TELEVISION RECEIVERS
JOWISZ 04, JOWISZ 05
SERVICING INSTRUCTION

UNITRA

JOWISZ 04
JOWISZ 05

UNITRA
POLKOLOR

WARSZAWSKIE ZAKŁADY TELEWIZYJNE
ul. Matuszewska 14, 03-876 Warszawa

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P.W.

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I. RECEIVER'S APPLICATION

Television receivers JOWISZ 04 and JOWISZ 05 are intended for reception of the colour television programs as well as monochromatic ones of CCIR standard in SECAM III B opt. system indoor in temperate climate conditions (N3).

In VHF (very high frequency) range the I — II bands comprise the 2 — 4 channels and III band the 5 — 12 channels. In UHF (ultra high frequency) range the IV — V bands comprise the 21—60 channels.

To enable connection of the earphones, additional loudspeaker or magnetophone for recording the receivers are equipped with sockets. The JOWISZ 04 set can be constructed without door (p. 6 on the fig. 1)

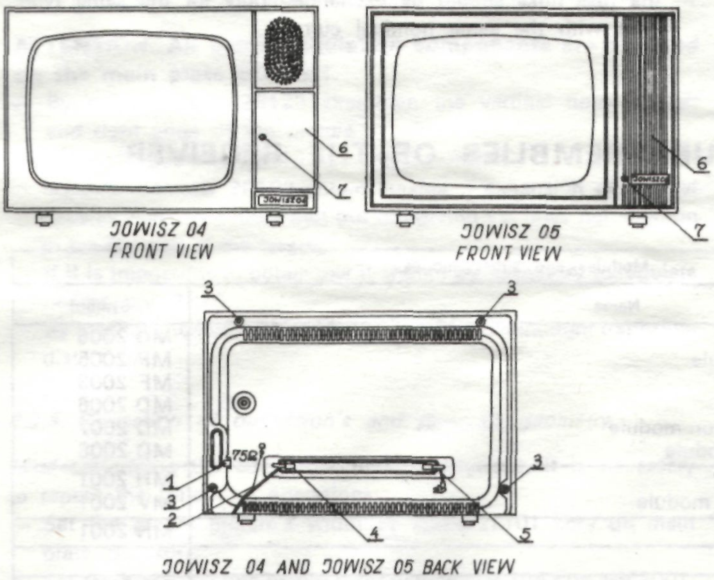


Fig. 1. External view of the Jowisz 04 and Jowisz 05
1 — VHF and UHF antenna socket, coaxial 75 Ω, *2* — door keys, *3* — fastening screws of the back cover, *4* — mains cable holding clamps, *5* — mains cable, *6* — door, *7* — door's lock

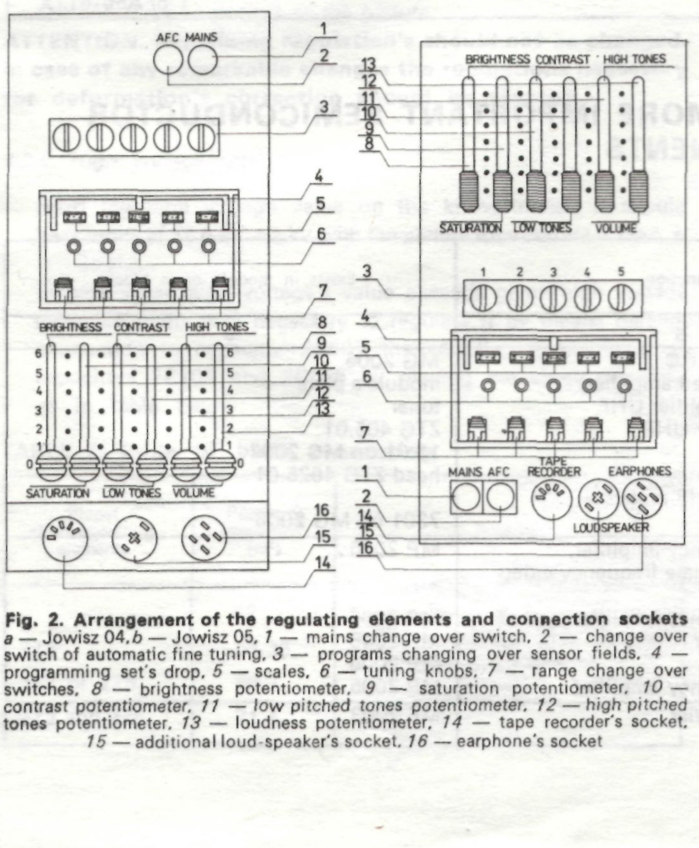


Fig. 2. Arrangement of the regulating elements and connection sockets
a — Jowisz 04, *b* — Jowisz 05, *1* — mains change over switch, *2* — change over switch of automatic fine tuning, *3* — programs changing over sensor fields, *4* — programming set's drop, *5* — scales, *6* — tuning knobs, *7* — range change over switches, *8* — brightness potentiometer, *9* — saturation potentiometer, *10* — contrast potentiometer, *11* — low pitched tones potentiometer, *12* — high pitched tones potentiometer, *13* — loudness potentiometer, *14* — tape recorder's socket, *15* — additional loud-speaker's socket, *16* — earphone's socket

II. TECHNICAL DATA OF THE RECEIVER

- *Receiver's construction: block-module with possibility of replacement of the block and modules.*
- Supply voltage: 220 + 5%, —10%, 50 Hz
- Power consumption ≤ 200 VA
- Power supply: stabilized, with galvanic separation between mains and the receivers chassis owing to the commutation systems
- Overvoltage and overcurrent protection by means of special electronic automatic acting circuits and fuses
- Fuses:
  a) normal cut out fuses WTA-3, 15 A — 2 pcs. (B51, B52)
  b) normal cut out fuses WTA-1, 6 A —, 1 pcs. (3B101)
  c) time delay cut out fuse WTAT-800 mA — 1 pcs. (2B101)
- Picture tube PIL system with following data: screen's diagonal 56 cm (22"), deflection angle 110°, tube *neck's diameter 29 mm* type A56-610X or A56-611X
- Integrated circuits — 12 pcs.
- Transistors — 53 pcs.
- Thyristors — 2 pcs.
- Diodes — 97 pcs.
- Elliptic loudspeaker with magnetic acreened system GD10-16/4-4 W-15 Ω type
- Aerial input common for VHF and UHF range — coaxial 75 Ω impedance

Connection sockets characteristic

- Earphones socket GM 590-1-666 type with switch adapted to earphones posessing the impedance of about 200 Ω, 300 mV output signal level electromotive force at the 0,5 W power discharged in loudspeaker.
- Additional loudspeaker socket for loudspeaker: impedance of 8 Ω, output power 2 W.
- Tape recorder's socket: GM 345-1-666 type adapted to the tape recorder with input impedance of 25 kΩ.
- Aerial coaxial socket, common for the VHF and UHF ranges, adapted to the WZA 3/6 plug.

Receiver's basic technical specification

- Video intermediate frequency — 38,9 MHz
- Soundintermediate frequency — 33,4 MHz
- Video channel sensivity in I-III ranges (VHF)
  a) noise limited ≤ —59 dB/mW (for s/M ratio 34 dB)
  b) limited by synchronization ≤ —74 dB/mW
- Video channel sensivity in IV-V ranges (UHF)
  a) noise limited ≤ 53 dB/mW (for s/N ratio 34 dB)
  b) limited by synchronization ≤ —68 dB/mW
- Sound channel noise limited sensivity
  a) in I-III ranges (VHF) ≤ —74 dB/mW
  b) in IV-V ranges (UHF) ≤ —70 dB/mW
- Maximum usable input signal
  a) with input signal attenuator ≤ +6 dB/mW
  b) without additional attenuator ≤ —10 dB/mW
- Picture resolution:
  a) horizontal ≤ 400 lines
  b) vertical ≤ 420 lines
- Synchronization catching range:
  a) horizontal ≤ I± 400I Hz
  b) vertical ≤ 4 Hz
- Maximum undistorted sound output power ≤ 2,5 W
- *Fine tunning stability in function of all destabilizating factors* with automatic frequency control AFC ≤ I± 100I kHz

- Fine tunning repeatability ⩽ I± 300I kHz
- Attenuation of the chrominance signal in the luminance channel on frequencies:
  a) 4,1 MHz and 4,6 MHz ⩽ 12 dB
  b) 4,35 MHz ⩽ 6 dB
- Maximum useful luminance ⩾ 120 cd/m²
- Geometric distortion of the picture:
  a) deflection linearity ⩽ I± 8%I
  b) picture's outline distortion ⩽ 3%
- Picture's maximum dimensions
  a) height — 337 mm +6%
  b) width — 447 mm +6%
- Main dimensions of the receiver in mms:

	JOWISZ 04	Jowisz 05
width	704	704
height	475	475
depth	415	395

- Mass of the receiver
  a) without packing about 32 kgs.
  b) in packing about 35 kgs.

III. EXPLOITATION SAFETY DURING MEASUREMENTS, TUNING AND CONTROL

Television receiver is constructed in the way assuring maximum safety for the user. Safety of the exploitation is controlled in production cycle. Therefore care should be taken not to spoil this safety during control tuning, measurements, repairs, assembly or dismantling of the receiver, introducing any alternations incompatible with technical documentation of the TV-set.

Moreover by carrying on any work in television set with the back cover taken off attention should be paid on following items:

— when the back cover is taken of special caution should be preserved because there are some components under line voltage — "hot mass",
in thyristor circuits of the deflection block there exists voltages about 650 Vpp,

— in picture tube block and in deflection block there exists high voltages from 5 kV to 25 kV,

— the wires connecting picture tube (graphite coating) to the chassis should be also connected by the cable with clamp to the spark gaps mass on the picture tube plate's stand,

— the fuse links should be exchanged only for the same type, links with the same nominal current.

IV. MAIN BLOCKS MODULES AND SUBASSEMBLIES OF THE RECEIVER

TABLE 1

No.	Blocks		Modules and subassemblies	
	Name	Symbol	Name	Symbol
1	Signal block	BS 2002	— Tuner module — Intermediate frequency module — Sound's module — Luminance module — Chrominance and identification module — Discrimination and matrix module	MG 2006 MP 2005 MF 2003 MD 2006 MD 2007 MD 2008
2	Deflection block	BO 2001	— Synchronization module — Vertical deflection ("frame") module	MH 2001 MV 2001
3	Power supply block	BZ 2001	— Stabilization module	MN 2001
4	Interference filter	ZP 2001		
5	Control block	BR 2001	— Control segment — Switching on-programming unit	SR 2001 ZZP-20521E
6	Picture tube block	BK 2001	— Picture tube plate — Picture tube with deflection unit and correctous magnets	PK 2001 A56-610X or A56-611X

V. RECEIVER'S EQUIPMENT IN THE MORE IMPORTANT SEMICONDUCTOR COMPONENTS

TABLE 2

No.	Indication on the diagram	Type	Type of component	Function	Exists in module or in block
1	2	3	4	5	6
1	T1	BC 158A	transistor	voltage amplifier AGC (automatic controlled amplifier)	MG 2006 module's plate
2	T103	BF 180	transistor	high frequency amplifier UHF	tuner
3	T104	BF 181D	transistor	selfoscillating mixer UHF	ZTG 405.01
4	T304	BF 200	transistor	VHF amplifier	13.01 on MG 2002
5	T305	BF 14A	transistor	intermediate frequency UHF amplifier or VHF mixer	head ZTG 4025.01
6	T306	BF 14B	transistor	VHF oscillator	7301 on MG 2006
7	50	TDA 440 (A240 D)	integrated circuit	intermediate frequency amplifier, AGC unit, intermediate frequency video demodulator	MP 2005.
8	T50	BF 197	transistor	intermediate frequency amplifier	MP 2005
9	T51	BF 197	transistor	controlling amplifier discriminator AFC intermediate frequency amplifier	MP 2005 MP 2005 MP 2005
11	S102	TBA 800 (UL 1480P)	integrated circuit	sound power amplifier	MF 2003

1	2	3	4	5	6
12	S102	TBA 120S (UL 1242N)	integrated circuit	limiter, sound difference frequency amplifier, demodulator, preamplifier of low frequency signal	MF 2003
13	S200	UL 1111	integrated circuit	shifting of the blanking levels, restoration of the DC component, brightness control, picture tube current limitation	MD 2006
14	S201	UL 1101	integrated circuit	electronic contrast control	
15	T200	BC 147	transistor	chrominance trap change-over switch	
16	S250	UL 1102	integrated circuit	limiter, discriminater, selective amplifier 7,8 kHz	MD 2007
17	S251	A 295D	integrated circuit	switch over (flip-flop multivibrator) saturation control limiter	MD 2007
18	T250	BC 147A	transistor	emitter loaded amplifier (follower)	MD 2007
19	T251	TF 197	transistor	chrominance amplifier	MD 2007
20	T252	BC 147A	transistor	delayed signal amplifier	MD 2007
21	T253	BC 147A	transistor	forming the pulse liberating the chrominance subcarrier from line extinguishing impulse	MD 2007
22	T254	BC 147A	transistor	switching on and switching off unit of the chrominance channel control in integrated circuit S251	MD 2007
23	S300	A 230D	integrated circuit	matrix R, G, B	MD 2008
24	T300	BF 197	transistor	discriminator's R-Y driver	MD 2008
25	T301	BF 197	transistor	discriminator's B-Y driver	MD 2008
26	T350	BC 147A	transistor	emitter loaded amplifier (follower)	BS 2002 main plate
27	T351	BC 337	transistor	emitter loaded amplifier R	BS 2002 main plate
28	T352	BF 459	transistor	amplifier R	BS 2002 main plate
29	T353	BC 337	transistor	emitter loaded amplifier G	BS 2002 main plate
30	T354	BF 459	transistor	amplifier G	BS 2002 main plate
31	T355	BC 337	transistor	emitter loaded amplifier B	BS 2002 main plate
32	T356	BF 459	transistor	amplifier B	BS 2002 main plate
33	2S1	TBA 940 (UL 1261N)	integrated circuit	horizontal deflection generator, synchronizing pulses selector and separator	MH 2001
34	2T1	BC 313-16	transistor	pulses amplifier	MH 2001
35	2T2	BC 158A	transistor	pulses amplifier	MH 2001
36	2T51	BC 148B	transistor	vertical deflection	MV 2001
37	2T52	BC 148B	transistor	generator	
38	2T53	BC 147B	transistor	current amplifier	
39	2T54	BC 313-16	transistor	(vertical deflection positive cycle)	MV 2001
40	2T55	BC 313-16	transistor	current amplifier (vertical deflection negative cycle)	MV 2001
41	2Th101	S3901EF	thyristor	commutation thyristor of horizontal deflection	BO 2001 radiator
42	2Th102	S3900SF	thyristor	scanning thyristor of horizontal deflection	radiator
43	2D109	TVK-186-5	high voltage multiplier	high voltage and focusing voltage rectifier	radiator
44	2T101	2N 6292	transistor	vertical deflection output stage (positive step)	radiator
45	2T102	2N 6292	transistor	vertical deflection output stage (negative cycle)	radiator
46	S1	TDA 2640	integrated circuit	power supply control circuit	MN 2001
47	3T1	BC 211	transistor	keying transistor	MN 2001
48	3T2	BC 148A	transistor	line pulses detector	MN 2001
49	3T3	BF 258	transistor	pulse amplifier	MN 2001
50	3T101	BU 326	transistor	convertors keying transistor	main plate
51	3T102	BD 137	transistor	voltage stabilizer +24 V for sound module	BZ 2001
52	4T1	BC 149C	transistor	low frequency signal amplifier	SR 2001 in BR 2001
53	4T2	BC 158A	transistor	keying transistor for time constant changing in line synchronization unit	
54	US1	UL 1111N	integrated circuit	switching on of the respective arrangement's sections	ZZP 20521E in BR 2001
55	US2	UL 1550L	integrated circuit	voltage stabilizer feeding the varycaps	ZZP 20521E in BR 2001
56	T1	BC 147	transistor	switchover transistors	ZZP 20521E in BR 2001
57	T6	BC 158		of the first section	
58	T2	BC 147	transistor	transistors switchover	ZZP 20521E in BR 2001
59	T7	BC 158		of the second section	
60	T3	BC 147	transistor	transistors switchover	ZZP 20521E in BR 2001
61	T8	BC 158		of the third section	
62	T4	BC 147	transistor	switchover transistors	ZZP 20521E in BR 2001
63	T9	BC 158		of the fourth section	
64	T5	BC 147	transistor	switchover transistors	ZZP 20521E in BR 2001
65	T10	BC 158		of the fifth section	
66	T11	BC 157	transistor	emitter loaded amplifier (follower)	ZZP 20521E in BR 2001
67	T16	BC 157	transistor	keying transistor for sound softening	
68	T17	BC 147	transistor	keying transistor for sound softening	

TABLE 3

VI. RECEIVER'S INDUCTIVE COMPONENTS DATA

Coils

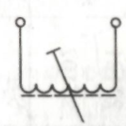
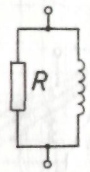
No.	Name	Designation on the scheme	Scheme	Data				
				L	winding's r	n turns	wire	core
1	2	3	4	5	6	7	8	9
1	Coil	L350		11,8 μH		40	DNE130 Ls0,15	RGMs 4 × 0,8 × × 10/U-11
2	Coil for picture width control	2L101		3,8 μH ±10% without core; $L_{min} \leqslant 4{,}3$ μH, $L_{max} \leqslant 19{,}5$ μH with core	30 mΩ ±15%	28,5	LNEJ3 × 4 × 15 × 0,1	RGMr 8 × 1 × × 28/F1001
3	Suppressor's f_H coil	2L108		265 μH ±10% without core; $L_{min} \leqslant 350$ μH, $L_{max} \geqslant 800$ μH with core	1,72 Ω ±10%	225	DN2E130L 0,300	RGMr 6 × 0,75 × × 13/F1001
4	Coil	2L104		2,5 μH ±10%		15,5	DN2E130Ls 0,800	
5	Coil	3L101 3L102 3L104 3L105		10 μH ±10%		58,5	DN2E130Ls 0,450	
6	Demagnetizing coil				11,8 Ω ±10%		DN2E130Ls 0,450	
7	Centering reactor	2L106		0,84 mH ±10% without core; 3,5 mH ±10% with core	2,15 Ω ±10%	330	DN2E130Lu 0,400	RWO 8 × 3 × 25
8	Phase correction reactor NS	2L107		154 μH ±10% without core; $L_{min} \leqslant 450$ μH, $L_{max} \geqslant 670$ μH with core	0,3 Ω ±10%	170	DN2E130Lu 0,800	RGMr 8 × 28/F1001

TABLE 4

Chokes

No.	Name	Designation on the scheme	Scheme	Data			
				L	*n* windings	wire	core
1	2	3	4	5	6	7	8
1	Choke	Dł 351 Dł 352 Dł 353		50 μH	112	DNEJ ø 0,1	resistor OWZ 0,5 W 22 kΩ 10%
2	Choke	Dł 354 Dł 356 Dł 357 Dł 359		50 μH with core	66	DNE130ls 0,355	RWO 3,1 × 1,3 × 10/F201
3	Choke	Dł 355				DSm ø 0,8	RWO 3,2 × 1,3 × 10/F201
4	Choke	Dł 358		2 mH with core	300	DNE130ls 0,450	RWO 5 × 1,3 × 35/F1001
5	Choke	Dł 360		100 μH with core	72	DNE130ls 0,315	RWO 5 × 1,3 × 20/F1001
6	Choke	Dł 361		1,5 mH with core	278	DNE130ls 0,200	RWO 5 × 1,3 × 20/F1001
7	Choke	2L1 2L2		2,2 μH ±15% with core	12	DNE130ls 0,300	RWO 3,2 × 1,3 × 10/F201

condt table 4

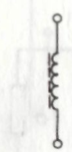
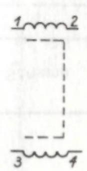
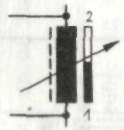
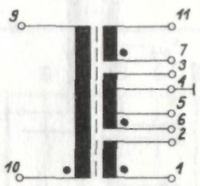
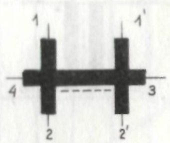
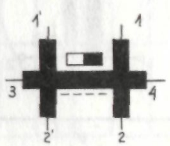
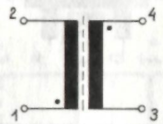
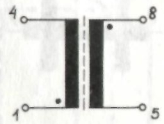
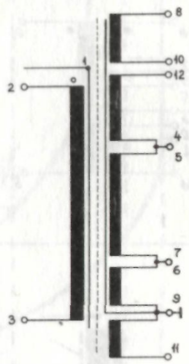
1	2	3	4	5	6	7	8
8	Choke	2L102		100 μH ±10% with core	68	DNEJ130ls 0,300	RWO 5,1 × 3 × 20/F1001
9	Choke	2L103		1,5 mH ±10% with core	268	DN2E130ls 0,200	RWO F1001
10	Choke	3L103		30 μH ±10% with core	39	DNE2130ls 0,45	RWO 5 × 1,3 × 20/F1001
11	Choke	3L106		10 μH ±30% with core	2	TDY1 × 0,4	RWO 5 × 2 × 5 F1001
12	Choke	3L51		$L_{1-2} = L_{3-1}$ with core	$n_{1-2} = n_{3-4}$	DNE130Ls 0,45	RP40 × 24 × 16 F3001

TABLE 5

Remaining inductive components

No	Name	Designation on the scheme	Scheme	Data: No of pins	Data: L	Data: r	Data: n turns	Data: wire	Data: core
1	2	3	4	5	6	7	8	9	10
1	Commutation transformer	2Tr 101		1— 2 3— 4	4 µH ±20% 48 µH ±10%	— —	5	DN2E 130Lu 0,35 high frequency conductor LNEJ 3 × 4 × 15 × 0,1	EI 42/15 F807
2	Linearity corrector	2L 105			52 µH ±10% with core $L_{min} \leqslant 6$ µH $L_{max} \geqslant 18$ µH	44 mΩ ±15%	38	LLNEJ 105 × 0,07	RWO 5 × 1,3 × 40,5/F 1001 Magneta 1) MO1-12×3×3×10 2) MA1-12D×9D×8D
3	Horizontal deflection	2Tr 103		1— 2 3— 4 3— 6 3— 5 4— 5 4— 6 5— 6 7—11 9—11	5,5 mH ±20% 1,4 mH ±10%		2 5 32 10 5 27 22 700 52	DN2E 130 Lu 0,15 DNE2E 130 Lu 0,15 DNE2E 130 Lu 0,15 DN2E 130 Lu 0,15 DN2E 130 Lu 0,15 DN2E 130 Lu 0,15 DN2E 130 Lu 0,15 DN2E 130 Lu 0,15 DN2E 130 Lu 0,15	
4	Transductor of WE correction	2Tr102 102		1— 2 1— 2 3— 4	19 µH ±15% 670 mH ±15% 59,2 Ω ±10%	59,2 Ω±10%	6,5 1100	DNE 155L 0,700 DNE 130L 0,120	EI 25/F807
5	Transductor of NS correction	2Tr104		1— 2 1— 2 3— 4	17 mH ±10% 2,1 Ω ±10% 1 mH ±15%	2,1 Ω±10%	130 28	DNE 130L 0,300 DNE 155 0,600	EI 25/F807 magnet MWO ø12 3 × 3/10/F81

condt table 5

1	2	3	4	5	6	7	8	9	10
6	Convertor's impulse	3Tr1		1— 2 3— 4	600 µH ±15% 1,7 Ω ±10% 290 µH ±15% 1,2 Ω ±10%	1,7 Ω±10% 1,2 Ω±10%	50 35	DNE 130L 0,140 DNE 130L 0,140	FE 20/F806
7	Convertor's control transformer	3Tr101		1— 4 5— 8	720 mH ±30% 20 Ω ±10% 1,1 mH ±30% 140 mΩ ±10%	20 Ω±10% 145 mΩ±10%	500 23	DNE 130L 0,150 DNE 130L 0,450	EI 25/F607
8	Convertors output transformer	3Tr102		2— 3 4—12 5—11 6—10 7— 8 7— 9	5,1 mH ±10% 430 mΩ ±10% — — — — —	430 mΩ±10% — — — — —	110,5 50 17 105 8,5 6	2 × DNE 155 0,600 2 × DNE 155 0,600 DNE 155 0,600 2 × DNE155 0,600 2 × DNE155 0,600 2 × DNE155 0,600	EE 65/F806

VII. DESCRIPTION OF THE RECEIVER'S SYSTEM

1. Control block BR 2001

Control block 2001 is intended to:

- connect and disconect the receiver from the line,
- control the brightness, saturation, contrast, timbre and sound volume,
- tune the receiver to the transmitting station,
- switching on or switching off the automatic frequency control through the high frequency channel,
- transmitt through the sockets the sound signal to the earphones, magnetophone (recording) and additional loudspeaker,
- depress sound in time of programs switching over,
- *enable reproduction of the program from video recorder on 5th channel.*

These functions are executed by the system based on 4T2 transistor, which after switching on 5th channel transfers +12 V voltage to the MH 2001 module on deflection block in order to change the time constant in line generator.

The control block consists of the following subassemblies:

- two segment change over switch Isostat type containing line switch and AFC switch,
- potentiometers set for brightness, contrast, saturation, sound force, high and low tones control,
- switching on and programming unit ZZP-20521 E,
- control segment SR 2001,
- magnetophone's, earphones' and additional loudspeaker's sockets.

All the control block systems are bound with signal block BS 2001 together.

Line change over switch is connected with interference eliminator ZP 2001.

1.1. Switching-on and programming unit ZZP-20521E

Switching on and programming unit after connection to the head tuned-over by the varicaps enables programming and switching on any wanted (from five selected) TV channel. The unit is functionally divided into two parts: switching on and programming.

The switching-on part is built as an electronic system in which after touching one of its sensing elements the voltage supplying correspondent range can be carried on to the tuner as well as the voltage supplying varicaps. The height of this voltage will be proper to the selected channel. Simultaneously there will be switched off the voltages from other channels.

Programmer is formed as a composition of range change-over switches strip potentiometers.

This unit consists of 5 similar switching-on programming sections. Section No 1 *regarding the R20 resistor, is connected as the first* when the voltage starts feeding this system. Each section consists of:

- sensing element with one electrode connected through the proper transistor of the integrated circuit US1 to two switching over transistors: T1 and T6 (section 1), T2 and T7 (section 2), T3 and T8 (section 3), T4 and T9 (section 4), T5 and T10 (section 5),
- signalling lamps L1, L2, L3, L4, L5,
- ranges change-over switches (S1, S2, S3, S4, S5,) by which the voltage scanning the tuner's range is transmitted,
- slip potentiometers (P1, P2, P3, P4, P5) intended for setting up the voltage feeding the tuner varicaps,
- diodes D16, D17, D18, D19, D20 scanning minimum voltage level in connection point of their anodes,
- *safety resistors R1, R2, R3, R4, R5 parting in safe way the use* from the electrical systems of the receiver,
- emitter loaded amplifier (follower) (T11) separating the load carried by the tuner on the remaining system and AFC discriminator.

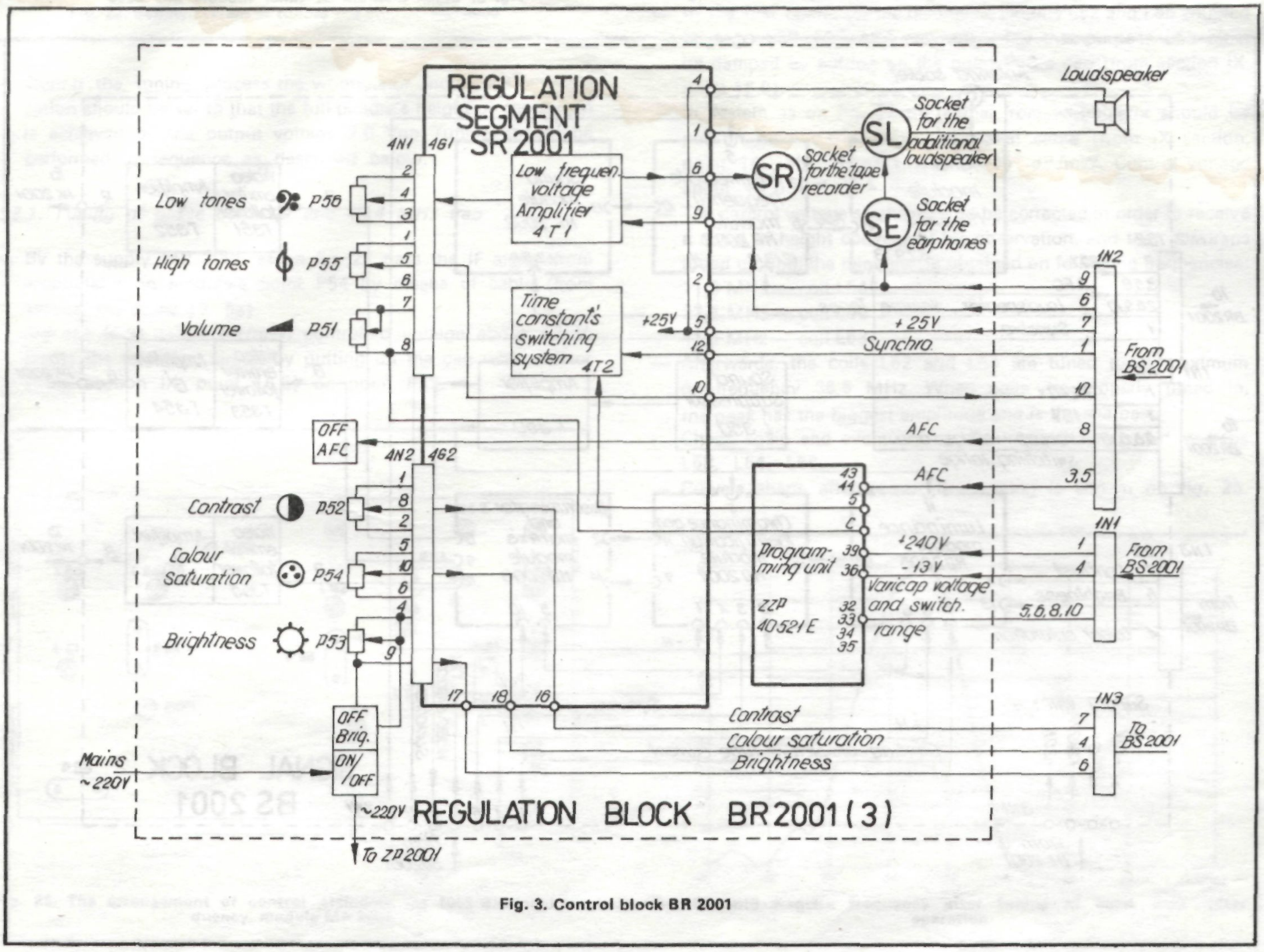


Fig. 3. Control block BR 2001

— integrated circuit S2 assuring the stability of the varicaps feeding voltage.

After switching on the 20 V and –13 V to the unit it takes place connection of the section 1 by the currents flowing in transistor circuits T6 and T1. As the result the voltage on the collector of T1 transistor is diminished from +33 V polarizing the diode D6 for conducting. This causes increase of current flowing through transistor T1 and T6. This process causes saturation of both transistors and the section is switched on.

In result the current flowing through transistor T1, diode D1 and range change-over switch S1 causes scanning of the proper tuner range. Simultaneously the current flowing through light indicator L1 and diode D11 causes alteration of voltage on potentiometer P1 and anode D16 from 33 V to the value depending from the position of the slider. This voltage supplies the tuner varicaps through the AFC system and transistor T11.

Switching-over from section to section is followed by the polarization in direction of conducting of the relative transistor from integrated circuit S1 and switching-over transistors and above described process is repeated. Previous section is switched-off ownig to additional voltage drop originating on resistor R15 because of current flowing in new section. This voltage drop chocks transistors connected to the former section.

The sound depressing system at switching-over particular sections is based on transistors T16 and T17.

2. Signal block BS 2001

In signal block BS 2001 the following functions performed: reception, transfer, ampliying and detection of high frequency video and sound signals. Finally this block delivers: video signals R, G, B for picture tube control, low frequency signal for loudspeaker control and video signal to deflection BO 2001 block in order to secure horizontal and vertical synchroinzation. Block diagram BS 2001 is shown on fig. 4.

High frequency signal is carried on from the antenna to the head module MG 2002, where is amplified and converted to intermediate frequency.

Intermediate frequency signal is transferred from the output of MG 2006 module to the intermediate frequency module MP 2005. On the output of that module there exist two video signals of similar amplitude and opposite polarization. One of these signals is carried on to decoder (modules MD 2006/3 and 2007) through sound trap and emitter loaded amplifier (follower) and to module MH 2001 in deflection block in order of separation the horizontal and vertical synchronization impulse. The second signal is carried on to the sound module MF 2003 in order of separating the intercarrier sound signal.

Video signals R, G, B received on the output from module MD 2008 are transferred to the emitter loaded amplifiers (followers) which are aplied for control of video output amplifiers R, G, B equipped with transistors T352, T354, T356. Output signals from these amplifiers are transferred to the picture tube's cathodes.

2.1. Tuner module MG 2006

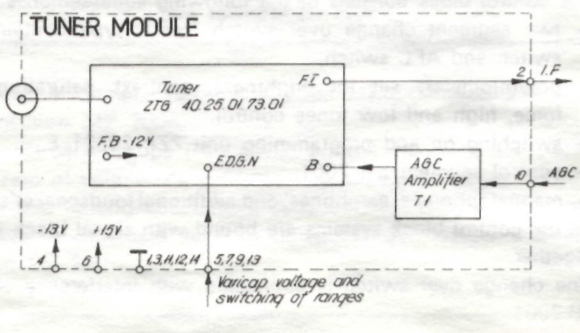


Fig. 5. Block diagram of tuner module MG 2006

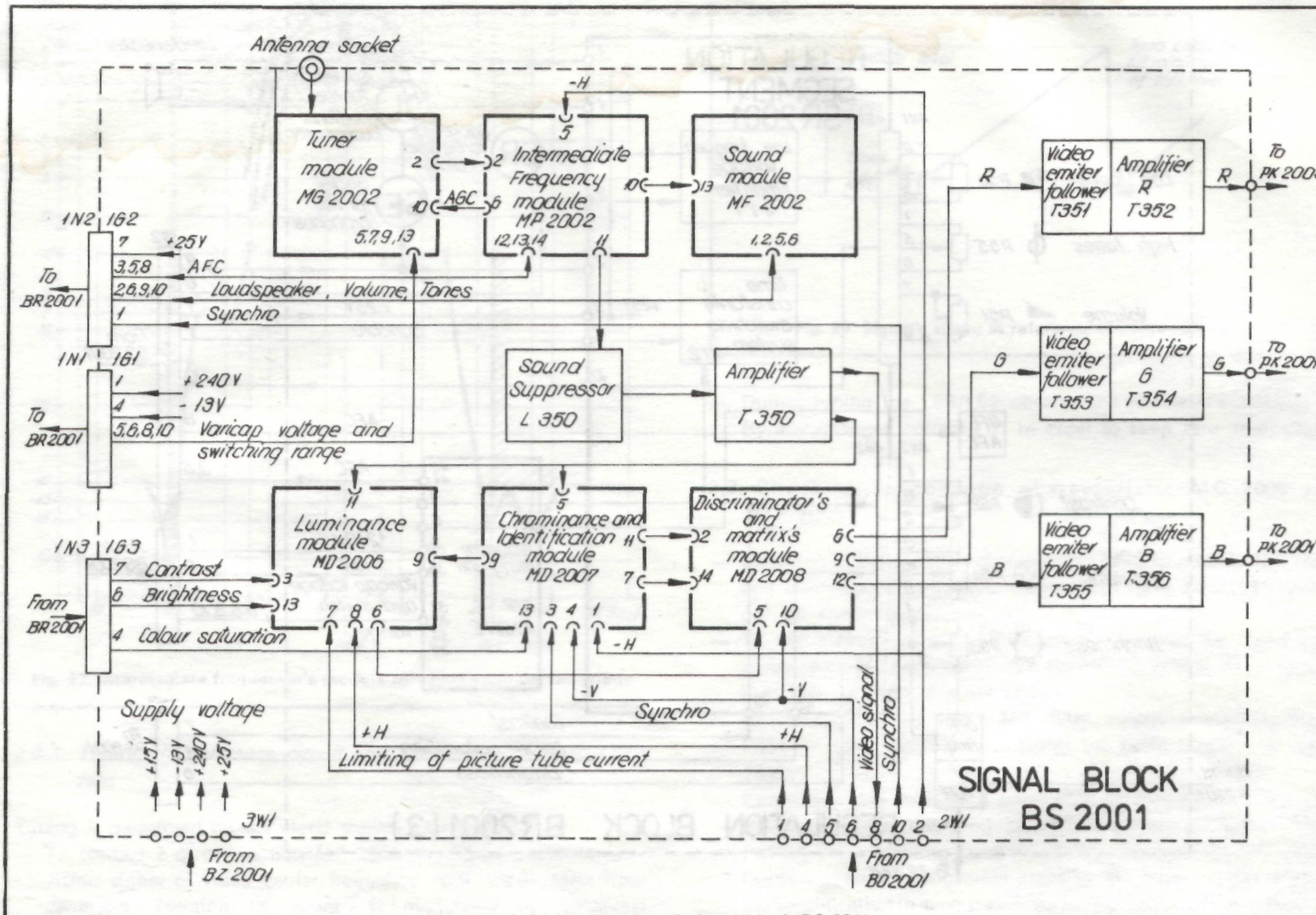


Fig. 4. Block diagram of signal block BS 2001

The integrated tuner VHF/UHF electronic tuned-over by the varicaps is applied on the receiver input and is used as high frequency amplifier, mixer and heterodyne.
High frequency video and sound signal coming from antenna socket is submitted to amplification and frequency convertion.
After passing through the intermediate frequency filter it is transferred from the output of MG 2006 module directly to the input of intermediate frequency amplifier MP 2005.

2.2. Integrated tuner

The integrated tuner is applied to reception of TV signals in range of I-V band. It is electronicaly switched over and tuned over by the voltages coming from programming unit which delivers to the tuner the supply voltage –13 V and control voltage for the varicaps (0 ÷ +28 V).
The tuner consists of VHF and UHF parts constructed on two printed plates located in metallic screened casing. VHF part consists of: high frequency amplifier (T304), mixer (T305) and oscillator (T306). Tuning over of the circuits is arranged by changing the capacity varicap diodes (V301, V302, V303). For switching over of the ranges are applied diodes D306, D315, D316, D319, D323, D324, D325, D314, D326, V310, V311, V312.
The UHF part works on two transistors: T103 (high frequency amplifier), T104 (self oscillating mixer). Moreover during work on UHF the mixer of VHF part is utilized as intermediate frequency amplifier.
For tuning over the varicap diodes V102, V103 are used. Supply and control voltages are delivered to the tuner through the bushing capacitors: I and II range — bushing G, III range — E, V — range N, control voltage for varicaps — D, voltage AGC — B, mixer — F. Intermediate frequency signal is carried out through the bushing F1.

2.3. Intermediate frequency video amplifier MP 2005 (fig. 6)

Video and sound intermediate signals taken from the tuner output are submitted to the primary amplifying by T50 transistor.
Amplitude and phase characteristic of video intermediate amplifier is shaped by the three circuit band-pass filter, corrector and traps on frequency 31,9 MHz (L54, C55, C56), 33,5 MHz (L56, C59), 40,4 MHz (L63, C89), 41,4 MHz (L53, C57, C58) and circuit L1, C1, C2, C3 on module MG 2006 and circuit L341, C322 in the tuner. The three circuits band pass filter is built of: L50, C52, (I circuit), L52, C54 (II circuit); L55, C60, C62 (III circuit).
Transistor T52 is coupled with the last circuit. Application in the collector circuit of transistor T52 of phase corrector, constructed in form of two circuit band pass filter (L57, C86 — I circuit, L64, C90 — II circuit) and coupled through overcomponsated trap (L62, C87, C88, R86) resulted improvement of the phase characteristics of intermediate frequency amplifier and assures good square wave response. Moreover in phase correctors circuit there is a trap for frequency 40,4 MHz.
Transistor T52 is applied as separator isolating three circuits band pass filter from the phase correction circuits and to equalize the insertion losses of phase corrector.
The integrated circuit S50 is coupled with the last circuit of phase corrector. It follows in S50 the stronghtening of intermediate frequency signal by amplifiers of controlled amplification, synchronic amplitude detection and primary video voltage amplification after detection.
On the outputs of integrated circuit there are obtained two video signal of similar amplitude but opposite polarization. The integrated circuit cooperates also with the reference circuit emanating the video carrying signal f_{pw} of intermediate frequency 38,9 MHz. This signal after amplification by the transistor T51 controls the stage of frequency discriminator on which output there is obtained the DC voltage. Its sign (plus, minus) and value depend from the relative value of difference between the intermediate frequency signal and the tuning frequency of discriminator.
For the intermediate frequency signal equal 38,9 MHz, the output voltage of discrimination is equal zero. This voltage is applied for automatic frequency control setting (AFC) and is transferred to the transistor's T11 base on control segment SR 2001.
Integrated circuit S50 also assures automatic gain control frequency tuner amplifier. For assuring the proper work of AGC systems negative pulses of retrace line deflections of the value between the peaks about 2,5 Vpp which are obtained from horizontal deflection transformer on block BO 2001 are carried on the S50 system. On the output 5 system S50 delivers current for the tuner high frequency control.
The treshold of setting of AGC for the tuner is pointed by the R58 resistor.
Potentiometer R59 is for white level control.

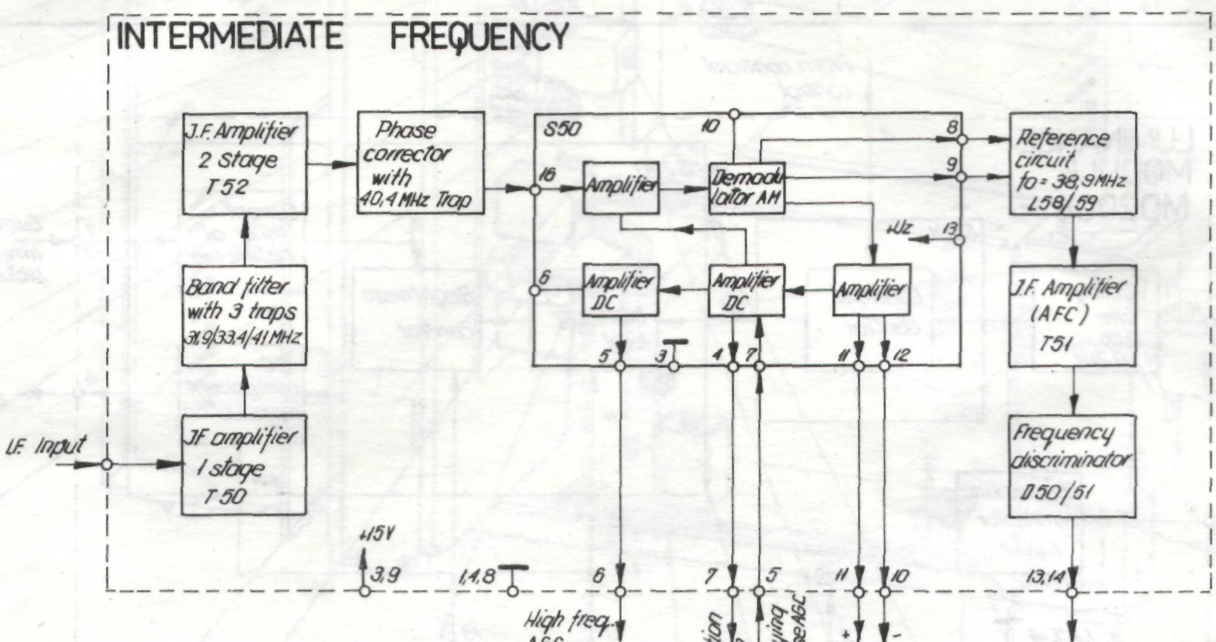


Fig. 6. Block diagram of the intermediate frequency module MP 2005

2.4. Sound module MF 2003 (fig. 7)

The sound module MF 2003, intermediate frequency amplifier situated on control block, and sounds timbre control systems make together the sound channel.
Selective separation of the differential frequency signal is done by means of ceramic filter FC101. In the integrated circuit S101 takes place the amplification, limitation and detection of the differential signal FM in coincidence system where the resonance circuit with L101 coil acts a phase shifter.

The video signal taken from transistor's T350 emitter is passed on the delay line of about 560 ns delay. The chrominance signal eliminator's unit is switched on by the transistor T200. During colour emission the direct voltage saturating transistor is led on the base of this transistor from module MD 2007.
In result takes part suppressing of the chrominance signal in about 3,7 — 5,2 MHz band through resonance circuits build on L200, 201 coils and C202, 203, 204, 205 capacitors. Contrast control is performed by means of changing the direct voltage transferred from control block on pins 1,5 of integrated circuit S201.

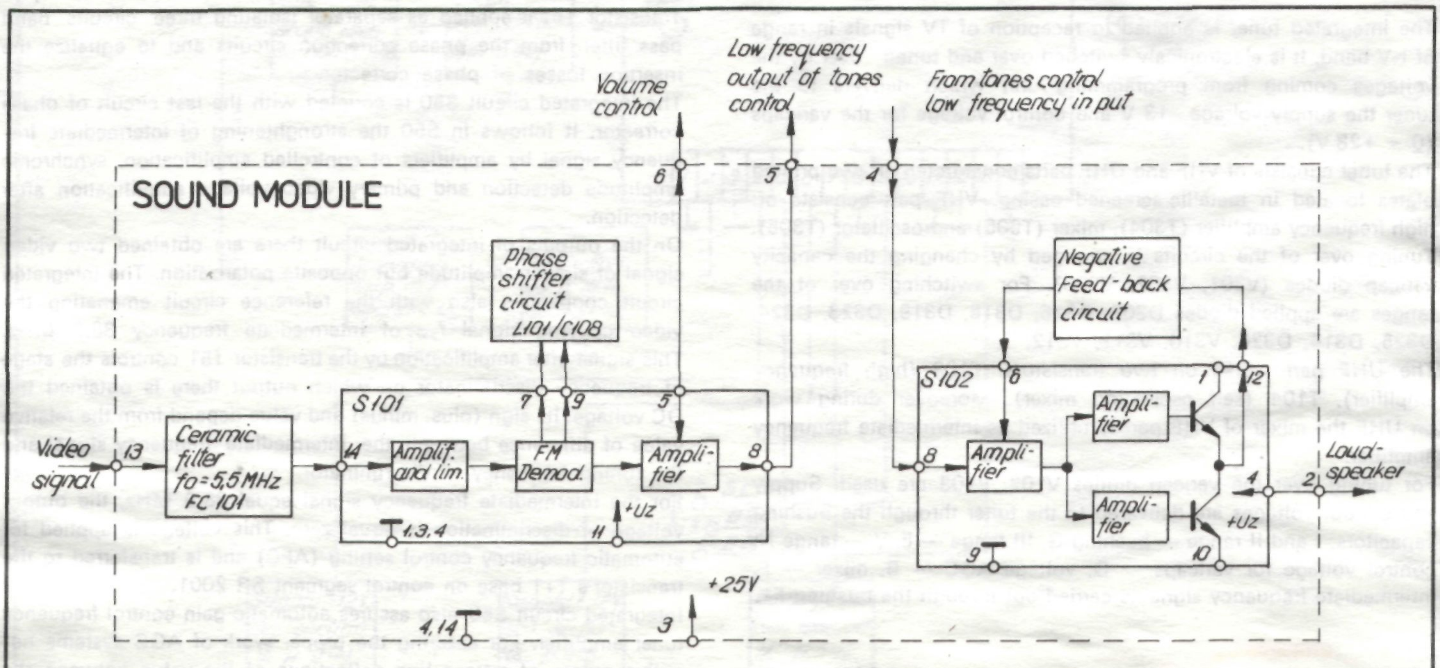


Fig. 7. Sound module's MF 2003 block diagram

Sound power's control with potentiometer P51 is achieved by the changes of the amplification of integrated unit S101. Components R108, R109, C113 create the negative feed-back in low frequency amplifier constructed on integrated circuit S102.

2.5. Luminance module MD 2006

After such control there is changed the amplitude of video signal on the output from integrated circuit (outputs 8, 14) without any change of the voltage of the black level. Keying the output 12 of integrated circuit S200 by the horizontal deflection retrace pulses of positive polarization causes that on the input 2 of thus circuit takes place shifting of video signal blanking level. The voltage

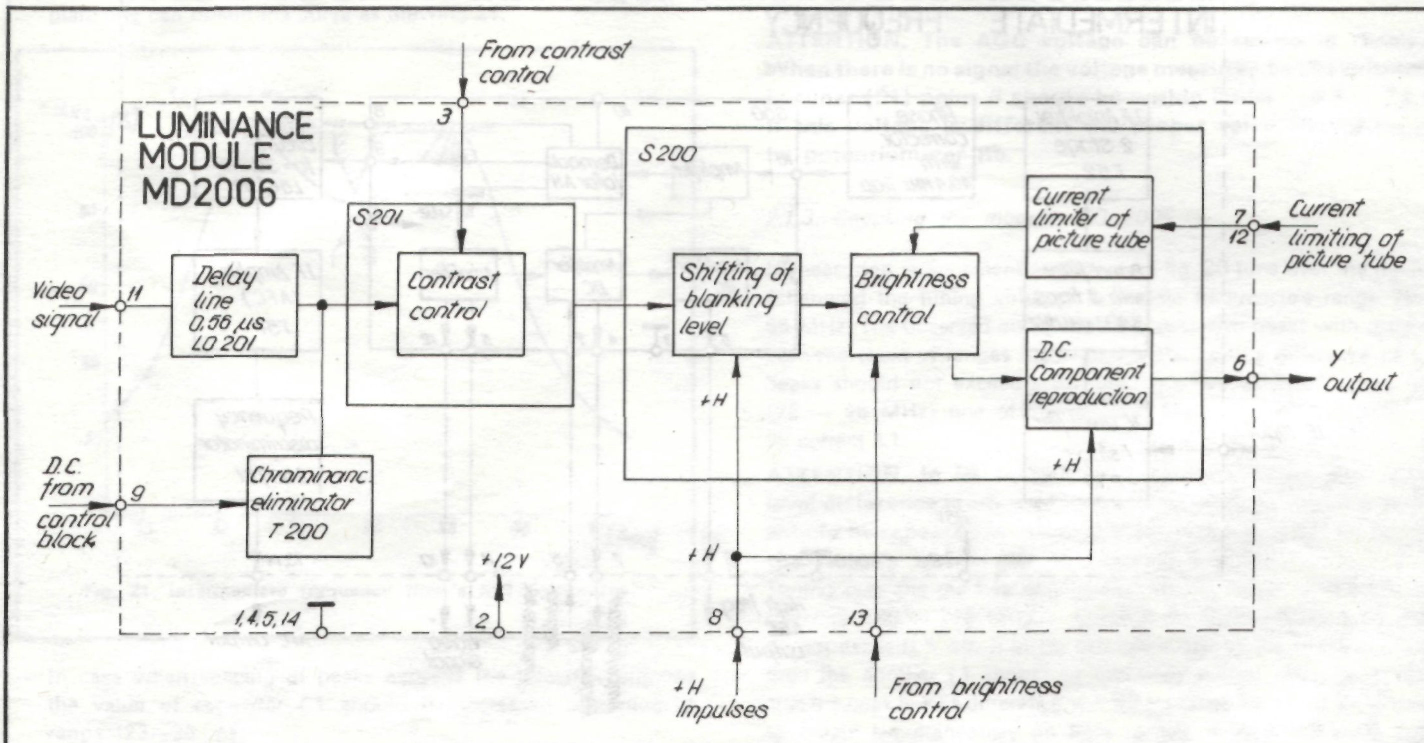


Fig. 8. Luminance module MD 2006 block diagram

value relative to this level is proportional to the DC voltage from brightness potentiometer.
Reproducing of the constant component on the blanking level effects the change of black level in video signal. It depends from the position of brightness control potentiometer, without change of the voltage relative to the blanking level. The picture tube current limitation system acts when the picture tube current increases over 1,1 mA and limits the maximal brightness.
Shiftings of blanking level brightness control and picture tube current's limitation is performed in integrated circuit S200.

2.6. Chrominance and identification module MD 2007 (fig. 9)

Video signal taken from transistor's T350 emitter is given on the preliminary amplifier, constructed on transistor T251. After amplification it follows the process of chrominance signal separation from video signal and deemphasis in resonance circuit of bell characteristic (L251, C274, C275, 276). Chrominance subcarrier's signal is transfered from transistor's T252 emitter to the direct channel and from its collector to the delayed channel. Preliminary amplified chrominance subcarrier's signal is transferred from collector T251 to the identification system responsing to chrominance subcarrier located in back part of line's blanking pulse.
The integrated circuit S250 is used as limiter keyed by horizontal synchronization pulses coming from MH 2001 module. It is used also as quadrature discriminator and selective amplifier about 7,8 kHz. Sine voltage of f = about 7,8 kHz obtained on output of selective amplifier is applied for work control of bistable change-over element in S251 integrated circuit and after rectifying for clearing the chrominance channel in time of colour emission.
Moreover the S251 integrated circuit performs the function of change-over switch and chrominance signals limitator. On the output from this circuit there are obtained:
1) the differential chrominance signals with amplitude depending from the position of saturation control potentiometer, 2) DC voltage identificating colour emission transferred to the MD 2006 module.

2.7. Discriminators and matrixes module MD 2008 (fig. 10)

Frequency modulated differential chrominance signal's D_R' and D_B' are sent in two channels to preliminary amplifiers (built on T300, T301 transmitters) and next to the discriminator stages. Obtained in result of demodulation signals U_{R-Y} and U_{B-Y} are carried on through the low deem-phase systems to the integrated circuit S300 which is applied as matrix.
The S300 circuit is also used for collecting the voltage deciding of the work points for transistors and for blanking V retraces.

3. Deflection block BO 2001

The deflection block consists of: synchronization and horizontal deflection generator's MH 2001 module, vertical deflection system units module MV 2001, vertical deflection system's output transistor stage, horizontal deflection system thyristor together with the unit of high voltage and others auxiliary voltages generating, geometric distortion correction systems in horizontal direction (WE) and vertical direction (NS) and picture position control systems.
The horizontal deflection system is supplied by synchronic stabilized pulse voltage having frequency of horizontal deflection and served from supply block.
Scanning thyristor 2Th102 with connected in anti-paralell way diode acts as a key switching on in time of scanning the deflection coils to the voltage existing on capacitor 2C111. In the first stage of scanning the circuit of deflection current flying in result of delivery the magnetic energy by the deflection coils to the capacitor 2C111 is closed by the diode and thyristor 2Th102 is chocked. In the second stage of scanning the discharging of capacitor 2C111 results that the deflection current flies in the circuit. Voltage existing on the capacitor causes chocking the diode and conducting of the scanning thyristor 2Th102. Positive pulse controlling the thyristor's 2Th102 gate is transferred through the 2L103 choke from capacitor 2C104. On capacitor terminals there exists the voltage of the shape similar to the voltage on the anode of the chocked in this time commutation thyristor 2Th101. This commutation thyristor 2Th101 together with connected in antiparalell way diode, commutation coil (winding 3—4 2Tr101) and capacitors 2C107 and 2C108 — perform a circuit closing the way for deflection current in retrace period.

In the first part of retrace period the magnetic energy collected in the deflection coils acts as the agent causing the flow of deflecting current. The positive pulse switching on the commutation thyristor 2Th101 in time of the first part of retrace period is obtained from module MH 2001.

In time of the second part of retrace period the energy collected in capacitors 2C107 and 2C108 during the previous retrace cycle acts as the current source in deflection system. These capacitors polarize the commutation thyristor 2Th101 in blocking direction and flow of current is enabled by diode connected anti-parallel to the thyristor. In the second part of retrace the energy collected in capacitors 2C107 and 2C108 re-enters again into magnetic energy of deflecting coils. Control of the gate of scanning thyristor 2Th102 in time of retrace by negative voltage is obtained from additional winding of the commutation coil.

The energy lesses in deflection circuit are compelemented in result of direct charging the 2C107 and 2C108 capacitors by the pulse voltage synchronized with the mains frequency and delivered from the pin supplier on 2G2K3 output of the deflection block in time of chocking of commutation thyristor 2Th101. The energy necessary for charging the capacitors is stored in output transformer of the pin supplier in time of conductivity of commutation thyristor 2Th101.
System consisting of 2L102 choke, 2R103 resistor and 2C102 capacitor is applied for high frequency oscillation suppression in switching-over components circuit (thyristor-commutation coil).
The construction on the system on scanning thyristor side is a conventional one, it means that the horizontal deflection transformer acts as an anode thyristor charge.

Geometric distortion correcting unit

The receiver uses the two-transductor picture geometric distortion's correction system completely constructed on passive components. The geometric distortion compensating method is based on amplitude modulation of the both deflection currents. It means that in case of horizontal deflection currents the modulation wave should have the parabolic shape and vertical deflection's frequency. In case of vertical deflection currents — on the saw-tooth wave should be laid on the parabolic waves of the cycle equal to the horizontal deflection's cycle.

Correction of WE on the screen's edges is realised by the system composed from side columns' winding of the parallel transductor 2Tr104 (parallely connected to the horizontal deflection coils), resistor 2R124, diodes 2D105 and potentiometer 2R128) (distortion amplitude correction control in horizontal direction on picture edges). On the other hand the control winding (on the centre column) of the same transductor (connected in series to the vertical deflection coils) with the unit containing controlled inductance 2L107NS distortion phase correction control, potentiometer 2R126NS distortion amplitude correction control) and connected in series capacitors 2C123 and 2C124 assure the NS correction. Transductor in series 2Tr102 (side columns' winding is connected in series to horizontal deflection coils but through the centre column's winding flies the parabolic current of vertical deflection frequency (assures the central part of the picture).

The parabolic wave is achieved by the double integration of the line voltage existing in vertical deflection output transistors' connection point. At the same time the potentiometers 2R109, 2R110 allow to settle adequate amplitude and shape of the parabola, it means the distortion WE compensation in the central part of the picture.

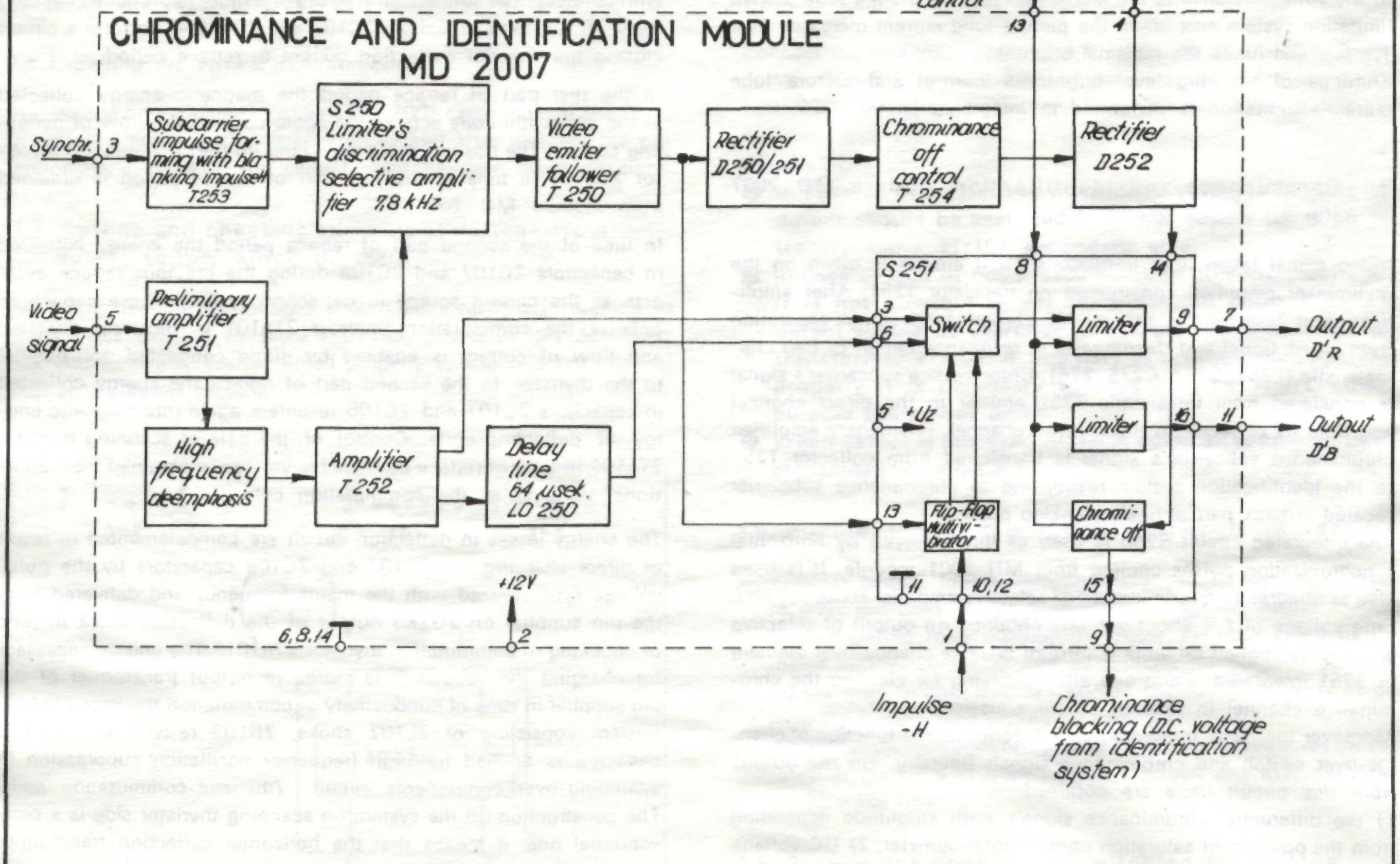


Fig. 9. Chrominance and identification MD 2007 module's block diagram

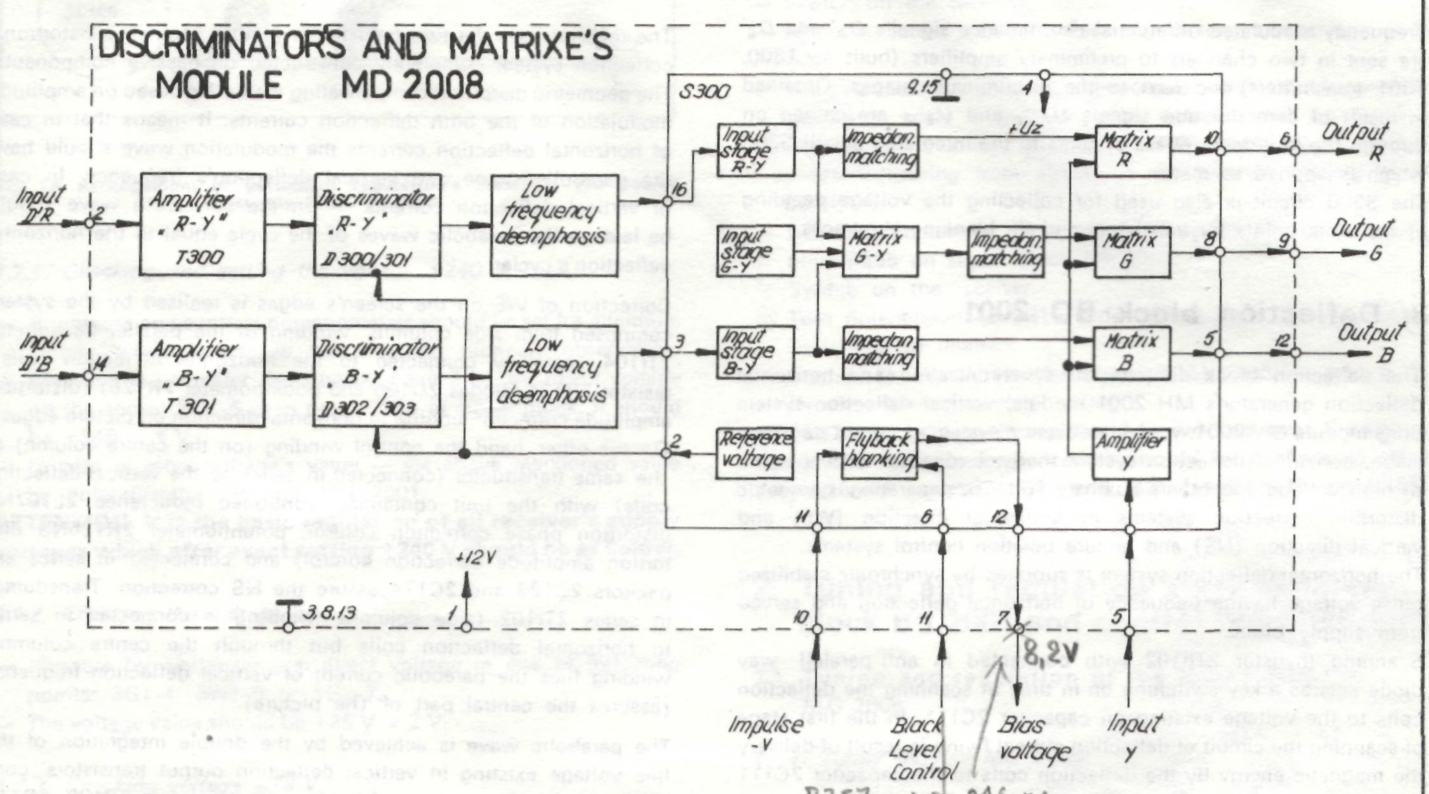


Fig. 10. Discriminators and matrixes module MD 2008 block diagram

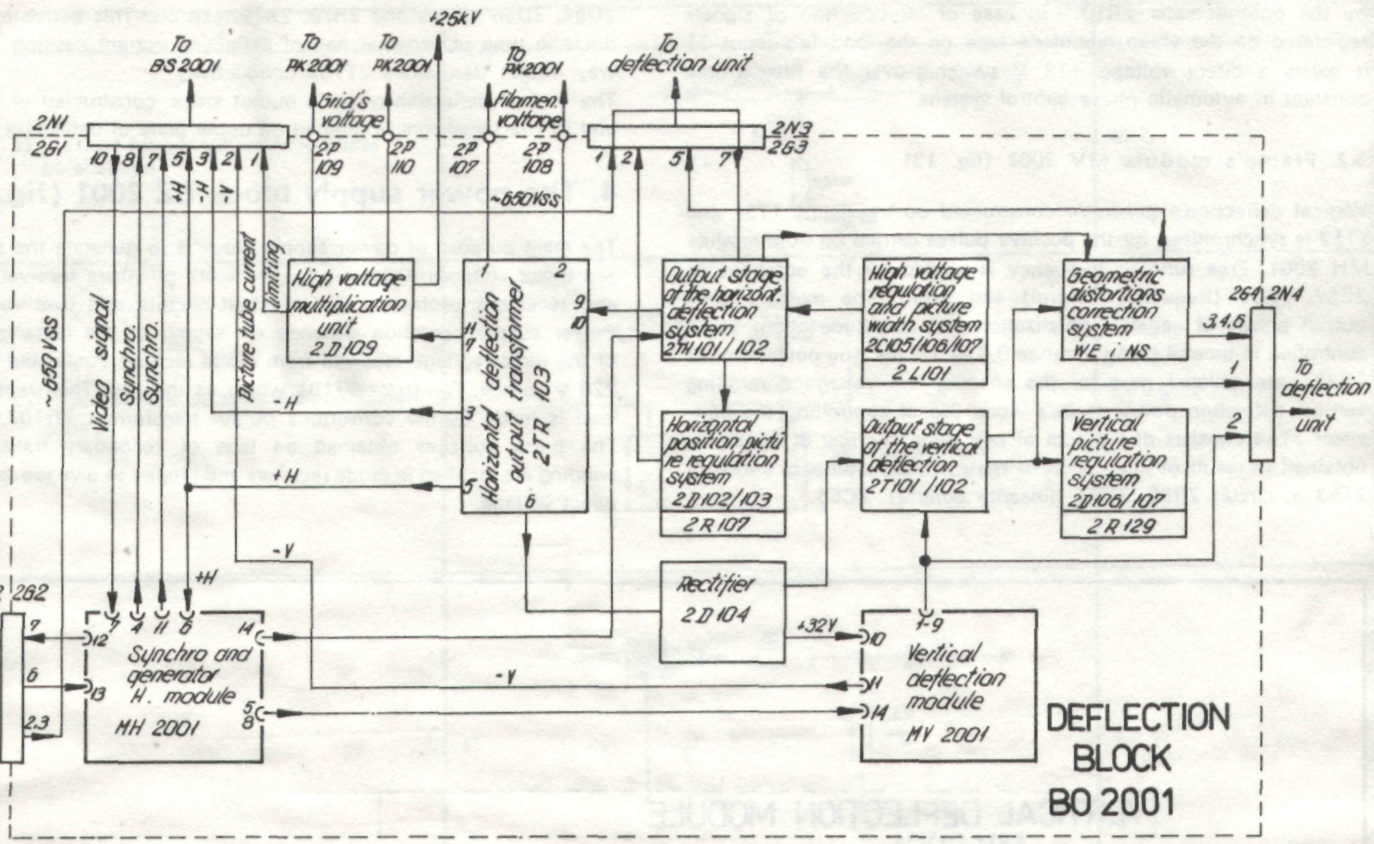


Fig. 11

3.1. The synchronization and horizontal deflection generator module MH 2001 (fig. 12)

The integrated circuit 1S1 collects system performing following functions: selector separator, generator of horizontal deflection and phase comparison. In result of separation the synchronizing pulses from the complete video signal (selection) there is obtained on the 6 circuit's output the complete synchronizing signal.
In result of separation on the 7th circuit's leg there are obtained vertical synchronization pulses transferred afterwards to the "frame" module MV 2001. Frequency of horizontal deflection generator is compared with the pulses of horizontal synchronization. Frequency of free vibration is settled by the resistors 2R13, 2R14 (frequency control) and capacitor 2C8. On the output 2 of integrated circuit 2S1 there are obtained the pulses which after amplification by the transistor 2T1 are used for control of 2Th101 thyristor, and after amplification by the second transistor 2T2 are used synchronization of the convertor in BZ 2001. In the integrated circuit also takes part the comparison of the line's synchronizing impulses with the line retrace pulses from the horizontal deflection's transformer in order to compensate of the phase shift existing between line generator and output stage.

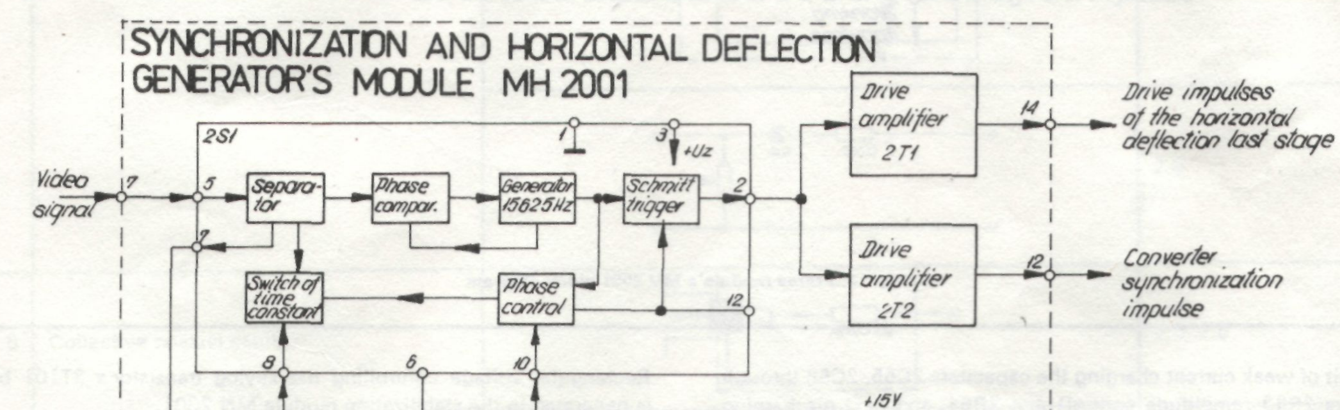


Fig. 12. Synchronization module MH 2001 block diagram

Picture's phase shift in relation to the picture's grid is controlled by the potentiometer 2R10. In case of reproduction of signals registered on the video recorder's tape on the module's input 11 it exists a direct voltage +12 V switchig-over the filter's time constant in automatic phase control system.

3.2. Frame's module MV 2001 (fig. 13)

Vertical deflection's generator constructed on transistors 1T51 and 2T52 is synchronized by the positive pulses carried on from module MH 2001. Free running frequency is settled by the components 2C52, 2R59 (frequency control) and 2R58. The multivibrator's output pulses of negative polarization and amplitude about 14 V, controlled in time of being in range 0,8 — 1,2 ms (by potentiometer 2R82), are utilized next for the shaping the voltage controlling vertical deflection power stage's work. Signal controlling the transistor 2T53 consists of the sum of two runs. The first in the signal obtained in result of integration of the run from emitter of transistor 2T53 in circuit 2R66, 2R67 (linearity control), 2C56.

in result of interruption performed by the circuit consisting of 2D53, 2D54, 2D55 diodes and 2R78, 2R79 resistors. This transistor conducts in time of negative half of deflecting current causing in this way output transistor's 2T102 conductivity.
The vertical deflection power's output stage, constructed of 2T101 and 2T102 transistors, is situated on upper plate of deflection block.

4. The power supply block BZ 2001 (fig. 14)

The main purpose of power supply block is to generate the stabilized direct voltages necessary for the work of others receiver block and receiver's protection against short-circuits and over-voltages. Power supply operation depends on keying of the rectangle run of the direct voltage received from diode rectifier connected to the 220 V source. Transistor 3T101 works as the key. This transistor's load is made by the convertor's output transformer 3Tr102.
The pulse voltages obtained on taps of secondary transformer winding are rectified in diode rectifiers and filtered to give the required direct voltage.

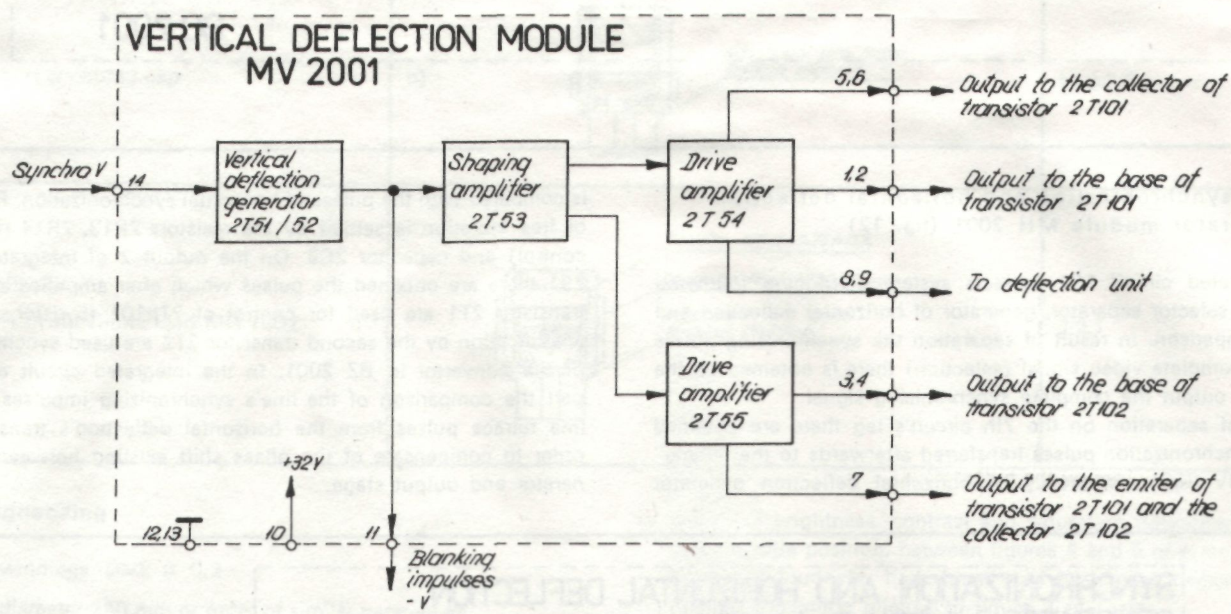


Fig. 13. Frame module's MV 2001 block diagram

In result of weak current charging the capacitors 2C55, 2C56 through resistors 2R63 (amplitude control) and 2R64, and next discharging them in circuit consisted of diode 2D52, resistor 2R61 and saturated transistor.
Diode 2D52 is applied to separate the generating stage from the circuit generating the saw-tooth voltage in scanning period and diminishing the linearity and amplitude control reacting on the multivibrator's work.
After current amplification of the signal by the two-stage preamplifier built on transistors 2T53 and 2T54 there is obtained a signal necessary for control of 2T101 transistor in positive cycle of deflecting current. Simultaneously at this time transistor 2T55 is chocked

Rectangular voltage controlling the keying transistor's 3T101 base is generated in the stabilization module MN 2001.
This voltage given from module's MN 2001 output 6 to the controlling transformer 3Tr101 primary voltage and after transforming is carried on through the shaping system 3R109, 3C108, 3R108 to the transistor's 3T101 base. Stabilization of the output voltages from the convertor is performed on the principle of controlling this transistor pulses' width. Increasing the transistor's conductivity period causes increase of power transferred by output transformer what results the increase output voltages.
Controlling voltage applied to the modulation of transistor's 3T104 controlling pulses' width is generated in stabilization module MN 2001.

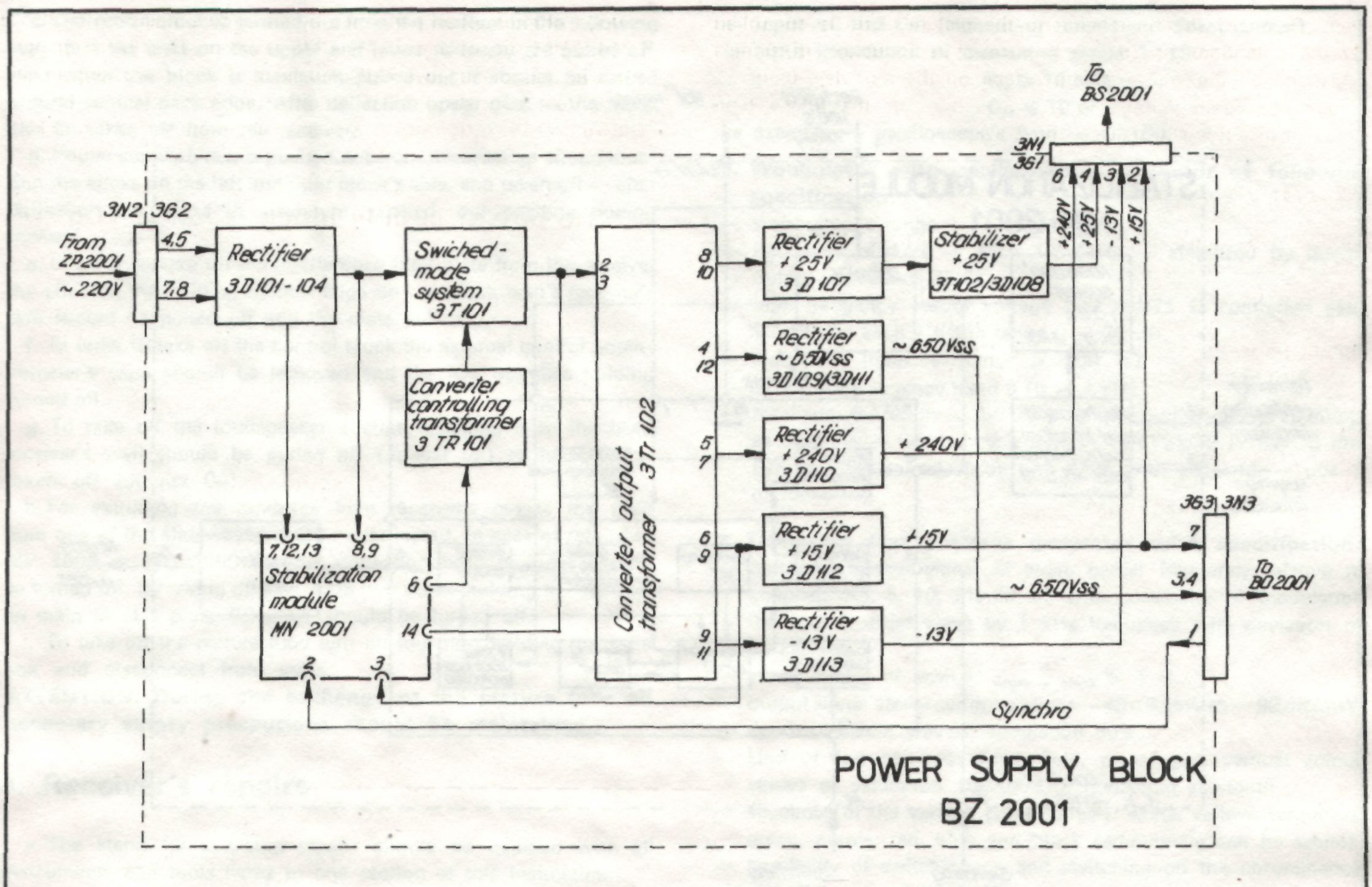


Fig. 14. The power supply block's BZ 2001 block diagram

4.1. Stabilization module MN 2001 (fig. 15)

The module MN 2001 generates rectangular voltage controlling transistor 3T101 on plate BZ 2001.

Transistor 3T3 through transformer 3Tr101 on main plate BZ 2001 controls the main switchover transistor 3T101. Controlling pulses are delivered to base 3T3 by the integrated circuits S1 on output 6. Integrated circuit S1 posess the following functional components: generator synchronized by the pulses of the line, modulator of pulses width, comparator, switching-on circuit controlled by the DC voltage (working in case of long lasting overvoltage and short circuits as well as small main voltage).

The supply voltage 12 V received from the rectified line voltage is connected to the terminal 1 of S1 circuit.

Synchronising pulses of line frequency are passed to circuit's input 2. The component 3C14, 3R16 are stating the generator's free running frequency. It must be higher than the frequency in time of synchronization.

In comaparator's system the reference voltage 6,2 V (on term signal) is compared to control voltage (terminal 10). Rising of control voltage decrease the output voltage's filling coefficient on output 6 and inversely.

The control voltage is received as result of keying through transistor 3T1 of the voltage taken from output transformer's 3Tr102 secondary winding in BZ 2001 by the modules of line frequency taken from deflection block and next recified in detector's unit constructed on transistor 3T2. Simultaneously the signal received before detector is applied for generator's synchronization. Potentiometer 3R7 serves for setting the supply voltages required for the others receiver's blocks. The voltage proportional to current flying in primary winding output transformer 3Tr102 are carried on between outputs 12 and 11 of the circuit S1. When this voltage exceeds 1 V the system starts to "test". It automaticaly switches on and switches off the output voltage. At the momentary exceeding of permissible current's value in transformer's primary winding system switches off and again automatic switches on the output voltage. At the durable exceeding of this maximum current such process is repeated several times. After each "testing" impulse increases voltage on capacitor 3C7. After exceeding by this voltage 5 V level the module permanently blocks the supply. When overvoltage takes place in the system, what is shown as voltage increase on the integrated circuit output 8 over 6,2 V, the system acts similary. The proportion of the capacity 3C7 to the capacity 3C8 settles quantity of switching operation at the durable short circuit or overvoltage.

After switching on the supply the width of module's output impulse increases fluently causing gradual increase of output voltages and diminishing possibility of damage during switching on. Time of "soft start" is determined by the value of time constant elements 3R10, 3C8 on output of integrated circuit S1.

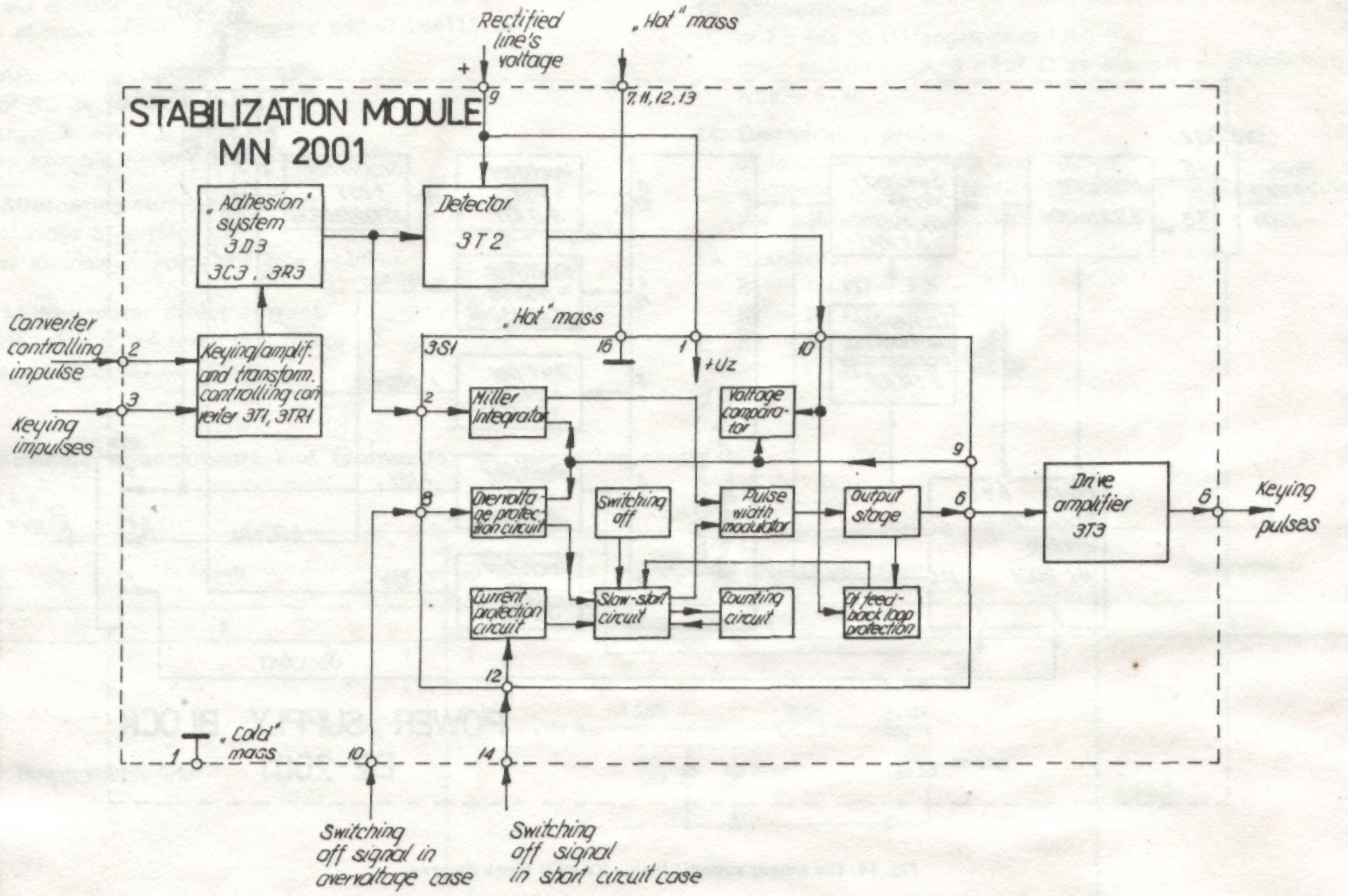


Fig. 15. Stabilization module's MN 2001 block diagram

4.2. Interference filter ZP 2001

The task of interference filter is to reject the noises effected by the signals transferred from the receiver to the supply line. This task is performed by the reactor 3L51 and capacitors 3C51 and 3C52. Moreover on the interference filter plate is situated the system cooperating with the coils demagnetising the picture tube's mask— posistor 3R52 (binary thermistor of positive temperature coefficient), resistor 3R53 and capacitor 3C53.

In moment of switching on the receiver to the line the posistors resistance is very small. Through the demagnetising coils flows big current about 5 A value and the voltage on the demagnetising coil's terminals is ⩾ 250 Vpp.

Flow of current causes posistors heating and gradual increase of its resistance and therefore decreasing of demagnetising current. After about 40 s it takes place the stabilising of the voltage on demagnetising coils on level ⩽ 1 Vpp.

Resistor 3R53 has the task to shut the way for current's posistor connected to the input terminal what is necessary for blocking the demagnetising coil's current in fixed state.

5. Picture tube's plate PK 2001

Picture tube's plate PK 2001 is applied to carry on video signals R, G, B received from signal block BS 2001 to corresponding picture tube's cathodes and to transfer the heating voltage from deflection block BO 2001 to picture tube, second grid voltage and third grid voltage destined for picture's sharpness control. On the plate is also situated the set of protectives gaps spark protecting the receiver's systems against damages caused by possible overvoltage on the picture tube's electrodes.

VIII. RECOMENDATIONS FOR SERVICING REPAIRS

1. Short description of receiver's construction

- Receiver's construction is a block-module type (list of blocks and modules is given in Section III).
- The blocks are inter connected by means of connectors enabling quick disconnection without soldering tools.
- The modules are connected with blocks through multi-contacts connectors with coding key and slideways proper insertion of any module to the correspondending place. It is possible for servicing purpose to use the modules on the print side.
- Receiver's blocks can be pushed out or deflected to position when is easy access to the main plate or modules from the element's side or mosaic's side.

2. Procedure at receiver's dismantling

ATTENTION. Before beginning of receiver's dismantling there is necessary to remember to take off the mains cable's plug from the line socket and discharged the picture tube and high voltage multiplier by the probe (section IX, point 14).

a. The back cover can be taken off after turning off four holding screws.

b. The signal block can be turned around right vertical edge after compressing two clicks on the left side over and under block and pulling this block back. After turning off two screw on top and bottom on the right edge, pushing down the lower slideway and pulling the block forward — it can be taken off from the holding slideways.

c. Deflection block is pushed out from the receiver in the following way: first the cliks on the upper and lower slideway are pulled off, next when the block is maximum pulled out it should be turned around vertical back edge. After deflection upper click — the block can be taken off from the receiver.

d. Power supply block is pushed out from the receiver after deflection the clicks on the left and right block's side, and taken off — after deflection the clicks in maximum pushed out position pulling forward.

e. In order to take off the interference filter plate from the receiver the click on the holding frame's edge on the block wall's receiver's side should be pulled off and the plate pulled up.

f. In order to take off the control block the external control potentiometer's caps should be removed and the four spindles holding turned off.

g. To take off the loudspeaker 4 clips fastening it to the front receiver's wall should be pulled off (Jowisz 05) or two springs taken off (Jowisz 04).

h. For extruding the modules from receiver's blocks the click from one of the slideways should be deflected. In case of removing MP 2005 or MG 2000 the bar conecting both modules should be turned off. By taking off MG 2006 two screw holding this module on main block's plate BS 2001 should be turned off.

i. To take off the picture tube turn off four nuts holding it on the box and disconnect from mass.

ATTENTION. During the exchange of the picture tube all necessary safety precautions should be maintained.

3. Receiver's repairs

a. The stand for servicing repairs should be equiped with all instruments and tools listed in one section of this Instruction.

b. Before starting any repair — take off back receiver's wall, switch on receiver to the line and state the kind of defect and possible place of its apperance.

c. The exact defect's location should be made by measuring relative voltages and observation of processes and characteristics.

d. If defect which appears in any module or block could not be quickly located the defected module or block should be replaced by the proper one.

e. Defected modules or blocks can be repaired only on the stands specially prepared for such work.

f. When soldering or desoldering any components from the printed plate remember — not to overheat the soldered points. Such unskilled work conducts to destruction of printed plates (causing unsticking and breaking away of the foil from laminate). For soldering it should be applied the solder: LC-60 Cu2 1230 with colophony acc. PN-64/M-69410.

g. Components foreseen to be removed should be cut off, after that the solder's and terminal's remaining pieces removed from the soldered point by means of miniature 40 W soldering iron and solder puller off RML-R-023 or other proper for this task.

h. Defected integrated circuits should be desoldered out by means of miniature soldering tool 40 W with specialy for that prepared chisel. If it is not possible — procede as given in point "g".

i. When repair is completed perform necessary control and tuning relative to the repaired defect, module and block.

j. After repair and control switch off the receiver from the line and mount the back cover.

k. In case if repaired receiver is under guaranty it should be sealed.

IX. LIST OF MEASURING INSTRUMENTS AND AUXILIARY ARRANGEMENTS NECESSARY FOR TUNING, REGULATION AND REPAIR OF THE RECEIVER

1. Two channel oscilloscope of parameters:

— range of transferred frequencies ≥ 10 MHz,
— maximum sensibility ≤ 10 mV/cm,
— error of time and amplitude measurement ≤ ± 5%,
— maximum input voltage ≥ 700 V,
— input AC and DC (alternating current and direct current),
— input impedance of measuring probe 1 : 10

$R_{in} \geq 10\ M\Omega$

$C_{in} \leq 10\ pF$,

as example — oscilloscope's type — OS150.

2. Wobbulator with oscillographic indicator of following specification:

— wobbulator's range 1 — 45 MHz,
— frequency markers — each 1,0 MHz — stabilized by quartz,
— output impedance 75 Ω,
— high frequency output voltage 200 mV/75 Ω controlled each 10 dB and each 1 dB in range 0 — 70 dB,
— indicator's input resistance ≥ 500 kΩ,
— indicator's frequency band 3 Hz — 7 kHz,
— maximum sensibility — full deflection for output voltage 20 mVpp, as example — wobbulator's type — POLYSKOP IV SWOB firm R/S or universal television unit K935 with generator — pos. 4 of tool's list.

3. Television test patterns generator with specification:

— output television signal of video carrier frequency relative to channels 1,3, 8, 10, 21, 38, 60 with possibility of modulation the sound carrier wave by 1 kHz frequency with deviation of 50 kHz,
— video output of level $U_{white - black} \geq 1$ V,
— output signal's level controlled from — 40 dB/mW to — 80 dB/mW,
— depth of carrier wave's modulation 90%,
— kind of test patterns: white field, cross, grid, vertical colour stripes of saturation 100/0/75/0, horizontal sawtooth,
— sequence of the vertical colour stripes: white, yellow, turquoise, green, purple, red, blue and black (additionaly can be white),
— possibility of switching on and switching off the chrominance signal,
— possibility of switching on and switching off separate colours R, G, B

as example — generator's type — K935C.

4. Generator of parameters:

— frequency range 3 — 50 MHz,
— output voltage 0 — 1,5 Vpp,
— output impedance 75 Ω,
— possibility of switching off the output voltage,
— possibility of frequency modulation by signal 400 Hz or 1000 Hz with deviation $F = 50$ kHz,
— possibility of modulation by video signal,

as example — generator's type — K 930.

5. Stabilized power supply following, specification:

a) nominal voltage

+12 ± 0,5 V,
+15 ± 0,5 V,
−12 ± 0,5 V

current capacity of each source ≥ 125 mA,
maximum ripple voltage ≤ 5 mVpp,

b) controlled voltage +1 V ÷ +25 V

current capacity ≥ 500 mA
maximum ripple voltage ≤ 5 mVpp
stabilization of the fixed voltage ≤ 1%
as example power supply — P 316 MERATRONIX.

6. Frequency meter (digital frequency meter) of following specification:

— measuring frequency 0 — 5,5 MHz
— measuring accuracy ± 1 kHz
— input resistance ≥ 500 kΩ

as example — meter's type — PFL 20 ZOPAN.

7. Oscilloscope with memory of maximum input voltage $U_{in} \geq 250$ V

8. Digital direct voltage voltmeter of following specification:

a) — range 10 V (DC)
— reading's accuracy 0,001 V,

b) — range 250 V (DC)
— reading's accuracy 0,01 V

as example — voltmeter's type — Multimeter V533.

9. Direct voltage voltmeter
of $R_{in} \geqslant$ 100 kΩ/V
$U_{max} \geqslant$ 700 V, class 1,5
as example — voltmeter's type V 640 or UM111.

10. Alternating voltage voltmeter
of $R_{in} \geqslant$ 10 kΩ/V
$U_{max} \geqslant$ 300 V_{sk}, class 1,5
as example — voltmeter's type UM111.

11. Alternating current ammeter
of range 5 A, class 1,5
as example — ammeter's type — V640.

12. Milliammeter direct current
class 1,5, 2 mA range in housing,
assuring of 30 kV insulation,
reading accuracy 0,04 mA
as example — milliammeter's type — V640.

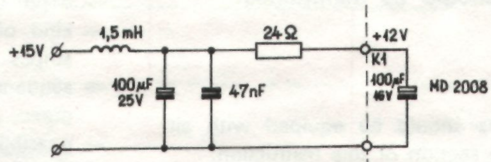
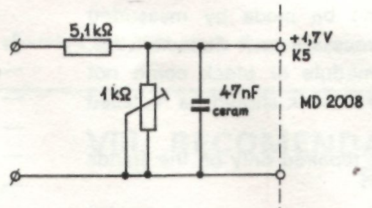
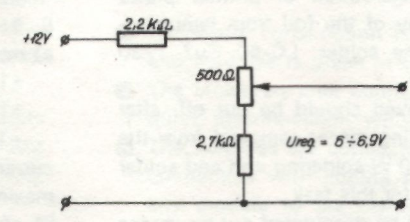
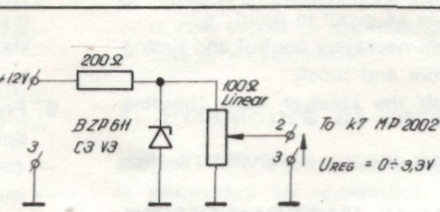
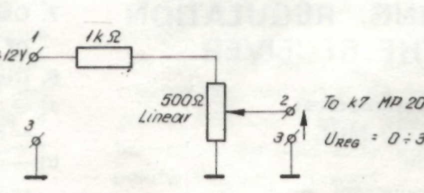
13. Kilovoltmeter
of 7,5 and 30 kV ranges, class 1,0
input impedance $\geqslant 3 \times 10^9$ Ω as example — kilovoltmeter's type — S196.

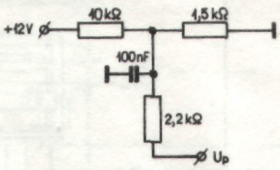
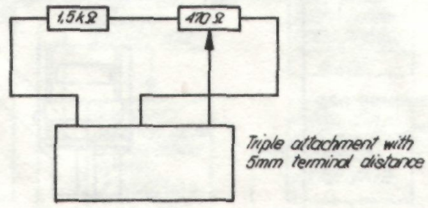
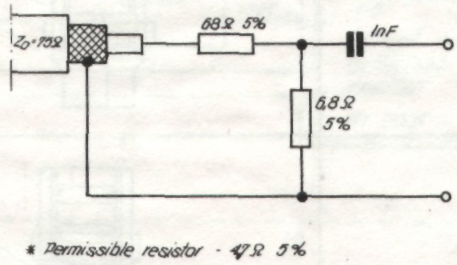
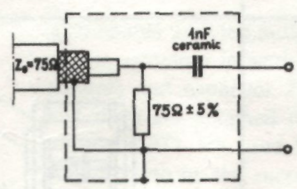
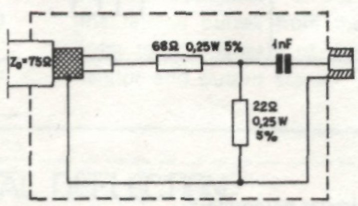
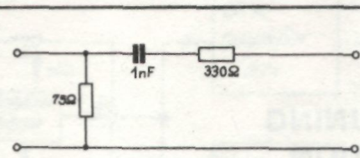
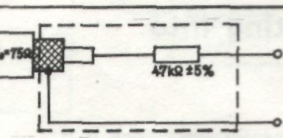
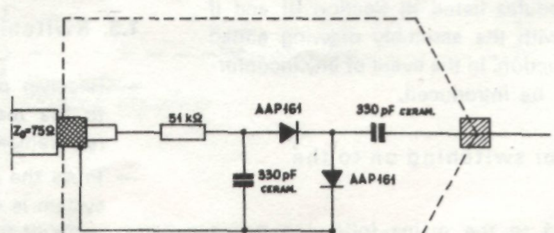
14. Discharging probe
of resistance $\geqslant$ 5 MΩ and voltage withstand $\geqslant$ 30 kV applied for discharging of picture tube's and high voltage multiplier's capacity.

15. Resistors:
R1' — 1,4 kΩ — 5% — 45 W
R1' — 2,7 kΩ — 5% — 25 W
R2 — 2 kΩ — 5% — 35 W
R2' — 1 kΩ — 5% — 65 W.

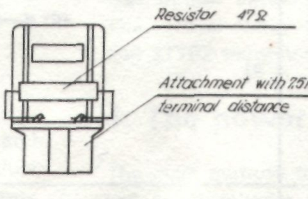
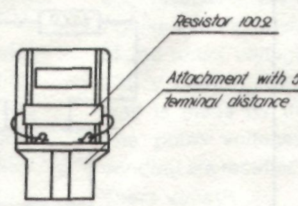
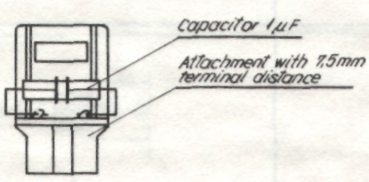
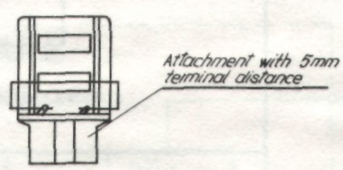
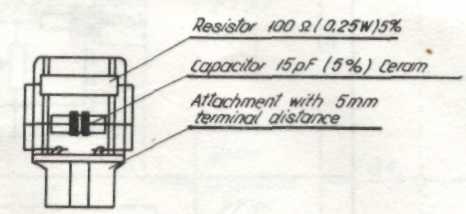
16. Auxiliary arrangements and termination of measuring cables

TABLE 6

No.	Name		Arrangement (picture's description)	Destination
1	2		3	4
1	Power supply filter			2.11.1 2.11.2
2	Polarization systems	a)		2.11.1 2.11.2
		b)		2.7
3	Systems for the manual control of NP 2002 module	a)		2.2
		b)		2.5

1	2	3	4
4	a) Systems for generation of matrixes polarization	a) 	a) 2.11
	b) Potentiometer of manual amplification control	b) 	b) 2.3
5	Coaxial signal cables	a)  * Permissible resistor - 47Ω 5%	2.2.1
		b) 	2.2.2, 2.5, 2.7, 2.11, 2.11.1, 2.11.2
		c) 	2.11, 2.3, 2.9
		d) 	2.8
6	Collective coaxial cable		2.3, 2.5
7	Detection probe		2.11, 2.7, 2.8, 2.9

condt table 6

1	2	3	4
8	Reference circuit's damping cap		2.2.1
9	Resonance circuit's L50, L52 damping cap		2.2.2
10	a) Cap for setting of horizontal synchronization	a) 	a) 1.6.2
	b) Short circuiting cap	b) 	b) 2.2.2
11	Cap with substitute load MG 2002		2.2.1

17. Demagnetizing
loop:
1450 windings DNE ø 0,3

inside diameter 250 mm or other of similar parameters.

18. Capacitor
47 nF/25 V.

X. RECEIVER'S TUNING AND REGULATION

1. Receiver's preliminary putting into operation

1.1. Checking receiver's assembly

Before receiver is put in operating it is necessary the check if it is furnished with blocks and modules listed in Section III and if it is assemblied in accordance with the assembly drawing added as the enclosure No 3 to this Instruction. In the event of any inconformities necessary changes should be introduced.

1.2. Preparing the receiver for switching on to the mains

Before the receiver is connected to the mains following action should be performed:

— sliders of brightness, contrast and saturation potentiometers set up in middle position, between figures 4 and 5 of scale;
— sliders of loudness, high tones and low tones potentiometers set up in position relative to figure 3 of scale;
— switch AFC (automatic frequency control) set up in open position;
— to the receiver's aesial input connect a television signal cousisting of vertical colour stripes with the level of — 50 dB/mW from test pattern's generator (section IX, point 3); this signal level should be kept during all regulations described in this instruction if not given otherwise;
— connect ammeter (section IX, point 11) to the circuit of net line.

ATTENTION. Before switching on the receiver to the mains no regulation in power supply block should be carried in relation to manufacture regulation. Misadjustment of this block can cause damage of other receiver's blocks.

1.3. Switching on the receiver to the mains

— Receiver prepared according to point 1.2. should be connected to the mains through separating transformer with fulfills the requirements of PN-75/T-04501 — points 2.2.1, 2.5 and 5.1.
— Press the key mains and when the operation of demagnetizing system is completed after about 5 sec read on the ammeter the value of the current taken by the receiver from the mains 220 V, 50 Hz.

— If this current's value exceeds 1 A (this is approximate value because instrument is scaled for sinusoid run) the receiver should be switched off, because this shows the defect of any block or the error in the assembly.
— In such case the receiver's checking should be repeated (acc. to point 1.1) or defected block must be found. After repair repeat operations described above.
— Tune the receiver by hand to the selected channel (acc. to point 1.4) and after that press the key AFC.

ATTENTION. In case if receiver automatically switches off without consumption of current exceeding 1 A the regulation should be performed of the voltage switching off the convertor (acc. to point 1.9 of this section).

1.4. Receiver's fine tuning to the selected channel

Following operations should be performed for programming whichover channel in bands I — V.

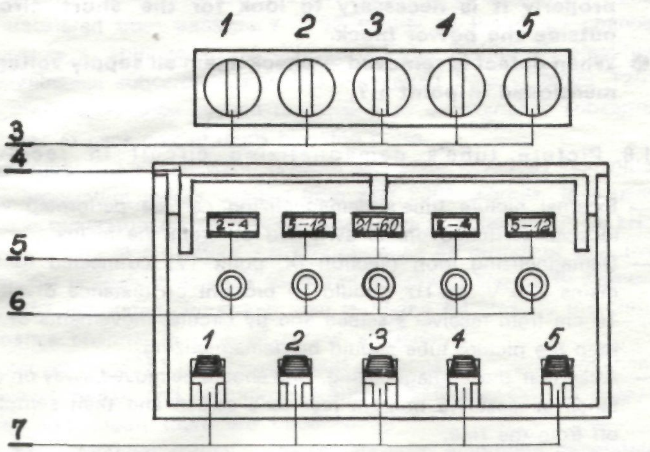


Fig. 16. Drawing programming unit ZZP 20521 E
3 — sensor fields of programm's switch over, 4 — flap, 5 — scales, 6 — fine tuning handwheels, 7 — range's changing over switches

— Press off the AFC receiver's key.
— Raise flap *4* completly up, and after that press it home.
— Select with the switchover *7* (by pressing or pulling off) the scale *5* containing wanted channel. The arrangement of channels on three ranges is following:
range I, II — channels from 2 to 4,
range III — channels from 5 to 12,
range IV, V — channels from 21 to 60.
— Touch the switchover's selected sensor field *3*.
— Tune fine handwheel *6* the receiver to the desired channel turning it to the right or to the left. The red marker sliding on scale *5* shows approximately the channel to which receiver is tuned. At the optimum fine tuning of receiver the picture should be readable and the sound not distorted.
— Press the AFC key.
— Operating in similar way with other segments it is possible to program in sum 5 wanted channels. Selecting one of them is achieved by touching relative sensor filed of the program's changing over switch.
— *After programming the flap 4 can be pulled off up to resistance* and next dropped down.

1.5. Checking the interference filter ZP 2001

Measure with voltmeter (section IX, point 10) the main's voltage to the receiver. It should be in range between 220 V + 5%, –10%

1.5.1. Checking the voltage on interference filter's output

With the same voltmeter measure the voltage on filter's output between points 3P53 and 3P54. This voltage should not differ from the voltage feeding the receiver more as ± 2 V.

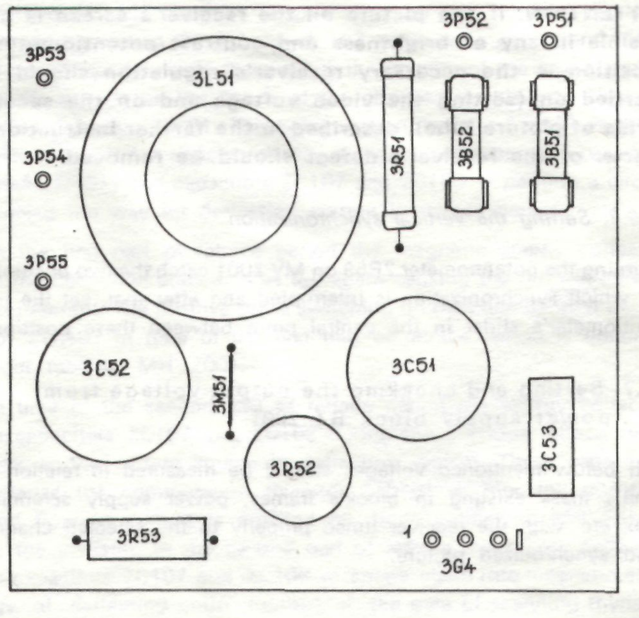


Fig. 17. Arrangement of components and measuring points in interference filter ZP 2001

1.5.2. Checking the demagnetizing unit of picture tube

Checking the function of picture tube's demagnetizing unit should be performed in moment of switching on the receiver when its elements have ambient temperature (cold thermostor) in following way:
— connect the oscilloscope with memory (section IX, point 7) between the terminals 1 and 3 3G4 socket's;
— switch on the receiver by change over switch (line) and read the voltage's value between-peaks from oscilloscope's screen.
When the set works properly this voltage's value should be:
— in switching on moment $U \geqslant$ 250 Vpp
— after 40 sec time $U \leqslant$ 1 Vpp

ATTENTION. It is allowed to check acc. point 1.5 on the stand outside the receiver. The other way of checking the demagnetizing system, assuring proper examination, is allowed.

1.6. Setting the phase of horizontal and vertical synchronization

The regulation should be carried on before setting and checking the voltage in feeding block.

1.6.1. Setting the horizontal synchronization's phase

— Connect one oscilloscope's input (section IX, point I) to point P352 in block BS 2001.
— Connect the second input to the one of given points: 2G1-3, 2G1-5, 2W1-2, or 2W1-4.
— Turning potentiometer 2R10 on MH 2001 shift the return line's pulse to the centre of quenching line's pulse in video signal.
— Disconnect the oscilloscope from the receiver.
— The substitution method of setting based on setting the picture without wrappies is also alloweed.

1.6.2. Setting the horizontal synchronization

— Pass the grid signal on the antenna input.
— By means of the cap (section IX, point 16. 10 a) short circuit points 2Z2 on the main plate BO 2001 or P353 on main plate BS 2001.
— Turning the potentiometer 2R14 on MH 2001 set up the slow speed horizontal deflection generator's frequency on the border synchronizing the picture on the screen.
— Take off the cap from points 2Z2.

ATTENTION. If the picture on the receiver's screen is not visible in any of brightness and contrast potentiometer's position — the necessary receiver's regulation should be carried on (setting the video voltage and on the second grids of picture tube), described in the farther Instruction's parts, or the receiver's defect should be removed.

1.6.3. Setting the vertical synchronization

Turning the potentiometer 2R59 on MV 2001 catch the two positions, in which synchronization is interrupted and after that, set the potentiometer's slider in the central point between these positions.

1.7. Setting and checking the output voltage from power supply block BZ 2001

All below mentioned voltages should be measured in relation to unit's mass existing in block's frames, power supply screnning box etc. with the receiver tuned properly to the selected channel and synchronized picture.

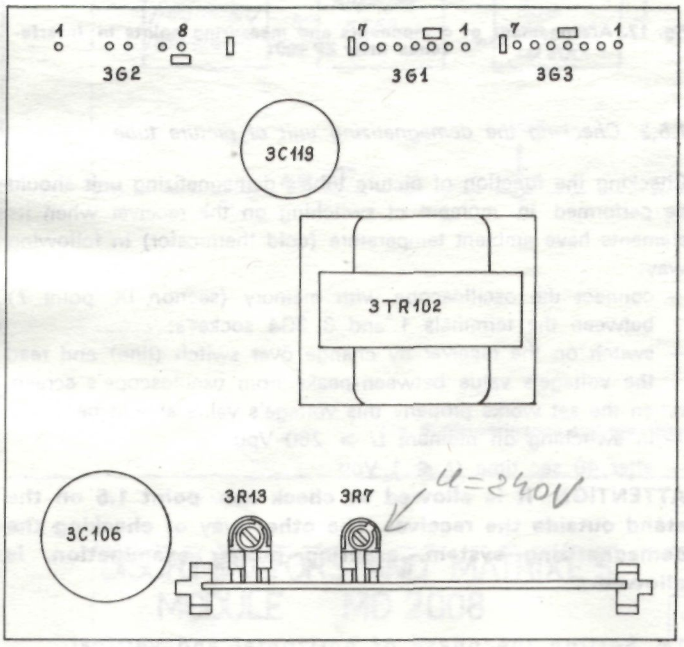


Fig. 18. Arrangement of periodical regulation's elements the power supply block BZ 2001

1.7.1. Checking and setting the voltage +240 V

— Brightness and contrast potentiometers should be set for minimum picture tube's luminance but enabling picture's observation.
— Measure by voltmeter (section IX, point 8 b) the direct voltage on the socket 3G1-6 or in point P355 of signal block. It should be +240 ± 1 V.
— In case of other voltage's value — set above mentioned value by potentiometer 2R7 on MN 2001.

ATTENTION. It is the basic regulation of all receiver's supply voltages which after exact setting +240 V should be as below.

1.7.2. Checking the voltage +25 V

— Measure by voltmeter the direct voltage in one of following points: 3G1-4, 3W1-6 or 1G2-7.
— The voltage value should be +25 V ± 2 V.

1.7.3. Checking voltage –13 V

— Measure by voltmeter the direct voltage in one of following points: 3G1-3, 3W1-2 or 1G1-4.
— The voltage value should be –13 V ±1 V

1.7.4. Checking by voltmeter the direct voltage +15 V

Measure by voltmeter the direct voltage in one of following points: 3G1-2, 3G3-7, or 3W1-1. The voltage value should be +15 V ±1V.

1.7.5. Checking the pulse voltage

Connect the oscilloscope (section IV, point 1) to one of following points: 3G3-3,4 or 2G3-1,7 and measure the pulse voltage of horizontal deflection frequency. The voltage value should be 650 Vss ±35 Vss.

ATTENTION

- **In case of one of above mentioned voltages missing the defect should be searched in power supply block on the transformer's 3Tr102 secondary side.**
- **In case of lack or not proper value of all supply voltages, if is not possible to set them acc. to point 1.7.1. the defect should be searched in module MN 2001 or before transformer 3Tr102. If this part of arrangement operates properly it is necessary to look for the short circuit outside the power block.**
- **When defect is removed — check again all supply voltages mentioned in point 1.7.**

1.8. Picture tube's demagnetizing circuit in receiver

— External picture tube's demagnetizing can be performed with receiver switched on, or switched off from the mains.
— Demagnetizing loop (section IX, point 17) connected to the mains 220 V, 50 Hz, should be brought on distance of about 10 cm from receiver's screen and by circular movements of the loop the picture tube should be demagnetizing.
— After that the demagnetizing loop should be moved away on distance at least 1,5 m from receiver's screen and then switched off from the line.

1.9. Setting the convertor's switching off voltage

Setting this voltage should be done after receiver's repair and after performed all necessary regulations according this Instruction.
— Switch off the receiver.
— Pass the colour vertical stripes signal to the receiver's aerial input.
— The brightness and contrast potentiometer's slides put in position relative to scale 6 and saturation potentiometer on scale 0.
— Slider of potentiometer 3R13 on MN 2001 turn to the left extreme position (locking from above on the inserted feeding block BZ 2001).
— Connect the resistor R1 (section IX, point 15) to measuring point P355 on signal block BS 2001.
— Switch on the receiver.
— Turn potentiometer's 3R13 slider to the right up to receiver's switching on moment.
Connect resistor R2 (section IX, point 15) parallel to resistor R1. Receiver should be start testing.

ATTENTION. In case if resistor has worked over 5 minutes the above described operations should be performed using respectively resistors R1' and R2' (section IX, point 15).

2. Tuning and regulation systems in signal block BS 2001 and control block BR 2001

2.1. Tuning and regulation of the turner module MG 2006

2.1.1. Turner module MG 2006

Measuring arrangement diagram is shown on fig. 20.
— The signal from wobbulator (section IX, point 2), of level –25 dB/mW should be transferred to turner measuring point TP-FJ with cable terminated as in section IX, point 16.5c.

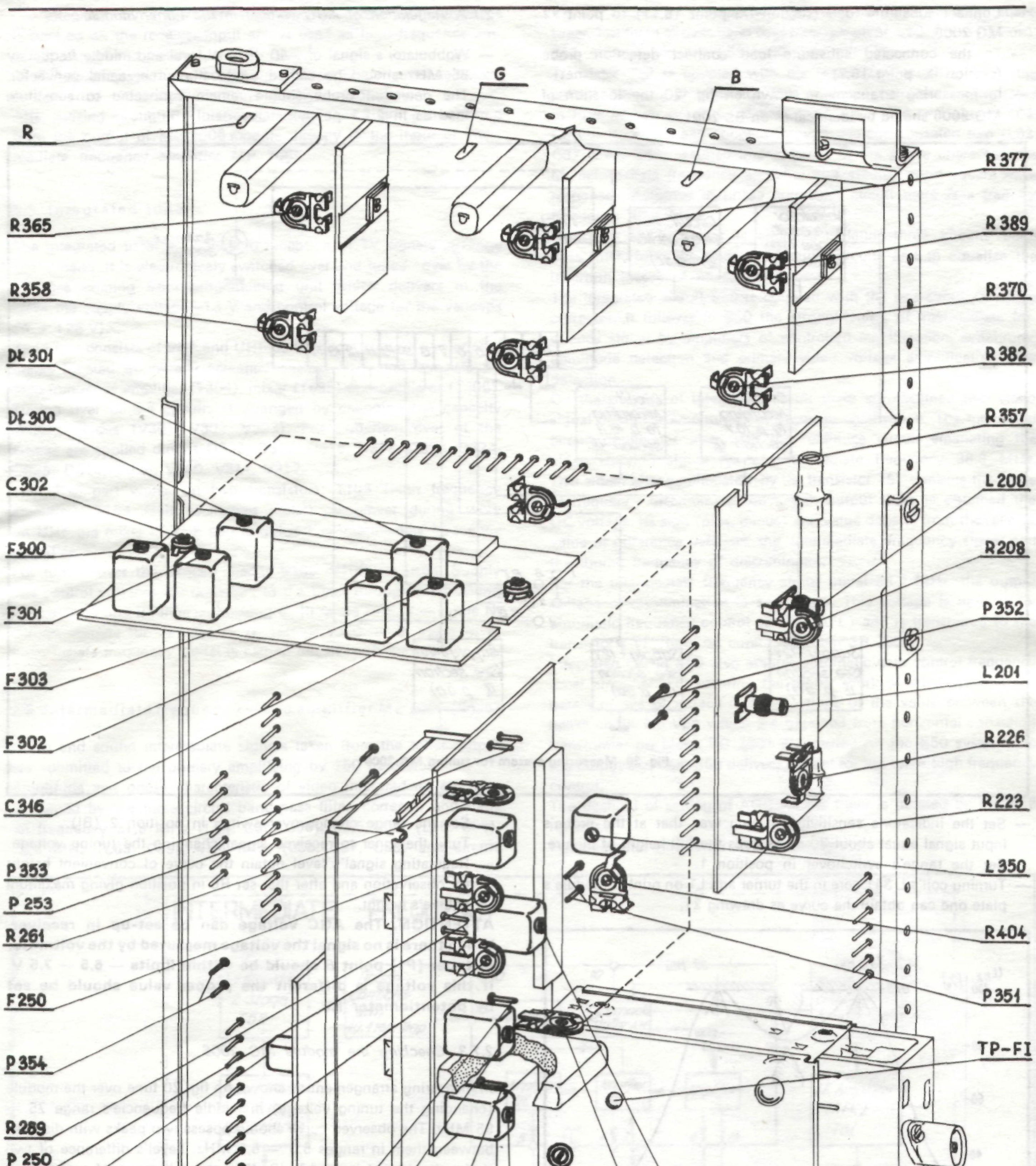


Fig. 19. The arrangement of the periodical regulation elements in signal block BS 2002

— Connect substitute load (section IX, point 16.11) to point k2 MG 2006.
— To the connected substitute load connect detection probe (section IX, point 16.7).
— In measuring arrangement shown on fig. 20 the location of MG 2006 should be identical as on BS 2001.

2.1.2. Regulation of AGC voltage in the turner module

— Wobbulator's signal of –40 dB/mW level and middle frequency 85 MHz should be carried on to the turner aerial convector.
— The detection probe should remain connected to substitute load as in 2.1.1 point.

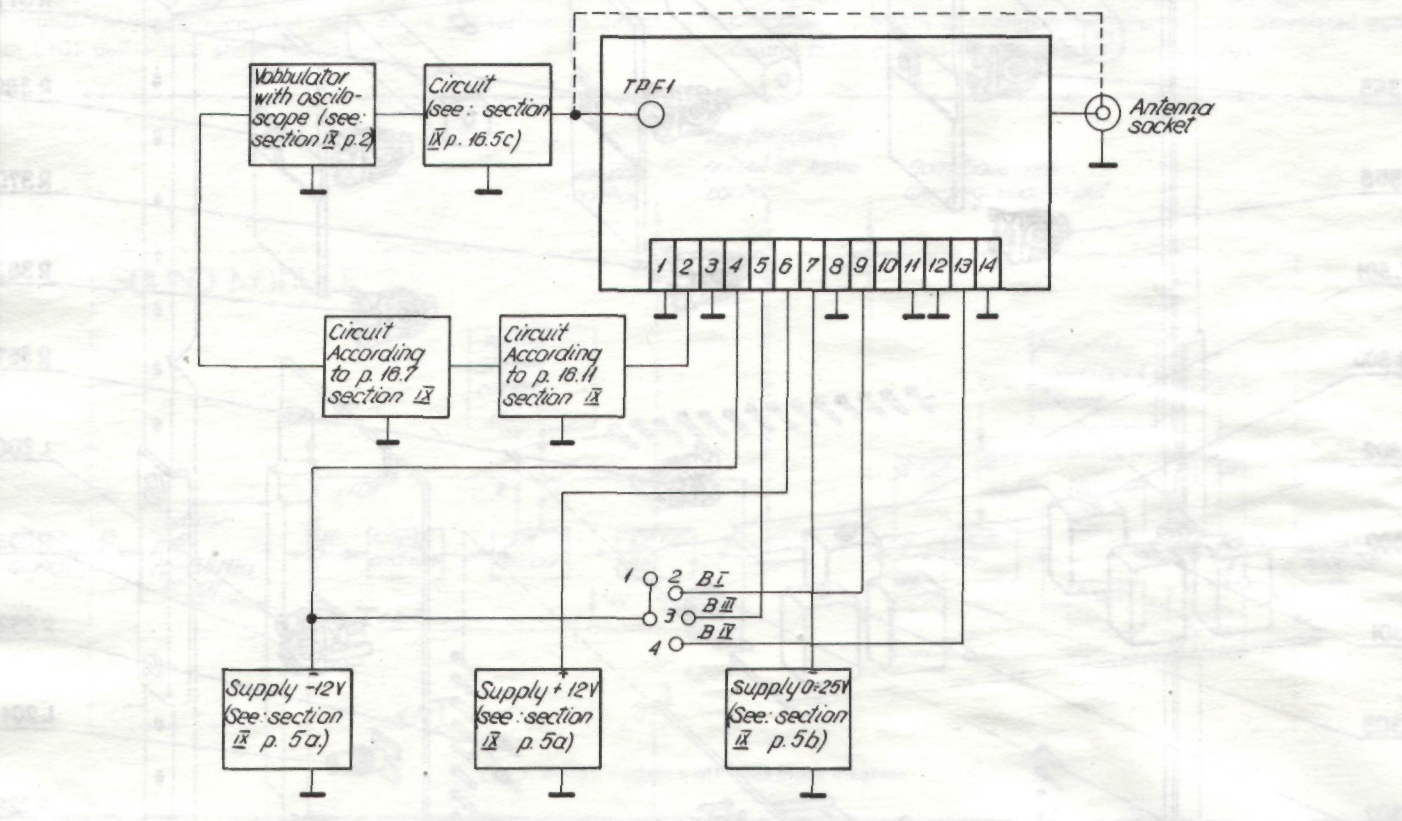


Fig. 20. Measuring system for tuning MG 2006

— Set the indicator's sensitivity in such way that at the probe's input signal equal about 30 mVss gires the full height of picture. Set the range's switchover in position 1.
— Turning coil's L 341 core in the turner and L1 on printed module's plate one can obtain the curve as drawing 21.

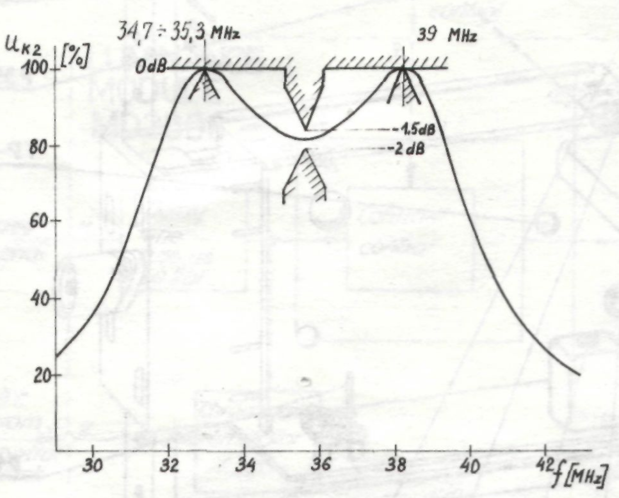


Fig. 21. Intermediate frequency filter's MG 2006 curve

— In case when spacing of peaks exceeds the tolerance allowed the value of capacitor C1 should be increased remaining in range |22—33| pF.
If the peak's spacing is to small the capacitor's capacity should be decreased.

— Set the range change-over switch in position 2 (BI).
— Tune the tuner to received signal changing the tuning voltage.
— Regulating signal's level obtain the curve of convenient height for observation and after that set R6 in position giving maximum courve's height.

ATTENTION. The AGC voltage can be set-up in receiver. When there is no signal the voltage measured by the voltmeter in tuner (P1) point *B* should be within limits — 6,5 — 7,5 V. If this voltage is different the proper value should be set by potentiometer R6.

2.1.3. Checking the module MG 2006

In measuring arrangement as shown on fig. 20 tune over the module (changing the tuning voltage) in middle frequencie's range 75 — 95 MHz. The observed curve should posess two peaks with distance between them in ranges 5,0 — 6,0 MHz. Level's difference of two peaks should not exceed 1 dB. If in the full range of tuning over (75 — 95 MHz) one of the peaks is higher, it will be necessary to correct L1.

ATTENTION. In 55 — 75 MHz frequency range the peak's level difference is allowed up to 3 dB. Above given operations *should be repeated in range B III (channels 6 — 12) by setting* the range's switchover in position 3/B III).

Tuning over the module and wobbulator in range of middle frequencies 180 — 225 MHz — check if the level difference of peaks do not exceeds 1 dB. If in the full range one of the peaks is higher, then the another L1 should be corrected paying attention to have also the peak level's difference ⩽ 1 dB for range BI. If it is not possible to obtain simultaneously on both ranges BI and BIII both peaks level's difference ⩽ 1 dB there should be necessary to correct the tuning over the tuner.

Setting range's switchover in possition 4 (B — IV) — check module's operation (courve's existance) in range 475 — 785 MHz (IV — V range).

2.2. Tuning the module MP 2005

— Take off module MP 2005 from signal block and connect it as is shown on fig. 22 to the power supply sources and to the amplification control system (section IX, points 16. 3a or 16. 3b).
— The housings of all measuring instruments connect with themselves and with tuned modules MP 2005 mass.

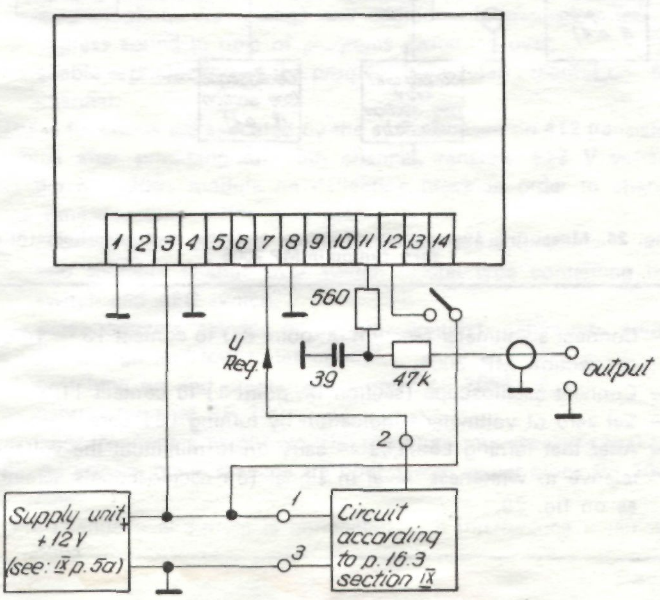


Fig. 22. Supply system at tuning the module MP 2005

— During the tuning process the wobbulator indicator's amplification should be set to that the full picture's height on the screen is achieved by the output voltage 2,0 Vpp. Tuning should be performed in sequence as described below.

2.2.1. Tuning of phase corrector and 40,4 MHz trap

— By the supply MP 2005 as on fig. 22 pass the IF signal from wobbulator on module's point P54 by means of cable (from section IX, point 16. 5a).
— *Signal's level — 35 dB/mW, controlled voltage about +2 V.* Damp the reference circuit by putting on the cap with resistor (from section IX, point 16.8) on point P52.

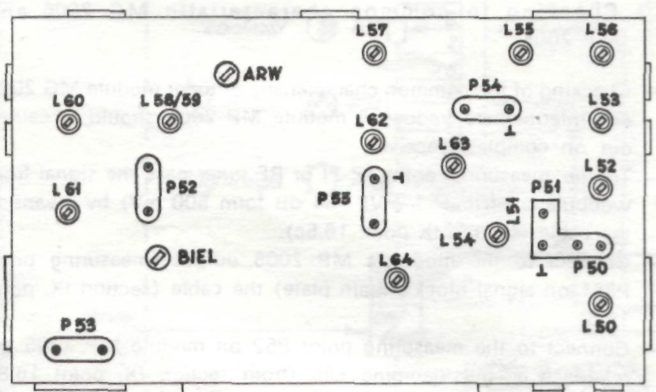


Fig. 23. The arrangement of control elements on intermediate frequency module MP 2005

— Tune off coils L62 and L63 by turning off the cores. Tuning with cores L57 and L64 — receive curve with one peak on the frequency 36,5 MHz.
— Correcting the control voltage receive curve of convenient height for observation. Afterwards turn on the core L62 till obtaining left edge's shape as on fig. 22.
Turning in the core L62 causes decrease of curve's height which should be corrected by control voltage.
— *In the last regulation phase the core L63 should be turned in* for receiving minimum of frequency 40,4 MHz.
— The final curve's shape should be as on fig. 24.

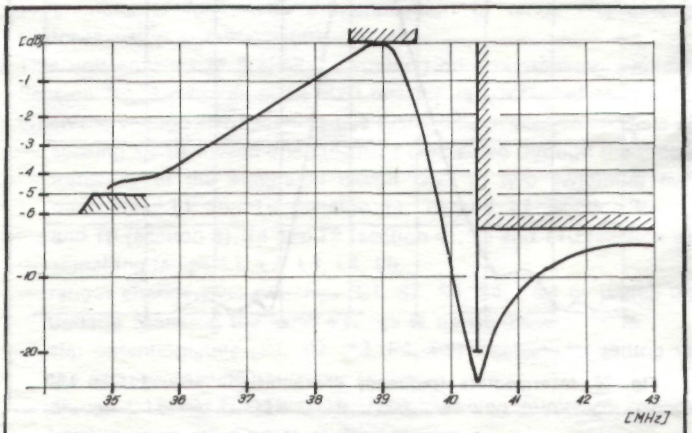


Fig. 24. Characteristic of phase corrector and of 40,4 MHz trap

2.2.2. Tuning the band pass filter

The tuning of the concentrated selectivitie's filter consists of two operations.
— In the first operation the resonance circuits L52 and L55 coupled by traps L53, L54, L56 are tuned. For that purpose L50 must be damped by putting on the point P50 a cap (from section IX, point 16.9).
— *In system as on fig. 22 the signal from wobbulator should be* put on module's k2 input by signal cable (from IX section, point 16. 5b). Signal's level −35 dB/mW. Control voltage about +2,0 V.
— The control voltage's value should be corrected in order to receive a curve of height convenient for observation, and then the traps tuned up until the minimum is obtained on following frequencies:
11,9 MHz — coil L54
33,5 MHz — coil L56
41,5 MHz — coil L53
— Afterwards, the coils L52 and L55 are tuned toget maximum on frequency 36,5 MHz. When coils are properly tuned in, the peak has the biggest amplitude and is the sharpest.
Check again and eventualy correct minima determined by traps L53, L54, L56.
— Curve's shape after proper fine tuning is shown on fig. 25.

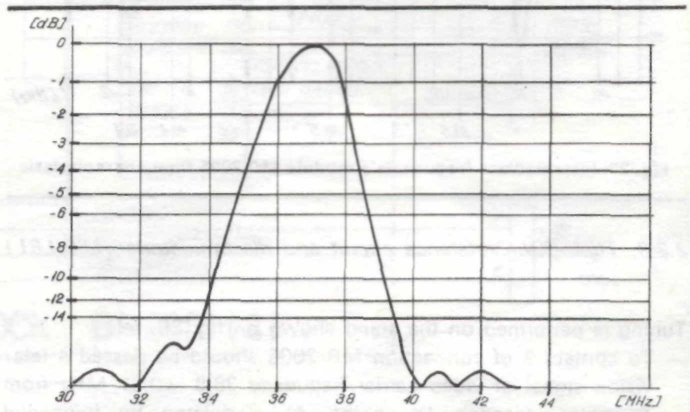


Fig. 25. Intermediate frequency after tuning of band pass filter operation

— On second operation the coil L50 is tuned and between L50 and L52 is set by streching the windings of L51. Take off the cap with resistor from point P50. Put on P51 a shortcircuit cap (from section IX, point 16.10b). Signal level –35 dB/mW. Control voltage +2,0 ±0,05 V. Turning the core of L50 set maximum peak height on 37,2 MHz.
— Curve's shape is shown on fig. 26.

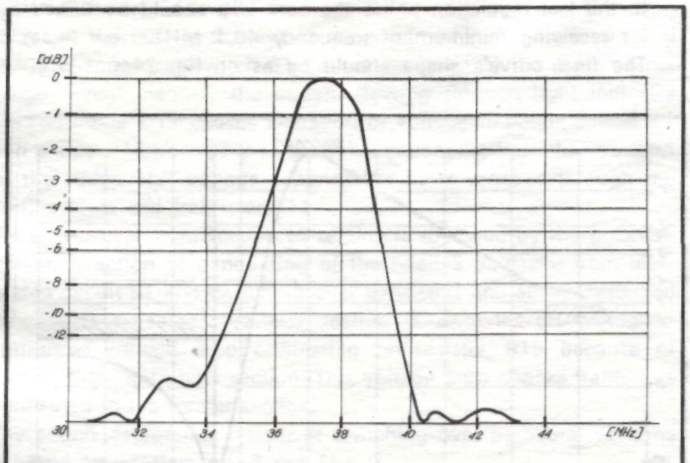


Fig. 26. Intermediate frequency characteristic after tuning L50

— For fixing the coupling between L50 and L52 take off the shortcircuit cap from P51. Decrease signal level to –45 dB/mW and carry on streching the windings of L51 the intermediate frequencie's curve to shape shown on fig. 27.

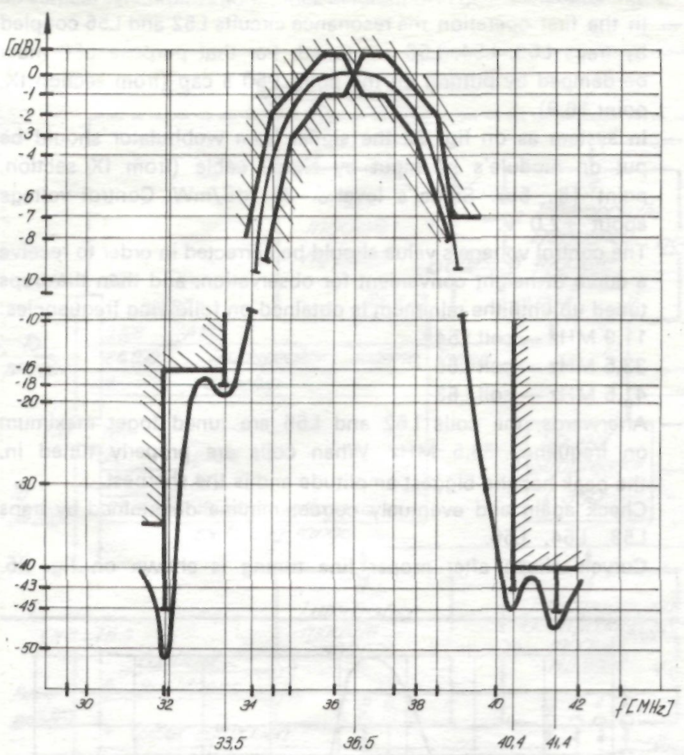


Fig. 27. Intermediate frequencie's module MP 2005 final characteristic

2.2.3. Tuning the reference circuit and discriminator's (L60/L61) zero

Tuning is performed on the stand shown on fig. 28.
— To contact 2 of connection MP 2005 should be passed a television signal of video carrier frequency 38,9 ±0,01 MHz from generator (section IX, point 4) modulated by horizontal saw-tooth signal (generator section IX, point 3) of video modulation depth 100% and level –50 dB/mW.

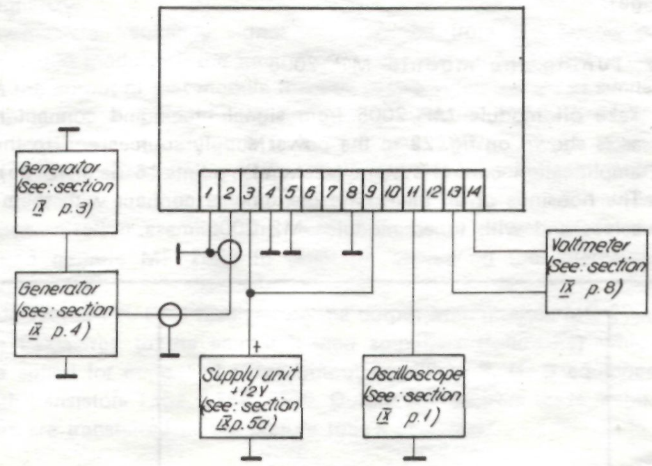


Fig. 28. Measuring system for reference circuit's and discriminator's zero tuning in MP 2005

— Connect a voltmeter (section IX, point 8a) to contact 13 — 14 of connection MP 2005.
— Connect oscilloscope (section IX, point 1) to contact 11.
— Set zero of voltmeter's indication by turning L61 core.
— After that turning L58/L59 — carry on to minimum the voltage relative to whiteness' level in signal (on oscilloscope's screen) as on fig. 29.

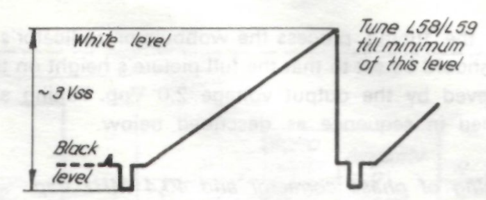


Fig. 29. Signal's shape at reference circuit's tuning

— During tuning the L58/L59 observe the voltmeter's indications. By any changes correct L61 in order to keep zero indications.

2.3. Checking to common characteristic MG 2006 and MP 2005

— Checking of the common characteristic of tuner module MG 2006 and intermediate frequency module MP 2005 should be carried out on complete receiver.
— To the measuring point TP-FI or RF tuner pass the signal from wobbulator of level 1 mV(–54 dB form 500 mV) by means of the cable (section IX point 16.5c).
— Connect to the module's MP 2005 output (measuring point P351 on signal block's main plate) the cable (section IX, point 16.6).
— Connect to the measuring point P52 on module MP 2005 the reference circuit's damping cap (from section IX, point 16.8).
— Put on the measuring point P350 the cap with manual amplification control arrangement (section IX, point 16.4b) and set the amplification in such way — to get the height of curve received on the wobbulator oscilloscope indicator's screen of value 2 Vpp (fig. 30).

— In case the received characteristic do not conform with tolerance tield shown on fig. 30 the correction should be done by turning L52 (the frequency of 38,9 MHz should be on -6 dB), and L62 coils (the flat part of curve should be horizontal) on MP 2005 module.

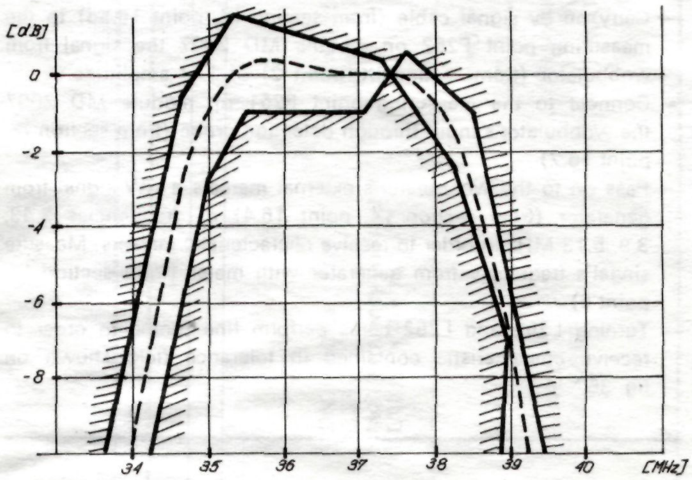


Fig. 30. Common characteristics MG 2006 and MP 2005

— If the proper regulation is not possible what indicates improper tuning of the module MP 2005 or MG 2006 — repeated correction of tuning up of these modules is required.
— Disconnect the damping resistor from point P52 and regulation system from point P350.

2.4. Regulation of RF tuner AGC voltage and of maximum amplification

— Carry on to the aerial input the signal from TV test patterns generator of level −40 dB/mW. Tune up the receiver to the selected channel observing on the oscilloscope the video signal measuring point P352 and signal block's main plate.
— To the tuner's leg *B* (measuring point P1) connect a digital DC voltage meter (section IX, point 8a).
— Regulating with the potentiometer R58 (AGC) on module MP 2005 carry on up the state when signal level's change from −70 dB/mW does not change voltage's value indicated by the meter (the value of this voltage is selected in regulation process of module MG 2006 (point 2.1.2) and corresponds to the greatest module's amplification). At the signal's level change to −45 dB/mW voltage should change to the value about −5 V.
— Regulating with the potentiometer R404 carry on up the state by which noise voltage in point P352 on signal block's main plate measured on oscilloscope without input signal on input will be 3,0 Vss ±0,1 V.

2.5. Tuning the sound module MF 2003

Tuning the sound module can be realized in two methods.

METHOD I

Tuning takes place in signal block BS 2001. Using system from section IX, point 16.3 carry on to the contact K7 of module MP 2005 the voltage +2,8 V. Set the sound power's potentiometer in the receiver on maximum.
— To the sound module's MF 2003 output k13 pass by signal cable (from section IX, point 16.5b) from generator (section IX, point 4) a modulated signal of 3 — 10 mVss level.
— Connect oscilloscope (section IX, point 1) to the point P354 on signal block's main plate.
— Turning the core of coil L101 on MF 2003 receive on the oscilloscope's screen sinusoid of maximum amplitude and without visible distortion.

METHOD II

This method is based on tuning the module on the separate stand at module's feednig as on fig. 31.

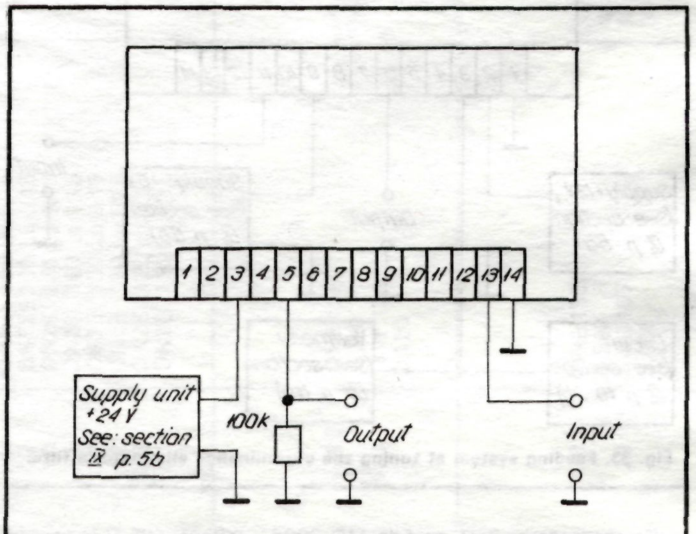


Fig. 31. Feeding system at sound module's MF 2003 tuning

— Signal from wobbulator (section IX, point 2) of level 50 mVss should be passed to system's k13 input by cable (from section IX, point 16.5b).
— To the system's k5 output connect collective cable (section IX, point 16.6).
— Turning the core of L101 on module receive characteristic as on fig. 32. Height of the curve should be 2 Vss.

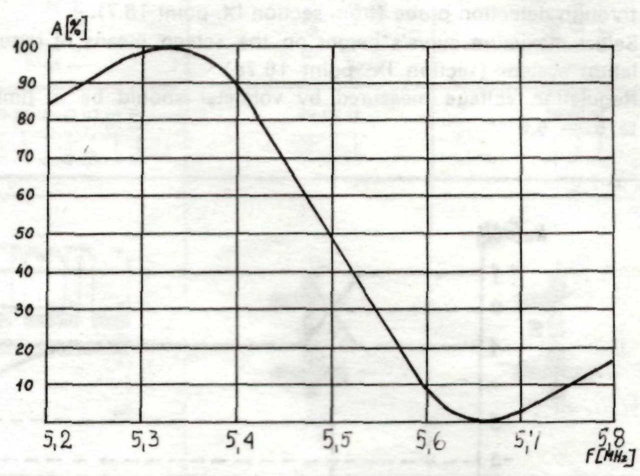


Fig. 32. Sound discriminator's characteristic

2.6. Tuning the sound drop system

— Pass from generator (section IX, point 3) a signal of level −50 dB/mW on receiver's antenna input.
— In generator the sound carrier frequency modulation should be switched on.
— Connect the oscilloscope probe (section IX, point 1) to the point P352 on signal block's main plate.
— Set with the core of filter L350 on main signal block's plate minimum of observed, on oscilloscope's screen run 5,5 MHz (for maximum oscilloscope's sensibility).

2.7. Tuning the chrominance filter

Tuning the chrominance eliminator's filter should be performed in feeding system shown on fig. 33.

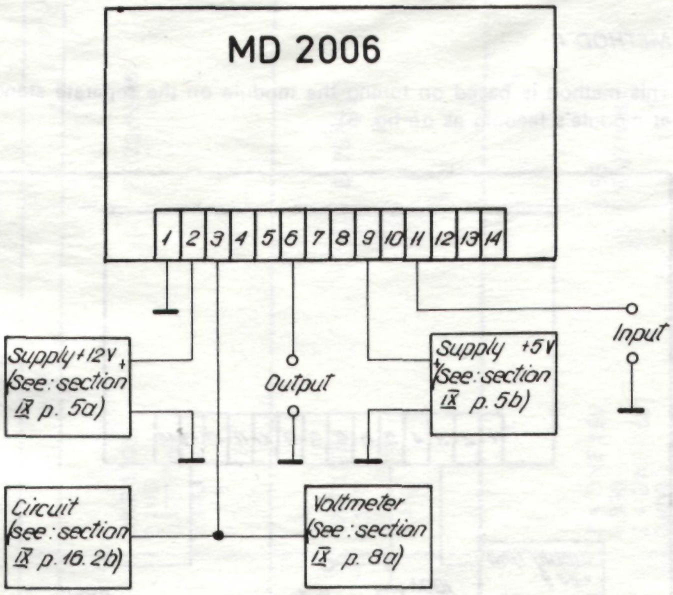


Fig. 33. Feeding system at tuning the chrominance eliminator's filter

— To the contact 9 of module MD 2006 voltage +5 V is carried on in order to switch on the chrominance traps.
— To the contact 11 passed signal from wobbulator (section IX, point 2) of level 1 Vss by the supplying cable (from section IX, point 16.5b).
— To the input of wobbulator's external markers is given not modulated signal from generator (from section IX, point 4) of frequencies 3,4, 3,9, 4,1, 4,35, 4,6 and 5,2 MHz in order to receive characteristics markers. Measure signal's frequency from generator characteristics markers. Measure signal's frequency from generator by meter (from section IX, point 6).
— Connect to contact 6 the wobbulator's oscilloscope indicator through detection probe (from section IX, point 16.7).
— Select maximum curve's height on the screen means of regulation system (section IX, point 16.2b)
Regulation voltage measured by volmeter should be in limite 6 — 6,9 V.

— Turning the cores of coils L200 and L201 on module receive on the wobbulator's screen the characteristic as on fig. 34 contained in tolerance field in range of frequency 1 — 6 MHz.

2.8. Tuning the system which adjust delay line 64 µs

— Solder off the M359 bridge on main plate BS 2002.
— *Short-circuit the transistor's T252 base with a capacitor 47 nF* to mass (section IX, point 18).
— Carry on by signal cable (from section IX, point 16.5d) to the measuring point P252 on module MD 2007 the signal from wobbulator (from section IX, point 2) of 1 V amplitude.
— Connect to the measuring point P251 on module MD 2007 the wobbulator's input through detection probe (from section IX, point 16.7)
— Pass on to the wobbulator's external markers a CW signal from generator (from section IX, point 16.4) of frequencies 3,43, 3,9, 5,13 MHz in order to receive characteristic markers. Measure singal's frequency from generator with meter (from section IX, point 6).
— Turning L253 and L252 cores perform fine tuning in order to receive characteristic contained in tolerance field shown on fig. 35.

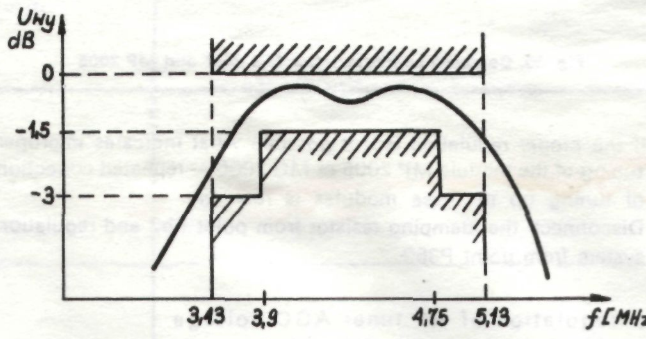


Fig. 35. Delayed channel's characteristic's tolerance field

2.9. High frequency deem-phasis circuit's tuning

High frequency deem-phasis circuit's tuning can be performed using two methods (the method II is recommended).

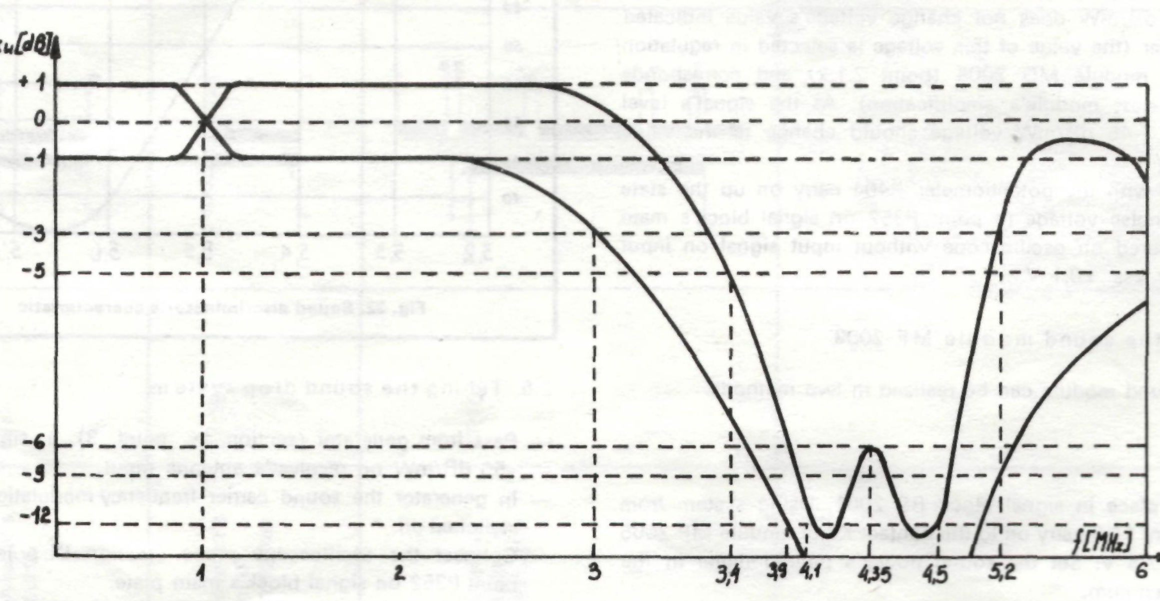


Fig. 34. Amplitude — frequency characteristic of luminance for colour reception

METHOD I

— Pass the television signal of vertical colour stripes on the receiver's antenna input.

— Connect oscilloscope (from section IX, point 1) to the measuring point P252 on module MD 2007.

— Turning cores of L251 coil on module MD 2007 receive minimum amplitude's modulation on two neighbouring lines as on fig. 36.

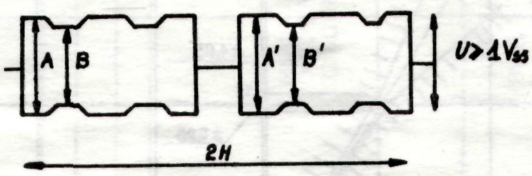


Fig. 36. The method of defining the high frequency deem-phasis fine tuning accuracy

— The high voltage deem-phasis circuit is considered as fine tuned if below mentioned requirements are fulfilled:

$$\frac{2(A-B)}{A+B} \cdot 100\% \leqslant 10\%$$

$$\frac{2(A'-B')}{A'-B'} \cdot 100\% \leqslant 10\%$$

METHOD II

— Solder off M359 bridge on main plate BS 2002.

— Pass on to k5 contact of module MD 2007 by signal cable (from section IX, point 16.5c) a signal from wobbulator (section IX, point 2) of 1 Vss/75 Ω level.

— Connect to P252 measuring point on module MD 2007 the wobbulator's input through detection probe (from section IX, point 16.7).

— Pass on to wobbulator's external marker's input the signal from generator (from section IX, point 4) of frequencies 3,891, 4,154, 4,423, 4,721 MHz in order to receive characteristic markers.

— Measure the frequency of signal from generator with meter (from section IX, point 6).

— Turning core of L251 coil on module MD 2007 receive a characteristic shown on fig. 37.

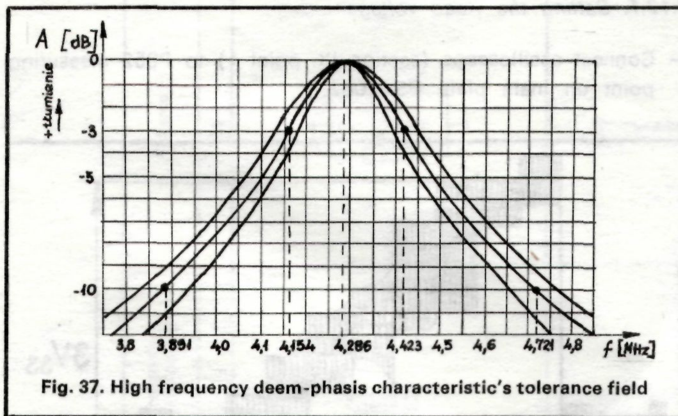


Fig. 37. High frequency deem-phasis characteristic's tolerance field

— Deviations from standard characteristic shown on drawing 37 should not be as ±1 dB in frequency range 3,891 — 4,721 MHz.

2.10. Equalization of amplitudes in direct and delayed channel

— Pass the signal of vertical colour stripes on receiver's aerial input from generator (from section IX, point 3).

— Connect oscilloscope (section IX, point 1) to P252 measuring point and next to measuring point P251. Both points are on module MD 2007.

— Set by potentiometer R285 on module MD 2007 the chrominance signal's amplitude in P251 as equal to amplitude in P252.

2.11. Checking the chrominance discriminator's fine tuning

— Take off modules MD 2006 and MD 2007 from signal block. Connect to plug 6 in module MD 2006 plug's set on main block's plate the direct voltage U_p from the system (section IX, point 16.4a).

— Connect to plug 11 of module's MD 2007 plug's set on block's main plate through signal cable (from section IX, point 16.5b) a signal from generator (from section IX, point 4).

— Perform measuring by digital voltmeter (from section IX, point 8a) the direct voltage on contact k6 of module MD 2008 with lack of signal from generator and switched on signal of 4,406 MHz ±1 kHz frequency and 1 Vss level.

— If difference of voltmeter's indications is ⩾ 0,01 V — discriminator should be tuned up according to point 2.11.1 and after tuning should be corrected with coil's F301/L302 core.

— Switch over the signal cable from generator to plug 7 of module's MD 2007 plug's set on block's BS 2001 main plate and set the frequency in generator on 4,250 MHz ±1 kHz.

— Connect a digital voltmeter to module's MD 2008 contact k12 and perform voltage measurement with lack of dignal from generator and switched on signal of 4,250 MHz ± 1 kHz frequency and 1 Vss level.

— If voltage's difference is bigger than 0,014 — the disciminator should be tuned up acc. to point 2.11.2 and after tuning corrected by coils F303/L305 core.

— Measure the signal's frequency from generator with frequency meter (from section IX, point 6).

— Afterwards switch off the block feeding systems and insert modules MD 2006 and MD 2007. Connect signal block to the receiver.

2.11.1. Tuning the discriminator of differential signal R-Y

Feeding system's diagram is shown on fig. 38.

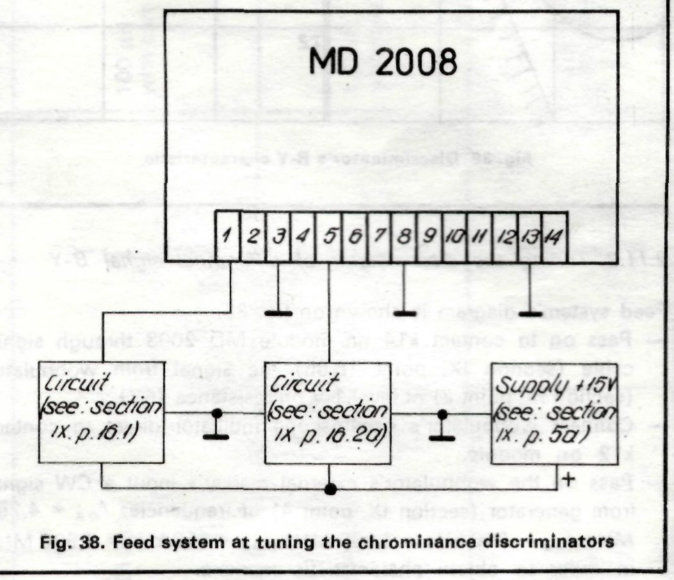


Fig. 38. Feed system at tuning the chrominance discriminators

— Connect to contact k2 on module MD 2008 through signal cable (from section IX, point 16.5b) the signal from wobbulator (section IX, point 2) of 1 V level on resistance 75 Ω.

— Connect wobbulator's oscilloscope indicator direct to k6 contact on module.

— Pass on to the wobbulator's external markers input a CW signal from generator (from section IX, point 4) of frequencies f_{OR} =

= 4,406250 MHz, f_{OR} — 650 kHz = 3,756250 MHz and f_{OR} + +650 kHz = 5,056250 MHz in order to receive characteristic markers.
- — Signal's frequency from generator should measured by meter (section IX, point 6).
- — Discriminator should be tuned in following sequence:
  - distance between peaks is regulated by turning the coil's F300/L300/L301 core,
  - frequency of fine tuning f_{OR} is regulated by turning core of F301/L302 coil,
  - linearity is regulated by capacitor C302.

These components are contained on module MD 2008. As these regulation are interdependent, they should be repeated until the curve as on fig. 39 is obtained.

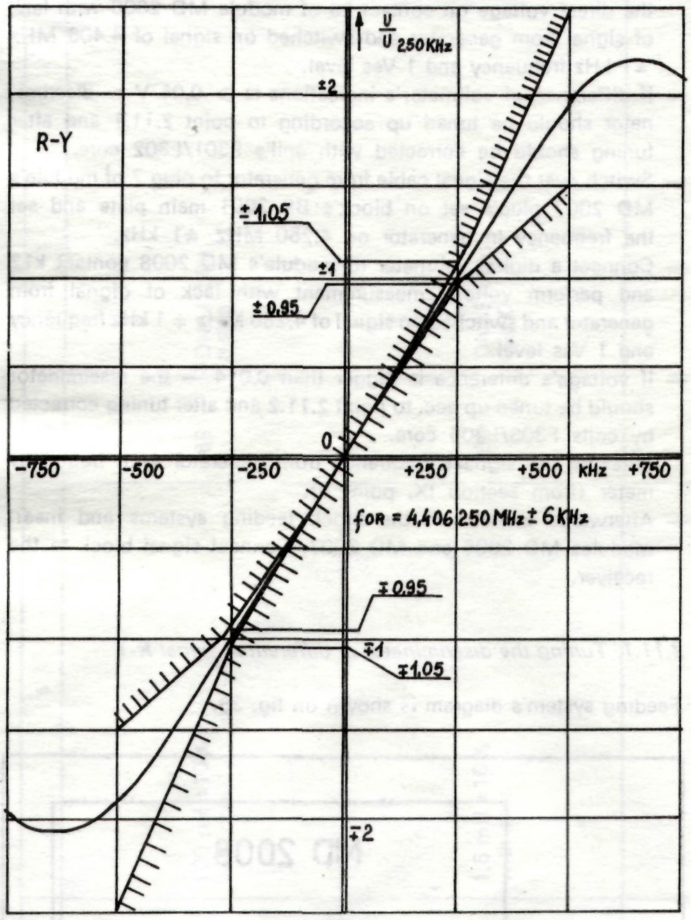


Fig. 39. Discriminator's R-Y characteristic

2.11.2. Tuning the discriminator of differential signal B-Y

Feed system's diagram is shown on fig. 38.

- — Pass on to contact k14 on module MD 2008 through signal cable (section IX, point 16.5b) the signal from wobbulator (section IX, point 2) of level 1 V on resistance 75 Ω.
- — Connect wobbulator's oscilloscope indicator direct to contact k12 on module.
- — Pass on the wobbulator's external marker's input a CW signal from generator (section IX, point 4) of frequencies f_{OB} = 4,250 MHz, f_{OB} — 650 kHz = 3,600 MHz, f_{OB} + 650 kHz = 4,900 MHz in order to obtain characteristic markers.
- — Signals frequency from generator should be measured by meter (section IX, point 6).

The discriminator should be tuned in following sequence:

- — distance between peaks is regulated by turning the coils F302/L303/L304 core,
- — frequency of fine tuning f_{OB} is regulated by turning core of F303/L305,
- — linearity is regulated by capacitor C316.

These components are contained on module MD 2008. As these regulations are interdependent, they should be repeated until the curve as on fig. 40 is obtained.

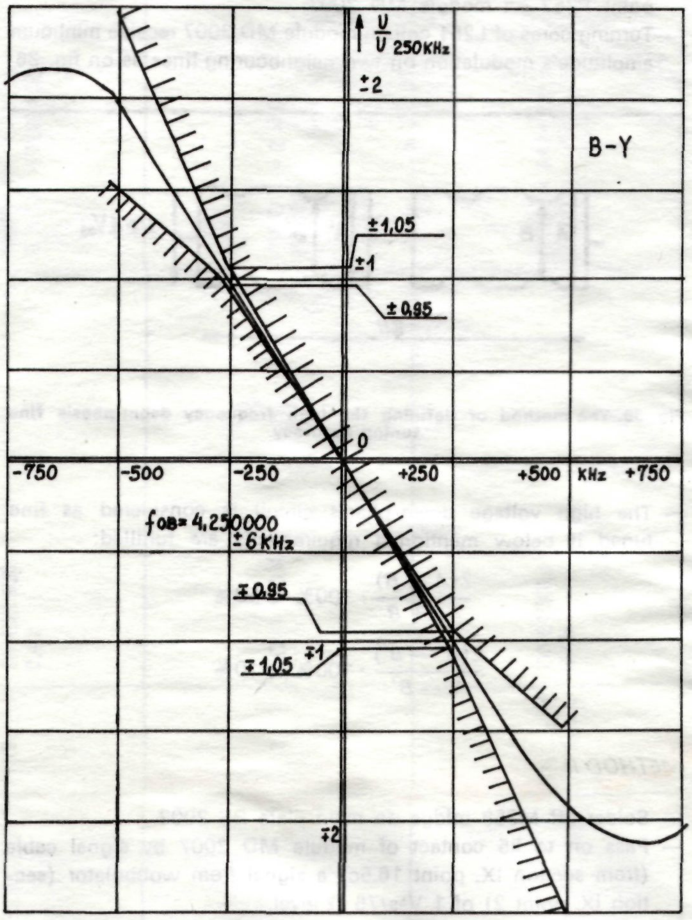


Fig. 40. Discriminator's B-Y characteristic

2.12. Setting the video voltage and range of contrast control

- — Pass the vertical colour strip's signal on the receiver's aerial input.
- — Set the saturation potentiometer on "0" (zero) scale.

2.12.1. Setting the video voltage

- — Connect oscilloscope (section IX, point 1) to P352 measuring point on main plate BS 2002.

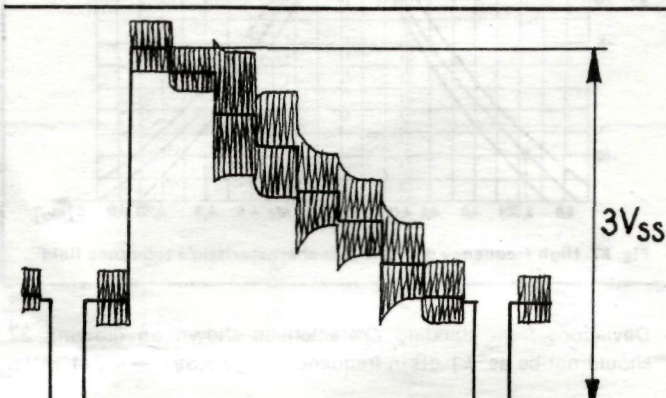


Fig. 41. The scape and voltage's value in point P352

— Measure video voltage's value in this point.
It should be of value and shape as shown on fig. 39.
— In case of the amplitude differs from value required by fig. 41 it should be set by potentiometer R59 in MP 2005.

2.12.2. Setting the range of contrast control

— Check the video voltage acc. to point 2.12.1.
— Put the brightness potentiometer's slider in central position.
— Connect oscilloscope to point R on main plate BS 2001 (input DC).
— Set by the potentiometer on regulation segment SR 2001 in point R the signal's value equal 100 V + 5 V black-white by the contrast potentiometer's position relative to scale's point 6.

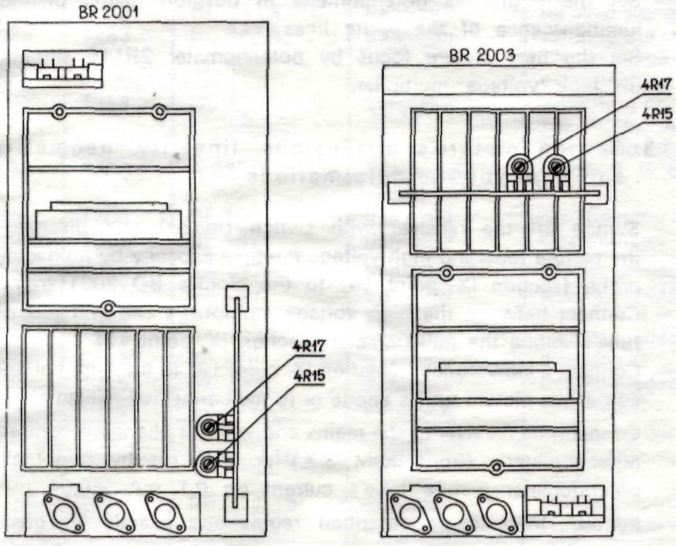


Fig. 42. The arrangement of periodical regulation components in BR 2001

— Diminish the contrast to the position relative to figure "0" on scale. Signal in point R should be contained in limits 15 — 25 V black-white. At another value, set by potentiometer 4R17 signal in this point and check again signal's value relative to minimum contrast. It should be 100 V + 5 V black-white.
— These regulation should assure the contrast control in range from 4 : 1 to 7 : 1 at signal's value in point R equal 100 V + 5 V black-white for maximum contrast.

2.12.3. Setting the balance of electronic contrast regulation

— Set by the brightness potentiometer in point R the black level in signal on level 220 V ± 5 V (check on oscilloscope input DC).
— Changing contrast potentiometer's position from 0 — 6 measure black level change. If it exceeds 5 V it is necessary adjust the black level stability for contrast potentiometer's positions 0 — 6 by potentiometer R208 on module MD 2006 with above given tolerance.
— Disconnect the oscilloscope.

2.13. Regulation of black level on picture tube's cathode's (static balance of white)

ATTENTION. The under described regulations in signal block BS 2002 can be made only after prior execution of the regulations described in points: 3.1, 3.3.
— Pass on the receiver's aerial input a television signal corresponding to the picture of the grate.
— Set the contrast potentiometer on "0" scale.
— Set the brightness potentiometer in position giving small luminance of picture raster.
— Set the sliders of potentiometers R365, R377, R389 on main plate BS 2002 in position giving grey luminance of picture's raster without supremacy of any other colour.

2.14. Regulation of video signal's amplitudes on picture tube's cathodes (dynamic white balance)

— Connect on receiver's antenna input the test of vertical colour strips.
— Set the saturation potentiometer in position relative to scale "0".
— Set the brightness and contrast potentiometer's sliders in position giving visibility of all steps of gradation on the screen.
— Receive by means of potentiometers R358, R370, R382 on main plate BS 2002 identical luminance hue of all strips on the screen.

2.15. Regulation of the system limiting the picture tube's current

— Disconnect the receiver from the mains.
Set the brightness and contrast potentiometer in position relative to 6 scale and saturation potentiometer on "0" scale.
— Turn to the left potentiometer's R226 slider (looking on the plate MD 2006 from components side).
— Discharge the capacity of picture tube and high voltage multiplier by the probe (section IX, point 14).
— Connect milliammeter (section IX, point 12) between high voltage multiplier's cap and picture tube's anode.
— Connect receiver to the main line and set by means of potentiometer R223 on MD 2006 the picture tube current on value equal 1,6 mA ± 0,04 mA.
— Decrease by potentiometer R226 the picture tube's current to value 1,1 mA ± 0,04 mA.
— Disconnect receiver from the mains and disconnect milliammeter from picture tube anode.

2.16. Setting matrixing of signal *B*

— Set the contrast potentiometer on 6 scale.
— Connect the oscilloscope's probe (section IX, point 1) DC input to the point R.
— Set by means of brightness potentiometer voltage relative to black level on value 180 V ± 5 V.
— By the saturation regulation's potentiometer set a properly matriced signal *R* (according to definition 100/75/0).
— Next connect the oscilloscope probe to the signal's *B* output on main plate BS 2002.
— Set a properly matriced signal *B* on the oscilloscope screen according to definition 100/0/75/0 by potentiometer R276 on module MD 2007.
— Disconnect the oscilloscope.

2.17. Checking, tuning and regulation of colour identification's system

2.17.1. Checking the colour indentification system

— Connect the oscilloscope (section IX, point 1) to the point P250 on MD 2007.
— In this point the voltage should have sinusoidal shape. The frequency should be equal to the half of line frequency and the value 4 — 6 V.
— Change the test in picture's generator to grid picture without signal of chrominance subcarrier.
— In this case there should not appear any colour noises on the receiver's screen.
— In the case of another voltage value in P250 or with colour noises on the screen with black-white picture the module should be set according to point 2.17.2.

2.17.2. Tuning and regulation of identification system

— Pass on the receiver aerial input a picture of colour stripes or any one colour test.
— Connect the oscilloscope (section IX, point 1) to the point P253.

— Settle by the resistor R299 the positive pulse width in point on value 4,7 µsec. ± 0,2 µsec.
— Switch over the oscilloscope to the point P250.
— Set R261 in left extreme position (minimum resistance).
— Turning F250 and R289 receive on oscilloscope the pulses of maximum amplitude by preserving the symetry of upper and lover pulse as on fig. 43.

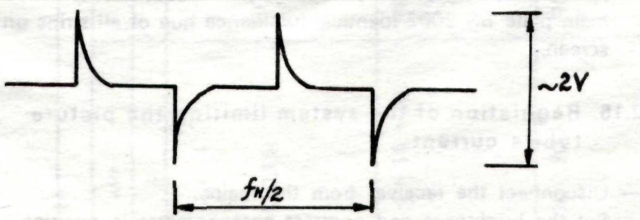


Fig. 43. The pulses shape in P250 by turning R261 to extreme left position

— Next settle in this point the sinusoidal run of frequency $F_{H/2}$ and amplitude 4 — 6 by potentiometer R261.

ATTENTION. Small deformation of the sinusoidal run in lower part appearing at maximum amplitude (about 6 Vss) is acceptable.

3. Regulation of systems in deflection block BO 2001

3.1. Voltage setting on the picture tube's second grid

— Pass on the receiver's aerial input the television signal of vertical colour stripes.
— Set the saturation potentiometer on zero scale.
— Set the brightness and contrast potentiometer's in positions giving small screen luminescence.
— Connect a direct voltage voltmeter (section IX, point 9) to the point 5P4 of picture tube's plate PK 2001.
— Set the voltage in this point on +550 V ±25 V by means of potentiometer 2R120.
— Disconnect the voltmeter.

3.2. Setting the picture focussing

— Pass on the receiver aerial input the television signal of white grid on the block raster.
— Set the contrast potentiometer in position between scale's figures 4 and 5.
— Set the brightness potentiometer in position giving distinct luminenscence of the white lines.
— Set the best picture focus by potentiometer 2R116 situated on high voltage multiplier.

3.3. Setting picture's dimensions, linearity, geometric and high voltage deformations

— Switch off the receiver with switch (mains) and discharge the picture tube and high voltage multiple capacity by unloading probe (section IX, point 14) to the block's BO 2001 frame.
— Connect between the high voltage multiplier's cap and picture tube's anode the milliammeter (section IX, point 12)
— Connect a kilovoltmeter (section IX, point 13) to the high voltage cup at the picture tube's anode or to the connected milliammeter.
— Connect the receiver to the mains and without changing contrast potentiometer's (from point 3.2.) position set by brightness potentiometer picture tube's current on 0,1 mA ±0,04 mA.
— Perform then lower described regulations exactly in given sequence.

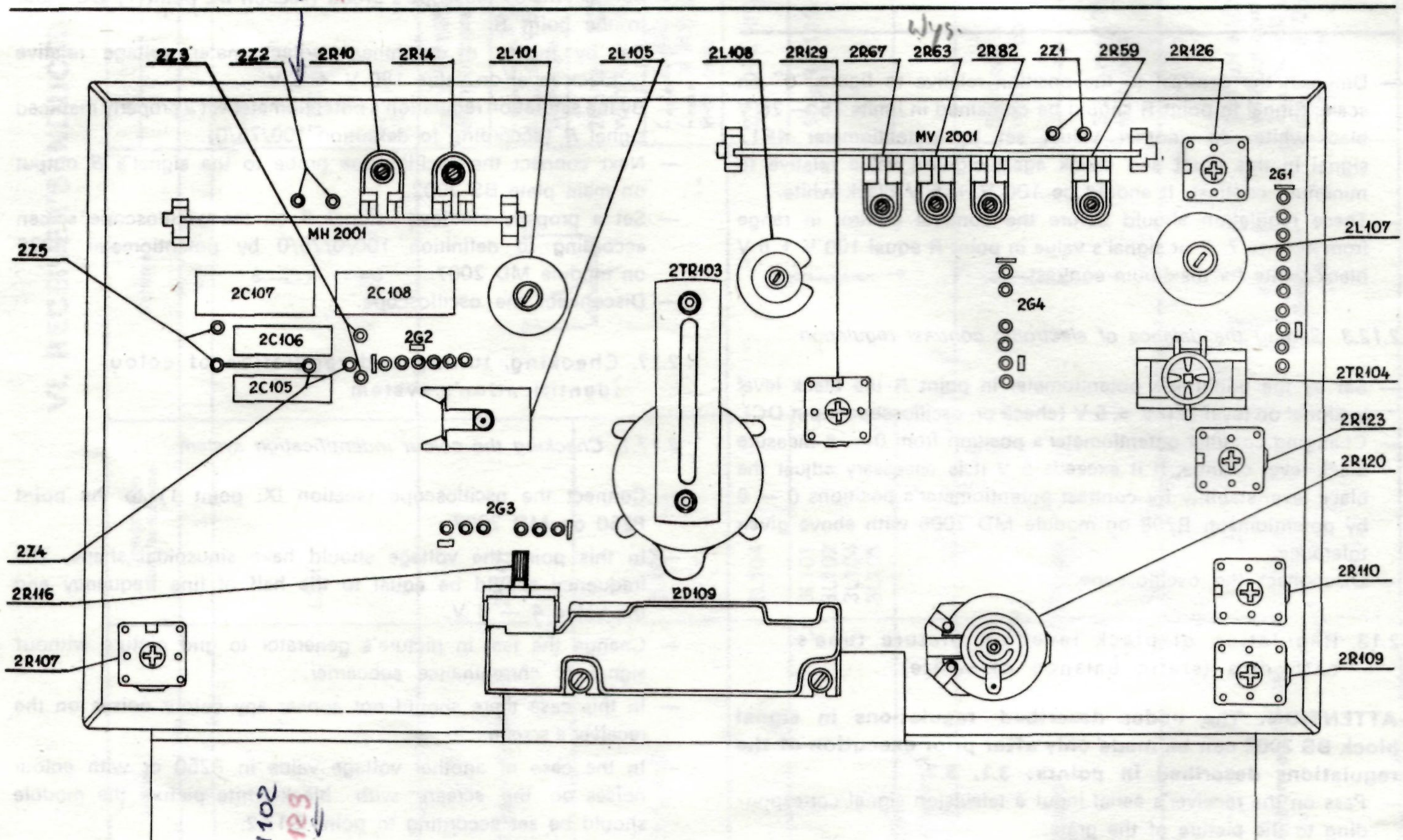


Fig. 44. The arrangement of periodical regulation components in deflection block BO 2001

3.3.1. Setting the linearity, position and dimension of the picture in horizontal direction

— Set the horizontal picture's linearity turning the magnet in corrector 2L105 on the main plate BO 2001.
— Centre the picture in horizontal direction potentiometer 2R107 on the main plate BO 2001.
— Settle the proper picture's width by the coil's 2L101 core on the main plate BO 2001 (picture width 3% overscanning from each screen's edge).

3.3.2. Setting the linearity, position and dimension of the picture vertical direction

— Set the picture linearity in vertical direction by potentiometer 2R67 on MV 2001.
— Centre the picture in vertical direction by potentiometer 2R129 on main plate BO 2001.
— By potentiometer 2R63 on MV 2001 set the proper picture's height (picture with 3% overscanning from each screen edge).

3.3.3. Setting the picture's minimum geometrical distortion

ATTENTION. All below regulation components are situated on the main plate BO 2001.
— By potentiometer 2R123 straighten the vertical lines on left and right edge of the picture.
— Set potentiometer 2R110 in control position.
— By potentiometer 2R109 obtain maximum expansion of vertical lines in picture's middle part but not giving yet lines deformation in the top part of the screen.
If it is impossible to obtain this it should be necessary to regulate additionaly 2R10.
— By magnet situated on transductor 2Tr104 set minimum trapezium distortion.

3.3.4. Correction of dimension's and picture's geometry

After performing the above described regulations, it is necessary to repeat the following operations:
— Set the proper picture's width by coil's 2L101 core on main plate BO 2001.
— Set the proper picture height by potentiometer 2R63 on MV 2001.
— By potentiometer 2R123 obtain straightening of the vertical lines on left and right of picture's edge.
— By the potentiometer 2R126 obtain straightening of the horizontal lines on top and bottom of the picture.
ATTENTION. Remaining regulation's should not be changed. In case of any remarkable changes the regulations necessary for deformation's correction should be repated.

3.3.5. High voltage setting

— Read the high voltage value on the kilovoltmeter. It should be in limits of 25,6 kV ±1 kV with the picture tube current 0,1 mA ± ±0,04 mA .
— In case when high voltage's value exceeds given high voltage tolerance limits it is necessary to regulate it by means parallel connection to capacitor 2C107 the coupling combination of capacitors 2C105 and 2C106 by placing the short circuiting as in .table below:

TABLE 7. **Table of bar's connecting**

Placet short-circuiting elements	Resultant capacity (nF)	Remarks
—	62	Capacities increase causes high voltage increase and decrease of picture's dimension.
2Z4	64,35	
2Z3 or 2Z5	66,7	
2Z3 and 2Z5	71,4	

ATTENTION. Connecting by the shorting and another combination of components as on the table is not allowed.
ATTENTION. In case of high voltage change it is necessary to check if the picture dimensions have not been changed beyond permitted tolerance. If they have changed — perform necessary regulations.

3.4. Setting the time of vertical retrace

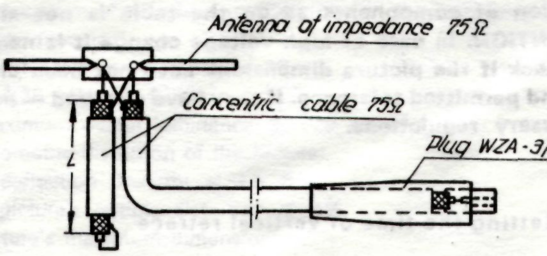
— Connect oscilloscope's probe (section IX, point 14) to terminal 11 of module MV 2001.
— Turning the potentiometer 2R82 on module MV 2001 settle the time of vertical retrace equal 1,2 ± 0,1 msec.

XI. AERIAL INSTALLATION

In order to ensure to best possible television program reception it is necessary to match the aerial impedance to the receiver's input impedance (75 Ω). Only then the smallest transmission losses are obtained and additional signal's reflection avoided.
The most proper is an outdoor aerial adapted to the local reception conditions with coaxial cable of 75 Ω impedance. If the user posses a television antenna with symmetrical cable there is advised to replace this cable for coaxial one, after relative matching it, checking and cleaning the contact connections between antenna and the cable. The coaxial cable carrying the signal from aerial should be terminated by plug WZA 3/6, which belongs to additional receiver's equipment. In view of immonity to external interferences it is advisable to adapt antenna instalations with coaxial cable.
If the interferences are small without any influence on picture and sound reception there is allowed to apply instalation with symmetric cable and adapting system. It is not advisable to apply any room antenna because the quaranty of good reception is much smaller as in case of outdoor antenna.
For the users living in big distance from the television program's transmission station (when output signal from antenna is smaller as 1 mV/75 Ω *it is advisable the application of antenna proamplifiers* with universal input and output 75 Ω (300 Ω). Such arrangement is also useful in regions particularly not favourable in view of reception conditions, for example — in mountain volleys. Kind of fitting depends on antenna type and cable carrying the signal from external antenna to the receiver. Therefore it exist several alternatives of adaptations (see alternatives I — V). It is advisable to apply antenna instalations according to alternatives I, II, IV b.
Antenna's balun transformer SA/I — IV is used for adapting the antenna's impedance and the cable's carrying television signal to the receiver. Balun transformer is prepared for direct fixing the antenna's terminals in plastic, and belongs to the antenna's equipment. Receiver's balun transformer SO/I — IV is used for adaptation of the impedance of the cable carrying the television signal to the receiver. It should be free suspended between connected to it two kinds of cables (symmetric 300 Ω and coaxial 75 Ω) and situated in the same room in vicinity of the receiver. Both balun transformers are utilised at receptions of television program on any of channels from I to IV frequency band, that means from channel 1 to 12, and from 21 to 39 (48,5 MHz to 630 MHz) in accordance to OIRT standart. Purchase of above mentioned balun transformers is possible in electrical shops. Antenna plug WZA-3/6 belongs to the receiver's equipment.

VARIANT I

In case of the application by the user of the aerial of input impedance (75 Ω) adaptation should be made as on fig. 45.
The leading cable should be then terminated with plug WZA-3/6



Channel No	1	2	FM	3	4	5	6	7	8	9	10	11	12
L (m)	0,97	0,81	0,71	0,62	0,57	0,52	0,28	0,27	0,26	0,25	0,24	0,23	0,22

Fig. 45. Antenna installation for variant I

VARIANT II

In case of the application the antenna of impedance 300 Ω and concentric cable 75 Ω there should be installed an antenna balun transformer SA/I-IV type. Installation should be made according enclosed Instruction. Terminate then the loading cable by plug WZA-3/6 as on fig. 46.

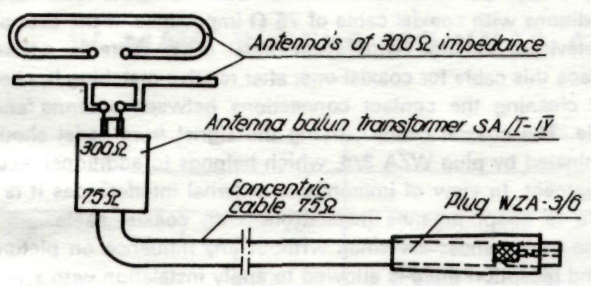


Fig. 46. Antenna installation for variant II

VARIANT III

In case antenna of 300 Ω impedance and symetric cable (300 Ω) the cable should be connected to the receiver through receiver's balun transformer SO/I-IV type. Symmetric cable should then be connected to terminale marked (300 Ω), but from terminals marked (75 Ω) carried on one piece of coaxial cable terminated with antenna plug WZA-3/6.

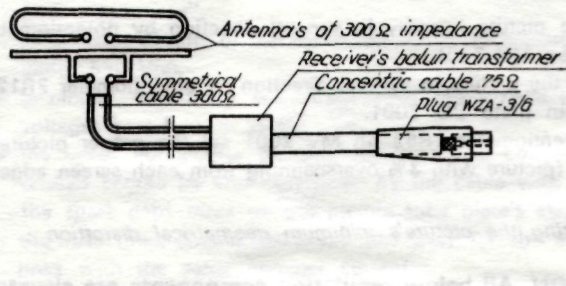


Fig. 47. Antenna instalation for variant III

VARIANT IV

If the user is using a community antenna and his receiver is connected by subscriber's cable terminated with symmetrical cable for the adaptation should be used a receiver's balun transformer SO-/I-IV type. Connect symmetrical cable to terminals (300 Ω) and connect to terminals (75 Ω) one piece of cable terminated with plug WZA-3/6 (fig. 48).

The change is possible in subscriber's cable in such way that antenna balun transformer is disconnected and in its place to the cable 75 Ω connected plug WZA-3/6 (fig. 48).

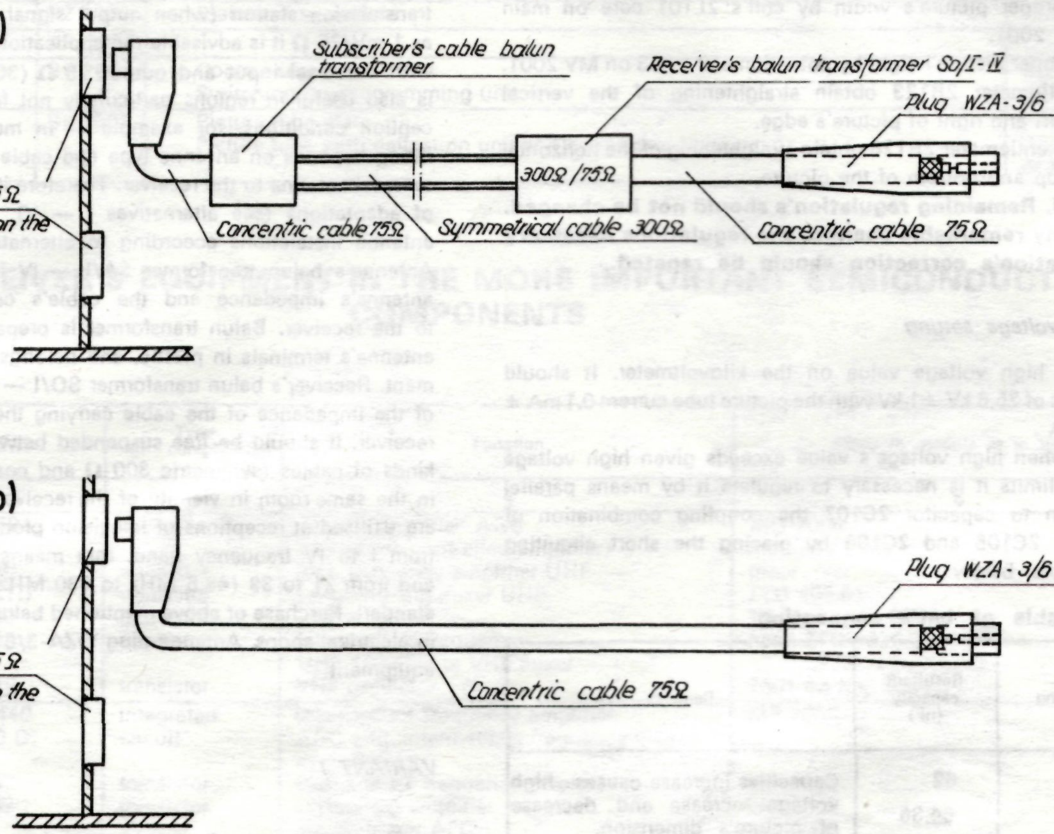


Fig. 48. Antenna installation for variant IV

VARIANT V

If the user posses 2 television antennas, the antenna switch should be applied and connection performed as on fig. 49.

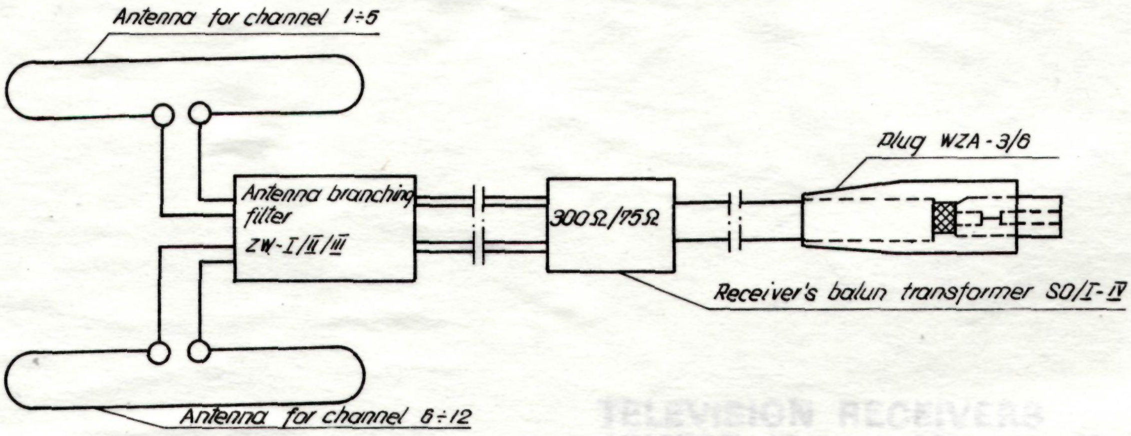
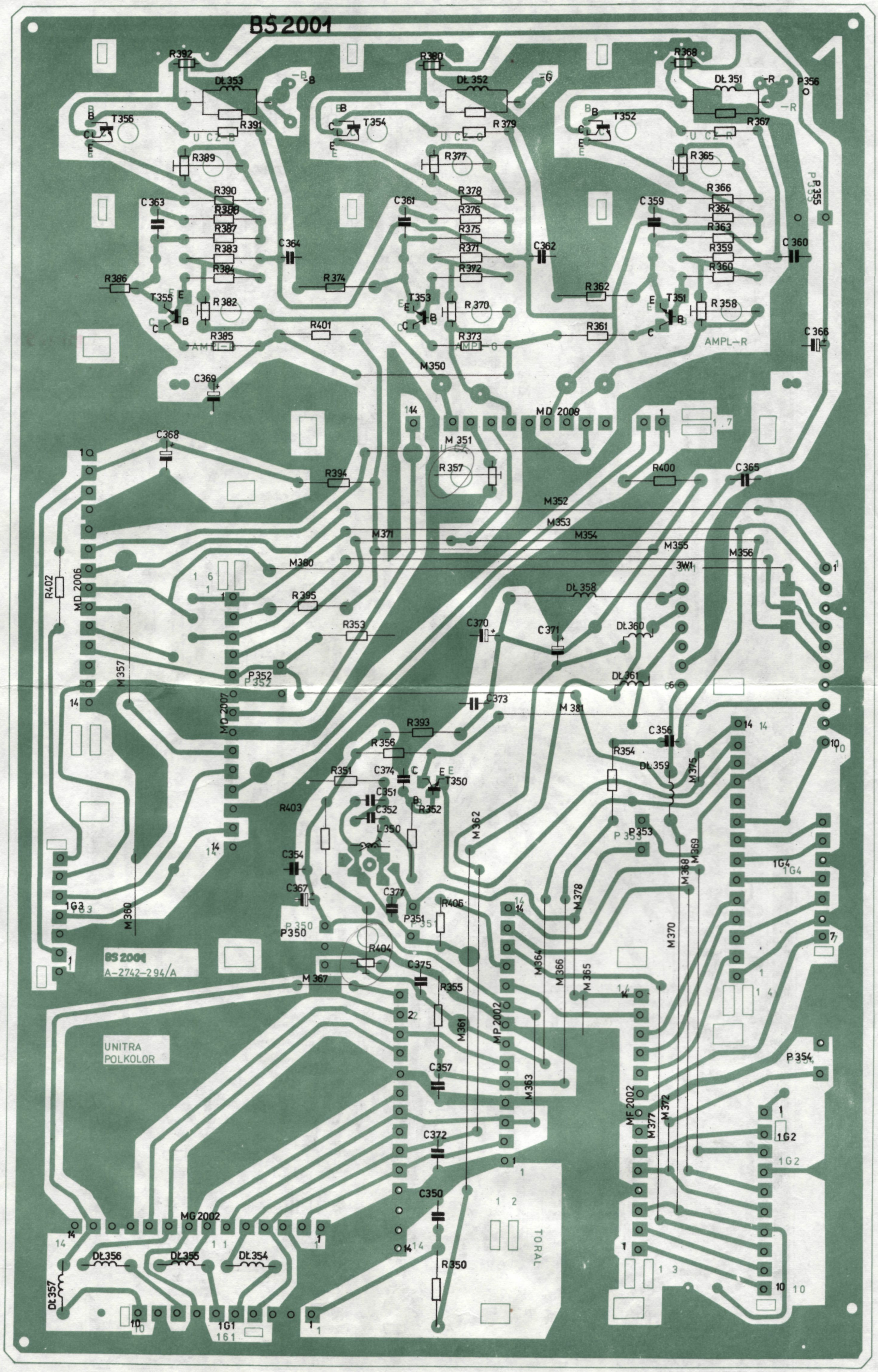
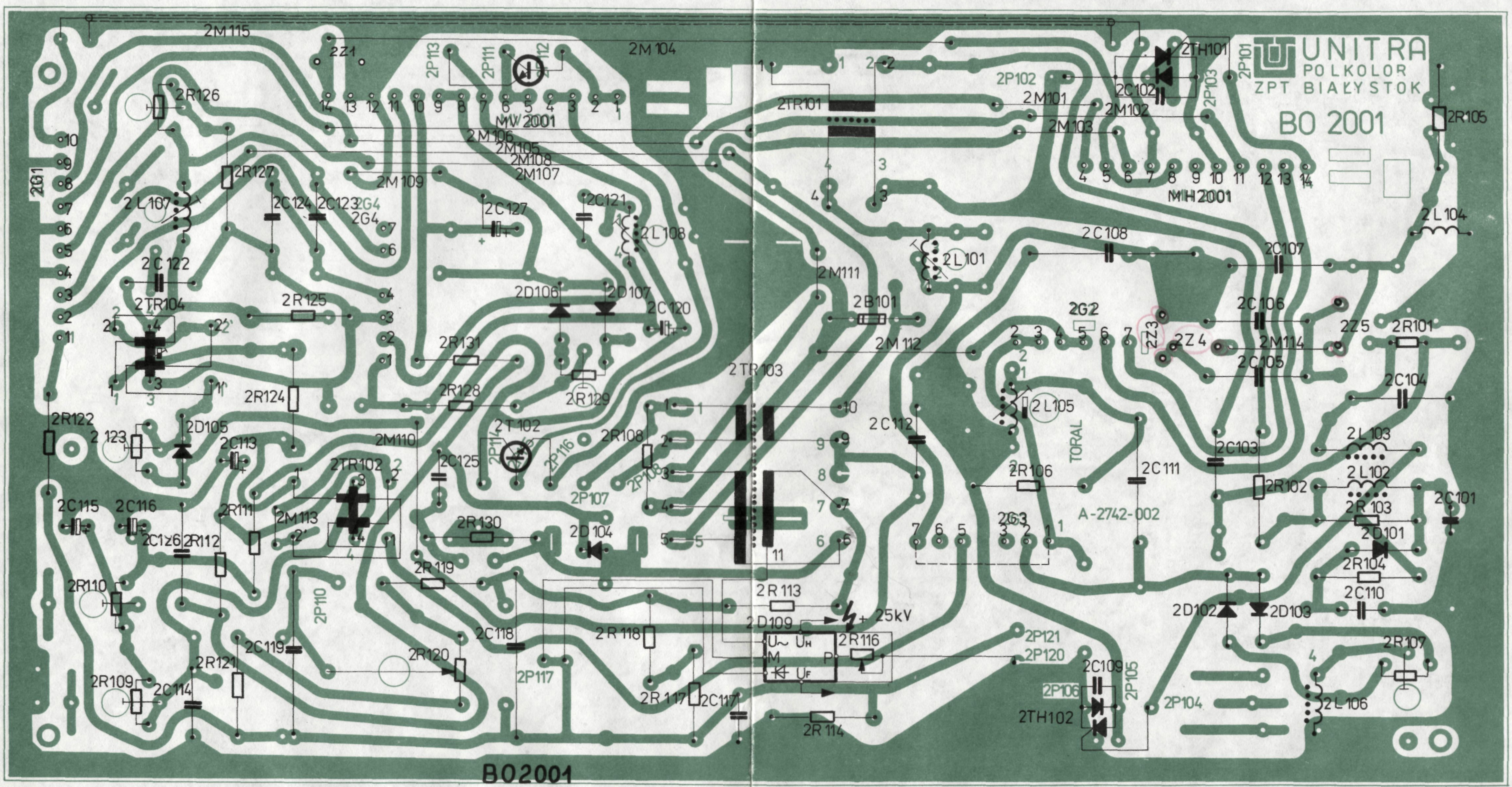


Fig. 49. Antenna installation for variant V

WPM „WEMA" — 1000 — 6/81-Z/F
Drukarnia Kujawska Inowrocław. Zam. 945


BS 2001
R392
R380
R368
DŁ 353
DŁ 352
DŁ 351
T356
T354
T352
R391
R379
R367
P356
R389
R377
R365
P355
R390
R378
R366
C363
C361
C359
R388
R376
R364
R387
R375
R363
R383
R371
R359
C364
C362
C360
R384
R372
R360
R386
R374
R362
T355
T353
T351
R382
R370
R358
R401
R361
R385
R373
C366
AMPL-B
AMPL-G
AMPL-R
C369
M350
MD 2008
C368
M 351
R357
R394
R400
C365
M352
M353
M354
M355
M356
M371
M380
3W1
R402
MD 2006
R395
DŁ 358
R353
C370
C371
DŁ 360
M357
P352
DŁ 361
MD 2007
C373
M 381
R393
C356
R356
R354
R351
C374
T350
DŁ 359
M375
C351
R352
R403
C352
L350
M 362
P 353
M369
1G4
C354
M368
M378
C367
C377
R405
1G3
P 350
P351
M370
M360
BS 2001
A-2742-294/A
R404
M364
M366
M 365
M 367
C375
R355
M361
MP 2002
UNITRA
POLKOLOR
C357
P 354
M363
MF 2002
M377
M372
1G2
C372
C350
MG 2002
TORAL
DŁ 356
DŁ 355
DŁ 354
DŁ 357
R350
1G1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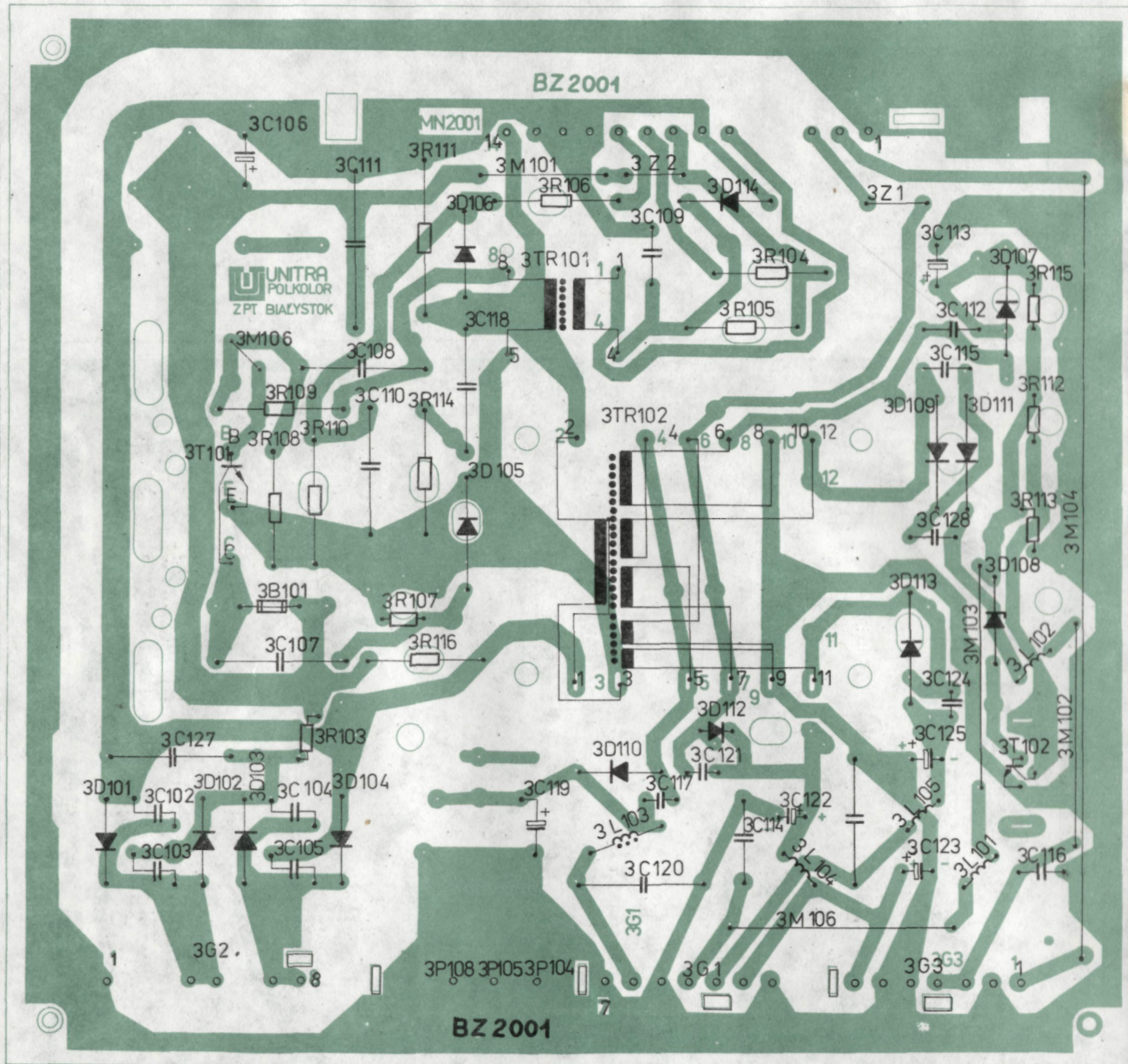
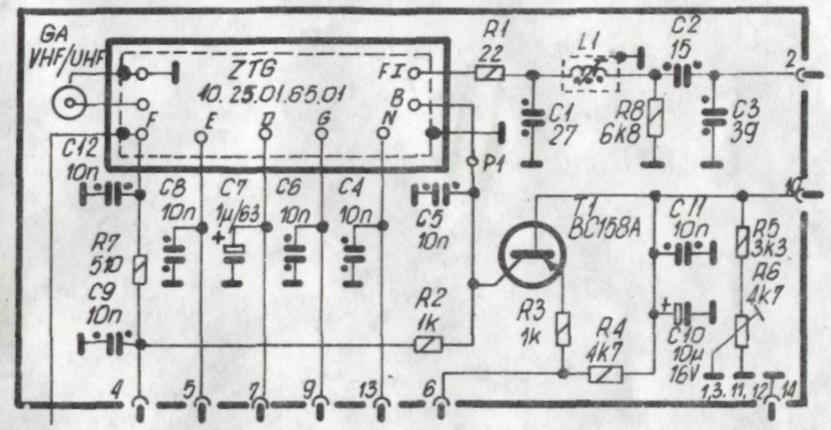
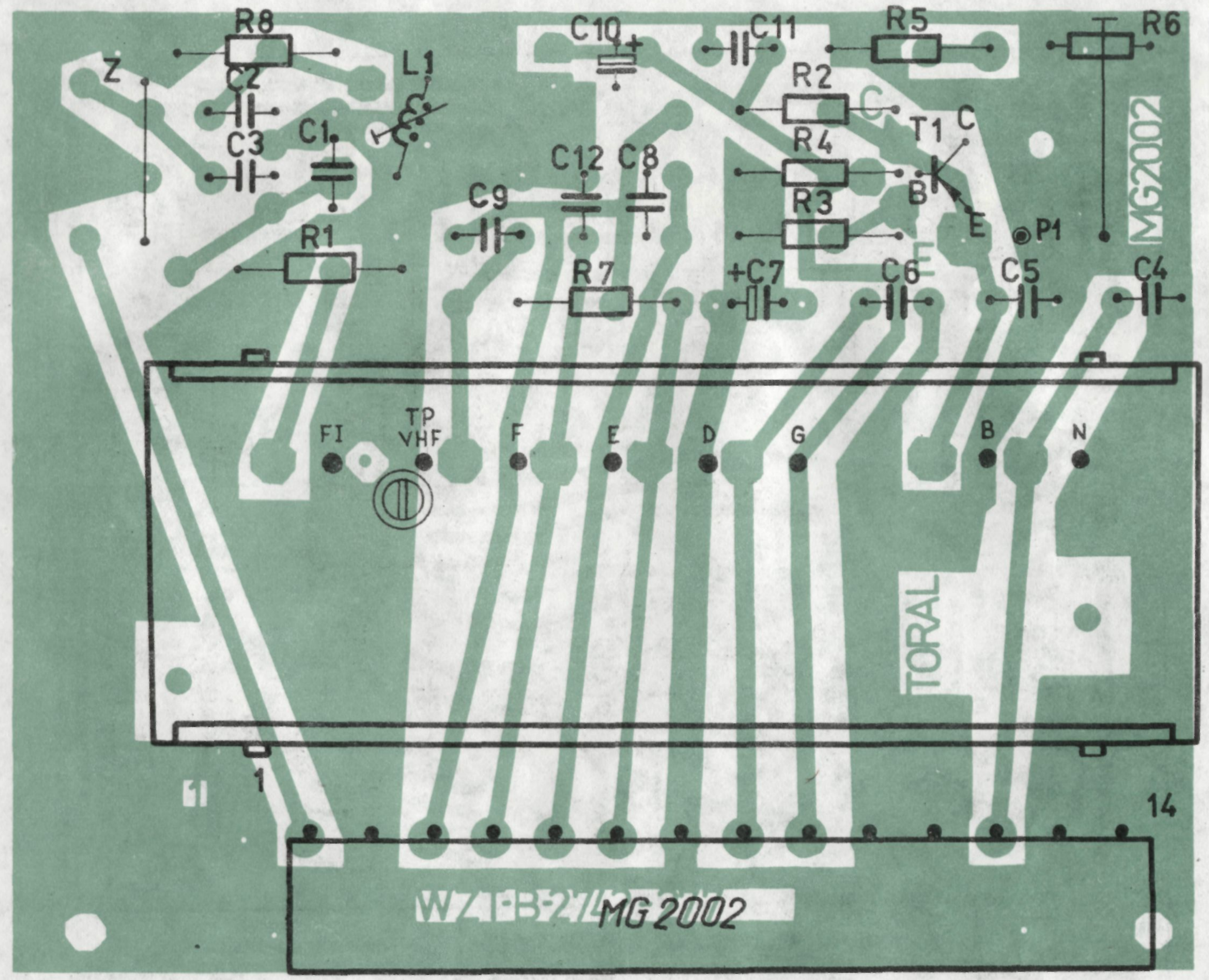
POLKOLOR
ZPT BIAŁYSTOK
BO 2001
BO2001
A-2742-002
TORAL
MH2001
MV2001
25kV


BZ 2001
MN2001
UNITRA POLKOLOR
ZPT BIAŁYSTOK
3TR101
3TR102
3M101
3M102
3M103
3M104
3M106
3Z1
3Z2
3G1
3G2
3G3
3P108 3P105 3P104
BZ 2001


GA VHF/UHF
ZTG
10.25.01.65.01
FI
B
N
G
D
E
F
R1 22
L1
C2 15
C1 27
R8 6k8
C3 39
C12 10n
C8 10n
C7 1µ/63
C6 10n
C4 10n
C5 10n
P1
T1 BC158A
C11 10n
R5 3k3
R6 4k7
R7 510
C9 10n
R2 1k
R3 1k
R4 4k7
C10 10µ 16V
4
5
7
9
13
6
1,3,11,12,14


R8
C10
C11
R5
R6
Z
C2
C3
C1
L1
R2
R4
R3
T1
C
B
E
P1
MG2002
C9
C12
C8
R1
R7
+C7
C6
C5
C4
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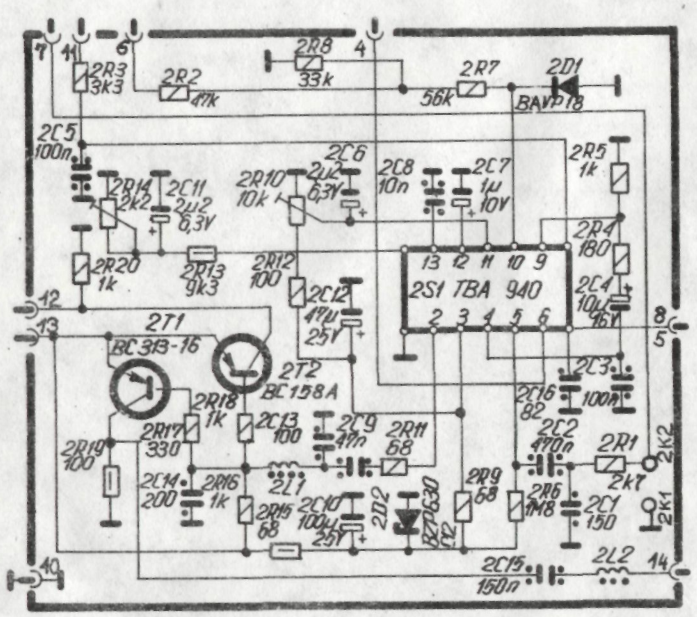
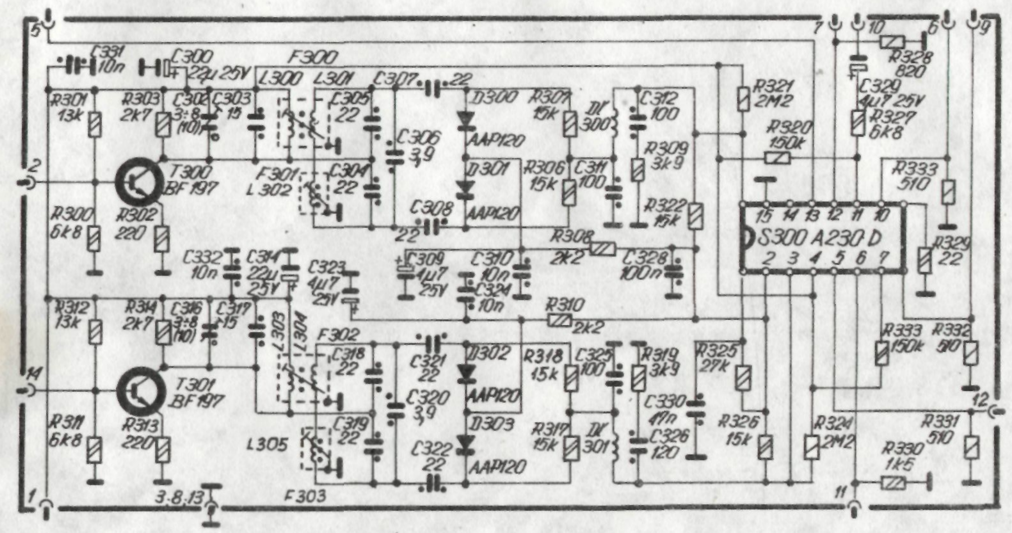
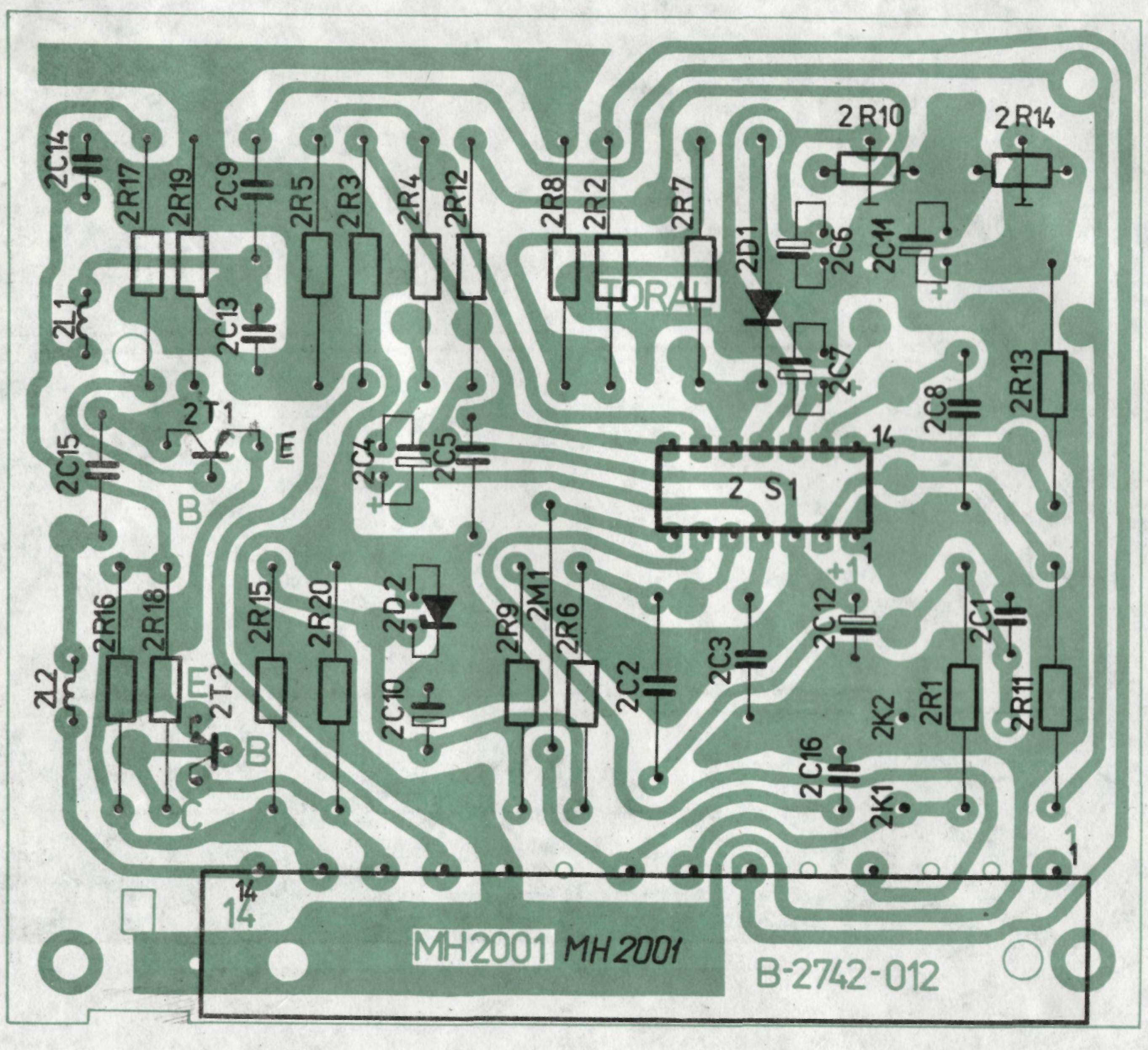
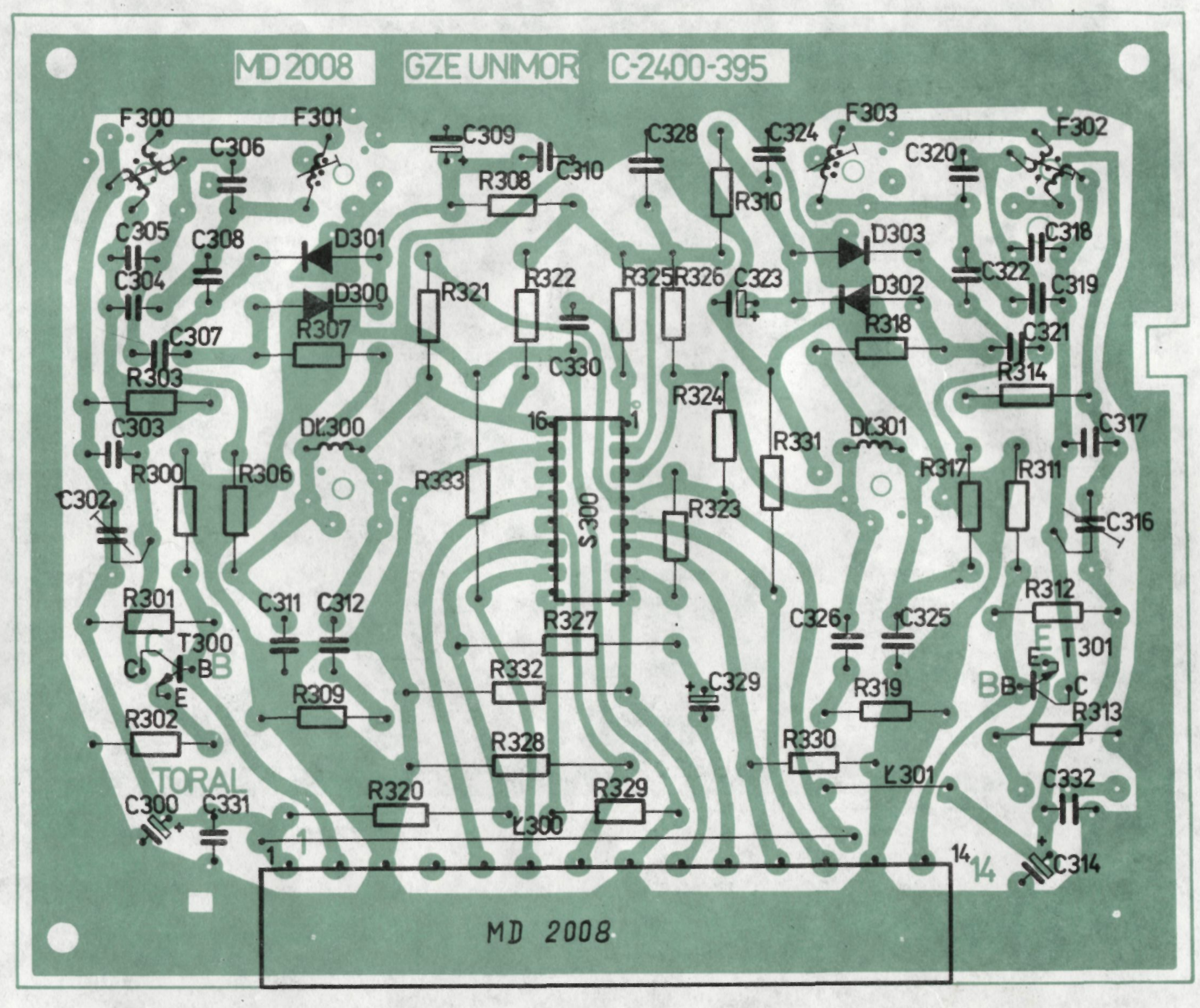
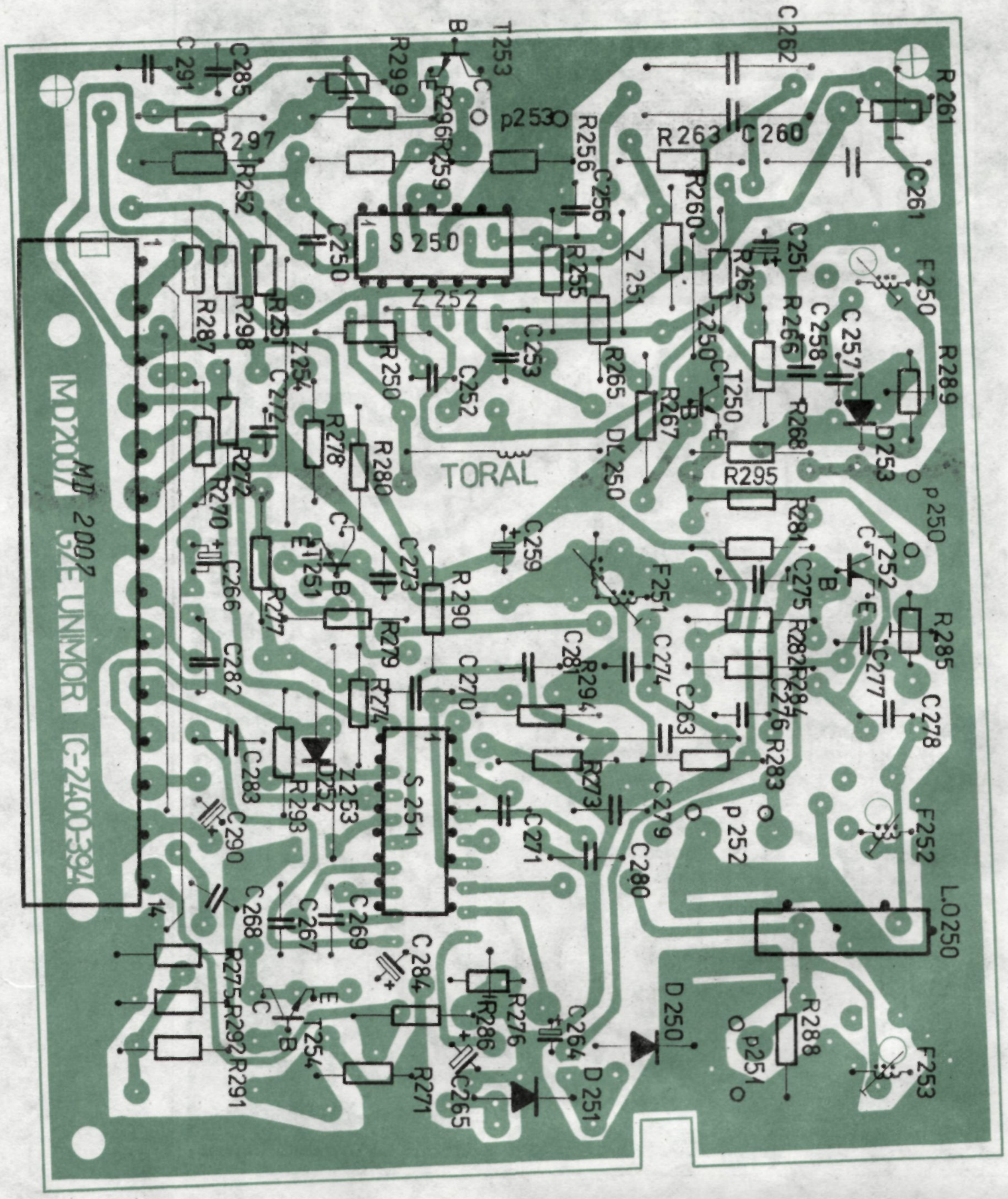
TP VHF
F
E
D
G
B
N
TORAL
1
14
MG 2002

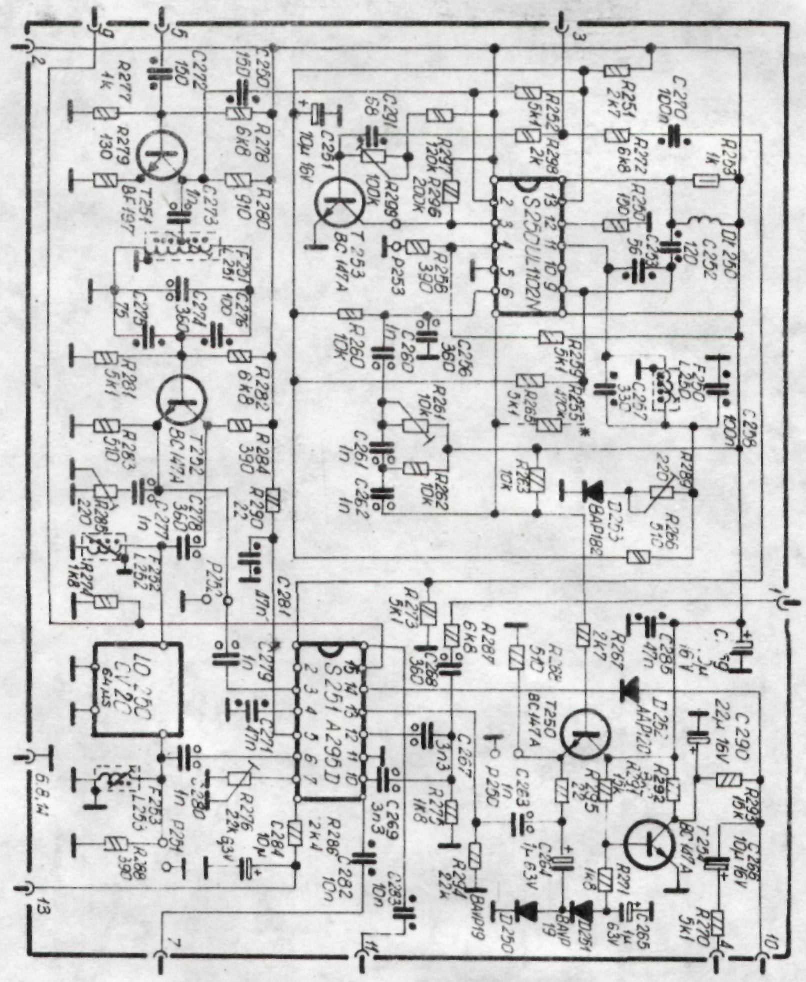


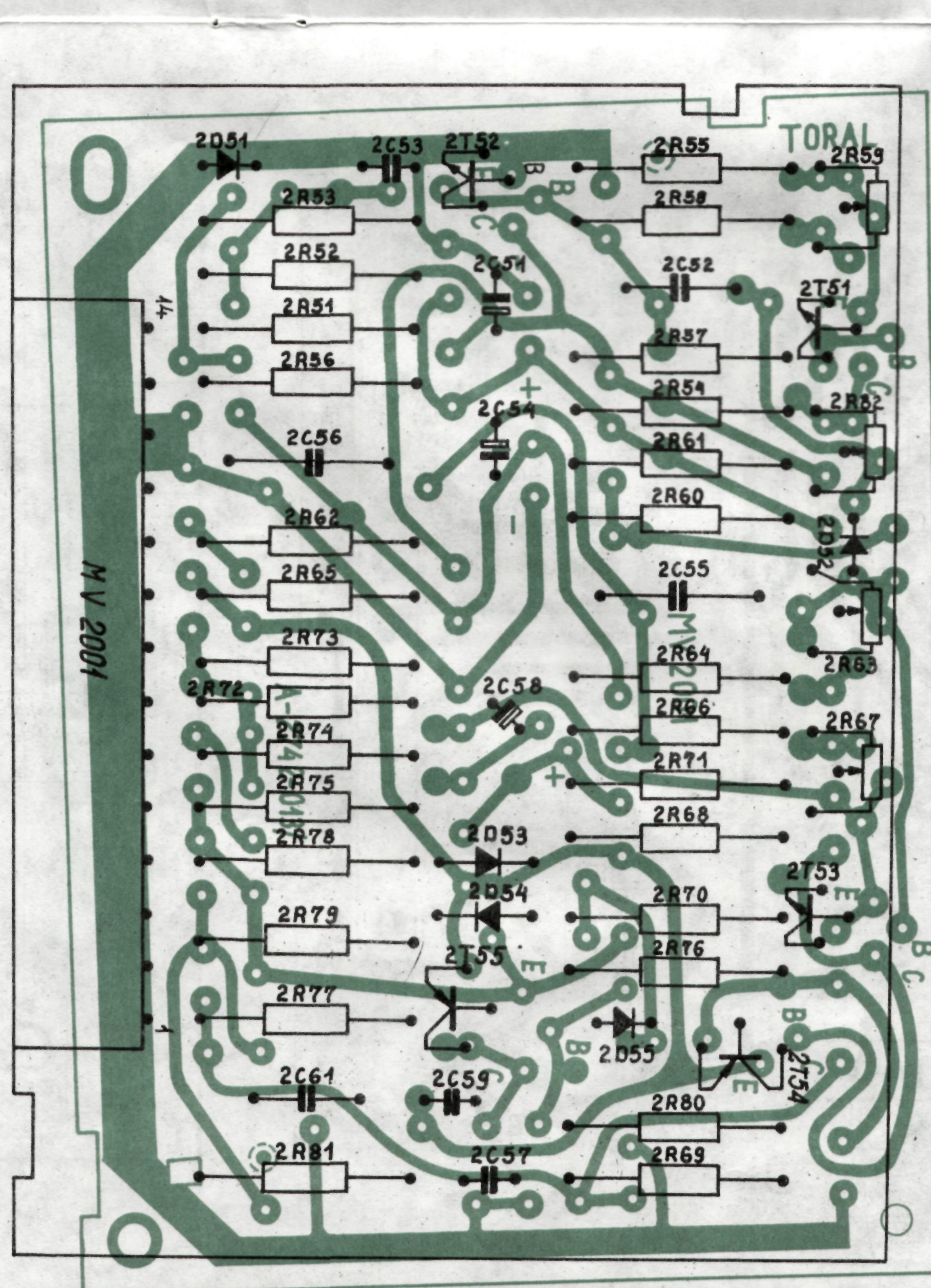



MH2001 MH2001
B-2742-012
TORAL


MD 2008
GZE UNIMOR
C-2400-395
TORAL
MD 2008


TORAL
S 250
S 251
LO250

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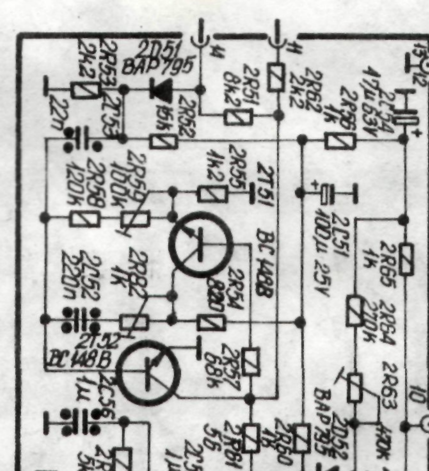
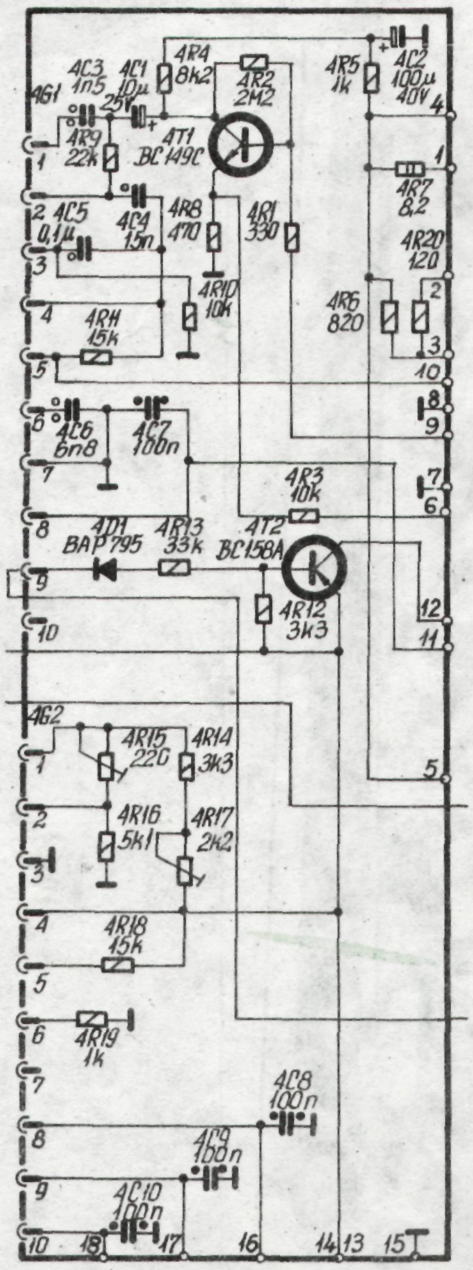
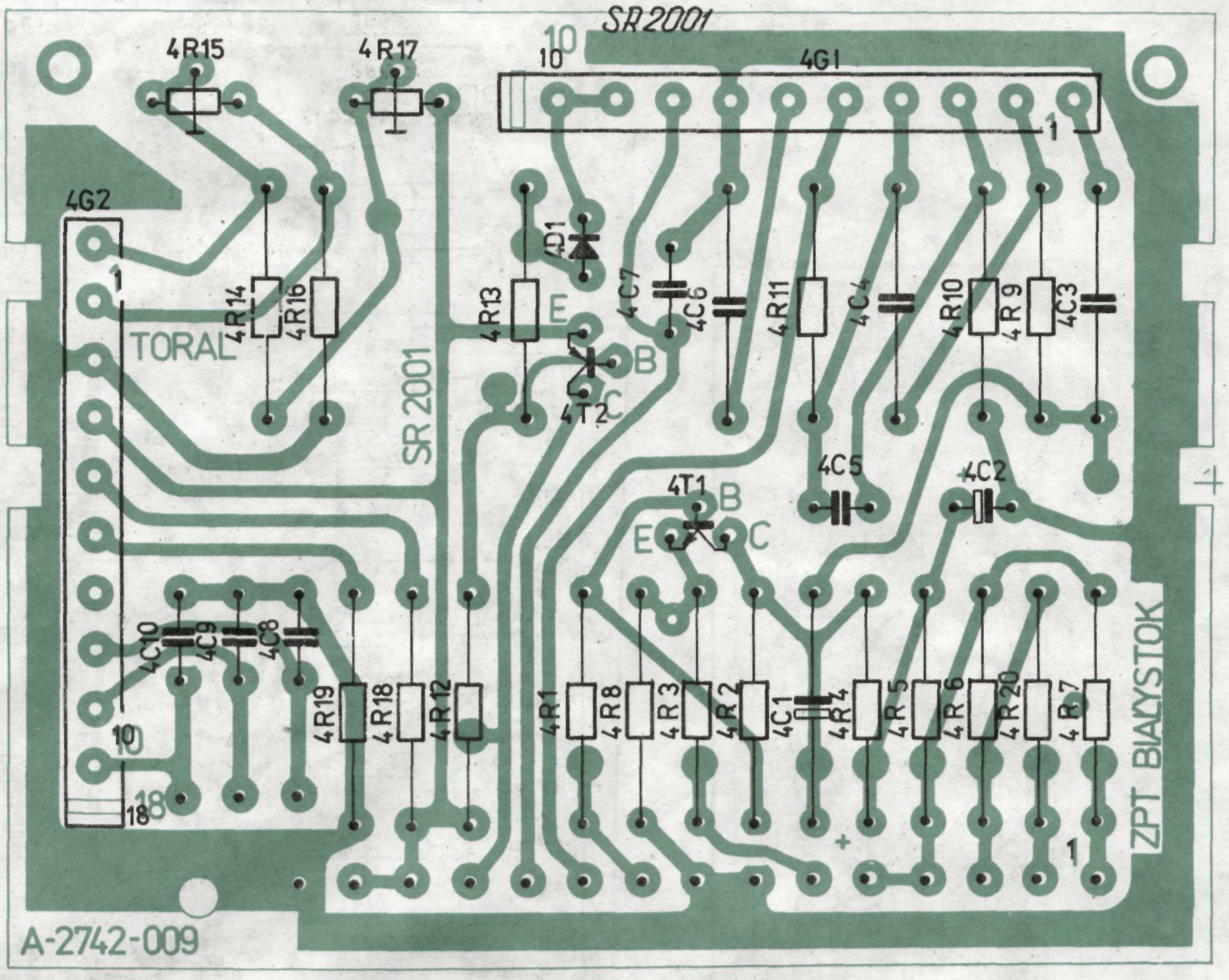
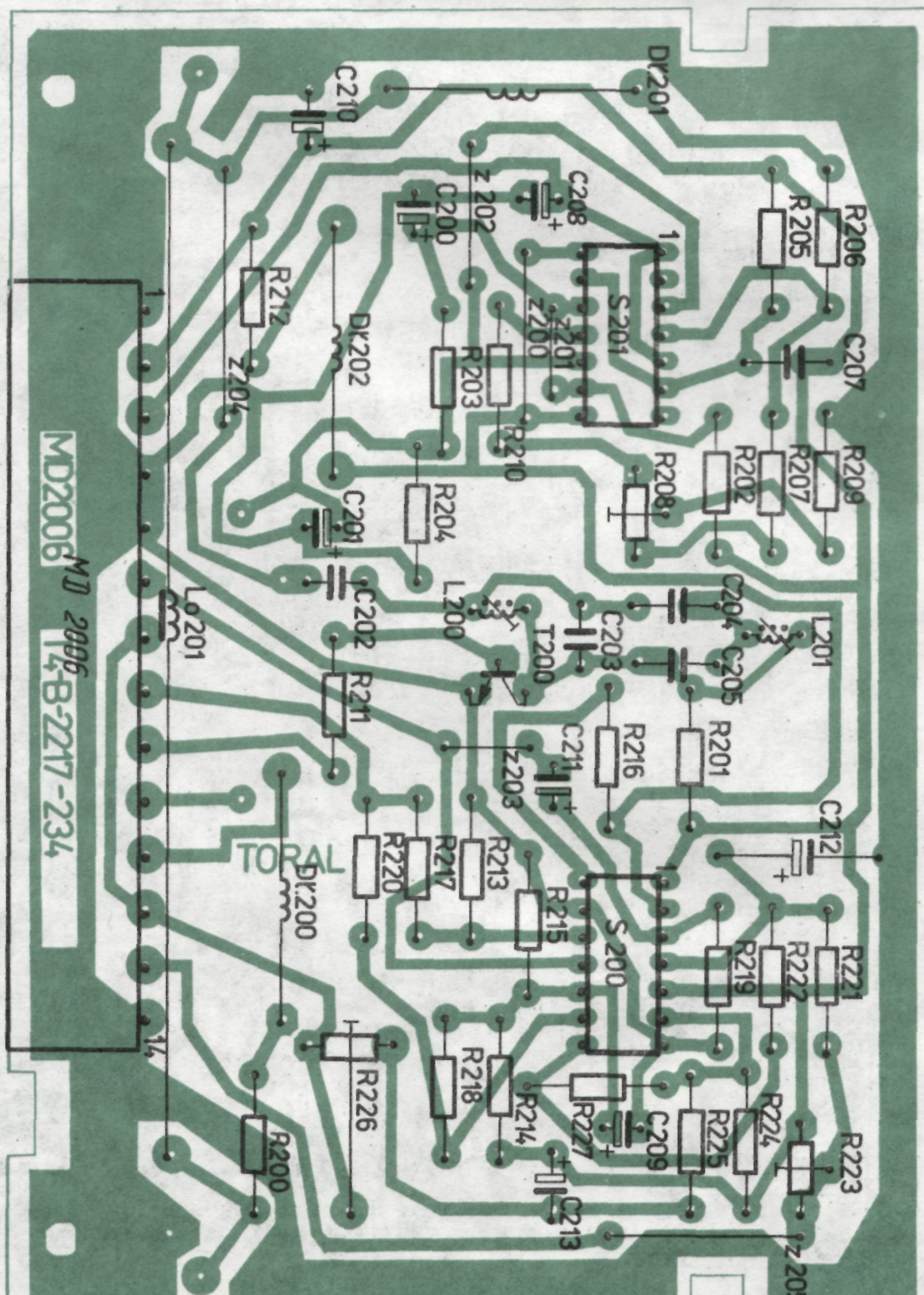
M V 2001







SR2001
4G1
4G2
TORAL
SR 2001
ZPT BIAŁYSTOK
A-2742-009



MD2006
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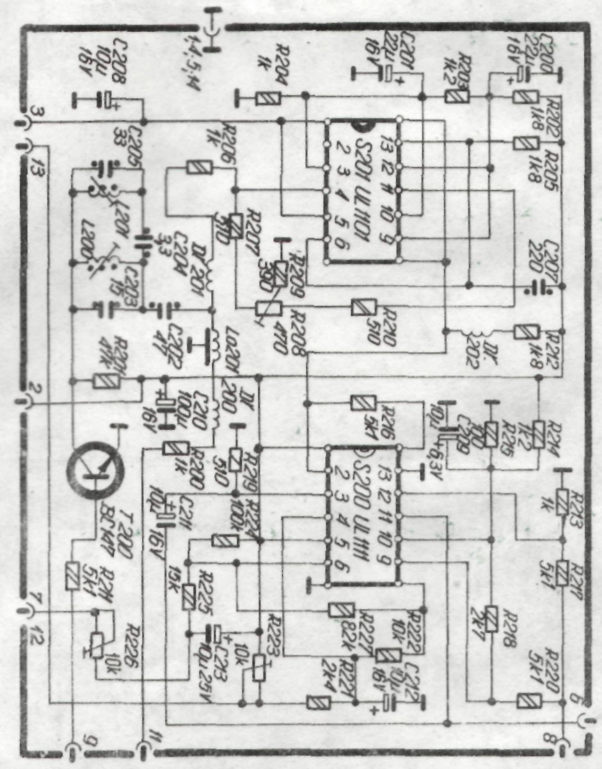
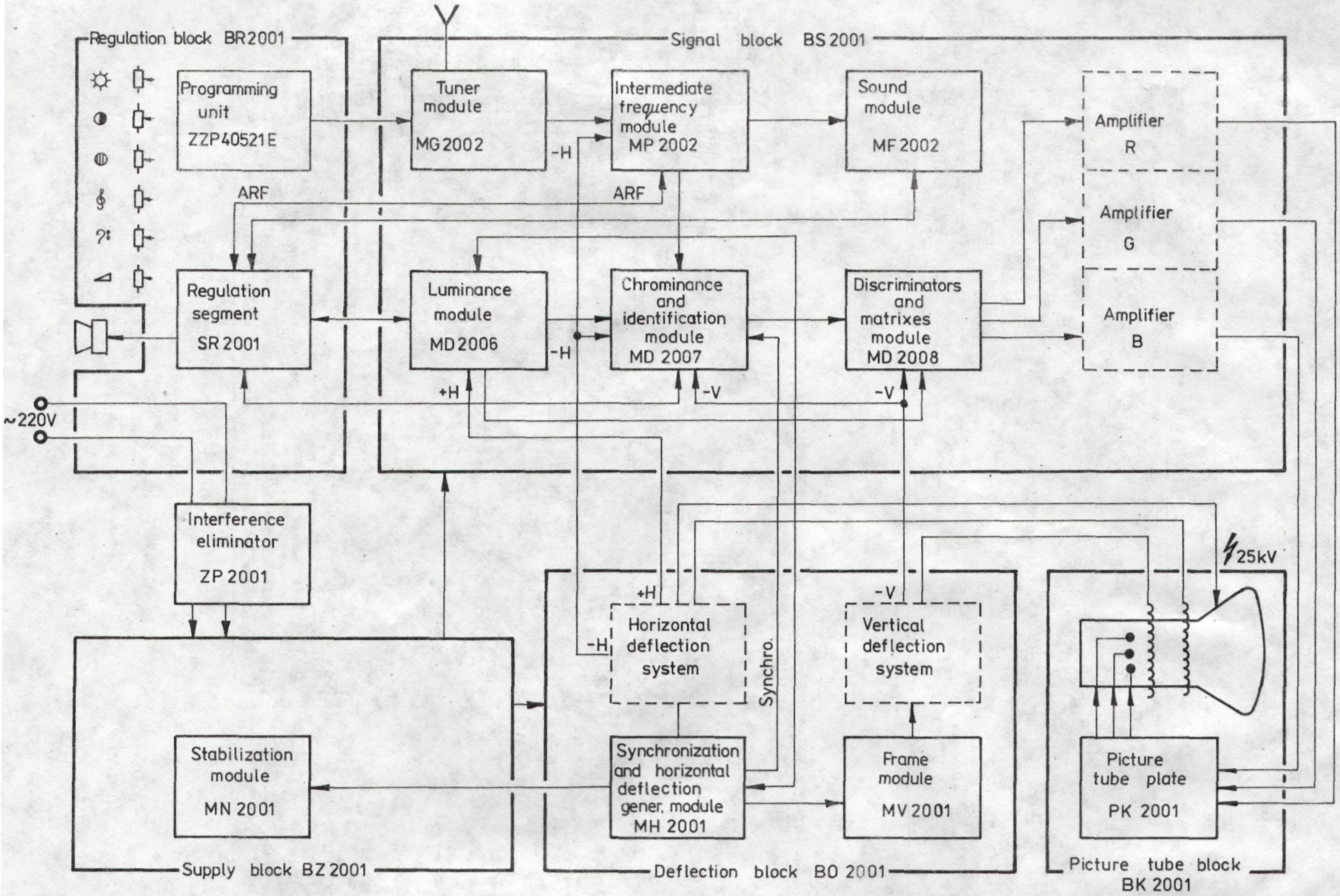
14-B-2217-234
TORAL

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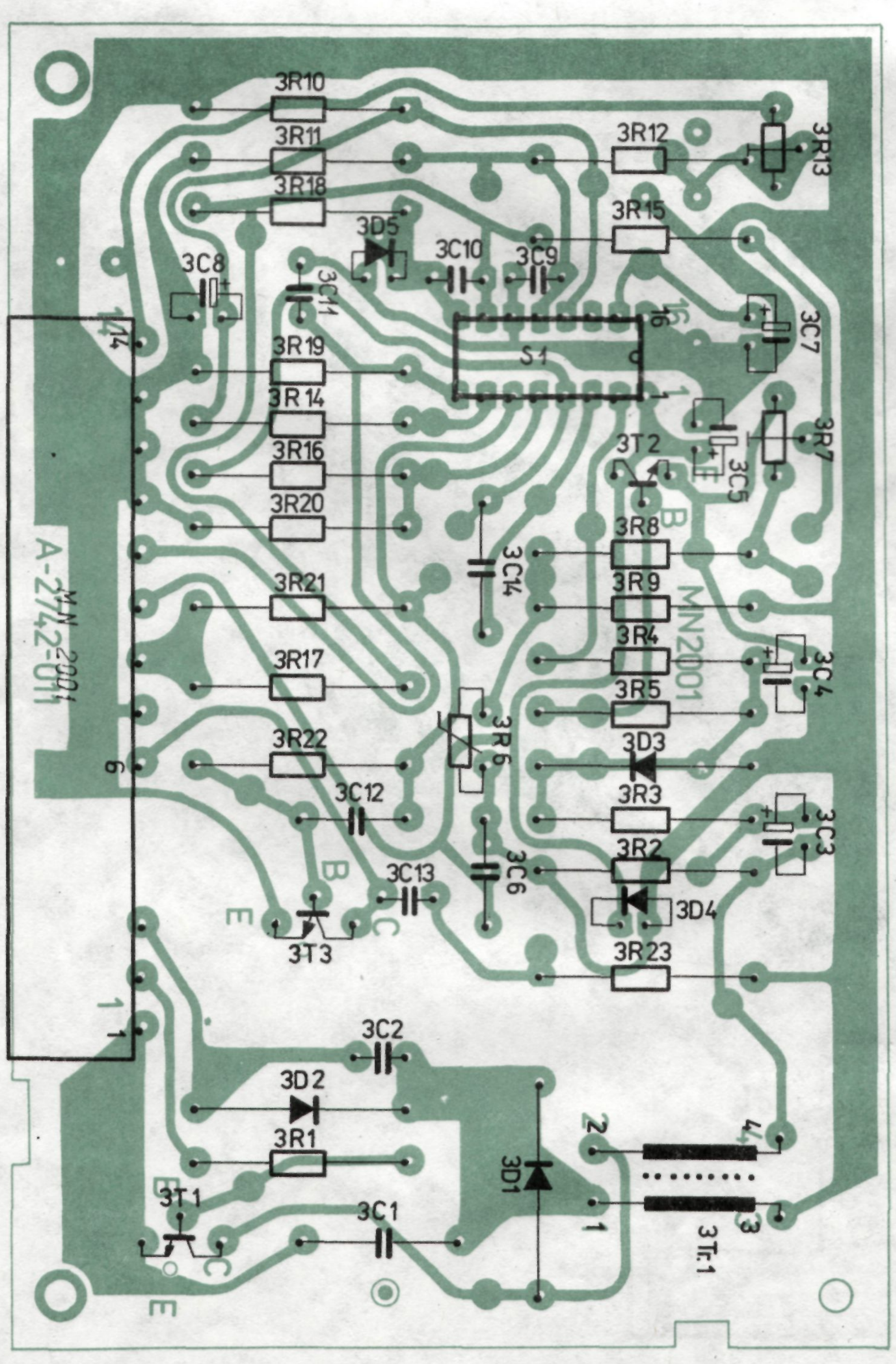
Signal block BS2001
Programming unit ZZP40521E
Tuner module MG2002
Intermediate frequency module MP 2002
Sound module MF 2002
Amplifier R
Amplifier G
Amplifier B
ARF
ARF
-H
Regulation segment SR 2001
Luminance module MD2006
Chrominance and identification module MD 2007
Discriminators and matrixes module MD 2008
-H
+H
-V
-V
~220V
Interference eliminator ZP 2001
25kV
+H
-H
Horizontal deflection system
Synchro.
-V
Vertical deflection system
Stabilization module MN 2001
Synchronization and horizontal deflection gener. module MH 2001
Frame module MV 2001
Picture tube plate PK 2001
Supply block BZ 2001
Deflection block BO 2001
Picture tube block BK 2001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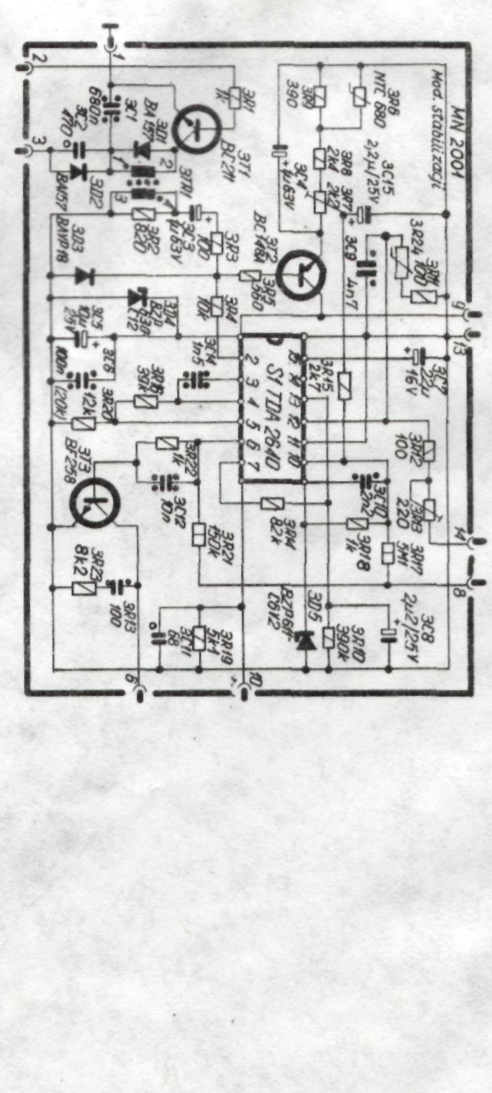
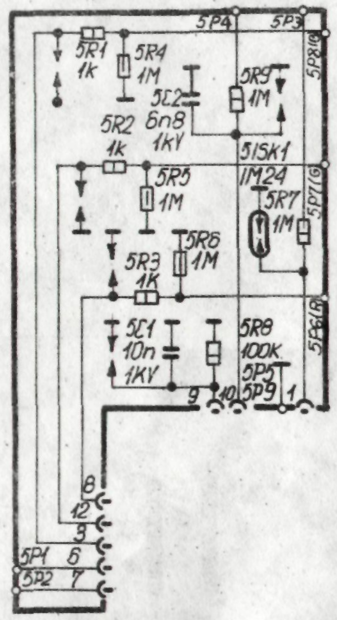
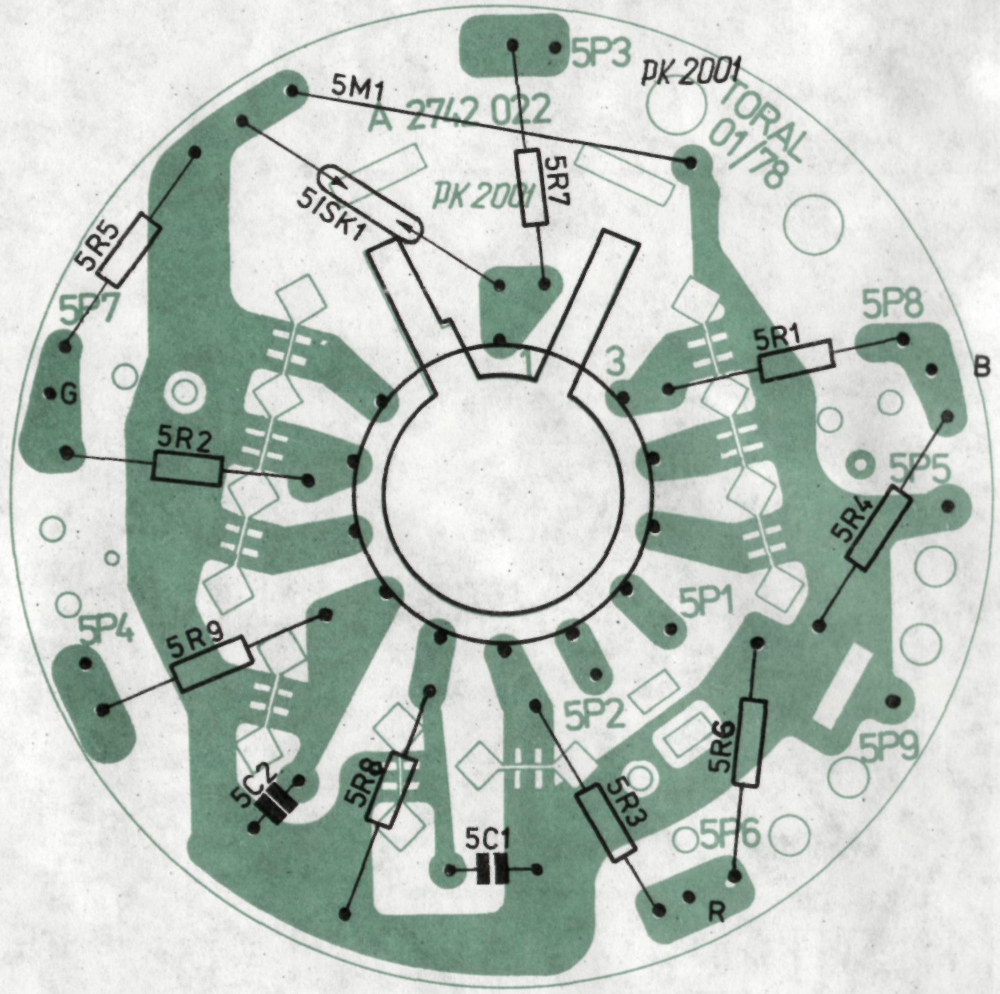
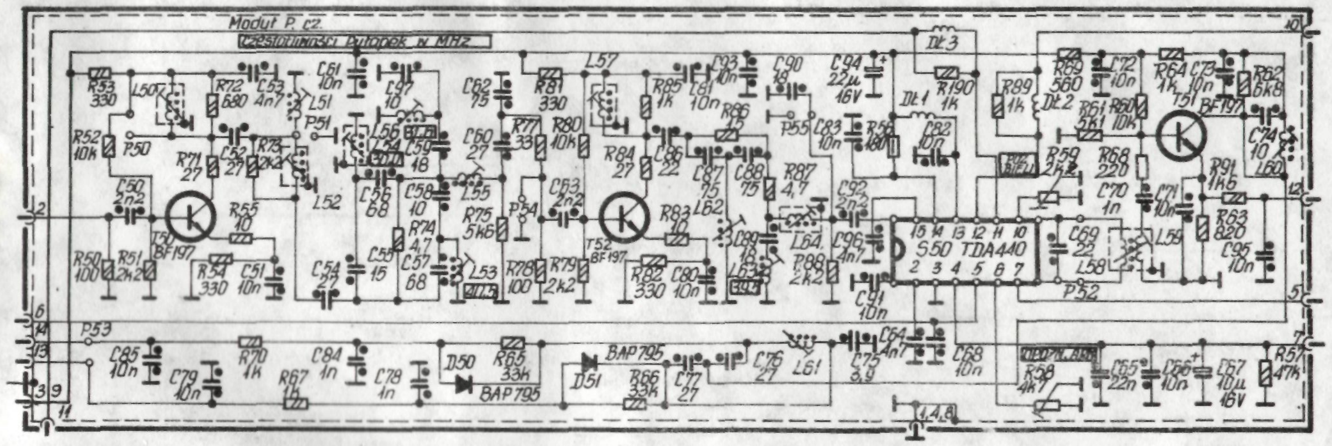
3R18
3R12
3R13
3R15
3D5
3C10
3C9
3C8
3C11
16
S1
3C7
3R19
3R14
3R16
3R20
3T2
3C5
3R7
3C14
3R8
3R9
3R21
3R4
3R5
MN2001
A-2742-011
3C4
3R17
3R22
3R6
3D3
3R3
3C12
3C6
3C3
3R2
3C13
3D4
3T3
3R23
3C2
3D2
3R1
3D1
3T1
3C1
3Tr1
B
E
C



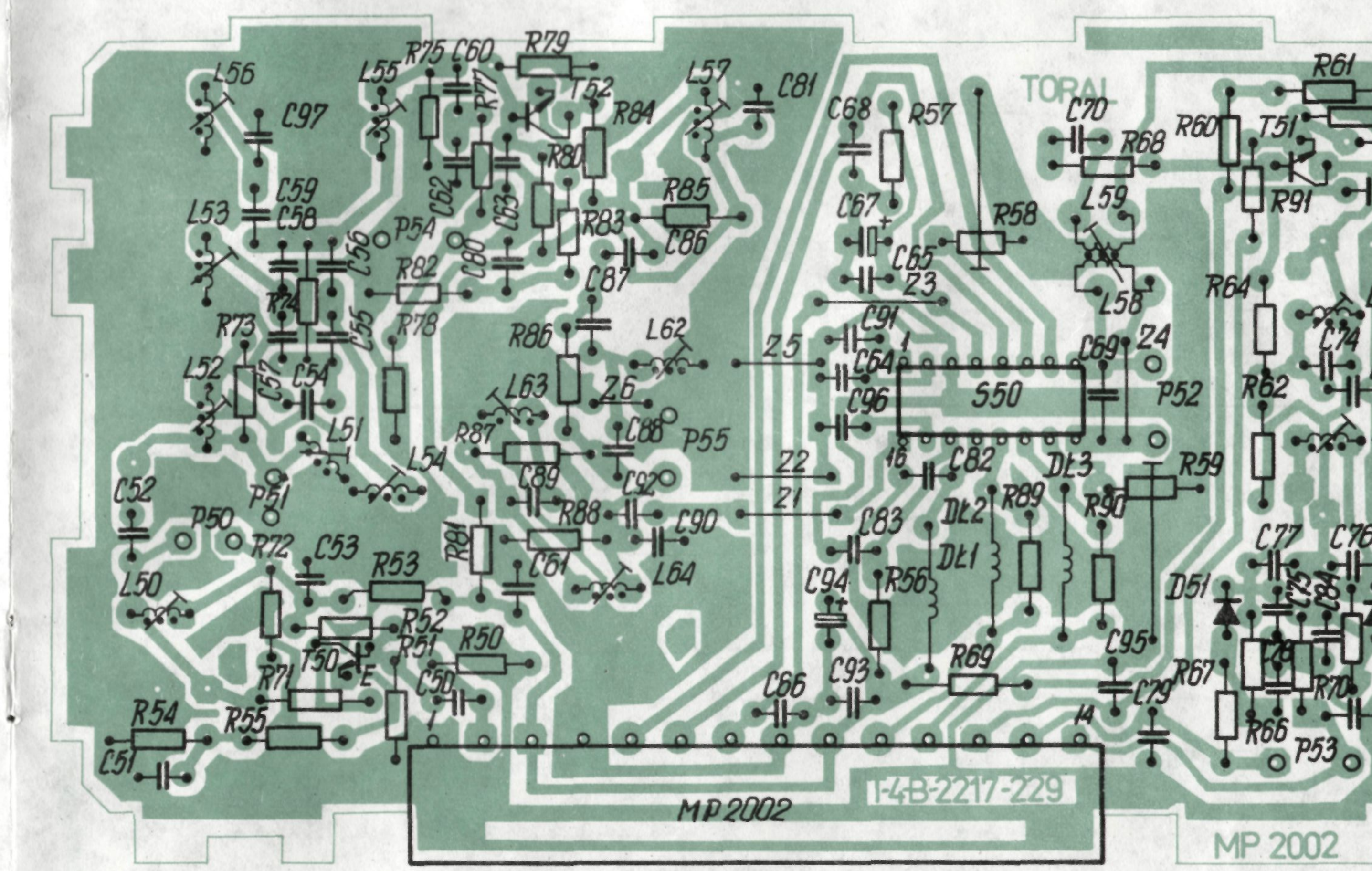




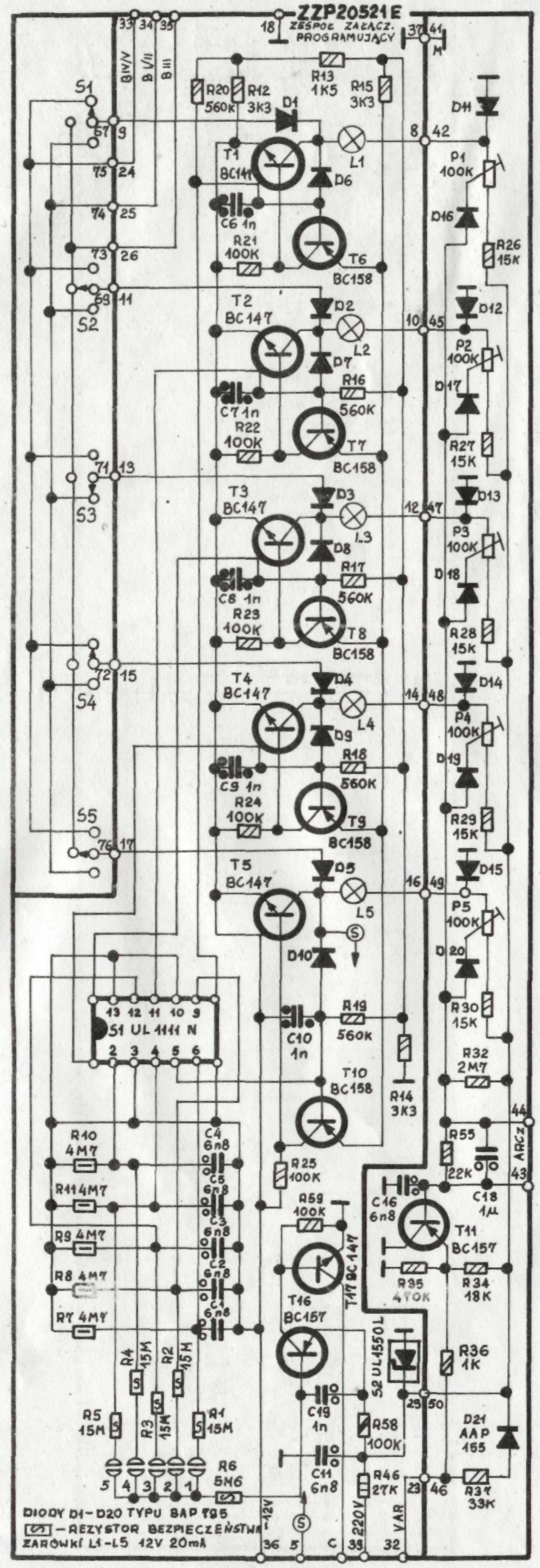
PK 2001
TORAL
01/78
A 2742 022
PK 2001
5M1
5ISK1



550 TDA440



TORAL
MP 2002
1-4B-2217-229
MP 2002


ZZP20521E
ZESPÓŁ ZAŁĄCZ. PROGRAMUJĄCY
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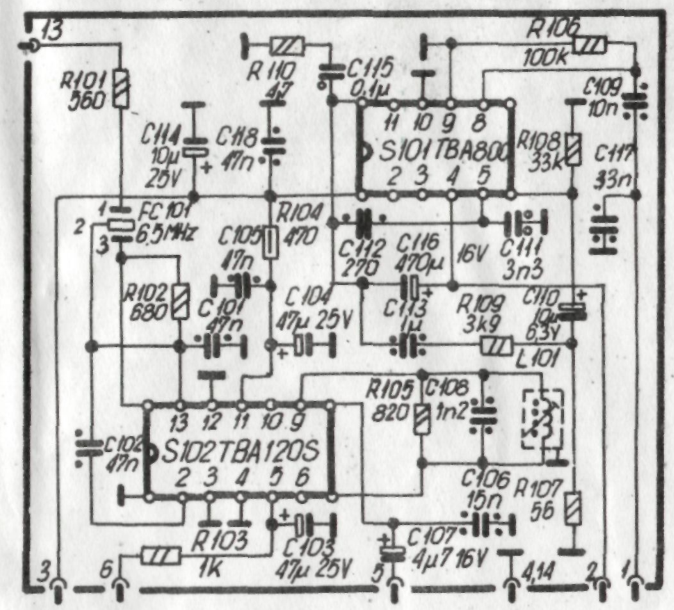
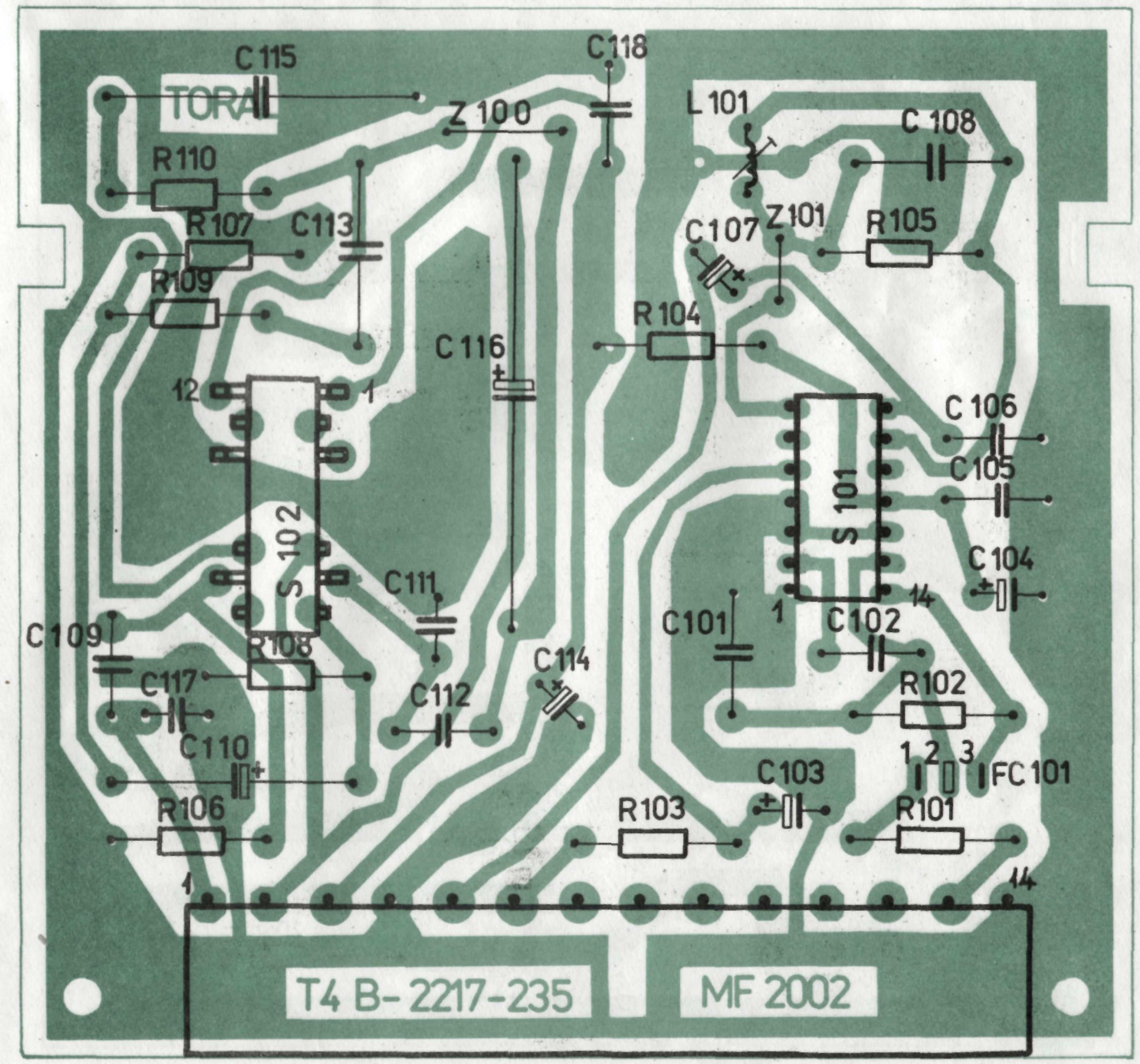
S2 UL1550L
DIODY D1–D20 TYPU BAP 795
– REZYSTOR BEZPIECZEŃSTWA
ŻARÓWKI L1–L5 12V 20mA
ARCZ
VAR
220V
12V


S101 TBA800
S102 TBA120S
FC101 6,5MHz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S 101
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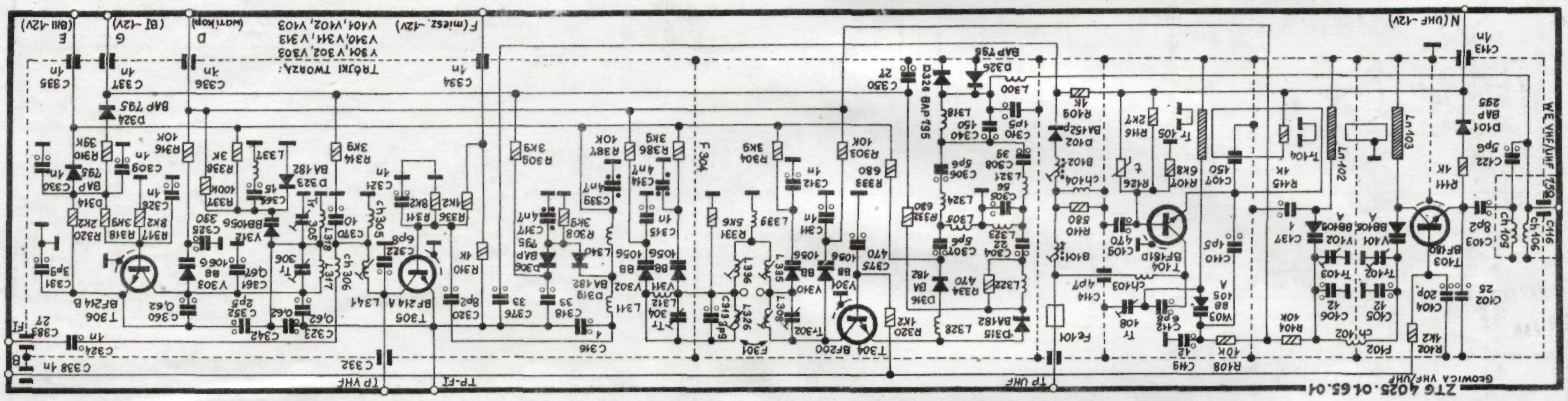
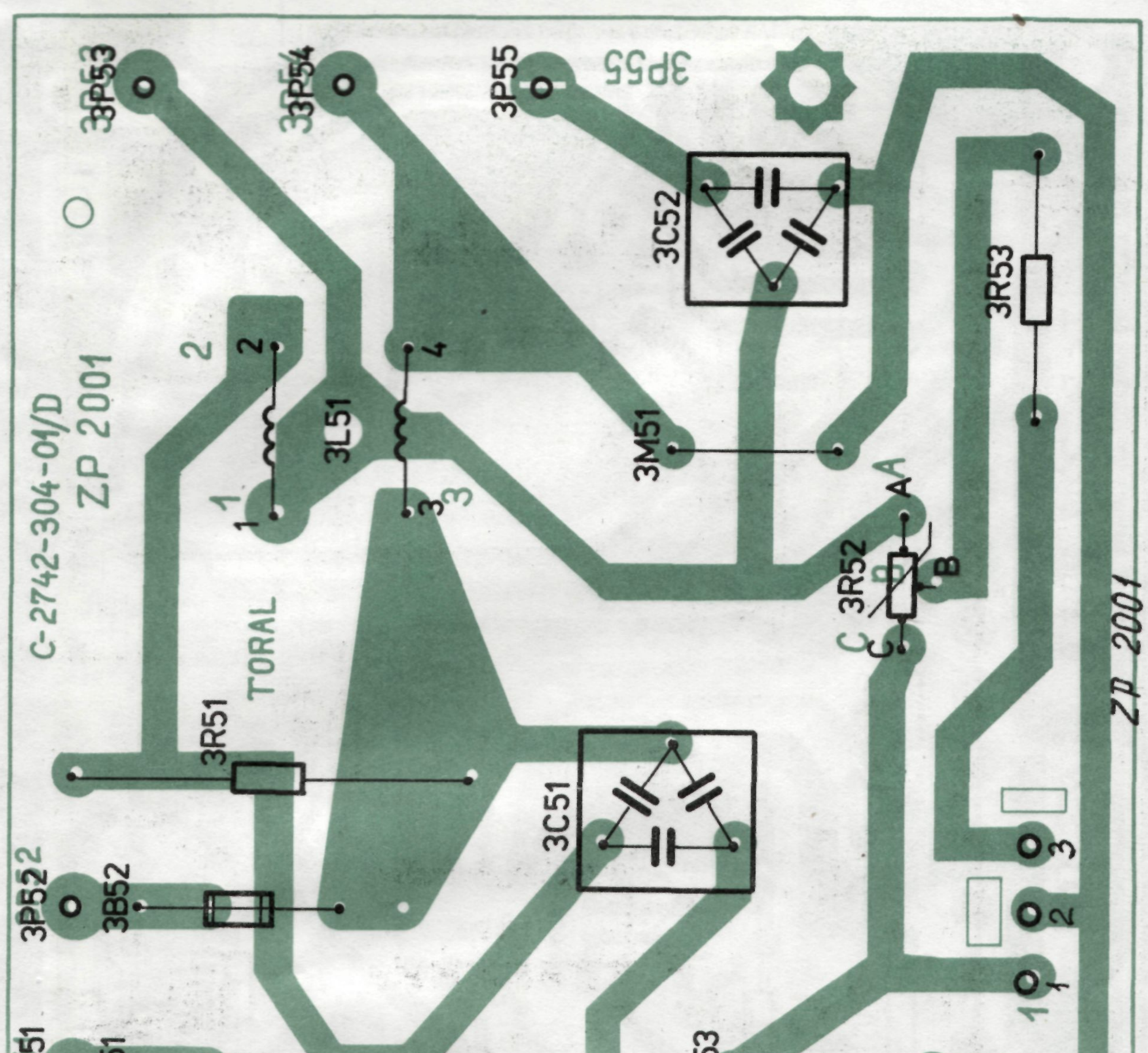
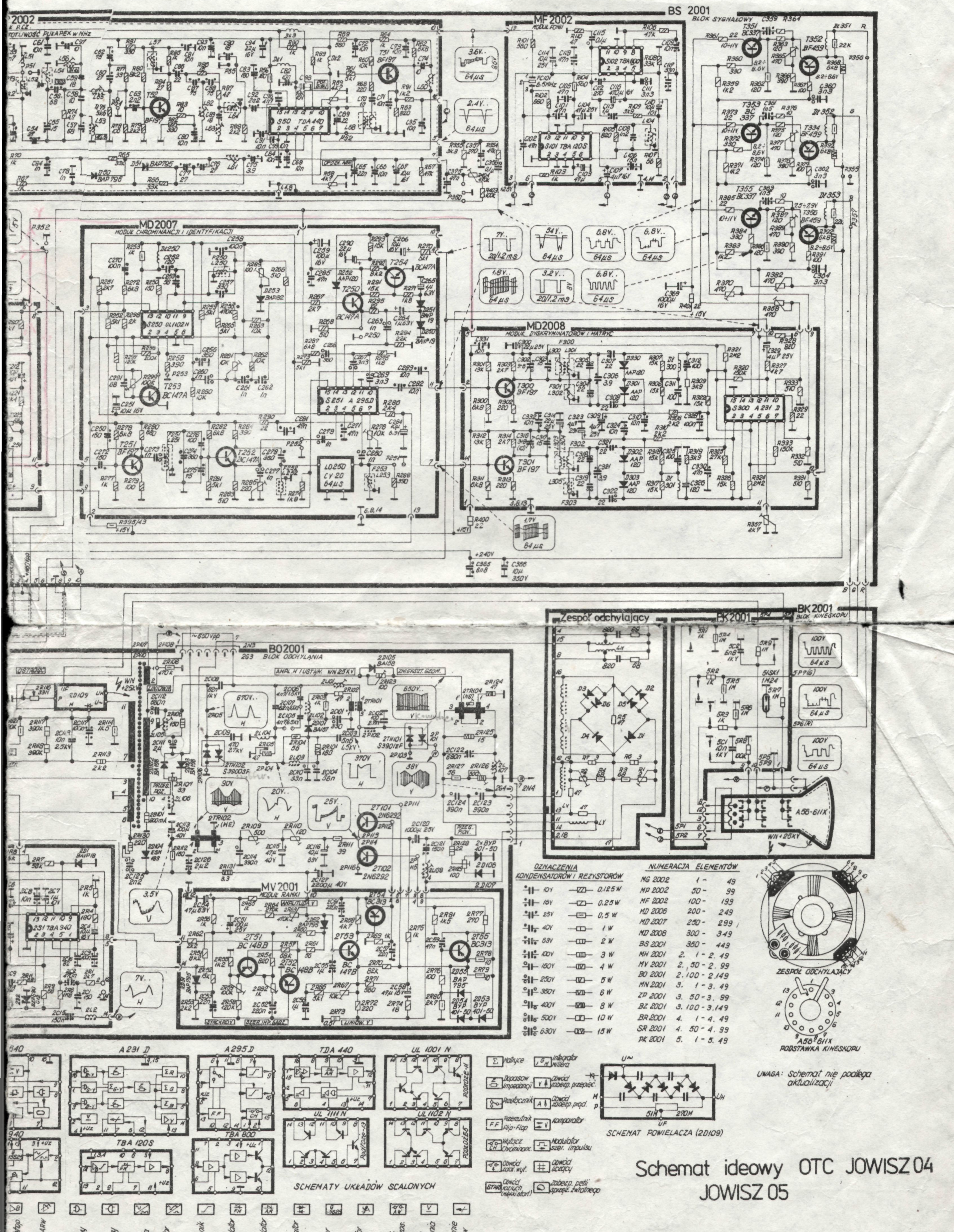
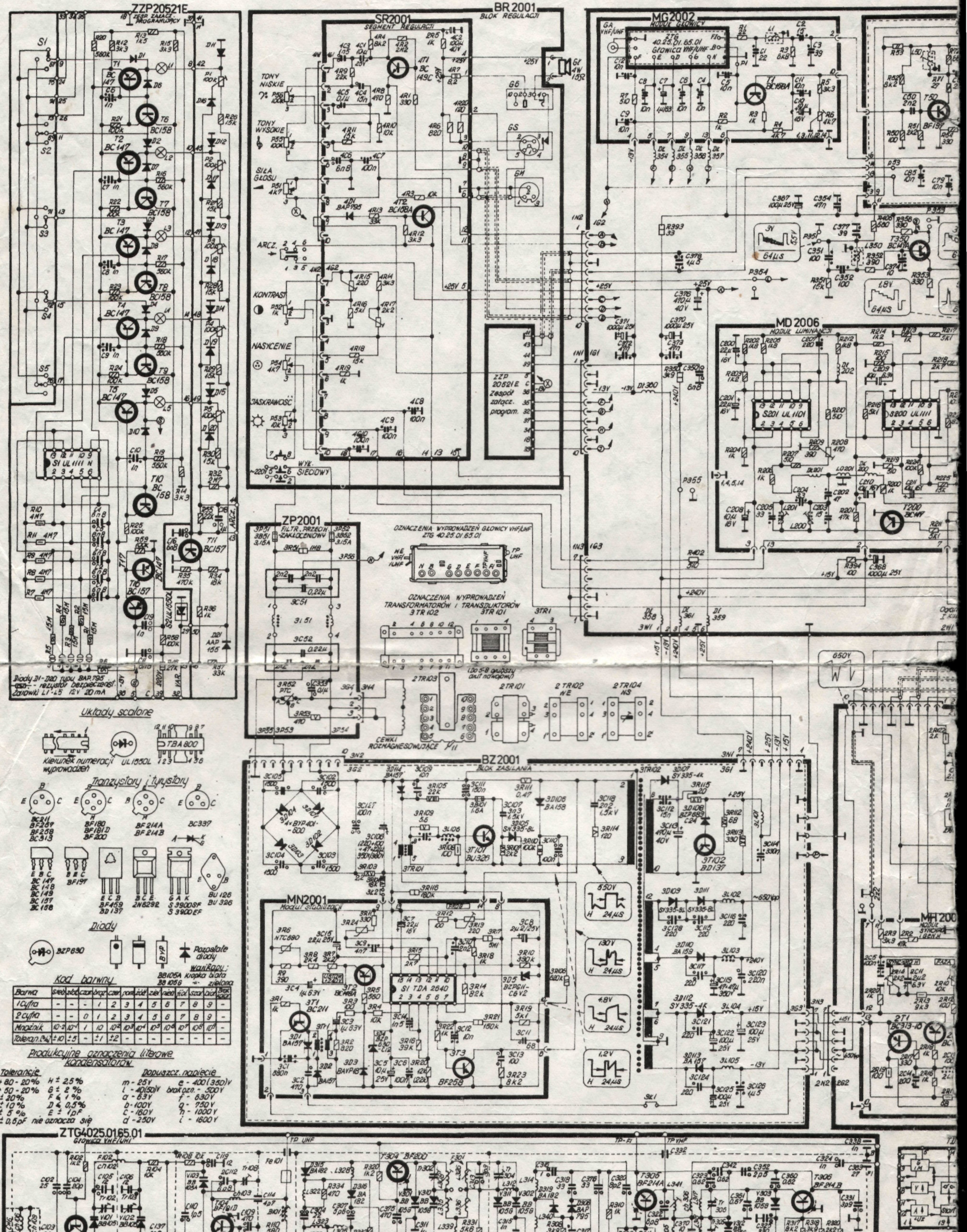
MF 2002




C-2742-304-01/D
ZP 2001
TORAL
3P51
3P52
3P53
3P54
3P55
3P56
3B51
3B52
3R51
3R52
3R53
3C51
3C52
3L51
3M51
3M53
3G4



Schemat ideowy OTC JOWISZ 04
JOWISZ 05



Barwa	srebr.	złot.	czarn.	brąz.	czerw.	pom.	żółt.	ziel.	nieb.	fiol.	szar.	biał.	Brak koloru
1 Cyfra	-	-	-	1	2	3	4	5	6	7	8	9	-
2 cyfra	-	-	0	1	2	3	4	5	6	7	8	9	-
Mnożnik	10^{-2}	10^{-1}	1	10	10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	-
Toleran. [%]	±10	±5	-	±1	±2	-	-	-	-	-	-	-	-

WEMA