

R 1117 Ny udgave 15/8-79



Sailor

Sailor

**INSTRUKTIONSBOG FOR
SAILOR R 1117**

**INSTRUCTION BOOK FOR
SAILOR R 1117**



A/S S. P. RADIO · AALBORG · DENMARK

CONTENTS:

GENERAL DESCRIPTION	2
TECHNICAL DATA	3
CONTROLS	5
PRINCIPLE OF OPERATION	7
AERIAL TUNE PROCEDURE	11
SERVICE:	
1. MAINTENANCE	
2. NECESSARY TEST EQUIPMENT	
3. TROUBLE-SHOOTING	
4. PERFORMANCE CHECK FOR R1117	
5. ADJUSTMENT PROCEDURE FOR R1117	
6. NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1117	
7. FUNCTION CHECK R1117	
PIN CONFIGURATIONS	
ADJUSTMENT LOCATIONS	
CIRCUIT DESCRIPTION AND SCHEMATIC DIAGRAMS	
PARTS LIST	
MAIN SCHEMATIC DIAGRAM	

A

GENERAL DESCRIPTION

INTRODUCTION

SAILOR R1117 is a telephony receiver intended for reception of A3, A3H, A3A, A3J, A2 and A2H signals in the frequency ranges 1.6 - 4.0 MHz and the 4, 6, 8, 12, 16, 22 and 25 MHz maritime HF bands.

SAILOR R1117 uses a digital synthesizer for frequency generation, and thus can be set to any frequency in the above mentioned frequency ranges. The frequency stability is controlled from one 10 MHz TCXO.

A

SAILOR R1117 is prepared for use in conjunction with telex equipment.

SAILOR R1117 is provided with higher order tunable RF filters to ensure good duplex performance.

SAILOR R1117 has automatical RF filter selection.

SAILOR R1117 fits into SAILOR 19" rack system.

TECHNICAL DATA

The receiver is fully synthesized and has a frequency resolution of 100 Hz.

The receiver has a speech clarifier with a frequency control range of ± 250 Hz.

The receiver is intended for reception of the following wave types A3, A3H, A3A, A3J, A2 and A2H.

Frequency ranges:

MF:	1.6 - 4.0 MHz
HF:	4 MHz: 4.063 - 4.438 MHz
	6 MHz: 6.200 - 6.525 MHz
	8 MHz: 8.195 - 8.815 MHz
	12 MHz: 12.330 - 13.200 MHz
	16 MHz: 16.460 - 17.360 MHz
	22 MHz: 22.000 - 22.720 MHz
	25 MHz: 25.010 - 25.600 MHz

Tuning error: less than 50 Hz

Frequency drift, short time: less than 5 Hz

Frequency drift, long time: less than 1 ppm (± 25 Hz) per year

Frequency drift: 0 - 40°C: less than 1 ppm (± 25 Hz)
Also possibility for better figures for frequency drift when using another TCXO.

<u>IF band width:</u>	SSB:	Min. pass band	:	350	to	2700 Hz
	(A3J)	Min. attenuation 20 dB:				+3100 Hz
		Min. attenuation 40 dB:		-150	and	3400 Hz
		Min. attenuation 60 dB:		-400	and	3700 Hz
	AM:	Min. pass band	:	-2.7	to	+2.7 kHz
	(A3H)	Min. attenuation 20 dB:		-6	to	+6 kHz
		Min. attenuation 60 dB:		-10	to	+10 kHz

Sensitivity, 20 dB SN/N:

MF, A3J:	< 16 dB/1uV
MF, A3H:	< 30 dB/1uV
HF, A3J:	< 11 dB/1uV
HF, A3H:	< 25 dB/1uV

Adjacent Channel Selectivity:

A3J:	> 40 dB at -1 and +4 kHz
	> 50 dB at -2 and +5 kHz
	> 60 dB at -5 and +8 kHz
A3 :	> 40 dB at -10 and +10 kHz
	> 50 dB at -20 and +20 kHz

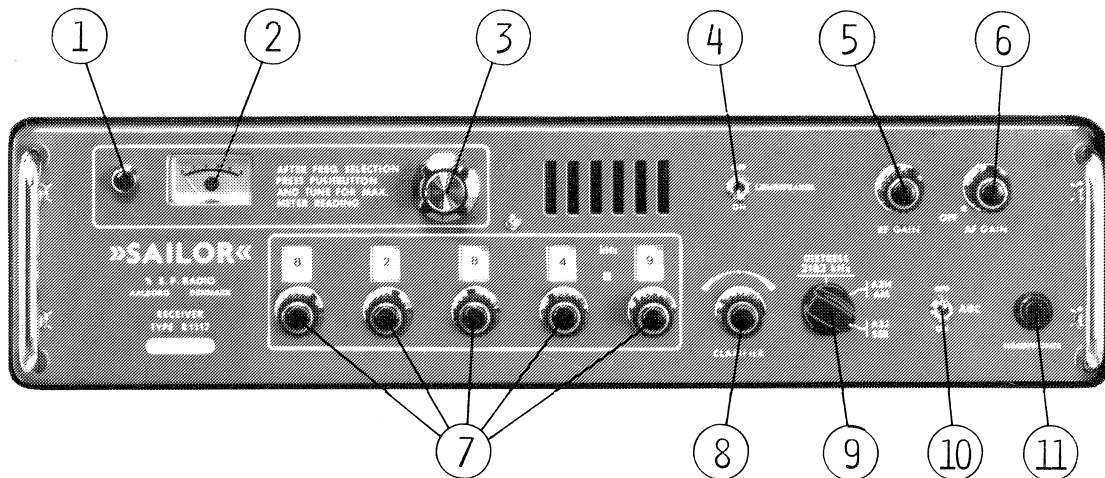
Blocking: wanted signal 60 dB/1uV
blocking level >100 dB/1uV

TECHNICAL DATA cont.:

<u>Cross Modulation:</u>	wanted signal	60 dB/1uV
	cross modulation level	> 90/dB/1uV
<u>Intermodulation:</u>	3rd order intermodulation	Δf 30 kHz
	intermodulation level	> 80 dB/1uV
<u>Operation Temperature Range:</u>	-15 ^o C to +55 ^o C	
<u>Spurious rejection:</u>	image rejection	> 60 dB
	IF rejection	> 60 dB
	all others	> 60 dB
<u>Spurious emission:</u>	P_{out}	1nW into 50 ohm
<u>Output power:</u>		5 W into 8 ohm
<u>Automatic gain control:</u>		
	AM AGC:	attack time approx. 20 mSec
		decay time approx. 250 mSec
	SSB AGC:	attack time approx. 3 mSec
		hang time approx. 2 Sec
<u>IF frequencies:</u>	1st IF:	10.6085 MHz
	2nd IF:	600 kHz

A

CONTROLS



- ① NOISE GENERATOR
Removes the aerial and activates the built-in noise generator.
- ② METER
The meter is showing the field strength of the incoming signal.
- ③ AERIAL TUNE
Tunes the RF filters to the chosen frequency when noise generator ① is activated.
- ④ LOUDSPEAKER ON/OFF SWITCH
Switches the loudspeakers ON or OFF.
- ⑤ RF-GAIN
Controls the amplification in the IF amplifier.
- ⑥ AF-GAIN
With main switch. Controls the audio output.
- ⑦ FREQUENCY SELECTORS
Determines the receiving frequency.
- ⑧ CLARIFIER
Correct for small frequency-errors in SSB signals. To be set for clearest reception of SSB signals.

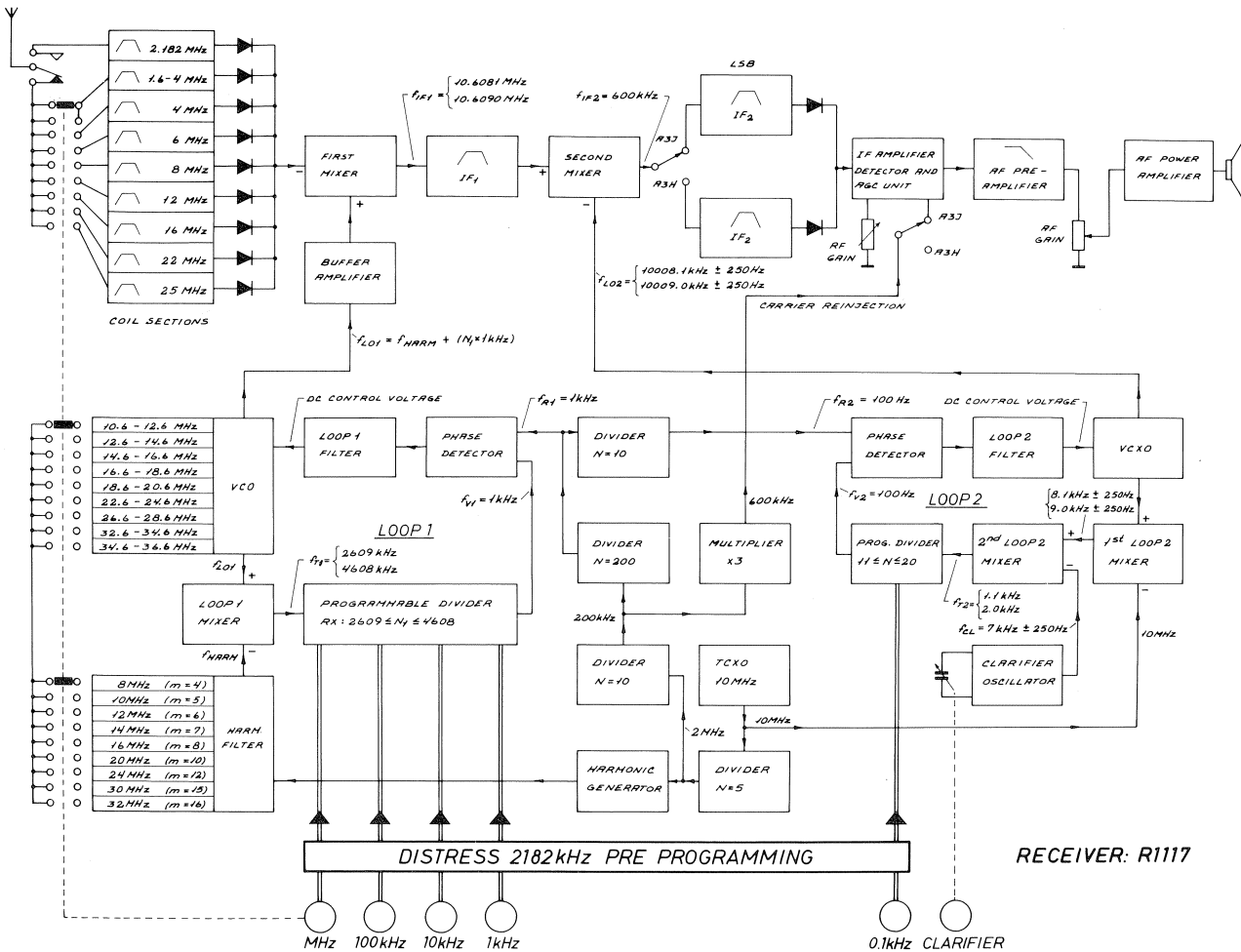
CONTROLS cont.:

- ⑨ MODE SWITCH
Switches between reception of A3H (A3, A3H, A2 or A2H) signals, and A3J (A3A and A3J) signals and fixed 2182 kHz (Distress frequency).

- ⑩ AGC ON/OFF SWITCH
Switches the AGC system from ON to OFF.

- ⑪ HEADPHONES
Receptacle for headphones.

PRINCIPLE OF OPERATION



RECEIVER R1117

The SAILOR R1117 is a fully synthesized double superheterodyne receiver with 10.6085 MHz 1st IF and 600 kHz 2nd IF.

The signal from the aerial is led through the COIL SECTIONS to the FIRST MIXER, where the aerial signal is mixed with the f_{LO1} signals having frequency resolution of 1 kHz, and thus giving a 1st IF frequency range from 10.6081 MHz to 10.6090 MHz.

The signal is then led through a double monolithic crystal filter with a center frequency of 10.6085 MHz to the SECOND MIXER, where the signal is mixed with the f_{LO2} signal having continuous tuning in the frequency range from 10.00785 MHz to 10.00925 MHz, and thus giving a 2nd IF frequency of 600 kHz.

PRINCIPLE OF OPERATION cont.:

The produced 2nd IF signal is led through either the AM FILTER or the SSB FILTER. The switching takes place electronically by means of the MODE SWITCH.

The signal is then passed on to the IF AMPLIFIER, DETECTOR and AGC UNIT. The IF AMPLIFIER consists of 3 AGC controlled amplifier stages. The detector for both AM and SSB reception is an envelope detector, and in the SSB mode the carrier is reinjected in such a way that the A3J signal is "converted" to a A3H signal.

The IF AMPLIFIER, DETECTOR and AGC UNIT contains the two AGC systems, the AM AGC system and the SSB HANG AGC system.

From the detector the AF signal is fed to the AF PREAMPLIFIER, which has an audiofilter; and amplifies the AF signal, and delivers signals for fixed AF output (0 dBm) and the AF POWER AMPLIFIER.

FREQUENCY GENERATION

The necessary frequencies are generated by two frequency synthesizers according to the Phase Locked Loop principle.

Local oscillator signal f_{L01} to First Mixer is generated in the Phase Locked Loop 1 and has a resolution of 1 kHz.

Local oscillator signal f_{L02} to Second Mixer is generated in the Phase-Locked Loop 2 and has a resolution of 100 Hz.

LOOP 1

The voltage-controlled oscillator (VCO) generates the necessary local oscillator frequencies in nine 2 MHz bands selected by the MHz Selector. Inside each 2 MHz band the VCO frequency f_{L01} can be varied by means of a DC control voltage from the Phase Detector. The DC control voltage is filtered in the Loop 1 Filter.

The Phase Detector receives two signals, one variable frequency f_{V1} and one reference frequency f_{R1} . The reference frequency f_{R1} is a result of the 10 MHz TCXO frequency being divided down to 1 kHz.

The variable frequency f_{V1} is generated from the VCO frequency f_{L01} in the following way:

In the Loop 1 Mixer the counter frequency f_{T1} is produced from the VCO frequency f_{L01} and the frequency f_{HARM} which is a multiple of 2 MHz. The 2 MHz signal is generated from the 10 MHz TCXO

$$f_{T1} = f_{L01} - f_{HARM} = f_{L01} - (m \times 2 \text{ MHz}) = N_1 \times 1 \text{ kHz}$$

For every 2 MHz band a new f_{L01} and f_{HARM} is selected of the MHz Selector, and it always results in a variation of 2 MHz of the frequency f_{T1} to the Programmable Divider.

The frequency f_{T1} is divided down by the dividing figure N_1 in the Programmable Divider to the variable frequency f_{V1}

$$f_{V1} = f_{T1} / N_1 = 1 \text{ kHz}$$

PRINCIPLE OF OPERATION cont.:

The working principle in a Phase Locked Loop is as follows:

If there is a frequency error between the variable frequency f_{V1} and the reference frequency f_{R1} , the regulation system has the characteristic that the DC Control Voltage will correct the VCO frequency and consequently the variable frequency f_{V1} so that f_{V1} will always follow the reference frequency f_{R1} in frequency.

$$f_{R1} = f_{V1} = 1 \text{ kHz}$$

The VCO frequency f_{L01} is now phase locked on a fixed frequency to the reference frequency f_{R1} and has therefore the same accuracy as this.

Changing of the VCO frequency f_{L01} by e.g. 1 kHz can be performed by changing the dividing figure N_1 in the Programmable Divider by one.

$$f_{L01} = f_{\text{HARM}} + (N_1 \times 1 \text{ kHz})$$

Principle of programming is as follows:

The Programmable Divider contains a counter circuit, which is counting down from a start figure $2000 + P_1$ and stops at the stop figure S_1 . Each time the counter reaches the stop figure S_1 , a pulse (f_{V1}) is given to the Phase Detector, and the counter will start counting down again from the start figure $2000 + P_1$. Division of f_{T1} by N_1 has now been achieved.

$$f_{V1} = f_{T1}/N_1; N_1 = 2000 + P_1 - S_1$$

The MHz Selector selects the correct pair of VCO and Harmonic Filter.

Inside each 2 MHz band the programmable figure P_1 , is encoded from the MHz, 100 kHz, 10 kHz and 1 kHz Selectors in BCD-code representing the direct frequency reading of the 2 MHz band.

$$\text{Start figure: } 2000 + P_1; 0 \leq P_1 \leq 1999$$

$$\text{Stop figure: } S_1 = -609$$

$$N_1 = 2000 + P_1 - S_1 = P_1 + 2609$$

Output frequency from Loop 1:

$$f_{L01} = m \times 2 \text{ MHz} + (P_1 + 2609) \times 1 \text{ kHz}; 4 \leq m \leq 16$$

LOOP 2

Phase Locked Loop 2 has a frequency variation of 1 kHz with a resolution of 100 Hz and contains also the speech clarifier.

The phase locked loop principle is the same as for Loop 1. The only difference is that we have two mixers in the feed-back to the Phase Detector, where the one injection signal is the fixed 10 MHz and the other f_{CL} is that from the Clarifier Oscillator.

The Clarifier Oscillator has a frequency variation of ± 250 Hz which also will result in a ± 250 Hz variation of the VCXO frequency f_{L02} .

PRINCIPLE OF OPERATION cont.:

Principle of programming is as follows:

The frequency shift in Loop 2 is controlled from the 0,1 kHz Selector.

The Programmable Divider is counting up from the start figure P_2 to stop figure S_2 .

The 0,1 kHz Selector is encoding the start figure P_2 in BCD code to the Programmable Divider.

$$\text{Start figure: } 0 \leq P_2 \leq 9$$

$$\text{Stop figure: } S_2 = 20$$

$$\text{Dividing figure: } N_2 = S_2 - P_2 = 20 - P_2$$

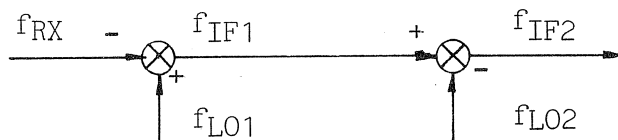
Output frequency from Loop 2:

$$f_{L02} = 10 \text{ MHz} + f_{CL} \pm 250 \text{ Hz} + (N_2 \times 0,1 \text{ kHz})$$

$$f_{L02} = 10.007 \text{ MHz} \pm 250 \text{ Hz} + (20 - P_2) \times 0,1 \text{ kHz}$$

$$f_{L02} = 10.009 \text{ MHz} \pm 250 \text{ Hz} - (P_2 \times 0,1 \text{ kHz})$$

RECEIVING FREQUENCY f_{RX} FOR RECEIVER R1117



$$f_{IF2} = 0,600 \text{ MHz}$$

$$f_{L02} = 10,009 \text{ MHz} \pm 250 \text{ Hz} - (P_2 \times 0,1 \text{ kHz})$$

$$f_{IF1} = f_{IF2} + f_{L02} = 10,609 \text{ MHz} - (P_2 \times 0,1 \text{ kHz})$$

$$f_{L01} = m \times 2 \text{ MHz} + (P_1 + 2609) \times 1 \text{ kHz}; 4 \leq m \leq 16$$

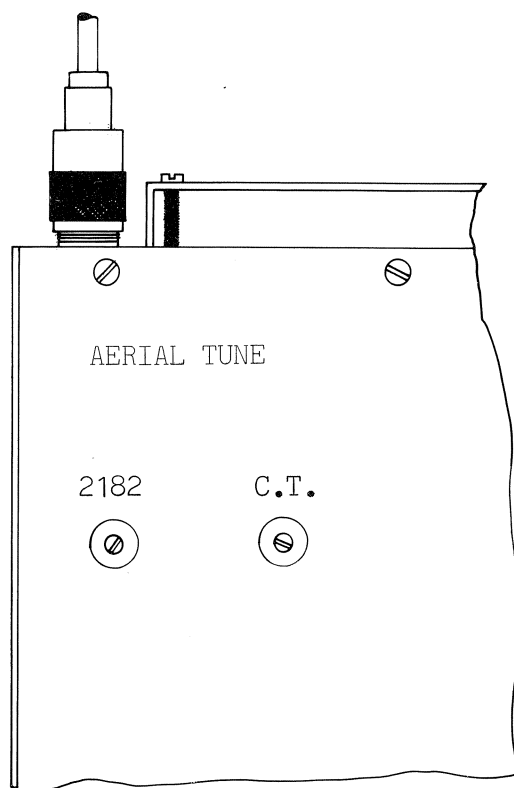
$$f_{RX} = f_{L01} - f_{IF1} = (m - 4) \times 2 \text{ MHz} + (P_1 + 0,1 P_2) \times 1 \text{ kHz}$$

AERIAL TUNE PROCEDURE

When the station has been installed the aerial trimmers for the receiver, one for fixed 2182 kHz and one for coast telephony, must be adjusted.

ADJUSTING PROCEDURE:

1. Set MODE SWITCH (9) to position 2182 kHz.
2. Set the AGC ON/OFF (10) switch to position ON.
3. Turn RF-GAIN (5) fully clockwise.
4. Set AF-GAIN (6) to suitable volume.
5. Adjust by means of an insulated trimming stick the AERIAL TUNE 2182 kHz for max. METER (2) deflection or max. signal or noise in the loudspeaker.
6. Set the receiver to position 2182 kHz by means of FREQUENCY SELECTORS (7)
7. Set MODE SWITCH (9) to position A3H/AM.
8. Press NOISE GENERATOR (1) and tune AERIAL TUNE (3) to max. METER (2) deflection.
9. Keep NOISE GENERATOR (1) activated and adjust the AERIAL TUNE C.T. for max. METER (2) deflection. Repeat points 8 and 9 if necessary.



SERVICE

1. MAINTENANCE
2. NECESSARY TEST EQUIPMENT
3. TROUBLE-SHOOTING
4. PERFORMANCE CHECK
5. ADJUSTMENT PROCEDURE
6. NECESSARY ADJUSTMENTS AFTER REPAIR
7. FUNCTION CHECK
8. MECHANICAL DISASSEMBLING T1127 ONLY

1. MAINTENANCE

1.1.

When the SAILOR SHORT WAVE SET type 1000 has been correctly installed, the maintenance can, depending on the environment and working hours, be reduced to a performance check at the service workshop at intervals not exceeding 5 years. A complete performance check list is enclosed in the PERFORMANCE CHECK section.

Also inspect the antennas, cables and plugs for mechanical defects, salt deposits, corrosion and any foreign bodies.

Along with each set a TEST SHEET is delivered, in which some of the measurements made at the factory are listed. If the performance check does not show the same values as those on the TEST SHEET, the set must be adjusted as described under ADJUSTMENT PROCEDURE.

Any repair of the set should be followed by a FUNCTION CHECK of the unit in question.

2. NECESSARY TEST EQUIPMENT

T1127	N140X	S1300	R1117	
X	X	X	X	<u>OSCILLOSCOPE:</u>
				Bandwidth 0-25 MHz
				Sensitivity 2mV/cm
				Input impedance 1 Mohm//30 pF
				Triggering EXT-INT-ENVELOPE
				E.g. PHILIPS PM3212
X		X	X	<u>PASSIVE PROBE:</u>
				Attenuation 10x
				Input resistance DC 10 Mohm
				Input capacitance 15 pF
				Compensation range 10 pF - 30 pF
				E.g. PHILIPS PM 9396
		X	X	<u>MULTIMETER:</u>
				Sensitivity (f.s.d.) 1V
				Input impedance 10 Mohm
				Accuracy (f.s.d.) <u>+2%</u>
				E.g. PHILIPS PM2503
X	X			<u>MULTIMETER:</u>
				Input impedance 30 Kohm/V
				Current range 100A
				Voltage range 0 ...500V, and 2,5 kV
				E.g. Unigor A43, with probe and shunt

NECESSARY TEST EQUIPMENT cont.:

T1127	N140X	S1300	R1117
		X	
			X
		X	X
			X

TOGENERATOR:

Frequency range 200 - 3000 Hz
 Output 1V RMS
 Output impedance ≤ 600 ohm
 E.g. PHILIPS PM5107

AF VOLTMETER:

Sensitivity (f.s.d.) 300 mV
 Input impedance ≥ 4 ohm
 Accuracy (f.s.d.) ± 5 %
 Frequency range 100 Hz - 5 kHz
 E.g. PHILIPS PM2503

FREQUENCY COUNTER:

Frequency range 100 Hz - 40 MHz
 Resolution 0,1 Hz at $f \geq 10$ MHz
 Accuracy $1 \cdot 10^{-7}$
 Sensitivity 100 mV RMS
 Input impedance 1 Mohm
 Single period measurement range 1 sec.
 resolution 1 mS
 E.g. PHILIPS PM6611 + PM9679

SIGNAL GENERATOR

Frequency range 550 kHz - 30 MHz
 R1118: 100 kHz - 30 MHz
 Output impedance 50/75 ohm
 Output voltage 1 uV - 100 mV EMF
 Modulation AM, 30%, 1000 Hz
 E.g. PHILIPS PM5326

A 2/5

NECESSARY TEST EQUIPMENT cont.:

T1127	N140X	S1300	R1117
X			
		X	X
		X	
X			
X			
X		X	

POWER SUPPLIES

T1127:

V_{out} 26,5V DC
 I_{out} 60A DC
 E.g. 2 pcs. LAMBDA type LMG24

R1117/S1300:

V_{out} 1 22V
 I_{out} 1 1,5A
 V_{out} 2 -45V
 I_{out} 2 0,2A
 E.g. SAILOR POWER SUPPLY type N1402

TEST BOX S1300:

SP type S1300/01 TEST BOX

POWER METER:

Power range 500W
 E.g. Bird Thruline Wattmeter Model 43
 plug-in element 500W 2-30 MHz
 impedance 50 ohm

RF-AMMETER (Thermocross)

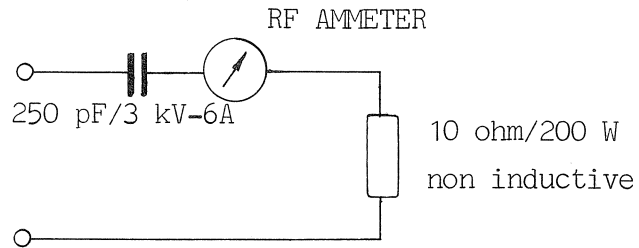
Current range 5A
 E.g. HELWEG MIKKELSEN & CO. Copenhagen, Denmark
 type TR-68x71 5A

DUMMY LOAD for HF bands, 4 MHz to 25 MHz

Impedance 50 ohm
 Frequency range 0-25 MHz
 Power range 500W
 E.g. BIRD Termaline Coaxial resistor Model 8401

T1127	N140X	S1300	R1117
X			

DUMMY LOAD for C.T. band 1.6 MHz to 4 MHz



250 pF

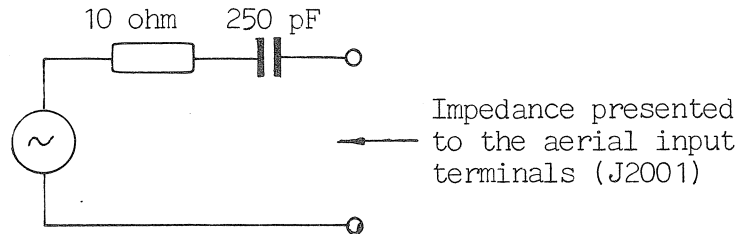
E.g. DRACORIC 06 1291 TD 20x50 L

8 KV_S 250 pF $\pm 20\%$ R85

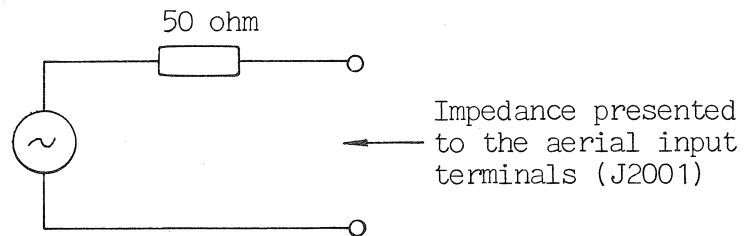
10 ohm

E.g. 10 pcs. DALE PH-25A-17, 100 ohm 5% 25W

X DUMMY LOAD for the C.T. band 1.6 to 4 MHz



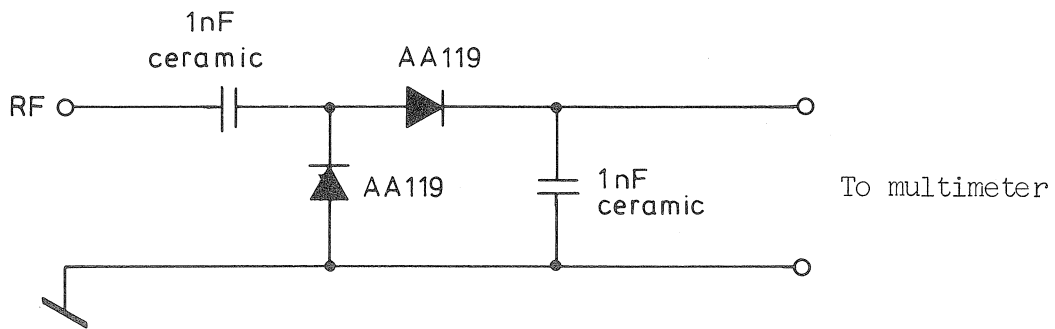
X DUMMY LOAD for the HF bands 4 MHz to 25 MHz



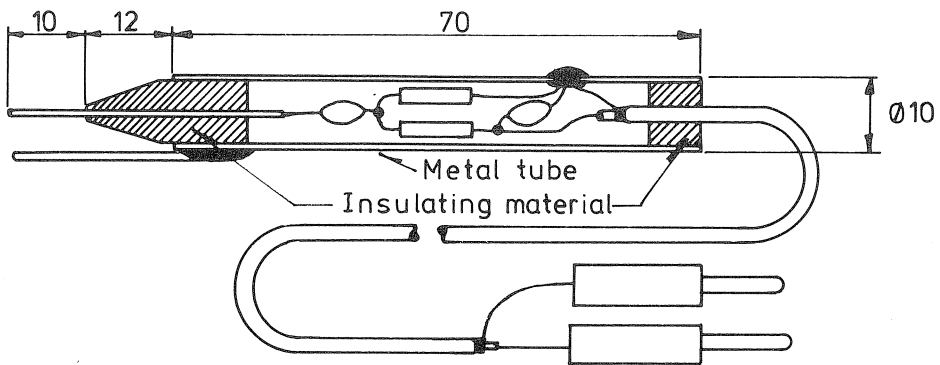
E.g. SAILOR Rx DUMMY LOAD type H219.

NECESSARY TEST EQUIPMENT cont.:

DIODE PROBE



LAYOUT OF THE DIODE PROBE



3. TROUBLE-SHOOTING

Trouble-shooting should only be performed by persons with sufficient technical knowledge, who have the necessary test equipment at their disposal, and who have carefully studied the operation principles and structure of the unit in question.

Start to find out whether the fault is somewhere in the antenna circuit, the power source, or in the short wave set.

For help with trouble-shooting in the short wave set there is a built-in test meter and test meter switch, located behind the air filter on the power supply.

When the fault has been located to a certain unit look up the PERFORMANCE CHECK list in the instruction book and make relevant performance check to incircle the fault. Then look up the CIRCUIT DESCRIPTION. This section contains schematic diagrams, description of the modules and pictures showing the location of the components. (ADJUSTMENT LOCATIONS).

Typical AC and DC voltages are indicated on the schematic diagrams.

No adjustment must take place unless the service workshop has the necessary test equipment to perform the ADJUSTMENT PROCEDURE in question.

After repair or replacement of the module look up the section NECESSARY ADJUSTMENTS AFTER REPAIR to see, whether the unit has to be adjusted or not.

Anyway the unit has to have a complete FUNCTION CHECK after repair.

TRUBLE-SHOOTING cont.:

TRUBLE-SHOOTING IN THE FREQUENCY GENERATING CIRCUIT

LOOP 1

If the fault has been located to LOOP 1 the following hints can be used for trouble-shooting.

If there is no output signal from the VCO the fault has to be found in the VCO-UNIT.

If the output frequency from the VCO is lower than the low frequency limits or higher than the high frequency limits of the 2 MHz band in question, the phase locked loop 1 is out of lock. For VCO frequencies look-up the section PRINCIPLE OF OPERATION.

1. Check the LOOP 1 MIXER output signal on the terminal "Loop 1 out".
 - a. If there is no output signal, the failure is on LOOP 1 MIXER, HARMONIC FILTER UNIT or VCO-UNIT.
 - b. If the output frequency is approx. 2 MHz or approx. 5 MHz, the VCO-UNIT LOOP 1 MIXER and the HARMONIC FILTER UNIT are apparently ok.
2. Check that the frequency on the phase/frequency detector IC106, pin 1 is 1 kHz.
3. Check the Loop 1 Programmable Divider.
 - a. If the frequency on the input terminal "Loop 1 In" is approx. 2 MHz and the frequency on the phase/frequency detector IC106, pin 3 is lower than 1 kHz, the programmable divider is apparently ok.
 - b. If the frequency on the input terminal "Loop 1 In" is approx. 5 MHz and the frequency on the phase/frequency detector IC106, pin 3 is higher than 1 kHz, the programmable divider is apparently ok.
4. Check the phase/frequency detector IC106.
 - a. Measure 1.5V DC on the terminal "PD1 (1.5V) out" on DIVIDER-UNIT.
 - b. If the input frequency on IC106, pin 3 is higher than 1 kHz and the DC-voltage on the terminal "PD1 out" on DIVIDER-UNIT is approx. 0.7V, the phase/frequency detector is apparently ok.
 - c. If the input frequency on IC106, pin 3 is lower than 1 kHz and the DC-voltage on the terminal "PD1 out" on DIVIDER-UNIT is approx. 2.3V, the phase/frequency detector is apparently ok.
5. Check the integrator IC202 on LOOP 1 FILTER & +18V SUPPLY-UNIT.
 - a. If the DC voltage on the terminal "PD1 In" is approx. 0.7V and the DC voltage on output terminal of IC202, pin 6 is approx. -4V, the integrator IC202 is apparently ok.
 - b. If the DC voltage on the terminal "PD1" is approx. 2.3V and the DC voltage on the output terminal of IC202, pin 6 is approx. -17V, the integrator IC202 is apparently ok.
6. If the failure has not been found yet the 1 kHz loop filter IC201 and the wirings to the VCO must be checked.

LOOP 2

If the fault has been located to LOOP 2 the following hints can be used for trouble-shooting.

If there is no output signal from the VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER on the terminal "VCXO out", the failure has to be found in the VCXO.

If the output frequency from the VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER on the terminal "VCXO out" is lower than 10.008 MHz or higher than 10.009 MHz, the phase locked loop 2 is out of lock.

1. Set the CLARIFIER to center position and check the output signal on VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER terminal "1st Loop 2 output".
 - a. If there is no output signal, the failure is in the 1st loop 2 mixer or the 10 MHz injection signal is missing.
 - b. If the output frequency is slightly lower than 8 kHz or slightly higher than 9 kHz the VCXO, the 1st loop 2 mixer and the 10 MHz injection signal is apparently ok.
2. Set the CLARIFIER to center position and check the output signal on the CLARIFIER AND 2nd LOOP 2 MIXER terminal "Loop 2 out".
 - a. If there is no output signal, the failure is on the CLARIFIER AND 2nd LOOP 2 MIXER circuit board.
 - b. If the output frequency is lower than 1 kHz or higher than 2 kHz, then the CLARIFIER AND 2nd LOOP 2 MIXER is apparently ok.
3. Check that the frequency on the phase/frequency detector IC113, pin 1 is 100 Hz.
4. Check the LOOP 2 Programmable Divider.
 - a. If the frequency on the input terminal "Loop 2 In" on the DIVIDER-UNIT is lower than 1 kHz and the frequency on the phase/frequency detector IC113, pin 3 is lower than 100 Hz, the programmable divider is apparently ok.
 - b. If the frequency on the input terminal "Loop 2 In" on the DIVIDER-UNIT is higher than 2 kHz and the frequency on the phase/frequency detector IC113, pin 3 is higher than 100 Hz, the programmable divider is apparently ok.
5. Check the phase/frequency detector IC113.
 - a. Measure 1.5V DC at the terminal "PD2 (1.5V)" on the DIVIDER-UNIT.
 - b. If the input frequency on IC113, pin 3 is lower than 100 Hz and the DC voltage on the terminal "PD2 Out" on DIVIDER-UNIT is approx. 0.7V, the phase/frequency detector is apparently ok.
 - c. If the input frequency on IC113, pin 3 is higher than 100 Hz and the DC voltage on the terminal "PD2 Out" on DIVIDER-UNIT is approx. 2.3V, the phase/frequency detector is apparently ok.
6. Check the integrator IC601 on VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER.
 - a. If the DC voltage on the terminal "PD2 In" is approx. 0.7V and the DC voltage on output terminal IC601, pin 6 is approx. 17V, the integrator IC601 is apparently ok.
 - b. If the DC voltage on the terminal "PD2 In" is approx. 2.3V and the DC voltage on the output terminal of IC601, pin 6 is approx. 1V, the integrator IC601 is apparently ok.
7. If the failure has not yet been found the 100 Hz loop filter must be checked.

4. PERFORMANCE CHECK FOR R1117

4.1.

DEFINITIONS USED - LOCATIONS

4.1.1.

Refer to 5.1.

4.1.2.

Refer to ADJUSTMENT LOCATIONS

4.2.

CHECK OF ±18V SUPPLY UNIT

4.2.1.

Connect the voltmeter to TP2.

4.2.2.

Check that the voltage is -18V
±0.2V.

4.2.3.

Connect the voltmeter to TP3.

4.2.4.

Check that the voltage is +18V
±0.2V.

4.3.

CHECK OF +5V REGULATOR

4.3.1.

Connect the voltmeter to pin 3 of
IC2001.

4.3.2.

Check that the voltage is 5V
±0.2V.

4.4.

CHECK OF TCXO

The receiver must be ON for at
least 5 minutes.

4.4.1.

Connect the counter to TP4.

4.4.2.

Check that the frequency is 10,000,000
±1 Hz.

4.5.

CHECK OF HARMONIC FILTERS

4.5.1.

Set the MODE SWITCH to pos. A3J.

4.5.2.

Set the MHz SELECTOR to pos. "1".

4.5.3.

Connect the voltmeter to TP6.

4.5.4.

Set the MHz SELECTOR to 1-2-4-6-8-12-
16-22-25 in turn.

4.5.5.

Check that the voltage is \leq 3.5V.

4.6.

CHECK OF VCO

4.6.1.

Set the MODE SWITCH to pos. A3J.

4.6.2.

Set the kHz SELECTORS to pos. 9.

4.6.2.

Unsolder the black/white wire located
at the 2182 kHz switch.

4.6.4.

Connect the voltmeter to TP7.

4.6.5.

Set the MHz SELECTOR to pos. 1 - 2 - 4 -
6 - 8 - 12 - 16 - 22 - 25 MHz in turn.

4.6.6.

Check that the voltage is -15V ±1V.

4.6.7.

Resolder the black/white wire.

4.6.8.

Set the kHz SELECTORS to pos. 0.

4.6.9.

Set the MHz SELECTOR to pos. 22 - 16 -
12 - 8 - 6 - 4 - 2 MHz in turn.

4.6.10.

Check that the voltage is -5 to -8V.

PERFORMANCE CHECK FOR R1117 cont.:

4.7.

CHECK OF CLARIFIER

4.7.1.

Set the MODE SWITCH to pos. A3J.

4.7.2.

Set the CLARIFIER knob to center position.

4.7.3.

Set the 100 Hz SELECTOR to pos. "0".

4.7.4.

Connect the counter to TP9.

4.7.5.

Check that the frequency is 9000 Hz ± 10 Hz.

4.7.6.

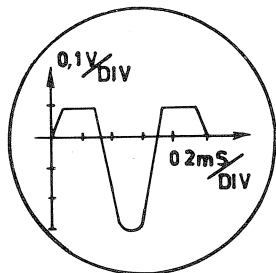
Check that the CLARIFIER deviation range is more than ± 100 Hz.

4.7.7.

Connect the 10:1 probe and scope to R718.

4.7.8.

Check that the wave form is as shown below.



4.8.

CHECK OF VCXO

4.8.1.

Set the MODE SWITCH to pos. A3J.

4.8.2.

Set the CLARIFIER knob to center position.

4.8.3.

Set the 100 Hz SELECTOR to pos. "5".

4.8.4.

Connect the voltmeter to TP8.

4.8.5.

Check that voltage is approx. 9V.

4.8.6.

Turn the CLARIFIER knob extreme counter clockwise.

4.8.7.

Set the 100 Hz SELECTOR to pos. "0".

4.8.8.

Check that the voltage is $\leq 14V$.

4.8.9.

Turn the CLARIFIER knob extreme clockwise.

4.8.10.

Set the 100 Hz SELECTOR to pos. "9".

4.8.11.

Check that the voltage is $\geq 4.5V$.

4.9.

CHECK OF 600 kHz GENERATOR

4.9.1.

Set the MODE SWITCH to pos. A3J.

4.9.2.

Connect the diode probe to TP5.

4.9.3.

Check that the voltage is approx. 1V.

4.9.4.

Check that the voltage disappears in the A3H MODE.

4.10.

CHECK OF LOOP 1 STEP RESPONSE

4.10.1.

Connect a 68 ohms resistor across HARMONIC FILTERS output.

4.10.2.

Set the MODE SWITCH to pos. A3J.

PERFORMANCE CHECK FOR R1117 cont.:

4.10.3.

Connect the 10:1 probe and the scope to TP7.

4.10.4.

Set the kHz SELECTORS to pos. "5".

4.10.5.

Set the MHz SELECTOR to pos. "1".

4.10.6.

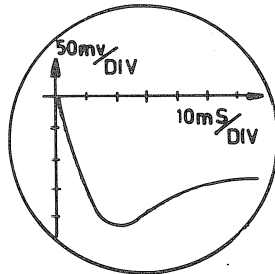
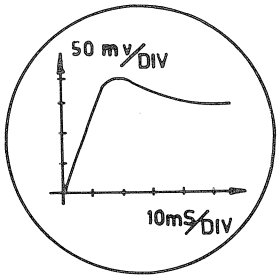
Short-circuit the yellow wire on the 100 kHz selector switch to chassis and check the step response on the scope. Typical wave form is shown below.

4.10.7.

Repeat 4.10.6. with the MHz SELECTOR in pos. 2 - 4 - 6 - 8 - 12 - 16 - 22 - 25 MHz.

4.10.8.

Remove the 68 ohms resistor from HARMONIC FILTER output.



4.11.

CHECK OF LOOP 2 STEP RESPONSE

4.11.1.

Set the MODE SWITCH to pos. A3J.

4.11.2.

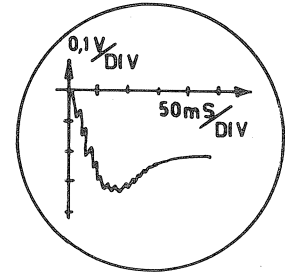
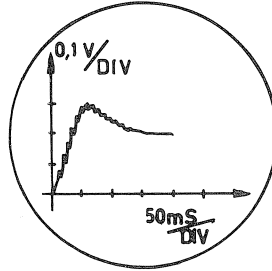
Connect the 10:1 probe and the scope to TP8.

4.11.3.

Set the 100 Hz SELECTOR to pos. "5".

4.11.4.

Short-circuit the yellow wire on the 100 Hz SELECTOR switch to chassis and check the step response on the scope. Typical wave form is shown below.



4.12.

CHECK OF +18V SUPPLY VOLTAGE

4.12.1.

Connect voltmeter to TP11.

4.12.2.

Measure 18V \pm 1.5V DC.

4.13.

CHECK OF +17V SUPPLY VOLTAGE

4.13.1.

Connect voltmeter to TP12.

4.13.2.

Turn AF GAIN fully counter clockwise.

4.13.3.

Measure 17.3V \pm 1.5V DC.

4.14.

CHECK OF -45V PROTECTION CIRCUIT

4.14.1.

Connect voltmeter to TP13.

4.14.2.

Measure approx. -45V.

PERFORMANCE CHECK FOR R1117 cont.:

4.14.3.

Connect output from TX-exciter S1300 to antenna input terminals on R1117.

4.14.4.

Use the following procedure at one frequency in each of the frequency bands for which the receiver is designed.

4.14.5.

Set S1300 to FULL POWER, DUPLEX, A3H and turn POWER LEVEL potentiometer fully clockwise.

4.14.6.

Set R1117 and S1300 to the same frequency.

4.14.7.

Tune R1117 as described on its front panel.

4.14.8.

Connect the voltmeter to TP13.

4.14.9.

Key S1300 by means of the KEY plug, and check that the voltage on TP13 increases.

4.15.

CHECK OF SWITCHING VOLTAGE FROM 4 MHz COIL SECTION

4.15.1.

Connect voltmeter to TP14.

4.15.2.

Check that DC voltage is approx. 0.7V when MHz SELECTOR is on 4 MHz, and approx. -1V in all other positions.

4.16.

CHECK OF LOCAL OSCILLATOR INPUTS

4.16.1.

Set $f_{RX} = 1600$ kHz.

4.16.2.

Connect diode probe to TP15.

4.16.3.

Measure $2.7V \pm 0.4V$.

4.16.4.

Connect diode probe to TP16.

4.16.5.

Measure $4.2V \pm 1V$.

4.16.6.

Set $f_{RX} = 25.600$ MHz.

4.16.7.

Measure $4.0V \pm 1V$.

4.16.8.

Set MODE SWITCH to A3J (SSB).

4.16.9.

Turn RF GAIN fully counter clockwise.

4.16.10.

Connect diode probe to TP10.

4.16.11.

Measure $1.2V \pm 0.3V$.

4.17.

CHECK OF DETECTOR LEVEL

4.17.1.

Set $f_G = 25.601$ MHz and $V_G = 1$ mV unmodulated.

4.17.2.

Set $f_{RX} = 25.600$ MHz.

4.17.3.

Set AGC ON/OFF to ON.

4.17.4.

Turn RF GAIN fully clockwise.

4.17.5.

Connect voltmeter to HEADPHONES via screened cable.

4.17.6.

Adjust AF GAIN so that meter reading is 0 dB in the 1V AC range.

4.17.7.

Set AGC ON/OFF to OFF.

4.17.8.

Adjust RF GAIN until meter reading is 0 dB again.

4.17.9.

Short-circuit Carrier Reinjection to ground, e.g. on the anode on D1607.

PERFORMANCE CHECK FOR R1117 cont.:

4.17.10.
Connect diode probe to TP10.

4.17.11.
Measure 300 mV \pm 50mV.

4.18.
CHECK OF AGC ATTACK - AND DECAY TIMES

4.18.1.
Perform 5.8.1. - 5.8.4.

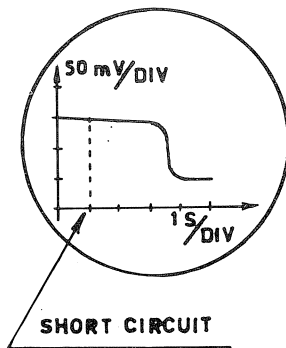
4.18.2.
Tune receiver as described on its front panel.

4.18.3.
Connect oscilloscope probe to TP19.

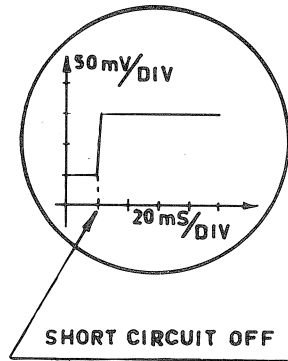
4.18.4.
By means of e.g. a trimming tool short-circuit inner and outer conductor on the short coax-cable carrying signal from IF-FILTERS to IF-AMPLIFIER, DETECTOR and AGC.

Do not under any circumstances short-circuit inner conductor to ground.

4.18.5.
When short-circuiting as mentioned above, no signal will come to the AGC-circuit, which causes the AGC voltage to decay as shown below.



4.18.6.
Removing the short-circuit causes the AGC-voltage to "attack" as shown below.

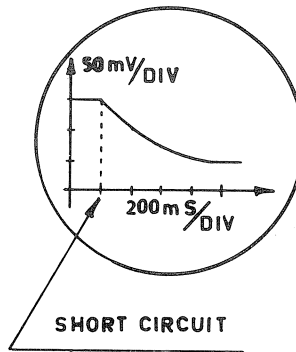


4.18.7.
Set MODE SWITCH to A3H (AM).

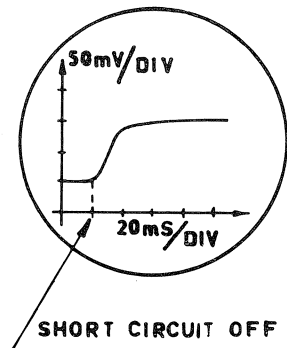
4.18.8.
Set $f_G = 4250$ kHz modulated to 30% with an 1 kHz tone.

4.18.9.
Perform 4.18.4.

4.18.10.
Similar to 4.18.5. a decay will be seen.



4.18.11.
Similar to 4.18.6. an "attack" will be seen.



PERFORMANCE CHECK FOR R1117 cont.:

4.19.
CHECK OF 0 dBm AF OUTPUT

4.19.1.
Perform 5.8.1. - 5.8.4.

4.19.2.
Tune receiver as described on its front panel.

4.19.3.
Connect voltmeter parallel to 560 ohm to TP17 and TP18.

4.19.4.
Measure $0.75 \pm 0.15V$ AC.

4.19.5.
Set MODE SWITCH to A3H (AM).

4.19.6.
Set $f_G = 4250$ kHz modulated to 30% with an 1 kHz tone.

4.19.7.
Measure $0.75V \pm 0.15V$ AC.

4.20.
CHECK OF AF AMPLIFIER

4.20.1.
Perform 5.8.1. - 5.8.4.

4.20.2.
Tune receiver as described on its front panel.

4.20.3.
Solder a 4 ohm (min. 10 W) resistor to TP21 and connect the oscilloscope probe parallel to that.

4.20.4.
Turn AF GAIN fully clockwise and check that AF voltage is at least 15V pp.

4.20.5.
Reduce AF GAIN until AF voltage is 14V pp. Now a sinusoidal signal should be seen (distortion is typical around 3%)

4.21.
CHECK OF SIMPLEX RELAY (RE1901)

4.21.1.
Perform 5.8.1. - 5.8.4.

4.21.2.
Tune receiver as described on its front panel.

4.21.3.
Connect TP11 to TP20 with a piece of wire and check that R1901 is activated and that METER reading is approx. 4. Also the AF tone in the loudspeaker should disappear completely.

4.22.
CHECK OF SENSITIVITY

4.22.1.
Refer to 5.11.

5. ADJUSTMENT PROCEDURE FOR R1117

NOTE: The trimming cores are factory sealed. Use normal cellulose thinner to break the seal.

5.1. DEFINITIONS USED

5.1.1.
 f_{RX} = frequency to which the receiver is adjusted (clarifier in the middle of its operating range).

f_G = signal generator frequency, i.e. the input frequency to the receiver.

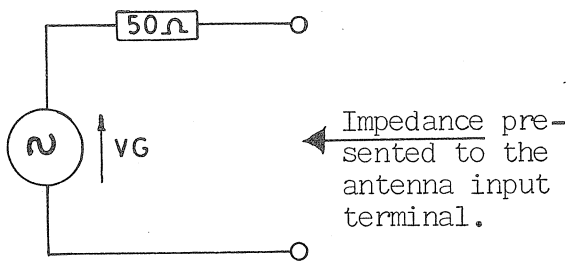
V_G = EMF of signal generator with proper generator impedance.

Z_G = Output impedance of signal generator.

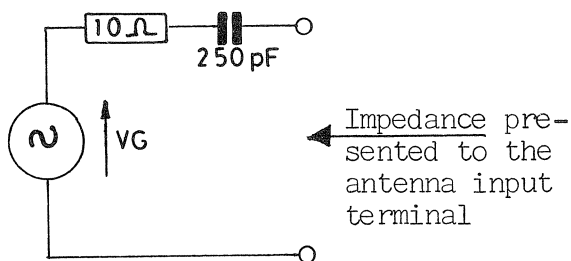
f_{AF} = Audio frequency to HEADPHONES and loudspeaker.

Two generator impedances are used.

For short-wave bands between 4 MHz and 30 MHz:



For C.T. band between 1.6 MHz and 4 MHz including 2182 kHz:



5.2.
 THE FOLLOWING SEQUENCE WILL OFTEN BE USED:

5.2.1.
 Connect signal generator with proper generator impedance to the antenna input terminal on the receiver.

5.2.2.
 Switch ON the receiver.

5.2.3.
 Set LOUDSPEAKER ON/OFF to ON.

5.2.4.
 Set AGC ON/OFF to ON.

5.2.5.
 Turn RF GAIN fully clockwise.

5.2.6.
 Set AF GAIN to the middle of its operating range.

5.3. ADJUSTMENT OF $\pm 18V$ SUPPLY UNIT

5.3.1.
 Connect the voltmeter to TP2.

5.3.2.
 Adjust R209 to $-18V \pm 0.2V$.

5.3.3.
 Connect the voltmeter to TP3.

5.3.4.
 Adjust R214 to $+18V \pm 0.2V$.

5.4. ADJUSTMENT OF TCXO

5.4.1.
 The receiver must be ON for at least 5 minutes.

5.4.2.
 Connect the counter to TP4.

5.4.3.
 Adjust R112 to 10,000,000 Hz.

PERFORMANCE CHECK FOR R1117 cont.:

4.19.
CHECK OF 0 dBm AF OUTPUT

4.19.1.
Perform 5.8.1. - 5.8.4.

4.19.2.
Tune receiver as described on its front panel.

4.19.3.
Connect voltmeter parallel to 560 ohm to TP17 and TP18.

4.19.4.
Measure $0.75 \pm 0.15V$ AC.

4.19.5.
Set MODE SWITCH to A3H (AM).

4.19.6.
Set $f_G = 4250$ kHz modulated to 30% with an 1 kHz tone.

4.19.7.
Measure $0.75V \pm 0.15V$ AC.

4.20.
CHECK OF AF AMPLIFIER

4.20.1.
Perform 5.8.1. - 5.8.4.

4.20.2.
Tune receiver as described on its front panel.

4.20.3.
Solder a 4 ohm (min. 10 W) resistor to TP21 and connect the oscilloscope probe parallel to that.

4.20.4.
Turn AF GAIN fully clockwise and check that AF voltage is at least 15V pp.

4.20.5.
Reduce AF GAIN until AF voltage is 14V pp. Now a sinusoidal signal should be seen (distortion is typical around 3%)

4.21.
CHECK OF SIMPLEX RELAY (RE1901)

4.21.1.
Perform 5.8.1. - 5.8.4.

4.21.2.
Tune receiver as described on its front panel.

4.21.3.
Connect TP11 to TP20 with a piece of wire and check that R1901 is activated and that METER reading is approx. 4. Also the AF tone in the loudspeaker should disappear completely.

4.22.
CHECK OF SENSITIVITY

4.22.1.
Refer to 5.11.

5. ADJUSTMENT PROCEDURE FOR R1117

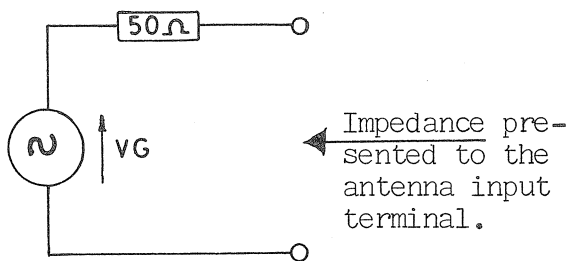
NOTE: The trimming cores are factory sealed. Use normal cellulose thinner to break the seal.

5.1. DEFINITIONS USED

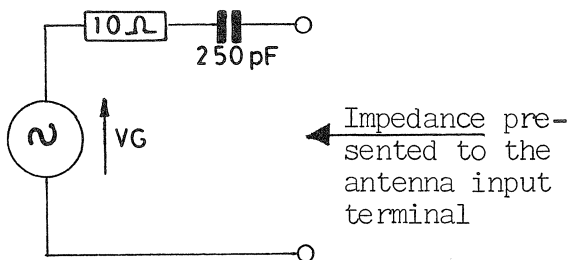
- 5.1.1.
 f_{RX} = frequency to which the receiver is adjusted (clarifier in the middle of its operating range).
 f_G = signal generator frequency, i.e. the input frequency to the receiver.
 V_G = EMF of signal generator with proper generator impedance.
 Z_G = Output impedance of signal generator.
 f_{AF} = Audio frequency to HEADPHONES and loudspeaker.

Two generator impedances are used.

For short-wave bands between 4 MHz and 30 MHz:



For C.T. band between 1.6 MHz and 4 MHz including 2182 kHz:



5.2. THE FOLLOWING SEQUENCE WILL OFTEN BE USED:

- 5.2.1. Connect signal generator with proper generator impedance to the antenna input terminal on the receiver.
 5.2.2. Switch ON the receiver.
 5.2.3. Set LOUDSPEAKER ON/OFF to ON.
 5.2.4. Set AGC ON/OFF to ON.
 5.2.5. Turn RF GAIN fully clockwise.
 5.2.6. Set AF GAIN to the middle of its operating range.

5.3. ADJUSTMENT OF $\pm 18V$ SUPPLY UNIT

- 5.3.1. Connect the voltmeter to TP2.
 5.3.2. Adjust R209 to $-18V \pm 0.2V$.
 5.3.3. Connect the voltmeter to TP3.
 5.3.4. Adjust R214 to $+18V \pm 0.2V$.

5.4. ADJUSTMENT OF TCXO

- 5.4.1. The receiver must be ON for at least 5 minutes.
 5.4.2. Connect the counter to TP4.
 5.4.3. Adjust R112 to 10,000,000 Hz.

ADJUSTMENT PROCEDURE FOR R1117 cont.:

5.5.

ADJUSTMENT OF CLARIFIER

5.5.1.

Set the CLARIFIER to center position.

5.5.2.

Set the MODE SWITCH to position 2182 kHz.

5.5.3.

Connect the counter to TP9.

5.5.4.

Adjust L701 to 9000 Hz.

5.6.

ADJUSTMENT OF VCXO

5.6.1.

Set the MODE SWITCH to pos. A3J.

5.6.2.

Set the CLARIFIER knob to center position.

5.6.3.

Set the 100 Hz SELECTOR to pos. "5".

5.6.4.

Connect the voltmeter to TP8.

5.6.5.

Adjust L601 to 9.0V.

5.7.

ADJUSTMENT OF 600 kHz GENERATOR

5.7.1.

Set the MODE SWITCH to pos. A3J.

5.7.2.

Connect the diode probe to TP5.

5.7.3.

Adjust L101 for max. deflection on the TP-meter (approx. 1V).

5.8.

ADJUSTMENT OF IF AMPLIFIER DETECTOR AND AGC.

5.8.1.

Perform 5.2. with $Z_G = 50$ ohm.

5.8.2.

Set MODE SWITCH to A3J.

5.8.3.

Set $f_{RX} = 4250$ kHz.

5.8.4.

Set $f_G = 4251$ kHz and $V_G = 10$ mV unmodulated.

5.8.5.

Set AERIAL TUNE to the middle of its operating range.

5.8.6.

Slowly reduce V_G until noise starts to dim the AF tone; then increase V_G 20 dB.

5.8.7.

Connect voltmeter to HEADPHONES via a screened cable, and adjust AF GAIN so that the meter reads 0 dB in the 1V AC range.

5.8.8.

Adjust L1605 for max. meter reading and at the same time keep this on 0 dB by reducing AF GAIN.

5.8.9.

Set AGC ON/OFF to OFF.

5.8.10.

Reduce RF GAIN until meter reading again is 0 dB in the 1V range.

5.8.11.

Adjust L1601 for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.9.

ADJUSTMENT OF IF FILTERS AND 1ST AND 2ND MIXER.

5.9.1.

Perform 5.2. with $Z_G = 50$ ohm.

5.9.2.

Perform 5.8.2., 5.8.3., 5.8.4., 5.8.6., and 5.8.7.

ADJUSTMENT PROCEDURE FOR R1117 cont.:

5.9.3.
Set AGC ON/OFF to OFF.

5.9.4.
Perform 5.8.10.

5.9.5.
Adjust L1501, L1401 and C1405 (in arbitrary order) for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.9.6.
Repeat 5.9.5. to obtain max. as well as possible.

NOTE: Crystal filters FL1401 and FL1501, and ceramic filter FL1502 are of decisive importance for the total AF pass-band characteristics in the A3H and the A3J mode. These characteristics may be checked in the way described below.

5.9.7.
Connect counter parallel to voltmeter.

5.9.8.
Adjust f_G so that f_{AF} varies between 300 Hz and 2700 Hz and find the AF frequency f_{AFM} that gives max. meter deflection.

5.9.9.
Adjust frequency f_G so that counter reads f_{AFM} .

5.9.10.
Set meter deflection to 0 dB in the 1V AC range by means of RF GAIN.

5.9.11.
Adjust f_G so that f_{AF} varies between 300 Hz and 2700 Hz.

NOTE: In this interval meter reading must not be less than -6 dB.

5.9.12.
Remove cable from HEADPHONES.

5.9.13.
Perform 5.2. with $Z_G = 50$ ohm.

5.9.14.
Set mode switch to A3H.

5.9.15.
Set $f_G = 4250$ kHz modulated 30% by an 1 kHz tone.

5.9.16.
Set $V_G = 10$ mV.

5.9.17.
Perform 5.8.6. and 5.8.7.

5.9.18.
Set AGC ON/OFF to OFF.

5.9.19.
Turn RF GAIN fully counter clockwise; then slowly turn it clockwise until meter reading is 0 dB in the 1V range.

5.9.20.
Adjust the two coils in AM filter FL1502 for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.9.21.
Connect counter parallel to voltmeter.

5.9.22.
Adjust modulation frequency (still 30% modulation) so that f_{AF} varies between 300 Hz and 2700 Hz and find the AF frequency f_{AFM} that gives max. meter deflection.

5.9.23.
Adjust modulation frequency so that counter reads f_{AFM} .

5.9.24.
Set meter reading to 0 dB in 1V AC range by means of RF GAIN.

5.9.25.
Adjust modulation frequency so that f_{AF} varies between 300 Hz and 2700 Hz.

NOTE: In this interval meter reading must not be less than -6 dB.

5.9.26.
Remove cable from HEADPHONES.

5.10.
ADJUSTMENT OF COIL SECTIONS
25 MHz COIL SECTION

5.10.1.
Perform 5.2. with $Z_G = 50$ ohm.

5.10.2.
Set MODE SWITCH to A3J.

ADJUSTMENT PROCEDURE FOR R1117 cont.:

5.10.3.

Set $f_{RX} = 25.300$ MHz

5.10.4.

Set $f_G = 25.301$ MHz and $V_G = 10$ mV unmodulated.

5.10.5.

Perform 5.8.6. and 5.8.7.

5.10.6.

Set AGC ON/OFF to OFF.

5.10.7.

Reduce RF GAIN until meter reading again is 0 dB in the 1V AC range.

5.10.8.

Adjust L1007, L1008 and L1010 for max. meter reading and at the same time keep this on 0 dB by means of RF GAIN.

5.10.9.

Repeat 5.10.8.

5.10.10.

Remove cable from HEADPHONES.

22 MHz, 16 MHz, 12 MHz, 8 MHz, 6 MHz and 4 MHz COIL SECTIONS

Because the adjustment procedure of these tuneable coil sections is the same, following definitions will be used.

$f_{min.}$ = min. frequency in the short wave band concerned.

$f_{max.}$ = max. frequency in the short wave band concerned.

For:

$f_{min.} = 4.063$ MHz and $f_{max.} = 4.438$ MHz

$f_{min.} = 6.200$ MHz and $f_{max.} = 6.525$ MHz

$f_{min.} = 8.195$ MHz and $f_{max.} = 8.815$ MHz

$f_{min.} = 12.330$ MHz and $f_{max.} = 13.200$ MHz

$f_{min.} = 16.460$ MHz and $f_{max.} = 17.360$ MHz

$f_{min.} = 22.000$ MHz and $f_{max.} = 22.720$ MHz

do the following:

5.10.11.

Perform 5.2. with $Z_G = 50$ ohm.

5.10.12.

Set MODE SWITCH to A3J.

5.10.13.

Set $f_{RX} = f_{min.}$

5.10.14.

Set $f_G = f_{min.} + 1$ kHz and $V_G = 10$ mV unmodulated.

5.10.15.

If $f_{min.}$ is one of the values 22.000 MHz, 16.460 MHz or 12.330 MHz turn the AERIAL TUNE fully counter clockwise.

If $f_{min.}$ is one of the values 8195 kHz, 6200 kHz or 4063 kHz turn it fully clockwise.

5.10.16.

Perform 5.8.6., 5.8.7., 5.10.6. and 5.10.7.

5.10.17.

Adjust coils, according to the following table:

Short wave bands	Coils to be adjusted
22	L1107, L1108, L1110
16	L1207, L1208, L1210
12	L1307, L1308, L1310
8	L1302, L1303, L1305
6	L1202, L1203, L1205
4	L1102, L1103, L1105

for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.10.18.

Repeat 5.10.17.

5.10.19.

Set $f_{rx} = f_{max.}$ and $f_G = f_{max.} + 1$ kHz.

5.10.20.

Use AERIAL TUNE and tune for max. meter reading.

NOTE: This must be between -2 dB and +4 dB.

5.10.21.

Remove cable from HEADPHONES.

ADJUSTMENT PROCEDURE FOR R1117 cont.:

2182 kHz COIL SECTION

5.10.22.

Perform 5.2.

5.10.23.

Set $f_G = 2182$ kHz modulated to 30% with 1 kHz and set $V_G = 10$ mV.

5.10.24.

Set MODE SWITCH to DISTRESS 2182 kHz.

5.10.25.

Perform 5.8.6., 5.8.7., 5.9.18. and 5.9.19. in succession.

5.10.26.

Adjust L1001 so that the core is levelled with the coil former.

5.10.27.

Adjust C802, L1002 and L1004 for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.10.28.

Repeat 5.10.27.

5.10.29.

Remove cable from HEADPHONES.

1.6 - 4 MHz COIL SECTION

5.10.30.

Perform 5.2.

5.10.31.

Set MODE SWITCH to A3J.

5.10.32.

Turn AERIAL TUNE fully counter clockwise.

5.10.33.

Adjust distance between end of core in L903 and dividing plate to approx. 3 mm.

5.10.34.

Tighten the lock nut.

5.10.35.

Set $f_{RX} = 3900$ kHz.

5.10.36.

Set $f_G = 3901$ kHz and $V_G = 10$ mV (or more) unmodulated.

5.10.37.

Line up the cores in L901 and L902 with that in L903.

5.10.38.

Set C801, C907 and C909 to the middle of the operating range.

5.10.39.

If AF tone in the loudspeaker is loud and clear perform 5.8.6. If not, adjust AERIAL TUNE and L901 and L902 in succession until the tone is as clear as possible, then perform 5.8.6.

5.10.40.

Perform 5.8.7., 5.8.9. and 5.8.10.

5.10.41.

Adjust L901, L902 and AERIAL TUNE for max. meter deflection and at the same time keep meter reading on 0 dB by reducing RF GAIN.

5.10.42.

Set $f_{RX} = 1600$ kHz and $f_G = 1601$ kHz and adjust AERIAL TUNE for max. meter deflection.

5.10.43

Adjust C801, C907, C909 and AERIAL TUNE for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.10.44.

Set $f_{RX} = 3900$ kHz and $f_G = 3901$ kHz.

5.10.45.

Adjust AERIAL TUNE for max. meter deflection.

5.10.46.

Repeat 5.10.41.- 5.10.45. a couple of times until no essential improvement is gained.

5.10.47.

Remove cables from HEADPHONES.

5.11.

SENSITIVITY MEASUREMENT

5.11.1.

Choose V_G according to following table (and refer to definitions given in section 5.1.)

Mode	f_{RX}	V_G (EMF)
A3J (SSB)	1.6 MHz - 4 MHz	16 dB above 1 uV or 6,3 uV
	4 MHz - 30 MHz	11 dB above 1 uV or 3,6 uV
A3H (AM)	1.6 MHz - 4 MHz incl. 2182 kHz	30 dB above 1 uV or 32 uV
	4 MHz - 30 MHz	25 dB above 1 uV or 18 uV

5.11.2.

Choose f_{RX} and f_G according to following table:

Mode	Band	f_{RX} MHz	f_G MHz
A3J (SSB)	1.6 MHz - 4 MHz	1.600	$f_{RX} + 1$ kHz unmodulated
		2.476	
		3.984	
	4 MHz	4.063	
		4.438	
	6 MHz	6.200	
		6.525	
	8 MHz	8.195	
8.815			
12 MHz	12.330		
	13.200		
16 MHz	16.460		
	17.360		
22 MHz	22.000		
	22.722		
25 MHz	25.041		
	25.307		
	25.559		
A3H (AM)		2.182	2.182 MHz 30% modulated with 1 kHz

ADJUSTMENT PROCEDURE FOR R1117 cont.:

5.11.3.

Perform 5.2.

5.11.4.

Tune COIL SECTIONS according to the method described on front plate (except in 25 MHz band and on 2182 kHz).

5.11.5.

Perform 5.8.7.

5.11.6.

Set AGC ON/OFF to OFF.

5.11.7.

Reduce RF GAIN until meter reading again is 0 dB.

5.11.8.

Fine tune COIL SECTIONS to max. meter reading and reduce this to 0 dB with RF GAIN.

5.11.9.

Set $V_G = 0$ and notice drop in meter reading.

In any case this must be at least 20 dB

Generally NOISE GENERATOR and METER can give quick and good information about the condition of the receiver.

For example a quick overall check of the receiver could be done by tuning it to a couple of frequencies in all of the bands to which it is designed and see, if in all cases a METER deflection between 1 and 2 can be obtained.

5.12.

ADJUSTMENT OF NOISE GENERATOR

5.12.1.

Set $f_{RX} = 25.300$ MHz.

5.12.2.

Press NOISE GENERATOR.

5.12.3.

Adjust R1903 for max. METER reading.

5.12.4.

Set $f_{RX} = 1600$ kHz.

5.12.5.

Press NOISE GENERATOR and tune for max. METER reading.

5.12.6.

This must be approx. the same as in

5.12.3.

NOTE: In an emergency a very rough adjustment of all of the above-mentioned units can be performed with the NOISE GENERATOR and the METER.

6. NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1117

In the following paragraphs reference is made to the ADJUSTMENT PROCEDURE R1117 and PERFORMANCE CHECK R1117. Definition used: refer to 5.1. Locations: refer to ADJUSTMENT LOCATIONS.

6.1.
Module No. 100: DIVIDER-UNIT

6.1.1.
Execute 4.3., 5.4., 5.7., 4.10., 4.11. and 5.11.

6.2.
Module No. 200: LOOP 1 FILTER & +18V SUPPLY-UNIT

6.2.1.
Execute 5.3., 4.6. on one frequency and 4.10.

6.3.
Module No. 300: VCO-UNIT

6.3.1.
Execute 4.6., 4.10. and 4.16.1. to 4.16.7. (both incl.).

6.4.
Module No. 400: HARMONIC FILTER-UNIT

6.4.1.
Execute 4.5. and 4.10.

6.5.
Module No. 500: LOOP 1 MIXER

6.5.1.
Execute 4.6. and 4.10.

6.6.
Module No. 600: VCXO, 1st LOOP 2 MIX. and LOOP 2 FILTER

6.6.1.
Execute 4.7.1. to 4.7.5. (both incl.), 5.6., 4.11. and 4.16.1. to 4.16.3. (both incl.).

6.7.
Module No. 700: CLARIFIER AND 2nd LOOP 2 MIXER.

6.7.1.
Execute 5.5. and 4.7.

6.8.
Module No. 800: BASE PRINT

6.8.1.
Execute 4.14., 5.10. and 5.11.

6.9.
Module No. 900 - 1300: AERIAL COIL SECTIONS

6.9.1.
Execute 4.14., 5.10. and 5.11. for the coil section in question.

6.10.
Module No. 1400: 1st MIXER and 2nd MIXER

6.10.1.
Execute 4.15., 4.16.1. to 4.16.7. (both incl.), 5.9. (adjustment of L1501 and point 5.9.20. excl.), and 5.11.

6.11.
Module No. 1500: IF-FILTERS

6.11.1.
Execute 5.9. (L1401 and C1405 excl.).

A 1/2

NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1117 cont.:

6.12.
Module No. 1600: IF AMPLIFIER

6.12.1.
Execute 5.8., 4.17 and 4.18.

6.13.
Module No. 1700: AUDIO AMPLIFIER UNIT

6.13.1.
Execute 4.19.1. to 4.19.4. (both incl.)
and 4.20.

6.14.
Module No. 1800: INPUT FILTER

6.14.1.
Execute 4.3., 4.12., 4.13., 4.14.1.,
4.14.2., 4.19.1. to 4.19.4. (both
incl.) and 4.21.

6.14.2.
Check that LOUDSPEAKER ON/OFF is func-
tional.

6.15.
Module No. 1900: AERIAL SWITCH

6.15.1.
Execute 5.12. and 4.21.

6.16.
Module No. 2000: kHz SELECTORS

6.16.1.
Check that all settings of the swit-
ches in question gives the proper
frequency.

6.17.
Module No. 2000: 100 Hz SELECTOR

6.17.1.
Check that all settings of the
switch gives the proper frequency.

6.18.
Module No. 2000: CLARIFIER CAPACITOR
C2001

6.18.1.
Adjust knob for symmetrical variation
range.

6.18.2.
Execute 5.5. and 4.7.6.

6.19.
Module No. 2000: MODE SWITCH S2005

6.19.1.
Execute 5.11. on 2182 kHz

6.19.2.
Execute 5.12.1., 5.12.2. and check that
METER reading is approx. 1.5.

6.19.3.
Check the switch voltages to the AM-
and SSB filters.
Refer to scematic diagram of the IF-
FILTERS.

6.19.4.
Execute 4.17. and 4.18.

6.20.
Module No. 2100: VCO BUFFER

6.20.1.
Execute 4.16.4. to 4.16.7. (both incl.).

7. FUNCTION CHECK R1117

NECESSARY TEST EQUIPMENT:

POWER SUPPLY E.g. SAILOR N1402
AF VOLTMETER E.g. PHILIPS PM2503
SIGNAL GENERATOR E.g. PHILIPS PM5326
ARTIFICIAL AERIAL 50 ohm and 10ohm/250pF

INITIAL SETTINGS:

1.
Set FREQUENCY SELECTORS to 2300 kHz.
2.
Set CLARIFIER to center position.
3.
Set MODE SWITCH to A3J.
4.
Set AGC ON/OFF to ON.
5.
Set LOUDSPEAKER ON/OFF to ON.
6.
Turn RF-GAIN fully clockwise.
7.
Turn AF-GAIN fully counter clockwise.
8.
Connect R1117 to ext. power supply (N1402).
9.
Short-circuit pin 12 to pin 20 in the power plug P2001.

FUNCTION CHECK:

- 7.1.
Turn AF-GAIN to suitable volume.
- 7.2.
Check that LOUDSPEAKER ON/OFF is functional.
- 7.3.
Connect headphones to HEADPHONES socket.

- 7.4.
Check that the loudspeaker now is off and the noise is heard in the headphones. Remove the headphones.
- 7.5.
Turn RF-GAIN fully counter clockwise.
- 7.6.
Check that the noise in the loudspeaker disappears and the METER reading is now approx. 4. Turn RF-GAIN fully clockwise.
- 7.7.
PRESS PUSH BUTTON AND TUNE FOR MAX. METER READING.
- 7.8.
Check that the METER reading is approx. 1,5.
- 7.9.
Repeat 7.7. and 7.8. on 22300 kHz.
- 7.10.
Set FREQUENCY SELECTORS to 1600 kHz and PRESS PUSH BUTTON AND TUNE FOR MAX. METER READING.
- 7.11.
Short-circuit pin 11 to pin 17 in the power plug P2001.
- 7.12.
Check that the loudspeaker is off and that the METER reading is approx. 4. Remove jumber wire.
- 7.13.
Connect the signal generator through artificial aerial to the receiver.
Output: +80 dB/uV 10ohm/250pF M=0 (CW)
- 7.14.
Set MODE SWITCH to pos. A3J.
- 7.15.
Adjust the signal generator to 1602 kHz.
- 7.16.
Now a 2 kHz beat note is heard in the loudspeaker. Check that the beat note frequency varies as the CLARIFIER knob and the 100 Hz FREQUENCY SELECTOR knob is turned (check all 100 Hz selector settings).

FUNCTION CHECK R1117 cont.:

7.17.

Set the CLARIFIER to center position and the 100 Hz selector to pos. 0.

7.18.

Connect the AF voltmeter to HEADPHONES.

7.19.

Set MODE SWITCH to pos. 2182 kHz.

7.20.

Connect the signal generator through artificial aerial to the receiver.

Output: +30dB/uV 10ohm/250pF

Freq: 2182 kHz M=0 (CW)

7.21.

Adjust AERIAL TUNE 2182 for minimum AF voltmeter reading (the location of the AERIAL TUNE 2182 is shown in the instruction book).

7.22.

Modulate the signal generator:

M=0,3 fm = 1 kHz.

7.23.

Adjust AF-GAIN for 0 dB AF meter reading in the 1V range.

7.24.

Set M=0 (CW) on the signal generator and check that the AF output is reduced at least 20 dB.

7.25.

Set MODE SWITCH to pos. A3H.

7.26.

Set FREQUENCY SELECTORS to 1600 kHz and PRESS PUSH BUTTON AND TUNE FOR MAX. METER READING.

7.27.

Adjust the signal generator to 1600 kHz.

Output: +30dB/uV 10ohm/250pF M=0 (CW)

7.28.

Adjust the AERIAL TUNE CT for min. AF meter deflection (the location of AERIAL TUNE CT is shown in the instruction book).

7.29.

Adjust the AERIAL TUNE for min. AF meter deflection. (Repeat 7.28. and

7.29. if necessary).

7.30.

Repeat 7.22., 7.23. and 7.24.

7.31.

Repeat 7.26., 7.27. and 7.30. on 2400 kHz and 3900 kHz.

7.32.

Set FREQUENCY SELECTORS to 1600 kHz and PRESS PUSH BUTTON AND TUNE FOR MAX. METER READING and adjust AERIAL TUNE CT for max. METER deflection.

7.33.

Set MODE SWITCH to pos. A3J.

7.34.

Set FREQUENCY SELECTORS to the LOW BAND LIMIT and PRESS PUSH BUTTON AND TUNE FOR MAX. METER READING (refer frequency table)

7.35.

Adjust the signal generator to Rx frequency + 1 kHz.

Output: +11dB/uV 50 ohm M=0

7.36.

Adjust AF-GAIN for 0 dB AF meter reading in the 1V range.

7.37.

Set AGC ON/OFF to pos. OFF and adjust RF-GAIN for 0 dB AF meter reading.

7.38.

Fine adjust the AERIAL TUNE for max. AF meter reading and adjust RF-GAIN for 0 dB AF meter reading.

7.39.

Disconnect the signal generator and check that the AF output is reduced at least 20 dB.

7.40.

Set AGC to ON; turn RF-GAIN fully clockwise and connect the signal generator to the artificial aerial.

7.41.

Set FREQUENCY SELECTORS to HIGH BAND LIMIT and PRESS PUSH BUTTON AND TUNE FOR MAX. METER READING.

7.42.

Repeat 7.35. to 7.40. (both incl.).

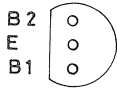
7.43.

Repeat 7.34. to 7.42. (both incl.) on the frequencies tabulated next page:

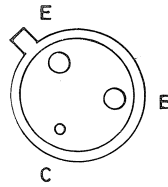
FUNCTION CHECK R1117 cont.:

LOW BAND LIMIT (kHz)	HIGH BAND LIMIT (kHz)
4061	4432
6203	6524
8195	8816
12337	13208
16459	17379
22000	22720
25040	25480

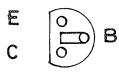
BOTTOM VIEW



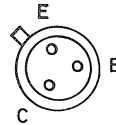
2N4871



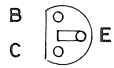
BFW17A



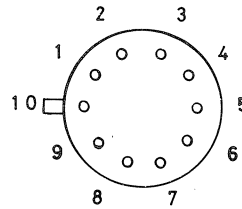
BC 328-25
BC 338
BC 547
BC 548 A,B,C
BC 556 A
BC 558 A,B,C



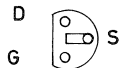
2N2368



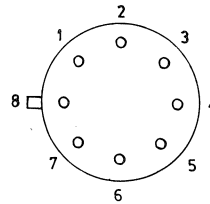
BF 199
BF 494



CA 3019



BF256 A,B,C



LM3053

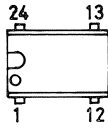


E310

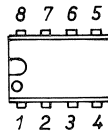
A 1/2

TOP VIEW

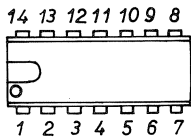
FRONT VIEW



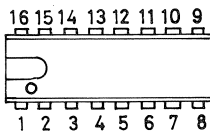
MC 14515 BCB



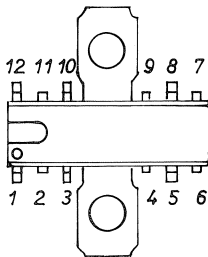
LM 308N
MC 1455 P1
MC 1458



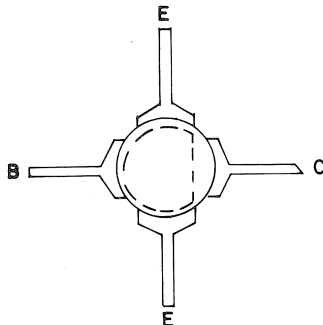
LM 324
LM 3086
MC 4044
MC 14077 B CP
MC 14081 B CP
SN 7407N
SN 7410N
SN 7472N
SN 74LS20N
SN 74LS27N
SN 74LS290N



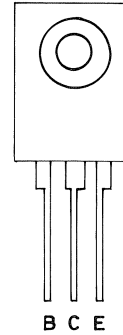
MC 14519 B CP
MC 14530 B CP
SN 74LS109N
SN 74LS192N
SN 74LS390N



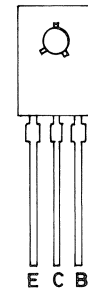
TCA 940



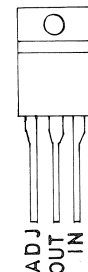
2N5641



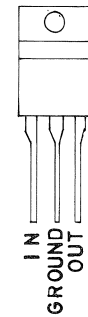
BD 577



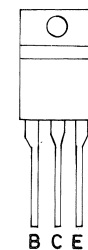
BD138
BD139



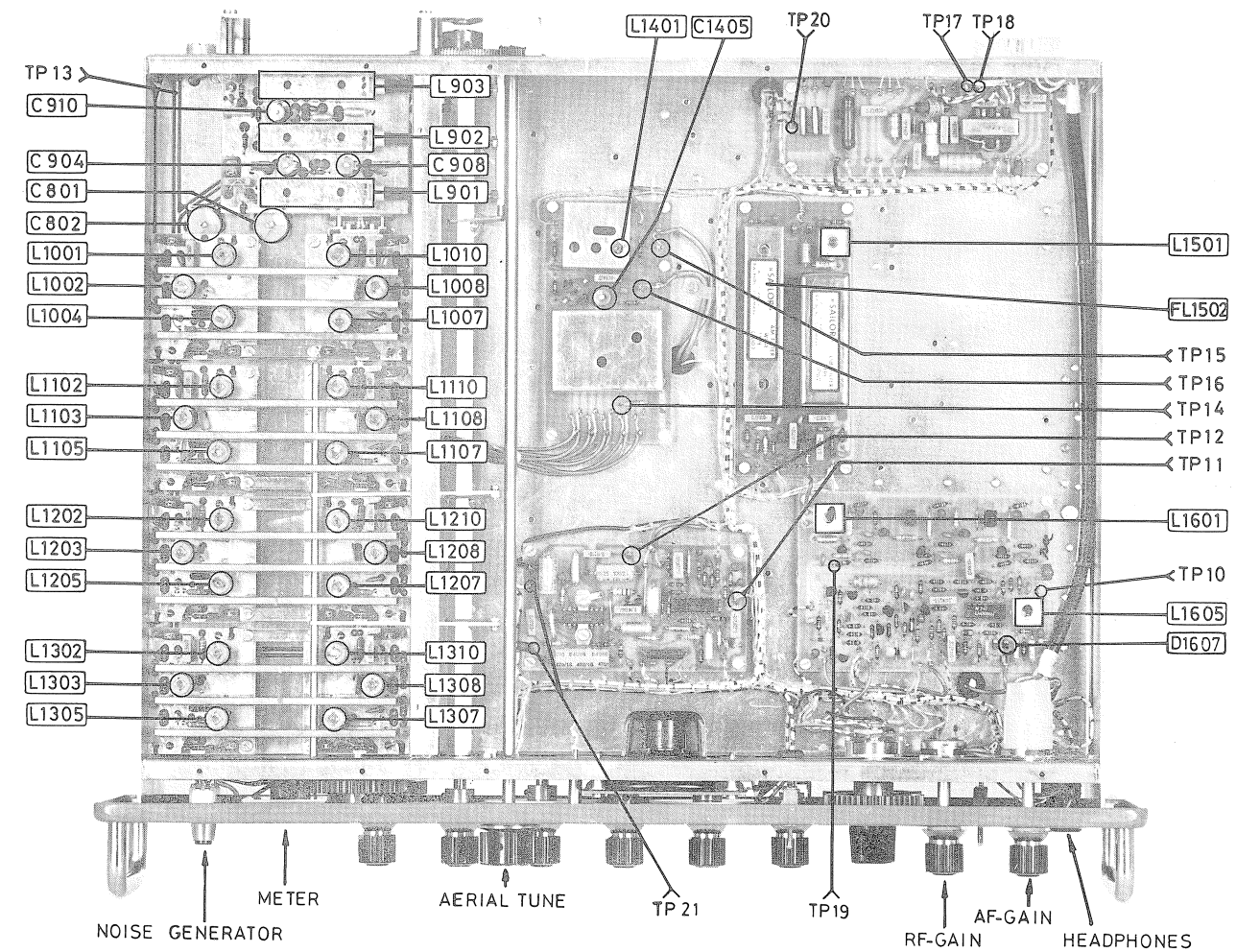
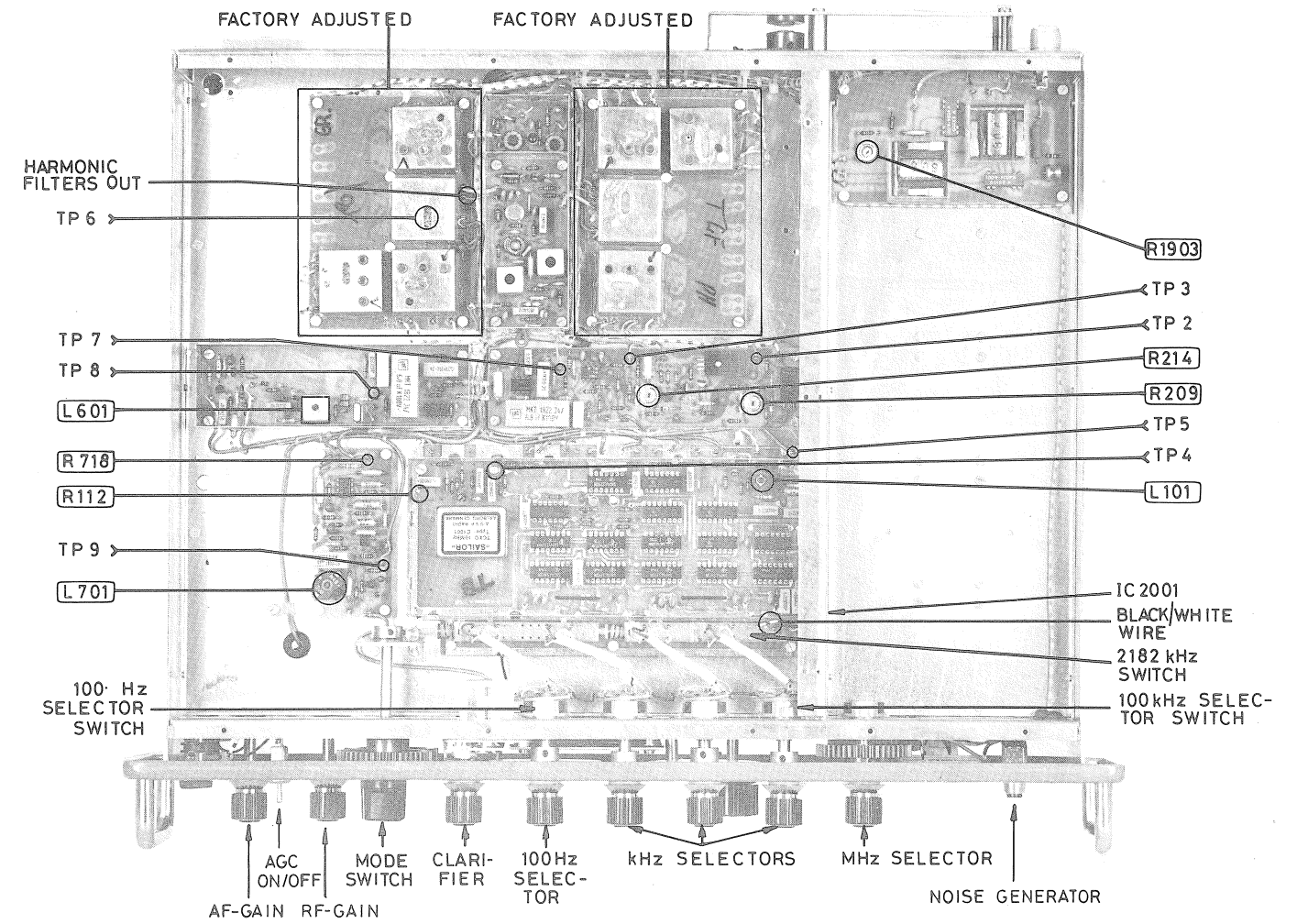
LM317 T



MC7805 CT
MC7818 CT



BD 241



ADJUSTMENT LOCATIONS R 1117

a		DIVIDER UNIT S1300/R1117			1/3		
Symbol	Description				Manufact.		
R101	Resistor	15Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13153
R102	Resistor	15Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13153
R103	Resistor	560 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13561
R104	Resistor	15Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13153
R105	Resistor	560 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13561
R106	Resistor	5,6Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13562
R107	Resistor	1,8Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13182
R108	Resistor	10Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13103
R109	Resistor	1,8Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13182
R110	Resistor	820 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13821
R111	Resistor	220 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13221
R112	Preset potentiometer	2Kohm	$\pm 10\%$	0,5 W	Bourns	3299	W-1-202
R113	Resistor	820 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13821
R114	Resistor	470 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13471
R115	Resistor	10Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13103
R116	Resistor	1,2Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13122
R117	Resistor	2,2Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13222
R118	Resistor	560 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13561
R119	Resistor	22Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13223
R120	Resistor	270 ohm	$\pm 5\%$	0,33W	Philips	2322	106 33271
R121	Resistor	1,8Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13182
R122	Resistor	10Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13103
R123	Resistor	220 ohm	$\pm 5\%$	0,33W	Philips	2322	106 33221
R124	Resistor	2,2Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13222
R125	Resistor	1Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13102
R126	Resistor	220 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13221
R127	Resistor	680 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13681
R128	Resistor	12Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13123
R129	Resistor	6,8Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13682
R130	Resistor	1Kohm	$\pm 5\%$	0,33W	Philips	2322	211 13102
R131	Resistor	820 ohm	$\pm 5\%$	0,33W	Philips	2322	211 13821
RA101	Resistor array	8x10Kohm	$\pm 5\%$	0,125W	ITT	VR8,	10Kohm $\pm 5\%$
RA102	Resistor array	8x10Kohm	$\pm 5\%$	0,125W	ITT	VR8,	10Kohm $\pm 5\%$

a		DIVIDER UNIT S1300/R1117		2/3	
Symbol	Description		Manufact.		
C101	Capacitor, polyester 10nF \pm 20%	250V	Philips	2222 344	40103
C102	Capacitor, tantalum 10uF-20/+50%	16V	ERO	ETP	2E
C103	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C104	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C105	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C106	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C107	Capacitor, ceramic 12pF NPO \pm 5%	400V	Ferroperm	9/0112.9	
C108	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C109	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C110	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C111	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C112	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C113	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C114	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C115	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C116	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C117	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C118	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C119	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C120	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C121	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C122	Capacitor, ceramic 10nF-20/+80%	32V	Ferroperm	9/0145.9	
C123	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C124	Capacitor, polyester 15nF \pm 20%	250V	Philips	2222 344	40153
C125	Capacitor, polyester 47nF \pm 20%	250V	Philips	2222 344	40473
C126	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C127	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C128	Capacitor, electrolytic 10uF-10/+100%	40V	Siemens	B41313-A7106-V	
C129	Capacitor, electrolytic 10uF-10/+100%	40V	Siemens	B41313-A7106-V	
C130	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C131	Capacitor, polyester 47nF \pm 20%	250V	Philips	2222 344	40473
C132	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C133	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C134	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C135	Capacitor, polyester 220nF \pm 20%	100V	Philips	2222 344	24224
C136	Capacitor, polystyrene 1,2nF \pm 5%	63V	Philips	2222 424	21202
C137	Capacitor, polystyrene 6,8nF \pm 5%	63V	Philips	2222 424	26802
L101	Coil		S.P.	TL	235

a		DIVIDER UNIT S1300/R1117		3/3
Symbol	Description		Manufact.	
D101	Diode, zener 12V $\pm 5\%$	0,4W	Philips	BZX 79 C12
D102	Diode, silicon		Philips	BAW 62
T101	Transistor		Philips	2N2368
T102	Transistor		Philips	2N2368
T103	Transistor		Philips	BF199
T104	Transistor		Philips	2N2368
T105	Transistor		Philips	BF199
IC101	Integrated circuit		Texas	SN74LS192N
IC102	Integrated circuit		Texas	SN74LS192N
IC103	Integrated circuit		Texas	SN74LS192N
IC104	Integrated circuit		Texas	SN74LS192N
IC105	Integrated circuit		Texas	SN74LS192N
IC106	Integrated circuit		Motorola	MC4044P
IC107	Integrated circuit		Texas	SN74LS390N
IC108	Integrated circuit		Texas	SN74LS20N
IC109	Integrated circuit		Texas	SN74LS27N
IC110	Integrated circuit		Texas	SN74LS109N
IC111	Integrated circuit		Texas	SN74LS390N
IC112	Integrated circuit		Texas	SN74LS390N
IC113	Integrated circuit		Motorola	MC4044P
IC114	Integrated circuit		Texas	SN7410N
IC115	Integrated circuit		Texas	SN74LS290N
X0101	TCXO 10,0 MHz		S.P.	C1001
S101	Switch for 2182 (R1117 only)		Petrick	7-3-21412

Symbol	Description	Manufact.	
R201	Resistor 1Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13102
R202	Resistor 82 ohm $\pm 5\%$ 0,33W	Philips	2322 211 13829
R204	Resistor 820 ohm $\pm 5\%$ 0,33W	Philips	2322 211 13821
R205	Resistor 2,2Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13222
R206	Resistor 12Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13123
R207	Resistor 1,2Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13122
R208	Resistor 3,3Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13332
R209	Preset potmeter cermet 2,2Kohm $\pm 20\%$ 0,5W	Philips	2322 482 20222
R210	Resistor 10Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13103
R212	Resistor 10Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13103
R213	Resistor 10Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13103
R214	Preset potmeter cermet 2,2Kohm $\pm 20\%$ 0,5W	Philips	2322 482 20222
R215	Resistor 3,3Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13332
R216	Resistor 1,5Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13152
R217	Resistor 10Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13103
R218	Resistor 3,3Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13332
R219	Resistor 2,7Kohm $\pm 5\%$ 0,33W	Philips	2322 106 33272
R220	Resistor 560 ohm $\pm 5\%$ 0,33W	Philips	2322 211 13561
R221	Resistor 3,92Kohm $\pm 1\%$ 0,25W	Vitrohm	471-0
R222	Resistor 22Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13223
R223	Resistor 150 ohm $\pm 5\%$ 0,33W	Philips	2322 211 13151
R224	Resistor 2,7Mohm $\pm 5\%$ 0,33W	Philips	2322 211 12275
R225	Resistor 4,7Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13472
R226	Resistor 2,2Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13222
R227	Resistor 3,92Kohm $\pm 1\%$ 0,25W	Vitrohm	471-0
R228	Resistor 3,92Kohm $\pm 1\%$ 0,25W	Vitrohm	471-0
R229	Resistor 36,5Kohm $\pm 1\%$ 0,25W	Vitrohm	471-0
	S1300 only		
R203	Resistor 270Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13274
R211	Resistor 15 ohm $\pm 5\%$ 0,33W	Philips	2322 211 13159
	R1117 only		
R203	Resistor 150Kohm $\pm 5\%$ 0,33W	Philips	2322 211 13154
R211	Resistor 12 ohm $\pm 5\%$ 0,33W	Philips	2322 211 13129

a		LOOP 1 FILTER & +18V SUPPLY UNIT S1300/R1117			2/2	
Symbol	Description			Manufact.		
C201	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145,9	
C202	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F	
C203	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F	
C204	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F	
C205	Capacitor electrolytic	10uF- 10/+100%	40V	Siemens	B41313-A7106V	
C206	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F	
C207	Capacitor polycarbonate	470nF ±10%	100V	Philips	2222 344 21474	
C208	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145,9	
C209	Capacitor polystyrene	39nF ±1%	63V	Philips	2222 424 43903	
C210	Capacitor tantalum	10uF-20/+50%	25 V	Ero	ETP-3F	
C211	Capacitor polyester	6,8uF ±10%	100V	Philips	2222 344 25685	
C212	Capacitor ceramic	220pF ±20%	400V	Ferroperm	9/0129,9	
C213	Capacitor ceramic	220pF ±20%	400V	Ferroperm	9/0129,9	
C214	Capacitor polyester	220nF ±10%	100V	Philips	2222 344 25224	
C215	Capacitor polyester	150nF ±10%	100V	Philips	2222 344 25154	
T201	Transistor			Philips	BD139	
T202	Transistor			Philips	BC548A	
T203	Transistor			Philips	BD138	
T204	Transistor			Philips	BC558	
T205	Transistor			Philips	BC556A	
T206	Transistor			Philips	BC548	
D201	Diode, zener	4,7V ± 5%	0,4W	Philips	BZX79C4V7	
D202	Diode, silicon			Philips	BAW62	
D203	Diode, silicon			Philips	BAW62	
D204	Diode, silicon			Philips	BAW62	
D205	Diode, zener	4,7V ± 5%		Philips	BZX79C4V7	
D206	Diode, silicon			Philips	BAV21	
IC201	Intergrated circuit			National	LM308N	
IC202	Intergrated circuit			National	LM308N	

MODULE NO: 300 AND 400

a	VCO-UNIT AND HARMONIC FILTER-UNIT S1300/R1117		1/1
<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
	<p>The units are factory adjusted and sealed and can only be repaired at the factory</p> <p>Module No: 300</p> <p>Module No: 400</p>	<p>S.P.</p> <p>S.P.</p>	<p>VCO-UNIT S1300/R1117</p> <p>HARMONIC FILTER-UNIT S1300/R1117</p>

a		LOOP 1 MIXER S1300/R1117			1/1	
Symbol	Description			Manufact.		
R501	Resistor	3.3 ohm \pm 5%	0.33W	Philips	2322 211 13338	
R502	Resistor	3.3kohm \pm 5%	0.33W	Philips	2322 211 13332	
R503	Resistor	15kohm \pm 5%	0.33W	Philips	2322 211 13153	
R504	Resistor	2.2kohm \pm 5%	0.33W	Philips	2322 211 13222	
R505	Resistor	270 ohm \pm 5%	0.33W	Philips	2322 211 13271	
R506	Resistor	100 ohm \pm 5%	0.33W	Philips	2322 211 13101	
R507	Resistor	10 ohm \pm 5%	0.33W	Philips	2322 211 13109	
R508	Resistor	330 ohm \pm 5%	0.33W	Philips	2322 211 13331	
R509	Resistor	2.7kohm \pm 5%	0.33W	Philips	2322 211 13272	
R510	Resistor	680 ohm \pm 5%	0.33W	Philips	2322 211 13681	
R511	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391	
R512	Resistor	470 ohm \pm 5%	0.33W	Philips	2322 211 13471	
R513	Resistor	27kohm \pm 5%	0.33W	Philips	2322 211 13273	
R514	Resistor	2.7kohm \pm 5%	0.33W	Philips	2322 211 13272	
R515	Resistor	560 ohm \pm 5%	0.33W	Philips	2322 211 13479	
R516	Resistor	47 ohm \pm 5%	0.33W	Philips	2322 211 13479	
C501	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C502	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C503	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C504	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C505	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C506	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C507	Capacitor ceramic	47pF \pm 2%	100V	Philips	2222 638 34479	
C508	Capacitor polyester	100nF \pm 20%	100V	Philips	2222 344 24104	
C509	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C510	Capacitor ceramic	100pF \pm 2%	100V	Philips	2222 638 34101	
C511	Capacitor polystyrene	180pF \pm 1%	500V	Philips	2222 427 41801	
C512	Capacitor ceramic	33pF \pm 2%	100V	Philips	2222 638 34339	
C513	Capacitor ceramic	56pF \pm 2%	100V	Philips	2222 638 34569	
C514	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C515	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9	
C516	Capacitor polyester	100nF \pm 20%	100V	Philips	2222 344 24104	
L501	Coil			S.P.	TL 059	
L502	Coil	12uH \pm 5%		Kaschke	220/5	
L503	Coil	12uH \pm 5%		Kaschke	220/5	
TR501	Transformer			S.P.	TL198	
T501	Transistor			Philips	BF199	
T502	Transistor			Philips	BF199	
IC501	Integrated circuit			N.S.	LM 3053	

a		VCXO AND LOOP 2 FILTER R1117		1/2		
Symbol	Description		Manufact.			
R601	Resistor 2,7 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13272
R602	Resistor 22 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13223
R603	Resistor 220 ohm $\pm 5\%$	0,33W	Philips	2322	211	13221
R604	Resistor 2,7 Mohm $\pm 5\%$	0,33W	Philips	2322	211	13275
R605	Resistor 4,7 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13472
R606	Resistor 10 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13103
R607	Resistor 6,8 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13682
R608	Resistor,NTC 4,7 Kohm $\pm 5\%$	0,5 W	Philips	2322	635	02472
R609	Resistor 68 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13683
R610	Resistor 15 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13153
R611	Resistor 680 ohm $\pm 5\%$	0,33W	Philips	2322	211	13681
R612	Resistor 180 ohm $\pm 5\%$	0,33W	Philips	2322	211	13181
R613	Resistor 33 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13333
R614	Resistor 1,5 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13152
R615	Resistor 100 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13104
R616	Resistor 5,6 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13562
R617	Resistor 18 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13183
R618	Resistor 10 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13103
R619	Resistor 390 ohm $\pm 5\%$	0,33W	Philips	2322	211	13391
R620	Resistor 39 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13393
R621	Resistor 5,6 Kohm $\pm 5\%$	0,33W	Philips	2322	211	13562
R622	Resistor 560 ohm $\pm 5\%$	0,33W	Philips	2322	211	13561
R623	Resistor 150 ohm $\pm 5\%$	0,33W	Philips	2322	211	13151
R624	Resistor 560 ohm $\pm 5\%$	0,33W	Philips	2322	211	13561
C601	Capacitor ceramic	10nF-20/+80% 32V	Ferroperm	9/0145,9		
C602	Capacitor tantalum	10uF-20/+50% 25V	Ero	ETP-3F		
C603	Capacitor polyester	330nF $\pm 10\%$ 100V	Philips	2222	344	25334
C604	Capacitor ceramic	33pF $\pm 2\%$ 100V	Philips	2222	642	34339
C605	Capacitor polyester	6,8uF $\pm 10\%$ 100V	Philips	2222	344	25685
C606	Capacitor polyester	47nF $\pm 10\%$ 100V	Philips	2222	344	25473
C607	Capacitor polyester	470nF $\pm 10\%$ 100V	Philips	2222	344	25474
C608	Capacitor polyester	47nF $\pm 20\%$ 100V	Philips	2222	344	24473
C609	Capacitor ceramic	56pF $\pm 5\%$ 32V	Ferroperm	9/0213,8		
C610	Capacitor Polystyrene	51pF $\pm 1\%$ 500V	Philips	2222	427	45109
C611	Capacitor ceramic	5,6pF $\pm 0,25pF$ 63V	Draloric	N150/1B		
C612	Capacitor ceramic	10nF-20/+80% 32V	Ferroperm	9/0145,9		
C613	Capacitor tantalum	10uF-20/+50% 25V	Ero	ETP-3F		

a		VCXO AND LOOP 2 FILTER R1117	2/2	
Symbol	Description	Manufact.		
C614	Capacitor polyester 47nF $\pm 20\%$ 100V	Philips	2222	344 24473
C615	Capacitor tantalum 10uF -20/+50% 25V	Ero	ETP-3F	
C616	Capacitor polystyrene 2,2nF $\pm 5\%$ 63V	Philips	2222	424 22202
C617	Capacitor feed-through 1nF -20/+80% 250V	Ferroperm	9/0138,58	
C618	Capacitor feed-through 1nF -20/+80% 250V	Ferroperm	9/0138,58	
C619	π -filter	Ferroperm	9/0168,50	
L601	Coil	S.P.	TL 257	
T601	Transistor	Philips	BF256B	
T602	Transistor	Philips	BF199	
T603	Transistor	Philips	BC558	
D601	Diode varicap.	Motorola	MV109	
D602	Diode varicap.	Motorola	MV109	
IC601	Integrated circuit	N.S.	LM308N	
X601	Crystal f = 10007.600 kHz	S.P.	C1009	

a		CLARIFIER AND 2ND LOOP 2 MIXER R1117		1/1	
Symbol	Description		Manufact.		
R701	Resistor	68 Kohm $\pm 5\%$	0,33W Philips	2322	211 13683
R702	Resistor	4,7 Kohm $\pm 5\%$	0,33W Philips	2322	211 13472
R703	Resistor	82 Kohm $\pm 5\%$	0,33W Philips	2322	211 13823
R704	Resistor	56 Kohm $\pm 5\%$	0,33W Philips	2322	211 13823
R705	Resistor	68 Kohm $\pm 5\%$	0,33W Philips	2322	211 23683
R706	Resistor	560 Kohm $\pm 5\%$	0,33W Philips	2322	211 13564
R707	Resistor	3,9 Kohm $\pm 5\%$	0,33W Philips	2322	211 13392
R708	Resistor	6,8 Kohm $\pm 5\%$	0,33W Philips	2322	211 13682
R709	Resistor	15 Kohm $\pm 5\%$	0,33W Philips	2322	106 33153
R710	Resistor	15 Kohm $\pm 5\%$	0,33W Philips	2322	211 13153
R711	Resistor	18 Kohm $\pm 5\%$	0,33W Philips	2322	211 13183
R712	Resistor	22 Kohm $\pm 5\%$	0,33W Philips	2322	211 13223
R713	Resistor	2,7 Kohm $\pm 5\%$	0,33W Philips	2322	211 13272
R714	Resistor	15 Kohm $\pm 5\%$	0,33W Philips	2322	211 13153
R715	Resistor	22 Kohm $\pm 5\%$	0,33W Philips	2322	211 13223
R716	Resistor	18 Kohm $\pm 5\%$	0,33W Philips	2322	211 13183
R717	Resistor	330 ohm $\pm 5\%$	0,33W Philips	2322	211 13331
R718	Resistor	560 ohm $\pm 5\%$	0,33W Philips	2322	211 13561
C701	Capacitor tantalum	10uF/25V-20/+50%	Ero	ETP3F	
C702	Capacitor polystyrene	3nF/63V + 2%	Philips	2222	424 33002
C703	Capacitor polyester	1uF/100V $\pm 20\%$	Ero	MKT 1822-510/0	
C704	Capacitor tantalum	1uF/35V-20/+50%	Ero	ETP1A	
C705	Capacitor tantalum	10uF/25V-20/+50%	Ero	ETP3F	
C706	Capacitor polystyrene	5,6nF/63V $\pm 2\%$	Philips	2222	424 35602
C707	Capacitor polystyrene	300pF/500V $\pm 2\%$	Philips	2222	427 33001
C708	Capacitor polystyrene	15nF/63V $\pm 5\%$	Philips	2222	424 21503
C709	Capacitor polystyrene	5,6nF/63V $\pm 2\%$	Philips	2222	424 35602
C710	Capacitor polystyrene	300pF/500V $\pm 2\%$	Philips	2222	427 33001
C711	Capacitor polystyrene	15nF/63V $\pm 5\%$	Philips	2222	424 21503
C712	Capacitor tantalum	10uF/25V-20/+50%	Ero	ETP3F	
L701	Coil		S.P.	TL223	
T701	Transistor		Philips	BC548B	
T702	Transistor		Philips	BC548B	
IC701	Integrated circuit		Motorola	MC1458C	

a		BASE PRINT, FRONT END R1117		1/1	
Symbol	Description			Manufact.	
R801	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R802	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R803	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R804	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R805	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R806	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R807	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R808	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R809	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R910	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
R911	Resistor	10 kohm \pm 5%	0.33W	Philips	2322 211 13103
C801	Capacitor, trimmer	7-120 pF Teflon		DAU	116 4901 120
C802	Capacitor, trimmer	7-120 pF Teflon		DAU	116 4901 120
RE801	Relay			Pasi	MZ/K BV806
S801	Switch	12 positions 4 decks		ITT	48432-61277

Symbol	Description	Manufact.	
R901	Resistor 56 kohm $\pm 5\%$ 0.33W	Philips	2322 211 13563
R902	Resistor 56 kohm $\pm 5\%$ 0.33W	Philips	2322 211 13563
R903	Resistor 56 kohm $\pm 5\%$ 0.33W	Philips	2322 211 13563
R904	Resistor 10 kohm $\pm 5\%$ 0.33W	Philips	2322 211 13103
C901	Capacitor polyester 10nF $\pm 20\%$ 250V	Philips	2322 344 40103
C902	Capacitor ceramic 150pF $\pm 5\%$ 400V	Ferroperm	9/0123.9 - 400V
C903	Capacitor polystyrene 110pF $\pm 5\%$ 630V	Philips	2222 427 21101
C904	Capacitor ceramic 5,6pF $\pm 0,25\text{pF}$ 400V	Ferroperm	9/0112.9 - 400V
C905	Capacitor ceramic 150pF $\pm 5\%$ 400V	Ferroperm	9/0123.9 - 400V
C906	Capacitor polystyrene 150pF $\pm 5\%$ 630V	Philips	2222 427 21501
C907	Capacitor trimmer 2,5 - 45pF Teflon	DAU	107.5901.045
C908	Capacitor ceramic 5,6pF $\pm 0,25\text{pF}$ 400V	Ferroperm	9/0112 .9 - 400V
C909	Capacitor trimmer 2,5 - 45pF Teflon	DAU	107.5901.045
C910	Capacitor polystyrene 150pF $\pm 5\%$ 630V	Philips	2222 427 21501
C911	Capacitor polystyrene 2,4nF $\pm 5\%$ 160V	Philips	2222 425 22402
C912	Capacitor ceramic 200pF $\pm 5\%$ 400V	Ferroperm	9/0123.9 - 400V
C913	Capacitor polyester 100nF $\pm 20\%$ 100V	Philips	2222 344 24104
L901	Coil	S.P.	TL261
L902	Coil	S.P.	TL261
L903	Coil	S.P.	TL261
D901	Diode, silicon	Philips	1N4148
D902	Diode, silicon	Philips	1N4148

a		2182 kHz/25 MHz COIL SECTION R1117			1/2	
Symbol	Description			Manufact.		
R1001	Resistor	10 Kohm $\pm 5\%$	0,33W	Philips	2322 211 13103	
R1002	Resistor	10 Kohm $\pm 5\%$	0,33W	Philips	2322 211 13103	
R1003	Resistor	10 Kohm $\pm 5\%$	0,33W	Philips	2322 211 13103	
R1004	Resistor	10 Kohm $\pm 5\%$	0,33W	Philips	2322 211 13103	
C1001	Capacitor polyester	10nF $\pm 20\%$	250V	Philips	2222 344 40103	
C1002	Capacitor ceramic	22pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500V	
C1003	Capacitor ceramic	1,5pF $\pm 0,25pF$	400V	Ferroperm	9/0110.9 - 400V	
C1004	Capacitor polystyrene	82pF $\pm 2\%$	500V	Philips	2222 42738209	
C1005	Capacitor ceramic	1,5pF $\pm 0,25pF$	400V	Ferroperm	9/0110.9 - 400V	
C1006	Capacitor polystyrene	82pF $\pm 2\%$	500V	Philips	2222 427 38209	
C1007	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145.9 - 32V	
C1008	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145.9 - 32V	
C1009	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145.9 - 32V	
C1010	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145.9 - 32V	
C1011	Capacitor ceramic	39pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/39/H/500V	
C1012	Capacitor ceramic	2,2pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V	
C1013	Capacitor ceramic	2,2pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V	
C1014	Capacitor ceramic	39pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/39/H/500V	
C1015	Capacitor ceramic	2,2pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V	
C1016	Capacitor ceramic	2,2pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V	
C1017	Capacitor ceramic	39pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/39/H/500V	
C1018	Capacitor polyester	10nF $\pm 20\%$	250V	Philips	2222 344 40103	
L1001	Coil			S.P.	TL 224	
L1002	Coil			S.P.	TL 192	
L1003	Coil	3,3uH $\pm 20\%$		Philips	4322 057 03380	
L1004	Coil			S.P.	TL 192	
L1005	Coil	100nH $\pm 20\%$		Philips	4322 057 01070	
L1006	Coil	100nH $\pm 20\%$		Philips	4322 057 01070	
L1007	Coil			S.P.	TL 191	
L1008	Coil			S.P.	TL 191	
L1009	Coil	100nH $\pm 20\%$		Philips	4322 057 01070	
L1010	Coil			S.P.	TL 191	

MODULE NO: 1000

2182 kHz/25 MHz COIL SECTION R1117

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
D1001	Diode, silicon	Philips	1N4148
D1002	Diode, silicon	Philips	1N4148
D1003	Diode, silicon	Philips	1N4148
D1004	Diode, silicon	Philips	1N4148
D1005	Diode, silicon	Philips	1N4148

a		4 MHz/22MHz COIL SECTION R1117			1/2	
Symbol	Description			Manufact.		
R1101	Resistor	10 Kohm $\pm 5\%$	0,33W	Philips	2322 211 13103	
R1102	Resistor	10 Kohm $\pm 5\%$	0,33W	Philips	2322 211 13103	
C1101	Capacitor polyester	10nF $\pm 20\%$	250V	Philips	2222 344 40103	
C1102	Capacitor ceramic	47pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/47/H/500V	
C1103	Capacitor tuning			S.P.		
C1104	Capacitor ceramic	1,5pF $\pm 0,25pF$	400V	Ferroperm	9/0110.9-400V	
C1105	Capacitor ceramic	47pF $\pm 3\%$	500V	KCK	SDPU/6B/N150/47/H/500V	
C1106	Capacitor tuning			S.P.		
C1107	Capacitor ceramic	1,5pF $\pm 0,25pF$	400V	Ferroperm	9/0110.9-400V	
C1108	Capacitor ceramic	47pF $\pm 3\%$	500V	KCK	SDPU/6B/N150/47/H/500V	
C1109	Capacitor tuning			S.P.		
C1110	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9-32V	
C1111	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9-32V	
C1112	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9-32V	
C1113	Capacitor ceramic	10nF-20/+80%	32V	Ferroperm	9/0145.9-32V	
C1114	Capacitor ceramic	22pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500V	
C1115	Capacitor tuning			S.P.		
C1116	Capacitor ceramic	2,2pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9-250V	
C1117	Capacitor ceramic	1,8pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9-250V	
C1118	Capacitor tuning			S.P.		
C1119	Capacitor ceramic	27pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/27/H/500V	
C1120	Capacitor ceramic	2,2pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9-250V	
C1121	Capacitor ceramic	1,8pF $\pm 0,25pF$	250V	Ferroperm	9/0112.9-250V	
C1122	Capacitor tuning			S.P.		
C1123	Capacitor ceramic	22pF $\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500V	
C1124	Capacitor polyester	10nF $\pm 20\%$	250V	Philips	2222 344 40103	
L1101	Coil	680nH $\pm 20\%$		Philips	4322 057 06870	
L1102	Coil			S.P.	TL 186	
L1103	Coil			S.P.	TL 186	
L1104	Coil	1,5uH $\pm 20\%$		Philips	4322 057 01580	
L1105	Coil			S.P.	TL 186	
L1106	Coil	100nH $\pm 20\%$		Philips	4322 057 01070	
L1107	Coil			S.P.	TL 191	
L1108	Coil			S.P.	TL 191	
L1109	Coil	150nF $\pm 20\%$		Philips	4322 057 01570	
L1110	Coil			S.P.	TL 191	
L1111	Coil	150nF $\pm 20\%$		Philips	4322 057 01570	

a	4 MHz/22MHz COIL SECTION R1117	2/2	
<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
D1101	Diode, silicon	Philips	1N4148
D1102	Diode, silicon	Philips	1N4148
D1103	Diode, silicon	Philips	1N4148
D1104	Diode, silicon	Philips	1N4148

a		6 MHz/16 MHz COIL SECTION R1117			1/2	
Symbol	Description			Manufact.		
R1201	Resistor	10 Kohm	$\pm 5\%$	0.33W	Philips	2322 211 13103
R1202	Resistor	10 Kohm	$\pm 5\%$	0.33W	Philips	2322 211 13103
C1201	Capacitor polyester	10nF	$\pm 20\%$	250V	Philips	2222 344 40103
C1202	Capacitor polystyrene	62pF	$\pm 2\%$	500V	Philips	2222 427 36209
C1203	Capacitor tuning				S.P.	
C1204	Capacitor ceramic	1,5pF	$\pm 0,25pF$	400V	Ferroperm	9/0110.9 - 400V
C1205	Capacitor tuning				S.P.	
C1206	Capacitor polystyrene	62pF	$\pm 2\%$	500V	Philips	2222 427 36209
C1207	Capacitor ceramic	1,5pF	$\pm 0,25pF$	400V	Ferroperm	9/0110.9 - 400V
C1208	Capacitor tuning				S.P.	
C1209	Capacitor polystyrene	62pF	$\pm 2\%$	500V	Philips	2222 427 36209
C1210	Capacitor ceramic	10nF	-20/+80%	32V	Ferroperm	9/0145.9 - 32V
C1211	Capacitor ceramic	10nF	-20/+80%	32V	Ferroperm	9/0145.9 - 32V
C1212	Capacitor ceramic	10nF	-20/+80%	32V	Ferroperm	9/0145.9 - 32V
C1213	Capacitor ceramic	10nF	-20/+80%	32V	Ferroperm	9/0145.9 - 32V
C1214	Capacitor ceramic	22pF	$\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500V
C1215	Capacitor tuning				S.P.	
C1216	Capacitor ceramic	2,2pF	$\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V
C1217	Capacitor ceramic	1,8pF	$\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V
C1218	Capacitor tuning				S.P.	
C1219	Capacitor ceramic	22nF	$\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500V
C1220	Capacitor ceramic	2,2pF	$\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V
C1221	Capacitor ceramic	1,8pF	$\pm 0,25pF$	250V	Ferroperm	9/0112.9 - 250V
C1222	Capacitor tuning				S.P.	
C1223	Capacitor ceramic	22pF	$\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500V
C1224	Capacitor polyester	10nF	$\pm 20\%$	250V	Philips	2222 344 40103
L1201	Coil	330nH	$\pm 20\%$		Philips	4322 057 03370
L1202	Coil				S.P.	TL 187
L1203	Coil				S.P.	TL 187
L1204	Coil	680nH	$\pm 20\%$		Philips	4322 057 06870
L1205	Coil				S.P.	TL 187
L1206	Coil	150nH	$\pm 20\%$		Philips	4322 057 01570
L1207	Coil				S.P.	TL 190
L1208	Coil				S.P.	TL 190
L1209	Coil	100nH	$\pm 20\%$		Philips	4322 057 01070
L1210	Coil				S.P.	TL 190

a	6 MHz/16 MHz COIL SECTION R1117		2/2
<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
D1201	Diode, silicon	Philips	1N4148
D1202	Diode, silicon	Philips	1N4148
D1203	Diode, silicon	Philips	1N4148
D1203	Diode, silicon	Philips	1N4148

a		8 MHz/12 MHz COIL SECTION R1117			1/2	
Symbol	Description			Manufact.		
R1301	Resistor	10 Kohm	$\pm 5\%$	0,33W	Philips	2322 211 13103
R1302	Resistor	10 Kohm	$\pm 5\%$	0,33W	Philips	2322 211 13103
C1301	Capacitor polyester	10nF	$\pm 20\%$	250V	Philips	2222 344 40103
C1302	Capacitor polystyrene	62pF	$\pm 2\%$	500V	Philips	2222 427 36209
C1303	Capacitor tuning				S.P.	
C1304	Capacitor ceramic	1,2 pF	$\pm 0,25\text{pF}$	250V	Ferroperm	9/0112,9 - 250V
C1305	Capacitor tuning				S.P.	
C1306	Capacitor polystyrene	62pF	$\pm 2\%$	500V	Philips	2222 427 36209
C1307	Capacitor ceramic	1,2pF	$\pm 0,25\text{pF}$	250V	Ferroperm	9/0112,9 - 250V
C1308	Capacitor tuning				S.P.	
C1309	Capacitor polystyrene	62pF	$\pm 2\%$	500V	Philips	2222 427 36209
C1310	Capacitor ceramic	10nF-20/+80%		32V	Ferroperm	9/0145,9 - 32V
C1311	Capacitor ceramic	10nF-20/+80%		32V	Ferroperm	9/0145,9 - 32V
C1312	Capacitor ceramic	10nF-20/+80%		32V	Ferroperm	9/0145,9 - 32V
C1313	Capacitor ceramic	10nF-20/+80%		32V	Ferroperm	9/0145,9 - 32V
C1314	Capacitor ceramic	22pF	$\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500
C1315	Capacitor tuning				S.P.	
C1316	Capacitor ceramic	2,2pF	$\pm 0,25\text{pF}$	250V	Ferroperm	9/0112,9 - 250V
C1317	Capacitor ceramic	1,8pF	$\pm 0,25\text{pF}$	250V	Ferroperm	9/0112,9 - 250V
C1318	Capacitor ceramic	27pF	$\pm 3\%$	500V	KCK	SDPU-6B/N150/27/H/500
C1319	Capacitor tuning				S.P.	
C1320	Capacitor ceramic	2,2pF	$\pm 0,25\text{pF}$	250V	Ferroperm	9/0112,9 - 250V
C1321	Capacitor ceramic	1,8pF	$\pm 0,25\text{pF}$	250V	Ferroperm	9/0112,9 - 250V
C1322	Capacitor tuning				S.P.	
C1323	Capacitor ceramic	22pF	$\pm 3\%$	500V	KCK	SDPU-6B/N150/22/H/500
C1324	Capacitor polyester	10nF	$\pm 20\%$	250V	Philips	2222 344 40103
L1301	Coil	330nH	$\pm 20\%$		Philips	4322 057 03370
L1302	Coil				S.P.	TL 188
L1303	Coil				S.P.	TL 188
L1304	Coil	470nH	$\pm 20\%$		Philips	4322 057 04770
L1305	Coil				S.P.	TL 188
L1306	Coil	330nH	$\pm 20\%$		Philips	4322 057 03370
L1307	Coil				S.P.	TL 189
L1308	Coil				S.P.	TL 189
L1309	Coil	220nH	$\pm 20\%$		Philips	4322 057 02270
L1310	Coil				S.P.	TL 189

a		8 MHz/12 MHz COIL SECTION R1117		2/2
<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>		
D1301	Diode, silicon	Philips	1N4148	
D1302	Diode, silicon	Philips	1N4148	
D1303	Diode, silicon	Philips	1N4148	
D1304	Diode, silicon	Philips	1N4148	

a		1st MIXER AND 2nd MIXER R1117			1/2	
Symbol	Description			Manufact.		
R1401	Resistor	1,2Kohm $\pm 5\%$	0,33W	Philips	2322	211 13122
R1402	Resistor	100 ohm $\pm 5\%$	0,33W	Philips	2322	211 13101
R1403	Resistor	100 ohm $\pm 5\%$	0,33W	Philips	2322	211 13101
R1404	Resistor	68Kohm $\pm 5\%$	0,33W	Philips	2322	106 33683
R1405	Resistor	100 ohm $\pm 5\%$	0,33W	Philips	2322	211 13101
R1406	Resistor	100 ohm $\pm 5\%$	0,33W	Philips	2322	211 13101
R1407	Resistor	3,3Kohm $\pm 5\%$	0,33W	Philips	2322	211 13332
R1408	Resistor	1Kohm $\pm 5\%$	0,33W	Philips	2322	211 13102
C1401	Capacitor polystyrene	100pF $\pm 5\%$	630V	Philips	2222	427 21001
C1402	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145,9	- 32V
C1403	Capacitor ceramic	0,68pF $\pm 0,25$ pF	250V	Ferroperm	9/0110,9	- 250V
C1404	Capacitor ceramic	0,68pF $\pm 0,25$ pF	250V	Ferroperm	9/0110,9	- 250V
C1405	Capacitor trimmer	2 - 18 pF	Teflon	DAU	107.2901.018	
C1406	Capacitor polyester	10nF $\pm 20\%$	250V	Philips	2222	344 40103
C1407	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145,9	- 32V
C1408	Capacitor ceramic	4,7pF $\pm 0,25$ pF	400V	Ferroperm	9/0112,9	- 400V
C1409	Capacitor ceramic	56pF $\pm 5\%$	25V	Ferroperm	9/0213,8	- 25V
C1410	Capacitor ceramic	10nF -20/+80%	32V	Ferroperm	9/0145,9	- 32V
TR1401	Transformer			S.P.	TL	232
TR1402	Transformer			S.P.	TL	233
TR1403	Transformer			S.P.	TL	233
TR1404	Transformer			S.P.	TL	231
L1401	Coil			S.P.	TL	230
T1401	Transistor			Philips	BF256B	
T1402	Transistor			Philips	BF256B	
T1403	Transistor			Philips	BF256C	

a		1st MIXER AND 2nd MIXER R1117		2/2	
<i>Symbol</i>	<i>Description</i>		<i>Manufact.</i>		
D1401	Diode, switch		Philips	BA182	
D1402	Diode, switch		Philips	BA182	
D1403	Diode, switch		Philips	BA182	
D1404	Diode, switch		Philips	BA182	
D1405	Diode, switch		Philips	BA182	
D1406	Diode, switch		Philips	BA182	
D1407	Diode, switch		Philips	BA182	
D1408	Diode, switch		Philips	BA182	
D1409	Diode, switch		Philips	BA182	
D1410	Diode, silicon		Philips	1N4148	
D1411	Diode, silicon		Philips	1N4148	
FP1401	Ferrit, bead.	Grade 4B1	Philips	4322 020 34420	
FP1402	Ferrit, bead.	Grade 4B1	Philips	4322 020 34420	
FP1403	Ferrit, bead.	Grade 4B1	Philips	4322 020 34420	
FL1401	Crystal filter 10.6085 MHz		S.P.	C1008	

a		IF-FILTERS RJ117			1/1	
Symbol	Description			Manufact.		
R1501	Resistor	390 ohm	$\pm 5\%$	0.33W	Philips	2322 211 13391
R1502	Resistor	390 ohm	$\pm 5\%$	0.33W	Philips	2322 211 13391
R1503	Resistor	39kohm	$\pm 5\%$	0.33W	Philips	2322 211 13393
R1504	Resistor	3,9kohm	$\pm 5\%$	0.33W	Philips	2322 211 13392
R1505	Resistor	56kohm	$\pm 5\%$	0.33W	Philips	2322 211 13563
R1506	Resistor	56kohm	$\pm 5\%$	0.33W	Philips	2322 211 13563
R1507	Resistor	120kohm	$\pm 5\%$	0.33W	Philips	2322 211 13124
R1508	Resistor	120kohm	$\pm 5\%$	0.33W	Philips	2322 211 13124
R1509	Resistor	120 ohm	$\pm 5\%$	0.33W	Philips	2322 211 13121
R1510	Resistor	120 ohm	$\pm 5\%$	0.33W	Philips	2322 211 13121
R1511	Resistor	1,5kohm	$\pm 5\%$	0.33W	Philips	2322 211 13152
R1512	Resistor	270 ohm	$\pm 5\%$	0.33W	Philips	2322 211 13271
C1501	Capacitor	tantalum	10uF-20/+50%	25V	ERO	ETP-3F
C1502	Capacitor	tantalum	10uF-20/+50%	25V	ERO	ETP-3F
C1503	Capacitor	polystyrene	3,9nF \pm 2%	160V	Philips	2222 425 33902
C1504	Capacitor	polystyrene	3,3nF \pm 2%	160V	Philips	2222 425 33302
C1505	Capacitor	ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1506	Capacitor	ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1507	Capacitor	polyester	100nF \pm 20%	100V	Philips	2222 344 24104
C1508	Capacitor	polyester	100nF \pm 20%	100V	Philips	2222 344 24104
C1509	Capacitor	ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1510	Capacitor	ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1511	Capacitor	polyester	100nF \pm 20%	100V	Philips	2222 344 24104
C1512	Capacitor	tantalum	10uF-20/+50%	25V	ERO	ETP-3F
C1513	Capacitor	tantalum	10uF-20/+50%	25V	ERO	ETP-3F
C1514	Capacitor	polyester	100nF \pm 20%	100V	Philips	2222 344 24104
L1501	Coil				S.P.	TL 194
T1501	Transistor				Philips	BF 256 A
T1502	Transistor				Philips	BF 256 A
D1501	Diode, switch				Philips	BA 182
D1502,	Diode, switch				Philips	BA 182
FL1501	SSB filter			600 kHz	S.P.	Type C1002
FL1502	AM filter - WIDE			600 kHz	S.P.	Type C1003

a IF-AGC-DETECTOR R1117						1/4
Symbol	Description			Manufact.		
R1601	Resistor	2,2Kohm	+5%	0,33W	Philips	2322 211 13222
R1602	Resistor	5,1 ohm	+5%	0,33W	Philips	2322 211 13518
R1603	Resistor	5,6Kohm	+5%	0,33W	Philips	2322 211 13562
R1604	Resistor	6,8Kohm	+5%	0,33W	Philips	2322 211 13682
R1605	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1606	Resistor	8,2Kohm	+5%	0,33W	Philips	2322 211 13822
R1607	Resistor	1,2Kohm	+5%	0,33W	Philips	2322 211 13122
R1608	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1609	Resistor	4,7Kohm	+5%	0,33W	Philips	2322 211 13472
R1610	Resistor NTC	6,8Kohm	+10%	0,5 W	Philips	2322 642 12682
R1611	Resistor	390 ohm	+5%	0,33W	Philips	2322 211 13391
R1612	Resistor	5,1 ohm	+5%	0,33W	Philips	2322 211 13518
R1613	Resistor	8,2Kohm	+5%	0,33W	Philips	2322 211 13822
R1614	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1615	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1616	Resistor	3,9Kohm	+5%	0,33W	Philips	2322 211 13392
R1617	Resistor	1Kohm	+5%	0,33W	Philips	2322 211 13102
R1618	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1619	Resistor	3,9 ohm	+5%	0,33W	Philips	2322 211 13398
R1620	Resistor	390 Ohm	+5%	0,33W	Philips	2322 211 13391
R1621	Resistor	5,1 ohm	+5%	0,33W	Philips	2322 211 13518
R1622	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1623	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1624	Resistor	1,2Kohm	+5%	0,33W	Philips	2322 211 13122
R1625	Resistor	18Kohm	+5%	0,33W	Philips	2322 211 13183
R1626	Resistor	12Kohm	+5%	0,33W	Philips	2322 211 13123
R1627	Resistor	1Mohm	+5%	0,33W	Philips	2322 211 13105
R1628	Resistor	15Kohm	+5%	0,33W	Philips	2322 211 13153
R1629	Resistor	470 ohm	+5%	0,33W	Philips	2322 211 13471
R1630	Resistor	15Kohm	+5%	0,33W	Philips	2322 211 13153
R1631	Resistor	4,7Kohm	+5%	0,33W	Philips	2322 211 13472
R1632	Resistor	3,9Kohm	+5%	0,33W	Philips	2322 211 13392
R1633	Resistor	1Mohm	+5%	0,33W	Philips	2322 211 13105
R1634	Resistor	3,3Kohm	+5%	0,33W	Philips	2322 211 13332
R1635	Resistor	390 ohm	+5%	0,33W	Philips	2322 211 13391
R1636	Resistor	1Kohm	+5%	0,33W	Philips	2322 211 13102
R1637	Resistor	120Kohm	+5%	0,33W	Philips	2322 211 13124
R1638	Resistor	18Kohm	+5%	0,33W	Philips	2322 211 13183

a		IF-AGC-DETECTOR R1117			2/4	
Symbol	Description		Manufact.			
R1639	Resistor	22Kohm $\pm 5\%$	0,33W Philips	2322	211	13223
R1640	Resistor	1Kohm $\pm 5\%$	0,33W Philips	2322	211	13102
R1641	Resistor	5,6Kohm $\pm 5\%$	0,33W Philips	2322	211	13562
R1642	Resistor	1Kohm $\pm 5\%$	0,33W Philips	2322	211	13102
R1643	Resistor	220 ohm $\pm 5\%$	0,33W Philips	2322	211	13221
R1644	Resistor	47Kohm $\pm 5\%$	0,33W Philips	2322	211	13473
R1645	Resistor	10Kohm $\pm 5\%$	0,33W Philips	2322	211	13103
R1646	Resistor	27Kohm $\pm 5\%$	0,33W Philips	2322	211	13273
R1647	Resistor	10Kohm $\pm 5\%$	0,33W Philips	2322	211	13103
R1648	Resistor	2,2Kohm $\pm 5\%$	0,33W Philips	2322	211	13222
R1649	Resistor	5,6Kohm $\pm 5\%$	0,33W Philips	2322	211	13562
R1650	Resistor	1Kohm $\pm 5\%$	0,33W Philips	2322	211	13102
R1651	Resistor	10Kohm $\pm 5\%$	0,33W Philips	2322	211	13103
R1652	Resistor	820 ohm $\pm 5\%$	0,33W Philips	2322	211	13821
R1653	Resistor	1,5Kohm $\pm 5\%$	0,33W Philips	2322	211	13152
R1654	Resistor	1Mohm $\pm 5\%$	0,33W Philips	2322	211	13105
R1655	Resistor	100Kohm $\pm 5\%$	0,33W Philips	2322	211	13104
R1656	Resistor	12Kohm $\pm 5\%$	0,33W Philips	2322	211	13123
R1657	Resistor	100 ohm $\pm 5\%$	0,33W Philips	2322	211	13101
R1658	Resistor	100Kohm $\pm 5\%$	0,33W Philips	2322	211	13104
R1659	Resistor	47Kohm $\pm 5\%$	0,33W Philips	2322	211	13473
R1660	Resistor	3,9Kohm $\pm 5\%$	0,33W Philips	2322	211	13392
R1661	Resistor	1Kohm $\pm 5\%$	0,33W Philips	2322	211	13102
R1662	Resistor	100Kohm $\pm 5\%$	0,33W Philips	2322	211	13104
R1663	Resistor	33Kohm $\pm 5\%$	0,33W Philips	2322	211	13333
R1664	Resistor	47 ohm $\pm 5\%$	0,33W Philips	2322	211	13479
C1601	Capacitor polystyrene	3,3nF $\pm 5\%$	160V Philips	2222	425	23302
C1602	Capacitor polystyrene	360pF $\pm 2\%$	630V Philips	2222	427	33601
C1603	Capacitor ceramic	10nF-20/+80%	30V Ferroperm	9/0145,9		
C1604	Capacitor tantalum	10uF-20/+50%	25V Ero	ETP-3F		
C1605	Capacitor ceramic	10nF-20/+80%	30V Ferroperm	9/0145,9		
C1606	Capacitor ceramic	10nF-20/+80%	30V Ferroperm	9/0145,9		
C1607	Capacitor tantalum	10uF-20/+50%	25V Ero	ETP-3F		
C1608	Capacitor tantalum	10uF-20/+50%	25V Ero	ETP-3F		
C1609	Capacitor polystyrene	1nF $\pm 5\%$	250V Philips	2222	426	21002
C1610	Capacitor polystyrene	120pF $\pm 2\%$	630V Philips	2222	427	31201
C1611	Capacitor electrolytic	10uF-10/+100%	25V Siemens	B41313-A5106-V		

a		IF-AGC-DETECTOR R1117			3/4
Symbol	Description			Manufact.	
C1612	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1613	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1614	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F
C1615	Capacitor tantalum	22uF+10%	16V	Ero	ETQ-4
C1616	Capacitor polystyrene	1nF+5%	250V	Philips	2222 426 21002
C1617	Capacitor polystyrene	120pF+2%	630V	Philips	2222 427 31201
C1618	Capacitor tantalum	10uF-20/+50%	25V	Philips	ETP-3F
C1619	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1620	Capacitor ceramic	4.7nF-20/+80%	30V	Ferroperm	9/0145.9
C1621	Capacitor polystyrene	270pF+5%	630V	Philips	2222 427 22701
C1622	Capacitor polyester	47nF+20%	250V	Philips	2222 344 40473
C1623	Capacitor ceramic	270pF+10%	400V	Ferroperm	9/0129.9
C1624	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1625	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F
C1626	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1627	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1628	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1629	Capacitor tantalum	10uF+10%	16V	Ero	ETQ-3
C1630	Capacitor polystyrene	1,5nF +5%	250V	Philips	2222 426 21502
C1631	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
C1632	Capacitor polyester	22nF+20%	250V	Philips	2222 344 40223
C1633	Capacitor polystyrene	1,5nF+5%	250V	Philips	2222 426 21502
C1634	Capacitor tantalum	10uF-20/+50%	25V	Ero	ETP-3F
C1635	Capacitor ceramic	10nF-20/+80%	30V	Ferroperm	9/0145.9
L1601	Coil			S.P.	TL195
L1602	Coil	470uH+5%		Kaschke	200/5
L1603	Coil	390uH+5%		Kaschke	200/5
L1604	Coil	330uH+5%		Kaschke	200/5
L1605	Coil			S.P.	TL196
T1601	Transistor			Philips	BC548B
T1602	Transistor			Philips	BC548B
T1603	Transistor			Philips	BF256A
T1604	Transistor			Philips	BC548B
T1605	Transistor			Philips	BC548C
T1606	Transistor			Philips	BF256A
T1607	Transistor			Philips	BC548B
T1608	Transistor			Philips	BC558B

a		IF-AGC-DETECTOR R1117		4/4
<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>		
T1609	Transistor	Philips		BC548B
T1610	Transistor	Philips		BC558B
T1611	Transistor	Philips		BC548B
T1612	Transistor	Philips		BC548B
T1613	Transistor	Philips		BC548B
T1614	Transistor	Philips		BC548B
T1615	Transistor, array	N.S.		LM3086
D1601	Diode, silicon	Philips		1N4148
D1602	Diode, silicon	Philips		1N4148
D1603	Diode, germanium	Philips		AA119
D1604	Diode, silicon	Philips		1N4148
D1605	Diode, switch	Philips		BA182
D1606	Diode, switch	Philips		BA182
D1607	Diode, switch	Philips		BA182
D1608	Diode, zener 4.7V \pm 5%	1W Motorola		1N4732A

a		AF-AMPLIFIER-UNIT R1117			1/2	
Symbol	Description			Manufact.		
R1701	Resistor	82 Kohm $\pm 5\%$	0,33W	Philips	2322 106	33823
R1702	Resistor	6,8 Kohm $\pm 5\%$	0,33W	Philips	2322 106	33682
R1703	Resistor	27 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13273
R1704	Resistor	68 Kohm $\pm 5\%$	0,33W	Philips	2322 106	33683
R1705	Resistor	56 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13563
R1706	Resistor	3,3 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13332
R1707	Resistor	100 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13104
R1708	Resistor	3,3 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13332
R1709	Resistor	12 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13123
R1710	Resistor	12 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13123
R1711	Resistor	12 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13123
R1712	Resistor	3,3 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13332
R1713	Resistor	56 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13563
R1714	Resistor	18 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13183
R1715	Resistor	68 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13683
R1716	Resistor	15 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13153
R1717	Resistor	3,3 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13332
R1718	Resistor	4,7 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13472
R1719	Resistor	56 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13563
R1720	Resistor	1,2 Kohm $\pm 5\%$	0,33W	Philips	2322 211	13122
R1721	Resistor	560 ohm $\pm 5\%$	0,33W	Philips	2322 211	13561
R1722	Resistor	56 ohm $\pm 5\%$	0,33W	Philips	2322 211	13569
R1723	Resistor	100 ohm $\pm 5\%$	0,5W	Philips	2322 212	13101
R1724	Resistor	1 ohm $\pm 5\%$	0,33W	Philips	2322 211	13108
R1725	Resistor	10 ohm $\pm 5\%$	0,33W	Philips	2322 211	13109
R1726	Resistor	39 ohm $\pm 5\%$	0,33W	Philips	2322 211	13399
R1727	Resistor	8,2 ohm $\pm 5\%$	4,2W	Philips	2322 330	22828
R1728	Resistor	56 Kohm $\pm 5\%$	0,33W	Philips	2322 106	33563
C1701	Capacitor polyester	220nF $\pm 20\%$	100V	Ero	MKT1822-422/0	
C1702	Capacitor tantalum	4,7uF -20/+50%	25V	Ero	ETP-2D	
C1703	Capacitor tantalum	10uF -20/+50%	25V	Ero	ETP-3F	
C1704	Capacitor polystyrene	15nF $\pm 2\%$	63V	Philips	2222 424	31503
C1705	Capacitor polystyrene	30nF $\pm 2\%$	63V	Philips	2222 424	33003
C1706	Capacitor polystyrene	1,3nF $\pm 2\%$	160V	Philips	2222 425	31302
C1707	Capacitor polystyrene	39nF $\pm 2\%$	63V	Philips	2222 424	33903
C1708	Capacitor polystyrene	470pF $\pm 2\%$	250V	Philips	2222 426	34701
C1709	Capacitor polyester	220nF $\pm 20\%$	100V	Ero	MKT1822- 422/0	

a		AF-AMPLIFIER UNIT R1117		2/2	
Symbol	Description		Manufact.		
C1710	Capacitor tantalum	4.7uF-20/+50%	25V	Ero	ETP-2D
C1711	Capacitor tantalum	4.7uF-20/+50%	25V	Ero	ETP-2D
C1712	Capacitor electrolytic	100uF-10/+50%	25V	Siemens	B41283-B5107-T
C1713	Capacitor tantalum	22uF-20/+50%	16V	Ero	ETP-2G
C1714	Capacitor polystyrene	4.7nF \pm 2%	63V	Philips	2222 424 34702
C1715	Capacitor polystyrene	1nF \pm 2%	250V	Philips	2222 426 31002
C1716	Capacitor polyester	100nF \pm 20%	100V	Ero	MKT1822-410/0
C1717	Capacitor tantalum	22uF-20/+50%	16V	Ero	ETP-3G
C1718	Capacitor electrolytic	470uF-10/+50%	16V	Siemens	B41283-A4477-T
C1719	Capacitor electrolytic	100uF-10/+50%	25V	Siemens	B41283-B5107-T
C1720	Capacitor polyester	100nF \pm 20%	100V	Ero	MKT1822-410/0
C1721	Capacitor polyester	100nF \pm 20%	100V	Ero	MKT1822-410/0
IC1701	Integrated circuit			National	LM324
IC1702	Integrated circuit			SGS/ATES	TCA940

a		INPUT FILTER R1117		1/1	
Symbol	Description		Manufact.		
R1801	Resistor 22 kohm \pm 5%	0.33W	Philips	2322 211 13223	
R1802	Resistor 330 ohm \pm 5%	1.15W	Philips	2322 214 13331	
R1803	Resistor 33 ohm \pm 5%	7 W	Philips	2322 330 32339	
C1801	Capacitor polyester 100nF \pm 20%	100V	Philips	2222 344 24104	
C1802	Capacitor polyester 100nF \pm 20%	100V	Philips	2222 344 24104	
C1803	Capacitor polycarbonate 1nF \pm 20%	630V	Ero	KC 1849 210/6	
C1804	Capacitor polycarbonate 1nF \pm 20%	630V	Ero	KC 1849 210/6	
C1805	Capacitor polyester 100nF \pm 20%	100V	Philips	2222 344 24104	
C1806	Capacitor polyester 10nF \pm 20%	400V	Philips	2222 344 54103	
C1807	Capacitor polyester 100nF \pm 20%	100V	Philips	2222 344 24104	
C1808	Capacitor electrolytic 47uF-10/+50%	63V	Siemens	B41283-C8476-T	
C1809	Capacitor polyester 10nF \pm 20%	400V	Philips	2222 344 54103	
C1810	Capacitor polyester 10nF \pm 20%	400V	Philips	2222 344 54103	
C1811	Capacitor electrolytic 10uF-10/+100%	40V	Siemens	B41313-A7106-V	
C1812	Capacitor polyester 220nF \pm 20%	100V	Philips	2222 344 24224	
C1813	Capacitor polyester 10nF \pm 20%	400V	Philips	2222 344 54103	
L1801	Coil TL 079		S.P.	TL 079	
D1801	Diode, zener 51V \pm 5%	1W	Motorola	1N4757A	
TR1801	Transformer LF 1:1		Tradania	type 2296	

a		AERIAL SWITCH R1117			1/1	
Symbol	Description				Manufact.	
R1901	Resistor	15 ohm	$\pm 5\%$	2,5W	Philips	2322 192 31509
R1902	Resistor	100Kohm	$\pm 5\%$	0,33W	Philips	2322 211 13104
R1903	Preset potmeter	10Kohm	LIN $\pm 20\%$	0,1W	Philips	2322 410 03357
R1904	Resistor	2,2Kohm	$\pm 5\%$	0,33W	Philips	2322 211 13222
C1901	Capacitor polystyrene	3,3nF	$\pm 5\%$	160V	Philips	2222 425 23302
D1901	Diode, zener	8,2V	$\pm 5\%$	0,4W	Philips	BZY88 C8V2
GL1901	Neon lamp				Siemens	B1 C90-Q69x151
RE1901	Relay				Pasi	MZ/K BV806
RE1902	Relay DLR				Siemens	V23100-V4024-A001
RE1903	Relay DLR				Siemens	V23100-V4024-A001
RE1904	Relay				Pasi	MZ/K BV806

Symbol	Description	Manufact.	
C2001	Capacitor variable 2 x 235pF	Helag	250-30
J2001	Aerial socket	K.V.Hansen	So239
J2002	Headphone socket	Cliff	type S1/BB
IC2001	Voltage regulator 5V, 1A	Motorola	MC7805 CT
IC2002	Voltage regulator 18V, 1A	Motorola	MC7818 CT
LS2001	Loudspeaker 8 ohm	Peerless	E230MT/8 ohm
ME2001	Meter	ELMATOK	MG 20E
P2001	Power plug	Molex	03-06-2364
R2001	Potentiometer 4k7 ohm LIN.	Piher	21U s/i ø6
R2002	Resistor 1 kohm $\pm 5\%$ 0,33W	Philips	2322 211 13102
R2003	Potentiometer 10 kohm LOG. w. switch	Piher	21U c/i2 ø6
S2001	Switch BCD Coded 10 pos. SM25HP	ITT	48432 62486
S2002	Switch BCD Coded 10 pos. SM25HP	ITT	48432 62486
S2003	Switch BCD Coded 10 pos. SM25HP	ITT	48432 62486
S2004	Switch BCD Coded 10 pos. SM25HP	ITT	48432 62486
S2005	Switch MODE 3 pos. SM25	ITT	48432 62504
S2006	Switch AGC ON/OFF	C&K	7101 SYZB
S2007	Switch Push Button TUNE	C&K	8321
S2008	Switch Loudspeaker ON/OFF	C&K	7101 SYZB
T2001	Transistor BD577	Motorola	BD577
	Index Unit 12 pos. SM25	ITT	27590-30064
FP2001	Ferrit bead Grade 4B1	Philips	4322 020 34420
FP2002	Ferrit bead	Kaschke	K3/1200/0,1HZ 4/2/7A
FP2003	Ferrit bead	Kaschke	K3/1200/0,1HZ 4/2/7A
FP2004	Ferrit bead	Kaschke	K3/1200/0,1HZ 4/2/7A
FP2005	Ferrit bead	Kaschke	K3/1200/0,1HZ 4/2/7A

a		VCO BUFFER R1117				1/1		
Symbol	Description					Manufact.		
R2101	Resistor	270	ohm	$\pm 5\%$	0,33W	Philips	2322	211 13271
R2102	Resistor	330	ohm	$\pm 5\%$	0,33W	Philips	2322	211 13331
R2103	Resistor NTC	1	Kohm	$\pm 10\%$	0,5 W	Philips	2322	642 12102
R2104	Resistor	100	ohm	$\pm 5\%$	0,33W	Philips	2322	211 13101
R2105	Resistor	560	ohm	$\pm 5\%$	0,33W	Philips	2322	211 13561
C2101	Capacitor ceramic	10nF		-20/+80%	32V	Ferroperm	9/0145,9-	32V
C2102	Capacitor ceramic	10nF		-20/+80%	32V	Ferroperm	9/0145,9-	32V
C2103	Capacitor feed-through	1nF		-20/+80%	250V	Ferroperm	9/0138,58-	250V
L2101	Coil	0,47uH		$\pm 20\%$		Philips	4322	057 04770
TR2101	Transformer					S.P.	TL	234
TR2102	Transformer					S.P.	TL	234
T2101	Transistor					Silconic	E310	

CIRCUIT DESCRIPTIONS AND SCHEMATIC DIAGRAMS

A S1301, S1300/TT,T; R1117

CIRCUIT DESCRIPTION FOR DIVIDER UNIT S1300 & R1117

This unit contains the logic part of phase locked LOOP 1 and phase locked LOOP 2.

The 10 MHz reference oscillator (TCXO), reference divider, 2 MHz spectrum generator, 600 kHz carrier generator, programmable dividers for LOOP 1 and LOOP 2 and the phase/frequency detectors for LOOP 1 and LOOP 2.

10 MHz REFERENCE

The frequency stability of the exciter is related to the 10 MHz TCXO X0101. The 10 MHz reference signal is amplified in the transistors T103 and T104.

REFERENCE DIVIDER

The counters IC115, IC111 and IC107 divides the 10 MHz reference signal down to respectively $f_{R1} = 1$ kHz and $f_{R2} = 100$ Hz.

2 MHz HARMONIC SPECTRUM GENERATOR

With a repetition frequency of 2 MHz the output Q_D of IC115 goes low and the nand-gates in IC114 will generate a narrow pulse due to the delay-time in the gates.

600 kHz GENERATOR

The output on IC111 pin 5, Q_B has a high contents of 600 kHz, which is amplified in the transistor T105 and filter in the tuned circuit L101, C136 and C137.

PROGRAMMABLE DIVIDER FOR LOOP 1

The variable frequency f_{T1} from LOOP 1 MIXER is amplified and shaped in T101 and IC109a. Independent of which 2 MHz band used the frequency f_{T1} will vary from 2699 kHz to 4698 kHz as the VCO varies 2 MHz. The programmable divider divides f_{T1} down to 1 kHz (dividing figure N_1). This means that there is 2000 frequencies in each 2 MHz band. The frequency is controlled by the FREQUENCY SELECTOR, which encodes the start figure P_1 into the BCD counters IC101, IC102, IC103 and IC104.

The stop figure S_1 is controlled from the gates IC108b and IC109c. When the counter outputs $Q_A, Q_B \dots$ etc. equals the stop figure $S_1 + 2$ the J-K flip-flop IC110b uses 2 clock pulses to load the start figure P_1 into the counters IC101, IC102, IC103 and IC104. The counter counts down from the start figure P_1 to stop figure S_1 and thus the dividing figure $N_1 = P_1 - S_1$.

LOOP 1 PHASE/FREQUENCY DETECTOR

The reference frequency $f_{R1} = 1$ kHz and the variable frequency $f_{V1} = 1$ kHz are fed into the phase/frequency detector IC106. The phase/frequency detector IC106 generates an error voltage, which is proportional to frequency or

phase difference between the two signals mentioned above. This error voltage is fed into the integrator on the LOOP 1 FILTER & \pm 18V SUPPLY UNIT.

PROGRAMMABLE DIVIDER FOR LOOP 2

The variable frequency f_{T2} from the loop 2 mixer is amplified and shaped in T102 and IC109b. The frequency f_{T2} will vary between 98.1 kHz and 99.0 kHz depending on the 100 Hz programming. The programmable divider divides f_{T1} down to 100 Hz (dividing figure N_2).

From the FREQUENCY SELECTOR the start figure P_2 encodes into the BCD counter IC105.

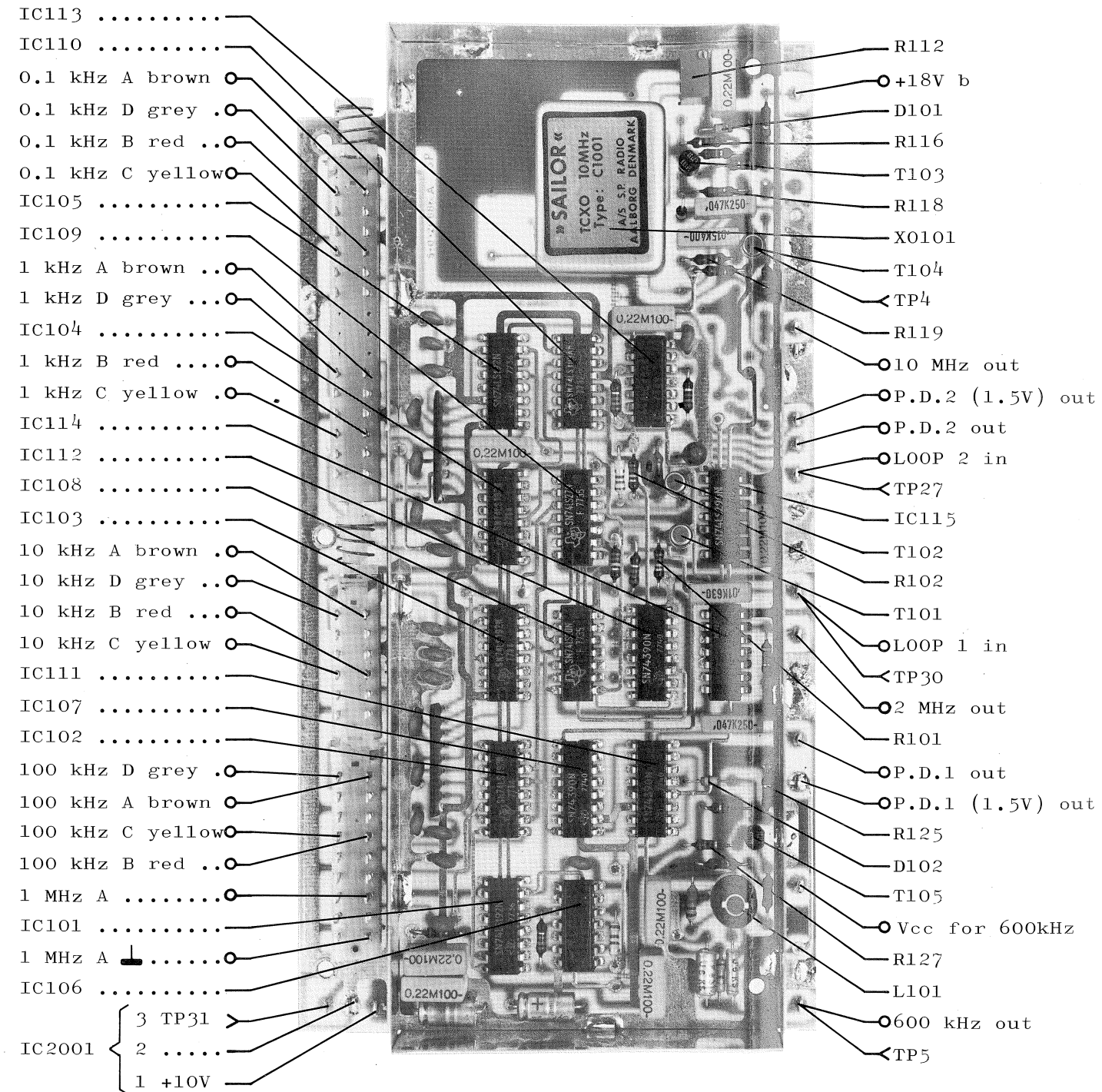
The stop figure S_2 is controlled from the gate IC108a. When the counter outputs $Q_A, Q_B, Q_C \dots$ etc. equals the stop figure $S_2 - 2$ the J-K flip-flop IC110a uses 2 clock pulses to load the start figure P_2 into the counters IC105 and IC112. The counter will count up from the start figure P_2 to the stop figure S_2 and thus the dividing figure is $N_2 = S_2 - P_2$.

LOOP 2 PHASE/FREQUENCY DETECTOR

The reference frequency $f_{R2} = 100$ Hz and the variable frequency $f_{V1} = 100$ Hz, are fed into the phase/frequency detector IC113. The phase/frequency detector IC113 generates an error voltage proportional to the frequency or the phase difference between the two signals mentioned above. This error voltage is fed into the integrator on the VCXO & LOOP 2 FILTER UNIT.

TEST CONDITIONS

Frequency selector : $f = 2.0005$ MHz
 Mode : A3J
 Clarifier : Center position
 Oscilloscope input : Passive probe 10 Mohm//11 pF
 DC voltmeter input : 10 Mohm
 : Diode probe measurements
 TP : Testpoints
 All voltage statements are typical



A2/2 R1117

CIRCUIT DESCRIPTION LOOP 1 FILTER & $\pm 18V$ SUPPLY UNIT S1300 & R1117

This unit contains two regulated power supplies $\pm 18V$ with fold-back current limiter, the complete integrator and filter for LOOP 1.

-18V SUPPLY

The series transistor T201 supplies a $-18V$ output controlled by the current flow into its base from T202, where a portion of the output voltage, via a voltage divider containing R209, is compared to a reference voltage created by R204, D202 and D201. The fold-back is within the circuit. When the output current from the regulator increases the base current must increase too, but this current is limited by R204. When the regulator reaches this limit T205 stops conducting and so it folds back. To ensure that T201 starts conducting R203 is added.

+18V SUPPLY

The principle of operation for this regulator is exactly as described above, with an additional current limiter containing T204 and T206 to ensure the fold-back characteristic is maintained within design limits. To ensure start-up R212 is added.

INTEGRATOR & LOOP 1 FILTER

The integrator is built-up around IC202, the integration capacitor is C211. R220 feeds current into the diode coupled Darlington pair in the phase comparator MC4044 on the divider board to perform the 1.5V reference. Output from the integrator pin 6 on IC202 feeds into the active low-pass filter IC201 to filter out the 1 kHz ripple from the phase comparator. The voltage divider R217 and R218 connected to IC202 via D206 ensure that the output voltage swing is within approx. $-4V$ to $-17V$.

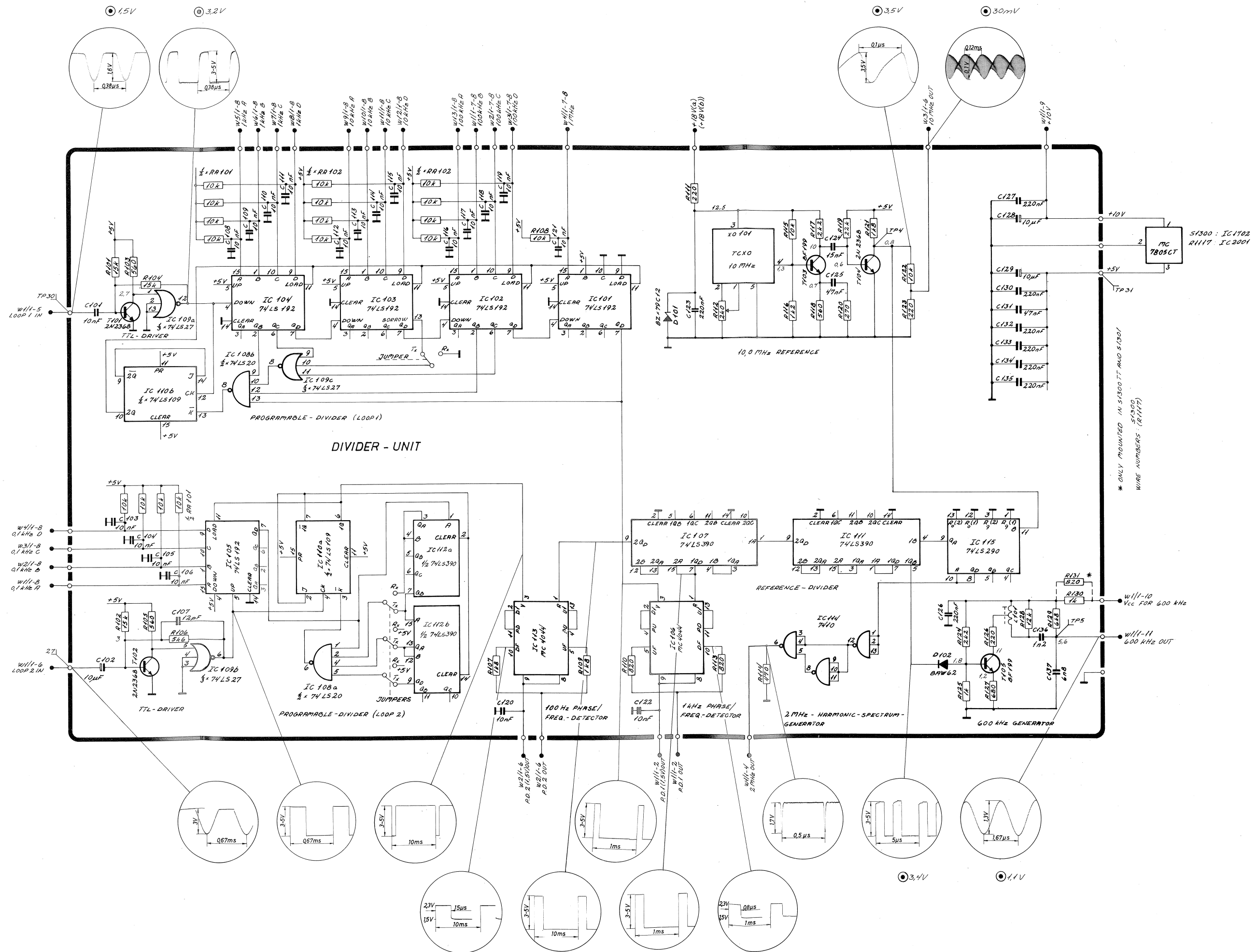
TEST CONDITIONS

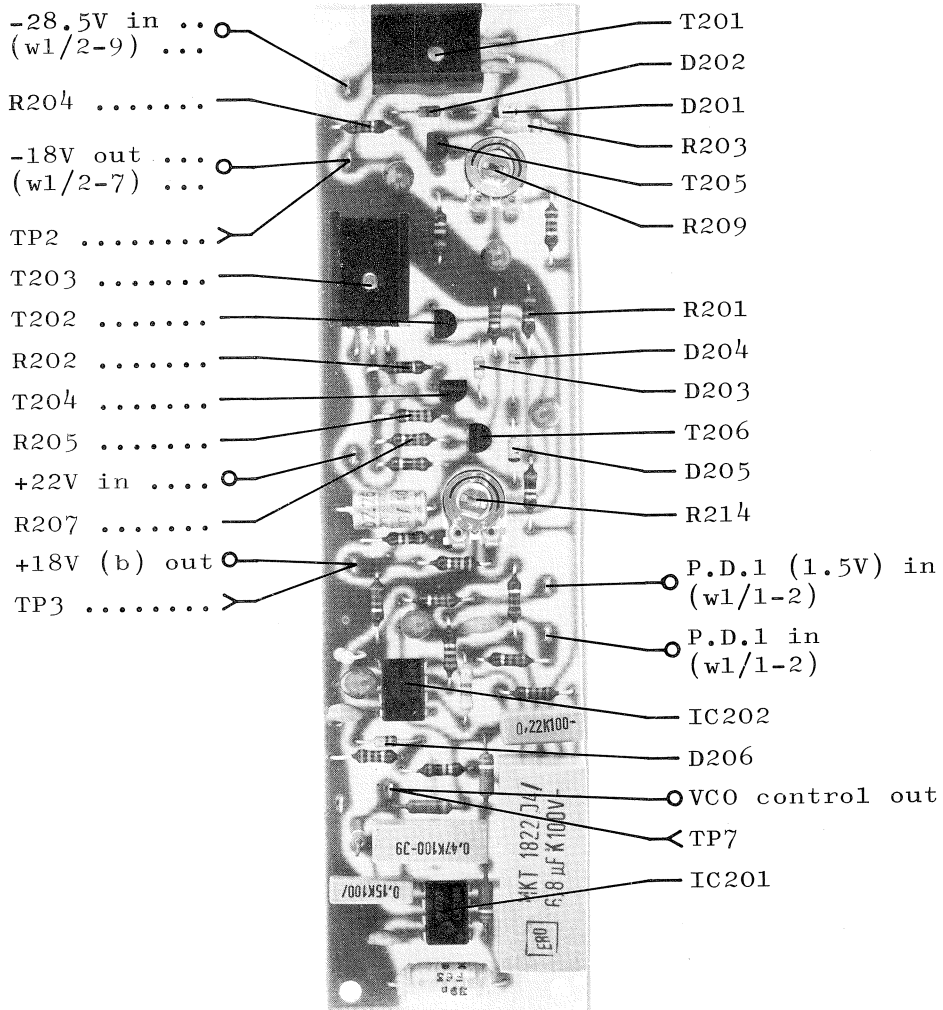
Frequency selector : 1A (f = 2.0005 MHz)
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
: Diode probe measurements

TP : Testpoints

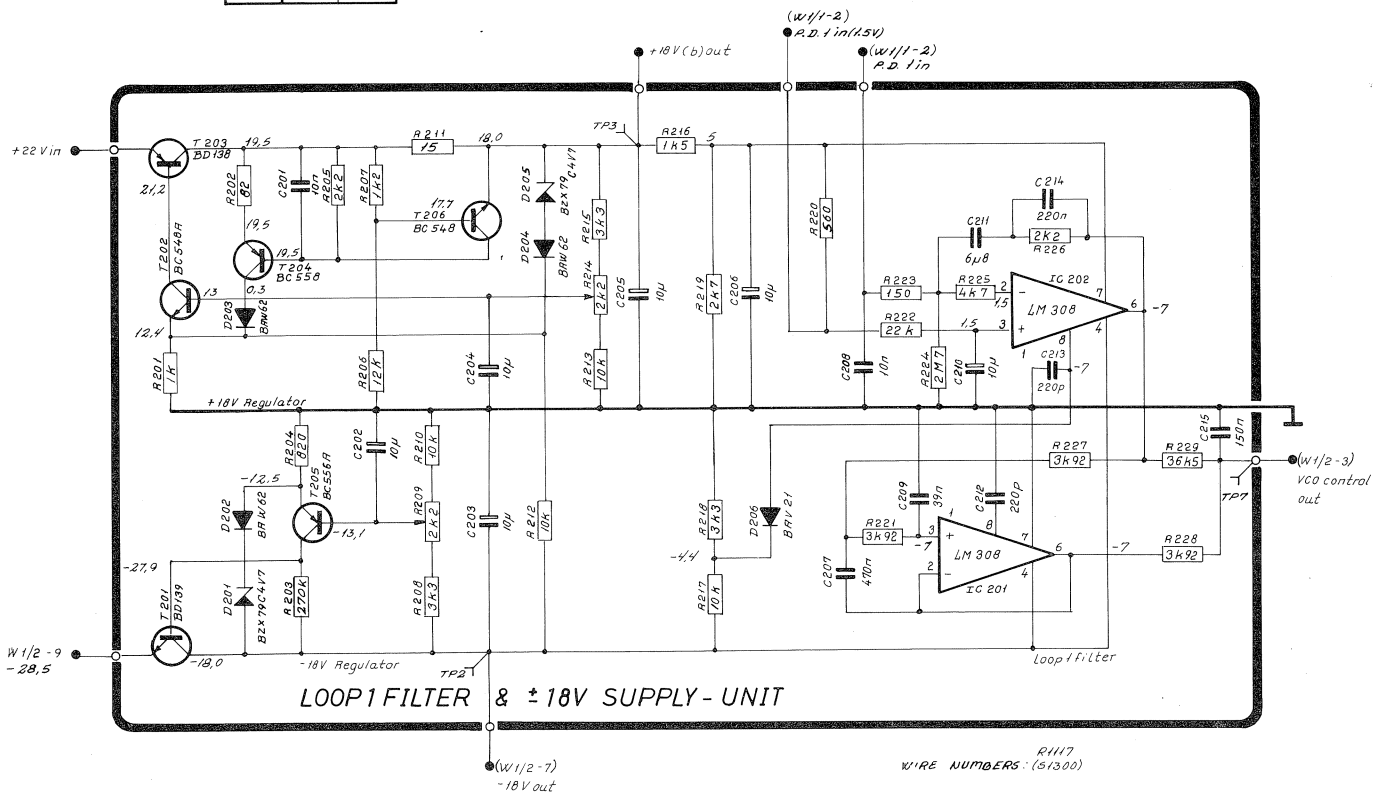
All voltage statements are typical

12
 8V b
 01
 16
 03
 18
 101
 04
 4
 19
 MHz out
 D.2 (1.5V) out
 D.2 out
 OP 2 in
 27
 115
 02
 02
 01
 OP 1 in
 30
 MHz out
 01
 D.1 out
 D.1 (1.5V) out
 25
 02
 05
 c for 600kHz
 27
 01
 0 kHz out
 5





	S1300	R1117
R203	270k Ω	150k Ω
R211	15 Ω	12 Ω

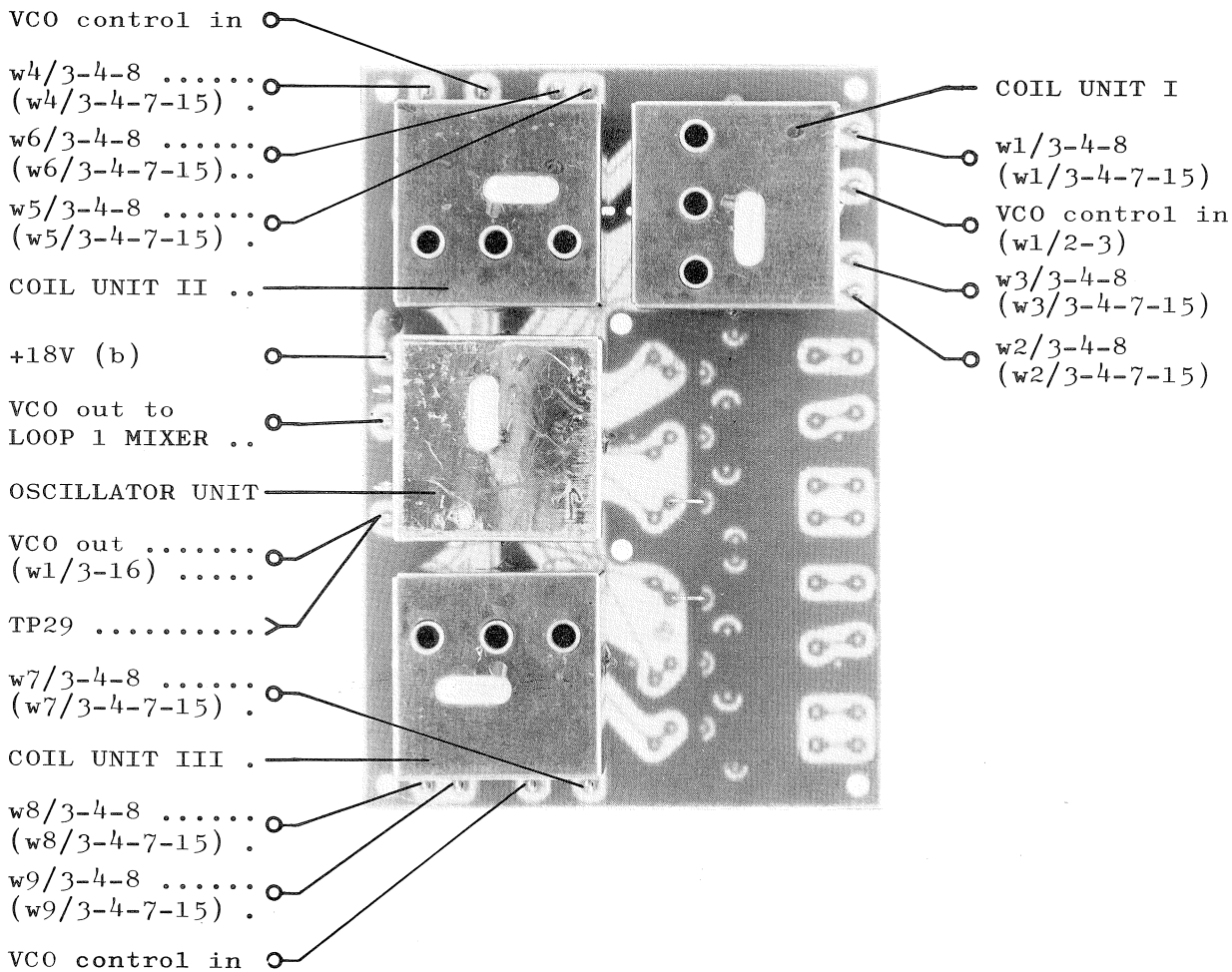


R1117
WIRE NUMBERS: (S1300)

CIRCUIT DESCRIPTION VCO-UNIT S1300 & R1117

This unit contains in principle nine VCO's constructed in such a way that it contains one single oscillator unit and nine coil units switched in and out by the diodes D301 to D320. The oscillator circuit is made up of T301 and T302, the output signal is fed through the buffer amplifier T303. The signal current in T303 is measured by the level detector C312, R307 and D321, and via T304 it regulates the oscillator amplitude to maintain a constant output voltage.

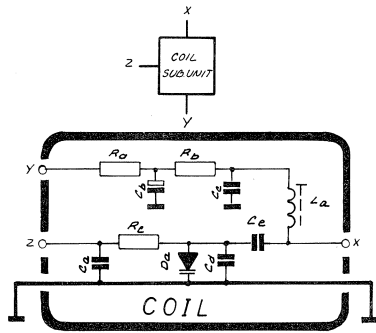
The oscillator unit is factory adjusted and sealed and cannot be repaired in the field, it must be replaced and can be repaired at the factory.



A1/2 S1301, S1300/TF, T; R1117

TEST CONDITIONS

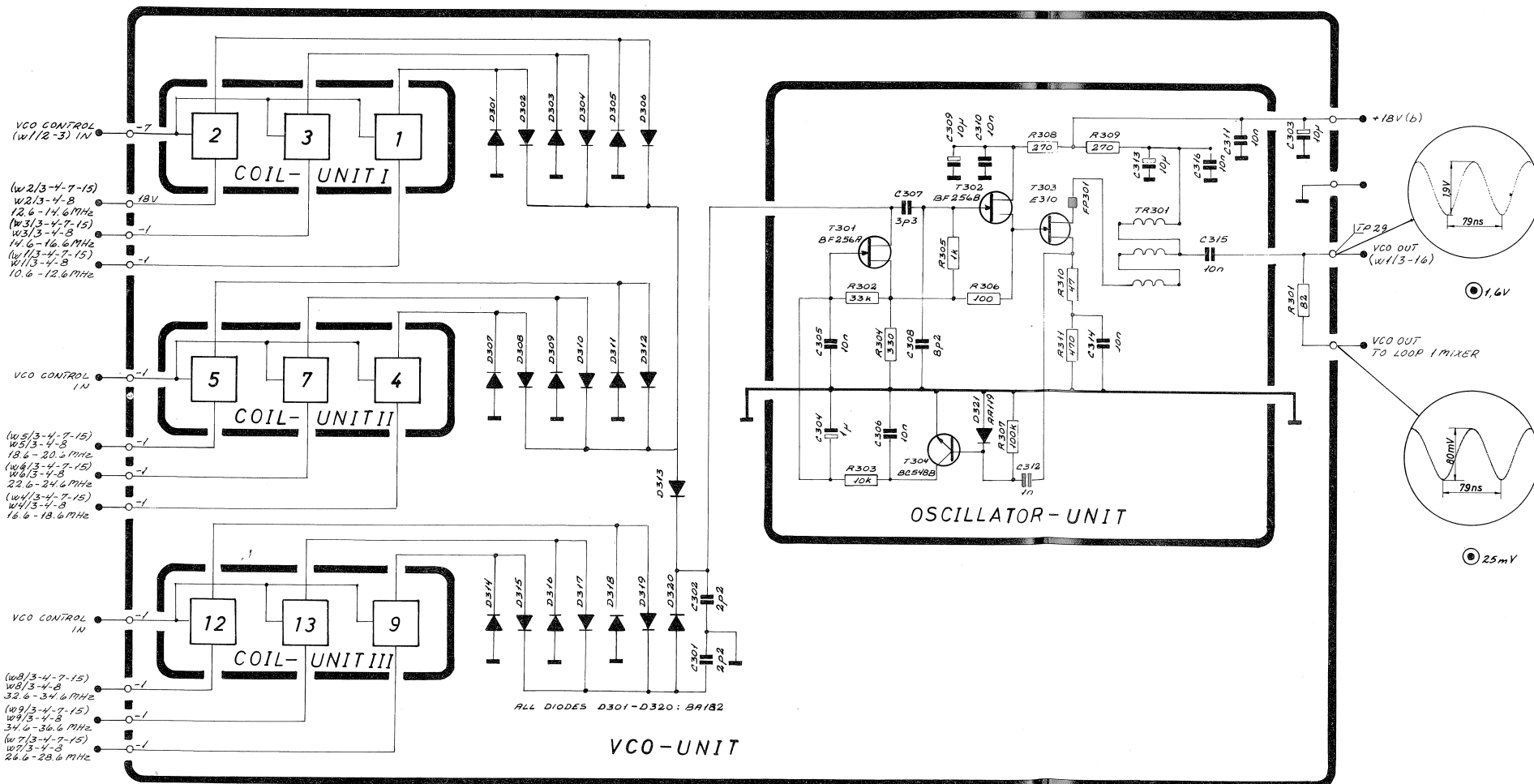
- Frequency selector : 1A (f = 2.0005 MHz)
- Oscilloscope input : Passive probe 10 Mohm//11 pF
- DC voltmeter input : 10 Mohm
- : Diode probe measurements
- TP : Testpoints
- All voltage statements are typical



COIL UNIT	COIL	R _A (Ω)	R _B (Ω)	R _C (Ω)	C _A (nF)	C _B (μF)	C _C (nF)	C _D (pF)	C _E (pF)	L _A	L _B
I	1	R312 470	R321 47	R330 546	C317 10n	C320 10μ	C329 10n	C338 100	C347 120	L301 7L208	D322 BB113
	2	R313 470	R322 47	R331 546		C321 10μ	C330 10n	C339 4p7	C348 100	L302 7L209	D323 BB113
	3	R314 470	R323 47	R332 447		C322 10μ	C331 10n	C340 8p2	C349 82	L303 7L210	D324 BB113
II	4	R315 470	R324 47	R333 3K9	C318 10n	C323 10μ	C332 10n	C341 10p	C350 68	L304 7L211	D325 BB113
	5	R316 470	R325 47	R334 3K3		C324 10μ	C333 10n	C342 8p2	C351 56	L305 7L212	D326 BB113
	7	R317 470	R326 47	R335 3K3		C325 10μ	C334 10n	C343 10p	C352 47	L306 7L213	D327 BB113
III	9	R318 470	R327 47	R336 3K3	C319 10n	C326 10μ	C335 10n	C344 5p6	C353 39	L307 7L214	D328 BB113
	12	R319 470	R328 47	R337 447		C327 10μ	C336 10n	C345 8p2	C354 33	L308 7L216	D329 BB113
	13	R320 470	R329 47	R338 6K8		C328 10μ	C337 10n	C346 5p6	C355 31	L309 7L215	D330 BB113

TABLE FOR COMPONENT VALUES OF COILS

WIRES: (S1300)

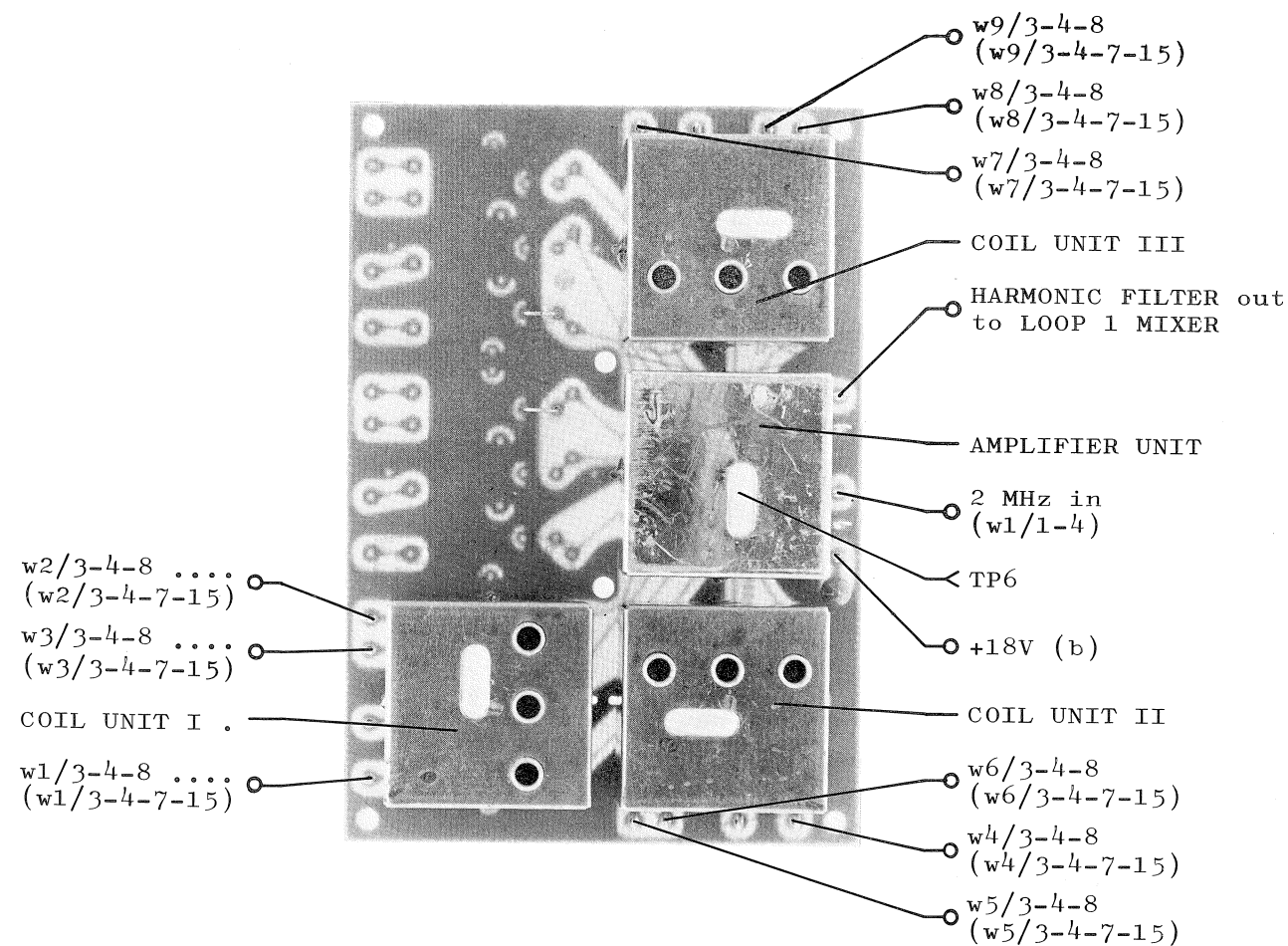


A2/2 S1301, S1300/TT,T; R1117

CIRCUIT DESCRIPTION HARMONIC FILTER UNIT S1300 & R1117

This unit is a tuned amplifier, it receives 2 MHz impulses from the divider board and filters out the wanted harmonic with a tuned circuit. On the board there is one single amplifier and nine coil units switched in and out by the diodes D401 to D420. The tuned amplifier is T401 feeding into the source follower T402. The output voltage is measured by the level detector C411, R409 and D422 and via T403 it regulates the transconductance in T401 to maintain a constant output voltage.

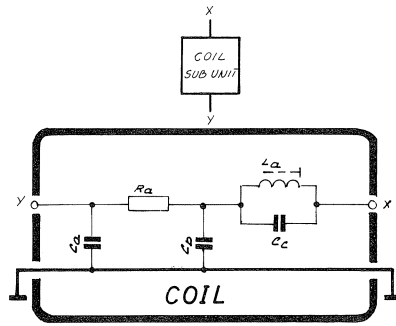
The harmonic filter unit is factory adjusted and sealed and cannot be repaired in the field. It must be replaced and can be repaired at the factory.



A1/2 S1301, S1300/TT, T, R1117

TEST CONDITIONS

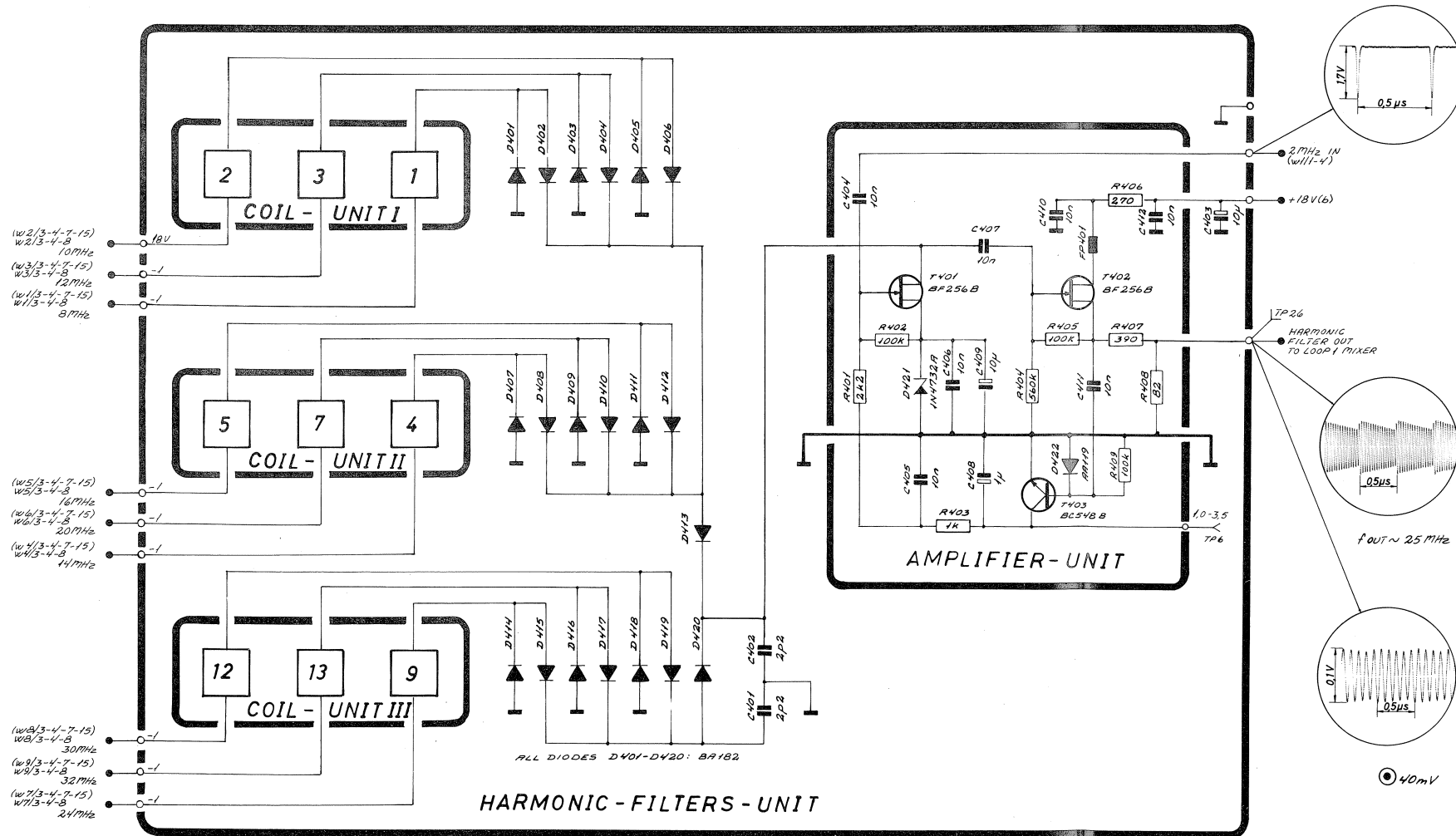
- Frequency selector : 1A (f = 2.0005 MHz)
- Oscilloscope input : Passive probe 10 Mohm//11 pF
- DC voltmeter input : 10 Mohm
- : Diode probe measurements
- TP : Testpoints
- All voltage statements are typical



COIL UNIT	COIL	R _a (Ω)	C _a (nF)	C _b (nF)	C _c (pF)	L _a
I	1	R409 470	C413 10	C422 10	C431 300	L401 TL199
	2	R410 470	C414 10	C423 10	C432 240	L402 TL200
	3	R411 470	C415 10	C424 10	C433 220	L403 TL201
II	4	R412 470	C416 10	C425 10	C434 180	L404 TL202
	5	R413 470	C417 10	C426 10	C435 180	L405 TL203
III	7	R414 470	C418 10	C427 10	C436 110	L406 TL203
	9	R415 470	C419 10	C428 10	C437 100	L407 TL204
	12	R416 470	C420 10	C429 10	C438 82	L408 TL205
	13	R417 470	C421 10	C430 10	C439 91	L409 TL206

TABLE FOR COMPONENT VALUES OF COILS

RH7
WIRE NUMBERS (S1300)



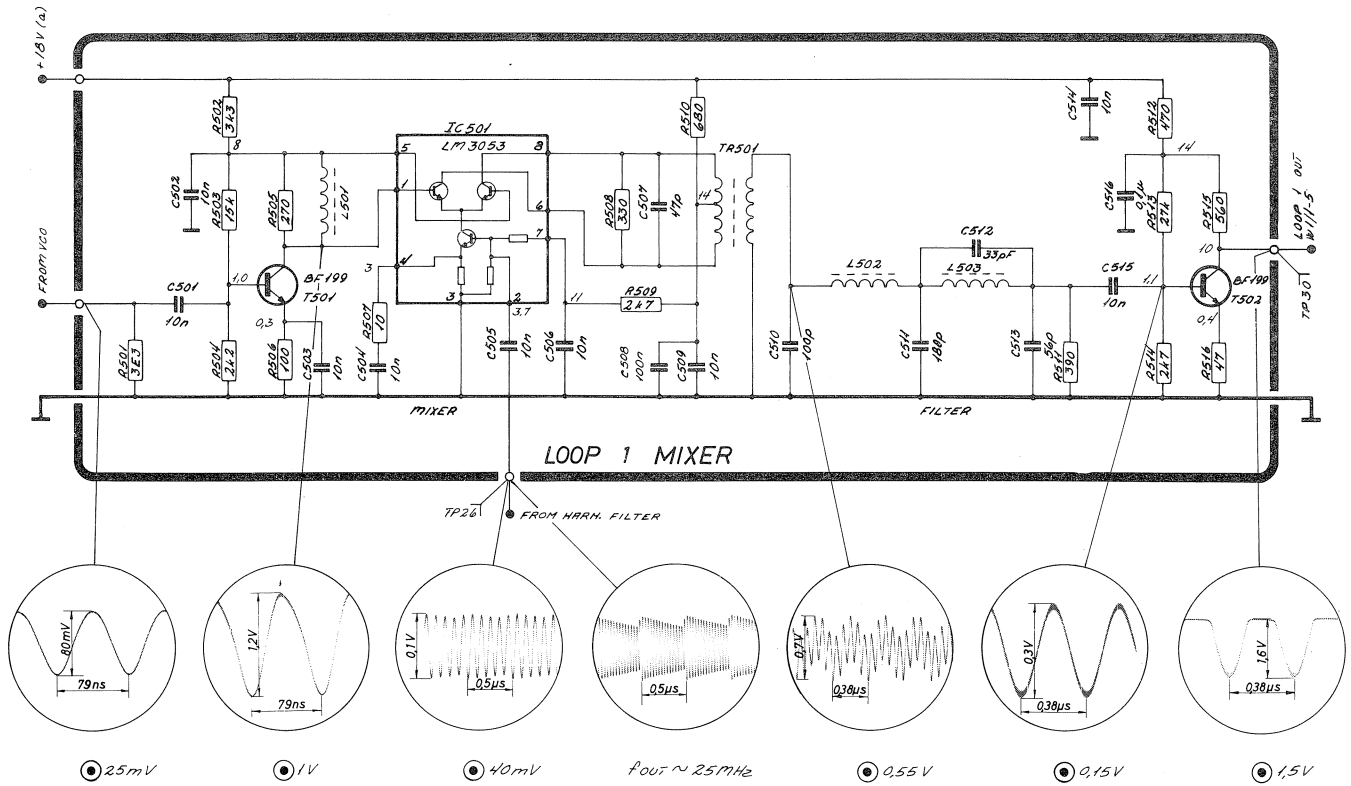
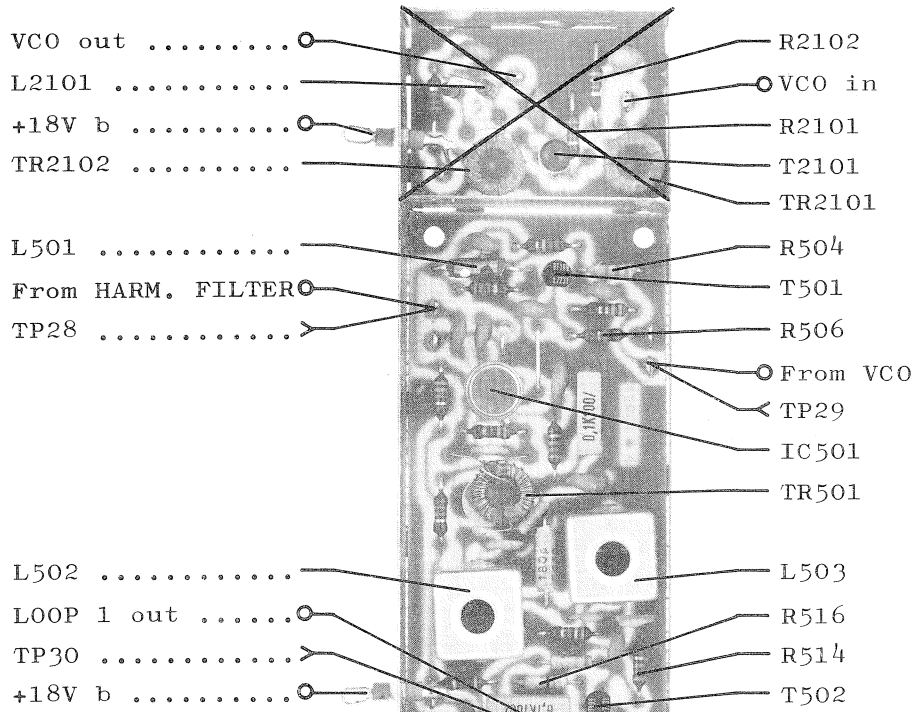
CIRCUIT DESCRIPTION LOOP 1 MIXER S1300 & R1117

This unit mixes together the VCO signal and the signal from the harmonic filter and filters out the difference frequency to supply the variable divider.

The VCO signal is fed to the top of R501 which is part of a voltage divider. From here it is fed into a buffer amplifier T501 and after that to the integrated balanced mixer IC501. To this the harmonic filter signal is applied via C505. Output from the mixer is fed into the combiner transformer TR501 feeding into the low-pass filter containing L502 and L503. This low-pass filter filters out the wanted mixing product and prevents the two local-oscillator signals from reaching the variable divider. The filtered signal is amplified in the output amplifier T502.

TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
: Diode probe measurements
TP : Testpoints
All voltage statements are typical



CIRCUIT DESCRIPTION VCXO, 1ST LOOP 2 MIXER AND LOOP 2 FILTER R1117

This unit contains the integrator and loop filter for loop 2, the voltage controlled crystal oscillator (VCXO) and the first loop 2 mixer.

LOOP 2 FILTER

The integrator is built-up around IC601, the integration capacitor is C605. R601 is feeding current into the diode coupled Darlington pair in the phase comparator MC4044 on the divider board in order to perform the 1,5V reference. Output from the integrator pin 6 in IC601 is feeding into the low-pass filter R607, C607, R609 and C606 to filter out the 100 Hz ripple from the phase comparator. From the low-pass filter the control voltage is fed into the VCXO via R615.

VCXO

The VCXO is built-up around the FET T601. The oscillator is an ordinary Hartley oscillator with a crystal in the feed-back path. The crystal is tuned with a couple of varicaps. D601 and D602 to perform the voltage control of the frequency. The output from the VCXO to second mixer is taken on the tap of the coil L601.

A portion of the oscillator signal is taken from the source via R610 to the first loop 2 mixer.

FIRST LOOP 2 MIXER

As mentioned above the VCXO signal is fed into the base of mixer transistor T602 via R610, and 10 MHz from the TCXO appear to the same base via R619. Because of the big difference between the two oscillator frequencies and the wanted output frequency the only filtering needed to filter out the wanted mixing product is R621 and C616. The mixer transistor is feeding into the output amplifier T603.

TEST CONDITIONS

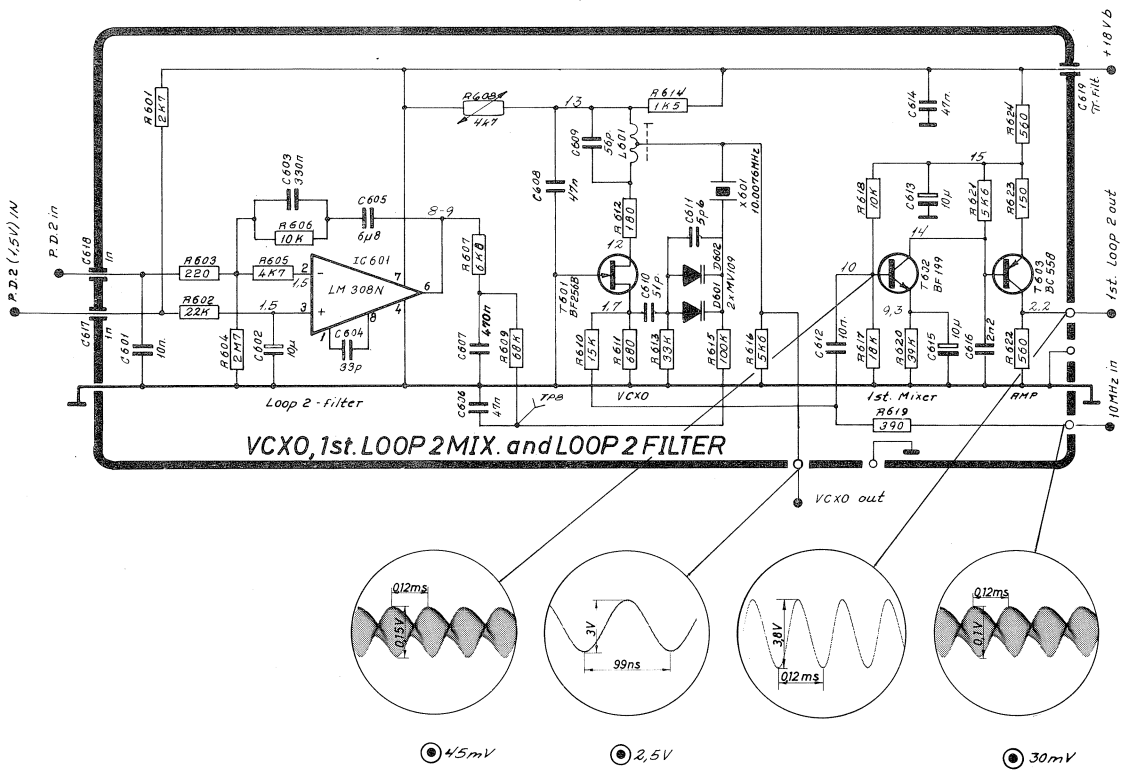
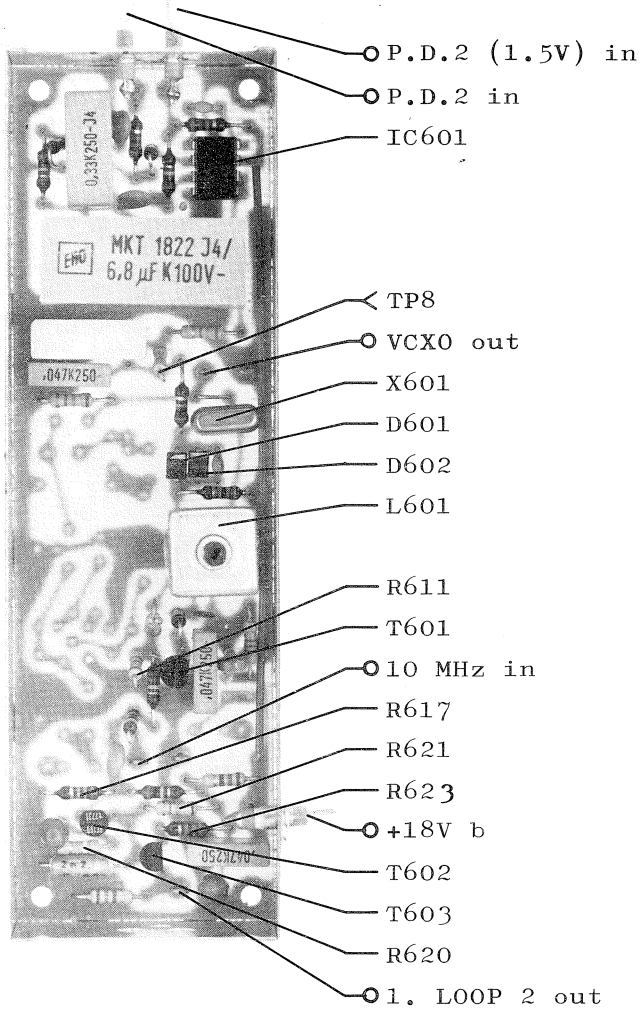
Frequency selector : f = 2.0005 MHz
Mode : A3J
Clarifier : Center position
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm

: Diode probe measurements

TP : Testpoints

All voltage statements are typical

A1/2 R1117



CIRCUIT DESCRIPTION CLARIFIER AND 2ND LOOP 2 MIXER R1117

This unit contains the clarifier AF oscillator, 2nd LOOP 2 mixer and a low-pass filter.

AF OSCILLATOR

The AF oscillator consists of the transistor T701 and the tuned circuit L701, C702, C703 and the clarifier control capacitor C2001. The nominal frequency is 7 kHz (clarifier to center pos.).

2ND LOOP 2 MIXER

From the collector of T701 the signal is fed to the base of the 2nd loop 2 mixer T702, where it is subtracted from the other injection signal, having a nominal frequency range from 8.1 kHz to 9.0 kHz (clarifier to center pos.).

LOW-PASS FILTER

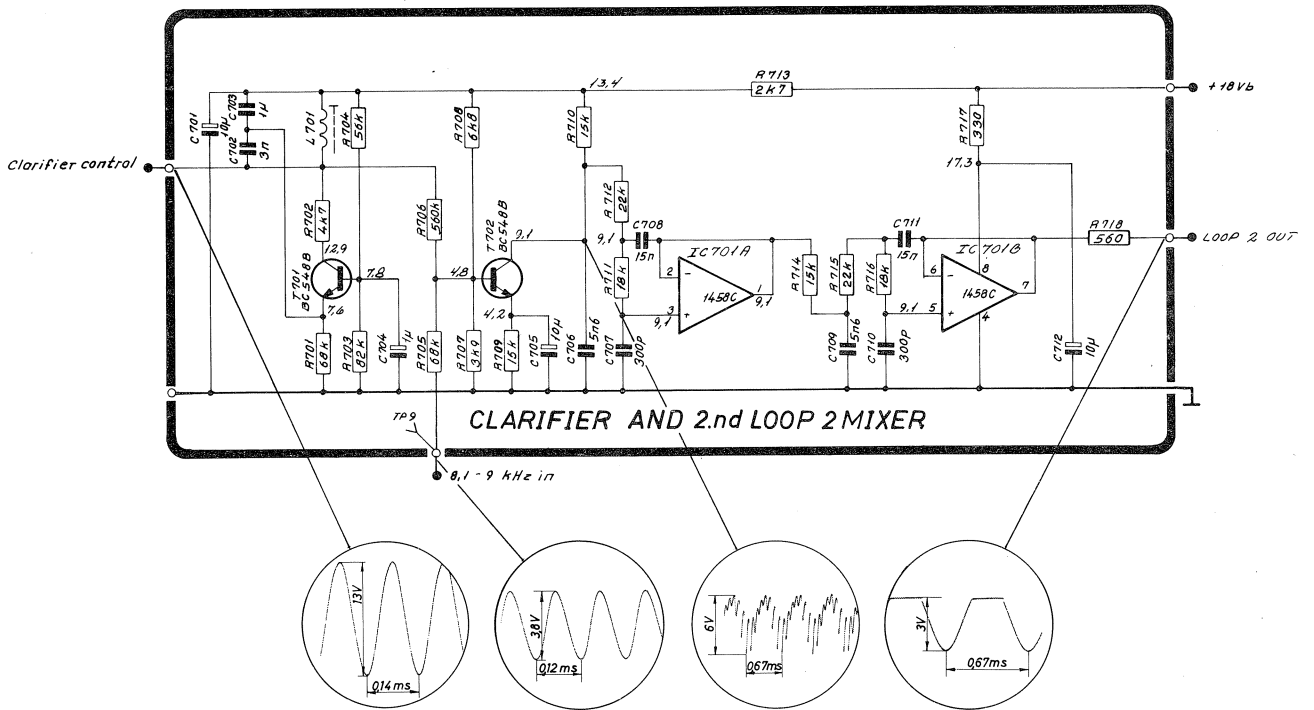
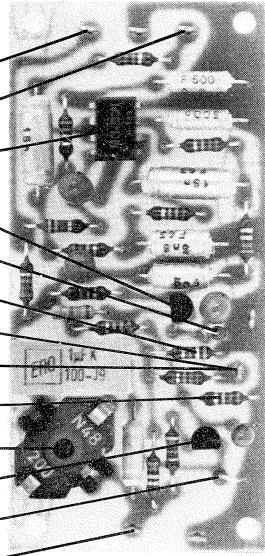
The mixed signal on the collector of T702 is fed to a sixth order active low-pass filter with a cut-off frequency of 3.5 kHz, and thus allows the difference frequency to pass through. The nominal output frequency range is 1.1 kHz - 2.0 kHz. The filter is built up around IC701 and IC702. The output frequency is fed to the programmable divider on the DIVIDER-UNIT.

TEST CONDITIONS

Frequency selector : f = 2.0005 MHz
Mode : A3J
Clarifier : Center position
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
: Diode probe measurements
TP : Testpoints
All voltage statements are typical

A1/2 R1117

- +18V b
- LOOP 2 out
- IC701
- T702
- R709
- R707
- TP9
- 8.1-9 kHz in
- R703
- L701
- T701
- R701
- CLARIFIER CONTROL



CIRCUIT DESCRIPTION COIL SECTIONS R1117

1.6 - 4 MHz COIL SECTION

This section consists of three capacitive coupled and permeability tuned band-pass filters.

The aerial signal enters the coil section through the aerial trimming capacitor C801, which is a part of the tuning capacitor for L901, and leaves the filter at the impedance transformer C910 and C911. The two reverse biased diodes D901 and D902 are a part of the aerial coil protection circuit.

4 - 6 - 8 - 12 - 16 - 22 MHz COIL SECTIONS

These sections consists of three capacitive coupled and capacitive tuned band-pass filters.

The aerial signal enters the coil section at an inductive impedance transformer and leaves the filter at another inductive impedance transformer.

The two reverse biased diodes at the input coils are a part of the aerial coil protection circuit.

2.182 - 25 MHz COIL SECTIONS

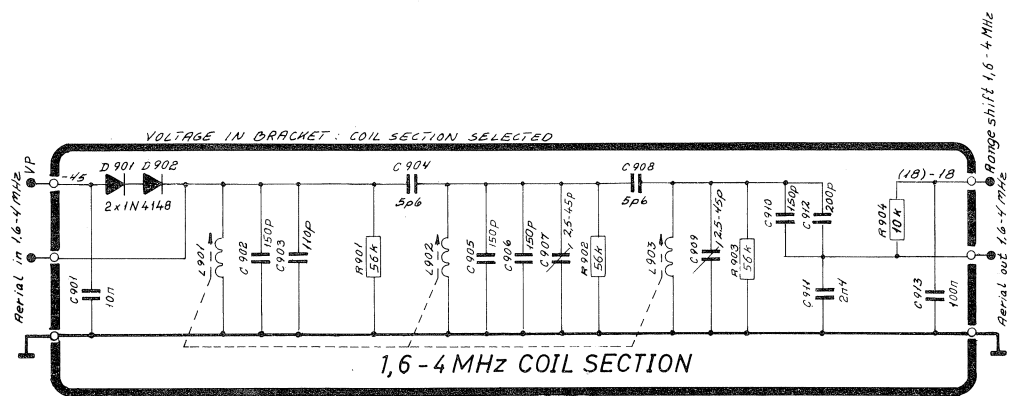
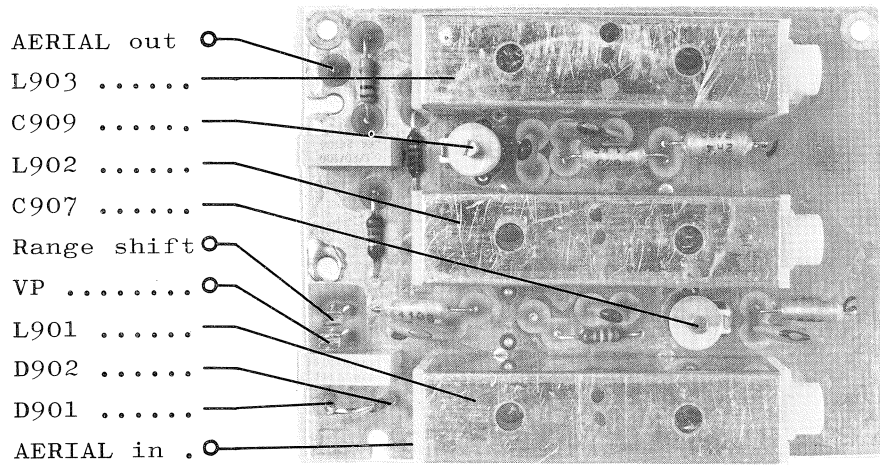
These sections consists of three capacitive coupled fixed tuned band-pass filters.

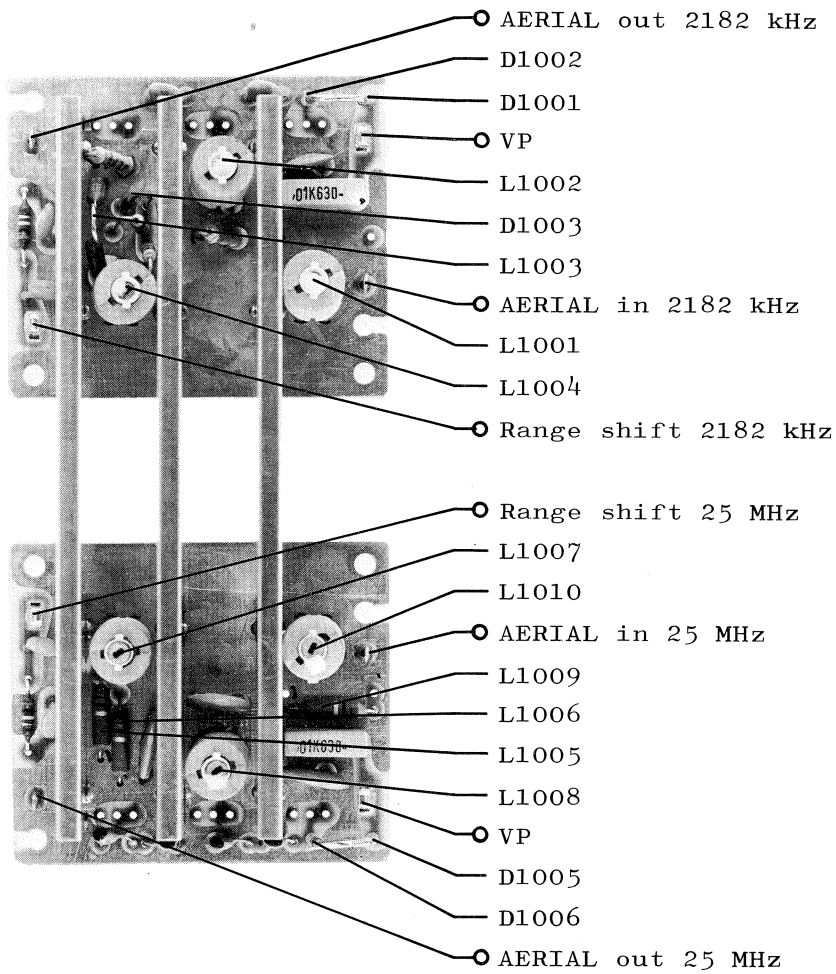
The aerial signal enters the 2182 kHz coil section through the aerial trimming capacitor C802, which is a part of the tuning capacitor for L1001 and leaves the filter at the impedance transformer L1003 and L1004.

The two reverse biased diodes D1001 and D1002 are a part of the aerial coil protection circuit.

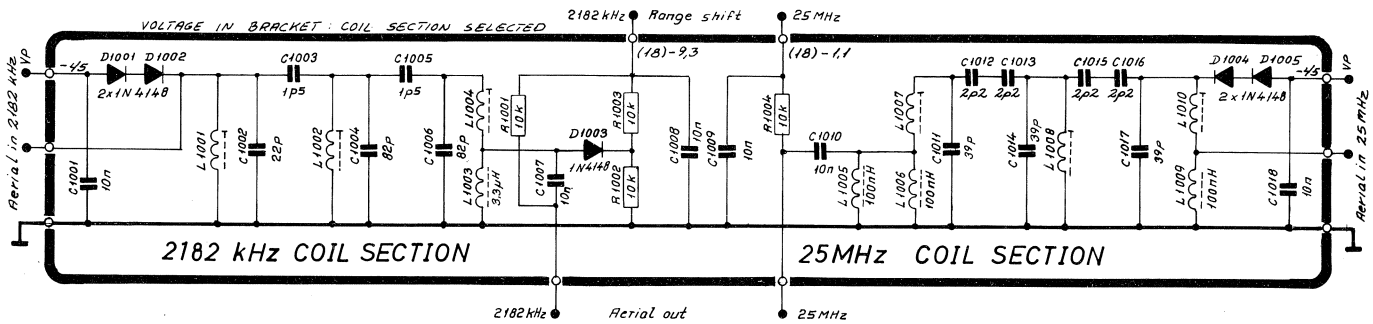
The signal-flow in the 25 MHz coil section is exactly as in the 4 - 6 - 8 - 12 - 16 - 22 MHz coil sections.

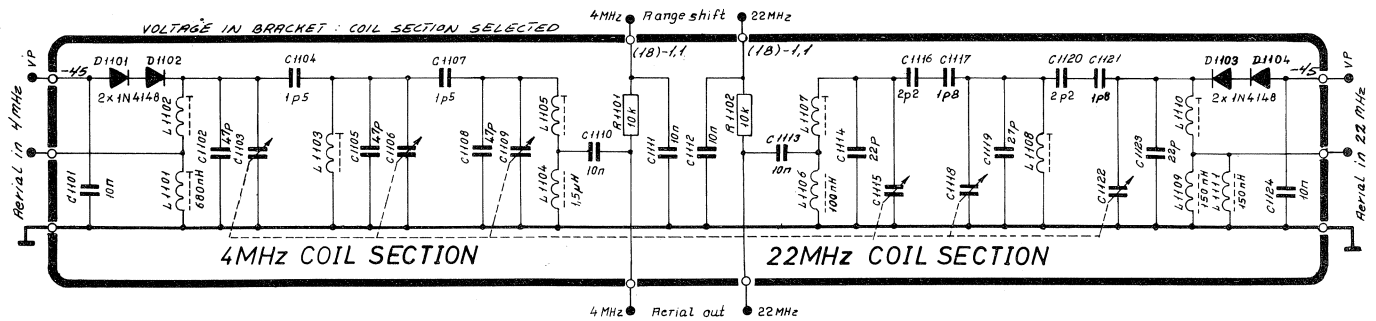
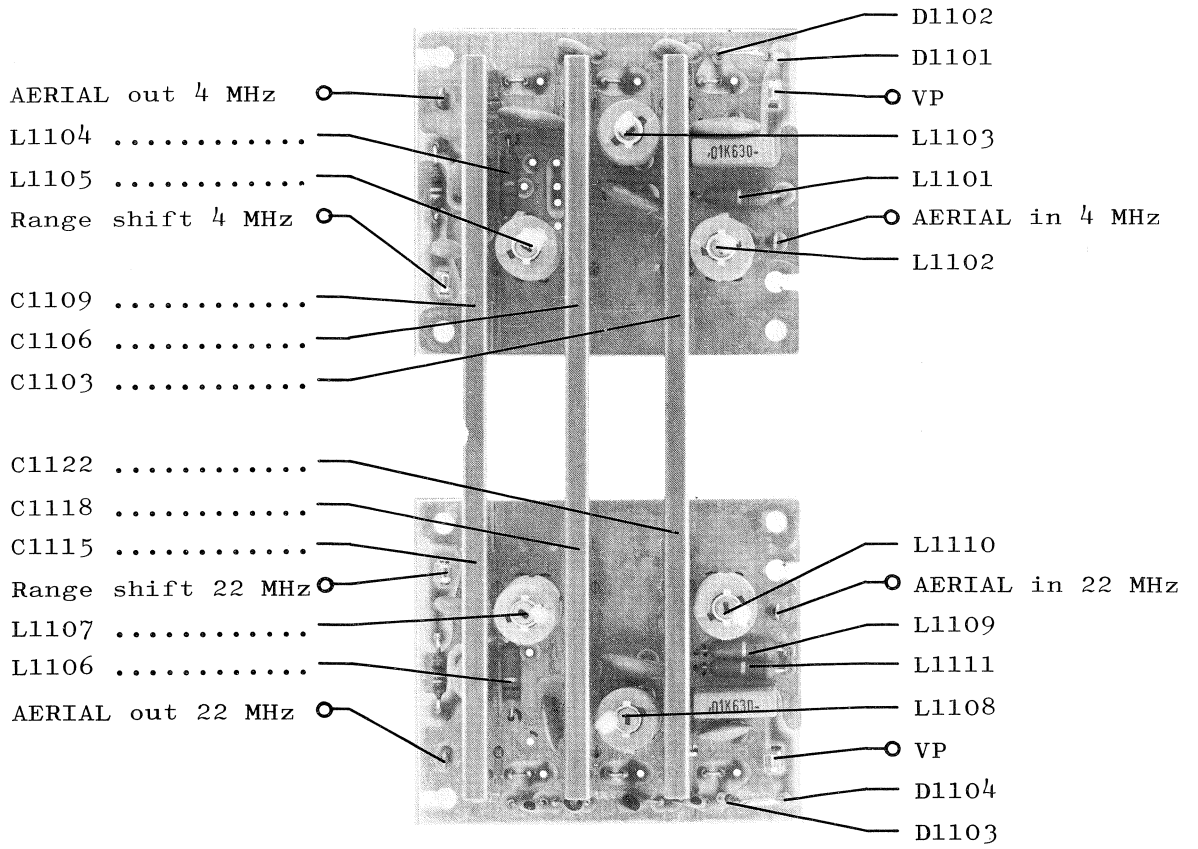
A1/6
R1117

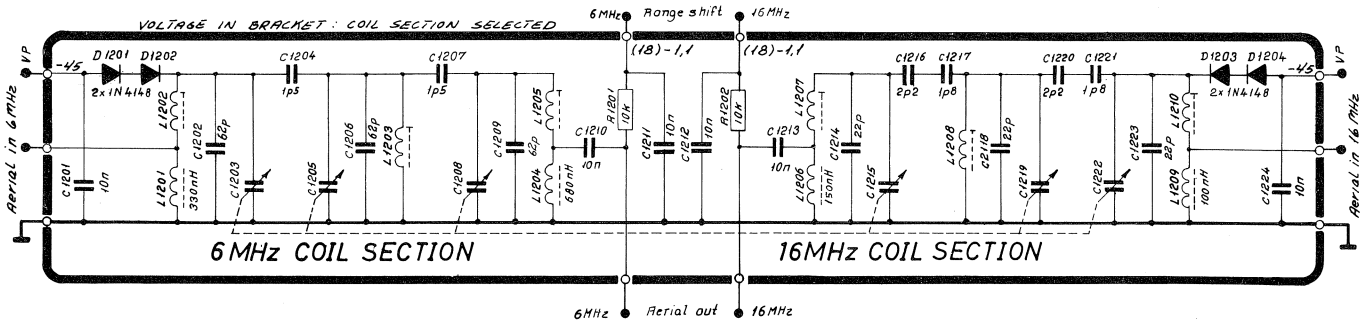
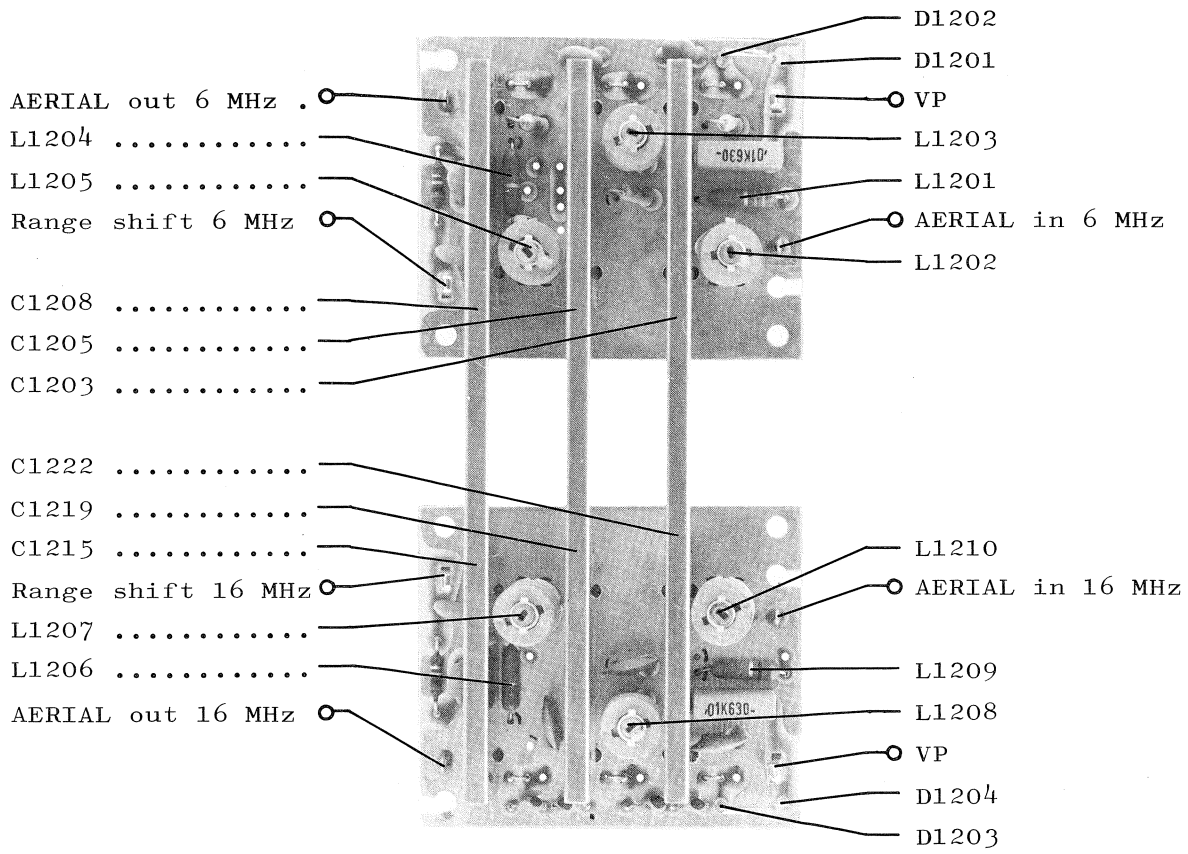




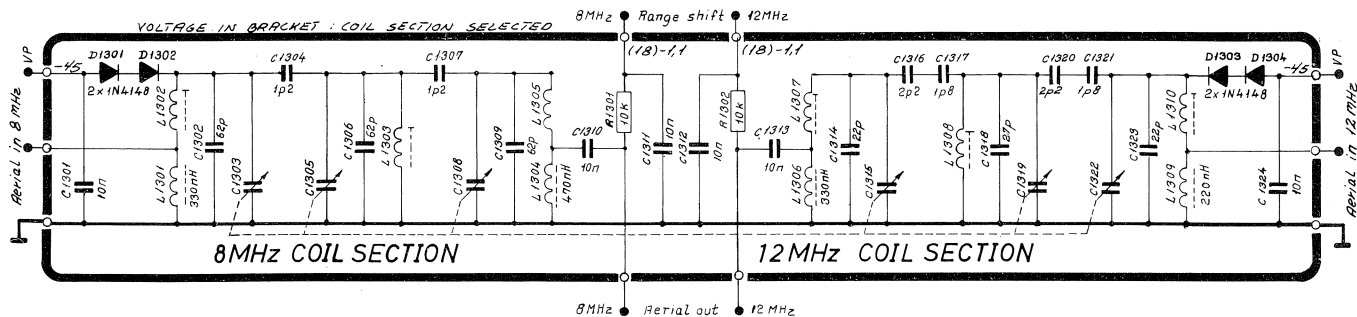
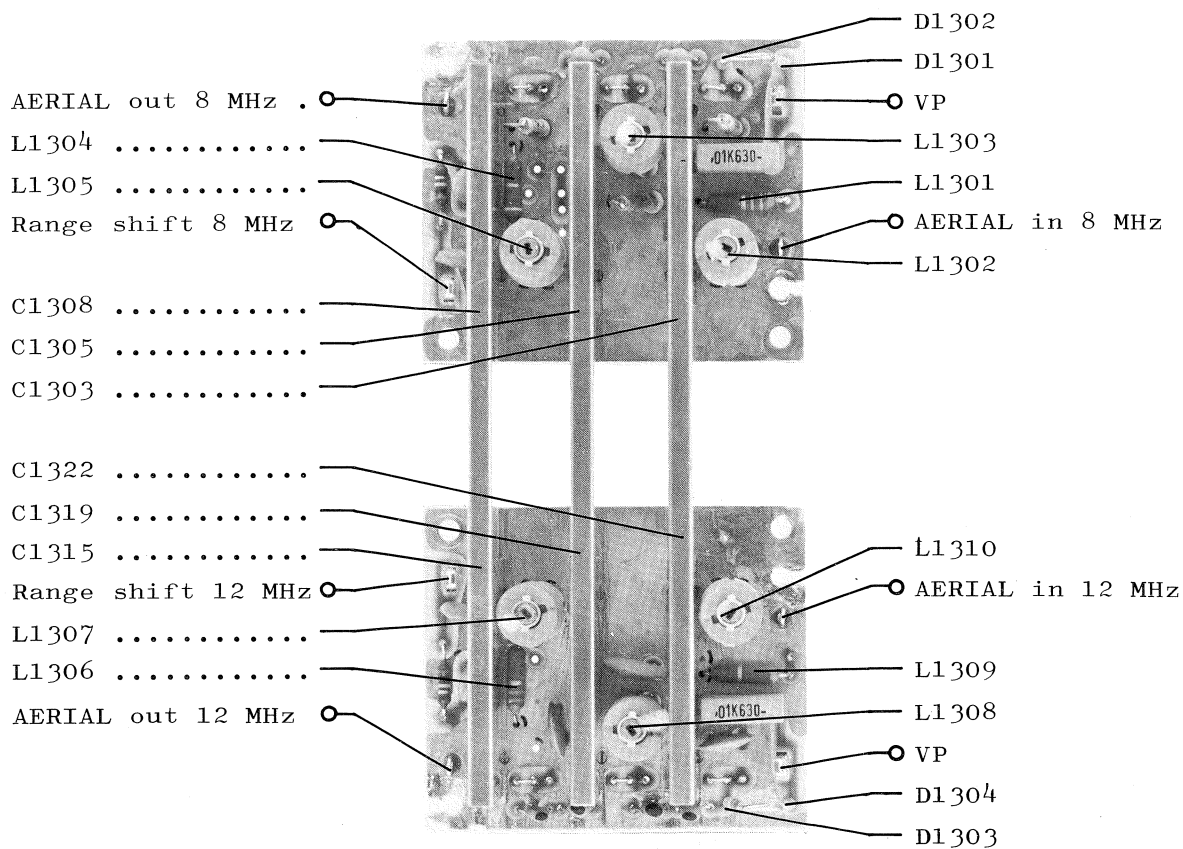
A3/6 R1117







A5/6 R1117



CIRCUIT DESCRIPTION 1ST MIXER AND 2ND MIXER R1117

This unit contains the aerial input switching diodes, the first mixer, the first IF selectivity and the second mixer.

1ST MIXER

From the coil sections the signal is fed to the balanced transformer TR1401 and via the impedance step-up transformers TR1402 and TR1403 to the balanced FET mixer T1401 and T1402. The first local oscillator signal from the VCO BUFFER is fed into the sources of the FET's. The difference frequency on the drains of the FET's is filtered out in the tuned circuit TR1404 and C1405.

1ST IF SELECTIVITY

The tuned transformer TR1404 ensures the proper generator impedance for the crystal filter TL1401. The center frequency of the filter is 10.6085 MHz. The tuned circuit L1401 and C1409 in conjunction with R1407 ensures the proper load impedance for the crystal filter and improves the far away attenuation of the filter.

2ND MIXER

From the crystal filter the signal is fed to the gate of the second mixer T1403, which is an unbalanced FET mixer. The second local oscillator signal from the VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER is fed into the source of the FET. The difference frequency at the drain of the FET is filtered out in the IF FILTERS.

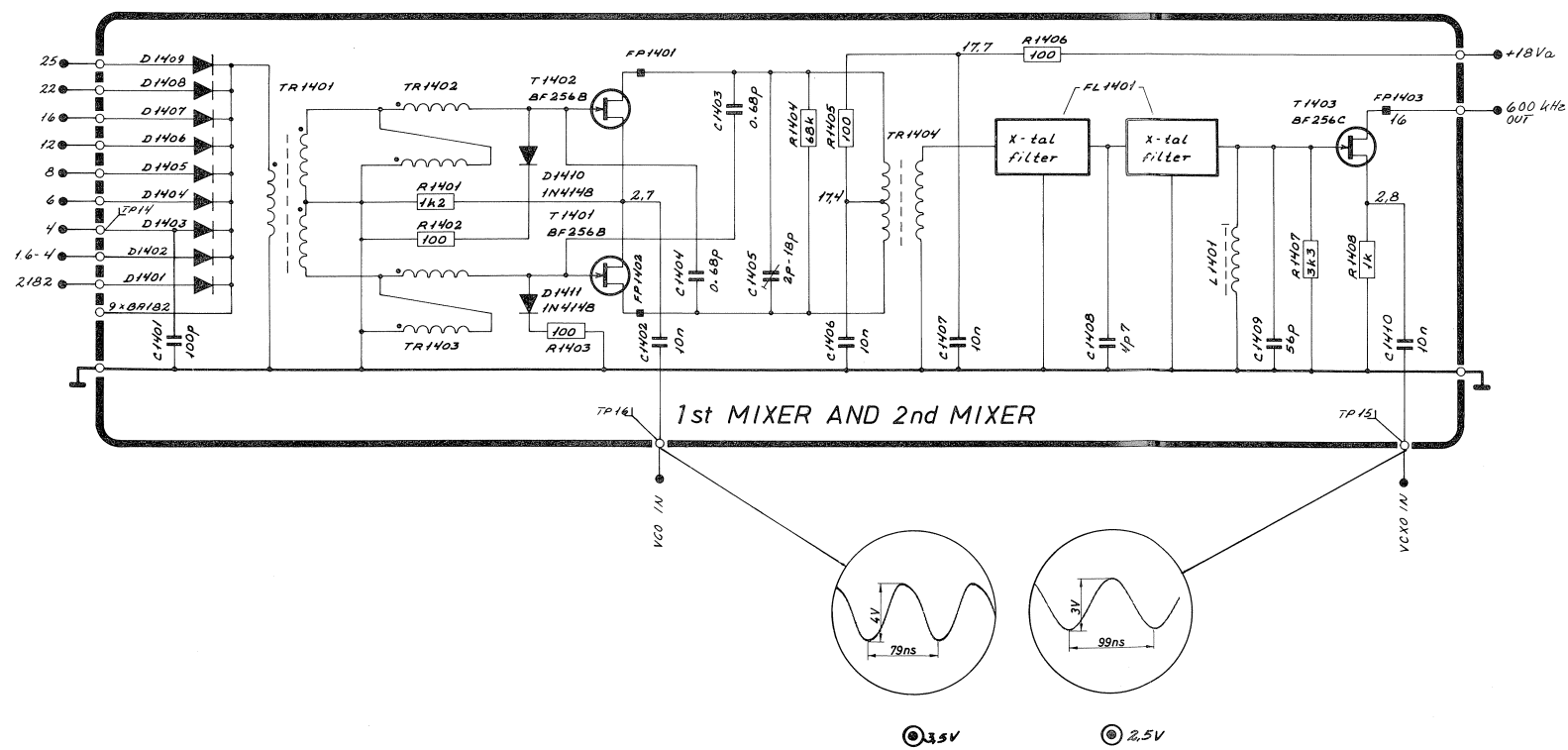
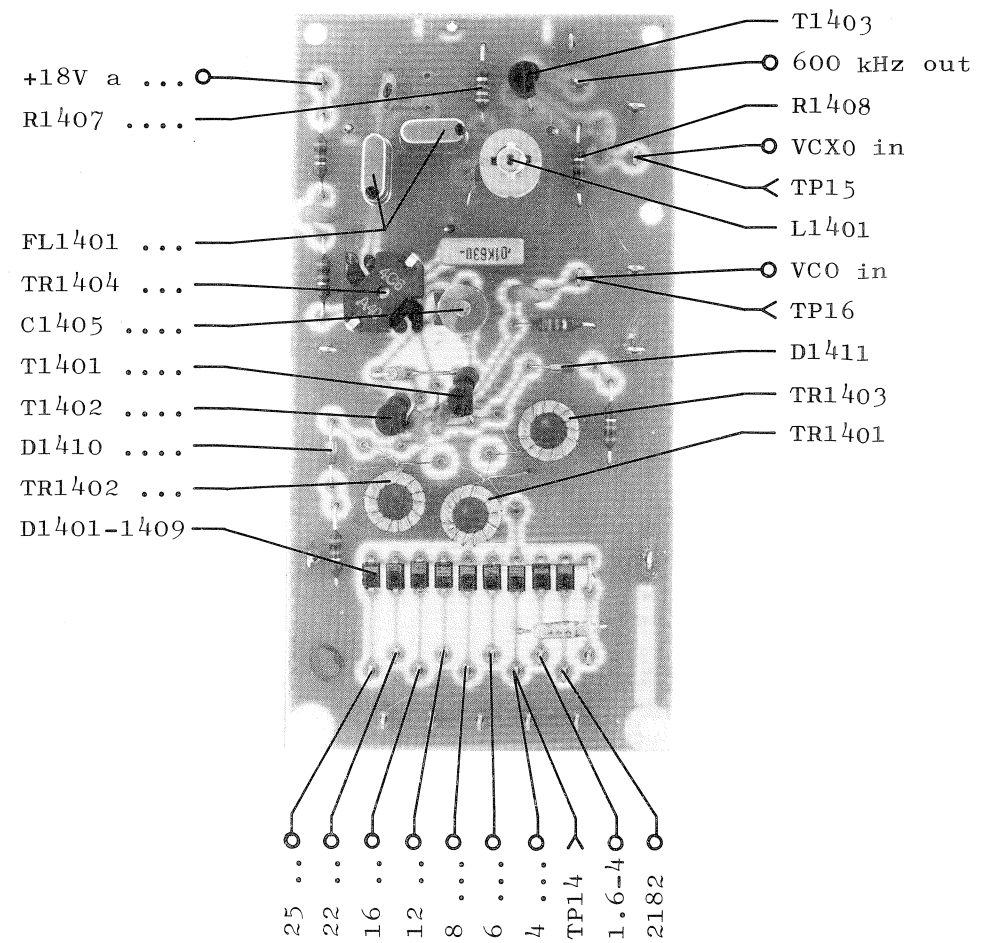
TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
: Diode probe measurements

TP : Testpoints

All voltage statements are typical

A1/2 R1117



CIRCUIT DESCRIPTION IF FILTERS R1117

This unit contains the AM filter, the SSB filter and the first 600 kHz amplifier.

The high order AM filter FL1502 ensures the necessary AM selectivity (adjacent channel selectivity etc.).

The high order SSB filter FL1501 ensures the necessary SSB selectivity (carrier rejection, adjacent channel selectivity etc.).

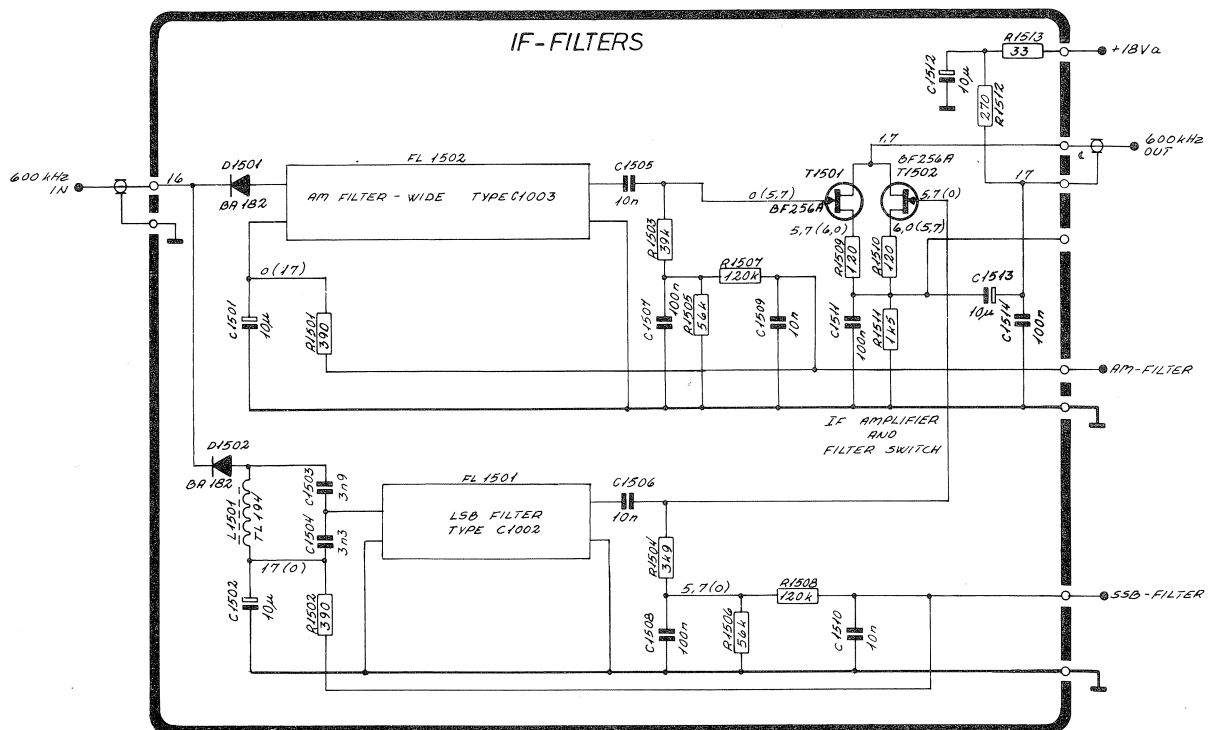
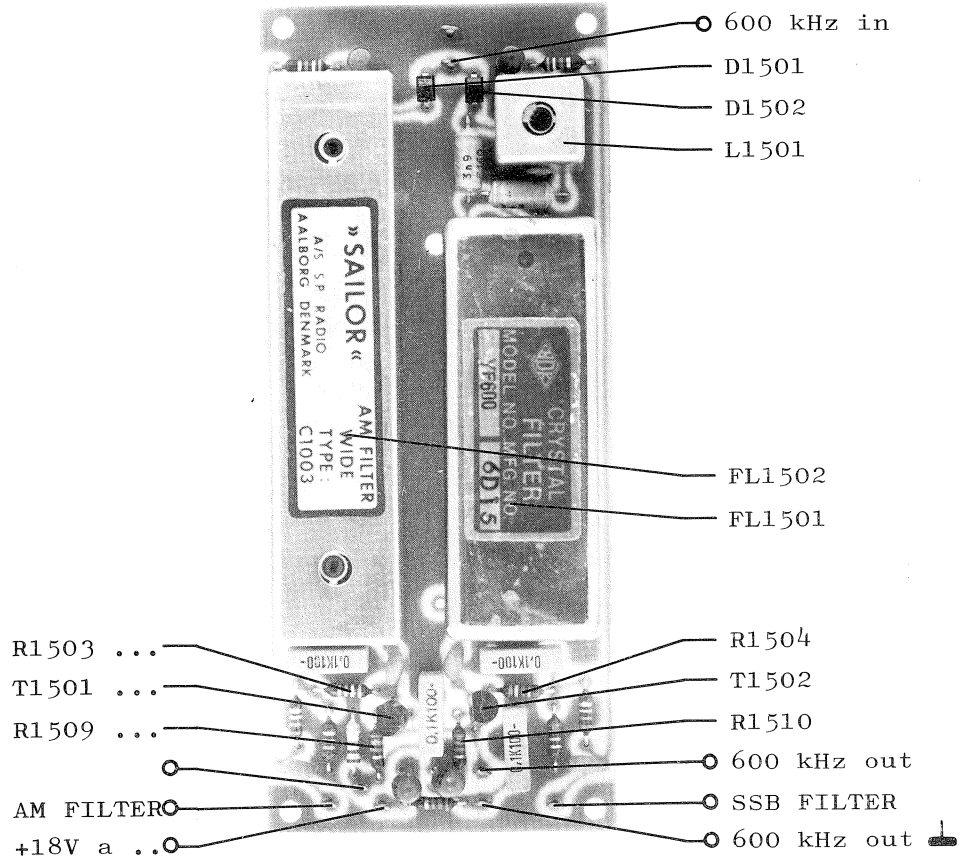
The FETs T1501 and T1502 are the first 600 kHz tuned amplifier stages. The tuned circuit is located on the IF AMPLIFIER, DETECTOR AND AGC circuit board.

The switching-in and -out takes place by means of the switching diodes D1501, D1502 and the FETs T1501 and T1502.

The center frequency of the second IF is 600 kHz.

TEST CONDITIONS

Mode : A3J (A3H)
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
All voltage statements are typical



CIRCUIT DESCRIPTION IF AMPLIFIER, DETECTOR AND AGC

This unit contains the 600 kHz IF amplifier, the AM- and SSB detectors and the AM and SSB AGC system.

IF AMPLIFIER

The IF signal from the IF FILTERS enters the 600 kHz tuned circuit L1601, C1601 and C1602. From a tap on L1601 the signal is fed to the gate of T1603, where it is amplified. The load of T1603 consists of a 600 kHz fixed tuned circuit L1602, C1609 and C1610.

From the drain of T1603 the signal is fed to the gate of T1606 where it is amplified. The load of T1606 consists of a 600 kHz fixed tuned circuit L1603, C1616 and C1617. Diodes D1601 and D1602 are an amplitude limiter circuit.

From the drain of T1606 the signal is fed to the base of the untuned amplifier T1612.

From the collector of T1612 the signal is fed to the base of the tuned amplifier T1615D. The tuned circuit consists of L1605, C1630 and C1633.

DETECTOR

From L1605 the signal is fed to the bases of T1615A and T1615B, which are an envelope transistor detector. In the SSB mode, a carrier reinjection signal is added to the IF signal via T1615C and L1605 in such a way that the modulation present is kept low, approx. 11% in the resulting A3H signal, to ensure low detector distortion.

A1/2 R1117

AGC SYSTEM

The control of the amplification is carried out by reducing the load impedance of the three tuned amplifier stages, by means of the transistors T1601, T1604 and T1607. By increasing current in the above mentioned transistors, the load impedance of the tuned amplifier stages decreases, thus decreasing the voltage gain. The AGC voltage is fed to T1601, T1604 and T1607 from C1615 via the emitter follower T1605.

A3H (AM) MODE

The information to the AGC system is taken out at the emitter of T1615D and fed to the emitter follower T1611 and via C1623 to the peak-peak detector consisting of D1606 and T1610. At the same time T1610 acts as a DC amplifier with the ripple filter R1630, C1620. The signal is then fed to another emitter follower T1609. From the emitter the signal is fed to the capacitor C1615, thus feeding the AGC voltage to the transistors T1601, T1604 and T1607.

The resistors R1623, R1631, the transistor T1613 and the diode D1604 is the discharge path. In the A3H mode T1614 is off and T1605 is inactive.

A3J (SSB) MODE

Charge of C1615:

As in the A3H mode the signal is taken out at the emitter of T1615D and passed through T1611, T1610, T1609 and R1624 to C1615.

At the same time C1629 is charged to 4.7 Volt via T1608 and R1617, and thus giving a reference voltage for the hang AGC system. In the A3J mode the transistor T1614 is ON and thus the transistor T1613 is off. This means that the base of T1614 has a DC level of 1.4 Volt.

Discharge of C1615:

When the IF signal disappears the only discharge path for C1615 is via the base of the emitter follower T1605 as T1613 is off. At the same time the discharge of C1629 via R1655, T1614 and D1604 starts. When the voltage across C1629 is so low that T1614 goes off, T1613 goes ON and discharges C1615 via R1631 and R1624.

Remaining functions of the unit:

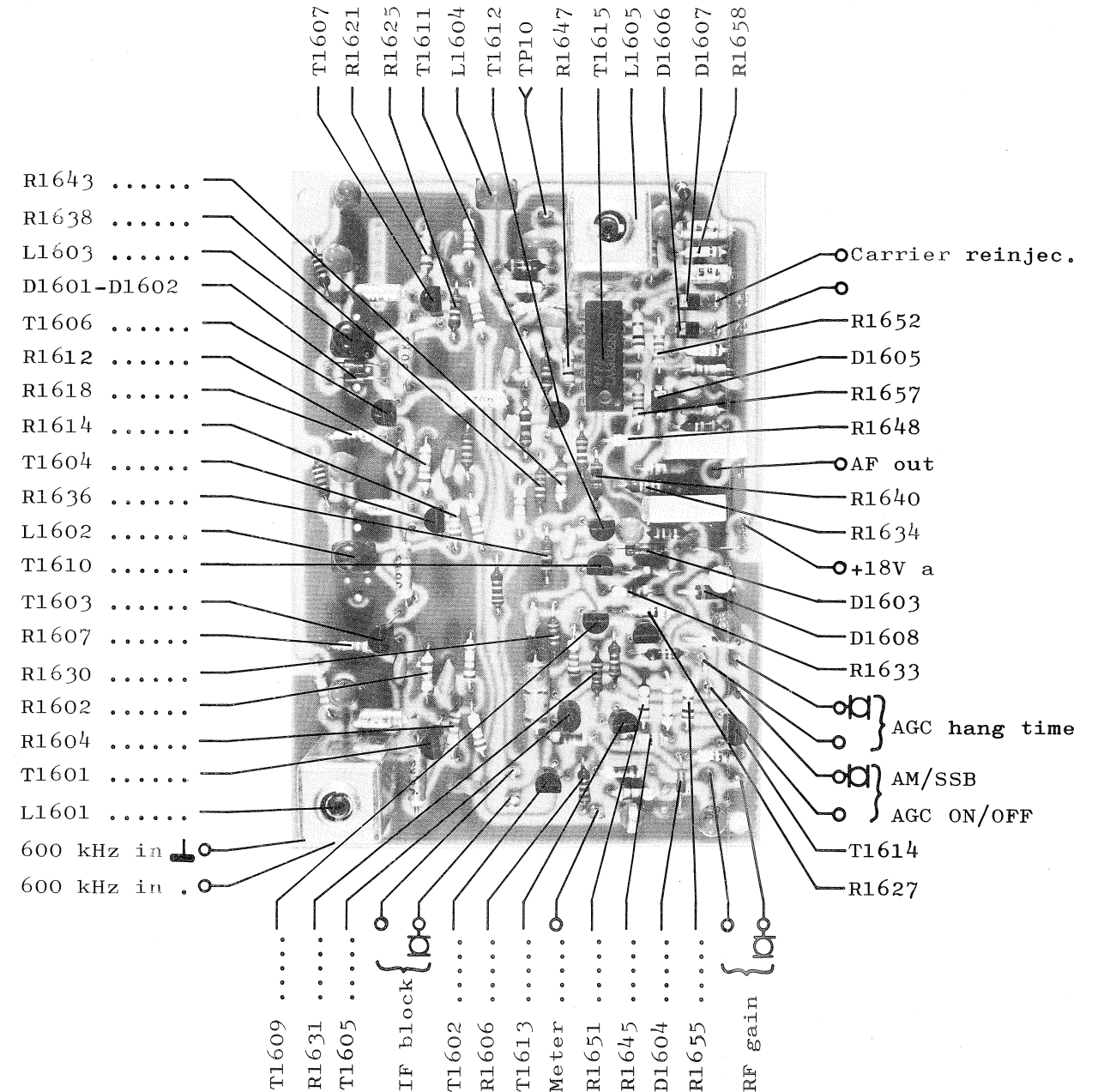
The transistor T1602 is the emitter follower for the AGC meter.

The AGC on/off function is performed by short-circuiting R1619 and C1615.

The MGC function is performed by means of the voltage divider R1616, R2001 (RF-GAIN), R2002, R1608, R1609 and R1610.

TEST CONDITIONS

- Frequency selector : f = 4.2000 MHz
- Mode : A3J (A3H)
- Clarifier : Center position
- HF input : 1 mV EMF/50 ohm
- AGC : ON
- RF gain : Maximum
- Front end tuned to max. meter reading
- Oscilloscope input : Passive probe 10 Mohm//11 pF
- DC voltmeter input : 10 Mohm
- : Diode probe measurements
- TP : Testpoints
- All voltage statements are typical



A2/2 R1117

CIRCUIT DESCRIPTION AUDIO AMPLIFIER UNIT

This unit contains the AF preamplifier, the active low-pass filter, the 0 dBm fixed AF output amplifier and the AF power amplifier.

AF PREAMPLIFIERS AND LOW-PASS FILTER

The AF signal from the detector is amplified in the operational amplifier IC1701d and fed to the fifth order active low-pass filter with a cut-off frequency of 2.9 kHz. The active filter is built-up around the operational amplifiers IC1701b and IC1701c. The signal is then fed to the 0 dBm fixed AF output amplifier IC1701a. The output from this enters the output transformer T1801 on the INPUT FILTER circuit board.

AF POWER AMPLIFIER

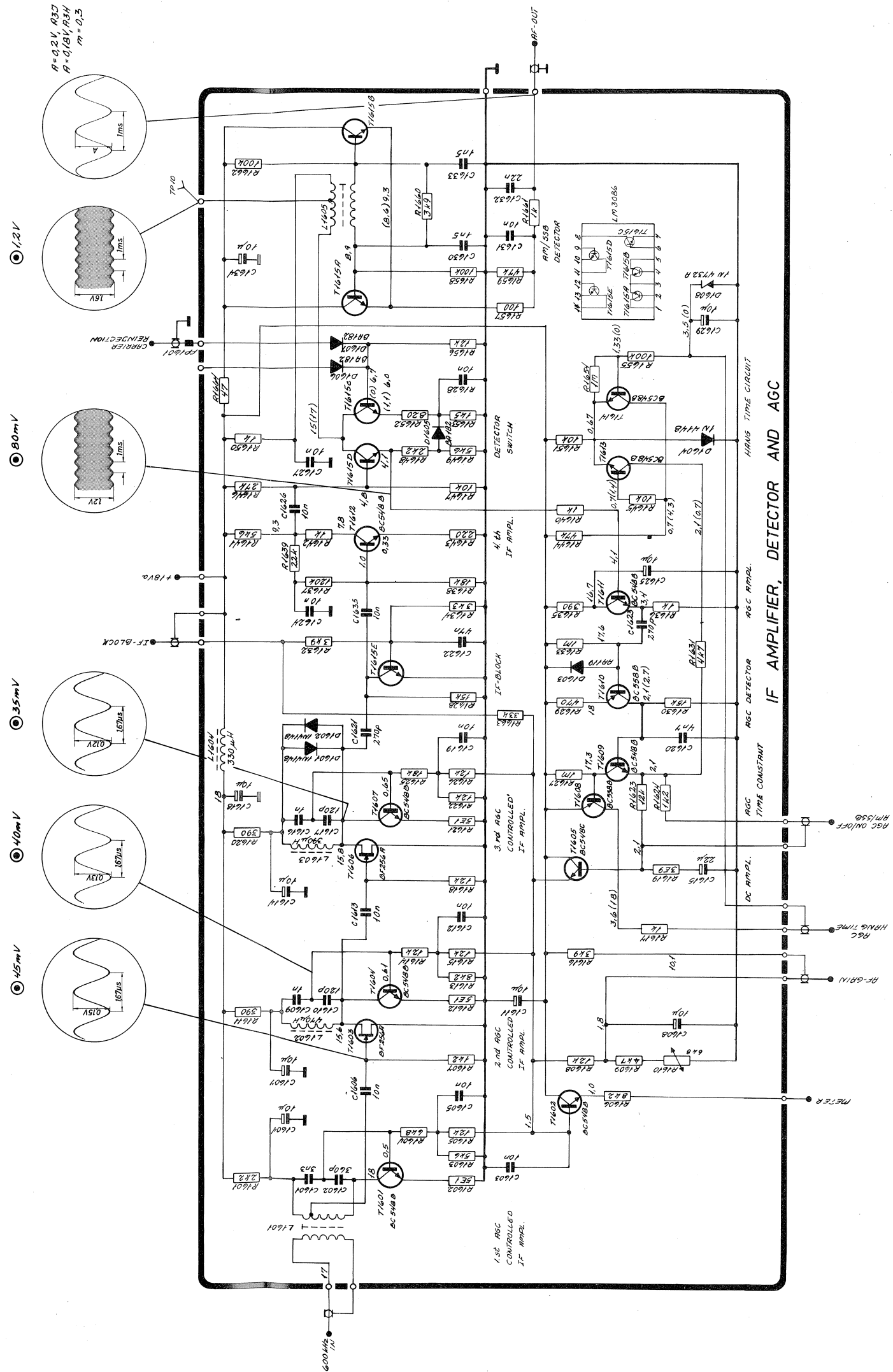
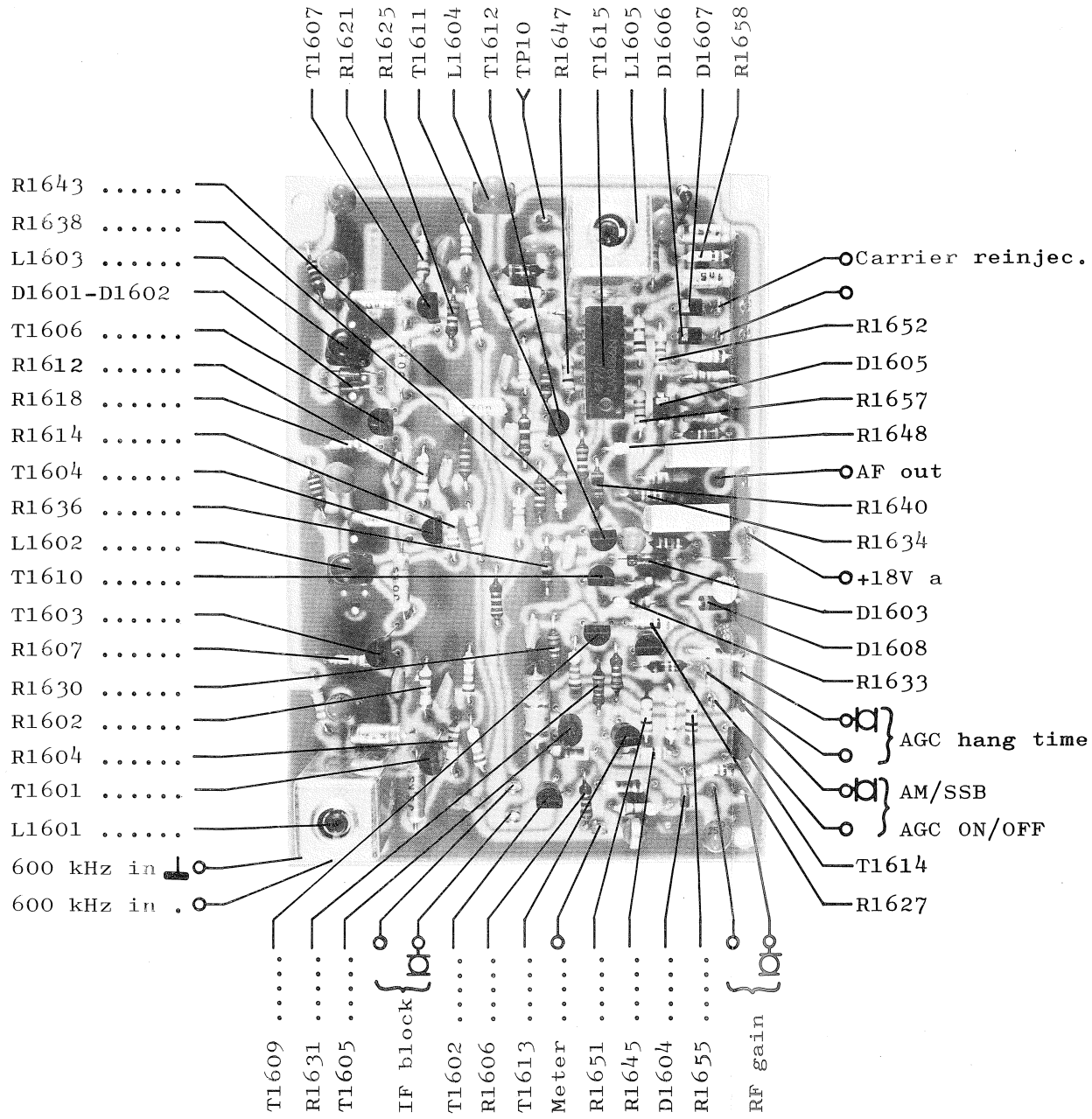
From the output of the active filter the signal is fed to the AF-GAIN (R2003), and from there to the input terminal, pin 8 of IC1702.

The integrated AF power amplifier IC1702 has two built-in protection facilities, namely output current limiter and thermal shut-down, which means that the output amplifier cannot be destroyed by overload.

From the output terminal, pin 12, the signal is fed to the loudspeaker and the voltage divider for headphones output.

TEST CONDITIONS

Frequency selector : f = 4.2000 MHz
Mode : A3J (A3H)
Clarifier : Center position
HF input : 1 mV EMF/50 ohm
AGC : ON
RF gain : Maximum
Front end tuned to max. meter reading
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
: Diode probe measurements
TP : Testpoints
All voltage statements are typical



C

Th
fi

AF

Th
IC
qu
fi
ar
on

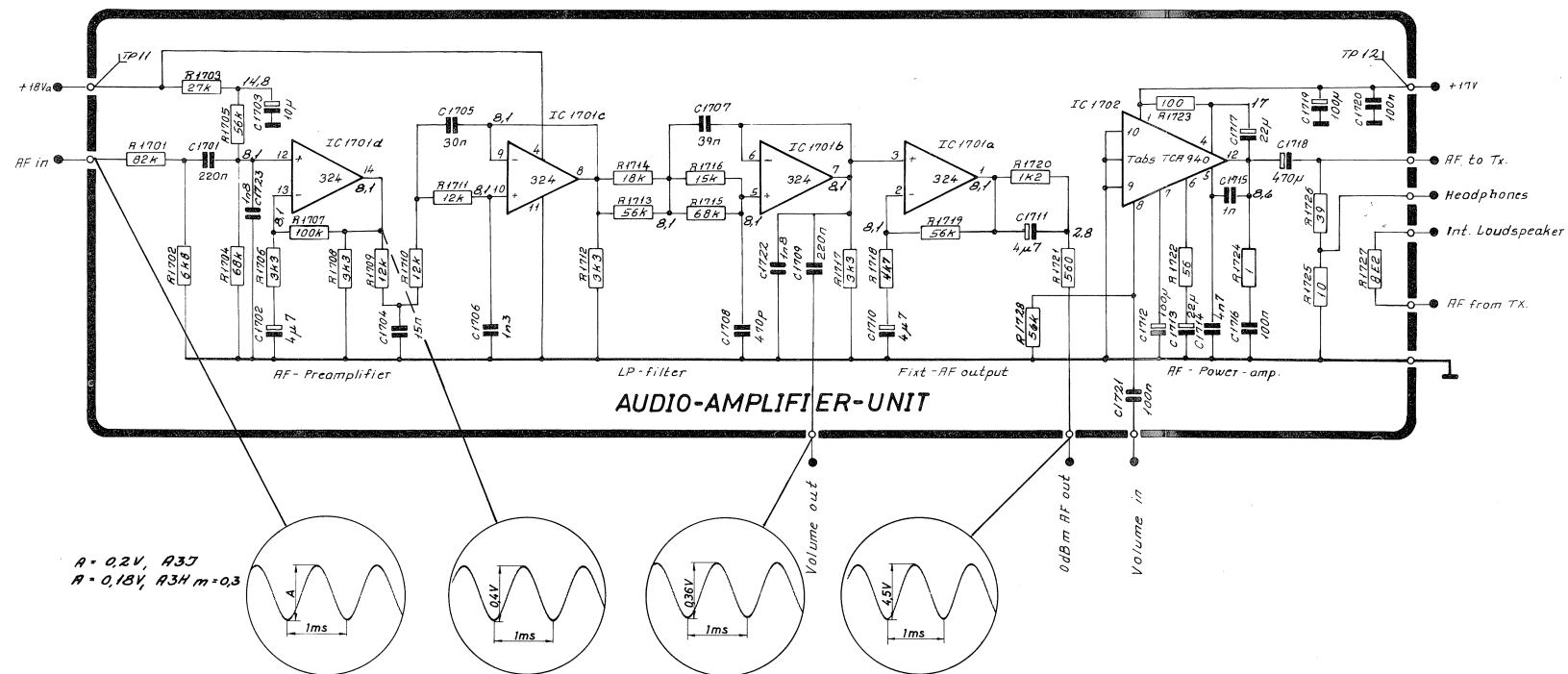
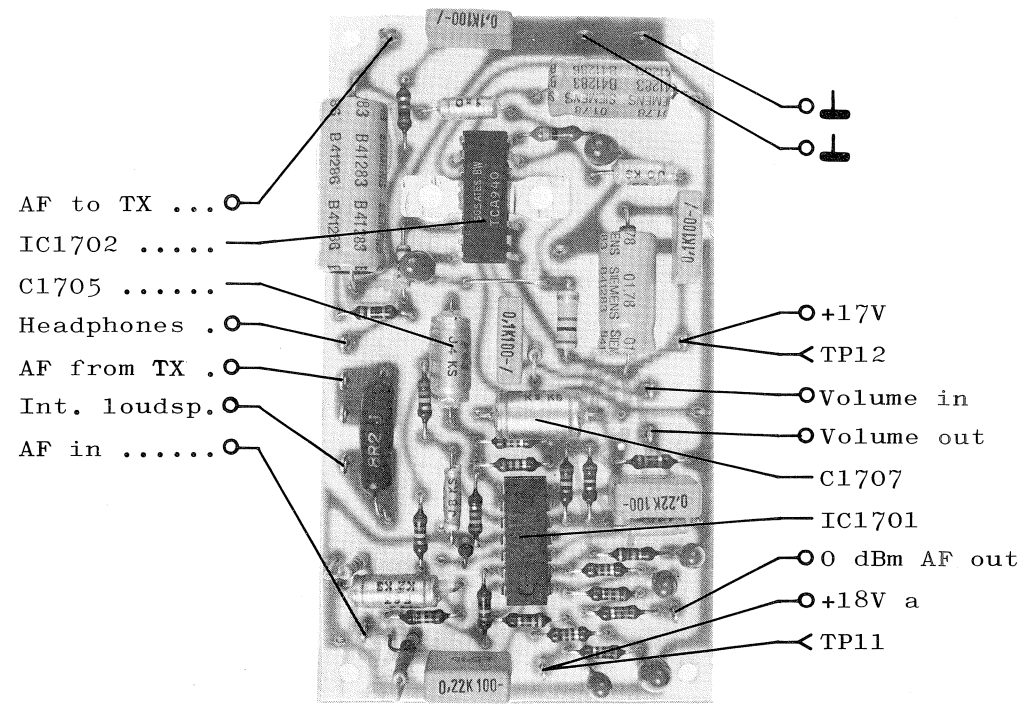
AF

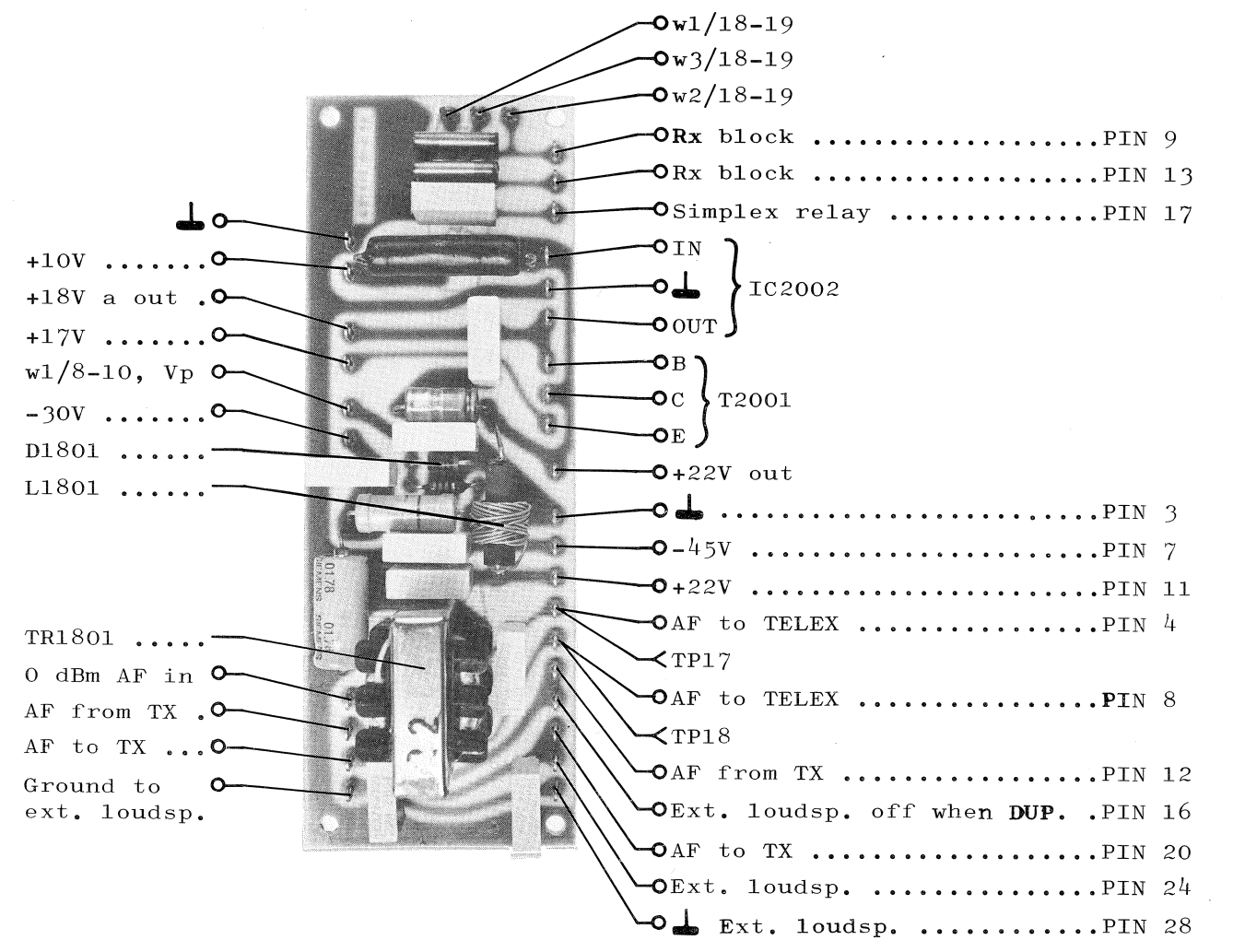
Fr
an

Th
na
pu

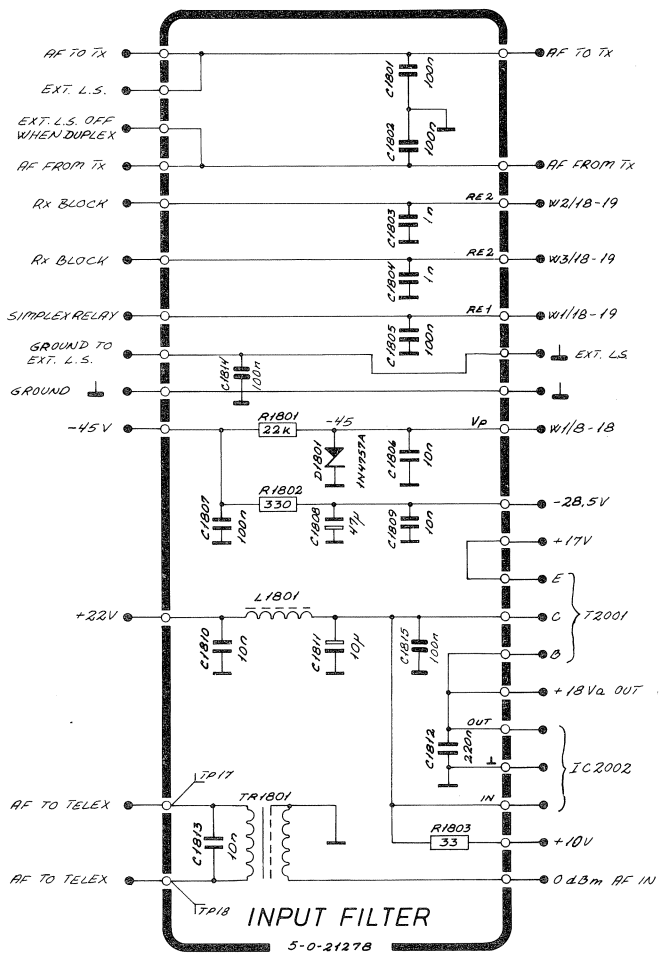
Fr
vo

MC





A1/2 R1117



CIRCUIT DESCRIPTION VCO BUFFER R1117

This unit contains the VCO buffer amplifier.

The signal from the VCO-UNIT enters the gate of the FET amplifier T2101 via the impedance step-up transformer TR2101. To ensure correct load impedance of the VCO amplifier TR2101 is loaded with R2101.

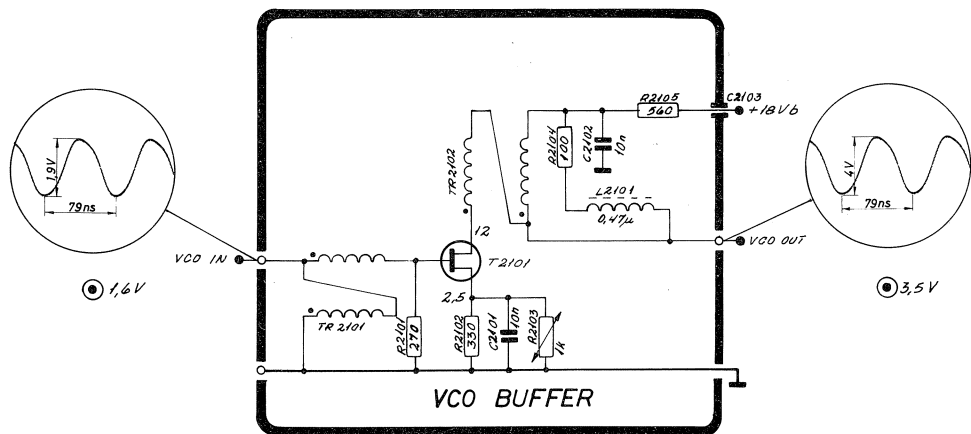
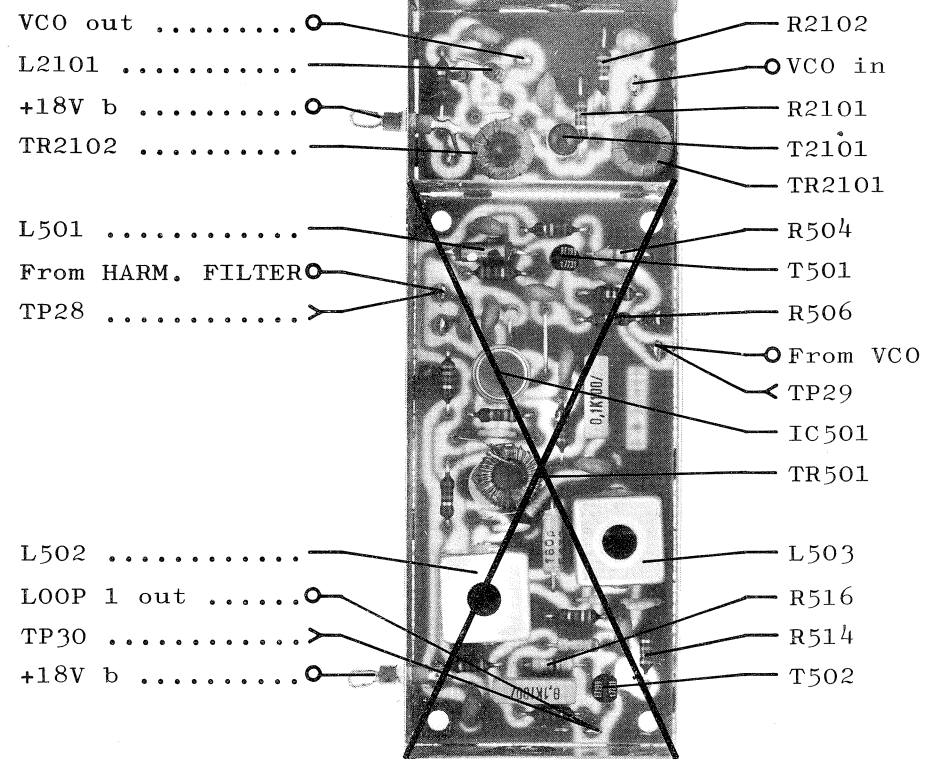
On the drain of T2101 is an impedance step-down transformer TR2102 and a frequency response compensation circuit L2101 and R2104.

The buffer stage is temperature compensated by means of R2103.

TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
: Diode probe measurements
TP : Testpoints
All voltage statements are typical

A1/2 R1117

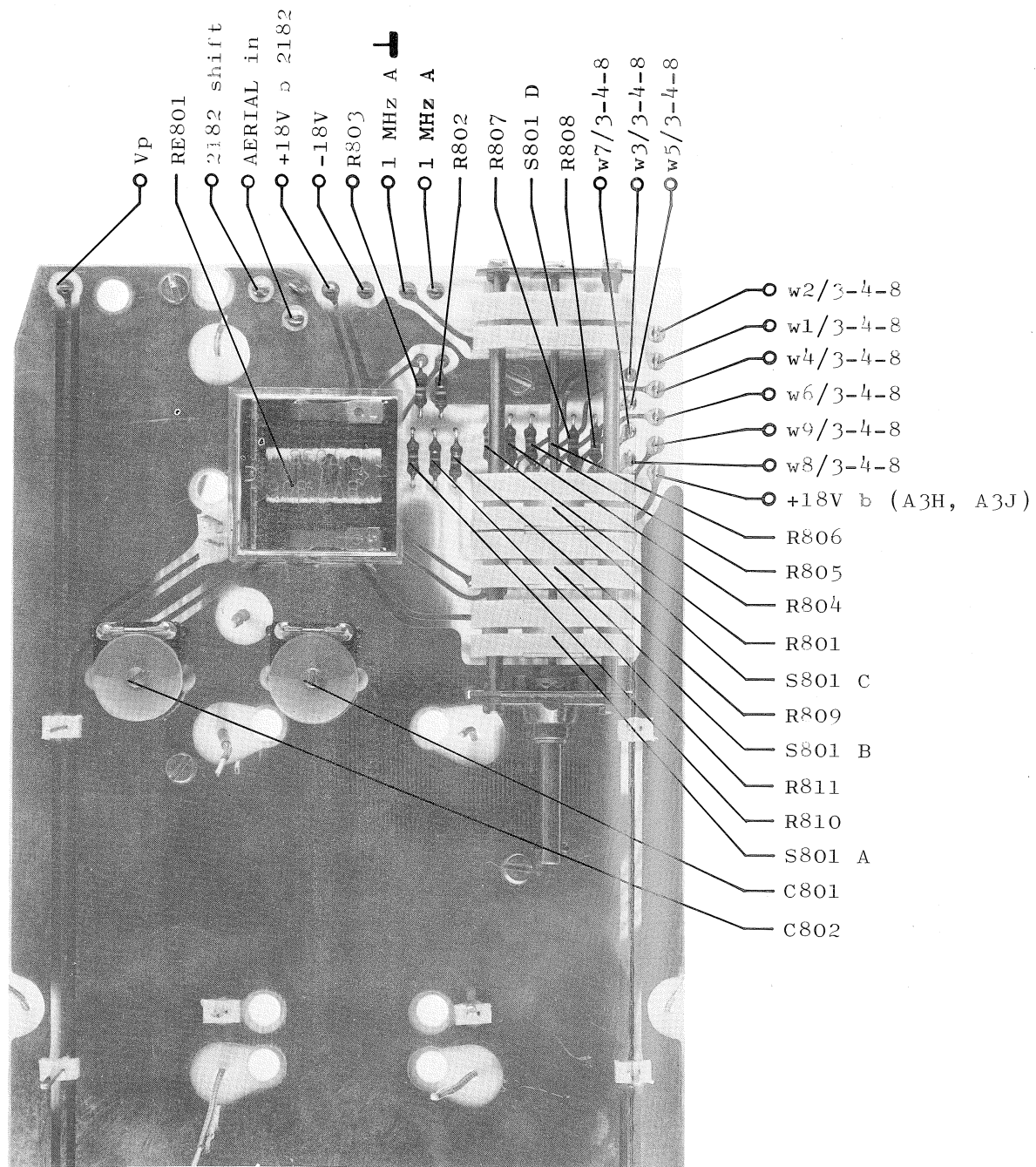


CIRCUIT DESCRIPTION BASE PRINT R1117

This PCB contains the MHz switch, the 2182 kHz shift relay and the aerial tuning capacitors.

The MHz switch S801 selects the VCO, HARMONIC FILTER and COIL SECTION in question. The 2182 kHz shift relay selects the proper VCO, HARMONIC FILTER and the fixed tuned 2182 kHz aerial coil section.

The capacitor C801 is the C.T. band aerial tuning capacitor and C802 is the 2182 kHz aerial tuning capacitor.



CIRCUIT DESCRIPTION AERIAL SWITCH R1117

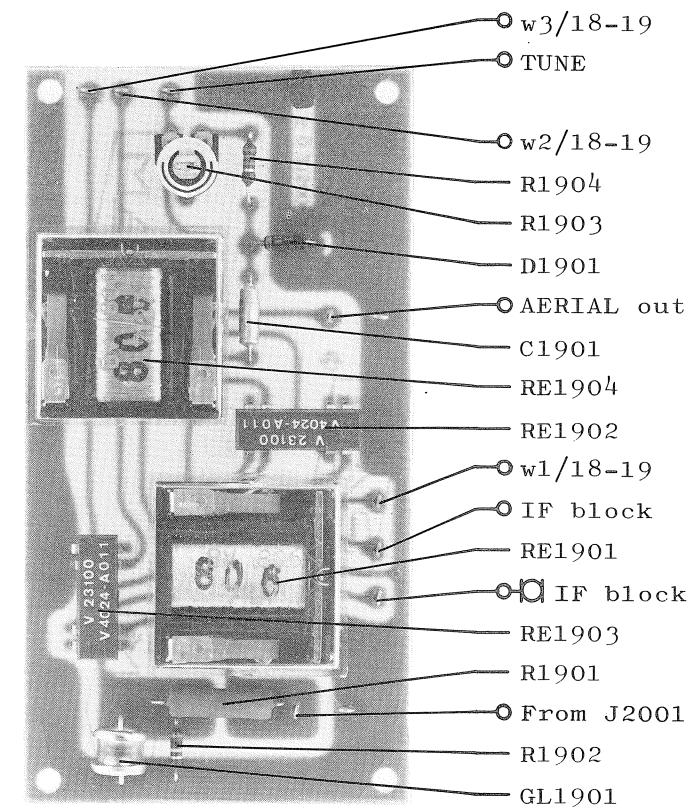
This unit contains the simplex relay and the noise generator.

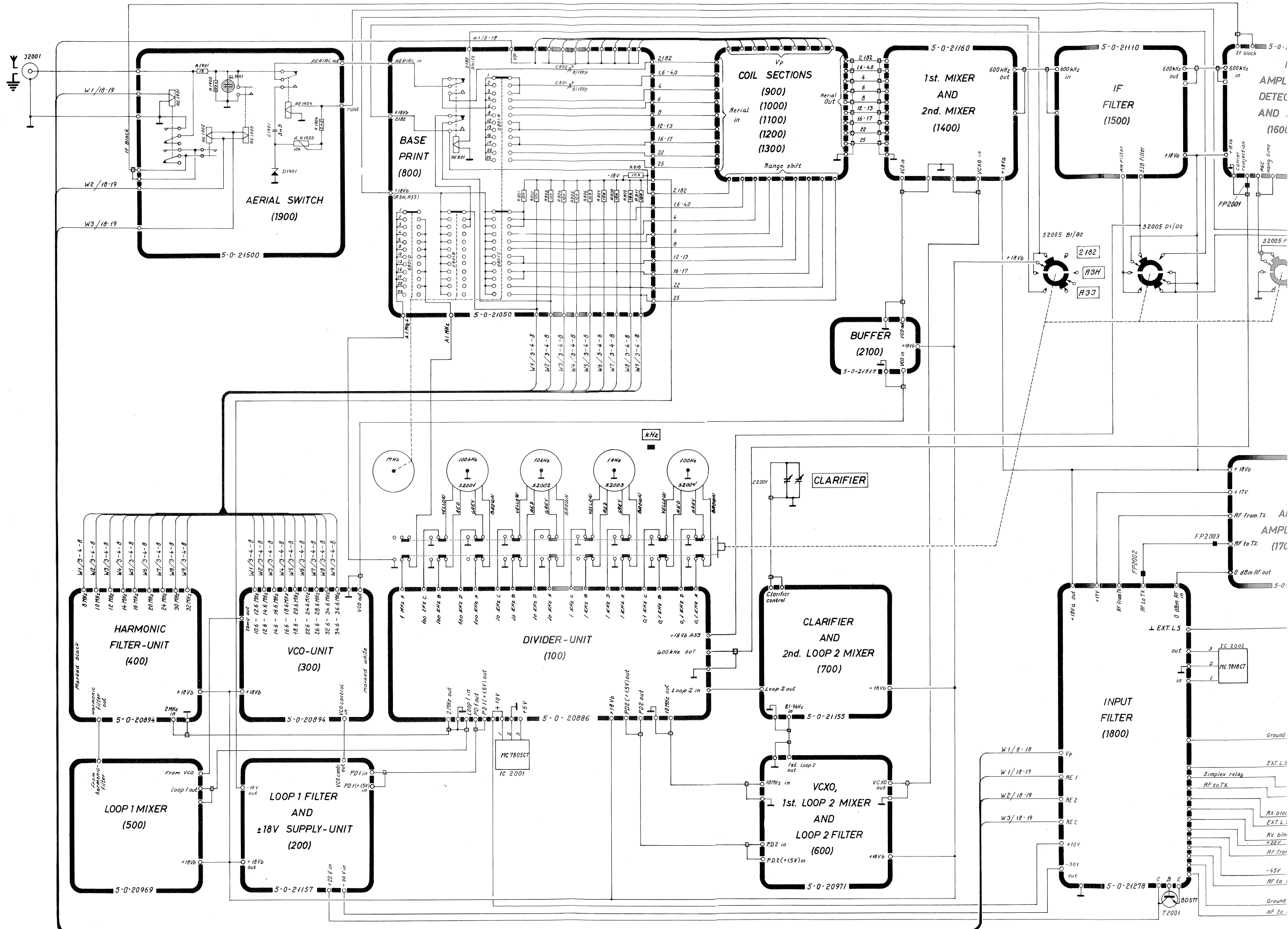
The aerial signal enters the BASE PRINT via R1901 and RE1904. The resistor R1902 and the neon bulb GL1901 are a part of the aerial coil protection circuit.

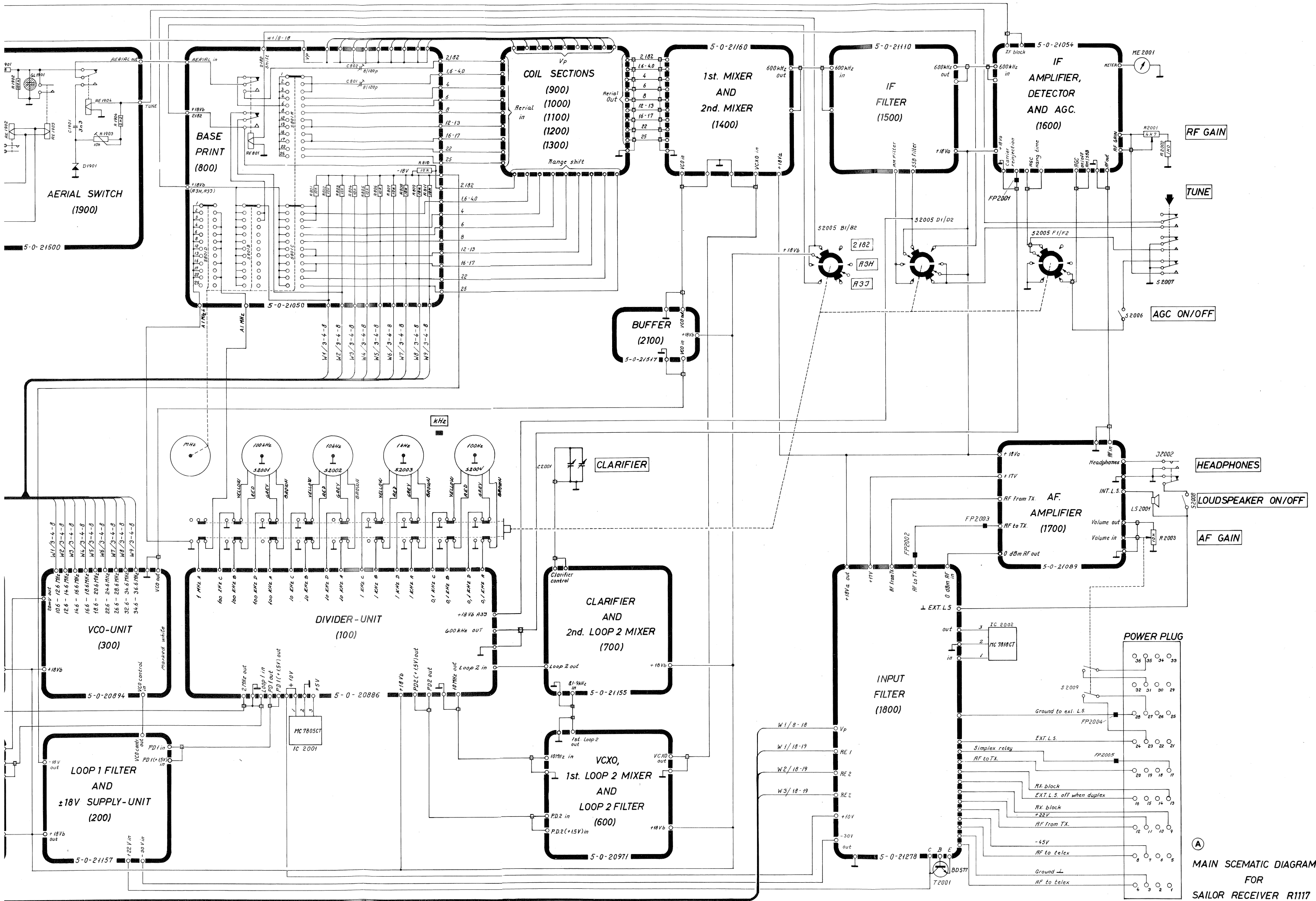
The relay RE1901 is the simplex relay, which short-circuits the aerial and blocks the IF amplifier in the simplex mode when the transmitter is keyed.

The relays RE1902 and RE1903 have the same functions as RE1901 in the telex mode.

The zenerdiode D1901 generates white noise when the relay RE1904 is activated.







RF GAIN

TUNE

AGC ON/OFF

HEADPHONES

LOUDSPEAKER ON/OFF

AF GAIN

MAIN SCHEMATIC DIAGRAM FOR SAILOR RECEIVER R1117

