

DANCOM

COMMUNICATION EQUIPMENT

VHF RADIOTELEPHONE RT 408



DANISH COMMUNICATION EQUIPMENT A/S
DENMARK
PHONE 08-37 19 22. TELEX 69 798
SØRUP. DK-9530 STØVRING

1. GENERAL DESCRIPTION

1.4 HOW TO MODIFY FROM DUPLEX TO SEMIDUPLEX

Each set leaving the factory has been carefully tested for Duplex operation and will normally be delivered wired for Duplex operation.

To modify a set from Duplex operation to Semiduplex operation two modifications have to be carried out.

1. Connection (yellow wire) between diode D4 (on the Duplex/Simplex switch circuit 002.0465) and resistor R5 (on the Receiver board 002.0448) has to be removed.
2. Diode D16 on the Exciter board 002.0447 has to be removed.

1.5 INSTALLATION OF THE SEL-CALL DECODER 002.0450

When an RT 408 set has never been fitted with sel-call decoder before, the set must be prepared by removing a resistor R8 in the control panel 002.0449.

The resistor is easily removed just by cutting it away from the PC-board.

The sel-call decoder consists of the unit 002.0450 and the connection cable 005.465.

Space for the unit is reserved at the chassis side where the receiver board is located.

Place the decoder board in the reserved space, fix the 5 screws and connect the multicable from the connector on the decoder board to connector »D« on the control panel board.

After installation the decoder must be programmed to the ship's code given by the PTT.

1.6 HOW TO PROGRAM A SEL-CALL CODE

The selective call sign consists of 5 individual tones. To program a decoder to a given number it is necessary to connect a total of 5 connections to the taps on the Tonecoil.

Example:

GIVEN NUMBER 53432:

lead 1 (brown)	to tap 5
lead 2 (red)	to tap 3
lead 3 (orange)	to tap 4
lead 4 (yellow)	to tap 3
lead 5 (green)	to tap 2

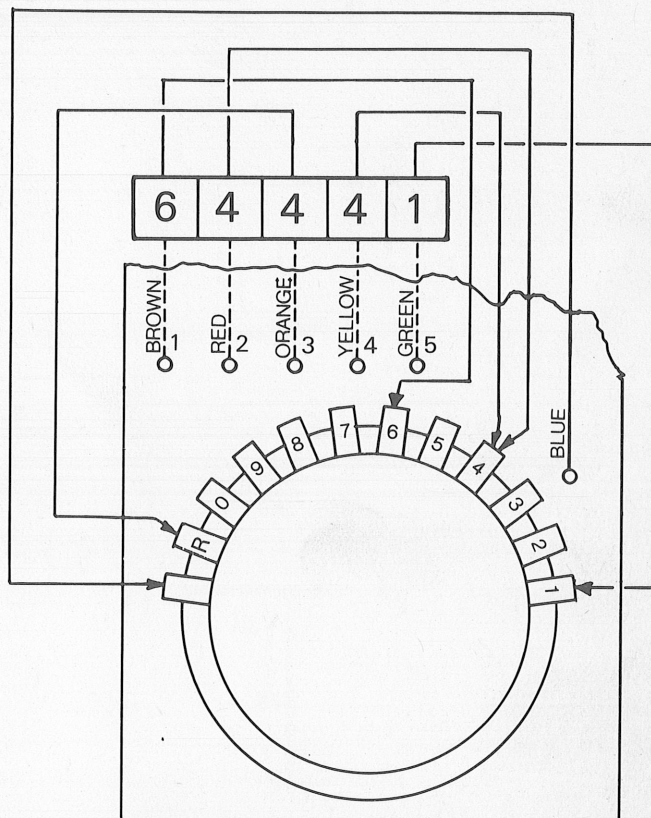
In case the same digit is repeated, one will have to use the special tone for repetitive digits.

Example:

GIVEN NUMBER 64441:

lead 1 (brown)	to tap 6
lead 2 (red)	to tap 4
lead 3 (orange)	to tap r
lead 4 (yellow)	to tap 4
lead 5 (green)	to tap 1

Example of code number 64441
(repetitive digits)



1.7 TESTING THE SEL-CALL DECODER

By means of the built-in test circuits all the logic function of the decoder can be tested.

Switch on the set.

Keep the test switch in position »TEST«. A light shall now be seen shortly in the lamp »CALL« and then move to the CQ lamp. At the same time the alarm signal shall be heard from the set's loudspeaker (2 seconds).

If there is any external alarm connected, this shall also give the alarm.

Reset the decoder by pressing the switch into position »Reset«.

Neither the CALL nor the CQ lamp shall now be alight and the set is ready to receive a call.

When on board a ship, call the local coast station and ask them to give a test call with your number.

1. GENERAL DESCRIPTION

1.1 HOW TO MODIFY FROM DUPLEX TO SEMIDUPLEX

Each set having the factory has been internally wired for duplex operation and will normally be delivered wired for duplex operation.

To modify a set from duplex operation to semiduplex operation two modifications have to be carried out:

1. Connection (yellow wire) between block 24 (on the Duplex/Simplex switch unit 002 0455) and resistor 002 0457 has to be removed.

2. Bridge 016 on the Extern board 002 0451 has to be removed.

1.2 INSTALLATION OF THE SEL-CALL DECODER 002 0480

When the SEL-CALL set has never been fitted with a call decoder, the set must be repaired by removing a resistor 016 on the control panel 002 0451.

The resistor is easily removed just by cutting it away from the P.C. board.

The sel-call decoder consists of the unit 002 0480 and the connection cable 002 0482.

Space for the unit is reserved at the chassis side where the receiver board is located.

Place the decoder board in the reserved space. Fix the 2 screws and connect the multi-core from the connector on the decoder board to connector 20 on the control panel board.

After installation the decoder must be programmed to the code given by the PTT.

1.3 HOW TO PROGRAM A SEL-CALL CODE

The selective call sign consists of 5 individual tones. To program a decoder to a given number it is necessary to connect a total of 5 connections to the taps on the Latched.

GIVEN NUMBER 23321

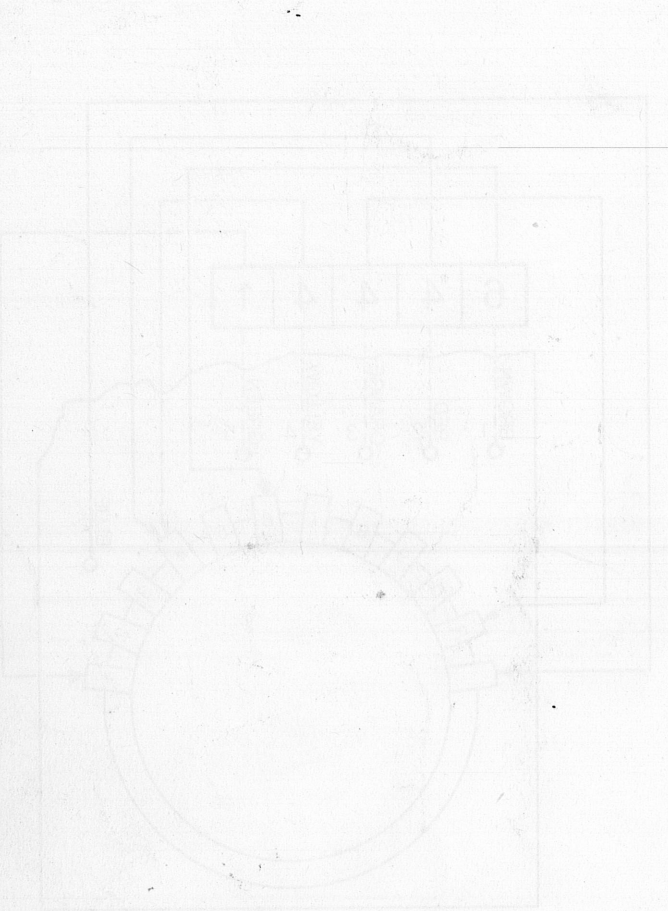
Lead 1 (brown)	to tap 5
Lead 2 (red)	to tap 3
Lead 3 (yellow)	to tap 4
Lead 4 (green)	to tap 2
Lead 5 (blue)	to tap 1

In case the same number is repeated one will have to use the same code for repeating digits.

GIVEN NUMBER 23321

Lead 1 (brown)	to tap 5
Lead 2 (red)	to tap 3
Lead 3 (yellow)	to tap 4
Lead 4 (green)	to tap 2
Lead 5 (blue)	to tap 1

1.4 TESTING THE SEL-CALL DECODER



By means of the multi-tone test circuit on the left function of the decoder can be tested.

Switch on the set.

Keep the test switch (position 1) at 1. When the set now be seen shortly in the lamp 002 0451 and then move to the 02 lamp. At the same time the alarm signal will be heard from the set's loudspeaker. If everything is correct.

If there is any problem when connecting the set, also check the alarm.

Reset the decoder by pressing the switch into position 0.

Neither the Call nor the 02 lamp will now be seen.

When on board a ship, call the set with a test station and when there is a test call with one number.

1.9 Frequency table

ch. 1 - 28

ch. 60 - 88

Ch	TX freq	Rx freq	Mo. freq	VCO fr	Sy. osc.	Sy. fr.
1	156.050	160.650	16,8	139.250	135.400	3.850
2	156.100	160.700	16,8	139.300	135.400	3.900
3	156.150	160.750	16,8	139.350	135.400	3.950
4	156.200	160.800	16,8	139.400	135.400	4.000
5	156.250	160.850	16,8	139.450	135.400	4.050
6	156.300	156.300	21,4	134.900	130.800	4.100
7	156.350	160.950	16,8	139.550	130.800	4.150
8	156.400	156.400	21,4	135.000	130.800	4.200
9	156.450	156.450	21,4	135.050	130.800	4.250
10	156.500	156.500	21,4	135.100	130.800	4.300
11	156.550	156.550	21,4	135.150	130.800	4.350
12	156.600	156.600	21,4	135.200	130.800	4.400
13	156.650	156.650	21,4	135.250	130.800	4.450
14	156.700	156.700	21,4	135.300	130.800	4.500
15	156.750	156.750	21,4	135.350	130.800	4.550
16	156.800	156.800	21,4	135.400	130.800	4.600
17	156.850	156.850	21,4	135.450	130.800	4.650
18	156.900	161.500	16,8	140.100	135.400	4.700
19	156.950	161.550	16,8	140.150	135.400	4.750
20	157.000	161.600	16,8	140.200	135.400	4.800
21	157.050	161.650	16,8	140.250	135.400	4.850
22	157.100	161.700	16,8	140.300	135.400	4.900
23	157.150	161.750	16,8	140.350	135.400	4.950
24	157.200	161.800	16,8	140.400	135.400	5.000
25	157.250	161.850	16,8	140.450	135.400	5.050
26	157.300	161.900	16,8	140.500	135.400	5.100
27	157.350	161.950	16,8	140.550	135.400	5.150
28	157.400	162.000	16,8	140.600	135.400	5.200

CH	TX freq	RX freq	Mo. freq	VCO fr	Sy. osc.	Sy. fr.
60	156.025	160.625	16,8	139.225	135.400	3.825
61	156.075	160.675	16,8	139.275	135.400	3.875
62	156.125	160.725	16,8	139.325	135.400	3.925
63	156.175	160.775	16,8	139.375	135.400	3.975
64	156.225	160.825	16,8	139.425	135.400	4.025
65	156.275	160.875	16,8	139.475	135.400	4.075
66	156.325	160.925	16,8	139.525	135.400	4.125
67	156.375	156.375	21,4	134.975	130.800	4.175
68	156.425	156.425	21,4	135.025	130.800	4.225
69	156.475	156.475	21,4	135.075	130.800	4.275
70	156.525	156.525	21,4	135.125	130.800	4.325
71	156.575	156.575	21,4	135.175	130.800	4.375
72	156.625	156.625	21,4	135.225	130.800	4.425
73	156.675	156.675	21,4	135.275	130.800	4.475
74	156.725	156.725	21,4	135.325	130.800	4.525
75	-	-	-	-	-	-
76	-	-	-	-	-	-
77	156.875	156.875	21,4	135.475	135.400	4.675
78	156.925	161.525	16,8	140.125	135.400	4.725
79	156.975	161.575	16,8	140.175	135.400	4.775
80	157.025	161.625	16,8	140.225	135.400	4.825
81	157.075	161.675	16,8	140.275	135.400	4.875
82	157.125	161.725	16,8	140.325	135.400	4.925
83	157.175	161.775	16,8	140.375	135.400	4.975
84	157.225	161.825	16,8	140.425	135.400	5.025
85	157.275	161.875	16,8	140.475	135.400	5.075
86	157.325	161.925	16,8	140.525	135.400	5.125
87	157.375	161.975	16,8	140.575	135.400	5.175
88	157.425	162.025	16,8	140.625	135.400	5.225

1.10

ch. 00-29

CH selector		Prom	Prom input code								Divide	Prom 1 output				Prom 2 output				Prom 3 output			
0-80	0-9	Word	(128)	(64)	(32)	(16)	(8)	(4)	(2)	(1)	Ratio	(8)	(4)	(2)	(1)	(128)	(64)	(32)	(16)	S/D	BL	PWR	
			Pin	(15)	(1)	(2)	(3)	(4)	(7)	(6)	(5)					(9)	(10)	(11)	(12)	(9)	(10)	(11)	(12)
00	0	0	0	0	0	0	0	0	0	0		1	1	1	1	1	1	1	1	1	1	1	
01	1	0	0	0	0	0	0	0	0	1	1 5 4	1	0	1	0	1	0	0	1	0	0	1	
02	2	0	0	0	0	0	0	0	1	0	1 5 6	1	1	0	0	1	0	0	1	0	0	1	
03	3	0	0	0	0	0	0	0	1	1	1 5 8	1	1	1	0	1	0	0	1	0	0	1	
04	4	0	0	0	0	0	0	1	1	0	1 6 0	0	0	0	0	1	0	1	0	0	0	1	
05	5	0	0	0	0	0	0	1	0	1	1 6 2	0	0	1	0	1	0	1	0	0	0	1	
06	6	0	0	0	0	0	0	1	1	0	1 6 4	0	1	0	0	1	0	1	0	1	0	1	
07	7	0	0	0	0	0	0	1	1	1	1 6 6	0	1	1	0	1	0	1	0	0	0	1	
08	8	0	0	0	0	0	1	0	0	0	1 6 8	1	0	0	0	1	0	1	0	1	0	1	
09	9	0	0	0	0	0	1	0	0	1	1 7 0	1	0	1	0	1	0	1	0	1	0	1	
10	16	0	0	0	0	1	0	0	0	0	1 7 2	1	1	0	0	1	0	1	0	1	0	1	
11	17	0	0	0	0	1	0	0	0	1	1 7 4	1	1	1	0	1	0	1	0	1	0	1	
12	18	0	0	0	0	1	0	0	1	0	1 7 6	0	0	0	0	1	0	1	1	1	0	1	
13	19	0	0	0	0	1	0	0	1	1	1 7 8	0	0	1	0	1	0	1	1	1	0	1	
14	20	0	0	0	0	1	0	1	0	0	1 8 0	0	1	0	0	1	0	1	1	1	0	1	
15	21	0	0	0	0	1	0	1	0	1	1 8 2	0	1	1	0	1	0	1	1	1	0	1	
16	22	0	0	0	0	1	0	1	1	0	1 8 4	1	0	0	0	1	0	1	1	1	0	1	
17	23	0	0	0	0	1	0	1	1	1	1 8 6	1	0	1	0	1	0	1	1	1	0	1	
18	24	0	0	0	0	1	1	0	0	0	1 8 8	1	1	0	0	1	0	1	1	0	0	1	
19	25	0	0	0	0	1	1	0	0	1	1 9 0	1	1	1	0	1	0	1	1	0	0	1	
20	32	0	0	0	1	0	0	0	0	0	1 9 2	0	0	0	0	1	1	0	0	0	0	1	
21	33	0	0	0	1	0	0	0	0	1	1 9 4	0	0	1	0	1	1	0	0	0	0	1	
22	34	0	0	0	1	0	0	0	1	0	1 9 6	0	1	0	0	1	1	0	0	0	0	1	
23	35	0	0	0	1	0	0	0	1	1	1 9 8	0	1	1	0	1	1	0	0	0	0	1	
24	36	0	0	0	1	0	0	1	0	0	2 0 0	1	0	0	0	1	1	0	0	0	0	1	
25	37	0	0	0	1	0	0	1	0	1	2 0 2	1	0	1	0	1	1	0	0	0	0	1	
26	38	0	0	0	1	0	0	1	1	0	2 0 4	1	1	0	0	1	1	0	0	0	0	1	
27	39	0	0	0	1	0	0	1	1	1	2 0 6	1	1	1	0	1	1	0	0	0	0	1	
28	40	0	0	0	1	0	1	0	0	0	2 0 8	0	0	0	0	1	1	0	1	0	0	1	
29	41	0	0	0	1	0	1	0	0	1		1	1	1	1	1	1	1	1	1	1	1	

ch. 60-89

CH selector		Prom	Prom input code								Divide	Prom 1 output				Prom 2 output				Prom 3 output			
0-80	0-9	Word	(128)	(64)	(32)	(16)	(8)	(4)	(2)	(1)	Ratio	(8)	(4)	(2)	(1)	(128)	(64)	(32)	(16)	S/D	BL	PWR	NC
			Pin(15)	(1)	(2)	(3)	(4)	(7)	(6)	(5)		(9)	(10)	(11)	(12)	(9)	(10)	(11)	(12)	(9)	(10)	(11)	(12)
60		96	0	1	1	0	0	0	0	0	1 5 3	1	0	0	1	1	0	0	1	0	0	0	1
61		97	0	1	1	0	0	0	0	1	1 5 5	1	0	1	1	1	0	0	1	0	0	0	1
62		98	0	1	1	0	0	0	1	0	1 5 7	1	1	0	1	1	0	0	1	0	0	0	1
63		99	0	1	1	0	0	0	1	1	1 5 9	1	1	1	1	1	0	0	1	0	0	0	1
64		100	0	1	0	0	0	1	0	0	1 6 1	0	0	0	1	1	0	1	0	0	0	0	1
65		101	0	1	1	0	0	1	0	1	1 6 3	0	0	1	1	1	0	1	0	0	0	0	1
66		102	0	1	1	0	0	1	1	0	1 6 5	0	1	0	1	1	0	1	0	0	0	0	1
67		103	0	1	1	0	0	1	1	1	1 6 7	0	1	1	1	1	0	1	0	1	0	0	1
68		104	0	1	1	0	1	0	0	0	1 6 9	1	0	0	1	1	0	1	0	1	0	0	1
69		105	0	1	1	0	1	0	0	1	1 7 1	1	0	1	1	1	0	1	0	1	0	0	1
70		112	0	1	1	1	0	0	0	0	1 7 3	1	1	0	1	1	0	1	0	1	0	0	1
71		113	0	1	1	1	0	0	0	1	1 7 5	1	1	1	1	1	0	1	0	1	0	0	1
72		114	0	1	1	1	0	0	1	0	1 7 7	0	0	0	1	1	0	1	1	1	0	0	1
73		115	0	1	1	1	0	0	1	1	1 7 9	0	0	1	1	1	0	1	1	1	0	0	1
74		116	0	1	1	1	0	1	0	0	1 8 1	0	1	0	1	1	0	1	1	1	0	0	1
75		117	0	1	1	1	0	1	0	1		1	1	1	1	1	1	1	1	1	1	1	1
76		118	0	1	1	1	0	1	1	0		1	1	1	1	1	1	1	1	1	1	1	1
77		119	0	1	1	1	0	1	1	1	1 8 7	1	0	1	1	1	0	1	1	1	0	0	1
78		120	0	1	1	1	1	0	0	0	1 8 9	1	1	0	1	1	0	1	1	0	0	0	1
79		121	0	1	1	1	1	0	0	1	1 9 1	1	1	1	1	1	0	1	1	0	0	0	1
80		128	1	0	0	0	0	0	0	0	1 9 3	0	0	0	1	1	1	0	0	0	0	0	1
81		129	1	0	0	0	0	0	0	1	1 9 5	0	0	1	1	1	1	0	0	0	0	0	1
82		130	1	0	0	0	0	0	1	0	1 9 7	0	1	0	1	1	1	0	0	0	0	0	1
83		131	1	0	0	0	0	0	1	1	1 9 9	0	1	1	1	1	1	0	0	0	0	0	1
84		132	1	0	0	0	0	1	0	0	2 0 1	1	0	0	1	1	1	0	0	0	0	0	1
85		133	1	0	0	0	0	1	0	1	2 0 3	1	0	1	1	1	1	0	0	0	0	0	1
86		134	1	0	0	0	0	1	1	0	2 0 5	1	1	0	1	1	1	0	0	0	0	0	1
87		135	1	0	0	0	0	1	1	1	2 0 7	1	1	1	1	1	1	0	0	0	0	0	1
88		136	1	0	0	0	1	0	0	0	2 0 9	0	0	0	1	1	1	0	1	0	0	0	1
89		137	1	0	0	0	1	0	0	1		1	1	1	1	1	1	1	1	1	1	1	1

2. GENERAL CIRCUIT DESCRIPTION

2.1 CONTROL PANEL

The CONTROL PANEL in the RT 408 is a complete sub-unit which contains all necessary controls, plugs etc. When dismantling the RT 408, loosen 4 screws and unsolder 2 cables, after which the panel can be separated for inspection or repair.

The CONTROL PANEL is constructed so that there is no ingress from waterspray.

All holes behind knobs, lightdiodes etc. are sealed with rubber inserts. To prevent water from accumulating on the front panel (when mounted vertically) there are two holes in the front frame, these serve as water outlets.

The front frame is supplied with a groove, fitted with a rubber gasket to be jointed to the cabinet, which will mean that the joint is waterproof.

The MAIN FUNCTIONS on the front panel are as follows:

1. CHANNEL SELECTOR SW 1 AND SW 2
2. MAIN SWITCH SW 5
3. VOLUME AND SQUELCH CONTROLS P 1 and P 2
4. DIMMER CIRCUIT P 3
5. TX INDICATOR LED 3
6. CONTROLS FOR SEL-CALL UNIT SW 3 AND SW 4

2.1.1 Channel selector

The CHANNEL SELECTOR contains 2 BCD (Binary Coded Decimal) switches SW 1 and SW 2. The selected code leads through 8 connections in the MULTIPLUG A (pin 2 to 15) to the PROM inputs in the EXCITER. When the base of T3 is at »logic 1« level, the common terminals of the switch selectors are connected to ground through T3. The transistor T3 is controlled from three functions:

- A. MAIN SWITCH (CH 16)
- B. AUTOMATIC CH 16 FROM MICROTELEPHONE CRADLE
- C. DUAL WATCH CIRCUIT

When selected on »CH 16«, THE MAIN SWITCH SW 5.2 connects T3's base direct to ground. The base is also connected to ground »logic 1«, when the switch SW 1 on the MICROTELEPHONE CRADLE is switched to »CH 16« and the MICROTELEPHONE is placed on the CRADLE, (this means that switch SW 2 is activated). Finally information is given from the DUAL WATCH circuit at pin 10 in the MULTIPLUG A. When changing the voltage on the base on T3, the lights in the CHANNEL SELECTOR and MAIN SWITCH change over to CH 16 or viceversa.

At »logic 1« from the control terminals, transistor T2 is on, and LA 2 (CHAN. SW.) is lit, which means that the base at T1 is connected to ground. LA1 is off. (CHAN. 16). The opposite occurs when »logic 0« is at the control terminals.

2.1.2 Main switch

The MAIN SWITCH has 4 positions:

1. OFF
2. 1W
3. 25W
4. CH 16

SW 5.1 connects battery supply to RECEIVER, EXCITER, SEL-CALL UNIT and CONTROL PANEL in the positions 2, 3, and 4.

SW 5.2 connects base of T7 to ground, this prevents the CONTROL CIRCUIT in the EXCITER driving T7 on. T7 controls the POWER RELAY and »25 W« indicator LED 4, the TRANSMITTER output is now limited to 1W.

In position »25 W« the base of T7 is released and can be controlled from the CONTROL CIRCUIT in the EXCITER. In position »CH 16« T3's base is grounded through R3, and T7 is »cut off« and disconnects SW 1 and SW 2 from ground. The inputcode on the PROM's is »logic 1« word 255. Word 255 is programmed to be »CH 16«.

2.1.3 Volume and squelch controls

P1 and P2 control VOLUME and SQUELCH respectively. P1 is grounded through T6, which normally drives on from R8. SW 2 will ground the base of T6 when the microtelephone is removed from the cradle, also the Sel-Call Decoder can ground the base of T6, and T6 is »cut off«. P1 loses its connection to ground and the signal to the loudspeaker is »muted«.

2.1.4 Dimmer circuit

The light intensity from all lamps can be regulated by P3-DIMMER-. P3 acts together with R4 as a voltage divider, connected to base of T4, which is a seriesregulator. All lamps are connected to emitter at T4. By means of the resultant changeable voltage at the emitter, the light intensity is adjustable.

2.1.5 TX-Indicator

TX indicator LED 3 is controlled by transistor T5 through R7 from EXCITER UNIT, which operates the ANTENNA RELAY. The indication is glowing, when the TRANSMITTER is keyed.

2.1.6 Controls for selcall unit

LED 1 indicates the »CALL« function. LED 2 indicates the »CQ« function. Both functions are controlled from the SEL-CALL UNIT. SW 3 is a 3 position switch, it is springloaded in 2 positions. The function is to »TEST« and »RESET« the SEL-CALL DECODER. SW 4 switches ON and OFF »mute« function from the SEL-CALL DECODER.

2.2 THE RECEIVER

The receiver circuit is built up on a P.C. board which is supplied with a 16-pole plug connection. Apart from the antenna and the VCO all connections go through this plug. The receiver contains the following circuits:

1. VHF-amplifier
2. 1st mixer
3. VCO
4. 21.4 MHz 1st IF-amplifier
5. 2nd mixer
6. 2nd oscillator
7. 455 KHz 2nd IF-amplifier and detector
8. LF-pre-amplifier and de-emphasis
9. Mute and electronic volume control
10. LF-output amplifier
11. Squelch
12. 10 volt regulator

2.2.1 VHF-amplifier

This stage amplifies and selects the signals from the antenna before the 1st mixer is fed with these signals. The VHF-amplifier consists of a critically coupled band-pass filter L1, L2 between the antenna and the VHF-amplifier (transistor T2) and a slightly coupled band-pass filter L3, L4 between T2 and 1st mixer (T3).

The VHF-transistor T2 is coupled as grounded gate with a view to reverse attenuation and stability. The band-pass filter circuits are tuned partly with fixed capacitors C5, C8, C12 and C17 and partly with the capacity diodes D1, D2, D3 and D4 in series with the capacitors C4, C7, C13 and C16.

By reception in the duplex-band 160 - 163 MHz the capacity diodes are preloaded with about 10 volt and have therefore low capacity.

By reception in the simplex band in the range 156 - 158 MHz the transistor T1 is fed with a positive preloading voltage, through the simplex/duplex pilot wire, and gives resulting saturation. The potentiometer P1, which is connected to the collector in T1, is thereby grounded. Through the resultant voltage division with R1 and P1 the capacity diodes are fed with the voltage which is necessary to tune the band-pass filter to the simplex band.

2.2.2 1st mixer

The mixer converts the received antenna signal into the 1st IF frequency of 21.4 MHz by means of the signal from the VCO. The signal from the VCO is always equal to the antenna signal less the 1st IF.

The mixer transistor T3 is a dual gate field effect transistor in which gate 1 is fed with the signal frequency and the source with the oscillator frequency. The induced oscillator signal will lie between 0.5 to 0.8 volt effective. The transistor is coupled to the filter FL1 through an impedance matching circuit which consists of L5 and C19.

2.2.3 VCO

The VCO produces the necessary signal to the 1st mixer in the receiver and the driver signal to the transmitter. By simplex it operates in the frequency range 134.9 - 135.425 MHz and by duplex in the range 139.250 - 140.625 MHz.

The oscillator itself consists of the transistor T8 and the oscillating circuit L11, C63 plus the capacity diode D6 in series with C61 besides the extra parallel capacitors C57, C58 and C62.

The oscillator is succeeded by the transistor T9 which functions as a buffer stage. The necessary VCO voltage to the exciter of the transmitter is taken from this stage through the resistor R59 and the capacitor C72. Furthermore the VCO signal is transferred to the transistor T10 through R60 and C73. Here the signal is amplified before it is passed to the 1st mixer.

The VCO frequency is controlled by the control voltage from the phase lock loop through the capacity diode D6. The diode is fed with the voltage from the common VHF/DC coaxial cable through the filter R50, C60, R40 and R48. To avoid too strong influence from the capacity diode, extra parallel capacity is added, controlled by the simplex/duplex pilot wire through the transistor T7.

In simplex the transistor is fed with a positive preloading by means of which C58 is connected to ground corresponding to an increase of the total capacity across L11 and thereby the VCO frequency is reduced by about 4.6 MHz.

In duplex the transistor T7 is cut off so that C58 has lost the connection to ground. Thereby the total capacity across L11 is reduced and the VCO oscillates in the higher duplex frequency range.

The tuning circuits in the two buffer stages T9 and T11 are both attenuated so effectively so that they cover the whole simplex and duplex frequency range.

2.2.4 21.4 MHz 1st IF-amplifier

The amplifier amplifies the 21.4 MHz 1st IF-signal from the filter FL1 and feeds the 2nd mixer with this signal. In this stage a grounded gate field effect transistor is used. This transistor is connected to FL1 through the impedance matching circuit L6, C21 and to the 2nd mixer through the matching circuit L7, C25.

2.2.5 2nd mixer

The 2nd mixer converts the 21.4 MHz 1st IF-signal into 455 KHz (2nd IF) by means of the signal from the 2nd oscillator which oscillates at 21.855 MHz. The base in the mixer transistor T5 is fed with both the signal from the 21.4 MHz 1st IF-amplifier and the signal from the 2nd oscillator.

The oscillator signal is fed to the mixer in the correct value through the capacitor C28.

The 455 KHz 2nd IF is taken from the collector in T5 through the circuit L8, C27. Together with the circuit L9, C30 and the choke coil CH1, this circuit forms a 455 KHz band-pass filter. The 455 KHz signal is passed to the 455 KHz IF-amplifier and the detector IC1 through this band-pass filter.

2.2.6 2nd oscillator

The oscillator oscillates at the frequency 21855 KHz by means of a quartz crystal X1 and transistor T11 in a Hartley arrangement. The frequency can be varied slightly around the nominal frequency with the trimmer C77.

2.2.7 455 KHz 2nd IF-amplifier and detector

This stage, consisting of an integrated circuit, carries out the following functions:

- A: Amplifies the 455 KHz signal
- B: Functions as an effective limiter
- C: Detects the FM-signal from the detector
- D: Amplifies the low frequency from the detector
- E: Functions as mute circuit
- F: Supplies the squelch with noise voltage

Pin 14 of the amplifier is fed with the 455 KHz 2nd IF-signal. The diode D5 prevents extremely strong signals from overloading the amplifier. With the coil L10 and the capacitor C36 the detector is tuned to resonance at 455 KHz. The built-in mute function is controlled by the transistor T6 and when no antenna signal is received from the squelch, this transistor is fed with a positive voltage at the base, which saturates T6.

The voltage on terminal 5 is approximately 4.5 volt which is obtained from terminal 4 through R21. It drops thereby to 0 volt and reduces the LF level on terminal 8 by approximately 60 dB. The noise signal to the squelch from terminal 12 is constant and unaffected by the mute function.

2.2.8 LF-amplifier and de-emphasis

An amplification, which is adequate for supplying the headphone direct from its output terminal 6 through the capacitor C42, is achieved by means of the operating amplifier IC2 which is coupled as an active filter.

The active filter consisting of IC2, R28, R29, R31, C38 and C39 gives the wanted de-emphasis of 6 dB/octave. To avoid varying LF-output at variable temperatures the LF-output from the 455 KHz amplifier is compensated with the thermistor R26 and the resistor R27.

2.2.9 Mute and electronic volume control

IC3 functions as an electronic volume control to supply the LF-loudspeaker level with a DC voltage. IC3 is an integrated circuit containing an amplifier which gives maximum amplification when terminal 2 is a 0 volt in relation to terminal 3. By increasing the voltage gradually in positive direction on terminal 2, the amplification is reduced by up to 40-50 dB for a voltage of approximately 6 volt.

R46 on terminal 2 is connected by the multiplug to a potentiometer (P1) in the control unit. The potentiometer is coupled as a variable resistance to the 0 potential and forms therefore a voltage divider with R36 and R46 making the voltage on terminal 2 in IC3 variable and thereby able to vary the LF-voltage to the LF-output.

If muting of the loudspeaker is requested, the ground connection to the potentiometer P1 is disconnected via a driver transistor T6 and terminal 2 in IC2 is drawn positive via R36 and reduces the level to the LF-output amplifier. R34 and R37 reduce the relatively strong voltage from IC2 to a suitable level on IC3. The LF-output from IC2 is temperature compensated with the thermistor R37 and R38.

2.2.10 LF-output amplifier

This stage amplifies the LF-level from IC3 so that it is able to supply a low impedance loudspeaker. An integrated circuit

IC4 is used. The requested amplification in the circuit is regulated with the negative feedback circuit R43, R42 and C48. The LF-signal is passed to pin 1 via R40. Through R45 and R41 an external low frequency can be added (terminal 5 in the multiplug). This low frequency is independent of the adjustment of the volume control.

In RT 408 the LF-signal is fed with an alarm signal from the selcall unit via this circuit. The signal to the loudspeaker is passed to terminals 4 and 13 of the multiplug via C51. Furthermore a separate ground wire is led to the loudspeaker through terminals 3 and 14 to eliminate unwanted currents in the chassis. The circuit R44, C52 prevents self-oscillation at high frequencies.

2.2.11 The squelch

The function of the squelch is to switch on and off the LF-signal from the detector depending on reception or non-reception of a signal. From IC1 the squelch signal is carried through C81 to a selective amplifier which consists of the transistor T12 and the LC-circuit L14, C82. The amplifier is tuned to about 16 KHz.

The amplifier selects the noise signal which is amplified and fed to the diode peak detector D7 and D8 through C84 and R74. After the peak detector the DC-signal is amplified through the transistors T13 and T14 and fed to the base of T6, which will switch on and off the LF-signal through IC1 depending on the presence of noise or not.

The working principle is as follows:

Without signal on the receiver white noise is generated in the 2nd IF-amplifier. The noise around 16 KHz is detected, and the base of T13 is fed with the DC-signal in series with the voltage from the squelch potentiometer which is placed across C85.

The voltage from the peak detector has a negative sign and will therefore move the emitter towards lower voltage. Hereby T14 is brought into cut off, and the voltage on the collector in T14 rises towards plus 10 volt by means of which T6 is pre-loaded and saturated. The LF-signal from IC1 is muted.

The noise in the 2nd IF-amplifier is suppressed with signal on the receiver, and the voltage from the rectifier in the detector D7, D8 is reduced. The emitter voltage in T13 increases hereby, and the base in T14 is pre-loaded positively. T14 saturates and the voltage on the collector approaches 0 volt. T6 is brought into cut off, and low frequency from the detector passes undamped. The transistor T15 inverts the function from T14 so that it is adapted to the dual watch function.

2.2.12 10 volt regulator

The regulator stabilizes the battery voltage to +10 volt through the series transistor T16. Together with the zener diode D9, T18 senses the 10 volt voltage. The base in T16 is fed with the regulating voltage through T17. R87 reduces the current to the base in T16 so that burning of T16 is avoided by occasional short-circuit of the regulated voltage. C91 prevents HF self-oscillation and suppresses noise on the power supply so that these are not transferred to the regulated voltage.

2.3 THE EXCITER

The exciter is mounted on a P.C. board. It is supplied with two 16 pole multiplugs through which all outlets and inlets are fed, except 2 coaxial cables from drive to output stage and from VCO in - DC control out, respectively.

The exciter contains the following functions:

- A. Microphone Amplifier and Clipper
- B. Low-pass Filter
- C. FM-Modulator
- D. TX-Mixer
- E. Band-pass Amplifier
- F. TX-Driver
- G. Reference oscillator and fixed Divider
- H. Phase Detector and loop Filter
- I. Synthesizer Oscillator and Trebler
- J. Synthesizer Mixer and Buffer
- K. Programable Divider
- L. VCO Buffers
- M. Dual Watch
- N. Control Circuit
- O. 10 volt Regulator
- P. 5 volt Regulator

2.3.1 Microphone Amplifier and Clipper

An operation amplifier IC1 is used as microphone amplifier. The sensitivity of the microphone signal is adjusted with P3. P3 is connected to +10 volt and functions as voltage drop resistor for the microphone pre-amplifier, which is placed in the microtelephone cradle. The amplifier has a frequency dependent feedback consisting of R49, C47 and R50 which makes it possible to obtain the wanted pre-emphasis of 6 dB/octave from approximately 300 to 3000 Hz.

The amplified signal is fed through C46 to the diode clipper which consists of the diodes D6 and D7 and the voltage divider R45, R46 and R47. The signal is fed from the clipper through C45 to the succeeding low-pass filter.

2.3.2 Low-pass Filter

The transistor T10 is coupled as an active low-pass filter which gives a strong cut-off for frequencies above 3000 Hz. The simplex and duplex modulators respectively are fed with the microphone signal from the low-pass filter through R38, C40 and the potentiometer P1 and P2.

2.3.3 FM-Modulator

The circuit consist of an oscillator T7, two almost identical modulators and a change-over circuit.

Each of the modulators is supplied with a crystal, Simplex 21.4, Duplex 16.8, the frequency of which is modulated with the capacity diodes D4 and D5. The diodes are pre-loaded with the voltage from the zener diode D5 a, to approximately 5 volt. The LF-voltage from the microphone amplifier is superimposed on the DC-voltage whereby the capacity of the diodes is varied in accordance with the speech oscillations. In Duplex L8, D4 and L7 form together with C39, D3, C35 and C36 the feedback in the oscillator circuit. The crystal X1, which oscillates at 16.8 MHz, is coupled via L7 to the oscillator and determines its oscillation frequency.

The frequency can be adjusted with L8, the modulation linearity can be adjusted with L7.

In simplex a 21.4 MHz crystal is used. It is coupled to the oscillator through L10, D5, L9, C38, D2, C35 and C36. The frequency can be adjusted with L9 and the modulation linearity can be adjusted with L10.

The change between the simplex and duplex modulators is effected from the simplex/duplex pilot wire. In simplex the pilot wire is placed at a logical »1« which saturates T8. Hereby D3 is pre-loaded with about 4 volt. The base of the transistor T9 is fed with a logical »0« and is therefore not conducting. The current from R31 and R28 runs through the diode D2, and the diode conducts. Thereby the connection from the oscillator to the simplex modulator (21.4 MHz) is established.

In duplex the simplex/duplex pilot wire is placed at a logical »0«. Therefore T8 is not conducting, and T9 saturated. Hereby D2 is reversed pre-loaded with about 4 volt. Due to the current through R30 and R28, D3 is conductive, and the connection to the duplex modulator is established. The TX-Mixer is fed via C33 and R24 with the output from the modulator.

2.3.4 TX-Mixer

The VCO signal is converted in the TX-mixer with one of the FM-modulator signals into the transmission frequency. With a view to the spurious attenuation the mixer is built up as a balanced field effect mixer with the transistors T4 and T5.

The parallel connected transistor gates are controlled with the VCO signal and saturated. Through a balanced circuit L6 the sources of the transistors are fed with the modulation signal in opposition. The converted signal - (the TX-frequency) - is taken out across a balanced high Q circuit L5A. The circuit couples inductively to a similar circuit L5. Together they form a band-pass filter which performs the function of eliminating the unwanted mixer products.

The transistor T6 functions as amplifier for the signals from the modulators. The circuit L6 is effectively attenuated so that it covers both 16.8 and 21.4 MHz.

2.3.5 Band-pass amplifier

To avoid loading the band-pass filter L5 and L5A a dual gate field effect transistor T3 is used as succeeding amplifier. T3 amplifies the signal from the mixer and passes it via the coils L4 and L3 through a band-pass filter to the base in T2, 1st amplifier in the TX-driver.

2.3.6 TX-Driver

The TX-driver consists of 2 transistors T2 and T1. In this the relatively weak signal from the band-pass filter amplifier is amplified to a 300 mW level. The transistor T2 is coupled to T1 through a matching circuit C9 and L2. T1 is tuned in the collector circuit with L1 and from the collector the signal is fed via C1 through a 3 dB 50 ohms attenuator pad to the PA-stage.

An HF-detector is coupled to the collector of T2 with the diode D1. The collector permits of measurement to be made with a normal DC-voltmeter. The circuits L5A, L5, L4, L3 and L2 can be trimmed to resonance at this testpoint.

2.3.7 Reference oscillator and fixed divider

The reference oscillator and fixed divider circuit produces a 25 KHz reference signal for the phase detector. The oscillator itself is equipped with a 6.4 MHz crystal and coupled as a conventional Hartley arrangement with the transistor T26. T25 has sinusoidal function to the TTL convertor and produces 6.4 MHz direct to the fixed divider IC9.

IC9 contains a divider with a division ratio of 256 corresponding to an output on pin 8 of 25 KHz for an input of 6.4 MHz on pin 1. The frequency of the reference oscillator is adjustable with the trimmer C103.

2.3.8 Phase detector and loop filter

The phase detector IC8 compares the frequency and the phase of the reference oscillator with the frequency and the phase of the programmable divider. If there is any frequency difference, the frequency detector starts functioning and gives impulses to the integrator T24, T23. Across the loop filter in the integrator a DC-voltage is built up, this is fed to the capacity diode D6 in the VCO on the receiver circuit. The DC-voltage adjusts the VCO frequency and when it comes close enough to the reference frequency, the phase detector starts functioning and locks the VCO frequency (which has been mixed and divided down to 25 KHz) so that there is exact synchronism with the divided reference frequency.

The phase discriminator is a digital type. Input 1 pin 1 is a pure 25 KHz reference frequency signal. Input 2 pin 3 has relation to the VCO frequency. If input 2 is above 25 KHz, the discriminator will produce a voltage of 2.25 volt pin 5-10. If input 2 is below 25 KHz or missing, a voltage of 0.75 volt will be produced by the discriminator. If input 2 is at 25 KHz but has a phase difference to input 1, positive or negative impulses will be produced within the range 0.75 to 2.25 volt.

The function of the integrator filter is to remove 25 KHz residual products and to integrate the impulses from a phase discriminator into a DC-voltage. The output voltage to the VCO will lie between 2 and 9 volt. The result of the DC-control voltage on the VCO is that input 2 is always 25 KHz.

2.3.9 Synthesizer oscillator and trebler

The function of the synthesizer oscillator is to produce a VHF signal which together with the VCO signal can be mixed to a lower frequency in the synthesizer mixer from where it is fed to an ordinary programmable divider and trebled.

There are 2 crystals in the synthesizer oscillator, one at the frequency 45.133 MHz and one at the frequency 43.6 MHz. The crystals can be connected to the oscillator transistor T17 via the change-over system with T16 and D13, which is controlled from the simplex/duplex pilot wire.

In simplex the pilot wire is logical »1«. The transistor T16 is therefore saturated and it connects effectively L13 to ground coupling the crystal X4 to the oscillator T17 which oscillates now at 43.6 MHz. The diode D13 insulates the crystal X3 from ground.

In duplex the pilot wire is logical »0«. The transistor T16 is cut off and represents a high resistance. The diode D13 is now conductive due to the current from +10 volt through the resistors R82 and R80. Therefore, the crystal X3 is coupled in, and the oscillator T17 oscillates at 45.133 MHz.

The oscillator signal is fed from the connection between C70 and C71 to the transistor T18, which is used as trebler. The circuit L14, C73 in the collector of T18 is tuned to the 3rd harmonic of the crystal frequency $3 \times 43.6 \text{ MHz} (= 130.8 \text{ MHz})$ in simplex and $3 \times 45.133 \text{ MHz} (= 135.4 \text{ MHz})$ in duplex respectively. Through C75 the circuit is coupled to an extra tuned circuit L15, C76 so that a band-pass filter is formed. From L15 the signal is coupled inductively to gate 1 in the synthesizer mixer T20. The HF-voltage to gate 1 can be checked across R93 with a testprobe or an HF-voltmeter.

2.3.10 Synthesizer Mixer and Buffer

The VCO signal is mixed with the signal from the synthesizer oscillator in the synthesizer mixer, and the difference frequency – which lies in the range of approximately 3-6.4 MHz – is fed to pin 4 in 1st programmable divider IC3 through the buffers T21 and T22, which convert sinus into TTL level.

2.3.11 Programmable Divider

The difference frequency from the synthesizer mixer is divided with the wanted division ratio N in the programmable divider. The divider consists of 2 integrated circuits (IC3 and IC5) each of these being programmable dividers with a maximum division ratio of 16. By means of coupling, a division ratio of maximum 255 is reached. The dividers are programmed from 2 Programmable Read Only Memories (PROMs).

In principle the programmable divider is able to divide with the division ratio 1 to 255 corresponding to an input frequency from 25 KHz to 6375 KHz for an output frequency of 25 KHz.

In practice the whole division range is not used. A division ratio from about 120 to 225 is used.

The programming of the divider takes place via the four data inputs to pins 15-1-10-9 of IC3 and IC5 for data 1-2-4-8 in IC5 respectively. If, for instance, all data inputs are at logical »1«, the division ratio will be $1+2+4+8+16+32+64+128=255$.

The division ratio of a given frequency is found and via the synthesizer mixer fed to the input of the programmable divider. The frequency in KHz is divided with 25 and is equal to the division ratio.

Example: From the frequency table point 1.9 a synthesizer frequency of 4600 KHz for CH 16 is taken

$$\frac{4600}{25} = 184$$

The data input to the divider is therefore $128+32+16+8 = 184$ for this division ratio.

The Proms, which supply the programmable divider with data input, must therefore be programmed in such a way that a logical »1« is produced on the data input 8-16-32 and 128 and a logical »0« on the others.

The selection of the data »words« with which the Proms have been programmed is made by means of the channel selector on the frontplate of the equipment.

There are 2 channel selector switches, each coded in BCD form, one for the »ones« and the other for the »tens« in the wanted channel number.

The switch for »ones« SW 1 is connected to inputs 1-2-4-8 of the Proms while the switch for »tens« SW 2 is connected to inputs 16-32-64 and 128.

Each Prom contains 256 words of 4 bits. Totally 100 of these words can be selected with the channel selector, please see Prom Input Code point 1.10.

The resistors R107 to R114 are connected to the Prom inputs. If the connections to the channel selector are cut off, these resistors will place a logical »1« on all Prom inputs which corresponds to the selection of word 255. Usually this word is programmed to CH16. I.a. this function is used by auto CH 16 and by Dual Watch.

2.3.12 VCO Buffers

Two VCO buffers have been introduced in order to obtain a suitable signal level to the TX-mixer and the synthesizer mixer and to get a suitable insulation between the VCO and the stages mentioned.

The buffer, transistor T12, for the TX-mixer amplifies the VCO signal so that approximately 0.8-0.9 volt effective is produced across the resistor R18.

The circuit L11, C55 is effectively attenuated so that it covers both the simplex and the duplex VCO frequencies.

With a view to the insulation between the VCO and the synthesizer oscillator the buffer for the synthesizer mixer is supplied with a FET in grounded gate arrangement. The circuit L16, C79 covers both the simplex and the duplex VCO frequencies.

D14, C81 and R97 permit control of the VCO-voltage to the synthesizer mixer with a normal DC-voltmeter.

2.3.13 Dual Watch

The dual watch circuit gives the choice of listening to traffic on any selected channel in addition to CH 16.

The circuit changes the receive frequency between the selected channel and CH 16 approximately 3 times a second and in such a way that it is possible to listen to CH 16 in about 1/10 of the total listening time. Therefore it is possible to understand the traffic on the selected channel even if there are »gaps« in the transmission. When there is traffic on CH 16, this channel has priority, and the circuit will change over to CH 16 and remain there as long as the traffic continues.

The circuit can be controlled from a switch on the micro-telephone cradle marked 16 - N - W.

Position »16« for automatic change to CH 16 when the microtelephone is placed on the cradle.

Position »W« for Dual Watch when the microtelephone is placed on the cradle.

Position »N« (Normal) corresponds to unchanged frequency setting when the microtelephone is placed on the cradle.

The circuit itself is built up around a monostable flip-flop with the transistors T14 and T15. Through selection of R71 and R72 a curve form with a ratio of about 1:10 is obtained.

One of the outputs of the flip-flop is connected to the two switches SW1 and SW2 through R78 so that the common ground connection in the switches through the transistor T3 can be released. In this position all the Prom inputs will be at logical »1« corresponding to word 255 which has been programmed with CH 16. Due to the inverting in T3 a logical »0« on the output of the flip-flop corresponds to a logical »0« on the ground ends of the switches and therefore to CH 16.

The dual watch function is controlled from the squelch through the transistor T13 and the diode D12.

The function is as follows:

1. With no signal on CH 16 and on the selected channel, there is a logical »0« on the pilot wire from the squelch of both channels. The transistor T13 is therefore not conducting and the flip-flop T13, T14 can work without any hindrance.

2. Signal on selected channel but no signal on CH 16.

When the receiver is set at the selected channel, a logical »1« is produced from the squelch. However, this does not influence the flip-flop as T14 will be saturated when the equipment operates on the channel selected with the channel selector. A logical »0« will therefore be transmitted through the diode D12 to the pilot wire from the squelch and due to R67 this »0« will suppress the logical »1« coming from the squelch...

With the diodes D10-D11 a possible residual voltage is prevented from reaching the base on T13. T13 is therefore still not conducting and the flip-flop works without hindrance.

3. Signal on CH16, with or without signal on selected channel.

By listening of CH 16 the squelch reacts and the pilot wire gives a logical »1« level. At the same time the transistor T14 is at logical »1«. There will therefore be no suppression of the logical »1« coming from the squelch and this will reach the base of T13 and saturate the transistor. Hereby the flip-flop is blocked as T13 functions as a short-circuit in the feedback way between T14 - T15. The flip-flop remains in the CH 16 position as long as the signal continues.

2.3.14 Control circuit

The control circuit contains the following functions:

1. Automatic reduction of the transmission power
2. Change-over between simplex/duplex
3. Blocking of unwanted channels
4. Muting of the receiver when the equipment is being operated in the simplex mode
5. TX-Keying

Prom 3, IC7 controls the following functions:

Automatic reduction of transmission power
Simplex/duplex
Blocking

Prom 3 is connected to the channel selector in parallel with Prom 1 and Prom 2 which control the frequency adjustment. When unprogrammed, the Prom will give a logical »1« on the used bits, pins 9, 11 and 12.

Re point 1: (Automatic reduction of the transmission power)

The transistor is connected to Prom 3 pin 11 through R128.

When the base of T27 is fed with a logical »1«, T27 will give a logical »0«, and this will be transmitted to the control panel through terminal 16 in connector B from where it will control the power relay RL1 in the power amplifier of the transmitter. Logical »1« from the Prom corresponds to reduced power.

Re point 2: (Change-over between simplex/duplex)

The simplex/duplex change is controlled direct from Prom 3 pin 9 from where it is transmitted to the circuits in both exciter and receiver.

The synthesizer oscillator and the modulator are controlled in the exciter. The VCO and the tuning of the HF-stage are controlled in the receiver.

A logical »1« on the S/D wire corresponds to simplex.

Re point 3 and 5: (Blocking of unwanted channels, TX-Keying)

By prohibited channels or channels on which only listening is requested, for instance US Weather channels, a blocking of the TX-keying circuit is made from Prom 3 pin 12.

The transistors T29 and T30 are also included in the circuit. If blocking of a channel is requested, the base of T30 is fed with a logical »1« from the prom through R133. Hereby T30 is saturated. At the same time it saturates T29 and short circuits the base to the Emitter in the transistor T28 which functions as TX-keying transistor. The result is that information from the microphone key is prevented from affecting T28 and the transmitter cannot be keyed.

Re point 4: (Muting of the receiver when the equipment is being operated in the simplex mode)

When the equipment is to be duplex operated, the receiver must always be operative also during simultaneous transmission.

In simplex the mute circuit of the receiver is affected with R130 and D17 by transmission of a positive voltage via pin 12 in connector A. In duplex this function is suppressed with the diode D16 which is connected to the S/D pilot wire. In duplex this wire is at a logical »0«.

2.3.15 10 volt Regulator

The regulator stabilizes the battery voltage to +10 volt through the series transistor T16. Together with the zener diode D9, T18 senses the 10 volt voltage. The base in T16 is fed with the regulating voltage through T17. R87 reduces the current to the base in T16 so that burning of T16 is avoided by occasional short-circuit of the regulated voltage. C91 prevents HF self-oscillation and suppresses noise on the power supply so that these are not transferred to the regulated voltage.

2.3.16 5 volt Regulator

The regulator consists of an integrated circuit IC2 into which all the functions have been built.

The function of C60, C61 and C62 is to provide stability in the regulator.

2.4. THE SELECTIVE CALL SYSTEM

The selective call system has been developed in order to improve the possibility of obtaining quicker radio connection between shore and ship.

This system makes it possible for the coast radio stations automatically to make individual calls to ships about the existing traffic independent to the ship's watch period and all ships' calls in connection with distress, urgency traffic, and announcement of vital navigation notices.

On VHF the selective call is transmitted on CH 16. It is therefore very important always to set the receiver of the VHF equipment at CH 16 when the receiver is not used for other purposes.

The calling system is built up in accordance with the recommendations of the International Telecommunication Union ITU as described in the radio regulations ITU Geneve 1976, appendix 20 C.

A brief description of the system is as follows:

2.4.1 The selective call signal

The selective call signal consists of a 5-figure call number which is – figure by figure – transmitted as impulses of low frequency oscillations modulated into a carrier wave.

The numerical value of the single figure is characterized by the frequency of the low frequency oscillation

1 = 1124 Hz	6 = 1540 Hz
2 = 1197 Hz	7 = 1640 Hz
3 = 1275 Hz	8 = 1747 Hz
4 = 1358 Hz	9 = 1860 Hz
5 = 1446 Hz	0 = 1981 Hz

Numerical value repetition = 2110 Hz

The duration of the impulse for a figure is 100 msec \pm 10 msec, the interval between 2 successive impulses is 3 msec \pm 2 msec.

The selective call signal is transmitted twice with an interval of 900 msec \pm 100 msec and there will be at least 1 second's interval between transmission of calls to different ships.

2.4.2 All ship's call (CQ)

Transmission of all ships' calls, which activate the decoder equipment in all ships irrespective of their individual call number, consists in transmission of impulses of all 11 low frequency oscillations in succession. Each impulse is transmitted with a duration of 17 msec \pm 1 msec at intervals of maximum 1 msec. The transmission is continued over a period of 5 sec.

4. THE SELECTIVE CALL SYSTEM

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On VHF the selective call is transmitted on CH 16. It is therefore very important always to set the receiver of the VHF equipment at CH 16 when the receiver is not used for other purposes.

The calling system is built up in accordance with the recommendations of the International Telecommunication Union (ITU) as described in the radio regulations ITU Geneva 1978, appendix 20.2.

A brief description of the system is as follows:

2.3.16 5 volt Regulator

The regulator consists of an integrated circuit IC2 into which all the functions have been built.

The function of C60, C61 and C62 is to provide stability in the regulator.

2.3.16 10 volt Regulator

The regulator stabilizes the battery voltage to +10 volt through the series transistor T16. Together with the Zener diode D8, T16 senses the 10 volt voltage. The base of T16 is fed with the regulating voltage through T17. T17 induces the current to the base of T16 so that burning of T16 is avoided by sectional short-circuit of the regulated voltage. C61 prevents self-oscillation and suppresses noise on the power supply so that these are not transmitted to the regulated voltage.

2.4.1 The selective call signal

The selective call signal consists of a 5-figure call number which is a figure by figure transmitted as impulses of low frequency oscillations modulated with a carrier wave.

The numerical value of the signal figure is characterized by the frequency of the low frequency oscillation.

1 = 1125 Hz	6 = 1545 Hz
2 = 1157 Hz	7 = 1540 Hz
3 = 1215 Hz	8 = 1573 Hz
4 = 1255 Hz	9 = 1560 Hz
5 = 1285 Hz	0 = 1581 Hz

Numerical value repetition = 2110 Hz

The duration of the impulse for a figure is 100 msec \pm 10 msec. The interval between 3 successive impulses is 3 msec \pm 2 msec.

The selective call signal is transmitted twice with an interval of 500 msec \pm 100 msec and there will be at least 1 second interval between transmission of calls to different ships.

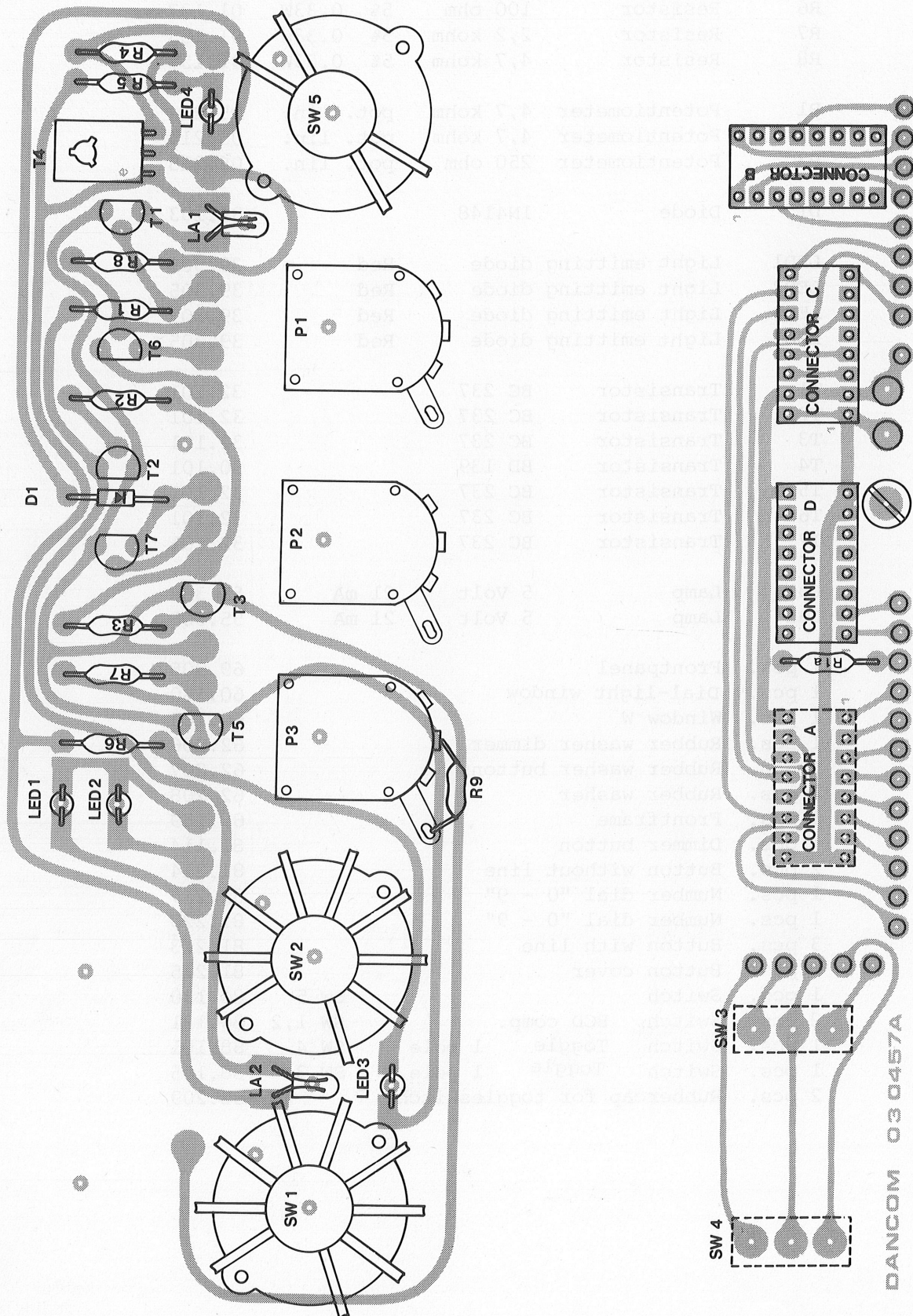
2.4.2 All ship's call (CC)

Transmission of all ship's calls which activate the decoder equipment of all ships irrespective of their individual call number, consists in transmission of impulses of all 10 low frequency oscillations in succession. Each impulse is transmitted with a duration of 13 msec \pm 1 msec in intervals of maximum 1 msec. The transmission is continued over a period of 5 sec.

5.1.1 CONTROL PANEL 002.0449

R1	Resistor	2,2 kohm	5%	0.33W	01.153
R2	Resistor	2,2 kohm	5%	0.33W	01.153
R3	Resistor	2,2 kohm	5%	0.33W	01.153
R4	Resistor	390 ohm	5%	0.33W	01.144
R5	Resistor	100 ohm	5%	0.33W	01.137
R6	Resistor	100 ohm	5%	0.33W	01.137
R7	Resistor	2,2 kohm	5%	0.33W	01.153
R8	Resistor	4,7 kohm	5%	0.33W	01.157
P1	Potentiometer	4,7 kohm	pot. lin.		05.214
P2	Potentiometer	4,7 kohm	pot. lin.		05.214
P3	Potentiometer	250 ohm	pot. lin.		05.215
D1	Diode	1N4148			39.103
LED1	Light emitting diode		Red		39.305
LED2	Light emitting diode		Red		39.305
LED3	Light emitting diode		Red		39.305
LED4	Light emitting diode		Red		39.305
T1	Transistor	BC 237			32.101
T2	Transistor	BC 237			32.101
T3	Transistor	BC 237			32.101
T4	Transistor	BD 139			30.101
T5	Transistor	BC 237			32.101
T6	Transistor	BC 237			32.101
T7	Transistor	BC 237			32.101
La1	Lamp	5 Volt	21 mA		55.308
La2	Lamp	5 Volt	21 mA		55.308
1 pcs.	Frontpanel				69.905
1 pcs.	Dial-light window				60.150
1 pcs.	Window W				60.165
1 pcs.	Rubber washer dimmer				62.206
5 pcs.	Rubber washer buttons				62.207
4 pcs.	Rubber washer				62.208
1 pcs.	Frontframe				62.189
1 pcs.	Dimmer button				81.114
2 pcs.	Button without line				81.214
1 pcs.	Number dial "0 - 9"				81.217
1 pcs.	Number dial "0 - 9"				81.220
3 pcs.	Button with line				81.213
5 pcs.	Button cover				81.215
1 pcs.	Switch		SW 5		86.130
2 pcs.	Switch BCD comp.		SW 1,2		86.131
1 pcs.	Switch Toggle 1 pole		SW 4		88.101
1 pcs.	Switch Toggle 1 pole		SW 3		88.105
2 pcs.	Rubbercap for toggleswitch				62.209

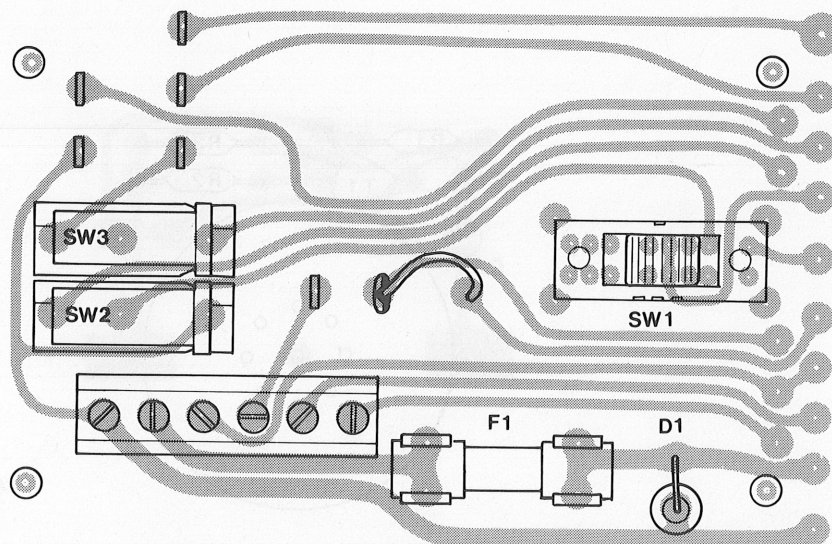
5.1.2 COMPONENT LAY OUT FOR CONTROL PANEL



5.2.1 TELEPHONE CRADLE 002.0467.

D1	Diode	1N5401	38.102
F1	Fuse	6 amp	55.408
SW1	Slide switch		88.201
SW2	Micro switch		87.106
SW3	Micro switch		87.106
Loudspeaker		3W 8 ohm	28.107
Plastic Cover - Upper			62.192
Plastic Cover - Bottom			62.193
Ratchet, big			62.195
Ratchet, small			62.196
Ratchet for switch			62.197
Flatspring		(62.196)	67.222
Flatspring		(62.195)	67.223
Spring		(62.197)	67.107

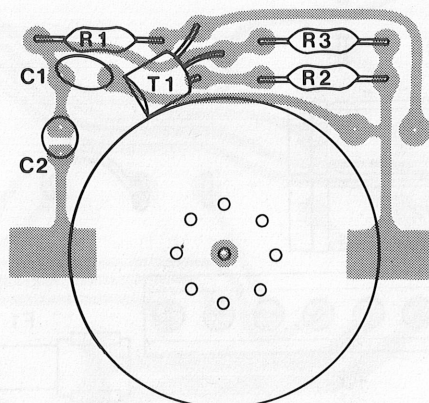
5.2.2 COMPONENT LAY OUT FOR TELEPHONE CRADLE

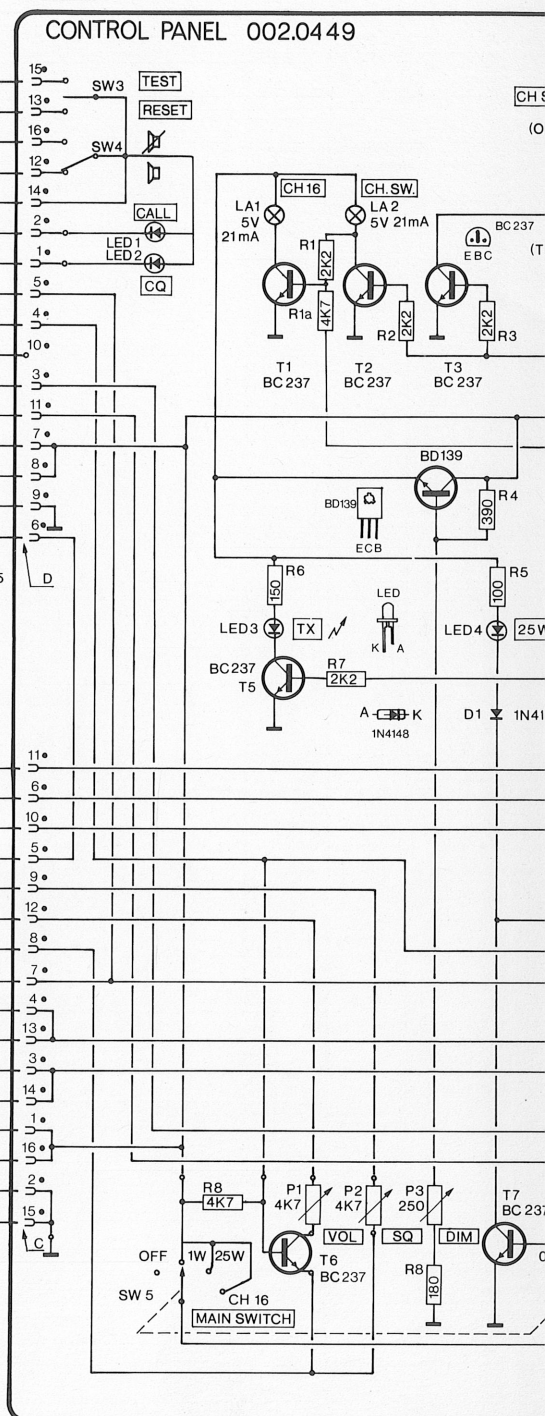
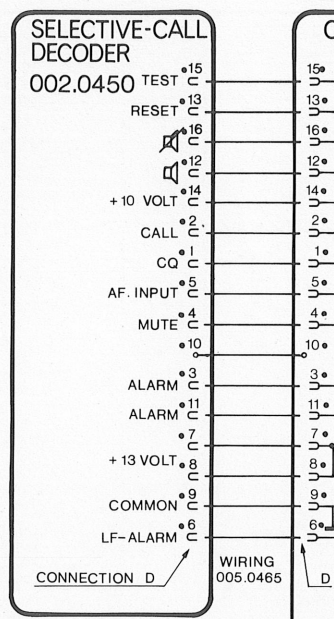
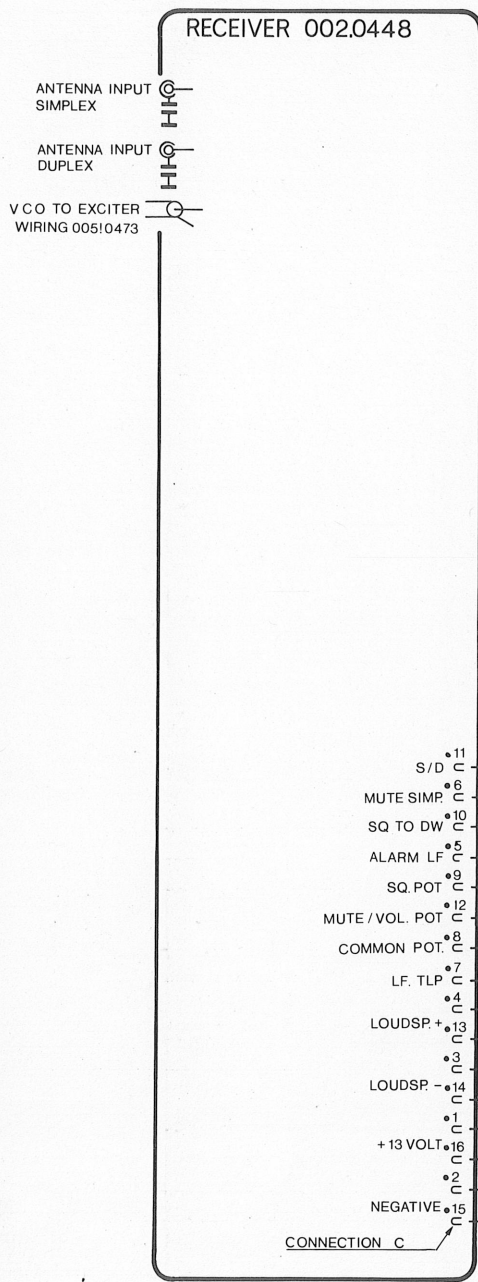


5.3.1 TELEPHONE HANDSET 002.0468.

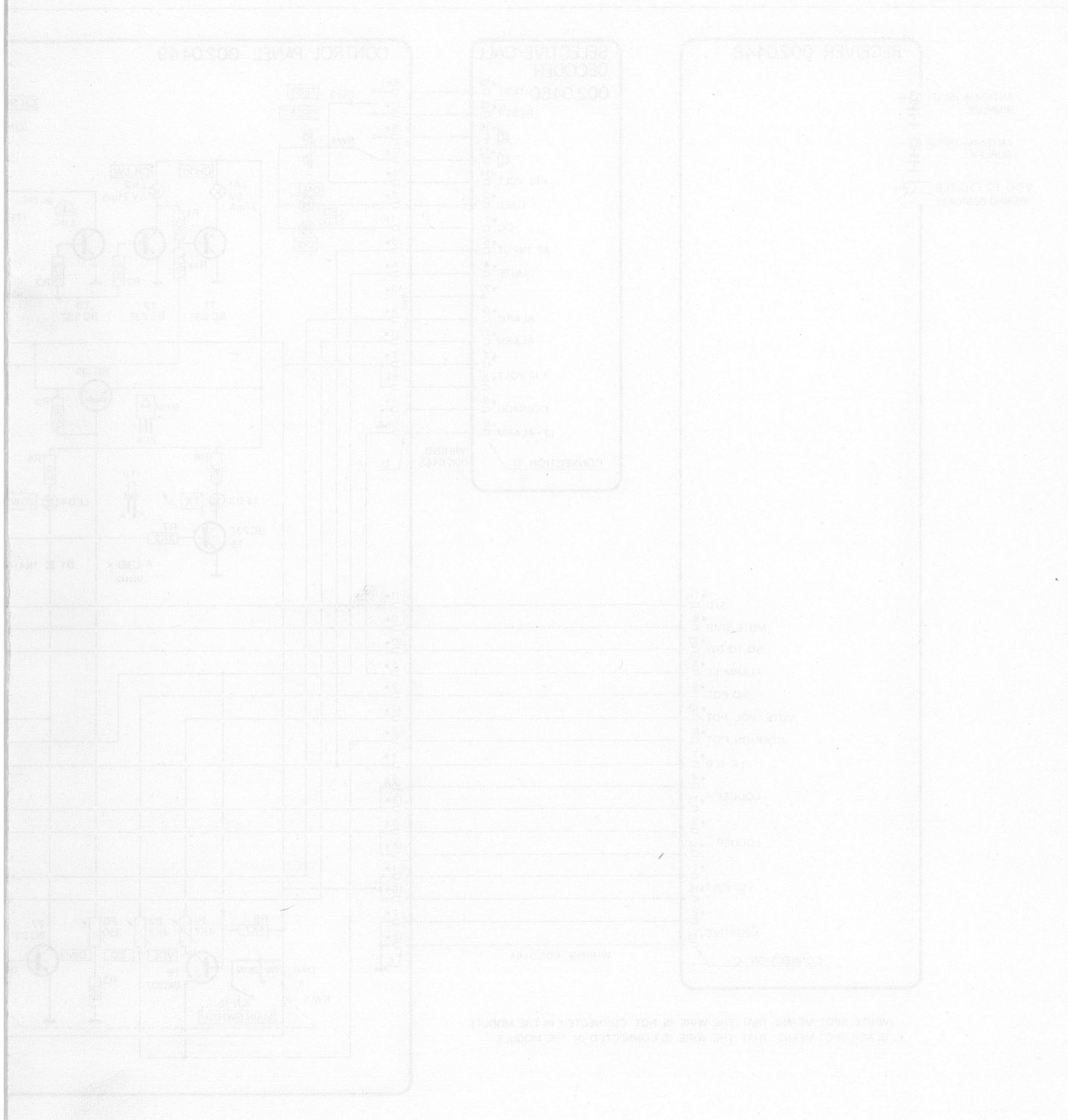
R1	Resistor	22	kohm	5%	0.33W	01.165
R2	Resistor	10	ohm	5%	0.33W	01.125
R3	Resistor	10	kohm	5%	0.33W	01.161
C1	Capacitor, cer	10	nF		30V	14.907
C2	Capacitor, tantal	22	uF		16V	13.129
T1	Transistor	BC 237				32.101
2 pcs.	Microphone capsule				200 ohm	28.108
	Plastic Cover - Upper					62.198
	Plastic Cover - Bottom					62.199
	Key					62.200
	Spring for key					67.108
	Micro switch					87.107
	Spiralcord					78.104

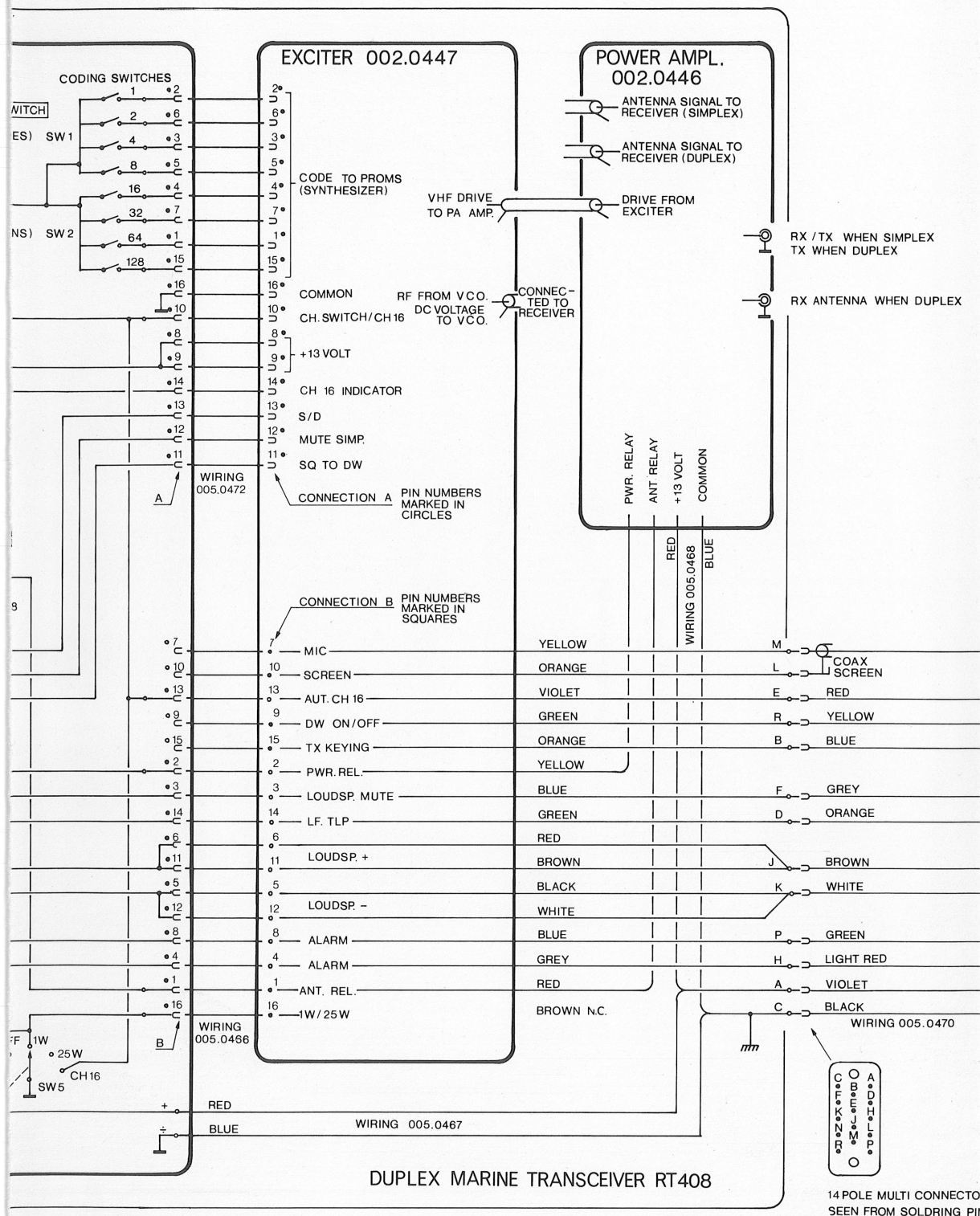
5.3.2 COMPONENT LAY OUT FOR TELEPHONE HANDSET

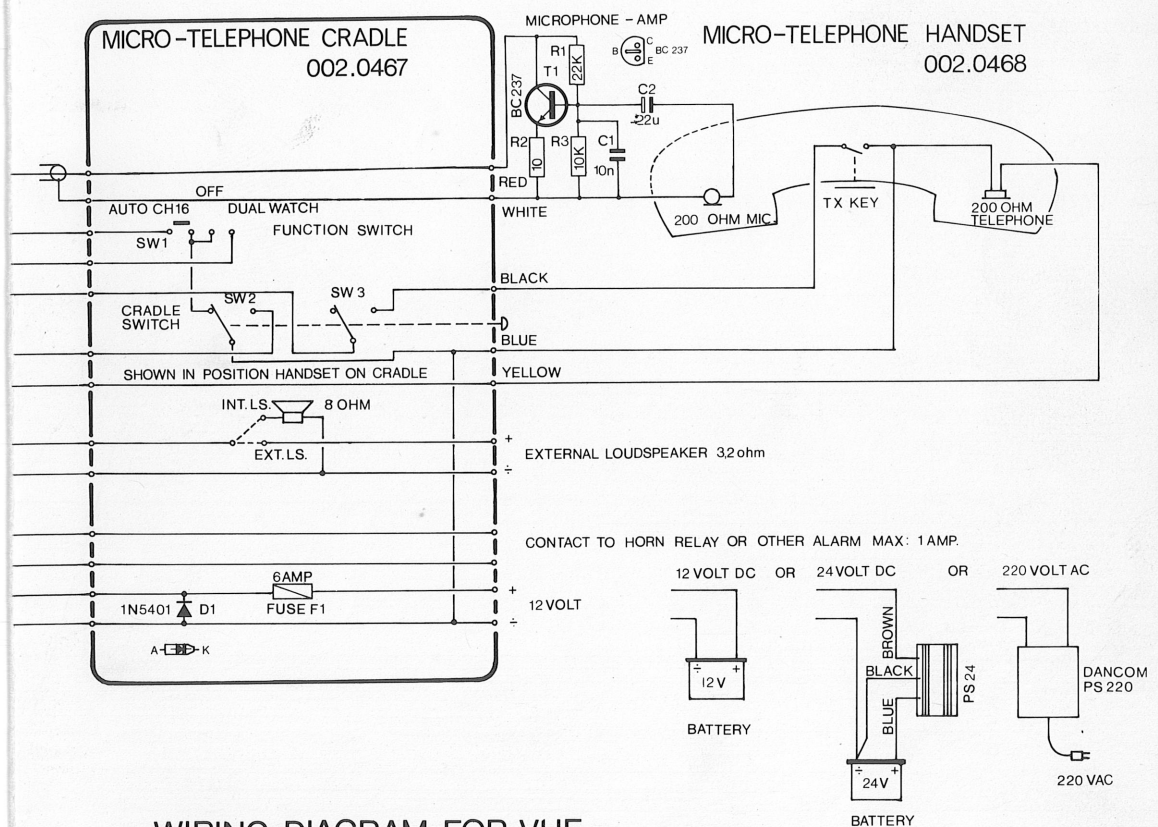
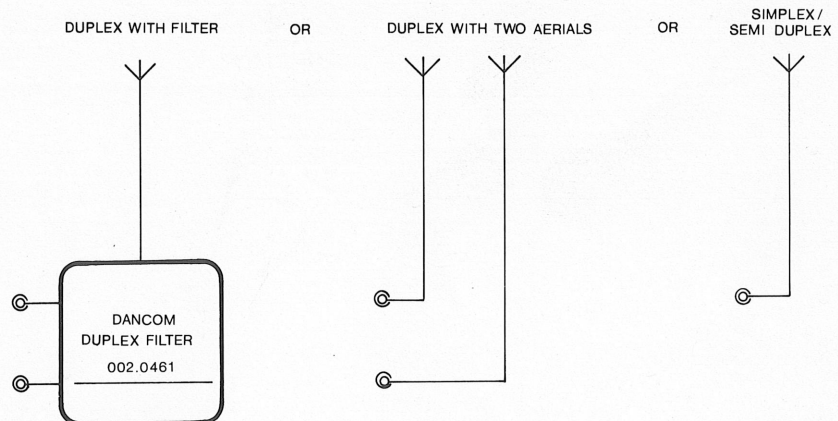




WHITE SPOT MEANS THAT THE WIRE IS NOT CONNECTED IN THE MODULE
 • BLACK SPOT MEANS THAT THE WIRE IS CONNECTED IN THE MODULE



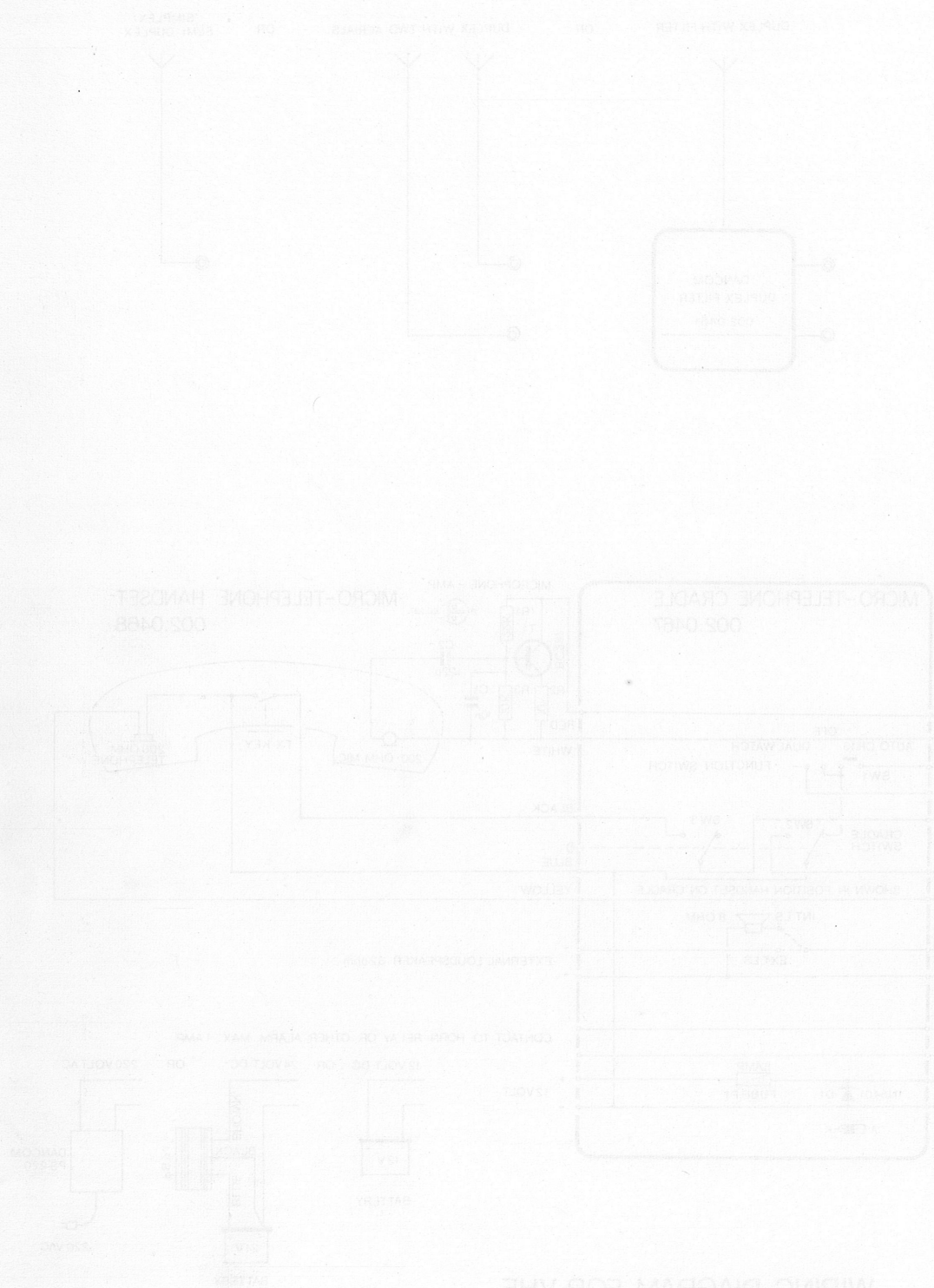




**WIRING DIAGRAM FOR VHF
MARINE RADIO TELEPHONE RT 408
DRAWING NO. 01.0401A**

5.4.3

WIRING DIAGRAM FOR THE
MARINE RADIO TELEPHONE RT 408
DRAWING NO. 010401A



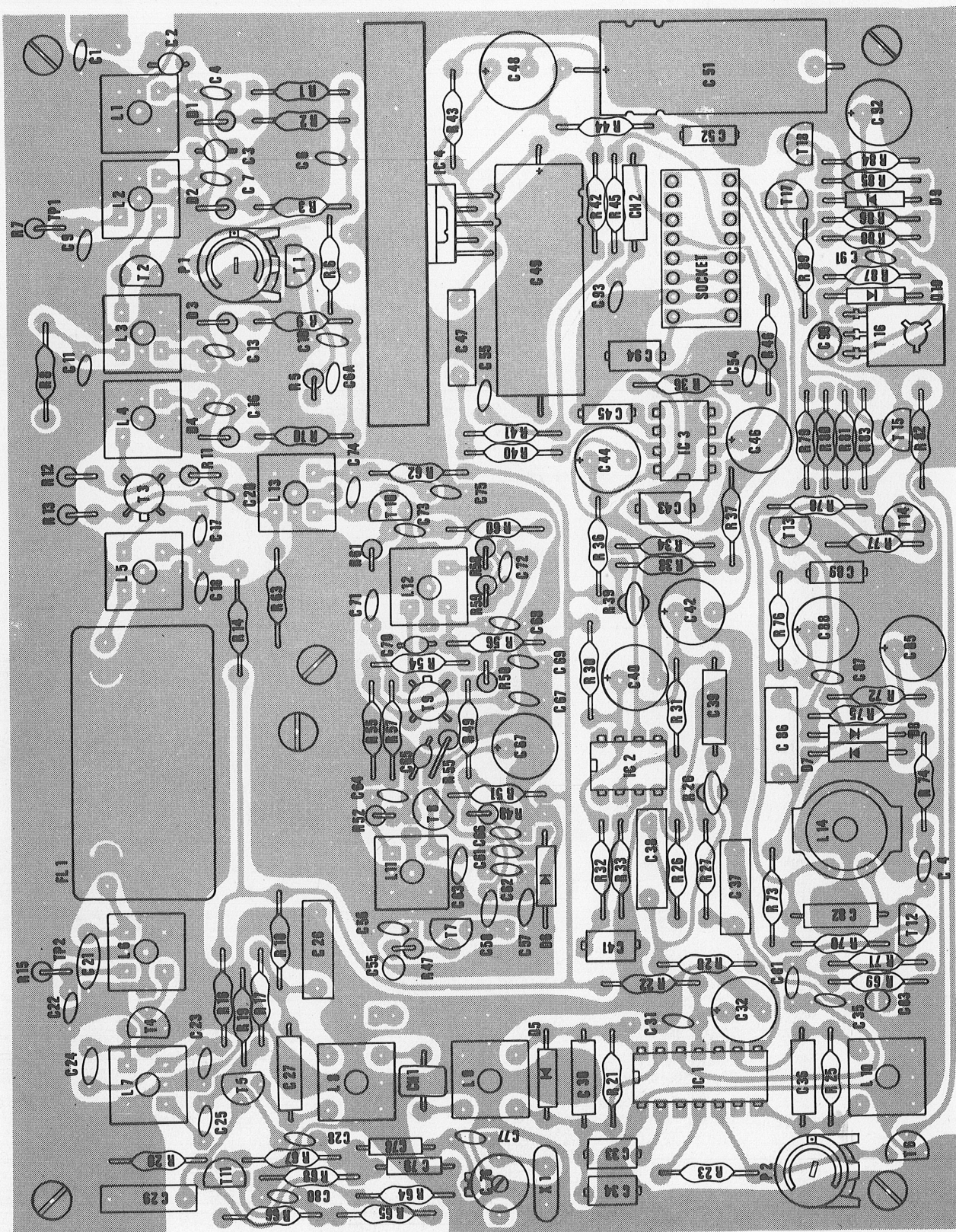
5.5.1 RECEIVER 002.0448

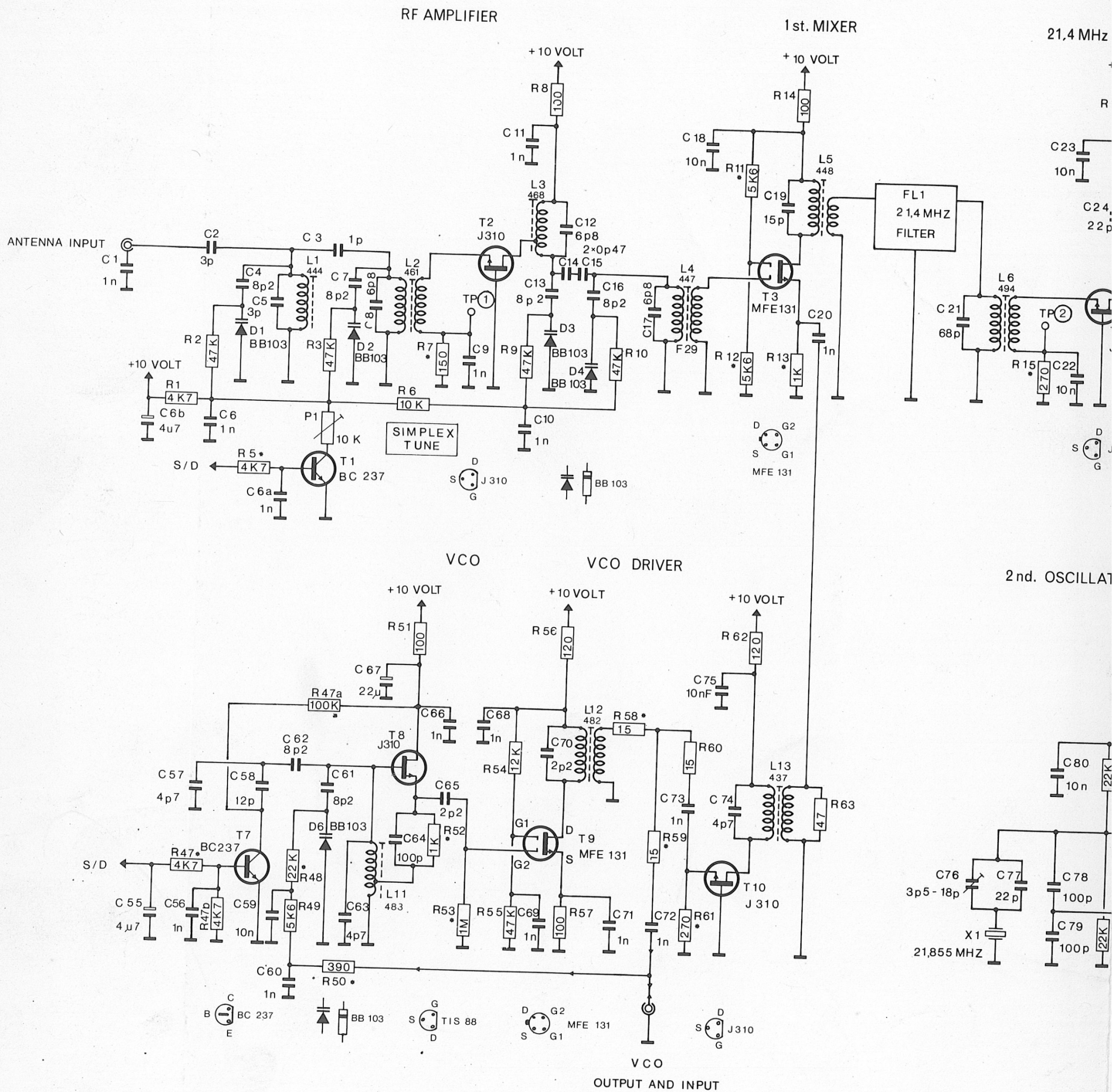
R1	Resistor	4,7 kohm	5%	0.33W	01.157
R2	Resistor	47 kohm	5%	0.33W	01.169
R3	Resistor	47 kohm	5%	0.33W	01.169
R4	Not used				
R5	Resistor	4,7 kohm	5%	0.33W	01.257
R6	Resistor	10 kohm	5%	0.33W	01.161
R7	Resistor	150 ohm	5%	0.33W	01.239
R8	Resistor	100 ohm	5%	0.33W	01.137
R9	Resistor	47 kohm	5%	0.33W	01.169
R10	Resistor	47 kohm	5%	0.33W	01.169
R11	Resistor	5,6 kohm	5%	0.33W	01.258
R12	Resistor	5,6 kohm	5%	0.33W	01.258
R13	Resistor	1 kohm	5%	0.33W	01.249
R14	Resistor	100 ohm	5%	0.33W	01.137
R15	Resistor	270 ohm	5%	0.33W	01.242
R16	Resistor	100 ohm	5%	0.33W	01.137
R17	Resistor	8,2 kohm	5%	0.33W	01.160
R18	Resistor	100 ohm	5%	0.33W	01.137
R19	Resistor	10 kohm	5%	0.33W	01.161
R20	Resistor	1 kohm	5%	0.33W	01.149
R21	Resistor	12 kohm	5%	0.33W	01.162
R22	Resistor	100 ohm	5%	0.33W	01.137
R23	Resistor	2,2 kohm	5%	0.33W	01.153
R24	Not used				
R25	Resistor	4,7 kohm	5%	0.33W	01.157
R26	Resistor	2 kohm		NTC	03.103
R27	Resistor	680 ohm	5%	0.33W	01.147
R28	Resistor	10 kohm	5%	0.33W	01.161
R29	Resistor	2,7 kohm	5%	0.33W	01.154
R30	Resistor	100 ohm	5%	0.33W	01.137
R31	Resistor	220 kohm	5%	0.33W	01.177
R32	Resistor	56 kohm	5%	0.33W	01.170
R33	Resistor	56 kohm	5%	0.33W	01.170
R34	Resistor	47 kohm	5%	0.33W	01.169
R35	Resistor	100 ohm	5%	0.33W	01.137
R36	Resistor	15 kohm	5%	0.33W	01.163
R37	Resistor	1,5 kohm	5%	0.33W	01.151
R38	Resistor	4,7 kohm	5%	0.33W	01.157
R39	Resistor	2 kohm		NTC	03.103
R40	Resistor	1 kohm	5%	0.33W	01.149
R41	Resistor	4,7 kohm	5%	0.33W	01.157
R42	Resistor	2,2 ohm	5%	0.33W	01.117
R43	Resistor	220 ohm	5%	0.33W	01.141
R44	Resistor	1 ohm	5%	0.33W	01.113
R45	Resistor	4,7 kohm	5%	0.33W	01.157
R46	Resistor	1 kohm	5%	0.33W	01.149
R47	Resistor	4,7 kohm	5%	0.33W	01.257
R47a	Resistor	100 kohm	5%	0.33W	01.273
R47b	Resistor	4,7 kohm	5%	0.33W	01.157
R48	Resistor	22 kohm	5%	0.33W	01.265
R49	Resistor	5,6 kohm	5%	0.33W	01.158
R50	Resistor	390 ohm	5%	0.33W	01.244
R51	Resistor	100 ohm	5%	0.33W	01.137
R52	Resistor	1 kohm	5%	0.33W	01.249
R53	Resistor	1 Mohm	5%	0.33W	01.285
R54	Resistor	12 kohm	5%	0.33W	01.162
R55	Resistor	47 kohm	5%	0.33W	01.169
R56	Resistor	120 ohm	5%	0.33W	01.138
R57	Resistor	100 ohm	5%	0.33W	01.137
R58	Resistor	15 ohm	5%	0.33W	01.227
R59	Resistor	15 ohm	5%	0.33W	01.227
R60	Resistor	15 ohm	5%	0.33W	01.127
R61	Resistor	270 ohm	5%	0.33W	01.242
R62	Resistor	120 ohm	5%	0.33W	01.138
R63	Resistor	47 ohm	5%	0.33W	01.133
R64	Resistor	22 kohm	5%	0.33W	01.165
R65	Resistor	22 kohm	5%	0.33W	01.165
R66	Resistor	4,7 kohm	5%	0.33W	01.157
R67	Resistor	10 ohm	5%	0.33W	01.125
R68	Resistor	1 kohm	5%	0.33W	01.149
R69	Resistor	4,7 kohm	5%	0.33W	01.157
R70	Resistor	47 kohm	5%	0.33W	01.169
R71	Resistor	2,2 kohm	5%	0.33W	01.153
R72	Resistor	470 ohm	5%	0.33W	01.145
R73	Resistor	5,6 kohm	5%	0.33W	01.158
R74	Resistor	22 kohm	5%	0.33W	01.165
R75	Resistor	100 kohm	5%	0.33W	01.173
R76	Resistor	22 kohm	5%	0.33W	01.165
R77	Resistor	100 ohm	5%	0.33W	01.137
R78	Resistor	3,3 kohm	5%	0.33W	01.155
R79	Resistor	120 ohm	5%	0.33W	01.138
R80	Resistor	3,3 kohm	5%	0.33W	01.155
R81	Resistor	3,3 kohm	5%	0.33W	01.155
R82	Resistor	4,7 kohm	5%	0.33W	01.157
R83	Resistor	820 ohm	5%	0.33W	01.148
R84	Resistor	82 ohm	5%	0.33W	01.136

R85	Resistor	120 ohm	5%	0.33W	01.138
R86	Resistor	10 kohm	5%	0.33W	01.161
R87	Resistor	1 kohm	5%	0.33W	01.149
R88	Resistor	10 kohm	5%	0.33W	01.161
R89	Resistor	470 ohm	5%	0.33W	01.145
P1	Potentiometer	10 kohm			04.161
P2	Potentiometer	10 kohm			04.161
C1	Capacitor,cer	1 nF	40V		14.902
C2	Capacitor,cer	3,0 pF			14.219
C2a	Not used				
C3	Capacitor,cer	1 pF	250V		14.113
C4	Capacitor,cer	8,2 pF			14.124
C5	Capacitro,cer	3,0 pF			14.219
C6	Capacitor, cer	1 nF			14.902
C6a	Capacitor, cer	1 nF			14.902
C6b	Capacitor, tantal	4,7 uF			13.121
C7	Capacitor, cer	8,2 pF			14.124
C8	Capacitor, cer	6,8 pF			14.123
C9	Capacitor, cer	1 nF			14.902
C10	Capacitor, cer	1 nF			14.902
C11	Capacitor, cer	1 nF			14.902
C12	Capacitor, cer	6,8 pF			14.123
C13	Capacitor, cer	8,2 pF			14.124
C14	Capacitor, cer	0,47 pF			14.109
C15	Capacitor, cer	0,47 pF			14.109
C16	Capacitor, cer	8,2 pF			14.124
C17	Capacitor, cer	6,8 nF			14.123
C18	Capacitor, cer	10 nF			14.907
C19	Capacitor, cer	15 pF			14.127
C20	Capacitor, cer	1 nF			14.902
C21	Capacitor, cer	68 pF			16.369
C22	Capacitor, cer	10 nF			14.907
C23	Capacitor, cer	10 nF			14.907
C24	Capacitor, cer	22 pF			14.129
C25	Capacitor,cer	10 nF			14.907
C26	Capacitor,poly	68 nF			11.223
C27	Capacitor,sty	2,2 nF	5%		10.157
C28	Capacitor,cer	6,8 pF			14.123
C29	Capacitor,poly	68 nF	250V		11.223
C30	Capacitor,sty	2,2 nF			10.157
C31	Capacitor,cer	10 nF			14.907
C32	Capacitor,ellyt	10 uF	63V		12.625
C33	Capacitor,poly	220 nF			11.101
C34	Capacitor,poly	220 nF			11.101
C35	Capacitor,cer	1 nF			14.902
C36	Capacitor,sty	2,2 nF			10.157
C37	Capacitor,poly	22 nF			11.317
C38	Capacitor,poly	47 nF	250V		11.221
C39	Capacitor,sty	2,7 nF			10.159
C40	Capacitor,ellyt	10 uF	63V		12.625
C41	Capacitor,poly	220 nF			11.101
C42	Capacitor,ellyt	10 uF	63V		12.625
C43	Capacitor,poly	220 nF			11.101
C44	Capacitor,ellyt	10 uF	63V		12.625
C45	Capacitor,poly	3,3 nF			11.104
C46	Capacitor,ellyt	10 uF	63V		12.625
C47	Capacitor,poly	22 nF			11.317
C48	Capacitor,ellyt	100 uF	25V		12.399
C49	Capacitor,ellyt	1000 uF	16V		12.249
C50	Not used				
C51	Capacitor,ellyt	1000 uF	16V		12.249
C52	Capacitor,poly	100 nF			11.103
C53	Capacitor,cer	1 nF			14.902
C54	Capacitor,cer	1 nF			14.902
C55	Capacitor,tantal	4,7 uF	16V		13.121
C56	Capacitor,cer	1 nF			14.902
C57	Capacitor,cer	4,7 pF			14.121
C58	Capacitor,cer	12 pF			14.126
C59	Capacitor,cer	10 nF			14.907
C60	Capacitor,cer	1 nF			14.902
C61	Capacitor,cer	6,8 pF	P 100		14.123
C62	Capacitor,cer	8,2 pF	P 100		14.151
C63	Capacitor,cer	4,7 pF			14.121
C64	Capacitor,cer	100 pF			16.373
C65	Capacitor,cer	2,2 pF			14.117
C66	Capacitor,cer	1 nF			14.902
C67	Capacitor,ellyt	22 uF	40V		12.429
C68	Capacitor,cer	1 nF			14.902
C69	Capacitor,cer	1 nF			14.902
C70	Capacitor,cer	2,2 pF			14.117
C71	Capacitor,cer	1 nF			14.902
C72	Capacitor,cer	1 nF			14.902
C73	Capacitor,cer	1 nF			14.902
C74	Capacitor,cer	4,7 pF			14.121
C75	Capacitor,cer	10 nF			14.907
C76	Capacitor,trimmer	3,5-18 pF			17.101
C77	Capacitor,cer	22 pF			14.129
C78	Capacitor,sty	100 pF	5%		10.125
C79	Capacitor,sty	100 pF	5%		10.125
C80	Capacitor,cer	10 nF			14.907

C81	Capacitor,cer	1 nF		14.902
C82	Capacitor,sty	1 nF		10.149
C83	Capacitor,tantal	4,7 uF	16V	13.121
C84	Capacitor,cer	1 nF		14.902
C85	Capacitor,ellyt	10 uF	63V	12.625
C86	Capacitor,poly	68 nF		11.223
C87	Capacitor,cer	10 nF	30V	14.907
C88	Capacitor,ellyt	10 uF	63V	12.625
C89	Capacitor,poly	100 nF		11.103
C90	Capacitor,tantal	22 uF	16V	13.129
C91	Capacitor,cer	10 nF		14.907
C92	Capacitor,ellyt	10 uF	63V	12.625
C93	Capacitor,cer	1 nF		14.902
C94	Capacitor,poly	220 nF		11.101
D1	Diode	BB 103	Cap	39.401
D2	Diode	BB 103	Cap	39.401
D3	Diode	BB 103	Cap	39.401
D4	Diode	BB 103	Cap	39.401
D5	Diode	AA 116		39.102
D6	Diode	BB 103	Cap	39.401
D7	Diode	AA 116		39.102
D8	Diode	AA 116		39.102
D9	Diode	8,2V	Jen	39.708
D10	Diode	IN 4148		39.103
T1	Transistor	BC 237		32.101
T2	Transistor	J 310		34.107
T3	Transistor	MFE 131		34.108
T4	Transistor	J 310		34.107
T5	Transistor	BF 199		33.102
T6	Transistor	BC 237		32.101
T7	Transistor	BC 237		32.101
T8	Transistor	J 310		34.107
T9	Transistor	MFE 131		34.108
T10	Transistor	J 310		34.107
T11	Transistor	BF 199		33.102
T12	Transistor	BC 237		32.101
T13	Transistor	BC 307		32.102
T14	Transistor	BC 237		32.101
T15	Transistor	BC 237		32.101
T16	Transistor	BD 140		30.102
T17	Transistor	BC 237		32.101
T18	Transistor	BC 237		32.101
FL1	Crystal filter	21,4 MHz		50.207
X1	Crystal	21,855 MHz		50.115
IC1	Integrated circuit	TBA 120V		35.107
IC2	Integrated circuit	uA 741		35.106
IC3	Integrated circuit	MC 3340P		35.109
IC4	Integrated circuit	TDA 2002		35.108
CH1	1 pcs. 6 holeferritebite silverwire			76.110
CH2	Choke			004.0405
L1	Coil			004.0444
L2	Coil			004.0461
L3	Coil			004.0468
L4	Coil			004.0447
L5	Coil			004.0448
L6	Coil			004.0494
L7	Coil			004.0450
L8	Coil			004.0424
L9	Coil			004.0424
L10	Coil			004.0425
L11	Coil			004.0483
L12	Coil			004.0482
L13	Coil			004.0437
L14	Coil			004.0426

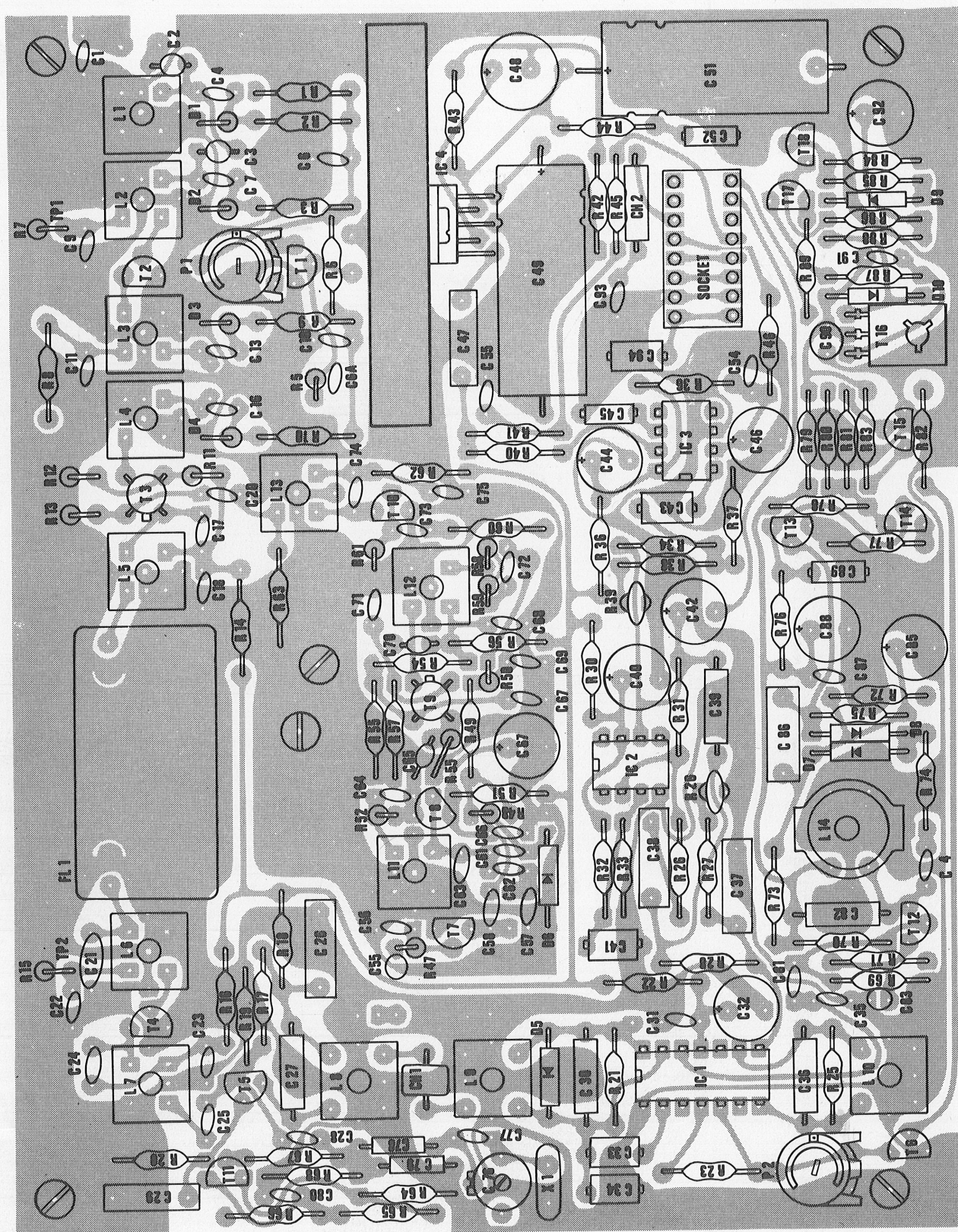
5.5.2 COMPONENT LAY OUT FOR RECEIVER







5.5.2 COMPONENT LAY OUT FOR RECEIVER



RECEIVED 003 0445

C81	Capacitor,cer	1 nF		14.902
C82	Capacitor,sty	1 nF		10.149
C83	Capacitor,tantal	4,7 uF	16V	13.121
C84	Capacitor,cer	1 nF		14.902
C85	Capacitor,ellyt	10 uF	63V	12.625
C86	Capacitor,poly	68 nF		11.223
C87	Capacitor,cer	10 nF	30V	14.907
C88	Capacitor,ellyt	10 uF	63V	12.625
C89	Capacitor,poly	100 nF		11.103
C90	Capacitor,tantal	22 uF	16V	13.129
C91	Capacitor,cer	10 nF		14.907
C92	Capacitor,ellyt	10 uF	63V	12.625
C93	Capacitor,cer	1 nF		14.902
C94	Capacitor,poly	220 nF		11.101
D1	Diode	BB 103	Cap	39.401
D2	Diode	BB 103	Cap	39.401
D3	Diode	BB 103	Cap	39.401
D4	Diode	BB 103	Cap	39.401
D5	Diode	AA 116		39.102
D6	Diode	BB 103	Cap	39.401
D7	Diode	AA 116		39.102
D8	Diode	AA 116		39.102
D9	Diode	AA 116		39.102
D10	Diode	8,2V	Jen	39.708
		IN 4148		39.103
T1	Transistor	BC 237		32.101
T2	Transistor	J 310		34.107
T3	Transistor	MFE 131		34.108
T4	Transistor	J 310		34.107
T5	Transistor	BF 199		33.102
T6	Transistor	BC 237		32.101
T7	Transistor	BC 237		32.101
T8	Transistor	J 310		34.107
T9	Transistor	MFE 131		34.108
T10	Transistor	J 310		34.107
T11	Transistor	BF 199		33.102
T12	Transistor	BC 237		32.101
T13	Transistor	BC 307		32.102
T14	Transistor	BC 237		32.101
T15	Transistor	BC 237		32.101
T16	Transistor	BD 140		30.102
T17	Transistor	BC 237		32.101
T18	Transistor	BC 237		32.101
FL1	Crystal filter	21,4 MHz		50.207
X1	Crystal	21,855 MHz		50.115
IC1	Integrated circuit	TBA 120V		35.107
IC2	Integrated circuit	uA 741		35.106
IC3	Integrated circuit	MC 3340P		35.109
IC4	Integrated circuit	TDA 2002		35.108
CH1	1 pcs. 6 holeferritebite silverwire			
	0,5 mm 4cm			
CH2	Choke			76.110
L1	Coil			004.0405
L2	Coil			004.0444
L3	Coil			004.0461
L4	Coil			004.0468
L5	Coil			004.0447
L6	Coil			004.0448
L7	Coil			004.0494
L8	Coil			004.0450
L9	Coil			004.0424
L10	Coil			004.0424
L11	Coil			004.0425
L12	Coil			004.0483
L13	Coil			004.0482
L14	Coil			004.0437
				004.0426

5.5.1 RECEIVER 002.0448

R1	Resistor	4,7 kohm	5%	0.33W	01.157
R2	Resistor	47 kohm	5%	0.33W	01.169
R3	Resistor	47 kohm	5%	0.33W	01.169
R4	Not used				
R5	Resistor	4,7 kohm	5%	0.33W	01.257
R6	Resistor	10 kohm	5%	0.33W	01.161
R7	Resistor	150 ohm	5%	0.33W	01.239
R8	Resistor	100 ohm	5%	0.33W	01.137
R9	Resistor	47 kohm	5%	0.33W	01.169
R10	Resistor	47 kohm	5%	0.33W	01.169
R11	Resistor	5,6 kohm	5%	0.33W	01.258
R12	Resistor	5,6 kohm	5%	0.33W	01.258
R13	Resistor	1 kohm	5%	0.33W	01.249
R14	Resistor	100 ohm	5%	0.33W	01.137
R15	Resistor	270 ohm	5%	0.33W	01.242
R16	Resistor	100 ohm	5%	0.33W	01.137
R17	Resistor	8,2 kohm	5%	0.33W	01.160
R18	Resistor	100 ohm	5%	0.33W	01.137
R19	Resistor	10 kohm	5%	0.33W	01.161
R20	Resistor	1 kohm	5%	0.33W	01.149
R21	Resistor	12 kohm	5%	0.33W	01.162
R22	Resistor	100 ohm	5%	0.33W	01.137
R23	Resistor	2,2 kohm	5%	0.33W	01.153
R24	Not used				
R25	Resistor	4,7 kohm	5%	0.33W	01.157
R26	Resistor	2 kohm		NTC	03.103
R27	Resistor	680 ohm	5%	0.33W	01.147
R28	Resistor	10 kohm	5%	0.33W	01.161
R29	Resistor	2,7 kohm	5%	0.33W	01.154
R30	Resistor	100 ohm	5%	0.33W	01.137
R31	Resistor	220 kohm	5%	0.33W	01.177
R32	Resistor	56 kohm	5%	0.33W	01.170
R33	Resistor	56 kohm	5%	0.33W	01.170
R34	Resistor	47 kohm	5%	0.33W	01.169
R35	Resistor	100 ohm	5%	0.33W	01.137
R36	Resistor	15 kohm	5%	0.33W	01.163
R37	Resistor	1,5 kohm	5%	0.33W	01.151
R38	Resistor	4,7 kohm	5%	0.33W	01.157
R39	Resistor	2 kohm		NTC	03.103
R40	Resistor	1 kohm	5%	0.33W	01.149
R41	Resistor	4,7 kohm	5%	0.33W	01.157
R42	Resistor	2,2 ohm	5%	0.33W	01.117
R43	Resistor	220 ohm	5%	0.33W	01.141
R44	Resistor	1 ohm	5%	0.33W	01.113
R45	Resistor	4,7 kohm	5%	0.33W	01.157
R46	Resistor	1 kohm	5%	0.33W	01.149
R47	Resistor	4,7 kohm	5%	0.33W	01.257
R47a	Resistor	100 kohm	5%	0.33W	01.273
R47b	Resistor	4,7 kohm	5%	0.33W	01.157
R48	Resistor	22 kohm	5%	0.33W	01.265
R49	Resistor	5,6 kohm	5%	0.33W	01.158
R50	Resistor	390 ohm	5%	0.33W	01.244
R51	Resistor	100 ohm	5%	0.33W	01.137
R52	Resistor	1 kohm	5%	0.33W	01.249
R53	Resistor	1 Mohm	5%	0.33W	01.285
R54	Resistor	12 kohm	5%	0.33W	01.162
R55	Resistor	47 kohm	5%	0.33W	01.169
R56	Resistor	120 ohm	5%	0.33W	01.138
R57	Resistor	100 ohm	5%	0.33W	01.137
R58	Resistor	15 ohm	5%	0.33W	01.227
R59	Resistor	15 ohm	5%	0.33W	01.227
R60	Resistor	15 ohm	5%	0.33W	01.127
R61	Resistor	270 ohm	5%	0.33W	01.242
R62	Resistor	120 ohm	5%	0.33W	01.138
R63	Resistor	47 ohm	5%	0.33W	01.133
R64	Resistor	22 kohm	5%	0.33W	01.165
R65	Resistor	22 kohm	5%	0.33W	01.165
R66	Resistor	4,7 kohm	5%	0.33W	01.157
R67	Resistor	10 ohm	5%	0.33W	01.125
R68	Resistor	1 kohm	5%	0.33W	01.149
R69	Resistor	4,7 kohm	5%	0.33W	01.157
R70	Resistor	47 kohm	5%	0.33W	01.169
R71	Resistor	2,2 kohm	5%	0.33W	01.153
R72	Resistor	470 ohm	5%	0.33W	01.145
R73	Resistor	5,6 kohm	5%	0.33W	01.158
R74	Resistor	22 kohm	5%	0.33W	01.165
R75	Resistor	100 kohm	5%	0.33W	01.173
R76	Resistor	22 kohm	5%	0.33W	01.165
R77	Resistor	100 ohm	5%	0.33W	01.137
R78	Resistor	3,3 kohm	5%	0.33W	01.155
R79	Resistor	120 ohm	5%	0.33W	01.138
R80	Resistor	3,3 kohm	5%	0.33W	01.155
R81	Resistor	3,3 kohm	5%	0.33W	01.155
R82	Resistor	4,7 kohm	5%	0.33W	01.157
R83	Resistor	820 ohm	5%	0.33W	01.148
R84	Resistor	82 ohm	5%	0.33W	01.136

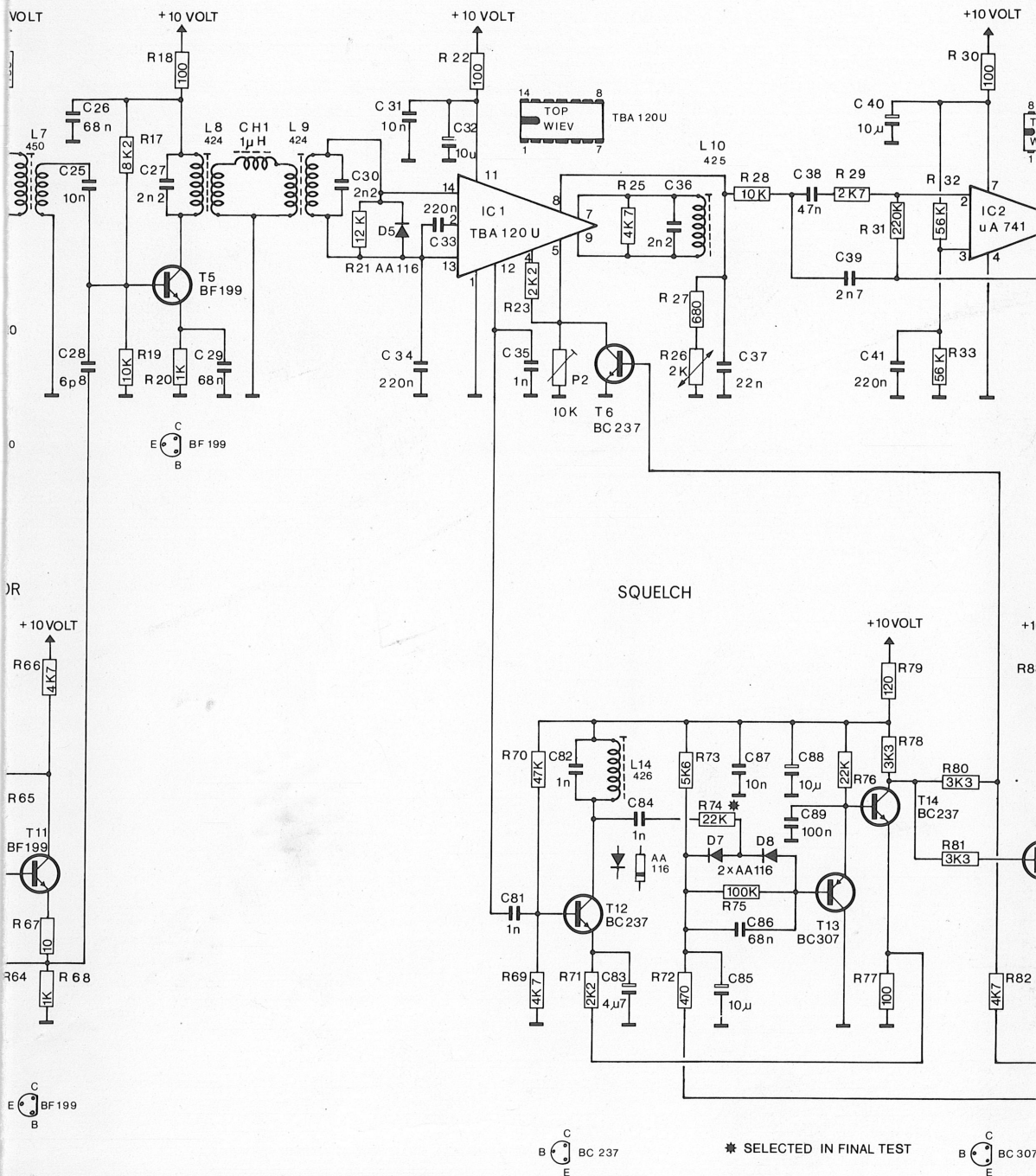
R85	Resistor	120 ohm	5%	0.33W	01.161
R86	Resistor	10 kohm	5%	0.33W	01.149
R87	Resistor	1 kohm	5%	0.33W	01.161
R88	Resistor	10 kohm	5%	0.33W	01.145
R89	Resistor	470 ohm	5%	0.33W	01.145
P1	Potentiometer	10 kohm			04.161
P2	Potentiometer	10 kohm			04.161
C1	Capacitor,cer	1 nF	40V		14.902
C2	Capacitor,cer	3,0 pF			14.219
C2a	Not used				
C3	Capacitor,cer	1 pF	250V		14.113
C4	Capacitor,cer	8,2 pF			14.124
C5	Capacitor,cer	3,0 pF			14.219
C6	Capacitor,cer	1 nF			14.902
C6a	Capacitor,cer	1 nF			14.902
C6b	Capacitor,tantal	4,7 uF			13.121
C7	Capacitor,cer	8,2 pF			14.124
C8	Capacitor,cer	6,8 pF			14.123
C9	Capacitor,cer	1 nF			14.902
C10	Capacitor,cer	1 nF			14.902
C11	Capacitor,cer	1 nF			14.902
C12	Capacitor,cer	6,8 pF			14.123
C13	Capacitor,cer	8,2 pF			14.124
C14	Capacitor,cer	0,47 pF			14.109
C15	Capacitor,cer	0,47 pF			14.109
C16	Capacitor,cer	8,2 pF			14.124
C17	Capacitor,cer	6,8 nF			14.123
C18	Capacitor,cer	10 nF			14.907
C19	Capacitor,cer	15 pF			14.127
C20	Capacitor,cer	1 nF			14.902
C21	Capacitor,cer	68 pF			16.369
C22	Capacitor,cer	10 nF			14.907
C23	Capacitor,cer	10 nF			14.907
C24	Capacitor,cer	22 pF			14.129
C25	Capacitor,cer	10 nF			14.907
C26	Capacitor,poly	68 nF			11.223
C27	Capacitor,sty	2,2 nF	5%		10.157
C28	Capacitor,cer	6,8 pF			14.123
C29	Capacitor,poly	68 nF	250V		11.223
C30	Capacitor,sty	2,2 nF			10.157
C31	Capacitor,cer	10 nF			14.907
C32	Capacitor,cer	10 uF	63V		12.625
C33	Capacitor,ellyt	220 nF			11.101
C34	Capacitor,poly	220 nF			11.101
C35	Capacitor,cer	1 nF			14.902
C36	Capacitor,sty	2,2 nF			10.157
C37	Capacitor,poly	22 nF			11.317
C38	Capacitor,poly	47 nF	250V		11.221
C39	Capacitor,sty	2,7 nF			10.159
C40	Capacitor,ellyt	10 uF	63V		12.625
C41	Capacitor,poly	220 nF			11.101
C42	Capacitor,ellyt	10 uF	63V		12.625
C43	Capacitor,poly	220 nF			11.101
C44	Capacitor,ellyt	10 uF	63V		12.625
C45	Capacitor,poly	3,3 nF			11.104
C46	Capacitor,ellyt	10 uF	63V		12.625
C47	Capacitor,poly	22 nF			11.317
C48	Capacitor,ellyt	100 uF	25V		12.399
C49	Capacitor,ellyt	1000 uF	16V		12.249
C50	Not used				
C51	Capacitor,ellyt	1000 uF	16V		12.249
C52	Capacitor,poly	100 nF			11.103
C53	Capacitor,cer	1 nF			14.902
C54	Capacitor,cer	1 nF			14.902
C55	Capacitor,tantal	4,7 uF	16V		13.121
C56	Capacitor,cer	1 nF			14.902
C57	Capacitor,cer	4,7 pF			14.121
C58	Capacitor,cer	12 pF			14.126
C59	Capacitor,cer	10 nF			14.907
C60	Capacitor,cer	1 nF			14.902
C61	Capacitor,cer	6,8 pF	P 100		14.123
C62	Capacitor,cer	8,2 pF	P 100		14.151
C63	Capacitor,cer	4,7 pF			14.121
C64	Capacitor,cer	100 pF			16.373
C65	Capacitor,cer	2,2 pF			14.117
C66	Capacitor,cer	1 nF			14.902
C67	Capacitor,ellyt	22 uF	40V		12.429
C68	Capacitor,cer	1 nF			14.902
C69	Capacitor,cer	1 nF			14.902
C70	Capacitor,cer	2,2 pF			14.117
C71	Capacitor,cer	1 nF			14.902
C72	Capacitor,cer	1 nF			14.902
C73	Capacitor,cer	1 nF			14.121
C74	Capacitor,cer	4,7 pF			14.907
C75	Capacitor,cer	10 nF			17.101
C76	Capacitor,trimmer	3,5-18 pF			14.129
C77	Capacitor,cer	22 pF			10.125
C78	Capacitor,sty	100 pF	5%		10.125
C79	Capacitor,sty	100 pF	5%		14.907
C80	Capacitor,cer	10 nF			

IF AMPLIFIER

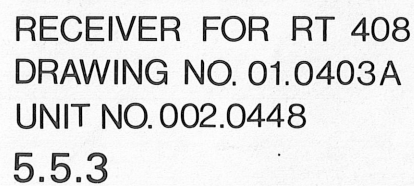
2nd. MIXER

2nd IF AMPLIFIER & DETECTOR

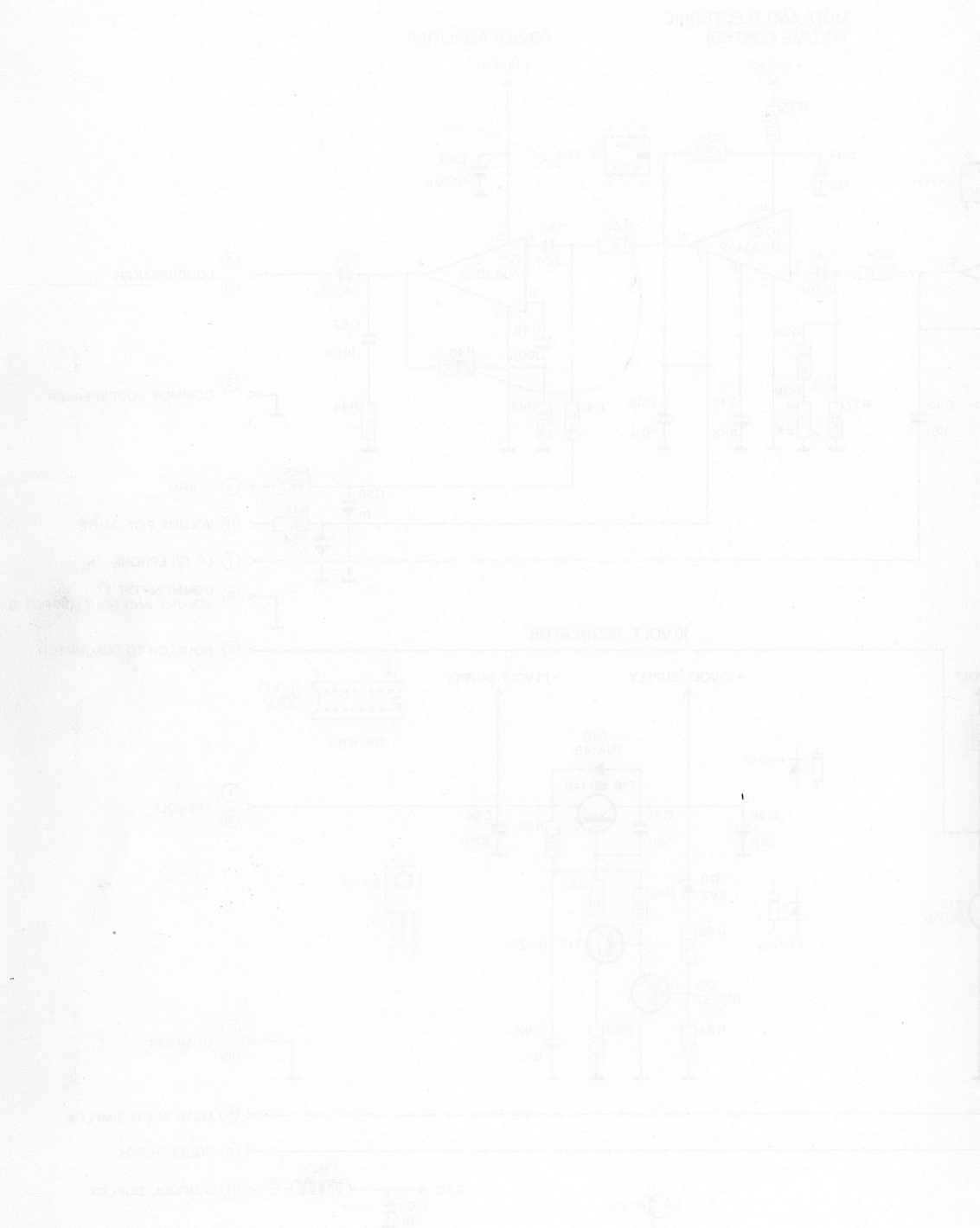
AF - PRE AMPLIFI



* SELECTED IN FINAL TEST



RECEIVER FOR RT 408
DRAWING NO. 01.0403A
UNIT NO. 002.0448
5.5.3



RECEIVER FOR RT 408
 DRAWING NO. 010403A
 UNIT NO. 002,0418
 B.5.3

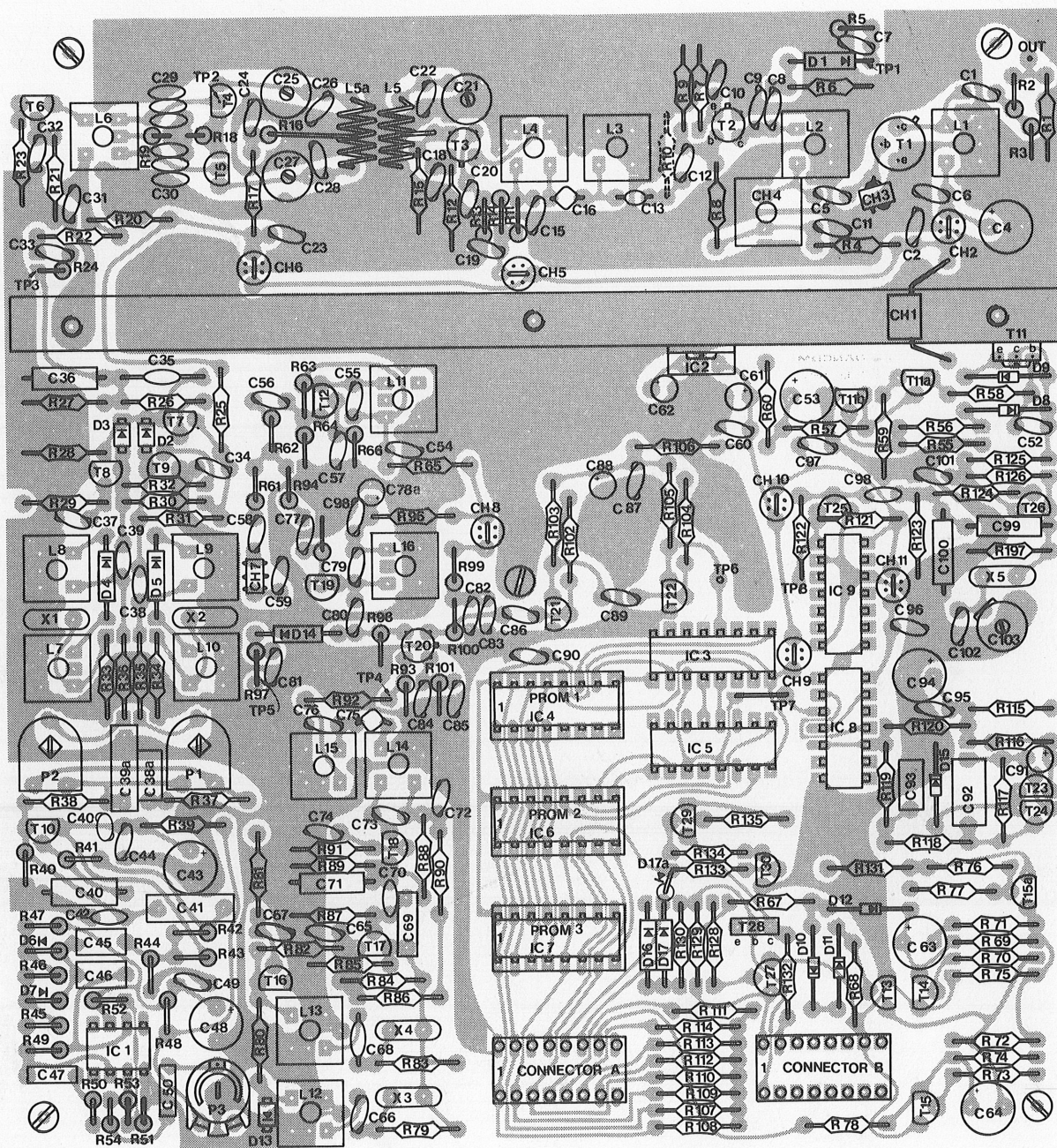
5.6.1 EXCITER 002.0447

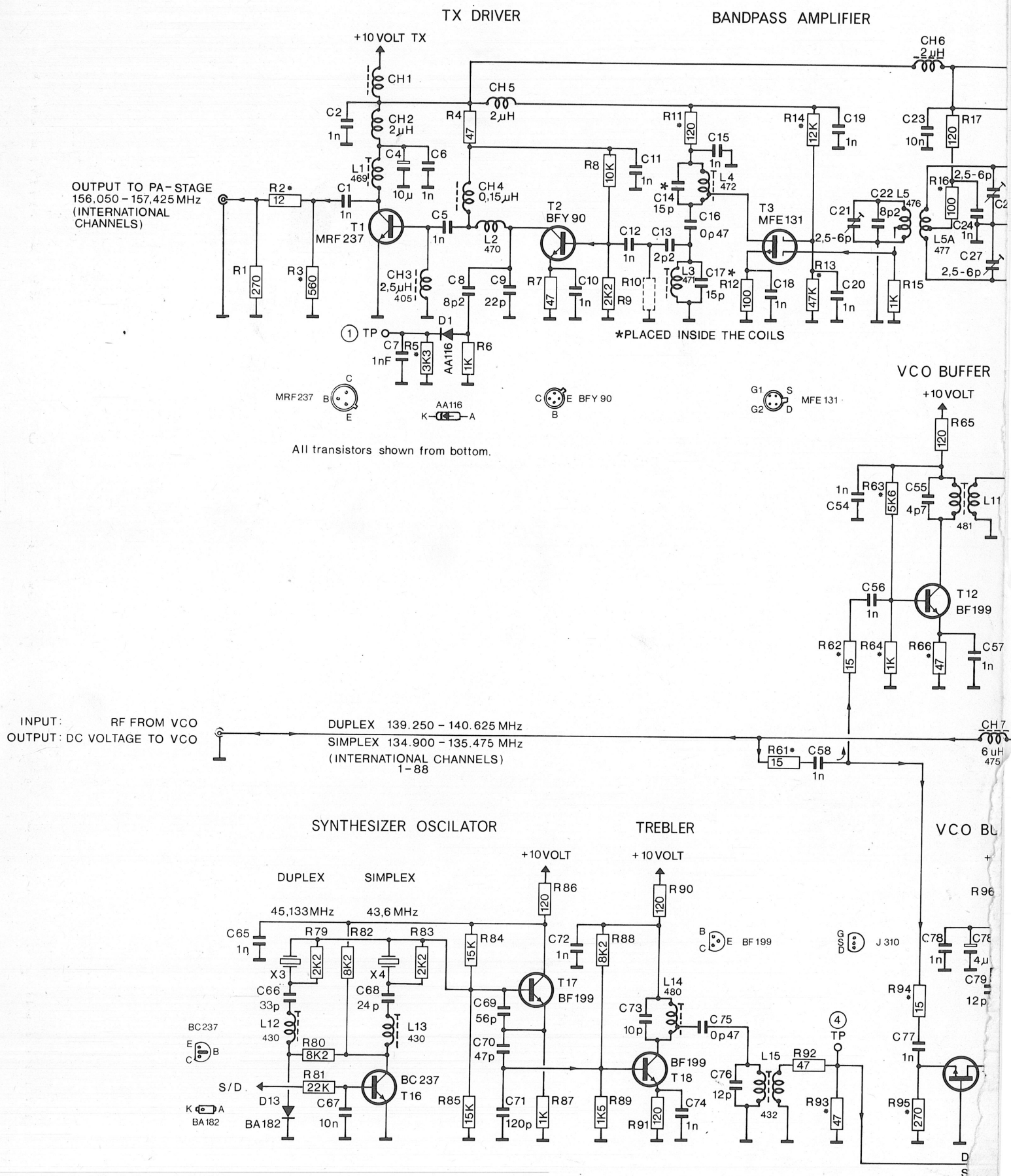
RESISTORS

R1	Resistor	270 ohm	5%	0.33W	01.142
R2	Resistor	12 ohm	5%	0.33W	01.226
R3	Resistor	560 ohm	5%	0.33W	01.246
R4	Resistor	47 ohm	5%	0.33W	01.133
R5	Resistor	3,3 kohm	5%	0.33W	01.255
R6	Resistor	1 kohm	5%	0.33W	01.149
R7	Resistor	47 ohm	5%	0.33W	01.133
R8	Resistor	10 kohm	5%	0.33W	01.161
R9	Resistor	2,2 kohm	5%	0.33W	01.153
R10	Not used				
R11	Resistor	120 ohm	5%	0.33W	01.238
R12	Resistor	100 ohm	5%	0.33W	01.137
R13	Resistor	47 kohm	5%	0.33W	01.269
R14	Resistor	12 kohm	5%	0.33W	01.262
R15	Resistor	1 kohm	5%	0.33W	01.149
R16	Resistor	100 ohm	5%	0.33W	01.237
R17	Resistor	120 ohm	5%	0.33W	01.138
R18	Resistor	47 ohm	5%	0.33W	01.233
R19	Resistor	470 ohm	5%	0.33W	01.245
R20	Resistor	120 ohm	5%	0.33W	01.138
R21	Resistor	100 ohm	5%	0.33W	01.137
R22	Resistor	1,2 kohm	5%	0.33W	01.150
R23	Resistor	470 ohm	5%	0.33W	01.145
R24	Resistor	56 ohm	5%	0.33W	01.234
R25	Resistor	120 ohm	5%	0.33W	01.138
R26	Resistor	22 ohm	5%	0.33W	01.129
R27	Resistor	1 kohm	5%	0.33W	01.149
R28	Resistor	4,7 kohm	5%	0.33W	01.157
R29	Resistor	22 kohm	5%	0.33W	01.165
R30	Resistor	4,7 kohm	5%	0.33W	01.157
R31	Resistor	4,7 kohm	5%	0.33W	01.157
R32	Resistor	18 kohm	5%	0.33W	01.164
R33	Resistor	2,2 kohm	5%	0.33W	01.153
R34	Resistor	2,2 kohm	5%	0.33W	01.153
R35	Resistor	10 kohm	5%	0.33W	01.161
R36	Resistor	10 kohm	5%	0.33W	01.161
R36a	Resistor	1,5 kohm	5%	0.33W	01.251
R37	Resistor	1,5 kohm	5%	0.33W	01.151
R38	Resistor	4,7 kohm	5%	0.33W	01.157
R39	Resistor	120 ohm	5%	0.33W	01.138
R40	Resistor	2,2 kohm	5%	0.33W	01.253
R41	Resistor	18 kohm	5%	0.33W	01.264
R42	Resistor	18 kohm	5%	0.33W	01.264
R43	Resistor	33 kohm	5%	0.33W	01.267
R44	Resistor	56 kohm	5%	0.33W	01.270
R45	Resistor	220 ohm	5%	0.33W	01.241
R46	Resistor	470 ohm	5%	0.33W	01.245
R47	Resistor	220 ohm	5%	0.33W	01.241
R48	Resistor	120 ohm	5%	0.33W	01.238
R49	Resistor	56 kohm	5%	0.33W	01.270
R50	Resistor	560 ohm	5%	0.33W	01.246
R51	Resistor	12 kohm	5%	0.33W	01.262
R52	Resistor	10 kohm	5%	0.33W	01.261
R53	Resistor	56 kohm	5%	0.33W	01.270
R54	Resistor	1 kohm	5%	0.33W	01.249
R55	Resistor	82 ohm	5%	0.33W	01.136
R56	Resistor	180 ohm	5%	0.33W	01.140
R57	Resistor	10 kohm	5%	0.33W	01.161
R58	Resistor	1 kohm	5%	0.33W	01.149
R59	Resistor	470 ohm	5%	0.33W	01.145
R60	Resistor	10 kohm	5%	0.33W	01.161
R61	Resistor	15 ohm	5%	0.33W	01.227
R62	Resistor	15 ohm	5%	0.33W	01.227
R63	Resistor	5,6 kohm	5%	0.33W	01.258
R64	Resistor	1 kohm	5%	0.33W	01.249
R65	Resistor	120 ohm	5%	0.33W	01.138
R66	Resistor	47 ohm	5%	0.33W	01.233
R67	Resistor	47 kohm	5%	0.33W	01.169
R68	Resistor	4,7 kohm	5%	0.33W	01.157
R69	Resistor	4,7 kohm	5%	0.33W	01.157
R70	Resistor	1 kohm	5%	0.33W	01.149
R71	Resistor	100 kohm	5%	0.33W	01.173
R72	Resistor	22 kohm	5%	0.33W	01.165
R73	Resistor	1 kohm	5%	0.33W	01.149
R74	Resistor	4,7 kohm	5%	0.33W	01.157
R75	Resistor	1 kohm	5%	0.33W	01.149
R76	Resistor	1 kohm	5%	0.33W	01.149
R77	Resistor	4,7 kohm	5%	0.33W	01.157
R78	Resistor	4,7 kohm	5%	0.33W	01.157
R79	Resistor	2,2 kohm	5%	0.33W	01.153
R80	Resistor	8,2 kohm	5%	0.33W	01.160
R81	Resistor	22 kohm	5%	0.33W	01.165
R82	Resistor	8,2 kohm	5%	0.33W	01.160
R83	Resistor	2,2 kohm	5%	0.33W	01.153
R84	Resistor	15 kohm	5%	0.33W	01.163
R85	Resistor	15 kohm	5%	0.33W	01.163
R86	Resistor	120 ohm	5%	0.33W	01.138
R87	Resistor	1 kohm	5%	0.33W	01.149
R88	Resistor	8,2 kohm	5%	0.33W	01.160
R89	Resistor	1,5 kohm	5%	0.33W	01.151
R90	Resistor	120 ohm	5%	0.33W	01.138
R91	Resistor	120 ohm	5%	0.33W	01.138
R92	Resistor	47 ohm	5%	0.33W	01.133
R93	Resistor	47 ohm	5%	0.33W	01.233
R94	Resistor	15 ohm	5%	0.33W	01.227
R95	Resistor	270 ohm	5%	0.33W	01.242
R96	Resistor	120 ohm	5%	0.33W	01.138
R97	Resistor	1 kohm	5%	0.33W	01.249
R98	Resistor	680 ohm	5%	0.33W	01.247
R99	Resistor	120 ohm	5%	0.33W	01.238
R100	Resistor	1 kohm	5%	0.33W	01.249
R101	Resistor	1 kohm	5%	0.33W	01.249
R102	Resistor	82 kohm	5%	0.33W	01.172
R103	Resistor	1 kohm	5%	0.33W	01.149
R104	Resistor	56 kohm	5%	0.33W	01.170
R105	Resistor	560 ohm	5%	0.33W	01.146
R106	Resistor	10 ohm	5%	0.33W	01.125
R107	Resistor	1 kohm	5%	0.33W	01.149
R108	Resistor	1 kohm	5%	0.33W	01.149
R109	Resistor	1 kohm	5%	0.33W	01.149
R110	Resistor	1 kohm	5%	0.33W	01.149
R111	Resistor	1 kohm	5%	0.33W	01.149
R112	Resistor	1 kohm	5%	0.33W	01.149
R113	Resistor	1 kohm	5%	0.33W	01.149
R114	Resistor	1 kohm	5%	0.33W	01.149
R115	Resistor	120 ohm	5%	0.33W	01.138
R116	Resistor	1 kohm	5%	0.33W	01.149
R117	Resistor	470 ohm	5%	0.33W	01.145
R118	Resistor	470 ohm	5%	0.33W	01.145
R119	Resistor	470 ohm	5%	0.33W	01.145
R120	Resistor	1 mohm	5%	0.33W	01.185
R121	Resistor	560 ohm	5%	0.33W	01.146
R122	Resistor	47 kohm	5%	0.33W	01.169
R123	Resistor	1 kohm	5%	0.33W	01.149
R124	Resistor	22 ohm	5%	0.33W	01.129
R125	Resistor	120 ohm	5%	0.33W	01.138
R126	Resistor	15 kohm	5%	0.33W	01.163
R127	Resistor	8,2 kohm	5%	0.33W	01.160
R128	Resistor	4,7 kohm	5%	0.33W	01.157
R129	Resistor	4,7 kohm	5%	0.33W	01.157
R130	Resistor	3,3 kohm	5%	0.33W	01.155
R131	Resistor	15 kohm	5%	0.33W	01.163
R132	Resistor	1,5 kohm	5%	0.33W	01.151
R133	Resistor	4,7 kohm	5%	0.33W	01.157
R134	Resistor	4,7 kohm	5%	0.33W	01.157
R135	Resistor	4,7 kohm	5%	0.33W	01.157
P1	Potentiometer	10 kohm	pre. set.		04.161
P2	Potentiometer	10 kohm	pre. set.		04.161
P3	Potentiometer	1 kohm	pre. set.		04.149
C1	Capacitor,cer	1nF	30V		14.902
C2	Capacitor,cer	1nF	30V		14.902
C3	Not used				
C4	Capacitor,ellyt	10 uF	63V		12.625
C5	Capacitor,cer	1 nF	30V		14.902
C6	Capacitor,cer	1 nF	30V		14.902
C7	Capacitor,cer	1 nF	30V		14.902
C8	Capacitor,cer	8,2 pF	N 150		14.124
C9	Capacitor,cer	22 pF	N 150		14.129
C10	Capacitor,cer	1 nF	30V		14.902
C11	Capacitor,cer	1 nF	30V		14.902
C12	Capacitor,cer	1 nF	30V		14.902
C13	Capacitor,cer	2,2 pF	NPO		14.117
C14	Not used				
C15	Capacitor,cer	1 nF	30V		14.902
C16	Capacitor,cer	0,47 pF	P 100		14.109
C17	Not used				
C18	Capacitor,cer	1 nF	30V		14.902
C19	Capacitor,cer	1 nF	30V		14.902
C20	Capacitor,cer	1 nF	30V		14.902
C21	Capacitor,var	2,5-6 pF	trimmer		17.105
C22	Capacitor,cer	8,2 pF	n 150		14.124
C23	Capacitor,cer	10 nF	30V		14.907
C24	Capacitor,cer	1 nF	30V		14.902
C25	Capacitor,var	2,5-6 pF	trimmer		17.105
C26	Capacitor,cer	15 pF	N 150		14.127
C27	Capacitor,var	2,5-6 pF	trimmer		17.105
C28	Capacitor,cer	15 pF	N 150		14.127
C29	Capacitor,cer	3 pcs 120 pF	N 150		16.381
C30	Capacitor,cer	3 pcs 120 pF	N 150		16.381
C31	Capacitor,cer	10 nF	30V		14.907
C32	Capacitor,cer	10 nF	30V		14.907
C33	Capacitor,cer	10 nF	30V		14.907
C34	Capacitor,cer	10 nF	30V		14.907
C35	Capacitor,cer	120 pF	N 750		14.338
C36	Capacitor,sty	270 pF			10.135
C37	Capacitor,cer	10 nF	30V		14.907
C38	Capacitor,cer	120 pF	N 750		14.338
C38a	Capacitor,poly	220 nF			11.101

C39	Capacitor,cer	120 pF	N750	14.338	T6	Transistor	BF 199	33.102
C39a	Capacitor,poly	6,8 nF		11.111	T7	Transistor	BF 199	33.102
C40	Capacitor,tantal	1 uF	35V	13.113	T8	Transistor	BC 237	32.101
C40a	Capacitor,sty	1000 pF		10.149	T9	Transistor	BC 237	32.101
C41	Capacitor,poly	6,8 nF		11.111	T10	Transistor	BC 237	32.101
C42	Capacitor,ker	100 pF	N 150	16.373	T11	Transistor	BD 140	30.102
C43	Capacitor,ellyt	10 uF	63V	12.625	T11a	Transistor	BC 237	32.101
C44	Capacitor,cer	10 nF	30V	14.907	T11b	Transistor	BC 237	32.101
C45	Capacitor,poly	220 nF		11.101	T12	Transistor	BF 199	33.102
C46	Capacitor,poly	220 nF		11.101	T12a	Transistor	BC 237	32.101
C47	Capacitor,poly	0,15uF		11.227	T13	Transistor	BC 237	32.101
C48	Capacitor,ellyt	10 uF	63V	12.625	T14	Transistor	BC 237	32.101
C49	Capacitor,cer	10 nF	30V	14.907	T15	Transistor	BC 237	32.101
C50	Capacitor,poly	100 nF		11.103	T15a	Transistor	BC 307	32.102
C51	Not used				T16	Transistor	BC 237	32.101
C52	Capacitor,cer	10 nF	30V	14.907	T17	Transistor	BF 199	33.102
C53	Capacitor,ellyt	10 uF	63V	12.625	T18	Transistor	BF 199	33.102
C54	Capacitor,cer	1 nF	30V	14.902	T19	Transistor	J 310	34.107
C55	Capacitor,cer	4,7 pF	N 150	14.121	T20	Transistor	MFE 131	34.108
C56	Capacitor,cer	1 nF	30V	14.902	T21	Transistor	BC 237	32.101
C57	Capacitor,cer	1 nF	30V	14.902	T22	Transistor	BC 237	32.101
C58	Capacitor,cer	1 nF	30V	14.902	T23	Transistor	BC 307	32.102
C59	Capacitor,cer	1 nF	30V	14.902	T24	Transistor	BC 237	32.101
C60	Capacitor,cer	10 nF	30V	14.907	T25	Transistor	BC 237	32.101
C61	Capacitor,tantal	10 uF	16V	13.125	T26	Transistor	BF 199	33.102
C62	Capacitor,tantal	10 uF	16V	13.125	T27	Transistor	BC 237	32.101
C63	Capacitor,ellyt	10 uF	63V	12.625	T28	Transistor	BD 140	30.102
C64	Capacitor,ellyt	10 uF	63V	12.625	T29	Transistor	BC 307	32.102
C65	Capacitor,cer	1 nF	30V	12.902	T30	Transistor	BC 237	32.101
C66	Capacitor,cer	33 pF	N 150	14.131				
C67	Capacitor,cer	10 nF	30V	14.907	IC1	Integrated circuit	UA 741	35.106
C68	Capacitor,cer	33 pF	N 150	14.131	IC2	Integrated circuit	7805 CP	35.205
C69	Capacitor,sty	56 pF		10.119	IC3	Integrated circuit	74193	36.107
C70	Capacitor,cer	47 pF	63 V	14.333	IC4	Integrated circuit	Prom 7611	36.830
C71	Capacitor,sty	120 pF		10.127	IC5	Integrated circuit	74193	36.107
C72	Capacitor,cer	1 nF	30V	14.902	IC6	Integrated circuit	Prom 7611	36.830
C73	Capacitor,cer	10 pF	N 150	14.125	IC7	Integrated circuit	Prom 7611	36.830
C74	Capacitor,cer	1 nF	30V	14.902	IC8	Integrated circuit	MC 4044	36.111
C75	Capacitor,cer	0,47 pF	P 100	14.109	IC9	Integrated circuit	SN 74 LS 393	36.152
C76	Capacitor,cer	10 pF	N 150	14.125				
C77	Capacitor,cer	1 nF	30V	14.902	X1	Crystal	16,8 MHz	50.106
C78	Capacitor,cer	1 nF	30V	14.902	X2	Crystal	21,4 MHz	50.107
C78a	Capacitor,tantal	4,7 uF		13.121	X3	Crystal	45,133 MHz	50.135
C79	Capacitor,cer	12 pF	N 150	14.126	X4	Crystal	43,6 MHz	50.134
C80	Capacitor,cer	1 nF	30V	14.902	X5	Crystal	6,4 MHz	50.108
C81	Capacitor,cer	1 nF	30V	14.902				
C82	Capacitor,cer	1 nF	30V	14.902	CH1	Choke		41.106
C83	Capacitor,cer	10 nF	30V	14.907	CH2	Choke		41.106
C84	Capacitor,cer	10 nF	30V	14.907	CH3	Choke		004.0405
C85	Capacitor,cer	1 nF	30V	14.902	CH4	Choke	0,15 uH	22.111
C86	Capacitor,cer	1 nF	30V	14.902	CH5	Choke		41.106
C87	Capacitor,cer	10 nF	30V	14.907	CH6	Choke		41.106
C88	Capacitor,tantal	4,7 uF	16V	13.121	CH7	Choke		004.0475
C89	Capacitor,cer	1 nF	30V	14.902	CH8	Choke		41.106
C90	Capacitor,cer	10 nF	30V	14.907	CH9	Choke		41.106
C91	Capacitor, tantal	4,7 uF	16V	13.121	CH10	Choke		41.106
C92	Capacitor, poly	470 nF		11.102	CH11	Choke		41.106
C93	Capacitor, poly	220 nF		11.101				
C94	Capacitor, ellyt	22 uF	40V	12.429	L1	Coil		004.0469
C95	Capacitor, cer	10 nF	30V	14.907	L2	Coil		004.0470
C96	Capacitor, cer	10 nF	30V	14.907	L3	Coil		004.0471
C97	Capacitor, cer	10 nF	30V	14.907	L4	Coil		004.0472
C98	Capacitor, cer	82 pF	25 V	14.336	L5	Coil		004.0476
C99	Capacitor, sty	220 pF		10.133	L5a	Coil		004.0477
C100	Capacitor, sty	220 pF		10.133	L6	Coil		004.0478
C101	Capacitor, cer	10 nF	30V	14.907	L7	Coil		004.0460
C102	Capacitor, cer	22 pF	N150	14.129	L8	Coil		004.0439
C103	Capacitor, trimme	3.5-18 pF		17.101	L9	Coil		004.0439
					L10	Coil		004.0460
D1	Diode	AA116		39.102	L11	Coil		004.0481
D2	Diode	BA182		39.101	L12	Coil		004.0430
D3	Diode	BA182		39.101	L13	Coil		004.0430
D4	Diode	BB103		39.401	L14	Coil		004.0480
D5	Diode	BB103		39.401	L15	Coil		004.0432
D5a	Diode	1N 823		39.716	L16	Coil		004.0444
D6	Diode	AA116		39.102				
D7	Diode	AA116		39.102		1 pcs. coil can for choke 4		47.103
D8	Diode	8,2V zener		39.708		1 pcs. cooling block		83.217
D9	Diode	1N4148		39.103		5 pcs. IC-connector		80.513
D10	Diode	1N4148		39.103				
D11	Diode	1N4148		39.103				
D12	Diode	1N4148		39.103				
D13	Diode	BA182		39.101				
D14	Diode	AA116		39.102				
D15	Diode	1N4148		39.103				
D16	Diode	AA116		39.102				
D17	Diode	AA116		39.102				
D17a	Diode	AA116		39.102				
T1	Transistor	MRF 237		31.107				
T2	Transistor	BFY 90		33.104				
T3	Transistor	MFE 131		34.108				
T4	Transistor	J 310		34.107				
T5	Transistor	J 310		34.107				

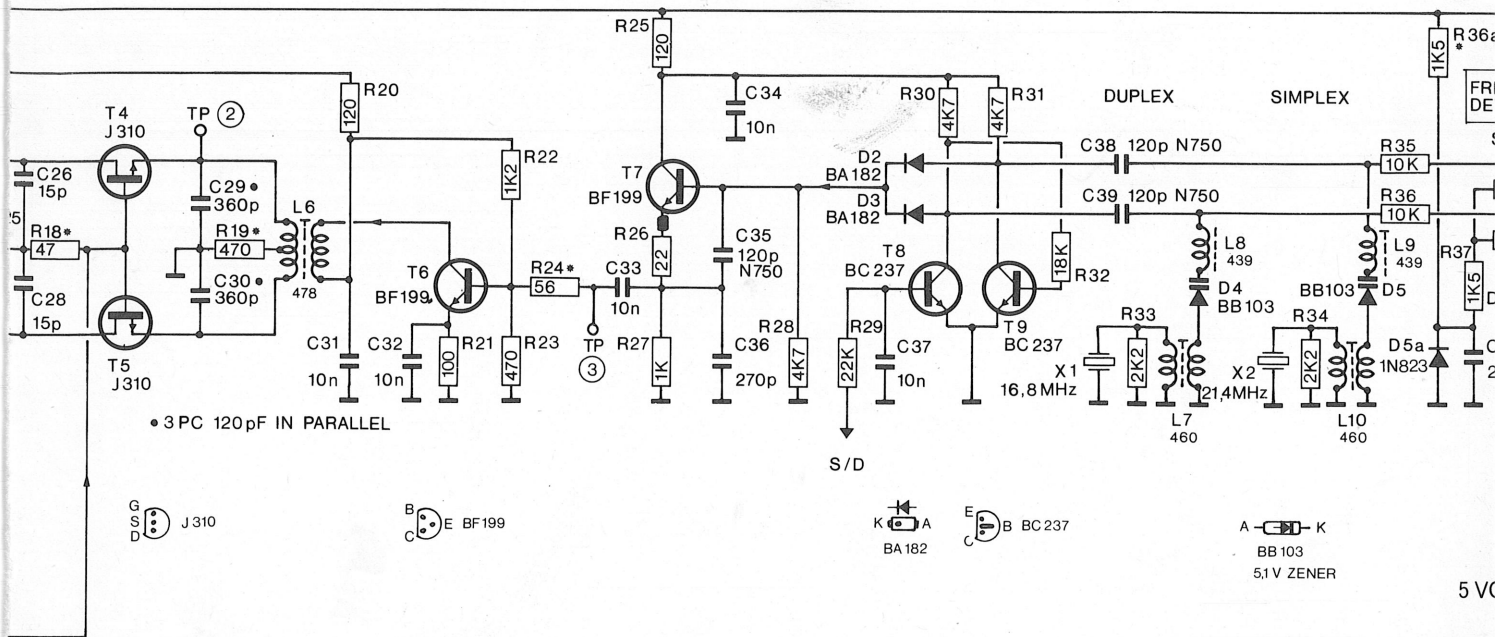
5.6.2 COMPONENT LAY OUT FOR EXCITER





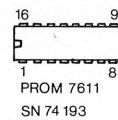
TX MIXER

FM MODULATOR

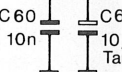


B E BF199

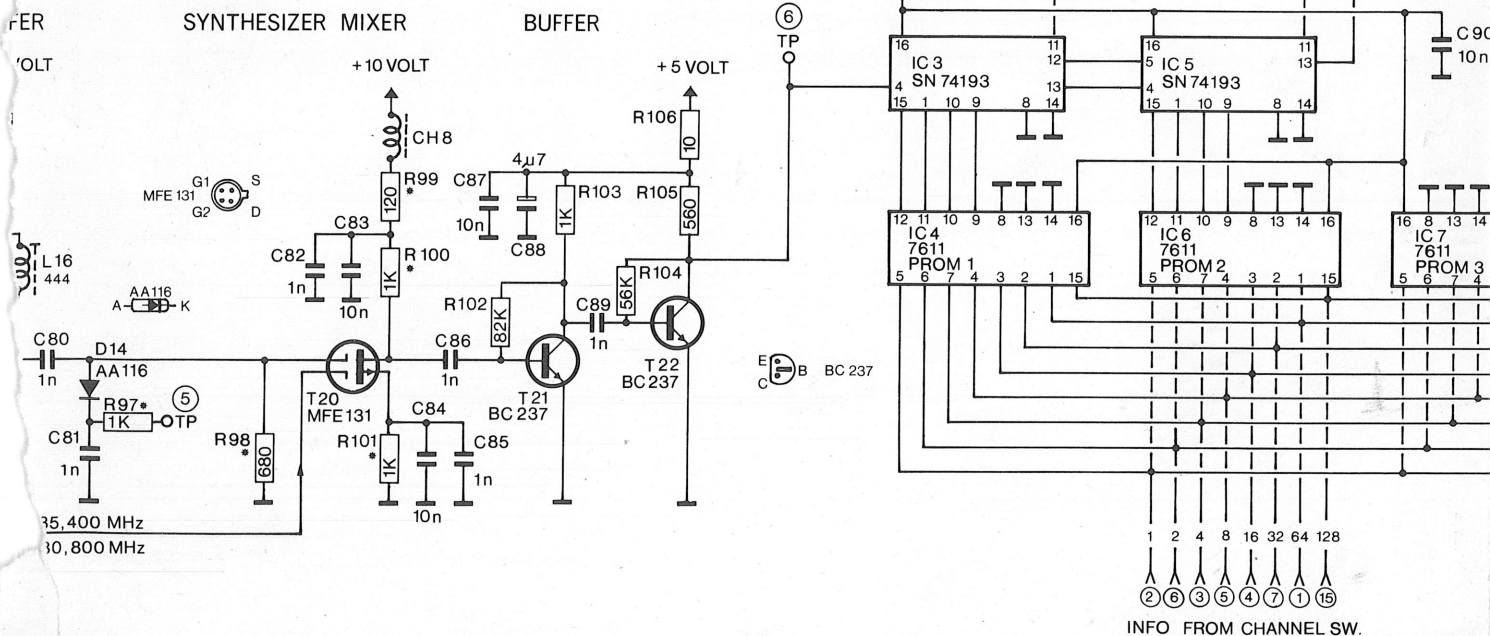
Top view



+5 VOLT SUPPLY

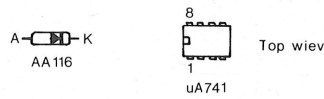
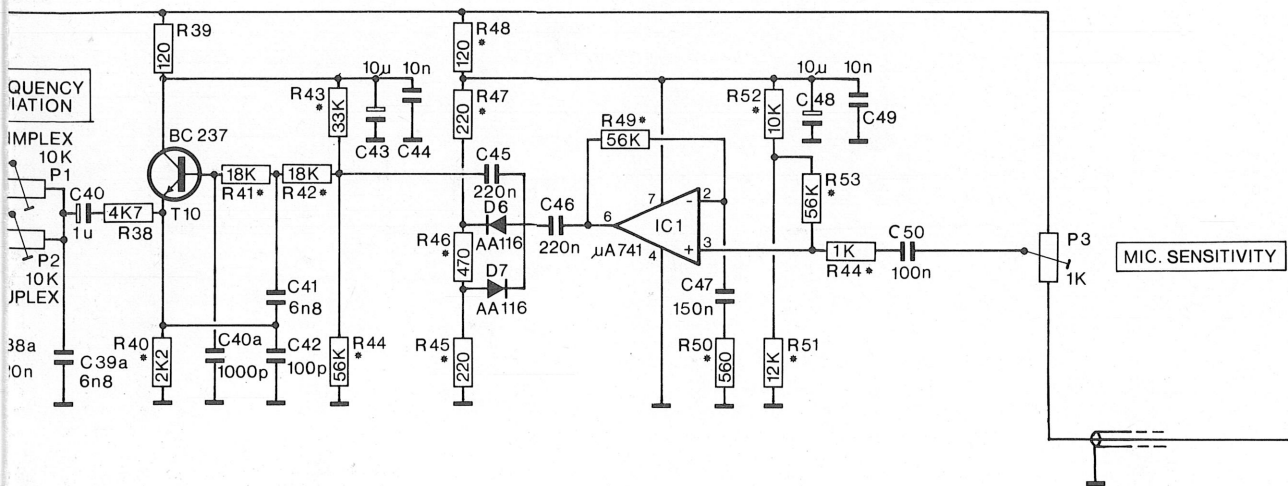


PROGRAMMABLE DIVIDER

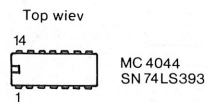
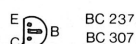
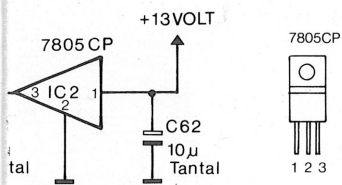


LOW-PASS FILTER

MICROPHONE AMPLIFIER CLIPPER

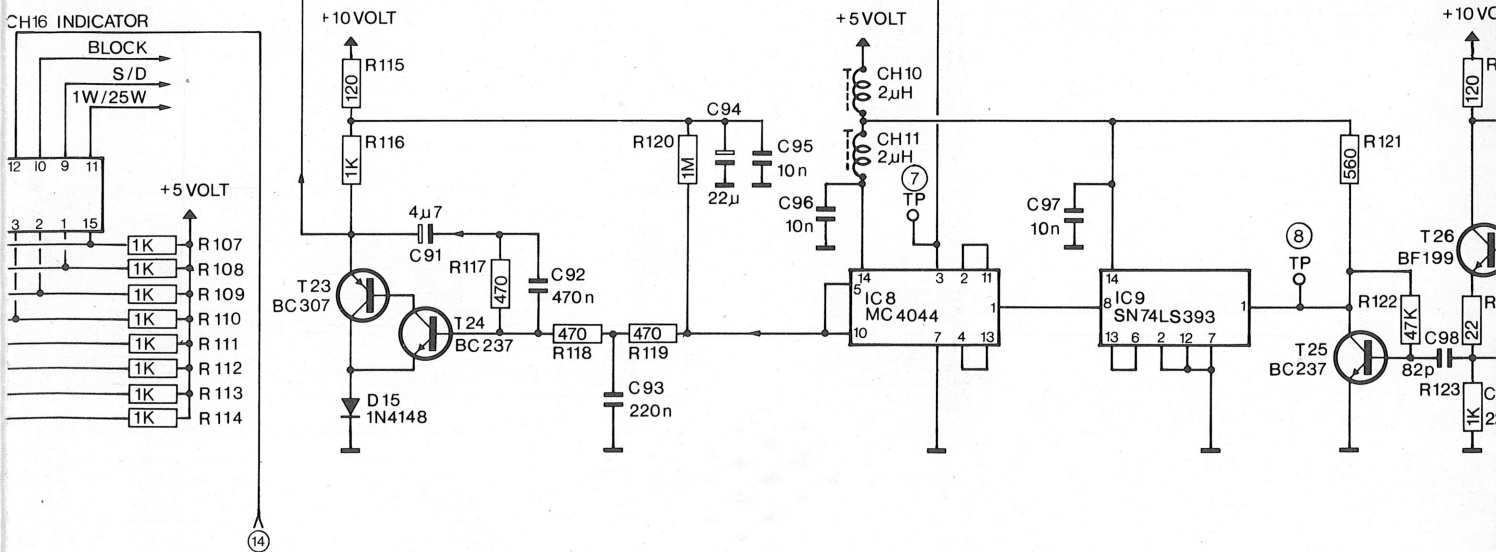


LT REGULATOR

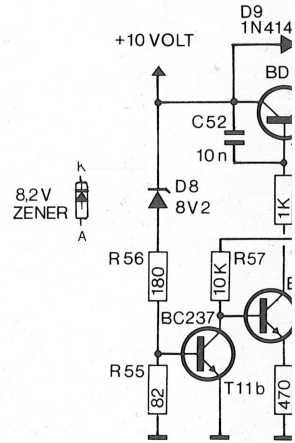


LOOP FILTER

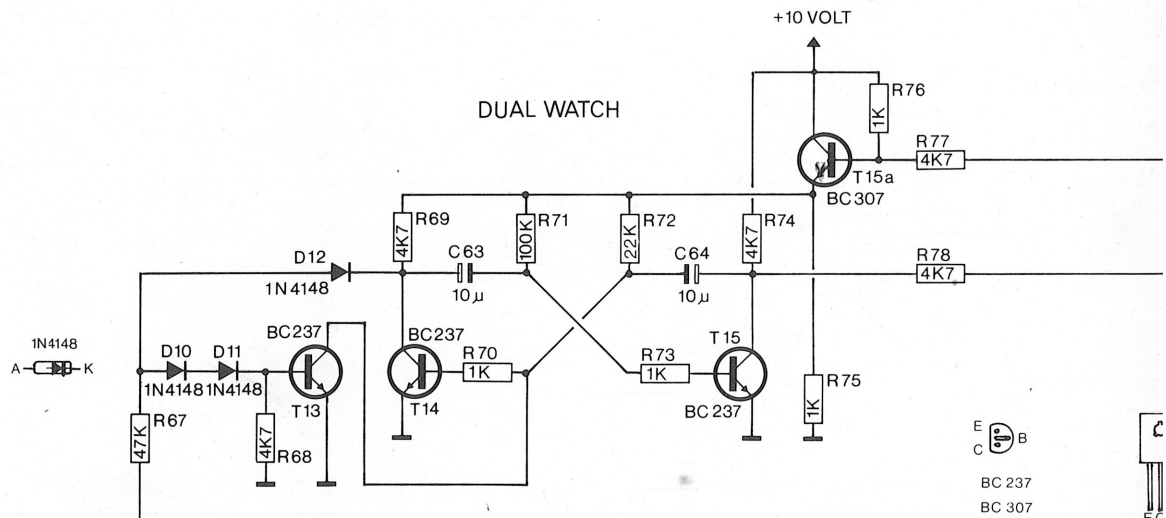
PHASE DETECTOR FIXED DIVIDER



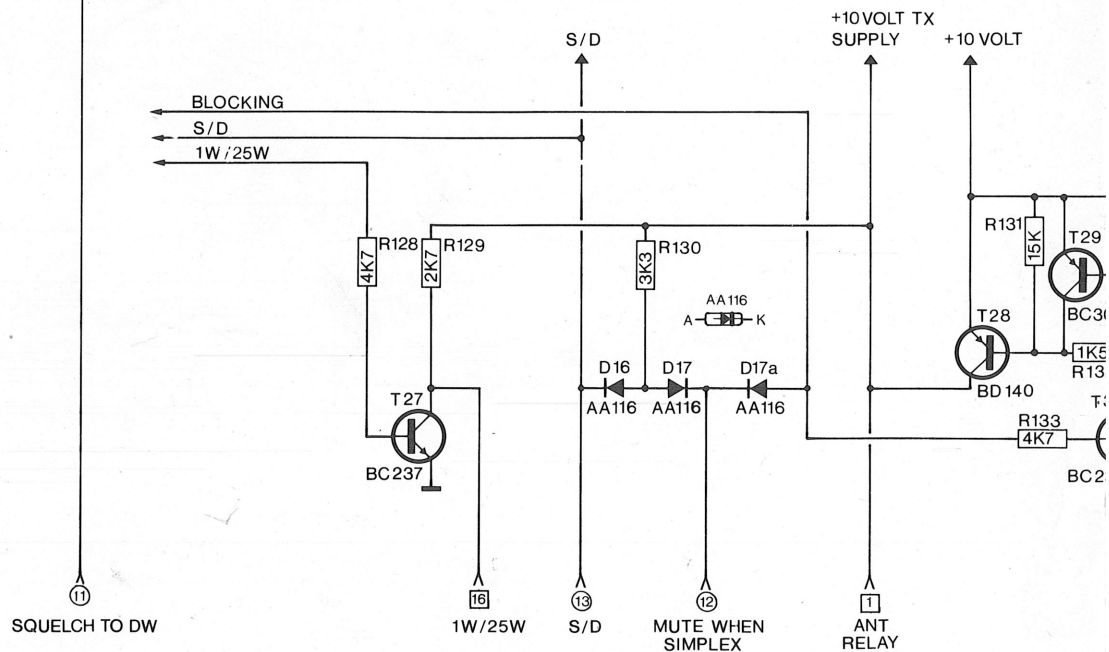
10 VOLT REGUL



AUTOMATIC CH. 16 OR DUAL WATCH

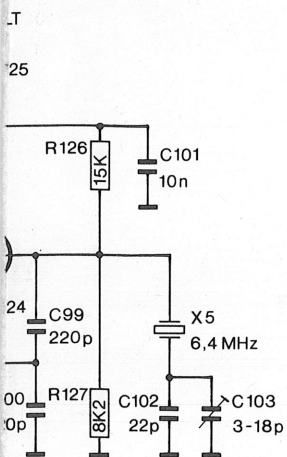


CONTROL CIRCUITS



BF 199

ENCE OSCILLATOR



SQUELCH TO DW

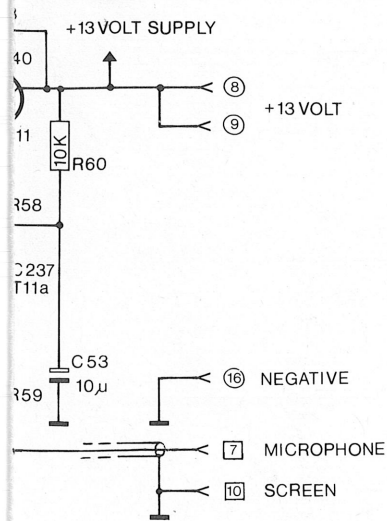
1W/25W

S/D

MUTE WHEN
SIMPLEX

ANT
RELAY

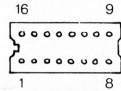
TOR



9 DUAL WATCH ON-OFF
1-OFF 0-ON

10 CH. SWITCH/CH.16
1-CH. SWITCH. 0-CH. 16

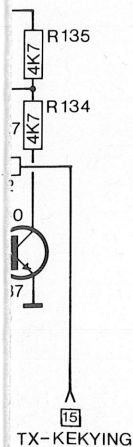
TOP VIEW



SOCKET FOR FLAT-
- CABLES

○ PIN NUMBERS IN CIRCLES
BELONGS TO CONNECTOR A

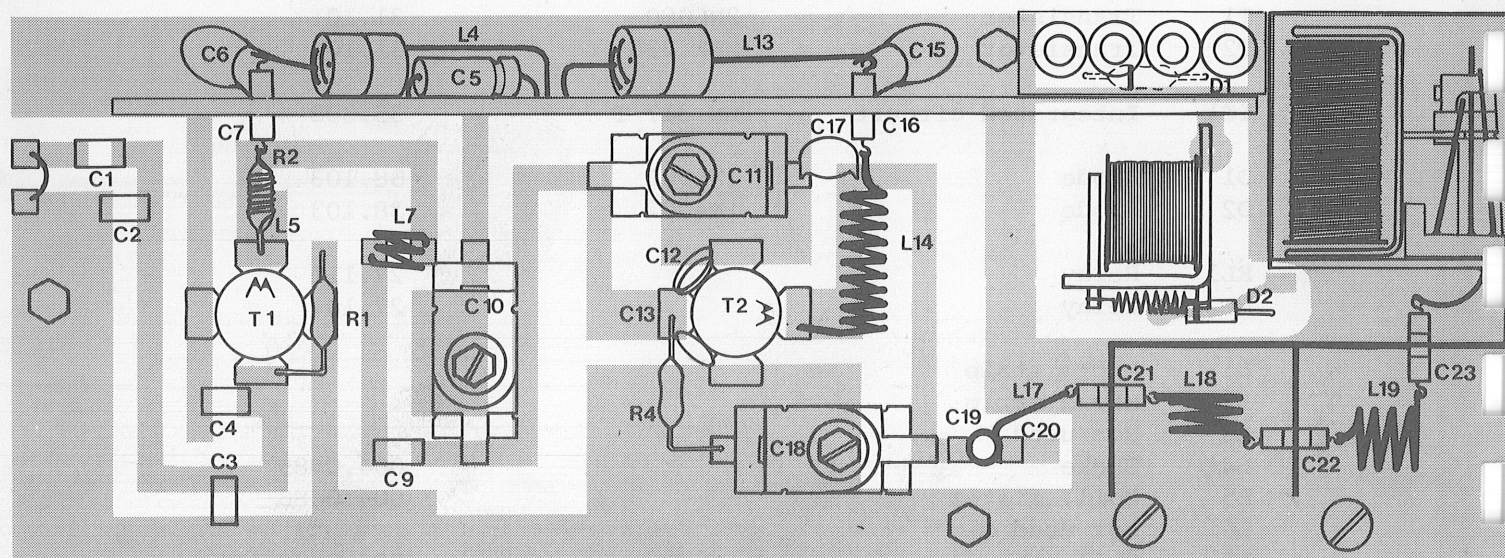
□ PIN NUMBERS IN SQUARES
BELONGS TO CONNECTOR B



VHF EXCITER FOR RT 408
UNIT NO. 002.0447
DRAWING NO. 01.0402A
5.6.3

L15	Micro strip	
L16	Micro strip	
L17	Coil, air	004.0490
L18	Coil, air	004.0490
L19	Coil, air	004.0491
Heat sink		83.109
Cover		65.361
BNC plug		80.708
VHF plug		87.713
Stay for cover		70.707
Stay for transistors		70.703

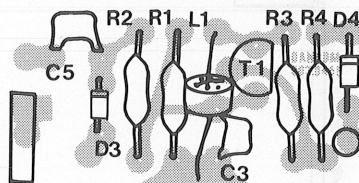
5.7.2 COMPONENT LAY OUT FOR POWER AMPLIFIER

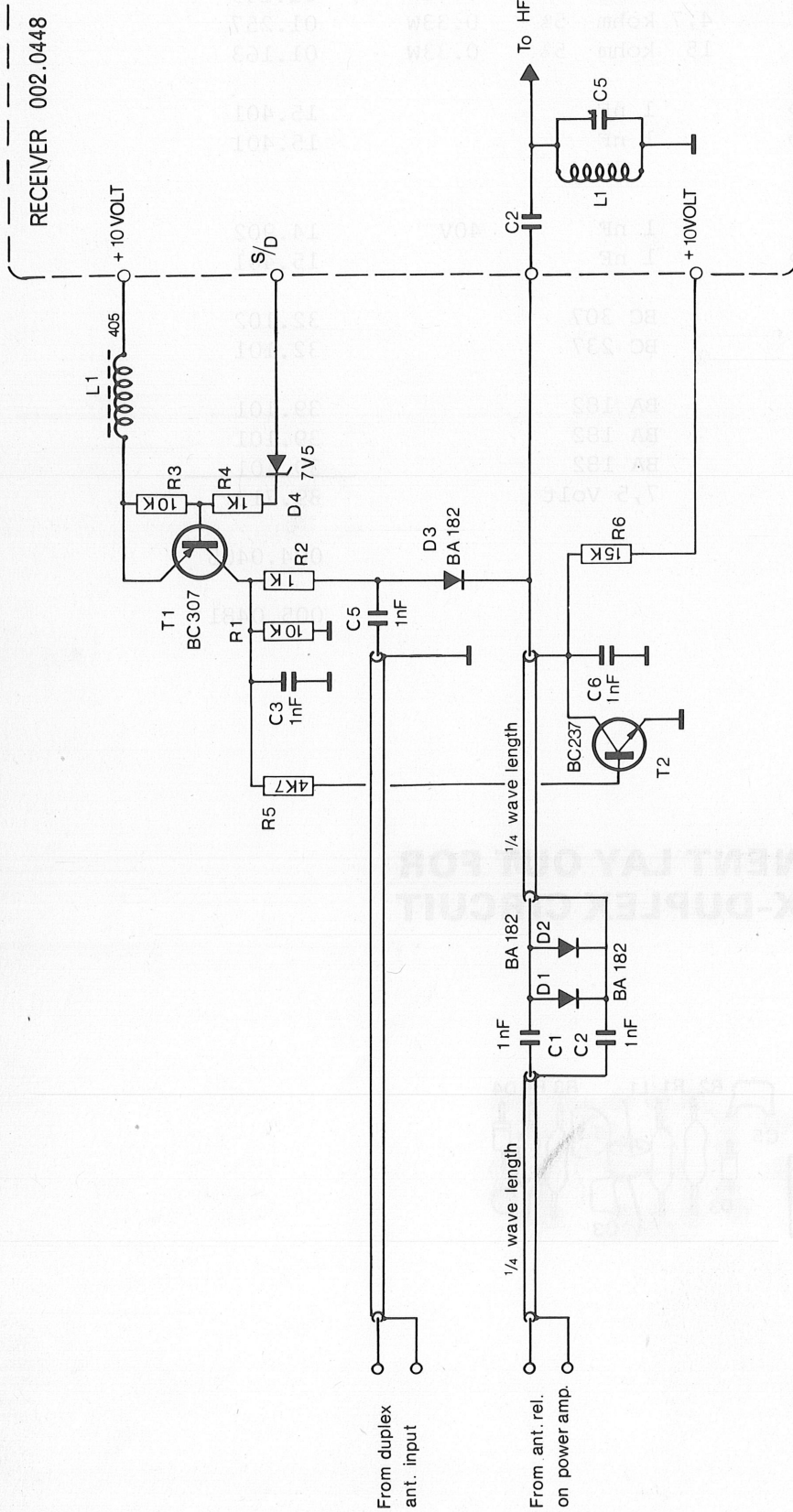


5.8.1 SIMPLEX-DUPLEX CIRCUIT 002.0465.

R1	Resistor	10	kohm	5%	0.33W	01.161
R2	Resistor	1	kohm	5%	0.33W	01.149
R3	Resistor	10	kohm	5%	0.33W	01.161
R4	Resistor	1	kohm	5%	0.33W	01.149
R5	Resistor	4,7	kohm	5%	0.33W	01.257
R6	Resistor	15	kohm	5%	0.33W	01.163
C1	Capacitor, chip	1	nF			15.401
C2	Capacitor, chip	1	nF			15.401
C3	Not used					
C4	Not used					
C5	Capacitor, cer	1	nF		40V	14.902
C6	Capacitor, chip	1	nF			15.401
T1	Transistor	BC 307				32.102
T2	Transistor	BC 237				32.101
D1	Diode	BA 182				39.101
D2	Diode	BA 182				39.101
D3	Diode	BA 182				39.101
D4	Diode, zener	7,5 Volt				39.713
L1	Coil					004.0405
	Wiring					005.0481

5.8.2 COMPONENT LAY OUT FOR SIMPLEX-DUPLEX CIRCUIT



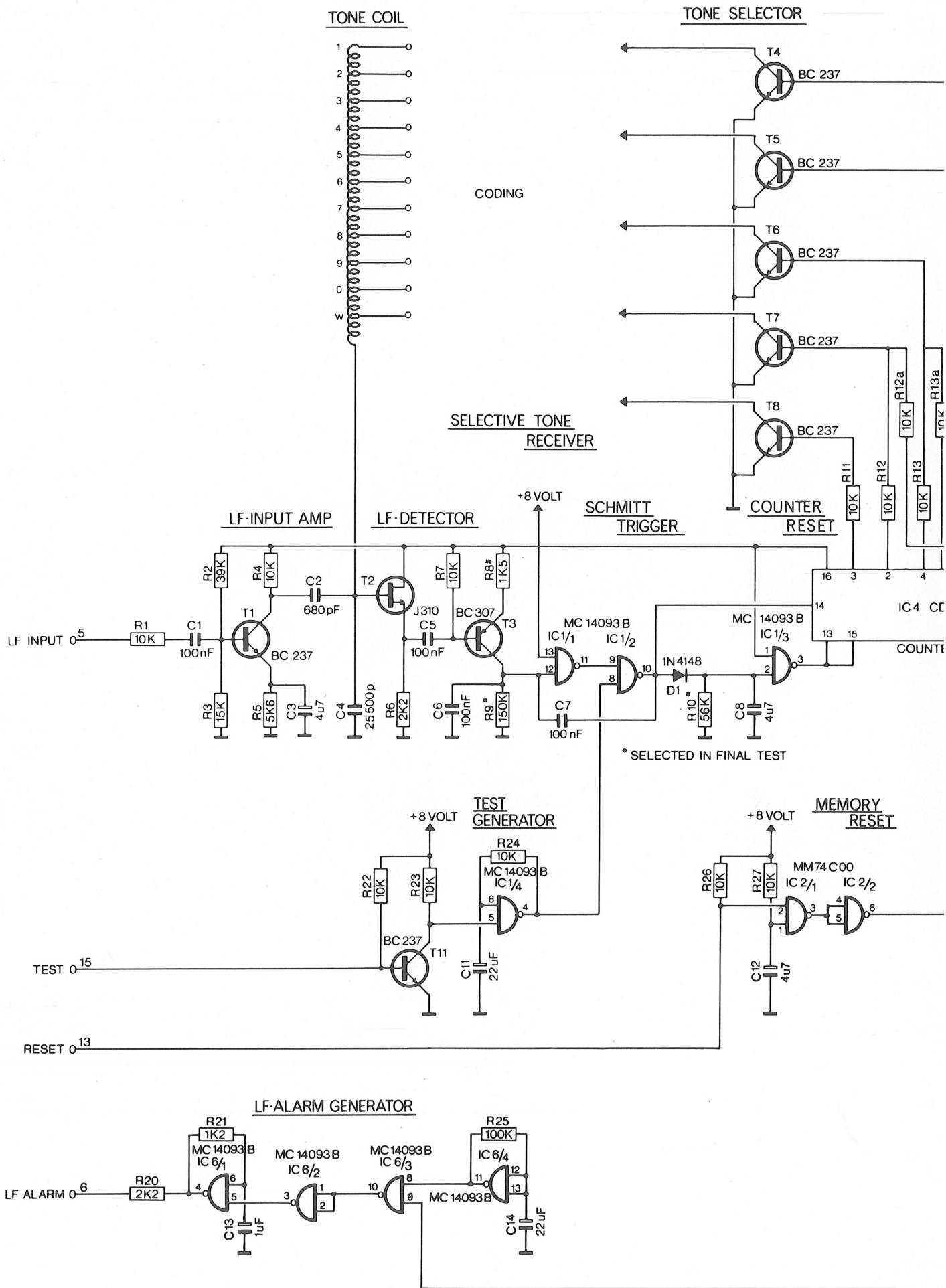


Duplex/Simplex
switch circuit

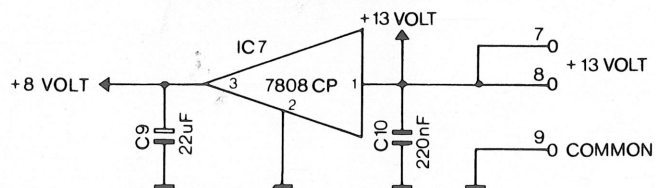
Unit no. 002.0465

Drawing no. 01.0416A

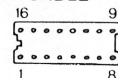
5.8.3



VOLTAGE REGULATOR



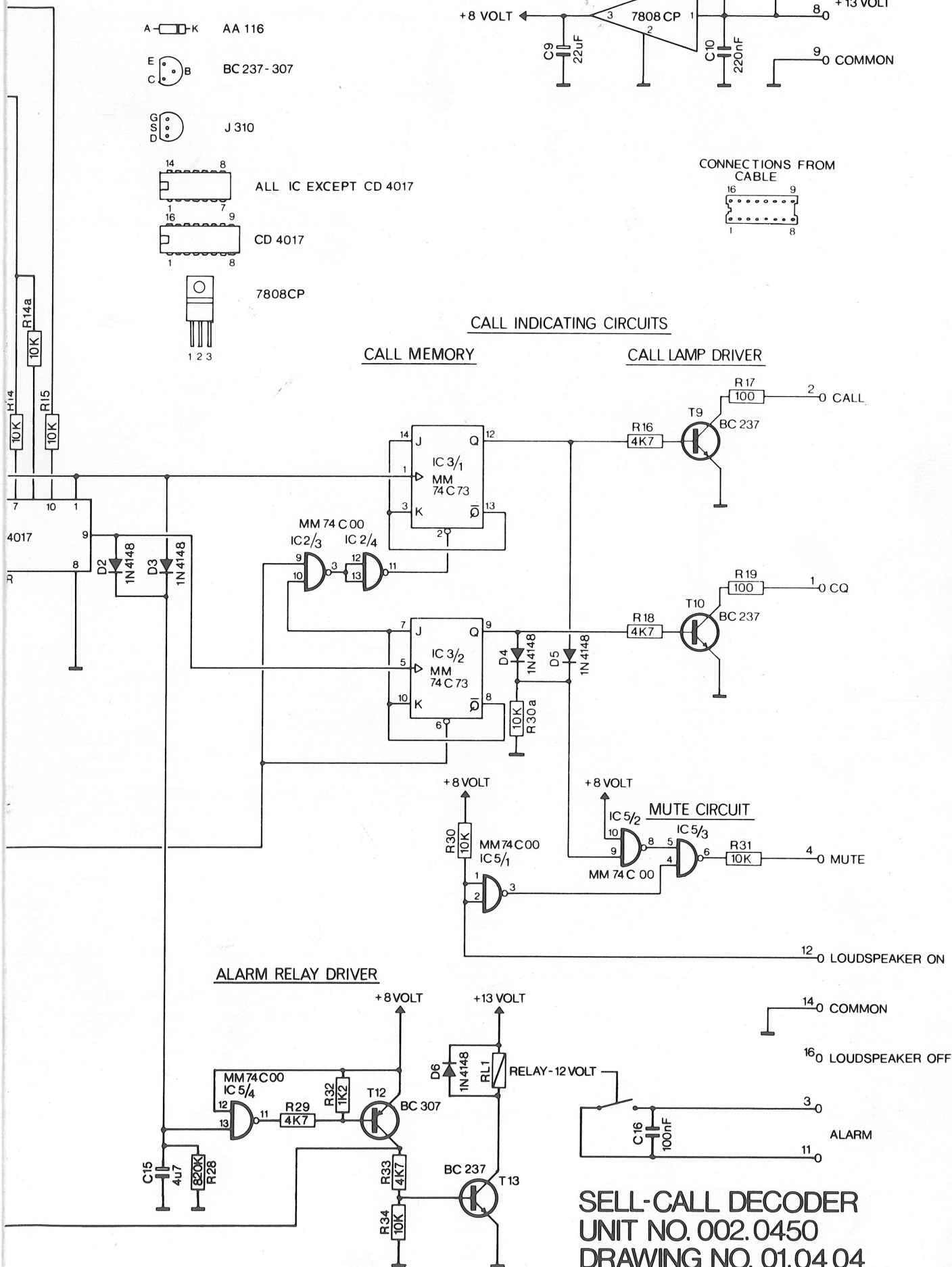
CONNECTIONS FROM CABLE



CALL INDICATING CIRCUITS

CALL MEMORY

CALL LAMP DRIVER

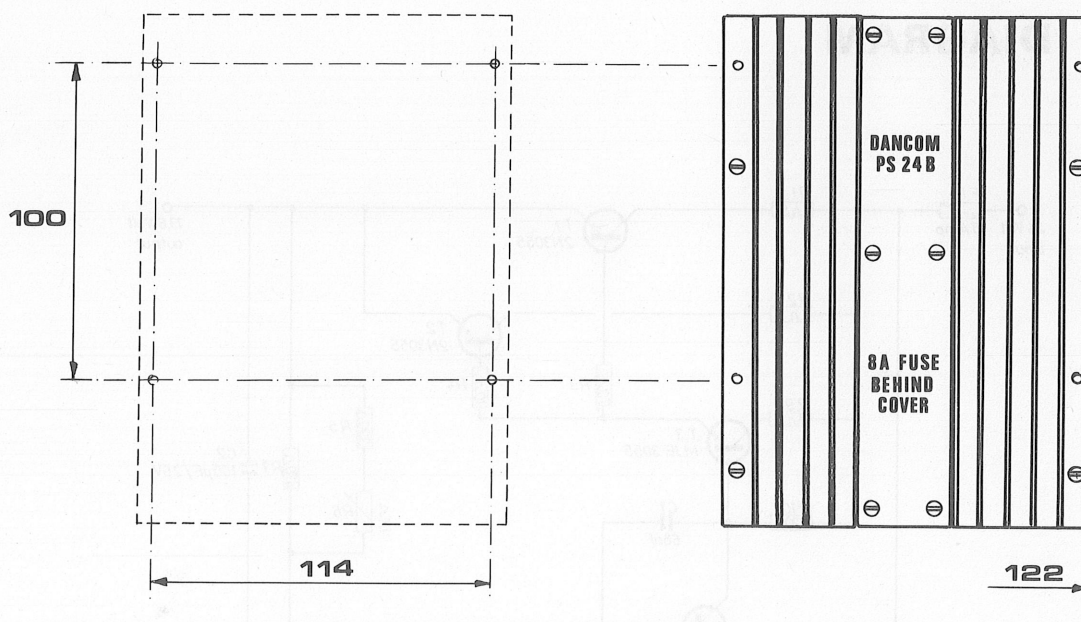
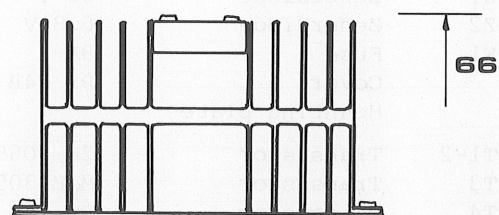
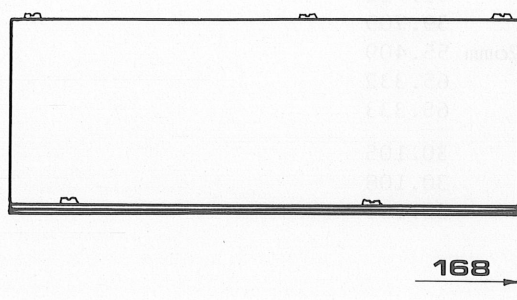


SELL-CALL DECODER
UNIT NO.002.0450
DRAWING NO. 01.04 04

5.10 POWER SUPPLY PS 24B

PS 24 B

WEIGHT : 1200 gr.



CONNECTIONS:

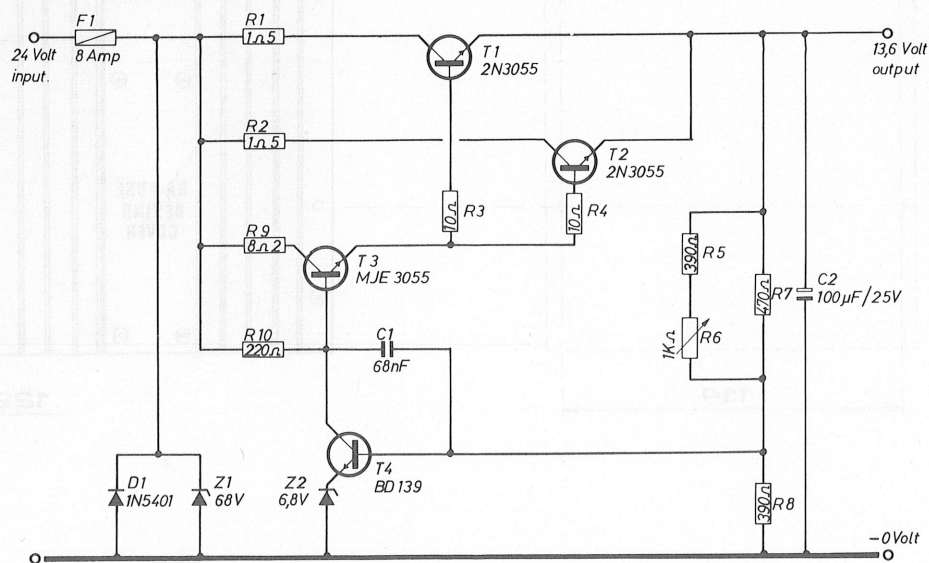
Brown wire:	+ 13,6 VDC
Blue wire:	+ 24,0 VDC
Black wire:	Negative ground

5.10.1 PARTS LIST

POWER SUPPLY 24B

R1-2	Resistor	1.5 ohm	5%	16W	02.515
R3-4	Resistor	10 ohm	5%	3W	02.225
R5	Resistor	390 ohm	5%	0.33W	01.144
R6	Resistor	1 kohm			04.149
R7	Resistor	470 ohm	5%	0.33W	01.145
R8	Resistor	390 ohm	5%	0.33W	01.144
R9	Resistor	8.2 ohm	5%	5W	02.324
R10	Resistor	220 ohm	5%	3W	02.241
C1	Capacitor, poly	0.068 uF			11.223
C2	Capacitor, ellyt	100 uF			12.337
D1	Diode	1N 5401			38.102
Z1	Zenerdiode	68 V		2W	39.711
Z2	Zenerdiode	6.8 V		2W	39.709
F1	Fuse	8A		5x20mm	55.409
	Cover	PS 24B			65.332
	Mounting plate				65.333
T1-2	Transistor	2N 3055			30.105
T3	Transistor	MJE 3055			30.108
T4	Transistor	BD 139			30.101

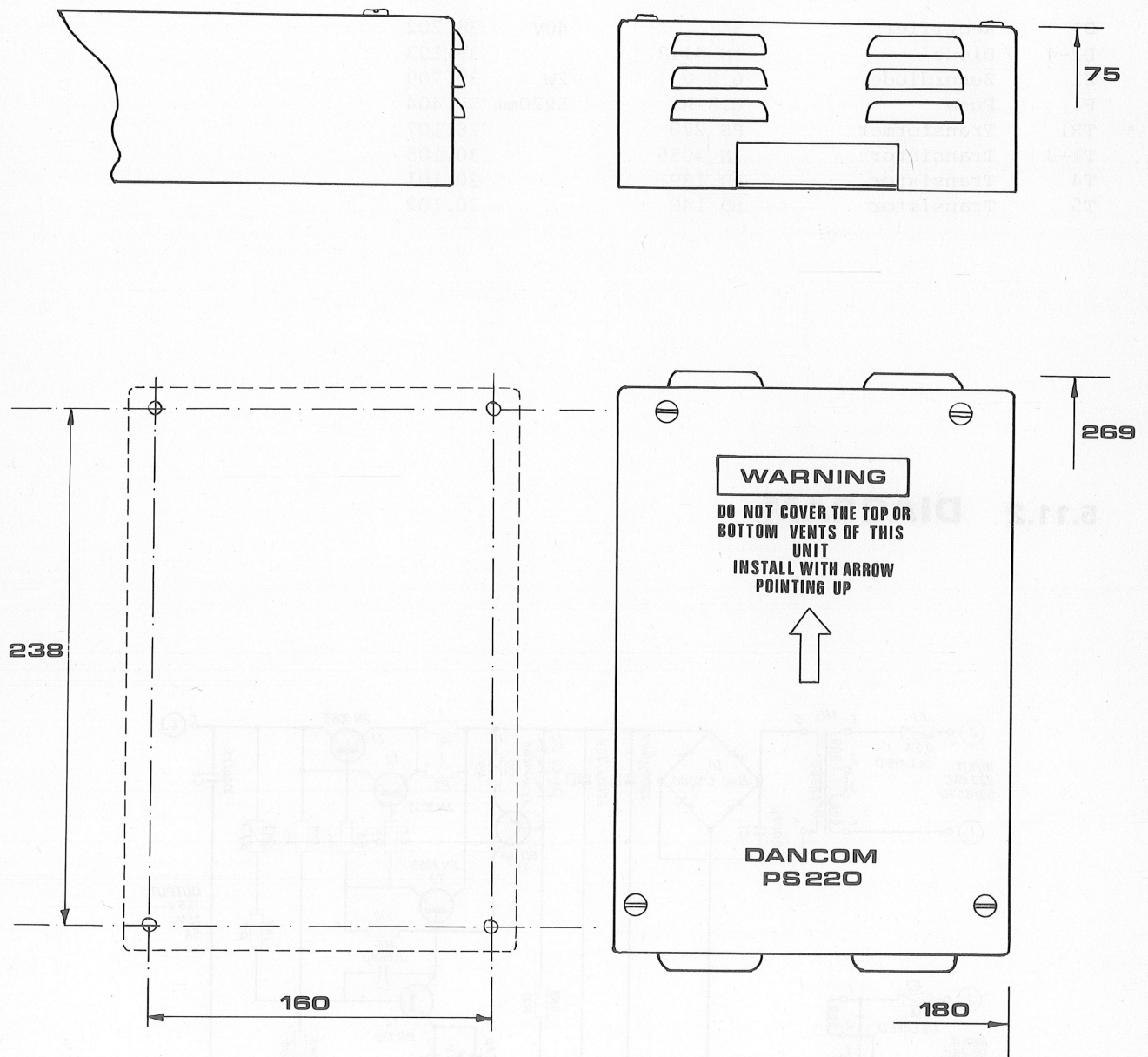
5.10.2 DIAGRAM



5.11 POWER SUPPLY PS 220

PS 220

WEIGHT : 4000 gr.



POWER SUPPLY 220

R1-2	Resistor	1 ohm	5%	16W	02.513
R3-4	Resistor	6.8 ohm	5%	5W	02.323
R5-6	Resistor	1.8 ohm	5%	0.33W	01.152
R8	Resistor	100 ohm	5%	0.33W	01.23
R9	Resistor	120 ohm	5%	0.33W	01.138
R10	Resistor	6.8 ohm	5%	0.33W	01.159
C1	Capacitor, poly	0.068 uF			11.223
C2-3	Capacitor, ellyt	2200 u		50V	12.553
C4	Capacitor, poly	0.068 uF			11.223
C5	Capacitor, ellyt	100 uF		25V	12.337
C6	Capacitor, poly	0.068 uF			11.223
D1	Rectifier	5A		40V	38.202
D2-4	Diode	1N 4148			39.103
Z1	Zenerdiode	6.8 V		2W	39.709
F1	Fuse	0.8 A		5x20mm	55.404
TR1	Transformer	PS 220			26.107
T1-3	Transistor	2N 3055			30.105
T4	Transistor	BD 139			30.101
T5	Transistor	BD 140			30.102

5.11.2 DIAGRAM

