

Service manual

SHIPMATE RS 8000

Marine
VHF
Radiotelephone



Service manual

NO: 9002 E

May 1985



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2. SPECIFICATIONS

2.1. GENERAL

Channels:	55 international marine channels 15 private channels available
Channel spacing:	25 KHz
Mode of operation:	Simplex/Semiduplex
Temperature range:	-20°C to +55°C
Frequency stability:	±10 ppm
Supply voltage:	12 V Battery 24 V by separate converter 220 V by separate converter
Current drain:	Transmit high power (25 W), 4,5 A Transmit low power (1 W), 1,5 A Stand by 0,6 A
Dual Watch:	Channel 16 plus an operator selected channel
Aut. Ch. 16:	Separate push button for channel 16
Weight:	2,5 kg
Dimensions:	56 x 160 x 210 mm

All measurements according to CEPT.

2.2. TRANSMITTER

Frequency range:	155,0 MHz - 159,0 MHz
Power output:	25 Watts, 1 W reduced power
Spurious emission:	-80 dB
AF response:	6 dB/octave
Modulation:	±5 KHz
Ant. impedance:	50 ohms

2.3. RECEIVER

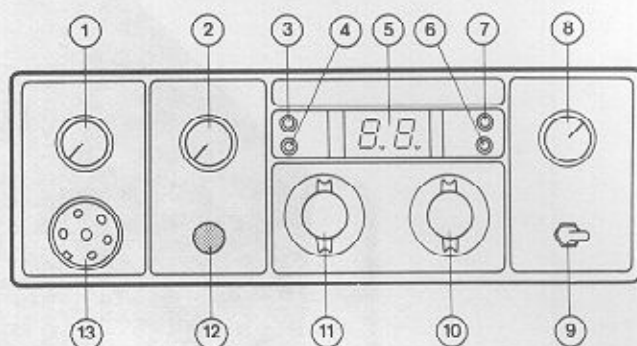
Frequency range:	155,0 MHz - 159,0 MHz 159,6 MHz - 163,6 MHz
Sensitivity:	0,3 uV/12 dB SINAD
Intermodulation:	70 dB
AF output power:	4 W in 4 ohms
Squelch:	Adjustable from 6 dB to 20 dB SINAD
Distortion:	3%

2.4. SELCALL

Alarm:	Acoustic signal in loudspeaker Light indication for received sel- call and/or for received CQ-call
Ext. Alarm:	Relay contact Max. 100 V Max. 1 A. Max. 10 VA

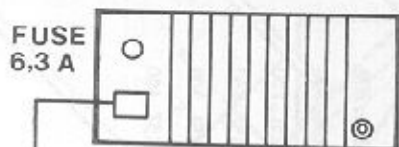
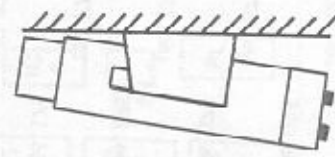
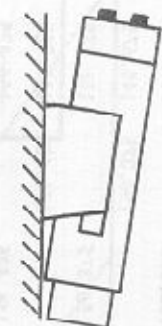
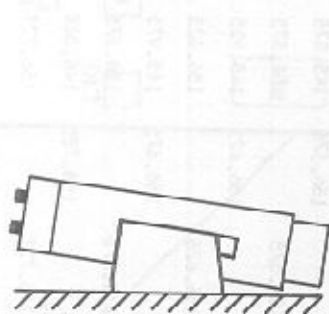
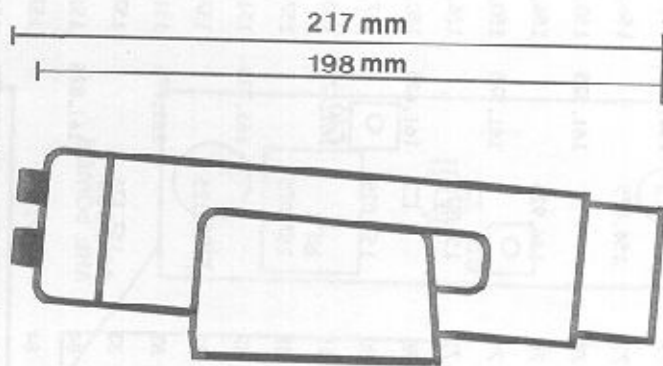
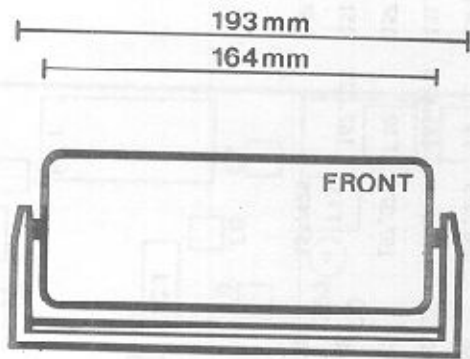
Build in automatic test facility for the selcall.

3. OPERATION

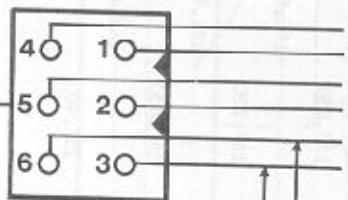


1. ON/OFF switch and volume control for external loud-speaker. The volume control will have no effect on the hand-set earphone level.
2. To mute the receiver noise in periods with no signal, the squelch control knob should be turned clockwise until noise cut-off occurs.
25 W transmitter power when the knob is pushed in.
1 W transmitter power when the knob is pulled out.
3. Transmitter indicator. Indicates that the transmitter is operating.
4. DUAL WATCH indicator. Indicates that the DUAL WATCH function is on. In this condition it is not possible to transmit.
5. Channel indicator.
6. CALL indicator. Indicates that a selective tone call has been received from a coast station.
7. CQ indicator. Indicates that a CQ/ALARM call has been received either from your own testbutton or from a coast station.
NB: Both these indicators will be illuminated if the SELCALL module is tested from the front panel test switch.
8. Dimmer control and DUAL WATCH switch. By means of the dimmer control the light intensity in the channel display and indicators can be regulated.
DUAL WATCH is on when the knob is pulled out.
DUAL WATCH is off when the knob is pushed in.
- 9A. TEST RESET switch for SELCALL
By selecting the TEST position of this switch for approx. 1 sec. the SELCALL module can be tested. The CALL and CQ indicators will be illuminated and an alarm signal will be heard in the loudspeaker. By selecting the RESET position the CALL and CQ indicators will go off and the SELCALL module is reset.
- 9B. Optional extra U.S. channels.
If the SELCALL module is not fitted, a switch can be included in place of the SELCALL switch to select either U.S. or INTERNATIONAL channels.
10. Channel selector. Selects second channel digit.
11. Channel selector. Selects first channel digit.
12. CH 16 knob. When it is pushed the radiotelephone operates on the calling and distress channel. The channel display will indicate 16. The channel selector switches are overridden and the DUAL WATCH function is inhibited. By again pushing the CH 16 knob the radiotelephone reverses to the channel set by the channel selector switches.
13. Handset connector.

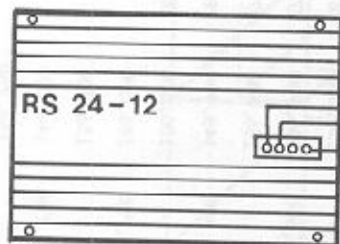
4. INSTALLATION



ANTENNA CONNECTOR
PL 259 50 Ohm
CABLE RG 8 / RG 56

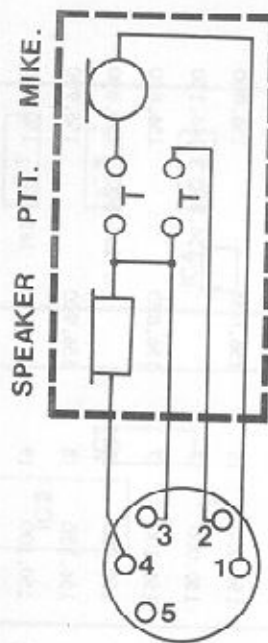


LOUDSPEAKER
4 Ohm, 4 Watts
ALARM RELAY
FROM SELCALL
BATT. -
BATT. + 12 VOLT



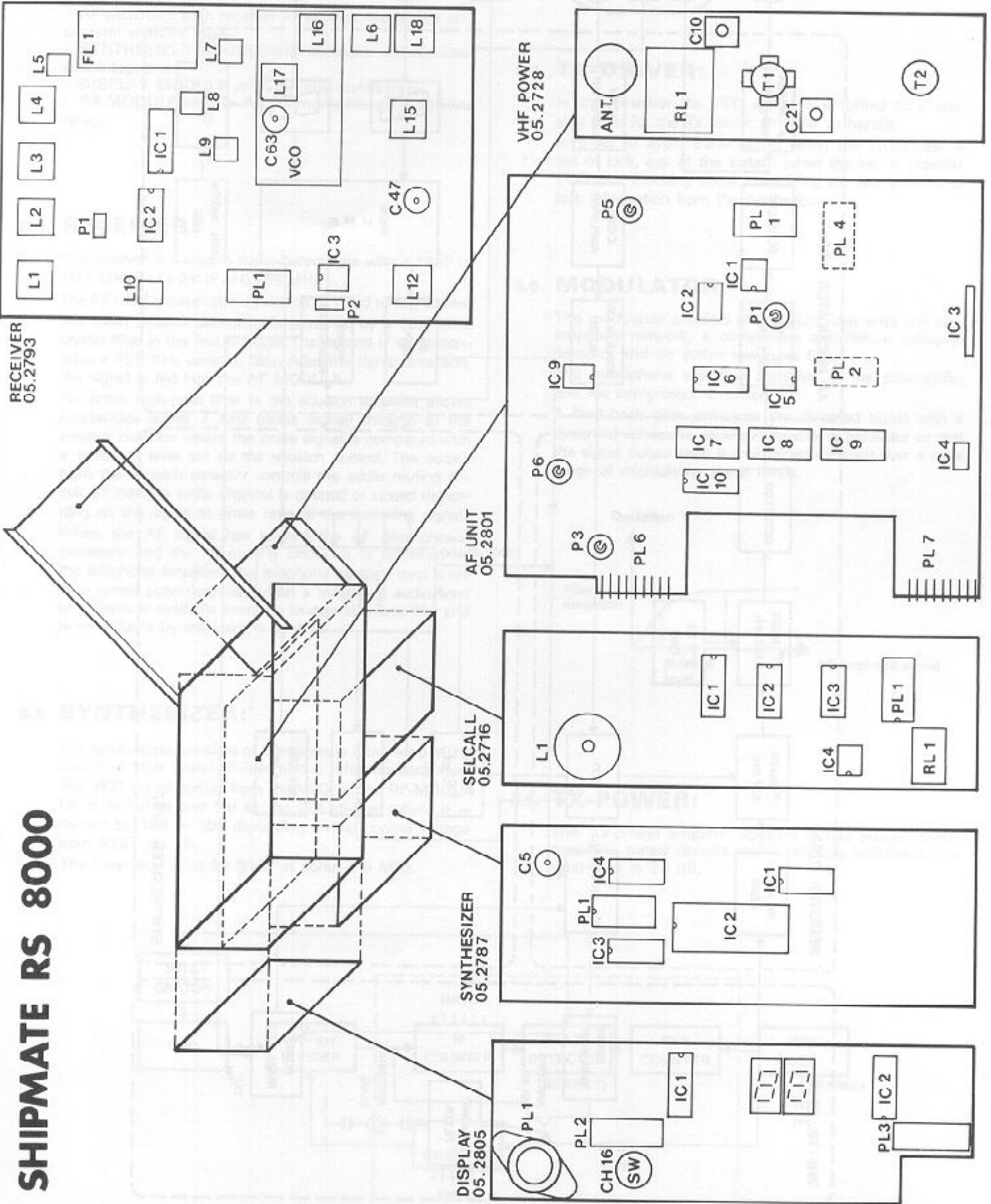
POWER CABLE
MINIMUM 1,5mm²

HANDSET

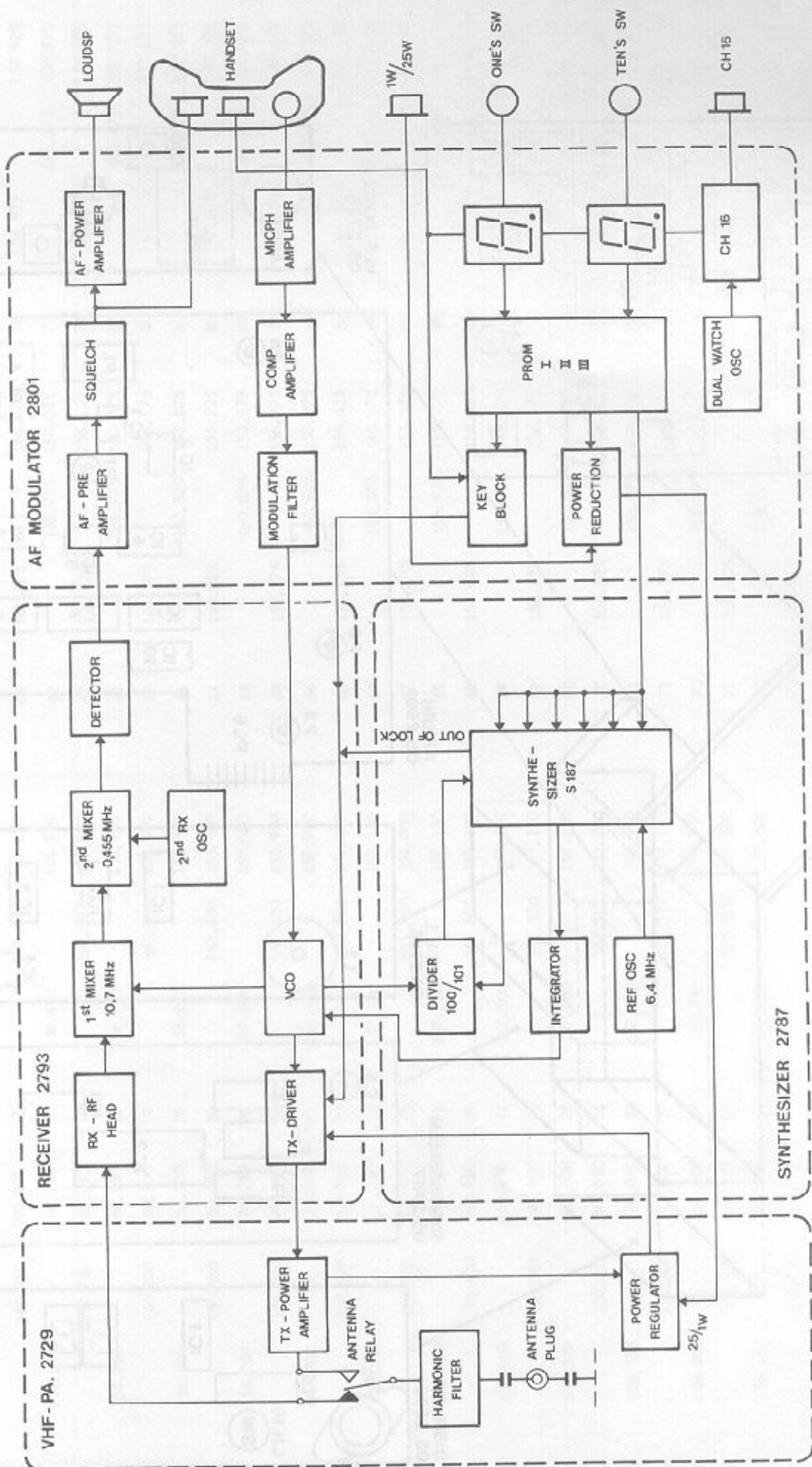


6. MECHANICAL LAY OUT

SHIPMATE RS 8000



7. BLOCKDIAGRAM



8. CIRCUIT DESCRIPTION

8.1. GENERAL

RS 8000 is built up of the following modules:

- RF MODULE with receiver RF section, Tx-driver and VCO.
- AF MODULE with receiver AF section, modulator and channel selector logic.
- SYNTHESIZER MODULE with counters, ref. oscillator and integrator.
- DISPLAY MODULE with the channel displays.
- PA MODULE with Tx-PA, harmonic filter and antenna relay.

8.2. RECEIVER:

The receiver is a double super-heterodyne with a 1st IF of 10.7 MHz and a 2nd IF of 0.455 MHz.

The RF head incorporates a junction FET and tuning diodes. The main receiver selectivity is governed by a 10.7 MHz crystal filter in the first IF stage. The second IF stage contains a 455 KHz ceramic filter. After the signal detection, the signal is fed into the AF MODULE.

An active high-pass filter in the squelch amplifier allows frequencies above 7 KHz (noise signal) through to the squelch detector where the noise signal is compared with a threshold level set by the squelch control. The output from the squelch detector controls the audio muting circuit so that the audio channel is opened or closed depending on the signal to noise ratio of the incoming signal.

When the AF signal has passed the AF déemphasis-generator and the AF-muting circuit, it is amplified by the telephone amplifier. The telephone handset level is set by a preset potentiometer, whilst a maximum audio level of 4 watts is available from the loudspeaker amplifier and is controllable by the volume control.

8.3. SYNTHESIZER:

The synthesizer consists of a largescale integrated MOS circuit, a high speed divider and a reference oscillator. The VCO signal comes from the VCO on the RF-MODULE. It is buffered and fed to the ECL divider where it is divided by 100 or 101 depending on the control voltage from S187 pin 15.

The frequency input for S187 is about 1.5 MHz.

In S187 there are 3 counters.

M-counter

A-counter

Reference-counter.

8.4. TX-DRIVER:

In the Tx-driver the VCO signal is amplified to a suitable level for the Tx power amplifier to handle.

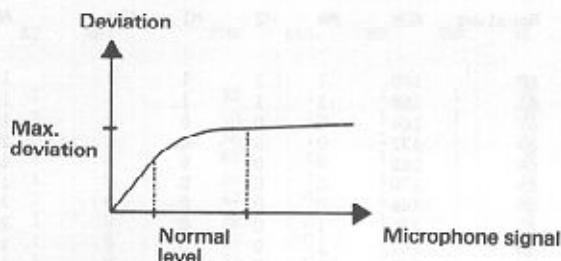
In order to avoid transmission when the synthesizer is out of lock, e.g. at the instant when the key is pressed, there is a blocking circuit combining the key and out of lock information from the synthesizer.

8.5. MODULATOR:

The modulator consists of a preamplifier with the pre-emphasis network, a compressor amplifier, a fullwave-detector and an active low pass filter.

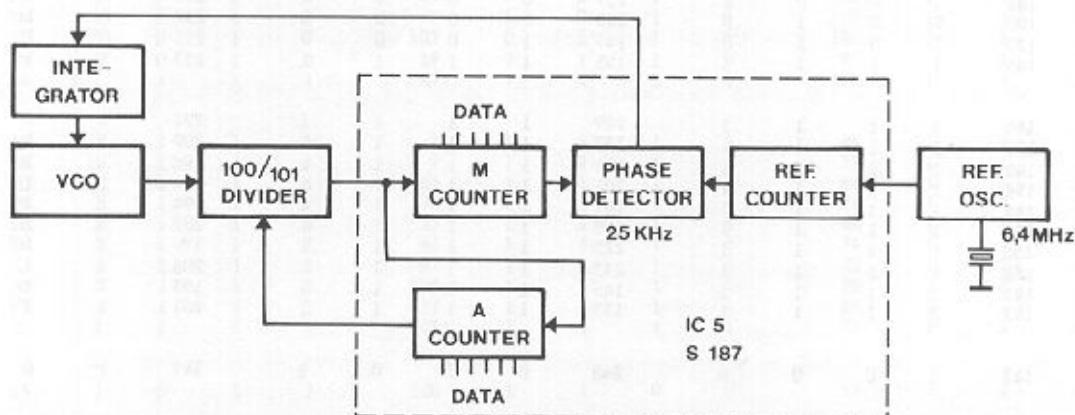
The microphone signal is amplified in the preamplifier and the compressor amplifier.

A feed back path compares the detected signal with a threshold voltage to drive an attenuating transistor so that the signal output level is maintained constant over a wide range of microphone signal levels.



8.6. TX-POWER:

The Tx-power amplifier consists of two powertransistors. The tuned circuits are in stripline technique. The total gain is 20 dB.



8.7. CHANNEL CODES

CHANNEL	PROM I					PROM II					PROM III					
	Receiver	ADR	M4	M2	M1	A32	ADR	A4	A8	A2	A64	ADR	A16	Simpl	M8	BL
0	240	1	1	1	1	135	1	1	1	1	240	1	1	1	1	1
1	248	1	1	1	1	143	0	0	0	1	248	0	1	0	0	0
2	244	0	0	0	0	199	0	0	0	0	244	0	1	1	0	0
3	252	0	0	0	0	207	1	0	0	0	252	0	1	1	0	0
4	242	0	0	0	0	166	0	1	0	0	242	0	1	1	0	0
5	250	0	0	0	0	175	1	1	0	0	250	0	1	1	0	0
6	246	1	0	0	1	231	0	0	0	0	246	1	0	0	0	0
7	254	0	0	0	0	239	1	0	0	0	254	1	1	1	0	0
8	241	1	0	0	1	151	0	1	0	0	241	1	0	0	0	0
9	249	1	0	0	1	159	1	1	0	0	249	1	0	0	0	0
10	208	1	0	0	0	133	0	0	0	1	208	0	0	0	0	0
11	216	1	0	0	0	141	1	0	0	1	216	0	0	0	0	0
12	212	1	0	0	0	197	0	1	0	1	212	0	0	0	0	0
13	220	1	0	0	0	205	1	1	0	1	220	0	0	0	0	0
14	210	1	0	0	0	165	0	0	0	1	210	1	0	0	0	0
15	218	1	0	0	0	173	1	0	0	1	218	1	0	0	0	0
16	214	1	0	0	0	229	0	1	0	1	214	1	0	0	0	0
17	222	1	0	0	0	137	1	1	0	1	222	1	0	0	0	0
18	209	0	0	0	0	149	0	0	0	1	209	0	1	1	0	0
19	217	0	0	0	0	157	1	0	0	1	217	0	1	1	0	0
20	224	0	0	0	0	154	0	1	0	1	176	0	1	1	0	0
21	232	0	0	0	0	142	1	1	0	1	184	0	1	1	0	0
22	228	0	0	0	0	190	0	0	0	1	180	1	1	1	0	0
23	236	0	0	0	0	206	1	0	0	1	188	1	1	1	0	0
24	226	0	0	0	0	166	0	1	0	1	178	1	1	1	0	0
25	234	0	0	0	0	174	1	1	0	1	186	1	1	1	0	0
26	230	0	0	0	1	230	0	0	0	1	182	0	1	1	0	0
27	238	0	0	1	0	238	0	0	0	0	190	0	1	1	0	0
28	225	0	0	1	0	134	1	0	0	0	177	0	1	1	0	0
29	233	1	1	1	1	158	1	1	1	1	185	1	1	1	1	1

CHANNEL	PROM I					PROM II					PROM III					
	Receiver	ADR	M4	M2	M1	A32	ADR	A4	A8	A2	A64	ADR	A16	Simpl	M8	BL
60	160	1	1	1	0	130	1	1	1	1	160	1	1	0	0	0
61	168	1	1	1	1	138	0	0	1	1	168	0	1	0	0	0
62	164	0	0	0	0	194	0	0	1	0	164	0	1	1	0	0
63	172	0	0	0	0	202	1	0	1	0	172	0	1	1	0	0
64	162	0	0	0	0	162	0	1	1	0	162	0	1	1	0	0
65	170	0	0	0	0	170	1	1	1	0	170	0	1	1	0	0
66	166	0	0	0	0	226	0	0	1	0	166	1	1	1	0	0
67	174	1	0	0	1	234	1	0	1	0	174	1	0	0	0	0
68	161	1	0	0	1	146	0	1	1	0	161	1	0	0	0	0
69	169	1	0	0	1	154	1	1	1	0	169	1	0	0	0	0
70	128	1	0	0	0	128	0	0	1	1	128	0	0	0	0	0
71	136	1	0	0	0	136	1	0	1	1	136	0	0	0	0	0
72	132	1	0	0	0	192	0	1	1	1	132	0	0	0	0	0
73	140	1	0	0	0	200	1	1	1	1	140	0	0	0	0	0
74	130	1	0	0	0	160	0	0	1	1	130	1	0	0	0	0
75	138	1	1	1	1	168	1	1	1	1	138	1	1	1	1	1
76	134	1	1	1	1	224	1	1	1	1	134	1	1	1	1	1
77	142	1	0	0	0	232	1	1	1	1	142	1	0	0	0	0
78	129	0	0	0	0	144	0	0	1	1	129	0	1	1	0	0
79	137	0	0	0	0	152	1	0	1	1	137	0	1	1	0	0
80	176	0	0	0	0	131	0	1	0	1	224	0	1	1	0	0
81	184	0	0	0	0	139	1	1	0	1	232	0	1	1	0	0
82	180	0	0	0	0	195	0	0	0	1	228	1	1	1	0	0
83	188	0	0	0	0	203	1	0	0	1	236	1	1	1	0	0
84	178	0	0	0	0	163	0	1	0	1	226	1	1	1	0	0
85	186	0	0	0	0	171	1	1	0	1	234	1	1	1	0	0
86	182	0	0	0	1	227	0	0	0	1	230	0	1	1	0	0
87	190	0	0	1	0	235	0	0	0	0	238	0	1	1	0	0
88	177	0	0	1	0	147	1	0	0	0	225	0	1	1	0	0
89	185	1	1	1	1	155	1	1	1	1	233	1	1	1	1	1
P0	144	1	1	1	1	129	1	1	1	1	192	1	1	1	1	1
P1	152	1	1	1	1	137	1	1	1	1	200	1	1	1	1	1
P2	148	1	1	1	1	193	1	1	1	1	196	1	1	1	1	1
P3	156	1	1	1	1	201	1	1	1	1	204	1	1	1	1	1
P4	146	1	1	1	1	161	1	1	1	1	194	1	1	1	1	1
P5	154	1	1	1	1	169	1	1	1	1	202	1	1	1	1	1
P6	150	1	1	1	1	225	1	1	1	1	198	1	1	1	1	1
P7	158	1	1	1	1	233	1	1	1	1	206	1	1	1	1	1
P8	145	1	1	1	1	145	1	1	1	1	193	1	1	1	1	1
P9	153	1	1	1	1	153	1	1	1	1	201	1	1	1	1	1
16RA	143	1	0	0	0	248	0	1	0	1	143	1	0	0	0	0

CHANNEL	PROM I					PROM II					PROM III				
	Transmit	ADR	M4	M2	M1	A32	ADR	A4	A8	A2	A64	ADR	A16	RP	M8
0	112	1	1	1	1	7	1	1	1	1	112	1	1	1	1
1	120	1	0	0	0	15	1	0	0	1	120	1	1	1	0
2	116	1	0	0	0	71	0	1	0	1	116	1	1	1	0
3	124	1	0	0	0	79	1	1	0	1	124	1	1	1	0
4	114	1	0	0	1	39	0	0	0	1	114	0	1	1	0
5	112	1	0	1	0	47	0	0	0	0	122	0	1	1	0
6	118	1	0	1	0	103	1	0	0	0	118	0	1	1	0
7	126	1	0	1	0	111	0	1	0	0	126	0	1	1	0
8	113	1	0	1	0	23	1	1	0	0	113	0	1	1	0
9	121	1	0	1	0	31	0	0	0	0	121	1	1	1	0
10	80	1	0	1	0	5	1	0	0	0	80	1	1	1	0
11	88	1	0	1	0	13	0	1	0	0	88	1	1	1	0
12	84	1	0	1	0	69	1	1	0	0	84	1	1	1	0
13	92	1	0	1	1	77	0	0	0	0	92	0	1	1	0
14	82	1	0	1	1	37	1	0	0	0	82	0	1	1	0
15	90	1	0	1	1	45	0	1	0	0	90	0	1	1	0
16	86	1	0	1	1	101	1	1	0	0	86	0	1	1	0
17	94	1	0	1	1	109	0	0	0	0	94	1	1	1	0
18	81	1	0	1	1	21	1	0	0	0	81	1	1	1	0
19	89	1	0	1	1	29	0	1	0	0	89	1	1	1	0
20	96	1	0	1	1	6	1	1	0	0	96	1	1	1	0
21	104	1	0	1	0	14	0	0	0	1	104	1	1	1	0
22	100	1	0	1	0	70	1	0	0	1	100	0	1	1	0
23	108	1	0	1	0	78	0	1	0	1	108	0	1	1	0
24	98	1	0	1	0	38	1	1	0	1	98	0	1	1	0
25	106	1	0	1	0	46	0	0	0	1	106	1	1	1	0
26	102	1	0	1	0	102	1	0	0	1	102	1	1	1	0
27	110	1	0	1	0	110	0	1	0	1	110	1	1	1	0
28	97	1	0	1	0	6	1	1	0	1	97	1	1	1	0
29	105	1	1	1	1	30	1	1	1	1	105	1	1	1	1

CHANNEL	PROM I					PROM II					PROM III				
	Transmit	ADR	M4	M2	M1	A32	ADR	A4	A8	A2	A64	ADR	A16	RP	M8
60	32	1	0	0	0	2	0	0	1	1	32	1	1	1	0
61	40	1	0	0	0	10	1	0	1	1	40	1	1	1	0
62	36	1	0	0	0	66	0	1	1	0	36	1	1	1	0
63	44	1	0	0	0	74	1	1	1	0	44	1	1	1	0
64	34	1	0	0	1	34	0	0	1	0	34	0	1	1	0
65	42	1	0	1	0	42	0	0	1	0	42	0	1	1	0
66	38	1	0	1	0	98	1	0	1	0	38	0	1	1	0
67	46	1	0	1	0	106	0	1	1	0	46	0	1	1	0
68	33	1	0	1	0	18	1	1	1	0	33	0	1	1	0
69	41	1	0	1	0	26	0	0	1	0	41	1	1	1	0
70	00	1	0	1	0	00	1	0	1	1	0	1	1	1	0
71	8	1	0	1	0	8	0	1	1	1	8	1	1	1	0
72	4	1	0	1	0	64	1	1	1	1	4	1	1	1	0
73	12	1	0	1	1	72	0	0	1	1	12	0	1	1	0
74	2	1	0	1	1	32	1	0	1	1	2	0	1	1	0
75	10	1	1	1	1	40	1	1	1	1	10	1	1	1	0
76	6	1	1	1	1	96	1	1	1	1	6	1	1	1	1
77	14	1	0	1	1	104	0	0	1	1	14	1	1	1	0
78	1	1	0	1	1	16	1	0	1	1	1	1	1	1	0
79	9	1	0	1	1	24	0	1	1	1	9	1	1	1	0
80	48	1	0	1	1	3	1	1	1	1	48	1	1	1	0
81	56	1	0	1	0	11	0	0	1	1	56	1	1	1	0
82	52	1	0	1	0	67	1	0	1	1	52	0	1	1	0
83	60	1	0	1	0	75	0	1	1	1	60	0	1	1	0
84	50	1	0	1	0	35	1	1	1	1	50	0	1	1	0
85	58	1	0	1	0	43	0	0	1	1	58	1	1	1	0
86	54	1	0	1	0	99	1	0	1	1	54	1	1	1	0
87	62	1	0	1	0	107	0	1	1	0	62	1	1	1	0
88	49	1	0	1	0	19	0	1	1	0	49	1	1	1	0
89	57	1	1	1	1	27	1	1	1	1	57	1	1	1	1
P0	16	1	1	1	1	1	1	1	1	1	16	1	1	1	1
P1	24	1	1	1	1	9	1	1	1	1	24	1	1	1	1
P2	20	1	1	1	1	65	1	1	1	1	20	1	1	1	1
P3	28	1	1	1	1	73	1	1	1	1	28	1	1	1	1
P4	18	1	1	1	1	33	1	1	1	1	18	1	1	1	1
P5	26	1	1	1	1	41	1	1	1	1	26	1	1	1	1
P6	22	1	1	1	1	97	1	1	1	1	22	1	1	1	1
P7	30	1	1	1	1	105	1	1	1	1	30	1	1	1	1
P8	17	1	1	1	1	17	1	1	1	1	17	1	1	1	1
P9	25	1	1	1	1	25	1	1	1	1	25	1	1	1	1
16TA	15	1	0	1	1	120	1	1	0	0	15	0	1	1	0

9. ALIGNMENT

9.1 ALIGNMENT OF VCO

Necessary measuring equipment:

Voltmeter and RF probe or RF voltmeter.

Check supply voltage 13.2 V.

Check output from 5V and 10V (9.5V) regulators.

Connect voltmeter to TP3 - VCO - DC (receiverboard).

Select CH88 162.025 MHz VCO 151.325 MHz highest RX frequency.

Adjust C63 to TP3 = 7.5 volt.

Key the transmitter CH88 157.425 MHz.

Check voltage in TP3 to be 4-6 V.

Select CH6 156.300 MHz VCO 145.600 MHz lowest RX frequency.

Check voltage in TP3 to be 1.5-2.5 V.

Connect voltmeter with RF probe to output of L18 (RF-input on synthesizer).

Select CH88.

Adjust L16, L18 to max. output - minimum 400 mV RMS.

Check the voltage in TP3 again 7.5 V.

NB: When installing private channels, check that VCO-DC never exceed 1-8 VDC.

9.2 ALIGNMENT OF CHANNEL FREQUENCY

Necessary measuring equipment:

Frequency counter.

50 ohm dummy load.

Connect frequency counter to the dummy load.

Select CH18 and key the transmitter LOW POWER.

Adjust C5 in 6.4 MHz oscillator Synthesizer module (through hole in AF board).

Frequency must be 156.900.0 MHz \pm 100 Hz.

9.3 ALIGNMENT OF RECEIVER RF AND IF.

Necessary measuring equipment:

Signal generator.

Distortion meter.

Oscilloscope.

Select CH18 161.500 MHz (VCO = 150.800 MHz).

Connect distortion meter across the loudspeaker terminals. Connect signal generator to the antenna connector and tune it to 161.500.0 MHz modulated with 1 KHz \pm 3 KHz deviation.

Connect oscilloscope to TP1, frequency 455 MHz and sensitivity 0.1 V/cm.

Use a non-loading test probe.

Increase the signal generator output until you see a signal in TP1.

Tune L9, L8, L7, L6, L5, L4, L3, L2 and L1 to max. signal in TP1.

If the signal in TP1 exceeds 500 mV pp, the signal generator output must be reduced.

L5 and L7 are tuned to minimum distortion of the loudspeaker output.

Be sure that the generator still is exactly on the frequency. L10 is tuned to max. signal in the loudspeaker.

L6 is tuned 1 turn down (clockwise).

The sensitivity at 12 dB SINAD or S/N must be better than 0.4 μ V (0.8 μ V EMF).

Select CH11 156.550 MHz (VCO = 145.850 MHz).

Tune P1 to best sensitivity. At 12 dB SINAD or S/N the sensitivity must be better than 0.4 μ V (0.8 μ V EMF).

9.4 ALIGNMENT OF TX-DRIVER.

Necessary measuring equipment:

Voltmeter and RF probe or a watt-meter.

Connect a 47 ohms resistor or watt-meter to the Tx-driver output and measure the voltage or power.

Select CH18 (156.900 MHz) and key the transmitter.

Tune L15, C47 and L12 to max. output minimum 3 V/50 ohms - 180 mW.

9.5 ALIGNMENT OF VHF-PA.

Necessary measuring equipment:

VHF power meter.

Connect the power meter to the antenna connector.

Select CH18 (156.900 MHz).

At 10.8 V supply voltage tune C21 and C10 to max. output power.

At 15.0 V supply voltage adjust output power to 25 W with P2 on receiver module.

Output power must be 20W \pm 2W at 12.0 V supply voltage.

Normal drive in MFR 238 gives a transmitcurrent for the total set at 4-4.5 A.

Switch to reduced power.

Output must be 0.5W-1W.

This can be adjusted by changing R89 on AF module.

9.6 ALIGNMENT OF MODULATOR.

Necessary measuring equipment:

Tone generator.

Oscilloscope.

Deviation meter.

50 ohm dummy load.

Select CH18 and key transmitter on LOW POWER.

Connect deviation meter to the dummy load.

Connect tone generator to the microphone terminals.

Input 1 KHz 100 mV pp (35 mV RMS) on the terminal.

Turn P6 in middle position.

Check the compressor function. Signal in TP1 must be 2-5 V.

Adjust P5 to a deviation on \pm 4.5 KHz.

Reduce tone generator input to 3.5 mV RMS on the terminals.

Adjust P6 to a deviation on \pm 3 KHz.

P6 can be readjusted to the actual microphone level.

Check that the max. deviation still is \pm 4.5 KHz when the receiver module is locked in the correct position and the TX-power is on maximum.

9.7 ALIGNMENT OF RECEIVER - AF AND SQ.

Necessary measuring equipment:

Signal generator.

Oscilloscope.

Select CH16 156.800 MHz.

1 KHz mod. \pm 3 KHz dev. 1 mV ant.

Adjust P3 to a telephone level of 600 mVpp.

Disconnect the signal generator.

Set SQ potm. in center position.

Adjust P2 to threshold level.

9.8. ALIGNMENT AND CODING OF SELCALL.

Necessary measuring equipment:

AF generator.

Frequency counter.

RF generator.

Oscilloscope.

Adjust the AF generator using a frequency counter to the first tone in the code.

Connect the AF generator to the modulation input of the RF generator - CH16 deviation ± 1 KHz.

Short circuit pin 15-16 IC1.

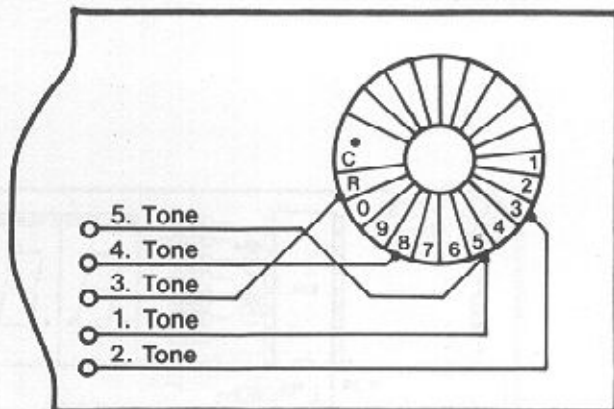
Connect oscilloscope to TP1 and adjust L1 to maximum signal.

Disconnect the short circuit pin 15-16 IC1.

Connect oscilloscope to TP3.

Time of high level 12-15 m sec. determined by R4.

Time of low level 210-290 m sec. determined by R8.



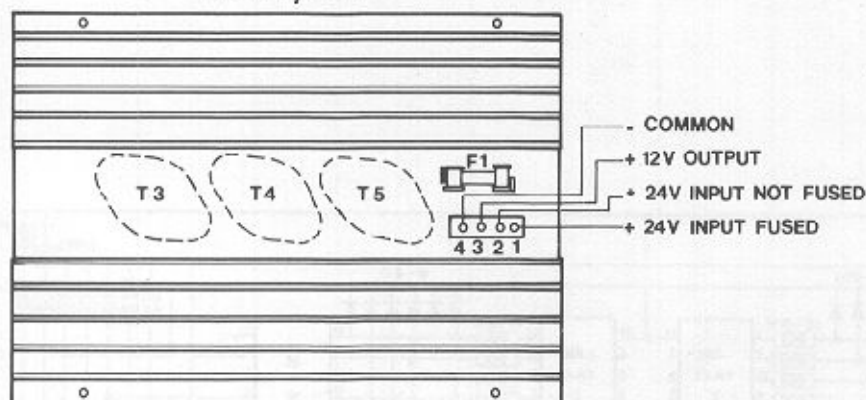
THE CODE ON THE LAYOUT DRAWING IS :
53R85 = 53385

Tone Frequency		4	1358 Hz	8	1747 Hz
1	1124 Hz	5	1446 Hz	9	1860 Hz
2	1197 Hz	6	1540 Hz	0	1981 Hz
3	1275 Hz	7	1640 Hz	R	2110 Hz

10. OPTIONS

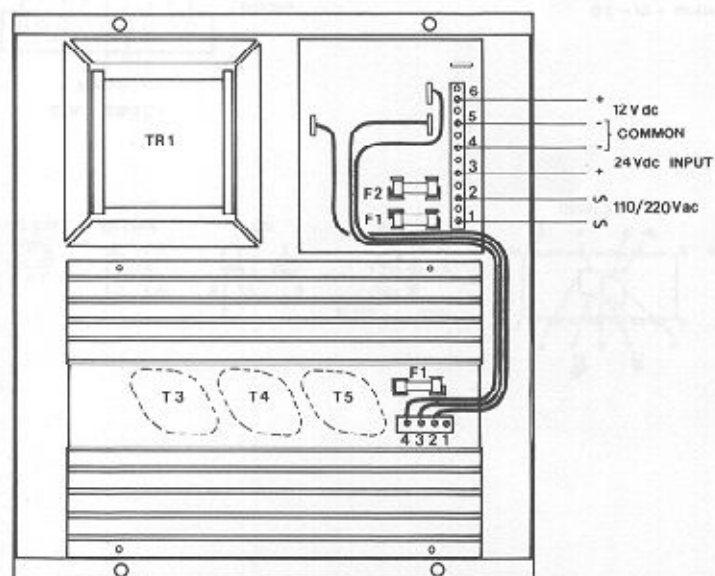
10.1. 24V REGULATOR

RS 24/12V



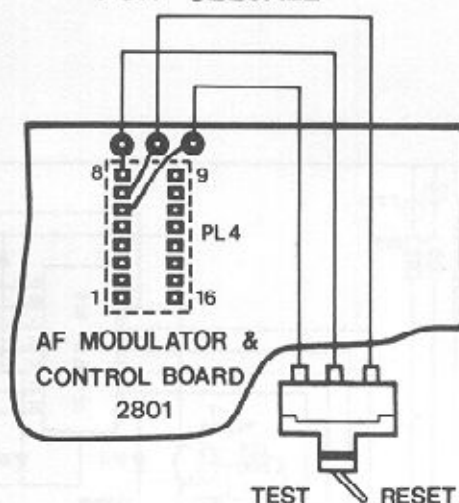
10.2. 220V REGULATOR

RS 220/12V

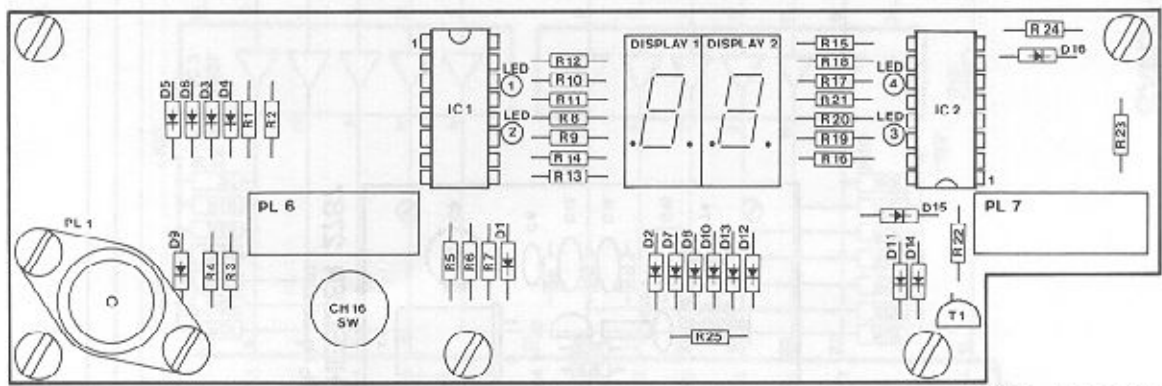


10.3. SELCALL

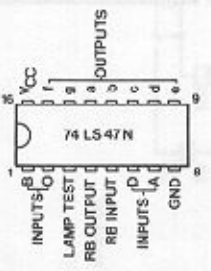
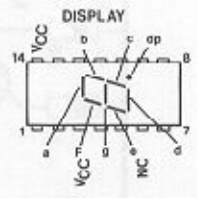
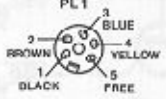
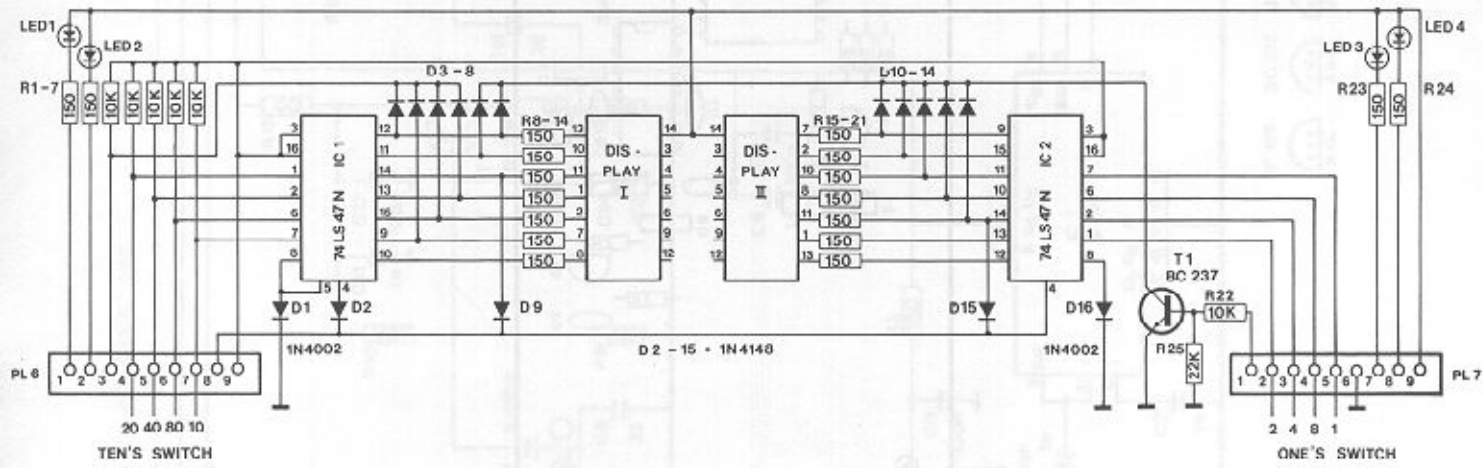
TEST ON/OFF SWITCH FOR SELCALL



DISPLAY CIRCUIT 2803
INSTRUMENT NO. 20.70.2



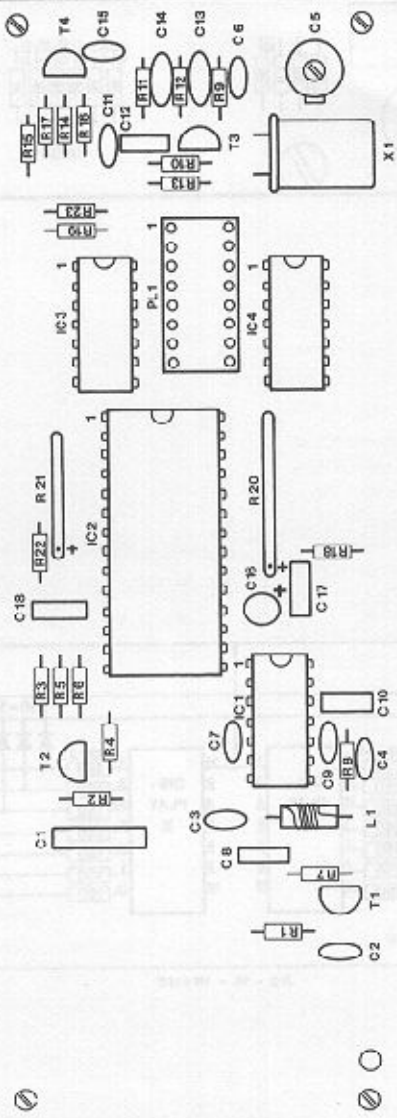
DISPLAY 2805
DRAWING No. 00.2805

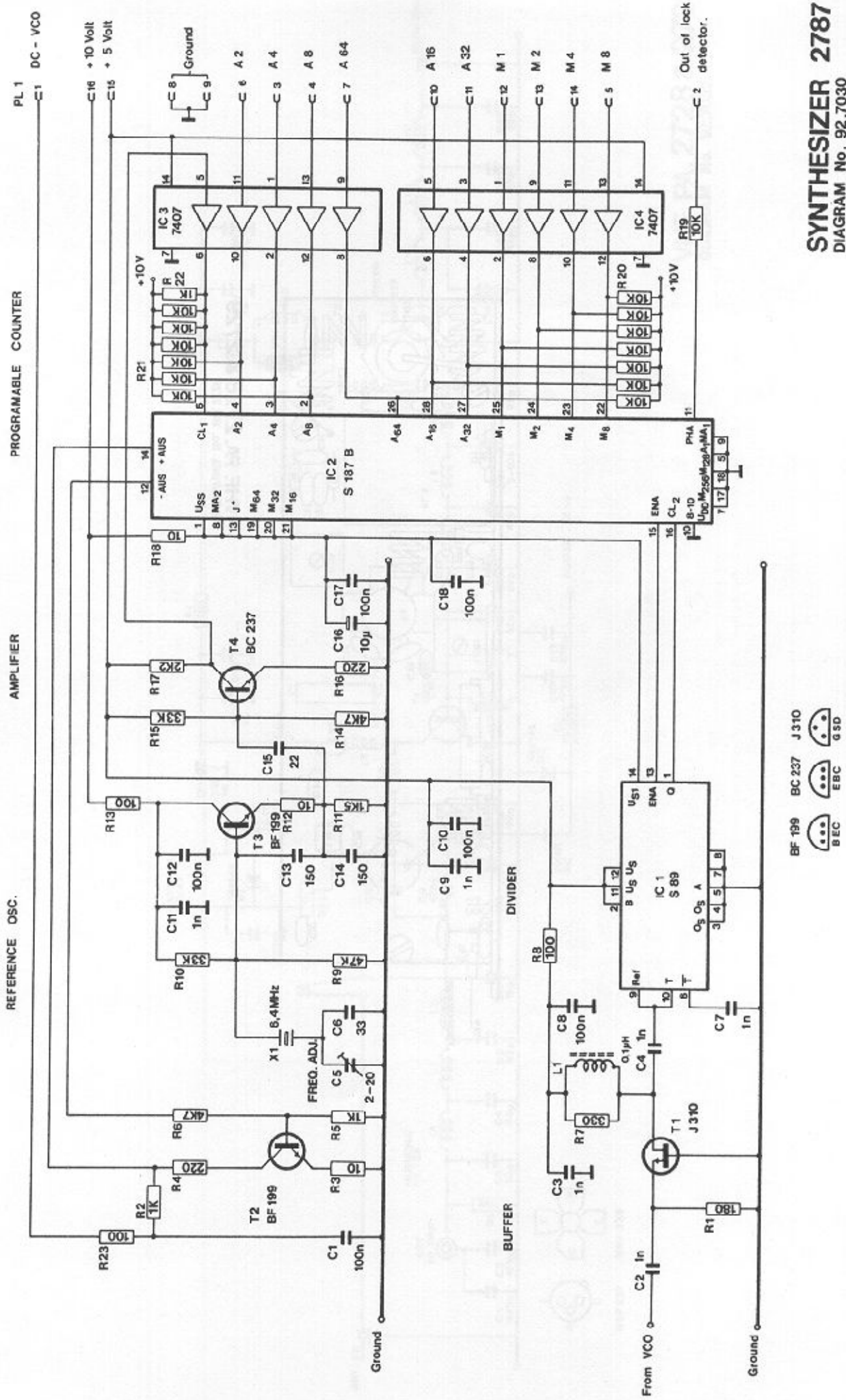


DISPLAY CIRCUIT 2805
DIAGRAM No. 92.7035

SYNTHESIZER 2787

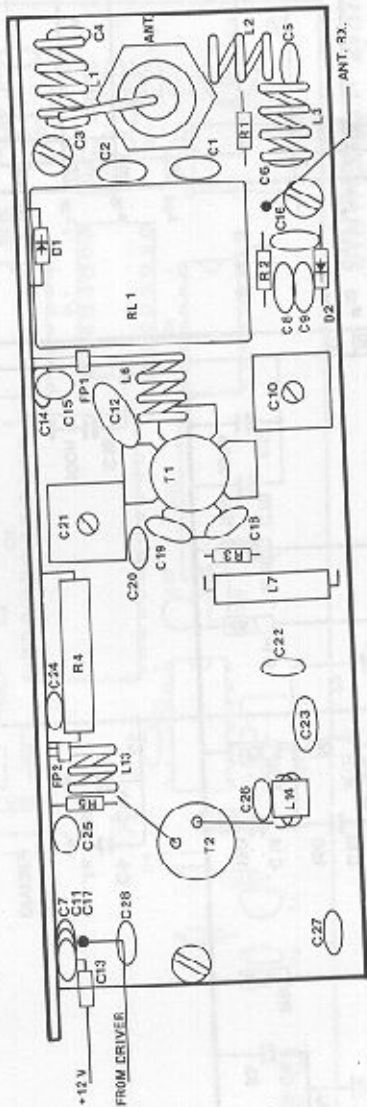
DRAWING No. 80.2787



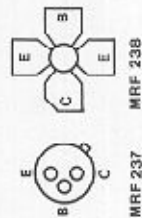
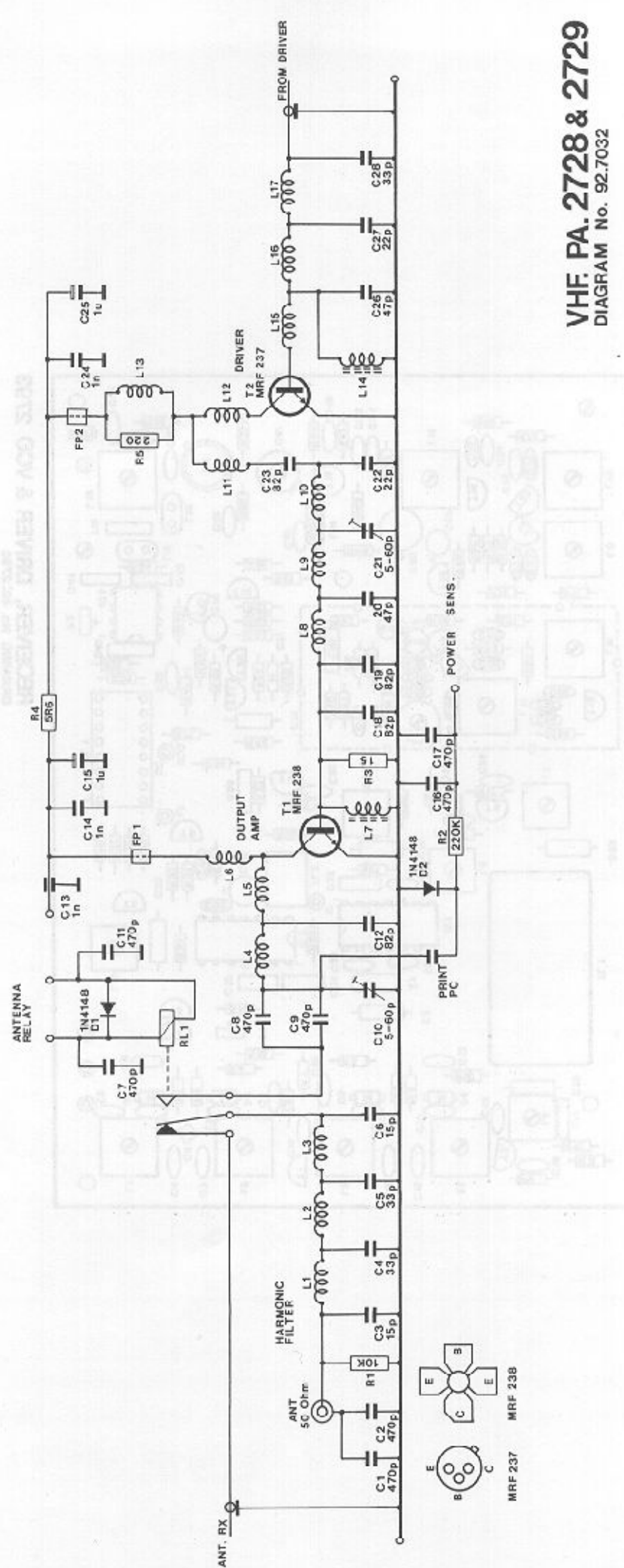


- BF 199  BEC
- BC 237  EBC
- J 310  GSD

VHF. PA. 2728 & 2729
 DRAWING No. 80.2729

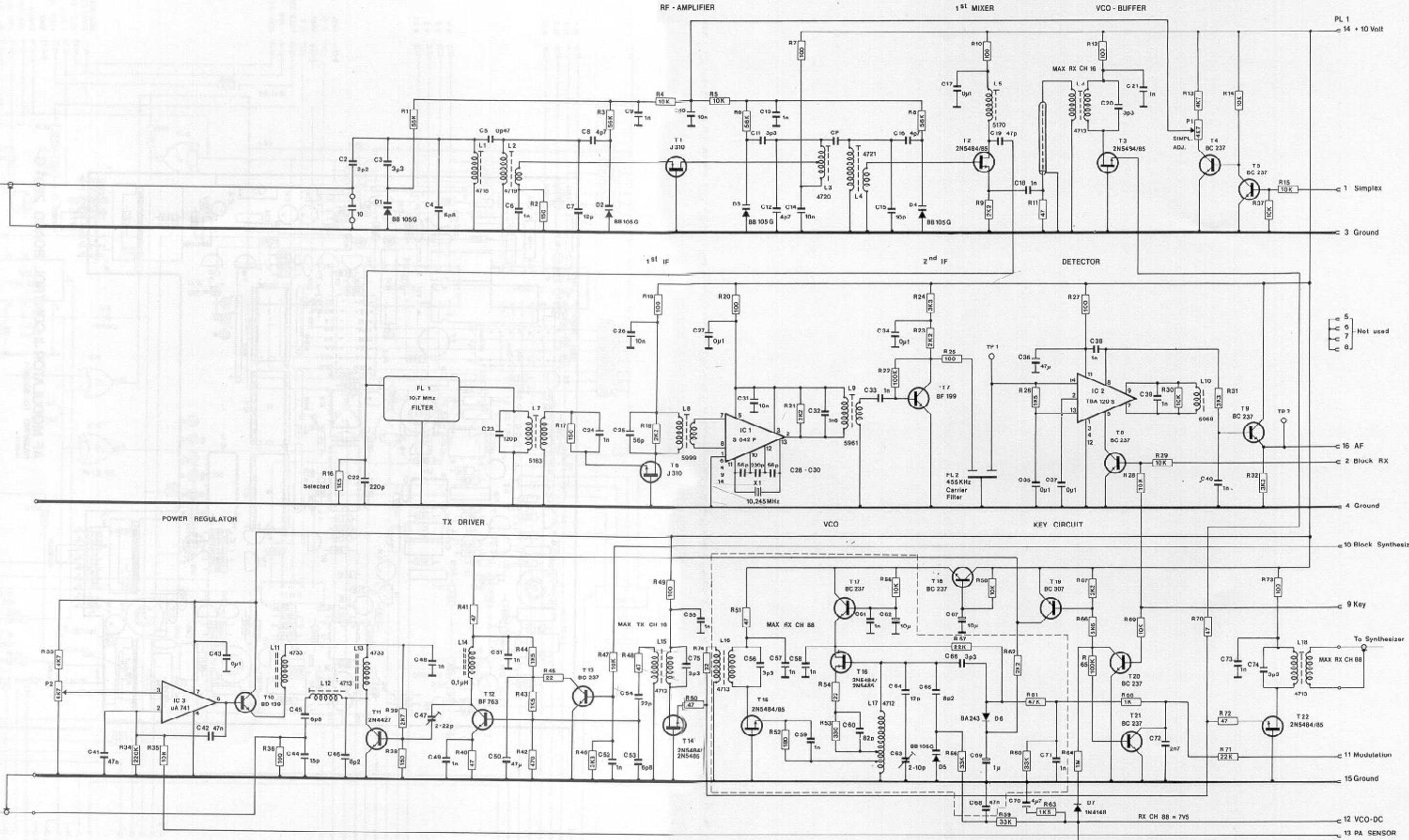


RECEIVER UNIT
 ANTENNA RELAY



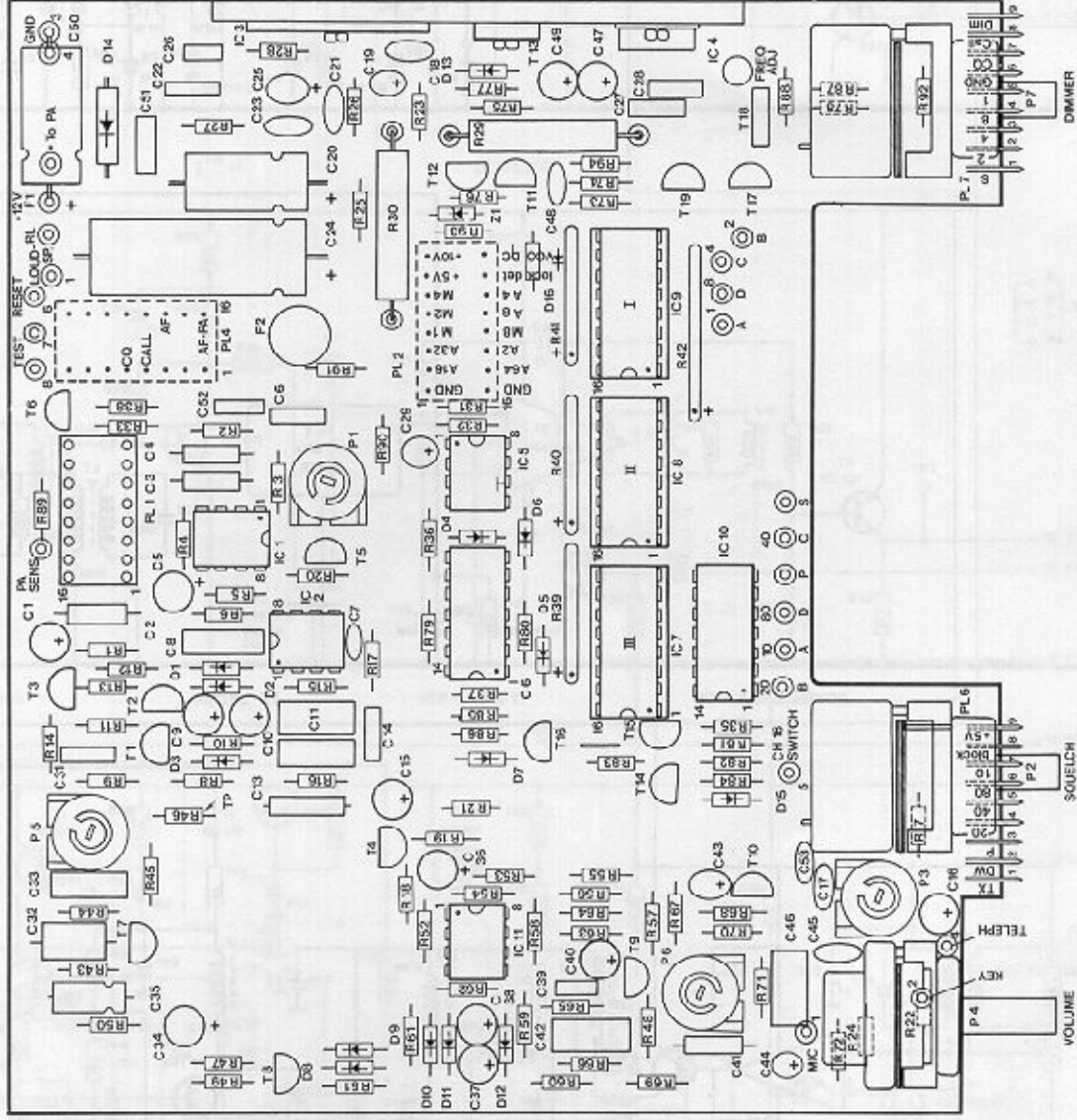
MRF 237 MRF 238

VHF. PA. 2728 & 2729
 DIAGRAM No. 92.7032



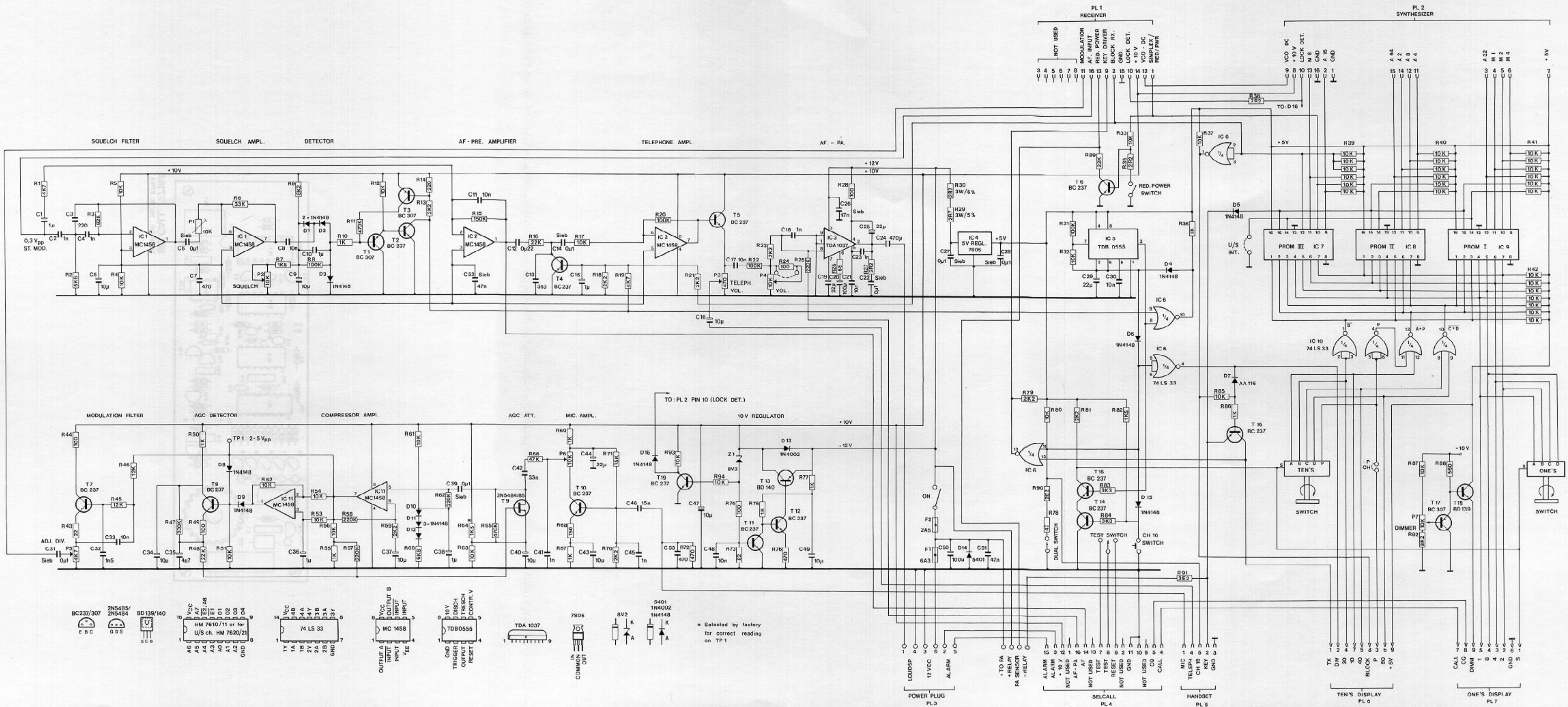
- BC 237 & BC 307
- BF 763
- J 310
- 2N5484/2N5485
- 2N4427
- BD 139
- BB 105 G
- BA 243 & 1N4148
- S 042 P
- TBA 120 S
- UA 741

RECEIVER, DRIVER & VCO 2793
 DIAGRAM No. 92.7031
 840011

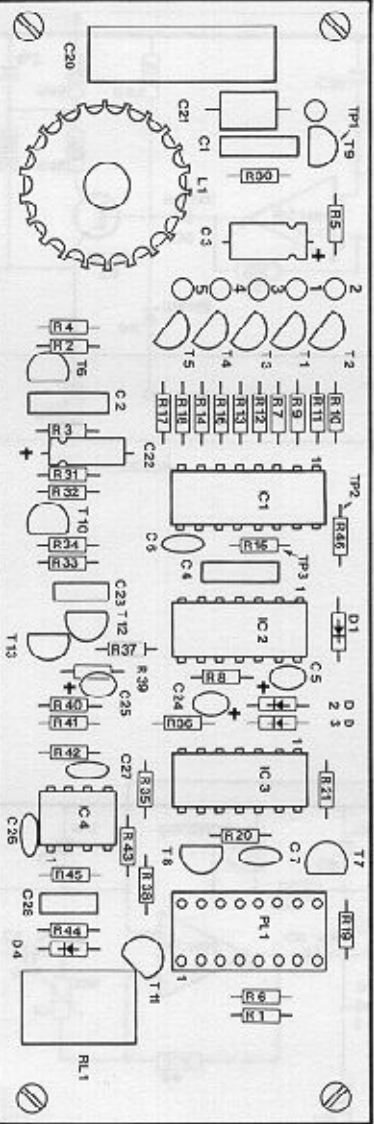


AF MODULATOR & CONTROL BOARD 2801G

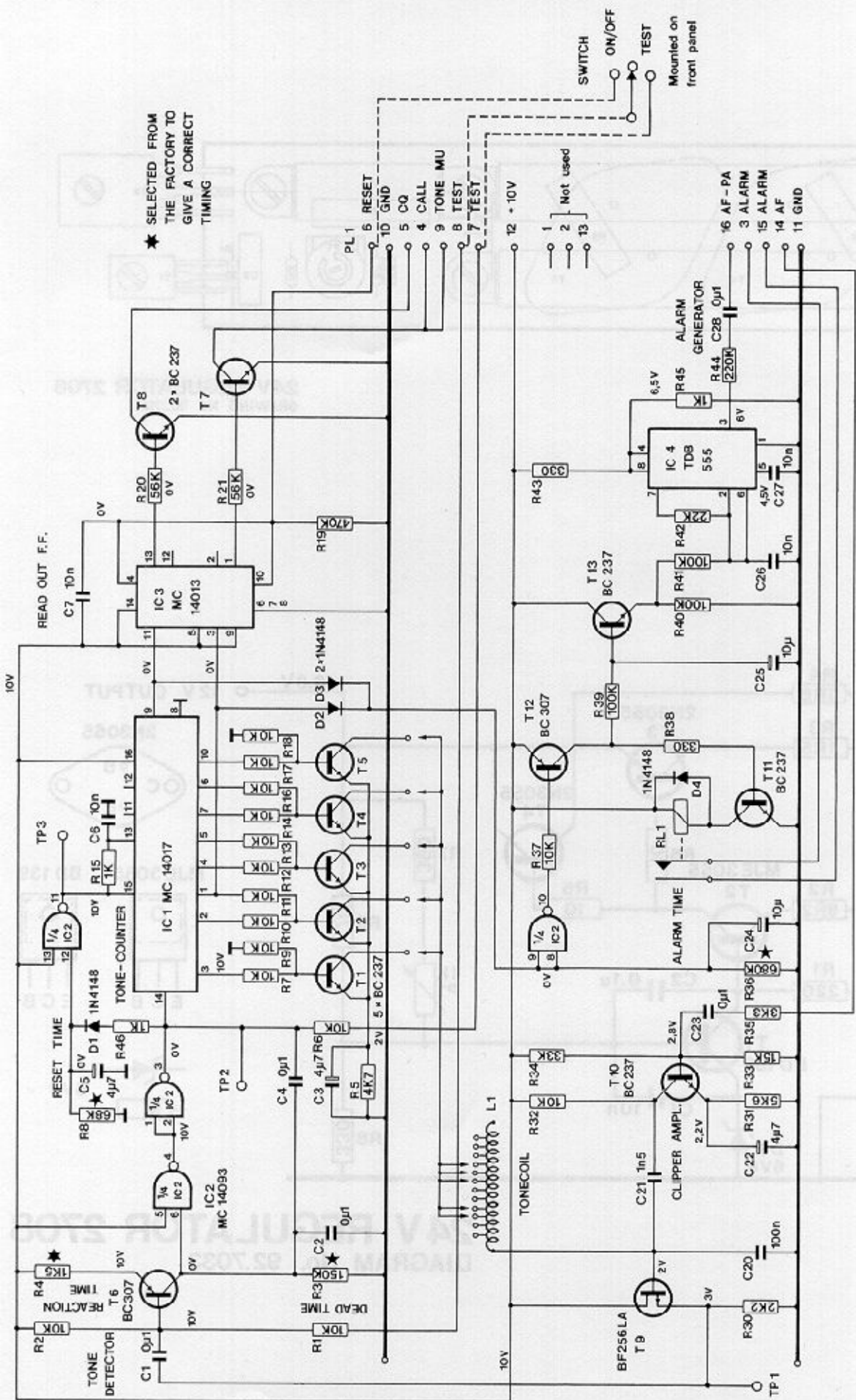
DRAWING No. 30.2801
84092



AF MODULATOR & CONTROL BOARD 2801G
 DIAGRAM No. 92.7034
 540911



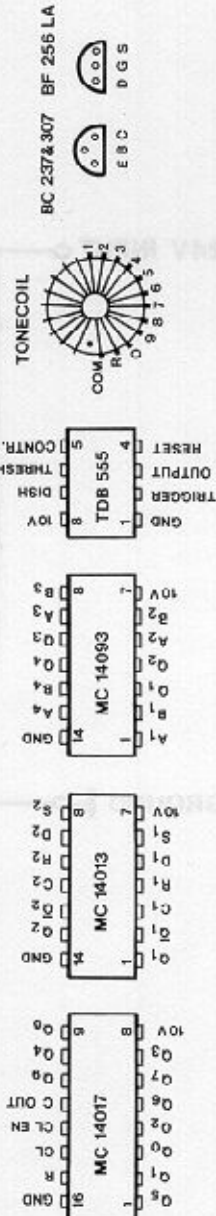
SELCALL 2716A
 DRAWING NO. 80.2716A



★ SELECTED FROM THE FACTORY TO GIVE A CORRECT TIMING

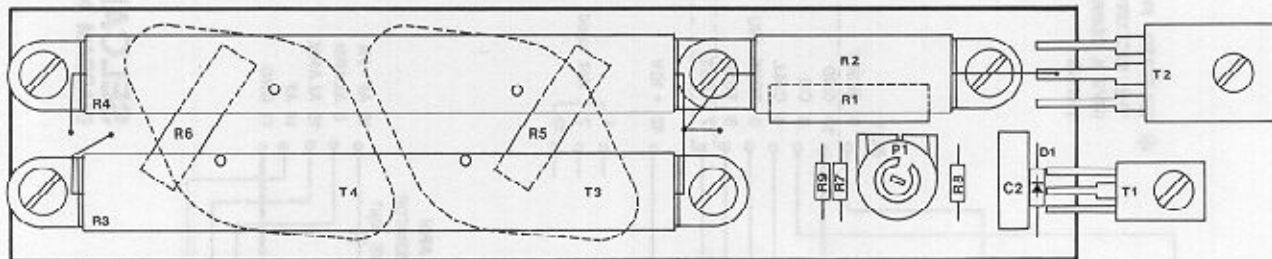
SWITCH ON/OFF TEST

Mounted on front panel

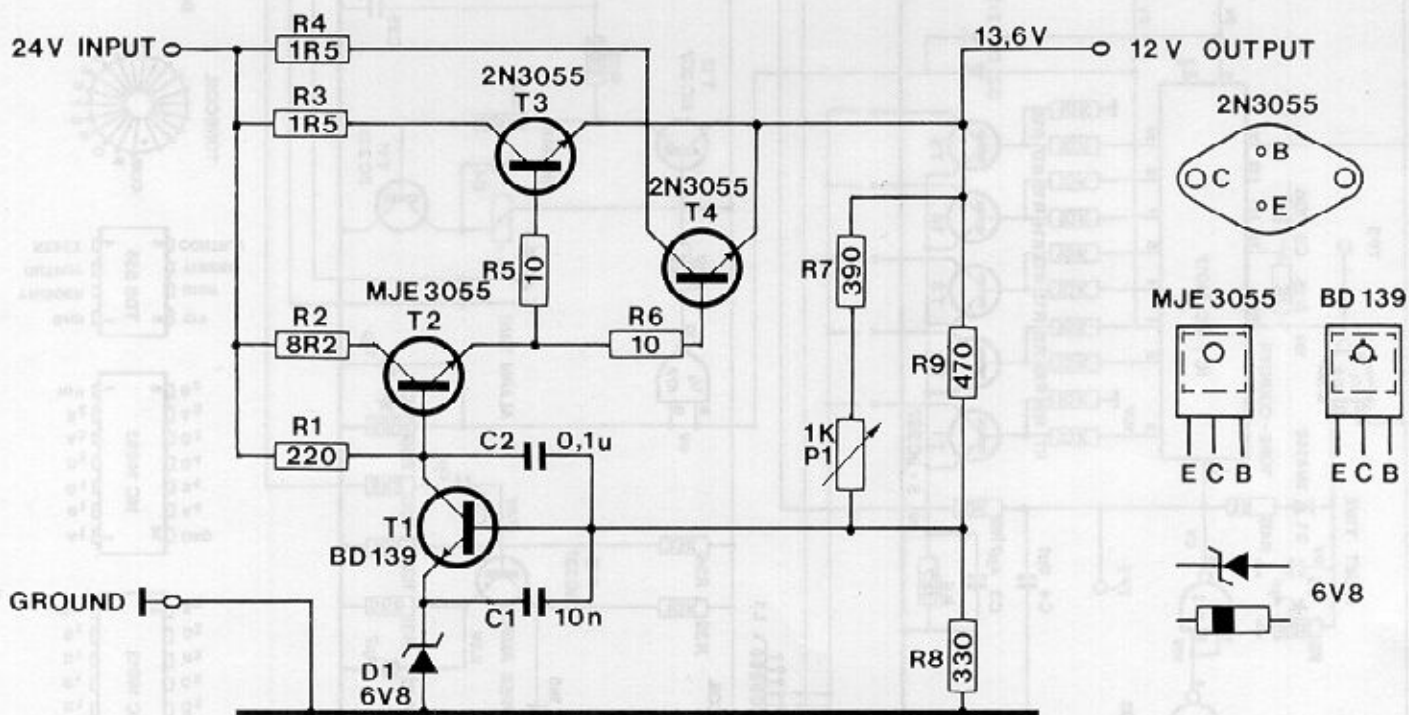


SELCALL 2716A

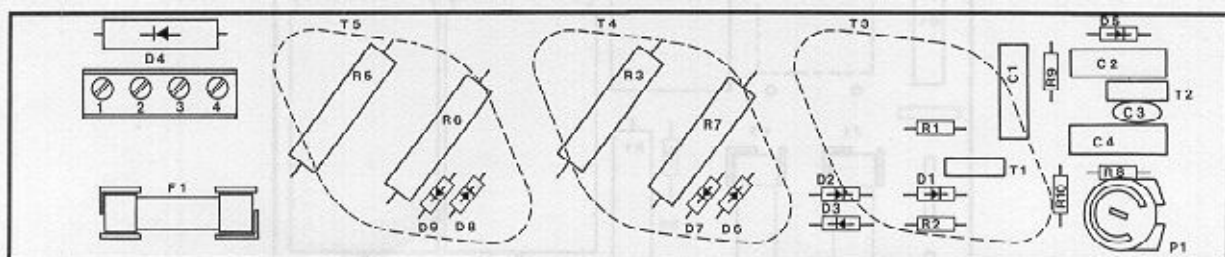
DIAGRAM No. 92.7006A



24V REGULATOR 2708
DRAWING No. 80.2708



24V REGULATOR 2708
DIAGRAM No. 92.7033



24-12V REGULATOR 2754

DRAWING No. 80.2754

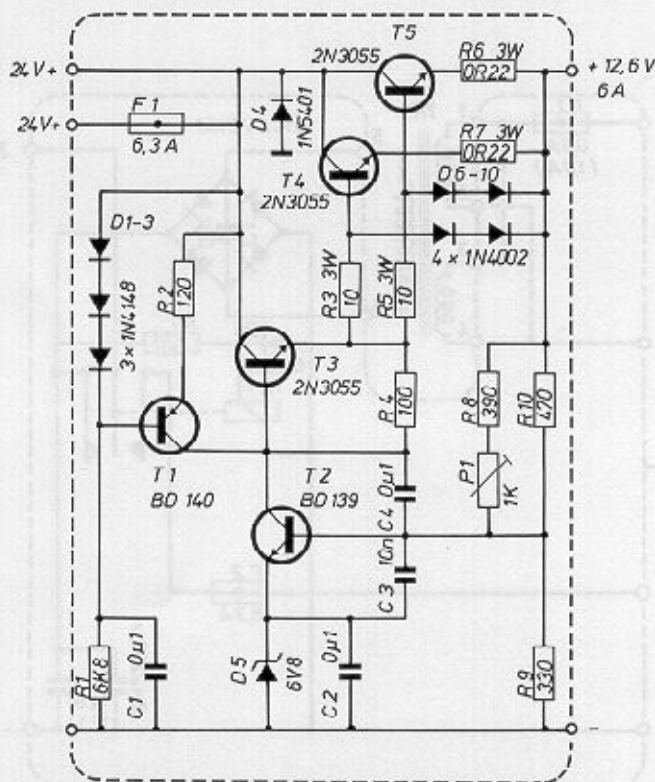
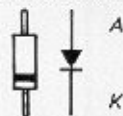
BD 139 & BD 140



2N3055

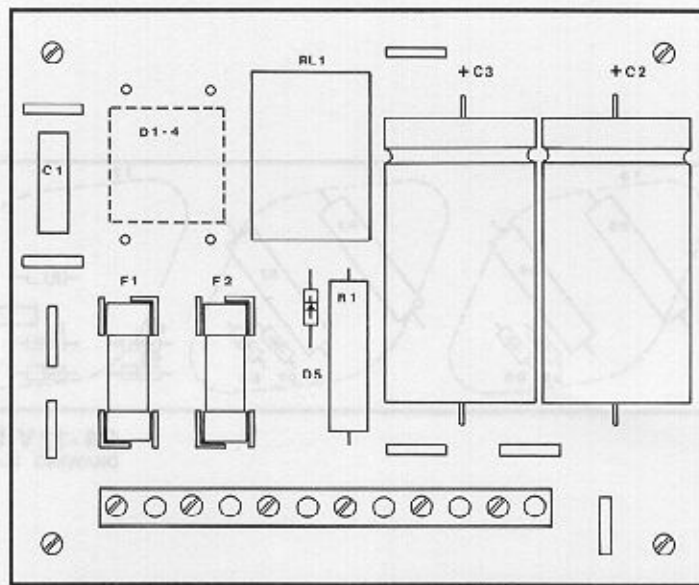


1N4002 & 1N4148

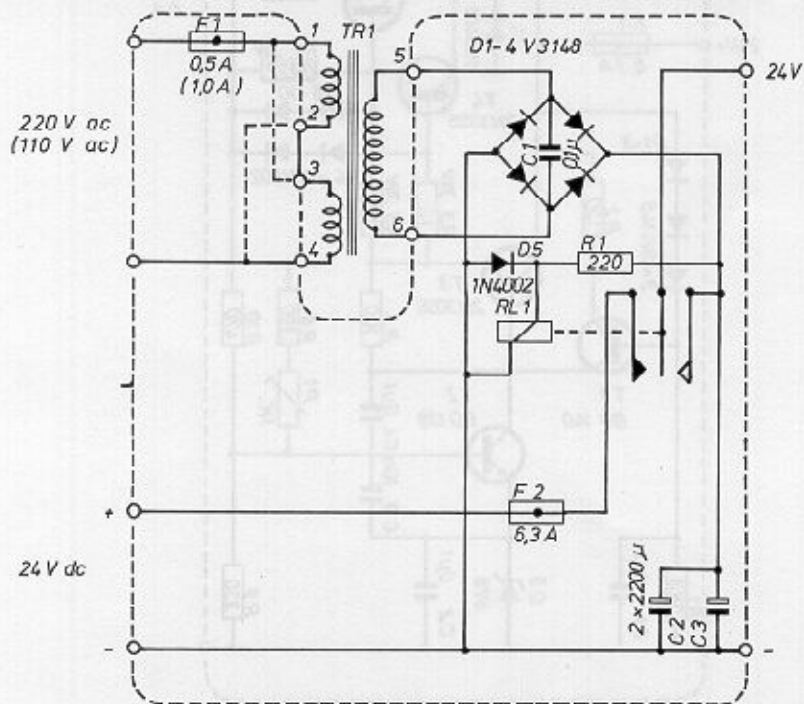


RS 24-12V REGULATOR 2754

DIAGRAM No. 92.7018



220-24V REGULATOR 2755
DRAWING No. 80.2755



RS 220-24V REGULATOR 2755
DIAGRAM No. 92.7017

SYNTHESIZER 2787

R1	Resistor	180 ohm Phillips	2322 211 13181	C15	Capacitor cer.	22p	Ferroperm	9/0116,9
R2	Resistor	1 Kohm Phillips	2322 211 13102	C16	Capacitor tan.	10uF	ITT	399E106MD 168C
R3	Resistor	10 ohm Phillips	2322 211 13109	C17	Capacitor sieb.	100h	Siemens	B37449 F6104 S2
R4	Resistor	220 ohm Phillips	2322 211 13221	C18	Capacitor sieb.	100h	Siemens	B37449 F6104 S2
R5	Resistor	1 Kohm Phillips	2322 211 13102	T1	Transistor	Motorola		J 310
R6	Resistor	4,7 Kohm Phillips	2322 211 13472	T2	Transistor	Siemens		BF 199
R7	Resistor	330 ohm Phillips	2322 211 13331	T3	Transistor	Siemens		BF 199
R8	Resistor	100 ohm Phillips	2322 211 13101	T4	Transistor	Siemens		BC 237
R9	Resistor	47 Kohm Phillips	2322 211 13473					
R10	Resistor	33 Kohm Phillips	2322 211 13333					
R11	Resistor	1,5 Kohm Phillips	2322 211 13152					
R12	Resistor	10 ohm Phillips	2322 211 13109					
R13	Resistor	100 ohm Phillips	2322 211 13101	IC1	Integrated cct.	Siemens		S B9
R14	Resistor	4,7 Kohm Phillips	2322 211 13472	IC2	Integrated cct.	Siemens		S 187 B
R15	Resistor	33 Kohm Phillips	2322 211 13333	IC3	Integrated cct.	Siemens		7407
R16	Resistor	220 ohm Phillips	2322 211 13221	IC4	Integrated cct.	Siemens		7407
R17	Resistor	2,2 Kohm Phillips	2322 211 13222					
R18	Resistor	10 ohm Phillips	2322 211 13109					
R19	Resistor	10 Kohm Phillips	2322 211 13103	L1	Coil	R&S		
R20	Resistor	10 Kohm Rohm	RM8 1030					
R21	Resistor	10 Kohm Rohm	RM6 1030					
C1	Capacitor poly.	0,1u Phillips	2222 344 21104					
C2	Capacitor cer.	1n Drealoric	EDRU 5					
C3	Capacitor cer.	1n Drealoric	EDRU 5					
C4	Capacitor cer.	1n Drealoric	EDRU 5					
C5	Capacitor trin.	2-22p Phillips	2222 808 11229					
C6	Capacitor cer.	33p Ferroperm	9/0121,8					
C7	Capacitor cer.	1n Drealoric	EDRU 5					
C8	Capacitor sieb.	100n Siemens	B37449 F6104 S2					
C9	Capacitor cer.	1n Drealoric	EDRU 5					
C10	Capacitor sieb.	100n Siemens	B37449 F6104 S2					
C11	Capacitor cer.	1n Drealoric	EDRU 5					
C12	Capacitor sieb.	100n Siemens	B37449 F6104 S2					
C13	Capacitor cer.	150n Ferroperm	9/0121,8					
C14	Capacitor cer.	150n Ferroperm	9/0121,8					

RECEIVER, DRIVER & VCO 2793

R1	Resistor	56 Kohm Phillips	2322 211 13151	R38	Resistor	150 ohm Phillips	2322 211 13151
R2	Resistor	150 ohm Phillips	2322 211 13151	R39	Resistor	2,7 Kohm Phillips	2322 211 13272
R3	Resistor	56 Kohm Phillips	2322 211 13151	R40	Resistor	47 ohm Phillips	2322 211 13479
R4	Resistor	10 Kohm Phillips	2322 211 13103	R41	Resistor	47 ohm Phillips	2322 211 13479
R5	Resistor	10 Kohm Phillips	2322 211 13103	R42	Resistor	470 ohm Phillips	2322 211 13471
R6	Resistor	56 Kohm Phillips	2322 211 13151	R43	Resistor	1,5 Kohm Phillips	2322 211 13152
R7	Resistor	100 ohm Phillips	2322 211 13101	R44	Resistor	1,5 Kohm Phillips	2322 211 13152
R8	Resistor	56 Kohm Phillips	2322 211 13151	R45	Resistor	22 ohm Phillips	2322 211 13229
R9	Resistor	2,2 Kohm Phillips	2322 211 13222	R46	Resistor	3,3 ohm Phillips	2322 211 13332
R10	Resistor	100 ohm Phillips	2322 211 13101	R47	Resistor	10 Kohm Phillips	2322 211 13103
R11	Resistor	47 ohm Phillips	2322 211 13479	R48	Resistor	47 ohm Phillips	2322 211 13479
R12	Resistor	100 ohm Phillips	2322 211 13101	R49	Resistor	100 ohm Phillips	2322 211 13101
R13	Resistor	4,7 Kohm Phillips	2322 211 13472	R50	Resistor	47 ohm Phillips	2322 211 13479
R14	Resistor	10 Kohm Phillips	2322 211 13103	R51	Resistor	47 ohm Phillips	2322 211 13479
R15	Resistor	10 Kohm Phillips	2322 211 13103	R52	Resistor	180 ohm Phillips	2322 211 13181
R16	Selected in final test			R53	Resistor	330 ohm Phillips	2322 211 13331
R17	Resistor	150 ohm Phillips	2322 211 13151	R54	Resistor	22 Kohm Phillips	2322 211 13229
R18	Resistor	2,2 Kohm Phillips	2322 211 13222	R55	Resistor	10 Kohm Phillips	2322 211 13103
R19	Resistor	100 ohm Phillips	2322 211 13101	R56	Resistor	33 Kohm Phillips	2322 211 13333
R20	Resistor	100 ohm Phillips	2322 211 13101	R57	Resistor	22 Kohm Phillips	2322 211 13223
R21	Resistor	2,2 Kohm Phillips	2322 211 13222	R58	Resistor	10 Kohm Phillips	2322 211 13103
R22	Resistor	100 Kohm Phillips	2322 211 13104	R59	Resistor	33 Kohm Phillips	2322 211 13333
R23	Resistor	2,2 Kohm Phillips	2322 211 13222	R60	Resistor	33 Kohm Phillips	2322 211 13333
R24	Resistor	3,3 Kohm Phillips	2322 211 13332	R61	Resistor	47 Kohm Phillips	2322 211 13473
R25	Resistor	100 ohm Phillips	2322 211 13101	R62	Resistor	2,2 Kohm Phillips	2322 211 13222
R26	Resistor	1,5 Kohm Phillips	2322 211 13152	R63	Resistor	1,5 Kohm Phillips	2322 211 13152
R27	Resistor	100 ohm Phillips	2322 211 13101	R64	Resistor	1 Mohm Phillips	2322 211 13118
R28	Resistor	10 Kohm Phillips	2322 211 13103	R65	Resistor	100 Kohm Phillips	2322 211 13104
R29	Resistor	10 Kohm Phillips	2322 211 13103	R66	Resistor	5,6 Kohm Phillips	2322 211 13562
R30	Resistor	10 Kohm Phillips	2322 211 13103	R67	Resistor	2,2 Kohm Phillips	2322 211 13222
R31	Resistor	3,3 Kohm Phillips	2322 211 13332	R68	Resistor	1 Kohm Phillips	2322 211 13102
R32	Resistor	3,3 Kohm Phillips	2322 211 13332	R69	Resistor	10 Kohm Phillips	2322 211 13103
R33	Resistor	4,7 Kohm Phillips	2322 211 13472	R70	Resistor	47 ohm Phillips	2322 211 13479
R34	Resistor	220 Kohm Phillips	2322 211 13224	R71	Resistor	22 Kohm Phillips	2322 211 13223
R35	Resistor	10 Kohm Phillips	2322 211 13103	R72	Resistor	47 ohm Phillips	2322 211 13479
R36	Resistor	100 ohm Phillips	2322 211 13101	R73	Resistor	100 ohm Phillips	2322 211 13101
R37	Resistor	10 Kohm Phillips	2322 211 13103	R74	Resistor	22 ohm Phillips	2322 211 13229

VHF PA 2728 & 29

R1	Resistor	10 Kohm Philips	2722 211 13103	T1	Transistor	Motorola	MRF 238
R2	Resistor	220 Kohm Philips	2722 211 13224	T2	Transistor	Motorola	MRF 237
R3	Resistor	15 ohm Philips	2722 211 13159				
R4	Resistor	5,6 ohm Radio Farts	145130				
R5	Resistor	220 ohm Philips	2722 211 13221	RL1	Relay	Siemens	V23027 A0002 A101
C1	Capacitor cer.	470p Ferroperm	9/0129,9	L1	Coil	R&S	
C2	Capacitor cer.	470p Ferroperm	9/0129,9	L2	Coil	R&S	
C3	Capacitor cer.	15p Ferroperm	9/0116,9	L3	Coil	R&S	
C4	Capacitor cer.	33p Ferroperm	9/0115,9	L4	Coil Stripline		
C5	Capacitor cer.	33p Ferroperm	9/0116,8	L5	Coil Stripline		
C6	Capacitor cer.	15p Ferroperm	9/0116,9	L6	Coil		
C7	Capacitor cer.	470p Ferroperm	9/0129,9	L7	Coil		
C8	Capacitor cer.	470p Ferroperm	9/0129,9	L8	Coil Stripline		
C9	Capacitor cer.	470p Ferroperm	9/0129,9	L9	Coil Stripline		
C10	Capacitor trin.	5-60p Philips	2222 809 08003	L10	Coil Stripline		
C11	Capacitor cer.	470p Ferroperm	9/0129,9	L11	Coil Stripline		
C12	Capacitor cer.	82p Ferroperm	9/0121,9	L12	Coil Stripline		
C13	Capacitor feed through	1n Ferroperm	9/0139,58	L13	Coil	R&S	
C14	Capacitor cer.	1n Draloric	EDRU 5	L14	Coil	R&S	
C15	Capacitor tan.	4,7u IIT	TAG 4R7M25 SP	L15	Coil Stripline		
C16	Capacitor cer.	470p Ferroperm	9/0129,9	L16	Coil Stripline		
C17	Capacitor cer.	470p Ferroperm	9/0129,9				
C18	Capacitor cer.	82p Ferroperm	9/0121,9				
C19	Capacitor cer.	82p Ferroperm	9/0121,9				
C20	Capacitor cer.	82p Ferroperm	9/0121,9				
C21	Capacitor trin.	5-60p Philips	2222 809 08003				
C22	Capacitor cer.	22p Ferroperm	9/0116,9				
C23	Capacitor cer.	82p Ferroperm	9/0121,9				
C24	Capacitor cer.	1n Draloric	EDRU 5				
C25	Capacitor tan.	4,7u IIT	TAG 4R7M25 SP				
C26	Capacitor cer.	47p Ferroperm	9/0116,8				
C27	Capacitor cer.	22p Ferroperm	9/0116,9				
C28	Capacitor cer.	33p Ferroperm	9/0116,8				

D1 Diode

1N4148

IIT

RECEIVER DRIVER & AGC STAGE

P1	Potentiometer trim.	4,7 kOhm Philips	2322 410 05056	C35	Capacitor sieb.	0,1u	Siemens	B37 449 F6104 S2
P2	Potentiometer trim.	4,7 kOhm Philips	2322 410 05056	C36	Capacitor ellyt.	47u	ITT	45 42 00 130
C2	Capacitor cer.	2,2p Ferroperm	9/0116,9	C37	Capacitor sieb.	0,1u	Siemens	1337 449 F6104 S2
C3	Capacitor cer.	4,7p Ferroperm	9/0116,9	C38	Capacitor cer.	1n	Draloric	EDRU 5
C4	Capacitor cer.	6,8p Ferroperm	9/0116,9	C39	Capacitor sty.	1n	Philips	2222 426 41002
C5	Capacitor cer.	0,47p Ferroperm	9/0110,9	C40	Capacitor cer.	1n	Draloric	EDRU 5
C6	Capacitor cer.	1n Draloric	EDRU 5	C41	Capacitor sieb.	47n	Siemens	B37 449 F6473 S2
C7	Capacitor cer.	12p Ferroperm	9/0116,9	C42	Capacitor sieb.	47n	Siemens	B37 449 F6473 S2
C8	Capacitor cer.	4,7p Ferroperm	9/116,9	C43	Capacitor sieb.	0,10	Siemens	B37 449 F6104 S2
C9	Capacitor cer.	1n Draloric	EDRU 5	C44	Capacitor cer.	15p	Ferroperm	9/0116,9
C10	Capacitor cer.	10n Draloric	EDRU 5	C45	Capacitor cer.	6,8p	Ferroperm	9/0116,9
C11	Capacitor cer.	3,3p Ferroperm	9/0116,9	C46	Capacitor cer.	8,2p	Ferroperm	9/0116,9
C12	Capacitor cer.	4,7p Ferroperm	EDRU 5	C47	Capacitor trim.	2-22p	Philips	2222 808 11229
C13	Capacitor cer.	1n Draloric	EDRU 5	C48	Capacitor cer.	1n	Draloric	EDRU 5
C14	Capacitor cer.	10n Draloric	EDRU 5	C49	Capacitor cer.	1n	Draloric	EDRU 5
C15	Capacitor cer.	10p Ferroperm	EDRU 5	C50	Capacitor ellyt.	47u	ITT	454200130
C16	Capacitor cer.	4,7p Ferroperm	9/0116,9	C51	Capacitor cer.	1n	Draloric	EDRU 5
C17	Capacitor sieb.	0,1u Siemens	B37 449 F6104 S2	C52	Capacitor cer.	1n	Draloric	EDRU 5
C18	Capacitor cer.	1n Draloric	EDRU 5	C53	Capacitor cer.	6,8p	Ferroperm	9/0116,9
C19	Capacitor cer.	47p Ferroperm	9/0116,8	C54	Capacitor cer.	22p	Ferroperm	9/0116,9
C20	Capacitor cer.	3,3p Ferroperm	9/0116,9	C55	Capacitor cer.	1n	Draloric	EDRU 5
C21	Capacitor cer.	1n Draloric	EDRU 5	C56	Capacitor cer.	3,3p	Ferroperm	9/0116,9
C22	Capacitor sty.	220p Philips	2222 427 42201	C57	Capacitor cer.	1n	Draloric	EDRU 5
C23	Capacitor sty.	120p Philips	2222 427 41201	C58	Capacitor cer.	1n	Draloric	EDRU 5
C24	Capacitor cer.	1n Draloric	EDRU 5	C59	Capacitor cer.	1n	Draloric	EDRU 5
C25	Capacitor cer.	56p Ferroperm	9/0116,8	C60	Capacitor cer.	82p	Draloric	EDRU 5
C26	Capacitor cer.	10n Draloric	EDRU 5	C61	Capacitor cer.	1n	Draloric	EDRU 5
C27	Capacitor sieb.	0,1u Siemens	B37 449 F6104 S2	C62	Capacitor tan.	10u	ITT	TAG 10M25 SP
C28	Capacitor cer.	56p Ferroperm	9/0116,8	C63	Capacitor trim.	2-10p	Philips	2222 808 11109
C29	Capacitor sty.	220 Philips	2222 427 42201	C64	Capacitor cer.	12p	Ferroperm	9/0116,9
C30	Capacitor cer.	65p Ferroperm	9/0116,8	C65	Capacitor cer.	8,2p	Ferroperm	9/0116,9
C31	Capacitor cer.	10n Draloric	EDRU 5	C66	Capacitor cer.	3,3p	Ferroperm	9/0116,9
C32	Capacitor sty.	1,8n Draloric	2222 425 41802	C67	Capacitor tan.	10u	ITT	TAG 10M25 SP
C33	Capacitor cer.	1n Draloric	EDRU 5	C68	Capacitor sieb.	47n	Siemens	B37 449 F6473 S2
C34	Capacitor sieb.	0,1u Siemens	B37 449 F6104 S2	C69	Capacitor tan.	1u	ITT	TAG 1R035 SP
				C70	Capacitor tan.	4,7u	Kemet	1399CA75MD16BC
				C71	Capacitor cer.	1n	Draloric	EDRU 5

C72	Capacitor sty.	2,7n	Philips	222 425 42702	IC1	Integrated ect.	Siemens	Sc42 P
C73	Capacitor cer.	In	Draloric	EDRU 5	IC2	Integrated ect.	Siemens	TBA 120 S
C74	Capacitor cer.	3,3p	Ferroperm	9/0116,9	IC3	Integrated ect.	Siemens	uA 741
C75	Capacitor cer.	3,3p	Ferroperm	9/0116,9				
D1	Diode		Siemens	8B 105 G	X1	Crystal	R&S	10,245 MHz
D2	Diode		Siemens	8B 105 G				
D3	Diode		Siemens	8B 105 G	FL1	Crystal-filter	R&S	10,700 MHz
D4	Diode		Siemens	8B 105 G				
D5	Diode		Siemens	8B 105 G				
D6	Diode		Siemens	BA 243	L1	Coil	R&S	471B
D7	Diode		Siemens	1N4148	L2	Coil	R&S	4723
T1	Transistor		Siemens	J 310	L3	Coil	R&S	4720
T2	Transistor		Intersil	2N5484/85	L4	Coil	R&S	4721
T3	Transistor		Intersil	2N5484/85	L5	Coil	NEOSID	5173
T4	Transistor		Siemens	BC 237	L6	Coil	R&S	4713
T5	Transistor		Siemens	BC 237	L7	Coil	NEOSID	5163
T6	Transistor		Siemens	J 310	L8	Coil	NEOSID	5999
T7	Transistor		Siemens	BF 199	L9	Coil	NEOSID	5961
T8	Transistor		Siemens	BF 237	L10	Coil	NEOSID	5968
T9	Transistor		Siemens	BC 237	L11	Coil	R&S	4733
T10	Transistor		Siemens	BC 237	L12	Coil	R&S	4713
T11	Transistor		Motocla	2N4427	L13	Coil	R&S	4733
T12	Transistor		Siemens	BF 763	L14	Coil, drossel	Ferroperm	c, LuH 1588
T13	Transistor		Siemens	BC 237	L15	Coil	R&S	4713
T14	Transistor		Intersil	2N5484/85	L16	Coil	R&S	4713
T15	Transistor		Intersil	2N5484/85	L17	Coil	R&S	4712
T16	Transistor		Intersil	2N5484/85	L18	Coil	R&S	4713
T17	Transistor		Siemens	BC 237				
T18	Transistor		Siemens	BC 237				
T19	Transistor		Siemens	BC 307				
T20	Transistor		Siemens	BC 237				
T21	Transistor		Siemens	BC 237				
T22	Transistor		Intersil	2N5484/85				

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R1	Resistor	4,7 Kohm Philips	2322 211 13472	R38	Resistor	2,2 ohm Philips	2322 211 13228
R2	Resistor	5,6 Kohm Philips	2322 211 13562	R39	Resistor	10 Kohm Rohm	RM6 103 J
R3	Resistor	82 Kohm Philips	2322 211 13823	R40	Resistor	10 Kohm Rohm	RM6 103 J
R4	Resistor	10 Kohm Philips	2322 211 13103	R41	Resistor	10 Kohm Rohm	RM6 103 J
R5	Resistor	10 Kohm Philips	2322 211 13103	R42	Resistor	10 Kohm Rohm	RM6 103 J
R6	Resistor	33 Kohm Philips	2322 211 13333	R43	Resistor	22 ohm Philips	2322 211 13229
R7	Resistor	1,5 Kohm Philips	2322 211 13152	R44	Resistor	100 ohm Philips	2322 211 13101
R8	Resistor	100 Kohm Philips	2322 211 13104	R45	Resistor	12 Kohm Philips	2322 211 13123
R9	Resistor	8,2 Kohm Philips	2322 211 13822	R46	Resistor	12 Kohm Philips	2322 211 13123
R10	Resistor	1 Kohm Philips	2322 211 13102	R47	Resistor	330 Kohm Philips	2322 211 13334
R11	Resistor	470 Kohm Philips	2322 211 13474	R48	Resistor	22 Kohm Philips	2322 211 13223
R12	Resistor	10 Kohm Philips	2322 211 13103	R49	Resistor	100 ohm Philips	2322 211 13101
R13	Resistor	2,2 Kohm Philips	2322 211 13222	R50	Resistor	1 Kohm Philips	2322 211 13102
R14	Resistor	220 Kohm Philips	2322 211 13221	R51	Resistor	10 Kohm Philips	2322 211 13103
R15	Resistor	150 Kohm Philips	2322 211 13154	R52	Resistor	10 Kohm Philips	2322 211 13103
R16	Resistor	22 Kohm Philips	2322 211 13223	R53	Resistor	10 Kohm Philips	2322 211 13103
R17	Resistor	10 Kohm Philips	2322 211 13103	R54	Resistor	10 Kohm Philips	2322 211 13103
R18	Resistor	2,2 Kohm Philips	2322 211 13222	R55	Resistor	1 Kohm Philips	2322 211 13102
R19	Resistor	4,7 Kohm Philips	2322 211 13472	R56	Resistor	10 Kohm Philips	2322 211 13103
R20	Resistor	100 Kohm Philips	2322 211 13104	R57	Resistor	220 Kohm Philips	2322 211 13224
R21	Resistor	2,2 Kohm Philips	2322 211 13222	R58	Resistor	220 Kohm Philips	2322 211 13224
R22	Resistor	180 Kohm Philips	2322 211 13184	R59	Resistor	2,2 Kohm Philips	2322 211 13222
R23	Resistor	2,2 Kohm Philips	2322 211 13222	R60	Resistor	6,8 Kohm Philips	2322 211 13682
R24	Resistor	100 ohm Philips	2322 211 13101	R61	Resistor	10 Kohm Philips	2322 211 13103
R25	Resistor	220 Kohm Philips	2322 211 13224	R62	Resistor	220 Kohm Philips	2322 211 13224
R26	Resistor	68 ohm Philips	2322 211 13689	R63	Resistor	10 Kohm Philips	2322 211 13103
R27	Resistor	2,2 ohm Philips	2322 211 13228	R64	Selected by factory		
R28	Resistor	100 ohm Philips	2322 211 13101	R65	Resistor	470 Kohm Philips	2322 211 13474
R29	Resistor	2,7 ohm Radio Parts	14 51 26	R66	Resistor	47 Kohm Philips	2322 211 13473
R30	Resistor	2,7 ohm Radio Parts	14 51 26	R67	Resistor	1 Kohm Philips	2322 211 13102
R31	Resistor	100 Kohm Philips	2322 211 13104	R68	Resistor	150 ohm Philips	2322 211 13151
R32	Resistor	10 Kohm Philips	2322 211 13103	R69	Resistor	1 Kohm Philips	2322 211 13102
R33	Resistor	10 Kohm Philips	2322 211 13103	R70	Resistor	2,2 Kohm Philips	2322 211 13222
R34	Not used			R71	Resistor	15 Kohm Philips	2322 211 13153
R35	Resistor	2,2 ohm Philips	2322 211 13228	R72	Resistor	470 ohm Philips	2322 211 13471
R36	Resistor	1 Kohm Philips	2322 211 13102	R73	Resistor	82 ohm Philips	2322 211 13829
R37	Resistor	10 Kohm Philips	2322 211 13103	R74	Resistor	100 ohm Philips	2322 211 13101

R75	Resistor	1 Kohm Philips	2322 211 13102	C9	Capacitor ellyt.	10u	Matsushita	45 4200 170
R76	Resistor	470 ohm Philips	2322 211 13471	C10	Capacitor ellyt.	1u	Matsushita	45 4200 370
R77	Resistor	1 Kohm Philips	2322 211 13102	C11	Capacitor poly.	10n	Philips	2222 344 55103
R78	Resistor	47 Kohm Philips	2322 211 13479	C12	Capacitor poly.	0,22u	Philips	2222 344 21224
R79	Resistor	2,2 Kohm Philips	2322 211 13222	C13	Capacitor sty.	3,3n	Philips	2222 425 43302
R80	Resistor	10 Kohm Philips	2322 211 13103	C14	Capacitor sieb.	0,1u	Siemens	837 449 F6104 S2
R81	Resistor	2,2 Kohm Philips	2322 211 13222	C15	Capacitor ellyt.	1u	Matsushita	45 4200 370
R82	Resistor	1,5 Kohm Philips	2322 211 13152	C16	Capacitor ellyt.	10u	Matsushita	45 4200 170
R83	Resistor	3,3 Kohm Philips	2322 211 13332	C17	Capacitor cer.	10u	Draloric	EDRU 5
R84	Resistor	3,3 Kohm Philips	2322 211 13332	C18	Capacitor cer.	1n	Draloric	EDRU 5
R85	Resistor	10 Kohm Philips	2322 211 13103	C19	Capacitor tan.	22u	ITT	TAG 22M25 SP
R86	Resistor	1 Kohm Philips	2322 211 13102	C20	Capacitor ellyt.	100u	Philips	2222 016 36101
R87	Resistor	10 Kohm Philips	2322 211 13103	C21	Capacitor cer.	1n	Draloric	EDRU 5
R88	Resistor	560 ohm Philips	2322 211 13561	C22	Capacitor sieb.	0,1u	Siemens	837 449 F6104 S2
R89	Resistor	22 Kohm Philips	2322 211 13223	C23	Capacitor cer.	1n	Draloric	EDRU 5
R90	Resistor	2,2 ohm Philips	2322 211 13228	C24	Capacitor ellyt	470u	Philips	2222 032 16471
R91	Resistor	2,2 ohm Philips	2322 211 13228	C25	Capacitor tan.	22u	ITT	TAG 22M25 SP
R92	Resistor	6,2 Kohm Philips	2322 211 13822	C26	Capacitor sieb.	47n	Siemens	837 F6473 S2
R93	Resistor	10 Kohm Philips	2322 211 13103	C27	Capacitor sieb.	0,1u	Siemens	837 445 F6104 S2
R94	Resistor	10 Kohm Philips	2322 211 13103	C28	Capacitor sieb.	0,1u	Siemens	837 445 F6104 S2
P1	Potentiom.	10 Kohm Philips	2322 410 30507	C29	Capacitor tan.	22u	ITT	TAG 22M25 SP
P2	Potentiom.	10 Kohm Rowico	813 342 SPEC.	C30	Capacitor cer.	10n	Draloric	EDRU 5
P3	Potentiom.	470 ohm Philips	2322 410 03353	C31	Capacitor sieb.	0,1u	Siemens	837 449 F6104 S2
P4	Potentiom.	22 Kohm Rowico	803 301 SPEC.	C32	Capacitor sty.	1,5n	Philips	2222 426 41502
P5	Potentiom.	4,7 Kohm Philips	2322 410 03356	C33	Capacitor poly.	10n	Philips	2222 344 55103
P6	Potentiom.	10 Kohm Philips	2322 410 30507	C34	Capacitor ellyt.	10n	Matsushita	45 4200 170
P7	Potentiom.	10 Kohm Rowico	813 342 SPEC.	C35	Capacitor ellyt.	4,7u	ITT	45 4020 199
C1	Capacitor ellyt.	1u Matsushita	45 4200 370	C36	Capacitor ellyt.	1u	Matsushita	45 4200 370
C2	Capacitor sty.	1n Philips	2222 427 41001	C37	Capacitor ellyt.	10u	Matsushita	45 4200 170
C3	Capacitor sty.	220p Philips	2222 427 42201	C38	Capacitor ellyt.	1u	Matsushita	45 4200 370
C4	Capacitor sty.	1n Philips	2222 427 41001	C39	Capacitor sieb.	0,1u	Siemens	837 449 F6104 S2
C5	Capacitor ellyt.	10u Matsushita	45 4200 170	C40	Capacitor ellyt	10u	Matsushita	45 4200 170
C6	Capacitor sieb.	0,1u Siemens	837449 F6104 S2	C41	Capacitor sty.	1n	Philips	2222 427 41001
C7	Capacitor cer.	470p Ferroperm	9/0129,9	C42	Capacitor poly.	33n	Philips	2222 344 55333
C8	Capacitor poly.	10n Philips	2222 344 55103	C43	Capacitor tan.	10u	ITT	TAG 10M25 SF
				C44	Capacitor tan.	22u	ITT	TAG 22M25 SP
				C45	Capacitor cer.	1n	Draloric	EDRU 5

C46	Capacitor poly.	15n	Phillips	2222 344 55153	T12	Transistor	Siemens	BC 237
C47	Capacitor ellyt.	10u	Matsushita	45 4200 170	T13	Transistor	Siemens	BC 140
C48	Capacitor cer.	10n	Draloric	EDRU 5	T14	Transistor	Siemens	BC 237
C49	Capacitor ellyt.	10u	Matsushita	45 4200 170	T15	Transistor	Siemens	BC 237
C50	Capacitor ellyt.	100u	Phillips	2222 D16 36101	T16	Transistor	Siemens	BC 237
C51	Capacitor sieb.	47n	Siemens	837 449 F6473 52	T17	Transistor	Siemens	BC 307
C52	Capacitor sieb.	47n	Siemens	837 F6473 52	T18	Transistor	Siemens	BC 139
					T19	Transistor	Siemens	BC 237
D1	Diode		ITT	1N4148	IC1	Integrated cct.	Texas	MC 1458
D2	Diode		ITT	1N4148	IC2	Integrated cct.	Texas	MC 1458
D3	Diode		ITT	1N4148	IC3	Integrated cct.	Siemens	TDA 1037
D4	Diode		ITT	1N4148	IC4	Integrated cct.	Texas	7805
D5	Diode		ITT	1N4148	IC5	Integrated cct.	Texas	TDB 0555
D6	Diode		ITT	1N4148	IC6	Integrated cct.	Texas	74LS33
D7	Diode		Siemens	AA 116	IC7	Integrated cct.	Harris	PROM 7611
D8	Diode		ITT	1N4148	IC8	Integrated cct.	Harris	PROM 7611
D9	Diode		ITT	1N4148	IC9	Integrated cct.	Harris	PROM 7611
D10	Diode		ITT	1N4148	IC10	Integrated cct.	Texas	74LS33
D11	Diode		ITT	1N4148				
D12	Diode		ITT	1N4148				
D13	Diode		ITT	1N4148				
D14	Diode		Phillips	5401				
D15	Diode		ITT	1N4148				
D16	Diode		ITT	1N4148				
Z1	Diode, zener		Siemens	8,2V				
T1	Transistor		Siemens	BC 307				
T2	Transistor		Siemens	BC 237				
T3	Transistor		Siemens	BC 307				
T4	Transistor		Siemens	BC 237				
T5	Transistor		Siemens	BC 237				
T6	Transistor		Siemens	BC 237				
T7	Transistor		Siemens	BC 237				
T8	Transistor		Siemens	BC 237				
T9	Transistor		Intersil	2N5434/85				
T10	Transistor		Siemens	BC 237				
T11	Transistor		Siemens	BC 237				

R1	Resistor	10 Kohm Philips	2322 211 13103	R46	Resistor	1 Kohm Philips	2322 211 13102
R2	Resistor	10 Kohm Philips	2322 211 13103				
R3	Selected in final test						
R4	Selected in final test						
R5	Resistor	4,7 Kohm Philips	2322 211 13472	C1	Capacitor poly.	0,1u Phillips	2222 344 21104
R6	Resistor	10 Kohm Philips	2322 211 13103	C2	Capacitor poly	0,1u Phillips	2222 344 21104
R7	Resistor	10 Kohm Philips	2322 211 13103	C3	Capacitor ellyt.	4,7u IIT	45 40 20 199
R8	Selected in final test			C4	Capacitor poly	0,1u Phillips	2222 344 21104
R9	Resistor	10 Kohm Philips	2322 211 13103	C5	Capacitor tan.	4,7u IIT	TAC 4R7M25 SP
R10	Resistor	10 Kohm Philips	2322 211 13103	C6	Capacitor cer.	10n Draloric	EDRU 5
R11	Resistor	10 Kohm Philips	2322 211 13103	C7	Capacitor cer.	10n Draloric	EDRU 5
R12	Resistor	10 Kohm Philips	2322 211 13103	C20	Capacitor sty.	100n Rifa	PFE 216 C0610F
R13	Resistor	10 Kohm Philips	2322 211 13103	C21	Capacitor sty.	1,5n Phillips	2222 425 41502
R14	Resistor	10 Kohm Philips	2322 211 13103	C22	Capacitor ellyt.	4,7u IIT	45 40 20 199
R15	Resistor	1 Kohm Philips	2322 211 13102	C23	Capacitor sieb.	0,1u Siemens	837449 S2
R16	Resistor	10 Kohm Philips	2322 211 13103	C24	Capacitor tan.	10u IIT	TAC 10M25 SP F6104 S2
R17	Resistor	10 Kohm Philips	2322 211 13103	C25	Capacitor tan.	10u IIT	TAC 10M25 SP
R18	Resistor	10 Kohm Philips	2322 211 13103	C26	Capacitor cer.	10n Draloric	EDRU 5
R19	Resistor	470 Kohm Philips	2322 211 13474	C27	Capacitor cer.	10n Draloric	EDRU 5
R20	Resistor	56 Kohm Philips	2322 211 13563	C28	Capacitor sieb.	0,1u Siemens	837449 F6109 S2
R21	Resistor	56 Kohm Philips	2322 211 13563				
R30	Resistor	2,2 Kohm Philips	2322 211 13222	D1	Diode	Siemens	1N4148
R31	Resistor	5,6 Kohm Philips	2322 211 13562	D2	Diode	Siemens	1N4148
R32	Resistor	10 Kohm Philips	2322 211 13103	D3	Diode	Siemens	1N4148
R33	Resistor	15 Kohm Philips	2322 211 13153	D4	Diode	Siemens	1N4148
R34	Resistor	33 Kohm Philips	2322 211 13333				
R35	Resistor	3,3 Kohm Philips	2322 211 13332				
R36	Selected in final test			T1	Transistor	Siemens	BC 237
R37	Resistor	10 Kohm	2322 211 13103	T2	Transistor	Siemens	BC 237
R38	Resistor	330 Kohm	2322 211 13331	T3	Transistor	Siemens	BC 237
R39	Resistor	100 Kohm	2322 211 13104	T4	Transistor	Siemens	BC 237
R40	Resistor	100 Kohm	2322 211 13104	T5	Transistor	Siemens	BC 237
R41	Resistor	100 Kohm	2322 211 13104	T6	Transistor	Siemens	BC 307
R42	Resistor	22 Kohm	2322 211 13223	T7	Transistor	Siemens	BC 237
R43	Resistor	330 Kohm	2322 211 13331	T8	Transistor	Siemens	BC 237
R44	Resistor	220 Kohm	2322 211 13224	T9	Transistor	Texas	BC 256 LA
R45	Resistor	1 Kohm	2322 211 13102	T10	Transistor	Siemens	BC 237

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T11	Transistor	Siemens	BC 237	R1	Resistor	3w, 220 ohm Philips	2322 211 13221
T12	Transistor	Siemens	BC 307	R2	Resistor	6w, 8,2 ohm Diplomatic	146132
T13	Transistor	Siemens	BC 237	R3	Resistor	17w, 1,5 ohm Diplomatic	149123
				R4	Resistor	17w, 1,5 ohm Diplomatic	149123
L1	Tonecoil	R&S		R5	Resistor	3w, 10 ohm Philips	2322 211 13109
				R6	Resistor	3w, 10 ohm Philips	2322 211 13109
IC1	Integrated cct.	Mototola	MC 14017	R7	Resistor	390 ohm Philips	2322 211 13391
IC2	Integrated cct.	Motorola	MC 14093	R8	Resistor	330 ohm Philips	2322 211 13331
IC3	Integrated cct.	Motorola	MC 14013	R9	Resistor	470 ohm Philips	2322 211 13471
IC4	Integrated cct.	Texas	T08 555	P1	Potentium. trim.	1 Kohm Philips	2322 410 03354
				C1	Capacitor cer.	10n Draloric	EDRU 5
				C2	Capacitor poly.	0,1u Philips	2222 344 21104
				T1	Transistor	Siemens	BC 139
				T2	Transistor	Motorola	NJE 3055
				T3	Transistor	Siemens	2N3055
				T4	Transistor	Siemens	2N3055
D1	Diode, zener	Siemens					6,8V

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R1	Resistor	6,8 Kohm	Philips	2322 211	L3682
R2	Resistor	120 ohm	Philips	2322 211	L3121
R3	Resistor	3v,10 ohm	Philips	2322 211	L3109
R4	Resistor	100 ohm	Philips	2322 211	L3101
R5	Resistor	3v,10 ohm	Philips	2322 211	L3109
R6	Resistor	3v,0,22 ohm	Philips	145 105	
R7	Resistor	3v,0,22 ohm	Philips	145 105	
R8	Resistor	390 ohm	Philips	2322 211	L3391
R9	Resistor	330 ohm	Philips	2322 211	L3331
R10	Resistor	470 ohm	Philips	2322 211	L3471

P1 Potentiom. pre. set. 1 Kohm Philips 2322 410 03354

C1	Capacitor poly.	0,1u	Philips	2222 344	21104
C2	Capacitor poly.	0,1u	Philips	2222 344	21104
C3	Capacitor cer.	10n	Draloric	EDR0 5	
C4	Capacitor poly.	0,1u	Philips	222 344	21104

D1	Diode	ITT	IN414E
D2	Diode	ITT	IN414E
D3	Diode	ITT	IN414E
D4	Diode	Philips	IN5401
D5	Diode, zener	Siemens	6,8V
D6-10	Diode	ITT	IN4002

T1	Transistor	Siemens	BD 140
T2	Transistor	Siemens	BD 139
T3	Transistor	Siemens	2N3055
T4	Transistor	Siemens	2N3055
T5	Transistor	Siemens	2N3055

RS 220-24 2755

R1	Resistor	3v,220 ohm	Philips	2322 211	L3221
C1	Capacitor poly.	0,1u	Philips	2222 344	21104
C3	Capacitor ellipt.	2200u	Frako	108 333	
C4	Capacitor ellipt.	2200u	Frako	108 333	
D1-4	Diode, bridge		Radio Parts	LD148M	004380
D5	Diode		ITT	IN4002	

R1	Resistor	27kohm	Philips	2322 211	L3221
R2	Resistor	27kohm	Philips	2322 211	L3221
R3	Resistor	27kohm	Philips	2322 211	L3221
R4	Resistor	27kohm	Philips	2322 211	L3221
C1	Capacitor poly.	0,1u	Philips	2222 344	21104
C2	Capacitor poly.	0,1u	Philips	2222 344	21104
D1-4	Diode, bridge		Radio Parts	LD148M	004380
D5	Diode		ITT	IN4002	

R1	Resistor	27kohm	Philips	2322 211	L3221
R2	Resistor	27kohm	Philips	2322 211	L3221
R3	Resistor	27kohm	Philips	2322 211	L3221
R4	Resistor	27kohm	Philips	2322 211	L3221
C1	Capacitor poly.	0,1u	Philips	2222 344	21104
C2	Capacitor poly.	0,1u	Philips	2222 344	21104
D1-4	Diode, bridge		Radio Parts	LD148M	004380
D5	Diode		ITT	IN4002	

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