Sailor

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INSTRUKTIONSBOG FOR SAILOR R 1117

INSTRUCTION BOOK FOR SAILOR R 1117

A/S S. P. RADIO · AALBORG · DENMARK

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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.

<u>Frequency ranges</u>:

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	

<u>Tuning error</u>: less than 50 Hz

<u>Frequency drift, short time</u>: less than 5 Hz

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

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

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<u>Sensitivity, 20 dB SN/N</u>:

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

<u>Adjacent Channel Selectivity</u>:

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

<u>Blocking</u>:

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

TECHNICAL DATA cont.:

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

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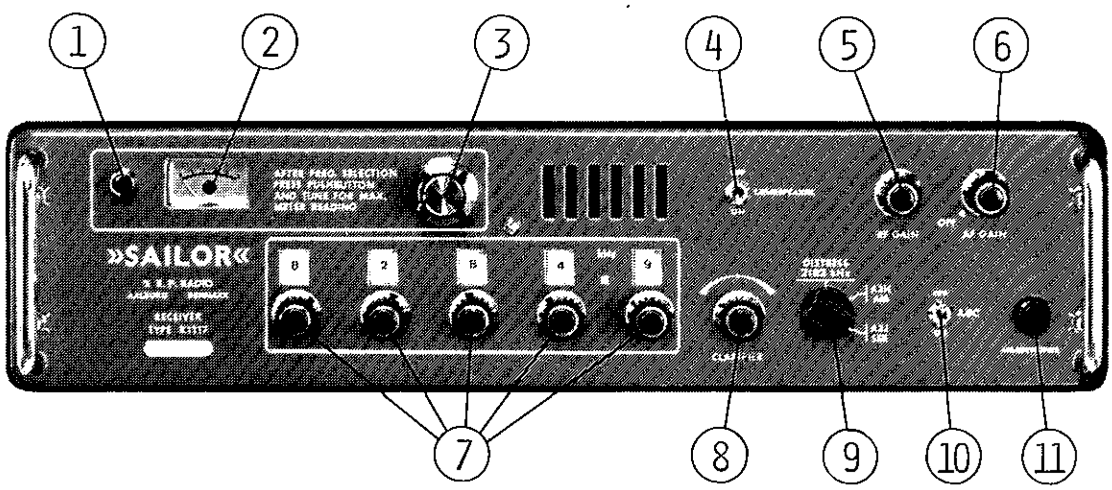
CONTROLS



(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.

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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

Receptable for headphones.

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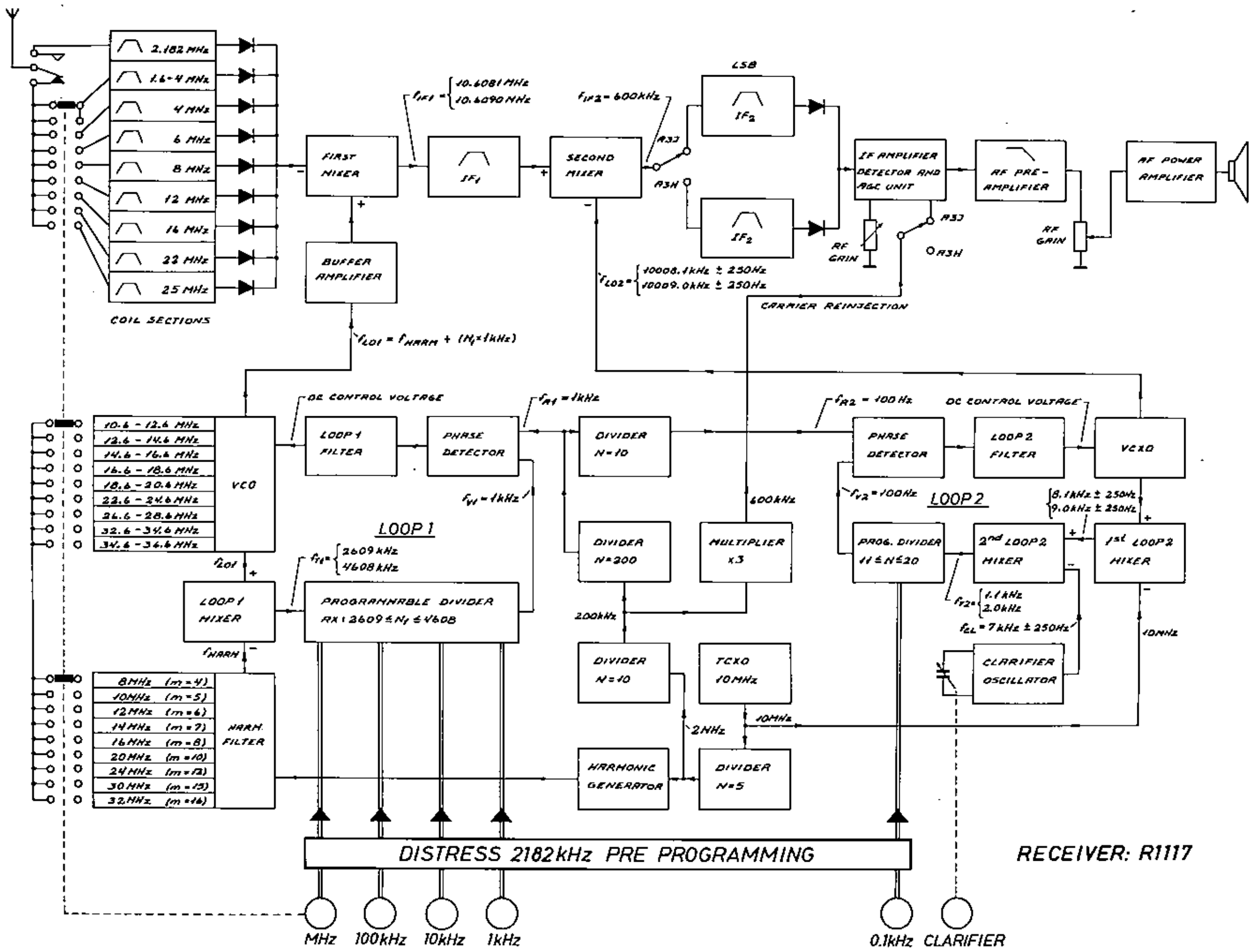

RECEIVER R1117

The SAILOR R1117 is a fully synthesized double superhetereodyne 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_{L01} 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 monolitic crystal filter with a center frequency of 10.6085 MHz to the SECOND MIXER, where the signal is mixed with the f_{L02} 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.

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_{LO1} to First Mixer is generated in the Phase Locked Loop 1 and has a resolution of 1 kHz.

Local oscillator signal f_{LO2} to Second Mixer is generated in the Phase-Locked Loop 2 and has a resolution of 100 Hz.

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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_{LO1} 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_{LO1} in the following way:

In the Loop 1 Mixer the counter frequency f_{T1} is produced from the VCO frequency f_{LO1} and the frequency f_{HARM} which is a multiple of 2 MHz. The 2 MHz signal is generated from the 10 MHz TCXO

$$f_{T1} = f_{LO1} - f_{HARM} = f_{LO1} - (m \times 2\text{ MHz}) = N_1 \times 1\text{ kHz}$$

For every 2 MHz band a new f_{LO1} 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}

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

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_{LO1} 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_{LO1} by e.g. 1 kHz can be performed by changing the dividing figure N_1 in the Programmable Divider by one.

$$f_{LO1} = f_{HARM} + (N_1 \text{ x } 1 \text{ kHz})$$

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.

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

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.

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

Stop figure: $S_1 = -609$

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

Output frequency from Loop 1:

$$f_{LO1} = m \text{ x } 2 \text{ MHz} + (P_1 + 2609) \text{ x } 1 \text{ kHz}; \quad 4 \leq m \leq 16$$

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_{LO2}.

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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.

Start figure: $0 \leq P_2 \leq 9$

Stop figure: $S_2 = 20$

Dividing figure: $N_2 = S_2 - P_2 = 20 - P_2$

Output frequency from Loop 2:

$$f_{LO2} = 10\text{ MHz} + f_{CL} \pm 250\text{ Hz} + (N_2 \times 0,1\text{ kHz})$$
$$f_{LO2} = 10.007\text{ MHz} \pm 250\text{ Hz} + (20 - P_2) \times 0,1\text{ kHz}$$
$$f_{LO2} = 10.009\text{ MHz} \pm 250\text{ Hz} - (P_2 \times 0,1\text{ kHz})$$

RECEIVING FREQUENCY F_{RX} FOR RECEIVER R1117

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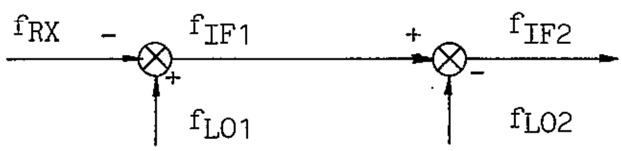


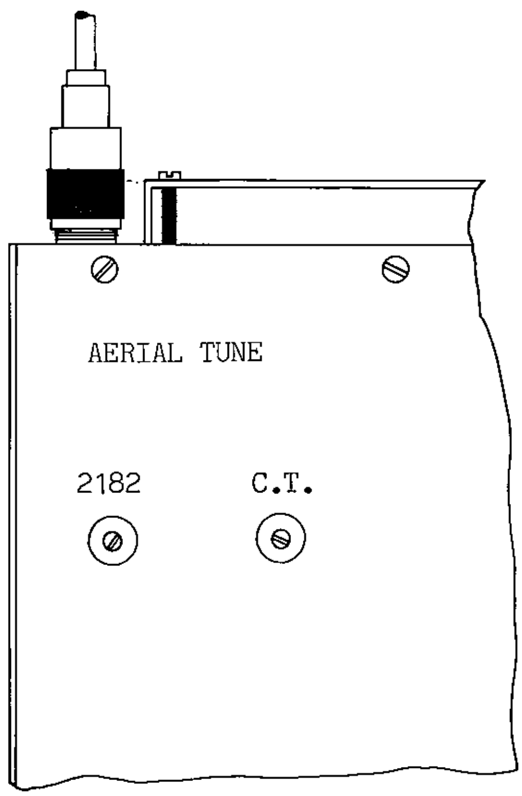
$$f_{IF2} = 0,600\text{ MHz}$$
$$f_{LO2} = 10,009\text{ MHz} \pm 250\text{ Hz} - (P_2 \times 0,1\text{ kHz})$$
$$f_{IF1} = f_{IF2} + f_{LO2} = 10,609\text{ MHz} - (P_2 \times 0,1\text{ kHz})$$
$$f_{LO1} = m \times 2\text{ MHz} + (P_1 + 2609) \times 1\text{ kHz};\ 4 \leq m \leq 16$$
$$f_{RX} = f_{LO1} - f_{IF1} = (m - 4) \times 2\text{ MHz} + (P_1 + 0,1\ P_2) \times 1\text{ kHz}$$

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 measurings 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.)	±2%
				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.:

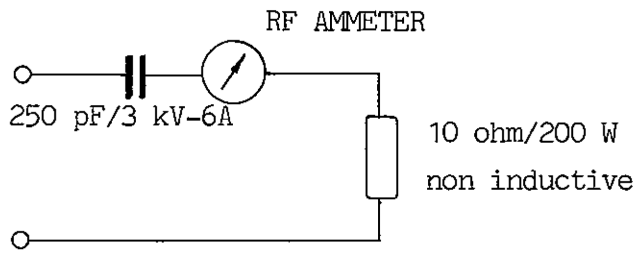
T1127	N140X	S1300	R1117	Equipment	
		X		<u>TONEGENERATOR:</u>	
				Frequency range	200 - 3000 Hz
				Output	1V RMS
				Output impedance	≦ 600 ohm
				E.g. PHILIPS	PM5107
			X	<u>AF VOLTMETER:</u>	
				Sensitivity (f.s.d.)	300 mV
				Input impedance	≧ 4 ohm
				Accuracy (f.s.d.)	±5 %
				Frequency range	100 Hz - 5 kHz
				E.g. PHILIPS	PM2503
		X	X	<u>FREQUENCY COUNTER:</u>	
				Frequency range	100 Hz - 40 MHz
				Resolution	0,1 Hz at f ≧ 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
			X	<u>SIGNAL GENERATOR</u>	
				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

NECESSARY TEST EQUIPMENT cont.:

T1127	N140X	S1300	R1117	
				POWER SUPPLIES
X				T1127: V_{out} 26,5V DC I_{out} 60A DC E.g. 2 pcs. LAMBDA type LMG24
		X	X	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
		X		TEST BOX S1300: SP type S1300/01 TEST BOX
X				POWER METER: Power range 500W E.g. Bird Thruline Wattmeter Model 43 plug-in element 500W 2-30 MHz impedance 50 ohm
X				RF-AMMETER (Thermocross) Current range 5A E.g. HELWEG MIKKELSEN & CO. Copenhagen, Denmark type TR-68x71 5A
X		X		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

NECESSARY TEST EQUIPMENT cont.:

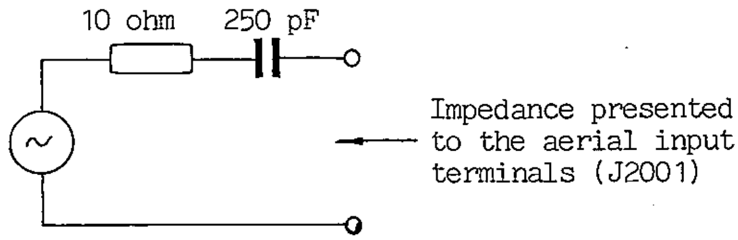
T1127	N140X	S1300	R1117	
X				DUMMY LOAD for C.T. band 1.6 MHz to 4 MHz



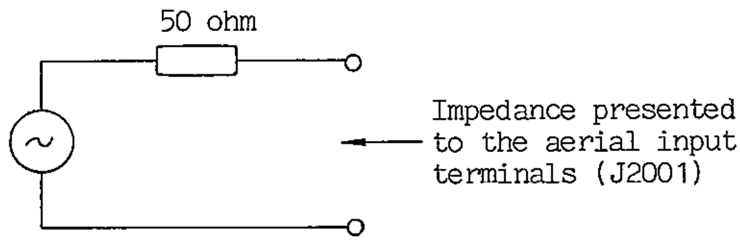
250 pF
E.g. DRACORIC 06 1291 TD 20x50 L
8 KV_S 250 pF ±20% R85

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

T1127	N140X	S1300	R1117	
			X	DUMMY LOAD for the C.T. band 1.6 to 4 MHz



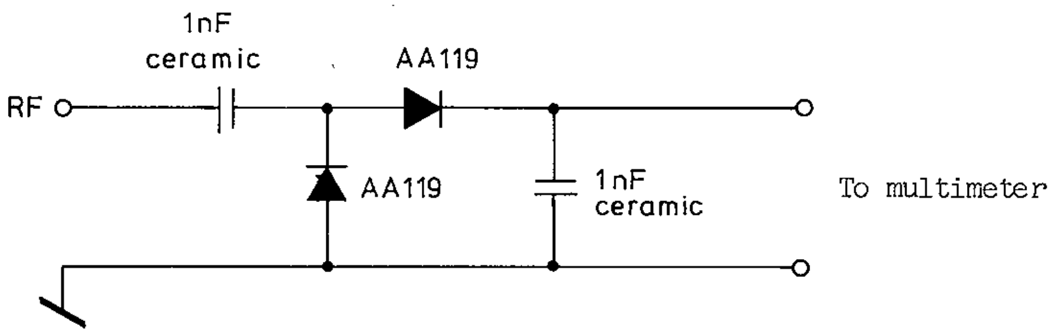
T1127	N140X	S1300	R1117	
			X	DUMMY LOAD for the HF bands 4 MHz to 25 MHz



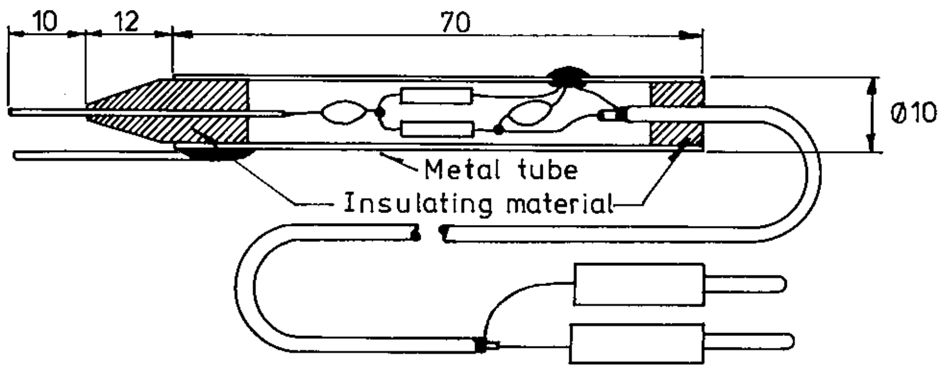
E.g. SAILOR Rx DUMMY LOAD type H219.

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 our 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 scematic diagrams, description of the modules and pictures showing the location of the components. (ADJUSTMENT LOCATIONS).
Typical AC and DC voltages are indicated on the scematic 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.

TROUBLE-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 ≤ 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.

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. "O".

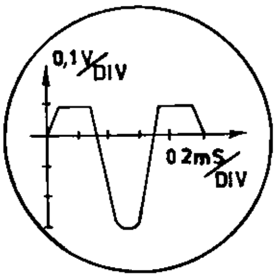
4.7.4.
Connect the counter to TP9.

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. "O".

4.8.8.
Check that the voltage is ≤ 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 ≥ 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.

4.10.3.
Connect the 10:1 probe and the scope to TP7.

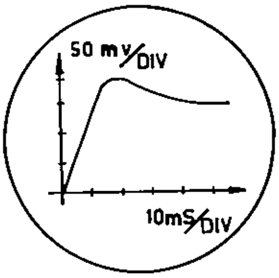
4.10.4.
Set the kHz SELECTORS to pos. "5".

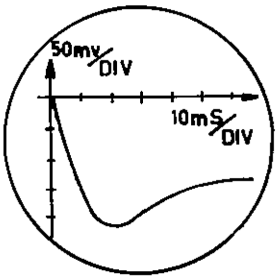
4.10.5.
Set the MHz SELECTOR to pos. "1".

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.





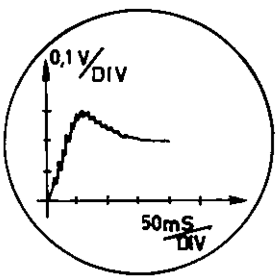
4.11.
CHECK OF LOOP 2 STEP RESPONSE

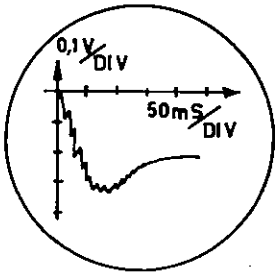
4.11.1.
Set the MODE SWITCH to pos. A3J.

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 ±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 ±1.5V DC.

4.14.
CHECK OF -45V PROTECTION CIRCUIT

4.14.1.
Connect voltmeter to TP13.

4.14.2.
Measure approx. -45V.

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.

4.17.10.
Connect diode probe to TP10.

4.17.11.
Measure 300 mV ±50mV.

4.18.
CHECK OF AGC ATTACK - AND DECAY TIMES

4.18.1.
Perform 5.8.1. - 5.8.4.

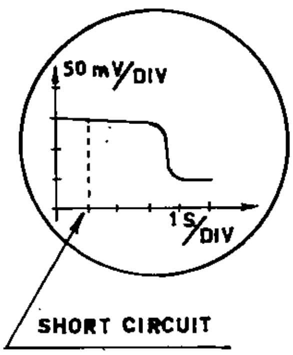
4.18.2.
Tune receiver as described on its front panel.

4.18.3.
Connect oscilloscope probe to TP19.

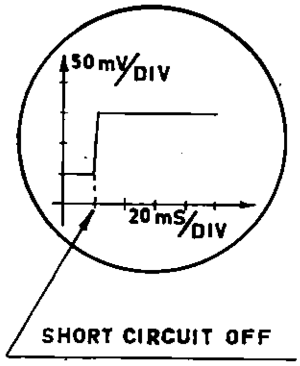
4.18.4.
By means of e.g. a trimming tool short-circuit inner and outer conductor on the short coax-cable carrying signal from IF-FILTERS to IF-AMPLIFIER, DETECTOR and AGC.

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.

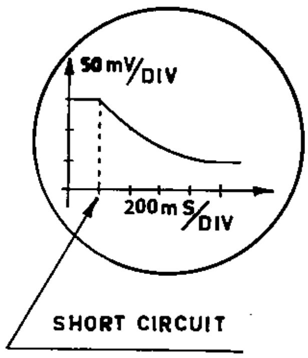


4.18.7.
Set MODE SWITCH to A3H (AM).

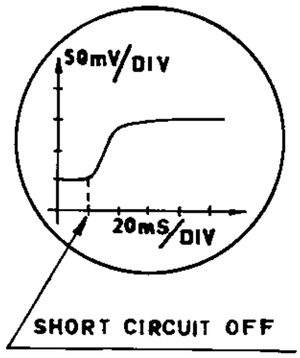
4.18.8.
Set f_G = 4250 kHz modulated to 30% with an 1 kHz tone.

4.18.9.
Perform 4.18.4.

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



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



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 ±0.15V AC.

4.19.5.
Set MODE SWITCH to A3H (AM).

4.19.6.
Set f_G = 4250 kHz modulated to 30% with an1 kHz tone.

4.19.7.
Measure 0.75V ±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.

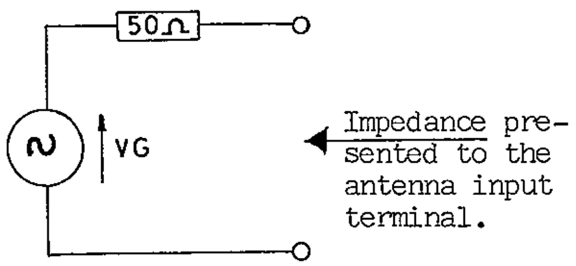
V_G = EMF of signal generator with proper generator impedance.

Z_G = Output impedance of signal generator.

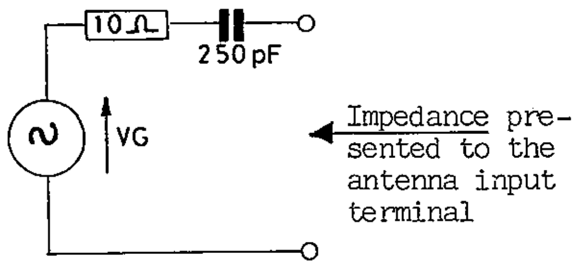
f_{AF} = Audio frequency to HEADPHONES and loudspeaker.

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 ±18V SUPPLY UNIT

5.3.1.
Connect the voltmeter to TP2.

5.3.2.
Adjust R209 to -18V ±0.2V.

5.3.3.
Connect the voltmeter to TP3.

5.3.4.
Adjust R214 to +18V ±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.

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.

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 passband 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
<u>25 MHz COIL SECTION</u>

5.10.1.
Perform 5.2. with Z_G = 50 ohm.

5.10.2.
Set MODE SWITCH to A3J.

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.

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

5.11.3.
Perform 5.2.

5.11.4.
Tune COIL SECTIONS according to the methode 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.

<u>In any case this must be at least 20 dB</u>

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.

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.

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 MIXE

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 functional.

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 switches 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.

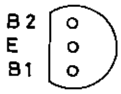
7.42.
Repeat 7.35. to 7.40. (both incl.).

7.43.
Repeat 7.34. to 7.42. (both incl.) on the frequencies tabulated next page:

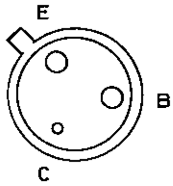
FUNCTION CHECK R1117 cont.:

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

BOTTOM VIEW

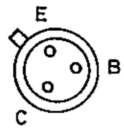


2N4871



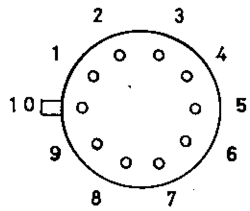
BFW 17A

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

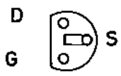


2N2368

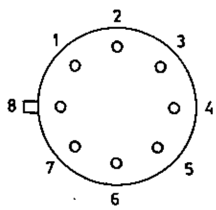
BF 199
BF 494



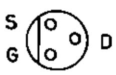
CA 3019



BF256 A,B,C



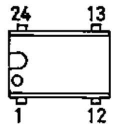
LM3053



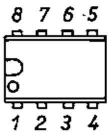
E310

A 1/2

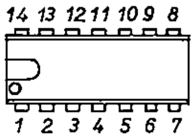
TOP VIEW



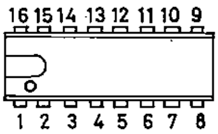
MC 14515 BCB



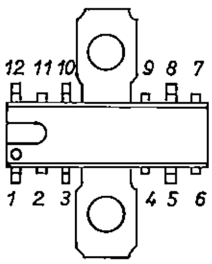
LM 308 N
MC 1455 P 1
MC 1458



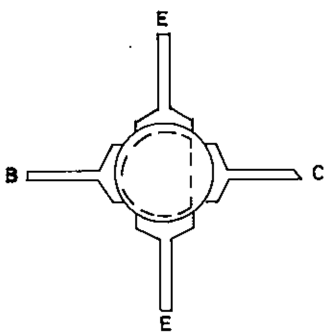
LM 324
LM 3086
MC 40 44
MC 14 077 B CP
MC 14081 B CP
SN 7407N
SN 7410N
SN 7472 N
SN 74 LS 20 N
SN 74 LS27 N
SN 74 LS 290 N



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

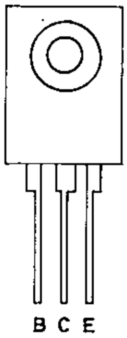


TCA 940

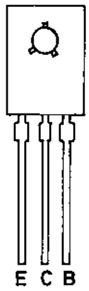


2N5641

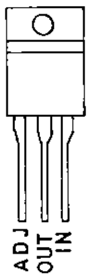
FRONT VIEW



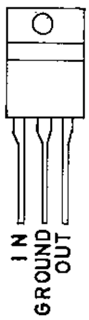
BD 577



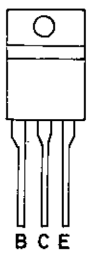
BD138
BD139



LM317 T



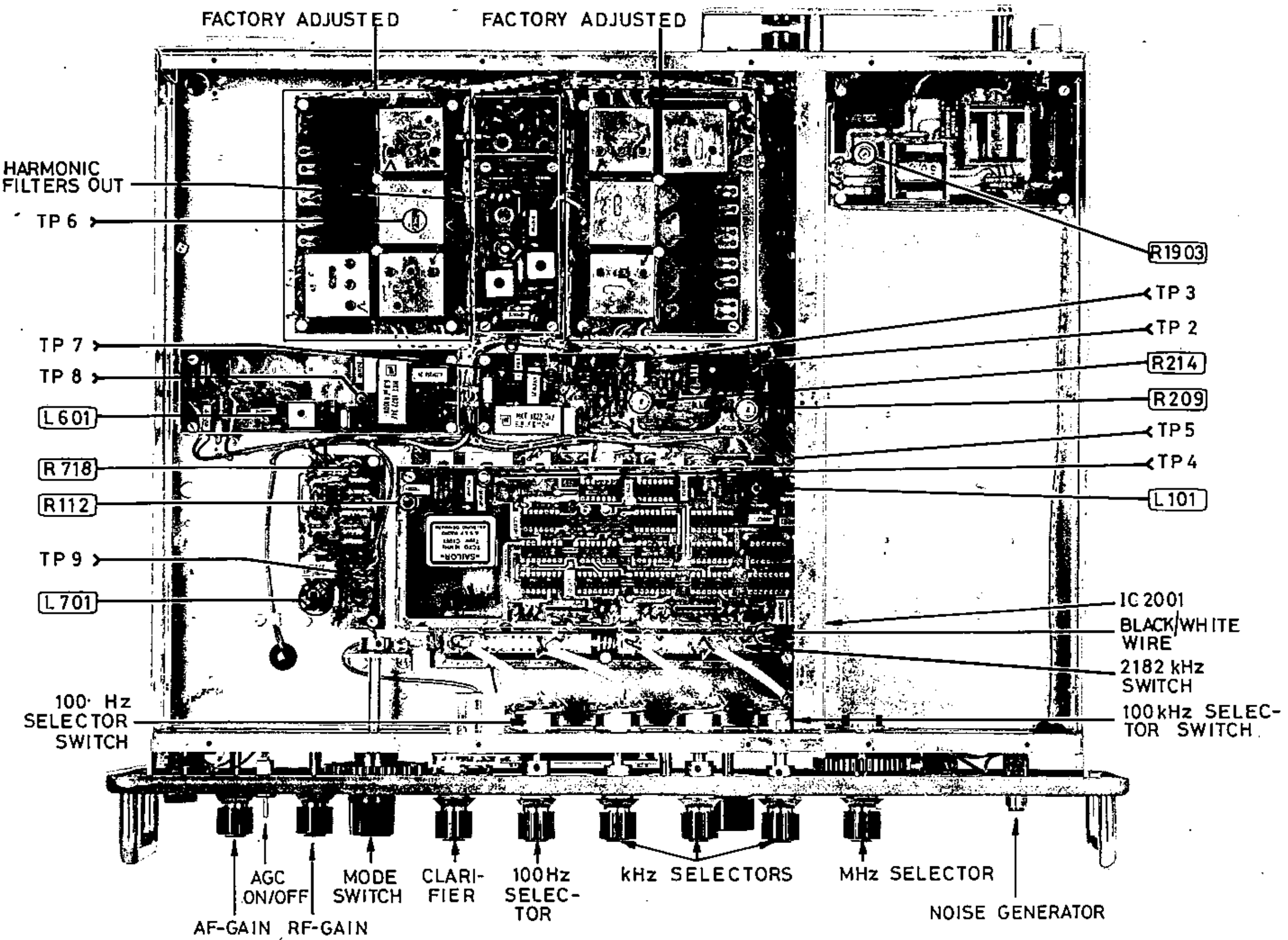
MC 7805 CT
MC 7818 CT

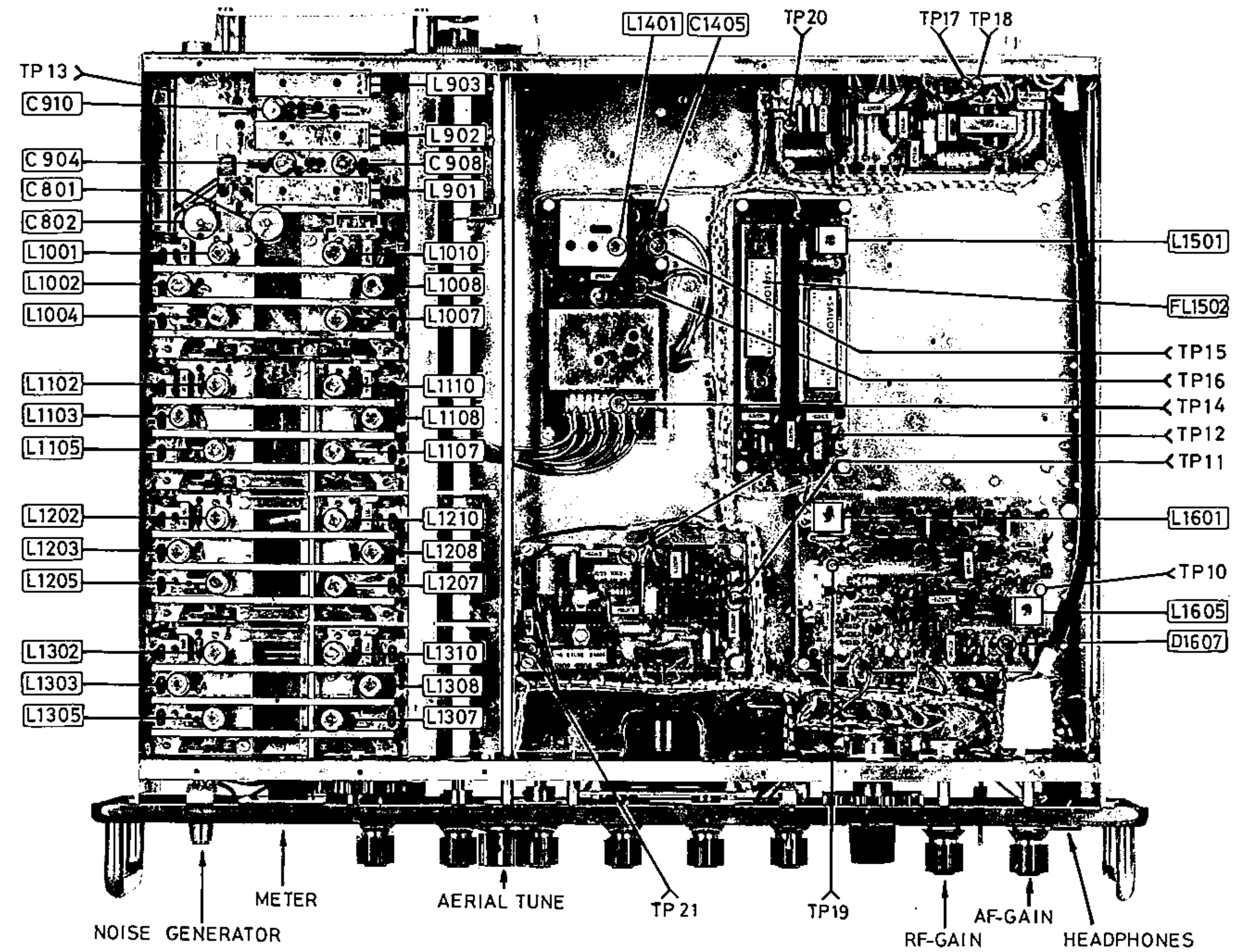


BD 241

PIN CONFIGURATIONS

A 2/2





ADJUSTMENT LOCATIONS R1117

CIRCUIT DESCRIPTIONS AND SCHEMATIC DIAGRAMS

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.

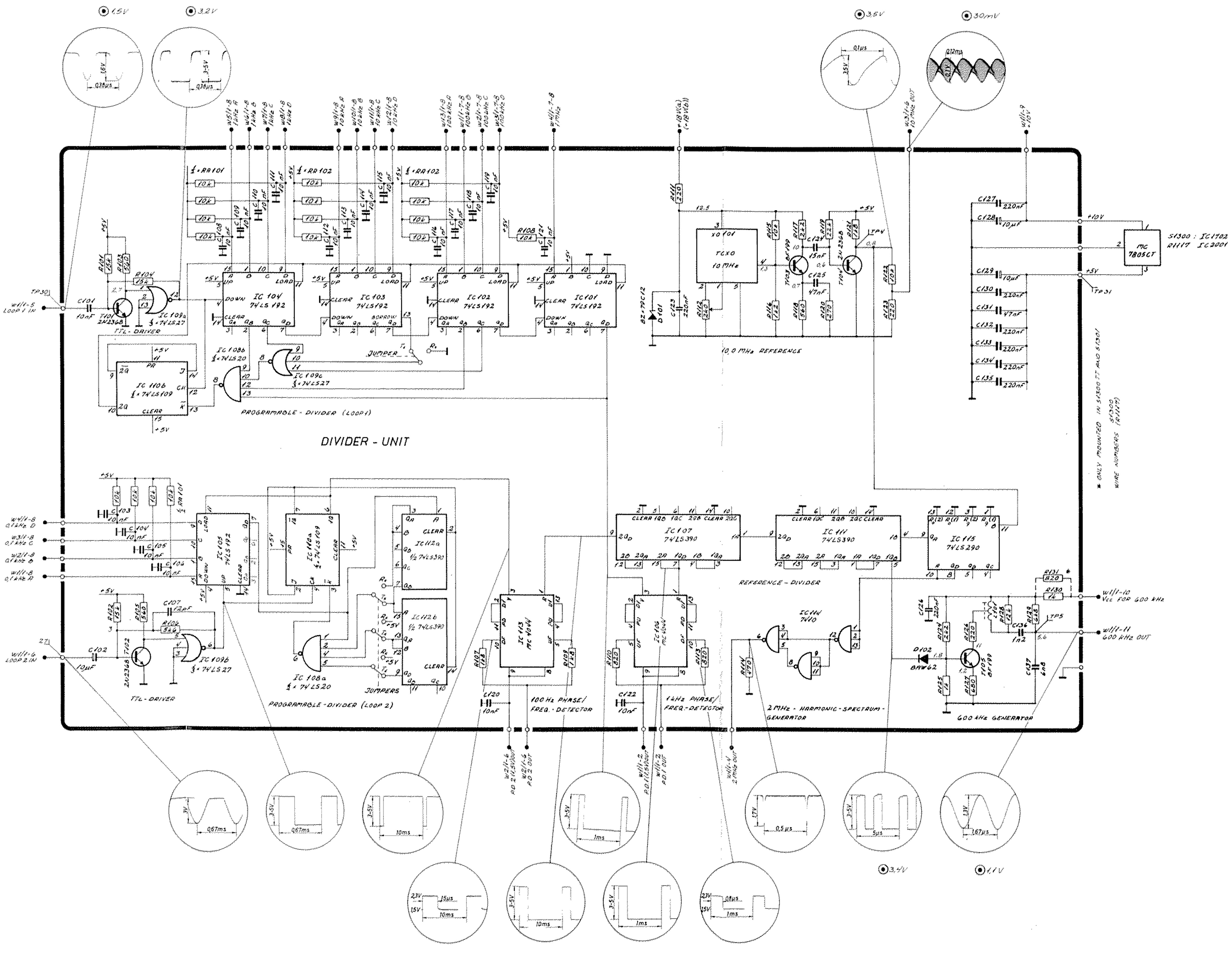
The stop figure S_1 is controlled from the gates IC108b and IC109c. When the counter outputs Q_A, Q_B ... etc. equals the stop figure S_1 + 2 the J-K flip-flop IC110b uses 2 clock pulses to load the start figure P_1 into the counters IC101, IC102, IC103 and IC104. The counter counts down from the start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

2
V b
1
6
3
8
01
4

9
MHz out
.2 (1.5V) out
.2 out
P 2 in
7
15
2
2
1
P 1 in
0
Hz out
1
.1 out
.1 (1.5V) out
5
2
5
 for 600kHz
7
1
 kHz out



CIRCUIT DESCRIPTION LOOP 1 FILTER & ±18V SUPPLY UNIT S1300 & R1117

This unit contains two regulated power supplies ±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

phase difference between the two signals mentioned above. This error voltage is fed into the integrator on the LOOP 1 FILTER & ± 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).
7.85 9.25

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 ... 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.

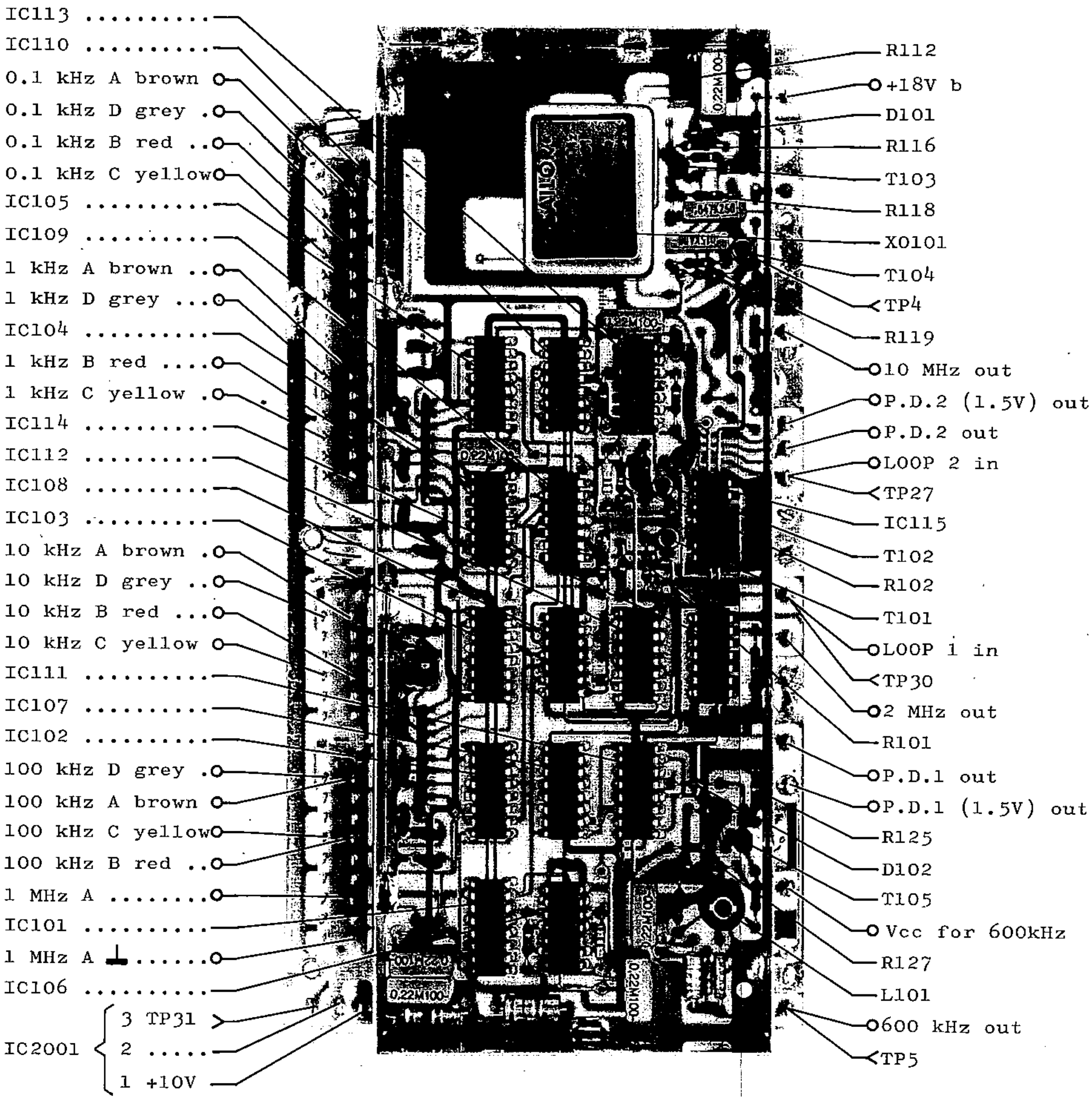
TEST CONDITIONS

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

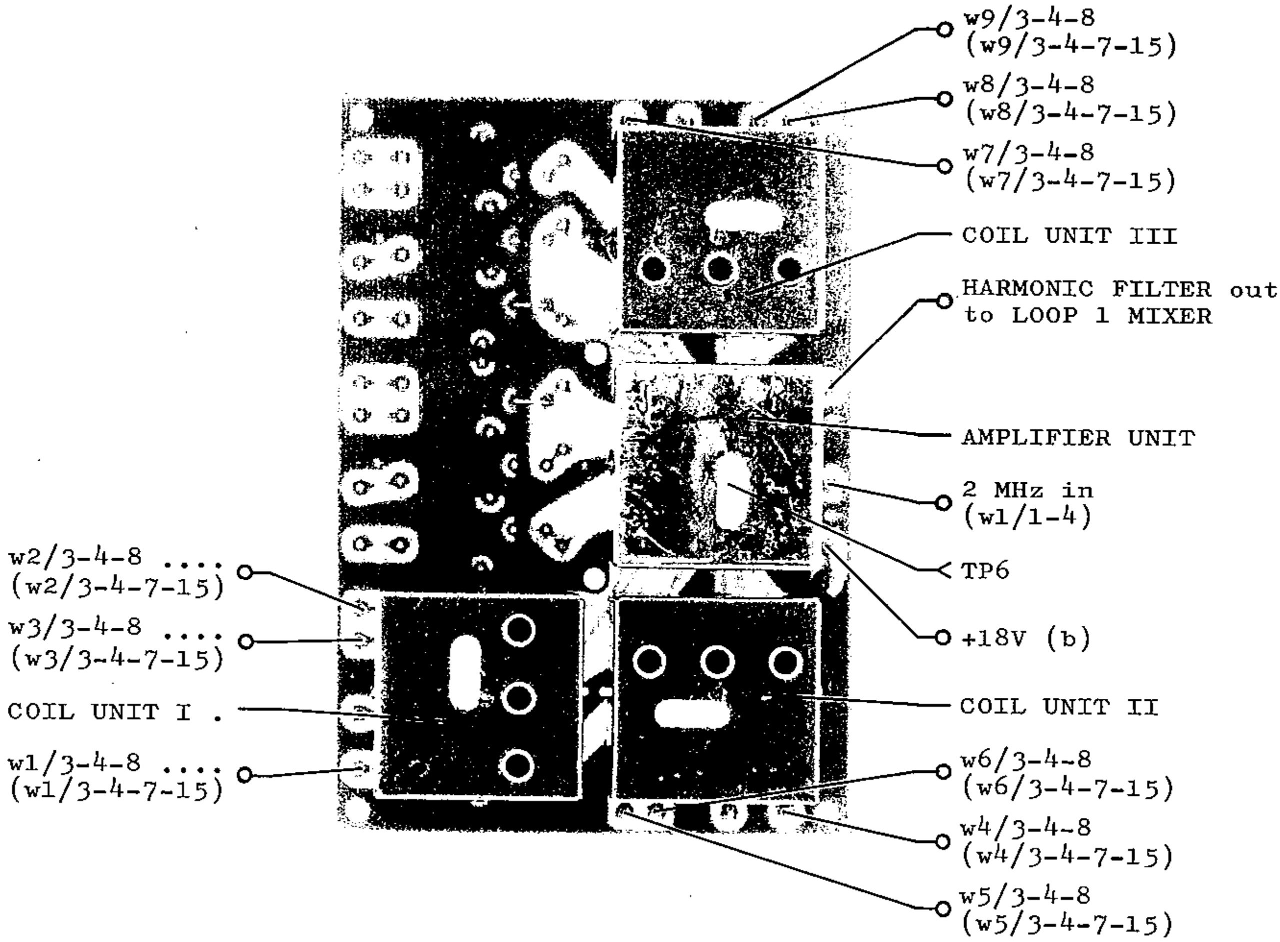
All voltage statements are typical


IC113
IC110
0.1 kHz A brown
0.1 kHz D grey
0.1 kHz B red
0.1 kHz C yellow
IC105
IC109
1 kHz A brown
1 kHz D grey
IC104
1 kHz B red
1 kHz C yellow
IC114
IC112
IC108
IC103
10 kHz A brown
10 kHz D grey
10 kHz B red
10 kHz C yellow
IC111
IC107
IC102
100 kHz D grey
100 kHz A brown
100 kHz C yellow
100 kHz B red
1 MHz A
IC101
1 MHz A
IC106
IC2001
3 TP31
2
1 +10V
R112
+18V b
D101
R116
T103
R118
X0101
T104
TP4
R119
10 MHz out
P.D.2 (1.5V) out
P.D.2 out
LOOP 2 in
TP27
IC115
T102
R102
T101
LOOP 1 in
TP30
2 MHz out
R101
P.D.1 out
P.D.1 (1.5V) out
R125
D102
T105
Vcc for 600kHz
R127
L101
600 kHz out
TP5

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

CIRCUIT DESCRIPTION HARMONIC FILTER UNIT S1300 & R1117

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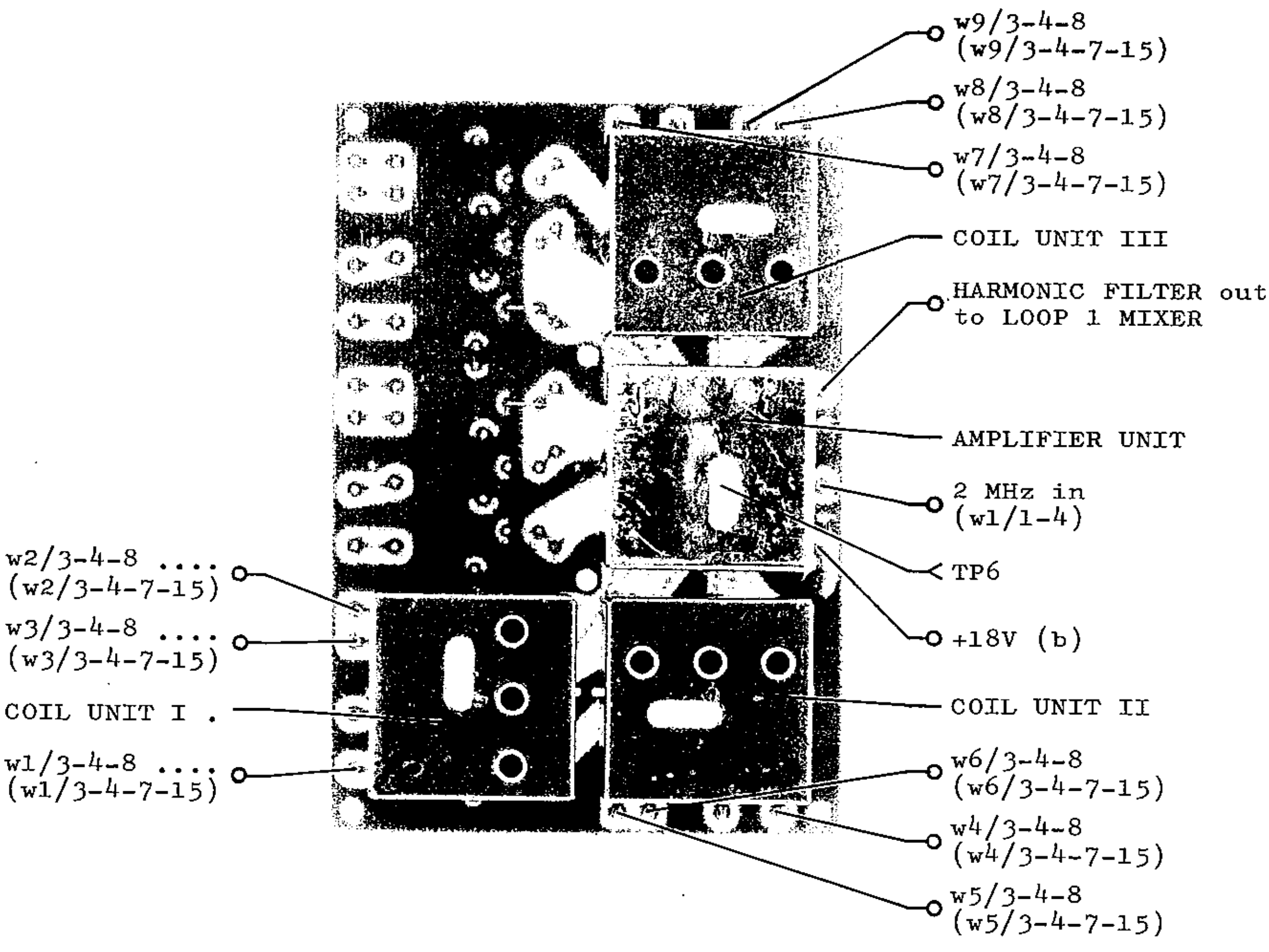


A1/2 S1301, S1300/TT,T; R1117

TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)

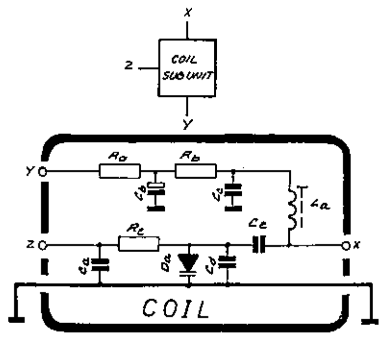
Oscilloscope input : Passive probe 10 Mohm//11 pF

DC voltmeter input : 10 Mohm

⦿ : Diode probe measurements

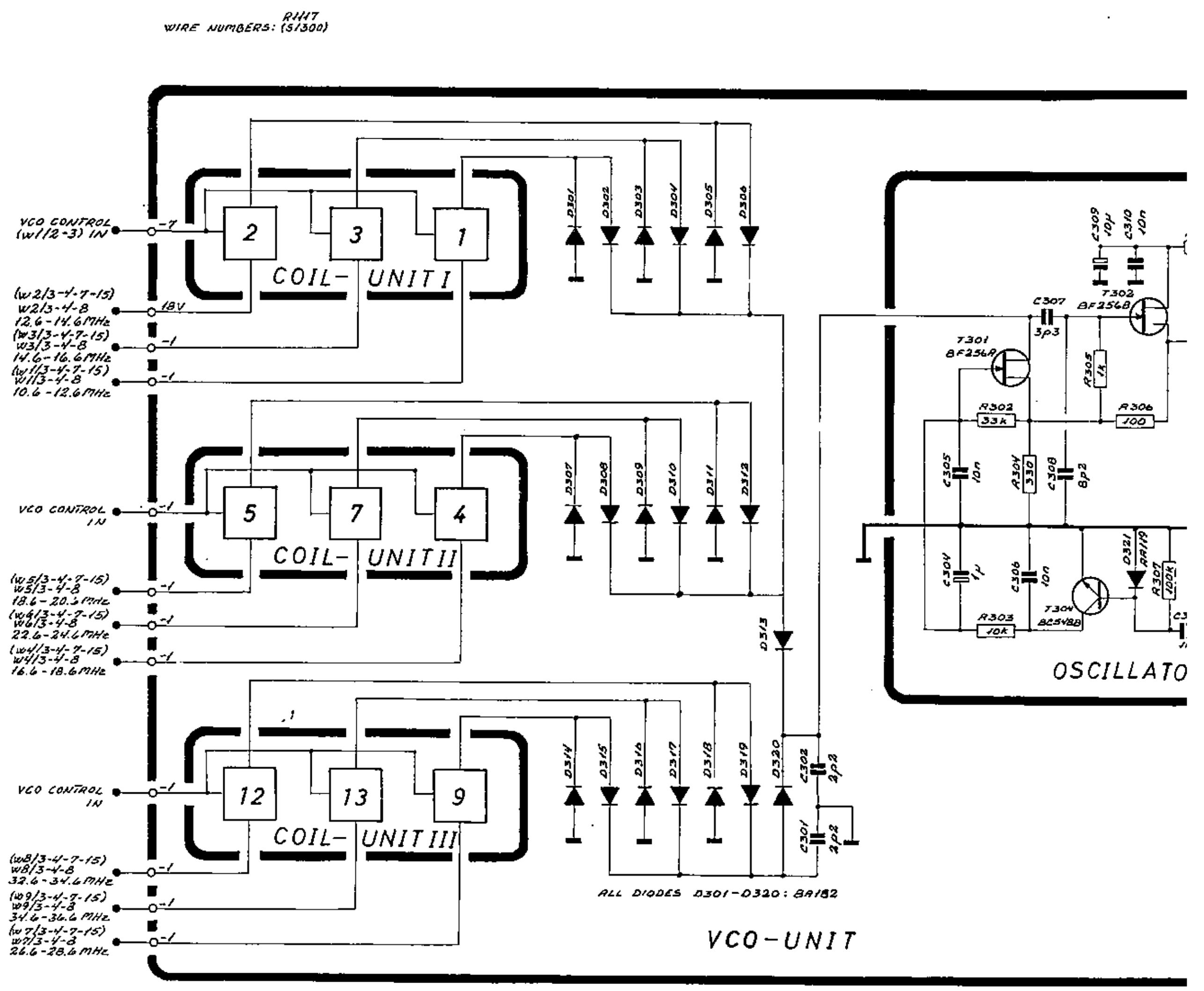
TP : Testpoints

All voltage statements are typical



COIL UNIT	COIL	R_a (Ω)	R_b (Ω)	R_c (Ω)
I	1	R312 470	R321 47	R330 5k6
	2	R313 470	R322 47	R331 5k6
	3	R314 470	R323 47	R332 4k7
II	4	R315 470	R324 47	R333 3k9
	5	R316 470	R325 47	R334 3k3
	7	R317 470	R326 47	R335 3k3
III	9	R318 470	R327 47	R336 3k3
	12	R319 470	R328 47	R337 4k7
	13	R320 470	R329 47	R338 6k8

TABLE FOR COMPONENTVA



TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)

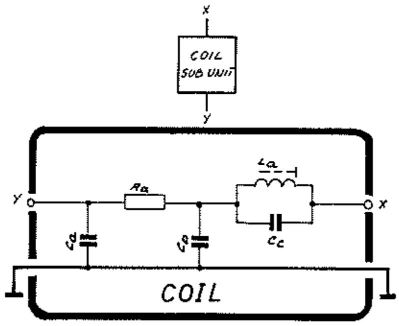
Oscilloscope input : Passive probe 10 Mohm//11 pF

DC voltmeter input : 10 Mohm

⦿ : Diode probe measurements

TP : Testpoints

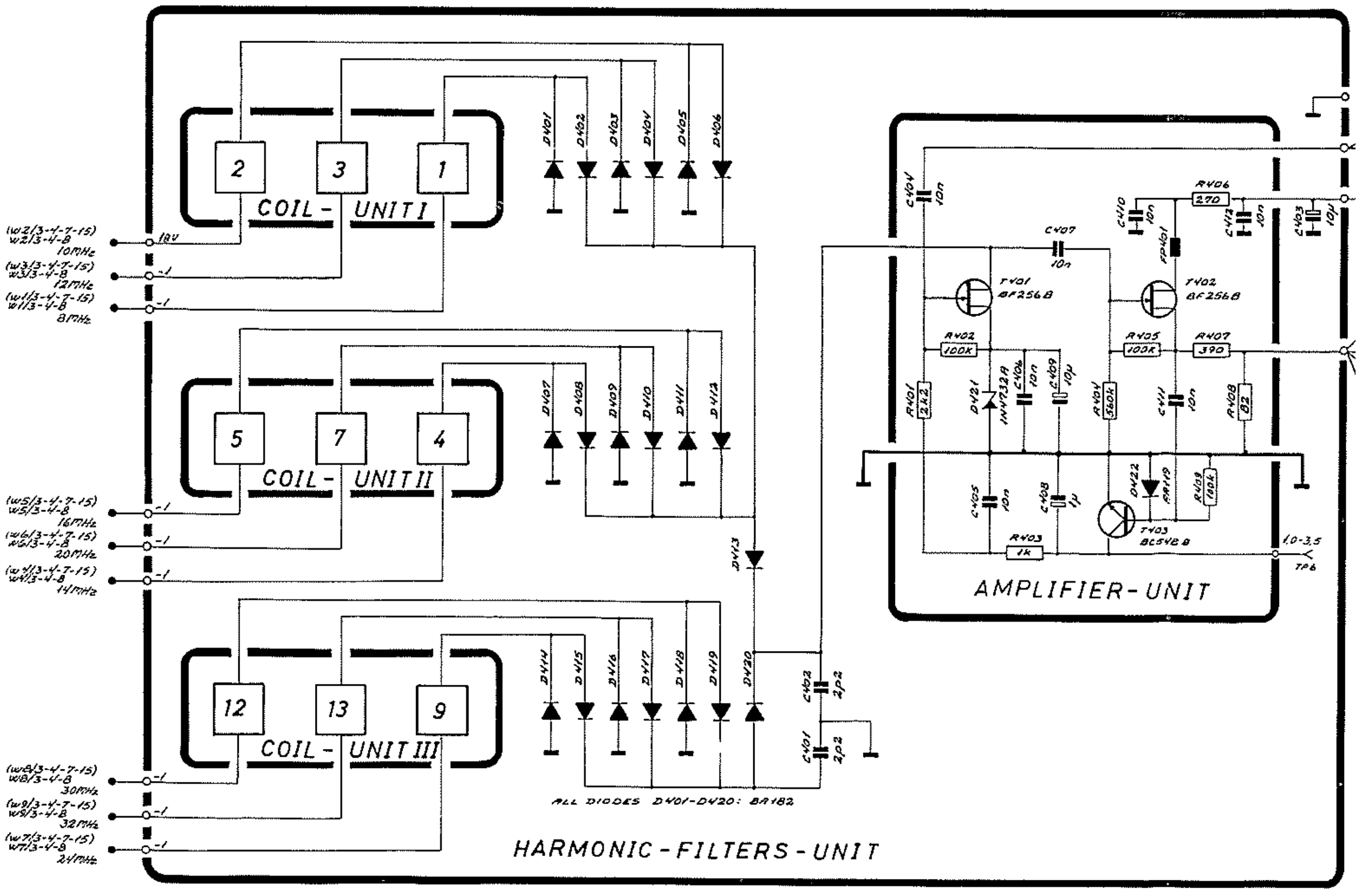
All voltage statements are typical

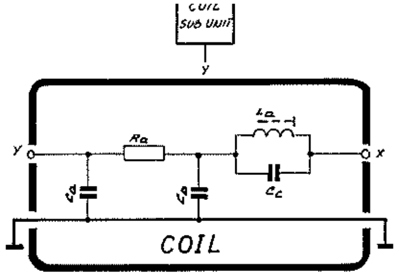


COIL UNIT	COIL	R_a (Ω)	C_a (nF)	C_b (nF)	C_c (pF)	L_a
I	1	R409 470	C413 10	C422 10	C431 300	L401 TL199
	2	R410 470	C414 10	C423 10	C432 240	L402 TL200
	3	R411 470	C415 10	C424 10	C433 220	L403 TL201
II	4	R412 470	C416 10	C425 10	C434 180	L404 TL202
	5	R413 470	C417 10	C426 10	C435 180	L405 TL203
	7	R414 470	C418 10	C427 10	C436 110	L406 TL203
III	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 COMPONENTVALUES OF COILS

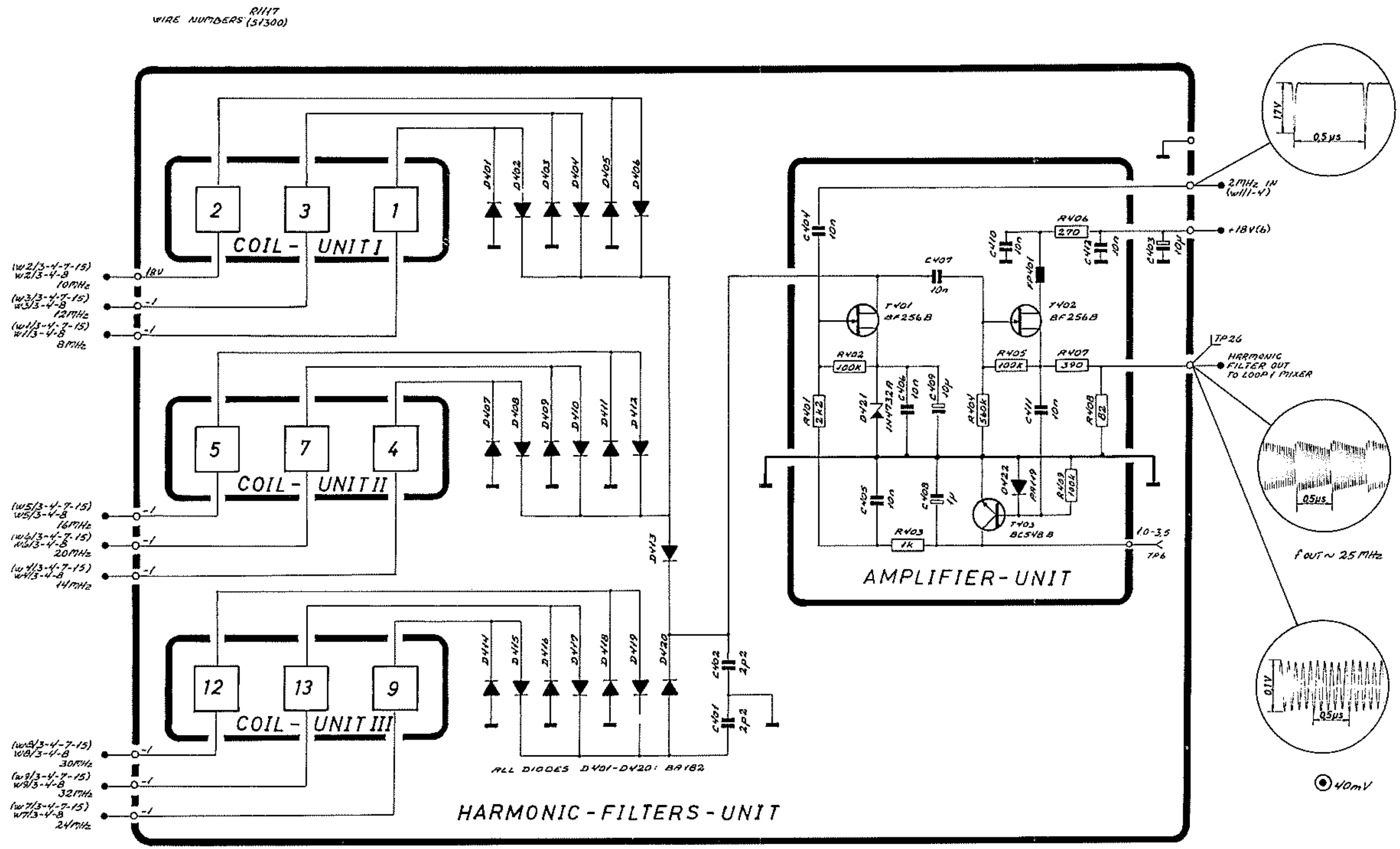
WIRE NUMBERS R1117 (51300)





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
	7	R414 470	C418 10	C427 10	C436 110	L406 TL203
III	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



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)

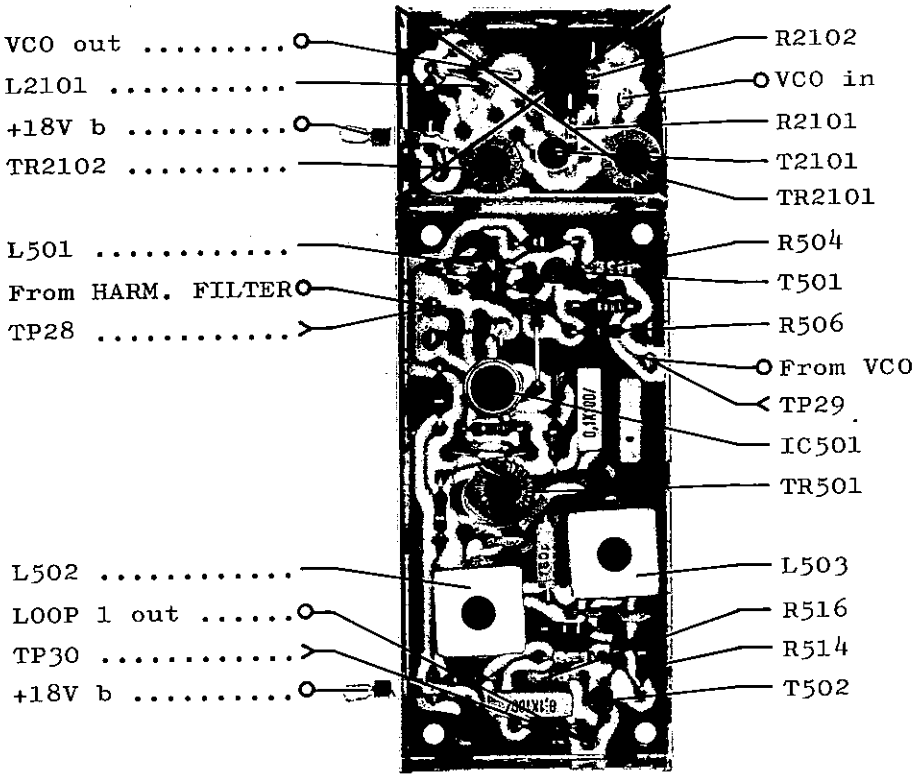
Oscilloscope input : Passive probe 10 Mohm//11 pF

DC voltmeter input : 10 Mohm

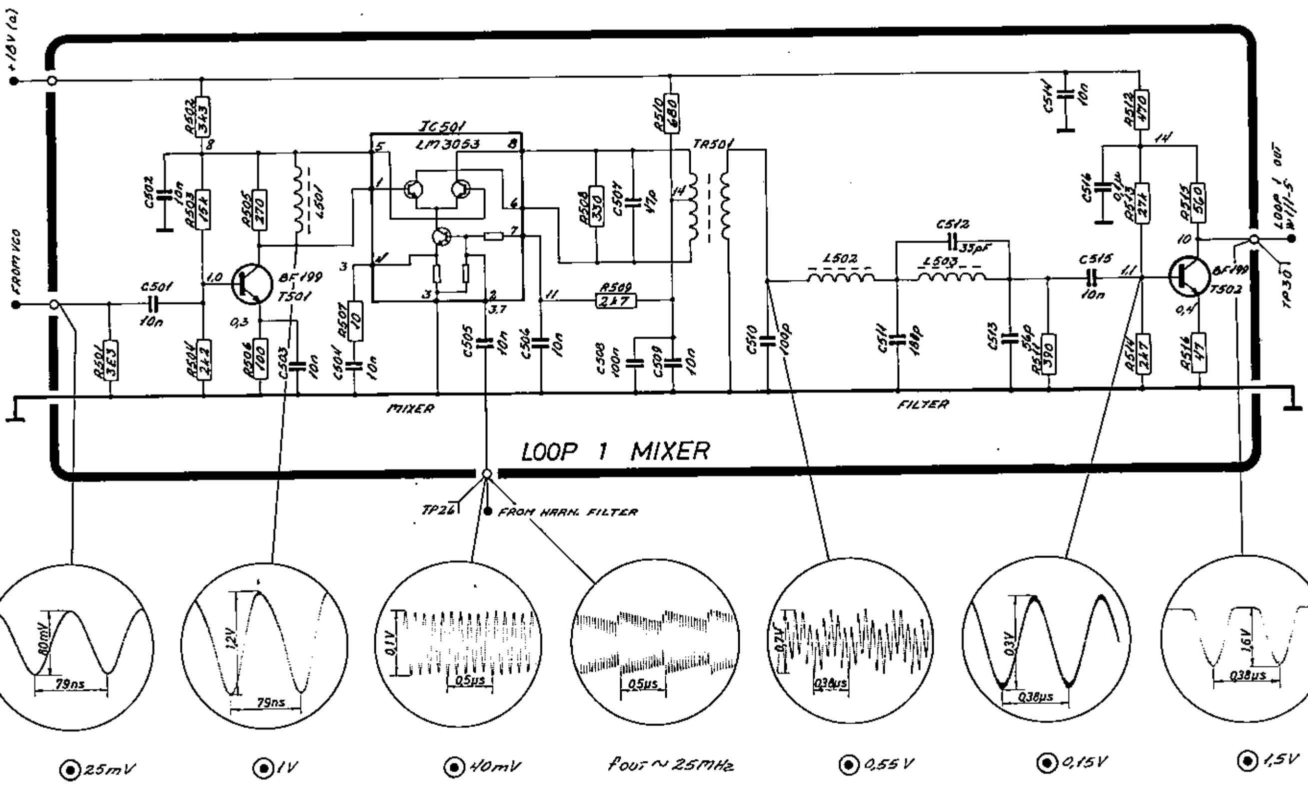
⦿ : Diode probe measurements

TP : Testpoints

All voltage statements are typical


VCO out
L2101
+18V b
TR2102
L501
From HARM. FILTER
TP28
L502
LOOP 1 out
TP30
+18V b
R2102
VCO in
R2101
T2101
TR2101
R504
T501
R506
From VCO
TP29
IC501
TR501
L503
R516
R514
T502

A2/2 R1117


+18V (a)
FROM VCO
IC501
LM3053
TR501
MIXER
FILTER
LOOP 1 MIXER
L502
L503
C512
33pF
BF199
T501
T502
LOOP 1 OUT
TP30
TP26
FROM HARM. FILTER
79ns
0,5µs
0,38µs
25mV
1V
40mV
fOUT ~ 25MHz
0,55V
0,15V
1,5V

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.

A1/2 R1117

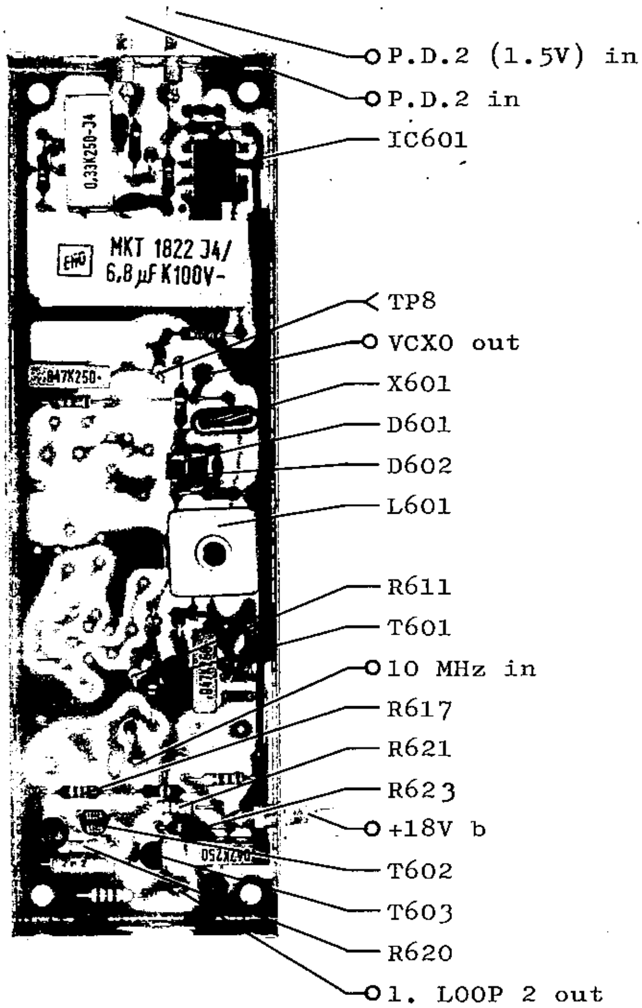
TEST CONDITIONS

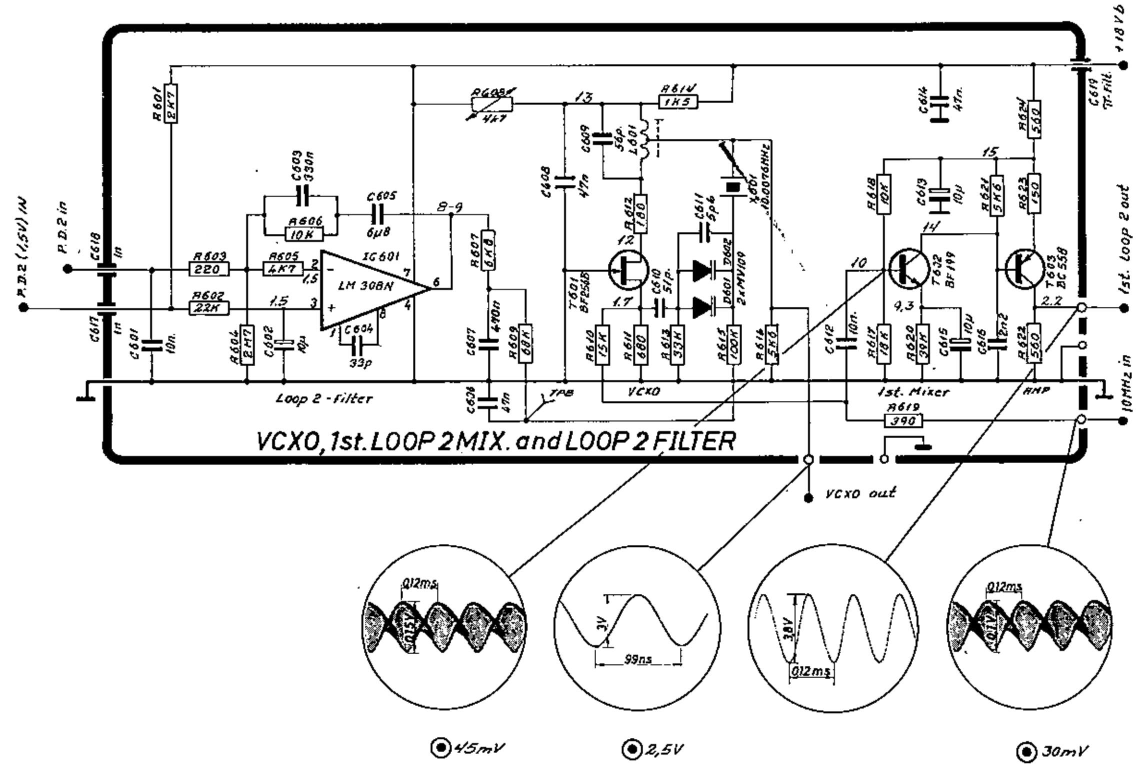
Frequency selector	: f = 2.0005 MHz
Mode	: A3J
Clarifier	: Center position
Oscilloscope input	: Passive probe 10 Mohm//11 pF
DC voltmeter input	: 10 Mohm

⦿ : Diode probe measurements

TP : Testpoints

All voltage statements are typical


P.D.2 (1.5V) in
P.D.2 in
IC601
MKT 1822 J4/
6,8 µF K100V-
TP8
VCXO out
X601
D601
D602
L601
R611
T601
10 MHz in
R617
R621
R623
+18V b
T602
T603
R620
1. LOOP 2 out


VCXO, 1st. LOOP 2 MIX. and LOOP 2 FILTER
P.D.2 (1,5V) in
P.D.2 in
+18 Vb
1st. Loop 2 out
10MHz in
VCXO out
LM 308N
IC601
Loop 2 - Filter
VCXO
1st. Mixer
AMP
TP8
0,12ms
99ns
3V
3,8V
45mV
2,5V
30mV

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

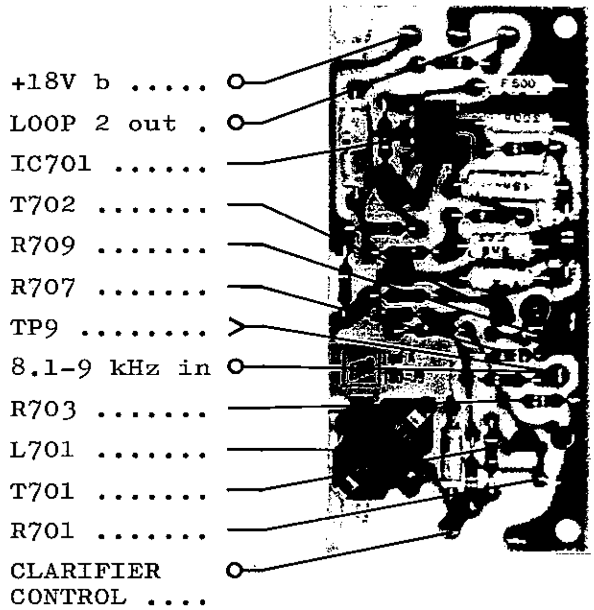
Frequency selector	: f = 2.0005 MHz
Mode	: A3J
Clarifier	: Center position
Oscilloscope input	: Passive probe 10 Mohm//11 pF
DC voltmeter input	: 10 Mohm

⊙ : Diode probe measurements

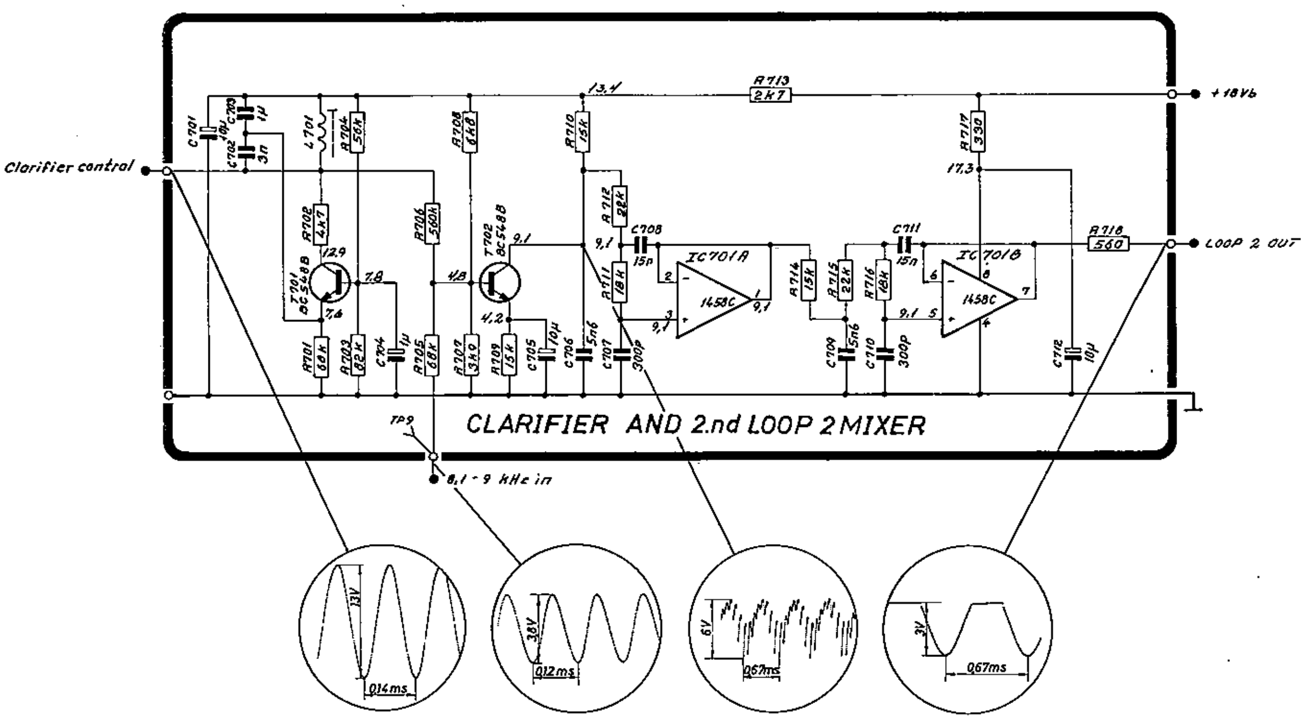
TP : Testpoints

All voltage statements are typical

A2/2 R1117



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



CLARIFIER AND 2.nd LOOP 2 MIXER
Clarifier control
+18Vb
LOOP 2 OUT
TP9
8,1-9 kHz in
R713 2k7
IC701A 1458C
IC701B 1458C
T701 BC548B
T702 BC548B
13V
0,14ms
3,8V
0,12ms
6V
0,67ms
3V
0,67ms

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

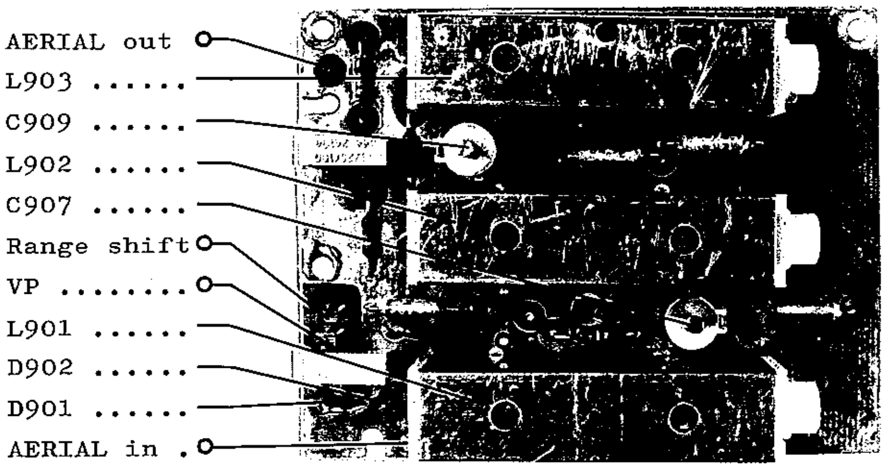
These sections consists of three capacitive coupled fixed tuned band-pass filters.

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.

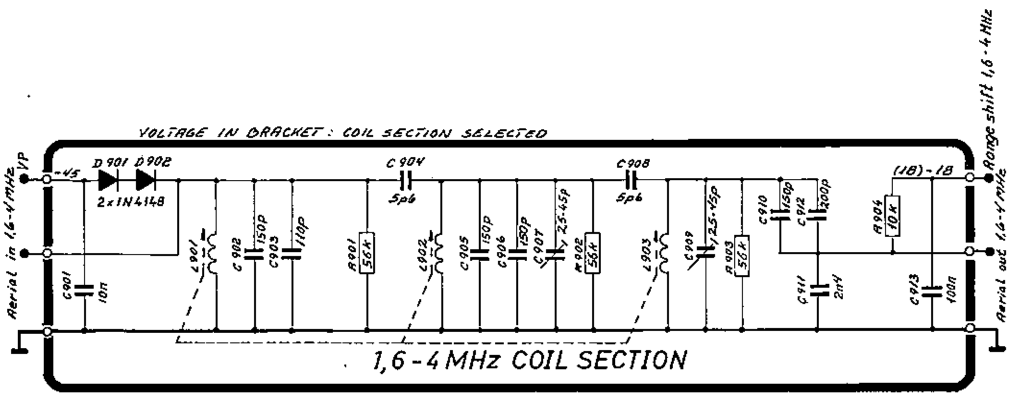
The two reverse biased diodes D1001 and D1002 are a part of the aerial coil protection circuit.

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

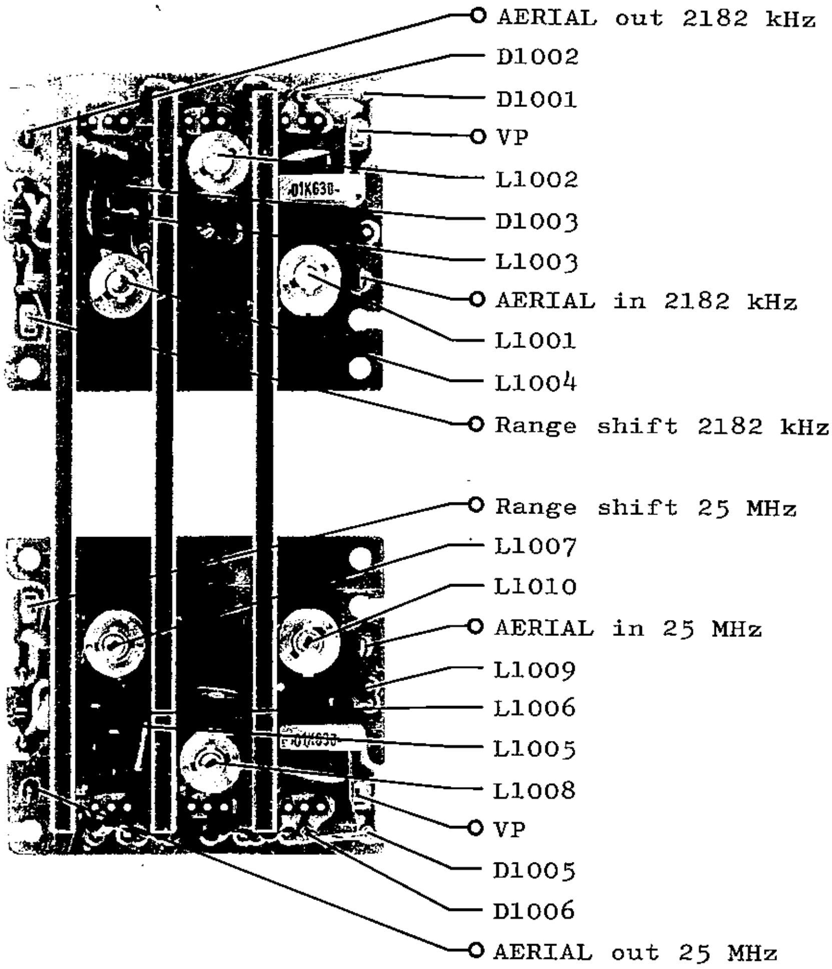
A2/6 R1117



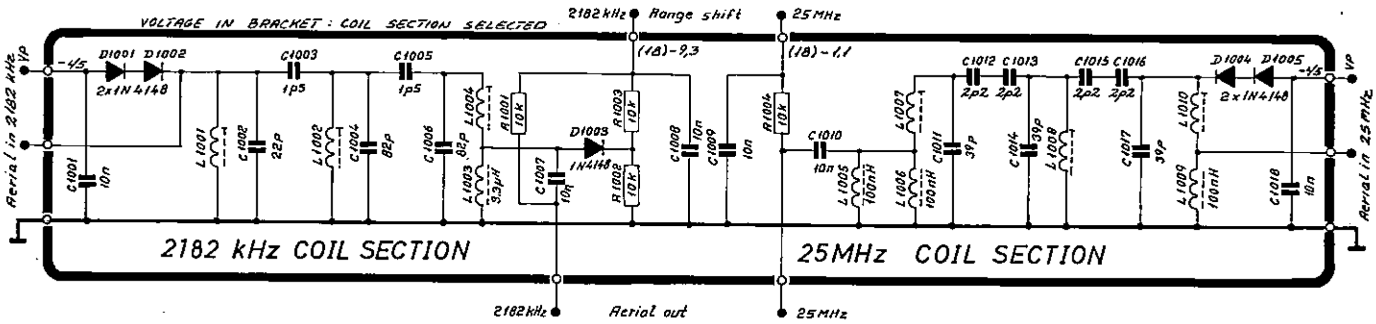
AERIAL out
L903
C909
L902
C907
Range shift
VP
L901
D902
D901
AERIAL in

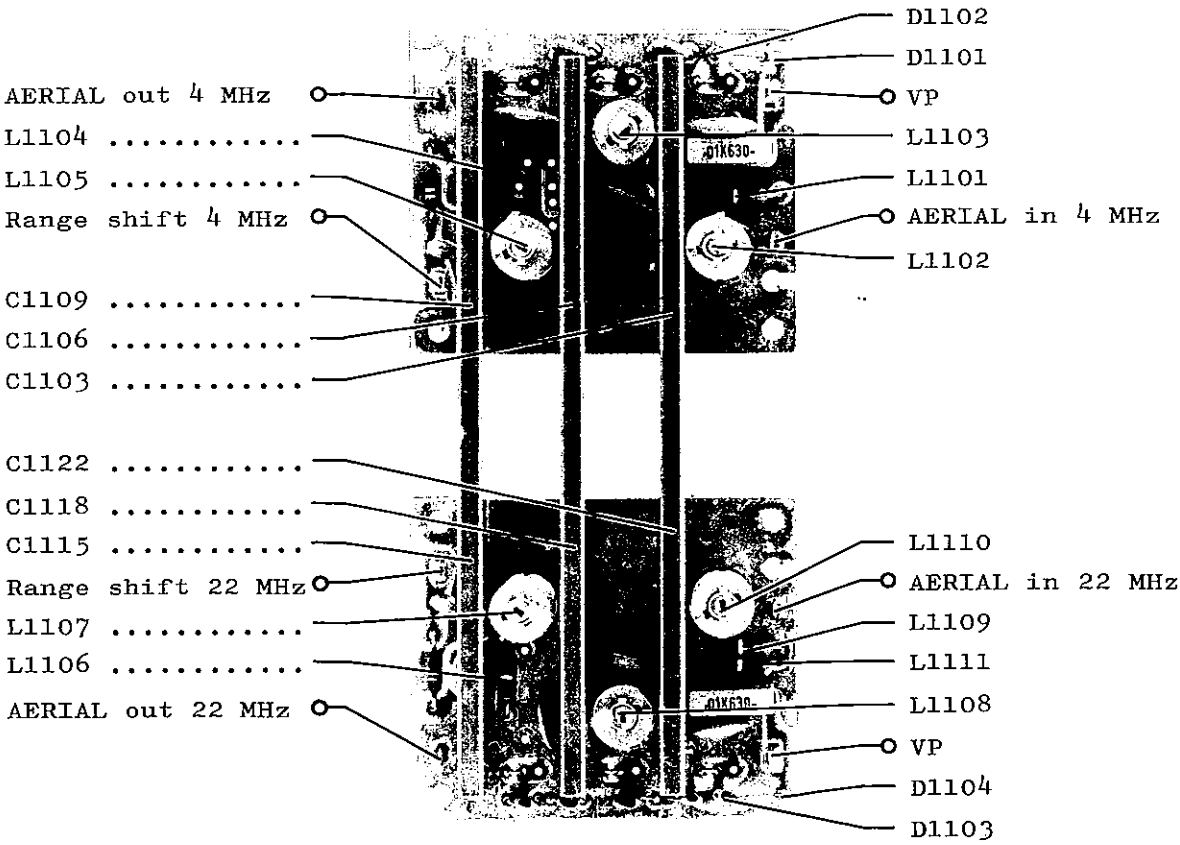


VOLTAGE IN BRACKET : COIL SECTION SELECTED
VP
Aerial in 1,6-4 MHz
D901 D902
2xIN4148
C901 10n
L901
C902 150p
C903 110p
R901 56k
C904 5p6
L902
C905 150p
C906 150p
C907 2,5-45p
R902 56k
C908 5p6
L903
C909 2,5-45p
R903 56k
C910 150p
C912 200p
C911 2n4
R904 10k
(18)-18
C913 100n
Range shift 1,6-4 MHz
Aerial out 1,6-4 MHz
1,6-4 MHz COIL SECTION

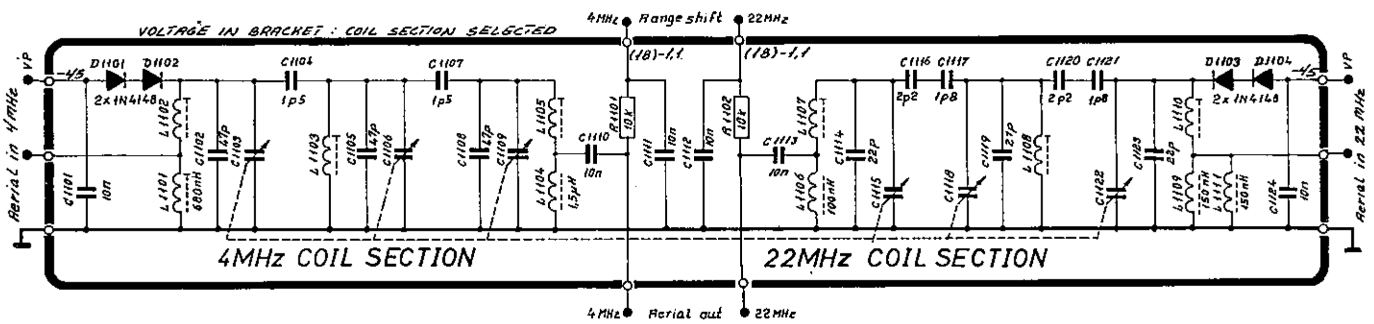

AERIAL out 2182 kHz
D1002
D1001
VP
L1002
D1003
L1003
AERIAL in 2182 kHz
L1001
L1004
Range shift 2182 kHz
Range shift 25 MHz
L1007
L1010
AERIAL in 25 MHz
L1009
L1006
L1005
L1008
VP
D1005
D1006
AERIAL out 25 MHz

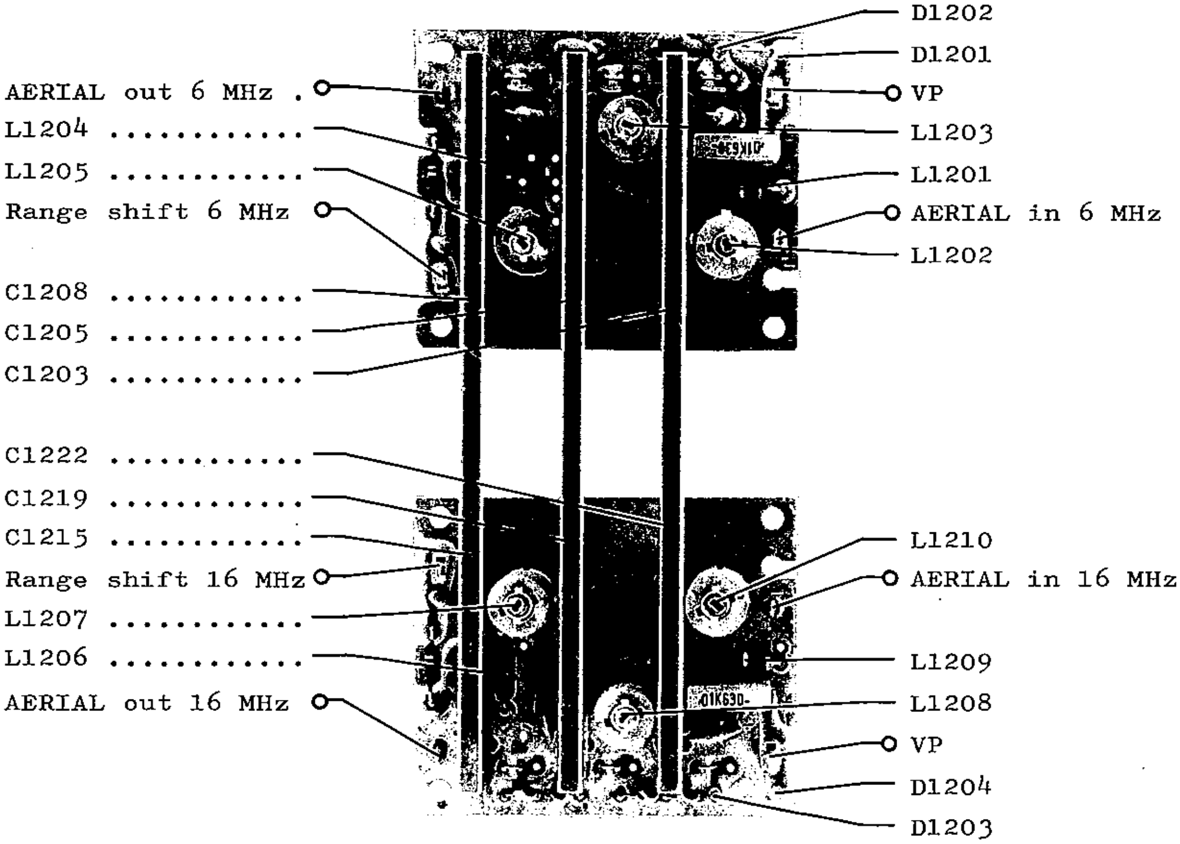
A3/6 R1117


VOLTAGE IN BRACKET : COIL SECTION SELECTED
2182 kHz
Range shift
25 MHz
(18) - 9,3
(18) - 1,1
D1001 D1002
2x1N4148
D1003
1N4148
D1004 D1005
2x1N4148
Aerial in 2182 kHz
VP
Aerial in 25 MHz
2182 kHz COIL SECTION
25MHz COIL SECTION
2182 kHz
Aerial out
25 MHz


AERIAL out 4 MHz
L1104 ....
L1105 ....
Range shift 4 MHz
C1109 ....
C1106 ....
C1103 ....
C1122 ....
C1118 ....
C1115 ....
Range shift 22 MHz
L1107 ....
L1106 ....
AERIAL out 22 MHz
D1102
D1101
VP
L1103
L1101
AERIAL in 4 MHz
L1102
L1110
AERIAL in 22 MHz
L1109
L1111
L1108
VP
D1104
D1103

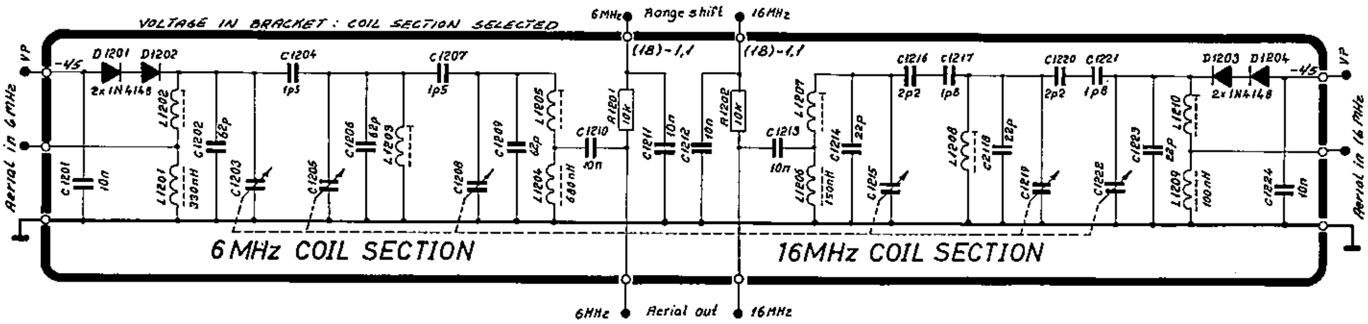
A4/6 R1117


VOLTAGE IN BRACKET : COIL SECTION SELECTED
4MHz Range shift 22MHz
(18)-1,1
(18)-1,1
VP
Aerial in 4MHz
D1101 D1102
2x1N4148
C1101 10n
L1101
L1102
680nH
C1102 47p
C1103
C1104 1p5
L1103
C1105 47p
C1106
C1107 1p5
C1108 47p
C1109
L1105
L1104 1,5µH
C1110 10n
R1101 10k
C1111 10n
C1112 10n
R1102 10k
C1113 10n
L1106 100nH
L1107
C1114 22p
C1115
C1116 C1117
2p2 1p8
C1118
C1119 27p
L1108
C1120 C1121
2p2 1p8
C1122
C1123 22p
D1103 D1104
2x1N4148
L1110
L1109 150nH
L1111 150nH
C1124 10n
VP
Aerial in 22 MHz
4MHz COIL SECTION
22MHz COIL SECTION
4MHz Aerial out 22MHz

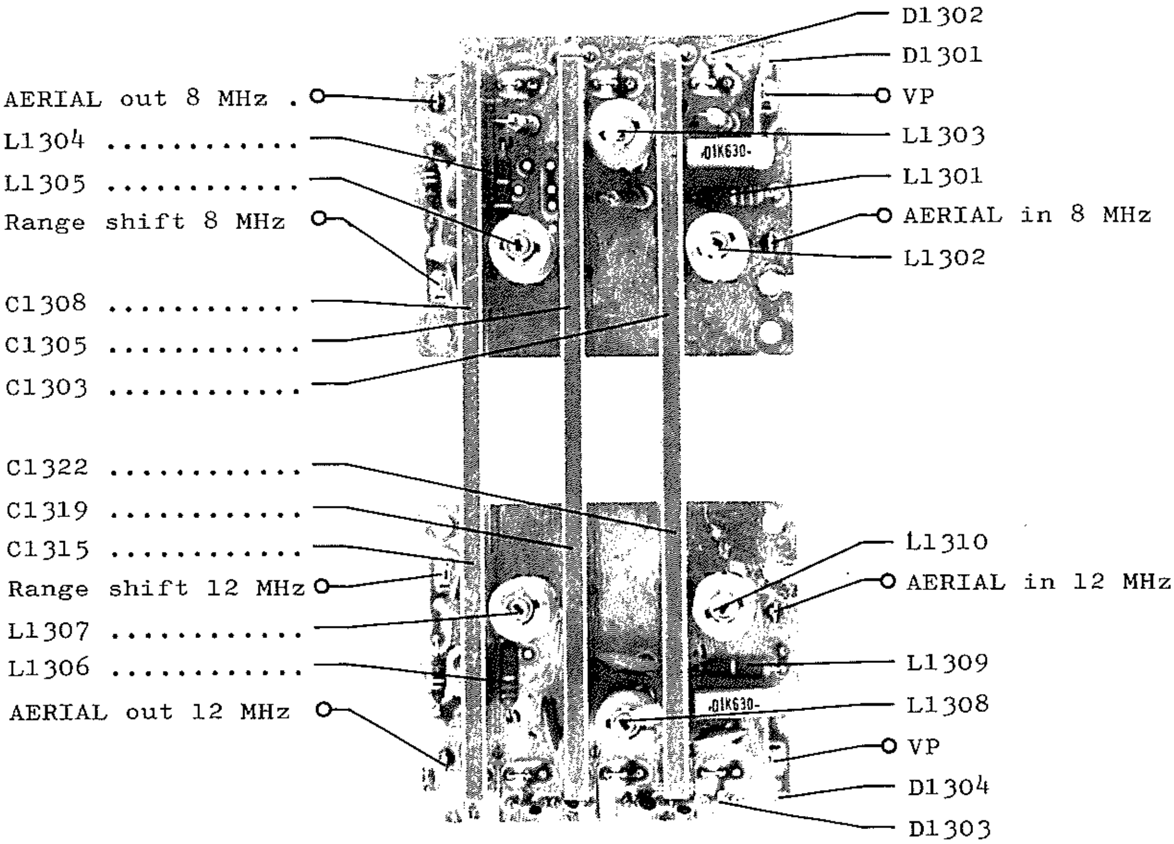


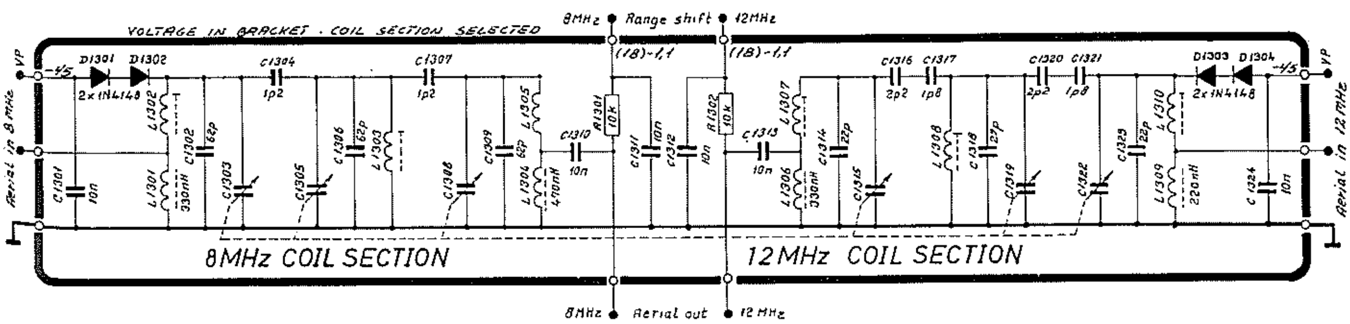
AERIAL out 6 MHz .
L1204 ....
L1205 ....
Range shift 6 MHz
C1208 ....
C1205 ....
C1203 ....
C1222 ....
C1219 ....
C1215 ....
Range shift 16 MHz
L1207 ....
L1206 ....
AERIAL out 16 MHz
D1202
D1201
VP
L1203
L1201
AERIAL in 6 MHz
L1202
L1210
AERIAL in 16 MHz
L1209
L1208
VP
D1204
D1203

A5/6 R1117



VOLTAGE IN BRACKET : COIL SECTION SELECTED
6MHz
Range shift
16MHz
(18)-1,1
(18)-1,1
6 MHz COIL SECTION
16MHz COIL SECTION
6MHz
Aerial out
16MHz


AERIAL out 8 MHz
L1304
L1305
Range shift 8 MHz
C1308
C1305
C1303
C1322
C1319
C1315
Range shift 12 MHz
L1307
L1306
AERIAL out 12 MHz
D1302
D1301
VP
L1303
L1301
AERIAL in 8 MHz
L1302
L1310
AERIAL in 12 MHz
L1309
L1308
VP
D1304
D1303


VOLTAGE IN BRACKET . COIL SECTION SELECTED
8MHz Range shift 12MHz
(18)-1,1
(18)-1,1
VP
Aerial in 8 MHz
D1301 D1302
2x1N4148
D1303 D1304
2x1N4148
Aerial in 12 MHz
8MHz COIL SECTION
12MHz COIL SECTION
8MHz Aerial out 12 MHz

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 localoscillator 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

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.

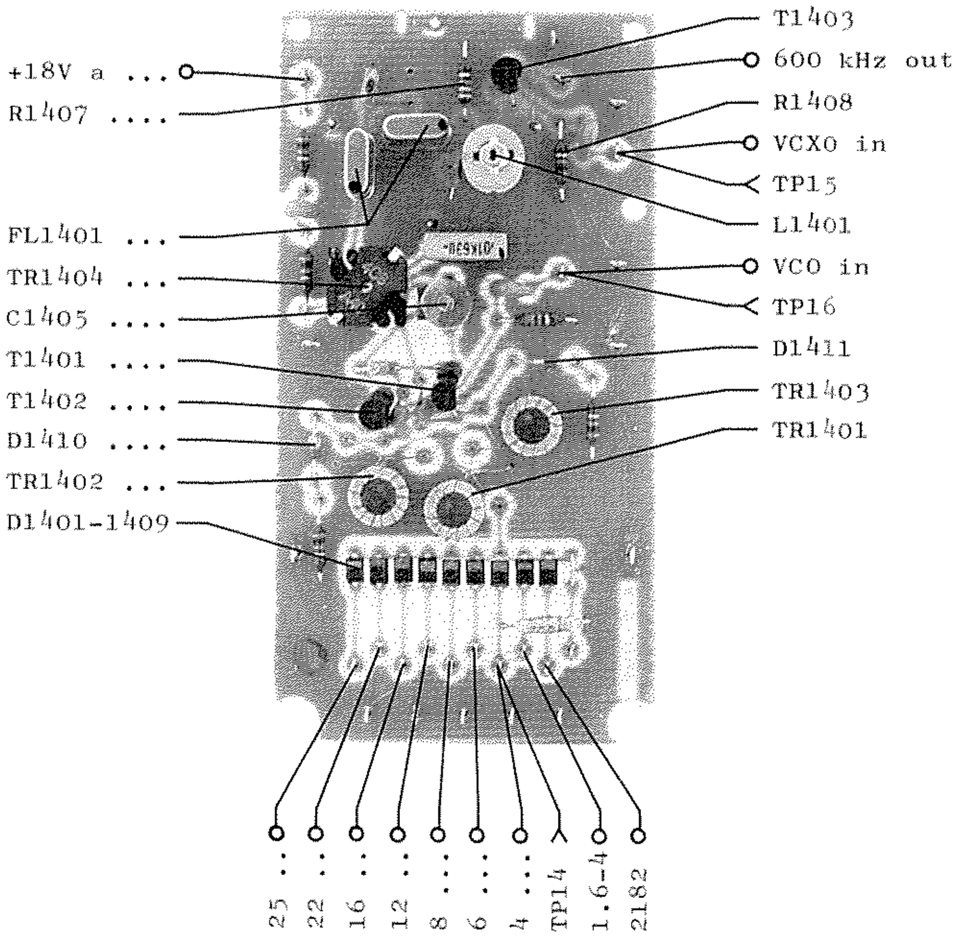
The switching-in and -out takes place by means of the switching diodes D1501, D1502 and the FETs T1501 and T1502.

The center frequency of the second IF is 600 kHz.

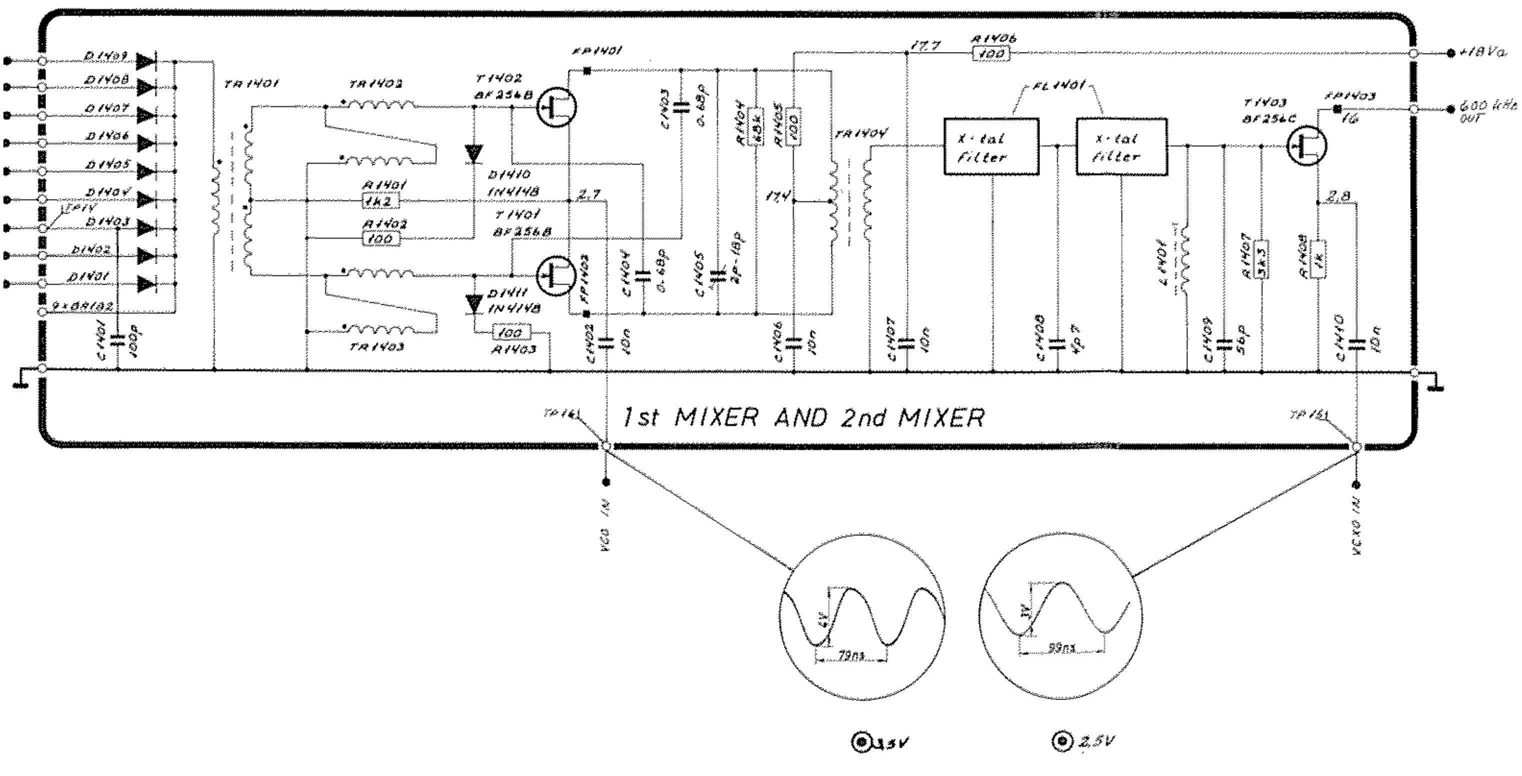
TEST CONDITIONS

Mode	: A3J (A3H)
Oscilloscope input	: Passive probe 10 Mohm//11 pF
DC voltmeter input	: 10 Mohm

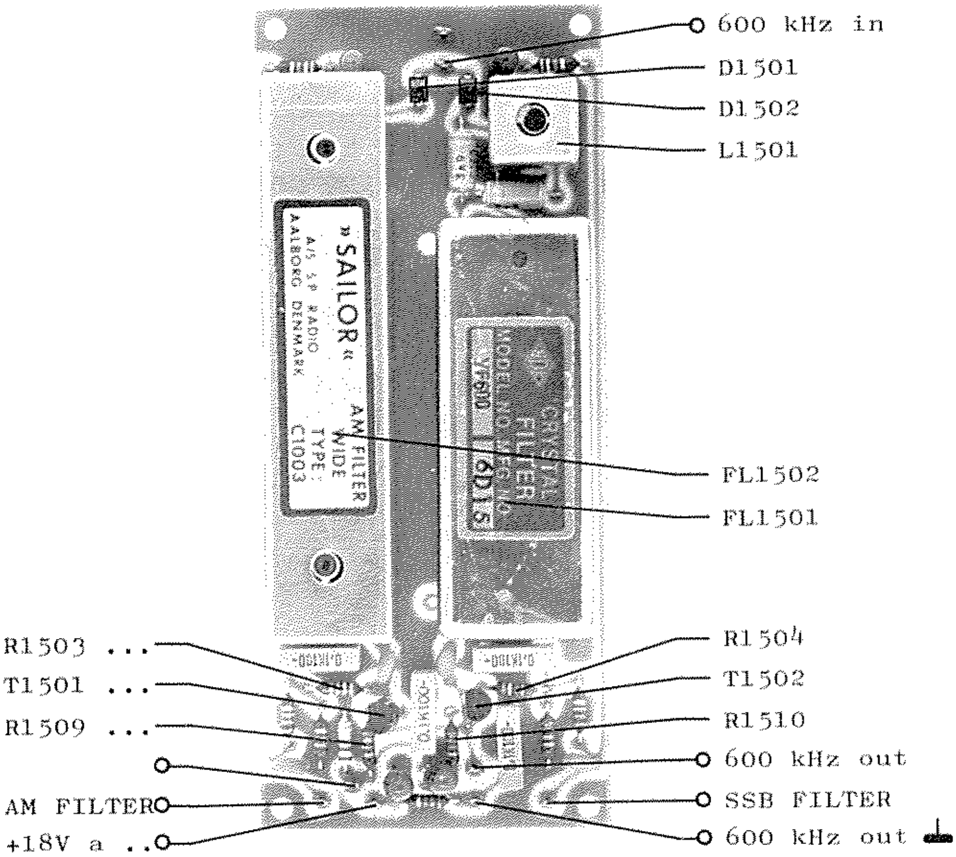
All voltage statements are typical



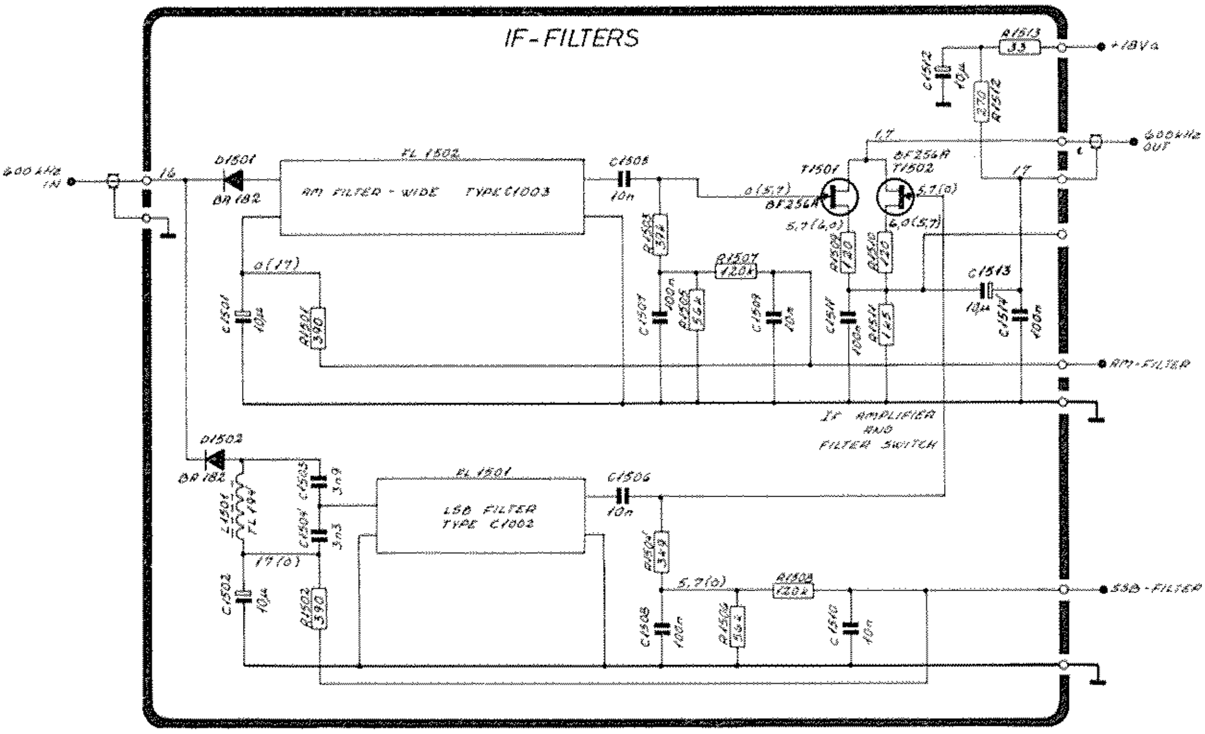
+18V a ...
R1407 ....
FL1401 ...
TR1404 ...
C1405 ....
T1401 ....
T1402 ....
D1410 ....
TR1402 ...
D1401-1409
T1403
600 kHz out
R1408
VCXO in
TP15
L1401
VCO in
TP16
D1411
TR1403
TR1401
25 ..
22 ..
16 ..
12 ..
8 ..
6 ..
4 ..
TP14
1.6-4
2182



1st MIXER AND 2nd MIXER
+18Va
600 kHz OUT
VCO IN
VCXO IN
X-tal filter
X-tal filter
FL1401
TR1401
TR1402
TR1403
TR1404
T1402 BF256B
T1401 BF256B
T1403 BF256C
D1410 1N4148
D1411 1N4148
9 x BA182
4V
79ns
3V
99ns
3,5V
2,5V


600 kHz in
D1501
D1502
L1501
FL1502
FL1501
R1503 ...
T1501 ...
R1509 ...
AM FILTER
+18V a ..
R1504
T1502
R1510
600 kHz out
SSB FILTER
600 kHz out

A2/2 R1117


IF-FILTERS
600 kHz IN
D1501
BA 182
FL 1502
AM FILTER - WIDE TYPE C1003
C1505
10n
T1501
BF256A
T1502
BF256A
R1513
33
+18Va
C1512
10µ
270
R1512
600kHz OUT
C1513
10µ
C1514
100n
AM-FILTER
IF AMPLIFIER AND FILTER SWITCH
D1502
BA 182
L1501
FL 1501
LSB FILTER TYPE C1002
C1506
10n
R1508
120k
SSB-FILTER

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

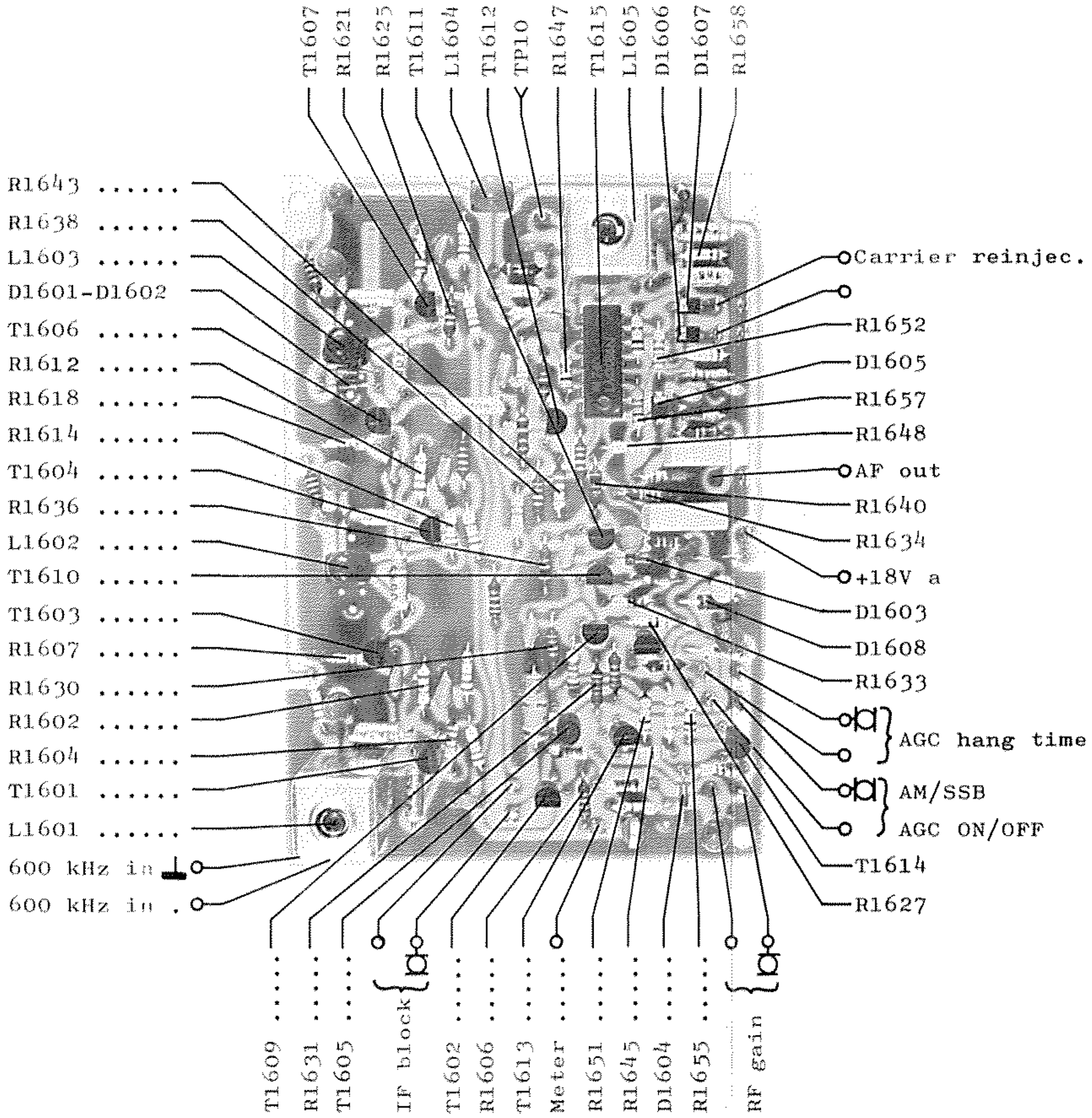
Oscilloscope input	:	Passive probe 10 Mohm//11 pF
DC voltmeter input	:	10 Mohm

⊙ : Diode probe measurements

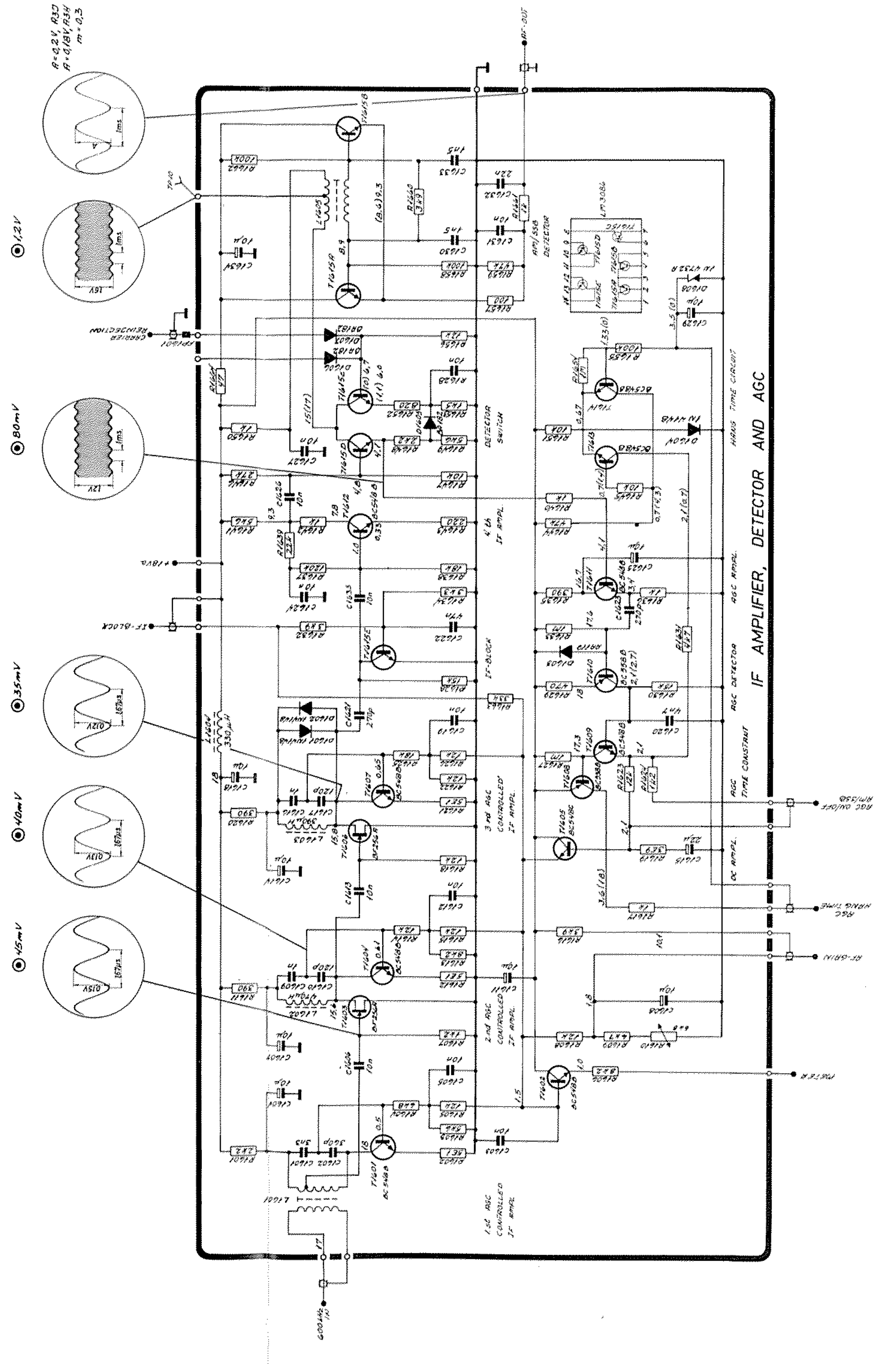
TP : Testpoints

All voltage statements are typical

:d



T1607
R1621
R1625
T1611
L1604
T1612
TP10
R1647
T1615
L1605
D1606
D1607
R1658
R1643 ......
R1638 ......
L1603 ......
D1601-D1602
T1606 ......
R1612 ......
R1618 ......
R1614 ......
T1604 ......
R1636 ......
L1602 ......
T1610 ......
T1603 ......
R1607 ......
R1630 ......
R1602 ......
R1604 ......
T1601 ......
L1601 ......
600 kHz in
600 kHz in
Carrier reinjec.
R1652
D1605
R1657
R1648
AF out
R1640
R1634
+18V a
D1603
D1608
R1633
AGC hang time
AM/SSB
AGC ON/OFF
T1614
R1627
T1609
R1631
T1605
IF block
T1602
T1606
T1613
Meter
R1651
R1645
D1604
R1655
RF gain



IF AMPLIFIER, DETECTOR AND AGC

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

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

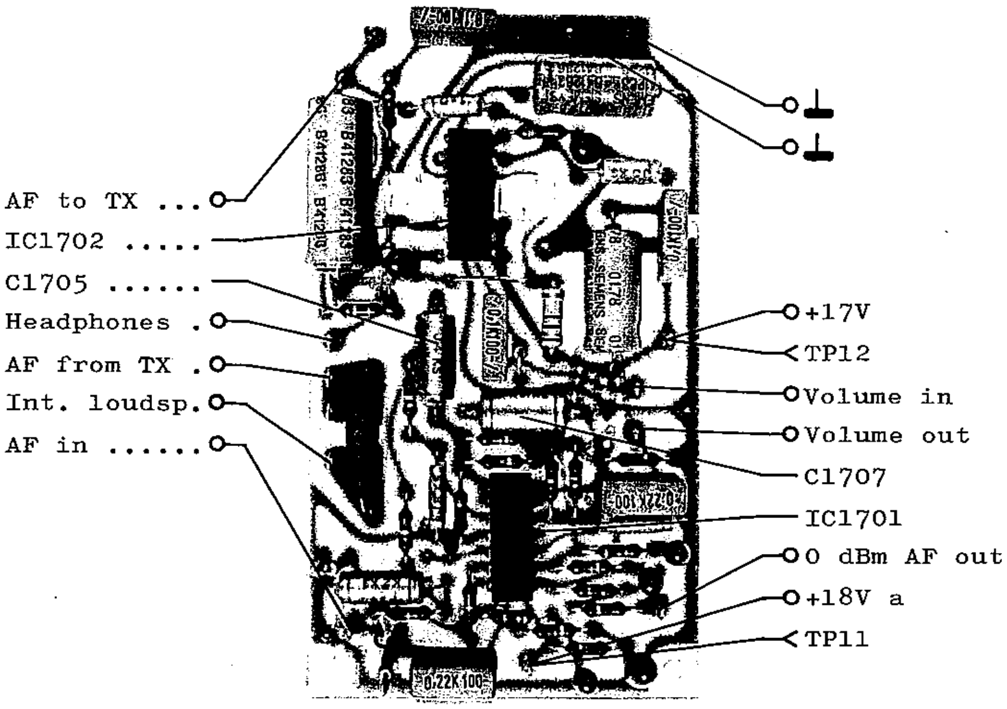
Front end tuned to max. meter reading

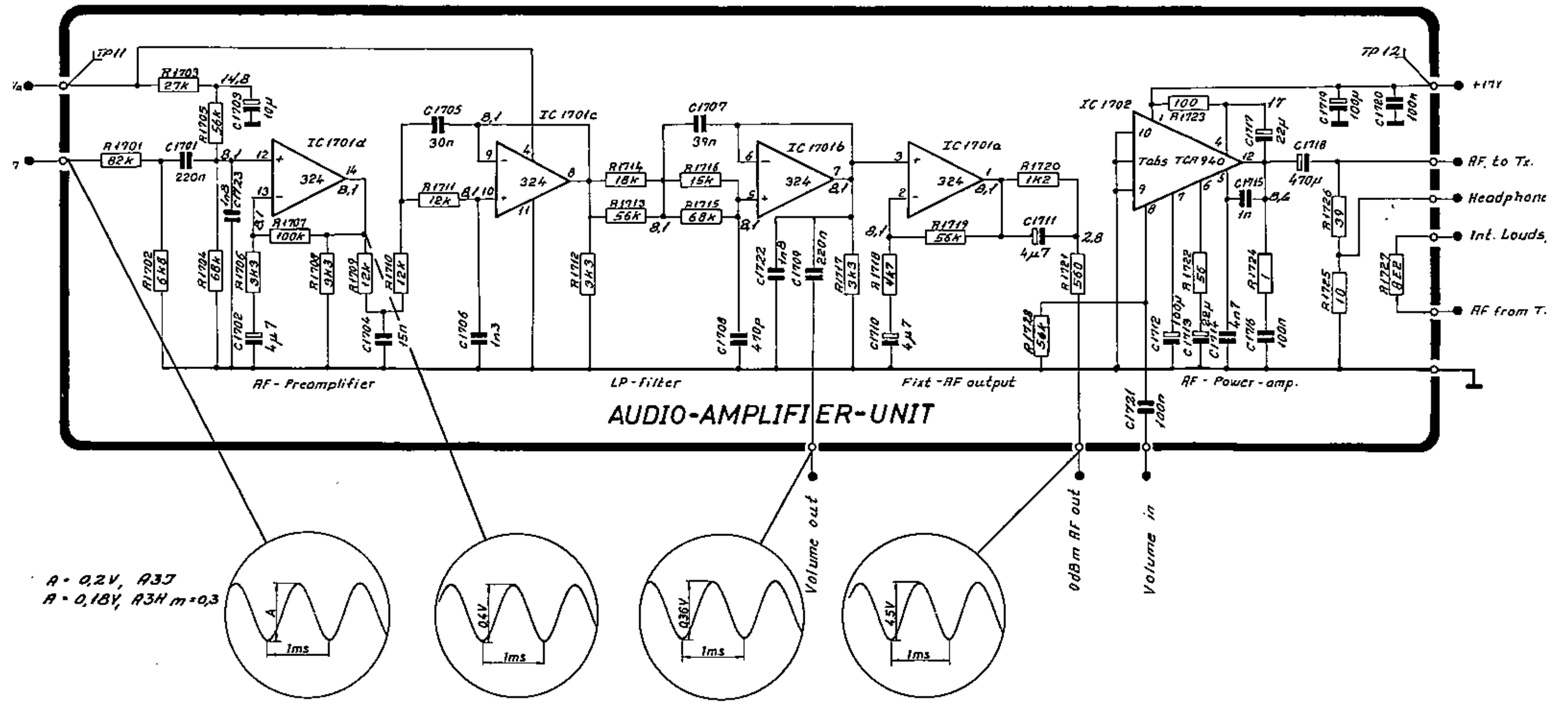
Oscilloscope input	: Passive probe 10 Mohm//11 pF
DC voltmeter input	: 10 Mohm

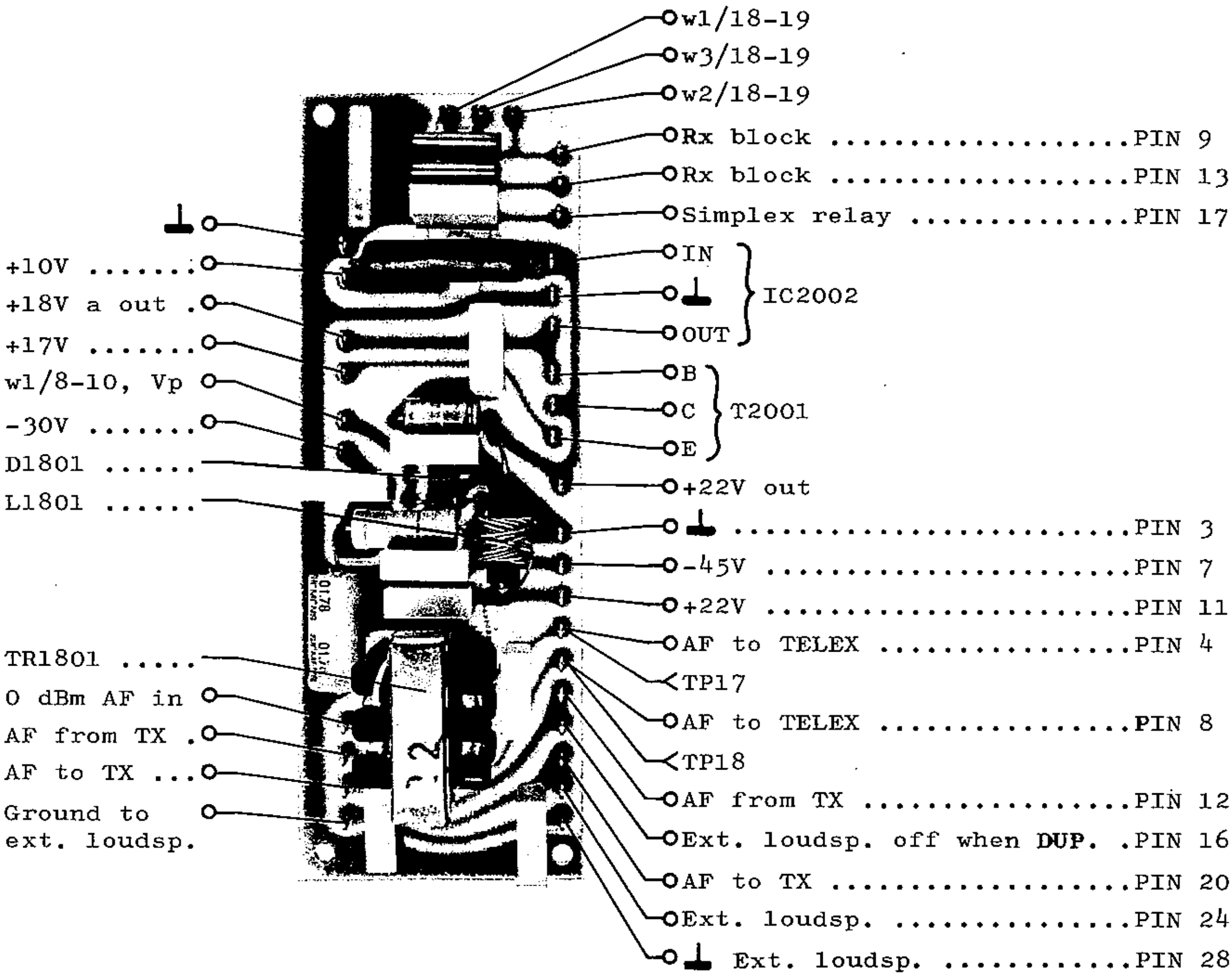
⦿ : Diode probe measurements

TP : Testpoints

All voltage statements are typical

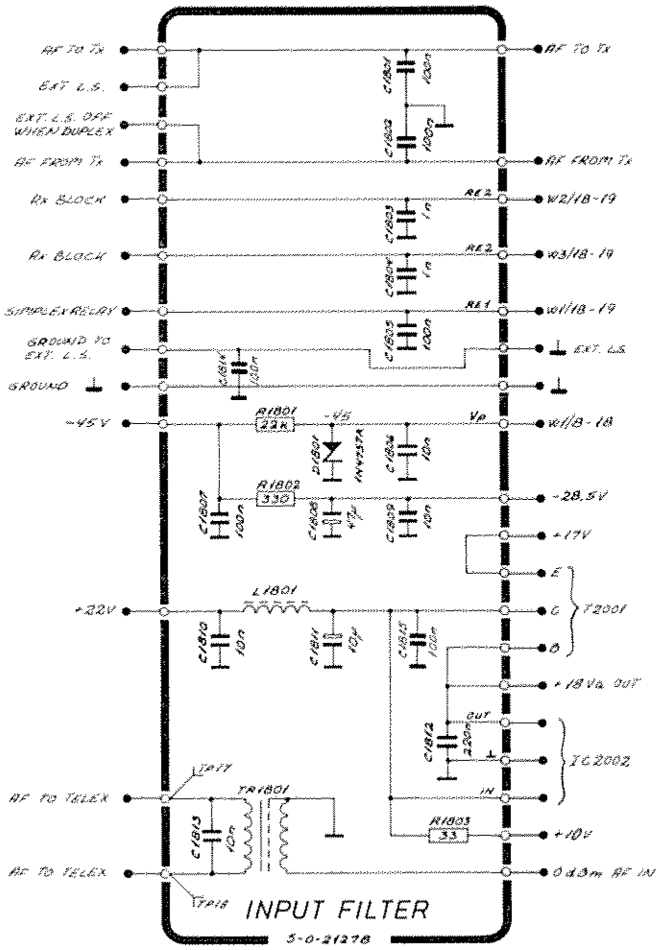

AF to TX ...
IC1702 .....
C1705 ......
Headphones .
AF from TX .
Int. loudsp.
AF in ......
+17V
TP12
Volume in
Volume out
C1707
IC1701
0 dBm AF out
+18V a
TP11


AUDIO-AMPLIFIER-UNIT
AF - Preamplifier
LP - filter
Fixt - AF output
AF - Power - amp.
IC 1701d
IC 1701c
IC 1701b
IC 1701a
IC 1702
TCA 940
TP11
TP12
AF to Tx.
Headphone
Int. Louds.
AF from T.
Volume out
0dBm AF out
Volume in
A = 0,2V, A3J
A = 0,18V, A3H m=0,3
1ms


w1/18-19
w3/18-19
w2/18-19
Rx block ....PIN 9
Rx block ....PIN 13
Simplex relay ....PIN 17
IN
OUT
IC2002
B
C
E
T2001
+22V out
......................PIN 3
-45V ....PIN 7
+22V ....PIN 11
AF to TELEX ....PIN 4
TP17
AF to TELEX ....PIN 8
TP18
AF from TX ....PIN 12
Ext. loudsp. off when DUP. .PIN 16
AF to TX ....PIN 20
Ext. loudsp. ....PIN 24
Ext. loudsp. ....PIN 28
+10V ....
+18V a out .
+17V ....
w1/8-10, Vp
-30V ....
D1801 ......
L1801 ......
TR1801 .....
0 dBm AF in
AF from TX .
AF to TX ...
Ground to ext. loudsp.

A1/2 R1117

A2/2 R1117



AF TO Tx
EXT L.S.
EXT. L.S. OFF WHEN DUPLEX
AF FROM Tx
Rx BLOCK
Rx BLOCK
SIMPLEX RELAY
GROUND TO EXT. L.S.
GROUND
-45V
+22V
AF TO TELEX
AF TO TELEX
AF TO Tx
AF FROM Tx
W2/18-19
W3/18-19
W1/18-19
EXT. L.S.
W1/8-18
-28,5V
+17V
E
C
B
T2001
+18V OUT
IC2002
+10V
0 dBm AF IN
C1801 100n
C1802 100n
C1803 1n
C1804 1n
C1805 100n
C1814 100n
R1801 22K
D1801 1N4757A
C1806 10n
R1802 330
C1807 100n
C1808 47µ
C1809 10n
L1801
C1810 10n
C1811 10µ
C1815 100n
C1812 220n
R1803 33
TR1801
C1813 10n
TP17
TP18
INPUT FILTER
5-0-21278

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 transformator 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

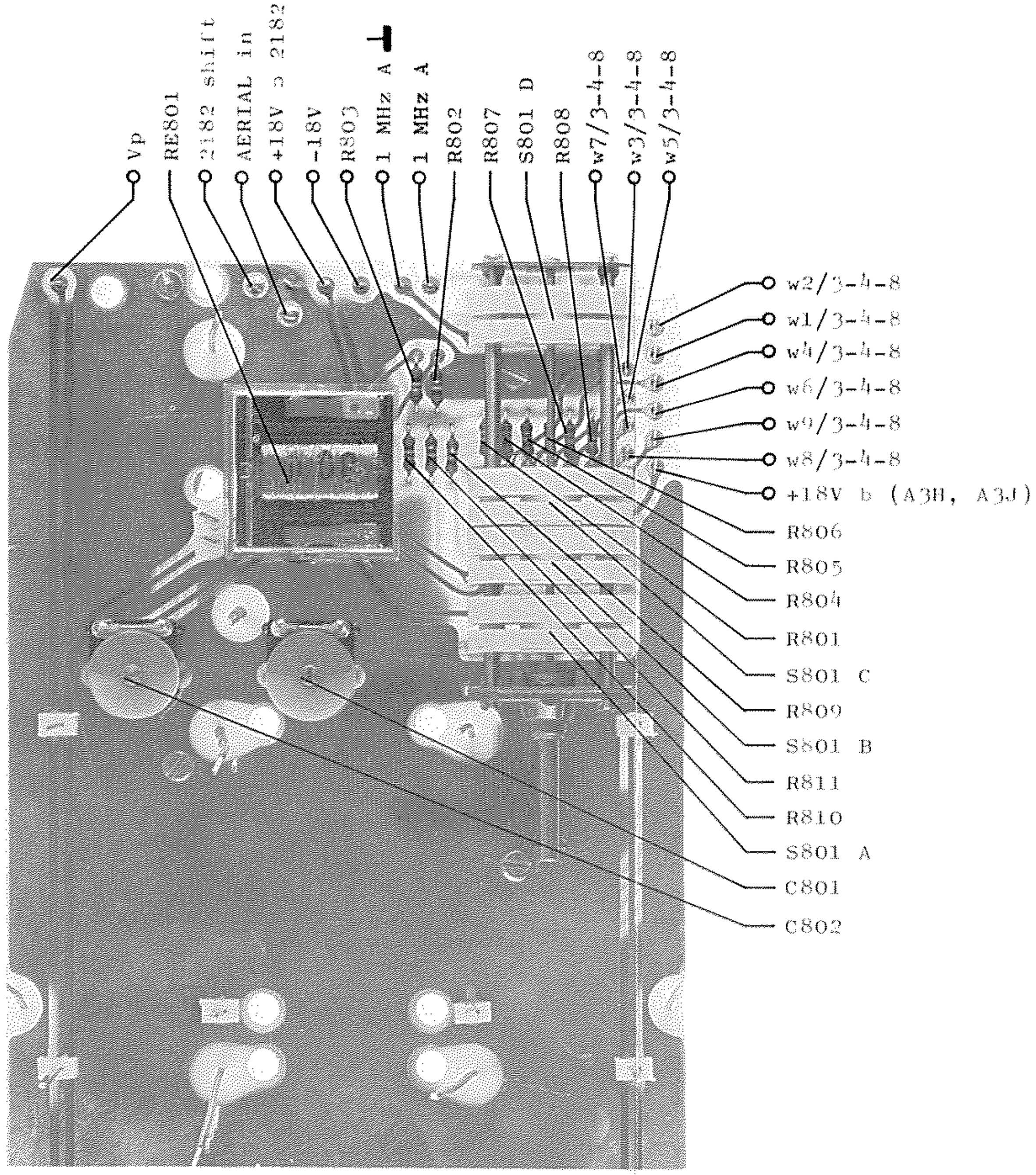
All voltage statements are typical

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

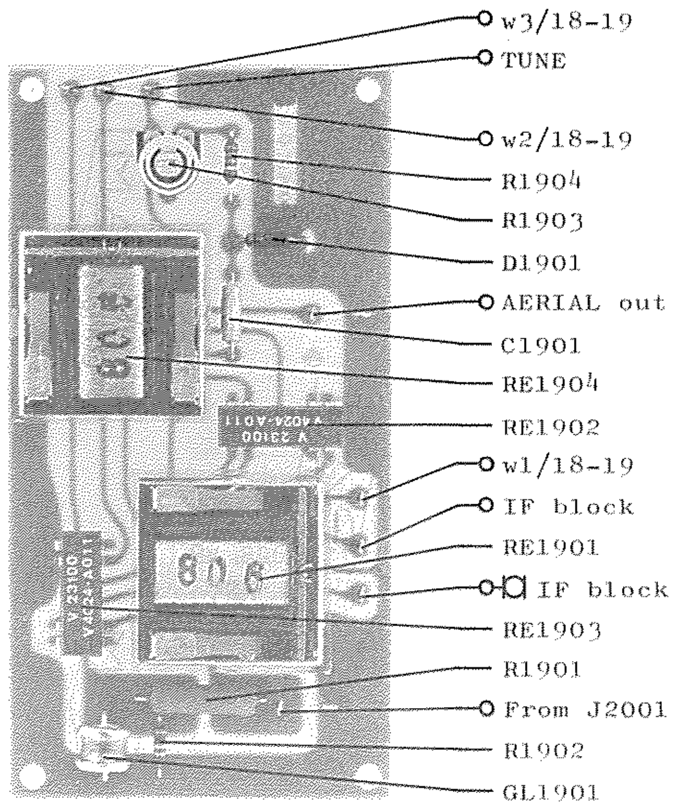
This unit contains the simplex relay and the noise generator.

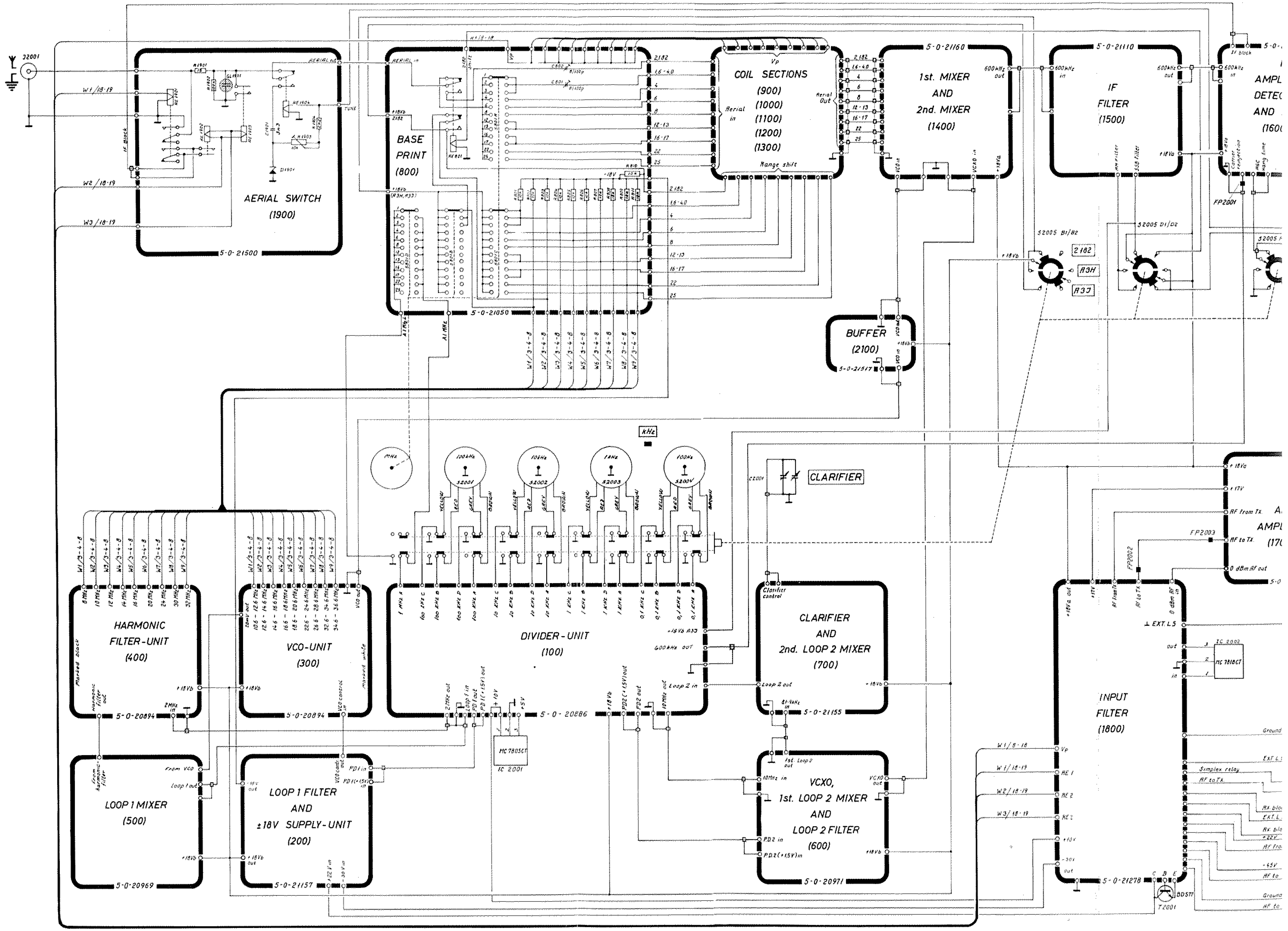
The aerial signal enters the BASE PRINT via R1901 and RE1904. The resistor R1902 and the neon bulb GL1901 are a part of the aerial coil protection circuit.

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.

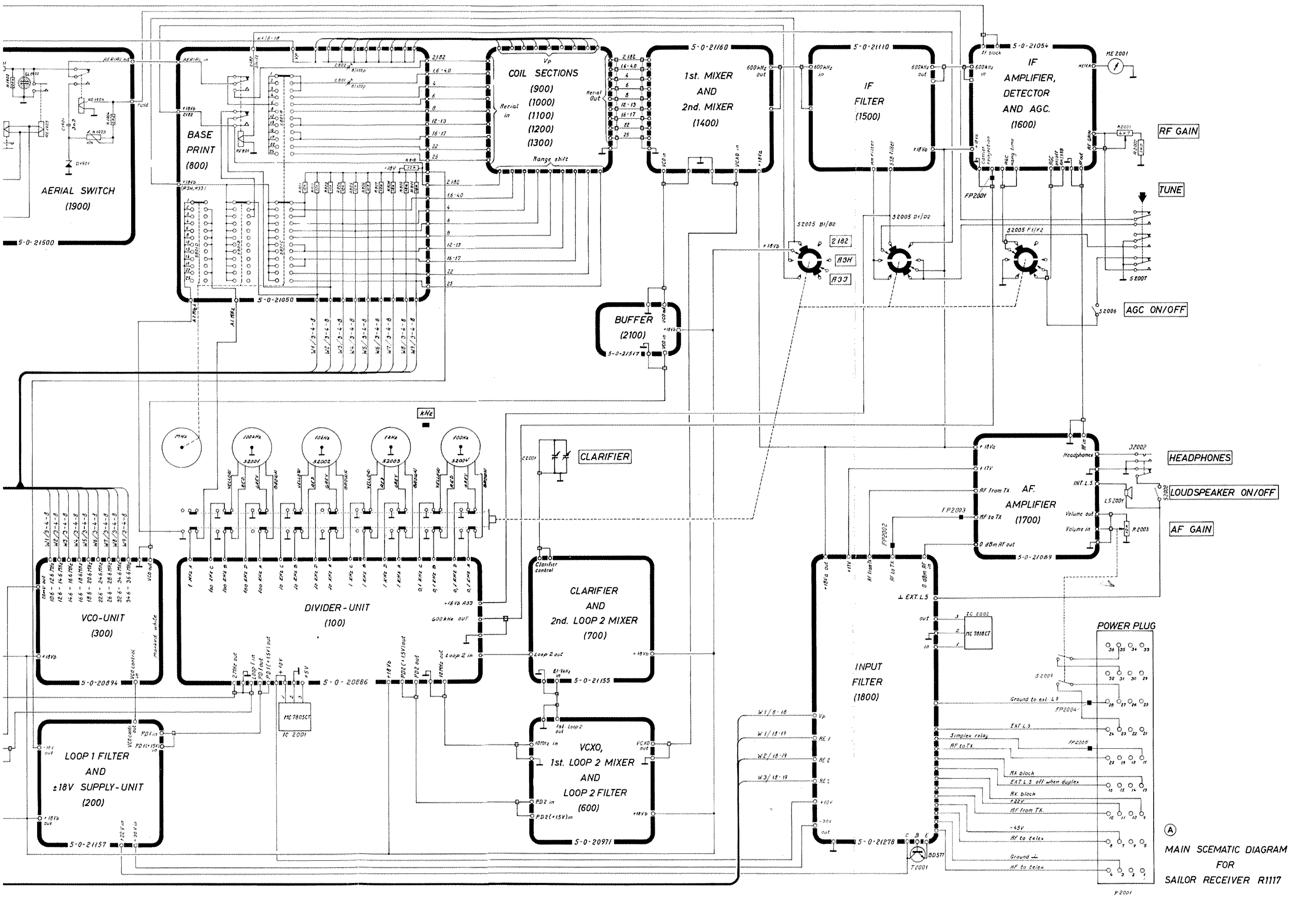
The relays RE1902 and RE1903 have the same functions as RE1901 in the telex mode.

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





AERIAL SWITCH
(1900)
5-0-21500
BASE
PRINT
(800)
5-0-21050
COIL SECTIONS
(900)
(1000)
(1100)
(1200)
(1300)
1st. MIXER
AND
2nd. MIXER
(1400)
5-0-21160
IF
FILTER
(1500)
5-0-21110
BUFFER
(2100)
5-0-21517
CLARIFIER
HARMONIC
FILTER-UNIT
(400)
5-0-20894
VCO-UNIT
(300)
5-0-20894
DIVIDER-UNIT
(100)
5-0-20886
CLARIFIER
AND
2nd. LOOP 2 MIXER
(700)
5-0-21155
LOOP 1 MIXER
(500)
5-0-20969
LOOP 1 FILTER
AND
±18V SUPPLY-UNIT
(200)
5-0-21157
VCXO,
1st. LOOP 2 MIXER
AND
LOOP 2 FILTER
(600)
5-0-20971
INPUT
FILTER
(1800)
5-0-21278
MC 7805CT
IC 2001
IC 2002
MC 7818CT
T 2001
BD 577
FP2001
FP2002
FP2003
S2005 B1/B2
S2005 D1/D2
S2001
S2002
S2003
S2004
J2001



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MAIN SCEMATIC DIAGRAM
FOR
SAILOR RECEIVER R1117