

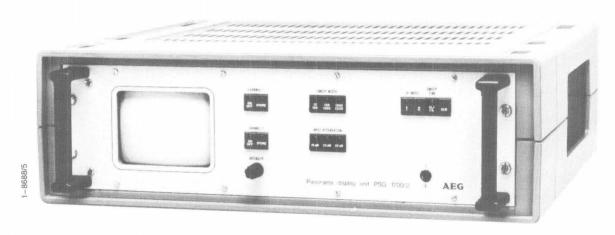
Technical Manual

Panorama Display Unit PSG 1700/2

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Panorama Display Unit PSG 1700/2

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1 DESCRIPTION

1.1 General Information

1.1.1 Designation

The unit described in this technical manual bears the designation: Panorama Display Unit PSG 1700/2

1.1.2 Possible Utilization

The Panorama Display Unit PSG 1700/2 is a supplementary unit for the new range of receivers from AEG.

It is used together with the VLF/HF receiver type E 1700/E 1800 and with the VHF/UHF receiver type E 1900 for frequency band monitoring in the frequency range from $10 \, \text{kHz}$ to $1000 \, \text{MHz}$.

The Panorama Display Unit PSG 1700/2 is equally suitable for wideband panorama operating mode and for narrow band transmission spectrum analysis. The display bandwidth and the analyzer filters have been designed for applications in the VLF-HF band as well as in the VHF/UHF band.

The frequency panorama can be displayed and frozen in two display channels, arranged one above the other on the cathode ray tube screen. Thus it is possible to make direct comparison between a live frequency band and a frequency band stored in memory.

In another available operating mode, one frequency band can be depicted with different display widths simultaneously.

It is also possible to display simultaneously the mutually independent frequency bands of two receivers.

The large dynamic range and the signal level depiction on a logarithmic screen scale calibration, facilitate assessment of the received signal levels.

The optional cursor function makes possible quick and accurate tuning even when the observed transmissions are present only for a short time.

This panorama display unit is intended for mobile operation as well as for operation in fixed stations. It can be equipped optionally with a mains power supply module for 110/220 V, 50 Hz to 60 Hz AC mains input, or with a mains-/battery power supply module.

1.1.3 General Description

The unit can be supplied as table unit or as drawer unit for 19" equipment rack systems. All manual control and indicator elements are located on the front panel.

The individual subassemblies are designed as plug-in modules and plug-in circuit cards, which are inserted into the unit from the rear.

The equipment connectors are located on the rear side of the unit.

1.2 Scope of Delivery

1.2.1 Standard Version

Qty.	Description	Stock Number
1	Panorama Display Unit PSG 1700/2	
	 for 2 HF Receivers E 1700/E 1800 with Mains Power Supply Module NV 1705 	52.1810.905.00
	 for 1 HF Receiver E 1700/E 1800 and 1 VHF/UHF Receiver E 1900 with Mains Power Supply Module NV 1705 	52.1810.906.00
	 for 2 VHF/UHF Receivers E 1900 with Mains Power Supply Module NV 1705 	52.1810.907.00
1	Mains Connecting Cable	5L.4582.001.17
10	Mains Fuses	
	for 220 V input voltage: T 0.63 B for 110 V input voltage: T 1.25 B	5N.4811.073.01 5N.4811.076.01
1	IF Signal Cable	52.1810.801.00 *
1	Technical Manual PSG 1700/2	5X.0172.225.86
1	Panorama Display Unit PSG 1700/2	
	 for 2 HF Receivers E 1700/E 1800 with Mains-/Battery Power Supply Module NB 1705 	52.1810.925.00
	 for 1 HF Receiver E 1700/E 1800 and 1 VHF/UHF Receiver E 1900 with Mains-/ Battery Power Supply Module NB 1705 	52.1810.926.00
	 for 2 VHF/UHF Receivers E 1900 with Mains-/Battery Power Supply Module NB 1705 	52.1810.927.00
1	Battery Plug, 3-pole, NC 37RC BAG	5L.4531.012.80
1	Mains Connecting Cable	5L.4582.001.17
10	Main circuit fuses, 24 V, T 6, 3 B	5N.4811.081.02
10	Mains Fuses for 110 V input voltage: T 1.25 B for 220 V input voltage: T 0.63 B	5N.4811.076.01 5N.4811.073.01
1	IF Signal Cable	52.1810.801.00 *
1	Technical Manual PSG 1700/2	5X.0172.225.86

^{*} Two cables are required when operating with two receivers.

1.2.2 Special Accessories (must be ordered separately)

Qty.	Description	Stock Number
1	Panorama Display Unit PSG 1700/2 with PSE 1705	
	 for 2 HF Receivers E 1700/E 1800 with Mains Power Supply Module NV 1705 	52.1810.908.00
	 for 2 VHF/UHF Receivers E 1900 with Mains Power Supply Module NV 1705 	52.1810.909.00
	 for 2 HF Receivers E 1700/E 1800 with Mains-/Battery Power Supply Module NB 1705 	52.1810.928.00
	 for 2 VHF/UHF Receivers E 1900 with Mains-/ Battery Power Supply Module NB 1705 	52.1810.929.00
1	IF Signal Cable	52.1810.801.00 *
1	Control Cable for E 1700 for E 1800 for E 1900	52.1810.802.00 * 52.1810.803.00 * 52.1810.804.00 *
1	Table Cabinet	52.1719.792.00
1	Battery Power Connecting Cable for NB 1705	52.9458.202.00

^{*} Two cables are required in each position when operating with two receivers.

1.2.3 Replacement and Service Parts (must be ordered separately)

Replacement Parts

Qty.	Description	Stock Number
1	RF Plug ''BNC'' (MIL 39012)	5M.4521.220.52
10	Fuses T 0.63 B	5N.4811.073.01
10	Fuses T 1.25 B	5N.4811.076.01
10	Fuses T 6.3 B	5N.4811.081.02
10	Fuses T 2.5 B	5N.4811.079.02

Service Parts

Qty.	Description	Stock Number
1	Adapter Card, 2-row	52.1360.880.00
1	Adapter Card, 3-row	52.1360.881.00
1	Adapter Cable with HV insert	52.1810.092.00
1	Extractor Tool	52.1810.899.01

Please contact AEG Aktiengesellschaft for further replacement parts which are available classified according to maintenance level and time period.

1.2.4 Reference list

Description	Stock Number	Printboard Number
RU 1705	52.1810.001.00	80.040.10.3.001
NV 1705	52.1810.100.00	80.040.27.001
GP 1705/1	52.1810.110.00	80.040.23.1.001
GP 1705/2	52.1810.120.00	80.040.23.2.001
HS 1705	52.1810.170.00	80.040.22.001
VV 1705	52.1810.160.00	80.040.25.001
AV 1705	52.1810.130.00	80.040.24.001
AV 1706	52.1810.140.00	80.040.26.001
BE 1705	52.1810.300.00	80.040.07.001
ZA 1705 (Motherboard only)	52.1810.400.00	80.040.11.001
(Input Circuit 10.7 MHz)	52.1810.401.00	
(Input Circuit 21.4 MHz)	52.1810.402.00	
ZA 1705 (with 10.7 MHz/10.7 MHz)	52.1810.404.00	
ZA 1705 (with 10.7 MHz/21.4 MHz)	52.1810.405.00	
ZA 1705 (with 21.4 MHz/21.4 MHz)	52.1810.406.00	
OS 1705	52.1810.410.00	80.040.12.001
WO 1705	52.1810.421.00	80.040.13.001
PR 1705	52.1810.501.00	80.040.17.001
BW 1705	52.1810.510.00	80.040.18.001
AD 1705	52.1810.520.00	80.040.19.001
DA 1705	52.1810.530.00	80.040.20.001
GT 1705	52.1810.210.00	80.040.33.01
GT 1706	52.1810.220.00	80.040.34.01
PSE 1705	52.1810.540.00	80.040.16.001
NB 1705	52.1810.250.00	80.040.36.000

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1.3 Technical Data

1.3.1 Electrical Data

The electrical data are specified here for the ambient temperature range from $+10\,^{\circ}\text{C}$ to $+40\,^{\circ}\text{C}$.

Center frequency:

10.7 MHz (E 1700/E 1800)

21.4 MHz (E 1900)

Display ranges:

Frequency range

10 kHz to 30 MHz:

10 kHz

100 kHz

1000 kHz

Filter bandwidth, analyzer mode:

20 Hz

200 Hz

2000 Hz

Filter bandwidth,

panorama mode: 200 Hz

2000 Hz

10000 Hz

Frequency range

20 MHz to 1000 MHz:

0.1 MHz

1 MHz

5 MHz

Filter bandwidth, analyzer mode:

0.2 kHz

2 kHz

10 kHz

Filter bandwidth,

panorama mode:

2 kHz

10 kHz

50 kHz

Center frequency drift:

less than 1% of display range

Nonlinearity:

less than 1% of display width

Selectivity (3 dB/60 dB):

1:8

(20 Hz) to

1:1.6

(50 kHz)

Scan times:

2 scan times can be selected in each display range: fast sweep for search mode (max. 10 cycles/second);

slow sweep for signal analysis

Cursor (option):

vertical line which can be set from the receiver;

smallest step 0.1% of display range

Signal level

Input level range:

-107 dBm to +23 dBm

Display:

80 dB, subdivided into 10 dB steps

Attenuation factor:

50 dB, in 5 steps of 10 dB each

Amplitude tolerance:

±3dB

Image frequency rejection:

70 dB

Crosstalk rejection between

inputs:

≥ 70 dB (typical 90 dB)

Intermodulation rejection:

70 dB

Display dimensions:

100 mm x 80 mm

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Image refresh: digital memory for two display channels

Image resolution: 1000 pixel each in x and y direction

Inputs: IF signal 2 x TNC, 50 Ohms

Cursor: 3 x 50-pole

Mains connection: $110 \text{ V}/220 \text{ V} \pm 10\%$

48 Hz - 66 Hz about 100 VA

Mains-/Battery connection:

(optional)

110 V/220 V ±10% 48 Hz - 66 Hz

about 100 VA

24 V DC nominal (21.5 - 30 V actual)

4.5 A

1.3.2 Environmental Capabilities

Ambient Temperature Range:

Guarantee of performance

specifications: $+10 \text{ to } +40 \,^{\circ}\text{C}$ May be operated: $-20 \text{ to } +50 \,^{\circ}\text{C}$ May be stored: $-40 \text{ to } +70 \,^{\circ}\text{C}$

Humidity tolerance: Operation is permissible for 96 hours with 90% relative

humidity and +40 °C ambient temperature. A mean relative humidity of 75% is tolerated throughout the ser-

vice life of the unit.

Vibration and mechanical

shock tolerance: No damage results when the switched-on unit is subject-

ed to vibration with a stroke of \pm 0.5 mm at 10 to 30 Hz or with a peak acceleration up to 2 g in the range from

30 to 70 Hz.

The unit remains functional whilst being shaken with

a stroke of \pm 1 mm at 5 Hz.

No damage results when the switched-on unit is subjected to a mechanical shock of 10 ms duration and up to

10 g acceleration.

1.3.3 Dimensions and Weight

	Height	Width	Depth	Weight
	mm	mm	mm	N
Drawer unit:	132.5	483	445	about 110

These dimensions are valid for the complete unit in drawer unit form, including the handles.

1.4 Technical Description

The basic version of the panorama display unit is sectioned according to the following sub-assemblies (modules):

Designation	Stock Number	
Skeleton Assembly RU 1705	52.1810.001.00	
Mains Power Supply Module NV 1705	52.1810.100.00	
Mains-/Battery Power Supply NB 1705	52.1810.250.00	Option
Manual Control Panel BE 1705	52.1810.300.00	
Intermediate Frequency and Analyzer Module ZA 1705	52.1810.400.00	
Oscillator OS 1705 (Oscillator I)	52.1810.410.00	
Sweep Oscillator WO 1705 (Oscillator II)	52.1810.421.00	
Processor PR 1705	52.1810.501.00	
Image Refresh Memory BW 1705	52.1810.510.00	
Analog/Digital Converter AD 1705	52.1810.520.00	
Digital/Analog Converter DA 1705	52.1810.530.00	
Parallel Interface (Cursor) PSE 1705	52.1810.540.00	Option

The Panorama Display Unit PSG 1700/2 can be operated optionally with the Mains Power Supply Module NV 1705 or with the Mains-/Battery Power Supply Module NB 1705. Using the Mains Power Supply Module NV 1705, it can be connected to 110 V or 220 V alternating mains voltage. The input voltage to the Mains-/Battery Power Supply Module NB 1705 is 110/220 V or 24 V DC. The power supply unit also contains the magnetically deflected cathode ray display tube, the beam deflection amplifiers, the video amplifier for intensity control and the high voltage generator.

The Intermediate Frequency and Analyzer Module ZA 1705 converts the receiver intermediate frequencies of 10.7 MHz or 21.4 MHz to three lower intermediate frequencies on which frequency selection is made. This module also contains the channel selector switch, an attenuator switch, the bandwidth switch and a logarithmic amplifier with rectifier.

The Oscillator Module OS 1705 (Oscillator I) produces the variable local oscillator frequency required for the first mixer in the module ZA 1705. This module also contains crystal oscillators, programmable frequency dividers and a phase locked loop which stabilizes the oscillator frequency.

The Sweep Oscillator WO 1705 (Oscillator II) produces the linearly variable reference frequency for the phase locked loop in the Oscillator I.

The Processor PR 1705 performs setting of the unit, sweep sequence control, measured value processing and organization of the image refresh memory with associated digital/analog converters for the x and y axes.

In the Image Refresh Memory Module BW 1705, the measured values are stored digitally in buffer memory and read out again at constant speed with about 50 Hz repetition frequency, giving a flicker-free display even for very slow sweep rates. The capacity of the image refresh memory is sufficient for 2 measured curves.

The Analog/Digital Converter Module AD 1705 digitizes the instantaneous amplitude values for each measuring step.

The Digital/Analog Converter Module DA 1705 contains one digital/analog converter each for the x and for the y deflection direction. The digital values coming from the image refresh memory are converted to analog voltages for driving the beam deflection amplifiers which are contained in the Module NV 1705 or NB 1705.

1.4.1 Functional Description

The intermediate frequency signals of 10.7 ± 0.5 MHz or 21.4 ± 2.5 MHz which are connected to the input jacks BU 1 and BU 2, are first of all taken through bandpass filters which establish the required image frequency rejection factor of 80 dB. Switchover between the two receiver intermediate frequencies is made with a microprocessor controlled diode switch. Thereafter, the signal is passed through a programmable attenuator switch which can be switched in steps of 10/20/20 dB. Next follows the ring modulator mixer stage in which the variable first local oscillator frequency from the module OS 1705 is used to convert the signal frequency to the first intermediate frequency of 6.3 MHz. The widest bandpass filter with a bandwidth of 50 kHz is located here. Part of the filter circuit lies on the input side of the first intermediate frequency amplifier and has impedance transformation characteristics to improve the noise figure.

After an amplifier which operates still at the 6.3 MHz level, the signal is applied to the second mixer stage which is an integrated circuit. Frequency conversion to a second intermediate frequency of 100 kHz is made here with a fixed frequency of 6.4 MHz. Two further bandpass filters, with bandwidths of 10 kHz and 2 kHz, are located at the 100 kHz level. The insertion loss of the filters is compensated in each case by amplifiers located between the filters.

A further integrated circuit mixer stage converts the signal to a third intermediate frequency of 5.88 kHz, with the aid of a fixed frequency of 94.12 kHz. The 94.12 kHz oscillator frequency is obtained by dividing the 6.4 MHz oscillator frequency by a factor of 68. After conversion of the signal to the third intermediate frequency follow the bandpass filters for the bandwidths of 200 Hz and 20 Hz. Here too, the insertion loss factors of the filters are compensated by amplifiers lying between them.

Bandwidth selection under microprocessor control is made by a chain of integrated circuit analog switches. The signal, which has a frequency of 100 kHz or 5.88 kHz depending on the selected bandwidth, is taken via a level-matching amplifier to a logarithmic amplifier. The latter functions according to the principle of successive amplitude limiting and covers a dynamic range of 70 dB. The logarithmic IF signal is now rectified and then smoothed (integrated) by a video frequency filter which is switched by the microprocessor according to the value of the intermediate frequency. The signal is then taken via an amplifier to the Analog/Digital Converter Module AD 1705.

The variable local oscillator frequency for the first mixer stage is produced in the module OS 1705. Depending on the nominal input frequency of 10.7 MHz or 21.4 MHz, it covers the range 17 ± 0.5 MHz or 27.7 ± 2.5 MHz. In the range 17 ± 0.5 MHz the oscillator operates at 34 ± 1 MHz and the output frequency is divided by a factor of 2.

In order to achieve high accuracy and stability, a phase locked loop is used to stabilize the oscillator frequency. Each display range is subdivided into 1000 frequency steps. This high frequency resolution gives a quasi-continuous tuning characteristic. The frequency steps are not visible in the display. In order to obtain this high resolution with an adequate sweep rate, a special principle for frequency synthesis has been devised. It ensures constant relative frequency resolution and accuracy with respect to the actual display range. With the exception of the display range 21.4 ± 2.5 MHz, the oscillator signal id downward-mixed with a fixed frequency produced in a bank of crystal oscillators. The resulting intermediate fre-

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quency is divided down by a factor depending on the particular display range, and then compared in a phase comparator with a reference frequency produced in the module WO 1705. This reference frequency lies in the range 250 kHz to 302 kHz. The oscillator frequency is corrected with the output signal of the phase comparator.

In the range 21.4 ± 2.5 MHz, the oscillator signal is divided by a factor of 100 without mixing, and then applied to the phase comparator.

Frequency sweep is obtained by varying the phase reference frequency in 1000 steps. This is performed in the module WO 1705. In order to obtain adequate spectral purity of the oscillator signal, a coil-tuned oscillator circuit is used. The nonlinearity of the tuning characteristic is corrected with negative feedback via a linear frequency discriminator. The tuning voltage for the oscillator is produced by a digital/analog converter which is driven by a counter whose clock frequency comes from the Processor PR 1705. In order to obtain the required accuracy, the sweep start and sweep end frequency of the oscillator are recalibrated during each retrace between two successive sweep cycles. Calibration is made by comparison with the nominal frequencies for the sweep range limits, using two phase locked loops. By setting the counter to its initial or to its end value, this procedure gives correction voltages for the zero point and for the end value of the sweep oscillator control voltage. The correction voltages are stored in capacitors and remain constant during the next sweep cycle.

The nominal frequencies for the band limits are produced in a phase locked loop (PLL) circuit. An oscillator frequency which is higher by a factor of 32 is divided down by a microprocessor-set programmable factor. The resulting frequency is phase-compared with a fixed frequency of 64 kHz, which is obtained by frequency division from 6.4 MHz.

The digital circuitry of the unit is distributed over 6 printed circuit boards. The circuit board PR 1705 contains the microprocessor, the program memory, a programmable clock generator and a direct memory access (DMA) controller which controls writing of the measured values into the image refresh memory. The clock generator produces the measuring sequence clock signal, which is programmed by the microprocessor to suit the selected display range, and also the constant clock frequency for image repetition rate. The measurement is made in 1000 steps. This gives an address word length of 10 bits for the x-axis.

The logarithmic and rectified measured signal (module ZA 1705) is applied to an analog/digital converter which is located on the circuit board AD 1705. A sample and hold amplifier is connected ahead of the analog/digital converter, to hold the measured value until the end of a measuring step, i.e. until the transient response time for the oscillator and filters has passed. At the same time the analog to digital conversion is initiated. After completion, the converter sends a signal to the DMA controller I, which thereupon writes the digitized measured value into the image refresh memory. The current image repetition cycle is briefly interrupted during this procedure. The measured values are digitized with 10 bit resolution, so that 1000 amplitude steps are available in the y-direction.

The image refresh memory on the module BW 1705 consists of static RAM (random access memory) with a capacity of 4 k x 11 bits. 10 bits are required for the amplitude values and 1 bit is used for intensity control of the cathode ray tube. Two measured curves can be stored, together requiring a total memory capacity of 2 k x 11 bits. The remaining 2 k are used to generate the raster on the cathode ray tube. The pairs of values for the electronic raster are generated during initialization of the microprocessor section after switching the unit on.

For display reproduction of the measured curves, the memory address gives the x-coordinate and the data content of this address gives the y-coordinate. Switchover is made to x/y-mode for displaying the electronic raster. Pairs of values, each belonging to one picture dot (picture element, "pixel") are read from RAM. Lines are traced on the display screen by the beam movement over successive pixel. The complete displayed image can consist of up

to 2 measured curves on the electronic raster and is repeated at a rate of 50 Hz. The image repetition is controlled by the DMA controller II. The clock rate is specified by the programmable clock generator on the module PR 1705. The DMA controller and the image refresh memory are separated by buffers from the address and data bus of the microprocessor. Image refresh can thus take place independent of other activities by the microprocessor. Through connection to the microprocessor bus is made either when measured data have to be written into memory or when the DMA controller is being programmed by the microprocessor.

The digital values coming from the image refresh memory are converted to analog signals by two digital/analog converters (DAC) on the circuit board DA 1705. Two low-pass filters are used to interpolare between the individual pixels. These filters are connected to the output side of the digital/analog converters. The two signals are then taken via amplifiers to the cathode ray display section.

The set reception frequency is read by the microprocessor via the digital Parallel Data Interface PSE 1705. The position of the frequency cursor is calculated together with the selected display range. In an initialization routine, the microprocessor checks whether both digital inputs are engaged and makes a decision for the cursor operating mode. The initialization routine can be started by the pushbutton "CLR".

Either:

1. Operation with one receiver.

This must be the master receiver: IF signal to BU 1

Digital signal to BU 3

or

2. Operation with two receivers.

Master receiver: IF signal to BU 1

Digital signal to BU 3

Slave receiver: IF signal to BU 2

Digital signal to BU 4

Manual settings of the unit are made with presskeys which are located on the circuit board BE 1705 which is mounted directly behind the front panel. Each keypress produces a program interrupt. A keyboard encoder generates a codeword which is sent to the microprocessor. The LEDs in the keys are also switched therewith.

The cathode ray display unit, which also contains the power supply module (type NV 1705 or type NB 1705), uses a magnetically deflected cathode ray tube. The deflection amplifiers for the x-direction and for the y-direction are constructed identically. They contain a diode network to correct for tangent distortion of the cathode ray tube. Switchover is made between two supply voltages to reduce power consumption of the deflection output stage. When the image contents require only a slow deflection speed, then only a low supply voltage is applied to the power output amplifier. A differentiator circuit detects a higher deflection speed, e.g. for reproduction of sharp spikes. In this case an electronic changeover switch connects a three times greater supply voltage to the deflection output stages.

2 OPERATING INSTRUCTIONS

2.1 Special Precautions to Prevent Accidents

When connecting up and operating the unit, use one of the approved types of protection according to German Electrical Regulations VDE 0100 (grounding to mains neutral line, direct grounding, grounding to mains ground conductor).

CAUTION: Before opening the unit, disconnect the power supply cable.

2.2 Setting-Up and Taking-Down

2.2.1 Explanation of the Rear Side of the Unit

Module	Designation	Functional Description	Remarks
ZA 1705	BU 1	Input for receiver intermediate frequency 10.7 MHz or 21.4 MHz	(Master)
	BU 2	Input for receiver intermediate frequency 10.7 MHz or 21.4 MHz	(Slave)
PSE 1705	BU 3	Control output for digital center frequency setting E 1700/E 1800 or E 1900 (Master)	
	BU 4	Control output for slave receiver E 1700/E 1800 or E 1900	
RU 1705 with NV 1705	ST 1	Mains connector 110/220 V AC The unit must be in the switched- off state when connecting up to the power source.	
	Si 1	Mains fuse	
	Τ	Grounding connection (mains ground conductor; protection ground)	
RU 1705	ST 1	Battery power connector 24 V DC	
with NB 1705	ST 2	Mains connector 110/220 V AC The unit must be in switched-off state when connecting up to the power source.	
	Si 1	Fuse (DC) = 6.3 A	
	Si 2	Fuse (AC) = 2.5 A (110 V) 1.25 A (220 V)	
	1.	Grounding connection (mains ground conductor; protection ground)	

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2.2.2 Pinout of control lines

2.2.2.1 Control line to E 1700 (52.1810.802.00)

PSG 1700/2 BU 3 + 4 / Contact No.	Function		,	E 1700; SR 1520 BU 701 / Contact No.	Remarks
1	Commanding puls	inpu ⁻	t (FEKO)	1	1
3	Control line for da		,	3	2
4	Identification line			4	
5	10 Hz decade	-	bit A	5	
6	10 Hz decade		bit C	6	
7	100 Hz decade		bit D	7	
8	100 Hz decade		bit B	8	
9	1 kHz decade		bit D	9	
10	1 kHz decade		bit B	10	
11	10 kHz decade		bit D	11	
12	10 kHz decade		bit B	12	
13	100 kHz decade		bit D	13	
14	100 kHz decade		bit C	14	
15	100 kHz decade		bit A	15	
16	1 MHz decade		bit B	16	
17	1 MHz decade		bit A	17	
22	10 Hz decade	-	bit B	22	
23	10 Hz decade		bit D	23	
24	100 Hz decade		bit C	24	
25	100 Hz decade	_	bit A	25	
26	1 kHz decade		bit C	26	
27	1 kHz decade		bit A	27	
28	10 kHz decade		bit C	28	
29	10 kHz decade		bit A	29	
30	100 kHz decade		bit B	30	
31	1 MHz decade	_	bit D	31	
32	1 MHz decade	-	bit C	32	
33	10 MHz decade		bit B	33	
34	GND (0 V)			34	
44	Mode of operation	-	bit C	44	
45	Mode of operation	-	bit B	45	
46	Mode of operation	_	bit A	46	
47	Bandwidth	_	bit A	47	
48	Bandwidth	_	bit B	48	
49	Bandwidth		bit C	49	
50	10 MHz decade	_	bit A	50	

Remarks:

^{1 &}quot;L" data input (FEKO) 2 "L" data output (TSG)

2.2.2.2 Control line to E 1800 (52.1810.803.00)

PSG 1700/2 BU 3 + 4 / Contact No.	Function			E 1800; PSE 1800 BU 11 / Contact No.	Remarks
5	10 Hz decade	_	bit A	5	
6	10 Hz decade		bit C	6	
7	100 Hz decade	_	bit D	7	
8	100 Hz decade	_	bit B	8	
9	1 kHz decade	_	bit D	9	
10	1 kHz decade	_	bit B	10	
11	10 kHz decade		bit D	11	
12	10 kHz decade	_	bit B	12	
13	100 kHz decade	_	bit D	13	
14	100 kHz decade	_	bit C	14	
15	100 kHz decade	_	bit A	15	
16	1 MHz decade	_	bit B	16	
17	1 MHz decade		bit A	17	
22	10 Hz decade	_	bit B	2	
23	10 Hz decade		bit D	3	
24	100 Hz decade	_	bit C	1	
25	100 Hz decade	_	bit A	18	
26	1 kHz decade	_	bit C	26	
27	1 kHz decade	_	bit A	27	
28	10 kHz decade	_	bit C	28	
29	10 kHz decade	_	bit A	29	
30	100 kHz decade	_	bit B	30	
31	1 MHz decade		bit D	31	
32	1 MHz decade		bit C	32	
33	10 MHz decade	_	bit B	33	
34	GND (0 V)			34	
42	Control signal PSG			42	1
50	10 MHz decade	_	bit A	50	

Remarks:

1 "L": PSG 1700 in store mode (Cursor)

"H": PSG 1700 in normal mode (No Cursor)

Control line to E 1900 (52.1810.804.00) 2.2.2.3

5 6 7	100 Hz decade 100 Hz decade			Contact No.	
6	100 Hz decade		bit A	3	
		_	bit C	18	
	1 kHz decade		bit D	9	
8	1 kHz decade	-	bit B	10	
9	10 kHz decade		bit D	11	
10	10 kHz decade		bit B	12	
11	100 kHz decade	-	bit D	13	
12	100 kHz decade		bit B	30	
13	1 MHz decade		bit D	31	
14	1 MHz decade		bit C	32	
15	1 MHz decade		bit A	17	
16	10 MHz decade		bit B	33	
17	10 MHz decade		bit A	50	
22	100 Hz decade		bit B	8	
23	100 Hz decade		bit D	42	
24	1 kHz decade		bit C	26	
25	1 kHz decade		bit A	27	
26	10 kHz decade		bit C	28	
27	10 kHz decade		bit A	29	
28	100 kHz decade		bit C	14	
29	100 kHz decade		bit A	15	
30	1 MHz decade	_	bit B	16	
31	10 MHz decade		bit D	20	
32	10 MHz decade		bit C	36	
33	100 MHz decade		bit B	19	
34	GND (0 V)			34	
37	100 MHz decade		bit C	38	
38	100 MHz decade	_	bit D	39	
42 50	Input control signal 100 MHz decade	PSG	1700/2 bit A	5 41	1

Remarks: 1 "L": PSG 1700 in store mode (Cursor)

"H": PSG 1700 in normal mode (No Cursor)

Electrical characteristic (Antenna matrix): data output: "L": $U \le 0.6 \text{ V}; \ I \le 2 \text{ mA}$ "H": $U \ge 2.4 \text{ V}; \ I \le 0.4 \text{ mA}$

2.2.3 Internal pinout of connector strips BU 3 and BU 4, as well as BU 6.1

The internal connections of connector strips BU 3 and BU 4 (see page B 01) to connector strip BU 6.1 are made by short wires. The connector strip BU 6.1 is plugged into plug connector St 6.1 mounted to the Printed Circuit Board Parallel Interface PSE 1705 (see Annex 18, Sheet 2).

BU 3 and BU 4 (cannon jacks, 50-pole) Contact No.	BU 6.1 (Berg jack, 2 x 22 pole) Contact No.	Remarks				
1	b 16	''L'' ê Data input (FEKO)				
3	a 17	"L" = Data output (TSG)				
5	b 15	10 Hz decade — bit A				
6	b 14	10 Hz decade — bit C				
7	a 3	100 Hz decade — bit D				
8	a 4	100 Hz decade — bit C				
9	b1	1 kHz decade — bit D				
10	a 1	1 kHz decade — bit B				
11	a 13	10 kHz decade — bit D				
12	a 10	10 kHz decade — bit B				
13	b 12	100 kHz decade — bit D				
14	b 11	100 kHz decade — bit C				
15	b 13	100 kHz decade - bit A				
16	b 7	1 MHz decade — bit B				
17	b 8	1 MHz decade — bit A				
22	a 15	10 Hz decade — bit B				
23	a 14	10 Hz decade — bit D				
24	b 3	100 Hz decade — bit C				
25	b 4	100 Hz decade — bit A				
26	a 2	1 kHz decade — bit C				
27	b 2	1 kHz decade — bit A				
28	a 11	10 kHz decade — bit C				
29	b 10	10 kHz decade — bit A				
30	a 12	100 kHz decade — bit B				
31	b 6	1 MHz decade — bit D				
32	a 7	1 MHz decade — bit C				
33	a 6	10 MHz decade — bit B				
34	a 18	Ground				
43	b 18	LSB change of range, osc.				
44	b 22	Mode of operation C				
45	b 21	Mode of operation B				
46	b 20	Mode of operation A				
47	a 20	Bandwidth A				
48	a 21	Bandwidth B				
49	a 22	Bandwidth C				
50	a 8	10 MHz decade — bit A				
Additional to E 1600:		100 MHz				
37	b 5	100 MHz decade — bit C				
38	a 5	100 MHz decade — bit D				

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2.3 Checks before Commissioning

Make sure that the nominal value of the local mains voltage corresponds to the input voltage setting of the unit.

NOTE:

The Mains Power Supply Module NV 1705 has been set in the factory for 220 V mains input voltage. If the nominal value of the local mains voltage is 110 V, then the connections to the mains transformer TR 1 must be changed accordingly by a trained person. These connections are located under a Plexiglass cover on which the proper connections are marked.

The Mains-/Battery Power Supply Module NB 1705 has been set in the factory for 220 V mains input voltage. If the nominal value of local mains voltage is 110 V, set the power selection switch at rear of the module to the correct value.

If it is necessary to convert the unit for a different mains voltage, then a different mains fuse is required too (Si 1 in the module RU 1705). The mains voltage plate can be turned round after releasing two screws. The proper fuse rating for each nominal mains voltage is marked on the plate.

Make sure that all plug connectors are firmly seated and that the fixing screws for the drawer units are tightened down.

2.4 Commissioning and Operation

2.4.1 Functions of the Manual Control Elements

Legend	Function	Explanation
0 I	Toggle switch	Power: ON Power: OFF
INTENSITY	Potentiometer	For adjusting the display intensity
CHANNEL 1 ON OFF	Channel selector key	When both channels are displayed simultaneously, this key is associated with the "upper" channel. The active state of this key is indicated by the LED. When the channel is switched off, it is switched on by pressing this key once and switched off by pressing it again.

Legend	Function	Explanation
STORE	Memory key	The image for channel 1 is stored by pressing this key. The storage mode is cancelled by pressing this key again.
CHANNEL 2 ON OFF	Channel selector key	When both channels are displayed simultaneously, this key is associated with the "lower" channel. The active state of this key is indicated by the LED. When the channel is switched off it is switched on by pressing the key once and switched off by pressing it again.
STORE	Memory key	The image for channel 2 is stored by pressing this key. The storage mode is cancelled by pressing this key again.
SWEEP WIDTH 10 100 100 1000 1000 5000	Display Range 10 kHz 100 kHz 100 kHz 1000 kHz 1000 kHz 5000 kHz	Display range for 10.7 MHz IF Display range for 21.4 MHz IF Display range for 10.7 MHz IF Display range for 21.4 MHz IF Display range for 10.7 MHz IF Display range for 21.4 MHz IF The keys are mutually releasing. The LED in the currently switched on key is lit. The corresponding filter band- widths for analyzer mode and for pano- rama mode are described in Section 1.3.1.
INPUT ATTENUATION	10 dB 20 dB 20 dB	The attenuation values are switched in- dividually and they are additive. The LEDs in pressed (active) keys are lit.
IF INPUT 1 2	Input selector switch	The IF signal of the receiver connected to BU 1 is displayed. The IF signal of the receiver connected to BU 2 is displayed. These keys are mutually interlocked electronically.
SWEEP TIME FA SL	Operating mode	Panorama mode Analyzer mode The built-in LED is lit for analyzer mode.
CLR	Reset key	Press in the case of program disturbance. Reinitializes the microprocessor. Sets to CHANNEL 1, SWEEP WIDTH 1 MHz or 5 MHz.

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2.4.1.1 Function of the Frequency Cursor

The cursor module option in the PSG 1700/2 extends the functions of the unit with a frequency cursor. The frequency cursor can be generated in two ways:

Operation with one receiver:

In normal operation, the center frequency of the panorama display corresponds to the reception frequency tuned-in at the receiver. When the spectrum is frozen, a frequency cursor runs away from the center of the display according to the tuning setting of the receiver. The actually received signal can be shown in the second display channel of the PSG 1700/2.

Operation with two receivers:

The position of the frequency cursor is determined by receiver 2, provided that the reception frequency of the second receiver lies within the display range for the first receiver. When operating with the two display channels of the PSG 1700/2, the frequency cursor is superimposed in the correct frequency position in both display channels. When the second display channel is used to display the IF signal of the second receiver, then the corresponding frequency line lies in the center of the display.

NOTE: When using the optional cursor module, both input channels of the PSG 1700/2 must be designed for the same intermediate frequency.

2.4.2 Operating

2.4.2.1 First-Time Switch-On

Switch-on the Panorama Display Unit PSG 1700/2 with the toggle switch on the front side. The unit is ready for routine operation after a few seconds cathode heat-up time for the cathode ray tube.

The guaranteed performance is obtained after about 15 minutes at room temperature.

For further manual control, actuate the manual control elements as tabulated in Section 2.4.1.

2.4.2.2 Commencing Operation after Prolonged Storage

To recommence operation of a unit after lengthy storage (for longer than one year), actuate all switches several times, and pull out and reinsert all plug connectors several times. This is intended to break up any oxidation layers which may have formed on the electrical contacts.

2.5 Operation under Severe Environmental Conditions

The Panorama Display Unit PSG 1700/2 can be operated with any ambient temperature in the range from $-20\,^{\circ}$ C to $+50\,^{\circ}$ C. It is suitable for operation inside buildings, in motor vehicles, on board ships, etc. When operating the unit out of doors, protect it against water, strong solar radiation and dirt.

Position the unit such that adequate ventilation is ensured when ambient temperatures are high.

If it is necessary to use forced air cooling, filter the cooling air to remove dust particles. Clean the air filters at regular time intervals specified by the manufacturer.

2.6 Care

The Panorama Display Unit PSG 1700/2 requires no special care procedure. According to the extent of contamination with dirt, clean the unit with a soft dry non-fluffy rag or with a small brush. Use a rag moistened with methylated spirit to clean the display screen. Also check that all plug connectors are seated firmly.

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3 MAINTENANCE AND REPAIRS BY THE OPERATING STAFF

3.1 Maintenance

3.1.1 Special Tools

No special tools are required.

3.1.2 Maintenance Time Schedule

When the unit is part of an equipment, maintenance must follow the maintenance time schedule for the complete equipment. Apart from this, only the cleaning tasks specified in Section 2.6 must be carried out.

3.1.3 Maintenance Instructions

Observe the following points with respect to the cleaning instructions given in Section 2.6:

When necessary, clean the front panel and the case using a soft non-fluffy rag. In the case of severe contamination with dirt, clean with a rag soaked in a mild soap solution.

Before recommencing operation after prolonged storage, actuate all switches several times. Also unplug and reinsert all cable plug connectors several times, to break up any oxide layers which may have formed on the electrical contacts.

3.2 Repairs by the Operating Staff

3.2.1 Special Tools, Measuring Equipment and Test Units

Special tools are not required. A multimeter with Ri greater than 10 kOhm/V suffices as measuring and test unit for making simple repairs.

3.2.2 Simple Fault Tracing

Fault Symptoms	Possible Cause	Remedy			
With power switch ON: Key LEDs dark;	No mains or battery voltage present	Check mains or battery voltage			
o display.	Power cable not connected or defective	Check power cable and the plug connectors			
	Fuse blown	Replace the fuse			
	Battery connected with wrong polarity	Reverse the battery connection			
The unit can not be ontrolled with the presskeys on the ront panel	Microprocessor program disturbed	Press the RESET key			
he crossed axes and	Receiver not connected	Connect the receiver			
aseline appear on the	Receiver switched off	Switch on the receiver			
lisplay screen, but no ignals	Connecting cable or plugs between receiver and PSG 1700/2 defective	Check and if necessary replace the cable			
	Receiver defective	Repair the receiver			

3.2.3 Instructions for Making Repairs

Repairs which can be carried out by the operating staff are confined to replacing blown fuses according to Section 3.2.2. Any further required repairs beyond this must be carried out by trained persons (see Section 4).

The mains fuse is located on the rear side of the unit.

3.3 Instructions for conservation of the unit when operation thereof is discontinued for a prolonged period

No special maintenance tasks are required when operation of the Panorama Display Unit PSG 1700/2 is to be discontinued for a prolonged period. The unit contains no components whose characteristics change or which are subject to self-consumption during prolonged storage. However, the unit should be stored in dry and dustproof rooms, in which contamination of the unit with dirt is ruled out. Otherwise special packing is required, e.g. sealing in plastic film.

4 REPAIRS BY SPECIALLY TRAINED PERSONS

4.1 Special Tools, Measuring Equipment and Test Units

- Storage oscilloscope, e.g. HP 141 A
- Digital multimeter with high voltage probe, e.g. PM 2424
- Multimeter, e.g. UM AEG
- Logic analyzer, e.g. HP 1615A
- Calibrated RF signal generator, e.g. HP 8656 A

4.2 Functional Principles

4.2.1 Intermediate Frequency and Analyzer Module ZA 1705 (see Annex 6 and 7)

This module has two input channels which can be fitted optionally with filters for $10.7~\mathrm{MHz}$ or $21.4~\mathrm{MHz}$. These have respective bandwidths of $\pm~0.5~\mathrm{MHz}$ and $\pm~2.5~\mathrm{MHz}$ and they are used to improve the image frequency rejection factor and to reject any unwanted signal components which may be present in the output frequency spectra of the connected receivers, which might otherwise cause input overloading of the unit. The maximum allowed input signal level is $300~\mathrm{mV}$ for each channel.

The switch diodes D 1 to D 3 and D 4 to D 7 are controlled by the microprocessor output signal CHNA to switch over between the input channels. The achieved signal isolation between the channels is in the region of 100 dB to 110 dB. Three attenuator networks are constructed with the diodes D 8 to D 16. They are switched electronically in steps of 10/20/20 dB by the microprocessor, with the signals $\overline{ATT1}$ to $\overline{ATT3}$.

Both input filter types have an insertion loss of 3.5 dB to 4 dB. The diode channel switches and the attenuator networks together also have an insertion loss of 3.5 dB to 4 dB, resulting in a total attenuation of 7 to 8 dB from the inputs to the first mixer stage M 1.

All voltage values specified in the following description are based on a signal level of 600 mV peak-peak at the input of the logarithmic amplifier (see below). This corresponds to 0 dB indication on the display screen, which is achieved with an input voltage lying between 3 mV and max. 10 mV.

In the ring modulator mixer stage M 1, the input signal is converted with the variable oscillator FOS1 to a fixed intermediate frequency of 6.3 MHz. FOS1 varies over the range 17.0 ± 0.5 MHz for the input frequency 10.7 MHz, or over the range 27.7 ± 2.5 MHz for the input frequency 21.4 MHz. The mixer stage M 1 operates into an impedance transforming tuned circuit with the coil L 9 which is tuned to the intermediate frequency. A signal voltage of about 200 mV peak-peak is produced in the drain circuit of the first amplifier transistor T 1. The coils L 10 to L 13 with the associated varicap diodes constitute a four-circuit bandpass filter. The drain circuit of the transistor T 2 contains a further tuned circuit with the inductance L 14, which is tuned to the intermediate frequency. A signal voltage of about 60 mV peak-peak appears at the input of the next following integrated circuit mixer stage IC 1. The filter network has a 3 dB bandwidth of 50 kHz. A rejection factor greater than 80 dB is achieved for the 6.5 MHz image frequency.

In the integrated circuit mixer IC 1, the signal is converted with the 6.4 MHz crystal frequency to an intermediate frequency of 100 kHz. A signal voltage of 300 mV peak-peak appears at the output of the mixer. When the bandwidth of 50 kHz is switched on, the signal fed to the logarithmic amplifier is taken off trom the output of the transistor T 3, via the integrated circuit analog switches IC 4 and IC 5. The highly damped tuned circuits with L 15 and L 16 are provided to reduce the background noise level.

The transistor T 4 makes compensation for the insertion loss of the next following three-circuit bandpass filter consisting of the coils L 17 to L 19 with associated capacitors. This filter has a bandwidth of 10 kHz. The nominal signal level of 600 mV peak-peak at the output of the filter can be adjusted with the potentiometer P 1.

The next following 2 kHz filter, which too is tuned to the 100 kHz intermediate frequency, consists of the inductances L 20 to L 22 with associated capacitors and has an insertion loss of 12 dB to 14 dB which is compensated by the operational amplifier IC 2. The signal voltage at the output of this operational amplifier is 3 V peak-peak. The signal voltage at the output of the filter can be adjusted with the potentiometer P 2 to the nominal value of 600 mV peak-peak.

The amplifier IC 3 followed by the three-circuit bandpass filter with the coils L 23 to L 25 is provided for implementing an additional filter bandwidth, which is not equipped when using the module in the Panorama Display Unit PSG 1700/2. For this reason, this circuit is not fitted.

The transistor T 5 operates as impedance converter to drive the integrated circuit mixer stage IC 9. A signal voltage of about 160 mV peak-peak appears at the output of this mixer stage. The frequency conversion is made with an oscillator frequency of 94.12 kHz which is produced in a frequency divider circuit IC 8 (division factor 68). The output frequency of this mixer stage is the third intermediate frequency of 5.88 kHz. The signal voltage at the output of the transistor T 6 is about 0.7 V peak-peak. The four tuned circuit bandpass filter with the inductances L 26 to L 29 has a 3 dB bandwidth of 200 Hz. The nominal output voltage of 600 mV peak-peak can be adjusted with the potentiometer P 4.

The transistor T 7 compensates for the insertion loss of the next following 20 Hz filter with the coils L 30 to L 33. A signal voltage of 3 V peak-peak appears at the collector of the transistor. T 8 is used for impedance conversion. The output signal voltage can be adjusted with P 5 to the nominal value of 600 mV peak-peak.

The filter bandwidths are selected by the analog switches IC 4 to IC 7 and IC 10 to IC 15 which are controlled by the microprocessor output signals FIL A to FIL E. A signal voltage of 600 mV peak-peak appears at output pin 4 of IC 5 (for 0 dB level indication on the display screen), with a frequency of 100 kHz or $5.88 \, \text{kHz}$. This corresponds to an input voltage of 3 mV to max. $10 \, \text{mV}$ (rms).

The logarithmic amplifier with output rectifier consists of the integrated circuits IC 17 to IC 19. The signal is first of all amplified to a level of about 2.1 V peak-peak. Logarithmic conversion is performed by successive limiting and amplification by seven limiter circuits and six operational amplifiers. This establishes progressive segment approximation to a logarithmic characteristic.

At the output of the logarithmic amplifier, the signal voltage is 2.2 V peak-peak for 0 dB and 0.55 V peak-peak for -70 dB. The next following operational amplifier boosts the signal level for 0 dB to 6 V peak-peak. The negative feedback loop of the operational amplifier contains a negative temperature coefficient (NTC) resistor which compensates for the temperature drift of the logarithmic conversion.

Fullwave rectification is employed to minimize the required smoothing components. The time constant of the integrator network can be switched with the transistor T 10. When

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using the module in the PSG 1700/2, switchover is not required and T 10 is replaced by a shorting jumper. The next following circuit with the two operational amplifiers in IC 19, output pins 8 and 14, is used for ripple filtering.

The transistors T 11 and T 12, which are connected as emitter followers, are also used for temperature compensation of the offset of the logarithmic amplifier. At the output of this circuit, the signal level is 0 V for 0 dB display and -1.2 V for -70 dB display.

The microprocessor commands are stored in the latches IC 23 and IC 24. The gates IC 21 and IC 22 are used for address decoding.

4.2.2 Oscillator OS 1705 (Oscillator I) (see Annex 8)

This module is partially shielded. The non-shielded section contains the digital integrated circuits IC 1, IC 2 and IC 4 which constitute the interface to the microprocessor bus. IC 1 is an octal latch which stores the setting values. IC 2 is used for address decoding. The commands taken over from the microprocessor are further decoded in IC 4 for controlling the analog circuit sections.

The crystal oscillator, consisting of the transistors T 1 and T 2, produces the 6.4 MHz reference frequency. The 6.4 MHz signal is fed to the module ZA 1705 via a low-pass filter consisting of L 1, C 103 and C 104 and a plugged coaxial connection. A frequency of 64 kHz required in the module WO 1705 is produced by 100:1 frequency division.

The variable local oscillator frequency used for the first frequency conversion of the receiver intermediate frequency in the module ZA 1705, is generated in the oscillator with the transistor T 20 which is tuned by the varicap diode D 7. The maximum tuning range is 34 MHz \pm 1 MHz for the 10.7 receiver intermediate frequency and 27.7 \pm 2.5 MHz for the 21.4 MHz receiver intermediate frequency. D 6 and D 8 are switch diodes for range switching. The control signal RNGE is issued by the microprocessor.

The oscillator signal is coupled out via the coil L 11. The transistors T 21, T 22 and T 24 are used to decouple the distribution. The signal is taken either directly or, for 10.7 MHz IF via IC 11, output pin 9, frequency-divided by a factor of 2, to the output amplifier T 18/T 19. The connection to the module ZA 1705 is made with a coaxial line.

The branches via transistor T 24 and IC 11, output pin 5, are used for phase synchronization. In the range 21.4 MHz \pm 2.5 MHz, the 27.7 MHz \pm 2.5 MHz signal is divided down by IC 11 and IC 9 by a factor of 100, and the resulting 252 kHz to 302 kHz signal is compared in the phase detector IC 8 with the reference signal FREF which is generated in the module WO 1705. FREF is varied linearly downwards in the specified range. This sweeps the oscillator frequency over the range 30.2 to 25.2 MHz.

In all other ranges, synchronization is obtained by conversion in the ring modulator mixer M 1. The conversion frequencies are produced by the oscillators T 6, T 8, T 10, T 12 and T 14, switched by the transistors T 5, T 7, T 9, T 11 and T 13 and with the switch diodes D 1 to D 5. After the mixer stage, the resulting synchronization intermediate frequency is selected in the low-pass filter L 8, L 9, C 86, C 88, C 89, amplified and limited by T 25, D9, D 10 and T 23 and then divided down by IC 5 and IC 7 according to the switched on range. Selection of the division factor is made by the digital multiplexer integrated circuit IC 6. In order to avoid disturbing unwanted frequencies, in all ranges the subsequent circuit sections which are not required are disabled by the control signals CLR0 to CLR3.

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The table in Annex 3 shows the associations between the display ranges and the frequencies and division factors in the synchronizing circuit.

The output of the phase detector IC 8 controls the varicap diode D 7 via the loop filter IC IC 10/1 with R 70, R 69 and C 60. The parallel resonant circuit L 10/C 62 suppresses otherwise disturbing residual reference frequency signal FREF. In the 10.7 MHz ± 0.005 MHz display range, the resistor R 115 is connected to ground via the transistor T 26. This improves the oscillator noise figure close to the carrier frequency.

In order to ensure that the synchronized oscillator always operates above the down-conversion frequency FOS2, the 500 μ s duration output pulse CAPT from the microprocessor, forces the control voltage via the transistors T 16 and T 17 to the most negative value producing the highest possible oscillator frequency, during the retrace after each sweep cycle.

The following table shows the association between the display ranges and the control signals RNG A to RNG E:

			RNG		
	Α	В	С	D	E
	0	О	1	0	0
	0	1	0	0	0
	0	0	0	0	0
	1	О	1	1	1
	1	1	0	0	1
(1	O	0	0	1
	1	0	0	(0

4.2.3 Sweep Oscillator WO 1705 (Oscillator 2) (see Annex 9)

The reference frequency FREF for phase synchronization of the variable oscillator OS 1705 (see Section 4.2.2), is generated in the module WO 1705. It can be varied linearly under control by the microprocessor, over the range 250 kHz to 302 kHz.

A coil-tuned oscillator with the transistor T 3 is used to minimize sideband noise generation. Tuning is made with the varicap diode D 9. The transistors T 3 and T 4 are used to provide gain and for impedance conversion. In order to linearize the curved characteristic of the tuning diode, a negative feedback loop is connected via the multivibrator IC 22 (monostable) which is operated as frequency to voltage converter, and the control amplifier IC 21.

The oscillator is controlled by the 10 bit digital to analog converter (DAC) IC 20 with the operational amplifier IC 23/1. A quasi-linear frequency sweep voltage is produced 1000 step sequence switching with the counter IC 13. The step switching clock signal from the microprocessor section is applied to IC 13.

The stability of the oscillator alone is inadequate to achieve the specified accuracy. Thus the bottom and top limit frequencies are recalibrated during each retrace between two successive sweep cycles. For this purpose, comparisons with the nominal values are made with two phase locked loop (PLL) circuits. The reference frequencies are produced by a phase-synchronized microprocessor-controlled calibrating oscillator.

The calibrating oscillator is an integrated circuit IC 15. It is switched off after completion of the calibration, by disappearance of the signals CALL and CALU, to prevent generation of interfering frequencies which could produce spurious signals during the sweep cycle. In order to obtain fastest possible settling of the calibration frequencies, the calibration oscillator operates at 32 times the respective limit frequency of the sweep range. IC 16 divides down by a factor of 32 to the original frequency. Synchronisation is effected by phase comparison in IC 8 of the oscillator frequency after down-division by IC 7 and IC 10. The oscillator correction is made via the loop filter IC 1, R 3, R 2 and C 42. The phase control reference frequency is 64 kHz. It is generated in the module OS 1705. The integrated circuits IC 2, IC 11 and IC 12 are not fitted when the module WO 1705 is used in the PSG 1700/2. The frequency division factor is set by the microprocessor via the control lines R 1 to R 128. IC 9 is used to extend the frequency divider output pulse in order to ensure reliable operation of the CMOS phase comparator IC 8.

The comparison of the oscillator frequency with the nominal values generated in the calibration oscillator, is made during the calibration procedure in the sweep retrace, by the phase detector IC 27. The bottom limit point is calibrated first. For this purpose, the microprocessor sets the signal CALL to true for 10 ms. This signal sets all inputs of the digital/ analog converter (DAC) to zero, via the gates IC 14, IC 18 and IC 19. Furthermore, the analog switches IC 24 and IC 26 close the phase locked loop with the loop filter IC 23/14, R 43, R 46, C 31, C 32. After the settle time, the oscillator T 3 takes over the exact frequency dictated by the calibrating oscillator and C 31 charges to the voltage value which is required to obtain this frequency. When the CALL signal is reset, the switch IC 26 opens, the control loop is broken and C 31 retains its charge, which determines the zero point of the digital/analog converter (DAC) for the duration of the next sweep cycle. When CALU is now set true to calibrate the upper limit frequency, the counter IC 13 is first of all reset, and the interposed inverting gates IC 14, IC 18 and IC 19 set all inputs of the digital/analog converter (DAC) IC 20 to one. The signal CALU also switches over the analog switches IC 24 and IC 25, so that a phase locked loop is established via the loop filter IC 23/8, R 42, R 48, C 35 and C 36. IC 23/7 provides level matching. Its output voltage is applied to the DAC as reference voltage. When CALU is reset, C 36 retains the charge which is required to set the oscillator to the top limit frequency. Thus it is now ensured that when the counter counts from 0 to 999, the programmed sweep range is covered exactly between the defined limit frequencies, in 1000 steps.

The commands from the microprocessor are taken over from the bus by the latches IC 3 and IC 6. IC 4 and IC 5 are used for address decoding.

4.2.4 Processor PR 1705 (see Annex 10)

The module PR 1705 contains the microprocessor with program memory, the data memory for the calculated setting values, the interrupt controller, the timer, address decoding logic and buffers for the address and control lines of the microprocessor bus for driving the peripheral circuits which are located on other printed circuit boards.

The microprocessor IC 7 is clocked by a 6 MHz crystal whose operating frequency is divided internally to give the 3 MHz system clock frequency. When the <u>unit</u> is switched on, the combination R 1, D 1, C 12 produces the power-on reset function RIN which initializes the microprocessor and its entire peripheral circuitry. IC 1 and IC 2 are the program memory EPROMs. IC 3 and IC 4 are not fitted; these locations are spares for mode:"cursor". IC 8 is the address latch for the 8 low order address bits which the microprocessor outputs in time multiplex mode with the data. They are written into the latch on the signal ALE.

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IC 10 and IC 11 decode the high order address bits, with which the peripherals are accessed by the microprocessor.

IC 12 with the address latch IC 5 is the DMA controller, which writes the measured values from the analog/digital converter (ADC) (see Section 4.2.6) into the image refresh memory (see Section 4.2.5). On completion of the conversion, the ADC produces the signal R0. IC 12 thereupon issues the command H0 which stops the microprocessor-controlled program execution sequence, switches all bus lines to the high impedance state (tristate) and thus gives the DMA controller access to the bus. As confirmation of this status, the microprocessor issues the signal HAK. The DMA controller is programmed such that it issues the signal IR1 after 1000 measured points. IR1 reports to the microprocessor via the interrupt controller IC 21, that the sweep cycle has been completed.

IC 6 and IC 15 are line drivers which are used as bus buffers for the high order address bits and for the control signals. IC 24 is a resistor array which loads the connected signals with 1 kOhm to ground.

IC 20 and IC 23 are used for buffer storage of the three most significant bits of the data word. The data word consists of 10 bits for the measured value and one bit for beam intensity control. IC 20 is used for read operations and IC 23 is used for write operations. The gate IC 13 prevents response of the circuit also when the program memories are accessed by the address bits $\overline{E0}$ to $\overline{E3}$.

The timer IC 17 is operated with the frequency of 1.5 MHz which is divided by the flip-flop IC 18. The timer is programmed by the microprocessor initialization routine such that its output signal IR2 gives the measuring clock pulse sequence and IR3 determines the image repetition frequency of 50 Hz. IR2 depends on the selected display range. Both signals are reported to the microprocessor via the interrupt controller IC 21.

The signals GA2 and BST are not required when this module is used in the Panorama Display Unit PSG 1700/2.

4.2.5 Image Refresh Memory BW 1705 (see Annex 11)

The image refresh memory consists of the 11 RAMs IC 17, IC 18, IC 21 to IC 23, IC 25 to IC 27 and IC 29 to IC 31 which have a storage capacity of $4k \times 1$ bit each.

Reading of data during image repetition is controlled by the DMA controller IC 5 with associated address latch IC 1. The process runs isolated from the microprocessor bus by IC 2 and IC 3, so that image repetition and program sequence are mutually independent. A connection to the microprocessor bus is required when programming the DMA controller and when writing into the RAMs. In order to indicate to the microprocessor that IC 5 is active, the signal $\overline{\rm DON}$ is generated to interrupt the microprocessor activity.

Two operating modes must be distinguished for image repetition: output of the measured curve and output of the axes cross. In the first case, data is output only for the ordinate. Data transfer takes place on $\overline{\text{W1}}$. Writing of the axes cross requires data output for the abscissa too, which is effected by $\overline{\text{W2}}$. IC 5 is activated under microprocessor control by RQ0 and RQ1 from IC 19.

IC 10, IC 12 and IC 13 are used for address decoding.

The memory chips must be addressable by the microprocessor as well as by the DMA controller Switchover is made by IC 16, IC 20 and IC 24, controlled by AEN issued by IC 5.

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The logic combination via the gates IC 11 and IC 15 produces the control signals for the RAMs.

00 to 010 are the outputs of the image refresh memory which are taken directly to the digital/analog converters (see Section 4.2.7). Access is possible via IC 4 and IC 8 to allow the microprocessor to read the memory contents too.

4.2.6 Analog/Digital Converter AD 1705 (see Annex 12)

The analog measured values (line ANIN) from the module ZA 1705 (see Section 4.2.1) are amplified by IC 14. An offset correction can be made with P 2. IC 19 is a sample and hold circuit. The reference voltage for the analog/digital converter (ADC) IC 20 is produced by the diode D 5 followed by the amplifier IC 14, and with T 2. IC 13 and IC 18 are used for takeover of the converted data. This can take place either by the microprocessor with $\overline{\text{RD}}$ and $\overline{\text{P17}}$, or by the DMA controller in the module PR 1705, with $\overline{\text{AST}}$ and $\overline{\text{AKO}}$. After completion of the conversion, the signal R0 indicates to the DMA controller that valid data are available.

The 300 kHz clock signal for the analog/digital converter (ADC) IC 20 is obtained from the microprocessor clock signal by frequency division with IC 11.

This module contains the working memory (RAM) with $2k \times 8$ bits capacity, consisting of IC 2 to IC 5 each having $1k \times 4$ bits capacity. CMOS-RAM chips are used here to permit battery back-up of the setting data for the unit in the case of power supply failure. However, no use is made of this facility when using the module in the PSG 1700/2.

IC 8 is used for address decoding and IC 1 as bus buffer. The logic functions with IC 9 prevent erratic change of the memory contents on power supply failure when battery backup is used.

4.2.7 Digital/Analog Converter DA 1705 (see Annex 13)

The data read from the image refresh memory BW 1705 (see Section 4.2.5) are converted by the digital/analog converters IC 22 (for the x-direction) and IC 23 (for the y-direction) into analog signals, which are applied to the beam deflection amplifiers. When the measured curve is output, the x-deflection signal is generated by the counter IC 1. The counter is clocked by the signal DP. After the end of the output cycle, the DMA controller in the module BW 1705 resets the counter with the signal TC. On output of the axes cross, the x-deflection data too are taken from the image refresh memory.

IC 2, IC 3 and IC 5 are used to switch over between the two operating modes. The 10 bit long data words are double-buffered by IC 7 to IC 12, IC 14 and IC 15. The double buffering is necessary in order to generate a 10 bit data word from the successive bytes output on the 8 bit data bus. The 10 bit data words are applied to the DACs.

The reference voltage for the DACs is produced by the reference diode D 1. The DAC for the y-direction is offset by half the display height (DAC IC 23) when displaying two data channels on the screen, by switching over the most significant bit (MSB) with the signal UNT.

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After the DACs follow the amplifiers IC 25 and IC 27. The gain in the y-direction is halved with IC 28 when displaying two channels.

The analog switch IC 29 is omitted when using the module in the Panorama Display Unit PSG 1700/2.

After the amplifiers follow active low-pass filters using the operational amplifiers IC 30 and IC 32. The cut-off frequency is 150 kHz in the y-direction and 80 kHz in the x-direction.

When using the module in the PSG 1700/2, the analog switch IC 26 always connects the output of IC 32 to the input of IC 31, which is used for impedance conversion. The amplitudes in the x-direction and y-direction can be adjusted with the setting potentiometers P 4 and P 6. P 3 and P 5 are provided for position adjustment in the x-direction and y-direction (shift controls).

The signal DU is used to set the display intensity. Two intensity levels are provided: the intensity of the measured curve can be adjusted with potentiometer P 1 and the intensity of the axes cross can be adjusted with potentiometer P 2. Switchover between the two intensity levels is made with the signal MOD. The actual switchover is performed by the analog switch IC 21. The operational amplifier IC 16 provides level matching and impedance conversion.

Blanking is performed by IC 18. Blanking is controlled either by the 11th bit of the image refresh memory 010, or on data takeover from the analog/digital converter AD 1705 (see Section 4.2.6), by the DMA controller in the module PR 1705.

IC 4 is an 8 bit latch which is used for output of control signals by the microprocessor.

4.2.8 Manual Control Panel BE 1705 (see Annex 14)

The manual control panel is mounted directly behind the front panel of the unit. It carries the manual control keys Ta 1 to Ta 14. The keys Ta 1 and Ta 13 have a built-in LED indicator. The functions of the keys Ta 1 to Ta 13 are decoded by the keyboard decoder IC 15 and placed via the bus buffer IC 3 onto the microprocessor bus. The signal S 7 produces the interrupt IR7 which informs the microprocessor that a keystroke has been made. The microprocessor thereupon calls the data via the address $\overline{P3}$.

The monoflop IC 1 which is triggered by the address line $\overline{P3}$, is provided to produce a wait time for the microprocessor, in order to permit data settle before data takeover.

The LED indicators in the keys are driven by the LED driver IC 6.

4.2.9 Skeleton Assembly RU 1705 (see Annex 15)

The skeleton assembly of the unit contains the motherboard which mutually interconnects the modules in printed circuit technology. Some analog and RF signal lines are coaxial cables.

In addition to the interconnections, the motherboard carries three voltage regulators for power supply for the analog modules ZA 1705, OS 1705 and WO 1705. They decouple and

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provide interference suppression for the power supply voltages, to prevent disturbance of the analog modules by signals in the digital section. All voltage control loops use the reference diode D 3. The output voltages +5 V, +15 V and -15 V are produced from the input voltages +15 V, +24 V and -24 V. The resistors R 1 to R 3 are provided to distribute the power dissipation in the series controllers and to limit the short circuit current.

The combination D 4, D 5 and R 15 prevents latching of the operational amplifier IC 1 when switching-on the unit.

4.2.10. Mains Power Supply Module NV 1705 (see Annex 16)

The module NV 1705 contains the mains transformer and the rectifiers, smoothing components and voltage regulator circuits for producing all power supply voltages which are required in the unit. Furthermore, this module contains the magnetically deflected cathode ray tube with deflection yoke, the deflection amplifiers for the x-direction and for the ydirection, the video amplifier for beam intensity control of the cathode ray tube and the high voltage generator. A mains filter F 1 is incorporated to suppress mains-borne RF interference. The mains plug St 1 and the mains fuse Si 1 together with the mains filter F 1, form an integral assembly. The primary side changeover between 110 V and 220 V mains input voltage to the transformer TR 1, is made by transferring soldered connections. The rectifiers, smoothing components and voltage regulator circuits are distributed on the two printed circuit boards GP 1705/1 and GP 1705/2. Regulated output voltages of +15 V and -15 V, +24 V and -24 V, and +5 V are produced. The integrated circuit +5 V voltage regulator is mounted on the rear panel of the module, which is constructed as heat sink. Unrequlated power supply voltages of +12 V and -12 V or +33 V and -33 V are used as power supply for the beam deflection amplifiers. Switchover is made between these two voltage levels depending on the instantaneous beam deflection rate.

The High Voltage Power Supply HS 1705 is mounted in a metal case which prevents accidental human contact. The high voltage for the cathode ray tube is produced by an oscillator circuit using the transistor T 1 and the television line output transformer TR 1. The oscillator operates at a frequency of about 25 kHz. The final acceleration voltage for the cathode ray tube is 8 kV. It is produced in a voltage doubler circuit using the diodes D 1 and D 2. The grid voltages for the cathode ray tube are rectified by the diode D 3. Beam focus is established with the trimmer potentiometer P 1. The negative bias voltage for the Wehnelt cylinder is obtained with the diode D 4. The mean display intensity is set with the potentiometer P 2. The potentiometer P 3 on the front panel is provided for manual intensity adjustment. To suppress a bright spot on the screen after switch-off of the unit, a rectifier circuit with short charging time constant, consisting of the diodes D 6 and D 7 and the capacitor C 8, switches off the transistor T 2 and thus places the full negative bias voltage on the Wehnelt cylinder of the cathode ray tube.

The cathode ray tube is heated with 12 V direct voltage.

The video amplifier VV 1705 and the cathode ray tube socket are mounted on a printed circuit board which is seated on the neck of the cathode ray tube. The video amplifier consists of the two transistors T 4 and T 5. Voltages less than 0.7 V at pin 8 of the circuit board blank the beam. Maximum intensity is obtained with a voltage level of about 4 V.

The deflection amplifiers AV 1705 for the x-direction and for the y-direction are constructed identically. The input voltages ABL for these amplifiers are 10 V peak-peak for maximum beam deflection in the x-direction and 5 V peak-peak for maximum beam deflection in the y-direction. The network with the diodes D 1 to D 4 is provided for correcting tangent distortion. The beam position and gain can be adjusted with the potentiometers P 1 and P 2.

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Negative feedback is used to establish good deflection linearity. The beam deflection current is measured by the resistor R 37 and the resulting voltage in the amplifier IC 1 is compared with the nominal value. The transistors T 3 and T 4 are current amplifiers for driving the output stage transistors T 5 and T 6. To minimize heat dissipation in the unit, the output stages are switched off by the microprocessor signal \overline{OFF} which controls the transistors T 1 and T 2, so that the output stages draw no current when no beam deflection is taking place.

The output stages AV 1706 are operated with +10 V or +33 V power supply voltage, depending on the rate of change of the signal being displayed. Switchover is made with the two transistors T 7 and T 8. The transistors T 5 to T 8 are mounted on the rear panel of the module, which is designed as heat sink. The switchover criterion is obtained with a differentiator circuit using the integrated circuits IC 3 and IC 4, from the instantaneous voltage present across the deflection coil. The two operational amplifiers in IC 3 function as fullwave rectifier. The comparator IC 4, input 2, is used to produce the switchover threshold, whic can be adjusted with the potentiometer P 3. IC 4, input 6, is connected as inverter

4.2.11 Mains-/Battery Power Supply Module NB 1705 (see Annex 19, 17)

The combined AC/DC power supply NB 1705 can be used for connecting the equipment to 110/220 V AC +10% -15% and/or 24 V DC -10% +20%.

Switching from 220 V AC to 110 V AC is achieved using a built in selection switch. This can be operated after removal of the rear cover. WARNING! On changing from 220 V to 110 V the 0.63 A fuse must be changed for a 1.25 A fuse and vice versa.

The module NB 1705 contains

- the mains transformer, the bridge rectifier and smoothing components
- switchover switch
- battery power supply BV 1705

The mains transformer TR 1, rectifier GR 1 and capacitor C 3, C 4 convert the mains voltage to a nominal 24 V DC. The switchover switch, switches automatically between mains and battery supply depending on supply voltage connected. The supply line is switched by relay RI 1. The switching point is determined by potentiometer P 1 and is set so that with a mains supply of 187 V (93.5 V) or more, the set switches to mains. A mains voltage of 187 V (93.5 V) produces an unloaded DC of 26 V and loaded DC of 21 V across C 3, C 4. To prevent relay jitter a large switching hysteresis is built in with the operation amplifier IC 1 and R 4, R 5. Thereby the equipment switches back to DC supply when the rectified mains voltage drops to 18 V under load. This switching point is equivalent to a mains voltage of 163 V (81.5 V).

The battery power supply module BV 1705 (Annex 17) is intended for connection to a nominal 24 V DC input supply. It will function with an actual input voltage in the tolerance range from 21.5 V to 30 V. This module, like the Mains Power Supply Module NV 1705, produces all power supply voltages used inside the unit. The +5 V supply is produced by an integrated circuit switching-type voltage regulator. A linear integrated voltage regulator is provided for the +15 V supply. It is mounted on the heat sink which forms the rear panel of the case. The negative voltages of -15 V and -24 V as well as the +24 V positive voltage, are produced by an electrically isolated chopped power supply circuit. The integrated circuit switching controller IC 1 drives the VMOS transistors T 2 and T 3 which switch the

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primary side of the transformer TR 1. The voltages on the secondary side are rectified by D 2 to D 7. The control voltage for the chopped power supply circuit is derived from the -15 V line. The operational amplifier IC 3 inverts the control variable. T 1 is provided to assist start of oscillation. The circuit branch with IC 4 and IC 2 produces current limiting to prevent destruction of the switch transistors T 2 and T 3 on overload. The diode D 1 is a suppressor diode with 5.05 V nominal voltage. It prevents overvoltage on the +5 V supply line. The diodes D 9 and D 10 are overvoltage limiting Z diodes with nominal voltage 75 V.

They clip inductive voltage spikes across the transistors T 2 and T 3 to prevent destruction of these transistors.

For all other subassemblies in this module, the same description holds as given in Section 4.2.10.

4.2.12 Parallel Data Interface (Cursor) PSE 1705 (see Annex 18)

The input/output chip IC 21 has three 8-bit data ports in which the central processing unit (microprocessor) can write and read data. Each port is sectioned into two decimal digits. IC 24, IC 25 and IC 26 are used as input/output buffers to the receiver interface modules. The receiver is prepared for the desired operating mode via the lines TSG 1 and TSG 2 (repeater display unit) and via the lines FEKO 1 and FEKO 2 (remote commanding). The gates IC 28 are the driver stages required for this purpose. IC 20 is an 8 bit latch for output of the control signals. The least significant digit of the receiver frequency is output via IC 22 and IC 27 and it can be read via IC 30. IC 1, IC 2, IC 3, IC 4, IC 6 and IC 7 are used for address decoding.

4.3 Fault Tracing

The purpose of the following tests is to determine which circuit card is defective. The defective circuit card should then be replaced by an intact one of the same kind.

Fault tracing at the components level is not envisaged. Do not carry out any soldering operations on the circuit cards except in the places provided (soldered jumper connections), because this would damage the protective lacquer coating and thus impair the long-term dependability of the unit.

However, fault tracing at the components level is possible by using the functional description (Section 4.2) together with the circuit diagrams and component layout plans.

4.3.1 Mains Power Supply Module NV 1705 and Mains-/Battery Power Supply Module NB 1705

4.3.1.1 Power Supply Voltages (NV 1705/NB 1705)

- Measure all non-stabilized and stabilized output voltages. If the values are not correct, proceed as follows:
- If one or several stabilized voltages are greater than their nominal values, then replace the module because one or several voltage regulators are defective.
- If one or several stabilized voltages are less than their nominal values, then the cause may be either defective voltage regulators or overload. In order to distinguish between these two possibilities, connect the module to the input voltage outside the unit, using adapter cables. If the fault is then still present, then the module is defective and must be replaced.

4.3.1.2 High Voltage Generator (HS 1705)

If no display intensity is present, measure the high voltage at the cathode ray tube final anode connector, using a high voltage measuring probe. The nominal value is about 8 kV. If the actual reading is much smaller, then the high voltage generator section is defective. This subassembly can easily be replaced by an intact one.

Caution when working on the high voltage generator DANGER OF LETHAL ELECTRIC SHOCK

4.3.1.3 Beam Deflection Amplifiers (AV 1705/AV 1706)

Faults in the beam deflection circuitry for the cathode ray tube usually produce symptoms such as half-side or missing beam deflection on one or both axes. If such symptoms appear, then the power supply module is defective and should be replaced by an intact one.

4.3.2 Skeleton Assembly RU 1705

- Faulty or insecure plugged connections to the modules may be traced and in some instances cured by pulling out and reinserting the respective modules several times whilst the unit is switched off. If necessary, replace the motherboard.
- The motherboard carries voltage regulator circuits for power supply for the analog modules ZA 1705, OS 1705 and WO 1705. Check the output voltages +15 V, -15 V and +5 V. If one or several of these voltages is/are greater than the nominal value, then the corresponding regulator(s) is/are defective and the motherboard must be replaced.
- If one or several of the voltages is/are smaller than the nominal value, then pull out the three above-named analog modules to determine whether an overload condition

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was present. If the voltages are still incorrect on the motherboard in the no load condition, then a voltage regulator fault is present and the motherboard must be replaced.

4.3.3 Manual Control Panel BE 1705

If keyboard-entered commands are executed incorrectly or not at all, then in most cases the cause is a defective manual control key. If this is so, then replace the manual control panel. In an emergency, a defective key may be unsoldered and a new one fitted.

4.3.4 Intermediate Frequency and Analyzer Module ZA 1705

Preparations:

- Connect a calibrated RF signal generator tuned to 10.7 MHz or 21.4 MHz to the input of the unit.
- Set the output level of the RF signal generator to 5 mV.

Set the PSG 1700/2 to display range 10.7 \pm 0.5 MHz or 21.4 \pm 2.5 MHz.

It is assumed that the other parts of the unit are intact and that the power supply voltages, the 6.4 MHz reference frequency and the first local oscillator voltage FOS1 are present and connected.

Check the following signal voltage levels:

Test point TP 3,
Test point TP 5,
Test point TP 5,
Test point TP 7,
Test point TP 7,
Test point TP 8,
Test point TP 8,
Test point TP 9,
Test point TP 9,
Test point TP 10,
Test point TP 10,
100 kHz, nominal level about 160 mV peak-peak
94.12 kHz squarewave, nominal level 0.5 V peak-peak
5.88 kHz, nominal level 0.7 V peak-peak
100 kHz, nominal level 600 mV peak-peak

The signal level should be 600 mV peak-peak at test point TP 10 in all display ranges.

All the specified signal voltages are not present continuously, but only briefly when the sweep cycle is just passing over the input frequency of 10.7 MHz or 21.4 MHz. This is true too for the voltage values specified below.

The signal amplitude should be about 6.5 V peak-peak at the output of the logarithmic amplifier, IC 19 pin 1. A rectified signal with an amplitude ranging from -1.2 V to 0 V should appear at the output of the module (pin 7c of the plug strip connector).

4.3.5 Oscillator OS 1705

For fault tracing on the module OS 1705, it is assumed that the module WO 1705, which provides the signal FREF for synchronizing the internal oscillator, is intact.

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- The reference frequency oscillator should deliver a signal amplitude of 0.3 V to 0.6 V peak-peak at its 6.4 MHz coaxial output. A 64 MHz TTL signal should be present at pin 10c of the plug connector.
- Check the function of the down-conversion oscillators at test point TP 3. The amplitude should lie in the range from 200 mV peak-peak to 600 mV peak-peak, depending on the set display range. The following relationships exist between the display width and the crystal frequency:

Display Range	Frequency	
21.4 MHz ± 2.5 MHz	no signal	
21.4 MHz ± 0.5 MHz	22.2 MHz	
21.4 MHz ± 0.05 MHz	27.15 MHz	
10.7 MHz ± 0.5 MHz	23 MHz	
10.7 MHz ± 0.05 MHz	32.9 MHz	
10.7 MHz ± 0.005 MHz	33.724 MHz	

If no signal or insufficient signal is present in one of the ranges, then attempt to make correction with the trimmer capacitors C 16, C 24, C 32, C 40 or C 48.

- The signal amplitude should be about 1.5 V peak-peak at test point TP 4 at the oscillator output FOS1. The signal waveform should be an approximate squarewave.
- The synchronization of the circuit can be checked at test point TP 1. An approximately sawtooth waveform voltage at the sweep cycle rate should appear in the display ranges 10.7 MHz \pm 0.5 MHz and 21.4 MHz \pm 2.5 MHz. The voltage excursion should be about -2 V to +10 V. If this condition is not satisfied, then attempt to make correction by detuning the inductance L 11.

4.3.6 Sweep Oscillator WO 1705

For checking this module, first make sure that the 64 kHz reference voltage is correctly present at plug connector pin 28c.

Make the following check measurements:

- Test point TP 4, 250 kHz to 300 kHz swept, amplitude about 5 V peak-peak
- Test point TP 10, direct voltage about 0 V, adjustment is possible with trimmer potentiometer P 1
- Test point TP 6, direct voltage, about 8 V
- Test point TP 5, sawtooth voltage waveform 4.5 V to 5.9 V
- Test point TP 9, curved sawtooth waveform, +5 V to -6 V
- Test point TP 8, staircase voltage at the sweep cycle rate, voltage steps 3.2 V, 2.5 V, 2 V (baseline)

4.3.7 Digital Modules

In view of the circuit complexity and numerous inter-relationships of the functions, it is not possible to give any generally valid fault tracing instructions for fault tracing in the digital modules Processor PR 1705, Image Refresh Memory BW 1705, Analog/Digital Converter AD 1705 and Digital/Analog Converter DA 1705. If faults are suspected in these modules, replace them individually and successively by modules of the same kind which are known to be intact, in order to determine which module is defective.

4.4 Making Repairs

Repairs at components level is not envisaged. Repairs are carried out by replacing of defective circuit boards detected by Fault Tracing (Section 4.3).

Do not carry out any soldering operation on the circuit boards except in the places provided (soldered jumper connections), because this would damage the protective coating and thus impair the long term reliability of the unit.

PSG 1700/2 4-15



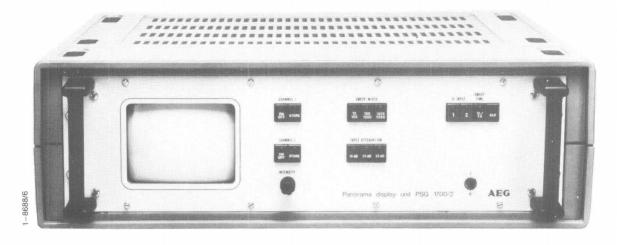


Fig. 1 Panorama Display Unit PSG 1700/2, front view

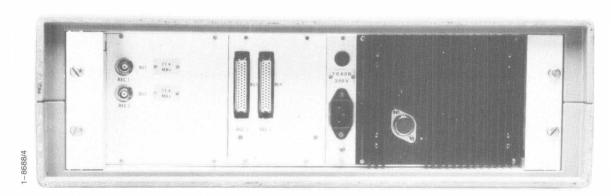


Fig. 2 Panorama Display Unit PSG 1700/2, rear view (Version with Mains Power Supply)

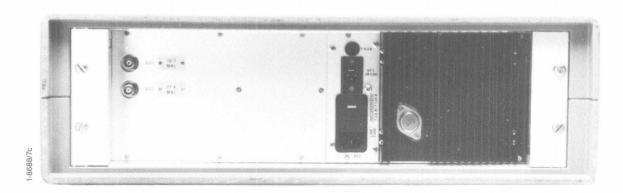


Fig. 3 Panorama Display Unit PSG 1700/2, rear view (Version with Mains-/Battery Power Supply)



Lists of components

4.6.1

Body RU 1705 52.1810.001.00

Item	Description	Electr. Values/Type
BU 1 and BU 2 BU 3, BU 6 to BU 10 BU 11	Connector strip 60-pin with 2 coax contacts Connector strip 64-pin Connector strip 60-pin with 3 HV contacts	G 06 M 604 P3 BDBL 53740-5001 G 06 D 64 P3 BBBL G 06 M 604 PU BEBL 51157
C 1 to C 5 C 6 and C 7 C 8 C 9 to C 11	Electrolytic capacitor Tantalum electrolytic capacitor Electrolytic capacitor Ceramic capacitor	$100~\mu\text{F}, 25~\text{V}$ $1~\mu\text{F}, 35~\text{V}$ $100~\mu\text{F}, 25~\text{V}$ $10~\text{nF}, 63~\text{V}$
D 1 and D 2 D 3 D 4 D 5	Z-diode Reference diode Z-diode Diode	ZPD 8,2 1 N 825 ZPD 18 1 N 4148
IC 1	Quadruple operational amplifier	TL 084 CN
K 1	Flat cable 24-pin	24 XY 200
R 1 R 2 R 3 R 4 to R 6 R 7 R 8 R 9 to R 12 R 13 R 14 R 15 R 16 R 17 and R 18	Wire resistor Wire resistor Wire resistor Carbon-film resistor Metal-film resistor Metal-film resistor Metal-film resistor Metal-film resistor Metal-film resistor Carbon-film resistor Carbon-film resistor Carbon-film resistor	$\begin{array}{c} 22\;\Omega,\;3\;\mathrm{W}\\ 15\;\Omega,\;3\;\mathrm{W}\\ 18\;\Omega,\;3\;\mathrm{W}\\ 2,2\;\mathrm{k}\Omega,\;5\%,\;0,25\;\mathrm{W}\\ 8,87\;\mathrm{k}\Omega,\;1\%,\;0,25\;\mathrm{W}\\ 6,19\;\mathrm{k}\Omega,\;1\%,\;0,25\;\mathrm{W}\\ 10\;\mathrm{k}\Omega,\;1\%,\;0,25\;\mathrm{W}\\ 2,0\;\mathrm{k}\Omega,\;1\%,\;0,25\;\mathrm{W}\\ 2,0\;\mathrm{k}\Omega,\;1\%,\;0,25\;\mathrm{W}\\ 20\;\Omega,\;5\%,\;0,25\;\mathrm{W}\\ 220\;\Omega,\;5\%,\;0,25\;\mathrm{W}\\ 220\;\Omega,\;5\%,\;0,25\;\mathrm{W}\\ 220\;\Omega,\;5\%,\;0,25\;\mathrm{W}\\ \end{array}$
SO 1	DIL socket 24-pin	AMP 0641604
T 1 T 2 T 3	npn transistor npn transistor pnp transistor	2 N 4923 BD 645 BD 646

4.6.2

Mains Power Supply NV 1705 52.1810.100.00

Item	Description	Electr. Values/Type
C 18	Electrolytic capacitor (mounted at AV 1706)	10 μF, 63 V
IC 5	Integrated voltage regulator	LM 323 K
L 1	Deflection unit	AE 71/T 11
Roe 1	Rectangular CRT (mounted on drawer unit)	M 14 - 100 W
S 1	Main switch	0145.1903 G

Item	Description	Electr. Values/Type
Si 1	Mains fuse	220 V: T 0.63 A 110 V: T 1.25 A
St 1	Blade contact connector 60-pin with 3 HV inserts	G 06 M 604 P3 BDBL 51155
Tr 1	Mains transformer	BV 17844
F 1	Mains filter and main circuit connection	ERUF 1767-0230-210

4.6.2.1 Mains Unit Board GP 1705/1 52.1810.110.00

Item	Description	Electr. Values/Type
C 1 to C 4	Electrolytic capacitor	2200 μF, 40 V
C 5 to C 8	Electrolytic capacitor	10 μF, 63 V
D 1 to D 4	Rectifier diode	BY 246-06
GL 1	Bridge rectifier	B 80 C 1500
C 1	Integrated voltage regulator (TO 220 package)	+15 V. 7815
C 2	Integrated voltage regulator (TO 220 package)	-15 V. 7915
C 3	Integrated voltage regulator (TO 220 package)	+24 V, 7824
IC 4	Integrated voltage regulator (TO 220 package)	-24 V. 7924

4.6.2.2 Mains Unit Board GP 1705/2 52.1810.120.00

Item	Description	Electr. Values/Type
C 1 to C 4	Electrolytic capacitor	4700 μF, 16 V
D 1 to D 4	Rectifier diode	BY 246-06
D 5 and D 6	Rectifier diode	BYS 26-45

4.6.2.3 High Voltage Generation HS 1705, Power Supply AC 52.1810.170.00

Item	Description	Electr. Values/Type
C 1	Styroflex capacitor	2,7 nF, 63 V
C 2	Plastic foil capacitor	10 nF, 400 V
C 3 and C 4	Electrolytic capacitor	$10 \mu \text{F}, 63 \text{V}$
C 5	Electrolytic capacitor	10 μF, 100 V
C 6	Ceramic capacitor	1 nF, 6 kV
C 7	Plastic foil capacitor	68 nF, 400 V
C 8	Tantalum electrolytic capacitor	2,2 μF, 20 V
D 1 and D 2	High voltage diode	ESJA35-12
D 3 and D 4	Rectifier diode	1 N 4007
C A . O.2		

Item	Description	Electr. Values/Types
D 5	Z-diode	ZPD 3,3
D 6 and D 7	Silicon diode	1 N 4148
L 1 and L 2	Choke RM 15	10 μΗ
P 1	Trimming potentiometer (72 x)	2 ΜΩ
P 2	Trimming potentiometer (72 x)	500 κΩ
R 1	Carbon-film resistor	27 Ω, 5%, 2 W
R 2	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R 3	Carbon-film resistor	$27 \text{ k}\Omega$, 5%, 0,25 W
R 4	Carbon-film resistor	470 Ω , 5%, 0,25 W
R 5	Carbon-film resistor	22 Ω, 5%, 0,25 W
R 6	Carbon-film resistor	470 Ω, 5%, 0,25 W
R 7	Carbon-film resistor	$3.9 \text{ k}\Omega$, 5%, 0,25 W
R 8	Carbon-film resistor	82 k Ω , 5%, 0,25 W
R 9	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 10	Carbon-film resistor	2,7 k Ω , 5%, 0,25 W
St 1	High voltage connection cable with plug	AT 3515,5
St 2	Plug connector 14-pin (2 x 7-pin)	SL 4/25/14 G
Т 1	npn transistor	BD 237
Т 2	pnp transistor	BC 640
Tr 1	Line deflection trafo	ZT 67/T 9

If the HS 1705 is employed in a NB 1705 module the following alternations must be performed:

Video Amplifier VV 1705, Power Supply AC 52.1810.160.00 4.6.2.4

Item	Description	Electr. Values/Type
C 11	Electrolytic capacitor	4,7 μF, 25 V
C 12	Tantal capacitor	1 μF, 35 V
C 13	Ceramic capacitor	68 pF, 35 V
C 14	Electrolytic capacitor	10 μF, 63 V
D 10	Z-diode	ZPD 3,9
L 3	Choke RM 15	3,3 μΗ
R 15	Carbon-film resistor	6,8 k Ω , 5%, 0,25 W
R 16	Carbon-film resistor	470 Ω , 5%, 2 W
R 17 and R 18	Carbon-film resistor	$100 \Omega, 5\%, 0.25 W$
R 19	Carbon-film resistor	56 Ω, 5%, 0,25 W
R 20	Carbon-film resistor	33 Ω, 5%, 0,25 W
R 21 and R 23	Carbon-film resistor	10 Ω , 5%, 0,25 W
Т 4	pnp transistor	2 N 2905
T 5	npn transistor	2 N 2219
	P. A. C. St. And Color Proposition and	
So 1	CRT-socket	AT 3510,5

If the HS 1705 is employed in a NB 1705 module the following alternations must be performed: $-\,$ R 22 is additionally equipped, rating: 39 $\Omega/0.5~\mathrm{W}$

⁻⁻ C 8 omitted,

⁻ R 10 changes to 470 Ω

The deflection preamplifier for the X and Y directions are built-up identically and equipped with the same components.

Item	Description	Electr. Values/Type
C 1 and C 3	Tantalum electrolytic capacitor	1 μF, 35 V
C 4 and C 5	Tantalum electrolytic capacitor	$2,2 \mu\text{F}$, 20V
C 6 and C 7	Ceramic capacitor	10 nF, 63 V
C 8 and C 9	Ceramic capacitor	1 nF
C 10 and C 11	Plastic foil capacitor	15 nF, 63 V
C 18 and C 19	Ceramic capacitor	100 nF, 63 V
C 20	Ceramic capacitor	6,8 pF, 63 V
C 21	Ceramic capacitor	1 nF
C 22 and C 23	Ceramic capacitor	100 nF, 63 V
C 24	Ceramic capacitor	15 pF, 63 V
C 25 and C 26	Ceramic capacitor	100 nF, 63 V
D 1 to D 8 and	Ciliana diada	1 01 4140
D 17 to D 19	Silicon diode	1 N 4148
IC 1	Operational amplifier	LM 318 H
IC 2	Dual comparator	LM 393 H
IC 3	Dual operational amplifier	LF 353 H
IC 4	Dual comparator	LM 393 H
P 1	Trimming potentiometer 89P	1 M Ω
P 2	Trimming potentiometer 89P	5 κΩ
P 3	Trimming potentiometer 89P	25 kΩ
R 1	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 2	Carbon-film resistor	390 Ω , 5%, 0,25 W
R 3 and R 4	Metal-film resistor	47 k Ω , 1%, 0,25 w
R 5	Carbon-film resistor	390 Ω , 5%, 0,25 W
R 6	Carbon-film resistor	220 Ω , 5%, 0,25 W
R 7	Carbon-film resistor	$1,8~\text{k}\Omega$, 5% , $0,25~\text{W}$
R 8 and R 9	Metal-film resistor	47 k Ω , 1%, 0,25 W
R 10	Carbon-film resistor	220 Ω , 5%, 0,25 W
R 11	Carbon-film resistor	1,8 k Ω , 5%, 0,25 W
R 12	Carbon-film resistor	22 k Ω , 5%, 0,25 W
R 13	Carbon-film resistor	1 M Ω , 5%, 0,25 W
R 14	Carbon-film resistor	10 k Ω , 5%, 0,25 W
R 15	Carbon-film resistor	560 Ω , 5%, 0,25 W
R 16	Carbon-film resistor	56 k Ω , 5%, 0,25 W
R 17	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R 18	Carbon-film resistor	6,8 k Ω , 5%, 0,25 W
R 19 and R 20	Carbon-film resistor	68 Ω, 5%, 0,25 W
R 21	Carbon-film resistor	6,8 kΩ, 5%, 0,25 W
R 22	Carbon-film resistor	10 k Ω , 5%, 0,25 W
R 23	Carbon-film resistor	2,2 k Ω , 5%, 0,25 W
R 24	Carbon-film resistor	1,8 k Ω , 5%, 0,25 W
R 25	Carbon-film resistor	3,3 k Ω , 5%, 0,25 W
R 26	Carbon-film resistor	$2,2 \text{ k}\Omega, 5\%, 0,25 \text{ W}$
R 27	Carbon-film resistor	3,3 k Ω , 5%, 0,25 W
R 28	Carbon-film resistor	$2,2 k\Omega, 5\%, 0,25 W$
R 29 and R 30	Carbon-film resistor	27 Ω, 5%, 0,25 W
R 37	Wire resistor	0,39 Ω, 5%, 2 W
R 41	Carbon-film resistor	$2,7 \text{ k}\Omega, 5\%, 0,25 \text{ W}$
R 42	Carbon-film resistor	$1,2 \text{ k}\Omega, 5\%, 0,25 \text{ W}$
R 43 to R 47	Carbon-film resistor	2,7 kΩ, 5%, 0,25 W
R 48	Carbon-film resistor	$100 \text{ k}\Omega$, 5%, 0,25 W
R 49	Carbon-film resistor	100 kΩ, 5%, 0,25 W
R 50	Carbon-film resistor	10 kΩ, 5%, 0,25 W
R 51	Carbon-film resistor	3,3 k Ω , 5%, 0,25 W
1, 01	Carbon-film resistor	$1.5 \text{ k}\Omega$, 5%, 0,25 W

Item	Description	Electr. Values/Type
R 54	Carbon-film resistor	100 Ω, 5%, 0,25 W
R 55	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0.25 W
R 56	Carbon-film resistor	$1 \text{M}\Omega$, 5%, 0.25 W
R 57	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 w
R 58	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 59 and R 60	Carbon-film resistor	22 Ω, 5%, 0,25 W
St 1	Plug 14-pin (2 x 7 pins)	SL 4/25/14 G
T 1	pnp transistor	BCY 58 IX
T 2	npn transistor	BCY 78 IX
T 3	npn transistor	2 N 2219
T 4	pnp transistor	2 N 2905

4.6.2.6 Final Deflection Amplifier AV 1706 and AV 1706/1 (Power Supply AC) 52.1810.140.00

The final deflection amplifiers for the X and Y directions are built-up identically and equipped with the same components.

tem	Description	Electr. Values/Type
C 12 and C 12'	Ceramic capacitor	100 nF, 63 V
C 13 and C 14	Electrolytic capacitor	1 μF, 63 V
C 13' and C 14'	Electrolytic capacitor	$1 \mu F, 63 V$
C 15 and C 15'	Ceramic capacitor	100 nF, 63 V
C 16 and C 17	Ceramic capacitor	10 nF, 63 V
C 16' and C 17'	Ceramic capacitor	10 nF, 63 V
C 18	Electrolytic capacitor (functionally to NV 17	05) 10 μF, 63 V
D 9 and D 12	Silicon diode	BYS 26-45
D 9' and D 12'	Silicon diode	BYS 26-45
D 13 and D 13'	Z-diode	ZPD 18
D 14 and D 14'	Z-diode	ZPD 12
D 15 and D 15'	Z-diode	ZPD 18
D 16 and D 16'	Z-diode	ZPD 12
R 31 and R 31'	Carbon-film resistor	220 Ω, 5%, 0,25 W
R 32 and R 32'	Carbon-film resistor	10 Ω, 5%, 0,25 W
R 33 and R 33'	Carbon-film resistor	220 Ω , 5%, 0,25 W
R 34 and R 34'	Carbon-film resistor	10 Ω, 5%, 0,25 W
R 35 and R 38	Carbon-film resistor	$2,2 \text{ k}\Omega$, 5%, 0,25 W
R 35' and R 38'	Carbon-film resistor	2,2 kΩ, 5%, 0,25 W
R 39 and R 40	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R 39' and R 40'	Carbon-film resistor	1 kΩ, 5%, 0,25 W
T 5 and T 5'	pnp transistor	BD 250 B
T 6 and T 6'	npn transistor	BD 245 B
Γ 7 and Τ 7'	pnp Darlington transistor	BD 650
T 8 and T 8'	npn Darlington transistor	BD 645

If the AV 1706 and AV 1706/1 are employed in a NB 1705 module the following alternations must be performed:

- T 7 and T 7' omittedT 5 and T 5' change to BD 746 B,
- T 6 and T 6' change to BD 745 B,
- C 19 additionally equipped; Electrolytic capacitor 10 μ F, 63 V

Item	Description	Electr. Values/Type
C 1	Electrolytic capacitor	100 μF, 25 V
C 2	Ceramic capacitor	47 nF, 63 V
C 3	Ceramic capacitor	150 pF
C 4 to C 10	Ceramic capacitor	47 nF, 63 V
IC 1	Digital integrated circuit	54 LS 123 J
IC 2	Digital integrated circuit	54 LS 32 J
IC 3	Digital integrated circuit	54 LS 244 J
IC 4	Digital integrated circuit	54 LS 04 J
IC 5	Digital integrated circuit	MM 74 C 923 N
IC 6	Digital integrated circuit	ICM 7218 AUI
IC 7	Resistor network 10-X-1-392G	3,9 kΩ
R 1	Carbon-film resistor	10 kΩ, 5%, 0,25 W
R 2	Carbon-film resistor	220 k Ω , 5%, 0,25 W
R 3	Carbon-film resistor	22 k Ω , 5%, 0,25 W
So 1	DIL socket, 24-pin	AMP 064 1604
Ta 1 to Ta 13	Key switch with LED	SERL green
Ta 14	Key switch	SER
P 3	Potentiometer (Preostat)	100 kΩ, 0,15 W
NW 1	Resistor network, 6-pin, 4,7 k Ω	6 X-1-472

4.6.4 Intermediate Frequency and Analysis Module ZA 1705 52.1810.400.00

The module ZA 1705 can be equipped with the following input circuits:

Input 10.7 MHz/10.7 MHz: 52.1810.404.00 Input 10.7 MHz/21.4 MHz: 52.1810.405.00 Input 21.4 MHz/21.4 MHz: 52.1810.406.00

4.6.4.1 Input (ZA 1705) 10.7 MHz 52.1810.401.00

Item	Description	Electr. Values/Type
BU 1 BU 2	Jack Jack	TNC SMB
C 8 C 9 C 10 C 11 C 12 and C 13 C 14	Styroflex capacitor Ceramic capacitor Ceramic capacitor Styroflex capacitor Ceramic capacitor Bushing-type capacitor	3,9 nF 330 pF 27 pF 3,9 nF 10 nF, 63 V 2 nF
D 1 to D 3	Switching diode	BA 182
Dr 1	Choke RM 10	100 μΗ
L 6 L 7 L 8	Inductor Inductor Inductor	4 Wdg BVPSG400.6 6,5 μΗ BVPSG400.7 4 Wdg BVPSG400.8
SA 06		PSG 1700/2

tem	Description	Electr. Values/Type
1	Carbon-film resistor	1,8 kΩ, 5%, 0,1 W
2	Carbon-film resistor	2,7 kΩ, 5%, 0,1 W
3	Carbon-film resistor	$1.8 \text{ k}\Omega, 5\%, 0.1 \text{ W}$

4.6.4.2 Input (ZA 1705) 21.4 MHz 52.1810.402

tem	Description	Electr. Values/Type
3U 1	Jack	TNC
3U 2	Jack	SMB
2 1	Styroflex capacitor	560 pF
2	Ceramic capacitor	100 pF
3	Ceramic capacitor	33 pF
2.4	Styroflex capacitor	1 nF
5	Ceramic capacitor	27 pF
5a	Ceramic capacitor	6,8 pF
6	Styroflex capacitor	560 pF
C 12 and C 13	Ceramic capacitor	10 nF, 63 V
14	Bushing-type capacitor	2 nF
0 1 to D 3	Switching diode	BA 182
Or 1	Choke RM 10	100 μΗ
_ 1	Inductor	6 Wdg BVPSG400.1
2	Inductor	2,18 μH BVPSG400.2
_ 3	Inductor	4 Wdg BVPSG400.3
_ 4	Inductor	2,18 μH BVPSG400.4
5	Inductor	6 Wdg BVPSG400.5
₹ 1	Carbon-film resistor	1,8 k Ω , 5%, 0,1 W
R 2	Carbon-film resistor	$2,7 \text{ k}\Omega$, 5%, 0,1 W
R 3	Carbon-film resistor	$1,8 \text{ k}\Omega, 5\%, 0,1 \text{ W}$

4.6.4.3 Equipment of Intermediate Frequency and Analysis Module ZA 1705 (Motherboard) 52.1810.400.00

Item	Description	Electr. Values/Type
C 15 to C 28 C 29 to C 31	Ceramic capacitor Bushing-type capacitor	10 nF, 63 V 2,0 nF
C 31a C 32 to C 35 C 36 to C 40 C 41 C 42 and C 43 C 44 and C 45 C 46 C 47	Ceramic capacitor Bushing-type capacitor Ceramic capacitor Styroflex capacitor Ceramic capacitor Ceramic capacitor Ceramic capacitor Ceramic capacitor Ceramic capacitor Bushing-type capacitor	10 nF, 63 V 2,0 nF 10 nF, 63 V 3,3 nF 120 pF 180 pF 10 nF, 63 V 100 nF, 63 V 2,0 nF 2,2 µF, 20 V
C 49 C 50 C 51 C 52	Tantalum electrolytic capacitor Ceramic capacitor Ceramic capacitor Ceramic capacitor	2,2 μF, 20 V 2,7 pF 100 pF 82 pF

Itam	Description	Floats Values/Type
Item	Description	Electr. Values/Type
C 53	Ceramic capacitor	1 pF
C 54	Ceramic capacitor	100 pF
C 55	Ceramic capacitor	82 pF
C 56	Ceramic capacitor	1 pF
C 57 C 58	Ceramic capacitor	100 pF
C 59	Ceramic capacitor Ceramic capacitor	82 pF 1 pF
C 60	Ceramic capacitor	82 pF
C 61	Ceramic capacitor	100 pF
C 61a	Ceramic capacitor	2,7 pF
C 62	Ceramic capacitor	10 nF, 63 V
C 63	Styroflex capacitor	330 pF, 63 V
C 64	Ceramic capacitor	33 pF
C 65	Ceramic capacitor	100 nF, 63 V
C 66 C 67	Ceramic capacitor	1 nF
C 68	Ceramic capacitor Ceramic capacitor	100 nF, 63 V 1 nF
C 69 and C 70	Tantalum electrolytic capacitor	2,2 μF, 20 V
C 71	Styroflex capacitor	820 pF, 63 V
C 72	Ceramic capacitor	100 nF, 63 V
C 73	Ceramic capacitor	10 nF, 63 V
C 74	Tantalum electrolytic capacitor	2,2 μF, 20 V
C 75	Styroflex capacitor	680 pF, 63 V
C 76	Tantalum electrolytic capacitor	2,2 μF, 20 V
C 77	Ceramic capacitor	5,6 pF
C 78	Ceramic capacitor	100 pF
C 79	Styroflex capacitor	1 nF, 1%
C 80 C 81	Ceramic capacitor Ceramic capacitor	5,6 pF 68 pF
C 82	Styroflex capacitor	1 nF, 1%
C 83	Ceramic capacitor	5,6 pF
C 84	Ceramic capacitor	68 pF
C 85	Styroflex capacitor	1 nF, 1%
C 86	Ceramic capacitor	5,6 pF
C 87	Ceramic capacitor	100 pF
C 88	Ceramic capacitor	5,6 pF
C 89	Ceramic capacitor	56 pF
C 90	Styroflex capacitor	1 nF, 1% 15 pF
C 91 C 92	Ceramic capacitor Styroflex capacitor	1 nF, 1%
C 93	Ceramic capacitor	15 pF
C 94	Styroflex capacitor	1 nF, 1%
C 95	Ceramic capacitor	5,6 pF
C 96	Ceramic capacitor	56 pF
C 97 and C 98	Ceramic capacitor	100 nF, 63 V
C 99	Ceramic capacitor	10 nF, 63 V
C 100 and C 101	Ceramic capacitor	100 nF, 63 V 2 nF
C 102 C 103 to C 107	Bushing-type capacitor not equipped	2 111
C 108	Bushing-type capacitor	2 nF
C 109	Electrolytic capacitor	100 μF, 25 V
C 110 and C 111	Bushing-type capacitor	2,0 nF
C 112	Ceramic capacitor	1 nF
C 113	Ceramic capacitor	100 nF, 63 V
C 114	Ceramic capacitor	10 nF, 63 V
C 115	Ceramic capacitor	1 nF
C 116	Electrolytic capacitor	10 μF, 25 V 100 nF, 63 V
C 117 C 118 to C 122	Ceramic capacitor Tantalum electrolytic capacitor	2,2 μF, 20 V
and C 119a C 123	Plastic foil capacitor	0,47 μF
C 124	Styroflex capacitor	2,7 nF, 1%
C 125	Styroflex capacitor	33 nF, 1%
C 126	Ceramic capacitor	120 pF
C 127	Styroflex capacitor	1,2 nF, 1%
C 128	Styroflex capacitor	33 nF, 1%
C 129	Ceramic capacitor	150 pF

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Item	Description	Electr. Values/Type
C 130	Styroflex capacitor	2,7 nF, 1%
C 131	Styroflex capacitor	33 nF, 1%
C 132	Ceramic capacitor	100 nF, 63 V
C 133	Electrolytic capacitor	100 μF, 25 V
C 134	Tantalum electrolytic capacitor	2,2 μF, 20 V
C 136	Plastic foil capacitor	0,47 μF
C 137	Ceramic capacitor	150 pF
C 138	Ceramic capacitor	120 pF
C 139	Styroflex capacitor	33 nF, 1%
C 140	Ceramic capacitor	33 pF, 1%
C 141	Ceramic capacitor	100 pF
C 142	Styroflex capacitor	33 nF, 1%
C 143	Ceramic capacitor	100 pF
C 144	Ceramic capacitor	180 pF
C 145	Styroflex capacitor	33 nF, 1%
C 146	Ceramic capacitor	100 nF, 63 V
C 147 and C 148	Electrolytic capacitor	10 μF, 25 V
C 149	Tantalum electrolytic capacitor	2,2 μF, 20 V
C 150 and C 151	Tantalum electrolytic capacitor	2,2 μF, 20 V
C 155	Ceramic capacitor	10 nF, 63 V
C 156 to C 159	Ceramic capacitor	10 nF, 63 V
C 160 to C 171	Ceramic capacitor	100 nF, 63 V
C 172	Ceramic capacitor	47 pF
C 173 to C 175	Plastic foil capacitor	10 nF, 63 V
C 176 and C 177	Ceramic capacitor	100 nF, 63 V
C 178 and C 179	Electrolytic capacitor	10 μF, 25 V
C 180	Tantalum electrolytic capacitor	2,2 μF, 20 V
D 4 to D 16	Switching diode	BA 182
D 17	Z-diode	ZPD 5,6
D 18 and D 19	Schottky diode	hpa 2835
D 20	Z-diode	ZPD 5,6
D 21 to D 34	Schottky diode	hpa 2835
D 35 and D 36	Schottky diode	hpa 2811
Dr 2 to Dr 4	Choke RM 10	100 μΗ
Dr 5 and Dr 6	Choke RM 10	470 μΗ
Dr 7 and Dr 8	Choke RM 10	220 μΗ
IC 1	Integrated mixer	MC 1496 G
IC 2	Operational amplifier	LF 356 H
IC 3	not equipped	
IC 4 to IC 7	Integrated analog switch	TL 601 CP
IC 8	Digital integrated circuit	54 LS 393 J
IC 9	Integrated mixer	MC 1496 G
IC 10 to IC 15	Integrated analog switch	TL 601 CP
IC 16	Operational amplifier	LF 356 H
IC 17 to IC 20	Quadruple operational amplifier	TL 084 CN
IC 21	Digital integrated circuit	54 LS 32 N
IC 22	Digital integrated circuit	54 LS 00 N
IC 23 and IC 24	Digital integrated circuit	54 LS 174 N
L 9	Inductor	2,53 μH BVPSG400.09
L 10	Inductor	3,52 μH BVPSG400.10
L 11	Inductor	3,52 μH BVPSG400.11
L 12	Inductor	3,52 μH BVPSG400.12
L 13	Inductor	3,52 μH BVPSG400.13
L 14	Inductor	1,75 μH BVPSG400.14
L 15	Inductor	2,94 μH BVPSG400.15 2,94 μH BVPSG400.16
L 16	Inductor	
L 17	Inductor	2,22 mH BVPSG400.17 2,22 mH BVPSG400.18
L 18	Inductor	2,22 mH BVPSG400.18 2,22 mH BVPSG400.19
L 19	Inductor	2,22 mH BVPSG400.19 2,4 mH BVPSG400.20
L 20	Inductor	
L 20 L 21 L 22	Inductor Inductor Inductor	2,4 mH BVPSG400.21 2,4 mH BVPSG400.22

Item	Description	Electr. Values/Type
L 23 to L 25	not equipped	
L 26	Inductor	1,56 mH BVPSG400.26
L 27	Inductor	19 mH BVPSG400.27
L 28	Inductor	19 mH BVPSG400.28
L 29	Inductor	19 mH BVPSG400.29
L 30	Inductor	1,56 mH BVPSG400.30
L 31	Inductor	22,2 mH BVPSG400.31
L 32	Inductor	22,2 mH BVPSG400.32
L 33	Inductor	22,2 mH BVPSG400.33
L 34	Choke RM 10	0,15 μΗ
M 1	Mixer	IE 500
P 1	Trimming potentiometer RJ6	1 κΩ
P 2	Trimming potentiometer RJ6	10 kΩ
P 4	Trimming potentiometer RJ6	5 kΩ
P 5	Trimming potentiometer RJ6	2 κΩ
P 6	Trimming potentiometer RJ6	10 kΩ
R 4	Carbon-film resistor	100 Ω , 5%, 0,1 W
R 5	Carbon-film resistor	$1,8 \text{ k}\Omega$, 5%, 0,1 W
R 6 and R 7	Carbon-film resistor	1 kΩ, 5%, 0,1 W
R 8	Carbon-film resistor	$1,8 \text{ k}\Omega, 5\%, 0,1 \text{ W}$
R 9 to R 11	Carbon-film resistor	100 Ω, 5%, 0,1 W
R 12 to R 16	Carbon-film resistor	220 Ω, 5%, 0,1 W
R 17 and R 18	Carbon-film resistor	100 Ω, 5%, 0,1 W
R 19	Carbon-film resistor	3,3 kΩ, 5%, 0,1 W
R 20 and R 21	Carbon-film resistor Carbon-film resistor	39 Ω , 5%, 0,1 W 10 Ω , 5%, 0,1 W
R 22	Carbon-film resistor	$1.8 \text{ k}\Omega, 5\%, 0.1 \text{ W}$
R 23 and R 24 R 25 and R 26	Carbon-film resistor	$3,3 \text{ k}\Omega$, 5%, 0,1 W
R 27	Carbon-film resistor	27 Ω, 5%, 0,1 W
R 28	Carbon-film resistor	33 Ω, 5%, 0,1 W
R 29	Carbon-film resistor	$27 \Omega, 5\%, 0.1 W$
R 30 and R 31	Carbon-film resistor	$1.8 \text{ k}\Omega, 5\%, 0.1 \text{ W}$
R 32 and R 33	Carbon-film resistor	3,3 k Ω , 5%, 0,1 W
R 34	Carbon-film resistor	39 Ω , 5%, 0,1 W
R 35	Carbon-film resistor	$1,8~\text{k}\Omega$, 5% , $0,1~\text{W}$
R 36	Carbon-film resistor	39 Ω , 5%, 0,1 W
R 37	Carbon-film resistor	10 Ω, 5%, 0,1 W
R 38	Carbon-film resistor	1,8 kΩ, 5%, 0,1 W
R 39	Carbon-film resistor	$3,3 \text{ k}\Omega, 5\%, 0,1 \text{ W}$
R 40	Carbon-film resistor	1 k Ω , 5%, 0,1 W 1 ,8 k Ω , 5%, 0,1 W
R 41	Carbon-film resistor Carbon-film resistor	470 Ω, 5%, 0,1 W
R 42 and R 43 R 44	Carbon-film resistor	$1.8 \text{ k}\Omega, 5\%, 0.1 \text{ W}$
R 45	Carbon-film resistor	1 kΩ, 5%, 0,1 W
R 46	Carbon-film resistor	$1,8 \text{ k}\Omega, 5\%, 0,1 \text{ W}$
R 47 and R 48	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,1 W
R 49	Carbon-film resistor	4,7 k Ω , 5%, 0,1 W
R 50 and R 51	Carbon-film resistor	10 kΩ, 5%, 0,1 W
R 52	Carbon-film resistor	220 Ω, 5%, 0,1 W
R 53	Carbon-film resistor	1 kΩ, 5%, 0,1 W
R 54	Carbon-film resistor	4,7 kΩ, 5%, 0,1 W
R 55 and R 56	Carbon-film resistor	1 kΩ, 5%, 0,1 W
R 57	Carbon-film resistor	100 Ω , 5%, 0,1 W 2,7 k Ω , 5%, 0,1 W
R 58	Carbon-film resistor	$4,7 \text{ k}\Omega, 5\%, 0,1 \text{ W}$
R 59 and R 60	Carbon-film resistor Carbon-film resistor	10 kΩ, 5%, 0,1 W
R 61	Carbon-film resistor	1 kΩ, 5%, 0,1 W
R 62	Carbon-film resistor	2,2 kΩ, 5%, 0,1 W
R 63 R 64 and R 65	Carbon-film resistor	10 kΩ, 5%, 0,1 W
R 66	Carbon-film resistor	27 kΩ, 5%, 0,1 W
R 67 and R 68	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,1 W
		$100 \Omega, 5\%, 0.1 W$
R 69 and R 70	Carbon-film resistor	100 44, 0 70, 0 72 11
R 69 and R 70 R 71	Carbon-film resistor Carbon-film resistor	330 kΩ, 5%, 0,1 W

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R 74 Carbon-film resistor $2,7 \mathrm{k}\Omega, 5\%, 0, 0$, R 75 to R 78 not equipped $2,7 \mathrm{k}\Omega, 5\%, 0, 1$ R 80 Carbon-film resistor $22 \Omega, 5\%, 0, 1$ R 80 Carbon-film resistor $220 \Omega, 5\%, 0, 1$ R 81 Carbon-film resistor $220 \Omega, 5\%, 0, 1$ R 82 Carbon-film resistor $220 \Omega, 5\%, 0, 1$ R 83 Carbon-film resistor $220 \Omega, 5\%, 0, 1$ R 84 Carbon-film resistor $220 \Omega, 5\%, 0, 1$ R 85 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 85 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 87 and R 88 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 89 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 89 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 89 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 89 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 92 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 93 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 94 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 95 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 96 and R 97 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 98 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 100 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 101 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 102 and R 103 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 104 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 105 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 106 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 107 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 108 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 109 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 109 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 109 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 109 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 109 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$ R 109 Carbon-film resistor $200 \Omega, 5\%, 0, 0, 1$	es/Type
R 75 to R 78 not equipped R 79 Carbon-film resistor $22 \Omega, 5\%, 0.1\%$ R 80 Carbon-film resistor $10 \ k\Omega, 5\%, 0.1\%$ R 81 Carbon-film resistor $4.7 \ k\Omega, 5\%, 0.1\%$ R 82 Carbon-film resistor $22 \Omega, 5\%, 0.1\%$ R 83 Carbon-film resistor $22 \Omega, 5\%, 0.1\%$ R 84 Carbon-film resistor $22 \Omega, 5\%, 0.1\%$ R 85 Carbon-film resistor $100 \Omega, 5\%, 0.1\%$ R 86 Carbon-film resistor $100 \Omega, 5\%, 0.1\%$ R 87 and R 88 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 89 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 89 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 92 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 93 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 94 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 95 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 96 and R 97 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 98 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 99 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 90 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 101 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 102 and R 103 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 104 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 105 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 106 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 107 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 106 Carbon-film resistor $10 k\Omega, 5\%, 0.1\%$ R 107 Carbon-film resistor $100 k\Omega, 5\%, 0.1\%$ R 108 Carbon-film resistor $100 k\Omega, 5\%, 0.1\%$ R 109 Carbon-film resistor $100 k\Omega, 5\%, 0.1\%$	W
Carbon-film resistor $22 \Omega, 5\%, 0, 1$ $0 R 80$ Carbon-film resistor $10 R \Omega, 5\%, 0, 1$ $0 R 81$ Carbon-film resistor $0 R 82$ Carbon-film resistor $0 R 82$ Carbon-film resistor $0 R 83$ Carbon-film resistor $0 R 83$ Carbon-film resistor $0 R 84$ Carbon-film resistor $0 R 85$ Carbon-film resistor $0 R 95$	1 W
R 80 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 81 Carbon-film resistor $4,7 \text{ k}\Omega, 5\%, 0, 1$ R 82 Carbon-film resistor $220 \Omega, 5\%, 0, 1$ R 83 Carbon-film resistor $22 \Omega, 5\%, 0, 1$ R 84 Carbon-film resistor $22 \Omega, 5\%, 0, 1$ R 85 Carbon-film resistor $390 \Omega, 5\%, 0, 1$ R 86 Carbon-film resistor $100 \Omega, 5\%, 0, 1$ R 87 and R 88 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 89 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 89 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 80 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 80 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 80 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 92 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 94 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 95 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 96 and R 97 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 99 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 99 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 100 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 101 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 102 and R 103 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 104 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 105 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 106 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 107 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 108 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 109 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$ R 108 Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0, 1$	
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Carbon-film resistor $220 \Omega, 5\%, 0, 1$ $22 \Omega, 5\%, 0, 1$	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	W
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	W
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1 W
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
108 Carbon-film resistor 2,2 k Ω , 5%, 0,1 109 Carbon-film resistor 10 k Ω , 5%, 0,1	
109 Carbon-film resistor 10 k Ω , 5%, 0,1	
10010 5% 0	
110 Carbon-film resistor 100 k32. 5%. 0.	
Carbon-film resistor 91 k Ω , 5%, 0,1	
Carbon-film resistor $10 \text{ k}\Omega, 5\%, 0,1$	
Carbon-film resistor 120 k Ω , 5%, 0,	
Carbon-film resistor $10 \text{ k}\Omega$, 5%, 0,1	
Carbon-film resistor 33 k Ω , 5%, 0,1 carbon-film resistor 3,3 k Ω , 5%, 0,1 carbon-film resistor 3,3 k Ω , 5%, 0,1 carbon-film resistor	
6010 50 0	
200 0 50 01	
10.10 5% 0.1	
2210 50 01	
Table 121 Carbon-film resistor 33 k Ω , 5%, 0,1 122 and R 123 Carbon-film resistor 3,3 k Ω , 5%, 0,1 3,3 k Ω , 5%, 0,1 120 and R 123 Carbon-film resistor	
124 Carbon-film resistor 820 Ω , 5%, 0,1	
125 Carbon-film resistor 12 k Ω , 5%, 0,1	
126 Carbon-film resistor 33 k Ω , 5%, 0,1	. W
127 Carbon-film resistor 100 k Ω , 5%, 0,	
128 Carbon-film resistor 33 k Ω , 5%, 0,1	
129 Carbon-film resistor 10 k Ω , 5%, 0,1	
130 Carbon-film resistor 12 k Ω , 5%, 0,1	
Carbon-film resistor 33 k Ω , 5%, 0,1	
132 Carbon-film resistor 100 k Ω , 5%, 0,	
133 Carbon-film resistor 33 k Ω , 5%, 0,1	
134 Carbon-film resistor 10 k Ω , 5%, 0,1	
135 Carbon-film resistor 12 k Ω , 5%, 0,1 136 Carbon-film resistor 33 k Ω , 5%, 0,1	
10010 50/ 0	
22 10 5% 0.1	
101.0 50 0.1	
1010 5% 01	
2210 5% 0.1	
10010 5% 0	
22 1.0 5% 0.1	
143 Carbon-film resistor $33 \text{ k}\Omega$, 5%, 0,1 $144 \text{ and R } 145$ Carbon-film resistor $12 \text{ k}\Omega$, 5%, 0,1	
12 Kas, 5%, 13 144 and R 145 Carbon-film resistor $12 Kas, 5%, 0,1$	
Carbon-film resistor $Carbon-film$ resistor $Carbon-film$ resistor $Carbon-film$ resistor $Carbon-film$ resistor $Carbon-film$	
148 Carbon-film resistor $33 \text{ k}\Omega$, 5%, 0,1	'T AA
R 149 Carbon-film resistor 12 k Ω , 5%, 0,1	
1 1 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	L W

Item	Description	Electr. Values/Type
R 150	Carbon-film resistor	2,7 kΩ, 5%, 0,1 W
R 151	Carbon-film resistor	$4,7 \text{ k}\Omega, 5\%, 0,1 \text{ W}$
R 152	NTC resistor	1,5 k Ω
R 153	Carbon-film resistor	6,8 k Ω , 5%, 0,1 W
R 154 to R 161	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,1 W
R 162	Carbon-film resistor	$100~\Omega$, 5%, 0,1 W
R 163 and R 164	Carbon-film resistor	10 kΩ, 5%, 0,1 W
St 1	Blade contact connector 60-pin	G 06 M 604 P3 BDBL
	with 2 coaxial inserts	53742
T 1 and T 2	N channel field effect transistor	2 N 4416
T 3 and T 4	pnp transistor	BCY 78 IX
T 5	npn transistor	BCY 58 IX
T 6	pnp transistor	BCY 781X
T 7	npn transistor	BCY 58 IX
T 8	N channel field effect transistor	2 N 4416
T 9	npn transistor	2 N 918
T 10	Transistor	2 N 4351
T 11 to T 13	npn transistor	BCY 58 IX
T 14	npn transistor	BCY 78 IX

If a unit is equipped with two input circuits 21.4 MHz, the following parts are not fitted:

- C 136 to C 146

- IC 14 - IC 15 - L 30 to L 33

- R 108

— R 109 — Т 8

Oscillator OS 1705 (Oscillator I) 52.1810.410.00 4.6.5

Item	Description	Electr. Values/Type	
C 13	Ceramic capacitor	100 pF	
C 14 and C 15	Ceramic capacitor	18 pF	
C 16	Ceramic trimmer	4,5 - 15 pF	
C 17	Ceramic capacitor	33 pF	
C 18	Ceramic trimmer	3,5 - 13 pF	
C 19	Ceramic capacitor	330 pF	
C 20	Ceramic capacitor	10 nF, 63 V	
C 21	Ceramic capacitor	82 pF	
C 22	Ceramic capacitor	22 pF	
C 23	Ceramic capacitor	18 pF	
C 24	Ceramic trimmer	4,5 - 15 pF	
C 25	Ceramic capacitor	39 pF	
C 26	Ceramic trimmer	3,5 - 13 pF	
C 27	Ceramic capacitor	330 pF	
C 28	Ceramic capacitor	10 nF, 63 V	
C 29	Ceramic capacitor	82 pF	
C 30	Ceramic capacitor	47 pF	
C 31	Ceramic capacitor	22 pF	
C 32	Ceramic trimmer	4,5 - 15 pF	
C 33	Ceramic capacitor	47 pF	
C 34	Ceramic trimmer	3,5 - 13 pF	
C 35	Ceramic capacitor	470 pF	
C 36	Ceramic capacitor	10 nF, 63 V	
C 37 and C 38	Ceramic capacitor	100 pF	
C 39	Ceramic capacitor	10 pF	
C 40	Ceramic trimmer	4,5 - 15 pF	

242 Ceramic trimmer 7 - 35 pF	Item	Description	Electr. Values/Type
4.34 Ceramic capacitor 1,5 n F 4.44 Ceramic capacitor 10 n F, 63 V 4.5 and C 46 Ceramic capacitor 100 p F 4.48 Ceramic capacitor 22 p F 4.49 Ceramic capacitor 47 p F 5.50 Ceramic capacitor 2,2 n F 5.51 Ceramic capacitor 10 n F, 63 V 5.52 Ceramic capacitor 1 n F 5.55 Ceramic capacitor 10 n F, 63 V 5.56 Ceramic capacitor 1 n F 5.57 Ceramic capacitor 1 n F 5.58 Tantalum electrolytic capacitor 1,7 μ F, 35 V 5.59 Ceramic capacitor 1,7 μ F, 35 V 60 Plastic foil capacitor 4,7 μ F, 35 V 61 Tantalum electrolytic capacitor 8,2 p F 64 And C 65 Ceramic capacitor 8,2 p F 64 And C 65 Ceramic capacitor 8,2 p F 65 Ceramic capacitor 4,7 μ F, 35 V 66 Tantalum electrolytic capacitor 4,8 p F <td>C 41</td> <td>Ceramic capacitor</td> <td>33 pF</td>	C 41	Ceramic capacitor	33 pF
244 Ceramic capacitor 10 n F, 63 V 45 and C 46 Ceramic capacitor 22 pF 48 Ceramic capacitor 45 - 15 pF 49 Ceramic capacitor 47 pF 50 Ceramic capacitor 47 pF 51 Ceramic capacitor 10 nF, 63 V 51 Ceramic capacitor 10 nF, 63 V 52 Ceramic capacitor 10 nF, 63 V 55 Ceramic capacitor 10 nF, 63 V 56 Ad C 57 Ceramic capacitor 10 nF, 63 V 58 Tantalum electrolytic capacitor 4,7 μF, 35 V 59 Ceramic capacitor 0,047 μF 60 Plastic foil capacitor 0,047 μF 61 Tantalum electrolytic capacitor 330 pF 63 Ceramic capacitor 330 pF 64 and C 65 Ceramic capacitor 330 pF 65 Ceramic capacitor 6,8 pF 66 Ceramic capacitor 6,8 pF 67 Ceramic capacitor 6,8 pF 70 Cera	C 42	Ceramic trimmer	7 - 35 pF
45 and C 46 Ceramic capacitor 100 pF 247 Ceramic caracitor 22 pF 48 Ceramic capacitor 47 pF 50 Ceramic capacitor 47 pF 51 Ceramic capacitor 10 nF, 63 V 53 Ceramic capacitor 10 nF, 63 V 55 Ceramic capacitor 10 nF, 63 V 56 And C 57 Ceramic capacitor 100 nF, 63 V 59 Ceramic capacitor 10 nF, 63 V 60 Plastic foil capacitor 0,047 μF 61 Tantalum electrolytic capacitor 4,7 μF, 35 V 62 Ceramic capacitor 30 pF 63 Ceramic capacitor 8,2 pF 64 and C 55 Ceramic capacitor 30 pF 64 And C 65 Ceramic capacitor 4,7 μF, 35 V 66 Tantalum electrolytic capacitor 4,7 μF, 35 V 67 Ceramic capacitor 4,7 μF, 35 V 68 Ceramic capacitor 4,7 μF, 35 V 69 Ceramic capacitor 5,6 pF <tr< td=""><td>C 43</td><td>Ceramic capacitor</td><td>1,5 nF</td></tr<>	C 43	Ceramic capacitor	1,5 nF
24	2 44	Ceramic capacitor	10 nF, 63 V
4.84 Ceramic trimmer 4,5 - 15 pF 4.95 Ceramic capacitor 47 pF 5.50 Ceramic trimmer 7 - 35 pF 5.51 Ceramic capacitor 10 nF, 63 V 5.53 Ceramic capacitor 10 nF, 63 V 5.55 Ceramic capacitor 10 nF, 63 V 5.66 And C 57 Ceramic capacitor 100 nF, 63 V 5.99 Ceramic capacitor 1 nF 60 Plastic foil capacitor 0,047 μF 61 Tantalum electrolytic capacitor 330 pF 62 Ceramic capacitor 330 pF 63 Ceramic capacitor 330 pF 64 And C 65 Ceramic capacitor 330 pF 67 Ceramic capacitor 330 pF 68 Ceramic capacitor 5,6 pF 69 Ceramic capacitor 5,6 pF 71 Ceramic capacitor 10 nF, 63 V 74 And C 75 Ceramic capacitor 10 nF, 63 V 74 And C 75 Ceramic capacitor 10 nF, 63 V	C 45 and C 46	Ceramic capacitor	100 pF
Ceramic capacitor	2.47	Ceramic capacitor	22 pF
So	2 48	Ceramic trimmer	4,5 - 15 pF
Section		Ceramic capacitor	· · · · · · · · · · · · · · · · · · ·
Solid Ceramic capacitor 10 nF, 63 V			
1		AND	
10			
100 n			
Tantalum electrolytic capacitor			
Ceramic capacitor		The state of the s	
Fig. Plastic foil capacitor Co. A μ μ		The state of the s	
Tantalum electrolytic capacitor			
Geam Capacitor Geam Capacitor Geam Geam Capacitor Geam			
63 Ceramic capacitor 8,2 pF 64 and C 65 Ceramic capacitor 330 pF 66 Tantalum electrolytic capacitor 330 pF 67 Ceramic capacitor 6,8 pF 69 Ceramic capacitor 5,6 pF 70 Ceramic capacitor 82 pF 71 Ceramic capacitor 10 nF, 63 V 72 Ceramic capacitor 10 nF, 63 V 73 Ceramic capacitor 10 nF, 63 V 74 And C 75 Ceramic capacitor 1 nF 77 Ceramic capacitor 1 nF 79 C 81 Ceramic capacitor 1 nF 79 C 81 Ceramic capacitor 1 nF 82 Ceramic capacitor 1 nF 83 and C 84 Ceramic capacitor 100 nF, 63 V 85 Ceramic capacitor 10 nF, 63 V 86 Ceramic capacitor 10 nF, 63 V 87 Tantalum electrolytic capacitor 47 pF 88 Ceramic capacitor 10 nF, 63 V 89<			
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1.0			
667 Ceramic capacitor 330 pF 688 Ceramic capacitor 6,8 pF 699 Ceramic capacitor 82 pF 700 Ceramic capacitor 10 nF, 63 V 711 Ceramic capacitor 10 nF, 63 V 722 Ceramic capacitor 10 nF, 63 V 74 Ceramic capacitor 10 nF, 63 V 76 Ceramic capacitor 10 nF, 63 V 776 Ceramic capacitor 10 nF, 63 V 778 Ceramic capacitor 10 nF, 63 V 78 Ceramic capacitor 100 nF, 63 V 82 Ceramic capacitor 10 nF, 63 V 82 Ceramic capacitor 10 nF, 63 V 83 and C 84 Ceramic capacitor 10 nF, 63 V 85 Ceramic capacitor 30 pF 88 Ceramic capacitor 47 pF 88 Ceramic capacitor 390 pF 101 and C 102 Ceramic capacitor 10 nF, 63 V 103 and C 104 Ceramic capacitor 10 nF, 63 V 105 and C 106 Ceramic capacitor		·	
Ceramic capacitor		A STATE OF THE PARTY OF THE PAR	
Ceramic capacitor			
Ceramic capacitor S2 pF			
Ceramic capacitor 10 nF, 63 V			
1 n			
10 n F, 63 V		The State of the American Control of the State of the Sta	
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
Ceramic capacitor 10 nF, 63 V 1 nF		•	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		CONTRACTOR	
Ceramic capacitor 100 nF, 63 V 1 nF 100 nF, 63 V 1 nF, 6			
82 Ceramic capacitor 1 nF 83 and C 84 Ceramic capacitor 100 nF, 63 V 85 Ceramic capacitor 390 pF 86 Ceramic capacitor 4,7 μF, 35 V 88 Ceramic capacitor 470 pF 89 Ceramic capacitor 390 pF 101 and C 102 Ceramic capacitor 100 nF, 63 V 103 and C 104 Ceramic capacitor 47 pF 105 and C 106 Ceramic capacitor 10 nF, 63 V 107 Ceramic capacitor 10 nF, 63 V 109 Ceramic capacitor 10 nF, 63 V 110 and C 111 Ceramic capacitor 10 nF, 63 V 112 Ceramic capacitor 10 nF, 63 V 112 Ceramic capacitor 1 nF 115 to C 119 Ceramic capacitor 1 nF 120 Plastic foil capacitor Wima MUS 1 μF, 50 V 121 to C 123 Ceramic capacitor 10 nF, 63 V 124 Ceramic capacitor 10 nF, 63 V 125 to C 129 Ceramic capacitor 10 nF, 63 V 130 and C 131 Ceramic capacitor 10 nF, 63 V <td< td=""><td></td><td></td><td></td></td<>			
83 and C 84 Ceramic capacitor 100 nF, 63 V 85 Ceramic capacitor 10 nF, 63 V 86 Ceramic capacitor 390 pF 87 Tantalum electrolytic capacitor 4,7 μ F, 35 V 88 Ceramic capacitor 470 pF 88 Ceramic capacitor 390 pF 101 and C 102 Ceramic capacitor 100 nF, 63 V 103 and C 104 Ceramic capacitor 47 pF 105 and C 106 Ceramic capacitor 100 nF, 63 V 107 Ceramic capacitor 10 nF, 63 V 108 Ceramic capacitor 10 nF, 63 V 109 Ceramic capacitor 10 nF, 63 V 109 Ceramic capacitor 10 nF, 63 V 110 and C 111 Ceramic capacitor 10 nF, 63 V 1112 Ceramic capacitor 100 nF, 63 V 1114 Ceramic capacitor 100 nF, 63 V 1115 to C 119 Ceramic capacitor 10 nF, 63 V 112 Ceramic capacitor 10 nF, 63 V 112 Ceramic capacitor 10 nF, 63 V 112 Ceramic capacitor 100 nF, 63 V 1130 and C 131 Ceramic capacitor 100 nF, 63 V 125 to C 129 Ceramic capacitor 100 nF, 63 V 1330 and C 131 Ceramic capacitor 100 nF, 63 V 135 Ceramic capacitor 100 nF, 63 V 136 Ceramic capacitor 100 nF, 63 V 137 Ceramic ca		The state of the s	
85Ceramic capacitor10 nF, 63 V86Ceramic capacitor390 pF87Tantalum electrolytic capacitor4,7 μF, 35 V88Ceramic capacitor470 pF89Ceramic capacitor100 nF, 63 V103 and C 104Ceramic capacitor10 nF, 63 V105 and C 106Ceramic capacitor10 nF, 63 V107Ceramic capacitor18 pF108Ceramic trimmer7 - 35 pF109Ceramic capacitor10 nF, 63 V110 and C 111Ceramic capacitor10 nF, 63 V1112Ceramic capacitor1 nF113Ceramic capacitor10 nF, 63 V114Ceramic capacitor10 nF, 63 V115 to C 119Ceramic capacitor10 nF, 63 V120Plastic foil capacitor Wima MUS1 μF, 50 V121 to C 123Ceramic capacitor10 nF, 63 V124Ceramic capacitor10 nF, 63 V125 to C 129Ceramic capacitor10 nF, 63 V133 and C 131Ceramic capacitor10 nF, 63 V133 and C 134Tantalum electrolytic capacitor100 nF, 63 V135Ceramic capacitor100 nF, 63 V135Ceramic capacitor10 nF, 63 V135Ceramic capacitor10 nF, 63 V136Commic capacitor10 nF, 63 V137Variable capacitance diodeBB 909100Notething diodeBB 909101Notething diodeBB 909102Notething diodeBB 909103		54 2 1000 CO 10 10 10 10 10 10 10 10 10 10 10 10 10	100 nF, 63 V
866Ceramic capacitor390 pF87Tantalum electrolytic capacitor4,7 μF, 35 V88Ceramic capacitor390 pF89Ceramic capacitor390 pF101 and C 102Ceramic capacitor100 nF, 63 V103 and C 104Ceramic capacitor47 pF105 and C 106Ceramic capacitor10 nF, 63 V107Ceramic capacitor18 pF108Ceramic trimmer7 · 35 pF109Ceramic capacitor10 nF, 63 V110 and C 111Ceramic capacitor100 nF, 63 V1112Ceramic capacitor1 nF1113Ceramic capacitor1 nF114Ceramic capacitor10 nF, 63 V120Plastic foil capacitor Wima MUS1 μF, 50 V121to C 123Ceramic capacitor10 nF, 63 V1224Ceramic capacitor10 nF, 63 V1225 to C 129Ceramic capacitor10 nF, 63 V130 and C 131Ceramic capacitor100 nF, 63 V133Ceramic capacitor100 nF, 63 V135Ceramic capacitor100 nF, 63 V135Ceramic capacitor100 nF, 63 V135Ceramic capacitor100 nF, 63 V136, C 138 to C 141Ceramic capacitor10 μF, 16 V136, C 138 to C 141Ceramic capacitor10 μF, 16 V107Variable capacitance diodeBB 909108Switching diodeBA 282109 and D 10Schottky diodeBA 282		ACTIVATED AND PROPERTY AND ACTIVATION OF CONTRACT AND ACTIVATE AND ACTIVATED AND ACTIVATED AND ACTIVATED ACTIVATED AND ACTIVATED ACTIVAT	10 nF, 63 V
Tantalum electrolytic capacitor $4,7~\mu F, 35~V$ 88 Ceramic capacitor $470~pF$ 89 Ceramic capacitor $390~pF$ $101~and~C~102$ Ceramic capacitor $47~pF$ $105~and~C~106$ Ceramic capacitor $47~pF$ $105~and~C~106$ Ceramic capacitor $10~nF, 63~V$ 107 Ceramic capacitor $10~nF, 63~V$ 108 Ceramic trimmer 109 Ceramic capacitor $10~nF, 63~V$ 1109 Ceramic capacitor $10~nF, 63~V$ 1110 Ceramic capacitor $100~nF, 63~V$ 1112 Ceramic capacitor $100~nF, 63~V$ 1113 Ceramic capacitor $100~nF, 63~V$ 1114 Ceramic capacitor $100~nF, 63~V$ $1115~to~C~119$ Ceramic capacitor $100~nF, 63~V$ 1120 Plastic foil capacitor Wima MUS $1~\mu F, 50~V$ $1121~to~C~123$ Ceramic capacitor $100~nF, 63~V$ $1125~to~C~129$ Ceramic capacitor $100~nF, 63~V$ $1125~to~C~129$ Ceramic capacitor $100~nF, 63~V$ $1133~and~C~131$ Ceramic capacitor $100~nF, 63~V$ $1135~and~C~131$ Ceramic capacitor $100~nF, 63~V$ $1136~and~C~131$ Ceramic capacitor $100~nF, 63~V$ $1135~and~C~131$ Ceramic capacitor $100~nF, 63~V$ $1150~and~C~131$ Ceramic capacitor $100~nF, 63~V$ 1150			390 pF
$\begin{array}{cccccccccccccccccccccccccccccccccccc$		Tantalum electrolytic capacitor	4,7 μF, 35 V
Ceramic capacitor 390 pF 101 and C 102 Ceramic capacitor 47 pF 105 and C 106 Ceramic capacitor 47 pF 107 Ceramic capacitor 10 nF , 63 V 108 Ceramic capacitor 10 nF , 63 V 109 Ceramic capacitor 10 nF , 63 V 110 and C 111 Ceramic capacitor 10 nF , 63 V 1112 Ceramic capacitor 10 nF , 63 V 112 Ceramic capacitor 10 nF , 63 V 113 Ceramic capacitor 10 nF , 63 V 114 Ceramic capacitor 10 nF , 63 V 115 to C 119 Ceramic capacitor 10 nF , 63 V 120 Plastic foil capacitor Wima MUS $1 \mu \text{F}$, 50 V 121 to C 123 Ceramic capacitor 10 nF , 63 V 125 to C 129 Ceramic capacitor 10 nF , 63 V 126 to C 129 Ceramic capacitor 10 nF , 63 V 130 and C 131 Ceramic capacitor 10 nF , 63 V 133 and C 134 Tantalum electrolytic capacitor 10 nF , 63 V 135 Electrolytic capacitor 10 nF , 63 V 136, C 138 to C 141 Ceramic capacitor 10 nF , 63 V 150 D 6 Switching diode BA 282 17 Variable capacitance diode BB 909 18 Switching diode BA 282 19 and D 10 Schottky diode BA 282 19 and D 10 Schottky diode		Ceramic capacitor	470 pF
$\begin{array}{cccccccccccccccccccccccccccccccccccc$: 89	Ceramic capacitor	390 pF
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	101 and C 102	Ceramic capacitor	100 nF, 63 V
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	103 and C 104	Ceramic capacitor	47 pF
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	105 and C 106	Ceramic capacitor	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	107	Ceramic capacitor	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	108		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
Ceramic capacitor $100 \text{ nF, } 63 \text{ V}$ $114 \text{ Ceramic capacitor}$ $115 \text{ to C } 119 \text{ Ceramic capacitor}$ $115 \text{ to C } 119 \text{ Ceramic capacitor}$ $1120 \text{ Plastic foil capacitor Wima MUS}$ $1121 \text{ to C } 123 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $121 \text{ to C } 123 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $124 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $125 \text{ to C } 129 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $130 \text{ and C } 131 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $132 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $133 \text{ and C } 134 \text{ Tantalum electrolytic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $135 \text{ Electrolytic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $135 \text{ Electrolytic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $136, \text{ C } 138 \text{ to C } 141 \text{ Ceramic capacitor}$ $100 \text{ nF, } 63 \text{ V}$ $100 $			
Call to C 119 Ceramic capacitor 10 nF, 63 V Call to C 120 Plastic foil capacitor 100 nF, 63 V Call to C 123 Ceramic capacitor 100 nF, 63 V Call to C 124 Ceramic capacitor 100 nF, 63 V Call to C 129 Ceramic capacitor 100 nF, 63 V Call to C 129 Ceramic capacitor 100 nF, 63 V Call to C 129 Ceramic capacitor 100 nF, 63 V Call to C 131 Ceramic capacitor 100 nF, 63 V Call to C 132 Ceramic capacitor 100 nF, 63 V Call to C 134 Tantalum electrolytic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V Call to C 138 to C 141 Ceramic capacitor 100 nF, 63 V			
Ceramic capacitor $10 \text{ nF, } 63 \text{ V}$ $120 \text{ Plastic foil capacitor Wima MUS}$ $11 \text{ pF, } 50 \text{ V}$ $121 \text{ to C } 123$ $121 \text{ Ceramic capacitor}$ $122 \text{ Ceramic capacitor}$ $132 \text{ Ceramic capacitor}$ $133 \text{ and C } 131$ $132 \text{ Ceramic capacitor}$ $133 \text{ Ceramic capacitor}$ $133 \text{ Ceramic capacitor}$ $134 \text{ Ceramic capacitor}$ $135 \text{ Ceramic capacitor}$ $136 \text{ C } 138 \text{ to C } 141$ $136 \text{ C } 138 \text{ to C } 141$ $137 \text{ Ceramic capacitor}$ $138 \text{ C } 138 \text{ to C } 141$ $138 \text{ C } 141$ $140 \text{ Ceramic capacitor}$ 150 capacitor $150 capacito$		5-94 AM 5-94 A	
Plastic foil capacitor Wima MUS 1 μ F, 50 V 121 to C 123 Ceramic capacitor 100 nF, 63 V 124 Ceramic capacitor 10 nF, 63 V 125 to C 129 Ceramic capacitor 100 nF, 63 V 130 and C 131 Ceramic capacitor 4,7 nF 132 Ceramic capacitor 100 nF, 63 V 133 and C 134 Tantalum electrolytic capacitor 4,7 μ F, 35 V 135 Electrolytic capacitor 10 μ F, 16 V 136, C 138 to C 141 Ceramic capacitor 100 nF, 63 V 150 nF, 63 V 150 nF, 63 V 150 nF, 65 V 150 nF, 65 N			
Ceramic capacitor 100 nF, 63 V 121 to C 123 Ceramic capacitor 10 nF, 63 V 125 to C 129 Ceramic capacitor 100 nF, 63 V 130 and C 131 Ceramic capacitor 4,7 nF 132 Ceramic capacitor 100 nF, 63 V 133 and C 134 Tantalum electrolytic capacitor 4,7 μ F, 35 V 135 Electrolytic capacitor 10 μ F, 16 V 136, C 138 to C 141 Ceramic capacitor 100 nF, 63 V 150 nF, 63 V 150 nF, 63 V 150 nF, 65 V 150 nF, 65 V 150 nF, 65 V 150 nF, 65 N 150 nF, 65			
Ceramic capacitor 10 nF, 63 V 125 to C 129 Ceramic capacitor 4,7 nF 132 Ceramic capacitor 100 nF, 63 V 133 and C 131 Ceramic capacitor 100 nF, 63 V 133 and C 134 Tantalum electrolytic capacitor 4,7 μ F, 35 V 135 Electrolytic capacitor 10 μ F, 16 V 136, C 138 to C 141 Ceramic capacitor 100 nF, 63 V 100 nF, 63 V 110 D 6 Switching diode BA 282 BB 909 Switching diode BA 282 BB 909 Switching diode BA 282 BB 909 BA 282 Schottky diode BA 283 hpa 2835			
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$\begin{array}{cccccccccccccccccccccccccccccccccccc$			
Ceramic capacitor 100 nF, 63 V 133 and C 134 Tantalum electrolytic capacitor 4,7 μ F, 35 V 135 Electrolytic capacitor 100 nF, 63 V 136, C 138 to C 141 Ceramic capacitor 100 nF, 63 V 100 nF, 63 V 11 to D 6 Switching diode BA 282 BB 909 Switching diode BA 282 BB 909 Switching diode BA 282 BB 909 BA 282 Schottky diode BA 282 hpa 2835			
Tantalum electrolytic capacitor 4,7 μ F, 35 V Electrolytic capacitor 10 μ F, 16 V 136, C 138 to C 141 Ceramic capacitor 100 nF, 63 V 1 to D 6 Switching diode BA 282 BB 909 Switching diode BA 282 BB 909 Switching diode BA 282 BB 909 BA 282 BA 282 BA 282 BA 282 BA 283 Schottky diode BA 283 BA 2		The Street Control of the Control of	
Electrolytic capacitor $10 \mu F$, $16 V$ 136 , C 138 to C 141 Ceramic capacitor $100 nF$, $63 V$ O $1 to D 6$ Switching diode BA 282 0.7 Variable capacitance diode BB 909 0.8 Switching diode BA 282 0.9 and D 10 Schottky diode BA 283			
2 136, C 138 to C 141 Ceramic capacitor 100 nF, 63 V 2 1 to D 6 Switching diode 2 7 Variable capacitance diode 3 8 Switching diode 4 8 999 5 8 Switching diode 5 9 and D 10 Schottky diode 100 nF, 63 V 100 nF, 63 V			and the control of th
D 1 to D 6 Switching diode BA 282 D 7 Variable capacitance diode BB 909 D 8 Switching diode BA 282 D 9 and D 10 Schottky diode hpa 2835	136 C 130 + C 141		
Variable capacitance diode Switching diode Switching diode 9 and D 10 Schottky diode BB 909 BA 282 hpa 2835	. 136, C 138 to C 141	Ceranne capacitor	
Variable capacitance diode Switching diode Switching diode Switching diode BB 909 BA 282 hpa 2835	1 to D 6	Switching diode	BA 282
Switching diode BA 282 O 9 and D 10 Schottky diode hpa 2835			
9 and D 10 Schottky diode hpa 2835			
y and D 10			
D 13, D 14 and D 16 Silicon diode 1 N 4148			

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IC 1 IC 2		
IC 3 IC 4 IC 5 IC 6 IC 7 IC 8 IC 9 IC 10 IC 11 IC 12 IC 13	Digital integrated circuit Digital integrated circuit Voltage regulator Digital integrated circuit Dual operational amplifier Dual operational amplifier Dual operational amplifier Digital integrated circuit	54 LS 273 J 54 LS 00 J 78 L 08 ACLP CD 4028 BE 54 LS 390 J MC 14512 BCP 54 LS 390 J CD 4046 BE 54 LS 390 J LF 353 H 74 F 74 74 F 00 54 LS 390 J
L 1 L 2 L 3 to L 9 L 10 L 11	Choke RM 10 Choke RM 10 Choke RM 10 Inductor	22 μH 10 μH 1 μH BVPSG410.01 BVPSG410.02
M 1	Mixer	IE 500
Q 1 Q 2 Q 3 Q 4 Q 5 Q 6	Crystal oscillator	6,4 MHz 33,724 MHz 32,9 MHz 23,0 MHz 27,15 MHz 22,2 MHz
R 1 R 2 R 3 R 4 and R 5 R 6 R 7 R 8 R 9 R 10 R 11 R 12 R 13 R 14 R 15 R 16 R 17 R 18 R 19 R 20 R 21 R 22 R 23 R 24 R 25 R 26 R 27 R 28 R 29 R 30 R 31 R 32 R 34 R 35	Carbon-film resistor	680 Ω , 5%, 0,25 W 47 Ω , 5%, 0,25 W 470 Ω , 5%, 0,25 W 33 Ω , 5%, 0,25 W 1 k Ω , 5%, 0,25 W 100 Ω , 5%, 0,25 W 47 Ω , 5%, 0,25 W 470 Ω , 5%, 0,25 W 330 Ω , 5%, 0,25 W 100 Ω , 5%, 0,25 W 100 Ω , 5%, 0,25 W 100 Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 100 Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 330 Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 3,3 k Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 2,2 k Ω , 5%, 0,25 W 2,3 k Ω , 5%, 0,25 W 2,4 k Ω , 5%, 0,25 W 2,5 k Ω , 5%, 0,25 W 2,7 k Ω , 5%, 0,25 W 1,5 k Ω , 5%, 0,25 W 2,7 k Ω , 5%, 0,25 W

Item	Description	Electr. Values/Type
R 39	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 40	Carbon-film resistor	22 kΩ, 5%, 0,25 W
R 41	Carbon-film resistor	12 kΩ, 5%, 0,25 W
R 42	Carbon-film resistor	6,8 kΩ, 5%, 0,25 W
R 43	Carbon-film resistor	1,5 kΩ, 5%, 0,25 W
R 44	Carbon-film resistor	33 kΩ, 5%, 0,25 W
R 45	Carbon-film resistor	100 Ω, 5%, 0,25 W
R 46	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 47	Carbon-film resistor	22 kΩ, 5%, 0,25 W
R 48	Carbon-film resistor	12 kΩ, 5%, 0,25 W
R 49	Carbon-film resistor	6.8 kΩ, 5%, 0,25 W
R 50	Carbon-film resistor	1,5 kΩ, 5%, 0,25 W
R 51	Carbon-film resistor	33 kΩ, 5%, 0,25 W
R 52	Carbon-film resistor	10 Ω, 5%, 0,25 W
R 53	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 54	Carbon-film resistor	22 kΩ, 5%, 0,25 W
R 55	Carbon-film resistor	12 kΩ, 5%, 0,25 W
R 56	Carbon-film resistor	2,7 kΩ, 5%, 0,25 W
R 57	Carbon-film resistor	330 Ω, 5%, 0,25 W
R 58	Carbon-film resistor	2,2 kΩ, 5%, 0,25 W
R 59	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 60	Carbon-film resistor	33 Ω , 5%, 0,25 W
R 61	Carbon-film resistor	9,1 kΩ, 5%, 0,25 W
R 62	Carbon-film resistor	330 Ω , 5%, 0,25 W
R 63	Carbon-film resistor	1,2 kΩ, 5%, 0,25 W
R 64	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 65 to R 67	Carbon-film resistor	100 kΩ, 5%, 0,25 W
R 68	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 69	Carbon-film resistor	2,2 kΩ, 5%, 0,25 W
R 70	Carbon-film resistor	5,6 kΩ, 5%, 0,25 W
R 71 and R 72	Carbon-film resistor	10 k Ω , 5%, 0,25 W
R 73	Carbon-film resistor	33 kΩ, 5%, 0,25 W
R 74	Carbon-film resistor	15 k Ω , 5%, 0,25 W
R 75	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R 76	Carbon-film resistor	100 kΩ, 5%, 0,25 W
R 77	Carbon-film resistor	1 kΩ, 5%, 0,25 W
R 78	Carbon-film resistor	56 k Ω , 5%, 0,25 W
R 79	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 80	Carbon-film resistor	56 k Ω , 5%, 0,25 W
R 81	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 82	Carbon-film resistor	6,8 k Ω , 5%, 0,25 W
R 83	Carbon-film resistor	22 Ω, 5%, 0,25 W
R 84	Carbon-film resistor	$1,5 \text{ k}\Omega, 5\%, 0,25 \text{ W}$
R 85	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 86	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 87	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R 88	Carbon-film resistor	100 Ω , 5%, 0,25 W
R 89	Carbon-film resistor	270 Ω , 5%, 0,25 W
R 90	Carbon-film resistor	47 Ω, 5%, 0,25 W
R 91	Carbon-film resistor	10 kΩ, 5%, 0,25 W
R 92	Carbon-film resistor	47 Ω, 5%, 0,25 W
R 93	Carbon-film resistor	33 Ω, 5%, 0,25 W
R 94	Carbon-film resistor	100 Ω, 5%, 0,25 W
R 95	Carbon-film resistor	470 Ω, 5%, 0,25 W
R 96	Carbon-film resistor	$2,2$ k Ω , 5%, $0,25$ W
R 97	Carbon-film resistor	330 Ω, 5%, 0,25 W
R 98	Carbon-film resistor	82 Ω, 5%, 0,25 W
R 99	Carbon-film resistor	330 Ω, 5%, 0,25 W
R 100	Carbon-film resistor	33 Ω, 5%, 0,25 W
R 101	Carbon-film resistor	$9,1 \text{ k}\Omega$, 5%, 0,25 W
R 102	Carbon-film resistor	330 Ω, 5%, 0,25 W
R 103	Carbon-film resistor	10 kΩ, 5%, 0,25 W
R 104	Carbon-film resistor	22 kΩ, 5%, 0,25 W
R 105	Carbon-film resistor	470 Ω, 5%, 0,25 W
R 106 and R 107	Carbon-film resistor	100 Ω, 5%, 0,25 W
R 108	Carbon-film resistor	5,6 k Ω , 5%, 0,25 W

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Item	Description	Electr. Values/Type
R 109	Carbon-film resistor	120 Ω, 5%, 0,25 W
R 110	Carbon-film resistor	82 Ω , 5%, 0,25 W
R 112	Carbon-film resistor	100Ω , 5%, 0,25 W
R 113 and R 114	Carbon-film resistor	$47~\text{k}\Omega$, 5%, 0,25 W
R 115	Carbon-film resistor	$100~\mathrm{k}\Omega$, 5%, 0,25 W
R 116 and R 117	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R 118	Carbon-film resistor	43 Ω , 5%, 0,25 W
R 119	Carbon-film resistor	150 Ω, 5%, 0,25 W
St 2	Blade contact connector 60-pin	G 06 M 604 P3 BDBL
	with 2 coaxial inserts	53742
T 1 to T 3	Transistor	2 N 918
T 4	Transistor	2 N 2907
T 5	Transistor	BCY 58 IX
T 6	Transistor	2 N 918
T 7	Transistor	BCY 58 IX
T 8	Transistor	2 N 918
T 9	Transistor	BCY 58 IX
T 10 and T 12	Transistor	2 N 918
T 11 and T 13	Transistor	BCY 58 IX
T 14 and T 15	Transistor	2 N 918
T 16	Transistor	BCY 58 IX
T 17	Transistor	BCY 78 IX
T 18	Transistor	2 N 2222
T 19 and T 21	Transistor	2 N 2907
T 20	Transistor	2 N 918
T 22, T 24 and T 25	Transistor	2 N 918
T 23	Transistor	2 N 708
T 26	Transistor	BCY 58 IX

Sweep Oscillator WO 1705 (Oscillator II) 52.1810.421.00

Item	Description	Electr. Values/Type
C 1 to C 3	Tantalum capacitor	1 μF, 35 V
C 4 and C 5	Ceramic multi-layer capacitor	10 nF, 63 V
C 6 and C 7	Tantalum capacitor	1 μF, 35 V
C 8	Ceramic capacitor	330 pF
C 9 and C 10	Ceramic multi-layer capacitor	100 nF, 63 V
C 11	Ceramic trimmer	3/12 pF
C 11 *	Ceramic capacitor	8,2 pF
C 12	Electrolytic capacitor	10 μF, 63 V
C 13 to C 15	Ceramic capacitor	150 pF
C 16	Ceramic capacitor	120 pF
C 17	Styroflex capacitor	4,7 nF
C 18	Styroflex capacitor	2,2 nF
C 19	Electrolytic capacitor	100 μF, 25 V
C 20	Ceramic multi-layer capacitor	100 nF, 63 V
C 21	Styroflex capacitor	4,7 nF
C 22	Electrolytic capacitor	$100 \mu \text{F}$, 25 V
C 23 and C 24	Ceramic multi-layer capacitor	100 nF, 63 V
C 25	Plastic foil capacitor	0,01 nF
C 26	Ceramic multi-layer capacitor	100 nF, 63 V
C 27	Ceramic capacitor	27 pF
C 28	Ceramic capacitor	1 nF
C 29	Electrolytic capacitor	100 μF, 25 V
C 30	Tantalum capacitor	1 μF, 35 V
C 31	Plastic foil capacitor	0,22 μF, 63 V
C 32	Ceramic capacitor	1 nF
C 33 and C 34	Ceramic multi-layer capacitor	10 nF, 63 V

4.6.6

Item	Description	Electr. Values/Type
C 25	Coramic canacitor	1
C 35	Ceramic capacitor	1 nF
C 36	Plastic foil capacitor	0,22 μF, 63 V
C 37	Electrolytic capacitor	100 μF, 25 V
C 38	Ceramic multi-layer capacitor	100 nF, 63 V
C 39	Electrolytic capacitor	10 μF, 63 V
C 40 and C 41	Ceramic capacitor	1 nF
C 42	Plastic foil capacitor	0,01 μF, 63 V
C 43 and C 44	Ceramic multi-layer capacitor	10 nF, 63 V
D 6	Z-diode	ZPD 3,0
D 7 and D 8	Reference diode	1 N 825
D 9	Variable capacitor diode	BB 130
D 10 and D 11	Z-diode	ZPD 10
D 10 and D 11	2 4.040	2. 5 10
Dr 1 and Dr 2	Choke RM 15	240 μΗ
IC 1	Integrated circuit	LF 356 H
IC 2	not equipped	
IC 3	Integrated circuit	54 LS 273 J
IC 4	Integrated circuit	54 LS 00 J
IC 5	Integrated circuit	54 LS 32 J
IC 6	Integrated circuit	54 LS 174 J
IC 7	Integrated circuit	54 LS 169 J
IC 8	Integrated circuit	CD 4046 BE
IC 9	Integrated circuit	54 LS 123 J
IC 10	Integrated circuit	54 LS 169 J
IC 11 and IC 12	not equipped	
IC 13	Integrated circuit	MC 1 4040 BCP
IC 14	Integrated circuit	MC 1400 1 BCP
IC 15	Integrated circuit	54 LS 624 J
IC 16	Integrated circuit	54 LS 393 J
IC 17	Voltage regulator	MC 7912 CT
IC 18 and IC 19	Integrated circuit	MC 1400 1 BCP
IC 20	Integrated circuit	DAC 1020 LCN
IC 21	Integrated circuit	LF 356 H
IC 22	Integrated circuit	CD 4047 BE
IC 23	Integrated circuit	TL 084 CN
IC 24 to IC 26	Integrated circuit	TL 601 CP
IC 27	Integrated circuit	CD 4046 BE
10 27	integrated en eart	
L 1	Inductor	0,4 MH, BVPSG420.1
P 1	Potentiometer RJ 6	2 kΩ
R 1	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R2 to R5	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 6	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R7 to R9	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R 10	Carbon-film resistor	33 k Ω , 5%, 0,25 W
R 11	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R 12	Carbon-film resistor	3,3 k Ω , 5%, 0,25 W
R 13	Carbon-film resistor	2,2 kΩ, 5%, 0,25 W
R 14	Carbon-film resistor	$1.5 \text{ k}\Omega, 5\%, 0.25 \text{ W}$
R 15	Carbon-film resistor	$100 \Omega, 5\%, 0.25 W$
R 16	Carbon-film resistor	22 kΩ, 5%, 0,25 W
R 17 and R 18	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 19	Carbon-film resistor	150 Ω , 5%, 0,25 W
R 20	Carbon-film resistor	820 Ω, 5%, 0,25 W
R 21 and R 22	Carbon-film resistor	100 kΩ, 5%, 0,25 W
R 24	Carbon-film resistor	2,4 kΩ, 5%, 0,25 W
R 25	Carbon-film resistor	10 kΩ, 5%, 0,25 W
	Carbon-film resistor	4,7 kΩ, 5%, 0,25 W
R 26	Carbon-film resistor	100 kΩ, 5%, 0,25 W
R 27	Carbon-film resistor	22 kΩ, 5%, 0,25 W
R 28	-	$150 \Omega, 5\%, 0.25 W$
R 29	Carbon-film resistor	2,7 kΩ, 5%, 0,25 W
R 30	Carbon-film resistor	2,7 132, 370, 0,23 1

Item	Description	Electr. Values/Type
R 31	Carbon-film resistor	150 Ω, 5%, 0,25 W
R 32	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 33	Carbon-film resistor	$4,7 \text{ k}\Omega, 5\%, 0.25 \text{ W}$
R 34	Carbon-film resistor	150 Ω , 5%, 0,25 W
R 35	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R 36	Carbon-film resistor	100 Ω , 5%, 0,25 W
R 37	Carbon-film resistor	4,7 k Ω , 5%, 0,25 W
R 39	Carbon-film resistor	220 Ω, 5%, 0,25 W
R 40 and R 41	Carbon-film resistor	$100 \text{ k}\Omega$, 5%, 0,25 W
R 42 and R 43	Carbon-film resistor	$1,2 \text{ k}\Omega$, 5%, 0,25 W
R 44	Metal-film resistor	$2 k\Omega, 1\%, 0.25 W$
R 45	Carbon-film resistor	33 k Ω , 5%, 0,25 W
R 46	Carbon-film resistor	$2,2 \text{ k}\Omega$, 5%, 0,25 W
R 47	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 48	Carbon-film resistor	3,3 k Ω , 5%, 0,25 W
R 49	Carbon-film resistor	5,1 k Ω , 5%, 0,25 W
R 50	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 51	Carbon-film resistor	5,1 k Ω , 5%, 0,25 W
R 52	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 53	Carbon-film resistor	820 Ω , 5%, 0,25 W
R 55	Carbon-film resistor	10 k Ω , 5%, 0,25 W
St 3	Blade contact connector 64-pin	G 06 D 64 P4 BEBL
T 1 and T 5	pnp transistor	BCY 78 IX
Γ 2 to T 4	npn transistor	BCY 58 IX

4.6.7 Processor PR 1705 52.1810.501.00

tem	Description	Electr. Values/Type
0.1	Tantalum electrolytic capacitor	1 μF, 35 V
2 2	Ceramic capacitor	10 nF, 63 V
C 3 to C 5	Tantalum electrolytic capacitor	$1 \mu F$, $35 V$
C 6 and C 7	Ceramic capacitor	4,7 pF
2.8	Tantalum electrolytic capacitor	1 μF, 35 V
C 9 to C 11	Ceramic capacitor	10 nF, 63 V
C 12	Tantalum electrolytic capacitor	2,2 μF, 35 V
C 13 and C 14	Ceramic capacitor	10 nF, 63 V
C 15	Ceramic capacitor	1 nF
C 16 and C 17	Ceramic capacitor	10 nF, 63 V
C 18 and C 19	Tantalum electrolytic capacitor	1 μF, 35 V
20 to C 22	Ceramic capacitor	10 nF, 63 V
23	Tantalum electrolytic capacitor	1 μF, 35 V
24	Tantalum electrolytic capacitor	1 μF, 35 V
C 25 to C 27	Ceramic capacitor	10 nF, 63 V
28	Electrolytic capacitor	$47 \mu \text{F}, 6,3 \text{V}$
C 29 and C 30	Tantalum electrolytic capacitor	$1 \mu F$, $35 V$
C 31	Electrolytic capacitor	$10 \mu \text{F}$, 25 V
C 32	Plastic foil capacitor	0,22 μF, 63 V
33	Plastic foil capacitor	$1 \mu F$, $50 V$
D 1, D 2 and D 4	Silicon diode	1 N 4148
3	Z-diode	ZPD 3,9
C 1 to IC 4	EPROM 2 k x 8 bits	MBM 2716
C 1 10 1C 4	Digital integrated circuit	54 LS 373 J
C 6	Digital integrated circuit	54 LS 244 J
IC 7	Microprocessor	D 8085 AC

Item	Description	Electr. Values/Type
IC 8	Digital integrated circuit	54 LS 373 J
IC 9	Digital integrated circuit	54 LS 245 J
IC 10 and IC 11	Digital integrated circuit	54 LS 42 J
IC 12	DMA controller	8257-5
IC 13	Digital integrated circuit	54 LS 21 J
IC 14	Digital integrated circuit	54 LS 08 J
IC 15	Digital integrated circuit	54 LS 125 J
IC 16	Digital integrated circuit	54 LS 32 J
IC 17	Timer	D 8253-C5
IC 18	Digital integrated circuit	54 LS 74 J
IC 19	Digital integrated circuit	54 LS 32 J
IC 20	Digital integrated circuit	54 LS 173 J
IC 21	Interrupt controller	D 8259 AC
IC 22	Digital integrated circuit	54 LS 04 J
IC 23	Digital integrated circuit	54 LS 173 J
IC 24	Resistor network	898-1-R 3,3 k Ω
IC 25	Digital integrated circuit	54 LS 14 J
IC 26	Digital integrated circuit	54 LS 123 J
NW 1	not equipped	
NW 2 and NW 3	Resistor network, 10-pin, 3,3 k Ω	10-X-1-332
Qu 1	Crystal oscillator	6 MHz
R 1	Carbon-film resistor	100 k Ω , 5%, 0,25 W
R 2 and R 3	Carbon-film resistor	2,2 k Ω , 5%, 0,25 W
R 4	Carbon-film resistor	$100~\Omega$, 5%, 0,25 W
R 5 and R 6	Carbon-film resistor	$1~\mathrm{k}\Omega$, 5%, 0,25 W
R 7 and R 8	Carbon-film resistor	2,2 k Ω , 5%, 0,25 W
R 9 and R 10	Carbon-film resistor	$1~\text{k}\Omega$, 5%, 0,25 W
R 13 and R 14	Carbon-film resistor	100 k Ω , 5%, 0,25 W
R 15	Carbon-film resistor	1 k Ω , 5%, 0,25 W
St 7	Blade contact connector 64-pin	G 06 D 64 P4 BEBL

4.6.8 Image Repeat Memory BW 1705 52.1810.510.00

Item	Description	Electr. Values/Type
C 1 to C 7	Ceramic capacitor	10 nF, 63 V
C 8	Ceramic capacitor	1 nF
C 9	Tantalum electrolytic capacitor	1 μF, 35 V
C 10 to C 32	Ceramic capacitor	10 nF, 63 V
C 33	Ceramic capacitor	100 pF
C 34	Ceramic capacitor	150 pF
C 35	Ceramic capacitor	820 pF
C 36	Electrolytic capacitor	10 μF, 16 V
IC 1	Digital integrated circuit	54 LS 373 J
IC 2	Digital integrated circuit	54 LS 244 J
IC 3	Digital integrated circuit	54 HCT 244
IC 4	Digital integrated circuit	54 LS 244 J
IC 5	DMA controller	D 8257-C5
IC 6	Digital integrated circuit	54 LS 04 J
IC 7	Digital integrated circuit	54 LS 32 J
IC 8	Digital integrated circuit	54 LS 125 J
IC 9	Digital integrated circuit	54 LS 00 J
IC 10	Digital integrated circuit	54 LS 32 J
IC 11	Digital integrated circuit	54 LS 08 J
IC 12 and IC 13	Digital integrated circuit	54 LS 42 J
IC 14	Digital integrated circuit	54 LS 14 J

Item	Description	Electr. Values/Type
IC 15	Digital integrated circuit	54 LS 32 J
IC 16	Digital integrated circuit	54 LS 157 J
IC 17 and IC 18	RAM 4 k x 1	HM 16504-5
IC 19	Digital integrated circuit	54 LS 259 J
IC 20	Digital integrated circuit	54 LS 157 J
IC 21 to IC 23	RAM 4 k x 1	HM 16504-5
IC 24	Digital integrated circuit	54 LS 157 J
IC 25 to IC 27	RAM 4 k x 1	HM 16504-5
IC 28	Digital integrated circuit	54 LS 123 J
IC 29 to IC 31	RAM 4 k x 1	HM 16504-5
R 1 to R 3	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 4	Carbon-film resistor	560 Ω , 5%, 0,25 W
R 5	Carbon-film resistor	$4.7 \text{ k}\Omega$, 5%, 0.25 W
R 6	Carbon-film resistor	22 k Ω , 5%, 0,25 W
R 7 to R 17	Carbon-film resistor	$3.9 \text{ k}\Omega$, 5%, 0.25 W
R 18	Carbon-film resistor	390 Ω , 5%, 0,25 W
D 1 and D 2	Diode	hpa 5082-2835
St 8	Blade contact connector 64-pin	G 06 D 64 PU BEBL

4.6.9 Analog/Digital Converter AD 1705 52.1810.520.00

tem	Description	Electr. Values/Type
3 1	Electrolytic capacitor	10 μF, 25 V
C 2 and C 3	Ceramic capacitor	10 nF, 63 V
C 4	Tantalum electrolytic capacitor	$1 \mu F$, $35 V$
C 5 and C 7	Ceramic capacitor	10 nF, 63 V
6	not equipped	1 7 25 1/
C 8 and C 9 C 10 and C 11	Tantalum electrolytic capacitor not equipped	1 μF, 35 V
2 12 to C 21 and	not equipped	
C 23 and C 24	Ceramic capacitor	10 nF, 63 V
22	Ceramic capacitor	180 pF
25 and C 26	Ceramic capacitor	68 nF, 63 V
27	Tantalum electrolytic capacitor	$4,7 \mu\text{F}, 35 \text{V}$
C 28 and C 29	Ceramic capacitor	68 nF, 63 V
30 31	Tantalum electrolytic capacitor Ceramic capacitor	4,7 μF, 35 V 560 pF
- 31	Cerainic capacitor	300 pi
0 1 and D 2	Silicon diode	1 N 4148
0.3	not equipped	755.00
0 4	Z-diode	ZPD 3,9 1 N 825
5	Reference diode	1 14 825
C 1	Digital integrated circuit	54 LS 245 J
C 2 and IC 4	CMOS-RAM 1 k x 4	μpd 2114 LC-2
C 3 and IC 5	not equipped	
C 6	Digital integrated circuit	54 LS 32 J
C 7	Digital integrated circuit	54 LS 04 J
C 8 C 9	Digital integrated circuit	54 LS 42 J MC 14 011 BCP
2 9 2 10	Digital integrated circuit Digital integrated circuit	54 LS 08 J
C 11	Digital integrated circuit Digital integrated circuit	54 LS 90 J
C 12	Digital integrated circuit	54 LS 32 J
C 13	Digital integrated circuit	54 LS 125 J
C 14	Dual operational amplifier	LF 353 H
C 15 and IC 16	Digital integrated circuit	54 LS 74 J

Item	Description	Electr. Values/Type
IC 17	Digital integrated circuit	54 LS 123 J
IC 18	Digital integrated circuit	54 LS 244 J
IC 19	SAMPLE/HOLD module	LF 398 H
IC 20	Analog/Digital converter	ADC 1211 HCD
P 1	Trimming potentiometer 89 P	1 k Ω
P 2	Trimming potentiometer 89 P	100 κΩ
R 1	Carbon-film resistor	2,2 kΩ, 5%, 0,25 W
R 2 and R 3	Carbon-film resistor	10 k Ω , 5%, 0,25 W
R 4	not equipped	
R 5	Carbon-film resistor	$2,2$ k Ω , 5% , $0,25$ W
R 6	Carbon-film resistor	100 Ω, 5%, 0,25 W
R 7	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R 8 and R 9	Carbon-film resistor	1,5 k Ω , 5%, 0,25 W
R 10	Carbon-film resistor	100 Ω , 5%, 0,25 W
R 11	Carbon-film resistor	33 k Ω , 5%, 0,25 W
R 12	Carbon-film resistor	10 k Ω , 5%, 0,25 W
R 13 and R 14	Carbon-film resistor	100 Ω , 5%, 0,25 W
R 15	Carbon-film resistor	15 k Ω , 5%, 0,25 W
R 16	Carbon-film resistor	10 k Ω , 5%, 0,25 W
R 17	Carbon-film resistor	1,5 k Ω , 5%, 0,25 W
R 18	Carbon-film resistor	330 Ω , 5%, 0,25 W
R 19	Carbon-film resistor	$1~\text{k}\Omega$, 5%, 0,25 W
R 20	Carbon-film resistor	100 kΩ, 5%, 0,25 W
St 9	Blade contact connector 64-pin	G 06 D 64 P4 BEBL
Т1	pnp transistor	BCY 78 IX
T 2	npn transistor	2 N 2222

4.6.10 Digital/Analog Converter DA 1705 52.1810.530.00

tem	Description	Electr. Values/Type
1	Electrolytic capacitor	10 μF, 16 V
2 and C 3	Tantalum electrolytic capacitor	1 μF, 35 V
4 to C 13 and	Soles ar description of the control	
16 to C 25	Ceramic capacitor	10 nF, 63 V
14	Ceramic capacitor	33 pF
15	Ceramic capacitor	56 pF
26	Tantalum electrolytic capacitor	$1 \mu F$, $35 V$
27 to C 29	Ceramic capacitor	10 nF, 63 V
30, C 34 and C 36	Tantalum electrolytic capacitor	1 μF, 35 V
31 and C 38	Ceramic capacitor	10 nF, 63 V
32 and C 37	Ceramic capacitor	56 pF
33, C 35	Ceramic capacitor	100 nF, 63 V
34 and C 36	Electrolytic capacitor	10μ F, $25 V$
39 and C 40	Ceramic capacitor	10 nF, 63 V
41	Ceramic capacitor	100 nF, 63 V
42, C 44 to C 47	Ceramic capacitor	10 nF, 63 V
43	Plastic foil capacitor	0,1 μF
48 and C 49	Ceramic capacitor	12 pF
50 to C 53, C 58	Ceramic capacitor	10 nF, 63 V
54 and C 55	Ceramic capacitor	100 nF, 63 V
56 and C 57	Styroflex capacitor	1000 pF, 1%
59	Ceramic capacitor	100 pF
60	Styroflex capacitor	680 pF, 1%
61 and C 62	Ceramic capacitor	10 nF, 63 V
63	Ceramic capacitor	180 pF
64 and C 65	Ceramic capacitor	10 nF, 63 V

Item	Description	Electr. Values/Type
C 66	Styroflex capacitor	680 pF, 1%
C 67 and C 68	Ceramic capacitor	10 nF, 63 V
C 69	Ceramic capacitor	180 pF
C 70	Ceramic capacitor	100 pF
C 71 and C 72	Ceramic capacitor	100 pF, 63 V
D 1	Reference diode	1 N 825
IC 1	Digital integrated circuit	MC 14040 BCP
IC 2, IC 3 and IC 5	Digital integrated circuit	54 LS 157 J
IC 4	Digital integrated circuit	54 LS 259 J
IC 6	Digital integrated circuit	54 LS 123 J
IC 7 to IC 10	Digital integrated circuit	54 LS 374 J
IC 11, IC 12, IC 14,	Digital integrated circuit	54 LS 173 J
IC 15 IC 13	Digital integrated circuit	54 LS 32 J
IC 16	Operational amplifier	LF 356 H
IC 17	Digital integrated circuit	54 LS 74 J
IC 18	Integrated analog switch	TL 182 CN
IC 19	Digital integrated circuit	54 LS 08 J
IC 20	Digital integrated circuit	54 LS 00
IC 21	Integrated analog switch	TL 182 CN
IC 22 and IC 23	Digital/analog converter	AM 6012 DC
IC 24		54 LS 04 J
IC 25 and IC 27	Digital integrated circuit	
	Operational amplifier Integrated analog switch	LM 318 H TL 182 CN
IC 26 and IC 28	3	1 L 102 CIV
IC 29 IC 30 to IC 32	not equipped Operational amplifier	LF 356 H
10 30 10 10 32	Operational amplifier	21-33011
P 1 and P 2	Trimming potentiometer 89 P	10 κΩ
P 3 to P 6	Trimming potentiometer 89 P	5 kΩ
R 1	Carbon-film resistor	3,3 k Ω , 5%, 0,25 W
R 2	Carbon-film resistor	$4,7 \text{ k}\Omega, 5\%, 0,25 \text{ W}$
R 3	Carbon-film resistor	10 kΩ, 5%, 0,25 W
R 4	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 5	Carbon-film resistor	4,7 kΩ, 5%, 0,25 W
R 6	Carbon-film resistor	10 kΩ, 5%, 0,25 W
R 7	Carbon-film resistor	560 Ω, 5%, 0,25 W
R 8 and R 9	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
	Carbon-film resistor	820 Ω, 5%, 0,25 W
R 10	Carbon-film resistor Carbon-film resistor	3,3 kΩ, 5%, 0,25 W
R 11		4,7 kΩ, 5%, 0,25 W
R 12	Carbon-film resistor Carbon-film resistor	22 Ω, 5%, 0,25 W
R 13 and R 14	Carbon-film resistor	5,6 kΩ, 5%, 0,25 W
R 15 and R 16		1.5 kΩ, 5%, 0,25 W
R 17	Carbon-film resistor	560 Ω, 5%, 0,25 W
R 18	Carbon-film resistor	4,99 kΩ, 1%, 0,25 W
R 19 and R 20	Metal-film resistor	8,2 kΩ, 5%, 0,25 W
R 21	Carbon-film resistor	1,2 kΩ, 5%, 0,25 W
R 22	Carbon-film resistor	560 Ω, 5%, 0,25 W
R 23	Carbon-film resistor	2,49 kΩ, 5%, 0,25 W
R 24	Metal-film resistor	1 kΩ, 5%, 0,25 W
R 25	Carbon-film resistor	4,99 kΩ, 1%, 0,25 W
	Metal-film resistor	4.33 K46, 170, U.23 W
R 26 and R 27		
	Carbon-film resistor	1,2 kΩ, 5%, 0,25 W

Item	Description	Electr. Values/Type
C 18 and C 19	Electrolytic capacitor	10 μF, 63 V
Si 1	Main fuse	T 6.3 B, 250 V
St 1	Blade contact connector 60-pin with 3 HV-inserts	G 06 M 604 P3 BDBL 51 155
IC 1	Integrated voltage regulator	LM 340 K15
L 1	Deflection unit	AE 71/T 11
R 8 R 36 and R 37	NTC resistor Wire resistor	1Ω , 20%, $7\mathrm{W}$ 150 Ω , 10%, $2\mathrm{W}$
Roe 1	Rectangular CRT	M 14-100 W
GR 1	Rectifier (funct. to switch-over-switch assy)	SES 5403 C
S 1	Power-Switch	D 145.1903 G
TR 1	Transformer (funct. to switch-over switching assy)	11 527/P2 S02

4.6.11.1 Clocked Mains Unit GT 1705 52.1810.210.00

Item	Description	Electr. Values/Type
C 1 and C 2	Electrolytic capacitor	1000 μF, 63 V
C 3	Tantalum electrolytic capacitor	22 μF, 35 V
C 4	Plastic foil capacitor	47 nF, 63 V
C 5	Plastic foil capacitor	10 nF, 63 V
C 6	Tantalum electrolytic capacitor	22 μF, 16 V
C 8	Tantalum electrolytic capacitor	1 μF, 35 V
C 10	Plastic foil capacitor	$0.1 \mu \text{F}, 63 \text{V}$
C 11	Plastic foil capacitor	$0,47 \mu F,63 V$
C 12	Tantalum electrolytic capacitor	10 μF, 35 V
C 13	Electrolytic capacitor EYF	4700 μF, 25 V
C 14	Electrolytic capacitor EKR	1000 μF, 25 V
C 15 and C 16	Electrolytic capacitor EKM	470 μF, 63 V
C 17 and C 18	Electrolytic capacitor	10 μF, 25 V
C 19 and C 20	Electrolytic capacitor EK	470 μ F, 40 \vee
C 21	Plastic foil capacitor	1 nF, 100 V
C 23	Electrolytic capacitor EK	$100 \mu F$, $16 V$
C 24	Tantalum electrolytic capacitor	1 μF, 35 V
D 1	Z-diode	ZPD 10
D 2 and D 3	Rectifier diode	BYW 72
D 4 to D 7	Rectifier diode	BYW 33
D 4 10 D 7	Silicon diode	1 N 4148
D 9 and D 10	Overvoltage protection diode	TVS 360
D 11 *	Schottky rectifier diode	SB 540
D 12 and D 12	Silicon rectifier diode	1 N 4002
	Swa 4 t H	SG 3524 N
IC 1	PWM controller	LF 356 H
IC 3	Operational amplifier	
IC 4	Comparator	LM 311 H
IC 5	CMOS inverter	CD 4049
IC 6	Integrated voltage regulator	LM 317 T LM 337 T
IC 7	Integrated voltage regulator	LW 33/ I

^{*} In NB 1705: not equipped (wire connection)

Item	Description	Electr. Values/Type
L 1 and L 2	Storage choke 422/059	160 μH, 6,3 A
L 3	Choke RM 15	240 μΗ
L 4 and L 5	Choke	100 μH, 2,5 A
L 6	Storage choke 422/060	250 μH, 5 A
L 7	Open core choke	330 μH, 1,4 A
P 1	Trimming potentiometer	2 κΩ
R 1	Carbon-film resistor	2,7 kΩ, 5%, 0,25 W
R 2	Carbon-film resistor	22 k Ω , 5%, 0,25 W
R 3 and R 4	Carbon-film resistor	$3,9 \text{ k}\Omega$, 5%, 0,25 W
R 6	Carbon-film resistor	18 k Ω , 5%, 0,25 W
R 7	Carbon-film resistor	5,1 k Ω , 5%, 0,25 W
R 8, R 11 and R 14	Carbon-film resistor	$1 \text{ k}\Omega$, 5%, 0,25 W
R 9, R 10, R 12, R 13	Carbon-film resistor	$10 \text{ k}\Omega$, 5%, 0,25 W
R 15	Carbon-film resistor	8,2 k Ω , 5%, 0,25 W
R 16	Carbon-film resistor	1,5 k Ω , 5%, 0,25 W
R 18	Carbon-film resistor	470 Ω , 5%, 0,25 W
R 19 and R 20	Carbon-film resistor	$2,2 \text{ k}\Omega$, 5%, 0,25 W
R 21 to R 30	Carbon-film resistor	$1~\Omega$, 5%, 0,25 W
R 31 and R 32	Carbon-film resistor	$2,2 \text{ k}\Omega$, 5%, 0,25 W
R 33 and R 34	Carbon-film resistor	120 Ω , 5%, 0,25 W
R 35	Wire resistor	100 Ω , 5%, 5 W
R 37	Carbon-film resistor	10 k Ω , 5%, 0,25 W
ST 1	Multipoint plug 18-pin (2 x 9-pin)	SL 4/25/18 G
TR 1	Power transformer RM 14	BV 80.040.33.006
Т 1	npn transistor	BCY 58 IX
T 2	VMOS transistor	BUZ 20
T 3	VMOS transistor	BUZ 20

4.6.11.2 Clocked Mains Unit GT 1706 52.1810.220.00

Item	Description	Electr. Values/Type
C 1	Electrolytic capacitor	1000 μF, 63 V
C 2	Tantalum electrolytic capacitor	$10 \mu \text{F}, 35 \text{V}$
C 3 and C 4	Tantalum electrolytic capacitor	1 μF, 35 V
C 5	Styroflex capacitor	10 nF, 63 V
C 6	Plastic foil capacitor	100 nF, 63 V
C 7	Electrolytic capacitor EK	470 μF, 25 V
C 8	Tantalum electrolytic capacitor	47 μF, 35 V
C 9	Electrolytic capacitor EK	100 μF, 25 V
C 10	Tantalum electrolytic capacitor	22 μF, 35 V
C 11	Tantalum electrolytic capacitor	2,2 μF, 20 V
D 1	Diode	1 N 4148
D 2	Z-diode	ZPD 3,3
D 3	Z-diode	ZPD 16
D 4	Suppressor diode	TVS 505
IC 1	PMW controller	SG 3524
L 1	Storage choke 422/059	160 μH, 6,3 A
L 2	Open core choke	100 μH, 2,5 A
P 1	Trimming potentiometer	1 κΩ

Item	Description	Electr. Values/Type
R 1 R 2	Carbon-film resistor Carbon-film resistor	330 Ω , 5%, 0,25 W 680 Ω , 5%, 0,25 W
R 3 R 4	Carbon-film resistor Carbon-film resistor	1,8 k Ω , 5%, 0,25 W 15 k Ω , 5%, 0,25 W
R 5 to R 7 R 9	Carbon-film resistor Carbon-film resistor	4,7 kΩ, 5%, 0,25 W 3,3 kΩ, 5%, 0,25 W
R 10 R 11 R 14	Carbon-film resistor Carbon-film resistor Wire resistor	$100~\Omega,5\%,0,25~W$ $4,7~k\Omega,5\%,0,25~W$ $0.12~\Omega,10\%,5~W$
T 1	Darlington transistor	0,12 32, 10%, 5 W
T 2	Transistor	BCY 78 IX
Si 1	Fine-wire fuse	T 2,5 B
SH 1	Fuse holder	19597/583

The module BV 1705 contains additionally the circuit boards:

AV 1705

AV 1706 modified HS 1705 modified

VV 1705 modified

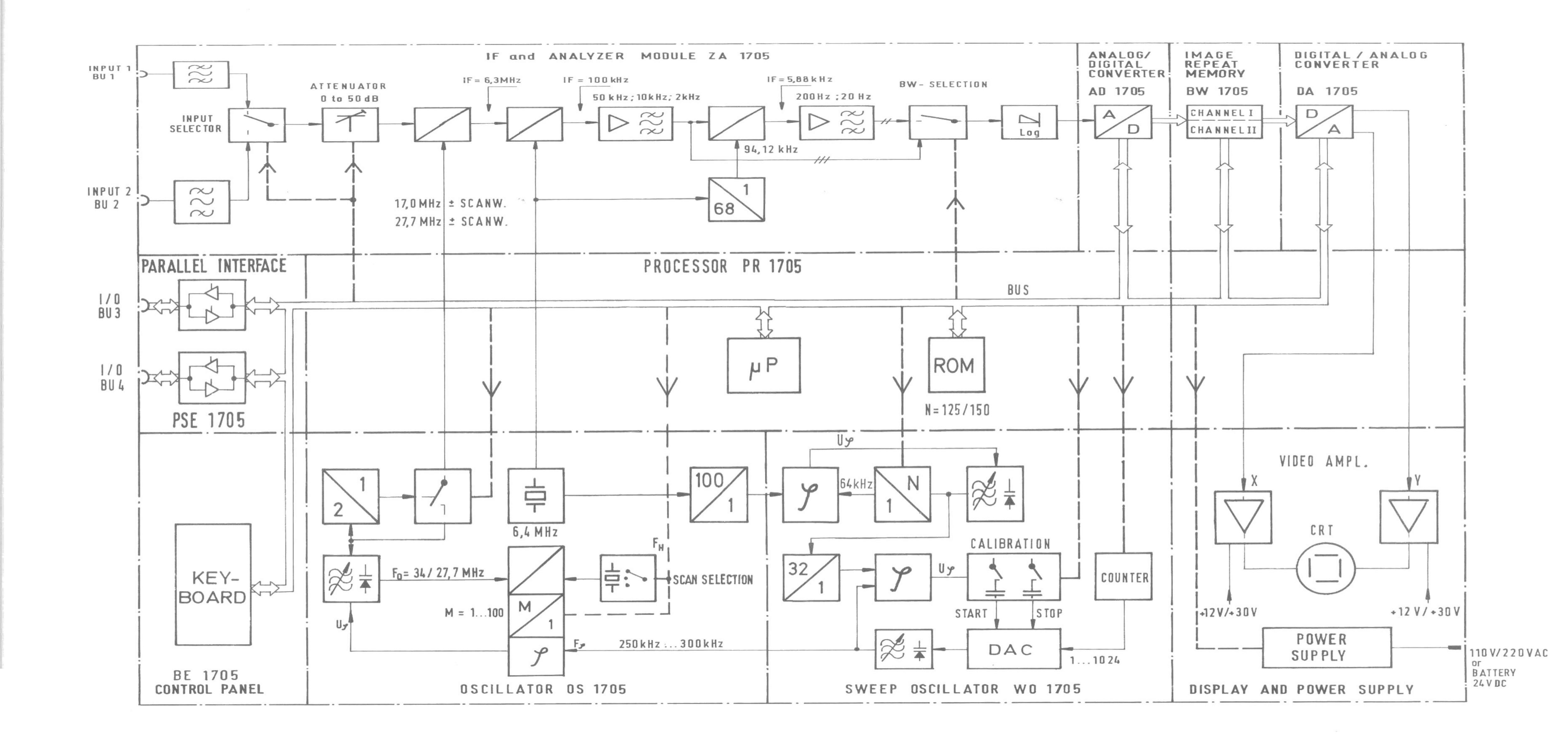
4.6.11.3 Switch-over Switch 52.1810.290.00

Item	Description	Electr. Values/Type	
C 1	Ceramic capacitor	100 nF, 63 V	
C 2	Plastic foil capacitor	$0,1 \mu \text{F}, 63 \text{V}$	
C 3 and C 4	Electrolytic capacitor	10 000 μ F, 40 V	
D 1	Schottky diode	SB 540	
D 2 and D 3	Silicon diode	1 N 4001	
D 4	Z-diode	ZPD 12	
D 5	Silicon diode	1 N 4148	
GR 1	Rectifier (mounted on NV 1705-assy)	SES 5403C	
IC 1	Operational amplifier	LF 356 H	
R 1	Carbon-film resistor	3,3 kΩ, 5%, 0,25 W	
R 2	Metal-film resistor	820 k Ω , 1%, 0,25 W	
R 3	Carbon-film resistor	680 k Ω , 5%, 0,25 W	
R 4	Carbon-film resistor	$18 \text{ k}\Omega$, 5%, 0,25 W	
R 5	Metal-film resistor	75 k Ω , 1%, 0,25 W	
R 6	Carbon-film resistor	47 k Ω , 5%, 0,25 W	
R 7	Carbon-film resistor	10 k Ω , 5%, 0,25 W	
TR 1	Ring core transformer	No. 11527-P2 S02	
	(mounted on NV 1705-assy)		
P 1	Trimming potentiometer 89 P	500 κΩ	
Т 1	Transistor	BCY 58 IX	
RL 1	Relais	V23056-A102-A101	

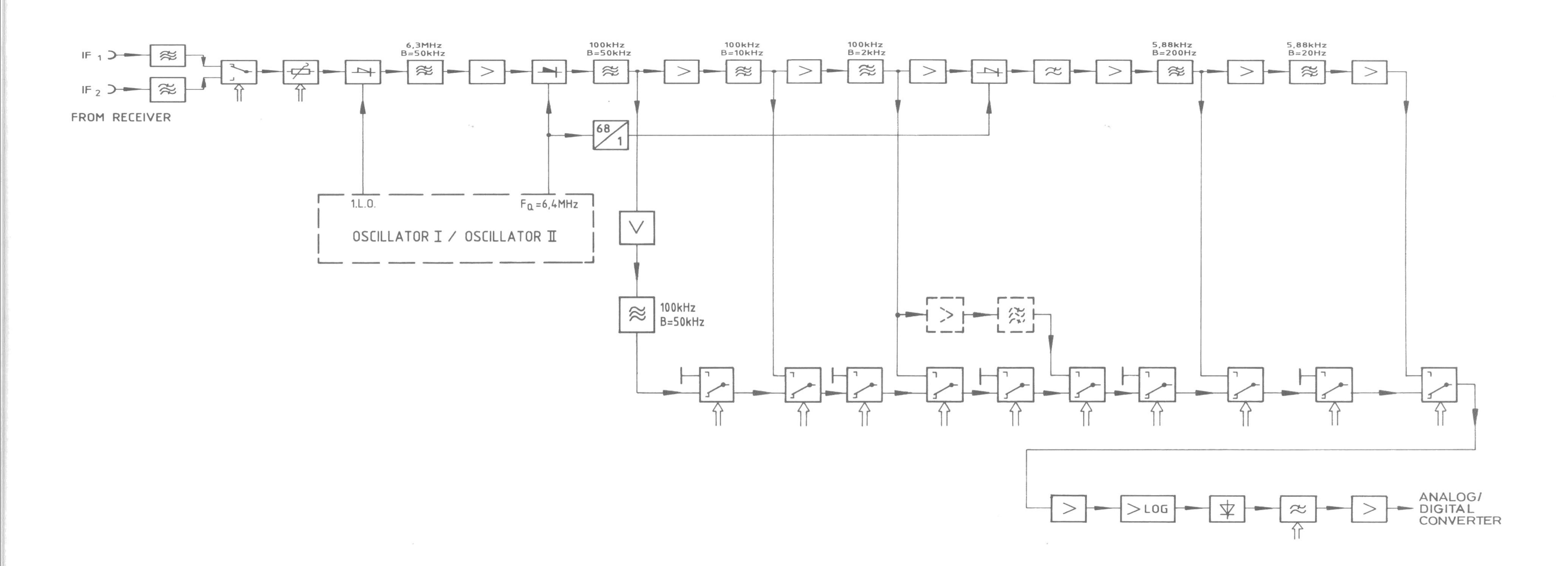
4.6.12 Parallel Interface (Cursor) PSE 1705 52.1810.540.00

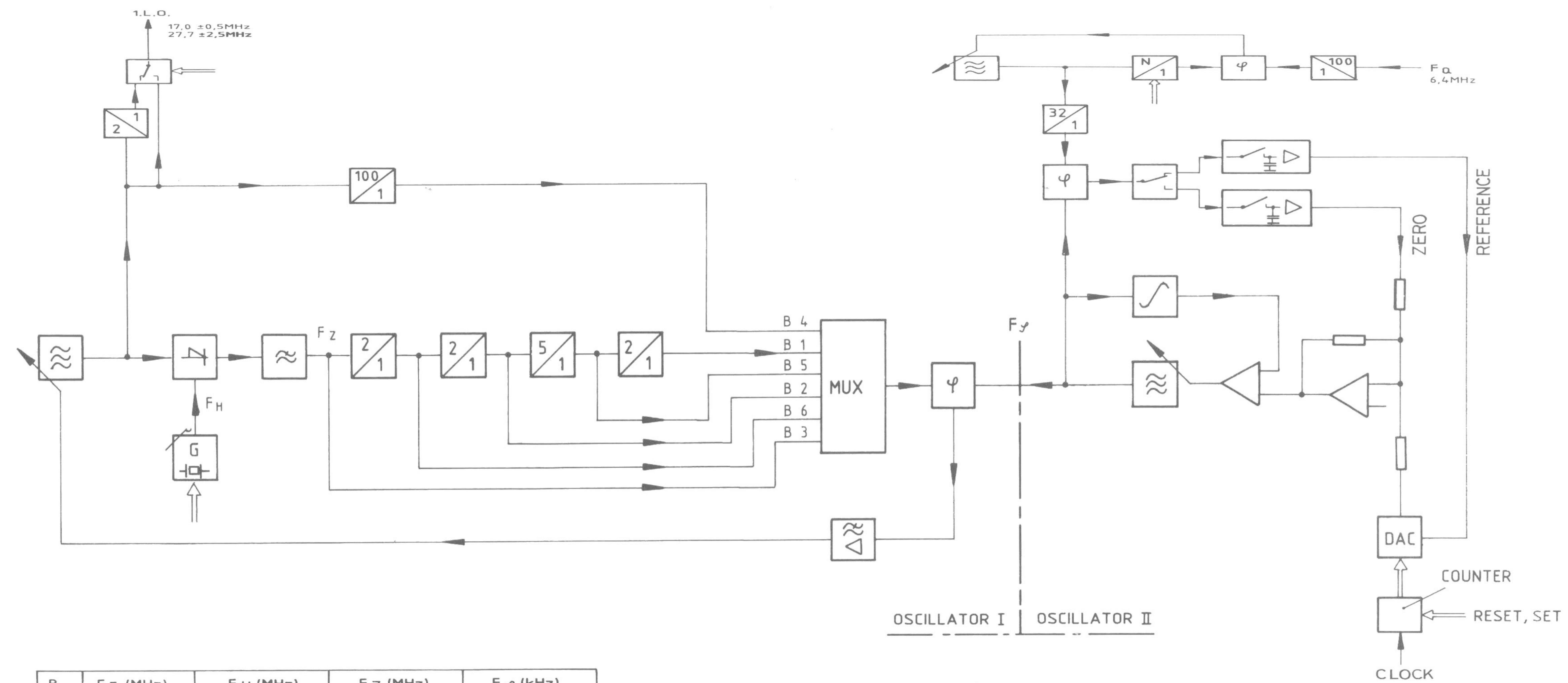
Item	Description	Electr. Values/Type
BU 3 and BU 4	Jack, 50-pin (mounted at rear of PSG 1700/2)	DD 50 S
C 1 to C 4 C 6 and C 7 C 5	Ceramic capacitor	10 nF, 63 V
C 14 and C 24 C 25	Ceramic capacitor not equipped	100 nF, 63 V
C 29, C 31 and C 32 C 30 C 33 C 34 and C 35 C 36 C 37	Ceramic capacitor Plastic foil capacitor Tantalum electrolytic capacitor Ceramic capacitor Ceramic capacitor Electrolytic capacitor	10 nF, 63 V 0,1 μF, 35 V 1 μF, 35 V 10 nF, 63 V 1 nF 4,7 μF, 25 V
D 1 and D 2	Silicon diode	1 N 4148
IC 1	Digital integrated circuit	54 LS 32 J
IC 2 to IC 4, IC 6 and IC 7 IC 5 IC 20 IC 21 IC 22 IC 23 IC 24 to IC 26 IC 27 and IC 28 IC 29 IC 30 IC 31	Digital integrated circuit not equipped Digital integrated circuit Resistor network, 9-pin, 3,9 kΩ	54 LS 42 J 54 LS 259 J D 82 55 AC-5 54 LS 75 J 54 LS 04 J 54 LS 641 J 54 LS 38 J 54 LS 32 J 54 LS 244 J 54 LS 373 J 9X-1-392K
R 5, R 8, R 10 and R 11 R 9 R 12 R 13 R 14 R 15 and R 16	Carbon-film resistor Carbon-film resistor not equipped Carbon-film resistor Carbon-film resistor not equipped	560 Ω , 5%, 0,25 W 10 k Ω , 5%, 0,25 W 3,3 k Ω , 5%, 0,25 W 100 k Ω , 5%, 0,25 W
St 6 St 6.1	Blade contact connector 64-pin Multipoint plug 44-pin, 2 x 22-pin	G 06 D 64 P4 BEBL SL 4/25/44 G
BU 6.1	Connector strip, 2 x 22-pin	65 846 004
Т 3	npn transistor	BCY 58 IX

BU 3 and BU 4 are connected by internal short wires (Internal Pinout see section 2.2.3) to connector strip BU 6.1 which is plugged into plug connector St 6.1.

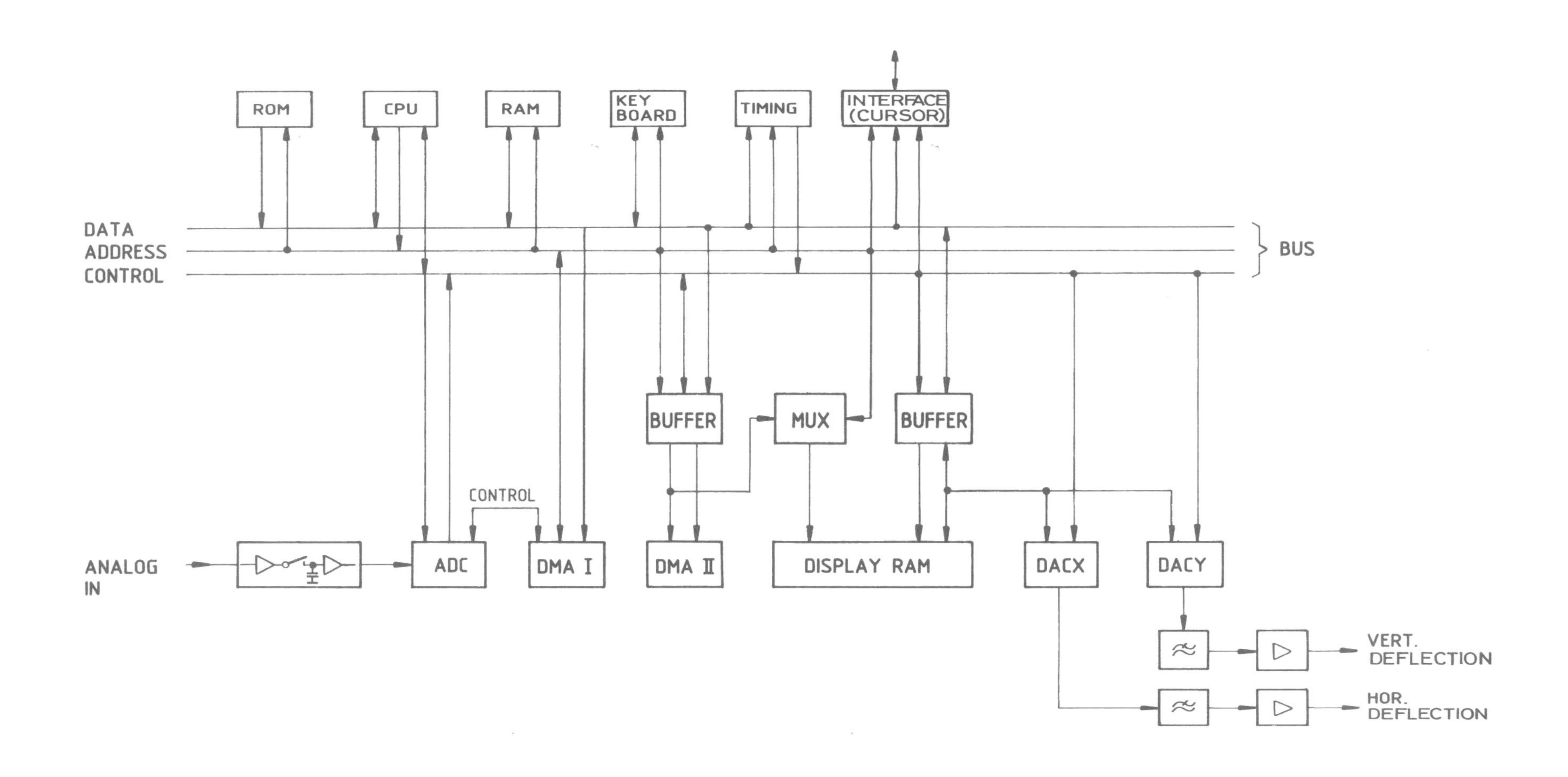


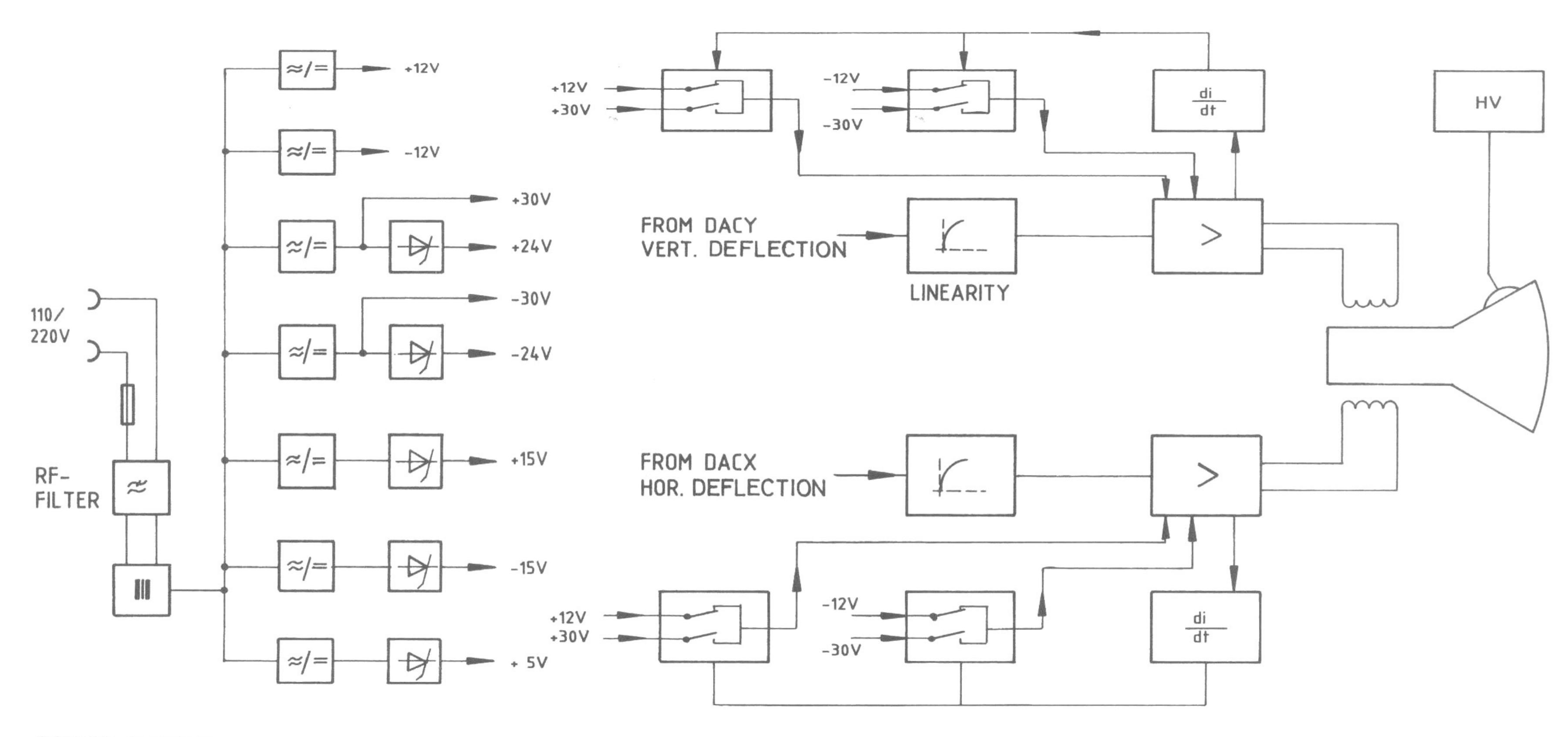
PSG 1700/2



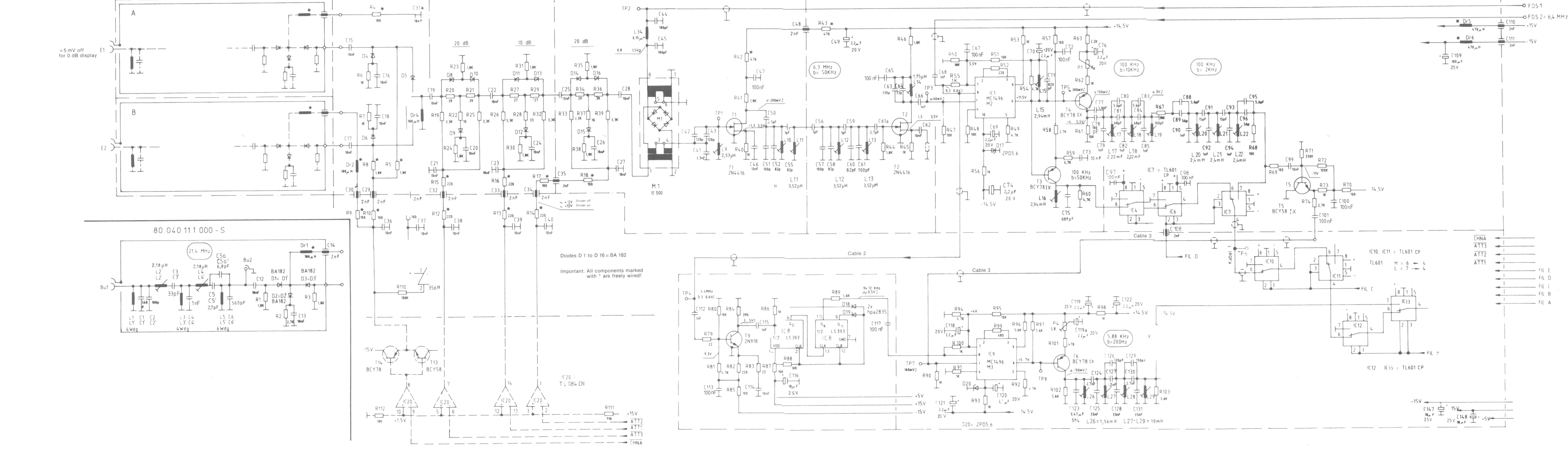


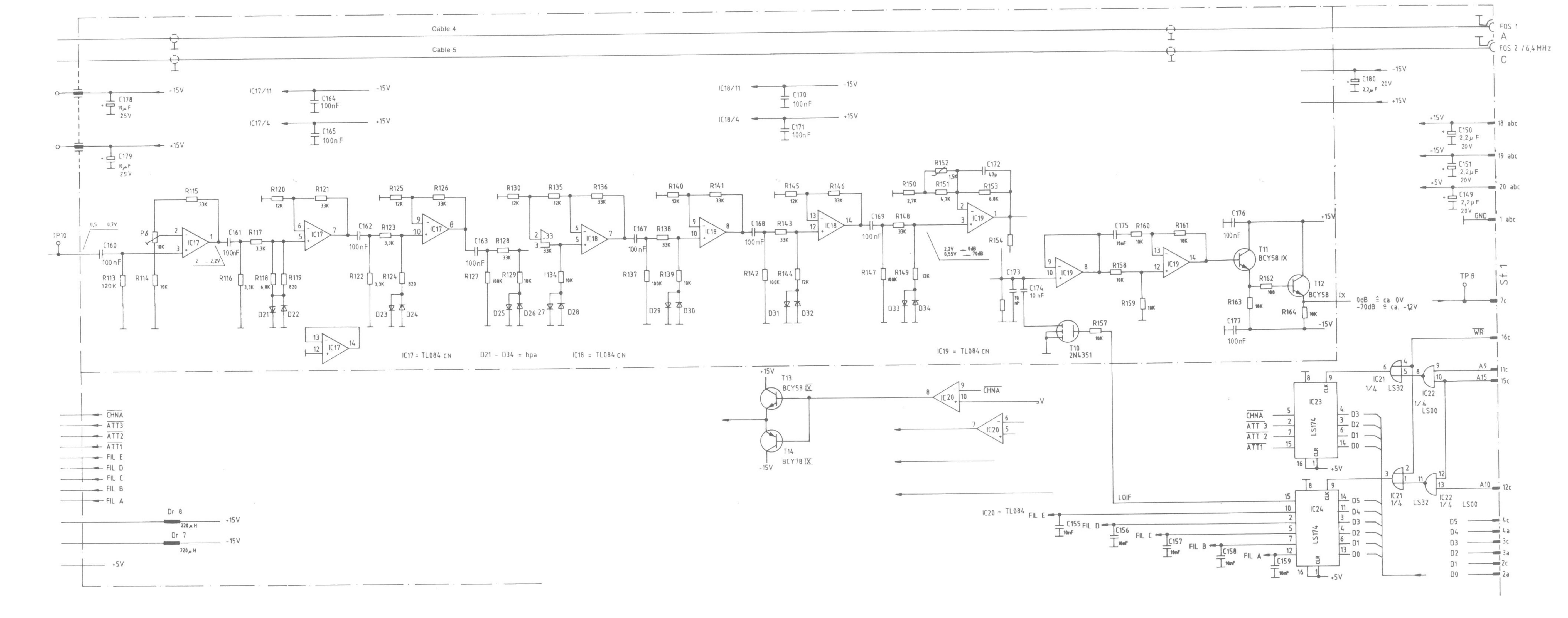
В	FE (MHz)	F H (MHz)	FZ (MHz)	F ≠ (kHz)
1	10.7 ±0.5	23	1012	250300
2	10.7 ±0.05	32.9	11.2	250300
3	10.7 ±0.005	33.726	0.2640.284	264284
4	21.4 ±2.5			252302
5	21.4 ±0.5	22.2	56	250300
6	21.4 ±0.05	27.15	0.50.6	250300

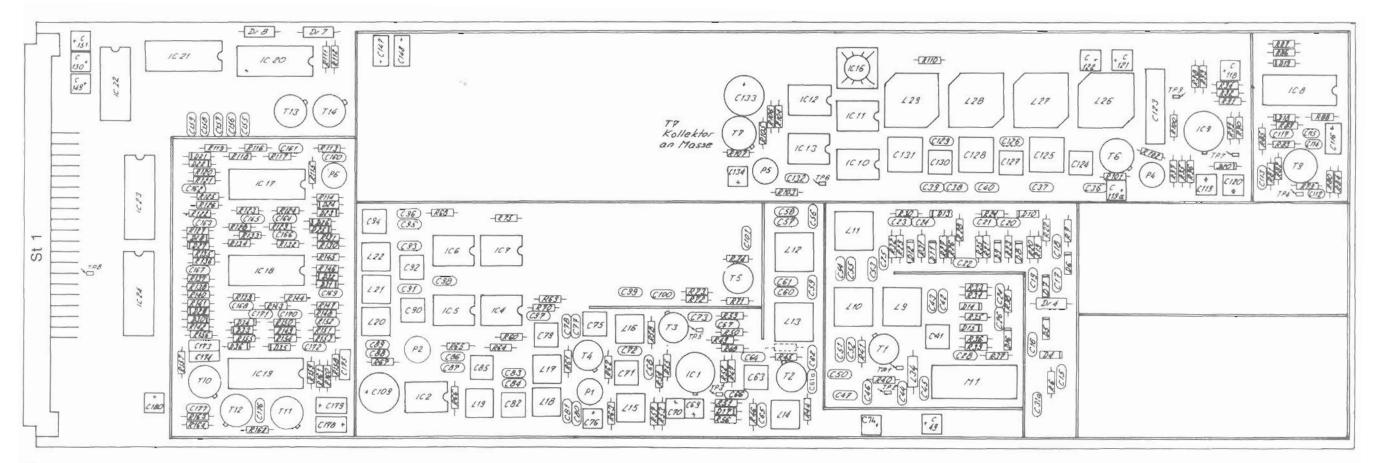




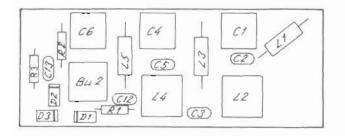
POWER SUPPLY



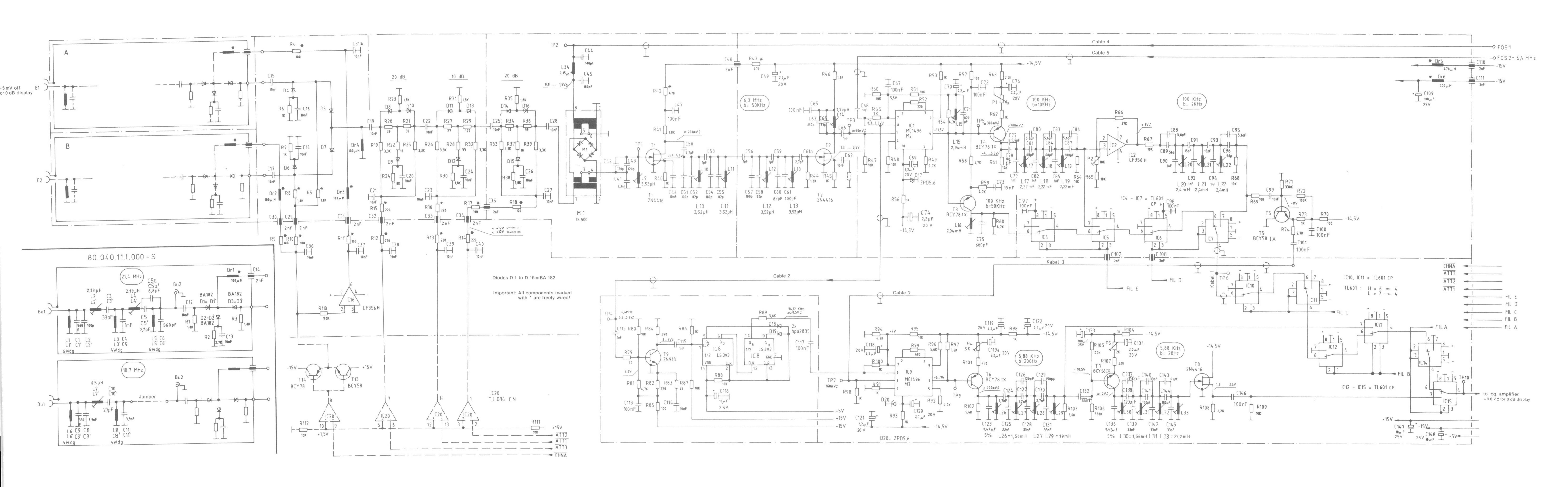


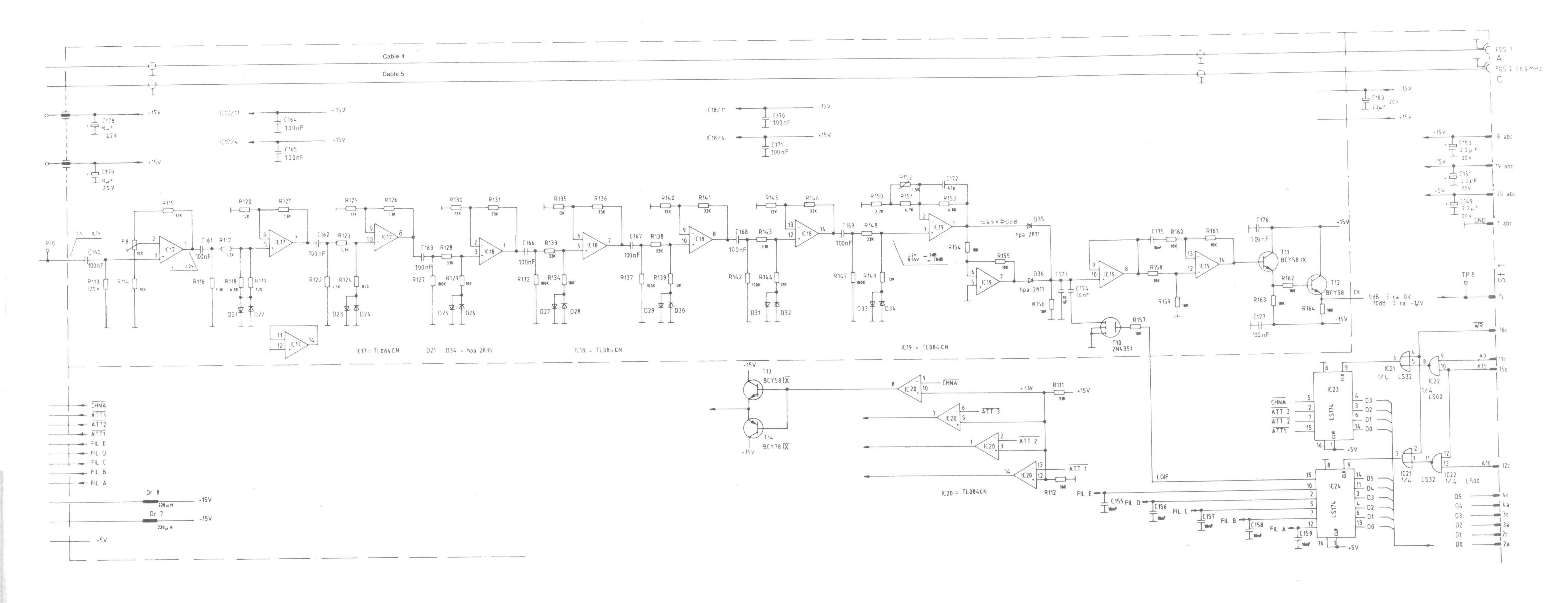


Signal processing, board 1



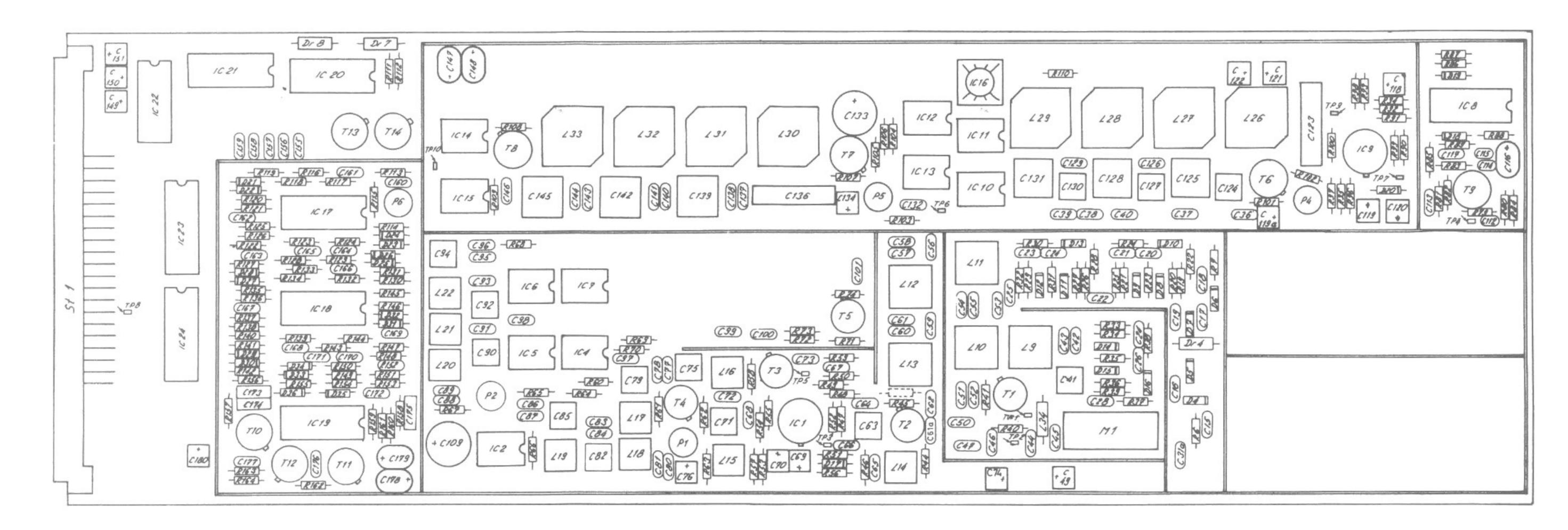
Version 21.4 MHz



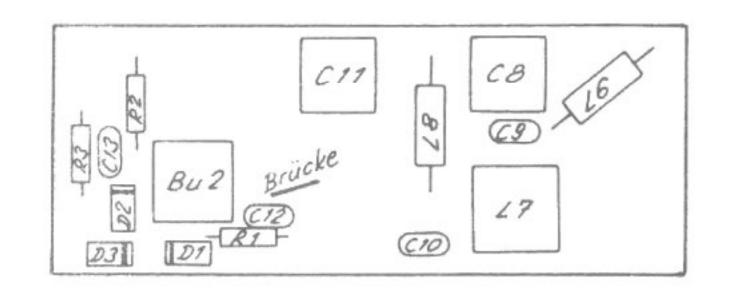


Intermediate Frequency and Analysis Module ZA 1705
(Signal Processing 10.7 MHz and 21.4 MHz or 2×10.7 MHz)

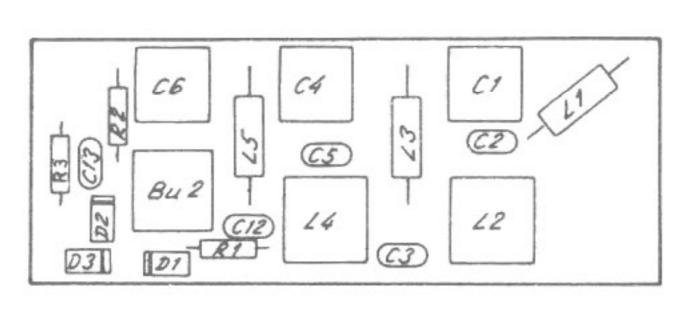
Annex 7, Sheet 2



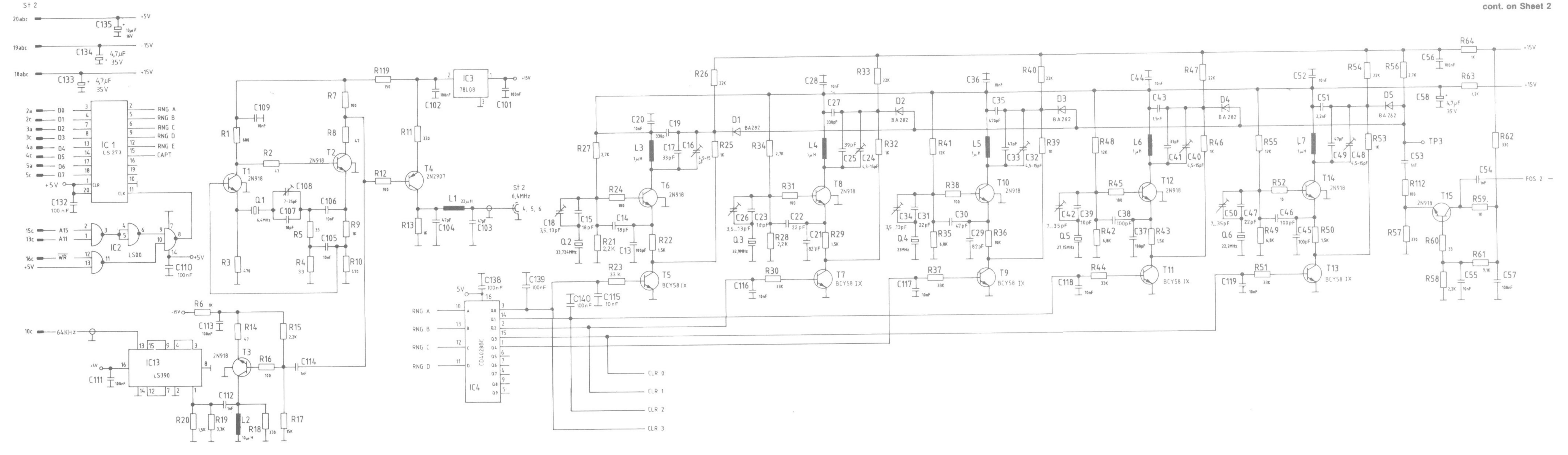
Signal processing, board 1

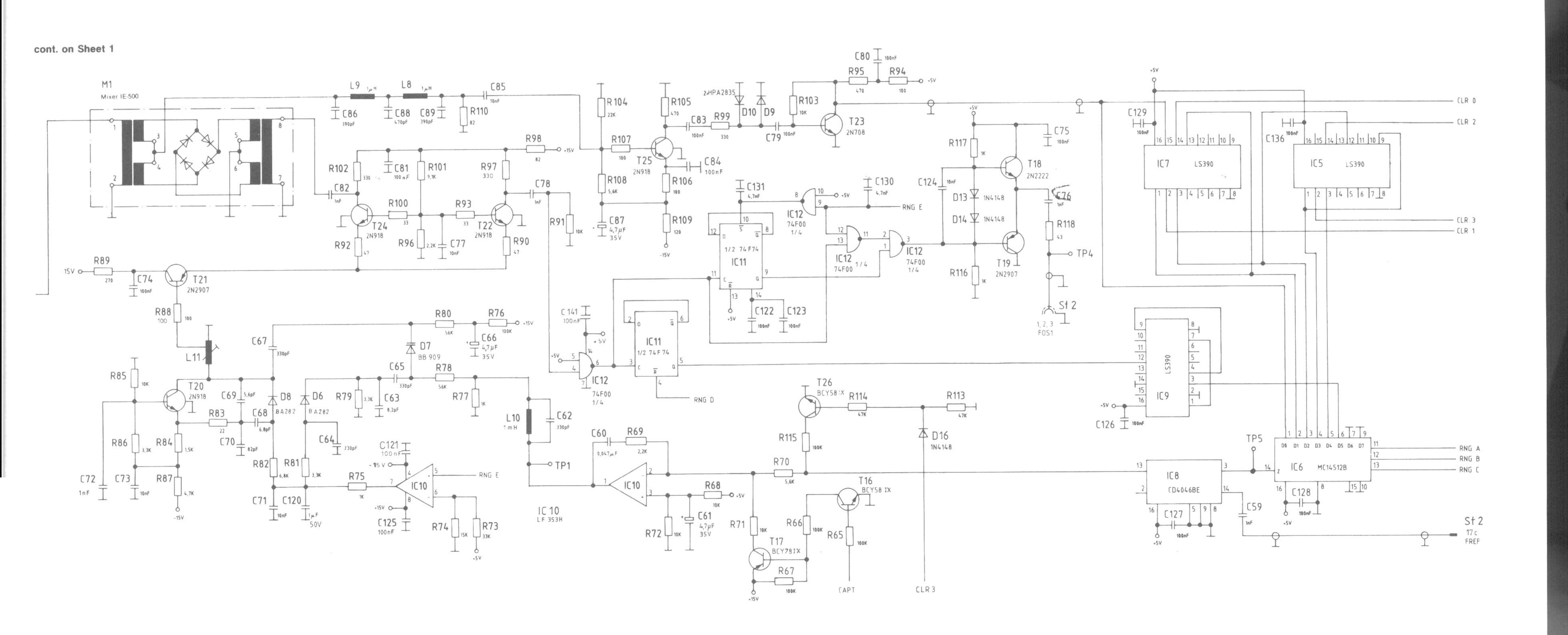


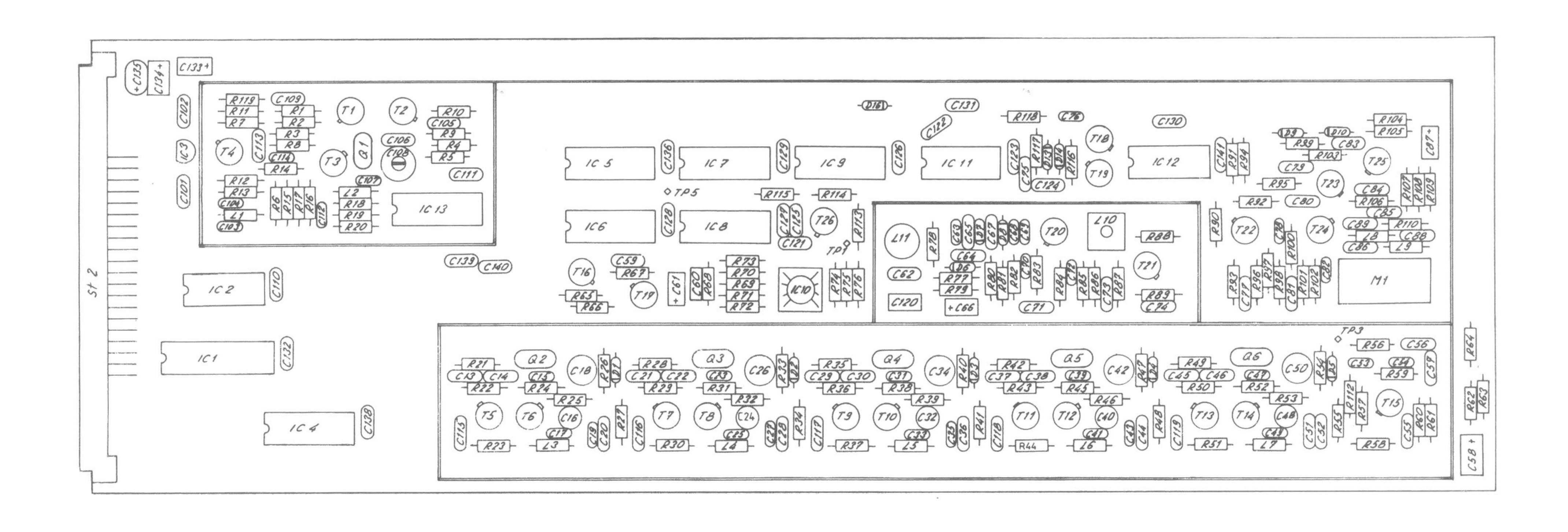


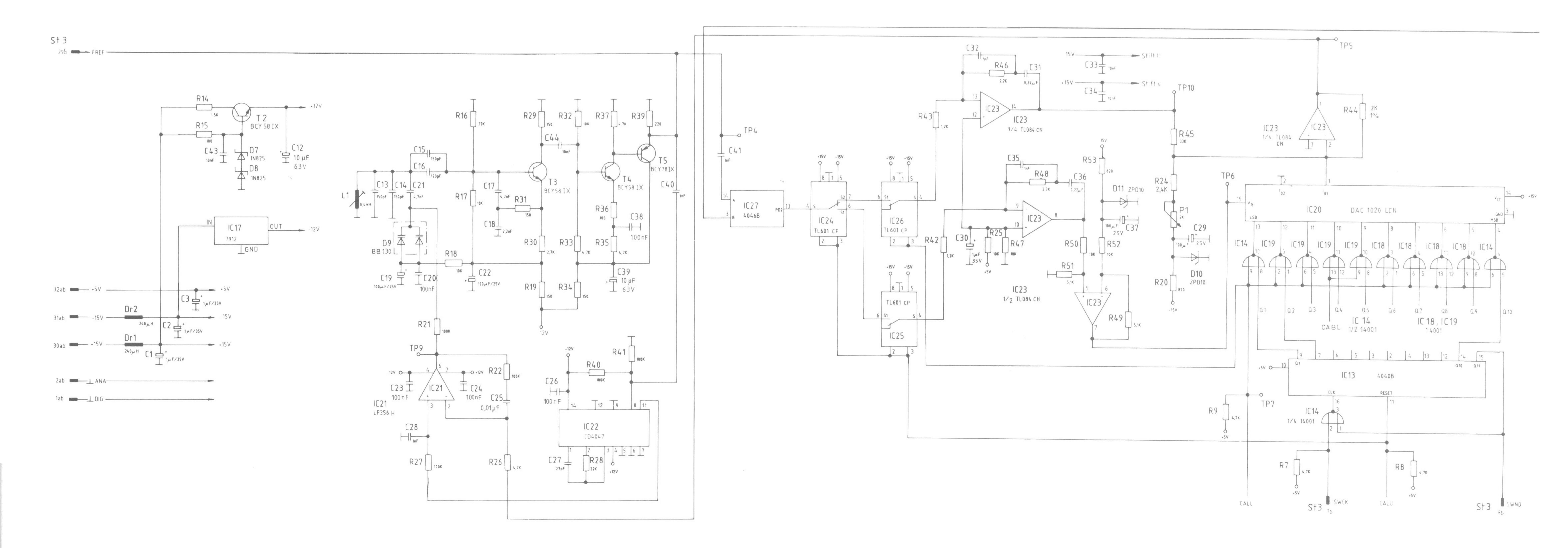


Version 21.4 MHz

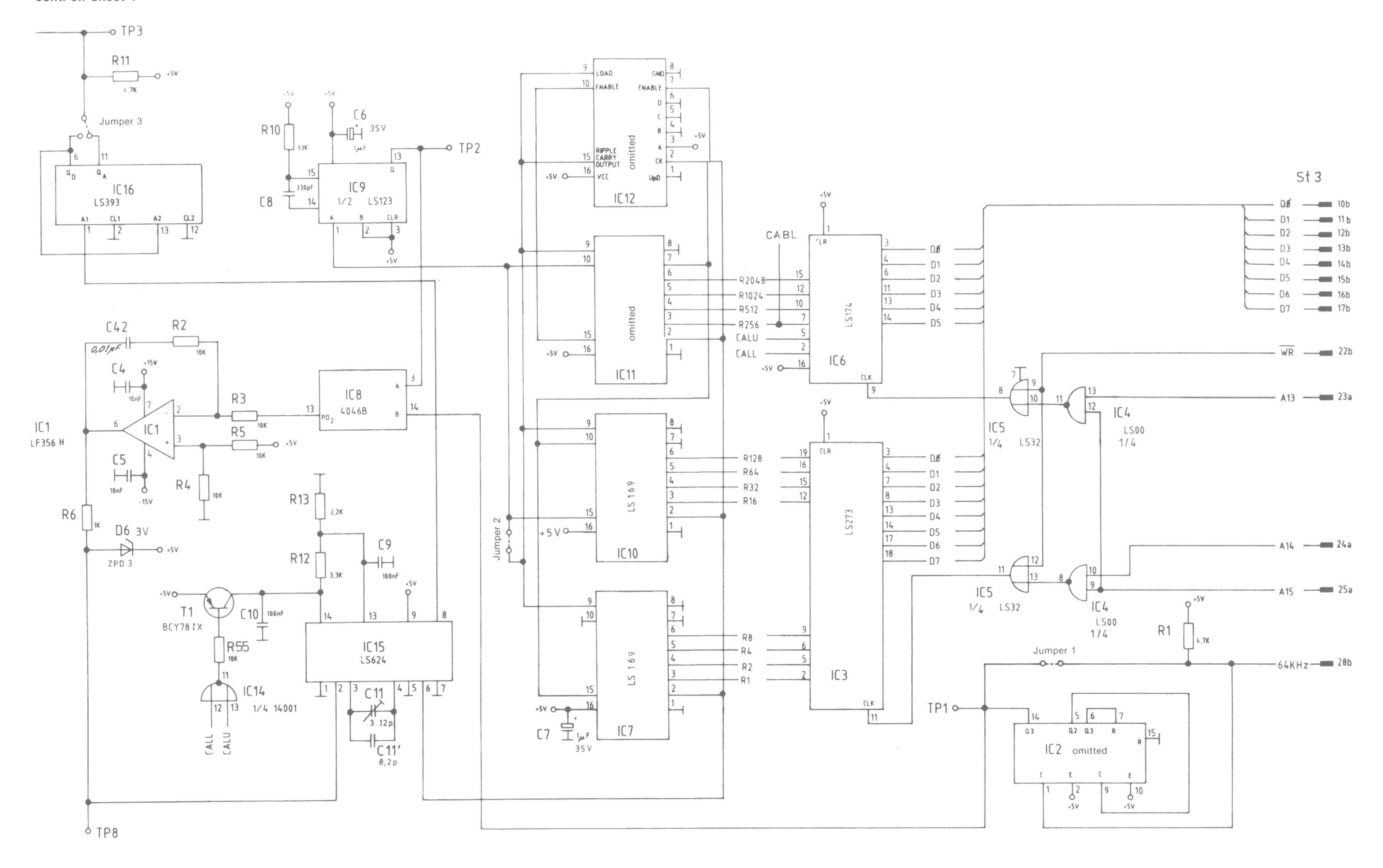


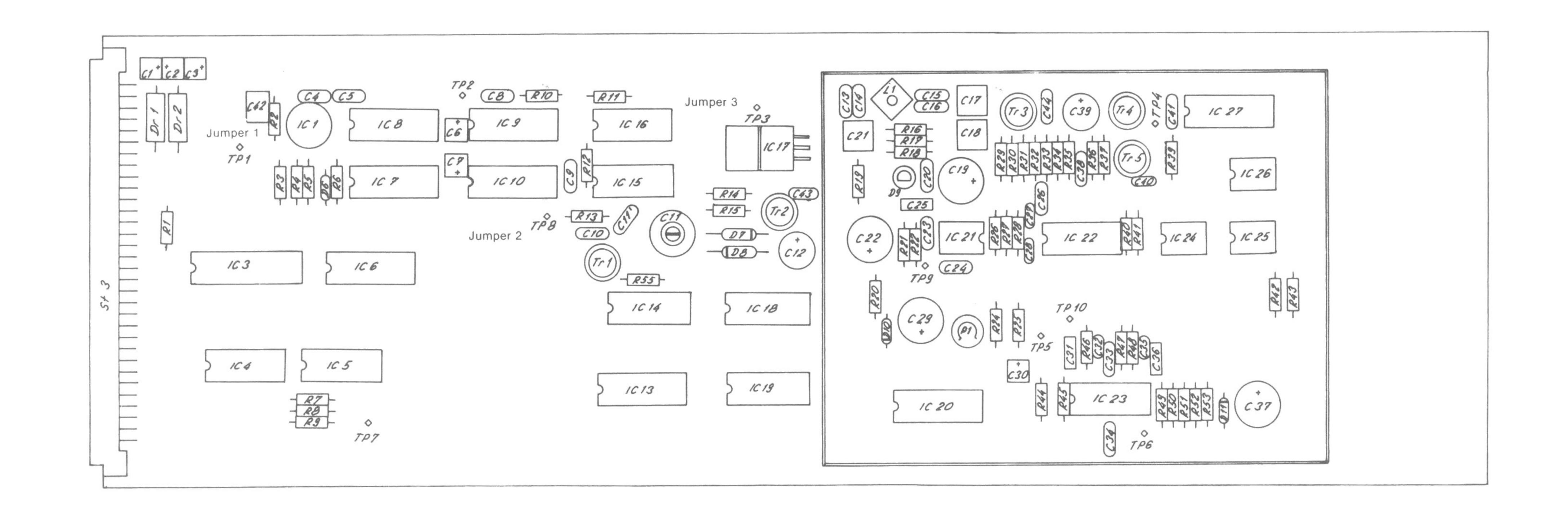


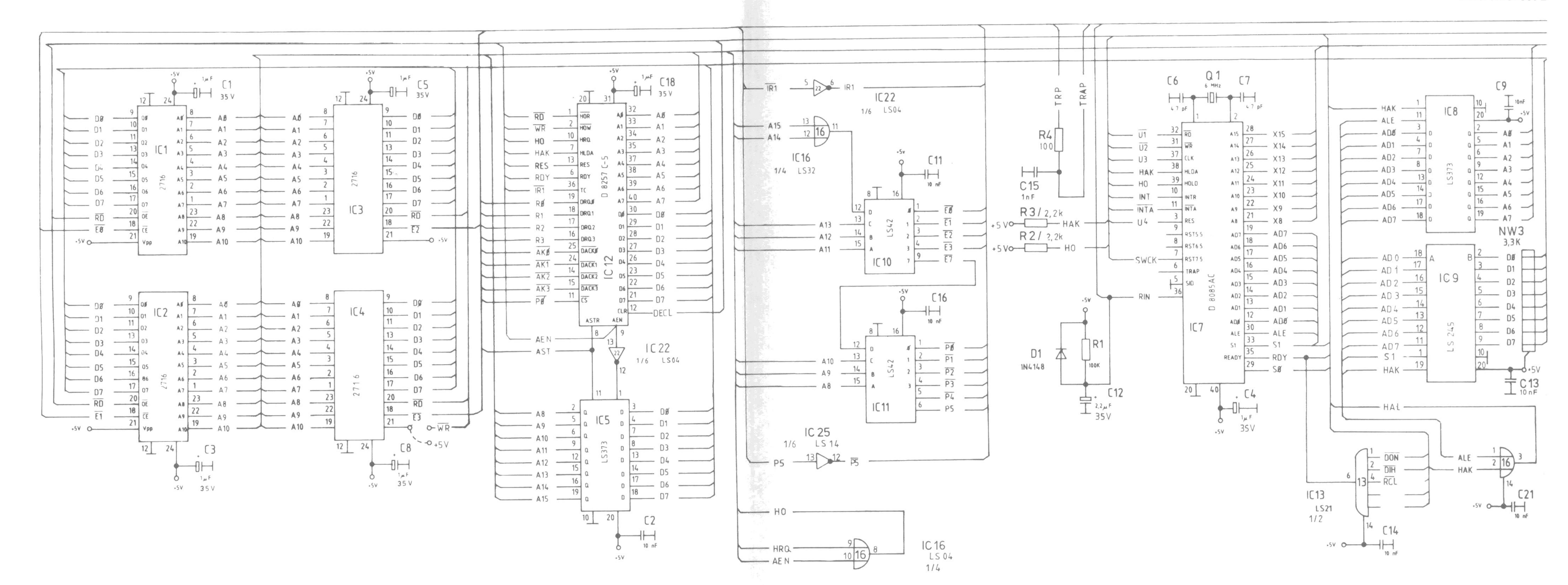


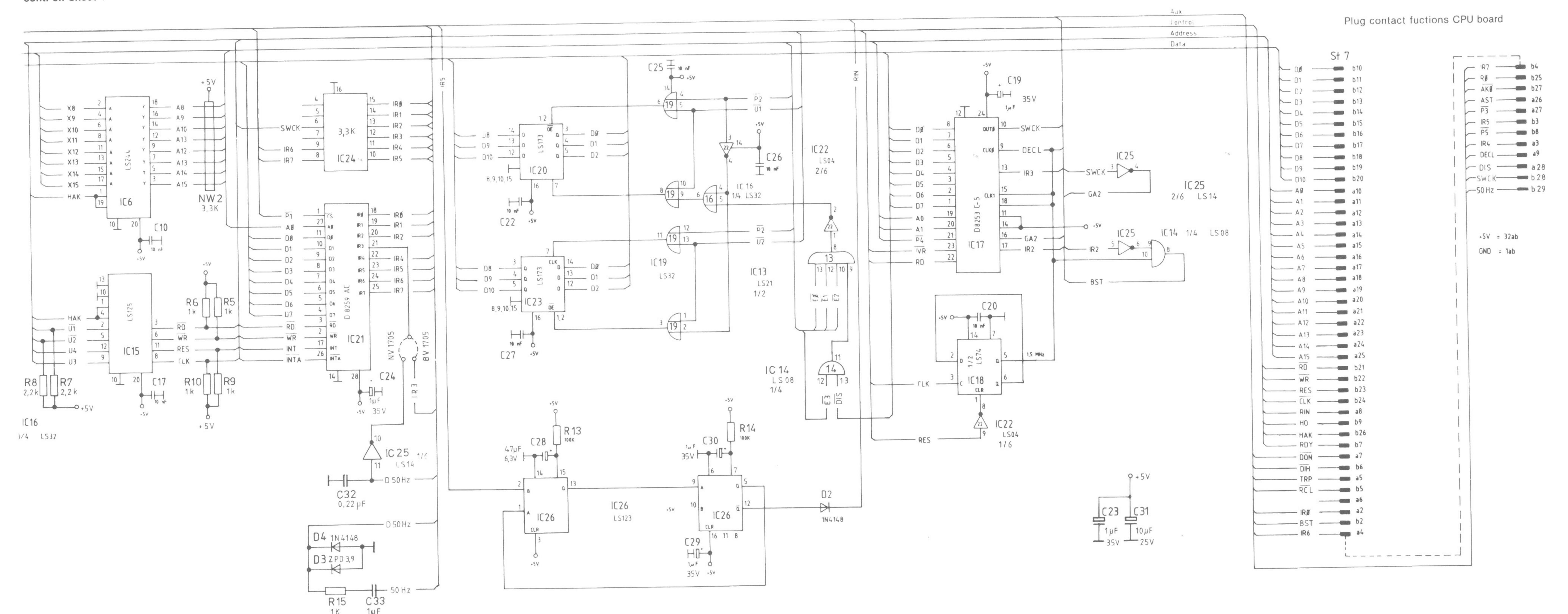


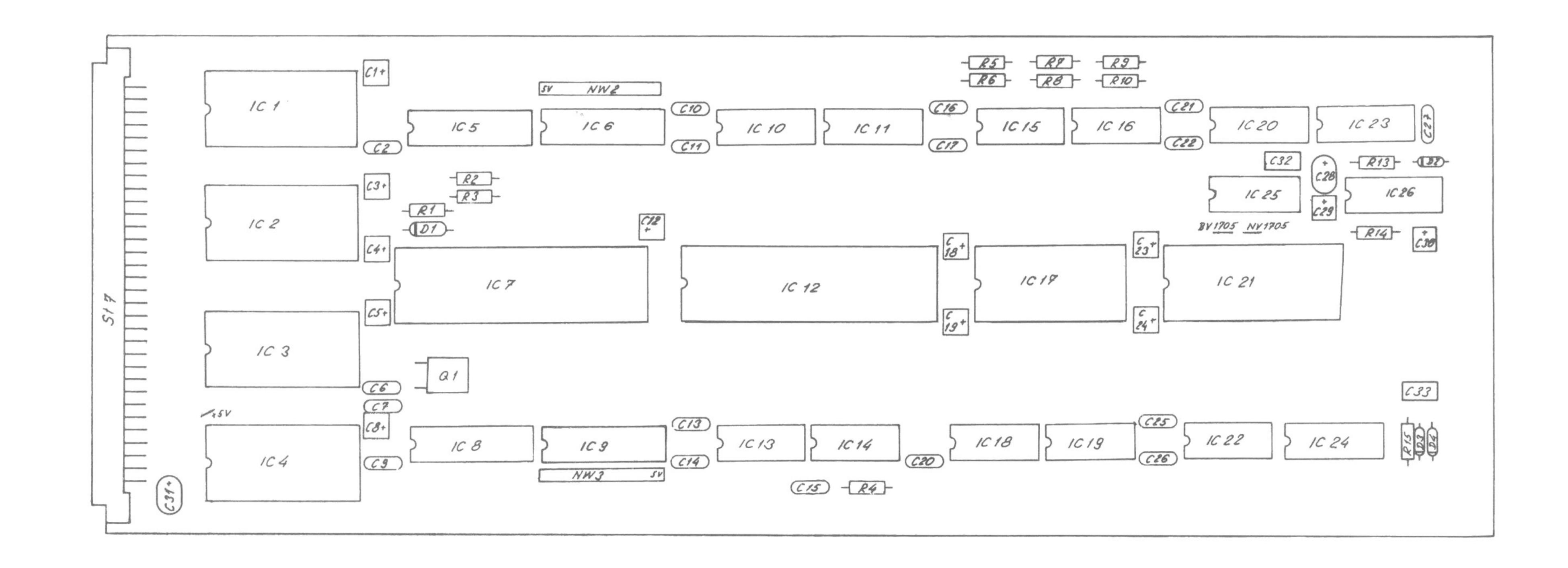
cont. on Sheet 1

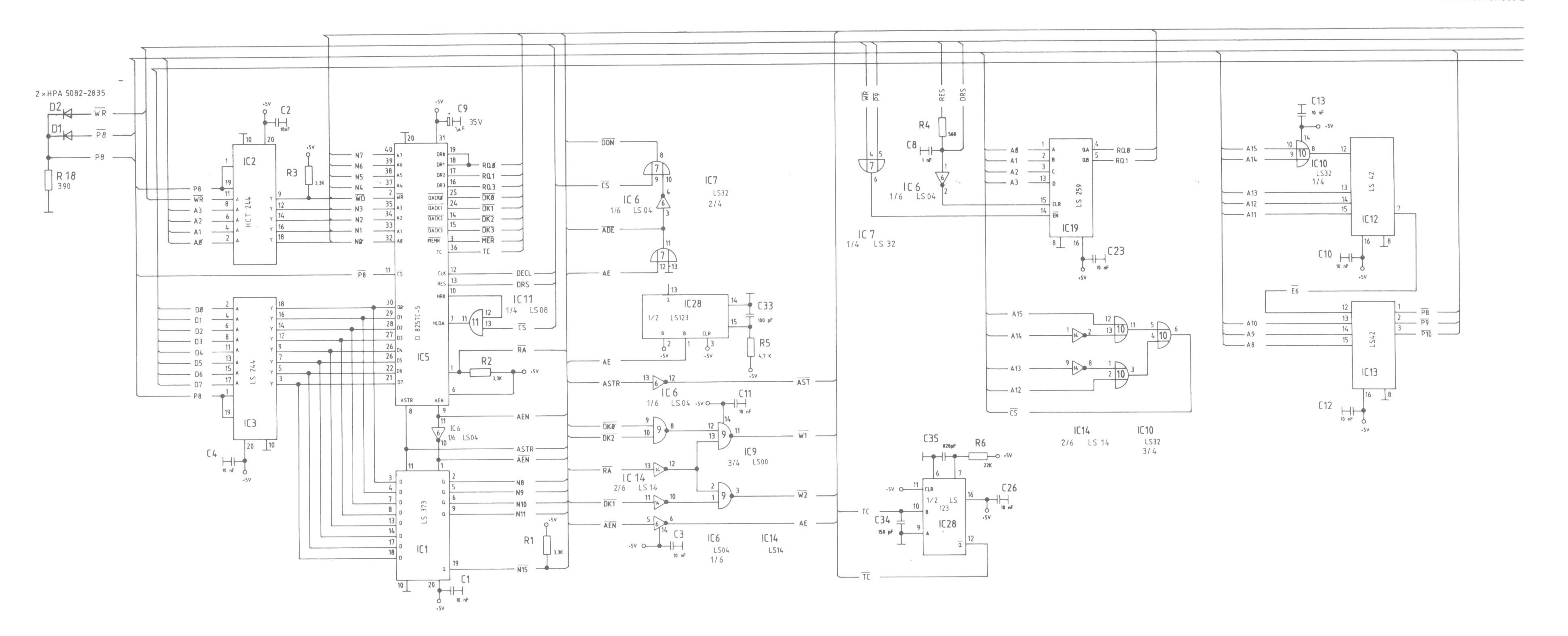


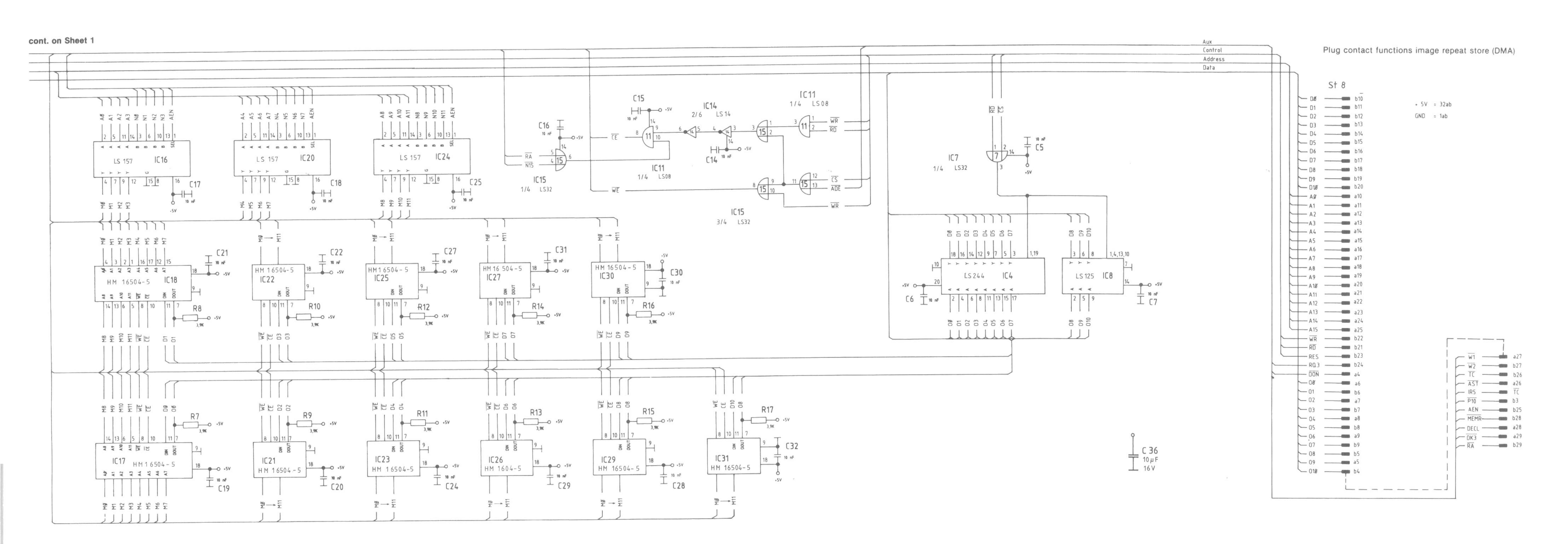


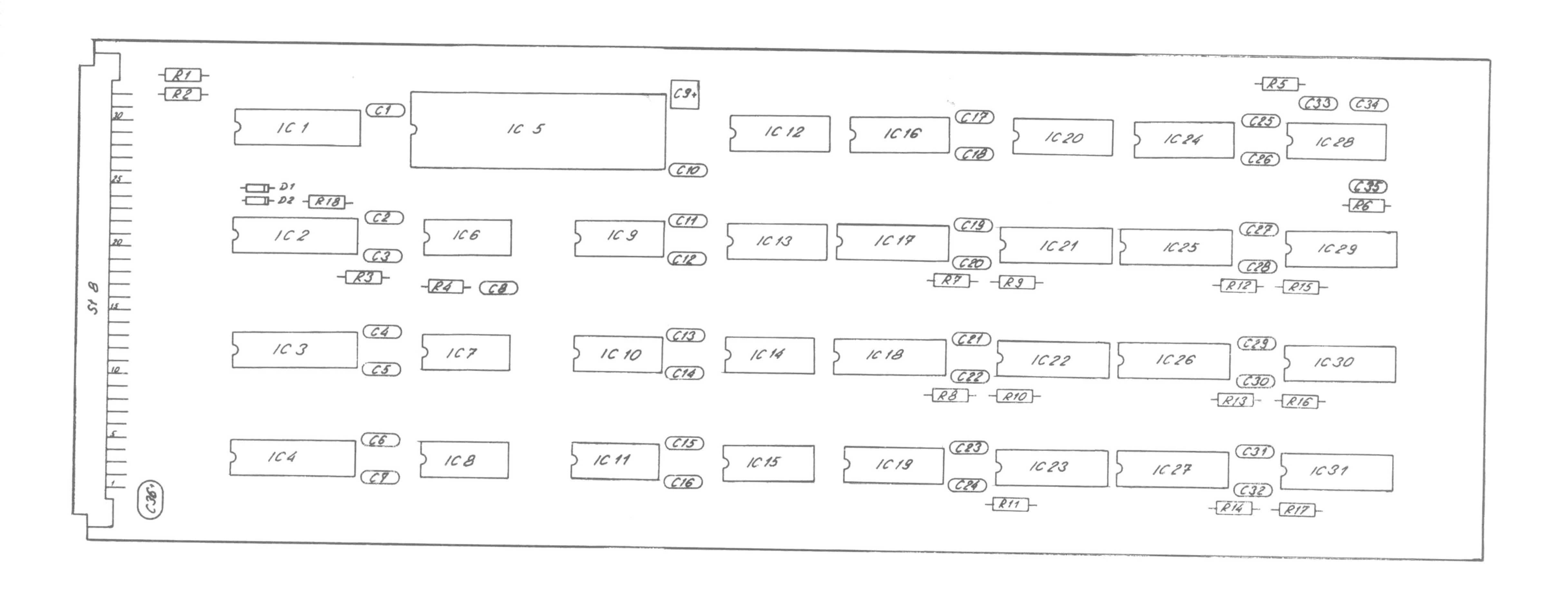


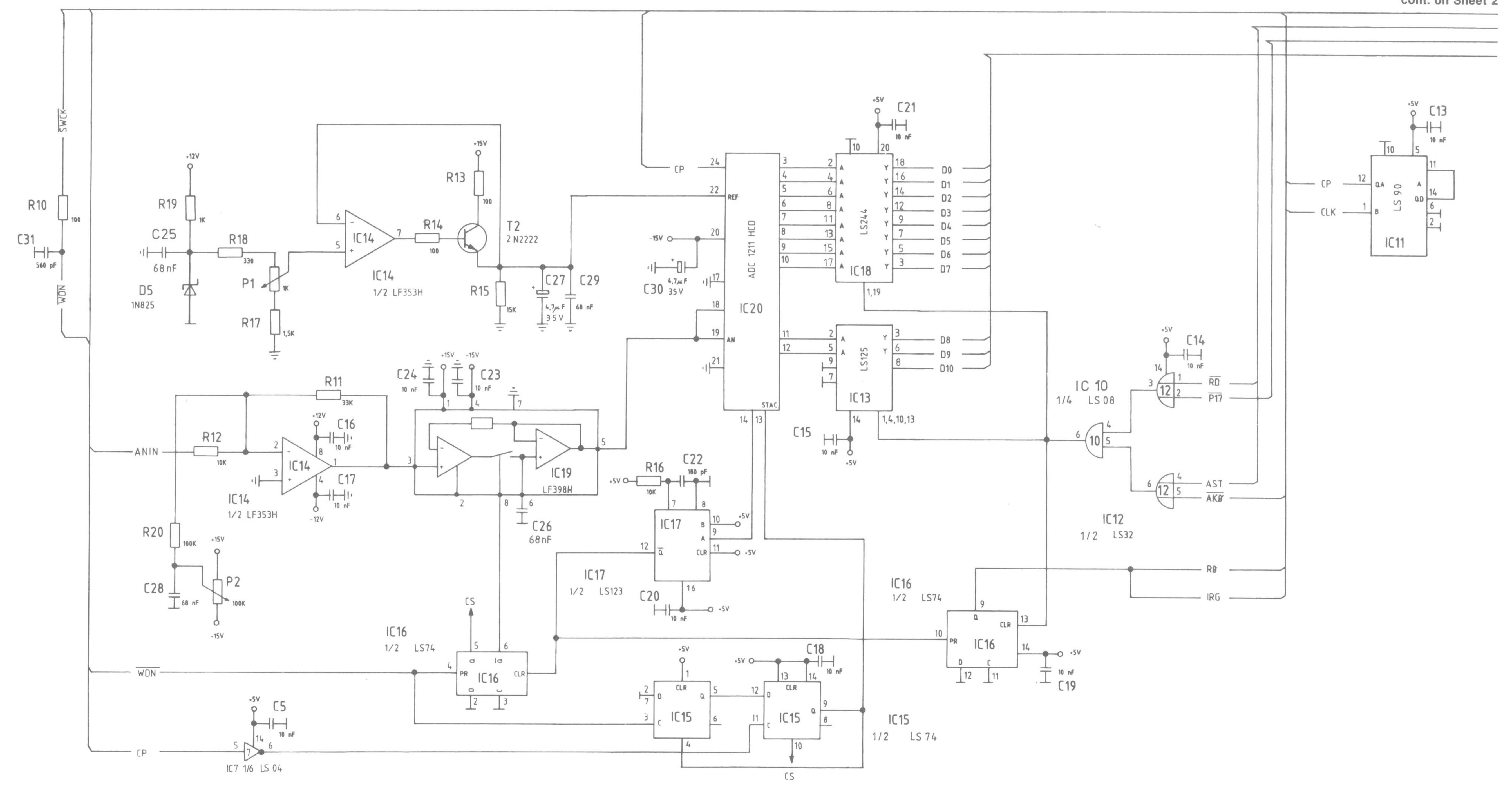


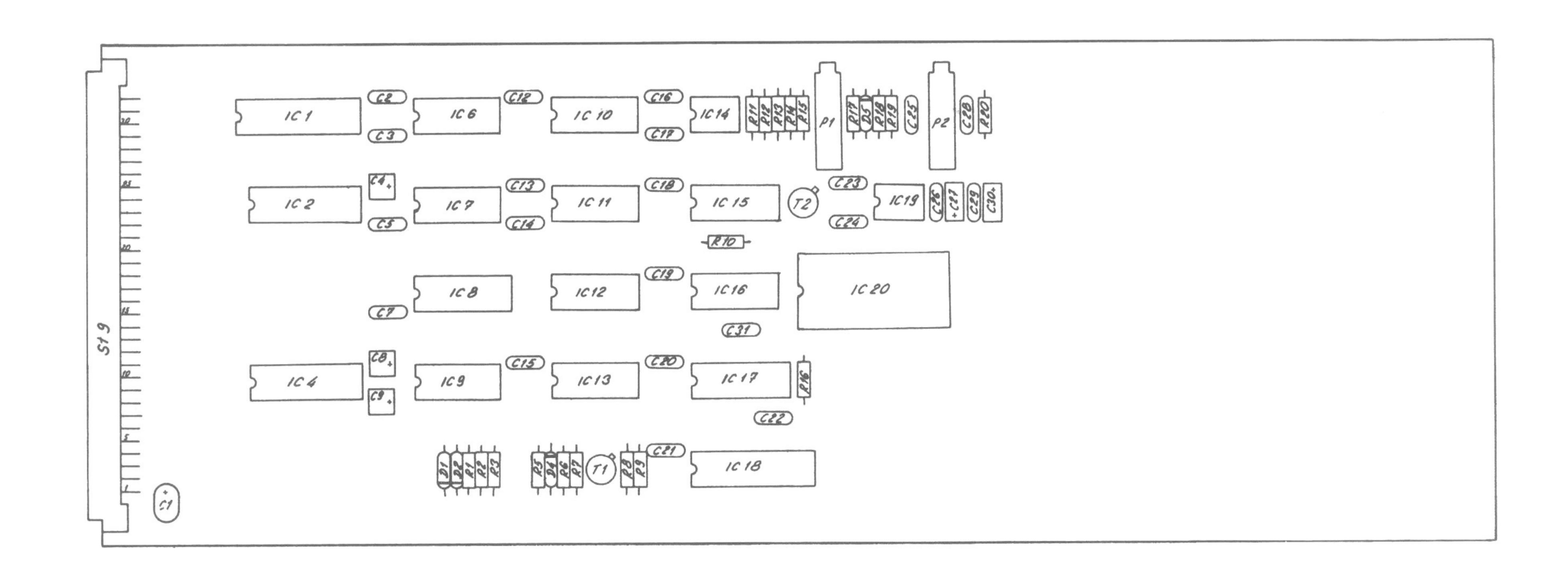


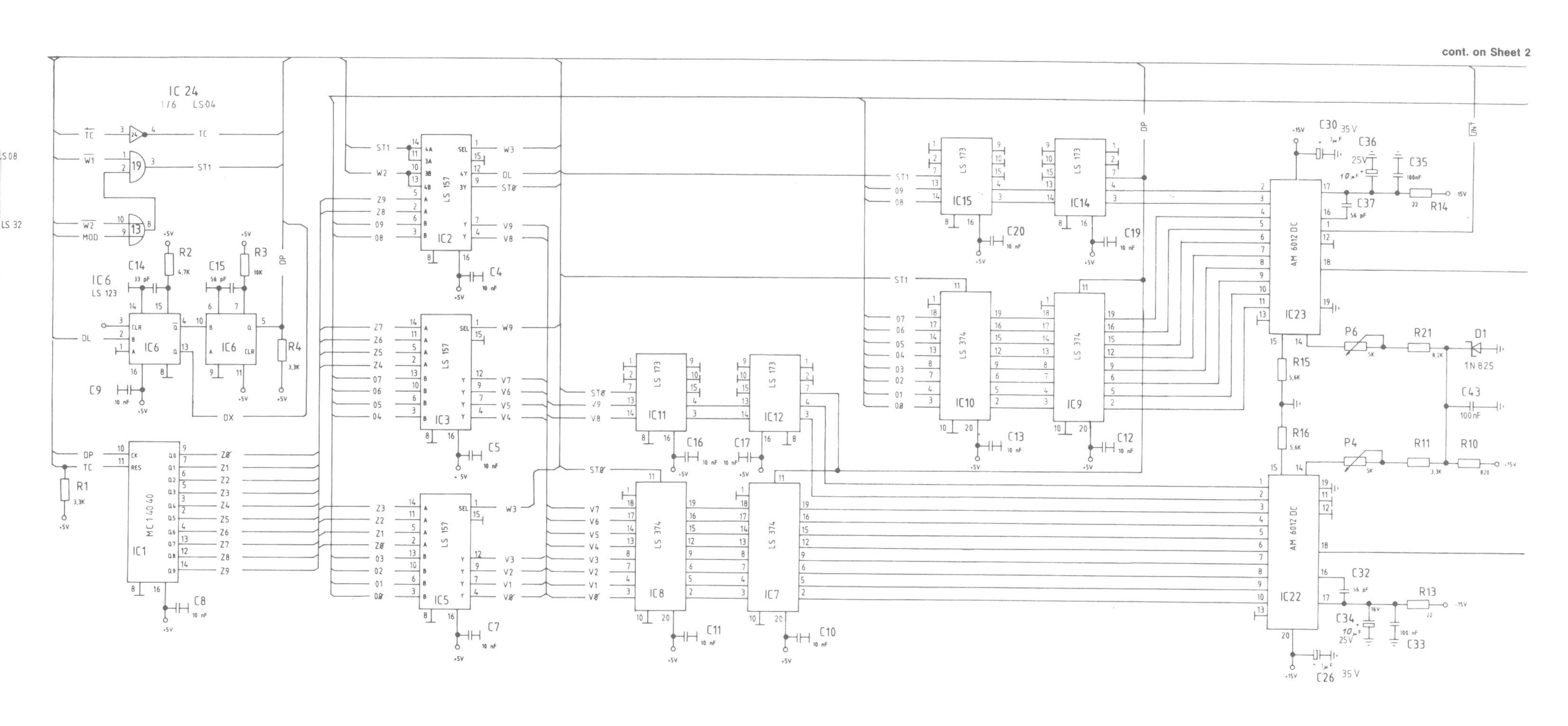


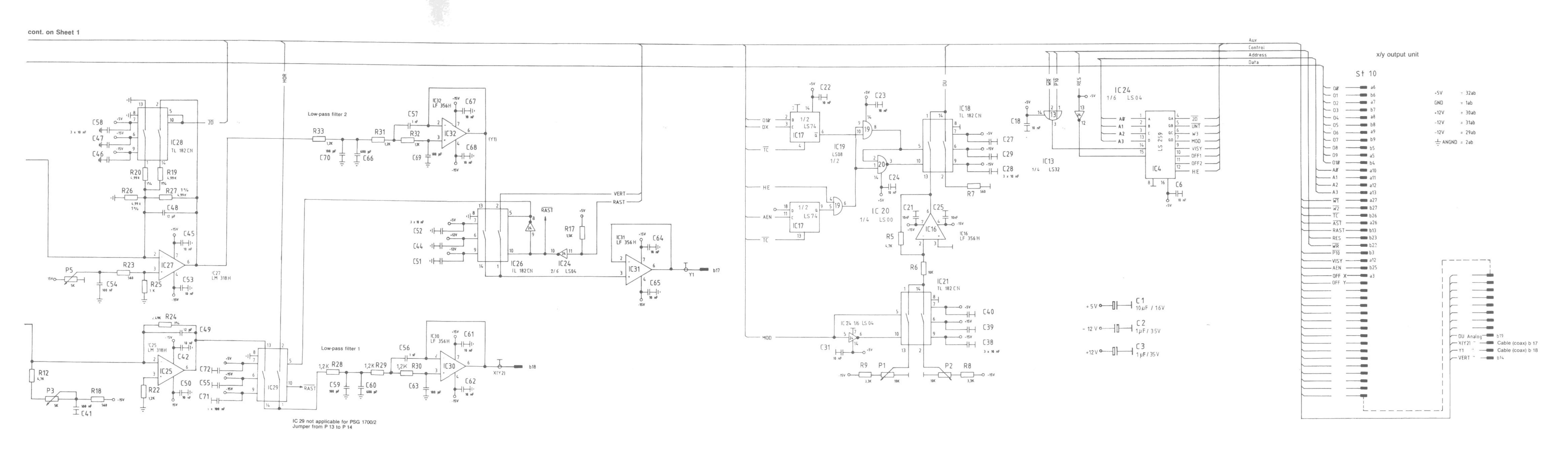


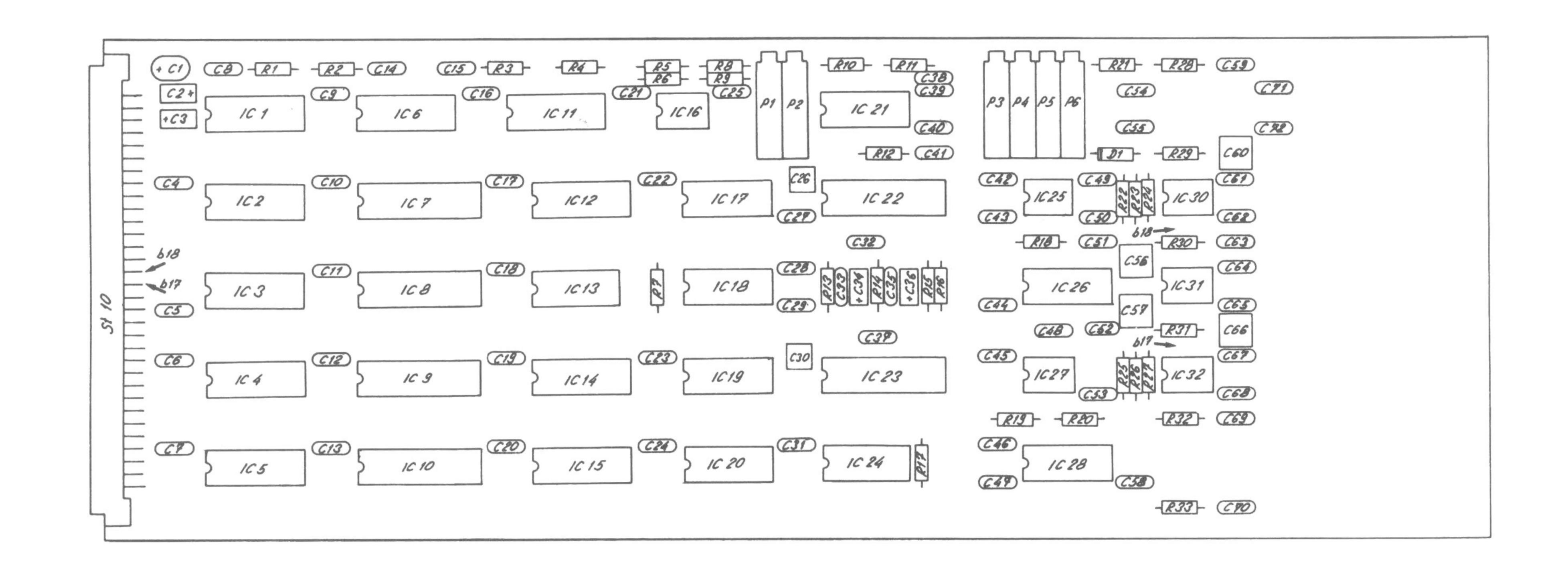


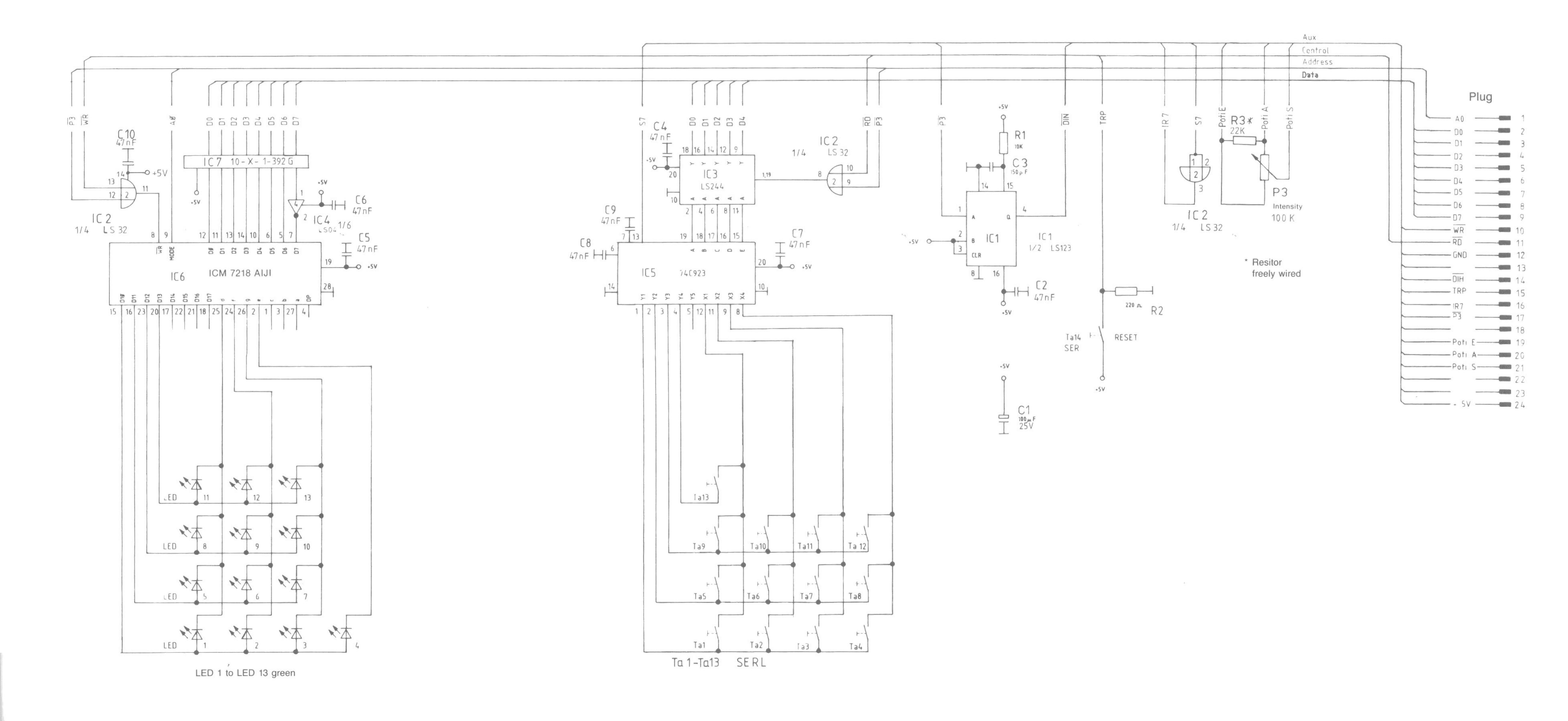


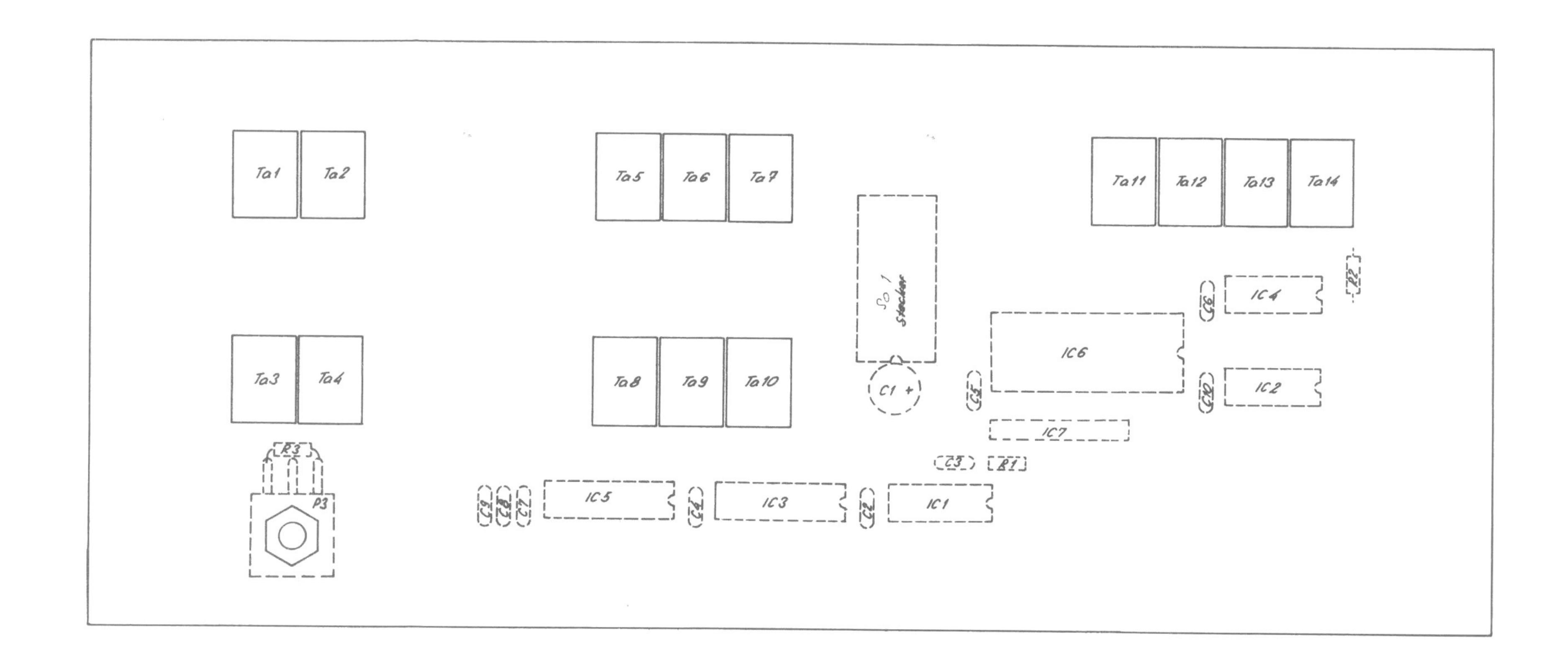


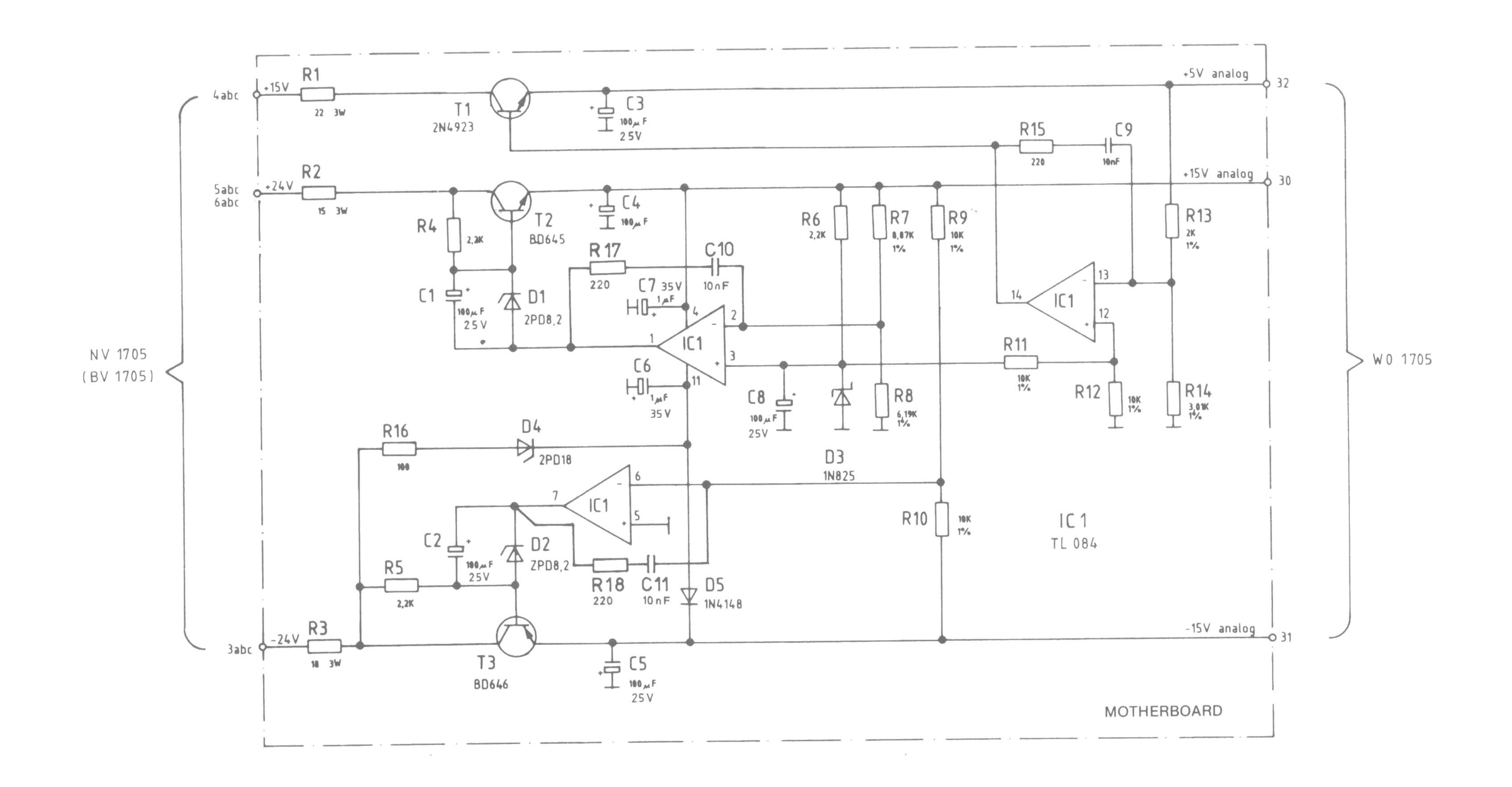


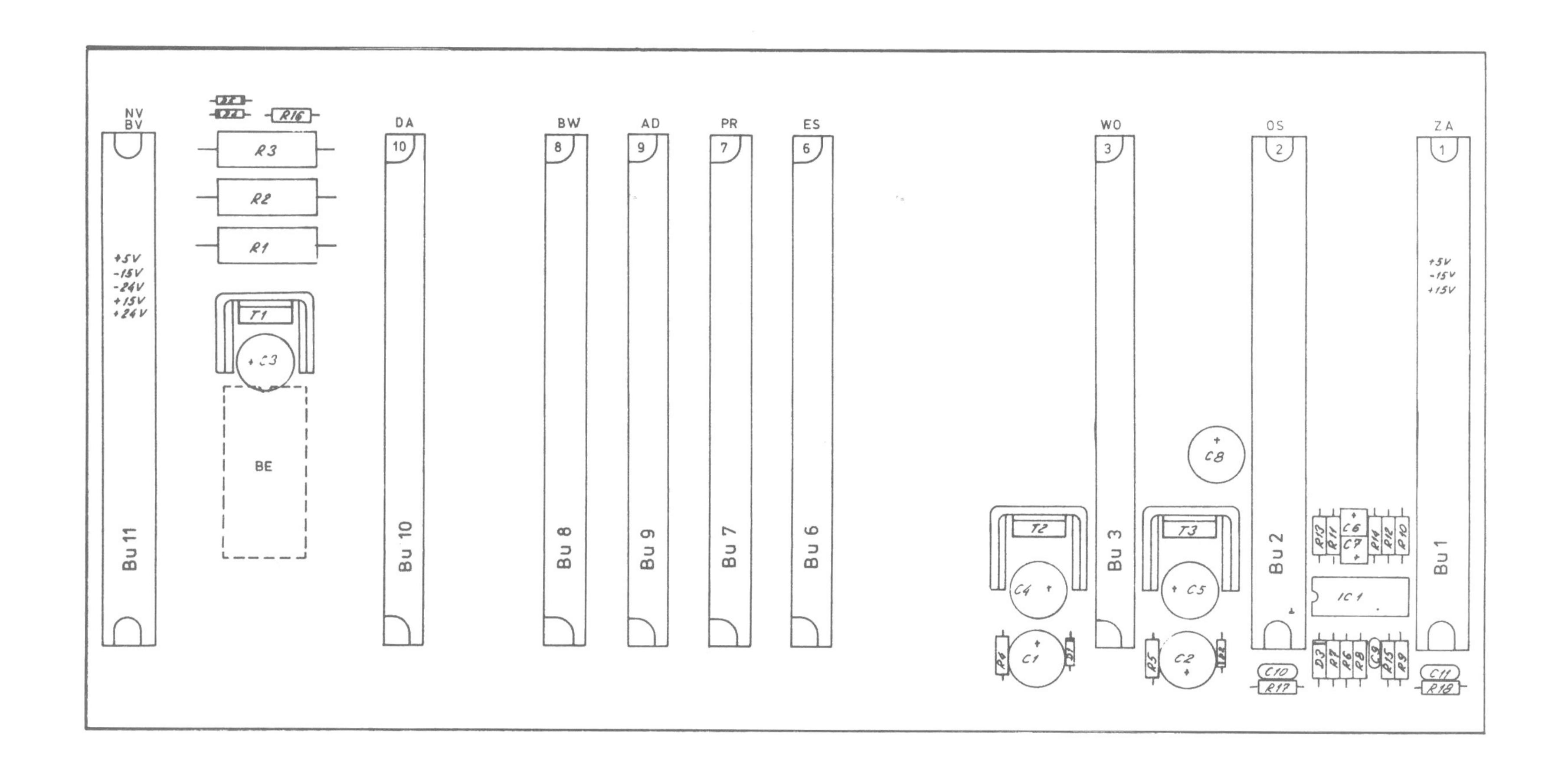


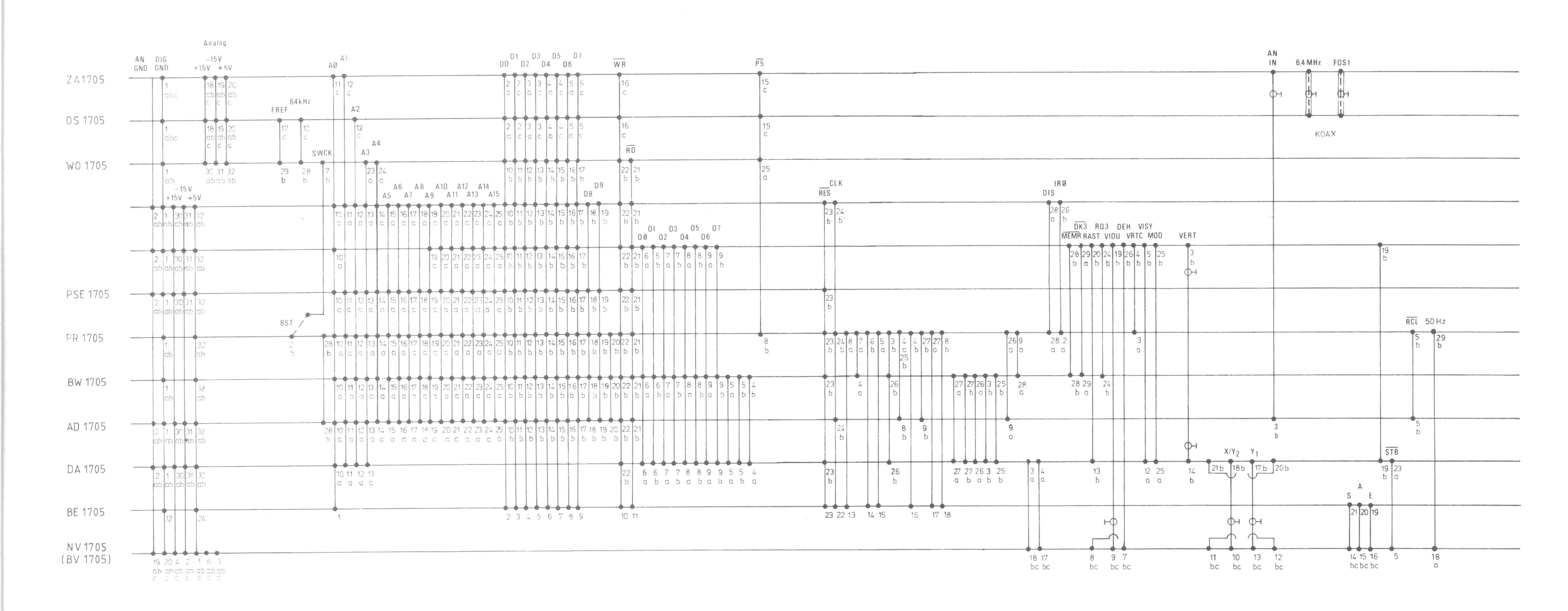


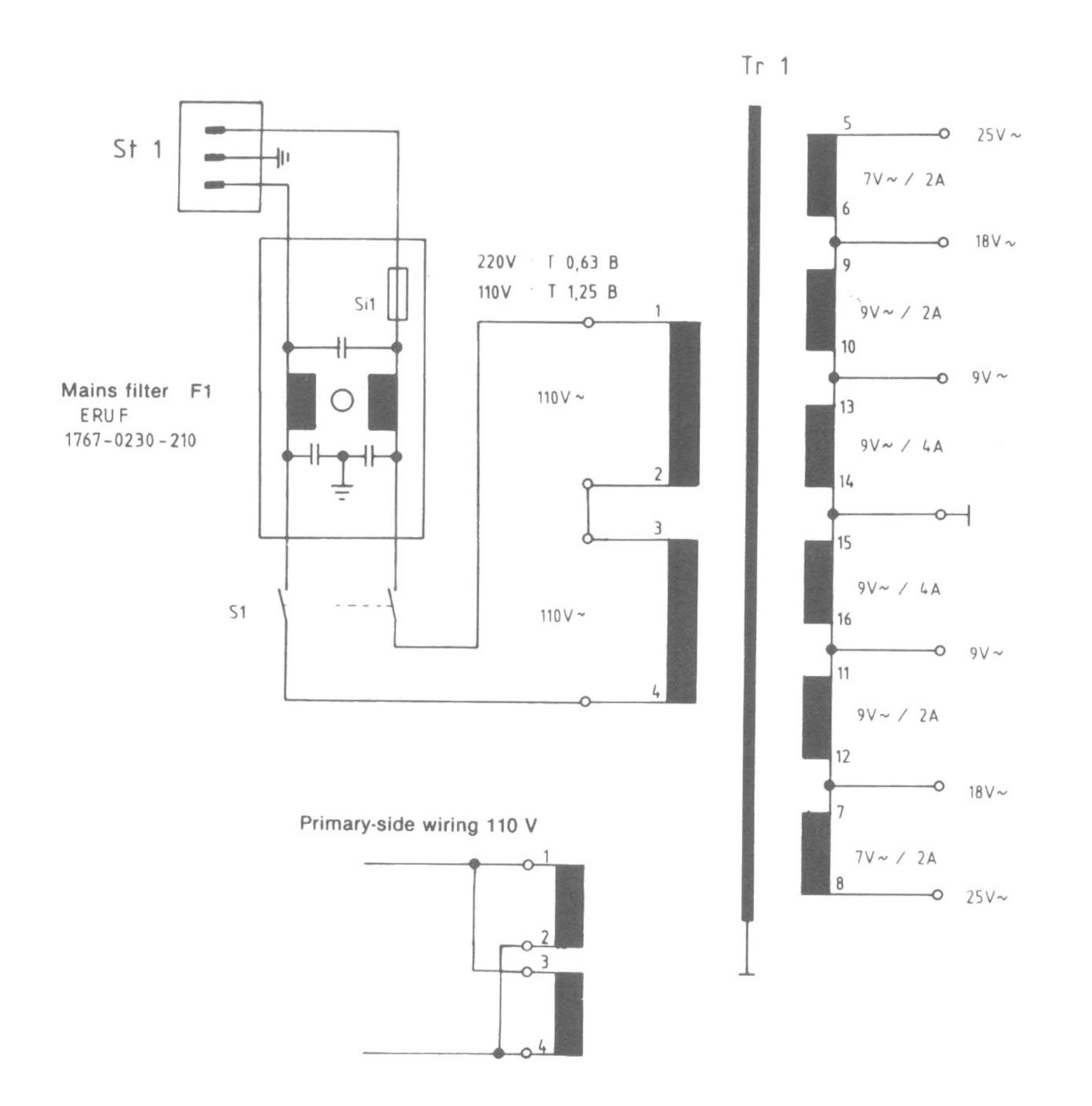


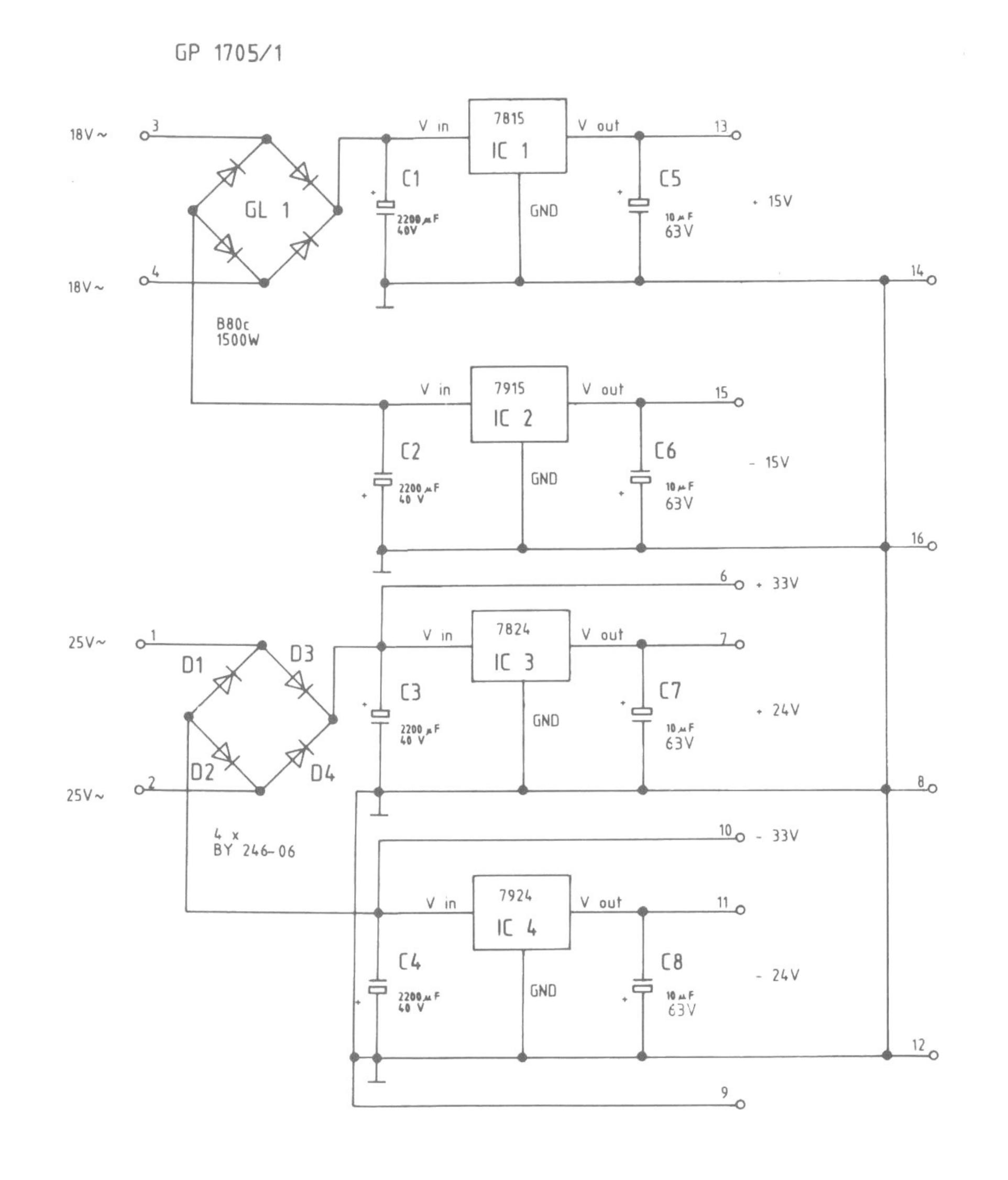


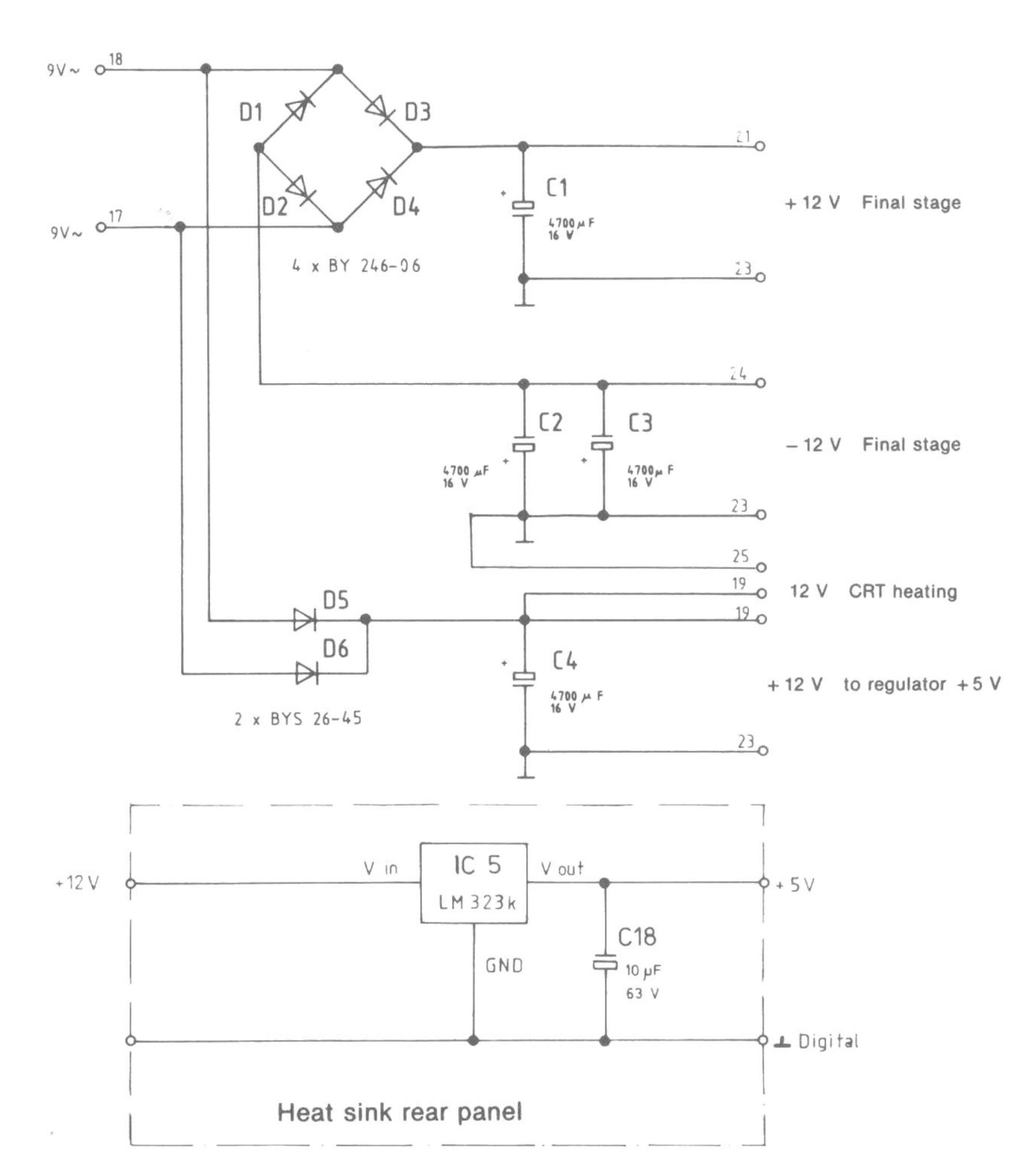




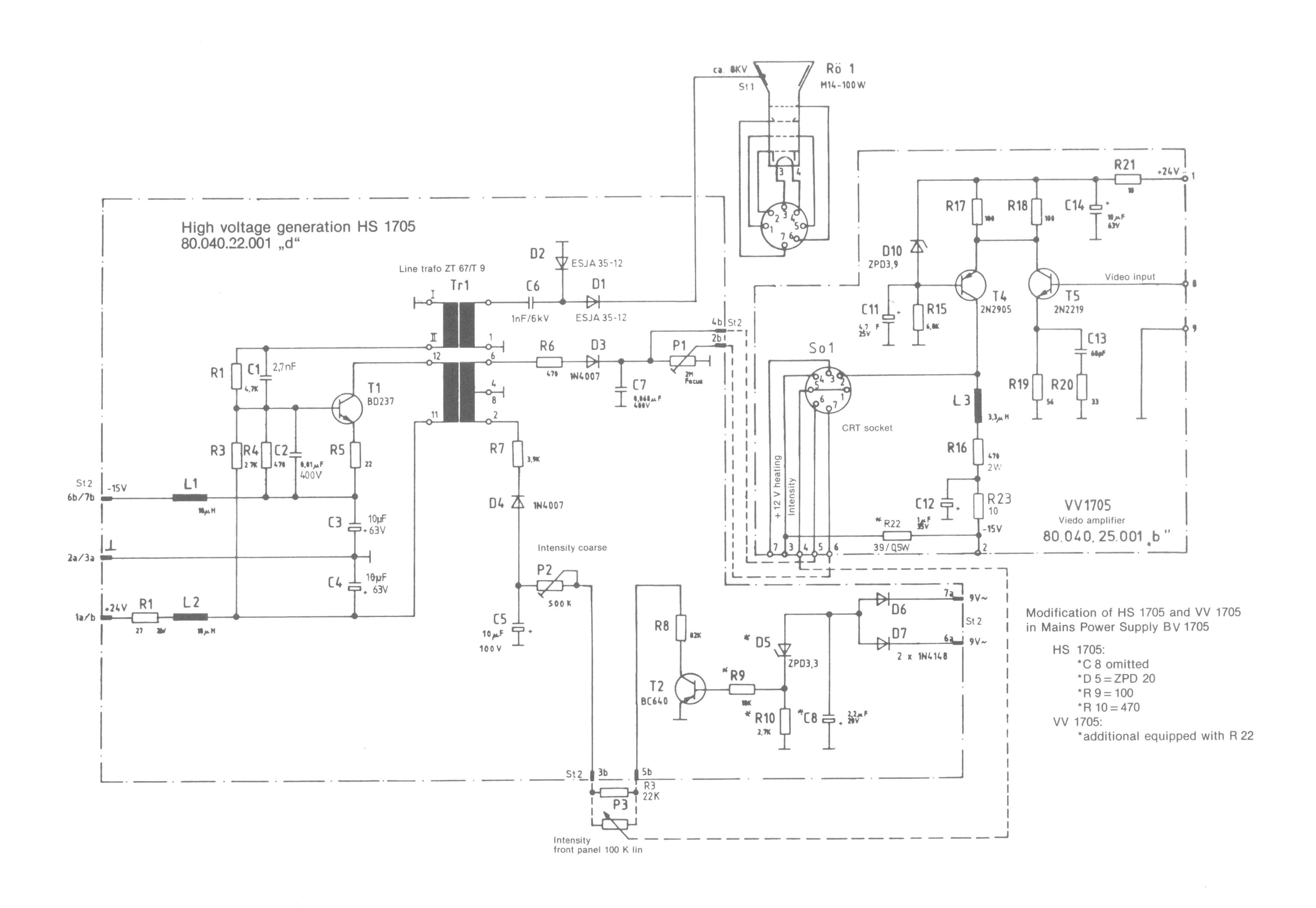


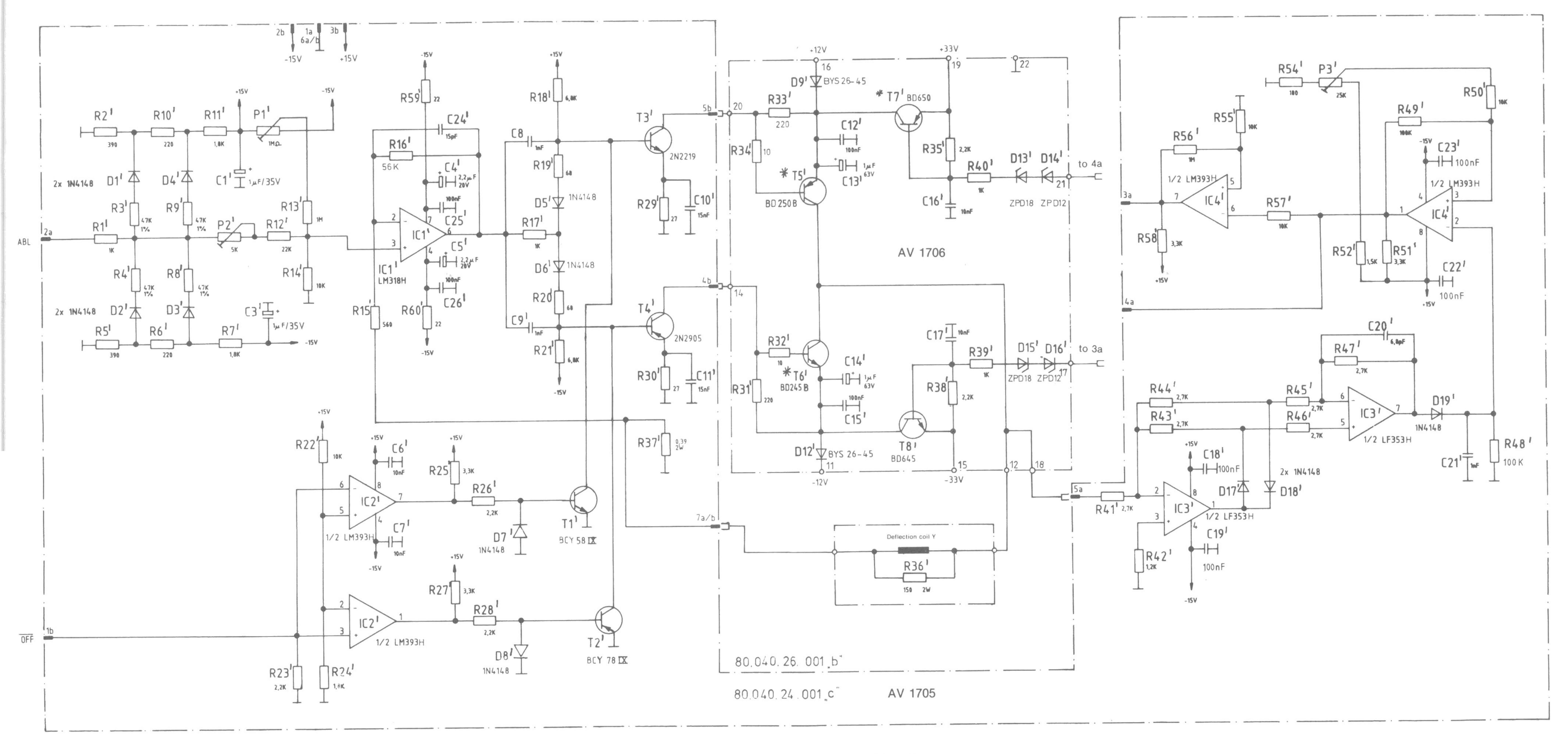






GP 1705/2

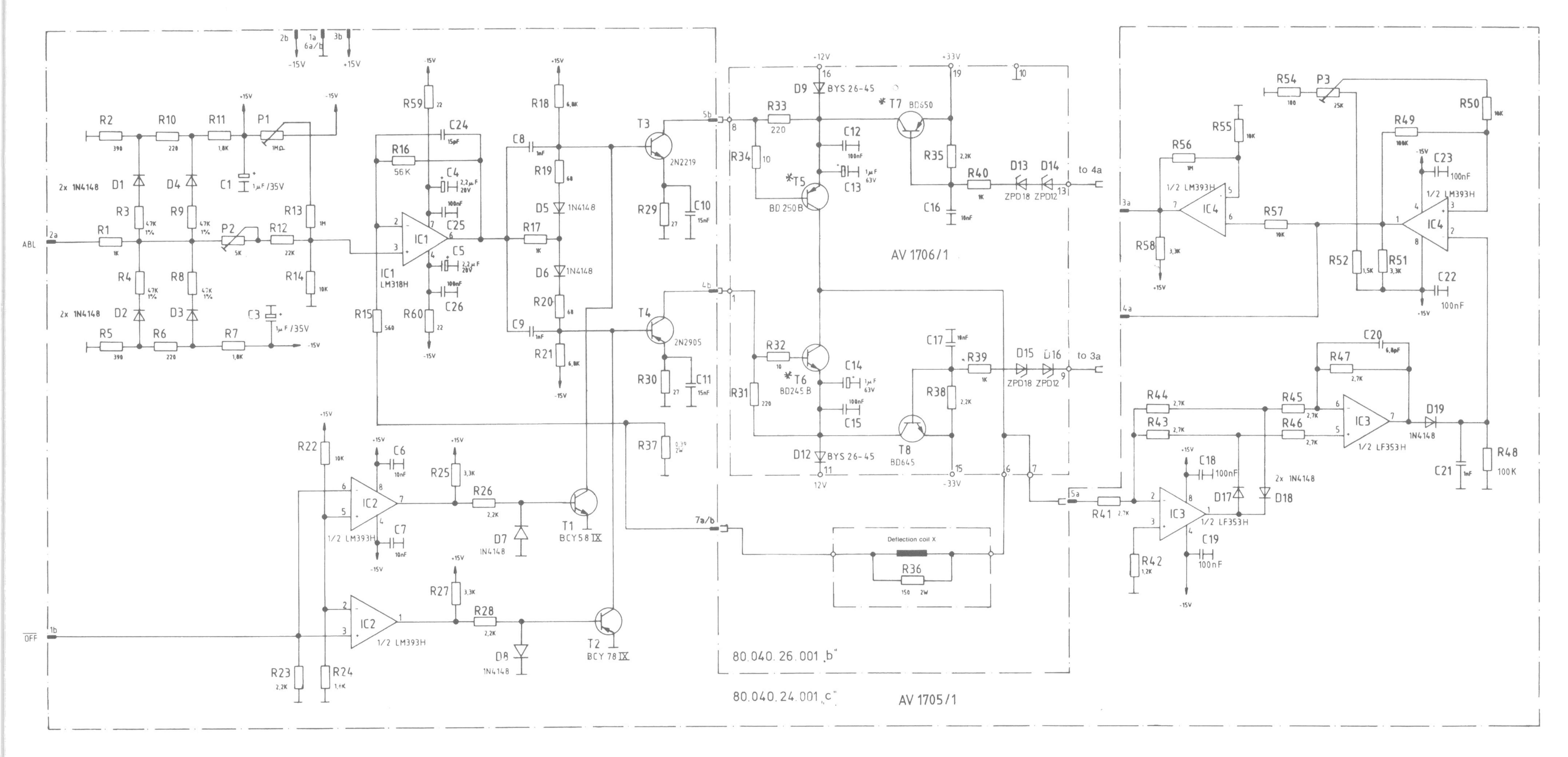




Modification of the final stage AV 1706 in Battery Power Supply Version BV 1705:

- * T 7 omitted
- * T 5 = BD 746 B
- * T 6 = BD 745 B

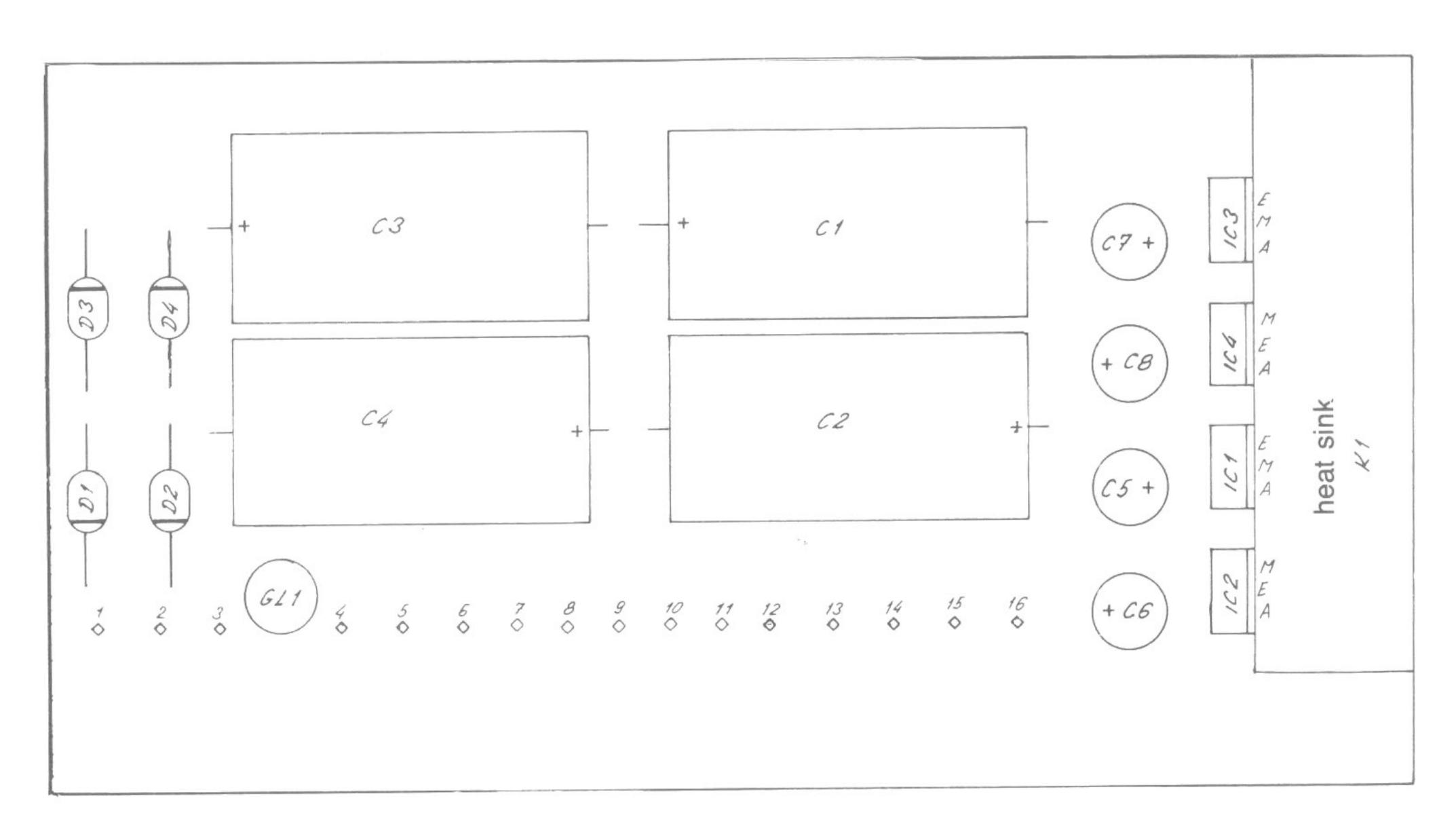
additional equipped with C 19 10 μ F/63 V (See Annex 16, Sheet 5)



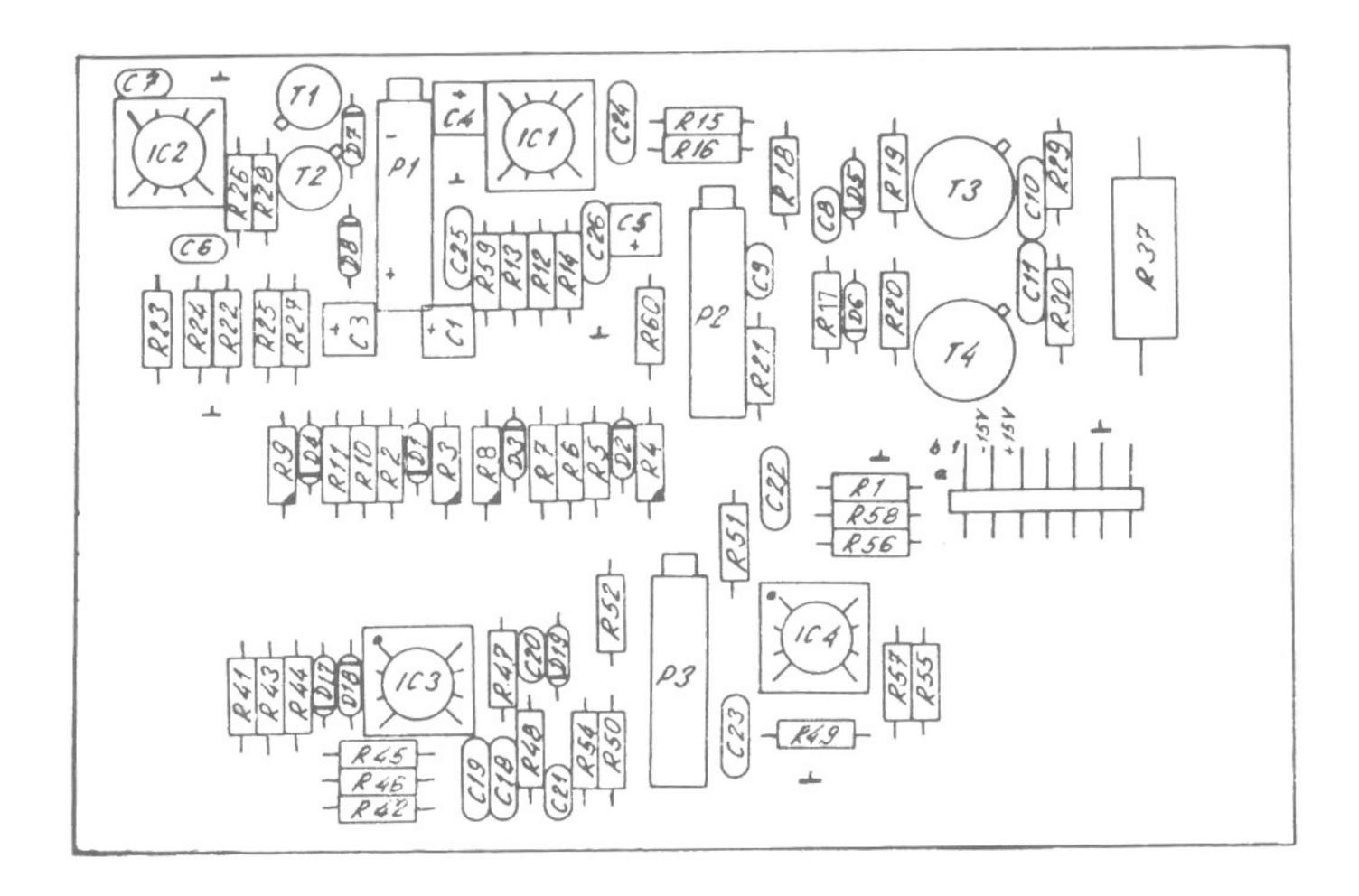
Modification of the final stage AV 1706/1 in Battery Power Supply Version BV 1705:

- * T 7' omitted
- * T 5' = BD 746 B
- * T 6' = BD 745 B

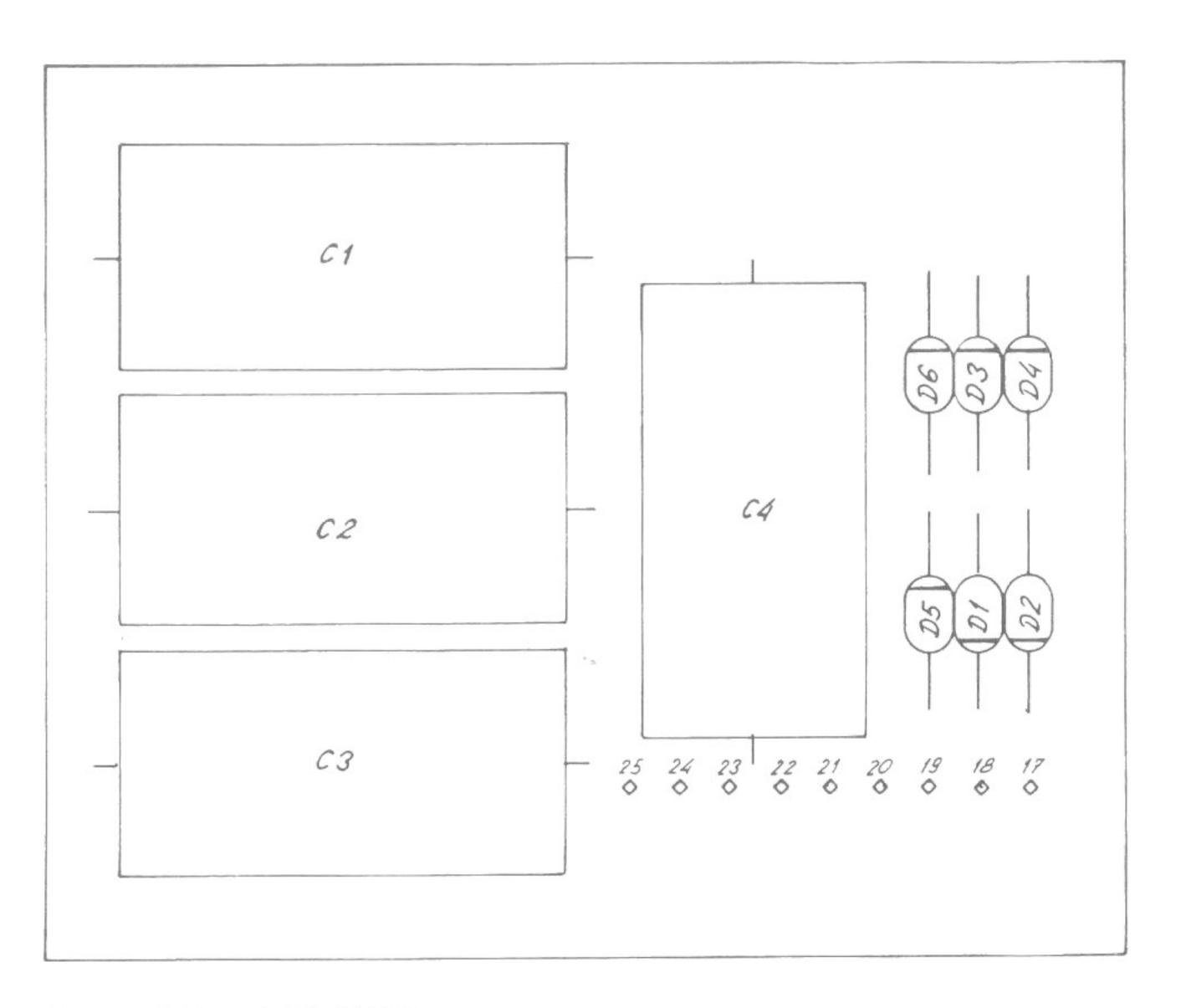
additional equipped with C 19 10 μ F/63 V (See Annex 16, Sheet 5)



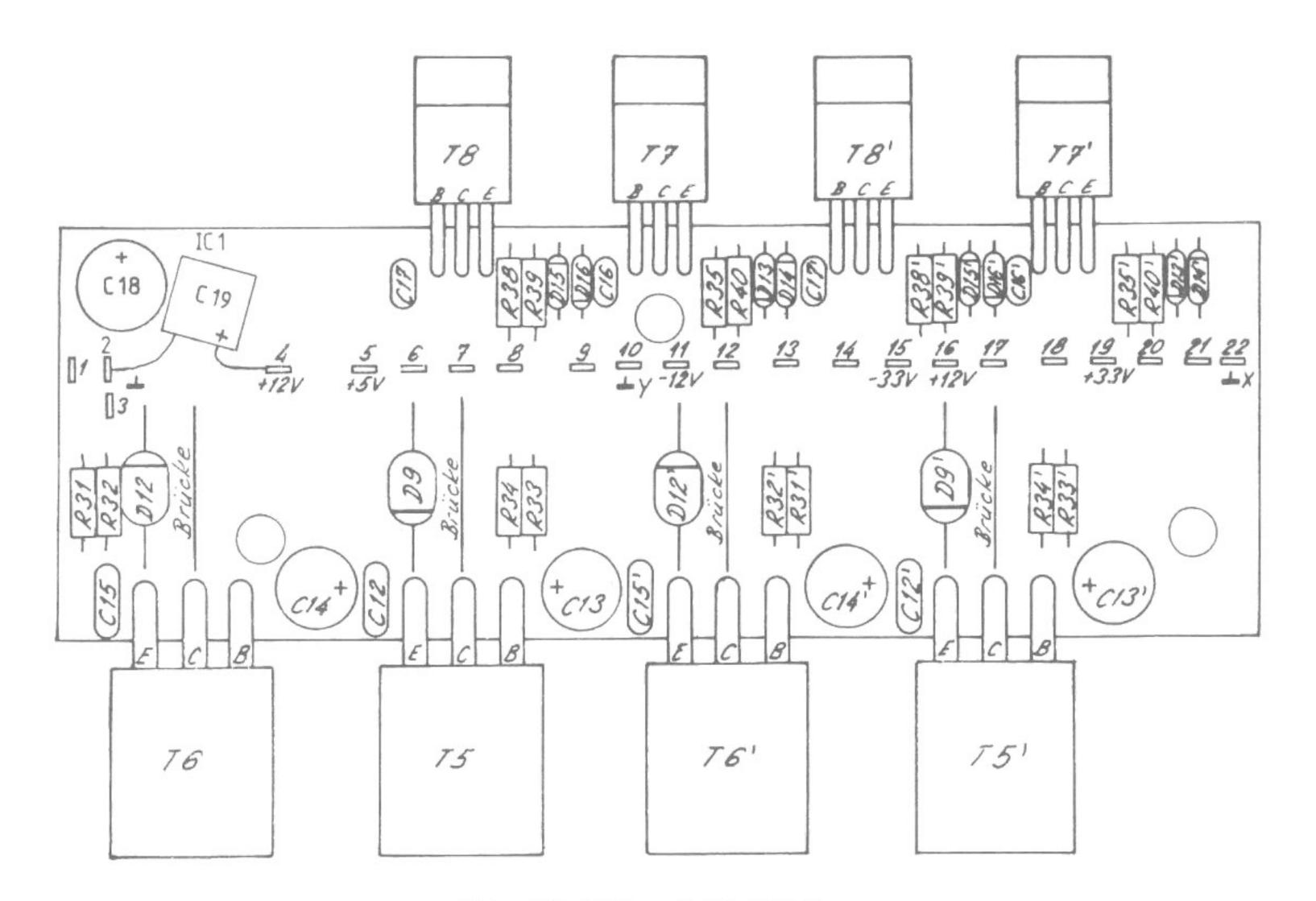
Mains unit board GP 1705/1 in NV 1705 and NB 1705 identically



Y-Deflection Preamplifier AV 1705 (X-Deflection Preamplifier AV 1705/1 identically) in NV 1705, BV 1705 and NB 1705

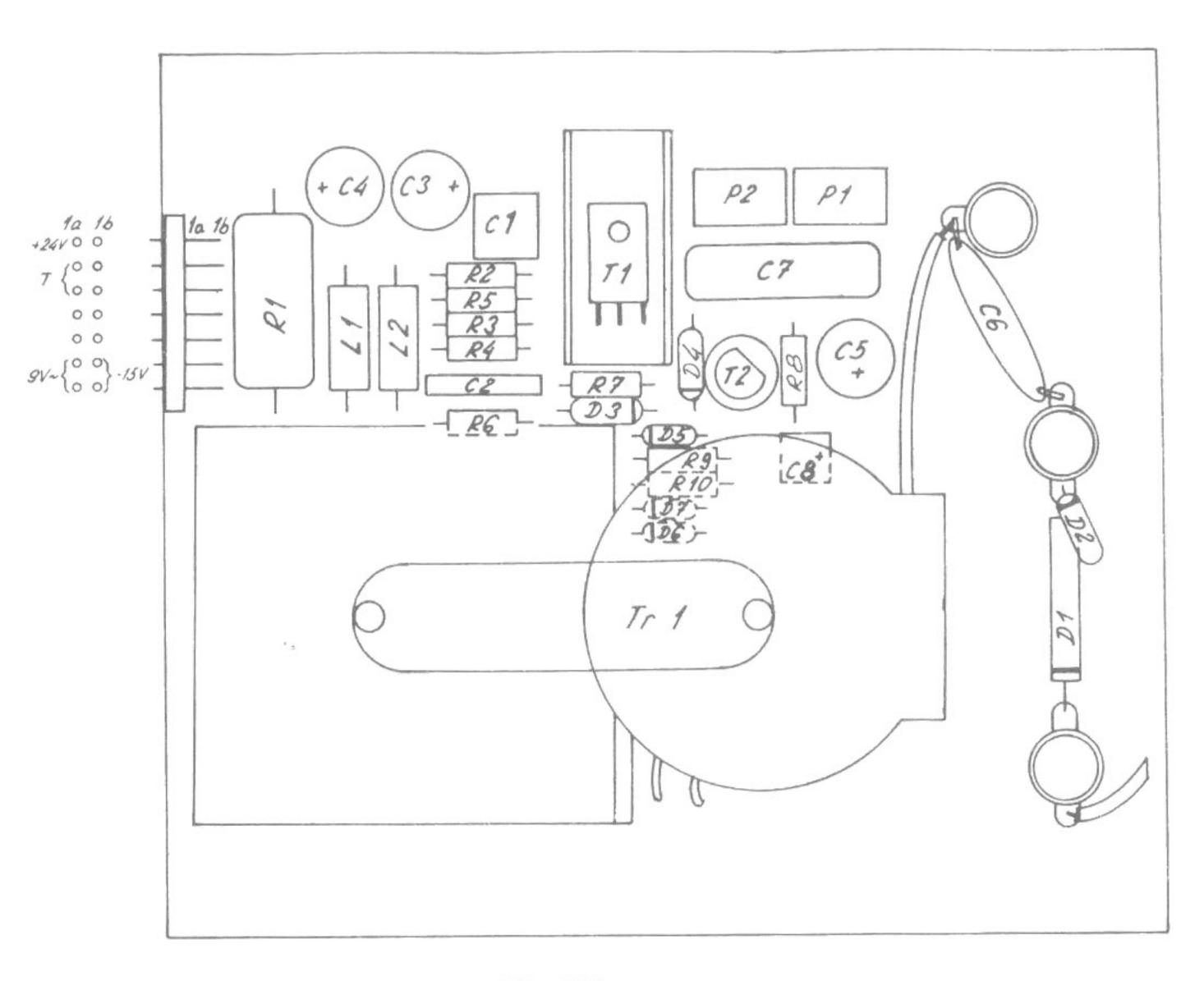


Mains unit board GP 1705/2 in NV 1705 and NB 1705 identically



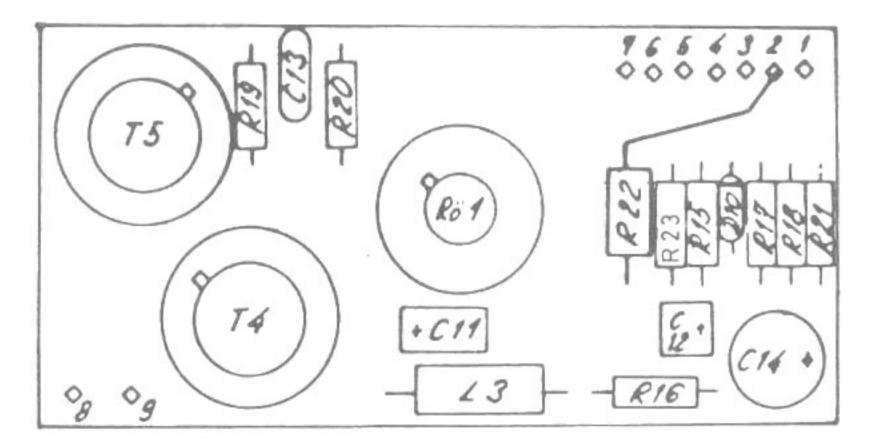
X-Y Final Deflection stage Amplifier AV 1706 and AV 1706/1

Modification for Battery Power Supply BV 1705 and NB 1705:
T 7 and T 7' omitted.
additional equipped with C 19.
T 5 and T 5' = BD 746 B
T 6 and T 6' = BD 745 B



High Voltage Generation HS 1705

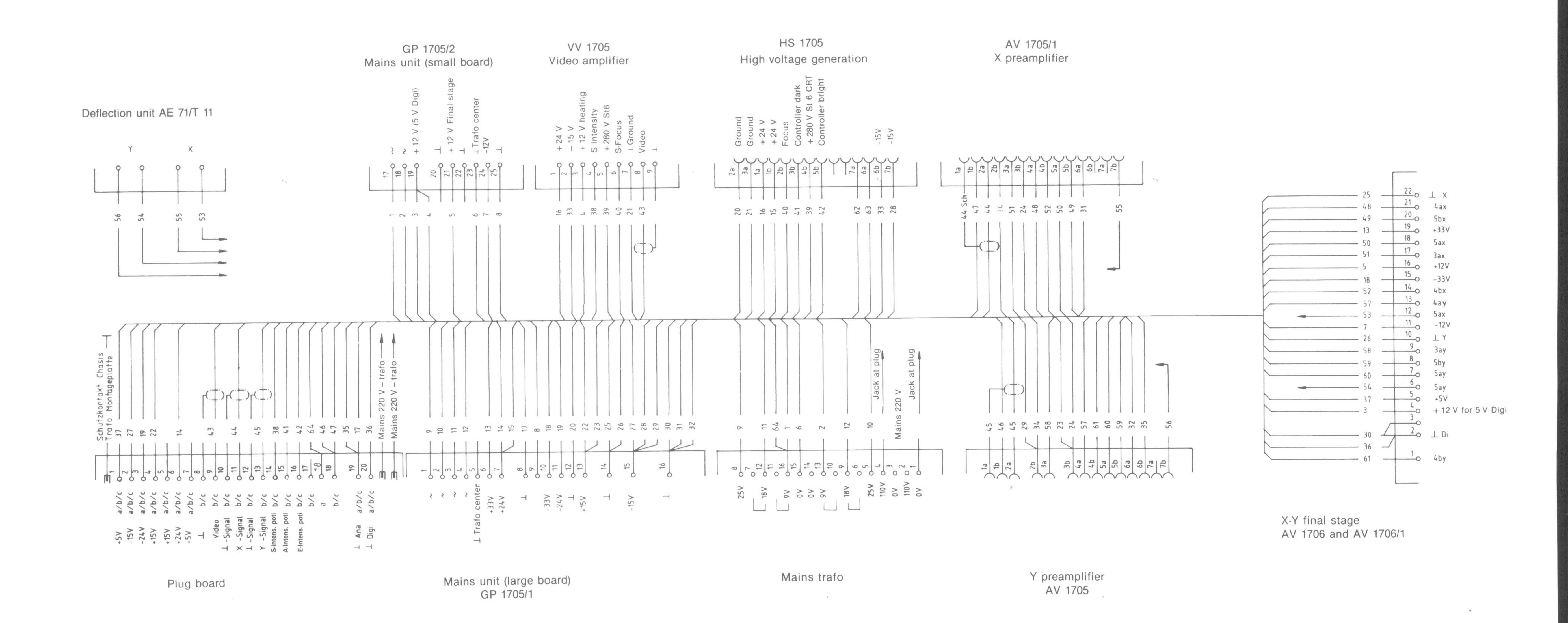
Modification in NB 1705: D 5 = ZPD 20 D 9 = 100 Ω D 10 = 470 Ω C 8 omitted

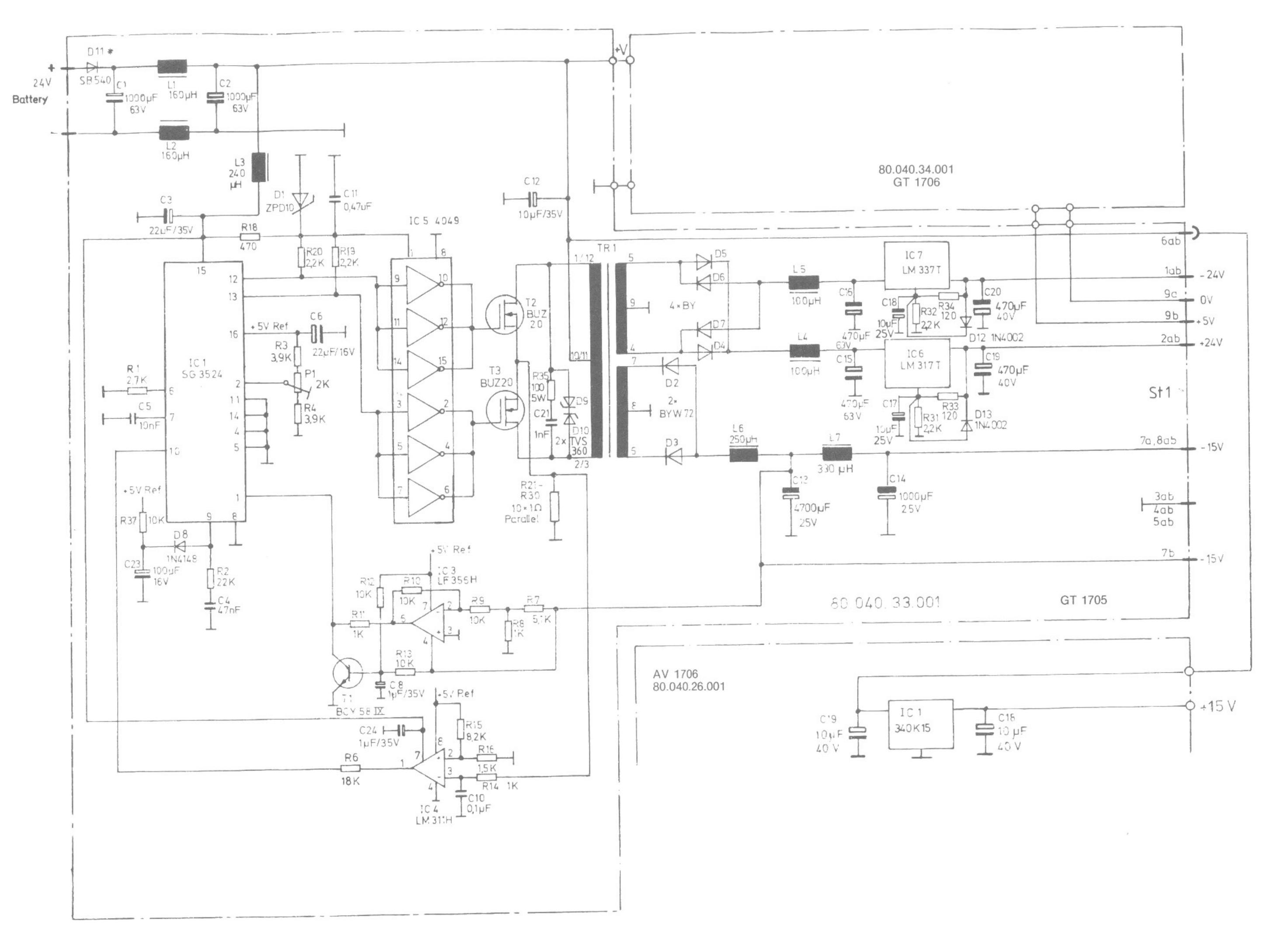


CRT socket and Video Amplifier VV 1705

Modification in NB 1705: additional equipped with R 22

Components Layout Diagrams
Mains Power Supply and CRT Circuitries
Annex 16, Sheet 5





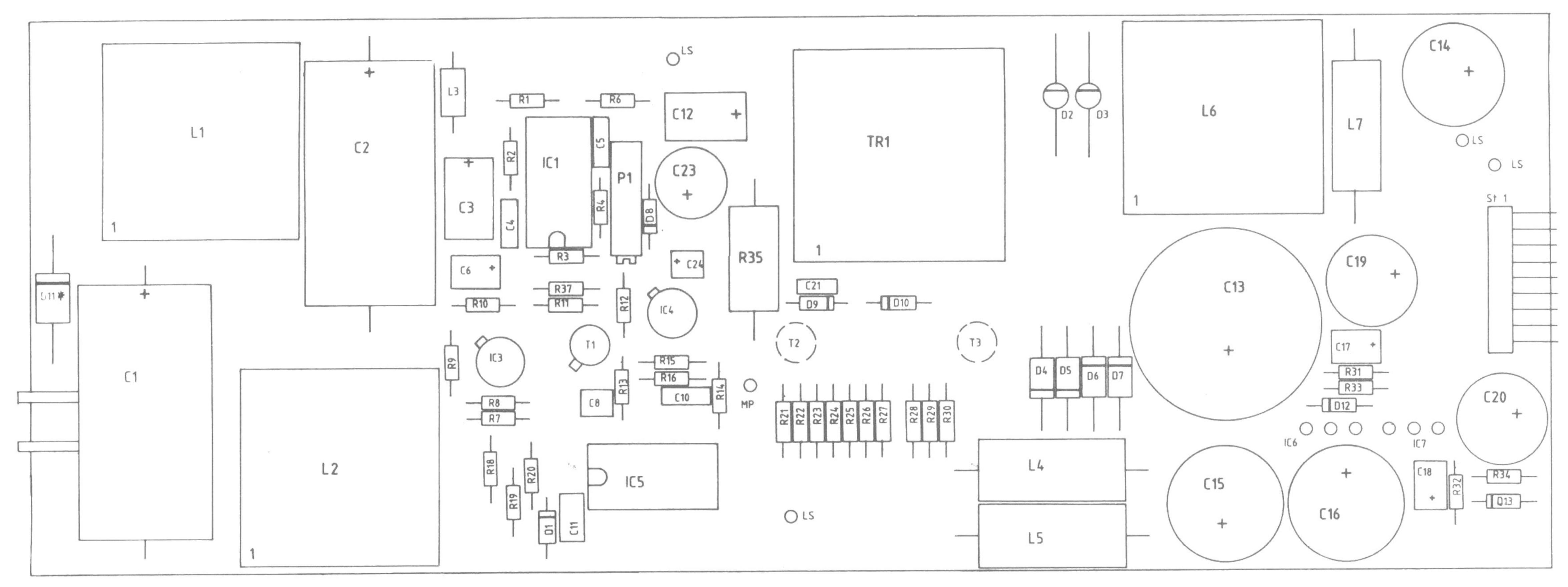
GT 1705

Modification for Mains-/Battery Power Supply NB 1705:

* D 11 omitted (for it a jumper)

GT 1706

Circuit Diagrams
Battery Power Supply BV 1705
(with GT 1705 and GT 1706)
Annex 17, Sheet 1

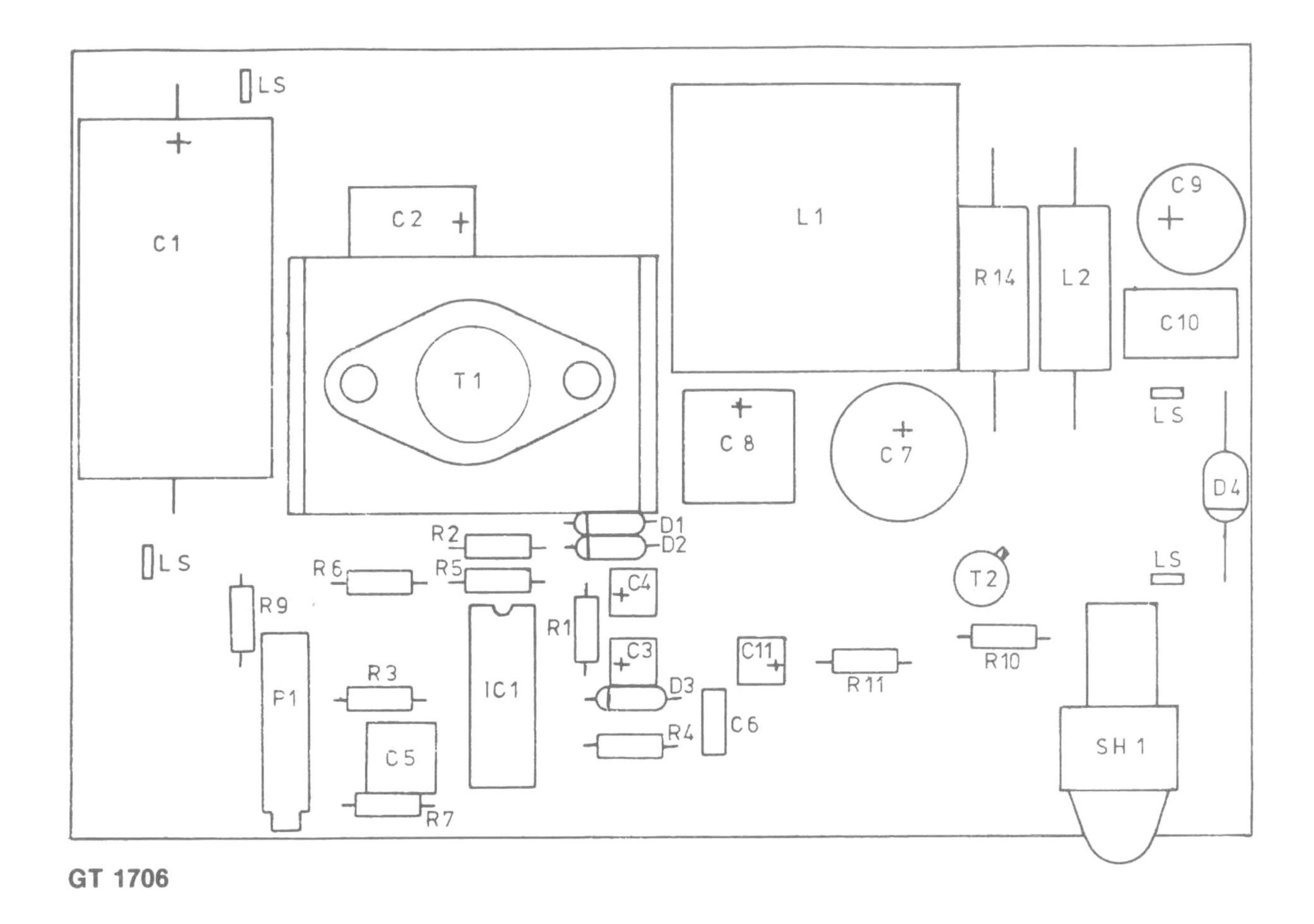


GT 1705

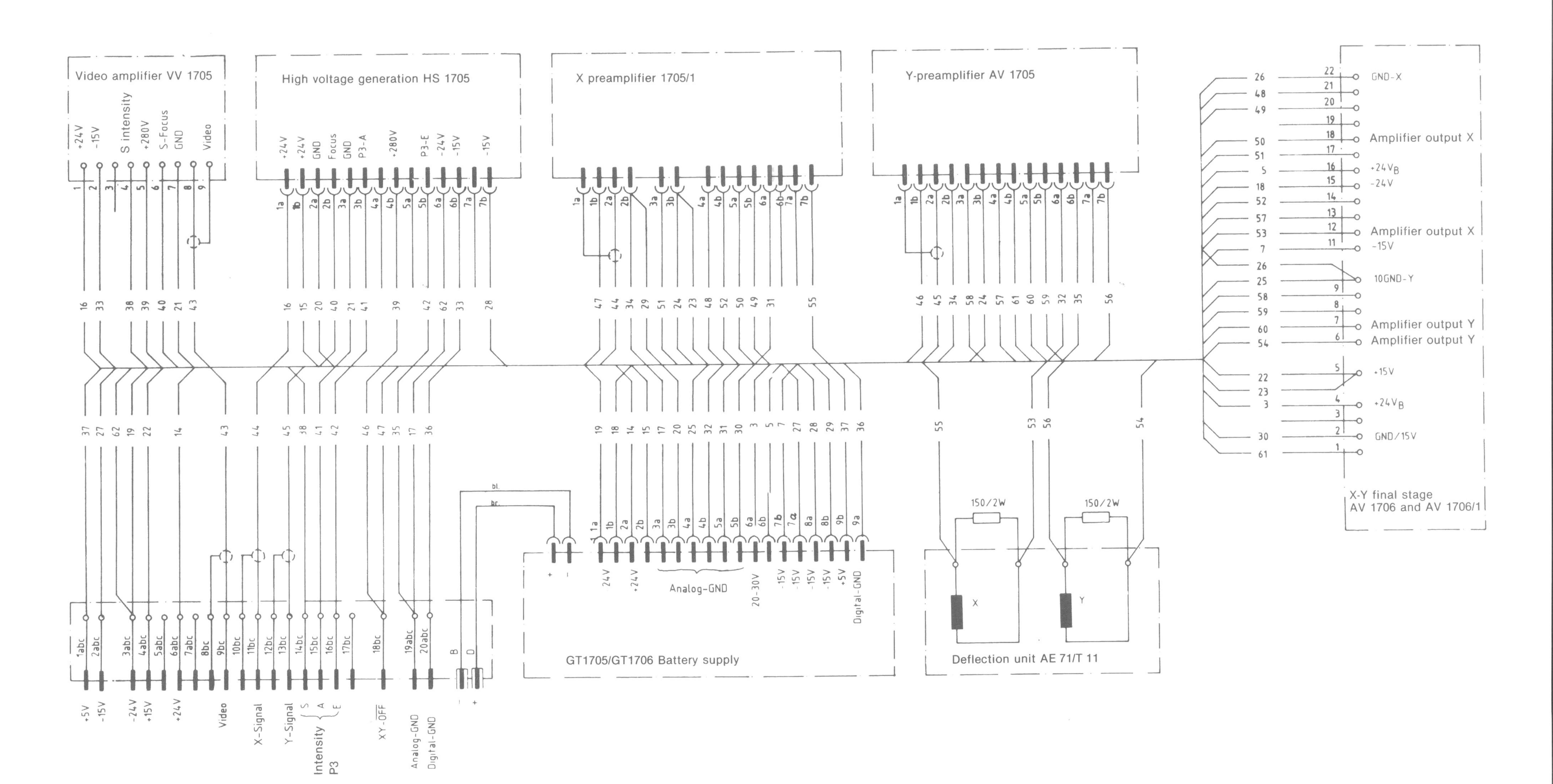
Modification for Mains-/Battery Power Supply NB 1705:

* D 11 omitted (for it a jumper)

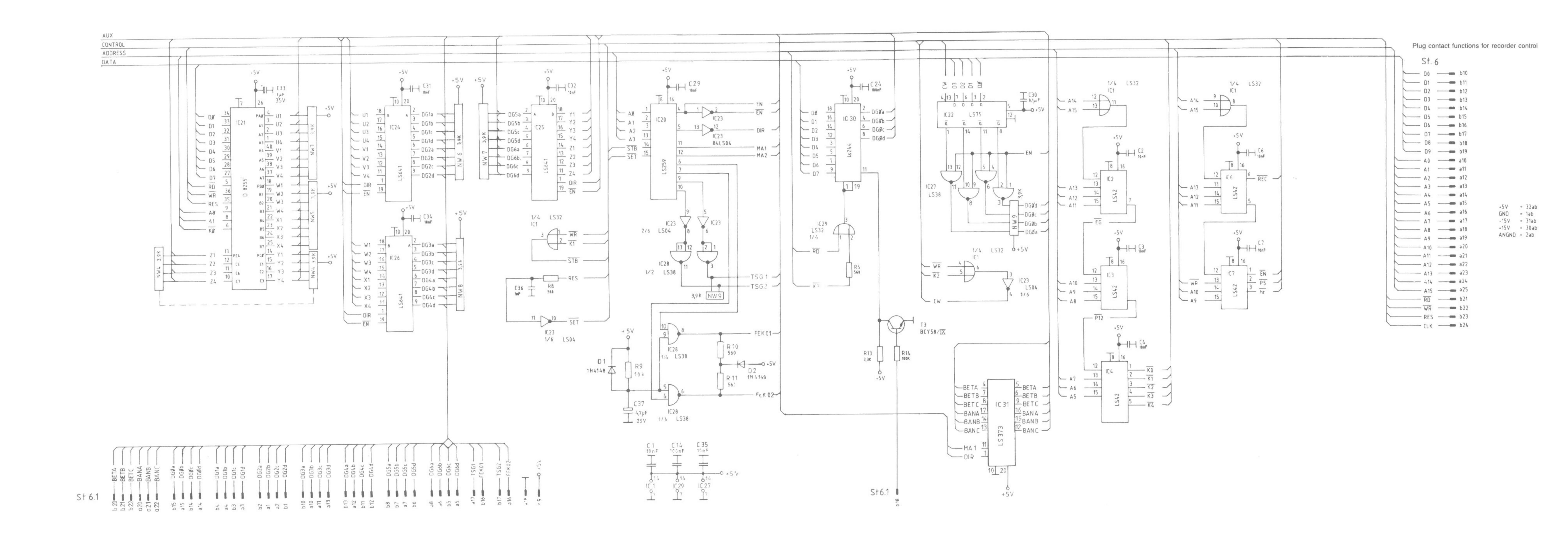
T 2, T 3, IC 6 and IC 7 are mounted on the heat sink!

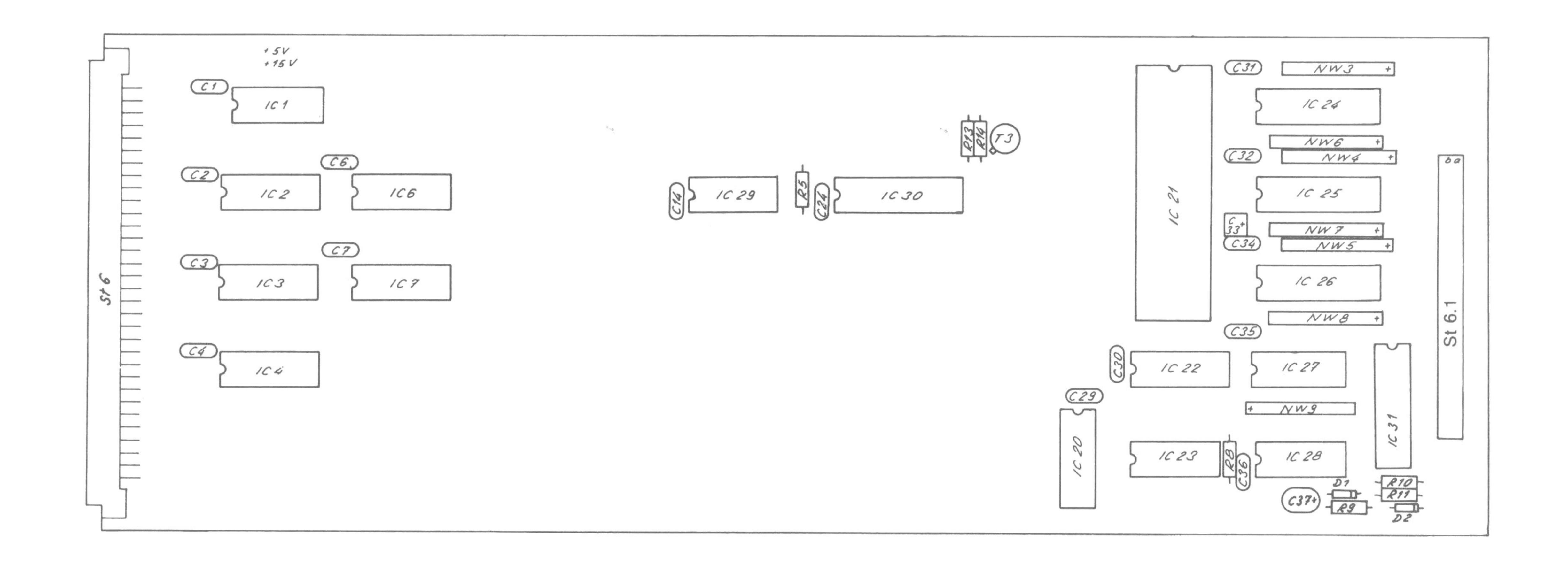


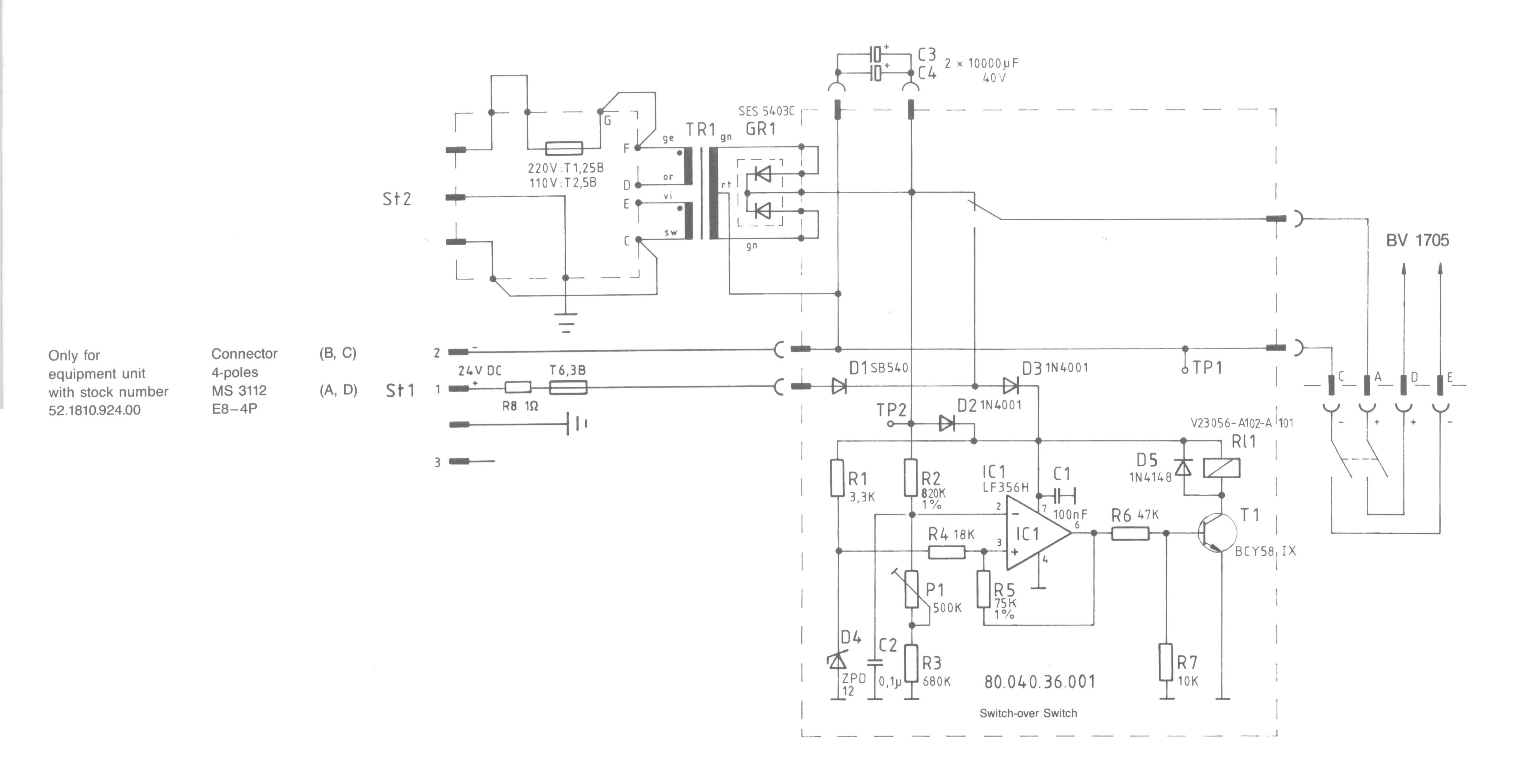
Components Layout Diagrams
Battery Power Supply BV 1705
Annex 17, Sheet 2

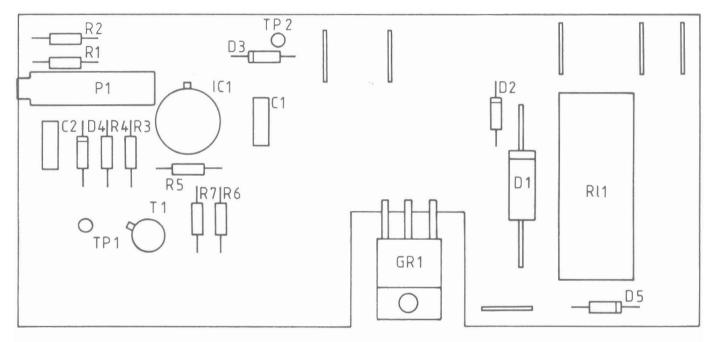


Plug board

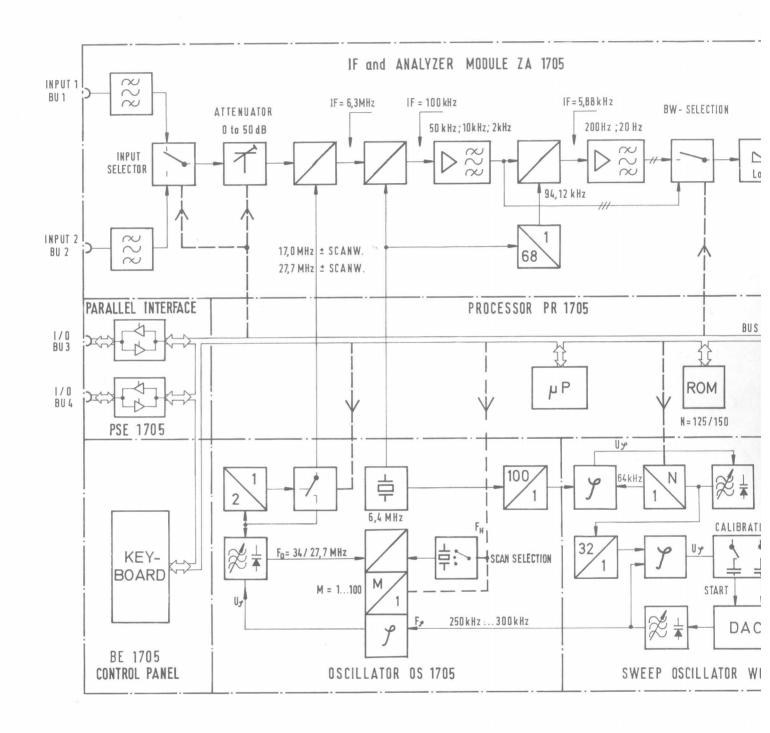


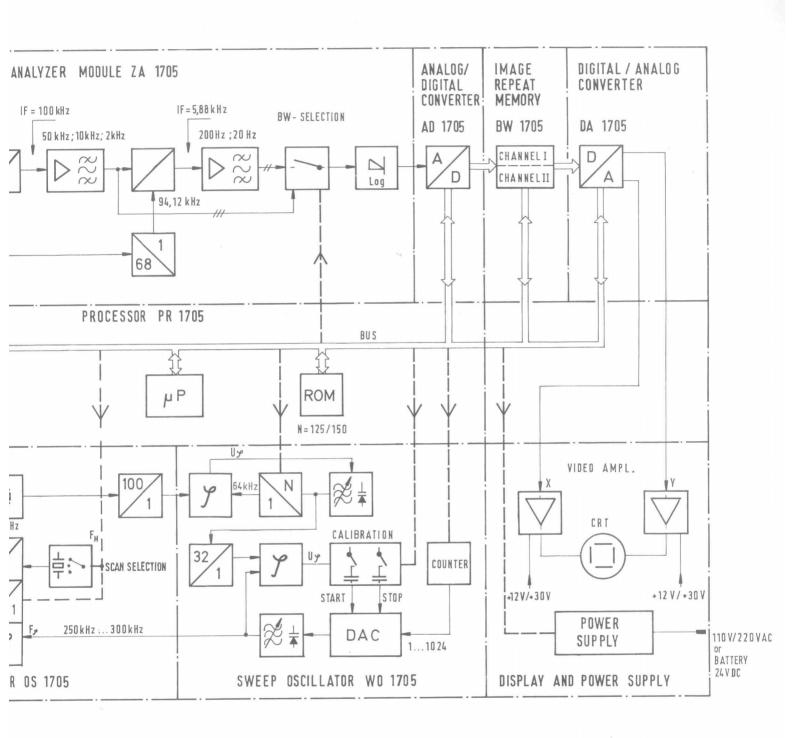


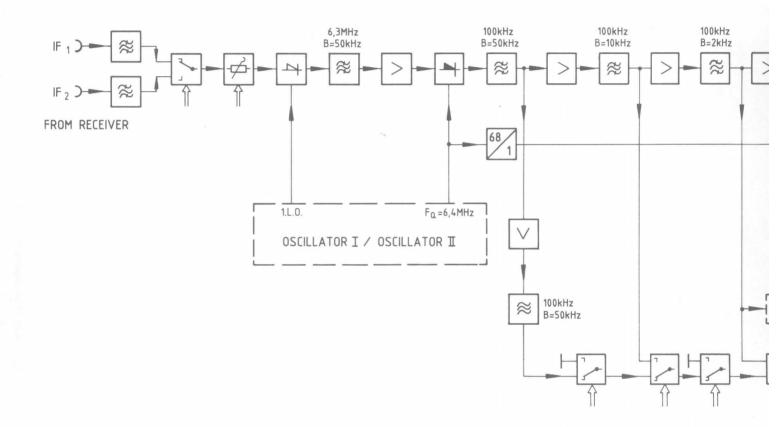


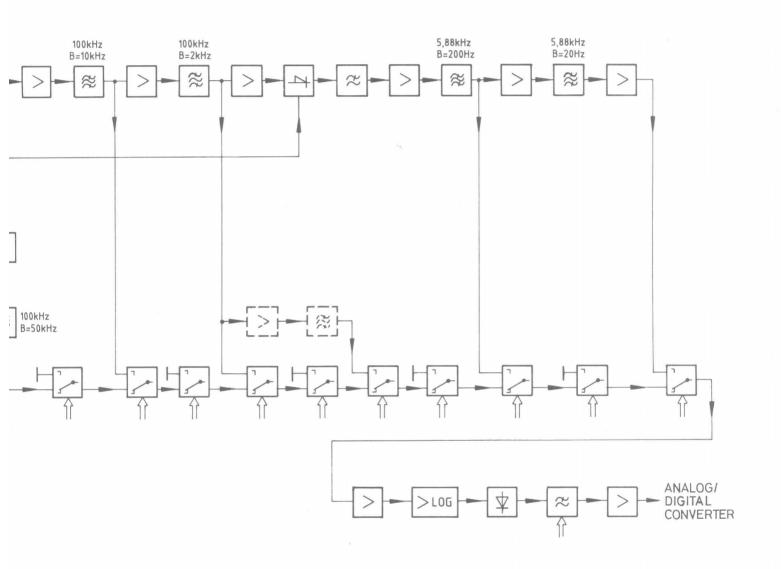


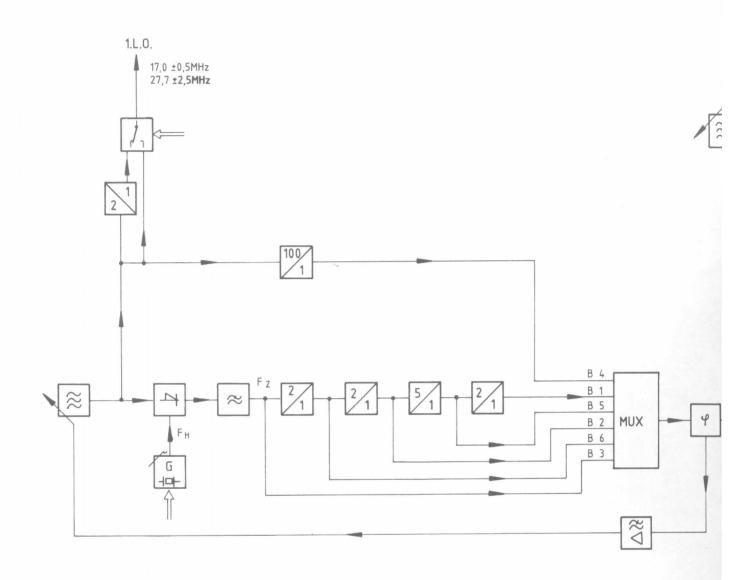
Switch-over Switch





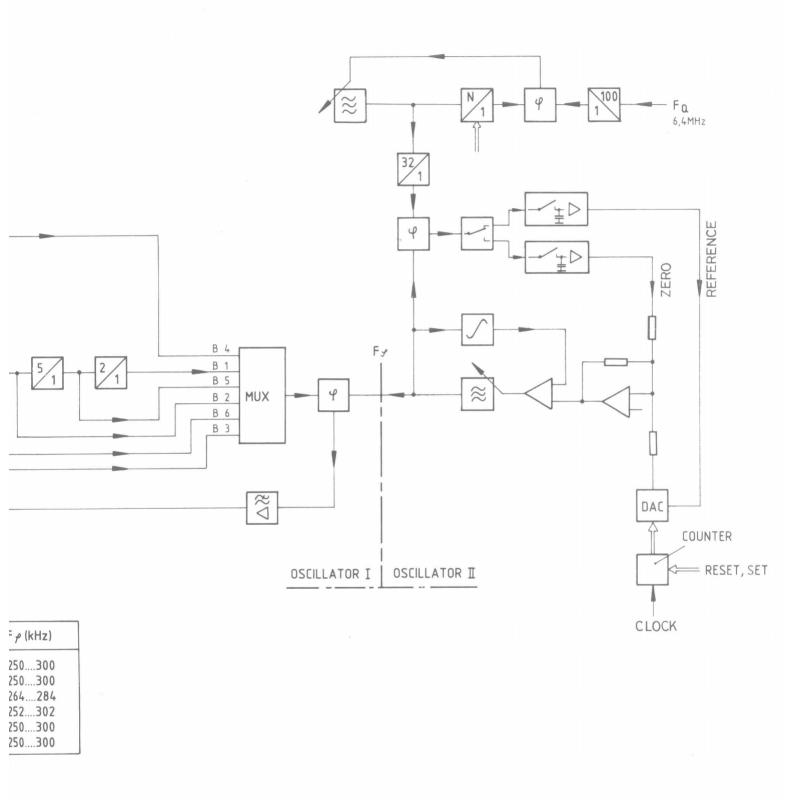




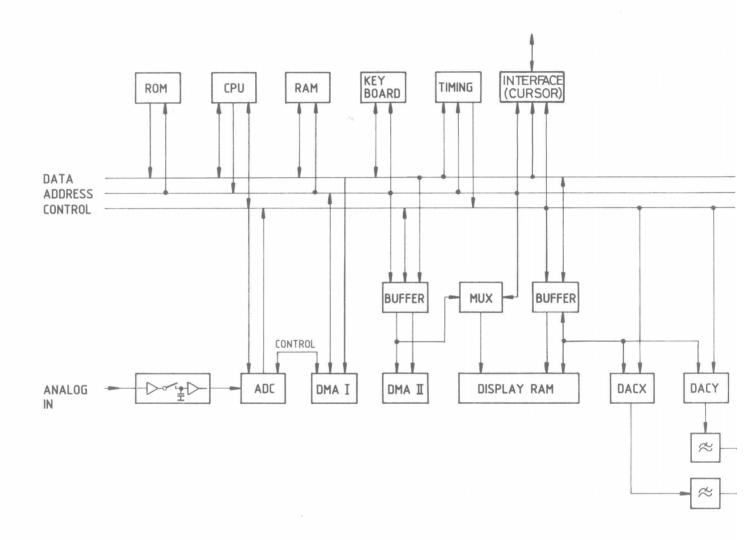


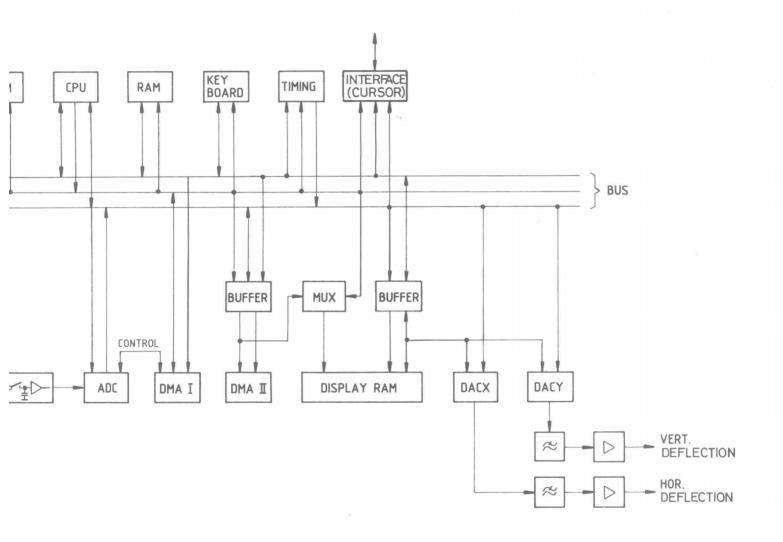
OSCILLATO

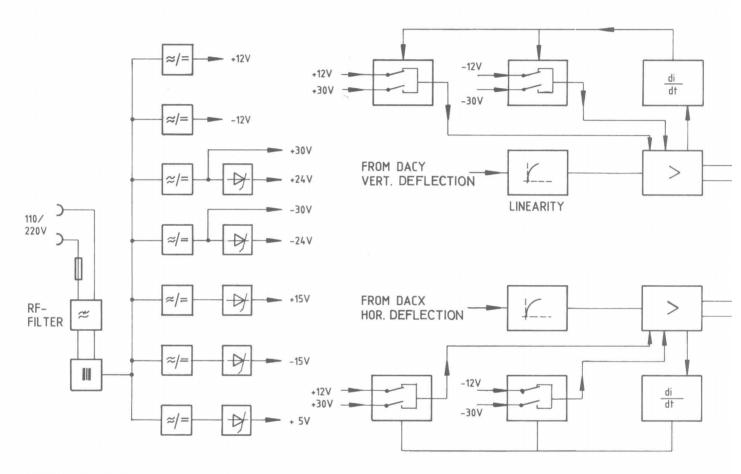
В	FE (MHz)	F _H (MHz)	F Z (MHz)	F ≠ (kHz)
1	10.7 ±0.5	23	1012	250300
2	10.7 ±0.05	32.9	11.2	250300
3	10.7 ±0.005	33.726	0.2640.284	264284
4	21.4 ±2.5			252302
5	21.4 ±0.5	22.2	56	250300
6	21.4 ±0.05	27.15	0.50.6	250300



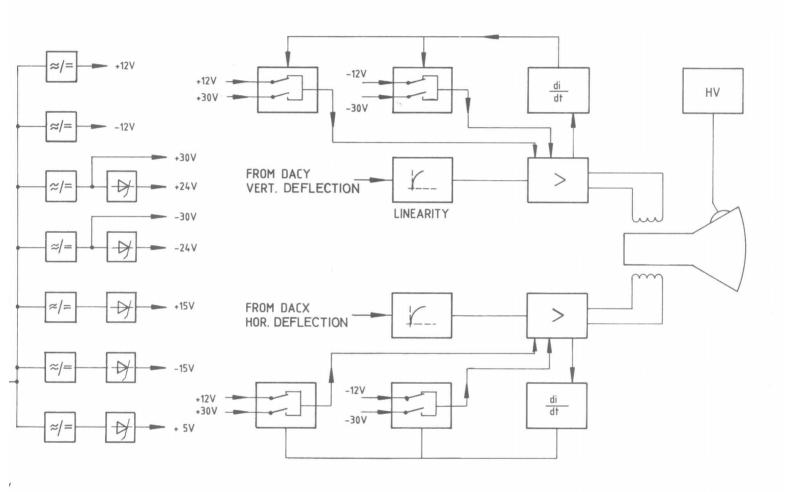
General Circuit Diagram
Oscillator OS 1705 (Oscillator I)
and Sweep Oscillator WO 1705 (Oscillator II)
Annex 3

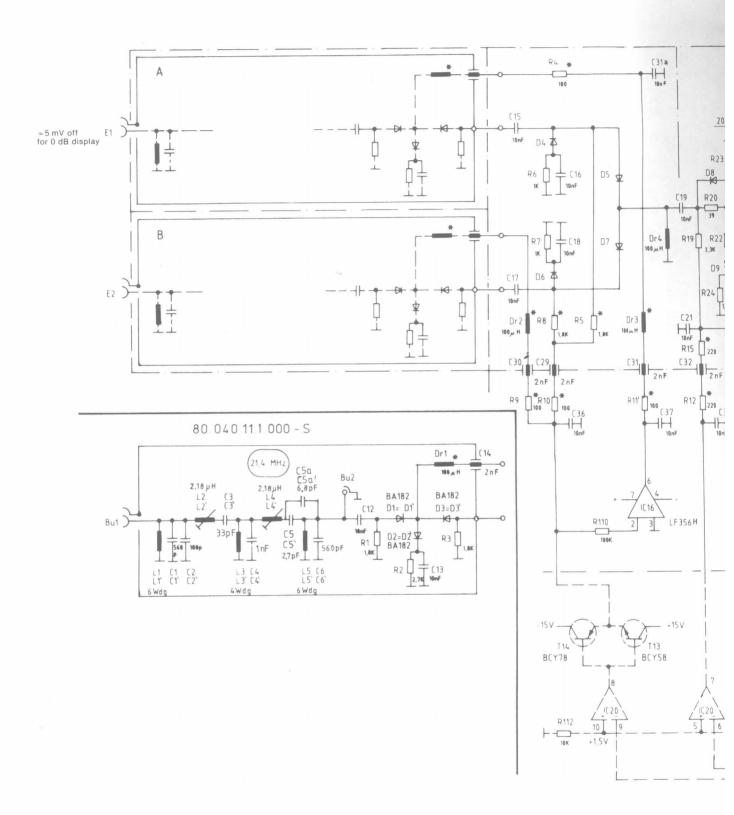


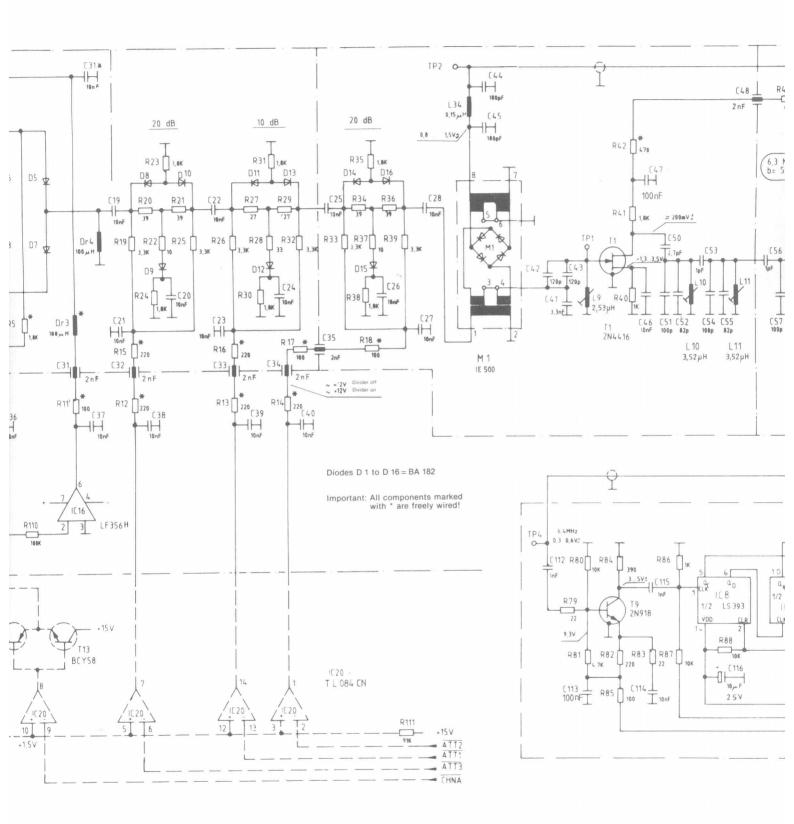


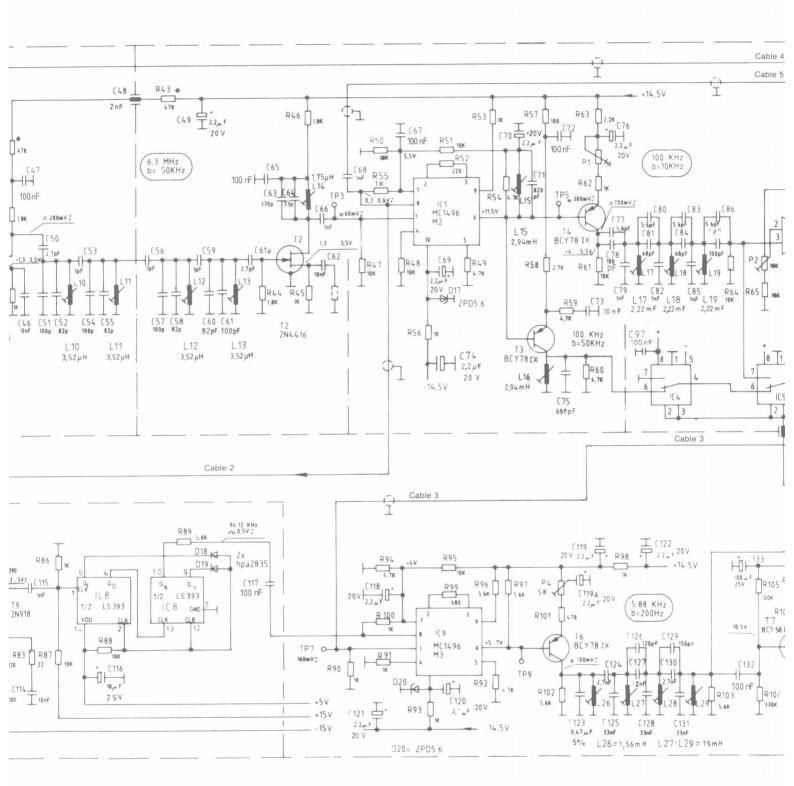


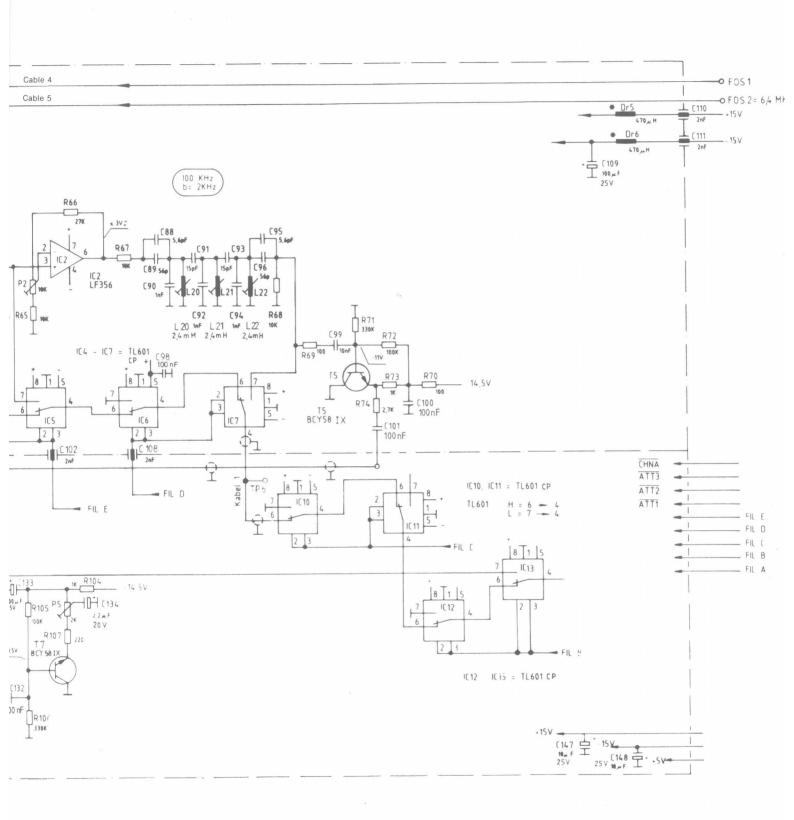
POWER SUPPLY



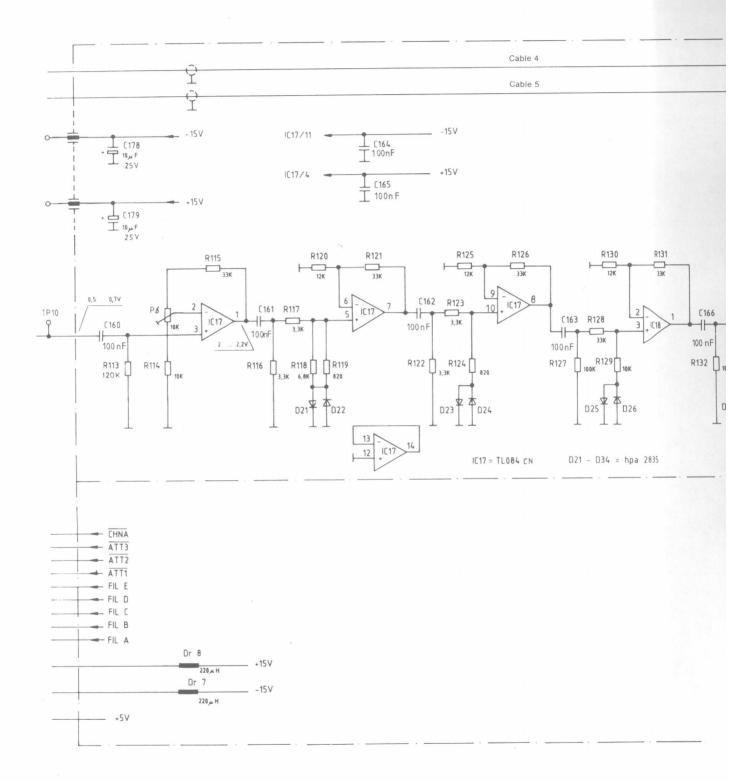


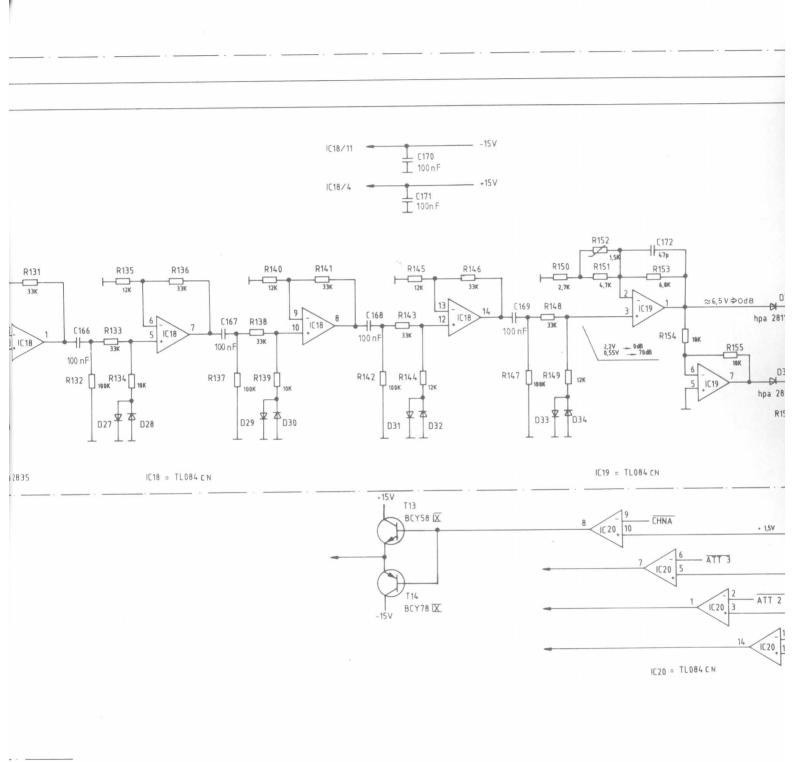


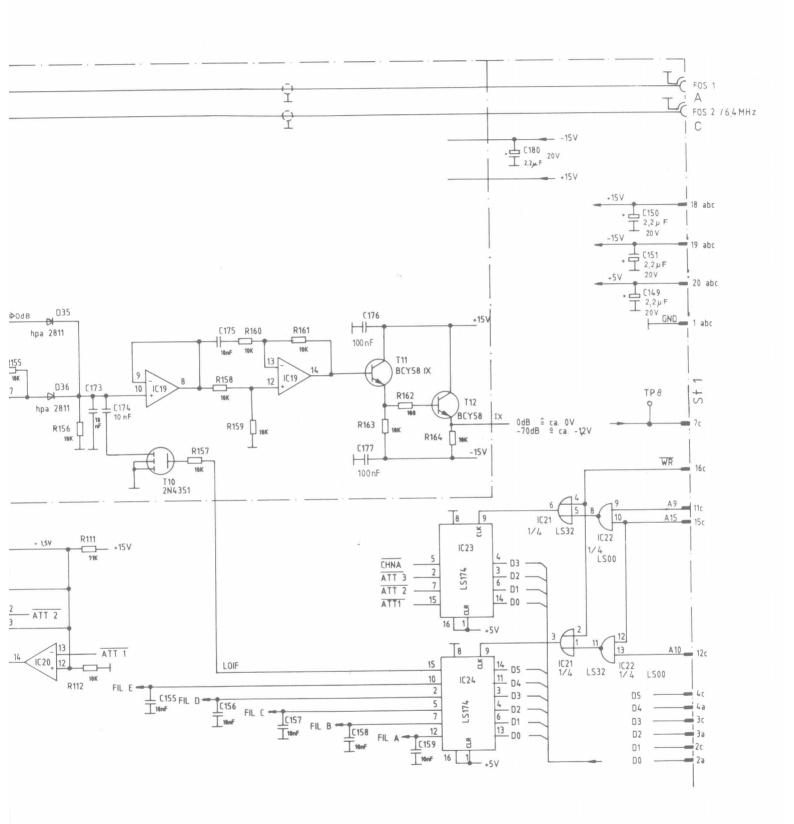




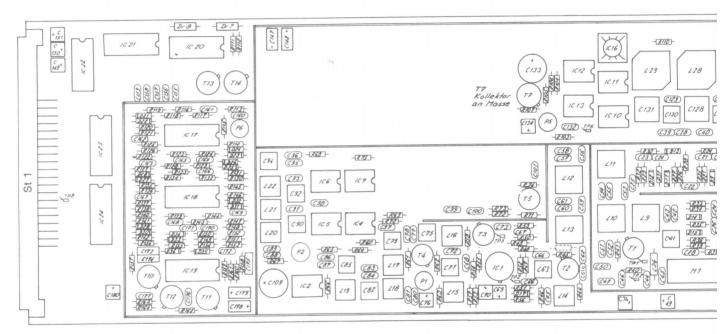
Circuit Diagra
Intermediate Frequency and Analysis Module ZA 17(
(Signal Processing 2×21.4 MH
Annex 6, Sheet



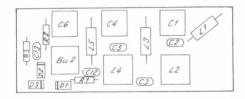




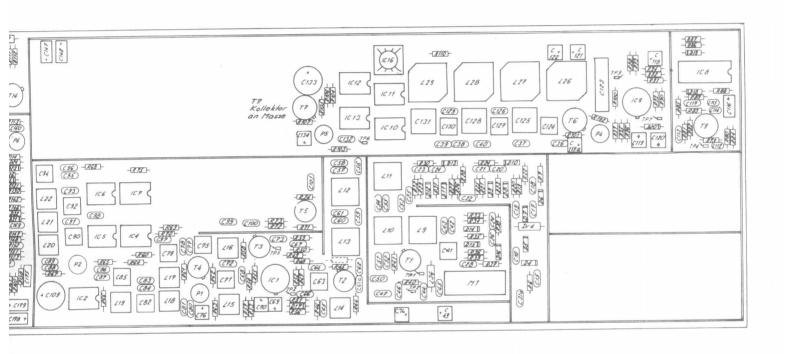
Circuit Diagram
Intermediate Frequency and Analysis Module ZA 1705
(Signal Processing 2×21.4 MHz)
Annex 6, Sheet 2



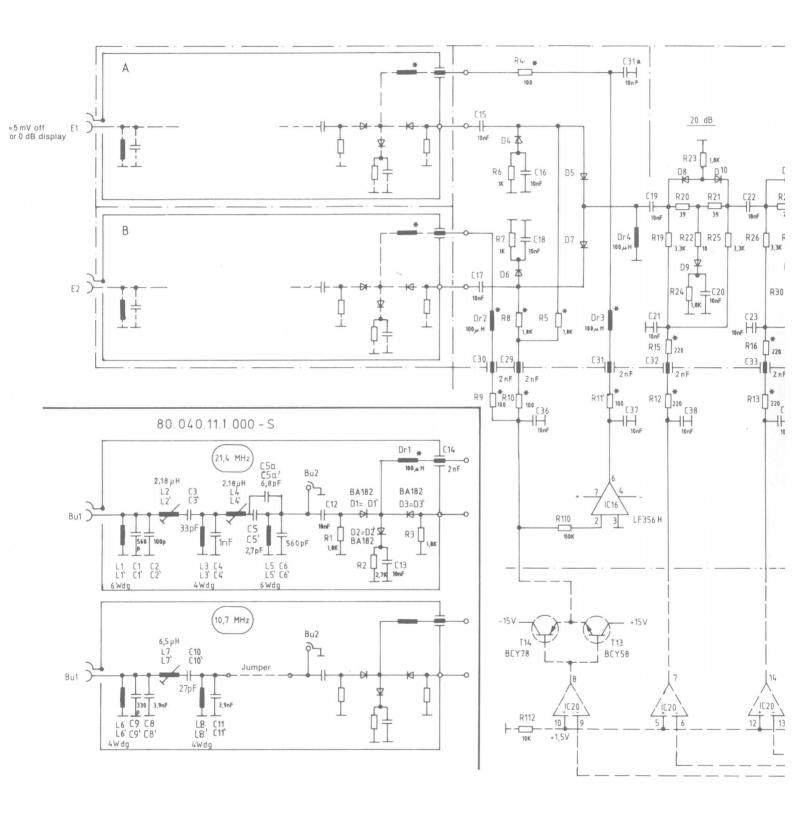
Signal processing, board 1

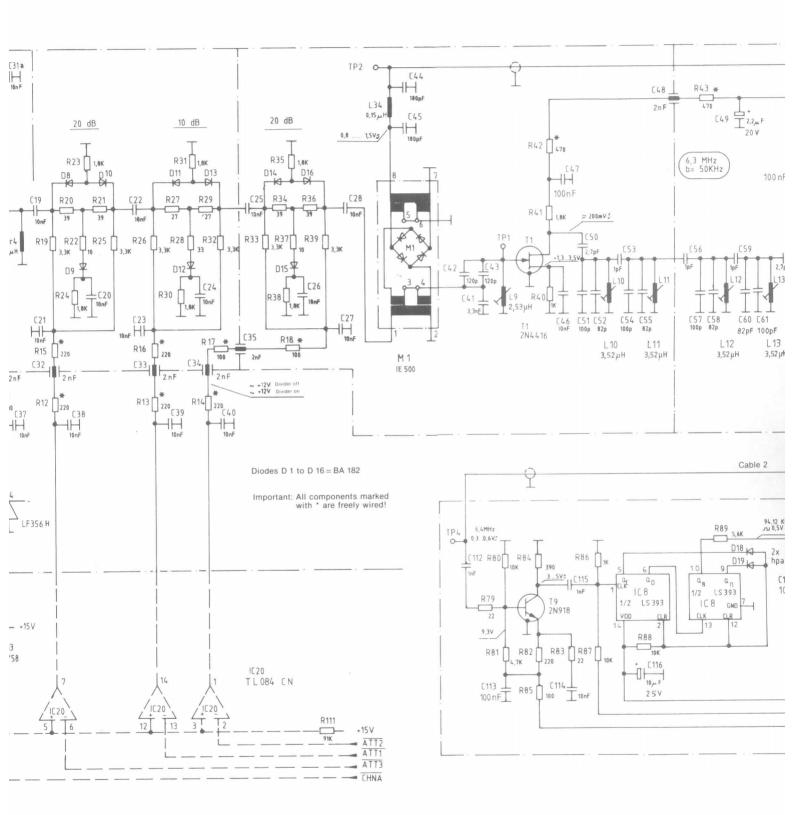


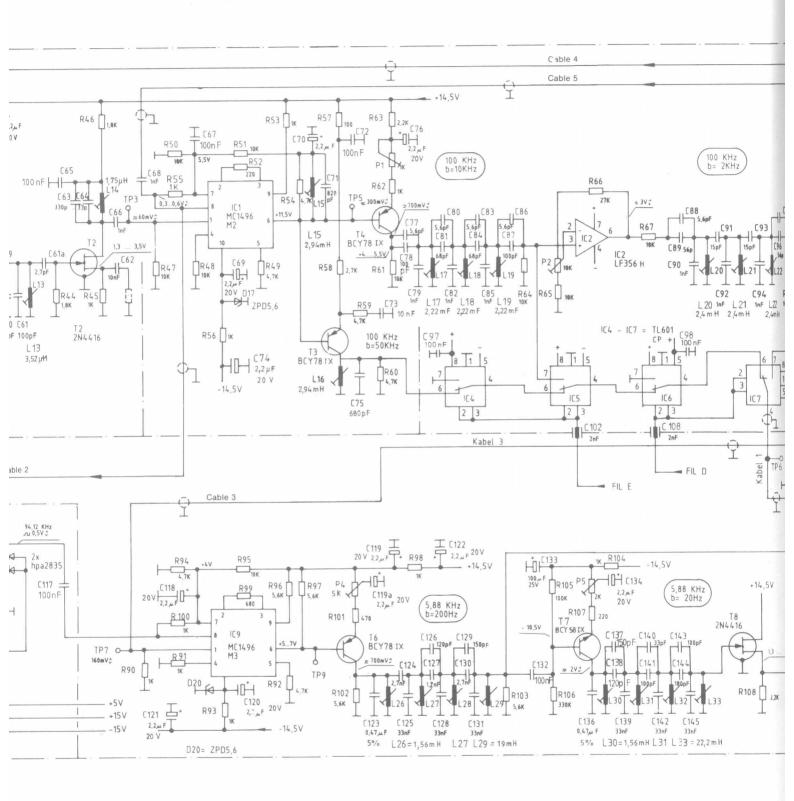
Version 21.4 MHz

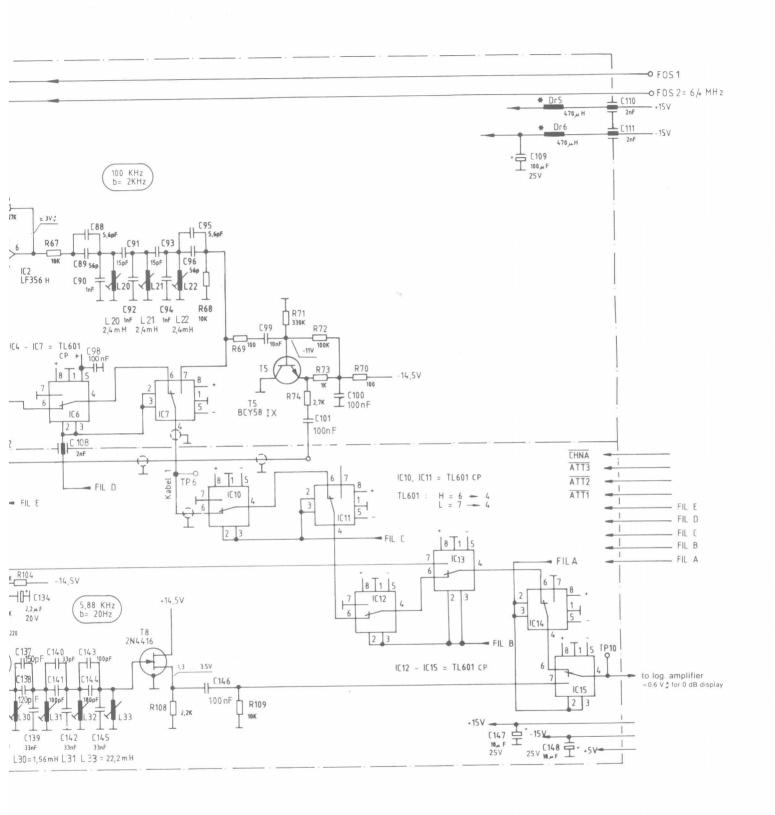


Components Layout Diagram Intermediate Frequency and Analysis Module ZA 1705 (Signal Processing 2×21.4 MHz) Annex 6, Sheet 3



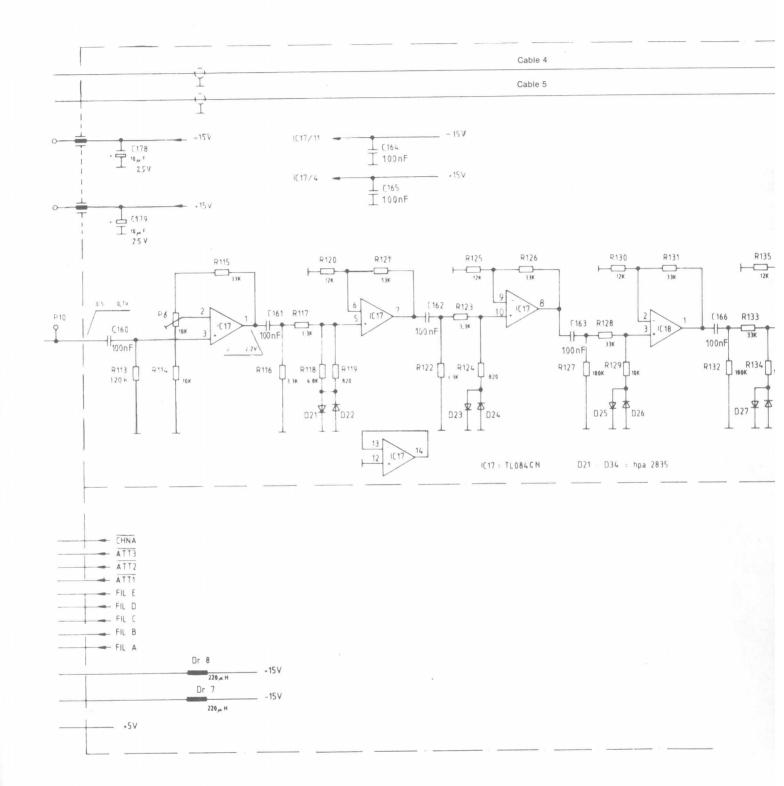


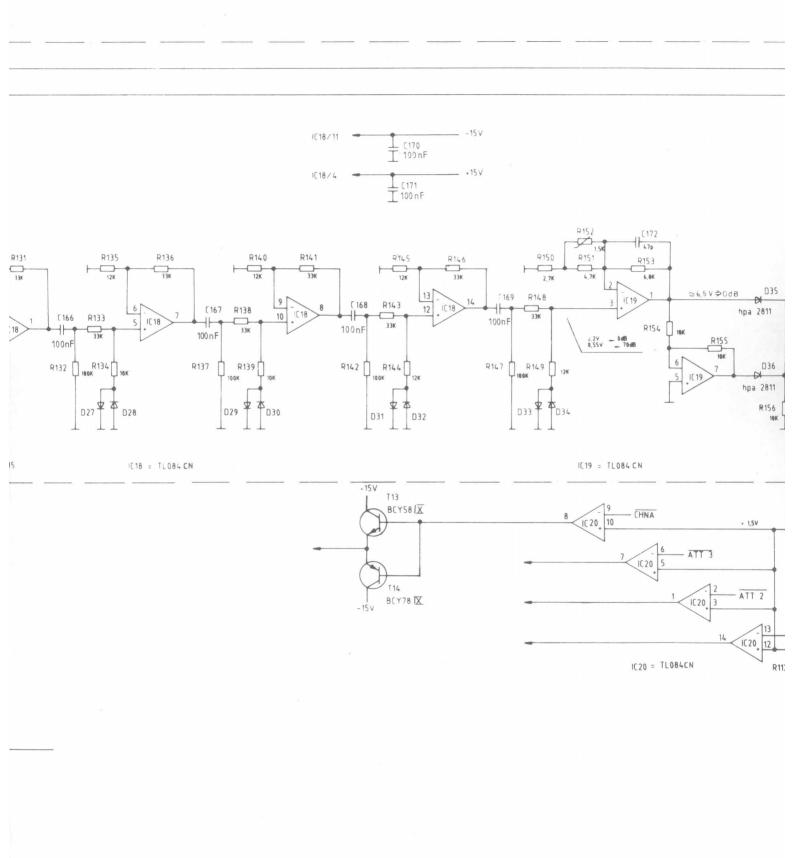


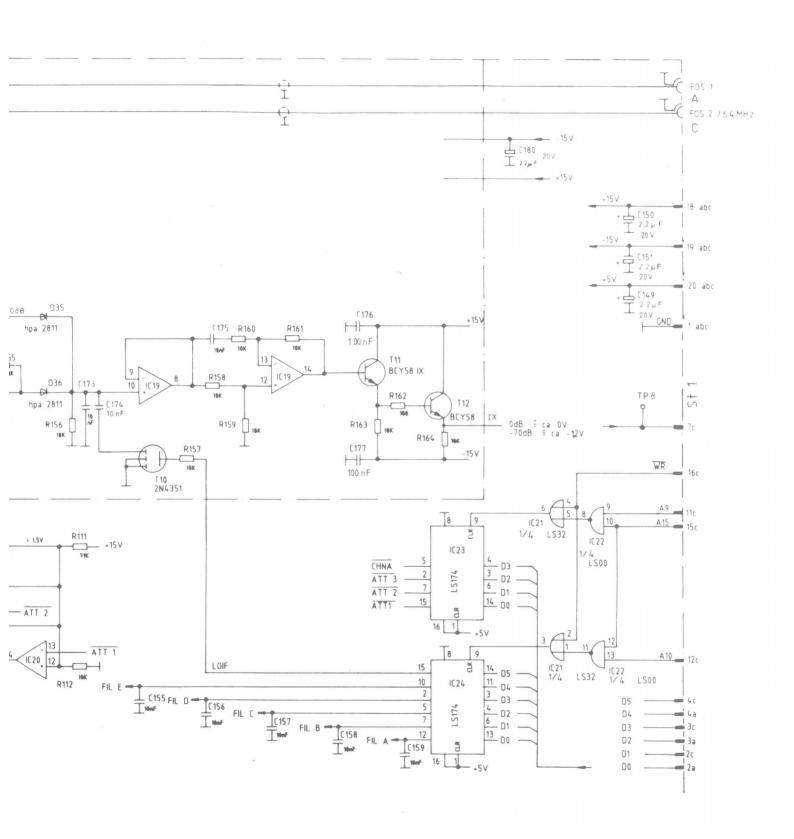


Circuit Diagram
Intermediate Frequency and Analysis Module ZA 1705
(Signal Processing 10.7 MHz and 21.4 MHz or 2×10.7 MHz)

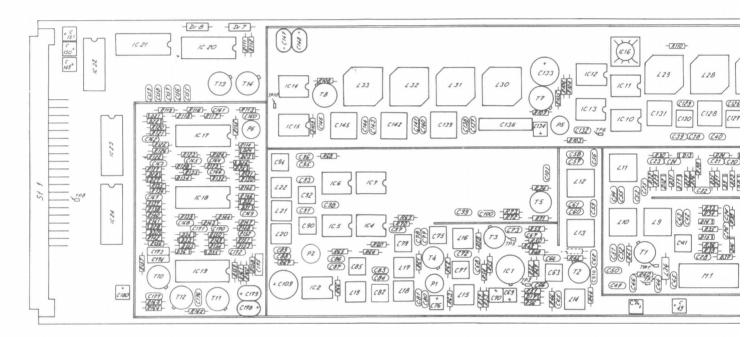
Annex 7, Sheet 1



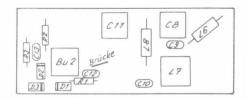




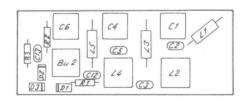
Circuit Diagram
Intermediate Frequency and Analysis Module ZA 1705
(Signal Processing 10.7 MHz and 21.4 MHz or 2×10.7 MHz)
Annex 7, Sheet 2



Signal processing, board 1

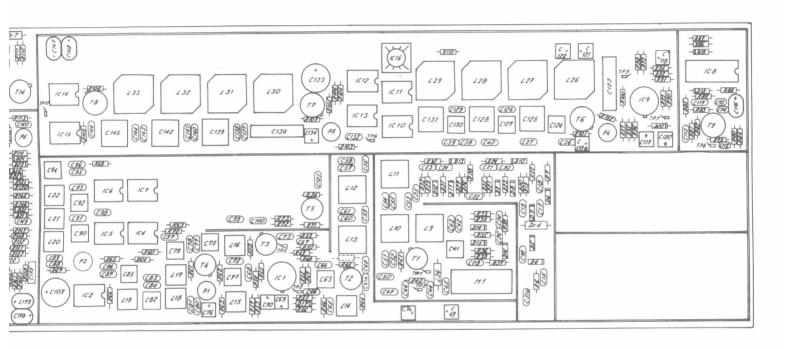


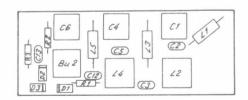
Version 10.7 MHz



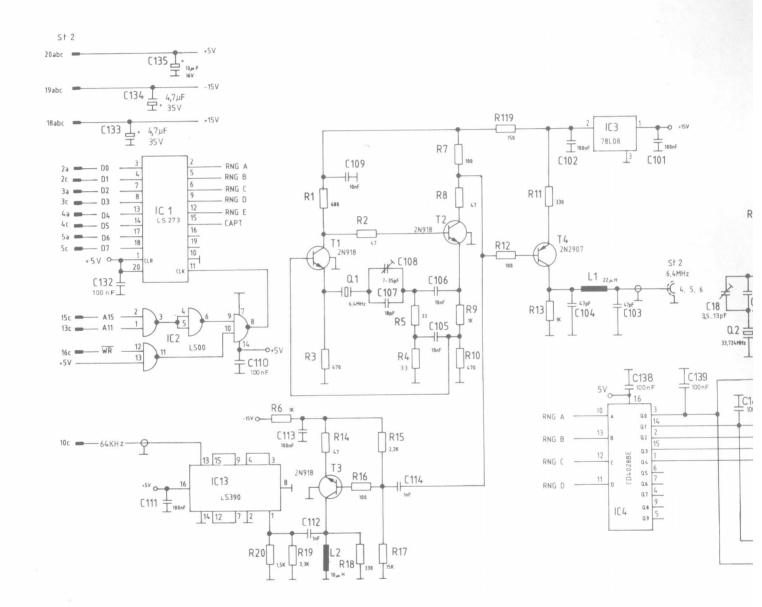
Version 21.4 MHz

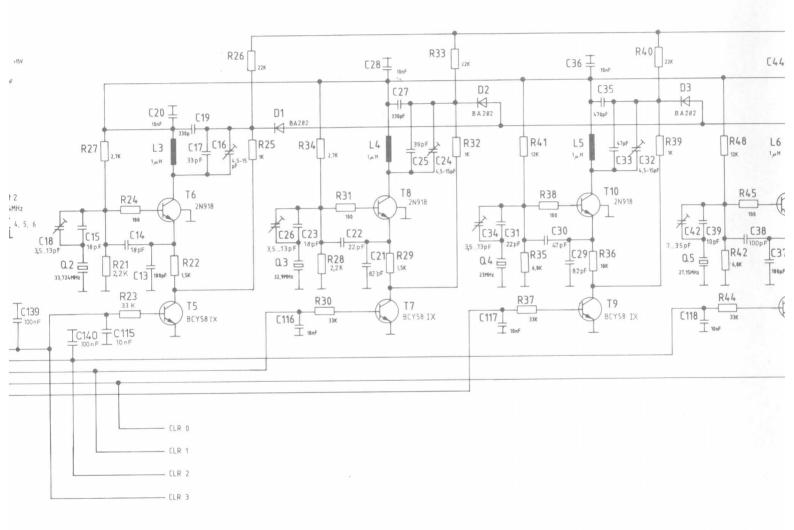
Intermediate Frequency a (Signal Processing 10.7 MHz and

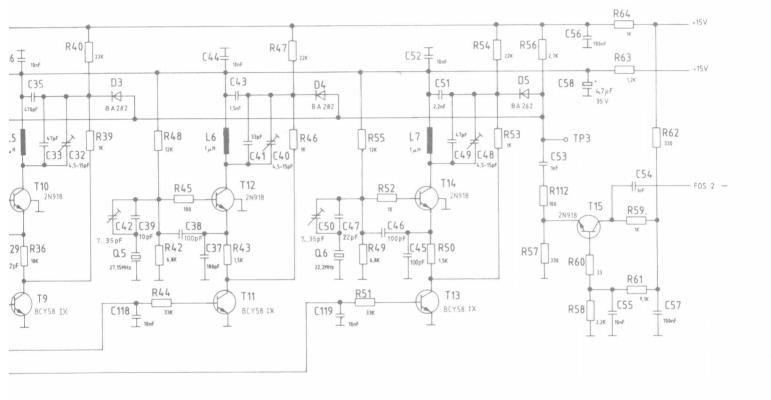




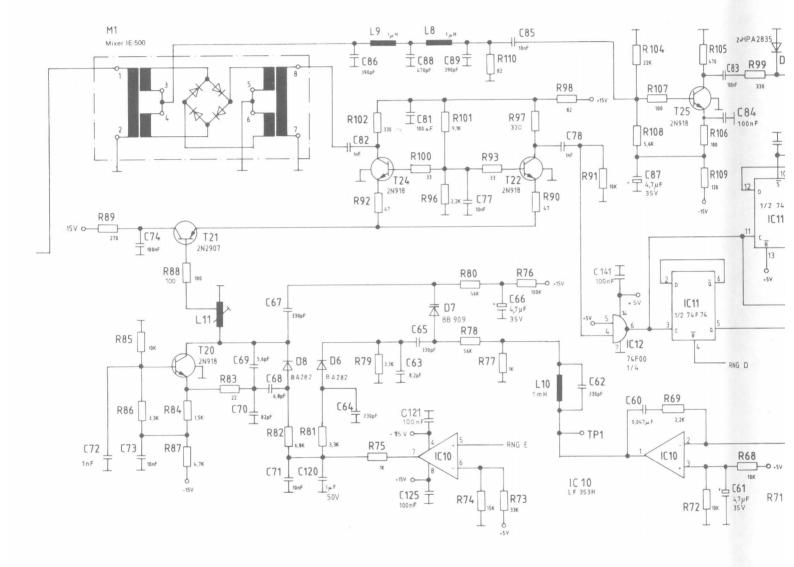
Version 21.4 MHz

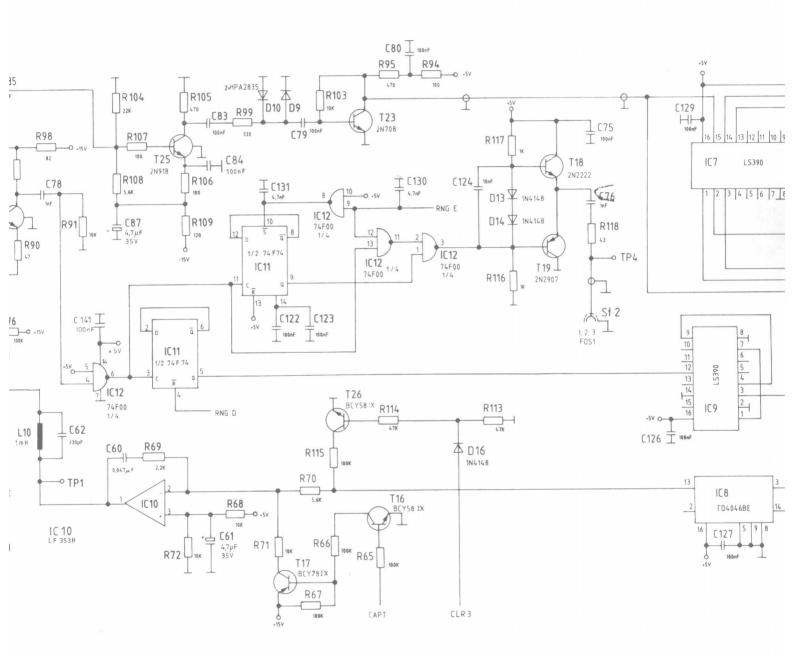


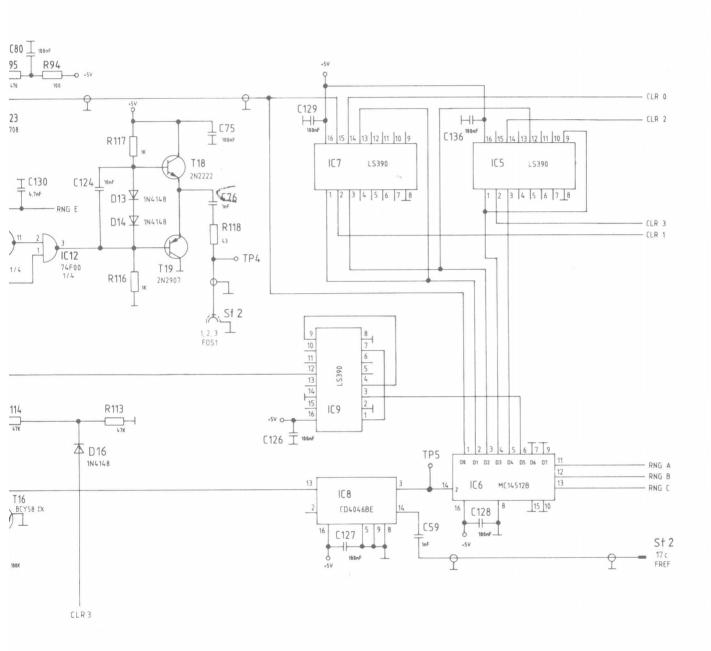




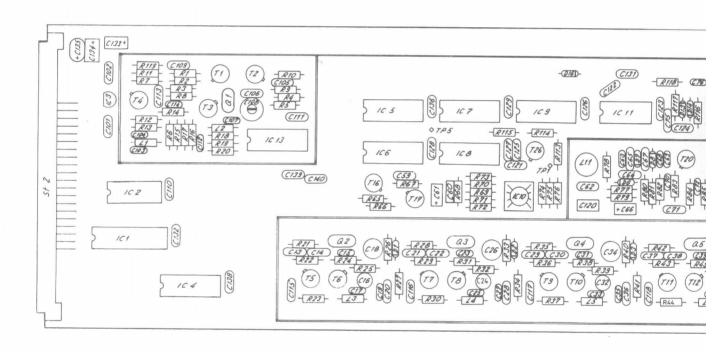
Circuit Diagram Oscillator OS 1705 (Oscillator I) Annex 8, Sheet 1

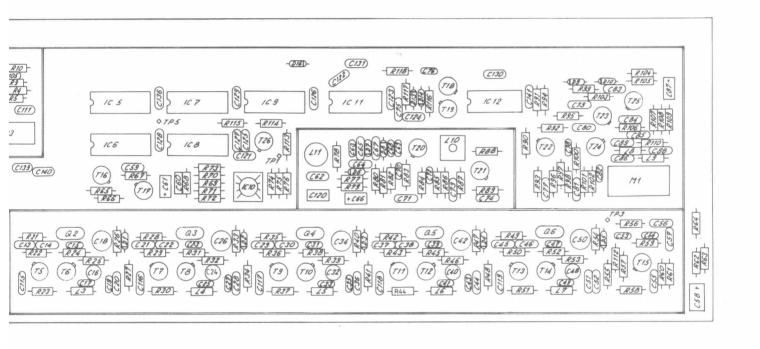




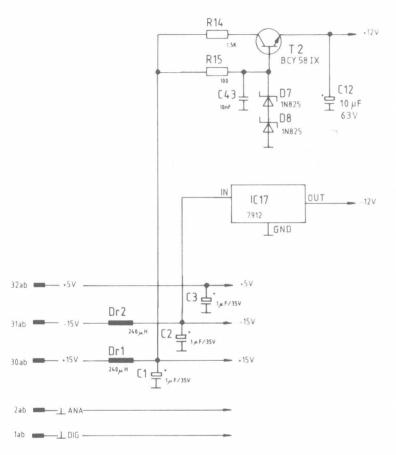


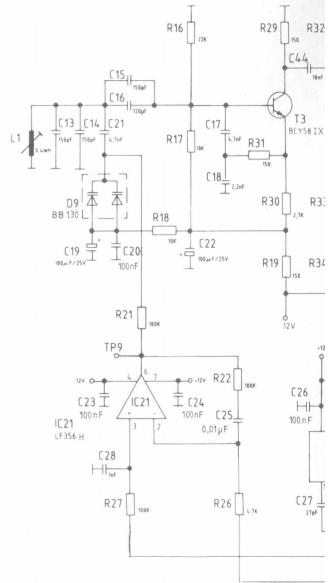
Oscillator OS 1705 (Oscillator I) Annex 8, Sheet 2

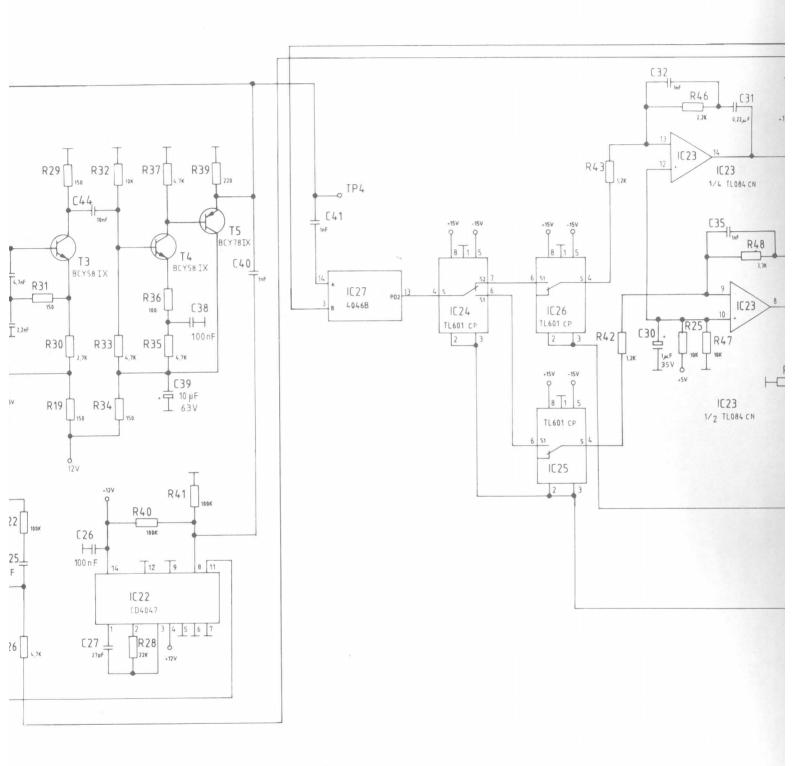


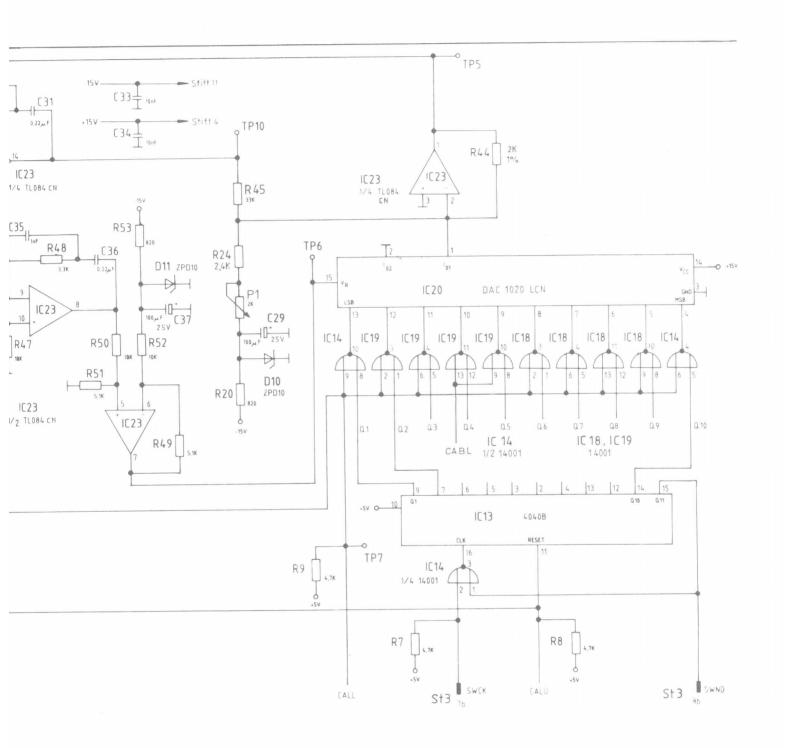


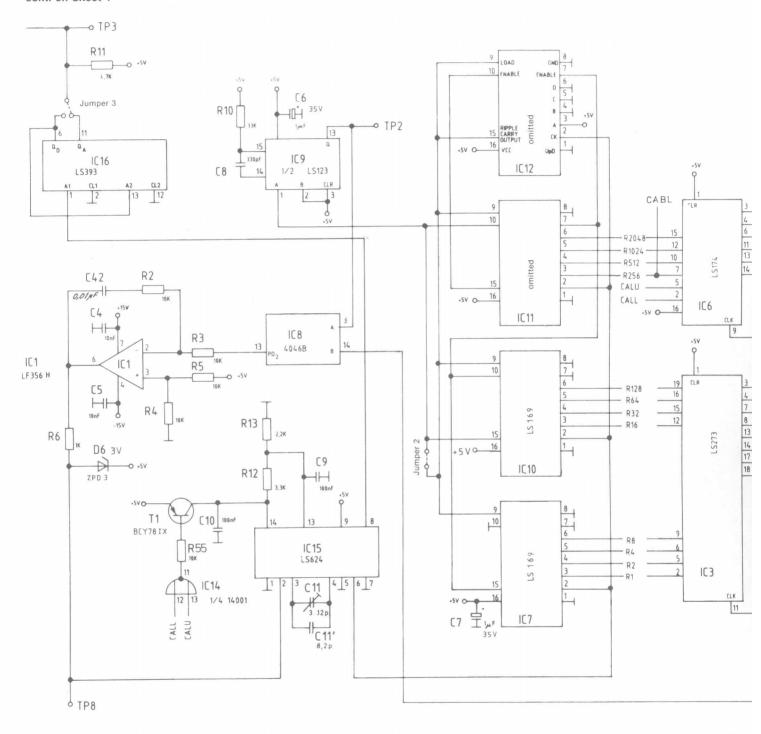
Components Layout Diagram
Oscillator OS 1705
(Oscillator I)
Annex 8, Sheet 3

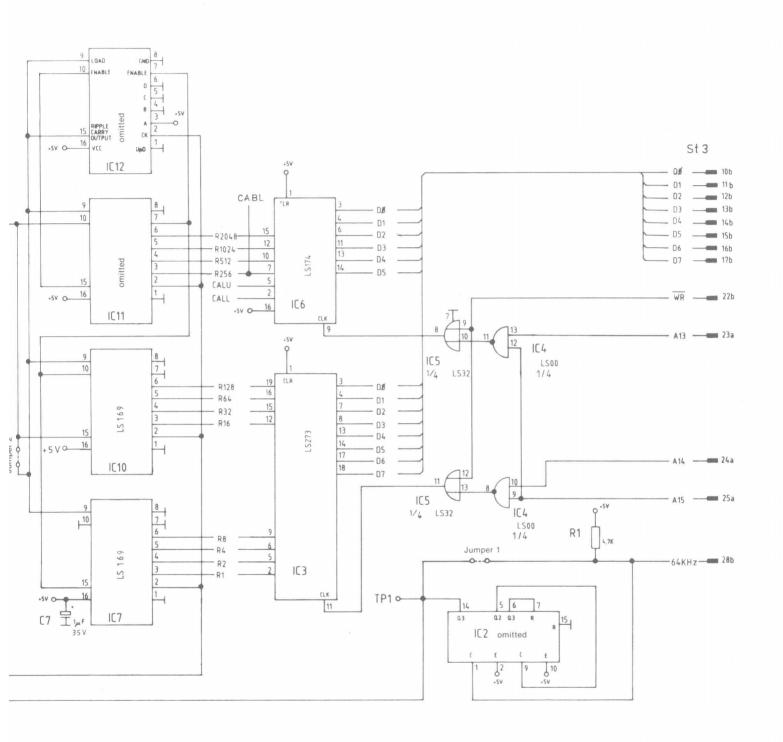


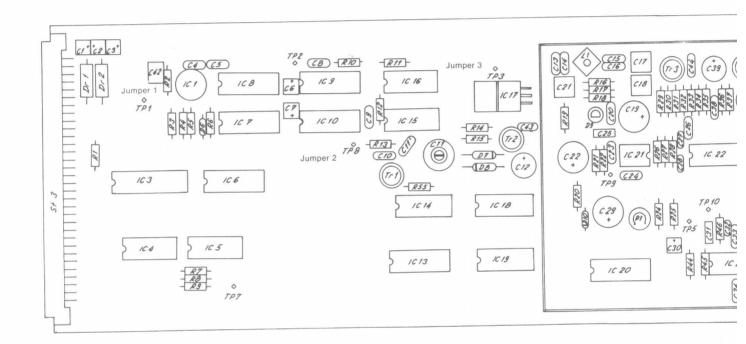


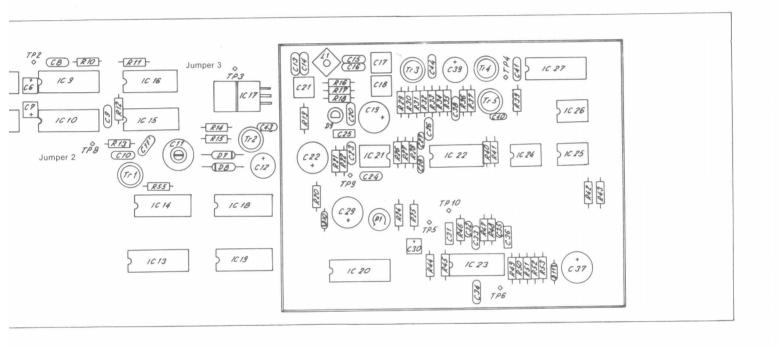


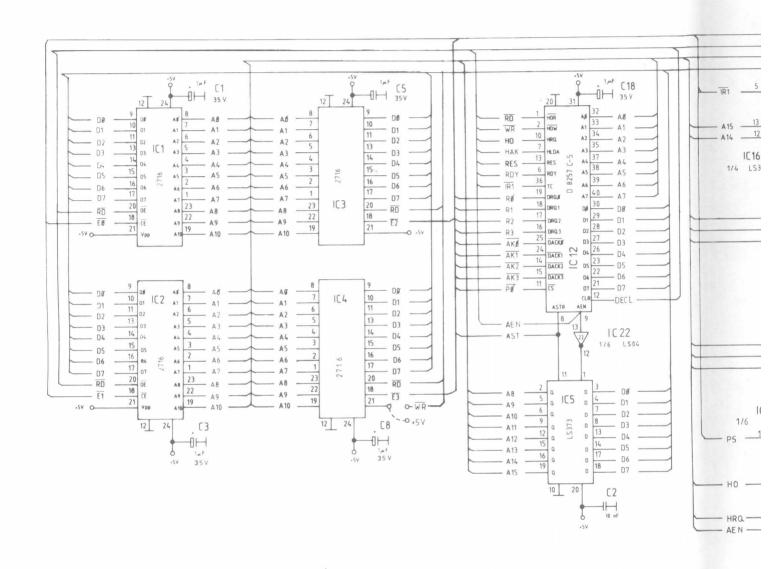


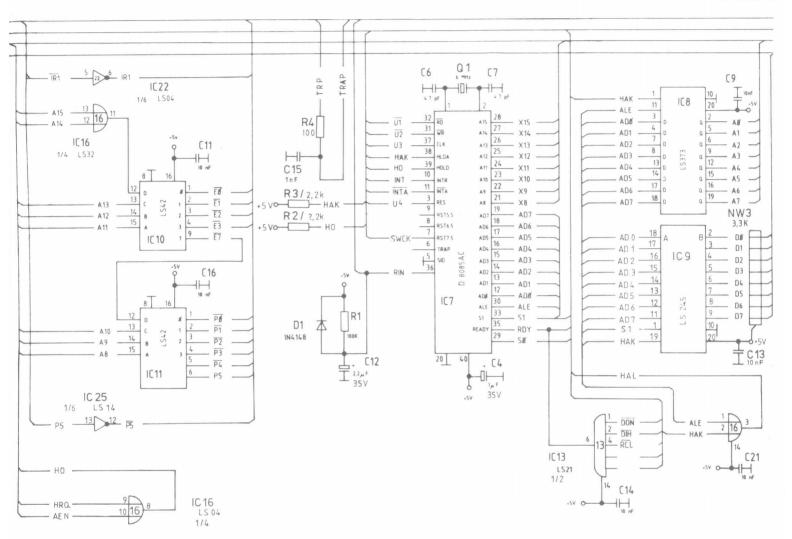


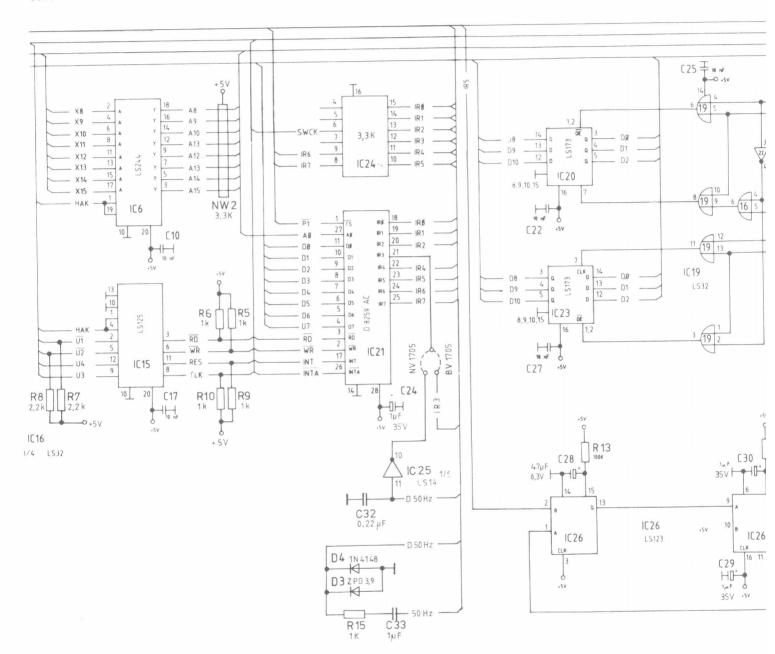


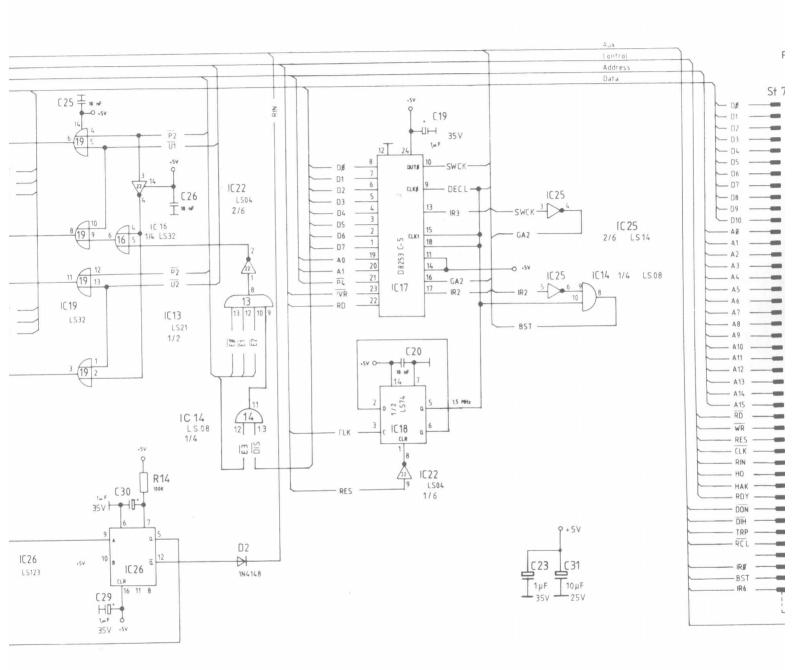


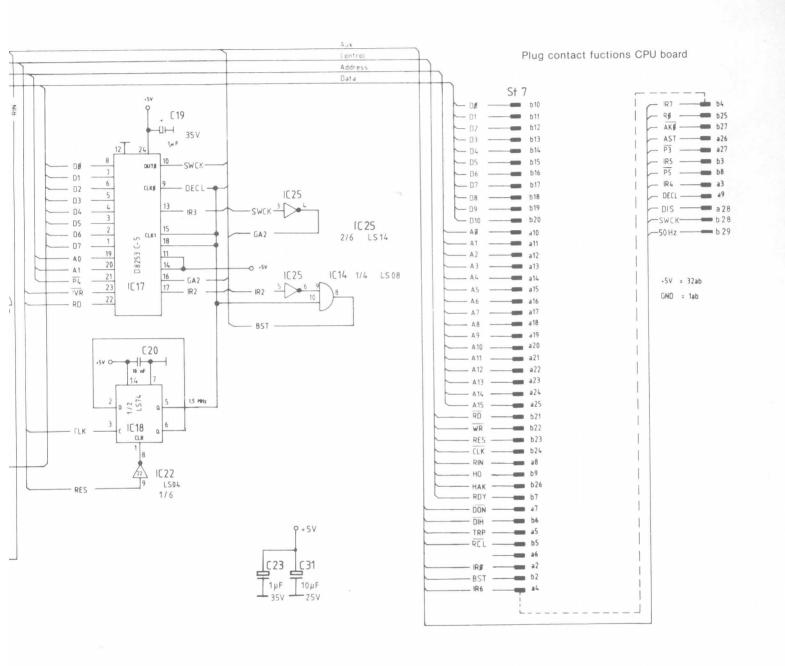


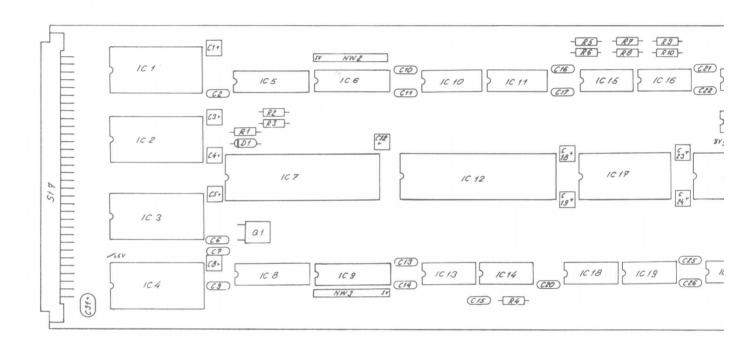


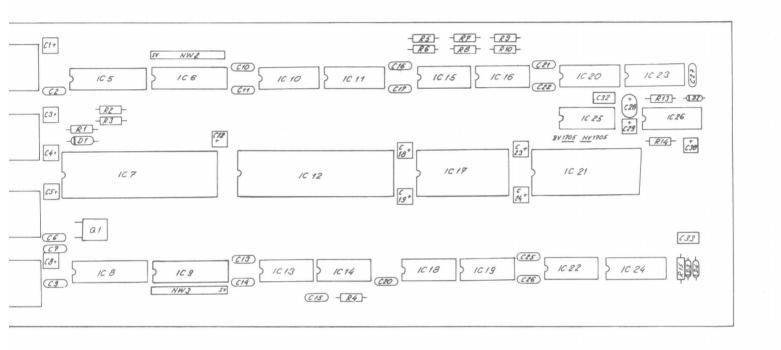


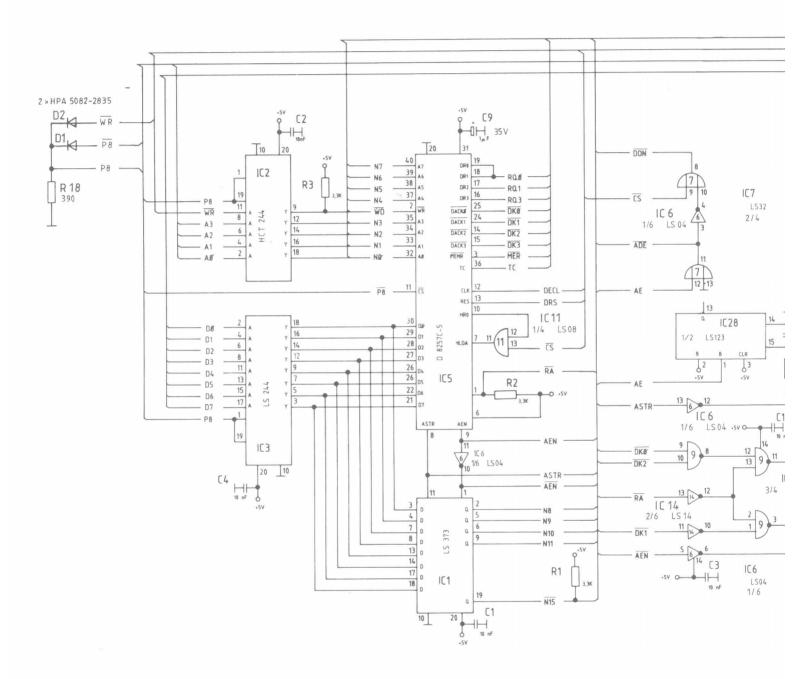


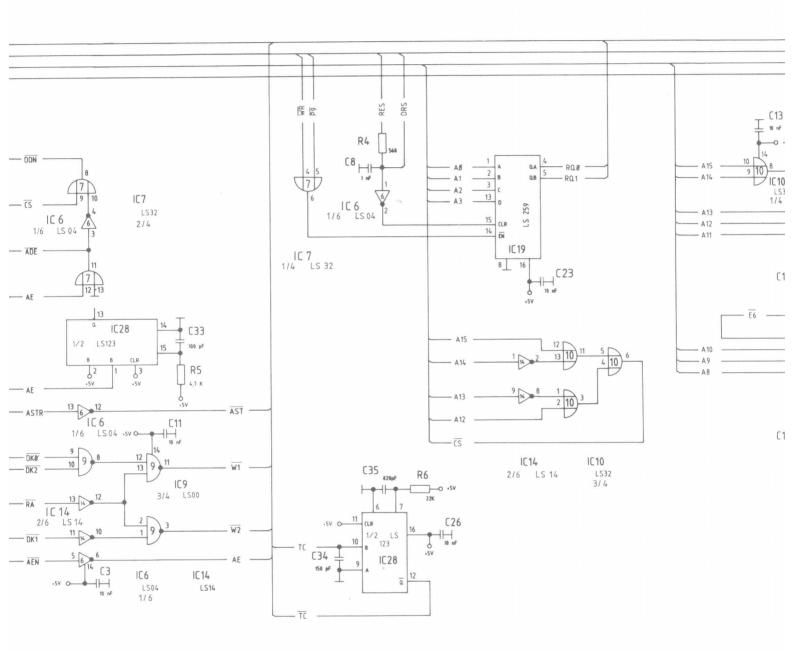


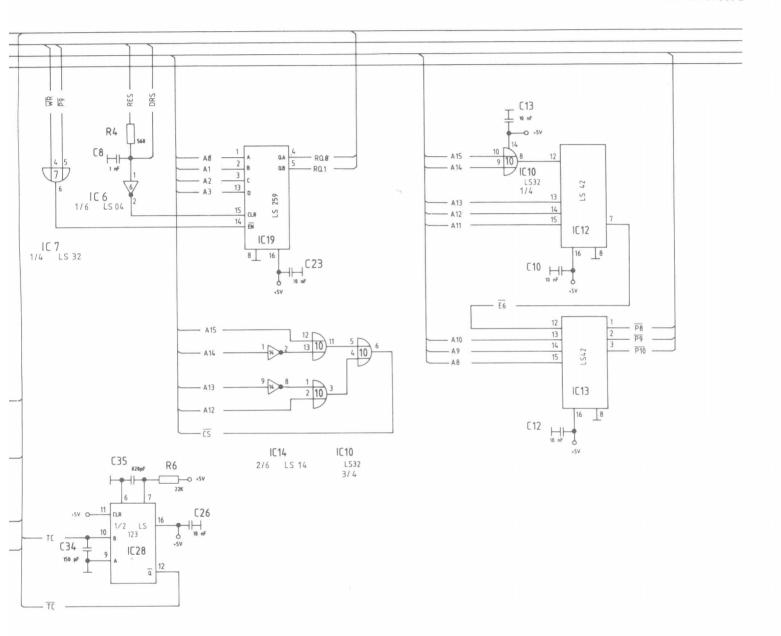


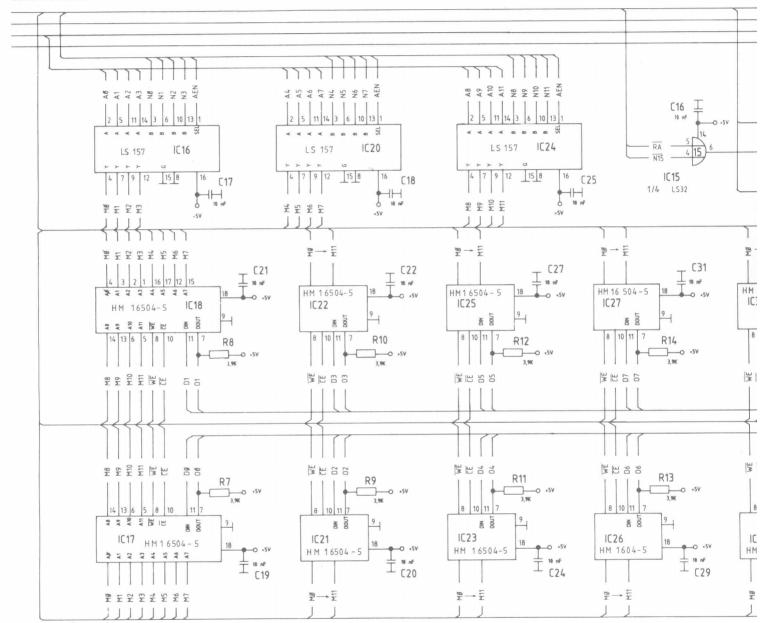


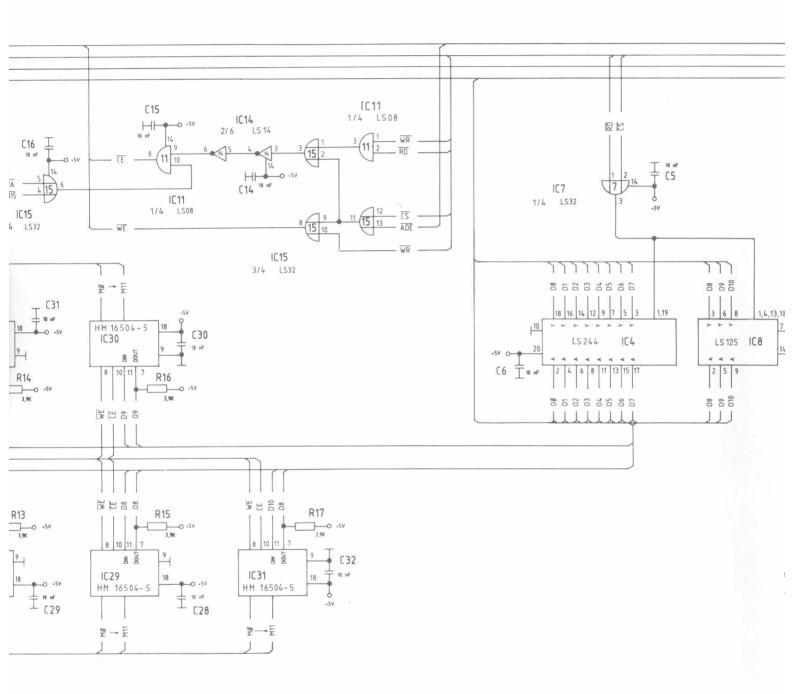


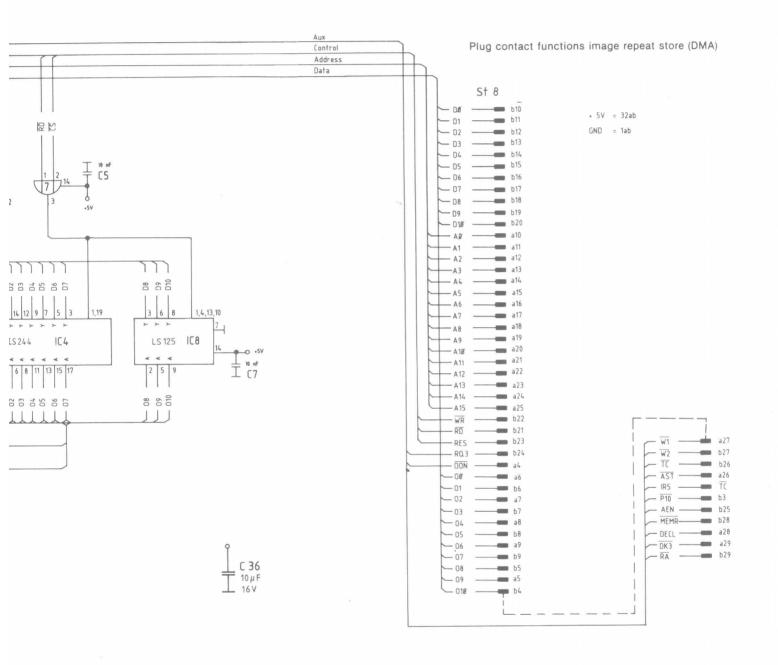


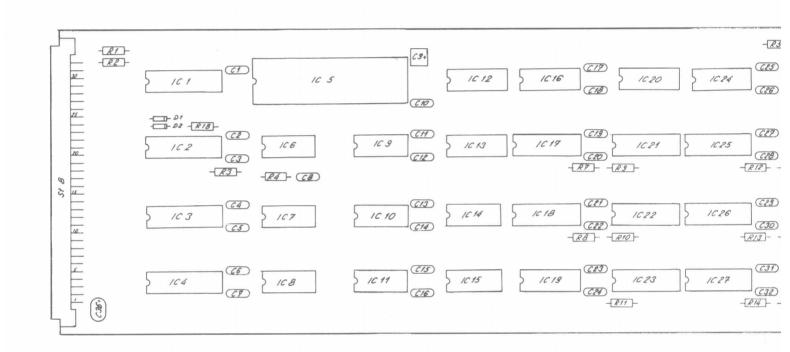


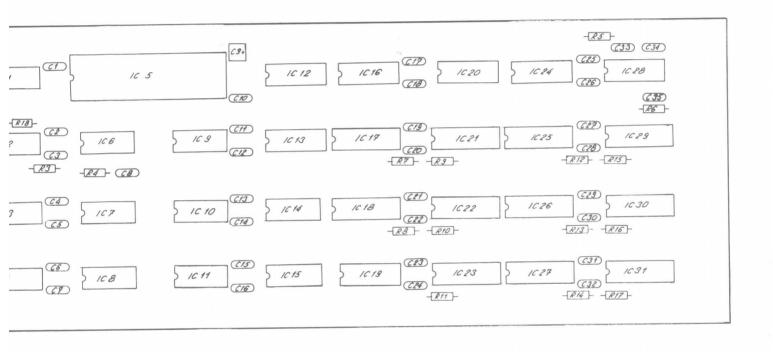


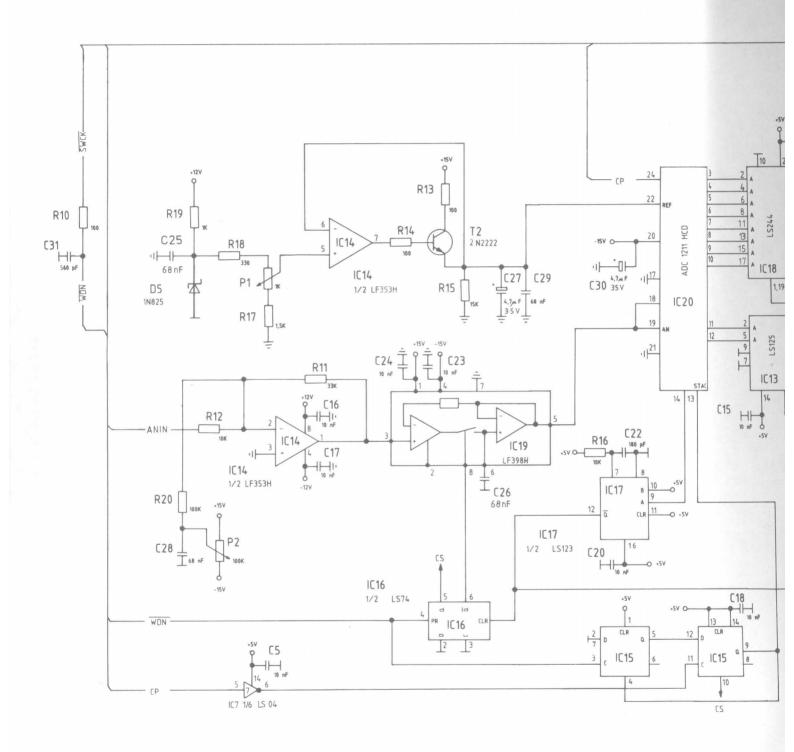


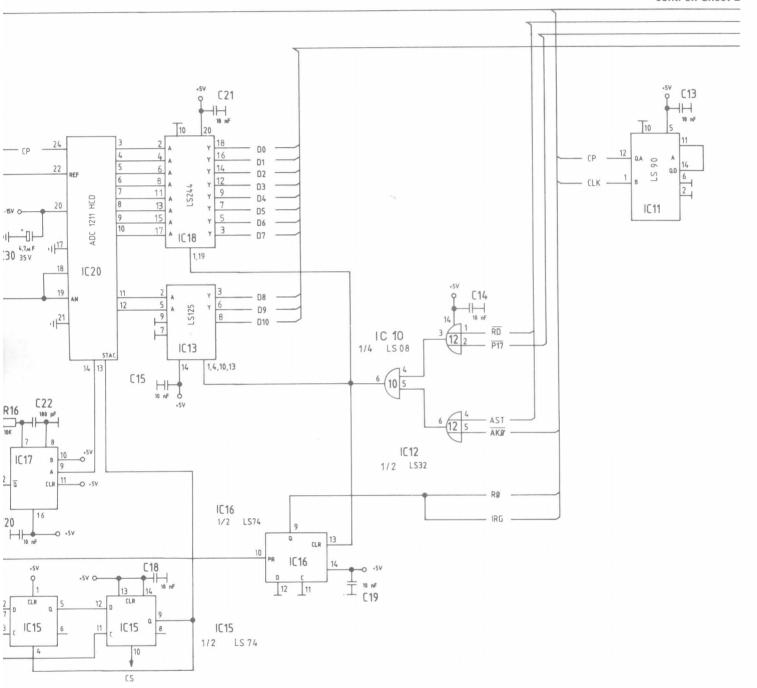


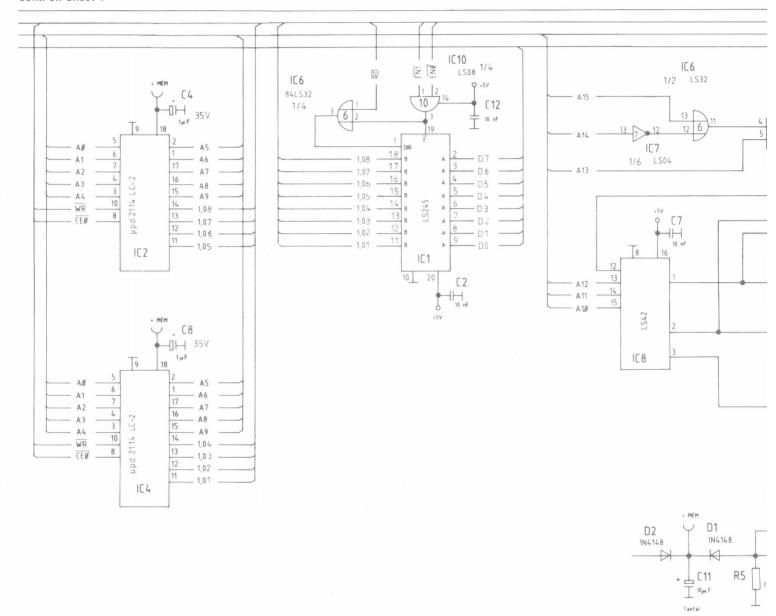


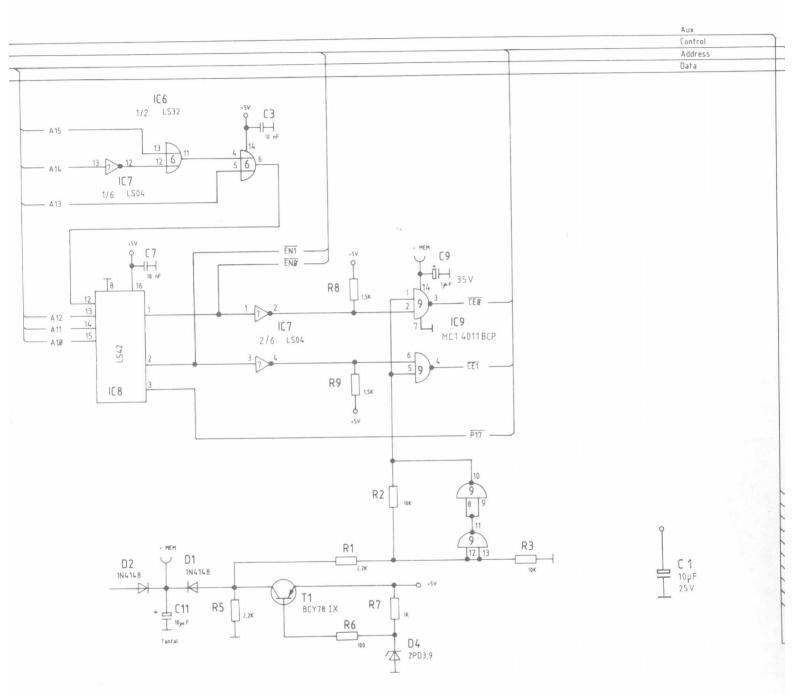


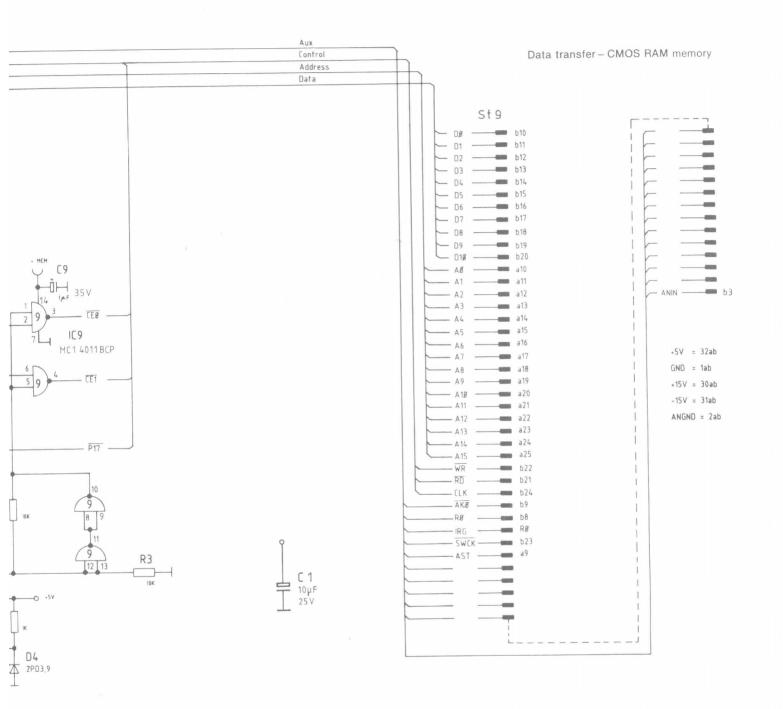


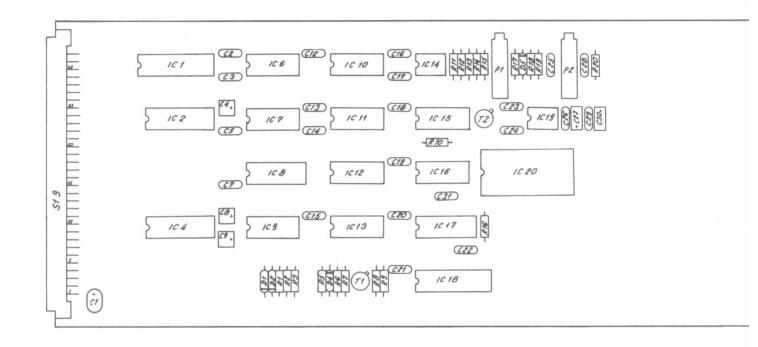


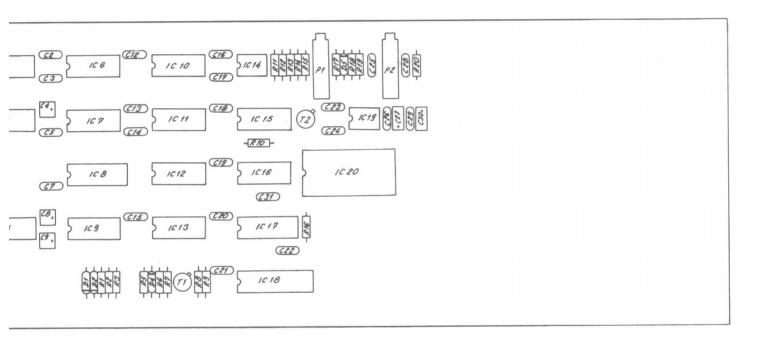


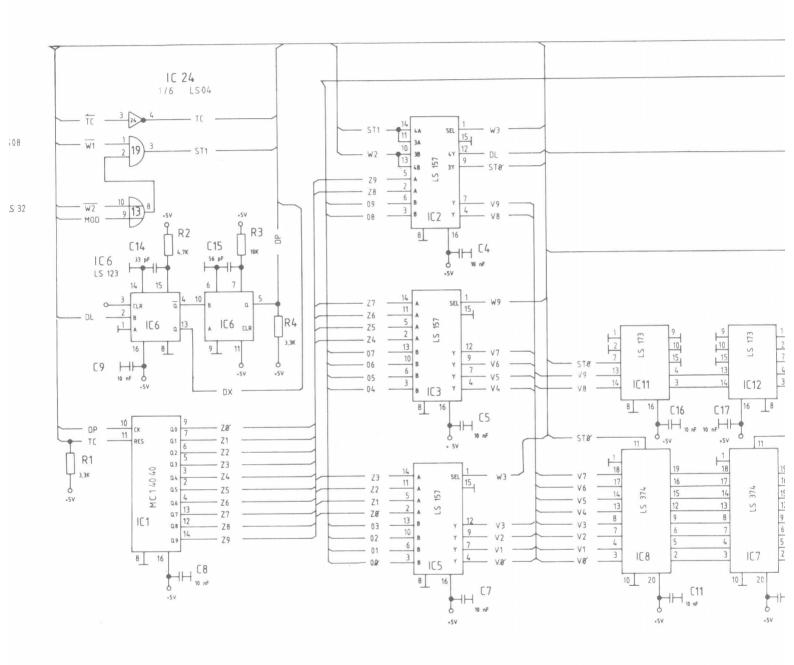




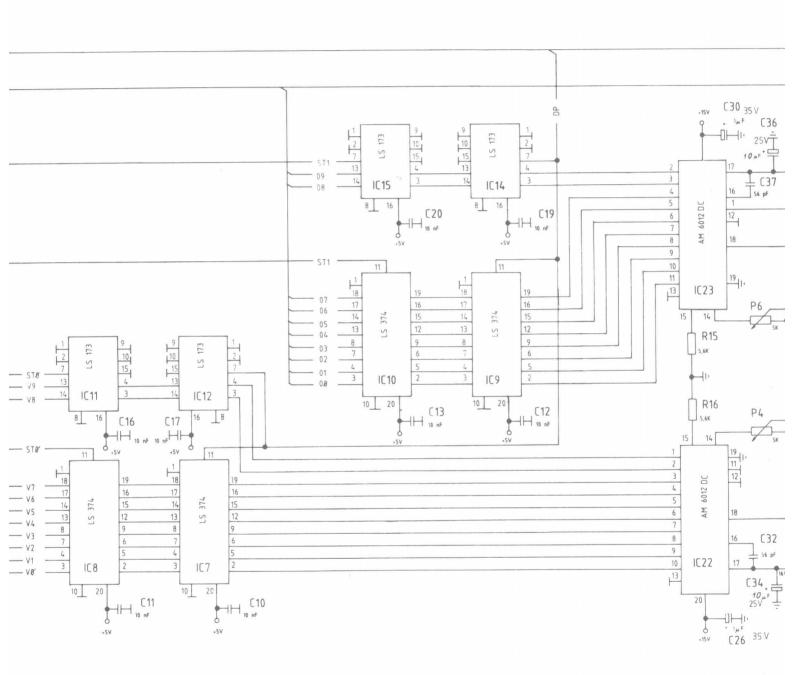


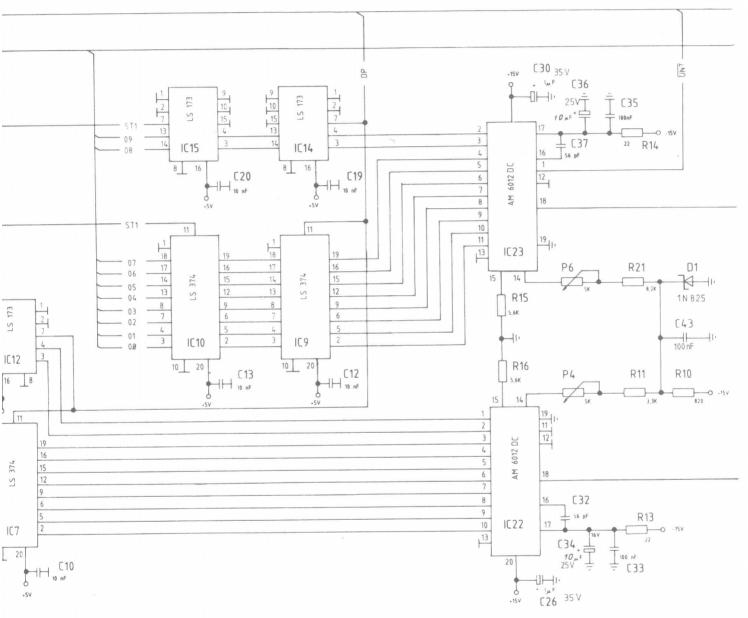


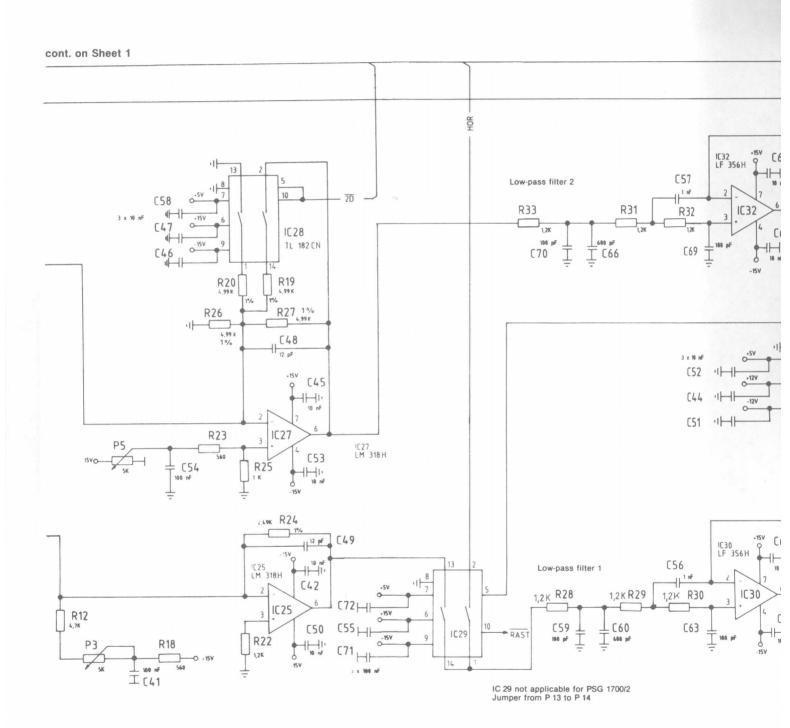


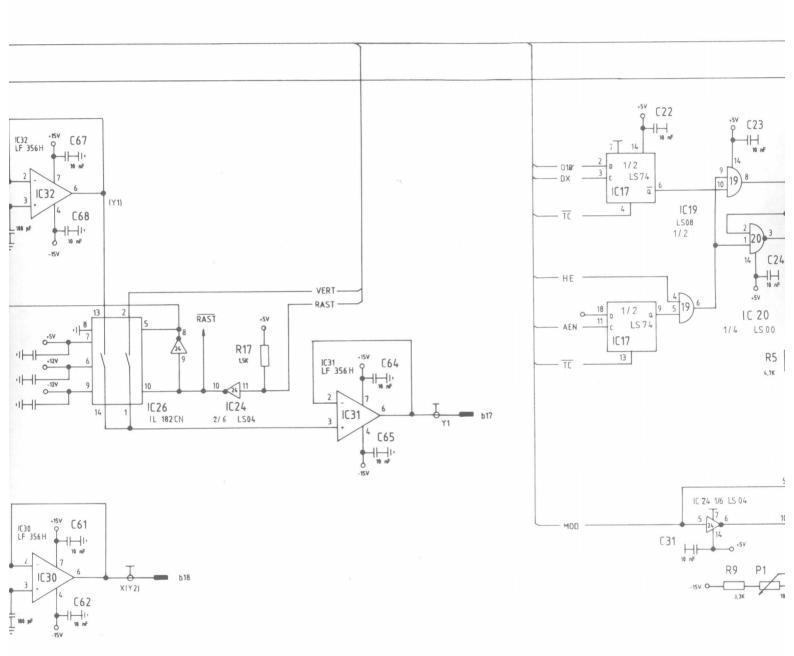


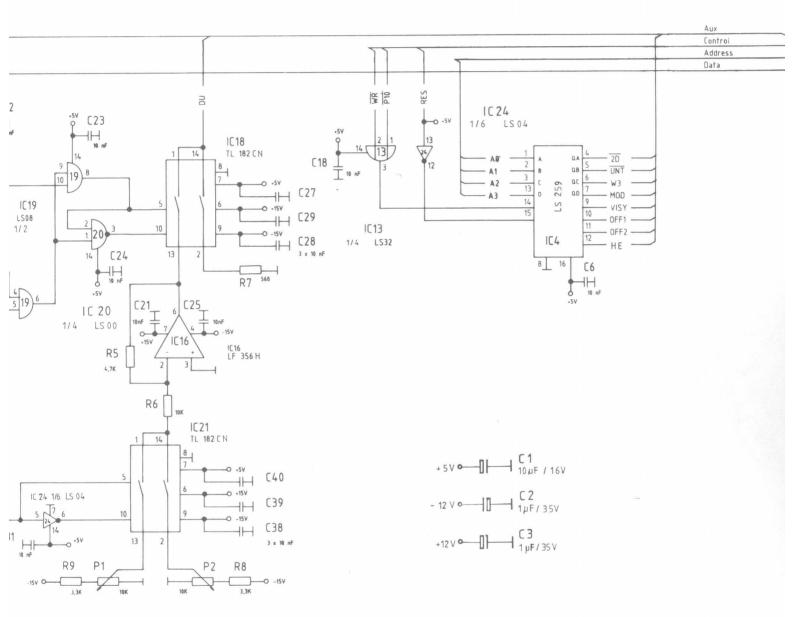
700/2

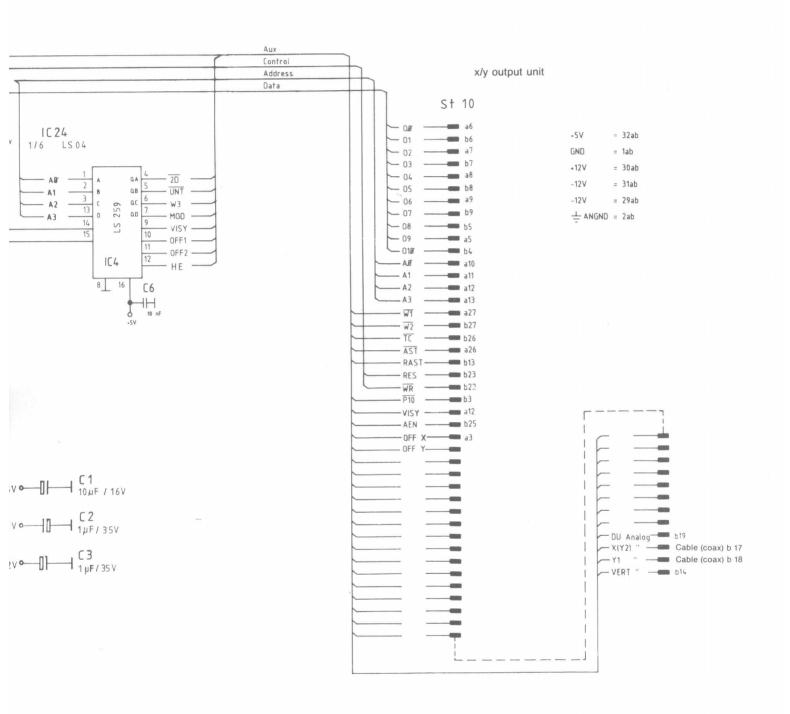


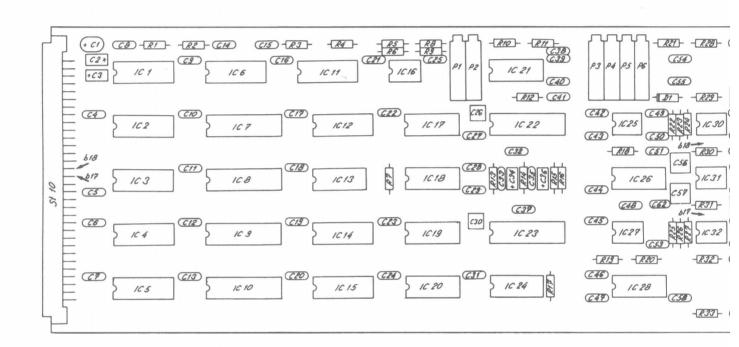


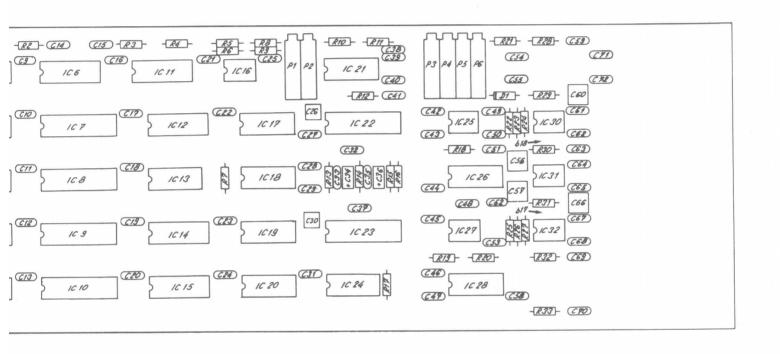


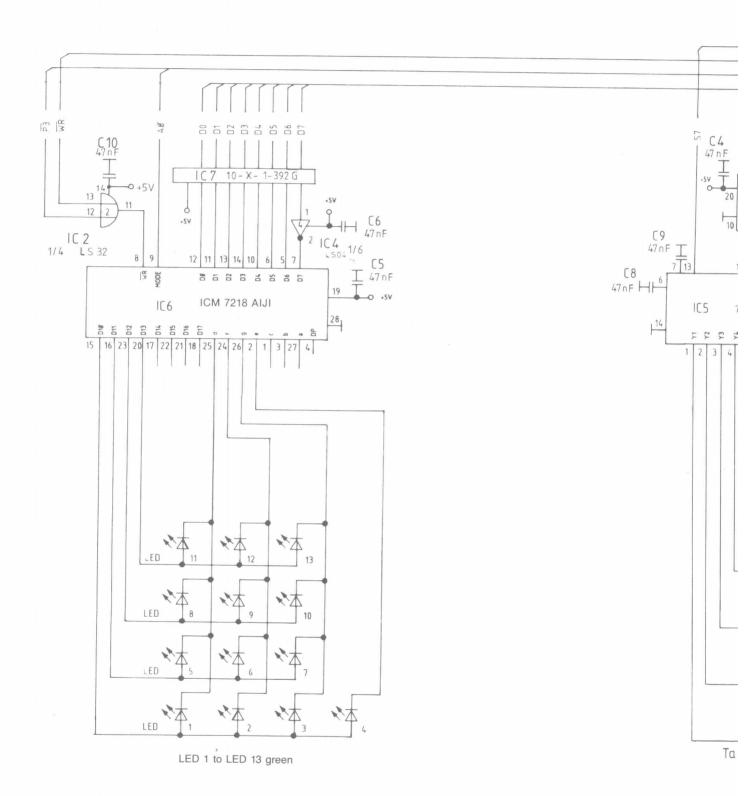


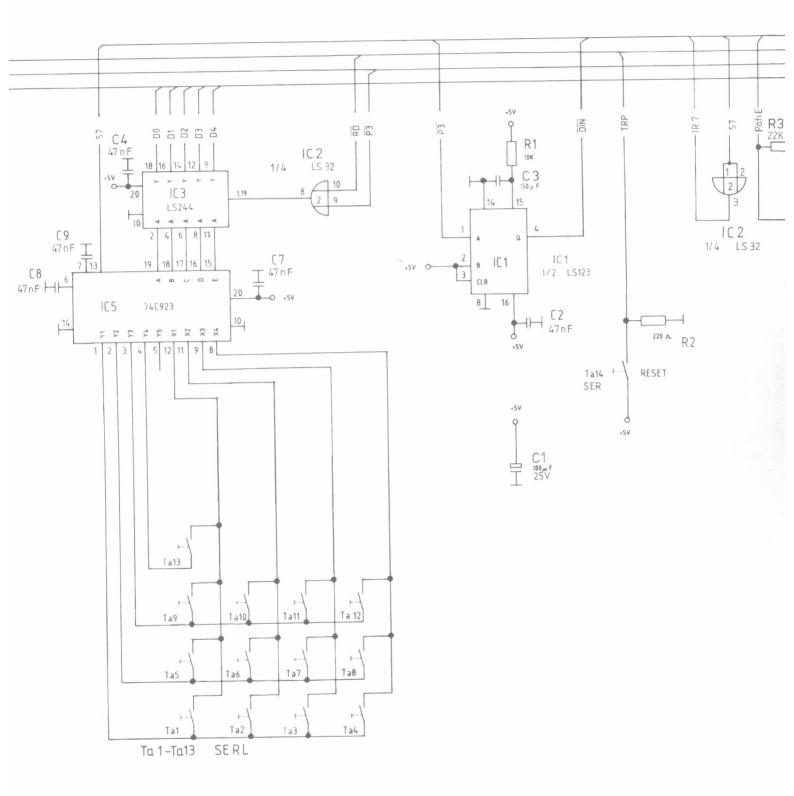


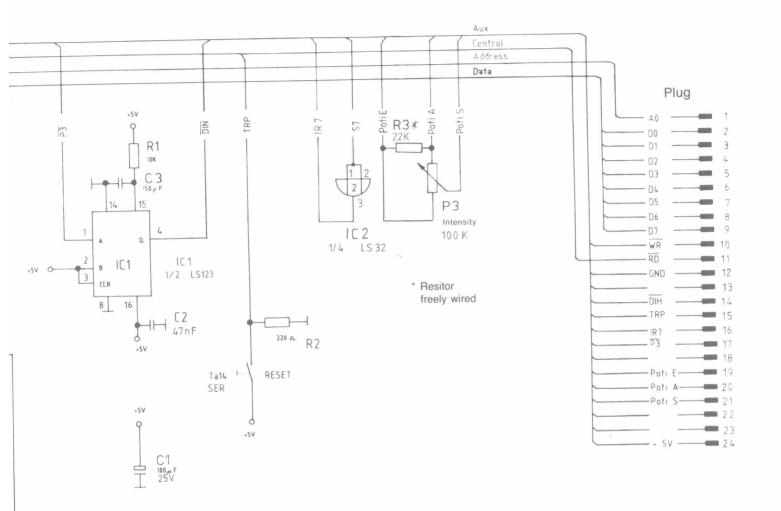


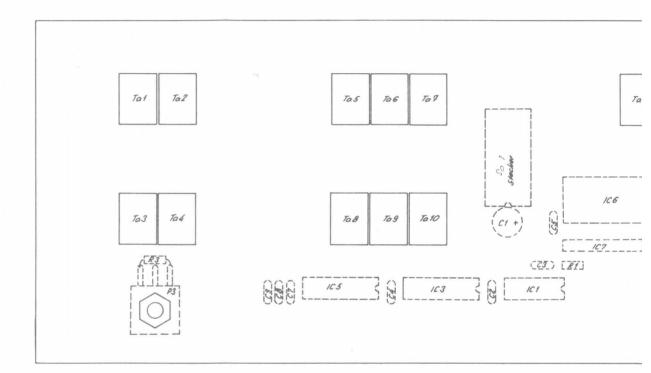


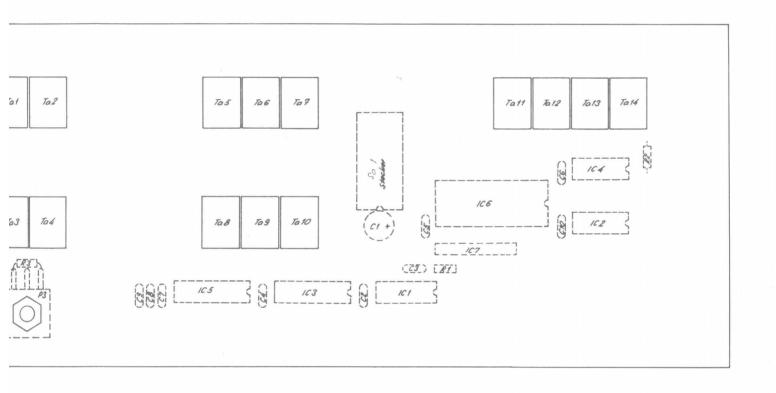


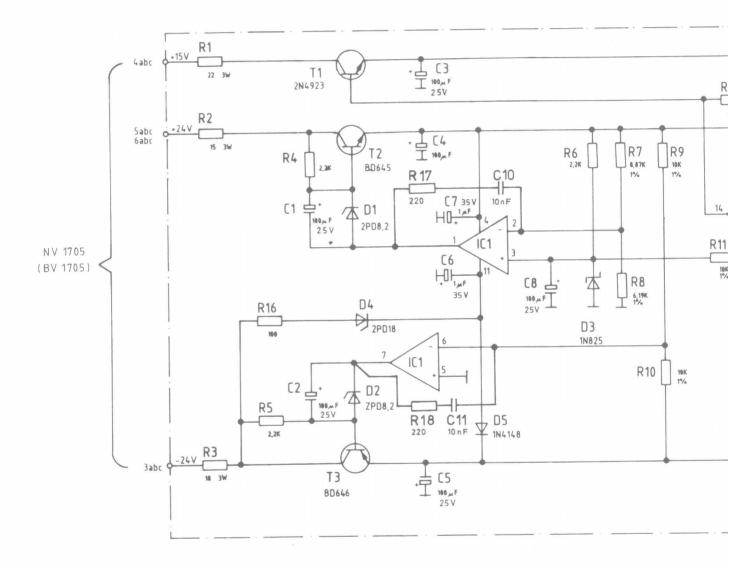


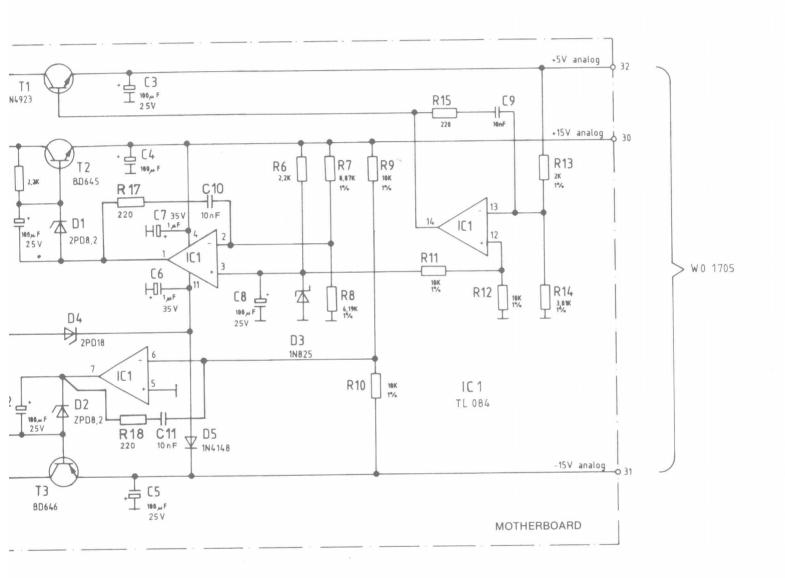


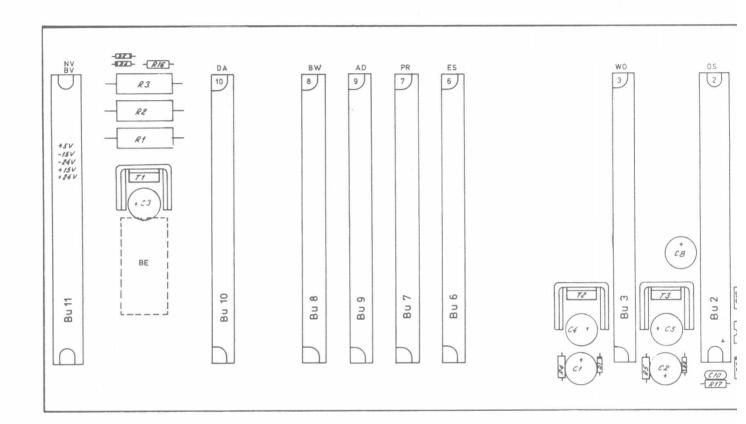


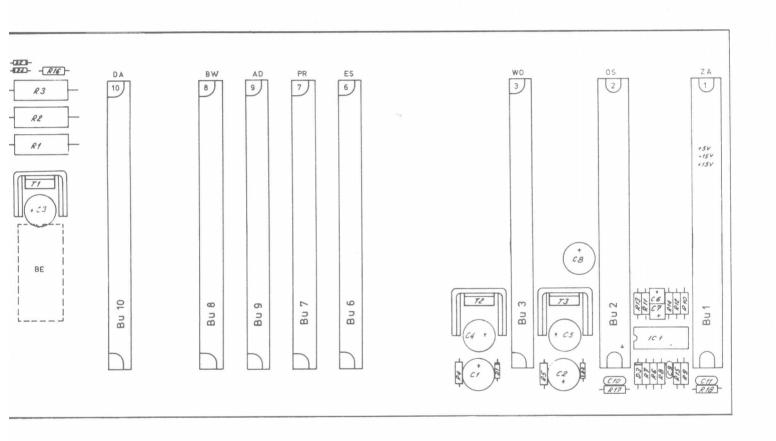


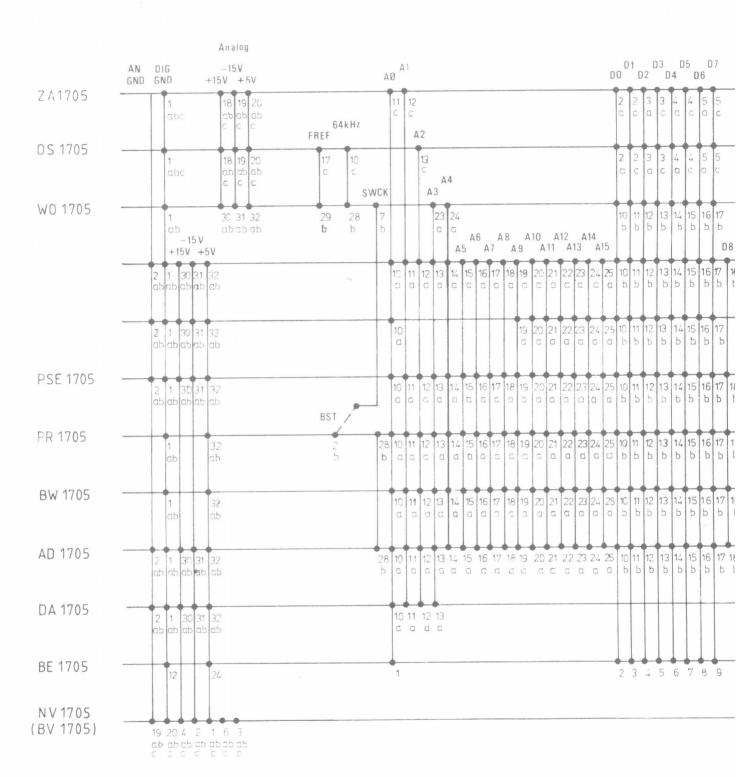


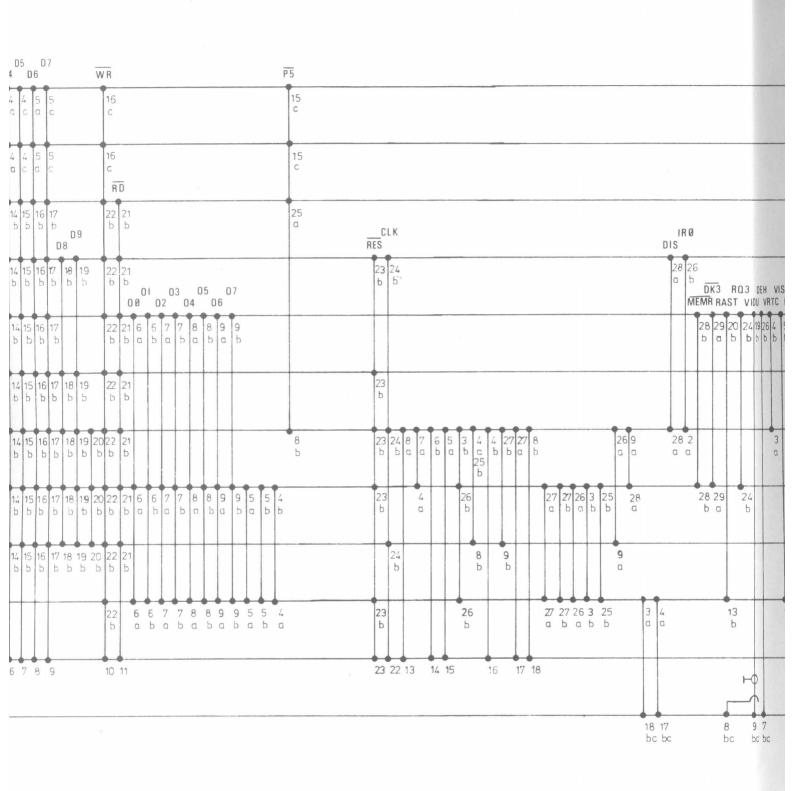


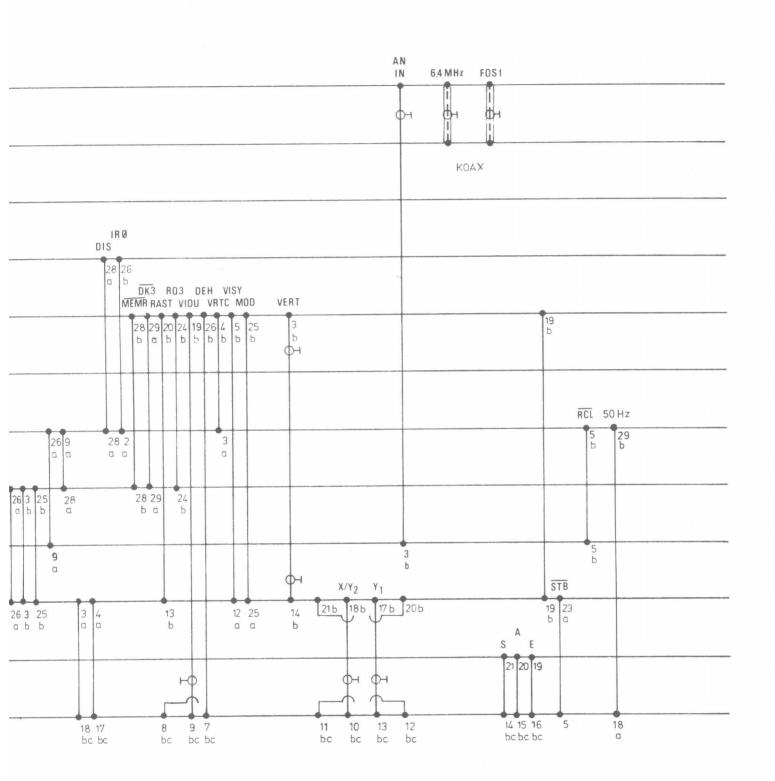


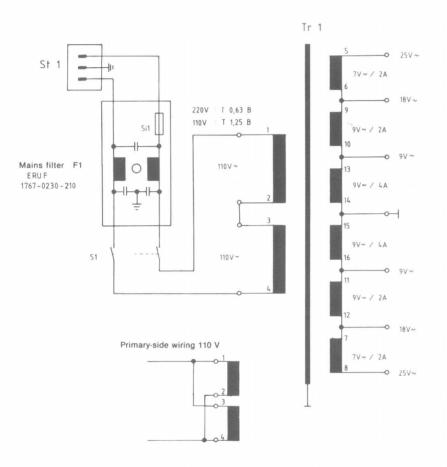


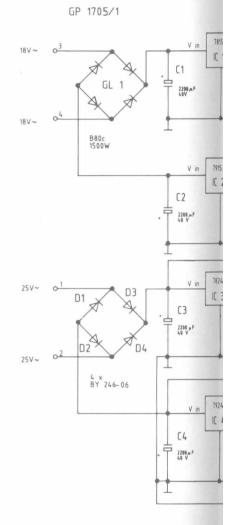


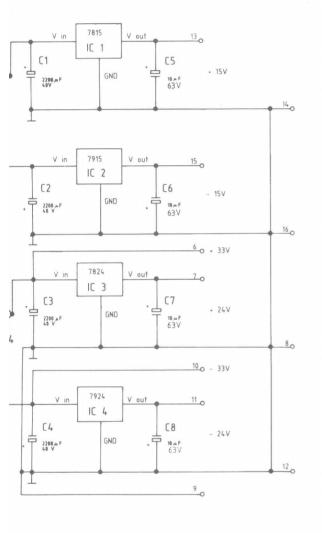


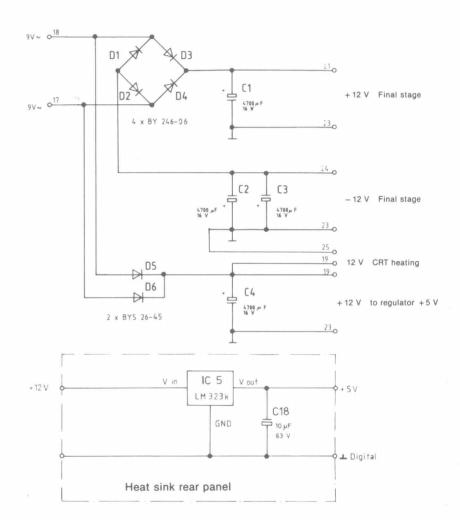


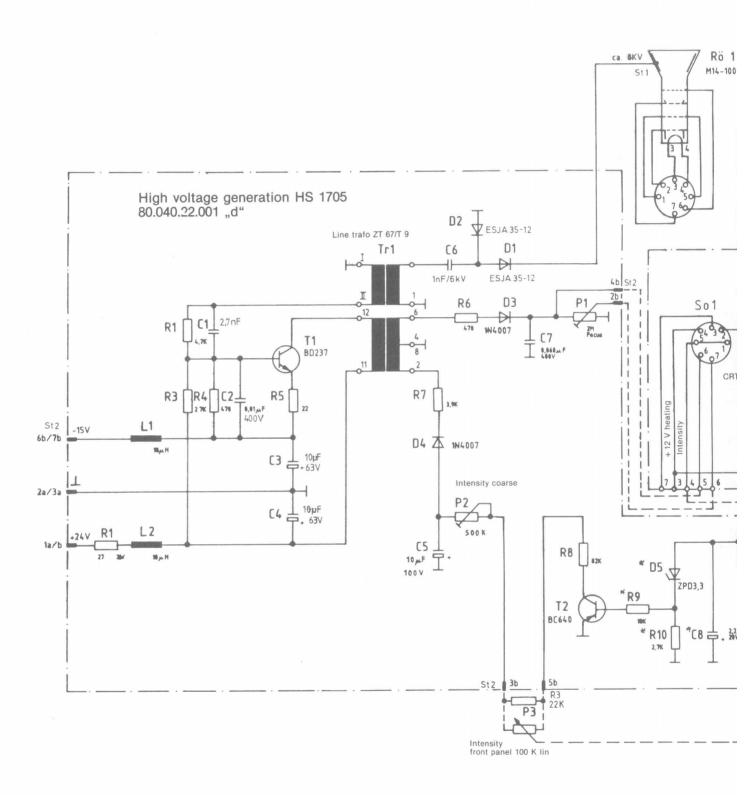


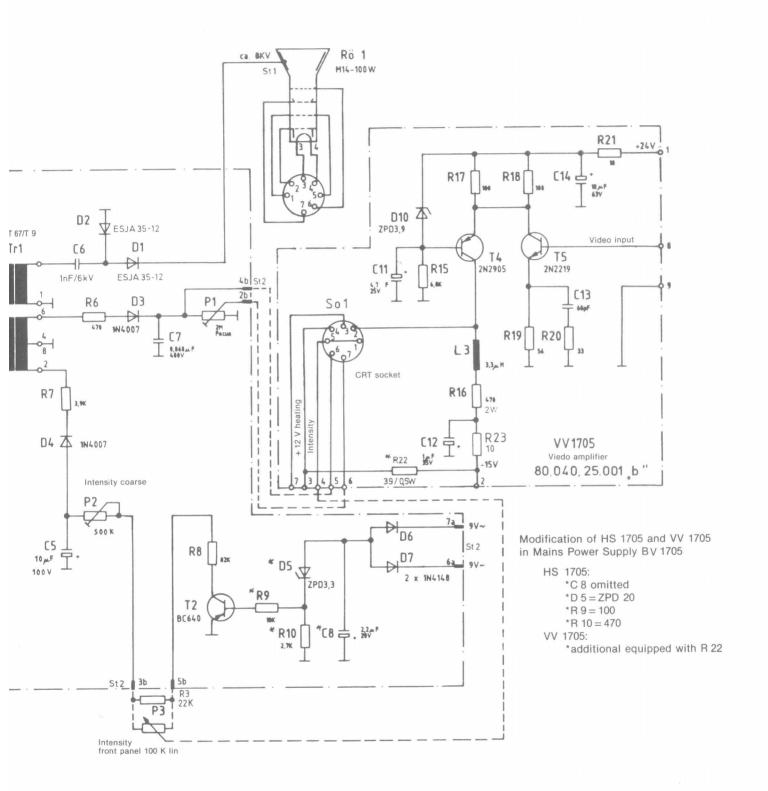


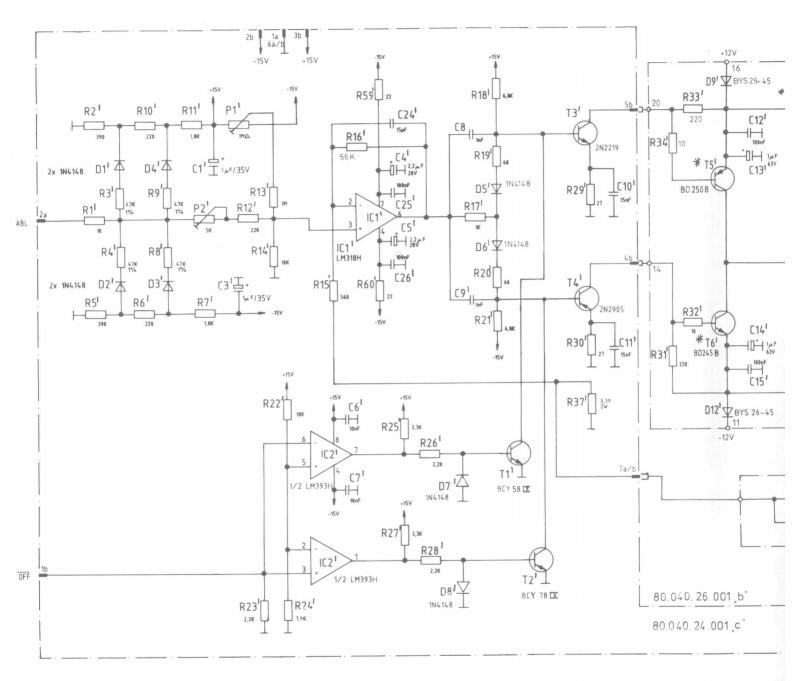








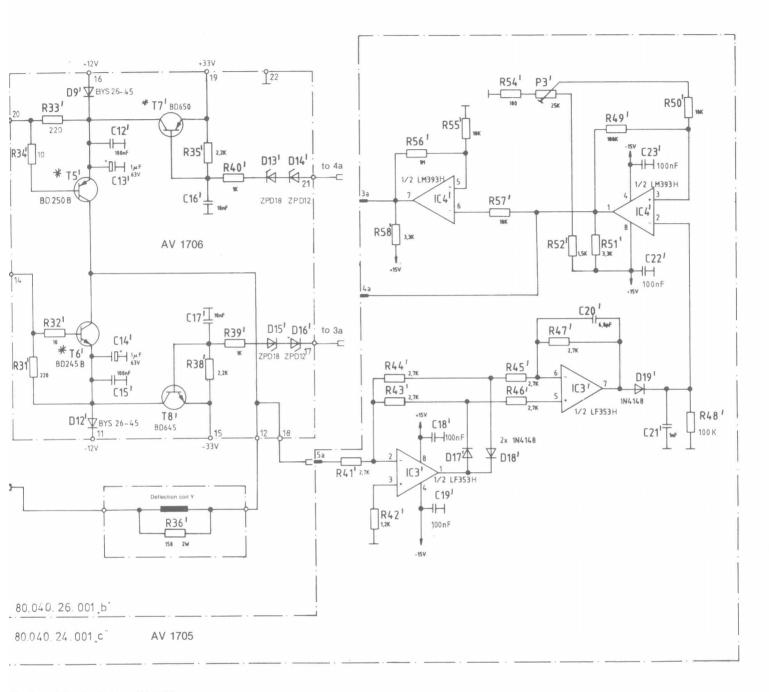




Modification of the final stage AV in Battery Power Supply Version I

- * T 7 omitted
- * T 5 = BD 746 B
- * T 6 = BD 745 B

additional equipped with C 19 10 (See Annex 16, Sheet 5)



diffication of the final stage AV 1706 lattery Power Supply Version BV 1705:

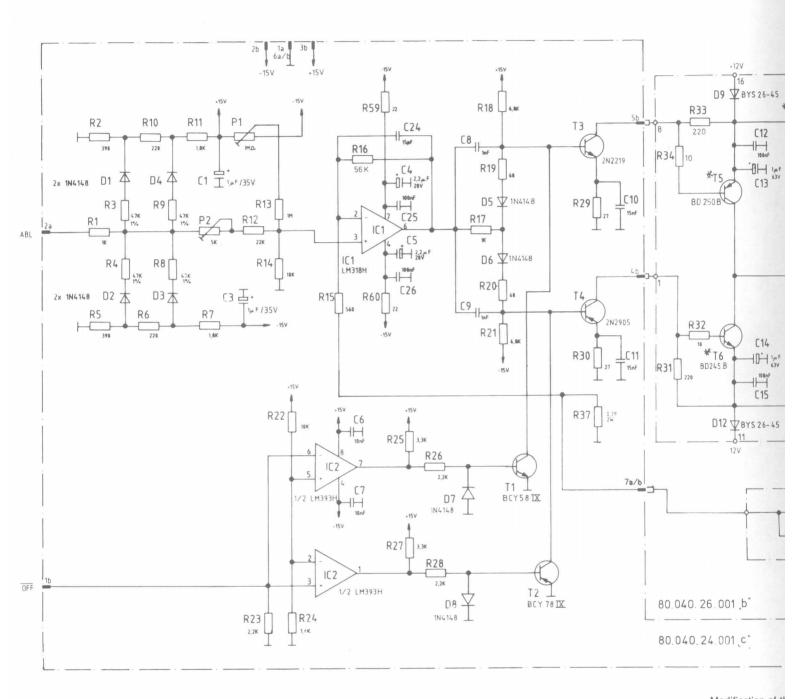
7 omitted

5 = BD 746 B

6 = BD 745 B

itional equipped with C 19 10 $\mu\text{F/63}~\text{V}$

a Annex 16, Sheet 5)

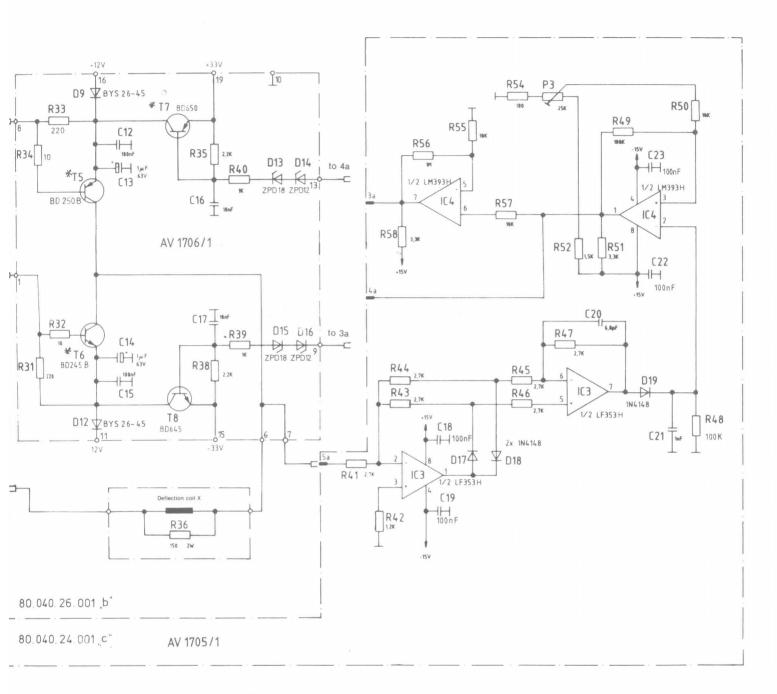


Modification of the in Battery Power

^{*} T 7' omitted

^{*} T 5' = BD 746

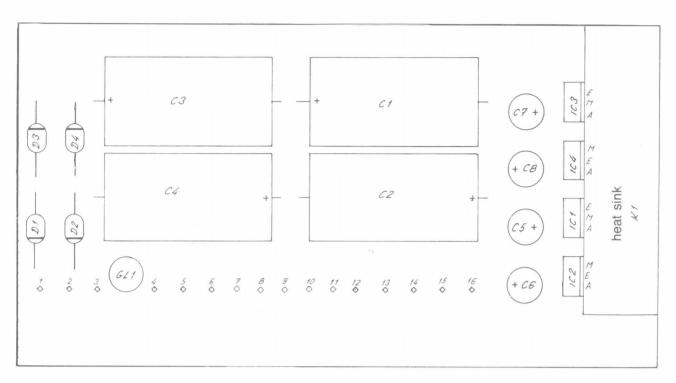
^{*} T 6' = BD 748 additional equipr (See Annex 16, \$



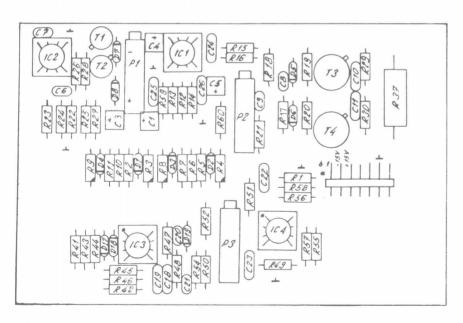
Modification of the final stage AV 1706/1 in Battery Power Supply Version BV 1705:

- * T 7' omitted
- * T 5' = BD 746 B
- * T 6' = BD 745 B

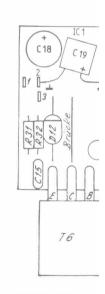
additional equipped with C 19 10 $\mu\text{F/63}$ V (See Annex 16, Sheet 5)



Mains unit board GP 1705/1 in NV 1705 and NB 1705 identically



Y-Deflection Preamplifier AV 1705 (X-Deflection Preamplifier AV 1705/1 identically) in NV 1705, BV 1705 and NB 1705

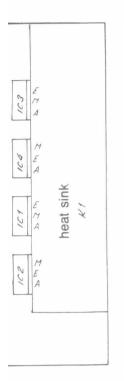


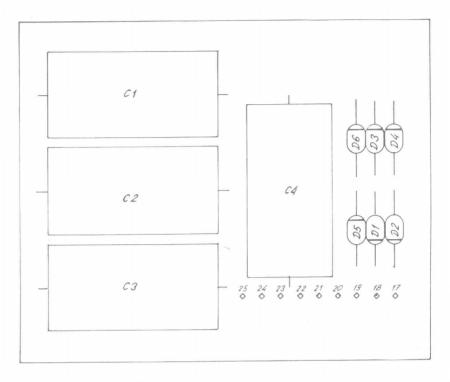
Mai

in N

X-Y Final Deflect

Modification for B T 7 and T 7' omit additional equippor T 5 and T 5' = E T 6 and T 6' = E



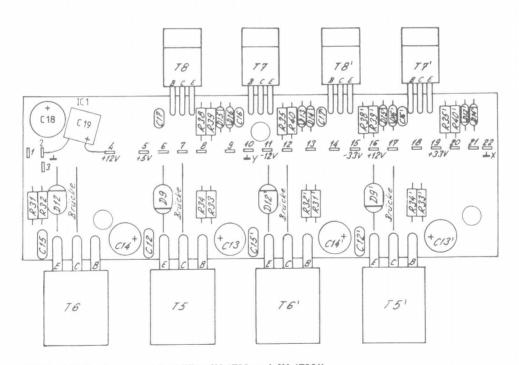


10 16 10

High Voltage Ge

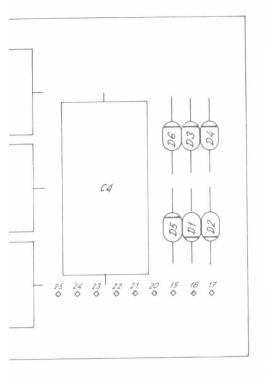
Modification in N D 5 = ZPD 20 D 9 = 100 Ω D 10 = 470 Ω C 8 omitted

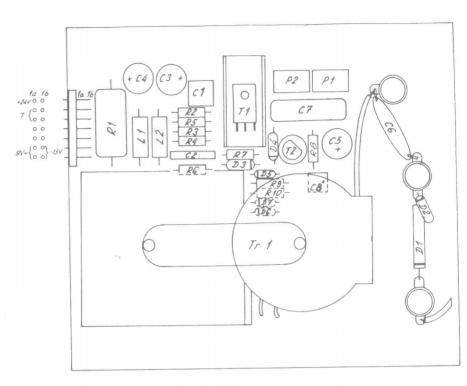
Mains unit board GP 1705/2 in NV 1705 and NB 1705 identically



X-Y Final Deflection stage Amplifier AV 1706 and AV 1706/1

Modification for Battery Power Supply BV 1705 and NB 1705: T 7 and T 7' omitted. additional equipped with C 19. T 5 and T 5' = BD 746 B T 6 and T 6' = BD 745 B





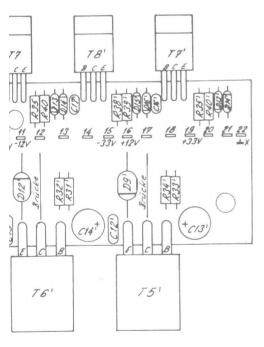
High Voltage Generation HS 1705

Modification in NB 1705:

D 5 = ZPD 20 D 9 = 100 Ω

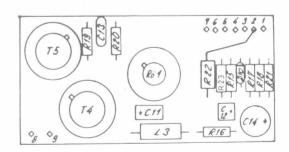
D 10 = 470 Ω

C 8 omitted



and AV 1706/1

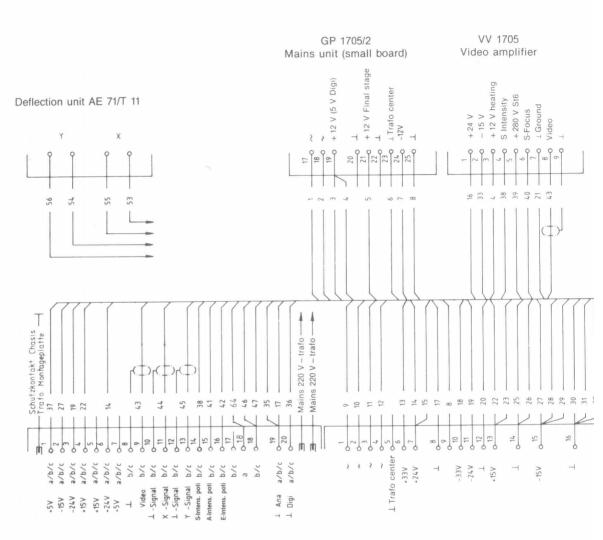
and NB 1705:



CRT socket and Video Amplifier VV 1705

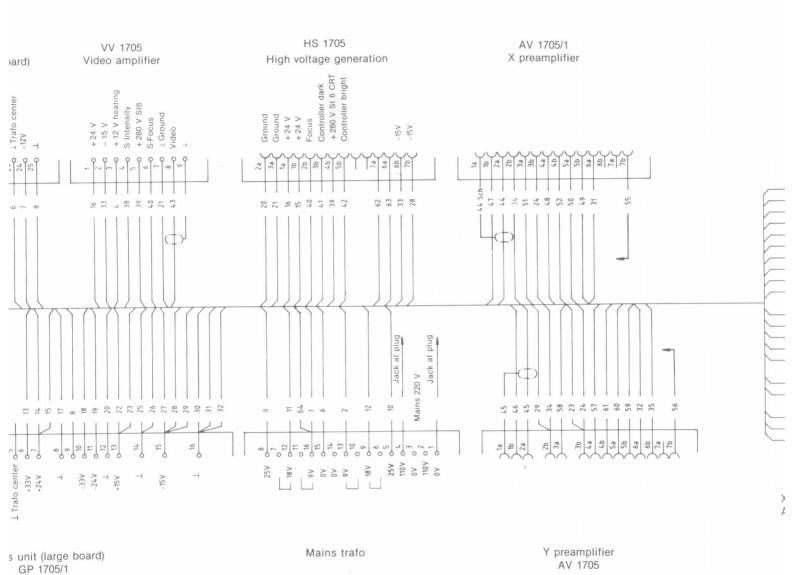
Modification in NB 1705: additional equipped with R 22

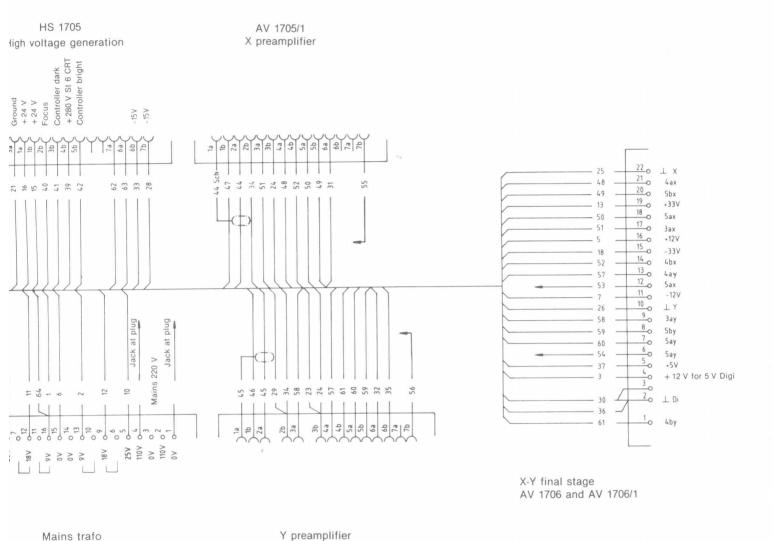
Components Layout Diagrams
Mains Power Supply and CRT Circuitries
Annex 16, Sheet 5



Plug board

Mains unit (large board) GP 1705/1

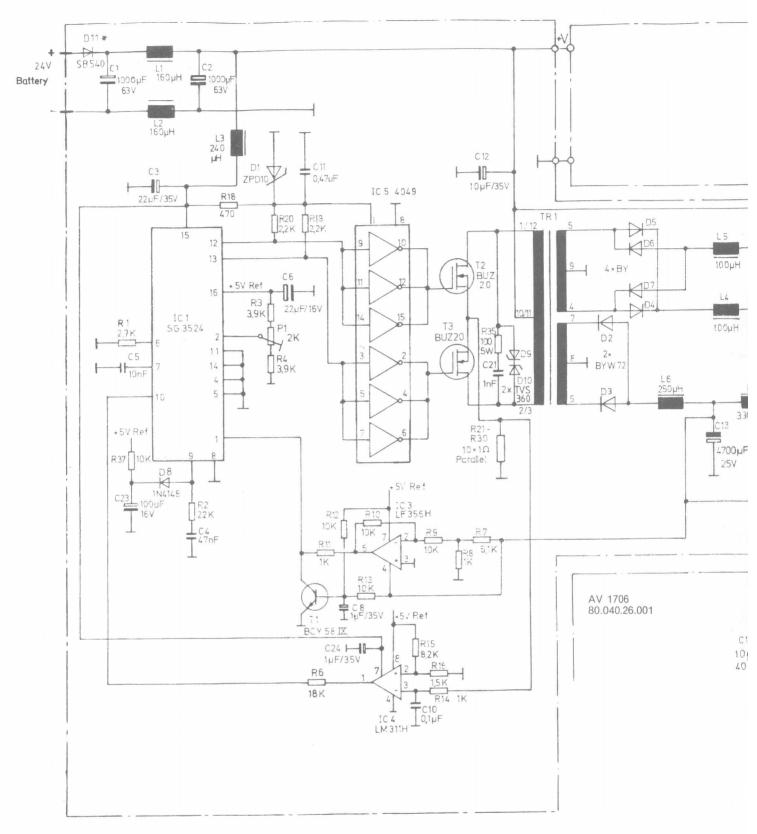




AV 1705

Mains trafo

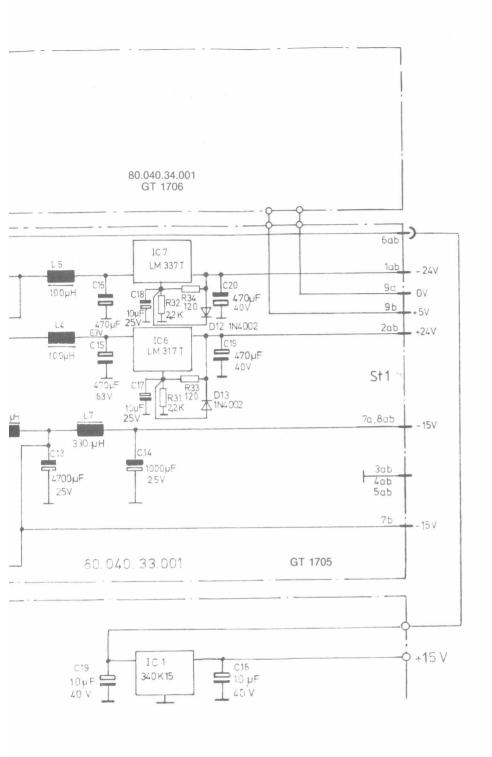
Line Diagram Mains Power Supply NS 1705 Annex 16, Sheet 6

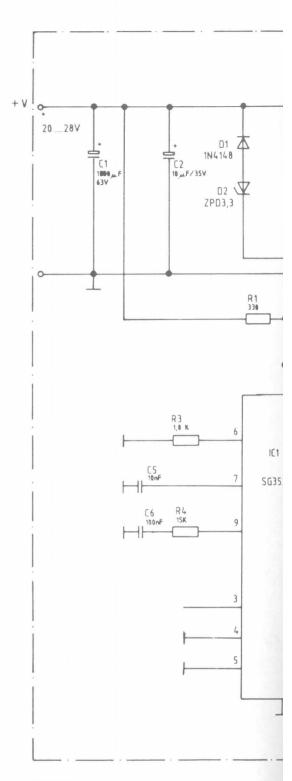


GT 1705

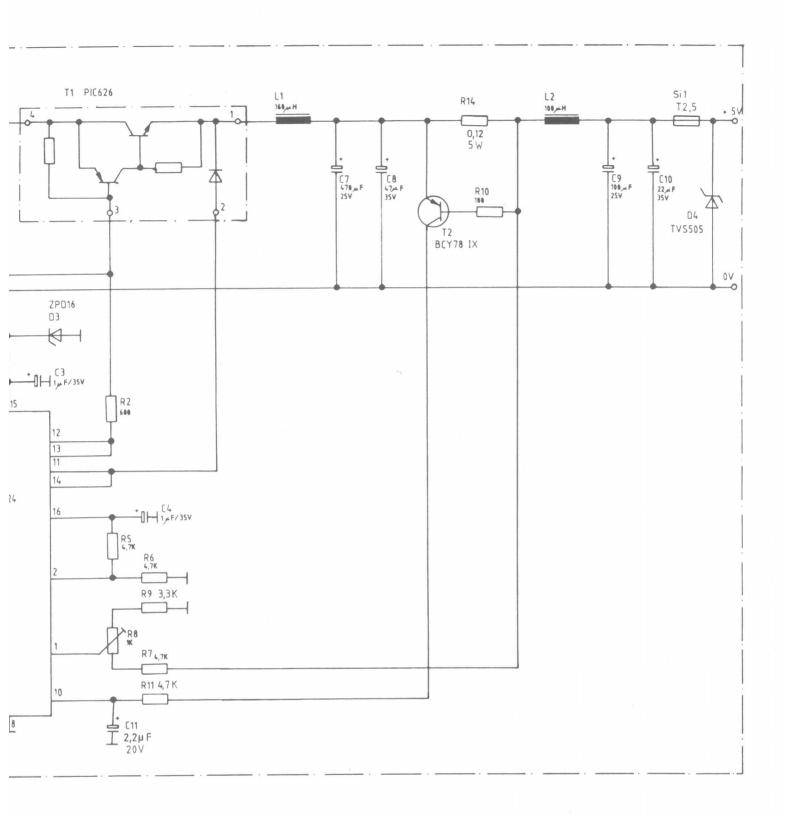
Modification for Mains-/Battery Power Supply NB 1705:

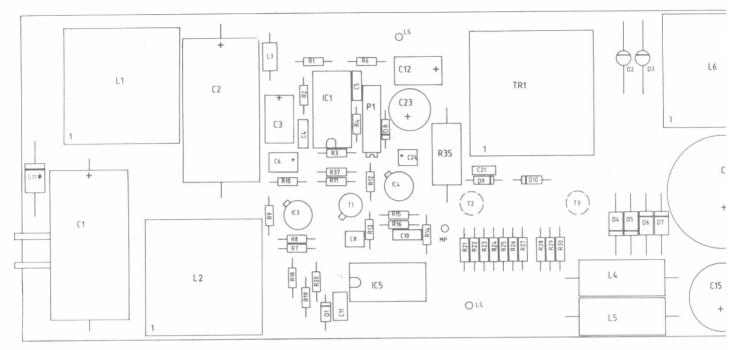
* D 11 omitted (for it a jumper)





GT 1706

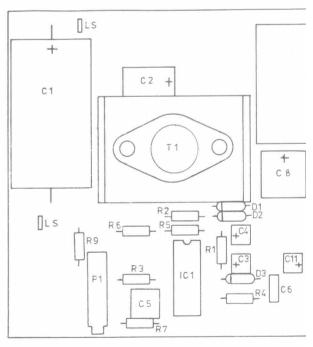




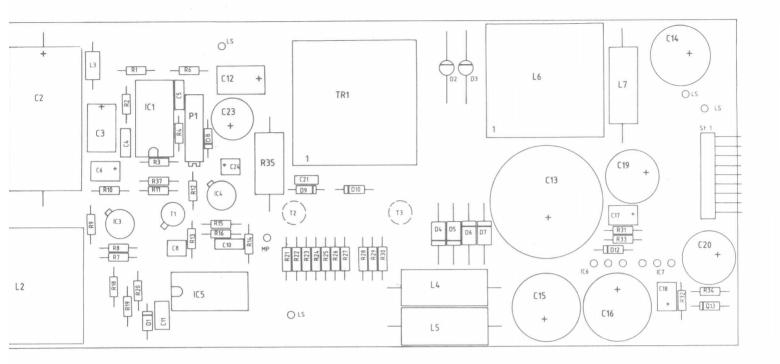
GT 1705

Modification for Mains-/Battery Power Supply NB 1705: * D 11 omitted (for it a jumper)

T 2, T 3, IC 6 and IC 7 a

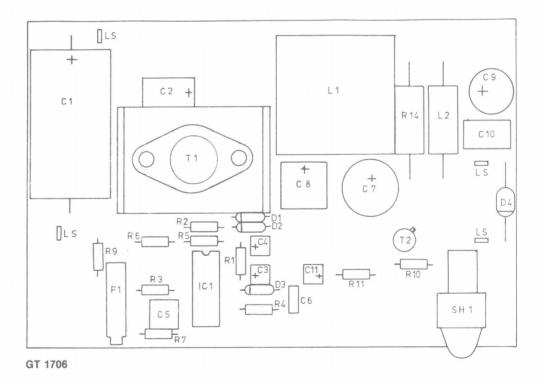


GT 1706

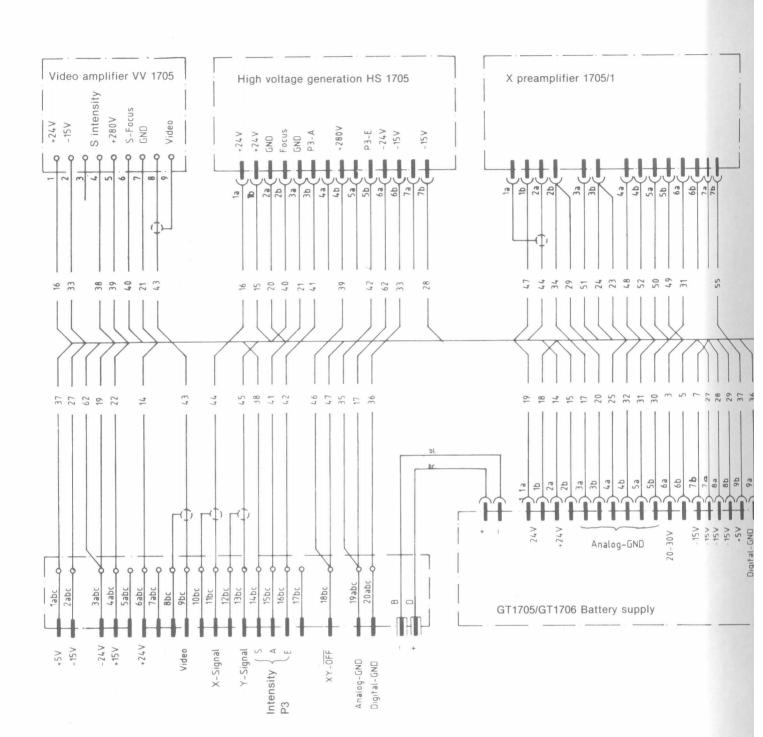


wer Supply NB 1705:

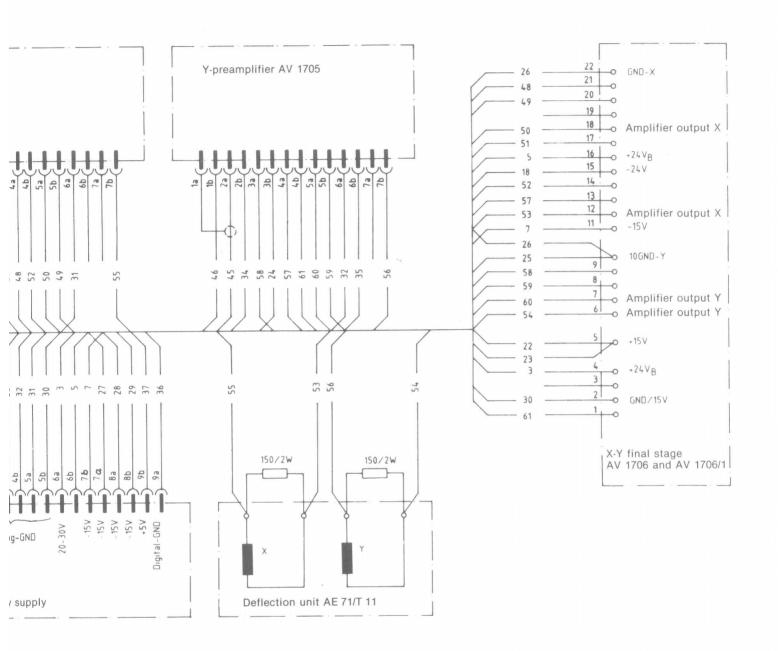
T 2, T 3, IC 6 and IC 7 are mounted on the heat sink!

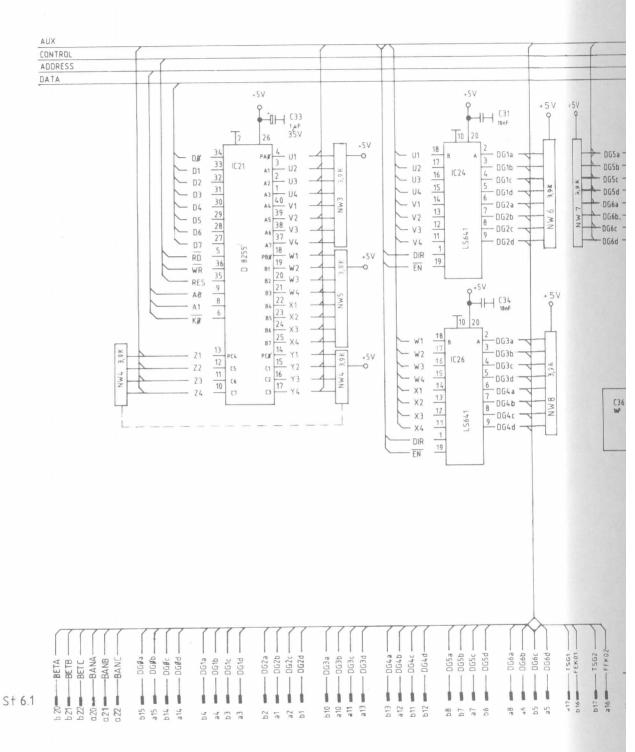


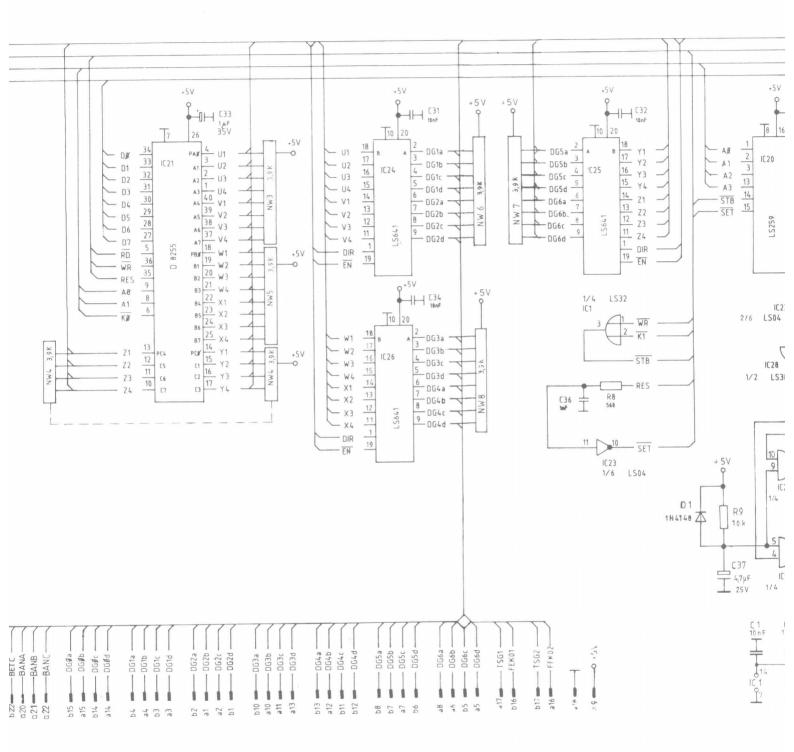
Components Layout Diagrams Battery Power Supply BV 1705 Annex 17, Sheet 2

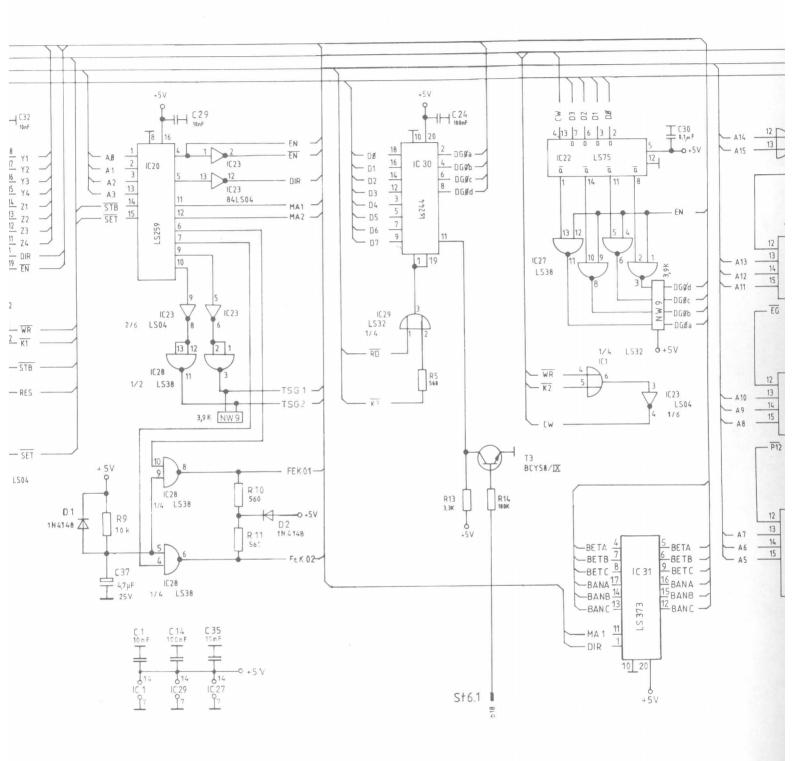


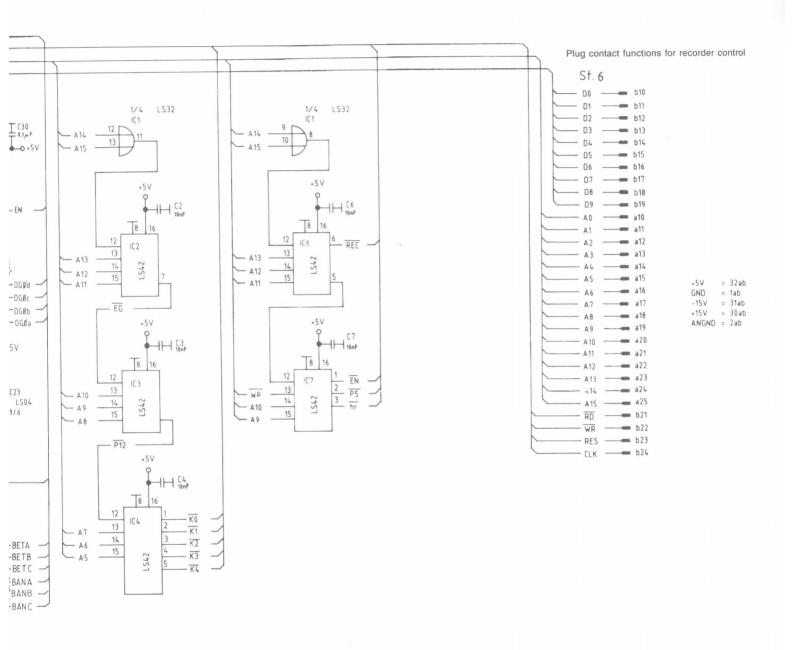
Plug board

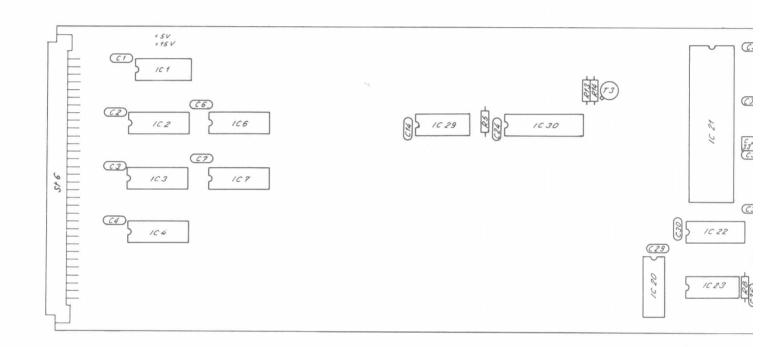


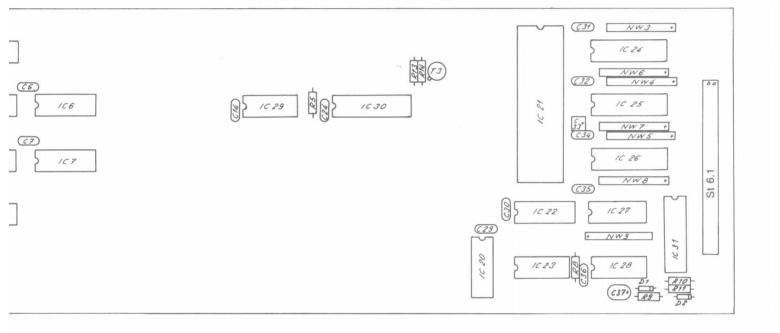


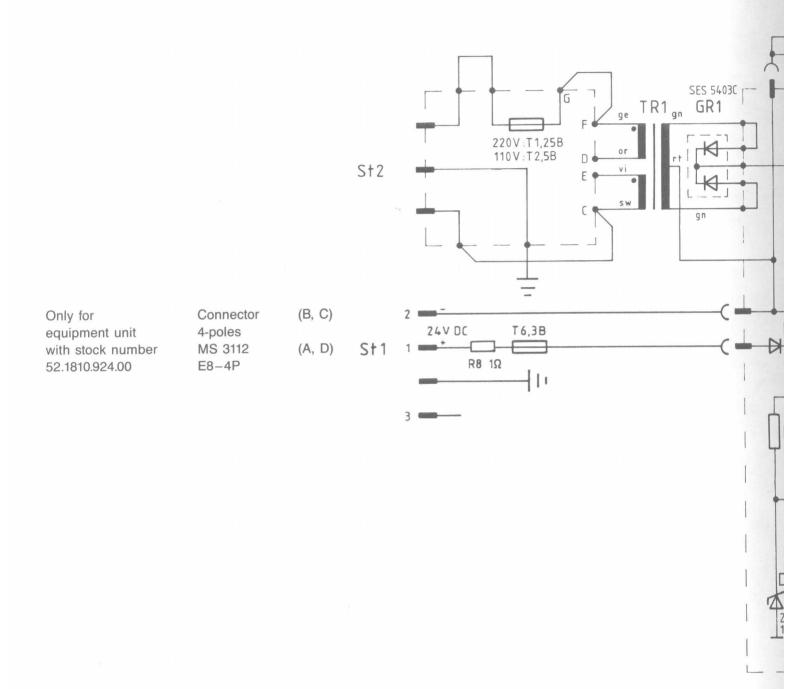


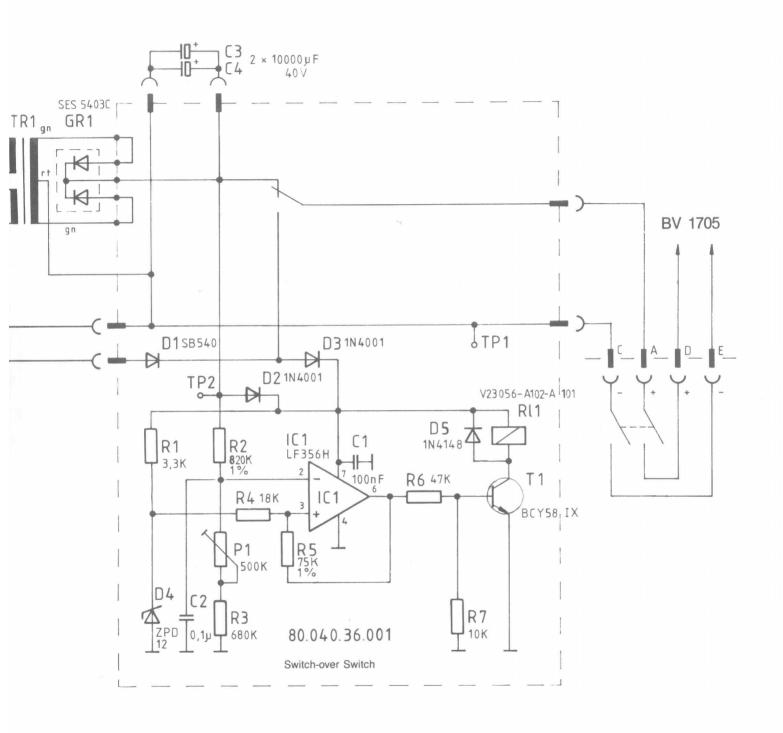


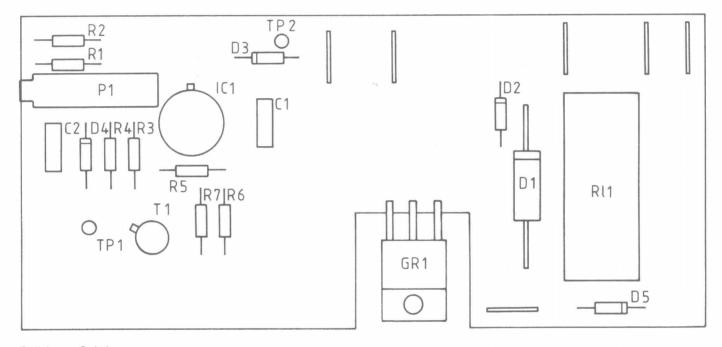












Switch-over Switch

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Acceptance Test Instructions
and
Acceptance Test Protocol
for
Panoramic Display Unit PSG1700/2

E	Bearbeiter / Q	C-Inspe	ector				
				Bearb. Gepr.	Datum 10/84 11/84	Name Rimbach Söllner	Gegenstand/Item Acceptance Test Instructions/ Protocol Panoramic Display PSG1700/2
Rev.	AE	Date	Name		AEG		Prüfünterläge/Test Document Blatt 52.1810.000.00 PV 8 12
Zust	Änderung	Datum	Name	Ursprung:			Ers. für ; Ers. durch :

Ers. durch:

Name

Datum Name Ursprung:

Date

AE

Änderung

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		Prüfprote Test Rec								
2 Serie	nnummer / Serialnumber	3 Hersteller / M		4 WA 5						
6										
3.1	Testing the cursor	function								
	Press "STORE" of cannot be changed line (cursor line) at A continuously det ± 50 kHz for E 19 according to the receiver setting to the receiver setting the exactly at the (f>20,005.00 kHz a 1 second sequence or 29,950 < f < 30,00 to the left side of (29,950 MHz) the receiver is det	by the receiver arises exactly in uning of the recommend of the recommend of the eceiver tuning. In a commend of the or > 30,050 MHz) are to a lower free display. At a recommend of the cursor reaches the example of the	tuning. At the same the midst of the eiver up to ± 5 kH the shifting of the kHz (30,050 MHz) display and by an the cursorline the quency, (19,995.00 sor appears again acceiver setting of	me time a vertice display. Hz for E 1800/3 cursor to both the cursor must increasing deturn the flashes in about the cursor must be flashes in about 19.995.00 kland will be shift exactly 19.995.00	and sides ning out Hz ted					
3.2	Testing of receiver	reset	*							
	Release storage (p	ressing "STORE"	channel l, green	LED is off). Th	е					
	frequency of the receiver is now reset to the original former value of									
	20,000.00 kHz and the display of the PSG 1700/2 is on-line. Check the									
	right frequency at	the right freque	ncy at the receive	r and the disapp	earing					
	cursor at the PSG	1700/2.								
7 MVA	/ MRB ja / yes	nein / Protokoll-I	Nr / Protocol-No.							
8 Beme	rkungen / Remarks			<u> </u>						
				# #						
				*						
9 Bearb	peiter / QC-Inspector	10	***************************************	[11]						
J Bound	, on or a composition									
15	Bear Gep	Datum Name b. 10/84Rimbach r. 11/84Böllner	12 Gegenstand/Item Panoramic Dis	olay PSG 1700/2						
	3		13 Prüfunterlage / Test	Document	Blatt					
Rev. A	AE Date Name	AEG	52.1810.000.00	PV8	10					
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Ers. durch:

Datum Name Ursprung:

Änderung

AEG

Prüfprotokoll-Nr

AEG Aktiengesellschaft

3 Hersteller / Manufacturer

Seriennummer / Serialnumber

226 1286

4 WA

13 Prüfunterlage / Test Document

Ers. für:

52.1810.000.00 PV 8

Istwert/

Actual

Value

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-10 v

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