

Sailor

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**INSTRUKTIONSBOG FOR
SAILOR S1300**

**INSTRUCTION BOOK FOR
SAILOR S1300**



A/S S. P. RADIO · AALBORG · DENMARK

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GENERAL DESCRIPTION

SAILOR S1300 is a telephony exciter for use in conjunction with the transmitter T1127.

SAILOR S1300 can be programmed for 240 channels free selected in the frequency range 1.6 - 4.0 MHz and the 4, 6, 8, 12, 16, 22 and 25 MHz maritime HF bands.

SAILOR S1300 channel programming is extremely easy and can be carried out with normal hand tools, no instruments are required.

SAILOR S1300 uses a digital synthesizer for frequency generation. The frequency stability is controlled from one 10 MHz TCXO.

SAILOR S1300 produces completely finished signals on the transmission frequency.

SAILOR S1300 has possibility for the following transmission modes A3J, A3A and A3H.

SAILOR S1300 is provided with a built-in alarm signal generator for distress calls.

SAILOR S1300 fits into SAILOR 19" rack system.

SAILOR S1300 is supplied from N1400 (24V DC) or N1401 (AC mains).

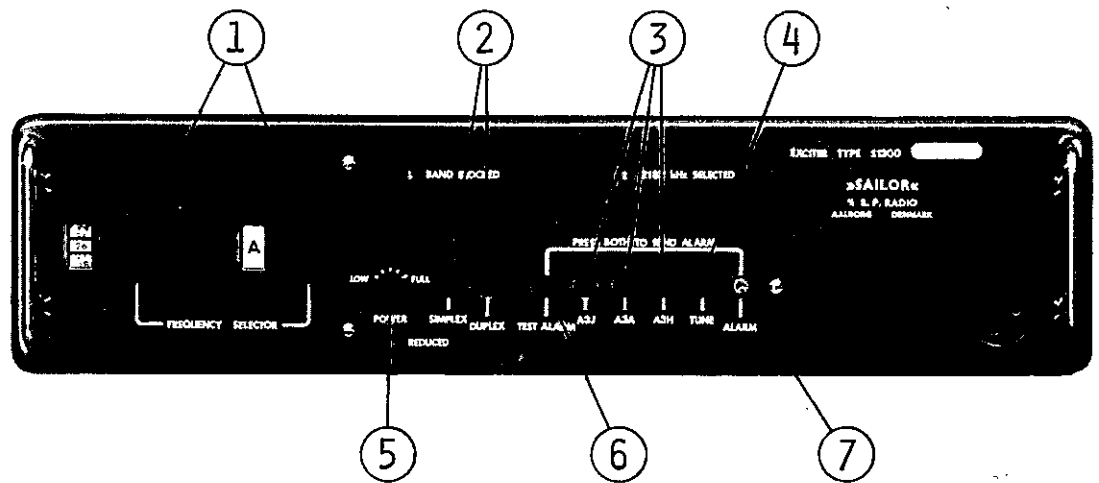
SAILOR S1300 is prepared for connection to telex.

TECHNICAL DATA

The exciter S1300 delivers USB signals on the channel frequency.

<u>Number of channels:</u>		240 channels free selected in the maritime MF and HF bands (resolution 100 Hz).
<u>Frequency range:</u>	MF:	1.6 - 4.0 MHz
	HF:	4, 6, 8, 12, 22 and 25 MHz maritime bands.
<u>Frequency stability:</u>		
Temperature range 0°C to +40°C:		Less than ± 1 ppm (± 25 Hz)
Long term stability :		Less than ± 1 ppm (± 25 Hz) per year
Short term stability :		Less than ± 2 Hz
<u>Mode of operation:</u>		A3J, A3A and A3H
<u>Distress call:</u>		Automatic A3H on 2182 kHz Two-Tone-Alarm: 1300 and 2200 Hz with a duration of 45 secs.
<u>Output power:</u>		1 Watt PEP/50 ohm
<u>Output power reduction:</u>		Three steps: 0 dB, 6 dB and 12 dB
<u>Modulation:</u>		350 - 2700 Hz with compressor
<u>Operation Temperature range:</u>		-15°C to +55°C

CONTROLS



① FREQUENCY SELECTORS

By means of the Frequency Selectors, 240 pre-programmed frequencies can be selected in four groups A-B-C-D with 60 positions in each group.

② SIMPLEX, DUPLEX

Press button SIMPLEX for Single-Frequency Operation.
Press button DUPLEX for Two-Frequency Operation.

③ A3J, A3A and A3H

Select transmission mode A3J, A3A or A3H.

④ TUNE

For tuning of Transmitter T1127, press button TUNE and a two-tone signal is generated.

⑤ POWER

For reducing the RF-output-Power in five 5 dB steps varying between 0 dB and -20 dB.

⑥ TEST ALARM

Press button TEST ALARM and the two-tone-alarm signal will be heard in the microtelephone handset.

⑦ ALARM

Press both buttons TEST ALARM (6) and ALARM (7) for transmitting two-tone-alarm signal.

Third Mixer is a double balanced mixer where both the local oscillator signal f_{LO2} and 2nd IF-signal f_{IF2} is suppressed. The output from the mixer is the carrier frequency f_{TX} , with the upper side-band. The band filter section serves the purpose of removing all undesired mixing products and the signal passes from the Band-Filters to the Driver-Unit where the final amplification to max. 1 Watt PEP/50 ohm takes place.

FREQUENCY GENERATION

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

Local oscillator signal f_{LO2} to Third Mixer is generated in the Phase Locked Loop 1 and has a resolution of 1 kHz.

Local oscillator signal f_{LO1} to Second Mixer is generated in the Phase-Locked Loop 2 and has a resolution of 100 Hz.

LOOP 1

The voltage controlled oscillator (VCO) generates the necessary local oscillator frequencies in nine 2 MHz bands electronically selected by the MHz Selector via the Band and the Motor Control Unit. Inside each 2 MHz band the VCO-frequency f_{LO2} 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_{LO2} in the following way:

In the Loop 1 Mixer the counter frequency f_{T1} is produced from the VCO frequency f_{LO2} and the frequency f_{HARM} which is a multiple of 2 MHz. The 2 MHz signal is generated from the 10 MHz TCXO

$$f_{T1} = f_{LO2} - f_{HARM} = f_{LO2} - (m \times 2 \text{ MHz}) = N_1 \times 1 \text{ kHz}$$

For every 2 MHz band a new 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 phase 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 phase

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

PRINCIPLE OF OPERATION cont.:

The VCO frequency f_{LO2} 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_{LO2} by e.g. 1 kHz can be performed by changing the dividing figure N_1 in the Programmable Divider by one.

$$f_{LO2} = f_{HARM} + (N_1 \times 1 \text{ kHz})$$

Principle of programming is as follows:

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

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

A special code from the MHz Selector to the Band and Motor-control-unit selects the right 2 MHz band for the VCO and Harmonic Filter.

Inside each 2 MHz band the programmable figure P_1 , is encoded from the Frequency Selector (MHz and kHz positions) in BCD-code representing the direct frequency reading of the 2 MHz band.

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

$$\text{Stop-figure : } S_1 = -699$$

$$N_1 = 2000 + P_1 - S_1 = P_1 + 2699$$

Output frequency from Loop 1:

$$f_{LO2} = m \times 2 \text{ MHz} + (P_1 + 2699) \times 1 \text{ kHz} \quad 4 \leq m \leq 16$$

LOOP 2

Phase Locked Loop 2 has a frequency variation of 1 kHz with a resolution of 100 Hz and the working principle is the same as for Phase Locked Loop 1. Principle of programming is as follows:

The frequency shift in Loop 2 is controlled from the 100 Hz Selector.

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

The 100 Hz Selector is encoding the start-figure P_2 in BCD-code to the Programmable Divider.

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

$$\text{Stop figure : } S_2 = 990$$

$$\text{Dividing figure : } N_2 = S_2 - P_2 = 990 - P_2$$

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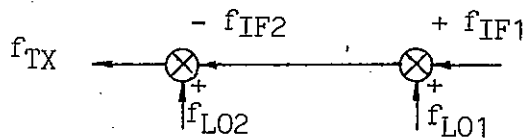
PRINCIPLE OF OPERATION cont.:

Output frequency from Loop 2:

$$f_{L01} = 10 \text{ MHz} + (N_2 \times 0,1 \text{ kHz}) = 10 \text{ MHz} + ((990 - P_2) \times 0,1 \text{ kHz});$$

$$f_{L01} = 10,099 \text{ MHz} - (P_2 \times 0,1 \text{ kHz});$$

CARRIER FREQUENCY f_{TX} FROM EXCITER S1300



$$f_{IF1} = 0,600 \text{ MHz};$$

$$f_{L01} = 10,099 \text{ MHz} - (P_2 \times 0,1 \text{ kHz});$$

$$f_{IF2} = f_{IF1} + f_{L02} = 10,699 \text{ MHz} - (P_2 \times 0,1 \text{ kHz})$$

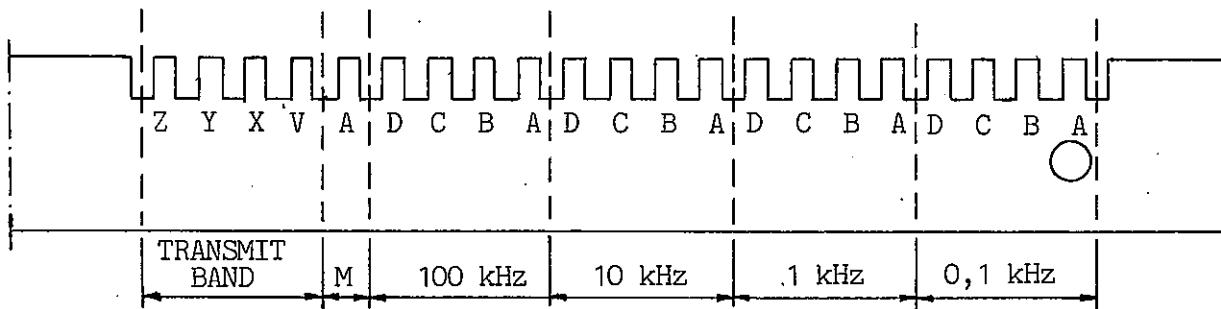
$$f_{L02} = m \times 2 \text{ MHz} + (P_1 + 2699) \times 1 \text{ kHz} \quad 4 \leq m \leq 16$$

$$f_{TX} = f_{L02} - f_{IF2} = (m - 4) \times 2 \text{ MHz} + (P_1 + (0,1 \times P_2)) \times 1 \text{ kHz}$$

FREQUENCY PROGRAMMING

PROGRAMMING OF CARRIER FREQUENCIES

The Programming strip is carrying information for the frequency synthesizer and for selecting one of the 19 transmitter bands.



The Programming Strip has 21 bits. The drawing of the Programming Strip shows where the information for transmitter bands, MHz, 100 kHz, 10 kHz, 1 kHz and 0,1 kHz are located.

FREQUENCY PROGRAMMING cont.:

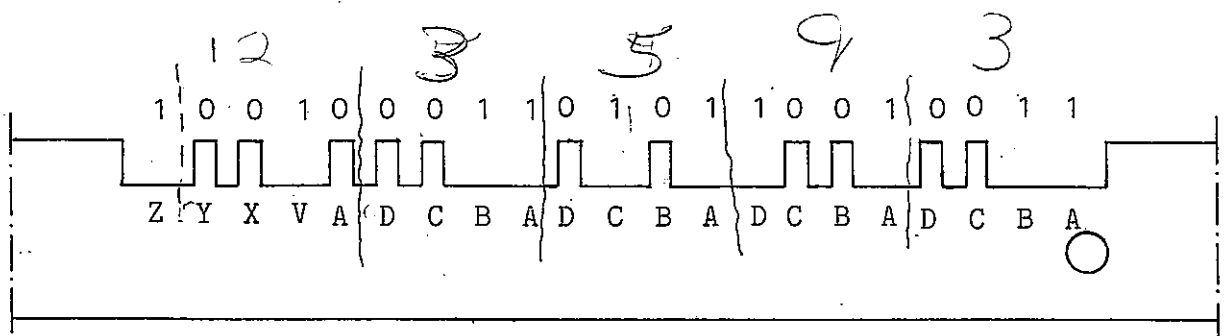
HOW TO PROGRAM A CARRIER FREQUENCY:

Find the frequency in the Programming Table and read directly the programming of the transmitter band code, MHz code, and 100 kHz code. For 10 kHz, 1 kHz, and 0,1 kHz the decimal number for each decade must be converted to a 4 bits BCD code. Use conversion table from decimal to BCD.

Conversion Table	
Decimal	BCD
	DCBA
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Programming example:

Carrier frequency 12359,3 kHz.



Binary "1": Cut the bit off with a nippers.

FREQUENCY PROGRAMMING cont.:

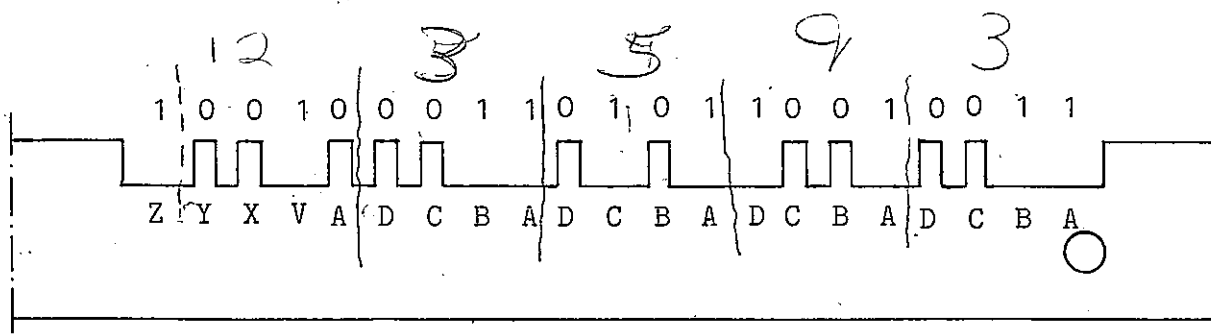
HOW TO PROGRAM A CARRIER FREQUENCY:

Find the frequency in the Programming Table and read directly the programming of the transmitter band code, MHz code, and 100 kHz code. For 10 kHz, 1 kHz, and 0,1 kHz the decimal number for each decade must be converted to a 4 bits BCD code. Use conversion table from decimal to BCD.

Conversion Table	
Decimal	BCD
	DCBA
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Programming example:

Carrier frequency 12359,3 kHz.



Binary "1": Cut the bit off with a nippers.

FREQUENCY PROGRAMMING cont.:

PROGRAMMING TABLE

Carrier Frequencies	Programming Code					
	kHz	zyxv	M A	100 DCBA	10 DCBA	1 DCBA
1 600.0 to 1 699.9	0001	1	0110			
1 700.0 to 1 799.9	0001	1	0111			
1 800.0 to 1 899.9	0001	1	1000			
1 900.0 to 1 999.9	0001	1	1001			
2 000.0 to 2 099.9	0001	0	0000			
2 100.0 to 2 199.9	0001	0	0001			
2 200.0 to 2 299.9	0001	0	0010			
2 300.0 to 2 399.9	0001	0	0011			
2 400.0 to 2 499.9	0001	0	0100			
2 500.0 to 2 599.9	0001	0	0101			
2 600.0 to 2 699.9	0001	0	0110			
2 700.0 to 2 799.9	0001	0	0111			
2 800.0 to 2 899.9	0010	0	1000			
2 900.0 to 2 999.9	0010	0	1001			
3 000.0 to 3 099.9	0010	1	0000			
3 100.0 to 3 199.9	0011	1	0001			
3 200.0 to 3 299.9	0011	1	0010			
3 300.0 to 3 399.9	0011	1	0011			
3 400.0 to 3 499.9	0100	1	0100			
3 500.0 to 3 599.9	0100	1	0101			
3 600.0 to 3 699.9	0100	1	0110			
3 700.0 to 3 799.9	0101	1	0111			
3 800.0 to 3 899.9	0101	1	1000			
3 900.0 to 3 999.9	0101	1	1001			
4 000.0 to 4 099.9	0110	0	0000			
4 100.0 to 4 199.9	0110	0	0001			
6 200.0 to 6 299.9	0111	0	0010			
8 100.0 to 8 199.9	1000	0	0001			
8 200.0 to 8 299.9	1000	0	0010			
12 300.0 to 12 399.9	1001	0	0011			
12 400.0 to 12 499.9	1001	0	0100			
16 400.0 to 16 499.9	1010	0	0100			
16 500.0 to 16 599.9	1010	0	0101			
22 000.0 to 22 099.9	1011	0	0000			
22 100.0 to 22 199.9	1011	0	0001			
25 000.0 to 25 099.9	1100	1	0000			
Distress 2 182.0	1110	0	0001	1000	0010	0000
Special	1101					

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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

0110 0001 0100 1001
0000

1. MAINTENANCE

1.1.

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

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

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

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

2. NECESSARY TEST EQUIPMENT

T1127	N140X	S1300	R1117	
X	X	X	X	<u>OSCILLOSCOPE:</u>
				Bandwidth 0-25 MHz
				Sensitivity 2mV/cm
				Input impedance 1 Mohm//30 pF
				Triggering EXT-INT-ENVELOPE
				E.g. PHILIPS PM3212
X		X	X	<u>PASSIVE PROBE:</u>
				Attenuation 10x
				Input resistance DC 10 Mohm
				Input capacitance 15 pF
				Compensation range 10 pF - 30 pF
				E.g. PHILIPS PM 9396
		X	X	<u>MULTIMETER:</u>
				Sensitivity (f.s.d.) 1V
				Input impedance 10 Mohm
				Accuracy (f.s.d.) +2%
				E.g. PHILIPS PM2503
X	X			<u>MULTIMETER:</u>
				Sensitivity 0.3V and 3A
				Input impedance 30 Kohm/V
				Accuracy (F.S.d.) +1%
				Current range 100A
				Voltage range 500V, and 2.5 kV
				E.g. Unigor A43, with probe and shunt

T1127	N140X	S1300	R1117
		X	
			X
		X	X
			X

TONEGENERATOR:

Frequency range 200 - 3000 Hz
 Output 1V RMS
 Output impedance $\leq 600 \text{ ohm}$
 E.g. PHILIPS PM5107

AF VOLTMETER:

Sensitivity (f.s.d.) 300 mV
 Input impedance $\geq 4 \text{ ohm}$
 Accuracy (f.s.d.) $\pm 5 \%$
 Frequency range 100 Hz - 5 kHz
 E.g. PHILIPS PM2503

FREQUENCY COUNTER:

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

SIGNAL GENERATOR

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

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

POWER SUPPLIES

T1127:

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

R1117/S1300:

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

TEST BOX S1300:

SP type S1300/01 TEST BOX

POWER METER:

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

RF-AMMETER (Thermocross)

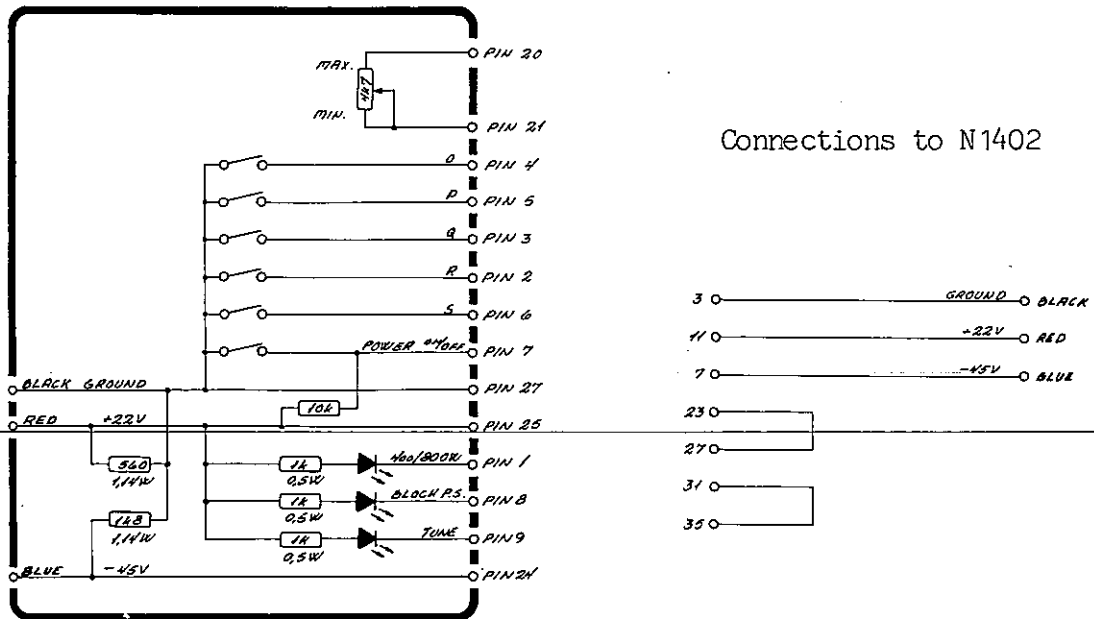
Current range 5A
 E.g. HELWEG MIKKELSEN & CO. Copenhagen, Denmark
 type TR-68x71 5A

DUMMY LOAD for HF bands, 4 MHz to 25 MHz

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

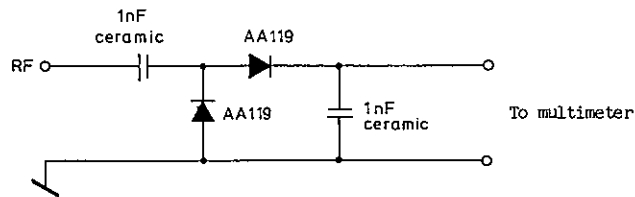
NECESSARY TEST EQUIPMENT cont.:

SCHEMATIC DIAGRAM FOR TESTBOX S1300/1301.

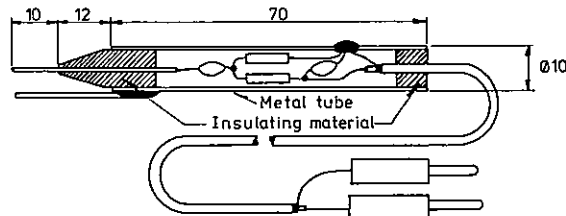


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DIODE PROBE



LAYOUT OF THE PROBE



Necessary test equipment cont.:

FREQUENCY TABLE FOR TEST STRIPS

Programming Code								Programming Code							
Progr. freq.	Pos.	zyxv	M	100	10	1	0,1	Progr. freq.	Pos.	zyxv	M	100	10	1	0,1
			A	DCBA	DCBA	DCBA	DCBA				A	DCBA	DCBA	DCBA	DCBA
2000,5	1A	0101	0	0000	0000	0000	0101	25999,0	10A	1100	1	1001	1001	1001	0000
2000,0	1B	0100	0	0000	0000	0000	0000	24000,0	10B	1100	0	0000	0000	0000	0000
2000,9	1C	0010	0	0000	0000	0000	1001	NONE	10C	1111	0	0000	0000	0000	0000
2000,0	1D	0001	0	0000	0000	0000	0000	NONE	10D	0000	0	0000	0000	0000	0000
2200,0	2A	0001	0	0010	0000	0000	0000	2000,0	11A	0101	0	0000	0000	0000	0000
2600,0	2B	0001	0	0110	0000	0000	0000	4400,0	11B	0110	0	0100	0000	0000	0000
1600,0	2C	0001	1	0110	0000	0000	0000	3000,0	11C	0101	1	0000	0000	0000	0000
2400,9	2D	0011	0	0100	0000	0000	1001	5000,0	11D	0110	1	0000	0000	0000	0000
1888,8	3A	0001	1	1000	1000	1000	1000	6200,0	12A	0111	0	0010	0000	0000	0000
2444,4	3B	0001	0	0100	0100	0100	0100	6263,0	12B	0111	0	0010	0110	0011	0000
4222,2	3C	0110	0	0010	0010	0010	0010	6325,0	12C	0111	0	0011	0010	0101	0000
6300,0	3D	0111	0	0011	0000	0000	0000	NONE	12D	0000	0	0000	0000	0000	0000
8300,0	4A	1000	0	0011	0000	0000	0000	8195,0	13A	1000	0	0001	1001	0101	0000
12300,0	4B	1001	0	0011	0000	0000	0000	8315,0	13B	1000	0	0011	0001	0101	0000
16300,0	4C	1010	0	0011	0000	0000	0000	8435,0	13C	1000	0	0100	0011	0101	0000
22111,1	4D	1011	0	0001	0001	0001	0001	NONE	13D	0000	0	0000	0000	0000	0000
25300,0	5A	1100	1	0011	0000	0000	0000	12330,0	14A	1001	0	0011	0011	0000	0000
NONE	5B	0000	0	0000	0000	0000	0000	12491,0	14B	1001	0	0100	1001	0001	0000
400,0	5C	1101	0	0100	0000	0000	0000	12652,0	14C	1001	0	0110	0101	0010	0000
2182,0	5D	1110	0	0001	1000	0010	0000	NONE	14D	0000	0	0000	0000	0000	0000
1999,0	6A	1101	1	1001	1001	1001	0000	16460,0	15A	1010	0	0100	0110	0000	0000
0000,0	6B	1101	0	0000	0000	0000	0000	16660,0	15B	1010	0	0110	0110	0000	0000
3999,0	6C	0010	1	1001	1001	1001	0000	16859,0	15C	1010	0	1000	0101	1001	0000
2000,0	6D	0010	0	0000	0000	0000	0000	NONE	15D	0000	0	0000	0000	0000	0000
5999,0	7A	0110	1	1001	1001	1001	0000	22000,0	16A	1011	0	0000	0000	0000	0000
4000,0	7B	0110	0	0000	0000	0000	0000	22156,0	16B	1011	0	0001	0101	0110	0000
7999,0	7C	0111	1	1001	1001	1001	0000	22311,0	16C	1011	0	0011	0001	0001	0000
6000,0	7D	0111	0	0000	0000	0000	0000	NONE	16D	0000	0	0000	0000	0000	0000
9999,0	8A	1000	1	1001	1001	1001	0000	25070,0	17A	1100	1	0000	0111	0000	0000
8000,0	8B	1000	0	0000	0000	0000	0000	25090,0	17B	1100	1	0000	1001	0000	0000
13999,0	8C	1001	1	1001	1001	1001	0000	25110,0	17C	1100	1	0001	0001	0000	0000
12000,0	8D	1001	0	0000	0000	0000	0000	NONE	17D	0000	0	0000	0000	0000	0000
17999,0	9A	1010	1	1001	1001	1001	0000	595,0	18A	1101	0	0101	1001	0101	0000
16000,0	9B	1010	0	0000	0000	0000	0000	598,0	18B	1101	0	0101	1001	1000	0000
23999,0	9C	1011	1	1001	1001	1001	0000	601,0	18C	1101	0	0110	0000	0001	0000
22000,0	9D	1011	0	0000	0000	0000	0000	NONE	18D	0000	0	0000	0000	0000	0000

3. TROUBLE-SHOOTING

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

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

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

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

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

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

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

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

TROUBLE-SHOOTING cont.:

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.

4. PERFORMANCE CHECK FOR S1300

Before executing performance check the exciter must be connected to power supplies +22V and -45V via the testbox S1300/01. The output connector shall be loaded with 50 ohm, and the exciter shall be activated by a microphone key plug with a capacitor in it for connection to tone generator.

For S1300TT insert the artificial key between the testbox and the exciter.

For necessary frequency codes the supplied set of programming strips must be mounted in the frequency selector, in position 1 to 18 corresponding to the numbers printed on the strips.

- | | |
|--|--|
| 4.1.1.
Connect voltmeter to TP1. | 4.2.1.
Set "POWER ON/OFF" to "1". |
| 4.1.2.
Check the voltage to be within 18V
<u>+0.2V.</u> | 4.2.2.
Set the frequency selector to 1A. |
| 4.1.3.
Connect voltmeter to TP2. | 4.2.3.
Code the corresponding motor code on
the testbox S1300/01. |
| 4.1.4.
Check the voltage to be within -18V
<u>+0.2V.</u> | 4.2.4.
Check that the LEDs on the testbox is
lighting as indicated in fig. 1. Note
that for incorrect code is TUNE lamp
lighting instead of BLOCK P.S. |
| 4.1.5.
Connect voltmeter between TP1 and TP3. | 4.2.5.
Go to next position as indicated in
fig. 1, and go through 4.2.3., 4.2.4.
and 4.2.5. until 5D is done. |
| 4.1.6.
Check the voltage to be within 100 mV. | 4.2.6.
In position 5D 2182 lamp on exciter front
panel must be lighting. |
| 4.1.7.
Connect voltmeter to TP31. | 4.2.7.
In the same position set "POWER ON/OFF"
to "0", and check that BLOCK P.S. turns
off. |
| 4.1.8.
Check the voltage to be within 5V
<u>+0.2V.</u> | See table on next page. |
| 4.1.9.
Connect frequency counter to TP4. | |
| 4.1.10.
Check the frequency to be within
10 000 000 Hz <u>+1 Hz.</u> | |

4.2. MOTOR CONTROL PRINT

In the positions 1A to 5D (both incl.)
the motor control circuit is checked.
In fig. 1 is shown the truth table for
the motor control code to be tested.

TRUBLE-SHOOTING cont.:

LOOP 2

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

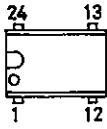
If there is no output signal from the VCXO and LOOP 2 FILTER on the terminal "VCXO out" , the failure has to be found in the VCXO.

If the output frequency from the VCXO and LOOP 2 FILTER on the terminal "VCXO out" is lower than 10.098 MHz or higher than 10.099 MHz, the phase locked loop 2 is out of lock.

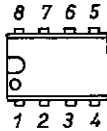
1. Check the output signal on VCXO and LOOP 2 FILTER terminal "Loop 2 out".
 - a. If there is no output signal, the failure is in the loop 2 mixer or the 10 MHz injection signal is missing.
 - b. If the output frequency is slightly lower than 98 kHz or slightly higher than 99 kHz, the VCXO, LOOP 2 mixer and the 10 MHz injection signal are apparently ok.
2. Check that the frequency on the phase/frequency detector IC113, pin 1 is 100 Hz.
3. Check the LOOP 2 Programmable Divider.
 - a. If the frequency on the input terminal "Loop 2 In" is approx. 97 kHz and the frequency on the phase/frequency detector IC113, pin 3 is slightly lower than 100 Hz, the programmable divider is apparently ok.
 - b. If the frequency on the input terminal "Loop 2 In" is approx. 100 kHz and the frequency on the phase/frequency detector IC113, pin 3 is slightly higher than 100 Hz, the programmable divider is apparently ok.
4. Check the phase/frequency detector IC113.
 - a. Measure 1.5V DC on 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 voltage 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 is apparently ok.
5. Check the integrator IC601 on VCXO 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 of 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.
6. If the failure has not yet been found the 100 Hz loop filter must be checked.

TOP VIEW

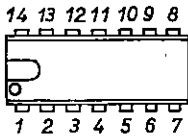
FRONT VIEW



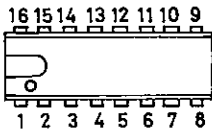
MC 14515 BCB



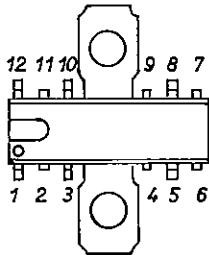
LM 308 N
MC 1455 P1
MC 1458



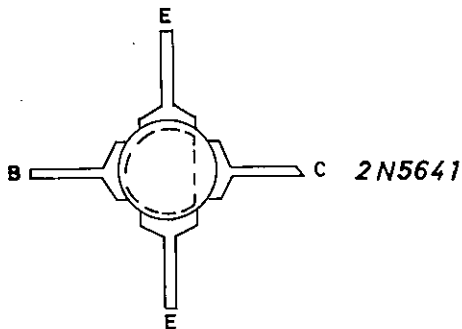
LM 324
LM 3086
MC 4044
MC 14077 B CP
MC 14081 B CP
SN 7407N
SN 7410N
SN 7472N
SN 74LS 20N
SN 74LS27 N
SN 74 LS 290N



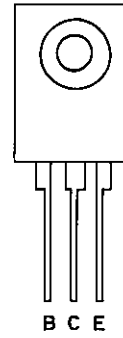
MC 14519 B CP
MC14530B CP
SN 74LS109N
SN 74LS192N
SN 74LS390N



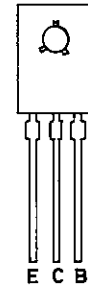
TCA 940



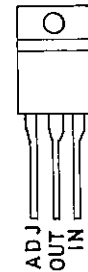
2N5641



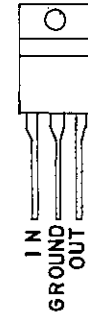
BD 577



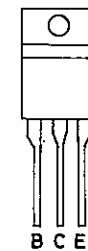
BD138
BD139



LM317 T

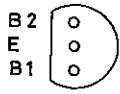


MC7805 CT
MC7818 CT

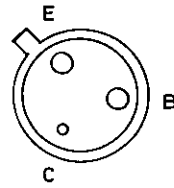


BD 241

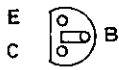
BOTTOM VIEW



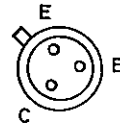
2N4871



BFW17A



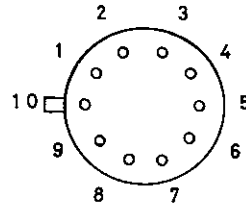
BC 328-25
BC 338
BC 547
BC 548 A,B,C
BC 556 A
BC 558 A,B,C



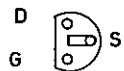
2N2368



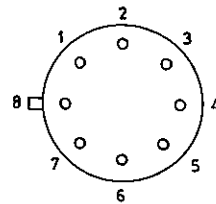
BF 199
BF 494



CA3019



BF256 A,B,C



LM3053



E310

5. ADJUSTMENT PROCEDURE FOR S1300

Before adjustment of the exciter, the set of programming strips must be mounted in the frequency selector in the positions 1 to 18 corresponding to the numbers printed on the strips. Furthermore the exciter must be connected to +22V and -45V power supplies via the testbox S1300/S1301, the output connector shall be loaded with 50 ohm, the exciter shall be activated by a microphone key plug with a capacitor in it for connection to a tone generator and if it is an S1300TT in question the artificial key must be inserted between the testbox and the exciter.

The following adjustment steps are all starting with information about channel selected, and operation mode of the exciter, e.g. 1A, tune.

The trimming cores are factory sealed. In order to break the seal, use normal cellulose thinner.

5.1. DC ADJUSTMENTS

5.1.1.
Connect voltmeter to TP1.

5.1.2.
Adjust R902 to +18V.

5.1.3.
Connect voltmeter to TP2.

5.1.4.
Adjust R209 to -18V.

5.1.5.
Connect voltmeter between TP1 and TP3.

5.1.6.
Adjust R214 to less than 100 mV.

5.1.7.
Disconnect brown wire to TP22, and insert amperemeter.

5.1.8.
Adjust R1536 to 285 mA.

5.1.9.
Reconnect brown wire to TP22.

5.2. MICROPHONE AMPLIFIER

5.2.1.
1A, A3J. Connect tone generator, 1000 Hz and 300 mV pp. measured on TP25.

5.2.2.
Connect oscilloscope to TP12.

5.2.3.
Turn R1201 fully counter clockwise, and then clockwise until the measured level is just constant.

5.2.4.
Add 10 dB to tone generator output 1V pp.

5.2.5.
Adjust R1224 for symmetrical clipping.

5.2.6.
Connect oscilloscope to TP13.

5.2.7.
Change to tune position.

5.2.8.
Adjust R1232 to 80 mV pp.

5.3. TCXO

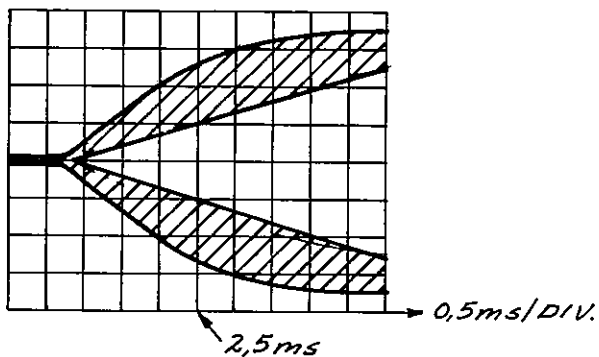
5.3.1.
Connect frequency counter to TP4.

5.3.2.
Adjust R112 to 10 000 000 Hz.

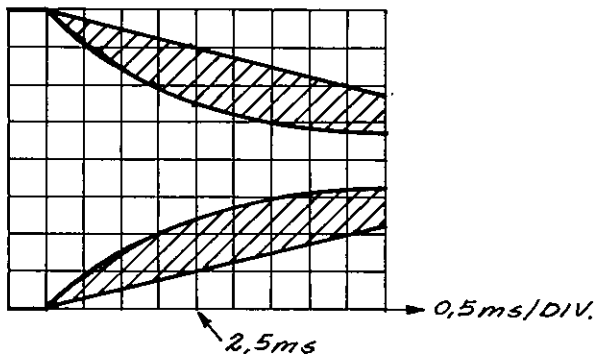
5.4. SIGNAL PATH

5.4.1.
1A, A3J, with no input from tone generator. Connect oscilloscope to TP9 via 1:10 probe.

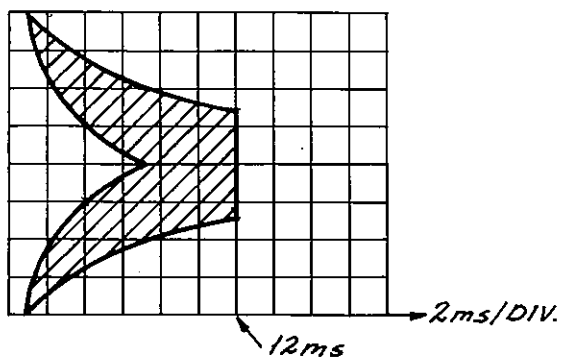
PERFORMANCE CHECK FOR S1300 cont.:



4.16.5. S1300TT only.
Trig the oscilloscope on the opposite edge and check the output envelope with the figure below.



4.16.6. S1300TT only.
Change sweep rate to 2 mS/div. and check the +22V from delay as indicated on the figure below.



4.16.7. S1300TT only.
Connect the oscilloscope to TP35 on the A2H oscillator board and check that the voltage is +22V for a time period between 10 mS and 30 mS.

ADJUSTMENT PROCEDURE FOR S1300 cont.:

5.4.2.
Adjust L101, L1101 and L1103 for max.

5.4.3.
Adjust R1125 and C1123 for min. This adjustment shall be repeated until the measured signal is almost a 1,2 MHz Sine.

5.4.4.
Turn power level potentiometer fully clockwise.

5.4.5.
Connect oscilloscope to TP23 via 1:10 probe.

5.4.6.
Adjust R1625 to min.

5.4.7.
1A, tune, full power. Connect oscilloscope to TP21 via 1:10 probe. If the signal is clipped, reduce output until it is undistorted.

5.4.8.
Adjust L1108, L601, L1603 and L1604 for max.

5.4.9.
Connect oscilloscope to TP17 via 1:10 probe and set output to max.

5.4.10.
Adjust R1151 to 350 mV pp.

5.4.11.
Connect oscilloscope to TP20 via 1:10 probe.

5.4.12.
Adjust R1631 to 2,8V pp.

5.4.13.
Connect oscilloscope to TP21 via 1:10 probe.

5.4.14.
Adjust R1534 to 21V pp.

5.5.
A3H CARRIER

5.5.1.
1A, tune and full power. Connect oscilloscope to TP21 via 1:10 probe.

5.5.2.
Adjust power level potentiometer to full screen (8 cm).

5.5.3.
Change to A3H without modulation. Adjust the A3H carrier now seen to 4.4 cm with R1109.

5.6.
ALARM GENERATOR

5.6.1.
1A, test alarm. Short-circuit C1301. One of the two alarm tones can now be measured on TP11. By removing and establishing the short-circuit, the alarm generator can be changed to the other tone. If necessary the tones may be adjusted on L1301: 2200 Hz \pm 15 Hz and L1302: 1300 Hz \pm 10 Hz.

5.6.2.
Disconnect the established short-circuit.

5.6.3.
Connect frequency counter, in time period position, to TP10.

5.6.4.
Adjust R1301 to 250 mS \pm 10 mS. Under adjustment the alarm generator will stop after about 45 secs. For restart, release test alarm push button, and activate it again.

———— " ————

The following filter adjustments shall only be carried out when some repair is done around a filter.

5.7.
600 kHz SSB FILTER

5.7.1.
1A, tune. Connect oscilloscope to TP21 via 1:10 probe.

5.7.2.
Adjust L1106 and L1107 for max.

5.7.3.
Control of filter response is carried out in mode A3J, with tonegenerator connected to microphone plug, output 1V pp measured on TP25.

ADJUSTMENT PROCEDURE FOR S1300 cont.:

Frequency response is measured with diode probe on TP21. Max. permissible ripple is 2 dB in the frequency range 500 Hz - 2500 Hz, -6 dB frequencies is approx. 350 Hz and 2700 Hz.

5.7.4.
Go through 5.4.9. - 5.4.14.

5.8.
10.7 MHz FILTER

5.8.1.
18B, A3H without modulation. Disconnect innercore of coaxial cable W1/6-16.

5.8.2.
Connect point 1 to point 5 on mixer-board with an external wire.

5.8.3.
Connect oscilloscope to TP19 via 1:10 probe.

5.8.4.
Adjust L1601 and L1602 to max.

5.8.5.
Adjust slightly L1601 and/or L1602 until the amplitude is the same within ± 0.25 dB, in the positions 18A, 18B and 18C.

5.8.6.
Remove wire between 1 and 5, reconnect W1/6-16.

5.8.7.
Go through 5.4.9. - 5.4.14.

5.9.
BAND FILTER UNIT AND LOWPASS FILTER

5.9.1.
11A, B, C and D, tune. Connect diode-probe to TP21.

5.9.2.
Adjust power level potentiometer until 7.75V, corresponding to +20 dB on the decibel scale, is attained. Repeat adjustment of L1513 and L1514 until output difference is below 0.5 dB in the positions A, B and C, and output level in position D is 3 dB below the deflection in position A.

5.9.3.
11A, tune. Connect diode probe to TP21.

5.9.4.
Adjust power level potentiometer to +20 dB (7.75V).

The frequencies for bandpass filter adjustments is chosen so that center frequency is in position B, and bandlimits in position A and C.

Every single bandpass filter shall be adjusted to max. output. The output must be within ± 0.25 dB in A and C relative to B. And the deflection on the center frequency, position B, shall be between 19.0 dB and 20.5 dB.

The test frequencies for the bandpass filters is arranged as follows: pos. 12 is 6 MHz, pos. 13 is 8 MHz ... and pos. 17 is 25 MHz.

5.9.5.
Go through 5.4.9. - 5.4.14.

5.10.
A2H OSCILLATOR & DELAY UNIT S1300TT ONLY

5.10.1.
Connect frequency counter to TP32.

5.10.2.
1A, A2H adjust L1801 to 465 Hz ± 5 Hz.

5.10.3.
Connect oscilloscope to TP21 via 1:10 probe.

5.10.4.
1A, tune and full power, adjust power level potentiometer to full screen (8 cm).

5.10.5.
Change to A2H, and adjust R1806 until the A2H signal now seen is 8 cm pp.

5.10.6.
Connect oscilloscope to TP35, and trig the oscilloscope from the artificial key.

5.10.7.
1A, A1. Adjust the voltage now seen to be +22V for a time period of 18 mS ± 1 mS on the potentiometer R1819.

PERFORMANCE CHECK FOR S1300 cont.:

4.11.8. S1300TT only.

Connect frequency counter to TP32, and check the frequency to be within 455 Hz to 475 Hz in A2H position.

4.11.9. S1300TT only.

Position 1A and A3J. Connect tone generator, 1500 Hz and 1V pp. to the microphone plug and adjust the output level to full deflection (8 cm) on the oscilloscope screen.

4.11.10. S1300TT only.

Position 1A and telex. Connect the grey/white wire W2/9-10 to the yellow wire W1/9-10 on the mode switch board. Connect TP33 to ground and check the steady state output to be within 7 cm pp. to 8 cm pp. on the oscilloscope.

4.11.11. S1300TT only.

Connect TP33 to +22V on brown wire TP34 on mode switch unit and check the steady state output to be within 4.5 cm pp. and 6 cm pp. Disconnect the established connections.

4.12.

BANDPASS FILTER UNIT

Lowpass filter and bandpass filters are checked as described in adjustment procedure 5.9.1. - 5.9.4.

4.13.

ALARM GENERATOR

The alarm signal generator is checked as described in adjustment procedure 5.6.1. - 5.6.2.

4.14.

FREQUENCY RESPONSE

Frequency responses from microphone plug to output socket is measured as described in adjustment procedure 5.7.1. and 5.7.3.

4.15.

DISTRESS

Connect a handset to the exciter, switch it to 5D and do a talk test. Check the output on TP21 with oscilloscope. Press alarm and test alarm at the same time.

The distress signal can now be seen on the oscilloscope. The time from start of alarm signal until it automatically disappears is checked by a watch to be within 35 secs. and 55. secs.

4.16.

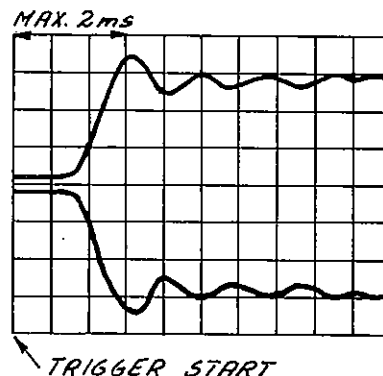
TELEX AND TELEGRAPHY

4.16.1. S1300TT only.

Connect oscilloscope to TP21, and tone-generator to the artificial key. Tone-generator output: 1500Hz and 1Vpp.

4.16.2. S1300TT only.

In position 1A and TELEX, trig the oscilloscope from the artificial key, and check the output envelope on the oscilloscope with the figure below. Disconnect the tonegenerator.



4.16.3. S1300TT only.

In position 1A, A1 and oscilloscope sensitivity to 0.1V/div., adjust power level potentiometer until the steady state level is 8 cm pp. on the screen.

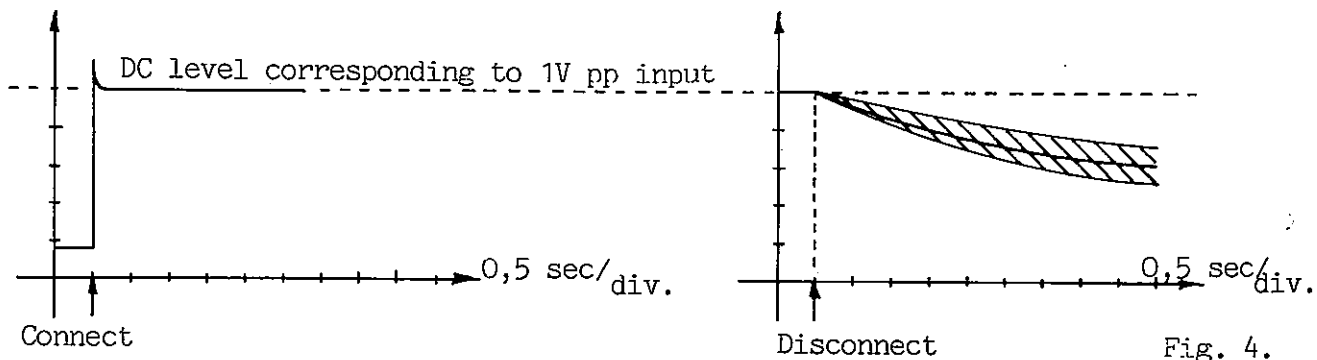
4.16.4. S1300TT only.

Trig the oscilloscope from the artificial key and check the output envelope on the oscilloscope with the figure next page.

PERFORMANCE CHECK FOR S1300 cont.:

4.8.2.

By connection and disconnection of the tone generator signal the measured voltage shall be as shown on fig. 4.



4.9.
OUTPUT LEVEL

4.9.1.
Connect oscilloscope to TP21 via 1:10 probe.

4.9.2.
In position 1A, tune, full power and power level potentiometer fully clockwise.
Measure the voltage to be within 18V pp. and 21V pp.

4.10.
POWER REDUCTION

4.10.1.
Connect diode probe to TP21.

4.10.2.
In position 1A, tune and full power. Check that the power level potentiometer can change output level between 10 dB and 13 dB.

4.10.3.
With power level potentiometer fully clockwise. Check the first power reduction step to be between 4 dB and 6 dB below full power, the second step 8 dB to 12 dB, the third step 12 dB to 18 dB and the fourth step 17 dB to 23 dB below full power.

4.11.
A3H AND A3A

4.11.1.
Connect oscilloscope to TP21 via 1:10 probe.

4.11.2.
In position 1A, tune and full power. Adjust power level potentiometer until there is full deflection (8 cm) on oscilloscope screen.

4.11.3.
Change to A3H, without modulation. Check A3H carrier, now seen, to be within 4 cm and 5 cm.

4.11.4.
Connect tone generator, 1000 Hz and 1V pp. to microphone plug.

4.11.5.
Check the output in A3H, A3A and A3J to be within 7 cm pp. and 8 cm pp. on oscilloscope.

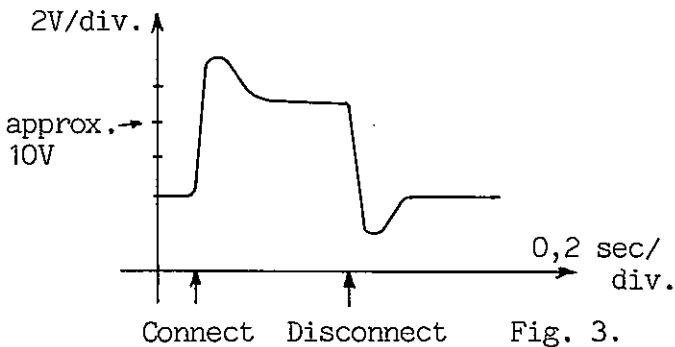
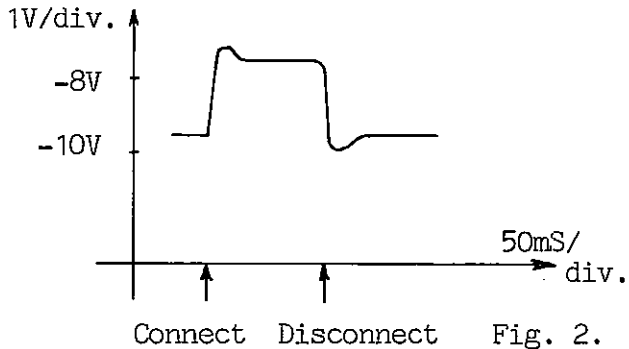
4.11.6. S1300TT only.
Check the output in A2H to be within 7 cm pp. and 8 cm pp. on the oscilloscope.

4.11.7. S1300TT only.
Check the output in A1 to be within 5 cm pp. and 6.4 cm pp. on the oscilloscope.

PERFORMANCE CHECK FOR S1300 cont.:

4.5.4.

In position 2D short-circuit grey control wire to divider board to ground. Step response is seen on oscilloscope compare to fig. 3.



4.6.

LEVEL CHECK.

4.6.1.

Connect oscilloscope to TP29 via 1:10 probe.

4.6.2.

Check the voltage to be above 1,7V pp. in position 1A.

4.6.3.

Connect oscilloscope to TP27 via 1:10 probe.

4.6.4.

Check the voltage to be above 1,6V pp. in position 1A.

4.6.5.

Connect oscilloscope to TP28 via 1:10 probe.

4.6.6.

Check the voltage to be above 2,5V pp. in position 1A.

4.6.7.

Connect voltmeter to TP8.

4.6.8.

Check the voltage to be within 6V to 11V in position 1A.

4.6.9.

Check the voltages to be below 14.5V in position B.

4.6.10.

Check the voltage to be above 4V in position 1C.

4.7.

MICROPHONE AMPLIFIER

4.7.1.

Connect oscilloscope to TP12.

4.7.2.

In position A3J and 1A connect tone-generator, 1000 Hz, to microphone plug.

4.7.3.

Turn tonegenerator output control fully counter clockwise, and then clockwise until the level on TP12 just is constant. This limitation shall happen at approx. 300 mV pp. measured on TP25.

4.7.4.

Add 10 dB to tonegenerator output (1V pp), and check that the measured signal is approx. symmetrical clipped.

4.8.

ATTACK- AND DECAY TIME

4.8.1.

Connect oscilloscope to TP24.

PERFORMANCE CHECK FOR S1300 cont.:

Pos.	s r q p o	Block P.S.	tune	400/800W	Frequency
1A	1 0 1 0 1	x			
1B	1 0 1 0 0	x			
1C	1 0 0 1 0	x			
1D	0 0 0 0 0	x			
2A	0 0 0 0 1	x			
2B	0 0 0 1 1	x			
2C	0 1 0 1 1	x			
2D	1 0 0 1 1	x			
3A	0 1 1 0 0	x			1888.8
3B	0 0 0 1 0	x			2444.4
3C	1 0 1 1 0	x	x		4222.2
3D	1 0 1 1 1	x	x		6300.0
4A	1 1 0 0 0	x	x		8300.0
4B	1 1 0 0 1	x	x		12300.0
4C	1 1 0 1 0	x	x		16300.0
4D	1 1 0 1 1	x	x		22111.1
5A	1 1 1 0 0	x	x		25300.0
5B	∅ ∅ ∅ ∅ ∅			x	
5C	1 1 1 0 1	x			
5D	1 1 1 1 0	x			

FIG. 1.

x indicates light in the corresponding LED on the test box.

∅ indicates don't care.

4.2.8.
In position 10C shall only 400/800W LED be lighting.

4.3.
FREQUENCY SELECTION

4.3.1.
Connect frequency counter to TP21.
Mode A3A.

4.3.2.
Check the frequency from position 3A to 5A (both incl.), and compare with the frequencies in fig. 1.

4.4.
HARMONIC FILTER AND VCO
Load TP26 with 68 ohm.

4.4.1.
Connect frequency counter to TP30.

4.4.2.
Connect voltmeter to TP6.

4.4.3.
Connect voltmeter to TP7.

In the positions 6A to 10B (both incl.) check the above mentioned test points.

ad. 4.4.1. In the positions A and C: 4698 kHz and in the positions B and D: 2699 kHz.

ad. 4.4.2. In all positions below 3,5V.

ad. 4.4.3. In the positions A and C: 15V +1V and in the positions B and D: above 5V.

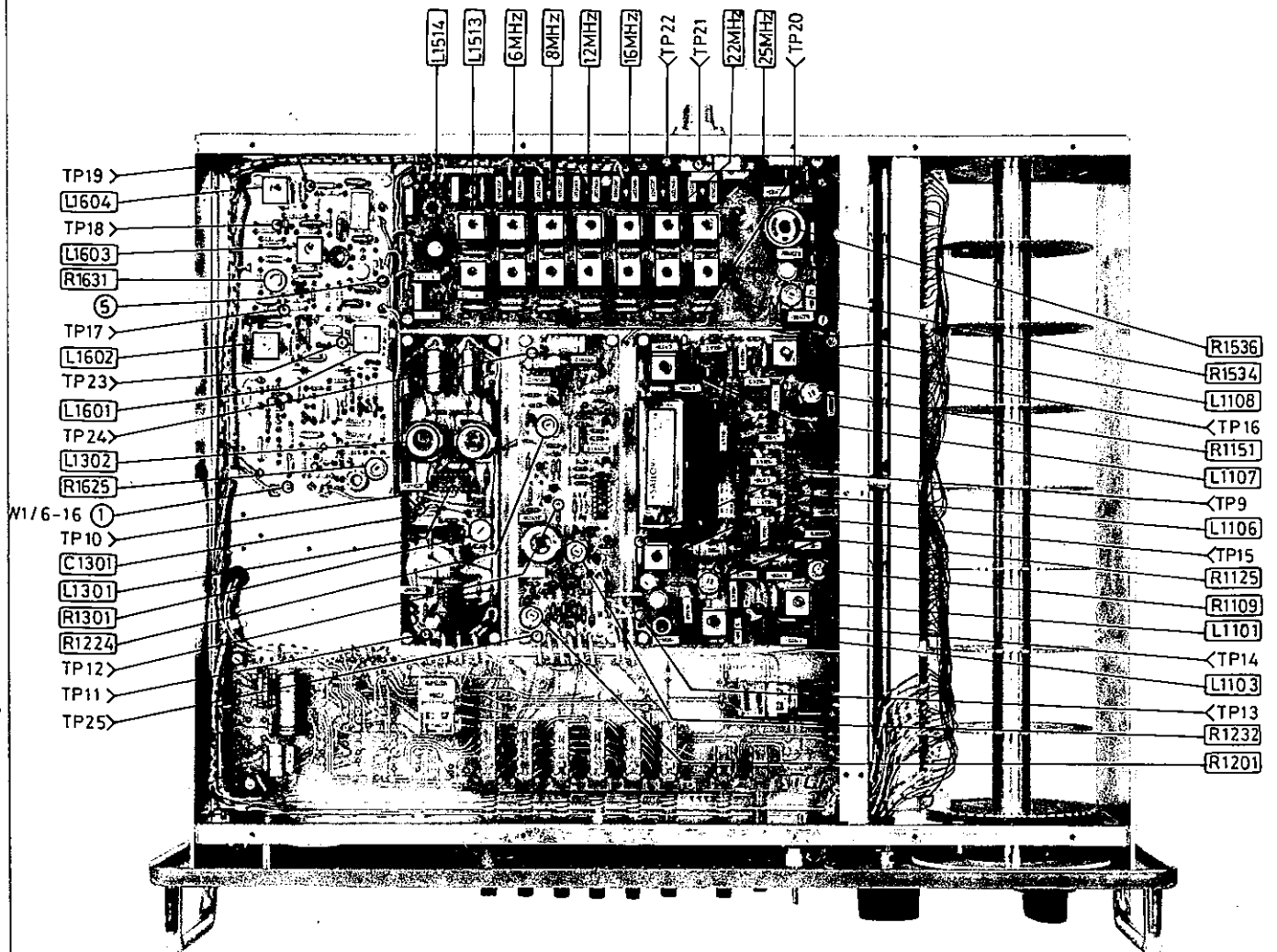
Disconnect 68 ohm load on TP26.

4.5.
STEP RESPONSE

4.5.1.
Connect oscilloscope to TP7.

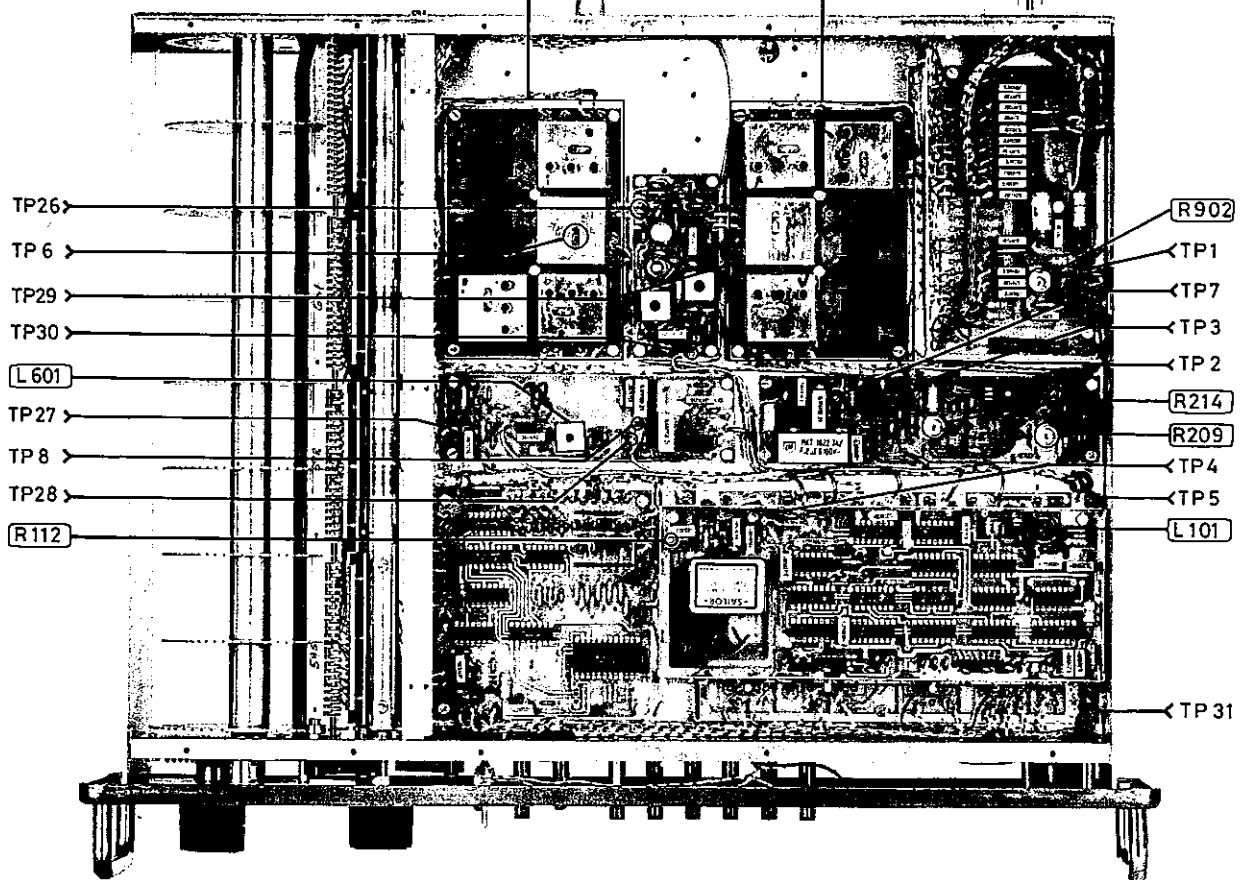
4.5.2.
In position 2D short-circuit black/yellow control wire on divider board to ground. Step response is seen on oscilloscope, compare to fig. 2.

4.5.3.
Connect oscilloscope to TP8.



W176-16 ①

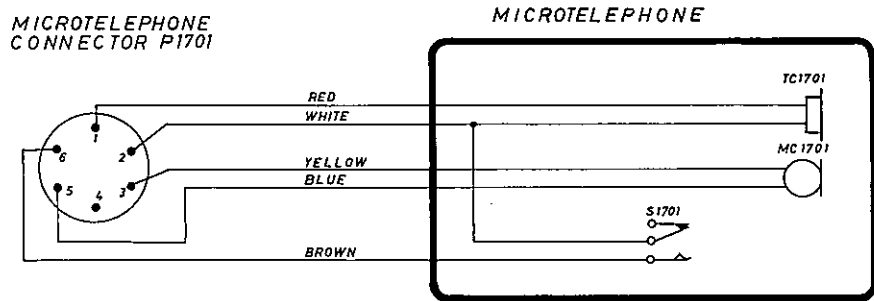
FACTORY ADJUSTED FACTORY ADJUSTED



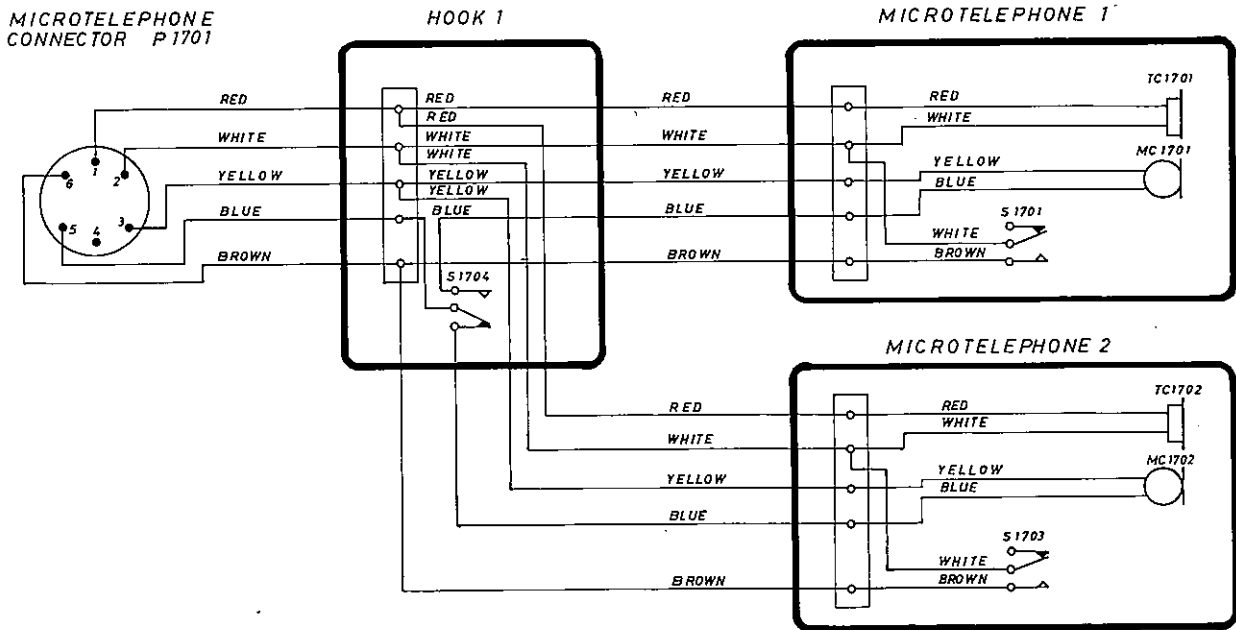
MICROTELEPHONE INSTALLATION S1300

It is possible on request to get a special two microphone installation as described on the schematic diagram below.

NORMAL INSTALLATION WITH ONE MICROTELEPHONE



SPECIAL INSTALLATION WITH TWO MICROTELEPHONES Microtelephone one with preference.



CIRCUIT DESCRIPTIONS AND SCHEMATIC DIAGRAMS

A S1301, S1300/TT,T; R1117

CIRCUIT DESCRIPTION FOR DIVIDER UNIT S1300 & R1117

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

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

10 MHz REFERENCE

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

REFERENCE DIVIDER

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

2 MHz HARMONIC SPECTRUM GENERATOR

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

600 kHz GENERATOR

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

PROGRAMMABLE DIVIDER FOR LOOP 1

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

The stop figure S_1 is controlled from the gates IC108b and IC109c. When the counter outputs Q_A , Q_B ... 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

CIRCUIT DESCRIPTION LOOP 1 FILTER & $\pm 18V$ 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 of 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 $-17V$.

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

PROGRAMMABLE DIVIDER FOR LOOP 2

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

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

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

LOOP 2 PHASE/FREQUENCY DETECTOR

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

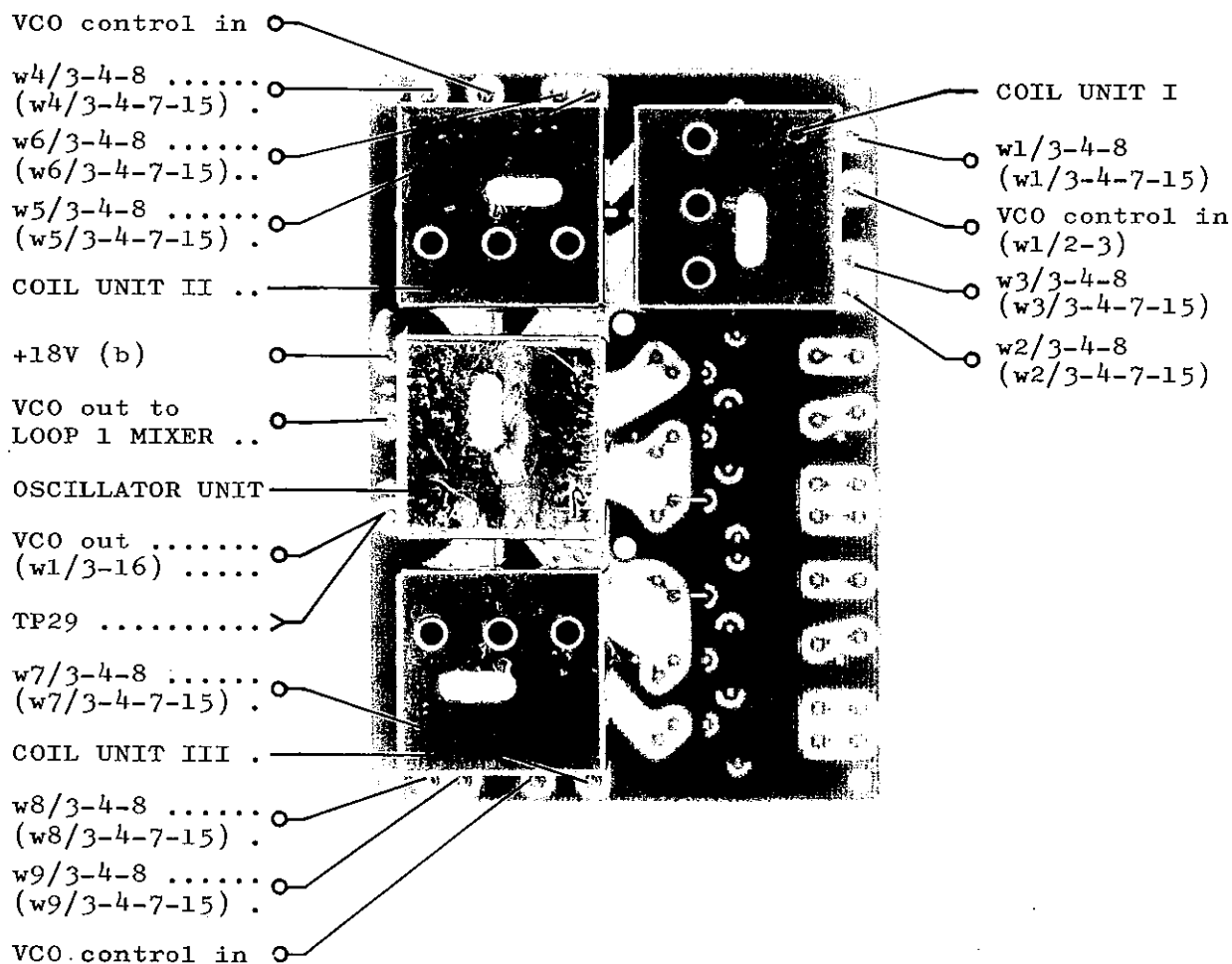
TEST CONDITIONS

Frequency selector : 1A ($f = 2.0005$ MHz)
Mode : A3J
KEY : ON
Oscilloscope input : Passive probe 10 Mohm/11pF
DC voltmeter input : 10 Mohm
⊙ : Diode probe measurements
TP : Testpoints
All voltage statements are typical

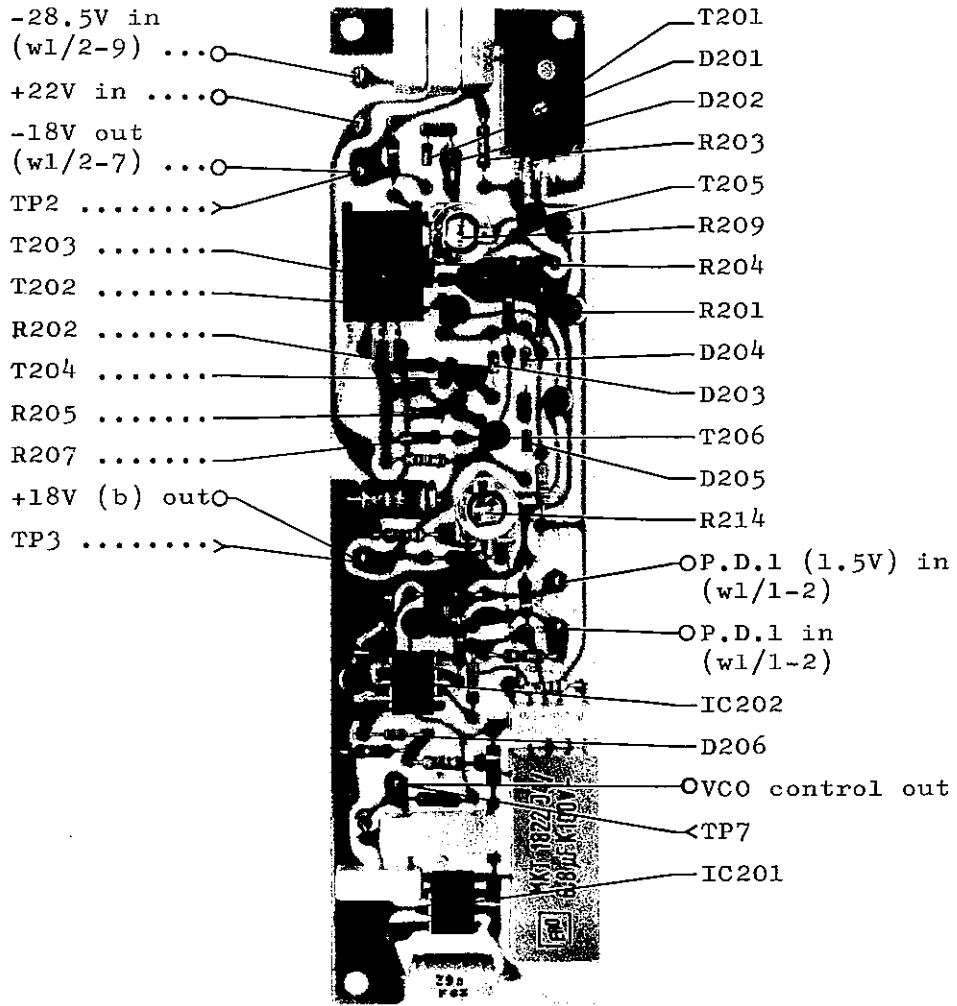
CIRCUIT DESCRIPTION VCO-UNIT S1300 & R1117

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

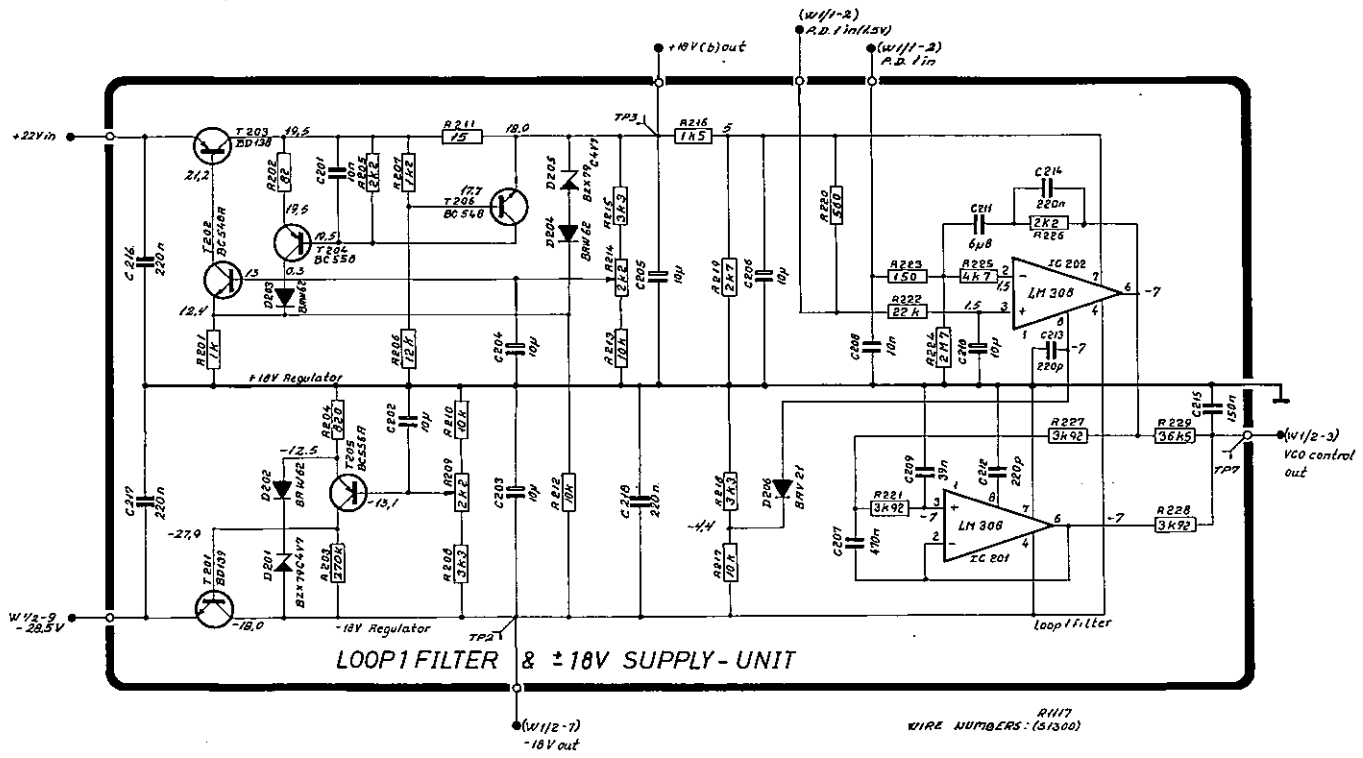
The oscillator unit is factory adjusted and sealed and cannot be repaired in the field, it must be replaced and can be repaired at the factory.



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



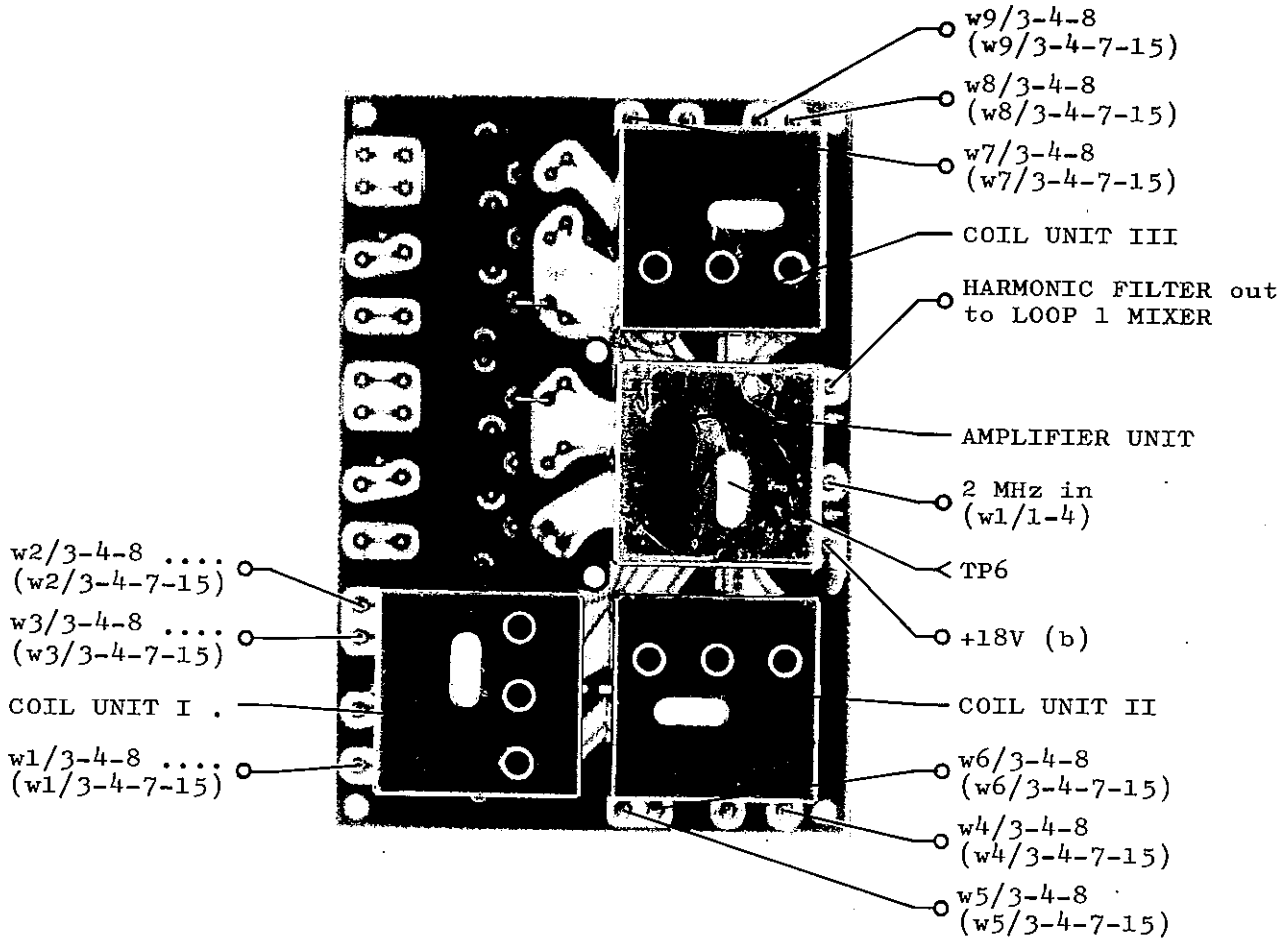
	S1300	R1117
R203	270k Ω	150k Ω
R211	15 Ω	12 Ω



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/TF, T; R1117

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

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

CIRCUIT DESCRIPTION MOTOR CONTROL UNIT S1300

SELECTION OF THE FREQUENCY BANDS IN TRANSMITTER T1127.

This unit contains the control circuits for the band selection in T1127 and S1300, output power and power supply ON/OFF.

The transmitter T1127 has a 19 position drum switch driven by a step-motor. For each position a five bit code (S,R,Q,P,O) is generated.

The FREQUENCY SELECTOR in the exciter is programmed with a code for the 19 bands corresponding to the code from the transmitter. The two codes are compared and if the codes are unequal the step-motor runs and for equal codes the step-motor stops.

From the FREQUENCY-SELECTOR the transmit band code (ZYXV), the MHz code (A) and the 100 kHz code (DCB) are delivered to MOTOR CONTROL UNIT. In the first six MF bands the DATA SELECTOR IC702 transfers the MHz code (A) and 100 kHz code (DCB) to the comparator IC703a,b,c,d and IC704c. In all other bands the DATA SELECTOR IC702 transfers the transmit band code (ZYXV) to the comparator IC703a,b,c,d and IC704c.

The information from the comparator is inverted in IC704b and via IC705c to T714 which controls the step-motor. IC705b stops the information if the decimal code of (ZYXV) is 15 or 0 indicating that no programming strip or an unprogrammed one is mounted. This information is also fed to IC705a and T715 in order to block the power supply. The information that the step-motor is running and the POWER ON/OFF information are fed to IC705a and T715 in order to block the power supply.

SELECTION OF VCO AND HARMONIC FILTER

For each 2 MHz band a VCO and a HARMONIC FILTER are used. To cover the MF and HF maritime band 9 VCO's and HARMONIC FILTERS are used.

From the FREQUENCY SELECTOR the transmit band code (ZYXV) is fed to the 4 to 16 Line Decoder IC707 and the MHz code (A) are fed to the Majority Logic IC706a.

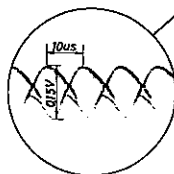
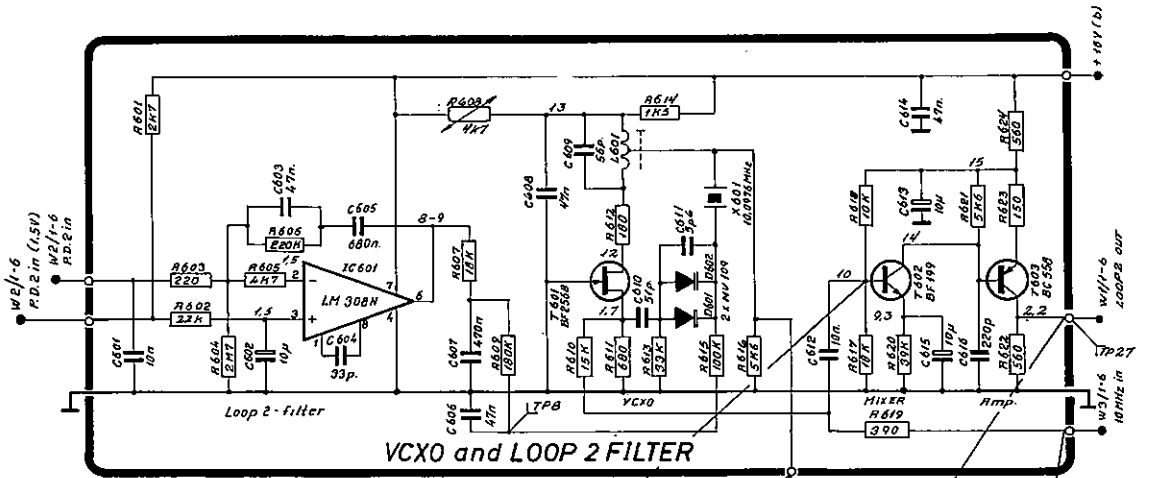
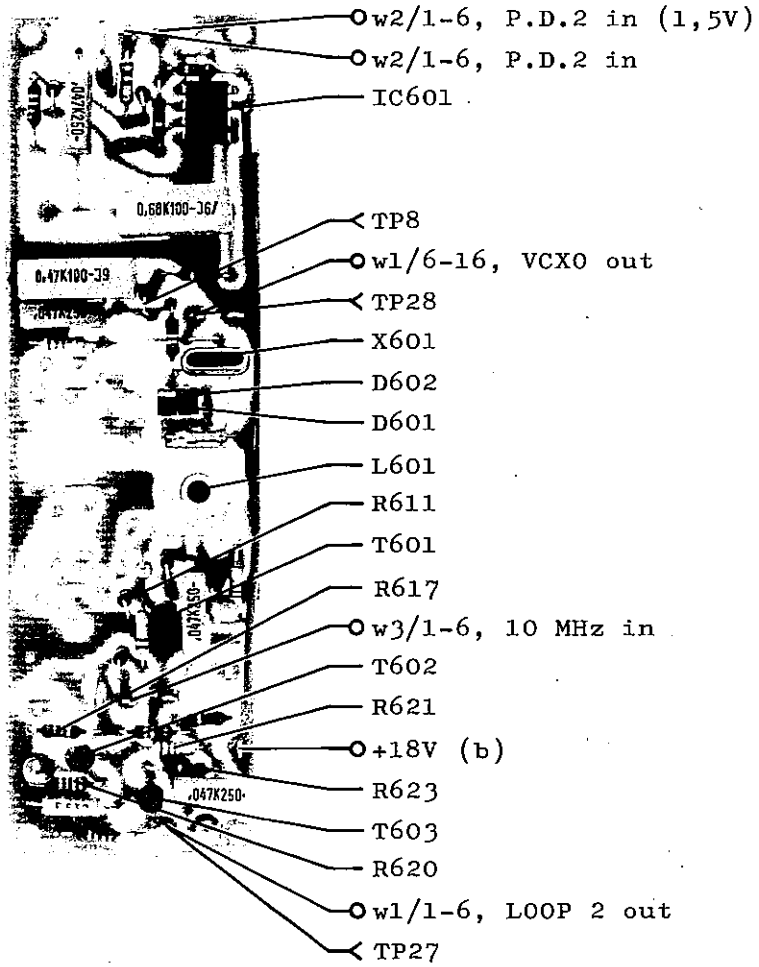
For the two frequency bands from 1.6 - 2.0 MHz the MHz code (A) controls the Majority Logic IC706a to switch on the transistor T702, and thus selects the 0 - 2 MHz VCO.

For the four frequency bands from 2.0 - 2.9 MHz the MHz code (A) controls the Majority Logic IC706b to switch on the transistor T703, and thus selects the 2 - 4 MHz VCO.

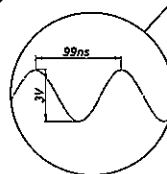
For the four frequency bands from 2.8 - 4.0 MHz the transmit band code (ZYXV) activates the outputs from 2 - 5 on the 4 to 16 Line Decoder IC707. These outputs controls the Majority Logic IC706b to switch on the transistor T703 and thus selects the 2 - 4 MHz VCO.

For the 7 HF bands the transmit band code (ZYXV) activates the outputs from 6 to 12 on the 4 to 16 Line Decoder IC707. These outputs switch on the transistors T704 to T710 in order to select the corresponding VCO's 4 - 6 MHz, 6 - 8 MHz, 8 - 10 MHz, 12 - 14 MHz, 16 - 18 MHz, 22 - 24 MHz and 24 - 26 MHz.

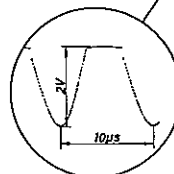
For the 2182 MHz band the transmit band code (ZYXV) activates output 14 on the 4 to 16 Line Decoder IC707. This output switches on the transistor T703 via the Majority Logic IC706b and thus selects the 2 - 4 MHz VCO. The output 14 on IC707 is fed through T712 and T713 to indicate that 2182 kHz is selected.



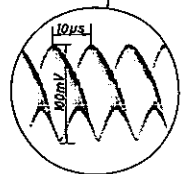
● 45mV



● 2.5V



● 1.7V



● 30mV

CIRCUIT DESCRIPTION VCXO & LOOP 2 FILTER S1300

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

LOOP 2 FILTER

The integrator is built up around IC601 the integration capacitor is C605. R601 feeds current into the diode coupled Darlington pair in the phase comparator MC4044 on the divider board to make the 1.5V reference. Output from the integrator pin 6 on IC601 is fed into the low-pass filters 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 via R615 into the VCXO.

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 the varicaps D601 and D602 to carry out the voltage control of the frequency. The output from the VCXO to first mixer is taken from the tap on the coil L601. From the source a portion of the oscillator signal is taken to the loop 2 mixer.

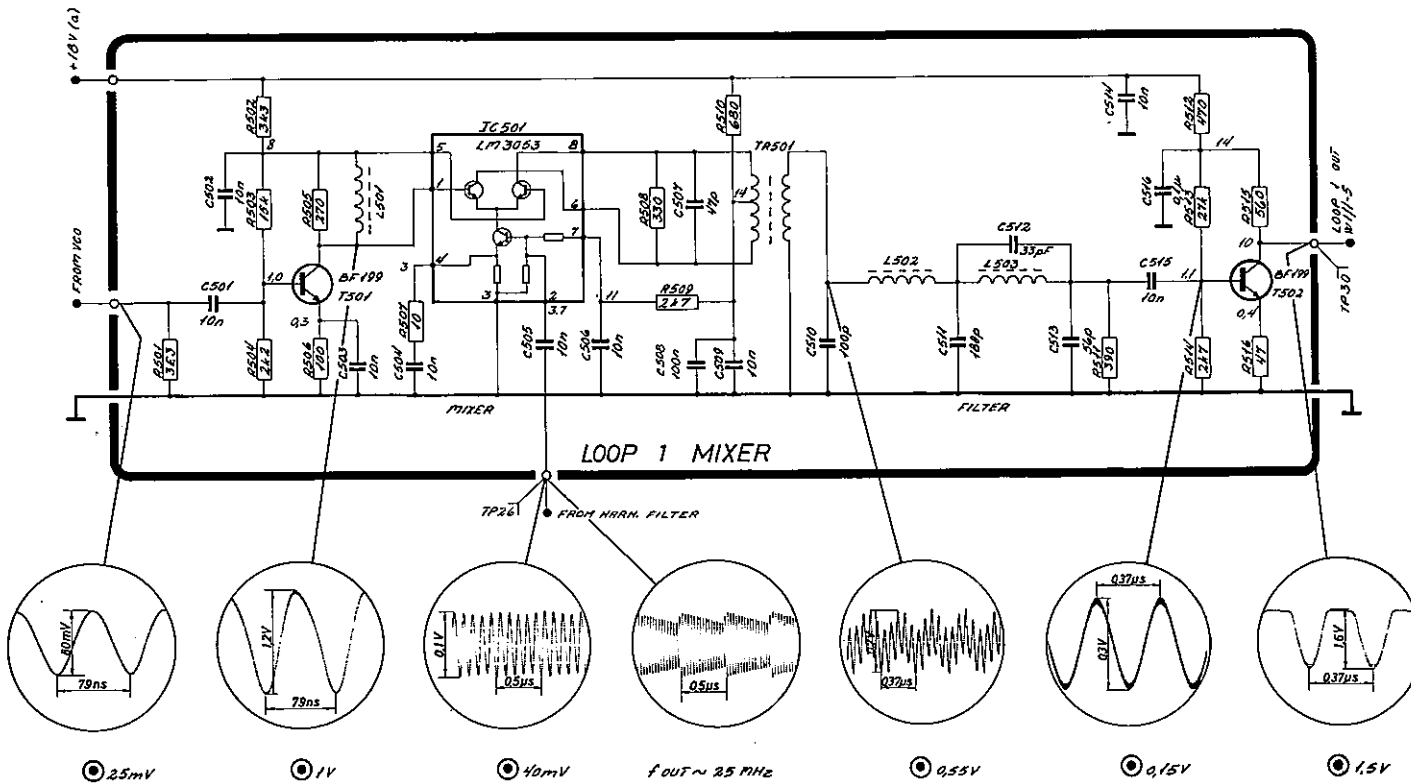
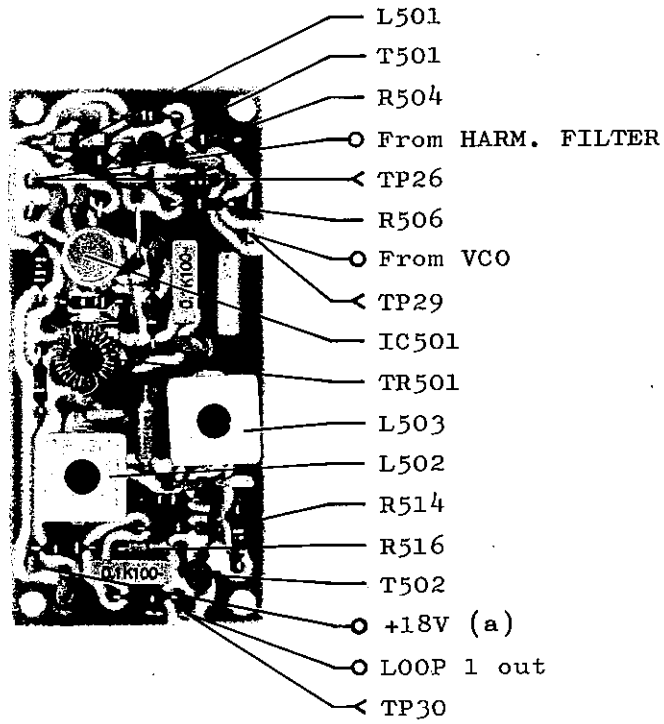
LOOP 2 MIXER

As mentioned above the VCXO signal is fed into the base of mixer transistor T602 via R610. 10 MHz from the TCXO are applied 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 frequency product is R621 and C616. The mixer transistor feeds into the output amplifier T603.

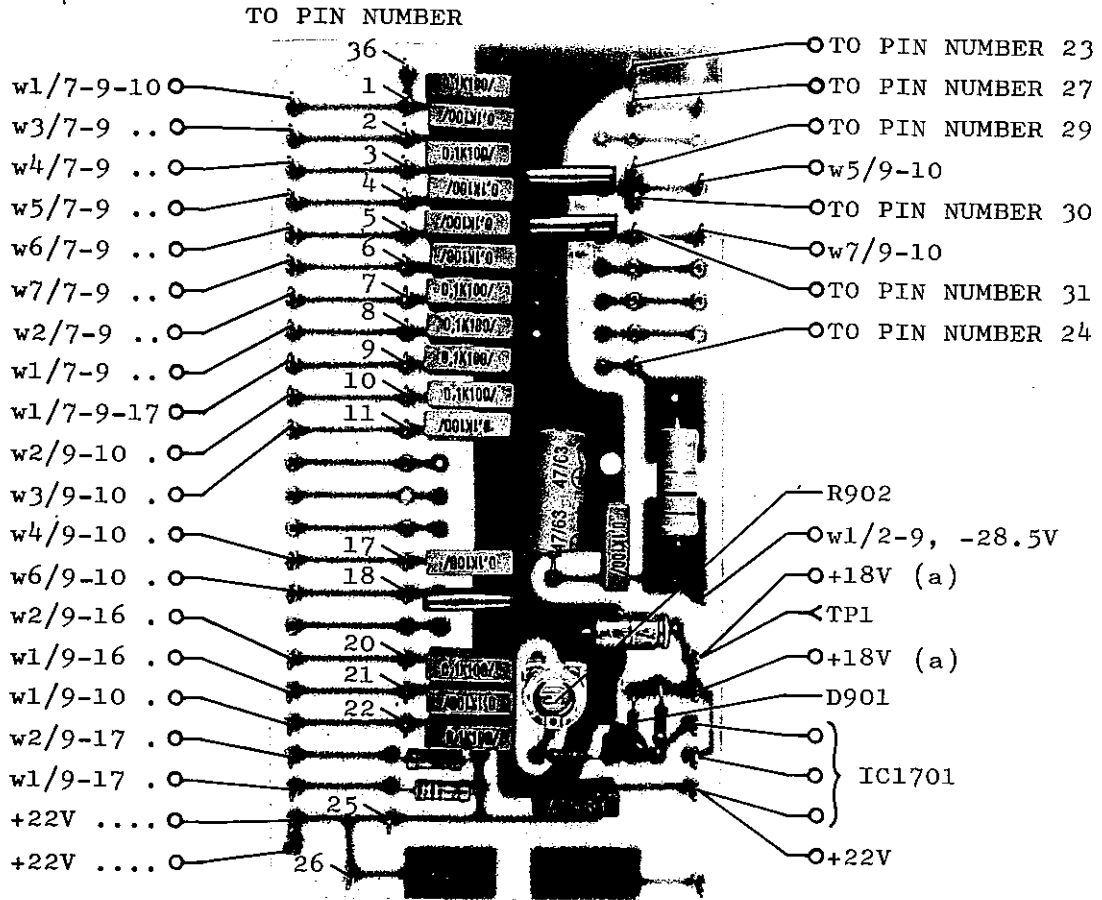
TEST CONDITIONS

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

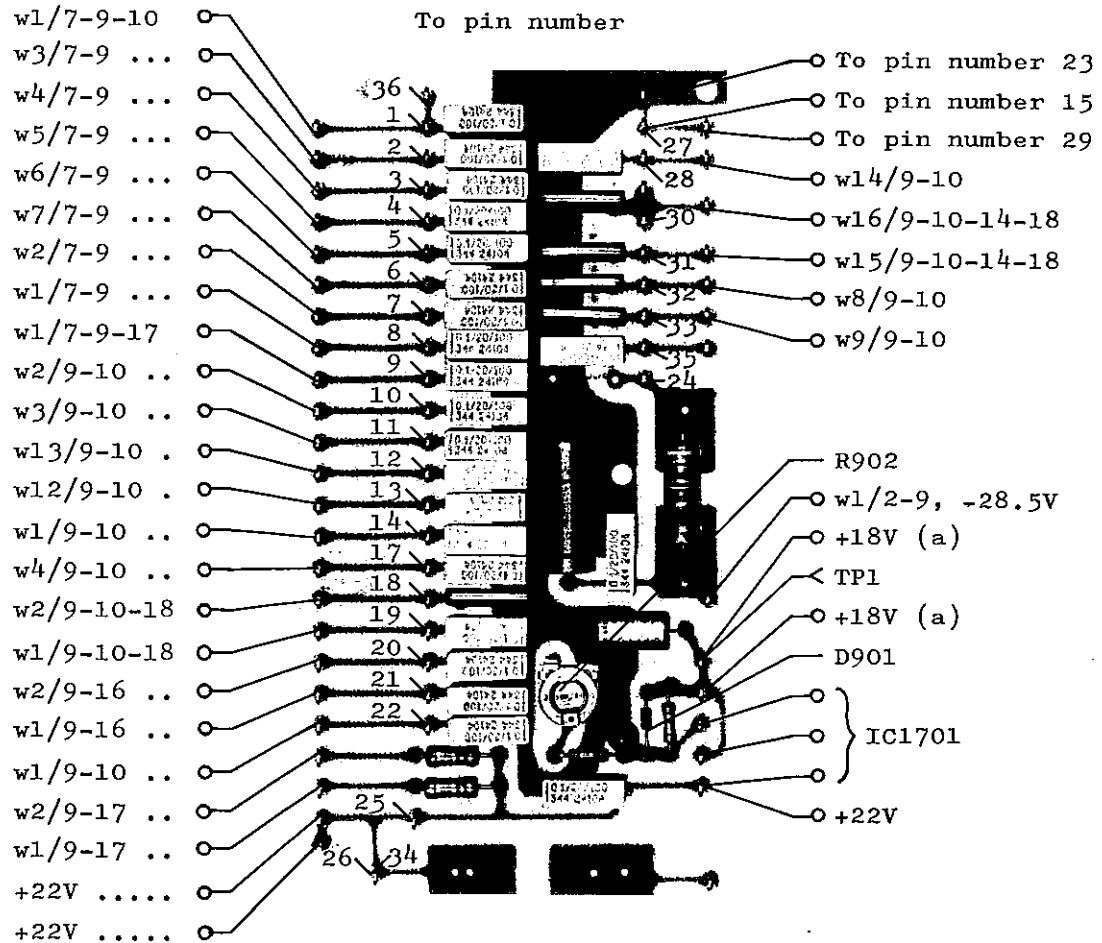
A1/2 S1301, S1300/TT, T



S1300



S1301



A1/2 S1301, S1300/TT, T

CIRCUIT DESCRIPTION SSB GENERATOR S1300

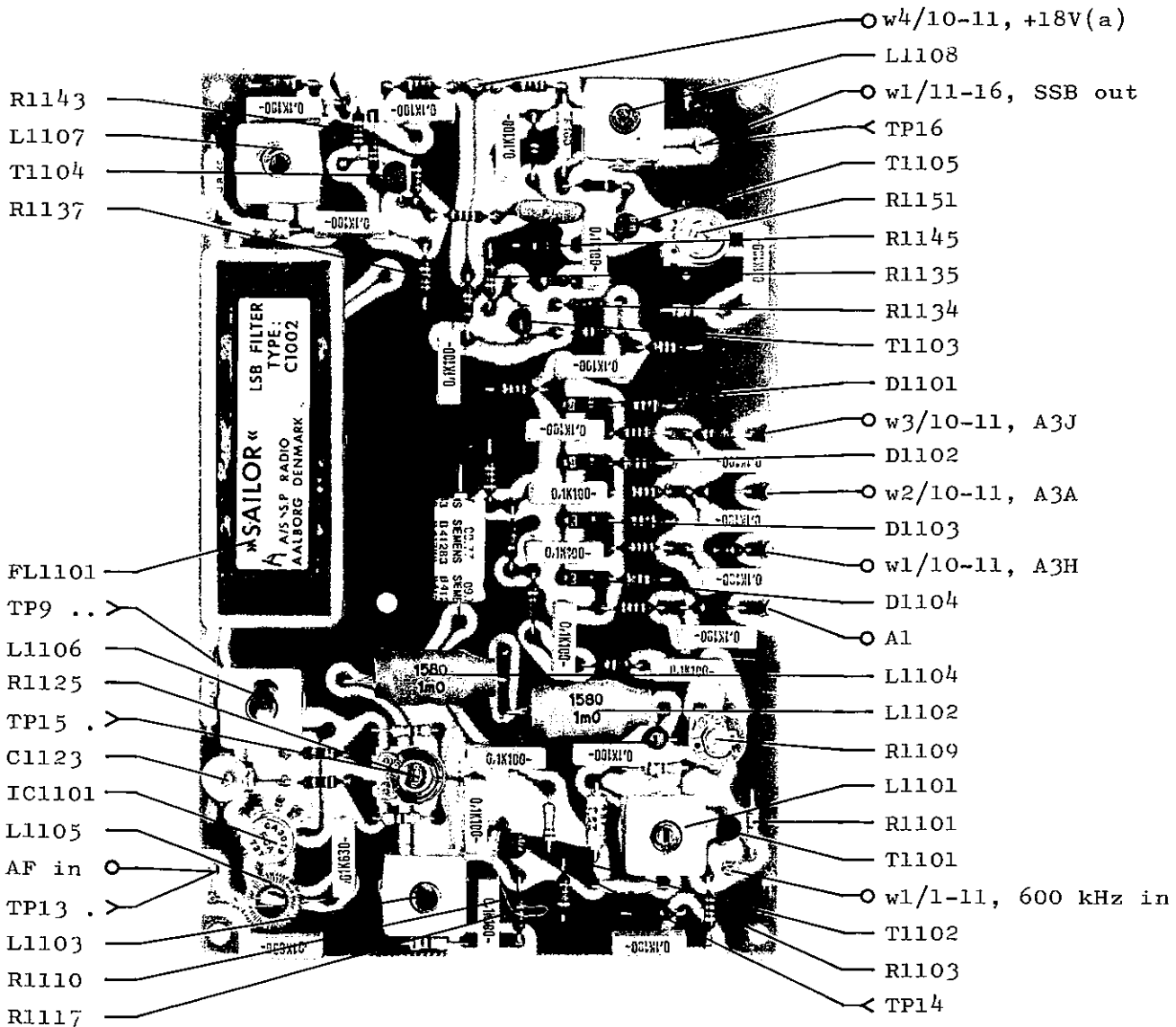
In this unit the required types of signals are generated (A3A, A3H and A3J).

SSB GENERATOR

The 600 kHz carrier signal from the divider unit is fed to T1101 and T1102 two tuned amplifiers. From the collector of T1101 600 kHz signal is taken to the carrier reinsertion circuit. From the collector of T1102 the carrier signal is fed into the double balanced modulator IC1101, which in addition receives AF signals via the low-pass filter L1105, C1118 and C1121, to remove RF pick-up from the microphone amplifier. A double sideband signal is now created on TP9 and fed into the crystal filter FL1101. The tuned circuits containing L1106 and L1107 around the filter carries out proper impedance matching to the filter. T1104 is an untuned buffer stage feeding into the tuned output amplifier T1105. On the base of T1105 the SSB signal from T1104 and the chosen portion of reinserted carrier from T1103 are added.

CARRIER INSERTION

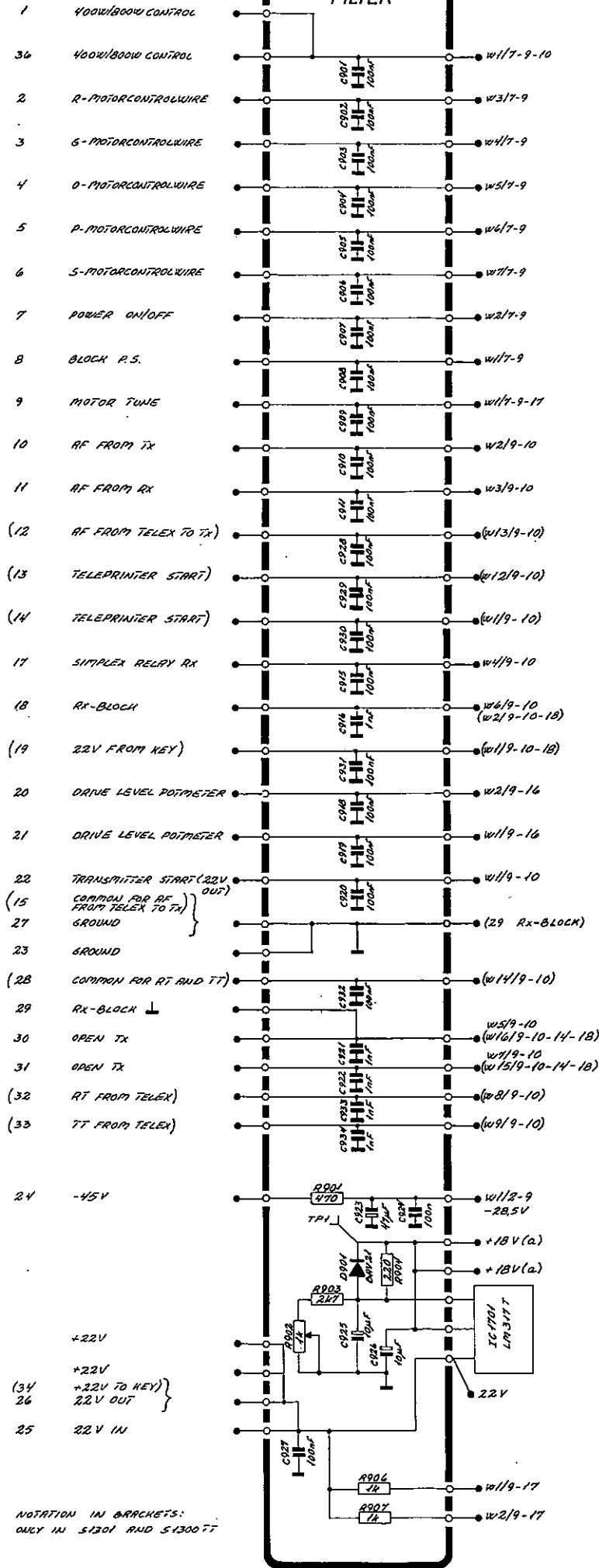
600 kHz carrier from the collector of T1101 is fed into a voltage divider R1109, R1118, R1123, R1128 and R1130. The necessary portion of carrier is chosen with diode D1101, D1102, D1103 or D1104, buffered by the emitter follower T1103 and fed via R1147 to the output amplifier.



MODULE NO. 1100

A1/2 S1301, S1300/TF, T

TO PIN NUMBER



CIRCUIT DESCRIPTION MICROPHONE AMPLIFIER S1300

This unit generates and processes all the AF signals used in normal operation.

COMPRESSOR

The AF signal is after level regulation in R1201 fed into a voltage divider R1204, R1205 and then the FET T1202 acts as an electronically variable attenuator. The amount of attenuation is controlled by the voltage applied to the gate of the FET T1202.

The FET T1202 is biased in the off condition by 5.1V from zenerdiode D1202, with no control voltage applied to the gate. Under these conditions no attenuation takes place. With a control voltage of 5.1V applied to the gate, max. attenuation is obtained.

The electronically controlled attenuator is used to keep the output across the FET T1202 constant independent of speech volume, so performing a compressor action.

The control voltage already mentioned is derived from the very same signal, across the FET T1202 after amplification by T1203 and T1205. The output is taken across R1219 and fed to the level detector system consisting of T1210 and D1205.

As soon as the applied voltage to the base of T1210 becomes sufficiently low (about 4.7V) the collector current in transistor T1210 cuts off. This means that transistor T1208 normally saturated by the collector current of T1210 cuts off, leading to saturation of T1207 with the result that capacitor C1214 is charged very quickly.

The voltage across C1214 is slowly discharged via R1218 and the filter circuit R1218 and C1208 and is applied to the gate of the previously mentioned FET T1202 via R1212.

Presence of the control voltage causes the attenuation to increase until the collector current in transistor T1210 is not cut off any more, and a balanced condition is established. The amplified and compressed microphone signal then passes through to an AF filter driven by T1212 and T1213 removing signals insignificant for clarity. The AF signal from the filter is carried to the fixed voltage divider R1238, R1244, R1243 and R1242. The AF voltages from this voltage divider is chosen with the diode D1206, D1207, D1208 or D1209 feeding into the output amplifier.

TEST TONE GENERATOR

The test tone generator is a two-tone generator operating at the frequencies 2400 Hz and 1200 Hz. The multivibrator, composed of T1206, T1209 is oscillating at 2400 Hz, and in the integrated circuit IC1201 this frequency is divided to 1200 Hz, which can be measured on pin 8.

T1204 functions as emitter follower, and the 2400 Hz signal is fed from here via R1214 to the output transistor T1201. The 1200 Hz signal is also fed to T1201 via R1208 and is mixed with the 2400 Hz signal. The mixed signal is supplied to the compressor input during tuning of the transmitter and owing to the presence of the AF filter. Sinewave shaped tones are produced, as the two-tone generator itself delivers square wave voltages.

CIRCUIT DESCRIPTION FOR MODE SWITCH S1300

This unit contains the necessary switches to switch between the needed operation modes, relays to activate the exciter, one for normal operation and one for 2182 kHz operation. Furthermore there is a relay to secure no A3H transmission above 4 MHz, only activated in some countries.

In the special telegraphy and telex versions there are four further push buttons, and on the printed circuit board there is a special circuit activated in telex mode. When output duty cycle is too high, the output is reduced to protect the power supplies against overload.

SIMPLEX/DUPLEX SELECTOR

The switch is controlling: The RX loudspeaker, the receiver blocking and the simplex relay in the receiver.

MODE SELECTOR

The wanted transmission mode is in the exciter chosen via a + 18V DC voltage fed to necessary diode switches on the SSB generator and the microphone amplifier.

The transmit relay RE1001 is activated via the microtelephone key or, if the TEST ALARM button is pressed, via the alarm signal generator.

The 2182 relay RE1003 is activated from the motor control unit, where it is detected if the distress frequency 2182 is selected

The A3H relay RE1002 interrupts the 18V to the SSB generator, and so ensures no output of the exciter, under two conditions. First A3H is chosen, and second a frequency above 4 MHz is selected. The second condition is detected from the motor control unit and fed via the 400W/800W control wire to the transistor T1001. If the dotted connection on S1002-D3 is removed the A3H relay is disabled and so the exciter is able to transmit A3H in the full frequency range.

Most of the diodes on the mode switch printed circuit board are transient protection diodes, these are: D1001, D1002, D1003, D1009, D1010, D1014, D1015, D1016, D1019 and D1020.

D1004 prevents the alarm signal generator to start when the exciter is keyed and the alarm button is pressed.

D1005, D1006 and D1013 prevents the reduced power to get an unwanted voltage if distress is selected.

D1007 makes it possible to choose A2H or A3H on the microphone amplifier, even if A3H is chosen on the SSB generator.

D1008 makes it impossible for an external voltage on the wire SIMPLEX RELAY RX to disturb the key circuit.

D1101 prevents the wires 22V FROM DELAY and 22V FROM KEY to be connected together and in that way make the delay circuit selflocking.

CIRCUIT DESCRIPTION ALARM SIGNAL GENERATOR S1300

This module has the task of modulating the exciter with the standardized "Distress" signal. This signal is composed of two tones, 1300 Hz and 2200 Hz. The switching between these two tones takes place at intervals of 0.25 secs. The generation of this signal is automatically stopped after 45 secs.

The transistor T1303 operates as a 1300 Hz oscillator and T1302 as 2200 Hz oscillator. The switching period between the two tones is determined by T1301, which is a unijunction transistor giving a shift pulse to the integrated circuit IC1301, which operates as a flip-flop in such a way that the output signals on pin 6 and pin 8 fall from +6V to 0V and back each time T1301 gives a shift pulse.

In addition the voltage on pin 6 is +6V, when the voltage on pin 8 is 0V and vice-versa. In this way the gate diode D1302 is brought into conduction, when pin 6 reaches the value 0V, which has the effect that D1301 is cut off and only the 2200 Hz signal is fed out to T1304. At the next shift pulse the 1300 Hz signal is supplied to T1304. T1304 is operating as power amplifier and delivers the signal to both microtelephone and compressor.

Start and stop of the alarm signal generator takes place by means of the integrated timer IC1302. With supply voltage appearing, it feeds through to pin 3 and starts charging C1316. After a time period determined by R1323, R1325 and C1316 this feeding through is blocked and the alarm signal generator stops. The transistor T1305 is only saturated when the alarm signal generator is activated, and it activates a relay on the mode switch circuit board.

TEST CONDITIONS

Mode : TEST ALARM
Oscilloscope input : Passive probe 10 Mohm//11 pF
DC voltmeter input : 10 Mohm
TP: Testpoints
All voltage statements are typical

CIRCUIT DESCRIPTION MIXER UNIT S1300

In this unit the 600 kHz signal from the SSB generator is mixed together with the VCXO and VCO signals in two steps to produce the wanted output frequency. In addition the necessary power level regulation is controlled in this unit.

FIRST MIXER

The transistors T1602 and T1603 form a balanced mixer. The 600 kHz signal is fed into the mixer via the phase splitting transformer TR1601. The VCXO signal is fed into the emitters via the buffer amplifier T1601. In this transistor it is possible to regulate the DC working point in two ways. One: changing the emitter resistor at the point "fixed power regulation". Two: changing the base current via a potentiometer between the two points "drive level potmeter". This DC working point regulation will control the amplitude of the VCXO signal to the mixer and in that way the output power is regulated.

FILTER AND AMPLIFIER

The first mixer feeds into the crystal filter FL1601. The tuned circuits containing L1601 and L1602 around the filter carry out proper impedance-matching to the filter. T1604 and T1605 are two buffer amplifiers, the circuit C1622, L1604, C1623 and R1643 carries out correct generator impedance for the mixer M1601.

SECOND MIXER

The second mixer M1601 is a double balanced hotcarrier diode mixer which mixes the 10.7 MHz signal together with the chosen VCO signal. The transistor T1606 is a wideband power amplifier supplying the mixer with the necessary power for proper operation. Output from the mixer is fed into the band filter unit.

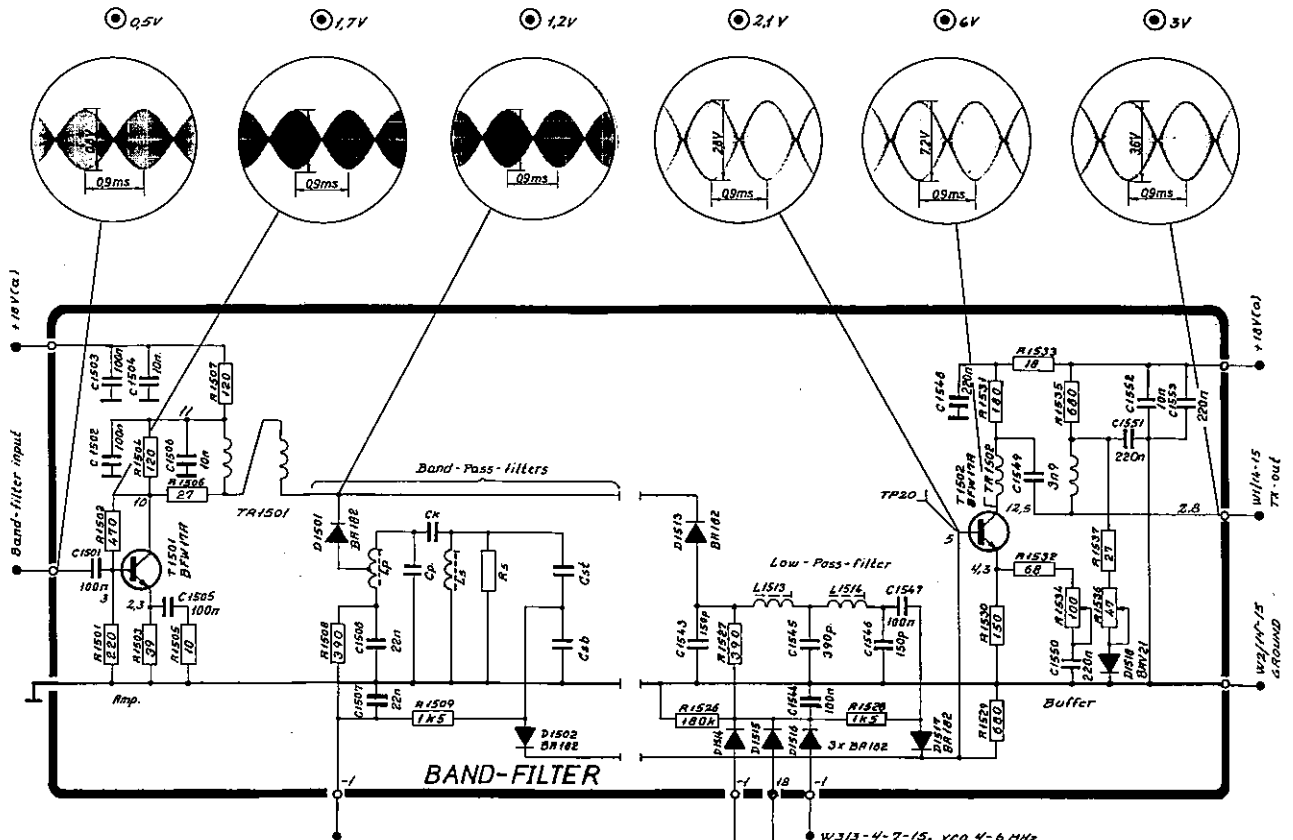
TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)
Power level : FULL
Mode : TUNE
Maximum drive, 50 ohm connected to TX out, J1702
Oscilloscope input : Passive probe 10 Mohm/11 pF
DC voltmeter input : 10 Mohm
⊙ : Diode probe measurements
TP : Testpoints
ALL voltage statements are typical

Frequency selector : 1A (f = 2.0005 MHz)
 Power level : FULL
 Mode : TUNE
 Maximum drive, 50 ohm connected to TX out, J1702
 Oscilloscope input : Passive probe 10 Mohm/11 pF
 DC voltmeter input : 10 Mohm
 ⊙ : Diode probe measurements
 TP : Testpoints
 ALL voltage statements are typical

Component tabel for Band-Pass-Filters

BRND	Lp	Cp	Ck	Ls	Rs	Csb	Cst
25 MHz	L1501	C1509 62pF	C1510 3.3pF	L1502	R1510 non	C1511 180pF	C1512 91pF
22 MHz	L1503	C1515 75pF	C1516 4.3pF	L1504	R1513 non	C1517 220pF	C1518 110pF
16 MHz	L1505	C1521 91pF	C1522 5.1pF	L1506	R1516 non	C1523 270pF	C1524 130pF
12 MHz	L1507	C1527 120pF	C1528 7.5pF	L1508	R1519 45k ohm	C1529 330pF	C1530 180pF
8 MHz	L1509	C1533 180pF	C1534 11pF	L1510	R1522 15k ohm	C1535 510pF	C1536 270pF
6 MHz	L1511	C1539 220pF	C1540 13pF	L1512	R1525 22k ohm	C1541 680pF	C1542 330pF

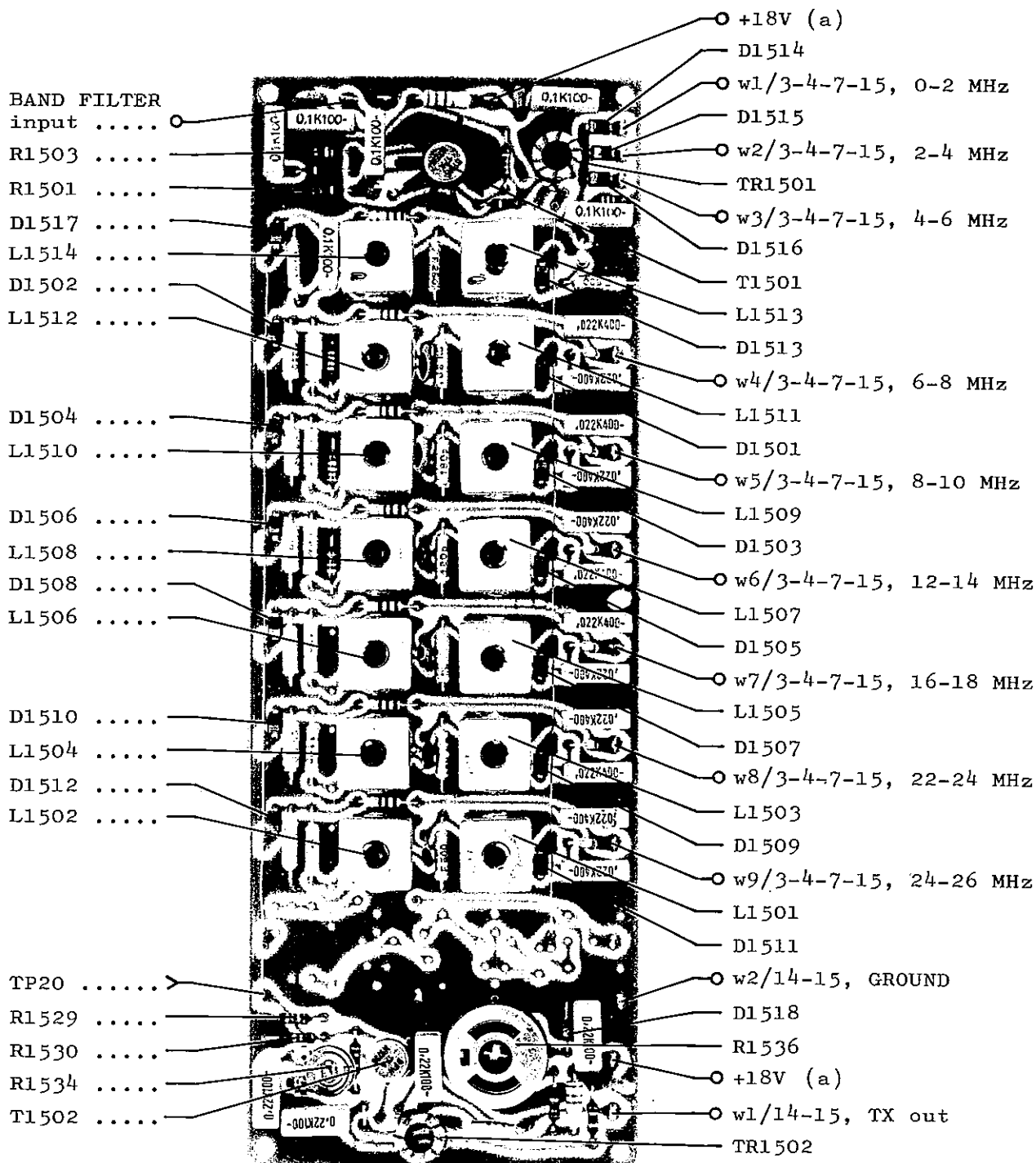


W9/3-4-7-15, VCO 24-26 MHz or
 W8/3-4-7-15, VCO 22-24 MHz or
 W7/3-4-7-15, VCO 16-18 MHz or
 W6/3-4-7-15, VCO 12-14 MHz or
 W5/3-4-7-15, VCO 8-10 MHz or
 W4/3-4-7-15, VCO 6-8 MHz
 W3/3-4-7-15, VCO 4-6 MHz
 W2/3-4-7-15, VCO 2-4 MHz
 W1/3-4-7-15, VCO 0-2 MHz

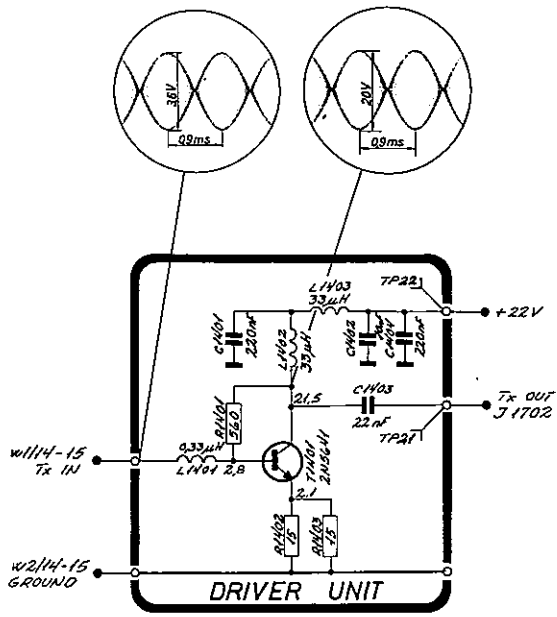
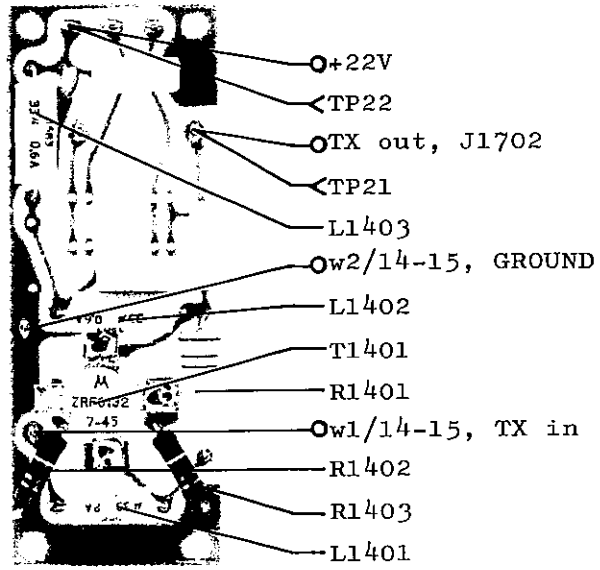
CIRCUIT DESCRIPTION BAND FILTER S1300

This unit contains two amplifiers, six band-pass filters and a low-pass filter.

The signal from second mixer appears at the base of first amplifier T1501 via C1501. This amplifier is supplied with feed-back via R1502 and R1505 to act as the correct load for the mixer. Output from this amplifier is via an 1:2 transformer TR1501, fed into the selected band-pass filter or low-pass filter. The band-pass filter contains two tuned circuits, each with a coilcap on the input side and a capacitor on the output. Output from the chosen filter is fed into the buffer amplifier T1502 in conjunction with the output transformer TR1502 there is frequency compensation. C1549, R1535, R1537, R1536 and D1518 produce bias for the driver transistor.



A1/2 S1301, S1300/TT, T



CIRCUIT DESCRIPTION DRIVER UNIT S1300

The driver unit produces the wanted one watt PEP into a 50 ohm load. The drive signal is applied to the base of T1401 via L1401. Combined with the drive signal the DC current is needed to bring T1401 to proper working point (IC = 285 mA). R1401, R1402 and R1403 perform feed-back and L1401 is together with input capacitance of the transistor a frequency compensation.

TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)

Power level : FULL

Mode : TUNE

Maximum drive, 50 ohm connected to TX out, J1702

Oscilloscope input : Passive probe 10 Mohm//11 pF

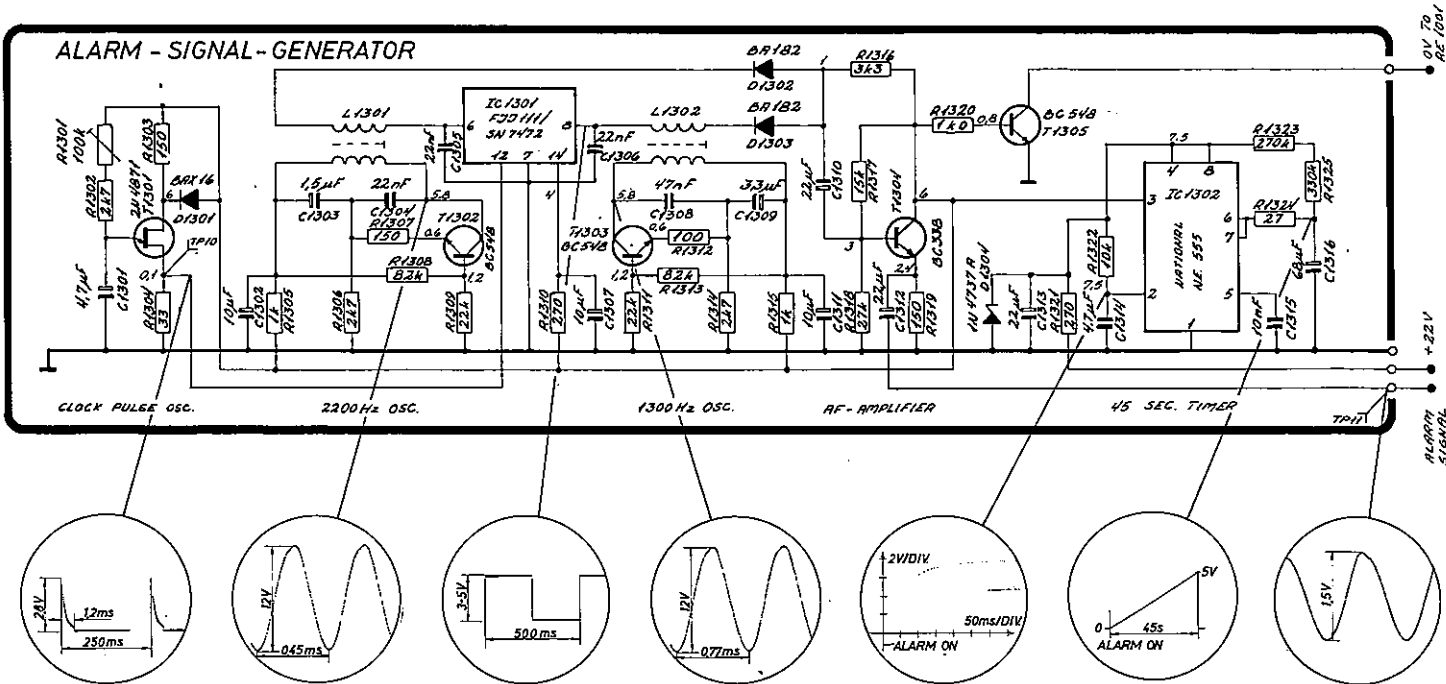
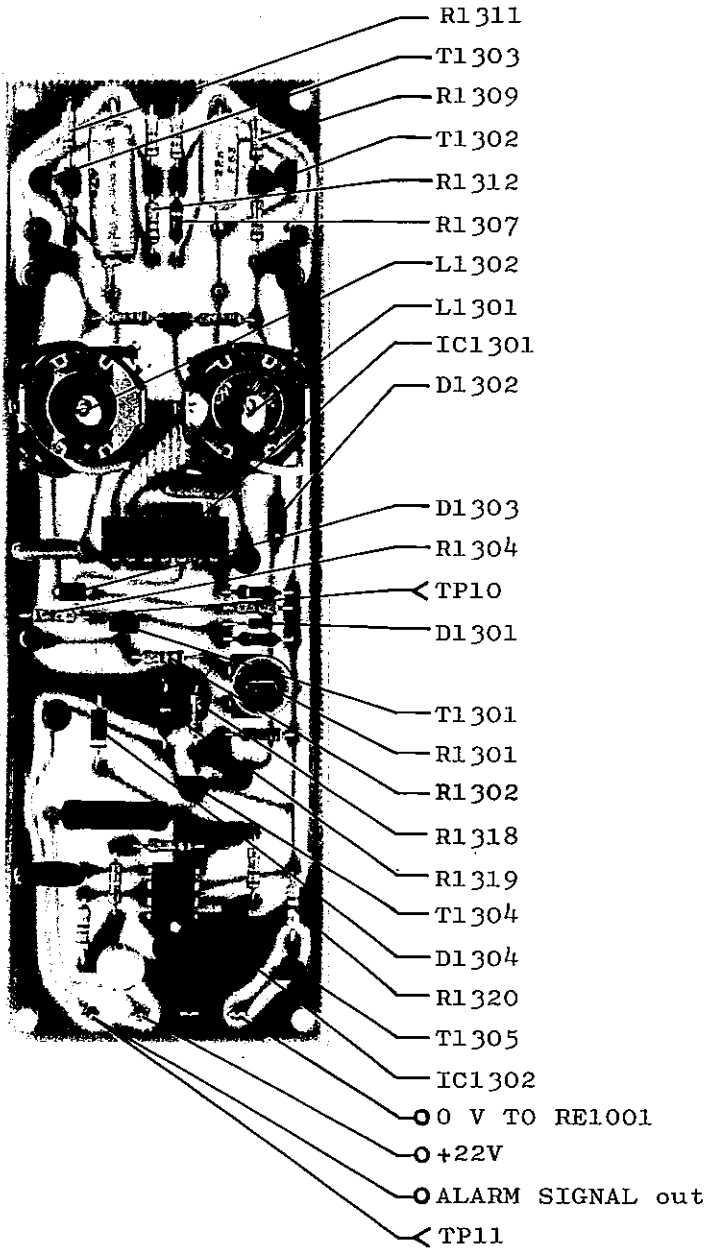
DC voltmeter input : 10 Mohm

⊙ : Diode probe measurements

TP : Testpoints

All voltage statements are typical

A1/2 S1300



6. NECESSARY ADJUSTMENTS AFTER REPAIR FOR S1300

In the following paragraphs is referred to the necessary adjustment- and performance check paragraphs in chapter 4 and 5.

6.1. DIVIDER UNIT

Execute 4.1.8., 5.3. and adjust L101 as described in 5.4.1. and 5.4.2.
Check 4.3.1., 4.3.2., 4.5. and 4.9.

6.2. LOOP 1 FILTER & $\pm 18V$ POWER SUPPLY

Execute 5.1.1. - 5.1.6. (both incl.).
Check 4.4., 4.5.1. and 4.5.2.

6.3. VCO UNIT, HARMONIC FILTER OR LOOP 1 MIXER

Check 4.3., 4.4., 4.5.1. and 4.5.2.

6.4. VCXO AND LOOP 2 FILTER

Execute 5.4.7. - 5.4.14. (both incl.) without adjusting L1108, L1603 and L1604.
Check 4.6.5. - 4.6.10. (both incl.).
Check 4.5.3. and 4.5.4.

6.5. MOTOR CONTROL UNIT

Check 4.2. and 4.3.

6.6. FILTER UNIT

Execute 5.1.1., 5.1.2., 5.1.5. and 5.1.6.

6.7. MODE SWITCH UNIT

Perform a FUNCTION CHECK 7.

6.8. SSB GENERATOR

Execute 5.4. and 5.5., without adjusting L101, L601, L1603 and L1604.
If it is an S1300TT in question execute 5.10.3. and 5.10.4.

6.9. MICROPHONE AMPLIFIER

Execute 5.2. and 5.4.9. - 5.4.14. (both incl.).
Check 4.8.

6.10. ALARM SIGNAL GENERATOR

Execute 5.6.
Check 4.15.

6.11. DRIVER UNIT OR BANDPASS FILTER

Execute 5.1.8., 5.1.9. and 5.9., no coil adjustment will generally be necessary.

6.12. MIXER UNIT

Execute 5.4.4. - 5.4.14. (both incl.) without adjusting L1108 and L1601.

6.13. A2H OSCILLATOR & DELAY UNIT

Execute 5.10.

7. FUNCTION CHECK FOR S1300

7.1.1.

Connect S1300/01 testbox, power supplies, 50 ohm load and tone generator via key plug to exciter. If it is an S1300TT in question, insert the artificial key between the testbox and the exciter.

7.1.2.

Connect frequency counter to output connector via 1:10 probe.

7.1.3.

Set exciter to A3A, full power, power level potentiometer fully clockwise and no modulation.

7.1.4.

Measure a frequency in every band.

In CT two: one below and one above 2 MHz. And compare to the frequency table on T1127 or in the operating instruction manual. The frequency accuracy shall be within 0.5 ppm.

7.2.1.

Change to tune position.

7.2.2.

Connect diode probe to output connector.

7.2.3.

Go through the above mentioned channels and check the voltage to be within 16V and 20V.

7.2.4.

Check that power level potentiometer control range is approx. 12 dB.

7.2.5.

With power level potentiometer fully clockwise, check the first power reduction step to be between 4 dB and 6 dB below full power, the second step 8 dB to 12 dB, the third step 12 dB to 18 dB and the fourth step 17 dB to 23 dB below full power.

7.3.1.

Change to A3J. Choose a channel below 10 MHz.

7.3.2.

Supply 1500 Hz and 1V RMS to microphone plug.

7.3.3.

Adjust power level potentiometer until meter deflection is 7.75V corresponding to +20 dB.

7.3.4.

Change tone generator frequency between 500 Hz and 2500 Hz, and check that the output amplitude ripple is below 2 dB. Check that -6 dB frequencies are approx. 300 Hz and 2700 Hz.

7.3.5.

Turn tone generator to 1500 Hz.

FUNCTION CHECK FOR S1300 cont.:

7.3.6.

Disconnect diode probe and connect oscilloscope to output connector.

7.3.7.

Change to tune position.

7.3.8.

Adjust power level potentiometer to full deflection on oscilloscope - screen (8 cm pp.)

7.3.9.

Check that the amplitude is within 7 cm pp. and 8 cm pp. in the positions A3J, A3H and A3A.

7.3.10. S1300TT only.

Check that the steady state amplitude is within 7 cm pp. and 8 cm pp. in A2H position.

7.3.11. S1300TT only.

Check that the steady state amplitude is within 5 cm pp. and 6.4 cm pp. in A1 position.

7.3.12. S1300TT only.

Supply 1500 Hz and 1V RMS to the artificial key.

7.3.13. S1300TT only.

Check that the steady state amplitude is within 6 cm pp. and 8 cm pp. in telex position.

7.4.1.

Change frequency selector to position 1 (distress).

7.4.2.

Press alarm and test alarm at the same time. The distress signal can now be seen on the oscilloscope. The time from start of alarm signal until it automatically disappears shall be between 35 secs. and 55 secs.

Check that power switch is disabled under alarm transmission.



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

PROGRAMMABLE DIVIDER FOR LOOP 2

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

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

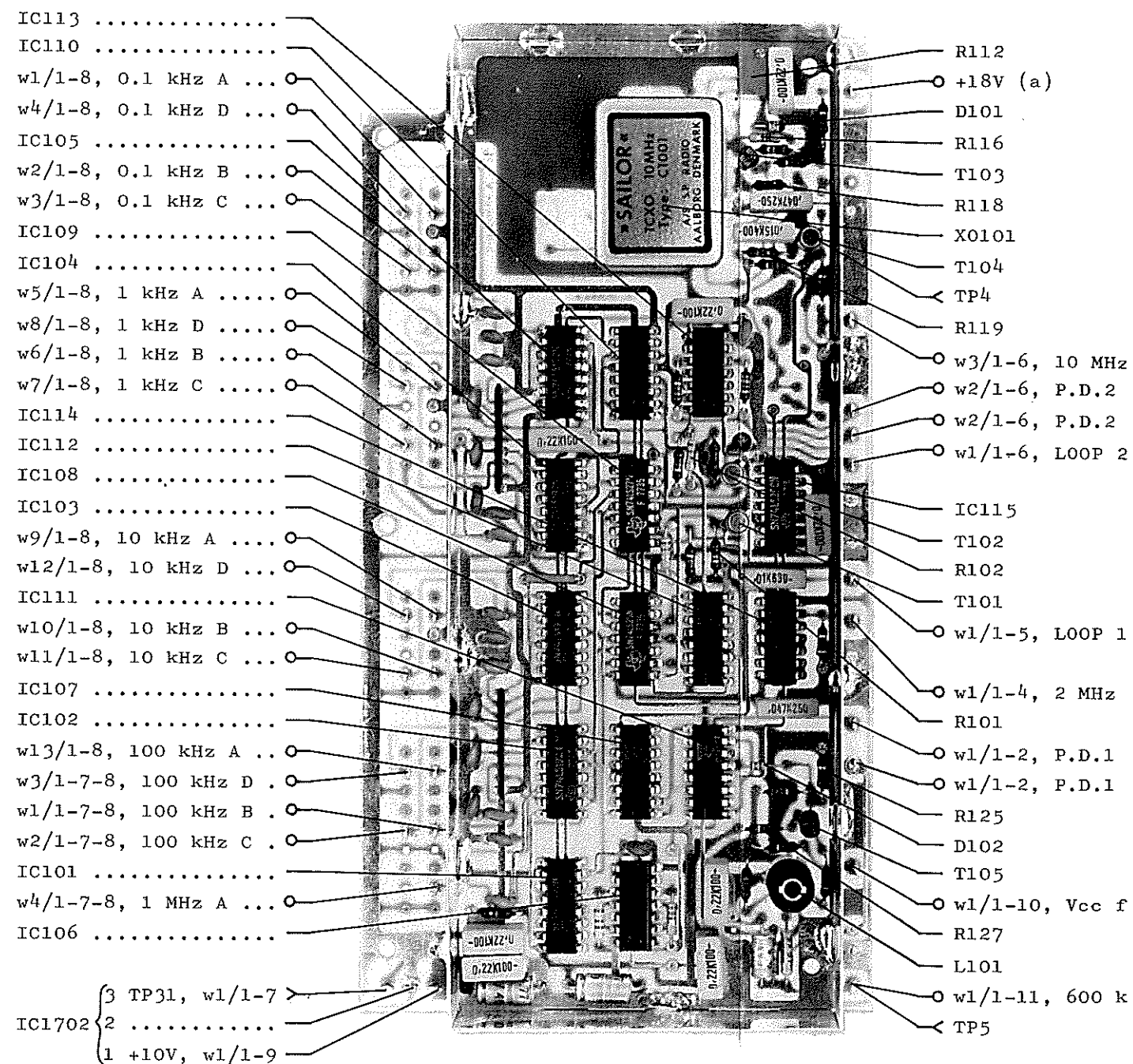
The stop figure S_2 is controlled from the gate IC108a. When the counter outputs $Q_A, Q_B, Q_C \dots$ etc. equals the stop figure $S_2 - 2$ the J-K flip-flop IC110a uses 2 clock pulses to load the start figure P_2 into the counters IC105 and IC112. The counter will count up from the start figure P_2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

LOOP 2 PHASE/FREQUENCY DETECTOR

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

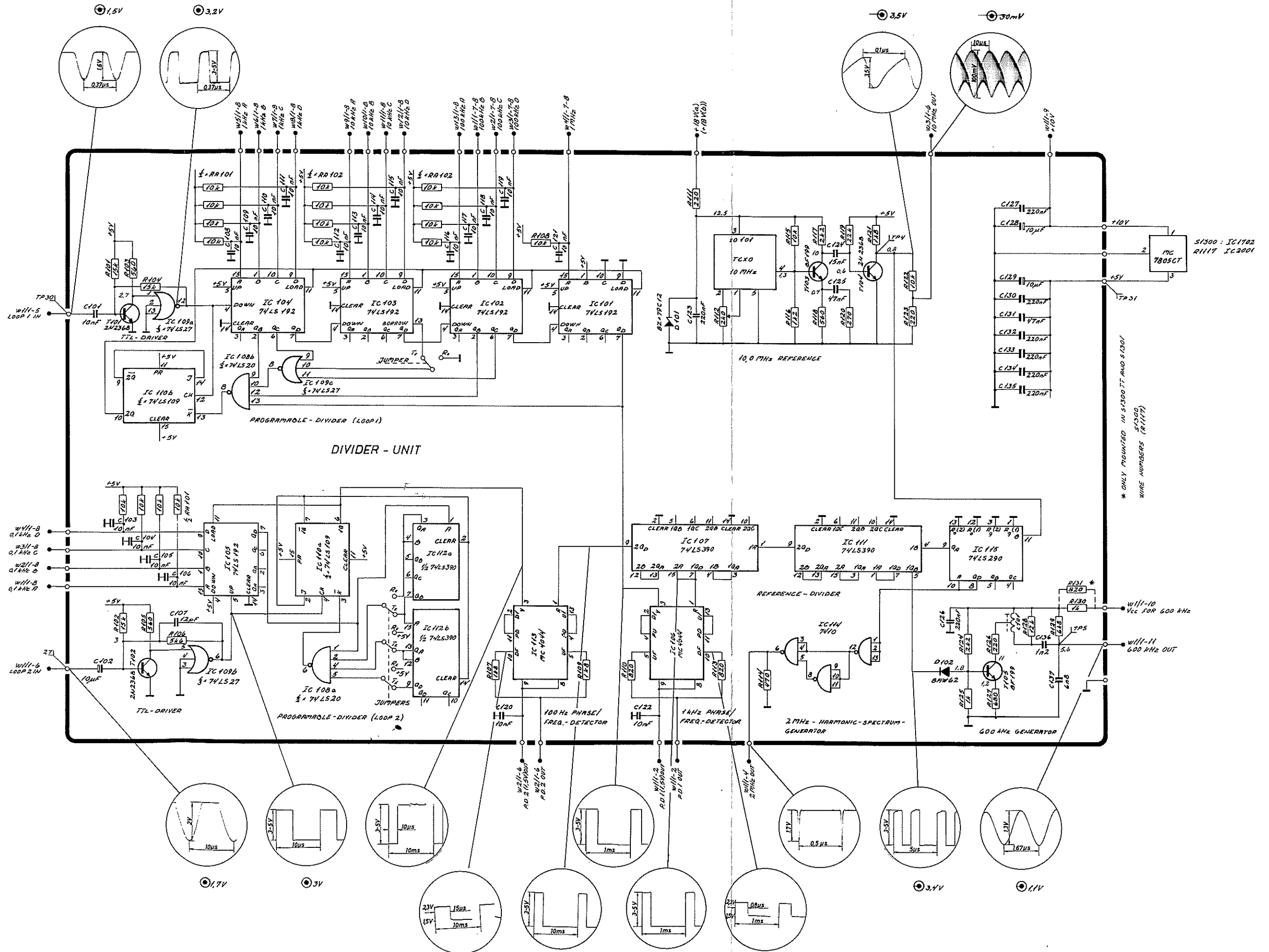
TEST CONDITIONS

- Frequency selector : 1A ($f = 2.0005$ MHz)
- Mode : A3J
- KEY : ON
- Oscilloscope input : Passive probe 10 Mohm/11pF
- DC voltmeter input : 10 Mohm
- ⊙ : Diode probe measurements
- TP : Testpoints
- All voltage statements are typical



A2/2 S1301, S1300/TT, T

- R112
- +18V (a)
- D101
- R116
- T103
- R118
- X0101
- T104
- < TP4
- R119
- w3/1-6, 10 MHz out
- w2/1-6, P.D.2 (1.5V) out
- w2/1-6, P.D.2 out
- w1/1-6, LOOP 2 in
- IC115
- T102
- R102
- T101
- w1/1-5, LOOP 1 in
- w1/1-4, 2 MHz out
- R101
- w1/1-2, P.D.1 out
- w1/1-2, P.D.1 (1.5V) out
- R125
- D102
- T105
- w1/1-10, Vcc for 600kHz
- R127
- L101
- w1/1-11, 600 kHz out
- < TP5



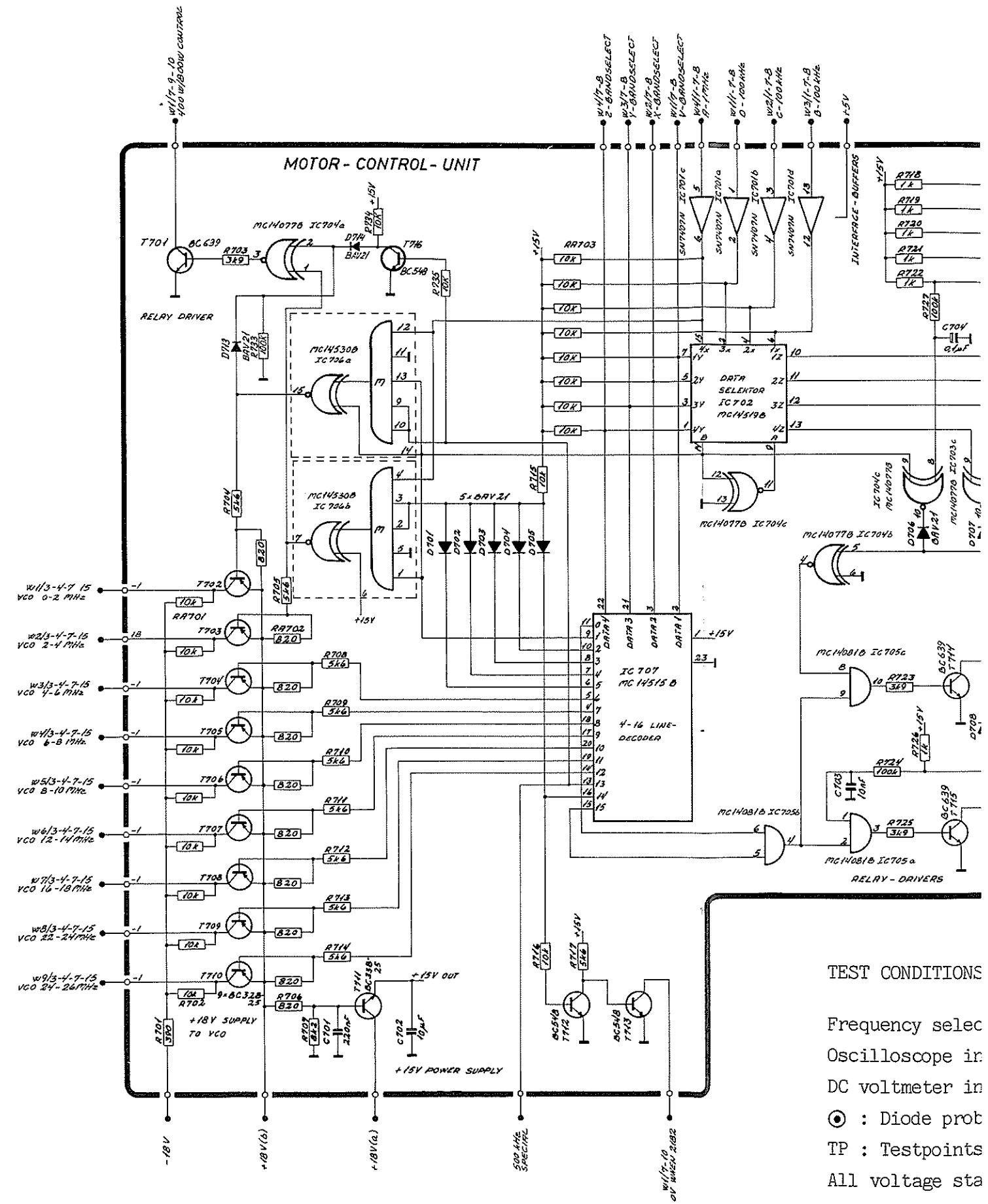
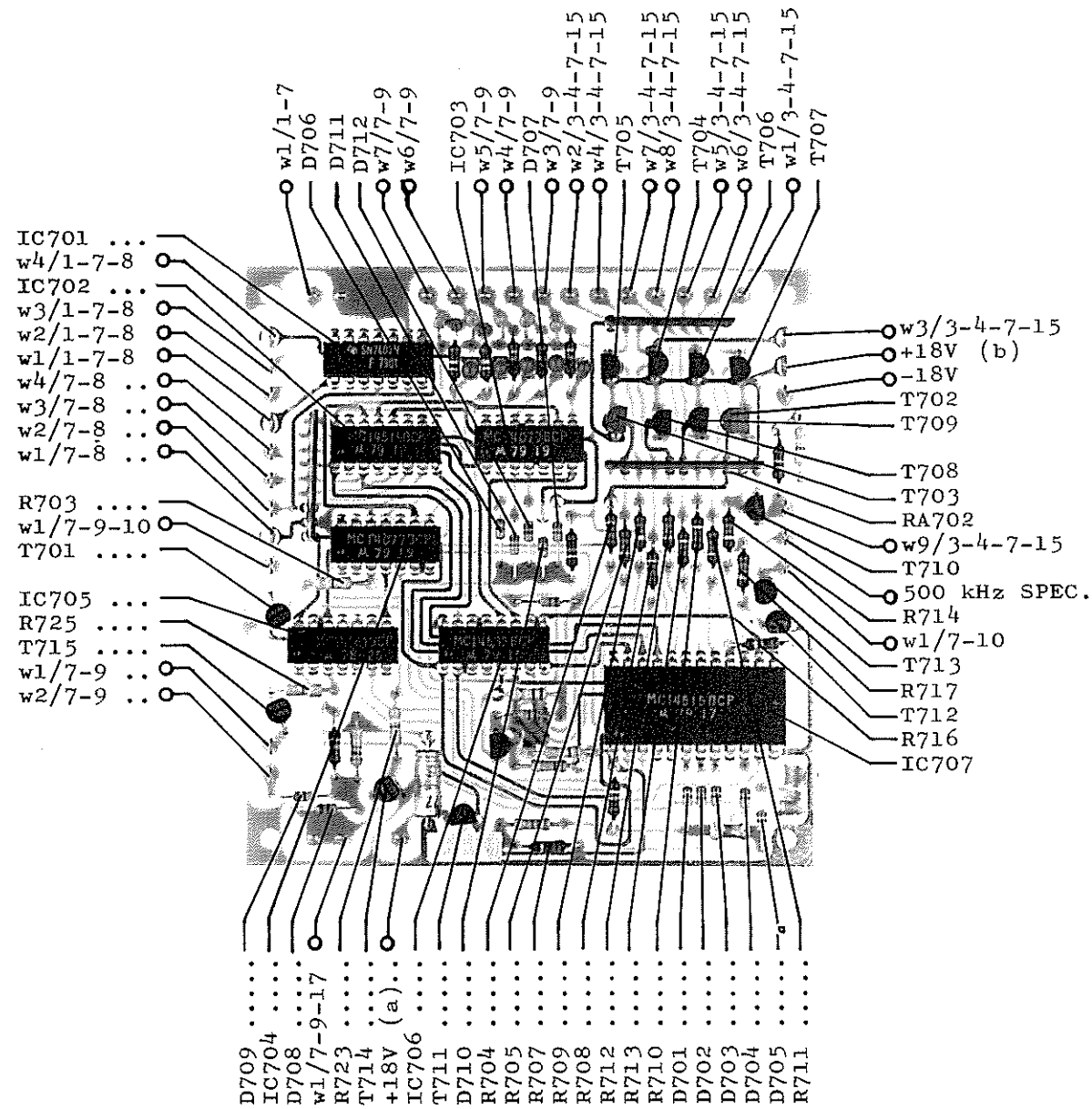
* ONLY MOUNTED IN S1300 TT AND S1301 S1300 S1301 R1117 IC2001 WIRE NUMBERS (R1117)

For the 500 kHz band the transmit band code (ZYXV) activates output 13 on the 4 to 16 Line Decoder IC707. This output switches on the transistor T702 via the Majority Logic IC706b and thus selects the 0 - 2 MHz VCO.

400W/800W CONTROL

In the MF band from 1.6 - 4 MHz the output power must not exceed 400W PEP. The information that a frequency below 4 MHz is selected is fed from the outputs on the Majority Logics IC706a and IC706b to the IC704a and T701.

A2/2 S1301, S1300/TT,T

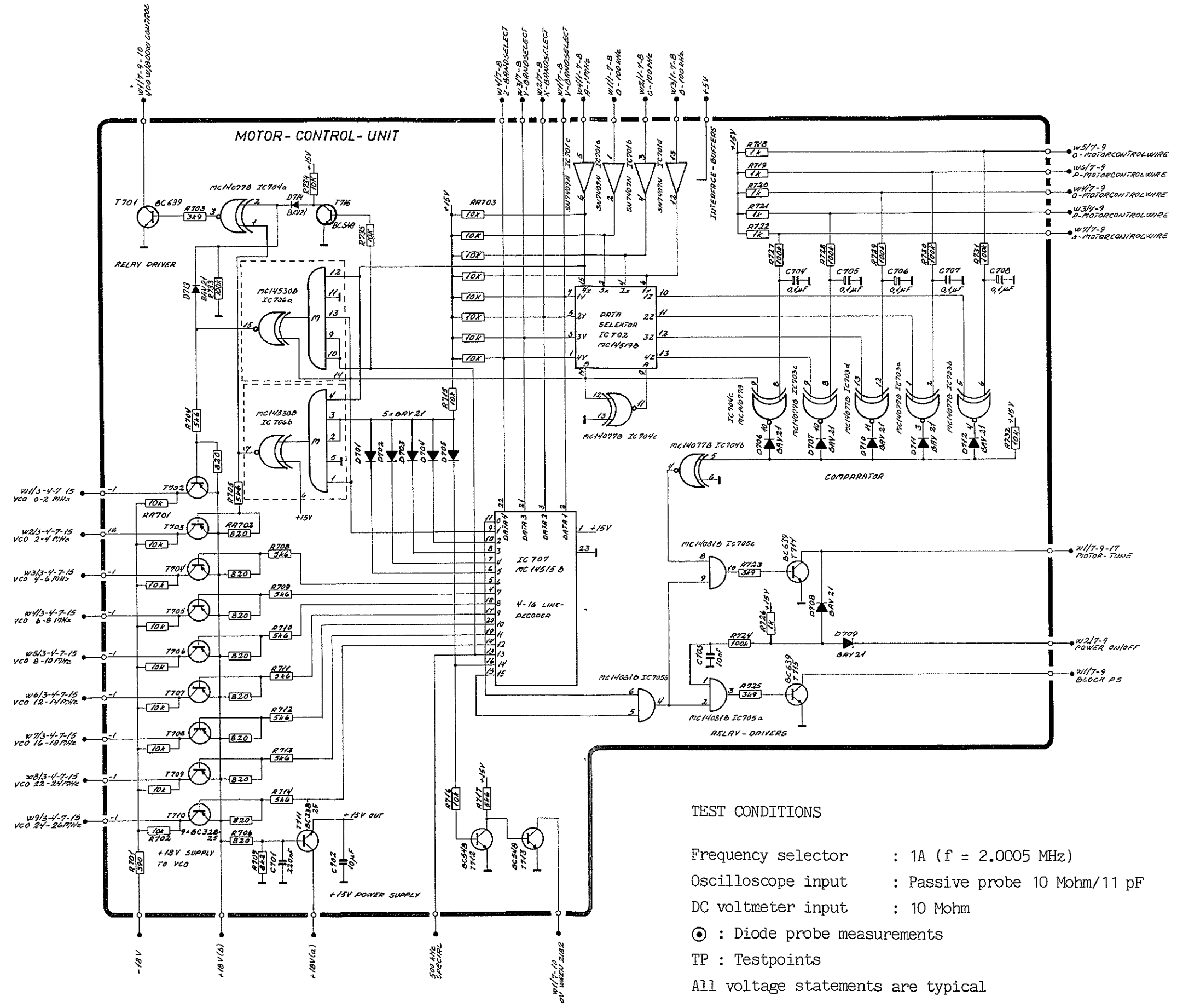
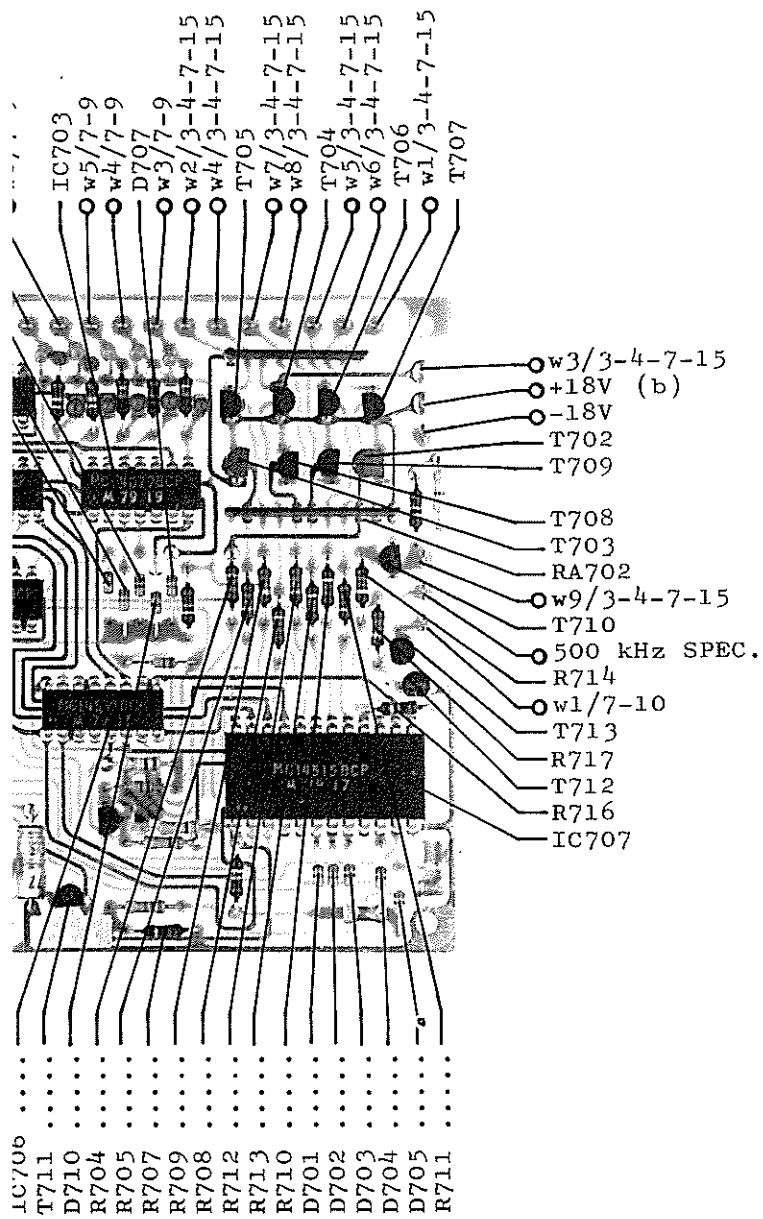


TEST CONDITIONS

Frequency selec
Oscilloscope in
DC voltmeter in
⊙ : Diode prot
TP : Testpoints
All voltage sta

Transmit band code (ZYXV) activates output 13 on the IC706a and IC706b to the transistor T702 via this output switches on the transistor T702 via thus selects the 0 - 2 MHz VCO.

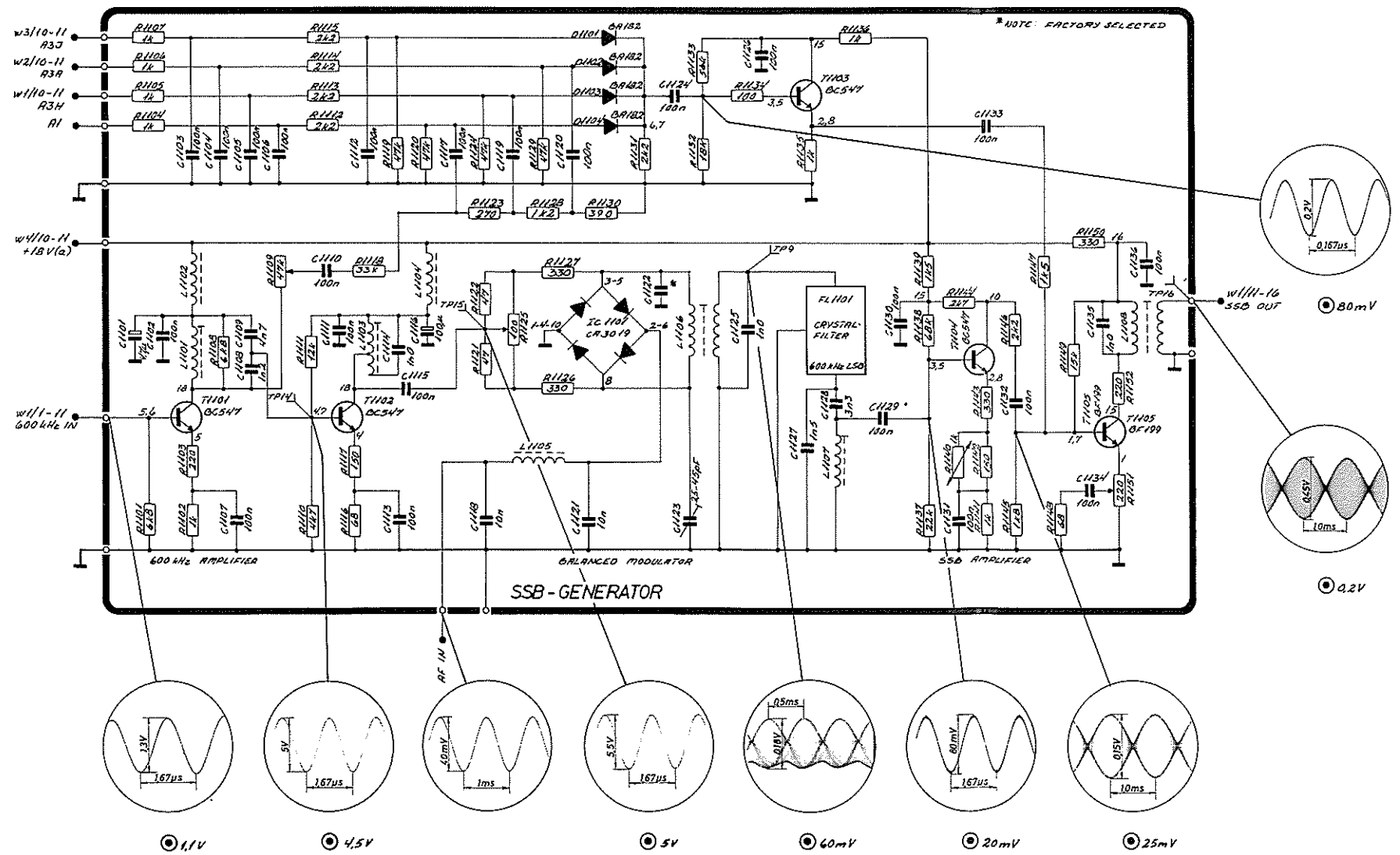
At 1 MHz the output power must not exceed 400W PEP. Frequency below 4 MHz is selected is fed from the output of IC706a and IC706b to the IC704a and T701.



TEST CONDITIONS

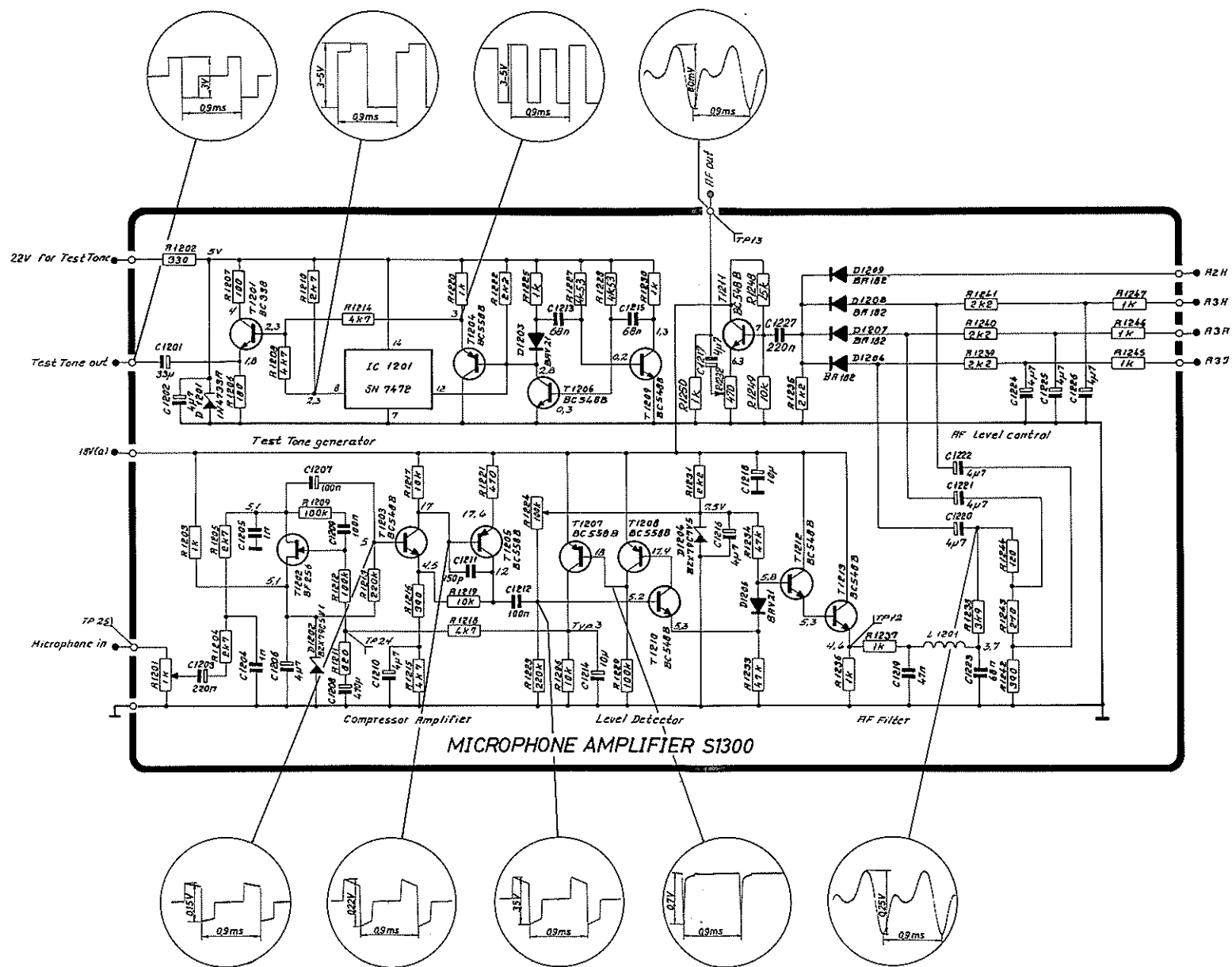
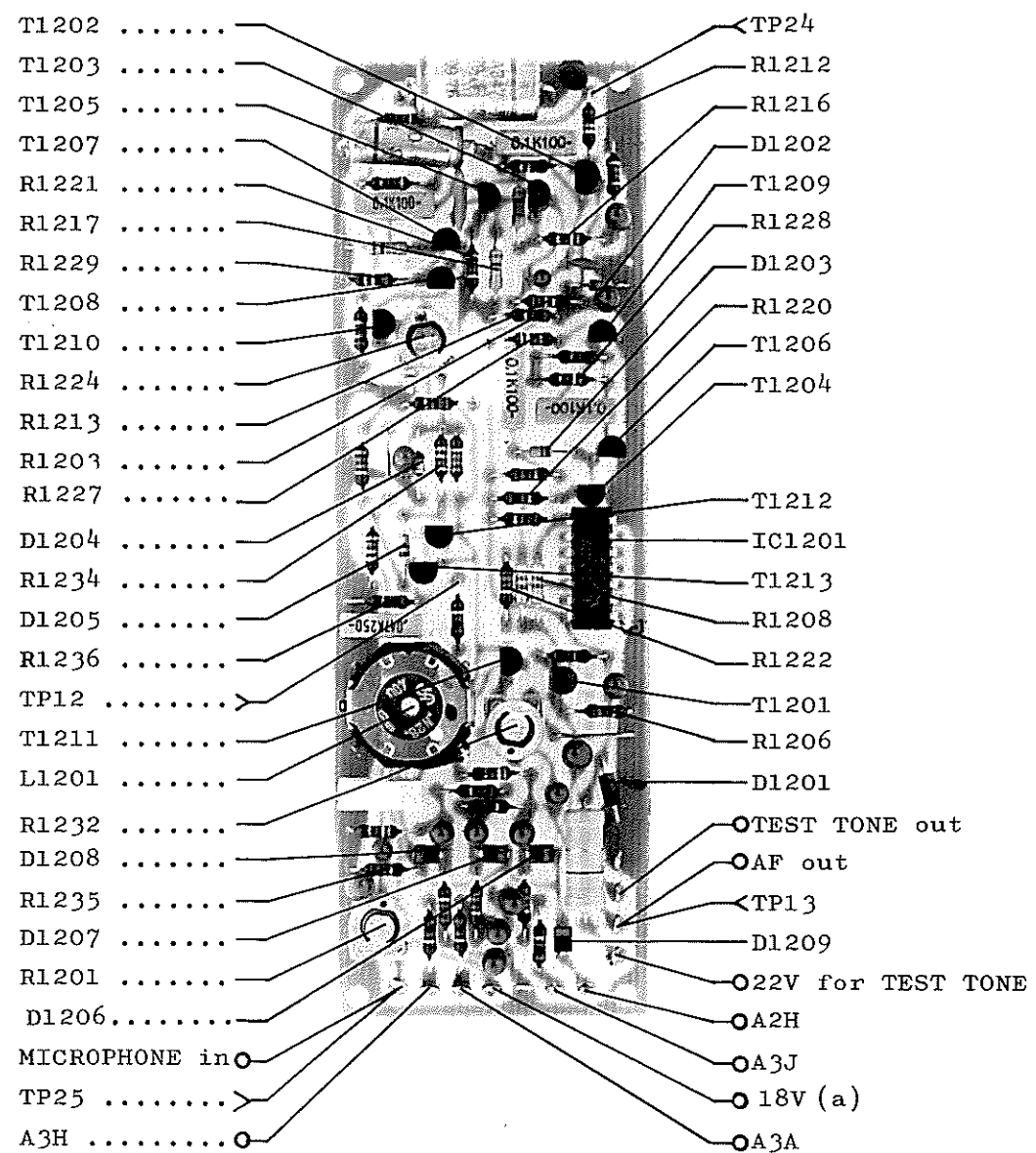
- Frequency selector : 1A (f = 2.0005 MHz)
- Mode : A3H
- AF input 1 kHz : 1 Vpp (series condenser) } via microphone plug
- KEY : ON
- Oscilloscope input : Passive probe 10 Mohm/11pF
- DC voltmeter input : 10 Mohm
- ⊙ : Diode probe measurements
- TP : Testpoints
- All voltage statements are typical

A2/2 S1301, S1300/TT, T



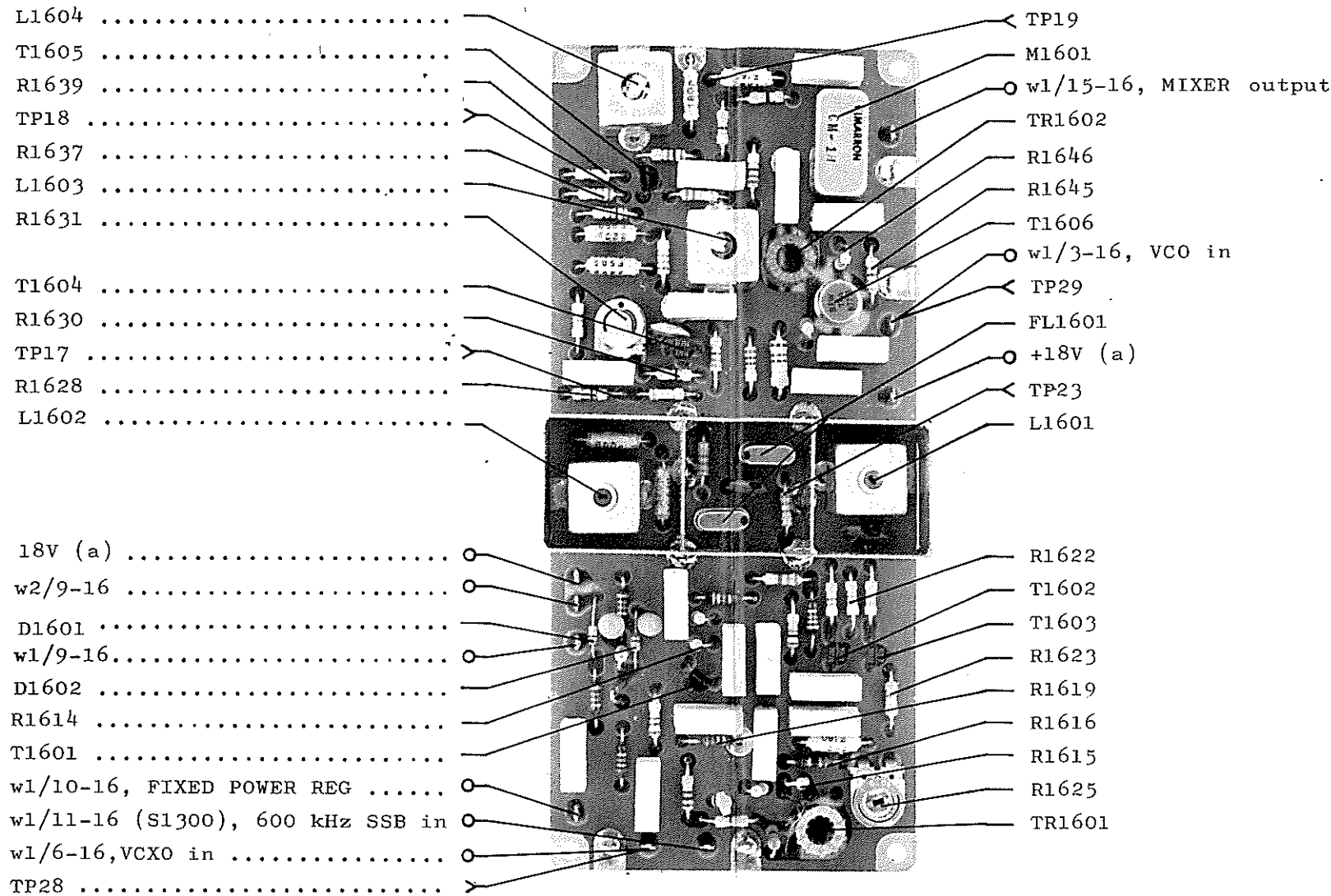
TEST CONDITIONS

Mode : TUNE
 Oscilloscope input : Passive probe 10 Mohm//11 pF
 DC voltmeter input : 10 Mohm
 TP: Testpoints
 All voltage statements are typical

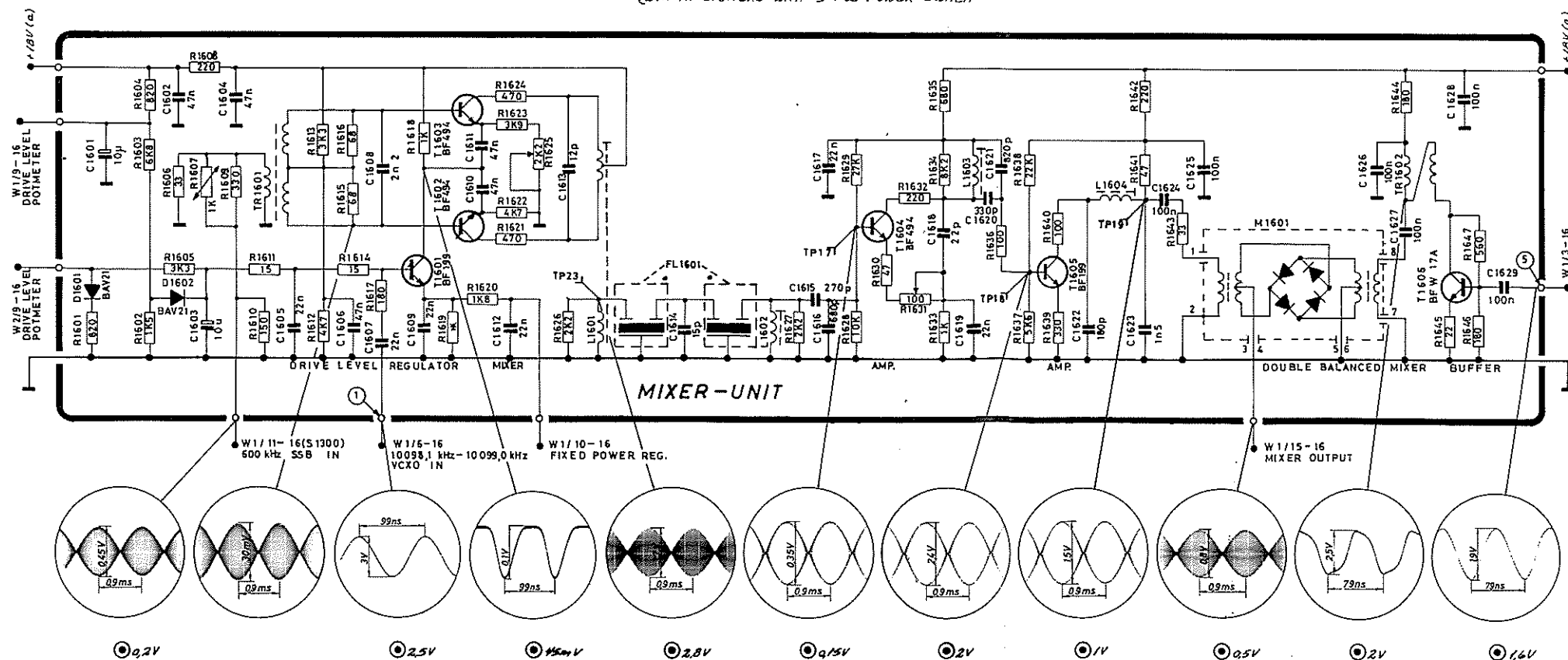


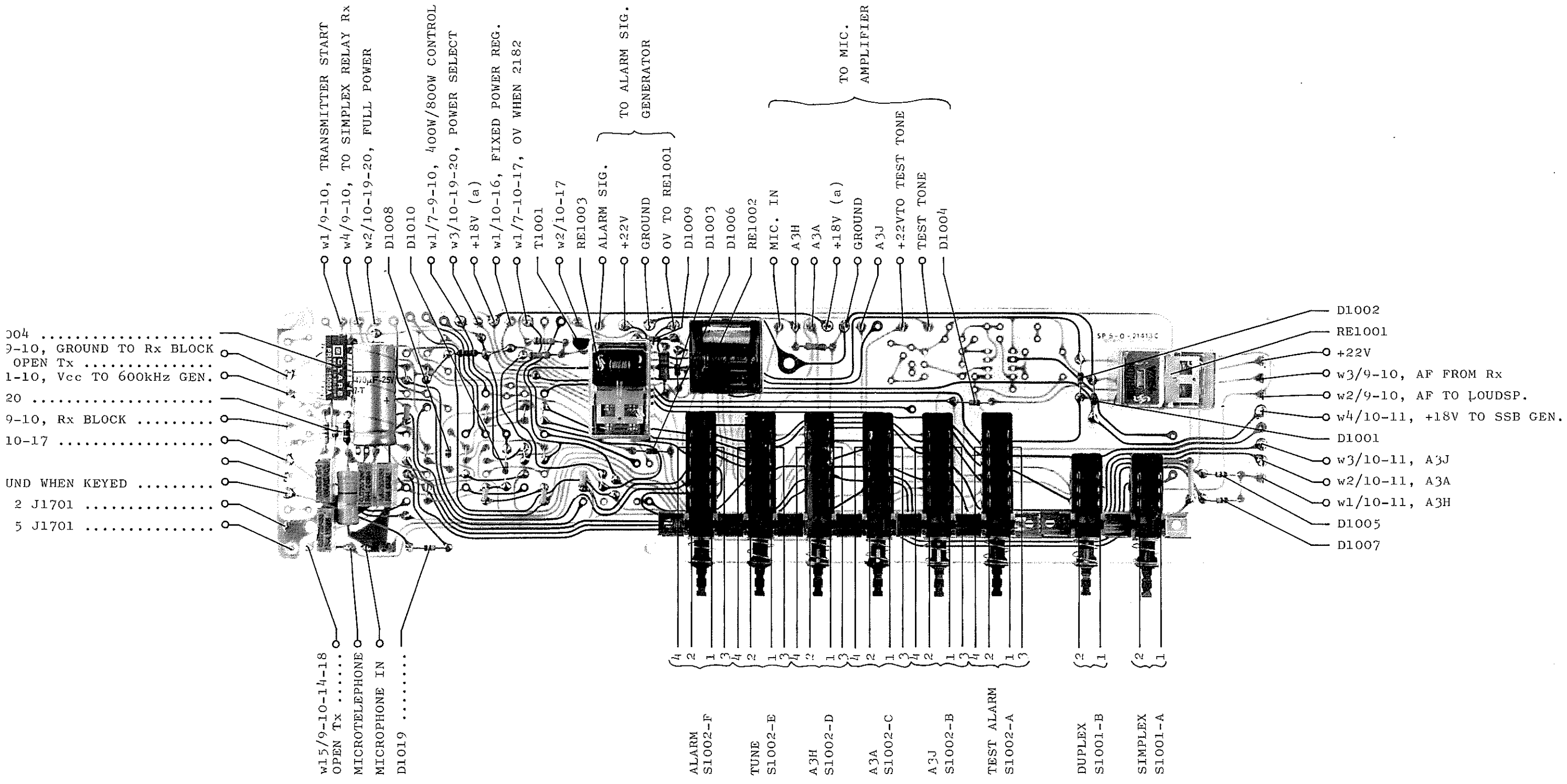
A2/2 S1301, S1300/TT, T

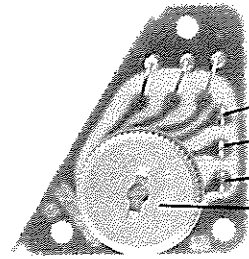
A2/2 S1301, S1300/TT,T



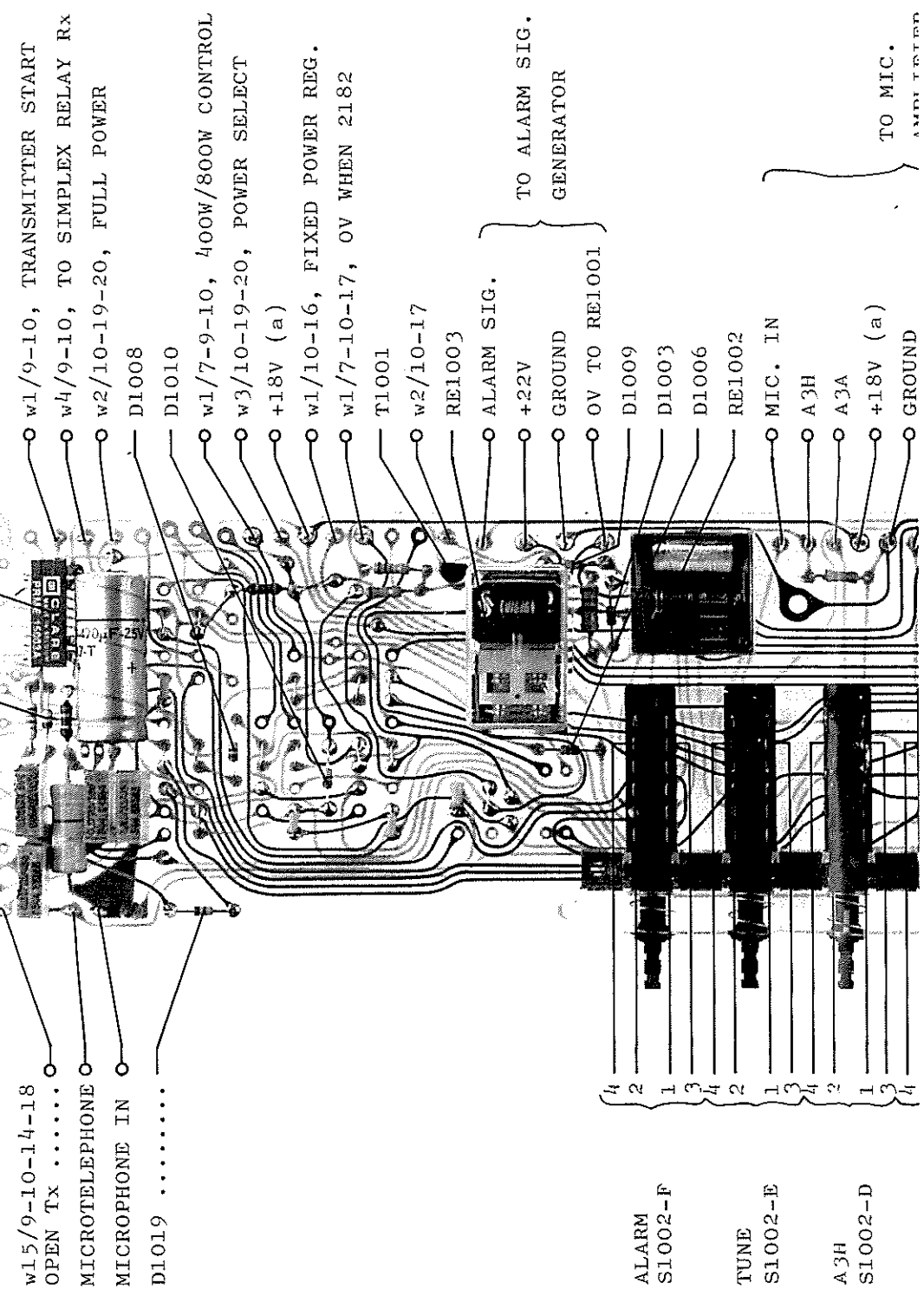
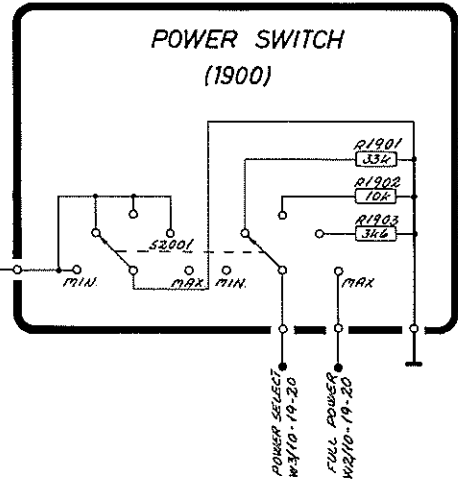
* R1619 { 12K IN EXCITERS WITH 3 POS POWER SWITCH
27K IN EXCITERS WITH 5 POS POWER SWITCH







- w2/10-19-20, FULL POWER
- w3/10-19-20, POWER SELECT
- w1/17-19-21
- S2001

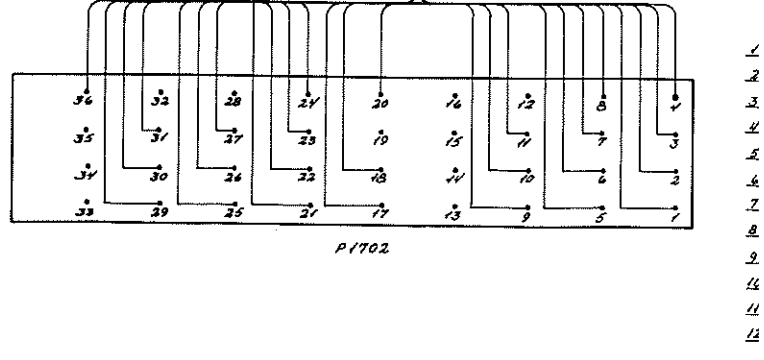
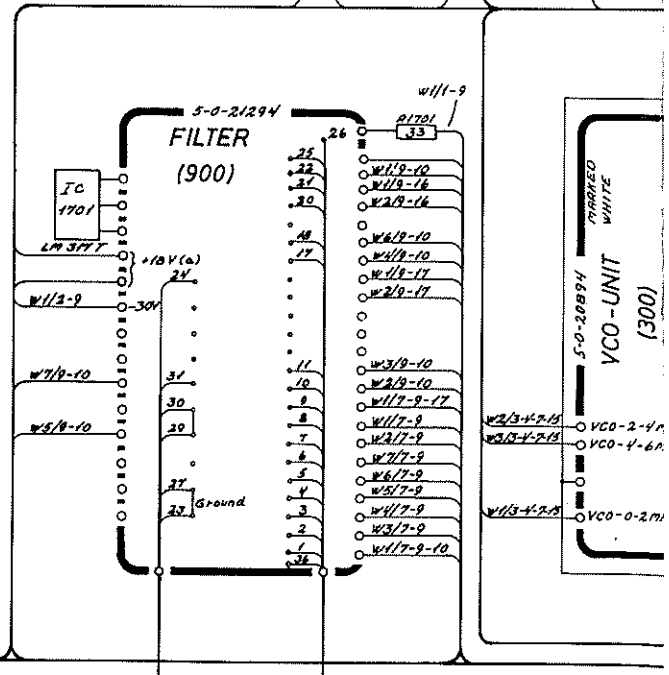
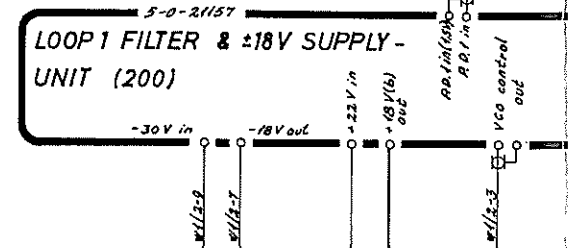
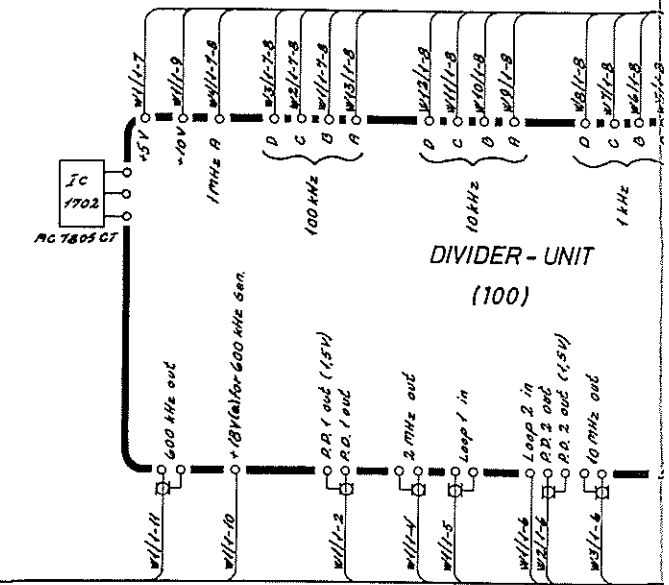
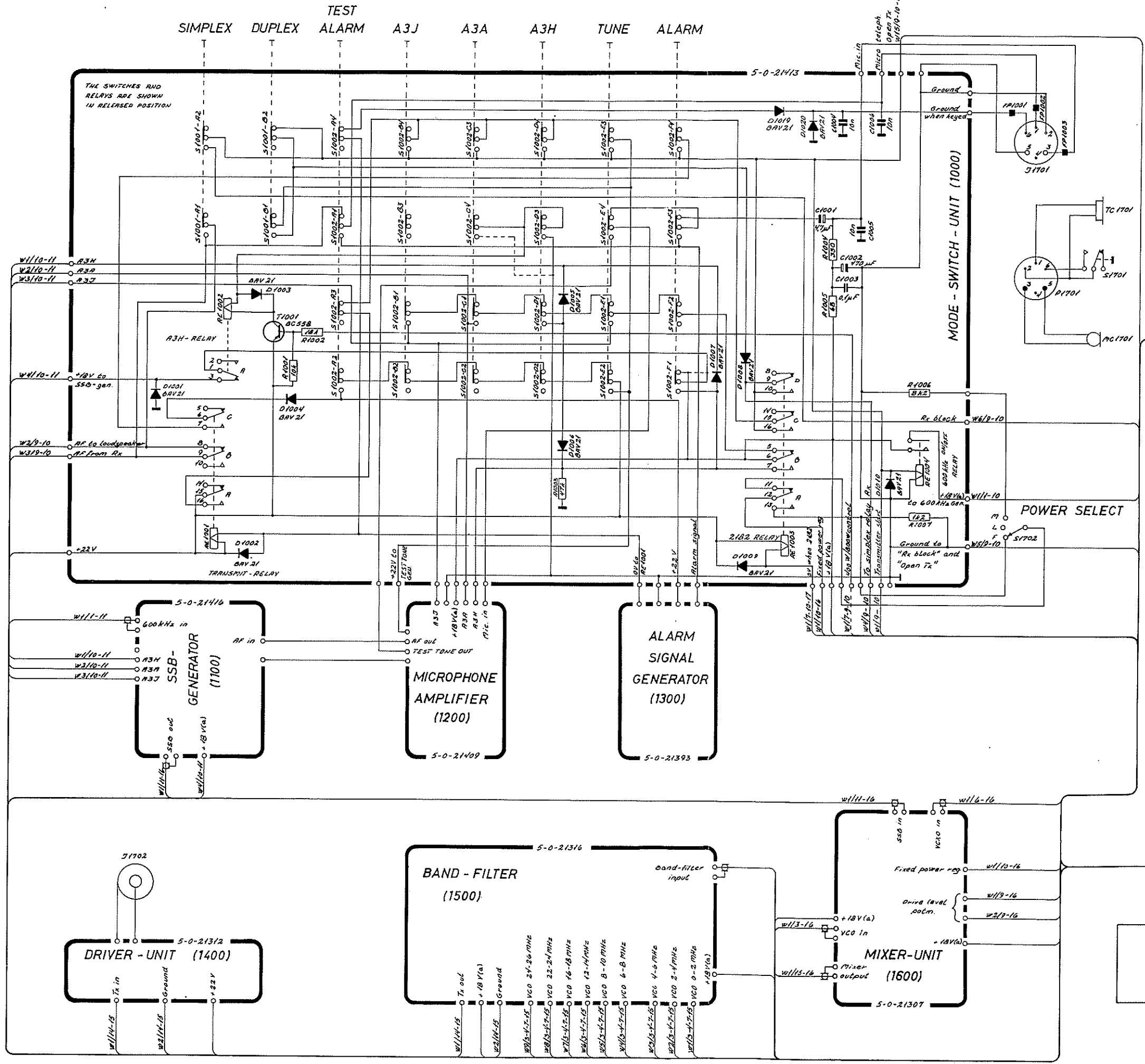


- RE1004 w5/9-10, GROUND TO Rx BLOCK AND OPEN Tx
- w1/1-10, Vcc TO 600kHz GEN.
- D1020
- w6/9-10, Rx BLOCK
- w1/10-17
- GROUND WHEN KEYED
- PIN 2 J1701
- PIN 5 J1701

- w15/9-10-14-18 OPEN Tx
- MICROTELEPHONE
- MICROPHONE IN
- D1019

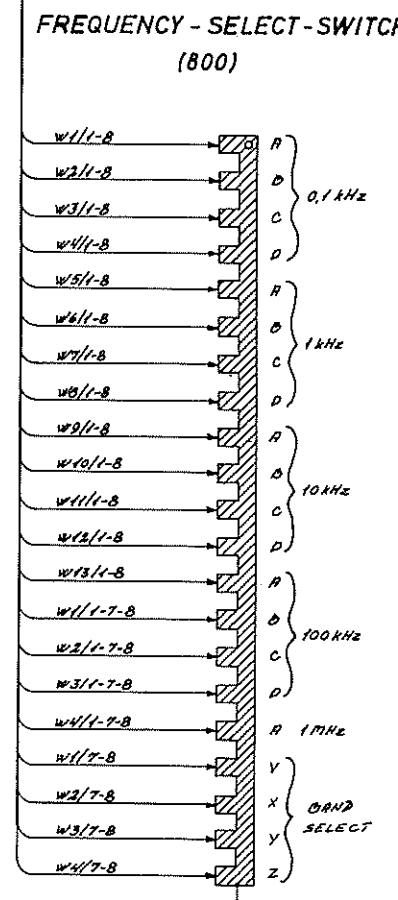
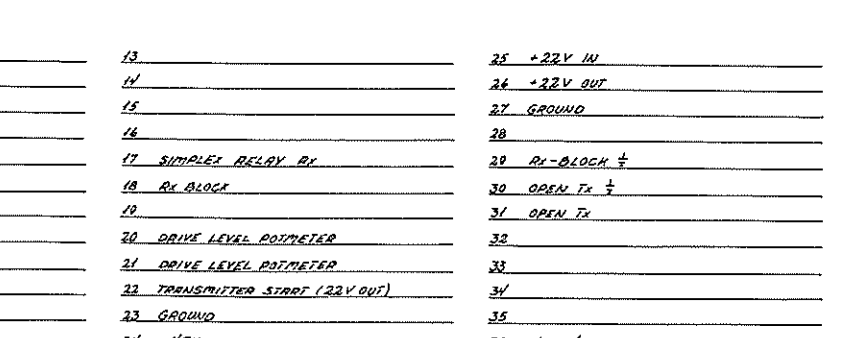
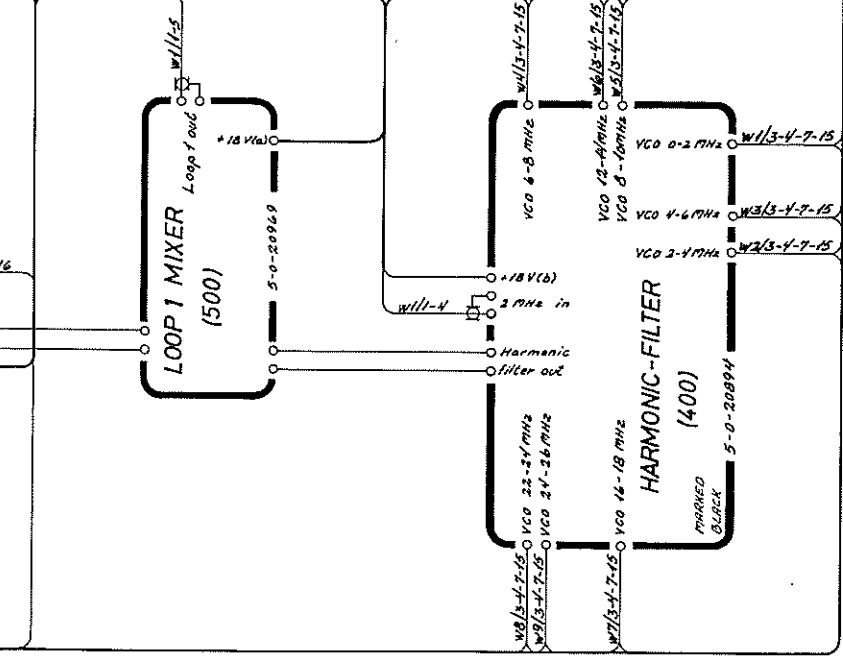
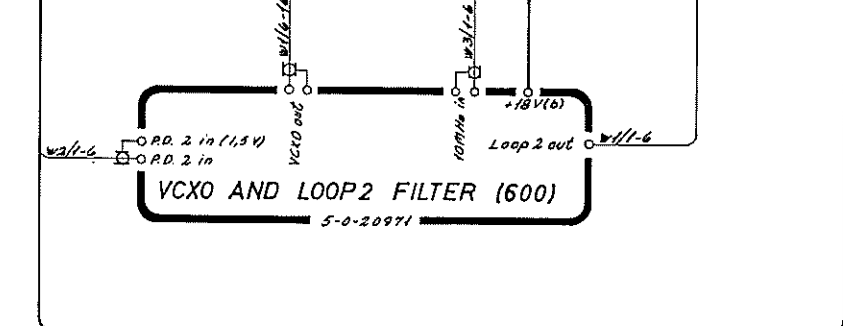
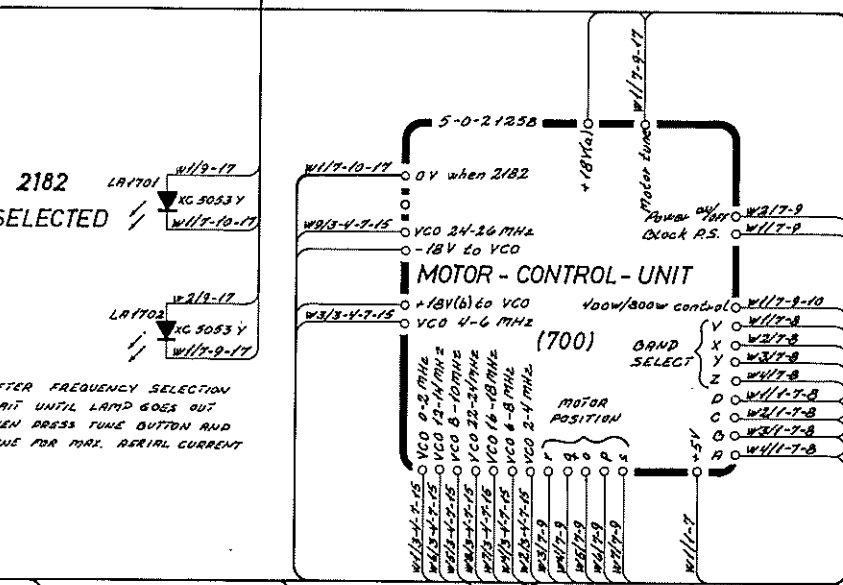
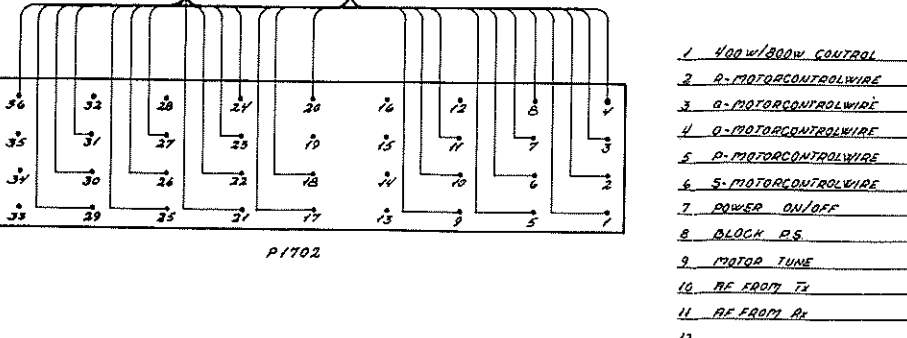
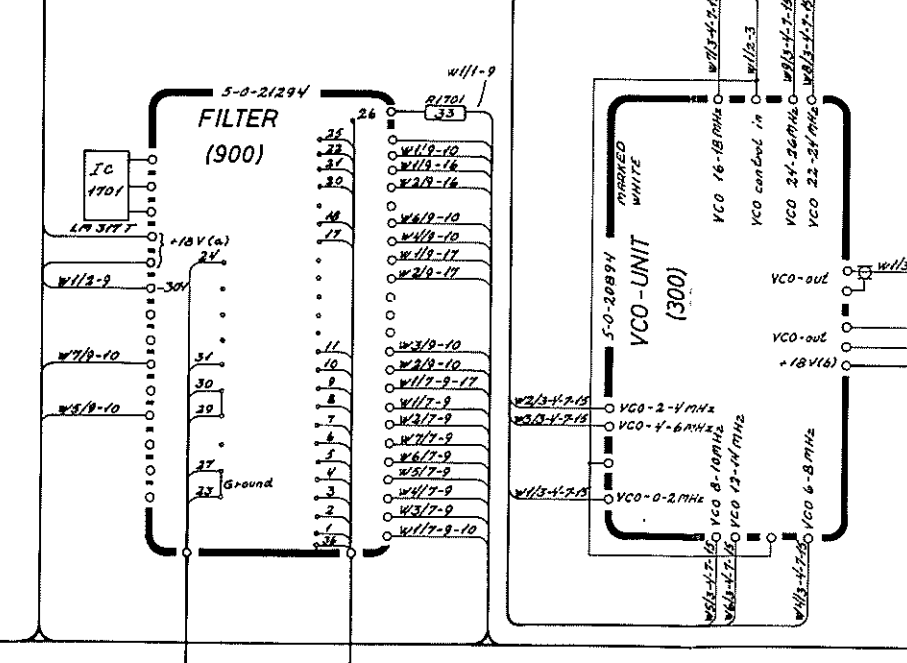
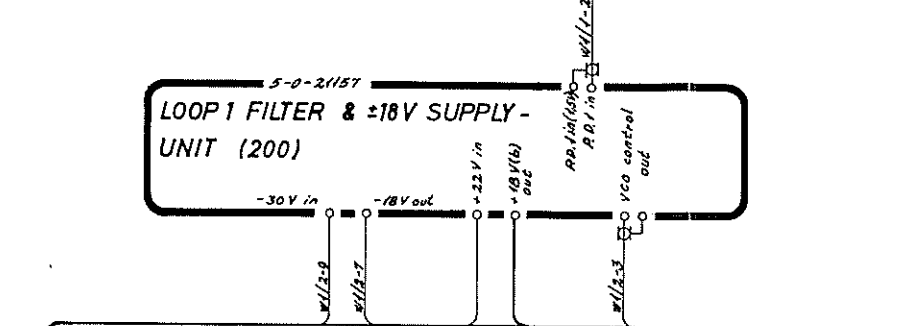
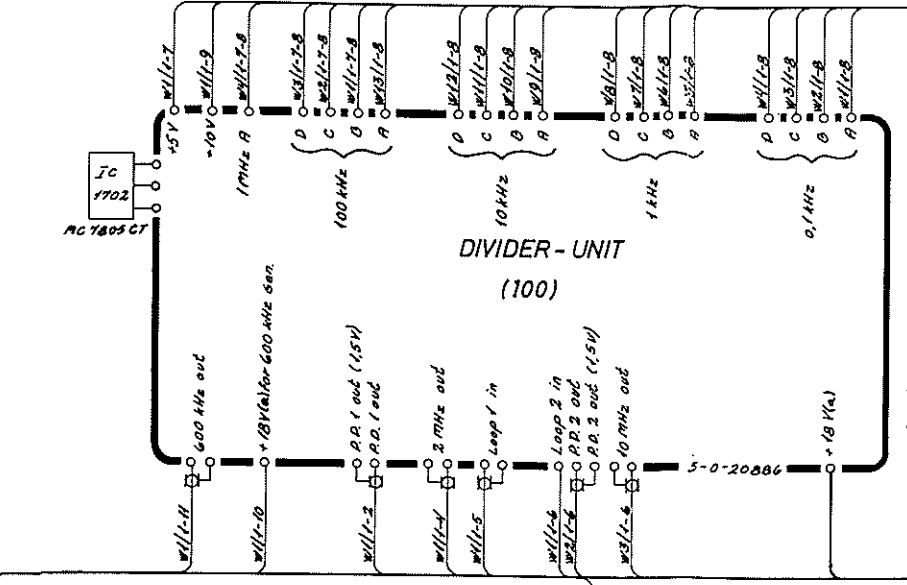
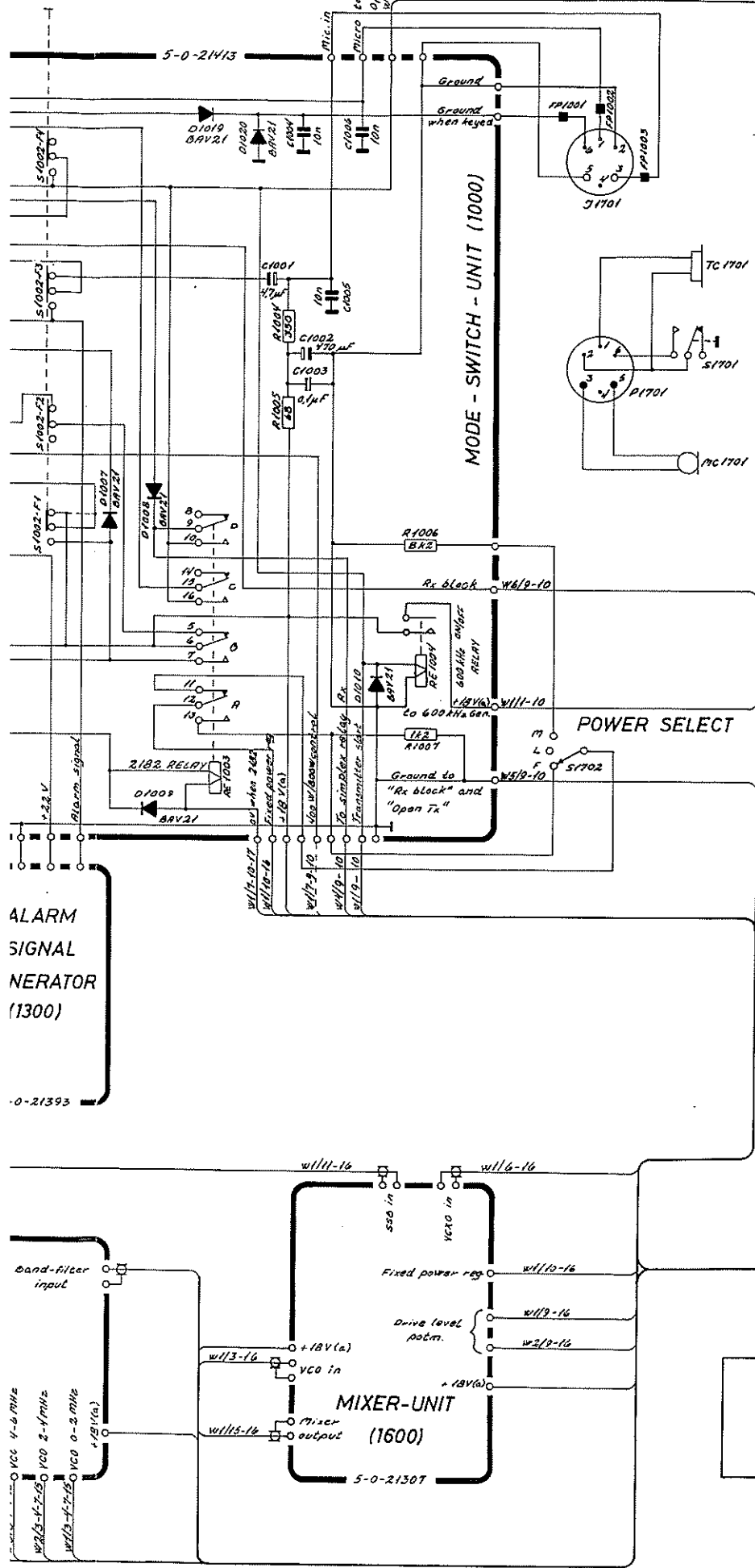
- ALARM S1002-F
- TUNE S1002-E
- A3H S1002-D

- w1/9-10, TRANSMITTER START
- w4/9-10, TO SIMPLEX RELAY RX
- w2/10-19-20, FULL POWER
- D1008
- D1010
- w1/7-9-10, 400W/800W CONTROL
- w3/10-19-20, POWER SELECT
- +18V (a)
- w1/10-16, FIXED POWER REG.
- w1/7-10-17, OV WHEN 2182
- T1001
- w2/10-17
- RE1003
- ALARM SIG.
- +22V
- GROUND
- OV TO RE1001
- D1009
- D1003
- D1006
- RE1002
- MIC. IN
- A3H
- A3A
- +18V (a)
- GROUND
- TO ALARM SIG. GENERATOR
- TO MIC.



- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12

ALARM



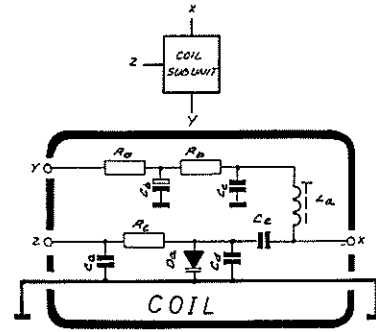
THE SWITCH IS SHOWN UNPROGRAMMED

- | | | |
|-----------------------|---------------------------------|-----------------------|
| 1. 400w/800w CONTROL | 13 | 25. +22V IN |
| 2. P-MOTORCONTROLWIRE | 14 | 26. +22V OUT |
| 3. Q-MOTORCONTROLWIRE | 15 | 27. GROUND |
| 4. R-MOTORCONTROLWIRE | 16 | 28 |
| 5. S-MOTORCONTROLWIRE | 17. SIMPLEX RELAY RI | 29. RI-BLOCK 1/2 |
| 6. T-MOTORCONTROLWIRE | 18. RI-BLOCK | 30. OPEN Tx 1/2 |
| 7. POWER ON/OFF | 19 | 31. OPEN Tx |
| 8. BLOCK P.S. | 20. DRIVE LEVEL POTMETER | 32 |
| 9. MOTOR TUNE | 21. DRIVE LEVEL POTMETER | 33 |
| 10. RF FROM Tx | 22. TRANSMITTER START (22V OUT) | 34 |
| 11. RF FROM Rx | 23. GROUND | 35 |
| 12. -45V | 24. -45V | 36. 400w/800w CONTROL |

B MAIN SCHEMATIC DIAGRAM SAILOR SSB S1300

TEST CONDITIONS

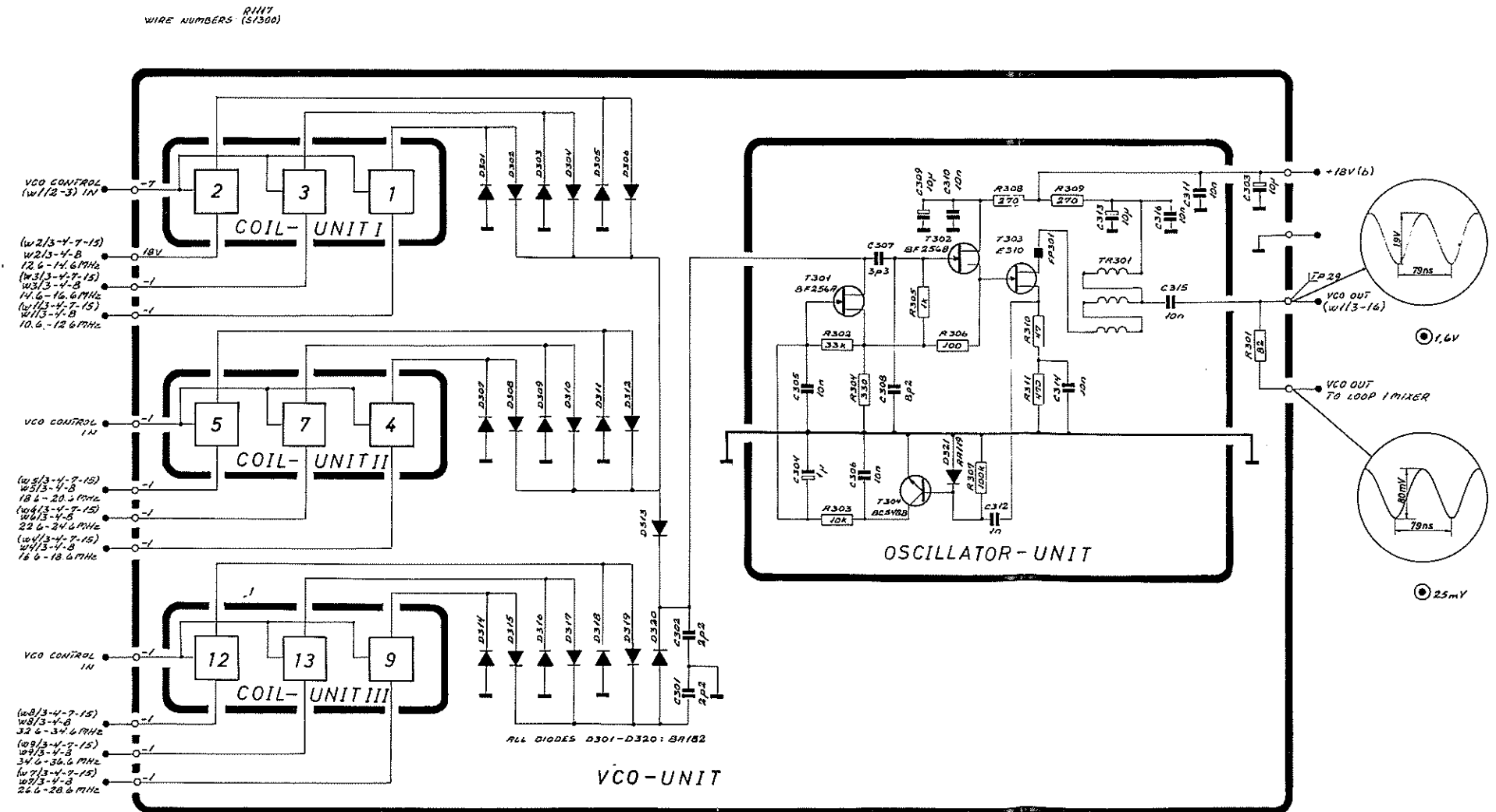
- Frequency selector : 1A (f = 2.0005 MHz)
- Oscilloscope input : Passive probe 10 Mohm//11 pF
- DC voltmeter input : 10 Mohm
- ⊙ : Diode probe measurements
- TP : Testpoints
- All voltage statements are typical



COIL UNIT	COIL	R _A (Ω)	R _B (Ω)	R _C (Ω)	C _A (nF)	C _B (μF)	C _C (nF)	C _D (pF)	C _E (pF)	L _A	D _{SA}
I	1	R312 470	R321 47	R330 546	C317 10n	C320 10μ	C329 10n	C338 4n7	C347 120	L301 7L208	D322 8B113
	2	R313 470	R322 47	R331 546		C331 10μ	C330 10n	C339 4n7	C348 100	L302 7L209	D323 8B113
	3	R314 470	R323 47	R332 447		C322 10μ	C331 10n	C340 8p2	C349 82	L303 7L210	D324 8B113
II	4	R315 470	R324 47	R333 343	C318 10n	C323 10μ	C332 10n	C341 8p2	C350 48	L304 7L211	D325 8B113
	5	R316 470	R325 47	R334 343		C324 10μ	C333 10n	C342 8p2	C351 56	L305 7L212	D326 8B113
	7	R317 470	R326 47	R335 343		C325 10μ	C334 10n	C343 10p	C352 47	L306 7L213	D327 8B113
III	9	R318 470	R327 47	R336 343	C319 10n	C326 10μ	C335 10n	C344 5p6	C353 39	L307 7L214	D328 8B113
	12	R319 470	R328 47	R337 447		C327 10μ	C336 10n	C345 8p2	C354 33	L308 7L216	D329 8B113
	13	R320 470	R329 47	R338 648		C328 10μ	C337 10n	C346 5p6	C355 31	L309 7L215	D330 8B113

TABLE FOR COMPONENT VALUES OF COILS

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



TEST CONDITIONS

Frequency selector : 1A (f = 2.0005 MHz)

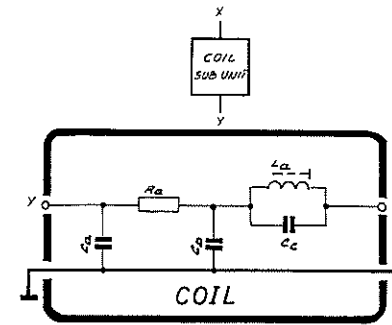
Oscilloscope input : Passive probe 10 Mohm//11 pF

DC voltmeter input : 10 Mohm

⊙ : Diode probe measurements

TP : Testpoints

All voltage statements are typical



COIL UNIT	COIL	R _a (Ω)	C _a (nF)	C _b (nF)	C _c (pF)	L _a
I	1	R409 470	C413 10	C422 10	C431 300	L401 TL199
	2	R410 470	C414 10	C423 10	C432 240	L402 TL200
	3	R411 470	C415 10	C424 10	C433 220	L403 TL201
II	4	R412 470	C416 10	C425 10	C434 180	L404 TL202
	5	R413 470	C417 10	C426 10	C435 180	L405 TL203
	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

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

R1117
WIRE NUMBERS (S1300)

