



Sailor

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**INSTRUKTIONSBOG FOR
SAILOR R1120**

**INSTRUCTION BOOK FOR
SAILOR R1120**



A/S S. P. RADIO · AALBORG · DENMARK

INSTRUCTION BOOK FOR
RECEIVER R1119/R1120

VALID FROM S.N. 255239

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GENERAL DESCRIPTION

INTRODUCTION

SAILOR R1120 is a main receiver intended for reception of A3, A3H, A3A, A3J, A2, A2H, A1 & F1 signals in the frequency range 10 kHz to 30 MHz.

SAILOR R1120 uses a digital synthesizer for frequency generation, and thus can be set to any frequency in the above mentioned frequency range. The digital synthesizer is controlled from a key board or the built-in continuous tuning wheel, the frequency selected is displayed on a six segment liquid crystal display (LCD). The frequency stability is controlled from one 10 MHz TCXO.

SAILOR R1120 is prepared for use in conjunction with telex and faximile equipment.

SAILOR R1120 is provided with higher order tunable RF filters to ensure good duplex performance.

SAILOR R1120 has automatical RF filter selection.

SAILOR R1120 fits into SAILOR 19" rack system.

SAILOR R1120 can be supplied with a selfcontaining cabinet H1225, and an AC/DC power supply N1405 with automatic change-over from AC to DC.

TECHNICAL DATA

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

The receiver has a speech clarifier with a frequency control range of ± 150 Hz.

The receiver is intended for reception of the following wave types A3 (A3E), A3H (H3E), A3A (R3E), A3J (J3E), A2 (A2A), A2H (H2A), A1 (A1A), F1 (F1B) and 2.4F1 (F1C).

Frequency ranges: 10 kHz - 30 MHz

Tuning error: less than 30 Hz

Frequency drift, short time: less than 5 Hz

Frequency drift, long time: less than 25 Hz per year

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

IF band width:

Mode or band width	Min. pass band at -6 dB	Max. pass band at -60 dB	Classification of reception	
			old	new
SSB/A3J	+ 350 Hz + 2700 Hz	- 300 Hz + 3400 Hz	A3A A3J F1 2.4F4	R3E J3E F1B F1C
AM/A3H	\pm 2900 Hz	\pm 9.5 kHz	A3 A3H	A3E H3E
MCW/A2 CW/A1 Interme- diate	\pm 1200 Hz	\pm 2800 Hz	A1 A2 A2H	A1A A2A H2A
CW/A1 Narrow	\pm 700 Hz	\pm 1700 Hz	A1	A1A
CW/A1 V.Narrow	max. \pm 190 Hz	\pm 600 Hz	A1	A1A

Options:

			SP TYPE
AUX Telex	+ 1300 Hz + 1700 Hz	+ 1075 Hz + 1925 Hz	C1022
AUX Telex	+ 1500 Hz + 1900 Hz	+ 1275 Hz + 2125 Hz	C1023
AUX Telex	+ 1700 Hz + 2100 Hz	+ 1475 Hz + 2375 Hz	C1024
AUX LSB	- 350 Hz - 2700 Hz	+ 300 Hz - 3400 Hz	C1013

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TECHNICAL DATA cont.:

Sensitivity, 20 dB SN/N:

MF, A3J :	< 16 dB/1 uV
MF, A3H :	< 30 dB/1 uV
HF, A3J :	< 10 dB/1 uV
HF, A3H :	< 24 dB/1 uV
HF, A1/Narrow:	< 5 dB/1 uV

Adjacent Channel Selectivity:

A3J:	>50 dB at -1 and +4 kHz
	>55 dB at -2 and +5 kHz
	>75 dB at -5 and +8 kHz
A3:	>55 dB at -10 and +10 kHz
	>75 dB at -20 and +20 kHz

Blocking:

wanted signal	60 dB/1 uV
blocking level	>110 dB/1 uV

Cross Modulation:

wanted signal	60 dB/1 uV
cross modulation level	>100 dB/1 uV

Intermodulation:

3rd order intermodulation	$\Delta f = 30$ kHz
intermodulation level	>90 dB/1 uV

Operation Temperature Range:

-15°C to +55°C

Spurious rejection:

image rejection	> 60 dB
IF rejection	> 60 dB
all others	> 70 dB

Spurious emission:

$P_{out} < 0.1$ nW into 50 ohm

Audio outputs:

Loudspeaker	4W into 8 ohms
Headphones	60 mW into 8 ohms
Line	0 dBm into 600 ohms

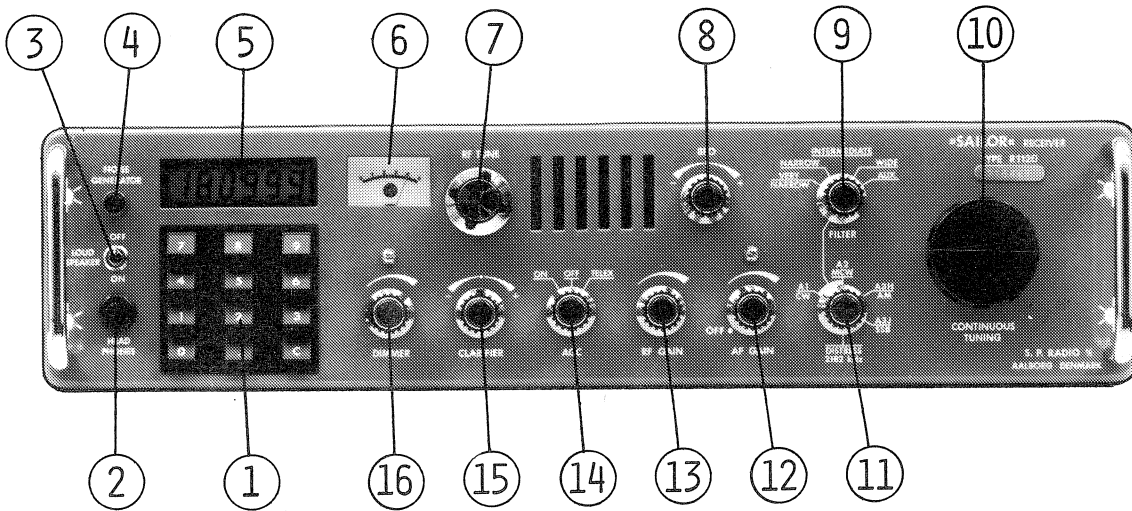
Automatic gain control:

AM AGC:	attack time approx.	35 mSec
	decay time approx.	80 mSec
$\Delta V_{in} = 40$ dB		
SSB AGC:	attack time approx.	2 mSec
	hang time approx.	3 Sec
TELEX AGC:	attack time approx.	2 mS
	decay time approx.	80 mS

IF frequencies:

1st IF:	10.6085 MHz & 16.6085 MHz
2nd IF:	600 kHz

CONTROLS R1120



- ① KEYBOARD
 Enters the frequency into the frequency synthesizer. The frequency shall be entered in kHz, and only if a fractional kHz is wanted it is necessary to activate the decimal point key. Before a new frequency is entered, and if a wrong figure is keyed in all the display is cleared by means of the clear key C. After clearing and keying in a new frequency, the receiver is blocked. Furthermore the zero key and the decimal point key controls the CONTINUOUS TUNING ⑩.
- ② HEADPHONES
 Receptable for headphones.
- ③ LOUDSPEAKER ON/OFF
 Switches ON or OFF the loudspeakers.
- ④ NOISE GENERATOR
 Removes the keyboard controlled receiver blocking and the aerial, and activates the built-in noise generator.
- ⑤ DISPLAY
 Displays the keyed figures and finally the actual receiving frequency.
- ⑥ METER
 Shows the field strength of the incoming signal.

CONTROLS cont.:

- ⑦ RF TUNE
Tunes the band filter to the chosen frequency.
- ⑧ BFO
Adjusts the beat note in A1 mode.
- ⑨ FILTER
Chooses the wanted bandwidth in A1- and A2 mode, and disables the BFO in the AUX. position.
- ⑩ CONTINUOUS TUNING
Is activated by pressing the decimal point key on the KEYBOARD ①, and tunes over the full frequency range. The tuning wheel can be disabled by pressing the zero key on the KEYBOARD ①.
- ⑪ MODE SWITCH
Switches between reception of fixed 2182 kHz (Distress), A3J - (A3J and A3A), A3H - (A3H and A3), A2 (A2 and A2H) and A1 signals.
- ⑫ AF GAIN
Controls the AF output and turns the mains on/off.
- ⑬ RF GAIN
Controls the overall RF amplification in the receiver.
- ⑭ AGC
Changes between slow (ON) and fast (TELEX) release time for the SSB AGC system or switches OFF the AGC.
- ⑮ CLARIFIER
Provides incremental tuning over a +150 Hz frequency range.
- ⑯ DIMMER
Controls the light intensity from the DISPLAY and the METER.

DIRECTIONS FOR USE

INITIAL SETTINGS

Turn on the receiver on the AF GAIN (12) or on the power supply N1400 or N1401 and turn the AF GAIN (12) to approx. middle position. Turn the CLARIFIER (15) to the center position, the RF GAIN (13) fully clockwise and the AGC SWITCH (14) to position ON. Choose the wanted mode of reception on the MODE SWITCH (11). (For further description of mode filter - and AGC selection, please examine the paragraphs below).

FREQUENCY CONTROL

The frequency is controlled from the KEYBOARD (1) and the CONTINUOUS TUNING (10) wheel. The wanted frequency must be entered into the KEYBOARD (1) in kHz and is then displayed on the liquid crystal DISPLAY (5). The decimal point is only to be used when a fractional kHz is wanted. After entering a frequency the receiver is blocked and the CONTINUOUS TUNING (10) wheel is disabled.

After keying in a frequency you must press the NOISE GENERATOR (4) and adjust RF TUNE (7) for maximum reading on the METER (6). For frequencies below 150 kHz chosen there is no tuning to be done on the RF TUNE (7), just press NOISE GENERATOR (4) to unblock the receiver.

Now the wanted frequency is selected and the receiver front end is tuned. The CLARIFIER (15) controls the frequency between the 100 Hz steps selectable.

For searching over a frequency range the CONTINUOUS TUNING (10) wheel is activated by pressing the decimal point key on the KEYBOARD (1). When the desired frequency is found the CONTINUOUS TUNING (10) wheel can be disabled by pressing the zero key on the KEYBOARD (1).

The CONTINUOUS TUNING (10) wheel is able to tune the receiver over the full frequency range 10 kHz to 30 MHz. It is necessary to follow the frequency tuning wheel with the front end tuning on the RF TUNE (7). Each time you pass a band limit by means of the CONTINUOUS TUNING (10) the receiver blocks. (Band-limits: 150 kHz, 530 kHz, 1.6 MHz, 4 MHz, 7 MHz, 14 MHz and 30 MHz). To unblock the receiver again you must press the NOISE GENERATOR (4) and adjust the RF-TUNE (7) for maximum METER (6) reading.

DISTRESS

With the controls set as described under INITIAL SETTINGS above just turn the MODE SWITCH (11) to DISTRESS (2182 kHz) position. Now the receiver is ready for reception on the distress frequency, mode selection (AM) and front end tuning is automatically done in the receiver.

SSB TELEPHONY

For normal telephony purpose turn the MODE SWITCH (11) to A3J (SSB) position. Now SSB reception of normal upper sideband is established. For SSB telephony purpose the preferable AGC (14) position is ON.

DIRECTIONS FOR USE cont.:

It is possible by means of the RF GAIN (13) to control the attack level for the AGC system in such a way that signals below a certain level not attacks the AGC system.

In noisy environments it can be advantageous to switch OFF the AGC (14) and control the gain by the RF GAIN (13) to avoid that noise impulses activates the AGC circuit.

Another possibility for gain regulation under strong repetitive noise impulses is to switch the AGC (14) to the TELEX position and turn the RF GAIN (13) fully clockwise.

The AGC system now regulates the amplification down immediately and thus prevents the noise impulse to be heard in the loudspeaker. When the noise impulse disappears again the amplification increases rapidly. This fast AGC system suppresses effectively noise impulses, but for SSB purpose it furthermore introduces some distortion because of the missing hang time in this position. For that reason it is only advantageous to use the TELEX AGC system when your environments is so noisy that the ON pos. is unusable.

GENERAL BROADCASTING

With the controls set as described under INITIAL SETTINGS above, turn the MODE SWITCH (11) to A3H (AM) position. Now you are ready to key in a wanted frequency or search by means of the CONTINUOUS TUNING (10) as described under FREQUENCY CONTROL.

TELEX IN SSB MODE

For telex reception the receiver is operating as described under SSB TELEPHONY. Because of the nature of the telex signal (it contains no envelope modulation) is the most advantageous AGC (14) choice the TELEX one. The extremely good noise performance of this AGC is fully utilized because no distortion can be introduced.

Special attention must be paid to the frequency selected. The telex service frequencies listed by the authorities are assigned frequency. For that reason you must set the frequency either 1700 Hz or 1500 Hz below the assigned frequency, depending upon the telex equipment used.

TELEX IN AUX. MODE IF TELEX FILTER IS FITTED

As in the TELEX IN SSB MODE except that the MODE SWITCH (11) is set to position A1 (CW) and the FILTER SWITCH (9) to position AUX.

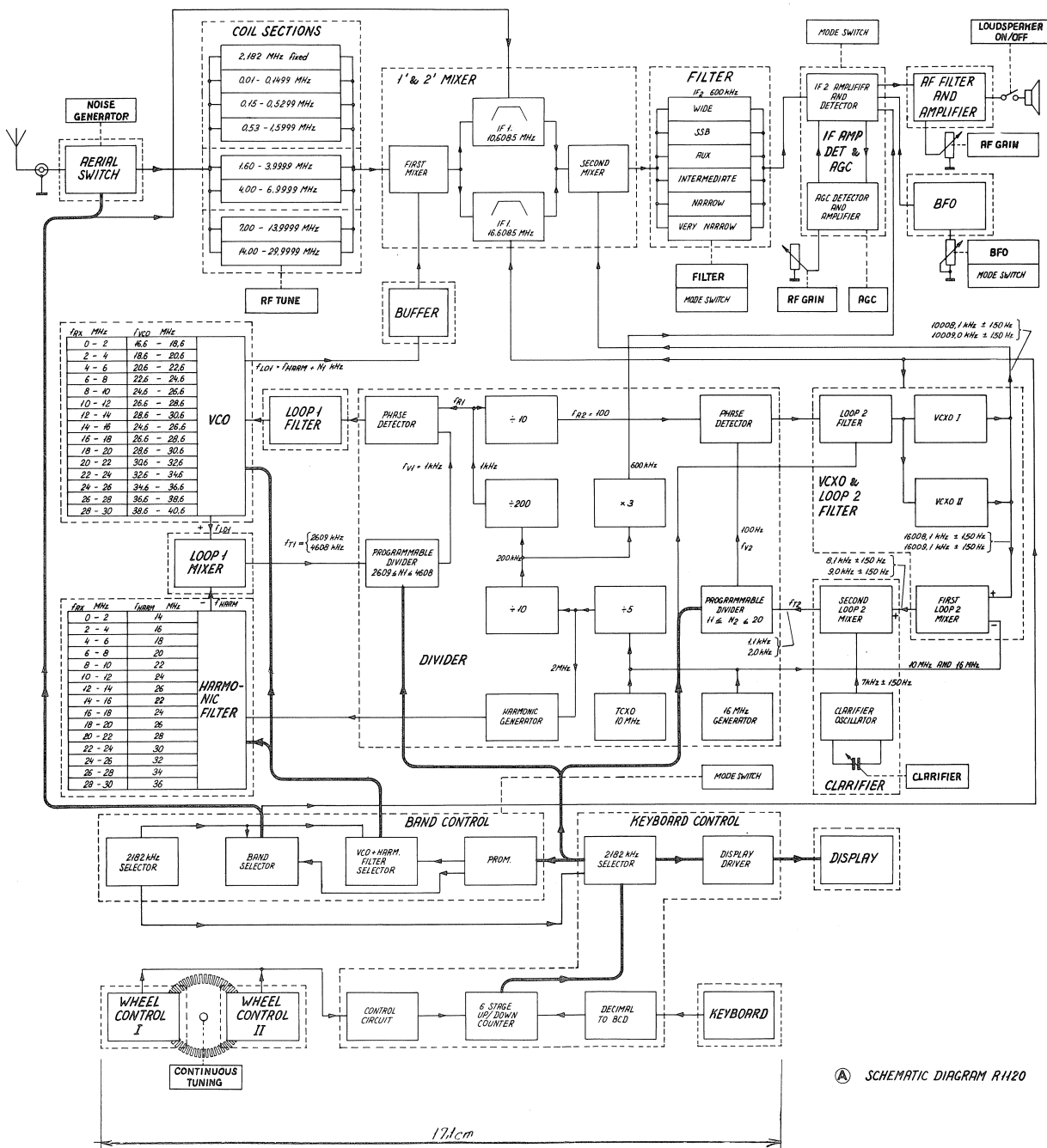
MODULATED TELEGRAPHY

With the controls set as described under INITIAL SETTINGS above, turn the MODE SWITCH (11) to position A2 (MCW) and the FILTER SWITCH (9) to INTERMEDIATE. The AGC system now chosen is the SSB one, and you must set the AGC (14) to the most suitable position (ON or TELEX) after the present noise conditions.

TELEGRAPHY

With the controls set as described under INITIAL SETTINGS above, turn the MODE SWITCH (11) to A1 (CW) position and turn the FILTER SWITCH (9) to suitable bandwidth. Now the receiver is ready for telegraphy reception and the BFO (8) is operational and can be tuned to a desirable beat note. For the same reasons as described in the telex paragraph the most advantageous AGC (14) choice is the ON one.

PRINCIPLE OF OPERATION



(A) SCHEMATIC DIAGRAM R1120

RECEIVER R 1120

The SAILOR R1120 is a fully synthesized double superheterodyne receiver with 10.6085 or 16.6085 MHz 1st IF and 600 kHz 2nd IF.

The signal from the aerial is led through the BAND FILTER UNIT to the FIRST MIXER, where the aerial signal is mixed with the f_{L01} signal having frequency resolution of 1 kHz, and thus giving a 1st IF frequency range from 10.6081 MHz to 10.6090 MHz or 16.6081 MHz to 16.6090 MHz.

PRINCIPLE OF OPERATION cont.:

The signal is then led through a double monolithic crystal filter to the SECOND MIXER, where the signal is mixed with the f_{L02} signal having continuous tuning in the frequency range from 10.00795 MHz to 10.00915 MHz or 16.00795 MHz to 16.00915 MHz, and thus giving a 2nd IF frequency of 600 kHz.

The 16.6085 MHz 1st IF is selected in the frequency range 0.0100 MHz to 13.9999 MHz and 10.6085 MHz in the range 14.0000 MHz to 29.9999 MHz.

The produced 2nd IF signal is led through one of the five filters available on the IF FILTER UNIT. The switching takes place electronically by means of the MODE and/or the FILTER SWITCH.

The signal is then passed on to the IF2 AMPLIFIER and DETECTOR. The IF amplifier consists of 3 AGC controlled amplifier stages. The detector for both AM and SSB reception is an envelope detector, and in the SSB and CW mode the carrier is reinjected in such a way that the incoming signal is converted to an A3H signal.

The reinjected carrier in SSB mode is 600 kHz derived from the 10 MHz reference oscillator, and in CW mode the carrier signal from the beat frequency oscillator BFO is used. This frequency can be varied between 599.5 kHz and 601.8 kHz.

The AGC DETECTOR AND AMPLIFIER consists of the AM AGC system and the hang AGC system.

The audio frequency signal is fed from the detector to the AF FILTER AND AMPLIFIER, consisting of an audio filter, a preamplifier and an output power amplifier, which delivers signal to the fixed AF output (0 dBm), the headphones and the speakers.

FREQUENCY GENERATION

The necessary frequencies are generated by two frequency synthesizers according to the phase locked principle.

Local oscillator signal f_{L01} to FIRST MIXER is generated in the phase locked loop 1 and has a resolution of 1 kHz.

Local oscillator signal f_{L02} to SECOND MIXER is generated in the phase locked loop 2 and has a resolution of 100 Hz, and continuous tuning over the 100 Hz steps by means of the CLARIFIER.

LOOP 1

The voltage controlled oscillator (VCO) generates the necessary local oscillator signal to FIRST MIXER in twelve 2 MHz bands selected by the BAND CONTROL UNIT. Inside each 2 MHz band the VCO frequency f_{L01} is controlled by a DC controlled voltage derived from the PHASE DETECTOR and filtered out in the LOOP 1 FILTER.

PRINCIPLE OF OPERATION cont.:

The PHASE DETECTOR compares two signals, a variable frequency f_{V1} and a reference frequency f_{R1} . The reference frequency f_{R1} is the 10 MHz TCXO frequency divided down to 1 kHz.

The variable frequency f_{V1} is generated from the VCO frequency f_{LO1} in the following way:

In the LOOP 1 MIXER the counter frequency f_{T1} is produced as the difference between the VCO frequency f_{LO1} and the frequency f_{HARM} which is a multiple of 2 MHz derived from the 10 MHz TCXO.

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

For each 2 MHz band a new f_{LO1} and f_{HARM} is selected by the BAND CONTROL UNIT, and it always results in a 2 MHz variation of the frequency f_{T1} to PROGRAMMABLE DIVIDER.

The frequency f_{T1} is divided down by a 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:

A frequency error between the variable frequency f_{V1} and the reference frequency f_{R1} will via the PHASE DETECTOR and the LOOP 1 FILTER cause a DC control voltage controlling the VCO frequency and consequently the variable frequency f_{V1} so that f_{V1} follows the reference frequency f_{R1} in frequency.

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

The VCO frequency f_{LO1} is now phase locked on a fixed frequency to the reference frequency f_{R1} and has therefore the same accuracy as this.

Changing of the VCO frequency f_{LO1} by 1 kHz is carried out by changing the dividing figure N_1 in the PROGRAMMABLE DIVIDER by one.

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

Principle of programming:

The PROGRAMMABLE DIVIDER contains a counter circuit 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 fed to the PHASE DETECTOR, and the counter starts counting down again from the start figure $2000 + P_1$. Division of f_{T1} by N_1 is now achieved.

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

PRINCIPLE OF OPERATION cont.:

The BAND CONTROL unit selects the correct VCO- and HARMONIC FILTER range.

Inside each 2 MHz band the programmable figure P_1 , is encoded from the KEY BOARD CONTROL unit in BCD code representing the frequency within the 2 MHz band.

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

Stop figure: $S_1 = -609$

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

Output frequency from Loop 1:

$$f_{L01} = m \times 2 \text{ MHz} + (P_1 + 2069) \times 1 \text{ kHz}; 7 \leq m \leq 18$$

LOOP 2

The voltage controlled crystal oscillator (VCXO) generates the necessary local oscillator signal to SECOND MIXER. The VCXO is in the Loop 2 system phase locked to the internal 10 MHz reference frequency.

The phase locked loop principle is the same as for the Loop 1 system. The only difference is that there are two mixers in the feed-back path, where the one injection signal is a fixed 10 MHz or 16 MHz signal and the other one f_{CL} is the CLARIFIER signal.

The CLARIFIER has a frequency variation of ± 150 Hz which results in a ± 150 Hz variation of the VCXO frequency f_{L02} .

Principle of programming:

The frequency shift in Loop 2 is controlled from the 0.1 kHz code from the KEY BOARD CONTROL UNIT.

The PROGRAMMABLE DIVIDER counts up from the start figure P_2 to the stop figure S_2 .

The 0.1 kHz code controls the start figure P_2 to the PROGRAMMABLE DIVIDER.

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

Stop figure: $S_2 = 20$

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

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PRINCIPLE OF OPERATION cont.:

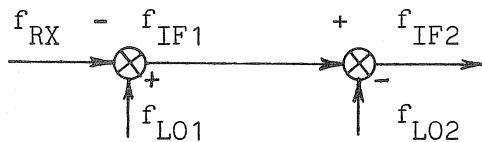
Output frequency from Loop 2:

$$\begin{aligned} f_{L02} &= 10 \text{ MHz} + f_{CL} \pm 150 \text{ Hz} + (N_2 \times 0.1 \text{ kHz}) \\ f_{L02} &= 10.007 \text{ MHz} \pm 150 \text{ Hz} + (20 - P_2) \times 0.1 \text{ kHz} \\ f_{L02} &= 10.009 \text{ MHz} \pm 150 \text{ Hz} - (P_2 \times 0.1 \text{ kHz}) \end{aligned}$$

or:

$$\begin{aligned} f_{L02} &= 16 \text{ MHz} + f_{CL} \pm 150 \text{ Hz} + (N_2 \times 0.1 \text{ kHz}) \\ f_{L02} &= 16.007 \text{ MHz} \pm 150 \text{ Hz} + (20 - P_2) \times 0.1 \text{ kHz} \\ f_{L02} &= 16.009 \text{ MHz} \pm 150 \text{ Hz} - P_2 \times 0.1 \text{ kHz} \end{aligned}$$

RECEIVING FREQUENCY f_{RX} FOR RECEIVER R1119 & R1120



$$f_{IF2} = 0.600 \text{ MHz}$$

$$f_{L02} = \begin{cases} 10.009 \text{ MHz} + 150 \text{ Hz} - (P_2 \times 0,1 \text{ kHz}) \\ 16.009 \text{ MHz} \pm 150 \text{ Hz} - (P_2 \times 0,1 \text{ kHz}) \end{cases}$$

$$f_{IF1} = f_{IF2} + f_{L02} = \begin{cases} 10.009 \text{ MHz} - (P_2 \times 0,1 \text{ kHz}) \\ 16.009 \text{ MHz} - (P_2 \times 0,1 \text{ kHz}) \end{cases}$$

$$f_{L01} = m \times 2 \text{ MHz} + (P_1 + 2609) \times 1 \text{ kHz}, 7 \leq m \leq 18$$

For $0.0100 \text{ MHz} \leq f_{RX} \leq 13.9999 \text{ MHz}$

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

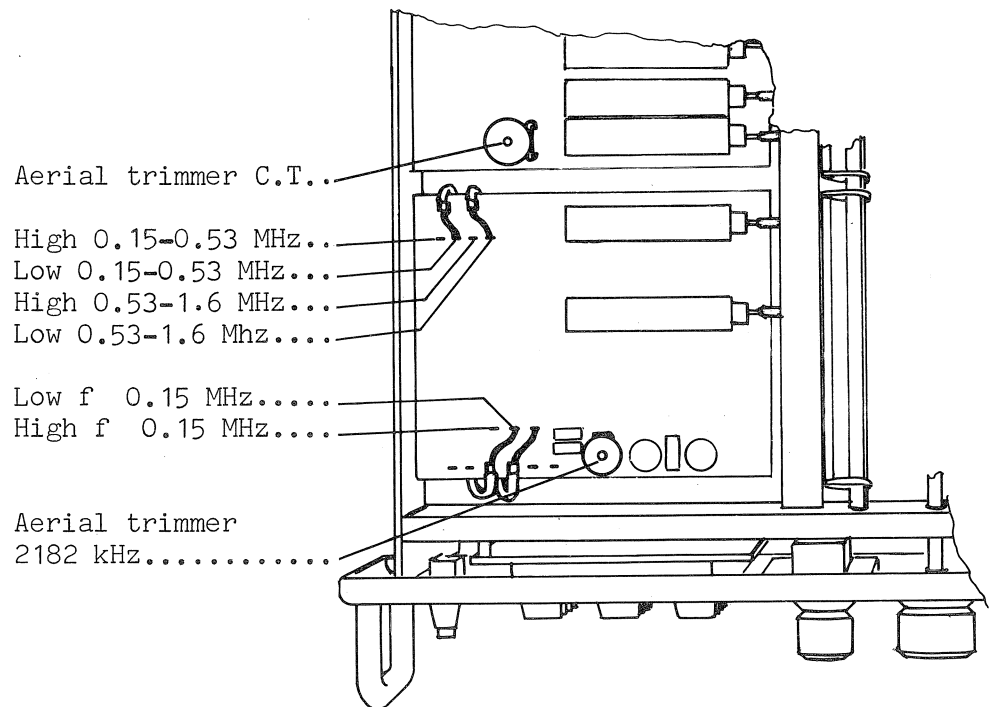
For $14.0000 \text{ MHz} \leq f_{RX} \leq 29.9999 \text{ MHz}$

$$f_{RX} = f_{L02} - f_{IF1} = (m-7) \times 2 \text{ MHz} + (P_1 + 0,1 P_2) \times 1 \text{ kHz}$$

AERIAL TUNE PROCEDURE

When the receiver has been installed the aerial trimmer for the 2182 kHz input filter must be adjusted, and for installation with short coax cables 1 1/2 m. it may be advantageous to adjust the aerial trimmer for the C.T. band 1.6 - 4 MHz.

NOTE: The length of the coax cable is from the aerial input socket of the receiver to the connection box for the aerial.



ADJUSTING PROCEDURE 2182 kHz:

1. Set mode switch to pos. 2182 kHz.
2. Set AGC switch to pos. ON.
3. Turn RF GAIN fully clockwise.
4. Turn AF GAIN to suitable volume.
5. Adjust by means of an insulated trimming stick the aerial trimmer 2182 kHz for max. METER reading or max. noise in the loudspeaker.

ADJUSTING PROCEDURE C.T. BAND (cable length 1 1/2 m.):

1. Set mode switch to pos. AM.
2. Set AGC switch to pos. ON.
3. Turn RF GAIN fully clockwise.
4. Turn AF GAIN to suitable volume.

AERIAL TUNE PROCEDURE cont.:

5. Key in a low frequency in the C.T. band e.g. 1610 kHz by means of the KEYBOARD.
6. Activate the NOISE GENERATOR and adjust RF TUNE for max. meter reading.
7. Press the decimal point key on the KEYBOARD and search by means of the CONTINUOUS TUNING wheel for a weak station in the low end of the C.T. band.
8. Adjust RF TUNE for max. METER reading.
9. Adjust by means of an insulated trimming stick the aerial trimmer C.T. for max. METER reading.
10. Repeat 8) and 9) until no essential improvement is achieved.

CHANGE OF INPUT IMPEDANCE FOR FREQUENCIES BELOW 1.6 MHz:

For installations with short coax cables and short aerials it may be advantageous to shift from 50 ohms input impedance, pos. LOW to high input impedance pos. HIGH.

To determine which pos. is the most advantageous, search for a weak station near the band limits, note the METER readings. Change for the other input impedance and check if the METER readings have increased. Remember to adjust RF TUNE.

Band limits: 150 kHz, 530 kHz and 1.6 MHz.

SERVICE

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

1. MAINTENANCE

1.1.

When the SAILOR SHORT WAVE SET type 1000 has been correctly installed, the maintenance can, dependent 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

TX: T1127, T1127L

EXC: S1300, S1301

RX: R1119, R1120

PS: N1400, N1401

TX	EXC	RX	PS	
X	X	X	X	<u>OSCILLOSCOPE:</u> Bandwidth DC - 35 MHz Sensitivity 2 mV/cm Input impedance 1 Mohm//30 pF Triggering EXT-INT-ENVELOPE E.g. PHILIPS type PM3216
X	X	X		<u>PASSIVE PROBE:</u> Attenuation 20 dB (10X) Input resistance 10 Mohm Input capacitance 15 pF Compensation range 10 - 30 pF E.g. PHILIPS type PM8925
	X	X		<u>MULTIMETER:</u> Sensitivity DC (f.s.d.) 1V Input impedance 10 Mohm Accuracy (f.s.d.) <u>+2%</u> E.g. PHILIPS type PM2505
X			X	<u>MULTIMETER:</u> Sensitivity DC (f.s.d.) 0.3V & 3A Input impedance 30 kohm/V Accuracy (f.s.d.) <u>+1%</u> Current range 100 A Voltage range 500V & 2.5 kV E.g. Unigor type A43 Shunt type GE4277 H.T.probe type GE4196

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NECESSARY TEST EQUIPMENT cont.:

TX	EXC	RX	PS
	X	X	
		X	
	X	X	
		X	
X		X	

TONE GENERATOR:

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

AF VOLTMETER:

Sensitivity (f.s.d.) 300 mV
 Input impedance ≥ 4 ohm
 Accuracy (f.s.d.) $\pm 5\%$
 Frequency range 100 - 3000 Hz
 E.g. PHILIPS type PM2505

FREQUENCY COUNTER:

Frequency range 100 Hz - 30 MHz
 Resolution 0.1 Hz at $f \geq 10$ MHz
 Accuracy 1×10^{-7}
 Sensitivity 100 mV RMS
 Input impedance 1 Mohm//25 pF
 Single period range 1 sec.
 Resolution 1 mSec.
 E.g. PHILIPS type PM6611 + PM9679

SIGNAL GENERATOR:

Frequency range 0.1 - 30 MHz
 Output impedance 50/75 ohm
 Output voltage 1 uV - 100 mV EMF
 Modulation AM, 30%, 1000 Hz
 Ext. mod. 300 - 2700 Hz
 Ext. mod. sensitivity 1V for M=0.3
 E.g. PHILIPS PM5326

POWER SUPPLIES:

N1400/T1127:
 Vout 26.5V DC
 Iout 70A DC
 E.g. 2 pcs. LAMBDA type LXS-G-24-0V-R

1000 A 2/4

NECESSARY TEST EQUIPMENT cont.:

TX	EXC	RX	PS	
	X			<u>POWER SUPPLIES:</u> S1300, S1301 Vout 1 22V Iout 1 1.5A Vout 2 -45V Iout 2 -0.1A E.g. SAILOR types N1402 N1402 spec. N1405
	X	X		R1119, R1120: Vout 1 22V Iout 1 1A Vout 2 8V Iout 2 1A Vout 3 -45V Iout 3 -0.1A E.g. SAILOR types N1402 spec. N1405
	X			<u>TEST BOX S1300/S1301:</u> S.P. type S1300/01 Test box
	X			<u>ARTIFICIAL KEY S1300TT/S1301:</u> S.P. type Artificial key
X				<u>POWER METER:</u> Power range 500W Impedance 50 ohm E.g. Bird Thruline Wattmeter Model 43 Plug-in element 500W 2-30 MHz
X				<u>RF AMMETER (Thermocross):</u> Current range 5A E.g. Helweg Mikkelsen & Co. TR-68x71, 5A Copenhagen, Denmark type

1000 A 3/4

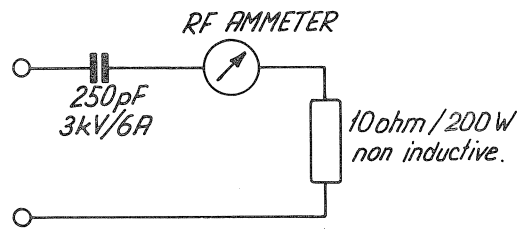
NECESSARY TEST EQUIPMENT cont.:

TX	EXC	RX	PS
X	X		
X			

DUMMY LOAD for HF bands, 4 - 25 MHz:

Impedance 50 ohm
 Frequency range 4 - 25 MHz
 Power range 400W
 SWR 1:1.2
 E.g. Bird Termaline Coaxial Resistor Model 8401

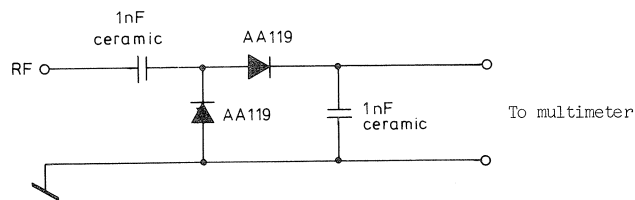
DUMMY LOAD for C.T. band 1.6 - 4 MHz:



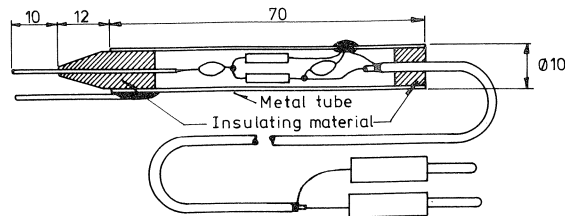
E.g. Draloric type 06-1291TD 20x50L 8KV_s 250 pF $\pm 20\%$ R85
 E.g. 10 pcs. Dale type PH-25A-17, 100 ohm, 5%, 25W

1000 A 4/4

DIODE PROBE



LAYOUT OF THE PROBE



3. TROUBLE-SHOOTING

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

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

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

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

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

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

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

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

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, module 1400.
 - 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 IC1006, pin 1 is 1 kHz.
3. Check the Loop 1 Programmable Divider, module 1000.
 - a. If the frequency on the input terminal LOOP 1 IN is approx. 2 MHz and the frequency on the phase/frequency detector IC1006, pin 3 is lower than 1 kHz, the programmable divider is apparently ok.
 - b. If the frequency on terminal LOOP 1 IN is approx. 5 MHz and the frequency on the phase/frequency detector IC1006, pin 3 is higher than 1 kHz, the programmable divider is apparently ok.
4. Check the phase/frequency detector IC1006.
 - a. Measure 1.5V DC on PD 1 OUT on the DIVIDER-UNIT.
 - b. If the input frequency on IC1006, pin 3 is higher than 1 kHz and the DC-voltage on PD 1 OUT is approx. 0.7V, the phase/frequency detector is apparently ok.
 - c. If the input frequency on IC1006, pin 3 is lower than 1 kHz and the DC-voltage on PD 1 OUT is approx. 2.3V, the phase/frequency detector is apparently ok.
5. Check the integrator IC1102 on LOOP 1 FILTER & +18V SUPPLY-UNIT, module 1100.
 - a. If the DC voltage on PD 1 IN is approx. 0.7V and the DC voltage on output terminal of IC1102, pin 6 is approx. -4V, the integrator IC1102 is apparently ok.
 - b. If the DC voltage on PD 1 IN is approx. 2.3V and the DC voltage on the output terminal of IC1102, pin 6 is approx. -17V, the integrator IC1102 is apparently ok.
6. If the failure has not been found yet the 1 kHz loop filter IC1101 and the selection circuit for choosing VCO- and HARMONIC FILTER must be checked.

R1119 & R1120 A 2/3

TROUBLE-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, 1st LOOP 2 MIXER and LOOP 2 FILTER on terminal LO 2 OUT, the failure has to be found in the VCXO.

If the output frequency from the VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER on terminal LO 2 OUT is lower than 10.008 MHz or higher than 10.009 MHz, respectively 16.008 MHz and 16.009 MHz, the phase-locked loop 2 is out of lock.

1. Set the CLARIFIER to center position and check the output signal from VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER on terminal FIRST LOOP 2 OUT.
 - a. If there is no output signal, the failure is in the 1st loop 2 mixer or that the 10 MHz and/or 16 MHz injection signal is missing.
 - b. If the output frequency is slightly lower than 8 kHz or slightly higher than 9 kHz the VCXO, the 1st loop 2 mixer and the 10 MHz and/or 16 MHz injection signal are apparently ok.
2. Set the CLARIFIER to center position and check the output signal on TP10 on the CLARIFIER AND 2nd LOOP 2 MIXER, module 1700.
 - a. If there is no output signal, the failure is on the CLARIFIER AND 2nd LOOP 2 MIXER circuit board.
 - b. If the output frequency is lower than 1 kHz or higher than 2 kHz, then the CLARIFIER AND 2nd LOOP 2 MIXER is apparently ok.
3. Check that the frequency on the phase/frequency detector IC1013, pin 1 is 100 Hz.
4. Check the LOOP 2 Programmable Divider.
 - a. If the frequency on terminal LOOP 2 IN, module 1000 is lower than 1 kHz and the frequency on the phase/frequency detector IC1013, pin 3 is lower than 100 Hz, the programmable divider is apparently ok.
 - b. If the frequency on terminal LOOP 2 IN, module 1000 is higher than 2 kHz and the frequency on the phase/frequency detector IC1013, pin 3 is higher than 100 Hz, the programmable divider is apparently ok.
5. Check the phase/frequency detector IC1013.
 - a. Measure 1.5V DC on terminal PD 2 OUT on the DIVIDER-UNIT.
 - b. If the input frequency on IC1013, pin 3 is lower than 100 Hz and the DC voltage on terminal PD 2 OUT is approx. 0.7V, the phase/frequency detector is apparently ok.
 - c. If the input frequency on IC1013, pin 3 is higher than 100 Hz and the DC voltage on terminal PD 2 OUT is approx. 2.3V, the phase/frequency detector is apparently ok.
6. Check the integrator IC1601b on VCXO, 1st LOOP 2 MIXER and LOOP 2 FILTER.
 - a. If the DC voltage on TP9 is approx. 0.7V and the DC voltage on output terminal IC1601b, pin 1 is approx. 17V, the integrator is apparently ok.
 - b. If the DC voltage on TP9 is approx. 2.3V and the DC voltage on the output terminal of IC1601b, pin 1 is approx. 1V, the integrator is apparently ok.
7. If the failure has not yet been found the summing amplifier IC1601a and the loop filter C1614 and R1616 must be checked.

4. PERFORMANCE CHECK FOR R1119 AND R1120

4.1.
DEFINITIONS USED - LOCATIONS.

4.1.1.
Definitions used refer to 5.1.

4.1.2.
Locations refer to ADJUSTMENT LOCATIONS.

4.2.
CHECK OF +18V SUPPLY UNIT.

4.2.1.
Connect the voltmeter to TP2.

4.2.2.
Check that the voltage is +18V +0.2V.

4.2.3.
Connect the voltmeter to TP1.

4.2.4.
Check that the voltage is -18V +0.2V.

4.3.
CHECK OF +5V REGULATOR.

4.3.1.
Connect the voltmeter to pin 3 of IC2602.

4.3.2.
Check that the voltage is 5V +0.2V.

4.3.3.
Connect the voltmeter to TP23.

4.3.4.
Check that the voltage is 5V +0.2V.

4.4.
CHECK OF TCXO.
The receiver must be ON for at least 5 minutes.

4.4.1.
Connect the counter to TP3.

4.4.2.
Check that the frequency is 10,000,000 +1 Hz.

4.5.
CHECK OF KEYBOARD.

4.5.1.
Press the KEYBOARD C and 1 simultaneously. The DISPLAY shows 111111.

4.5.2.
Repeat 4.5.1. for C and 2, 3 9.

4.5.3.
Press the KEYBOARD C and 9 simultaneously, release C before 9. The DISPLAY shows 999999. Check that no noise is heard from the loudspeaker.

4.5.4.
Press the KEYBOARD 0. The DISPLAY shows 999990.

4.5.5.
Press the KEYBOARD decimal point. The DISPLAY shows 99990.0.

4.5.6.
Press the KEYBOARD 1. The DISPLAY shows 99990.1.

4.5.7.
Press the KEYBOARD C. The DISPLAY shows 000000.

4.5.8.
Press the KEYBOARD 99. The DISPLAY shows 000099.

4.5.9.
Press the NOISE GENERATOR button. The DISPLAY shows 00099.0. Check that noise is heard from the loudspeaker.

4.5.10.
Press the KEYBOARD decimal point. Check that noise is heard from the loudspeaker.

4.5.11.
Turn the CONTINUOUS TUNING until the DISPLAY shows 00150.0. Check that no noise is heard from the loudspeaker.

4.5.12.
Turn the CONTINUOUS TUNING until the DISPLAY shows 00149.0. Press the NOISE GENERATOR, check that noise is heard from the loudspeaker.

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

4.5.13.

Turn the CONTINUOUS TUNING until the DISPLAY shows 99999.9. Check that no noise is heard from the loudspeaker.

4.5.14.

Press the KEYBOARD 0 and turn the CONTINUOUS TUNING. The displayed figure must not change.

4.5.15.

Connect the passive probe to IC2020, pin 8 and to a scope.

4.5.16.

Turn the CONTINUOUS TUNING and check that the voltage on pin 8 is approx. 4V DC.

4.5.17.

Connect the passive probe to IC2020, pin 11 and to a scope.

4.5.18.

Turn the CONTINUOUS TUNING and check that the voltage on pin 11 is approx. 0V DC.

4.5.19.

Set the MODE SWITCH to DISTRESS 2182 kHz.

4.5.20.

Check that the DISPLAY shows 2182 kHz.

4.6.

CHECK OF HARMONIC FILTERS.

4.6.1.

Set the MODE SWITCH to A3J.

4.6.2.

Connect the voltmeter to TP 24.

4.6.3.

Enter the following f_{RX} to the KEYBOARD and press the NOISE GENERATOR. $f_{RX} = 1 - 2 - 4 - 6 - 8 - 10 - 12 - 14 - 16 - 18 - 20 - 22 - 24 - 26 - 28$ MHz.

4.6.4.

Check that the voltage is $\leq 3.5V$ DC for serial number below (21XXXX) and check that the voltage is $\leq X.XV$ DC for serial numbers above (21XXXX).

4.7.

CHECK OF VCO.

4.7.1.

Set MODE SWITCH to A3J.

4.7.2.

Connect the voltmeter to TP11.

4.7.3.

Enter the following f_{RX} to the KEYBOARD and press the NOISE GENERATOR. $f_{RX} = 1.999 - 3.999 - 5.999 - 7.999 - 9.999 - 11.999 - 13.999 - 15.999 - 17.999 - 19.999 - 21.999 - 23.999 - 25.999 - 27.999 - 29.999$ kHz.

4.7.4.

Check that the voltage is $15V \pm 1V$.

4.7.5.

Enter the following f_{RX} to the KEYBOARD and press the NOISE GENERATOR. $f_{RX} = 0 - 2 - 4 - 6 - 8 - 10 - 12 - 14 - 16 - 18 - 20 - 22 - 24 - 26 - 28$ MHz.

4.7.6.

Check that the voltage is $7.0V \pm 1.5V$.

4.8.

CHECK OF CLARIFIER.

4.8.1.

Set the MODE SWITCH to A3J.

4.8.2.

Set the CLARIFIER to center position.

4.8.3.

Press the CLEAR and the NOISE GENERATOR button.

4.8.4.

Connect the counter to TP4.

4.8.5.

Check that the frequency is 9000 Hz ± 10 Hz.

4.8.6.

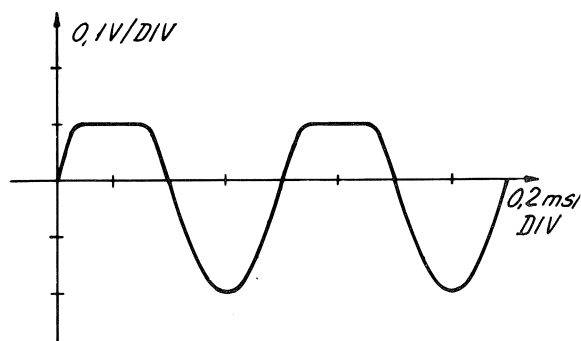
Check that the CLARIFIER deviation range is more than ± 150 Hz.

4.8.7.

Connect the passive probe to TP10 and to a scope.

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

4.8.8.
Check that the wave form is as shown below.



4.8.9.
Enter $f_{RX} = 16$ MHz to the KEYBOARD and press the NOISE GENERATOR.

4.8.10.
Check that the wave form is as shown in point 4.8.8.

4.9.
CHECK OF VCXO.

4.9.1.
Set the MODE SWITCH to A3J.

4.9.2.
Connect +5V to TP25.

4.9.3.
Press the CLEAR, the NOISE GENERATOR button and the DECIMAL POINT key.

4.9.4.
Connect the voltmeter to TP12.

4.9.5.
Check that the voltage is $14V \pm 1V$.

4.9.6.
Turn the CONTINUOUS TUNING and check that a one decimal change in the 100 Hz display causes a 0.6V change in the meter reading.

4.9.7.
Check that the voltage is $8.5 \pm 1V$ when the 100 Hz display shows 9.

4.9.8.
Remove the +5V from TP25.

4.9.9.
Enter the following $f_{RX} = 10000.0$ kHz to the KEYBOARD, press the NOISE GENERATOR button.

4.9.10.
Turn the CLARIFIER extreme counter clockwise.

4.9.11.
Check that the voltage is $11V \pm 1V$.

4.9.12.
Enter the following $f_{RX} = 10000.9$ kHz to the KEYBOARD, press the NOISE GENERATOR button.

4.9.13.
Turn the CLARIFIER extreme clockwise.

4.9.14.
Check that the voltage is $7V \pm 1V$.

4.9.15.
Enter the following $f_{RX} = 16000.0$ kHz to the KEYBOARD, press the NOISE GENERATOR button.

4.9.16.
Turn the CLARIFIER extreme counter clockwise.

4.9.17.
Check that the voltage is $11V \pm 1V$.

4.9.18.
Enter the following $f_{RX} = 16000.9$ kHz to the KEYBOARD and press the NOISE GENERATOR button.

4.9.19.
Turn the CLARIFIER extreme clockwise.

4.9.20.
Check that the voltage is $6V \pm 1V$.

4.10.
CHECK OF 600 kHz GENERATOR.

4.10.1.
Set the MODE SWITCH to pos. A3J.

4.10.2.
Connect the diode probe to TP27.

4.10.3.
Check that the voltage is $1V \pm 0.2V$.

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

4.10.4.

Check that the voltage disappears in the A3H MODE.

4.11.

CHECK OF BFO OSCILLATOR (R1120 only).

4.11.1.

Set the MODE SWITCH to pos. A1.

4.11.2.

Set the FILTER SWITCH to pos. NARROW.

4.11.3.

Set the BFO to center position.

4.11.4.

Connect the counter to TP26.

4.11.5.

Check that the frequency is 600,000 Hz ± 10 Hz.

4.11.6.

Check that the BFO deviation range is at least 598.2 kHz to 600.5 kHz.

4.11.7.

Connect the diode probe to TP26.

4.11.8.

Check that the voltage is 1.3V ± 0.2 V.

4.12.

CHECK OF LOOP 1 STEP RESPONSE.

4.12.1.

Connect a 68 ohm resistor across HARMONIC FILTERS output.

4.12.2.

Set the MODE SWITCH to pos. A3J.

4.12.3.

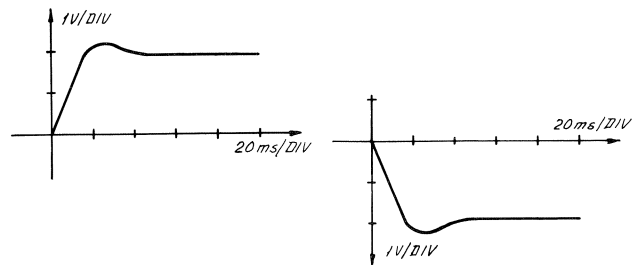
Connect the passive probe and the scope to TP11.

4.12.4.

Enter $f_{RX} = 22499.9$ kHz to the KEYBOARD and press the NOISE GENERATOR button.

4.12.5.

Short-circuit the yellow wire on the 100 Hz data input at the divider board to chassis and check the step response on the scope. Typical wave form is shown next column.



4.12.6.

Remove the 68 ohm resistor from HARMONIC FILTER output.

4.13.

CHECK OF LOOP 2 STEP RESPONSE.

4.13.1.

Set the MODE SWITCH to pos. A3J.

4.13.2.

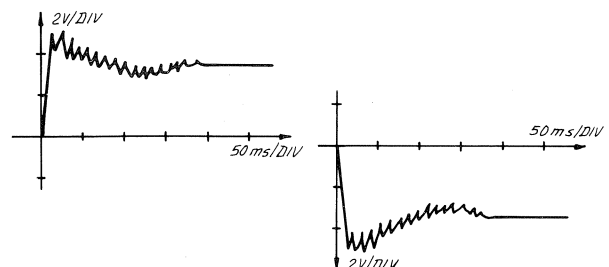
Connect the passive probe and the scope to TP12.

4.13.3.

Enter $f_{RX} = 22499.9$ kHz to the KEYBOARD and press the NOISE GENERATOR button.

4.13.4.

Short-circuit the grey wire on the 100 Hz data input at the divider board to chassis and check the step response on the scope. Typical wave form is shown below.



4.14.

CHECK OF +18V SUPPLY VOLTAGE.

4.14.1.

Connect the voltmeter to TP13.

R1119 & R1120 A 4/9

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

4.14.2.
Measure $18V \pm 1.5V$ DC.

4.15.
CHECK OF +17V SUPPLY VOLTAGE.

4.15.1.
Connect the voltmeter to TP14.

4.15.2.
Turn AF GAIN fully clockwise.

4.15.3.
Measure $17.3V \pm 1.5V$ DC.

4.16.
CHECK OF -45V PROTECTION CIRCUIT.

4.16.1.
Connect the voltmeter to TP15.

4.16.2.
Measure approx. -45V DC.

4.16.3.
Connect output from TX-exciter S1300 to antenna input terminals of the receiver.

4.16.4.
Use the following procedure at one frequency in each of the frequency bands 2182 kHz FIXED, 0.15 - 0.53 MHz, 0.53 - 1.6 MHz, 1.6 - 4.0 MHz, 4.0 - 7.0 MHz, 7.0 - 14.0 MHz, 14.0 - 30.0 MHz.

4.16.5.
Set S1300 to FULL POWER, DUPLEX, A3H and turn POWER LEVEL potentiometer fully clockwise,

4.16.6.
Set S1300 and the receiver on the same frequency.

4.16.7.
Connect the voltmeter to TP15.

4.16.8.
Press the NOISE GENERATOR button and adjust RF TUNE to max. deflection on the METER.

4.16.9.
Key S1300 by means of the KEY plug and check that the voltage on TP15 increases.

4.17.
CHECK OF LOCAL OSCILLATOR INPUTS.

4.17.1.
Enter $f_{RX} = 1.0$ MHz to the KEYBOARD and press the NOISE GENERATOR button.

4.17.2.
Connect the diode probe to TP16.

4.17.3.
Measure $0.6V \pm 0.15V$.

4.17.4.
Connect the diode probe to TP17.

4.17.5.
Measure $3.7V \pm 0.7V$.

4.17.6.
Enter $f_{RX} = 25.0$ MHz to the KEYBOARD and press the NOISE GENERATOR button.

4.17.7.
Connect the diode probe to TP16.

4.17.8.
Measure $0.6V \pm 0.15V$.

4.17.9.
Connect the diode probe to TP17.

4.17.10.
Measure $3.7V \pm 0.7V$

4.17.11.
Set the MODE SWITCH to A3J.

4.17.12.
Turn RF GAIN fully counter clockwise.

4.17.13.
Connect diode probe to TP18.

4.17.14.
Measure $1.7V \pm 0.3V$.

4.17.15. (R1120 only)
Set the MODE SWITCH to A1 and the FILTER SWITCH to NARROW.

4.17.16. (R1120 only)
Connect diode probe to TP18.

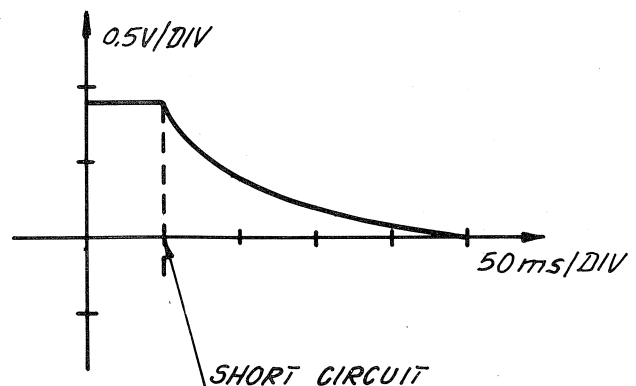
4.17.17. (R1120 only)
Measure $2.2V \pm 0.4V$.

4.17.18. (R1119 fitted with AUX FILTER)
Set MODE SWITCH to AUX and repeat 4.17.13. and 4.17.14.

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

- 4.18.
CHECK OF LOOP 1 MIXER.
- 4.18.1.
Enter $f_{RX} = 28.0$ MHz to the KEYBOARD and press the NOISE GENERATOR button.
- 4.18.2.
Connect the diode probe to TP28.
- 4.18.3.
Measure $1.3V \pm 0.5V$.
- 4.18.4.
Enter $f_{RX} = 29.999$ MHz to the KEYBOARD and press the NOISE GENERATOR button.
- 4.18.5.
Connect the diode probe to TP28.
- 4.18.6.
Measure $1.3V \pm 0.5V$.
- 4.19.
CHECK OF DETECTOR LEVEL.
- 4.19.1.
Set MODE SWITCH to A3J.
- 4.19.2.
Enter $f_{RX} = 25,000$ kHz to the KEYBOARD. Press the NOISE GENERATOR button and adjust RF TUNE to max. deflection on the METER.
- 4.19.3.
Set the signal generator to $f_G = 25,001$ kHz and $V_G = 1$ mV.
- 4.19.4.
Set AGC ON/OFF to TELEX.
- 4.19.5.
Turn RF GAIN fully clockwise.
- 4.19.6.
Connect voltmeter to HEADPHONES via a screened cable and adjust AF GAIN to the meter reads 0 dB in the 1V AC range.
- 4.19.7.
Set AGC ON/OFF to OFF.
- 4.19.8.
Adjust RF GAIN until meter reading is 0 dB in the 1V range.

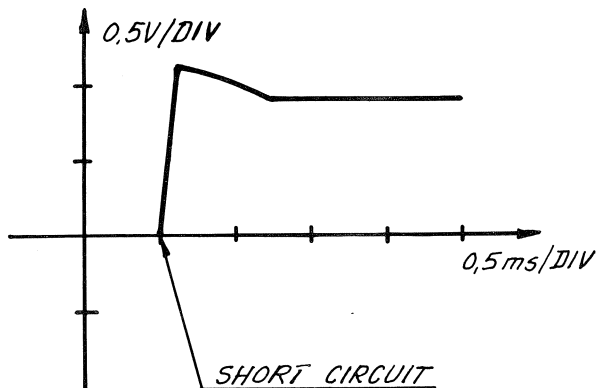
- 4.19.9.
Short-circuit carrier reinjection to ground e.g. on the anode of D812.
- 4.19.10.
Connect the diode probe to TP18.
- 4.19.11.
Measure 550 mV ± 100 mV.
- 4.20.
CHECK OF AGC ATTACK - AND DECAY TIME.
- 4.20.1.
Enter $f_{RX} = 3,900$ kHz to the KEYBOARD. Press the NOISE GENERATOR button and adjust RF TUNE to max. deflection on the METER.
- 4.20.2.
Set the signal generator to $f_G = 3,901$ kHz and $V_G = 1$ mV.
- 4.20.3.
Set AGC ON/OFF to TELEX and turn RF GAIN fully clockwise.
- 4.20.4.
Connect the passive probe to the scope and to TP19.
- 4.20.5.
By means of e.g. a trimming tool short-circuit inner and outer conductor on the coax cable leading from IF-FILTERS to IF-AMPLIFIER, DETECTOR and AGC.
- 4.20.6.
When short-circuiting as mentioned above, no signal will come to the AGC-circuit, which causes the AGC voltage to decay as shown below.



PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

4.20.7.

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

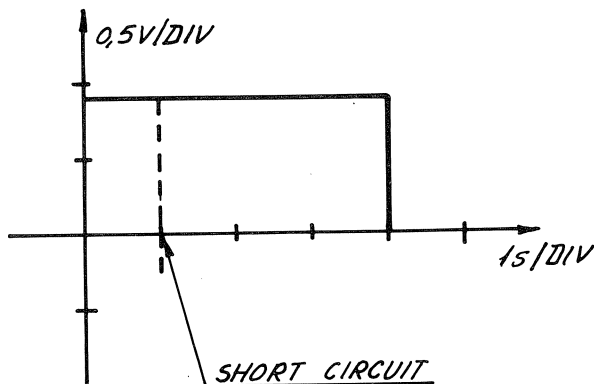


4.20.8.

Set AGC SWITCH to ON.

4.20.9.

Similar to 4.20.6. a decay will be seen.

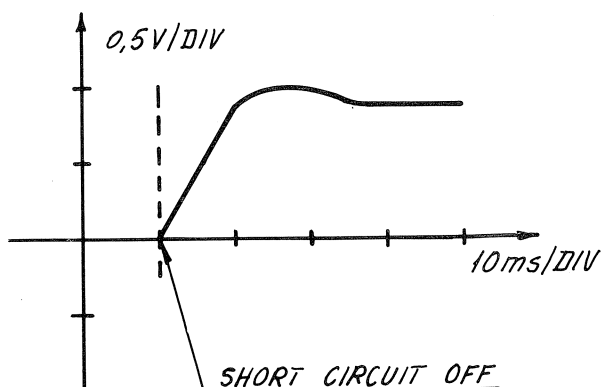


4.20.10.

Set MODE SWITCH to A3H (AM).

4.20.11.

Similar to 4.20.7. an "attack" will be seen.



4.21.

CHECK OF 0 dBm AF OUTPUT.

4.21.1.

Enter $f_{RX} = 6700$ kHz to the KEYBOARD. Press the NOISE GENERATOR button and adjust RF TUNE to max. deflection on the METER.

4.21.2.

Set the signal generator to 6701 kHz and $V_G = 1$ mV.

4.21.3.

Set the MODE SWITCH to A3J and the AGC SWITCH to ON.

4.21.4.

Connect voltmeter and 560 ohm resistor parallel to TP20 and TP21.

4.21.5.

Measure $0.9V \pm 0.2V$ AC.

4.21.6.

Set MODE SWITCH to A3H (AM).

4.21.7.

Modulate f_G to 30% with an 1 kHz tone.

4.21.8.

Measure $0.8V \pm 0.2V$ AC.

4.22.

CHECK OF AF AMPLIFIER.

4.22.1.

Perform 4.20.1. - 4.20.3.

4.22.2.

Solder a 4 ohm (min. 10 W) resistor to TP22 and connect the oscilloscope probe parallel to the resistor.

4.22.3.

Set the LOUDSPEAKER ON/OFF to OFF.

4.22.4.

Turn the AF GAIN fully clockwise and check that the AF voltage is at least 15Vpp.

4.22.5.

Reduce AF GAIN until AF voltage is 13 Vpp. Now a sinusoidal signal should be seen (distortion is typical around 3%)

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

4.23.
CHECK OF SIMPLEX RELAY.

4.23.1.
Connect an ohm-meter to the antenna input terminal and to ground.

4.23.2.
Connect TP30 to TP29 with a piece of wire and check that RE101 is activated.

4.23.3.
Check that the ohm-meter is showing a short-circuit.

4.24.
SENSITIVITY MEASUREMENT.

4.24.1.
Choose f_{RX} and f_G according to table 4.24.11.

4.24.2.
Choose V_G according to table 4.24.12. (and refer to the definitions given in section 5.1.).

NOTE: The sensitivity measured in A3J mode must be 14 dB better than the measured sensitivity in A3H mode.

4.24.3.
Enter f_{RX} to the KEYBOARD. Press the NOISE GENERATOR button and adjust RF TUNE to max. deflection on the METER.

4.24.4.
Set the signal generator to the stated f_G and V_G .

4.24.5.
Set the MODE SWITCH to A3H.

4.24.6.
Connect the voltmeter to HEADPHONES via a screened cable and adjust AF GAIN to the meter reads 0 dB in the 1V range.

4.24.7.
Set AGC ON/OFF to OFF.

4.24.8.
Reduce RF GAIN until the meter reading again is 0 dB.

4.24.9.
Fine tune RF TUNE to max. meter reading and reduce the meter reading to 0 dB with RF GAIN.

4.24.10.
Remove the modulation from V_G and notice the drop on the meter reading.

In any case this must be at least 20 dB.

4.24.11.
Table 4.24.11.(next page).

PERFORMANCE CHECK FOR R1119 AND R1120 cont.:

MODE	f_{RX}	V_G (EMF) $R_G = 50$ ohm
A3H (AM)	100 kHz - 149 kHz	50 dB above 1 uV or 320 uV
	150 kHz - 529 kHz	30 dB above 1 uV or 32 uV
	530 kHz - 1.6 MHz	30 dB above 1 uV or 32 uV
	1.6 MHz - 4.0 MHz incl. 2182 kHz	30 dB above 1 uV or 32 uV
	4.0 MHz - 30.0 MHz	25 dB above 1 uV or 18 uV

4.24.12.

Table 4.24.12.

MODE	BAND	f_{RX} MHz	f_G MHz
A3H (AM)	100 kHz - 149 kHz	100 kHz 149 kHz	f_{RX} modulated 30% with 1 kHz
	150 kHz - 529 kHz	150 kHz 280 kHz 529 kHz	
	530 kHz - 1.599 kHz	530 kHz 920 kHz 1.599 kHz	
	1.6 MHz - 3.999 MHz	1.6 MHz 2.182 MHz 2.530 MHz 3.999 MHz	
	DISTRESS 2182 kHz	2.182 kHz Fixed	
	4.0 MHz - 29.999 MHz	4.000 MHz 5.290 MHz 6.999 MHz 7.000 MHz 9.900 MHz 13.999 MHz 14.000 MHz 20.880 MHz 28.000 MHz	

R1119 & R1120 A 9/9

5. ADJUSTMENT PROCEDURE FOR R1119 & R1120

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

5.1. DEFINITIONS USED.

5.1.1.

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

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

V_G = EMF of signal generator with proper generator impedance.

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

5.2. THE FOLLOWING SEQUENCE WILL OFTEN BE USED:

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

5.2.2.
Switch ON the receiver.

5.2.3.
Set LOUDSPEAKER ON/OFF to ON.

5.2.4.
Set AGC SWITCH to TELEX.

5.2.5.
Turn RF GAIN fully clockwise.

5.2.6.
Set AF GAIN to approx. middle position.

5.2.7.
Set the signal generator to the stated f_G and V_G .

5.2.8.
Enter the stated f_{RX} to the KEYBOARD. Press the NOISE GENERATOR button and adjust RF TUNE to max. deflection on the METER.

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

5.3.1.
Connect the voltmeter to TP1.

5.3.2.
Adjust R1110 to $-18V \pm 0.2V$.

5.3.3.
Connect the voltmeter to TP2.

5.3.4.
Adjust R1114 to $+18V \pm 0.2V$.

5.4. ADJUSTMENT OF TCXO.

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

5.4.2.
Connect the counter to TP3.

5.4.3.
Adjust R1013 to 10,000,000 Hz.

5.5. ADJUSTMENT OF CLARIFIER.

5.5.1.
Set the CLARIFIER to its center position.

5.5.2.
Set the MODE SWITCH to position 2182 kHz.

5.5.3.
Connect the counter to TP4.

5.5.4.
Adjust L1701 to 9000 Hz.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

5.6.
ADJUSTMENT OF 600 kHz GENERATOR.

5.6.1.
Set the MODE SWITCH to pos. A3J.

5.6.2.
Connect the diode probe to TP5.

5.6.3.
Adjust L1002 for max. deflection on the TP-meter (approx. 1V).

5.7.
ADJUSTMENT OF BFO (R1120 only).

5.7.1.
Set the CLARIFIER to its center position.

5.7.2.
Set the MODE SWITCH to A1.

5.7.3.
Set the FILTER SWITCH to WIDE.

5.7.4.
Connect the frequency counter to TP6.

5.7.5.
Remove the BFO button.

5.7.6.
Adjust the potentiometer to 600,000 Hz.

5.7.7.
Mount the button with dot to dot, to indicate the center position.

5.8.
ADJUSTMENT OF 16 MHz GENERATOR.

5.8.1.
Enter $f_{RX} = 11111$ kHz to the KEYBOARD, (press 1 and C simultaneously) and execute 5.2.

5.8.2.
Connect the diode probe to TP4.

5.8.3.
Adjust L1001 to max. voltage (approx. 2V).

5.9.
ADJUSTMENT OF IF AMPLIFIER DETECTOR.

5.9.1.
Connect the signal generator to TP7 through a 10 nF capacitor, execute 5.2.2., 5.2.3., 5.2.4., 5.2.5., 5.2.6., set the signal generator to $f_G = 599$ kHz and $V_G = 10$ mV.

5.9.2.
Set MODE SWITCH to A3J.

5.9.3.
Slowly reduce V_G until noise starts to dim the AF tone; then increase V_G 20 dB.

5.9.4.
Connect voltmeter to HEADPHONES via a screened cable, and adjust AF GAIN so that the meter reads 0 dB in the 1V AC range.

5.9.5.
Adjust L805 for max. meter reading and at the same time keep this on 0 dB by reducing AF GAIN.

5.9.6.
Set AGC SWITCH to OFF.

5.9.7.
Reduce RF GAIN until meter reading again is 0 dB in the 1V range.

5.9.8.
Adjust L801 for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.

5.10.
ADJUSTMENT OF IF FILTER.

5.10.1.
Execute 5.2. with $f_G = 600,0$ kHz, $V_G = V_G$ max. & $f_{RX} = 11111$ kHz.

5.10.2.
Connect the signal generator to TP7 through a 10 nF capacitor.

5.10.3.
Set the MODE SWITCH to A3H.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

5.10.4.
Turn the trimming cores in L602, L603, L604 and L605 fully counter clockwise.

5.10.5.
Connect the diode probe to TP8.

5.10.6.
Adjust L601 to max. meter deflection.

5.10.7.
Adjust L602 to min. meter deflection.

5.10.8.
Adjust L603 to max. meter deflection.

5.10.9.
Adjust L604 to min. meter deflection.

5.10.10.
Adjust L605 to max. meter deflection.

5.10.11.
Remove the diode probe.

5.10.12.
Set V_G to 10 mV and modulate the signal generator 30 per cent with 1 kHz.

5.10.13.
Execute 5.9.3., 5.9.4., 5.9.6. and 5.9.7.

5.10.14.
Modulate the signal generator with a tone generator (modulation depth 30 per cent). Vary the modulation frequency between 300 Hz and 2700 Hz and find the frequency giving max. meter deflection.

5.10.15.
Set meter reading to 0 dB by means of the RF GAIN.

5.10.16.
Adjust the modulation frequency between 300 Hz and 2700 Hz and check that the meter reading is not less than -6 dB in this range.

5.10.17.
Set the MODE SWITCH to A3J.

5.10.18.
Set the AGC SWITCH to TELEX.

5.10.19.
Set the $f_G = 599,0$ kHz and $V_G = 10$ mV unmodulated.

5.10.20.
Execute 5.9.3., 5.9.4., 5.9.6. and 5.9.7.

5.10.21.
Adjust L606 for max. meter reading and keep this on 0 dB by reducing RF GAIN.

5.10.22.
Connect the frequency counter parallel to the voltmeter, and thus measure the frequency of the detected AF signal, f_{AF} .

5.10.23.
Adjust f_G so that f_{AF} varies between 300 Hz and 2700 Hz and find the frequency that gives max. meter deflection.

5.10.24.
Set meter reading to 0 dB by means of the RF GAIN.

5.10.25.
Adjust f_G so that f_{AF} varies between 300 Hz and 2700 Hz and check the meter reading is not less than -6 dB in this frequency range.

THE FOLLOWING POINTS 5.10.26. to 5.10.44. IS ONLY TO BE EXECUTED FOR R1120.

AUX FILTER ADJUSTMENT EXECUTE 5.10.45. AND 5.10.52.

5.10.26.
Set $f_G = 601$ kHz and $V_G = 10$ mV unmodulated. Execute 5.10.2.

5.10.27.
Set MODE SWITCH to A1 and FILTER SWITCH to INTERMEDIATE.

5.10.28.
Set the AGC SWITCH to TELEX.

5.10.29.
Turn RF GAIN fully clockwise.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

- 5.10.30.
Set the BFO to $f_{AF} = 1000$ Hz.
- 5.10.31.
Execute 5.9.3., 5.9.4., 5.9.6. and 5.9.7.
- 5.10.32.
Adjust L608 for max. meter reading and at the same time keep this on 0 dB by reducing RF GAIN.
- 5.10.33.
Adjust f_G between 599.0 kHz and 601.0 kHz, and simultaneously adjust the BFO so that f_{AF} is approx. 1000 Hz. Find the frequency f_G that gives max. meter reading and adjust this reading to 0 dB by means of RF GAIN.
- 5.10.34.
Adjust f_G between 599.0 kHz and 601.0 kHz and simultaneously adjust the BFO so that f_{AF} is approx. 1000 Hz. Check that the meter reading is above -6 dB in this frequency range.
- 5.10.35.
Set the FILTER SWITCH to NARROW and $f_G = 600$ kHz.
- 5.10.36.
Execute 5.2.4., 5.2.5., 5.2.6., 5.9.6., 5.9.7. and adjust the BFO for f_{AF} approx. 1000 Hz.
- 5.10.37.
Adjust L609 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.
- 5.10.38.
Execute 5.10.33. and 5.10.34. by varying f_G in the frequency range 599.5 kHz to 600.5 kHz.
- 5.10.39.
Set the FILTER SWITCH to VERY NARROW and $f_G = 600$ kHz.
- 5.10.40.
Execute 5.2.4., 5.2.5., 5.9.6., 5.9.7. and adjust the BFO for f_{AF} approx. 1000 Hz.
- 5.10.41.
Adjust L610 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

- 5.10.42.
Execute 5.10.33. by varying f_G in the frequency range 599.8 kHz to 600.2 kHz.
- 5.10.43.
Set f_G to 599.8 kHz and 600.2 kHz respectively. Check that the meter reading is below -6 dB at both frequencies.
- 5.10.44.
Remove the signal generator from TP7, and remove the plug from HEADPHONES.

R1119 TELEX AND R1120

- AUX FILTER ADJUSTMENT EXECUTE 5.10.45. and 5.10.52.
- 5.10.45.
Set MODE SWITCH to A1, FILTER SWITCH to AUX and the AGC SWITCH to TELEX.
- 5.10.46.
Set $f_G = 1200$ kHz - filter center frequency, $V_G = 10$ mV unmodulated and execute 5.10.2.
Filter center frequency appears from section TECHNICAL DATA.
- 5.10.47.
Turn RF GAIN fully clockwise and set the BFO to $f_{AF} = 1000$ Hz (except for LSB filter adjustment).
- 5.10.48.
Execute 5.9.3., 5.9.4., 5.9.6. and 5.9.7.
- 5.10.49.
Adjust L606 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.
- 5.10.50.
Adjust f_G inside the min. pass band as illustrated in TECHNICAL DATA, find the frequency f_G that gives max. meter reading and adjust this reading to 0 dB by means of RF GAIN.
- 5.10.51.
Adjust f_G inside the min. pass band as illustrated in TECHNICAL DATA. Check that the meter reading is above -6 dB in this frequency range.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

5.10.52.

Remove the signal generator from TP7 and remove the plug from HEADPHONES.

5.11.

ADJUSTMENT OF FIRST AND SECOND MIXER.

5.11.1.

Execute 5.2. $f_{RX} = 3$ kHz and $V_G = 0$.

5.11.2.

Set the MODE SWITCH to A3H.

5.11.3.

Adjust R506 for min. deflection on the TUNE meter.

5.11.4.

Connect the signal generator to TP9.

5.11.5.

For $f_{RX} = 10000$ kHz, $f_G = 16608.5$ kHz modulated 30 per cent, 1 kHz and $V_G = 10$ mV. Execute 5.2.4., 5.2.5., 5.2.7., 5.2.8., 5.9.3., 5.9.4., 5.9.6. and 5.9.7.

5.11.6.

Remove the innercores of the six coaxial cables to the input of first mixer.

5.11.7.

Adjust C512 and L503 for max. meter reading and keep this on 0 dB by reducing RF GAIN.

5.11.8.

Change f_{RX} to 20000 kHz and f_G to 10608.5 kHz and press the NOISE GENERATOR to unblock the receiver.

5.11.9.

Adjust C511 and L501 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.11.10.

Reconnect the six coaxial cables.

5.12.

MECHANICAL ADJUSTMENT OF THE FRONT-END TUNING MECHANISM.

5.12.1.

Loosen the mechanical adjusting ring mounted behind the front plate on the TUNE shaft.

5.12.2.

Mount a 3x8 mm screw DIN84 and a 6 mm spacing pipe in the square bar carrying the ferrite cores. Use the hole nearest the front plate.

5.12.3.

Turn the square bars extreme left.

5.12.4.

Turn the adjusting ring clockwise against the stop screw.

5.12.5.

Turn the TUNE shaft counter clockwise so much that you can tighten the adjusting ring through the hole in the division plate behind the front plate.

5.12.6.

Turn the TUNE shaft fully counter clockwise.

5.12.7.

Adjust the ferrite cores for L201 and L202 so that the ends of the cores are flushing with the division plate.

5.12.8.

Adjust the ferrite cores for L301, L302, L303, L304, L305, L306, L401, L402, L403, L404, L405 and L406 so that the ends of the cores are flushing in a distance of 2 mm from the division plate.

5.12.9.

Remove the screw and spacing pipe mounted in paragraph 5.12.2.

5.13.

ADJUSTMENT OF 14 - 30 MHz and 7 - 14 MHz BAND FILTERS.

5.13.1.

Set the MODE SWITCH to A3H and set C408 and C414 to middle position.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

5.13.2.
Execute 5.2. with $f_G = f_{RX} = 28000$ kHz
 $V_G = 10$ mV.

5.13.3.
Execute 5.9.4., 5.9.6. and 5.9.7.

5.13.4.
Adjust L401, L404 and L406 for max.
meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.13.5.
Execute 5.2.8. for $f_{RX} = f_G = 14000$ kHz.

5.13.6.
Adjust C408 and C414 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.13.7.
Execute 5.2.8. for $f_{RX} = f_G = 28000$ kHz.

5.13.8.
Repeat 5.13.4., 5.13.5., 5.13.6. and 5.13.7. successively until there is no need for further adjustments.
NOTE: You must be very careful and adjust to exactly maximum.

5.13.9.
Remove the cable from HEADPHONE.

5.13.10.
Enter f_{RX} 14000 kHz to the KEYBOARD. Press the NOISE GENERATOR and turn RF TUNE over its full range. Check that there is only one maximum on the METER. If a maximum is obtained for the RF TUNE turned fully counter clockwise it is necessary to screw the ferrite cores to L401, L404 and L406 a bit farther out of the coil formers and then repeat 5.13.3. to 5.13.10.
If a maximum is obtained for the RF TUNE turned fully clockwise it is necessary to screw the ferrite cores L401, L404 and L406 a bit farther into the coil formers and then repeat 5.13.3. to 5.13.10.

5.13.11.
Lock the cores with the counter nut.

5.13.12.
Set C413 and C418 to middle position.

5.13.13.
Execute 5.2.4., 5.2.5., 5.2.7., 5.2.8., 5.9.4., 5.9.6. and 5.9.7. with $f_{RX} = f_G = 10000$ kHz and $V_G = 10$ mV modulated 30 per cent with 1 kHz.

5.13.14.
Adjust L402, L403 and L405 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.13.15.
Execute 5.2.8. for $f_{RX} = f_G = 7000$ kHz.

5.13.16.
Adjust C413 and C418 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.13.17.
Execute 5.2.8. for $f_{RX} = f_G = 10000$ kHz.

5.13.18.
Repeat 5.13.14., 5.13.15., 5.13.16. and 5.13.17. successively until there is no need for further adjustments.
NOTE: You must be very careful and adjust to exactly maximum.

5.13.19.
Execute 5.2.8. for $f_{RX} = f_G = 13999$ kHz.

5.13.20.
Adjust C413 and C418 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.
NOTE: You must be very careful and adjust to exactly maximum.

5.13.21.
Lock the cores with the counter nuts.

5.13.22.
Perform a SENSITIVITY MEASUREMENT (4.24.) in the frequency band of current interest and remove the cable from HEADPHONES.

5.14.
ADJUSTMENT OF 4 - 7 MHz and 1.6 - 4 MHz.

5.14.1.
Set the MODE SWITCH to A3H.

5.14.2.
Set C312 and C318 to middle position.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

5.14.3.

Execute 5.2., 5.9.4., 5.9.6. and 5.9.7. with $f_{RX} = f_G = 6999$ kHz, $V_G = 10$ mV modulated 30 per cent with 1 kHz.

5.14.4.

Adjust L302, L304 and L305 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.14.5.

Execute 5.2.8. for $f_{RX} = f_G = 4000$ kHz.

5.14.6.

Adjust C312 and C318 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.14.7.

Execute 5.2.8. for $f_{RX} = f_G = 6999$ kHz.

5.14.8.

Repeat 5.14.4., 5.14.5., 5.14.6. and 5.14.7. successively until there is no need for further adjustment.

NOTE: You must be very careful and adjust to exactly maximum.

5.14.9.

Set C301, C313 and C319 to middle position.

5.14.10.

Execute 5.2., 5.9.4., 5.9.6. and 5.9.7. with $f_{RX} = f_G = 3900$ kHz, $V_G = 10$ mV modulated 30 per cent with 1 kHz.

5.14.11.

Adjust L301, L303 and L306 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.14.12.

Execute 5.2.8. for $f_{RX} = f_G = 1600$ kHz.

5.14.13.

Adjust C301, C313 and C319 for max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.14.14.

Execute 5.2.8. for $f_G = f_{RX} = 3900$ kHz.

5.14.15.

Repeat 5.14.11., 5.14.12., 5.14.13. and 5.14.14. successively until there is no need for further adjustment.

NOTE: You must be very careful and adjust to exactly maximum.

5.14.16.

Lock the cores with the counter nut.

5.14.17.

Execute 5.13.22.

5.15.

ADJUSTMENT OF 530 - 1600 kHz, 150 - 530 kHz AND 2182 kHz.

5.15.1.

Set the MODE SWITCH to A3H.

5.15.2.

Set C210 to minimum capacity.

5.15.3.

Execute 5.2., 5.9.4., 5.9.6. and 5.9.7. with $f_G = f_{RX} = 560$ kHz and $V_G = 10$ mV modulated 30 per cent with 1 kHz.

5.14.4.

$f_G = f_{RX} = 530$ kHz push the NOISE GENERATOR button, but do not touch the RF TUNE.

5.15.5.

Adjust C210 to max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.15.6.

Execute 5.2.8. with $f_G = f_{RX} = 1599$ kHz. If no METER maximum is obtainable it is necessary to screw the ferrite core to L202 a bit farther out of the coil formers and then repeat 5.15.2. to 5.15.6.

5.15.7.

Set C209 to minimum capacity.

5.15.8.

Execute 5.2., 5.9.4., 5.9.6. and 5.9.7. with $f_G = f_{RX} = 160$ kHz and $V_G = 10$ mV modulated 30 per cent with 1 kHz.

ADJUSTMENT PROCEDURE FOR R1119 & R1120 cont.:

5.15.9.
 $f_G = f_{RX} = 150$ kHz push the NOISE GENERATOR button, but do not touch the RF TUNE.

5.15.10.
 Adjust C209 to max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.15.11.
 Execute 5.2.8. with $f_G = f_{RX} = 529$ kHz. If no METER maximum is obtainable it is necessary to screw the ferrite core to L201 a bit farther out of the coil formers and then repeat 5.15.7. to 5.15.11.

5.15.12.
 Lock the cores with the counter nut.

5.15.13.
 Set MODE SWITCH to DISTRESS 2182 kHz.

5.15.14.
 Execute 5.2., 5.9.4., 5.9.6. and 5.9.7. with $f_G = f_{RX} = 2182$ kHz and $V_G = 10$ mV modulated 30 per cent with 1 kHz.

5.15.15.
 Adjust the screw core of L209 to be in level with the top of the coil former.

5.15.16.
 Adjust C219 and L205 to max. meter reading and keep the meter reading on 0 dB by adjusting the RF GAIN.

5.15.17.
 Execute 5.13.22.

5.16.
 ADJUSTMENT OF WHEEL I AND II.

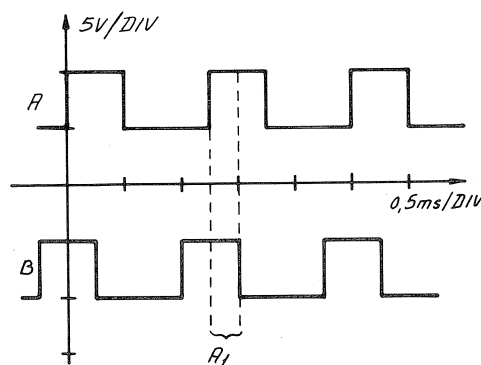
5.16.1.
 Switch the receiver ON.

5.16.2.
 Push the NOISE GENERATOR button and the decimal point key.

5.16.3.
 Connect a passive probe to IC2020 pin 8 and to channel A on an oscilloscope. Connect a passive probe to IC2020 pin 11 and to channel B on an oscilloscope. Let the oscilloscope be positive triggered by channel A.

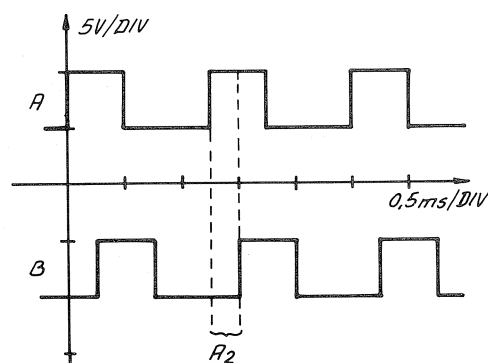
5.16.4.
 Turn the CONTINUOUS TUNING clockwise.

5.16.5.
 Check that the waveforms are as shown below.



5.16.6.
 Turn the CONTINUOUS TUNING counter clockwise.

5.16.7.
 Check that the waveforms are as shown below.



5.16.8.
 By adjusting the P.C.boards WHEEL I AND WHEEL II the sections marked A1 and A2 should be made equal.
 NOTE: The adjustment should be done before remounting the front panel.

6. NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1119 AND R1120

In the following paragraphs reference is made to the ADJUSTMENT PROCEDURE FOR R1119 AND R1120 and PERFORMANCE CHECK FOR R1119 AND R1120.

Definition used: refer to 5.1.

Locations: refer to ADJUSTMENT LOCATIONS.

6.1.

Module No. 100: AERIAL SWITCH.

6.1.1.

Execute 4.23.

6.1.2.

Enter the following f_{RX} to the KEYBOARD and press the NOISE GENERATOR button.

$f_{RX} = 240 \text{ kHz} - 800 \text{ kHz} - 2182 \text{ kHz} - 6.0 \text{ MHz} - 10.0 \text{ MHz} - 20.0 \text{ MHz}.$

6.1.3.

When pressing the NOISE GENERATOR, adjust the RF TUNE to max. deflection on the METER.

6.1.4.

Check that max. METER deflection is at least 1.5..

6.1.5.

Set the MODE SWITCH to DISTRESS 2182 kHz.

6.1.6.

Press the NOISE GENERATOR and check that the deflection on the METER is at least 1.5.

6.2.

Module No. 200: BANDFILTER 0.01-1.6 MHz.

6.2.1.

Execute 4.15., 5.15. and 4.24. for the coil section in question.

6.3.

Module No. 300: BANDFILTER 1.6-4.0 MHz and 4.0 - 7.0 MHz.

6.3.1.

Execute 4.15., 5.14. and 4.24. for the coil section in question.

6.4.

Module No. 400: BANDFILTER 7.0-14.0 MHz and 14.0-30.0 MHz.

6.4.1.

Execute 4.15., 5.13. and 4.24. for the coil section in question.

6.5.

Module No. 500: 1st and 2nd MIXER.

6.5.1.

Execute 5.11. and 4.17.

6.5.2.

Enter $f_{RX} = 2.182 \text{ MHz}$ to the KEYBOARD and press the NOISE GENERATOR button.

6.5.3.

Check that the deflection on the METER is at least 1.5.

6.6.

Module No. 600 or 700: IF FILTER.

6.6.1.

Execute 5.10., 6.5.2. and 6.5.3.

6.7.

Module No. 800: IF AMPLIFIER, AGC AND DETECTOR.

6.7.1.

Execute 5.9., 4.19., 4.20., 6.5.2. and 6.5.3.

6.8.

Module No. 900: AUDIO AMPLIFIER.

NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1119 AND R1120 cont.:

6.8.1.
Execute 4.21. and 4.22.

6.9.
Module No. 1000: DIVIDER-UNIT.

6.9.1.
Execute 4.3., 5.4., 5.6., 5.8., 4.12.,
4.13. and 4.24.

6.10.
Module No. 1100: LOOP 1 FILTER AND $\pm 18V$
SUPPLY-UNIT.

6.10.1.
Execute 5.3., 4.6. with $f_{RX} = 10.0$ MHz,
4.12. and 4.18.

6.11.
Module No. 1200: VCO-UNIT.

6.11.1.
Execute 4.7., 4.12. and 4.17.

6.12.
Module No. 1300: HARMONIC FILTER-UNIT.

6.12.1.
Execute 4.6., 4.12.

6.13.
Module No. 1400: LOOP 1. MIXER-UNIT.

6.13.1.
Execute 4.7. and 4.12.

6.14.
Module No. 1500: VCO BUFFER-UNIT.

6.14.1.
Execute 4.17. with the exception of
point 2, 3, 7 and 8.

6.15.
Module No. 1600: VCXO, 1st LOOP 2 MIXER
AND LOOP 2 FILTER.

6.15.1.
Execute 4.8.1. to 4.8.5. (both incl.),
4.9., 4.13. and 6.17. with the excep-
tion of point 4, 5, 9 and 10.

6.16.
Module No. 1700: CLARIFIER AND 2nd
LOOP 2 MIXER.

6.16.1.
Execute 5.5. and 4.8.

6.17.
Module No. 1800: BFO-UNIT.

6.17.1.
Execute 5.7. and 4.11.

6.18.
Module No. 1900: BAND CONTROL.

6.18.1.
Press the KEYBOARD CLEAR, the NOISE
GENERATOR button and the KEYBOARD DECI-
MAL POINT.

6.18.2.
Turn the CONTINUOUS TUNING clockwise.

6.18.3.
Check that noise is heard from the loud-
speaker until the DISPLAY shows 150.0
kHz then the receiver is blocked.

6.18.4.
Press the NOISE GENERATOR button. Check
that noise is heard from the loudspeaker.

6.18.5.
Turn the CONTINUOUS TUNING clockwise.

6.18.6.
Check that noise is heard from the loud-
speaker until the DISPLAY shows 530.0
kHz then the receiver is blocked.

NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1119 AND R1120 cont.:

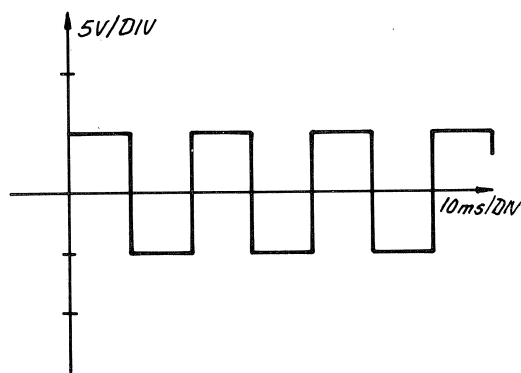
6.18.7.
Repeat 4.18.4. to 4.18.6. and check that the receiver has the following blocking frequencies 1.6 MHz, 4.0 MHz, 7.0 MHz, 14.0 MHz and 30.0 MHz.

6.18.8.
Execute 4.24.

6.19.
Module No. 2000: KEYBOARD CONTROL.

6.19.1.
Connect the passive probe to TP29 and to the scope.

6.19.2.
Check that the wave form seen on the scope is as shown below.



6.19.3.
Execute 4.3.3., 4.3.4. and 4.5.

6.19.4.
Execute 6.18.1. - 6.18.7. (both incl.).

6.19.5.
Enter $f_{RX} = 1111.1$ kHz to the KEYBOARD.

6.19.6.
Connect the voltmeter to the wires of 100 Hz, 1 kHz, 10 kHz, 100 kHz and 1 MHz data input terminals at the divider-unit.

6.19.7.
Check that the voltmeter shows 5V DC on the brown wires and the brown/black wire and that the voltmeter shows 0V DC on the other wires.

6.19.8.
Enter $f_{RX} = 222.2$ kHz to the KEYBOARD.

6.19.9.
Repeat 6.19.6.

6.19.10.
Check that the voltmeter shows 5V DC on the red wires and that the voltmeter shows 0V DC on the other wires.

6.19.11.
Enter $f_{RX} = 444.4$ kHz to the KEYBOARD.

6.19.12.
Repeat 6.19.6.

6.19.13.
Check that the voltmeter shows 5V DC on the yellow wires and that the voltmeter shows 0V DC on the other wires.

6.19.14.
Enter $f_{RX} = 888.8$ kHz to the KEYBOARD.

6.19.15.
Repeat 6.19.6.

6.19.16.
Check that the voltmeter shows 5V DC on the grey wires and that the voltmeter shows 0V DC on the other wires.

6.20.
Module No. 2100: KEYBOARD.

6.20.1.
Execute 4.5.1. - 4.5.5. (both incl.).

6.21.
Module No. 2200: DISPLAY.

6.21.1.
Execute 6.19.1. and 6.19.2.

6.21.2.
Execute 4.5.1. - 4.5.5. (both incl.).

NECESSARY ADJUSTMENTS AFTER REPAIR FOR R1119 AND R1120 cont.:

6.22.

Module No. 2300 and 2400: WHEEL I AND II.

6.22.1.

Execute 5.16., 4.5.14. - 4.5.18. (both incl.).

6.23.

Module No. 2500: INPUT FILTER.

6.23.1.

Execute 4.14., 4.15., 4.16.1., 4.16.2., 4.21.1. - 4.21.5. (both incl.) and 4.23.

6.24.

Module No. 2600: CLARIFIER CAPACITOR.

6.24.1.

Adjust knob for symmetrical variation range.

6.24.2.

Execute 5.5. and 4.8.4. - 4.8.6. (both incl.).

7. FUNCTION CHECK R1119 AND R1120

NECESSARY TEST EQUIPMENT:

POWER SUPPLY E.g. SAILOR N1405
MULTIMETER E.g. PHILIPS PM2503
If a signal generator is by hand this can be used.
SIGNAL GENERATOR E.g. PHILIPS PM5326

INITIAL SETTINGS:

1.
Set the CLARIFIER to center position.
2.
Set the AGC SWITCH to TELEX MODE.
3.
Turn the RF GAIN fully clockwise.
4.
Turn the AF GAIN fully counter clockwise.
5.
Set the MODE SWITCH to DISTRESS 2182 kHz.
6.
Set the LOUDSPEAKER ON/OFF to ON.
7.
Set the BFO to center position (R1120 only).
8.
Set the FILTER SWITCH to WIDE (R1120 only).
9.
Connect the receiver to the power supply (N1405).
10.
Connect the antenna input terminals to the antenna or to the signal generator.

FUNCTION CHECK:

- 7.1.
Turn AF GAIN to suitable volume.
- 7.2.
Check that the LOUDSPEAKER ON/OFF is functional.
- 7.3.
Connect headphones to HEADPHONES socket.
- 7.4.
Check that the loudspeaker now is off and the noise is heard in the headphones.
Remove the headphones.
- 7.5.
Turn RF GAIN fully counter clockwise.
- 7.6.
Check that the noise in the loudspeaker disappears and the RF METER reading is now approx. 5. Turn RF GAIN fully clockwise.
- 7.7.
Press the NOISE GENERATOR button.
- 7.8.
Check that the RF METER reading is at least 1.5.
- 7.9.
Check that the DISPLAY shows 2182 kHz.
- 7.10.
Set the MODE SWITCH to A3J.
- 7.11.
Press the KEYBOARD C. The DISPLAY shows 000000.
- 7.12.
Check that no noise is heard from the loudspeaker.
- 7.13.
Press the KEYBOARD C and 1 simultaneously. The DISPLAY shows 111111.
- 7.14.
Repeat 7.13. for C and 2, 3 ---- 9,0.

FUNCTION CHECK R1119 AND R1120 cont.:

7.15.
Press the KEYBOARD C and the NOISE GENERATOR button. The DISPLAY shows 00000.0.

Check that noise is heard from the loudspeaker.

7.16.
Press the KEYBOARD decimal point. The DISPLAY shows 00000.0.

7.17.
Turn the CONTINUOUS TUNING clockwise until the DISPLAY shows 00150.0 kHz. Check that no noise is heard from the loudspeaker.

7.18.
Press the KEYBOARD 0 and turn the CONTINUOUS TUNING. The displayed figure must not change.

7.19.
Press the KEYBOARD C and the NOISE GENERATOR button.

7.20.
Turn the CLARIFIER extreme clockwise and check that the beat note heard from the loudspeaker change.

7.21.
Repeat 7.20. within the CLARIFIER extreme counter clockwise.

7.22. (R1120 only)
Set the MODE SWITCH to A1.

7.23. (R1120 only)
Adjust the BFO until no beat note is heard from the loudspeaker. Check that the BFO now is in its counter position.

7.24. (R1120 only)
Turn the BFO extreme clockwise. Check that a beat note is heard from the loudspeaker.

7.25. (R1120 only)
Repeat 7.24. with the BFO extreme counter clockwise.

7.26. (R1120 only)
Set the FILTER SWITCH to VERY NARROW.

7.27. (R1120 only)
Set the CLARIFIER to center position.

7.28. (R1120 only)
Turn the BFO to center position and then clockwise until a proper beat note is heard from the loudspeaker.

7.30. (R1120 only)
Connect the voltmeter to HEADPHONES via a screened cable and adjust AF GAIN to the meter reads 0 dB in the 0.3V range.

7.31. (R1120 only)
Set the AGC ON/OFF to OFF.

7.32. (R1120 only)
Reduce RF GAIN until the meter reading is 0 dB again.

7.33. (R1120 only)
Press the KEYBOARD decimal point.

7.34. (R1120 only)
Turn the CONTINUOUS TUNING clockwise until the DISPLAY shows 00000.4 kHz.

7.35. (R1120 only)
Check that the meter reading is ≤ -10 dB.

7.36. (R1120 only)
Set the FILTER SWITCH to NARROW.

7.37. (R1120 only)
Adjust the RF GAIN until the meter reading is 0 dB again.

7.38. (R1120 only)
Turn the CONTINUOUS TUNING clockwise until the DISPLAY shows 00001.0 kHz.

7.39. (R1120 only)
Check that the meter reading is ≤ -10 dB.

7.40. (R1120 only)
Set the FILTER SWITCH to INTERMEDIATE.

7.41. (R1120 only)
Repeat 7.37.

7.42. (R1120 only)
Turn the CONTINUOUS TUNING clockwise until the DISPLAY shows 00001.5 kHz.

FUNCTION CHECK R1119 AND R1120 cont.:

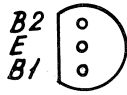
- 7.43. (R1120 only)
Check that the meter reading is ≤ -10 dB.
- 7.44. (R1120 only)
Set the FILTER SWITCH to WIDE.
- 7.45. (R1120 only)
Repeat 7.37.
- 7.46. (R1120 only)
Turn the CONTINUOUS TUNING clockwise until the DISPLAY shows 00003.0 kHz.
- 7.47. (R1120 only)
Check that the meter reading is ≤ -10 dB.
- 7.48. (R1120 only)
Set the FILTER SWITCH to AUX.
- 7.49. (R1120 only)
If an AUX FILTER is fitted find a radio station and check that the filter bandwidth is correct.
- 7.50. (R1120 only)
Set the FILTER SWITCH to WIDE.
- 7.51. (R1120 only)
Set the MODE SWITCH to A2.
Set the AGC SWITCH to TELEX.
Turn the RF GAIN fully clockwise.
- 7.52. (R1120 only)
Press the KEYBOARD C and the NOISE GENERATOR button.
- 7.53. (R1120 only)
Press the KEYBOARD decimal point.
Turn the CONTINUOUS TUNING clockwise.
- 7.54. (R1120 only)
Check that the RF METER deviation begins to drop when the DISPLAY shows 00003.0 kHz and that the RF METER is approx. 0 when the DISPLAY shows 00010.0 kHz.
- 7.55. (R1120 only)
Set the MODE SWITCH to A3J.
- 7.56. (R1120 only)
Disconnect the meter from HEADPHONES.
- 7.57. (R1120 only)
Press the KEYBOARD C and the NOISE GENERATOR button.
- 7.58. (R1120 only)
Turn the CLARIFIER extreme counter clockwise.
- 7.59.
Press the KEYBOARD decimal point.
- 7.60.
Check that the RF METER shows approx. 3.
- 7.61.
Turn the CONTINUOUS TUNING until the DISPLAY shows 00000.5 kHz.
- 7.62.
Check that the RF METER shows approx. 0.
- 7.63.
Set the MODE SWITCH to A3H (AM).
- 7.64.
Check that the RF METER shows approx. 3.
- 7.65.
Turn the CONTINUOUS TUNING clockwise.
- 7.66.
Check that the RF METER deviation begins to drop when the DISPLAY shows 00003.0 kHz and that the RF METER is approx. 0 when the DISPLAY shows 00010.0 kHz.
- 7.67. (R1119 only)
Set the MODE SWITCH to TELEX.
- 7.68. (R1119 only)
If an AUX filter is fitted. Check the filter bandwidth by means of a suitable broadcast station or the signal generator.
- 7.69. (R1119 only)
Set the MODE SWITCH to A3H (AM).
- 7.70.
Set the MODE SWITCH to A3J (SSB).
- 7.71.
Set the AGC SWITCH to ON.
- 7.72.
Press the KEYBOARD C and the NOISE GENERATOR button.
- 7.73.
Press the KEYBOARD decimal point.

FUNCTION CHECK R1119 AND R1120 cont.:

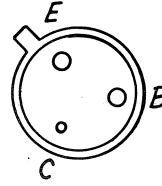
- 7.74.
Turn the CLARIFIER extreme counter clockwise.
- 7.75.
Notice the position of the RF METER pointer.
- 7.76.
Turn the CONTINUOUS TUNING counter clockwise.
- 7.77.
Check that it takes approx. 3 secs. after turning the CONTINUOUS TUNING until the pointer of the RF METER is approx. 0.
- 7.78.
If a signal generator is by hand, set $f_G = f_{RX}$, $V_G = 1$ mV modulated 30 per cent with 1 kHz.
- 7.79.
If no signal generator is by hand, connect a DC voltmeter to TP11.
- 7.80.
Set the MODE SWITCH to A3H (AM).
- 7.81.
Enter $f_{RX} = 1.999$ MHz to the KEYBOARD.
- 7.82.
Press the NOISE GENERATOR and adjust the RF TUNE to max. deflection on the RF METER and check that the RF METER deflection is at least 1.5.
- 7.83.
Check that a 1000 Hz tone is heard from the loudspeaker if a signal generator is used.
- 7.84.
If no signal generator is used check that the voltmeter measures $15V \pm 1.5V$ DC.
- 7.85.
Repeat 7.82. - 7.84. for $f_{RX} = f_G =$
3.999 - 5.999 - 7.999 - 9.999 - 11.999 -
13.999 - 15.999 - 17.999 - 19.999 -
21.999 - 23.999 - 25.999 - 27.999 -
29.999 MHz.

- 7.86.
Turn the DIMMER extreme clockwise.
- 7.87.
Check that the DISPLAY and the RF METER is illuminated.

BOTTOM VIEW



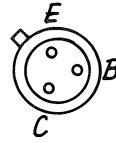
2N 4871



BFW 17A



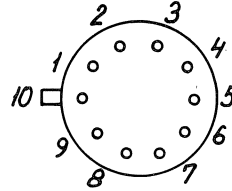
BC 328 - 25
BC 338
BC 547
BC 548 A, B, C
BC 556 A
BC 558 A, B, C



2N 2368



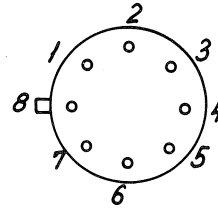
BF 199
BF 494



CA 3019



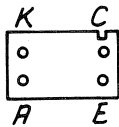
BF 256 A, B, C



LM 3053

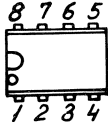


E 310

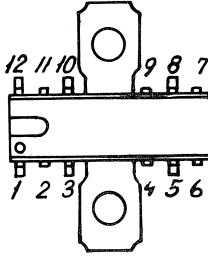


OPB 825

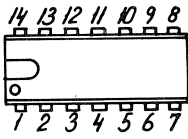
TOP VIEW



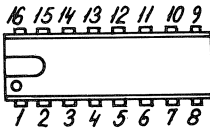
LM 308 N
MC 1455 P1
MC 1458 C



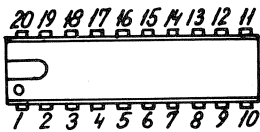
TCA 940



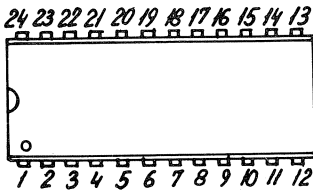
LM 324 N
LM 3086
MC 4044 P
MC 14011 BCP
MC 14077 BCP
MC 14081 BCP
SN 7406 N
SN 7407 N
SN 74010 N
SN 74072 N
SN 74 LS 00 N
SN 74 LS 04 N
SN 74 LS 08 N
SN 74 LS 11 N
SN 74 LS 20 N
SN 74 LS 27 N
SN 74 LS 32 N
SN 74 LS 74 N
SN 74 LS 86 N
SN 74 LS 132 N
SN 74 LS 290 N



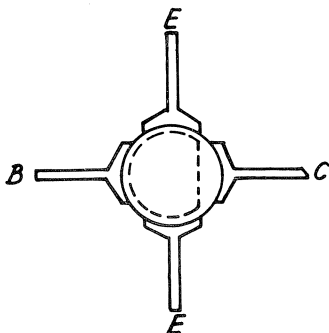
CD 4056 B
MC 14519 BCP
MC 14530 BCP
SN 74 LS 42 N
SN 74 LS 109 N
SN 74 LS 123 N
SN 74 LS 138 N
SN 74 LS 148 N
SN 74 LS 192 N
SN 74 LS 390 N
SN 74 LS 668 N



6308-1

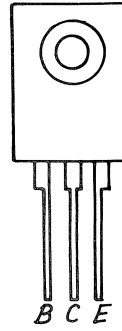


MC 14515 BCP



2N 5641

FRONT VIEW



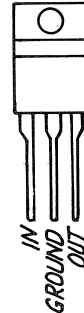
BD 577



BD 138
BD 139



LM 317T

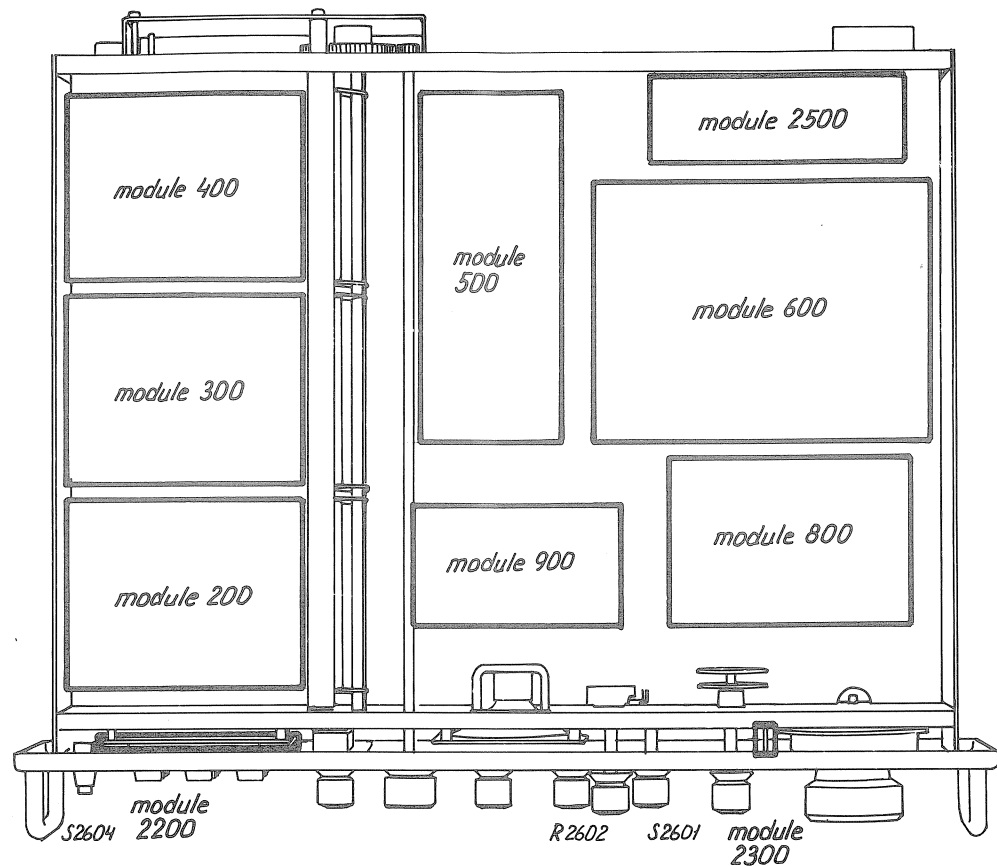


MC 7805 CT
MC 7818 CT

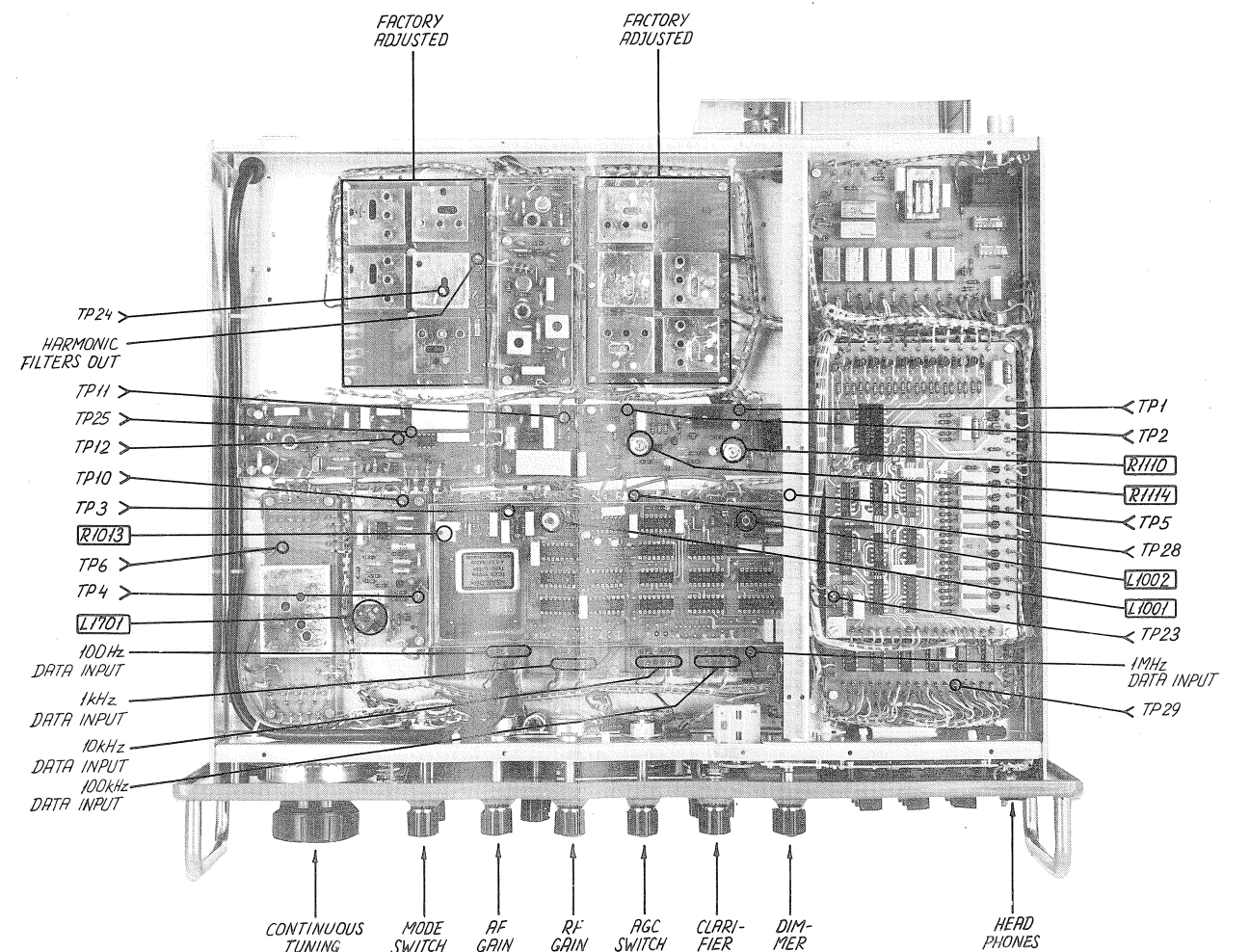
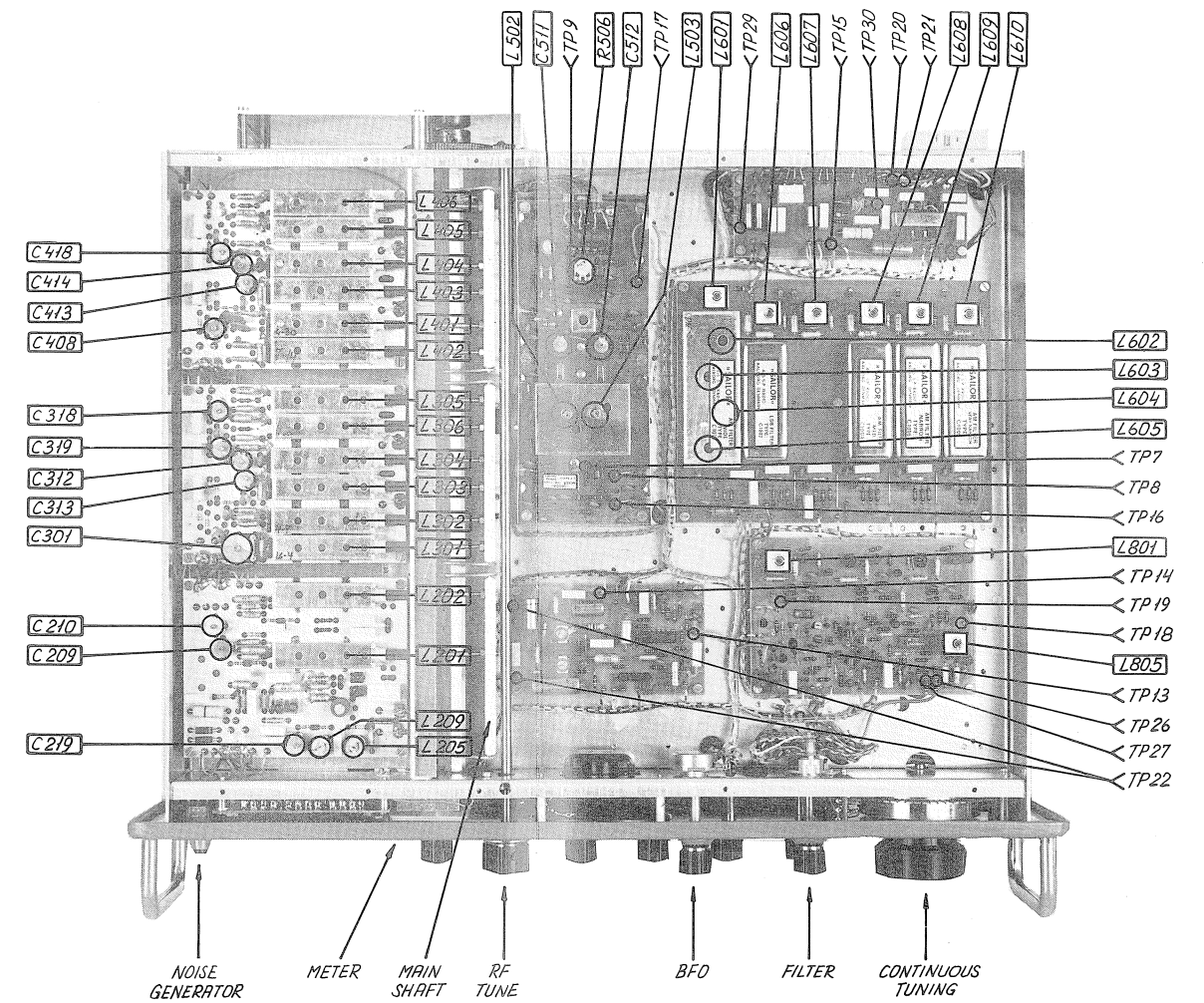
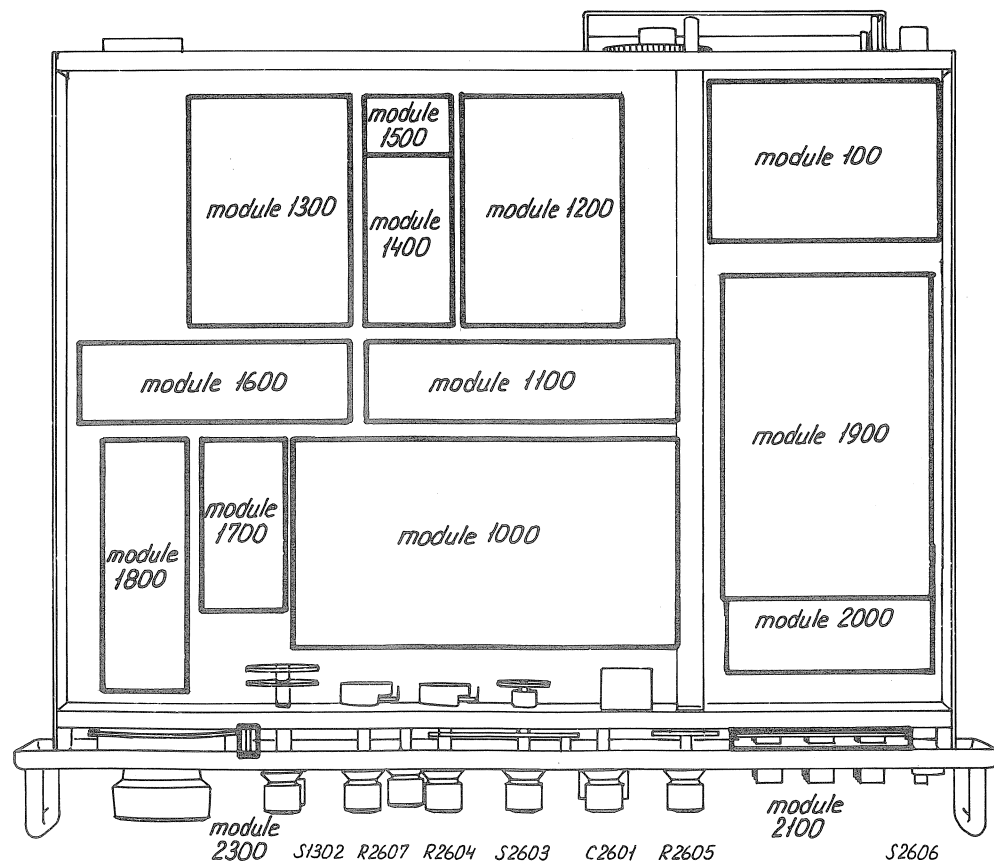


BD 241

R1120 A 1/1



Chassis montage 2600



ADJUSTMENT LOCATIONS R1120

CIRCUIT DESCRIPTIONS AND SCHEMATIC DIAGRAMS

CIRCUIT DESCRIPTION AERIAL SWITCH R1119 & R1120

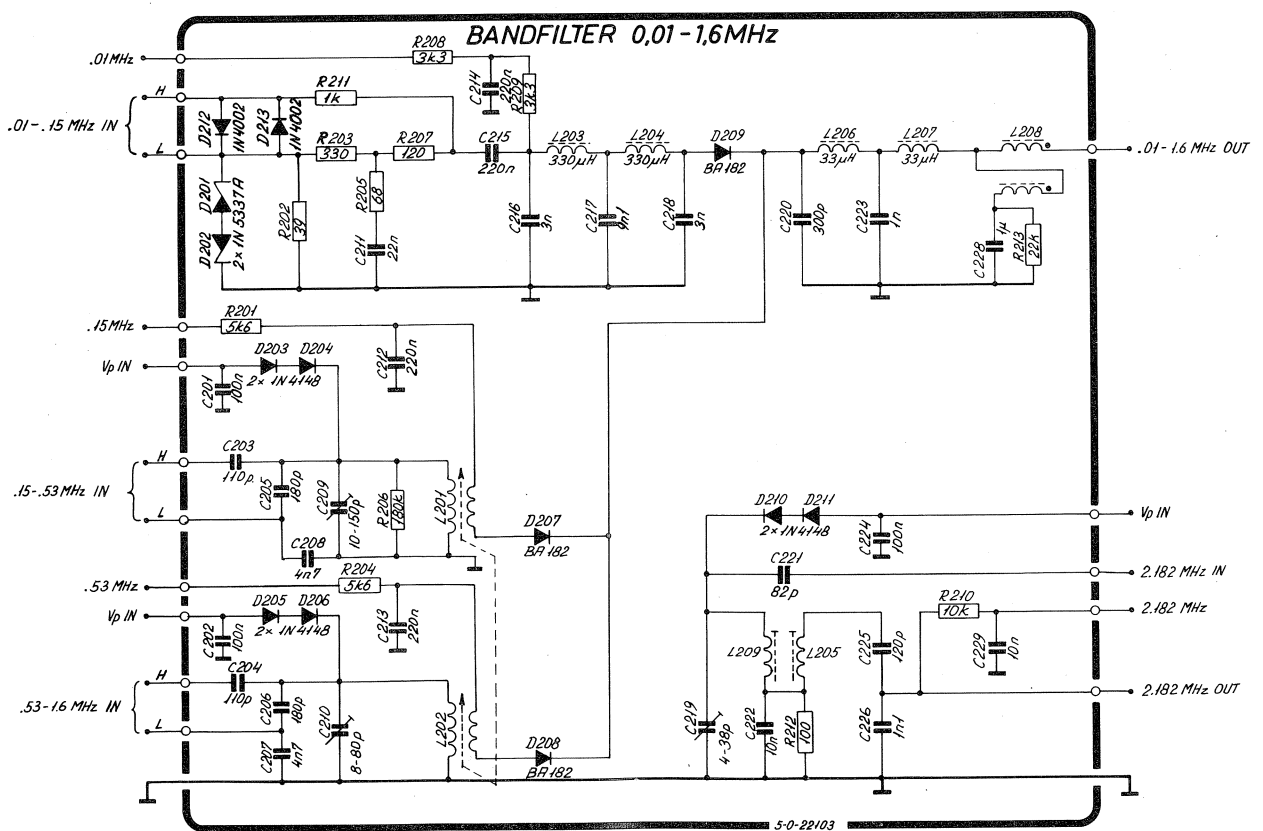
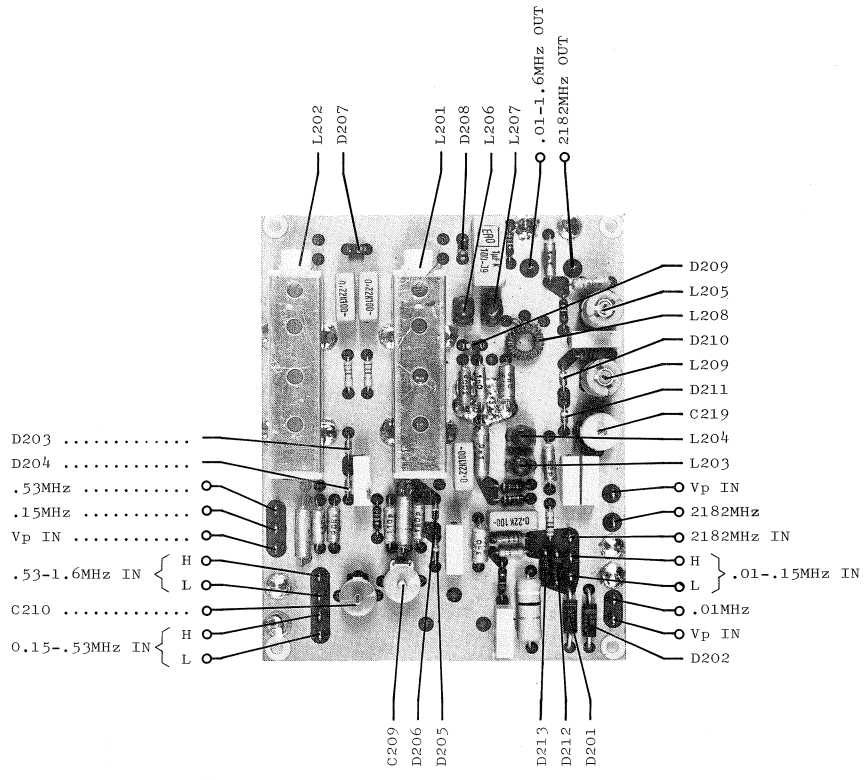
This unit contains the simplex relay, the blocking relay, the noise generator and the aerial switch relays.

The aerial signal enters the BAND FILTER via RE102, R104 and one of the relays RE105 - RE112.

The relay RE101 is the simplex relay, RE103 is the blocking relay and RE104 is the aerial short-circuit relay in the telex mode.

The zenerdiode D102 generates white noise, which is led to the BAND FILTER in question via RE102.

Transistor T101 is a part of the internal blocking system.



CIRCUIT DESCRIPTION BAND FILTER 1.6 - 7 MHz R1119 & R1120

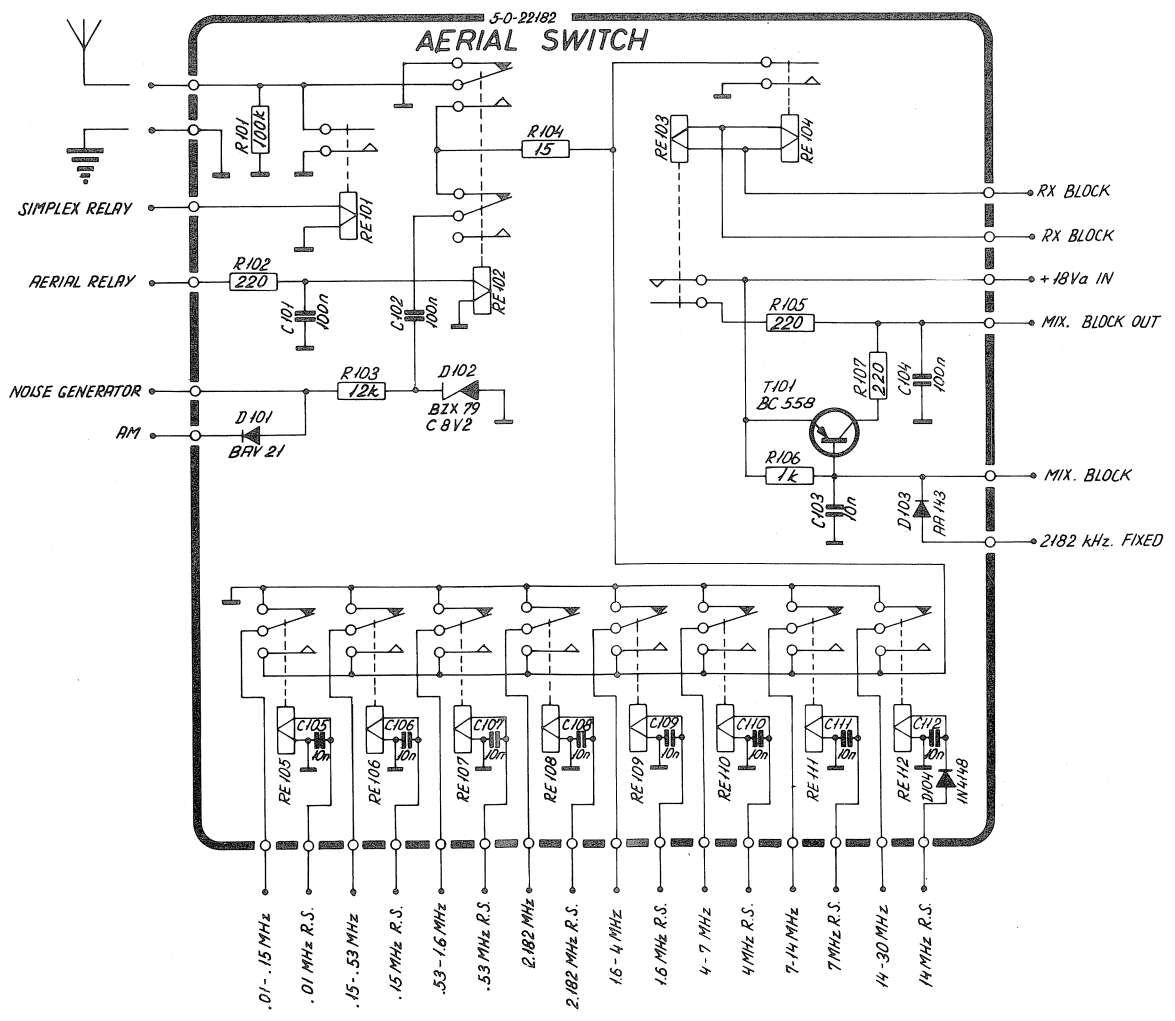
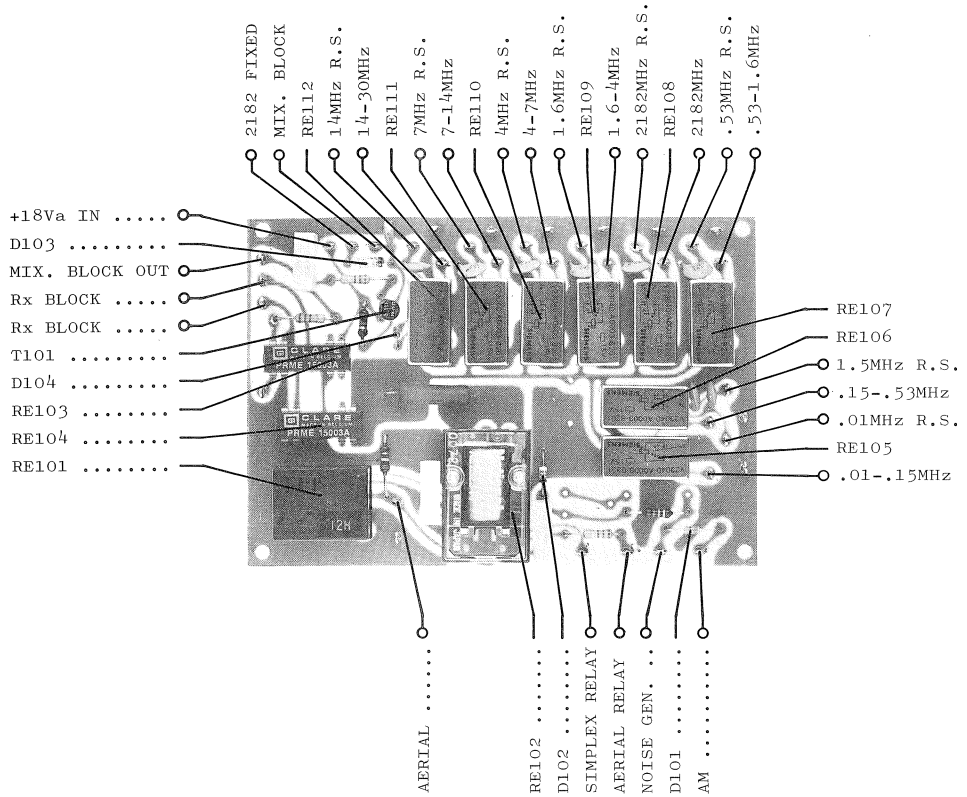
This section consists of two tuneable band pass filters covering the frequency ranges of 1.6 - 4 MHz and 4 - 7 MHz.

1.6 - 4 MHz BP FILTER:

The aerial signal enters the filter through the aerial trimming capacitor C301, which is a part of the tuning capacitor for L301 and leaves the capacitive coupled filter at the impedance transformer C321 and C323. The two reverse biased diodes D301 and D302 are part of the aerial coil protection circuit.

4 - 7 MHz BP FILTER:

The aerial signal enters the filter through the capacitive impedance transformer C304 and C305 and leaves the filter at the impedance transformer C320 and C322. The two reverse biased diodes D303 and D304 are part of the aerial coil protection circuit.



CIRCUIT DESCRIPTION BAND FILTERS 0.01 - 1.6 MHz R1119 & R1120

This section is divided into 4 sub groups, namely a low pass filter for frequencies below 150 kHz, a coil section for the frequency range 150 - 530 kHz, another covering the 530 - 1600 kHz band and the fixed tuned 2182 kHz filter.

All filters except the 2182 kHz one have a high impedance input terminal for short aerials and short coax cables and a low impedance input terminal, approx. 50 ohm, for long coax cables.

150 kHz LP FILTER:

The aerial signal enters the filter either through the input attenuator consisting of R202, R203, R205, C211 and R207 or via R211 and led to the 150 kHz LP filter C216, L203, C217, L204 and C218 and via D209 to the 1.6 MHz LP filter consisting of C220, L206, C223, L207 and C532 located at the mixer PCB. L208 is an impedance step-up transformer. The two zener diodes D201 and D202 are part of the aerial coil protection circuit.

150 - 530 kHz COIL SECTION:

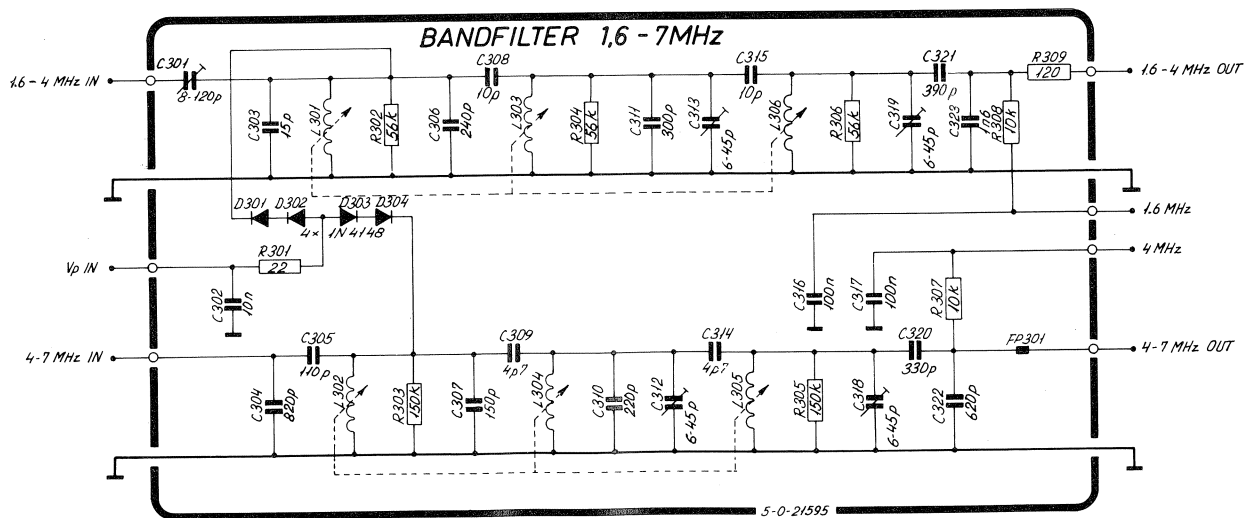
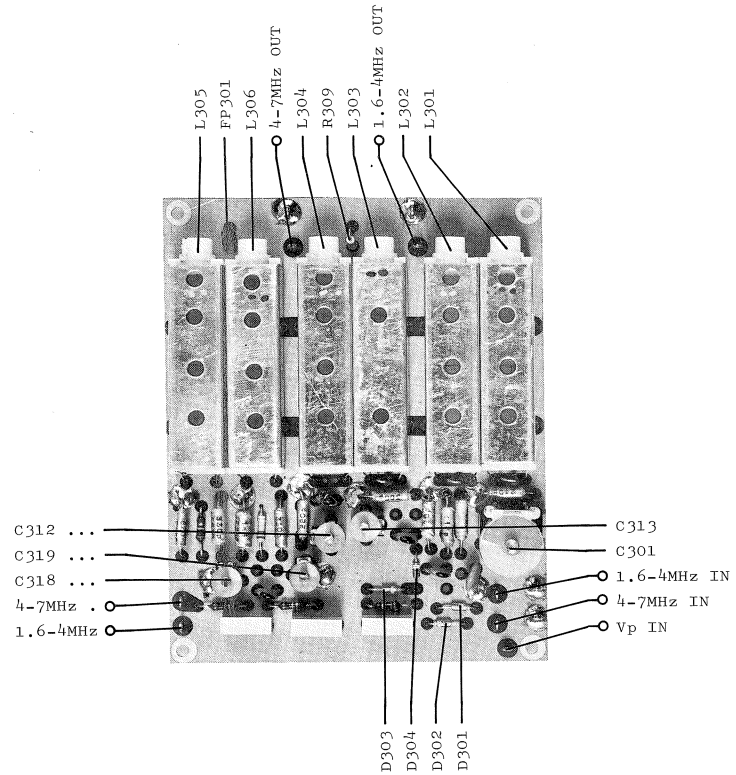
The aerial signal enters the filter either through the "high" input terminal C203 or via the impedance transformer C205 and C208 and leaves the filter via the link of L201 and led through the 1.6 MHz LP filter. The two reverse biased diodes D203 and D204 are part of the aerial protection circuit.

530 - 1600 kHz COIL SECTION:

The aerial signal enters the filter either through the "high" input terminal C204 or via the impedance transformer C206 and C207 and leaves the filter via the link of L202 and led through the 1.6 MHz LP filter. The two reverse biased diodes D205 and D206 are part of the aerial protection circuit.

2182 kHz COIL SECTION:

The aerial signal enters the filter through C221 and leaves the filter at the impedance transformer C225 and C226. The coupling between L209 and L205 takes place by means of C222. Capacitor C219 is the aerial trimming capacitor. The two reverse biased diodes D210 and D211 are part of the aerial protection circuit.



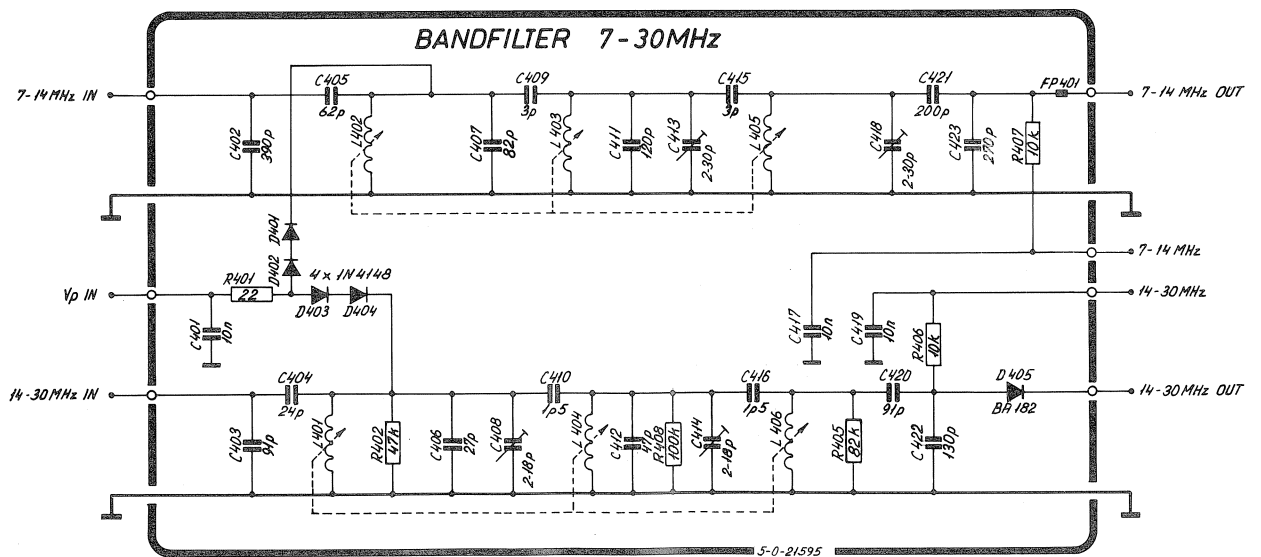
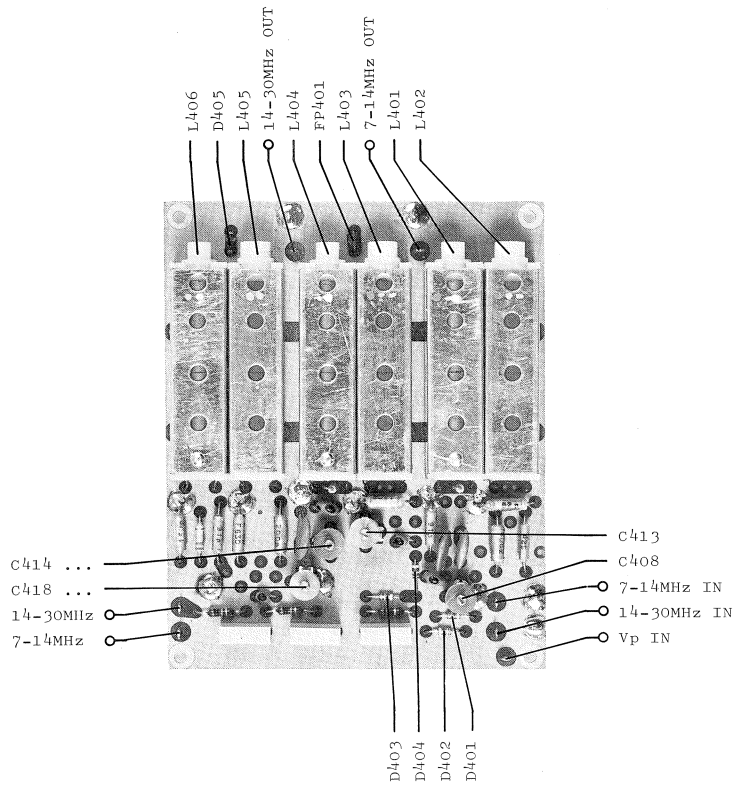
CIRCUIT DESCRIPTION BAND FILTER 7 - 30 MHz R1119 & R1120

This section consists of two tuneable band pass filters covering the frequency ranges of 7 - 14 MHz and 14 - 30 MHz.

7 - 14 MHz AND (14 - 30)MHz BP FILTERS

The aerial signal enters the filter through the capacitive impedance transformer C402 and C405 (C403 and C404) and leaves the filter at the impedance transformer C421 and C423 (C420 and C422).

The two reverse biased diodes D401 and D402 (D403 and D404) are part of the aerial coil protection circuit.



CIRCUIT DESCRIPTION 1ST & 2ND MIXER R1119 & R1120

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

1st MIXER

From the band filters the signal is fed to the balanced transformer TR501 and led to the balanced FET mixer T501 and T502. The first local oscillator signal from the VCO BUFFER is fed into the sources of the FET's. The difference frequency at the drains of the FET's is filtered out in the tuned circuits either TR502 and C512, for receiver frequency settings below 14 MHz or TR502, C508 and C511 for frequency settings above 14 MHz.

1st IF SELECTIVITY

For receiver frequency settings below 14 MHz, the tuned transformer TR501 ensures a proper generator impedance for the monolithic crystal filter FL502. The center frequency of the filter is 16.6085 MHz. The tuned circuit L503 and C519 ensures proper load impedance for the filter FL502 and proper generator impedance for the second mixer M501.

For receiver frequency settings above 14 MHz the tuned transformer ensures a proper generator impedance for the monolithic crystal filter FL501 the center frequency of which is 10.6085 MHz. The tuned circuit L502 and C518 ensures proper load impedance for the filter FL501 and proper generator impedance for the second mixer M501.

The switching between the two IF's takes place by means of either R515, D513, R520, R514, R511 and D510 or R517, D514, R520, R513, R512 and D511.

2nd MIXER

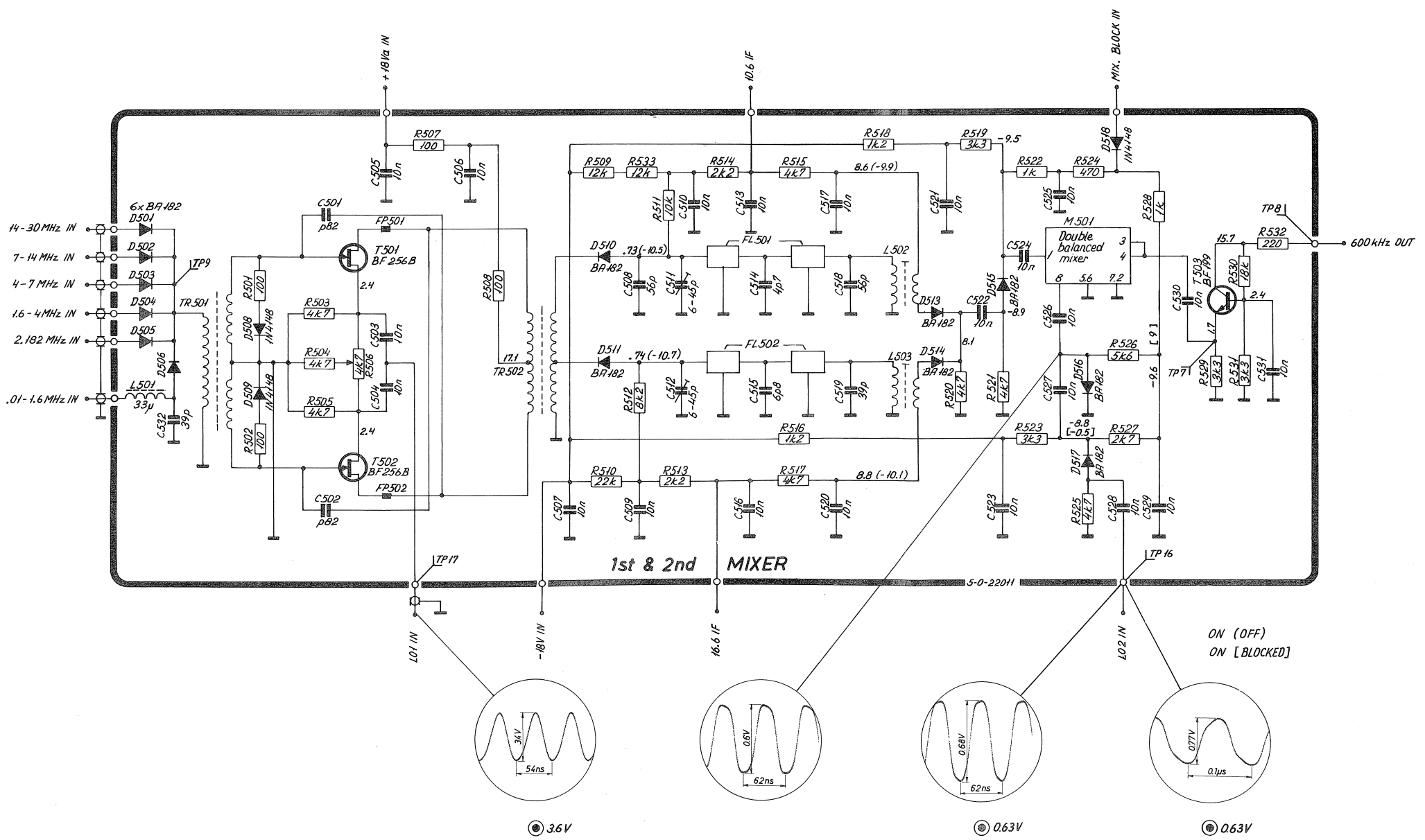
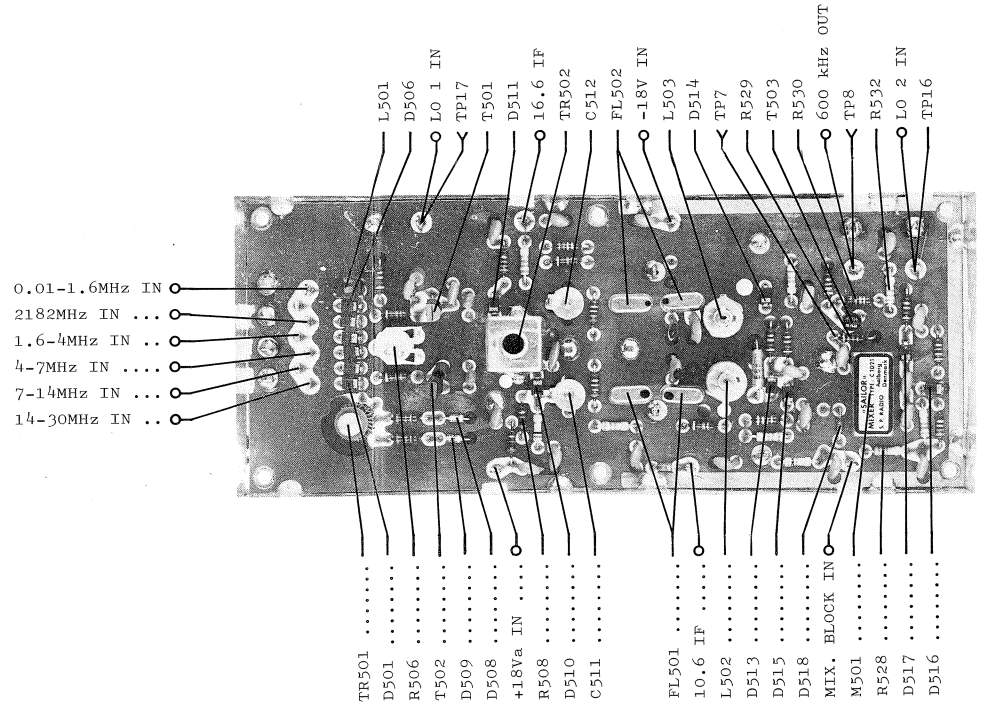
From the coil L502/L503 the signal is fed to the input port of the balanced diode mixer M501. The second local oscillator signal from the VCXO 1st LOOP 2 MIXER & LOOP 2 FILTER is fed to the LO port of the mixer.

From the output port of the mixer the signal is led to the common base buffer amplifier T503. The difference frequency at the collector of T503 is filtered out in the IF-FILTERS.

The remaining components D518, R524, R522, D515, R521, R528, R526, D516, R525, D517 and R525 is the mixer blocking circuit, which secures that no energy is stored in the IF-FILTER's when the receiver is blocked.

TEST CONDITIONS

Frequency setting : 2.0005 MHz
 Oscilloscope input : Passive probe 10:1
 DC voltmeter input : 10 Mohm
 ●: Diode probe measurement
 TP: Testpoint
 All voltage statements are typical



CIRCUIT DESCRIPTION IF FILTER R1120

This unit contains the AM filter, the SSB filter, the telegraphy filters, the external circuit for an auxiliary filter and a tuned 600 kHz amplifier.

The fifth order AM filter C1016 ensures the necessary adjacent channel selectivity and far away attenuation in the AM mode.

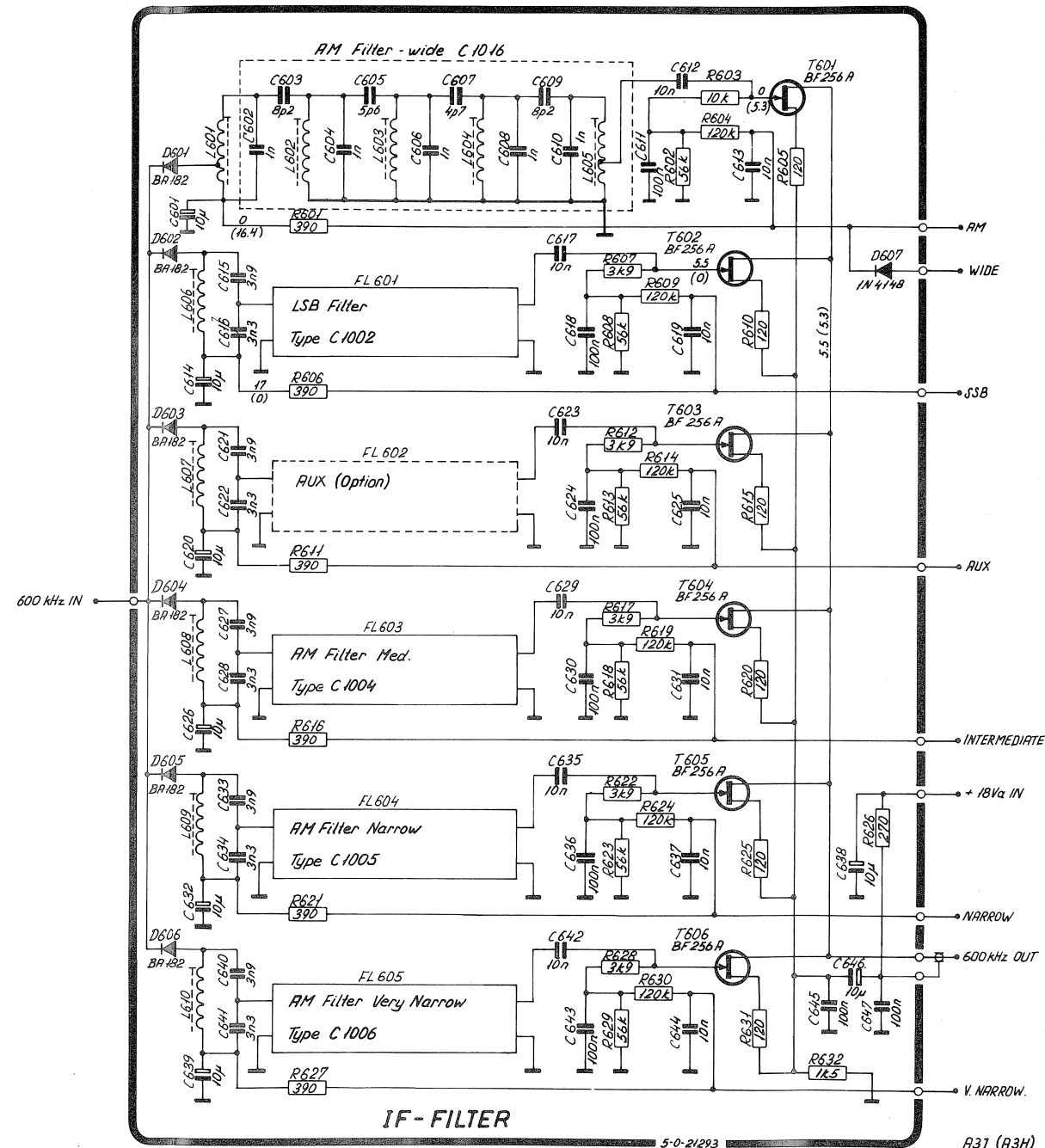
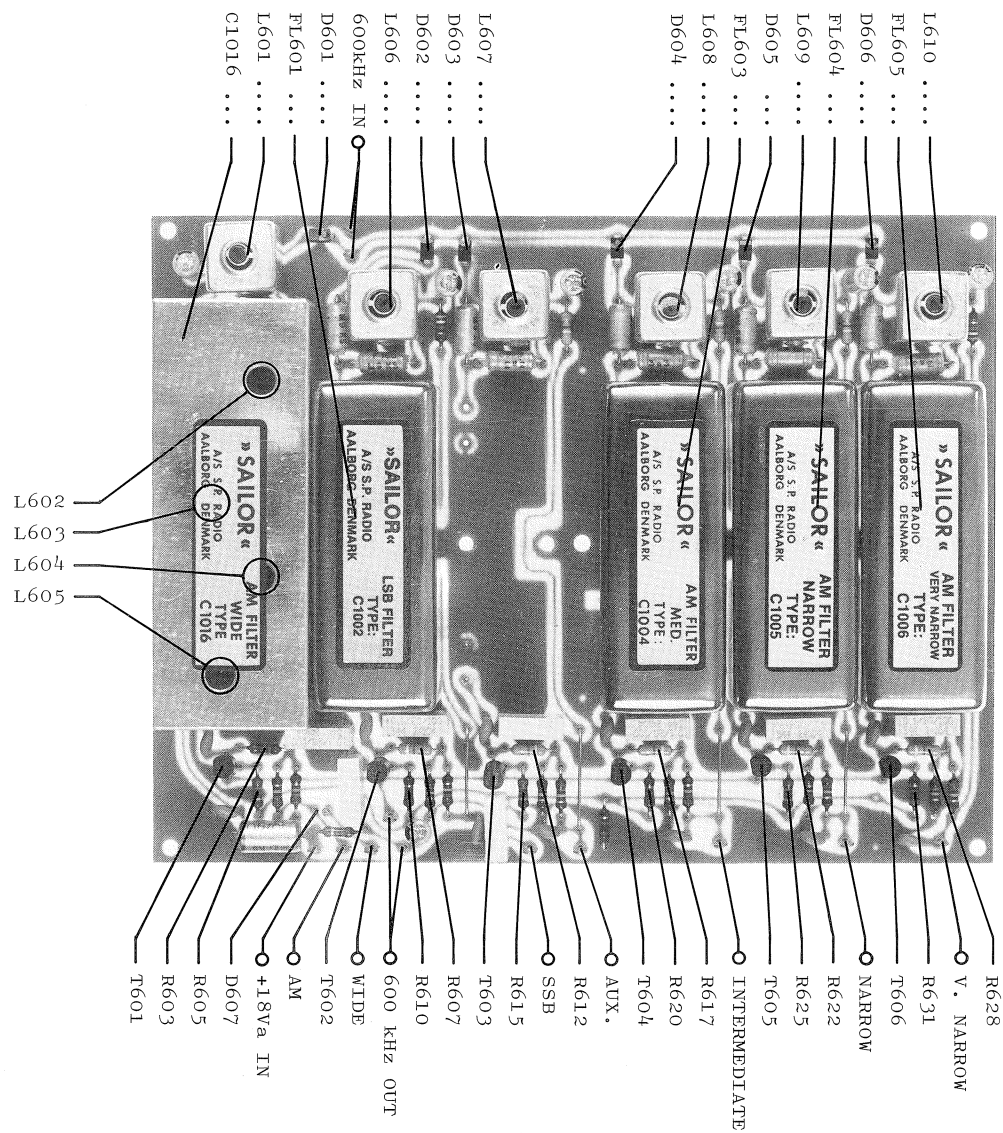
The high order SSB filter FL601 together with the tuned circuit L606, C615 and C616 ensures the necessary carrier rejection, adjacent channel selectivity and far away attenuation in the SSB mode.

The high order telegraphy filters FL603, FL604 and FL605 together with their tuned circuits ensures the necessary adjacent channel selectivity and far away attenuation in the A1 and A2 modes.

Depending on the filter chosen one of the FET's T601, T602, T603, T604, T605 and T606 is a 600 kHz tuned amplifier stage. The tuned circuit is located on the IF AMPLIFIER, DETECTOR AND AGC PCB.

The switching in and out takes place by means of the switching diodes D601, D602, D603, D604, D605, D606 and the above mentioned FET's.

The center frequency of the second IF is 600 kHz.



CIRCUIT DESCRIPTION IF AMPLIFIER, DETECTOR AND AGC R1119 & R1120

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

IF AMPLIFIER

The IF signal from the IF FILTERS enters the 600 kHz tuned circuit L801, C802 and C803. From a tap on L801 the signal is fed to the gate of T804 where it is amplified. The load of T804 consists of a 600 kHz fixed tuned circuit L802, C810 and C811.

From the drain of T804 the signal is fed to the gate of T808. The load of T808 consists of a 600 kHz fixed tuned circuit L803, C818 and C819. The diodes D805 and D806 are amplitude limiters to protect T814.

From the drain of T808 the signal is fed to the base of the untuned amplifier T814. From the collector of T814 the signal is fed to the base of the tuned amplifier T817D. The tuned circuit consists of L805, C834 and C837.

The stabistors D814 and D815 are amplitude limiters to limit the output in the AGC OFF mode.

DETECTOR

From L805 the signal is fed to the bases of T817A and T817B, which are an envelope transistor detector suitable for AM signals.

In the SSB mode a carrier reinjection signal is added to the IF signal via T817C and L805 in such a way that the modulation percent is kept low, approx. 11% in the resulting A3H signal to ensure low detector distortion.

R1120 only:

In the A1 mode the BFO signal is added to the IF signal instead of the fixed 600 kHz carrier reinjection signal.

AGC SYSTEM

The control of the IF amplification is carried out by negative feed-back and decreasing of the load impedance of the three tuned amplifier stages by means of the transistors T801, T806 and T809. That will say increasing current means decreasing gain. The AGC voltage is fed to T801, T806 and T809 from C813 via the amplifier consisting of T803 and T805.

A3H (AM) MODE

The information to the AGC system is taken at the emitter of T817D and fed to the emitter follower T813 via C825 to a peak detector consisting of D808 and T812.

CIRCUIT DESCRIPTION IF AMPLIFIER, DETECTOR AND AGC R1119 & R1120 cont.:

T812 acts as a DC amplifier with a ripple filter R835 and C820. The signal is then fed to another emitter follower T810. The signal from T811 is grounded through R826. From T810 the signal is fed to the capacitor C813, thus feeding the AGC voltage to transistor T805. C813 is discharged through R820 and R827 which in A3H mode is grounded.

The discharge path through R841 is off because T815 is off.

A3J (SSB) MODE

Charge of C813 and C816.

As in the A3H mode the signal is taken at the emitter of T817D and passed through T813, T812 and R835 to the transistors T811 and T810, transistor T811 is charging C816 through R826 and T810 is charging C813 through R820. C816 is charged very fast to the AGC voltage, but because of the voltage divider R826 and R824 the voltage on C813 is taking over after a while, meaning that in the steady state condition the AGC voltage is the voltage on C813.

At the same time C832 is charged to 4.2V via T807 and R828, giving a reference voltage for the hang AGC system. When the voltage on C828 is over 1.2V transistor T816 is on and T815 is off meaning that the discharge path of C813 through R841 is off.

When the IF signal disappears the only discharge path of C813 is via the base of T805 as T815 is off. C832 is now discharged through R865, T816 and D810. When the voltage across C832 is so low that T816 goes off, T815 goes on and C813 is discharged through R841.

When the AGC switch is in TELEX MODE, R827 is grounded and C813 is discharged through R820 and R827 when the IF signal disappears.

Remaining functions of the unit:

The transistor T802 is the emitter follower for the AGC meter.

The AGC ON/OFF function is performed by grounding the base of T810 and T811.

The MGC function is performed by means of the voltage divider R801, R802, R2604 (RF-GAIN) R2603 and R803.

TEST CONDITIONS

- Frequency setting : f = 2.0005 MHz
- Mode : A3J (A3H)
- Clarifier : Center position
- RF input : 1 mW EMF/50 ohm
- AGC : ON
- RF gain : Maximum
- Front end tuned to max. meter reading
- Oscilloscope input : Passive probe 10:1
- DC voltmeter input : 10 Mohm
- ⊙: Diode probe measurements
- TP: Testpoints
- All voltage statements are typical

R1119 & R1120 A 2/2

CIRCUIT DESCRIPTION AUDIO AMPLIFIER R1119 & R1120

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

AF PREAMPLIFIER AND LOW PASS FILTER

The AF signal from the detector is amplified in the operational amplifier IC901d and fed to the fifth order active LP filter with a cut-off frequency of 2.9 kHz. The active filter is built-up around the operational amplifiers IC901c and IC901b. The signal is then fed to the 0 dBm fixed AF output amplifier IC901a, the output from which enters the output transformer L2502 located on the INPUT FILTER circuit board.

AF POWER AMPLIFIER

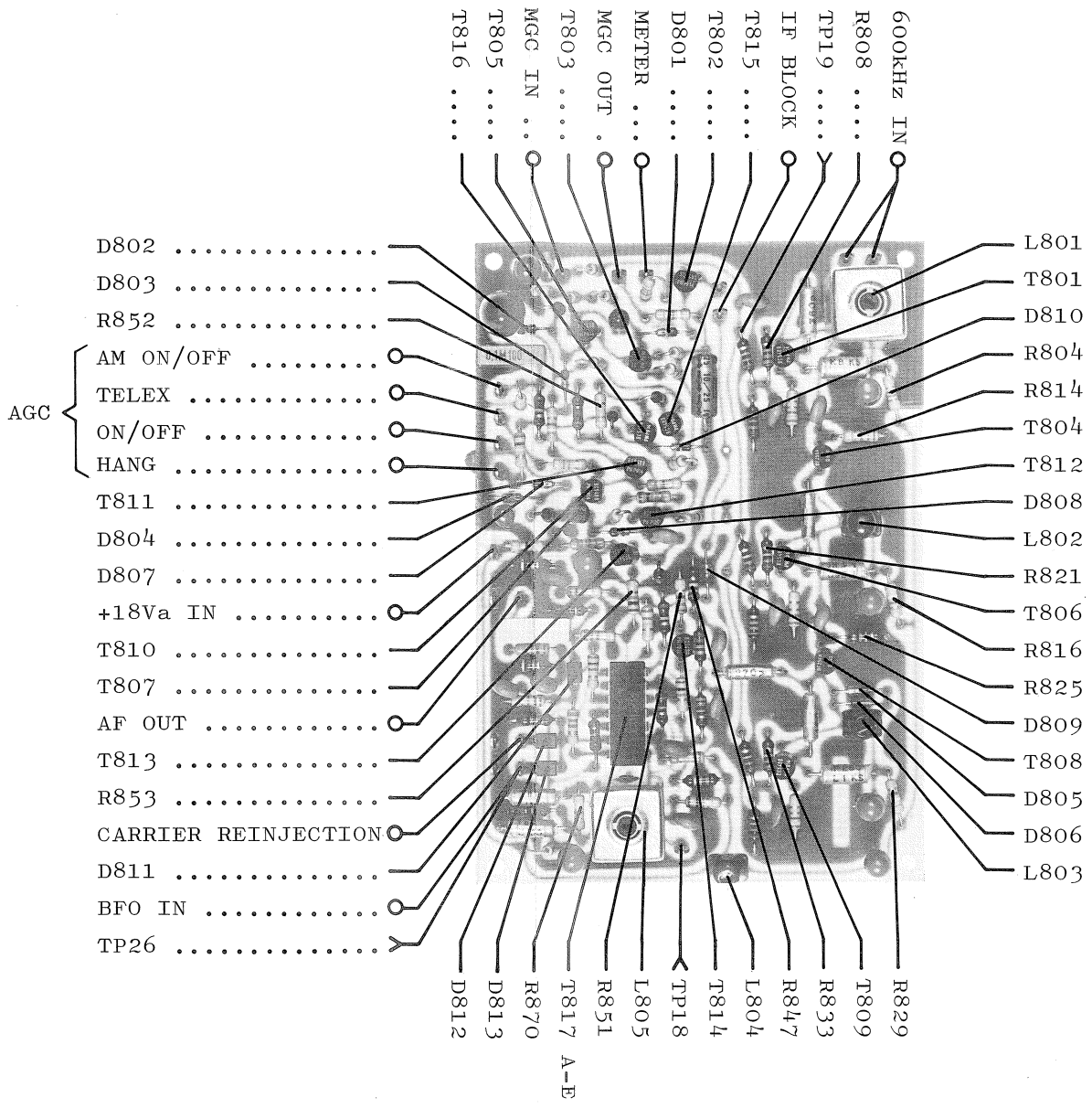
From the output of the active filter, R921, the signal is fed to the AF GAIN, R2607, and from there to the input of the power amplifier C914.

The integrated power amplifier IC902 has two built-in protection facilities, namely output current limiter and thermal shut-down, which means that the power amplifier cannot be destroyed by overload.

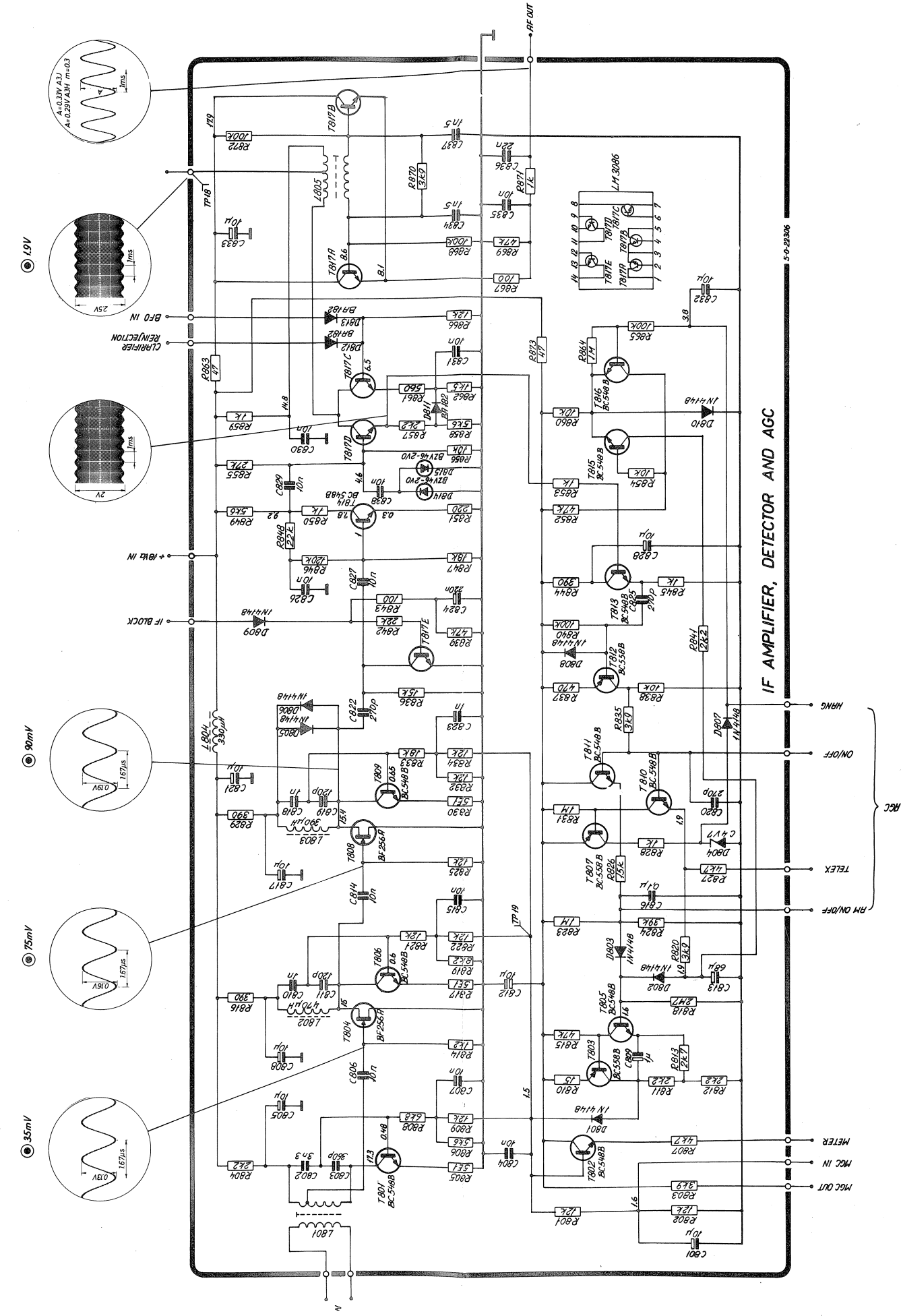
From the output terminal, pin 12, the signal is fed to the loudspeaker and the voltage divider for headphones output, J2602.

TEST CONDITIONS

Frequency setting	: f = 2.0005 MHz
Mode	: A3J (A3H)
Clarifier	: Center position
RF input	: 1 mW EMF/50 ohm
AGC	: ON
RF gain	: Maximum
Front end tuned to max. meter reading	
Oscilloscope input	: Passive probe 10:1
DC voltmeter input	: 10 Mohm
⊙: Diode probe measurements	
TP: Testpoints	
All voltage statements are typical	



- | | | |
|---------------------|-------|-----------|
| D802 | ..... | L801 |
| D803 | ..... | T801 |
| R852 | ..... | D810 |
| AM ON/OFF | ..... | R804 |
| TELEX | ..... | R814 |
| ON/OFF | ..... | T804 |
| HANG | ..... | T812 |
| T811 | ..... | D808 |
| D804 | ..... | L802 |
| D807 | ..... | R821 |
| +18Va IN | ..... | T806 |
| T810 | ..... | R816 |
| T807 | ..... | R825 |
| AF OUT | ..... | D809 |
| T813 | ..... | T808 |
| R853 | ..... | D805 |
| CARRIER REINJECTION | ..... | D806 |
| D811 | ..... | L803 |
| BFO IN | ..... | R829 |
| TP26 | ..... | T809 |
| | | T810 |
| | | R833 |
| | | R847 |
| | | L804 |
| | | T814 |
| | | TP18 |
| | | L805 |
| | | T817 |
| | | R851 |
| | | L801 |
| | | R870 |
| | | D812 |
| | | D813 |
| | | R812 |
| | | T802 |
| | | D801 |
| | | METER |
| | | MGC OUT |
| | | T803 |
| | | MGC IN |
| | | T805 |
| | | T816 |
| | | 600KHZ IN |
| | | R808 |
| | | TP19 |
| | | IF BLOCK |
| | | T815 |
| | | T802 |
| | | D801 |
| | | METER |
| | | MGC OUT |
| | | T803 |
| | | MGC IN |
| | | T805 |
| | | T816 |
| | | 600KHZ IN |



IF AMPLIFIER, DETECTOR AND AGC

CIRCUIT DESCRIPTION AUDIO AMPLIFIER R1119 & R1120

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

AF PREAMPLIFIER AND LOW PASS FILTER

The AF signal from the detector is amplified in the operational amplifier IC901d and fed to the fifth order active LP filter with a cut-off frequency of 2.9 kHz. The active filter is built-up around the operational amplifiers IC901c and IC901b. The signal is then fed to the 0 dBm fixed AF output amplifier IC901a, the output from which enters the output transformer L2502 located on the INPUT FILTER circuit board.

AF POWER AMPLIFIER

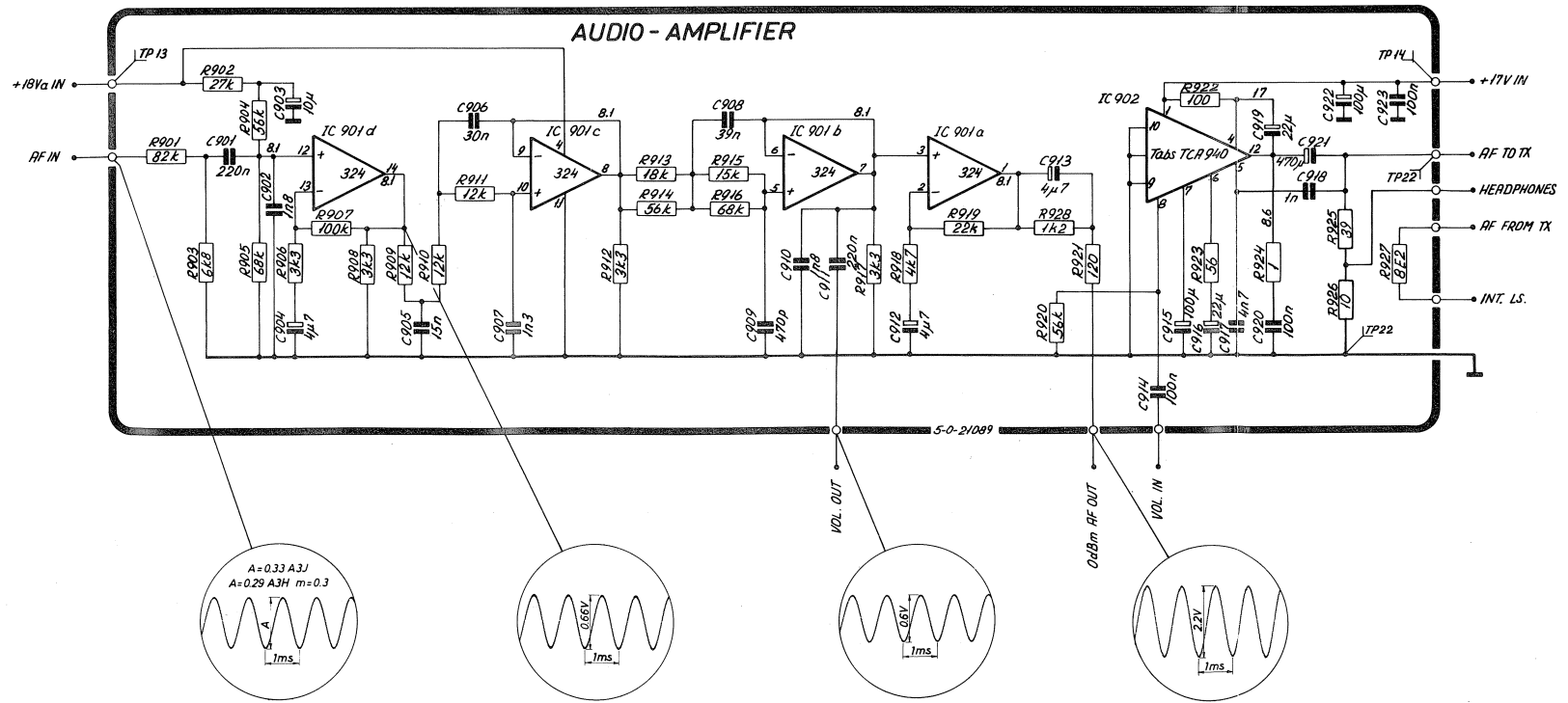
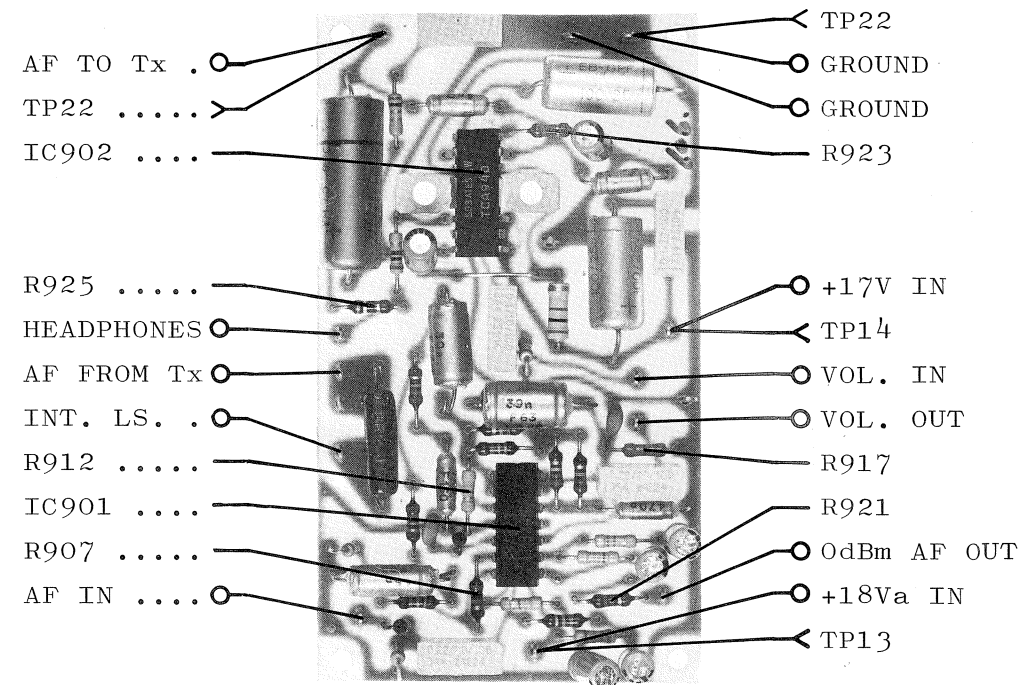
From the output of the active filter, R921, the signal is fed to the AF GAIN, R2607, and from there to the input of the power amplifier C914.

The integrated power amplifier IC902 has two built-in protection facilities, namely output current limiter and thermal shut-down, which means that the power amplifier cannot be destroyed by overload.

From the output terminal, pin 12, the signal is fed to the loudspeaker and the voltage divider for headphones output, J2602.

TEST CONDITIONS

Frequency setting	: f = 2.0005 MHz
Mode	: A3J (A3H)
Clarifier	: Center position
RF input	: 1 mW EMF/50 ohm
AGC	: ON
RF gain	: Maximum
Front end tuned to max. meter reading	
Oscilloscope input	: Passive probe 10:1
DC voltmeter input	: 10 Mohm
⊙: Diode probe measurements	
TP: Testpoints	
All voltage statements are typical	



CIRCUIT DESCRIPTION FOR DIVIDER UNIT R1119 & R1120

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, the phase/frequency detectors for LOOP 1 and LOOP 2 and the 10/16 MHz output for the VCXO 1st LOOP 2 MIXER & LOOP 2 FILTER.

10 MHz REFERENCE

The frequency stability of the receiver is related to the 10 MHz TCXO X01001. The 10 MHz reference signal is amplified in the transistors T1004 and T1005.

REFERENCE DIVIDER

The counters IC1015, IC1011 and IC1007 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 IC1015 goes low and the nand-gates in IC1014 will generate a narrow pulse due to the delay-time in the gates.

600 kHz GENERATOR

The output on IC1011 pin 5, Q_B has a high contents of 600 kHz, which is amplified in the transistor T1006 and filter in the tuned circuit L1002, C1021 and C1022.

PROGRAMMABLE DIVIDER FOR LOOP 1

The variable frequency f_{T1} from LOOP 1 MIXER is amplified and shaped in T1001 and IC1009a. 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 KEYBOARD CONTROL, which encodes the start figure P_1 into the BCD counters IC1001, IC1002, IC1003 and IC1004.

The stop figure S_1 is controlled from the gates IC1008b and IC1009c. When the counter outputs Q_A , Q_B ... etc. equals the stop figure $S_1 + 2$ the J-K flip-flop IC1010b uses 2 clock pulses to load the start figure P_1 into the counters IC1001, IC1002, IC1003 and IC1004. 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 IC1006. The phase/frequency detector IC1006 generates an error voltage, which is proportional to frequency or phase difference between the two signals mentioned above. This error voltage is fed into the integrator on the LOOP 1 FILTER & + 18V SUPPLY UNIT.

PROGRAMMABLE DIVIDER FOR LOOP 2

The variable frequency f_{T2} from the loop 2 mixer is amplified and shaped in T1002 and IC1009b. The frequency f_{T2} will vary between 7.85 kHz and 9.25 kHz depending on the 100 Hz programming. The programmable divider divides f_{T1} down to 100 Hz (dividing figure N_2).

From the KEYBOARD CONTROL the start figure P_2 encodes into the BCD counter IC1005.

The stop figure S_2 is controlled from the gate IC1008a. When the counter outputs $Q_A, Q_B, Q_C \dots$ etc. equals the stop figure $S_2 - 2$ the J-K flip-flop IC1010a uses 2 clock pulses to load the start figure P_2 into the counters IC1005 and IC1012. 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 IC1013. The phase/frequency detector IC1013 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 1st LOOP 2 MIXER & LOOP 2 FILTER.

10/16 MHz OUTPUT

The 10 MHz and the 16 MHz outputs are respectively taken from the 10 MHz amplifier T1005 and the 16 MHz tuned amplifier T1003 which is fed from pin 11 of the reference divider IC1015. This output has a high content of 16 MHz. The signals are added in the resistors R1027, R1025 and R1026 and fed to the VCXO 1st LOOP 1 MIXER & LOOP 2 FILTER.

TEST CONDITIONS

Frequency setting : 2.0005 MHz
 Mode : A3J
 Clarifier : Center position
 Oscilloscope input : Passive probe 10:1
 DC voltmeter input : 10 Mohm

⊙: Diode probe measurements

TP: Testpoints

All voltage statements are typical

CIRCUIT DESCRIPTION LOOP 1 FILTER & \pm 18V SUPPLY UNIT R1119 & R1120

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

-18V SUPPLY

The series transistor T1103 supplies a -18V output controlled by the current flow into its base from T1105, where a portion of the output voltage, via a voltage divider containing R1110, is compared to a reference voltage created by R1103, D1102 and D1103. 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 R1103. When the regulator reaches this limit, T1105 stops conducting and so it folds back. To ensure that T1103 starts conducting R1104 is added.

+18V SUPPLY

The principle of operation for this regulator is exactly as described above, with an additional current limiter containing T1104 and T1106 to ensure the fold-back characteristic is maintained within design limits. To ensure start-up R1112 is added.

INTEGRATOR & LOOP 1 FILTER

The integrator is built-up around IC1102, the integration capacitor is C1113. R1120 feeds current into the diode coupled Darlington pair in the phase comparator MC4044 on the divider board to perform the 1.5V reference. Output from the integrator pin 6 on IC1102 feeds into the active low pass filter IC1101 to filter out the 1 kHz ripple from the phase comparator. The voltage divider R1118 and R1119 connected to IC1102 via D1106 ensure that the output voltage swing is within approx. -4V to -17V.

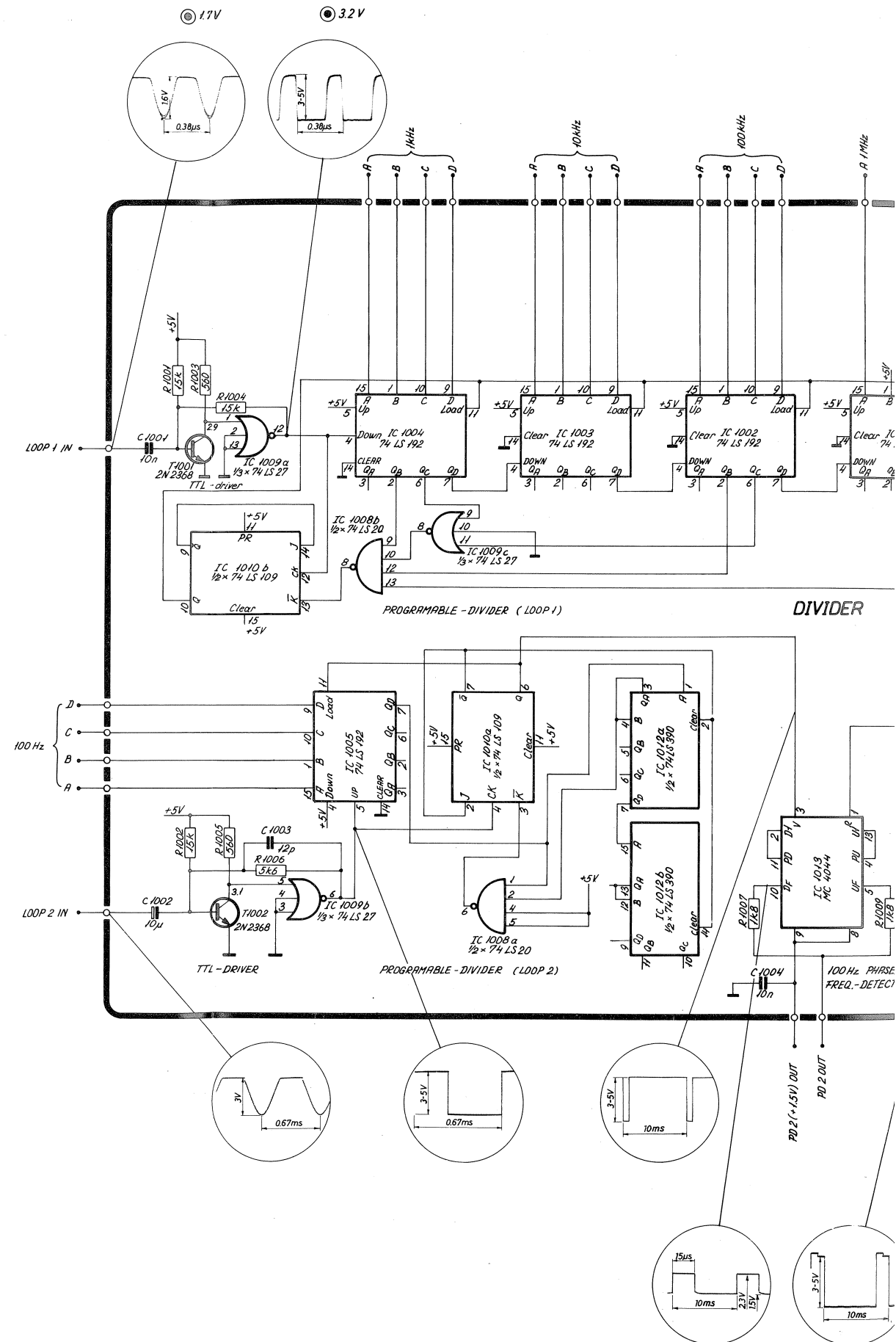
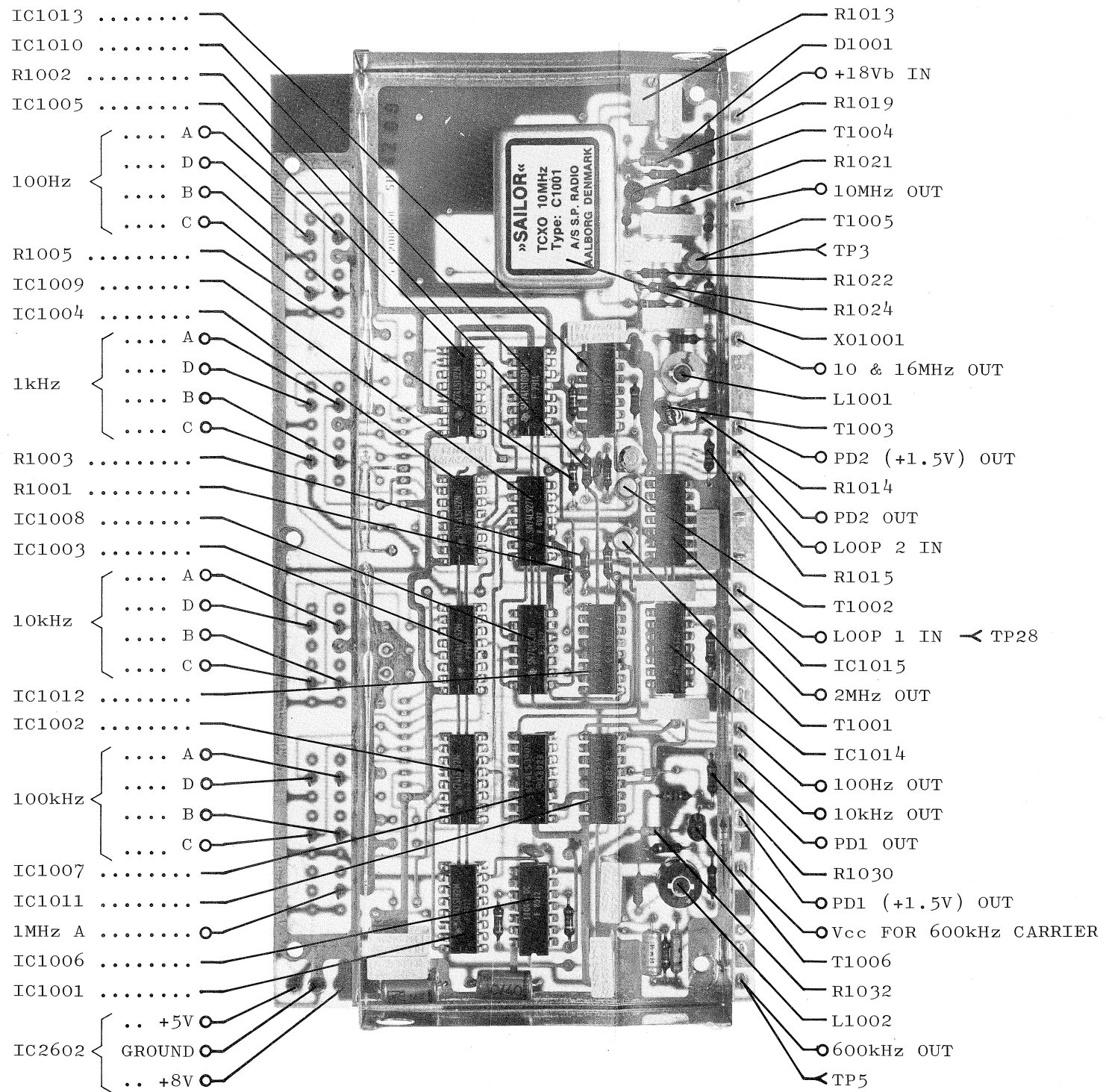
TEST CONDITIONS

Frequency setting : 2.0005 MHz
Oscilloscope input : Passive probe 10:1
DC voltmeter input : 10 Mohm

⊙: Diode probe measurement

TP: Testpoint

All voltage statements are typical



CIRCUIT DESCRIPTION LOOP 1 FILTER & ± 18V

This unit contains two regulated power supplies, a current limiter, the complete integrator and filter for I

-18V SUPPLY

The series transistor T1103 supplies a -18V output. Current flow into its base from T1105, where a portion of the voltage divider containing R1110, is compared to the output by R1103, D1102 and D1103. The fold-back is within the current from the regulator increases the base current, this current is limited by R1103. When the regulator stops conducting and so it folds back. To ensure regulation, R1104 is added.

+18V SUPPLY

The principle of operation for this regulator is similar to the -18V supply with an additional current limiter containing T1104. The fold-back characteristic is maintained within design limits. R1112 is added.

INTEGRATOR & LOOP 1 FILTER

The integrator is built-up around IC1102, the input current R1120 feeds current into the diode coupled Darlington comparator MC4044 on the divider board to perform the integration. The integrator pin 6 on IC1102 feeds into the active filter to filter out the 1 kHz ripple from the phase comparator. R1118 and R1119 connected to IC1102 via D1106 ensure the output swing is within approx. -4V to -17V.

TEST CONDITIONS

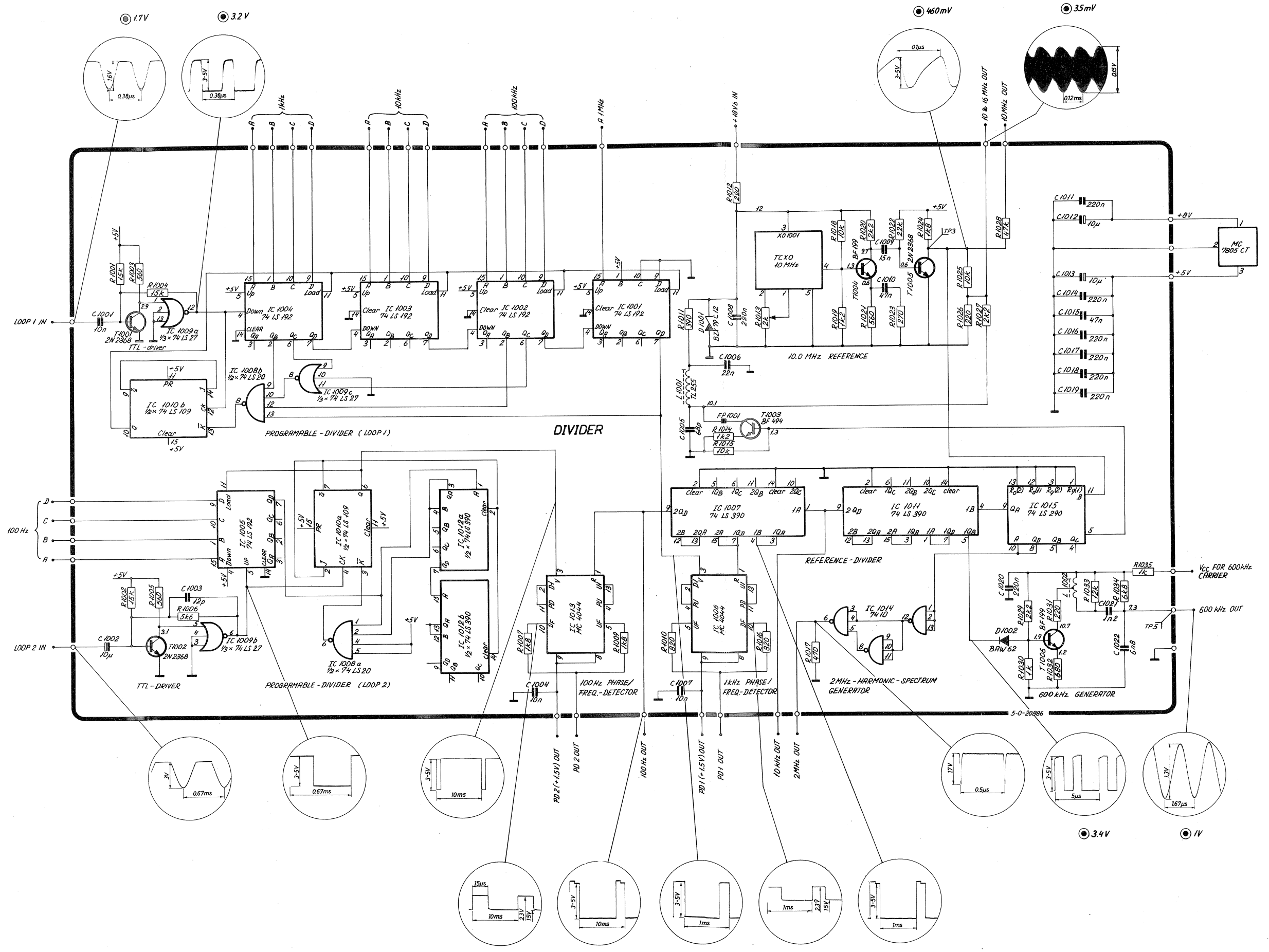
Frequency setting : 2.0 kHz
Oscilloscope input : Pas
DC voltmeter input : 10

⊙: Diode probe measurement

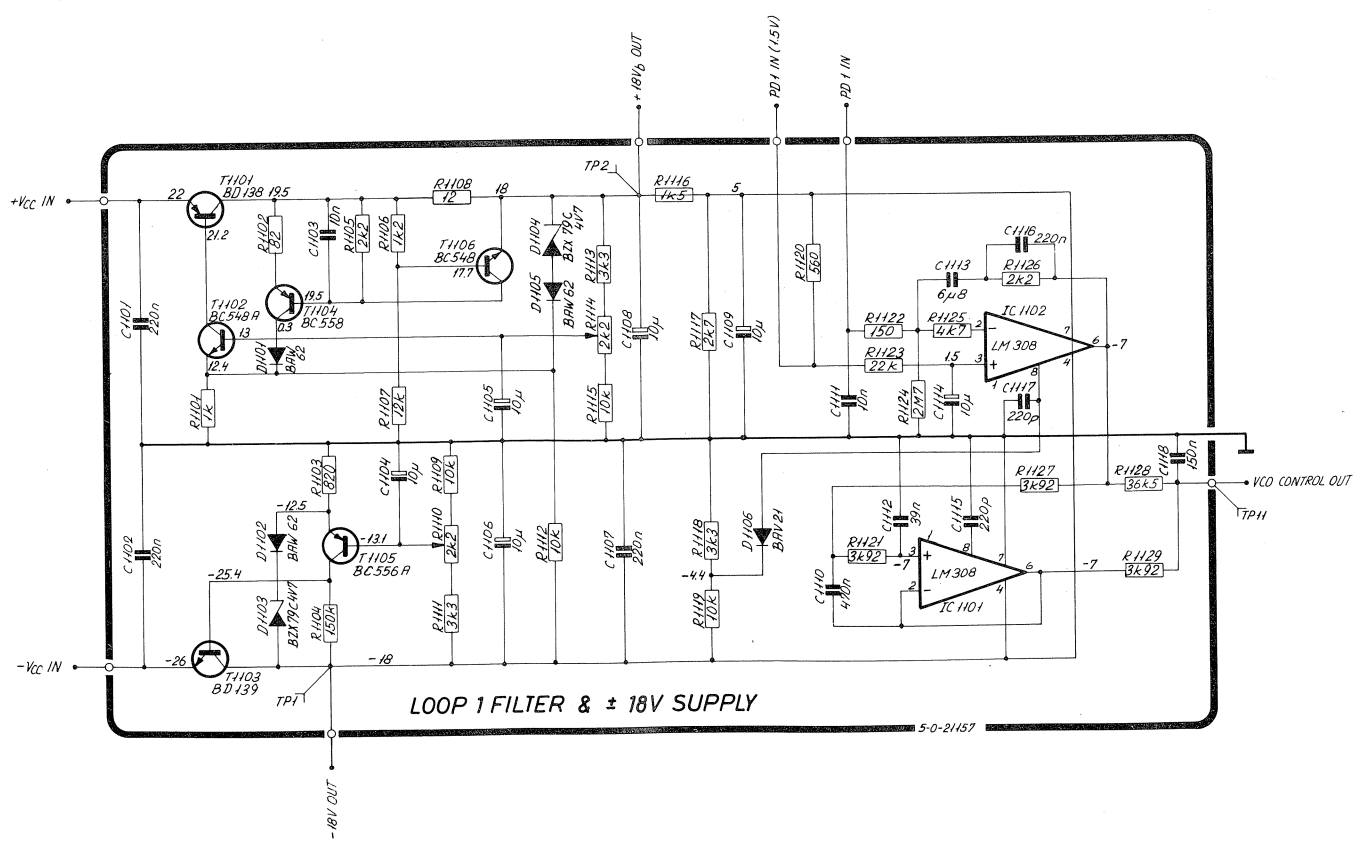
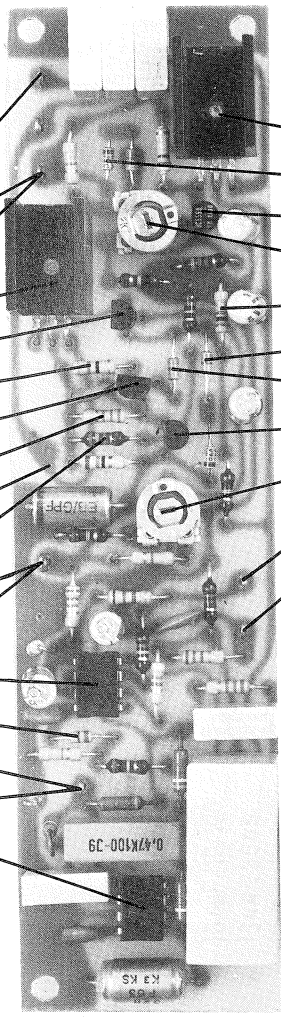
TP: Testpoint

All voltage statements are typical

- R1013
- D1001
- +18Vb IN
- R1019
- T1004
- R1021
- 10MHz OUT
- T1005
- TP3
- R1022
- R1024
- X01001
- 10 & 16MHz OUT
- L1001
- T1003
- PD2 (+1.5V) OUT
- R1014
- PD2 OUT
- LOOP 2 IN
- R1015
- T1002
- LOOP 1 IN TP28
- IC1015
- 2MHz OUT
- T1001
- IC1014
- 100Hz OUT
- 10kHz OUT
- PD1 OUT
- R1030
- PD1 (+1.5V) OUT
- Vcc FOR 600kHz CARRIER
- T1006
- R1032
- L1002
- 600kHz OUT
- TP5



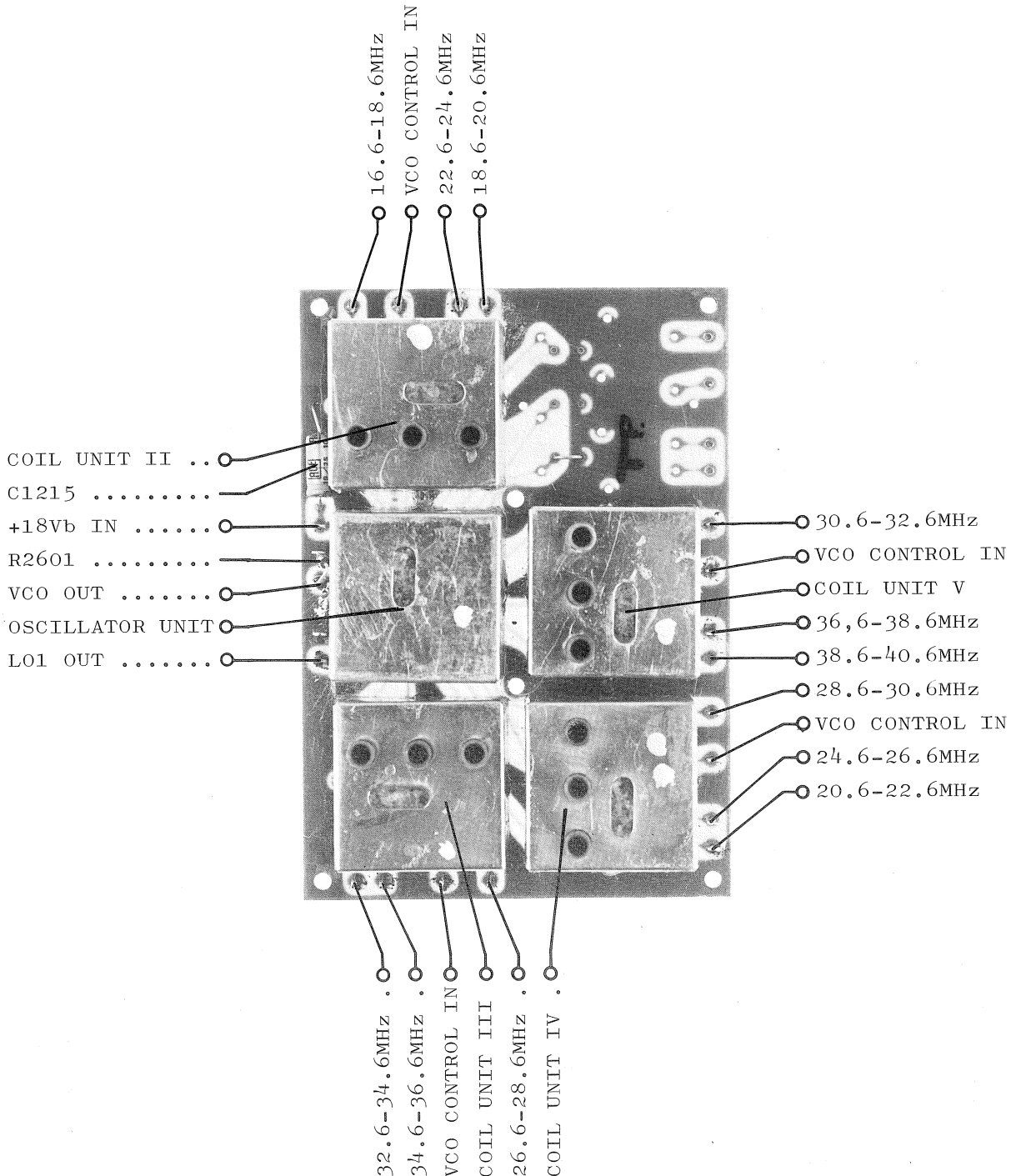
- Vcc IN
- 18V OUT
- TP1
- T1101
- T1102
- R1102
- T1104
- R1105
- +Vcc IN
- R1106
- +18Vb OUT
- TP2
- IC1102
- D1106
- VCO CONTROL OUT
- TP11
- IC1101
- T1103
- D1103
- T1105
- R1110
- R1101
- D1105
- D1101
- T1106
- R1114
- PD1 (+1.5V) IN
- PD1 IN



CIRCUIT DESCRIPTION VCO-UNIT R1119 & R1120

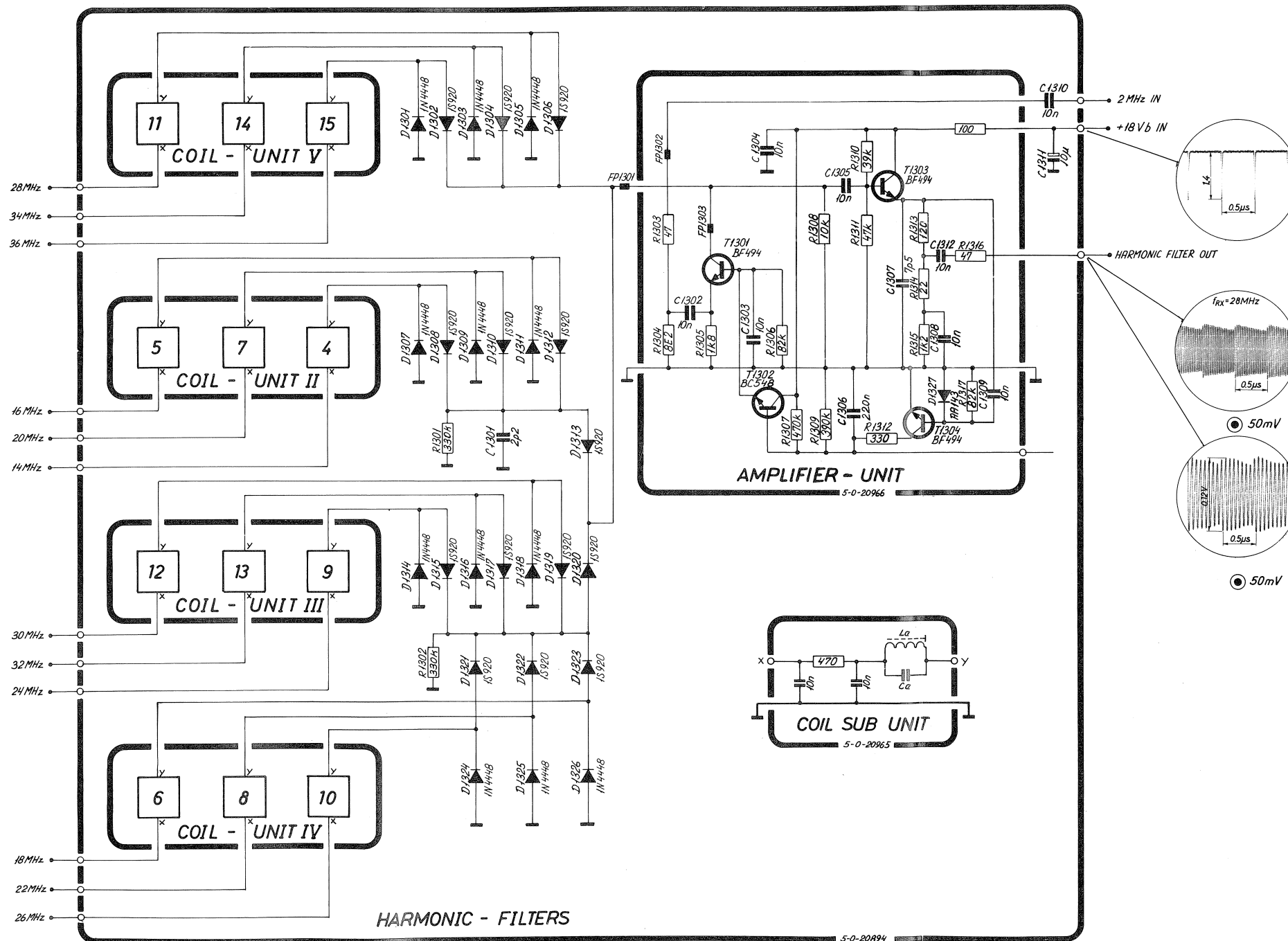
This unit contains in principle twelve VCO's constructed in such a way that it contains one single oscillator unit and twelve coil units switched in and out by the diodes D1201 to D1226. The oscillator circuit is made up of T1201 and T1203, the output signal is fed through the buffer amplifier T1204. The signal current in T1204 is measured by the level detector C1209, R1208 and D1227 and T1202 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.



TEST CONDITIONS

Frequency setting : 2.0005 MHz
 Oscilloscope input : Passive probe 10:1
 DC voltmeter input : 10 Mohm
 ⊙: Diode probe measurement
 TP: Testpoint
 All voltage statements are typical



R1119 & R1120 A 2/2

CIRCUIT DESCRIPTION LOOP 1 MIXER R1119 & R1120

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 via C1401 to the buffer amplifier T1401 and after that to the integrated balanced mixer IC1401. To this the harmonic filter signal is applied via C1405. Output from the mixer is fed into the combiner transformer TR1401 feeding into the low pass filter containing L1402, L1403, C1410, C1411, C1412 and C1413. 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 T1402.

TEST CONDITIONS

Frequency setting : 2.0005 MHz
Oscilloscope input : Passive probe 10:1
DC voltmeter input : 10 Mohm

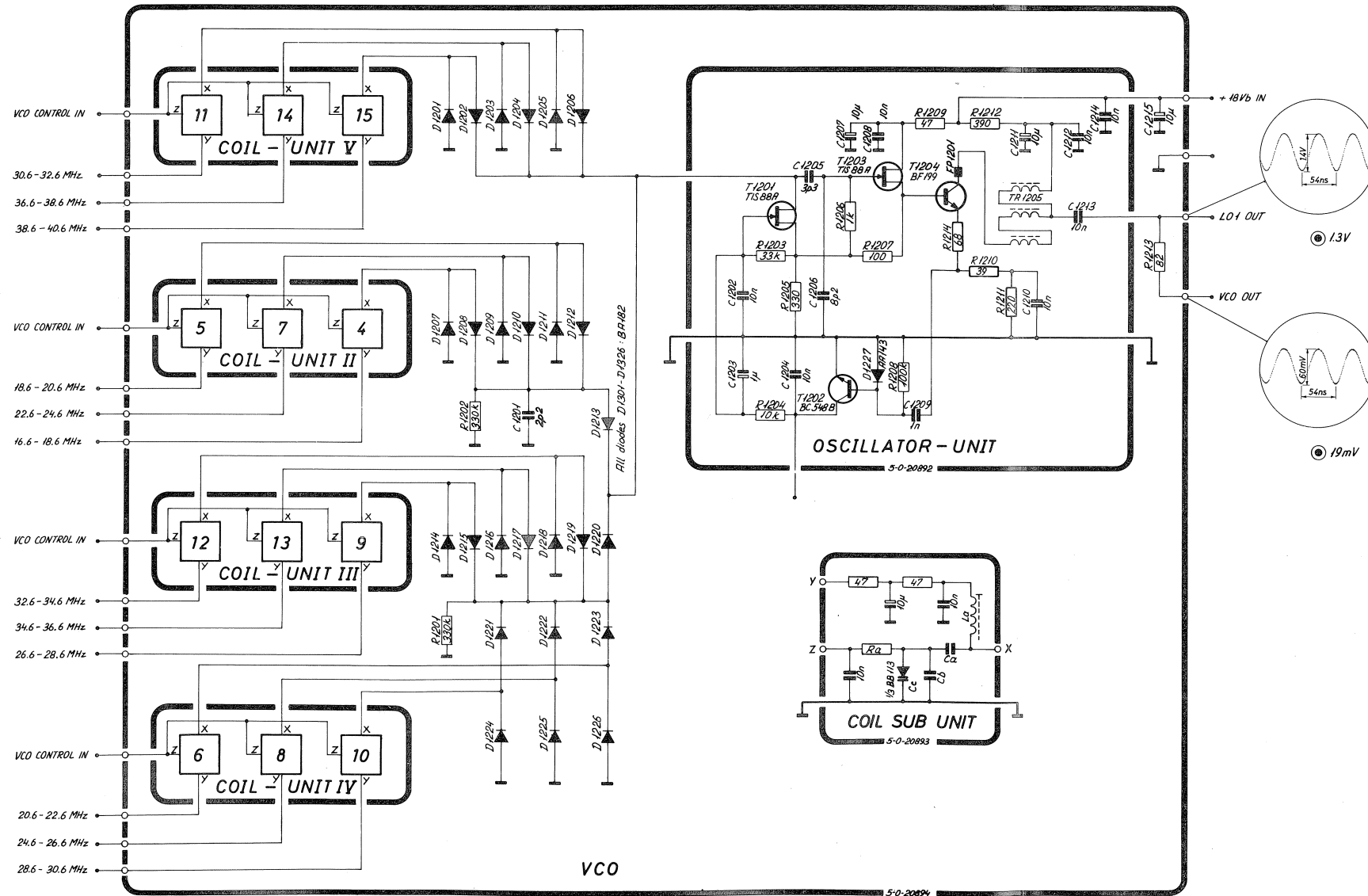
⊙: Diode probe measurement

TP: Testpoint

All voltage statements are typical

TEST CONDITIONS

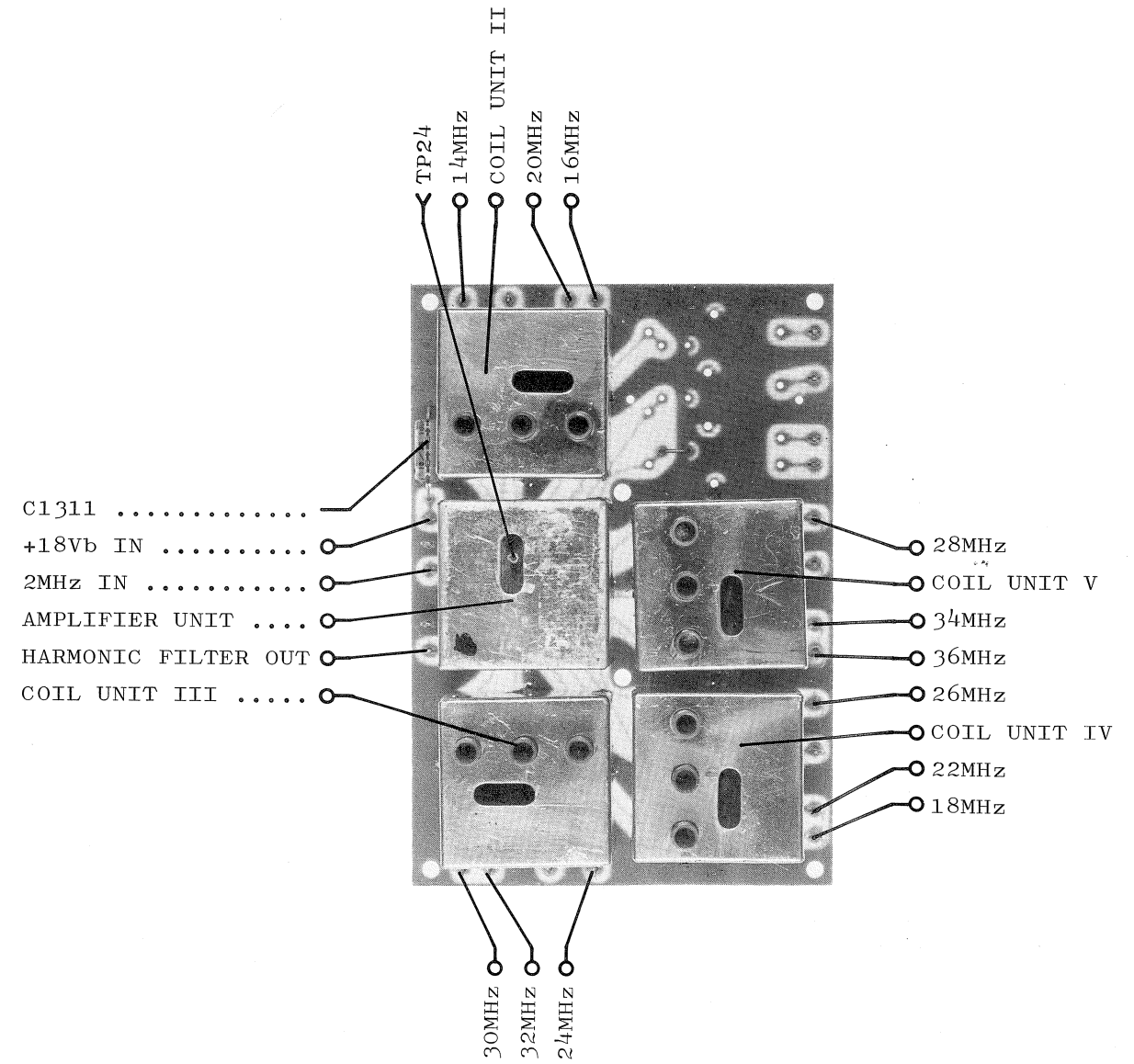
- Frequency setting : 2.0005 MHz
- Oscilloscope input : Passive probe 10:1
- DC voltmeter input : 10 Mohm
- ⊙: Diode probe measurement
- TP: Testpoint
- All voltage statements are typical



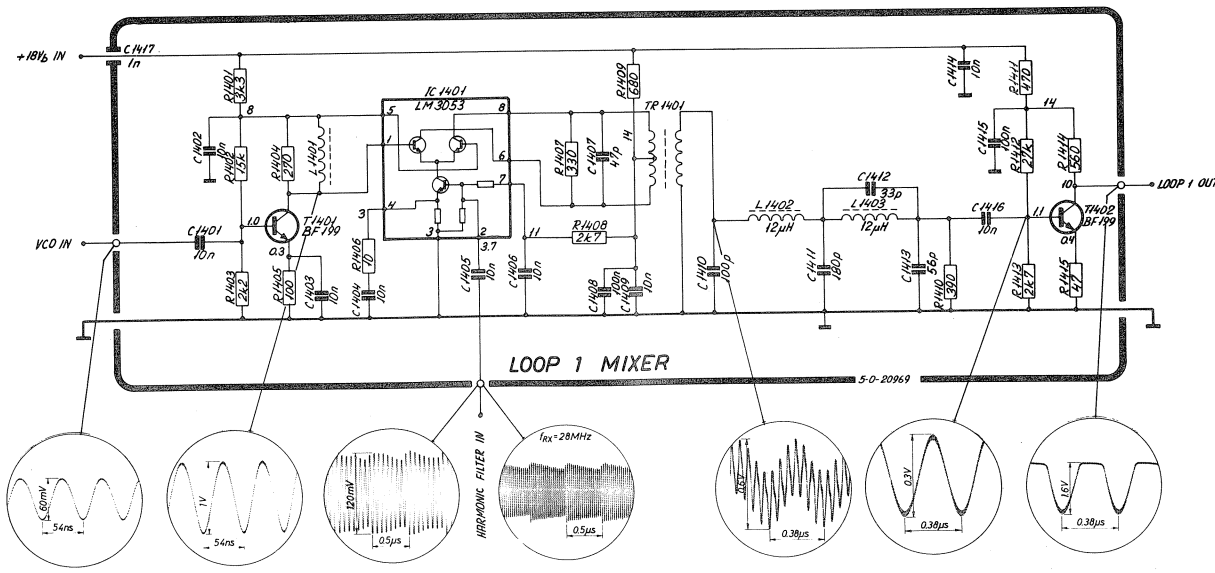
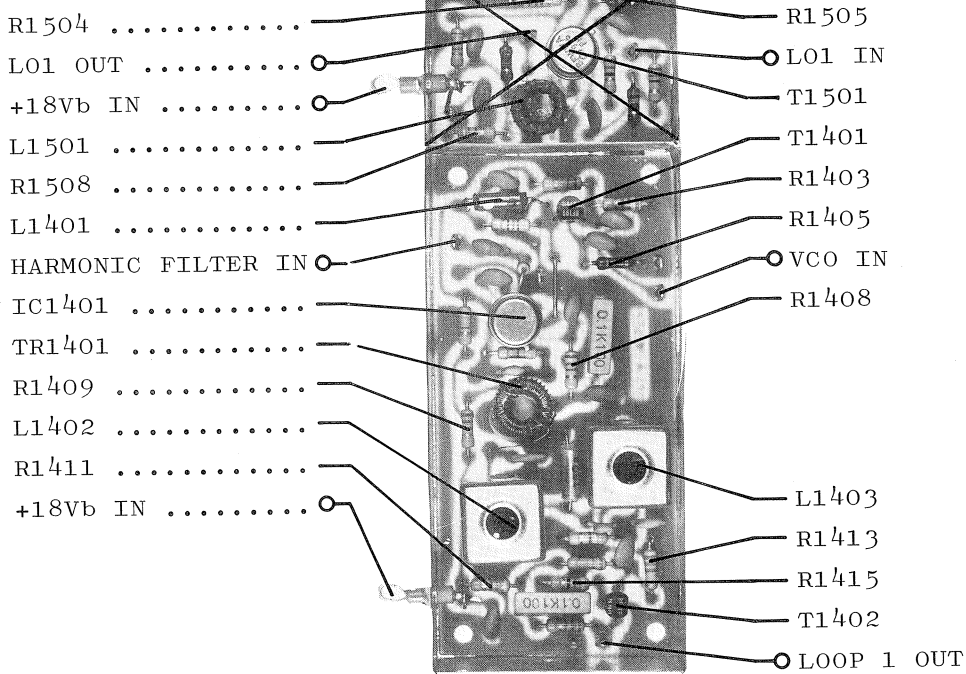
CIRCUIT DESCRIPTION HARMONIC FILTER UNIT R1119 & R1120

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 twelve coil units switched in and out by the diodes D1301 to D1326. The tuned amplifier is T1301 feeding into the source follower T1302. The output voltage is measured by the level detector C1309, R1308 and D1328 and via T1303 it regulates the transconductance in T1301 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.



R1119 & R1120 A 1/2



CIRCUIT DESCRIPTION VCO-BUFFER R1119 & R1120

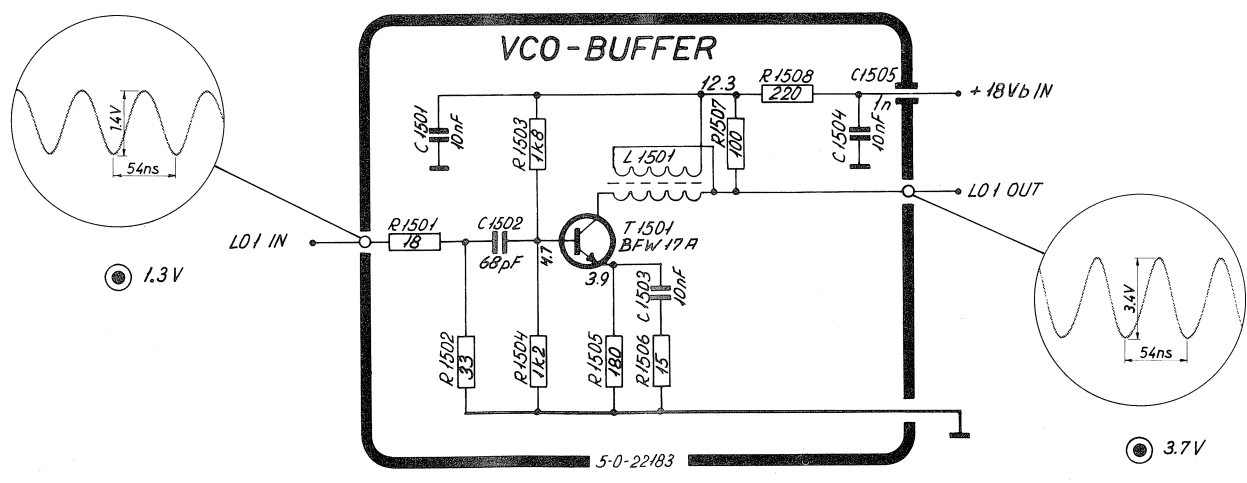
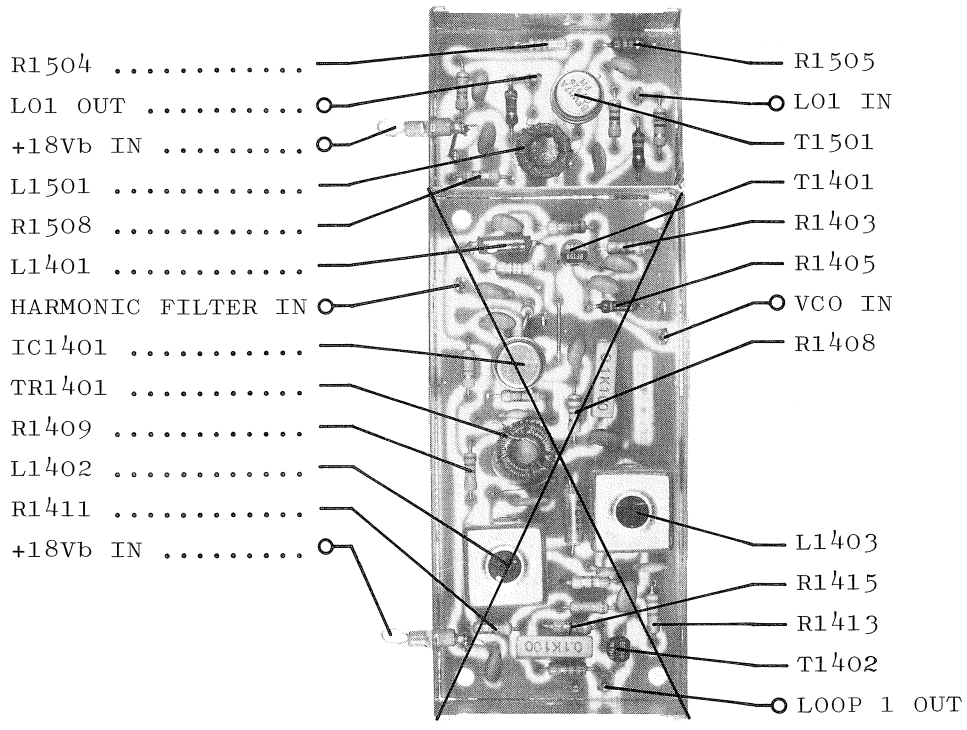
This unit contains the VCO buffer amplifier.

The signal from the VCO-UNIT enters the base of T1501 via the frequency compensating capacitor C1502. Capacitor C1503 and resistor R1506 are part of the frequency compensating circuit.

From the collector of T1501 the signal is fed to the 1st & 2nd MIXER circuit board via the impedance step down transformer L1501.

TEST CONDITIONS

Frequency setting : 2.0005 MHz
Oscilloscope input : Passive probe 10:1
DC voltmeter input : 10 Mohm
⊙: Diode probe measurement
TP: Testpoint
All voltage statements are typical



CIRCUIT DESCRIPTION VCXO 1st LOOP 2 MIXER & LOOP 2 FILTER R1119 & R1120

This unit contains the LOOP 2 integrator, the summing amplifier, the voltage controlled crystal oscillators (VCXO's) and the first LOOP 2 MIXER.

LOOP 2 INTEGRATOR

The integrator is built-up around IC1601a, the integration capacitor is C1609. R1628 feeds current into the diode coupled Darlington pair in the phase comparator IC1013 on the divider board in order to perform the 1.5V reference voltage. The output from the integrator pin 1 feeds into pin 5 of the summing amplifier.

SUMMING AMPLIFIER

The IC1601b sums up two signals namely the output from the integrator and the informations from the 100 Hz setting. This information is weighed by means of the resistors R1617, R1618, R1619, R1620 and R1621. This summing is done to speed up the LOOP 2 system in the continuous tuning mode.

The output, pin 7 of IC1601b, is fed to the VCXO's via a ripple filter consisting of R1616 and C1614.

VCXO's

The VCXO's are crystal controlled Pierce Collpits oscillators, the frequency of which are tuned of varicap's, D1601, D1605 and D1606.

For receiver frequencies below 14 MHz the 16 MHz oscillator is working and for frequencies above 14 MHz the 10 MHz one is working.

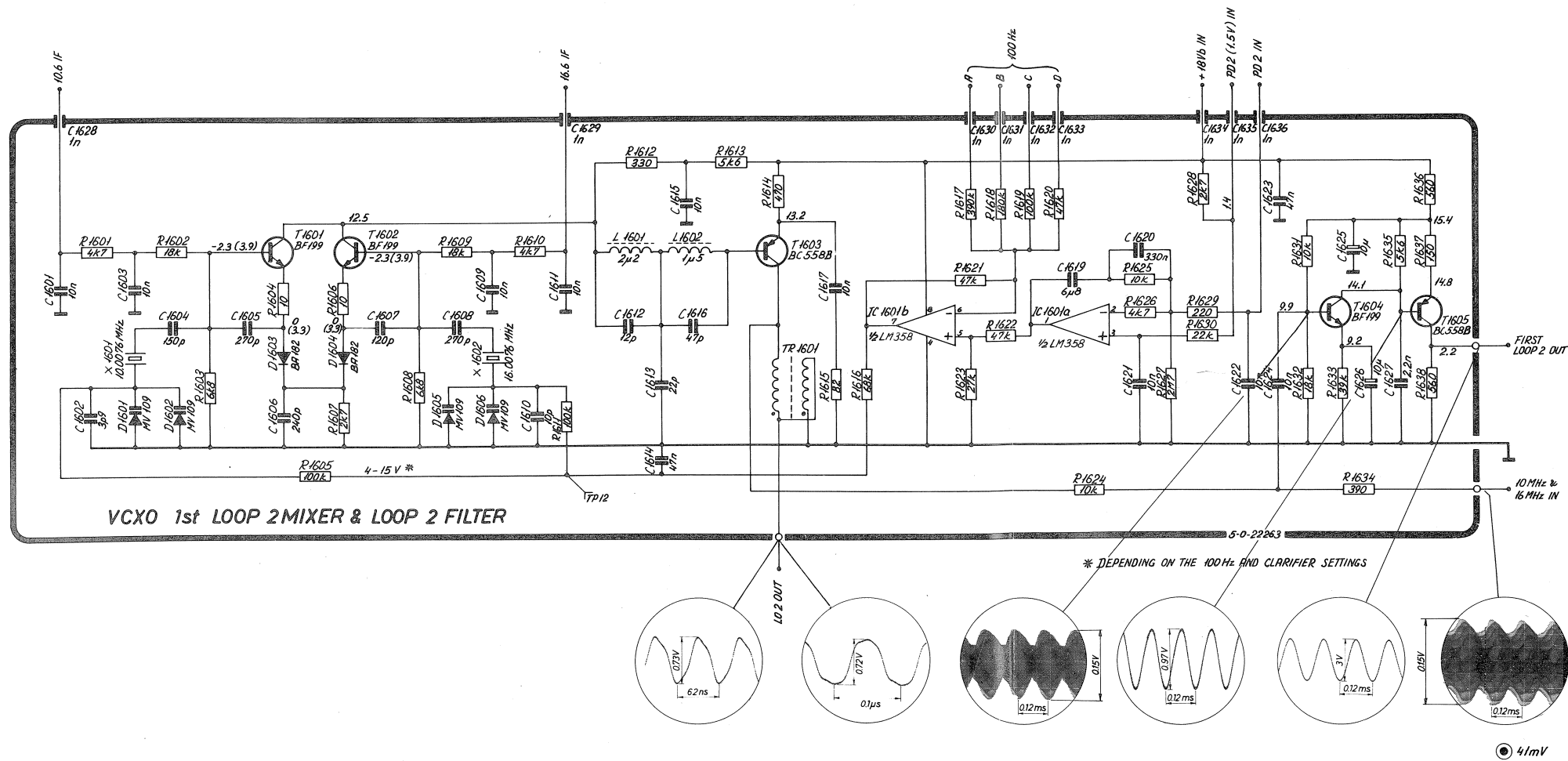
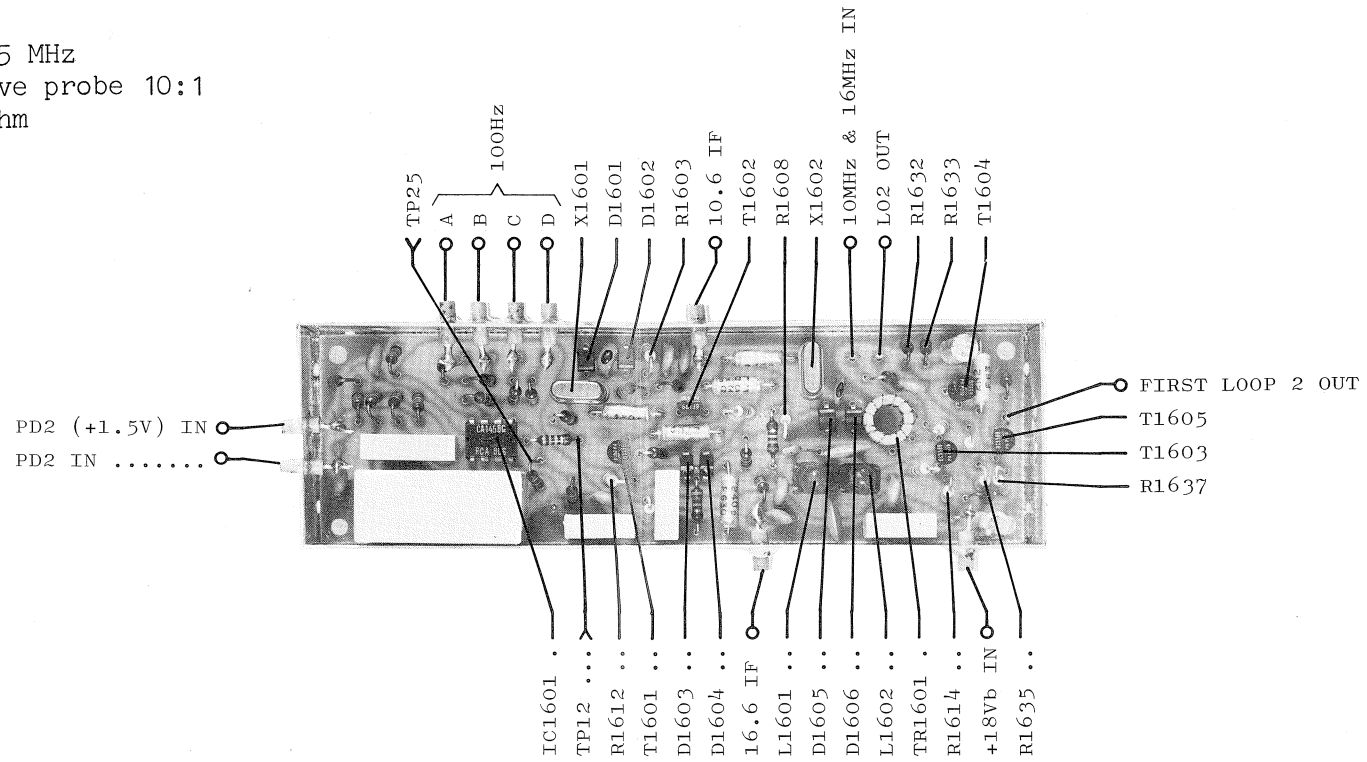
The outputs from the VCXO's are fed to the low pass filter consisting of L1609, L1610, C1612, C1613 and C1616, and then to the buffer amplifier T1603 and out via the impedance step down transformer TR1601 to the 2nd mixer located at the 1st AND 2nd MIXER circuit board. A portion of the oscillator signal is fed to the first loop 2 mixer via R1624.

FIRST LOOP 2 MIXER

As mentioned above the VCXO signal is fed into the base of mixer transistor T1604, together with the 10 MHz and 16 MHz signals from the DIVIDER UNIT. Because of the big difference between the mixer frequencies and the output frequency the only filtering needed to filter out the wanted mixing product is R1635 and C1627. The mixer transistor is feeding into the output amplifier T1605.

TEST CONDITIONS

Frequency setting : 2.0005 MHz
 Oscilloscope input : Passive probe 10:1
 DC voltmeter input : 10 Mohm
 ⊙: Diode probe measurement
 TP: Testpoint
 All voltage statements are typical



CIRCUIT DESCRIPTION CLARIFIER AND 2ND LOOP 2 MIXER R1119 & R1120

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

AF OSCILLATOR

The AF oscillator consists of the transistor T1701 and the tuned circuit L1701, C1702, C1703 and the clarifier control capacitors C2601, C2602 and C2603. The nominal frequency is 7 kHz (clarifier to center pos.).

2nd LOOP 2 MIXER

From the collector of T1701 the signal is fed to the base of the 2nd LOOP 2 MIXER T1702, where it is subtracted from the other injection signal, having a nominal frequency range from 8.1 kHz to 9.0 kHz (clarifier to center pos.).

LOW PASS FILTER

The mixed signal on the collector of T1702 is fed to a sixth order active low pass filter with a cut-off frequency of 3.5 kHz, and thus allows the difference frequency to pass through. The nominal output frequency range is 1.1 kHz - 2.0 kHz. The filter is built-up around IC1701A and IC1701B. The output frequency is fed to the programmable divider on the DIVIDER-UNIT.

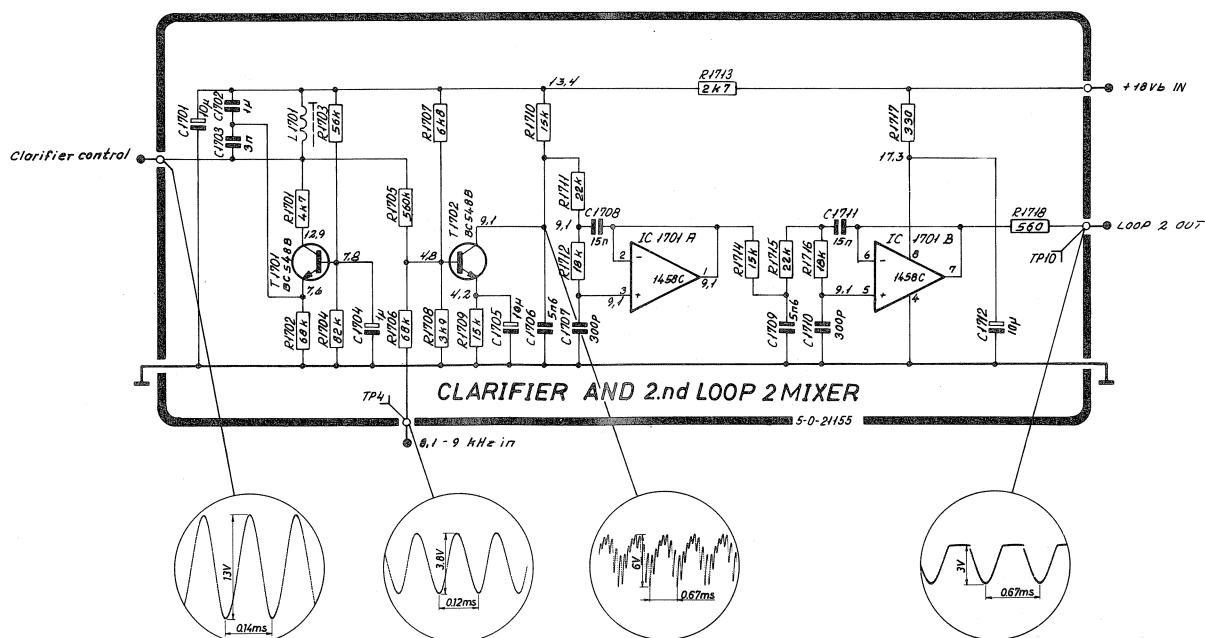
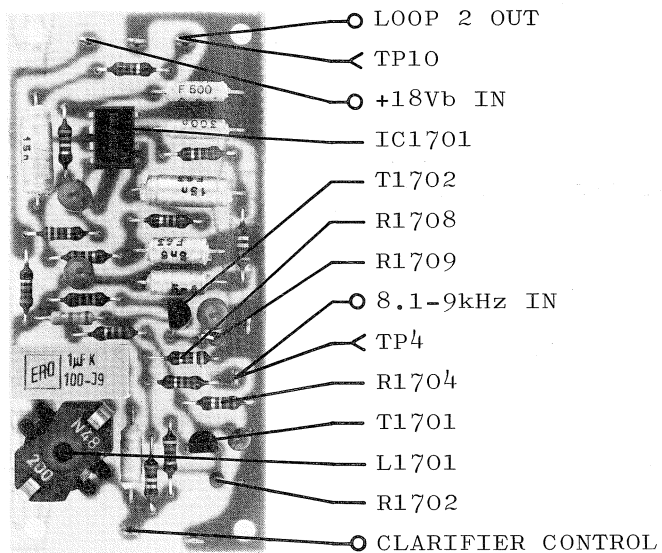
TEST CONDITIONS

Frequency setting : 2.0005 MHz
Oscilloscope input : Passive probe 10:1
DC voltmeter input : 10 Mohm

⊙: Diode probe measurement

TP: Testpoint

All voltage statements are typical



CIRCUIT DESCRIPTION BFO R1120

This unit contains the BFO oscillator, BFO mixer and the strapping terminals for the A1 and A2 modes.

BFO

The 9.4 MHz oscillator is a crystal controlled variocap. tuned Pierce Collpits oscillator.

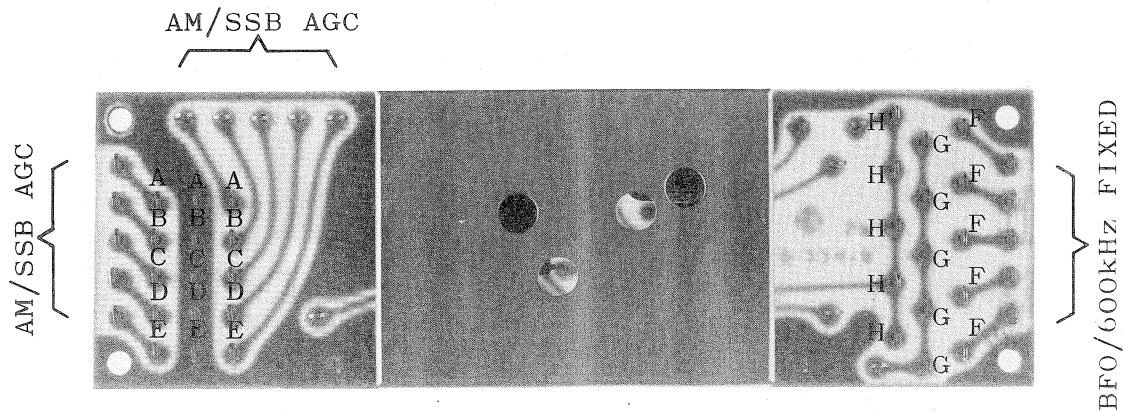
The control voltage for the variocap. is taken from the BFO control R2602.

From the collector of the oscillator transistor T1801 the signal is fed to the mixer T1802.

BFO MIXER

The 9.4 MHz signal from the oscillator T1801 and the 10 MHz signal from the DIVIDER UNIT are mixed in T1802, and the difference is filtered out in the low pass filter consisting of L1801, C1807 and C1809 and fed to the IF AMPLIFIER DETECTOR AND AGC CIRCUIT BOARD.

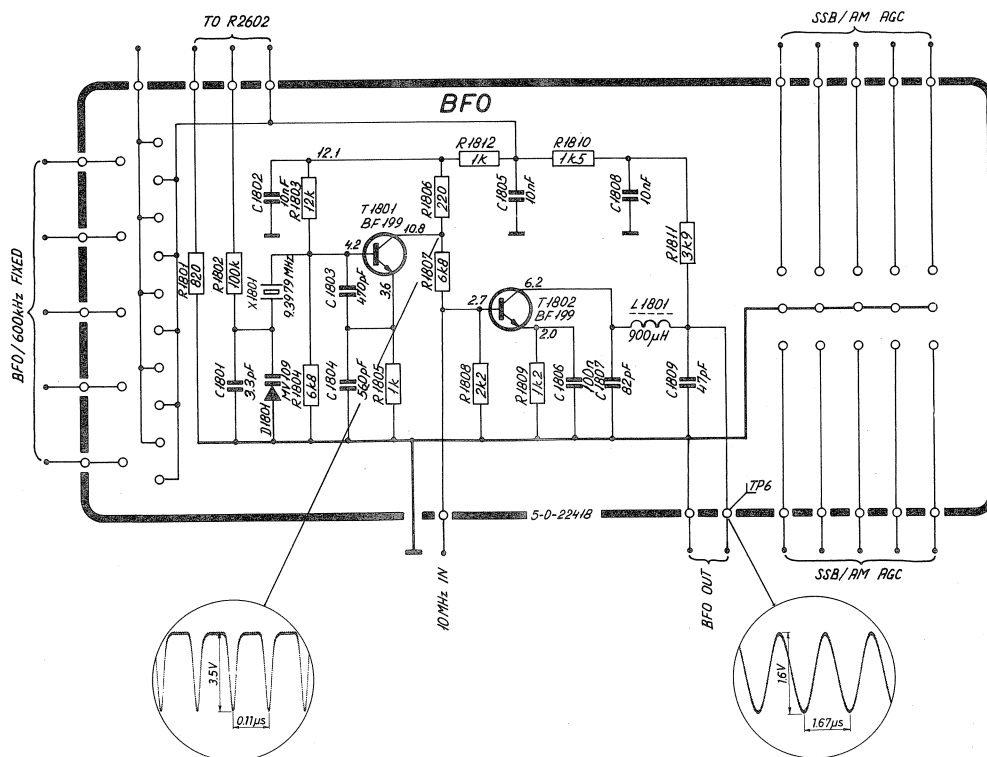
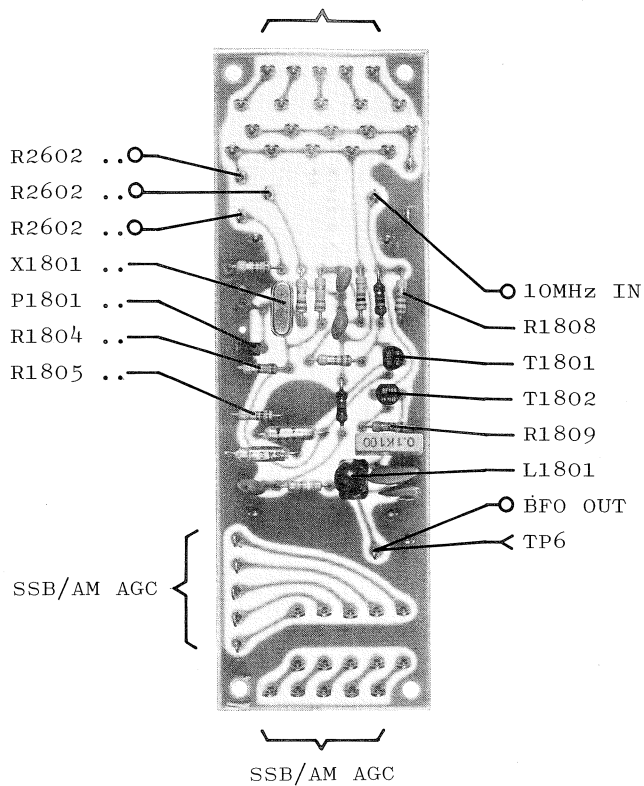
STRAPPING TERMINALS



AM/SSB AGC: Are the three identical letters connected, AM AGC is chosen, if no connection, SSB AGC is chosen.

BFO/600 kHz fix: Is F connected to G, 600 kHz fix is chosen, is F connected to H, BFO is chosen.

BFO/600kHz FIX.





IC2601

25

K IN FOR BAND SHIFT

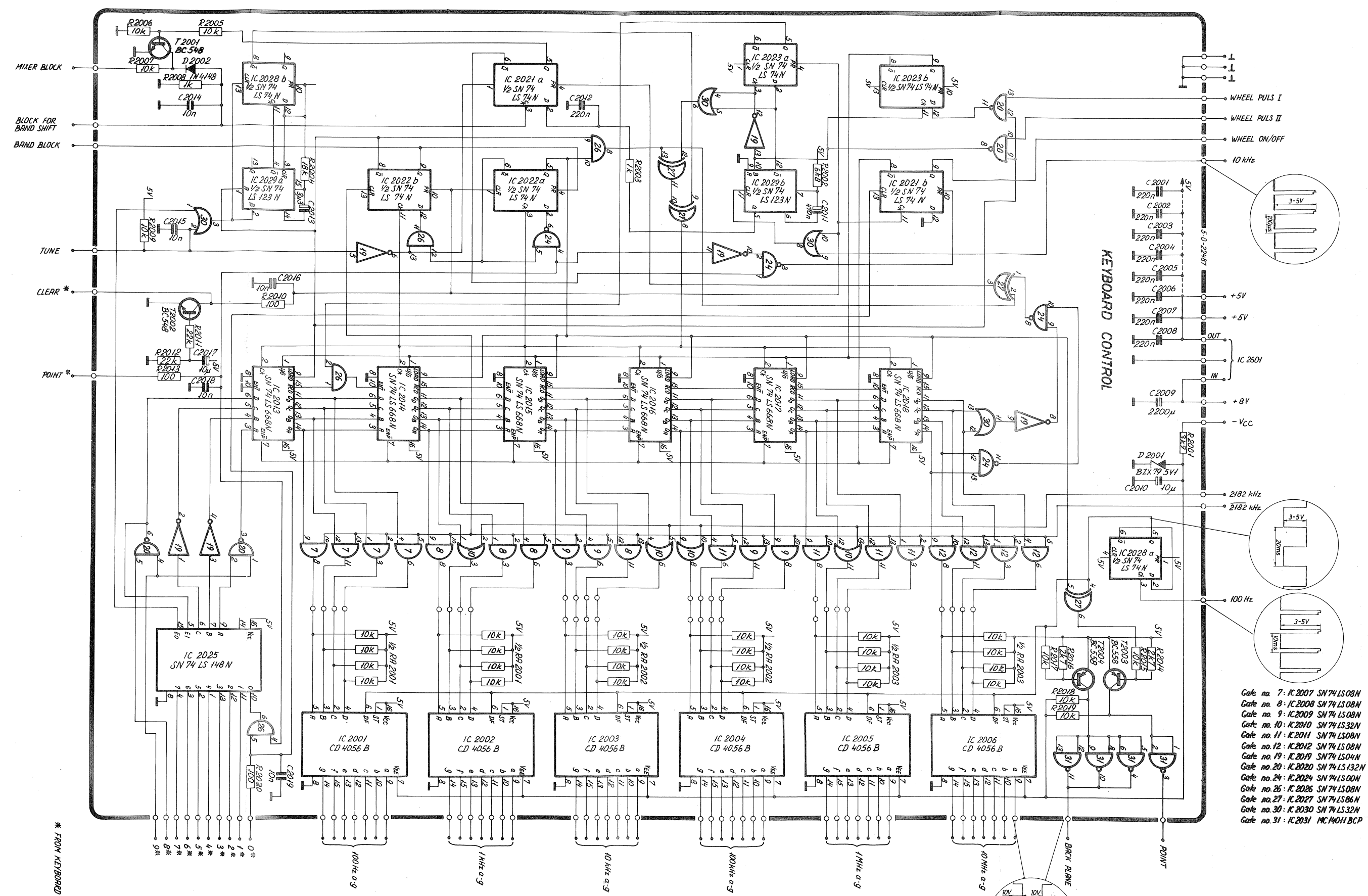
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13

07

01

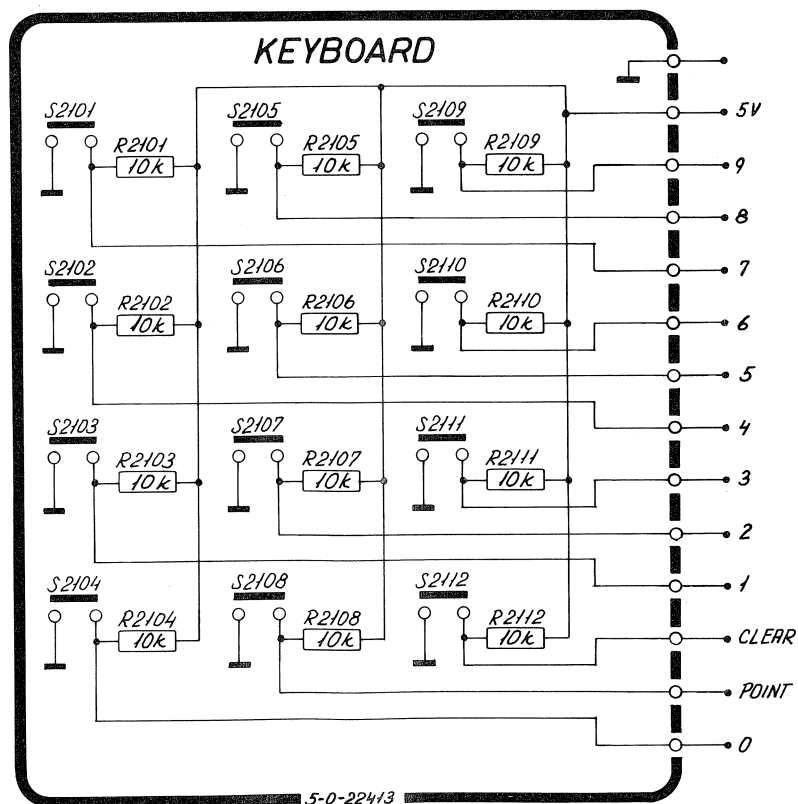
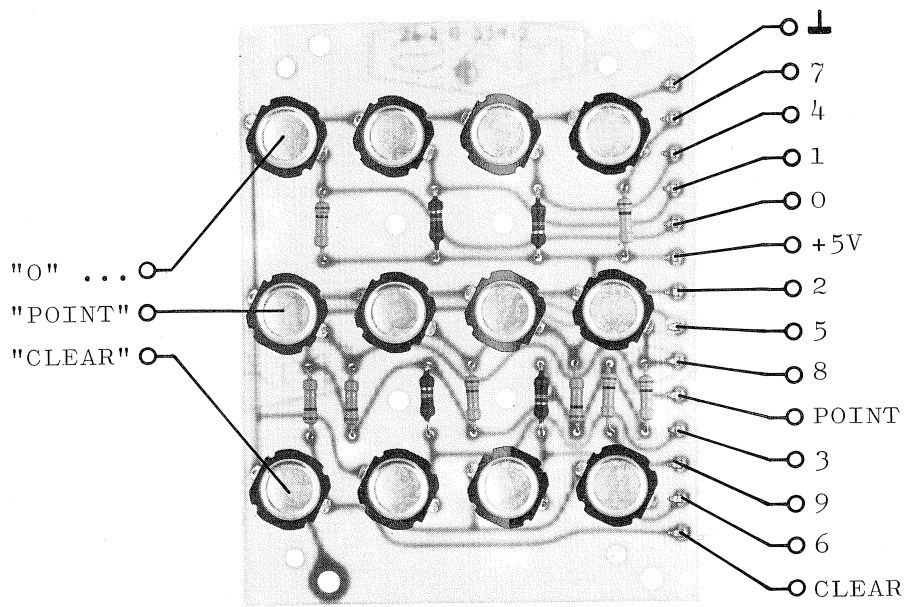
Hz

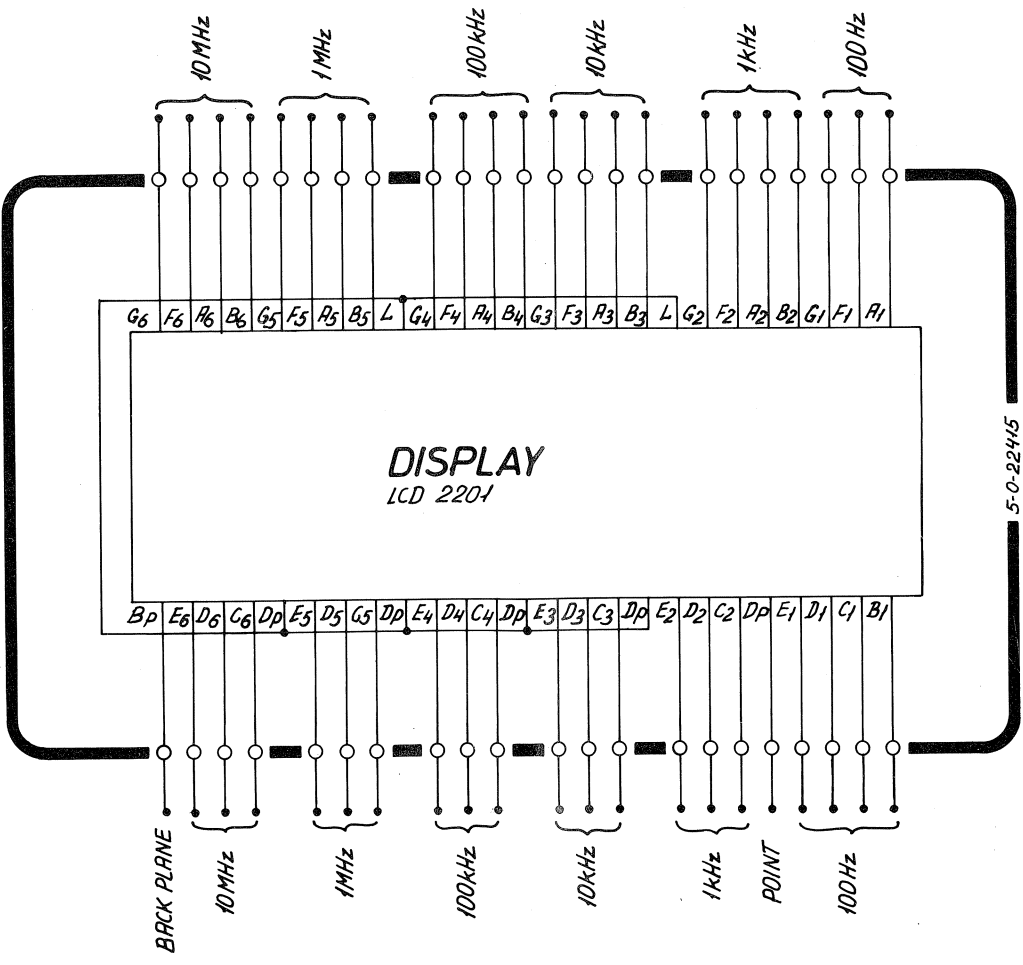
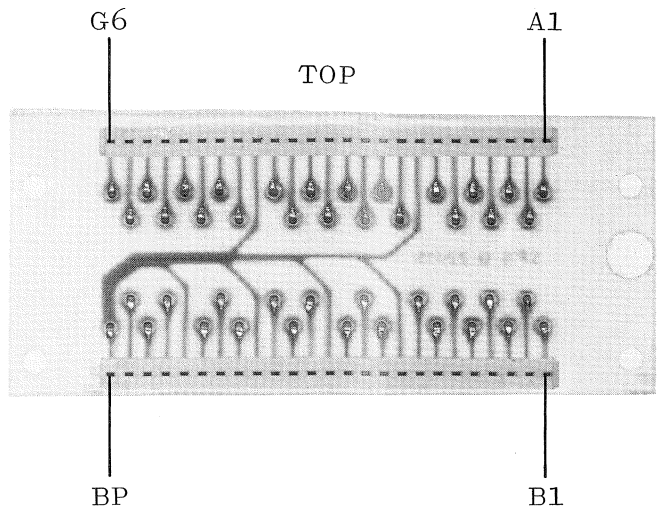
Hz

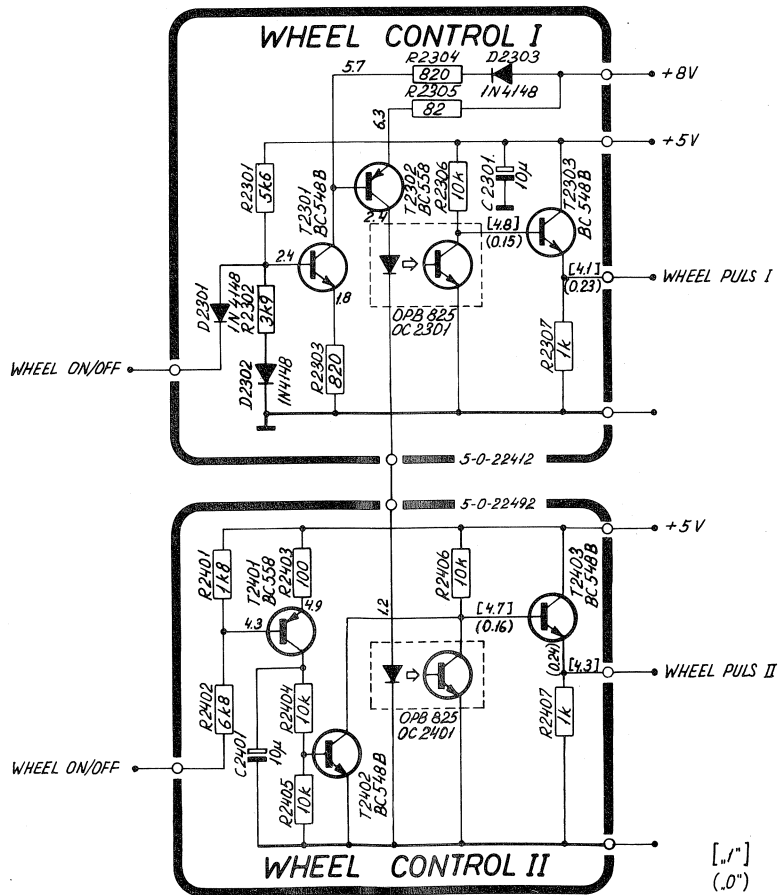
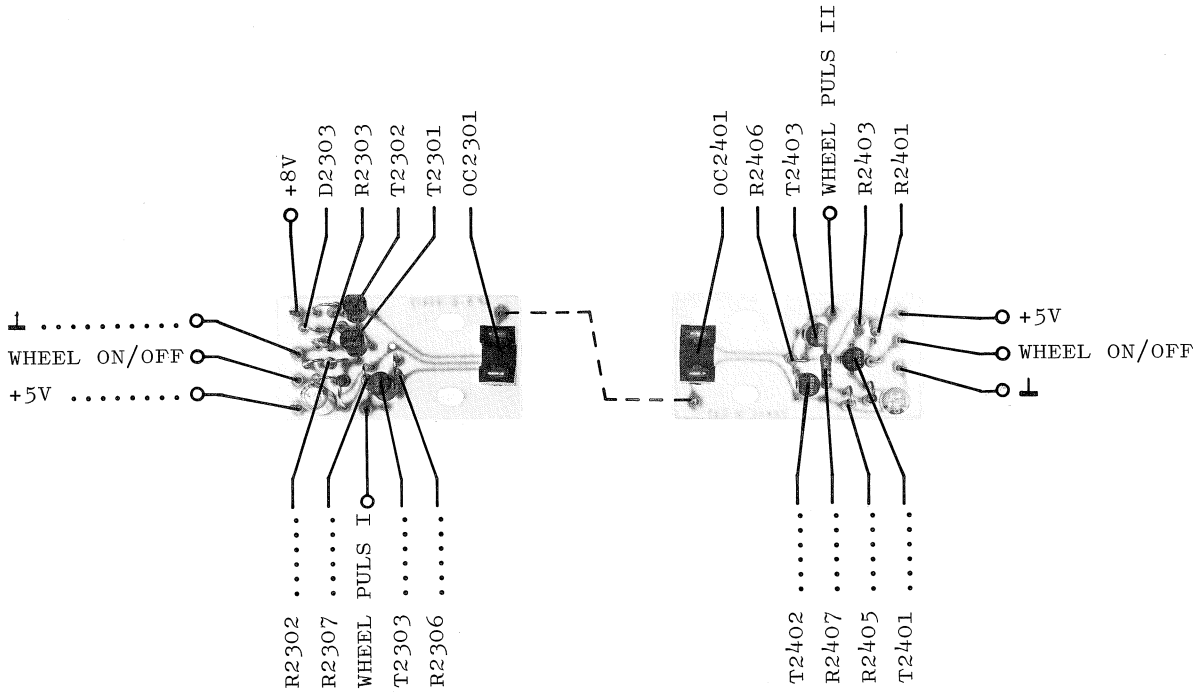


* FROM KEYBOARD

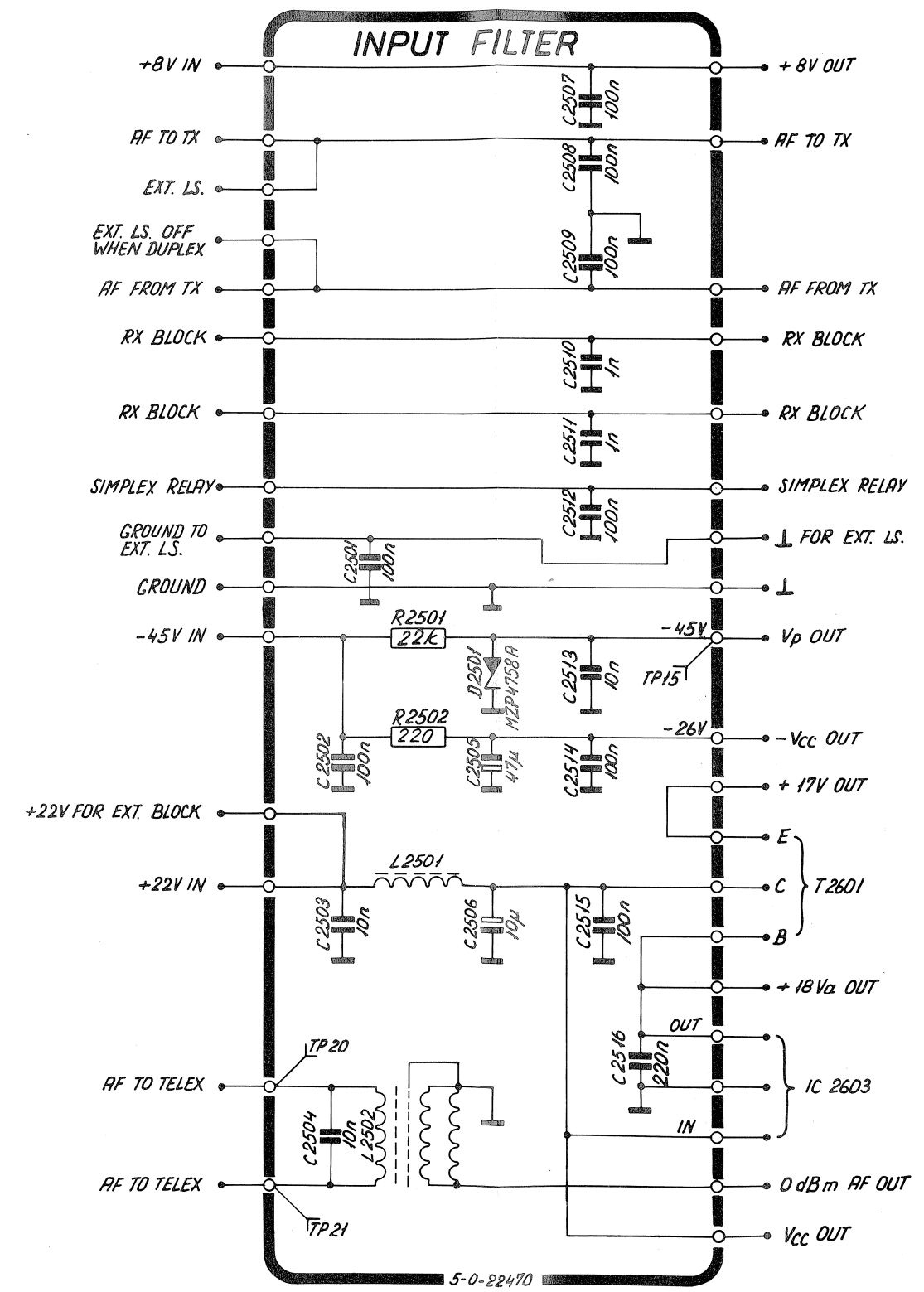
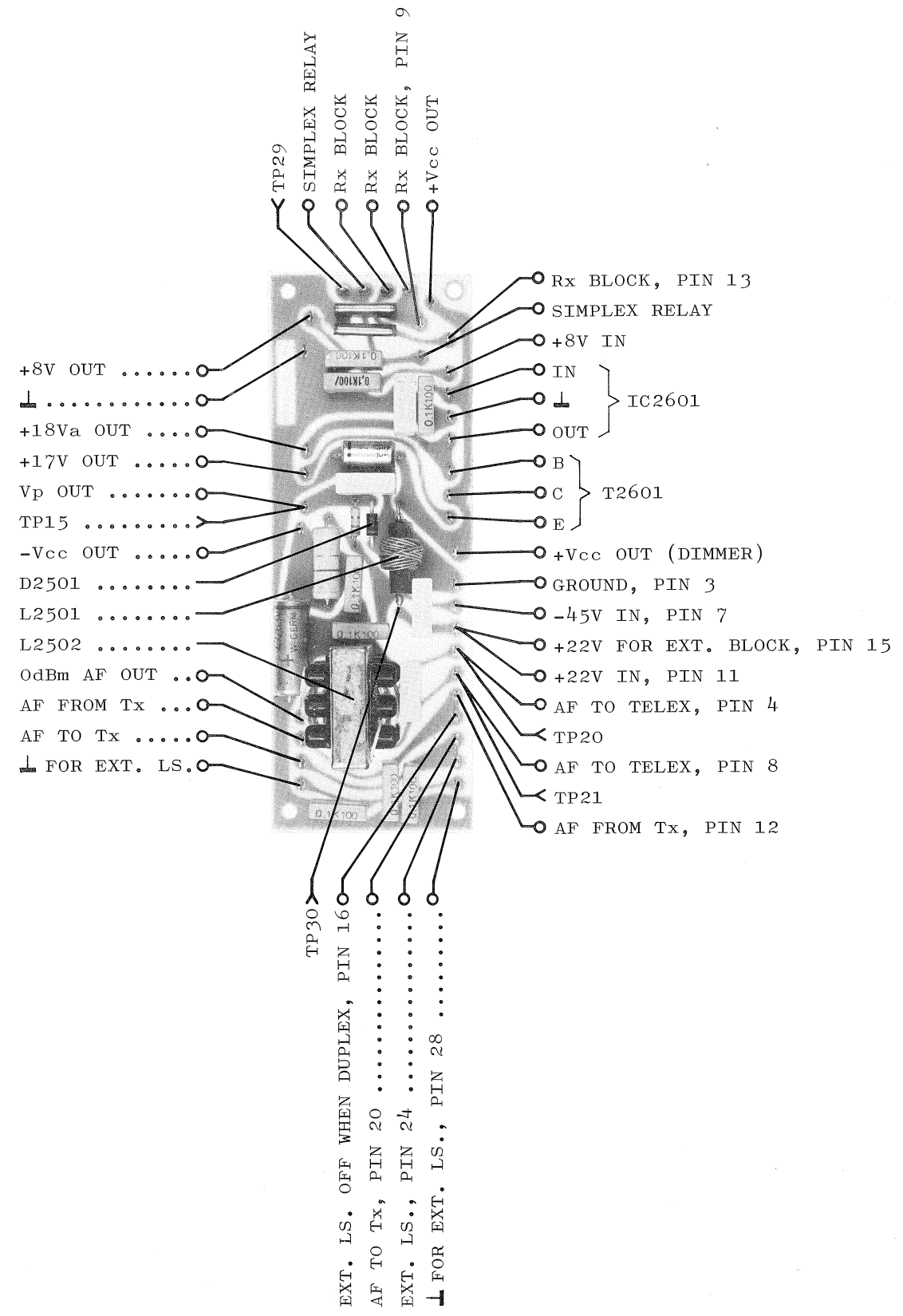
- Gate no. 7: IC 2007 SN 74 LS 08 N
- Gate no. 8: IC 2008 SN 74 LS 08 N
- Gate no. 9: IC 2009 SN 74 LS 08 N
- Gate no. 10: IC 2010 SN 74 LS 32 N
- Gate no. 11: IC 2011 SN 74 LS 08 N
- Gate no. 12: IC 2012 SN 74 LS 08 N
- Gate no. 19: IC 2019 SN 74 LS 04 N
- Gate no. 20: IC 2020 SN 74 LS 32 N
- Gate no. 24: IC 2024 SN 74 LS 00 N
- Gate no. 26: IC 2026 SN 74 LS 08 N
- Gate no. 27: IC 2027 SN 74 LS 86 N
- Gate no. 30: IC 2030 SN 74 LS 32 N
- Gate no. 31: IC 2031 MC 14011 BCP







[.1"]
(.0")



Symbol	Description			Manufact.		
C101	Capacitor polyester	100 nF	+20%	100V	Philips	2222 344 24104
C102	Capacitor polyester	100 nF	+20%	100V	Philips	2222 344 24104
C103	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C104	Capacitor polyester	100 nF	+20%	100V	Philips	2222 344 24104
C105	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C106	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C107	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C108	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C109	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C110	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C111	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C112	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C113	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
D101	Diode, silicon				Philips	BAV21
D102	Diode, zener	8.2V	+5%	0.4W	Philips	BZX79 C8V2
D103	Diode, germanium				Philips	AA143
D104	Diode, silicon				Philips	1N4148
R101	Resistor	100Kohm	+5%	0.33W	Philips	2322 211 13104
R102	Resistor	220 ohm	+5%	0.33W	Philips	2322 211 13221
R103	Resistor	12Kohm	+5%	0.33W	Philips	2322 211 13123
R104	Resistor	15 ohm	+5%	2.5W	Philips	2322 192 31509
R105	Resistor	220 ohm	+5%	0.33W	Philips	2322 211 13221
R106	Resistor	1Kohm	+5%	0.33W	Philips	2322 211 13102
R107	Resistor	220 ohm	+5%	0.33W	Philips	2322 211 13221
RE101	Relay				ITT	LZ24H
RE102	Relay				NATIONAL	NF2E-12V
RE103	Relay				CLAIRE	PRME 1500 3A
RE104	Relay				CLAIRE	PRME 1500 3A
RE105	Relay				SIEMENS	V23040-A0003-B101
RE106	Relay				SIEMENS	V23040-A0003-B101
RE107	Relay				SIEMENS	V23040-A0003-B101
RE108	Relay				SIEMENS	V23040-A0003-B101
RE109	Relay				SIEMENS	V23040-A0003-B101
RE110	Relay				SIEMENS	V23040-A0003-B101
RE111	Relay				SIEMENS	V23040-A0003-B101
RE112	Relay				SIEMENS	V23040-A0003-B101
T101	Transistor				Philips	BC558

Symbol	Description	Manufact.	
C201	Capacitor polyester 100 nF $\pm 20\%$	100V Philips	2222 344 24104
C202	Capacitor polyester 100 nF $\pm 20\%$	100V Philips	2222 344 24104
C203	Capacitor polystyrene 110 pF $\pm 5\%$	630V Philips	2222 427 21101
C204	Capacitor polystyrene 110 pF $\pm 5\%$	630V Philips	2222 427 21101
C205	Capacitor polystyrene 180 pF $\pm 5\%$	630V Philips	2222 427 21801
C206	Capacitor polystyrene 180 pF $\pm 5\%$	630V Philips	2222 427 21801
C207	Capacitor polystyrene 4n7 $\pm 5\%$	160V Philips	2222 425 24702
C208	Capacitor polystyrene 4n7 $\pm 5\%$	160V Philips	2222 425 24702
C209	Capacitor trimmer 10-150 pF polycarbonat	100V DAU	109.6601.150
C210	Capacitor trimmer 8- 80 pF polycarbonat	100V DAU	109.4601.080
C211	Capacitor polyester 22 nF $\pm 20\%$	400V Philips	2222 344 54223
C212	Capacitor polyester 220 nF $\pm 20\%$	100V Philips	2222 344 24224
C213	Capacitor polyester 220 nF $\pm 20\%$	100V Philips	2222 344 24224
C214	Capacitor polyester 220 nF $\pm 20\%$	100V Philips	2222 344 24224
C215	Capacitor polyester 220 nF $\pm 20\%$	100V Philips	2222 344 24224
C216	Capacitor polystyrene 3 nF $\pm 5\%$	160V Philips	2222 425 23002
C217	Capacitor polystyrene 9 n1 $\pm 5\%$	160V Philips	2222 425 29102
C218	Capacitor polystyrene 3 nF $\pm 5\%$	160V Philips	2222 425 23002
C219	Capacitor trimmer 4-38 pF TEFLON	100V DAU	109.3901.038
C220	Capacitor polystyrene 300 pF $\pm 5\%$	630V Philips	2222 427 23001
C221	Capacitor polystyrene 82 pF $\pm 5\%$	630V Philips	2222 427 28209
C222	Capacitor polyester 10 nF $\pm 10\%$	100V Philips	2222 344 55103
C223	Capacitor polystyrene 1 nF $\pm 5\%$	160V Philips	2222 425 21002
C224	Capacitor polyester 100 nF $\pm 20\%$	100V Philips	2222 344 24104
C225	Capacitor polystyrene 120 pF $\pm 5\%$	630V Philips	2222 427 21201
C226	Capacitor polystyrene 1n1 $\pm 5\%$	160V Philips	2222 425 21102
C227	Not used		
C228	Capacitor polyester 1 uF $\pm 20\%$	100V Philips	2222 344 24105
C229	Capacitor polyester 10 nF $\pm 20\%$	400V Philips	2222 344 54103
D201	Diode zener 4.7V $\pm 10\%$	5W MOTOROLA	1N5337A
D202	Diode zener 4.7V $\pm 10\%$	5W MOTOROLA	1N5337A
D203	Diode silicon	Philips	1N4148
D204	Diode silicon	Philips	1N4148
D205	Diode silicon	Philips	1N4148
D206	Diode silicon	Philips	1N4148
D207	Diode switch	Philips	BA182
D208	Diode switch	Philips	BA182
D209	Diode switch	Philips	BA182
D210	Diode silicon	Philips	1N4148
D211	Diode silicon	Philips	1N4148

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
D212	Diode silicon			Motorola	IN4002
D213	Diode silicon			Motorola	IN4002
L201	Coil			S.P.	TL286
L202	Coil			S.P.	TL287
L203	Coil	330 uH <u>+5 %</u>		Kaschke	Type 200
L204	Coil	330 uH <u>+5 %</u>		Kaschke	Type 200
L205	Coil			S.P.	TL192
L206	Coil	33 uH <u>+5 %</u>		Kaschke	Type 200
L207	Coil	33 uH <u>+5 %</u>		Kaschke	Type 200
L208	Coil			S.P.	TL069
L209	Coil			S.P.	TL192
R201	Resistor	5.6 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13562
R202	Resistor	39 ohm <u>+5 %</u>	1.15W	Philips	2322 214 13399
R203	Resistor	330 ohm <u>+5 %</u>	0.33W	Philips	2322 211 13331
R204	Resistor	5.6 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13562
R205	Resistor	68 ohm <u>+5 %</u>	0.33W	Philips	2322 211 13689
R206	Resistor	180 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13184
R207	Resistor	120 ohm <u>+5 %</u>	0.33W	Philips	2322 211 13121
R208	Resistor	3.3 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13332
R209	Resistor	3.3 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13332
R210	Resistor	10 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13103
R211	Resistor	1 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13102
R212	Resistor	100 ohm <u>+5 %</u>	0.33W	Philips	2322 211 13101
R213	Resistor	22 kohm <u>+5 %</u>	0.33W	Philips	2322 211 13223

Symbol	Description	Manufact.	
C301	Capacitor trimmer 8/125 pF TEFLON	100V DAU	116.4901.120
C302	Capacitor polyester 10 uF $\pm 20\%$	400V Philips	2222 344 54103
C303	Capacitor ceramic 15 pF ± 0.25 pF N150	400V Ferroperm	9/0116.9
C304	Capacitor polystyrene 820pF $\pm 2\%$	250V Philips	2222 426 38201
C305	Capacitor polystyrene 110pF $\pm 2\%$	630V Philips	2222 427 31101
C306	Capacitor polystyrene 240pF $\pm 2\%$	630V Philips	2222 427 32401
C307	Capacitor polystyrene 150pF $\pm 2\%$	630V Philips	2222 427 31501
C308	Capacitor ceramic 5p6 ± 0.25 pF NPO	400V Ferroperm	9/0112.9
C309	Capacitor ceramic 4p7 ± 0.25 pF NPO	400V Ferroperm	9/0112.9
C310	Capacitor polystyrene 220pF $\pm 2\%$	630V Philips	2222 427 32201
C311	Capacitor polystyrene 300pF $\pm 2\%$	630V Philips	2222 427 33001
C312	Capacitor trimmer 6/45pF TEFLON	100V DAU	107.5901.045
C313	Capacitor trimmer 6/45pF TEFLON	100V DAU	107.5901.045
C314	Capacitor ceramic 4p7 ± 0.25 pF NPO	400V Ferroperm	9/0112.9
C315	Capacitor ceramic 5p6 ± 0.25 pF NPO	400V Ferroperm	9/0112.9
C316	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24104
C317	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24104
C318	Capacitor trimmer 6/45pF TEFLON	100V DAU	107.5901.045
C319	Capacitor trimmer 6/45pF TEFLON	100V DAU	107.5901.045
C320	Capacitor polystyrene 330pF $\pm 2\%$	630V Philips	2222 427 33301
C321	Capacitor polystyrene 390pF $\pm 2\%$	630V Philips	2222 427 33901
C322	Capacitor polystyrene 620pF $\pm 2\%$	250V Philips	2222 426 35201
C323	Capacitor polystyrene 1n6 $\pm 2\%$	250V Philips	2222 426 31602
D301	Diode silicon	Philips	1N4148
D302	Diode silicon	Philips	1N4148
D303	Diode silicon	Philips	1N4148
D304	Diode silicon	Philips	1N4148
FP301	Ferrite bead 4B1	Philips	4322 020 34420
L301	Coil	S.P.	TL261
L302	Coil	S.P.	TL288
L303	Coil	S.P.	TL261
L304	Coil	S.P.	TL288
L305	Coil	S.P.	TL288
L303	Coil	S.P.	TL261
R301	Resistor 22 ohm $\pm 5\%$	0.33W Philips	2322 211 13229
R302	Resistor 56Kohm $\pm 5\%$	0.33W Philips	2322 106 33563
R303	Resistor 150Kohm $\pm 5\%$	0.33W Philips	2322 106 33154
R304	Resistor 56Kohm $\pm 5\%$	0.33W Philips	2322 106 33563

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
R305	Resistor 150Kohm \pm 5%	0.33W Philips	2322 211 13154
R306	Resistor 56Kohm \pm 5%	0.33W Philips	2322 211 13563
R307	Resistor 10Kohm \pm 5%	0.33W Philips	2322 211 13103
R308	Resistor 10Kohm \pm 5%	0.33W Philips	2322 211 13103
R309	Resistor 120 ohm \pm 5%	0.33W Philips	2322 106 33121

Symbol	Description	Manufact.	
C401	Capacitor polyester 10uF \pm 20% 400V	Philips	2222 344 54103
C402	Capacitor polystyrene 390pF \pm 2% 250V	Philips	2322 426 33901
C403	Capacitor polystyrene 91pF \pm 2% 630V	Philips	2322 427 39109
C404	Capacitor ceramic 24pF \pm 5% N150 400V	Ferroperm	9/0116.9
C405	Capacitor polystyrene 62pF \pm 2% 630V	Philips	2222 427 36209
C406	Capacitor ceramic 27pF \pm 5% N150 400V	Ferroperm	9/0116.9
C407	Capacitor polystyrene 82pF \pm 2% 630V	Philips	2222 427 38209
C408	Capacitor trimmer 2/18pF Teflon 100V	DAU	107.2901.018
C409	Capacitor ceramic 3pF \pm 0.25pF NPO 400V	Ferroperm	9/0112.9
C410	Capacitor ceramic 1p5 \pm 0.25pF NPO 250V	Ferroperm	9/0112.9
C411	Capacitor polystyrene 120pF \pm 2% 630V	Philips	2222 427 31201
C412	Capacitor ceramic 47pF \pm 5% N150 400V	Ferroperm	9/0116.9
C413	Capacitor trimmer 2/30pF Teflon 100V	DAU	107.3901.027
C414	Capacitor trimmer 2/18pF Teflon 100V	DAU	107.2901.018
C415	Capacitor ceramic 3pF \pm 0.25pF NPO 400V	Ferroperm	9/0112.9
C416	Capacitor ceramic 1p5 \pm 0.25pF NPO 250V	Ferroperm	9/0112.9
C417	Capacitor polyester 10nF \pm 20% 400V	Philips	2222 344 54103
C418	Capacitor trimmer 2/30pF Teflon 100V	DAU	107.3901.027
C419	Capacitor polyester 10nF \pm 20% 400V	Philips	2222 344 54103
C420	Capacitor polystyrene 91pF \pm 2% 630V	Philips	2222 427 39109
C421	Capacitor polystyrene 200pF \pm 2% 630V	Philips	2222 427 32001
C422	Capacitor polystyrene 130pF \pm 2% 630V	Philips	2222 427 31301
C423	Capacitor polystyrene 270pF \pm 2% 630V	Philips	2222 427 32701
D401	Diode silicon	Philips	1N4148
D402	Diode silicon	Philips	1N4148
D403	Diode silicon	Philips	1N4148
D404	Diode silicon	Philips	1N4148
D405	Diode switch	Philips	BA182
FP401	Ferrite bead 4B1	Philips	4322 020 34420
L401	Coil	S.P.	TL289
L402	Coil	S.P.	TL288
L403	Coil	S.P.	TL288
L404	Coil	S.P.	TL289
L405	Coil	S.P.	TL288
L406	Coil	S.P.	TL289

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
R401	Resistor	22 ohm \pm 5%	0.33W	Philips	2322 211 13229
R402	Resistor	47Kohm \pm 5%	0.33W	Philips	2322 106 33473
R403	Not used				
R404	Not used				
R405	Resistor	82Kohm \pm 5%	0.33W	Philips	2322 211 13823
R406	Resistor	10Kohm \pm 5%	0.33W	Philips	2322 211 13103
R407	Resistor	10Kohm \pm 5%	0.33W	Philips	2322 211 13103
R408	Resistor	100Kohm \pm 5%	0.33W	Philips	2322 106 33104

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
C501	Capacitor ceramic	0.82pF \pm 0.25pF	250V	Ferroperm	9/0110.9
C502	Capacitor ceramic	0.82pF \pm 0.25pF	250V	Ferroperm	9/0110.9
C503	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C504	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C505	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C506	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C507	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C508	Capacitor polystyrene	56pF \pm 2%	630V	Philips	2222 427 35609
C509	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C510	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C511	Capacitor trimmer	6/45 Teflon	100V	DAU	107.5901.045
C512	Capacitor trimmer	6/45 Teflon	100V	DAU	107.5901.045
C513	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C514	Capacitor ceramic	4p7 \pm 0.25pF	400V	Ferroperm	9/0112.9
C515	Capacitor ceramic	6p8 \pm 0.25pF	400V	Ferroperm	9/0112.9
C516	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C517	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C518	Capacitor ceramic	56pF \pm 5%N150	1000V	Ferroperm	9/0116.9
C519	Capacitor ceramic	39pF \pm 5%	400V	Ferroperm	9/0116.9
C520	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C521	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C522	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C523	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C524	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C525	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C526	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C527	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C528	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C529	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C530	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C531	Capacitor ceramic	10nF-20/+80%	50V	KCK	HE70SJYF 103Z
C532	Capacitor ceramic	39pF \pm 5%	400V	Ferroperm	9/0116.9
D501	Diode switch			Philips	BA182
D502	Diode switch			Philips	BA182
D503	Diode switch			Philips	BA182
D504	Diode switch			Philips	BA182
D505	Diode switch			Philips	BA182
D506	Diode switch			Philips	BA182
D507	Diode switch			Philips	BA182

Symbol	Description	Manufact.	
D508	Diode silicon	Philips	1N4148
D509	Diode silicon	Philips	1N4148
D510	Diode switch	Philips	BA182
D511	Diode switch	Philips	BA182
D512	Diode switch	Philips	BA182
D513	Diode switch	Philips	BA182
D514	Diode switch	Philips	BA182
D515	Diode switch	Philips	BA182
D516	Diode switch	Philips	BA182
D517	Diode switch	Philips	BA182
D518	Diode silicon	Philips	1N4148
FL501	Crystal filter 10.6085 MHz	S.P.	C1008
FL502	Crystal filter 16.6085 MHz	S.P.	C1014
FP501	Ferrite bead 4B1	Philips	4322 020 34420
FP502	Ferrite bead 4B1	Philips	4322 020 34420
L501	Coil 33uH $\pm 5\%$	Kaschke	type 200
L502	Coil	S.P.	TL290
L503	Coil	S.P.	TL273
M501	Mixer	S.P.	C1021
R501	Resistor	100 ohm $\pm 5\%$	0.33W Philips 2322 211 13101
R502	Resistor	100 ohm $\pm 5\%$	0.33W Philips 2322 211 13101
R503	Resistor	4K7 ohm $\pm 5\%$	0.33W Philips 2322 211 13472
R504	Resistor	4K7 ohm $\pm 5\%$	0.33W Philips 2322 211 13472
R505	Resistor	4K7 ohm $\pm 5\%$	0.33W Philips 2322 211 13472
R506	Preset potmeter	4K7 ohm $\pm 20\%$	0.3 W Noble IM8KV2-1S
R507	Resistor	100 ohm $\pm 5\%$	0.33W Philips 2322 211 13101
R508	Resistor	100 ohm $\pm 5\%$	0.33W Philips 2322 211 13101
R509	Resistor	12kohm $\pm 5\%$	0.33W Philips 2322 211 13123
R510	Resistor	22kohm $\pm 5\%$	0.33W Philips 2322 211 13223
R511	Resistor	10kohm $\pm 5\%$	0.33W Philips 2322 211 13103
R512	Resistor	8K2 ohm $\pm 5\%$	0.33W Philips 2322 211 13822
R513	Resistor	2K2 ohm $\pm 5\%$	0.33W Philips 2322 211 13222
R514	Resistor	2K2 ohm $\pm 5\%$	0.33W Philips 2322 211 13222
R515	Resistor	4K7 ohm $\pm 5\%$	0.33W Philips 2322 211 13472
R516	Resistor	1K2 ohm $\pm 5\%$	0.33W Philips 2322 211 13122
R516	Resistor	4K7 ohm $\pm 5\%$	0.33W Philips 2322 211 13472

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
R518	Resistor	1K2 ohm \pm 5%	0.33W	Philips	2322 211 13122
R519	Resistor	3K3 ohm \pm 5%	0.33W	Philips	2322 211 13332
R520	Resistor	4K7 ohm \pm 5%	0.33W	Philips	2322 211 13472
R521	Resistor	4K7 ohm \pm 5%	0.33W	Philips	2322 211 13472
R522	Resistor	1Kohm \pm 5%	0.33W	Philips	2322 211 13102
R523	Resistor	3K3 ohm \pm 5%	0.33W	Philips	2322 211 13332
R524	Resistor	470 ohm \pm 5%	0.33W	Philips	2322 211 13471
R525	Resistor	4K7 ohm \pm 5%	0.33W	Philips	2322 211 13472
R526	Resistor	5K6 ohm \pm 5%	0.33W	Philips	2322 211 13562
R527	Resistor	2K7 ohm \pm 5%	0.33W	Philips	2322 211 13272
R528	Resistor	1Kohm \pm 5%	0.33W	Philips	2322 211 13102
R529	Resistor	3K3 ohm \pm 5%	0.33W	Philips	2322 211 13332
R530	Resistor	18Kohm \pm 5%	0.33W	Philips	2322 211 13183
R531	Resistor	3K3 ohm \pm 5%	0.33W	Philips	2322 211 13332
R532	Resistor	220 ohm \pm 5%	0.33W	Philips	2322 211 13221
R533	Resistor	12Kohm \pm 5%	0.33W	Philips	2322 211 13123
T501	Transistor			Philips	BF256B
T502	Transistor			Philips	BF256B
T503	Transistor			Philips	BF199
TR501	Transformer			S.P.	TL272
TR502	Transformer			S.P.	TL269

Symbol	Description	Manufact.	
C601	Capacitor electrolytic 10uF \pm 20%	35V ERO	EK100AA210F
C602	Capacitor polystyrene 1nF \pm 2%	160V Philips	2222 425 31002
C603	Capacitor ceramic 8p2 \pm 0.25pF	400V Ferroperm	9/0112.9
C604	Capacitor polystyrene 1nF \pm 2%	500V Rifa	PFE216
C605	Capacitor ceramic 5p6 \pm 0.25pF	400V Ferroperm	9/0112.9
C606	Capacitor polystyrene 1nF \pm 2%	500V Rifa	PFE216
C607	Capacitor ceramic 4p7 \pm 0.25pF	400V Ferroperm	9/0112.9
C608	Capacitor polystyrene 1nF \pm 2%	500V Rifa	PFE216
C609	Capacitor ceramic 8p2 \pm 0.25pF	400V Ferroperm	9/0112.9
C610	Capacitor polystyrene 1nF \pm 2%	500V Rifa	PFE216
C611	Capacitor polystyrene 100nF \pm 20%	100V Philips	2222 344 24104
C612	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C613	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C614	Capacitor electrolytic 10uF \pm 20%	35V ERO	EK100AA210F
C615	Capacitor polystyrene 3n9 \pm 2%	160V Philips	2222 425 33902
C616	Capacitor polystyrene 3n3 \pm 2%	160V Philips	2222 425 33302
C617	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C618	Capacitor polyester 100nF \pm 20%	100V Philips	2222 344 24104
C619	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C620	Capacitor electrolytic 10uF \pm 20%	35V ERO	EK100AA210F
C621	Capacitor polystyrene 3n9 \pm 2%	160V Philips	2222 425 33902
C622	Capacitor polystyrene 3n3 \pm 2%	160V Philips	2222 425 33302
C623	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C624	Capacitor polyester 100nF \pm 20%	100V Philips	2222 344 24104
C625	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C626	Capacitor electrolytic 10uF \pm 20%	35V ERO	EK100AA210F
C627	Capacitor polystyrene 3n9 \pm 2%	160V Philips	2222 425 33902
C628	Capacitor polystyrene 3n3 \pm 2%	160V Philips	2222 425 33302
C629	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C630	Capacitor polyester 100nF \pm 20%	100V Philips	2222 344 24104
C631	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C632	Capacitor electrolytic 10uF \pm 20%	35V ERO	EK100AA210F
C633	Capacitor polystyrene 3n9 \pm 2%	160V Philips	2222 425 33902
C634	Capacitor polystyrene 3n3 \pm 2%	160V Philips	2222 425 33302
C635	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C636	Capacitor polyester 100nF \pm 20%	100V Philips	2222 344 24104
C637	Capacitor ceramic 10nF-20/+80%	50V KCK	HE70SJYF 103Z
C638	Capacitor electrolytic 10uF -10/+100%	40V Siemens	B4 1313-A7106V
C639	Capacitor electrolytic 10uF \pm 20%	35V ERO	EK100AA210F
C640	Capacitor polystyrene 3n9 \pm 2%	160V Philips	2222 425 33902

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
C641	Capacitor polystyrene	3n3 \pm 2%	160V	Philips	2222 425 33302
C642	Capacitor ceramic	10nF -20/+80%	50V	KCK	HE70SJYF 103Z
C643	Capacitor polyester	100nF \pm 20%	100V	Philips	2222 344 24104
C644	Capacitor ceramic	10nF -20/+80%	50V	KCK	HE70SJYF 103Z
C645	Capacitor polyester	100nF \pm 20%	100V	Philips	2222 344 24104
C646	Capacitor electrolytic	10uF \pm 20%	35V	ERO	EKI00AA210F
C647	Capacitor polyester	100nF \pm 20%	100V	Philips	2222 344 24104
D601	Diode switch			Philips	BA182
D602	Diode switch			Philips	BA182
D603	Diode switch			Philips	BA182
D604	Diode switch			Philips	BA182
D605	Diode switch			Philips	BA182
D606	Diode switch			Philips	BA182
D607	Diode silicon			Philips	1N4148
FL601	Crystal filter			S.P.	C1002
FL602	Option				
FL603	Crystal filter			S.P.	C1004
FL604	Crystal filter			S.P.	C1005
FL605	Crystal filter			S.P.	C1006
L601	Coil			S.P.	TL276
L602	Coil			S.P.	TL003
L603	Coil			S.P.	TL003
L604	Coil			S.P.	TL003
L605	Coil			S.P.	TL277
L606	Coil			S.P.	TL194
L607	Coil			S.P.	TL194
L608	Coil			S.P.	TL194
L609	Coil			S.P.	TL194
L610	Coil			S.P.	TL194
R601	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391
R602	Resistor	56kohm \pm 5%	0.33W	Philips	2322 211 13563
R603	Resistor	10kohm \pm 5%	0.33W	Philips	2322 211 13103
R604	Resistor	120kohm \pm 5%	0.33W	Philips	2322 211 13124
R605	Resistor	120 ohm \pm 5%	0.33W	Philips	2322 211 13121
R606	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
R607	Resistor	3k9 ohm \pm 5%	0.33W	Philips	2322 211 13392
R608	Resistor	56Kohm \pm 5%	0.33W	Philips	2322 211 13563
R609	Resistor	120Kohm \pm 5%	0.33W	Philips	2322 211 13124
R610	Resistor	120 ohm \pm 5%	0.33W	Philips	2322 211 13121
R611	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391
R612	Resistor	3k9 ohm \pm 5%	0.33W	Philips	2322 211 23392
R613	Resistor	56Kohm \pm 5%	0.33W	Philips	2322 211 13563
R614	Resistor	120Kohm \pm 5%	0.33W	Philips	2322 211 13121
R615	Resistor	120 ohm \pm 5%	0.33W	Philips	2322 211 13121
R616	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391
R617	Resistor	3k9 ohm \pm 5%	0.33W	Philips	2322 211 13392
R618	Resistor	56Kohm \pm 5%	0.33W	Philips	2322 211 13563
R619	Resistor	120Kohm \pm 5%	0.33W	Philips	2322 211 13121
R620	Resistor	120 ohm \pm 5%	0.33W	Philips	2322 211 13121
R621	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391
R622	Resistor	3K9 ohm \pm 5%	0.33W	Philips	2322 211 13392
R623	Resistor	56Kohm \pm 5%	0.33W	Philips	2322 211 13563
R624	Resistor	120Kohm \pm 5%	0.33W	Philips	2322 211 13124
R625	Resistor	120 ohm \pm 5%	0.33W	Philips	2322 211 13121
R626	Resistor	270 ohm \pm 5%	0.33W	Philips	2322 211 13271
R627	Resistor	390 ohm \pm 5%	0.33W	Philips	2322 211 13391
R628	Resistor	3k9 ohm \pm 5%	0.33W	Philips	2322 211 13392
R629	Resistor	56Kohm \pm 5%	0.33W	Philips	2322 211 13563
R630	Resistor	120Kohm \pm 5%	0.33W	Philips	2322 211 13124
R631	Resistor	120 ohm \pm 5%	0.33W	Philips	2322 211 13121
R632	Resistor	1K5 ohm \pm 5%	0.33W	Philips	2322 211 13152
T601	Transistor			Philips	BF256A
T602	Transistor			Philips	BF256A
T603	Transistor			Philips	BF256A
T604	Transistor			Philips	BF256A
T605	Transistor			Philips	BF256A
T606	Transistor			Philips	BF256A

Symbol	Description	Manufact.	
C701	Capacitor electrolytic 10uF +20%	35V ERO	EK100AA210F
C702	Capacitor electrolytic 10uF +20%	35V ERO	EK100AA210F
C703	Capacitor polystyrene 3n9 $\pm 2\%$	160V Philips	2222 425 33902
C704	Capacitor polystyrene 3n3 $\pm 2\%$	160V Philips	2222 425 33302
C705	Capacitor polystyrene 1nF $\pm 2\%$	160V Philips	2222 425 31002
C706	Capacitor ceramic 8p2 $\pm 0.25pF$	400V Ferroperm	9/0112.9
C707	Capacitor polystyrene 1nF $\pm 2\%$	500V Rifa	PFE216
C708	Capacitor ceramic 5p6 $\pm 0.25pF$	400V Ferroperm	9/0112.9
C709	Capacitor polystyrene 1nF $\pm 2\%$	500V Rifa	PFE216
C710	Capacitor ceramic 4p7 $\pm 0.25pF$	400V Ferroperm	9/0112.9
C711	Capacitor polystyrene 1nF $\pm 2\%$	500V Rifa	PFE216
C712	Capacitor ceramic 8p2 $\pm 0.25pF$	400V Ferroperm	9/0112.9
C713	Capacitor polystyrene 1nF $\pm 2\%$	500V Rifa	PFE216
C714	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C715	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24 104
C716	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24 104
C717	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C718	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C719	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C720	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24 104
C721	Capacitor electrolytic 10uF -10/+100%	40V Siemens	B4 1313-A7106-V
C722	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C723	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24 104
C724	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C725	Capacitor polystyrene 3n9 $\pm 2\%$	160V Philips	2222 425 33902
C726	Capacitor polystyrene 3n3 $\pm 2\%$	160V Philips	2222 425 33302
C727	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C728	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24 104
C729	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
D701	Diode switch	Philips	BA 182
D702	Diode switch	Philips	BA 182
D703	Diode silicon	Philips	1N4 148
D704	Diode switch	Philips	BA 182
FL701	Crystal filter LSB 600 kHz	S.P.	C1002
L701	Coil	S.P.	TL276
L702	Coil	S.P.	TL194
L703	Coil	S.P.	TL003

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
L704	Coil			S.P.	TL003
L705	Coil			S.P.	TL003
L706	Coil			S.P.	TL277
L707	Coil			S.P.	TL194
R701	Resistor	390 ohm <u>+5%</u>	0.33W	Philips	2322 211 13391
R702	Resistor	390 ohm <u>+5%</u>	0.33W	Philips	2322 211 13391
R703	Resistor	3k9 ohm <u>+5%</u>	0.33W	Philips	2322 211 13392
R704	Resistor	56kohm <u>+5%</u>	0.33W	Philips	2322 211 13563
R705	Resistor	120kohm <u>+5%</u>	0.33W	Philips	2322 211 13124
R706	Resistor	10kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R707	Resistor	56kohm <u>+5%</u>	0.33W	Philips	2322 211 13563
R708	Resistor	120kohm <u>+5%</u>	0.33W	Philips	2322 211 13124
R709	Resistor	120 ohm <u>+5%</u>	0.33W	Philips	2322 211 13121
R710	Resistor	120 ohm <u>+5%</u>	0.33W	Philips	2322 211 13121
R711	Resistor	1k5 ohm <u>+5%</u>	0.33W	Philips	2322 211 13152
R712	Resistor	270 ohm <u>+5%</u>	0.33W	Philips	2322 211 13271
R713	Resistor	390 ohm <u>+5%</u>	0.33W	Philips	2322 211 13391
R714	Resistor	3k9 ohm <u>+5%</u>	0.33W	Philips	2322 211 13392
R715	Resistor	56kohm <u>+5%</u>	0.33W	Philips	2322 211 13563
R716	Resistor	120kohm <u>+5%</u>	0.33W	Philips	2322 211 13124
R717	Resistor	120 ohm <u>+5%</u>	0.33W	Philips	2322 211 13121
T701	Transistor			Philips	BF256A
R702	Transistor			Philips	BF256A
T703	Transistor			Philips	BF256A

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
C801	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C802	Capacitor polystyrene 3n3 $\pm 5\%$	160V Philips	2222 425 23302
C803	Capacitor polystyrene 360pF $\pm 2\%$	630V Philips	2222 427 33601
C804	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C805	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C806	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C807	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C808	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C809	Capacitor electrolytic 1uF $\pm 20\%$	50V ERO	EK100AA110H
C810	Capacitor polystyrene 1nF $\pm 5\%$	250V Philips	2222 426 21002
C811	Capacitor polystyrene 120pF $\pm 2\%$	630V Philips	2222 427 31201
C812	Capacitor electrolytic 10uF -10/+100%	25V Siemens	B41313 A5106-V
C813	Capacitor tantalum 68uF $\pm 20\%$	16V Siemens	ETQ - 5
C814	Capacitor ceramic 10uF -20/+80%	50V KCK	HE70SJYF 103Z
C815	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C816	Capacitor polyester 100nF $\pm 20\%$	100V Philips	2222 344 24104
C817	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C818	Capacitor polystyrene 1nF $\pm 5\%$	250V Philips	2222 426 21002
C819	Capacitor polystyrene 120pF $\pm 2\%$	630V Philips	2222 427 31201
C820	Capacitor polystyrene 270pF $\pm 10\%$	400V Ferroperm	9/0129.9
C821	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C822	Capacitor ceramic 270pF $\pm 5\%$	630V Philips	2222 427 22701
C823	Capacitor ceramic 1nF -20/+80%	400V Ferroperm	9/0138.9
C824	Capacitor tantalum 220nF $\pm 20\%$	35V ERO	ETP 1A
C825	Capacitor ceramic 270pF $\pm 10\%$	400V Ferroperm	9/0129.9
C826	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C827	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C828	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C829	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103J
C830	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103J
C831	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103J
C832	Capacitor electrolytic 10uF $\pm 20\%$	35V ERO	EK100AA210F
C833	Capacitor electrolytic 10uF -20/+80%	35V ERO	EK100AA210F
C834	Capacitor polystyrene 1nF $\pm 5\%$	250V Philips	2222 426 21502
C835	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
C836	Capacitor polyester 22nF $\pm 20\%$	250V Philips	2222 344 40223
C837	Capacitor polystyrene 1n5 $\pm 5\%$	250V Philips	2222 426 21502
C838	Capacitor ceramic 10nF -20/+80%	50V KCK	HE70SJYF 103Z
D801	Diode silicon	Philips	1N4148
D802	Diode silicon	Philips	1N4148

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
D803	Diode silicon	Philips	1N4148
D804	Diode zener 4.7V \pm 5%	Philips	BZX79C4V7
D805	Diode silicon	Philips	1N4148
D806	Diode silicon	Philips	1N4148
D807	Diode silicon	Philips	1N4148
D808	Diode silicon	Philips	1N4148
D809	Diode silicon	Philips	1N4148
D810	Diode silicon	Philips	1N4148
D811	Diode switch	Philips	BA182
D812	Diode switch	Philips	BA182
D813	Diode switch	Philips	BA182
D814	Diode stabistor	Philips	BZV 46 2V0
D815	Diode stabistor	Philips	BZV 46 2V0
L801	Coil	S.P.	TL195
L802	Coil 470uH \pm 5%	Kaschke	Type 200/5
L803	Coil 390uH \pm 5%	Kaschke	Type 200/5
L804	Coil 330uH \pm 5%	Kaschke	Type 200/5
L805	Coil	S.P.	TL196
R801	Resistor 12Kohm \pm 5%	Philips	2322 106 33123
R802	Resistor 12Kohm \pm 5%	Philips	2322 106 33123
R803	Resistor 3k9 ohm \pm 5%	Philips	2322 211 13392
R804	Resistor 2k2 ohm \pm 5%	Philips	2322 211 13222
R805	Resistor 5E1 Ohm \pm 5%	Philips	2322 211 13518
R806	Resistor 5k6 ohm \pm 5%	Philips	2322 211 13562
R807	Resistor 4K7 ohm \pm 5%	Philips	2322 106 33472
R808	Resistor 6k8 ohm \pm 5%	Philips	2322 211 13682
R809	Resistor 12Kohm \pm 5%	Philips	2322 211 13123
R810	Resistor 15 ohm \pm 5%	Philips	2322 106 33159
R811	Resistor 2K2 ohm \pm 5%	Philips	2322 106 33222
R812	Resistor 2K2 ohm \pm 5%	Philips	2322 106 33222
R813	Resistor 2k7 ohm \pm 5%	Philips	2322 106 33272
R814	Resistor 1k2 ohm \pm 5%	Philips	2322 211 13122
R815	Resistor 47Kohm \pm 5%	Philips	2322 106 33473
R816	Resistor 390 ohm \pm 5%	Philips	2322 211 13391
R817	Resistor 5E1 ohm \pm 5%	Philips	2322 211 13518
R818	Resistor 2M7 ohm \pm 5%	Philips	2322 106 33275
R819	Resistor 8k2 ohm \pm 5%	Philips	2322 211 13822
R820	Resistor 3k9 ohm \pm 5%	Philips	2322 211 13392
R821	Resistor 12Kohm \pm 5%	Philips	2322 211 13123

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
R822	Resistor	12Kohm	+5%	0.33W	Philips	2322 211 13123
R823	Resistor	1Mohm	+5%	0.33W	Philips	2322 211 13105
R824	Resistor	39Kohm	+5%	0.33W	Philips	2322 106 33393
R825	Resistor	12Kohm	+5%	0.33W	Philips	2322 211 13123
R826	Resistor	15Kohm	+5%	0.33W	Philips	2322 211 13153
R827	Resistor	4k7 ohm	+5%	0.33W	Philips	2322 211 13472
R828	Resistor	1Kohm	+5%	0.33W	Philips	2322 106 33102
R829	Resistor	390 ohm	+5%	0.33W	Philips	2322 211 13391
R830	Resistor	5E1 ohm	+5%	0.33W	Philips	2322 211 13518
R831	Resistor	1Mohm	+5%	0.33W	Philips	2322 106 33105
R832	Resistor	12Kohm	+5%	0.33W	Philips	2322 211 13123
R833	Resistor	18k ohm	+5%	0.33W	Philips	2322 211 13183
R834	Resistor	12Kohm	+5%	0.33W	Philips	2322 211 13123
R835	Resistor	3k9 ohm	+5%	0.33W	Philips	2322 211 13392
R836	Resistor	15Kohm	+5%	0.33W	Philips	2322 211 13153
R837	Resistor	470 ohm	+5%	0.33W	Philips	2322 106 33471
R838	Resistor	10Kohm	+5%	0.33W	Philips	2322 106 33103
R839	Resistor	47Kohm	+5%	0.33W	Philips	2322 211 13473
R840	Resistor	100Kohm	+5%	0.33W	Philips	2322 211 13104
R841	Resistor	2k2 ohm	+5%	0.33W	Philips	2322 106 33222
R842	Resistor	22Kohm	+5%	0.33W	Philips	2322 211 13223
R843	Resistor	100 ohm	+5%	0.33W	Philips	2322 211 13101
R844	Resistor	390 ohm	+5%	0.33W	Philips	2322 211 13391
R845	Resistor	1Kohm	+5%	0.33W	Philips	2322 106 33102
R846	Resistor	120Kohm	+5%	0.33W	Philips	2322 211 13124
R847	Resistor	18Kohm	+5%	0.33W	Philips	2322 211 13183
R848	Resistor	22Kohm	+5%	0.33W	Philips	2322 211 13223
R849	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R850	Resistor	1Kohm	+5%	0.33W	Philips	2322 211 13102
R851	Resistor	220 ohm	+5%	0.33W	Philips	2322 211 13221
R852	Resistor	47Kohm	+5%	0.33W	Philips	2322 211 13473
R853	Resistor	1Kohm	+5%	0.33W	Philips	2322 211 13102
R854	Resistor	10Kohm	+5%	0.33W	Philips	2322 106 33103
R855	Resistor	27Kohm	+5%	0.33W	Philips	2322 211 13273
R856	Resistor	10Kohm	+5%	0.33W	Philips	2322 211 13103
R857	Resistor	2k2 ohm	+5%	0.33W	Philips	2322 211 13222
R858	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R859	Resistor	1Kohm	+5%	0.33W	Philips	2322 211 13102
R860	Resistor	10Kohm	+5%	0.33W	Philips	2322 106 33103
R861	Resistor	560 ohm	+5%	0.33W	Philips	2322 211 13561

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
R862	Resistor	1k5 ohm	+5%	0.33W	Philips	2322 211 13152
R863	Resistor	47 ohm	+5%	0.33W	Philips	2322 106 33479
R864	Resistor	1Mohm	+5%	0.33W	Philips	2322 106 33105
R865	Resistor	100Kohm	+5%	0.33W	Philips	2322 211 13104
R866	Resistor	12Kohm	+5%	0.33W	Philips	2322 211 13123
R867	Resistor	100 ohm	+5%	0.33W	Philips	2322 211 13101
R868	Resistor	100Kohm	+5%	0.33W	Philips	2322 211 13104
R869	Resistor	47Kohm	+5%	0.33W	Philips	2322 211 13473
R870	Resistor	3k9 ohm	+5%	0.33W	Philips	2322 211 13392
R871	Resistor	1Kohm	+5%	0.33W	Philips	2322 211 13102
R872	Resistor	100Kohm	+5%	0.33W	Philips	2322 211 13104
R873	Resistor	47 ohm	+5%	0.33W	Philips	2322 106 33479
T801	Transistor				Philips	BC548B
T802	Transistor				Philips	BC548B
T803	Transistor				Philips	BC558B
T804	Transistor				Philips	BF256A
T805	Transistor				Philips	BC548B
T806	Transistor				Philips	BC548B
T807	Transistor				Philips	BC558B
T808	Transistor				Philips	BF256A
T809	Transistor				Philips	BC548B
T810	Transistor				Philips	BC548B
T811	Transistor				Philips	BC548B
T812	Transistor				Philips	BC558B
T813	Transistor				Philips	BC548B
T814	Transistor				Philips	BC548B
T815	Transistor				Philips	BC548B
T816	Transistor				Philips	BC548B
T817	A - E Transistor array				National	LM3086N

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
C901	Capacitor polyester	220nF $\pm 20\%$	100V	ERO	MKT1822-422/0
C902	Capacitor ceramic	1n8-20/+80%	400V	Ferroperm	9/0141.9
C903	Capacitor electrolytic	10uF $\pm 20\%$	35V	ERO	EK100AA210F
C904	Capacitor electrolytic	4u7 $\pm 20\%$	50V	ERO	EK100AA147H
C905	Capacitor polystyrene	15nF $\pm 2\%$	63V	Philips	2222 424 31503
C906	Capacitor polystyrene	30nF $\pm 2\%$	63V	Philips	2222 424 33003
C907	Capacitor polystyrene	1n3 $\pm 2\%$	160V	Philips	2222 425 31302
C908	Capacitor polystyrene	39nF $\pm 2\%$	63V	Philips	2222 424 33903
C909	Capacitor polystyrene	470pF $\pm 2\%$	250V	Philips	2222 426 44701
C910	Capacitor ceramic	1n8-20/+80%	400V	Ferroperm	9/0141.9
C911	Capacitor polyester	220nF $\pm 20\%$	100V	ERO	MKT1822-422/0
C912	Capacitor electrolytic	4u7 $\pm 20\%$	50V	ERO	EK100AA147H
C913	Capacitor electrolytic	4u7 $\pm 20\%$	50V	ERO	EK100AA147H
C914	Capacitor polyester	100nF $\pm 20\%$	100V	ERO	MKT1822-410/0
C915	Capacitor electrolytic	100uF -10/+50	25V	Siemens	B41283-B5107-T
C916	Capacitor electrolytic	22uF $\pm 20\%$	35V	ERO	EK100BB222F
C917	Capacitor polystyrene	4n7 $\pm 2\%$	63V	Philips	2222 424 34702
C918	Capacitor polystyrene	1nF $\pm 2\%$	250V	Philips	2222 426 31002
C919	Capacitor electrolytic	22uF $\pm 20\%$	35V	ERO	EK100BB222F
C920	Capacitor polyester	100nF $\pm 20\%$	100V	ERO	MKT1822-410/0
C921	Capacitor electrolytic	470uF -10/+50%	16V	Siemens	B41283-A4477-T
C922	Capacitor electrolytic	100uF -10/+50%	25V	Siemens	B41283-B5107-T
C923	Capacitor polyester	100nF $\pm 20\%$	100V	ERO	MKT1822-410/0
IC901	Integrated circuit			National	LM324
IC902	Integrated circuit			SGS/ATES	TCA940
R901	Resistor	82Kohm $\pm 5\%$	0.33W	Philips	2322 211 13823
R902	Resistor	27Kohm $\pm 5\%$	0.33W	Philips	2322 211 13273
R903	Resistor	6k8 ohm $\pm 5\%$	0.33W	Philips	2322 106 33682
R904	Resistor	56Kohm $\pm 5\%$	0.33W	Philips	2222 211 13563
R905	Resistor	68Kohm $\pm 5\%$	0.33W	Philips	2222 106 33683
R906	Resistor	3k3 ohm $\pm 5\%$	0.33W	Philips	2222 211 13332
R907	Resistor	100Kohm $\pm 5\%$	0.33W	Philips	2222 211 13104
R908	Resistor	3k3 ohm $\pm 5\%$	0.33W	Philips	2222 106 33332
R909	Resistor	12Kohm $\pm 5\%$	0.33W	Philips	2222 211 13123
R910	Resistor	12Kohm $\pm 5\%$	0.33W	Philips	2222 211 13123
R911	Resistor	12Kohm $\pm 5\%$	0.33W	Philips	2222 211 13123
R912	Resistor	3k3 ohm $\pm 5\%$	0.33W	Philips	2222 211 13332
R913	Resistor	18Kohm $\pm 5\%$	0.33W	Philips	2222 211 13183

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
R914	Resistor	56Kohm	+5%	0.33W	Philips	2222 211 13563
R915	Resistor	15Kohm	+5%	0.33W	Philips	2222 211 13153
R916	Resistor	68Kohm	+5%	0.33W	Philips	2222 211 13683
R917	Resistor	3k3 ohm	+5%	0.33W	Philips	2322 211 13332
R918	Resistor	4k7 ohm	+5%	0.33W	Philips	2222 211 13472
R919	Resistor	22Kohm	+5%	0.33W	Philips	2222 211 13223
R920	Resistor	56Kohm	+5%	0.33W	Philips	2222 106 33563
R921	Resistor	120 ohm	+5%	0.33W	Philips	2222 211 13121
R922	Resistor	100 ohm	+5%	0.5W	Philips	2222 212 13101
R923	Resistor	56 ohm	+5%	0.33W	Philips	2222 211 13569
R924	Resistor	1 ohm	+5%	0.33W	Philips	2222 211 13108
R925	Resistor	39 ohm	+5%	0.33W	Philips	2222 211 13399
R926	Resistor	10 ohm	+5%	0.33W	Philips	2222 211 13109
R927	Resistor	8E2 ohm	+5%	4.2W	Philips	2222 330 22828
R928	Resistor	1K2 ohm	+5%	0.33W	Philips	2222 211 13122

Symbol	Description	Manufact.	
C1001	Capacitor 10 nF $\pm 20\%$ 400V	Philips	2222 344 54103
C1002	Capacitor electrolytic 10 uF $\pm 20\%$ 35V	ERO	EKI 00AA 210F
C1003	Capacitor ceramic 12 pF $\pm 5\%$ NPO 400V	Ferroperm	9/0112.9
C1004	Capacitor ceramic 10 nF $-20/+80\%$ 50V	KCK	HE70SJYF 103Z
C1005	Capacitor ceramic 68 pF $\pm 2\%$ N150 100V	KCK	SDPU-6E/N150/68/G/100V
C1006	Capacitor polyester 22 nF $\pm 20\%$ 400V	Philips	2222 344 54223
C1007	Capacitor polyester 10 nF $-20/+80\%$ 50V	KCK	HE70SJYF 103Z
C1008	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1009	Capacitor polyester 15 nF $\pm 20\%$ 400V	Philips	2222 344 54153
C1010	Capacitor polyester 47 nF $\pm 20\%$ 250V	Philips	2222 344 40473
C1011	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1012	Capacitor electrolytic 10 uF $-10/+100\%$ 40V	Siemens	B4 1313-A7106-V
C1013	Capacitor electrolytic 10 uF $-10/+100\%$ 40V	Siemens	B4 1313-A7106-V
C1014	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1015	Capacitor polyester 47 nF $\pm 20\%$ 250V	Philips	2222 344 40473
C1016	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1017	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1018	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1019	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1020	Capacitor polyester 220 nF $\pm 20\%$ 100V	Philips	2222 344 24224
C1021	Capacitor polystyrene 1n2F $\pm 5\%$ 63V	Philips	2222 424 21202
C1022	Capacitor polystyrene 6n8F $\pm 5\%$ 63V	Philips	2222 424 26802
D1001	Diode zener 12V $\pm 5\%$ 0.4W	Philips	BZX79C12
D1002	Diode silicon	Philips	BAW62
FP1001	Ferrite bead 4B1	Philips	4322 020 34420
IC1001	Integrated circuit	Texas	SN74LS192N
IC1002	Integrated circuit	Texas	SN74LS192N
IC1003	Integrated circuit	Texas	SN74LS192N
IC1004	Integrated circuit	Texas	SN74LS192N
IC1005	Integrated circuit	Texas	SN74LS192N
IC1006	Integrated circuit	Motorola	MC4044P
IC1007	Integrated circuit	Texas	SN74LS390N
IC1008	Integrated circuit	Texas	SN74LS20N
IC1009	Integrated circuit	Texas	SN74LS27N
IC1010	Integrated circuit	Texas	SN74LS109N
IC1011	Integrated circuit	Texas	SN74LS390N
IC1012	Integrated circuit	Texas	SN74LS390N

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
IC1013	Integrated circuit			Motorola	MC4044P	
IC1014	Integrated circuit			Texas	SN74 10N	
IC1015	Integrated circuit			Texas	SN74LS290N	
L1001	Coil			S.P.	TL255	
L1002	Coil			S.P.	TL235	
R1001	Resistor	15 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13153
R1002	Resistor	15 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13153
R1003	Resistor	560 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13561
R1004	Resistor	15 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13153
R1005	Resistor	560 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13561
R1006	Resistor	5K6 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13562
R1007	Resistor	1K8 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13182
R1008	not used					
R1009	Resistor	1K8 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13182
R1010	Resistor	820 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13821
R1011	Resistor	390 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13391
R1012	Resistor	220 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13221
R1013	Preset potmeter	2K ohm	<u>+10%</u>	0.5W	Bourns	3299W-1-202
R1014	Resistor	1K2 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33122
R1015	Resistor	10K ohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R1016	Resistor	820 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13821
R1017	Resistor	470 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13471
R1018	Resistor	10 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R1019	Resistor	1K2 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13122
R1020	Resistor	2K2 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13222
R1021	Resistor	560 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13561
R1022	Resistor	22 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13223
R1023	Resistor	270 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33271
R1024	Resistor	1K8 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13182
R1025	Resistor	10 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R1026	Resistor	220 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33221
R1027	Resistor	2K2 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13222
R1028	Resistor	47 Kohm	<u>+5%</u>	0.33W	Philips	2322 106 33473
R1029	Resistor	2K2 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13222
R1030	Resistor	1 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13102
R1031	Resistor	220 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13221
R1032	Resistor	680 ohm	<u>+5%</u>	0.33W	Philips	2322 211 13681
R1033	Resistor	12 Kohm	<u>+5%</u>	0.33W	Philips	2322 211 13123

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
R1034	Resistor	6K8 ohm <u>+5%</u>	0.33W	Philips	2322 211 13682
R1035	Resistor	1 Kohm <u>+5%</u>	0.33W	Philips	2322 211 13102
T1001	Transistor			Philips	2N2368
T1002	Transistor			Philips	2N2368
T1003	Transistor			Philips	BF494
T1004	Transistor			Philips	BF199
T1005	Transistor			Philips	2N2368
T1006	Transistor			Philips	BF199

Symbol	Description			Manufact.	
C1101	Capacitor polyester	220 nF $\pm 20\%$	100V	Philips	2222 344 24224
C1102	Capacitor polyester	220 nF $\pm 20\%$	100V	Philips	2222 344 24224
C1103	Capacitor ceramic	10 nF $-20/+80\%$	50V	KCK	HE70SJYF103Z
C1104	Capacitor electrolytic	10 uF $\pm 20\%$	35V	ERO	EKI 00AA 210F
C1105	Capacitor electrolytic	10 nF $\pm 20\%$	35V	ERO	EKI 00AA 210F
C1106	Capacitor electrolytic	10 uF $\pm 20\%$	35V	ERO	EKI 00AA 210F
C1107	Capacitor polyester	220 nF $\pm 20\%$	100V	Philips	2222 344 24224
C1108	Capacitor electrolytic	10 uF $-10/+100\%$	40V	Siemens	B41313-A7106-V
C1109	Capacitor electrolytic	10 uF $\pm 20\%$	35V	ERO	EKI 00AA 210F
C1110	Capacitor polycarbonate	470 nF $\pm 10\%$	100V	Philips	2222 344 21474
C1111	Capacitor ceramic	10 nF $-20/+80\%$	50V	KCK	HE70SJYF103Z
C1112	Capacitor polystyrene	39 nF $\pm 1\%$	63V	Philips	2222 424 43903
C1113	Capacitor polyester	6u8F $\pm 10\%$	100V	Philips	2222 344 25685
C1114	Capacitor electrolytic	10 uF $\pm 20\%$	35V	ERO	EKI 00AA 210F
C1115	Capacitor ceramic	220 pF $\pm 20\%$	400V	Ferroperm	9/0129.9
C1116	Capacitor polyester	220 uF $\pm 10\%$	100V	Philips	2222 344 25224
C1117	Capacitor ceramic	220 pF $\pm 20\%$	400V	Ferroperm	9/0129.9
C1118	Capacitor polyester	150 nF $\pm 10\%$	100V	Philips	2222 344 25154
D1101	Diode silicon			Philips	BAW62
D1102	Diode silicon			Philips	BAW62
D1103	Diode zener	4.7V $\pm 5\%$	0.4W	Philips	BZX79C4V7
D1104	Diode zener	4.7V $\pm 5\%$	0.4W	Philips	BZX79C4V7
D1105	Diode silicon			Philips	BAW62
D1106	Diode silicon			Philips	BAV21
IC1101	Integrated circuit			National	LM308
R1101	Resistor	1 Kohm $\pm 5\%$	0.33W	Philips	2322 211 13102
R1102	Resistor	82 ohm $\pm 5\%$	0.33W	Philips	2322 211 13829
R1103	Resistor	820 ohm $\pm 5\%$	0.33W	Philips	2322 211 13821
R1104	Resistor	150 Kohm $\pm 5\%$	0.33W	Philips	2322 211 13154
R1105	Resistor	2K2 ohm $\pm 5\%$	0.33W	Philips	2322 211 13222
R1106	Resistor	1K2 ohm $\pm 5\%$	0.33W	Philips	2322 211 13122
R1107	Resistor	12 Kohm $\pm 5\%$	0.33W	Philips	2322 211 13123
R1108	Resistor	12 ohm $\pm 5\%$	0.33W	Philips	2322 211 13129
R1109	Resistor	10 Kohm $\pm 5\%$	0.33W	Philips	2322 211 13103
R1110	Preset potmeter	2K2 ohm $\pm 20\%$	0.5W	Philips	2322 482 20222
R1111	Resistor	3K3 ohm $\pm 5\%$	0.33W	Philips	2322 211 13332
R1112	Resistor	10 Kohm $\pm 5\%$	0.33W	Philips	2322 211 13103

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
R1113	Resistor 3K3 ohm <u>+5%</u> 0.33W	Philips	2322 211 13332
R1114	Preset potmeter 2K2 ohm <u>+20%</u> 0.5W	Philips	2322 482 20222
R1115	Resistor 10 Kohm <u>+5%</u> 0.33W	Philips	2322 211 13103
R1116	Resistor 1K5 ohm <u>+5%</u> 0.33W	Philips	2322 211 13152
R1117	Resistor 2K7 ohm <u>+5%</u> 0.33W	Philips	2322 106 33272
R1118	Resistor 3K3 ohm <u>+5%</u> 0.33W	Philips	2322 211 13332
R1119	Resistor 10 Kohm <u>+5%</u> 0.33W	Philips	2322 211 13103
R1120	Resistor 560 ohm <u>+5%</u> 0.33W	Philips	2322 211 13561
R1121	Resistor 3K92 ohm <u>+1%</u> 0.25W	VITROHM	471-0
R1122	Resistor 150 ohm <u>+5%</u> 0.33W	Philips	2322 211 13151
R1123	Resistor 22 Kohm <u>+5%</u> 0.33W	Philips	2322 211 13223
R1124	Resistor 2M7 ohm <u>+5%</u> 0.33W	Philips	2322 211 12275
R1125	Resistor 4K7 ohm <u>+5%</u> 0.33W	Philips	2322 211 13472
R1126	Resistor 2K2 ohm <u>+5%</u> 0.33W	Philips	2322 211 13222
R1127	Resistor 3K92 ohm <u>+1%</u> 0.25W	VITROHM	471-0
R1128	Resistor 36K5 ohm <u>+1%</u> 0.25W	VITROHM	471-0
R1129	Resistor 3K92 ohm <u>+1%</u> 0.25W	VITROHM	471-0
T1101	Transistor	Philips	BD138
T1102	Transistor	Philips	BC548A
T1103	Transistor	Philips	BD139
T1104	Transistor	Philips	BC558
T1105	Transistor	Philips	BC556A
T1106	Transistor	Philips	BC548

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
	<p>The units are factory adjusted and sealed and can only be repaired at the factory.</p> <p>Module No. 1200</p> <p>Module No. 1300</p>	<p>S.P.</p> <p>S.P.</p>	<p>VCO UNIT</p> <p>HARMONIC FILTER UNIT</p>

Symbol	Description	Manufact.	
C1401	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1402	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1403	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1404	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1405	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1406	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1407	Capacitor ceramic 47 pF +2% N150	100V Philips	2222 638 34479
C1408	Capacitor polyester 100 nF +20%	100V Philips	2222 344 24104
C1409	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1410	Capacitor ceramic 100 pF +2% N150	100V Philips	2222 628 34101
C1411	Capacitor polystyrene 180 pF +1%	630V Philips	2222 427 41801
C1412	Capacitor ceramic 33 pF +2%	100V Philips	2222 628 34339
C1413	Capacitor ceramic 56 pF +2%	100V Philips	2222 628 34569
C1414	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1415	Capacitor polyester 100 nF +20%	100V Philips	2222 344 24104
C1416	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1417	Capacitor feed through 1 nF -20/+80%	250V Ferroperm	9/0138.58
IC1401	Integrated circuit	National	LM3053
L1401	Coil	S.P.	TL059
L1402	Coil 12 uH +5%	Kaschke	220/5
L1403	Coil 12 uH +5%	Kaschke	220/5
R1401	Resistor 3K3 ohm +5%	0.33W Philips	2322 211 13332
R1402	Resistor 15 Kohm +5%	0.33W Philips	2322 211 13153
R1403	Resistor 2K2 ohm +5%	0.33W Philips	2322 211 13222
R1404	Resistor 270 ohm +5%	0.33W Philips	2322 211 13271
R1405	Resistor 100 ohm +5%	0.33W Philips	2322 211 13101
R1406	Resistor 10 ohm +5%	0.33W Philips	2322 106 33109
R1407	Resistor 330 ohm +5%	0.33W Philips	2322 211 13331
R1408	Resistor 2K7 ohm +5%	0.33W Philips	2322 211 13272
R1409	Resistor 680 ohm +5%	0.33W Philips	2322 211 13681
R1410	Resistor 390 ohm +5%	0.33W Philips	2322 211 13391
R1411	Resistor 470 ohm +5%	0.33W Philips	2322 211 13471
R1412	Resistor 27 Kohm +5%	0.33W Philips	2322 211 13273
R1413	Resistor 2K7 ohm +5%	0.33W Philips	2322 211 13272
R1414	Resistor 560 ohm +5%	0.33W Philips	2322 211 13561
R1415	Resistor 47 ohm +5%	0.33W Philips	2322 211 13479

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
T1401	Transistor	Philips	BF199
T1402	Transistor	Philips	BF199
TR1401	Coil	S.P.	TL198

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
C1501	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1502	Capacitor ceramic	68 pF	+5% N220	50V	KCK	HE60SJRH680
C1503	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1504	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1505	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
L1501	Coil				S.P.	TL234
R1501	Resistor	18 ohm	+5%	0.33W	Philips	2322 211 13189
R1502	Resistor	33 ohm	+5%	0.33W	Philips	2322 211 13339
R1503	Resistor	1k8 ohm	+5%	0.33W	Philips	2322 211 13182
R1504	Resistor	1k2 ohm	+5%	0.33W	Philips	2322 211 13122
R1505	Resistor	180 ohm	+5%	0.33W	Philips	2322 211 13181
R1506	Resistor	15 ohm	+5%	0.33W	Philips	2322 211 13159
R1507	Resistor	100 ohm	+5%	0.33W	Philips	2322 211 13101
R1508	Resistor	220 ohm	+5%	0.33W	Philips	2322 211 13221
T1501	Transistor				Philips	BFW17A

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
C1601	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1602	Capacitor ceramic	3p9F	± 0.25 pF NPO	400V	Ferroperm	9/0112.9
C1603	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1604	Capacitor polystyrene	150 pF	$\pm 5\%$	630V	Philips	2222 427 21501
C1605	Capacitor polystyrene	270 pF	$\pm 5\%$	630V	Philips	2222 427 22701
C1606	Capacitor polystyrene	240 pF	$\pm 5\%$	630V	Philips	2222 427 22401
C1607	Capacitor polystyrene	120 pF	$\pm 5\%$	630V	Philips	2222 427 21201
C1608	Capacitor polystyrene	270 pF	$\pm 5\%$	630V	Philips	2222 427 22701
C1609	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1610	Capacitor ceramic	10 pF	$\pm 10\%$ NPO	400V	Ferroperm	9/0112.9
C1611	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1612	Capacitor ceramic	12 pF	$\pm 5\%$ N150	100V	KCK	SDRU-6B
C1613	Capacitor ceramic	22 pF	$\pm 5\%$ N150	100V	KCK	SDRU-6B
C1614	Capacitor polyester	47 nF	$\pm 10\%$	250V	Philips	2222 344 25473
C1615	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1616	Capacitor ceramic	47 pF	$\pm 5\%$ N150	100V	KCK	SDRU-6B
C1617	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1618	Not used					
C1619	Capacitor polyester	6u8F	$\pm 10\%$	100V	Philips	2222 344 25685
C1620	Capacitor polyester	330 nF	$\pm 10\%$	100V	Philips	2222 344 25334
C1621	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1622	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1623	Capacitor polyester	47 nF	$\pm 20\%$	100V	Philips	2222 344 24473
C1624	Capacitor ceramic	10 nF	-20/+80%	50V	KCK	HE70SJYF 103Z
C1625	Capacitor electrolytic	10 uF	$\pm 20\%$	35V	ERO	EKI 00AA210F
C1626	Capacitor electrolytic	10 uF	$\pm 20\%$	35V	ERO	EKI 00AA210F
C1627	Capacitor polystyrene	2n2F	$\pm 5\%$	100V	Philips	2222 424 22202
C1628	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1629	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1630	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1631	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1632	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1633	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1634	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1635	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
C1636	Capacitor feed through	1 nF	-20/+80%	250V	Ferroperm	9/0138.58
D1601	Diode varicap.				Motorola	MV109
D1602	Diode varicap.				Motorola	MV109

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
D1603	Diode switch			Telefunken	BA243
D1604	Diode switch			Telefunken	BA243
D1605	Diode varicap.			Motorola	MV109
D1606	Diode varicap.			Motorola	MV109
IC1601	Integrated circuit			National	LM358N
L1601	Coil	2u2H $\pm 10\%$		Kaschke	220
L1602	Coil	1u5H $\pm 10\%$		Kaschke	220
R1601	Resistor	4k7 ohm $\pm 5\%$	0.33W	Philips	2322 106 33472
R1602	Resistor	18 kohm $\pm 5\%$	0.33W	Philips	2322 211 13183
R1603	Resistor	6k8 ohm $\pm 5\%$	0.33W	Philips	2322 106 33682
R1604	Resistor	10 ohm $\pm 5\%$	0.33W	Philips	2322 106 33109
R1605	Resistor	100 kohm $\pm 5\%$	0.33W	Philips	2322 106 33104
R1606	Resistor	10 ohm $\pm 5\%$	0.33W	Philips	2322 106 33109
R1607	Resistor	2k7 ohm $\pm 5\%$	0.33W	Philips	2322 211 13272
R1608	Resistor	6k8 ohm $\pm 5\%$	0.33W	Philips	2322 106 33682
R1609	Resistor	18 kohm $\pm 5\%$	0.33W	Philips	2322 106 33183
R1610	Resistor	4k7 ohm $\pm 5\%$	0.33W	Philips	2322 106 33472
R1611	Resistor	100 kohm $\pm 5\%$	0.33W	Philips	2322 106 33104
R1612	Resistor	330 ohm $\pm 5\%$	0.33W	Philips	2322 106 33331
R1613	Resistor	5k6 ohm $\pm 5\%$	0.33W	Philips	2322 106 33562
R1614	Resistor	470 ohm $\pm 5\%$	0.33W	Philips	2322 106 33471
R1615	Resistor	82 ohm $\pm 5\%$	0.33W	Philips	2322 106 33829
R1616	Resistor	68 kohm $\pm 5\%$	0.33W	Philips	2322 211 13683
R1617	Resistor	390 kohm $\pm 5\%$	0.33W	Philips	2322 106 33394
R1618	Resistor	180 kohm $\pm 5\%$	0.33W	Philips	2322 106 33184
R1619	Resistor	100 kohm $\pm 5\%$	0.33W	Philips	2322 106 33104
R1620	Resistor	47 kohm $\pm 5\%$	0.33W	Philips	2322 106 33473
R1621	Resistor	47 kohm $\pm 5\%$	0.33W	Philips	2322 106 33473
R1622	Resistor	47 kohm $\pm 5\%$	0.33W	Philips	2322 106 33473
R1623	Resistor	27 kohm $\pm 5\%$	0.33W	Philips	2322 106 33273
R1624	Resistor	10 kohm $\pm 5\%$	0.33W	Philips	2322 106 33103
R1625	Resistor	10 kohm $\pm 5\%$	0.33W	Philips	2322 106 33103
R1626	Resistor	4k7 ohm $\pm 5\%$	0.33W	Philips	2322 106 33472
R1627	Resistor	2M7 ohm $\pm 5\%$	0.33W	Philips	2322 106 32275
R1628	Resistor	2k7 ohm $\pm 5\%$	0.33W	Philips	2322 106 33272
R1629	Resistor	220 ohm $\pm 5\%$	0.33W	Philips	2322 106 33221
R1630	Resistor	22 kohm $\pm 5\%$	0.33W	Philips	2322 106 33223
R1631	Resistor	10 kohm $\pm 5\%$	0.33W	Philips	2322 106 33103

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
R1632	Resistor	18 kohm	<u>+5%</u>	0.33W	Philips	2322 106 33183
R1633	Resistor	39 kohm	<u>+5%</u>	0.33W	Philips	2322 106 33393
R1634	Resistor	390 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33391
R1635	Resistor	5k6 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33562
R1636	Resistor	560 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33561
R1637	Resistor	150 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33151
R1638	Resistor	560 ohm	<u>+5%</u>	0.33W	Philips	2322 106 33561
T1601	Transistor				Philips	BF199
T1602	Transistor				Philips	BF199
T1603	Transistor				Philips	BC558B
T1604	Transistor				Philips	BF199
T1605	Transistor				Philips	BC558B
TR1601	Coil				S.P.	TL234
X1601	Crystal	10.0076 MHz			S.P.	C1018
X1602	Crystal	16.0076 MHz			S.P.	C1019

Symbol	Description	Manufact.	
C1701	Capacitor electrolytic 10 uF <u>+20%</u> 35V	ERO	EKI 00AA210F
C1702	Capacitor polyester 1 uF <u>+20%</u> 100V	ERO	MKT 1822 - 510/0
C1703	Capacitor polystyrene 3 nF <u>+2%</u> 100V	Philips	2222 424 33002
C1704	Capacitor electrolytic 1 uF <u>+20%</u> 50V	ERO	EKI 00AA110H
C1705	Capacitor electrolytic 10 uF <u>+20%</u> 35V	ERO	EKI 00AA210F
C1706	Capacitor polystyrene 5n6F <u>+2%</u> 100V	Philips	2222 424 35602
C1707	Capacitor polystyrene 300 pF <u>+2%</u> 630V	Philips	2222 427 33001
C1708	Capacitor polystyrene 15 nF <u>+5%</u> 100V	Philips	2222 424 21503
C1709	Capacitor polystyrene 5n6F <u>+2%</u> 100V	Philips	2222 424 35602
C1710	Capacitor polystyrene 300 pF <u>+2%</u> 630V	Philips	2222 427 33001
C1711	Capacitor polystyrene 15 nF <u>+5%</u> 100V	Philips	2322 424 21503
C1712	Capacitor electrolytic 10 uF <u>+20%</u> 35V	ERO	EKI 00AA210F
IC1701	Integrated circuit	Motorola	MC1458CP
L1701	Coil	S.P.	TL223
R1701	Resistor 4k7 ohm <u>+5%</u> 0.33W	Philips	2322 211 13472
R1702	Resistor 68 kohm <u>+5%</u> 0.33W	Philips	2322 106 33683
R1703	Resistor 56 kohm <u>+5%</u> 0.33W	Philips	2322 211 13563
R1704	Resistor 82 kohm <u>+5%</u> 0.33W	Philips	2322 211 13823
R1705	Resistor 560 kohm <u>+5%</u> 0.33W	Philips	2322 211 13564
R1706	Resistor 68 kohm <u>+5%</u> 0.33W	Philips	2322 211 13683
R1707	Resistor 6k8 ohm <u>+5%</u> 0.33W	Philips	2322 211 13682
R1708	Resistor 3k9 ohm <u>+5%</u> 0.33W	Philips	2322 211 13392
R1709	Resistor 15 kohm <u>+5%</u> 0.33W	Philips	2322 106 33153
R1710	Resistor 15 kohm <u>+5%</u> 0.33W	Philips	2322 211 13153
R1711	Resistor 22 kohm <u>+5%</u> 0.33W	Philips	2322 211 13223
R1712	Resistor 18 kohm <u>+5%</u> 0.33W	Philips	2322 211 13183
R1713	Resistor 2k7 ohm <u>+5%</u> 0.33W	Philips	2322 211 13272
R1714	Resistor 15 kohm <u>+5%</u> 0.33W	Philips	2322 211 13153
R1715	Resistor 22 kohm <u>+5%</u> 0.33W	Philips	2322 211 13223
R1716	Resistor 18 kohm <u>+5%</u> 0.33W	Philips	2322 211 13183
R1717	Resistor 330 ohm <u>+5%</u> 0.33W	Philips	2322 211 13331
R1718	Resistor 560 ohm <u>+5%</u> 0.33W	Philips	2322 211 13561
T1701	Transistor	Philips	BC548B
T1702	Transistor	Philips	BC548B

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
C1801	Capacitor ceramic	3p3F ± 0.25 pF N470	250V	Ferroperm	9/0119.9
C1802	Capacitor ceramic	10 nF $-20/+80\%$	50V	KCK	HE70SJYF103Z
C1803	Capacitor polystyrene	470 pF $\pm 2\%$	250V	Philips	2222 426 34701
C1804	Capacitor polystyrene	560 pF $\pm 2\%$	250V	Philips	2222 426 35601
C1805	Capacitor ceramic	10 nF $-20/+80\%$	50V	KCK	HE70SJYF103Z
C1806	Capacitor polyester	100 nF $\pm 20\%$	100V	ERO	MKT 1822 - 410/0
C1807	Capacitor ceramic	82 pF $\pm 5\%$ N150	500V	KCK	HM95SJPH820J
C1808	Capacitor ceramic	10 nF $-20/+80\%$	50V	KCK	HE70SJYF103Z
C1809	Capacitor ceramic	47 pF $\pm 3\%$ N150	500V	KCK	HM74SJPH470 3%
D1801	Diode varicap.			Motorola	MV106
L1801	Coil	900 uH $\pm 10\%$		Kaschke	200/5
R1801	Resistor	820 ohm $\pm 5\%$	0.33W	Philips	2322 211 13821
R1802	Resistor	100 kohm $\pm 5\%$	0.33W	Philips	2322 211 13104
R1803	Resistor	12 kohm $\pm 5\%$	0.33W	Philips	2322 211 13123
R1804	Resistor	6k8 ohm $\pm 5\%$	0.33W	Philips	2322 211 13682
R1805	Resistor	1 kohm $\pm 5\%$	0.33W	Philips	2322 211 13102
R1806	Resistor	220 ohm $\pm 5\%$	0.33W	Philips	2322 211 13221
R1807	Resistor	6k8 ohm $\pm 5\%$	0.33W	Philips	2322 211 13682
R1808	Resistor	2k2 ohm $\pm 5\%$	0.33W	Philips	2322 211 13222
R1809	Resistor	1k2 ohm $\pm 5\%$	0.33W	Philips	2322 211 13122
R1810	Resistor	1k5 ohm $\pm 5\%$	0.33W	Philips	2322 211 13152
R1811	Resistor	3k9 ohm $\pm 5\%$	0.33W	Philips	2322 211 13392
R1812	Resistor	1 kohm $\pm 5\%$	0.33W	Philips	2322 211 13102
T1801	Transistor			Philips	BF199
X1801	Crystal	9.3979 MHz		S.P.	C1020

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
C1901	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1902	Capacitor electrolytic 10 uF -10/+100%	25V Siemens	B4 1313-A5106-V
C1903	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1904	Capacitor ceramic 10 nF -20/+80%	50V KCK	HE70SJYF 103Z
C1905	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1906	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1907	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1908	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1909	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1910	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1911	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1912	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1913	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1914	Capacitor electrolytic 10 uF -10/+100%	25V Siemens	B4 1313-A5106-V
C1915	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1916	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1917	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1918	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1919	Capacitor electrolytic 10 uF -10/+100%	25V Siemens	B4 1313-A5106-V
C1920	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
C1921	Capacitor polyester 220 nF +20%	100V Philips	2222 344 24224
D1901	Diode silicon	Philips	1N4148
D1902	Diode silicon	Philips	1N4148
IC1901	Integrated circuit	Texas	SN74LS42N
IC1902	Integrated circuit	Texas	SN74LS32N
IC1903	Integrated circuit	Texas	SN74LS11N
IC1904	Integrated circuit	Texas	SN74LS08N
IC1905	Integrated circuit	MMI	6308-1
IC1906	Integrated circuit	Texas	SN7406N
IC1907	Integrated circuit	Texas	SN74LS138N
IC1908	Integrated circuit	Texas	SN7407N
IC1909	Integrated circuit	Texas	SN7407N
IC1910	Integrated circuit	Motorola	MC14515 BCP
R1901	Not used		
R1902	Not used		
R1903	Not used		
R1904	Not used		

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
R1905	Not used		
R1906	Not used		
R1907	Not used		
R1908	Not used		
R1909	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1910	Resistor 2k7 ohm <u>+5%</u>	0.33W Philips	2322 211 13272
R1911	Resistor 1 kohm <u>+5%</u>	0.33W Philips	2322 211 13102
R1912	Resistor 3k9 ohm <u>+5%</u>	0.33W Philips	2322 211 13392
R1913	Resistor 47 kohm <u>+5%</u>	0.33W Philips	2322 211 13473
R1914	Resistor 47 kohm <u>+5%</u>	0.33W Philips	2322 211 13473
R1915	Resistor 47 kohm <u>+5%</u>	0.33W Philips	2322 211 13473
R1916	Resistor 47 kohm <u>+5%</u>	0.33W Philips	2322 211 13473
R1917	Resistor 47 kohm <u>+5%</u>	0.33W Philips	2322 211 13473
R1918	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1919	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1920	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1921	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1922	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1923	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1924	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1925	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1926	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1927	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1928	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1929	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1930	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1931	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1932	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1933	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1934	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1935	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1936	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1937	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1938	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1939	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1940	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1941	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103
R1942	Resistor 5k6 ohm <u>+5%</u>	0.33W Philips	2322 211 13562
R1943	Resistor 820 ohm <u>+5%</u>	0.33W Philips	2322 211 13821
R1944	Resistor 10 kohm <u>+5%</u>	0.33W Philips	2322 211 13103

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
R1945	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1946	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1947	Resistor	10 kohm	+5%	0.33W	Philips	2322 211 13103
R1948	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1949	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1950	Resistor	10 kohm	+5%	0.33W	Philips	2322 211 13103
R1951	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1952	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1953	Resistor	10 kohm	+5%	0.33W	Philips	2322 211 13103
R1954	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1955	Resistor	8k2 ohm	+5%	0.33W	Philips	2322 211 13822
R1956	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1957	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1958	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1959	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1960	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1961	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1962	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1963	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1964	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1965	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1966	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1967	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1968	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1969	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1970	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1971	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1972	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1973	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1974	Resistor	5k6 ohm	+5%	0.33W	Philips	2322 211 13562
R1975	Resistor	820 ohm	+5%	0.33W	Philips	2322 211 13821
R1976	Resistor	22 ohm	+5%	0.33W	Philips	2322 211 13229
R1977	Resistor	1k8 ohm	+5%	0.33W	Philips	2322 211 13182
R1978	Resistor	2k7 ohm	+5%	0.33W	Philips	2322 211 13272
RA1901	Resistor array. 8x10 kohm +5%			0.125W	ITT	UR8 10 kohm +5%
T1901	Transistor				Philips	BC328-25
T1902	Transistor				Philips	BC328-25
T1903	Transistor				Philips	BC328-25

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
T1904	Transistor	Philips	BC328-25
T1905	Transistor	Philips	BC328-25
T1906	Transistor	Philips	BC328-25
T1907	Transistor	Philips	BC328-25
T1908	Transistor	Philips	BC328-25
T1909	Transistor	Philips	BC328-25
T1910	Transistor	Philips	BC328-25
T1911	Transistor	Philips	BC328-25
T1912	Transistor	Philips	BC328-25
T1913	Transistor	Philips	BC548
T1914	Transistor	Philips	BC558
T1915	Transistor	Philips	BC558
T1916	Transistor	Philips	BC558
T1917	Transistor	Philips	BC558
T1918	Transistor	Philips	BC558
T1919	Transistor	Philips	BC558
T1920	Transistor	Philips	BC558
T1921	Transistor	Philips	BC558
T1922	Transistor	Philips	BC558
T1923	Transistor	Philips	BC558
T1924	Transistor	Philips	BC558B

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
C2001	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2002	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2003	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2004	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2005	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2006	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2007	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2008	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2009	Capacitor electrolytic	2200uF <u>-20/+50%</u>	25V	ERO	EG.00KG 422E
C2010	Capacitor electrolytic	10 uF <u>+20%</u>	35V	ERO	EKI 00AA210F
C2011	Capacitor electrolytic	470 nF <u>+20%</u>	50V	ERO	EKI 00AA047H
C2012	Capacitor polyester	220 nF <u>+20%</u>	100V	Philips	2222 344 24224
C2013	Capacitor electrolytic	3u3F <u>+20%</u>	50V	ERO	EKI 00AA133H
C2014	Capacitor ceramic	10 nF <u>-20/+80%</u>	50V	KCK	HE70SJYF 103Z
C2015	Capacitor ceramic	10 nF <u>-20/+80%</u>	50V	KCK	HE70SJYF 103Z
C2016	Capacitor ceramic	10 nF <u>-20/+80%</u>	50V	KCK	HE70SJYF 103Z
C2017	Capacitor electrolytic	10 uF <u>+20%</u>	35V	ERO	EKI 00AA210F
C2018	Capacitor ceramic	10 nF <u>-20/+80%</u>	50V	KCK	HE70SJYF 103Z
C2019	Capacitor ceramic	10 nF <u>-20/+80%</u>	50V	KCK	HE70SJYF 103Z
D2001	Diode zener	5.1V <u>+5%</u>	0.4W	Philips	BZY79 C5V1
D2002	Diode silicon			Philips	1N4148
IC2001	Integrated circuit			RCA	CD4056B
IC2002	Integrated circuit			RCA	CD4056B
IC2003	Integrated circuit			RCA	CD4056B
IC2004	Integrated circuit			RCA	CD4056B
IC2005	Integrated circuit			RCA	CD4056B
IC2006	Integrated circuit			RCA	CD4056B
IC2007	Integrated circuit			Texas	SN74LS08N
IC2008	Integrated circuit			Texas	SN74LS08N
IC2009	Integrated circuit			Texas	SN74LS08N
IC2010	Integrated circuit			Texas	SN74LS32N
IC2011	Integrated circuit			Texas	SN74LS08N
IC2012	Integrated circuit			Texas	SN74LS08N
IC2013	Integrated circuit			Texas	SN74LS668N
IC2014	Integrated circuit			Texas	SN74LS668N
IC2015	Integrated circuit			Texas	SN74LS668N
IC2016	Integrated circuit			Texas	SN74LS668N
IC2017	Integrated circuit			Texas	SN74LS668N

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>	
IC2018	Integrated circuit			Texas	SN74LS668N
IC2019	Integrated circuit			Texas	SN74LS04N
IC2020	Integrated circuit			Texas	SN74LS132N
IC2021	Integrated circuit			Texas	SN74LS74AN
IC2022	Integrated circuit			Texas	SN74LS74AN
IC2023	Integrated circuit			Texas	SN74LS74AN
IC2024	Integrated circuit			Texas	SN74LS00N
IC2025	Integrated circuit			Texas	SN74LS148N
IC2026	Integrated circuit			Texas	SN74LS08N
IC2027	Integrated circuit			Texas	SN74LS86N
IC2028	Integrated circuit			Texas	SN74LS74AN
IC2029	Integrated circuit			Texas	SN74LS123N
IC2030	Integrated circuit			Texas	SN74LS32N
IC2031	Integrated circuit			Motorola	MC14011 BCP
R2001	Resistor	3k9 ohm <u>+5%</u>	0.33W	Philips	2322 211 13392
R2002	Resistor	6k8 ohm <u>+5%</u>	0.33W	Philips	2322 211 13682
R2003	Resistor	1 kohm <u>+5%</u>	0.33W	Philips	2322 211 13102
R2004	Resistor	18 kohm <u>+5%</u>	0.33W	Philips	2322 211 13183
R2005	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2006	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2007	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2008	Resistor	1 kohm <u>+5%</u>	0.33W	Philips	2322 211 13102
R2009	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2010	Resistor	100 ohm <u>+5%</u>	0.33W	Philips	2322 211 13101
R2011	Resistor	22 kohm <u>+5%</u>	0.33W	Philips	2322 211 13223
R2012	Resistor	22 kohm <u>+5%</u>	0.33W	Philips	2322 211 13223
R2013	Resistor	100 ohm <u>+5%</u>	0.33W	Philips	2322 211 13101
R2014	Resistor	2.7 kohm <u>+5%</u>	0.33W	Philips	2322 211 13272
R2015	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2016	Resistor	2.7 kohm <u>+5%</u>	0.33W	Philips	2322 211 13272
R2017	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2018	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2019	Resistor	10 kohm <u>+5%</u>	0.33W	Philips	2322 211 13103
R2020	Resistor	100 ohm <u>+5%</u>	0.33W	Philips	2322 211 13101
RA2001	Resistor array. 8x10 kohm <u>+5%</u>		0.125W	ITT	UR8 10 kohm <u>+5%</u>
RA2002	Resistor array. 8x10 kohm <u>+5%</u>		0.125W	ITT	UR8 10 kohm <u>+5%</u>
RA2003	Resistor array. 8x10 kohm <u>+5%</u>		0.125W	ITT	UR8 10 kohm <u>+5%</u>

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
T2001	Transistor	Philips	BC548
T2002	Transistor	Philips	BC548
T2003	Transistor	Philips	BC558
T2004	Transistor	Philips	BC558

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
R2101	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2102	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2103	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2104	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2105	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2106	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2107	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2108	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2109	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2110	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2111	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
R2112	Resistor	10 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13103
S2101	Switch			ITT		ED/SP
S2102	Switch			ITT		ED/SP
S2103	Switch			ITT		ED/SP
S2104	Switch			ITT		ED/SP
S2105	Switch			ITT		ED/SP
S2106	Switch			ITT		ED/SP
S2107	Switch			ITT		ED/SP
S2108	Switch			ITT		ED/SP
S2109	Switch			ITT		ED/SP
S2110	Switch			ITT		ED/SP
S2111	Switch			ITT		ED/SP
S2112	Switch			ITT		ED/SP

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DISPLAY R1119 & R1120

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<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
LCD2201	Display six segments	Data modul	60D7F05KG
J2201	Connector	AMP	2-583773-1
J2202	Connector	AMP	2-583773-1

<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
C2301	Capacitor electrolytic	10 uF	<u>+20%</u>	35V	ERO	EKI 00AA210F
D2301	Diode silicon				Philips	1N4148
D2302	Diode silicon				Philips	1N4148
D2303	Diode silicon				Philips	1N4148
OC2301	Opto coupler				TRW	OPB825
R2301	Resistor	5k6	ohm <u>+5%</u>	0.33W	Philips	2322 106 33562
R2302	Resistor	3k9	ohm <u>+5%</u>	0.33W	Philips	2322 106 33392
R2303	Resistor	820	ohm <u>+5%</u>	0.33W	Philips	2322 106 33821
R2304	Resistor	820	ohm <u>+5%</u>	0.33W	Philips	2322 106 33821
R2305	Resistor	82	ohm <u>+5%</u>	0.33W	Philips	2322 106 33829
R2306	Resistor	10	kohm <u>+5%</u>	0.33W	Philips	2322 106 33103
R2307	Resistor	1	kohm <u>+5%</u>	0.33W	Philips	2322 106 33102
T2301	Transistor				Philips	BC548
T2302	Transistor				Philips	BC558
T2303	Transistor				Philips	BC548

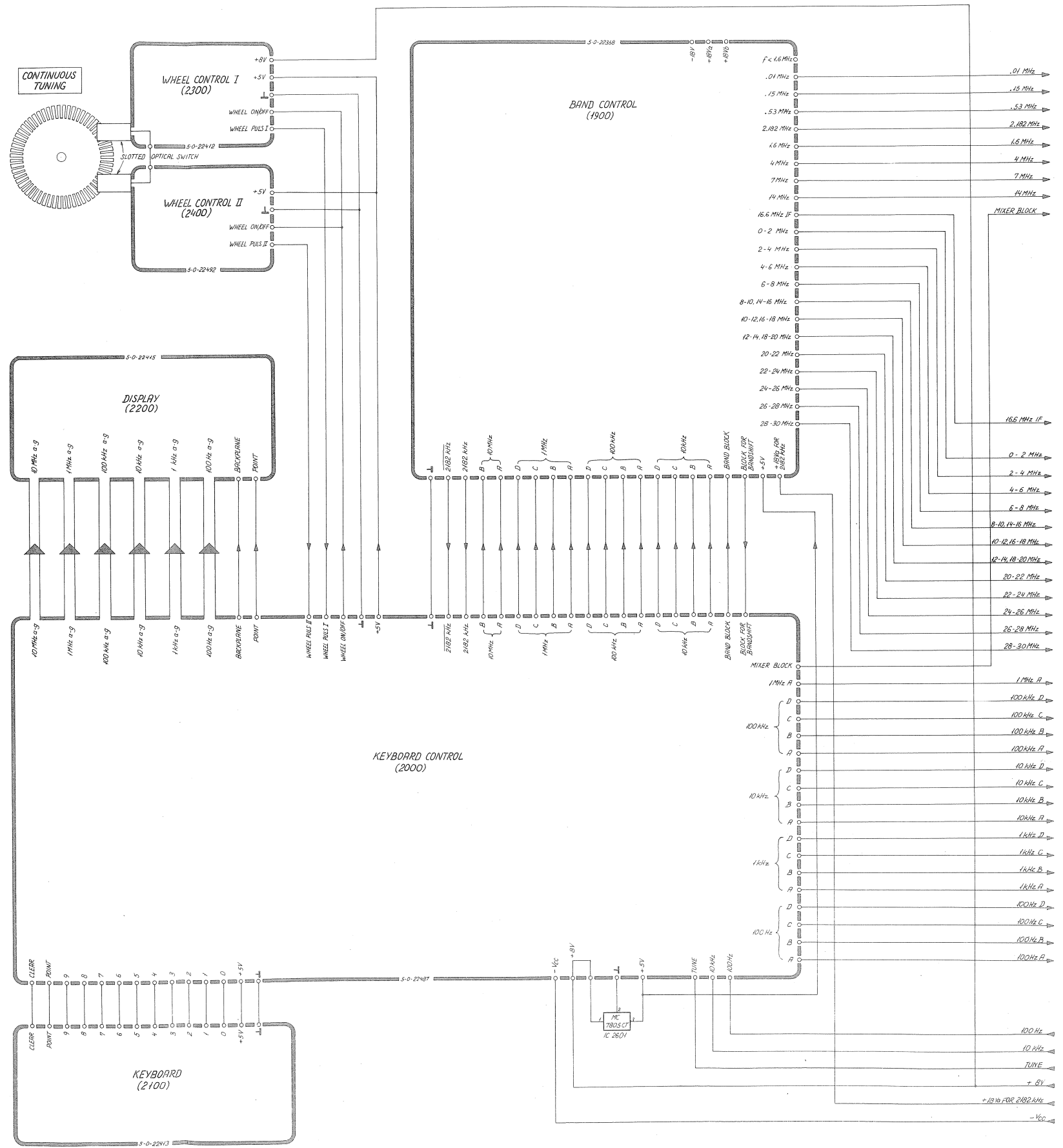
<i>Symbol</i>	<i>Description</i>		<i>Manufact.</i>	
C2401	Capacitor electrolytic 10 uF <u>+20%</u>	35V	ERO	EKI 00AA210F
OC2401	Opto coupler		TRW	OPB825
R2401	Resistor 1k8 ohm <u>+5%</u>	0.33W	Philips	2322 106 33182
R2402	Resistor 6k8 ohm <u>+5%</u>	0.33W	Philips	2322 106 33682
R2403	Resistor 100 ohm <u>+5%</u>	0.33W	Philips	2322 106 33101
R2404	Resistor 10 kohm <u>+5%</u>	0.33W	Philips	2322 106 33103
R2405	Resistor 10 kohm <u>+5%</u>	0.33W	Philips	2322 106 33103
R2406	Resistor 10 kohm <u>+5%</u>	0.33W	Philips	2322 106 33103
R2407	Resistor 1 kohm <u>+5%</u>	0.33W	Philips	2322 211 13102
T2401	Transistor		Philips	BC558
T2402	Transistor		Philips	BC548B
T2403	Transistor		Philips	BC548B

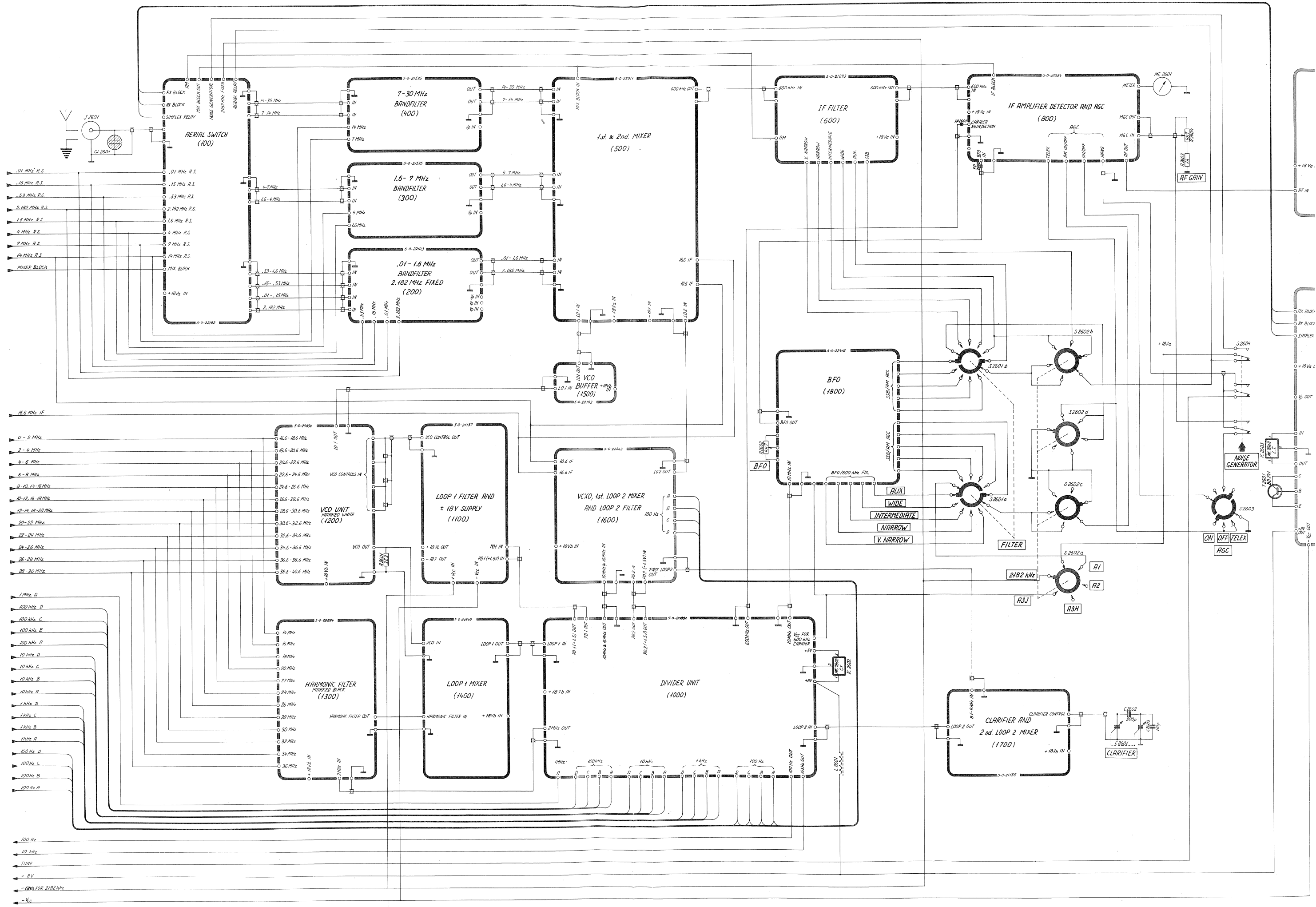
<i>Symbol</i>	<i>Description</i>			<i>Manufact.</i>		
C2501	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2502	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2503	Capacitor polyester	10 nF	<u>+20%</u>	400V	Philips	2222 344 54103
C2504	Capacitor polyester	10 nF	<u>+20%</u>	400V	Philips	2222 344 54103
C2505	Capacitor electrolytic	47 uF	-10/+50%	63V	ERO	EB 00FC 247J
C2506	Capacitor electrolytic	10 uF	-10/+100%	40V	ERO	EB 00CA 210G
C2507	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2508	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2509	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2510	Capacitor polycarbonate	1 uF	<u>+20%</u>	630V	ERO	KC1849 210/6
C2511	Capacitor polycarbonate	1 uF	<u>+20%</u>	630V	ERO	KC1849 210/6
C2512	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2513	Capacitor polyester	10 nF	<u>+20%</u>	400V	Philips	2222 344 54103
C2514	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2515	Capacitor polyester	100 nF	<u>+20%</u>	100V	Philips	2222 344 24104
C2516	Capacitor polyester	220 nF	<u>+20%</u>	100V	Philips	2222 344 24224
D2501	Diode zener	56V	<u>+5%</u>	1W	Motorola	MZP 4758A
L2501	Coil				S.P.	TL079
L2502	AF transformer				Tradania	2296
R2501	Resistor	22 kohm	<u>+5%</u>	0.33W	Philips	2322 211 13223
R2502	Resistor	220 ohm	<u>+5%</u>	1.15W	Philips	2322 214 13221

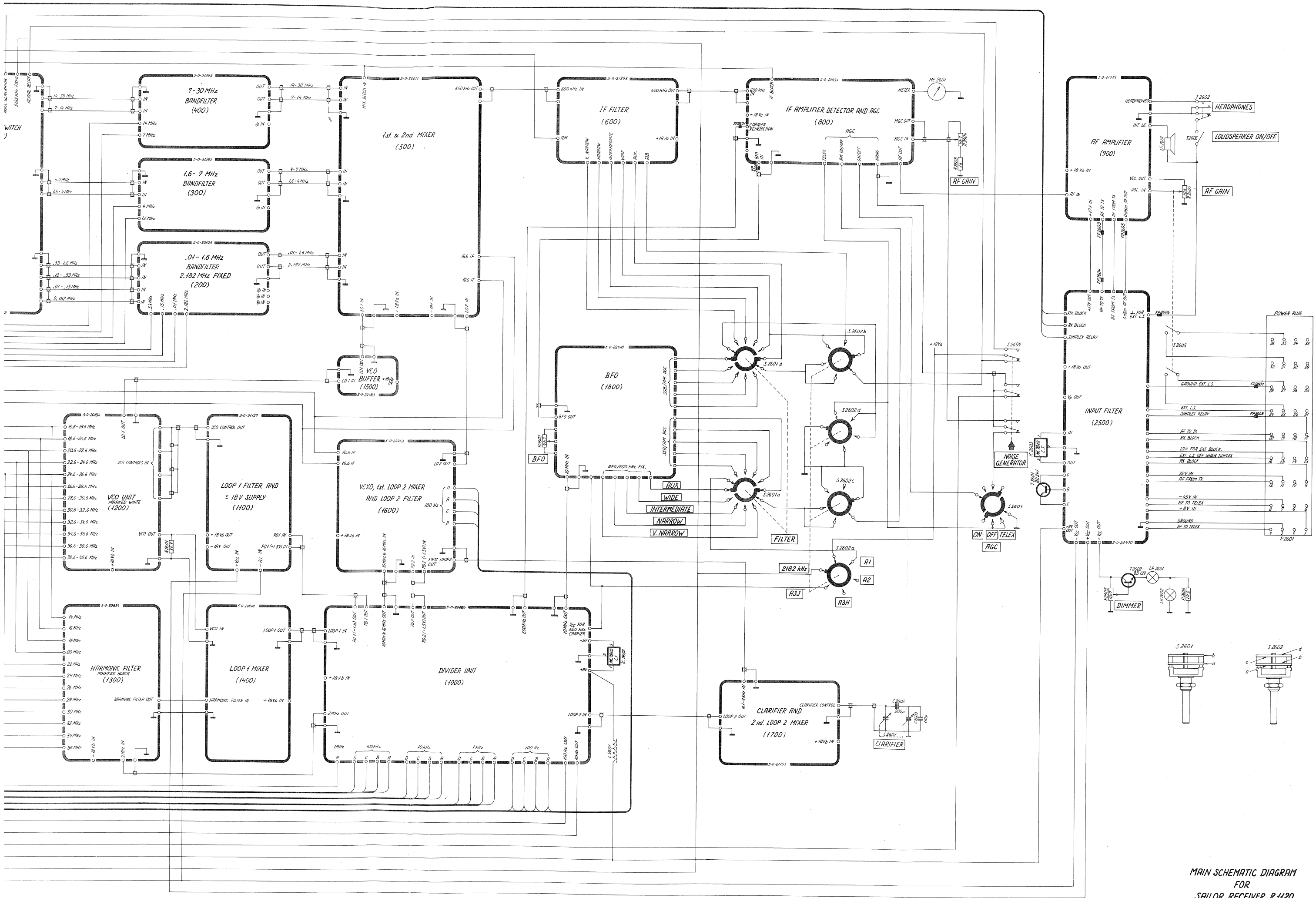
Symbol	Description			Manufact.	
C2601	Capacitor variable	2x335 pF		HELAG	250-30
C2602	Capacitor ceramic	200 pF +5% N150	100V	KCK	SPDU-4E
C2603	Capacitor ceramic	110 pF +5% N150	100V	KCK	SPDU-4B
FP2601	Ferrite bead Grade 4B1			Philips	4322 020 34420
FP2602	Ferrite bead Grade 4B1			Philips	4322 020 34420
FP2603	Ferrite bead Grade			Kaschke	K3/1200/0.1 Hz 4/2/7A
FP2604	Ferrite bead Grade			Kaschke	K3/1200/0.1 Hz 4/2/7A
FP2605	Ferrite bead Grade			Kaschke	K3/1200/0.1 Hz 4/2/7A
FP2606	Ferrite bead Grade			Kaschke	K3/1200/0.1 Hz 4/2/7A
FP2607	Ferrite bead Grade			Kaschke	K3/1200/0.1 Hz 4/2/7A
FP2608	Ferrite bead Grade			Kaschke	K3/1200/0.1 Hz 4/2/7A
GL2601	Neon lamp			Siemens	B1C90-Q69 X151
IC2601	Integrated circuit	5V 1A		Motorola	MC7805CT
IC2602	Integrated circuit	5V 1A		Motorola	MC7805CT
IC2603	Integrated circuit	18V 1A		Motorola	MC7818CT
J2601	Aerial socket			K.V.Hansen	S0239
J2602	Headphone socket			CLIFF	type S1/BB
L2601	Coil			S.P.	TL294
LA2601	Dial lamp	15V/37mA		OSHINE	OL-6003-MB
LA2602	Dial lamp	15V/37mA		OSHINE	OL-6003-MB
LS2601	Loudspeaker	8 ohm		Peerless	E230 MT/8 ohm
ME2601	Meter	MG20		MONI-METER	KL-218J-140
P2601	Power plug			MOLEX	03-06-2364
R2601	Resistor	3E3 ohm +5%	0.33W	Philips	2322 106 33338
R2602	Resistor variable	4k7 ohm LIN.		NOBLE	V24L5 (10x6.5)N 37S-B4.7K
R2603	Resistor variable	1 kohm +5%	0.33W	Philips	2222 211 13102
R2604	Resistor variable	4k7 ohm LIN.		NOBLE	V24L5 (10x6.5)N 37S-B4.7K
R2605	Resistor variable	4k7 ohm LIN.		NOBLE	V16L4N B4.7K
R2606	Resistor	1k2 ohm +5%	0.5W	Philips	2322 212 13122

<i>Symbol</i>	<i>Description</i>	<i>Manufact.</i>	
R2607	Resistor variable 10 kohm LOG	NOBLE	V24L5 (10x6.5)S (V12DV-S) 10K
S2601	Switch, 5 pos. SM25 30°	ITT	48432-62565
S2602	Switch, 5 pos. SM25 60°	ITT	48432-62573
S2603	Switch, 3 pos. SM25 30°	ITT	48432-62574
S2604	Switch, push button	C & K	8321
S2605	Switch, mains, part of R2607		
S2606	Switch, toggle	C & K	7101 SYZB
S2607	Switch, 3 pos. SM25 60°	ITT	48432-62587
T2601	Transistor	Motorola	BD241
T2602	Transistor	Motorola	BD139

*MAIN SCHEMATIC DIAGRAM
FOR
SAILOR RECEIVER R420*







MAIN SCHEMATIC DIAGRAM FOR SAILOR RECEIVER R120

