Sailor

Sailor

INSTRUKTIONSBOG FOR SAILOR T1130

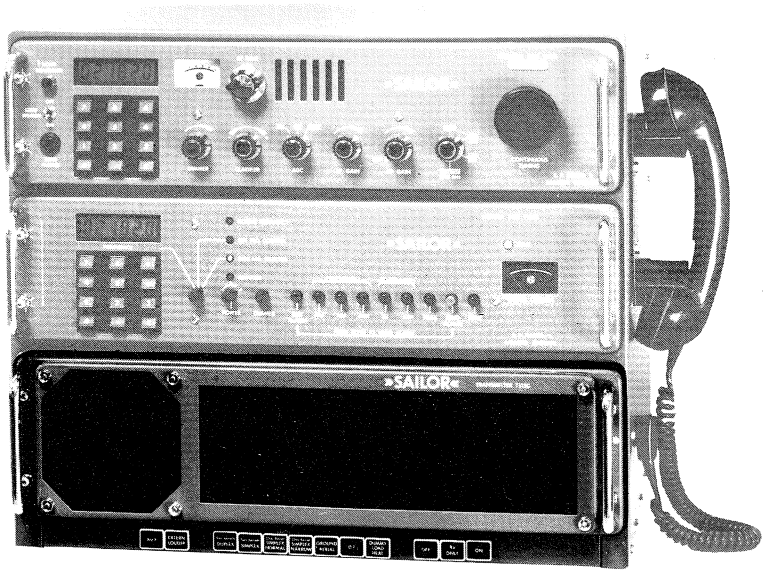
INSTRUCTION BOOK FOR SAILOR T1130

A/S S. P. RADIO · AALBORG · DENMARK

S.P. Radio A/S · Aalborg · Denmark

S.P. RADIO A/S - PORSVEJ 2 - 9200 AALBORG SV. - DENMARK - PHONE (08) 18 09 99 - INT. +45 8 18 09 99 - TELEGRAMS: ESPERA - TELEX 69 789

T 1130



INSTRUCTION BOOK FOR TRANSMITTER T1130

Valid from serial No. 261639

GENERAL DESCRIPTION

SAILOR T1130 is a 500 Watt PEP SSB transmitter.

SAILOR T1130 has 50 ohm output impedance.

SAILOR T1130 has continuously frequency covering from 1.6 MHz to 28 MHz.

SAILOR T1130 is constructed to be used together with AERIAL COUPLER AT1500.

SAILOR T1130 is automatically tuning the AT1500.

SAILOR T1130 has built-in power supply.

SAILOR T1130 can be supplied from:

- N1406 12V DC
- N1407 24V DC
- N1408 32V DC
- N1409 110/220/240V AC

SAILOR T1130 can be used in conjunction with exciter S1302, S1303 and S1304.

SAILOR T1130 fits into SAILOR 19" rack system.

SAILOR T1130 can operate automatic radiotelex in connection with exciter S1303, scanning receiver R1121 and radiotelex modem ARQ H1240

PRINCIPLE OF OPERATION

The SAILOR Transmitter T1130 has built-in power supply and is constructed to be used together with Aerial Coupler AT1500, Exciters S1302, S1303 and S1304. Receivers R1119 and R1120.

The RF signal from the exciter is amplifiered in a full-transistorized Power Amplifier delivering a power output of 550W PEP at 50 ohm. The power output from the Power Amplifier is feed through a Directional Coupler and then to a Low Pass Filter section. The output power after the low pass filter section is 500W PEP at 50 ohm and all harmonics are more than 43dB below the funtamental for the frequency range 1.6 MHz to 28 MHz.

The Directional Coupler is connected to a VSWR-CALCULATOR which is calculating the reflections coefficient. The output is connected to the Protection Circuit and the TUNE LOGIC.

The Protection Circuit is controling the drive level from the exciter in such a way that the Power Amplifier is protected against excessive VSWR.

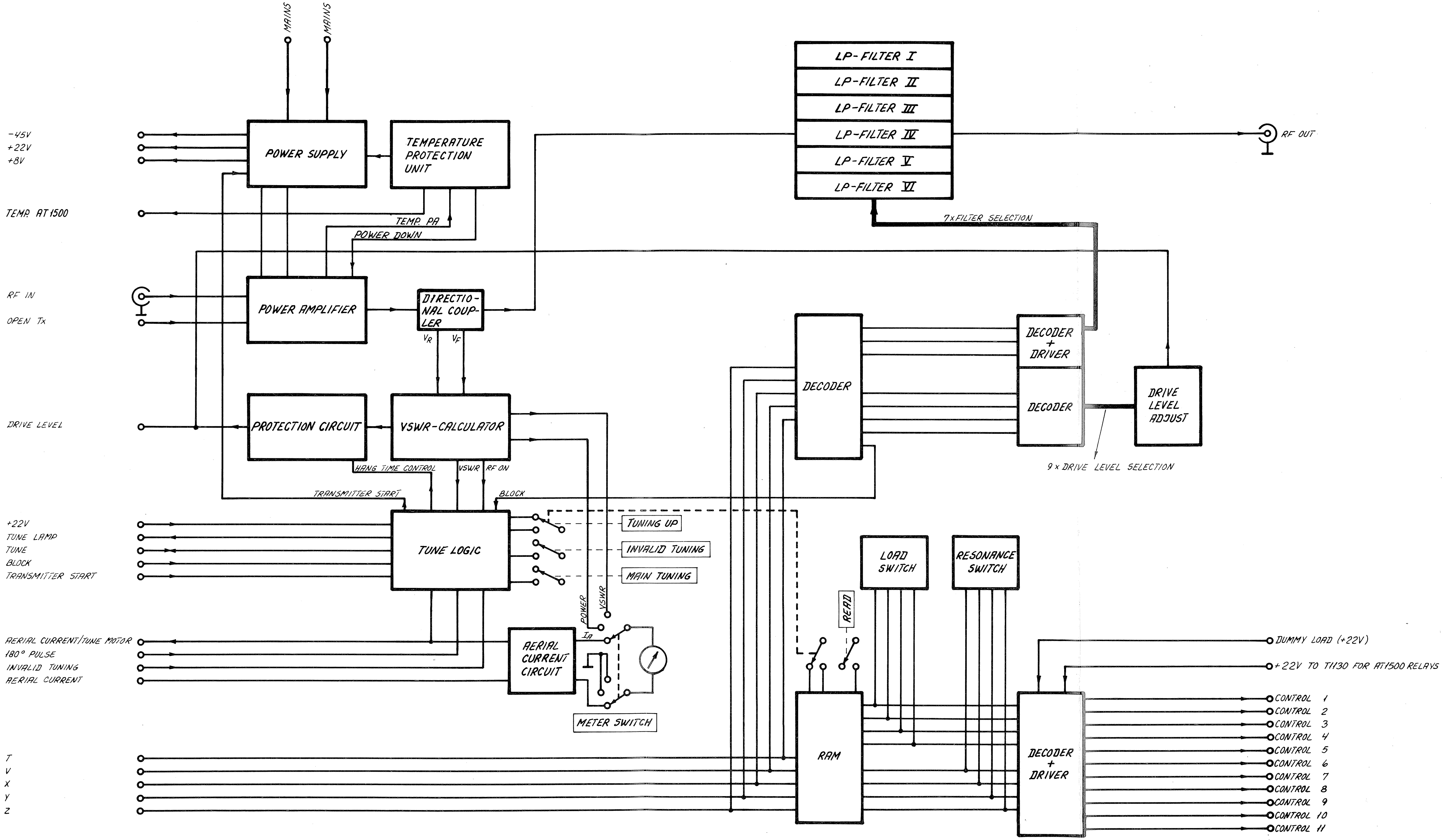
The TUNE logic is controlling the tune motor of the Aerial Coupler AT1500 and it is also controling the power supply through Transmitter start.

The Aerial Current Circuit is receiving a DC voltage propotional to the aerial current from the Aerial Coupler AT1500.

By means of the METER SWITCH it is possible to measure the Aerial Current, Power output and VSWR.

From S130x a 5 bit Frequency Band code is received. This code is Decoded and then controling the Low Pass Filter selection and drive level adjusting. Further more it is controling the date selection of the RAM. This RAM is programmeable under tuning up by means of the Load Switch and Resonance Switch. These switches are controling the presetings of the Aerial Coupler AT1500 through the Decoder and Driver. The RAM has litium battery back up so the presetings of the Load and Resonance will be remembered for at least 5 years. If the Aerial has been changed it is possible to change the presetings of Load and Resonance. The only necessary tool for tuning up is a screw-driver and all tuning up facilities are accessible, from the Front of the Transmitter.

T 113o A



TRANSMITTER T1130 ©

TUNE-UP PROCEDURE

When installing T1130/AT1500 or changing the aerial it is necessary to retune the pre-settings of AT1500. The procedure for this is as follows:

COARSE TUNING

1. Remove the filter at the front of T1130.
2. Set the uppermost switch at the extreme right in position AUTO, the second in position TUNE-UP and the fourth in position S.
3. Select the highest programmed frequency in each band listed in table 1.
4. Select the lowest permitted resonance number on the RESONANCE switch (see fig. 1) for the band in question according to table 2.
5. Select the lowest permitted load number on the LOAD switch (see fig. 1), for the band in question according to table 2.
6. Push the TUNE button on the exciter, and wait until the tune lamp on the exciter stops lighting or starts to flash. (Max. tune time 20 secs).
7. If the TUNE lamp stops lighting then press the button INVALID TUNING (see fig. 1). (If the TUNE lamp starts to flash after pressing INVALID TUNING - don't care!)
   a. If the red lamp below the push button does not light up you have found a tuning with a voltage standing wave ratio (VSWR) less than 2 and can go to FINAL TUNING point 1.
   b. If the red lamp lights up, then select a resonance number higher according to table 2, and start from point 5.
   c. If the TUNE lamp starts to flash, select the next load number according to table 2. Now repeat point 6 and 7, until the highest load number is reached.
8. Select the next resonance number on the RESONANCE switch and repeat point 5, 6 and 7.

T 113o A

FINAL TUNING

1. Set the uppermost switch in position MAN and record the reading on the AERIAL CURRENT meter and switch off again.
2. Select the next higher load number.
3. Push the TUNE button and wait for the tuning.
4. Set the uppermost switch in position MAN and record the reading on the AERIAL CURRENT meter, and switch off again.
5. If the TUNE lamp starts to flash or the reading is less than under previous tuning, then press the button INVALID TUNING (if the TUNE lamp starts to flash after pressing INVALID TUNING - don't care!)
   a. If the red lamp does not light up, set the LOAD switch to the previous number and procede with BANDWIDTH CHECK point 1.
   b. If the red lamp lights up then select a number higher resonance and continue from point 3.
6. If the reading is higher then press the button INVALID TUNING.
   a. If the red lamp does not light up then select a number higher load and continue from point 3.
   b. If the red lamp lights up then select a number higher resonance and continue from point 3.

BANDWIDTH CHECK

1. Select the lowest frequency in the band according to table 1.
2. Push the TUNE button.
3. If the TUNE lamp stops lighting press the button INVALID TUNING.
   a. If the red lamp does not light up the tuning of this frequency band is completed. Go to point 6.
   b. If the red lamp lights up, select a higher resonance number and continue from point 2.
4. If the TUNE lamp starts to flash, try the possibilities 1 to 5 in the table below (when changing RESONANCE/LOAD press TUNE button and wait for the tuning), until the tune lamp stops flashing then go to point 3.

	RESONANCE	LOAD
1	one step up	the same
2	one step up	one step down
3	one step down	one step up
4	the same	one step up
5	the same	one step down

5. If it has been necessary to change RESONANCE or LOAD number then continue from point 2 on the highest frequency in the band.
6. You have now found the right settings of RESONANCE/LOAD note the figures in the TUNING TABLE T1130/AT1500. Then press the button PROGRAMME; now the settings of RESONANCE/LOAD switches are programmed into the memory. Put meter switch in position AERIAL CURRENT, TUNING switch in position MAN. and note the aerial current in the TABLE T1130/AT1500, and please send the copy to S. P. Radio. When all frequency bands have been programmed then set the switches in position: AUTO, NORMAL, and AERIAL CURRENT. Replace the air filter.

THIS TUNING PROCEDURE HAS TO BE CARRIED OUT FOR ALL FREQUENCY BANDS IN WHICH THE EXCITER HAS PROGRAMMED FREQUENCIES!

TABLE 1

BANDS in T1130	MARITIME BANDS
2182.0 kHz	
1 600.0 - 1 799.9 kHz	1 600.0 - 1 799.9 kHz
1 800.0 - 1 999.9 kHz	1 800.0 - 1 999.9 kHz
2 000.0 - 2 199.9 kHz	2 000.0 - 2 199.9 kHz
2 200.0 - 2 399.9 kHz	2 200.0 - 2 399.9 kHz
2 400.0 - 2 599.9 kHz	2 400.0 - 2 599.9 kHz
2 600.0 - 2 799.9 kHz	2 600.0 - 2 799.9 kHz
2 800.0 - 2 999.9 kHz	2 800.0 - 2 999.9 kHz
3 000.0 - 3 099.9 kHz	3 000.0 - 3 099.9 kHz
3 100.0 - 3 399.9 kHz	3 100.0 - 3 399.9 kHz
3 400.0 - 3 699.9 kHz	3 400.0 - 3 699.9 kHz
3 700.0 - 3 999.9 kHz	3 700.0 - 3 999.9 kHz
4 000.0 - 4 299.9 kHz	4 063.0 - 4 219.4 kHz
4 300.0 - 4 599.9 kHz	
4 600.0 - 4 999.9 kHz	
5 000.0 - 5 499.9 kHz	
5 500.0 - 5 999.9 kHz	
6 000.0 - 6 399.9 kHz	6 200.0 - 6 325.4 kHz
6 400.0 - 6 999.9 kHz	
7 000.0 - 7 599.9 kHz	
7 600.0 - 7 999.9 kHz	
8 000.0 - 8 499.9 kHz	8 195.0 - 8 435.4 kHz
12 300.0 - 12 699.9 kHz	12 330.0 - 12 652.3 kHz
16 400.0 - 16 899.9 kHz	16 460.0 - 16 859.4 kHz
22 000.0 - 22 399.9 kHz	22 000.0 - 22 310.5 kHz
25 000.0 - 25 199.9 kHz	25 070.0 - 25 110.0 kHz
Optional	
Optional	

VALID FROM SERIAL NO. 261639 TO 2618oo

TABLE 2: PERMITTED RESONANCE AND LOAD NUMBERS

RESONANCE

Frequency MHz	Permitted Numbers										
1.6 - 3.1	0	1	2	3							
3.1 - 4.3		1	2	3							
6.2 - 6.4			2	3	4	5					
8.1 - 8.5			2	3	4	5	6	7			
12.3 - 12.7							6	7	8	9		
16.4 - 16.9								7	8	9	10	
22 - 22.4											10	11
25 - 25.2											10	11

LOAD

Frequency MHz	Permitted Numbers									
1.6 - 2.6	0	1								
2.6 - 3.1	0	1	2							
3.1 - 3.9	0	1	2	3	4	5	6			
4.0 - 4.3	0	1	2	3	4	5	6	7	8	9	10
6 - 8.5	0	1	2	3	4	5	6	7	8	9	
12.3 - 16.9	0	1	2	3	4	5	6	7			
22 - 25.1	0	1	2	3	4						

T 113o A

TUNE-UP PROCEDURE VALID FOR T1130 WITH SERIAL NO. HIGHER THAN 261800

After installation of T1130/AT1500 it is necessary to set the pre-setting of AT1500 for the aerial in question.
Aerial to be used must be between 5 - 15 metres, but where it is possible we recommend that aerials between 8 - 15 metres are used.

Before starting the tuning-up be sure that other aerials, crane derricks, booms, etc. are in the same position as when the ship is in open sea. If the ship is moored it must be away from cranes on land, high buildings, bridges, other ships, and any other source of interference.

For tune-up use the below description and table 2. If it is not possible to tune when using table 2, then check for resonances in wires etc. If nothing is found then use table 2a for selection of resonance/load.

COARSE TUNING

1. Remove the filter at the front of T1130.
2. Set the uppermost switch at the extreme right in position AUTO, the second in position TUNE-UP and the fourth in position S.
3. Select the highest programmed frequency in each band listed in table 2.
4. Select the lowest permitted resonance number on the RESONANCE switch (see fig. 1) for the band in question according to table 2.
5. Select the lowest permitted load number on the LOAD switch (see fig. 1), for the band in question according to table 2.
6. Push the TUNE button on the exciter, and wait until the tune lamp on the exciter stops lighting or starts to flash. (Max. tune time 20 secs).
7. If the TUNE lamp stops lighting then press the button INVALID TUNING (see fig. 1). (If the TUNE lamp starts to flash after pressing INVALID TUNING - don't care!)
   a. If the red lamp below the push button does not light up you have found a tuning with a voltage standing wave ratio (VSWR) less than 2 and can go to FINAL TUNING point 1.
   b. If the red lamp lights up, then select a resonance number higher according to table 2, and start from point 5.
   c. If the TUNE lamp starts to flash, select the next load number according to table 2. Now repeat point 6 and 7, until the highest load number is reached.
8. Select the next resonance number on the RESONANCE switch and repeat point 5, 6, and 7.

FINAL TUNING

1. Set the uppermost switch in position MAN and record the reading om the AERIAL CURRENT meter and switch off again.
2. Select the next higher load number.
3. Push the TUNE button and wait for the tuning.
4. Set the uppermost switch in position MAN and record the reading on the AERIAL CURRENT meter, and switch off again.

5. If the TUNE lamp starts to flash or the reading is less than under previous tuning, then press the button INVALID TUNING (if the TUNE lamp starts to flash after pressing INVALID TUNING - don't care!)

   a. If the red lamp does not light up, set the LOAD switch to the previous number and procede with BANDWIDTH CHECK point 1.

   b. If the red lamp lights up then select a number higher resonance and continue from point 3.

6. If the reading is higher then press the button INVALID TUNING.

   a. If the red lamp does not light up then select a number higher load and continue from point 3.

   b. If the red lamp lights up then select a number higher resonance and continue from point 3.

BANDWIDTH CHECK

1. Select the lowest frequency in the band according to table 2.
2. Push the TUNE button.
3. If the TUNE lamp stops lighting press the button INVALID TUNING.

   a. If the red lamp does not light up the tuning of this frequency band is completed. Go to point 6.

   b. If the red lamp lights up, select a higher resonance number and continue from point 2.

4. If the TUNE lamp starts to flash, try the possibilities 1 to 5 in the table below (when changing RESONANCE/LOAD press TUNE button and wait for the tuning), until the tune lamp stops flashing then go to point 3.

	RESONANCE	LOAD
1	one step up	the same
2	one step up	one step down
3	one step down	one step up
4	the same	one step up
5	the same	one step down

5. If it has been necessary to change RESONANCE or LOAD number then continue from point 2 on the highest frequency in the band.

6. You have now found the right settings of RESONANCE/LOAD note the figures in the TUNING TABLE T1130/AT1500. Then press the button PROGRAMME; now the settings of RESONANCE/LOAD switches are programmed into the memory. Put meter switch in position AERIAL CURRENT, TUNING switch in position MAN. and note the aerial current in the TUNING TABLE T1130/AT1500, and please send the copy to S. P. Radio. When all frequency bands have been programmed, then set the switches in position: AUTO, NORMAL, and AERIAL CURRENT. Replace the air filter.

THIS TUNING PROCEDURE HAS TO BE CARRIED OUT FOR ALL FREQUENCY BANDS IN WHICH THE EXCITER HAS PROGRAMMED FREQUENCIES!

TABLE 2. VALID FOR T1130 WITH SERIAL NO. HIGHER THAN 261800.

This table is based on several aerial measurements, but it has only to be considered as a guide.

To make the table more complete it is most important that you fill in the TUNING TABLE FOR T1130 which is in the back of this manual, and return it to S. P. Radio.

If it is not possible to tune the transmitter within the resonance and load numbers listed in table 2, then use TABLE 2a.

	AERIAL LENGTH																				
	5 m		6 m		7 m		8 m		9 m		10 m		11 m		12 m		13 m		14 m		15 m	
MARITIME FREQUENCY BANDS	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load	Resonance	Load
1 600.0 - 1 799.9 kHz	0- 3	1	0- 3	1	0- 3	1	4- 6	1	4- 6	1	4- 6	0-1	4- 6	0-1	4- 6	0-1	4- 6	0	4- 6	0	4- 6	0
1 800.0 - 1 999.9 kHz	0- 3	1	0- 3	1	0- 3	1	4- 6	0-1	4- 6	0-1	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0
2 000.0 - 2 199.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0
2 200.0 - 2 399.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0
2 400.0 - 2 599.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 7	0	4- 7	0	4- 7	0
2 600.0 - 2 799.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 7	0-1	4- 7	0-1	4- 7	0-1
2 800.0 - 2 999.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0-1	4- 7	0-1	4- 7	0-1
3 000.0 - 3 099.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0-1	4- 7	0-1	4- 7	0-1
3 100.0 - 3 399.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0	4- 7	0-1	4- 7	0-1	4- 7	0-1
3 400.0 - 3 699.9 kHz	0- 3	0	0- 3	0	0- 3	0	4- 7	0	4- 7	0	4- 7	0-1	4- 7	0-1	4- 7	0-1	4- 7	0-1	4- 7	1-2	4- 7	1-2
3 700.0 - 3 999.9 kHz	1- 3	0	1- 3	0	1- 3	0	4- 7	0-1	4- 7	0-1	4- 7	0-1	4- 7	0-2	4- 7	0-2	4- 7	0-3	4- 7	0-3	4- 7	0-4
4 063.0 - 4 219.4 kHz	1- 3	0	1- 3	0	1- 3	0-1	5- 7	0-2	5- 7	0-2	5- 7	0-2	5- 7	0-2	5- 7	0-2	5- 8	0-3	5- 8	1-7	5- 8	1-7
6 200.0 - 6.325.4 kHz	6- 8	0-1	6- 8	0-1	6- 9	0-2	6- 9	0-2	6- 9	1-5	6- 9	5-9	7- 9	5-9	7- 9	5-9	7- 9	5-8	7- 9	4-8	7- 9	4-8
8 195.0 - 8 435.4 kHz	9-11	0-1	9-11	0-2	9-11	0-5	9-11	2-7	9-11	2-8	9-11	2-6	9-11	2-5	9-11	1-4	8-10	1-4	8-10	1-5	8-10	1-5
12 330.0 - 12 652.3 kHz	10-12	3-6	10-12	2-6	10-12	1-5	10-13	0-4	10-13	0-4	10-13	0-4	10-13	0-4	10-13	0-5	10-13	0-5	10-13	0-5	10-13	0-5
16 460.0 - 16 859.4 kHz	11-13	0-2	11-13	0-2	11-13	0-2	11-13	1-5	11-13	1-4	11-13	1-4	11-13	1-4	12-14	2-5	12-14	2-5	12-14	1-5	12-14	1-5
22 000.0 - 22 310.5 kHz	14-15	1-3	14-15	1-3	14-15	1-3	14-15	1-4	14-15	1-4	14-15	1-4	14-15	1-4	14-15	1-4	14-15	1-4	14-15	1-4	14-15	1-4
25 070.0 - 25 110.0 kHz	14-15	0-3	14-15	0-3	14-15	0-3	14-15	0-4	14-15	0-4	14-15	0-4	14-15	0-4	14-15	0-4	14-15	0-4	14-15	0-4	14-15	0-4
Fixed 2 182.0 kHz	0- 3	0	0- 3	0	0- 3	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0	4- 6	0

TABLE 2a. Valid for T1130 with serial No. higher than 261800.

The table covers all permitted RESONANCE and LOAD numbers.

	AERIAL LENGTH			
	5 - 8 m		8 - 15 m	
FREUENCY BANDS IN T1130	Reso-nance	Load	Reso-nance	Load
2 182.0 kHz	0- 3	0- 1	4- 7	0- 1
1 600.0 - 1 799.9 kHz	0- 3	0- 1	4- 7	0- 1
1 800.0 - 1 999.9 kHz	0- 3	0- 1	4- 7	0- 1
2 000.0 - 2 199.9 kHz	0- 3	0- 1	4- 7	0- 1
2 200.0 - 2 399.9 kHz	0- 3	0- 1	4- 7	0- 1
2 400.0 - 2 599.9 kHz	0- 3	0- 1	4- 7	0- 1
2 600.0 - 2 799.9 kHz	0- 3	0- 2	4- 7	0- 2
2 800.0 - 2 999.9 kHz	0- 3	0- 2	4- 7	0- 2
3 000.0 - 3 099.9 kHz	0- 3	0- 2	4- 7	0- 2
3 100.0 - 3 399.9 kHz	0- 3	0- 6	4- 7	0- 6
3 400.0 - 3 699.9 kHz	0- 3	0- 6	4- 7	0- 6
3 700.0 - 3 999.9 kHz	0- 3	0- 6	4- 7	0- 6
4 000.0 - 4 299.9 kHz	1- 3	0-10	5- 7	0-10
4 300.0 - 4 599.9 kHz	4- 7	0-10	5- 7	0-10
4 600.0 - 4 999.9 kHz	4- 7	0-10	5- 7	0-10
5 000.0 - 5 499.9 kHz	5- 7	0- 9	5- 7	0- 9
5 500.0 - 5 999.9 kHz	5- 8	0- 9	5- 8	0- 9
6 000.0 - 6 399.9 kHz	6- 9	0- 9	6- 9	0- 9
6 400.0 - 6 999.9 kHz	6- 9	0- 9	6- 9	0- 9
7 000.0 - 7 599.9 kHz	6-10	0- 9	6-10	0- 9
7 600.0 - 7 999.9 kHz	6-11	0- 9	6-11	0- 9
8 000.0 - 8 499.9 kHz	6-11	0- 9	6-11	0- 9
12 300.0 - 12 699.9 kHz	10-13	0- 7	10-13	0- 7
16 400.0 - 16 899.9 kHz	11-14	0- 7	11-14	0- 7
22 000.0 - 22 399.9 kHz	14-15	0- 4	14-15	0- 4
25 000.0 - 25 199.9 kHz	14-15	0- 4	14-15	0- 4

SERVICE

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

1. MAINTENANCE

T 1130

1.1.
When the SAILOR SHORT WAVE PROGRAMME 1000/B has been correctly installed, the maintenance can, depending on the environment and working hours, be reduced to a performance check at the service workshop at intervals not exceding 5 years. A complete performance check list is enclosed in the PERFORMANCE CHECK section.

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

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

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

2. NECESSARY TEST EQUIPMENT

TX: T1127, T1127L, T1130
EXC: S1300, S1301, S1302, S1303, S1304
RX: R1119, R1120
PS: N1400, N1401, N1407, N1409

TX	EXC	RX	PS	Equipment	Specification
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.)	±2%
				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.)	±1%
				Current range	100 A
				Voltage range	500V & 2.5 kV
				E.g. Unigor type	A43
				Shunt type	GE4277
				H.T. probe type	GE4196
	X	X		<u>TONE GENERATOR</u>:	
				Frequency range	200 - 3000 Hz
				Output voltage	1V RMS
				Output impedance	600 ohm
				E.g. PHILIPS type	PM5107

NECESSARY TEST EQUIPMENT cont.:

TX	EXC	RX	PS	Equipment	Value
		X		<u>AF VOLTMETER</u>:	
				Sensitivity (f.s.d.)	300 mV
				Input impedance	4 ohm
				Accuracy (f.s.d.)	±5%
				Frequency range	100 - 3000 Hz
				E.g. PHILIPS type	PM2505
	X	X		<u>FREQUENCY COUNTER</u>:	
				Frequency range	100 Hz - 30 MHz
				Resolution	0.1 Hz at f 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
		X		<u>SIGNAL GENERATOR</u>:	
				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
X			X	<u>POWER SUPPLIES</u>:	
				N1400/T1127, N1407/T1130	
				V_{out}	26.5V DC
				I_{out} N1400/T1127	70A DC
				I_{out} N1407/T1130	35A DC
				E.g. 2 pcs. LAMBDA type (N1400/T1127)	LXS-G-24-OV-R
				1 pc. LAMBDA type (N1407/T1130)	LXS-G-24-OV-R
	X			<u>POWER SUPPLIES</u>:	
				S1300, S1301	
				V_{out} 1	22V
				I_{out} 1	1.5A
				V_{out} 2	-45V
				I_{out} 2	-0.1A
				E.g. SAILOR types	N1402 N1402 spec. N1405

T 113o

NECESSARY TEST EQUIPMENT cont.:

TX	EXC	RX	PS		
	X	X		R1119, R1120; S1302, S1303, S1304	
				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>TEST BOX S1302/S1303/S1304</u>:	
				S.P. type	S1302/03/04 Test box
	X			<u>ARTIFICIAL KEY S1303/04</u>:	
				S. P. type	Artificial key S1303/S1304
X				<u>POWER METER</u>:	
				Power range T1127	500W
				Power range T1130	250W
				Impedance	50 ohm
				E.g. Bird Thruline Wattmeter	Model 43
				Plug-in element T1127	500W 2-30 MHz
				Plug-in element T1130	250W 2-30 MHz
X				<u>RF AMMETER (Thermocross)</u>:	
				Current range	5A
				E.g. Helweg Mikkelsen & Co. Copenhagen, Denmark type	TR-68x71, 5A
	X			<u>DUMMY LOAD</u>:	
				Impedance	50 ohm
				Frequency range	0-30 MHz
				Power range	
				E.g. Fixed resistor 2 pcs. in parallel PHILIPS type	2322 212 13101

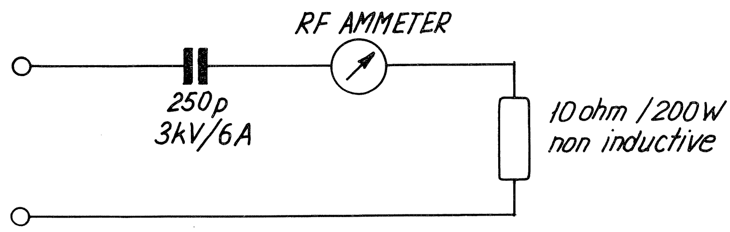
NECESSARY TEST EQUIPMENT cont.:

TX	EXC	RX	PS	Equipment
X	X			DUMMY LOAD for HF bands, 4 - 25 MHz
X				DUMMY LOAD for C.T. band 1.6 - 4 MHz

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

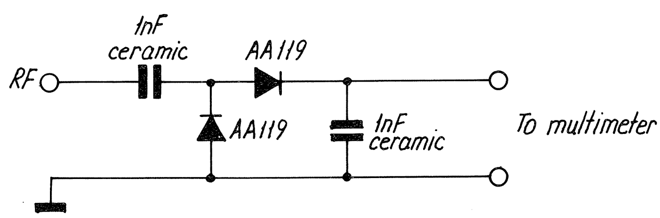
DUMMY LOAD for C.T. band 1.6 - 4 MHz:



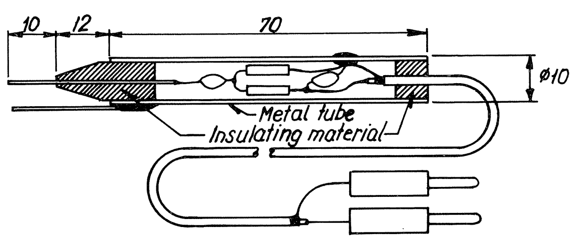
E.g. Draloric type 06-1291TD 20x50L 8KVs 250 pF ±20% R85

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

DIODE PROBE



LAYOUT OF THE PROBE



T 1130

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.

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

The unit has to have a complete FUNCTION CHECK after repair.

4. PERFORMANCE CHECK FOR T1130

To carry out the performance check it is necessary to have a complete station, consisting of: T1130, N1407 or N1409, S1302 or S1303/4, H1235, H1233, and AT1500.

If the station is working as a 50 ohm transmitter without AT1500 then AT1500 is not necessary.

If S1302, then it is necessary to have a set of test strips for testing of T1130. For inserting of test strips in the exciter see instruction book for SAILOR S1302.

If S1304, then you have to take out the plug to the frequency check module (2500) located on frequency control module (2100).

When T1130 is working without AT1500, then exclude the below noted sections when doing the performance check:

4.1.1. to 4.1.5.

4.1.16. to 4.1.25.

4.1.27. to 4.1.46.

4.2.1. to 4.2.10.

FREQUENCY TABLE FOR TEST STRIPS FOR TESTING OF T1130

Carrier Frequency kHz	Pos.	Programming code Z Y X V T	100 kHz D C B A	10 kHz D C B A	1 kHz D C B A	0.1 kHz D C B A
1600.0	1A	1 0 1 1 0	0 1 1 0	0 0 0 0	0 0 0 0	0 0 0 0
2199.0	1B	0 1 0 0 0	0 0 0 1	1 0 0 1	1 0 0 1	0 0 0 0
3099.0	1C	1 0 0 1 0	0 0 0 0	1 0 0 1	1 0 0 1	0 0 0 0
4299.0	1D	0 0 1 1 0	0 0 1 0	1 0 0 1	1 0 0 1	0 0 0 0
6399.0	2A	0 1 0 0 1	0 0 1 1	1 0 0 1	1 0 0 1	0 0 0 0
8499.0	2B	0 1 0 1 1	0 1 0 0	1 0 0 1	1 0 0 1	0 0 0 0
12699.0	2C	0 1 1 0 0	0 1 1 0	1 0 0 1	1 0 0 1	0 0 0 0
16899.0	2D	0 1 1 0 1	1 0 0 0	1 0 0 1	1 0 0 1	0 0 0 0
22399.0	3A	0 1 1 1 0	0 0 1 1	1 0 0 1	1 0 0 1	0 0 0 0
25199.0	3B	1 1 0 1 0	0 0 0 1	1 0 0 1	1 0 0 1	0 0 0 0

PERFORMANCE CHECK FOR T1130 cont.:

4.1.
TRANSMITTER CONTROL UNIT (300).

4.1.1.
CHECK OF AERIAL CURRENT CIRCUIT.

4.1.2.
Set meter switch S301 in position aerial current.

4.1.3.
Connect terminal W4/3-2 to ground and terminal W5/3-2 + 15V (IC101).

4.1.4.
Switch the set on and check meter reading on the aerial current meter S130X is 3.5 ± 0.5A.

4.1.5.
CHECK OF POWER METER CIRCUIT.

4.1.6.
Set meter switch in position power.

4.1.7.
Disconnect W41/3-4 and connect +8V to terminal W41/3-4.

4.1.8.
Switch the set on.

4.1.9.
Check meter reading on aerial current meter on S130X is 3 ± 0.5A.

4.1.10.
CHECK OF VSWR METER CIRCUIT.

4.1.11.
Set meter switch in position S.

4.1.12.
Disconnect W41/3-4 and connect +8V to terminal W41/3-4.

4.1.13.
Disconnect W39/3-4 and connect a 2 kohm resistor (two 1 kohm resistors in series) between terminal W41/3-4 and terminal W39/3-4 and a 1 kohm resistor from terminal W39/3-4 to ground.

4.1.14.
Switch the set on.

4.1.15.
Check the meter reading on the aerial current meter is 3 ± 0.2, and the voltage in tp 12 is 4.8 ± 0.2V.

4.1.16.
CHECK OF TUNING SWITCH.

4.1.17.
Disconnect the aerial (dummy load).

4.1.18.
Switch the set on.

4.1.19.
Key in a frequency e.g. 1600 kHz.

4.1.20.
Set the switch tuning in position manual.

4.1.21.
Check that the transmitter starts (+38V, +28V and blower starts).

4.1.22.
Switch the switch back to position automat.

4.1.23.
Key the transmitter with the microtelephone key.

4.1.24.
Check that the transmitter starts (+38V, +28V and blower starts).

4.1.25.
CHECK OF TUNE UP - NORMAL SWITCH AND PROGRAMME PUSH BUTTON.
See performance check of tuner control unit (500).

4.1.26.
CHECK OF DRIVE LEVEL.
See performance check PA-unit (1200).

4.1.27.
CHECK OF VSWR REFERANCE COUNTER (IC318).

4.1.28.
Connect terminal W3/3-2 to ground.

4.1.29.
Connect a voltmeter to tp 5.

4.1.30.
Disconnect the two coax cables at the rear of T1130.

4.1.31.
Disconnect W41/3-4 and connect +8V to terminal W41/3-4.

4.1.32.
Disconnect W39/3-4 and connect a 2 kohm resistor from W41/3-4 to W39/3-4 and a 1 kohm resistor from W39/3-4 to ground.

4.1.33.
Switch the set on.

4.1.34.
Key in a frequency e.g. 1600 kHz.

4.1.35.
Press the tune button, and check that the lamp lights up and the tune motor starts to run.

4.1.36.
Check that the voltage on W37/3-2 is 1.5 ±0.5V.

4.1.37.
Check that the voltage at tp 5 is 1.2 ±0.2V.

4.1.38.
Press the button invalid tuning and check the voltage at tp 5 is 1.2 ± 0.2V.

4.1.39.
Press the button invalid tuning and check the voltage at tp 5 is 2.8 ± 0.3V.

4.1.40.
Press the button invalid tuning and check the voltage at tp 5 is 4.9 ± 0.5V.

4.1.41.
Check that the tune lamp stops lighting, the tune motor stops and the voltage at W37/3-2 is OV.

4.1.42.
Press the button invalid tuning and check the voltage at tp 5 is 6.1 ± 0.6V.

4.1.43.
Press the button invalid tuning and check the voltage at tp 5 is 7.5 ±0.8V.

4.1.44.
Press the button invalid tuning and check the voltage at tp 5 is 8.8 ±1V.

4.1.45.
Press the button invalid tuning and check that the tune lamp starts to wink.

4.1.46.
When pressing invalid tuning, check that the lamp invalid tuning lights up.

4.1.47.
CHECK OF TRANSMITTER BLOCKING.

4.1.48.
Press tune button. The transmitter starts.

4.1.49.
Select dummy load and check that the transmitter stops and the tune lamp starts to wink.

4.1.50.
CHECK OF VSWR PROTECTION CIRCUIT.

4.1.51.
Check the voltage at the emitter of T332 is less than 10 mV.

4.1.52.
Disconnect the 2 kohm resistor W41/3-4 and W39/3-4.

4.1.53.
Connect a 1 kohm resistor between W41/3-4 and W39/3-4.

4.1.54.
Check the voltage at the emitter of T327 is 350 ±30 mV.

4.1.55.
Check that the meter reading on the aerial current meter is 2 ±0.5.

4.1.56.
Disconnect the 1 kohm resistor from W39/3-4 to ground.

4.1.57.
Connect a 2 kohm resistor from W39/3-4 to ground.

4.1.58.
Connect the black coax at the rear of T1130.

4.1.59.
Connect a dummy load 50 ohm/250W to the white coax socket, at the rear of T1130 and an oscilloscope with a 10:1 probe.

4.1.60.
Set meter switch to power.

4.1.61.
Check that the voltage at the emitter of T327 is 840 ± 60 mV.

4.1.62.
Short circuit the terminal W39/3-4 to ground.

4.1.63.
Press the tune button and note the peak to peak voltage.

4.1.64.
Remove the short circuit from W39/3-4 to ground and check that the peak to peak voltage decreases to between 0.63 to 0.75 times the value, previously noted.

4.2.
TUNER CONTROL UNIT (500).

4.2.1.
Switch the set on and select simplex narrow.

4.2.2.
Set S302 in position tune up.

4.2.3.
Key in a frequency e.g. 1600 kHz.

4.2.4.
Check the voltage of the lithium battery B501 is more than 3V.

4.2.5.
Set the switches RESONANCE and LOAD to 0, 1, 2 ... 15, and check the control outputs 1 to 11 is in accordance with the table below.

Resonance and Load	the voltage at control output No.										
	1	2	3	4	5	6	7	8	9	10	11
0	0	0	22	22	0	22	0	0	0	0	0
1	22	0	22	22	22	22	0	0	0	0	22
2	22	22	22	22	0	22	0	0	0	22	0
3	22	22	0	22	0	22	0	0	0	22	22
4	22	22	22	0	0	22	0	0	22	0	0
5	22	22	0	0	0	22	0	0	22	22	0
6	22	22	22	22	22	22	0	22	0	0	0
7	22	22	0	22	22	22	0	22	22	0	0
8	22	22	22	0	22	22	0	22	22	22	22
9	22	22	0	0	22	22	22	0	22	22	22
10	22	22	22	22	22	0	22	22	22	22	22
11	22	22	0	0	22	0	22	22	22	22	22
12	22	22	22	22	22	22	22	22	22	22	22
13	22	22	22	22	22	22	22	22	22	22	22
14	22	22	22	22	22	22	22	22	22	22	22
15	0	0	0	0	0	0	22	22	22	22	22
Dummy load	0	0	0	22	22	22	22	22	22	22	22

4.1.61.
Check that the voltage at the emitter of T327 is 840 ±60 mV.

4.1.62.
Short circuit the terminal W39/3-4 to ground.

4.1.63.
Press the tune button and note the peak to peak voltage.

4.1.64.
Remove the short circuit from W39/3-4 to ground and check that the peak to peak voltage decreases to between 0.63 to 0.75 times the value, previously noted.

4.2.
TUNER CONTROL UNIT (500).

4.2.1.
Switch the set on and select simplex narrow.

4.2.2.
Set S302 in position tune-up.

4.2.3.
Key in a frequency e.g. 1600 kHz.

4.2.4.
Check the voltage of the lithium battery B501 is more than 3V.

4.2.5.
Set the switches RESONANCE and LOAD to 0, 1, 2 ... 15, and check the control outputs 1 to 11 is in accordance with the table below.

Valid from serial No. 261800.

Resonance and Load	the voltage at control output No.										
	1	2	3	4	5	6	7	8	9	10	11
0	0	0	22	22	0	22	0	0	0	0	0
1	0	0	0	22	0	22	0	0	0	0	22
2	0	0	22	0	0	22	0	0	0	22	0
3	0	0	0	0	0	22	0	0	0	22	22
4	0	0	22	22	0	22	0	0	22	0	0
5	22	0	22	22	22	22	0	0	22	22	0
6	22	22	22	22	0	22	0	22	0	0	0
7	22	22	0	22	0	22	0	22	22	0	0
8	22	22	22	0	0	22	0	22	22	22	22
9	22	22	0	0	0	22	22	0	22	22	22
10	22	22	22	22	22	22	22	22	22	22	22
11	22	22	0	22	22	22	22	22	22	22	22
12	22	22	22	0	22	22	22	22	22	22	22
13	22	22	0	0	22	22	22	22	22	22	22
14	22	22	22	22	22	0	22	22	22	22	22
15	22	22	0	0	22	0	22	22	22	22	22
Dummy load	0	0	0	22	22	22	22	22	22	22	22

4.2.6.
Select dummy load/ heat and check the code for dummy load is in accordance with the table above.

4.2.7.
Set RESONANCE and LOAD to zero. Press the button programme, the code for zero is now programmed into the RAM.

4.2.8.
Set switch S302 in position normal.

4.2.9.
Switch the set off/on some times.

4.2.10.
Check that the code at the control outputs 1 to 11 is still ok.

4.3.
CHECK OF PA-MODULE 1200.

4.3.1.
CHECK OF D.C. CONDITIONS.

4.3.2.
Remove the two coax cables at the rear of T1130.

4.3.3.
Key in a frequency e.g. 1600 kHz and put the switch tuning in position manual.

4.3.4.
Check of supply voltage to PA-module.
+28V T1213 : 28 ±1V
+38V T1215 : 38 ±1V
Open TX : 22 ±1V

4.3.5.
Check of zero signal current.

4.3.6.
Connect an ammeter in series with +28V to T1212, and check that the current is 90 ±20 mA.

4.3.7.
Connect the ammeter in series with +28V to T1213, and check that the current is 90 ±20 mA.

4.3.8.
Remove the wire open Tx and check that the current is zero amps.

4.3.9.
Remount open Tx wire.

4.3.10.
Connect the ammeter in series with +38V to T1214 and check that the current is 150 ±20 mA.

4.3.11.
Connect the ammeter in series with +38V to T1215 and check that the current is 150 +20 mA.

4.3.12.
Remove the wire open Tx and check that the current is zero amps.

4.3.13.
Remount open Tx wire.

4.3.14.
Check that the voltage on the basis of T1207 is 12.3 ±0.5V.

4.3.15.
Remove open Tx wire and check that the voltage is less than 0.5V.

4.3.16.
Remount open Tx wire.

4.3.17.
Set the switch tuning to position automat.

4.3.18.
Switch the set off.

4.3.19.
CHECK OF RF CONDITIONS.

4.3.20.
Connect the coax cable from the exciter (black coax) to T1130, and connect a 50 ohm dummy load (250W mean power) to the output socket (marked white) at the rear side of T1130.

4.3.21.
Connect the ammeter in series with +38V to T1214 (10 amps.)

4.3.22.
Connect an oscilloscope with a 10 : 1 probe to the output socket of T1130.

4.3.23.
Switch the set on and select following frequencies: 2199 kHz, 3099 kHz, 4299 kHz, 6399 kHz, 8499 kHz, 12699 kHz, 16899 kHz, 22399 kHz, and 25199 kHz.

4.3.24.
Check at each frequency, that the current is 5 to 6.5 amps., and the peak to peak output voltage is 330V to 450V, and the envelope of the two tone test signal is ok, when keying the transmitter by means of the switch tuning.

4.4.
CHECK OF TEMPERATURE PROTECTION UNIT (1300).

4.4.1.
Measure the temperature at R109 (located on T1214) if the set has been switched off for some time, then the temperature can be set equal to run temperature.

4.4.2.
Switch the set on and measure the voltage across R109 and calculate the voltage at pin 3 IC1301a: $V_{pin3} = (90 - T_A) \cdot 0.0075 \cdot V_{R109} + V_{R109}$
T_A is the temperature at R109.
V_{R109} is the voltage across R109.
V_{pin3} is the voltage at pin 3 of IC1301a.

4.4.3.
Measure the voltage at pin 3 and check that it is equal to the calculated $V_{pin3} \pm 5\%$.

4.4.4.
Measure the voltage at pin 5 IC1301a and check that the voltage is $V_{pin3} \cdot 1.12$.

4.4.5.
Unsolder R109 and insert a 4.7 kohm potentiometer instead of R109.

4.4.7.
Connect the coax cable from the exciter (black coax) to T1130, and the 50 ohm dummy load (250W mean power) to the output socket (marked white) at the rear side of T1130.

4.4.8.
Connect an oscilloscope with a 10 : 1 probe to the output socket of T1130, and a voltmeter to +38V to T1214.

4.4.9.
Switch the set on and key in a frequency e.g. 1600 kHz.

4.4.10.
Set the switch to position manual. You will now see the two tone test signal at the output.

4.4.11.
Check that the voltages at P102 pin 1 is 22V, pin 2 is 22V, pin 3 is 0V and at drive reduction is 22V.

4.4.12.
Adjust the potentiometer until +38V to T1214 drops to 29 ± 2V and the output drops to approx. 40% of full power for transmitters with serial numbers below 261938 and for transmitters with serial numbers above 261938 it drops to approx. 70% of full power.

4.4.13.
Check that the voltages at P102 pin 3 is 22V and drive reduction is 0V.

4.4.14.
Adjust the potentiometer for a higher value until the transmitter stops.

4.4.15.
Check that the blowers are still running.

4.4.16.
Check that the voltage at P102 pin 2 is 0V.

4.2.6.
Select dummy load/heat and check the code for dummy load is in accordance with the table above.

4.2.7.
Set RESONANCE and LOAD to zero. Press the button programme, the code for zero is now programmed into the RAM.

4.2.8.
Set switch S302 in position normal.

4.2.9.
Switch the set off/on some times.

4.2.10.
Check that the code at the control outputs 1 to 11 is still ok.

4.3.
CHECK OF PA-MODULE 1200.

4.3.1.
CHECK OF D.C. CONDITIONS.

4.3.2.
Remove the two coax cables at the rear of T1130.

4.3.3.
Key in a frequency e.g. 1600 kHz and put the switch tuning in position manual.

4.3.4.
Check of supply voltage to PA-module.
+28V T1213 : 28 ±1V
+38V T1215 : 38 ±1V
Open TX : 22 ±1V

4.3.5.
Check of zero signal current.

4.3.6.
Connect an ammeter in series with +28V to T1212, and check that the current is 200 ±20 mA.

4.3.7.
Connect the ammeter in series with +28V to T1213, and check that the current is 200 ±20 mA.

4.3.8.
Remove the wire open Tx and check that the current is zero amps.

4.3.9.
Remount open Tx wire.

4.3.10.
Connect the ammeter is series with +38V to T1214 and check that the current is 45 mA ±5 mA.

4.3.11
Remove the wire open Tx and check that the current is zero amps.

4.3.12.
Remount open Tx wire.

4.3.13.
Check that the voltage on the basis of T1207 is 12.3 ±0.5V.

4.3.14.
Remove open Tx wire and check that the voltage is less than 0.5V.

4.3.15.
Remount open Tx wire.

4.3.16.
Set the switch tuning to position automat.

4.3.17.
Switch the set off.

4.3.19.
CHECK OF RF CONDITIONS.

4.3.20.
Connect the coax cable from the exciter (black coax) to T1130, and connect a 50 ohm dummy load (250W mean power) to the output socket (marked white) at the rear side of T1130.

4.3.21.
Connect the ammeter in series with +38V to T1214 (10 amps.)

4.3.22.
Connect an oscilloscope with a 10 : 1 probe to the output socket of T1130.

4.3.23.
Switch the set on and select following frequencies: 2199 kHz, 3099 kHz, 4299 kHz, 6399 kHz, 8499 kHz, 12699 kHz, 16899 kHz, 22399 kHz, and 25199 kHz.

4.3.24.
Check at each frequency, that the current is 5 to 6.5 amps., and the peak to peak output voltage is 330V to 450V, and the envelope of the two tone test signal is ok, when keying the transmitter by means of the switch tuning.

4.4.
CHECK OF TEMPERATURE PROTECTION UNIT (1300).

4.4.1.
Measure the temperature at R109 (located on T1214) if the set has been switched off for some time, then the temperature can be set equal to run temperature.

4.4.2.
Switch the set on and measure the voltage across R109 and calculate the voltage at pin 3 IC1301a: $V_{pin3} = (90 - T_A) \cdot 0.0075 \cdot V_{R109} + V_{R109}$
T_A is the temperature at R109.
V_{R109} is the voltage across R109.
V_{pin3} is the voltage at pin 3 of IC1301a.

4.4.3.
Measure the voltage at pin 3 and check that it is equal to the calculated $V_{pin3} \pm 5\%$.

4.4.4.
Measure the voltage at pin 5 IC1301a and check that the voltage is $V_{pin3} \cdot 1.12$.

4.4.5.
Unsolder R109 and insert a 4.7 kohm potentiometer instead of R109.

4.4.7.
Connect the coax cable from the exciter (black coax) to T1130, and the 50 ohm dummy load (250W mean power) to the output socket (marked white) at the rear side of T1130.

4.4.8.
Connect an oscilloscope with a 10 : 1 probe to the output socket of T1130, and a voltmeter to +38V to T1214.

4.4.9.
Switch the set on and key in a frequency e.g. 1600 kHz.

4.4.10.
Set the switch to position manual. You will now see the two tone test signal at the output.

4.4.11.
Check that the voltages at P102 pin 1 is 22V, pin 2 is 22V, pin 3 is 0V and at drive reduction is 22V.

4.4.12.
Adjust the potentiometer until +38V to T1214 drops to 29 ± 2V and the output drops to approx. 40% of full power for transmitters with serial numbers below 261938 and for transmitters with serial numbers above 261938 it drops to approx. 70% of full power.

4.4.13.
Check that the voltages at P102 pin 3 is 22V and drive reduction is 0V.

4.4.14.
Adjust the potentiometer for a higher value until the transmitter stops.

4.4.15.
Check that the blowers are still running.

4.4.16.
Check that the voltage at P102 pin 2 is 0V.

5. ADJUSTMENT PROCEDURE FOR T1130

To carry out the adjustment procedure it is necessary to have a complete station consisting of: H1235, S1302/3/4 and N1407/9.

For location of the modules see fig.

For location of test points and adjustments see fig.

5.1.
ADJUSTMENT OF TRANSMITTER CONTROL UNIT (300).

5.1.1.
ADJUSTMENT OF VSWR CALCULATOR.

5.1.2.
Disconnect W39/3-4 and W41/3-4.

5.1.3.
Connect one 1 kohm resistor from terminal W39/3-4 to ground, two 1 kohm resistors in series from terminal W39/3-4 to terminal W41/3-4 and connect terminal W41/3-4 to +5V.

5.1.4.
Connect a voltmeter across R342a, and set R334a fully clockwise.

5.1.5.
Switch the set on, and adjust R334a so that the voltage is approx. zero volts.

5.1.6.
ADJUSTMENT OF METER AMPLIFIER.

5.1.7.
Disconnect W39/3-4 and W41/3-4.

5.1.8.
Connect terminal W39/3-4 to terminal W41/3-4 and connect them to +5V.

5.1.9.
Switch the set on.

5.1.10.
Set the meter switch S301 to position S.

5.1.11.
Set R329a fully clockwise and adjust R318a to zero reading on the aerial meter on S130X.

5.1.12.
Connect terminal W41/3-4 to +5V.

5.1.13.
Connect two 1 kohm resistors in series between terminal W41/3-4 and terminal W39/3-4 and connect a 1 kohm resistor from terminal W39/3-4 to ground.

5.1.14.
Adjust R329a to a meter reading of 3 (the line just above 3).

5.1.15.
ADJUSTMENT OF POWER METER SENSITIVITY.

5.1.16.
Disconnect W41/3-4.

5.1.17.
Connect +8V to terminal W41/3-4.

5.1.18.
Set meter switch S301 to position power.

5.1.19.
Switch the set on.

5.1.20.
Adjust R399 to a meter reading of 3 (the line just above 3) on the aerial current meter S130X.

5.1.21.
ADJUSTMENT OF AERIAL CURRENT METER SENSITIVITY.

5.1.22.
Connect terminal W4/3-2 to ground and terminal W5/3-2 to +15V.

5.1.23.
Set meter switch to position I_A.

5.1.24.
Switch the set on.

5.1.25.
Adjust R302 to a meter reading of 3.5 on the aerial current meter on S130X.

5.1.26.
ADJUSTMENT OF $\frac{VR}{VF}$ COMPARATOR.

5.1.27.
Disconnect W39/3-4 and W41/3-4.

5.1.28.
Connect a 1 kohm resistor from terminal W39/3-4 to ground, two 1 kohm resistors in series from terminal W39/3-4 to terminal W41/3-4 and connect terminal W41/3-4 to +5V.

5.1.29.
Connect terminal W3/3-2 to ground.

5.1.30.
Connect a voltmeter between pin 7 IC318 and ground.

5.1.31.
Key the button invalid tuning until pin 7 IC318 goes high,

5.1.32.
With pin 7 IC318 high, measure the voltage between tp 5 and tp 12 and adjust R345 to zero volt.

5.1.33.
ADJUSTMENT OF DRIVE LEVEL.
See adjustment of PA-unit (1200).

5.2.
ADJUSTMENT OF FILTER SWITCH/DIRECTIONAL COUPLER (400).

5.2.1.
Disconnect input coax to filter 6 module 1100 W9/3-11, and connect the 50 ohm dummy load (250W mean power) to the coax cable.

5.2.2.
Select a frequency near to 22 MHz.

5.2.3.
Connect a voltmeter to terminal W39/3-2 (V_R).

5.2.4.
Put the switch tuning in position manual.

5.2.5.
Adjust C405 to minimum reading on the voltmeter.

5.3.
ADJUSTMENT OF PA-UNIT (1200).

5.3.1.
ADJUSTMENT OF ZERO SIGNAL CURRENTS.

5.3.2.
Remove the two coax connectors at the rear of T1130.

5.3.3.
Insert an ammeter in series with the driver supply +28V to T1212.

5.3.4.
Set the switch tuning in position manual.

5.3.5.
Adjust R1220 to a meter reading of 90 mA.

5.3.6.
Insert the ammeter in series with the driver supply +28V to T1213, and check that the current is 90 $\pm$20 mA.

5.3.7.
Insert the ammeter in series with PA-supply +38V to T1214.

5.3.8.
Set the switch tuning in position manual.

5.3.9.
Adjust R1232 to a meter reading of 150 mA.

5.3.10.
Insert the ammeter in series with PA-supply +38V to T1215 and check that the current is 150 $\pm$20 mA.

5.3.11.
Connect the two coax connectors at the rear of T1130.

5.3.12.
ADJUSTMENT OF DRIVE LEVEL.

5.3.13.
Disconnect the coax cable RF in from PA on filterswitch/directional coupler module (400).

5.3.14.
Connect a 50 ohm dummy load (250W mean power) to the coax cable.

5.3.15.
Insert an ammeter in +38V to T1214 (10A).

5.3.16.
Select a frequency according to the table below.

5.3.17.
Adjust the drive level potentiometer in question, to a meter reading of 6.5A.

5.3.18.
The points 5.3.16. to 5.3.17. has to be carried out for all frequencies in the table below.

Frequency kHz	Drive level potentiometer in question
1600	R330
4125	R328
6215	R326
8257	R324
12392	R322
16522	R320
22062	R318
25020	R316

5.4.
ADJUSTMENT OF TEMPERATURE PROTECTION UNIT (1300).

5.4.1.
Connect a voltmeter across R109.

5.4.2.
Be sure that the heat sink is cool. Then switch the set on and measure the voltage immediately after switching on.

5.4.3.
Measure the heatsink temperature (room temperature).

5.4.4.
Calculate the voltage on pin 3 of IC 1301a from the equalition below.

$V_{pin3} = (90 - T_A) \times 0.0075 \times V_{R109} + V_{R109}$.

T_A is the actual temperature of the heat sink.

V_{pin3} is the voltage at pin 3 of IC1301

5.4.5.
Adjust R1305 for a voltmeter reading equal to the just calculated V_{pin3}.

5.3.12.
ADJUSTMENT OF DRIVE LEVEL.

5.3.13.
Disconnect the coax cable RF in from PA on filterswitch/directional coupler module (400).

5.3.14.
Connect a 50 ohm dummy load (250W mean power) to the coax cable.

5.3.15.
Insert an ammeter in +38V to T1214 (15A).

5.3.16.
Select a frequency according to the table below.

5.3.17.
Adjust the drive level potentiometer in question, to a meter reading of 13A.

5.3.18.
The points 5.3.16. to 5.3.17. have to be carried out for all frequencies in the table below.

Frequency kHz	Drive level potentiometer in question
1600	R330
4125	R328
6215	R326
8257	R324
12392	R322
16522	R320
22062	R318
25020	R316

5.4.
ADJUSTMENT OF TEMPERATURE PROTECTION UNIT (1300).

5.4.1.
Connect a voltmeter across R109.

5.4.2.
Be sure that the heat sink is cool. Then switch the set on and measure the voltage immediately after switching on.

5.4.3.
Measure the heatsink temperature (room temperature).

5.4.4.
Calculate the voltage on pin 3 of IC1301a from the equalition below.

$$V_{pin3} = (90 - T_A) \times 0.0075 \times V_{R109} + V_{R109}.$$

T_A is the actual temperature of the heat sink.

V_{pin3} is the voltage at pin 3 of IC1301a.

5.4.5.
Adjust R1305 for a voltmeter reading equal to the just calculated V_{pin3}.

T1130

7. FUNCTION CHECK FOR T1130

To carry out the function check following equipment is necessary:

Power supply: N1407 or N1409.

Rack : H1235

Aerial coupler: AT1500

Dummy load: : 250 pF in series with 10 ohm e.g. SAILOR H1228.
For the frequency range 1.6 - 3.9 MHz.
50 ohm for the frequency range 4 - 28 MHz.

If installed with an aerial then use the aerial instead of dummy loads.

7.1.1.
Switch the set on.

7.1.2.
Check that the tune lamp starts to wink.

7.1.3.
Select two aerials duplex.

7.1.4.
Connect 250 pF/10 ohm dummy load for frequencies between 1.6 - 3.9 MHz and 50 ohm for frequencies between 4 - 28 MHz to AT1500 or use the aerial.

7.1.5.
Select a frequency in the lowest band according to the table below.

7.1.6.
Set S302 to tune up.

7.1.7.
When using dummy load select resonance and load according to table I below. When using an aerial see tuning table T1130/AT1500.

7.1.8.
Press the push button programme.

7.1.9.
Set S301 to position S.

7.1.10.
Press the tune button on S130X.

7.1.11.
When the tune sequence is finessed, then set the switch tuning S305 to position manual and check that the aerial current meter reading is more than 3.

7.1.12.
Set the meter switch to position power and check that the aerial current meter reading is more than 2.

7.1.13.
Set the meter switch to position aerial current and check that the aerial current reading is in accordance with the table below, when dummy load is used, or if an aerial is used in accordance with the noted value on the tuning table T1130/AT1500.

7.1.14.
Set tuning switch to position automat.

7.1.15.
Press the button invalid tuning and check that the red lamp does not light up. If the lamp lights up when an aerial is used, then the set has to be returned. See tuning up procedure.

7.1.16.
Select the next higher band according to the table below, and start from point 7.1.7. on this frequency.

7.1.17.
Set the switch S302 to position normal.

7.1.18.
Check that the transmitter will now work in all frequency bands, check with meter switch in position S that the meter reading is more than 3 on the aerial current meter.

7.1.19.
Check that the tune lamp starts to wink when pressing DUMMY LOAD HEAT.

FUNCTION CHECK FOR T1130 cont.:

7.1.20.
Select an illegal frequency and check that the transmitter will not tune.

7.1.21.
Set meter switch to position aerial current.

TABLE I

Frequency MHz	Resonance	Load	Aerial current
2.182 Fixed	1	0	3.1
1.6 - 1.799	1	0	3.1
1.8 - 1.999	1	0	3.1
2.0 - 2.199	1	0	3.1
2.2 - 2.399	1	0	3.1
2.4 - 2.599	1	0	3.1
2.6 - 2.799	2	0	3.1
2.8 - 2.999	2	0	3.1
3.0 - 3.099	2	0	3.1
3.1 - 3.399	2	0	3.1
3.4 - 3.699	2	0	3.1
3.7 - 3.999	3	0	3.1
4.0 - 4.299	3	9	1.8
4.3 - 4.599	3	9	1.8
4.6 - 4.999	3	9	1.8
5.0 - 5.499	4	9	1.8
5.5 - 5.999	4	9	1.8
6.0 - 6.399	4	7	1.8
6.4 - 6.999	4	8	1.8
7.0 - 7.599	5	8	1.8
7.6 - 7.999	5	8	1.8
8.0 - 8.499	7	8	1.8
12.3 - 12.699	8	6	1.8
16.4 - 16.899	9	5	1.3A
22.0 - 22.399	10	4	0.7A
25.0 - 25.199	11	4	0.7A

FUNCTION CHECK FOR T1130 cont.: (Valid from serial No. 261800)

7.1.20.
Select an illegal frequency and check that the transmitter will not tune.

7.1.21.
Set meter switch to position aerial current.

TABLE I valid from serial No. 261800

Frequency MHz	Resonance	Load	Aerial Current
2.182 fixed	5	0	3.1
1.6 - 1.799	5	0	3.1
1.8 - 1.999	5	0	3.1
2.0 - 2.199	5	0	3.1
2.2 - 2.399	5	0	3.1
2.4 - 2.599	5	0	3.1
2.6 - 2.799	6	0	3.1
2.8 - 2.999	6	0	3.1
3.0 - 3.099	6	0	3.1
3.1 - 3.399	6	0	3.1
3.4 - 3.699	6	0	3.1
3.7 - 3.999	7	0	3.1
4.0 - 4.299	7	9	1.8
4.3 - 4.599	7	9	1.8
4.6 - 4.999	7	9	1.8
5.0 - 5.499	8	9	1.8
5.5 - 5.999	8	9	1.8
6.0 - 6.399	8	7	1.8
6.4 - 6.999	8	8	1.8
7.0 - 7.599	9	8	1.8
7.6 - 7.999	9	8	1.8
8.0 - 8.499	11	8	1.8
12.3 - 12.699	12	6	1.8
16.4 - 16.899	13	5	1.3A
22.0 - 22.399	14	4	0.7A
25.0 - 25.199	15	4	0.7A

T1130 MADE SPECIAL FOR 50 OHM OUTPUT IMPEDANCE.

To carry out the function check following equipment is necessary:

Power supply: N1407 or N1409

Rack : H1235

Dummy load : 50 ohm

TABLE II

Band 1	1.6 - 2.199 MHz
Band 2	2.2 - 3.099 MHz
Band 3	3.1 - 4.299 MHz
Band 4	4.3 - 8.499 MHz
Band 5	8.5 - 16.899 MHz
Band 6	16.9 - 27.999 MHz

7.2.1.
Connect the 50 ohm dummy load to the output terminal of the transmitter.

7.2.2.
Select two aerials duplex.

7.2.3.
Switch the set on.

7.2.4.
Select a frequency as high as possible in the lowest band according to the table II below.

7.2.5.
Set tuning switch to position manual.

7.2.6.
Set meter switch to position S and check that the aerial current meter reading is higher than 3.

7.2.7.
Set meter switch to position power and check that the aerial current meter reading is higher than 2.

7.2.8.
Set tuning switch to position normal.

7.2.9.
Select a frequency as high as possible in the next higher band according to the table II below, and start from point 5.

7.2.10.
Press DUMMY LOAD HEAT and check that tune lamp starts to wink.

7.2.11.
Select an illegal frequency and check that the transmitter will not tune.

b	CHASSIS T1130		1/1
Symbol	*Description*	*Manufact.*	
MO101	Blower 24V 50 Hz	PABST	4624N
MO102	Blower 24V 50 Hz	PABST	4624N
R101	Resistor 100 ohm 5% 25W	ARCOL/ DANOTHERM	NHS 25
R102	Resistor 100 ohm 5% 25W	ARCOL/ DANOTHERM	NHS 25
R103	Resistor 100 ohm 5% 25W	ARCOL/ DANOTHERM	NHS 25
R104	Resistor 100 ohm 5% 25W	ARCOL/ DANOTHERM	NHS 25
R105	Resistor 100 ohm 5% 25W	ARCOL/ DANOTHERM	NHS 25
R106	Resistor 100 ohm 5% 25W	ARCOL/ DANOTHERM	NHS 25
R107	Resistor 22 ohm ±5% 25W	ARCOL/ DANOTHERM	HS 25
R108	Resistor 82 ohm ±5% 10W	ARCOL/ DANOTHERM	HS 10
R109	Resistor PTC KTY-11-2D	Siemens	Q62705-K56
IC101	Voltage regulator 15V	Motorola	LM340T15
IC102	Voltage regulator 5V	Motorola	LM340T5
T101	Transistor	Motorola	BDX53
T102	Transistor	Motorola	BDX53
TR101	Balun.	S.P.	TL298
L101	Choke	S.P.	SP no. 14576
L102	Choke	S.P.	SP no. 400383

MODULE NO: 200

b INPUT FILTER UNIT T1130

Symbol	Description				Manufact.	
C201	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C202						
C203	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-01104-K
C204						
C205	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C206						
C207	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C208						
C209	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C210						
C211	Capacitor polyester	1 nF	±10%	400V	Siemens	B32510-D6102-K
C212	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C213	Capacitor polyester	1 nF	±10%	400V	Siemens	B32510-D6102-K
C214	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C215	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C216	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C217	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C218	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C219	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C220	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C221	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C222	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C223	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C224	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C225	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C226	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C227	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C228	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C229	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C230	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C231	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C232	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C233	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C234	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C235	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C236	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C237	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C238	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C239	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C240	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K

a INPUT FILTER UNIT T1130

Symbol	Description			Manufact.	
FP201	Ferroxcube beads	3B		Philips	4322 020 34400
FP202	Ferroxcube beads	3B		Philips	4322 020 34400
FP203	Ferroxcube beads	3B		Philips	4322 020 34400
FP204	Ferroxcube beads	3B		Philips	4322 020 34400
FP205	Ferroxcube beads	3B		Philips	4322 020 34400
FP206	Ferroxcube beads	3B		Philips	4322 020 34400
FP207	Ferroxcube beads	3B		Philips	4322 020 34400
FP208	Ferroxcube beads	3B		Philips	4322 020 34400
FP209	Ferroxcube beads	3B		Philips	4322 020 34400
FP210	Ferroxcube beads	3B		Philips	4322 020 34400
FP211	Ferroxcube beads	3B		Philips	4322 020 34400
FP212	Ferroxcube beads	3B		Philips	4322 020 34400
FP213	Ferroxcube beads	3B		Philips	4322 020 34400
FP214	Ferroxcube beads	3B		Philips	4322 020 34400
FP215	Ferroxcube beads	3B		Philips	4322 020 34400
FP216	Ferroxcube beads	3B		Philips	4322 020 34400
FP217	Ferroxcube beads	3B		Philips	4322 020 34400
FP218	Ferroxcube beads	3B		Philips	4322 020 34400
FP219	Ferroxcube beads	3B		Philips	4322 020 34400
FP220	Ferroxcube beads	3B		Philips	4322 020 34400
FP221	Ferroxcube beads	3B		Philips	4322 020 34400
FP222	Ferroxcube beads	3B		Philips	4322 020 34400
FP223	Ferroxcube beads	3B		Philips	4322 020 34400
FP224	Ferroxcube beads	3B		Philips	4322 020 34400
FP225	Ferroxcube beads	3B		Philips	4322 020 34400
FP226	Ferroxcube beads	3B		Philips	4322 020 34400
FP227	Ferroxcube beads	3B		Philips	4322 020 34400
FP228	Ferroxcube beads	3B		Philips	4322 020 34400
FP229	Ferroxcube beads	3B		Philips	4322 020 34400
FP230	Ferroxcube beads	3B		Philips	4322 020 34400
R201	Resistor	47 ohm ±5%	0.33W	Philips	2322 211 13479
R202	Resistor	47 ohm ±5%	0.33W	Philips	2322 211 13479
R203	Resistor	47 ohm ±5%	0.33W	Philips	2322 211 13479
R204	Resistor	47 ohm ±5%	0.33W	Philips	2322 211 13479
R205	Resistor	47 ohm ±5%	0.33W	Philips	2322 211 13479

MODULE NO: 300

C	TRANSMITTER CONTROL UNIT T1130			1/7
Symbol	*Description*		*Manufact.*	
C301	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C302	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C303	Capacitor polyester	680 nF ±10%	100V	Siemens	B32560-D1684-K
C304	Capacitor polyester	150 nF ±10%	100V	Siemens	B32510-D1154-K
C305	Capacitor polyester	10 nF ±10%	400V	Siemens	B32510-D6103-K
C306	Capacitor polyester	47 nF ±10%	250V	Siemens	B32510-D3473-K
C307	Capacitor polyester	1 nF ±10%	400V	Siemens	B32510-D6102-K
C308	Capacitor polyester	1 nF ±10%	400V	Siemens	B32510-D6102-K
C309	Capacitor polyester	3.3 nF ±10%	400V	Siemens	B32510-D6332-K
C310	Capacitor polyester	470 nF ±10%	100V	Siemens	B32560-D1474-K
C311	Capacitor polyester	1 nF ±10%	400V	Siemens	B32510-D6102-K
C312	Capacitor electrolytic	10 uF	35V	ERO	EKI 00 AA 210F
C313	Capacitor polyester	10 nF ±10%	400V	Siemens	B32510-D6103-K
C314	Capacitor electrolytic	10 uF	35V	ERO	EKI 00 AA 210F
C315	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C316	Capacitor polyester	3.3 nF ±10%	400V	Siemens	B32510-D6332-K
C317	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C318	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C319	Capacitor polyester	1 nF	400V	Siemens	B32510-D6102-K
C320	Capacitor polyester	1 nF ±10%	400V	Siemens	B32510-D6102-K
C321	Capacitor polyester	1 nF ±10%	400V	Siemens	B32510-D6102-K
C322	Capacitor polyester	1 uF ±10%	250V	Siemens	B32513-D3105-K
C323	Capacitor polyester	10 nF +50%	400V	Siemens	B32510-D6103-K
C324	Capacitor polyester	1 nF	400V	Siemens	B32510-D6102-K
C325					
C326	Capacitor electrolytic	10uF	35V	ERO	EKI 00 AA 210F
C327	Capacitor polyester	220 nF ±10%	100V	Siemens	B32560-D1224-K
C328	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C329	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
C330	Capacitor polyester	100 nF ±10%	100V	Siemens	B32510-D1104-K
D301	Diode			Philips	AA143
D302	Diode			Philips	AA143
D303	Diode			Philips	BAV21
D304	Diode			Philips	BAV21
D305	Diode light emitting red.			Xciton	XC 5053Y
D306	Diode			Philips	BAV21

Symbol	Description			Manufact.	
D307	Diode			Philips	BAV21
D308	Diode			Philips	BAV21
D309	Diode			Philips	BAV21
D310	Diode			Philips	BAV21
D311	Diode			Philips	BAV21
D312	Diode			Philips	BAV21
D313	Diode			Philips	BAV21
D314	Diode			Philips	BAV21
D315	Diode			Philips	BAV21
D316	Diode			Philips	BAV21
D317	Diode			Philips	BAV21
D318	Diode			Philips	BAV21
D319	Diode, zener			Philips	BZX 79 C15
D320	Diode			Philips	AA143
D321	Diode			Philips	1N4448
D322	Diode			Philips	1N4448
D323	Diode			Philips	AA143
D324	Diode			Philips	1N4448
D325	Diode			Philips	BAV21
D326	Diode			Philips	BAV21
D327	Diode			Philips	BAV21
D328	Diode			Philips	BAV21
D329	Diode			Philips	BAV21
D330	Diode			Philips	BAV21
D331	Diode			Philips	BAV21
D332	Diode			Philips	BAV21
D333	Diode			Philips	BAV21
D334	Diode			Philips	BAV21
D335	Diode			Philips	BAV21
RA301	Resistor array	8x10 kohm ±5%	0.125W	ITT	UR8 10 kohm ±5%
R301	Resistor	22 kohm ±5%	0.33W	Philips	2322 211 13223
R302	Preset potmeter	10 kohm		Philips	2322 410 03357
R303	Resistor	1.5 kohm ±5%	0.33W	Philips	2322 211 13152
R304	Resistor	820 ohm ±5%	0.33W	Philips	2322 211 13821
R305	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562

MODULE NO: 300

Symbol	Description			Manufact.	
R306	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R307	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R308	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R309	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R310	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R311	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R312	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R313	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R314	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R315	Resistor	100 kohm ±5%			
R316	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R317	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R318	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R319	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R320	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R321	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R322	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R323	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R324	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R325	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R326	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R327	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R328	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R329	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R330	Preset potmeter	4.7 kohm	0.5W	Philips	2322 482 30472
R331	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R332	Resistor	22 kohm ±5%	0.33W	Philips	2322 211 13223
R333	Resistor	2.7 kohm ±5%	0.5W	Philips	2322 212 13272
R334	Resistor	150 ohm ±5%	0.33W	Philips	2322 211 13151
R335	Resistor	270 kohm ±5%	0.33W	Philips	2322 211 13274
R336	Resistor	680 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R337	Resistor	1 Mohm ±5%	0.33W	Philips	2322 211 13105
R338	Resistor	330 kohm ±5%	0.33W	Philips	2322 211 13334
R339	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R340	Resistor	1.8 Mohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R341	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R342	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R343	Resistor	1 Mohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R344	Resistor	1.8 Mohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R345	Preset potmeter	10 kohm		Philips	2322 410 03357
R346	Resistor	22 kohm ±5%	0.33W	Philips	2322 211 13223

Symbol	Description			Manufact.	
R347	Resistor	270 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R348	Resistor	270 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R349	Resistor	39 kohm ±5%	0.33W	Philips	2322 211 13393
R350	Resistor	100 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R351	Resistor	100 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R352	Resistor	100 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R353	Resistor	10 Mohm ±5%	0.33W	Philips	2322 211 12106
R354	Resistor	47 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R355	Resistor	100 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R356	Resistor	33 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R357	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R358	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R359	Resistor	22 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R360	Resistor	1 Mohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R361	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R362	Resistor	3.3 kohm ±5%	0.33W	Philips	2322 211 13334
R363	Resistor	15 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R364	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R365	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R366	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R367	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R368	Resistor	18 kohm ±5%	0.33W	Philips	2322 211 13183
R369	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R370	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R371	Resistor	5.6 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R372	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R373	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R374	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R375	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R376	Resistor	5.6 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R377	Resistor	5.6 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R378	Resistor	680 ohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R379	Resistor	5.6 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R380	Resistor	150 ohm ±5%	1.15W	Philips	2322 214 13151
R381	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R382	Resistor	1.8 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R383	Resistor	10 kohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R384	Resistor	2.2 Mohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R385	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R386	Resistor	3.9 Mohm ±5%	0.33W	Beysclag	MBA 0204-55-BX
R387	Resistor	3.3 kohm ±5%	0.33W	Philips	2322 211 13332

Symbol	Description			Manufact.	
R388	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R389	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R390	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R391	Resistor	15 kohm ±5%	0.33W	Philips	2322 211 13153
R392	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R393	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R394	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R395	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R396	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R397	Resistor	6.8 kohm ±5%	0.33W	Philips	2322 211 13682
R398	Resistor	33 kohm ±5%	0.33W	Philips	2322 211 13333
R399	Preset potmeter	10 kohm		Philips	2322 410 03357
R301a	Resistor	39 kohm ±5%	0.33W	Philips	2322 211 13393
R302a	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R303a	Resistor	3.9 kohm ±5%	0.33W	Philips	2322 211 13392
R304a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R305a	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R306a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R307a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R308a	Resistor	1 Mohm ±5%	0.33W	Philips	2322 211 13105
R309a	Resistor	3.3 kohm ±5%	0.33W	Philips	2322 211 13332
R310a	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R311a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R312a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R313a	Resistor	3.3 kohm ±5%	0.33W	Philips	2322 211 13332
R314a	Resistor	5.6 kohm ±5%	0.33W	Philips	2322 211 13562
R315a	Resistor	10 Mohm ±5%	0.33W	Philips	2322 211 12106
R316a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R317a	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R318a	Preset potmeter	4.7 kohm		Philips	2322 410 03356
R319a	Resistor	22 kohm ±5%	0.33W	Philips	2322 211 13223
R320a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R321a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R322a	Resistor	22 kohm ±5%	0.33W	Philips	2322 211 13223
R323a	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R324a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R325a	Resistor	3.3 kohm ±5%	0.33W	Philips	2322 211 13332
R326a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R327a	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R328a	Resistor	47 kohm ±5%	0.33W	Philips	2322 211 13473
R329a	Preset potmeter	10 kohm		Philips	2322 410 03357

Symbol	Description			Manufact.	
R330a	Resistor	820 ohm +5%	0.33W	Philips	2322 211 13821
R331a	Resistor	3.3 kohm +5%	0.33W	Philips	2322 211 13332
R332a	Resistor	100 kohm +5%	0.33W	Philips	2322 211 13104
R333a	Resistor	1 Mohm +5%	0.33W	Philips	2322 211 13105
R334a	Preset potmeter	100 ohm		Philips	2322 410 03352
R335a	Resistor	100 kohm +5%	0.33W	Philips	2322 211 13104
R336a	Resistor	10 kohm +5%	0.33W	Philips	2322 211 13103
R337a	Resistor	10 kohm +5%	0.33W	Philips	2322 211 13103
R338a	Resistor	120 ohm +5%	0.33W	Philips	2322 211 13121
R339a	Resistor	120 kohm +5%	0.33W	Philips	2322 211 13124
R340a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R341a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R342a	Resistor	82 ohm +5%	0.33W	Philips	2322 211 13829
R343a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R344a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R345a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R346a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R347a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R348a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
R349a	Resistor	2.7 kohm +5%	0.33W	Beysclag	MBA 0204-55-BX
RE301	Relay	24V		National	HB2-DC-24V
S301	Switch			ALCO	MSSA 2350R
S302	Switch			ALCO	MSS 2250R
S303	Switch			C&K	SPDT AV2 8125
S304	Switch			C&K	SPDT AV2 8125
S305	Switch			ALCO	MSS 2250R
T301	Transistor			Philips	BC327-25
T302	Transistor			Philips	BC327-25
T303	Transistor			Philips	BC327-25
T304	Transistor			Philips	BC327-25
T305	Transistor			Philips	BC327-25
T306	Transistor			Philips	BC327-25

MODULE NO: 300

Symbol	Description	Manufact.	
T307	Transistor	Philips	BC327-25
T308	Transistor	Philips	BC327-25
T309	Transistor	Philips	BC327-25
T310	Transistor	Philips	BC338
T311	Transistor	Philips	BC338
T312	Transistor	Philips	BC338
T313	Transistor	Philips	BC338
T314	Transistor	Philips	BD138
T315	Transistor	Philips	BC328
T316	Transistor	Philips	BC338
T317	Transistor	Philips	BC328
T318	Transistor	Philips	2N2368
T319	Transistor	Philips	BC338
T320	Transistor	Philips	BC338
T321	Transistor	Philips	BC338
T322	Transistor	Philips	BC141-10
IC301	Integrated circuit	MMI	6330-1
IC302	Integrated circuit	Motorola	MC14028B
IC303	Integrated circuit	Motorola	MC14028B
IC304	Integrated circuit	Texas	SN74LS06
IC305	Integrated circuit	Texas	SN74LS06
IC306	Integrated circuit	Texas	SN74LS06
IC307	Integrated circuit	Motorola	LM324
IC308	Integrated circuit	Motorola	MC14093B
IC309	Integrated circuit	Motorola	MC14093B
IC310	Integrated circuit	Motorola	MC14049B
IC311	Integrated circuit	Motorola	LM339
IC312	Integrated circuit	Motorola	MC14071B
IC313	Integrated circuit	Motorola	MC14043B
IC314	Integrated circuit	Motorola	MC14072B
IC315	Integrated circuit	Texas	NE 555P
IC316	Integrated circuit	Motorola	LM1458
IC317	Integrated circuit	Motorola	MC 14007B
IC318	Integrated circuit	Motorola	MC 14017B

a FILTER SWITCH/DIRECTION COUPLER T1130 1/2

Symbol	Description			Manufact.	
C401	Capacitor, ceramic	5.6 pF ±0.5 pF	400V	Ferroperm	9/0112.9
C402	Capacitor, ceramic	220 pF ±10%	50V	K.C.K.	HE 11 SJ CH 221K
C403	Capacitor, ceramic	110 pF ±10%	500V	K.C.K.	HM 11 SJ 111K
C404	Capacitor, ceramic	110 pF ±10%	500V	K.C.K.	HM 11 SJ 111K
C405	Capacitor, trimmer	8-80 pF		DAU	009.4601.080
C406	Capacitor, ceramic	220 pF ±10%	50V	K.C.K.	HE 11 SJ CH 221K
C407	Capacitor, ceramic	110 pF ±10%	500V	K.C.K.	HM 11 SJ 111K
C408	Capacitor, ceramic	110 pF ±10%	500V	K.C.K.	HM 11 SJ 111K
C409	Capacitor, polyester	1 nF ±10%	250V	Siemens	B32510-D6102-K
C410	Capacitor, polyester	150 nF ±10%	250V	Siemens	B32510-D1154-K
C411	Capacitor, polyester	150 nF ±10%	250V	Siemens	B32510-D1154-K
C412	Capacitor, polyester	10 nF ±10%	250V	Siemens	B32510-D6103-K
C413	Capacitor, polyester	10 nF ±10%	250V	Siemens	B32510-D6103-K
C414	Capacitor, polyester	10 nF ±10%	250V	Siemens	B32510-D6103-K
C415	Capacitor, polyester	10 nF ±10%	250V	Siemens	B32510-D6103-K
C416	Capacitor, polyester	100 nF ±10%	250V	Siemens	B32510-D1104-K
D401	Diode			Philips	BAV21
D402	Diode			Philips	BAV21
D403	Diode			Philips	BAV21
D404	Diode			Philips	BAV21
D405	Diode			Philips	BAV21
D406	Diode			Philips	BAV21
D407	Diode			Philips	AA143
D408	Diode			Philips	AA143
D409	Diode			Philips	1N4448
D410	Diode			Philips	1N4448
IC401	Integrated circuit			Motorola	LM324
R401	Resistor	3.9 kohm ±5%	0.33W	Philips	2322 211 13392
R402	Resistor	56 kohm ±5%	0.33W	Philips	2322 211 13563
R403	Resistor	100 ohm ±5%	0.33W	Philips	2322 211 13101
R404	Resistor	100 ohm ±5%	0.33W	Philips	2322 211 13101
R405	Resistor	100 ohm ±5%	0.33W	Philips	2322 211 13101
R406	Resistor	100 ohm ±5%	0.33W	Philips	2322 211 13101
R407	Resistor	56 kohm ±5%	0.33W	Philips	2322 211 13563
R408	Resistor	220 kohm ±5%	0.33W	Philips	2322 211 13224
R409	Resistor	220 kohm ±5%	0.33W	Philips	2322 211 13224

MODULE NO: 400

a FILTER SWITCH/DIRECTIONAL COUPLER T1130

Symbol	Description			Manufact.	
R410	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R411	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R412	Resistor	150 kohm ±5%	0.33W	Philips	2322 211 13154
R413	Resistor	150 kohm ±5%	0.33W	Philips	2322 211 13154
R414	Resistor	220 kohm ±5%	0.33W	Philips	2322 211 13224
R415	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R416	Resistor	2.7 Mohm ±5%	0.33W	Philips	2322 211 12275
R417	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
R418	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13104
RE401	Relay			PASI	MK/Z BV1222
RE402	Relay			PASI	MK/Z BV1222
RE403	Relay			PASI	MK/Z BV1222
RE404	Relay			PASI	MK/Z BV1222
RE405	Relay			PASI	MK/Z BV1222
RE406	Relay			PASI	MK/Z BV1222
TR401	Transformer			S.P.	TL.310

b TUNER CONTROL UNIT T1130

Symbol	Description				Manufact.	
C501	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C502	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C503	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C504	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C505	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C506	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C507	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C508	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C509	Capacitor polyester	220 nF	±10%	100V	Siemens	B32560-D1224-K
C510	Capacitor polyester	100 nF	±10%	100V	Siemens	B32510-D1104-K
C511	Capacitor electrolytic	10 uF	±20%	35V	ERO	EKI 00AA 210F
C512	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C513	Capacitor polyester	10 nF	±10%	400V	Siemens	B32510-D6103-K
C514	Capacitor electrolytic	1 uF	±20%	50V	ERO	EKI00A 110H
C515	Capacitor polyester	100 nF		100V	Siemens	B32510-D1104-K
C516	Capacitor electrolytic	1 uF	±20%	50V	ERO	EKI 00AA 110H
C517	Capacitor electrolytic	1 uF	±20%	50V	ERO	EKI 00AA 110H
D501	Diode, Silicon				Motorola	BY601
D502	Diode, Gremanium				Philips	AA143
D503	Diode, Zener				Philips	BZX79C6V2
D504	Diode, Zener				Philips	BZX79C4V3
D505	Diode, Silicon				Philips	1N4448
D506	Diode, Silicon				Philips	1N4448
D507	Diode, Zener				Philips	BZX79C6V2
D508	Diode, Silicon				Philips	BAV21
D509	Diode, Silicon				Philips	BAV21
IC501	Integrated circuit, PROM				MMI	6330-1
IC502	Integrated circuit				TEXAS	SN74LS173
IC503	Integrated circuit, PROM				MMI	6330-1
IC504	Integrated circuit				TEXAS	SN74LS173
IC505	Integrated citcuit, RAM				Motorola	MCM51L01
IC506	Integrated circuit				TEXAS	SN74LS09
IC507	Integrated circuit				TEXAS	SN74LS00
IC508	Integrated circuit				TEXAS	SN74LS109
IC509	Integrated circuit				TEXAS	NE555
R501	Resistor	100 kohm	±5%	0.33W	Philips	2322 211 13103
R502	Resistor	10 kohm	±5%	0.33W	Philips	2322 211 13103

MODULE NO: 500

a TUNER CONTROL UNIT T1130 2/4

Symbol	Description			Manufact.	
R503	Resistor	100 kohm ±5%	0.33W	Philips	2322 211 13103
R504	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R505	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R506	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R507	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R508	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R509	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R510	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R511	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R512	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R513	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R514	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R515	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R516	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R517	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R518	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R519	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R520	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R521	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R522	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R523	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R524	Resistor	820 ohm ±5%	0.5W	Philips	2322 212 13821
R525	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R526	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R527	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R528	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R529	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R530	Resistor	820 ohm ±5%	0.5W	Philips	2322 212 13821
R531	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R532	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R533	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R534	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R535	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R536	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R537	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R538	Resistor	8.2 kohm ±5%	0.33W	Philips	2322 211 13822
R539	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R540	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R541	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R542	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103

Symbol	Description			Manufact.	
R543	Resistor	100 ohm ±5%	0.33W	Philips	2322 211 13101
R544	Resistor	10 kohm ±5%	0.125W	ITT	UR 8 10 kohm ±5%
R545	Resistor	10 kohm	0.125W	ITT	UR 8 10 kohm ±5%
R546	Resistor	10 kohm ±5%	0.125W	ITT	UR 8 10 kohm ±5%
R547	Resistor	10 kohm ±5%	0.125W	ITT	UR 8 10 kohm +5%
R548	Resistor	10 kohm ±5%	0.125W	ITT	UR 8 10 kohm +5%
R549	Resistor	10 kohm ±5%	0.125W	ITT	UR 8 10 kohm ±5%
R550	Resistor	10 kohm ±5%	0.125W	ITT	UR 8 10 kohm ±5%
R551	Resistor	10 kohm +5%	0.125W	ITT	UR 8 10 kohm ±5%
R552	Resistor	33 kohm ±5%	0.33W	Philips	2322 211 13333
R553	Resistor	3.3 kohm ±5%	0.33W	Philips	2322 211 13332
R554	Resistor	100 ohm ±5%	0.33W	Philips	2322 211 13101
R555	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R556	Resistor	390 ohm ±5%	0.33W	Philips	2322 211 13391
R557	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R558	Resistor	2.7 kohm ±5%	0.33W	Philips	2322 211 13272
R559	Resistor	560 kohm ±5%	0.33W	Philips	2322 211 13561
R560	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R561	Resistor	1 kohm ±5%	0.33W	Philips	2322 211 13102
R562	Resistor	47 ohm ±5%	0.33W	Philips	2322 211 13479
R563	Resistor	10 kohm ±5%	0.33W	Philips	2322 211 13103
R564	Resistor	390 ohm ±5%	0.33W	Philips	2322 211 13391
R565	Resistor	1 kohm ±5%	0.33W	Philips	2223 211 13102
S501	Switch, 16 pos.			AB	235-H
S502	Switch, 16 pos.			AB	235-H
T501	Transistor			Philips	BC548
T502	Transistor			Philips	BC548
T503	Transistor			Philips	BC327
T504	Transistor			Philips	BC548
T505	Transistor			Philips	BC327
T506	Transistor			Philips	BC548
T507	Transistor			Philips	BC327
T508	Transistor			Philips	BC548
T509	Transistor			Philips	BC327
T510	Transistor			Philips	BC548
T511	Transistor			Philips	BC327
T512	Transistor			Philips	BC548
T513	Transistor			Philips	BC327
T514	Transistor			Philips	BC548

MODULE NO: 500

b TUNER CONTROL UNIT T1130

Symbol	Description	Manufact.	
T515	Transistor	Philips	BC327
T516	Transistor	Philips	BC548
T517	Transistor	Philips	BC327
T518	Transistor	Philips	BC548
T519	Transistor	Philips	BC327
T520	Transistor	Philips	BC548
T521	Transistor	Philips	BC327
T522	Transistor	Philips	BC548
T523	Transistor	Philips	BC327
T524	Transistor	Philips	BC558
T525	Transistor	Philips	BC548
T526	Transistor	Philips	BC558
T527	Transistor	Philips	BC548
B501	Battery, lithium	TADIRAN	TL-2150

a	LP-FILTER 1.6 - 2.2 MHz T1130		1/1
Symbol	*Description*	*Manufact.*	
C601	Capacitor, Mica 267 pF	S.P.	
C602	Capacitor, Mica 365 pF	S.P.	
C603	Capacitor, Mica 1.96 nF	S.P.	
C604	Capacitor, Mica 2.17 nF	S.P.	
C605	Capacitor, Mica 1.96 nF	S.P.	
L601	Inductor 2.14 uH	S.P.	
L602	Inductor 1.46 uH	S.P.	
L603	Inductor 4.07 uH	S.P.	
L604	Inductor 7.22 uH	S.P.	
L605	Inductor 7.22 uH	S.P.	
L606	Inductor 4.07 uH	S.P.	

MODULE NO: 700

a	LP-FILTER 2.2 - 3.1 MHz T1130		1/1
Symbol	*Description*	*Manufact.*	
C701	Capacitor, Mica 194 pF	S.P.	
C702	Capacitor, Mica 266 pF	S.P.	
C703	Capacitor, Mica 1.39 nF	S.P.	
C704	Capacitor, Mica 1.145 nF	S.P.	
C705	Capacitor, Mica 1.39 nF	S.P.	
L701	Inductor 1.56 uH	S.P.	
L702	Inductor 1.06 uH	S.P.	
L703	Inductor 2.89 uH	S.P.	
L704	Inductor 5.12 uH	S.P.	
L705	Inductor 5.12 uH	S.P.	
L706	Inductor 2.89 uH	S.P.	

a LP-FILTER 3.1 - 4.3 MHz T1130 1/1

Symbol	Description		Manufact.	
C801	Capacitor, Mica	138 pF	S.P.	
C802	Capacitor, Mica	188 pF	S.P.	
C803	Capacitor, Mica	1.00 nF	S.P.	
C804	Capacitor. Mica	1.10 nF	S.P.	
C805	Capacitor, Mica	1.00 nF	S.P.	
L801	Inductor	1.11 uH	S.P.	
L802	Inductor	755 nH	S.P.	
L803	Inductor	2.09 uH	S.P.	
L804	Inductor	3.70 uH	S.P.	
L805	Inductor	3.70 uH	S.P.	
L806	Inductor	2.09 uH	S.P.	

MODULE NO: 900

a	LP-FILTER 4.3 - 8.5 MHz T1130		1/1
Symbol	**Description**	**Manufact.**	
C901	Capacitor, Mica 99.1 pF	S.P.	
C902	Capacitor, Mica 136 pF	S.P.	
C903	Capacitor, Mica 508 pF	S.P.	
C904	Capacitor, Mica 536 pF	S.P.	
C905	Capacitor, Mica 508 pF	S.P.	
L901	Inductor 798 nH	S.P.	
L902	Inductor 545 nH	S.P.	
L903	Inductor 1.06 uH	S.P.	
L904	Inductor 1.87 uH	S.P.	
L905	Inductor 1.87 uH	S.P.	
L906	Inductor 1.06 uH	S.P.	

a	LP-FILTER 8.5 - 16.9 MHz T1130		1/1
Symbol	*Description*	*Manufact.*	
C1001	Capacitor, Mica 50.2 pF	S.P.	
C1002	Capacitor, Mica 68.7 pF	S.P.	
C1003	Capacitor, Mica 255 pF	S.P.	
C1004	Capacitor, Mica 282 pF	S.P.	
C1005	Capacitor, Mica 255 pF	S.P.	
L1001	Inductor 404 nH	S.P.	
L1002	Inductor 275 nH	S.P.	
L1003	Inductor 530 nH	S.P.	
L1004	Inductor 940 nH	S.P.	
L1005	Inductor 940 nH	S.P.	
L1006	Inductor 530 nH	S.P.	

MODULE NO: 1100

a LP-FILTER 16.9 - 28 MHz T1130 1/1

Symbol	Description		Manufact.	
C1101	Capacitor, Mica	26.7 pF	S.P.	
C1102	Capacitor, Mica	36.5 pF	S.P.	
C1103	Capacitor, Mica	147 pF	S.P.	
C1104	Capacitor, Mica	163 pF	S.P.	
C1105	Capacitor, Mica	147 pF	S.P.	
L1101	Inductor	214 nH	S.P.	
L1102	Inductor	146 nH	S.P.	
L1103	Inductor	305 nH	S.P.	
L1104	Inductor	542 nH	S.P.	
L1105	Inductor	542 nH	S.P.	
L1106	Inductor	305 nH	S.P.	

Symbol	Description			Manufact.	
C1201	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1202	Capacitor electrolytic	1 uF	50V	ROE	EKI 00AA 110H
C1203	Capacitor electrolytic	1 uF	50V	ROE	EKI 00AA 110H
C1204	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1205	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1206	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1207	Capacitor ceramic	150 pF 10%	25V	Ferroperm	9/0116.8
C1208	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1209	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1210	Capacitor polyester	100 nF	100V	Siemens	B32510-D1104-K
C1211	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1212	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1213	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1214	Capacitor polypropylen	560 pF	630V	Philips	2222 458 65601
C1215	Capacitor polypropylen	1100 pF	630V	Philips	2222 458 61102
C1216	Capacitor polypropylen	1100 pF	630V	Philips	2222 458 61102
C1217	Capacitor electrolytic	100 uF	16V	ROE	EKM 00CC 310D
C1218	Capacitor electrolytic	100 uF	16V	ROE	EKM 00CC 310D
C1219	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1220	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1221	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1222	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1223	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1224	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1225	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1226	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1227	Capacitor polypropylen	33 nF 10%	250V	ERO	MKP1841-333-25-5
C1228	Capacitor polypropylen	33 nF 10%	250V	ERO	MKP1841-333-25-5
C1229	Capacitor polypropylen	100 pF	630V	Philips	2222 458 61001
C1230	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1231	Capacitor electrolytic	470 uF	10V	ROE	EB00 GC 347C
C1232	Capacitor mica	2.4 nF 10%	250V	JAHRE	49.54/2400/10/250
C1233	Capacitor mica	2.4 nF 10%	250V	JAHRE	49.54/2400/10/250
C1234	Capacitor mica	2.4 nF 10%	250V	JAHRE	49.54/2400/10/250
C1235	Capacitor	Factory selected			
C1236	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1237	Capacitor polyester	100 nF	100V	ERO	MKT1822-410-01
C1238	Capacitor polypropylen	100 nF 10%	100V	ERO	MKT1841-410-01
C1239	Capacitor polypropylen	100 nF 10%	100V	ERO	MKT1841-410-01
C1240	Capacitor polypropylen	100 nF 10%	100V	ERO	MKT1841-410-01

Symbol	Description				Manufact.	
C1241	Capacitor polypropylen	100 nF	10%	100V	ERO	MKT1841-410-01
C1242	Capacitor polypropylen	100 nF	10%	100V	ERO	MKT1841-410-01
C1243	Capacitor polypropylen	100 nF	10%	100V	ERO	MKT1841-410-01
C1244	Capacitor mica	270 pF	10%	500V	JAHRE	49.54/270/10/500
C1245	Capacitor mica	15 nF	10%	100V	SOSHIN	DM20C153K1ICR
C1246	Capacitor mica	15 nF	10%	100V	SOSHIN	DM20C153K1ICR
C1247	Capacitor polypropylen	33 nF	10%	250V	ERO	MKP1841-333-25-5
C1248	Capacitor polypropylen	33 nF	10%	250V	ERO	MKP1841-333-15-5
C1249	Capacitor polypropylen	33 nF	10%	250V	ERO	MKP1841-333-15-5
C1250	Capacitor polypropylen	33 nF	10%	250V	ERO	MKP1841-333-15-5
C1251	Capacitor polypropylen	33 nF	10%	250V	ERO	MKP1841-333-25-5
C1252	Capacitor polypropylen	33 nF	10%	250V	ERO	MKP1841-333-25-5
C1253	Capacitor mica	2.4 nF	10%	250V	JAHRE	49.54/2400/10/250
C1254	Capacitor mica	2.4 nF	10%	250V	JAHRE	49.54/2400/10/250
C1255	Capacitor electrolytic	1 uF		50V	ROE	EKI00AA110H
C1256	Capacitor electrolytic	10 uF		63V	ROE	EB00CA210J
C1257	Capacitor electrolytic	10 uF		63V	ROE	EB00CA210J
C1258	Capacitor electrolytic	470 uF		40V	ROE	EB00HE347G
R1201	Resistor	180 ohm	5%	0.33W	Philips	2322 211 13181
R1202	Resistor	10 ohm	5%	0.33W	Philips	2322 211 13109
R1203	Resistor	680 ohm	5%	0.33W	Philips	2322 211 13681
R1204	Resistor	680 ohm	5%	0.33W	Philips	2322 211 13681
R1205	Resistor	820 ohm	5%	0.33W	Philips	2322 211 13821
R1206	Resistor	820 ohm	5%	0.33W	Philips	2322 211 13821
R1207	Resistor	470 ohm	5%	0.33W	Philips	2322 211 13471
R1208	Resistor	470 ohm	5%	0.33W	Philips	2322 211 13471
R1209	Resistor	82 ohm	5%	2.5W	Philips	2322 192 38209
R1210	Resistor	82 ohm	5%	2.5W	Philips	2322 192 38209
R1211	Resistor	15 ohm	5%	0.33W	Philips	2322 211 13159
R1212	Resistor	22 ohm	5%	0.33W	Philips	2322 211 13229
R1213	Resistor	1.78kohm	1%	0.25W	Philips	2322 150 51782
R1214	Resistor	2.67kohm	1%	0.25W	Philips	2322 150 52672
R1215	Resistor	15kohm	5%	0.33W	Philips	2322 211 13153
R1216	Resistor	1.8kohm	5%	0.33W	Philips	2322 211 13182
R1217	Resistor	1.8kohm	5%	0.5W	Philips	2322 212 13182
R1218	Resistor	3.3kohm	5%	0.33W	Philips	2322 211 13332
R1219	Resistor	10 ohm	5%	0.33W	Philips	2322 211 13109
R1220	Resistor preset	22 ohm			A.B.	HC10P-22 ohm
R1221	Resistor	2.2kohm	5%	2.5W	Philips	2322 192 32202
R1222	Resistor	22 ohm	5%	0.33W	Philips	2322 211 13229
R1224	Resistor	8.2 ohm	5%	0.33W	Philips	2322 211 13828

b. P.A. UNIT T1130

Symbol	Description				Manufact.	
R1225	Resistor	8.2	ohm 5%	0.33W	Philips	2322 211 13828
R1226	Resistor	2.2	ohm 5%	0.33W	Philips	2322 211 13228
R1227	Resistor	2.2	ohm 5%	0.33W	Philips	2322 211 13228
R1228	Resistor	18	ohm 5%	0.33W	Philips	2322 211 13189
R1229	Resistor	18	ohm 5%	0.33W	Philips	2322 211 13189
R1230	Resistor	33	ohm 5%	0.33W	Philips	2322 211 13339
R1231	Resistor	33	ohm 5%	0.33W	Philips	2322 211 13339
R1232	Resistor preset	22	ohm 10%		A.B.	HC 10P 22 ohm
R1233	Resistor	560	ohm 5%	4W	Philips	2322 330 22561
R1234	Resistor	22	ohm 5%	0.33W	Philips	2322 211 13229
R1235	Resistor					
R1236	Resistor	6.8	ohm 5%	2.5W	Philips	2322 192 36808
R1237	Resistor	6.8	ohm 5%	2.5W	Philips	2322 192 36808
R1238	Resistor	6.8	ohm 5%	2.5W	Philips	2322 192 36808
R1239	Resistor	6.8	ohm 5%	2.5W	Philips	2322 192 36808
R1240	Resistor	2.7	ohm 5%	2.5W	Philips	2322 192 32708
R1241	Resistor	2.7	ohm 5%	2.5W	Philips	2322 192 32708
R1242	Resistor	2.7	ohm 5%	2.5W	Philips	2322 192 32708
R1243	Resistor	2.7	ohm 5%	2.5W	Philips	2322 192 32708
R1244	Resistor	10	ohm 5%	2.5W	Philips	2322 192 31009
R1245	Resistor	10	ohm 5%	2.5W	Philips	2322 192 31009
R1246	Resistor	10	ohm 5%	2.5W	Philips	2322 192 31009
R1247	Resistor	10	ohm 5%	2.5W	Philips	2322 192 31009
R1248	Resistor	2.2	ohm 5%	0.35W	Philips	2322 211 13228
RE1201	Relay				Siemens	V23100-V4324-C010
FP1201	Ferroxcube bead				Philips	4322 020 34400
FP1202	Ferroxcube bead				Philips	4322 020 34400
FP1203	Ferroxcube bead				Philips	4322 020 34400
FP1204	Ferroxcube bead				Philips	4322 020 34400
FP1205	Ferroxcube bead				Philips	4322 020 34400
FP1206	Ferroxcube bead				Philips	4322 020 34400
FP1207	Ferroxcube bead				Philips	4322 020 34400
FP1208	Ferroxcube bead				Philips	4322 020 34400
L1201	Coil	2.2	uH 10%		Ferroperm	1582
L1202	Coil				S.P.	TL067
L1203	Coil				S.P.	TL067
L1204	Coil				S.P.	TL067
L1205	Coil				S.P.	TL067
L1206	Coil				S.P.	TL067

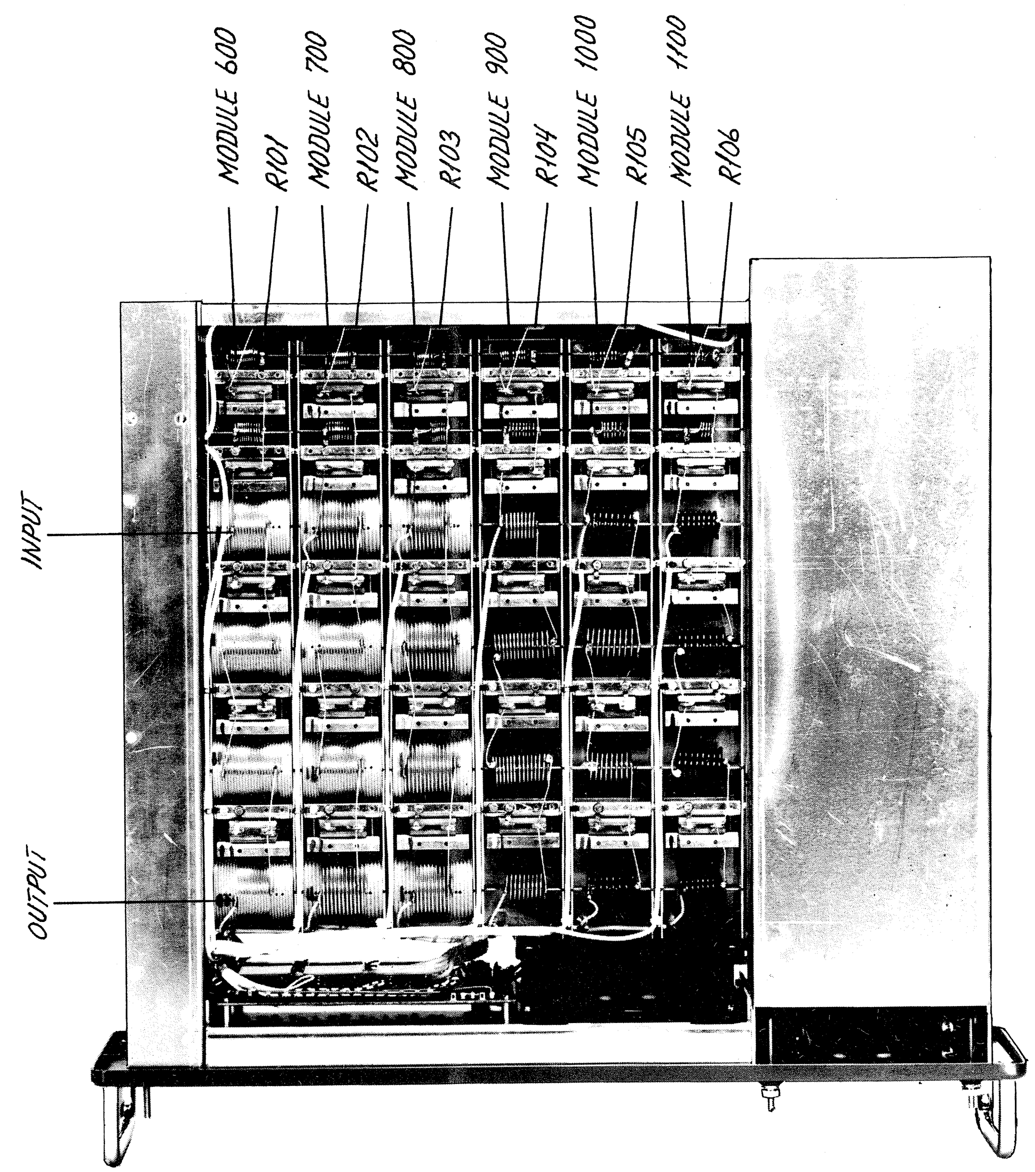
Symbol	Description	Manufact.	
L1207	Coil	S.P.	TL306
L1208	Coil	S.P.	TL306
L1209	Coil	S.P.	TL305
L1210	Coil	S.P.	TL305
L1211	Coil	S.P.	TL304
L1212	Coil	S.P.	TL304
L1213	Coil	S.P.	TL301
L1214	Coil	S.P.	TL301
TR1201	Transformer	S.P.	TL308
TR1202	Transformer	S.P.	TL307
TR1203	Transformer	S.P.	TL303
TR1204	Transformer	S.P.	TL302
TR1205	Transformer	S.P.	TL300
TR1206	Transformer	S.P.	TL299
T1201	Transistor	Motorola	BC328
T1202	Transistor	Motorola	BC548
T1203	Transistor	Motorola	BC548
T1204	Transistor	Motorola	BC548
T1205	Transistor	Motorola	BC548
T1206	Transistor	Motorola	2N3553
T1207	Transistor	Motorola	2N3553
T1208	Transistor	Motorola	2N5190
T1209	Transistor	Motorola	2N5190
T1210			
T1211			
T1212	Transistor	Motorola	MRF426
T1213	Transistor	Motorola	MRF426
T1214	Transistor	Thomson	TH430
T1215	Transistor	Thomson	TH430
D1201	Diode	Philips	BAV21

a TEMPERATURE PROTECTION UNIT T1130 1/

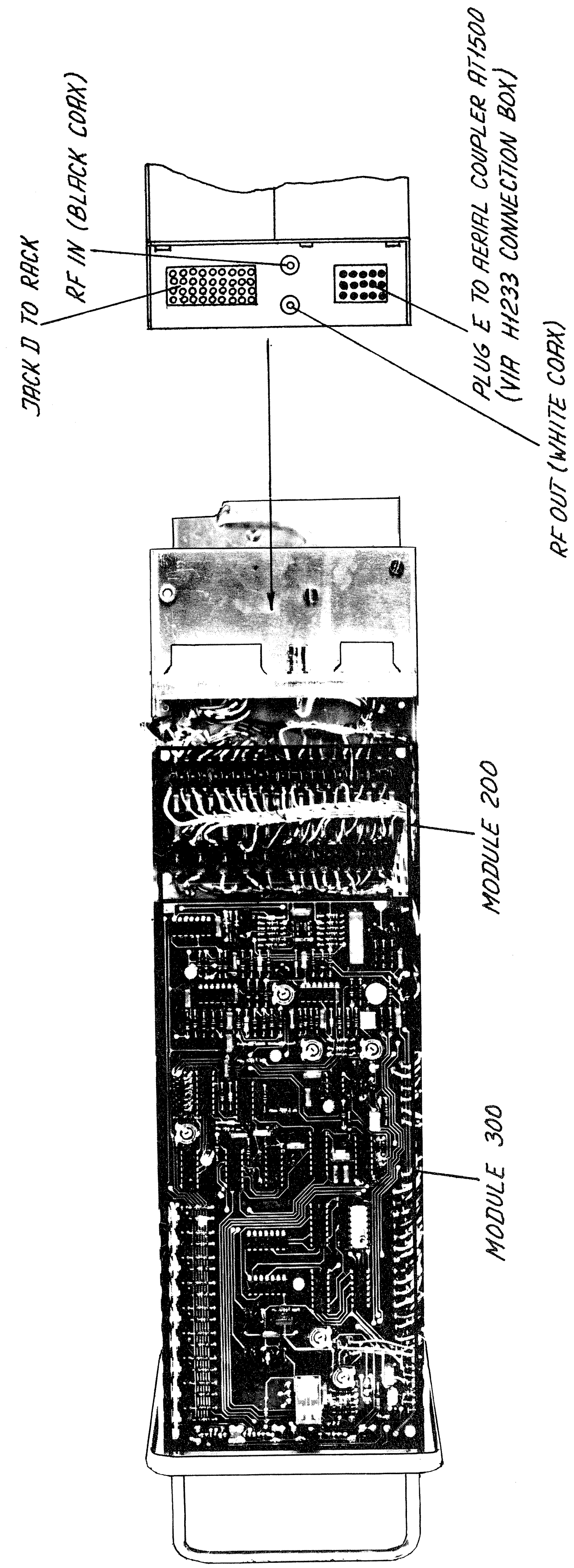
Symbol	Description				Manufact.	
C1301	Capacitor polyester	100 nF	+10%		Siemens	B32510-D1104-K
C1302	Capacitor polyester	100 nF	+10%		Siemens	B32510-D1104-K
C1303	Capacitor polyester	100 nF	+10%		Siemens	B32510-D1104-K
C1304	Capacitor polyester	100 nF	+10%		Siemens	B32510-D1104-K
R1301	Resistor	18.2 kohm	+1%	0.4W	Philips	2322 151 51823
R1302	Resistor	18.2 kohm	+1%	0.4W	Philips	2322 151 51823
R1303	Resistor	191 ohm	+1%	0.4W	Philips	2322 151 51911
R1304	Resistor	1.65 kohm	+1%	0.4W	Philips	2322 151 51652
R1305	Preset potentiometer	22 kohm	+10%		AB	HC 10-22k 10%
R1306	Resistor	680 kohm	+5%	0.33W	Philips	2322 211 13684
R1307	Resistor	680 kohm	+5%	0.33W	Philips	2322 211 13684
R1308	Resistor	15 kohm	+1%	0.4W	Philips	2322 151 51503
R1309	Resistor	33 kohm	+5%	0.33W	Philips	2322 211 13333
R1310	Resistor	33 kohm	+5%	0.33W	Philips	2322 211 13333
R1311	Resistor	33 kohm	+5%	0.33W	Philips	2322 211 13333
R1312	Resistor	33 kohm	+5%	0.33W	Philips	2322 211 13333
R1313	Resistor	6.8 kohm	+5%	0.33W	Philips	2322 211 13682
R1314	Resistor	22 ohm	+5%	0.33W	Philips	2322 211 13229
R1315	Resistor	6.8 kohm	+5%	0.33W	Philips	2322 211 13682
R1316	Resistor	22 ohm	+5%	0.33W	Philips	2322 211 13229
R1317	Resistor	22 ohm	+5%	0.33W	Philips	2322 211 13229
T1301	Transistor				Philips	BC639
T1302	Transistor				Philips	BC639
T1303	Transistor				Philips	BC639
T1304	Transistor				Philips	BC640
T1305	Transistor				Philips	BC639
IC1301	Integrated circuit				National	LM358

CIRCUIT DESCRIPTIONS AND SCHEMATIC DIAGRAMS

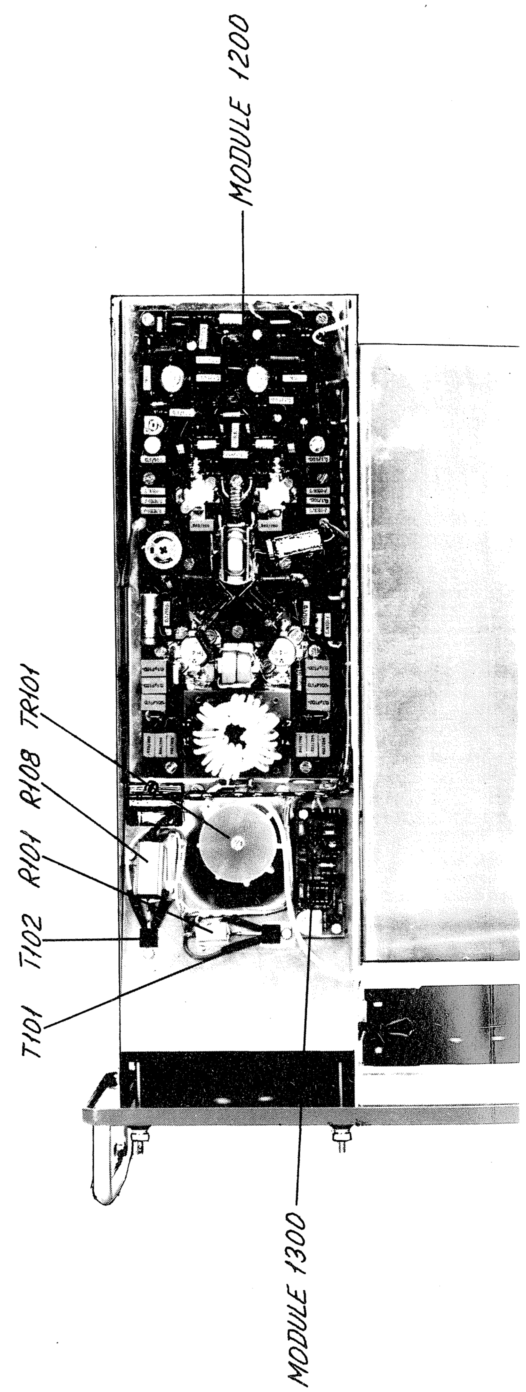
T 113o A



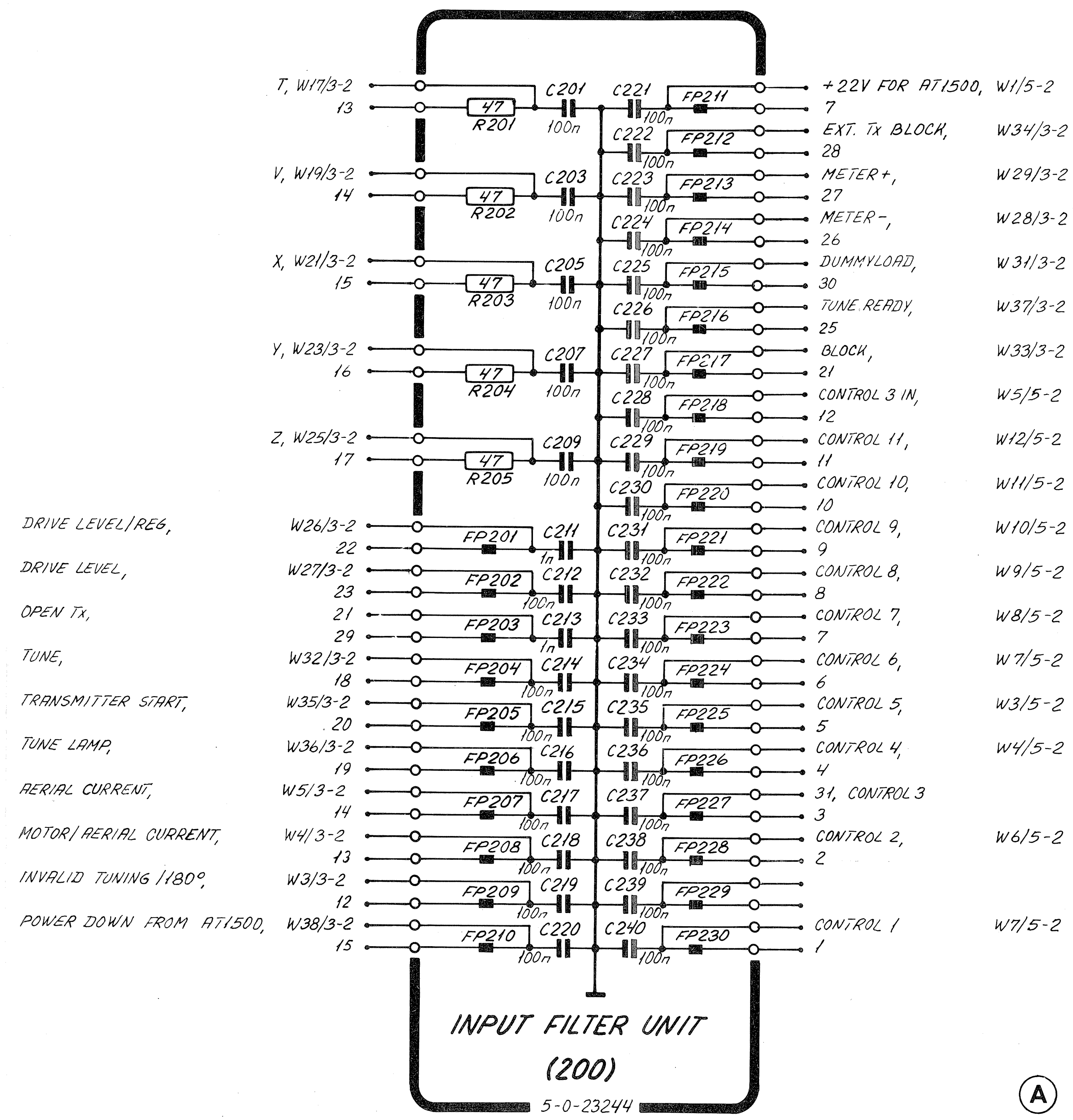
BOTTOM VIEW



RIGHT SIDE VIEW



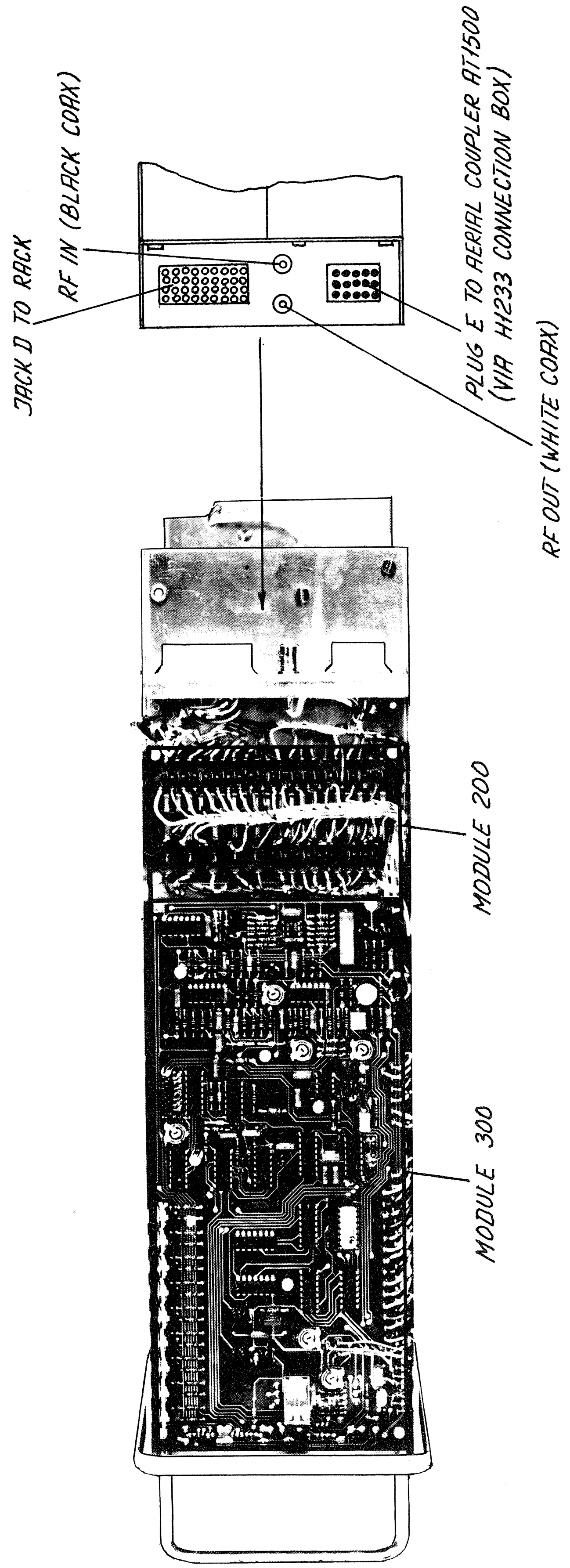
TOP



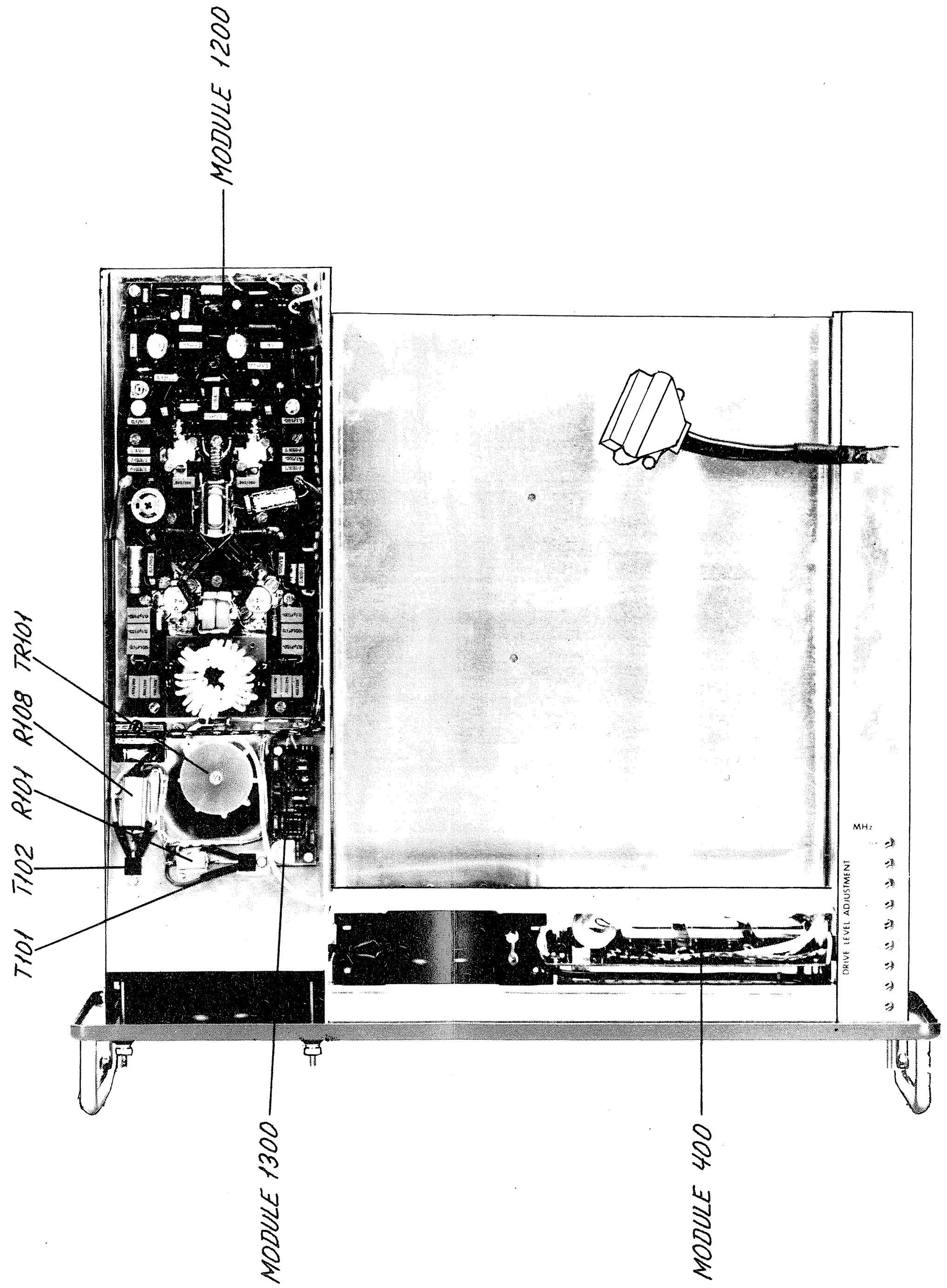
T, W17/3-2
13
V, W19/3-2
14
X, W21/3-2
15
Y, W23/3-2
16
Z, W25/3-2
17
DRIVE LEVEL/REG, W26/3-2
22
DRIVE LEVEL, W27/3-2
23
OPEN Tx, 21
29
TUNE, W32/3-2
18
TRANSMITTER START, W35/3-2
20
TUNE LAMP, W36/3-2
19
AERIAL CURRENT, W5/3-2
14
MOTOR/AERIAL CURRENT, W4/3-2
13
INVALID TUNING /180°, W3/3-2
12
POWER DOWN FROM AT1500, W38/3-2
15
47 R201
47 R202
47 R203
47 R204
47 R205
C201 100n
C203 100n
C205 100n
C207 100n
C209 100n
FP201 C211 1n
FP202 C212 100n
FP203 C213 1n
FP204 C214 100n
FP205 C215 100n
FP206 C216 100n
FP207 C217 100n
FP208 C218 100n
FP209 C219 100n
FP210 C220 100n
C221 100n FP211
C222 100n FP212
C223 100n FP213
C224 100n FP214
C225 100n FP215
C226 100n FP216
C227 100n FP217
C228 100n FP218
C229 100n FP219
C230 100n FP220
C231 100n FP221
C232 100n FP222
C233 100n FP223
C234 100n FP224
C235 100n FP225
C236 100n FP226
C237 100n FP227
C238 100n FP228
C239 100n FP229
C240 100n FP230
+22V FOR AT1500, W1/5-2
7
EXT. Tx BLOCK, W34/3-2
28
METER+, W29/3-2
27
METER-, W28/3-2
26
DUMMYLOAD, W31/3-2
30
TUNE READY, W37/3-2
25
BLOCK, W33/3-2
21
CONTROL 3 IN, W5/5-2
12
CONTROL 11, W12/5-2
11
CONTROL 10, W11/5-2
10
CONTROL 9, W10/5-2
9
CONTROL 8, W9/5-2
8
CONTROL 7, W8/5-2
7
CONTROL 6, W7/5-2
6
CONTROL 5, W3/5-2
5
CONTROL 4, W4/5-2
4
31, CONTROL 3
3
CONTROL 2, W6/5-2
2
CONTROL 1 W7/5-2
1
INPUT FILTER UNIT
(200)
5-0-23244

A

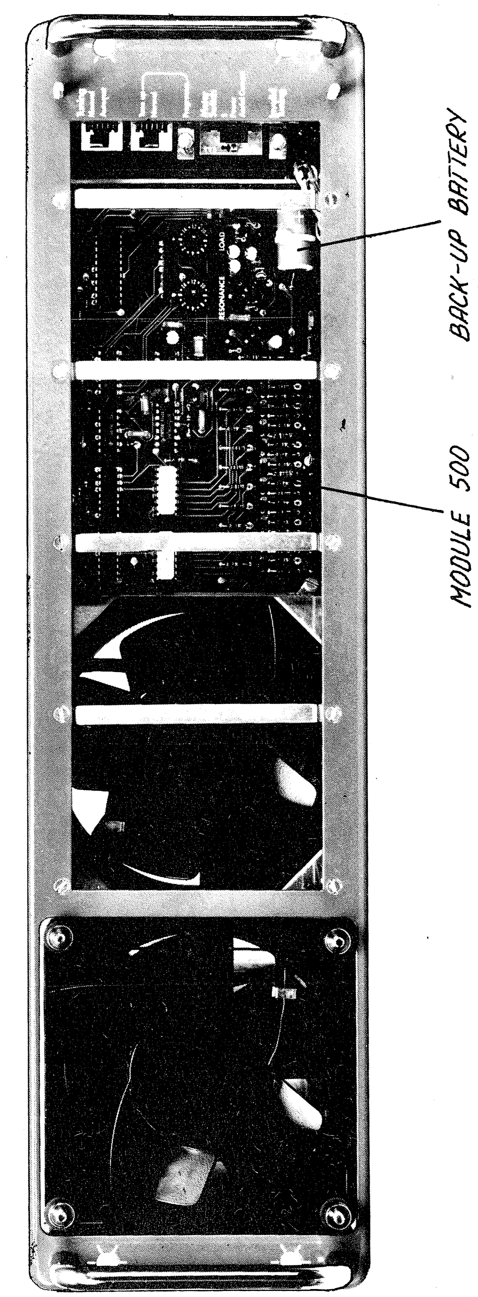
T 1130



RIGHT SIDE VIEW



TOP VIEW



FRONT VIEW

DRIVE

DRIVE

OPEN

TUNE,

TRANS

TUNE

AERIA

MOTOR

INVAL

POWE

CIRCUIT DESCRIPTION TRANSMITTER CONTROL UNIT T1130

The transmitter control unit consists of four circuits:

1. Meter switch S301.
2. Drive level and filter selector.
3. Tune logic.
4. VSWR-calculator, protection circuit.

1. METER SWITCH

By means of the meter switch it is possible to switch the aerial current meter between Aerial current, Power, and Standing wave ratio.

The aerial current detector is placed inside the aerial coupler AT1500. The detector gives a d.c. output voltage which is led to the transmitter control unit W4/3-2 and W5/3-2.

The meter sensitivity for small currents is set with R301 and R302, and for higher currents the diode D302 starts to conduct and thus reduces the meter sensitivity.

Power is measured by the directional coupler (400). The output voltage from module 400 is led to W41/3-2 and the meter sensitivity is set by R301a and R399. Full power is set to a meter reading of approx. 3 on the meter. When the output power is zero the voltage on W41/3-2 is 1.5V. In order to get the meter to show zero the diodes D321 and D322 are put in to give a voltage drop of 1.5V.

The standing wave ratio is calculated in the VSWR-calculator and amplified in IC307c. VSWR =   gives zero reading on the meter and is adjusted with R318a. VSWR = 1 gives max. reading and is adjusted with R329a. The meter shows zero reading until the output power is more than 20W. This is controlled by the comparator IC311d.

2. DRIVE LEVEL AND FILTER SELECTOR

The exciter gives a five bit frequency band code T,V,X,Y,Z. This code is decoded in IC301 into one four bit code and one three bit code. The last output from IC301 gives a block output when T,V,X,Y,Z is either one or zero. The four bit code goes to IC303, which is a 4 to 10 line decoder, selecting one of the nine drive level potentiometers. The three bit code goes to IC302, which is a 4 to 10 line decoder, selecting one of the 6 relays for low-pass filter switching on module 400. For the code see table 1.

3. TUNE LOGIC

The Tune logic takes care of controlling the tune sequence and blocking of the power supply to the PA-module.

A tune sequence always starts with a tune signal from the exciter on W32/3-2. The tune signal resets the tune logic and starts up the tune sequence. In the Aerial Coupler AT1500 there are some presettings which are set by the tuner control unit and a variometer controlled by a motor. When tuning,this motor drives the variometer. For every half turn,the variometer takes the same value. If we now look at the VSWR at the output of the power amplifier it will variate and reach the same value every half turn. If now the presettings are set correct, resonance in AT1500 will occur for every half turn and VSWR will have a minimum value. This minimum value is compared with a recerence value from the reference counter IC318. On the first full turn it will be VSWR = 1.2; on the next it will be VSWR = 1.5 and so on. When the VSWR measured at the output of the PA-module is less than the reference VSWR from IC318 the tune sequence will stop.

On the next pages you will find the block diagram and a time table showing tune and blocking sequences.

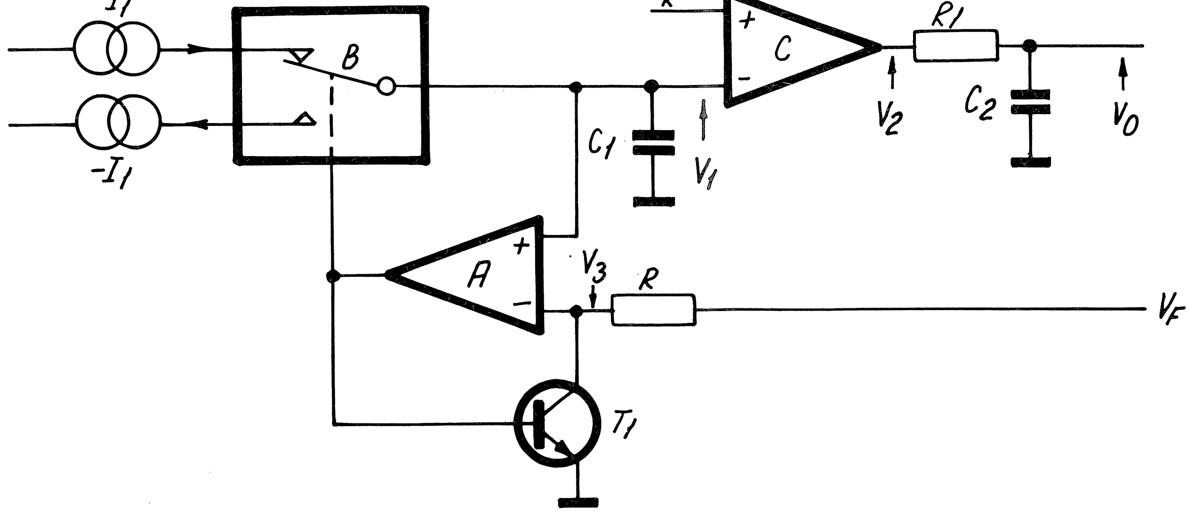
When the transmitter is blocked, the tune lamp on the exciter will wink to indicate that the transmitter is blocked. To cancel the blocking of the transmitter a tune pulse is needed.

When the transmitter, under an automatical tune-up procedure is unable to find a VSWR less than 5, the tune lamp will start to wink. But the transmitter will still be able to transmit with reduced power.

4. VSWR-CALCULATOR, PROTECTION CIRCUIT

The VSWR-calculator consists of IC316, IC317, IC311a, IC311b, and T318. Actually it is not calculating the VSWR but it is calculating the reflection coefficient $\rho = \frac{V_R}{V_F}$. V_R = reflected voltage and V_F = forward voltage from the directional coupler (400).

Block Diagram of the Divider

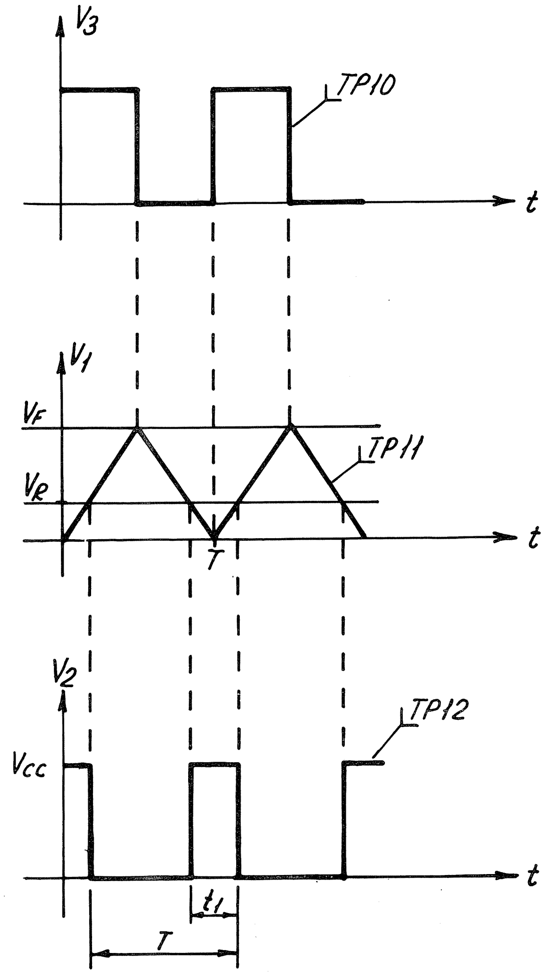


C_1 is charged (IC316b, T317) or discharged (IC316a, T316) with a constant current, depending on the position of the analog switch B (IC317) which is controlled by the comparator A. When V_1 is less than V_F, C1 is charged with I_1 until $V_1 = V_F$ then B switches and C1 is decharged with $-I_1$ and T1 is switched on. C_1 is decharging until $V_1 = 0$. V1 is now a triangle wave with a periode time T depending on V_F, $T = \frac{2 \times V_F \times C}{I_1}$ (see wave forms below).

V_1 is compared with V_R in comparator C (IC311b). The output V_2 has same periode time as V_1 and a pulse with t_1 depending on V_R $t_1 = \frac{2 \times V_R \times C_1}{C_1}$ (see wave forms below).

V_2 is fed into mean value detector R_1 and C_2. The mean value of V_2 is $\frac{V_{CC} \times t_1}{T} = V_{CC} \times \frac{V_R}{V_F} = V_O$.

This means that V_O is proportional to $\frac{V_R}{V_F}$. Below is shown the wave forms with numbers referring to the diagram.



T 113o

V_2 is mean value rectified (R321a, C320) and then fed to the meter amplifier (IC307c). The meter amplifier inverts the mean value, so when $V_{CC} \times \frac{V_R}{V_F} = 0$ then the output voltage is 13.5V and when $V_{CC} \times \frac{V_R}{V_F} = V_{CC}$ the output voltage is zero.

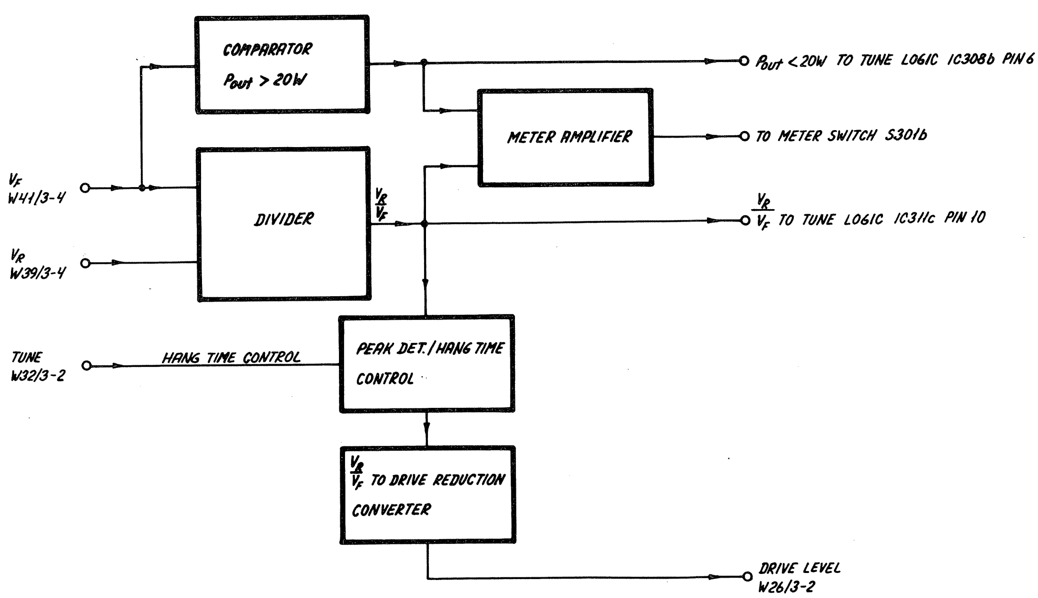
V_2 is also mean value rectified by R324a and C321 and fed into a peak value detector (IC307b, T321), the hangtime is controlled by T320, T319. When tuning T320 is off and C323 is determining the hangtime. When no tuning, T320 is on and the hangtime is controlled by C322, giving a long hangtime, so when speaking to the microphone the output voltage of the peak detector is constant.

The output of the peak detector is fed to a voltage to current converter (IC307a, T322). The output of this is connected to the drive level adjusting circuit. When the current floating through T322 is zero the drive level is max. When the current floating through T322 is 23 mA the drive level is reduced approx. 10 dB.

IC311d is a comparator and the output of this is zero, when $V_F \leq 1.6V\sim$ $P_{out} \leq 20W$. When $P > 20W$ the output goes high and thus allows the tuning logic to use the VSWR.

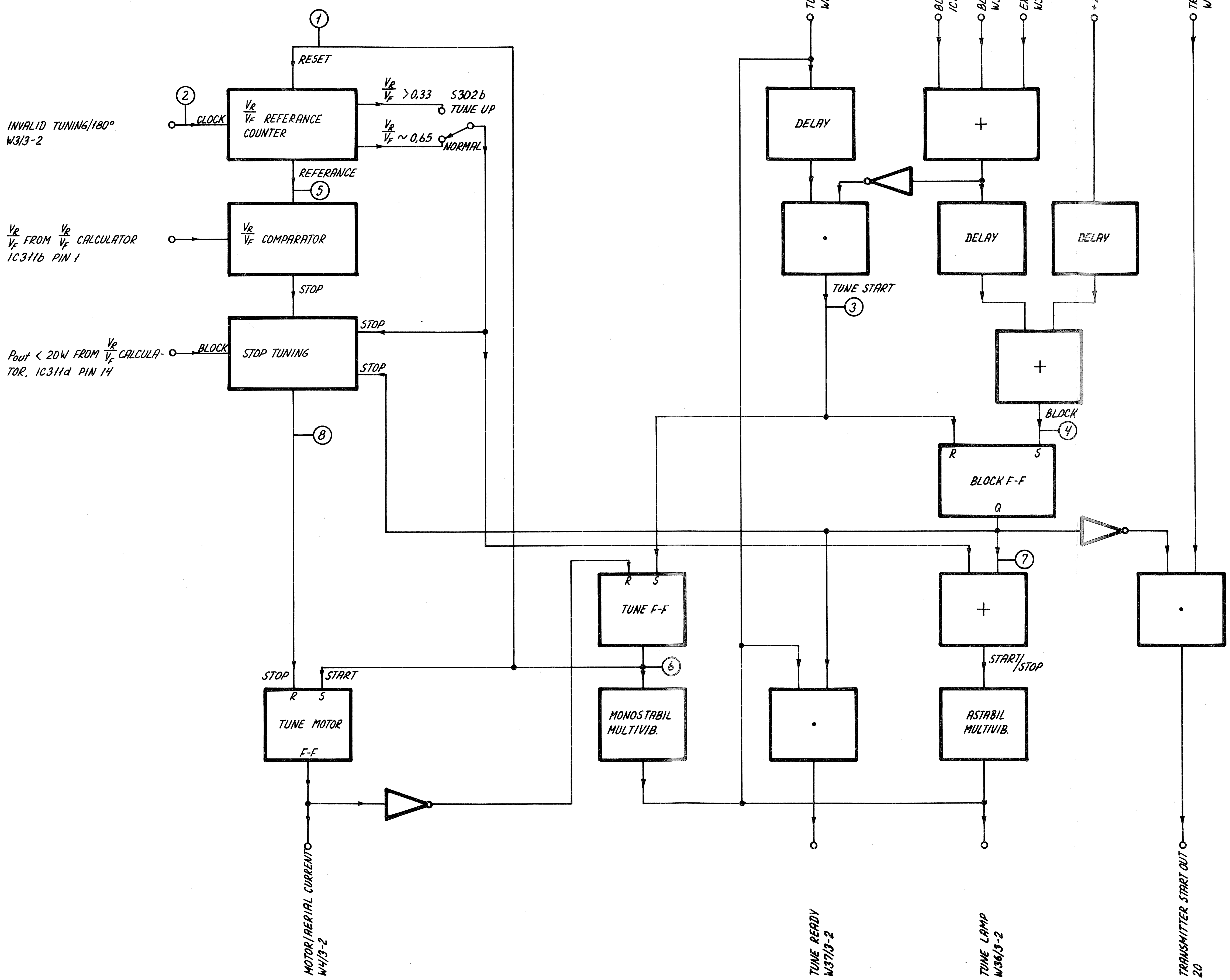
T 1130

BLOCK DIAGRAM WSWR CALCULATOR



T 1130

BLOCK DIAGRAM
TUNE LOGIC

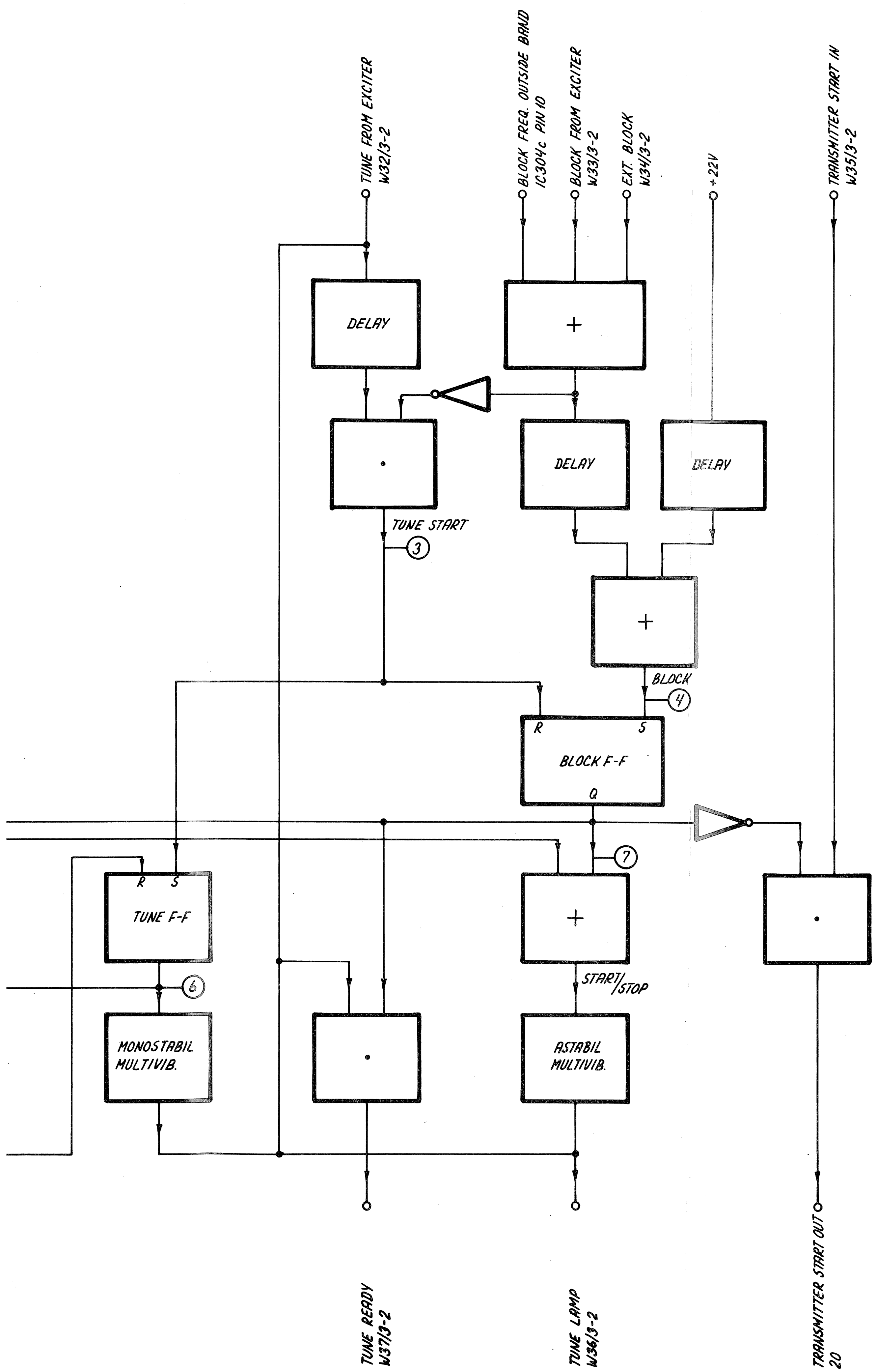


TIME TABLE FOR TUNI

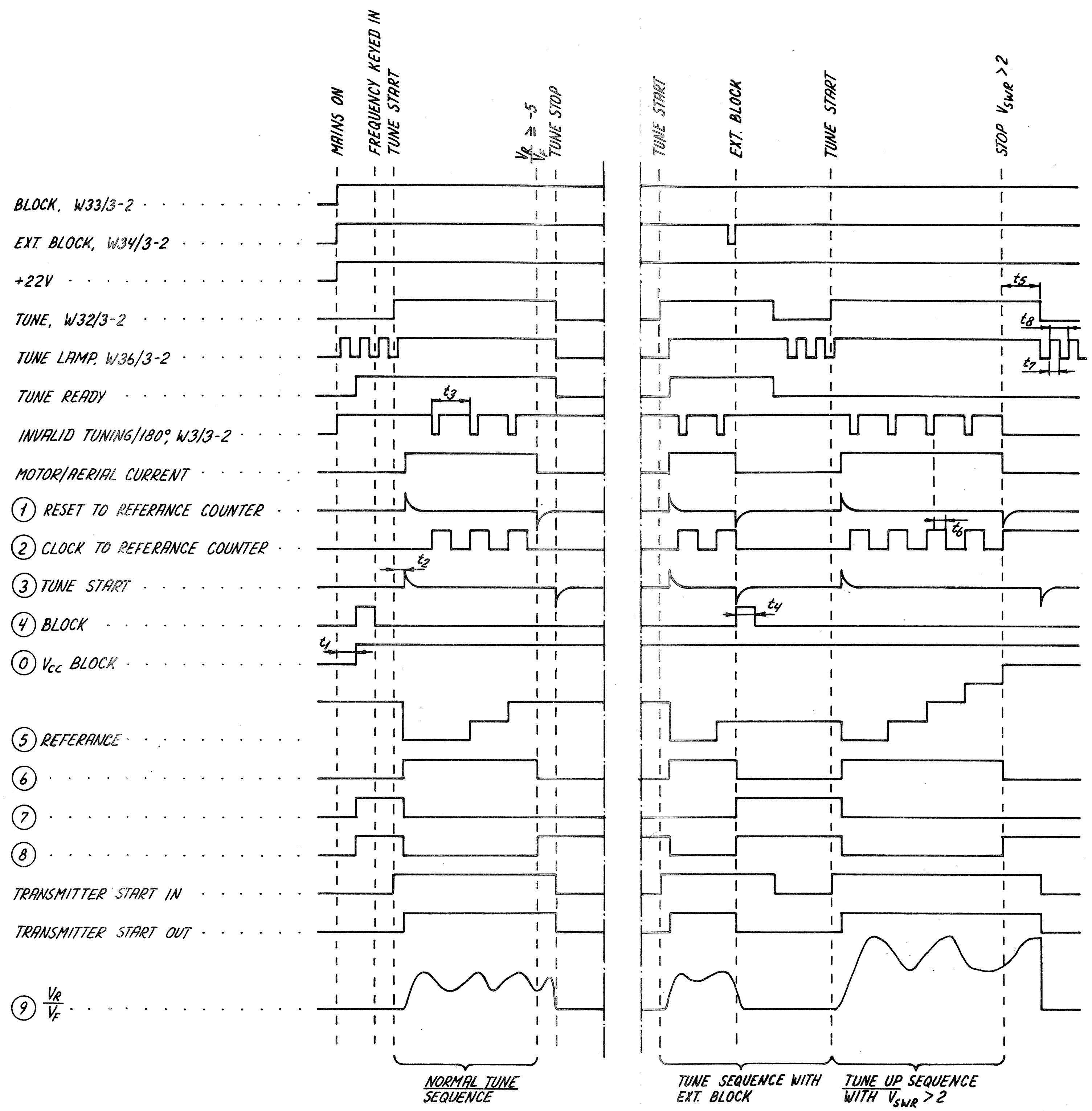
BLOCK, W33/3-2 · · · · · ·
EXT. BLOCK, W34/3-2 · · · ·
+22V · · · · · · · · · ·
TUNE, W32/3-2 · · · · · ·
TUNE LAMP, W36/3-2 · · · ·
TUNE READY · · · · · · ·
INVALID TUNING/180°, W3/3-2 ·
MOTOR/AERIAL CURRENT · · ·
(1) RESET TO REFERANCE COUNTE
(2) CLOCK TO REFERANCE COUNT
(3) TUNE START · · · · · ·
(4) BLOCK · · · · · · · ·
(0) V_{CC} BLOCK · · · · · ·

(5) REFERANCE · · · · ·
(6) · · · · · · · · · ·
(7) · · · · · · · · · ·
(8) · · · · · · · · · ·
TRANSMITTER START IN · · ·
TRANSMITTER START OUT · · ·

(9) $\frac{V_R}{V_F}$ · · · · · · · · ·



TIME TABLE FOR TUNING SEQUENCE



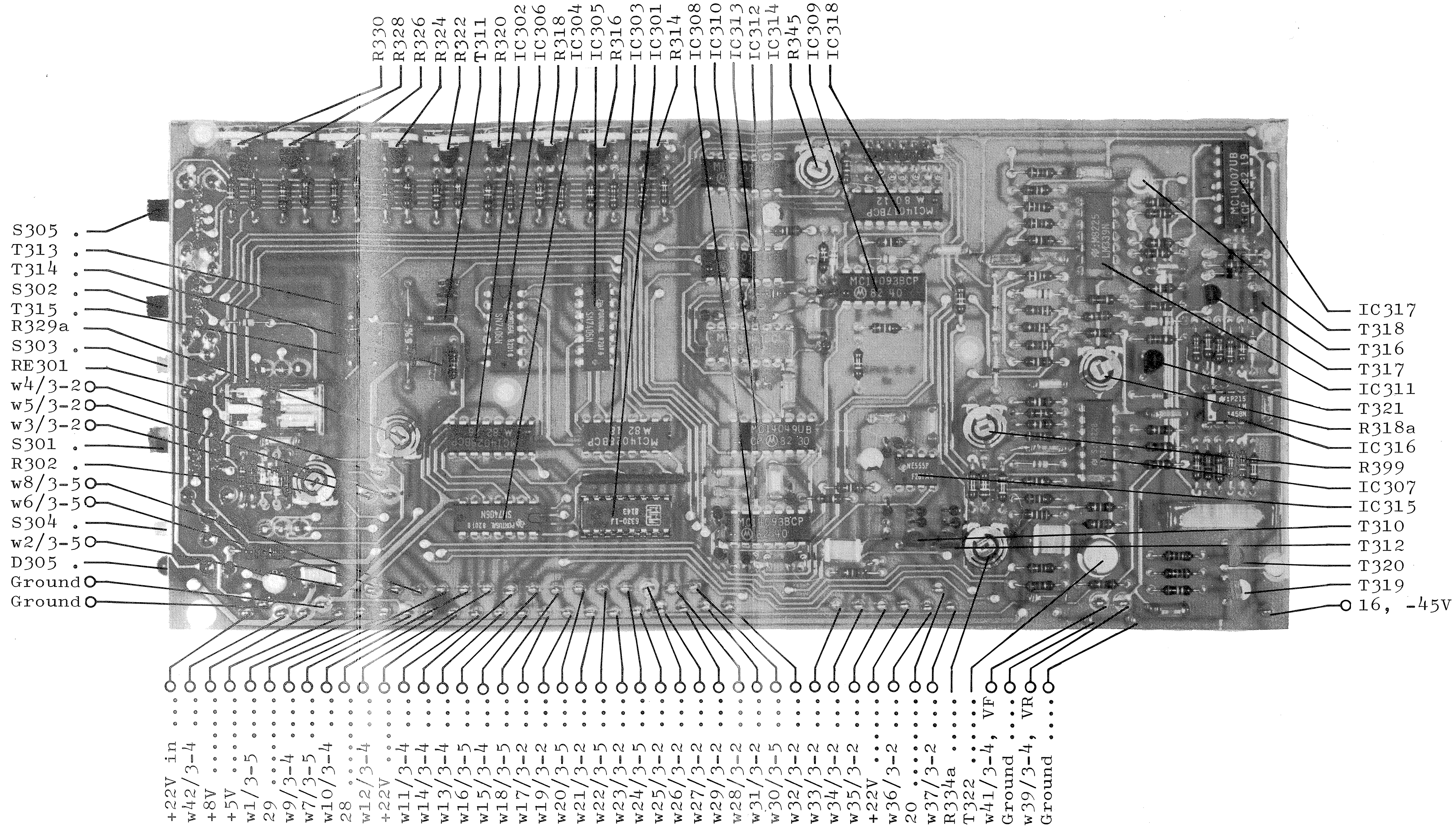
$38mS < t_1 < 163mS$
$25mS < t_2 < 108{,}8mS$
$3s < t_3 < 7s$
$0{,}5mS < t_4 < 2mS$

$0{,}5S < t_5 < 1{,}6S$
$210mS < t_6 < 350mS$
$0{,}35S < t_7 < 1S$
$0{,}5S < t_8 < 1{,}8S$

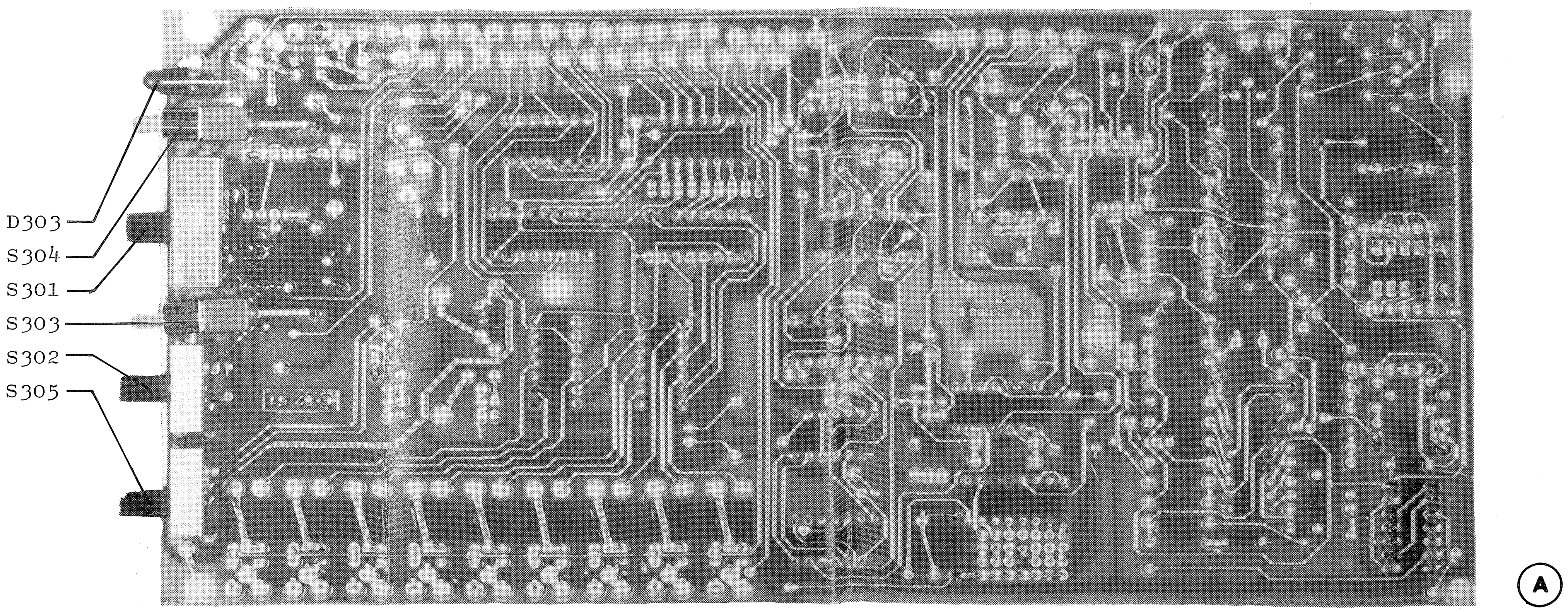
Table 1.

Frequency MHz	Z Y X V T	Output of IC301 1 2 3 4 5 6 7 8	Selected drive level potentiometer	Low-pass Filter
1.6 - 1.799	1 0 1 1 0	0 0 0 0 0 1 1 0	R330	1
1.8 - 1.999	1 0 0 0 1	0 0 0 0 0 1 1 0	R330	1
2.0 - 2.199	0 1 0 0 0	0 0 0 0 0 1 1 0	R330	1
2.2 - 2.399	0 0 0 0 1	0 0 0 0 1 0 1 0	R330	2
2.4 - 2.599	0 0 0 1 1	0 0 0 0 1 0 1 0	R330	2
2.6 - 2.799	0 0 1 0 0	0 0 0 0 1 0 1 0	R330	2
2.8 - 2.999	0 0 1 0 1	0 0 0 0 1 0 1 0	R330	2
3.0 - 3.099	1 0 0 1 0	0 0 0 0 1 0 1 0	R330	2
3.1 - 3.399	1 0 0 1 1	0 0 0 0 0 0 1 0	R330	3
3.4 - 3.699	1 0 1 0 0	0 0 0 0 0 0 1 0	R330	3
3.7 - 3.999	1 0 1 0 1	0 0 0 0 0 0 1 0	R330	3
4.0 - 4.299	0 0 1 1 0	1 0 0 0 0 0 1 0	R328	3
4.3 - 4,599	0 0 1 1 1	1 0 0 0 1 1 0 0	R328	4
4.6 - 4.999	0 0 0 1 0	1 0 0 0 1 1 0 0	R328	4
5.0 - 5.499	1 1 0 1 1	1 0 0 0 1 1 0 0	R328	4
5.5 - 5.999	1 0 1 1 1	1 0 0 0 1 1 0 0	R328	4
6.0 - 6.399	0 1 0 0 1	0 1 0 0 1 1 0 0	R326	4
6.4 - 6.999	0 1 0 1 0	0 1 0 0 1 1 0 0	R326	4
7.0 - 7.599	1 1 0 0 0	1 1 0 0 1 1 0 0	R324	4
7.6 - 7.999	1 1 0 0 1	1 1 0 0 1 1 0 0	R324	4
8.0 - 8.499	0 1 0 1 1	1 1 0 0 1 1 0 0	R324	4
12.3 - 12.699	0 1 1 0 0	0 0 1 0 0 1 0 0	R322	5
16.4 - 16.899	0 1 1 0 1	1 0 1 0 0 1 0 0	R320	5
22.0 - 22.399	0 1 1 1 0	0 1 1 0 1 0 0 0	R318	6
25.0 - 25.199	1 1 0 1 0	1 1 1 0 1 0 0 0	R316	6
2.182 Fixed	1 0 0 0 0	0 0 0 0 0 1 1 0	R330	1
Block	0 0 0 0 0	1 1 1 1 1 1 1 1		
Block	1 1 1 1 1	1 1 1 1 1 1 1 1		
Spare	0 1 1 1 1	0 0 0 1 1 0 0 0	R314	6
Spare	1 1 1 0 0	0 0 0 1 1 0 0 0	R314	6
Spare	1 1 1 0 1	0 0 0 1 1 0 0 0	R314	6
Spare	1 1 1 1 0	0 0 0 1 1 0 0 0	R314	6

T 1130 a

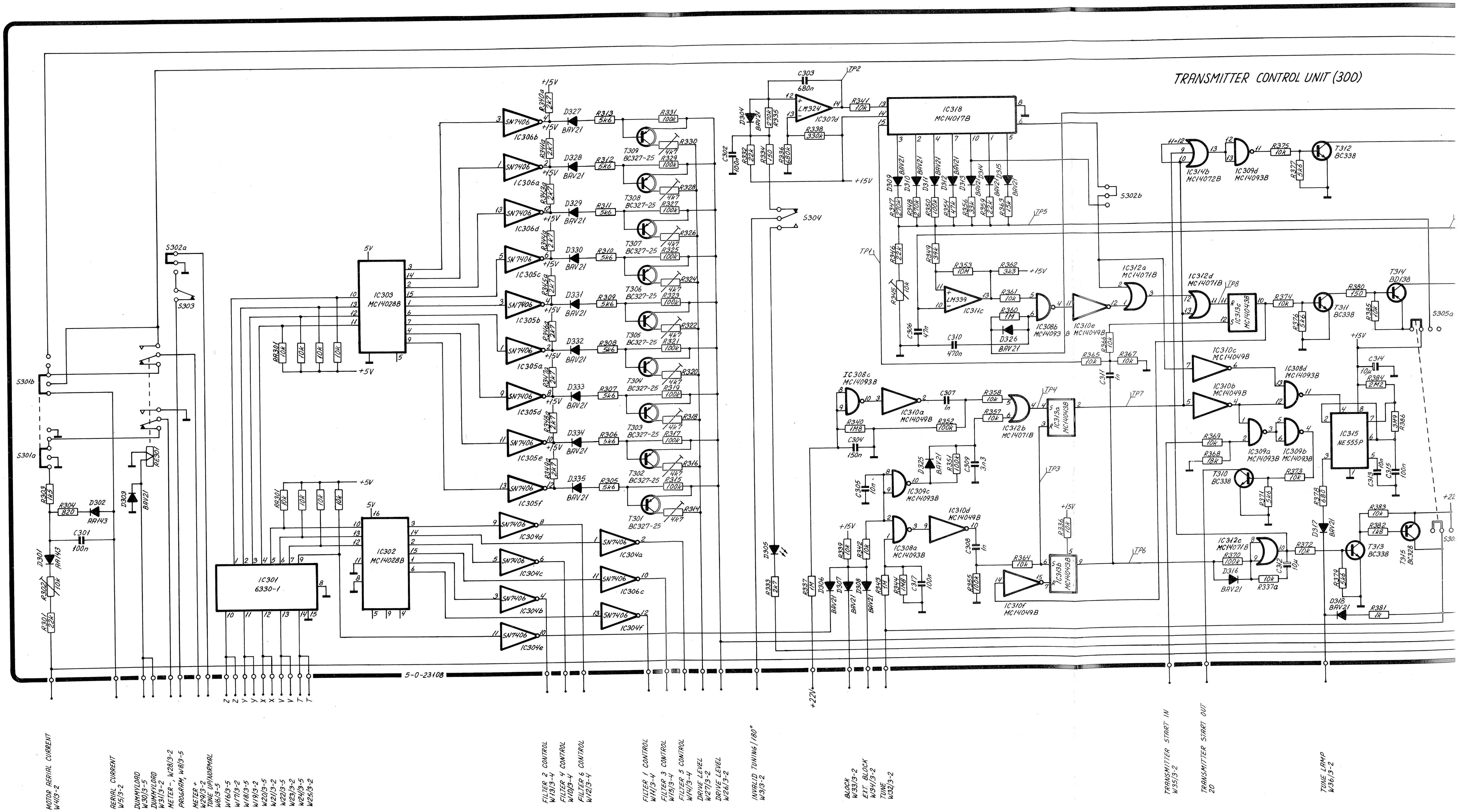

R330
R328
R326
R324
R322
T311
R320
IC302
IC306
R318
IC304
IC305
R316
IC303
IC301
R314
IC308
IC310
IC313
IC312
IC314
R345
IC309
IC318
S305
T313
T314
S302
T315
R329a
S303
RE301
w4/3-2
w5/3-2
w3/3-2
S301
R302
w8/3-5
w6/3-5
S304
w2/3-5
D305
Ground
Ground
IC317
T318
T316
T317
IC311
T321
R318a
IC316
R399
IC307
IC315
T310
T312
T320
T319
16, -45V
+22V in
w42/3-4
+8V
+5V
w1/3-5
29
w9/3-4
w7/3-5
w10/3-4
28
w12/3-4
+22V
w11/3-4
w14/3-4
w13/3-4
w16/3-5
w15/3-4
w18/3-5
w17/3-2
w19/3-2
w20/3-5
w21/3-2
w22/3-5
w23/3-2
w24/3-5
w25/3-2
w26/3-2
w27/3-2
w29/3-2
w28/3-2
w31/3-2
w30/3-5
w32/3-2
w33/3-2
w34/3-2
w35/3-2
+22V
w36/3-2
20
w37/3-2
R334a
T322
w41/3-4, VF
Ground
w39/3-4, VR
Ground

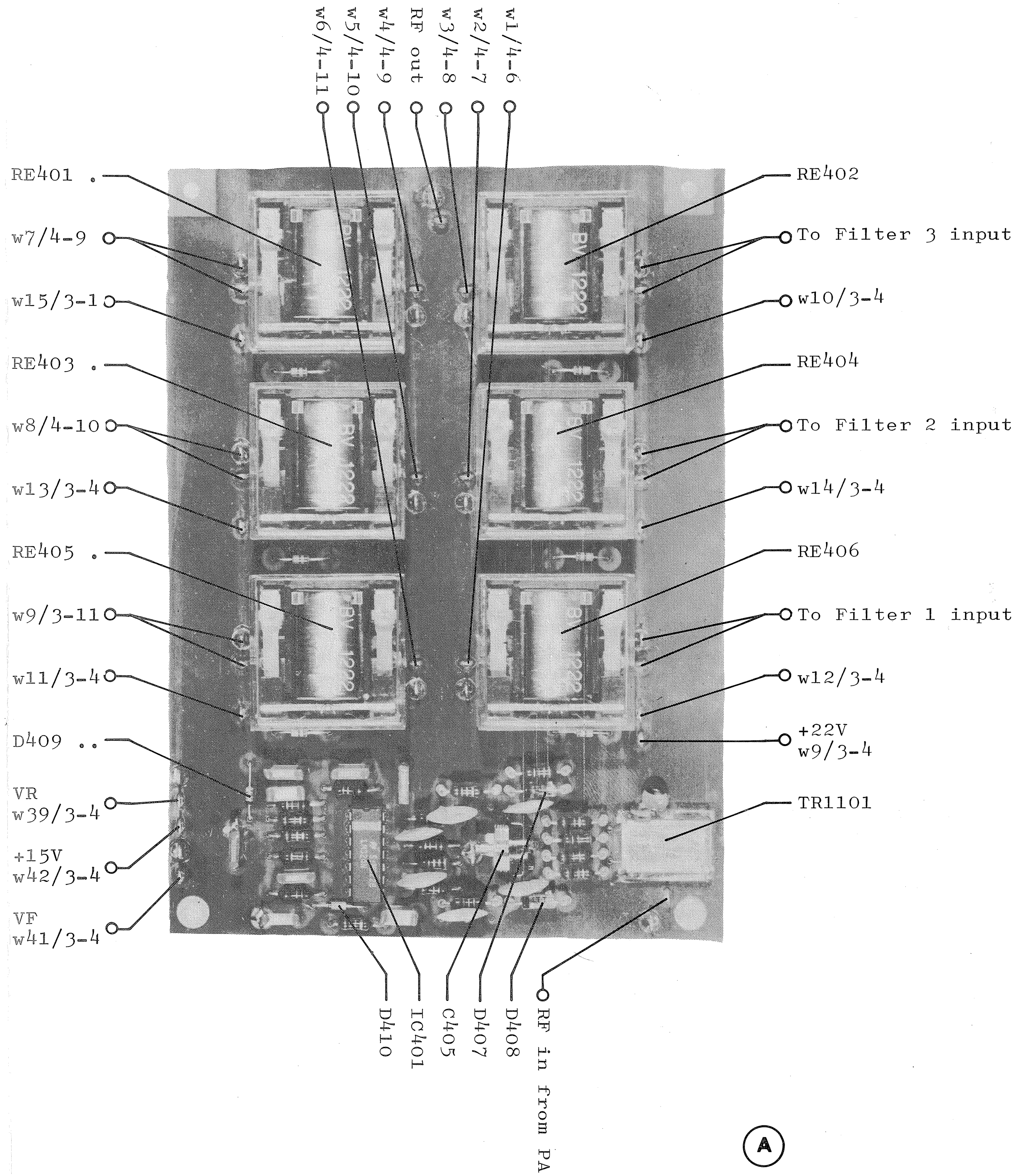
T 1130


D303
S304
S301
S303
S302
S305

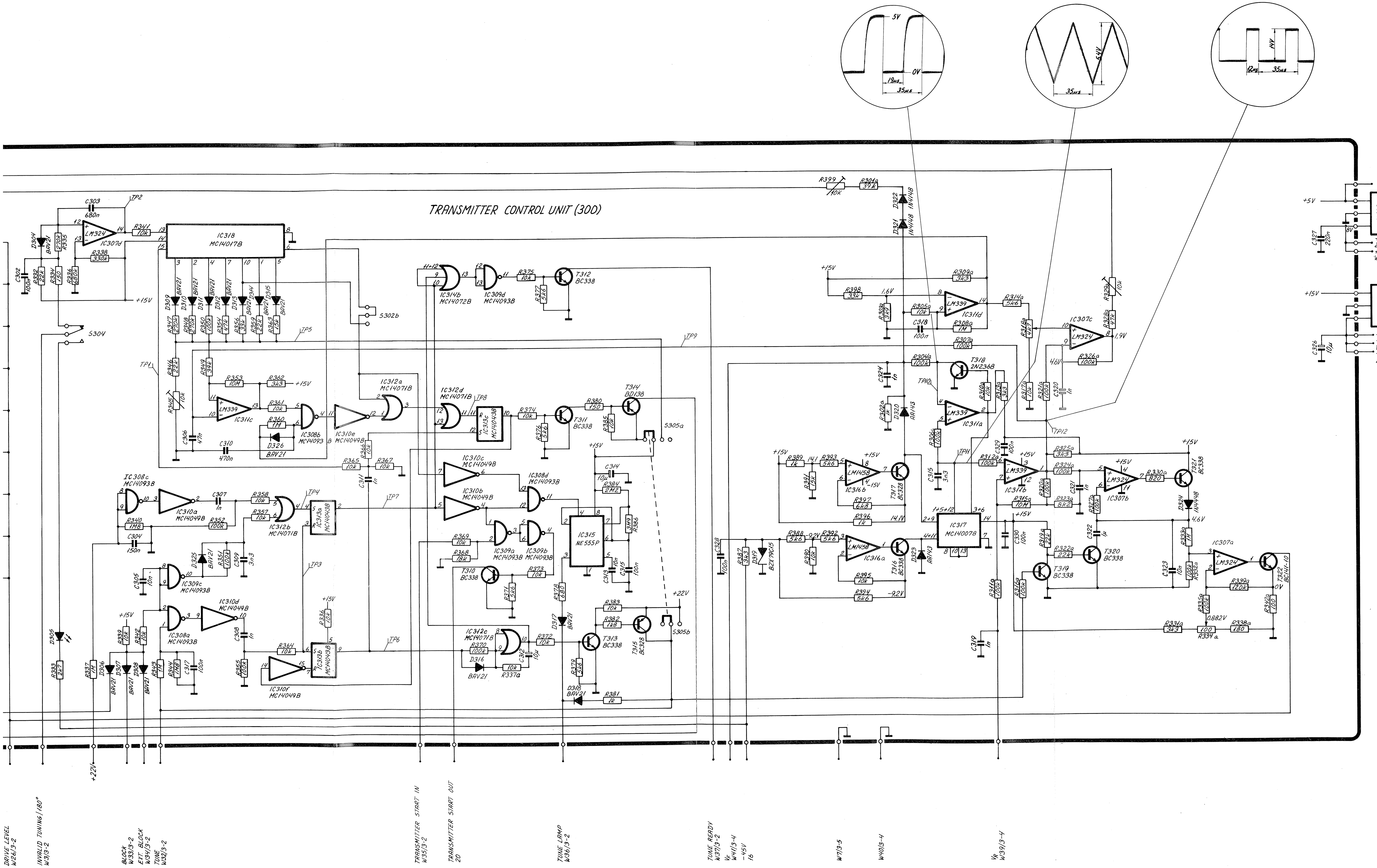
(A)

4-0-23I08D/0-6-23I08 TII30




w1/4-6
w2/4-7
w3/4-8
RF out
w4/4-9
w5/4-10
w6/4-11
RE401
w7/4-9
w15/3-1
RE403
w8/4-10
w13/3-4
RE405
w9/3-11
w11/3-4
D409
VR
w39/3-4
+15V
w42/3-4
VF
w41/3-4
RE402
To Filter 3 input
w10/3-4
RE404
To Filter 2 input
w14/3-4
RE406
To Filter 1 input
w12/3-4
+22V
w9/3-4
TR1101
D410
IC401
C405
D407
D408
RF in from PA
A

T 1130



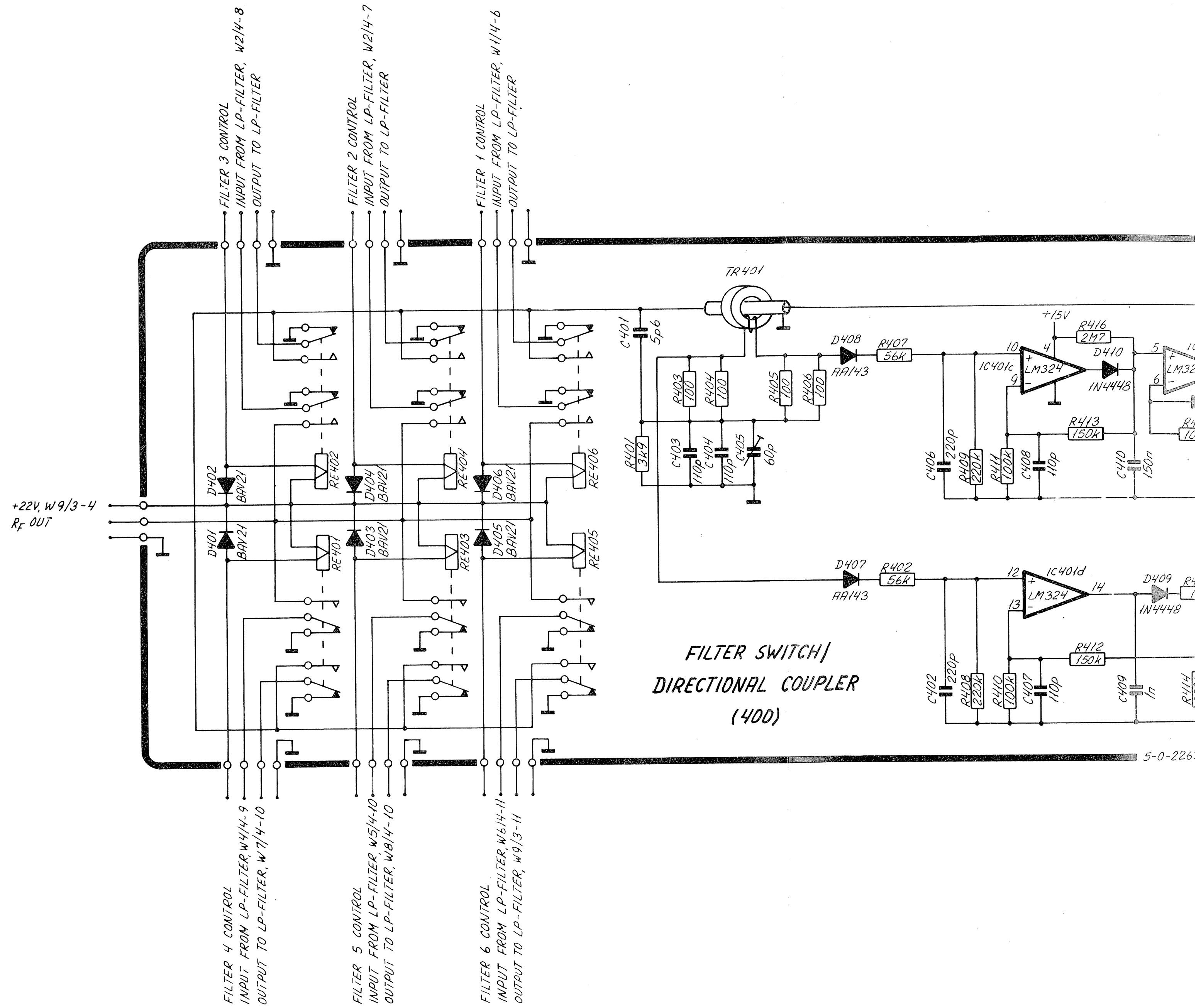
TRANSMITTER CONTROL UNIT (300)
IC318 MC14017B
IC315 NE555P
IC317 MC14007B
IC101 LM340T15
IC102 LM340T5
+5V W2/3-5
+8V 29
+8V W1/3-5
+22V
+22V
W9/3-4
+22V 28
+15V
DRIVE LEVEL W26/3-2
INVALID TUNING / 180° W3/3-2
+22V
BLOCK W33/3-2
EXT. BLOCK W34/3-2
TUNE W32/3-2
TRANSMITTER START IN W35/3-2
TRANSMITTER START OUT 20
TUNE LAMP W36/3-2
TUNE READY W37/3-2
V_F W41/3-4
-45V 16
W7/3-5
W40/3-4
V_R W39/3-4
5V
0V
35μs
35μs
14V
35μs

MODULE 300

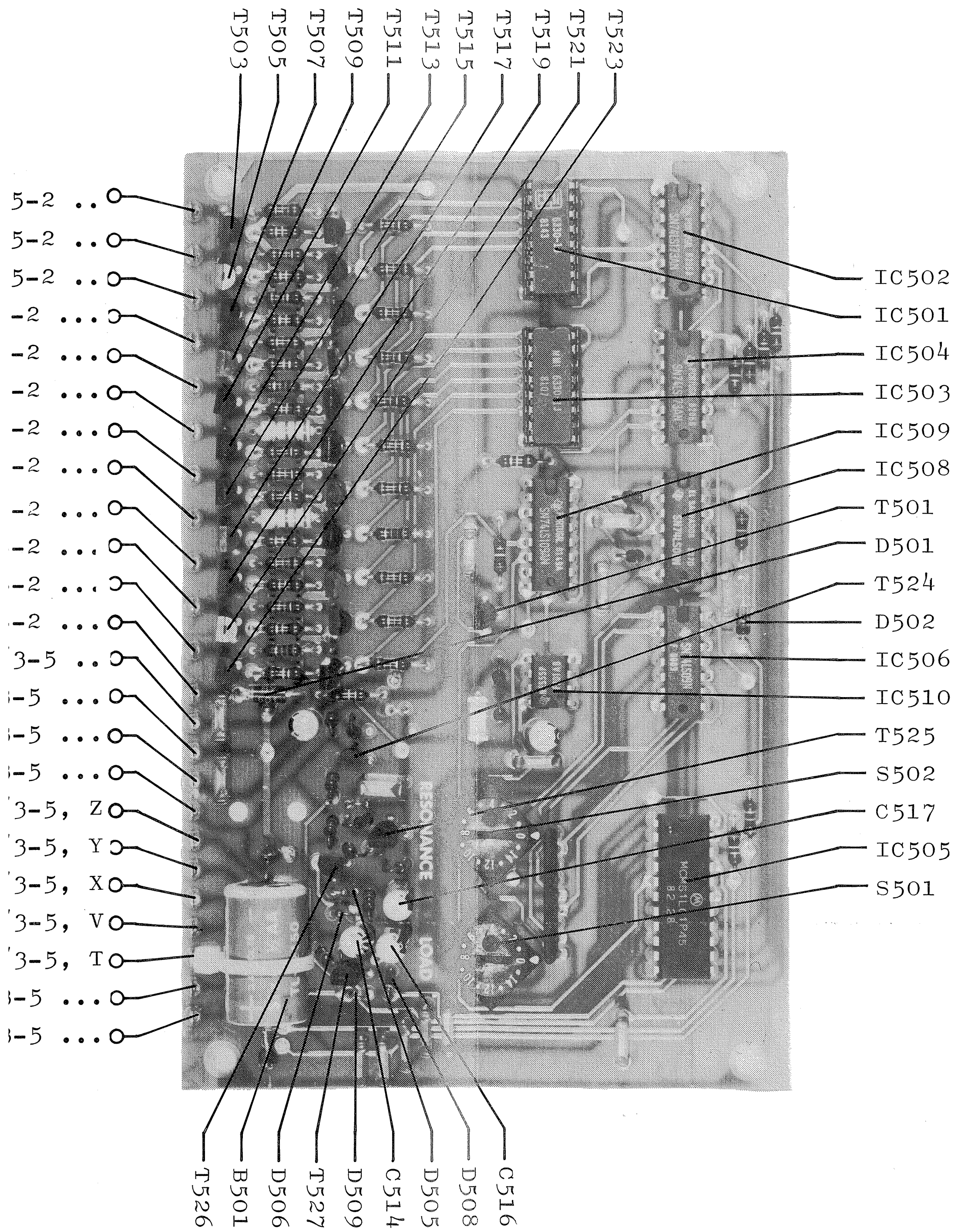
CIRCUIT DESCRIPTION FOR FILTER SWITCH/DIRECTIONAL COUPLER T1130

This unit takes care of the switching in and out of the lowpass filters and measures the forward travelling wave and the reflected wave (directional coupler) on the transmission line.

The directional coupler consists of a current transformer TR401. This transformer is loaded with two times 50 ohm forming a center tap. The voltage across one of the 50 ohm loads is proportional to the current in the transmission line. Into the center tap a voltage is fed which is proportional to the voltage on the transmission line. The current ratio of the current transformer and the voltage ratio of the voltage divider are adjusted so that when the transmission line is loaded with 50 ohm, the voltage from the voltage divider is equal to the voltage across one of the 50 ohm resistors in the current transformer. The voltage measured from ground to one end of the current transformer will be equal to zero (reflected voltage V_R) and at the other end the voltage will be two times the voltage across one 50 ohm resistor (forward voltage V_R). When the transmission line is misloaded the reflection coefficient will be $= V_R/V_F$. The V_F and V_R are detected with a quasi effective value detector (D408, C406, R407, D407, C402, and R402) which gives an output voltage proportional to the effective value of the V_F and V_R. The output of the detector is buffered and peak rectified in IC401, the output voltage V_F and V_R is now a DC-voltage proprotional to the peak of the effective value of the voltage on the transmission line. This means that V_F^2 WILL BE PROPORTIONAL TO THE Peak Envelope Power. These two voltages are fed to the reflection coefficient calculator in the transmitter control unit.



T 1130



CIRCUIT DESCRIPTION FOR TUNER CONTROL UNIT T1130

This unit takes care of controlling the presettings of the aerial coupler AT1500.

The input is a five bit bandcode coming from the exciter. This bandcode selects an address in the RAM IC505. Each address consists of two four bit words selected by pin 5. These two words are set by S501 RESONANCE and S502 LOAD. S501 and S502 are multiplexed into the RAM. The inputs and outputs of the RAM are connected in parallel. When programming the RAM pin 18 (output disable) is high (TUNE-UP position) and every time the push button PROGRAMME is activated pin 20 (read/write) goes low and the settings of S501/S502 are programmed into the RAM. If pin 18 is low (NORMAL position) it is not possible to programme the RAM. The multiplexing is controlled by a J-K flip-flop IC508 and IC509 as a clock generator. The outputs from the RAM go to two latches where the information are held so the outputs are steady (no multiplexing). The outputs from the latches go to two PROM's which converts the two times four bit codes to an eleven bit code for the presetting of the aerial coupler AT1500. Each output of the PROM's is buffered with two transistors.

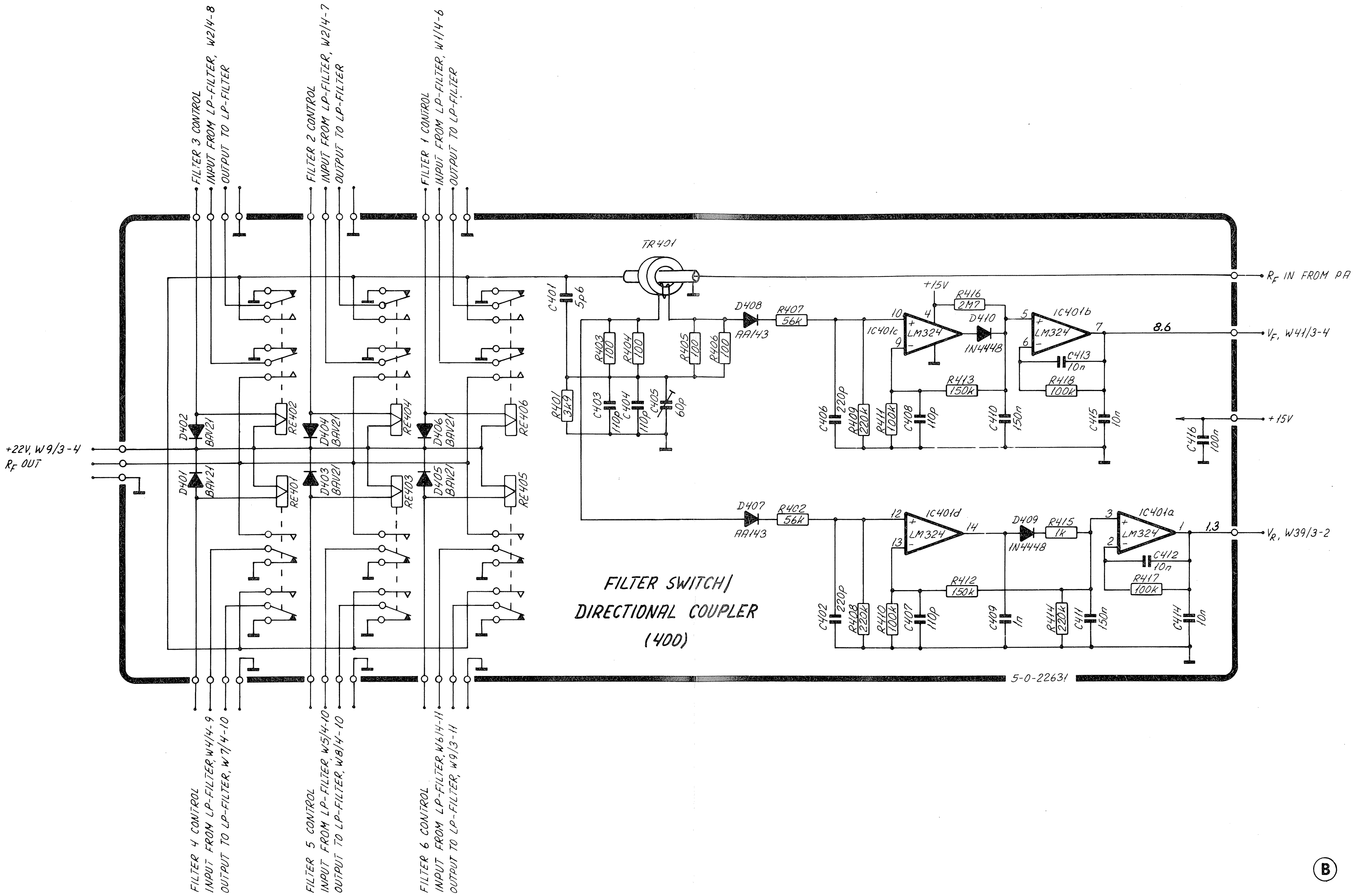
When dummy load is selected there will be 22V on the wire dummy load (W 30/3-5) and T501 will conduct, and pin 14 on IC501/IC503 will be low. Now a special code will be set for AT1500, and AT1500 will act as dummy load.

The power supply for the RAM consists of T524, T525, T526 and T527. The power supply is constructed so that, when switching on, pin 17 of the RAM is kept low, until pin 22 has reached 5V. When switching off, pin 17 will go low before the voltage on pin 22 drops. When switching off,the Litium Battery B501 will supply the RAM and all data in the RAM will be preserved. The Litium Battery will have a life of 9 years.

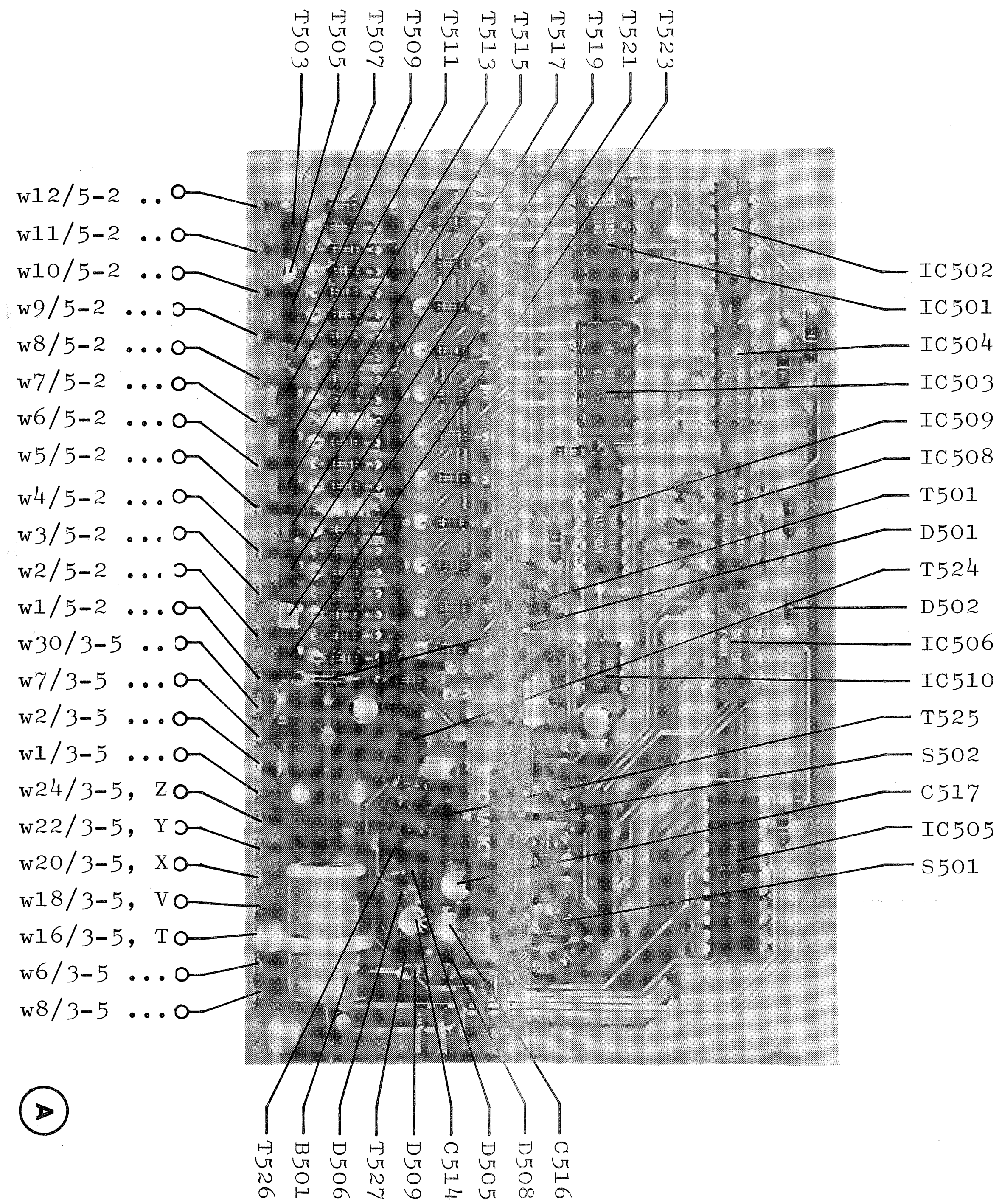
IPTION FOR FILTER SWITCH/DIRECTIONAL COUPLER T1130

care of the switching in and out of the lowpass filters and
·ward travelling wave and the reflected wave (directional coup-
ısmission line.

coupler consists of a current transformer TR401. This trans-
l with two times 50 ohm forming a center tap. The voltage across
ım loads is proportional to the current in the transmission line.
tap a voltage is fed which is proportional to the voltage on
ı line. The current ratio of the current transformer and the vol-
ıe voltage divider are adjusted so that when the transmission li-
·h 50 ohm, the voltage from the voltage divider is equal to the
ıne of the 50 ohm resistors in the current transformer. The vol-
·om ground to one end of the current transformer will be equal
·ed voltage V_R) and at the other end the voltage will be two ti-
across one 50 ohm resistor (forward voltage V_R). When the trans-
misloaded the reflection coefficient will be = V_R/V_F. The V_F
·ted with a quasi effective value detector (D408, C406, R407,
R402) which gives an output voltage proportional to the effec-
ıe V_F and V_R. The output of the detector is buffered and peak
01, the output voltage V_F and V_R is now a DC-voltage proprotio-
of the effective value of the voltage on the transmission line.
V_F^2 WILL BE PROPORTIONAL TO THE Peak Envelope Power. These two
to the reflection coefficient calculator in the transmitter con-



B



CIRCUIT DESCRIPTION FOR TUNER CONTROL UNIT T1130

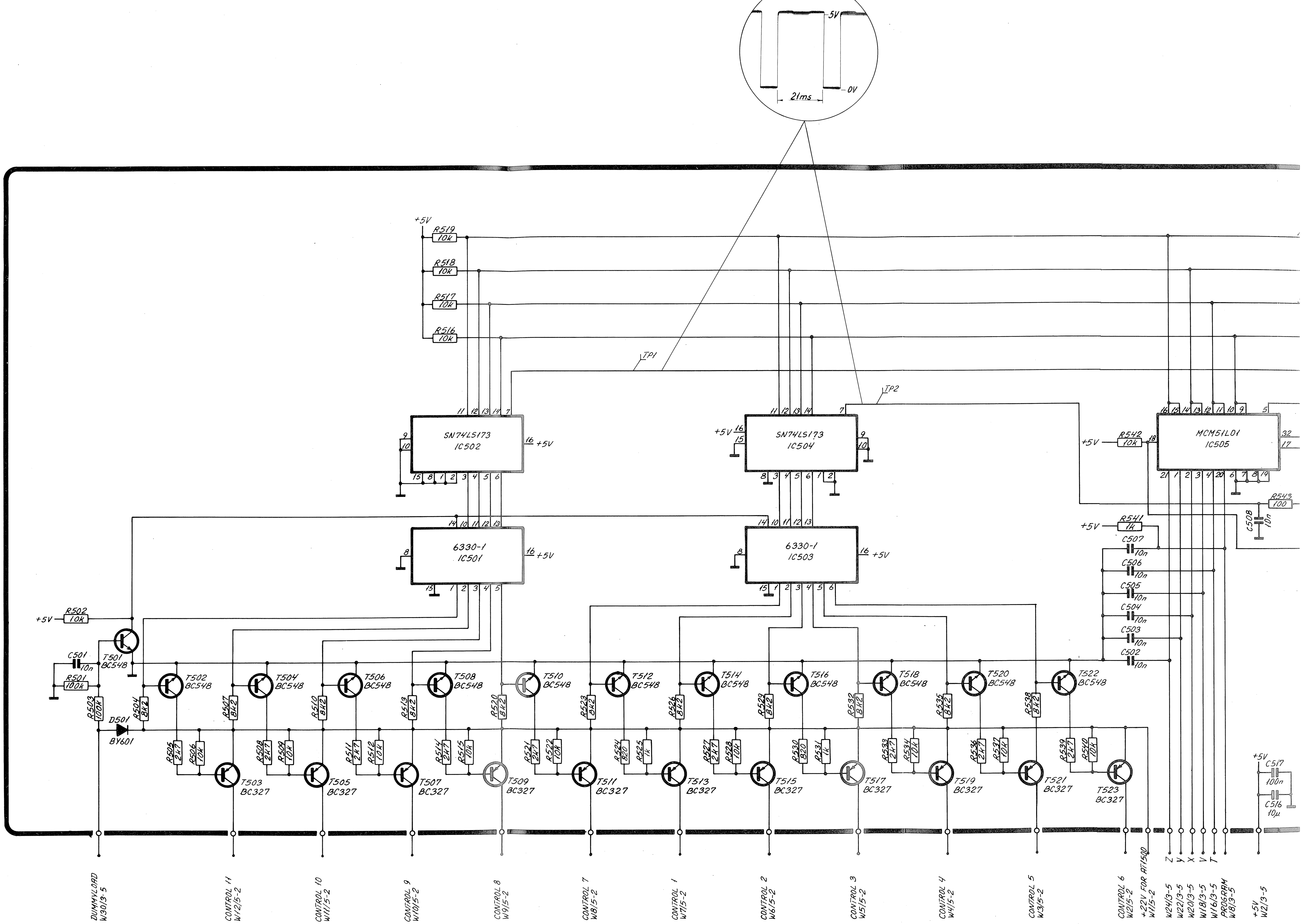
This unit takes care of controlling the presettings of the aer

The input is a five bit bandcode coming from the exciter. This an address in the RAM IC505. Each address consists of two four by pin 5. These two words are set by S501 RESONANCE and S502 l are multiplexed into the RAM. The inputs and outputs of the R parallel. When programming the RAM pin 18 (output disable) is tion) and every time the push button PROGRAMME is activated pi goes low and the settings of S501/S502 are programmed into the is low (NORMAL position) it is not possible to programme the l is controlled by a J-K flip-flop IC508 and IC509 as a clock ge from the RAM go to two latches where the information are held steady (no multiplexing). The outputs from the latches go to verts the two times four bit codes to an eleven bit code for the aerial coupler AT1500. Each output of the PROM's is buffe sistors.

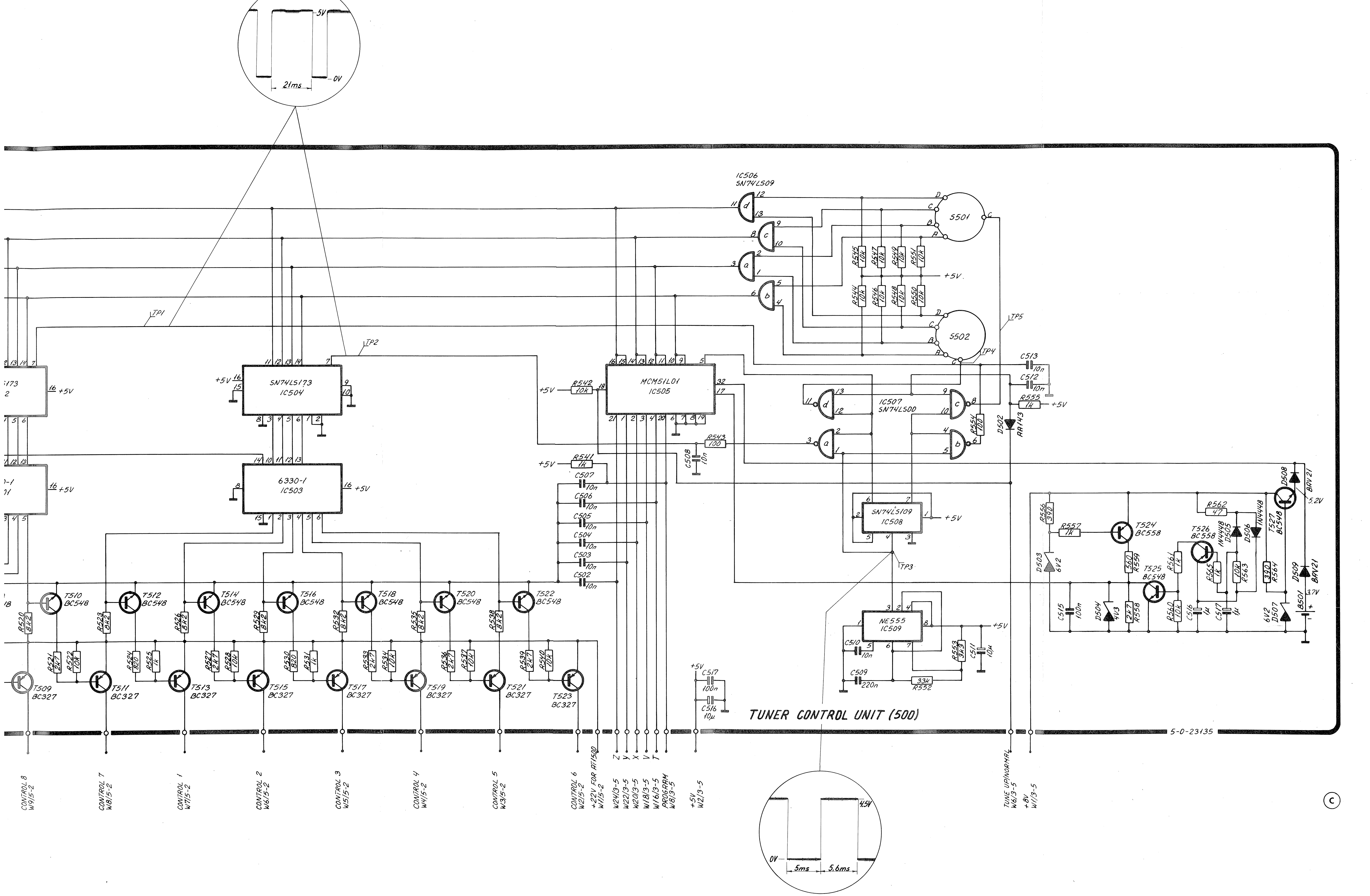
When dummy load is selected there will be 22V on the wire dum and T501 will conduct, and pin 14 on IC501/IC503 will be low. will be set for AT1500, and AT1500 will act as dummy load.

The power supply for the RAM consists of T524, T525, T526 and supply is constructed so that, when switching on, pin 17 of t until pin 22 has reached 5V. When switching off, pin 17 will voltage on pin 22 drops. When switching off,the Litium Batter the RAM and all data in the RAM will be preserved. The Litium a life of 9 years.

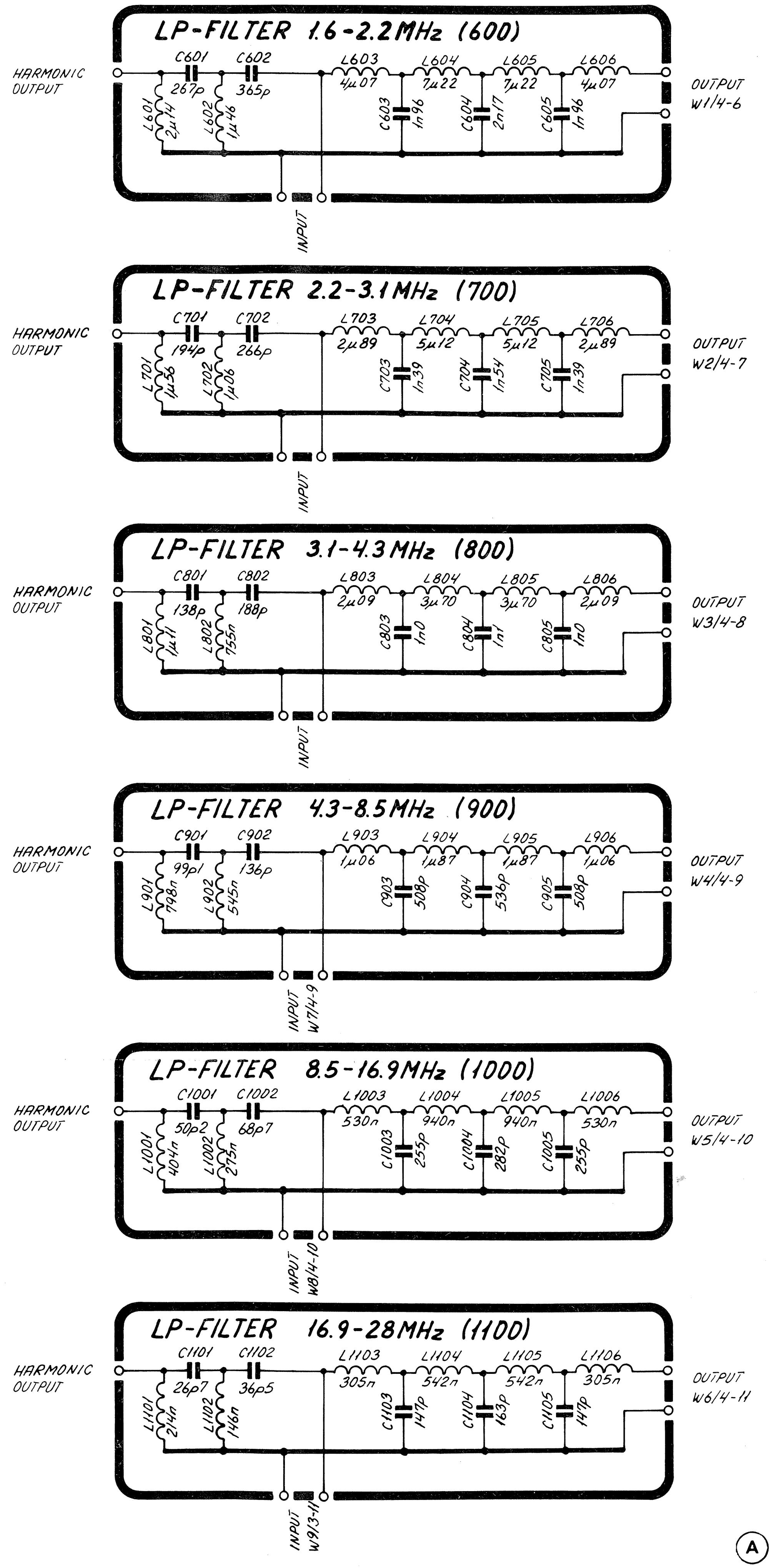
T 1130



5V
0V
21ms
TP1
TP2
+5V
R519 10k
R518 10k
R517 10k
R516 10k
SN74LS173 IC502
SN74LS173 IC504
MCM51L01 IC505
6330-1 IC501
6330-1 IC503
R542 10k
R541 1k
R543 100
C508 10n
C507 10n
C506 10n
C505 10n
C504 10n
C503 10n
C502 10n
R502 10k
C501 10n
R501 100k
T501 BC548
R503 100k
R504 8k2
D501 BY601
T502 BC548
T504 BC548
T506 BC548
T508 BC548
T510 BC548
T512 BC548
T514 BC548
T516 BC548
T518 BC548
T520 BC548
T522 BC548
T503 BC327
T505 BC327
T507 BC327
T509 BC327
T511 BC327
T513 BC327
T515 BC327
T517 BC327
T519 BC327
T521 BC327
T523 BC327
C517 100n
C516 10µ
DUMMYLOAD W30/3-5
CONTROL 11 W12/5-2
CONTROL 10 W11/5-2
CONTROL 9 W10/5-2
CONTROL 8 W9/5-2
CONTROL 7 W8/5-2
CONTROL 1 W7/5-2
CONTROL 2 W6/5-2
CONTROL 3 W5/5-2
CONTROL 4 W4/5-2
CONTROL 5 W3/5-2
CONTROL 6 W2/5-2
+22V FOR AT1500 W1/5-2
Z W24/3-5
Y W22/3-5
X W20/3-5
V W18/3-5
V W16/3-5
T PROGRAM W8/3-5
+5V W2/3-5

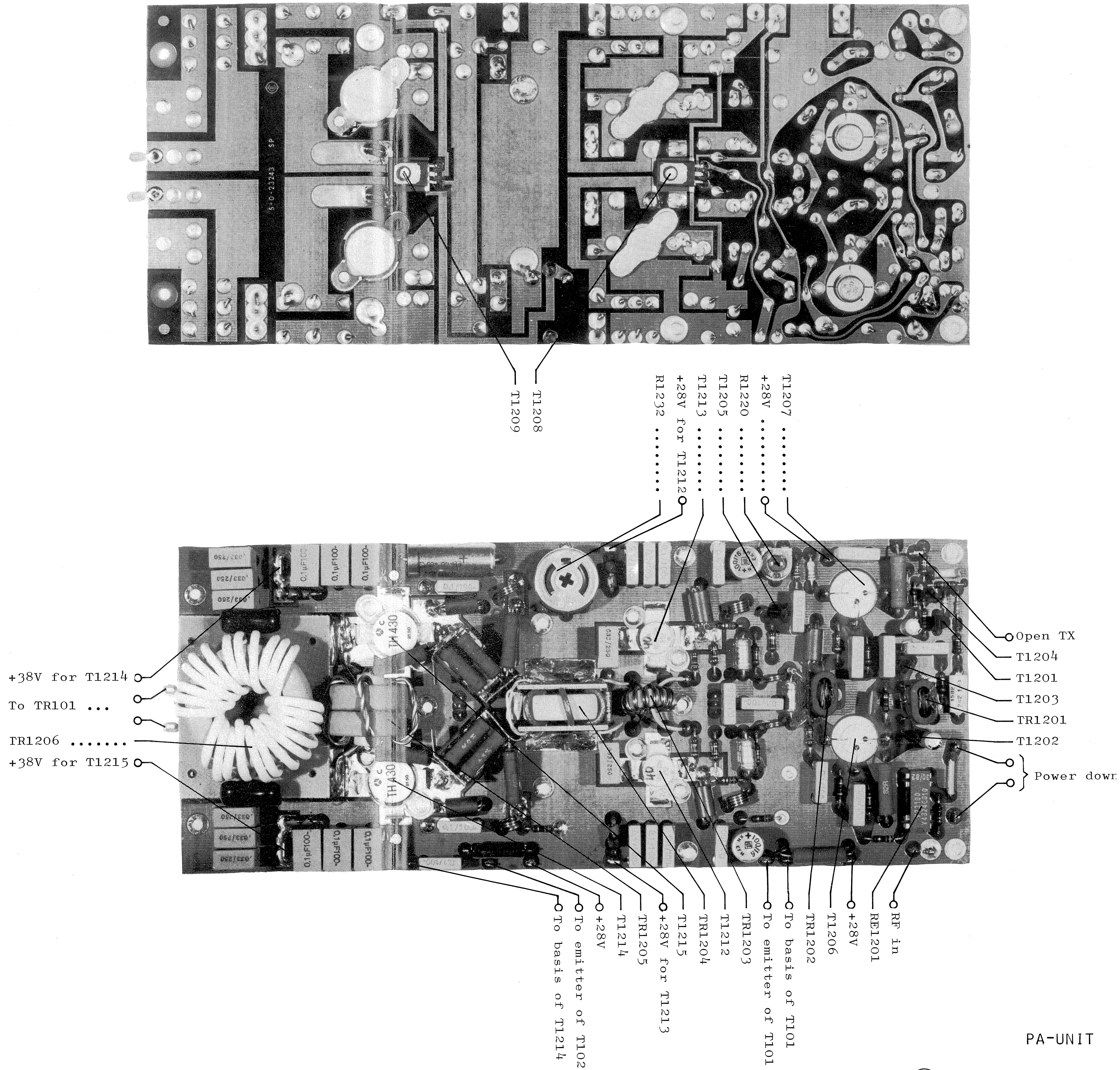

TUNER CONTROL UNIT (500)
IC506 SN74LS09
S501
S502
SN74LS173 IC504
6330-1 IC503
MCM51L01 IC505
IC507 SN74LS00
SN74LS109 IC508
NE555 IC509
CONTROL 8 W9/5-2
CONTROL 7 W8/5-2
CONTROL 1 W7/5-2
CONTROL 2 W6/5-2
CONTROL 3 W5/5-2
CONTROL 4 W4/5-2
CONTROL 5 W3/5-2
CONTROL 6 W2/5-2
+22V FOR RT500 W1/5-2
TUNE UP/NORMAL W6/3-5
+8V W1/3-5
5-0-23135

MODULE 500



(A)

MODULE 600-1100



PA-UNIT

(A) MODULE 1200

CIRCUIT DESCRIPTION PA-UNIT T1130

The power amplifier has a power gain of 45 dB.

The predriver is a push-pull class A amplifier, consisting of T1206 and T1207 with a power gain of 15 dB.

The transistors T1202 and T1203 is blocking transistors, When they are switched on, T1206 and T1207 are cut off and the gain is less than 0 dB. The predriver is blocked when open TX is low.

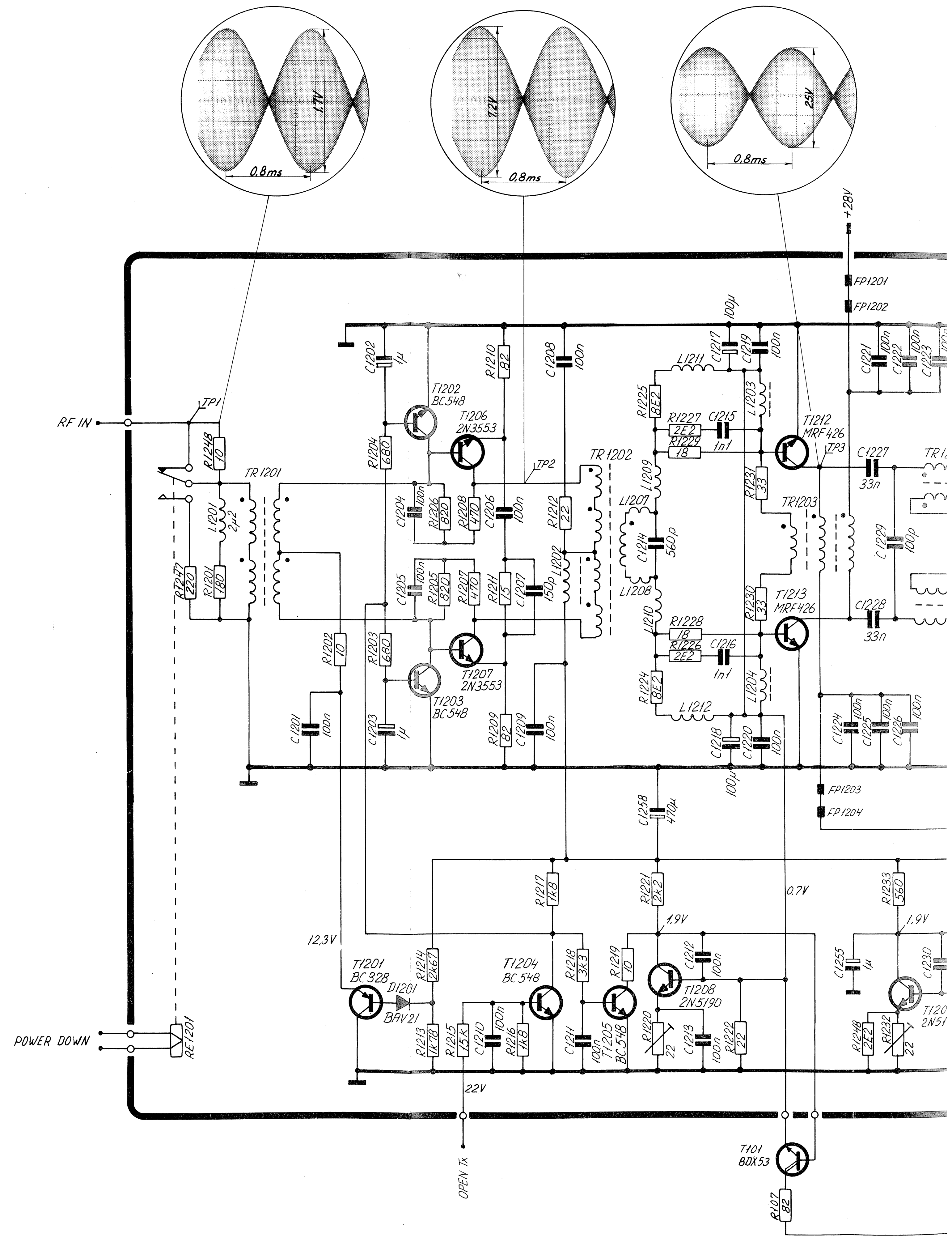
The driver is a push-pull class B amplifier, consisting of T1212 and T1213 with a power gain of 17 dB.

The bias supply regulator consists of T1208 and T101. T1208 is mounted on the heatsink in good terminal contact with the driver transistors. T1208 gives temperature compensation of the zero signal current in the driver and R1220 adjusts the zero signal current.

The output amplifier is a push-pull class B amplifier, consisting of T1214 and T1215 with a power gain of 13 dB.

The bias supply regulator consists of T1209 and T102. T1209 is mounted on the heatsink in good terminal contact with the output transistors. T1209 gives temperature compensation of the zero signal current in the output transistors and R1220 adjusts the zero signal current.

At the input there is a relay controlled attenuator (R1247, R1248, and RE1201). This attenuator is controlled from the temperature protection unit (1300).



4-0-23243D/TII30

CIRCUIT DESCRIPTION FOR TEMPERATURE PROTECTION UNIT T1130

This unit protects the power amplifier from overheating. If the temperature of the R109 is higher than 95°C, the supply voltage to the output stage will be reduced from 38V to 32V and the RF input will be reduced by 6 dB. If the temperature of R109 is higher than 115°C the power supply will be blocked and the blowers will run continuously until the temperature gets below 110°C.

The temperature sensor R109 has a positive temperature coefficient and is placed in the bottom of a voltage divider. The voltage at pin 2 of IC1301a will rise when temperature at R109 is rising. When the voltage at pin 2 gets higher than the voltage at pin 3 (t = 95°C), then the output pin 1 will change to zero. T1301 will stop conducting and thus reduce the 38V for the output stage to 32V. T1303 will stop conducting and T1305 will start conducting and activate the relay RE1201 at the input of the output stage. This will reduce the drive by 6 dB. When the temperature rises further the voltage at pin 6 of IC1301b will get higher than the voltage at pin 5 (t = 115°C), then the output pin 7 will change to zero. T1302 will stop conducting. T1304 will also stop conducting and the power supply for the output stage will be blocked. The two voltage comperators IC1301a/IC1301b have a hysteresis of approximately 5°C.

206 and T1207

ey are switched
The predriver

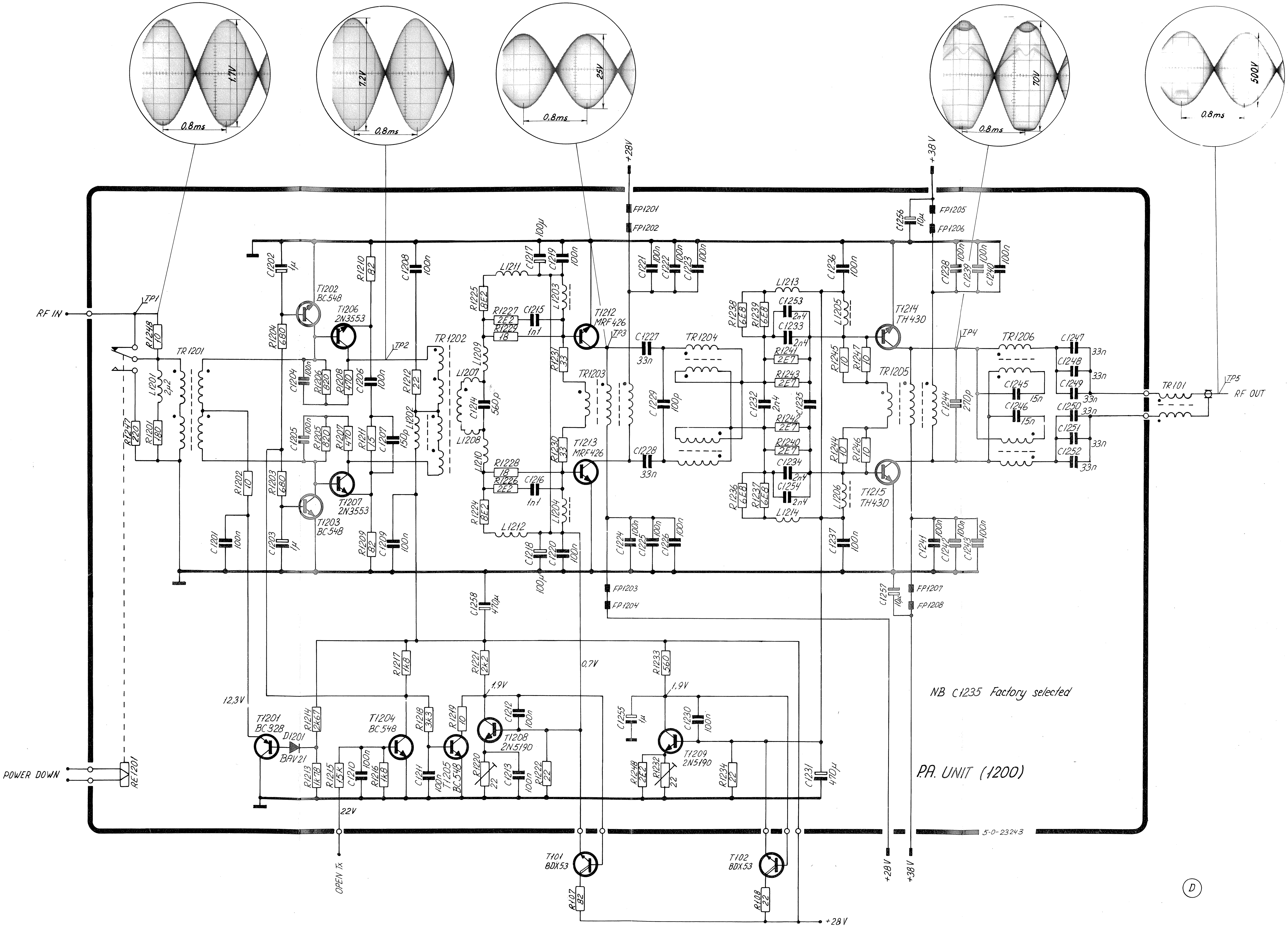
and T1213

ounted on the
1208 gives tem-
nd R1220 adjusts

of T1214 and

ounted on the
1209 gives
transistors

3, and RE1201).
it (1300).

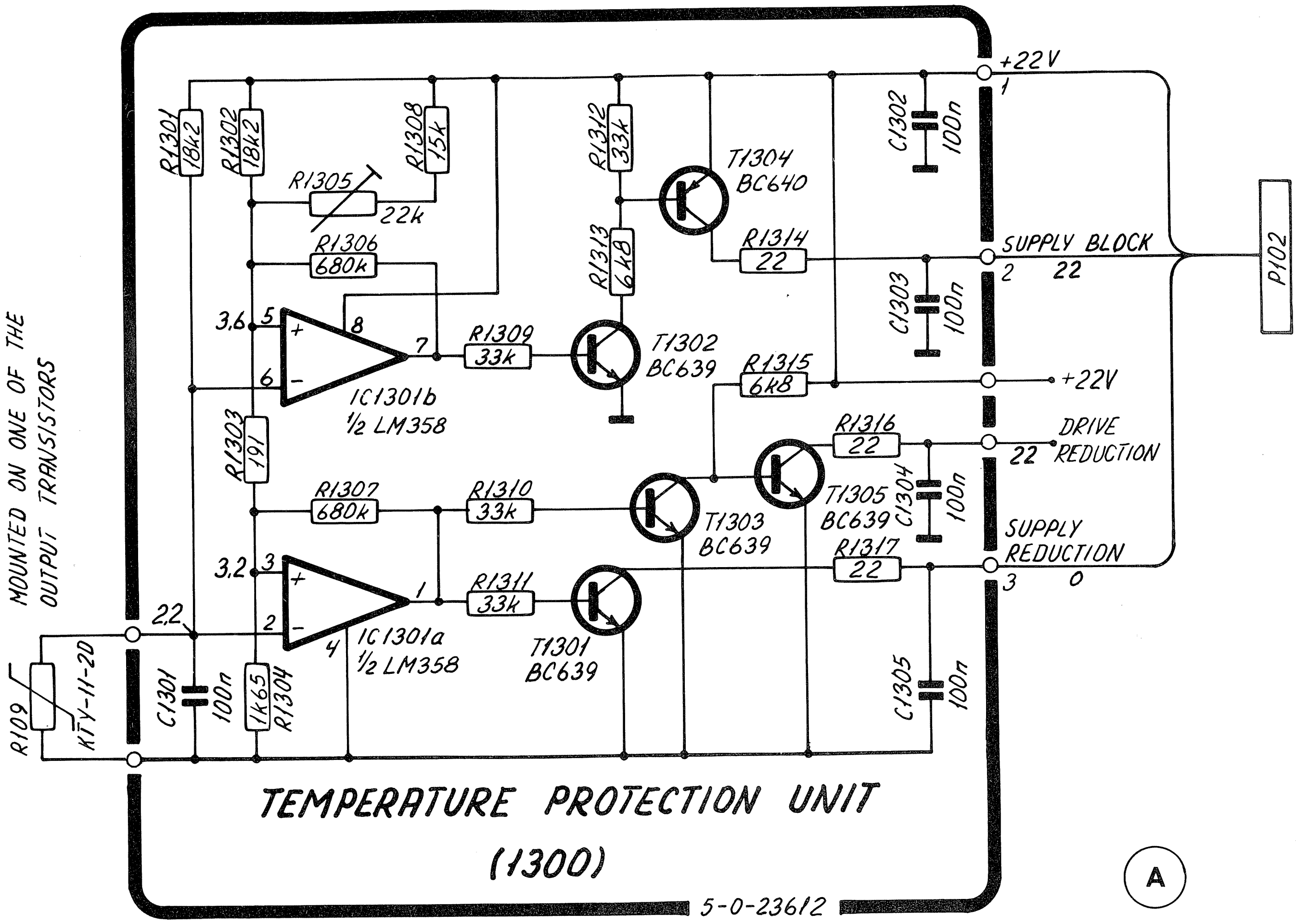


MODULE 1200

CIRCUIT DESC

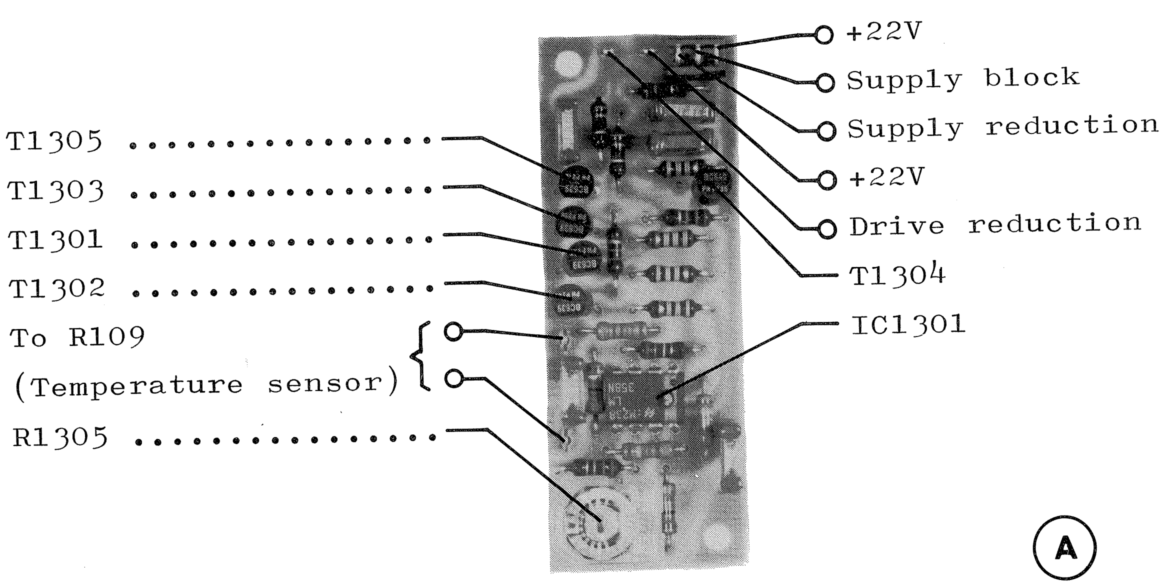
This unit prot
the R109 is hi
duced from 38V
ture of R109 i
wers will run

The temperatur
in the bottom
when temperatu
the voltage at
will stop cond
will stop cond
at the input o
temperature ri
the voltage at
T1302 will sto
for the output
have a hystere


+22V
1
SUPPLY BLOCK
2 22
+22V
DRIVE
22 REDUCTION
SUPPLY
REDUCTION
3 0
P102
C1302 100n
C1303 100n
C1304 100n
C1305 100n
C1301 100n
R1301 18k2
R1302 18k2
R1308 15k
R1305 22k
R1306 680k
R1312 33k
R1313 6k8
T1304 BC640
R1314 22
IC1301b ½ LM358
R1309 33k
T1302 BC639
R1315 6k8
R1316 22
T1305 BC639
R1303 191
R1307 680k
R1310 33k
T1303 BC639
R1317 22
IC1301a ½ LM358
R1311 33k
T1301 BC639
R1304 1k65
R109 KTY-11-2D
MOUNTED ON ONE OF THE OUTPUT TRANSISTORS
3,6
3,2
2,2
TEMPERATURE PROTECTION UNIT
(1300)
5-0-23612

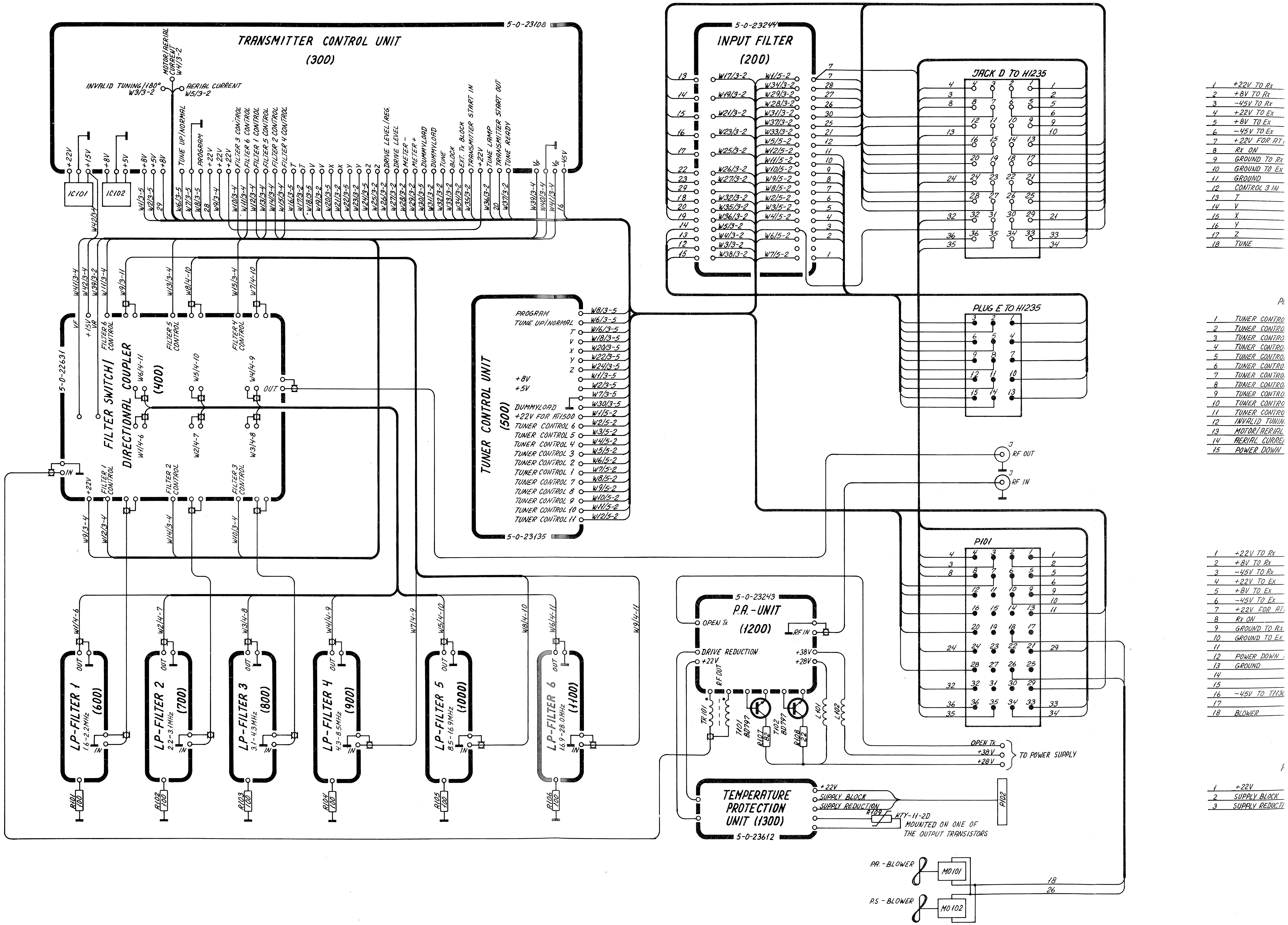
A

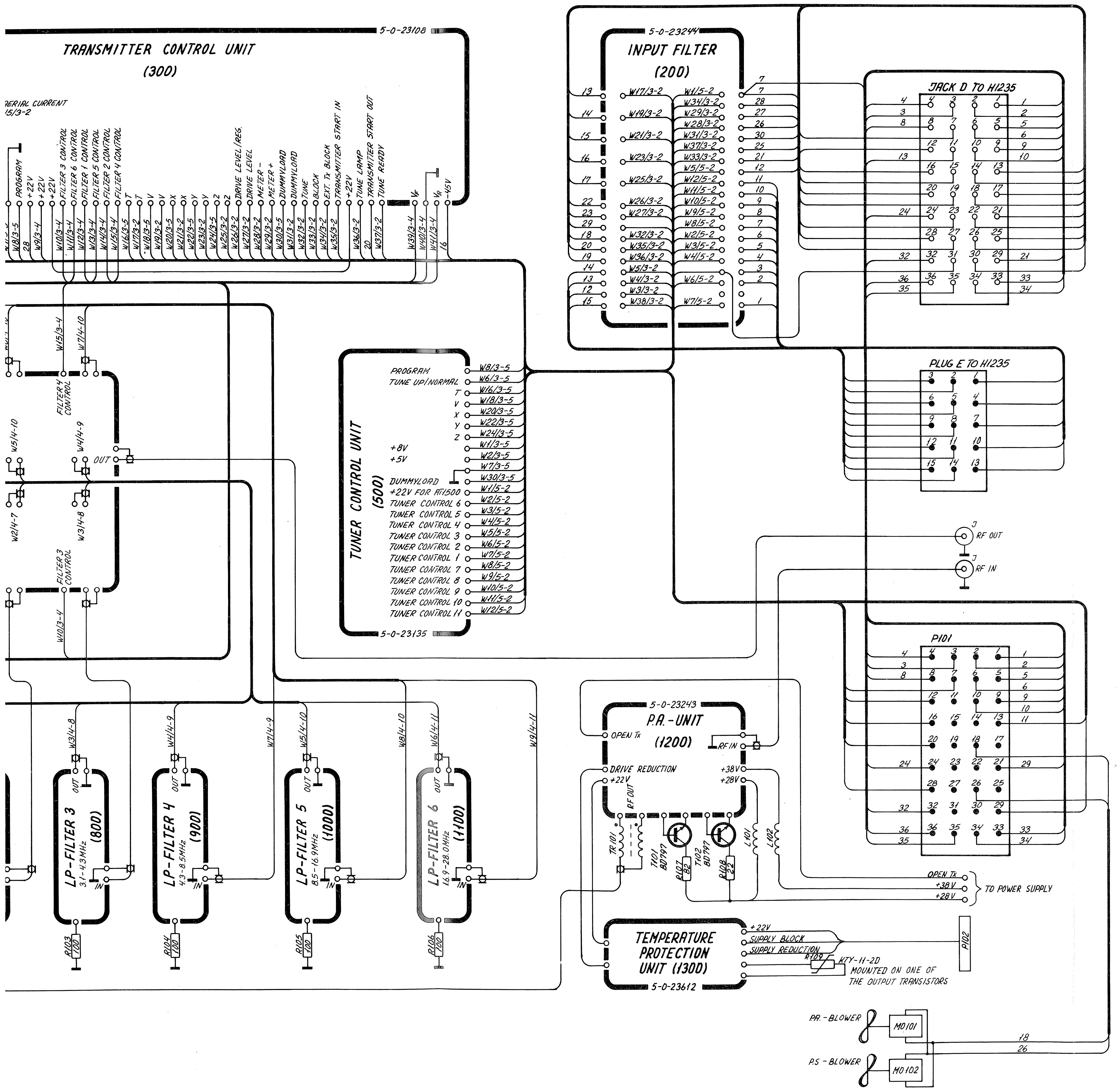
T 1130


T1305
T1303
T1301
T1302
To R109
(Temperature sensor)
R1305
+22V
Supply block
Supply reduction
+22V
Drive reduction
T1304
IC1301

A

4-0-23247D/TII30





JACK D

1	+22V TO Rx	19	TUNE LAMP
2	+8V TO Rx	20	TRANSMITTER START
3	-45V TO Rx	21	BLOCK
4	+22V TO Ex	22	DRIVE LEVEL/REG.
5	+8V TO Ex	23	DRIVE LEVEL
6	-45V TO Ex	24	HT ON
7	+22V FOR AT1500	25	TUNE READY
8	Rx ON	26	METER -
9	GROUND TO Rx	27	METER +
10	GROUND TO Ex	28	EXT. Tx BLOCK
11	GROUND	29	OPEN Tx
12	CONTROL 3 IN	30	DUMMYLOAD
13	T	31	CONTROL 3 TO AT1500
14	V	32	OFF
15	X	33	+BAT.
16	Y	34	+22V
17	Z	35	ON
18	TUNE	36	-45V

PLUG E

1	TUNER CONTROL 1
2	TUNER CONTROL 2
3	TUNER CONTROL 3
4	TUNER CONTROL 4
5	TUNER CONTROL 5
6	TUNER CONTROL 6
7	TUNER CONTROL 7
8	TUNER CONTROL 8
9	TUNER CONTROL 9
10	TUNER CONTROL 10
11	TUNER CONTROL 11
12	INVALID TUNING/180°
13	MOTOR/AERIAL CURRENT
14	AERIAL CURRENT
15	POWER DOWN FROM AT1500

P101

1	+22V TO Rx	19	
2	+8V TO Rx	20	TRANSMITTER START
3	-45V TO Rx	21	OPEN Tx
4	+22V TO Ex	22	
5	+8V TO Ex	23	
6	-45V TO Ex	24	HT ON
7	+22V FOR AT1500	25	
8	Rx ON	26	BLOWER
9	GROUND TO Rx	27	
10	GROUND TO Ex	28	+22V TO T1130
11		29	+8V TO T1130
12	POWER DOWN FROM POWER SUPPLY	30	
13	GROUND	31	
14		32	OFF
15		33	+BAT.
16	-45V TO T1130	34	+22V
17		35	ON
18	BLOWER	36	-45V

P102

1	+22V
2	SUPPLY BLOCK
3	SUPPLY REDUCTION

MAIN SCHEMATIC DIAGRAM
FOR
SAILOR TRANSMITTER T1130 (D)