/B, 35,36-40,50-54,57, 58A/B,61,66	22
36	CAPACITOR TANT	ECSF 1VE 105	C647,48	2
37	CAPACITOR ELEC	KMA16VB-10	C649	1
38	CAPACITOR ELEC	KMA25VB-10	C601,06,11,28	4
39	CAPACITOR ELEC	KMA25VB-33	C609	1
40	CAPACITOR MYLA	AMZ50V103K	C655,59,62,64,68	5

MODEL : BSR-230N                      CODE : BSR-230N                      UNIT : VHF PA

NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
41	CAPACITOR MYLA	AMZ50V223K	C627	1
42	CAPACITOR MICA	RM21P2H100J	C643,46	2
43	CAPACITOR MICA	RM21P2H200J	C644A,45	2
44	CAPACITOR MONO	RPE131R102K50	C660,63,65,67	4
45	CAPACITOR MONO	RPE131R103K50	C656	1
46	CHIP CAPACITOR	UC232H0220J	C608	1
47	CHIP CAPACITOR	UC232H0250J	C632	1
48	CHIP CAPACITOR	UC232H0270J	C641-42	2
49	CHIP CAPACITOR	UC232H0430J	C630	1
50	CHIP CAPACITOR	UC342H1000J	C613	1
51	CHIP CAPACITOR	UC342H1500J	C614,15,16,17	4
52	CHIP CAPACITOR	UC342H4700J	C607	1
53	RESISTOR CARBO	RD14B 150	R602	1
54	RESISTOR CARBO	RD14B 47	R609	1
55	RESISTOR CARBO	RD16B 1.5K	R622	1
56	RESISTOR CARBO	RD16B 1K	R610	1
57	RESISTOR CARBO	RD16B 10K	R614,21,24,26, 28-29	6
58	RESISTOR CARBO	RD16B 10K	R1	1
59	RESISTOR CARBO	RD16B 100	R606	1
60	RESISTOR CARBO	RD16B 100K	R612	1
61	RESISTOR CARBO	RD16B 2.2K	R611,13,15B,18 20,08	6
62	RESISTOR CARBO	RD16B 22K	R619,25	2
63	RESISTOR CARBO	RD16B 330	R617	1
64	RESISTOR CARBO	RD16B 330K	R623,27	2
65	RESISTOR CARBO	RD16B 4.7K	R607	2
66	RESISTOR CARBO	RD16B 470	R601,15A	2
67	RESISTOR CARBO	RD16B 68	R616	1
68	RESISTOR CARBO	RD16S 0	J601	1
69	RESISTOR METAL	RSMF1B 270	R603	1
70	RESISTOR METAL	SPR2 2W 47	R605	1
71	CONNECTOR BNC	BNC-108/1	CN7P/8P,TX	3
72	CONNECTOR	DSP01-002-430G	J1SP	1
73	CONNECTOR	DSP02-002-431G	J1P	1
74	FUSE HOLDER	F-40C	F1(NOKIA)	1
75	FUSE	FGBO125V 20A	(NOKIA)	1
76	FAN	PUDC1224		1
77	THERMOSTAT	US602MYTDL 40°C	K TYPE	1
78	9PIN-DSUB	XM2F-0910	CN603S	1
79	37PIN-DSUB	XM2F-3710	CN602S	1
80	9PIN COVER	XM2T-0901		1

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF PA	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
81	37PIN COVER	XM2T-3701		1
82	STUD	XM2Z-0023		4
83	CORD	0.2-40M/M RED		1
84	WIRE COAXIAL	4A-S266	CN5/10	1
85	CONNECTOR ASSY	4A-S269	CN16S *	
86	CONNECTOR ASSY	4A-S270	CN6S	1
87	CONNECTOR ASSY	4A-S272	CN607S	1
88	CONNECTOR ASSY	4A-S273	CN605S	1
89	CONNECTOR ASSY	4A-S274	CN1S	1
90	CONNECTOR ASSY	4A-S275	CN2S	1
91	CONNECTOR ASSY	4A-S276	CN3S	1
92	CONNECTOR ASSY	4A-S277	CN4S	1
93	CONNECTOR	8263-0212-000	CN16P	1
94	CONNECTOR	HSJ0780-01-010	CN606S	1
95	P.C.B.	10DSA117		1
96	P.C.B.	10LPF116		1
97	P.C.B.	10PAV218		1
98	P.C.B.	10PS218		1
99	RADIATION SHEET	3A10-0428		1
100	PA RADIATOR-11	1A10-0091	NOKIA(051 LOT-)	1
101	PA RADIATION PLATE-110	3A10-0427		1
102	STUD-110	4A10-1250		11
103	COVER PA UNIT-	4A10-1251		1
104	PLEAT-110	4A10-1256		1
105	SHORT A-110	4A10-1327		1
106	SHORT B-110	4A10-1328		1
107	BNC COVER-110	4A10-1334		1
108	COVER N-110	4A10-1576		1
109	PLATE TO INSTALL BNC	4A10-1655	200 CORE PA	2
110	FANSILD	4A10-2283		1
111	SPRING	97-221-01		
112	SPRING	97-525-01		
113	SCREW BIND	BD-2.6X5		4
114	SCREW BIND	BDB-2.6X5		2
115	SCREW BIND	BDB-3X12		2
116	SCREW FLAT	FL-2.6X10		2
117	SCREW FLAT	FL-2.6X8		2
118	WASHER FLAT	FW-2.6PAI		2
119	WASHER FLAT	FW-3PAI		2
120	NUT	NT-2.6PAI		2

MODEL : BSR-230N		CODE : BSR-230N	UNIT : VHF PA	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
121	NUT	NT-2PAI		2
122	NUT	NT-3PAI		4
123	NUT	NT-3PAI		4
124	SCREW OVAL	OV-2.6X5		11
125	SCREW OVAL	OV-3X8		3
126	SCREW PAN	PN-3X35		4
127	SCREW SEMS	SE-2.6X10		1
128	SCREW SEMS	SE-2.6X5		3
129	SCREW SEMS	SE-2.6X6		4
130	SCREW SEMS	SE-3X6		1
131	SCREW SEMS	SE-3X8		2
132	EARTH RUG	SPI-2.6PAI		2
133	WASHER SPRING	SW-2.6PAI		2
134	WASHER SPRING	SW-3PAI		6
135	SPADE RUG	2.6PAI		2
136	WASHER FIBER	4A10-1060		1

MODEL : BSR-230N

CODE : BSR-230N

UNIT : TERMINAL

NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1	NJM555D	IC	IC811	1
2	UPD7805H	IC	IC802	1
3	UPC7808H	IC	IC801	1
4	AN5733	IC	IC813	1
5	MC14002BCP	IC	IC808	1
6	MC14013BCP	IC	IC809	1
7	MC14049UBCP	IC	IC810	1
8	MC14585BCP	IC	IC807	1
9	M51304L	IC	IC803	1
10	NJM4556D	IC	IC804	1
11	NJM4558D	IC	IC812,15	2
12	TA7252AP	IC	IC814	1
13	TC5027BP	IC	IC806	1
14	TC5043P	IC	IC805	1
15	RN2202	TRANSISTOR	Q802-04,06	4
16	2SC2458(L)-Y	TRANSISTOR	Q801,05	2
17	2SC3623A	TRANSISTOR	Q807	1
18	DS135D	DIODE	D801,04	2
19	NAL 8SC-1	DIODE ARRAY	DA801	1
20	1SS132	DIODE	D802-03,05-16 18,20	17
21	1SS237	DIODE	D821-22, 23A/B 24-26	7
22	MR301-12S	RELAY	RL801	1
23	BT-600	TRANSFORMER	MT801	1
24	CH-105	COIL CHOKE	CH801	1
25	DD104B102K50	CAPACITOR CERA	C807	1
26	ECSF 1AE 475	CAPACITOR TANT	C810,17A/B,21	4
27	ECSF 1CE 106	CAPACITOR TANT	C823,12	2
28	ECSF 1VE 104	CAPACITOR TANT	C819-20, 46A/B-7	5
29	ECSF 1VE 105	CAPACITOR TANT	C804,06	2
30	ECSF 1VE 224	CAPACITOR TANT	C848	1
31	ECSF 1VE 474	CAPACITOR TANT	C809,11,13-16,49	7
32	KMA16VB-100	CAPACITOR ELEC	C803,05,36	3
33	KMA16VB-47	CAPACITOR ELEC	C830,34-35	3
34	KMA25VB-4R7	CAPACITOR ELEC	C808,29	2
35	KMA50VB-R1	CAPACITOR ELEC	C831	1
36	KMA50VB-1	CAPACITOR ELEC	C826	1
37	SME25VB-1000	CAPACITOR ELEC	C839	1
38	SME25VB-470	CAPACITOR ELEC	*C801,02,37	3
39	SME50VB-R47BP	CAPACITOR ELEC	C832	1
40	AMZ50V102Z	CAPACITOR MYLA	C825,28	2



MODEL : BSR-230N		CODE : BSR-230N	UNIT : TERMINAL	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
41	AMZ50V103K	CAPACITOR MYLA	C822,24,27,40	4
42	AMZ50V153K	CAPACITOR MYLA	C841-43	3
43	AMZ50V222K	CAPACITOR MYLA	C818	1
44	AMZ50V332K	CAPACITOR MYLA	C833	1
45	AMZ50V682K	CAPACITOR MYLA	C844	1
46	AMZ50V822K	CAPACITOR MYLA	C845	1
47	B32529-0104-J	CAPACITOR MONO	C838	1
48	RD16B 1.5K	RESISTOR CARBON	R814,43,49,55B	4
49	RD16B 1.8K	RESISTOR CARBON	R852	1
50	RD16B 1K	RESISTOR CARBON	R808,10A,21	3
51	RD16B 10K	RESISTOR CARBON	R801A,04,27,34, 47,48,51,54A, 55A,68-74	17
52	RD16B 100	RESISTOR CARBON	R807,56A	2
53	RD16B 100K	RESISTOR CARBON	R809A,28-29,40,50	5
54	RD16B 15K	RESISTOR CARBON	R861	1
55	RD16B 18K	RESISTOR CARBON	R856B,57	2
56	RD16B 2.2K	RESISTOR CARBON	R864	2
57	RD16B 22K	RESISTOR CARBON	R801B,60	2
58	RD16B 220K	RESISTOR CARBON	R863	1
59	RD16B 27K	RESISTOR CARBON	R832,37	2
60	RD16B 270	RESISTOR CARBON	R818-19	2
61	RD16B 270K	RESISTOR CARBON	R862	1
62	RD16B 3.3K	RESISTOR CARBON	R806,10B	2
63	RD16B 33K	RESISTOR CARBON	R812,22,31,44,54B 67	6
64	RD16B 39K	RESISTOR CARBON	R809B,13	2
65	RD16B 4.7K	RESISTOR CARBON	R802-03,30,36,41, 42,45,46,53	9
66	RD16B 47K	RESISTOR CARBON	R811,15,17,23A/B 65,66,24-26,33,35 38-39	14
67	RD16B 470K	RESISTOR CARBON	R858-59	2
68	RD16B 6.8K	RESISTOR CARBON	R816	1
69	RD16B68K	RESISTOR CARBON	R820	1
70	GF06P 1K	RESISTOR SEMI	FVR810	1
71	GF06P 1M	RESISTOR SEMI	FVR811	1
72	GF06P 10K	RESISTOR SEMI	FVR801,08,12	3
73	GF06P 20K	RESISTOR SEMI	FVR802-06,09	6
74	GF06P 5K	RESISTOR SEMI	FVR814-15	2
75	GF06P 500	RESISTOR SEMI	FVR807	1
76	RGLD4X473J	RESISTOR ARRAY	PA801	1
77	RGLD8X473J	RESISTOR ARRAY	PA802	1

MODEL : BSR-230N		CODE : BSR-230N	UNIT : TERMINAL	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
78	DSP01-002-430G	CONNECTOR	JP801S-09S	9
79	DSP02-002-431G	CONNECTOR	J801P-03P,05-09P	8
80	DSP03-003-432G	CONNECTOR	J804P	1
81	G6A-474P DC12	RELAY	RL802	1
82	KDS16-112	SWITCH DIP	S801	1
83	SB-03P-HVQ-A	CONNECTOR	CN304P	1
84	SB-07P-HVQ-A	CONNECTOR	CN303P	1
85	SB-08P-HVQ-A	CONNECTOR	CN101P,301P	2
86	SB-10P-HVQ-A	CONNECTOR	CN106P	1
87	SB-12P-HVQ-A	CONNECTOR	CN102P	1
88	3022-02A	CONNECTOR	TP801-803	3
89	5513-05CPB	CONNECTOR	CN802S	1
90	5513-08CPB	CONNECTOR	CN805S,07S	2
91	5513-09CPB	CONNECTOR	CN804S	1
92	5513-11CPB	CONNECTOR	CN801S,06S	2
93	5513-15CPB	CONNECTOR	CN803S	1
94	8263-0511-000	CONNECTOR	CN6P	1
95	8263-0611-000	CONNECTOR	CN601P	1
96	8283-0311-000	CONNECTOR	CN605P	1
97	8283-0711-000	CONNECTOR	CN4P	1
98	8283-0711-002	CONNECTOR	CN12P	1
99	8283-0711-003	CONNECTOR	CN514P	1
100	8283-0811-000	CONNECTOR	CN3P	1
101	8283-0811-003	CONNECTOR	CN13P	1
102	8283-0911-000	CONNECTOR	CN1P	1
103	8283-0911-001	CONNECTOR	CN15P	1
104	8283-0911-002	CONNECTOR	CN607P	1
105	8283-1011-000	CONNECTOR	CN2P	1
106	8283-1011-003	CONNECTOR	CN11P	1
107	8283-1511-003	CONNECTOR	CN14P	1
108	10NCB529	P.C.B.		1
109	10UK216	P.C.B.		1
110	4A10-1253	SUTD-110		4
111	4A10-1265	IC RADIATOR-11		2
112	FW-2.6PAI	WASHER FLAT		1
113	FW-3PAI	WASHER FLAT		4
114	NT-2.6PAI	NUT		8
115	NT-3PAI	NUT		4
116	PN-2.6 X 10	SCREW PAN		1
117	PN-2.6 X 8	SCREW PAN		3
118	SW-2.6PAI	WASHER SPRING		8
119	SW-3PAI	WASHER SPRING		4

MODEL : BSR-230N		CODE : BSR-230N	UNIT : BSR SHASSIS	
NO.	PARTS NAME	DESCRIPTION	CIRCUIT REFERENCE	Q'TY
1	R01-2102	DC SOCKET		1
2	DB-4A	LED	NOKIA	1
3	RD14S 680	RESISTOR CARBON	LED	1
4	BNC-J/NJ(F)	CONNECTOR		1
5	BNC-PA-JJ	CONNECTOR	CN10S	1
6	F-PHGR-4	37PIN-DSUB COV		2
7	F-27P-K117	37PIN-DSUB		2
8	RK097-SH-5KB	RESISTOR VARIABLE		1
9	RK097-SH-50KB	RESISTOR VARIABLE		1
10	RK0971110-10KB	VOLUME		1
11	0.2-105-GRY	CORD		1
12	0.2-130-BRN	CORD		1
13	0.2-135-BRN	CORD		1
14	0.2-135-GRN	CORD		1
15	0.2-145-RED	CORD		1
16	0.2-185-ORN	CORD		1
17	0.2-215-BLU	CORD		1
18	0.2-245-YEL	CORD		1
19	0.2-310-GRN	CORD		1
20	0.2-43-RED	CORD		1
21	UL-13	CRAMPER		3
22	2A10-0159	PANEL-110	NOKIA UK VERSION	1
23	3A01-0318	CHASSIS-110		1
24	3A10-0443L	SIDE BOARD (LEFT)	NOKIA	1
25	3A10-0433R	SIDE BOARD (RIGHT)	NOKIA	1
26	3A10-0444	UP AND DOWN BOARD-110	NOKIA	2
27	4A10-1261	STUD-110		9
28	4A10-1437	SQL RING		3
29	4A10-1843	HANDLE-110	WHITE	2
30	BD-2.6 X 4	SCREW BIND		8
31	BD-2.6 X 6	SCREW BIND		1
32	BD-3 X 8	SCREW BIND		6
33	BDB-3 X 6	SCREW BIND		56
34	BDB-4 X 6	SCREW BIND		8
35	CAP-4 X 10	SCREW CAP BOLT		8
36	FWB-4PAI	WASHER FLAT (BLK)		4
37	SE-3 X 10	SCREW SEMS		8
38	SE-3 X 6	SCREW SEMS		12
39	6-WRENCH 4PAI	WRENCH		1