ROHDE&SCHWARZ

Measuring Instruments
and Systems Division

Service manual

RADIOCOMMUNICATION TESTER CMT

802.2020.52
802.2020.54

VOLUME 1

The service manual consists of 2 volumes

Printed in the Federal
Republic of Germany

Contents of CMT Manual

Operating manual

1. Data Sheet

2. Preparations and Operation

3. Maintenance

Service manual

Volume 1

4. Service Manual for Complete Instrument

5. Service Instruction for Modules

	Order No.	Index
Power Pack	802.2814.02	1
Digital Unit	802.4517.02	2
Analog Unit	802.8435.02	3
1st Modulation Generator Module	802.5713.02	4
RF Oscillator Module including	802.8835.02	5
Reference Oscillator (OCXO) CMT-B1	803.8916.02	
Output Stage	802.7616.02	6
Attenuation Set Module	802.4223.02	7

Volume 2

5. Service Instruction for Modules

Oscilloscope Module	803.1111.00	1
Display/Keyboard Module	802.3662.00	2
Adjacent-channel Power Meter CMT-B6	803.7810.02	3
2nd AF Synthesizer CMT-B7	803.2618.02	4
IEC Bus/Control Interface CM-B4	803.3914.02	5
Autorun Control/Printer Interf. CM-B5	803.3314.02	6
RF Millivoltmeter CM-B8	803.6813.02	7
Duplex Modulation Meter CM-B9	803.5317.02	8
DTMF Decoder CM-B11	803.4610.02	9
Transfer Memory Module CM-Z1	803.7510.02	10

Table of Contents

		Page
4	Service Manual for Complete Instrument	4.1
4.1	Function Description	4.1
4.1.1	RF Synthesizer	4.1
4.1.2	Output Stage	4.1
4.1.3	1st Modulation Generator	4.1
4.1.4	Analog Unit	4.2
4.1.5	Digital Unit	4.3
4.1.6	Power Pack	4.3
4.1.7	Front Panel	4.3
4.1.8	Attenuation Set	4.4
4.1.9	Oscilloscope	4.4
4.1.10	Options	4.4
4.2	Mechanical Design	4.5
4.2.1	Opening the Instrument	4.5
4.2.2	Removing Plug-in Modules	4.5
4.2.3	Removing the Power Pack	4.5
4.2.4	Removing the IEC Bus/Control Interface Option CM-B4 and the Autorun Control/Printer Interface Option CM-B5	4.6
4.2.5	Removing the Attenuation Set	4.6
4.2.6	Removing the Oscilloscope	4.6
4.2.7	Removing the Front Panel	4.6
4.3	Testing and Adjustment	4.9
4.3.1	Adjusting the Power Pack	4.9
4.3.1.1	+5 V Operating Voltage	4.9
4.3.1.2	+24 V Operating Voltage	4.9
4.3.2	Adjusting the Digital Unit	4.10
4.3.3	Adjusting the RF Oscillator	4.10
4.3.3.1	Frequency Adjustment	4.10
4.3.3.2	Level Adjustment	4.10
4.3.4	Adjusting the Output Stage	4.11
4.3.4.1	Level Adjustments	4.11
4.3.4.2	Adjusting the Modulation Depth	4.11
4.3.5	Adjusting the Analog Unit	4.11
4.3.5.1	Adjusting the LO Conditioning	4.12
4.3.5.2	Adjusting the RF Amplifier, FM	4.12
4.3.5.3	Adjusting the RF Amplifier, AM	4.12
4.3.5.4	Adjusting the FM Demodulator	4.12
4.3.5.5	Adjusting the AM Demodulator	4.13
4.3.5.6	Adjusting the CCITT Filter	4.13
4.3.5.7	Adjusting the Distortion Control	4.14
4.3.5.8	Adjusting the 1-kHz Notch Filter	4.14
4.3.5.9	Adjusting the 990-Hz Notch Filter	4.14
4.3.5.10	Adjusting the 1010-Hz Notch Filter	4.15
4.3.5.11	Adjusting the Power Display	4.15
4.3.6	Adjusting the Attenuation Set	4.15
4.3.7	Adjusting the Oscilloscope	4.15
4.3.7.1	Adjusting the Horizontal Beam Deflection	4.16
4.3.8	Options	4.16
4.4	Troubleshooting	4.17

Contents

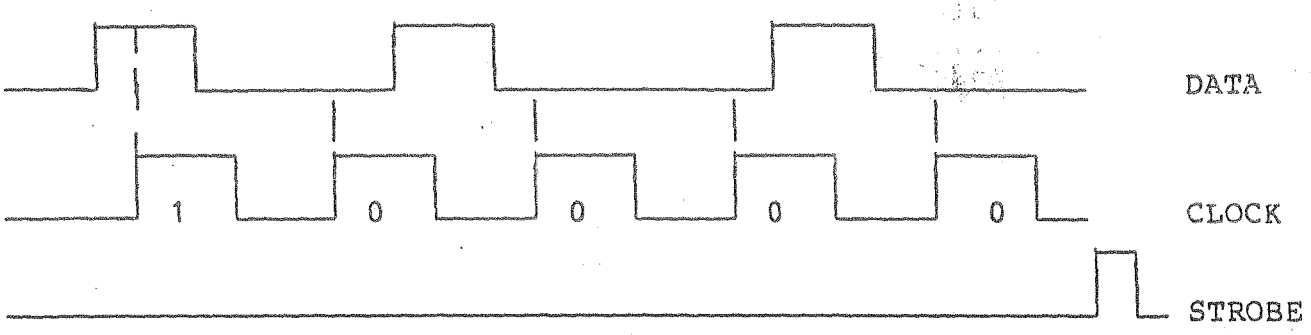
5 Service Manual for the Individual Modules

	Index
Power Pack	1
Digital Unit	2
Analog Unit	3
1st Modulation Generator Module	4
RF Oscillator Module incl. Reference Oscillator CMT-B1	5
Output Stage	6
Attenuation Set Module	7

General

Serial data transmission to the individual plug-in modules takes place on three lines: CLOCK, DATA and STROBE. The data must be read in using an external controller, e.g. PUC, in order to adjust or test the modules independent of the basic instrument.

The timing diagram for data transmission is shown below.



The data on the DATA line are transferred to the parallel/serial converter with each rising edge of the CLOCK pulses; a subsequent STROBE pulse enables the data at the converter outputs. The following BASIC program shows how the user port of the PUC can address the module:

```
1Ø POKE 59259,255          Set user port
2Ø DIM A(20)               Number of individual data bits,
                           20 in this case
3Ø A(1)=0:A(2)=1...        Define individual data

4Ø FOR I=1TO20
5Ø POKE 59471,A(I)      ┐  Read in data;
6Ø POKE 59471,A(I)+2    ┘  Line with significance 2^0 = DATA,

7Ø NEXT                    significance 2^1 = CLOCK

8Ø POKE 59471,4         ┐  Output of STROBE pulse on line
9Ø POKE 59471,O:END     ┘  with significance 2^2
```

4 Service Manual for Complete Instrument

(See circuit diagram 802.2020 S)

4.1 Function Description

4.1.1 RF Synthesizer

The RF synthesizer with frequency modulation generates RF frequencies in the range from 500 to 1000 MHz which is covered by three selectable oscillators. Three linked phase locked loops (PLL) produce the resolution required for the frequency setting. The main reference is a 10-MHz crystal oscillator (temperature-stabilized as option) to which a 100-MHz crystal oscillator is linked. The 100-MHz frequency is divided per program and produces the reference frequency for a crystal oscillator which can be adjusted by ±2 kHz and whose frequency, divided by a factor of 100, is the reference frequency for the coarse PLL of the RF oscillators.

If the Duplex Modulation Meter option CM-B9 is not fitted, the RF synthesizer is operated as a generator in the receiver test and as a mixing oscillator in the transmitter test. Information on voltages and on the locking of the PLLs is passed to the controller via the analog unit for test purposes and for troubleshooting.

4.1.2 Output Stage

The output stage divides the frequencies provided by the RF synthesizer such that a frequency range of 31.25 to 1000 MHz is covered. Appropriate filters are connected in series with the frequency dividers to ensure that the harmonics ratio required is attained. Frequencies <31.25 MHz are generated by mixing the 100-MHz crystal frequency with a corresponding oscillator frequency.

A controlled amplifier increases the RF signal to the max. level of 13 dBm. Fine variation of the level is achieved by modifying the reference input for the control via D/A converters. Amplitude modulation is also active and the modulation signal is superimposed on the reference value of the D/A converter.

4.1.3 1st Modulation Generator

The AF synthesizer and the modulation controller are accommodated on the 1st modulation generator module. The AF synthesizer is basically a set of shift registers whose outputs are activated in succession by a clock generated by the controller.

The output levels are added by a resistor chain to give a sine curve. The stepped sinewave produced is freed from harmonics by suitable filters and output following an attenuation set consisting of D/A converters and selectable voltage attenuators.

The modulation controller divides the level provided by the modulation generator into AM and FM paths. D/A converters are used to achieve the setting accuracy required for modulation. ΦM is enabled by a corresponding filter in the FM branch.

The signal applied to connector MOD. EXT. is routed to the analog unit module for calibration where its level is measured and the connected amplifier is adjusted to the modulation controller according to the result.

4.1.4 Analog Unit

The analog unit consists of the following function units: RF amplifier, LO conditioning, demodulators, AF conditioning and DC amplifier.

The RF signals to be measured are regulated to a constant level in the RF amplifier according to the type of modulation and then routed to the RF frequency counter and the mixer.

The LO conditioning amplifies the signals from the output stage to the level required for the mixer. Frequencies below 31.25 MHz are divided to generate the IF of 455 kHz for signal frequencies up to approx. 1 MHz. A generator with amplitude modulation is integrated for self-testing.

The demodulators contain the IF amplifiers, the AM and FM/ΦM demodulators and filters required to suppress the IF.

The AF conditioning weights the demodulated signal and the signal from the AF VOLTM input according to the measuring requirements; various filters (300-Hz HP, CCITT filter, 150-Hz HP) can be connected as required (rms or peak values). The signal to be measured is regulated to a constant rms value for distortion measurements and subsequently freed from the wanted signal in a notch filter.

The rectifiers (peak value and rms value rectifiers) are contained in the DC amplifier. A DC multiplexer connects the voltages supplied by the other modules to a selectable DC amplifier which passes the signal to the A/C converter incorporated in the digital unit.

4.1.5 Digital Unit

The digital unit consists of the following function units: RF counter, AF counter, A/D converter and controller.

The RF counter counts the frequency of the applied RF signal in the range from 1 to 1000 MHz. The setting of the RF synthesizer to generate the LO frequency required for demodulation is obtained from the counter result.

The AF counter counts the frequency of the demodulated signal as well as signals in the range from 10 Hz to 500 kHz applied to input AF VOLTM.

The controller controls the complete instrument. All data to the individual modules are applied via serial data lines (CLOCK, DATA, STROBE). Power fail logic with an additional battery voltage ensures that the data are not lost upon power failure or when the instrument is switched off.

4.1.6 Power Pack

The power pack supplies the instrument with the operating voltages of +5 V, +12 V, +15 V, -15 V and +24 V. The voltages are generated using a switched-mode power supply so that the instrument can also be operated using standard car batteries. When connected to the AC power supply, a transformer reduces the line voltage to the voltage required for the switched-mode power supply.

The instrument operates in STANDBY mode if the power pack is switched off from the front panel; all voltages are then switched off except the +12 V supply which is used for the 10-MHz crystal oven and the STANDBY logic.

Fuses are provided on the input side to protect the power pack. STANDBY mode is automatically switched on if one or more voltages on the secondary side are short-circuited with each other or to ground or if the power pack is operated without a secondary load.

4.1.7 Front Panel

All keys required to operate the instrument as well as the loudspeaker potentiometer and the spin wheel for fast adjustment of the parameters are located on the front panel.

The set parameters and the results are output on LCDs connected to the front panel via conductive rubber contacts. The loudspeaker amplifier is also mounted on the front panel with the loudspeaker control. A ribbon cable connects the front panel units to the motherboard and the digital unit.

4.1.8 Attenuation Set

The attenuation set contains the attenuator connected to relays for attenuating the RF synthesizer level as well as power attenuators in which the major part of the applied power is converted into heat. The connection between the power attenuators and the other attenuators is made via a 50-Ω star arrangement to which the power diode, the analog unit and the RF-30 dB output/input on the rear panel are connected.

Corresponding RF diodes are integrated to protect the attenuation set during mechanical switching and to detect power. A PCB screwed onto the attenuation set drives the attenuation set and evaluates the voltages from the diodes. The PCB is connected to the motherboard via a ribbon cable.

4.1.9 Oscilloscope

The oscilloscope enables visual display of the demodulated signals, the beat signal and externally applied signals.

The voltages required for the oscilloscope tube, the blanking amplifier and the deflection amplifier are generated by a switched-mode power pack with an operating voltage of 24 V. The deflection coefficients and the operating mode are read from the digital unit into RAMs, read out by D/A converters and written as Lissajous figures on the screen in the form of numbers, letters and arrows. The oscilloscope is powered via ribbon cables which are routed to the front panel.

4.1.10 Options

The function descriptions of the options are contained in the respective service manuals (Section 5).

4.2 Mechanical Design

Except for the front panel, power pack, attenuation set and oscilloscope, the CMT modules are designed as plug-in cards. Repairs can therefore be carried out rapidly or the faulty card can be completely replaced.

The electric connections are made via the common motherboard. Sensitive signals are routed via plug-in or screw-on coaxial connections. The connections from the power pack, front panel, attenuation set and oscilloscope to the other modules are made via plug-on ribbon cables.

A blower is provided at the rear to cool the modules. The air is sucked through the perforations at the side and blown out via the rear panel.

4.2.1 Opening the Instrument

Loosen the four Phillips screws at the rear used to secure the feet (marked A in Fig. 4-1); the captive screws remain in the feet. Remove the feet and slide out the top and bottom panels to the rear.

Caution: The power plug must be disconnected before removing the modules.

4.2.2 Removing Plug-in Modules

These modules are secured by two rails at the sides next to the motherboard. Loosen the Phillips screws marked A in Fig. 4-2 and press towards the rear using a suitable tool inserted into bracket B. Disconnect any coaxial and ribbon cables present and remove the modules from the instrument.

Note: If the IEC Bus/Control Interface option CM-B4 and the Autorun Control/Printer Interface option CM-B5 are present, these must be removed before removing the digital unit module (see Section 4.2.4).

4.2.3 Removing the Power Pack

Disconnect plugs X60, X61 and X70 from the motherboard. Loosen the five Phillips screws marked C and D in Fig. 4-1 and remove the power pack from the frame. Ensure that the cables leading from the power pack are not subjected to stress which could break the connected lead-through filters.

4.2.4 Removing the IEC Bus/Control Interface Option CM-B4 and the Autorun Control/Printer Interface Option CM-B5

Loosen the Phillips screws on the rear of the instrument (marked D and E in Fig. 4-1) and remove the option(s) towards the rear from the multiple connectors of the digital unit.

4.2.5 Removing the Attenuation Set

Unscrew the two SMA connectors from the cables with a solid jacket and pull off the two coaxial connectors.

The attenuation set with the heat sink is mounted to the chassis by four screws, two of which are fitted with nuts (marked C in Fig. 4-2). Loosen the screws and remove the attenuation set with the heat sink.

The drive board is fitted on the attenuation set using six screws. Before removing the board, desolder the two wires to the overtemperature sensor.

Note: The attenuation set must not be opened; the internal components consist of thin-film substrates which can only be replaced in the factory.

4.2.6 Removing the Oscilloscope

Loosen the hexagon socket screws of the rotary knobs on the front panel and remove the knobs. Loosen the six screws with which the inscription panel is secured (two screws in the centre between the displays). Loosen the screws marked A in Fig. 4-3. Disconnect the two ribbon cable plugs and the coaxial connector X605 from the analog unit module. The oscilloscope assembly can now be removed from the front.

4.2.7 Removing the Front Panel

Remove the inscription panel as described in Section 4.2.6 and loosen the screws marked B in Fig. 4-3. Disconnect the three ribbon cable connectors and remove the front panel.

Figs. 4-1 to 4-3 show the screws to be loosened to remove the modules.

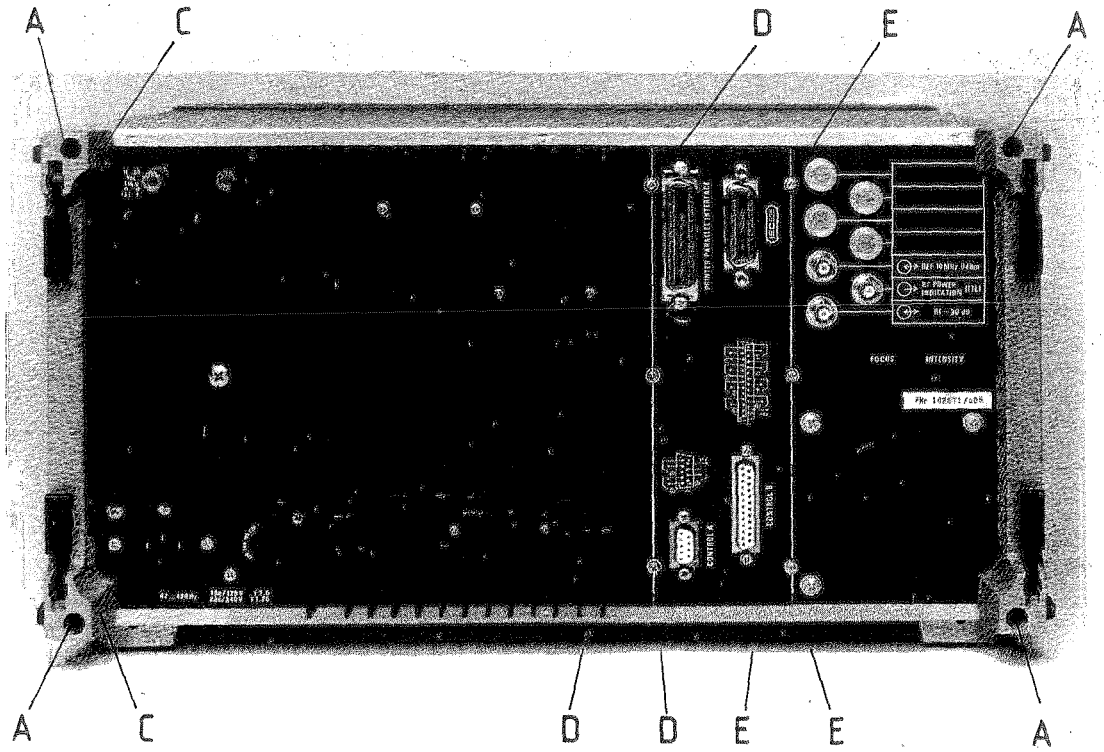


Fig. 4-1

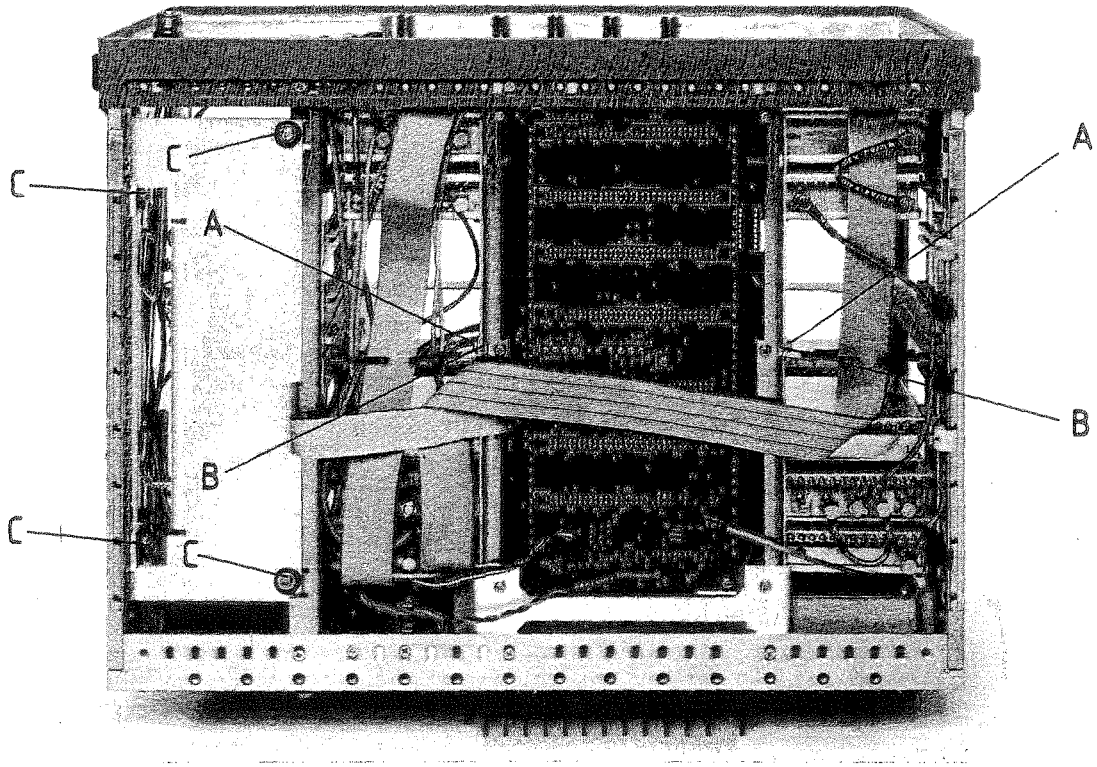


Fig. 4-2

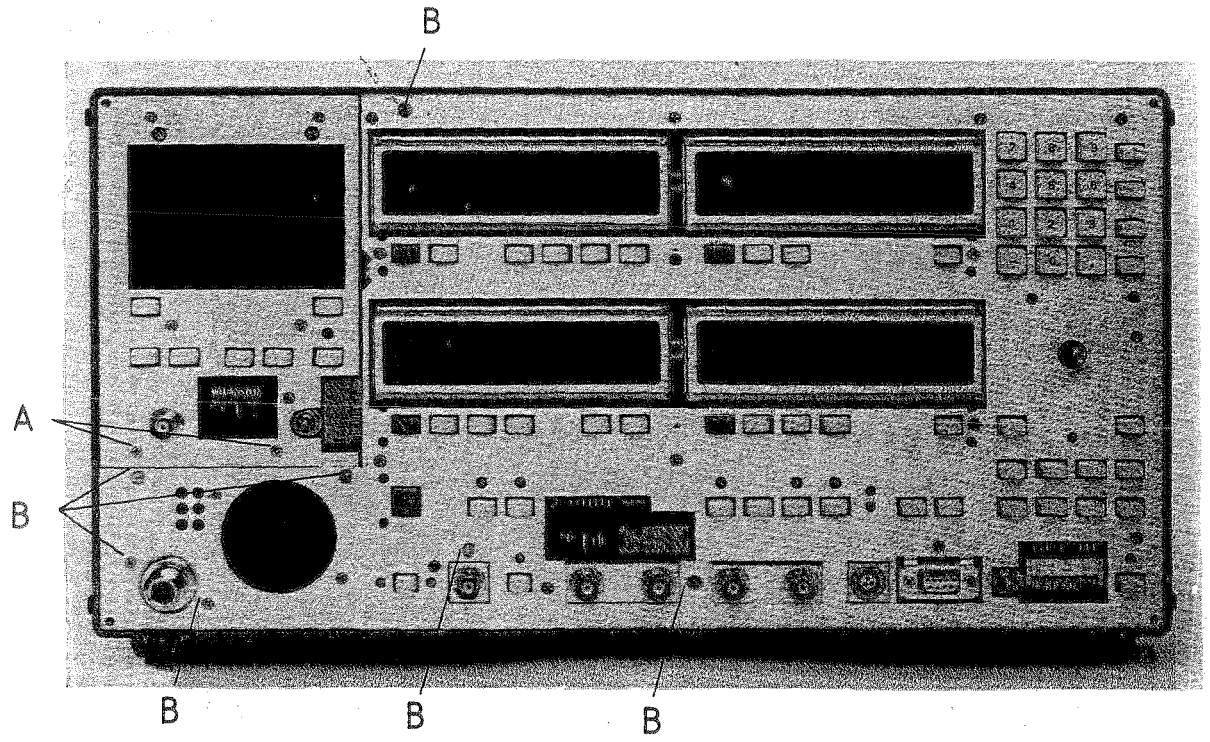


Fig. 4-3

4.3 Testing and Adjustment

Exact testing of the instrument specifications should be carried out according to Section 3.2 in the Operating Manual. Each test in the manual refers to a possible adjustment. Renewed testing is therefore necessary following adjustments.

Some adjustments on the CMT can be carried out without using the adapter cable; where required, this is clearly indicated.

Before carrying out any adjustments, ensure that the appropriate control element is about to be used; unintentional adjustment of set values can lead to large measurement errors.

All modules should be inserted or connected when an adjustment is carried out. If a module must be adjusted outside the instruments or if a fundamental unit is missing (e.g. digital unit), carry out the adjustment as described in Section 5.

The sequence of adjustments from module to module and also within modules ensures that the adjustments do not affect one another; if this is nevertheless possible, reference is made to the previously required setting.

4.3.1 Adjusting the Power Pack

4.3.1.1 +5 V Operating Voltage

Setting: + Switch on instrument

Adjustment point: + X61 on motherboard

Adjustment value: + Adjust to 5.3 V ±10 mV using R12

4.3.1.2 +24 V Operating Voltage

Setting: + Switch on instrument

Adjustment point: + X61 on motherboard

Adjustment value: + Adjust to 24 V +100 mV/-0 mV using R56

4.3.2 Adjusting the Digital Unit

Setting: → Switch on instrument

Adjustment point: → X58/A21 on motherboard

Adjustment value: → Adjust to 10 V ±1 mV using R109

4.3.3 Adjusting the RF Oscillator

→ Pull out module and connect to the CMT using the adapter cable.

→ Open module.

4.3.3.1 Frequency Adjustment

Settings: → Receiver test
→ Frequencies as in following table:

Frequency	Trimmer
500.001 MHz	C21
655.001 MHz	C51
825.001 MHz	C81

Adjustment point: → X9/2

Adjustment value: → Adjust to 2.5 V DC ±100 mV using C21, C51, C81

4.3.3.2 Level Adjustment

Settings: → Receiver test
→ Frequencies as in following table:

Frequency	Trimmer
575 MHz	R49
730 MHz	R79
900 MHz	R109

Adjustment point: → X310

Adjustment value: → Adjust to 0 dBm ±3 dB using R49, R79, R109

4.3.4 Adjusting the Output Stage

Note: Check adjustment 4.3.3.2 before adjusting the output stage.

Remove the module from the CMT and connect using the adapter cable. The module need not be opened for the adjustment.

4.3.4.1 Level Adjustments

Settings:
- → Receiver test
- → Frequencies as in following table
- → Set required level
- * Set level via hand wheel

	Frequency	Level	Trimmer	Adjustment value
	100 MHz	+13 dBm	R514	13 dBm ±0.05 dB
*	100 MHz	-16.9 dBm	R452	-6.9 dBm ±0.05 dB
	7.9 MHz	+13 dBm	R641	13 dBm ±0.05 dB
*	7.9 MHz	-16.9 dBm	R663	-6.9 dBm ±0.05 dB

Adjustment point: → X401 or RF IN/OUT on the front panel

Compare level of 13 dBm at 1 GHz and 330 MHz and take the average using R514.

4.3.4.2 Adjusting the Modulation Depth

Settings:
- → Receiver test
- → Frequency 100 MHz
- → Level 0.1 dBm
- → Modulation 80% AM
- → AF = 1 kHz

Adjustment point: → X401 or RF IN/OUT on the front panel

Adjustment value: → Adjust to 80% AM ±0.1% AM using R503

4.3.5 Adjusting the Analog Unit

→ Remove the module from the CMT and connect using the adapter cables.

→ Open module.

4.3.5.1 Adjusting the LO Conditioning

Settings:
- Transmitter test
- Fixed frequency 15 MHz

Adjustment point:
- D100/3

Adjustment value:
- Adjust to TTL level using R102
- Check at P30 whether TTL level is present at half frequency

4.3.5.2 Adjusting the RF Amplifier, FM

Settings:
- Transmitter test
- Apply 500 MHz, 20 mV to INPUT2
- Demodulation: FM

Adjustment point:
- X610/50 Ω

Adjustment value:
- Adjust to 150 mV ±5 mV using R87

4.3.5.3 Adjusting the RF Amplifier, AM

Note: The adjustment 4.3.5.2 must be checked before this adjustment.

Settings:
- Transmitter test
- Apply 500 MHz, 20 mV to INPUT2
- Demodulation: AM

Adjustment point:
- X610/50 Ω

Adjustment value:
- Adjust to 75 mV ±5 mV using R88

4.3.5.4 Adjusting the FM Demodulator

Settings:
- Transmitter test
- Apply 100 MHz, 20 mV, 10 kHz deviation to INPUT2
- Demodulation: FM, $\pm \frac{PK}{2}$

Adjustment point:
- DEMODULATION display

Adjustment value:
- Adjust to 10 kHz ±10 Hz using R304
- Adjust to 0 V_{DC} ±5 mV at DEMOD connector using R213

4.3.5.5 Adjusting the AM Demodulator

Note: Check adjustment 4.3.5.4 before this adjustment. The following three adjustments mutually affect one another; adjust in the specified sequence and check again at the end.

Settings:
- → Transmitter test 100 MHz
- → Apply 100 MHz, 10 mV, 80% AM, AF 1 kHz to INPUT2
- → Demodulation: AM, ± $\frac{PK}{2}$

Adjustment point 1: → D680/1

Adjustment value 1: → Adjust to 250 mV ±2 mV using R197 (take settling time into account)

Adjustment point 2: → DEMOD connector

Adjustment value 2: → Adjust to minimum limitation of lower sine half-wave using R254

Adjustment point 3: → DEMODULATION display

Adjustment value 3: → Adjust to 80% ±0.1% using R275 (take settling time into account)

4.3.5.6 Adjusting the CCITT Filter

Settings:
- → Receiver test
- → Apply 1 V_{rms}, 800 Hz to AF VOLTM
- → Press CCITT

Adjustment point: → AF VOLTMETER display

Adjustment value: → Adjust to 1 V ±10 mV using R388

Check: → When pressing CCITT again (off), the display must not change.

Note: → The rms meter should be calibrated prior to this adjustment.

4.3.5.7 Adjusting the Distortion Control

Note: The following two adjustments mutually affect one another. Check the adjustments at the end and correct if necessary.

Settings:	+ Receiver test + Apply 1 V_{rms}, 1 kHz to AF VOLTM
Adjustment point 1:	+ X23/1
Adjustment value 1:	+ Adjust to 1 V_{rms} ±1 mV using R543
Adjustment point 2:	+ N450/1
Adjustment value 2:	+ Adjust to pure $\sin^2$ using R542

4.3.5.8 Adjusting the 1-kHz Notch Filter

Settings:	+ Receiver test + Apply 1 kHz, 1 V_{rms} with low distortion (<0.01%) to AF VOLTM + Press DIST
Adjustment point:	+ AF VOLTMETER display
Adjustment value:	+ Alternately adjust to minimum distortion (<0.3%) using R557 and R556

4.3.5.9 Adjusting the 990-Hz Notch Filter

Settings:	+ Receiver test + Apply 1 V_{rms}, 990 Hz with low distortion (<0.01%) to AF VOLTM + Press DIST
Adjustment point:	+ AF VOLTMETER display
Adjustment value:	+ Adjust to minimum distortion (<0.3%) using R566

4.3.5.10 Adjusting the 1010-Hz Notch Filter

Settings:
- → Receiver test
- → Apply 1 V_{rms}, 1010 Hz with low distortion (<0.01%) to AF VOLTM
- → Press DIST

Adjustment point: → AF VOLTMETER display

Adjustment value: → Adjust to minimum distortion (<0.3%) using R571

4.3.5.11 Adjusting the Power Display

Settings:
- → Transmitter test
- → Apply a defined power = 10 W to RF IN/OUT

Adjustment point: → RF POWER display

Adjustment value: → Adjust to 10.2 W using R672

4.3.6 Adjusting the Attenuation Set

Settings:
- → Receiver test
- → Frequency 100 MHz
- → Level 13 dBm

Adjustment point: → RF LEVEL display

Adjustment value: → Rotate R34 until the attenuation set is heard to switch and -47 dBm is output on the display; subsequently rotate R34 approx. 1/6 revolution backwards

Note: Check the switchover threshold from receiver test to transmitter test following adjustment. The switchover threshold is at 0.35 W, approx. If the threshold is too low, rotate resistor R34 back further.

4.3.7 Adjusting the Oscilloscope

The oscilloscope must first be removed (see Section 4.2.6) and connected using the adapter cable; remove the mu-metal screening of the tube.

Note: When adjusting, ensure that no high-voltage parts are touched.

4.3.7.1 Adjusting the Horizontal Beam Deflection

Setting: + Switch on instrument

Adjustment point: + Graticule

Adjustment value: + After loosening the mounting screws of the tube, align the horizontal beam with the graticule

Note: Magnetic fields can lead to errors during the adjustment and the adjustment should therefore be checked after replacing the tube screen. Refer to the Service Manual, Section 5, for further adjustments.

4.3.8 Options

Adjustment of the options is described in Section 5.

4.4 Troubleshooting

This section provides references to the modules possibly associated with faults.

Note: Modules must not be removed or inserted under power. It is absolutely essential to short X75 on the digital unit after removing the analog unit module and before switching on the power again, since the D/A converter N100 (AD 7520) on the digital unit would otherwise be destroyed.

Fault: The instrument immediately enters STANDBY following power-up.

Plug-in jumper X75
(on digital unit)
inserted ?

No → Insert plug-in jumper X75

Yes ↓

Remove modules,
except digital
unit, in sequence

Faulty module found ?

No → Power pack faulty,
operating voltage on digital
unit faulty

Yes ↓

Short-circuit of
operating voltage(s)

Fault: The instrument does not accept commands from the keyboard

Briefly isolate instrument from power supply and switch on again. Instrument OK ?

Yes → Reset logic, digital unit

No ↓

Plug-in jumper X75 (on digital unit) inserted ?

No → Insert plug-in jumper

Yes ↓

Remove modules, except digital unit and RF oscillator, in sequence.

Faulty module found ?

Yes → Data transmission blocked

No ↓

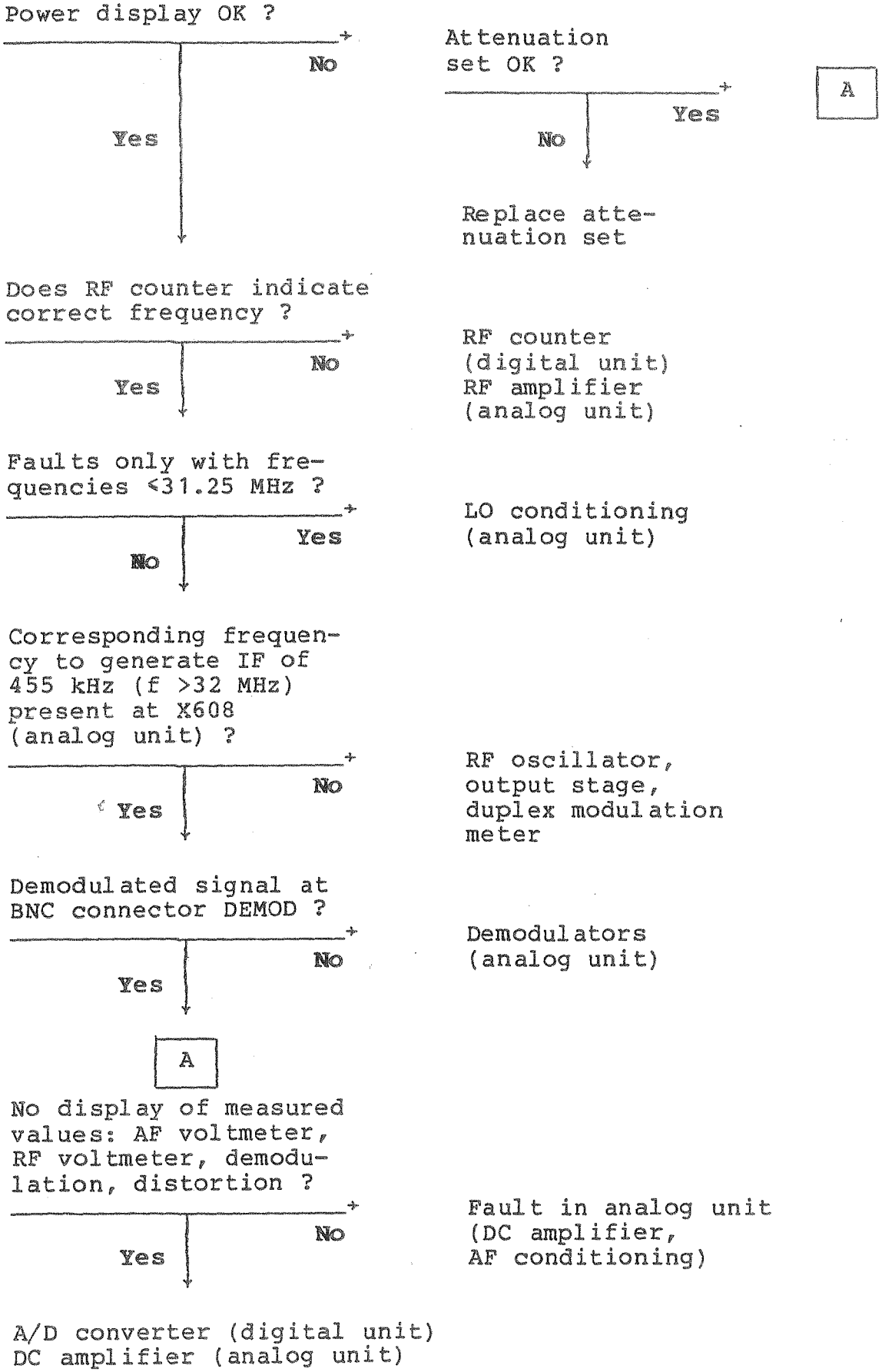
10-MHz TTL level at X701 (digital unit) ?

No → RF oscillator

Yes ↓

Digital unit, cable from front panel to digital unit, front panel

Fault: No demodulation display in transmitter test



ROHDE&SCHWARZ

Liste mechanischer Teile

List of mechanical parts

Bilder zur Liste mechanischer Teile

Figures pertaining to list of mechanical parts

D 44830

Liste zu den Bildern 4-10....4-13

List for Figs 4-10...4-13

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
1		1	MZ Haube oben 5E 1/1 T350 Cover, top	802.2537
2		1	MZ Haube unten 5E 1/1 T350 Cover, bottom	396.3838
3		1	MF Führungsschiene, rechts Guide rail, right	396.4757
4		1	MF Führungsschiene, links Guide rail, left	396.4763
8		2	MF GerätefuB, vorne Instrument foot, front	396.4534
9		2	MF AufstellfuB, unten Foot, bottom	396.4540
11		2	ZM GerätefuB, hinten Instrument foot, rear	396.4586
15		2	MF Seitenleiste T350 Side strip	396.3073
16		4	VS M3x6 DIN 965 A4	081.9378
17		1	ZM RückwandfuB, links 5E Rear-panel foot, left	802.2337
18		1	ZM RückwandfuB, rechts 5E Rear-panel foot, right	802.2320
19		4	VS Ansatzschr. M4 K.D7985 Screw	396.4492
21		2	ZM Tragegriff T350 Carrying handle	396.3215
22		4	MR Griffbuchse Washer	396.3321

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
23		4	VS M4x10 DIN 965 A4	081.9478
24		4	MF Abdeckung, Griffseite Cover, handle side	396.3338
30		1	ZM Frontrahmen 5E 1/1 Front frame	396.2154
31		4	MF SeitenfuB Side foot	396.4692
32		2	MF Stapelnutabdeckung Cover for groove	396.4728
33		5,3 M	WG HF-Dicht. O-Prot. 1,6 Si RF seal	396.1035
36	V1	1	Oszilloskop-Röhre (V1) Cathode ray tube	803.0873
37		1	DZ Schelle RD 37,3 B12,7 Clamp	015.8854
38		1	VS M3x25 DIN 7985 A4	081.9132
39		1	VS 3,2 DIN 125 A4	082.4670
40		1	VS 3 DIN 137 A2	005.0296
41		1	MH Abst. Rohr RD 4,5xRD8x10 Spacer	033.1706
42		1	MH Abst. Rohr RD 4,5xRD8x4 Spacer	033.1641
43		1	ZM Röhrenhalterung CRT support	803.1757
44		3	VS M3x5 DIN 7985 A4	084.1384
45		3	VS 3,2 DIN 125 A4	082.4670
46		3	VS 3 DIN 137 A2	005.0296

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
47		1	VS 3,2 DIN 9021 A4	031.5185
48		1	VS 3 DIN 137 A2	005.0296
49		1	ZM Röhrenschirmkasten CRT screening case	803.1786
50		1	VS M3x6 DIN 7985 A4	081.9061
51		2	VS M2,5x4 DIN 7985 A4	088.0024
52		2	VS 2,7 DIN 125 A4	082.4663
53		2	VS 2,6 DIN 137 A2	005.0280
54		1	MZ Befestigungsring Retaining ring	803.1863
55		1	OS Scheibe (PMMA) DV Scope screen	803.1805
56		2	VS M2,5x5 Zyl. Schraube Screw	088.7693
57	W52	1	Kabel (W52) Cable	803.2053
58		1	ZM Montageplatte Mounting plate	803.1711
59	A25	1	ED Scope	803.1211
60	A26	1	ED X/Y-Zeichenerzeugung X/Y character generation	803.1257
61		1	Deckel für Scope Cover for scope	803.1740
62		4	VS M3x40 DIN 7985 A4	081.9155
63	A24	1	ED Scope Tastatur Scope keyboard	803.1170

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
64		4	VS 3 DIN 137 A2	005.0296
65		2	VS M3x30 DIN 7985 A4	081.9149
66		2	VS 3 DIN 137 A2	005.0296
70		1	MZ Frontplatte Front panel	803.1792
71		4	VS M2,5x5 DIN 965 A4	088.4394
72		1	VS M2,5x16DIN 965 A4	088.0147
74	W55	1	DX Coax-Kabel (W55) Coaxial cable	803.2076
80		1	MH Dämpfungsring Damping ring	802.3504
81	B1	1	EL Lautsprecher 0,5 W RD 50 Loudspeaker	803.0509
82		1	MZ Dämpfungsgummi Damping rubber	802.3491
83		1	MZ Halteblech Supporting sheet	802.3485
84	C1	1	CE 470 µF ±20% 25 V 12,5x12,5	803.0715
85		2	MB Abstandsrohr Spacer	336.3731
86		1	DZ Kabelbi. RD 1-25 B2 Cable tie	015.9038
90		1	MZ Buchsenhalterung Female contact strip	802.2372
91		2	MZ Verdrehschutz Twisting protection	802.2489
92		1	MZ Verdrehschutz Twisting protection	802.2395

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
93		1	MZ Verschlußstopfen Stopper	332.7426
94	W7	1	DX HF-Kabel (W7) RF cable	803.0050
95	W5	1	DX HF-Kabel (W5) RF cable	803.0050
96	W4	1	DX HF-Kabel (W4) RF cable	803.0044
97	W6	1	DX HF-Kabel (W6) RF cable	803.0044
98	W8	1	DX HF-Kabel (W8) RF cable	803.0080
100	A10	1	ED Anzeige/Tastatur Display/keyboard	802.3662
101		1	MZ Buchsenhalterung Female contact support	802.3510
102		4	VS Zyl. Schr. M2,5x5 A2 Screw	088.7693
103		16	VS M2,5x16 DIN 965 A4	088.0147
104		2	VS M2,5x6 DIN 965 A4	088.0101
105	W1	1	DX HF-Kabel (W1) RF cable	803.0015
106		1	MB Mutter f. Frontrahmen Nut for front frame	396.3150
107		1	VS M3x10 DIN 965 A4	081.9390
108		2	VS M3x10 DIN 7985	081.9084
110		1	MZ Stützblech Supporting sheet	802.3840
111		2	Abstandhülse Spacer	802.3527

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
112		2	VS M2,5x16 DIN 965 A4	088.0147
113		2	MF Glaskörper Glass plate	802.3685
114		2	VS M2,5x6 DIN 965 A4	088.0101
120		1	Beschriftungsplatte Inscription panel	802.3456
121		1	OK Dreh. M.MULDE RD37 RD6 Knob	078.1192
122		2	OK Dreh. RD10,5 ACHS-RD4 Knob	078.2676
123		4	VS M3x6 DIN 7985 A4	081.9061
124		4	VS Scheibe RD3,1/7,2 H1,8 CR Washer	396.5518
125		2	VS Zyl. Schr. M2,5x5 A2 Screw	088.7693
130	A100	1	ED Motherboard	802.2714
131		1	MZ Schiene, rechts Rail, right	802.2495
132		1	MZ Schiene, links Rail, left	802.2345
133		6	VS 3 DIN 137 A2	005.0296
134		4	VS M3x6 DIN 7985 A4	081.9061
135		2	VS M3x8 DIN 7985 A4	081.9078
136		1	MZ Zwischenplatte Intermediate plate	802.2350
137		2	VS M3x10 DIN 965 A4	081.9084

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
138		2	MZ Zahnstange Rack	802.2366
139		4	VS M2,5x3 DIN 923	088.0976
140		2	VS 3 DIN 137 A2	005.0296
141		2	VS M3x8 DIN 7985 A4	081.9078
145		1	MZ Zwischenwand Intermediate panel	802.2308
146		4	MZ Feder Spring	802.2414
147		8	VN 2,5x4 DIN 7340 Cu Sn	088.7306
148		3	VS 3 DIN 137 A2	005.0296
149		3	VS M3x8 DIN 7985 A4	081.9078
150		1	WG Kantenschutz Edge protection	002.1356
151		1	MZ Querwand Transverse panel	802.2450
152		1	MZ Streifen, links Strip, left	802.2566
154		2	VS M3x12 DIN 7985 A4	081.9090
155		1	MZ Streifen, rechts Strip, right	802.2572
160	A7	1	ED Digitalteil Digital unit	802.4517
161	CM-B5	1	Ablaufsteuerung/DRU Autorun control	803.3314
162	CM-B4	1	IEC-625 Bus-Interface IEC-625 bus interface	803.3914

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
163	A6	1	ED Analogteil Analog unit	802.8435
164	A5	1	ED 1. Modulationsgenerator 1st modulation generator	802.5713
165	CMT-B7	1	2. NF-Synthesizer 2nd AF synthesizer	803.2618
166	CM-B8	1	HF-Millivoltmeter RF millivoltmeter	803.6813
167	CM-B11	1	DTMF-Auswerter DTMF decoder	803.4610
168	CMT-B6	1	NKL-Messer ACP meter	803.7810
169	A94	1	ED CR-Simulator CR simulator	804.0119
170	CM-B9	1	Duplex Modulat. Met. Duplex modulation meter	803.5317
171	A4	1	ED Ausgangsstufe Output stage	802.7616
172	A3	1	ED HF-Oszillator RF oscillator	802.8835
180	W43	1	DX HF-Kabel (W43) RF cable	803.0344
181	W9	1	DX HF-Kabel (W9) RF cable	803.0096
182	W10	1	DX HF-Kabel (W10) RF cable	803.0109
183	W11	1	DX HF-Kabel (W11) RF cable	803.0115
184	W12	1	DX HF-Kabel (W12) RF cable	803.0121
185	W2	1	DX HF-Kabel (W2) RF cable	803.0021
186	W3	1	DX HF-Kabel (W3) RF cable	803.0038

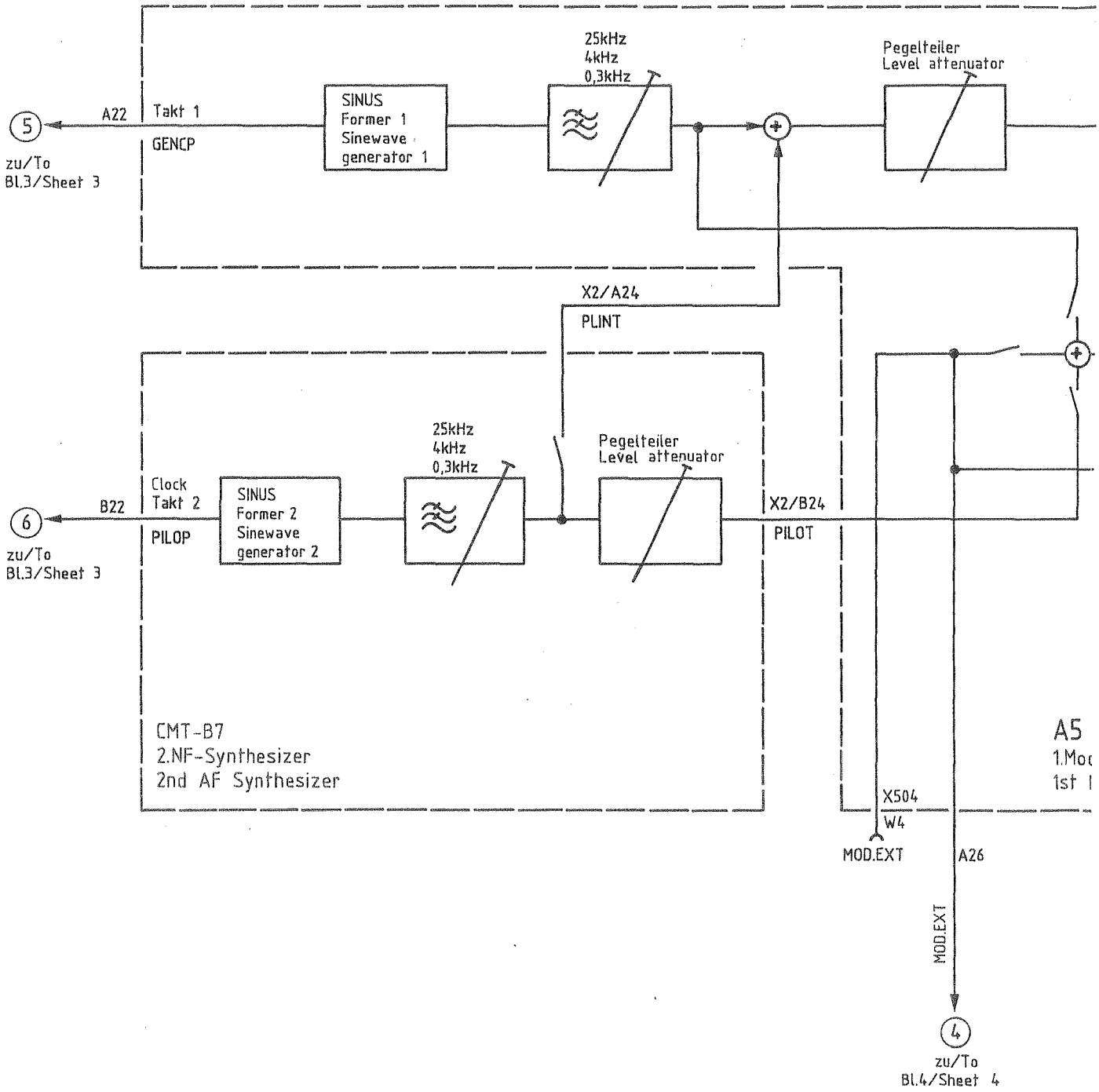
Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
187	W20	1	DX HF-Kabel (W20) RF cable	803.8045
188	W23	1	DX HF-Kabel (W23) RF cable	803.8068
189	W4	1	DX HF-Kabel (W4) RF cable	803.0044
190	W5	1	DX HF-Kabel (W5) RF cable	803.0050
191	W8	1	DX HF-Kabel (W8) RF cable	803.0080
192	W6	1	DX HF-Kabel (W6) RF cable	803.0044
193	W7	1	DX HF-Kabel (W7) RF cable	803.0050
194	W13	1	DX HF-Kabel (W13) RF cable	803.0138
195	W56	1	DX HF-Kabel (W56) RF cable	803.2082
196	W16	1	DX HF-Kabel (W16) RF cable	803.0167
197	W15	1	DX HF-Kabel (W15) RF cable	803.0150
198	W24	1	DX HF-Kabel (W24) RF cable	803.8074
199	W21	1	DX HF-Kabel (W21) RF cable	803.8051
200		1	ZM Rückrahmen 5E 1/1 Rear frame	396.2290
201		4	MG Rahmenschiene T350 Frame rail	396.2360
202		16	VS M3x8 DIN 965 A4	081.9384
203		1	WT Führungsschiene 5E (gn) Guide rail (green)	396.7527

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
204		1	WT Führungsschiene 5E (bl) Guide rail (blue)	396.7540
205		1	WT Führungsschiene 5E (gr) Guide rail (gray)	396.7491
206		1	WT Führungsschiene 5E (sw) Guide rail (black)	396.7533
207		1	WT Führungsschiene 5E (rt) Guide rail (red)	396.7510
208		1	WT Führungsschiene 5E (ge) Guide rail (yellow)	396.7504
209		1	MZ Führungsplatte, oben (sw) Guide plate, top (black)	396.7179
210		1	MZ Führungsplatte, unten (bl) Guide plate, bottom (blue)	396.7185
211		1	MZ Stützplatte 5E Supporting plate	396.7756
212		2	MZ Massefeder, links 5E Earth clip, left	396.7662
213		1	MZ Seitenblech Lateral sheet	803.1886
214		2	VS M3x8 DIN 7985 A4	081.9078
215	A17	1	ZE Eichleitung für CMT Attenuation set CMT	802.4223
216		4	VN 5x4,5 DIN 7340	031.2857
217		4	DZ Durchführungstülle Feedthrough	118.6630
218		2	VS B3,2 DIN 9021 A4	031.5185
219		2	VS M3 DIN 934 A4	016.4398
220		4	VS M3x16 DIN 7985 A4	081.9103

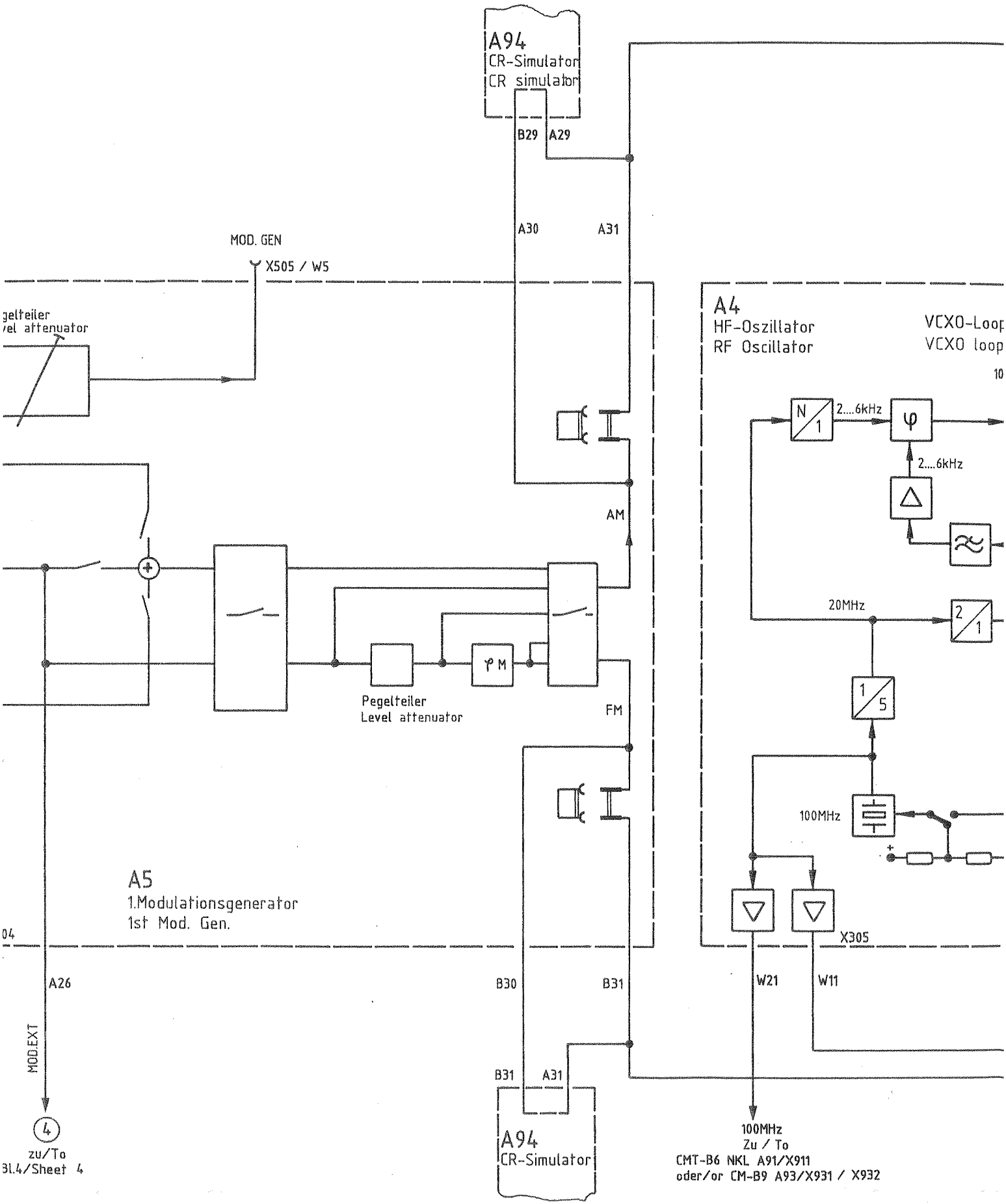
Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
223		2	VS B3,2 DIN 9021 A4	031.5185
230	W2	1	DX HF-Kabel (W2) RF cable	803.0021
231	W13	1	DX HF-Kabel (W13) RF cable	803.0138
232	W14	1	DX HF-Kabel (W14) RF cable	803.0144
233	W1	1	DX HF-Kabel (W1) RF cable	803.0015
238		1	Guβwanne lack. Cast-iron panel, painted	802.2837
239		1	Trafoeinheit Transformer	802.5091
240		1	VS 4,3 DIN 6797 A2	016.2837
241		1	VS M4x55	081.9626
242	Z1	1	FN Netzst. m. Filter 3A Power plug with filter	803.0938
243		2	VS 3 DIN 137 A2	005.0296
244		2	VS M3x10 DIN 7985 A4	081.9084
245		1	MZ Massefeder Earth clip	802.2843
246	S1	1	FR Spannungswähler m. Si. Voltage selector with fuse	803.0896
247		2	VS 2,6 DIN 137 A2	005.0280
248		2	VS M2,5 DIN 934 A4	088.0230
249		2	VS M2,5x12 DIN 7985 A4	088.0060

Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
250	F1	1	SS Schmelzs. T2 DIN 41662 Fuse	020.7546
			SS Schmelzs. T4 DIN 41571 Fuse	020.7600
254	X100	1	VK Rändelkl. Isol. (rot) Knurled clamp, insul. (red)	219.5300
255	X101	1	VK Rändelkl. Isol. (blau) Knurled clamp, insul. (blue)	219.5339
256		1	FR Sicherungshalter GR Fuse holder	087.5022
257	F2	1	SS Schmelzs. T16 5x20 Fuse	332.3789
260	A80	1	ED Netzteil Power supply	802.3110
261		1	MZ Kühlwinkel Heat sink	802.2908
262		1	ME HF-Deckel RF screen	802.3040
263		10	VS M3x6 DIN 7985 A4	081.9061
265		1	Rückwand Lüfter Rear-panel blower	802.2466
266	W25	1	DX HF-Kabel (W25) RF cable	803.0250
267	W14	1	DX HF-Kabel (W14) RF cable	803.0144
268	W9	1	DX HF-Kabel (W9) RF cable	803.0096
269		4	MP Verschlußstopfen Stopper	528.8500

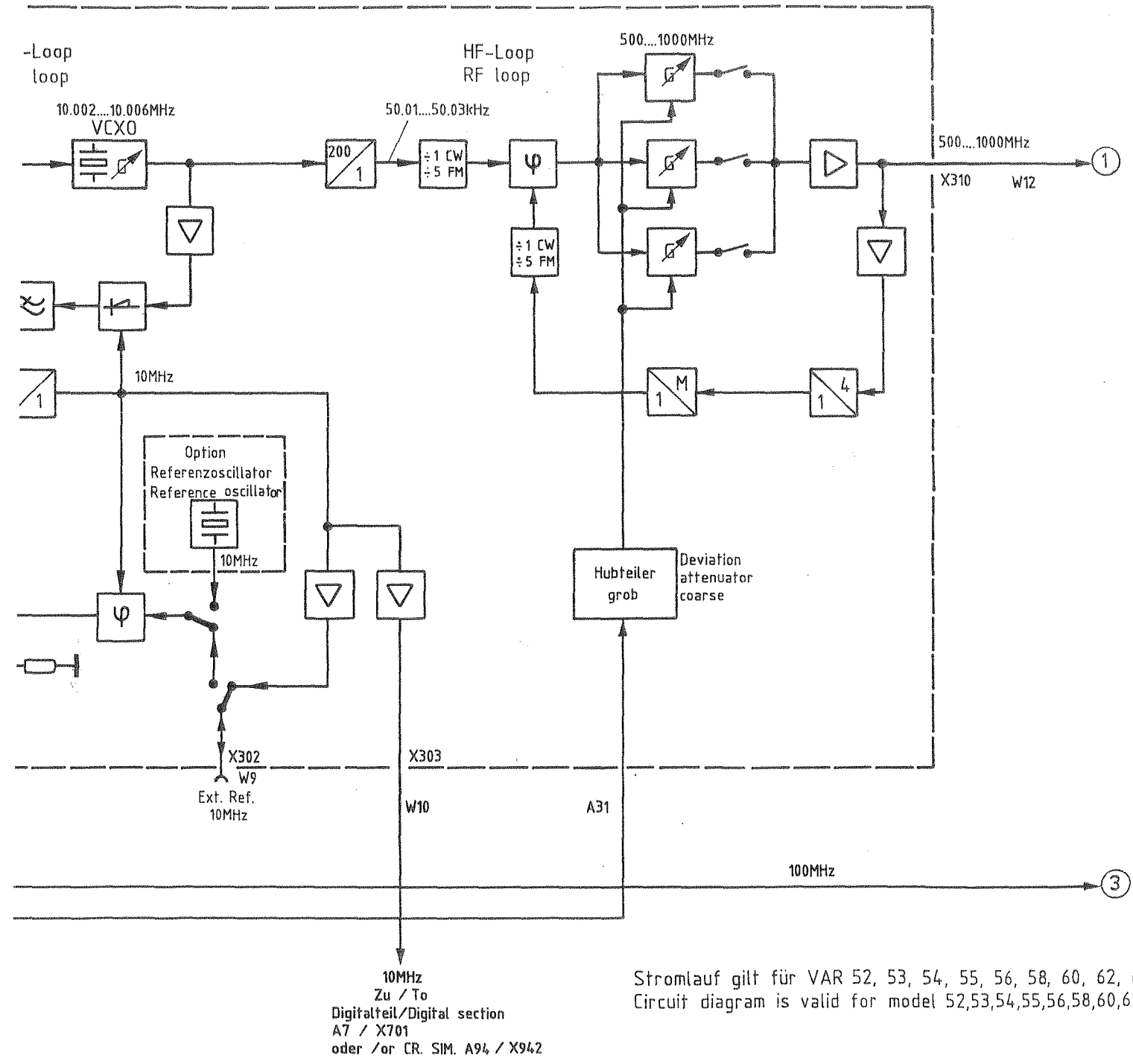
Lfd. Nr.	Kenn-zeichen	Stück-zahl	Benennung/Beschreibung	Sachnummer
No.	Unit/ Comp.No	Qty	Designation	Stock No.
270	E1	1	ZM Lüfter Blower	802.2595
271		4	VN 5x5 DIN 7340	031.2863
272		4	DZ Durchführungstülle 5x7x11 Feedthrough	099.3565
273		4	VS 4,3 DIN 125 A4	082.4686
274		4	VS M4x10 DIN 7985 A4	081.9184
275		2	VS 3,2 DIN 125 A4	082.4670
276		2	VS 3 DIN 137 A2	005.0296
277		2	VS M3x6 DIN 7985 A4	082.4670
280		1	MZ Blindplatte Dummy panel	802.2443
281		6	VS 2,7 DIN 125 A4	082.4663
282		6	VS 2,6 DIN 137 A2	005.0280
283		6	VS M2,5x6 DIN 7985 A4	088.0030
285		1	MZ Haltebügel Bracket	802.2420
286		4	VS M3x8 DIN 965 A4	081.9384



Zeichn.-Nr.

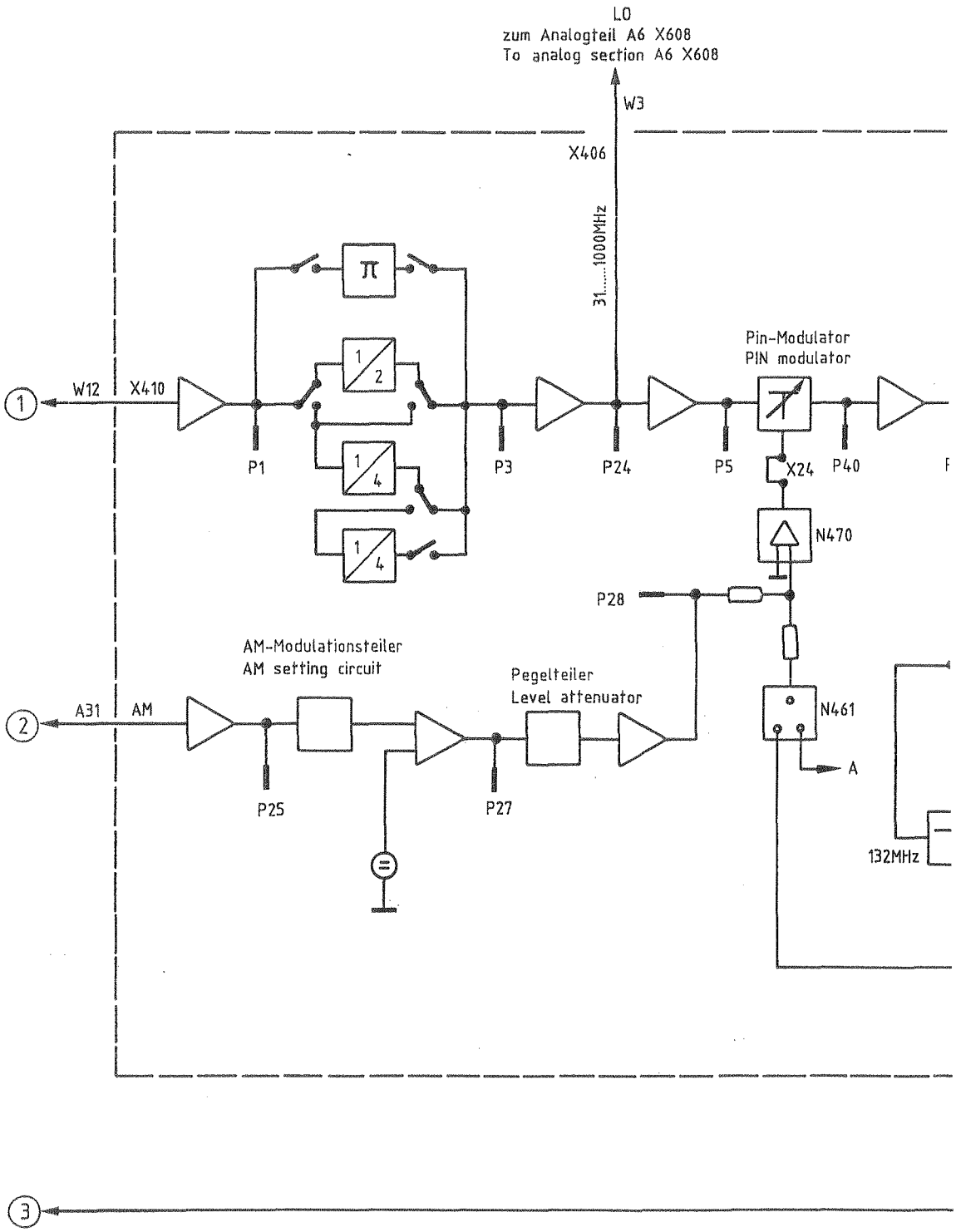


ROHDE&SCHWARZ	A	38951	11.87	IB					1KSA	Tag	
									Bearb.	7.86	
									Gepr.		
	And. Zust.	Änderungs-Mitteilung	Datum	Name	And. Zust.	Änderungs-Mitteilung	Datum	Name	Norm		

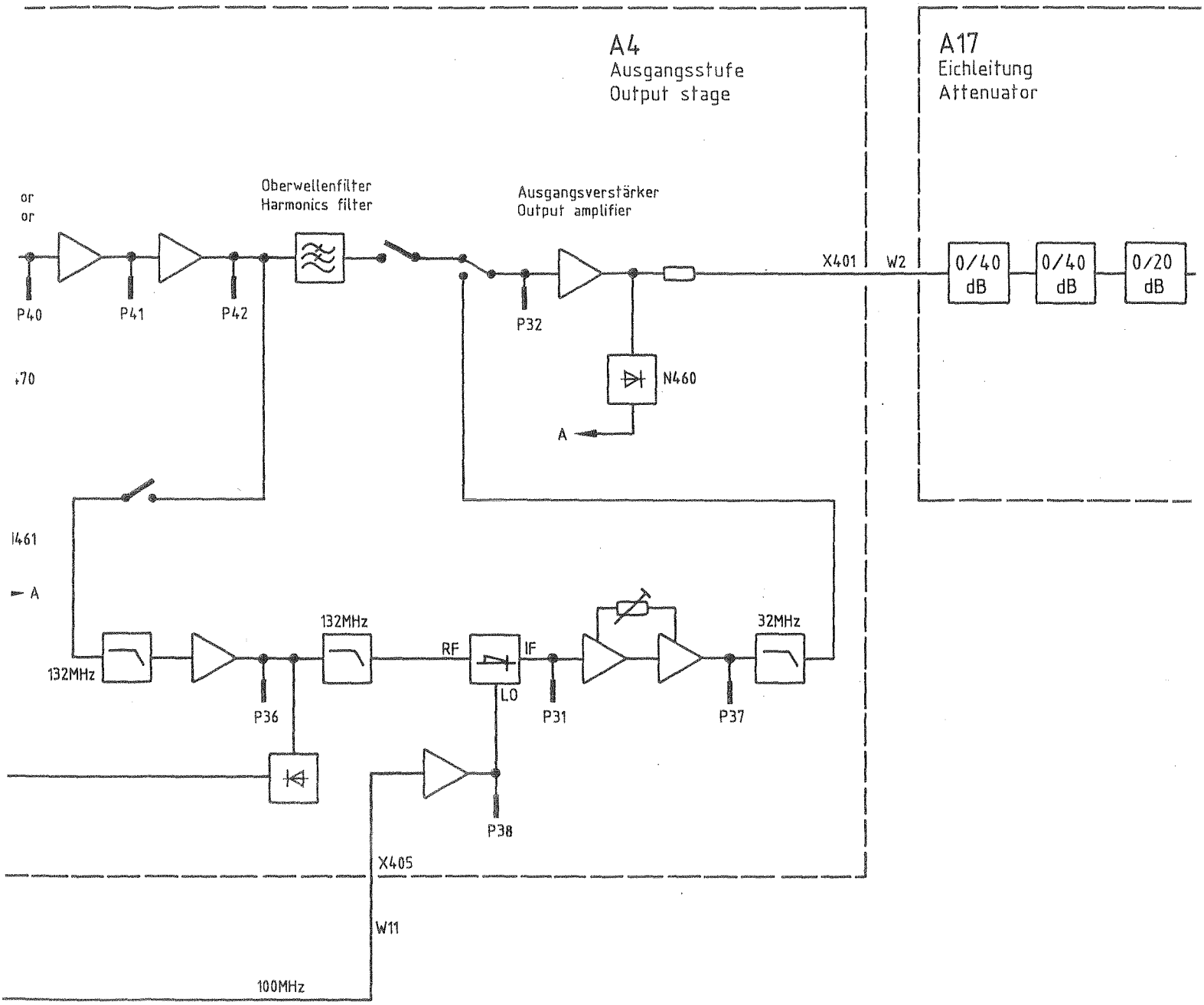


Stromlauf gilt für VAR 52, 53, 54, 55, 56, 58, 60, 62, 64,
Circuit diagram is valid for model 52,53,54,55,56,58,60,62,64

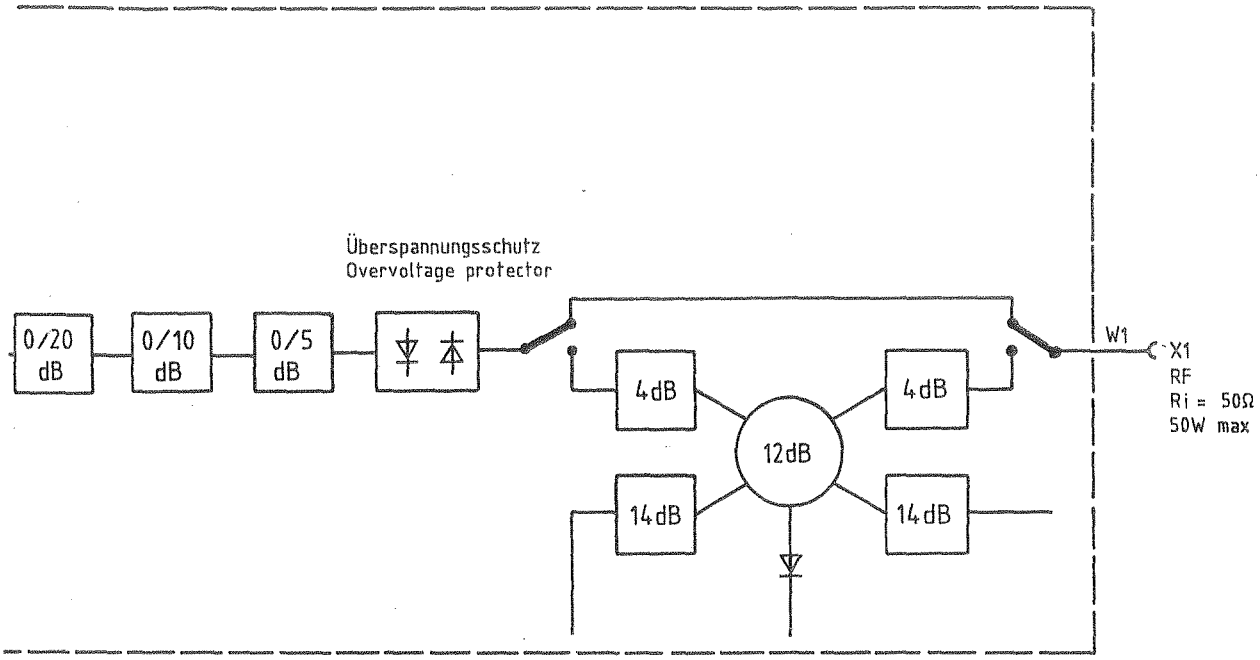
Name	Benennung		Zeichn.-Nr.	
CO	Radiocommunication Tester	Z	802.2020 FS	
	zu Gerät: CMT		reg. i. V. 802.2020 V	erste Z. 802.2020



Zeichn.-Nr.



ROHDE&SCHWARZ	A	38951	11.87	IB					1KSA	Tag
									Bearb.	7.86
									Gepr.	
	And. Zust.	Anderungs-Mitteilung	Datum	Name	And. Zust.	Anderungs-Mitteilung	Datum	Name	Norm	



Stromlauf gilt für VAR 52, 54, 56, 58, 60, 62, 64, 66
Circuit diagramm is valid for model 52, 54, 56, 58, 60, 62, 64, 66

	Name	Benennung		Zeichn.-Nr.
6	CO	Radiocommunication Tester	Z	802.2020 FS
		zu Gerät: CMT	reg. i. V. 802.2020 V	erste Z. 802.2020

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Power Pack

802.2814.02

Contents

		Page
5	Service Manual for Power Pack	5.1
5.1	Function Description	5.1
5.1.1	Total Concept	5.1
5.1.2	Stabilization of the Output Voltages	5.3
5.1.3	Protective Measures	5.4
5.1.3.1	Protection Against Incorrect Polarity	5.4
5.1.3.2	Monitoring the High-end Voltage	5.4
5.1.3.3	Limitation of the Duty Factor	5.4
5.1.3.4	Soft Start	5.4
5.1.3.5	Protection of the 5-V Output	5.5
5.1.3.6	Protection of the ±15-V and 24-V Outputs	5.5
5.1.3.7	Protection of the 12-V Output	5.6
5.2	Testing and Adjustment	5.7
5.2.1	Interfaces	5.7
5.2.2	Testing the Switch-on and Monitoring Logic	5.8
5.2.3	Starting-up the Switching Regulator	5.9
5.2.4	Testing the Power Pack under Load	5.11
5.2.5	Start-up with AC Supply Operation	5.12
5.2.6	Testing the Specification with the Power Pack Closed	5.12
5.3	Troubleshooting	5.13

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Power Pack

(See circuit diagram 802.2814 S and block diagram)

5.1 Function Description

5.1.1 Total Concept

The power pack automatically enters the STANDBY mode when the AC supply or battery voltage is applied.

The transformed AC supply voltage is rectified by a bridge rectifier into a high-end voltage of 28 to 35 V DC which is independent of the input voltage. The high-end voltage with battery operation is the same as the battery voltage reduced by the voltage drop of approx. 0.5 V across the protection diode V100. In this mode the power pack delivers a voltage of 8 to 12 V at the 12-V output (dependent on the high-end voltage). This powers the switching regulator IC, the monitoring and power-up logic and the OCXO of the synthesizer. Pressing the STANDBY key resets the feedback D flip-flop D70 and the switching regulator is started. The power pack then enters the POWER ON mode.

When loaded, the high-end voltage with AC supply operation drops to 20 to 30 V with a superimposed 100-Hz ripple (V_{pp}) of approx. 1 V; in battery mode it remains approximately the same.

A DC/DC converter operating according to the forward converter principle chops the high-end voltage, transforms the squarewave pulses and rectifies them again. Four output voltages are produced. Two storage elements are used for subsequent filtering: the toroidal core inductor L21 for the 5 V adjustable on the switching regulator N1 and a toroidal core with 3 windings L20 for the output voltages controlled to ±15 V and 24 V by low drop-out-voltage PNP series regulators.

The integrated fixed-voltage controllers N30, N40 and N60 stabilize the ±15 V and the 12 V; the 24 V are adjustable using IC N50 with series transistor V54. To ensure that the 12 V still remain controllable with battery voltages less than 15 V, the fixed-voltage controller N60 obtains its input voltage in POWER ON mode from the +15-V output. The switchover is handled by relay K30. Furthermore, this minimizes the losses at the 12-V output with high high-end voltages.

By resetting the D flip-flop D1, the window comparator N71 switches off the switching regulator and switches to the STANDBY mode in the event of faults such as overvoltages, undervoltages, overcurrents or short-circuits of the ±15 V or 24 V supplies. Comparator N70.1 also operates in a similar manner if it detects an overvoltage at the 5-V output. The current of the 5 V and high-end supplies is monitored by various comparators in the switching regulator IC N1. In the event of drastic faults such as a short-circuit of a power MOS FET, the power pack is isolated from the AC supply or the battery by a blown fuse.

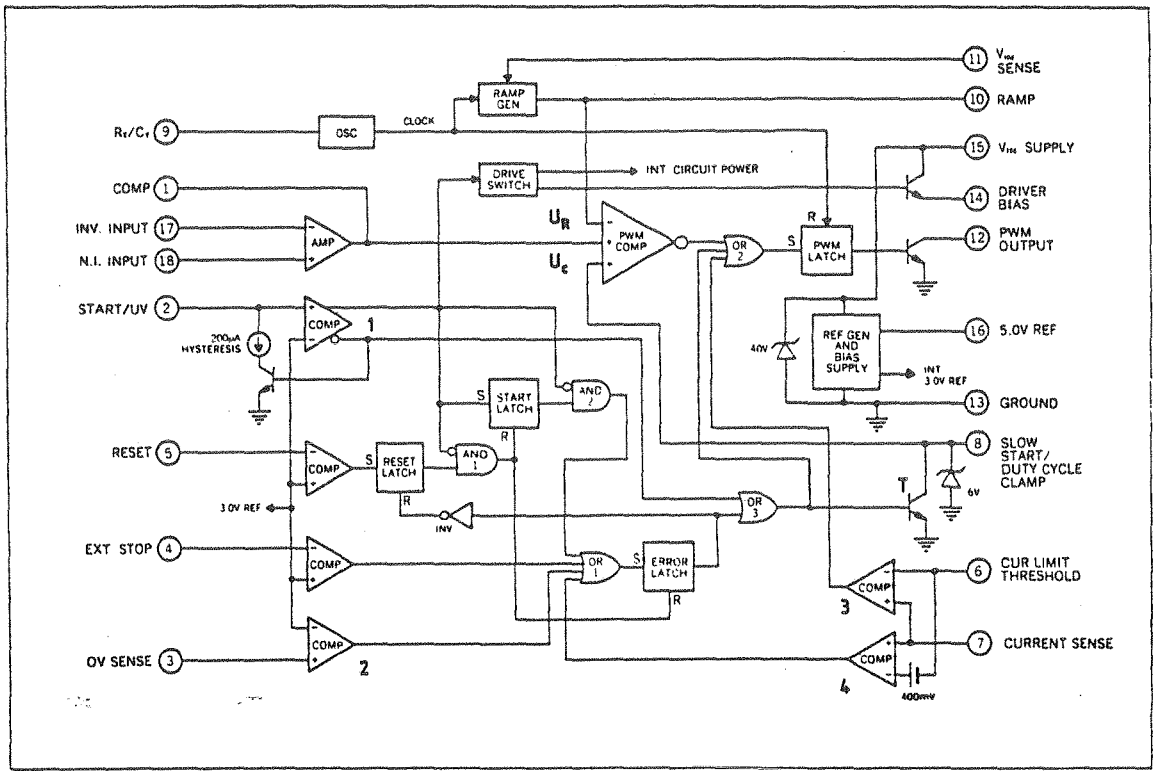


Fig. 5-1 Block diagram of the switching regulator IC

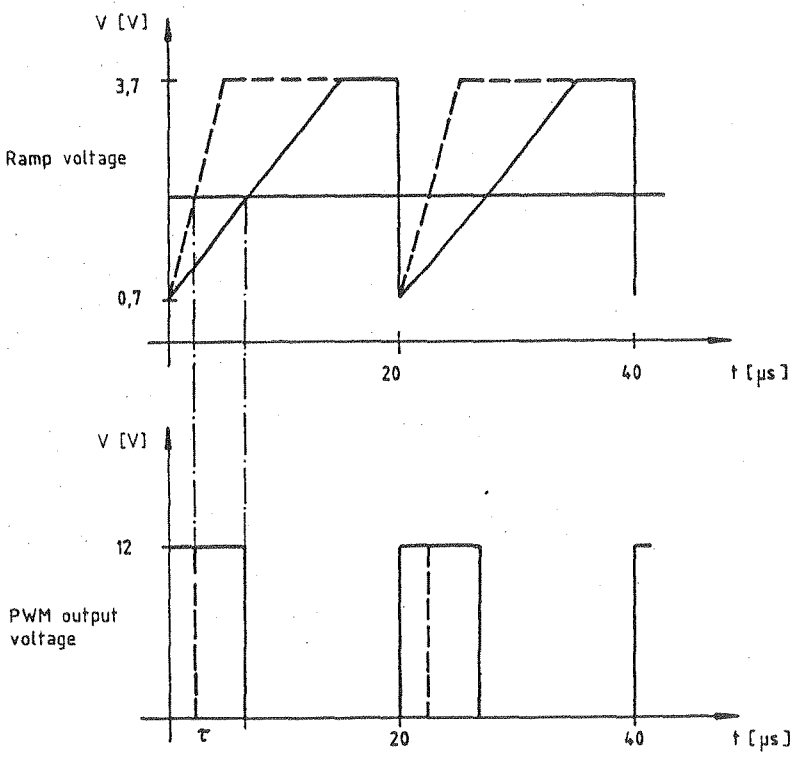


Fig. 5-2 Principle of control and generation of the duty factor

5.1.2 Stabilization of the Output Voltages

The output voltages are obtained by rectifying and LC filtering of transformed squarewave pulses with a fixed frequency f and a variable duty factor:

$$\frac{\tau}{T} : V_{out} = V_{in} \times v \times \frac{\tau}{T}$$

Where:

V_{out}	Output voltage
V_{in}	High-end voltage
v	Ratio of the secondary/primary windings of transformer T2
τ	Control phase period of the circuit-breaker
T = 1/f	The period

The squarewave pulses are obtained by switching the high-end voltage on and off. This is achieved via the primary winding of transformer T2 using 5 MOS FET power switches connected in parallel. A push-pull driver shortens the switching periods in order to reduce the switching losses. Decoupling of the gates using ferrite beads and a resistor prevents the production of high-frequency oscillations.

R6 and C7 determine the frequency of the RC oscillator (OSC) in the switching regulator IC N1 (Fig. 5-1) at 50 kHz.

The duty factor is generated by the pulse width modulation comparator (PWM-COMP in Fig. 5-1) by comparing a ramp voltage V_R with the smallest applied control voltage V_C (Fig. 5-2). The high-end voltage controls the slope of the ramp via R100 and thus sets approximately 5 V at the 5-V output. The remaining control deviation as a result of load-dependent voltage losses then shifts the control voltage V_C via the fault amplifier (AMP) until the deviation is a minimum and the output voltage is exactly 5.3 V. The control principle relieves the regulator since the influence of the high-end voltage on the output voltage is a minimum and V_C remains approximately 2.2 V.

Compensation of the 180° phase rotation of the LC filter L21-C22-C23 with a resonance frequency of 420 Hz by means of different pole and zero positions (C26, R114, R113, R9, C18) in the transmission function of the regulator guarantee high control amplification as well as stability of the control loop. The result is a highly constant 5-V output, high suppression of the 100-Hz ripple with AC supply operation and thus fast compensation of load variations. The voltage at the other outputs (cross-control) varies by approx. 1-V, however, depending on the load. Additional regulation of the other outputs using series-connected stabilizers is therefore necessary.

5.1.3 Protective Measures

5.1.3.1 Protection Against Incorrect Polarity

The Schottky diode V100 protects the power pack at the battery input from incorrect polarity.

5.1.3.2 Monitoring the High-end Voltage

The comparators COMP 1 and COMP 2 (Fig. 5-1) on the primary side ensure that the power pack only starts up with high-end voltages greater than 10 V and switches off with voltages greater than 35 V or smaller than 9 V. The comparators receive the corresponding reference voltages from the voltage dividers R_1 to R_4, set the error latch (Fig. 5-1) which then sets the voltage V_c to zero and therefore suppresses further generation of control pulses.

5.1.3.3 Limitation of the Duty Factor

Duty factors greater than 0.45 may lead to saturation of the transformer as a result of incomplete demagnetization. It is particularly dangerous if the high-end voltage is between 9 V and 10 V and the regulation stops. The voltage divider R101, R102 then reduces the control voltage V_c at PWM-COMP and thus prevents the duty factor from rising because of the small ramp gradient.

5.1.3.4 Soft Start

R101 and C14 determine the rate at which the output voltages are turned on. If transistor T (see Fig. 5-1) is blocked, C14 is charged via R101 and V_c increases continuously, thus leading to a successive increase in the duty factor and thus in the output voltage.

The turn-on time is dependent on the high-end voltage and is 30 to 200 ms:

$$t \approx 0.41 \text{ s} \times \log_e \frac{V_{in}}{V_{in} - 3 \text{ V}}$$

5.1.3.5 Protection of the 5-V Output

Two comparators (COMP 3 and 4 in Fig. 5-1) integrated in N1 monitor the voltage drop caused by the output current through R22 and weighted by the voltage dividers R104 to R107.

If

$$V_{76} = (V_{out} + I \times 0.047\ \Omega) \cdot \frac{R_{105}}{R_{104} + R_{105}} - \frac{V_{out}}{2}$$

becomes greater than 0 V, COMP 3 reduces the control voltage V_C until V_{76} remains ≈ 0 V. This results in a reverse current limiting characteristic (foldback): $I \approx 0.8\ 1/\Omega \times V_{out}$. If V_{76} becomes >0.4 V nevertheless, comparator COMP 4 sets the error latch and switches off the pulse generation. This corresponds to a short-circuit current of 18 A.

With a voltage greater than 5.6 V ±2% at this output, the comparator N70.1 sets the power pack to the STANDBY mode by resetting the D flip-flop D70. This protection is also triggered with no load at the 5-V output.

5.1.3.6 Protection of the ± 15-V and 24-V Outputs

These three voltages are added via R76 to R78 to approx. 5 V. The power pack is switched to the STANDBY mode by N71 via D70 if this voltage is outside the window of 4.7 to 5.4 V because of an overvoltage or undervoltage at one of the outputs.

N30 and N40 have an integrated foldback current limitation which is triggered between 2.5 and 5 A. This current limitation reduces the +15-V or -15-V output voltage which then leads to detection of the fault via the window comparator.

The current limitation of the 24-V series stabilization functions in a similar manner. The base current of V54 is measured in this case via R54. The output voltage drops with V_{BE} >0.7 V at V55 which shuts down the power pack. The inaccuracy of the limiting currenc I_F is a result of the spread of the current amplification of V54:

$$I_F \approx (70 \text{ to } 130) \times \frac{0.7\ V}{R54} \approx 0.9 \text{ to } 1.6\ A$$

The undefined current limitation endangers the power pack as a result of a continuous overcurrent since the power of the switching transistors is not monitored on the primary side.

To ensure safe start-up of the power pack, the window comparator is switched on with a delay via V84.

V55 limits the voltage prior to the 24-V series stabilization to approx. 36 V. The coupled inductor guarantees that the voltage before N30 and N40 is less than 30 V. These three outputs can therefore be driven without a load.

5.1.3.7 Protection of the 12-V Output

The N60 protects itself from overheating by means of an integrated thermal shutdown. R60 and V61 limit the input voltage to 33 V with high-end voltages greater than 33 V.

5.2 Testing and Adjustment

5.2.1 Interfaces

The power pack generates five stabilized output voltages with the following current drain values from AC supplies of 100, 120, 220 or 240 V, in each case ±10% and 47 to 400 Hz, or from a battery voltage of 11 to 30 V:

+ 5 V (4.6 A) divided into 5 V analog and 5 V digital,

+15 V (2.3 A),

-15 V (2.0 A),

+24 V (0.8 A),

+12 V (0.2 A).

With this regulated power of approx. 115 W, the active power drawn from the AC supply is approx. 190 W and that from the battery approx. 175 W, corresponding to an efficiency of approx. 60% and approx. 65%, respectively.

The unit also generates a power failure signal which indicates with a "Low" level if the 5-V supply falls below 5.1 V ±2% and a "High" level for the STANDBY LED. The associated key changes the operating mode of the power pack with a rising edge.

5.2.2 Testing the Switch-on and Monitoring Logic

- Remove jumper from P80 and apply a voltage of +5 V to P80.2: the switching regulator is switched off.
- Apply a variable +5 V to P73.
- Apply 20 V with a 2.0-A current limitation at the battery input.
- Measure a voltage > 4.7 V at P80.3 and 11.5 to 12.5 V at the 12-V output.

Testing D70

- A rising edge at X71 (STANDBY) resets D70: the voltage measured at P80.3 should be < 0.7 V.

Testing the ±15-V and 24-V monitoring

- Increasing the voltage above 5.4 V at P73 sets the D flip-flop.
- Set 5 V at P73 and reset the flip-flop again with a rising edge at X71.
- Reducing the voltage below 4.7 V at P73 sets the D flip-flop.
- Set 5 V at P73 and reset the flip-flop again with a rising edge at X71.

Testing the 5-V overvoltage detection

- Apply a voltage greater than 5.6 V ±2% at P71.1: the flip-flop is set again.

Testing the power failure

- The voltage at X70 is less than 0.7 V with a voltage of less than 5.1 V ±2% at P71.2; the voltage at X70 is greater than 4.7 V if the voltage at P71.2 is greater than 5.1 V ±2%.

5.2.3 Starting-up the Switching Regulator

- Disconnect the voltage at the battery input.
- Connect P80.1 and P80.2.
- Connect a minimum load to the output voltages:

  + 5 V : 5.1 Ω/5 W
  ±15 V : 68 Ω/5 W
  +24 V : 470 Ω/3 W

- Apply 20 V with 2-A current limitation: the power pack starts up.

Setting and testing the output voltages

- Set 5.3 V at the 5-V output using R12.
- Set 24.0 V at the 24-V output using R56.
- Measure the voltage at the ±15-V outputs: 14.8 to 15.2 V.
- Measure the voltage at P73: approx. 5 V.

Testing the voltage characteristics on the switching regulator

- Test the frequency at P1: 47 kHz ≤ f ≤ 53 kHz

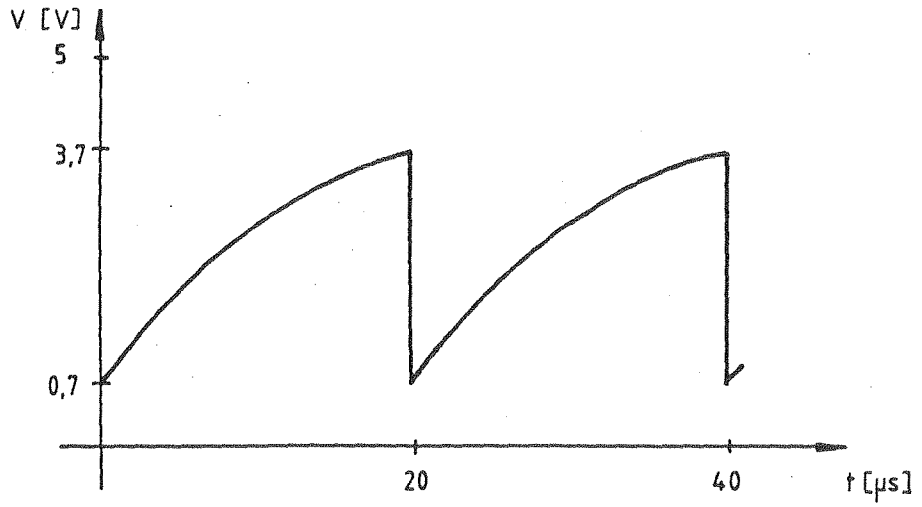


Fig. 5-3 Frequency at P1

→ Testing the ramp gradient at P2

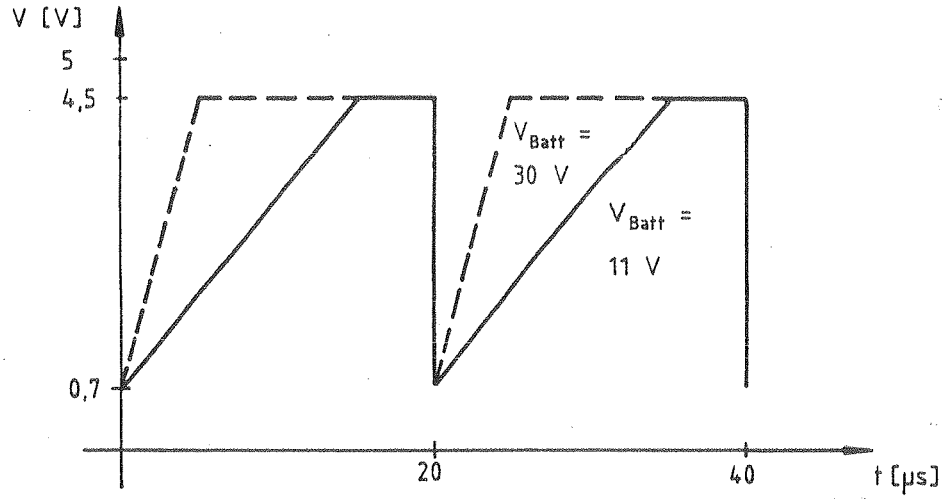


Fig. 5-4 Ramp gradient at P2

For $V_{battery}$ 11 V : $\frac{dV}{dt}$ approx. 0.25 $\frac{V}{\mu s}$

30 V : $\frac{dV}{dt}$ approx. 0.75 $\frac{V}{\mu s}$

→ Testing the controller voltage at P3: 2.0 to 2.5 V DC

Testing the overvoltage and undervoltage switch-off

- V_{batt} <9.5 V : the power pack switches off.
- V_{batt} 35 to 36 V: the power pack switches off.

5.2.4 Testing the Power Pack under Load

- Disconnect the voltage at the battery input.
- Connect P80.2 and P80.3.
- Connect the standard load to the output voltages:

  5 V : 2.2 Ω/12 W approx. 2.5 A

  ±15 V : 8.1 Ω/30 W aprrox. 1.8 A

  24 V : 47 Ω/13 W approx. 0.5 A

- Apply 11 V with 20-A current limitation.
- Rising edge at X71 switches on the power pack.

Testing the high-end voltages before the series regulators

- Pin 3 of N30 and N40 : V >16.2 V
- Emitter of V54 : V >25.2 V
- No-load on the ±15 V and the 24 V; 4.5 A on the 5 V
- Pin 3 of N30 and N40 : V <30 V
- Emitter of V54 : V <40 V

Testing the current limitation

- Set V_{batt} ≈ 20 V with 20-A current limitation

	Full load	Overload
5 V	4.6 A	Max. 5.5 A
+15 V	2.5 A	Max. 5 A
-15 V	2.0 A	Max. 5 A
24 V	0.8 A	Max. 1.6 A

- By decreasing the load resistance of each supply line, increase the current of the 4 output voltages until overloading occurs and test that the power pack switches off in each case.

5.2.5 Start-up with AC Supply Operation

- Disconnect the voltage at the battery input.
- Set the voltage selector to 240 V.
- Connect full load to the output voltages.
- Connect 240 V power supply.
- Check the DC voltage at P : with 264 V AC <34.5 V.
- Switch on with rising edge at X71.
- Test the DC voltage at the + and - terminals of C4

  With 264 V AC : 27 to 30 V

  With 240 V AC : 24 to 27 V

  With 218 V AC : 20 to 24 V

5.2.6 Testing the Specification with the Power Pack Closed

Voltage variations with input voltage of 11 to 30 V

+5.3 V ±0.08 V (2 to 4.6 A)

+15 V ±0.3 V (0 to 2.3 A)

-15 V ±0.3 V (0 to 2.0 A)

+24 V ±0.1 V (0 to 0.8 A)

+12 V ±0.5 V (0 to 0.2 A)

Measure the noise voltages on the output voltages using voltmeter URE with 100-kHz lowpass: <2 mV_{rms}.

5.3 Troubleshooting

Fault: The power pack does not start or switches off again immediately.

Cause: Incorrect polarity of voltage at battery terminals, voltage less than 9.5 V or greater than 35.5 V.

Fuse blown.

Short-circuit of output voltages.

The soft start timing (R101, C14) - switch-on of window comparator (R84, C72) - is incorrect.

Fault: ±15 V or 24 V not present.

Cause: Series regulator faulty.
Each series regulator can be tested separately by applying the high-end voltage of 17 V to C33 or C43 or 26 V to C52.

Fault: 5.3 V cannot be adjusted using R12.

Cause: 5-V current limitation active.
The limitation can be switched off by removing the jumpers P4 and P6 (only for test purposes).

Fault: The switch-on and monitoring logic is not operating.

Cause: D70, N70, N80 faulty.

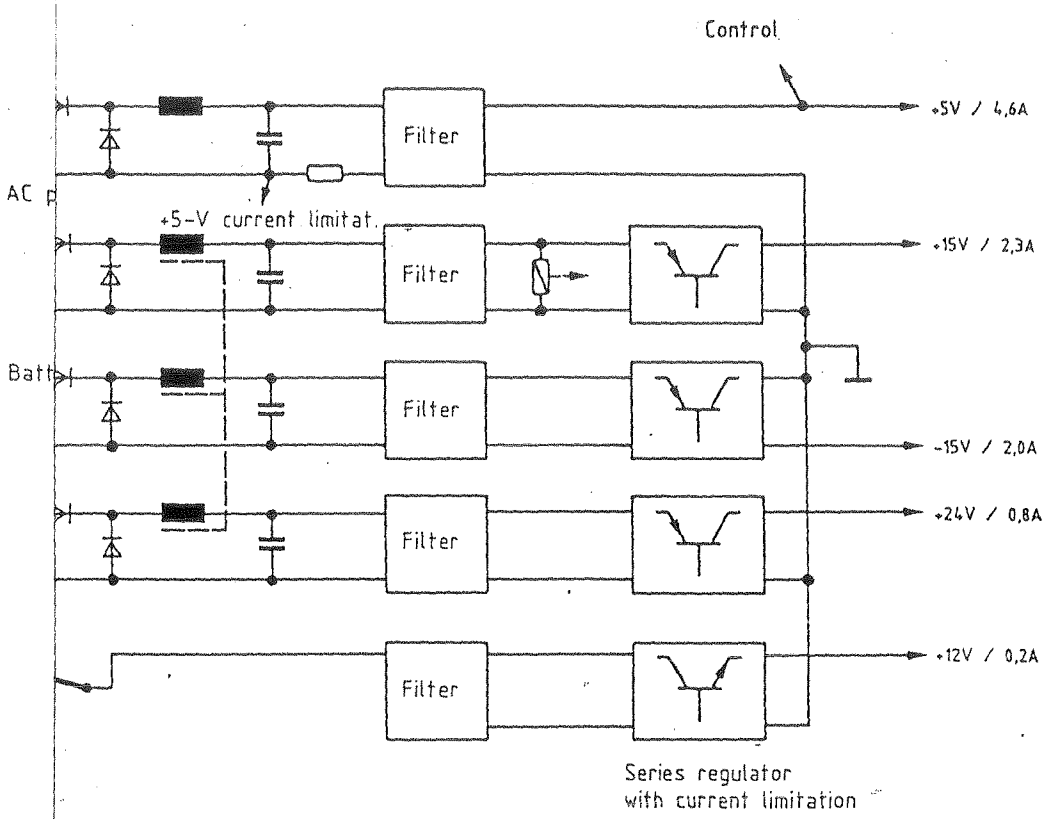
Test as with start-up after removing jumper at P80 and applying +5 V to P80.2.

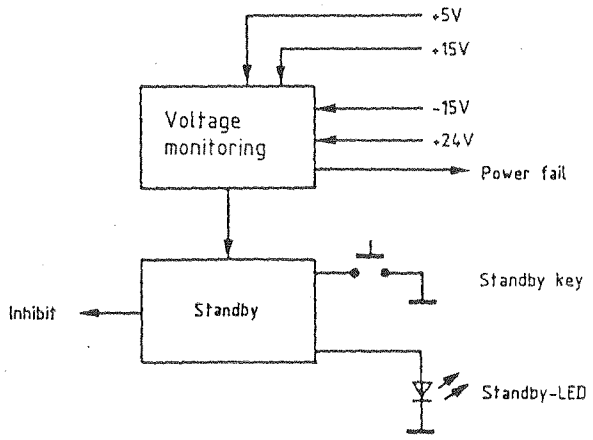
Fault: STANDBY voltage at C3, C4 too high.

Cause: T1 does not correspond to the specifications (secondary voltage too high).

Fault: High-end voltage at C52 too small.

Cause: L20 does not correspond to the specifications (number of ±15 V windings too high).





gram of power pack

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	30	0587	ZE NETZTEIL POWER SUPPLY	802.2814.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
A80	ED NETZTEIL NUR VAR : 02 32 POWER SUPPLY	802.3110.02	
A81	FILTERPLATTE FILTER BOARD	802.3004	802.3110.01
C1	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
C2	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
C3	CE 10MF-10+30%35V RD41X40 ELECTROLYTIC CAPACITOR NATIONAL ECE-T35R103L	803.0596	802.3110.01
C4	CE 10MF-10+30%35V RD41X40 ELECTROLYTIC CAPACITOR NATIONAL ECE-T35R103L	803.0596	802.3110.01
C5	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB CK05BX103K	CC 068.4060	802.3110.01
C6	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	802.3110.01
C7	CC 2,2NF+- 5%100V NPO VIE CAPACITOR ERIE 8133-100-COG-2,2NF-J	CC 060.0936	802.3110.01
C8	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
C9	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.3110.01
C11	CC 390PF+- 5%100V NPO VIE CERAMIC CAPACITOR UNIONCARB C052C391J2G1CA	CC 060.0842	802.3110.01
C12	CC 1,5NF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 152	CC 087.7048	802.3110.01
C13	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
C14	CE 4,7UF+-20%25V SAL ELECTR.CAPACITOR VALVO 2222 122 36478	CE 007.3928	802.3110.01
C15	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.3110.01
C16	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.3110.01
C17	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C18	CC 4,7NF+- 5%100V NPO VIE CERAMIC CAPACITOR ERIE 8737-100-COG-4,7NF-J	CC 060.0971	802.3110.01
C19	CC 470PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 471	CC 087.6993	802.3110.01
C20	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB CK05BX103K	CC 068.4060	802.3110.01
C21	CE 470UF-10+50%16V12,5X20 ALUMINIUM CAPACITOR ROEDERST EKR 00 FE 347 D	565.8400	802.3110.01
C22	CE 1000UF-10+50%25V 17X25 ALUMINIUM CAPACITOR ROEDERST. EKR00JG410E	565.9513	802.3110.01
C23	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C24	TRIMMWERT / SELECTED		802.3110.01
C25	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	802.3110.01
C26	CC 82NF+-10%50V5K1200VIEL CERAMIC CAPACITOR UNION CARB CK05BX823K	CC 084.5344	802.3110.01
C27	CE 470UF-10+50%40V15RDX25 ELECTROLYT CAPACITOR ROEDERSTEI EKR00HG347G	629.9776	802.3110.01
C28	TRIMMWERT / SELECTED		802.3110.01
C29	TRIMMWERT / SELECTED		802.3110.01
C31	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C32	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C33	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C34	CC 1UF+-10%50V7K1200VIEL CAPACITOR UNION CARB CK06BX105K	CC 084.5538	802.3110.01
C35	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	802.3110.01
C36	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	802.3110.01
C41	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C42	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C43	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C44	CC 1UF+-10%50V7K1200VIEL CAPACITOR UNION CARB CK06BX105K	CC 084.5538	802.3110.01
C45	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	802.3110.01
C46	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	802.3110.01
C50	CC 2,2NF+50-20%9HDK4000 CERAMIC CAPACITOR VALVO 2222 655 53222	006.0502	802.3110.01
C51	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C52	CE 470UF-10+50% 40V 15X30 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK470/40	CE 087.0572	802.3110.01
C54	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
C55	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	802.3110.01
C60	CE 100UF-10+50% 40V 13X17 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7107-Z	CE 022.7595	802.3110.01
C61	CK 330NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,33UF/5%	CK 099.2969	802.3110.01
C62	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	802.3110.01
C70	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
C71	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	802.3110.01
C72	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	802.3110.01
C73	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.3110.01
C74	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	802.3110.01
C75	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	802.3110.01
C76	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	802.3110.01
C77	CC 100PF+-2%4X5N750 CAPACITOR VALVO 2222 678 58101	CC 087.6906	802.3110.01

	Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	C100	CC 150NF+-10%100V K1200VI CAPACITOR UNION CARB CK06BX154K	CC 060.1161	
	C101	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB CK05BX103K	CC 068.4060	
	C102	CE 220UF-10+50%40V12,5X20 ALUMINIUM CAPACITOR ROEDERST EKR00FE322G	565.9494	
	C103	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB CK05BX103K	CC 068.4060	
	C104	CE 220UF-10+50%40V12,5X20 ALUMINIUM CAPACITOR ROEDERST EKR00FE322G	565.9494	
F	C104	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
	C105	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
	C106	CE 47UF-10+50% 40V 13X17 ELECTROLYTIC CAPACITOR ROEDERST ELKOEKU47/40	CE 247.4991	
	C107	CE 47UF-10+50% 40V 13X17 ELECTROLYTIC CAPACITOR ROEDERST ELKOEKU47/40	CE 247.4991	
	C108	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	802.3110.01
	D70	BL CD4013BE 2XD- FLIPFL FLIPFLOP RCA CD4013BE	BL 086.7021	802.3110.01
	F1	SS SCHMELZS.T2 D DIN41571 NUR VAR : 02 FUSE WICKMANN T2D DIN 41571 TROP	SS 020.7546	
	F1	SS SCHMELZS.T4 D DIN41571 NUR VAR : 32 FUSE WICKMANN T4D DIN 41571 TROP	SS 020.7600	
	F2	SS SCHMELZS.T16 5X20 FUSE SCHURTER 001.2516	332.3789	
	K30	SN 12V 1XUM AG/AU 1A 30W RELAY 12V SIEMENS V23101-A6-A101	803.0673	802.3110.01
	L10	LD STROMKOMP.-DROSSEL CHOKE	802.2795	802.3110.01
	L20	LU DREIFACHDROSSEL TOROIDAL CORE CHOKE VAC ZKB610-145-51-M2	803.0609	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L21	LD SPEICHERDR.100UH 5A CHOKE VAC ZKB419/205-51-HZ	803.0444	802.3110.01
L22	LD 9UH BEI 6 A 0,012 OHM CHOKE SIEMENS B8211-B-C22	LD 026.4826	802.3110.01
L30	LD 25UH BEI 3 A 0,046 OHM CHOKE SIEMENS B82111-B-C24	LD 026.4849	802.3110.01
L32	LD UKW-DR.Z=750 OHM 50MHZ CHOKE VALVO 431202036641	LD 026.4578	802.3110.01
L40	LD 25UH BEI 3 A 0,046 OHM CHOKE SIEMENS B82111-B-C24	LD 026.4849	802.3110.01
L42	LD UKW-DR.Z=750 OHM 50MHZ CHOKE VALVO 431202036641	LD 026.4578	802.3110.01
L50	LD 25UH BEI 3 A 0,046 OHM CHOKE SIEMENS B82111-B-C24	LD 026.4849	802.3110.01
L52	LD UKW-DR.Z=750 OHM 50MHZ CHOKE VALVO 431202036641	LD 026.4578	802.3110.01
L60	LD UKW-DR.Z=750 OHM 50MHZ CHOKE VALVO 431202036641	LD 026.4578	802.3110.01
N1	BO UC2840J 0A2 SCH.REGL REG.PULSE.WIDTH MODULATOR UNITRODE UC2840J	374.9904	802.3110.01
N30	BO SI3152V +15V2A0 VREGL VOLTAGE REGULATOR SANKEN SI-3152V	803.0615	802.3110.01
N40	BO SI3152V +15V2A0 VREGL VOLTAGE REGULATOR SANKEN SI-3152V	803.0615	802.3110.01
N50	BO UA723C ADJ0A1 VREGL VOLTAGE REGULATOR NSC LM723CN	BO 009.0190	802.3110.01
N60	BO LM7812CT +12V1A0 VREGL VOLTAGE REGULATOR NSC LM7812CT	BO 344.9641	802.3110.01
N70	BO CA3240AE 2XMOS OPAMP OPERATIONAL AMPLIFIER RCA CA3240AE	302.7040	802.3110.01
N71	BO CA3240AE 2XMOS OPAMP OPERATIONAL AMPLIFIER RCA CA3240AE	302.7040	802.3110.01
P1	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01
P2	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	30	0587	ZE NETZTEIL POWER SUPPLY	802.2814.01 SA	6

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
P3	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01
P4	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	802.3110.01
P5	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	802.3110.01
P6	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 2X3POL/PINS	FP 242.3600	802.3110.01
P7	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01
P71	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01
P73	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01
P80	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	802.3110.01
R1	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	802.3110.01
R2	RL 0,35W 3,24KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,24K-F-D	RL 082.6843	802.3110.01
R3	RL 0,35W 1,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,74K-F-D	RL 083.0784	802.3110.01
R4	RL 0,35W 604 OHM+-1%TK50 RESISTOR DRALORIC SMA/207/604OHM-F-C	RL 082.2425	802.3110.01
R5	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	802.3110.01
R6	TRIMMWERT / SELECTED		802.3110.01
R7	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	802.3110.01
R8	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	802.3110.01
R9	RL 0,35W 169 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/169K-F-C	RL 083.2164	802.3110.01
R10	TRIMMWERT / SELECTED		802.3110.01
R11	RL 0,35W 7,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/7,5K-F-D	RL 083.1197	802.3110.01

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteiliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	30	0587	ZE NETZTEIL POWER SUPPLY	802.2814.01 SA	7

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R12	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386X1-103	RS 247.7526	802.3110.01
R13	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	802.3110.01
BIS/TO R17			
R18	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	802.3110.01
R19	RJ 2W 5,6 OHM+-5% METALOXID RESISTOR RESISTA WK5 5,6 OHM 5%	803.0480	802.3110.01
R20	RJ 1W 18 OHM+-5%TK200 RESISTOR RESISTA 18OHM+-5% TK200	451.5055	802.3110.01
R22	RD 0,8W 47 MIOHM+-3% WIRE-WOUND RESISTOR SAGE 1000S/0,04OHM/3%	RD 069.1458	802.3110.01
R50	RD 2.4W 100 OHM +-3% WIRE-WOUND RESISTOR SAGE 1200S/100OHM/3%	RD 080.0377	802.3110.01
R51	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.3110.01
R52	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.1039	802.3110.01
R53	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	802.3110.01
R54	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	802.3110.01
R55	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	802.3110.01
R56	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-102	RS 247.5917	802.3110.01
R57	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.3110.01
R70	RL 0,35W 1,27KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/1,27K-F-C	RL 082.2490	802.3110.01
R71	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.3110.01
R73	RL 0,35W 1,37KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,37K-F-D	RL 083.0690	802.3110.01
R74	RL 0,35W 1,21KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,21K-F-D	RL 083.0655	802.3110.01

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteiliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	30	0587	ZE NETZTEIL POWER SUPPLY	802.2814.01 SA	8

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R76	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	802.3110.01
R77	RL 0,35W 29,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/29,4K-F-C	RL 083.1622	802.3110.01
R78	RL 0,35W 28,7KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/28,7K--FC	RL 083.1616	802.3110.01
R79	RL 0,35W 1,33KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,33K-F-D	RL 083.0684	802.3110.01
R82	RL 0,35W 806 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/806OHM-F-D	RL 083.0555	802.3110.01
R83	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.3110.01
R84	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	802.3110.01
R86	RL 0,35W 511 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/511OHM-F-D	RL 083.0426	802.3110.01
R87	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.3110.01
R88	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	802.3110.01
R89	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	802.3110.01
R90	RL 0,35W 2,05KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,05K-F-D	RL 083.0832	802.3110.01
R91	RL 0,35W 3,16KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,16K-F-D	RL 083.0984	802.3110.01
R92	RL 0,35W 3,16KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,16K-F-D	RL 083.0984	802.3110.01
R100	RL 0,35W 105 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/105K-F-C	RL 083.2029	802.3110.01
R101	RL 0,35W 41,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/41,2K-F-C	RL 082.2319	802.3110.01
R102	TRIMMWERT / SELECTED		802.3110.01
R103	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	802.3110.01
R104	RL 0,35W5,11KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207	RL 084.2500	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R105	RL 0,35W4,75KOHM+-0,1%T25 RESISTOR DRALORIC SMA/207/4,75K-B-E	RL 084.2445	802.3110.01
R106	RL 0,35W4,75KOHM+-0,1%T25 RESISTOR DRALORIC SMA/207/4,75K-B-E	RL 084.2445	802.3110.01
R107	RL 0,35W4,87KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207	RL 084.2468	802.3110.01
R113	RL 0,35W 931 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/931OHM-F-D	RL 083.0590	802.3110.01
R114	RL 0,35W 9,76KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/9,76K-F-D	RL 083.1280	802.3110.01
R116	RL 0,35W 226 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/226K-F-C	RL 083.2287	802.3110.01
S1	FR SPANNUNGSWAEHLER M.SI VOLTAGE SELECTOR SCHURTER R&S-ZCHNG.803.0896	803.0896	
T1	ZM TRAFOEINHEIT TRANSFORMER UNIT	802.3091	
T2	LU SCHALTTRAFO TRANSFORMER	802.2808	802.3110.01
V1	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	802.3110.01
V2	AM BUZ21 N 100V PMOSF POWER MOSFET SIEMENS BUZ21	AM 645.7300	802.3110.01
BIS/TO V6			
V7	AE 1N5655AJAN 70V1 SUPPR SUPPRESSOR DIODE SIEMENS 1N5655A JAN	580.9091	802.3110.01
V8	AG BYW29/150 GL 150V 7A0 RECTIFIER VALVO BYW29/150	AG 300.6799	802.3110.01
V9	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	802.3110.01
V10	AK 2N2222A NPN 40V 800MA TRANSISTOR VALVO 2N2222A	AK 010.5405	802.3110.01
V11	AG BYV21/45 SGL 45V 25A0 RECTIFIER VALVO BYV21/45	803.0473	
BIS/TO V14			
V19	AG BYW29/150 GL 150V 7A0 RECTIFIER VALVO BYW29/150	AG 300.6799	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V20	AG BYS28-90 2GL 90V 12A5 RECTIFIER SIEMENS BYS28-90	803.0638	802.3110.01
V30	AG BYV29/500 GL 500V 7A4 RECTIFIER VALVO BYV 29/500	803.0996	802.3110.01
V31	AG BYV29/500 GL 500V 7A4 RECTIFIER VALVO BYV 29/500	803.0996	802.3110.01
V32	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01
V40	AG BYV29/500 GL 500V 7A4 RECTIFIER VALVO BYV 29/500	803.0996	802.3110.01
V41	AG BYV29/500 GL 500V 7A4 RECTIFIER VALVO BYV 29/500	803.0996	802.3110.01
V50	AG BYV29/500 GL 500V 7A4 RECTIFIER VALVO BYV 29/500	803.0996	802.3110.01
V51	AG BYV29/500 GL 500V 7A4 RECTIFIER VALVO BYV 29/500	803.0996	802.3110.01
V52	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01
V53	AE BZX79/C6V8 0,5W Z-DI ZENER DIODE VALVO BZX79/C6V8	AE 012.2478	802.3110.01
V54	AL BDT92 PNP 60V 10A0 TRANSISTOR VALVO BDT 92	803.0650	802.3110.01
V55	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	802.3110.01
V56	AE UZ4736 36V 5.0W Z-DI ZENER DIODE UNITRODE UZ4736	803.0467	802.3110.01
V60	AG 1N4007 GL1000V 1A0 RECTIFIER AEG-TELEF 1N4007	AG 013.0310	802.3110.01
V70	AE BZX79/B5V6 0,5W Z-DI ZENER DIODE VALVO BZX79/B5V6	AE 012.5254	802.3110.01
V71	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01
V72	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V7	AE 012.2432	802.3110.01
V73	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	802.3110.01
V80	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V81	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01
V82	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01
V83	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V7	AE 012.2432	802.3110.01
V84	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	802.3110.01
V86	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	802.3110.01
V87	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.3110.01
V88	AE BZX55/B4V7 0,5W Z-DI ZENER DIODE INTERMETAL ZPD4,7+-2,5%	AE 080.4014	802.3110.01
V100	AG MBR2540 SGL 40V 25A0 RECTIFIER MOTOROLA MBR2540 M.ZUBEHOER	AG 086.9930	
W49	DX KABEL (W49) CABLE (W49)	803.0409	802.3004
W50	DX KABEL (W50) CABLE (W50)	803.0415	802.3004
W51	DX KABEL (W51) CABLE (W51)	803.0421	802.3004
X3	FP KURZSCHL.BUCHSE OFFEN SHORTING PLUG BERG 76264-101	FP 342.1895	802.3110.01
BIS/TO X6			
X20	FV FLACHSTECKER GR4,8X0,8 PLUG VOGT&CO 3826 MS/0,8 VERZINNT	FV 545.4000	802.3110.01
X30	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01
X40	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01
X50	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01
X60	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01
X70	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X71	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01
X72	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	802.3110.01
X80	FP KURZSCHL.BUCHSE OFFEN SHORTING PLUG BERG 76264-101	FP 342.1895	802.3110.01
X100	VK RAENDELKL.ISOL.ROT KNURLED CLAMP ELMA BV 42267	VK 219.5300	
X101	VK RAENDELKL.ISOL.BLAU KNURLED CLAMP ELMA BV 42270	VK 219.5339	
Z1	FN NETZST.M.FILTER 3A MAINS SUPPLY-FILTER CORCOM 3EF2	803.0938	
Z2	LD FILTER 3NF 25A 10MHZ FILTER ERIE 1204-050	LD 453.7110	
Z3	LD FILTER 3NF 25A 10MHZ FILTER ERIE 1204-050	LD 453.7110	
Z6	LD 5MHZ/20DB 10A CHOKE ERIE R&S-ZCHNG.453.4404	LD 453.4404	802.3004
BIS/TO Z14			- ENDE -

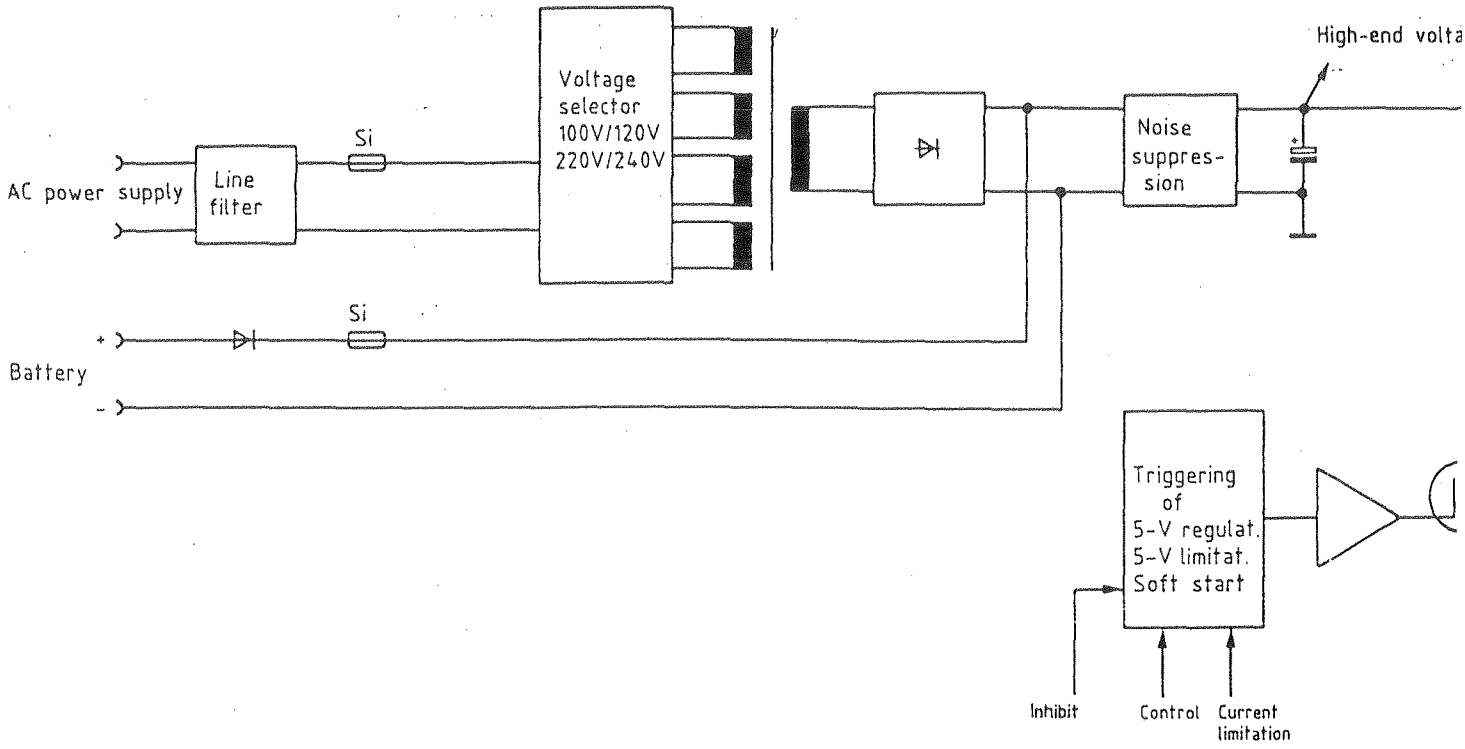


Fig.

802.2814.02

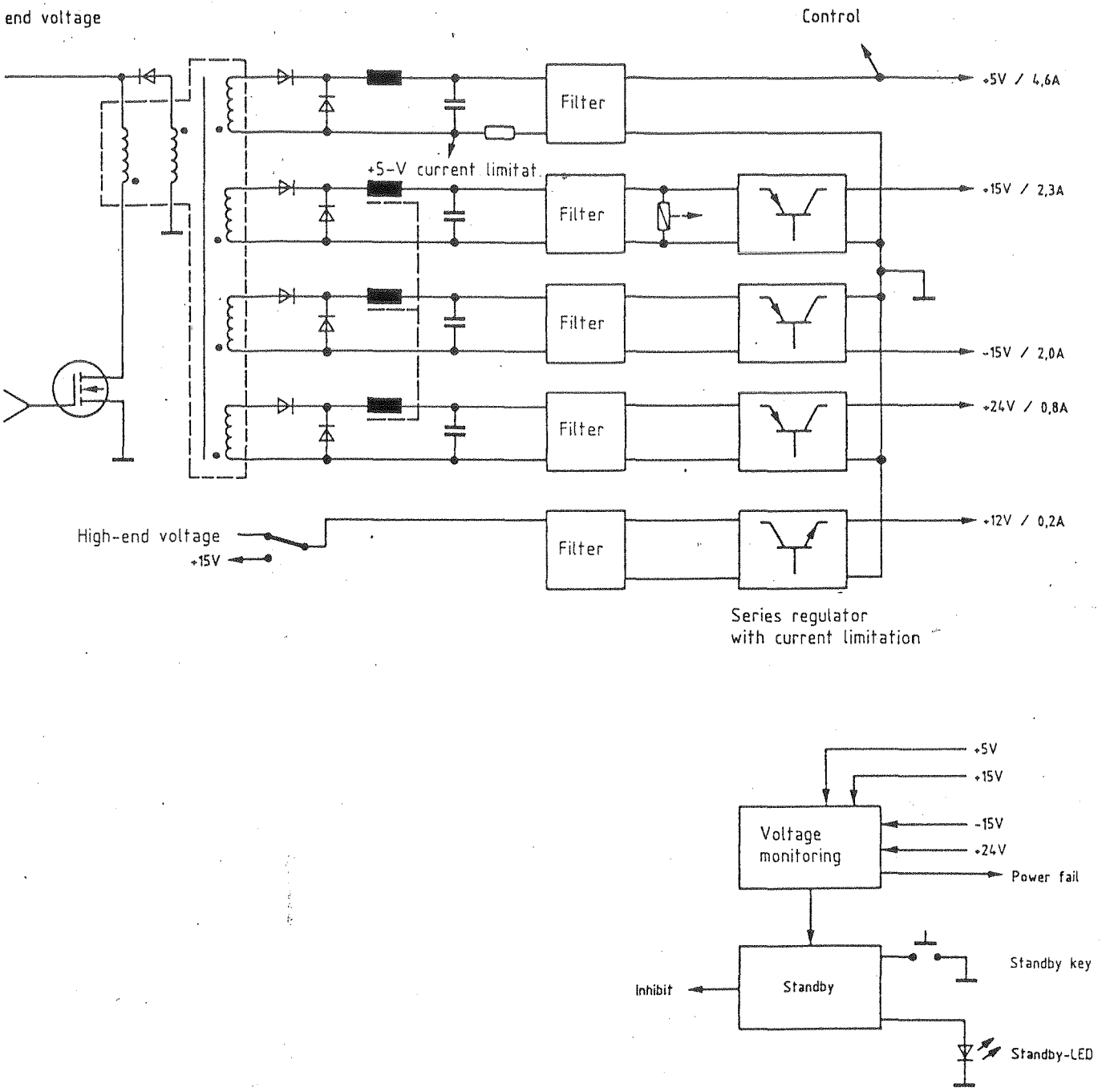
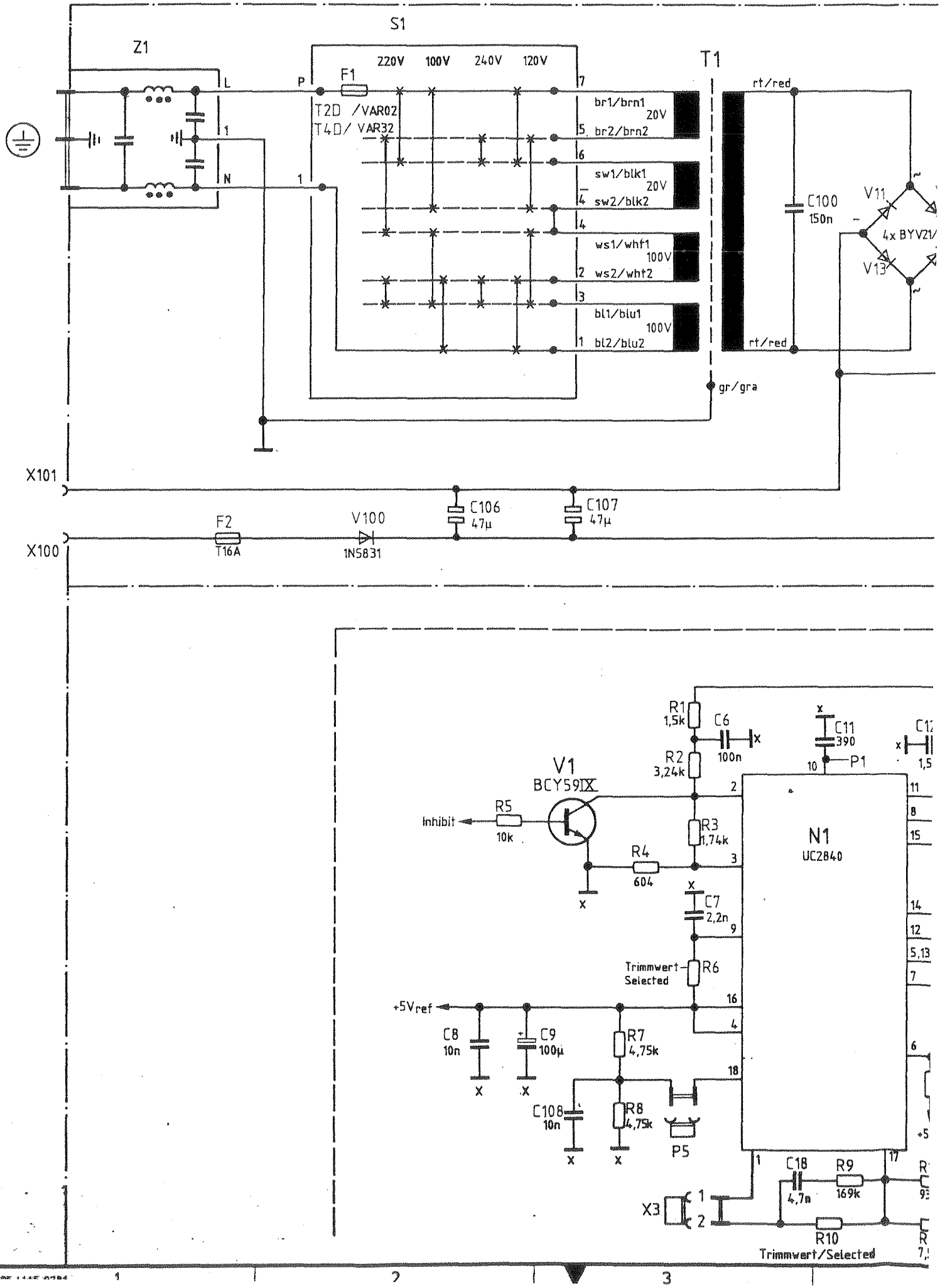
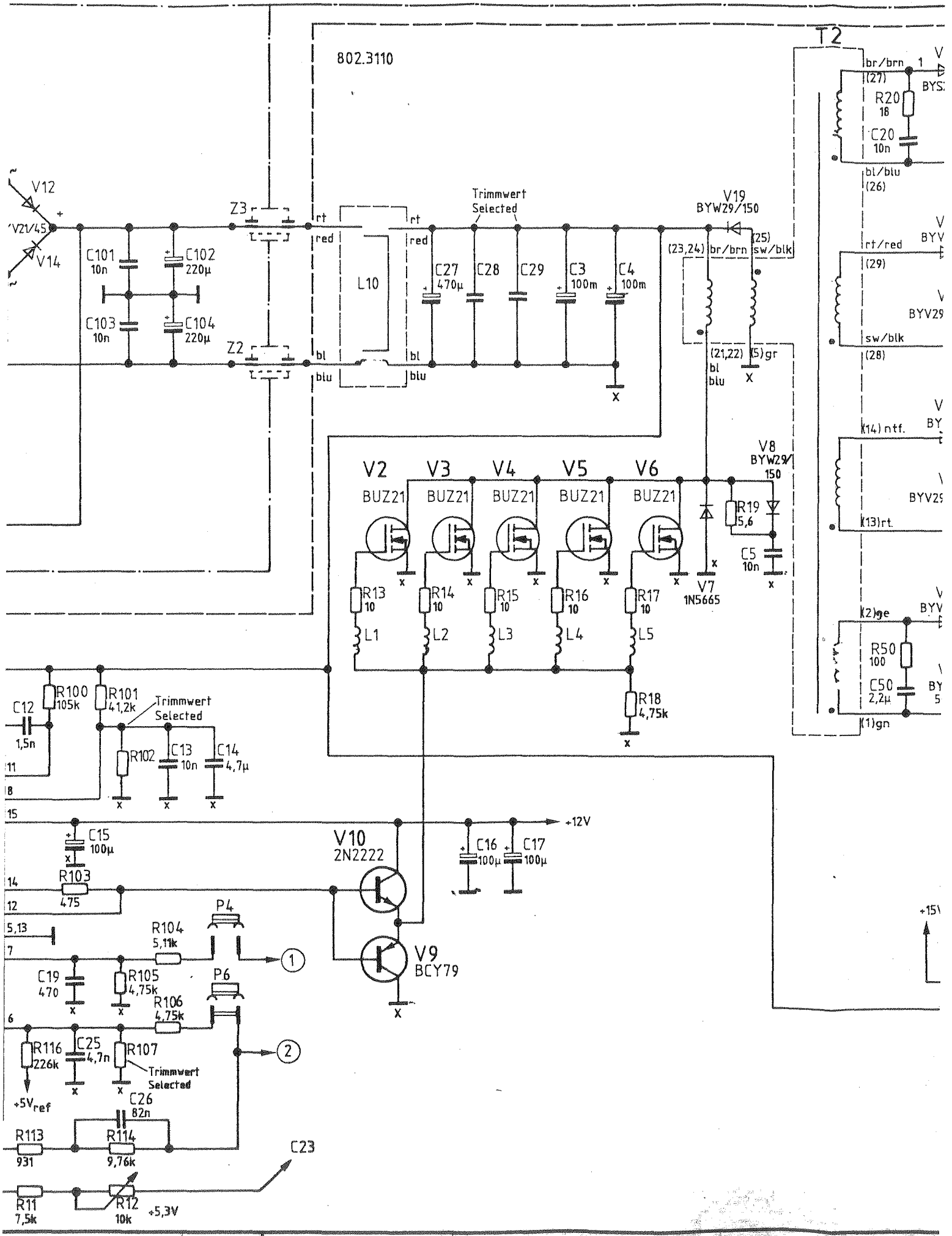
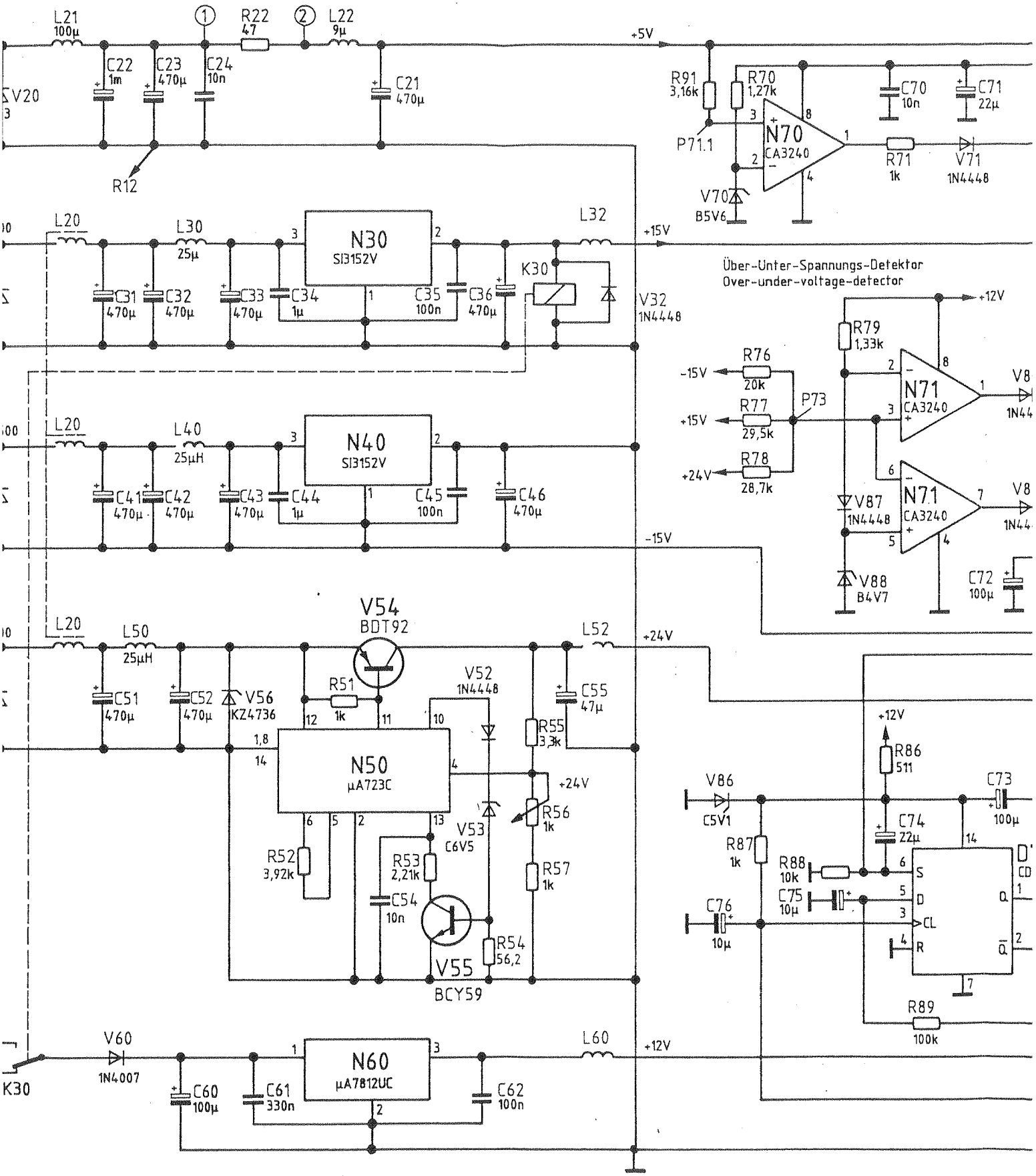


Fig. 5-5 Block diagram of power pack

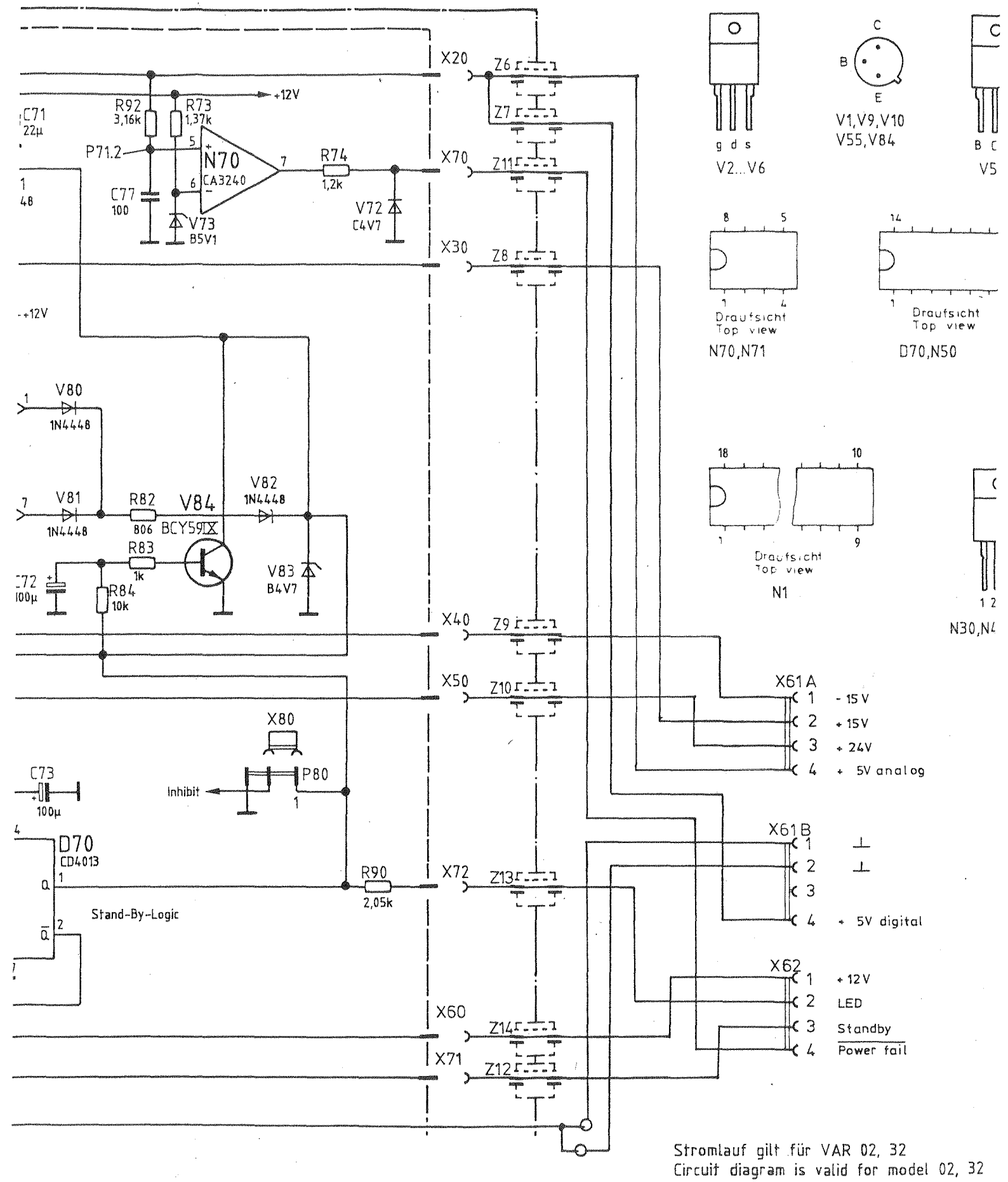

S1
Z1
T1
220V
100V
240V
120V
L
N
P
F1
T2D /VAR02
T4D/ VAR32
br1/brn1
20V
br2/brn2
sw1/blk1
20V
sw2/blk2
ws1/wht1
100V
ws2/wht2
bl1/blu1
100V
bl2/blu2
rt/red
rt/red
gr/gra
C100
150n
V11
4x BYV21/
V13
X101
X100
F2
T16A
V100
1N5831
C106
47µ
C107
47µ
R1
1,5k
C6
100n
R2
3,24k
V1
BCY59IX
Inhibit
R5
10k
R3
1,74k
R4
604
C7
2,2n
Trimmwert
Selected
R6
+5Vref
C8
10n
C9
100µ
R7
4,75k
C108
10n
R8
4,75k
P5
C11
390
P1
N1
UC2840
C18
4,7n
R9
169k
X3
R10
Trimmwert/Selected


802.3110
T2
V12
V21/45
V14
Z3
Z2
rt
red
bl
blu
L10
C101 10n
C102 220µ
C103 10n
C104 220µ
C27 470µ
C28
C29
C3 100m
C4 100m
Trimmwert Selected
V19 BYW29/150
(23,24) br/brn
(25) sw/blk
(21,22) bl blu
(5) gr
X
br/brn 1
(27)
R20 18
C20 10n
bl/blu
(26)
rt/red
(29)
sw/blk
(28)
(14) ntf.
(13) rt.
(2) ge
R50 100
C50 2,2µ
(1) gn
V2 BUZ21
V3 BUZ21
V4 BUZ21
V5 BUZ21
V6 BUZ21
V8 BYW29/150
V7 1N5665
R19 5,6
C5 10n
R13 10
R14 10
R15 10
R16 10
R17 10
L1
L2
L3
L4
L5
R18 4,75k
C12 1,5n
R100 105k
R101 41,2k
Trimmwert Selected
R102
C13 10n
C14 4,7µ
11
8
15
14
12
5,13
7
6
C15 100µ
R103 475
R104 5,11k
P4
P6
R105 4,75k
R106 4,75k
C19 470
R116 226k
C25 4,7n
R107
Trimmwert Selected
+5V ref
C26 82n
R113 931
R114 9,76k
C23
R11 7,5k
R12 10k
+5,3V
V10 2N2222
V9 BCY79
C16 100µ
C17 100µ
+12V
+15V
1
2



				D	35533	8.86	CO	1KGA	Tag	
B	32954	11.85	LS	E	35547	5.87	IB	Bearb.	6.85	
C	32954	4.86	CO	F	38951	11.87	IB	Gepr		
And. Zust	Änderungs-Mitteilung	Datum	Name	And. Zust	Änderungs-Mitteilung	Datum	Name	Norm		

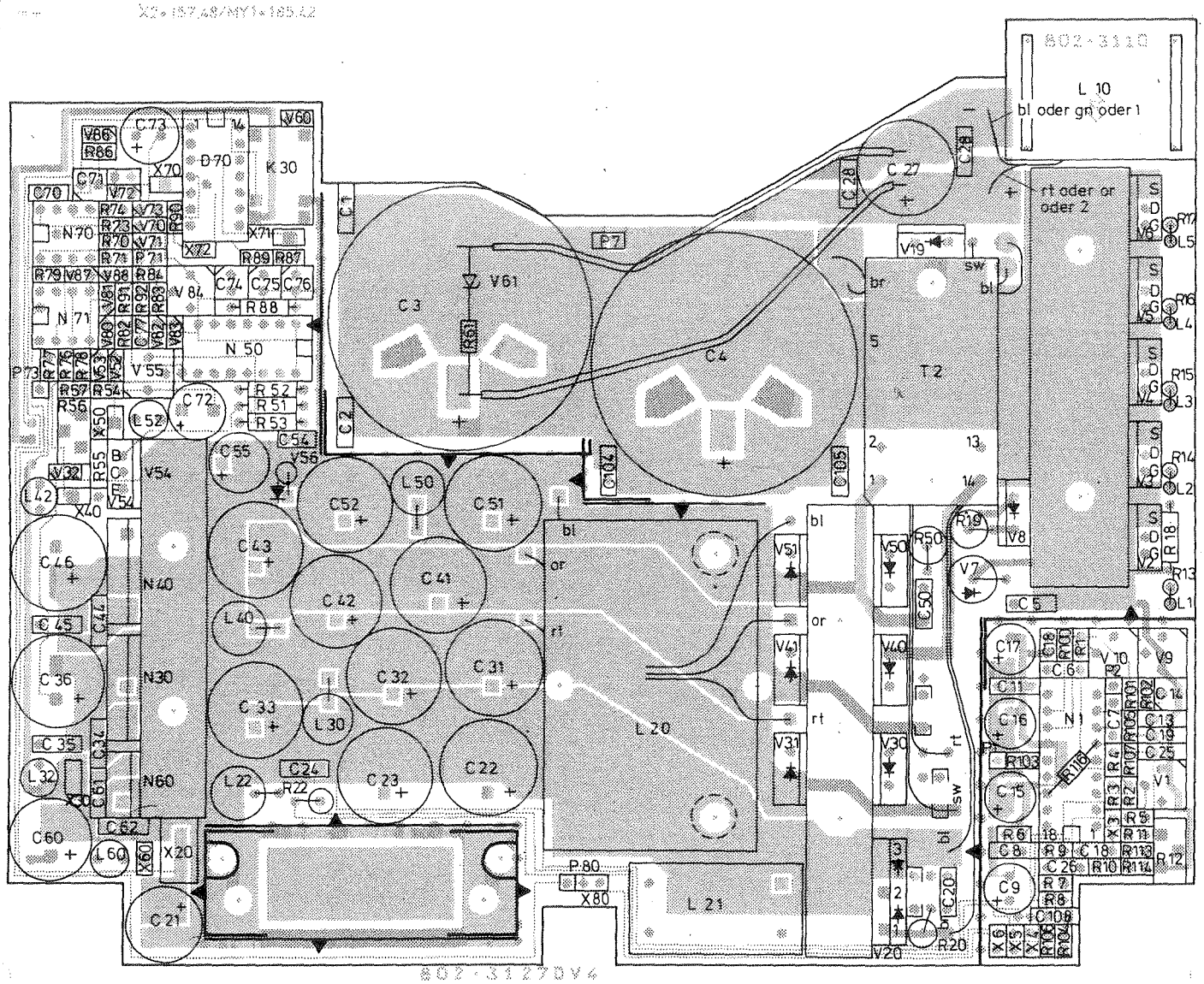
ROHDE&SCHWARZ



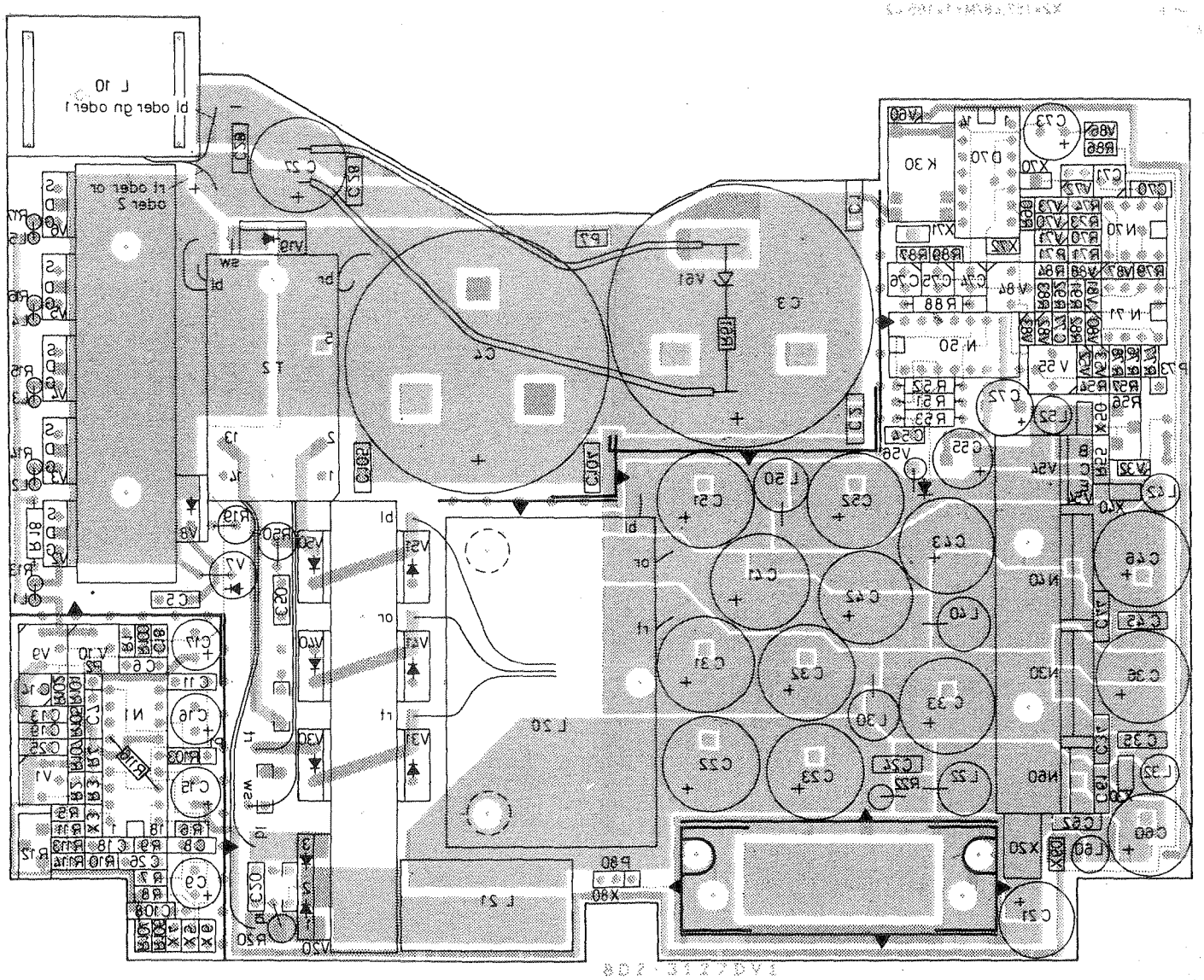
Stromlauf gilt für VAR 02, 32
Circuit diagram is valid for model 02, 32

ag	Name	Benennung		Zeichn.-Nr
85	FL	CMT Netzteil / Power Supply	Z	802.2814 S
		zu Gerät: CMT	reg. i V: 802.2020 V	erste Z:

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



Ansicht und Leitungsführung Lötseite
View of tracks on solder side



				Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1 KGA	Tag	Name	Benennung: Netzteil / Power supply — Z
				Bearb.	02.85	LS	
				Gepr.			
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr. 802.3110	Blatt-Nr. 2 v. Bl.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CMT		reg. i. V. 802.2020 V	erste Z. 802.2814

5 6 7 8 07 6001 81

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Digital Unit

802.4517.02

Printed in West Germany

Contents

		Page
5	Service Manual for Digital Unit	5.1
5.1	Function Description	5.1
5.1.1	CPU	5.3
5.1.2	Bus Interface	5.4
5.1.3	Address Decoder	5.5
5.1.4	RAM	5.5
5.1.5	EPROM	5.5
5.1.6	I/O Port	5.6
5.1.7	Interrupt Extension	5.6
5.1.8	Timer Array	5.8
5.1.9	Frequency Generators	5.8
5.1.10	Keyboard Interface	5.9
5.1.11	Power-Fail Circuit	5.9
5.1.12	A/D Converter Unit	5.10
5.1.12.1	Reference Source	5.10
5.1.12.2	A/D Converter	5.11
5.1.13	RF Counter	5.11
5.1.14	AF Counter	5.13
5.2	Testing and Adjustment	5.14
5.2.1	Testing the AD Converter Unit	5.14
5.2.1.1	Reference Source	5.14
5.2.1.2	A/D Converter	5.14
5.3	Troubleshooting	5.15

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Digital Unit
(See circuit diagram 802.4517 S and block diagram)

5.1 Function Description

The module comprises a complete processor with several special digital function groups. The processor is the central control and arithmetic unit of the instrument. It controls the complete hardware, can respond to certain peripheral events, controls simple and complex test sequences and carries out various calculations.

The digital unit contains its own 16-bit data bus and its own 20-bit address bus.

Fig. 5-1 shows the block diagram of the digital unit with the most important data and control lines where a link may consist of several signal lines.

Further units are also present on the module (RF counter, AF counter, A/D converter) whose functions are closely associated with the digital unit.

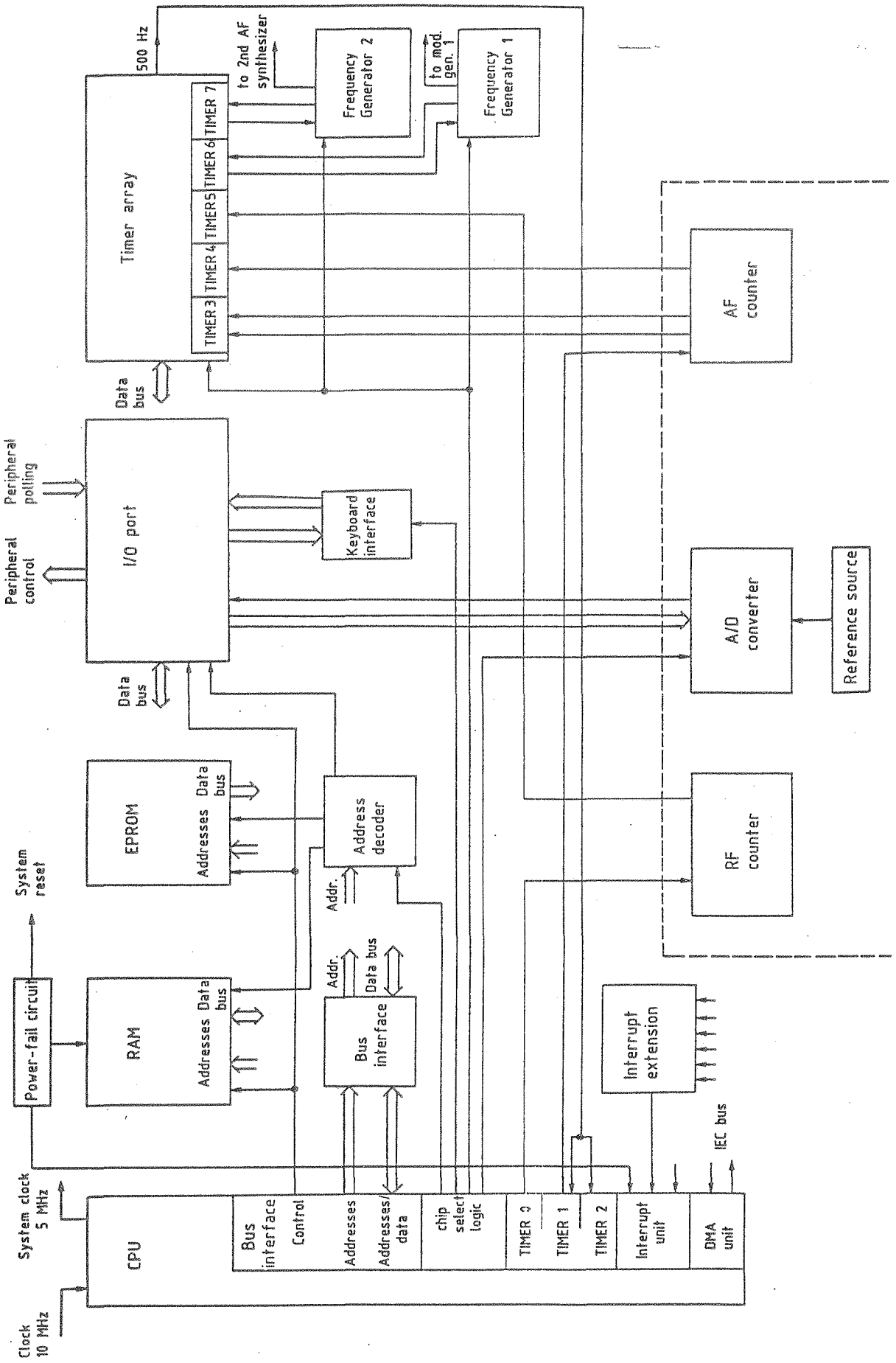


Fig. 5-1 Block diagram of the digital unit

5.1.1 CPU

A CPU of type 80186 is used. This 16-bit CPU uses an external clock of 10 MHz; the system clock is then 5 MHz.

The CPU has certain special features which are described below:

a) **Bus interface**

In addition to a number of control and status lines leading to and from the bus interface, this unit generates the most significant 4 address bits on special lines. The least significant 16 address bits are available on a common bus in multiplex mode with the 16 data bits. It is therefore necessary to temporarily store the least significant 16 address bits in an external bus interface (see Section 5.1.2).

b) **Chip select logic**

The CPU contains a chip select unit which provides various chip select outputs. This unit can be programmed such that the outputs only become active with certain address areas of the address bus.

A differentiation must be made between the memory and peripheral selection outputs. Seven selection outputs are available for driving peripheral modules. The CPU can be programmed for memory mapped or separate I/O area organization. The I/O area organization is used in this instrument. The peripheral selection outputs drive the I/O modules, the timer array, the A/D converter and the divider.

There are 6 memory selection outputs present which are not sufficient for the complete memory space of the instrument. They therefore first control, together with address lines, an external address decoder which may also be simply omitted as a result of the preselection in the CPU-internal chip select unit (see Section 5.1.3).

c) Timer unit

This unit contains 3 programmable timer/counter functions which may operate separately or as a group.

Timers 0 and 1 have external inputs and outputs. Timer 0 provides the gate time for the RF counter and timer 1 the gate time for the AF counter. These gate times can only be generated using an external reference clock of 500 MHz provided by the timer array.

Timer 2 is only used internally as the real-time clock of the system. It causes an internal interrupt every 10 ms which increments the clock.

d) Interrupt unit

The interrupt unit contains an interrupt controller with a non-maskable input (NMI) and four maskable inputs (INTØ to INT3). The NMI input is connected to the power-fail circuit. An interrupt is generated as soon as the operating voltage drops below a defined value and measures for data protection are initiated (see Section 5.1.11).

The priority of inputs INTØ to INT3 can be selected. Since their number would be insufficient for the instrument, input INTØ is expanded into six interrupt inputs using an external interrupt extension (see Section 5.1.7).

Examples of interrupt generators:
rotary pulse generator (spinwheel), keyboard, IEC bus, Centronics interface.

e) DMA unit

The DMA unit enables the fastest possible data transfer with peripheral units. This transmission mode is used together with the IEC bus.

5.1.2 Bus Interface

Since the microprocessor activates data and addresses in multiplex mode, it is necessary to store the addresses temporarily. Addresses AØ to A18 are loaded into intermediate memories. The control pulse required (ALE) is provided directly by the microprocessor.

The data bus DØ to D15 is controlled via line drivers. The CPU also provides the control signals for the data direction and activation in this case.

The address and data buses are local buses of the digital unit.

5.1.3 Address Decoder

The address decoder is responsible for selection of the various address areas of the complete memory. The input is provided by the CPU with certain address lines and lines from the chip select logic. A further signal ($\overline{BHE}$) can be used by the CPU to trigger individual bytes from the memory with 16-bit word organization. The decoder provides single signals at the output with which the individual memory areas can be directly selected.

5.1.4 RAM

The RAM of the digital unit has a capacity of 16 Kbyte and is divided into 16x8 Kbit. Static CMOS-RAMs are used. These low power types enable battery back-up when the power supply is switched off or if it fails. For this reason, the RAM has its own power supply which is automatically switched over in the power failure circuit (see Section 5.1.11).

5.1.5 EPROM

The read-only memory has six IC sockets which can be occupied by type 27256 chips. The total memory capacity is then 192 Kbyte.

5.1.6 I/O Port

This function unit is used to trigger and scan peripheral units. The link to the microprocessor consists of the common data bus, control signals from the CPU and triggering via the address decoder. The I/O data transmission is implemented in different ways. Most of I/O lines are provided by the programmable port chips D17 and D18.

D17 is programmed as a pure output port with 25 output signals which are mainly used as strobe signals for controlling a series of peripheral shift registers. This port also provides the serial data line DO-L and the associated clock line CPS-L.

D18 is programmed to service 12 outputs and 12 inputs. The outputs also include a number of strobe lines, the serial data line DO-S and the associated clock line CPS-S. Data from peripheral modules can be read in via the inputs.

The port chips D45 and D46 represent a pure output port which provides further strobe and control lines and controls the A/D converter.

5.1.7 Interrupt Extension

It is necessary to extend the CPU-internal interrupt controller since the number of peripheral modules which require an interrupt is larger than the number of CPU interrupt inputs.

An interrupt expander with six inputs is therefore connected prior to the CPU interrupt line INTØ.

Fig. 5-2 shows the block diagram of the circuit.

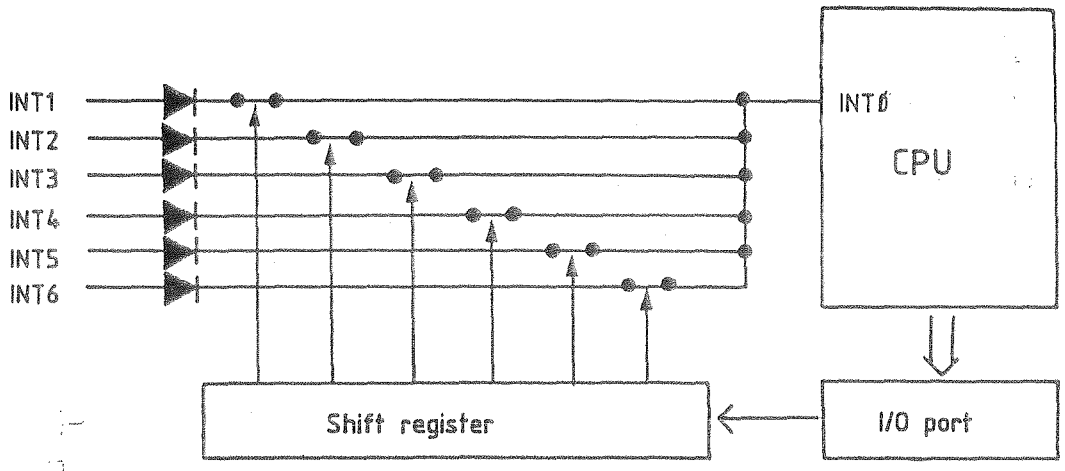


Fig. 5-2 Interrupt extension

The additional interrupt lines INT1 to INT6 are connected to a common point via a wired-OR link with serial, intermediate switches; the lines are taken to the interrupt line INTØ. The switches are normally closed. If an interrupt is requested via one of the lines INT1 to INT6, the CPU starts the interrupt program and a polling sequence. A serial shift register is accessed via the I/O port which in turn accesses the interrupt switches. The interrupt program first causes all switches to open. Signal INTØ becomes inactive. The switches are then closed in sequence. The source of interrupt is identified as soon as signal INTØ at the CPU interrupt input becomes active again and the program can service the actual interrupt request.

The shift register (D33) is controlled by the I/O ports with the following signals:

CPS-S	Clock line
DO-S	Data line
HFC	Strobe line

The switches (D36, D38) are analog switches.

5.1.8 Timer Array

The timer array consists of a single chip. It contains 5 independent timers which can be programmed as clocks, counters or pulse generators. Data exchange with the CPU takes place via the common data bus, additional control lines control the chip. The timer array also provides a 500-Hz reference clock to generate the gate times in the CPU-internal timers.

Summary of assignment, use and operating modes of the timers:

Timer	Operating mode	Use
3	Counter	Evaluation of AF counter
4	Counter	Evaluation of AF counter
5	Counter	Evaluation of RF counter
6	Divider	Control of frequency generator 1
7	Divider	Control of frequency generator 2

5.1.9 Frequency Generators

Two identical frequency generator circuits are present in the digital unit whose output signal is required to generate programmable sinewave frequencies. The output signal ist first extended in a monostable flip-flop and then passed on at a lower level to suppress interferences.

Each frequency generator consists of an intermediate memory, an adder, an input memory and a programmable decrementer.

Timer 6 assumes the function of the decrementer for generator 1.

Timer 7 assumes the function of the decrementer for generator 2.

The generator numbers are as follows:

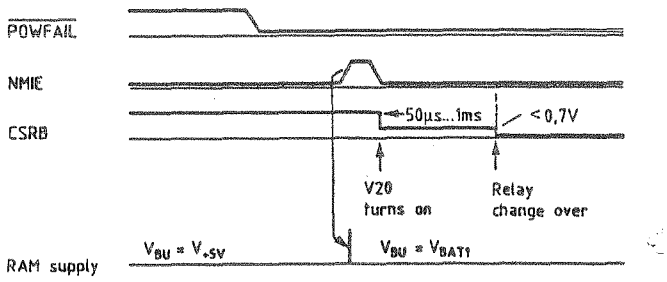
+ Generator 1 (D20 to D23)
+ Generator 2 (D25 to D28)

5.1.10 Keyboard Interface

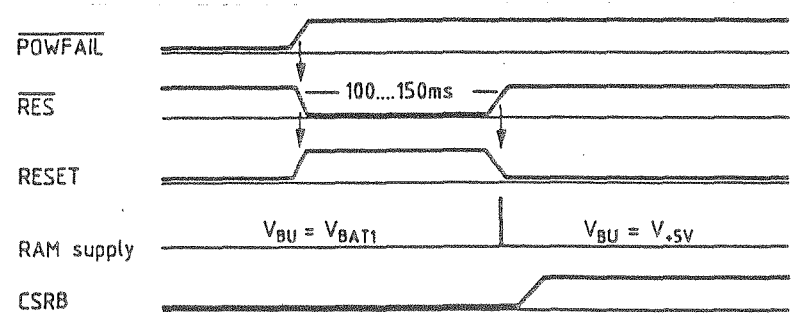
The interface comprises a 10x8 matrix with the keys located at the points of intersection. The 10 columns of the matrix are linked to an output port (D29, D30), the 8 rows to an input port (D31). Both ports are linked to the CPU via the data bus. In addition, selection lines and read or write lines lead to the two ports. A pressed key triggers an interrupt and the associated interrupt program then applies a test bit to all 10 rows in succession and polls the input port. In this manner, the point of intersection in the matrix at which a key was pressed can be determined.

5.1.11 Power-Fail Circuit

The power-fail circuit receives an active power-fail signal as soon as the monitored supply voltage drops below a critical value and then triggers an interrupt. The CPU then carries out a save routine and transmits a signal to the power-fail circuit following the last access to the RAM. The RAM supply is then switched over to the battery and the RAMs are transferred to low power mode. The power-fail signal enters the inactive status when the instrument is switched on and the critical value of the supply voltage has been exceeded. The circuit then triggers a system reset and subsequently switches over the RAM supply from the battery to the power pack. The control signal CSRB for low power mode of the RAMs is cancelled at the same time.



Sequence following transition of signal $\overline{\text{POWFAIL}}$ from High to Low.



Sequence following transition of signal $\overline{\text{POWFAIL}}$ from Low to High.

5.1.12 A/D Converter Unit

The A/D converter unit consists of the A/D converter and a reference voltage source used as the system reference (see Fig. 5-3).

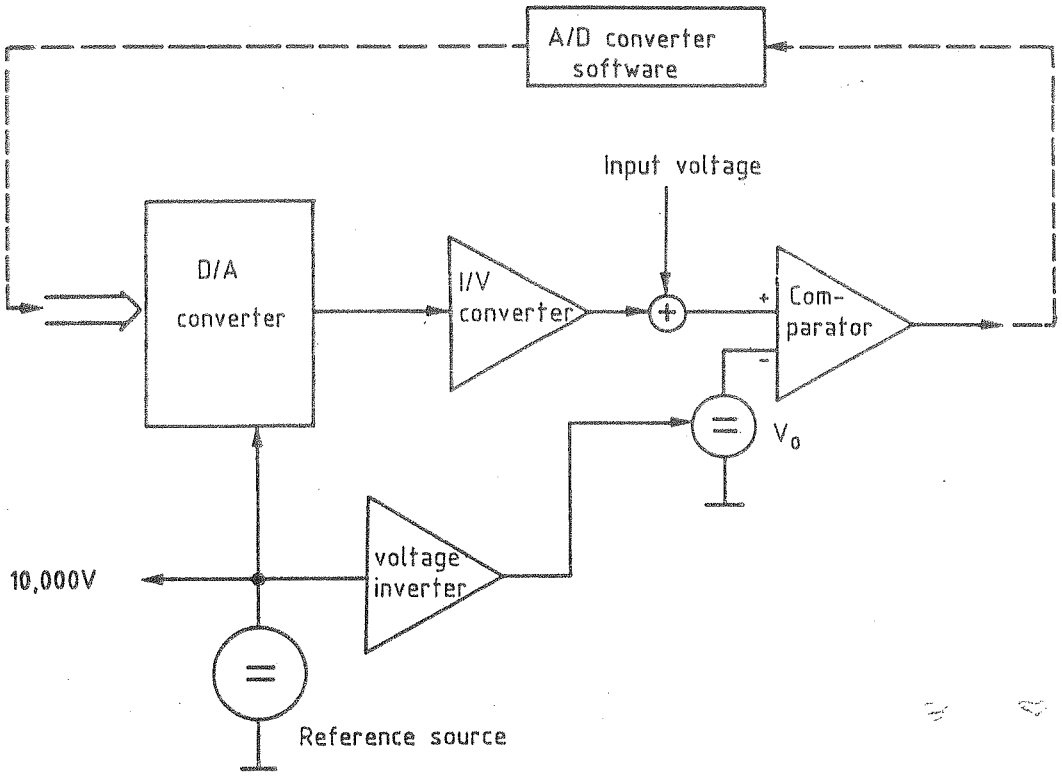


Fig. 5-3 Block diagram of the A/D converter unit

5.1.12.1 Reference Source

The reference source is designed using a temperature-compensated reference diode buffered via an operational amplifier. The voltage should be 10.000 V ±1 mV and can be set exactly using a trimmer.

5.1.12.2 A/D Converter

The A/D converter is used for digital acquisition of several analog variables and operates according to the principle of successive approximation.

Apart from the hardware, the A/D converter also contains a software program which drives the D/A converter with a 10-bit binary value during conversion of the applied input voltage. The D/A converter outputs a proportional current which is then converted into a proportional negative voltage by an inverting I/V converter. This voltage and the positive input voltage are applied to a comparator via a summation point.

If the load-independent voltage V_O=0 and the comparator output is High, the input voltage is higher than the voltage at the I/V converter output. This means that the D/A converter has been driven by the software with a binary value which is too small.

The program can supply the D/A converter with a more accurate binary value, however, since the software polls the comparator and has thus access to the result of the comparison. The final result is obtained after 10 such steps.

The load-independent voltage V_O at the comparator is obtained from the reference voltage and has a value of -100 mV. This enables negative voltages down to -200 mV to be detected. The upper input voltage limit of 10.2 V is above the reference voltage and is achieved by increasing the gain of the I/V converter.

5.1.13 RF Counter
(See Fig. 5-4)

The RF counter indicates the frequency of the applied RF signal in the range from 1 to 1000 MHz; the signal is first amplified, limited and then applied to a frequency divider and a transistor stage which improves the slew rate for low frequencies. The signals thus conditioned are applied via a diode switch to the divider chain consisting of a 3-bit ECL divider, an ECL/TTL converter and a 12-bit TTL divider. All dividers in the chain have binary outputs which are connected to parallel/serial shift registers which are read by the processor. The output of the divider chain is connected to a special timer chip which evaluates the divided frequency further.

A test is made whether the undivided signal or the signal divided by 4 is to be applied to the divider chain; the signal divided by 4 is first measured with a resolution of 10 kHz; the signal is measured without the predivider if the frequency is below 400 MHz, otherwise the divider remains connected.

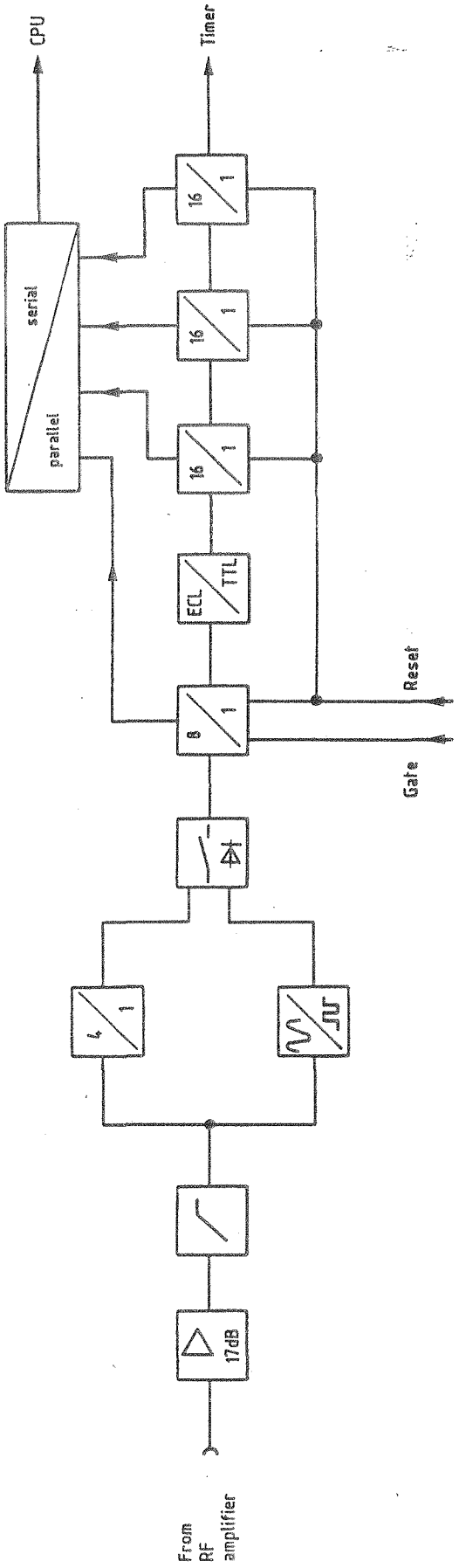


Fig. 5-4 Block diagram of the RF counter

5.1.14 AF Counter

The AF counter counts frequencies in the range from 10 Hz to 500 kHz. The signal to be counted is first amplified and then applied to two comparators. The reference signal of the comparators is then obtained from the positive and negative peak values of the counted signal. The output signals are applied to a clock-edge-controlled flip-flop with reset and then processed further in a special timer chip.

The advantage of this comparator control by a reference signal which depends on the amplitude of the input signal is the excellent processing even of noisy signals, as shown in Figs. 5-5 to 5-7.

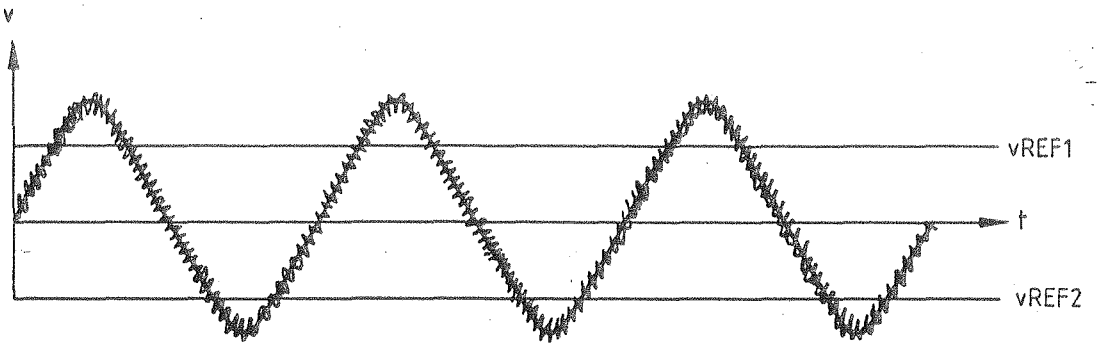


Fig. 5-5 Noisy input signal of comparators with reference voltage indicated

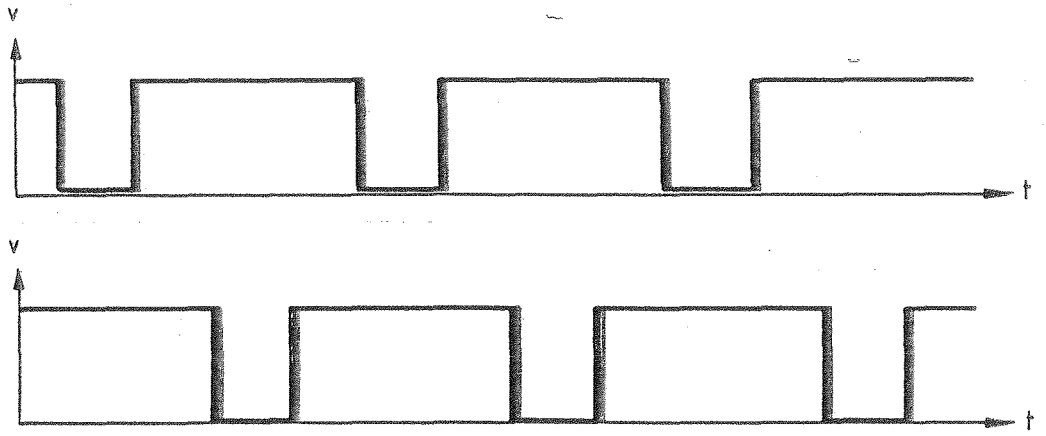


Fig. 5-6 Output signal of comparators with phase jitter

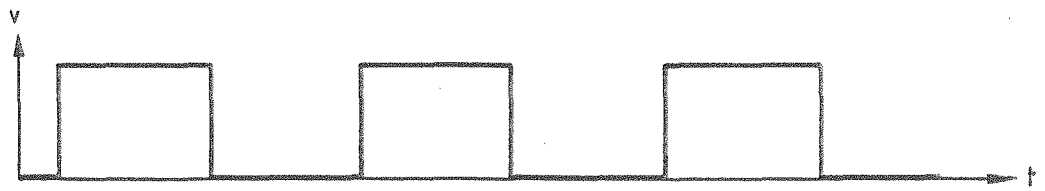


Fig. 5-7 Output signal of the flip-flop without phase jitter

5.2 Testing and Adjustment

5.2.1 Testing the A/D Converter Unit

The signal ground (SIGGND) must be connected to the main ground (GND). The plug-in jumper X75 must be inserted when operating the digital unit.

5.2.1.1 Reference Source

Measure the reference voltage against the signal ground (X1.A,B31) at test point P12 using a voltmeter. The voltage should be +10.000 V ±1 mV and can be adjusted if necessary using R109.

5.2.1.2 A/D Converter

Measure the DC voltage at test point P11 after testing and adjusting the reference source. It should be -100 mV ±5 mV compared to the signal ground. Apply a binary data word (X value) to the input of the D/A converter N100.

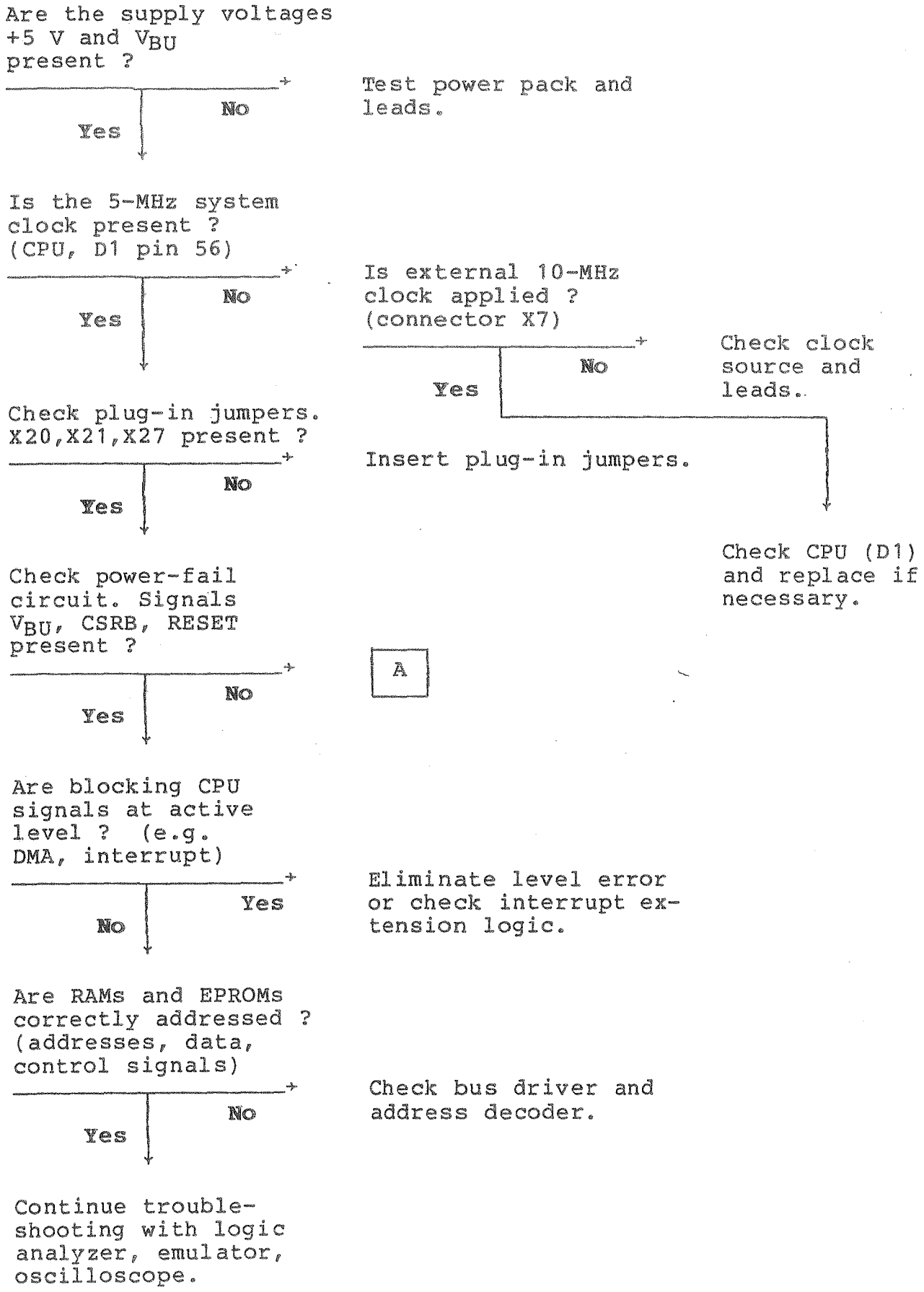
Apply a test voltage V_t to the signal input (MESSDC) (plug X1.A31 and test point P10) referred to the signal ground SIGGND (plug X1.A,B30). Vary the test voltage V_t such that the voltage range (see following table) associated with the X value is passed through.

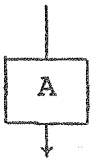
The TTL level at pin 7 of comparator N102 must change from High to Low if V_t is changed to higher values. The comparator voltage V_t associated with the changeover point must be within the tolerance associated with the X value.

The following table lists examples for three different X values:

X value	Tolerance within which the comparator changes from High to Low	
	V_t Lower limit	V_t Upper limit
0	-240 mV	-160 mV
512	+4.990 V	+5.290 V
1023	+10.190 V	+10.750 V

5.3 Troubleshooting





Power-fail circuit faulty.
Is the signal $\overline{\text{POWFAIL}}$ correct ?

No → $\overline{\text{POWFAIL}}$ signal line and power pack.

Yes ↓

Is the signal $\overline{\text{RES}}$ correct ?

No → Check D47, D48 and their circuitry.

Yes ↓

Is the signal RESET correct ?

No → Check $\overline{\text{RES}}$ and RESET lines. Are both lines OK ?

Yes ↓

Change changeover of RAM supply. Check timing of signal CSRB.

No → Eliminate fault.

Yes ↓

Check CPU (D1) and replace if necessary.

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C4 ..9	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C10	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C17	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C20 ..26	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C27	CE 10UF -10+50% 63V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7650	ROEDERST	ELKOEK10/63	
C28	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C29	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C30	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C31	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C32	CE 2,2UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7637	ROEDERST	ELKO EK 2/63	
C33	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C34	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C36	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C37	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C40	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C41	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C42	CC 100PF+-2%4X5N750 CAPACITOR	CC 087.6906	VALVO	2222 678 58101	
C43	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C44	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C45	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C46	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C47	CC 100PF+-2%4X5N750 CAPACITOR	CC 087.6906	VALVO	2222 678 58101	
C48	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C49 ..52	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C60	CE 2200UF-10+50%6,3V12X30 ELECTROLYTIC CAPAITOR	CE 534.1133	SIEMENS	B41010-B2228-T	
C61	CE 2200UF-10+50%6,3V12X30 ELECTROLYTIC CAPAITOR	CE 534.1133	SIEMENS	B41010-B2228-T	
C62	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR	CE 006.7120	ROEDERST	EK 00 CB 222 J	
C63	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR	CE 006.7120	ROEDERST	EK 00 CB 222 J	
C64	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C65	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C66	CE 2200UF-10+50%6,3V12X30 ELECTROLYTIC CAPAITOR	CE 534.1133	SIEMENS	B41010-B2228-T	
C67	CE 2200UF-10+50%6,3V12X30 ELECTROLYTIC CAPAITOR	CE 534.1133	SIEMENS	B41010-B2228-T	
C68	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C69	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C72	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C73	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C74	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C75	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR	CE 006.7120	ROEDERST	EK 00 CB 222 J	
C76	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C77	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C78	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C79	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR	CE 006.7120	ROEDERST	EK 00 CB 222 J	
C80	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C81	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C101	CC 82PF+-2%6X7NP0 CAPACITOR	CC 087.6535	VALVO	2222 678 10829	
C105	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C106	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR	803.0667	NATION PAN	ECE-A1VKS-100	
C107	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C109	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C110	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR	803.0667	NATION PAN	ECE-A1VKS-100	
C111	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C112	CC 100PF+-2%4X5N750 CAPACITOR	CC 087.6906	VALVO	2222 678 58101	
C113	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C200	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR	803.0580	MATSUSHITA	ECE-A1ESS-101	
C201	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR	803.0580	MATSUSHITA	ECE-A1ESS-101	
C202	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR	803.0580	MATSUSHITA	ECE-A1ESS-101	
C207	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR	803.0667	NATION PAN	ECE-A1VKS-100	
C208	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR	803.0667	NATION PAN	ECE-A1VKS-100	
C210	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR	803.0667	NATION PAN	ECE-A1VKS-100	
C211	CE 2,2UF+-20%20V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8104	ROEDERSTEI	ETR 1 2,2/20 20%	
C212	CE 2,2UF+-20%20V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8104	ROEDERSTEI	ETR 1 2,2/20 20%	
C213	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR	803.0580	MATSUSHITA	ECE-A1ESS-101	
C214	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR	803.0580	MATSUSHITA	ECE-A1ESS-101	
C300	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKRO5BX104KLEVELR	
C301	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C302	CC 4,7PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6387	VALVO	2222 678 09478	
C303	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKRO5BX104KLEVELR	
C320	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKRO5BX104KLEVELR	
C321	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C322	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKRO5BX104KLEVELR	
C323	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKRO5BX104KLEVELR	
C324	CC 4,7PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6387	VALVO	2222 678 09478	
C326	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C330	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKRO5BX104KLEVELR	
C331	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR	803.0715	MATSUSHITA	ECE-A1ESS-471U	
C332	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C333	CC 2,2NF+-10%5X6R2000 CAPACITOR	CC 087.7060	VALVO	2222 63051 222	
C334	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C335	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C336	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKR05BX104KLEVELR	
C340	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKR05BX104KLEVELR	
C342	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C343	CC 100NF+-10% 50V5K1200LR CAPACITOR	CC 092.0777	AEROVOX	CKR05BX104KLEVELR	
C344	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C345	CC 560PF+-10%3X4R2000 CAPACITOR	CC 087.7002	VALVO	2222 63051 561	
C346	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
D1	BC R80186 16B.CPU CPU	BC 393.1211	AMD	R80186	
D2	BL SN74LS245N 8XBUS-TRSCV IC 8XBUS TRSCV SN74LS245N	300.8833	TEXAS	SN74LS245N	
D3	BL SN74LS245N 8XBUS-TRSCV IC 8XBUS TRSCV SN74LS245N	300.8833	TEXAS	SN74LS245N	
D4	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D5	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D6	BL SN74LS375N 2X2BIT-D-RG DUAL 2BIT-D-LATCH	328.2281	TEXAS	SN74LS375N	
D7	BL SN74LS155AN 2X1:4-DEMU SN74LS155N 2X1:4-DEMUX	328.2246	TEXAS	SN74LS155AN	
D8	HS SOFTWARE CMT V PROM	802.5336			802.5213.01
D9	HS SOFTWARE CMT VI PROM	802.5342			802.5213.01
D10	HS SOFTWARE CMT I PROM	802.5288			802.5213.01
D11	HS SOFTWARE CMT II PROM	802.5307			802.5213.01
D12	HS SOFTWARE CMT III PROM	802.5313			802.5213.01
D13	HS SOFTWARE CMT IV PROM	802.5320			802.5213.01
D14	BL SN74LS155AN 2X1:4-DEMU SN74LS155N 2X1:4-DEMUX	328.2246	TEXAS	SN74LS155AN	
D15	BC HM6264LP15 8KX8B.SRAM SRAM	344.7410	HITACHI	HM6264LP15	
D16	BC HM6264LP15 8KX8B.SRAM SRAM	344.7410	HITACHI	HM6264LP15	
D17	BC D8255A PROGR.I/O-IF I/O-PORT	086.9830	INTEL	P8255A (PLASTIK)(-5)	
D18	BC D8255A PROGR.I/O-IF I/O-PORT	086.9830	INTEL	P8255A (PLASTIK)(-5)	
D19	BC AM9513DC TIMING CONTR TIMING CONTROLER	BC 339.4039	AMD	AM9513DC	
D20	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D21	BL SN74LS283N 4-BIT-ADD. IC SN74LS283N 4-BIT-ADD.	283.1760	TEXAS	SN74LS283N	
D22	BL SN74LS283N 4-BIT-ADD. IC SN74LS283N 4-BIT-ADD.	283.1760	TEXAS	SN74LS283N	
D23	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER	214.8998	TEXAS	SN74LS273N	
D24	BL SN74LS123N 2/MONOFLOP IC MONOFLOP SN74LS85N	235.8468	TEXAS	SN74LS123N	
D25	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D26	BL SN74LS283N 4-BIT-ADD. IC SN74LS283N 4-BIT-ADD.	283.1760	TEXAS	SN74LS283N	
D27	BL SN74LS283N 4-BIT-ADD. IC SN74LS283N 4-BIT-ADD.	283.1760	TEXAS	SN74LS283N	
D28	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER	214.8998	TEXAS	SN74LS273N	
D29	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D30	BL SN74LS375N 2X2BIT-D-RG DUAL 2BIT-D-LATCH	328.2281	TEXAS	SN74LS375N	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
D31	BL SN74LS245N 8XBUS-TRSCV IC 8XBUS TRSCV SN74LS245N	300.8833	TEXAS	SN74LS245N	
D32	BL CD4021BE 8BIT SH.REG SHIFT REGISTER	BL 086.7096	RCA	CD4021BE	
D33	BL CD4094BE 8BIT SH.REG SHIFT REGISTER	BL 586.7726	RCA	CD4094BE	
D36	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH	BL 418.0135	MOTOROLA	MC14066BAL	
D38	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH	BL 418.0135	MOTOROLA	MC14066BAL	
D39	BL 74F04PC 6XINVERTER HEX-INVERTER	BL 344.6588	FAIRCHILD	74F04PC	
D41	BL SN74LS32N 4/2INP.OR IC OR GATE SN74LS32N	266.4687	TEXAS	SN74LS32N	
D42	BL MM74HC02N 4X2IN.NORG QUAD 2-INPUT NOR GATE	BL 571.3142	MOTOROLA	MC74HC02N	
D43	BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP	BL 571.3171	NSC	MM74HC74N	
D44	BL SN74LS122N MONOFLOP IC MONOFLOP SN74LS122N	303.8957	TEXAS	SN74LS122N	
D45	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D46	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG.	336.7543	TEXAS	SN74LS373N	
D47	BL MM74C914N 6XSCHM.TRIG HEX SCHMITT TRIGGER	BL 282.3423	NSC	MM74C914N	
D48	BL CD4011BE 4X2IN.NANDG NAND GATE	BL 252.7337	RCA	CD4011BE	
D51	BL CD4094BE 8BIT SH.REG SHIFT REGISTER	BL 586.7726	RCA	CD4094BE	
D52	BL CD4052BE 2X4CHAN.MUX MULTIPLEXER/DEMULTIPLEXER	BL 243.1200	MOTOROLA	MC14052BCP	
D200	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N	266.7934	TEXAS	SN74LS74N	
D300	BL CA3199E 4:1 DIVID DIVIDER	372.1106	RCA	CA3199E	
D301	BL SP8735BDC 8:1DIVID UHF DIVIDER	BL 300.6176	PLESSEY	SP8735BDC	
D302	BL SN74LS26N 4/2INP.NAND IC SN74LS26N 4/2INP.NAND	280.7567	TEXAS	SN74LS26N	
D303	BL CD4021BE 8BIT SH.REG SHIFT REGISTER	BL 086.7096	RCA	CD4021BE	
D304	BL CD4021BE 8BIT SH.REG SHIFT REGISTER	BL 086.7096	RCA	CD4021BE	
D305	BL SN74S197N 4B.-COUNTER 4BIT-COUNTER	334.3570	TEXAS	SN74S197N	
D306	BL SN74LS393N 2XBIN.ZAEHL IC 2XBIN.COUNT.SN74LS393N	300.6982	TEXAS	SN74LS393N	
G1	EB 3,4V LITHIUM-BATTERIE LI BATTERY	565.1687	SAFT	LS 3 CNA	
K1	SR 5 V 1XU DIL RELAY	SR 340.4551	ELECTROL	RA 30421051	
L1	LD 25UH BEI 3 A 0,046 OHM CHOKE	LD 026.4849	SIEMENS	B82111-B-C24	
L2	LD 50UH BEI 0,3A 2,9 OHM CHOKE	LD 026.4649	SIEMENS	B82111-A-C17	
L3	LD 50UH BEI 0,3A 2,9 OHM CHOKE	LD 026.4649	SIEMENS	B82111-A-C17	
L100	LD 100 UH10%8,000HMO,084A CHOKE	LD 067.3101	DELEVAN	DROSSEL1025-68	
L101	LD 100 UH10%8,000HMO,084A CHOKE	LD 067.3101	DELEVAN	DROSSEL1025-68	
L300	LD 1000UH10%72,00HMO,028A CHOKE	LD 037.8005	DELEVAN	DROSSEL1025-92	
L302	LD 1000UH10%72,00HMO,028A CHOKE	LD 037.8005	DELEVAN	DROSSEL1025-92	
L326	LD 1000UH10%72,00HMO,028A CHOKE	LD 037.8005	DELEVAN	DROSSEL1025-92	
N100	BJ AD7520KN 9B.D/A-CONV D/A-CONVERTER	BJ 300.6499	ANALOG DEV	AD7520KN	
N101	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER	349.3058	NSC	LF411CN	
N102	BO LM311H COMPAR COMPARATOR	234.4469	RAYTHEON	LM311H	

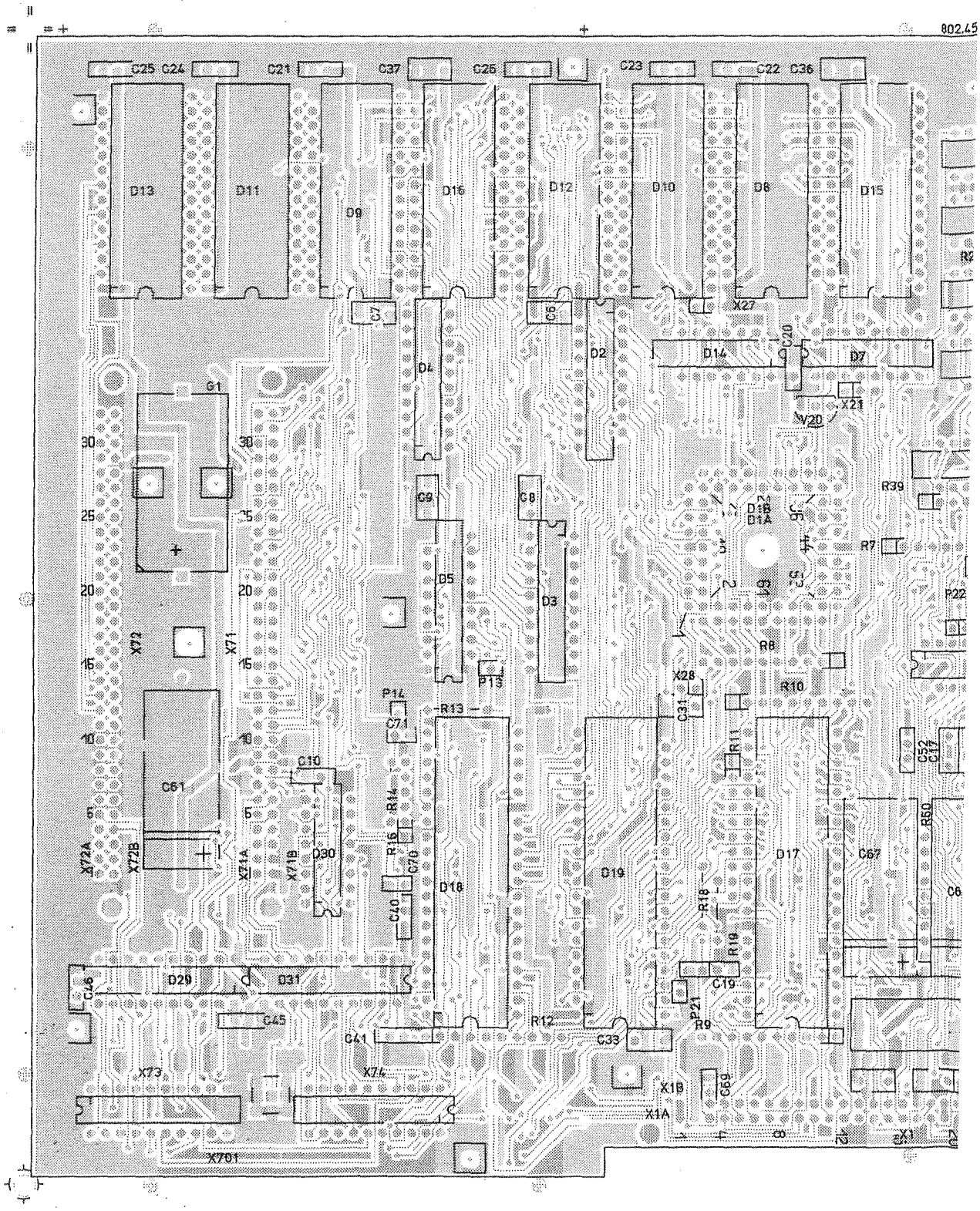
Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
N103	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N201	BO LF157J BIFET OPAMP OPERATIONAL AMPLIFIER	BO 343.1530	MOTOROLA	LF157J	
N202	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N203	BO TL820CN 2X COMPAR COMPARATOR	230.2278	TEXAS	TL820CN	
N300	BM OM350R ANTENNEN-VERST BROADBAND AMPLIFIER	803.0838	VALVO	OM350R SPEZ.	
N302	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER	BO 645.7251	MOTOROLA	LF156J	
P1	VL WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
..14	WIRE-WRAP PIN				
P21	VL WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
..24	WIRE-WRAP PIN				
P26	VL WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
..28	WIRE-WRAP PIN				
R4	RL 0,35W 301 OHM+-1%TK50 RESISTOR	RL 083.0210	DRALORIC	SMA0207/301OHM-F-D	
R6	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R7	RN 9X4,7KOHM+-2% SIL10 H5	RN 327.0804	BOURNS	431OR-101-472	
..12	NETWORK				
R13	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R14	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R15	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R16	RN 5X3,9KOHM+-2%SIL 6 H5 RESISTOR NETWORK	RN 317.9273	BOURNS	4306R-101-392	
R17	RL 0,35W 332 OHM+-1%TK50 RESISTOR	RL 083.0255	DRALORIC	SMA0207/332OHM-F-D	
R18	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R19	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R20	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R21	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R23	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R24	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R25	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R26	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R27	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R28	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	DRALORIC	SMA/207/22,1K-F-C	
R29	RL 0,35W 3,01KOHM+-1%TK50 RESISTOR	RL 083.0961	DRALORIC	SMA0207/3,01K-F-D	
R30	RL 0,35W 35,7KOHM+-1%TK50 RESISTOR	RL 083.1700	DRALORIC	SMA0207/35,7K-F-C	
R31	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R32	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R33	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R34	RL 0,35W 5,11KOHM+-1%TK50 RESISTOR	RL 082.2348	DRALORIC	SMA0207/5,11K-F-C	
R35	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R36	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR	RL 083.1351	DRALORIC	SMA0207/12,1K-F-D	
R37	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R38	RL 0,35W 5,11KOHM+-1%TK50 RESISTOR	RL 082.2348	DRALORIC	SMA0207/5,11K-F-C	
R39	RN 7X4,7KOHM+-2% SIL 8 RESISTOR NETWORK	RN 572.1550	BOURNS	4308R-101-472	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R40	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R41	RL 0,35W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	DRALORIC	SMA0207/1M-F-D	
R42	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R43	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R50	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R52	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R60	RN 9X3,3KOHM+-2%SIL10 H5 RESISTOR NETWORK	RN 340.2765	BOURNS	4310R-101-332	
R61	RN 9X3,3KOHM+-2%SIL10 H5 RESISTOR NETWORK	RN 340.2765	BOURNS	4310R-101-332	
R100	RL 0,35W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R101	RL 0,35W 6,81KOHM+-1%TK50 RESISTOR	RL 082.2560	DRALORIC	SMA 0207/6,81K-F-C	
R102	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R103	RL 0,35W30,1KOHM+-0,1%T25 RESISTOR	RL 084.3987	DRALORIC	SMA/207/30,1K-B-E	
R104	RL 0,35W 301 OHM+-1%TK50 RESISTOR	RL 083.0210	DRALORIC	SMA0207/301OHM-F-D	
R105	RL 0,35W 1,0 OHM+-1%TK50 METALFILMRESISTOR	RL 099.7860	RESISTA	MK2 1,00 OHM 1% TK50	
R106	RL 0,21W 820 OHM2% UNGEW. RESISTOR	RL 092.6069	RESISTA	MK1 820OHM 2% UNG.	
R107	RL 0,35W20,0KOHM+-0,1%T25 RESISTOR	RL 084.3641	DRALORIC	SMA0207/20,0K-B-E	
R108	RL 0,35W 453 OHM+-1%TK50 RESISTOR	RL 083.0378	DRALORIC	SMA0207/453OHM-F-D	
R109	RS 0,75W 1KOHM+-10%CERMET DEPOS.-CARBON POTENTIOMET	RS 037.7367	BOURNS	3006P-1-1 KOHM+-10%	
R110	RL 0,35W 7,68KOHM+-1%TK50 RESISTOR	RL 083.1200	DRALORIC	SMA0207/7,68K-F-D	
R111	RL 0,35W 681 OHM+-1%TK50 RESISTOR	RL 083.0490	DRALORIC	SMA0207/681OHM-F-D	
R112	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R113	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R114	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R202	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R203	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R204	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR	RL 083.1400	DRALORIC	SMA0207/15K-F-D	
R205	RL 0,35W 162KOHM+-1%TK50 RESISTOR	RL 082.2154	DRALORIC	SMA0207/162K-F-C	
R206	RL 0,35W 162KOHM+-1%TK50 RESISTOR	RL 082.2154	DRALORIC	SMA0207/162K-F-C	
R207	RL 0,35W 221 OHM+-1%TK50 RESISTOR	RL 083.0084	DRALORIC	SMA0207/221OHM-F-D	
R208	RL 0,35W 221 OHM+-1%TK50 RESISTOR	RL 083.0084	DRALORIC	SMA0207/221OHM-F-D	
R300	RL 0,35W 121 OHM+-1%TK50 RESISTOR	RL 082.9859	DRALORIC	SMA0207/121OHM-F-D	
R301	RL 0,21W 33 OHM2% UNGEW. RESISTOR	RL 092.5891	RESISTA	MK1 33OHM 2% UNGEW.	
R302	RL 0,21W 22 OHM2% UNGEW. RESISTOR	RL 092.5879	RESISTA	MK1 22OHM 2% UNGEW.	
R305	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR	RL 082.2277	DRALORIC	SMA0207/1,82K-F-C	
R306	RL 0,21W 1,0KOHM2% UNGEW. RESISTOR	RL 092.6075	RESISTA	MK1 1K 2% UNGEW.	
R307	RL 0,21W 10 OHM2% UNGEW. RESISTOR	RL 092.5833	RESISTA	MK1 10OHM 2% UNGEW.	
R308	RL 0,21W 390 OHM2% UNGEW. RESISTOR	RL 092.6023	RESISTA	MK1 390OHM 2% UNGEW.	
R309	RL 0,21W 56 OHM2% UNGEW. RESISTOR	RL 092.5927	RESISTA	MK1 56OHM 2% UNGEW.	
R310	RL 0,21W 100 OHM2% UNGEW. RESISTOR	RL 092.5956	RESISTA	MK1 100OHM 2% UNGEW.	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R320	RL 0,21W 390 OHM2% UNGEW. RESISTOR	RL 092.6023	RESISTA	MK1 390OHM 2% UNGEW.	
R321	RL 0,21W 390 OHM2% UNGEW. RESISTOR	RL 092.6023	RESISTA	MK1 390OHM 2% UNGEW.	
R322	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R323	RL 0,35W 3,57KOHM+-1%TK50 RESISTOR	RL 083.1022	DRALORIC	SMA0207/3,57K-F-D	
R325	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R326	RL 0,35W 332 OHM+-1%TK50 RESISTOR	RL 083.0255	DRALORIC	SMA0207/332OHM-F-D	
R327	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	DRALORIC	SMA0207/4,75K-F-D	
R328	RL 0,21W 68 OHM2% UNGEW. RESISTOR	RL 092.5933	RESISTA	MK1 68OHM 2% UNGEW.	
R331	RL 0,35W 8,25KOHM+-1%TK50 RESISTOR	RL 083.1239	DRALORIC	SMA0207/8,25K-F-D	
R332	RL 0,35W1,62KOHM+-0,1%T25 RESISTOR	RL 083.9546	DRALORIC	0207 1,62KOHM 0,1%	
R333	RL 0,35W 68,1KOHM+-1%TK50 RESISTOR	RL 082.2602	DRALORIC	SMA 0207/68,1K-F-C	
R340	RL 0,35W9,09KOHM+-0,1%T25 RESISTOR	RL 084.2980	DRALORIC	SMA0207/9,09K-B-E	
R341	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R342	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R343	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R344	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R350	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R351	RL 0,35W 681 OHM+-1%TK50 RESISTOR	RL 083.0490	DRALORIC	SMA0207/681OHM-F-D	
R352	RL 0,21W 100 OHM2% UNGEW. RESISTOR	RL 092.5956	RESISTA	MK1 100OHM 2% UNGEW.	
R360	RN 4X 10KOHM+-2%SIL 8 H5 RESISTOR NETWORK	RN 291.5154	BOURNS	4308R-102-103	
R370	RN 4X 10KOHM+-2%SIL 8 H5 RESISTOR NETWORK	RN 291.5154	BOURNS	4308R-102-103	
R380	RN 4X 10KOHM+-2%SIL 8 H5 RESISTOR NETWORK	RN 291.5154	BOURNS	4308R-102-103	
V2	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V3	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	HEWLETT-P.	5082-2800	
V4	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V5	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V6	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V10	AE 1N938 9,0V REF.DI REFERENCE DIODE	AE 012.4806	THOMSON	1N938	
V11	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V12	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V13	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V14	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V15	AK 2N4029 PNP 80V1000MA TRANSISTOR	083.7150	VALVO	2N4029	
V16	AK BC517 NPN 30V DARL. TRANSISTOR	AK 282.2133	SIEMENS	BC517	
V17	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V18	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V19	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V20	AK BC253C PNP 25V 100MA TRANSISTOR	010.2829	INTERMETAL	BC253C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
V21	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V30	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V31	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V100	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	HEWLETT-P.	5082-2800	
V202	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	HEWLETT-P.	5082-2800	
V203	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	HEWLETT-P.	5082-2800	
V205	AE BZX79/C8V2 0,5W Z-DI ZENER DIODE	AE 012.2490	VALVO	BZX79/C8V2	
V206	AE BZX79/C3V3 0,5W Z-DI ZENER DIODE	AE 012.2390	ITT	ZPD3,3	
V207	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE	AE 012.2426	VALVO	BZX79/C4V3	
V208	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE	AE 012.2426	VALVO	BZX79/C4V3	
V210	AE BZX79/C10 0;5W Z-DI ZENER DIODE	AE 012.2510	VALVO	BZX79/C10	
V211	AE BZX79/C10 0,5W Z-DI ZENER DIODE	AE 012.2510	VALVO	BZX79/C10	
V300 ..305	AE BA483 BER.SCH.DIOD.UHF DIODE	AE 568.2290	VALVO	BA483	
V306	AE BA483 BER.SCH.DIOD.UHF DIODE	AE 568.2290	VALVO	BA483	
V307	AE BZX79/B5V6 0,5W Z-DI ZENER DIODE	AE 012.5254	VALVO	BZX79/B5V6	
V308	AK BC173C NPN 25V 100MA TRANSISTOR	010.4444	INTERMETAL	BC173C	
V309	AK BFX48 PNP 30V 100MA TRANSISTOR	AK 010.3202	SGS	BFX48	
V314	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	HEWLETT-P.	5082-2800	
V315	AK BFR15A NPN 12V 30MA TRANSISTOR	AK 451.4320	SIEMENS	BFR15A	
V325	AE BA483 BER.SCH.DIOD.UHF DIODE	AE 568.2290	VALVO	BA483	
V326	AE BA483 BER.SCH.DIOD.UHF DIODE	AE 568.2290	VALVO	BA483	
V327	AE BA483 BER.SCH.DIOD.UHF DIODE	AE 568.2290	VALVO	BA483	
V360	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V361	AK BC253C PNP 25V 100MA TRANSISTOR	010.2829	INTERMETAL	BC253C	
V362	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE	AE 012.2432	VALVO	BZX79/C4V7	
V371	AK BC253C PNP 25V 100MA TRANSISTOR	010.2829	INTERMETAL	BC253C	
V372	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE	AE 012.2432	VALVO	BZX79/C4V7	
V381	AK BC253C PNP 25V 100MA TRANSISTOR	010.2829	INTERMETAL	BC253C	
V382	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE	AE 012.2432	VALVO	BZX79/C4V7	
W1	DX KABEL CABLE	802.5113			
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT	FP 084.6470	PANDUIT	100-064-033/999	
X20	VL WIRE-WRAP PIN 3-POLIG/3 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X21	VL WIRE-WRAP PIN 3-POLIG/3 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X24	FP INDIREKT.STECKERL.36P. 5-POLIG/5 PINS PIN CONNECTOR	FP 242.3600	BERG	75160-102-36	
X25	VL WIRE-WRAP PIN 2-POLIG/2 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X26	VL WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
	2-POLIG/2 PINS WIRE-WRAP PIN				
X27	VL WIRE-WRAP PIN 3-POLIG/3 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X28	VL WIRE-WRAP PIN 2-POLIG/2 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X29	VL WIRE-WRAP PIN 2-POLIG/2 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X30	VL WIRE-WRAP PIN 2-POLIG/2 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X71	FP IND.BUCHSENLEISTE 64P. FEMALE MULTIPOINT CONNECT	FP 278.1913	PANDUIT	100-064-433/999	
X72	FP IND.BUCHSENLEISTE 64P. FEMALE MULTIPOINT CONNECT	FP 278.1913	PANDUIT	100-064-433/999	
X73	FR IC-FASSUNG 20POL.DIL SOCKET	FR 092.7142	PRECICONT	US020T	
X74	FR IC-FASSUNG 20POL.DIL SOCKET	FR 092.7142	PRECICONT	US020T	
X75	VL WIRE-WRAP PIN 2-POLIG/2 PINS WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
X701	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR	FJ 602.8804	ROSENBERG	R&S-ZCHNG.602.8804	
X710	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR	FJ 602.8804	ROSENBERG	R&S-ZCHNG.602.8804	
					- ENDE -

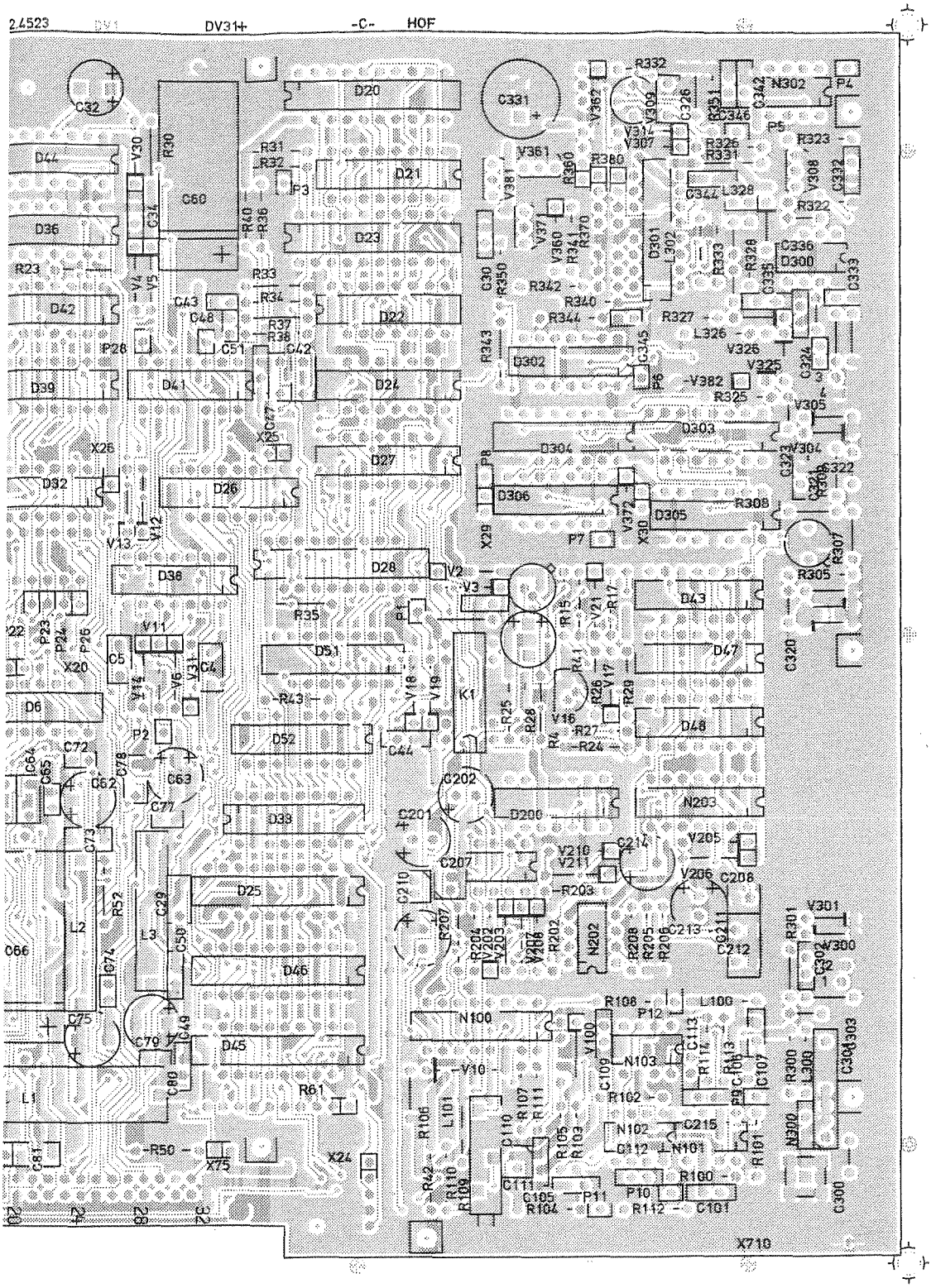


Ansicht und Leitungsführung Lötseite
View of tracks on solder side

(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährde
Bauelemente erfordern
besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive
devices require a specia
handling.

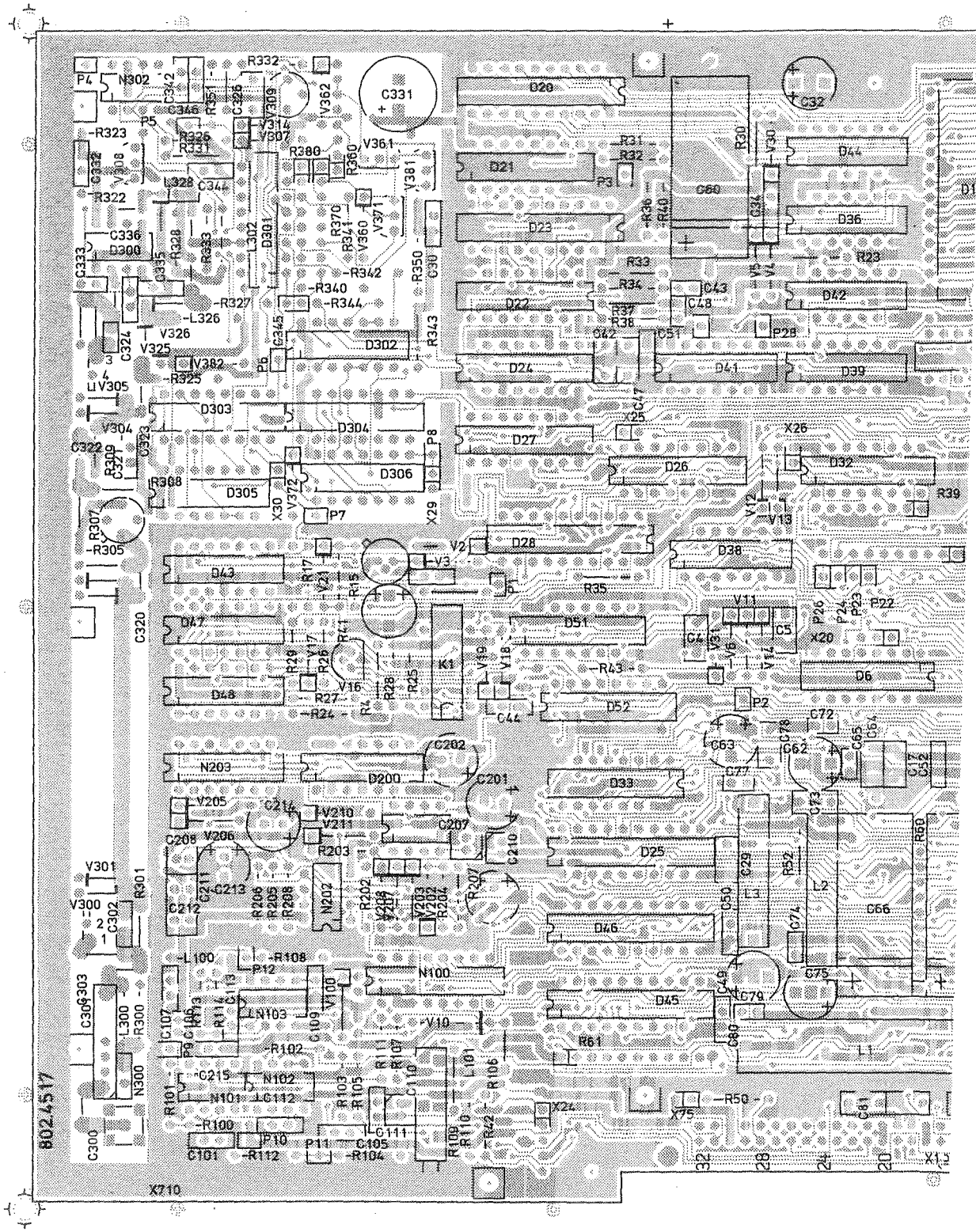


VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MODEL

H	35533	09.86	HO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	09.86	HO	DIGITALTEIL DIGITALSECTION
				Gepr.			Z
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 802.4517.01	EE
				zu Gerät CMT		reg. i. V. 802.2014 V	erste Z.

Blatt-Nr. 3 v. Bl.

07 6001 81

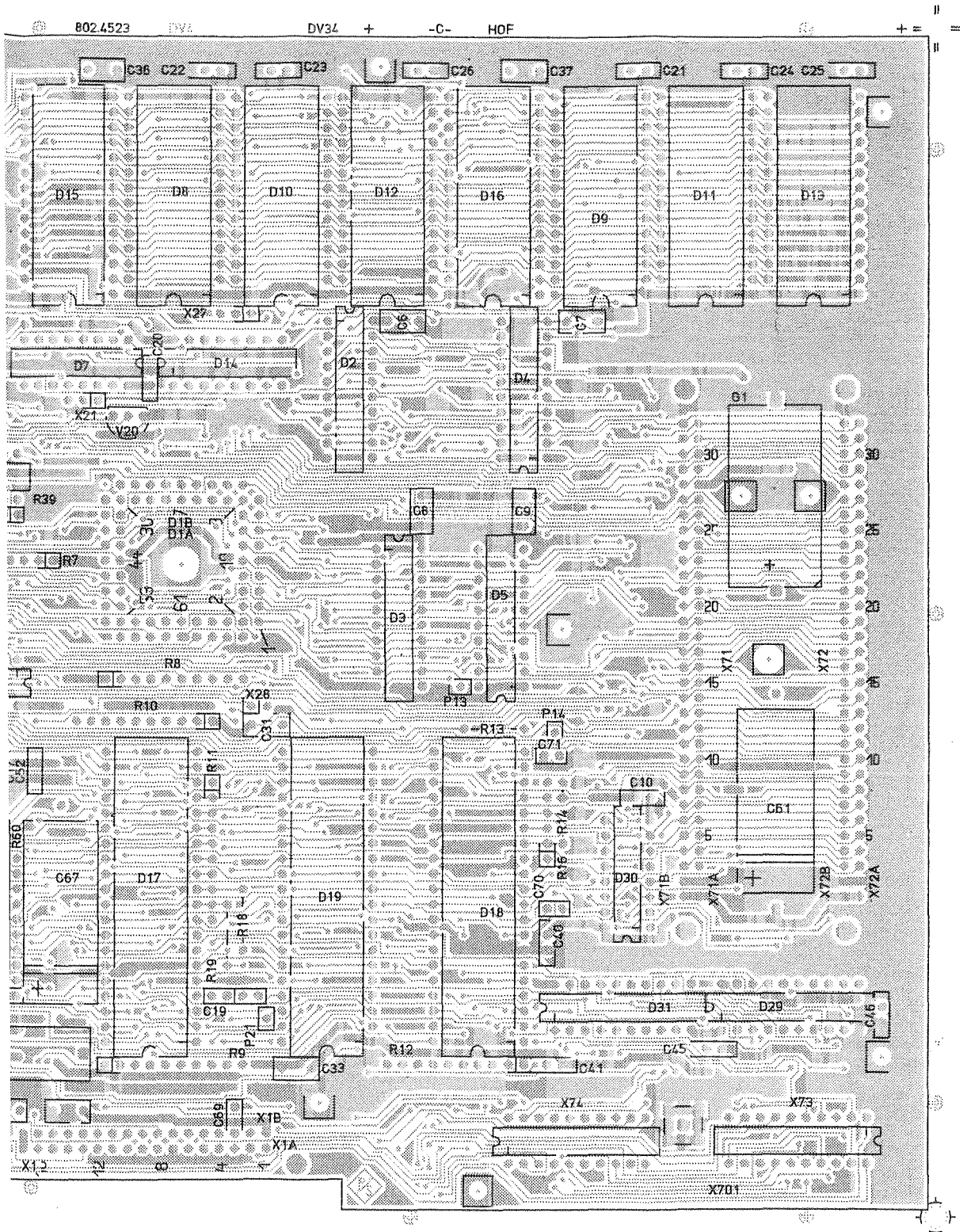


Ansicht und Leitungsführung. Bauteilseite
View of tracks on component side

(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

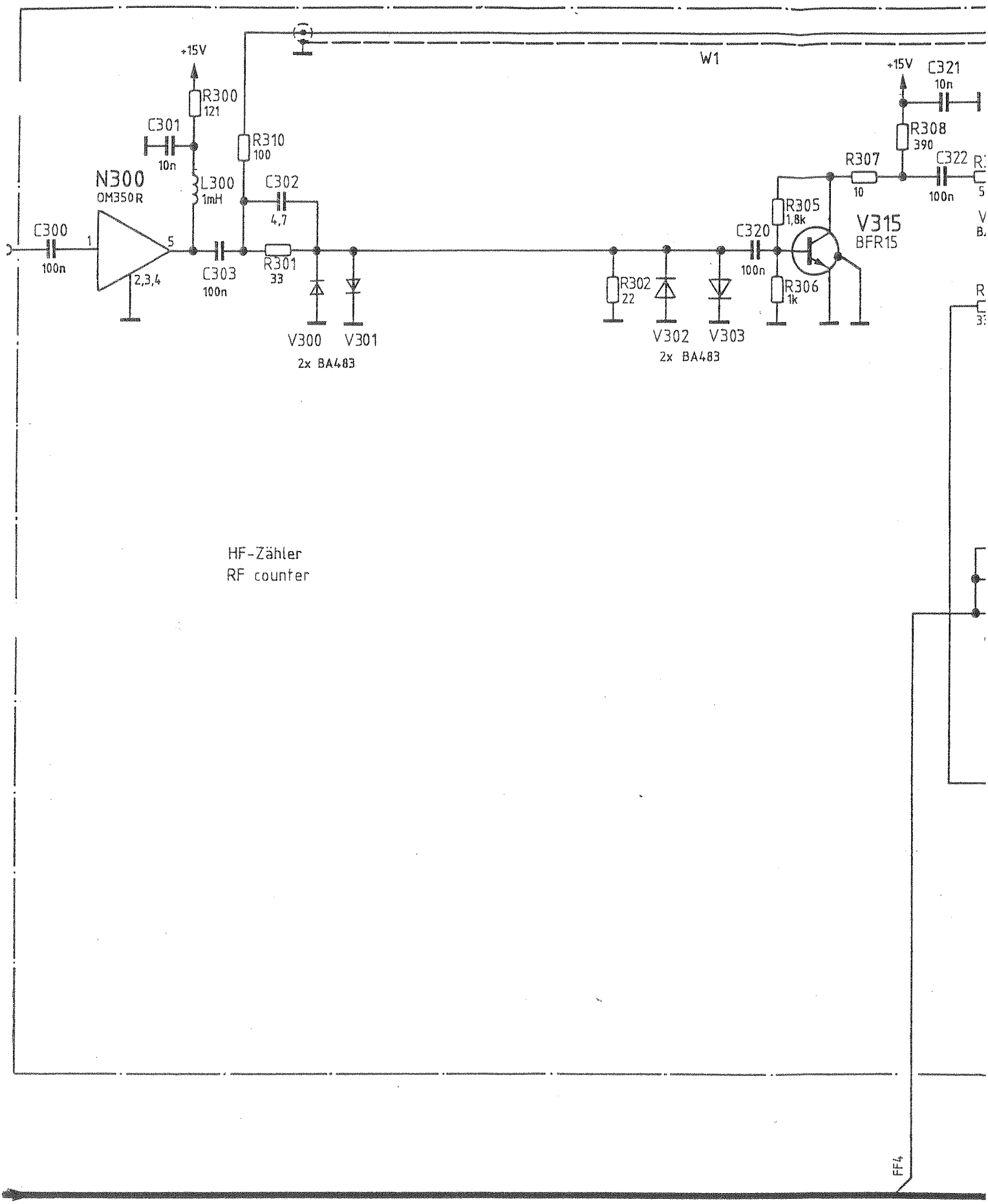


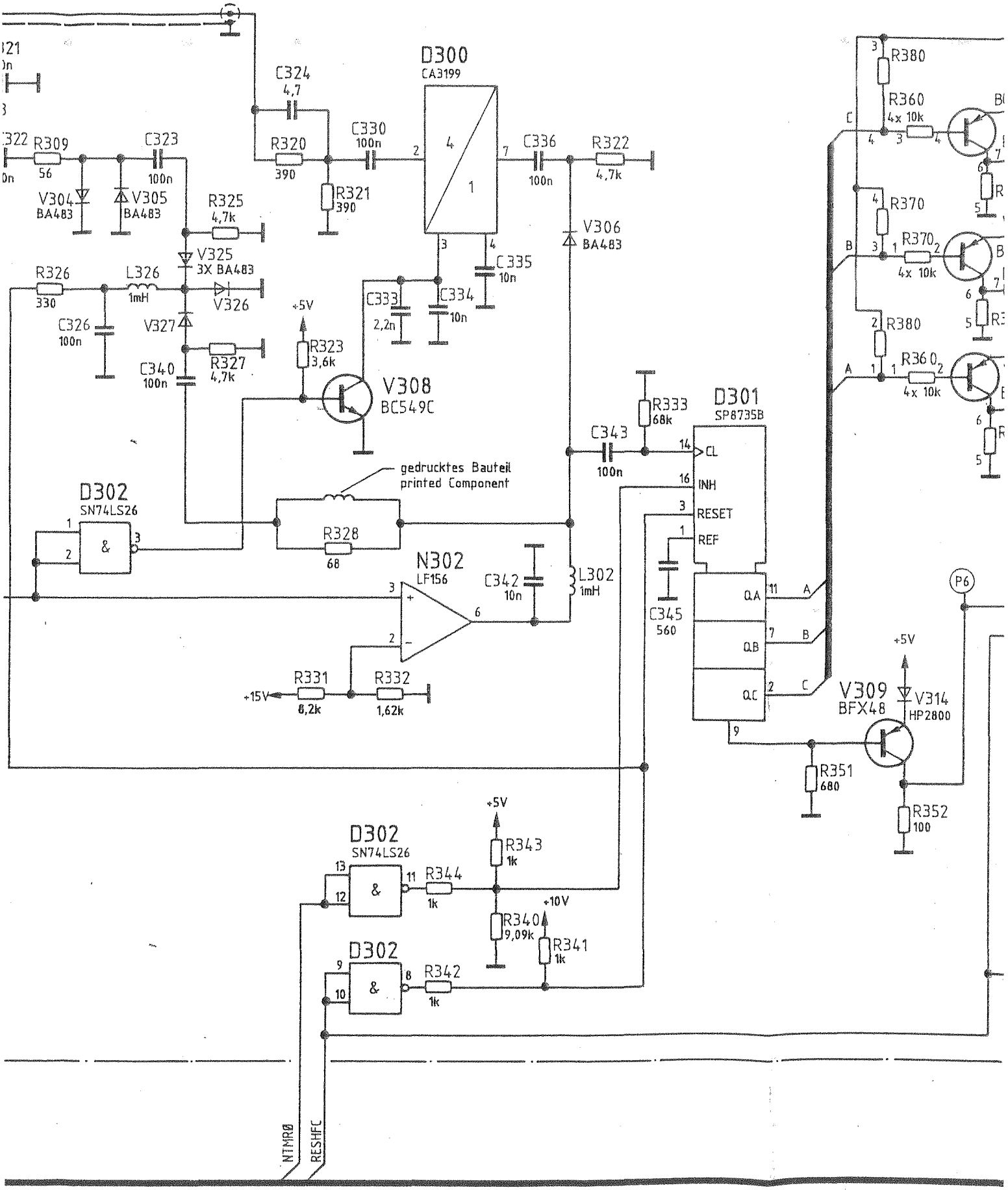
VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MODEL

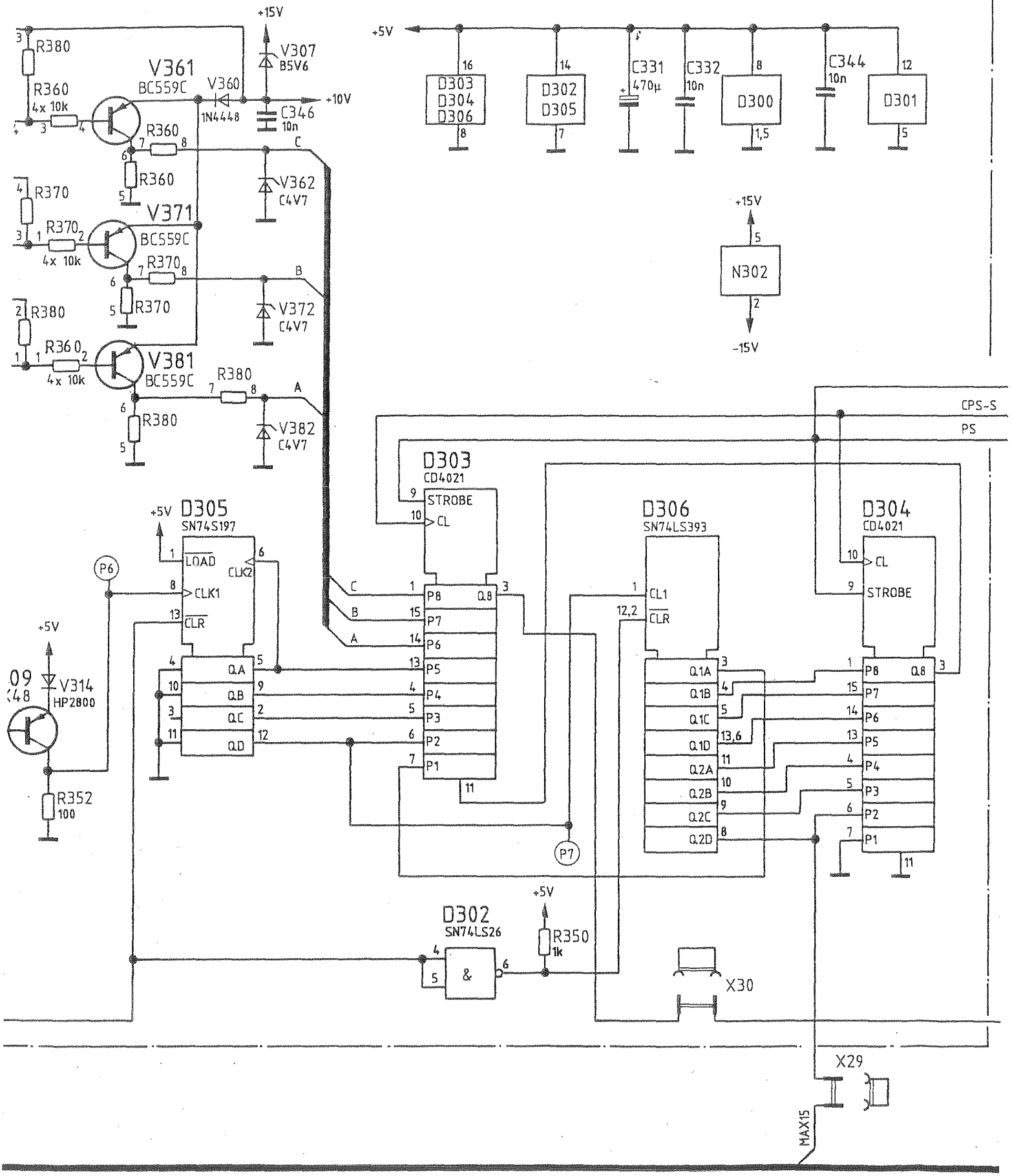
H	35533	09.86	HO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	09.86	HO	DIGITALTEIL DIGITALSECTION
				Gepr.			Z
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 802.4517.01	EE
				zu Gerät CMT		reg. i. V. 802.2014 V	erste Z.

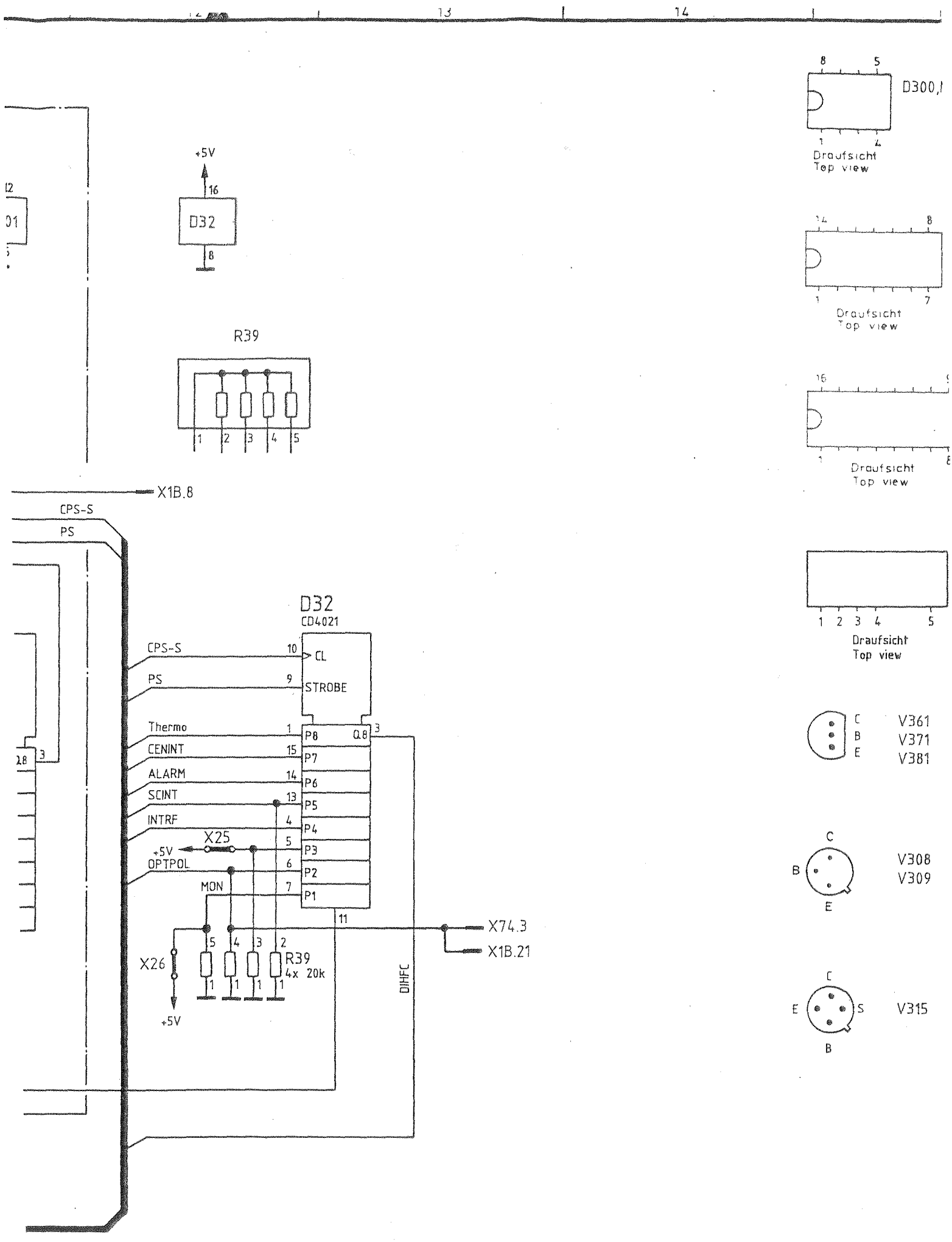
Blatt-Nr. 2 v. Bl.

hrdete
ern eine
ung
!
ve
ecial

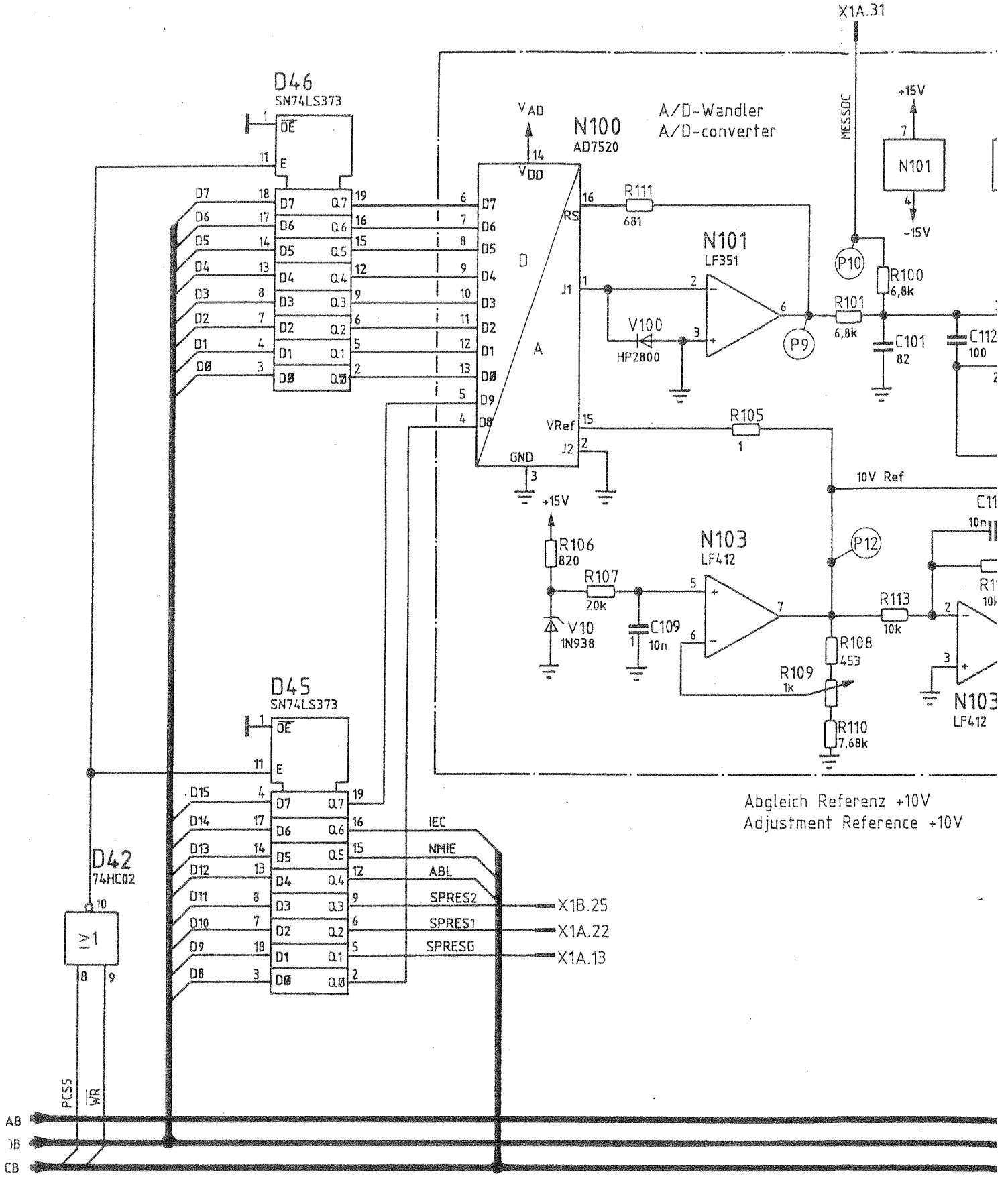

+15V
R300
121
C301
10n
L300
1mH
R310
100
C302
4,7
N300
OM350R
C300
100n
1
5
2,3,4
C303
100n
R301
33
V300
V301
2x BA483
W1
R302
22
V302
V303
2x BA483
C320
100n
R305
1,8k
R306
1k
V315
BFR15
R307
10
+15V
C321
10n
R308
390
C322
100n
HF-Zähler
RF counter
FF4

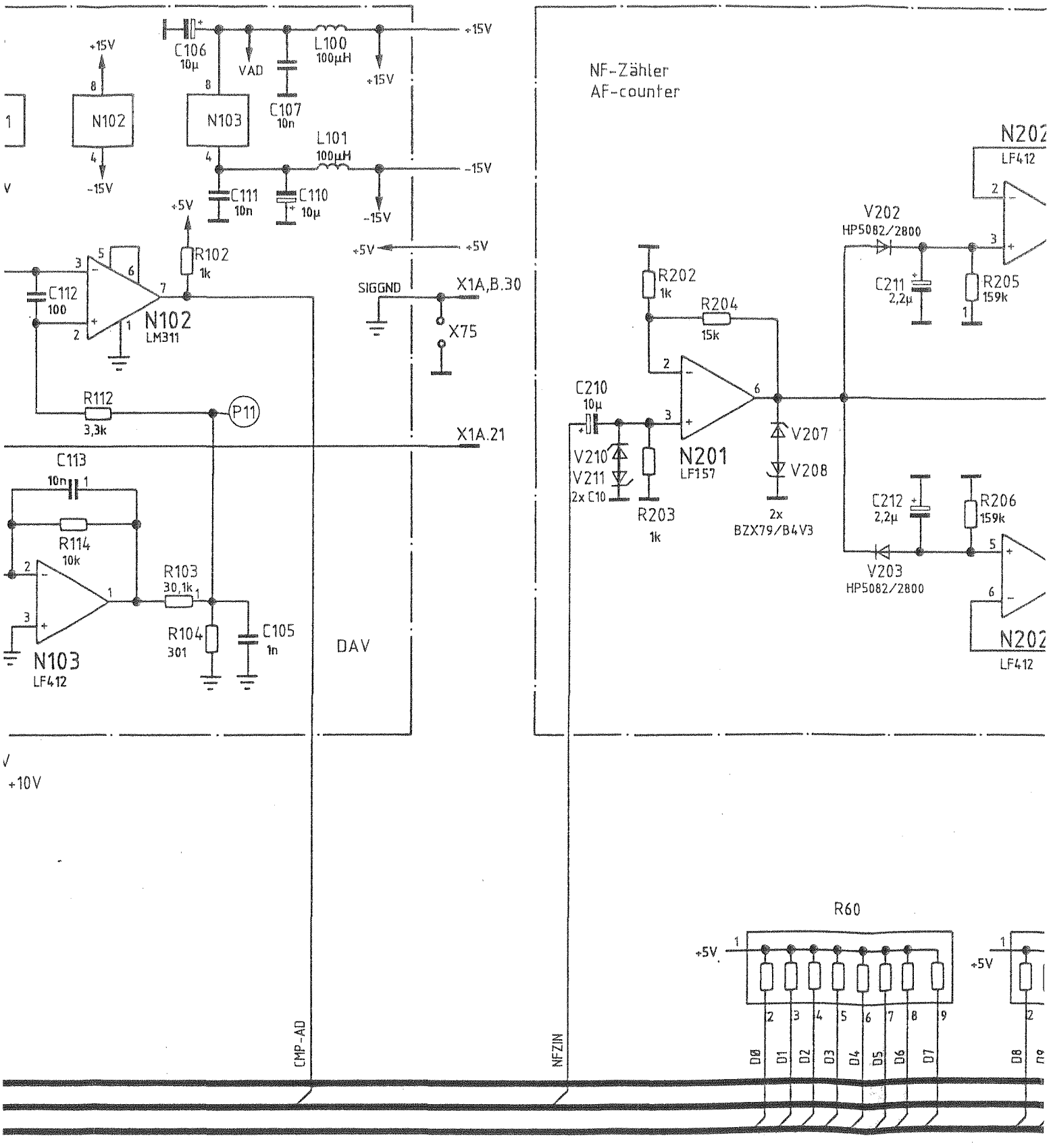

D300
CA3199
C324
4,7
R320
390
C330
100n
R321
390
C336
100n
R322
4,7k
R309
56
C323
100n
V304
BA483
V305
BA483
R325
4,7k
V306
BA483
V325
3X BA483
V326
R326
330
L326
1mH
C326
100n
V327
C340
100n
R327
4,7k
C333
2,2n
C334
10n
C335
10n
+5V
R323
3,6k
V308
BC549C
R333
68k
C343
100n
D301
SP8735B
CL
INH
RESET
REF
Q.A
Q.B
Q.C
C345
560
gedrucktes Bauteil
printed Component
D302
SN74LS26
R328
68
N302
LF156
C342
10n
L302
1mH
R331
8,2k
R332
1,62k
+15V
R380
R360
4x 10k
R370
R370
4x 10k
R380
R360
4x 10k
P6
+5V
V309
BFX48
V314
HP2800
R351
680
R352
100
D302
SN74LS26
R343
1k
R344
1k
+10V
R340
9,09k
R341
1k
D302
R342
1k
NTMR0
RESHFC

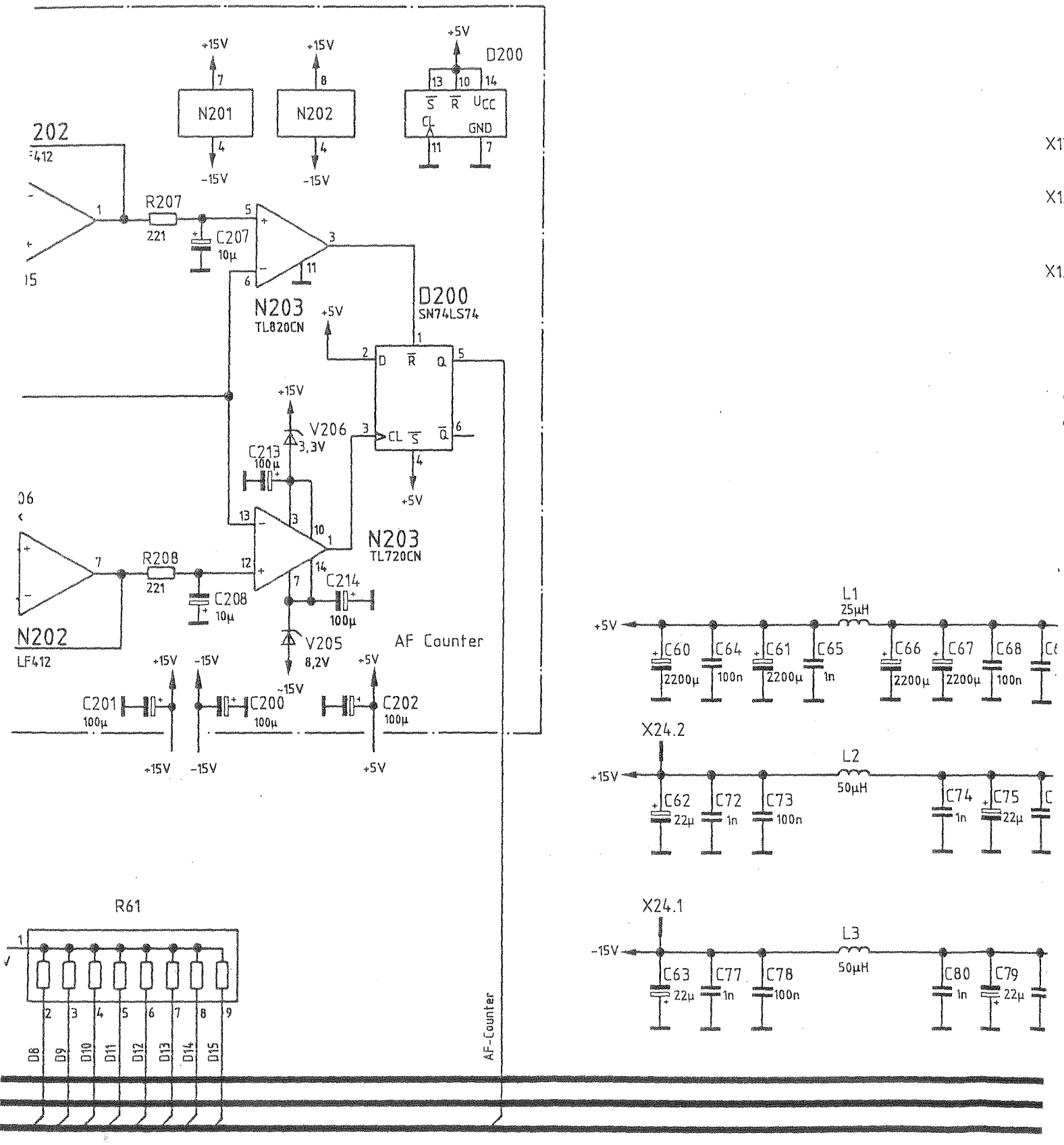

+15V
R380
V361
BC559C
V360
V307
B5V6
R360
4x 10k
1N4448
+10V
C346
10n
C
R360
V362
C4V7
R370
V371
R370
BC559C
4x 10k
B
R370
V372
C4V7
R380
R360
V381
BC559C
4x 10k
R380
A
R380
V382
C4V7
+5V
D303
D304
D306
D302
D305
C331
470µ
C332
10n
D300
C344
10n
D301
N302
-15V
CPS-S
PS
D303
CD4021
STROBE
CL
D305
SN74S197
LOAD
CLK2
CLK1
CLR
P6
Q.A
Q.B
Q.C
Q.D
P8
P7
P6
P5
P4
P3
P2
P1
D306
SN74LS393
CL1
CLR
Q.1A
Q.1B
Q.1C
Q.1D
Q.2A
Q.2B
Q.2C
Q.2D
D304
CD4021
CL
STROBE
V314
HP2800
R352
100
P7
D302
SN74LS26
&
R350
1k
X30
X29
MAX15



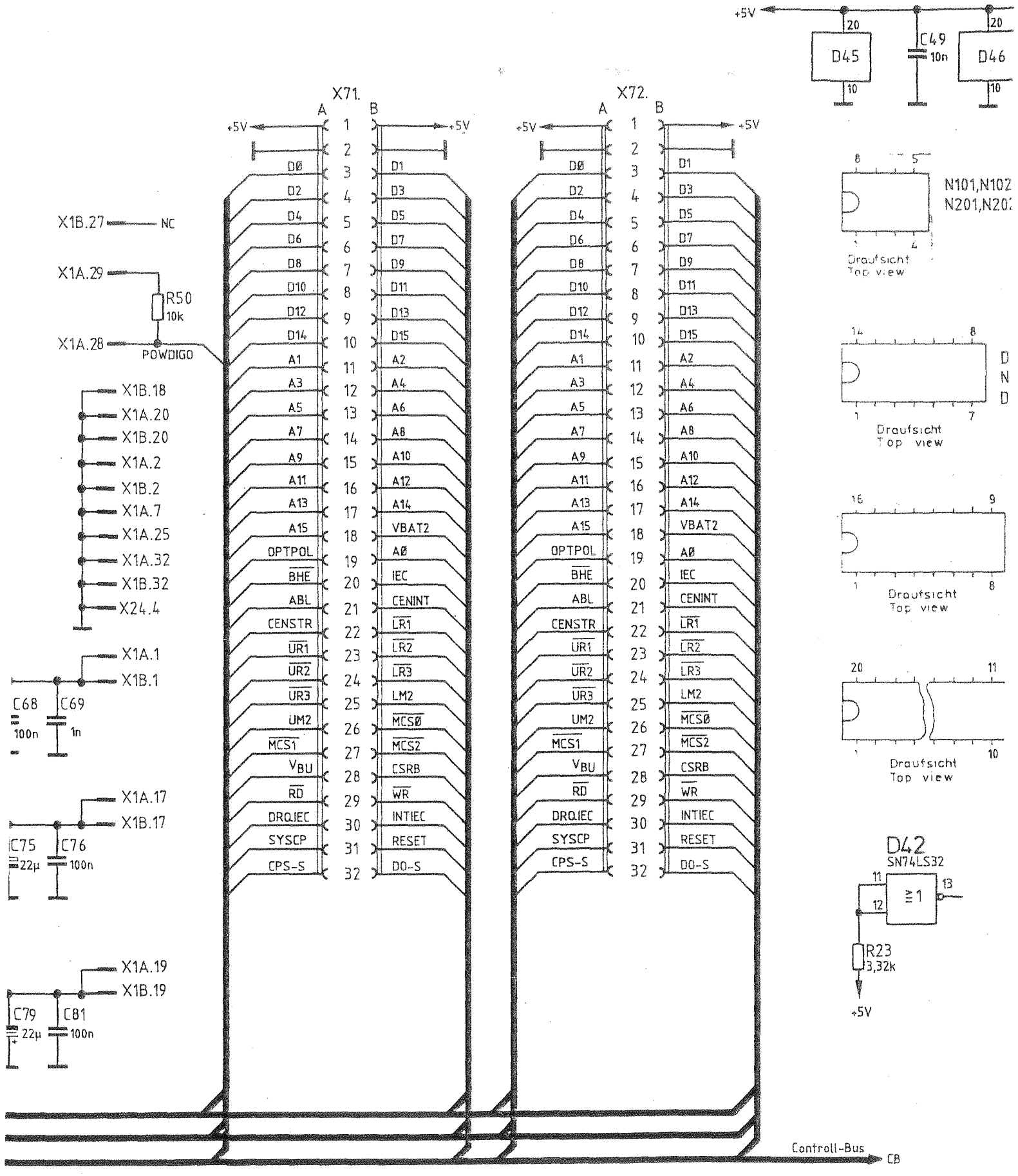
Stromlauf zu: Digitalteil / Digital section		Z	Zeichn.-Nr. 802.4517
CMT	reg. i. V. 802.2020 V	erste Z. 802.2020	


X1A.31
MESSOC
D46
SN74LS373
OE
E
D7 D6 D5 D4 D3 D2 D1 DØ
Q7 Q6 Q5 Q4 Q3 Q2 Q1 QØ
VAD
VDD
N100
AD7520
A/D-Wandler
A/D-converter
RS
D
A
J1
J2
VRef
GND
R111
681
R105
1
+15V
N101
LF351
-15V
P10
P9
R100
6,8k
R101
6,8k
C101
82
C112
100
V100
HP2800
10V Ref
R106
820
R107
20k
V10
1N938
C109
10n
N103
LF412
P12
R113
10k
R108
453
R109
1k
R110
7,68k
C11
10n
R1
10k
N103
LF412
Abgleich Referenz +10V
Adjustment Reference +10V
D45
SN74LS373
D15 D14 D13 D12 D11 D10 D9 D8
IEC
NMIE
ABL
SPRES2
SPRES1
SPRESG
X1B.25
X1A.22
X1A.13
D42
74HC02
≥1
PCS5
WR
AB
DB
CB

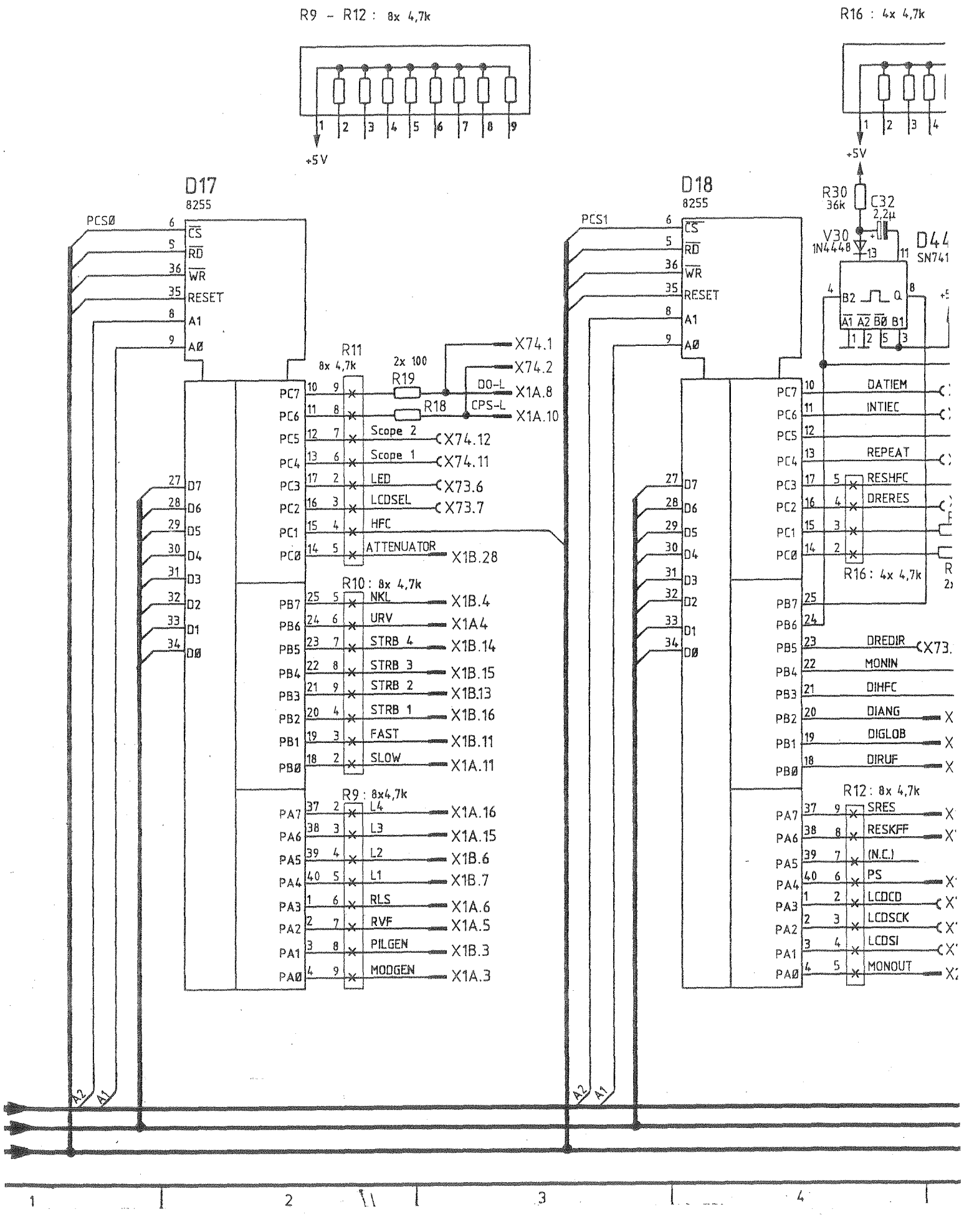

NF-Zähler
AF-counter
+15V
-15V
+5V
VAD
C106
10µ
C107
10n
L100
100µH
L101
100µH
C111
10n
C110
10µ
N102
N103
R102
1k
C112
100
LM311
SIGGND
X1A,B.30
X75
R112
3,3k
P11
X1A.21
C113
10n
R114
10k
R103
30,1k
R104
301
C105
1n
LF412
DAV
CMP-AD
NFZIN
N202
LF412
V202
HP5082/2800
C211
2,2µ
R205
159k
R202
1k
R204
15k
C210
10µ
V210
V211
2x C10
N201
LF157
R203
1k
V207
V208
2x
BZX79/B4V3
C212
2,2µ
R206
159k
V203
HP5082/2800
+10V
R60
D0
D1
D2
D3
D4
D5
D6
D7
D8

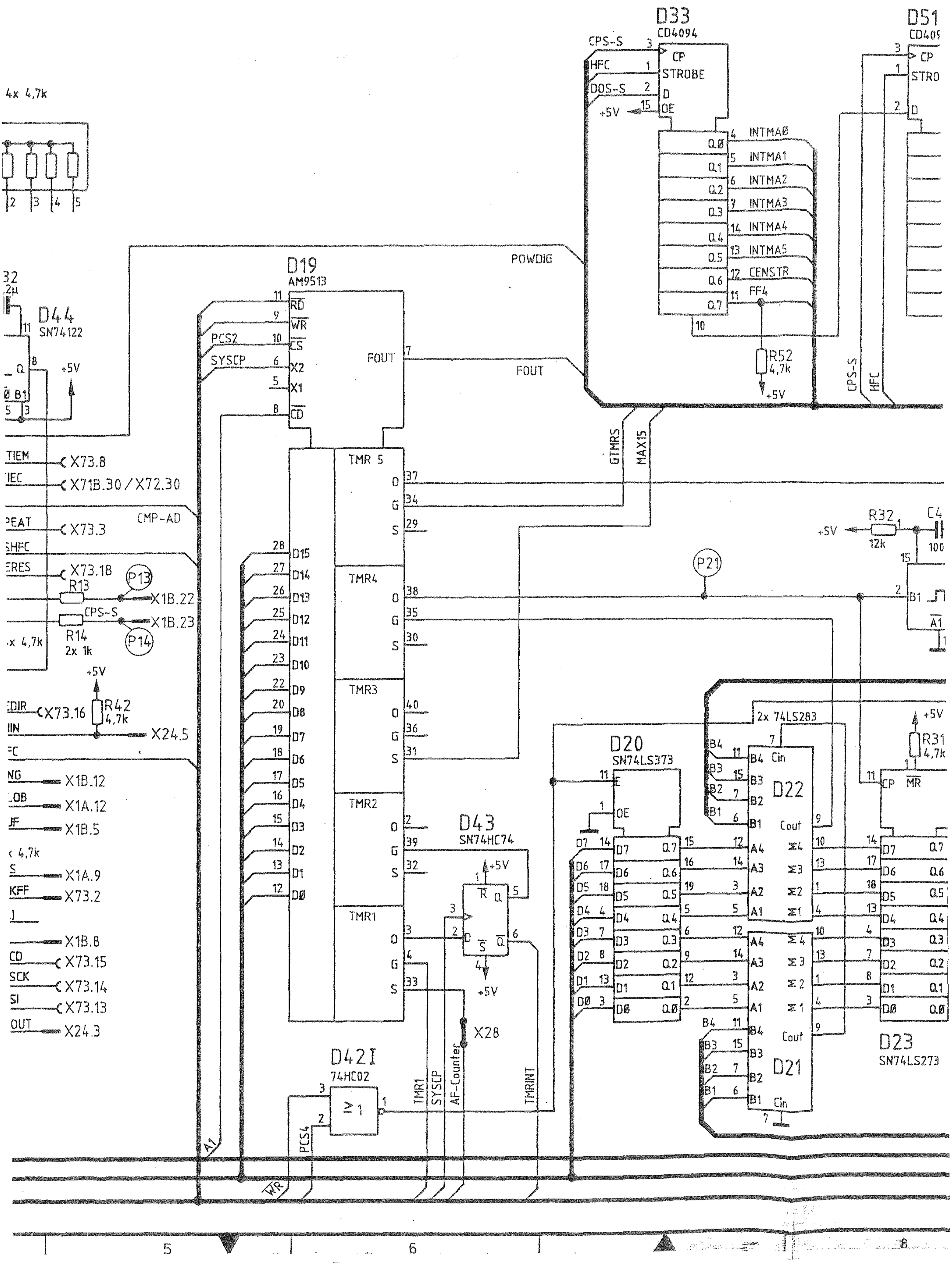


Klebekante für Druckerzeugnis, durch diese Zone möglichst nur Leitungen führen.

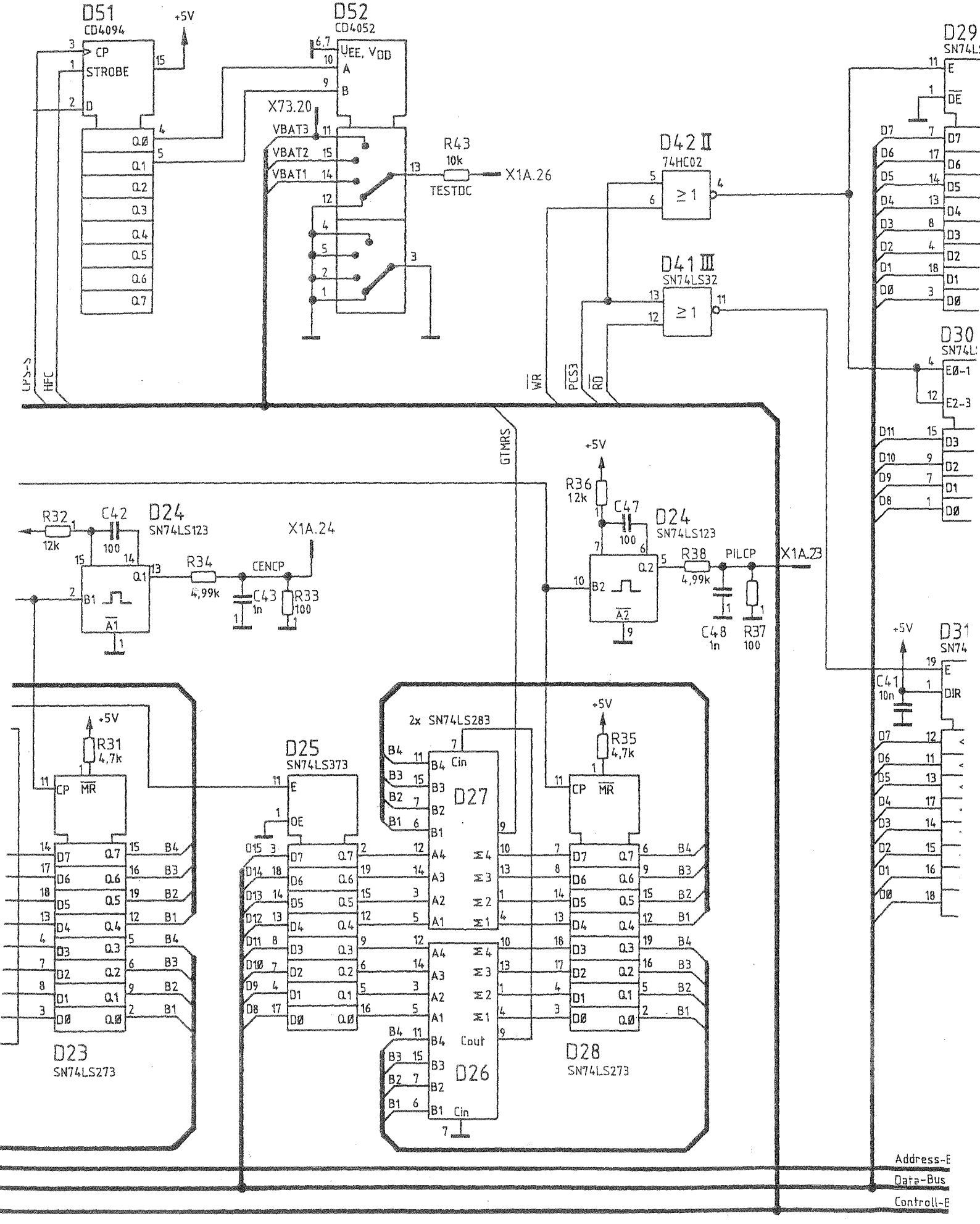


Stromlauf zu: Digitalteil/ Digital section			Z
CMT	reg. i. V. 802.2020 V	erste Z. 802.2020	Zeichn.-Nr. 802.4517

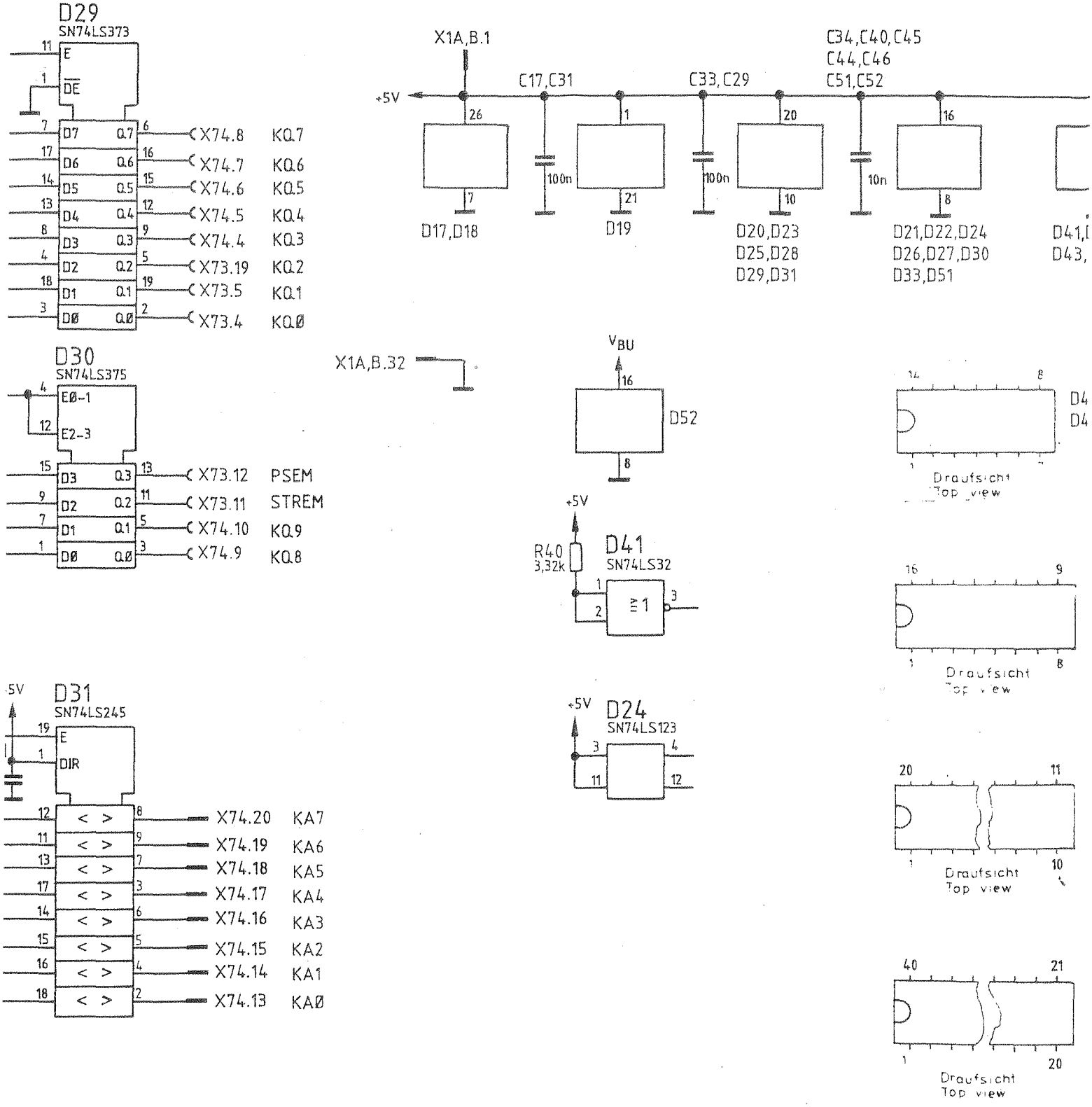

R9 – R12 : 8x 4,7k
1 2 3 4 5 6 7 8 9
+5V
R16 : 4x 4,7k
1 2 3 4
+5V
D17
8255
PCSØ
CS
RD
WR
RESET
A1
AØ
D7
D6
D5
D4
D3
D2
D1
DØ
R11
8x 4,7k
2x 100
R19
R18
D0-L
CPS-L
X74.1
X74.2
X1A.8
X1A.10
PC7
PC6
PC5
PC4
PC3
PC2
PC1
PCØ
Scope 2
Scope 1
LED
LCDSEL
HFC
ATTENUATOR
X74.12
X74.11
X73.6
X73.7
X1B.28
R10 : 8x 4,7k
PB7
PB6
PB5
PB4
PB3
PB2
PB1
PBØ
NKL
URV
STRB 4
STRB 3
STRB 2
STRB 1
FAST
SLOW
X1B.4
X1A4
X1B.14
X1B.15
X1B.13
X1B.16
X1B.11
X1A.11
R9 : 8x4,7k
PA7
PA6
PA5
PA4
PA3
PA2
PA1
PAØ
L4
L3
L2
L1
RLS
RVF
PILGEN
MODGEN
X1A.16
X1A.15
X1B.6
X1B.7
X1A.6
X1A.5
X1B.3
X1A.3
A2
A1
D18
8255
PCS1
R30
36k
C32
2,2µ
V30
1N4448
D44
SN741
B2
Q
A1 A2 BØ B1
DATIEM
INTIEC
REPEAT
RESHFC
DRERES
R16 : 4x 4,7k
DREDIR
MONIN
DIHFC
DIANG
DIGLOB
DIRUF
R12 : 8x 4,7k
SRES
RESKFF
(N.C.)
PS
LCDCD
LCDSCK
LCDSI
MONOUT
1
2
3
4



D33
CD4094
CPS-S
HFC
DOS-S
+5V
CP
STROBE
D
OE
INTMAØ
INTMA1
INTMA2
INTMA3
INTMA4
INTMA5
CENSTR
FF4
R52
4,7k
D51
POWDIG
4x 4,7k
D19
AM9513
RD
WR
CS
X2
X1
CD
PCS2
SYSCP
FOUT
D44
SN74122
TMR 5
TMR4
TMR3
TMR2
TMR1
GTMRS
MAX15
CMP-AD
X73.8
X71B.30 / X72.30
X73.3
X73.18
R13
P13
X1B.22
CPS-S
X1B.23
R14
2x 1k
P14
P21
R32
12k
R42
4,7k
X73.16
X24.5
X1B.12
X1A.12
X1B.5
X1A.9
X73.2
X1B.8
X73.15
X73.14
X73.13
X24.3
D43
SN74HC74
X28
D42I
74HC02
PCS4
TMR1
SYSCP
AF-Counter
TMRINT
A1
WR
D20
SN74LS373
2x 74LS283
D22
D21
Cin
Cout
R31
4,7k
D23
SN74LS273
CP
MR
5
6
8



Klebekante für Druckerzeugnis - durch diese Zone möglichst nur Leitungen führen



Address-Bus → AB
Data-Bus → DB
Controll-Bus → CB

Stromlauf zu
CMT Digitalteil / Digital section

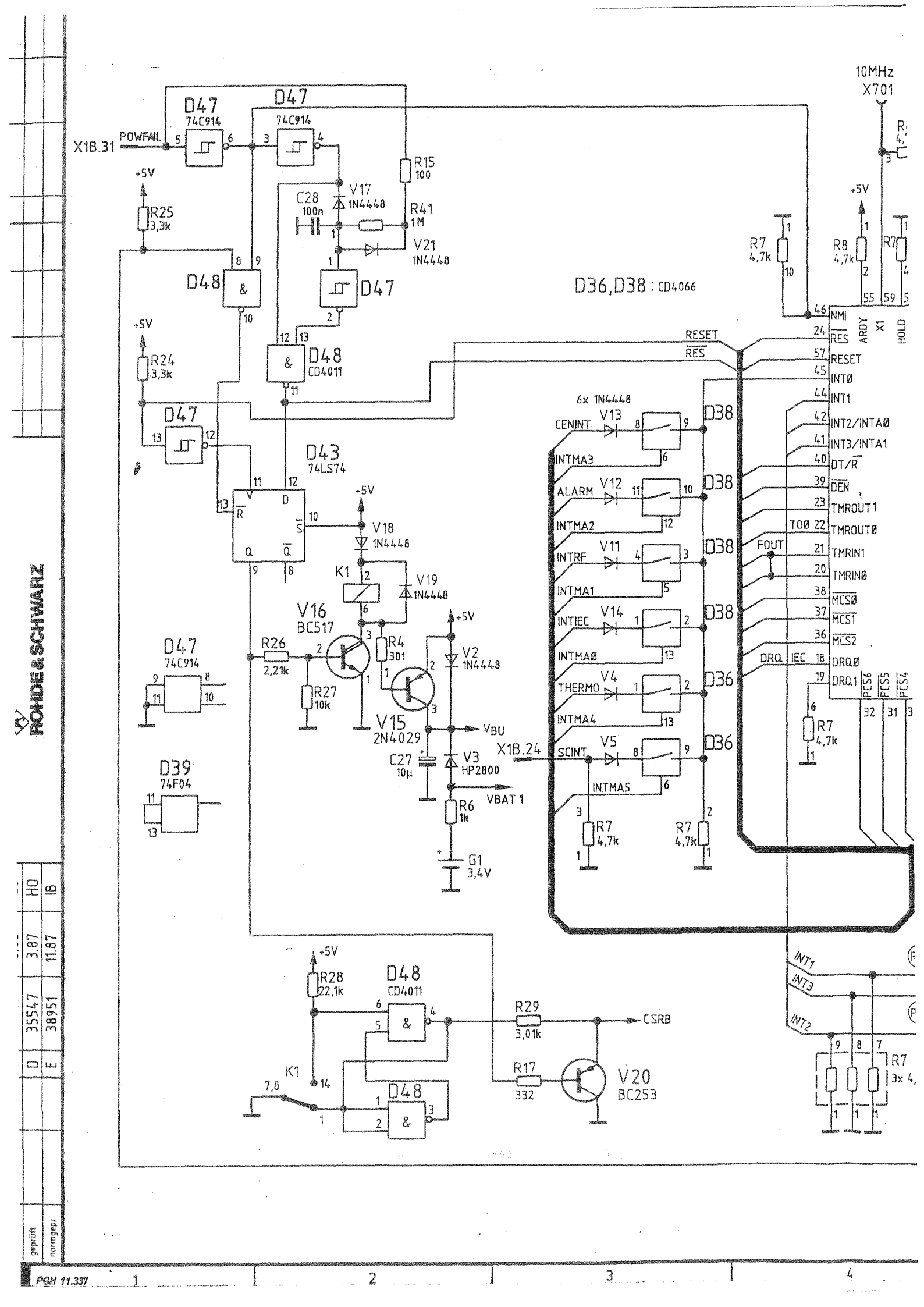
Z

Zeichn.-Nr.
802.451

CMT | reg. i. V. 802.2020 V | erste Z. ———

12 13 14

PF 095 4115-0480



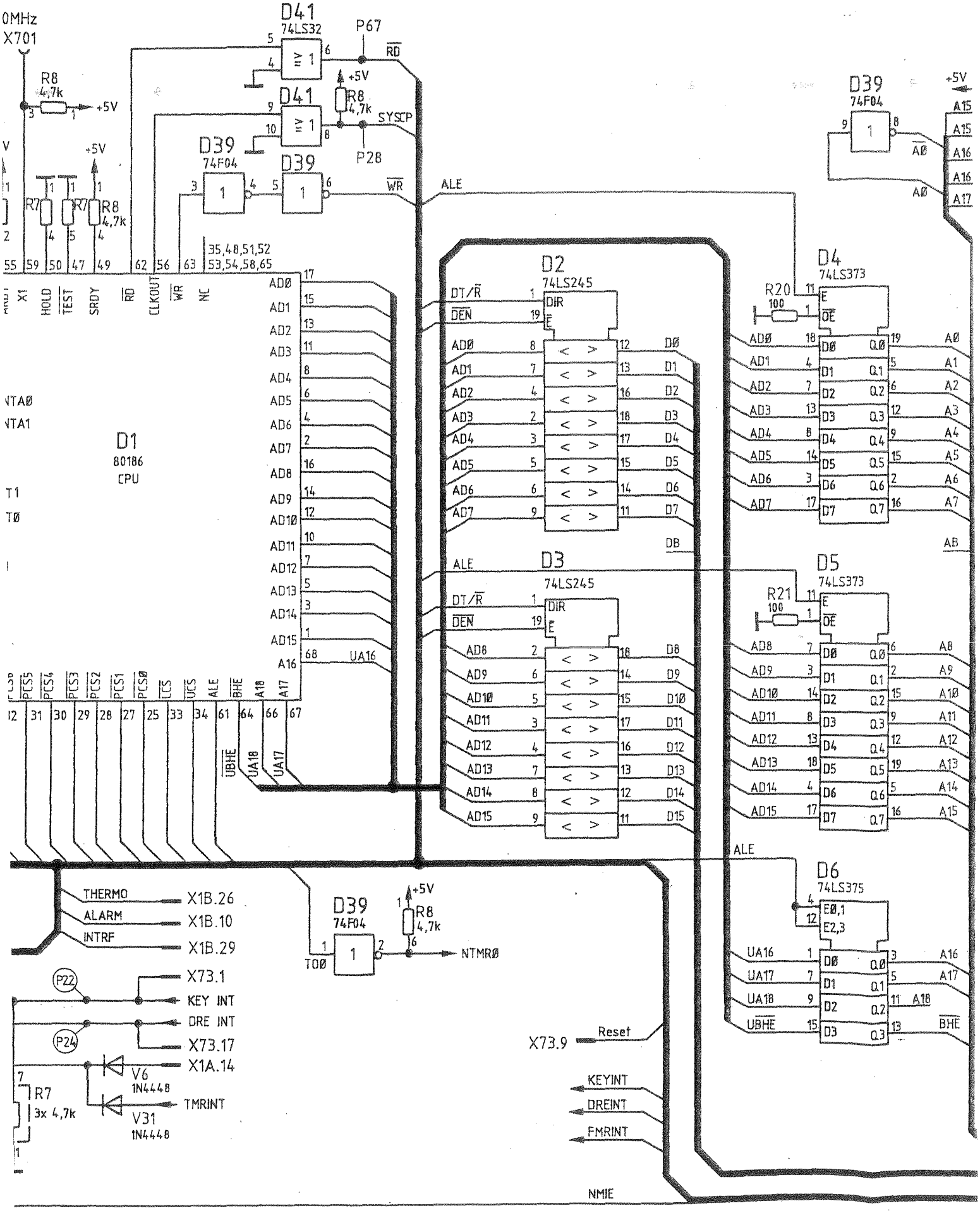
D	35547	3.87	HO
E	38951	11.87	IB

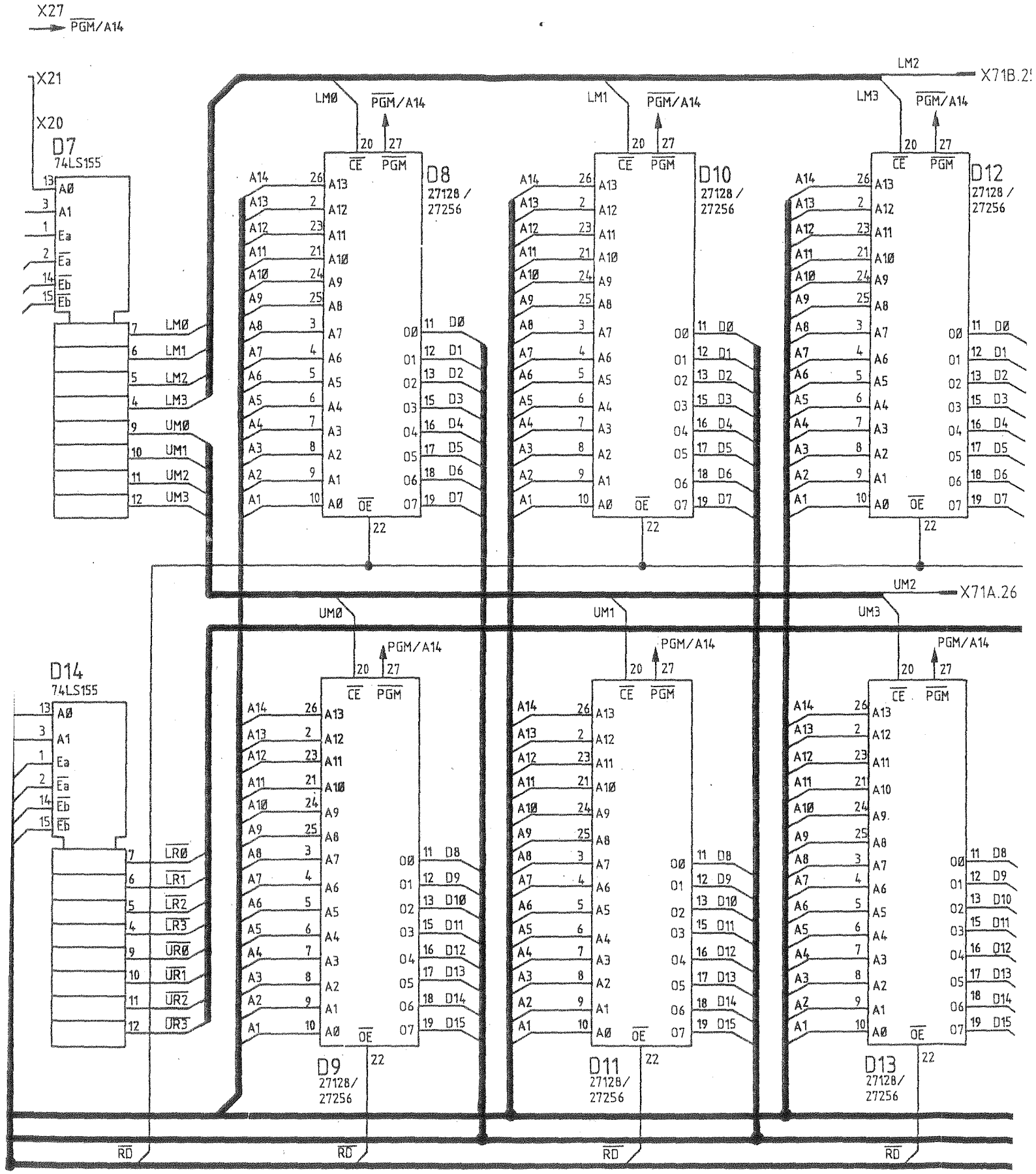
gepruft normgepr

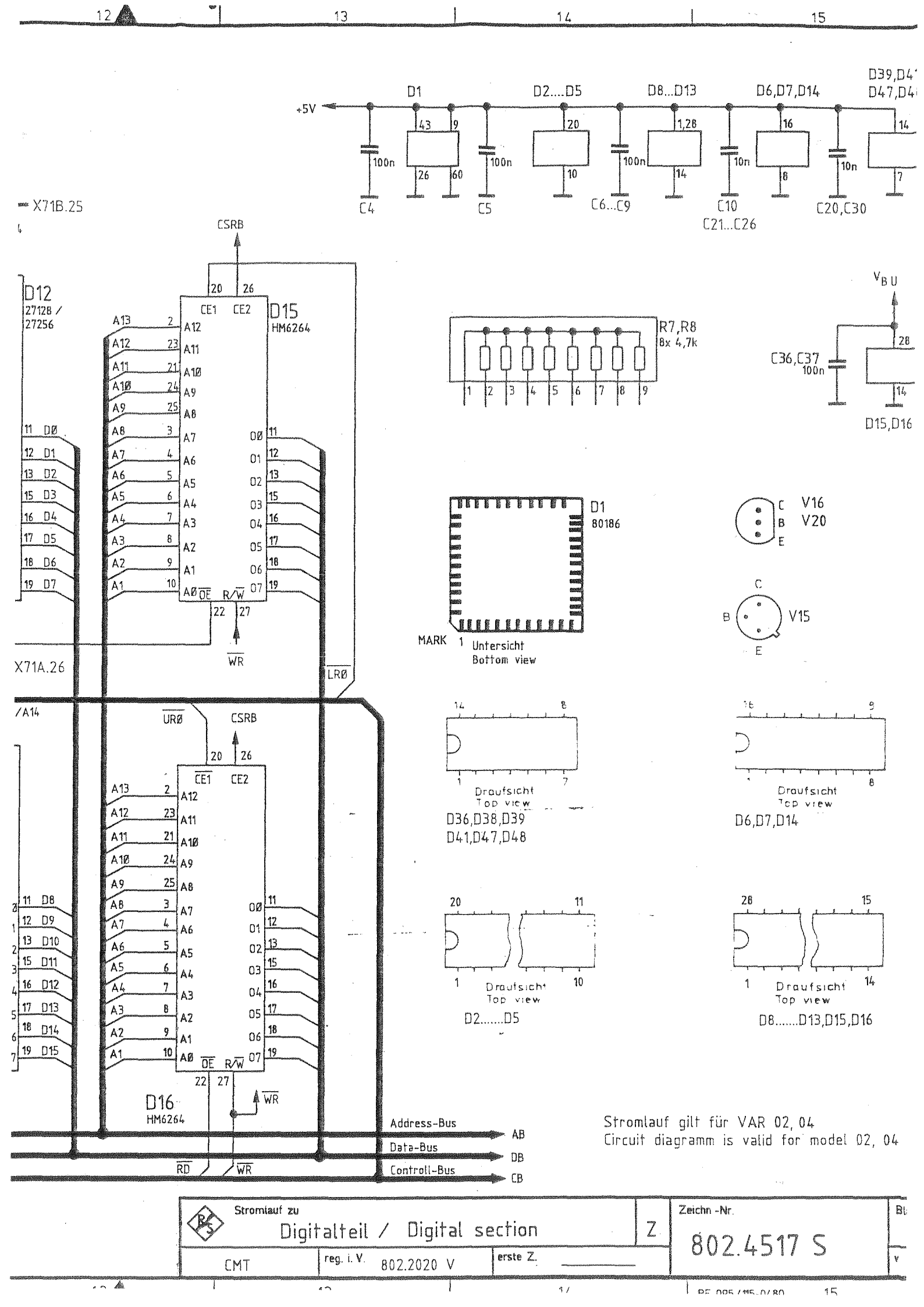
ROHDE & SCHWARZ

PGH 11.337

1 2 3 4


0MHz
X701
R8
4,7k
+5V
D41
74LS32
P67
RD
SYSCP
P28
D39
74F04
WR
ALE
35,48,51,52
53,54,58,65
D1
80186
CPU
HOLD
TEST
SRDY
CLKOUT
NC
AD0
AD1
AD2
AD3
AD4
AD5
AD6
AD7
AD8
AD9
AD10
AD11
AD12
AD13
AD14
AD15
A16
UA16
UA17
UA18
UBHE
BHE
D2
74LS245
DT/R
DEN
DIR
D3
D4
74LS373
R20
100
D5
R21
D6
74LS375
THERMO
ALARM
INTRF
X1B.26
X1B.10
X1B.29
TOØ
NTMRØ
X73.1
KEY INT
DRE INT
X73.17
X1A.14
V6
1N4448
V31
R7
3x 4,7k
TMRINT
X73.9
Reset
KEYINT
DREINT
FMRINT
NMIE


X27
PGM/A14
X21
X20
D7
74LS155
LM2
X71B.25
LM0
LM1
LM3
D8
27128 / 27256
D10
27128 / 27256
D12
27128 / 27256
UM2
X71A.26
UM0
UM1
UM3
D14
74LS155
D9
27128/ 27256
D11
27128/ 27256
D13
27128/ 27256
RD



Stromlauf gilt für VAR 02, 04
Circuit diagramm is valid for model 02, 04

Stromlauf zu: Digitalteil / Digital section			Z	Zeichn.-Nr. 802.4517 S
CMT	reg. i. V. 802.2020 V	erste Z.		

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

1st Modulation Generator Module

802.5713.02

Printed in West Germany

Contents

		Page
5	Service Manual of 1st Modulation Generator Module	5.1
5.1	Function Description	5.1
5.1.1	AF Synthesizer	5.1
5.1.2	Modulation Control Unit	5.2
5.2	Testing and Adjustment	5.3
5.2.1	Testing the Input Stage	5.3
5.2.2	Testing the Sinewave Generator	5.3
5.2.3	Testing the Reference Voltage	5.3
5.2.4	Testing the Filter	5.3
5.2.5	Testing and Adjustment of the Level Attenuator (Input Attenuator)	5.4
5.2.6	Testing the Fine Attenuator	5.4
5.2.7	Testing the Coarse Attenuator	5.4
5.2.8	Testing the Amplifier for External Modulation ...	5.5
5.2.9	Testing the Signal Selection	5.5
5.2.10	Testing the 1st Signal Distribution	5.6
5.2.11	Testing the FM Characteristic Correction	5.6
5.2.12	Testing the FM Deviation Setting	5.6
5.2.13	Testing the Preemphasis	5.6
5.2.14	Testing the 2nd Signal Distribution	5.7

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual of 1st Modulation Generator Module
(See circuit diagram 802.5713 S)

5.1 Function Description

The module consists of two function units: AF synthesizer and modulation control unit.

5.1.1 AF Synthesizer

The AF synthesizer covers the frequency range from 20 Hz to 25 kHz. It does not contain an oscillator and is driven at input GENCP via a TTL signal whose frequency is 32 times the desired AF and whose High level is divided from 5 V down to 100 mV before it is applied to the input comparator N100 of the AF synthesizer which is set to a threshold voltage of 50 mV.

The TTL signal regenerated in this manner clocks the shift registers D2 and D3 connected as a sinewave generator so that a stepped sinewave with 32 steps per cycle is generated. The change in polarity after 16 steps is achieved by the frequency divider D1 which divides the input frequency by 32 and thus loads the shift chain with 16 Low levels and 16 High levels per AF cycle. The stepped sinewave is balanced-to-earth at the output of adder N1 and has an amplitude of 2.5 V.

Three parallel, active Butterworth lowpass filters with different cut-off frequencies are then connected to smoothen the stepped sinewave. The first filter is used for frequencies from 20 Hz to 300 Hz, the second from >300 Hz to 4 kHz and the third from >4 kHz to 25 kHz. This prevents the distortion from being increased to a non-permissible level at low frequencies. The automatically selected filter is connected via N6.

A signal generated in the same manner from the same frequency range and with the same level (V_{rms} = 1.77 V) can be added (double tone) at the summing input PILINT (N7).

The circuit then contains three digital level attenuators with which the output level can be finely adjusted. These attenuators are the D/A converter N8 for 256 steps, the fine range attenuator N10 with 8 steps and the coarse attenuator 1:10 following amplifier N11 with V = 2.9.

Switchover between the signal reduced 10 times and the connected signal takes place at output X3 of the AF synthesizer using a relay because of the high maximum possible level of V_{rms} = 5.1 V.

5.1.2 Modulation Control Unit

The second function unit on the module is the modulation controller where different internal and external signals are combined and drive the AM and FM modulators at two outputs.

An external signal whose level can be modified in 8 steps (Gain = 0.4 to 10), in order to achieve V_{rms} = approx. 1 V, is applied to X4. The signal obtained can be routed to a peak-value meter by N16 (internal output MODMES). N17 is used to select between the external signal and the signal of the AF synthesizer which is available here with a constant level. The internal input EXTMOD (X1.B24) is not used.

The connection of the adder N20 is selected such that the two internally generated signals "Pilot tone" and "AF synthesizer" have a maximum level of V_{rms} = 1 V (AF synthesizer constant, pilot tone adjustable). These three signals can be distributed individually or combined to an AM path and an FM path via N21 (1st signal distribution) where the AM path is directly connected to the AM output and the following signal conditioning is possible with the FM path:

- A programmable level attenuator is used to adjust to various operating points on the FM modulator characteristic depending on the selected centre frequency.
- A second level divider is used to set the frequency deviation in 256 steps.

  Optionally:

  - Internal preemphasis for ΦM generation with 20 dB/decade (0 dB at 10 kHz, -20 dB at 1 kHz) or
  - Direct output for FM.

5.2 Testing and Adjustment

5.2.1 Testing the Input Stage

X1.A22 (GENCP): $f = 32 \times f_{AF}$, i.e. 640 Hz < f < 800 kHz, squarewave voltage (V_{Low} = 0 V, V_{High} = 100 mV) but distorted above f > 100 kHz by series-connected lowpass; $V_{max.}$ remains at 100 mV.

P1: TTL signal with $f = 32 \times f_{AF}$

5.2.2 Testing the Sinewave Generator

D1/3: TTL signal with $f = f_{AF}$

P4: Stepped sinewave (32 steps/cycle) with $f = f_{AF}$, v = 2.5 V ±1%.

5.2.3 Testing the Reference Voltage

P3: DC voltage V = +5 V ±0.3%.

5.2.4 Testing the Filter

P5: Sinewave signal with $f = f_{AF}$ and V_{rms} = 1.768 V ±1%

5.2.5 Testing and Adjustment of the Level Attenuator (Input Attenuator)

Set the following AF levels on the instrument with f = 1 kHz.
Set 5.10 V AF level. Using R51 adjust voltage at X505 to 5.10 V_{rms} ± 5 mV.

Measure the voltages at P6.

AF level [V]	V_{rms} [V] at P6
2.54	0.877
2.56	0.884
3.84	1.326 ±2%
4.48	1.547 ±2%
4.80	1.657 ±2%
4.96	1.713 ±2%
5.04	1.740 ±2%
5.08	1.754 ±2%
5.10	1.761 ±2%

5.2.6 Testing the Fine Attenuator

Set the following AF levels on the instrument with f = 1 kHz.

Measure the voltages at P7.

AF level [V]	V_{rms} [V] at P7
4.00	4.00 ±2%
2.00	2.00 ±2%
1.00	1.00 ±2%
0.40	0.40 ±2%
0.20	0.20 ±2%
0.10	0.10 ±2%

5.2.7 Testing the Coarse Attenuator

Set the following AF levels on the instrument with f = 1 kHz.

Measure the voltages at X505.

AF level [mV]	V_{rms} [mV] at X505
50.0	50.0 ±2%
50.5	50.5 ±2%

5.2.8 Testing the Amplifier for External Modulation

Apply the following AF levels to X504 with f = 1 kHz.

Measure the voltages at P8.

V_{rms} [mV] at X504	V_{rms} [mV] at P8
2500	1000 Tolerance: ±1.5%
1560	1000
1000	1000
625	1000
385	1000
250	1000
156	1000
100	1000

5.2.9 Testing the Signal Selection

Apply a sinewave signal with f = 1 kHz and V_{rms} = 1 V to X504.

Setting	Key sequence (receiver test)	Monitoring using oscilloscope	
		At N18/7	At N20/6
two-tone AM via EXT and INT1 (3 kHz)	50% EXT 3 kHz AF INT1 50% INT1	———	EXT signal (1 kHz) AF synth. signal (3 kHz)
AM via INT1	OFF 50% INT1	———	AF synth. signal (3 kHz)
Double modulation: AM via INT1 (3 kHz) FM via EXT	50% INT1 2 kHz EXT	EXT signal (1 kHz)	AF synth. signal (3 kHz)
AM via EXT	OFF 50% EXT	EXT signal (1 kHz)	———

5.2.10 Testing the 1st Signal Distribution

Apply a sinewave signal with f = 1 kHz and V_{rms} = 1 V to X504.

Setting	Key sequence (receiver test)	Monitoring using oscilloscope	
		At N22/6	At N23/7 = P9
Double modulation: AM via EXT (1 kHz) FM via INT1 (3 kHz)	50% EXT 2 kHz INT1	EXT signal (1 kHz)	INT1 signal (3 kHz)
Double modulation: AM via INT1 (3 kHz) FM via EXT	50% INT1 2 kHz EXT	INT1 signal (3 kHz)	EXT signal (1 kHz)
FM via INT1	OFF 2 kHz INT1	———	INT1 signal (3 kHz)

5.2.11 Testing the FM Characteristic Correction

- Set 25 kHz FM modulation.
- Vary the carrier frequency in the range 1 MHz to 1 GHz.

The measured deviation may deviate by ±2%.

5.2.12 Testing the FM Deviation Setting

- Set FM modulation; carrier frequency 500 MHz.
- Vary the deviation in the range 100 Hz to 100 kHz; AF = 1 kHz.

The error may be ± 1.5 %.

5.2.13 Testing the Preemphasis

- Set phase modulation, fixed centre frequency, fixed phase deviation.

When varying f_{AF}, the voltage at X1.B31 must change in the same direction and proportional to f_{AF}.

5.2.14 Testing the 2nd Signal Distribution

- Set any FM modulation. The voltage at X1.B31 must remain constant when varying f_{AF}.

- Set any phase modulation. The voltage at X1.B31 must change proportionally to f_{AF} when the latter is changed.

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	16	0387	EE 1.MODULATIONSGENERATOR 1ST MOD.GENERATOR	802.5713.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C2	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C3	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C4	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C5	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C6	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C7	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C8	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C9	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C10	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C11	CK 15NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5153-F	CK 340.8063	
C12	CK 10NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5103-F	CK 340.9076	
C13	CK 22NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,022UF/5%	CK 099.2881	
C14	CK 10NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5103-F	CK 340.9076	
C15	CK 39NF+-1%63V10QUX13 KP CAPACITOR SIEMENS B33531-A5393-F	CK 099.1940	
C16	CK 2,4NF+-1%63V,3QUX11KP CAPACITOR SIEMENS B33531-A5242-F	CK 334.5637	
C17	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C18	CK 6,8NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 6800/2,5%/63V	CK 099.6170	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C19	CK 4,7NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR SIEMENS B33531-A5472-F	CK 283.1701	
C20	CK 6,8NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 6800/2,5%/63V	CK 099.6170	
C21	CK 3,3NF+-1%63V6,3QUX11KP CAPACITOR SIEMENS B33531-A5332-F	CK 340.9030	
C22	CK 15NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5153-F	CK 340.8063	
C23	CK 1NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 1000/2,5%/63V	CK 099.6129	
C24	CK 1,5NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 1500/2,5%/63V	CK 099.6135	
C25	CK 1NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 1000/2,5%/63V	CK 099.6129	
C26	CK 3,3NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 3300/2,5%/63V	CK 099.6158	
C27	CK 470PF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 470/2,5%/63V	CK 099.6106	
C28	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C29	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C30	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C31	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C32	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C33	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C34	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C35	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C37	CK 2,7NF+-1%63V6,3QUX11KP CAPACITOR SIEMENS B33531-A5272-F	CK 340.6754	
C38	CK 3,3NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 3300/2,5%/63V	CK 099.6158	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C39	CK 3,3NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 3300/2,5%/63V	CK 099.6158	
C40	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C41	CE 2,2UF+-20%50V 4RDX5 ELEKTROLYTIC CAPACITOR NATIONAL ECE-A1HKS-2R2	803.0944	
C42	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
D1	BL CD4520BE 2XBIN.COUNT COUNTER RCA CD4520BE	BL 299.6908	
D2	BL CD4015BE 2X4B.SH.REG SHIFT REGISTER RCA CD4015BE	BL 086.7044	
D3	BL CD4015BE 2X4B.SH.REG SHIFT REGISTER RCA CD4015BE	BL 086.7044	
D4	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
BIS/TO D9			
K14	SR 5V2000HM 1MAL UM 1 REED RELAY ELECTROL RA 3042-1051-02	SR 267.5364	
N1	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N2	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
BIS/TO N5			
N6	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
N7	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N8	BJ AD7523JN 8B.D/A-CONV D/A CONVERTER MICRO POW. MP-7523JN	801.8219	
N9	BO LF351N BIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N10	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
N11	BO LF351N BIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N12	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP MJG	BJ 213.4530	
N13	BO NE5532FE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532FE	BO 332.0444	
N15	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N16	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP MJG	BJ 213.4530	
N17	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
N18	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N19	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N20	BO LF351N BIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N21	BL CD4052BE 2X4CHAN.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	
N22	BO LF351N BIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N23	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N24	BL CD4052BE 2X4CHAN.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	
N25	BJ AD7523JN 8B.D/A-CONV D/A CONVERTER MICRO POW. MP-7523JN	801.8219	
N26	BJ AD7523JN 8B.D/A-CONV D/A CONVERTER MICRO POW. MP-7523JN	801.8219	
N27	BO LF351N BIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N28	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N29	BO LM310N VOLT.FOLLOW VOLTAGE FOLLOWER NSC LM310N	266.0923	
N30	BO LM310N VOLT.FOLLOW VOLTAGE FOLLOWER NSC LM310N	266.0923	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
N31	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
N100	BO LM311N COMPAR COMPARATOR NSC LM311N	BO 394.8755	
P1	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
BIS/TO P16			
R1	RL 0,35W2,21 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21 OHM 1% TK50	RL 099.7948	
R2	RL 0,35W2,21 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21 OHM 1% TK50	RL 099.7948	
R3	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	
R4	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R5	RL 0,35W2,21 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21 OHM 1% TK50	RL 099.7948	
R6	RL 0,35W2,21 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21 OHM 1% TK50	RL 099.7948	
R7	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R8	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R9	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R10	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R11	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R12	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R13	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R14	RL 0,35W 178 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/178K-F-C	RL 083.2187	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R15	RL 0,35W 60,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/60,4K-F-C	RL 083.1851	
R16	RL 0,35W 36,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/36,5K-F-C	RL 083.1716	
R17	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R18	RL 0,35W22,6KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/22,6K-F-C	RL 082.2219	
R19	RL 0,35W 19,6KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/19,6K-F-C	RL 083.1516	
R20	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R21	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/17,4K-F-C	RL 083.1468	
R22	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/17,4K-F-C	RL 083.1468	
R23	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R24	RL 0,35W 19,6KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/19,6K-F-C	RL 083.1516	
R25	RL 0,35W22,6KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/22,6K-F-C	RL 082.2219	
R26	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R27	RL 0,35W 36,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/36,5K-F-C	RL 083.1716	
R28	RL 0,35W 60,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/60,4K-F-C	RL 083.1851	
R29	RL 0,35W 178 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/178K-F-C	RL 083.2187	
R30	RL 0,35W 10,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/10,2K-F-C	RL 082.2331	
R31	RL 0,35W 1,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,74K-F-D	RL 083.0784	
R32	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R33	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R34	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R35	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/17,4K-F-C	RL 083.1468	
R36	RL 0,35W 57,6KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/57,6K-F-C	RL 083.6830	
R37	RL 0,35W 19,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/19,1K-F-C	RL 083.1500	
R38	RL 0,35W 35,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/35,7K-F-C	RL 083.1700	
R39	RL 0,35W 30,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,1K-F-C	RL 083.1639	
R40	RL 0,35W 53,6KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/53,6K-F-C	RL 082.2590	
R41	RL 0,35W 2,61KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,61K-F-D	RL 083.0903	
R42	RL 0,35W 8,06KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/8,06K-F-D	RL 083.1222	
R43	RL 0,35W4,64KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,64K-F-C	RL 082.1687	
R44	RL 0,35W 6,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/6,49K-F-D	RL 083.1168	
R45	RL 0,35W 6,34KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/6,34K-F-D	RL 083.1151	
R46	RL 0,35W 7,15KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/7,15K-F-D	RL 083.1174	
R47	RL 0,35W 1,21KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,21K-F-D	RL 083.0655	
R48	RL 0,35W 3,40KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,40K-F-D	RL 083.1000	
R49	RL 0,35W 1,69KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,69K-F-D	RL 083.0778	
R50	RL 0,35W 2,37KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,37K-F-D	RL 083.0878	
R51	RS 0,3W 5KOHM+-10%CERMET TRIMMING POTENTIOMETER BOURNS 3296W-1- 5KOHM+-10%	RS 006.6698	
R52	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
BIS/TO			
R54			
R55	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R56	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R57	RL 0,35W 301 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/301OHM-F-D	RL 083.0210	
R58	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R59	RL 0,35W 49,9 OHM+-1%TK50 RESISTOR RESISTA MK2	RL 082.9520	
R60	RL 0,35W30,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,10HM-F-D	RL 082.9313	
R61	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R62	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R63	RL 0,35W 3,83KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,83K-F-D	RL 082.6614	
R64	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R65	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R66	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R67	RL 0,35W18,20 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/18,20HM-F-D TRIMMWERT/SELECTED	RL 082.9107	
R68	RL 0,35W2,00 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,00 OHM 1%TK50	RL 099.7931	
R69	RL 0,35W 6,81KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/6,81K-F-C	RL 082.2560	
R70	RG 1,62KOHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB 3216 1,62KOHM 1%	RG 006.9997	
R71	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R72	RL 0,35W3,97KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207	RL 084.2297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	TRIMMWERT/SELECTED		
R73	RL 0,35W 453 OHM+-1%TK50	RL 083.0378	
	RESISTOR		
	DRALORIC SMA0207/453OHM-F-D		
R74	RL 0,35W 267 OHM+-1%TK50	RL 083.0161	
	RESISTOR		
	DRALORIC SMA0207/267OHM-F-D		
R75	RL 0,35W 178 OHM+-1%TK50	RL 083.0003	
	RESISTOR		
	DRALORIC SMA0207/178OHM-F-D		
R76	RL 0,35W 115 OHM+-1%TK50	RL 082.9836	
	RESISTOR		
	DRALORIC SMA0207/115OHM-F-D		
R77	RL 0,35W 64,9 OHM+-1%TK50	RL 082.9620	
	RESISTOR		
	DRALORIC SMA0207/64,9OHM-F-D		
R78	RL 0,35W 45,3 OHM+-1%TK50	RL 082.9488	
	RESISTOR		
	DRALORIC SMA0207/45,3OHM-F-D		
R79	RL 0,35W26,7O OHM+-1%TK50	RL 082.9265	
	RESISTOR		
	DRALORIC SMA0207/26,7OHM-F-D		
R80	RL 0,35W 47,5 OHM+-1%TK50	RL 082.9507	
	RESISTOR		
	DRALORIC SMA0207/47,5OHM-F-D		
R81	RL 0,35W 100 OHM+-1%TK50	RL 082.6543	
	METALFILM-RESISTOR		
	DRALORIC SMA0207/100/HM-F-D		
R82	RL 0,35W 2,00KOHM+-1%TK50	RL 083.0826	
	RESISTOR		
	DRALORIC SMA0207/2,00K-F-D		
R83	RL 0,35W 2,00KOHM+-1%TK50	RL 083.0826	
	RESISTOR		
	DRALORIC SMA0207/2,00K-F-D		
R84	RL 0,35W 3,57KOHM+-1%TK50	RL 083.1022	
	RESISTOR		
	DRALORIC SMA0207/3,57K-F-D		
R85	RL 0,35W 2,00KOHM+-1%TK50	RL 083.0826	
	RESISTOR		
	DRALORIC SMA0207/2,00K-F-D		
R86	RL 0,35W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		
R87	RL 0,35W 3,57KOHM+-1%TK50	RL 083.1022	
	RESISTOR		
	DRALORIC SMA0207/3,57K-F-D		
R88	RL 0,35W 2,00KOHM+-1%TK50	RL 083.0826	
	RESISTOR		
	DRALORIC SMA0207/2,00K-F-D		
R89	RL 0,35W 3,57KOHM+-1%TK50	RL 083.1022	
	RESISTOR		
	DRALORIC SMA0207/3,57K-F-D		
R90	RL 0,35W 1KOHM+-1%TK50	RL 082.2160	
	RESISTOR		
	DRALORIC SMA0207/1K-F-C		

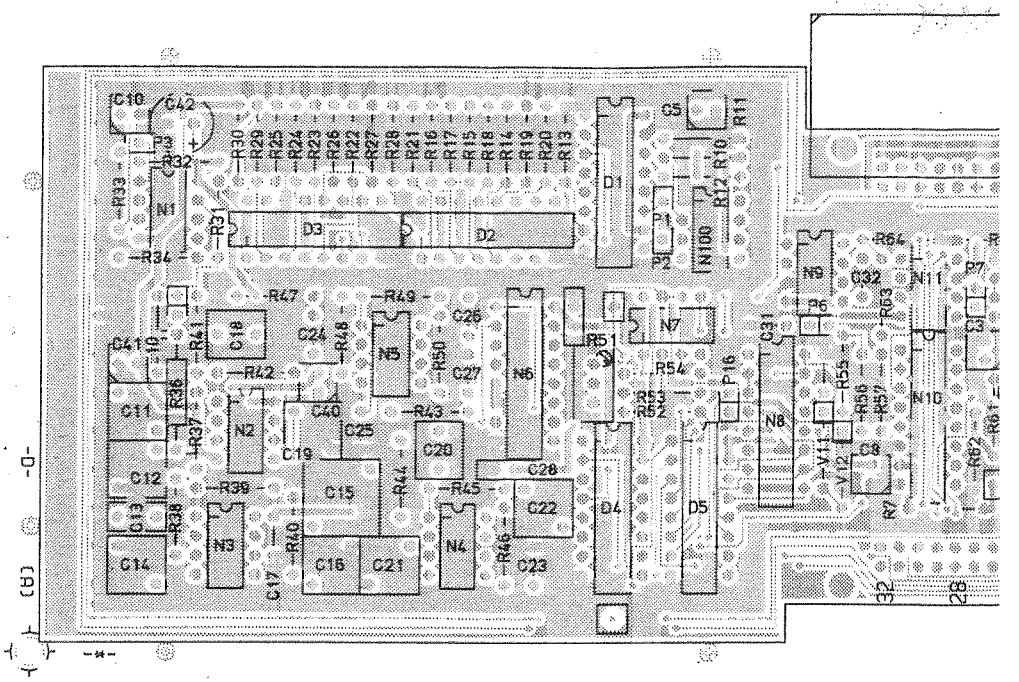
ROHDE&SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	16	0387	EE 1.MODULATIONSGENERATOR 1ST MOD.GENERATOR	802.5713.01 SA	10

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R91	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R92	RL 0,35W 5,90KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,90K-F-D TRIMMWERT/SELECTED	RL 083.1145	
R93	RL 0,35W 1,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,74K-F-D	RL 083.0784	
R94	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
V1	AE BZX79/C9V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C9V1	AE 012.2503	
V2	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V3	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V4	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V3	AE 012.2426	
BIS/TO V9			
V10	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V11	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V3	AE 012.2426	
V12	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V3	AE 012.2426	
V15	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
W1	DX KABEL CABLE	802.5888	
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	
X2	FP BUCHSENLEISTE64P.ABGEW PANDUIT 100-064-533/999	FP 099.0614	
X504	FJ EINBAUSTECKER SYST.SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	
X505	FJ EINBAUSTECKER SYST.SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	

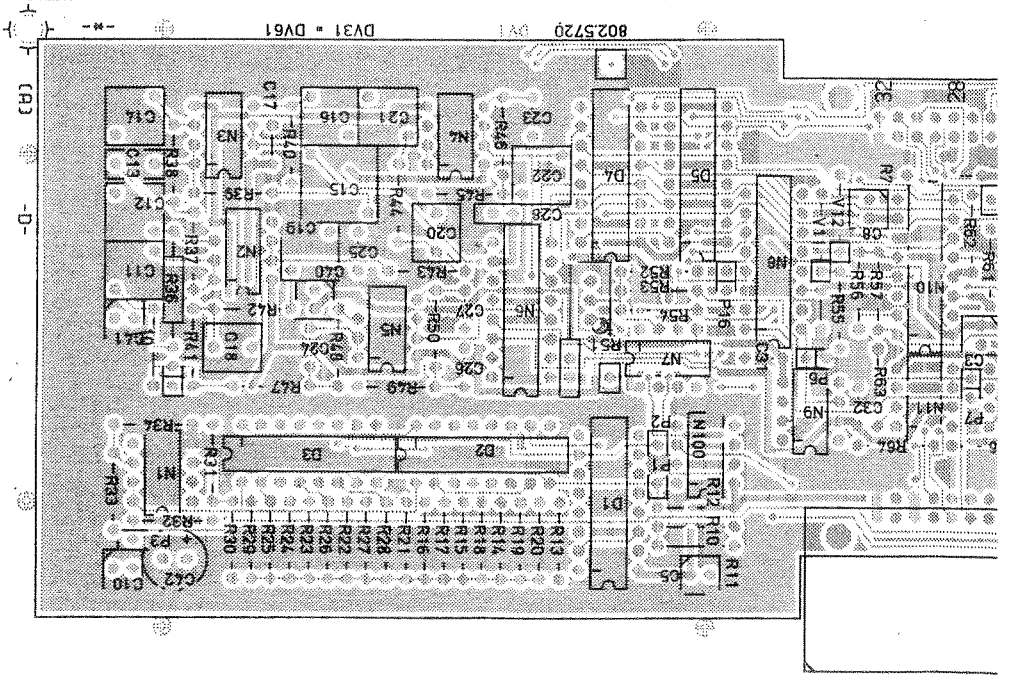
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X3A	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X3B	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X4A	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
X4B	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
			- ENDE -

Für diese Unterlage ... alten wir uns alle Rec ...

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



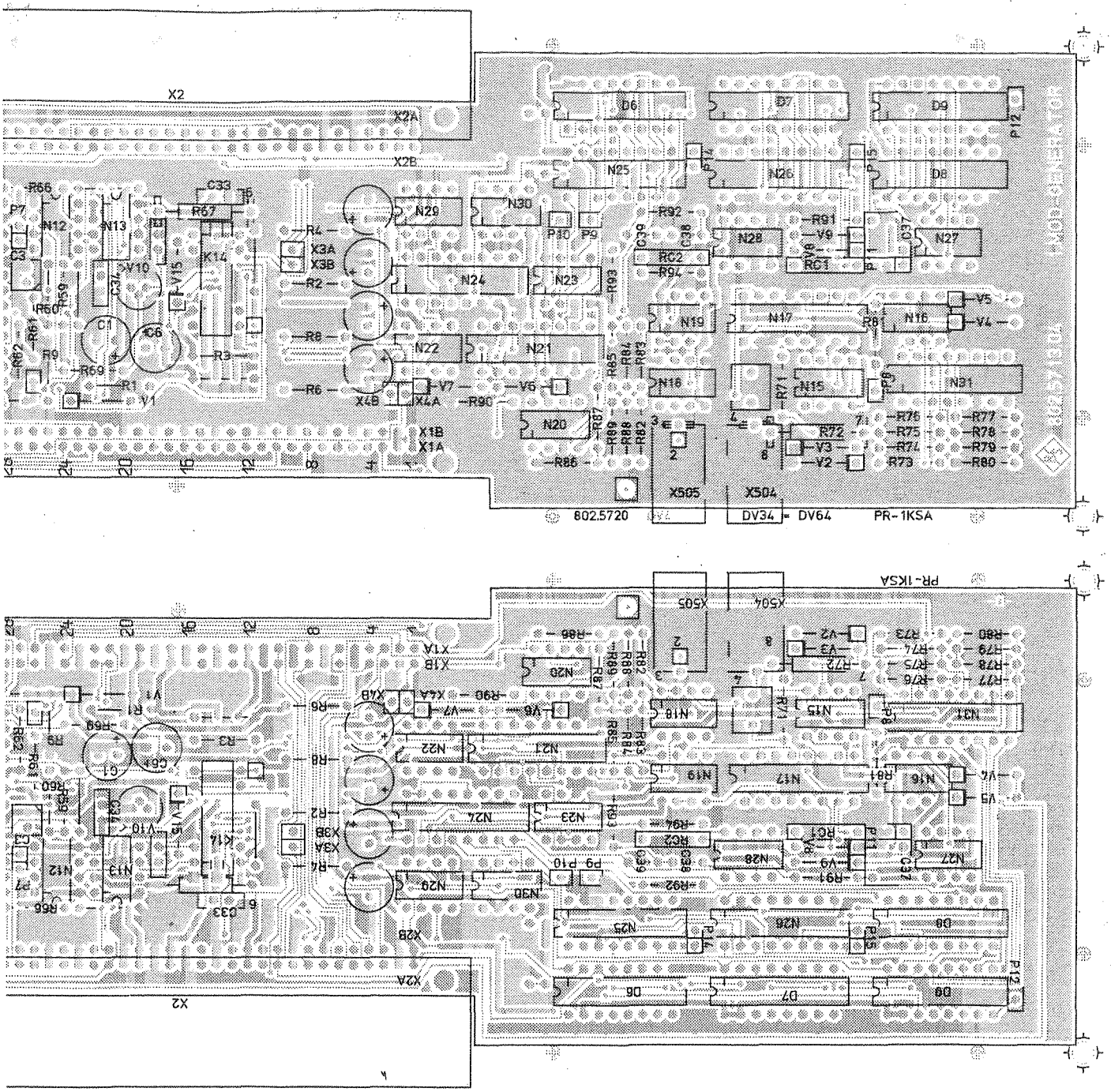
Ansicht und Leitungsführung Lötseite
View of tracks on solder side



(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.



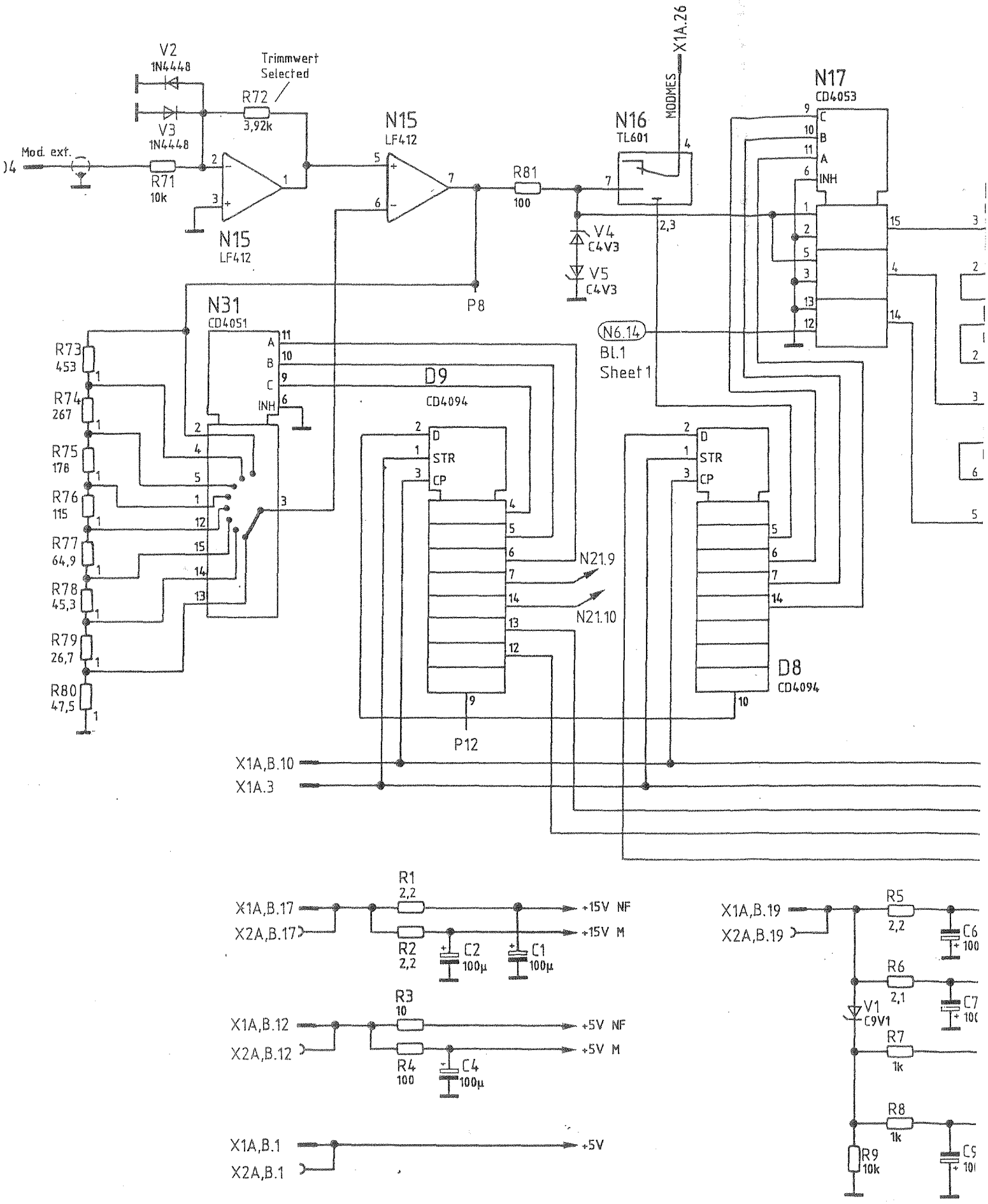
VARIANTENERKLÄRUNG/VERSION
VAR02 - GRUNDAUSFÜHRUNG/BASIC MODEL
VAR04 - AUSFUEHRUNG MIT C-NETZ MODIFKATION

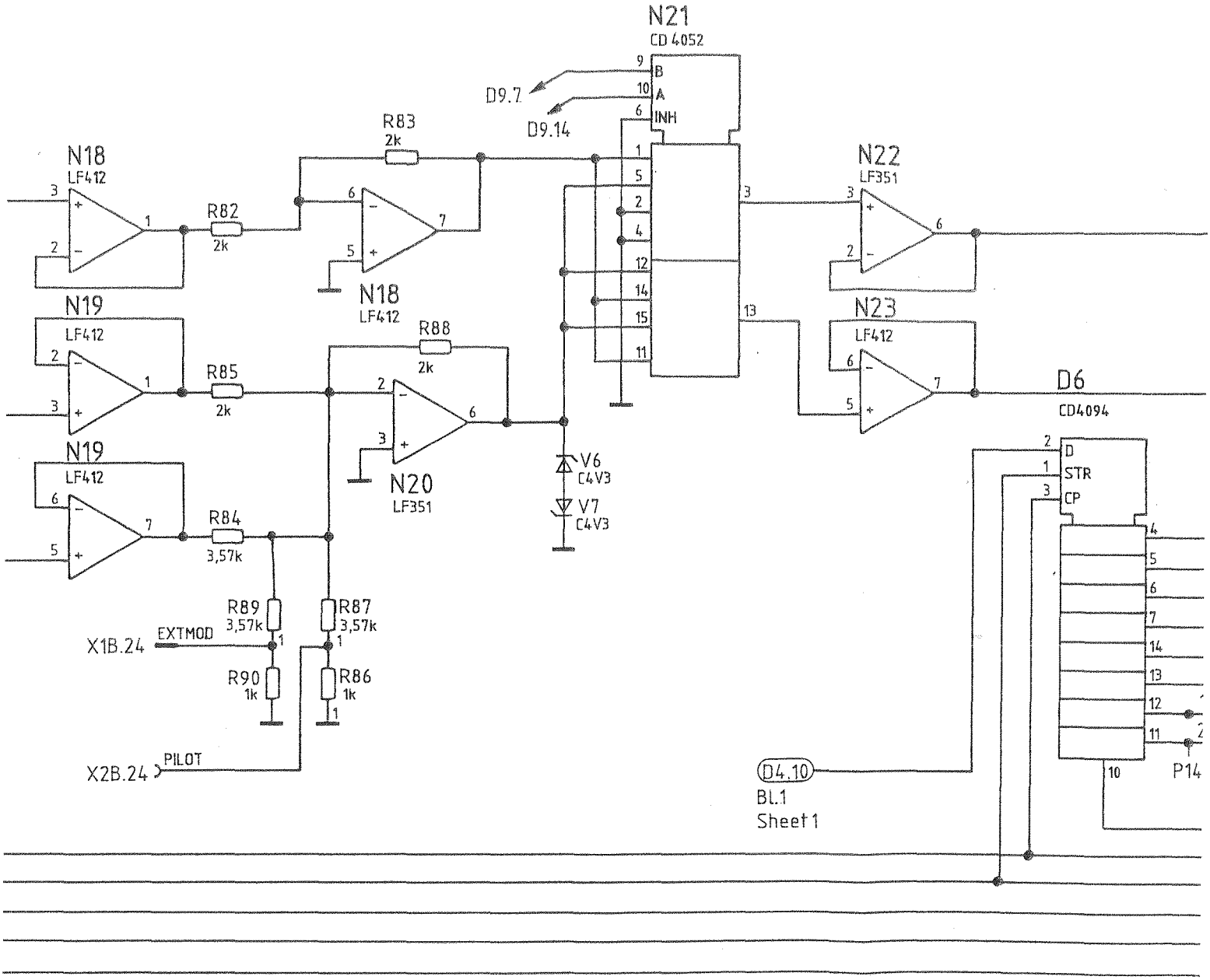
I	35547	12.86	PR	Maße ohne Toleranzangabe		Maßstab 1 : 1
K	38951	11.87	IB			Halbzeug, Werkstoff
				1KSA	Tag	Name
				Bearb.	12.86	PR
				Gepr.		
				Norm		
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE & SCHWARZ		Zeichn.-Nr. 802.5713.01 EE
				zu Gerät CMT		reg. i. V. 802.2020 V erste Z.

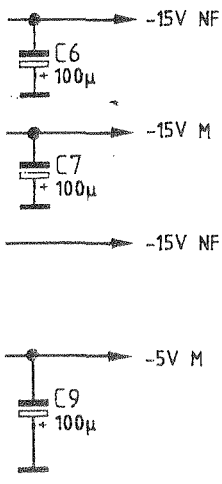
Benennung: Modulations Generator

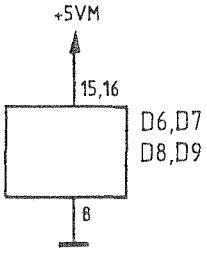
Z

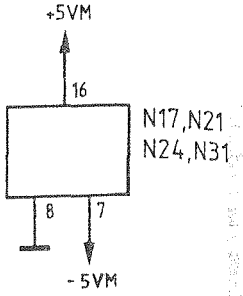
Blatt-Nr. 2 v. 2 Bl.

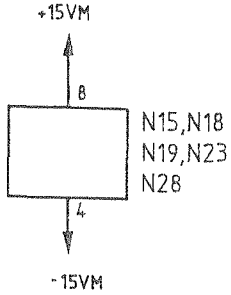

V2
1N4448
V3
1N4448
Trimmwert
Selected
R72
3,92k
Mod. ext.
R71
10k
N15
LF412
N15
LF412
N16
TL601
X1A.26
MODMES
N17
CD4053
R81
100
V4
C4V3
V5
C4V3
P8
N6.14
BL.1
Sheet 1
N31
CD4051
R73
453
R74
267
R75
178
R76
115
R77
64,9
R78
45,3
R79
26,7
R80
47,5
D9
CD4094
D8
CD4094
N21.9
N21.10
P12
X1A,B.10
X1A.3
X1A,B.17
X2A,B.17
R1
2,2
R2
2,2
C2
100µ
C1
100µ
+15V NF
+15V M
X1A,B.12
X2A,B.12
R3
10
R4
100
C4
100µ
+5V NF
+5V M
X1A,B.1
X2A,B.1
+5V
X1A,B.19
X2A,B.19
R5
2,2
R6
2,1
V1
C9V1
R7
1k
R8
1k
R9
10k

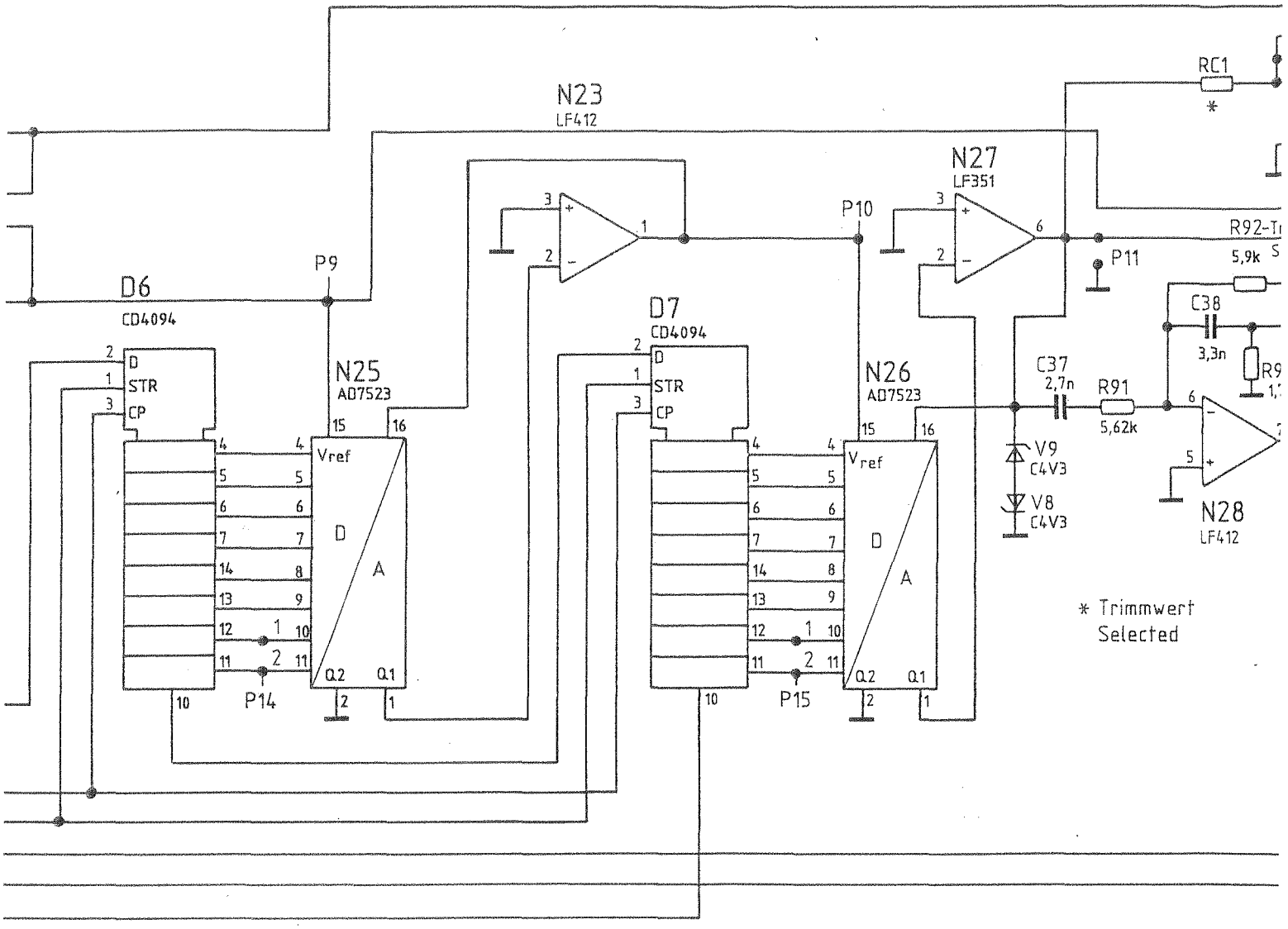

N21
CD 4052
D9.7
D9.14
B
A
INH
R83
2k
N18
LF412
R82
2k
N18
LF412
N22
LF351
N19
LF412
R85
2k
R88
2k
N23
LF412
D6
CD4094
N19
LF412
N20
LF351
V6
C4V3
V7
C4V3
R84
3,57k
R89
3,57k
R87
3,57k
X1B.24
EXTMOD
R90
1k
R86
1k
X2B.24
PILOT
D4.10
BL.1
Sheet 1
D
STR
CP
P14

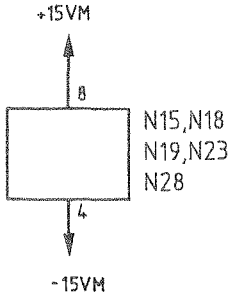

-15V NF
C6
100µ
-15V M
C7
100µ
-15V NF
-5V M
C9
100µ

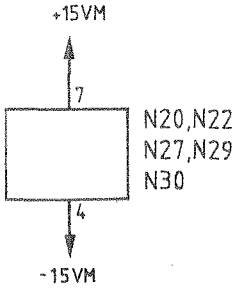

+5VM
15,16
8
D6,D7
D8,D9

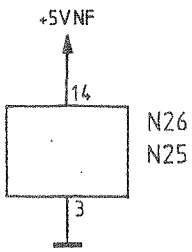

+5VM
16
8
7
N17,N21
N24,N31
-5VM


+15VM
8
4
N15,N18
N19,N23
N28
-15VM



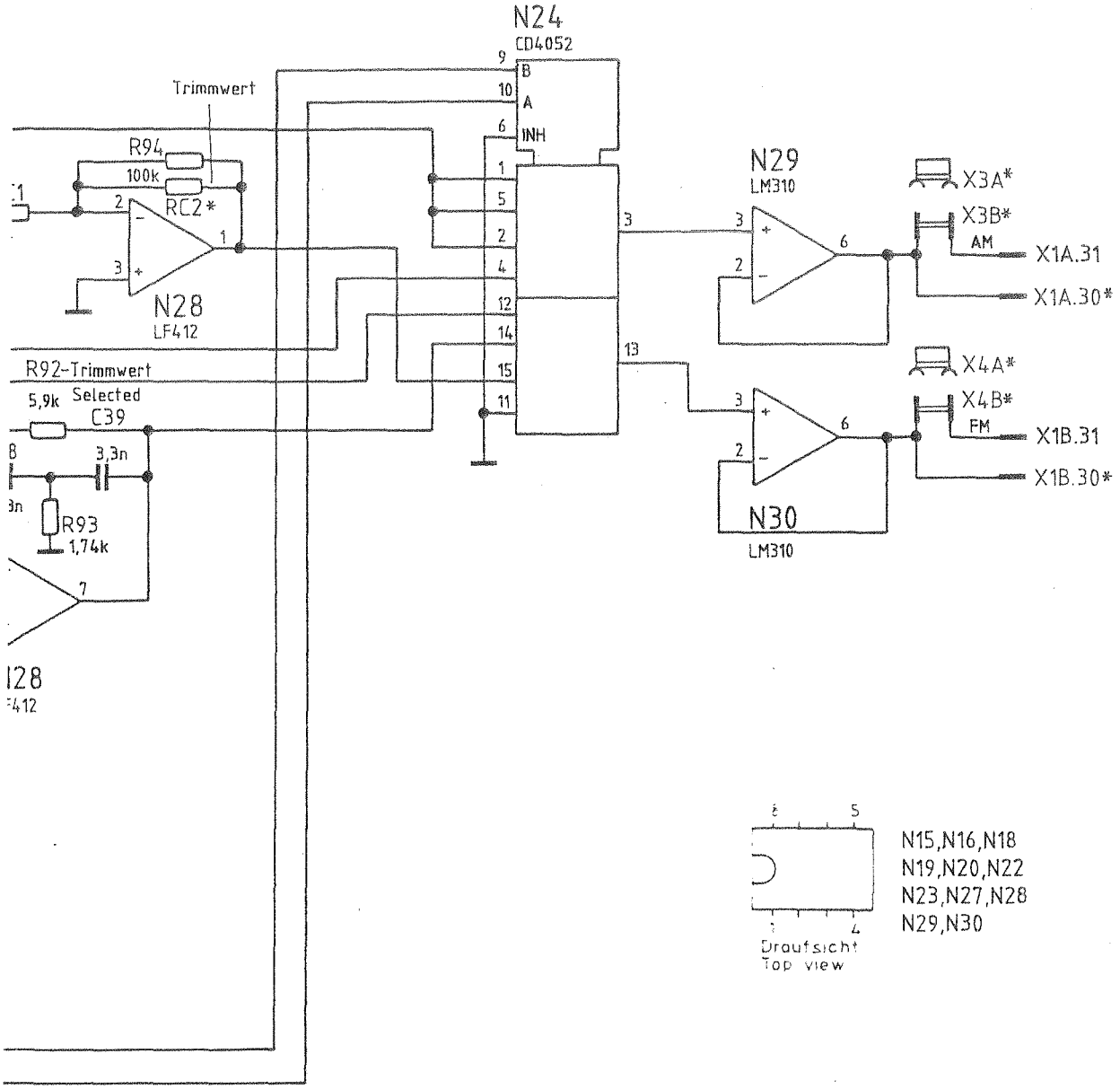




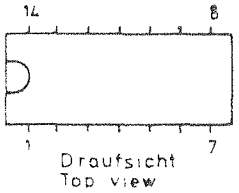


A		7.85	CO	D	35533	11.86	CO	1KSA	Tag
B	32954	11.85	CO	E	35547	05.87	IB	Beard	7.85
C	35533	6.86	CO					Gepr	
Änd Zust	Änderungs-Mitteilung	Datum	Name	Änd Zust	Änderungs-Mitteilung	Datum	Name	Norm	

ROHDE & SCHWARZ



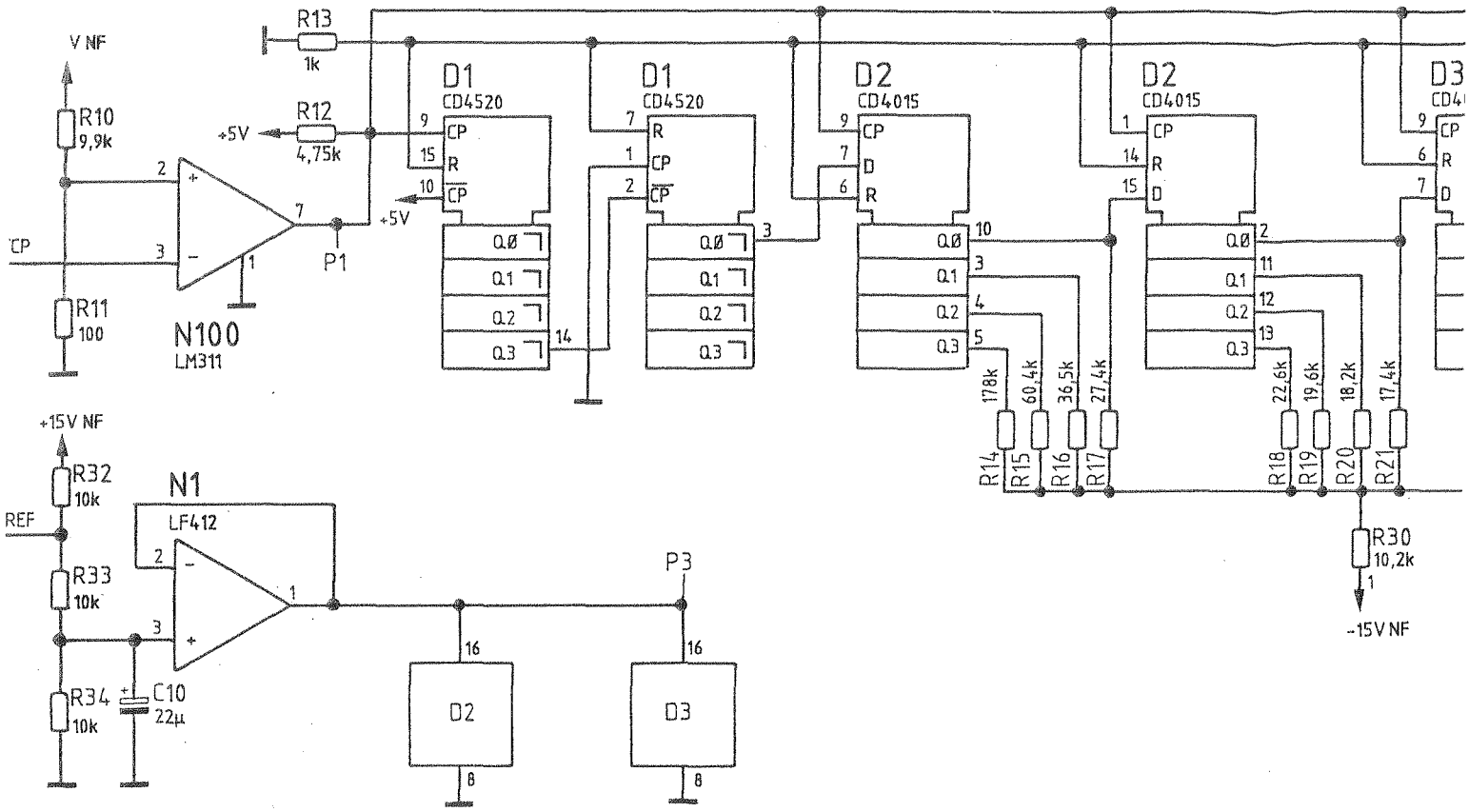
N15,N16,N18
N19,N20,N22
N23,N27,N28
N29,N30



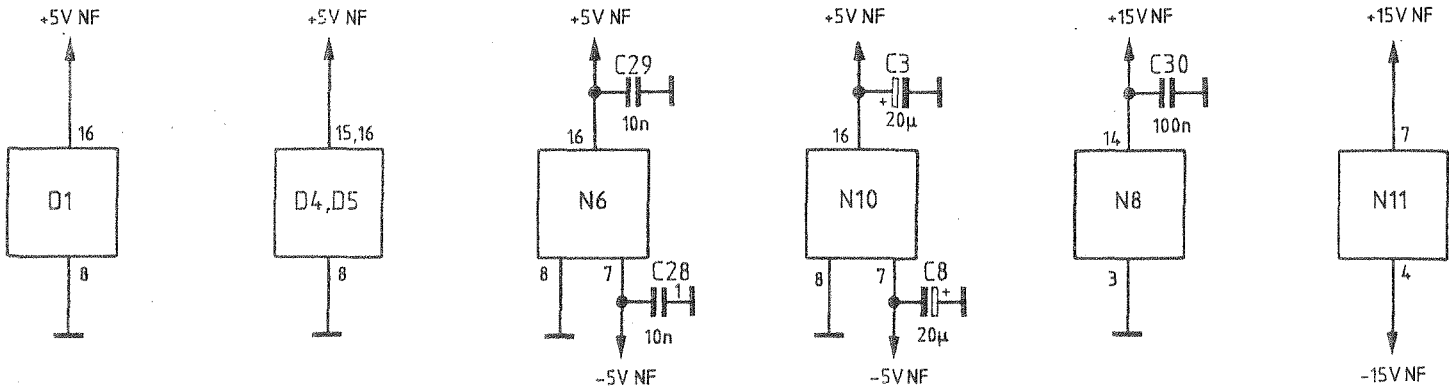
D6,D7,D8,D9
N17,N21,N24
N25,N26,N31

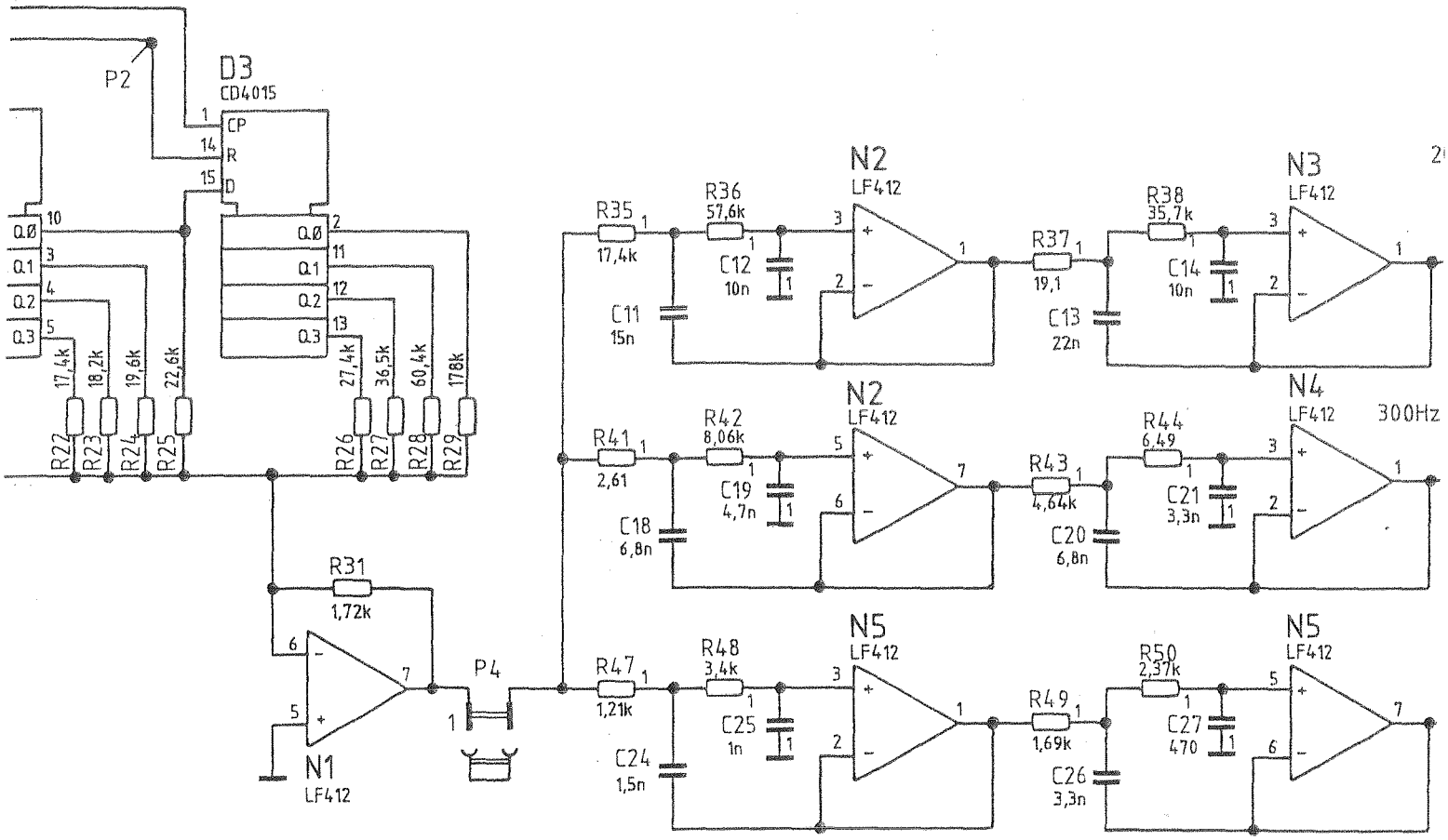
*) nur für VAR 04
only for model 04

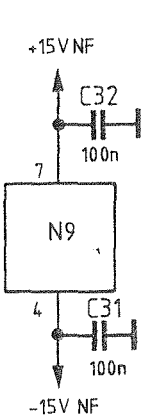
Tag	Name	Benennung		Zeichn.-Nr
7.85	CO	1. Mod.-Generator / 1st Mod.-Generator	Z	802.5713 S
		zu Gerät CMT		reg. V 802.2020 V erste Z

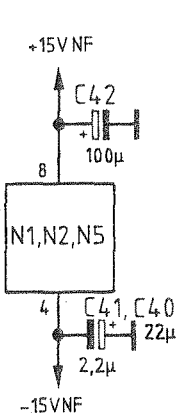

V NF
R10
9,9k
R13
1k
R12
4,75k
+5V
D1
CD4520
D1
CD4520
D2
CD4015
D2
CD4015
D3
CP
R
D
Q.0
Q.1
Q.2
Q.3
N100
LM311
P1
R11
100
178k
60,4k
36,5k
27,4k
22,6k
19,6k
18,2k
17,4k
R14
R15
R16
R17
R18
R19
R20
R21
R30
10,2k
-15V NF

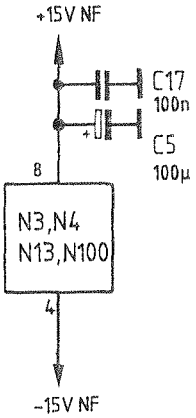
+15V NF
R32
10k
N1
LF412
REF
R33
10k
R34
10k
C10
22µ
P3
D2
D3

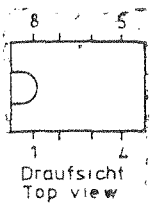

+5V NF
D1
+5V NF
D4,D5
+5V NF
C29
10n
N6
C28
10n
-5V NF
+5V NF
C3
20µ
N10
C8
20µ
-5V NF
+15V NF
C30
100n
N8
+15V NF
N11
-15V NF



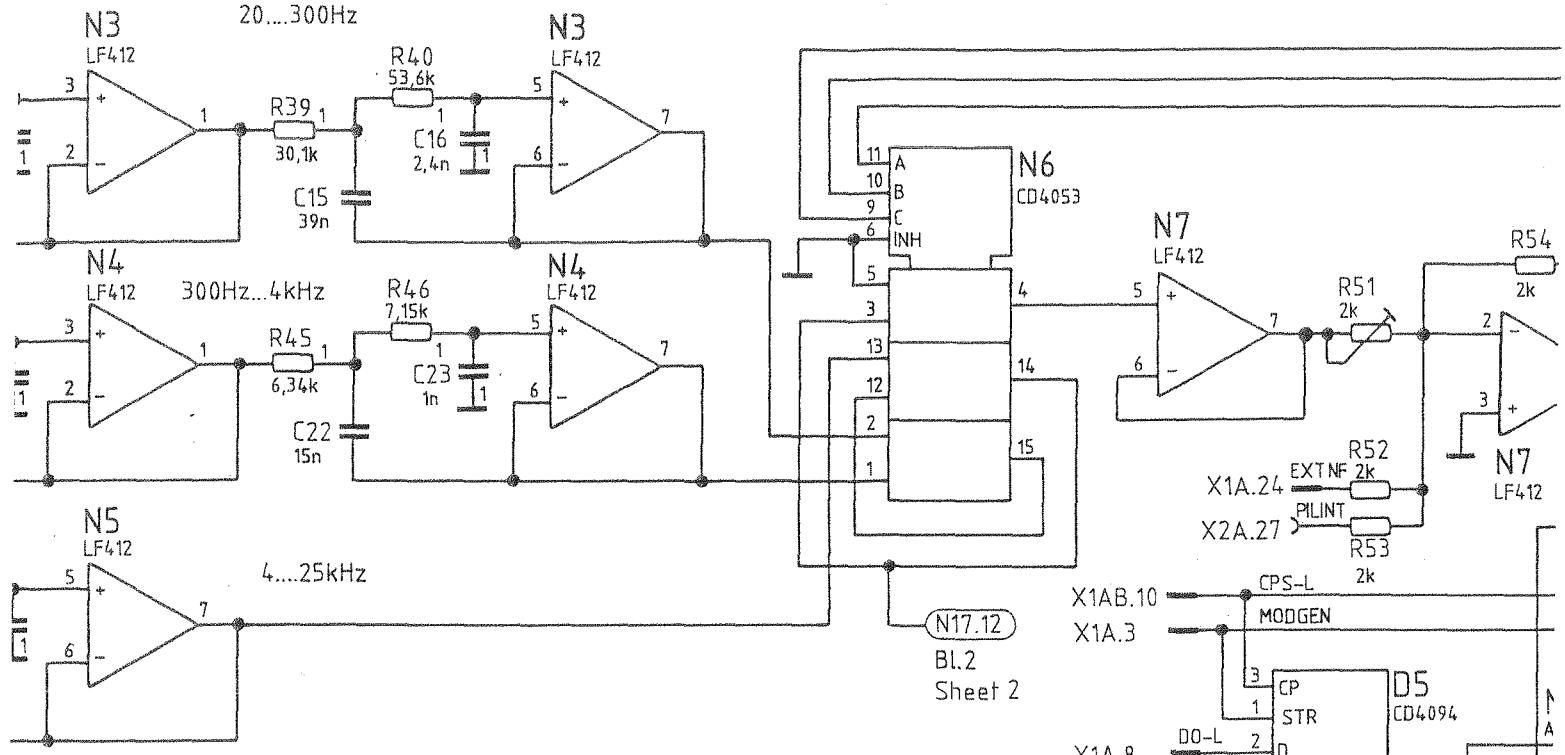


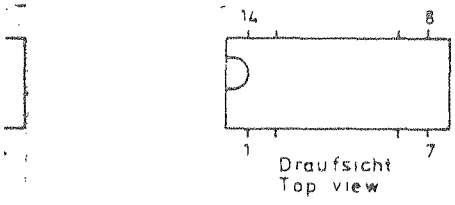




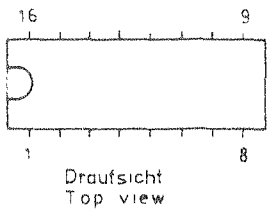


N1.....N5
N7,N9,N11
N12,N13





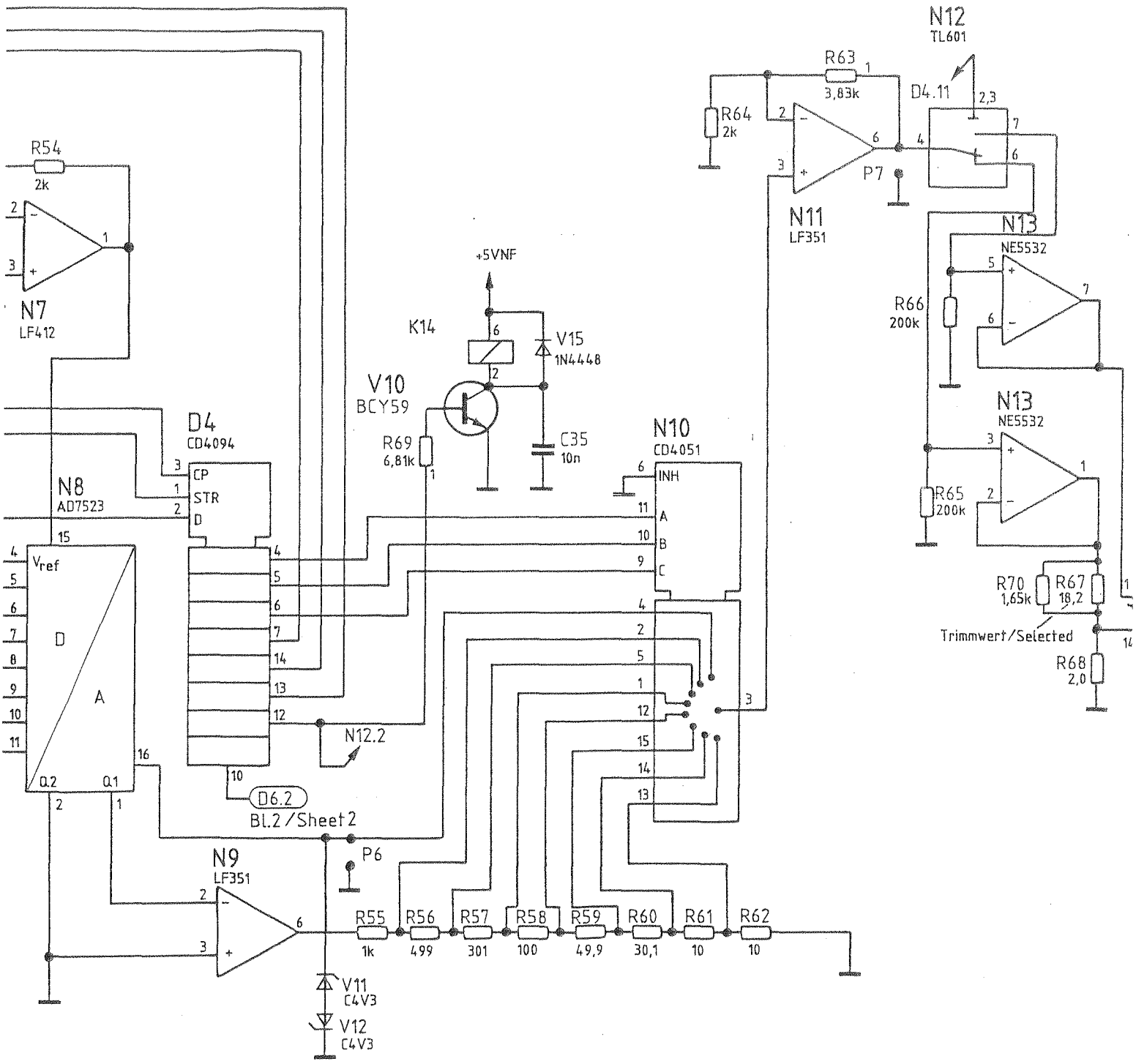
K14



D1.....D5,N6,N8,N10

A		7.85	CO	E	35547	5.87	IB	1KSA	Tag
B	32954	4.86	CO					Bearb	7.85
D	35533	11.86	CO					Gepr	
Änd Zust	Änderungs-Mitteilung	Datum	Name	Änd Zust	Änderungs-Mitteilung	Datum	Name	Norm	

ROHDE & SCHWARZ



Stromlauf gilt für VAR 02, 04
Circuit diagram is valid for model 02, 04

Tag	Name	Benennung		Zeichn.-Nr
7.85	CO	1. MOD.-Generator / 1st MOD.-Generator	Z	802.5713 S
		zu Gerät CMT		reg. V 802.2020 V erste Z

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS
RF Oscillator Module Including
Reference Oscillator Option (OCXO)
802.8835.02

Contents

		Page
5	Service Manual for RF Oscillator Module Including Reference Oscillator Option (OCXO)	5.1
5.1	Function Description	5.1
5.1.1	Reference Section	5.1
5.1.2	VCXO Loop	5.2
5.1.3	RF Loop	5.3
5.1.4	Control and Diagnosis	5.4
5.2	Testing and Adjustment	5.6
5.2.1	Adjusting the 100-MHz Crystal Oscillator	5.6
5.2.2	Testing the Synchronization with an External 10-MHz Reference Frequency	5.6
5.2.3	Adjusting the Reference Oscillator Option (OCXO)..	5.6
5.2.4	Testing the VCXO Loop	5.7
5.2.5	Frequency Adjustment of the RF Oscillators	5.7
5.2.6	Testing the RF Loop	5.8
5.2.7	Testing the Spurious FM	5.8
5.3	Troubleshooting	5.9
5.3.1	DC Voltage Values	5.9
5.3.2	Signal Level	5.10
5.3.3	RF Level	5.10
5.3.4	Testing the Control Signals for the M Divider ...	5.11
5.3.5	Testing the Control Signals for the N Divider ...	5.11
5.4	Interfaces	5.12

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for RF Oscillator Module Including Reference Oscillator Option (OCXO)

(See circuit diagram 802.8835 S and block diagram)

5.1 Function Description

The module contains a frequency synthesizer which delivers a frequency of 500 MHz to 1000 MHz with a resolution of 10 to 90 Hz. Two phase-locked loops are used for frequency synthesis. The individual loops are designated as RF loop and VCXO loop. The coarse spacing is generated in the RF loop and the fine spacing in the VCXO loop. The two phase-locked loops are synchronized with a crystal-stabilized reference frequency in order to obtain a stable output frequency. The output frequency is derived as follows:

$F=(M/N) \times 400000+M \times 200000$ where M=2499 to 4999
and N=3333 to 10000

If e.g. a frequency of 750 MHz is set, then M=3749 and N=7498.

A 100-MHz crystal oscillator generates the reference source for the frequency synthesis. All frequencies generated on the module are derived from this crystal oscillator. To obtain even greater stability, this crystal oscillator can be synchronized in a phase-locked loop with an external 10-MHz reference or an oven-stabilized 10-MHz crystal (option OXCO).

5.1.1 Reference Section

The tuning diode V512 is connected in series with the crystal (B500) in the 100-MHz crystal oscillator. The frequency can be adjusted within a small range using a tuning voltage which is adjustable with trimmer R632.

The oscillator frequency divided by 10 is compared with the 10-MHz signal of the external reference or the OCXO in the digital phase detector (D610) to bring it into synchronism. The pulses generated by the phase detector are integrated by a difference integrator (N620) into a DC voltage which is applied to the voltage-variable diode V512 as a tuning voltage. The tuning voltage is controlled such that the two 10-MHz signals at the phase detector always have the same phase. Switchover from self-oscillating to synchronized operation of the 100-MHz crystal oscillator takes place automatically when using the option (OCXO).

5.1.2 VCXO Loop

The 20-MHz signal from the reference unit is converted in the amplifier (V200) from ECL to TTL level and applied to the programmable N divider.

The N divider is a decadic counter with 4 digits. The counter is incremented with each clock pulse. The preset input of the individual counters is activated via the NAND gate (D202/2) when a count of 9999 is reached and the N divider is reset by the next clock pulse. Because a clock pulse is needed for loading the counter, it counts one step more than 9999. The required divider ratio at the output of the divider is therefore 10000 minus the initial count. If e.g. the divider ratio is to be N = 7498, (10000-7498) = 2502 must be loaded into the counter. This value is stored in BCD in the shift registers (D205, D206). The output signal of the N divider (2 to 6 kHz) is then mixed in the subsequent phase locked mixer to 10.002 to 10.006 MHz.

The voltage-controlled crystal oscillator (VCXO) consists of the oscillating transistor V230 and the resonant circuit elements B230, V232, L230, C232 and C233. The voltage-variable diode V232 enables the frequency to be tuned in the range from 10.002 MHz to 10.006 MHz. The oscillator signal is converted into a TTL level by D250. The output of D250 pin 10 is used to drive the divider D255 (100:1). The signal is applied from pin 1 of D250 to an active mixer D262 where it is converted down with 10 MHz from the reference section. The low intermediate frequency is applied via the lowpass filter R264, C264, R265, C265 to the comparator N260 which converts the signal to TTL level for the digital phase detector.

The phase detector, consisting of D210 and D202/4, compares the phase at pins 12 and 9. The signal at pin 12 is the output frequency of the N divider. The phase detector generates positive pulses at pin 5 if the frequency at pin 9 is higher than that at pin 12. These pulses cause the tuning voltage to drop following the inverting integrator N220 in order to reestablish synchronization. If the phase-locked loop has locked, only very narrow pulses are present at pins 2 and 5 of phase detector D210.

5.1.3 RF Loop

The output frequency range from 500 to 1000 MHz is generated in the RF loop. This range is divided amongst three oscillators.

Range in MHz			Transistor
Osc. 1	500 to 655		V30
Osc. 2	655 to 825		V60
Osc. 3	825 to 1000		V90

With negative impedance at its base, the oscillating transistor reduces the damping of a series resonant circuit. The inductance of the resonant circuit is generated using a coaxial cable in order to keep the microphony as low as possible. A voltage-variable diode is used for the tuning. The tuning voltage is applied to the cathode and the FM signal to the anode of the voltage-variable diode via RF chokes. The output power of the oscillator is set by the oscillating transistor using the adjustable constant current. A switching stage with two transistors driven at TTL level switches on the operating voltage for the oscillator as well as a switching diode to decouple the RF in the forward direction. The decoupling amplifier (V158) increases the output power of the oscillators from 0 dBm to 10 dBm. Following the decoupling amplifier, the signal is applied via an attenuator pad (R160, R161) to output connector X310 and via a second pad (R164, R165) and a hybrid amplifier (N300) to the M divider.

The M divider is a programmable high-frequency divider with a fixed divider (D310) and a selectable divider (D315). D310 divides the oscillator frequency by 4 down to between 125 and 250 MHz. D315 with the internal selector 11/10 operates together with auxiliary counter (D330) as a decadic counter stage in the 4-digit M divider.

D315 commences with the divider ratio of 11:1. The counters (D330 and D331) are incremented simultaneously after 11 input pulses. Once 9 has been reached on the auxiliary counter (D330), it switches the divider (D315) to a ratio 10:1. The auxiliary counter remains at its final value. The pulses divided by 10:1 are then only counted by the main counter (D331, D332 and D333). Once the main counter has also reached 9, the divider is again set to 11:1 by a reset pulse and the other dividers are set to the entered ratio. A new counting cycle can then commence. For example, if the dividing factor is 2654, the auxiliary counter and the main counter count 4 pulses and then the divider is switched from 11 to 10. The divider divides the input frequency by 10 for the remaining factor of the main counter (=261). The input frequency must deliver 4 x 11+(265-4) x 10 = 2654 pulses for the complete counting cycle; this corresponds to the above dividing factor.

The M divider must be loaded with the difference between the final count and the dividing factor because it counts upwards. Ten additional input pulses are used because the loading of the counters requires 1 clock pulse and the divider is set to a factor of 10 during this period. For example, if the divider ratio is to be M = 2654, then (10009-2654)=7355 must be loaded into the counter. This value is stored in BCD code in the shift registers (D360 and D365).

With FM switched off, the output signal of the M divider (approx. 50 kHz) is directly applied to the phase detector (D390) via a gate (D371). The phase detector compares this signal with the frequency of the VCXO loop divided by 200 and readjusts the RF oscillator using the subsequent integrator (N400) if there is a difference in phase. If FM is switched on, the control bandwidth should be small to enable frequency modulation with low modulation frequencies. This is achieved by switching over the integrator time constants and reducing the phase detector current. Furthermore, the input frequency of the phase detector is divided by 5 using divider (D370).

5.1.4 Control and Diagnosis

The module is controlled via a serial interface. The data for a complete setting are stored in 6 shift register ICs (D360, D365, D205, D206, D2, D18).

Eight different test points on the module can be polled by the multiplexer (D15) for diagnostic purposes. The tuning voltages of the oscillators are also constantly monitored by window discriminators (N240, N440, N660) and the loop-OK line is set to Low if the limits are violated.

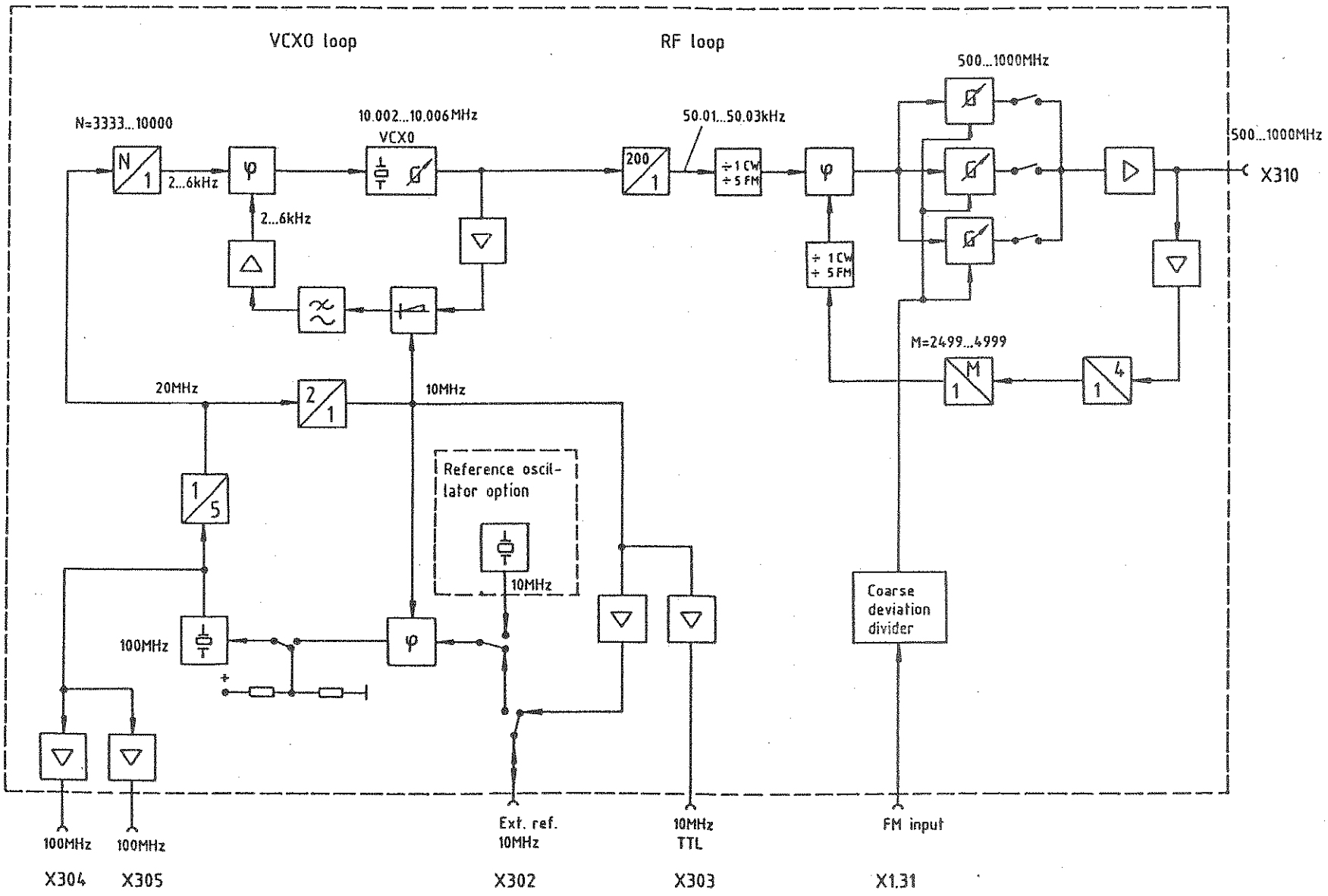


Fig. 5-1 Block diagram of the RF oscillator

5.2 Testing and Adjustment

5.2.1 Adjusting the 100-MHz Crystal Oscillator

→ Plug the module onto the service adapter (included in service kit). Remove the OCXO option if fitted.

→ Connect a voltmeter to anode V506. Adjust the voltage for minimum (9.5 to 11.2 V) using L500.

→ Connect a voltmeter to X11 (jumper X11 remains inserted) and a frequency counter to RF connector X304. Set the frequency to 100 MHz ±100 Hz using trimmer R632. The voltage at X11 is to be 8 ±1.5 V. Change L512 to 0.18 µH if the voltage is too high and to 0.27 µH if the voltage is too low (trimming value).

→ Carry out the fine adjustment with the module closed. Adjust the frequency to 100 MHz ±50 Hz using trimmer R632.

5.2.2 Testing the Synchronization with an External 10-MHz Reference Frequency

→ Set instrument to "External reference frequency".

→ Connect frequency counter to RF connection X304.

→ Apply a frequency of 10 MHz with a level of -7 dBm to connector REF 10 MHz. Operate the signal generator and the frequency counter with the same reference frequency. The output frequency at X304 must change from 99.99995 MHz to 100.0005 MHz when the input frequency changes from 9.999995 MHz to 10.005 MHz.

5.2.3 Adjusting the Reference Oscillator Option (OCXO)

→ Set instrument to "Internal reference frequency".

→ Wait 15 minutes for instrument to warm up.

→ Connect calibrated frequency counter to X304.

→ Adjust the frequency to 100 MHz ±5 Hz using trimmer "REF. FREQ. OPTION".

5.2.4 Testing the VCXO Loop

a) Instrument setting: frequency 500.1 MHz.

→ The tuning voltage at X6 must be > 3 V.
→ The frequency at X3 must be 10.002 MHz.

b) Instrument setting: frequency 500.3 MHz.

→ The tuning voltage at X6 must be > 12 V.
→ The frequency at X3 must be 10.006 MHz.

5.2.5 Frequency Adjustment of the RF Oscillators

→ Apply a DC voltage of 2 V ±0.1 V to X9/2 and 3.

→ Connect an RF analyzer or a frequency counter to RF connection X310.

→ Set trimmers R49, R79, R109 to maximum current.

→ Adjust the frequency according to the following table using trimmers C21, C51 and C81:

Instrument setting	Frequency at X310	Trimmer
520 MHz	500 MHz $\pm$ 5 MHz	C21
700 MHz	655 MHz $\pm$ 5 MHz	C51
900 MHz	825 MHz $\pm$ 5 MHz	C81

5.2.6 Testing the RF Loop

→ Connect a frequency counter and a power meter to RF connection X310. Check the level and the frequency with the following instrument settings.

→ Frequency setting on instrument: 501 MHz
654 MHz
656 MHz
824 MHz
826 MHz
1000 MHz

→ The frequency must agree with the setting.

→ The level must be 0 dBm ±3 dB.

→ The tuning voltage at X9 must be between 2 and 20 V.

5.2.7 Testing the Spurious FM

Test the spurious FM with the module closed.

→ Connect modulation analyzer to RF connection X310.

→ Set various frequencies between 500 and 1000 MHz on the instrument and measure the spurious FM.

→ The spurious FM (weighted to CCITT, RMS) must be < 8 Hz.

5.3 Troubleshooting

Troubleshooting can be readily carried out using the DC voltages and signal levels specified. The inductors L30, L60 and L90 must be checked if the RF oscillators have a high microphony sensitivity. The inductors must be positively adhered to the circuit board.

5.3.1 DC Voltage Values

Source V500	1.5 V ±0.5 V
Emitter V540	2.2 V ±0.3 V
N520/pin 11	3.8 V ±0.5 V
N570/pin 11	3.8 V ±0.5 V
Emitter V230	6.8 V ±1 V
D260/pin 6	8.6 V ±1 V
N400/pin 3	2.5 V ±0.3 V
Emitter V30, V60, V90	-9 V ±1.5 V
Collector V158	6.5 V ±1 V

5.3.2 Signal Level

N520/pin 7	100 MHz	ECL
N580/pin 7	10 MHz	TTL
D202/pin 3	20 MHz	TTL
P1	2 to 6 kHz	TTL
P2	2 to 6 kHz	TTL
X3	10,002 to 10,006 MHz	approx. 4 V_{pp}
X7	10 MHz	approx. 30 mV_{pp}
N260/pin 3	2 to 6 kHz	50 to 150 mV_{pp}
X8	50 kHz	TTL
P3,P4	50 kHz (10 kHz with FM)	TTL

5.3.3 RF Level

The RF levels have been measured using a 500-Ω probe.

P5	500 to 655 MHz	-12 to -3 dBm
P6	655 to 825 MHz	-10 to 0 dBm
P7	825 to 1000 MHz	-12 to -5 dBm
P8	500 to 1000 MHz	+5 to +10 dBm
P9	500 to 1000 MHz	-4 to +5 dBm
P10	500 to 1000 MHz	-12 to -5 dBm
P11	500 to 1000 MHz	-6 to +2 dBm
P12	125 to 250 MHz	+4 to +9 dBm

5.3.4. Testing the Control Signals for the M Divider

Frequency setting on instrument	Control signals at															
	D365								D360							
(MHz)	11	12	13	14	7	6	5	4	11	12	13	14	7	6	5	4
802	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
801.8	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1
801.6	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø
801.2	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø
800.4	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø
800	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø
798	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø
794	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø
786	Ø	1	1	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø
782	Ø	1	1	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
762	Ø	1	1	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
722	Ø	1	1	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
642	Ø	1	1	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
842	Ø	1	Ø	1	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø

5.3.5 Testing the Control Signals for the N Divider

Frequency setting on instrument	Control signals at															
	D206								D205							
(MHz)	11	12	13	14	7	6	5	4	11	12	13	14	7	6	5	4
500.1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
500.6002	Ø	1	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1
1000	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø
999.8	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø
999.4	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø
999.2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø
998.2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø
996.2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø
992.2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø
990.2	Ø	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
980.2	Ø	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
960.2	Ø	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
920.2	Ø	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
900.2	Ø	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
800.2	Ø	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
600.2	Ø	1	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø

5.4 Interfaces

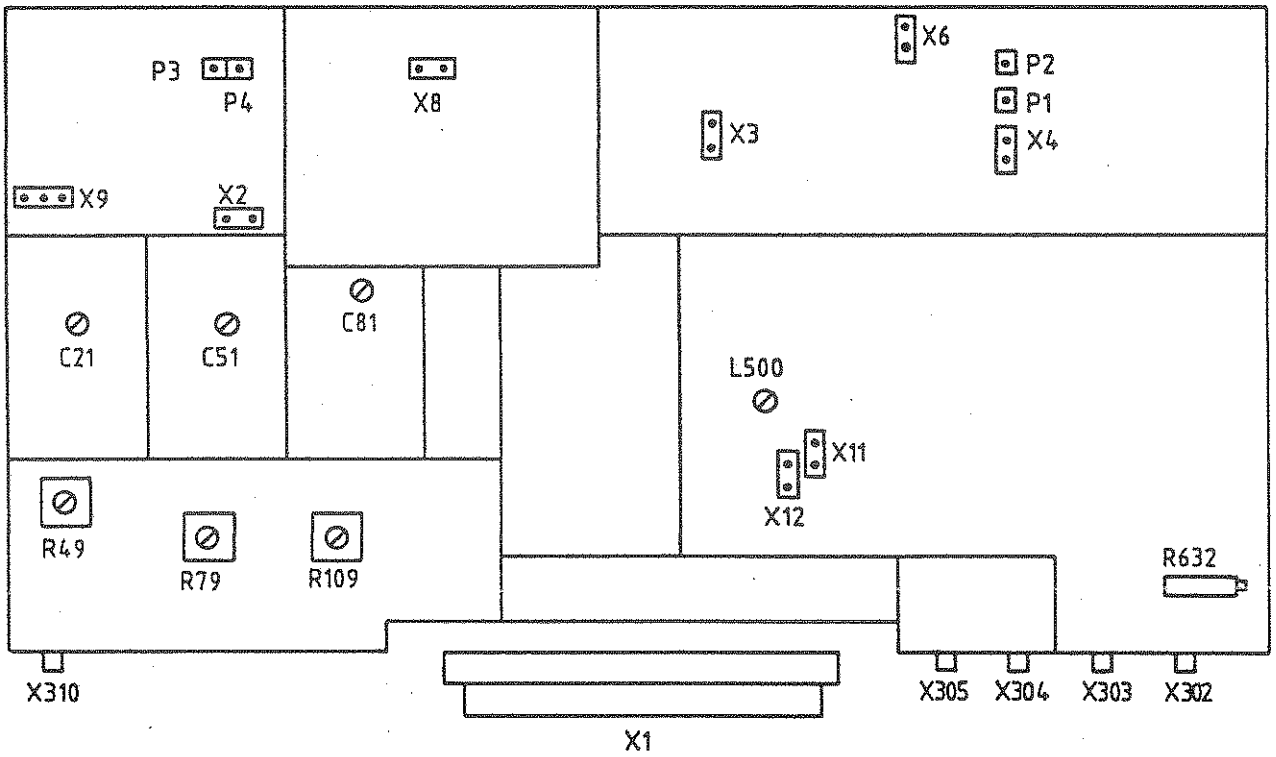


Bild 5-2 Location of the inputs/outputs and trimmers

Terminal	Designation	Frequency	Level
X302	REF.INT/EXT	10 MHz	0 dBm ±3 dB
X303	10-MHz clock	10 MHz	TTL
X304	100-MHz ref.	100 MHz	0 dBm ±3 dB
X305	100 MHz LO	100 MHz	0 dBm ±3 dB
X310	RF output	500 to 1000 MHz	0 dBm ±3 dB
X1.3	Loop OK	DC	0 to +5 V
X1.23	Test	DC	0 to +5 V
X1.31	FM input	50 Hz to 100 kHz	0 to 1 V_{rms}

Serial interface

X1.6	Strobe
X1.8	Data
X1.10	Clock

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	04	1087	ED HF-OSZILLATOR	802.8835.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
B230	EQ 10,006 MHZCL30HC49-1D3 QUARTZ CRYSTAL UNIT QUARZKERAM N. R&S SACHNUMMER	EQ 090.2366	
B500	EQ 100,000MHZ (5.)HC-43/U NUR VAR : 02 QUARTZ CRYSTAL UNIT QUARZKERAM N. R&S SACHNUMMER	EQ 950.6346	
B500	BD QUARZ MIT THERMOSTAT NUR VAR : 04	802.7145	
C3	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C4	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C6	CC 470PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A471JFA	CC 099.8515	
C9	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C10	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C11	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C12	CE 10 UF+-20%25V 7X 5X11 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 3 10/25 20%	CE 023.5980	
C13	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C15	CC 470PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 471	CC 087.6993	
C16	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C17	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C18	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C19	CC 47PF+-2%5X6NPO CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C20	CC 47PF+-5550V COG 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A470JFA	CC 099.8496	
C21	CT 13PF 7RDX13TK50 250V TRIMMER TEKELEC LUFTTRAT5400	CT 450.7283	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C22	CC 270PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A271JFA	CC 099.8867	
C23	CC 270PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A271JFA	CC 099.8867	
C24	CC 47PF+-5550V COG 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A470JFA	CC 099.8496	
C27	CC 6PF+-0,5PF50V NPO CERAMIC CHIP CAPACITOR VITRAMON VJ1206A6RODFA	CC 099.8709	
C29	CC 10PF+-0,5PF50VNPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A100DFA	CC 099.8480	
C30	CC 6PF+-0,5PF50V NPO CERAMIC CHIP CAPACITOR VITRAMON VJ1206A6RODFA	CC 099.8709	
C31	CC 8PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A8RODFA	CC 099.8721	
C33	CC 8PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A8RODFA	CC 099.8721	
C34	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C35	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C38	CC 330PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 331	CC 087.6970	
C40	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C41	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 2 4,7/20 20%	CE 022.8110	
C48	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 1 1/40 20%	CE 022.8185	
C49	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C50	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C51	CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER TEKELEC LUFTTRAT5200	CT 025.7367	
C52	CC 270PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A271JFA	CC 099.8867	
C53	CC 270PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A271JFA	CC 099.8867	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C54	CE 10UF -10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK10/63	CE 022.7650	
C55	CC 10PF+-0,5PF50VNPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A100DFA	CC 099.8480	
C59	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5RODFA	CC 099.8696	
C60	CC 4PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4ROCFA	CC 099.8680	
C61	CC 2PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A2ROCFA	CC 099.8673	
C63	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5RODFA	CC 099.8696	
C64	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C65	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C68	CC 330PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 331	CC 087.6970	
C70	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C71	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 2 4,7/20 20%	CE 022.8110	
C81	CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER TEKELEC LUFTTRAT5200	CT 025.7367	
C82	CC 270PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A271JFA	CC 099.8867	
C83	CC 270PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A271JFA	CC 099.8867	
C87	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C89	CC 10PF+-0,5PF50VNPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A100DFA	CC 099.8480	
C90	CC 2PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A2ROCFA	CC 099.8673	
C91	CC 2PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A2ROCFA	CC 099.8673	
C92	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C93	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C94	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C95	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 2 4,7/20 20%	CE 022.8110	
C98	CC 330PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 331	CC 087.6970	
C99	CC 4PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4ROCFA	CC 099.8680	
C100	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C116	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C139	CC 330PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 331	CC 087.6970	
C140	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 1 1/40 20%	CE 022.8185	
C141	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C156	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C160	CC 10PF+-0,5PF50VNPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A100DFA	CC 099.8480	
C162	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C200	CC 2,2NF+-10%5X6R2000 CAPACITOR VALVO 2222 63051 222	CC 087.7060	
C201 BIS/TO C211	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C212	CC 27PF+-2%4X5NPO CAPACITOR VALVO 2222 678 10279	CC 087.6470	
C220	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C221	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C222	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C223	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C225	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C226	CK 47NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,047UF/5%	CK 099.2917	
C230	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C231	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C232	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C233	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C250	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C251	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C255	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C257	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C259	CE 100UF-10+50% 25V 13X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK100/25	CE 208.4007	
C260	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C261	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C262	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C263	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C264	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO			

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C267			
C268	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C269	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C300	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C301	CK 10NF+-5%63V5RM MKT CAPACITOR WIMA FKS 2/100/0,01UF/5%	CK 099.2869	
C302	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C303	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C304	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C310	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C311	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C315	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C320	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C330	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C335			
C340	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	
C341	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	
C343	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	
C344	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C345	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C346	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C348	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C360	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C362	CC 47PF+-2%5X6NPO CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C364	CC 47PF+-2%5X6NPO CAPACITOR VALVO 2222 678 10479	CC 087.6506	
C366	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C367	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C370	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C371	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C380	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C390	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C400	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C401	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C402	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C410	CK 470NF+-10%160V27X7X17 WIMA MKP10 0,47UF160V 10%	803.0721	
C411	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C412	CK 470NF+-10%160V27X7X17 WIMA MKP10 0,47UF160V 10%	803.0721	
C413	CC 1,5PF+-0,25PF3X4P100 CAPACITOR VALVO 2222 678 03158	CC 087.6193	
C426	CK 220NF+-10%160V18X7X14 MET.POLYPROP.CAPACITOR WIMA MKP10 0,22UF160V 10%	803.0496	
C450	CC 470PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A471JFA	CC 099.8515	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C461	CC 470PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A471JFA	CC 099.8515	
C501	CC 18PF+-2%3X4NPO CAPACITOR VALVO 2222 678 10189	CC 087.6458	
C503	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C504	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C505	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C506	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C507	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C508	CC 220PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A221JFA	CC 099.8850	
C509	CC 15PF+-2%3X4NPO CAPACITOR VALVO 2222 678 10159	CC 087.6441	
C510	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C515	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C516	CC 10PF+-0,25PF3X4NPO CAPACITOR VALVO 2222 678 09109	CC 087.6429	
C520	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C525	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C530	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C540	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C550	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C551	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C561	CC 8,2PF+-0,25PF3X4NPO CAPACITOR VALVO 2222 678 09828	CC 087.6412	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C562	CC 18PF+-2%3X4NPO CAPACITOR VALVO 2222 678 10189	CC 087.6458	
C570	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C575	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C576	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C578	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C579	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C580	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C581	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C582	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C583	CC 15PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A150JFA	CC 099.8750	
C585	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C586	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C590	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C591	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C594	CC 82PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A820JFA	CC 099.8821	
C595	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C596	CC 330PF+-10%3X4R200C CAPACITOR VALVO 2222 63051 331	CC 087.6970	
C597	CC 680PF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 681	CC 087.7019	
C598	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C599	CC 330PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 331	CC 087.6970	
C600	CC 560PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 561	CC 087.7002	
C601	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C602	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C603	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C604	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C610	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C620	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C621	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C622	CC 470PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 471	CC 087.6993	
C623	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C630	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C631	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C633	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C634	CC 68PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A680JFA	CC 099.8815	
C640	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C641	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C642	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C650	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C667	CC 47PF+-5550V COG 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A470JFA	CC 099.8496	
C668	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C700	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
D1	BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX NSC MM74HC4051N	BL 099.9670	
D2	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D15	BL MM74HC4051N 8CH.AN.MUX 8CH.ANALOG MUX/DEMUX NSC MM74HC4051N	BL 099.9670	
D18	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D54	BO LT337AH -ADJ0A5 VREGL VOLTAGE REGULATOR LIN.TECHN. LT337AH	803.6665	
D150	BO UA78M12HC+12V0A5 VREGL VOLTAGE REGULATOR FAIRCHILD MA78M12HC	BO 569.3155	
D200	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
D202	BL MM74HC00N 4X2IN.NAND QUAD 2-INPUT NAND GATE MOTOROLA MC74HC00N	BL 571.3194	
D203	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
D205	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D206	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D207	BL MM74HC162N DEC.COUNT. SYNC.DECADE COUNTER NSC MM74HC162N	BL 099.9570	
D208	BL MM74HC162N DEC.COUNT. SYNC.DECADE COUNTER NSC MM74HC162N	BL 099.9570	
D210	BL MM74HC107N 2XJK-FF CL DUAL J-K FLIPFLOP W.CLEAR NSC MM74HC107N	BL 099.9534	
D250	BL SN74LS02N 4/2INP.NOR IC NOR GATE SN74LS02N TEXAS SN74LS02ON	266.4658	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D255	BL MM74HC390N 2X4B.COUNT DUAL 4-BIT DECADE COUNTER NSC MM74HC390N	BL 099.9640	
D260	BO MC1496L MOD/DEMOD MODULATOR/DEMODULATOR MOTOROLA MC1496L	BO 473.9024	
D310	BL CA3199ESEL 4:1 DIVID DIVIDER	801.8354	
D315	BL SP8647BDG10:1DIVID UHF DIVIDER PLESSEY SP8647BDG	BL 300.6747	
D320	BL 74F00PC 4X2IN.NANDG QUAD-NAND-GATE FAIRCHILD 74F00PC	BL 344.6659	
D330	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
D331	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
D332	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
D333	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
D360	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D365	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D370	BL MM74HC390N 2X4B.COUNT DUAL 4-BIT DECADE COUNTER NSC MM74HC390N	BL 099.9640	
D371	BL MM74HC02N 4X2IN.NORG QUAD 2-INPUT NOR GATE MOTOROLA MC74HC02N	BL 571.3142	
D380	BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP NSC MM74HC74N	BL 571.3171	
D390	BL MM74HC107N 2XJK-FF CL DUAL J-K FLIPFLOP W.CLEAR NSC MM74HC107N	BL 099.9534	
D395	BL MM74HC00N 4X2IN.NAND QUAD 2-INPUT NAND GATE MOTOROLA MC74HC00N	BL 571.3194	
D400	BL MM74HC02N 4X2IN.NORG QUAD 2-INPUT NOR GATE MOTOROLA MC74HC02N	BL 571.3142	
D410	BJ IH401AJE 4X ANALOGSCH ANALOG SWITCH INTERSIL IH401AJE	BJ 334.3870	
D530	BL MC10138L 4B.COUNTER COUNTER MOTOROLA MC10138L	BL 564.8407	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D590	BL SN74LS04N 6/INVERTER HEXINVERTER TEXAS SN74LS04N	266.2010	
D610	BL MC4044P PHASE-L-L PHASE LOCKED LOOP MOTOROLA MC4044P	BL 443.2980	
D630	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL604CP	BJ 300.6199	
D670	SR 5V200OHM 1MAL UM 1 REED RELAY ELECTROL RA 30421051-02	SR 267.5364	
L21	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L23	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L24	LD 0,39UH10%0,30OHM0,710A CHOKE DELEVAN DROSSEL1025-10	LD 067.2811	
L26	LL SPULE	802.7474	802.6455
L31	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L50	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L51	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L53	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L54	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L56	LL SPULE	802.7422	802.6455
L61	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L81	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L83	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L84	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L86	LL SPULE	802.7516	802.6455
L91	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L140	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L156	LD 1,00UH10%1,00OHM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L230	LD 15,0UH10%2,80OHM0,157A CHOKE DELEVAN DROSSEL1025-48	LD 067.3001	
L255	LD 220 UH10%21,0OHM0,052A CHOKE DELEVAN DROSSEL1025-76	LD 067.3147	
L259	LD 4,70UH10%1,20OHM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L304	LD 1,50UH10%0,22OHM0,560A CHOKE DELEVAN DROSSEL 1025-24	LD 067.2886	
L347	LD 2,20UH10%0,40OHM0,415A CHOKE DELEVAN DROSSEL1025-28	LD 067.2905	
L348	LD 2,20UH10%0,40OHM0,415A CHOKE DELEVAN DROSSEL1025-28	LD 067.2905	
L349	LD 2,20UH10%0,40OHM0,415A CHOKE DELEVAN DROSSEL1025-28	LD 067.2905	
L500	LD 115NH/22PF Q50 ALUKERN COIL-CORE TOKO E521 AN-070023	807.3077	
L501	LD 0,39UH10%0,30OHM0,710A CHOKE DELEVAN DROSSEL1025-10	LD 067.2811	
L512	TRIMMWERT / SELECTED		
L550	LD 4,70UH10%1,20OHM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L561	LD 0,39UH10%0,30OHM0,710A CHOKE DELEVAN DROSSEL1025-10	LD 067.2811	
L575	LD 4,70UH10%1,20OHM0,239A CHOKE DELEVAN DROSSEL1025-36	LD 067.2940	
L579	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L595	LD 1,00UH10%1,00OHM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L599	LD 1,00UH10%1,00OHM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L600	LD 0,47UH10%0,35OHM0,660A CHOKE DELEVAN DROSSEL1025-12	LD 067.2828	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L633	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
N10	BO NE5532AFE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532AFE	BO 356.0450	
N220	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N240	BO LM393N 2X COMPAR COMPARATOR NSC LM393N	BO 803.0696	
N260	BO LM311N COMPAR COMPARATOR NSC LM311N	BO 394.8755	
N300	BM OM345 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM345	BM 285.1596	
N400	BO LF356BJ BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF356J	300.6053	
N440	BO LM393N 2X COMPAR COMPARATOR NSC LM393N	BO 803.0696	
N520	BL MC10H116L 3X L.RECEIV LINE RECEIVER MOTOROLA MC10H116L	803.0538	
N570	BL MC10H116L 3X L.RECEIV LINE RECEIVER MOTOROLA MC10H116L	803.0538	
N580	BJ SN75140P 2XLINE REC LINE RECEIVER TEXAS INST SN75140P	801.8254	
N620	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N650	BO LM393N 2X COMPAR COMPARATOR NSC LM393N	BO 803.0696	
N660	BO LM393N 2X COMPAR COMPARATOR NSC LM393N	BO 803.0696	
P1	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
BIS/TO P4	1-POLIG		
R1	RL 0,35W 402 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/402OHM-F-D	RL 083.0326	
R2	RL 0,35W200 OHM+-0,1%TK25 RESISTOR DRALORIC SMA0207/200OHM-B-E	RL 083.7808	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R3	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R4	RL 0,35W 51,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/51,1OHM-F-D	RL 082.9536	
R5	RL 0,35W24,90 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/24,9OHM-F-D	RL 082.9236	
R6	RL 0,35W12,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1OHM-F-D	RL 082.8930	
R7	RL 0,35W6,19 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 6,19 OHM 1% TK50	RL 099.8050	
R8	RL 0,35W6,19 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 6,19 OHM 1% TK50	RL 099.8050	
R9	RL 0,35W 274 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/274OHM-F-D	RL 083.0178	
R10	RL 0,35W 511 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/511OHM-F-D	RL 083.0426	
R11	RL 0,35W15 OHM 1%TK50 RESISTOR DRALORIC SMA0207/15OHM-F-D	RL 082.9020	
R12	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R13	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R14	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R15	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R16	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R24	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R26	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R27	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R29	RG 47,5 OHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 47,5OHM F T	RG 007.5566	
R30	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R35	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R40	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R41	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R42	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R45	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R47	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R48	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R49	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R50	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R51	RL 0,35W 3,24KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,24K-F-D	RL 082.6843	
R52	RL 0,35W 332 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/332OHM-F-D	RL 083.0255	
R54	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R56	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R57	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R59	RG 47,5 OHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 47,5OHM F T	RG 007.5566	
R60	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R65	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R70	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R71	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R72	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R75	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R77	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R78	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R79	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R84	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R86	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R87	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R89	RG 47,5 OHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 47,5OHM F T	RG 007.5566	
R90	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R95	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R100	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R101	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R102	RL 0,35W 39,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/39,2OHM-F-D	RL 082.9420	
R105	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R107	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R108	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R109	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R116	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R155	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R156	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R157	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R160	RG 33,2 OHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 33,2OHM F T	RG 007.5520	
R161	RG 121 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 121OHM F T	RG 006.8903	
R162	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R163	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R164	RG 215 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 215OHM2% TK	006.8961	
R165	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R166	RL 0,35W 475 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/475K-F-C	RL 083.2593	
R168	RG 121 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 121OHM F T	RG 006.8903	
R169	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R200	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R201	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R202	RL 0,21W 221 OHM+-1%TK50 RESISTOR RESISTA MK1 221OHM 1% TK50	RL 092.1367	
R205	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R210	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R211	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R221	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R222	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R223	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R225	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	
R226	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R230	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R231	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R233	RL 0,35W 150 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/150OHM-F-D	RL 082.9942	
R234	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R235	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R236	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R240	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R241	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R242	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R243	RL 0,35W 33,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/33,2K-F-C	RL 083.1674	
R244	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R245	RL 0,35W 39,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/39,2K-F-C	RL 083.1745	
R249	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R250	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R251	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R252	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R253	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R254	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R255	RL 0,35W 150 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/150OHM-F-D	RL 082.9942	
R256	RL 0,35W 6,81KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/6,81K-F-C	RL 082.2560	
R257	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	
R258	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R259	RL 0,35W 274 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/274OHM-F-D	RL 083.0178	
R260	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.1039	
R261	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.1039	
R262	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R263	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R264	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R265	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R266	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R267	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R300	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R302	RG 26,1 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 26,1OHM2% TK	006.8749	
R303	RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 82,5OHM F T	RG 006.8861	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R310	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R311	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R312	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R315	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R316	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	
R320	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R333	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R334	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R400	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R401	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R402	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R403	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R404	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R405	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R406	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R407	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R410	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R411	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R412	RL 0,35W 33,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/33,2K-F-C	RL 083.1674	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R420	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R425	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/15K-F-D	RL 083.1400	
R428	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	
R429	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R430	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R440	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R441	RL 0,35W 33,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/33,2K-F-C	RL 083.1674	
R442	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R445	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R450	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R451	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R460	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R461	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R500	RG 34,8 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 34,8OHM2% TK	006.8778	
R501	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 4,64KOHM 2%	007.0712	
R502	RG 2,37KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 2,37KOHM 2%	007.0641	
R503	RG 3,32KOHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 3,32KOHM FT	RG 007.5789	
R504	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R505	RL 0,35W 825 OHM+-1%TK50 RESISTOR DRALORIC SMA 0207/825OHM-F-C	RL 082.2502	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R506	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R509	RL 0,21W 82 OHM2% UNGEW. RESISTOR RESISTA MK1 82OHM 2% UNGEW.	RL 092.5940	
R510	RG 383 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 383OHM2% TK	006.9022	
R512	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R513	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R520	RG 215 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 215OHM2% TK	006.8961	
R521	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R522	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R525	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R530	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R531	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R532	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R540	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R541	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.1039	
R542	RL 0,35W 6,81KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/6,81K-F-C	RL 082.2560	
R543	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R560	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R570	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R571	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R575	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R578	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R579	RG 562 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 562OHM F T	RG 006.9068	
R580	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R581	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R582	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R583	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R590	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R591	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R592	RL 0,35W 475 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/475K-F-C	RL 083.2593	
R593	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R594	RG 2,15KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 2,15KOHM 2%	007.0635	
R595	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R597	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R600	RL 0,35W22,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/22,1OHM-F-D	RL 082.9188	
R601	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R602	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R603	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R604	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R610	RL 0,35W 332 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/332K-F-C	RL 083.2441	
R611	RL 0,35W 332 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/332K-F-C	RL 083.2441	
R612	RL 0,35W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-C	RL 082.2602	
R620	RL 0,35W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-C	RL 082.2602	
R630	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R631	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R632	RS 0,75W10KOHM+-10%CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-10 KOHM+-10%	RS 037.7396	
R633	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R640	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R642	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/15K-F-D	RL 083.1400	
R650	RL 0,35W 332 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/332OHM-F-D	RL 083.0255	
R651	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/15K-F-D	RL 083.1400	
R652	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R653	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R654	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R655	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R656	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
R660	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R661	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R665	RL 0,35W 33,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/33,2K-F-C	RL 083.1674	
R666	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	
R667	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R668	RL 0,.35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R669	RL 0,35W 39,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/39,2K-F-C	RL 083.1745	
R671	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R672	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
V12	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
V21	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V22	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V30	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	
V40	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V45	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V48	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V50	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V51	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V52	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V60	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	

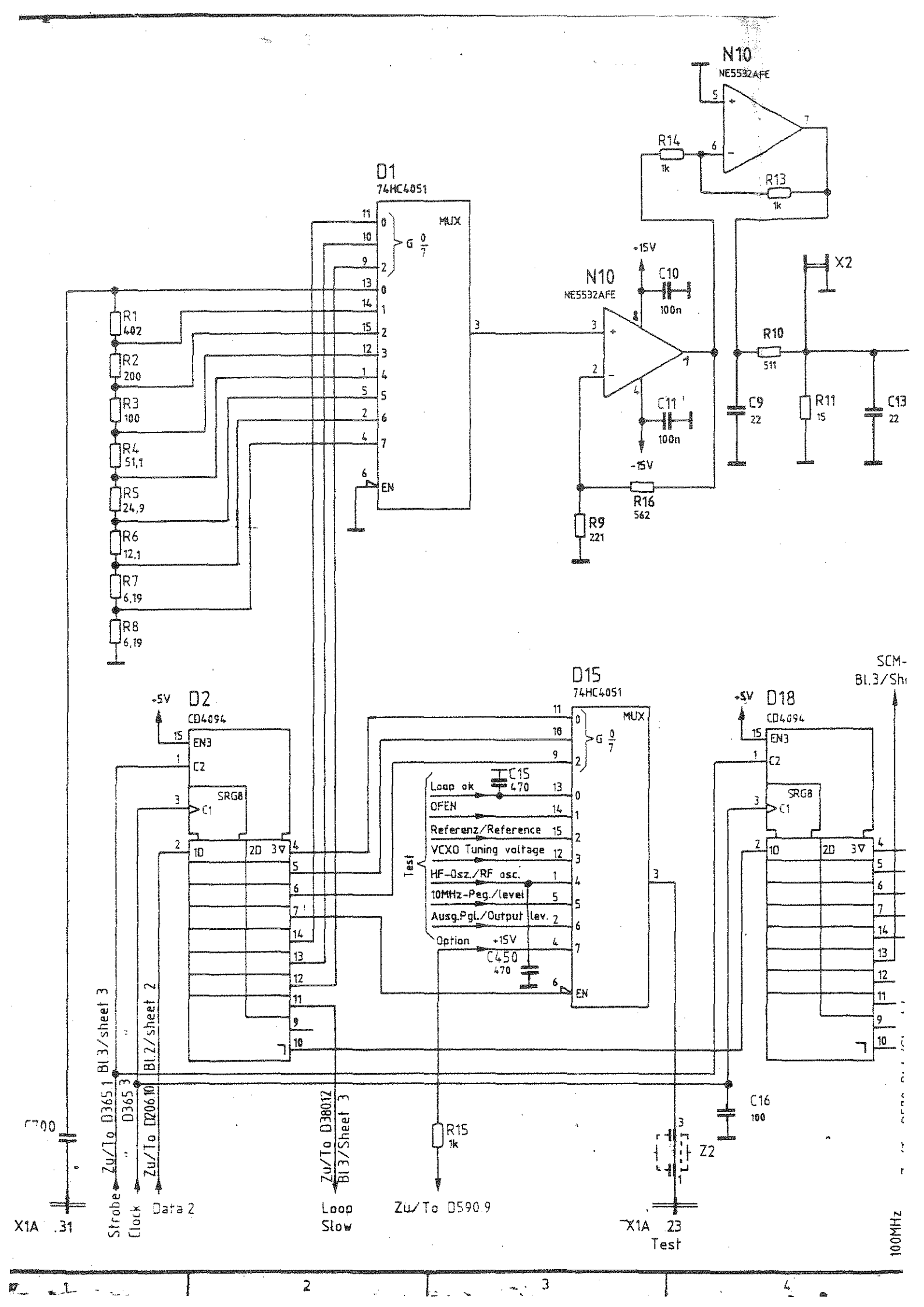
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V70	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V75	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V78	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V81	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V82	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V90	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	
V100	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V105	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V108	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V115	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V145	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V158	BM MAR8 BB.AMPL BROADBAND AMPLIFIER MCL MAR8	656.4720	
V162	AE BAR18 SCHOTTKYDI DIODE THOMSON BAR18	007.3440	
V175	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V200	AK 2N2369A NPN 15V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
V210	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V211	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V220	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V230	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	

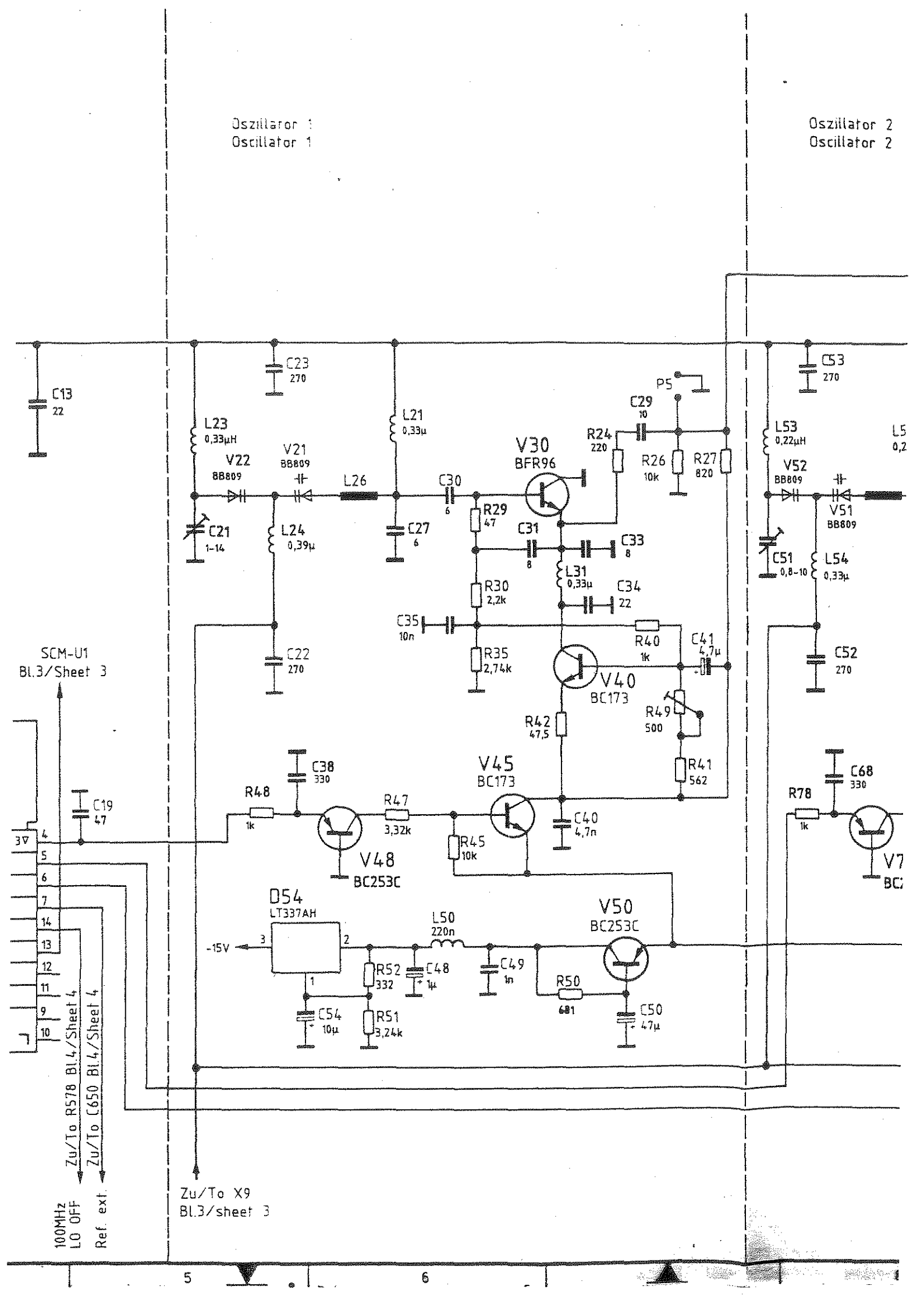
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V232	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V233	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V400	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V401	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V402	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V403	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V405	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V412	AE BZX79/C10 0,5W Z-DI ZENER DIODE VALVO BZX79/C10	AE 012.2510	
V420	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V425	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V460	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V500	AK BFY90 NPN 15V 25MA TRANSISTOR VALVO BFY90	AK 010.4550	
V506	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
V512	AE BB909B 25/ 3PF CDI TUNING DIODE VALVO BB909B	AE 092.9600	
V550	AK BFY90 NPN 15V 25MA TRANSISTOR VALVO BFY90	AK 010.4550	
V590	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V650	AL BD438 PNP 45V 4A0 TRANSISTOR VALVO BD438	AL 010.0403	
V651	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V652	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteiliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	04	1087	ED HF-OSZILLATOR	802.8835.01 SA	30

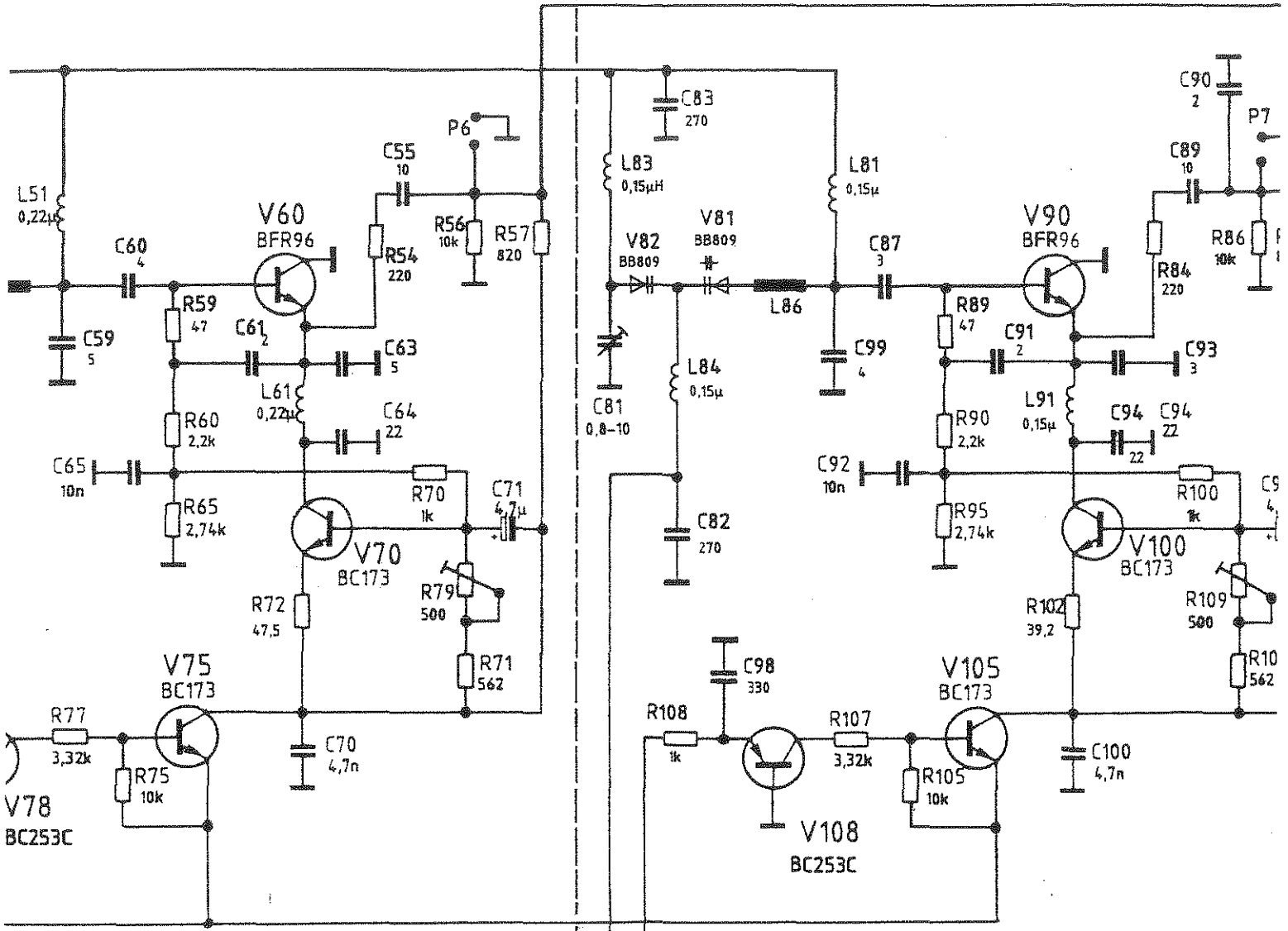
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V670	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V671	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V672	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
W1	DX HF-KABEL	802.6578	802.6455
X1	FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR PANDUIT 100-232-033/999	FP 514.4550	
X2	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X3	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X4	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X6	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X7	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003 2-POLIG	VL 088.4542	
X8	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003 2-POLIG	VL 088.4542	
X9	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003 3-POLIG	VL 088.4542	
X11	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003 2-POLIG	VL 088.4542	
X12	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003 2-POLIG	VL 088.4542	
X302	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X303	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X304	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X305	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X310	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
Z2	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
BIS/TO Z8			- ENDE -


N10
NE5532AFE
R14
1k
R13
1k
D1
74HC4051
MUX
G 0/7
EN
R1
402
R2
200
R3
100
R4
51,1
R5
24,9
R6
12,1
R7
6,19
R8
6,19
+15V
C10
100n
X2
R10
511
C9
22
R11
15
C13
22
C11
100n
-15V
R16
562
R9
221
D15
74HC4051
D2
CD4094
D18
CD4094
EN3
C2
SRG8
C1
1D
2D
3▽
C15
470
Loop ok
OFEN
Referenz/Reference
VCXO Tuning voltage
HF-Osz./RF osc.
10MHz-Peg./level
Ausg.Pgl./Output lev.
Option
Test
C450
470
C16
100
Z2
R15
1k
C700
SCM-
Bl.3/Sh
Bl3/sheet 3
Bl2/sheet 2
Zu/To D3651
Zu/To D3653
Zu/To D2061
Zu/To D3801
Bl3/Sheet 3
Zu/To D590.9
X1A .31
Strobe
Clock
Data 2
Loop
Slow
X1A 23
Test
100MHz

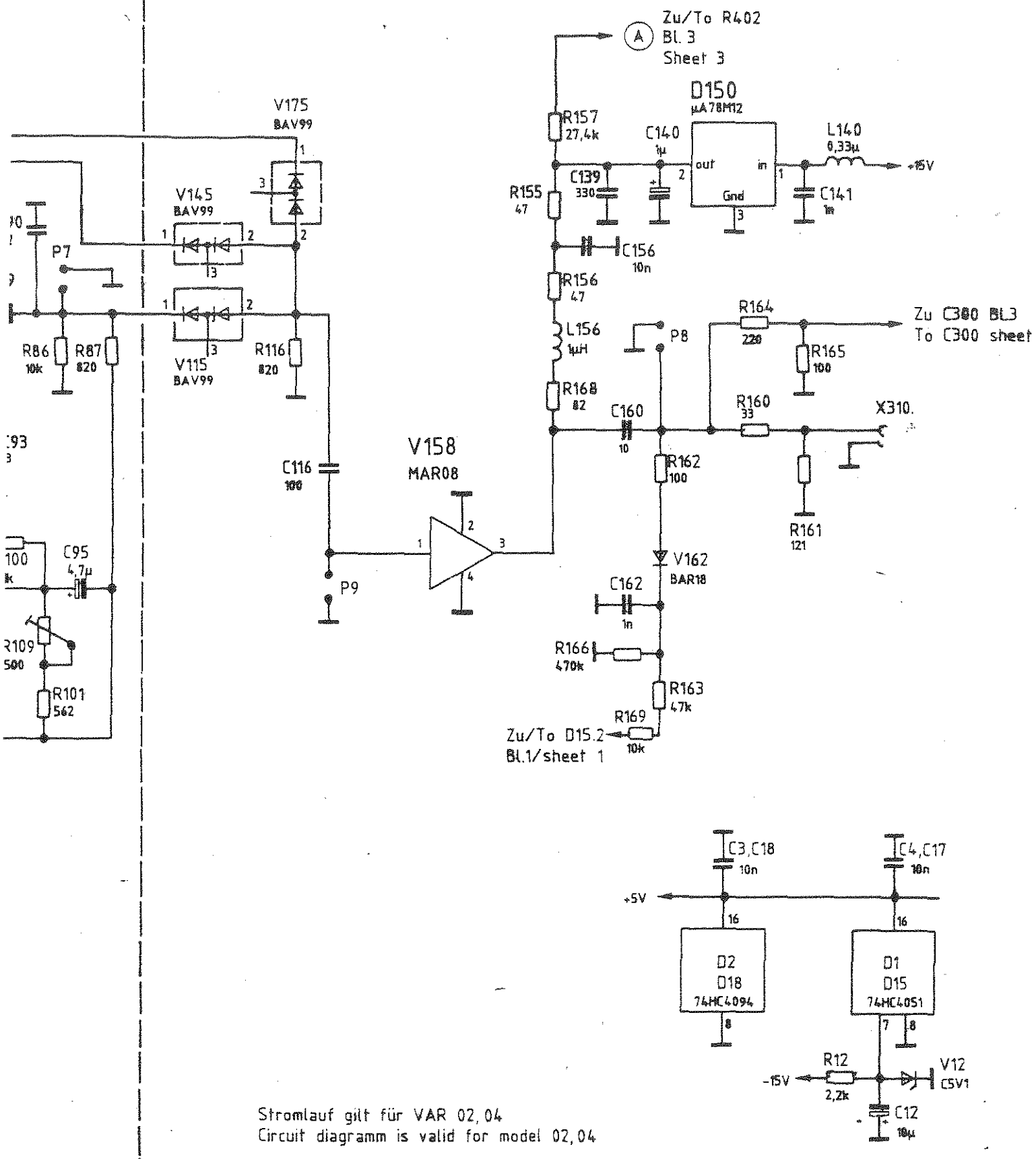

Oszillator 1
Oscillator 1
Oszillator 2
Oscillator 2
C13 22
C23 270
L23 0,33µH
V22 BB809
V21 BB809
L21 0,33µ
L26
C30 6
V30 BFR96
P5
C29 10
R24 220
R26 10k
R27 820
C53 270
L53 0,22µH
V52 BB809
V51 BB809
C21 1-14
L24 0,39µ
C27 6
R29 47
C31 8
C33 8
L31 0,33µ
C34 22
R30 2,2k
C35 10n
R40 1k
C41 4,7µ
R35 2,74k
V40 BC173
C51 0,8-10
L54 0,33µ
C52 270
C22 270
R42 47,5
R49 500
R41 562
SCM-U1
Bl.3/Sheet 3
C19 47
C38 330
R48 1k
R47 3,32k
V45 BC173
R45 10k
C40 4,7n
V48 BC253C
C68 330
R78 1k
V7
BC
D54 LT337AH
-15V
L50 220n
V50 BC253C
R52 332
C48 1µ
C49 1n
R50 681
C54 10µ
R51 3,24k
C50 47µ
3V
4
5
6
7
14
13
12
11
9
10
Zu/To R578 Bl.4/Sheet 4
Zu/To C650 Bl.4/Sheet 4
100MHz LO OFF
Ref. ext.
Zu/To X9
Bl.3/sheet 3
5
6

Oszillator 3
Oscillator 3



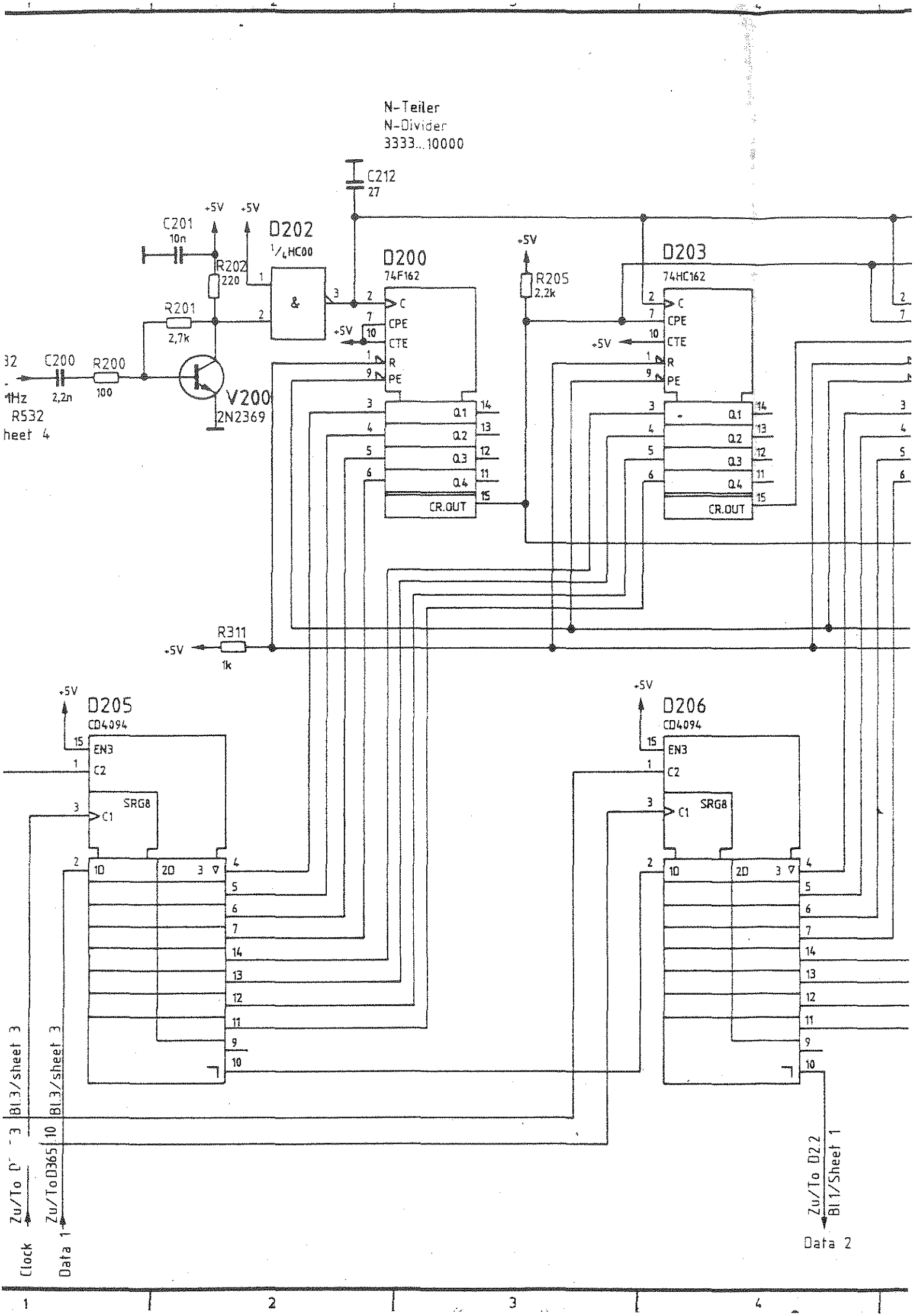
Klebekante für Druckerzeugnis; durch diese Zone möglichst nur Leitungen führen.

Verstärker
Amplifier

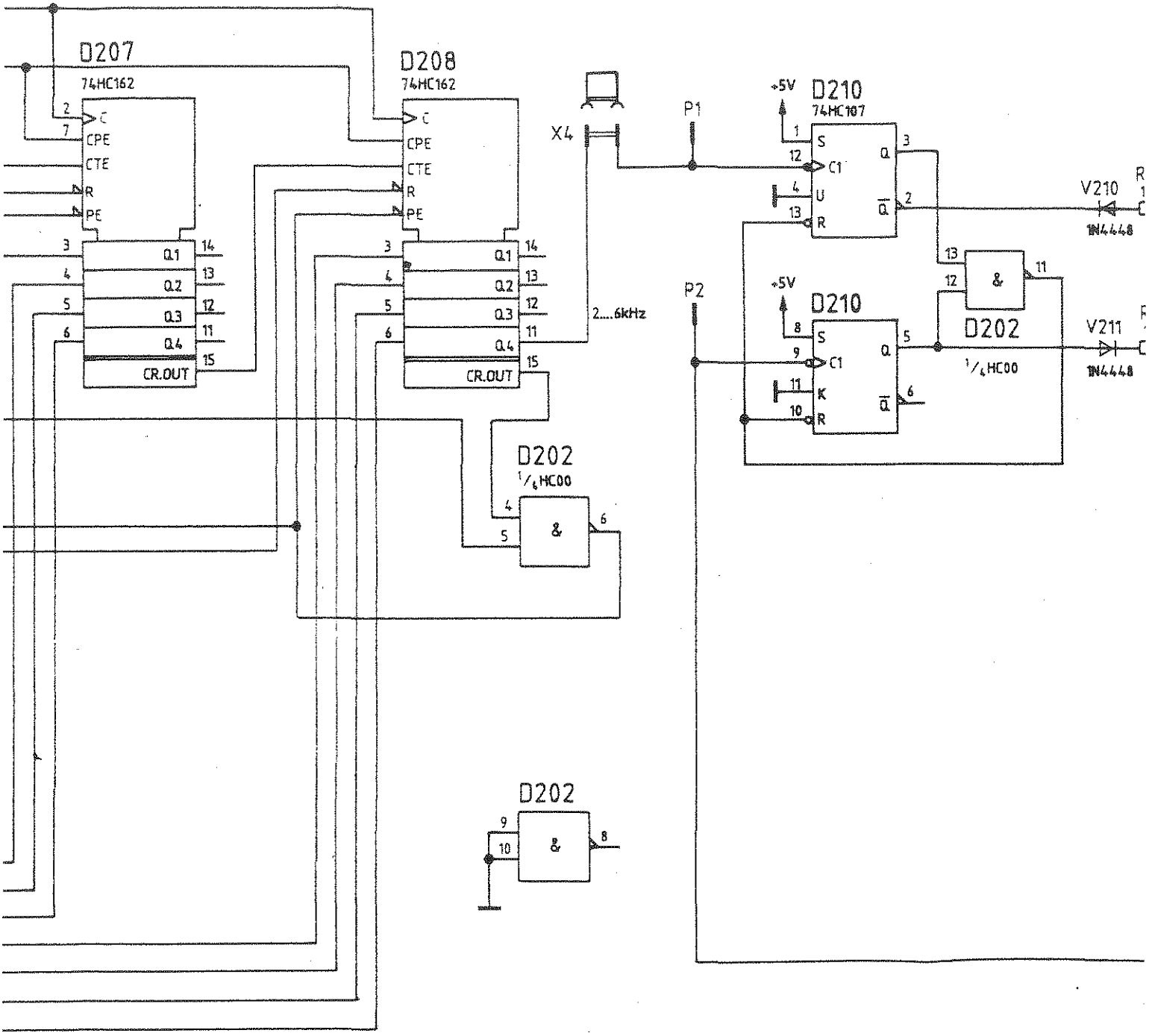


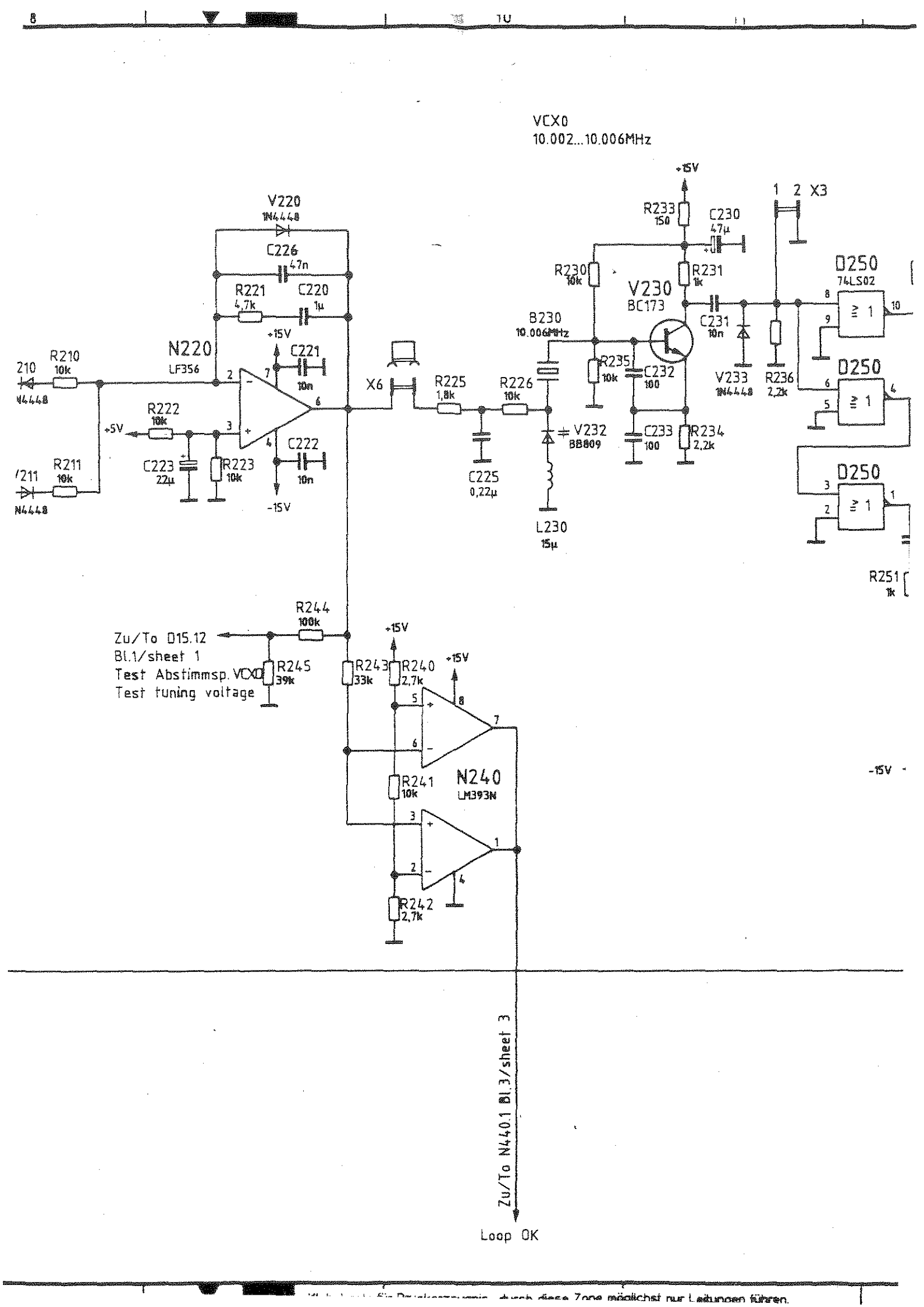
Stromlauf gilt für VAR 02,04
Circuit diagramm is valid for model 02,04

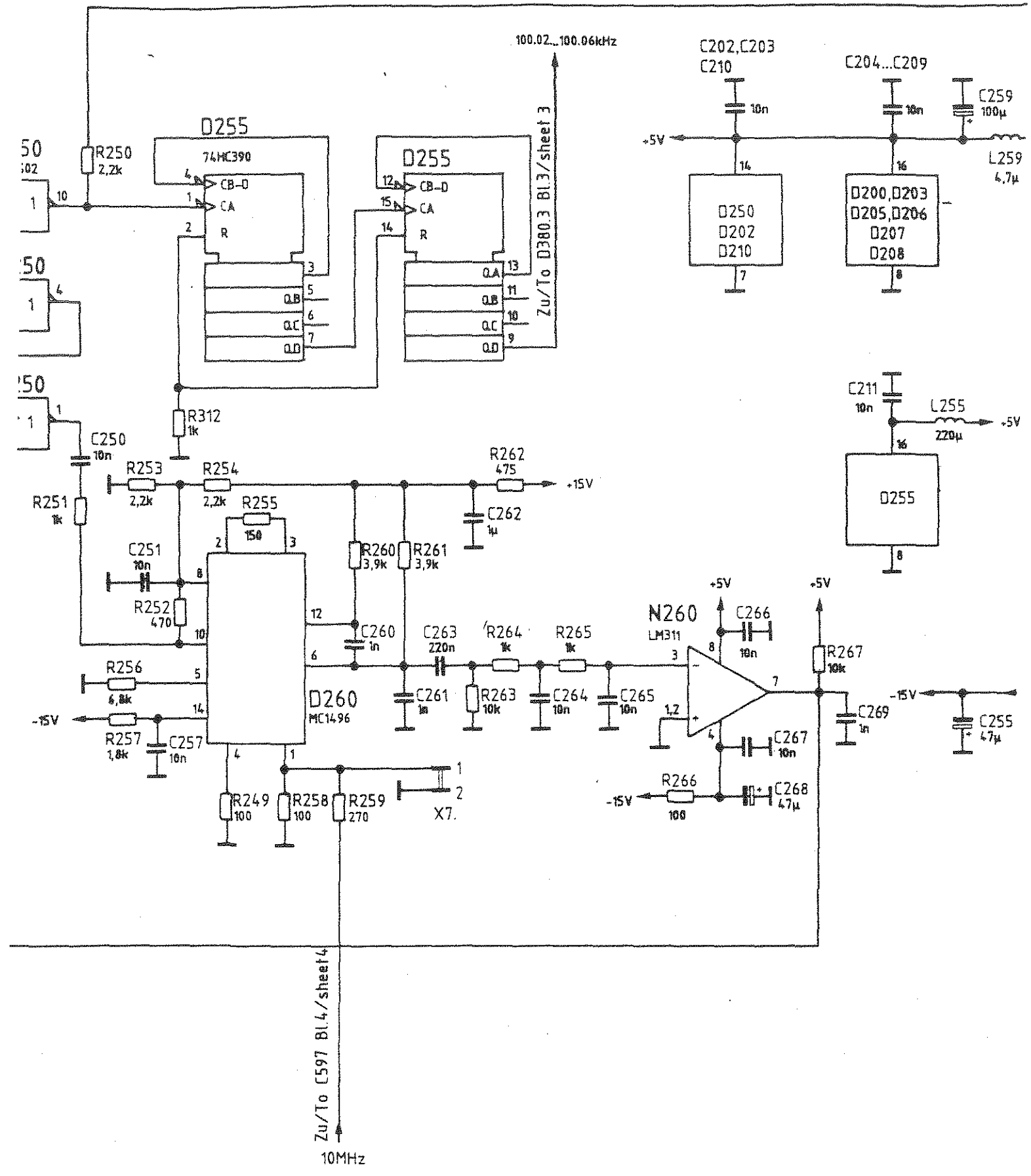
Stromlauf zu: HF-Oszillator / RF oscillator	Z	Zeichn.-Nr. 802. 8835
reg. i. V. 802.2020 V	erste Z.	


N-Teiler
N-Divider
3333...10000
C212
27
C201
10n
+5V
+5V
D202
1/4HC00
R202
220
R201
2,7k
C200
2,2n
R200
100
V200
2N2369
R532
heet 4
D200
74F162
D203
74HC162
R205
2,2k
R311
1k
CPE
CTE
PE
CR.OUT
D205
CD4094
D206
CD4094
EN3
C2
C1
SRG8
1D
2D
Bl 3/sheet 3
Bl 3/sheet 3
Zu/To D365
Zu/To D2.2
Bl 1/Sheet 1
Clock
Data 1
Data 2

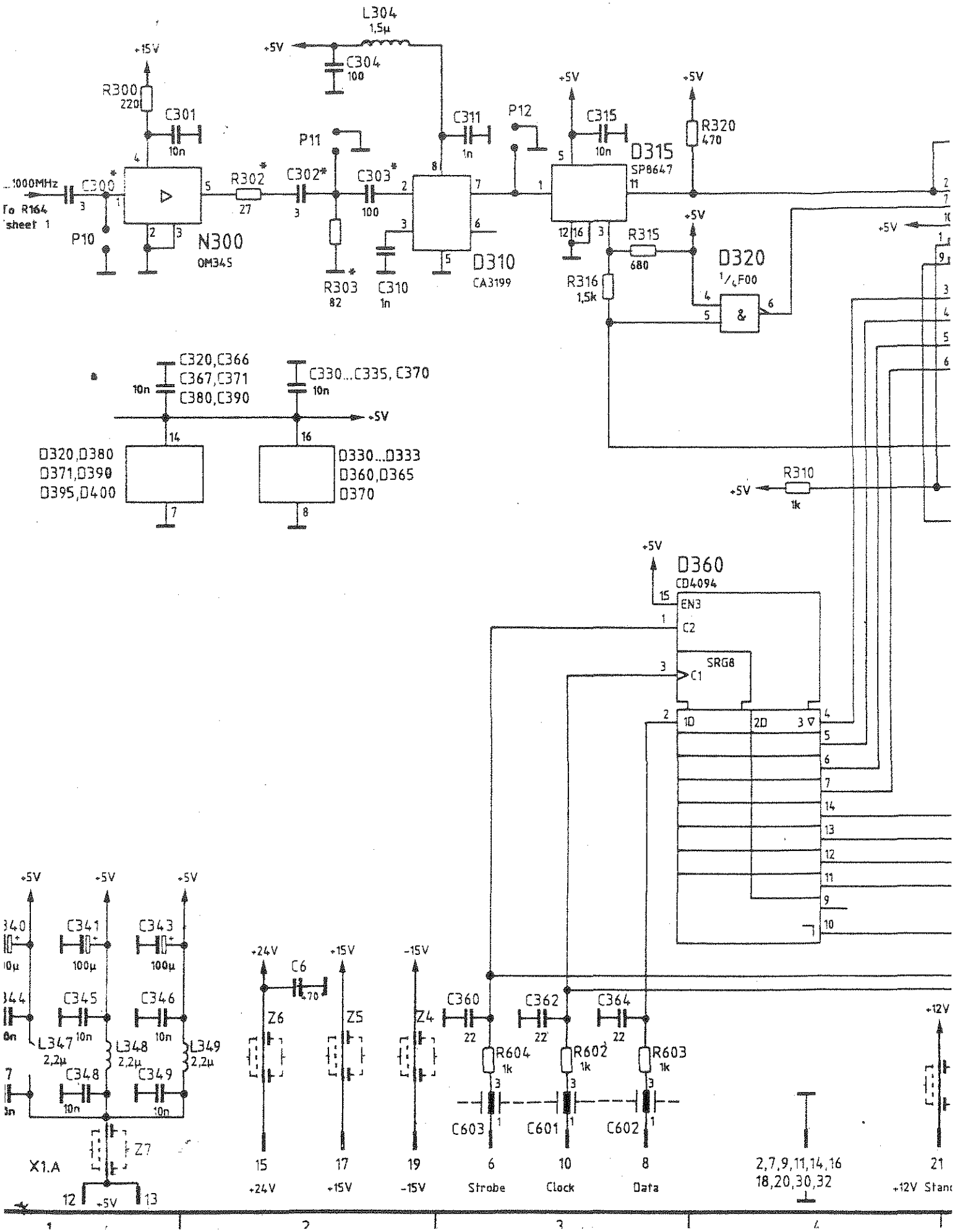
Phasendetektor
Phase detector



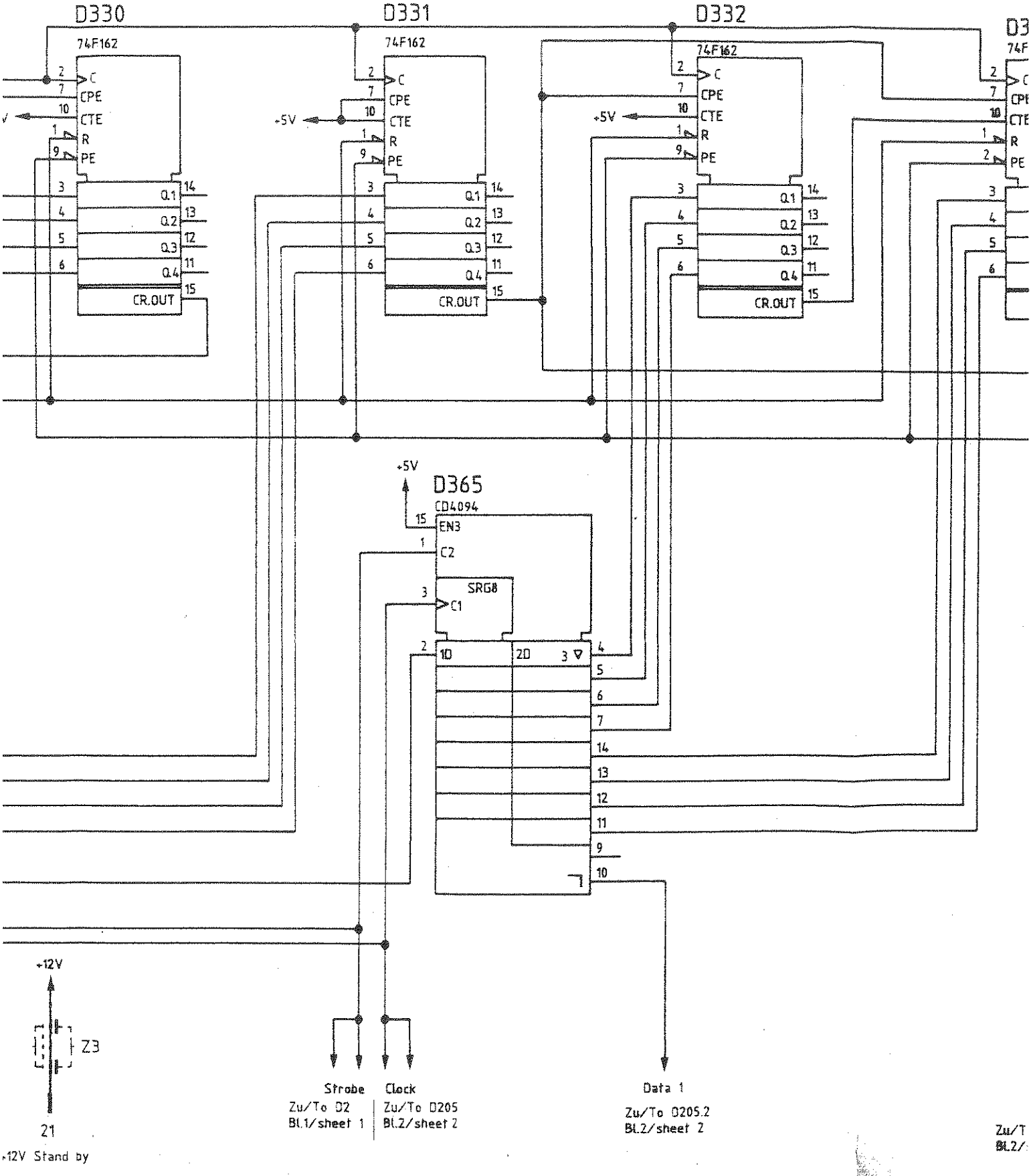

VCXO
10.002...10.006MHz
+15V
V220
1N4448
C226
47n
R221
4,7k
C220
1µ
N220
LF356
C221
10n
C222
10n
-15V
R222
10k
+5V
R223
10k
C223
22µ
R210
10k
R211
10k
X6
R225
1,8k
R226
10k
C225
0,22µ
B230
10.006MHz
V232
BB809
L230
15µ
R233
150
C230
47µ
R230
10k
R231
1k
V230
BC173
C231
10n
R235
10k
C232
100
C233
100
R234
2,2k
V233
1N4448
R236
2,2k
1 2 X3
D250
74LS02
R251
1k
R244
100k
Zu/To D15.12
Bl.1/sheet 1
Test Abstimmsp. VCXO
Test tuning voltage
R245
39k
R243
33k
R240
2,7k
R241
10k
N240
LM393N
R242
2,7k
Zu/To N440.1 Bl.3/sheet 3
Loop OK

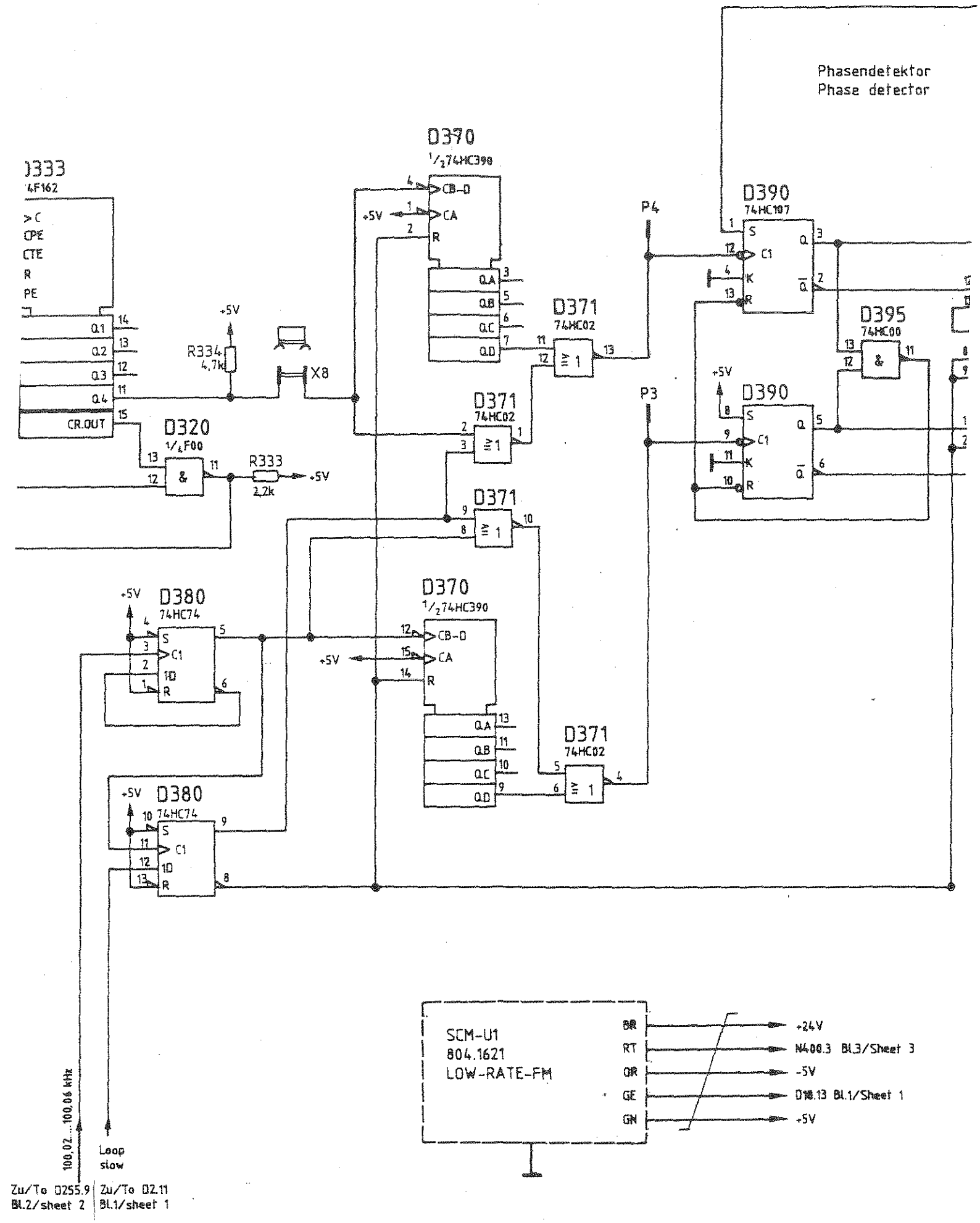


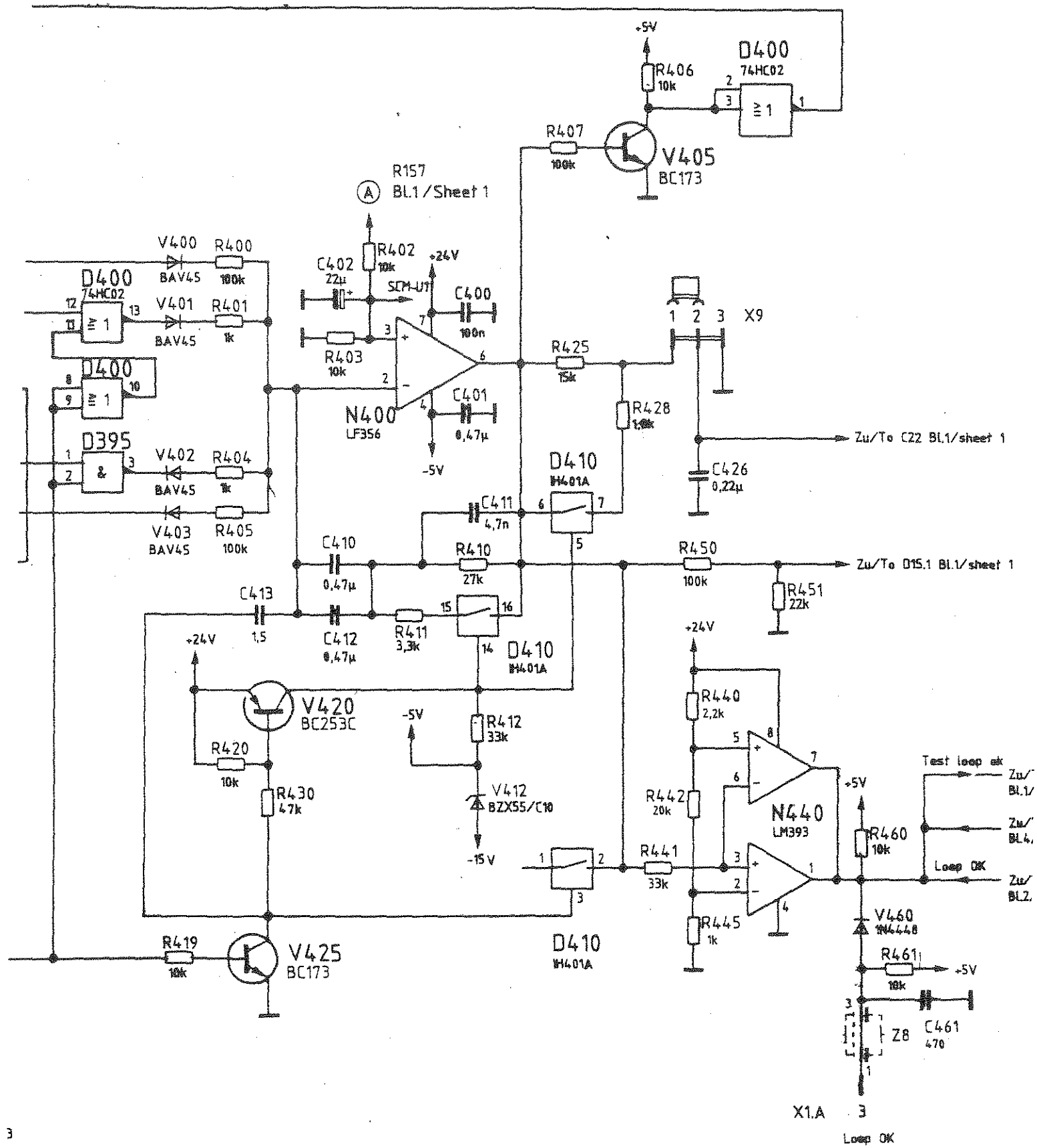
Stromlauf zu	HF-Oszillator / RF oscillator	Z	Zeichn.-Nr. 802. 883
	req. i. V. 802.2020 V	erste Z.	


L304
1,5µ
+5V
C304
100
+15V
R300
220
C301
10n
P11
C311
1n
P12
+5V
C315
10n
D315
SP8647
+5V
R320
470
...1000MHz
C300
To R164
sheet 1
P10
N300
OM345
R302
27
C302*
C303*
100
R303
82
C310
1n
D310
CA3199
R315
680
R316
1,5k
+5V
D320
1/4F00
&
C320,C366
C367,C371
C380,C390
10n
C330...C335, C370
10n
+5V
D320,D380
D371,D390
D395,D400
D330...D333
D360,D365
D370
R310
1k
+5V
D360
CD4094
EN3
C2
SRG8
C1
1D
2D
3D
C340
C341
C343
100µ
100µ
C344
C345
C346
10n
10n
L347
2,2µ
L348
2,2µ
L349
2,2µ
C348
C349
10n
10n
Z7
X1.A
+5V
+24V
C6
470
Z6
Z5
Z4
+15V
-15V
C360
C362
C364
22
22
22
R604
1k
R602
1k
R603
1k
C603
C601
C602
+12V
15
+24V
17
+15V
19
-15V
6
Strobe
10
Clock
8
Data
2,7,9,11,14,16
18,20,30,32
21
+12V

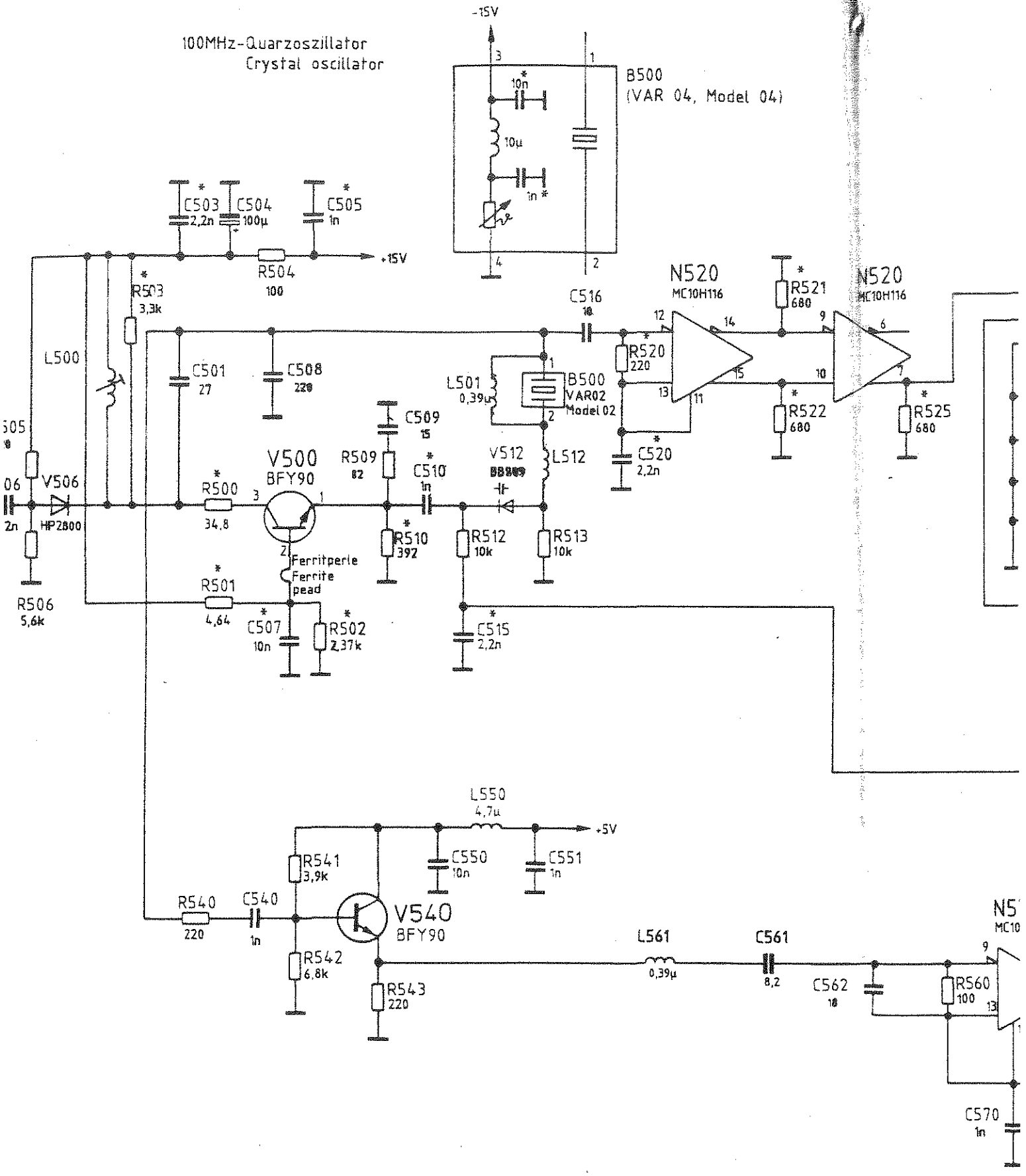
M-Teiler
M-Divider
M = 2499....4999

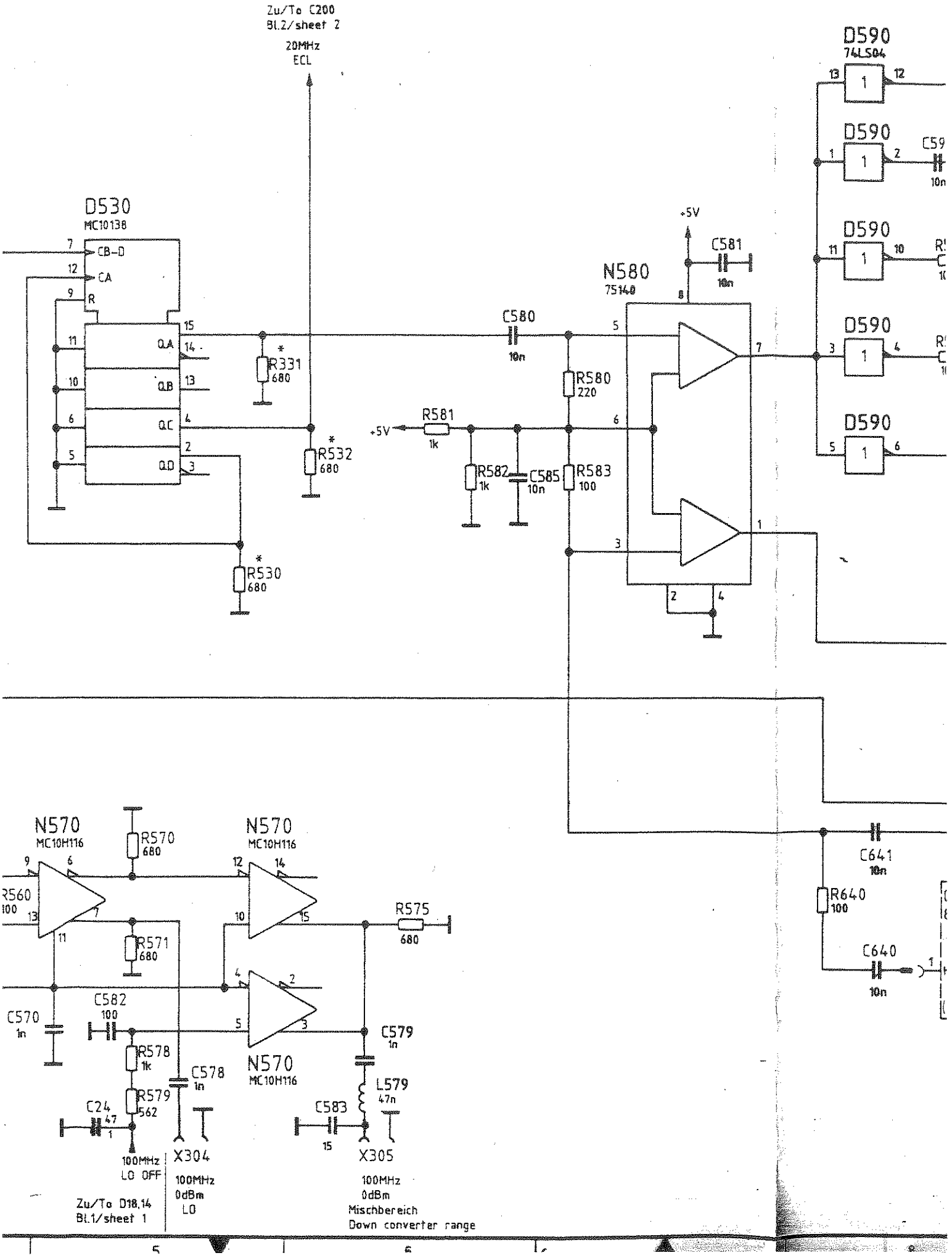


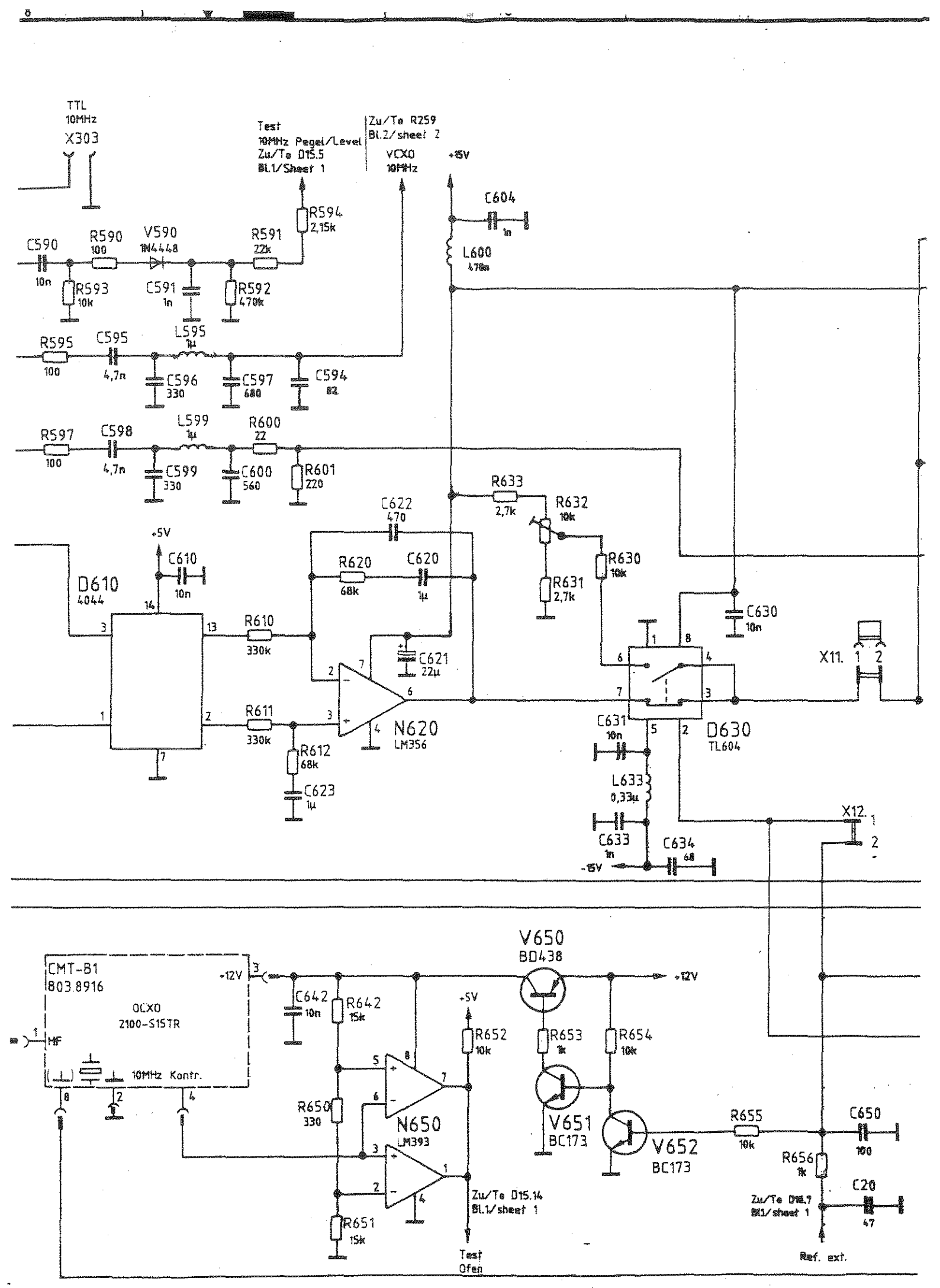




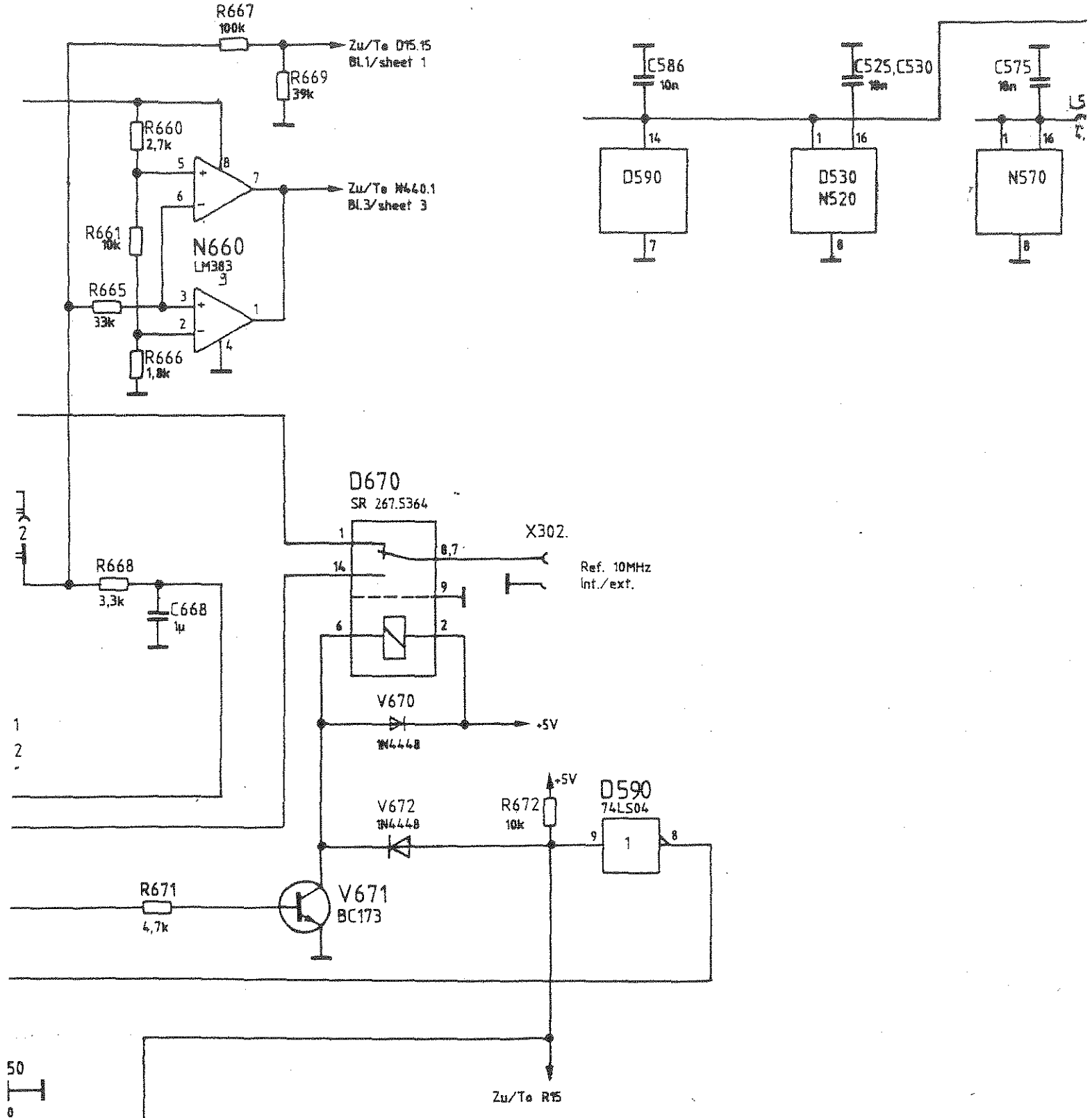
Stromlauf zu: HF-Oszillator / RF oscillator	Z	Zeichn.-Nr. 802. 8835 S	
reg. i. V. 802.2020 V	erste Z.		

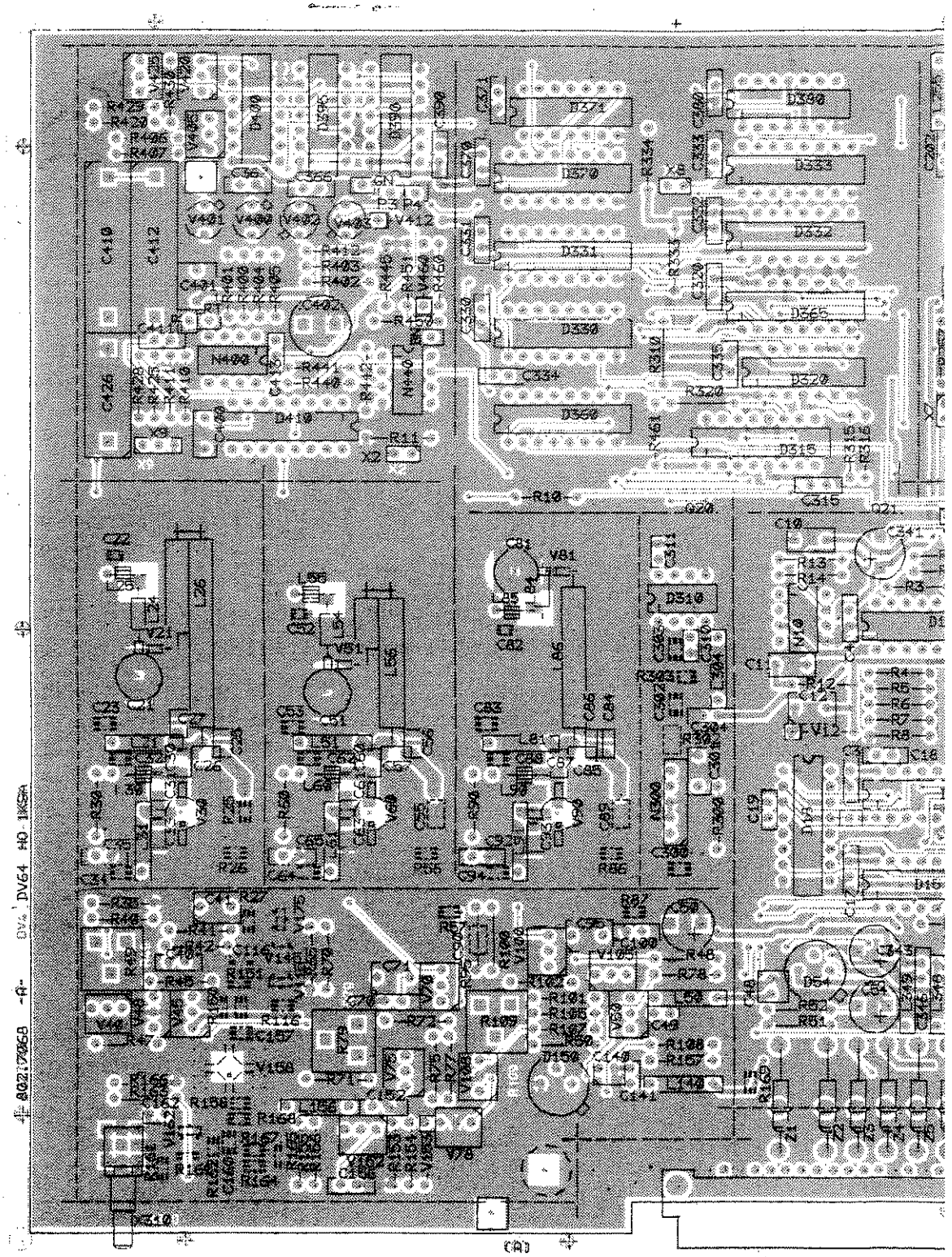

100MHz-Quarzoszillator
Crystal oscillator
-15V
B500
(VAR 04, Model 04)
10n
10µ
1n *
C503
2,2n
C504
100µ
C505
1n
R504
100
+15V
R503
3,3k
C516
18
N520
MC10H116
R521
680
N520
MC10H116
L500
C501
27
C508
220
L501
0,39µ
B500
VAR02
Model 02
R520
220
C509
15
V500
BFY90
R509
82
C510
1n
V512
BB809
L512
C520
2,2n
R522
680
R525
680
V506
HP2800
R500
34,8
R510
392
R512
10k
R513
10k
Ferritperle
Ferrite
pead
R501
4,64
R506
5,6k
C507
10n
R502
2,37k
C515
2,2n
L550
4,7µ
+5V
R541
3,9k
C550
10n
C551
1n
R540
220
C540
1n
V540
BFY90
R542
6,8k
R543
220
L561
0,39µ
C561
8,2
C562
18
R560
100
C570
1n


Zu/To C200
Bl.2/sheet 2
20MHz
ECL
D530
MC10138
CB-D
CA
R
Q.A
Q.B
Q.C
Q.D
R331
680
R532
680
R530
680
C580
10n
N580
75140
+5V
C581
10n
R580
220
R581
1k
R582
1k
C585
10n
R583
100
D590
74LS04
C59
10n
C641
10n
R640
100
C640
10n
N570
MC10H116
R570
680
R560
100
R571
680
R575
680
C582
100
C570
1n
R578
1k
C578
1n
R579
562
C24
47
100MHz
LO OFF
X304
100MHz
0dBm
LO
C579
1n
L579
47n
C583
X305
100MHz
0dBm
Mischbereich
Down converter range
Zu/To D18,14
Bl.1/sheet 1



Klebekante für Druckerzeugnis ; durch diese Zone möglichst nur Leitungen führen.


R667
100k
Zu/To D15.15
Bl.1/sheet 1
R669
39k
R660
2,7k
5
8
7
6
Zu/To N440.1
Bl.3/sheet 3
R661
10k
N660
LM383
R665
33k
3
2
1
4
R666
1,8k
C586
10n
14
D590
7
C525,C530
10n
1
16
D530
N520
8
C575
10n
1
16
N570
8
D670
SR 267.5364
1
14
8,7
9
6
2
X302.
Ref. 10MHz
Int./ext.
R668
3,3k
C668
1µ
V670
1N4448
+5V
V672
1N4448
R672
10k
+5V
D590
74LS04
9
1
8
R671
4,7k
V671
BC173
Zu/To R15
Stromlauf zu
HF-Oszillator/RF oscillator
Z
reg. i. V.
802.2020 V
erste Z.
Zeichn.-Nr.
802. 8835 S
12
13
14
15



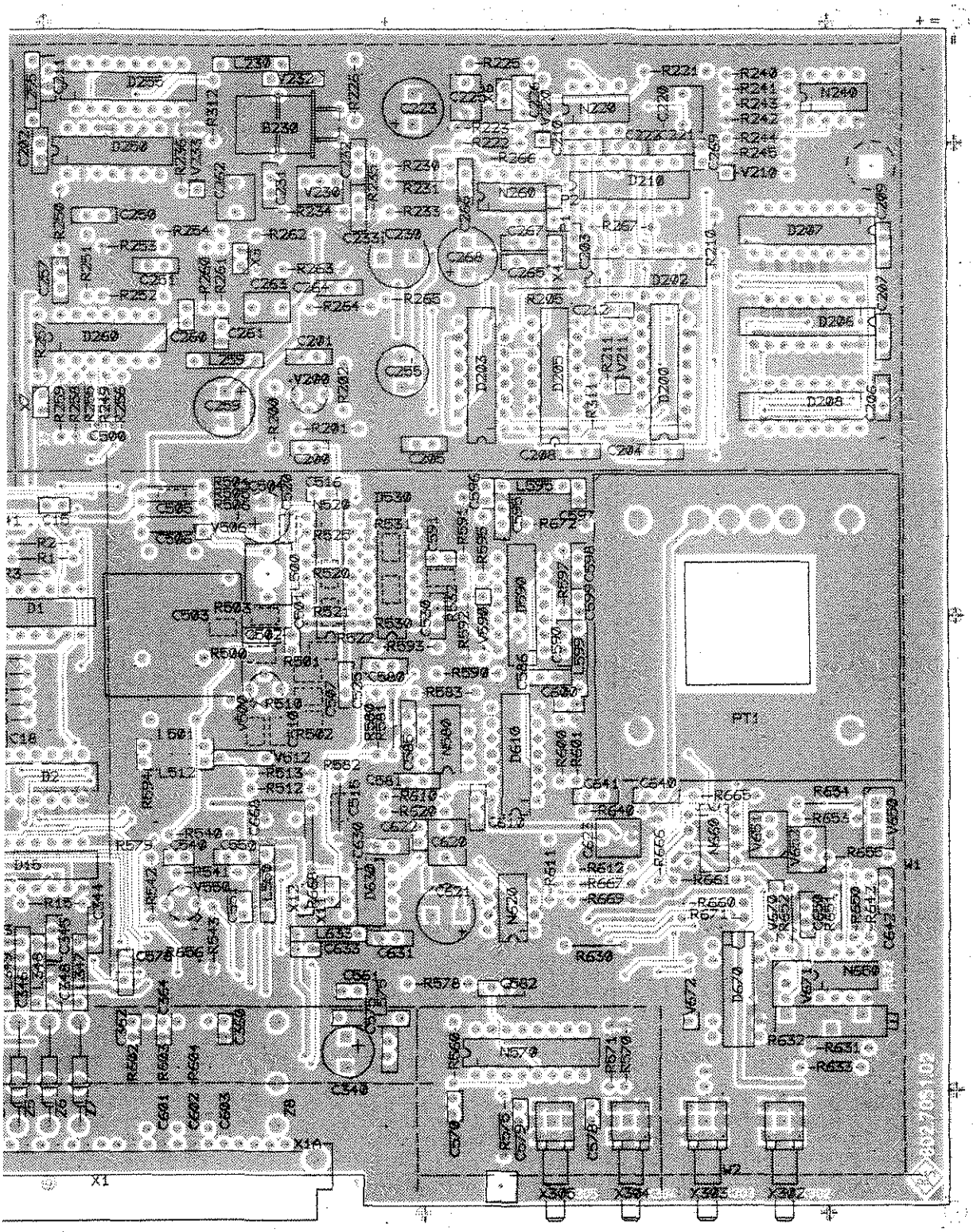
Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

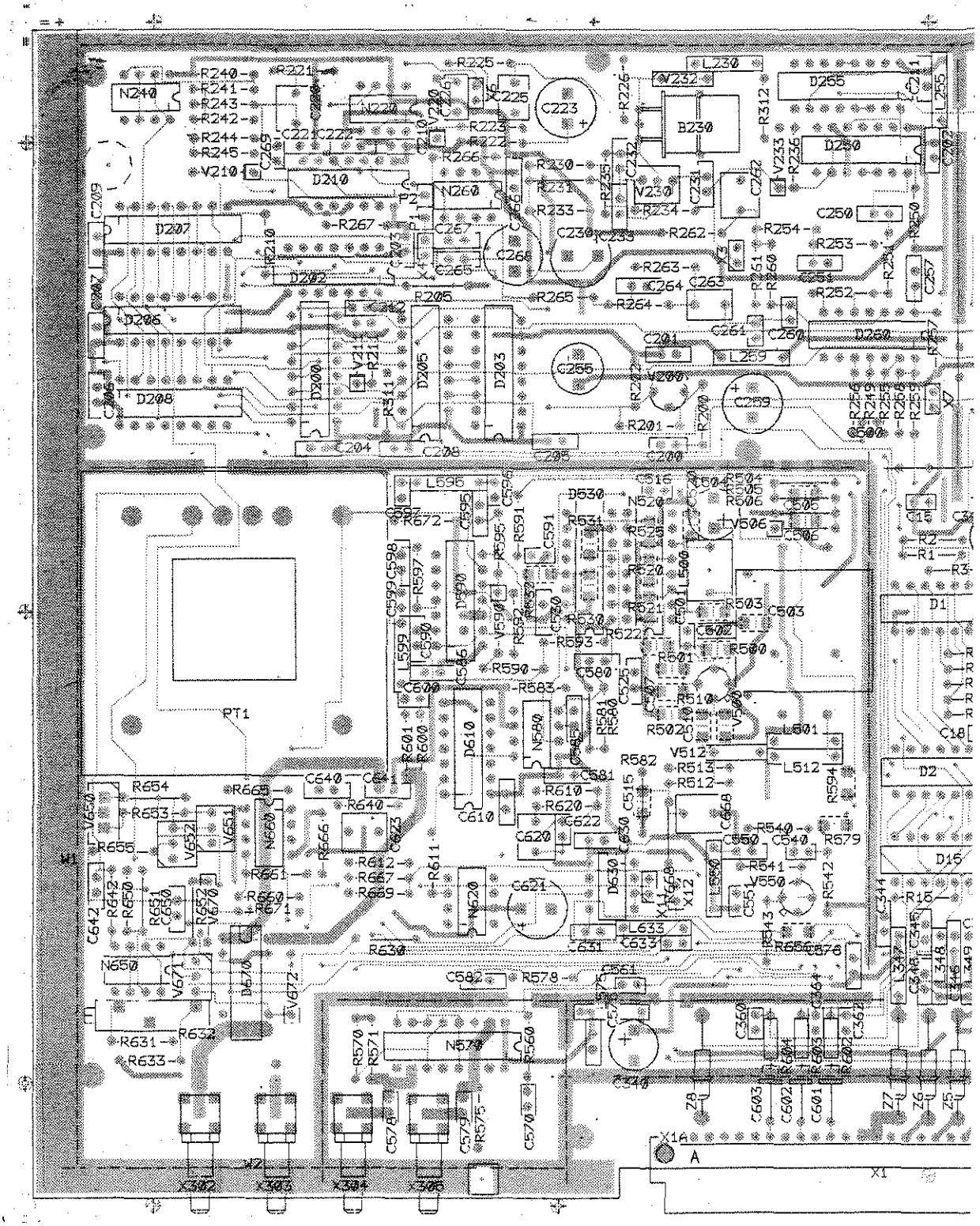
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MOI



				Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	10.87	LS	HF-OSZILLATOR RF-OSCILLATOR
				Gepr.			Z
				Norm			
MODEL	Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ	Zeichn.-Nr.	802.8835.01 EE
					zu Gerät CMT	reg. i. V. 802.2020 V	erste Z.

Blatt-Nr. 3 v. Bl.



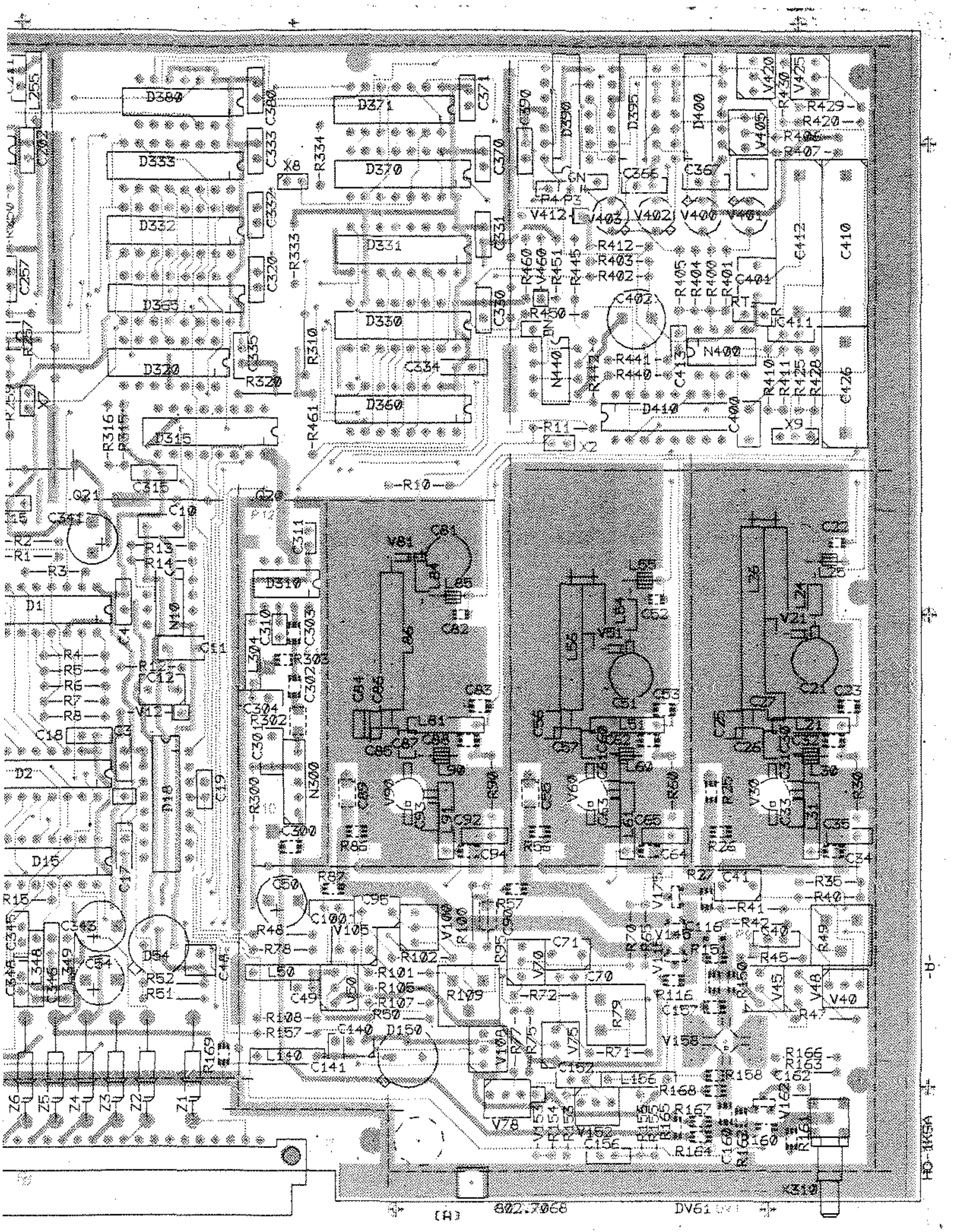
Ansicht und Leitungsführung Lötseite
View of tracks on solder side

(hierzu HVC 250)

ACHTUNG: EGB !
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD !
Electrostatic sensitive devices require a special handling.

VARIANTENERKLÄRUNG / VERSION
VAR 02 – GRUNDAUSFÜHRUNG / BASIC MODEL



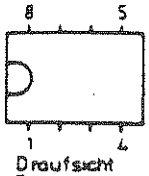
Maße ohne Toleranzangabe	Maßstab 1 : 1
	Halbzeug, Werkstoff
1KSA / Tag / Name	Benennung
Bearb. 10.87 LS	HF - OSZILLATOR
Gepr.	RF - OSCILLATOR
Norm	Z
ROHDE & SCHWARZ	Zeichn.-Nr. 802.8835.01 EE
zu Gerät CMT	reg. i. V. 802.2020 V
	erste Z.
	Blatt-Nr. 4 v. Bl.

DEL

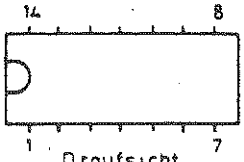
Änd. Zust. | Änderungs-Mitteilung | Tag | Name

5 6 7 8

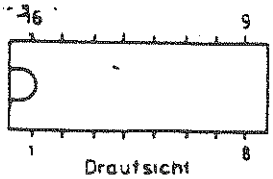
07 6001 81



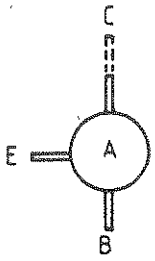
D310,D630,N10
N220,N240,N260
N400,N440,N580
N620,N650,N660



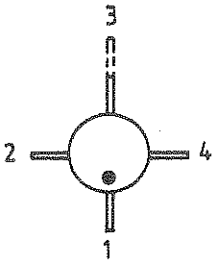
D202,D210,D250,D260
D320,D371,D380,D390
D395,D400,D590,D610



D1,D15,D18,D2,D200,D203
D205,D206,D207,D208,D255
D315,D330,D331,D332,D333
D360,D365,D370,D410,D530
N570,N520

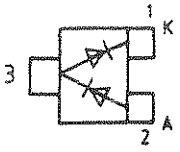


V30,V60,V90

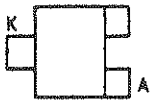


V158

N300



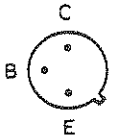
V115
V145
V175



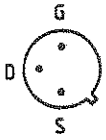
V162

V100,V105,V108
V152,V230,V40
V420,V425,V45
V48,V671,V70,
V75,V78

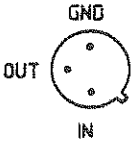
D50



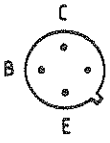
V651,V652



V500



D150



V550

				1KSA	Tag	Name	Benennung	
				Bearb.	09.87	LS	HF-Oszillator / RF oscillator	Z
				Gepr				
				Norm				
							Zeichn.-Nr	Blatt Nr
				ROHDE & SCHWARZ			802. 8835 S	5
And Zust	Anderungs-Mitteilung	Tag	Name	zu Gerat			reg. : V 802.2020 V	erste Z

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Attenuation Set Module

802.4223.02

Contents Page

5 Service Manual for Attenuation Set Module 5.1

5.1 Function Description 5.1

5.2 Testing and Adjustment 5.3

5.3 Interfaces 5.3

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Attenuation Set

(See circuit diagram 802.4223 S and block diagram)

Caution: The module must not be opened. The guarantee is otherwise void and the instrument must be recalibrated.

5.1 Function Description

The switches on the attenuator pads are driven by D1, a shift register (serial in/parallel out), via the power drivers D10, D11, D12, D13. The power attenuator pad (L) is driven via D3 and V8 because it is necessary to switch the pad from the RF overvoltage protection (limiter diodes Z9) in addition to via the controller interface. The signal path in this case is: Z9 → Z11/Z12 → comparators N1 → D3 (pin 6) → V8 → power attenuator pad. Once the limiter diodes have responded, the circuit V50 and V60 effects the diodes so, that they are fully driven in the forward direction for approx. 10 ms thus the RF power, which may be up to 50 W, is short-circuited until the power attenuator pad Z10 is switched on. If the function of the limiter diodes is no longer required, they can be switched in the reverse direction using V9, V10 and V11 so that they do not produce intermodulation. The components V15/R2 and V1/R27 determine the operating point of the limiter diodes.

The attenuation set is connected between the output stage of the RF synthesizer and the input/output of the instrument. The function of the attenuation set during the receiver test is to attenuate the level of the RF synthesizer. Two 40-dB attenuator pads, two 20-dB attenuator pads (one as part of the 12-dB power divider), one 10-dB attenuator pad and one 5-dB attenuator pad are used to this end. The smallest possible resolution is therefore 5 dB. The intermediate values are produced electronically by the output stage (802.7616.02).

A differentiation is made between two cases in the transmitter test: on the one hand, the signal passes directly via the power divider. If the power divider is bypassed, the signal on the RF overvoltage protection switches the divider on. The power is divided amongst 3 paths in this second case: to the rear (RF -30 dB) for further external processing, to the power meter and to the demodulators.

The signal of the power test point of Z10 is applied via Z13 and Z14 to the subtracting amplifier N5 whose output X41.16 is connected to the A/D converter. Once this analog signal has been digitized using the comparator, a power above a threshold of approx. 1 W indicates to the controller via D3 using an interrupt that a power is present. The power measuring diodes can also be biased in the reverse direction via N5 (pins 1, 2, 3) in order to prevent intermodulation whilst relinquishing the power measuring function.

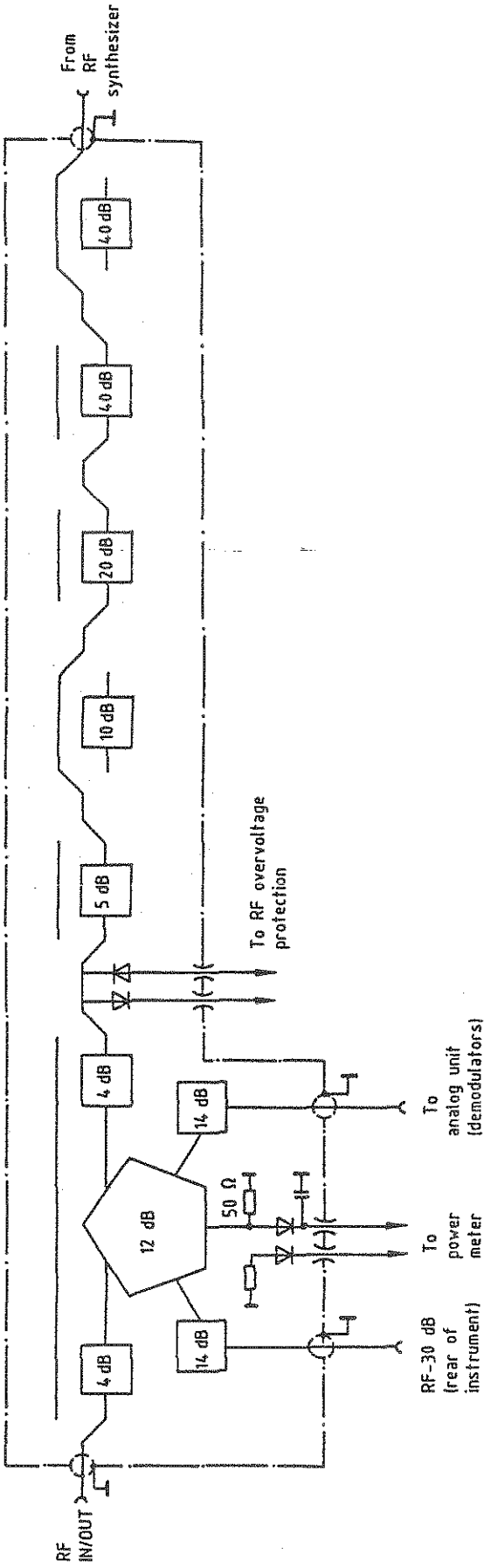


Fig. 5-1 Block diagram of the RF attenuation set

5.2 Testing and Adjustment

Potentiometer R34 is used to adjust the response threshold of the RF overvoltage protection. The adjustment is carried out in the complete instrument (see Section 4).

5.3 Interfaces

Connector	Input Output	Designation	Value
W1	I/O	RF IN/OUT	I: 5 mW to 50 W O: 1 V
W2	I	RF IN	1 V
Z13	O	Input voltage	$V_{PK\ RF}$ - 16 dB
Z14	O	Reference voltage	-0.25 V ±0.1 V
Z11	I/O	Positive overvoltage protect.	+3 V *)
Z12	I/O	negative	-3 V *)
X41.16	O	Power: DC	$V_{PK\ RF}$ - 16 dB
X41.13	O	Power: Trigger	TTL **)
X41.11	I	Data	CMOS 5 V
X41.12	I	Clock	CMOS 5 V
X41.15	I	Strobe	CMOS 5 V
X41.3	O	Interrupt: Power	CMOS 5 V
X41.14	O	Interrupt: Thermo	CMOS 5 V
X41.8	I	+24 V	<10 mA
X41.7	I	+15 V	<40 mA
X41.10	I	-15 V	<10 mA
X41.5	I	+ 5 V	<10 mA

*) Dependent on R34 in unloaded status
**) Threshold with V_{RF} = approx. 1 V

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	09	0987	ZE EICHLEITUNG FUER CMT	802.4223.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
A170	ED ANSTEUERUNG EICHLEIT. NUR VAR : 04	802.4298.04	
C1	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	802.4298.01
C2	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	802.4298.01
C3	CE 220UF+-20%25V RD8X14 ELECTROLYTIC CAPACITOR NIPPON SXE 25 VB 220 8X14	803.1063	802.4298.01
BIS/TO C7			
C8	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.4298.01
C9	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.4298.01
C10	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	802.4298.01
C11	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	802.4298.01
C12	TRIMMWERT / SELECTED		802.4298.01
C30	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	802.4298.01
C31	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	802.4298.01
C32	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	802.4298.01
C33	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	802.4298.01
C50	CK 680NF+-10%50VRM MKT CAPACITOR WIMA MKS2/50/0,68UF/10%	CK 099.2981	802.4298.01
C60	CK 680NF+-10%50VRM MKT CAPACITOR WIMA MKS2/50/0,68UF/10%	CK 099.2981	802.4298.01
D1	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	802.4298.01
D3	BL CD4013BE 2XD- FLIPFL FLIPFLOP RCA CD4013BE	BL 086.7021	802.4298.01
D10	BJ SN75361AP 2XTTL/MOS-LC LEVEL CONVERTER NSC DS75361N	BJ 294.8490	802.4298.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
BIS/TO D13			
K1	ZM ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8760
BIS/TO K5			
K7	ZM ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8760
K9	ZM ELEKTROMAGNET ELECTROMAGNET	294.8425	294.8760
N1	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	802.4298.01
N3	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	802.4298.01
N5	BO TL074IN 4XFET OPAMP OPERATIONAL AMPLIFIER TEXAS INST TL074IN	568.7528	802.4298.01
R1	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	802.4298.01
R2	RN 5X4,7KOHM+-2% SIL10 H5 RESISTOR NETWORK BOURNS 4310R-102-472	RN 647.5779	802.4298.01
R3	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	802.4298.01
R4	RL 0-WIDERSTAND DIN 0204 0-OHM RESISTOR DRALORIC OMA 0204	RL 069.0000	802.4298.01
R6	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	802.4298.01
R7	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	802.4298.01
R8	RL 0,35W 11,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/11,5K-F-D	RL 083.1339	802.4298.01
R9	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	802.4298.01
R10	RL 0,35W 5,11KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,11K-F-C	RL 082.2348	802.4298.01
R14	RN 5X 39KOHM+-2%SIL10 H5 RESISTOR NETWORK BOURNS 4310R-102-393	RN 569.3184	802.4298.01
R15	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	802.4298.01

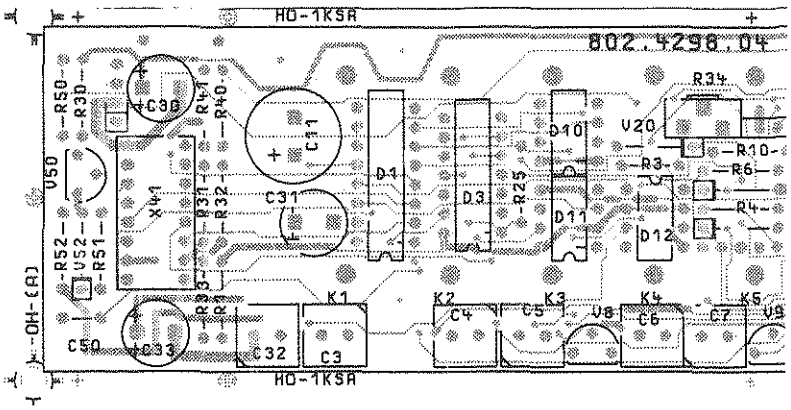
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R16	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	802.4298.01
R17	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	802.4298.01
R18	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	802.4298.01
R19	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	802.4298.01
R20	RL 0,35W 14,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/14,7K-F-D	RL 083.1397	802.4298.01
R21	RL 0,35W 301 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/301OHM-F-D	RL 083.0210	802.4298.01
R22	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.4298.01
R23	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-102	RS 247.5917	802.4298.01
R25	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1K-F-D	RL 083.1351	802.4298.01
R26	RL 0,35W 3,01KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,01K-F-D	RL 083.0961	802.4298.01
R27	RL 0-WIDERSTAND DIN 0204 0-OHM RESISTOR DRALORIC OMA 0204	RL 069.0000	802.4298.01
R29	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	802.4298.01
R30	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	802.4298.01
R31	RL 0,35W4,75 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 4,75 OHM 1% TK50	RL 099.8021	802.4298.01
R32	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	802.4298.01
R33	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	802.4298.01
R34	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-502	RS 247.7978	802.4298.01
R35	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	802.4298.01
R37	RL 0,35W 11,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/11,5K-F-D	RL 083.1339	802.4298.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R38	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	802.4298.01
R39	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	802.4298.01
R40	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	802.4298.01
R41	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	802.4298.01
R42	RL 0,35W 226 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/226OHM-F-D	RL 083.0090	802.4298.01
R43	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	802.4298.01
R44	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	802.4298.01
R50	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	802.4298.01
R51	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	802.4298.01
R52	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	802.4298.01
R60	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	802.4298.01
R61	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	802.4298.01
R62	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	802.4298.01
S1	ST OEFFNER 71GRD C+-6%SH THERMO SWITCH MICROTHERM R&S-ZCHNG.294.8790	294.8790	
V1	AE BZX85/C5V6 1,3W Z-DI ZENER DIODE THOMSON BZX85/C5V6	AE 092.8232	802.4298.01
V2	AE BZX79/C8V2 0,5W Z-DI ZENER DIODE VALVO BZX79/C8V2	AE 012.2490	802.4298.01
V3	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
BIS/TO V6			

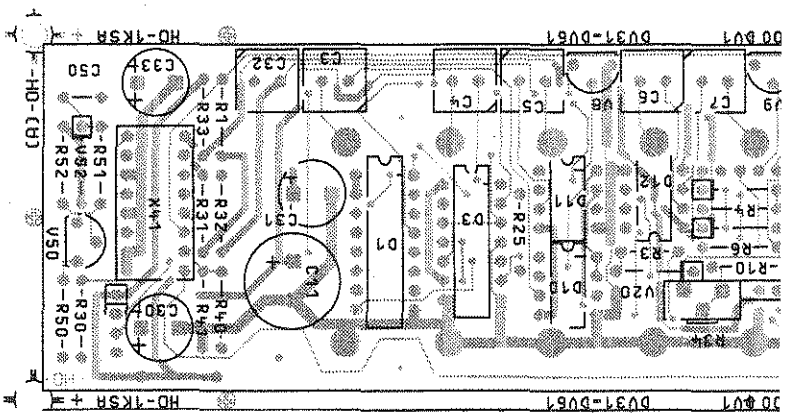
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V7	AE BZX79/C15 0,5W Z-DI ZENER DIODE VALVO BZX79/C15	AE 012.2555	802.4298.01
V8	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	802.4298.01
V9	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	802.4298.01
V10	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	802.4298.01
V11	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	802.4298.01
V12	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
V13	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
V14	AE BZX79/C5V6 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V6	AE 012.2455	802.4298.01
V15	AE BZX85/C5V6 1,3W Z-DI ZENER DIODE THOMSON BZX85/C5V6	AE 092.8232	802.4298.01
V16	AE BZX79/C8V2 0,5W Z-DI ZENER DIODE VALVO BZX79/C8V2	AE 012.2490	802.4298.01
V17	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
V18	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
V20	TRIMMWERT / SELECTED		802.4298.01
V50	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	802.4298.01
V52	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
V60	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	802.4298.01
V62	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	802.4298.01
W27	DX KABEL W27 CABLE W27	803.0273	
X41	FR IC-FASSUNG 16 POLIG 16-PIN IC-SOCKET PRECICONT USO16T	FR 249.6091	802.4298.01

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X42	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	802.4298.01
X113	FP STECKERL.ABGEW.36-POL. ANGLE PIN CONNECTOR BERG 75168-114-36	FP 087.9105	802.4298.01
Z1	DT DAEMPFUNGSGLIED40DB/50 ATTENUATOR 40DB/50	912.5269	800.9205
Z2	DT DAEMPFUNGSGLIED20DB/50 ATTENUATOR 20DB/50	912.5252	800.9205
Z3	BD DAEMPFUNGSGLIED 5DB/50 ATTENUATION 5DB/50	912.5281	800.9205
Z4	DT DAEMPFUNGSGLIED10DB/50 ATTENUATOR 10DB/50	912.5246	800.9205
Z5	DT DAEMPFUNGSGLIED40DB/50 ATTENUATOR 40DB/50	912.5269	800.9205
Z6	DT DAEMPFUNGSGLIED 4DB/50 ATTENUATOR 4DB/50	912.5230	800.9205
Z7	DT 2X14DB DAEMPFUNGSGLD.	915.0400	800.9205
Z8	DT VERBINDUNGSLEITUNG	912.5298	800.9205
Z9	BD UEBERSPANNUNGSSCHUTZ	800.9570	800.9205
Z10	BD LEISTUNGSVERTEILUNG	915.0300	800.9205
			- ENDE -

Ansicht und Leitungsfüh
View of tracks on compo



Ansicht und Leitungsfüh
View of tracks on solder

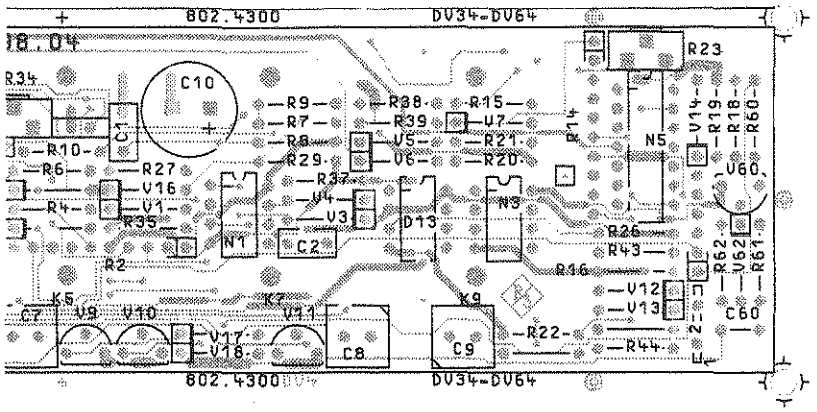


Ihrerzu HVC 2501

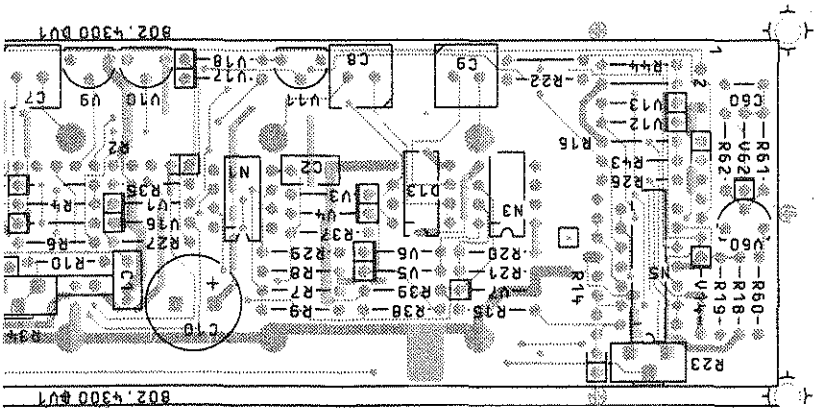
ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

gsführung Bauteilseite
omponent side



gsführung Lötseite
older side



VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MODEL
VAR 04 - AUSF. MIT C- NETZ MODIF.

Änd. Zust.	Änderungs-Mitteilung	Tag	Name

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

1KSA	Tag	Name
Bearb.	05.87	HO
Gepr.		
Norm		

Benennung

EICHLTG. ANSTEUERUNG
ATTENUATOR CONTROL

Z

ROHDE&SCHWARZ

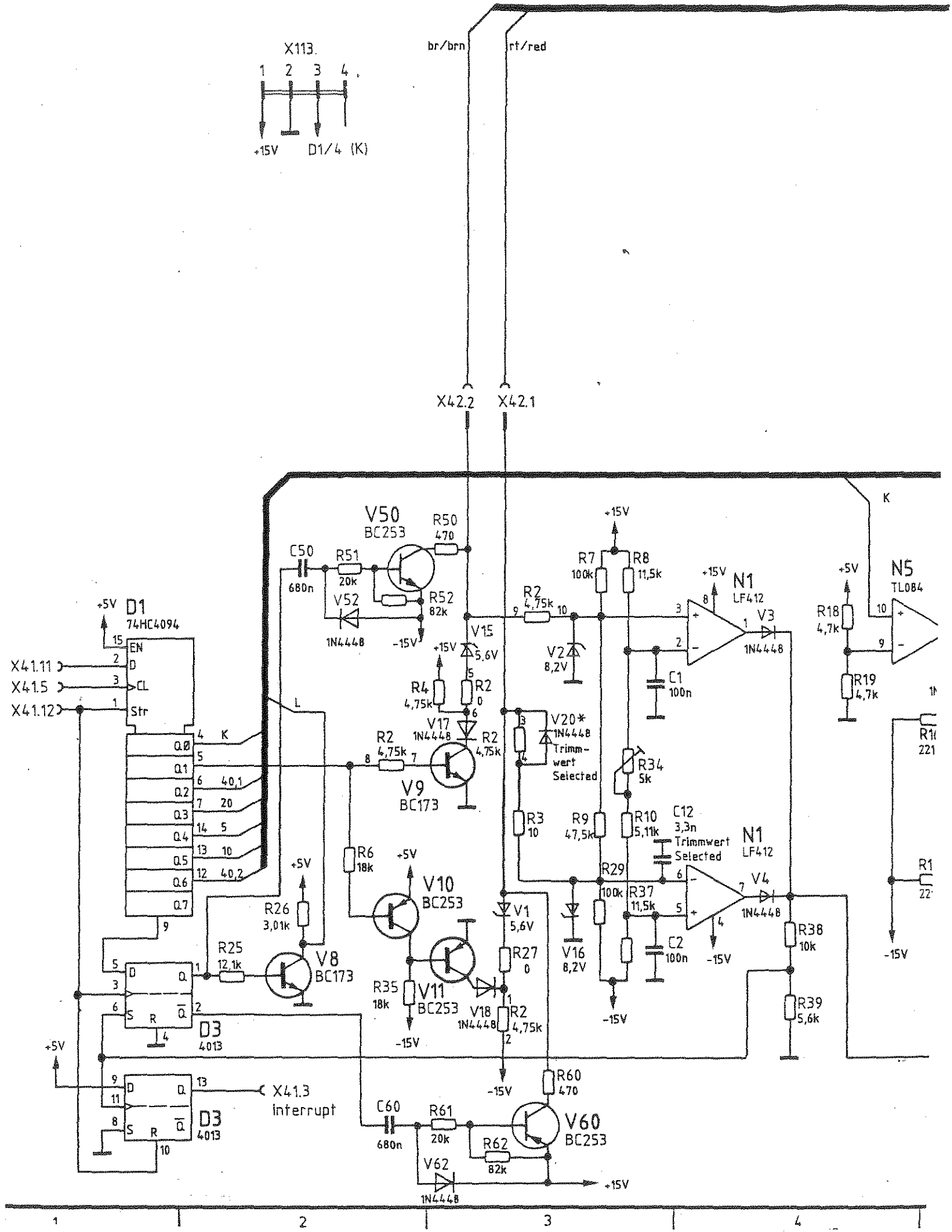
zu Gerät CMT

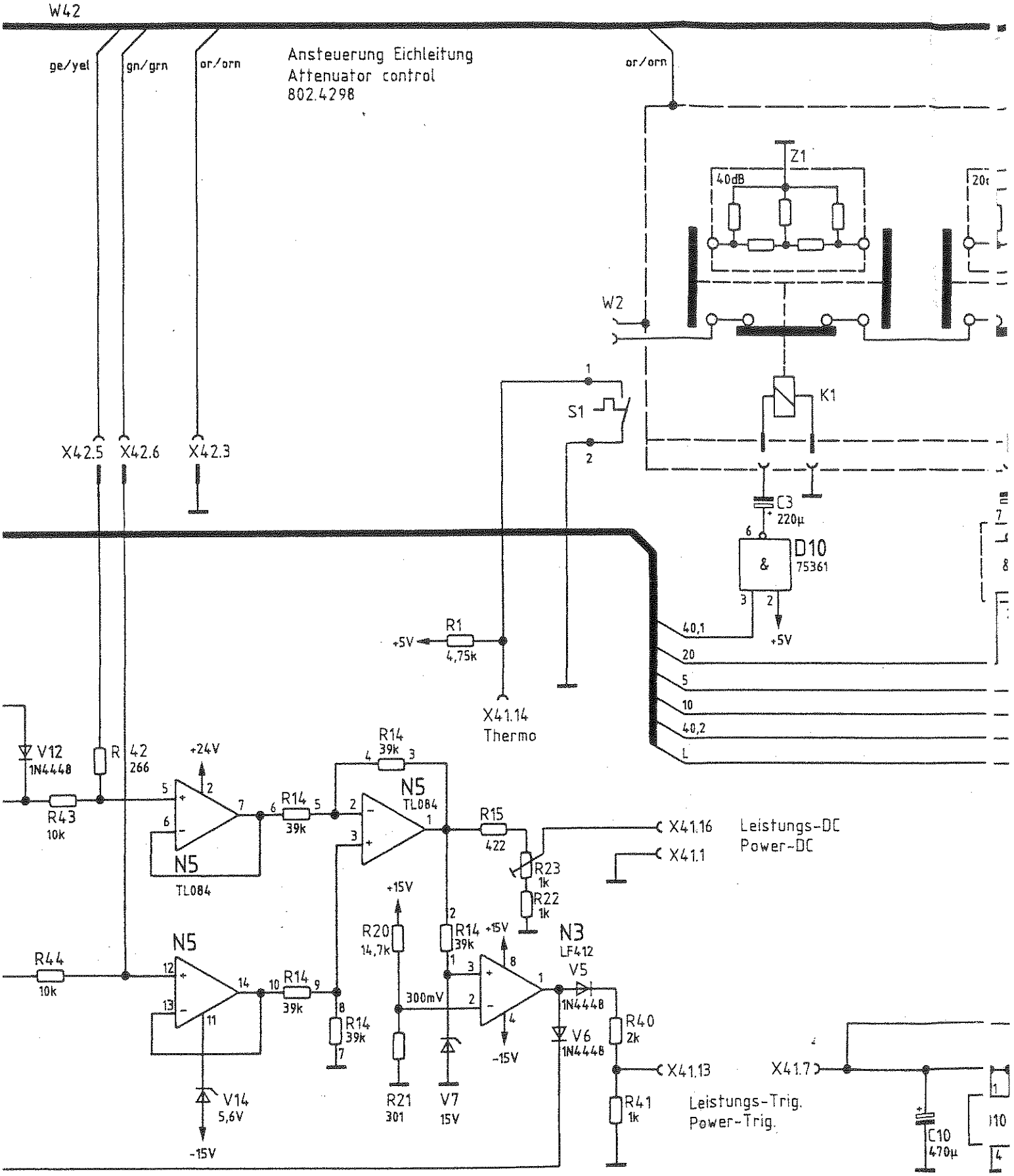
Zeichn.-Nr. 802.4298.01 ED

Blatt-Nr. 2 v. Bl.

reg. i. V. 802.2020 V erste Z.

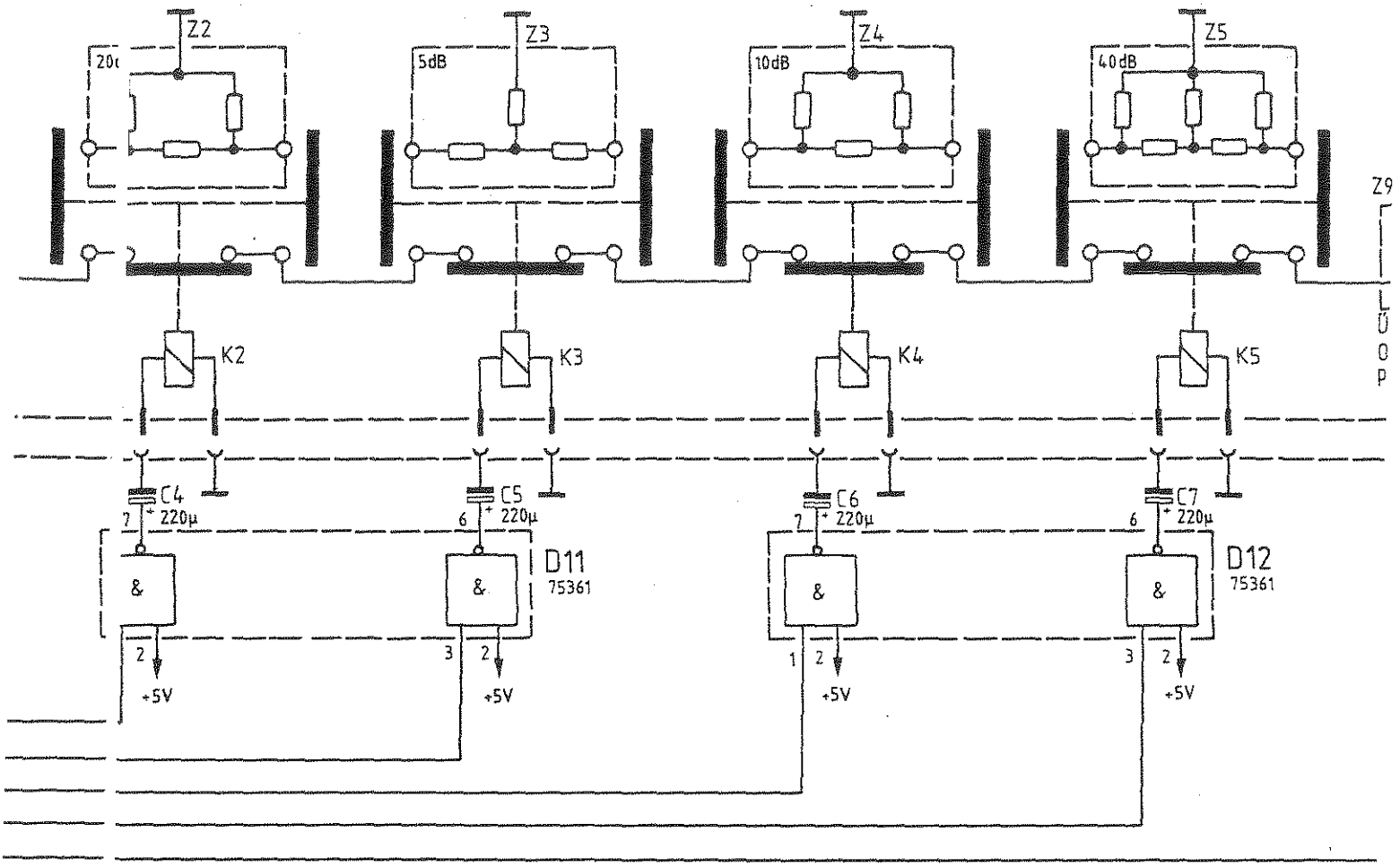
07 6001 81

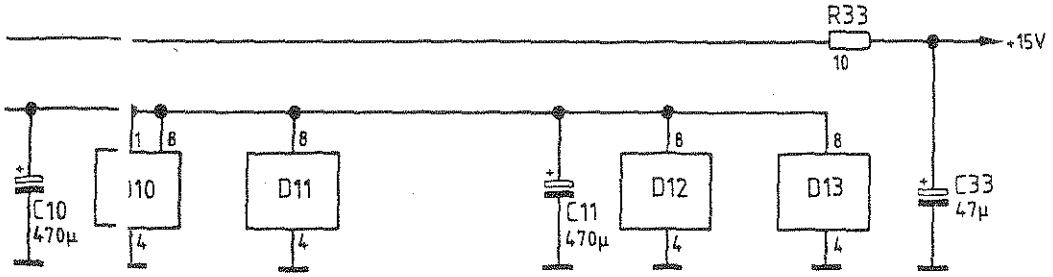

X113.
1 2 3 4
+15V D1/4 (K)
br/brn
rt/red
X42.2
X42.1
K
L
D1
74HC4094
EN
D
CL
Str
X41.11
X41.5
X41.12
Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7
V50
BC253
R50
470
C50
680n
R51
20k
R52
82k
V52
1N4448
-15V
V15
5,6V
R4
4,75k
R2
0
V17
1N4448
R2
4,75k
V9
BC173
R2
4,75k
V20*
1N4448
Trimm-
wert
Selected
R34
5k
R3
10
R6
18k
V10
BC253
R26
3,01k
R25
12,1k
V8
BC173
V11
BC253
R35
18k
V1
5,6V
R27
0
V18
1N4448
R2
4,75k
D3
4013
R7
100k
R8
11,5k
R2
4,75k
V2
8,2V
N1
LF412
V3
1N4448
C1
100n
R9
47,5k
R10
5,11k
C12
3,3n
Trimmwert
Selected
R29
100k
R37
11,5k
V16
8,2V
C2
100n
V4
1N4448
R38
10k
R39
5,6k
N5
TL084
R18
4,7k
R19
4,7k
X41.3
interrupt
C60
680n
R61
20k
R62
82k
V62
1N4448
R60
470
V60
BC253

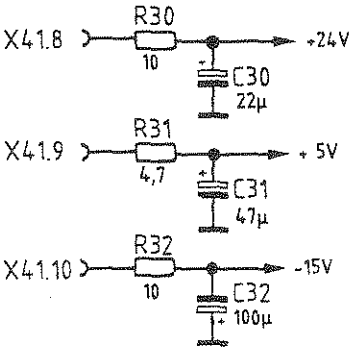

W42
ge/yel
gn/grn
or/orn
Ansteuerung Eichleitung
Attenuator control
802.4298
or/orn
Z1
40dB
W2
S1
K1
X42.5
X42.6
X42.3
C3
220µ
D10
75361
&
+5V
R1
4,75k
40,1
20
5
10
40,2
L
X41.14
Thermo
V12
1N4448
R 42
266
R43
10k
+24V
N5
TL084
R14
39k
R15
422
X41.16
Leistungs-DC
Power-DC
X41.1
R23
1k
R22
1k
+15V
R20
14,7k
R44
10k
N3
LF412
V5
1N4448
300mV
V6
1N4448
R40
2k
X41.13
R41
1k
Leistungs-Trig.
Power-Trig.
X41.7
C10
470µ
V14
5,6V
-15V
R21
301
V7
15V

rt/red

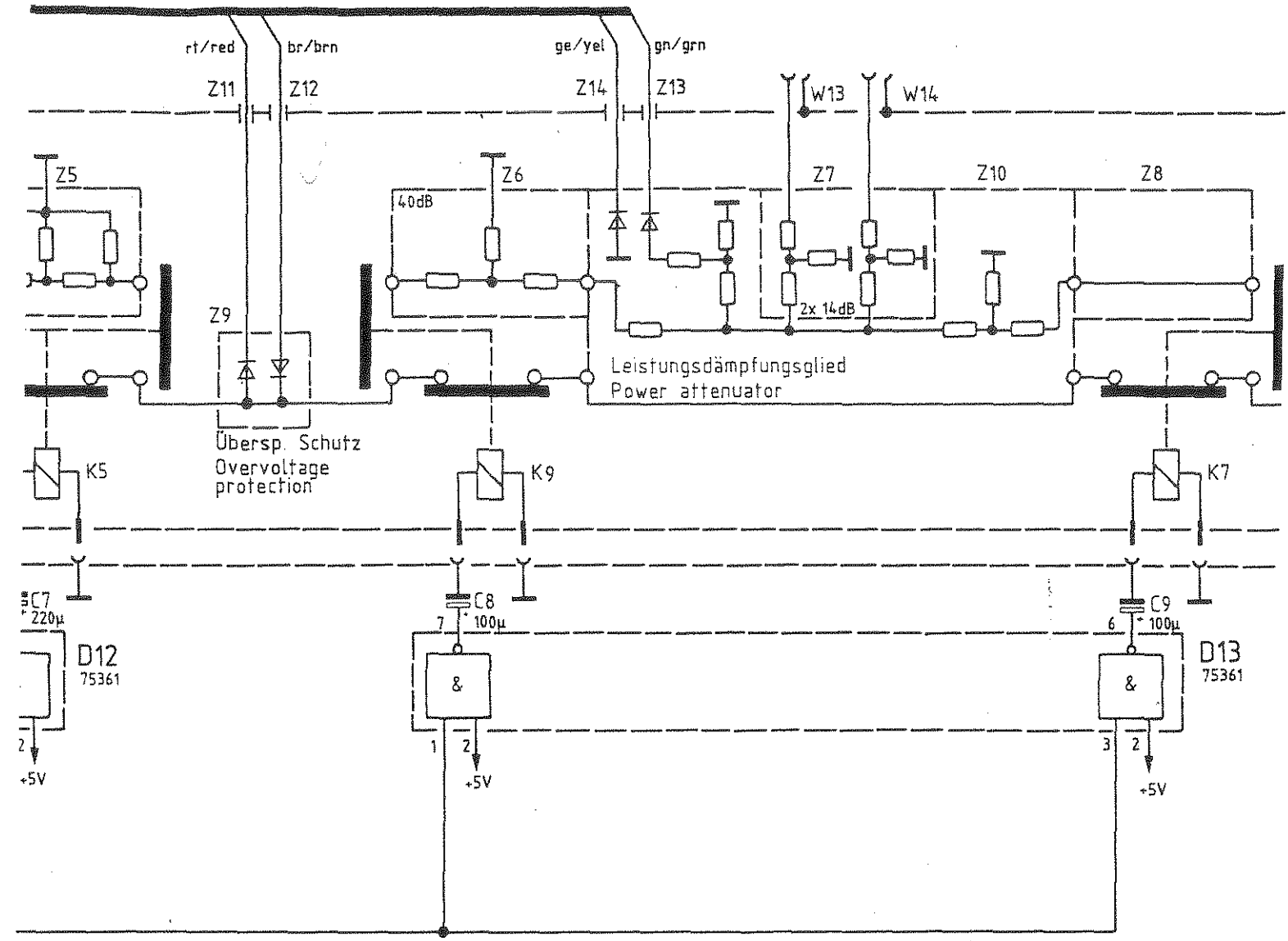
Z11



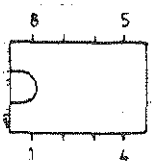




Klebekante für Druckerzeugnis - durch diese Zone möglichst nur Leitungen führen

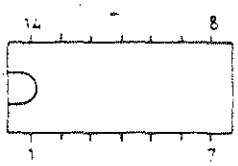


V8....V11



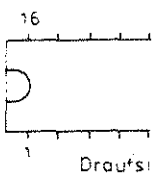
Draufsicht
Top view

N1,N3
D11,D12,D13



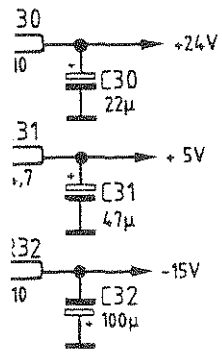
Draufsicht
Top view

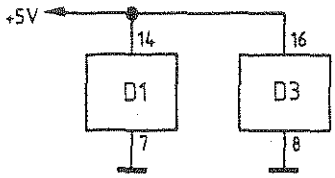
N5,D3



Draufsi
Top vi

D1





Stromlauf gilt für VAR 04
Circuit diagram is valid for model 04

Stromlauf zu CMT Eichleitung / CMT Attenuator			Z
CMT	reg. i. V. 802.2020 V	erste Z. 802.2020	Zeichn.-Nr. 802.4223 S

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Analog Unit

802.8435.02

Contents

		Page
5	Service Manual for Analog Unit	5.1
5.1	Function Description	5.1
5.1.1	RF Amplifier	5.1
5.1.2	LO Conditioning	5.3
5.1.3	Demodulators	5.5
5.1.3.1	FM (ΦM) Demodulator	5.5
5.1.3.2	AM Demodulator	5.5
5.1.4	AF Conditioning	5.7
5.1.4.1	Signal Distribution	5.7
5.1.4.2	RMS Path	5.7
5.1.4.3	Peak-value Path	5.8
5.1.4.4	SINAD/Distortion	5.8
5.1.5	DC Amplifier	5.10
5.1.5.1	RMS Meter	5.10
5.1.5.2	DC Multiplexer	5.10
5.1.6	Calibration	5.12
5.1.6.1	Calibration of the RF Synthesizer	5.12
5.1.6.2	Calibration of the DC Multiplexer, Peak-value Meter and RMS Meter	5.12
5.2	Testing and Adjustment	5.13
5.2.1	LEVEL FM R87 Adjustment	5.13
5.2.2	LEVEL AM R88 Adjustment	5.13
5.2.3	LO→TTL R102 Adjustment	5.13
5.2.4	FM DC R213 Adjustment	5.14
5.2.5	DEMOD LEVEL R304 Adjustment	5.14
5.2.6	AM LEVEL R197 Adjustment	5.14
5.2.7	AM SYMMETRY R254 Adjustment	5.14
5.2.8	AM DC R275 Adjustment	5.15
5.2.9	CCITT R388 Adjustment	5.15
5.2.10	LEVEL R543 Adjustment	5.15
5.2.11	BALANCE R542 Adjustment	5.15
5.2.12	1 kHz R557, R556 Adjustment	5.15
5.2.13	990 Hz R566 Adjustment	5.16
5.2.14	1010 Hz R571 Adjustment	5.16
5.2.15	POWER METER Adjustment	5.16

Page

5.3 Troubleshooting 5.17
5.3.1 Removal and Installation of ICs 5.17
5.3.2 Data Channels of the Analog Unit 5.17
5.3.3 Test Points 5.22
5.3.4 Interfaces (Pin Assignments) 5.24
5.3.4.1 Coaxial Connectors 5.24
5.3.4.2 64-contact Multipoint Connector 5.26
5.3.5 Troubleshooting Diagram 5.27

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Analog Unit

(See circuit diagram 802.8435 S and block diagrams 5-1 to 5-5)

5.1 Function Description

The analog unit is divided into the following function units:

- RF amplifier
- LO conditioning
- Demodulator
- AF conditioning
- DC amplifier

It conditions the signals to be measured according to the requirements and converts them into corresponding DC voltages. The analog unit is driven via two separate data channels.

5.1.1 RF Amplifier

(See circuit diagram 802.8435 S, sheet 1 and Fig. 5-1)

The RF amplifier controls the RF signals applied to the two selectable inputs to a constant level and then applies them to the RF counter and the RF input of the mixer. Amplifiers and attenuator pads connected in series suppress the LO mixer signal sufficiently at the inputs of the RF amplifier.

The signal from the power distributor is switched off by a diode switch in order to reduce the crosstalk between the inputs if the switchover relay is switched to the other input. A selectable attenuator pad is connected ahead of the following PIN diode attenuator to increase the dynamic range. The attenuator pad is switched on or off according to the result of the power measurement. A temperature-compensated peak-value rectifier detects the RF signal at the RF counter output and applies it to the integrator to generate the PIN attenuator voltage. The integrator operates with a selectable time constant and reference voltage depending on the type of modulation (FM, ΦM or AM).

The output signal of the rectifier is compared with a reference and a signal is then generated which informs the controller if the signal at the input is too small for the RF counter. The monoflop in this signal path bridges the dips which result with amplitude modulation.

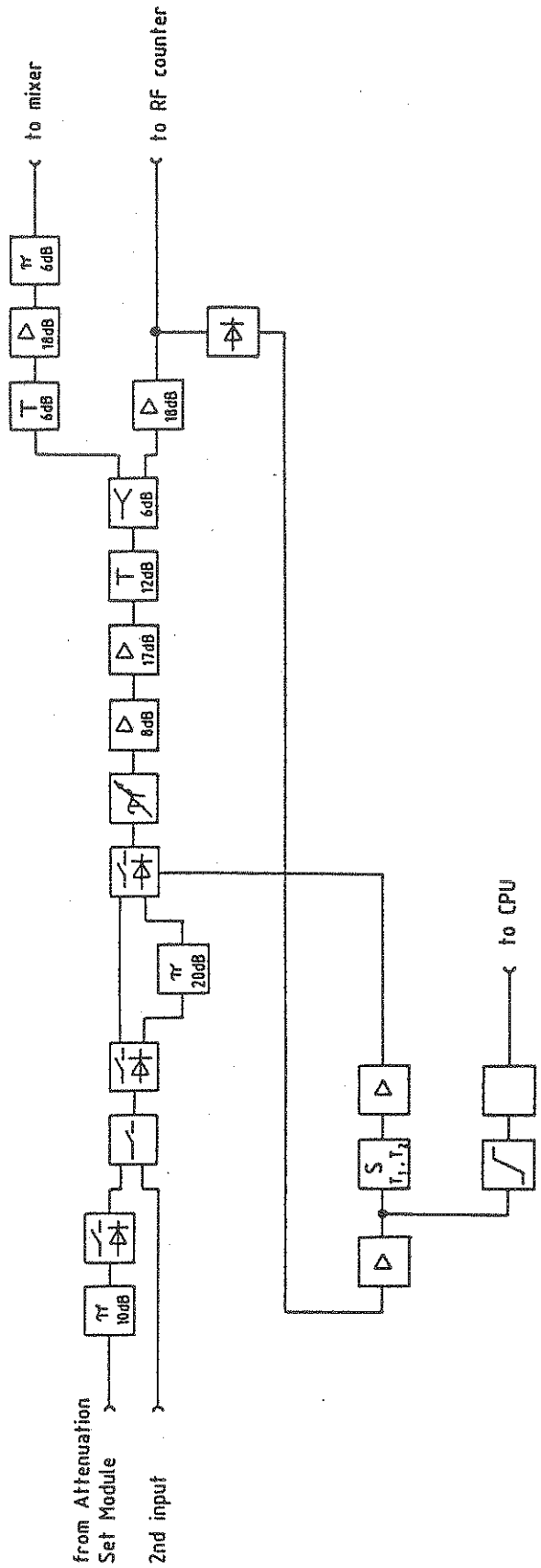


Fig. 5-1 Block diagram of the RF amplifier

5.1.2 LO Conditioning

(See circuit diagram 802.8435 S, sheet 4 and Fig. 5-2)

The RF synthesizer in the instrument generates frequencies in the range from 31.25 MHZ to 1 GHz with a level of -6 dBm ±3 dB for frequency conversion. The LO conditioning circuit generates the level required for mixing and divides the LO frequency to enable evaluation of frequencies <30.795 MHz.

The LO conditioning circuit also generates the test signal for the demodulators. This test signal is generated by dividing the LO frequency to the IF of 455 kHz. This signal path is also used to calibrate the deviation of the RF synthesizer.

The LO signal present at connector X4 is directly applied to the mixer for frequencies >31.25 MHz via a selectable amplifier and a PIN diode switch. Frequencies in the range from 31.25 MHz to 62.5 MHz are amplified to TTL level and applied to the frequency dividers. A 1:2 divider is connected in series with the programmable 7-bit divider in order to achieve a duty factor of 0.5. This arrangement enables dividing factors of 1/2, 1/4, 1/4(N+1), (N=Ø to 127) to be set. Unrequired dividers are switched off to suppress subharmonics.

The output signal of the programmable divider is applied to the test generator. This divides the frequency to 455 kHz and passes it on to the demodulators via a selectable voltage divider. The voltage divider can be bypassed using a switch which is opened and closed at the rate of 222 Hz (455 kHz : 2048). The result is amplitude modulation with a modulation frequency of approx. 110 Hz and a modulation depth of approx. 45%. If the RF demodulator is to be tested, permanently close the switch and frequency-modulate the input signal to the LO conditioning circuit.

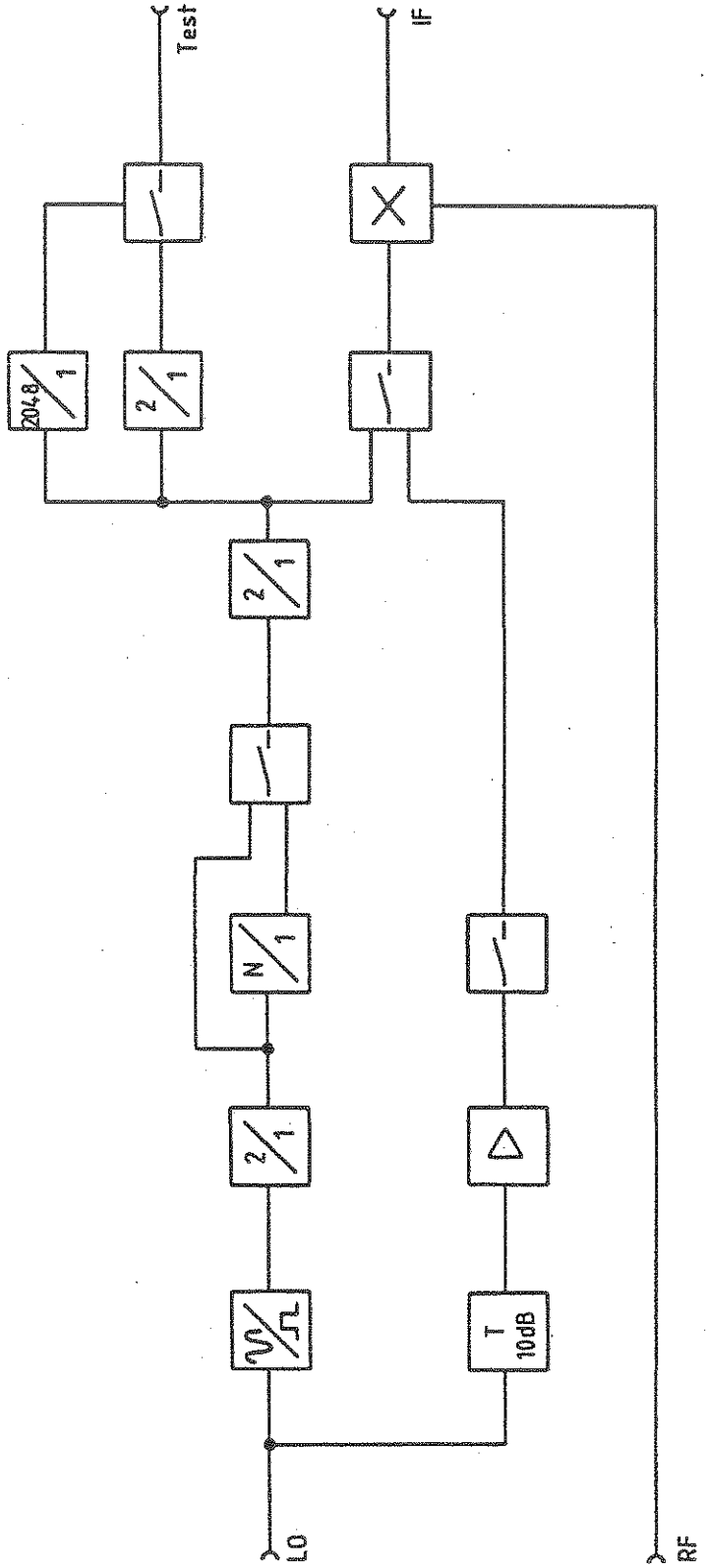


Fig. 5-2 Block diagram of the LO conditioning circuit

5.1.3 Demodulators

(See circuit diagram 802.8435 S, sheet 3 and Fig. 5-3)

This section conditions the frequency and level of the RF signals converted in the mixer and demodulates them according to the type of modulation AM, FM, ϕM.

The RF signal converted in the mixer to the IF centre frequency of 455 kHz is applied to the first low-noise amplifier stage via a 725-kHz lowpass which suppresses undesired mixer products. The signal is then applied directly or via a further amplifier with a series-connected 25-kHz bandpass filter to the regulated (AM) or limiting amplifier (FM, ϕM). The bandpass filter is used for selection with remote measurements and adjacent-channel power measurements.

5.1.3.1 FM (ϕM) Demodulator

The FM demodulator operates according to the principle of a counter discriminator. The FM signal is converted in a limiter into squarewave pulses of constant width (monoflop); both the positive and negative edges of the FM signal are used for triggering. Twice the IF, in this case 910 kHz, is thus present at the monoflop output. If the pulses of constant width are integrated, a DC voltage is produced which is proportional to the number of pulses per unit of time and thus the frequency of the input signal; the AC voltage component is the required demodulated AF voltage. Since the phase modulation corresponds to the frequency modulation when the modulated signal is integrated, the counter discriminator is also suitable for demodulating phase-modulated signals. A suitable filter corrects the frequency response of the demodulated signal.

The FM demodulator is frequency-linear up to 20 kHz; deemphasis with a time constant of 750 µs can be connected if required.

5.1.3.2 AM Demodulator

The AM demodulator operates as a bidirectional rectifier with subsequent lowpass filters. The AC voltage components are filtered out from the output signal of the rectifier and the remaining DC voltage applied via an integrator to the controlled amplifier; the DC voltage is used with FM to switch the signal path on and off (squelch function) since it is a measure of the signal strength of the IF.

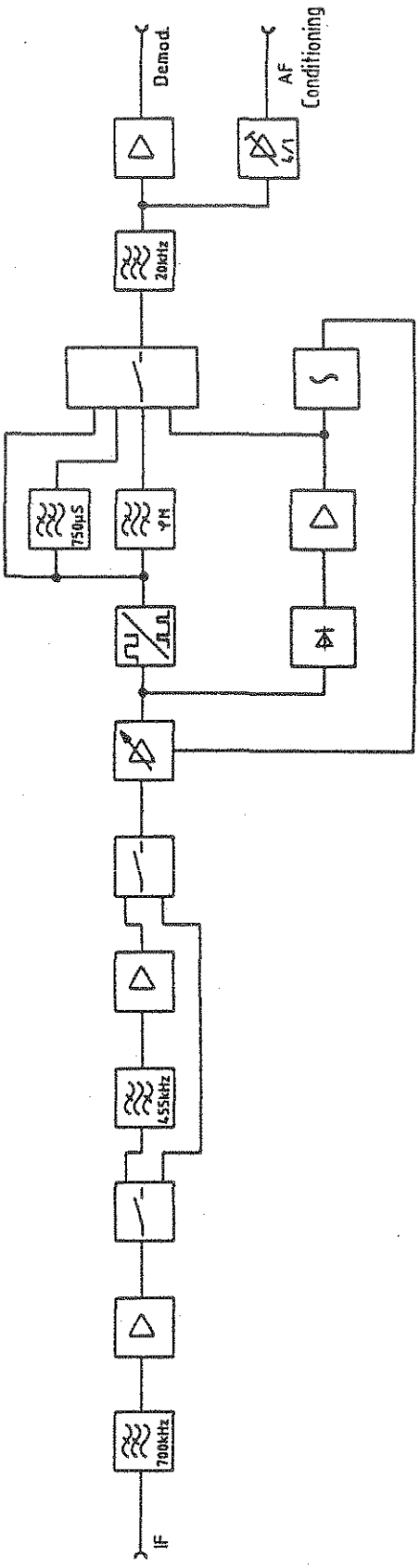


Fig. 5-3 Block diagram of the demodulators

5.1.4 AF Conditioning

(See circuit diagram 802.8435 S, sheet 2 and Fig. 5-4)

The AF conditioning circuit processes the two main AF paths in the instrument (demodulated and externally applied AF signals), weights them and applies them to the meter rectifiers, the oscilloscope (if fitted), the loudspeaker amplifier, the tone sequence decoder and the AF counter.

5.1.4.1 Signal Distribution

The external AF signal is applied directly to the main signal switch via a selectable 20-dB attenuator pad and also via the selectable CCITT filter.

The demodulated signal is applied to the main signal switch directly via a selectable 300-Hz highpass filter to suppress any pilot tones and/or via the selectable CCITT filter. The following combinations are therefore possible at the output of the switch:

AF external	Demodulated signal
Demodulated signal	-
AF external, CCITT	Demodulated signal
Demodulated signal, CCITT	Demodulated signal
AF external	AF external, CCITT
AF external	Demodulated signal, CCITT

Using further selectors it is possible to apply each of these signals to the peak-value meter, rms meter, SINAD meter, tone sequence decoder, AF counter, loudspeaker and oscilloscope.

5.1.4.2 RMS Path

The rms signal to be evaluated is applied to the 150-Hz highpass filter via a selectable 40/0-dB amplifier whose gain is determined from the result of the rms measurement. The highpass filter is connected when measurements are made in FAST mode (cf. Section 5.1.5, DC Amplifier). The signal is applied to the DC amplifier via three calibration switches which are required to determine the offset and gain errors of the rms meter.

5.1.4.3 Peak-value Path

The peak-value path is similar to the rms path. A signal inverter is fitted instead of the 150-Hz highpass filter so that the positive and negative peaks of the signal can be measured in the case of demodulation since the peak-value meter only detects positive signals.

Prior to the inverter, the external modulation signal connected via the modulation control is applied to the peak-value meter via a selector to enable calibration if necessary.

5.1.4.4 SINAD/Distortion

The SINAD/distortion meter is basically a controlled amplifier with a series-connected notch filter. A constant rms value is used as the setpoint; the output signal of the amplifier is square-rooted, integrated and applied to the controller, an OTA in the negative feedback path of the amplifier. The fundamental frequency (1 kHz) is subsequently filtered and the rms weighted from the regulated signal. A three-pole notch filter with pole frequencies at 990 Hz, 1 kHz and 1.01 kHz is used as the filter in order to intercept small differences between the fundamental frequency and the pole frequency.

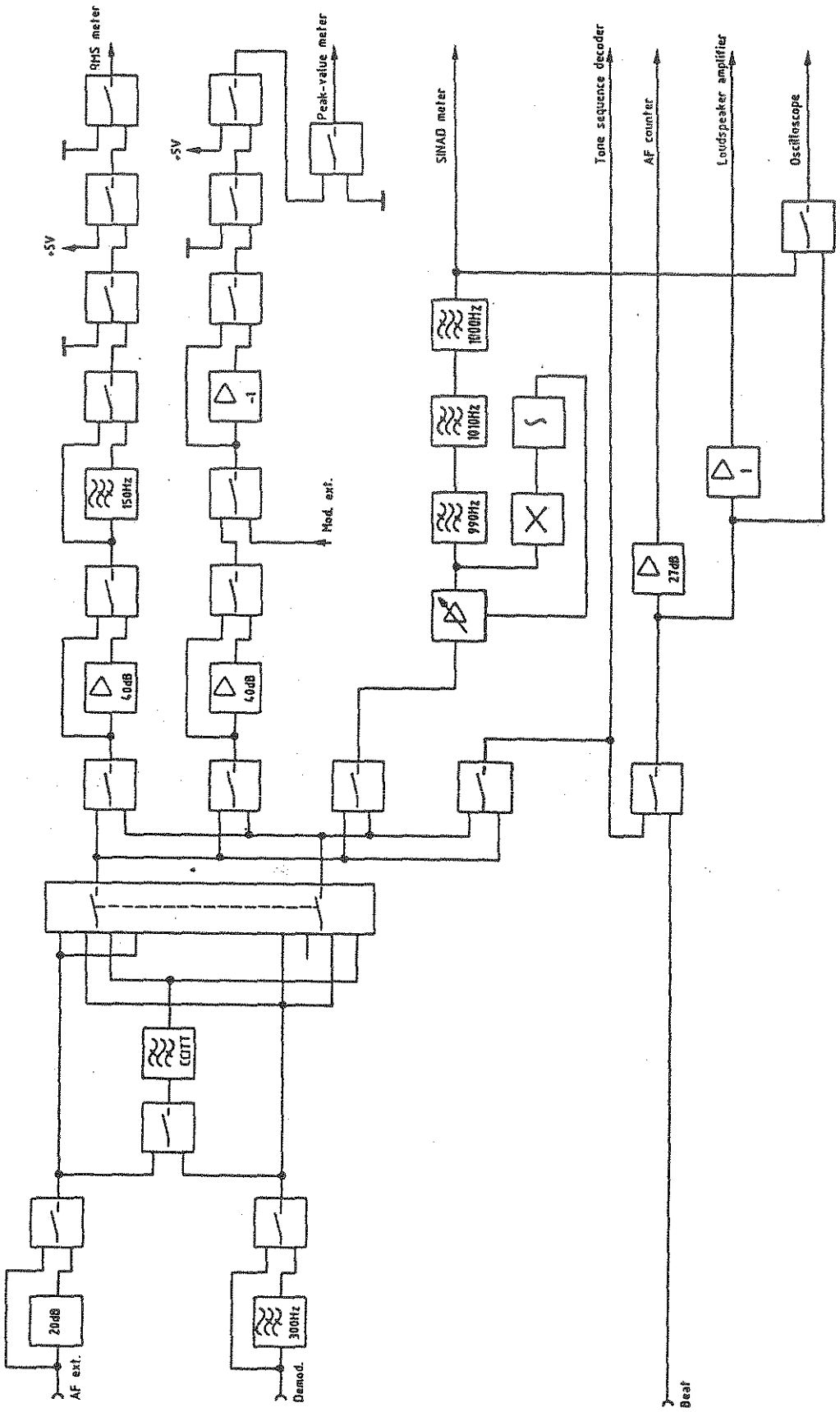


Fig. 5-4 Block diagram of the AF conditioning circuit

5.1.5 DC Amplifier

(See circuit diagram 802.8435 S, sheet 5 and Fig. 5-5)

The DC amplifier circuit conditions the incoming AC and DC voltages for the subsequent A/D converter.

5.1.5.1 RMS Meter

The rms meter is an IC which basically multiplies the input signal and subsequently generates the mean value. The rms meter is operated in two modes, fast and slow, in order to achieve a higher measuring rate. The selection of the two modes involves, on the one hand, changing the charging capacitor required to generate the mean value and, on the other, the switchover of the cut-off frequency of a 4th order lowpass filter with an optimized transient response connected in series with the IC. The cut-off frequencies of the input voltages are 50 Hz in the slow mode and 150 Hz in the fast mode. A 2nd order highpass filter is connected ahead of the rms meter to prevent AC voltages to be superimposed on the DC output voltage at input voltages <150 Hz in the fast mode (see Section 5.1.4.2, RMS Path).

5.1.5.2 DC Multiplexer

All DC voltages to be measured are combined and cyclically scanned on the DC multiplexer. A selectable amplifier ensures that the subsequent A/D converter operates in a high resolution range as far as possible.

The DC voltages applied to the DC multiplexer are:

- Peak-value meter (demodulation, MOD.EXT. input)
- RMS meter (AF voltmeter, spurious modulation)
- Distortion/SINAD meter
- Power measurement
- AM demodulator
- Adjacent-channel power meter
- +5-V calibration voltage
- PIN control voltage of the RF amplifier
- Self-test voltages
- RF millivoltmeter
- Ground

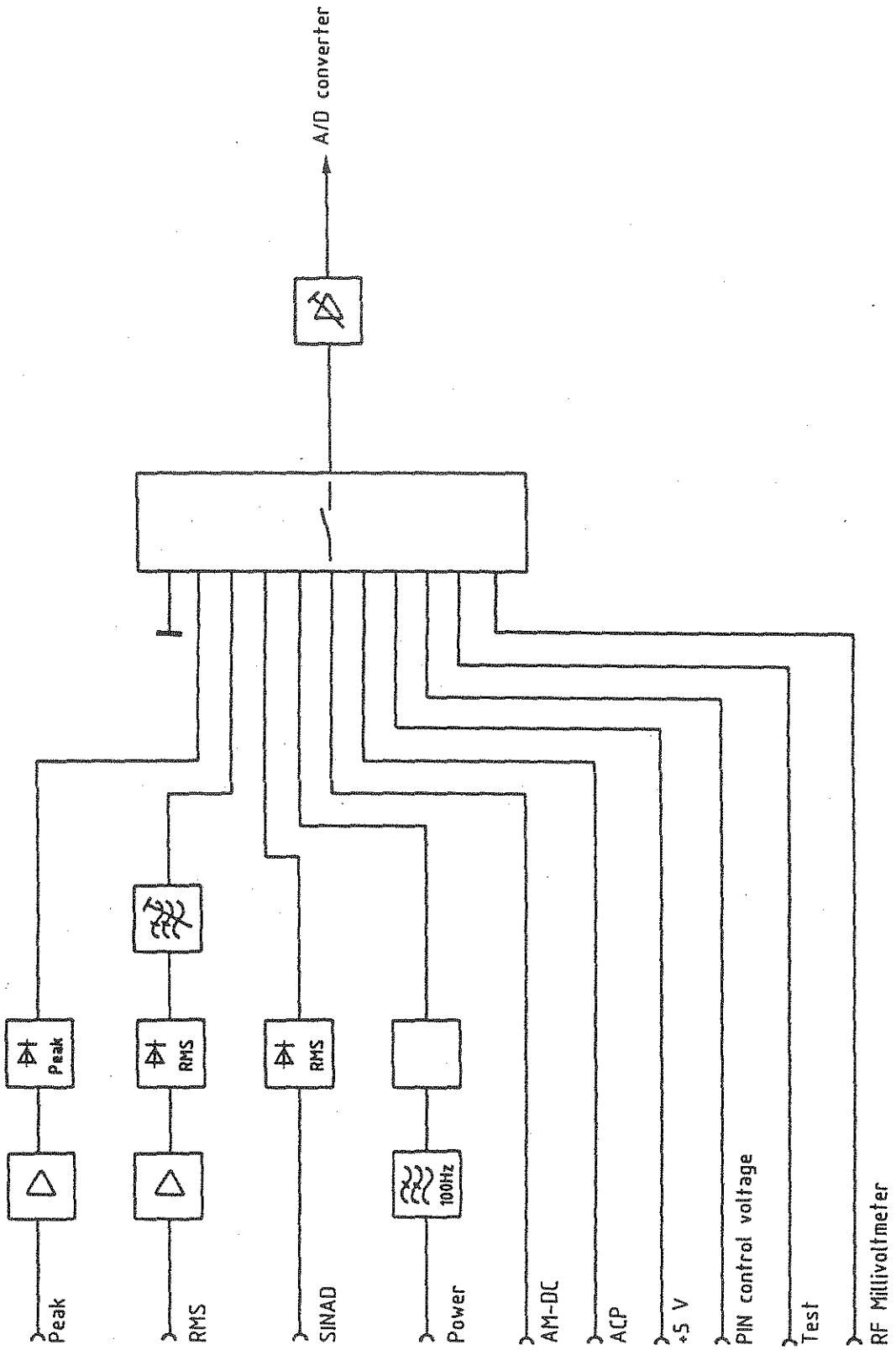


Fig. 5-5 Block diagram of the DC amplifier

5.1.6 Calibration

The analog unit of the instrument contains a number of calibration routines which counteract influences such as aging and temperature fluctuations.

The main calibration routines are:

Calibration of the
- RF synthesizer
- peak-value meter
- rms meter
- DC multiplexer.

5.1.6.1 Calibration of the RF Synthesizer

The RF synthesizer is calibrated with respect to the FM characteristics; a specific deviation is set at a defined RF frequency, measured by the analog unit and stored as a reference value. The signal required in the transmitter test for mixing is divided on the LO conditioning circuit to the IF of 455 kHz, applied to the FM demodulator via the test generator and then measured and stored in the usual way.

5.1.6.2 Calibration of the DC Multiplexer, Peak-value Meter and RMS Meter

The corresponding IC is calibrated by connecting its input to ground via a switch and then measuring the offset voltage. In order to correct gain errors, an extremely accurate reference voltage of +1 V_{DC} is applied, measured and stored as a correction factor. For measuring the offset voltage, the input of the corresponding IC is connected to ground. In addition, an AC voltage of 40 mV is applied to the rms meter from outside. Since offset voltages can be strongly temperature-dependent, this calibration is carried out immediately after the instrument is switched on and repeated cyclically at extended intervals of time.

5.2 Testing and Adjustment

Basic setting of the module is to be performed before each adjustment:

*

1 1 1 1 0 0 0 0	0 0 0 1 0 0 0 0	0 0 1 0 0 0 0 0	0 0 0 0 0 0 0 0

1 1 0 1 1 1 1 0	0 0 1 1 1 1 0 0	0 0 0 0 0 0 0 0

* 1st bit of the shift register,
  last bit to be shifted in.

The designations of the adjustments refer to the front panel labels.

5.2.1 LEVEL FM R87 Adjustment

(See circuit diagram 802.8435 S, sheet 1)

Setting: Bit No. 1=H, 2=H, 3=H, 4=H

→ Terminate X609 with 50 Ω.
→ Apply 500 MHz, 20 mV to X601.
→ Adjust level at X610 to 150 mV ±10 mV using R87.

5.2.2 LEVEL AM R88 Adjustment

(See circuit diagram 802.8435 S, sheet 1)

The LEVEL FM R87 adjustment must have been carried out before starting this adjustment.

Setting: Bit No. 3=L, 4=L

→ Terminate X609 with 50 Ω.
→ Apply 500 MHz, 20 mV to X601.
→ Adjust level at X610 to 75 mV ±5 mV using R88.

5.2.3 LO TTL R102 Adjustment

(See circuit diagram 802.8435 S, sheet 4)

Setting: Bit No. 48=H, 49=H

→ Apply 62.5 MHz -3 dBm ±3 dB to X608.
→ Set TTL level at D100/3 using R102.
→ Check whether TTL level with half the input frequency is present at P30.

5.2.4 FM DC R213 Adjustment

(See circuit diagram 802.8435 S, sheet 3)

Setting: Basic setting

→ Apply 500 MHz, 20 mV to X601.
→ Apply 500.455 MHz, -6 dBm ±3 dBm to X608.
→ Terminate X610 with 50 Ω.
→ Connect X609 to X607.
→ Apply 10 V ±0.5 mV to X1.A21.
→ Adjust DC voltage at X602 to 0 V ±5 mV using R213.

5.2.5 DEMOD LEVEL R304 Adjustment

(See circuit diagram 802.8435 S, sheet 3)

Setting: Basic setting

Repeat the first five steps given in 5.2.4:

→ Apply 500 MHz, 20 mV, 100 kHz deviation and 1 kHz AF to X601.
→ Adjust rms voltage at X602 to 3.535 V ±1 mV
(corresp. to 5 V_p) using R304.

5.2.6 AM LEVEL R197 Adjustment

(See circuit diagram 802.8435 S, sheets 3/5)

Setting: Bit No. 3=L, 4=L, 35=H, 36=L, 37=L
Same as in 5.2.4 except:

→ Apply 500 MHz, 20 mV, 99% AM and 1 kHz AF to X601.
→ Adjust DC level at D680/1 to 250 mV ±2 mV using R197.

This adjustment influences the AM DC R275 and AM SYMMETRY R254 adjustments and these must therefore be readjusted.

5.2.7 AM SYMMETRY R254 Adjustment

(See circuit diagram 802.8435 S, sheet 3)

Setting: As in 5.2.6

Same as in 5.2.6.

→ Connect oscilloscope to X602.
→ Adjust the limitation of the bottom 1-kHz half-wave to a minimum using R254.

This adjustment influences the AM DC R275 adjustment and this must therefore be readjusted.

5.2.8 AM DC R275 Adjustment

(See circuit diagram 802.8435 S, sheet 3)

The DEMOD LEVEL R304, AM LEVEL R197 and AM SYMMETRY R254 adjustments must already have been carried out.

Setting: As in 5.2.6

Same as in 5.2.6.

→ Adjust rms voltage at X602 to 3.535 V ±1 mV (corresp. to 5 V_p) using R275.
→ Check the AM LEVEL R197 adjustment.

5.2.9 CCITT R388 Adjustment

(See circuit diagram 802.8435 S, sheet 2)

Setting: Bit No. 17=L, 18=H

→ Apply 800 Hz, 1 V_{rms} to X603.
→ Adjust the rms voltage at P15 to 1 V ±1 mV using R388.

5.2.10 LEVEL R543 Adjustment

(See circuit diagram 802.8435 S, sheet 2)

Setting: Basic setting

→ Apply 1 kHz, 500 mV to X22/2.
→ Adjust rms voltage at X23/1 to 1 V ±5 mV using R543.

5.2.11 BALANCE R542 Adjustment

(See circuit diagram 802.8435 S, sheet 2)

Setting: Basic setting

→ Apply 1 kHz, 500 mV to X22/2.
→ Adjust an accurate $\sin^2$ using R542.

5.2.12 1 kHz R557, R556 Adjustment

(See circuit diagram 802.8435 S, sheet 2)

Setting: Basic setting

→ Apply 1 kHz, 1 V to X23/2.
→ Adjust the minimum voltage at P24 using R556 and R557 alternately.

5.2.13 990 Hz R566 Adjustment

(See circuit diagram 802.8435 S, sheet 2)

Setting: Basic setting

→ Apply 1 V, 990 Hz to X23/2.
→ Adjust to minimum voltage at P25 using R566.

5.2.14 1010 Hz R571 Adjustment

(See circuit diagram 802.8435 S, sheet 2)

Setting: Basic setting

→ Apply 1 V, 1010 Hz to X23/2.
→ Adjust to minimum voltage at P26 using R571.

5.2.15 POWER METER Adjustment

(See circuit diagram 802.8435 S, sheet 5)

The adjustment is made in the instrument (see Service Manual for Complete Instrument, Section 4).

5.3 Troubleshooting

5.3.1 Removal and Installation of ICs

The analog unit is a multilayer module, i.e. the printed circuit consists of several boards adhered together. Great care must therefore be taken when removing ICs. The ICs must be completely freed from tin using a desoldering tool and gently removed from the holes since the lead-through bushes could otherwise be torn and thus lines detached from the central layers.

The solder side of the module contains chip capacitors, chip resistors and chip ICs. Since these ICs are also adhered (automatic fitting), they should only be unsoldered if known for certain to be faulty; the ICs are often mechanically damaged because of the high soldering temperatures required so that corresponding spare parts should be available. New ICs should first be fixed using a non-conducting adhesive and then soldered at a low temperature using a very fine soldering iron.

An important indication of a mechanical defect in ICs (break in the substrate support, splitting or overheating of the soldered connections) is the function of the IC at frequencies above approx. 100 MHz; this particularly applies to chip capacitors.

5.3.2 Data Channels of the Analog Unit

The analog unit is addressed by the controller via two separate data channels (56-bit and 12-bit wide). The following tables listing the IC connections and the function can be used to test these data channels.

Table 5-1 Slow data channel

Component	Function	Function with H level
D97/4	Selection of X601 or X604 as input	X601
D97/5	Switch on/off the 20-dB attenuator pad	Switched off
D97/6	FM/AM time constant of control	FM
D97/7	RF level at X609 / 50 mV or 25 mV corresp. to FM or AM, respectively	50 mV, FM
D97/14	None	---
D97/13	None	---
D97/12	None	---
D97/11	None	---
D465/4	Connect calibration switch A ahead of rms meter to continuity or ground	Ground
D465/5	Connect calibration switch B ahead of rms meter to continuity or +5 V	+5 V
D465/6	Switch on/off 40-dB amplifier in peak-value path	40 dB switched on
D465/7	Connect MOD. EXT signal to peak-value meter	Switched off
D465/14	None	---
D465/13	Switch on/off 40-dB amplifier in rms path	40 dB switched on
D465/12	Switch on/off 150-Hz HP in rms path	150-Hz HP switched on
D465/11	None	---
D466/4	Switch on/off 20-dB attenuation at AF input	20 dB switched on
D466/5	Connect AF or demodulation signal to CCITT filter	AF signal
D466/6	Switch on/off 300-Hz HP in demodulation branch	Switched off
D466/7	None	---
D466/14	Connect beat or AF/demodulation signal to loudspeaker, AF counter, oscilloscope	Beat signal
D466/13	Connect AF or demodulation signal to peak-value path	AF signal
D466/12	Main distribution switch	See Table 5-2
D466/11	Main distribution switch	See Table 5-2

Component	Function	Function with H level
D467/4	Connect AF/demodulation/beat or pole filter signal to oscilloscope	Pole filter signal
D467/5	Connect calibration switch C ahead of rms meter to continuity or ground	Ground
D467/6	Connect rms or peak-value path to loudspeaker, AF counter, oscilloscope	Peak-value path
D467/7	Connect rms or peak-value path to distortion control	rms path
D467/14	Connect cailbration switch C ahead of peak-value meter to continuity or ground	Ground
D467/13	Connect calibration switch B ahead of peak-value meter to continuity or +5 V	+5 V
D467/12	Connect calibration switch A ahead of peak-value meter to continuity or ground	Ground
D467/11	Connect AF or demodulation signal to rms path	AF signal
D320/4	IF distribution switch	See Table 5-3
D320/5	IF distribution switch	See Table 5-3
D320/6	Switch on/off FM demodulator	Switched off
D320/7	Selection of demodulation	See Table 5-4
D320/14	Selection of demodulation	See Table 5-4
D320/13	Switch on/off demodulation signal	Switched on
D320/12	Switch on/off automatic IF level system (squelch)	Switched off
D320/11	Gain of demodulation signal, G = 1 or G = 4	G = 4
D104/4	None	---
D104/5	None	---
D104/6	Switch on/off calibration generator	Switched off
D104/7	Modulation of calibration generator, AM or FM	AM
D104/14	None	---
D104/13	Divider factor of LO conditioning	See table 5-5
D104/12	Divider factor of LO conditioning	See table 5-5
D104/11	Switch on/off first divider in LO branch	Switched on
D105/4	LO frequency <31.25 MHz or >31.25 MHz	>31.25 MHz

Table 5-2 Main distribution switch

D466/12	13	Function	
		RMS path	Peak-value path
L	L	AF signal	Demodulation signal
L	H	Demodulation signal	Ground
H	L	CCITT filter	Demodulation signal
H	H	AF signal	CCITT filter

Table 5-3 IF distribution switch

D320/4	5	Function
L	L	IF narrowband, 25 kHz
L	H	IF wideband
H	L	Calibration of RF synthesizer, test
H	H	Calibration of adjacent-channel power filter

Table 5-4 Selection of demodulation

D320/7	14	Function
L	L	AM demodulation
L	H	FM demodulation with deemphasis
H	L	ΦM demodulation
H	H	FM demodulation

Table 5-5 Divider factor of LO conditioning

D104/13	12	Function
L	L	Divider factor : 2
L	H	Switched off
H	L	Divider factor : 4
H	H	Divider factor : 4 (N+2)

The divider factor N is determined by the data at D105;
H level corresponds to divider factor 0.
The MSB is D105/5, the LSB is D105/11; the data width is 7 bit.

Table 5-6 Gain of DC amplifier

D698/4	5	6	Function
L	L	L	0 dB
L	L	H	6 dB
L	H	L	16 dB
L	H	H	26 dB
H	L	L	36 dB
H	L	H	46 dB
H	H	L	56 dB
H	H	H	inpermissible

Table 5-7 DC multiplexer

D698/7	14	13	Function
L	L	L	Peak value
L	L	H	rms value
L	H	L	Distortion
L	H	H	Power
H	L	L	AM DC
H	L	H	RF millivoltmeter
H	H	L	Adjacent-channel power
H	H	H	Test voltages

Table 5-8 Peak-value meter

D698/12	11	Function
L	L	Measure peak value
L	H	Hold peak value
H	L	Reset peak value
H	H	---

Table 5-9 Premultiplexer

D697/5	4	Function
L	L	Test voltages / slow rms measurement
L	H	Ground / slow rms measurement
H	L	PIN control voltage / fast rms measurement
H	H	+5-V calibration voltage/ fast rms measurement

D697/4: Switchover to positive or negative peak value.
L level corresponds to negative peak value.

5.3.3 Test Points

Circuit diagram 802.8435 S, sheet 3 (demodulators)

P1 Amplified output signal of mixer.
In normal mode, frequency f_{IF} = 455 kHz,
level approx. 135 mV (typical).

P2 Control voltage for controlled amplifier.
In normal mode with AM demodulation approx. 2 to 6 V_{DC}, with FM demodulation approx. 2 V.

P3, P4 Difference outputs of controlled amplifier.
In normal mode with AM demodulation, no clipped signal V_{pp} ≈ 1 V; with FM demodulation, squarewave signal of approx. 2.8 V_{pp}.

P5 Sum of signals at P3 und P4.

P6 Voltage of -5 V generated from the 10-V reference voltage.
Tolerance ±1% + tolerance of reference.

P7 +5 V, otherwise as P6.

P8 Output signal of FM demodulator.
TTL level, frequency 910 kHz.

P10 Amplified signal of P9.
Level: V_{pp} = 10 V corresponding to tolerance of reference voltage.

P11 Output signal of ΦM filter.

P12 Output signal of AM demodulator.
Positive full-wave rectified signal of P5.

P13 Signal to switch the demodulated signal on/off.

Circuit 802.8435 S, sheet 2 (AF conditioning)

P14 AF signal at X603 divided by 1 or 10.

P15 Output signal of CCITT filter.

P16 Selectable input/output signal of 300-Hz highpass.

P17 Output signal of 150-Hz highpass.

P18 Signal to rms meter.

P19 Signal to peak-value meter.

P20 Negative operating voltage to supply the CMOS switches, V_{DC} = -10 V ±5% + tolerance of -15 V operating voltage.

P21 Positive operating voltage to supply the CMOS switches, V_{DC} = 6 V ±10%

P24 Output signal of 1-kHz notch filter.

P25 Output signal of 990-Hz notch filter.

P26 Output signal of 1010-Hz notch filter.

Circuit diagram 802.8435 S, sheet 4 (LO conditioning)

P30 Frequency at X608 divided by 2.
Frequency range 15.625 to 31.25 MHz,
level: TTL.

5.3.4 Interfaces (Pin Assignments)

5.3.4.1 Coaxial Connectors

X601 Low level range input of RF amplifier.
Impedance: 50 Ω
Level: 5 to 500 mV
Frequency: 1 to 1000 MHz

X602 Demodulated signal.
Impedance: 600 Ω
Frequency: DC to 20 kHz
Level: 5 V_p corresp. to 100 kHz ΔF
5 V_p corresp. to 100% AM
5 V_p corresp. to 25 rad ΔΦ

With ΦM, frequency range 300 Hz to 10 kHz.

X603 AF voltmeter input.
Impedance: >100 kΩ
Frequency: 50 Hz to 50 kHz
Level: 100 µV to 35 V

X604 High level range input of RF amplifier.
Impedance: 50 Ω
Frequency: 1 to 1000 MHz
Level: 31.6 mV to 1.58 V

X605 Output for oscilloscope.

X606 IF output for adjacent-channel power.
Impedance: 1.5 kΩ
Frequency: 455 kHz ±12.5 kHz
Level: approx. 250 mV

X607 RF input of mixer.
Impedance: 50 Ω
Frequency: 1 to 1000 MHz
Level: 50 mV ±3 dB FM
25 mV ±3 dB AM

X608 LO input.
Impedance: 50 Ω
Frequency: 31.25 to 1000 MHz
Level: -3 dBm ±3 dB 31.25 ≤ f ≤ 62.5 MHz
-6 dBm ±3 dB 62.5 ≤ f ≤ 1000 MHz

X609 RF output of RF amplifier.
Impedance: 50 Ω
Frequency: 1 of 1000 MHz
Pegel: 50 mV ±3 dB FM
25 mV ±3 dB AM

X610 Counter output of RF amplifier.
Impedance: 50 Ω
Frequency: 1 to 1000 MHz
Level: 150 mV ±3 dB FM
75 mV ±3 dB AM

5.3.4.2 64-contact Multipoint Connector

1a	Output for controller: RF level too small (CMOS level)
1b	Power supply +5 V
3a	Strobe for fast data channel
3b	Clock for fast data channel
4a	Strobe for slow data channel
4b	Data for fast data channel
8a	Data for slow data channel
10a,b	Clock for slow data channel
12a,b	Power supply +5 V
17a,b	Power supply +15 V
18b	Output for AF counter
19a,b	Power supply -15 V
21a	10-V reference voltage input
25a	Output for loudspeaker amplifier
26a	Input to measure MOD.EXT.
27a	Self-test voltages input
27b	Power measurement input
28a	RF millivoltmeter input
29a	Adjacent-channel power meter input
30a,b	Output of signal ground for A/D converter
31b	Output of DC voltage for A/D converter

5.3.5 Troubleshooting Diagram

Incorrect or no demodulation measurement

Correct demod. signal at X602 ? 5 V_p corresp. to 100 kHz, 100% AM, 25 rad

→ Yes: DC amplifier, AF conditioning

No ↓

Fault only with AM ?

→ Yes: RF amplifier, AM demodulation

No ↓

IF of 455 kHz at P1 ?

→ Yes: FM demodulator, squelch, controlled amplifier

No ↓

Fault only with F < 31.25 MHz ?

→ Yes: Divider in LO conditioning

No ↓

RF synthesizer OK ?

→ No: RF synthesizer

Yes ↓

Frequency counter OK ?

→ Yes: Mixer, LO conditioning

No ↓

Demodulation via INPUT2 OK ?

→ Yes: RF amplifier, switchover

No ↓

RF amplifier

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	07	1087	ED ANALOGTEIL	802.8435.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C2	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C5	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C20	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C22	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C23	CC 0,5PF+-0,25PF50V NPO CERAMIC CHIP CAPACITOR ERIE GR42-6 0,5PF NPO50V	099.8650	
C25	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C26	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C27 BIS/TO C30	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C31	CC 4,3PF+-0,25PF50V2NPO CAPACITOR VITRAMON VJ0805A4R3CFA	CC 093.5643	
C32	CC 3,3NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y332KFA	CC 099.8909	
C34	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C35	CC 330PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A331JFA	CC 099.8873	
C40	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C41	CC 1,5NF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 152	CC 087.7048	
C42	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C45	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C46	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C47	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C48	CC 15PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A150JFA	CC 099.8750	
C49	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5RODFA	CC 099.8696	
C51	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C52	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C53	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C55	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C56	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C57	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C65	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C66	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C67	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C68	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
BIS/TO C71			
C72	CE 10UF+-20%16V RD3,5X5 ELECTROLYTIC CAPACITOR MATSUSHITA SRE 10UF+-20% 16V	803.0173	
C76	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C77	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C78	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C80	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C81	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C82	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C83	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C85	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C95	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C96	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C97	CK 47NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,047UF/5%	CK 099.2917	
C100	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C101	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C102	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C103	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C104	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C106	CC 27PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A270JFA	CC 099.8409	
BIS/TO C109			
C110	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C111	CC 27PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A270JFA	CC 099.8409	
C112	CC 27PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A270JFA	CC 099.8409	
C113	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
BIS/TO C118			

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C119	CC 330PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A331JFA	CC 099.8873	
C120	CC 3,3NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y332KFA	CC 099.8909	
C121	CC 330PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A331JFA	CC 099.8873	
C122	CC 330PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A331JFA	CC 099.8873	
C123	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C124	CC 3,3NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y332KFA	CC 099.8909	
C126	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C129	CC 220PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A221JFA	CC 099.8850	
C130	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C131	CC 330PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A331JFA	CC 099.8873	
C132	CC 330PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A331JFA	CC 099.8873	
C133	CC 100NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y104KFA	007.5237	
C135	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C136	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C137	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C138	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C141	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C144	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C147	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C150	CK 1,8NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR SIEMENS B33531-A5182-F	CK 283.1699	
C151	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C152	CK 7,5NF+-1,25%63V7,5QUAD CAPACITOR SIEMENS B33531-A5752-F	CK 213.4376	
C153	CC 56PF+-2%5X6NPO CAPACITOR VALVO 2222 678 10569	CC 087.6512	
C154	CK 6,8NF+-1%63V6,3QUX11KP CAPACITOR SIEMENS B33531-A5682-F	CK 099.1927	
C155	CC 56PF+-2%5X6NPO CAPACITOR VALVO 2222 678 10569	CC 087.6512	
C156	CC 1PF+-0,25PF3X4P100 CAPACITOR VALVO 2222 678 03108	CC 087.6170	
C157	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C158	CC 390PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A391JFA	CC 099.8880	
C159	CC 10PF+-0,5PF50VNPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A100DFA	CC 099.8480	
C160	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C161	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C162	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C163	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C165	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C166	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C168	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C170	CC 390PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A391JFA	CC 099.8880	
C171	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C172	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C175	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C176	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C177	CK 22NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,022UF/5%	CK 099.2881	
C180	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C181	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C182	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C183	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C184	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C185	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C190	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C195	CE 2,2UF+-20%20V 5X 4X 7 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 1 2,2/20 20%	CE 022.8104	
C202	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 2 10/16 20%	CE 022.8085	
C205	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C206	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C210	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C211	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C212	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C213	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C215	CC 120PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10121	CC 087.6558	
C216	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C217	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C220	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C221	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C223	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C225	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C226	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C230	CK 22NF+-1%63V8X8X11 KP CAPACITOR SIEMENS B33531-A5223-F	CK 213.4553	
C231	CK 560PF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR SIEMENS B33531-A5561-F	CK 283.1660	
C232	CC 10PF+-0,25PF3X4N750 CAPACITOR VALVO 2222 678 57109	CC 087.6787	
C233	CK 11NF+-1% 63V 7,5QUAD CAPACITOR SIEMENS B33531-A5113-F	CK 099.1679	
C234	CK 10NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5103-F	CK 340.9076	
C235	CK 27NF+-1% 63V 10QUAD CAPACITOR SIEMENS B33531-A5273-F	CK 099.1685	
C237	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C238	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C240	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C241	CK 10NF+-5%63V5RM MKT CAPACITOR WIMA FKS 2/100/0,01UF/5%	CK 099.2869	
C250	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C251	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C253	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C254	CC 6,8PF+-0,25PF4X5P100 CAPACITOR VALVO 2222 678 03688	CC 087.6270	
C255	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C256	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C261	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C262	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C273	CC 3,9PF/O,25PF63V3X5N150 CAPACITOR VALVO 2222 678 33398	CC 099.5545	
C274	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C275	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C282	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C283	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C284	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C285	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C300	CK 220PF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 220/2,5%/63V	CK 099.6087	
C302	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C303	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C305	CK 680PF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 680/2,5%/63V	CK 099.6112	
C306	CK 470PF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 470/2,5%/63V	CK 099.6106	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C310	CK 2,2NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 2200/2,5%/63V	CK 099.6141	
C311	CK 470PF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 470/2,5%/63V	CK 099.6106	
C312	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C313	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C315	CC 27PF+-2%4X5NPO CAPACITOR VALVO 2222 678 10279	CC 087.6470	
C340	CC 27PF+-2%4X5NPO CAPACITOR VALVO 2222 678 10279	CC 087.6470	
C350	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C351	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C352	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C353	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C354	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C355	CK 6,8NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 6800/2,5%/63V	CK 099.6170	
C356	CK 6,8NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 6800/2,5%/63V	CK 099.6170	
C357	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C358	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C359	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C360	CK 6,8NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 6800/2,5%/63V	CK 099.6170	
C361	CK 6,8NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 6800/2,5%/63V	CK 099.6170	
C365	CK 68NF+-1%63V12X12X12 PP CAPACITOR SIEMENS B33531-A5683-F	CK 303.7067	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C366	CK 68NF+-1%63V12X12X12 PP CAPACITOR SIEMENS B33531-A5683-F	CK 303.7067	
C370	CK 68NF+-1%63V12X12X12 PP CAPACITOR SIEMENS B33531-A5683-F	CK 303.7067	
C371	CK 68NF+-1%63V12X12X12 PP CAPACITOR SIEMENS B33531-A5683-F	CK 303.7067	
C372	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C373	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C380	CK 20NF+-1%63V6,3QUX11 KP CAPACITOR SIEMENS B33531-A5203-F	CK 334.5550	
C381	CK 20NF+-1%63V6,3QUX11 KP CAPACITOR SIEMENS B33531-A5203-F	CK 334.5550	
C382	CK 20NF+-1%63V6,3QUX11 KP CAPACITOR SIEMENS B33531-A5203-F	CK 334.5550	
C383	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C384	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C385	CK 3,9NF+-1%63V6,3QUX11KP CAPACITOR SIEMENS B33531-A5392-F	CK 340.8057	
C386	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C387	CK 6,8NF+-1%63V6,3QUX11KP CAPACITOR SIEMENS B33531-A5682-F	CK 099.1927	
C391	CC 56PF+-2%5X6NPO CAPACITOR VALVO 2222 678 10569	CC 087.6512	
C392	CK 1NF+-1,25%63V7,5QUAD. CAPACITOR SIEMENS B33531-A5102-F	CK 213.4353	
C393	CK 10NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5103-F	CK 340.9076	
C400	CK 100NF+-1%63V 11RDX22 CAPACITOR ROEDERST CK1853-410/06/1%	CK 024.6438	
C402	CK 560PF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR SIEMENS B33531-A5561-F	CK 283.1660	
C403	CK 47NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5473-F	CK 099.1904	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C404	CK 47NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5473-F	CK 099.1904	
C405	CK 20NF+-1%63V6,3QUX11 KP CAPACITOR SIEMENS B33531-A5203-F	CK 334.5550	
C406	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C407	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C408	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C409	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C410	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C411	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C415	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C416	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C418	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C419	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C420	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C425	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C426	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C427	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C428	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C429	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C430	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C435	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C436	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C438	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C439	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C440	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C445	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C446	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C448	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C449	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C451	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C452	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C455	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C456	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C457	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C458	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C465	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C470	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C475	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C480	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C485	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C500	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C501	CC 22PF+-2%3X4N750 CAPACITOR VALVO 2222 678 58229	CC 087.6829	
C502	CC 4,7PF+-0,25PF3X4NPO CAPACITOR VALVO 2222 678 09478	CC 087.6387	
C511	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C512	CC 3,3PF+-0,25PF3X4NPO CAPACITOR VALVO 2222 678 09338	CC 087.6364	
C513	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C521	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C522	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C523	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C530	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C531	CE 10UF+-20%35V RD5X5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C533	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C540	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C545	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C550	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C552	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C553	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C555	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C557	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	
C565	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	
C568	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	
C570	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	
C573	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	
C580	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C581	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C582	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C601	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C603	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C635	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C636	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C637	CK 4,7NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR WIMA FKP2 4700/2,5%/63V	CK 099.6164	
C638	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C645	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C646	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C647	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C648	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C650	CK 680NF+-10%50VRM MKT CAPACITOR WIMA MKS2/50/0,68UF/10%	CK 099.2981	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C651	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C653	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C654	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C655	CK 330NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,33UF/5%	CK 099.2969	
C656	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C660	CE 2,2UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 3 2,2/40 20%	CE 022.8191	
C661	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C662	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C663	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 2 10/16 20%	CE 022.8085	
C664	CE 10UF -10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK10/63	CE 022.7650	
C670	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ROEDERSTEI ETR 2 4,7/20 20%	CE 022.8110	
C671	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C672	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C675	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C676	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C680	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C685	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C686	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C687	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C700	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	
C701	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	
C703	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C704	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C705	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C706	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
D76	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D96	BL CD4047AE MULTIVIBR. MULTIVIBRATOR RCA CD4047AE	BL 086.7221	
D97	BL HEF4094BT 8B.SHIFTREG 8 STAGE BUS REGISTER VALVO HEF4094BT, GEGURTET	803.0867	
D100	BL SN74S74N 2XD-FLIPFL. FLIP-FLOP TEXAS SN74S74N	266.6621	
D101	BL 74F161PC 4B.BIN.CNT 4BIT SYNC.PRES.BIN.COUNT. VALVO N74F161N	BL 344.7103	
D102	BL 74F161PC 4B.BIN.CNT 4BIT SYNC.PRES.BIN.COUNT. VALVO N74F161N	BL 344.7103	
D103	BL SN74LS153N DATENSELEKT IC MULTIPLEXER SN74LS153N TEXAS SN74LS153N	266.4729	
D104	BL HEF4094BT 8B.SHIFTREG 8 STAGE BUS REGISTER VALVO HEF4094BT, GEGURTET	803.0867	
D105	BL HEF4094BT 8B.SHIFTREG 8 STAGE BUS REGISTER VALVO HEF4094BT, GEGURTET	803.0867	
D106	BL CD4040BE 12B.COUNTER COUNTER RCA CD4040BE	BL 086.7180	
D110	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP {MJG}	BJ 213.4530	
D220	BJ N8T20F 1XLINE REC LINE RECEIVER SIGNETICS N8T20F	BJ 289.4502	

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	07	1087	ED ANALOGTEIL	802.8435.01 SA	17

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D225	BL HEF4011BT 4X2IN.NANDG NAND GATE VALVO HEF4011BT	350.4154	
D280	BL CD4052BE 2X4CHAN.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	
D282	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP {MJG}	BJ 213.4530	
D315	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP {MJG}	BJ 213.4530	
D320	BL HEF4094BT 8B.SHIFTREG 8 STAGE BUS REGISTER VALVO HEF4094BT, GEGURTET	803.0867	
D352	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D410	BL CD4052BE 2X4CHAN.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	
D415	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D430	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D435	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP {MJG}	BJ 213.4530	
D445	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D450	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D455	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D465	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D466	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D467	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D470	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D650	BL MC14066BAL 4X ANALOGSW ANALOG SWITCH MOTOROLA MC14066BAL	BL 418.0135	
D675	BL CD4052BE 2X4CHAN.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D680	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D685	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D695	BL SN74LS05N 6/INVERT. OC IC INVERTER SN74LS05N TEXAS SN74LS05N	266.7911	
D696	BL SN74LS05N 6/INVERT. OC IC INVERTER SN74LS05N TEXAS SN74LS05N	266.7911	
D697	BL HEF4094BT 8B.SHIFTREG 8 STAGE BUS REGISTER VALVO HEF4094BT, GEGURTET	803.0867	
D698	BL HEF4094BT 8B.SHIFTREG 8 STAGE BUS REGISTER VALVO HEF4094BT, GEGURTET	803.0867	
E160	ER 455KHZ-BANDP.KER.B:30K 455KHZ-BANDPASS,CER.BW30K MURATA CFW 455 B	803.0809	
H600	EF 6V 0,02A OHNE SOCKEL LAMP 6V BUERKLIN 33 G112	EF 803.0815	
K5	SN HF-RELAIS 12V 1XUM RELAY SDS RF1E-12V	803.0821	
K166	SR 5 V 1XU DIL RELAY ELECTROL RA 30421051	SR 340.4551	
K168	SR 5 V 1XU DIL RELAY ELECTROL RA 30421051	SR 340.4551	
K350	SR 5V360OHM1MA11RH-JC-GEH RELAY CLARE PRME 15.005	SR 412.0027	
L1	LD 680 UH10%60,0OHM0,030A CHOKE DELEVAN DROSSEL1025-88	LD 067.3201	
L2	LD 680 UH10%60,0OHM0,030A CHOKE DELEVAN DROSSEL1025-88	LD 067.3201	
L20	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	
L21	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	
L25	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L26	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L27	LD 1000UH10%72,0OHM0,028A CHOKE DELEVAN DROSSEL1025-92	LD 037.8005	
L30	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	
L33	LD 270 UH10%25,0OHM0,047A CHOKE DELEVAN DROSSEL1025-78	LD 067.3153	
L46	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L50	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	
L55	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	
L100	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L123	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L130	LD 1000UH10%72,0OHM0,028A CHOKE DELEVAN DROSSEL1025-92	LD 037.8005	
L149	LD 1,00UH10%1,00OHM0,390A CHOKE DELEVAN 1025-20	LD 067.2863	
L150	LD 18UH+-2% 0,36A1,95 OHM MINI CHOKE JAHRE 74.11-18ROG	LD 283.1001	
L151	LD 18UH+-2% 0,36A1,95 OHM MINI CHOKE JAHRE 74.11-18ROG	LD 283.1001	
L180	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L185	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L210	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L212	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L213	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L216	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L315	LD 10,0UH10%3,30OHM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L340	LD 10,0UH10%3,30OHM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
N10	BO MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER NSC LM1558J	275.0816	
N15	BO MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER NSC LM1558J	275.0816	
N45	BM OM350R ANTENNEN-VERST BROADBAND AMPLIFIER VALVO OM350R SPEZ.	803.0838	
N50	BM OM350R ANTENNEN-VERST BROADBAND AMPLIFIER VALVO OM350R SPEZ.	803.0838	
N55	BM OM350R ANTENNEN-VERST BROADBAND AMPLIFIER VALVO OM350R SPEZ.	803.0838	
N70	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N90	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N100	BM OM350 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM350	BM 334.4953	
N115	BM TFM2 MIXER 1.0GHZ MIXER MCL TFM-2	BM 302.6080	
N120	BM OM361A ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM361A	BM 334.5314	
N130	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N170	BO LF157J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF157J	BO 343.1530	
N175	BO MC1590BGCS HF AMPL HF AMPLIFIER MOTOROLA MC1590BGCS	BO 455.4047	
N180	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N190	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N205	BO MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER NSC LM1558J	275.0816	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
N230	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N240	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N250	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N270	BO SE5534AFE LOW N.OPAMP OPERATIONAL AMPLIFIER SIGNETICS SE5534AFE	301.3335	
N290	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N300	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N310	BO NE5532AFE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532AFE	BO 356.0450	
N350	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N352	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N355	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N365	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N380	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N385	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N400	BO NE5532AFE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532AFE	BO 356.0450	
N415	BO NE5532AFE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532AFE	BO 356.0450	
N425	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N435	BO NE5532AFE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532AFE	BO 356.0450	
N445	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N455	BO CA3240AE 2XMOS OPAMP OPERATIONAL AMPLIFIER RCA CA3240AE	302.7040	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
N460	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N500	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N505	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N510	BO LM13600AN 2XOTA TRANSCONDUCTANCE AMPL. NSC LM13600AN	803.0796	
N520	BO MC1595L MULTIPLIER MULTIPLIER MOTOROLA MC1595L	BO 451.4365	
N530	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N550	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N565	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N570	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N580	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N600	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N630	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N635	BJ PKD01FP PEAK DETECT PEAK DETECTOR PMI PKD01	358.6256	
N640	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N645	BJ AD536AJH RMS/DC-CONV RMS/DC-CONVERTER ANALOG DEV AD536AJH	BJ 350.2639	
N650	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N660	BJ AD636JH RMS/DC-CONV RMS/DC-CONVERTER ANALOG DEV AD636JH	BJ 350.2780	
N670	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N685	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
P1	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 22X1POL.	FP 242.3600	
P2	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P3	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P4	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 1X3POL	FP 242.3600	
P5	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
BIS/TO P8			
P10	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
BIS/TO P21			
P24	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P25	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P26	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P28	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P30	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
R1	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R2	RG 68,1 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 68,1OHM F T	RG 006.8849	
R3	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R4	RD 0,8W 1,0KOHM+-3% WIRE-WOUND RESISTOR SAGE 1000S/1K/3%	RD 067.0602	
R5	RD 0,8W 1,0KOHM+-3% WIRE-WOUND RESISTOR SAGE 1000S/1K/3%	RD 067.0602	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R10	RL 0,35W 68,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/68,1OHM-F-D	RL 082.9636	
R15	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R16	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R17	RL 0,35W 68,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/68,1OHM-F-D	RL 082.9636	
R18	RL 0,35W 68,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/68,1OHM-F-D	RL 082.9636	
R20	RL 0,35W 243 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/243OHM-F-D	RL 083.0126	
R21	RD 0,8W 1,2KOHM+-3% WIRE WOUND RESISTOR SAGE 1000S/1,2K/3%	RD 067.7113	
R22	RG 61,9 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 61,9OHM F T	RG 006.8832	
R23	RG 237 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 237OHM2% TK	006.8978	
R24	RG 61,9 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 61,9OHM F T	RG 006.8832	
R25	RL 0,35W 243 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/243OHM-F-D	RL 083.0126	
R26	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R27	RL 0,35W 2,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,49K-F-D	RL 083.0890	
R30	RL 0,35W 453 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/453OHM-F-D	RL 083.0378	
R31	RG 46,4 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 46,4OHM2% TK	006.8803	
R32	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R33	RG 178 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 178OHM2% TK	006.8949	
R34	RL 0,21W 270 OHM2% UNGEW. RESISTOR RESISTA MK1 270OHM 2% UNGEW.	RL 092.6000	
R40	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R41	RL 0,35W 511 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/511OHM-F-D	RL 083.0426	
R42	RL 0,35W22,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/22,1OHM-F-D	RL 082.9188	
R45	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R46	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/130OHM-F-D	RL 082.9888	
R47	RG 34,8 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 34,8OHM2% TK	006.8778	
R48	RG 56,2 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 56,2OHM F T	RG 006.8826	
R49	RG 68,1 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 68,1OHM F T	RG 006.8849	
R50	RG 23,7 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 23,7OHM2% TK	006.8732	
R51	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/130OHM-F-D	RL 082.9888	
R55	RG 38,3 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 38,3OHM2% TK	006.8784	
R56	RG 178 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 178OHM2% TK	006.8949	
R57	RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR DALE CRCW1206 10,0 OHM FT	RG 006.8649	
R58	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/130OHM-F-D	RL 082.9888	
R60	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R61	RG 34,8 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 34,8OHM2% TK	006.8778	
R62	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R65	RG 274 KOHM+-1%TK100 RESISTOR CHIP DALE CRCW1206 274KOHM 1%	RG 007.4460	
R66	RG 56,2 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 56,2OHM F T	RG 006.8826	
R67	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 4,64KOHM 2%	007.0712	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R70	RL 0,35W 274 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/274K-F-C	RL 083.2364	
R71	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R75	RN 4X 100KOHM+-2%SIL 8 H5 RESISTOR NETWORK BOURNS 4308R-102-104	RN 333.9497	
R76	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R77	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R80	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R81	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R85	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R86	RL 0,35W 59,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/59,0K-F-C	RL 083.1845	
R87	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-202	RS 247.7961	
R88	RS 0,5W100KOHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386X-1-104	RS 087.7683	
R90	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R91	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R95	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R96	RL 0,35W 8,06KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/8,06K-F-D	RL 083.1222	
R97	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R98	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R99	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 4,64KOHM 2%	007.0712	
R100	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R102	RS 0,3W 10KOHM+-10%CERMET TRIMMING POTENTIOMETER BECKMAN 67W 10KOHM 10%	RS 006.9145	
R103	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R106	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R107	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R110	RG 3,16KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 3,16KOHM 2%	007.0670	
R111	RG 3,16KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 3,16KOHM 2%	007.0670	
R112	RG 100KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100KOHM F T	RG 007.1948	
R113	RG 100KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100KOHM F T	RG 007.1948	
R114	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R120	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R121	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R122	RG 23,7 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 23,7OHM2% TK	006.8732	
R123	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R124	RL 0,35W 37,4 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/37,4OHM-F-D	RL 082.9407	
R125	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	
R126	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	
R127	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R128	RG 20,0 OHM+-1%TK100 1206 RESISTOR CHIP DALE CRW1206 20,0OHM F-T	RG 007.5472	
R129	RG 51,1 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 51,1OHM F T	RG 006.8810	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R130	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R131	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R132	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R136	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R137	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R138	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R139	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
R140	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
R150	RL 0,35W 49,9 OHM+-1%TK50 RESISTOR RESISTA MK2	RL 082.9520	
R151	RG 51,1 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 51,1OHM F T	RG 006.8810	
R154	RL 0,21W 10,0 OHM+-1%TK50 RESISTOR RESISTA MK1 10,0OHM 1% TK50	RL 092.1715	
R156	RL 0,21W 1,21KOHM+-1%TK50 RESISTOR RESISTA MK1 1K21 1% TK50	RL 092.1450	
R157	RL 0,21W 221 OHM+-1%TK50 RESISTOR RESISTA MK1 221OHM 1% TK50	RL 092.1367	
R158	RL 0,21W 1,82KOHM+-1%TK50 RESISTOR RESISTA MK1 1K82 1% TK50	RL 092.1473	
R159	RL 0,21W 2,00KOHM+-1%TK50 RESISTOR RESISTA MK1 2K 1% TK50	092.0283	
R160	RL 0,21W 10,0KOHM+-1%TK50 RESISTOR RESISTA MK1 10K0 1% TK50	RL 092.1567	
R161	RL 0,21W 10,0KOHM+-1%TK50 RESISTOR RESISTA MK1 10K0 1% TK50	RL 092.1567	
R162	RL 0,21W 1,50KOHM+-1%TK50 RESISTOR RESISTA MK1 1K5 1% TK50	RL 092.1467	
R163	RL 0,21W 90,9 OHM+-1%TK50 RESISTOR RESISTA MK1	092.0125	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R164	RL 0,21W 1,21KOHM+-1%TK50 RESISTOR RESISTA MK1 1K21 1% TK50	RL 092.1450	
R165	RL 0,21W 1,50KOHM+-1%TK50 RESISTOR RESISTA MK1 1K5 1% TK50	RL 092.1467	
R166	RL 0,21W 10,0KOHM+-1%TK50 RESISTOR RESISTA MK1 10K0 1% TK50	RL 092.1567	
R167	RG 1,47KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 1,47KOHM 2%	006.9980	
R168	RL 0,21W 10,0KOHM+-1%TK50 RESISTOR RESISTA MK1 10K0 1% TK50	RL 092.1567	
R169	RG 3,16KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 3,16KOHM 2%	007.0670	
R170	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R171	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R172	RG 28,7KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 28,7KOHM 2%	007.0964	
R175	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R176	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R177	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R180	RN 4X1,0KOHM+-2%SIL 8 H5 RESISTOR NETWORK BOURNS 4308R-102-102	RN 291.4370	
R190	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R191	RL 0,35W 32,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/32,4K-F-C	RL 083.1668	
R192	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R195	RN 4X 10KOHM+-2%SIL 8 H5 RESISTOR NETWORK BOURNS 4308R-102-103	RN 291.5154	
R196	RL 0,35W 665 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/665OHM-F-C	RL 082.2419	
R197	RS 0,3W2,0KOHM+-10%CERMET TRIMMING POTENTIOMETER BECKMAN 67W 2KOHM 10%	RS 006.9139	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R198	RL 0,35W 30,9KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,9K-F-C	RL 083.1645	
R200	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R201	RL 0,35W10,0KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/10K-B-E	RL 084.3064	
R202	RL 0,35W10,0KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/10K-B-E	RL 084.3064	
R203	RL 0,35W10,0KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/10K-B-E	RL 084.3064	
R204	RL 0,35W10,0KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/10K-B-E	RL 084.3064	
R213	RS 0,3W 500 OHM+-10%CERM. TRIMMING POTENTIOMETER BOURNS 3296W-1- 500OHM+-10%	RS 006.6675	
R214	RG 13,0KOHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 13,0KOHM FT	RG 007.5837	
R215	RG 13,0KOHM+-1%TK100 1206 RESISTOR CHIP DALE CRCW1206 13,0KOHM FT .TRIMMWERT	RG 007.5837	
R220	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 4,64KOHM 2%	007.0712	
R221	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 4,64KOHM 2%	007.0712	
R222	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
R223	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R224	RL 0,35W 374 KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.2493	
R225	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R227	RL 0,35W 402 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/402OHM-F-D	RL 083.0326	
R228	RG 38,3KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 38,3KOHM 2%	007.0993	
R230	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R231	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R232	RL 0,35W 60,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/60,4K-F-C	RL 083.1851	
R233	RL 0,35W66,5KOHM+-0,1%T25 RESISTOR DRALORIC SMA/207/66,5K-B-E	RL 084.4648	
R234	RL 0,35W 14,3KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/14,3K-F-D	RL 083.1380	
R235	RL 0,35W 115 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/115K-F-C	RL 083.2058	
R240	RL 0,21W 10,0KOHM+-1%TK50 RESISTOR RESISTA MK1 10K0 1% TK50	RL 092.1567	
R241	RL 0,35W 75,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/75K-F-C	RL 083.1916	
R242	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R250	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 4,64KOHM 2%	007.0712	
R252	RL 0,35W 243 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/243OHM-F-D	RL 083.0126	
R254	RS 0,3W 10KOHM+-10%CERMET TRIMMING POTENTIOMETER BECKMAN 67W 10KOHM 10%	RS 006.9145	
R260	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R261	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R262	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R263	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R264	RG 464 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 464OHM2% TK	006.9045	
R265	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R266	RL 0,35W 511 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/511OHM-F-D	RL 083.0426	
R267	RL 0,35W 511 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/511OHM-F-D	RL 083.0426	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R270	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R271	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R272	RL 0,35W 143 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/143K-F-C	RL 083.2112	
R273	RL 0,35W 143 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/143K-F-C	RL 083.2112	
R274	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R275	RS 0,3W100KOHM+-10%CERMET TRIMMING POTENTIOMETER BECKMAN 67W 100KOHM 10%	RS 006.9168	
R279	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R281	RG 10,0 OHM+-1%TK100 1206 CHIP -RESISTOR DALE CRCW1206 10,0 OHM FT	RG 006.8649	
R282	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R283	RG 38,3KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 38,3KOHM 2%	007.0993	
R284	RG 38,3KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 38,3KOHM 2%	007.0993	
R285	RL 0,21W 39,2KOHM+-1%TK50 RESISTOR RESISTA MK1 39K2 1% TK50	RL 092.1638	
R288	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R289	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R290	RG 38,3KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 38,3KOHM 2%	007.0993	
R291	RL 0,35W1,50MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 1,50MOHM 1% TK50	RL 099.8138	
R292	RL 0,35W 56,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2K-F-C	RL 082.2231	
R294	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R300	RL 0,35W 14,3KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/14,3K-F-D	RL 083.1380	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R302	RL 0,35W 3,57KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,57K-F-D	RL 083.1022	
R303	RL 0,35W 511 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/511OHM-F-D	RL 083.0426	
R304	RS 0,3W 1KOHM+-10%CERMET TRIMMING POTENTIOMETER BOURNS 3296W-1- 1KOHM+-10%	RS 006.6681	
R305	RL 0,35W 2,15KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,15K-F-D	RL 083.0855	
R306	RL 0,35W 4,87KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,87K-F-D	RL 083.1100	
R310	RL 0,35W 3,09KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,09K-F-D	RL 083.0978	
R311	RL 0,35W 3,83KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,83K-F-D	RL 082.6614	
R314	RL 0,35W 604 OHM+-1%TK50 RESISTOR DRALORIC SMA/207/604OHM-F-C	RL 082.2425	
R315	RL 0,35W 604 OHM+-1%TK50 RESISTOR DRALORIC SMA/207/604OHM-F-C	RL 082.2425	
R317	RL 0,35W 3,01KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,01K-F-D	RL 083.0961	
R318	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R350	RL 0,35W 909 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/909K-F-C	RL 083.2858	
R351	RL 0,35W 97,6KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/97,6K-F-C	RL 083.2006	
R352	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R353	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R354	RL 0,35W 4,12KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,12K-F-D	RL 083.1051	
R355	RL 0,35W 30,9KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,9K-F-C	RL 083.1645	
R357	RL 0,35W 39,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/39,2K-F-C	RL 083.1745	
R360	RL 0,35W 110 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/110K-F-C	RL 083.2041	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R361	RL 0,35W 26,7KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/26,7K-F-C	RL 083.1597	
R365	RL 0,35W 29,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/29,4K-F-C	RL 083.1622	
R366	RL 0,35W 1,78KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,78K-F-D	RL 082.6643	
R370	RL 0,35W 604 OHM+-1%TK50 RESISTOR DRALORIC SMA/207/604OHM-F-C	RL 082.2425	
R371	RL 0,35W 110 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/110K-F-C	RL 083.2041	
R380	RL 0,35W 76,8KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/76,8K-F-C	RL 083.1922	
R381	RL 0,35W 28,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/28,0K-F-C	RL 083.1600	
R382	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R385	RL 0,35W 21,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/21,0K-F-C	RL 083.1539	
R386	RL 0,35W 19,6KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/19,6K-F-C	RL 083.1516	
R387	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R388	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER BOURNS 3386X-1-501	RS 247.7955	
R389	RL 0,35W 1,96KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1.96K-F-D	RL 083.0810	
R390	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R391	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R400	RL 0,35W 5,90KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,90K-F-D	RL 083.1145	
R401	RL 0,35W 5,90KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,90K-F-D	RL 083.1145	
R402	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R403	RL 0,35W4,64KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,64K-F-C	RL 082.1687	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R404	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R405	RL 0,35W 26,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/26,1K-F-C	RL 082.2431	
R415	RL 0,35W 300KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/300K-F-D	RL 082.7840	
R416	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	
R417	RL 0,35W 1,54KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,54K-F-D	RL 083.0749	
R425	RL 0,35W 35,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/35,7K-F-C	RL 083.1700	
R426	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R427	RL 0,35W 115 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/115K-F-C	RL 083.2058	
R430	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R435	RL 0,35W 300KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/300K-F-D	RL 082.7840	
R436	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	
R437	RL 0,35W 1,54KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,54K-F-D	RL 083.0749	
R445	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R446	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R447	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R448	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R451	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R452	RL 0,35W 249 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/249OHM-F-D	RL 083.0132	
R455	RL 0,35W 16,9KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/16,9K-F-C	RL 083.1451	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R456	RL 0,35W 102 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/102OHM-F-D	RL 082.9788	
R460	RL 0,35W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R461	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R471	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R472	RL 0,35W4,64KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,64K-F-C	RL 082.1687	
R475	RL 0,35W4,64KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,64K-F-C	RL 082.1687	
R480	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	
R485	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/10OHM-F-D	RL 082.8852	
R500	RL 0,35W 30,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,1K-F-C	RL 083.1639	
R501	RL 0,35W 59,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/59,0K-F-C	RL 083.1845	
R502	RL 0,35W3,92MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 3,92MOHM 1% TK50	RL 099.8238	
R510	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R511	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R512	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R513	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R514	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R515	RL 0,35W 16,9KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/16,9K-F-C	RL 083.1451	
R520	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R521	RL 0,35W13,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/13,7K-F-D	RL 082.6608	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R522	RL 0,35W13,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/13,7K-F-D	RL 082.6608	
R523	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R524	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R525	RL 0,35W 3,01KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,01K-F-D	RL 083.0961	
R530	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R531	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R532	RL 0,35W25,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/25,5K-F-C	RL 083.1580	
R533	RL 0,35W25,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/25,5K-F-C	RL 083.1580	
R534	RL 0,35W 37,4KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/37,4K-F-C	RL 083.1722	
R540	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R541	RL 0,35W 1,47KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,47K-F-D	RL 083.0726	
R542	RS 0,5W20KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386X-1-203	RS 087.7660	
R543	RS 0,5W20KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386X-1-203	RS 087.7660	
R544	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R545	RL 0,35W 1,47KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,47K-F-D	RL 083.0726	
R550	RL 0,35W 30,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,1K-F-C	RL 083.1639	
R552	RL 0,35W 11,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/11K-F-D	RL 083.1322	
R553	RL 0,35W 11,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/11K-F-D	RL 083.1322	
R555	RL 0,35W 26,7KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/26,7K-F-C	RL 083.1597	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R556	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-502	RS 247.7978	
R557	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-502	RS 247.7978	
R558	RL 0,35W 26,7KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/26,7K-F-C	RL 083.1597	
R559	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R560	RL 0,35W1,02KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207	RL 083.9169	
R561	RL 0,35W 51,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/51,1K-F-C	RL 083.1822	
R562	RL 0,35W 5,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,49K-F-D	RL 083.1139	
R565	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R566	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-502	RS 247.7978	
R567	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R568	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R569	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R570	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R571	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER BOURNS 3386X-1-502	RS 247.7978	
R572	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/17,4K-F-C	RL 083.1468	
R573	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R574	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R580	RL 0,35W 5,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,49K-F-D	RL 083.1139	
R581	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R582	RL 0,35W 750 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/750OHM-F-C	RL 082.2360	
R600	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R601	RL 0,35W 107 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/107K-F-C	RL 083.2035	
R635	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R636	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R637	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R650	RL 0,35W 2,43KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,43K-F-D	RL 083.0884	
R651	RL 0,35W 5,11KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,11K-F-C	RL 082.2348	
R652	RL 0,35W 15,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/15,4K-F-D	RL 083.1416	
R653	RL 0,35W 7,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/7,5K-F-D	RL 083.1197	
R655	RL 0,35W 2,55KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/2,55K-F-C	RL 082.2354	
R656	RL 0,35W 5,36KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/5,36K-F-C	RL 082.2460	
R657	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1K-F-D	RL 083.1351	
R658	RL 0,35W 5,90KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,90K-F-D	RL 083.1145	
R660	RL 0,35W 24,3KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/24,3K-F-C	RL 083.1574	
R670	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R671	RL 0,35W 4,22KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,22K-F-D	RL 083.1068	
R674	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R675	RN 4X 10KOHM+-2%SIL 8 H5 RESISTOR NETWORK BOURNS 4308R-102-103	RN 291.5154	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R685	RL 0,35W 14,3KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/14,3K-F-D	RL 083.1380	
R686	RL 0,35W 9,76KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/9,76K-F-D	RL 083.1280	
R687	RL 0,35W 3,09KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,09K-F-D	RL 083.0978	
R688	RL 0,35W 976 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/976OHM-F-D	RL 083.0603	
R689	RL 0,35W 309 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/309OHM-F-D	RL 083.0226	
R690	RL 0,35W 97,6 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/97,6OHM-F-D	RL 082.9771	
R691	RL 0,35W 45,3 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/45,3OHM-F-D	RL 082.9488	
R695	RN 5X 10KOHM+-2%SIL 6 H5 RESISTOR NETWORK BOURNS 4306R-101-103	RN 099.2675	
R696	RN 9X100KOHM+-2%SIL10 H5 RESISTOR NETWORK BOURNS 4310R-101-104	RN 542.5092	
V1	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V2	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V3	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V6	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V10	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V11	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V15	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V16	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V17	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V18	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V20	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V21	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V23	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V24	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V25	AE BZX79/C5V6 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V6	AE 012.2455	
V26	AE BZX79/C9V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C9V1	AE 012.2503	
V27	AE MA47111 200V PINDI PIN DIODE M/A-COM MA47111	803.0773	
V28	AE 5082-3081 100V PINDI PIN DIODE HEWLETT-P. 5082-3081	803.0780	
V29	AE 5082-3081 100V PINDI PIN DIODE HEWLETT-P. 5082-3081	803.0780	
V32	AK NE85637 NPN 12V 100MA TRANSISTOR NEC NE85637	801.8231	
V40	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V41	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V65	AE 5082-2804 2XSCHOTTKYDI DIODE HEWLETT-P. 5082-2804	AE 012.8724	
V70	AE 5082-2804 2XSCHOTTKYDI DIODE HEWLETT-P. 5082-2804	AE 012.8724	
V77	AE BZX79/C10 0,5W Z-DI ZENER DIODE VALVO BZX79/C10	AE 012.2510	
V78	AE BZX79/C10 0,5W Z-DI ZENER DIODE VALVO BZX79/C10	AE 012.2510	
V80	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V95	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V7	AE 012.2432	

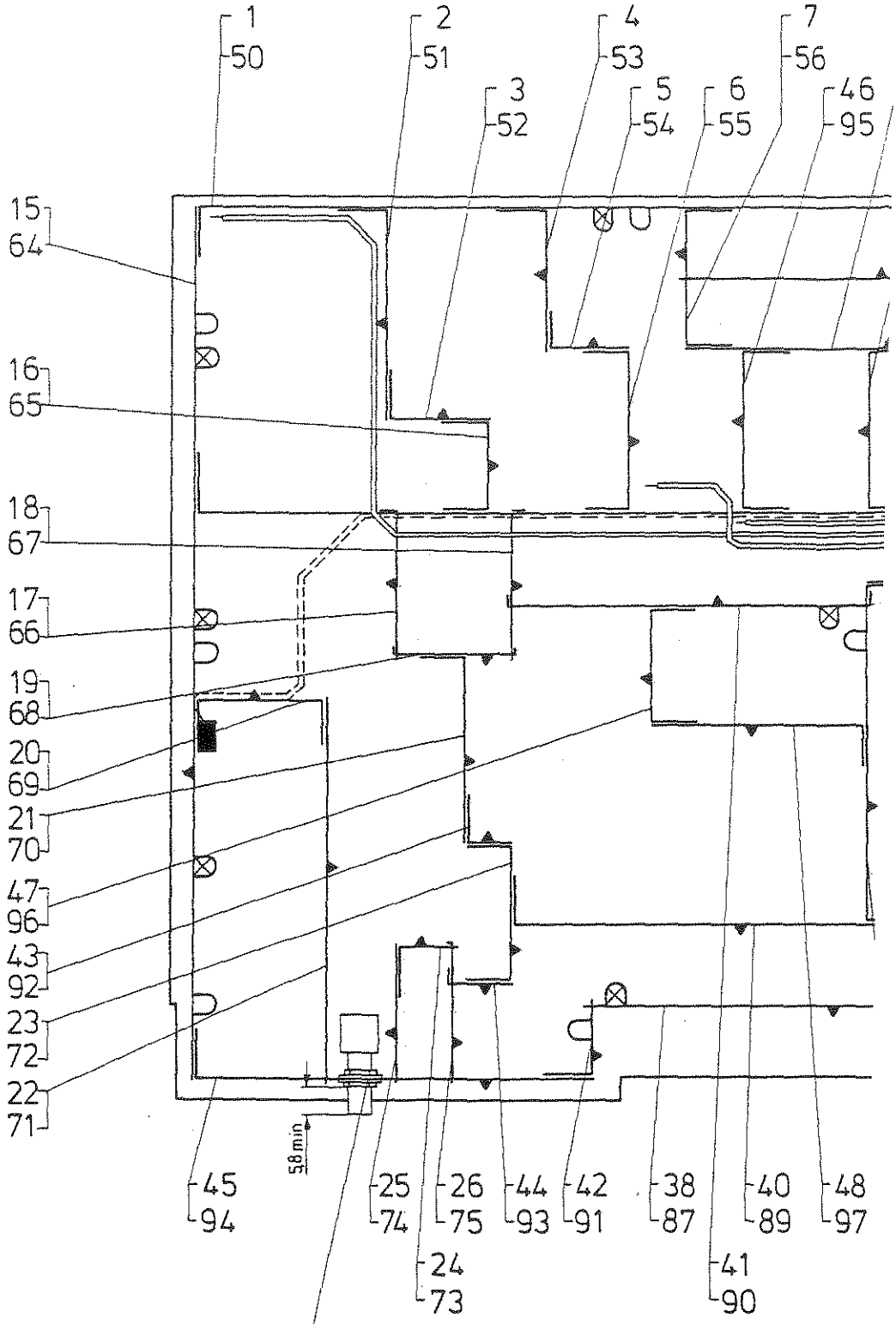
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V99	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V123	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V125	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V126	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V156	AK BFT66 NPN 15V 30MA TRANSISTOR SIEMENS BFT66	AK 252.5728	
V160	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V166	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V167	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V168	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V169	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V175	AE BZX79/C9V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C9V1	AE 012.2503	
V200	AE BA483 BER.SCH.DIOD.UHF DIODE VALVO BA483	AE 568.2290	
V205	AL BD139 NPN 80V 1A0 TRANSISTOR VALVO BD139	AL 274.8994	
V220	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V222	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V264	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V265	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
V266	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V267	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	

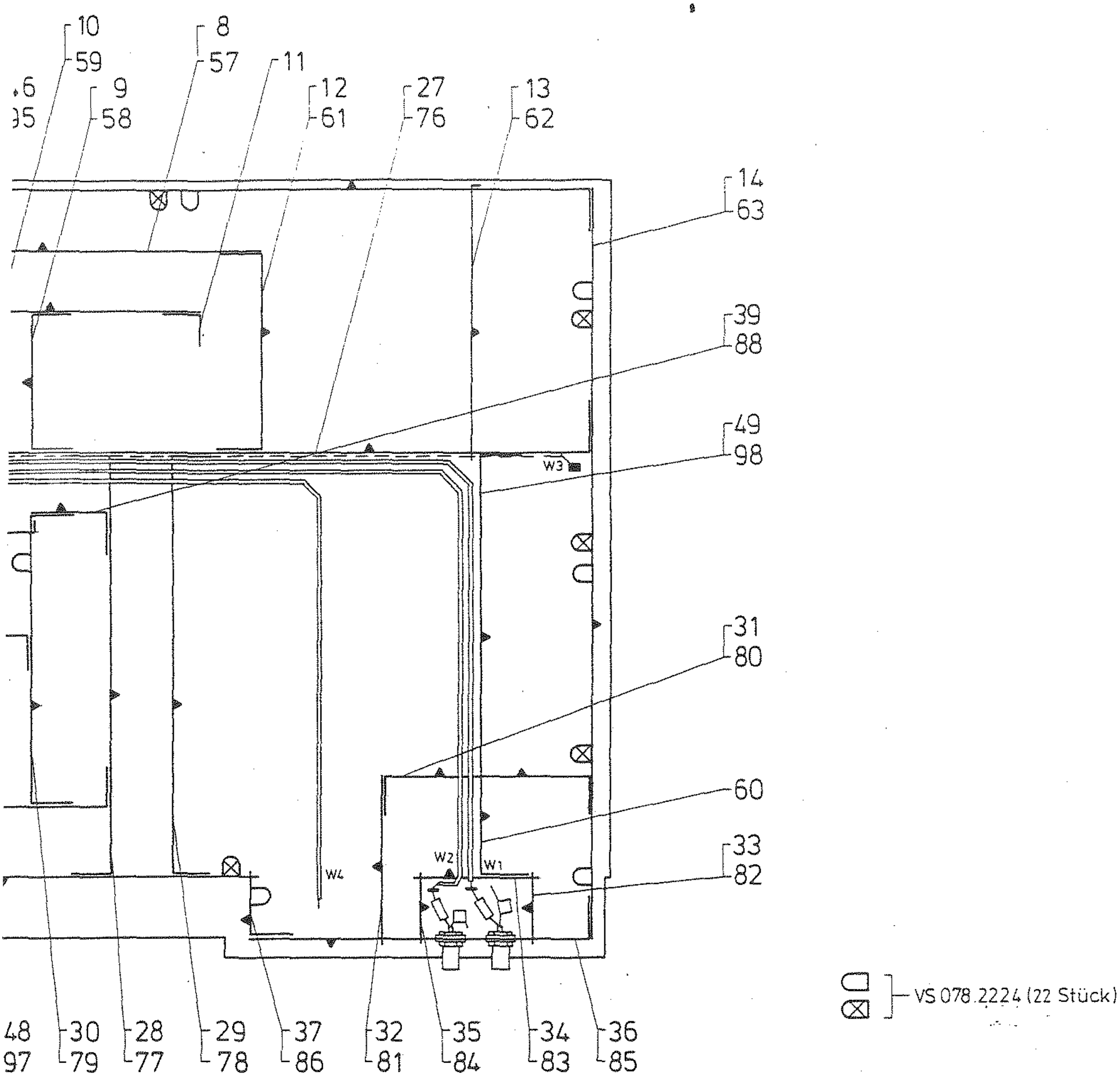
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V279	AE BZX79/C6V2 0,5W Z-DI ZENER DIODE VALVO BZX79/C6V2	AE 012.2461	
V280	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V3	AE 012.2426	
V281	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V3	AE 012.2426	
V284	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V290	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V351	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V352	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V353	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V354	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V355	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V356	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V365	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V366	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V405	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V406	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V415	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V416	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V425	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V426	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V435	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V436	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V445	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V446	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V448	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V449	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V472	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/B5V1	AE 262.5837	
V475	AE BZX79/C6V8 0,5W Z-DI ZENER DIODE VALVO BZX79/C6V8	AE 012.2478	
V476	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V510	AF HLMP1200 LED RT RD3 LED HEWLETT 5082-4487	AF 273.0448	
V660	AE BZX79/C10 0,5W Z-DI ZENER DIODE VALVO BZX79/C10	AE 012.2510	
V661	AE BZX79/C10 0,5W Z-DI ZENER DIODE VALVO BZX79/C10	AE 012.2510	
V674	AK BC550B NPN 50V 100MA TRANSISTOR SIEMENS BC550B GURT,POL.CBE	AK 007.2050	
W1	DX HF-KABEL RF CABLE	802.8512	
W2	DX HF-KABEL RF CABLE	802.8535	
W3	DX HF-KABEL RF CABLE	802.8558	
W4	DX HF-KABEL RF CABLE	802.8570	
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	
X10	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X22	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X23	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 2X3POL.	FP 242.3600	
X24	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X30	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X31	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 4X2POL.	FP 242.3600	
X601	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X602	FJ EINBAUSTECKER SYST.SMB FIXED PLUG RADIALL R.114 554	FJ 063.5139	
X603	FJ EINBAUSTECKER SYST.SMB FIXED PLUG RADIALL R.114 554	FJ 063.5139	
X604	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X605	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X606	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X607	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X608	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X609	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X610	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
Z1	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z2	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z5	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
Z20	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z25	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z26	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z30	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z50	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z101	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z102	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z103	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
			- ENDE -


1
50
2
51
4
53
7
56
3
52
5
54
6
55
46
95
15
64
16
65
18
67
17
66
19
68
20
69
21
70
47
96
43
92
23
72
22
71
58 min
45
94
25
74
26
75
44
93
42
91
38
87
40
89
48
97
24
73
41
90
017.6107 (10 Stück)
303.4197 (20 Stück)
Montage ohne Zahnscheibe



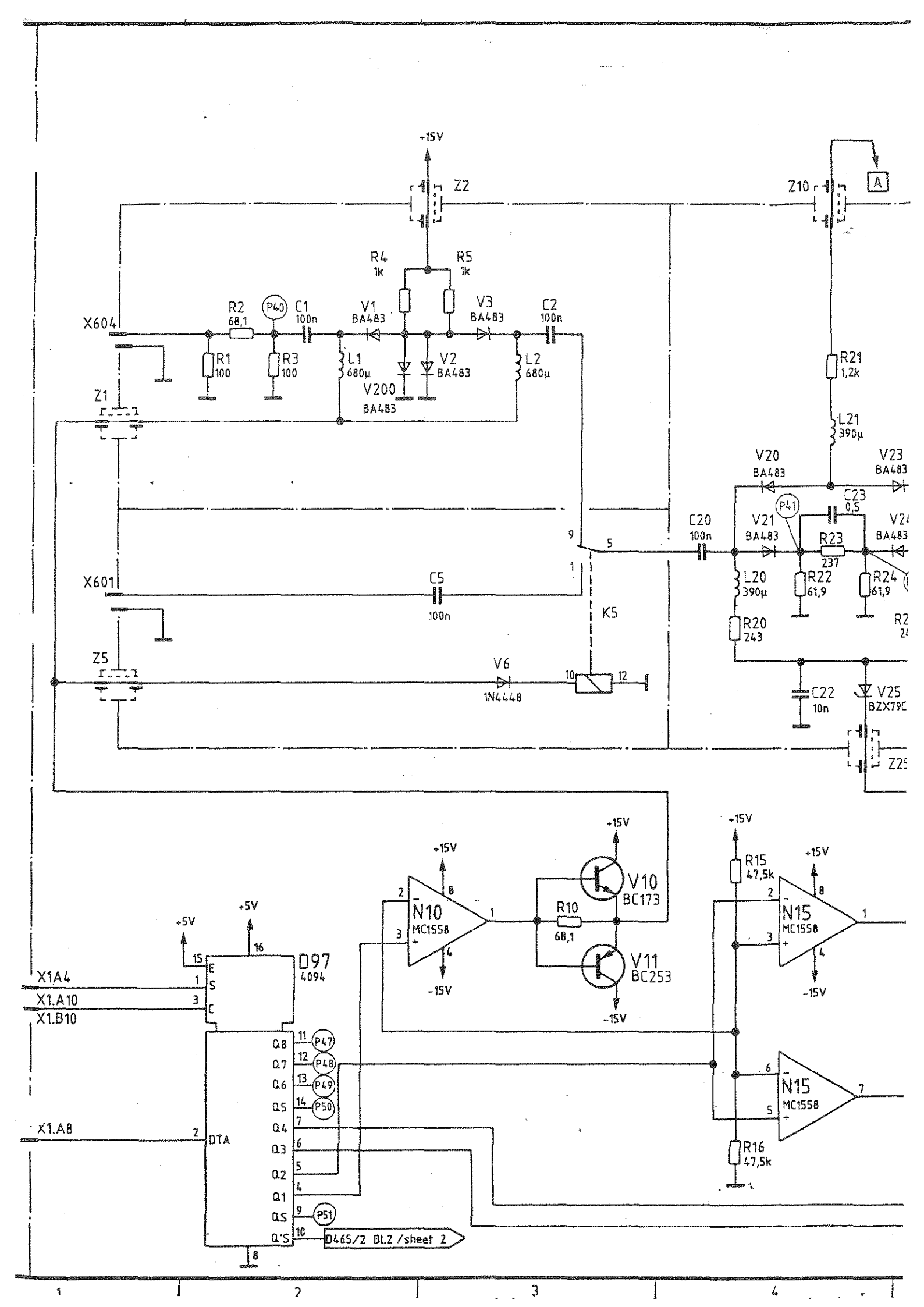
0 1 2 3 4 5

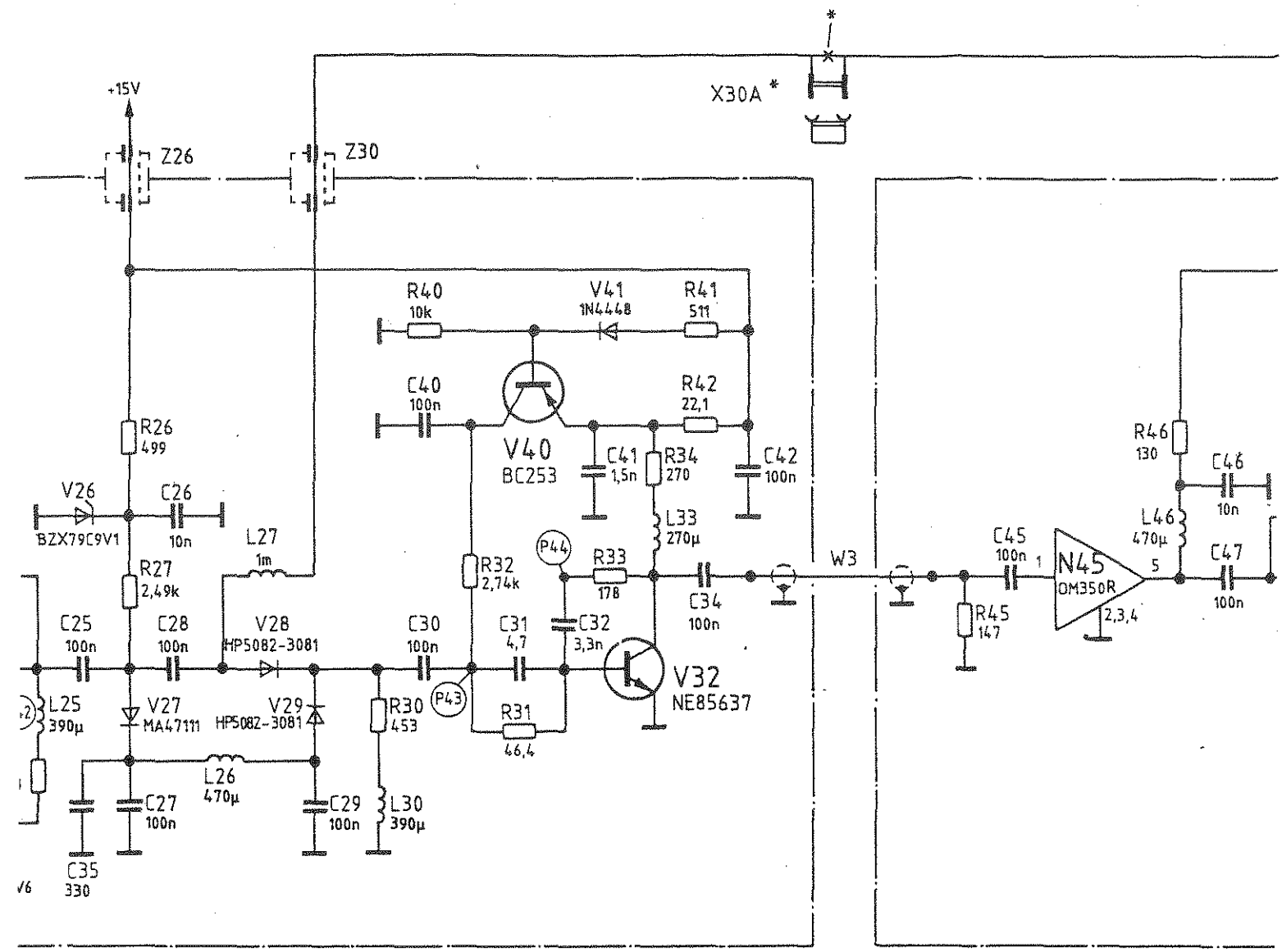
VERKLEINERUNG

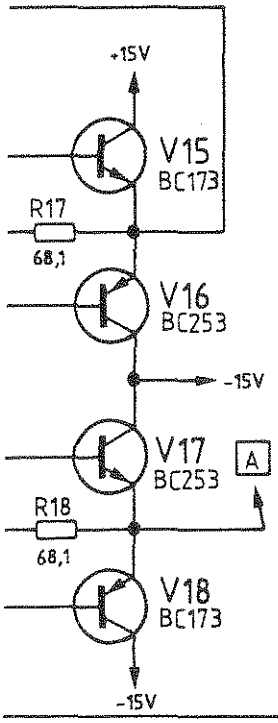
Achtung! MOS-Bauteile
Caution. MOS components

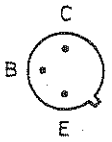
Maße ohne Toleranzangabe	Maßstab 1 : 1	
	Halbzeug, Werkstoff	
1KSA / Tag / Name	Benennung	
Bearb 6.87 BT	Analogteil Analog section	Z
Gepr		
Norm		
ROHDE & SCHWARZ	Zeichn. Nr. 802.8435.01	Blatt Nr. 3
z. Gerät CMT	802.2014 V	

5 6 7 8

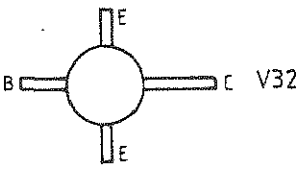

+15V
Z2
Z10
A
R4
1k
R5
1k
X604
R2
68,1
P40
C1
100n
V1
BA483
V3
BA483
C2
100n
R1
100
R3
100
L1
680µ
V2
BA483
L2
680µ
V200
BA483
Z1
R21
1,2k
L21
390µ
V20
BA483
V23
BA483
C23
0,5
P41
V21
BA483
C20
100n
R23
237
L20
390µ
R22
61,9
R24
61,9
R20
243
X601
C5
100n
K5
Z5
V6
1N4448
C22
10n
V25
BZX79C
+5V
D97
4094
X1A4
X1.A10
X1.B10
X1.A8
DTA
Q.8
Q.7
Q.6
Q.5
Q.4
Q.3
Q.2
Q.1
Q.S
Q.'S
P47
P48
P49
P50
P51
D465/2 BL2 /sheet 2
N10
MC1558
R10
68,1
V10
BC173
V11
BC253
-15V
R15
47,5k
N15
MC1558
R16
47,5k

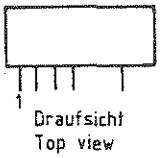




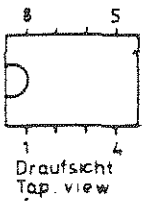


V10,V11,V15
V16,V17,V18
V40,V80

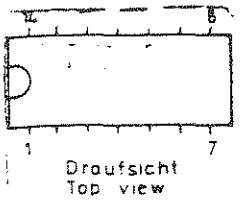




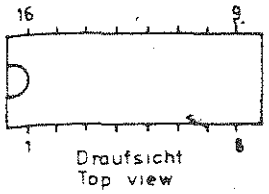
N45,N50
N55



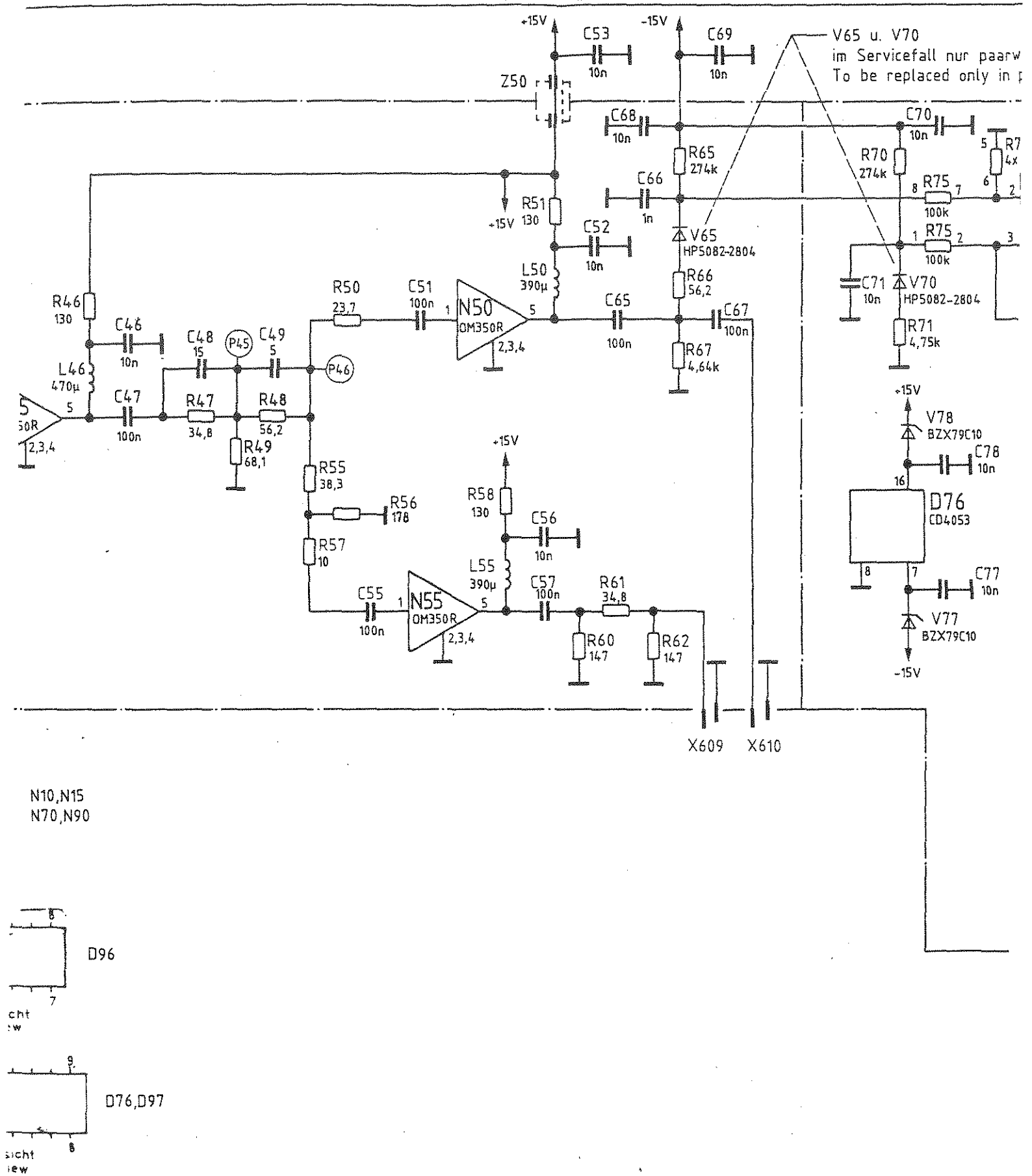
N10,N15
N70,N90



D96

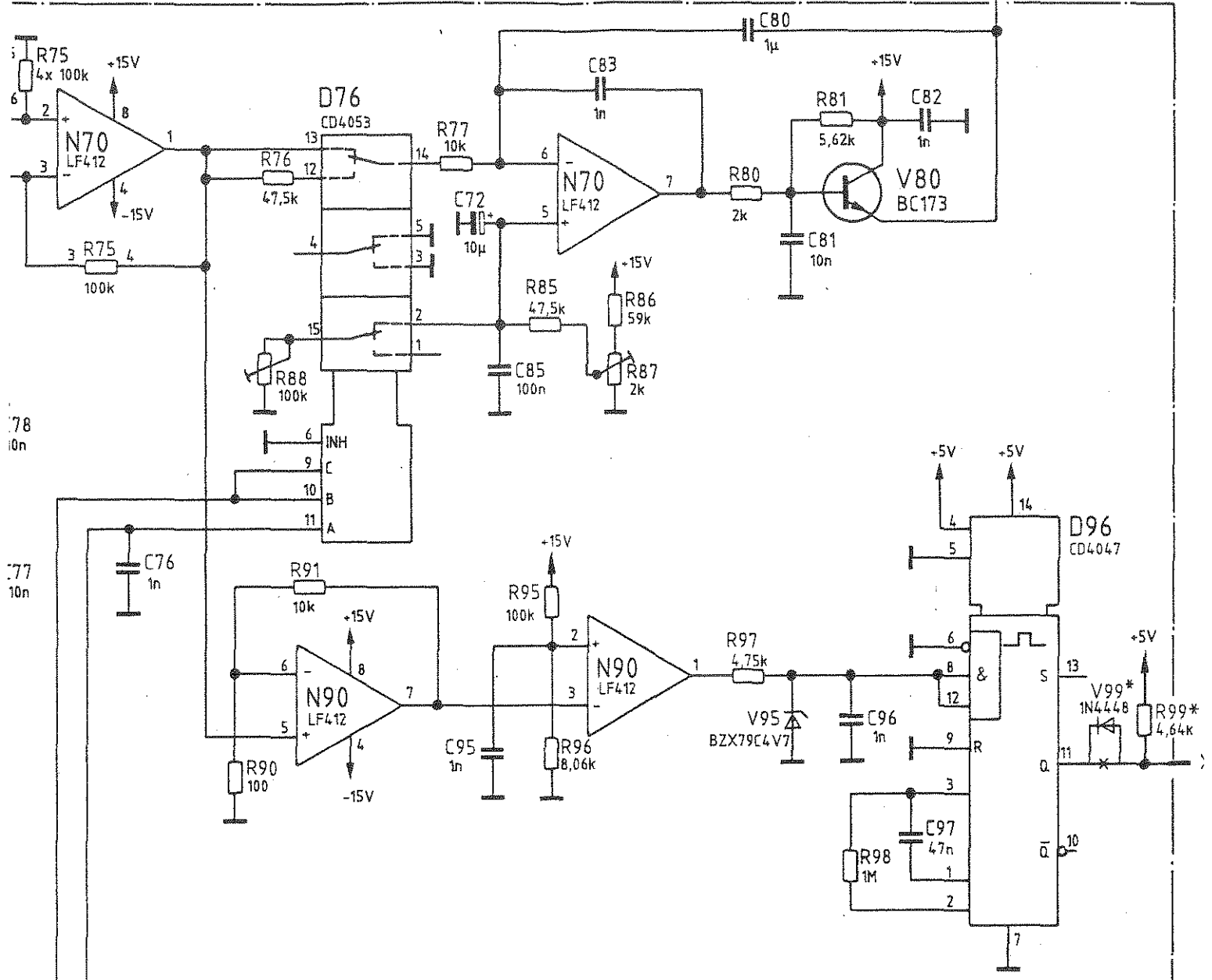


D76,D97



Klebekante für Druckerzeugnis, durch diese Zone möglichst nur Leitungen führen

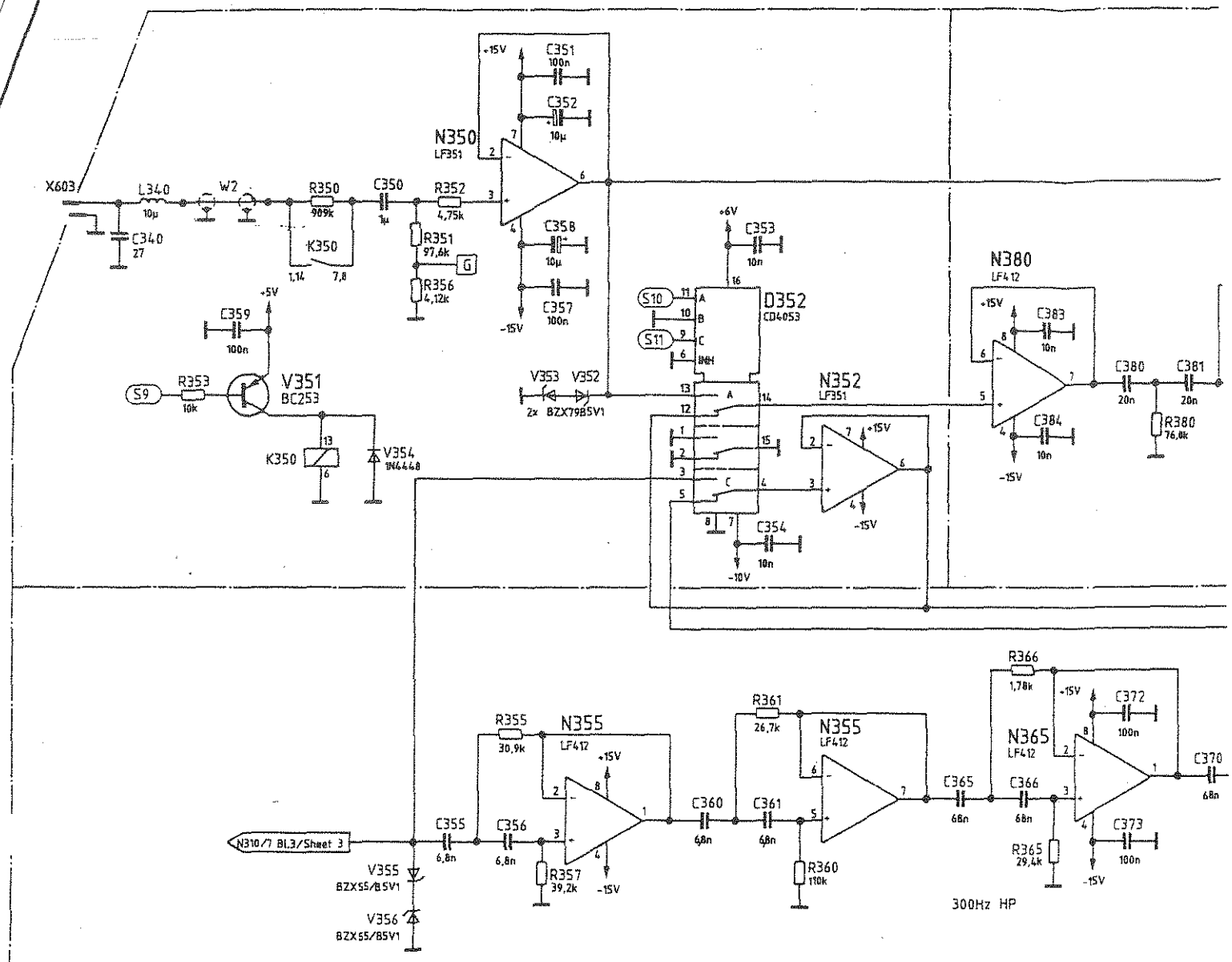
aarweise austauschen
/ in pairs

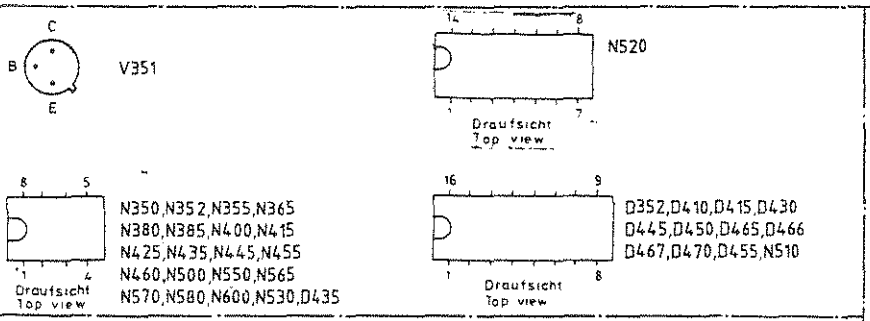


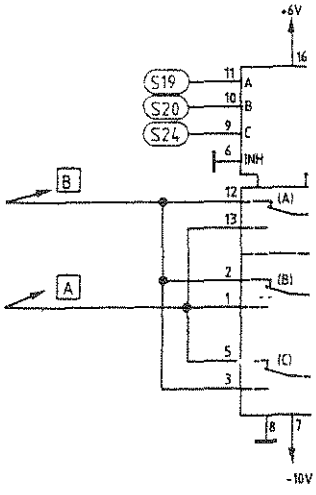
*) nur für VAR 04, 06
only for model 04, 06

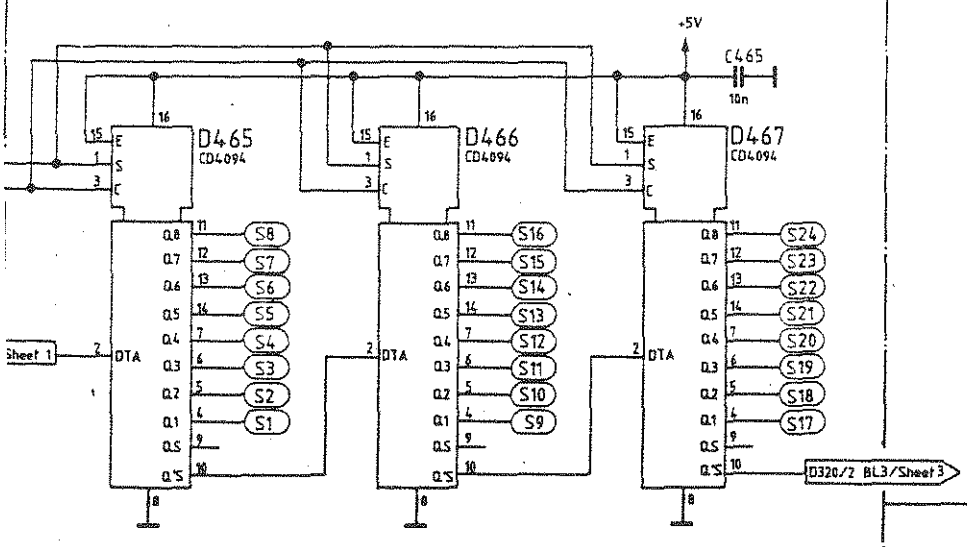
Stromlauf gilt für VAR 02, 04, 06,08
Circuit diagram is valid for model 02, 04, 06,08

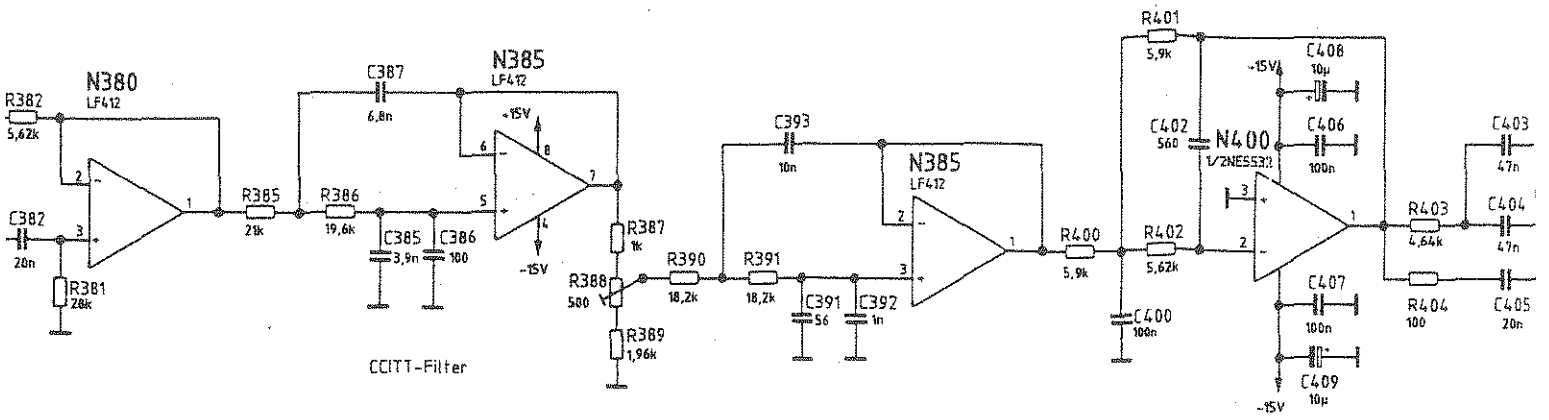
Stromlauf zu: Analogteil / Analog section			Z
CMT	reg. i V. 802.2020 V	erste Z. 802.2066	Zeichn.-Nr. 802.8435 S

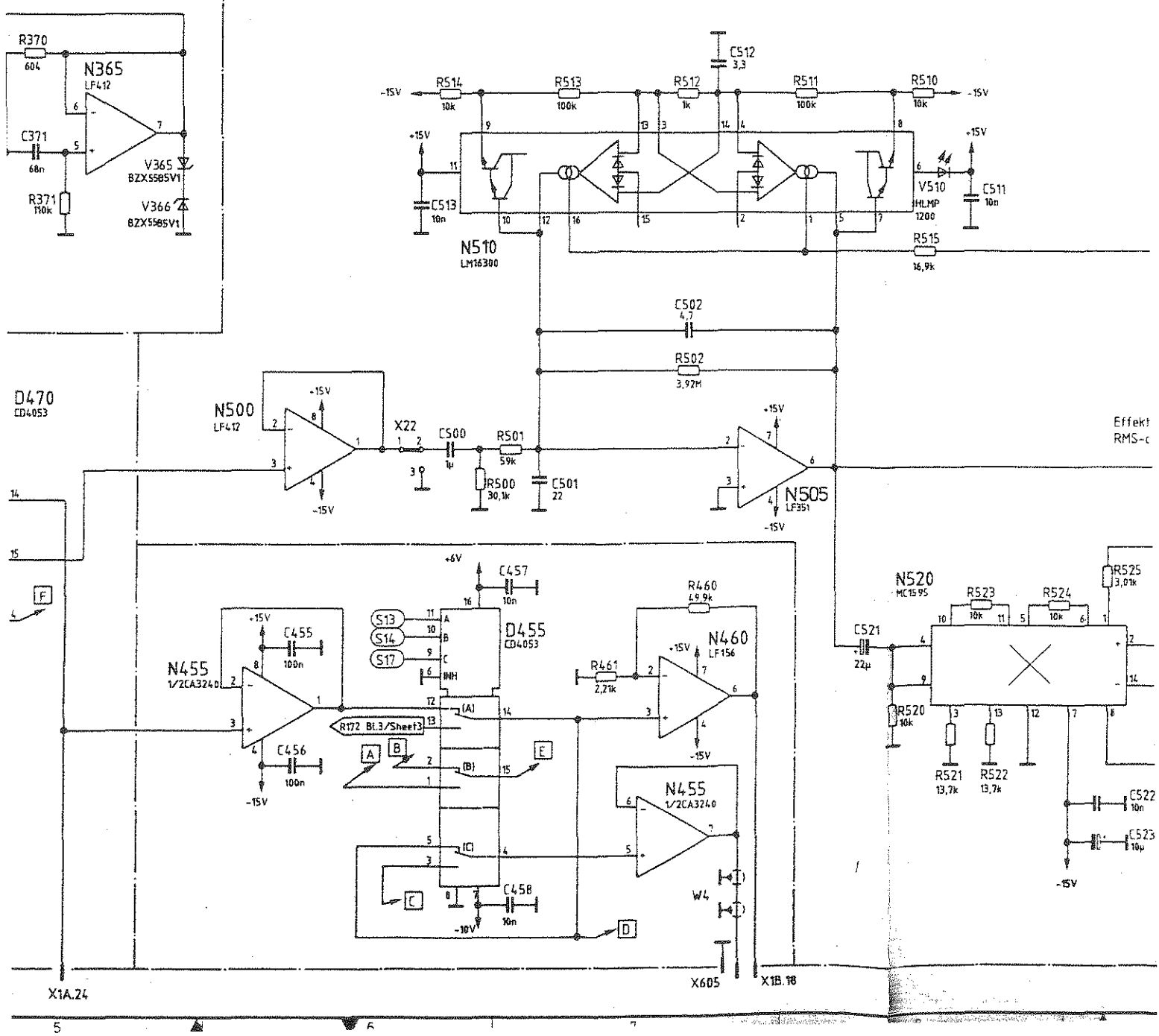

X603
L340
10µ
W2
C340
27
R350
909k
K350
1,14
7,8
C350
1µ
R352
4,75k
R351
97,6k
R356
4,12k
G
N350
LF351
+15V
-15V
C351
100n
C352
10µ
C358
10µ
C357
100n
+5V
C359
100n
S9
R353
10k
V351
BC253
K350
V354
1N4448
+6V
C353
10n
S10
S11
D352
CD4053
INH
V353
V352
2x BZX79B5V1
N352
LF351
C354
10n
-10V
N380
LF412
C383
10n
C384
10n
C380
20n
C381
20n
R380
76,8k
R366
1,78k
C372
100n
N365
LF412
C370
68n
C365
68n
C366
68n
C373
100n
R365
29,4k
R361
26,7k
N355
LF412
R355
30,9k
C355
6,8n
C356
6,8n
R357
39,2k
C360
6,8n
C361
6,8n
R360
110k
N310/7 BL3/Sheet 3
V355
BZX55/B5V1
V356
BZX55/B5V1
300Hz HP

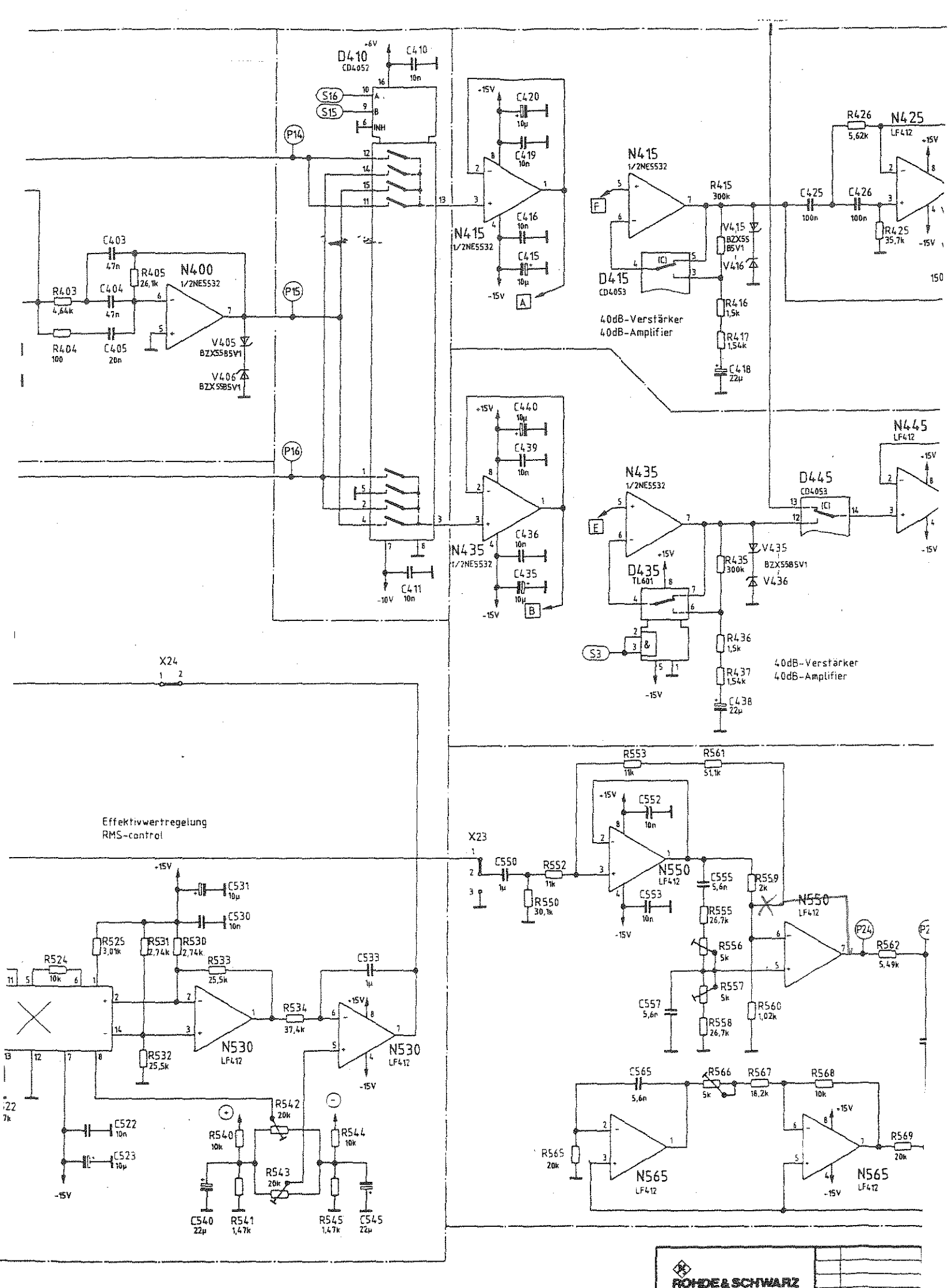

C
B
E
V351
N520
Draufsicht
Top view
N350,N352,N355,N365
N380,N385,N400,N415
N425,N435,N445,N455
N460,N500,N550,N565
N570,N580,N600,N530,D435
D352,D410,D415,D430
D445,D450,D465,D466
D467,D470,D455,N510

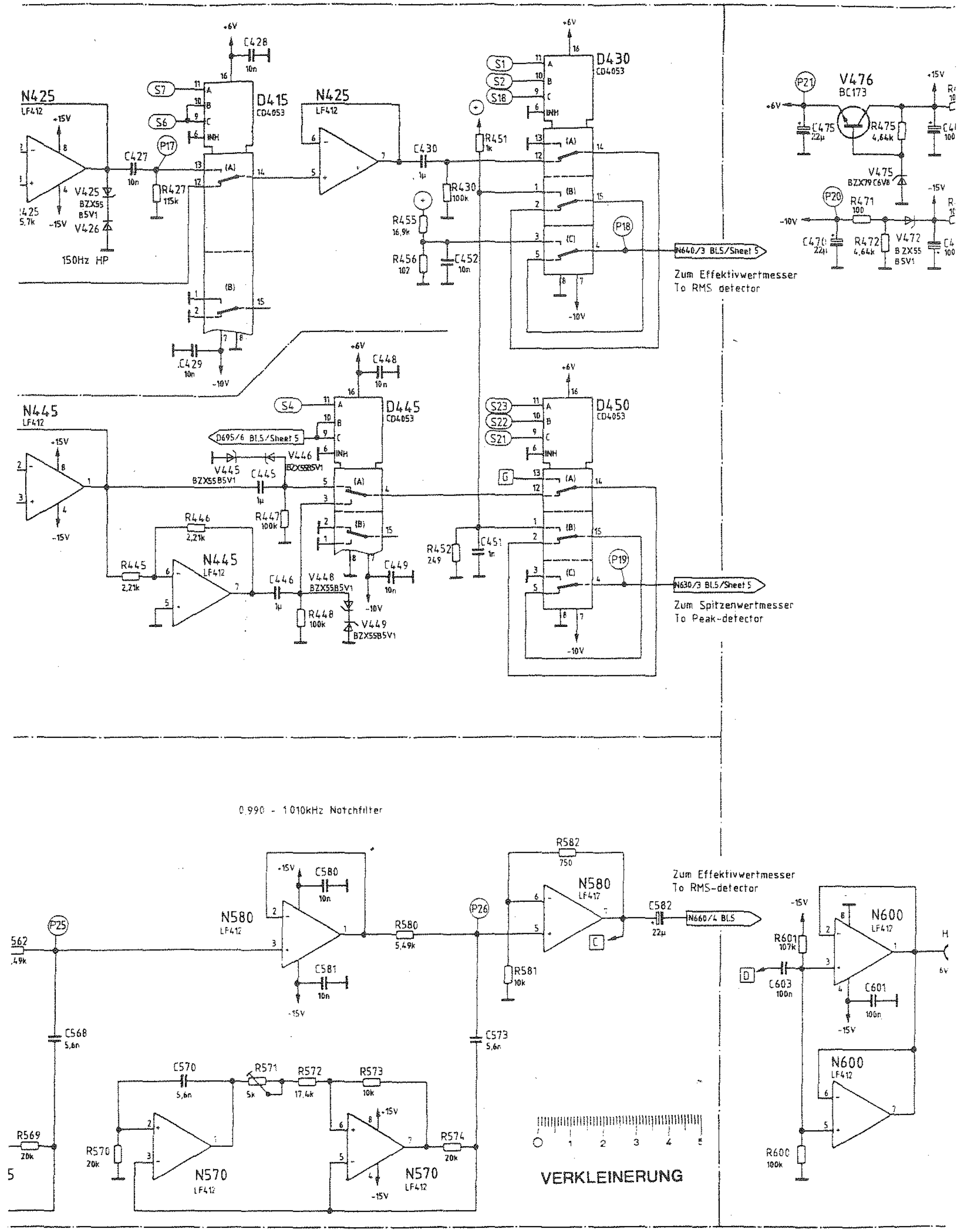

+6V
S19
S20
S24
INH
B
A
(A)
(B)
(C)
-10V


+5V
C465
10n
D465
CD4094
D466
CD4094
D467
CD4094
DTA
S8
S7
S6
S5
S4
S3
S2
S1
S16
S15
S14
S13
S12
S11
S10
S9
S24
S23
S22
S21
S20
S19
S18
S17
Sheet 1
D320/2 BL3/Sheet 3


N380
LF412
R382
5,62k
C382
20n
R381
20k
R385
21k
R386
19,6k
C387
6,8n
N385
LF412
C385
3,9n
C386
100
R387
1k
R388
500
R389
1,96k
CCITT-Filter
R390
18,2k
R391
18,2k
C393
10n
N385
LF412
C391
56
C392
1n
R400
5,9k
C400
100n
R401
5,9k
C402
560
N400
1/2NE5532
C408
10µ
C406
100n
C403
47n
R402
5,62k
C407
100n
C409
10µ
R403
4,64k
C404
47n
R404
100
C405
20n
+15V
-15V


R370
604
N365
LF412
C371
68n
R371
110k
V365
BZX5585V1
V366
BZX5585V1
C512
3,3
R514
10k
R513
100k
R512
1k
R511
100k
R510
10k
C513
10n
N510
LM1830
V510
HLMP
1200
C511
10n
R515
16,9k
C502
4,7
R502
3,92M
D470
CD4053
N500
LF412
X22
C500
1µ
R501
59k
R500
30,1k
C501
22
N505
LF351
Effekt
RMS-c
C457
10n
R460
49,9k
S13
S14
S17
D455
CD4053
INH
N455
1/2CA3240
C455
100n
C456
100n
R461
2,21k
N460
LF156
R172 Bl.3/Sheet3
A
B
E
C
D
N455
1/2CA3240
C458
10n
W4
N520
MC1595
R523
10k
R524
10k
R525
3,01k
C521
22µ
R520
10k
R521
13,7k
R522
13,7k
C522
10n
C523
10µ
X1A.24
X605
X1B.16

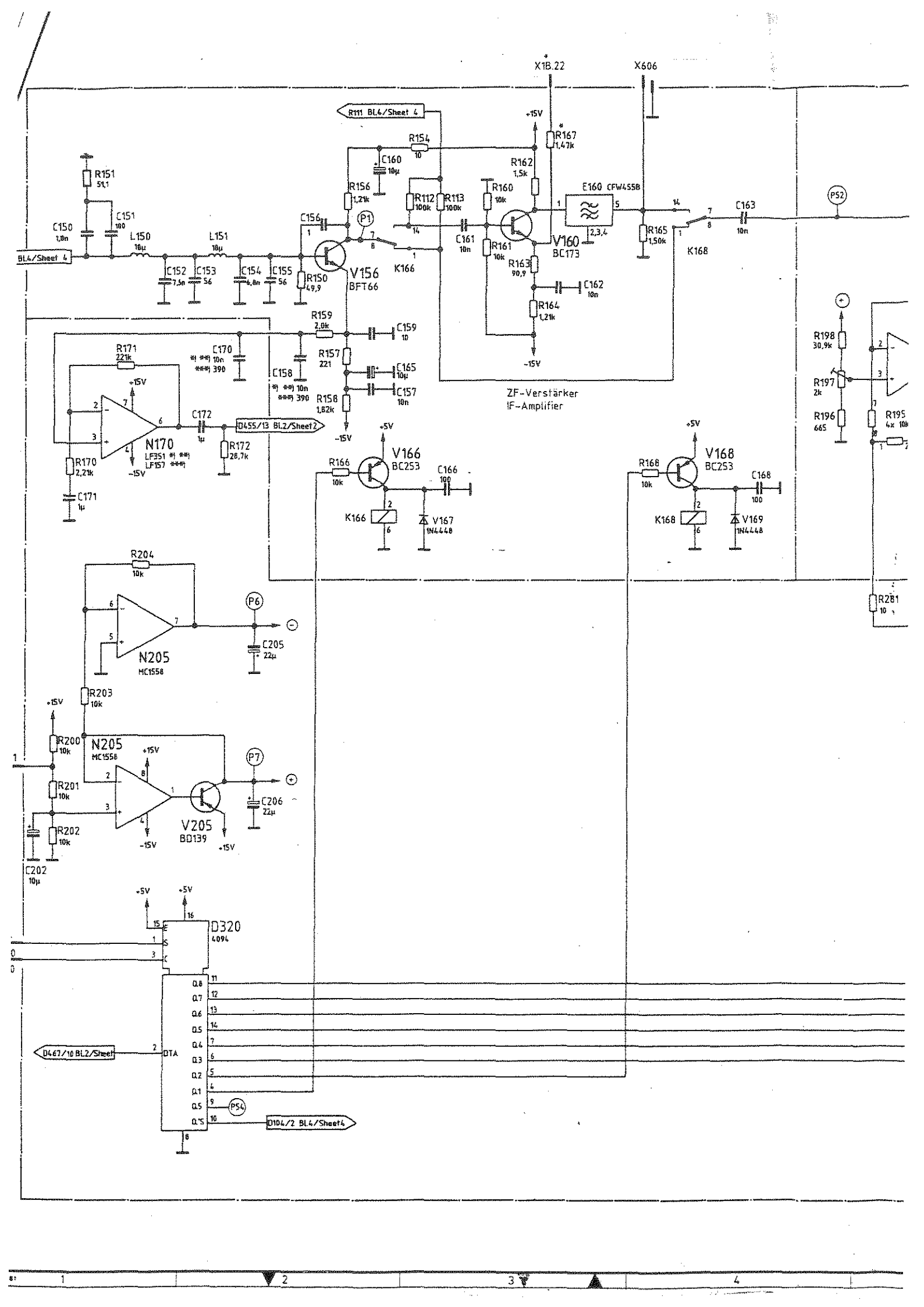

D410
CD4052
C410
10n
S16
S15
INH
P14
P15
P16
C403
47n
R405
26,1k
N400
1/2NE5532
R403
4,64k
C404
47n
R404
100
C405
20n
V405
BZX55B5V1
V406
BZX55B5V1
C420
10µ
C419
10n
N415
1/2NE5532
C416
10n
C415
10µ
-15V
A
N415
1/2NE5532
R415
300k
V415
BZX55
B5V1
V416
D415
CD4053
R416
1,5k
R417
1,54k
C418
22µ
40dB-Verstärker
40dB-Amplifier
R426
5,62k
N425
LF412
C425
100n
C426
100n
R425
35,7k
C440
10µ
C439
10n
N435
1/2NE5532
C436
10n
C435
10µ
B
C411
10n
N435
1/2NE5532
D435
TL601
R435
300k
V435
BZX55B5V1
V436
D445
CD4053
N445
LF412
S3
R436
1,5k
R437
1,54k
C438
22µ
40dB-Verstärker
40dB-Amplifier
X24
Effektivwertregelung
RMS-control
X23
C550
1µ
R552
11k
R550
30,1k
R553
11k
R561
51,1k
C552
10n
N550
LF412
C553
10n
C555
5,6n
R559
2k
R555
26,7k
R556
5k
R557
5k
C557
5,6n
R558
26,7k
R560
1,02k
N550
LF412
R562
5,49k
C565
5,6n
R566
5k
R567
18,2k
R568
10k
R565
20k
N565
LF412
R569
20k
N565
LF412
C531
10µ
C530
10n
R525
3,01k
R531
2,74k
R530
2,74k
R524
10k
R533
25,5k
C533
1µ
R534
37,4k
N530
LF412
R532
25,5k
N530
LF412
R542
20k
R540
10k
R544
10k
R543
20k
C522
10n
C523
10µ
C540
22µ
R541
1,47k
R545
1,47k
C545
22µ
-15V
RHODE&SCHWARZ



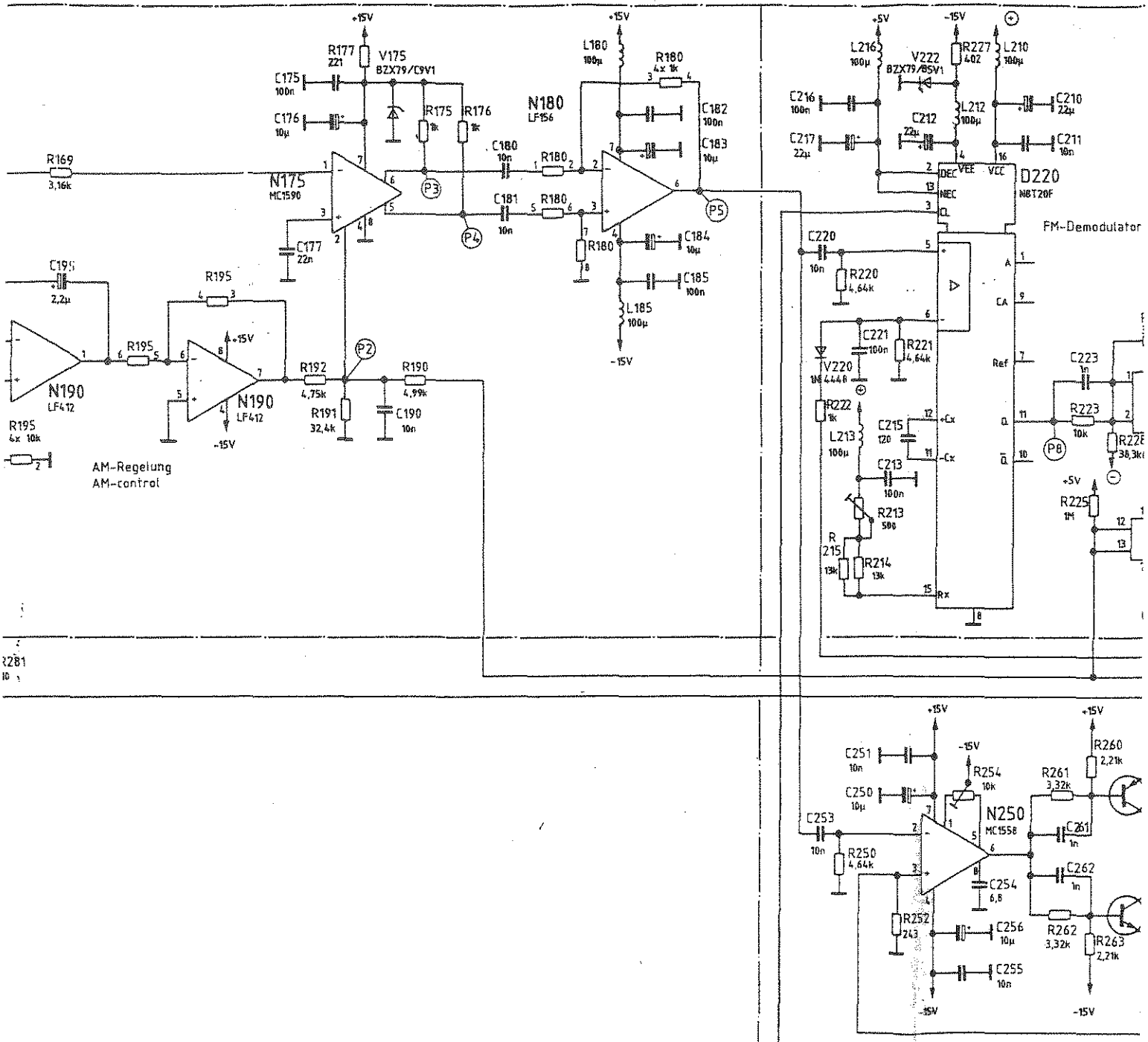
1KGA	Tag	Name	Benennung
Bearb	5.85	BT	Analogteil / Analog section
Gepr			
Norm			zu Gerät EMT

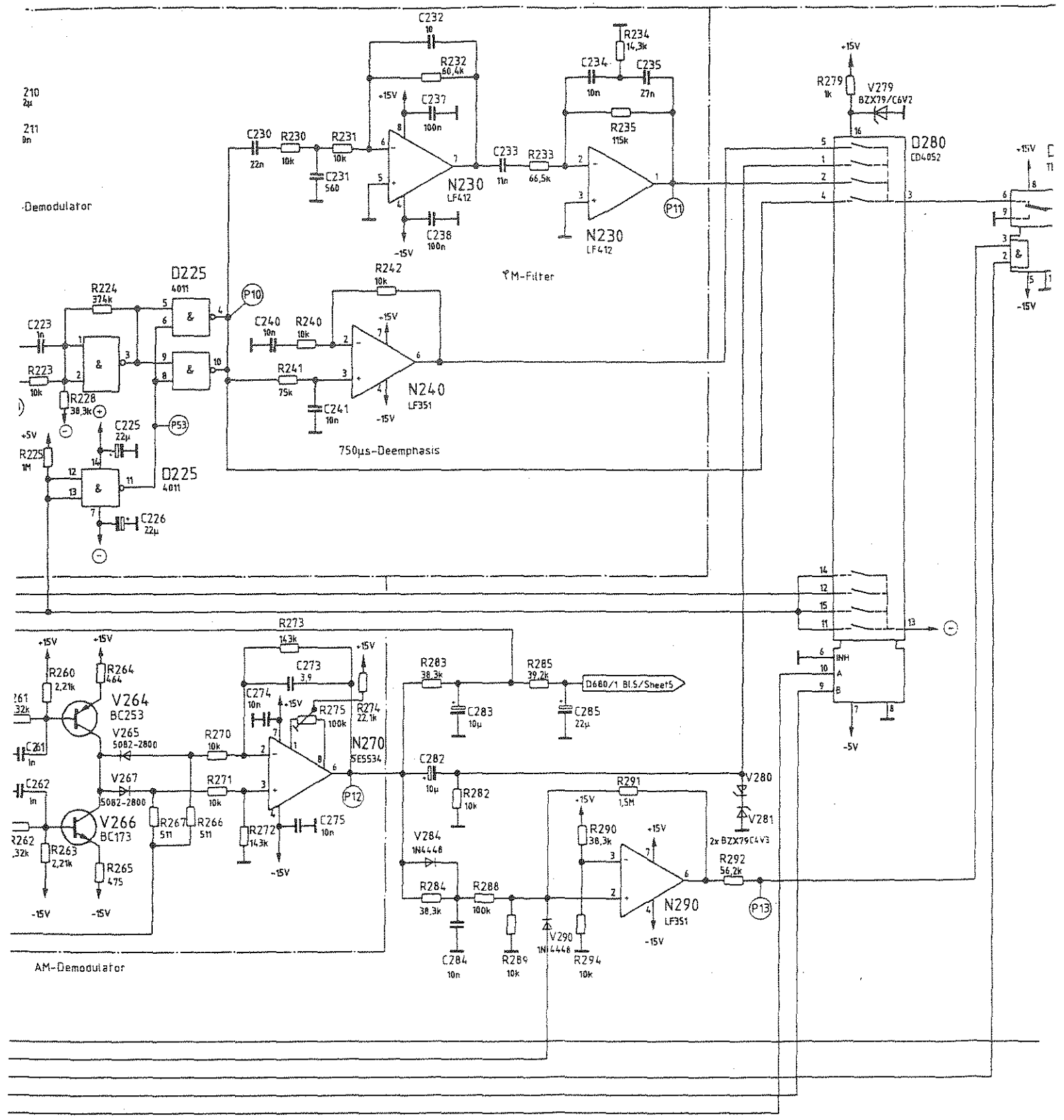
Z | Zeichn.-Nr. 802.8435 | 802.2020 V

13 | 14 | 15

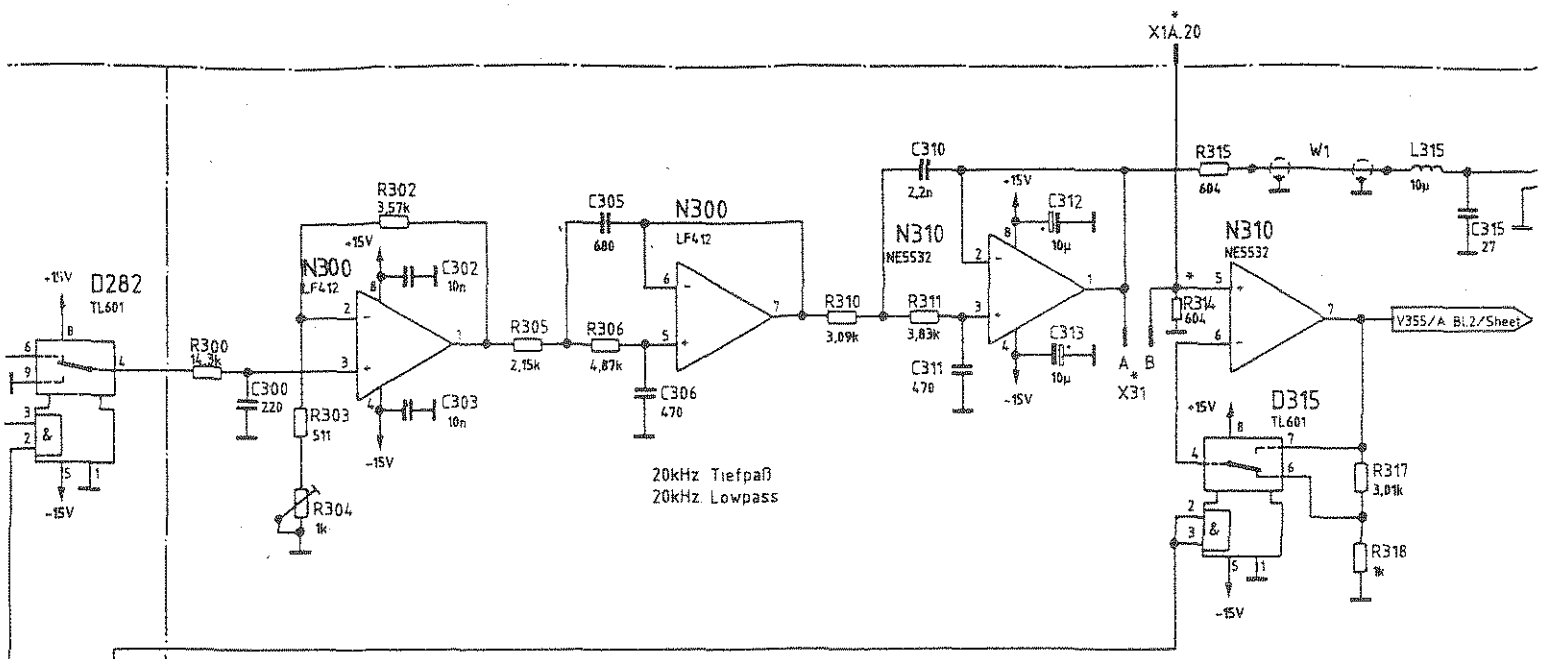


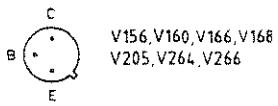
ZF-Verstärker
IF-Amplifier


AM-Regelung
AM-control
FM-Demodulator
AM-Demod
N175
MC1590
N180
LF156
N190
LF412
D220
N8T20F
N250
MC1558
V175
BZX79/C9V1
V220
V222
BZX79/B5V1

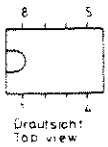


ROHDE & SCHWARZ	A	38 951

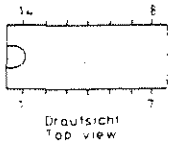




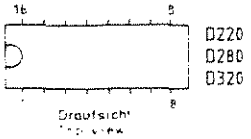
V156,V160,V166,V168
V205,V264,V266



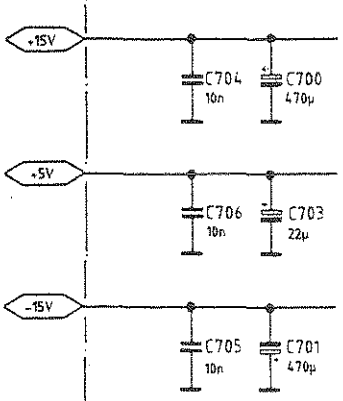
N170,N175,N180
N190,N205,N230
N240,N250,N270,D282
N290,N300,N310,D315



D325



D220
D280
D320



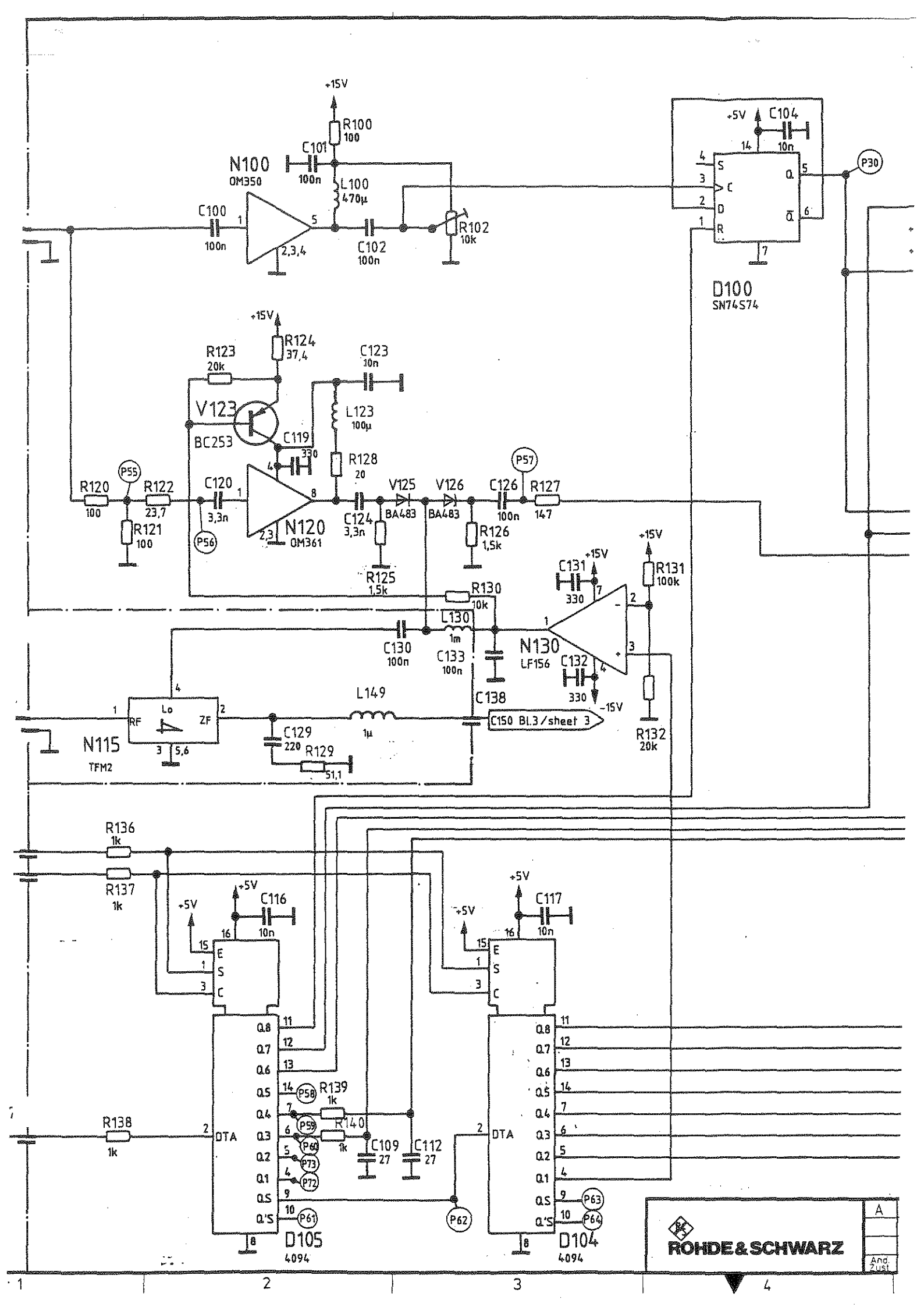
*) nur für VAR 04
only for model 04

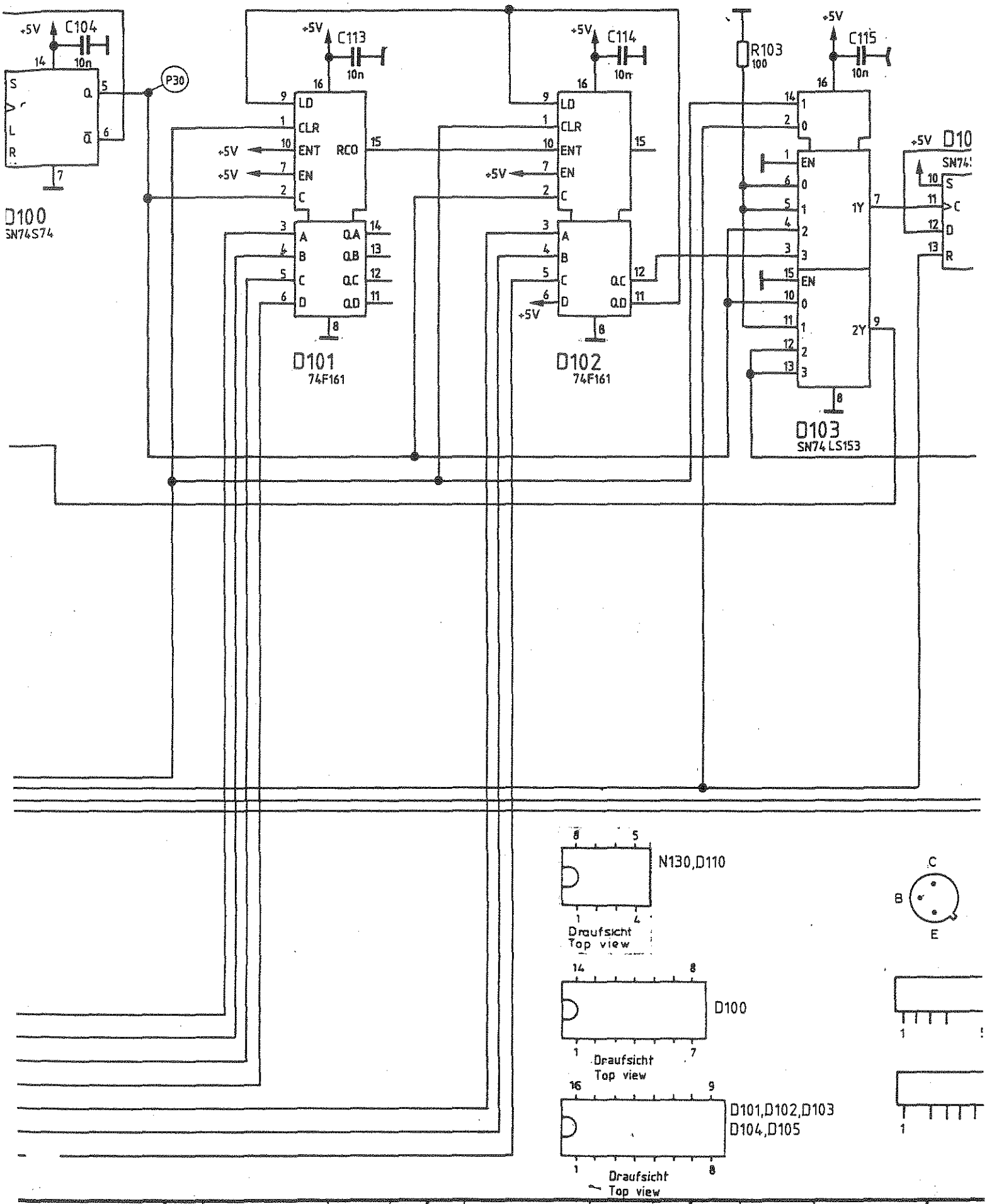
**) nur für VAR 02,08
only for model 02 08

***) nur für VAR 06
only for model 06

VERKLE

	09.87	lb					1KGA	Tag	Name	Benennung		Zeichn.-Nr.	
							Bearb.	5.85	BT	Analogteil / Analog section	Z	802.8435 S	
							gepr.						
ngs	Datum	Name	Änd. Index	Änderungs Beschr.	Datum	Name	Norm					Ers. f.	Ers. d.


+15V
R100
100
C101
100n
N100
OM350
L100
470µ
C100
100n
1
5
2,3,4
C102
100n
R102
10k
+5V
C104
10n
14
4
S
3
C
2
D
1
R
Q
5
Q̄
6
7
P30
D100
SN74S74
+15V
R123
20k
R124
37,4
C123
10n
V123
BC253
L123
100µ
C119
330
4
R128
20
P55
R120
100
R122
23,7
R121
100
C120
3,3n
P56
1
8
2,3
N120
OM361
C124
3,3n
V125
BA483
V126
BA483
C126
100n
R127
147
P57
R126
1,5k
R125
1,5k
+15V
C131
330
7
R131
100k
R130
10k
L130
1m
C130
100n
C133
100n
1
N130
LF156
C132
330
4
-15V
R132
20k
4
1
RF
Lo
ZF
2
3
5,6
N115
TFM2
L149
1µ
C138
C150 BL3/sheet 3
C129
220
R129
51,1
R136
1k
R137
1k
+5V
C116
10n
16
15
E
S
C
1
3
+5V
C117
10n
Q.8
Q.7
Q.6
Q.5
Q.4
Q.3
Q.2
Q.1
Q.S
Q.'S
11
12
13
14
7
6
5
4
9
10
R139
1k
P58
P59
R140
1k
P60
P73
P72
P61
R138
1k
2
DTA
C109
27
C112
27
D105
4094
P62
P63
P64
D104
4094
ROHDE&SCHWARZ
A
And.
Zust.
1
2
3
4

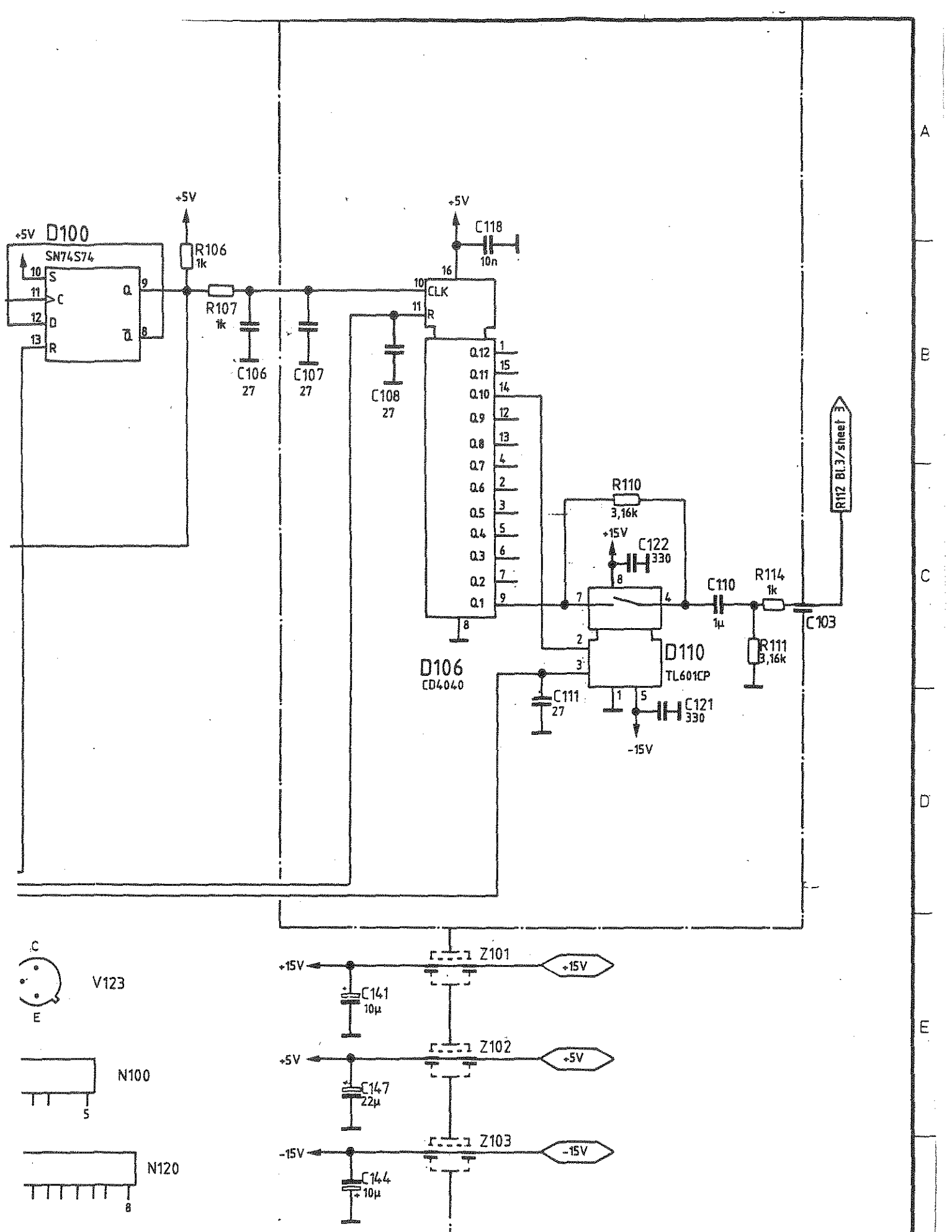


	A	38 951	09.87	lb					1KGA	Tag	Name
									Bearb.	4.85	BT
									Gepr.		
	And. Zust.	Anderungs-Mitteilung	Datum	Name	And. Zust.	Anderungs-Mitteilung	Datum	Name	Norm		

R&SCHWARZ

Benennur

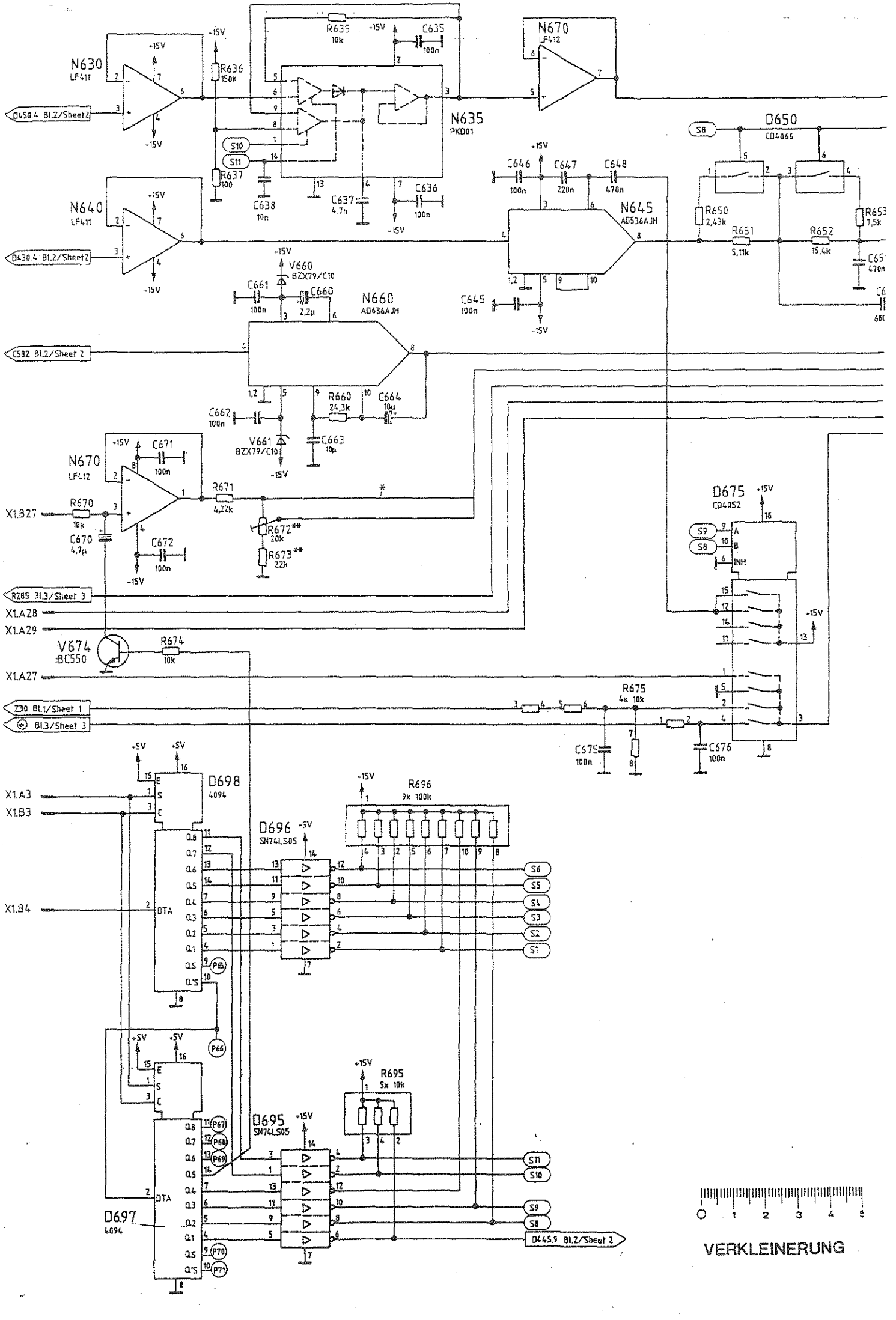
4 5 6 7



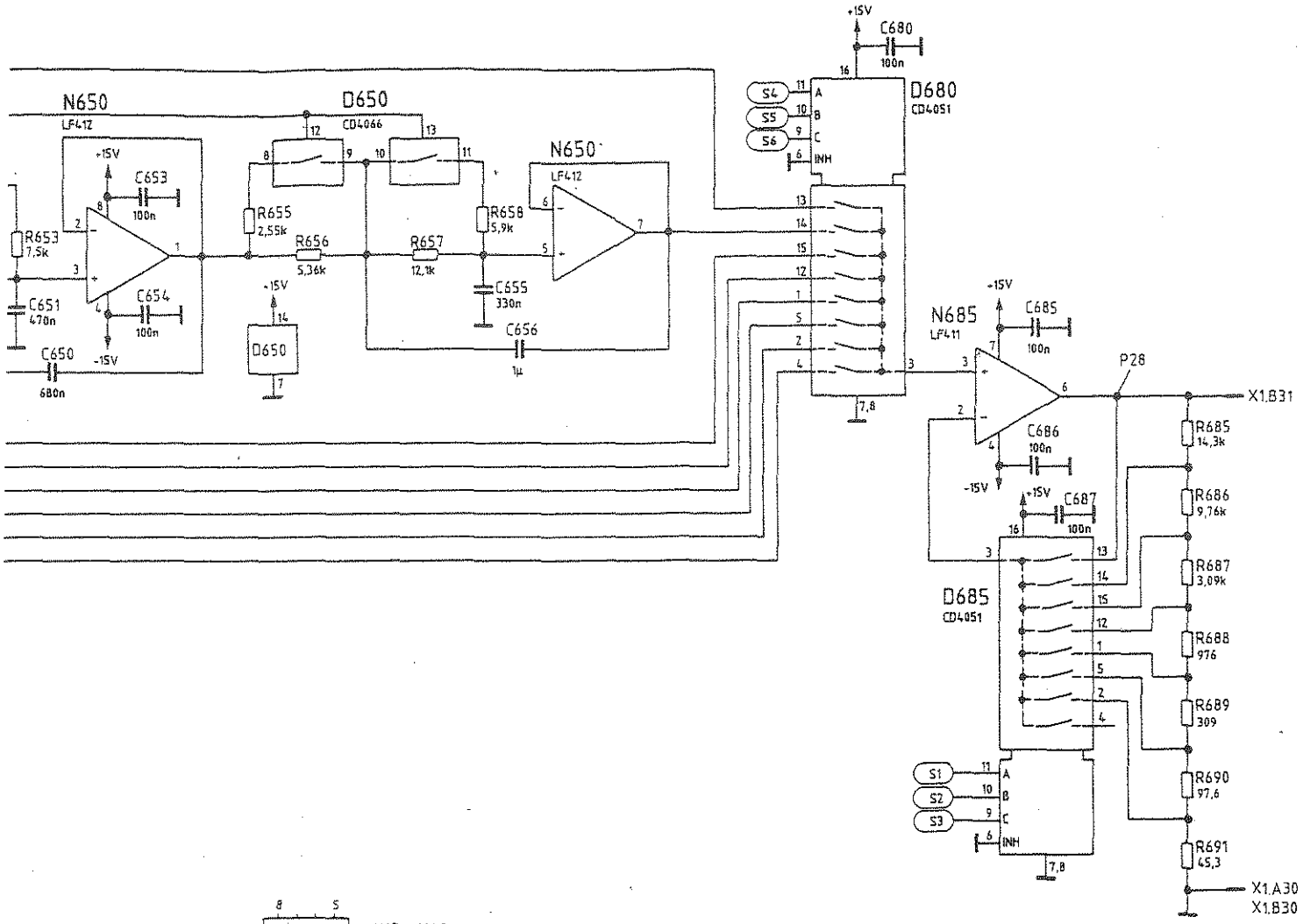
Benennung		Zeichn.-Nr.	Blatt-Nr.
Analogteil / Analog section	Z	802.8435 S	4 v. Bl.
zu Gerät: CMT		reg. i. V. 802.2020 V	erste Z. 802.2066

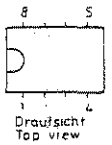
A B C D E F

8 9 10

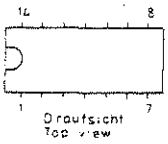


VERKLEINERUNG

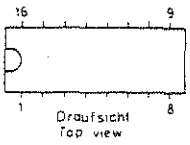




N630,N640
N650,N670
N685

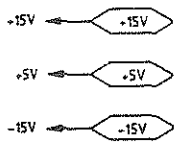


N635,D650,
D695,D696



D675,D680
D685,D697
D698

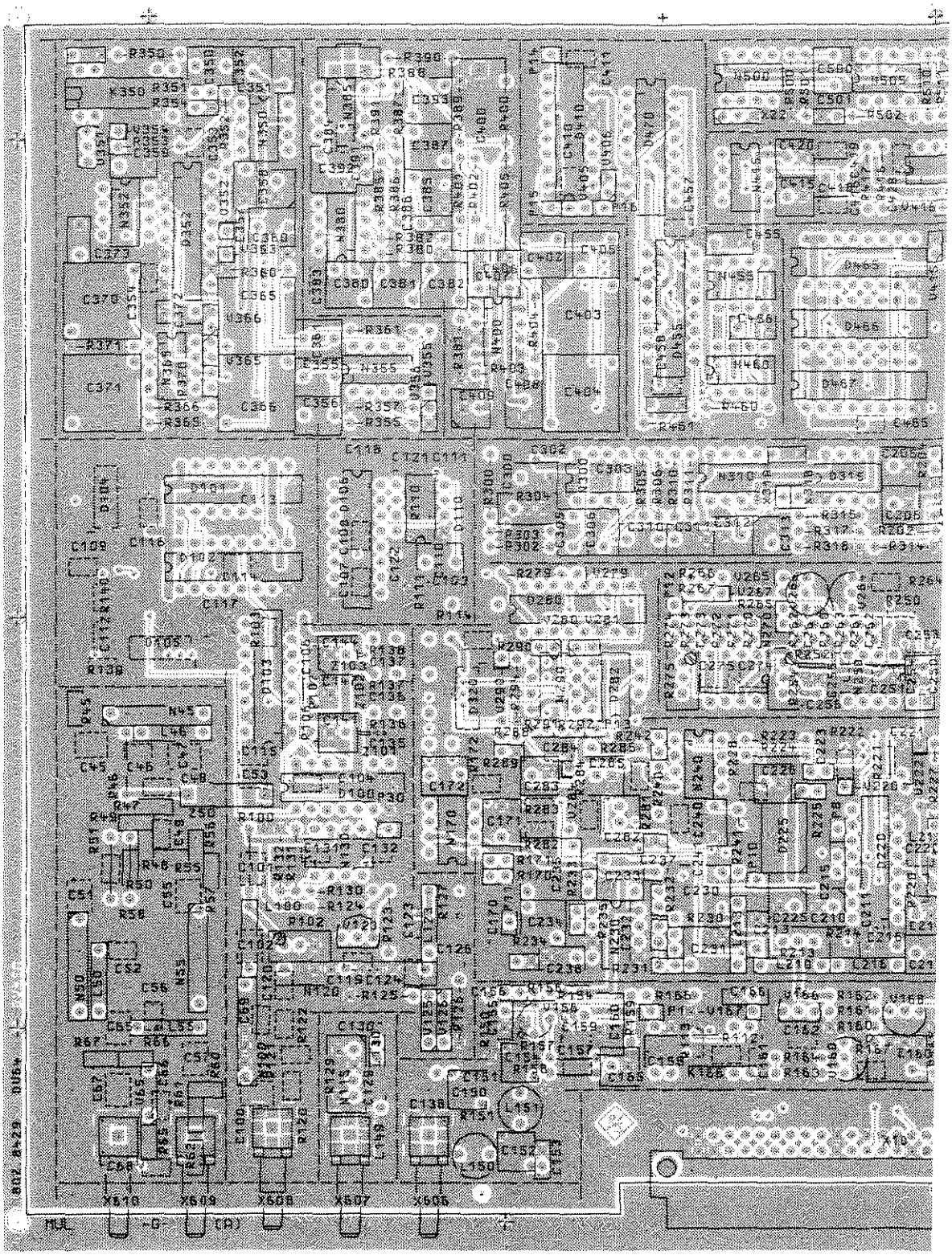
N645,N660



*) nur für VAR 04
only for model 04

**) nur für VAR 02,08
only for model 02,08

Stromlauf zu Analogteil / Analog section	Z	Zeichn. Nr. 802.8435 S	Bl. 5
		802.2020 V	802.2066



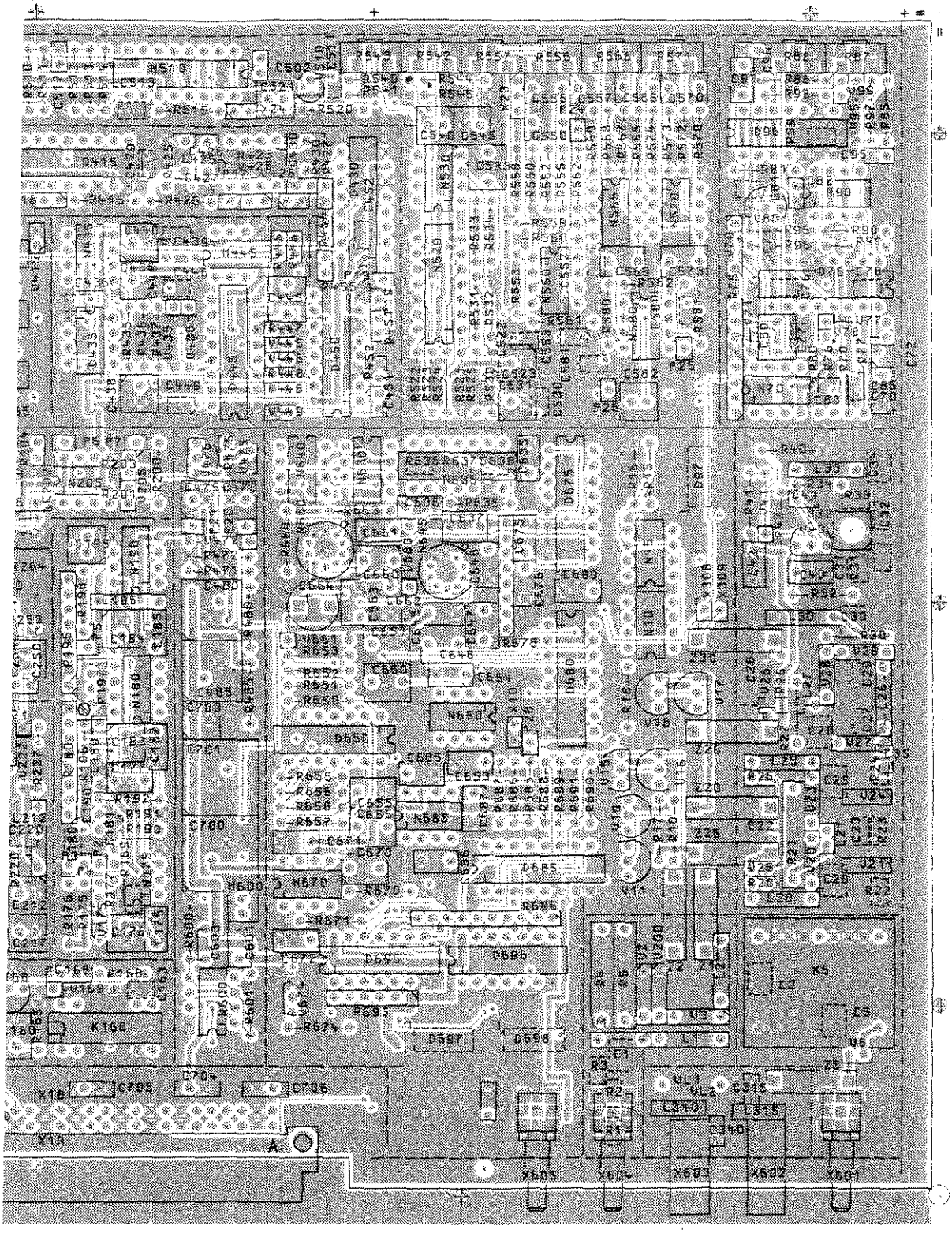
Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

DV 41

(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

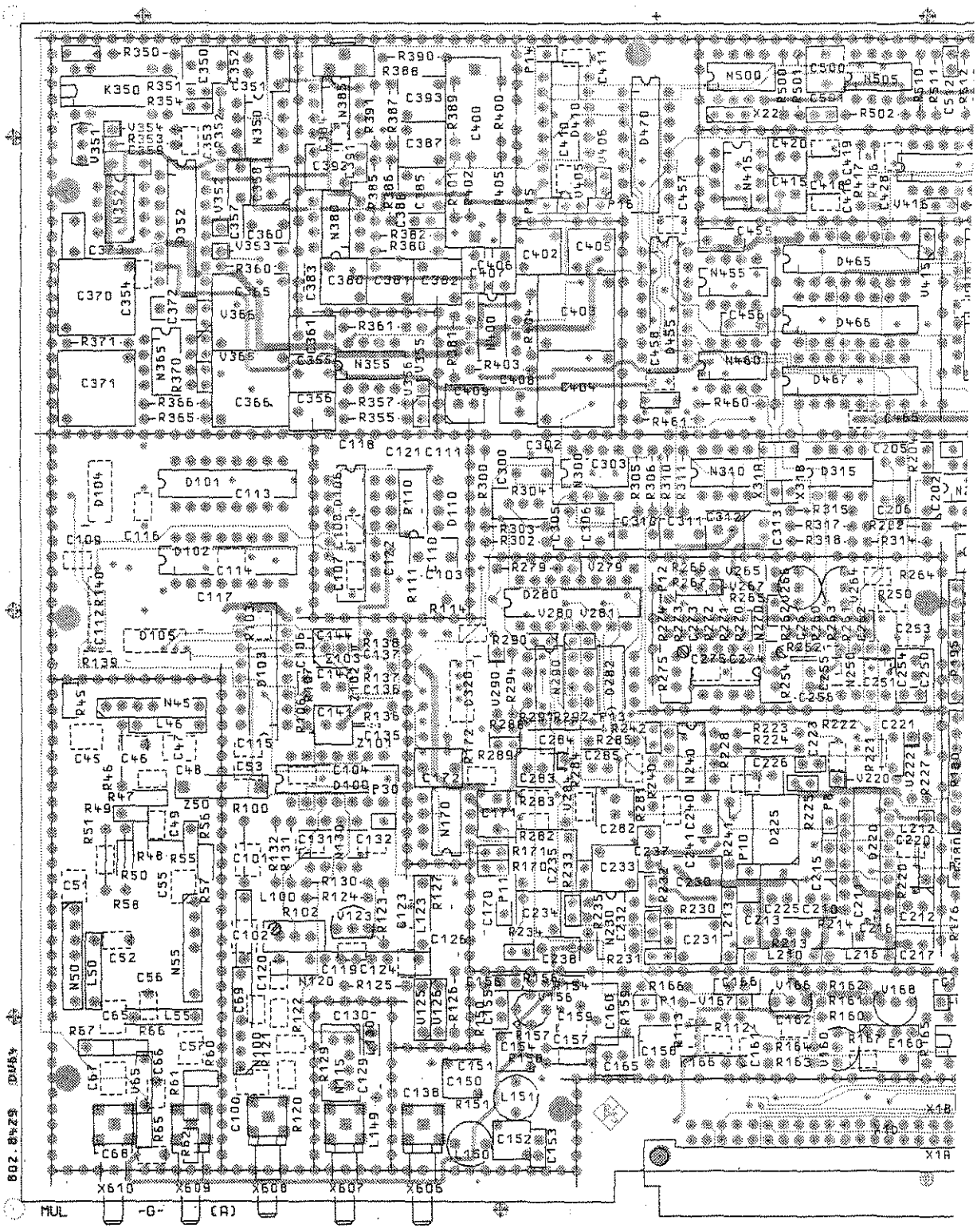


VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MODEL

				Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1 KSA	Tag	Name	Benennung
				Bearb.	05.87	SM	ANALOGTEIL Analog section — Z
				Gepr.			
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr. 802.8435.01 EE	Blatt-Nr. 4 v. 7 Bl.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CMT		reg. i. V. 802.2014 V	erste Z.

5 6 7 8

07 6001 8



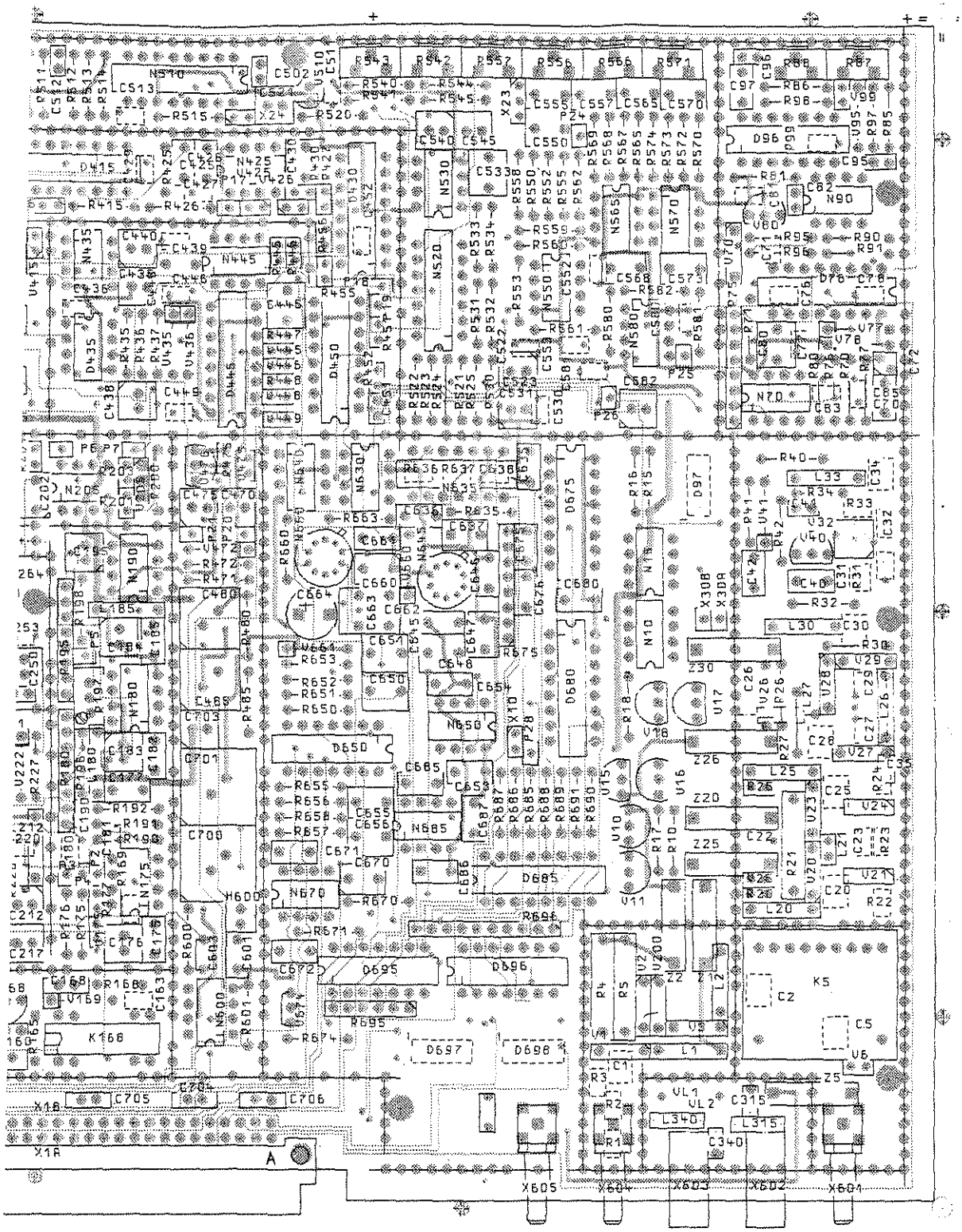
Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

DV43

(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

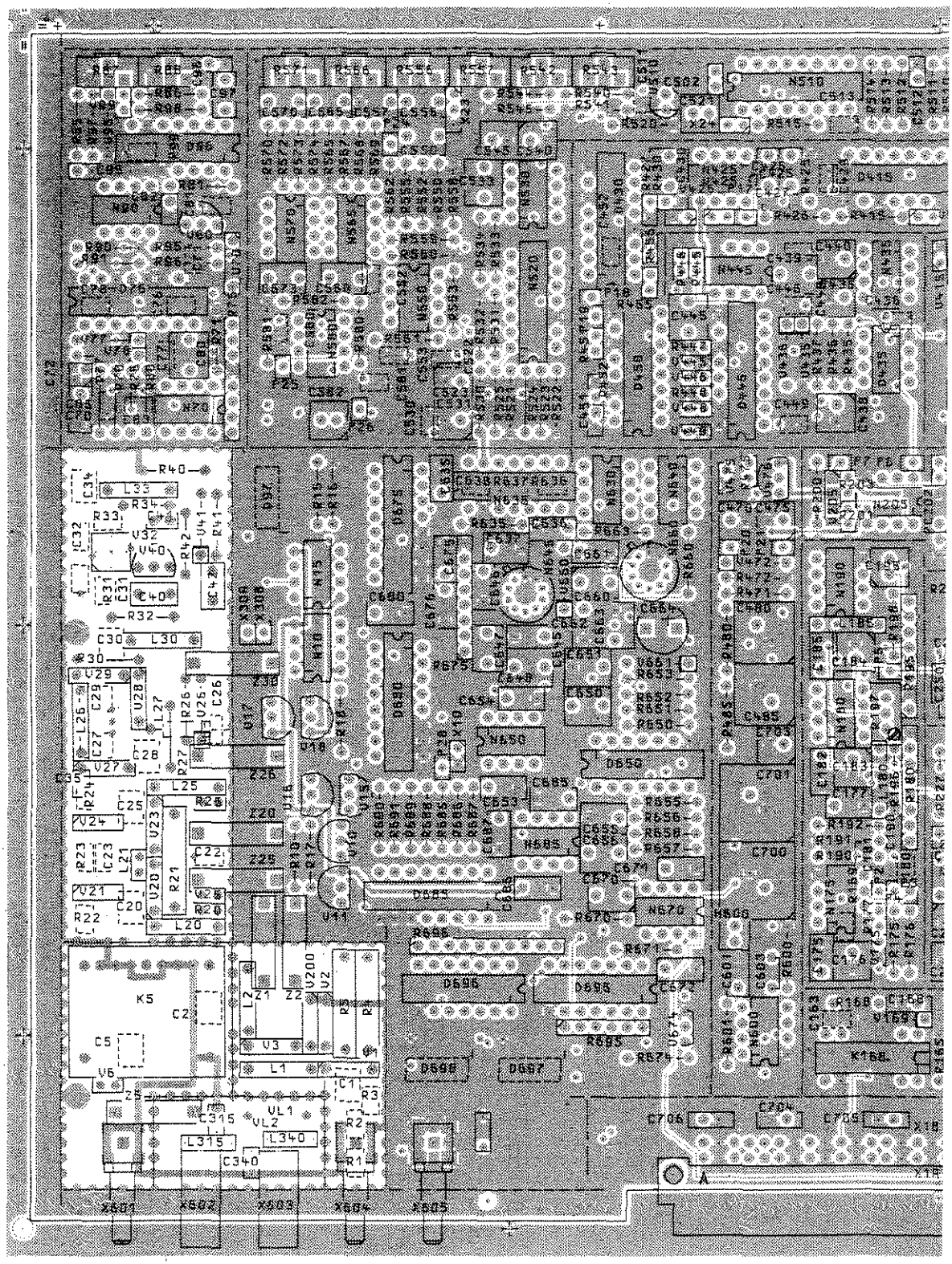


VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MODEL

				Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	05.87	BT	ANALOGTEIL Analog section
				Gepr.			Z
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr. 802.8435.01	EE
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CMT		reg. i. V. 802.2014 V	erste Z.

Blatt-Nr. 5 v. 7 Bl.

07 6001 8



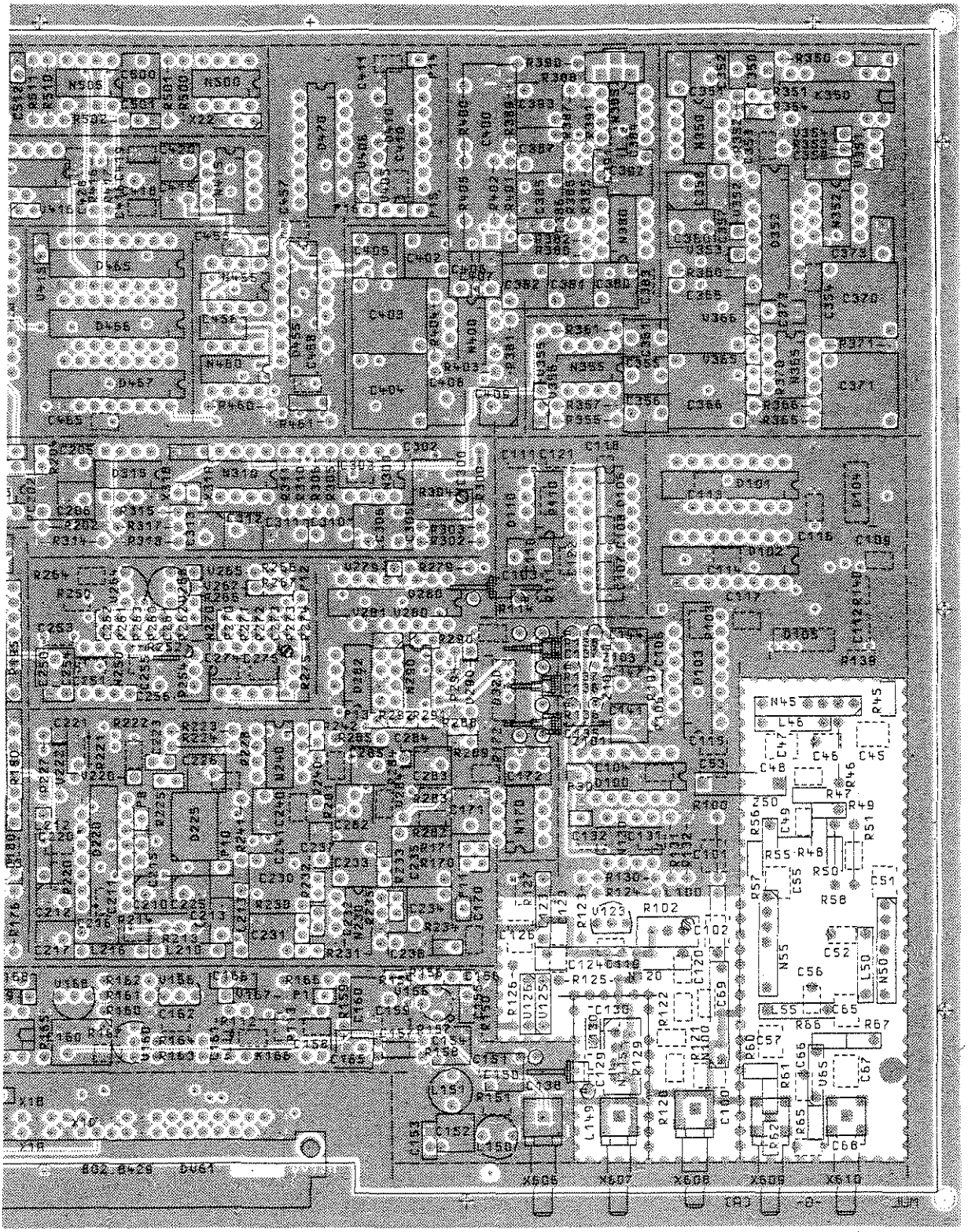
Ansicht und Leitungsführung Lötseite
View of tracks on solder side

DV 13

(herzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.



VARIANTENERKLÄRUNG / VERSION
VAR 02 – GRUNDAUSFÜHRUNG / BASIC MODEL

				Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	05.87	BT	ANALOGTEIL Analog section
				Gepr.			Z
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr. 802.8435.01	EE
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CMT		reg. i. V. 802.2014 V	erste Z.

Blatt-Nr. 6 v. 7 Bl.

ROHDE&SCHWARZ

Measuring Instruments and Systems Division

Service manual

RADIOCOMMUNICATION TESTER CMT

802.2020.52
802.2020.54

VOLUME 2

The service manual consists of 2 volumes

Printed in the Federal Republic of Germany

Contents of CMT Manual

Operating manual

1. Data Sheet

2. Preparations and Operation

3. Maintenance

Service manual

Volume 1

4. Service Manual for Complete Instrument

5. Service Instruction for Modules

	Order No.	Index
Power Pack	802.2814.02	1
Digital Unit	802.4517.02	2
Analog Unit	802.8435.02	3
1st Modulation Generator Module	802.5713.02	4
RF Oscillator Module including Reference Oscillator (OCXO) CMT-B1	802.8835.02 803.8916.02	5
Output Stage	802.7616.02	6
Attenuation Set Module	802.4223.02	7

Volume 2

5. Service Instruction for Modules

Oscilloscope Module	803.1111.00	1
Display/Keyboard Module	802.3662.00	2
Adjacent-channel Power Meter CMT-B6	803.7810.02	3
2nd AF Synthesizer CMT-B7	803.2618.02	4
IEC Bus/Control Interface CM-B4	803.3914.02	5
Autorun Control/Printer Interf. CM-B5	803.3314.02	6
RF Millivoltmeter CM-B8	803.6813.02	7
Duplex Modulation Meter CM-B9	803.5317.02	8
DTMF Decoder CM-B11	803.4610.02	9
Transfer Memory Module CM-Z1	803.7510.02	10

Contents

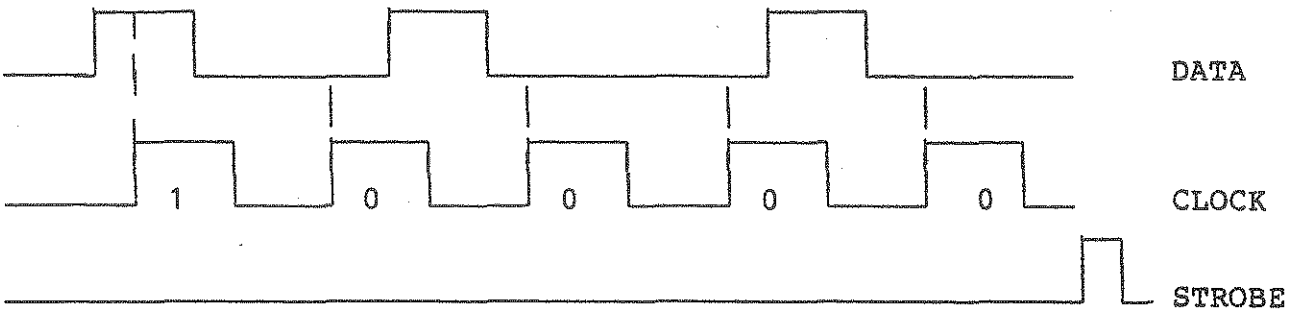
5 Service Manual for the Individual Modules

Index

Oscilloscope Module 1
Display/Keyboard Module 2
Adjacent-channel Power Meter CMT-B6 3
2nd AF Synthesizer CMT-B7 4
IEC Bus/Control Interface CM-B4 5
Autorun Control/Printer Interface CM-B5 6
RF Millivoltmeter CM-B8 7
Duplex Modulation Meter CM-B9 8
DTMF Decoder CM-B11 9
Transfer Memory CM-Z1 10

Serial data transmission to the individual plug-in modules takes place on three lines: CLOCK, DATA and STROBE. The data must be read in using an external controller, e.g. PUC, in order to adjust or test the modules independent of the basic instrument.

The timing diagram for data transmission is shown below.



The data on the DATA line are transferred to the parallel/serial converter with each rising edge of the CLOCK pulses; a subsequent STROBE pulse enables the data at the converter outputs. The following BASIC program shows how the user port of the PUC can address the module:

```
1Ø POKE 59259,255          Set user port
2Ø DIM A(20)               Number of individual data bits,
                           20 in this case
3Ø A(1)=0:A(2)=1...        Define individual data

4Ø FOR I=1T020
5Ø POKE 59471,A(I)         ┐ Read in data;
6Ø POKE 59471,A(I)+2       ┘ Line with significance 2^0 = DATA,

7Ø NEXT                    significance 2^1 = CLOCK

8Ø POKE 59471,4            ┐ Output of STROBE pulse on line
9Ø POKE 59471,O:END        ┘ with significance 2^2
```

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

IEC Bus/Control Interface Option CM-B4

803.3914.02

Contents

Page

5 Service Manual for IEC Bus/Control Interface Option CM-B4 ..... 5.1

5.1 Function Description 5.1
5.1.1 IEC-bus Interface 5.3
5.1.2 Relay Interface 5.3

5.2 Testing and Adjustment 5.3

Components lists
Circuit diagrams
Component layout diagrams

5 Service Manual for IEC Bus/Control Interface Option CM-B4

(See circuit diagram 803.3920 S and block diagram)

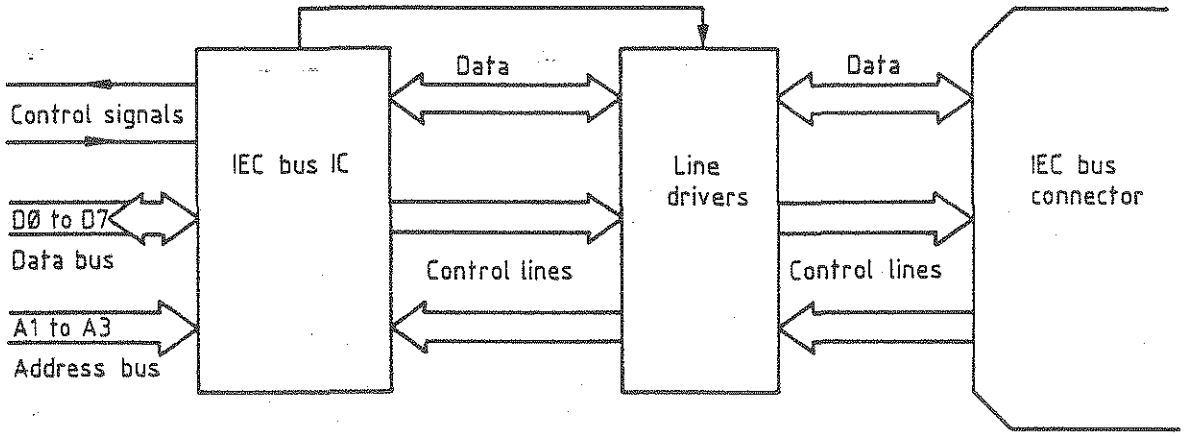
5.1 Function Description

This module comprises two subassemblies:

- IEC-bus interface
- Relay interface

The IEC-bus interface enables the instrument to be used as a listener or as a talker together with an IEC-bus controller.

It is also possible to access the eight relays on the module by the CMT. The contacts can be assigned as desired.



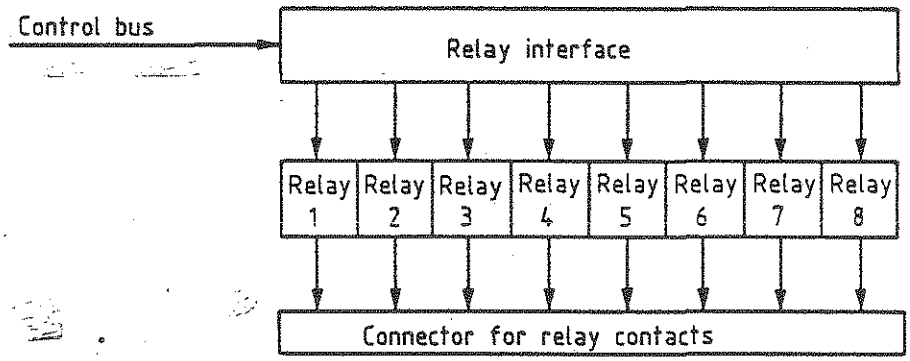


Fig. 5-1 Block diagram of the IEC-bus/control interface

5.1.1 IEC-bus Interface

The IEC-bus interface is based on the talker/listener IC 8291A GPIB. This IC provides all the interface functions which must be carried out between the controller and the IEC-bus output and can be directly addressed by the controller via the data bus and certain system control lines.

Functions:

- Read
- Write
- Load IEC-bus IC

It is possible to set the IC to a particular mode using the load operation. The internal registers of the 8291A IC are selected to this end via the address lines A1, A2, A3.

The controller addresses the IC via its select input $\overline{CS}$ by means of a special range selection line.

All IEC-bus signals pass via bidirectional line drivers before they are applied to the IEC-bus output. Data transfer with the CPU can take place under interrupt control or in DMA mode.

5.1.2 Relay Interface

The interface circuit for triggering the eight relays corresponds to the standard interface circuit with serial-to-parallel data conversion.

The interface circuit provides a control bit for each relay so that the complete interface need only provide eight parallel control lines.

The control bus consists of three lines:

CPS-S	Clock
DO-S	Data (relay control)
IEC	Strobe pulse

5.2 Testing and Adjustment

The module cannot be adjusted. All tests should be carried out using Section 3.

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

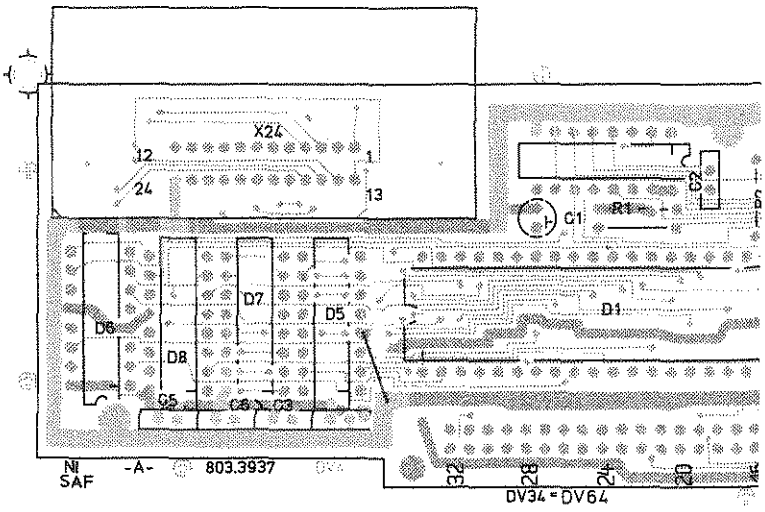
R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ / Datum / Date: 08 / 0285	Schaltteilliste für / Parts list for: ED IEC-BUS-INTERFACE	Sachnummer / Stock No.: 803.3920.01 SA	Blatt / Page: 1

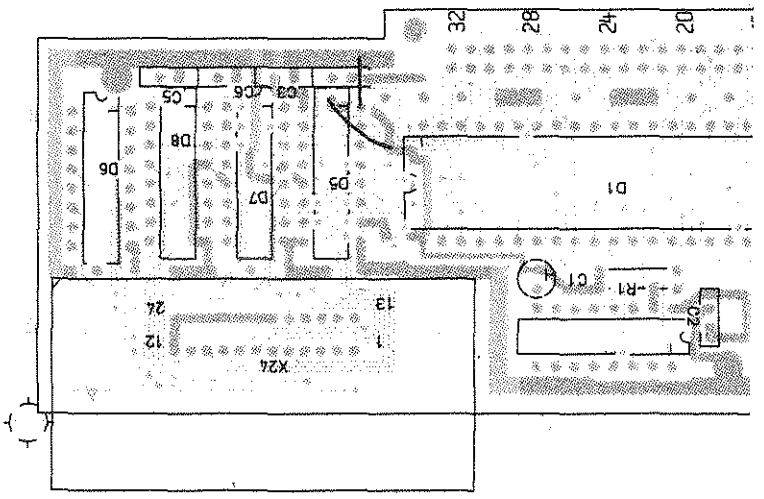
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C2	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C6			
D1	BC P8291A IEC BUS INTERF IEC BUS INTERFACE INTEL P2891A	BC 099.4978	
D2	BL SN7406N 6XINVERTER IC HEX INVERTER SN7406N TEXAS SN7406N	BL 237.0487	
D3	BL SN7406N 6XINVERTER IC HEX INVERTER SN7406N TEXAS SN7406N	BL 237.0487	
D4	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D5	BJ MC3448AP 4XBUS-TRANSC BUS-TRANSCEIVER MOTOROLA MC3448AP	BJ 300.6247	
BIS/TO D8			
K1	SR 5 V 1XU DIL RELAY SIEMENS V23100-V4305-C000	SR 340.4551	
K2	SR 5 V 1XU DIL RELAY SIEMENS V23100-V4305-C000	SR 340.4551	
K3	SR 5V360OHM1MAL1RH-JC-GEH RELAY CLARE PRME 15005	SR 412.0027	
BIS/TO K8			
R1	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R2	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R3	TRIMMWERT / SELECTED		
R4	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
V1	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448	AD 012.0700	
BIS/TO			

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V8			
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT ERNI STV-P-264 9722.333.	FP 084.6470	
X23	FM WINK.BUCHSENLEIST.25P. 25-SOCKET INSERT SOURIAU DB-25S-500C	FM 243.0962	
X24	FM BUCHSENLEISTE 24P. CONNECTOR AMPHENOL 57LE20240-27CR-D35	349.3012	
			- ENDE -

Ansicht und Leitungs
View of tracks on com

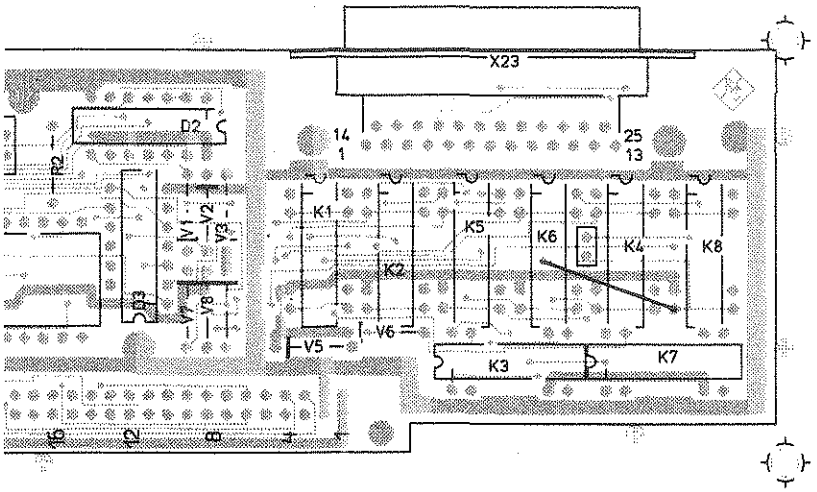


Ansicht und Leitungs
View of tracks on sol

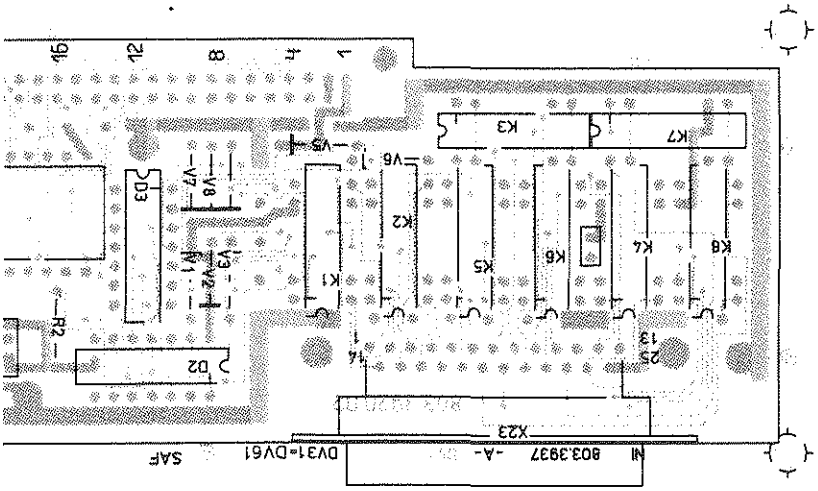


Achtung! MOS-Bauteile
Caution. MOS components

ıgsführung Bauteilseite
component side



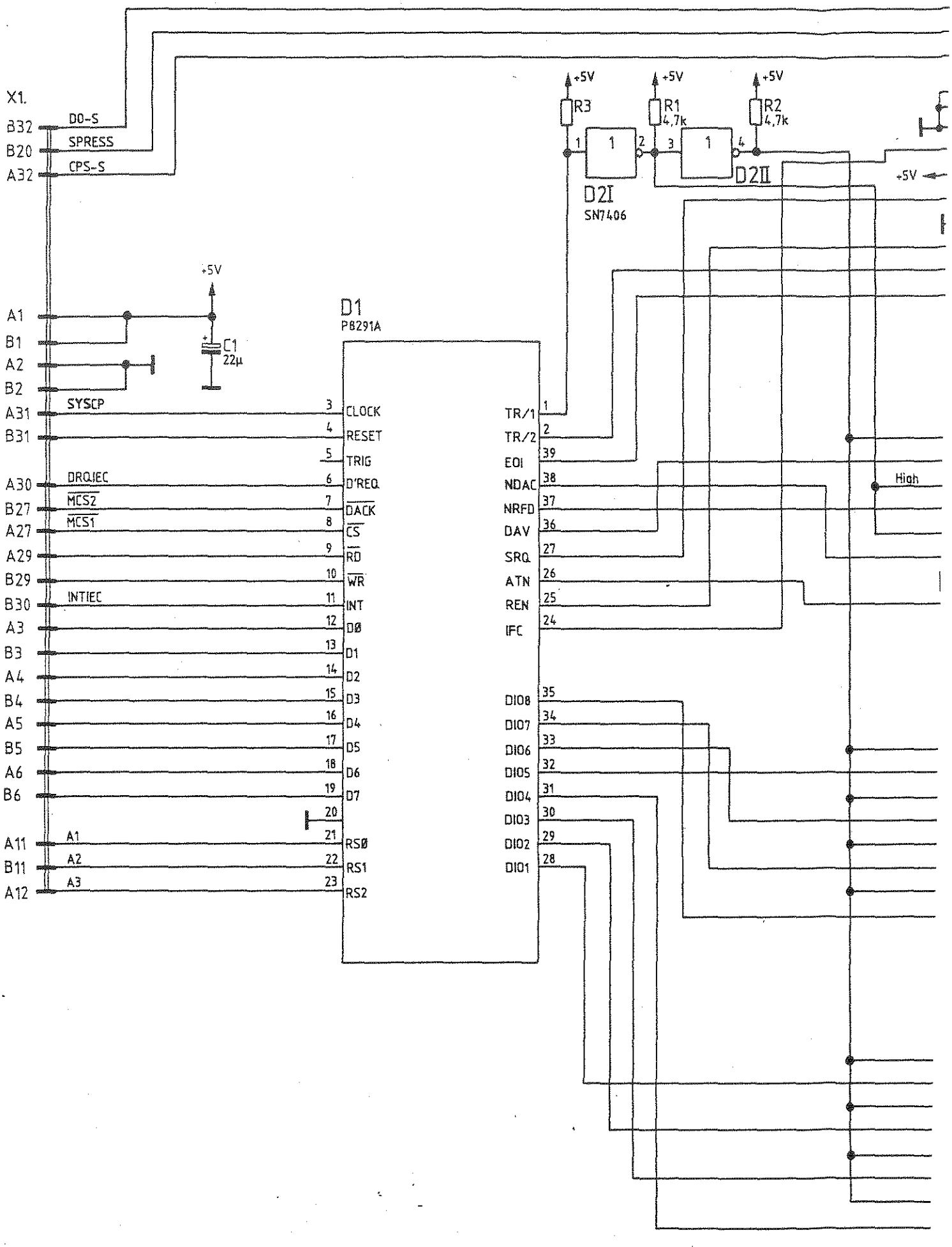
ıgsführung Lötseite
solder side

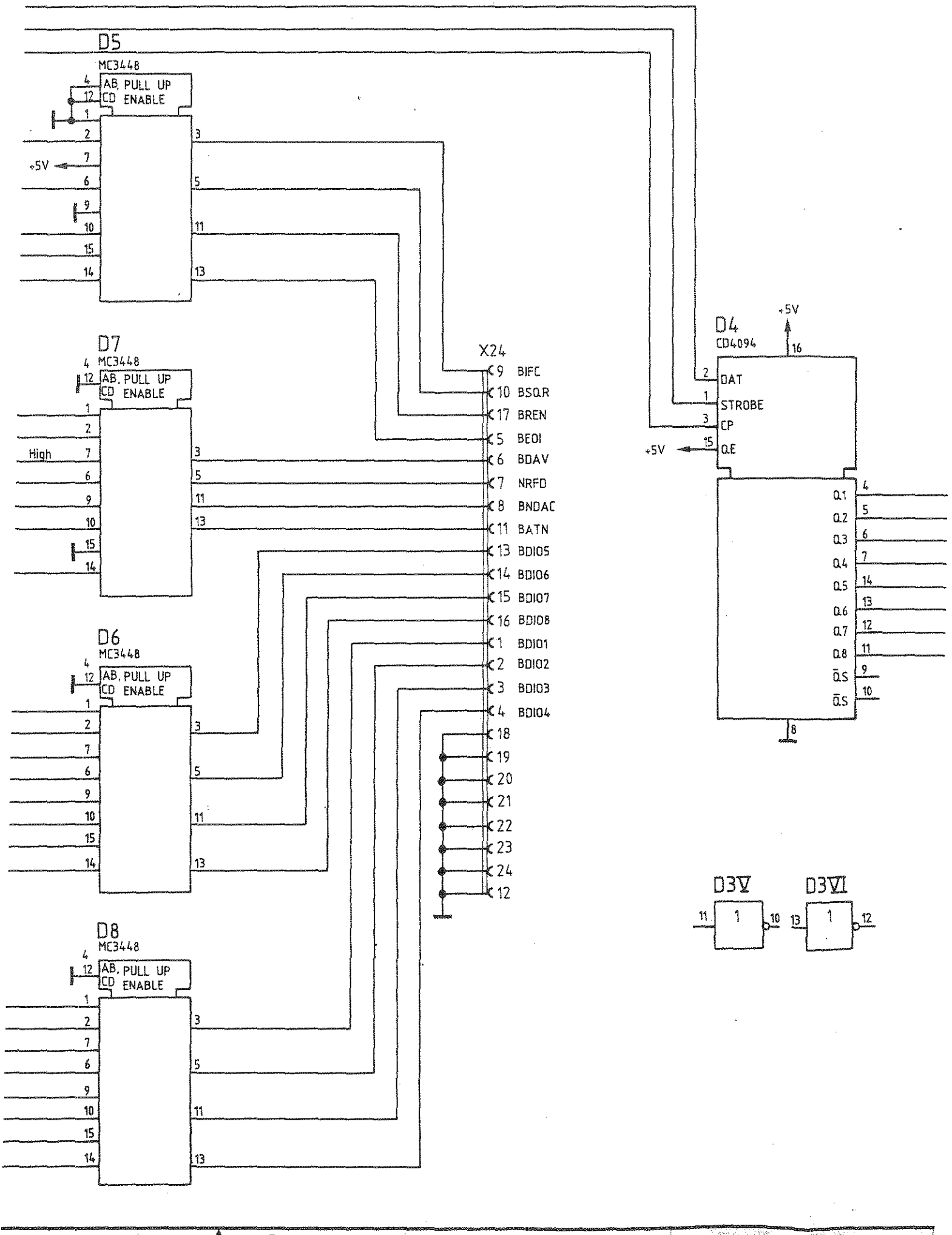


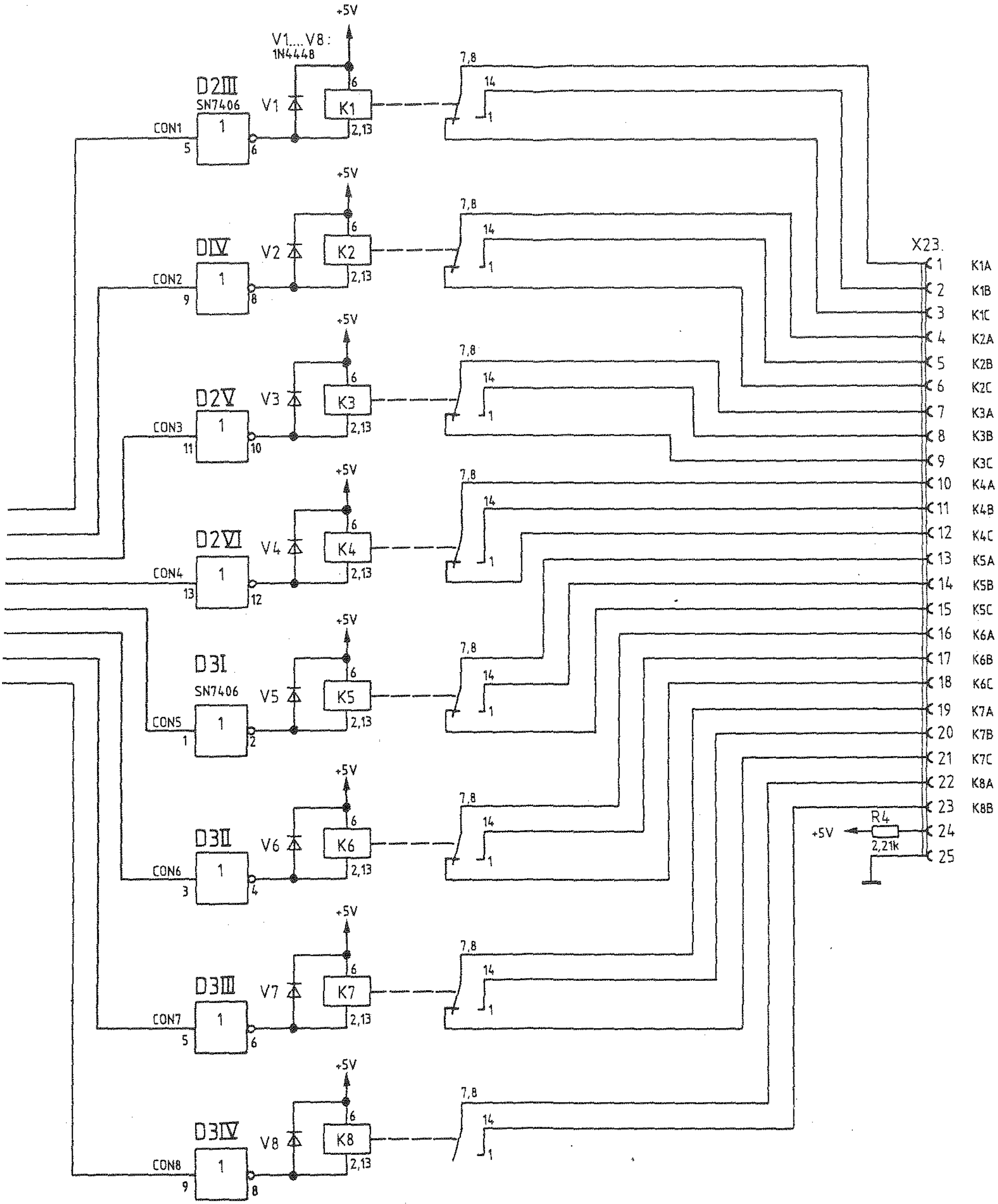
A	—	02.85	NI	Maße ohne Toleranzangabe		Maßstab 1 : 1
B	32912	8.85	NI			Halbzeug, Werkstoff
				1KGA	Tag	Name
				Bearb.	02.85	NI
				Gepr.		
				Norm		
						Benennung: IEC-BUS-INTERFACE
				ROHDE&SCHWARZ		Zeichn.-Nr. 803.3920
				zu Gerät CMT-B4		reg. i. V. 803.3914 V
Änd. Zust.	Änderungs-Mitteilung	Tag	Name			erste Z. —

Z

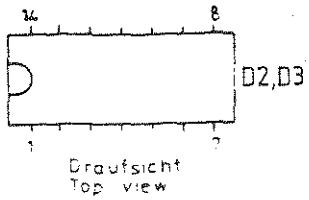
Blatt-Nr. 2 v. Bl.

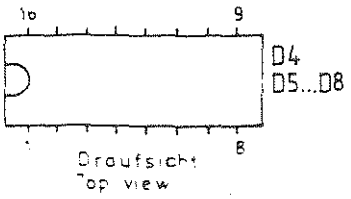

X1.
B32 D0-S
B20 SPRESS
A32 CPS-S
+5V
R3
R1 4,7k
R2 4,7k
D2I
SN7406
D2II
+5V
A1
B1
A2
B2
C1 22µ
D1
P8291A
A31 SYSCP
B31
A30 DRQIEC
B27 MCS2
A27 MCS1
A29
B29
B30 INTIEC
A3
B3
A4
B4
A5
B5
A6
B6
A11 A1
B11 A2
A12 A3
3 CLOCK
4 RESET
5 TRIG
6 D'REQ
7 DACK
8 CS
9 RD
10 WR
11 INT
12 D0
13 D1
14 D2
15 D3
16 D4
17 D5
18 D6
19 D7
20
21 RS0
22 RS1
23 RS2
TR/1 1
TR/2 2
EOI 39
NDAC 38
NRFD 37
DAV 36
SRQ 27
ATN 26
REN 25
IFC 24
DIO8 35
DIO7 34
DIO6 33
DIO5 32
DIO4 31
DIO3 30
DIO2 29
DIO1 28
High

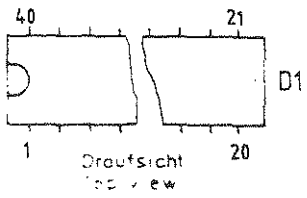

D5
MC3448
AB, PULL UP
CD ENABLE
+5V
D7
MC3448
AB, PULL UP
CD ENABLE
High
D6
MC3448
AB, PULL UP
CD ENABLE
D8
MC3448
AB, PULL UP
CD ENABLE
X24
9 BIFC
10 BSQR
17 BREN
5 BEOI
6 BDAV
7 NRFD
8 BNDAC
11 BATN
13 BDIO5
14 BDIO6
15 BDIO7
16 BDIO8
1 BDIO1
2 BDIO2
3 BDIO3
4 BDIO4
18
19
20
21
22
23
24
12
D4
CD4094
+5V
DAT
STROBE
CP
OE
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q'S
Q'S
D3V
D3VI

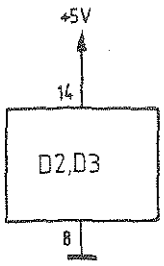


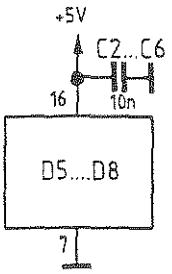
ROHDE&SCHWARZ	A		7.85	CO					1KGA	Tag
									Bearb	10.84
									Gepr	
	Änd Zust	Änderungs Mitt	Datum	Name	Änd	Änderungs	Datum	Name	Norm	

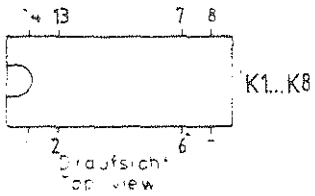












Stromlauf gilt für VAR 02
Circuit diagramm is valid for model 02

	Name	Benennung		Zeichn.-Nr
84	ni	IEC-BUS-Control interface IEC-BUS-Steuerinterface	Z	803.3920 S
		zu Gerät CM-B4		ersetzt 803.3914 V ersetzt Z 803.3914

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

2nd AF Synthesizer Option CMT-B7

803.2618.02

Contents Page

5 Service Manual for 2nd AF Synthesizer Option CMT-B7 ..... 5.1

5.1 Function Description 5.1

5.2 Testing and Adjustment 5.2
5.2.1 Testing the Input Stage 5.2
5.2.2 Adjusting the Sinewave Generator 5.2
5.2.3 Testing the Reference Voltage 5.2
5.2.4 Testing the Filter 5.2
5.2.5 Testing the Level Attenuator 5.2
5.2.6 Testing the PILINT Output (Internal Pilot Tone Output) 5.3

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for 2nd AF Synthesizer Option CMT-B7

(See circuit diagram 803.2624 S)

5.1 Function Description

This option is largely identical with the AF synthesizer on the 1st modulation generator module (802.5713.02).

A signal with 32 times the frequency of the required signal is applied to input PILCP (X1.B22). The level can be adjusted in 256 steps using the D/A converter N8 up to a maximum of 1.77 V_{rms}. The two outputs PILOT (X1.B24) and PILINT (X1.A27) provide signals for the two function units on the 1st modulation generator module: PILOT for the modulation control, PILINT for the AF synthesizer for two-tone generation.

The option also generates an interrupt signal either at phase positions 90° and 270° of the stepped sinewave.

5.2 Testing and Adjustment

The module need not be adjusted.

5.2.1 Testing the Input Stage

X1.B22 (PILCP): f = 32 x f_{PIL}, i.e. 640 Hz < f < 800 kHz, squarewave voltage (V_{Low} = 0 V, V_{High} = 100 mV) but distorted above f > 100 kHz by series-connected lowpass; $V_{max.}$ remains at 100 mV.

P1: TTL signal with f = 32 x f_{PIL}

5.2.2 Adjusting the Sinewave Generator

D1/3: TTL signal with f = f_{PIL}

P4: Stepped sinewave (32 steps/period) with f = f_{PIL}, Using R31, adjust peak amplitude to 2.5 V ± 10 mV.

5.2.3 Testing the Reference Voltage

P3: DC voltage V = +5 V ±0.3%.

5.2.4 Testing the Filter

P5: Sinewave signal with f = f_{PIL} and V_{rms} = 1.768 V ±1%

5.2.5 Testing the Level Attenuator

Instrument setting:

Modulation depth from 0 to 100%

The voltage V_{rms} at X1.B24 must change from 0 to 1.76 V without jumps.

5.2.6 Testing the PILINT Output (Internal Pilot Tone Output)

Instrument setting:

Two-tone modulation

X1.A27: Sinewave signal with V_{rms} = 1.768 V ±3%
$f = f_{INT2}$

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

Kennz. Comp.No.	Benennung Designation		Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
C1	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
C3	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
C4	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR		358.6062	NCC	SRE 22UF/16V+-20%	
C5	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR		358.6062	NCC	SRE 22UF/16V+-20%	
C6	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
C8	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR		358.6062	NCC	SRE 22UF/16V+-20%	
C10	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR		358.6062	NCC	SRE 22UF/16V+-20%	
C11	CK 15NF+-1%63V7,5QUX13 KP CAPACITOR	CK	340.8063	SIEMENS	B33531-A5153-F	
C12	CK 10NF+-1%63V7,5QUX13 KP CAPACITOR	CK	340.9076	SIEMENS	B33531-A5103-F	
C13	CK 22NF+-5%63V5RM MKT CAPACITOR	CK	099.2881	WIMA	MKS2/63/0,022UF/5%	
C14	CK 10NF+-1%63V7,5QUX13 KP CAPACITOR	CK	340.9076	SIEMENS	B33531-A5103-F	
C15	CK 39NF+-1%63V10QUX13 KP CAPACITOR	CK	099.1940	SIEMENS	B33531-A5393-F	
C16	CK 2,4NF+-1%63V,3QUX11KP CAPACITOR	CK	334.5637	SIEMENS	B33531-A5242-F	
C17	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C18	CK 6,8NF +-1% 63V RM5 KP POLYPROPYLENE CAPACITOR		007.7646	ROE	KP1830-268/061-R	
C19	CK 4,7NF+-1%63V6,3X11 KP PLASTIC-FOIL CAPACITOR	CK	283.1701	SIEMENS	B33531-A5472-F	
C20	CK 6,8NF +-1% 63V RM5 KP POLYPROPYLENE CAPACITOR		007.7646	ROE	KP1830-268/061-R	
C21	CK 3,3NF+-1%63V6,3QUX11KP CAPACITOR	CK	340.9030	SIEMENS	B33531-A5332-F	
C22	CK 15NF+-1%63V7,5QUX13 KP CAPACITOR	CK	340.8063	SIEMENS	B33531-A5153-F	
C23	CK 1NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR	CK	099.6129	WIMA	FKP2 1000/2,5%/63V	
C24	CK 1,5NF +-1% 100V RM5 KP POLYPROPYLENE CAPACITOR		007.7600	ROE	KP1830-215/011-R	
C25	CK 1NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR	CK	099.6129	WIMA	FKP2 1000/2,5%/63V	
C26	CK 3,3NF+-2,5%63V RM5 KP POLYPROPYLENE CAPACITOR	CK	099.6158	WIMA	FKP2 3300/2,5%/63V	
C27	CK 470PF +-1% 100V RM5 KP POLYPROPYLENE CAPACITOR		007.7575	ROE	KP1830-147/011-R	
C28	CC 10NF-20+50%7X8R4000 CAPACITOR	CC	087.7525	VALVO	2222 63051 64051103	
C29	CC 10NF-20+50%7X8R4000 CAPACITOR	CC	087.7525	VALVO	2222 63051 64051103	
C30 ..34	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC	084.5350	UNION CARB	CK05BX104K	
C35	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
C36	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
C37	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC	087.6429	VALVO	2222 678 09109	
C38	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC	087.6429	VALVO	2222 678 09109	
C60	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
C61	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR		803.0580	MATSUSHITA	ECE-A1ESS-101	
D1	BL CD4520BE 2XBIN.COUNT COUNTER	BL	299.6908	RCA	CD4520BE	
D2	BL CD4015BE 2X4B.SH.REG SHIFT REGISTER	BL	086.7044	RCA	CD4015BE	
D3	BL CD4015BE 2X4B.SH.REG SHIFT REGISTER	BL	086.7044	RCA	CD4015BE	
D4	BL CD4094BE 8BIT SH.REG SHIFT REGISTER	BL	586.7726	RCA	CD4094BE	
D5	BL CD4094BE 8BIT SH.REG SHIFT REGISTER	BL	586.7726	RCA	CD4094BE	

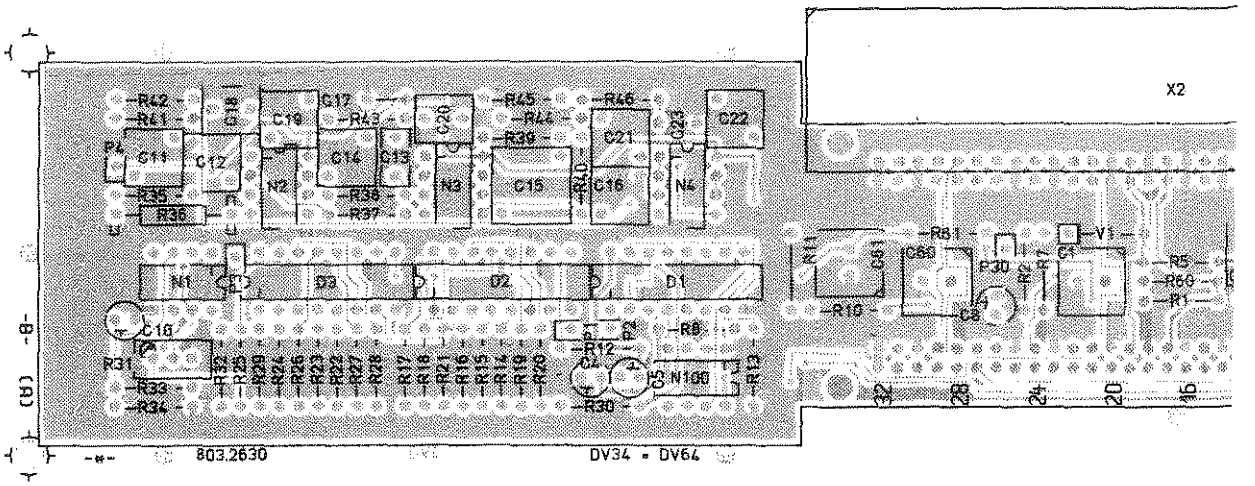
Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
D6	BL CD4071BE 4X2IN. ORG OR GATE	BL 299.6866	RCA	CD4071BE	
D7	BL MC14528BCP 2X MONOFLOP MONOSTABLE MULTIVIBRATOR	BL 086.7315	SSS	SCL4528BE	
N1	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N2	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N3	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N4	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N5	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N6	BL CD4053BE 3X2CH. MUX MULTIPLEXER	BL 565.3080	RCA	CD4053BE	
N7	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER	349.3058	NSC	LF411CN	
N8	BJ AD7523JN 8B.D/A-CONV D/A CONVERTER	801.8219	MICRO POW.	MP7523JN	
N9	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER	356.0521	NSC	LF412CN	
N10	BL CD4053BE 3X2CH. MUX MULTIPLEXER	BL 565.3080	RCA	CD4053BE	
N11	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER	349.3058	NSC	LF411CN	
N100	BO LM311N COMPAR COMPARATOR	BO 394.8755	NSC	LM311N	
O1	VL STECKLOETOESE 7,5X1,1 PLUG-IN SOLDERING LUG	VL 078.2747	-	R&S-ZCHNG.078.2747	
O2	VL STECKLOETOESE 7,5X1,1 PLUG-IN SOLDERING LUG	VL 078.2747	-	R&S-ZCHNG.078.2747	
P1 ..8	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4507	BERG	NR. 75 403-001	
P10	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4507	BERG	NR. 75 403-001	
P11	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4507	BERG	NR. 75 403-001	
P30	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4507	BERG	NR. 75 403-001	
R1	RL 0,35W2,21 OHM+-1%TK50 METALFILMRESISTOR	RL 099.7948	RESISTA	MK2 2,21 OHM 1% TK50	
R2	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R3	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR	RL 082.8852	DRALORIC	SMA0207/100HM-F-D	
R5	RL 0,35W2,21 OHM+-1%TK50 METALFILMRESISTOR	RL 099.7948	RESISTA	MK2 2,21 OHM 1% TK50	
R7	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR	RL 082.8852	DRALORIC	SMA0207/100HM-F-D	
R8	RL 0,35W4,75 OHM+-1%TK50 METALFILMRESISTOR	RL 099.8021	RESISTA	MK2 4,75 OHM 1% TK50	
R10	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R11	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R12	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR	RL 083.0826	DRALORIC	SMA0207/2,00K-F-D	
R13	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMA0207/1K-F-C	
R14	RL 0,35W 178 KOHM+-1%TK50 RESISTOR	RL 083.2187	DRALORIC	SMA/207/178K-F-C	
R15	RL 0,35W 60,4KOHM+-1%TK50 RESISTOR	RL 083.1851	DRALORIC	SMA0207/60,4K-F-C	
R16	RL 0,35W 36,5KOHM+-1%TK50 RESISTOR	RL 083.1716	DRALORIC	SMA0207/36,5K-F-C	
R17	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR	RL 082.2583	DRALORIC	SMA 0207/27,4K-F-C	
R18	RL 0,35W22,6KOHM+-1%TK50 RESISTOR	RL 082.2219	DRALORIC	SMA0207/22,6K-F-C	
R19	RL 0,35W 19,6KOHM+-1%TK50 RESISTOR	RL 083.1516	DRALORIC	SMA/207/19,6K-F-C	
R20	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR	RL 083.1480	DRALORIC	SMA/207/18,2K-F-C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R21	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR	RL 083.1468	DRALORIC	SMA0207/17,4K-F-C	
R22	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR	RL 083.1468	DRALORIC	SMA0207/17,4K-F-C	
R23	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR	RL 083.1480	DRALORIC	SMA/207/18,2K-F-C	
R24	RL 0,35W 19,6KOHM+-1%TK50 RESISTOR	RL 083.1516	DRALORIC	SMA/207/19,6K-F-C	
R25	RL 0,35W22,6KOHM+-1%TK50 RESISTOR	RL 082.2219	DRALORIC	SMA0207/22,6K-F-C	
R26	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR	RL 082.2583	DRALORIC	SMA 0207/27,4K-F-C	
R27	RL 0,35W 36,5KOHM+-1%TK50 RESISTOR	RL 083.1716	DRALORIC	SMA0207/36,5K-F-C	
R28	RL 0,35W 60,4KOHM+-1%TK50 RESISTOR	RL 083.1851	DRALORIC	SMA0207/60,4K-F-C	
R29	RL 0,35W 178 KOHM+-1%TK50 RESISTOR	RL 083.2187	DRALORIC	SMA/207/178K-F-C	
R30	RL 0,35W 10,2KOHM+-1%TK50 RESISTOR	RL 082.2331	DRALORIC	SMA/207/10,2K-F-C	
R31	RS 0,3W2,OKOHM+-10%CERMET TRIMMING POTENTIOMETER	RS 006.9139	BECKMAN	67W 2KOHM 10%	
R32	RL 0,35W 10,OKOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R33	RL 0,35W 10,OKOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R34	RL 0,35W 10,OKOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R35	RL 0,35W 17,4KOHM+-1%TK50 RESISTOR	RL 083.1468	DRALORIC	SMA0207/17,4K-F-C	
R36	RL 0,35W 57,6KOHM+-1%TK50 RESISTOR	RL 083.6830	DRALORIC	SMA0207/57,6K-F-C	
R37	RL 0,35W 19,1KOHM+-1%TK50 RESISTOR	RL 083.1500	DRALORIC	SMA/207/19,1K-F-C	
R38	RL 0,35W 35,7KOHM+-1%TK50 RESISTOR	RL 083.1700	DRALORIC	SMA0207/35,7K-F-C	
R39	RL 0,35W 30,1KOHM+-1%TK50 RESISTOR	RL 083.1639	DRALORIC	SMA0207/30,1K-F-C	
R40	RL 0,35W 53,6KOHM+-1%TK50 RESISTOR	RL 082.2590	DRALORIC	SMA 0207/53,6K-F-C	
R41	RL 0,35W 2,61KOHM+-1%TK50 RESISTOR	RL 083.0903	DRALORIC	SMA0207/2,61K-F-D	
R42	RL 0,35W 8,06KOHM+-1%TK50 RESISTOR	RL 083.1222	DRALORIC	SMA0207/8,06K-F-D	
R43	RL 0,35W4,64KOHM+-1%TK50 RESISTOR	RL 082.1687	DRALORIC	SMA0207/4,64K-F-C	
R44	RL 0,35W 6,49KOHM+-1%TK50 RESISTOR	RL 083.1168	DRALORIC	SMA0207/6,49K-F-D	
R45	RL 0,35W 6,34KOHM+-1%TK50 RESISTOR	RL 083.1151	DRALORIC	SMA0207/6,34K-F-D	
R46	RL 0,35W 7,15KOHM+-1%TK50 RESISTOR	RL 083.1174	DRALORIC	SMA0207/7,15K-F-D	
R47	RL 0,35W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	DRALORIC	SMA0207/1,21K-F-D	
R48	RL 0,35W 3,4OKOHM+-1%TK50 RESISTOR	RL 083.1000	DRALORIC	SMA0207/3,4OK-F-D	
R49	RL 0,35W 1,69KOHM+-1%TK50 RESISTOR	RL 083.0778	DRALORIC	SMA0207/1,69K-F-D	
R50	RL 0,35W 2,37KOHM+-1%TK50 RESISTOR	RL 083.0878	DRALORIC	SMA0207/2,37K-F-D	
R51	RL 0,35W 1,0 OHM+-1%TK50 METALFILMRESISTOR	RL 099.7860	RESISTA	MK2 1,00 OHM 1% TK50	
R53	RL 0,35W 10,OKOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R54	RL 0,35W 10,OKOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R60	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
R61	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR	RL 082.6543	DRALORIC	SMA0207/100/HM-F-D	
V1	AE BZX79/C9V1 0,5W Z-DI ZENER DIODE	AE 012.2503	VALVO	BZX79/C9V1	
V2	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT	FP 084.6470	PANDUIT	100-064-033/999	

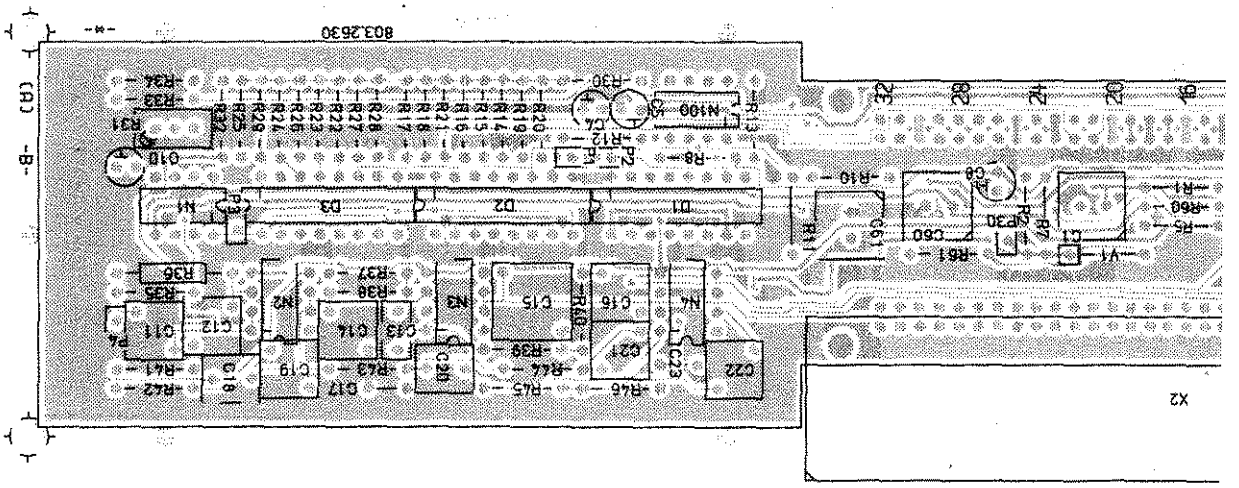
	Al	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
ROHDE & SCHWARZ	13	1287	ED 2.NF-SYNTHESIZER 2ND AF SYNTHESIZER	803.2624.01 SA	3+

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
X2	FP BUCHSENLEISTE64P.ABGEW	FP 099.0614	PANDUIT	100-064-533/999	
					- ENDE -

Ansicht und Leitungsführ
View of tracks on compon



Ansicht und Leitungsführ
View of tracks on solder

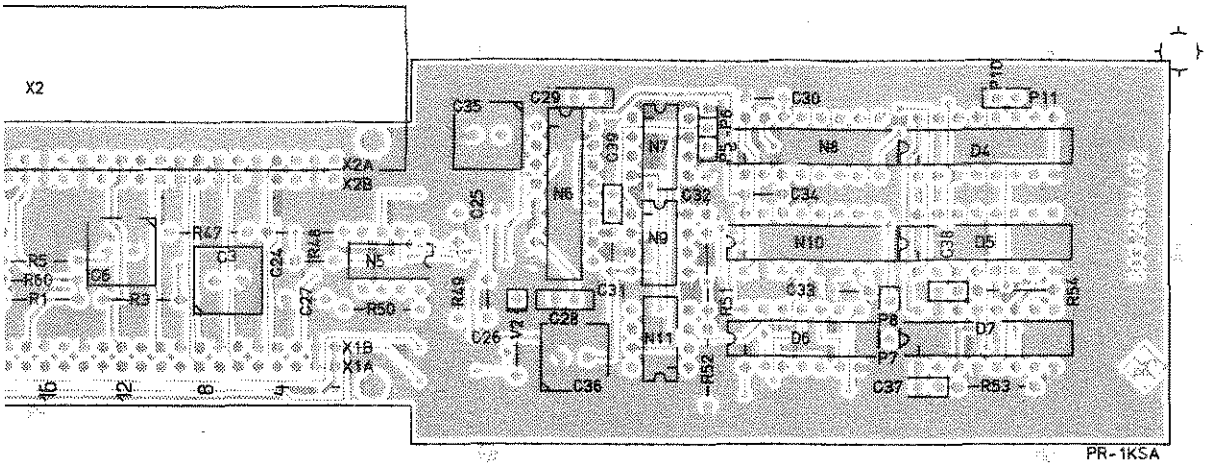


(hierzu HVC 250)

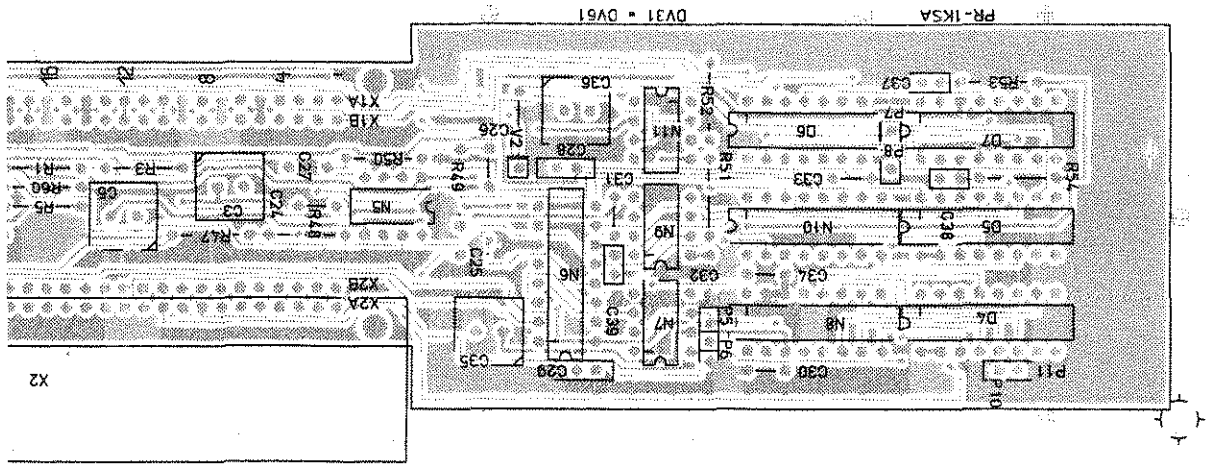
ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

sführung Bauteilseite
mponent side

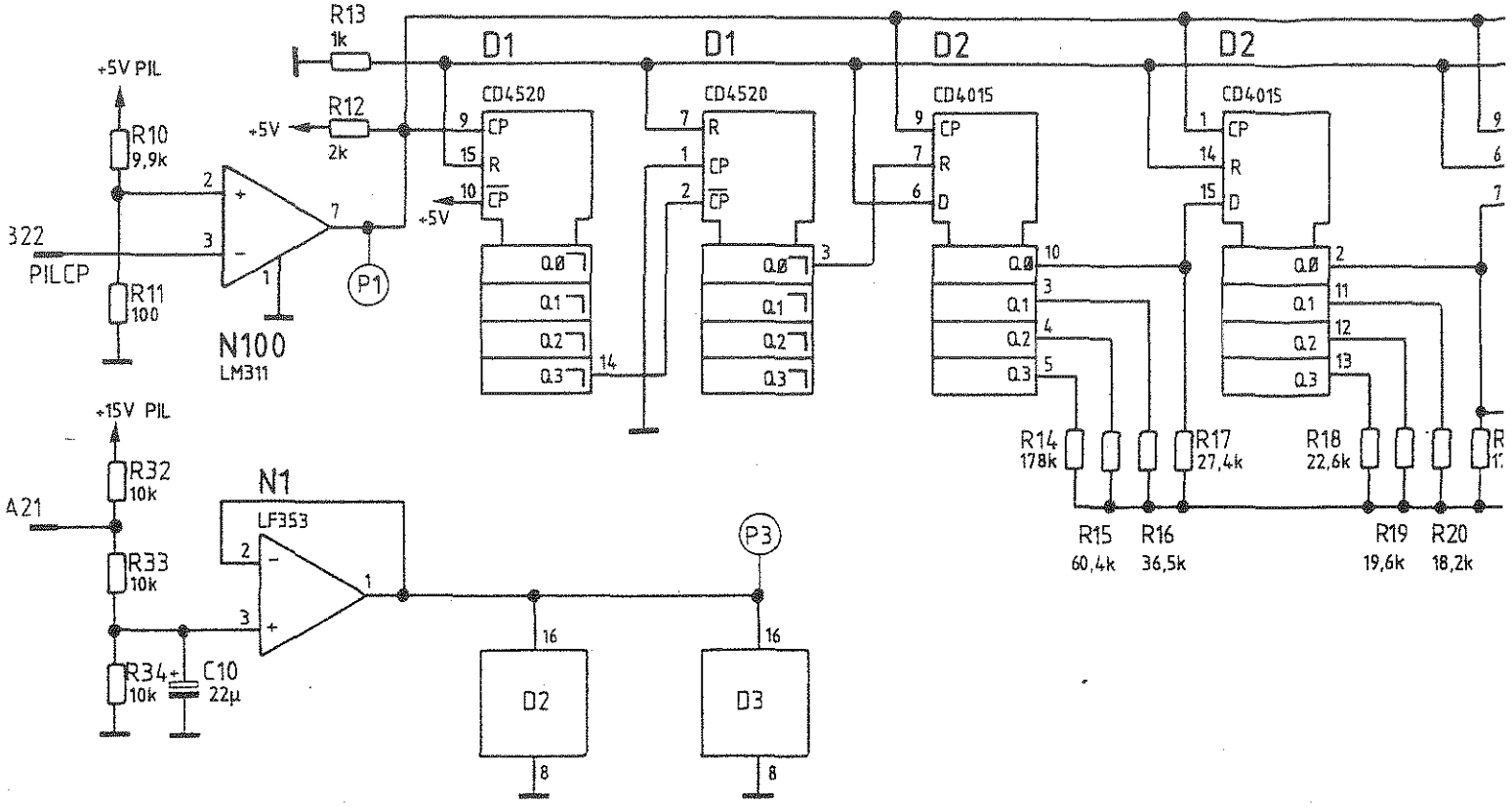


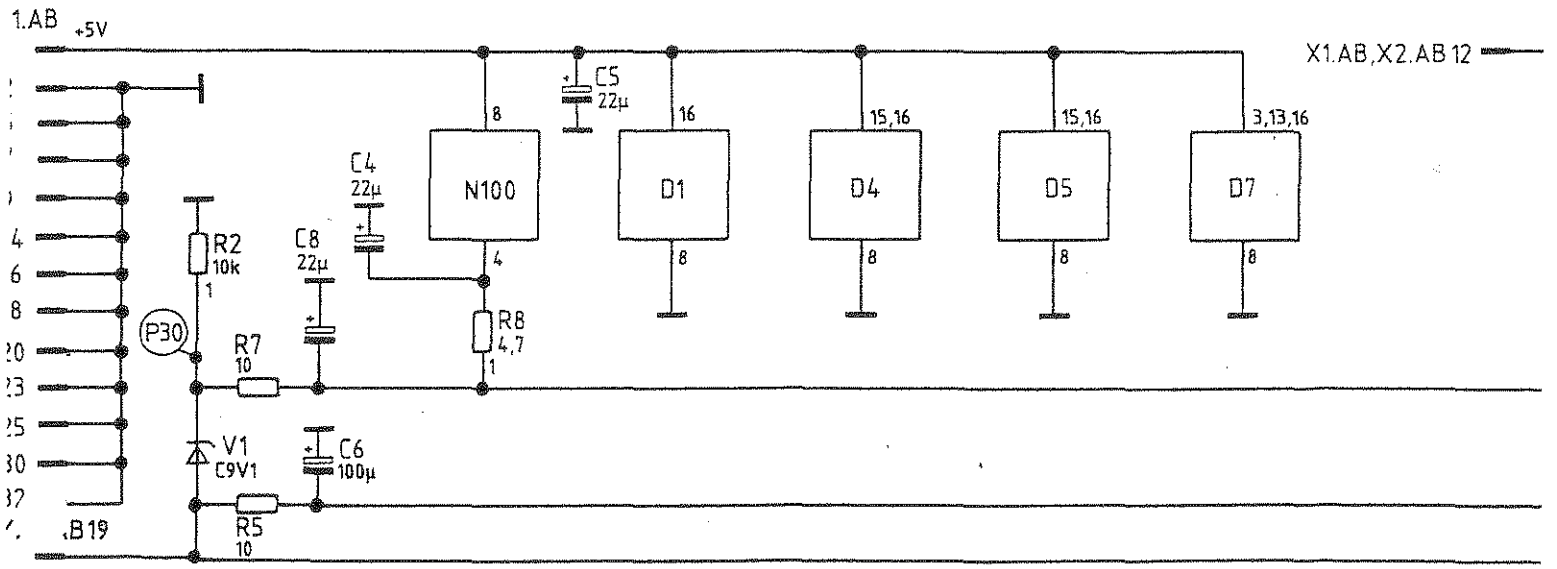
sführung Lötseite
der side

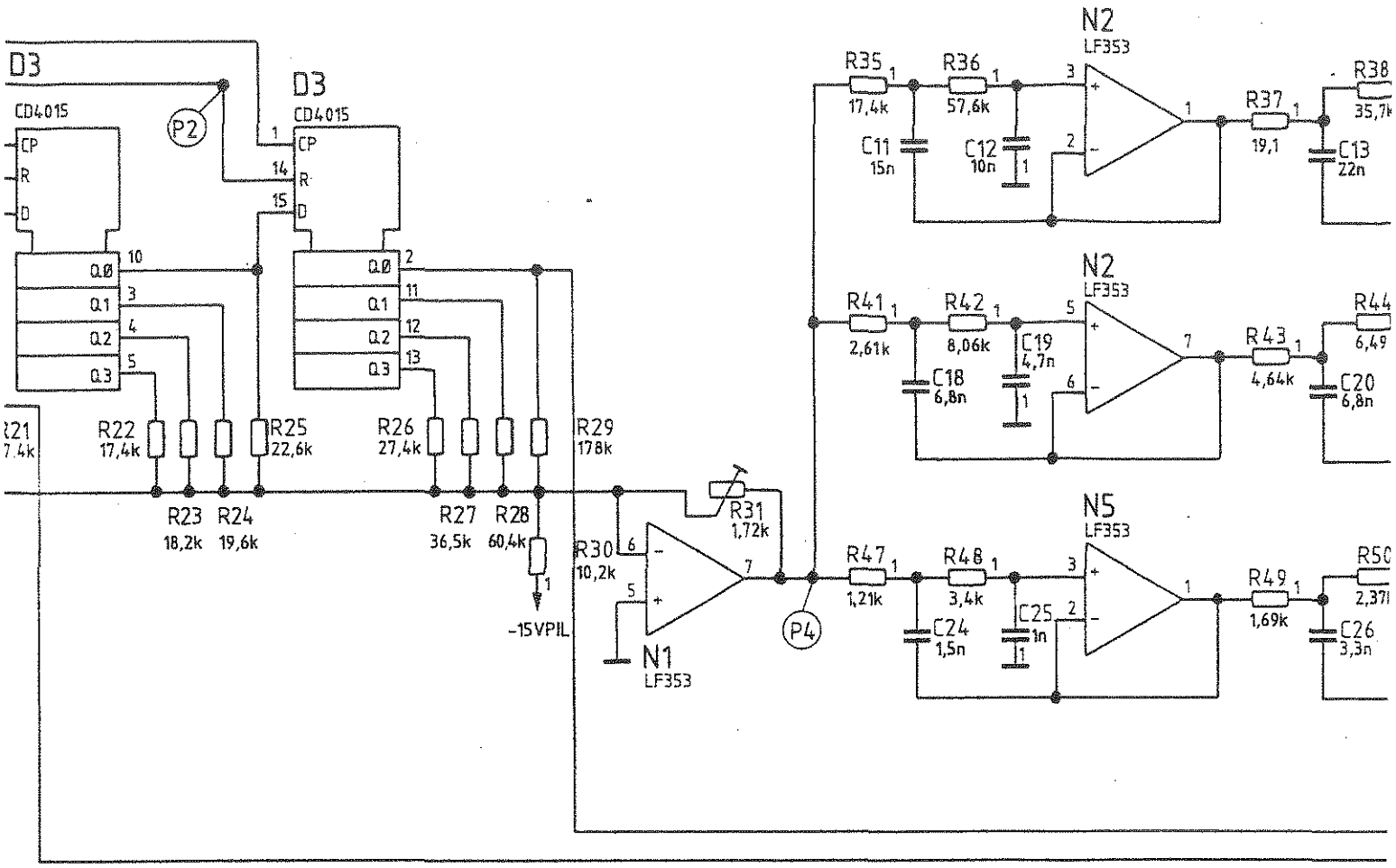


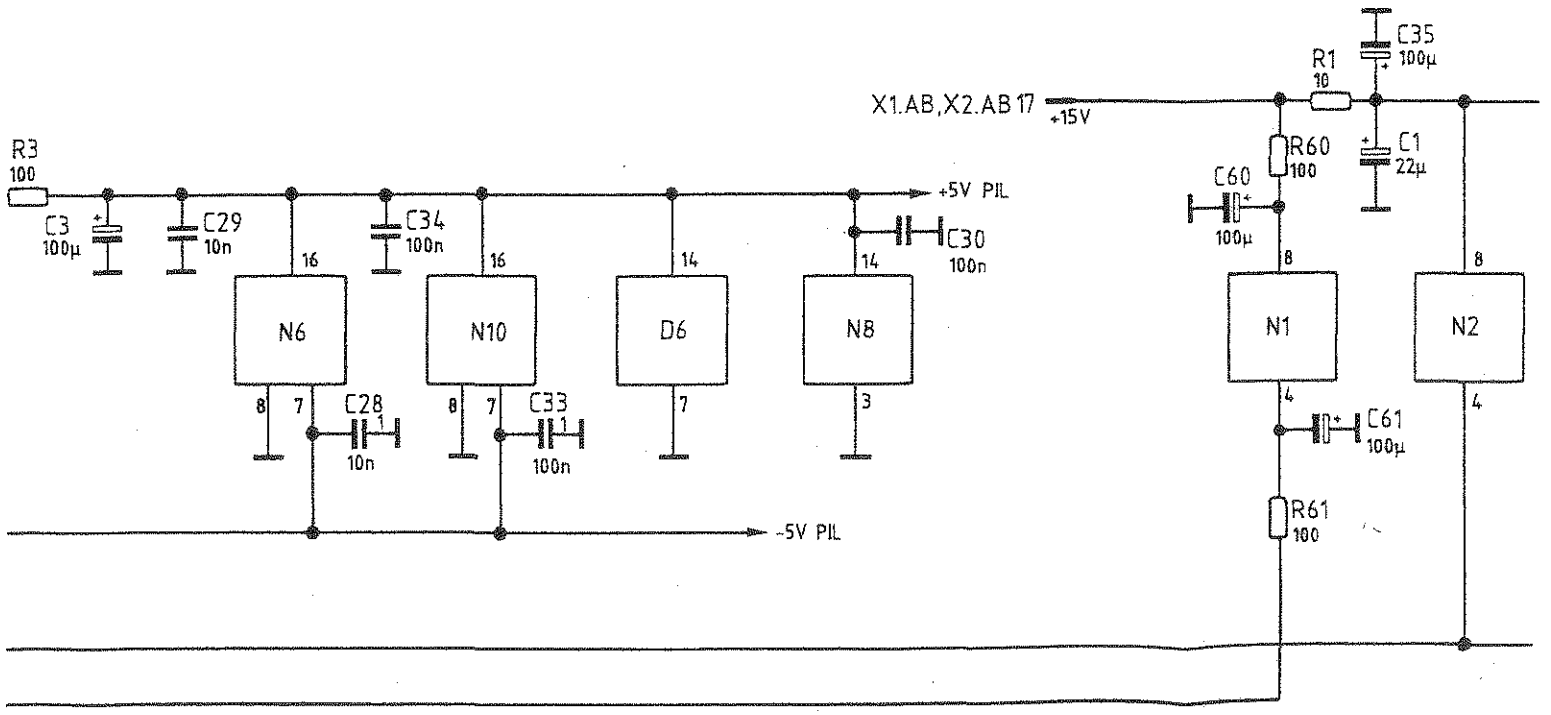
C	35549	12.86	PR	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	12.86	PR	2. NF-Synthesizer 2nd AF Synthesizer
				Gepr.			Z
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr.	803.2624.01 EE
				zu Gerät	671	reg. i. V. 803.2618 V	erste Z.

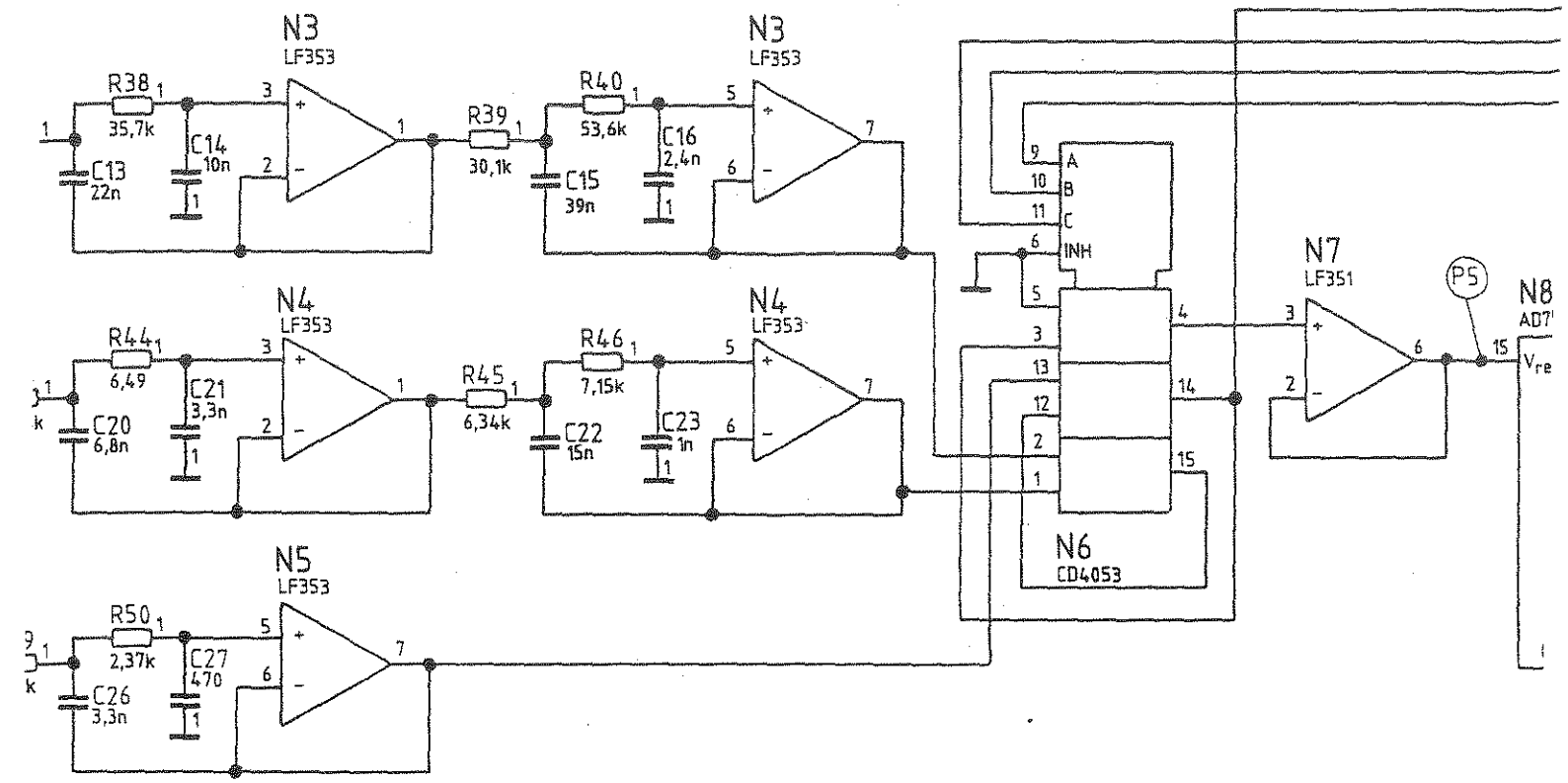
Blatt-Nr. 2 v. 2 Bl.

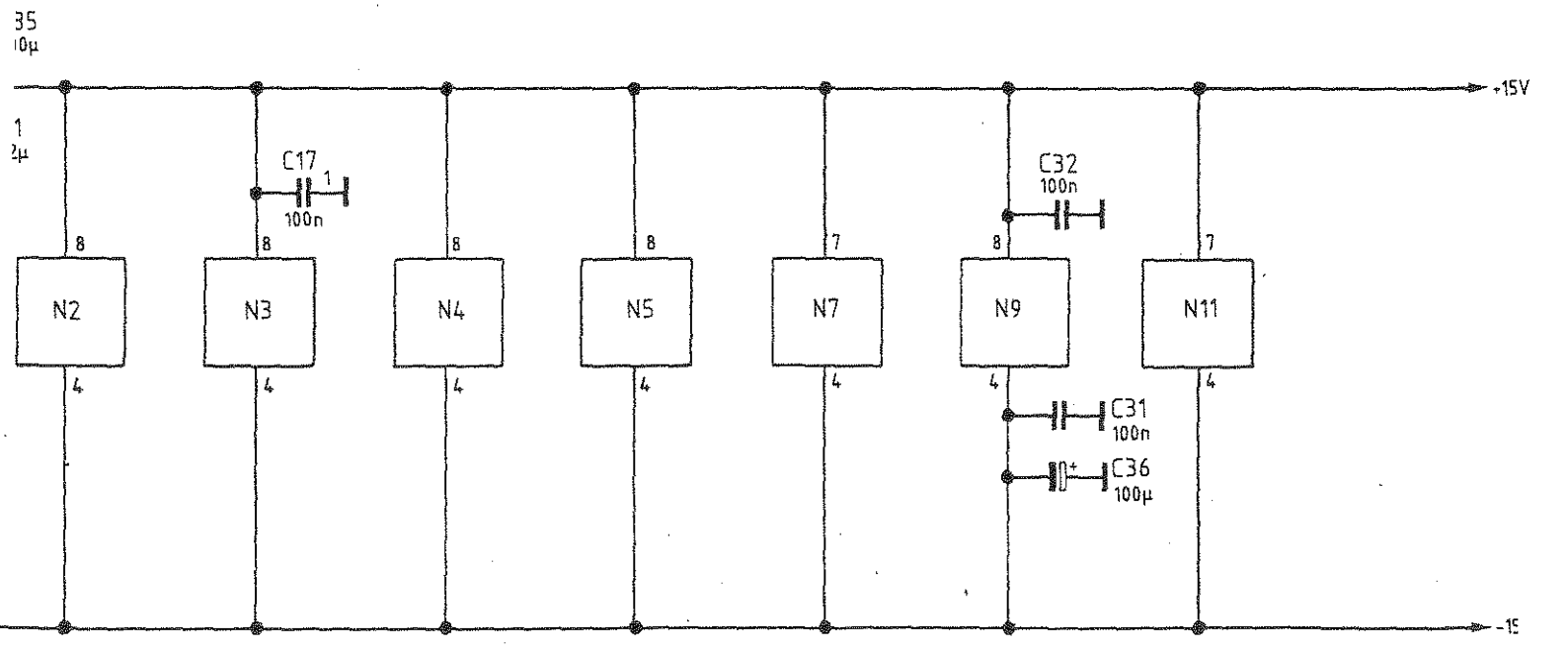

R13
1k
D1
D1
D2
D2
+5V PIL
R12
2k
+5V
CD4520
CD4520
CD4015
CD4015
R10
9,9k
322
PILCP
R11
100
N100
LM311
P1
+15V PIL
R32
10k
N1
LF353
A21
R33
10k
R34
10k
C10
22µ
P3
D2
D3
R14
178k
R17
27,4k
R18
22,6k
R15
60,4k
R16
36,5k
R19
19,6k
R20
18,2k

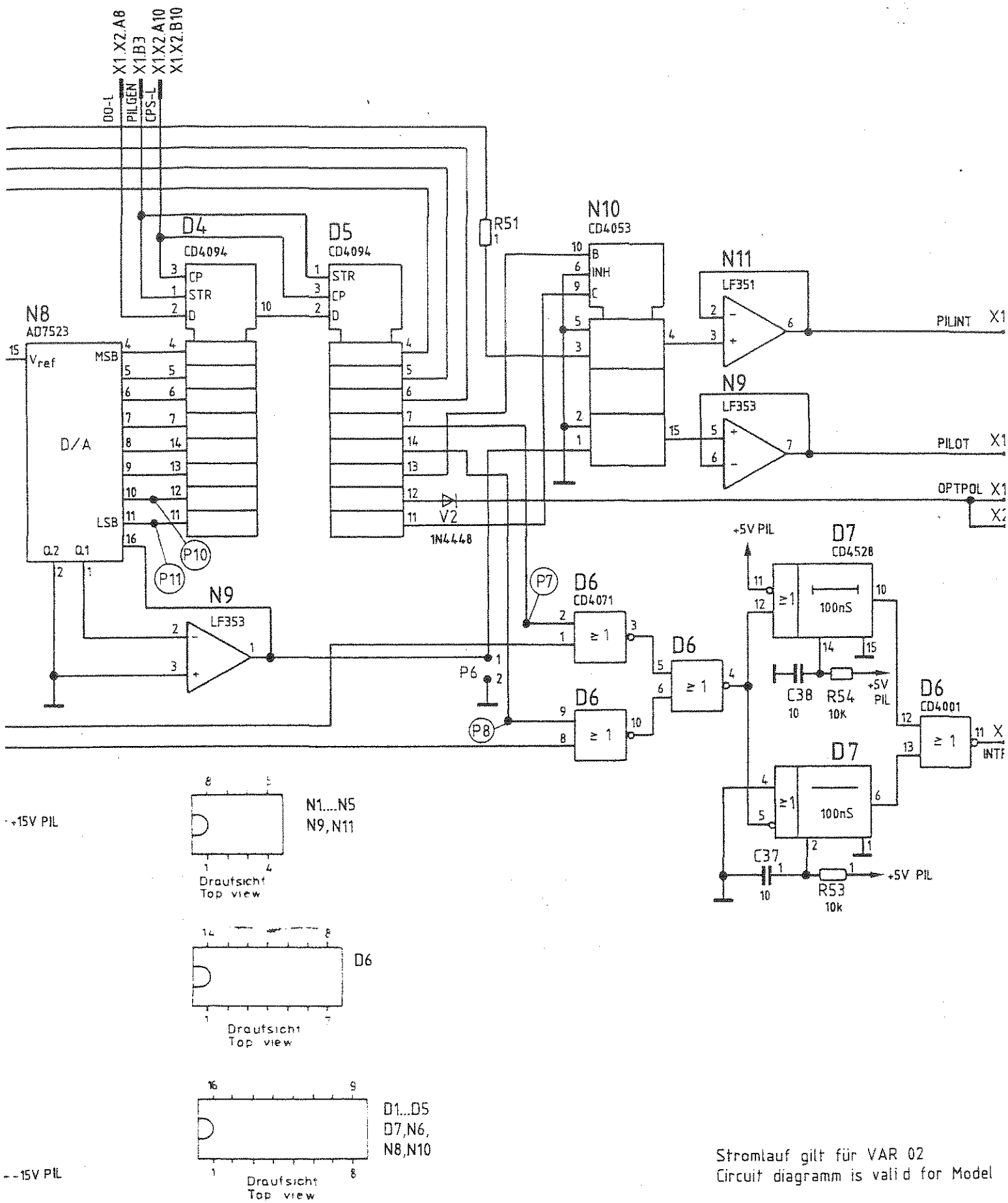

1.AB
+5V
X1.AB,X2.AB 12
C5
22µ
C4
22µ
C8
22µ
N100
D1
D4
D5
D7
R2
10k
R8
4,7
P30
R7
10
V1
C9V1
C6
100µ
R5
10
.B19


D3
CD4015
CP
R
D
Q0
Q1
Q2
Q3
P2
R22 17,4k
R25 22,6k
R26 27,4k
R29 178k
R23 18,2k
R24 19,6k
R27 36,5k
R28 60,4k
R31 1,72k
R30 10,2k
N1 LF353
-15VPIL
P4
N2 LF353
R35 17,4k
R36 57,6k
C11 15n
C12 10n
R37 19,1
C13 22n
R38 35,7k
R41 2,61k
R42 8,06k
C18 6,8n
C19 4,7n
R43 4,64k
C20 6,8n
R44 6,49
N5 LF353
R47 1,21k
R48 3,4k
C24 1,5n
C25 1n
R49 1,69k
C26 3,3n
R50 2,37k


X1.AB,X2.AB 17
+15V
R1 10
C35 100µ
R60 100
C1 22µ
C60 100µ
R3 100
C3 100µ
C29 10n
C34 100n
C30 100n
+5V PIL
N6
N10
D6
N8
N1
N2
C28 10n
C33 100n
C61 100µ
R61 100
-5V PIL


N3
LF353
R38
35,7k
C13
22n
C14
10n
R39
30,1k
R40
53,6k
C15
39n
C16
2,4n
N3
LF353
N4
LF353
R44
6,49
C20
6,8n
C21
3,3n
R45
6,34k
R46
7,15k
C22
15n
C23
1n
N4
LF353
N5
LF353
R50
2,37k
C26
3,3n
C27
470
N6
CD4053
A
B
C
INH
N7
LF351
P5
N8
AD7
Vre


+15V
C17
100n
C32
100n
N2
N3
N4
N5
N7
N9
N11
C31
100n
C36
100µ



Stromlauf zu 2.NF-Synthesizer / 2nd AF-Synthesizer		Z	Zeichn.-Nr. 803.2624 S
CMT-B7	reg. i V 803.2618 V	erste Z.	

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Adjacent-channel Power Meter

Option CMT-B6

803.7810.02

Contents

		Page
5	Service Manual for Adjacent-channel Power Meter Option CMT-B6 ...	5.1
5.1	Function Description	5.1
5.1.1	800-MHz Fixed Oscillator	5.3
5.1.2	455-kHz IF Section	5.3
5.2	Testing and Adjustment	5.4
5.2.1	Testing the Fixed Oscillator	5.4
5.2.2	Testing the IF Section	5.5
5.2.3	Adjusting the Fixed Oscillator	5.6
5.2.3.1	Adjusting the Oscillator	5.6
5.2.3.2	Adjusting the Phase Control	5.6
5.2.3.3	Adjusting the Level Converter	5.7
5.2.3.4	Adjusting the Oscillator Output Power	5.7
5.2.4	Adjusting the IF Section	5.7
5.2.4.1	Adjusting the Offset	5.7
5.2.4.2	Adjusting the Balance	5.8
5.3	Interfaces	5.9

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Adjacent-channel Power Meter Option CMT-B6

(See circuit diagram 803.7832 S)

5.1 Function Description

The internal RF synthesizer, the RF amplifier and mixer modules on the analog unit and the adjacent-channel power meter module are used for adjacent-channel power measurements.

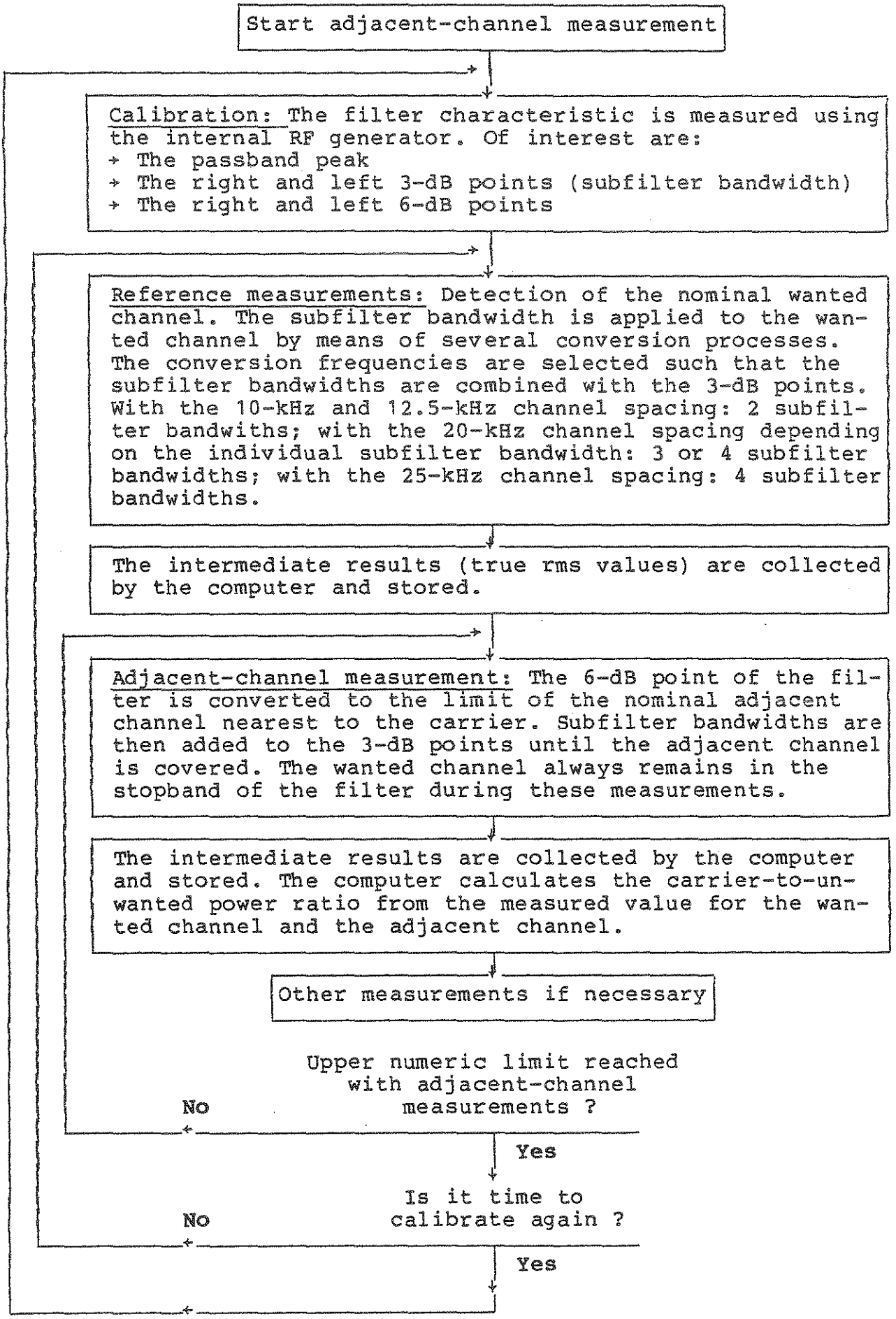
The adjacent-channel power meter module consists of two circuits which are almost independent of one another:

- A 800-MHz fixed oscillator of high spectral purity with a 1:2 divider.
- A 455-kHz IF section with the weighting filter, selectable amplifiers and an rms meter.

If a transmitter with an RF <200 MHz is to be measured, the transmitter frequency is directly converted to 455 kHz using the internal RF synthesizer. The signal quality of the internal RF synthesizer is sufficient in this frequency range to enable measurements up to approx. 80 dB.

If the transmitter frequency is in the 70-cm band (approx. 450 MHz) or in the 900-MHz band, conversion to 400 MHz or 800 MHz is required.

The adjacent-channel power measurement is made as follows (see flowchart) using the filter (E160) (the filter has a 3-dB bandwidth of approx. 3.5 kHz, a 6-dB bandwidth of approx. 4 kHz and a stopband attenuation of more than 80 dB) and several conversion processes.


Start adjacent-channel measurement
Calibration: The filter characteristic is measured using the internal RF generator. Of interest are:
→ The passband peak
→ The right and left 3-dB points (subfilter bandwidth)
→ The right and left 6-dB points
Reference measurements: Detection of the nominal wanted channel. The subfilter bandwidth is applied to the wanted channel by means of several conversion processes. The conversion frequencies are selected such that the subfilter bandwidths are combined with the 3-dB points. With the 10-kHz and 12.5-kHz channel spacing: 2 subfilter bandwiths; with the 20-kHz channel spacing depending on the individual subfilter bandwidth: 3 or 4 subfilter bandwidths; with the 25-kHz channel spacing: 4 subfilter bandwidths.
The intermediate results (true rms values) are collected by the computer and stored.
Adjacent-channel measurement: The 6-dB point of the filter is converted to the limit of the nominal adjacent channel nearest to the carrier. Subfilter bandwidths are then added to the 3-dB points until the adjacent channel is covered. The wanted channel always remains in the stopband of the filter during these measurements.
The intermediate results are collected by the computer and stored. The computer calculates the carrier-to-unwanted power ratio from the measured value for the wanted channel and the adjacent channel.
Other measurements if necessary
Upper numeric limit reached with adjacent-channel measurements ?
No
Yes
Is it time to calibrate again ?
No
Yes

5.1.1 800-MHz Fixed Oscillator

(See circuit diagram 803.7832 S, sheet 1)

This part of the circuit contains a broadband phase controlled 800-MHz fixed oscillator (V70). The signal is first divided by 2 (D10) and then by 4 (D30) by coupling out with R67 and then applied to the phase comparator D35. The 100-MHz reference signal is applied to the phase comparator from X911 via line receiver D36. The loop filter N60 provides the control loop with a bandwidth of approx. 100 kHz. The 800-MHz signal from the decoupler R68 and the signal from D10 divided by 2 are applied to the RF relay K100. The 800-MHz or 400-MHz signal is applied to the LO gate of mixer E110.

Transmitter signals with frequencies <200 MHz are applied from X917 to X916 without conversion. Transmitter frequencies of approx. 450 MHz (70-cm band) are converted with 400 MHz to approx. 50 MHz and applied to X916 for further conversion. Corresponding conversion for transmitter frequencies from the 900-MHz band takes place using the 800-MHz fixed frequency. The level at X916 after conversion is the same as that at X917 before conversion.

5.1.2 455-kHz IF Section

(See circuit diagram 803.7832 S, sheet 2)

This part of the circuit receives the IF of 455 kHz with a level of approx. 270 mV which is amplified by V155 to approx. 1 V_{rms}. The ceramic filter with a pass bandwidth of approx. 4 kHz and a blocking of above 80 dB separates the wanted channel and the adjacent channel using the conversion processes carried out by the internal RF synthesizer. The circuit then contains 8 amplifier stages with a gain of 0 or 10 dB in order to drive the input of the rms meter N215 in the correct dynamic range. The rms meter is an active multiplier circuit with the same signal at both inputs (pins 5 and 9). The integration required for the rms measurement is handled by C222. Square-root extraction has been omitted which means that the DC voltage at output X1.A28 corresponds to the square of the rms input voltage at P10. The useful range of the DC voltage at output X1.A28 is between 0.5 and 5 V.

5.2 Testing and Adjustment

5.2.1 Testing the Fixed Oscillator

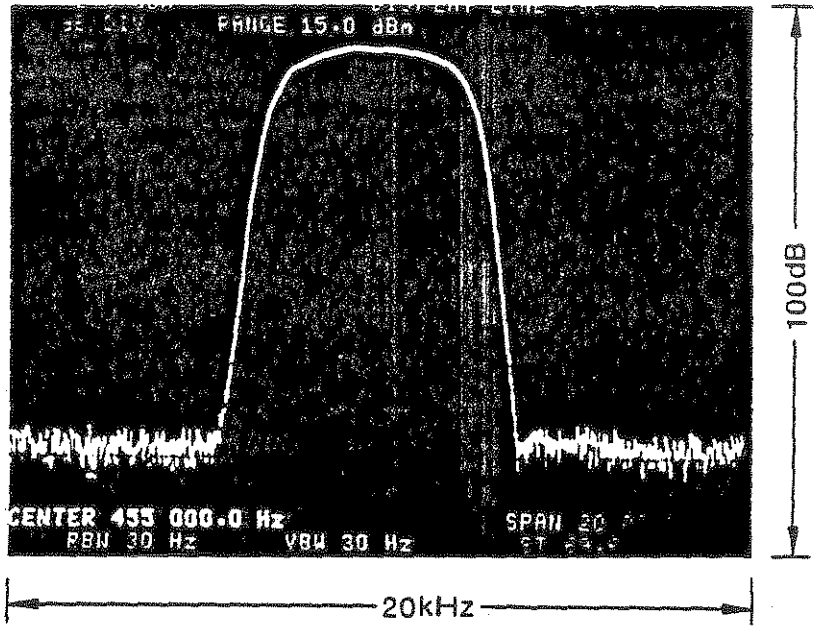
Test equipment:	RF synthesizer, e.g. SMPC	(at X917)
	Spectrum analyzer	(at X916)
	100-MHz crystal oscillator, e.g. from the basic instrument	(at X911)

- Apply unmodulated signal of 50 mV to X917.
- Switch relays K120 and K121 to the conversion path.
- RF analyzer setting: centre 50 MHz, span 200 kHz
- Connect K100 to the 800-MHz branch (pin 1) and set RF synthesizer to 850 MHz. A 50 MHz, 50 mV (±1 dB) signal with a high spectral purity must be measured on the RF analyzer.
- Connect K100 to the 400-MHz branch (pin 9) and adjust the RF synthesizer to 450 MHz. The RF analyzer should indicate the same signal as before.

5.2.2 Testing the IF Section

Test equipment: AF synthesizer, e.g. SPN (at X918)
DC-Voltmeter (at X1.A28)

Measure the filter characteristic over its total dynamic range using the selectable amplifiers (0 and 10 dB).



The relationship between the AC voltage and DC is logarithmic because the data are squared in the rms meter:

$$V_{DC} \text{ (logarithmic)} = \text{approx. } 10 \times \log \frac{V_{rms}}{V_{ref}} - \text{gain (dB)}$$

5.2.3 Adjusting the Fixed Oscillator

Test equipment: Spectrum analyzer
Voltmeter
100-MHz crystal oscillator
RF synthesizer

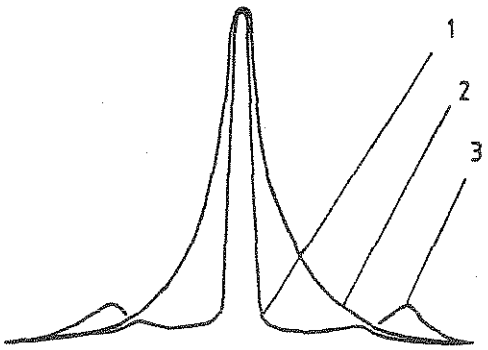
Carry out the adjustment with the cover closed, since with the cover opened other results are obtained. The test setup corresponds to that in Section 5.2.1.

5.2.3.1 Adjusting the Oscillator

- Apply a 100-MHz reference (ECL) to X911.
- Apply 850 MHz (50 mV) to X917.
- Connect spectrum analyzer to X916, centre 50 MHz, span 500 kHz.
- Connect voltmeter to P18.
- Set R78 and R52 to centre positions.
- Set output frequency to 800 MHz (50 MHz on analyzer) using C65 and adjust tuning voltage to 12 V ±0.5 V at P18.

5.2.3.2 Adjusting the Phase Control

Adjust the control bandwidth to 100 kHz using R61.



1 = correct

5.2.3.3 Adjusting the Level Converter

If the phase control does not lock when the power supply or the 100-MHz reference is switched on and off, the offset of the level converter must be adjusted.

→ Adjust R52 such that the PLL always locks.

5.2.3.4 Adjusting the Oscillator Output Power

→ Connect analyzer to K1.

→ Measure level of 400-MHz signal.

→ Set level of 800-MHz signal to the same value (approx. -7 dBm) using R78.

→ Check that both levels are the same.

5.2.4 Adjusting the IF Section

Test equipment:	AF synthesizer	(at X918)
	DC voltmeter	(at X1.A28)
	Oscilloscope	(at P11)

5.2.4.1 Adjusting the Offset

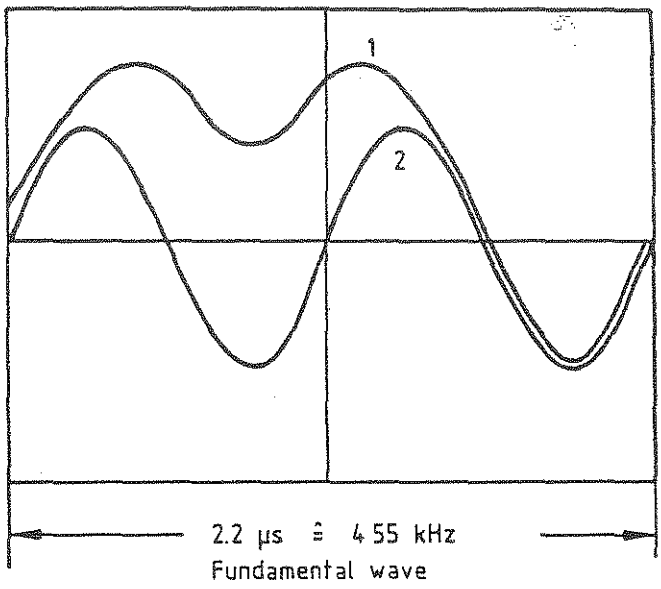
→ Apply 0 V to X918.

→ Set all amplifiers to 10 dB.

→ Adjust to 0 V (+10 mV/-0 mV) using R222.

5.2.4.2 Adjusting the Balance

- Apply 270 mV, 455 kHz.
- Set all amplifiers to 0 dB.
- Remove C222.
- Set the following signal shape on the oscilloscope using R226.



1 = not adjusted
2 = correctly adjusted

- Insert C222 again.
- Check offset adjustment.

5.3 Interfaces

Connectors	Input Output	De-signation	Value	Tolerance
X917	I	HF	50 mV	
X916	O	HF	50 mV	±1 dB
X911	I	100 MHz	ECL(to +5V)	
X918	I	ZF	270 mV	
X1.A28	O	DC	0.5 to 5V*)	
X1.A8	I	Data	CMOS 5 V	
X1.B10/A10	I	Clock	CMOS 5 V	
X1.A3	I	Strobe	CMOS 5 V	
X1.A1/B1	I	+5 V_D	approx. 230 mA	±30 mA
X1.A13/B13	I	+5 V_A	<25 mA	
X1.A17/B17	I	+15 V	approx. 60 mA	Without relay +60 mA/relay
X1.A19/B19	I	-15 V	approx. 40 mA	±10 mA
X1.A15/B15	I	+24 V	approx. 4 mA	±2 mA

*) Useful range of input voltage

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum / Date	Schaltteilliste für / Parts list for	Sachnummer / Stock No.	Blatt / Page
	01	0386	CMT-B6 NKL-MESSER CMT-B6 ACP METER	803.7810.01 SA	1

Kennzeichen / Component No.	Benennung/Beschreibung / Designation	Sachnummer / Stock No.	enthalten in / contained in
A91	ED NKL-MESSER ACP METER	803.7832.02	
W20	DX HF-KABEL W20 RF CABLE	803.8045	
W21	DX HF-KABEL W21 RF CABLE	803.8051	
W23	DX HF-KABEL W23 RF CABLE	803.8068	
W24	DX HF-KABEL W24 RF CABLE	803.8074	
			- ENDE -

ROHDE&SCHWARZ	Äl	Datum / Date	Schaltteilliste für / Parts list for	Sachnummer / Stock No.	Blatt / Page
	06	0487	ED NKL-MESSER ACP METER	803.7832.01 SA	1

Kennzeichen / Component No.	Benennung/Beschreibung / Designation	Sachnummer / Stock No.	enthalten in / contained in
C1	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C2	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C3	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C5	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C6	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C7	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C10	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C11	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C12	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C14	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C15	CK 33NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,033UF/5%	CK 099.2900	
C16	CC 220PF+-5%50V NP0 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A221JFA	CC 099.8850	
C30	CK 33NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,033UF/5%	CK 099.2900	
C31	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C32	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C35	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C36	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C37	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C55	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C56	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C59	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C60	CC 2,2NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y222KFA	CC 099.8444	
C61	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C62	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C63	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C64	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C65	CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER TEKELEC LUFTTRAT5200	CT 025.7367	
C66	CC 0,5PF+-0,25PF50V NPO CERAMIC CHIP CAPACITOR ERIE GR42-6 0,5PF NP050V	099.8650	
C67	CC 12PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A120JFA	CC 099.8744	
C68	CC 12PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A120JFA	CC 099.8744	
C70	CC 7PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A7R0DFA	CC 099.8715	
C71	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5R0DFA	CC 099.8696	
C72	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C73	CC 4PF+-0,25PF50V NP01206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4R0CFA	CC 099.8680	
C75	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C80	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C90	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	

ROHDE & SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	06	0487	ED NKL-MESSER ACP METER	803.7832.01 SA	3

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C91	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C92	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C95	CC 47NF+-10%100V5K1200 C CAPACITOR VITRAMON VJ1812Y473KFB	CC 082.3438	
C100	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C101	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C103	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C105	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C106	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C107	CC 4PF+-0,25PF50V NP01206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4R0CFA	CC 099.8680	
C108	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA		
C110	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC	
C111	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.[illegible]	
C115	CC 47NF+-10%100V5K1200 C CAPACITOR VITRAMON VJ1812Y473KFB	CC 082.3438	
C116	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C117	CC 47NF+-10%100V5K1200 C CAPACITOR VITRAMON VJ1812Y473KFB	CC 082.3438	
C120	CC 15PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A150JFA	CC 099.8750	
C121	CC 27PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A270JFA	CC 099.8409	
C122	CC 27PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A270JFA	CC 099.8409	
C123	CC 15PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A150JFA	CC 099.8750	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C124	CC 47NF+-10%100V5K1200 C CAPACITOR VITRAMON VJ1812Y473KFB	CC 082.3438	
C156	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C157	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C158	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C159	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C160	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C165	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C166	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C167	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C168	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C170	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C171	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C172	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C175	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C176	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C177	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C180	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C181	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C182	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C185	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C186	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C187	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C190	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C191	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C192	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C195	CE 220UF+-20%16V10RDX10 ELEKTROLYTIC CAPACITOR NATIONAL ECE-A1CSS-221	803.0850	
C196	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C197	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C198	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C199	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C200	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C201	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C202	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C205	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C210	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C211	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C212	CC 1,5NF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 152	CC 087.7048	
C214	CC 1,5NF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 152	CC 087.7048	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C220	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C221	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C222	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C223	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C230	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	35[illegible]	
C240	CC 100PF+- 5%100V NPO VIE CERAMIC CAPACITOR UNIONCARB C052C101J2G1CA		
C242	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,4[illegible]		
C250	CC 3,3NF+-10%6X7R200[illegible] CAPACITOR VALVO 2222 [illegible]		
C251	CC 3,3NF+-10%6[illegible] CAPACITOR VALVO		
C255	CE 100UF+		
C285			
	MA[illegible]		
C286	CC 10NF- CAPACITOR VALVO		
C287	CC 10NF-20+5 CAPACITOR VALVO 2222		
D10	BL SP8605BDG 2:1DI. DIVIDER PLESSEY SP8605BDG		

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D30	BL CA3199E 4:1 DIVIDER DIVIDER RCA CA3199E	372.1106	
D35	BL MC12040L PLL-PHASE-DET PHASE FREQUENCY DETECTOR MOTOROLA MC12040L	BL 302.5877	
D36	BL MC10116L 3XL. RECEIV LINE RECEIVER MOTOROLA MC10116L	BL 282.3275	
D165	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D175	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D185	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D195	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D205	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D206	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
E110	BM TFM2 MIXER 1.0GHZ MIXER MCL TFM-2	BM 302.6080	
E160	ER 455KHZ-BANDP.KER.B:3K 455MHZ-BANDPASS,CER.,BW3K MURATA CFK455J-A SELEKTIERT	803.0844	
K100	SN HF-RELAIS 12V 1XUM RELAY SDS RF1E-12V	803.0821	
K120	SN HF-RELAIS 12V 1XUM RELAY SDS RF1E-12V	803.0821	
K121	SN HF-RELAIS 12V 1XUM RELAY SDS RF1E-12V	803.0821	
L1	LD 10,0UH10%3,30OHM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L5	LD 10,0UH10%3,30OHM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L60	LD 10,0UH10%3,30OHM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L65	LL INDUKTIVITAET INDUCTOR	803.8080	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L70	LD 12,0UH10%2,700HM0,160A CHOKE DELEVAN DROSSEL1025-46	LD 067.2992	
L71	LD SPULE COIL	803.8100	
L73	LD 12,0UH10%2,700HM0,160A CHOKE DELEVAN DROSSEL1025-46	LD 067.2992	
L74	LD SPULE COIL	803.8100	
L80	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L90	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L105	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L106	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L107	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L108	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L109	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L115	LD 10,0UH10%3,300HM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
L120	LD 0,10UH10%0,080HM1,400A CHOKE DELEVAN DROSSEL1025-94	LD 067.2740	
L121	LD 0,15UH10%0,100HM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L122	LD 0,10UH10%0,080HM1,400A CHOKE DELEVAN DROSSEL1025-94	LD 067.2740	
L125	LD 0,12UH10%0,090HM1,300A CHOKE DELEVAN DROSSEL1025-96	LD 067.2757	
L126	LD 0,12UH10%0,090HM1,300A CHOKE DELEVAN DROSSEL1025-96	LD 067.2757	
L127	LD 0,12UH10%0,090HM1,300A CHOKE DELEVAN DROSSEL1025-96	LD 067.2757	
L213	LD 100 UH10%8,000HM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L214	LD 100 UH10%8,000HM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L285	LD 0,10UH10%0,080HM1,400A CHOKE DELEVAN DROSSEL1025-94	LD 067.2740	
N1	BM OM345 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM345	BM 285.1596	
N5	BM OM345 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM345	BM 285.1596	
N60	BO SE5534AFE LOW N.OPAMP OPERATIONAL AMPLIFIER SIGNETICS SE5534AFE	301.3335	
N90	BM OM350 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM350	BM 334.4953	
N105	BM OM361A ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM361A	BM 334.5314	
N115	BM OM350R SPEZ. BB.AMPL BROADBAND AMPLIFIER VALVO OM350R SPEZ.	803.0838	
N165	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N175	BO TL072ACP 2XFET OPAMP OPERATIONAL AMPLIFIER TEXAS TL072ACP	340.6054	
N185	BO TL072ACP 2XFET OPAMP OPERATIONAL AMPLIFIER TEXAS TL072ACP	340.6054	
N195	BO TL072ACP 2XFET OPAMP OPERATIONAL AMPLIFIER TEXAS TL072ACP	340.6054	
N215	BO MC1595L MULTIPLIER MULTIPLIER MOTOROLA MC1595L	BO 451.4365	
N230	BO CA1558E 2X OPAMP OPERATIONAL AMPLIFIER RCA CA1558E	BO 083.5570	
N240	BO LM308AH PREC. OPAMP OPERATIONAL AMPLIFIER MOTOROLA LM308AH	BO 257.4788	
N250	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N280	BO UA7905UC - 5V1AO VREGL VOLTAGE REGULATOR FAIRCHILD UA7905UC	BO 282.5449	
P2	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
BIS/TO P18			
R1	RG 42,2 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 42,20HM2% TK	RG 006.8790	
R2	RG 42,2 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 42,20HM2% TK	RG 006.8790	
R3	RG 42,2 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 42,20HM2% TK	RG 006.8790	
R4	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1300HM-F-D	RL 082.9888	
R5	RG 56,2 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 56,20HM1% TK	RG 006.8826	
R6	RG 21,5 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 21,50HM2% TK	RG 006.8726	
R7	RG 56,2 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 56,20HM1% TK	RG 006.8826	
R8	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1300HM-F-D	RL 082.9888	
R10	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 1000HM1% TK	RG 006.8884	
R11	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 1000HM1% TK	RG 006.8884	
R12	RG 56,2 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 56,20HM1% TK	RG 006.8826	
R13	RL 0,35W 432 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/4320HM-F-D	RL 083.0355	
R14	RL 0,35W 432 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/4320HM-F-D	RL 083.0355	
R35	RL 0,35W 536 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/5360HM-F-D	RL 083.0449	
R36	RL 0,35W 49,9 OHM+-1%TK50 RESISTOR RESISTA MK2	RL 082.9520	
R40	RG 511 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 5110HM1% TK	RG 006.9051	
R41	RG 511 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 5110HM1% TK	RG 006.9051	
R43	RG 511 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 5110HM1% TK	RG 006.9051	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R44	RG 511 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 511OHM1% TK	RG 006.9051	
R50	RG 51,1 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 51,1 OHM1%	RG 006.8810	
R51	RG 750 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 750OHM1% TK	RG 006.9097	
R52	RS 0,5W200 OHM+-10%10X10% CERMET POTENTIOMETER T BOURNS 3386F-1-201	RS 087.7554	
R53	RG 750 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 750OHM1% TK	RG 006.9097	
R54	RG 51,1 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 51,1 OHM1%	RG 006.8810	
R55	RG 90,9 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 90,0OHM1% TK	RG 006.8878	
R56	RG 90,9 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 90,0OHM1% TK	RG 006.8878	
R57	RG 619 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 6190HM1% TK	RG 006.9074	
R58	RG 619 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 6190HM1% TK	RG 006.9074	
R59	RG 619 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 6190HM1% TK	RG 006.9074	
R60	RG 619 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 6190HM1% TK	RG 006.9074	
R61	RL 0,35W 2,87KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,87K-F-D	RL 083.0949	
R62	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R63	RL 0,35W 2,87KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,87K-F-D	RL 083.0949	
R64	RL 0,35W 316 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/316OHM-F-D	RL 083.0232	
R67	RL 0,35W 75,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/750HM-F-D	RL 082.9665	
R68	RL 0,35W 75,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/750HM-F-D	RL 082.9665	
R75	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R76	RL 0,35W 2,67KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,67K-F-D	RL 083.0910	
R77	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R78	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R79	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R80	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R90	RG 42,2 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 42,2OHM2% TK	RG 006.8790	
R91	RG 46,4 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 46,4OHM2% TK	RG 006.8803	
R92	RG 42,2 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 42,2OHM2% TK	RG 006.8790	
R93	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/130OHM-F-D	RL 082.9888	
R100	RG 162 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 162OHM1% TK	RG 006.8932	
R101	RG 90,9 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 90,0OHM1% TK	RG 006.8878	
R102	RG 162 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 162OHM1% TK	RG 006.8932	
R103	RL 0,35W 127 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/127OHM-F-D	RL 082.9871	
R105	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/130OHM-F-D	RL 082.9888	
R110	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 100OHM1% TK	RG 006.8884	
R111	RG 61,9 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 61,9OHM1% TK	RG 006.8832	
R112	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DRALORIC CGB3216 100OHM1% TK	RG 006.8884	
R115	RL 0,35W 130 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/130OHM-F-D	RL 082.9888	
R125	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

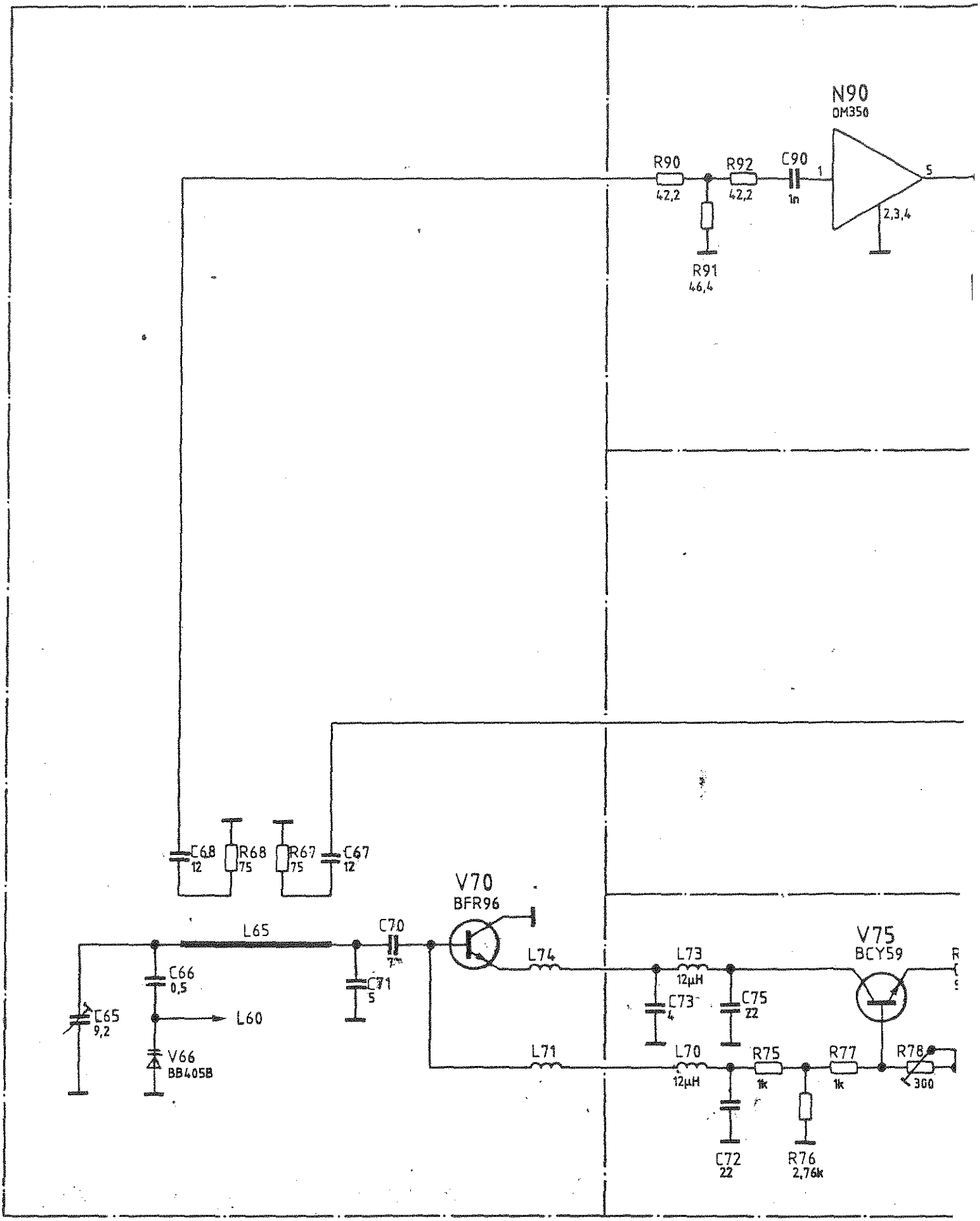
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R130	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R135	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R155	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R156	RL 0,35W 169 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/169K-F-C	RL 083.2164	
R157	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R158	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R159	RL 0,35W 402 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/402OHM-F-D	RL 083.0326	
R160	RL 0,35W 1,87KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,87K-F-D	RL 083.0790	
R161	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R165	RL 0,35W 215 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/215OHM-F-D	RL 083.0078	
R166	RL.0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R170	RL 0,35W 2,15KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,15K-F-D	RL 083.0855	
R171	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R175	RL 0,35W 2,26KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,26K-F-D	RL 083.0861	
R176	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R180	RL 0,35W 2,26KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,26K-F-D	RL 083.0861	
R181	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R185	RL 0,35W 2,26KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,26K-F-D	RL 083.0861	
R186	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

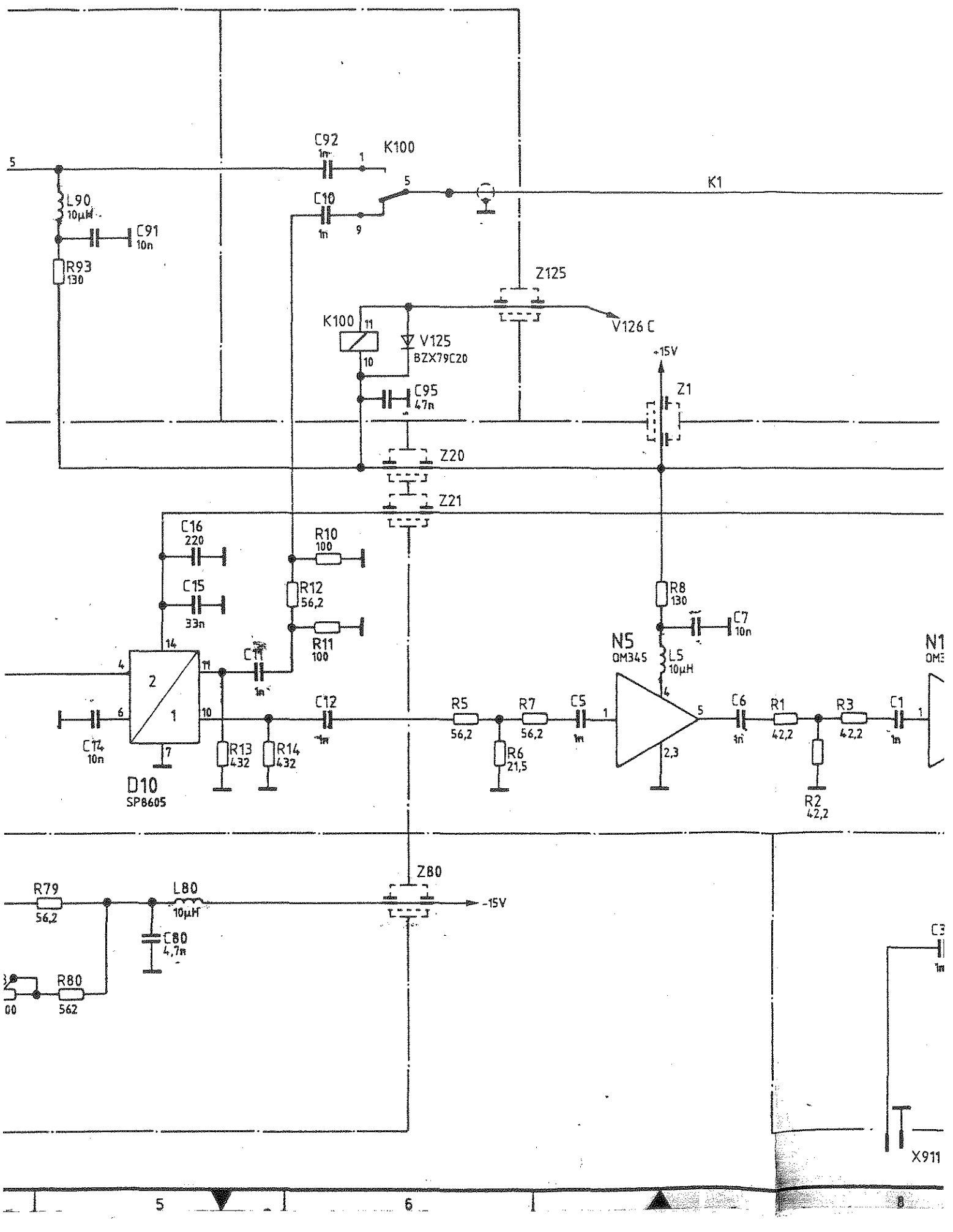
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R190	RL 0,35W 2,26KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,26K-F-D	RL 083.0861	
R191	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R195	RL 0,35W 2,26KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,26K-F-D	RL 083.0861	
R196	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R200	RL 0,35W 2,26KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,26K-F-D	RL 083.0861	
R201	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R210	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R211	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R215	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R216	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R217	RL 0,35W 10,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10,7K-F-D	RL 083.1316	
R218	RL 0,35W 10,7KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10,7K-F-D	RL 083.1316	
R219	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R220	RL 0,35W 3,65KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,65K-F-C	RL 082.2260	
R221	RL 0,35W 4,02KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,02K-F-D	RL 083.1045	
R222	RS 0,5W100 OHM+-10%10X10X CERMET POTENTIOMETER BOURNS 3386X-1-101	RS 247.7932	
R223	RL 0,35W 4,02KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,02K-F-D	RL 083.1045	
R230	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1K-F-D	RL 083.1351	
R231	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

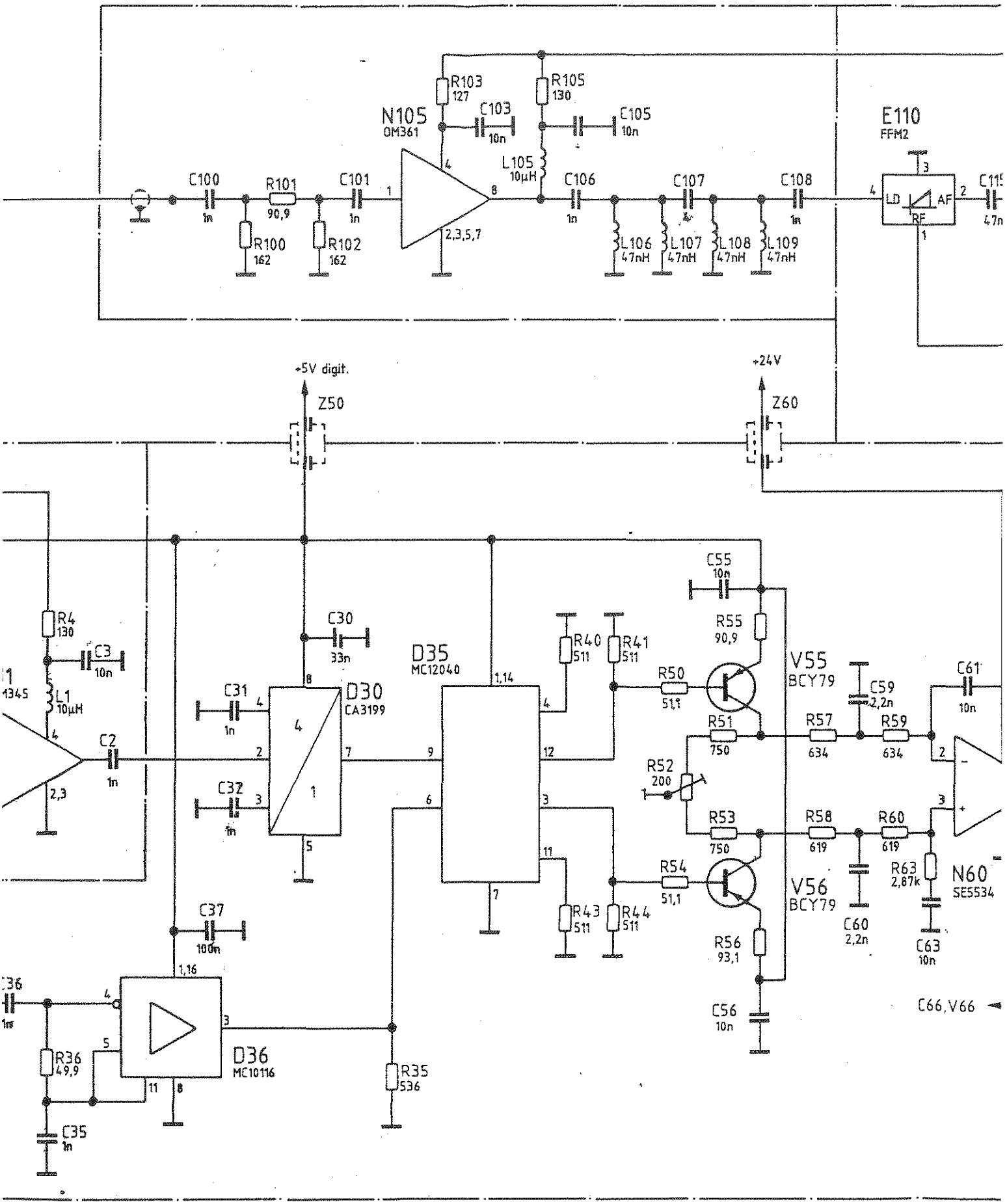
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R232	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R233	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R234	RL 0,35W 21,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/21,0K-F-C	RL 083.1539	
R235	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R240	RL 0,35W 40,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/40,2K-F-C	RL 083.1751	
R241	RL 0,35W 40,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/40,2K-F-C	RL 083.1751	
R242	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R243	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R244	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R250	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R251	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R252	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R255	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R260	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R265	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R270	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R271	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R272	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
V55	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	

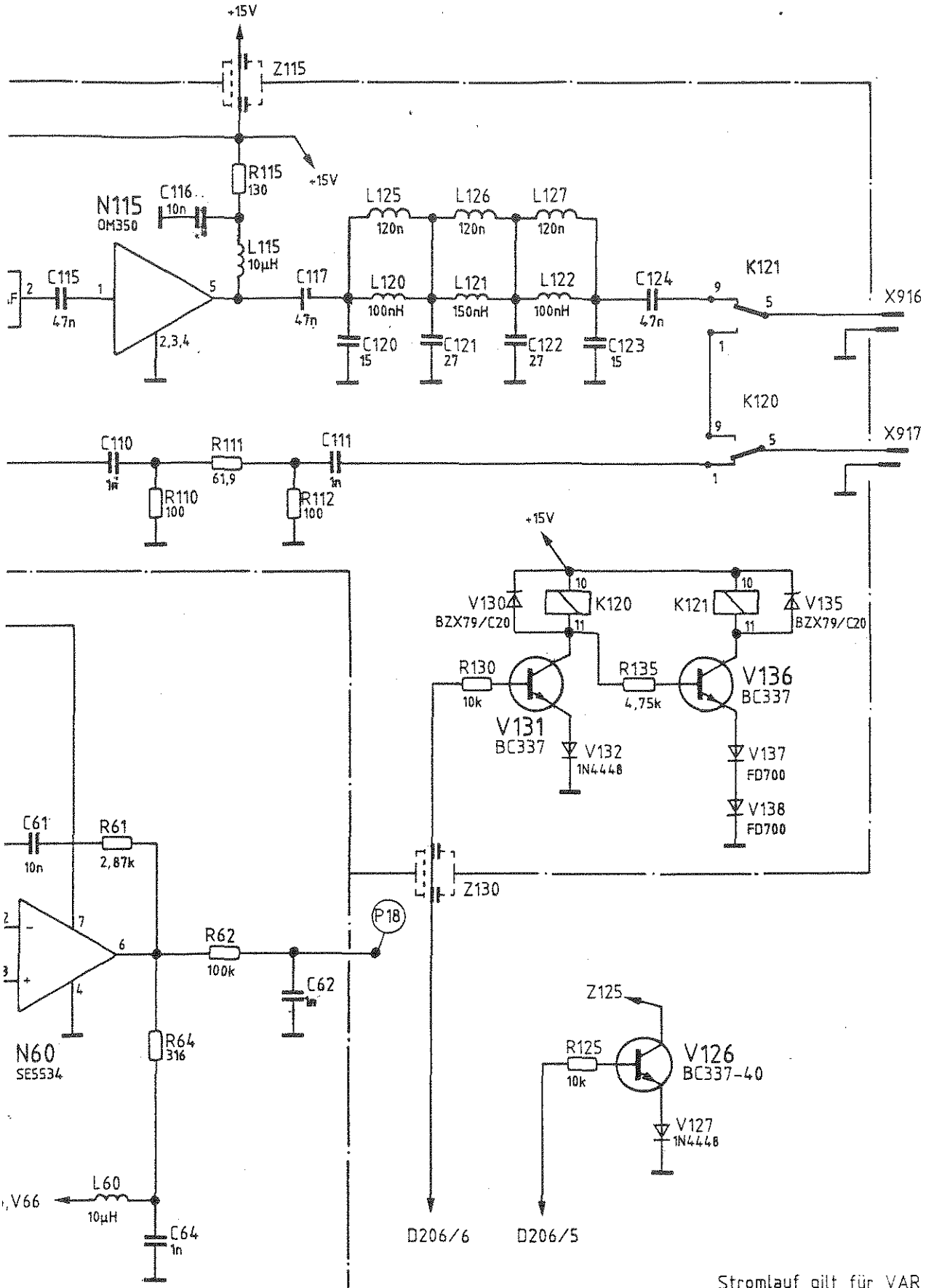
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V56	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	
V66	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V70	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	
V75	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V125	AE BZX79/C20 0,5W Z-DI ZENER DIODE VALVO BZX79/C20	AE 012.2584	
V126	AK BC337-40 NPN 45V 800MA TRANSISTOR INTERMETAL BC337-40	303.9524	
V127	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V130	AE BZX79/C20 0,5W Z-DI ZENER DIODE VALVO BZX79/C20	AE 012.2584	
V131	AK BC337-40 NPN 45V 800MA TRANSISTOR INTERMETAL BC337-40	303.9524	
V132	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V135	AE BZX79/C20 0,5W Z-DI ZENER DIODE VALVO BZX79/C20	AE 012.2584	
V136	AK BC337-40 NPN 45V 800MA TRANSISTOR INTERMETAL BC337-40	303.9524	
V137	AD BAY71 35V 0,12A UDI DIODE THOMSON BAY71	012.0575	
V138	AD FD700 20V 0,05A UDI DIODE FAIRCHILD FD700	AD 012.0500	
V155	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V206	AD BAY71 35V 0,12A UDI DIODE THOMSON BAY71	012.0575	
V270	AE BZX79/C9V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C9V1	AE 012.2503	
W1	DX KABEL W1 CABLE	803.8097	
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X911	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X916	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X917	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X918	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
Z1	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z20	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z21	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z50	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z60	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z80	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z115	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z125	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z130	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
			- ENDE -


N90
OM350
R90
42,2
R92
42,2
C90
1n
1
5
2,3,4
R91
46,4
C68
12
R68
75
R67
75
C67
12
V70
BFR96
L65
C70
7
C71
5
C66
0,5
C65
9,2
L60
V66
BB405B
L74
L73
12µH
C73
4
C75
22
V75
BCY59
L71
L70
12µH
R75
1k
R77
1k
R78
300
C72
22
R76
2,76k

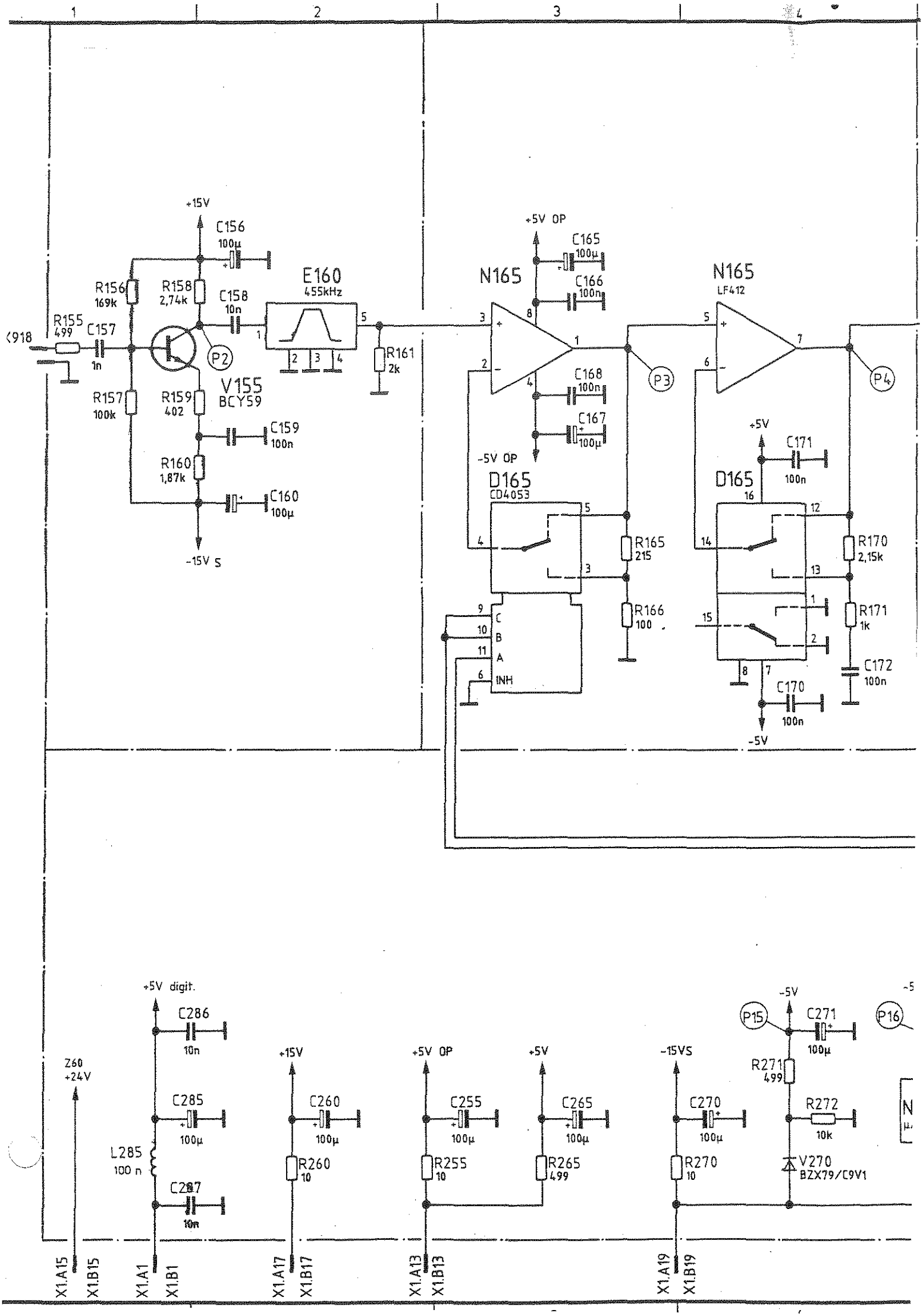

C92
1n
K100
5
1
L90
10µH
C91
10n
R93
130
C10
1n
9
5
K1
Z125
K100
11
10
V125
BZX79C20
V126 C
+15V
Z1
C95
47n
Z20
Z21
C16
220
C15
33n
R10
100
R12
56,2
R11
100
R8
130
C7
10n
N5
OM345
L5
10µH
N1
OME
14
4
2
1
11
10
6
7
C11
1n
C12
1n
C14
10n
D10
SP8605
R13
432
R14
432
R5
56,2
R7
56,2
R6
21,5
C5
1n
1
4
5
2,3
C6
1n
R1
42,2
R3
42,2
R2
42,2
C1
1n
1
Z80
-15V
R79
56,2
L80
10µH
C80
4,7n
R80
562
C3
1n
X911
5
6
8

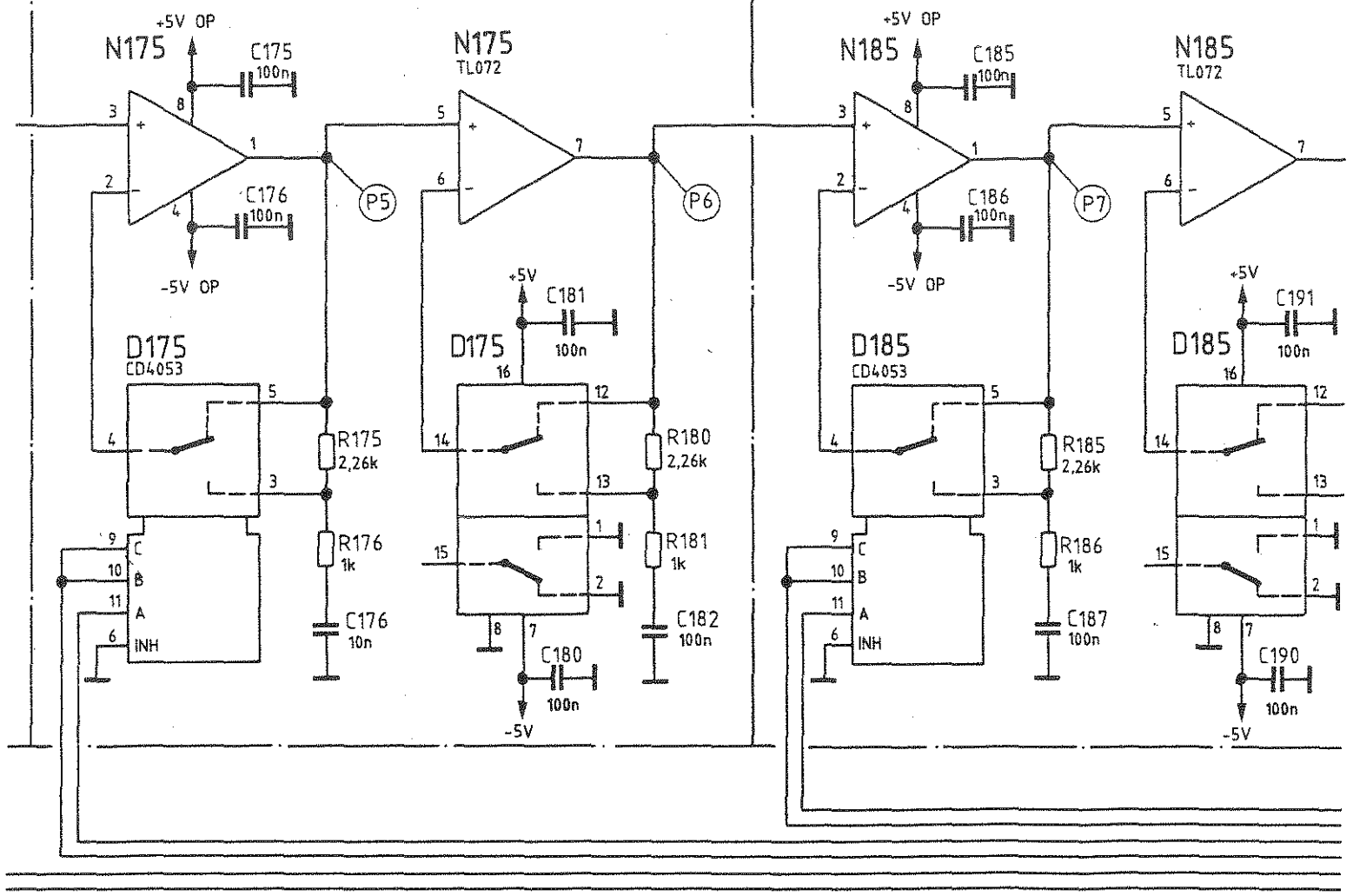

R103
127
R105
130
N105
OM361
C103
10n
C105
10n
E110
FFM2
L105
10µH
C100
1n
R101
90,9
C101
1n
C106
1n
C107
C108
1n
R100
162
R102
162
2,3,5,7
L106
47nH
L107
47nH
L108
47nH
L109
47nH
LD
AF
RF
+5V digit.
Z50
+24V
Z60
R4
130
C3
10n
L1
10µH
C2
1n
2,3
C30
33n
C31
1n
C32
1n
D30
CA3199
D35
MC12040
R40
511
R41
511
C55
10n
R55
90,9
V55
BCY79
R50
51,1
R51
750
R52
200
R53
750
R54
51,1
V56
BCY79
R56
93,1
C56
10n
R57
634
R59
634
C59
2,2n
C61
10n
R58
619
R60
619
C60
2,2n
R63
2,87k
C63
10n
N60
SE5534
R43
511
R44
511
C37
100n
D36
MC10116
R36
49,9
C35
1n
R35
536
C66,V66

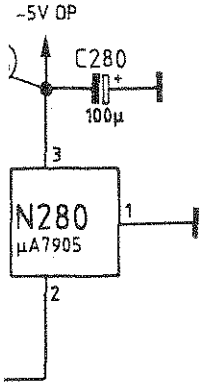


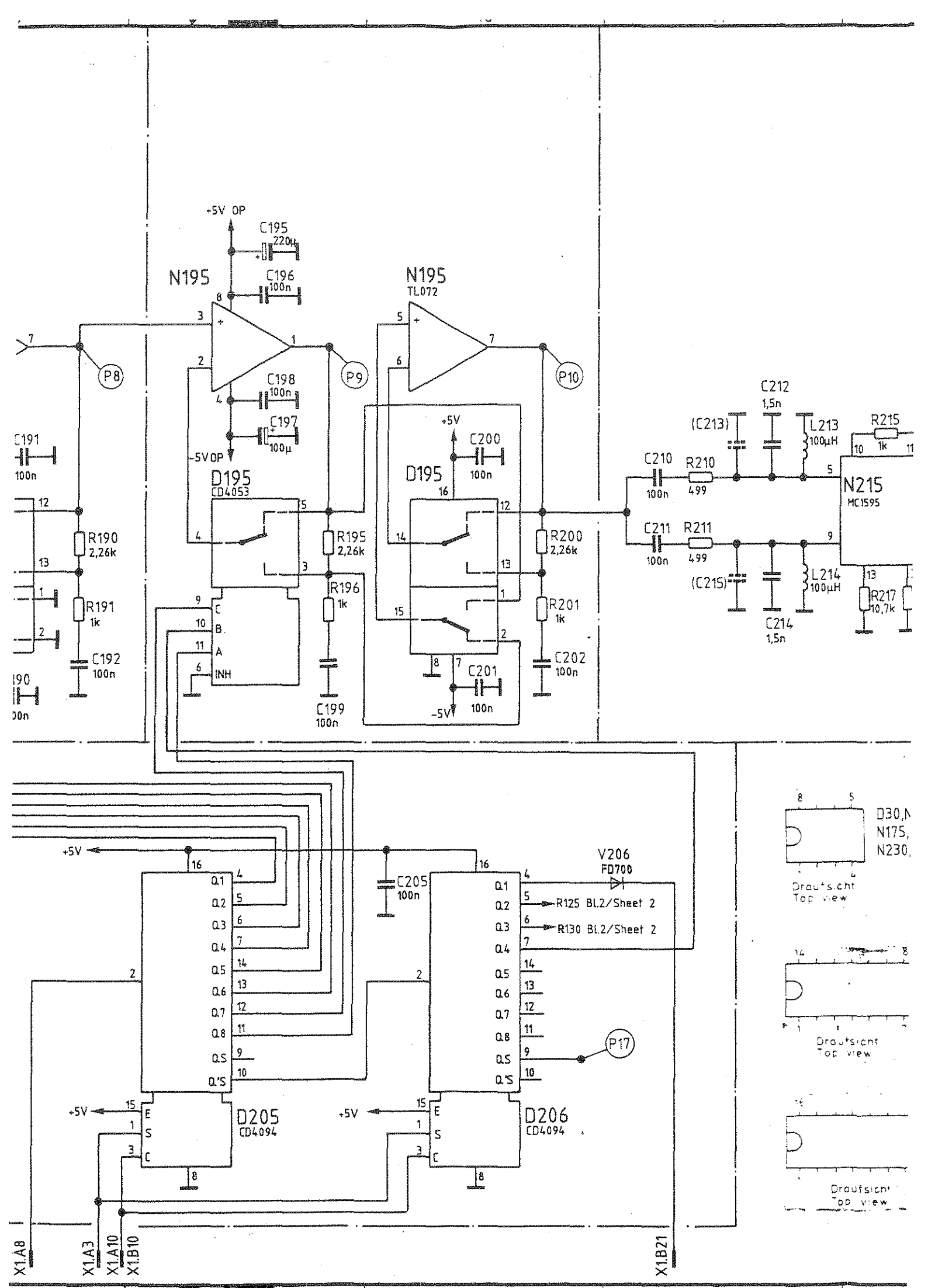
Stromlauf gilt für VAR 02
Circuit diagram is valid for model 02

Stromlauf zu NK-Leistungsmesser Adjacent-channel power meter			Zeichn.-Nr. 803.7832 S
CMT-B6	reg. i. V. 803.7810 V	erste Z. 803.7810	Blatt

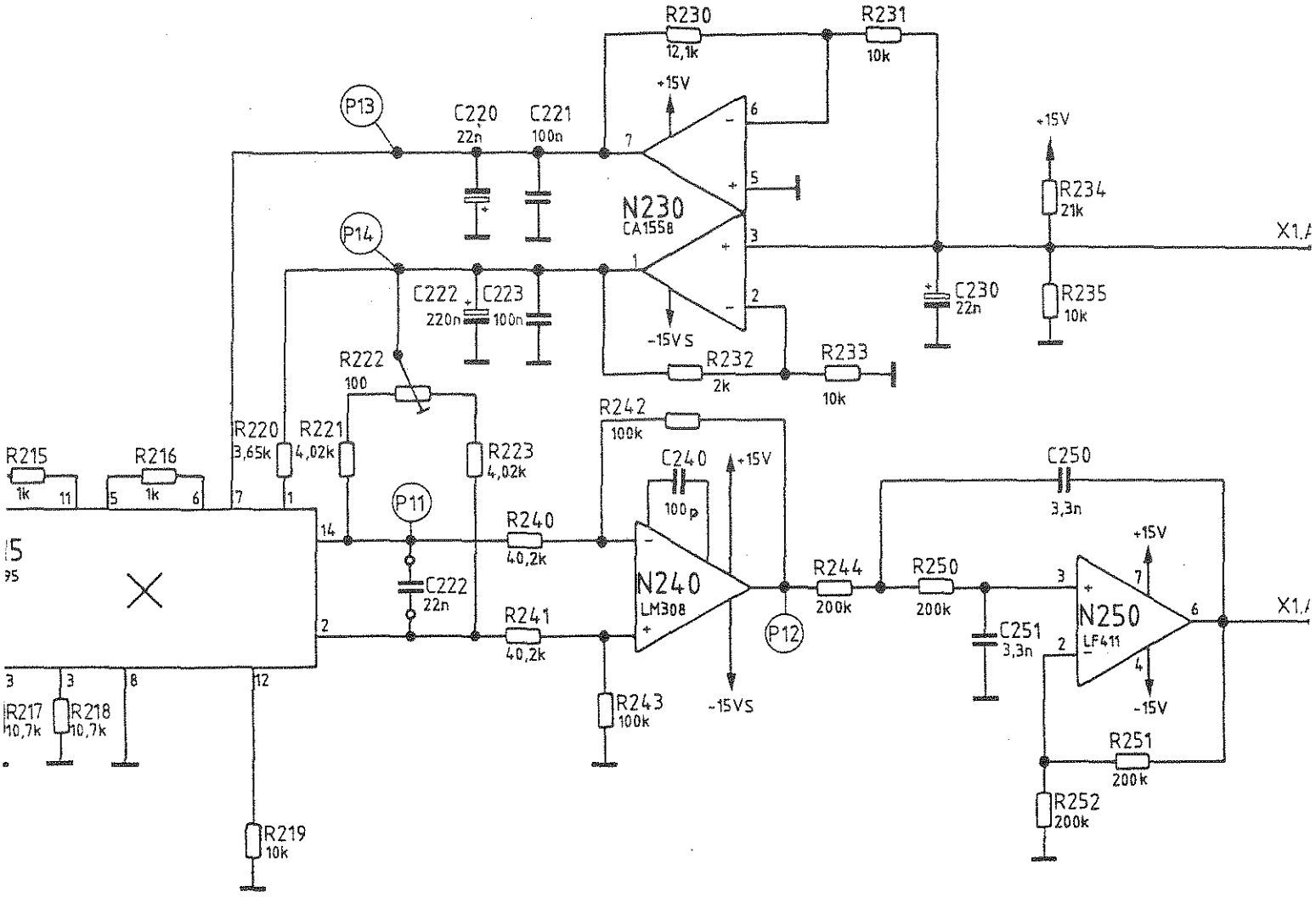

1
2
3
4
+15V
C156
100µ
R156
169k
R158
2,74k
C158
10n
E160
455kHz
R155
499
C157
1n
(918
P2
V155
BCY59
R157
100k
R159
402
C159
100n
R160
1,87k
C160
100µ
-15V S
R161
2k
+5V OP
C165
100µ
C166
100n
N165
C168
100n
C167
100µ
-5V OP
D165
CD4053
R165
215
R166
100
C
B
A
INH
P3
N165
LF412
C168
100n
C167
100µ
P4
+5V
C171
100n
D165
R170
2,15k
R171
1k
C172
100n
C170
100n
-5V
+5V digit.
C286
10n
C285
100µ
L285
100 n
C287
10n
Z60
+24V
+15V
C260
100µ
R260
10
+5V OP
C255
100µ
R255
10
+5V
C265
100µ
R265
499
-15VS
C270
100µ
R270
10
-5V
P15
C271
100µ
R271
499
R272
10k
V270
BZX79/C9V1
P16
X1.A15
X1.B15
X1.A1
X1.B1
X1.A17
X1.B17
X1.A13
X1.B13
X1.A19
X1.B19


N175
+5V OP
C175
100n
C176
100n
-5V OP
P5
N175
TL072
P6
+5V
C181
100n
D175
CD4053
R175
2,26k
R176
1k
C176
10n
R180
2,26k
R181
1k
C182
100n
C180
100n
-5V
N185
+5V OP
C185
100n
C186
100n
-5V OP
P7
N185
TL072
+5V
C191
100n
D185
CD4053
R185
2,26k
R186
1k
C187
100n
C190
100n
-5V
C
B
A
INH


-5V OP
C280
100µ
N280
µA7905



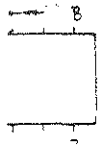
Klebekante für Druckerzeugnis - durch diese Zone möglichst nur Leitungen führen.



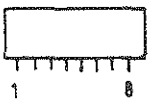
D30,N60,N165
N175,N185,N195
N230,N240,N280

N1,N5,N20
N90,N115

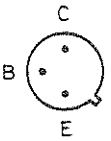
V126,V131
V136



D10,D35,N215
D165,D175,D185
D195,D205,D206

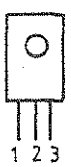


N105

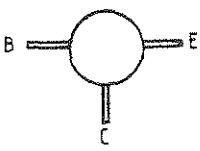


V55,V56
V75,V155

D36



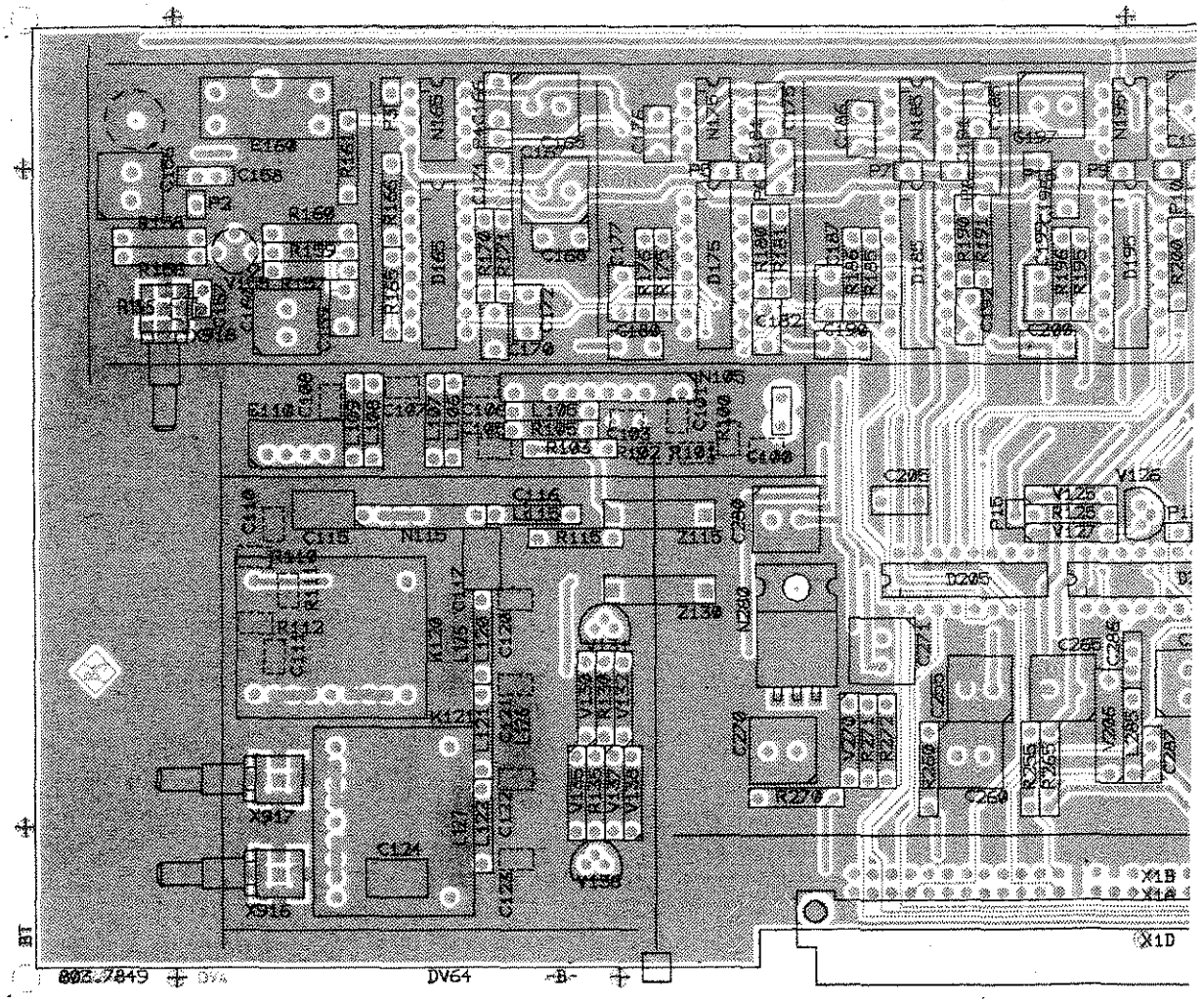
N280



V70

Stromlauf zu	NK-Leistungsmesser Adjacent-channel power meter	Z	Zeichn.-Nr. 803.7832 S
CMT-B6	reg. i. V. 803.7810 V	erste Z. 803.7810	

Ansicht und Leitungsf
View of tracks on com

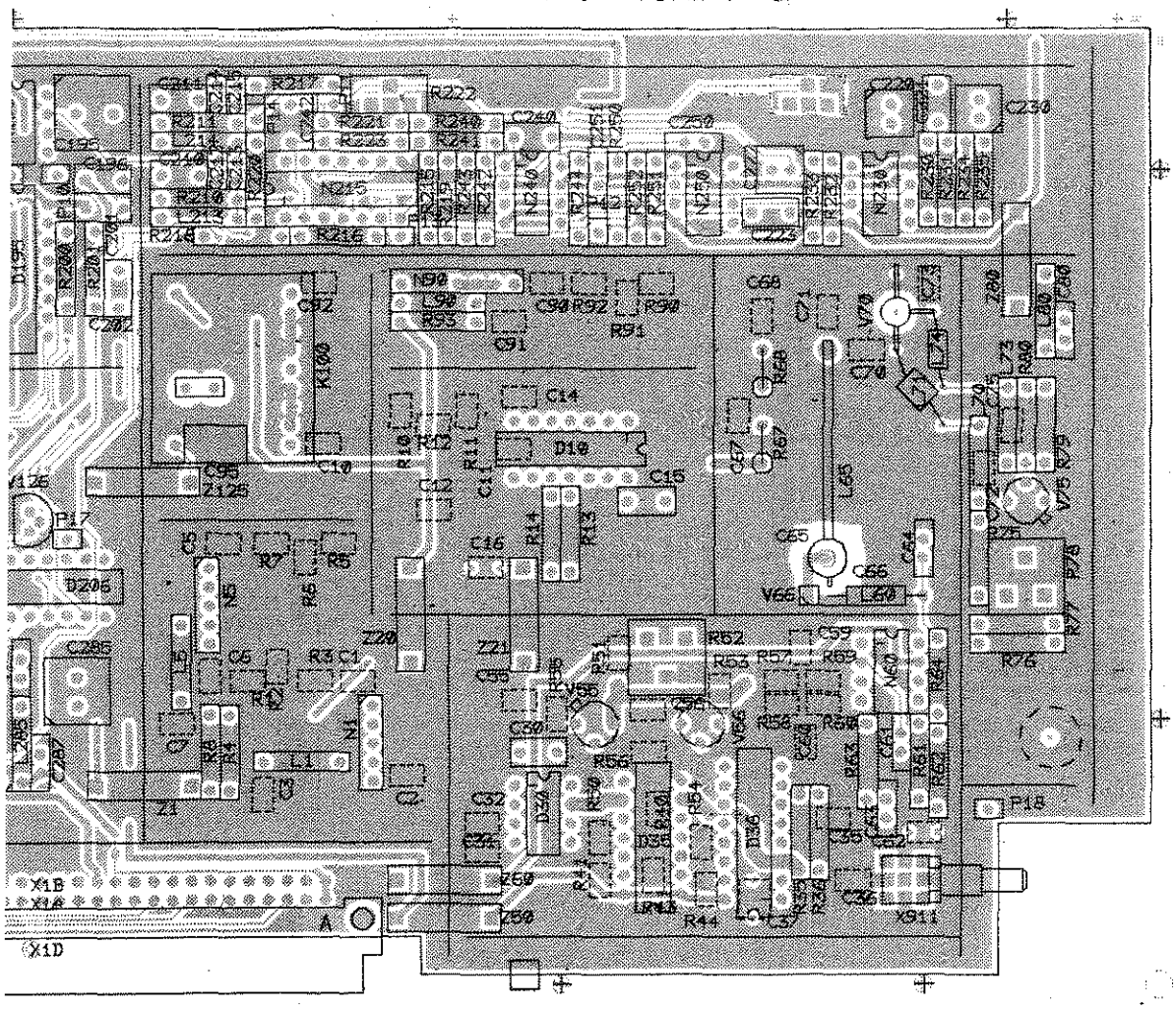


(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

ngsführung Bauteilseite
component side



Änd. Zust.	Änderungs-Mitteilung	Tag	Name
B	32914	12.85	BT
D	35531	11.86	BT
E	35553	4.87	PR
F	35553	4.87	PR
H	38956	9.87	IB

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

1KSA	Tag	Name
Bearb.	12.85	BT
Gepr.		
Norm		

Benennung

NK-Leistungsmesser
Adjacent-channel power meter

Z

ROHDE&SCHWARZ

zu Gerät CMT-B6

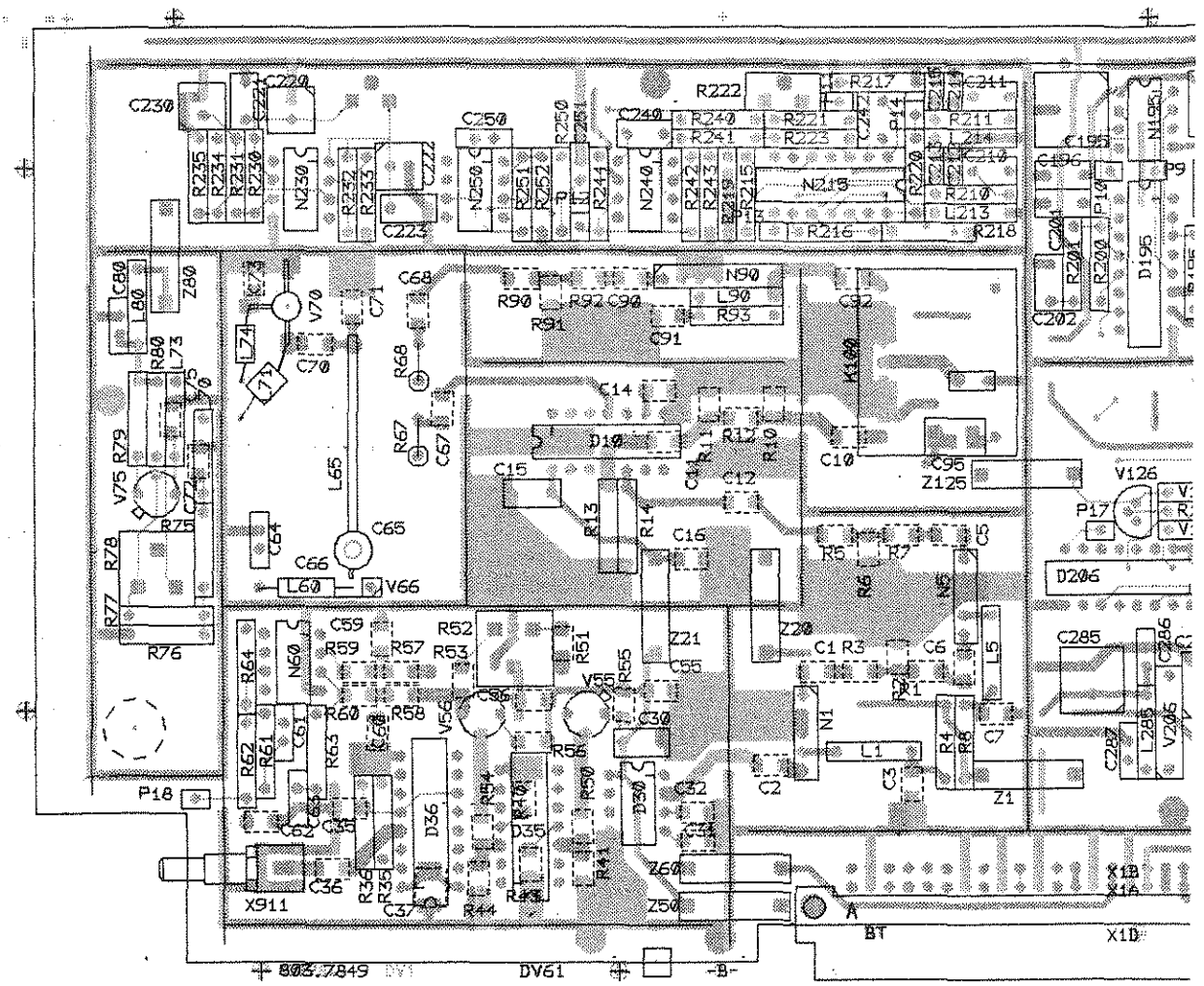
Zeichn.-Nr. 803.7832

Blatt-Nr. 2 v. Bl.

reg. i. V. 803.7810 V

erste Z.

Ansicht und Leitungs
View of tracks on sol

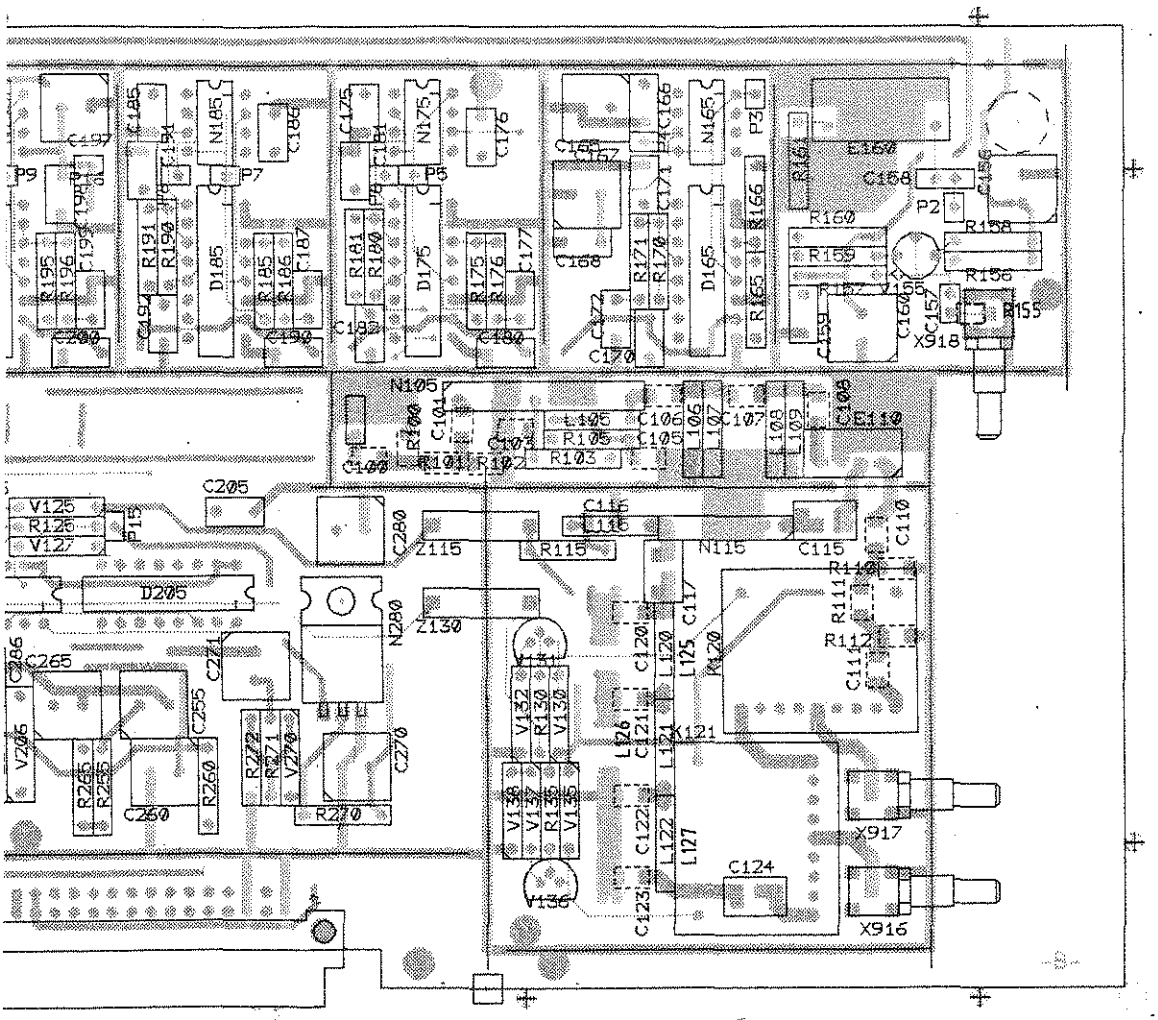


(therzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung

ATTENTION ESD!
Electrostatic sensitive devices require a special handling

gsführung Lötseite
older side



B	32914	12.85	BT	Maße ohne Toleranzangabe		Maßstab 1 : 1	
D	35531	11.86	BT			Halbzeug, Werkstoff	
E	35553	4.87	BT				
F	35553	4.87	PR				
H	38956	9.87	IB	1KSA	Tag / Name	Benennung	
				Bearb.	12.85 BT	NK-Leistungsmesser Adjacent-channel power meter	Z
				Gepr.			
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 803.7832	Blatt-Nr. 3 v. Bl.
				zu Gerät CMT-B6		reg. i. V. 803.7810 V	erste Z.

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Display/Keyboard Module

802.3662.00

Contents

		Page
5	Service Manual for Display/Keyboard Module	5.1
5.1	Function Description	5.1
5.1.1	Key Detection	5.1
5.1.2	Rotary Pulse Generator	5.2
5.1.3	Display Control	5.2
5.1.4	LED/Illumination Control	5.3
5.1.5	Loudspeaker Amplifier	5.3
5.2	Testing and Adjustment	5.4
5.2.1	Key Detection	5.4
5.2.2	Rotary Pulse Generator	5.4
5.2.3	Display Control	5.5
5.2.4	LED/Illumination Control	5.5
5.2.5	Loudspeaker Amplifier	5.5
5.3	Troubleshooting	5.6

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Display/Keyboard Module

(See circuit diagram 802.3410 S)

5.1 Function Description

The display/keyboard module consists of five units:

- Key detection
- Rotary pulse generator (spinwheel)
- Display control
- LED/illumination control
- Loudspeaker amplifier

5.1.1 Key Detection

All keys on the front panel (except the STANDBY key) are combined into a matrix.

In the reset state, the columns (KQ0 to KQ9) are held Low (static) by a port of the main controller, the flip-flop D7.I being reset by a pulse on line RESKFF (active High).

The signal REPEAT (active High) is produced by ANDing (D6) when any key is pressed and leads to an interrupt of the main controller on the digital unit module (KEYINT, active High, edge-triggered). The number of the pressed key is determined by the software as follows:

a) All column inputs KQ1 to KQ9 to High, KQ0 to Low.
   If one of the row outputs KA0 to KA7 is Low, the pressed key is at position KQ0/KAx ($0 \leq x \leq 7$).

b) Repetition of a).
   For all columns (KQ1 to KQ9 in succession to Low).

c) The value is only processed further if unequivocal pressing of a key has been detected; the interrupt is otherwise ignored (contact bounce or simultaneous pressing of several keys).

d) The keyboard is activated again following key detection, i.e. all columns are set to Low and the flip-flop is reset.

Key debouncing is also handled by the software, i.e. the key detection routine only starts 20 ms after the interrupt has been generated (switch-on bounce) and resetting of flip-flop D7.I 20 ms after the signal REPEAT has dropped out (switch-off bounce).

5.1.2 Rotary Pulse Generator

The rotary pulse generator is a magnetic disk with 12 north and south poles, two permanent magnets for latching in and two Hall generators with associated logic to detect movements and directions (24 pulses per rotation).

When the spinwheel is rotated, two squarewave signals with a mark-to-space ratio of 1:1 are present at test points P6 and P7 offset in phase by 90 degrees. Each rising and falling edge at P7 generates an interrupt for the controller via D4.IV, D3.I, D3.II, D2.III, D4.I and D4.II (DREINT, active High, edge-triggered) provided that flip-flops D3.I and D3.II have been reset by pulse DRERES (active Low). The direction information provided by D1.I, D1.II, D2.I and D2.II is transferred by the reset pulse (DRERES) to flip-flop D5.I and is available at connection DREDIR (High corresponds to clockwise).

Evaluation sequence:

1. Reset rotary pulse generator (Low pulse at DRERES).

2. Second reset following interrupt by DREINT (High) + direction information available at DREDIR. Buffer counter (software) is incremented or decremented by main controller.

3. DREINT is enabled on the digital unit module.

5.1.3 Display Control

The LCDs are driven in multiplex mode by special drivers (D10 to D18). The multiplex depth is 4 (backplanes), the multiplex frequency approx. 200 Hz.

The drivers are in the basic status following the switch-on reset (>100 ms !) at connection RESET (active High), i.e. all LCD segments are dark. The drivers must first be initialized (COMMAND mode, LCDCD High) via the lines LCDSI (data, active High), LCDCK (clock, active Low) and LCDCD (command/data switchover). The internal memory of the drivers is then loaded with the contents of the display via the same lines (now in DATA mode) in the form of a 16-byte string. The line OPTPOL is used to synchronize the slower drivers with the main controller, i.e. this line becomes High following each byte and stops the processor until the data have been processed.

The individual drivers are selected by the shift registers D20 and D21 via the serial channel LCD-SEL (strobe) in conjunction with DO-L and CPS-L (data/clock).

All drivers are provided with a system clock of approx. 100 kHz (P5) from D18 via buffer D26.II/D26.III.

The display contrast depends on voltage V11 which is generated by V1/N1.I.

5.1.4 LED/Illumination Control

All LEDs (except the STANDBY LED) are controlled by shift registers D22, D23 and D24 via the serial channel LED (strobe) in conjunction with DO-L (data) and CPS-L (clock). Since LEDs of different luminosity are used, an additional driver (D25) is required for the green LEDs. The display illumination is controlled via a buffer (V2) and a delay element (R30/C30) in order to compensate for the PTC effect of the lamps.

5.1.5 Loudspeaker Amplifier

The AF to be amplified is coupled to X11.A8 at low impedance (impedance → 0 Ω). The control circuit for N100.I is on the analog unit and is identical to the control of N100.II. The lamps are used at this point for dynamic compression because of their PTC effect. The complementary output stages V100/V101 or V104/V105 enable the high output currents which are required because of the low circuit impedance.

5.2 Testing and Adjustment

5.2.1 Key Detection

Test: 1. Apply Low to KQ0 to KQ9.

2. The line REPEAT must become High when each key is pressed. If not: key faulty.

3. After resetting the flip-flop D7.I (pulse >500 ns at connection RESKFF, active High), a High must be present at connection KEYINT following pressing of any key until the next reset. If not: D7.I faulty (or control lines).

Adjustment: none

5.2.2 Rotary Pulse Generator

Test: When moving the spinwheel, a squarewave voltage with a mark-to-space ratio of 1:1 and a frequency 12 x rpm/3600 Hz must be measured at test points P6 and P7 with a phase offset of 90 degrees. Deviations from TTL level at test points P6 and P7 indicate a fault in the Hall generator B1 or B2. The Hall generators are maladjusted if the phase offset varies greatly from 90 degrees.

After resetting flip-flops D3.I and D3.II (Low pulse at input DRERES >500 ns, TTL level), the interrupt output DREINT must assume a High level each time the spinwheel is moved and the direction of rotation (High with clockwise rotation) following reset of output DREDIR.

Adjustment: none

5.2.3 Display Control

Test: Correct operation of the display driver largely depends on the initialization and data transmission by the controller. It is therefore recommendable to carry out the test in the instrument using the firmware test aids (e.g. D 12 SPEC) (see Section 4).

Adjustment: All drivers are supplied by D18 with a system clock of approx. 100 kHz (P5) via buffer D26.II/D26.III. Potentiometer R29 can be used to compensate for component tolerances. Since the write speed directly depends on this clock, R29 is set such that flickering of the display is just no longer visible (or set to 100 kHz at P5).

The display contrast depends on voltage V11 generated by V1/N1.I. The controller R26 can be used to optimally adjust the contrast (for the respective viewing angle, generally viewed below 30 degrees from above).

5.2.4 LED/Illumination Control

Test: All LCD segments and all LEDs must light up simultaneously when the instrument is switched on.

Adjustment: none

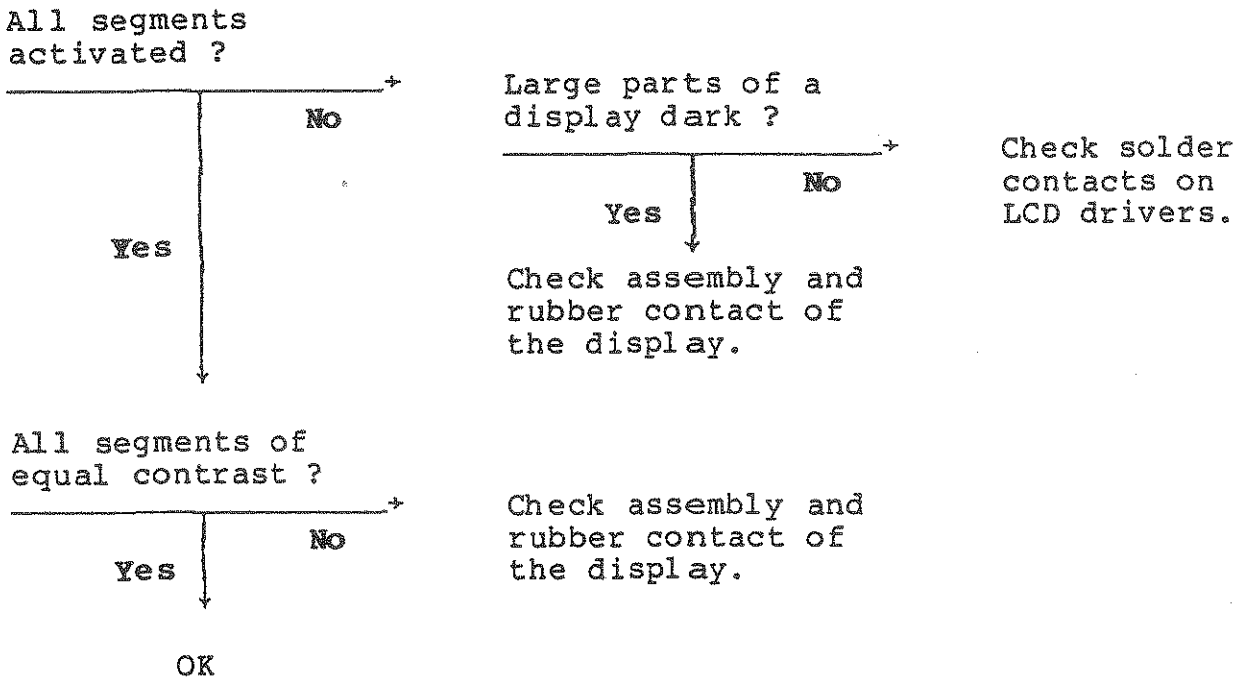
5.2.5 Loudspeaker Amplifier

Test: Apply an AC voltage with 1 kHz/10 mV to 1 V to X11.A8 (AC coupling as result of bias of -7.5 V, internal resistance of source corresponding to lamp H 100 or 100 Ω as substitute).

Check the output signal depending on the position of the loudspeaker control and the input level using an oscilloscope or loudspeaker (AC coupling since a bias of -7.5 V!).

Adjustment: none

5.3 Troubleshooting



ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
A10	ED ANZEIGE / TASTATUR NUR VAR/ONLY MOD: 02 DISPLAY KEYBOARD	802.3662.02			
A10	ED ANZEIGE/TASTATUR NUR VAR/ONLY MOD: 06 DISPLAY KEYBOARD	802.3662.06			
B1	EL LAUTSPR.0,5W RD50 SPEAKER	803.0509	VALVO	AD 2099 Z25	
C1	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR	803.0715	MATSUSHITA	ECE-A1ESS-471U	
W45 -	DX KABEL (W45) CABLE (W45)	803.0367			
					- ENDE -

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	ZUGEH.STROML./CIRC.DIAGR. 802.3410S				
B1	BS UGN3020T HALL-EFF.SW. HALL-EFF.SWITCH	BS 336.4750	SPRAGUE	UGN-3020T	
B2	BS UGN3020T HALL-EFF.SW. HALL-EFF.SWITCH	BS 336.4750	SPRAGUE	UGN-3020T	
C1 ..8	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	VALVO	2222 63051 102	
C10	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C11	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930	WIMA	MKS/2/63/0,1UF/5%	
C12	CE 10 UF+-20%16V 7X 4X 8 ELECTROLYTIC CAPACITOR	CE 022.8085	ROEDERSTEI	ETR 2 10/16 20%	
C13	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR	358.6062	NCC	SRE 22UF/16V+-20%	
C30	CE 4,7UF+-20%10V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8056	ROEDERSTEI	ETR 1 4,7/10 20%	
C100	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR	CC 099.8521	VITRAMON	VJ1206Y103KFA	
C101	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C103	CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	VITRAMON	VJ1812Y104KFA	
C201 ..207	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
C220 ..226	CC 10NF-20+50%7X8R4000 CAPACITOR	CC 087.7525	VALVO	2222 63051 64051103	
D1	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N	266.7934	TEXAS	SN74LS74N	
D2	BL SN74LS32N 4/2INP.OR IC OR GATE SN74LS32N	266.4687	TEXAS	SN74LS32N	
D3	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N	266.7934	TEXAS	SN74LS74N	
D4	BL SN74LS00N 4/2INP.NAND IC NAND GATE SN74LS00N	266.4641	TEXAS	SN74LS00N	
D5	BL SN74LS76AN 2/JK-MS-FLP IC FLIP FLOP SN74LS76N	266.2026	TEXAS	SN74LS76AN	
D6	BL CD4068BE 1X8IN.NANDG NAND GATE	BL 569.3161	RCA	CD4068BE	
D7	BL CD4013BE 2XD- FLIPFL FLIPFLOP	BL 086.7021	RCA	CD4013BE	
D8	ZM DREHIMPULSGEBER NUR VAR/ONLY MOD: 02 04 MOVING PULSE GENERATOR	EM 336.3348			
D10 ..16	BJ UPD7225G-00 LCD DRIV ALPHANUM.LCD CONTR/DRIVER	BJ 392.5320	NEC ELECTR	UPD7225G	
D17	BJ UPD7225G-00 LCD DRIV NUR VAR/ONLY MOD: 02 04 ALPHANUM.LCD CONTR/DRIVER	BJ 392.5320	NEC ELECTR	UPD7225G	
D18	BJ UPD7225G-00 LCD DRIV NUR VAR/ONLY MOD: 02 04 ALPHANUM.LCD CONTR/DRIVER	BJ 392.5320	NEC ELECTR	UPD7225G	
D20 ..24	BL CD4094BE 8BIT SH.REG SHIFT REGISTER	BL 586.7726	RCA	CD4094BE	
D25	BL SN7406N 6XINVERTER IC HEX INVERTER SN7406N	237.0487	TEXAS	SN7406N	
D26	BL CD4069UBE 6XINVERTER HEXINVERTER	BL 086.9999	RCA	CD4069OBE	
H1 ..6	AF HLMP1503 LED GN RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 252.5570	GEN.INSTR.	HLMP1503-1503-18/19	
H7	AF HLMP1700 LED RT RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9134	HP	HLMP1700	
H8	AF HLMP1700 LED RT RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9134	HP	HLMP1700	
H9	AF HLMP1700 LED RT RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9134	HP	HLMP1700	
H10	AF HLMP1700 LED RT RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9134	HP	HLMP1700	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
H11	AF HLMP1700 LED RT RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9134	HP	HLMP1700	
H12	AF HLMP1700 LED RT RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9134	HP	HLMP1700	
H13	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H14	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H15	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 06 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H16	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 06 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H17 ..21	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 02 04 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H22	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 04 FUER VAR 04/FOR MOD 04 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H80	AF HLMP1719 LED GE RD3 NUR VAR/ONLY MOD: 06 LED	AF 099.9140	GEN.INSTR.	HLMP-1719	
H100	EF 6V 0,02A OHNE SOCKEL LAMP 6V	EF 803.0815	BUERKLIN	33 G112	
H101 ..106	EF 28V 24MIL.A DRAHTANS. LAMP	EF 455.2238	MGG	1280-00	
H107	EF 28V 24MIL.A DRAHTANS. NUR VAR/ONLY MOD: 02 04 LAMP	EF 455.2238	MGG	1280-00	
H108	EF 28V 24MIL.A DRAHTANS. NUR VAR/ONLY MOD: 02 04 LAMP	EF 455.2238	MGG	1280-00	
N1	BO CA3240AE 2XMOS OPAMP OPERATIONAL AMPLIFIER	302.7040	RCA	CA3240AE	
N100	BO TL072ACD 2XFET OPAMP FUER VAR 04/FOR MOD.04 ********** LF353 B0342.2291 FUER VAR 02/FOR MOD 02 OPERATIONAL AMPLIFIER	803.1057	TEXAS	TL072ACD	
P1	BP LCD 10X 7SEGM.11MM TFL LC-DISPLAY	803.0521	VARITRONIX	R&S-ZCHNG.803.0521"D	
P2	BP LCD 4X 7SEGM.11MM TFL LC-DISPLAY	803.0515	VARITRONIX	LCD 4X	
P3	BP LCD 4X 7SEGM.11MM TFL LC-DISPLAY	803.0515	VARITRONIX	LCD 4X	
P4	BP LCD 4X 7SEGM.11MM TFL NUR VAR/ONLY MOD: 02 04 LC-DISPLAY	803.0515	VARITRONIX	LCD 4X	
P5	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
P6	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
P7	VL WIRE-WRAP PIN WIRE-WRAP PIN	VL 088.4542	BERG	NR. 75 403-003	
R1	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R2	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR	RL 082.2477	DRALORIC	SMA 0207/2,21K-F-C	
R3	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR	RL 083.1400	DRALORIC	SMA0207/15K-F-D	
R4	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR	RL 083.0990	DRALORIC	SMA0207/3,32K-F-D	
R5	RN 7X3,3KOHM+-2%SIL 8 H5 RESISTOR NETWORK	RN 291.4387	BOURNS	4308R-101-332	
R10 ..21	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR	RL 083.1297	DRALORIC	SMA0207/10K-F-D	
R22	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	DRALORIC	SMA/207/22,1K-F-C	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
R23	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMAO207/100K-F-C	
R24	RL 0,35W 681 KOHM+-1%TK50 RESISTOR	RL 083.2735	DRALORIC	SMAO207/381K-F-C	
R25	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	DRALORIC	SMA/207/47,5K-F-C	
R26	RS 0,5W5KOHM+-10%10X10X5 CERMET POTENTIOMETER T	RS 247.7890	BOURNS	3386F-1-502	
R27	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR	RL 082.2190	DRALORIC	SMAO207/5,62K-F-C	
R28	RL 0,35W 200KOHM+-1%TK50 RESISTOR	RL 083.2235	DRALORIC	SMAO207/200K-F-D	
R29	RS 0,5W200KOHM+-10%10X10X CERMET POTENTIOMETER T	RS 087.7590	BOURNS	3386F-1-204	
R30	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMAO207/100K-F-C	
R31	RL 0,35W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	DRALORIC	SMAO207/100K-F-C	
R40 ..44	RN 4X120 OHM+-2%SIL 8 H5 RESISTOR NETWORK	RN 291.4470	BOURNS	4308R-102-121	
R45	RL 0,35W 121 OHM+-1%TK50 RESISTOR	RL 082.9859	DRALORIC	SMAO207/1210HM-F-D	
R46	RL 0,21W 1,00KOHM+-1%TK50 RESISTOR	RL 092.1444	RESISTA	MK1 1K00 1% TK50	
R47	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMAO207/1K-F-C	
R49 ..52	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMAO207/1K-F-C	
R53	RG 121 OHM+-1%TK100 1206 NUR VAR/ONLY MOD: 04 FUER VAR04/FOR MOD 04 CHIP RESISTOR	RG 006.8903	DALE	CRCW1206 1210HM F T	
R60 ..62	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMAO207/1K-F-C	
R100	RS POTENTIOMETER POTENTIOMETER	802.3704			
R101	RL 0,35W 1KOHM+-1%TK50 RESISTOR	RL 082.2160	DRALORIC	SMAO207/1K-F-C	
R102	RL 0,35W 221 OHM+-1%TK50 RESISTOR	RL 083.0084	DRALORIC	SMAO207/2210HM-F-D	
R103	RG 215 OHM+-2%TK200 1206 TRIMMWERT/SELECTED CHIP RESISTOR	006.8961	DRALORIC	CGB3216 2150HM2% TK	
R104	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR	RG 006.7271	DALE	CRCW1206 1,0KOHM F T	
R105	RG 4,64KOHM+-2%TK200 1206 CHIP RESISTOR	007.0712	DRALORIC	CGB 3216 4,64KOHM 2%	
R106	RL 0,35W4,64KOHM+-1%TK50 RESISTOR	RL 082.1687	DRALORIC	SMAO207/4,64K-F-C	
S1 ..9	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S11	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S12	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S13	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S14	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S15	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S16 ..19	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S21	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S22	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S23	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S24	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	

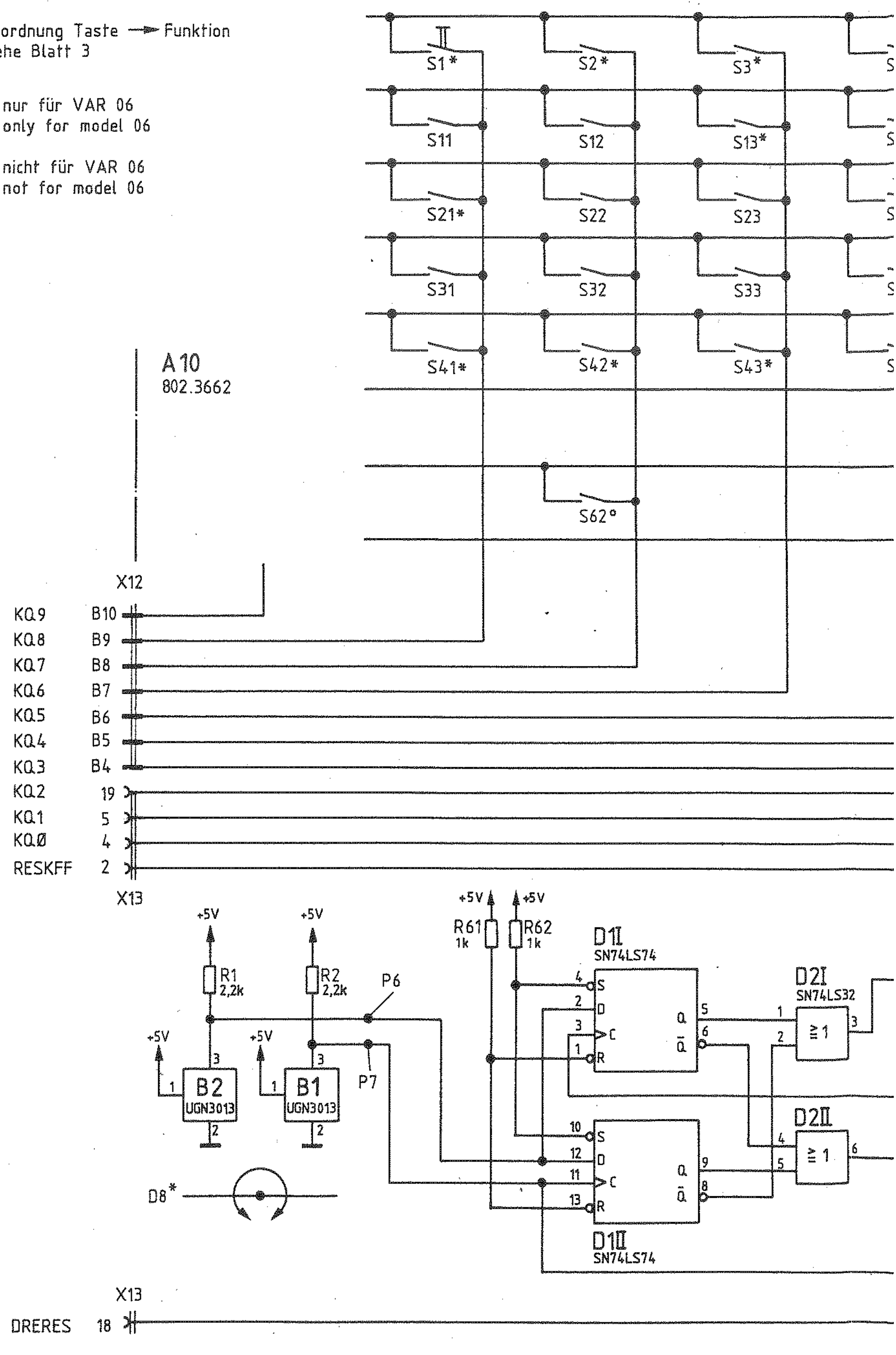
Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
S25	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S26 ..29	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S31	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S32	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S33	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S34	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S35	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S36	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S37	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S38	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S39	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S41	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
..45	PUSHBUTTON SWITCH				
S46	SB TASTER 1XA OHNE KNOPF	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
..49	PUSHBUTTON SWITCH				
S53	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S54	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S55	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S56	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S57	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S58	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S59	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S61	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S62	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 06 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S63	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S64	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S65	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S66	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
..69	PUSHBUTTON SWITCH				
S75	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 04	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
..79	PUSHBUTTON SWITCH				
S80	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 02 06 PUSHBUTTON SWITCH	SB 238.3850	SIEMENS	STB11 M.LED-LOECHERN	
S80	SB TASTER 1XA OHNE KNOPF NUR VAR/ONLY MOD: 04 PUSH BUTTON SWITCH	834.9020	SIEMENS	V42263-D0011-A009	

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
V1	AK BCY59IX NPN 45V 200MA TRANSISTOR	AK 010.5163	SIEMENS	BCY59IX	
V2	AM 2N6659 NKAN 35V FET MOS-FET	AM 303.9324	SILICONIX	2N6659	
V4	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	TEXAS INST	1N4448 GEGURTET	
V100	AK BC337-40 NPN 45V 800MA TRANSISTOR	303.9524	INTERMETAL	BC337-40	
V101	AK BC327-40 PNP 45V 800MA TRANSISTOR	303.9518	INTERMETAL	BC327-40	
V104	AK BC337-40 NPN 45V 800MA TRANSISTOR	303.9524	INTERMETAL	BC337-40	
V105	AK BC327-40 PNP 45V 800MA TRANSISTOR	303.9518	INTERMETAL	BC327-40	
X13	FR IC-FASSUNG 20POL.DIL SOCKET	FR 092.7142	PRECICONT	USO20T	
X14	FP WINKELSTECKERLEIST.36P 3-POLIG/3 PINS ANGLE PIN CONNECTOR	FP 243.3578	BERG	75168-113-36	
X14	DX BUCHSENEINHEIT X14 NUR VAR/ONLY MOD: 04 CONNECTOR X14	834.9614			
X15	FM BUCHSENLEISTE 9P.W.WP. NUR VAR/ONLY MOD: 02 04 CONNECTOR	FM 614.3760	FCT	F 9S4	
X11A	FP WINKELSTECKERLEIST.36P 8-POLIG/8 PINS ANGLE PIN CONNECTOR	FP 243.3578	BERG	75168-113-36	
X11B	FP STECKERL.ABGEW.36-POL. 8-POLIG/8 PINS ANGLE PIN CONNECTOR	FP 087.9105	BERG	75168-114-36	
X12A	FP STECKERL.ABGEW.36-POL. 10-POLIG/10 PINS ANGLE PIN CONNECTOR	FP 087.9105	BERG	75168-114-36	
X12B	FP WINKELSTECKERLEIST.36P 10-POLIG/10 PINS ANGLE PIN CONNECTOR	FP 243.3578	BERG	75168-113-36	
					- ENDE -

Zuordnung Taste → Funktion
siehe Blatt 3

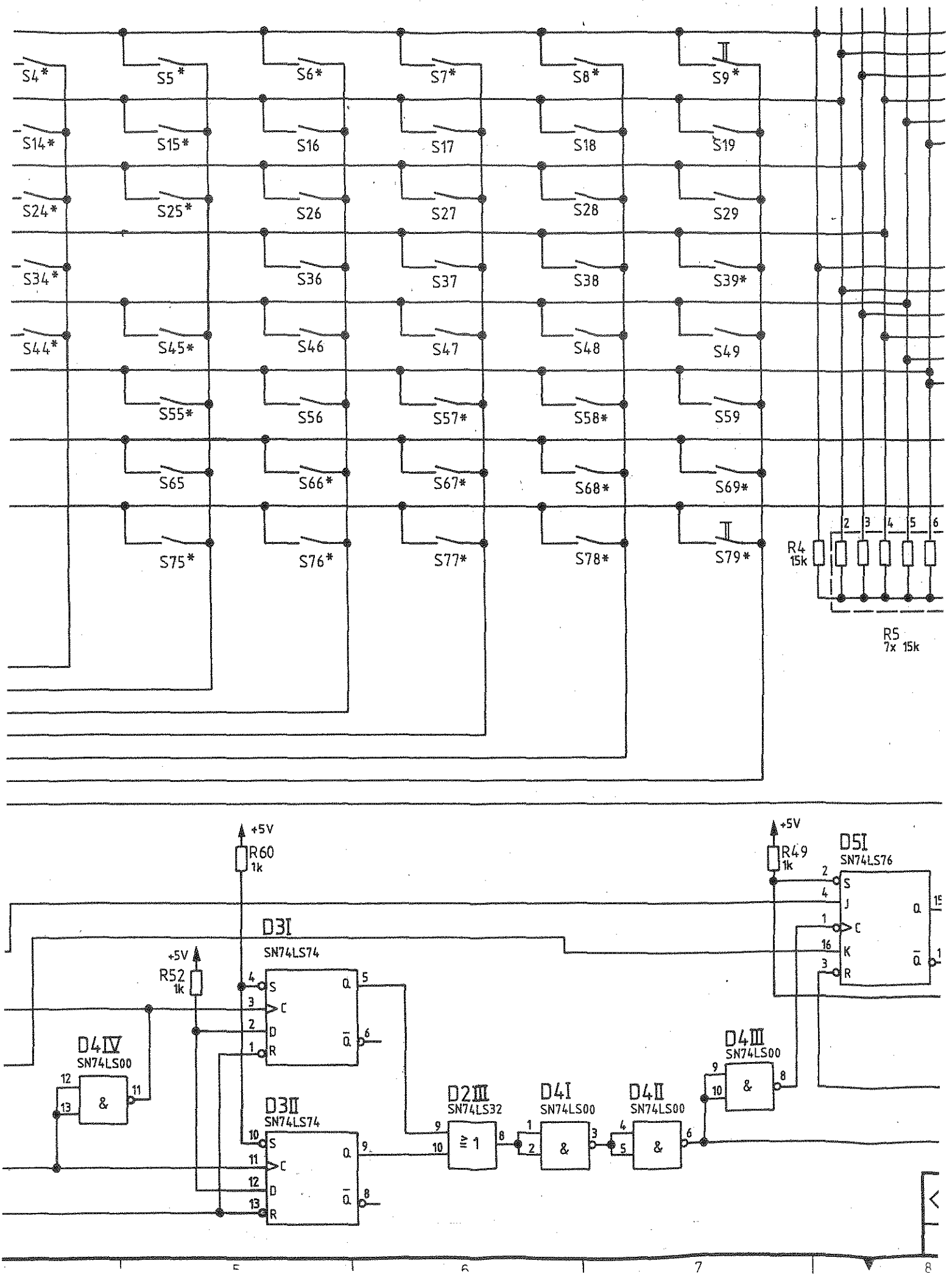
°) nur für VAR 06
only for model 06

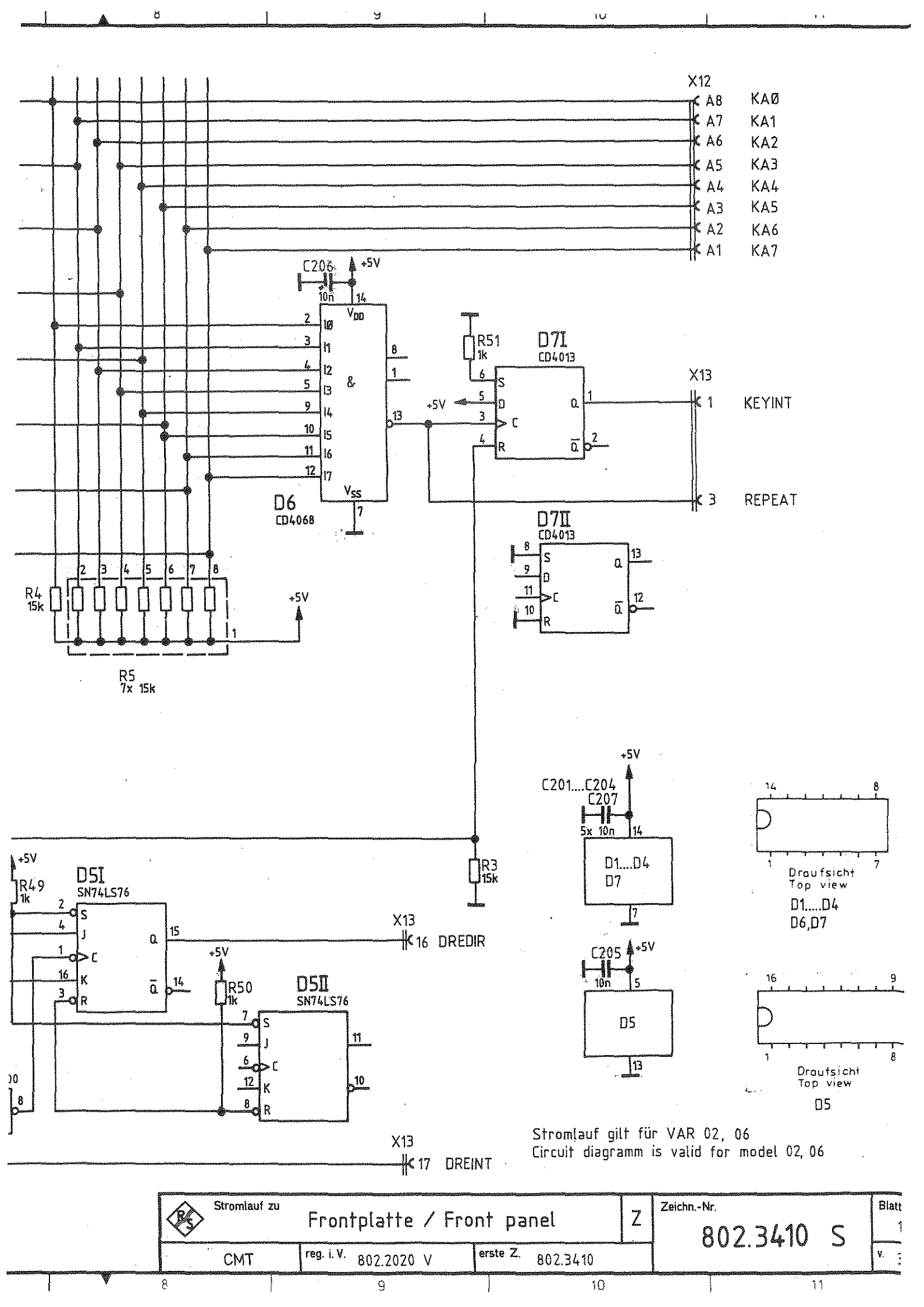
*) nicht für VAR 06
not for model 06



ROHDE & SCHWARZ

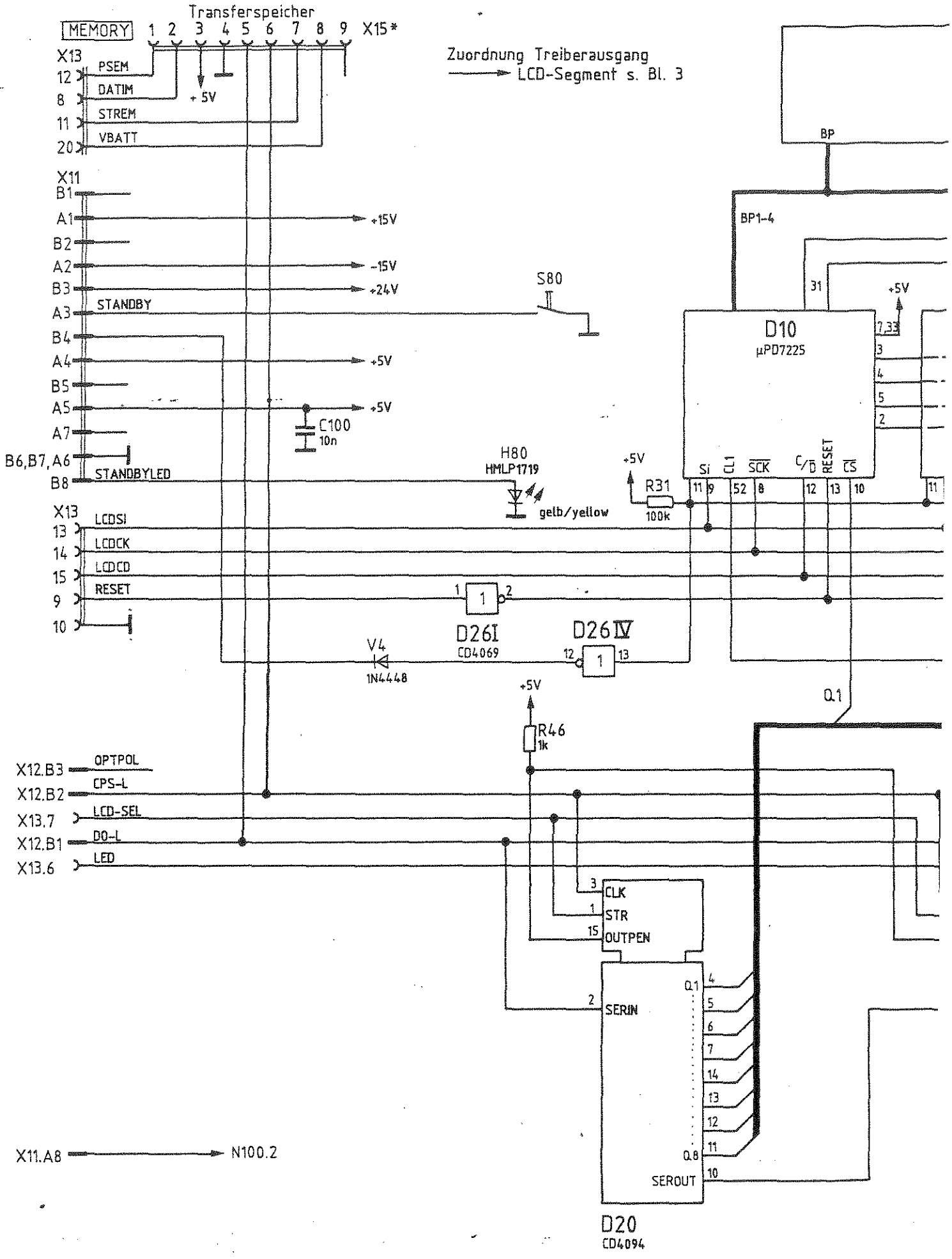
gezeichnet	10.84	GU	B	32954	4.86	CO
bearbeitet	10.84	CO	E	38951	11.87	IB
geprüft						
normgepr.						

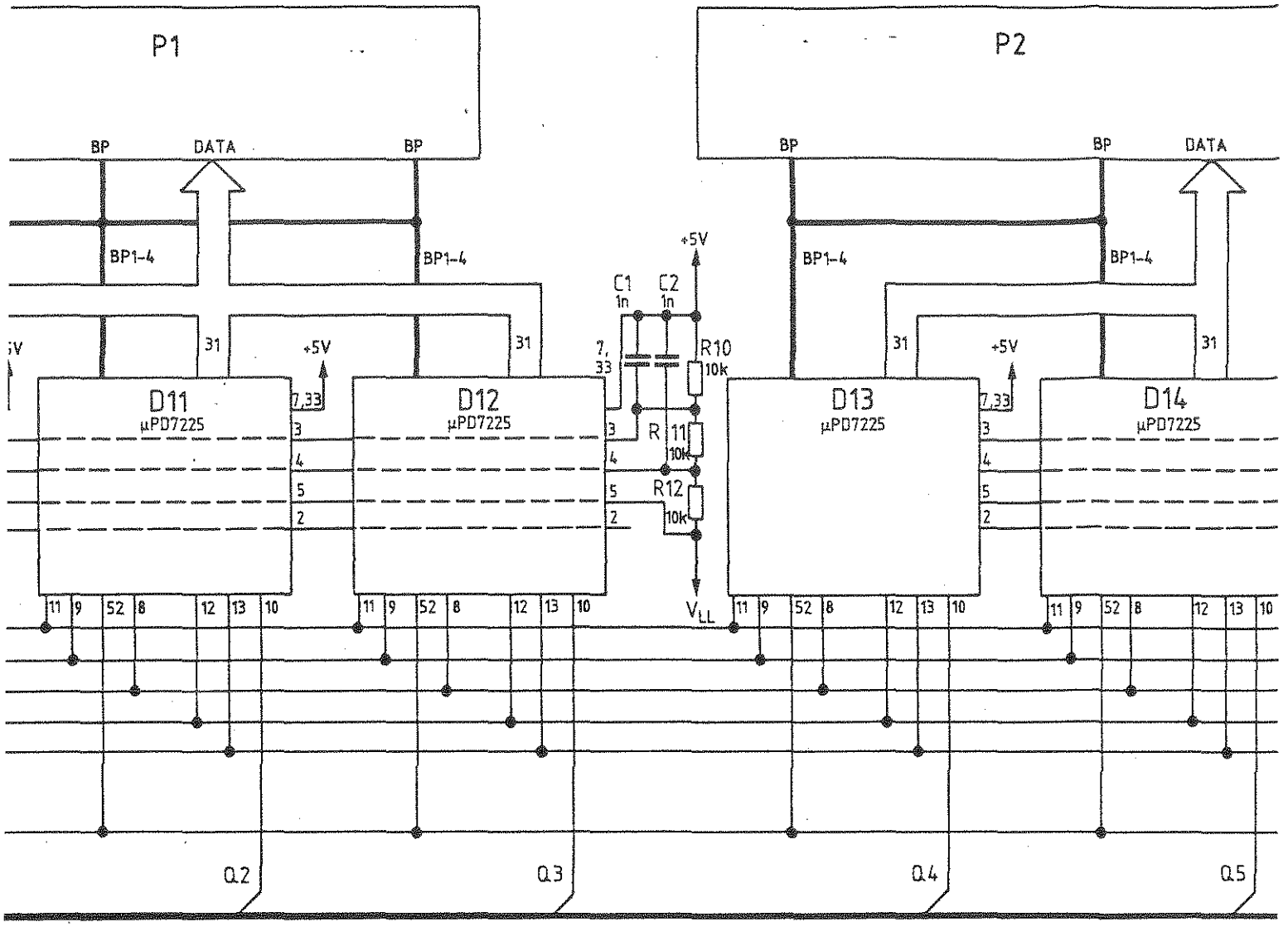

S4*
S5*
S6*
S7*
S8*
S9*
S14*
S15*
S16
S17
S18
S19
S24*
S25*
S26
S27
S28
S29
S34*
S36
S37
S38
S39*
S44*
S45*
S46
S47
S48
S49
S55*
S56
S57*
S58*
S59
S65
S66*
S67*
S68*
S69*
S75*
S76*
S77*
S78*
S79*
R4
15k
R5
7x 15k
+5V
R60
1k
R52
1k
R49
1k
D3I
SN74LS74
D3II
SN74LS74
D4IV
SN74LS00
D4III
SN74LS00
D4I
SN74LS00
D4II
SN74LS00
D2III
SN74LS32
D5I
SN74LS76

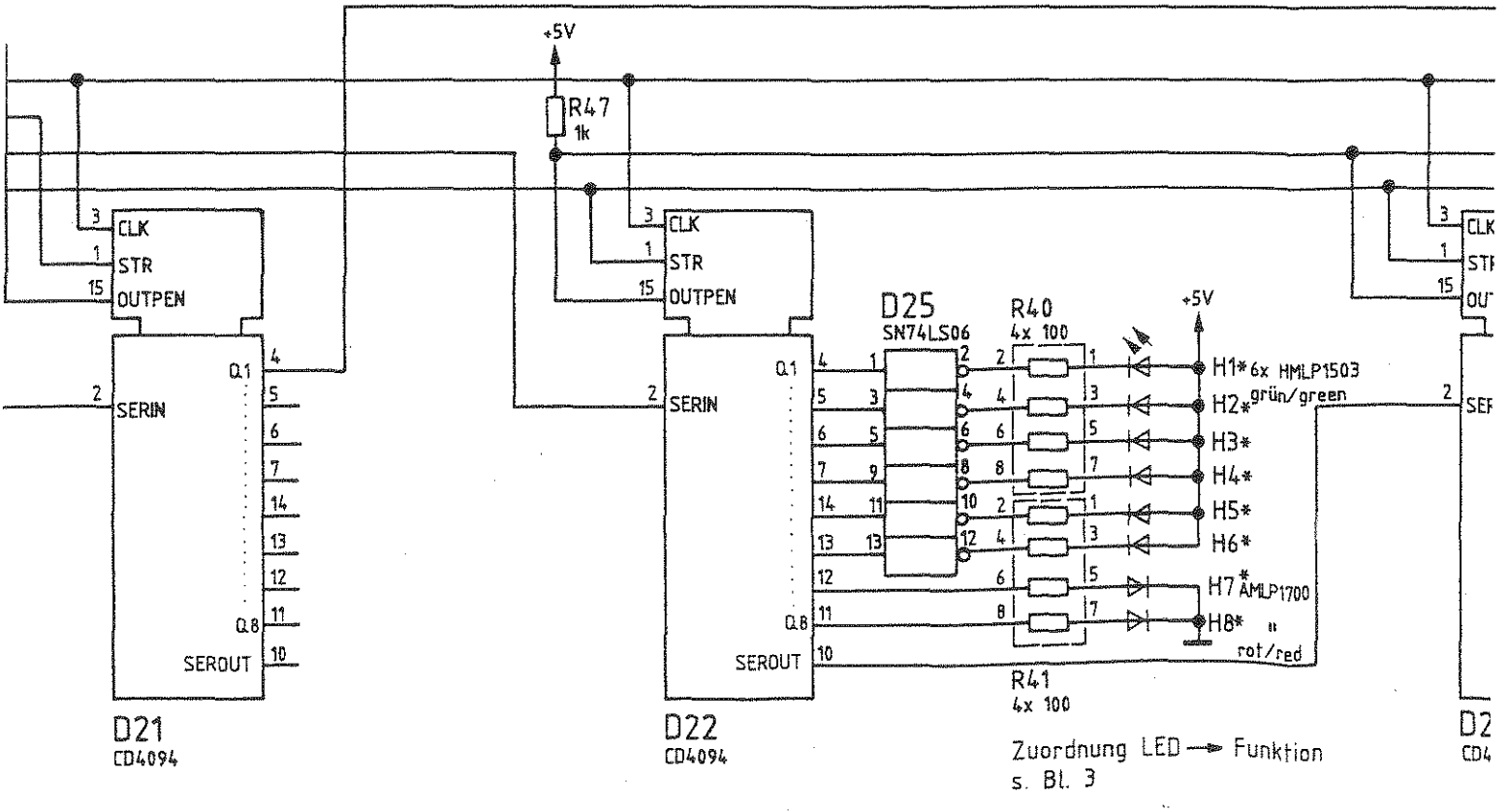


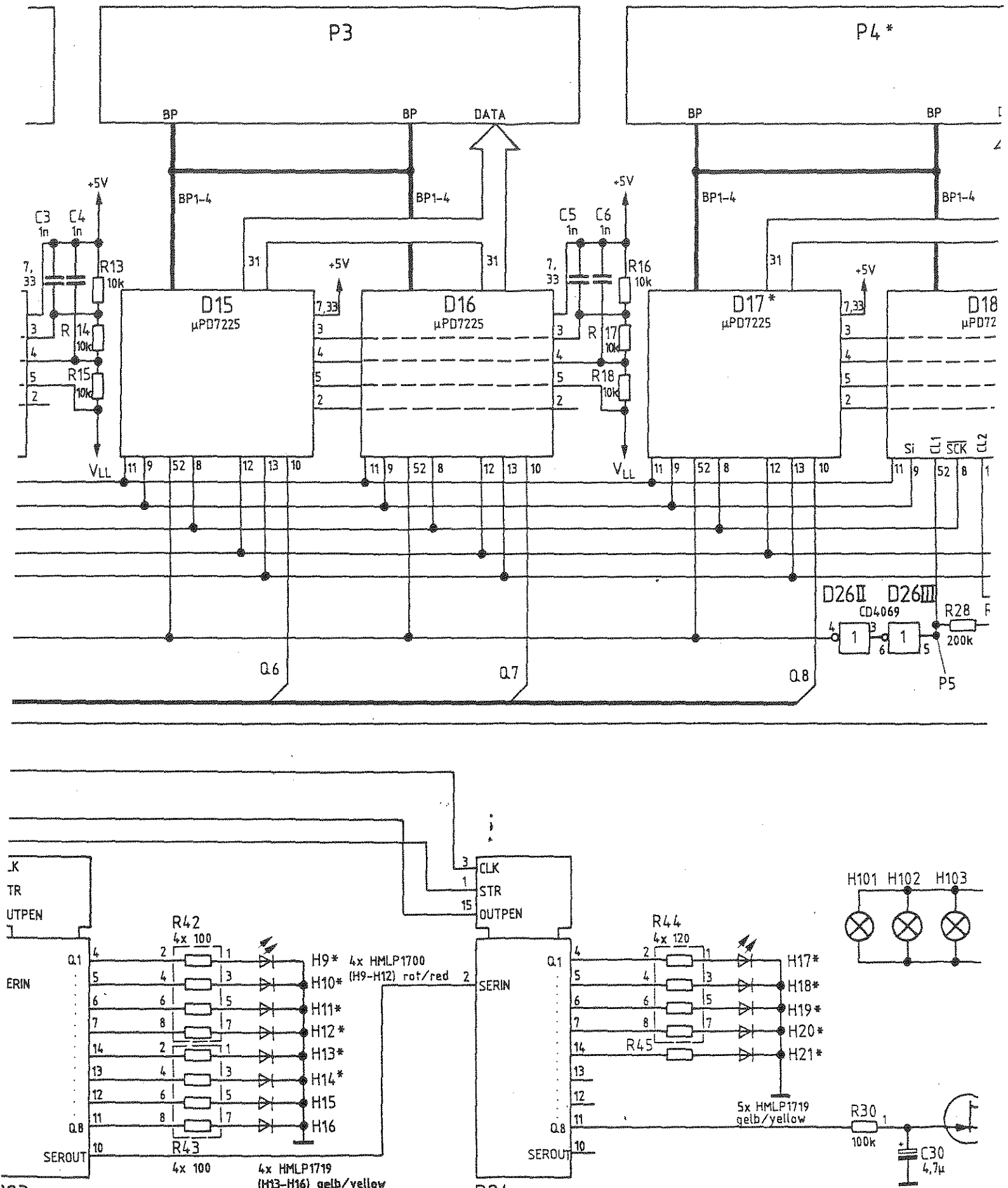
Stromlauf gilt für VAR 02, 06
Circuit diagramm is valid for model 02, 06

Stromlauf zu: Frontplatte / Front panel	Z	Zeichn.-Nr. 802.3410 S	Blatt 1	
CMT	reg. i. V. 802.2020 V	erste Z. 802.3410		v.

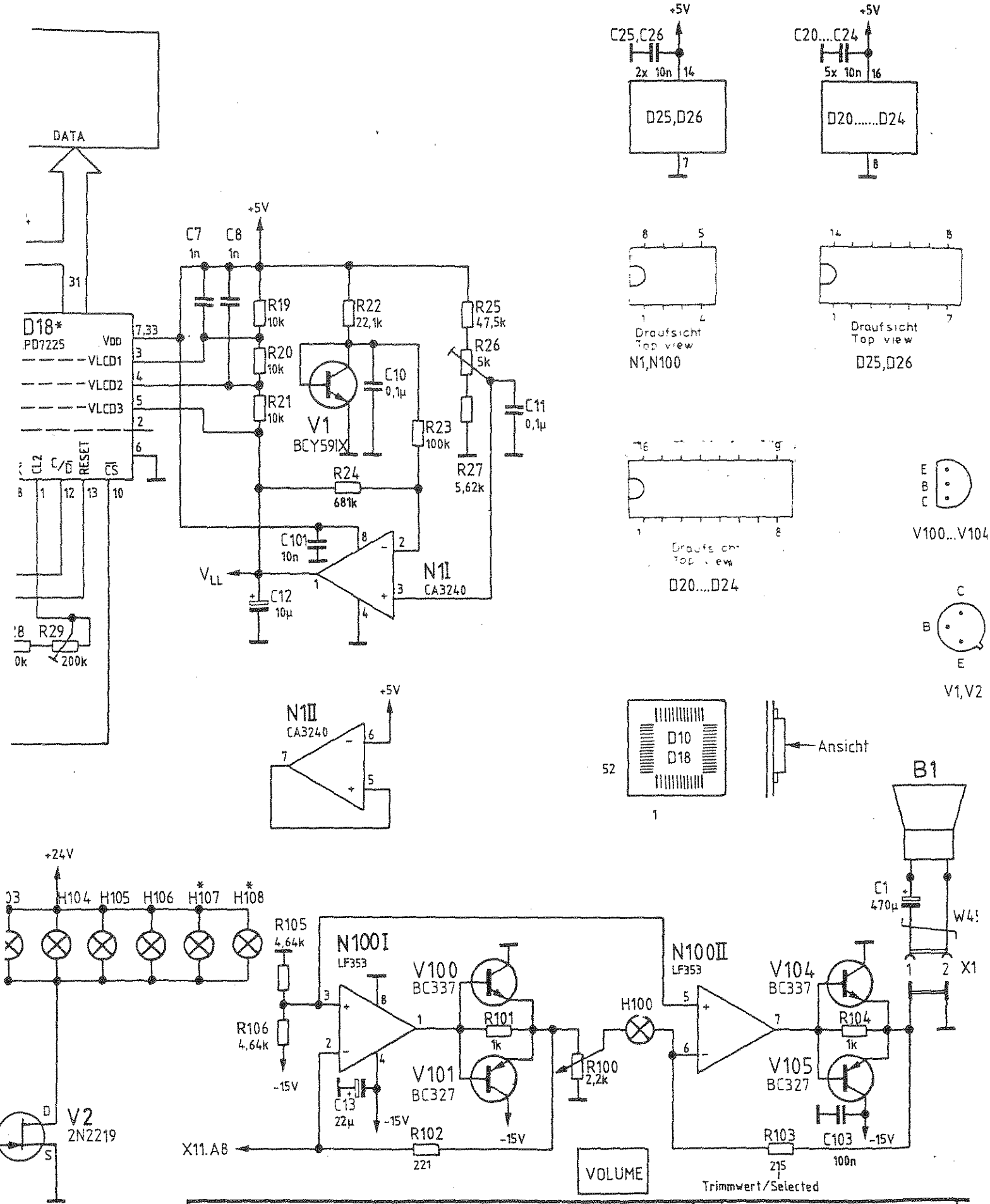

Transferspeicher
MEMORY
1 2 3 4 5 6 7 8 9 X15*
X13
12 PSEM
8 DATIM
11 STREM
20 VBATT
+5V
Zuordnung Treiberausgang
LCD-Segment s. Bl. 3
BP
BP1-4
X11
B1
A1 +15V
B2
A2 -15V
B3 +24V
A3 STANDBY
B4
A4 +5V
B5
A5 +5V
A7
B6,B7,A6
B8 STANDBYLED
C100
10n
S80
H80
HMLP1719
gelb/yellow
D10
µPD7225
31
+5V
7,33
3
4
5
2
Si
CL1
SCK
C/D
RESET
CS
11 9 52 8 12 13 10 11
R31
100k
X13
13 LCDSI
14 LCDCK
15 LCDCD
9 RESET
10
D26I
CD4069
D26IV
V4
1N4448
Q.1
R46
1k
X12.B3 OPTPOL
X12.B2 CPS-L
X13.7 LCD-SEL
X12.B1 DO-L
X13.6 LED
CLK
STR
OUTPEN
SERIN
Q.1
Q.8
SEROUT
D20
CD4094
X11.A8
N100.2

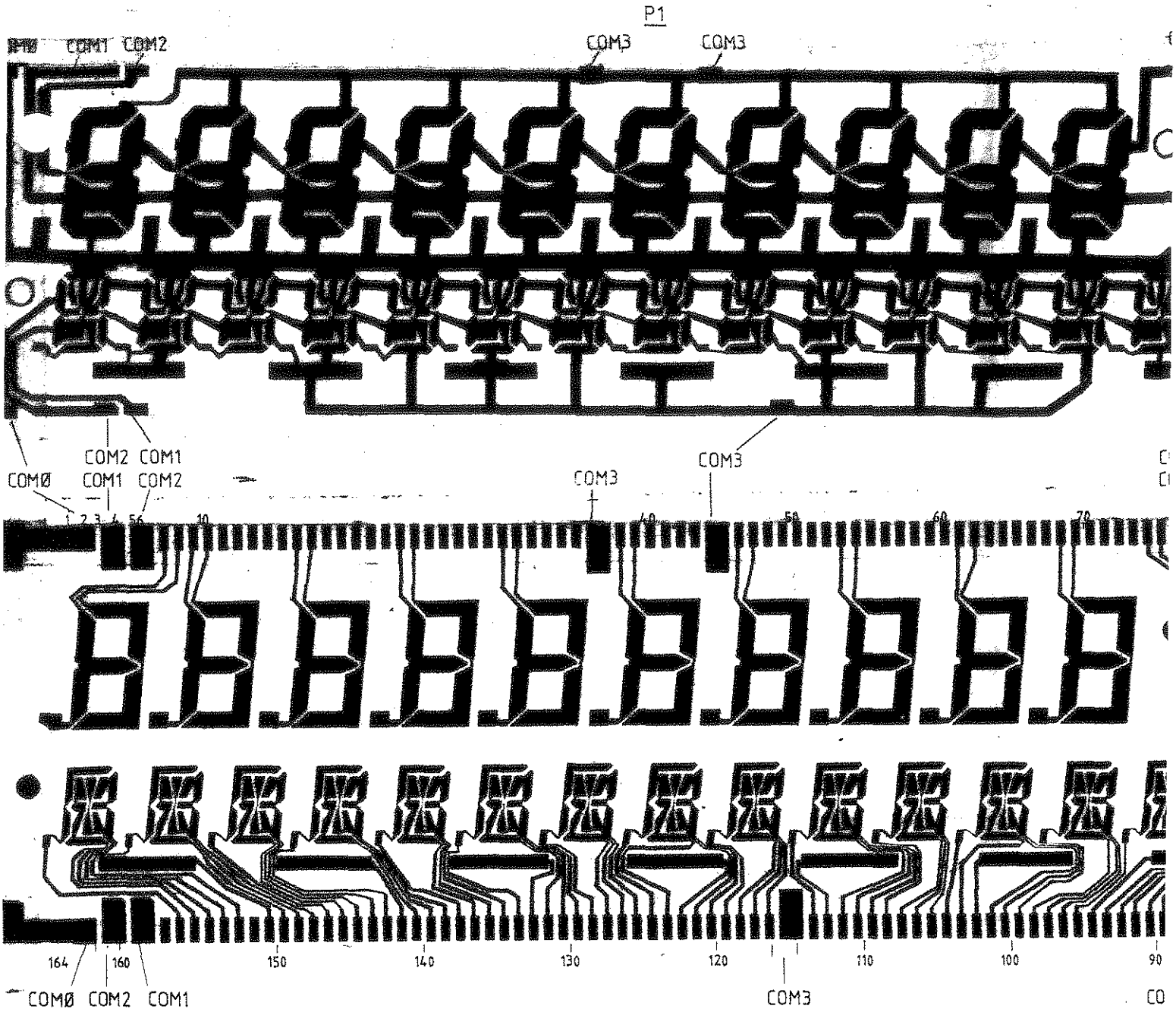

P1
P2
BP
DATA
BP1-4
+5V
C1
1n
C2
1n
R10
10k
R11
10k
R12
10k
D11
µPD7225
D12
µPD7225
D13
µPD7225
D14
µPD7225
V_{LL}
Q2
Q3
Q4
Q5


+5V
R47
1k
CLK
STR
OUTPEN
SERIN
SEROUT
Q1
Q8
D21
CD4094
D22
CD4094
D25
SN74LS06
R40
4x 100
R41
4x 100
H1* 6x HMLP1503
H2* grün/green
H3*
H4*
H5*
H6*
H7* AMLP1700
H8* " rot/red
Zuordnung LED → Funktion
s. Bl. 3

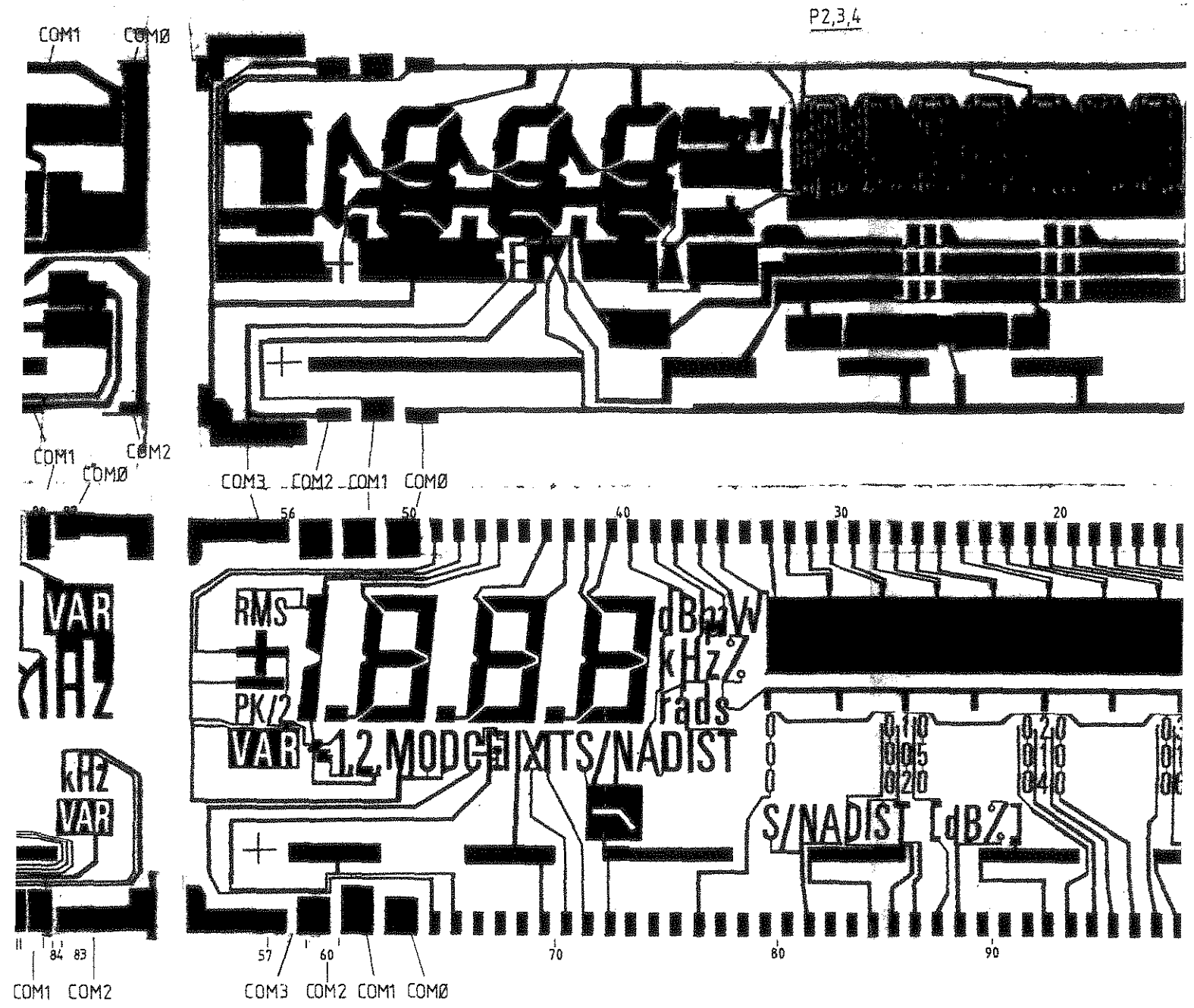


Klebekante für Druckerzeugnis, durch diese Zone möglichst nur Leitungen führen


DATA
+5V
C7
C8
1n
1n
31
D18*
PD7225
VDD
VLCD1
VLCD2
VLCD3
CL2
C/D
RESET
CS
7,33
3
4
5
2
6
1
12
13
10
R19
10k
R20
10k
R21
10k
R22
22,1k
R23
100k
R24
681k
R25
47,5k
R26
5k
R27
5,62k
C10
0,1µ
C11
0,1µ
V1
BCY59IX
C101
10n
C12
10µ
N1I
CA3240
V_LL
R29
200k
N1II
CA3240
+5V
C25,C26
2x 10n
14
D25,D26
7
C20....C24
5x 10n
16
D20.....D24
8
Draufsicht
Top view
N1,N100
D25,D26
D20....D24
E
B
C
V100...V104
V1,V2
D10
D18
52
1
Ansicht
B1
+24V
H103
H104
H105
H106
H107
H108
R105
4,64k
R106
4,64k
-15V
N100I
LF353
V100
BC337
V101
BC327
R101
1k
R100
2,2k
C13
22µ
R102
221
X11.A8
H100
N100II
LF353
V104
BC337
V105
BC327
R104
1k
R103
215
C103
100n
C1
470µ
W45
X1
V2
2N2219
VOLUME
Trimmwert/Selected
Stromlauf zu
Frontplatte / Front panel
Z
Zeichn.-Nr.
802.3410 S
CMT
reg. i. V.
802.2020 V
erste Z.
802.3410
PF 095 4115-0480



P 1	Treiber/Driver D10	D11	D12	PIN	P 1	Treiber/Driver D10	D11	D12	PIN	P 1	Treiber/Driver D10	D11	D12	PIN	P 1	Treiber/Driver D10	D11	D12	PIN	P 1	Tr D
1,2	X	X	X	15	46		X		31	89			X	48	106			X	35	125	
3,4	X	X	X	16	47		X		32	90			X	49	107			X	34	126	
5,6	X	X	X	17	53		X		34	91		X		50	108			X	32	127	
7		X		19	54		X		35	92			X	47	109			X	31	128	
8		X		20	61		X		36	93			X	46	110			X	30	129	
9		X		21	62		X		37	94			X	45	111			X	29	130	
10		X		22	68		X		38	95		X		49	112			X	28	131	
16		X		23	69		X		39	96			X	44	113		X		47	132	
17		X		24	74		X		40	97			X	43	114			X	27	133	
23		X		25	75		X		41	98			X	42	115,116	X	X	X	18	134	
		X		26	76		X		42	99			X	41	117			X	26	135	
30		X		27	77,78	X	X	X	17	100			X	40	118			X	25	136	
31		X		28	79,80	X	X	X	16	101			X	39	119			X	24	137	
36,37	X	X	X	18	81,82	X	X	X	15	102			X	38	120			X	23	138	
38		X		29	83,84	X	X	X	17	103		X		48	121			X	22	139	
39		X		30	85,86	X	X	X	16	104			X	37	122			X	21	140	
44,45	X	X	X	18	87,88	X	X	X	18	105			X	36	123		X		46	141	
															124			X	19		



P2 → D13,D14 ≙ P3 → D14,D15 ≙ P4 → D16,D17

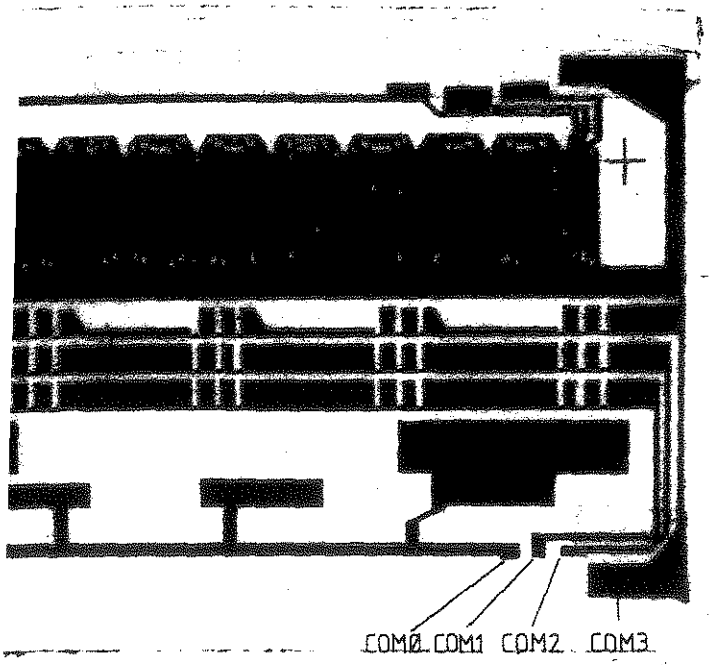
r/Driver 11	D12	PIN	P1	Treiber/Driver D10	D11	D12	PIN
	X	19	142		X		44
		47	143	X			31
		46	144	X			30
		45	145	X			29
		44	146	X			28
		43	147	X			27
		42	148	X			26
		41	149	X			25
X		45	150	X			24
		40	151		X		43
		39	153	X			23
		38	154	X			22
		37	155	X			21
		36	156	X			20
		35	157	X			19
		34	159,160	X	X	X	16
		32	161,162	X	X	X	17
			163,164	X	X	X	15

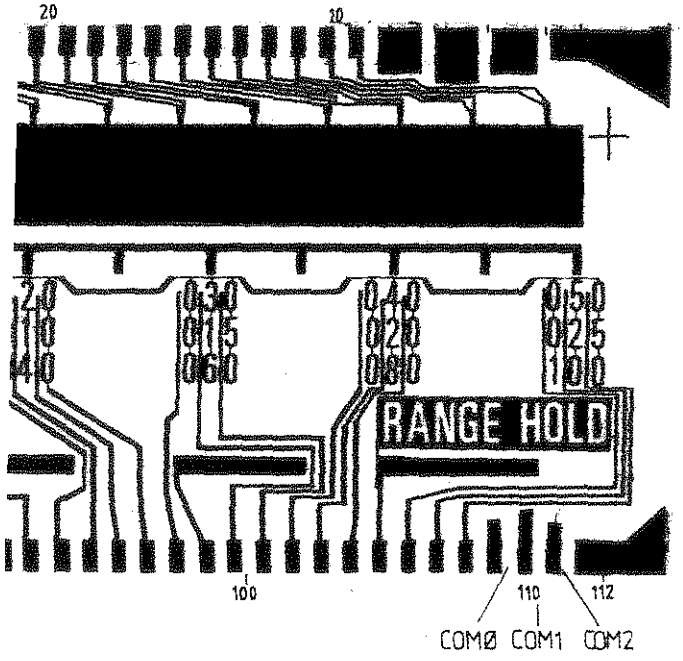
P2	Treiber/Driver D13	D14	PIN
1,2	X	X	18
3,4	X	X	17
5,6	X	X	16
7,8	X	X	15
9	X		44
10	X		43
11	X		42
12	X		41
13	X		40
14	X		39
15	X		38
16	X		37
17	X		36
18	X		35
19	X		34
20	X		32
21	X		31

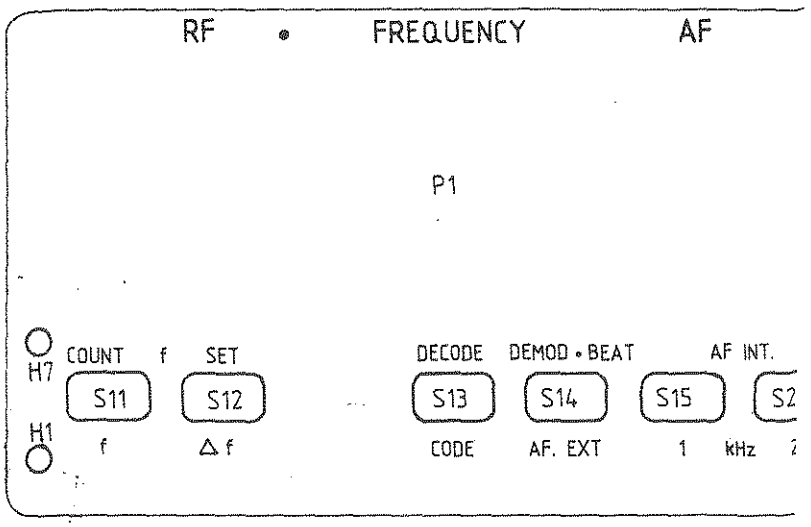
P2	Treiber/Driver D13	D14	PIN
22	X		30
23	X		29
24	X		28
25	X		27
26	X		26
27	X		25
28	X		24
29	X		23
30	X		22
31	X		21
32	X		20
33	X		19
35	X		45
36		X	19
37		X	20
38		X	21
39		X	22

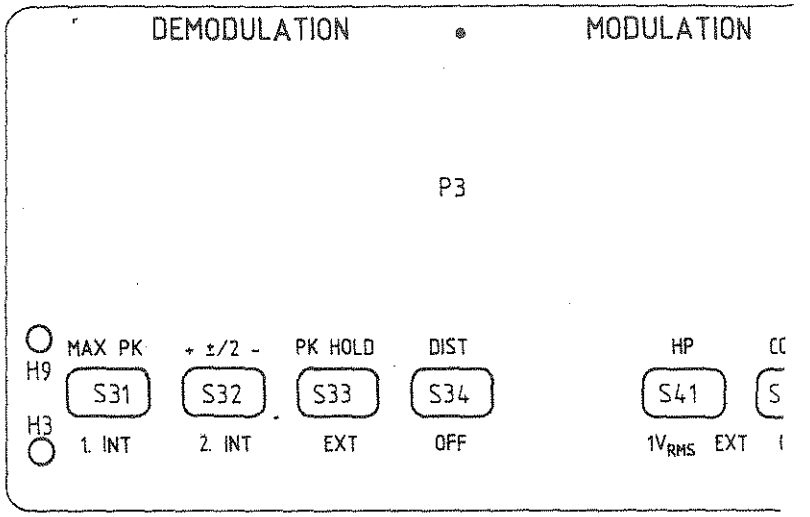
P2	Treiber/Driver D13	D14	PIN
40		X	23
41		X	24
42		X	25
43		X	26
44		X	27
45		X	28
46		X	29
47		X	30
48		X	31
49,50	X	X	15
51,52	X	X	16
53,54	X	X	17
55,56	X	X	18
57,58	X	X	18
59,60	X	X	17
61,62	X	X	16
63,64	X	X	15

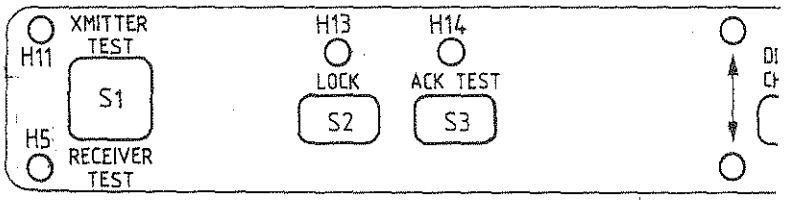
P2	Treiber/Driver D13	D14	PIN
65		X	32
66		X	34
70		X	35
71		X	36
72		X	37
73		X	38
77	X		46
82		X	39
85		X	40
86	X		47
87	X		48
88	X		49
89		X	41
93		X	42
94	X		47
95	X		48
96	X		49

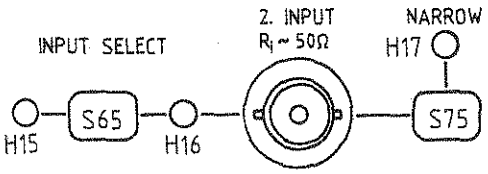






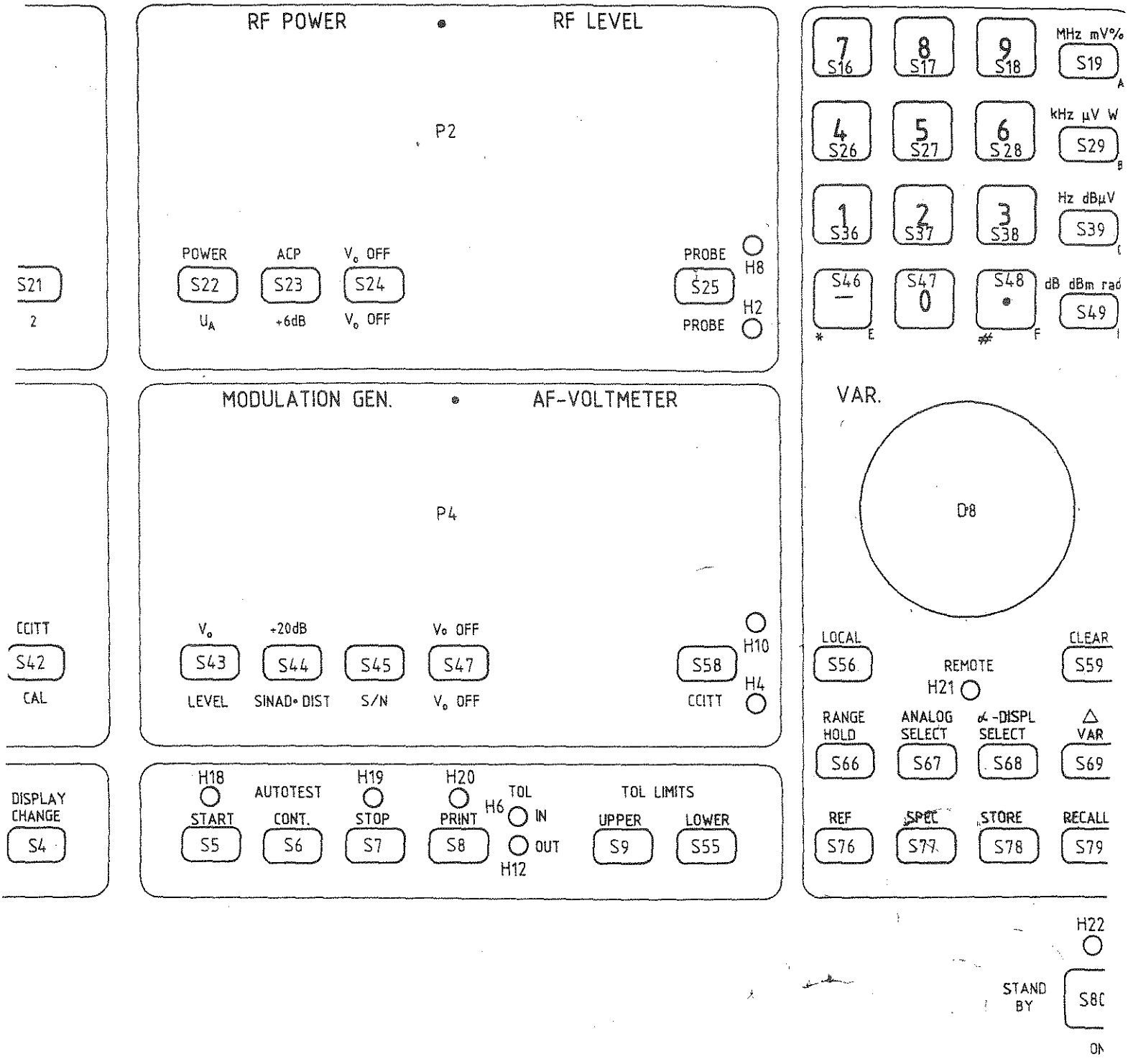






-D16,D17

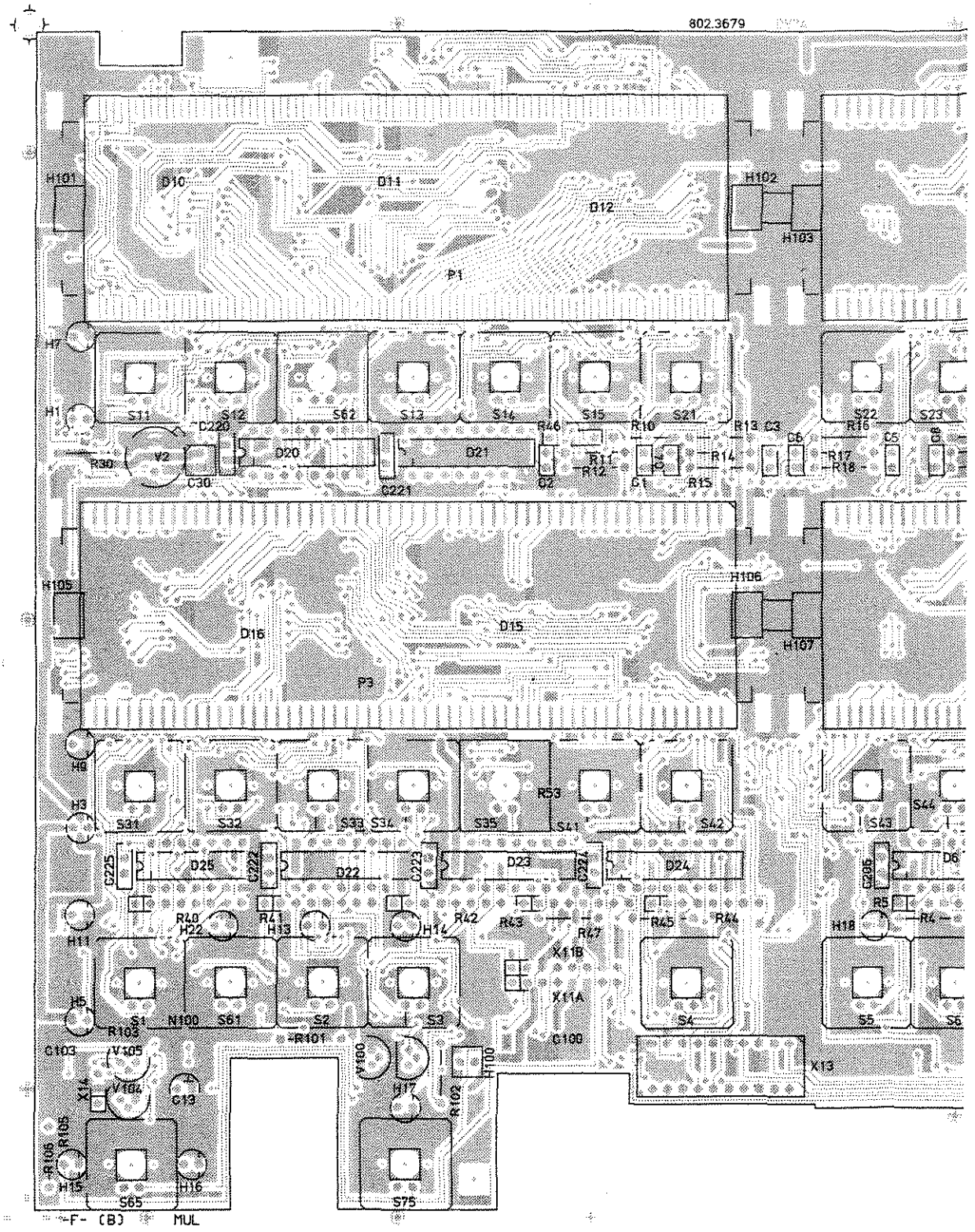
P2	Treiber/Driver D13	D14	PIN	P2	Treiber/Driver D13	D14	PIN
65		X	32	97	X		46
66		X	34	98	X		47
70		X	35	99		X	43
71		X	36	100	X		48
72		X	37	101	X		49
73		X	38	102	X		47
77	X		46	103	X		48
82		X	39	104	X		49
85		X	40	105		X	44
86	X		47	106	X		46
87	X		48	107	X		47
88	X		49	108	X		48
89		X	41	109	X	X	15
93		X	42	110	X	X	16
94	X		47	111	X	X	17
95	X		48	112	X	X	18
96	X		49				



Stromlauf gilt nur für VAR 02
Circuit diagramm is valid only for model 02

Stromlauf zu	Frontplatte / Front panel	Z	Zeichn.-Nr.
			802.3410 S
CMT —	reg. i. V. 802.2020 V	erste Z. 802.3410	

Ansicht und Leitung
View of tracks on c

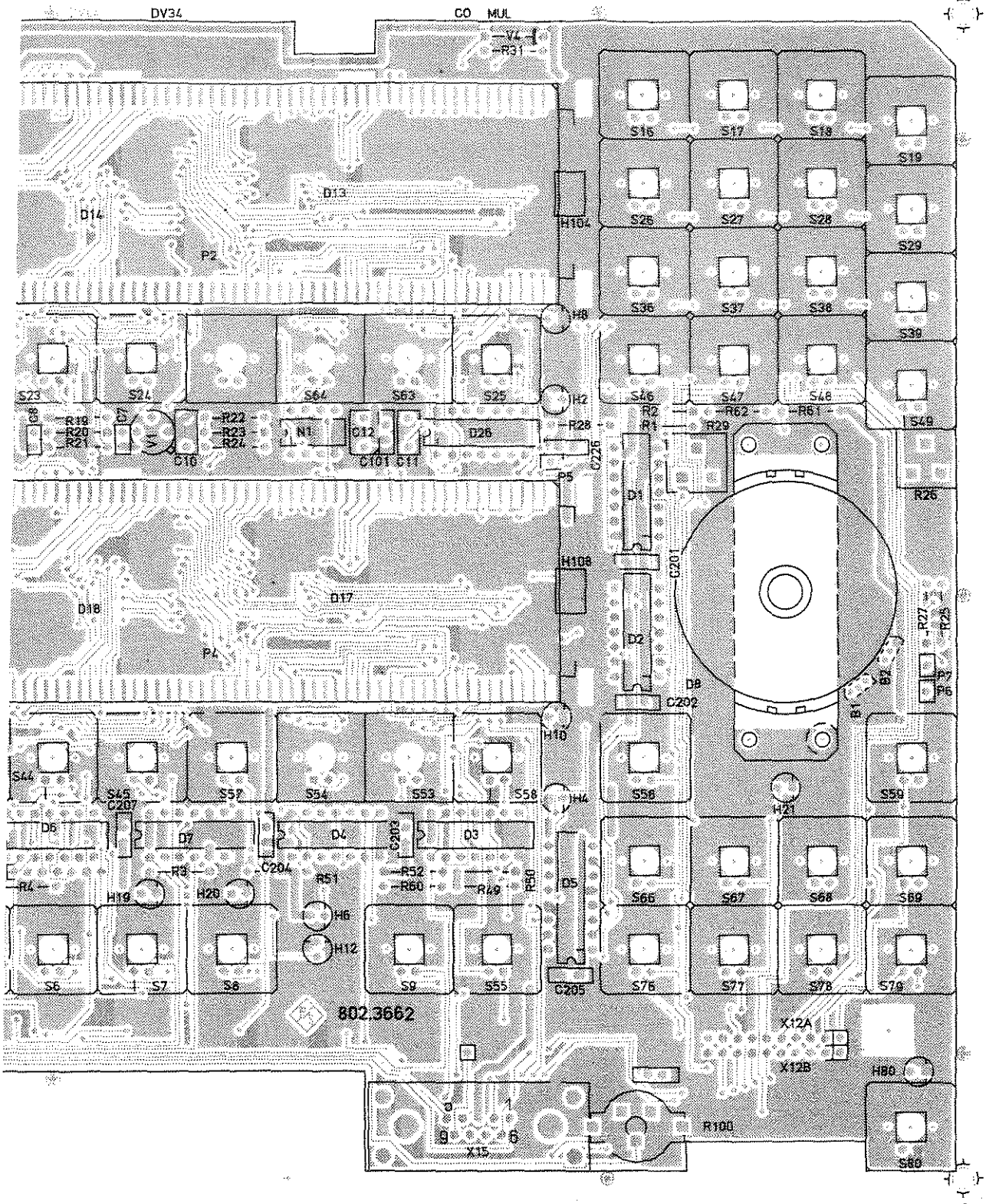


(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

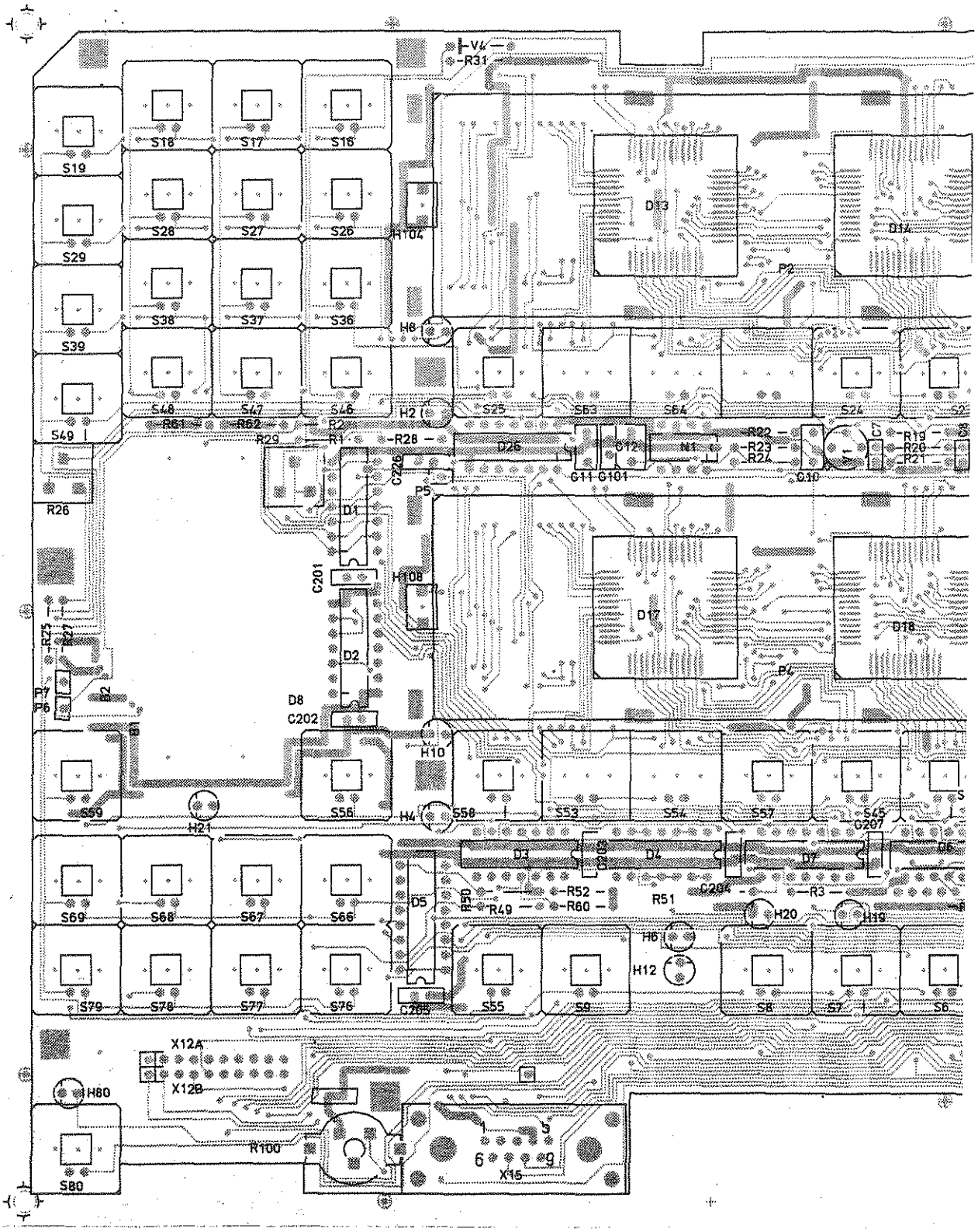
ungsführung Bauteilseite
component side



I	32954	03.86	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	03.86	CO	Anzeige / Tastatur Display / Keyboard
				Gepr.			
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr.	802.3662.01 EE
				zu Gerät CMT		reg. i. V.	erste Z.

iB!
gefährdete
lordern eine
habung.
SD!
nsitive
a special

Ansicht und Leitungsführ
View of tracks on solder

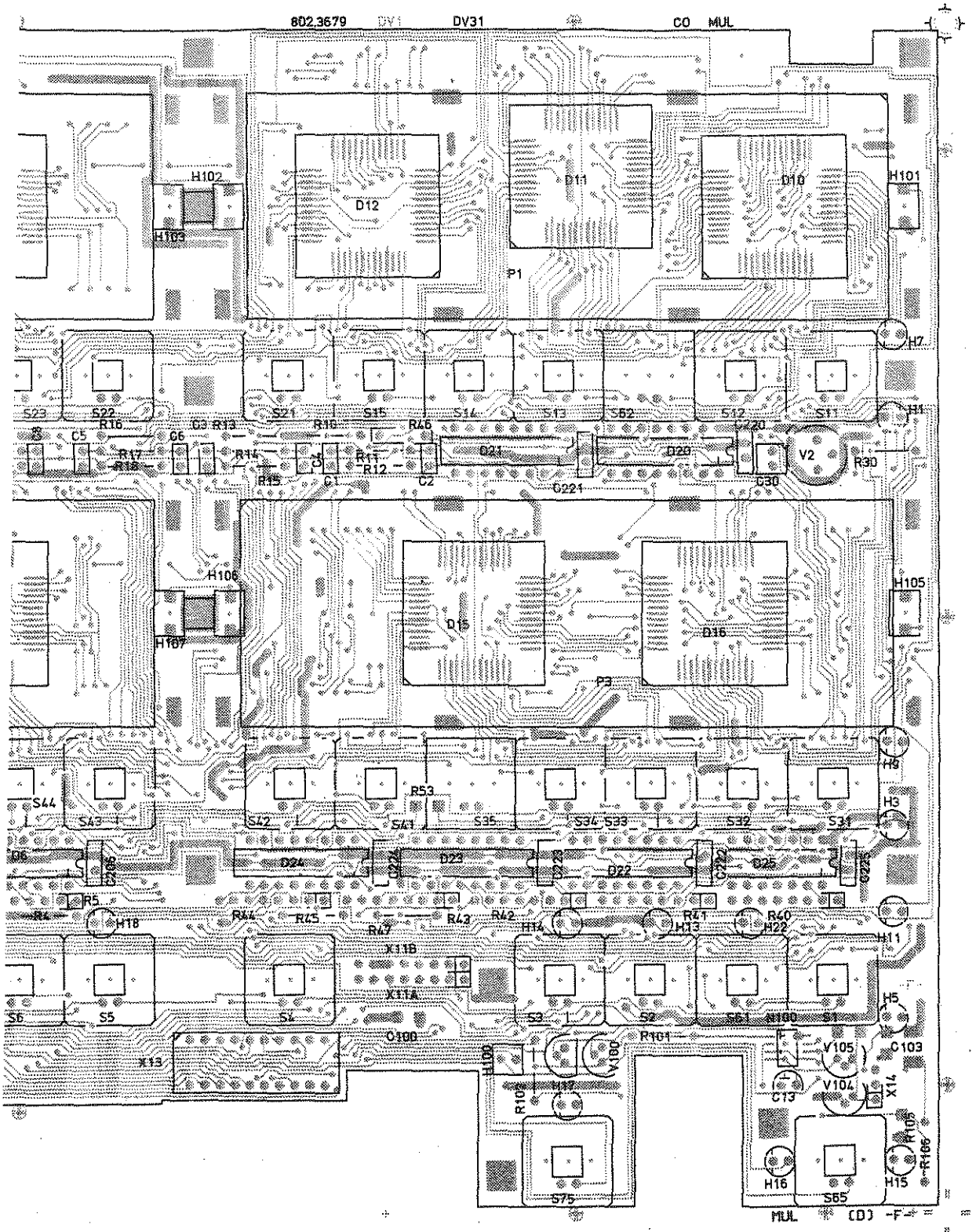


(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

hrung Lötseite
r side



I	32954	03.86	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	03.86	CO	Anzeige / Tastatur Display / Keyboard
				Gepr.			Z
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr.	802.3662.01 EE
				zu Gerät	CMT	reg. i. V.	802.2020 V
							Blatt-Nr. 3 v. Bl.
							erste Z.

rdete
n eine
ng.

e
cial

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Oscilloscope Module

803.1111.00

Contents

Page

5 Service Manual for Oscilloscope Module 5.1

5.1 Function Description 5.1
5.1.1 Power Pack, Blanking Amplifier and Deflection Amplifier 5.1
5.1.2 Preamplifier 5.2
5.1.3 X/Y Character Generation and Triggering 5.2

5.2 Testing and Adjustment 5.3
5.2.1 Adjusting the Filament Voltage and the Intensity 5.3
5.2.2 Adjusting the Astigmatism 5.3
5.2.3 Adjusting the Blanking 5.3
5.2.4 Adjusting the Time Base and the Deflection Amplifiers 5.4
5.2.5 Adjusting the Preamplifier 5.4

5.3 Logic Tables for Oscilloscope Settings 5.5

5.4 Logic Tables for Control of Character Generation 5.6

5.5 Troubleshooting 5.7

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Oscilloscope Module

(See circuit diagram 803.1211 S, sheet 1 and 2
and circuit diagram 803.1257 S)

5.1 Function Description

The oscilloscope module can be divided into three subgroups:

- Power pack, blanking amplifier and deflection amplifier
- Preamplifier
- X/Y character generation, triggering

5.1.1 Power Pack, Blanking Amplifier and Deflection Amplifier

The power pack generates from a +24-V DC voltage the voltages required for the deflection amplifier (140 V) and the blanking amplifier (+33 V) as well as the acceleration voltage (-1.7 kV) and the filament voltage (6.3 V) for the CRT. The DC voltage is converted to the required values by a pulsewidth-controlled DC push-pull converter.

The HT voltage for the CRT is regulated in order to prevent picture distortions as a result of varying beam acceleration. Since the other voltages are also controlled at the same time, the filament voltage can be adjusted by adjusting the HT voltage. The control voltage is generated using a high-impedance voltage divider from which the voltages for the intensity and focus are also tapped.

The blanking amplifier supplies the voltage required to suppress the flyback and undesired signals. A transistor switches a voltage generated by the DC converter to the cathode of the CRT for this purpose. An opto-isolator is used for the control of the cathode voltage since the cathode is at a high negative potential. The blanking frequency is increased by additional capacitive coupling of the blanking signals.

The deflection amplifier applies the voltages required for beam deflection to the CRT plates. The differential cascode amplifiers have a high cut-off frequency with a low working current. The amplifiers for X and Y deflection are almost identical in design. The X and Y positions of the beam can be adjusted by superimposing an adjustable DC voltage.

5.1.2 Preamplifier

The preamplifier adjusts the amplitude of the signals to be displayed for the Y amplifier. The signals can be applied either externally with AC or DC coupling or internally with fixed AC coupling. A total of 15 different gain settings can be selected corresponding to the signals to be displayed.

5.1.3 X/Y Character Generation and Triggering

With the oscilloscope in operation the X and Y deflection coefficients are output on the screen with the corresponding units (mV, kHz, %) in order to provide the user with information on the operating status. For this purpose the RAMs are written by the instrument processor and cyclically read out by the oscilloscope. The characters are controlled in the X direction via a 7-bit D/A converter and in the Y direction via a 3-bit D/A converter. One bit of the RAMs is used for blanking.

The characters are basically written during the flyback; the characters are thus synchronized with the standard screen display so that no gaps are produced in the individual displays as can occur in chop mode.

Triggering is automatic. Part of the signal applied to the Y amplifier controls a selectable current source via a comparator. The current source charges a capacitor which results in a linearly increasing voltage used for the X deflection. If no voltage is applied to the Y amplifier, a self-oscillating oscillator is selected which then drives the trigger circuit.

5.2 Testing and Adjustment

Note: Care must be taken when testing and adjusting the oscilloscope because of the high voltages present.

5.2.1 Adjusting the Filament Voltage and the Intensity

Settings:
- → Switch on instrument
- → Set intensity control R28 to minimum (fully counterclockwise)
  Allow approx. 5 min to warm up

Checkpoints:
- → Cathode of V18 (-)
- → Cathode of V15 (+)

Adjustments:
- → Adjust R29 so that a picture is just no longer visible
- → Adjust filament voltage to 6.2 V using R6
- → Set R28 to maximum (fully clockwise)
- → Adjust R27 until the filament voltage is 6.35 V
- → Check the dark position of R29

5.2.2 Adjusting the Astigmatism

Settings:
- → Switch on instrument
- → Set average intensity

Checkpoint:
- → Screen

Adjustment:
- → Optimize the picture sharpness in the centre and at the edges alternately using the R25 (focusing) and the R43 (astigmatism)

5.2.3 Adjusting the Blanking

Settings:
- → Switch on instrument
- → Set maximum brightness
- → Select maximum deflection frequency
- → Apply a 20-kHz sinewave signal to the external input

Checkpoint:
- → Screen

Adjustment:
- → Suppress the flyback using R36

5.2.4 Adjusting the Time Base and the Deflection Amplifiers

Settings:
- → Switch on instrument
- → Apply 1 V, 1 kHz to the external input

Checkpoint:
- → Screen

Adjustments:
- → Position the arrow on the screen using R61 and R64 such that it is located above the labelling of the selected function
- → Adjust the X deflection coefficient corresponding to the applied frequency using R208
- → Adjust the Y position of the arrow using R84 such that it is just visible above the bottom edge of the screen
- → Adjust the Y deflection coefficient corresponding to the applied amplitude using R81

5.2.5 Adjusting the Preamplifier

Settings:
- → Switch on instrument
- → Set maximum Y sensitivity
- → Select internal or external input
- → Set R146 (Y position) to centre position

Checkpoint:
- → Screen

Adjustment:
- → Position the beam in the center of the screen using R101 (internal) or R112 (external).

5.3 Logic Tables for Oscilloscope Settings

Function		D202				
		7	14	13	12	11
Time base in ms/div	20	L	L	L	H	L
	10	H	L	L	H	L
	5	L	H	L	H	L
	2	H	H	L	H	L
	1	L	L	H	H	L
	0.5	H	L	H	H	H
	0.2	L	H	H	H	H
	0.1	L	L	H	L	H
	0.05	H	L	H	L	H
	0.02	L	H	H	L	H
	0.01	H	H	H	L	H

Function		D5						
		4	5	6	7	14	13	12
X deflection in V/div (external)	10	H	H	H	H	H	H	L
	5	H	H	H	H	H	H	H
	2	H	H	H	H	L	H	H
	1	H	H	H	L	L	H	H
	0.5	H	H	H	H	H	L	H
	0.2	H	H	H	H	L	L	H
	0.1	H	H	H	L	L	L	H
	0.05	L	L	H	L	L	L	H
	0.02	L	H	L	L	L	L	H
	0.01	H	L	L	L	L	L	H
	0.005	L	L	L	L	L	L	H

Function		D5	D1		
		11	4	5	6
Switchover	Internal	L	H		
	External	H	L		
Coupling	External AC			L	
	External DC			H	
LED	On				L
	Off				H

Function	D203						
	4	5	6	7	14	13	12
X coordinate	0 LSB 1	0 1	0 1	0 1	0 1	0 1	0 MSB 1

Function		D203	D204			
		11	4	5	6	7
Y coordinate		0 LSB 1	0 1	0 1	0 MSB 1	
Z signal On Off						0 1
Reset address counter	$\overline{\text{RESET}}$ RESET		0 1			
Chip select	CS $\overline{\text{CS}}$			0 1		
Load RAM	$\overline{\text{LADEN}}$ LADEN				0 1	

5.5 Troubleshooting

no picture

Current drain of +24 V <0.2 A ?

→ No → N1, V1, V2, transformer

Yes ↓

HT voltage present ?

→ No → N1, V1, V2, transformer

Yes ↓

Remove V1, picture present ?

→ No → N1, V1, V2, transformer

Yes ↓

Blanking amplifier, deflection amplifier

No or incorrect character generation

Control logic according to table, Section 5.4 ?

→ No → D202, D203

Yes ↓

Address counter (P207) OK ?

→ No → D209, D225

Yes ↓

Switchover pulses at D222/12 ?

→ No → N200, N201, D223, D225

Yes ↓

Blanking OK ?

→ No → N207, blanking amplifier

Yes ↓

RAMs D206, D207, D208

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum / Date	Schaltteilliste für / Parts list for	Sachnummer / Stock No.	Blatt / Page
	07	0885	ZE OSCILLOSCOPE	803.1111.01 SA	1

Kennzeichen / Component No.	Benennung/Beschreibung / Designation	Sachnummer / Stock No.	enthalten in / contained in
A24	ED OSCILLOSCOP-TASTATUR KEYBOARD	803.1170.02	
A25	ED SCOPE	803.1211.02	
A26	ED X/Y ZEICHENERZEUGUNG X/Y MARKER GENERATION	803.1257.02	
V1	AT C312P31B OSC.ROE CATHODE RAY TUBE NEC C312P31B	803.0873	
W52	DX KABEL (W52) CABLE (W52)	803.2053	
W55	DX COAX-KABEL (W55)	803.2076	
X216	FR ROEHRENFASSUNG 14P(12) TUBESOCKET VALVO 55589/55594	288.5934	803.2053
			- ENDE -

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	05	0985	ED OSCILLOSCOPE-TASTATUR KEYBOARD	803.1170.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
H7	AF HLMP1401 LED GE RD3 LED HEWLETT-P. HLMP-1401	AF 235.4604	
R1	RS 10K 10%LIN 0,5W L9 POT. 10K 10%LIN 0,5W	803.2047	
S1	SB TASTER 1XA OHNE KNOPF PUSHBUTTON SWITCH SIEMENS STB11 M.LED-LOECHERN	SB 238.3850	
BIS/TO S7			
X210	DX STECKEREINHEIT CONNECTOR UNIT	803.2030	
X212	FR JC-FASSUNG 16 POLIG 16-PIN IC-SOCKET PRECICONT USO16T	FR 249.6091	
X214	FR IC-FASSUNG 20POL SOCKET PRECICONT USO20T	FR 092.7142	
			- ENDE -

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteiliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	19	0787	ED SCOPE	803.1211.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CE 220UF+-20%25VRD10X12,5 ELECTROLYTIC CAPACITOR PANASONIC ECE-A1ESS-221	801.8331	
C2	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C5	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C10	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C11	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR RESISTA QBX619/10NF/2KV	CC 022.0710	
C12	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR RESISTA QBX619/10NF/2KV	CC 022.0710	
C13	CC 10NF+50-20%HDK6000RD19 CERAMIC CAPACITOR RESISTA QBX619/10NF/2KV	CC 022.0710	
C14	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	
C15	CK 100NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-410/0	CK 006.5033	
C16	CK 100NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-410/0	CK 006.5033	
C17	CK 100NF+-20%400V QUADER PLASTIC-FOIL CAPACITOR ERO MKT 1822-410-40-6	CK 006.5256	
C18	CC 47PF+-10%6KV15N750 CERAMIC CAPACITOR RESISTA QFU615-47PF+10%	CC 022.1051	
C19	CC 47PF+-10%6KV15N750 CERAMIC CAPACITOR RESISTA QFU615-47PF+10%	CC 022.1051	
C20	CC 47PF+-10%6KV15N750 CERAMIC CAPACITOR RESISTA QFU615-47PF+10%	CC 022.1051	
C21	CC 1NF+50-20%2KV9RD K6000 CERAMIK DISC CAPACITOR RESISTA SDRU RBX609 1OOOP2KV	570.7744	
C22	CK 100NF+-20%250V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-410/2	CK 006.5179	
C23	CK 100NF+-20%250V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-410/2	CK 006.5179	
C24	CC 1NF+50-20%2KV9RD K6000 CERAMIK DISC CAPACITOR RESISTA SDRU RBX609 1OOOP2KV	570.7744	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C30	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C31	CC 1,2NF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 122	CC 087.7031	
C32	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C33	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C40	CC 33NF+-10%50V5K1200VIEL CERAMIC CAPACITOR UNION CARB CK05BX333K	CC 084.5315	
C41	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C42	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C50	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C51	CC 18PF+-2%3X4NPO CAPACITOR VALVO 2222 678 10189	CC 087.6458	
C52	CC 68PF+-2%6X7NPO CAPACITOR VALVO 2222 678 10689	CC 087.6529	
C53	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C54	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C55	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C56	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C57	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C60	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C61	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C62	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C63	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C64	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C65	CC 680PF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 681	CC 087.7019	
C66	CC 680PF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 681	CC 087.7019	
C70	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C71	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C72	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C73	CE 100UF+-20%25V RD8X9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C74	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C75	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
D1	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D2	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D3	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D4	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D5	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
K1	SR 5V360OHM1MAL1RH-JC-GEH RELAY CLARE PRME 15.005	SR 412.0027	
L1	LD 50UH BEI 0,3A 2,9 OHM CHOKE SIEMENS B82111-A-C17	LD 026.4649	
L2	LD 50UH BEI 0,3A 2,9 OHM CHOKE SIEMENS B82111-A-C17	LD 026.4649	
L3	LD 270 UH10%25,0OHM0,047A CHOKE DELEVAN DROSSEL1025-78	LD 067.3153	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L4	LD 270 UH10%25,0OHM0,047A CHOKE DELEVAN DROSSEL1025-78	LD 067.3153	
N1	BO SG3524BN 0A1 SCH.REGL REG.PULSE WIDTH MODULATOR SILICON GE SG3524BN	BO 099.8596	
N2	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N3	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N10	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N11	BJ TL607CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL607CP	BJ 339.6160	
N12	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N13	BJ TL607CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL607CP	BJ 339.6160	
N14	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL604CP	BJ 300.6199	
N15	BO NE5532AFE 2XL.N.OPAMP OPERATIONAL AMPLIFIER VALVO NE5532AFE	BO 356.0450	
N16	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
N17	BO RC4558DN 2X OPAMP OPERATIONAL AMPLIFIER RAYTHEON RC4558DN	BO 475.1672	
O109	VL STECKLOETOESE 7,5X1,1 PLUG-IN SOLDERING LUG - R&S-ZCHNG.078.2747	VL 078.2747	
BIS/TO O114			
O212	VL STECKLOETOESE 7,5X1,1 PLUG-IN SOLDERING LUG - R&S-ZCHNG.078.2747	VL 078.2747	
P1	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
BIS/TO P8			
R1	RL 0,35W 9,09KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/9,09K-F-C	RL 082.2177	

ROHDE&SCHWARZ	ÄZ.	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	19	0787	ED SCOPE	803.1211.01 SA	5

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R2	RL 0,35W 6,04KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/6,040HM-F-C	RL 082.6089	
R3	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R4	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R5	RL 0,35W22,6KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/22,6K-F-C	RL 082.2219	
R6	RS 0,5W20KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-203	RS 087.7577	
R7	RL 0,35W 4,12KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,12K-F-D	RL 083.1051	
R8	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R9	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R21	RF 0,5 W 3,9 MOHM +-5% DEPOS.-CARBON RESISTOR RESISTA SK4/3,9M5%	007.1802	
R22	RF 0,5 W 3,9 MOHM +-5% DEPOS.-CARBON RESISTOR RESISTA SK4/3,9M5%	007.1802	
R23	RL 0,35W2,21MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21MOHM 1% TK50	RL 099.8173	
R24	RL 0,35W2,21MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21MOHM 1% TK50	RL 099.8173	
R25	RS 0,25W 2,2MOHM+-30%LIN. POTENTIOMETER RUF 0473-300 2,2MOHM+-30	803.0973	
R26	RL 0,35W1,82MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 1,82MOHM 1% TK50	RL 099.8150	
R27	RS 0,5W1MOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-105	RS 087.7602	
R28	RS 0,25W 1MOHM+-20%LIN. POTENTIOMETER RUF 0473-300 1MOHM+-20%	803.0967	
R29	RS 0,5W1MOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-105	RS 087.7602	
R30	RL 0,35W1,50MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 1,50MOHM 1% TK50	RL 099.8138	
R31	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R33	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R34	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R35	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R36	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-103	RS 247.7903	
R37	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R38	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R39	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R40	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R41	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R42	RL 0,35W 56,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2K-F-C	RL 082.2231	
R43	RS 0,5W50KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-503	RS 247.7910	
R44	RL 0,35W 56,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2K-F-C	RL 082.2231	
R45	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R46	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R47	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R48	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R49	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R50	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R51	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R52	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R53	RL 0,35W25,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/25,5K-F-C	RL 083.1580	
R57	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R58	RL 0,35W 1,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,74K-F-D	RL 083.0784	
R60	RL 0,35W 49,9KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/49,9K-F-C	RL 082.6114	
R61	RS 0,5W50KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-503	RS 247.7910	
R62	RL 0,35W 13,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/13,0K-F-D	RL 083.1368	
R63	RL 0,35W5,76KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,76K-F-C	RL 083.6824	
R64	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-202	RS 247.7884	
R65	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R66	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R67	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R68	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R69	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R70	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R71	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R72	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R73	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R74	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R75	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R76	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R77	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R78	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R80	RL 0,35W 57,6KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/57,6K-F-C	RL 083.6830	
R81	RS 0,5W50KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-503	RS 247.7910	
R82	RL O,35W 13,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/13,0K-F-D	RL 083.1368	
R83	RL 0,35W 5,90KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,90K-F-D	RL 083.1145	
R84	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-102	RS 087.7560	
R85	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R86	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R87	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R88	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R89	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R100	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R101	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-103	RS 247.7903	
R102	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R103	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R104	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R105	RL 0,35W 1,02KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,02K-F-D	RL 083.0610	
R106	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R110	RL 0,35W 806 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/806K-F-C	RL 083.2806	
R111	RL 0,35W 200KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/200K-F-D	RL 083.2235	
R112	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-103	RS 247.7903	
R113	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R114	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R115	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R116	RL 0,35W 1,02KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,02K-F-D	RL 083.0610	
R117	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R118	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R120	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R121	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R122	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R123	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R124	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R125	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R126	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R127	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R128	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R129	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R130	RL 0,35W 200 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200OHM-F-D	RL 083.0049	
R131	RL 0,35W 200 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200OHM-F-D	RL 083.0049	
R135	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R136	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R137	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R138	RL 0,35W 3,01KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,01K-F-D	RL 083.0961	
R139	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R140	RL 0,35W 2,00KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,00K-F-D	RL 083.0826	
R141	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R142	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R143	RL 0,35W 499 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/499OHM-F-D	RL 083.0410	
R144	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R145	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R150	RL 0,35W 51,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/51,1OHM-F-D	RL 082.9536	
R151	RL 0,35W 51,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/51,1OHM-F-D	RL 082.9536	
R152	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R153	RL 0,35W 51,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/51,1OHM-F-D	RL 082.9536	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R154	RL 0,35W 51,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/51,1OHM-F-D	RL 082.9536	
R155	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R156	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R157	RL 0,35W 3,48KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,48K-F-D	RL 083.1016	
R158	RL 0,35W 6,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/6,49K-F-D	RL 083.1168	
R160	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
T1	LU HOCHSP.TRAFO TRANSFORMER	803.1305	
U1	BP SFH601-2 OPT.KOPPL.5KV OPTO COUPLER SIEMENS Q68000-A5058	346.5795	
V1	AM BUZ20 N 100V PMOSF POWER MOSFET SIEMENS BUZ20 C67078-H1302H2	586.8580	
V2	AM BUZ20 N 100V PMOSF POWER MOSFET SIEMENS BUZ20 C67078-H1302H2	586.8580	
V10	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V11	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V12	AG BY709 GL 12KV 4MA RECTIFIER VALVO BY709	254.2761	
V13	AG BY709 GL 12KV 4MA RECTIFIER VALVO BY709	254.2761	
V14	AG 1N5804 GL 100V 2A5 RECTIFIER UNITRODE 1N5804	AG 453.4762	
V15	AG 1N5804 GL 100V 2A5 RECTIFIER UNITRODE 1N5804	AG 453.4762	
V16	AG BYV96E GL1000V 0A8 RECTIFIER VALVO BYV96E	AG 099.9034	
V17	AG BYV96E GL1000V 0A8 RECTIFIER VALVO BYV96E	AG 099.9034	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V18	AE BZX79/C68 0,5W Z-DI ZENER DIODE VALVO BZX79/C68	AE 289.4731	
V19	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V20	AE BZX79/C33 0,5W Z-DI ZENER DIODE VALVO BZX79/C33	AE 012.2632	
V21	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V22	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	
V23	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V24	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V30	AK BF420 NPN300V 100MA TRANSISTOR VALVO BF420	AK 346.5837	
V31	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V32	AK BF420 NPN300V 100MA TRANSISTOR VALVO BF420	AK 346.5837	
V33	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V35	AK BF420 NPN300V 100MA TRANSISTOR VALVO BF420	AK 346.5837	
V36	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V37	AK BF420 NPN300V 100MA TRANSISTOR VALVO BF420	AK 346.5837	
V38	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V40	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
BIS/TO V43			
V44	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V45	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V50	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
BIS/TO V53 V54	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
X210	FR IC-FASSUNG 16 POLIG 16-PIN IC-SOCKET PRECICONT USO16T	FR 249.6091	
X211	FR IC-FASSUNG 16 POLIG 16-PIN IC-SOCKET PRECICONT USO16T	FR 249.6091	
X213	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 3-POLIG/3 PINS	FP 242.3600	
X215	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X217	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 3-POLIG/3PINS	FP 242.3600	
			- ENDE -

ROHDE&SCHWARZ	Äl	Datum / Date	Schaltteilliste für / Parts list for	Sachnummer / Stock No.	Blatt / Page
	11	0387	ED X/Y ZEICHENERZEUGUNG X/Y MARKER GENERATION	803.1257.01 SA	1

Kennzeichen / Component No.	Benennung/Beschreibung / Designation	Sachnummer / Stock No.	enthalten in / contained in
C200	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C201	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C202	CK 56NF+-1,25%63V7,5QUAD CAPACITOR SIEMENS B33531-A5563-F	CK 213.4399	
C203	CK 6,2NF+-1%63V6,3QUX11KP CAPACITOR SIEMENS B33531-A5622-F	CK 340.9053	
C204	CC 10PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09109	CC 087.6429	
C205	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C211			
C212	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C213	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C214	CK 47NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,047UF/5%	CK 099.2917	
C215	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C216	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C217	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C220	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C221	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C222	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C223	CC 100PF+-2%6X9NP0 CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C224	CC 5,6PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09568	CC 087.6393	
C225	CC 5,6PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09568	CC 087.6393	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C226	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
BIS/TO C229			
C230	CK 22NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,022UF/5%	CK 099.2881	
C233	CC 82PF+-2%6X7NPO CAPACITOR VALVO 2222 678 10829	CC 087.6535	
D200	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D201	BL HEF4104BP 4XCONV. 3S LEVEL CONVERTER VALVO HEF4104BP	BL 252.7395	
D202	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D203	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D204	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D205	BL CD4040BE 12B.COUNTER COUNTER RCA CD4040BE	BL 086.7180	
D206	BC TC5514P 1KX4B.SRAM SRAM TOSHIBA TC5514P	344.1411	
D207	BC TC5514P 1KX4B.SRAM SRAM TOSHIBA TC5514P	344.1411	
D208	BC TC5514P 1KX4B.SRAM SRAM TOSHIBA TC5514P	344.1411	
D209	BL CD4047BE MULTIVIBR. MULTIVIBRATOR RCA CD4047BE	BL 349.2980	
D220	BL CD4001BE 4X2INP.NORG NOR GATE RCA CD4001BE	BL 086.6960	
D221	BL CD4093BE 4XSCHM.TRIG SCHMITT-TRIGGER RCA CD4093BE	BL 516.3338	
D222	BL CD4069UBE 6XINVERTER HEXINVERTER RCA CD4069UBE	BL 086.9999	
D223	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	
D224	BL CD4053BE 3X2CH. MUX MULTIPLEXER RCA CD4053BE	BL 565.3080	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D225	BL MC14538BCP 2X MONOFLOP MONOSTABLE MULTIVIBRATOR MOTOROLA MC14538BCP	BL 252.7389	
N200	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N201	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N202	BO LF412CN 2XFET OPAMP OPERATIONAL AMPLIFIER NSC LF412CN	356.0521	
N203	BO LF351N DIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N204	BO LF351N DIFET OPAMP OPERATIONAL AMPLIFIER NSC LF351N	BO 301.6105	
N205	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL604CP	BJ 300.6199	
N206	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL604CP	BJ 300.6199	
N207	BJ TL604CP 2X ANALOGSCH ANALOG SWITCH TEXAS INST TL604CP	BJ 300.6199	
N208	BO ICM7555IPA TIMER TIMER INTERSIL ICM7555IPA	BO 303.9260	
P200	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
P201	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
BIS/TO P207			
P208	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
BIS/TO P210			
R200	RL 0,35W 681 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/381K-F-C	RL 083.2735	
R201	RL 0,35W 340 KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.2458	
R202	RL 0,35W 165 KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.2158	

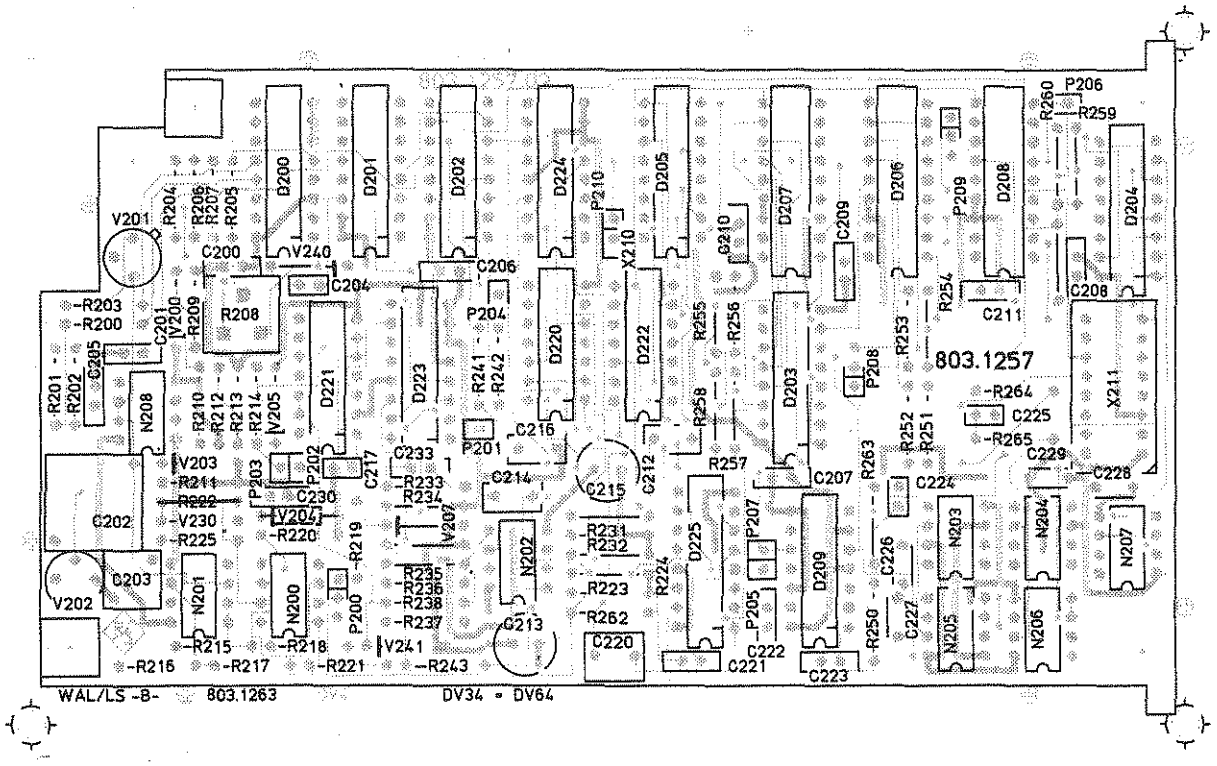
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R203	RL 0,35W 66,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/66,5K-F-C	RL 083.1874	
R204	RL 0,35W 32,4KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/32,4K-F-C	RL 083.1668	
R205	RL 0,35W 16,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/16,2K-F-D	RL 083.1439	
R206	RL 0,35W 6,34KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/6,34K-F-D	RL 083.1151	
R207	RL 0,35W 3,09KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,09K-F-D	RL 083.0978	
R208	RS 0,5W2KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-202	RS 247.7884	
R209	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R210	RL 0,35W 56,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2K-F-C	RL 082.2231	
R211	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R212	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R213	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R214	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R215	RL 0,35W15,2KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207	RL 084.3412	
R216	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R217	RL 0,35W21,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/21,5K-F-C	RL 082.1741	
R218	RL 0,35W 5,62KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/5,62K-F-C	RL 082.2190	
R219	RL 0,35W 4,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,32K-F-D	RL 082.6572	
R220	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R221	RL 0,35W 4,02KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,02K-F-D	RL 083.1045	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R222	RL 0-WIDERSTAND DIN 0204 0-OHM RESISTOR DRALORIC OMA 0204	RL 069.0000	
R223	RL 0,35W 56,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2K-F-C	RL 082.2231	
R224	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R225	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R226	RL 0,35W 18,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/18,2K-F-C	RL 083.1480	
R230	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R231	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R232	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1K-F-D	RL 083.1351	
R233	RL 0,35W 150 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/150K-F-C	RL 083.2129	
R234	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R235	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R236	RL 0,35W 475 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/475K-F-C	RL 083.2593	
R237	RL 0,35W 562 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/562K-F-C	RL 083.2664	
R238	RL 0,35W 9,09KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/9,09K-F-C	RL 082.2177	
R240	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R241	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R242	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R243	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R250	RL 0,35W50,5KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207	RL 084.4419	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R251	RL 0,35W 681 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/381K-F-C	RL 083.2735	
R252	RL 0,35W 332 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/332K-F-C	RL 083.2441	
R253	RL 0,35W 162KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/162K-F-C	RL 082.2154	
R254	RL 0,35W 82,5KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/82,5K-F-C	RL 082.2302	
R255	RL 0,35W 41,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/41,2K-F-C	RL 082.2319	
R256	RL 0,35W20,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20,5K-F-C	RL 082.2325	
R257	RL 0,35W 10,2KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/10,2K-F-C	RL 082.2331	
R258	RL 0,35W 681 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/381K-F-C	RL 083.2735	
R259	RL 0,35W 332 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/332K-F-C	RL 083.2441	
R260	RL 0,35W 162KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/162K-F-C	RL 082.2154	
R261	RL 0,35W 59,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/59,0K-F-C	RL 083.1845	
R262	RL 0,35W 14,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/14K-F-D	RL 083.1374	
R263	RL 0,35W 6,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/6,49K-F-D	RL 083.1168	
R264	RL 0,35W 14,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/14K-F-D	RL 083.1374	
R265	RL 0,35W 6,49KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/6,49K-F-D	RL 083.1168	
V200	AE BZX79/C4V3 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V3	AE 012.2426	
V201	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	
V202	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V203	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V204	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V7	AE 012.2432	
V205	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V7	AE 012.2432	
V207	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V230	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V240	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V241	AE BZX79/C4V7 0,5W Z-DI ZENER DIODE VALVO BZX79/C4V7	AE 012.2432	
X211	DX STECKEREINHEIT	803.2060	
			- ENDE -

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

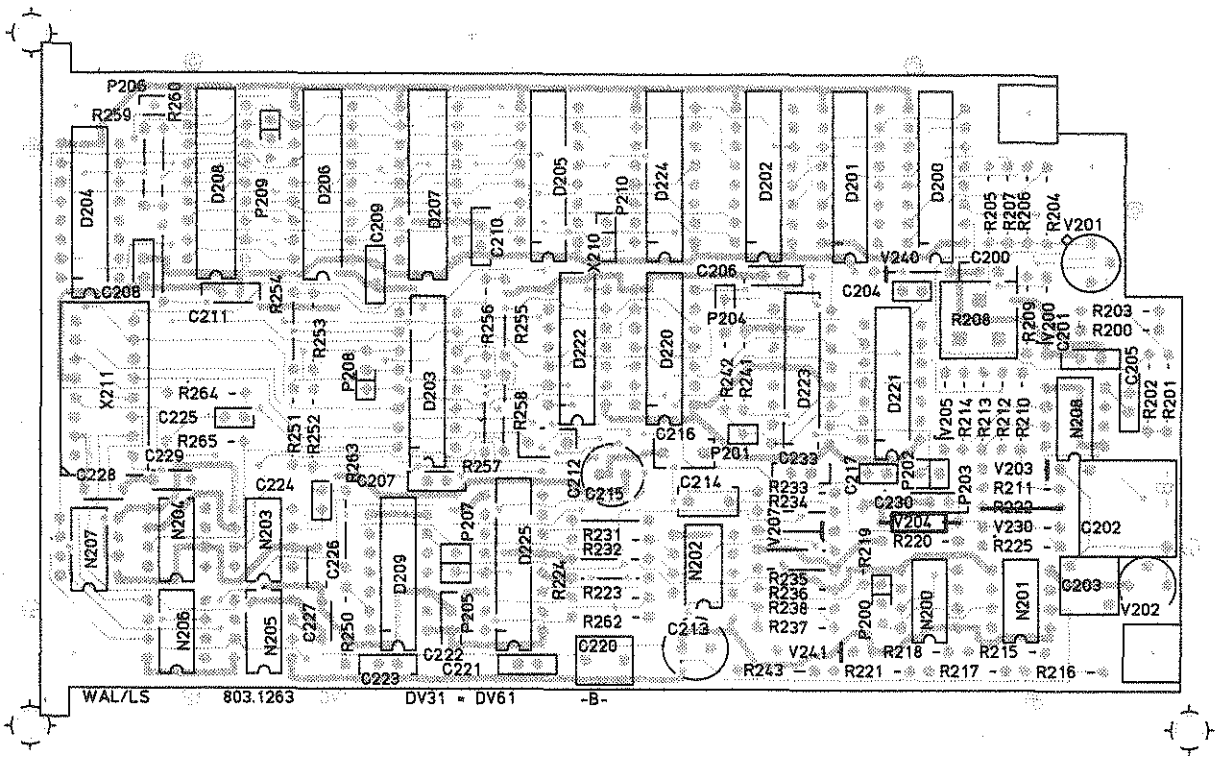


(hierzu HVC 2503)

ACHTUNG: EGB!
Elektrostatisch gefährd
Bauelemente erfordern
besondere Handhabung

ATTENTION ESD!
Electrostatic sensitive
devices require a speci
handling.

Ansicht und Leitungsführung Lötseite
View of tracks on solder side

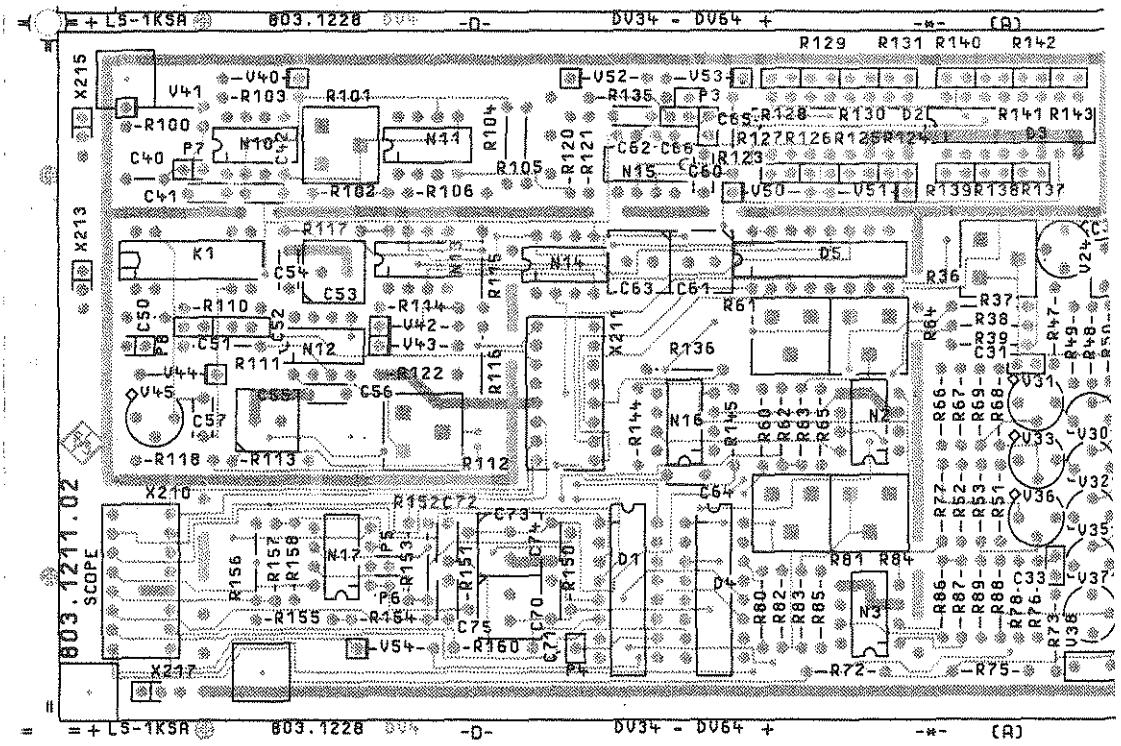


				Maße ohne Toleranzangabe		Maßstab 1:1
						Halbzeug, Werkstoff
				1KGA	Tag	Name
				Bearb.	8.85	LS
				Gepr.		
				Norm		
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 803.1257
				zu Gerät CMT		reg. i. V. 802 . 2020 erste Z. 803.1111

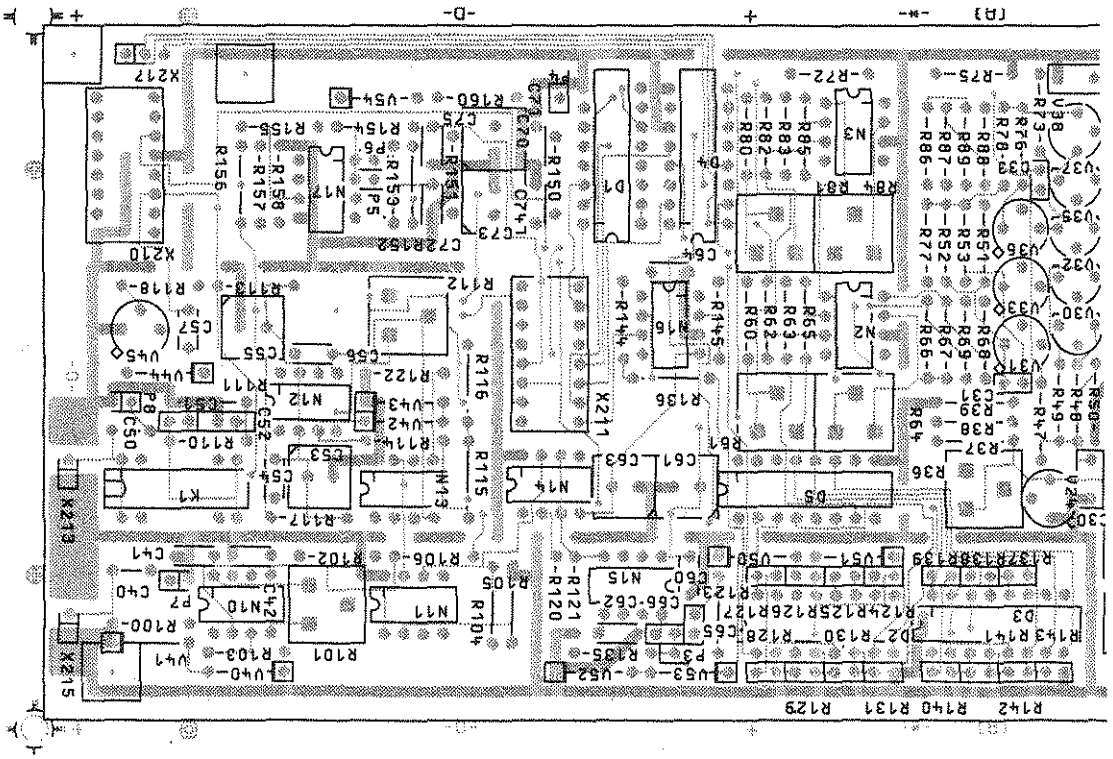
Benennung
XY-Zeichenerzeugung
XY MARKER GENERATION

Blatt-Nr. 2
v. 2 Bl.

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



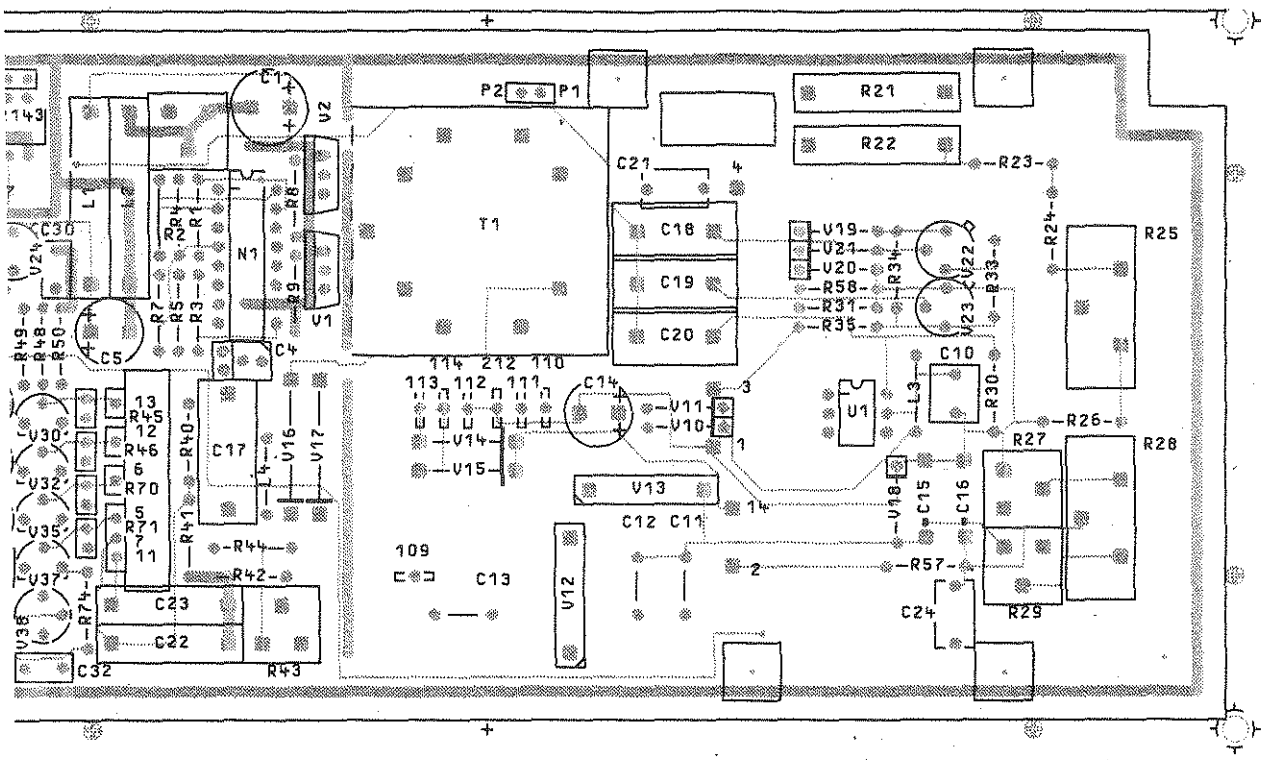
Ansicht und Leitungsführung Lötseite
View of tracks on solder side

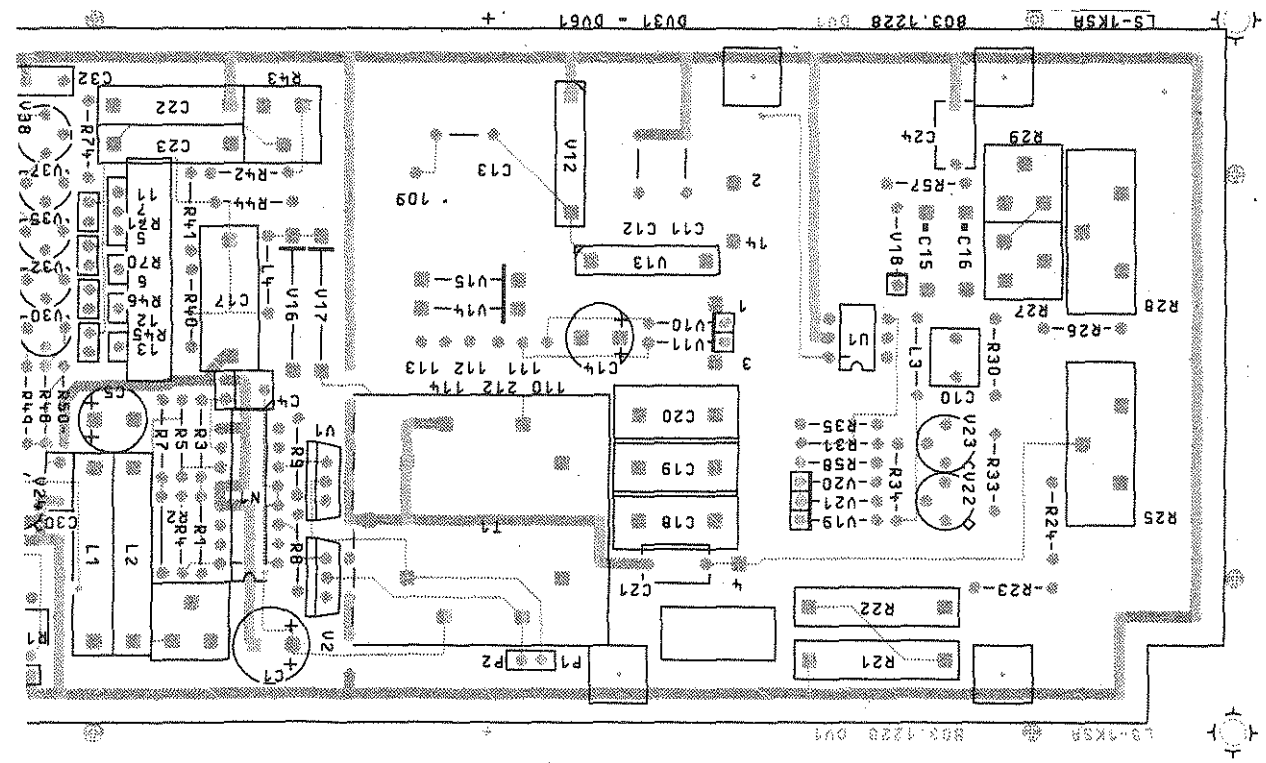


[hierzu HVC 250]

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

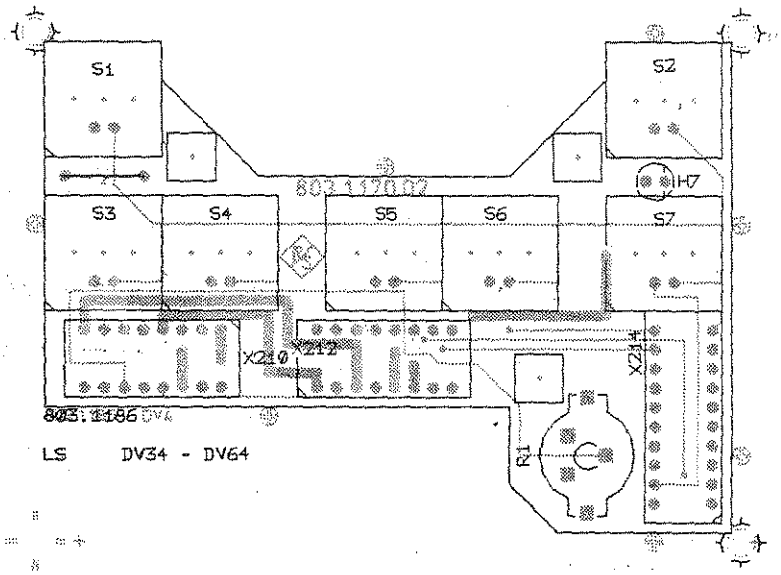




C	38951	05.87	LS	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	05.87	LS	SCOPE
				Gepr.			Z
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 803.1211.01	ED
				zu Gerät CMT		reg. i. V. 802.2020V	erste Z.

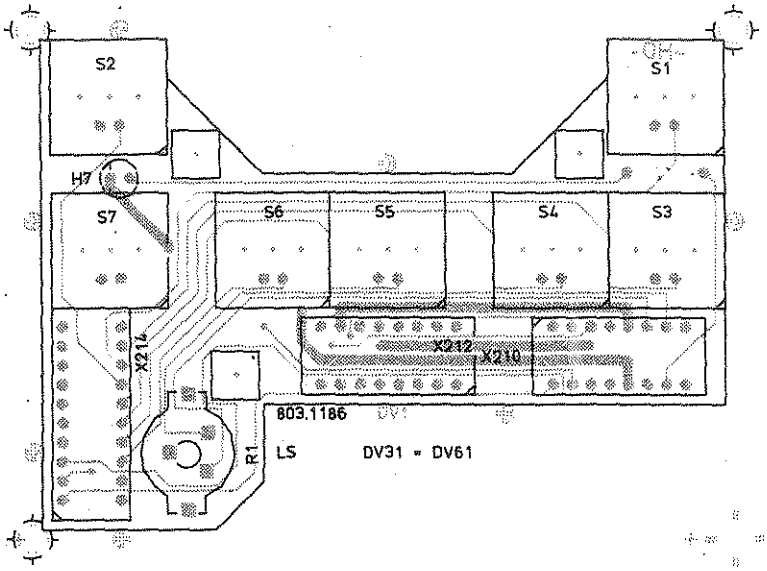
Blatt-Nr. 2 v. Bl.

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



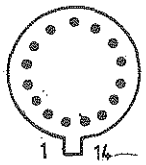
Achtung! MOS-Bauteile
Caution. MOS components

Ansicht und Leitungsführung Lötseite
View of tracks on solder side



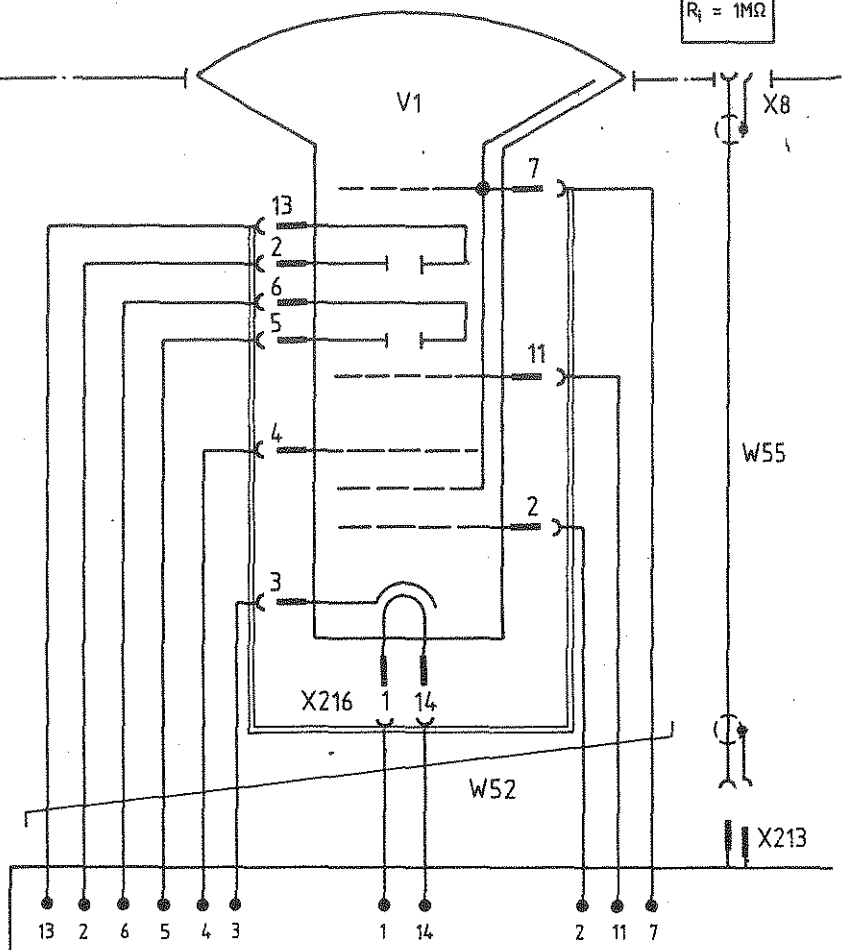
A	32910	8.85	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KGA	Tag	Name	Benennung
				Bearb.	10.84	LS	Oszilloskop - Tastatur Oscilloscope keyboard
				Gepr.			Z
				Norm			
				ROHDE&SCHWARZ			Zeichn.-Nr. 803.1170
							Blatt-Nr. 2 v. Bl.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CMT		reg. i. V. 802.2020 V	erste Z. 803.1111

Frontplatte
Front panel

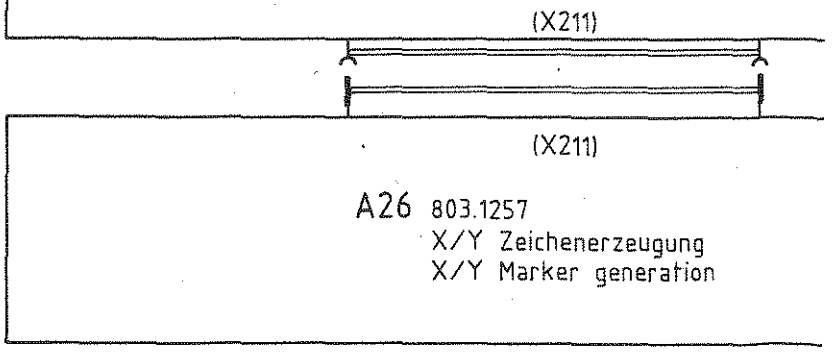


Untersicht
Bottom view

V1



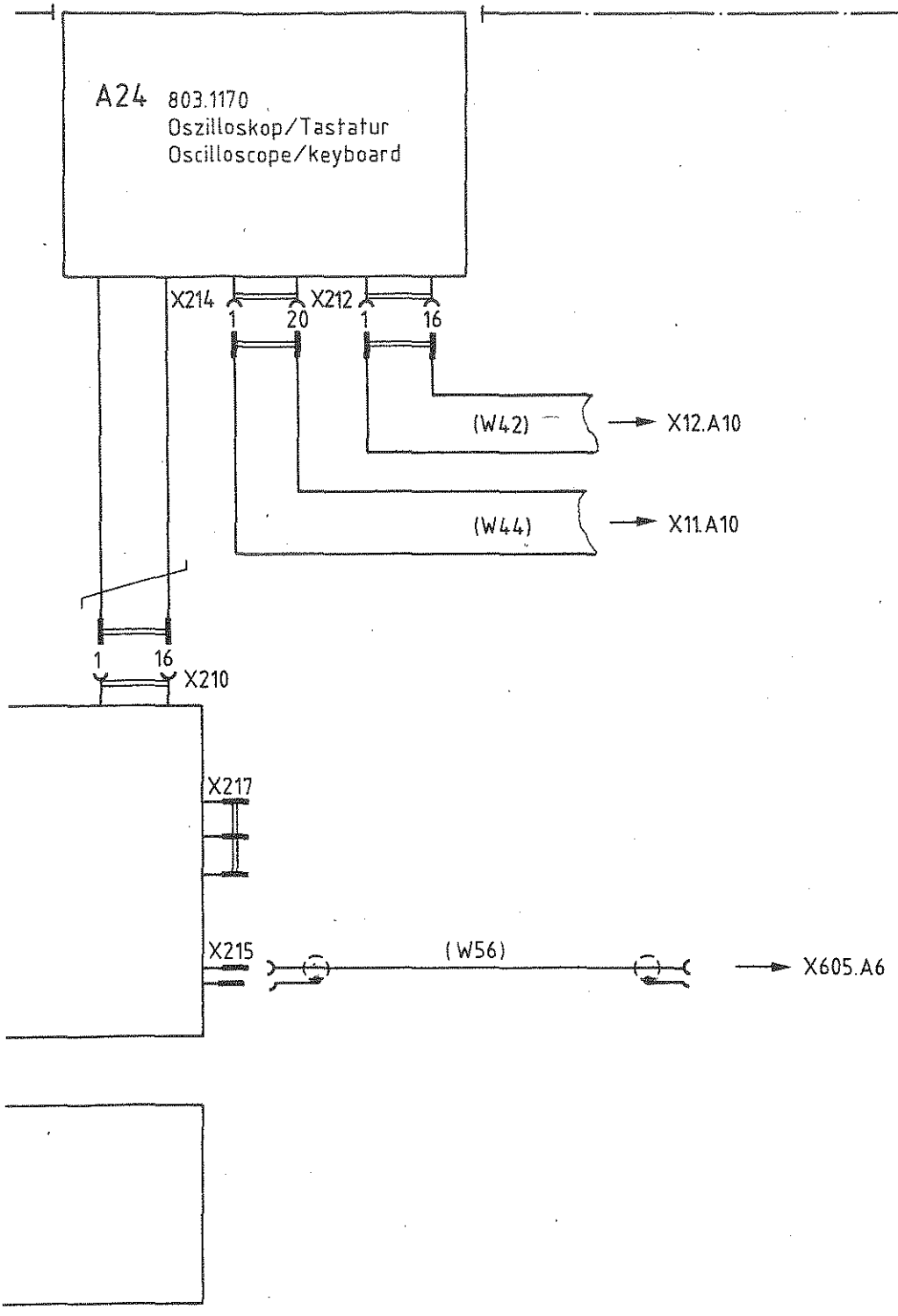
A25 803.1211
SCOPE



A26 803.1257
X/Y Zeichenerzeugung
X/Y Marker generation

ROHDE & SCHWARZ · MUNCHEN

normgepr.



Stromlauf gilt für VAR 02
Circuit diagramm is valid for model 02

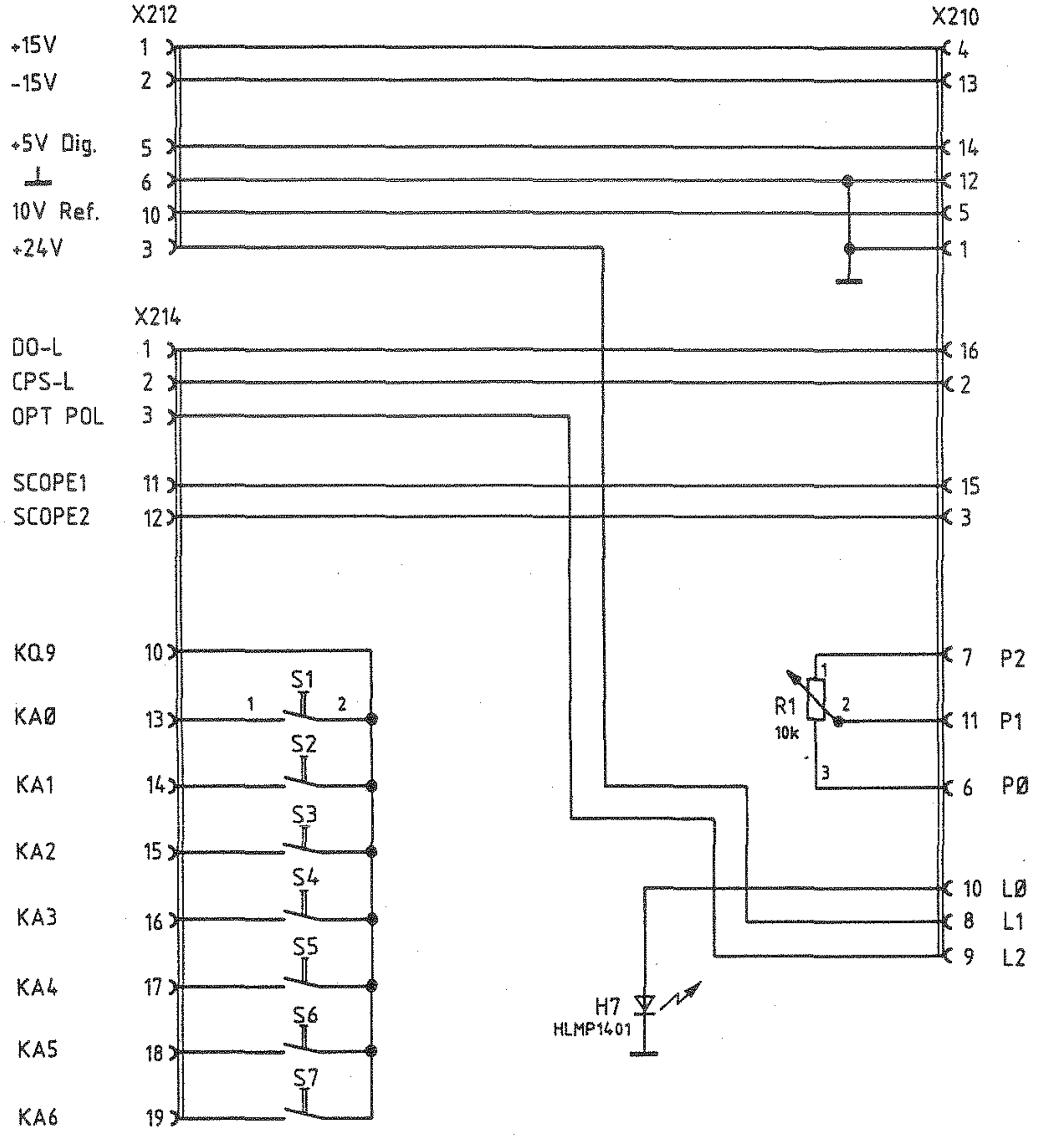
Stromlauf zu
CMT Oszilloskop / CMT Oscilloscope

Z

Zeichn. Nr. 803.1111 S

reg. i.V. 8.02.2020 V

erste Z.



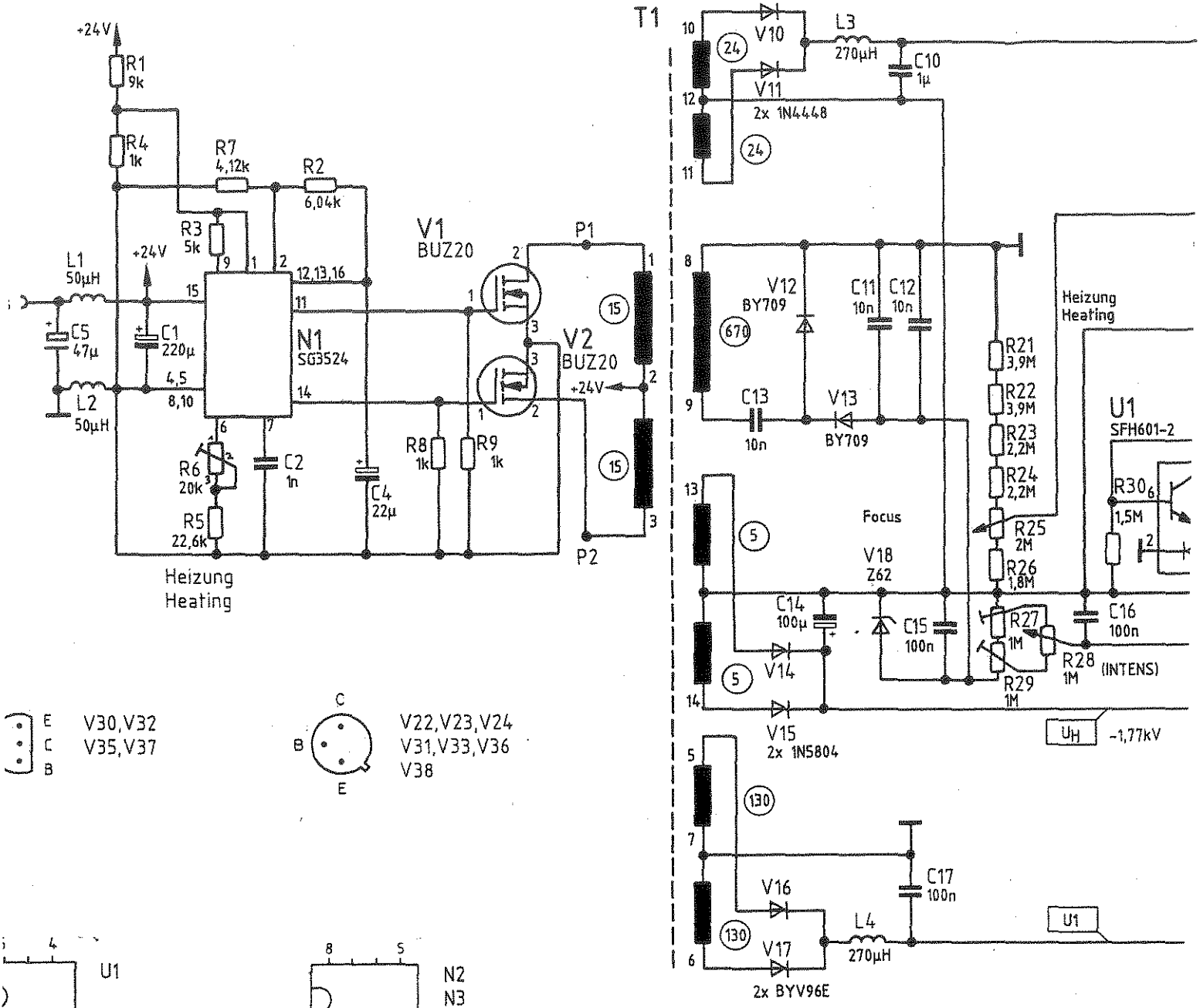
Stromlauf gilt für VAR 02
Circuit diagramm is valid for model 02

A		7.85	CO	1KGA	Tag	Name
				Bearb.	11.84	LS
				Gepr.		
				Norm		
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ zu Gerät CMT		

Benennung: ED-Oszilloskope Tastatur / ED-Oscilloscope keyboard — Z

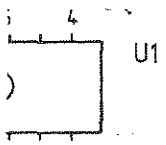
Zeichn.-Nr. 803.1170 S — Blatt-Nr. — v. Bl

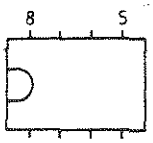
reg. i. V. 802.2020 V — erste Z. 803.1111



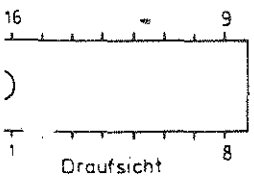
V30,V32
V35,V37

V22,V23,V24
V31,V33,V36
V38

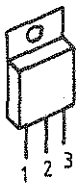




Netzteil und Endstufen
Power supply and output stages

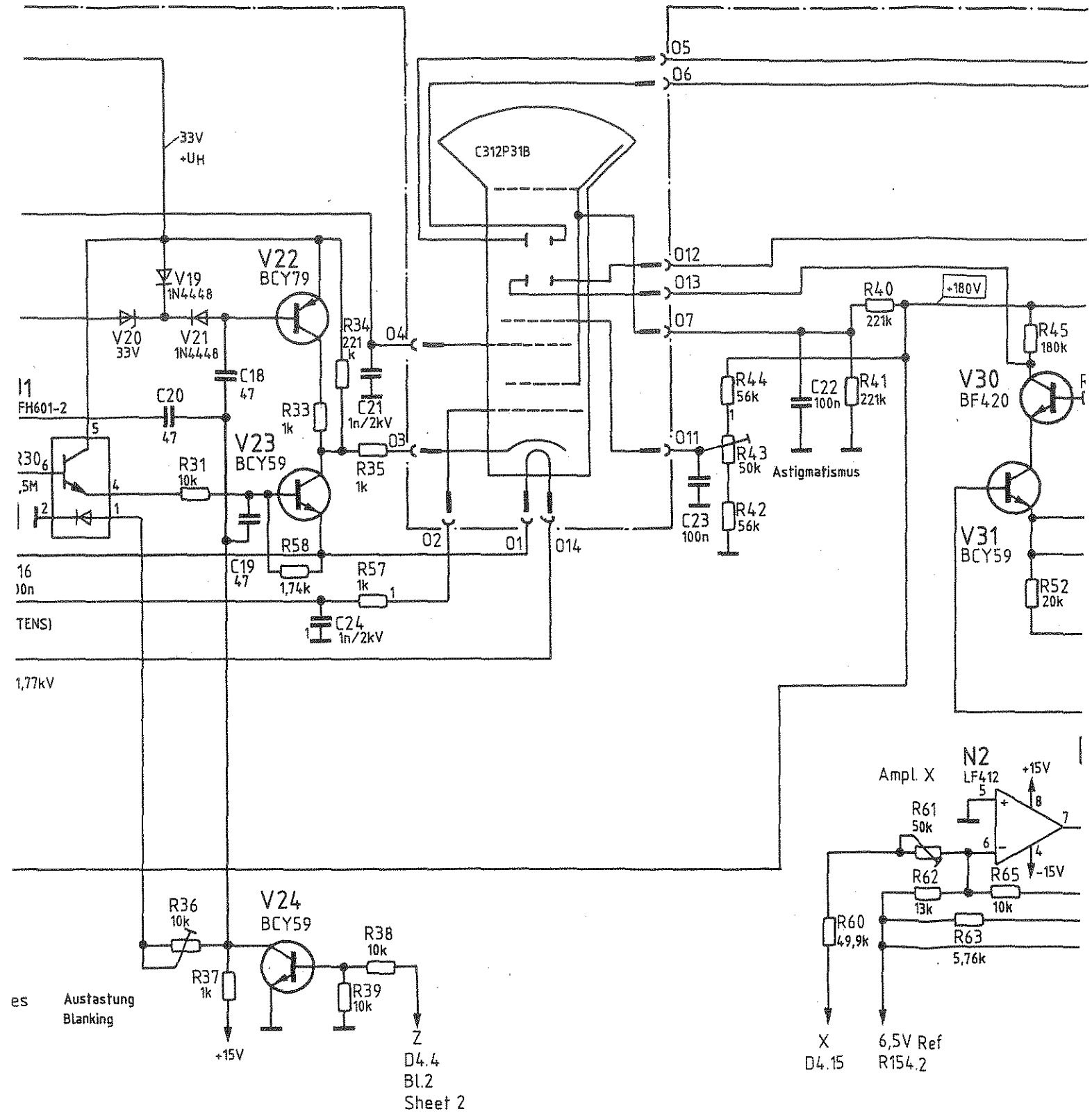


N1



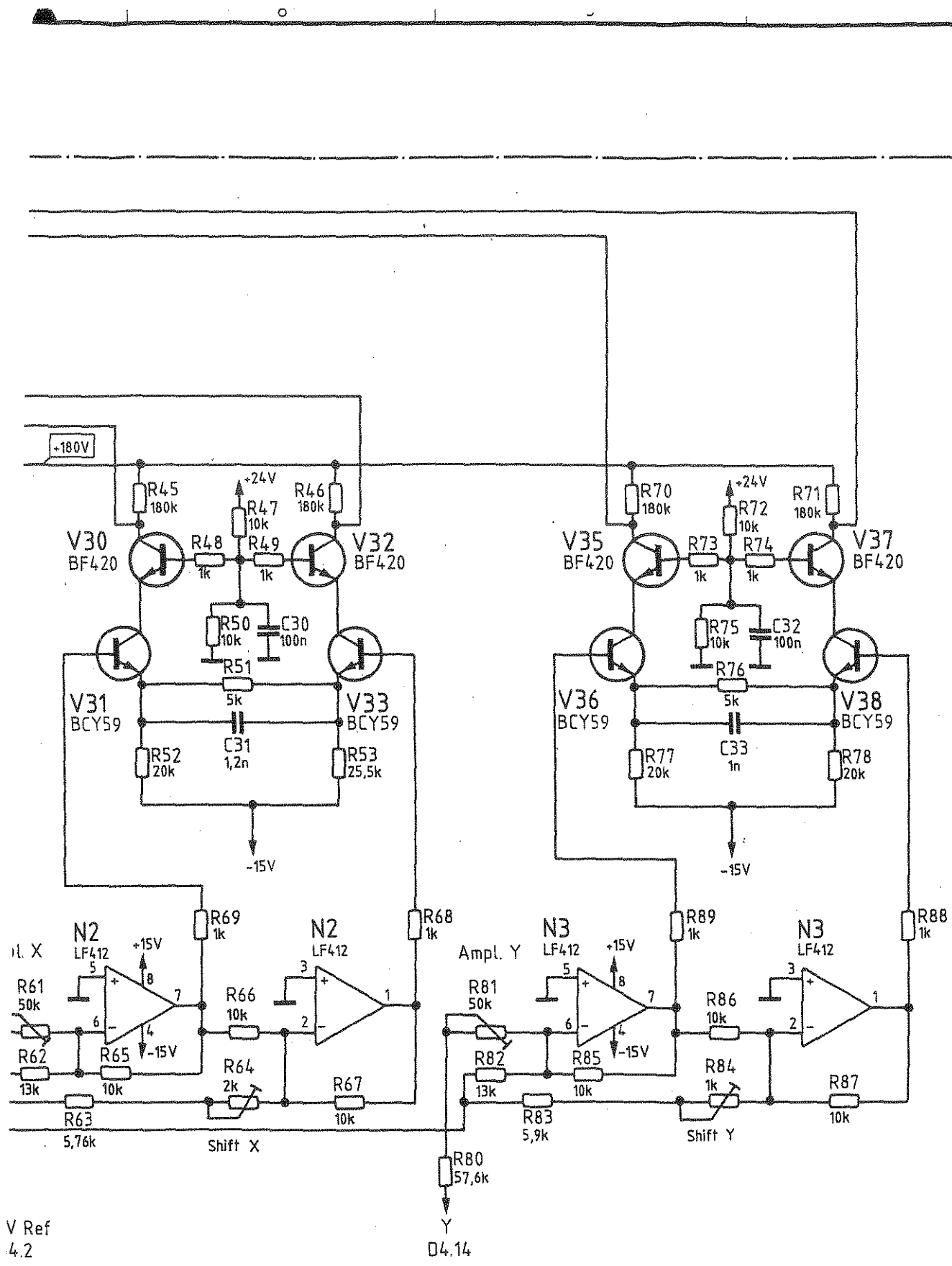
V1,V2

ROHDE&SCHWARZ

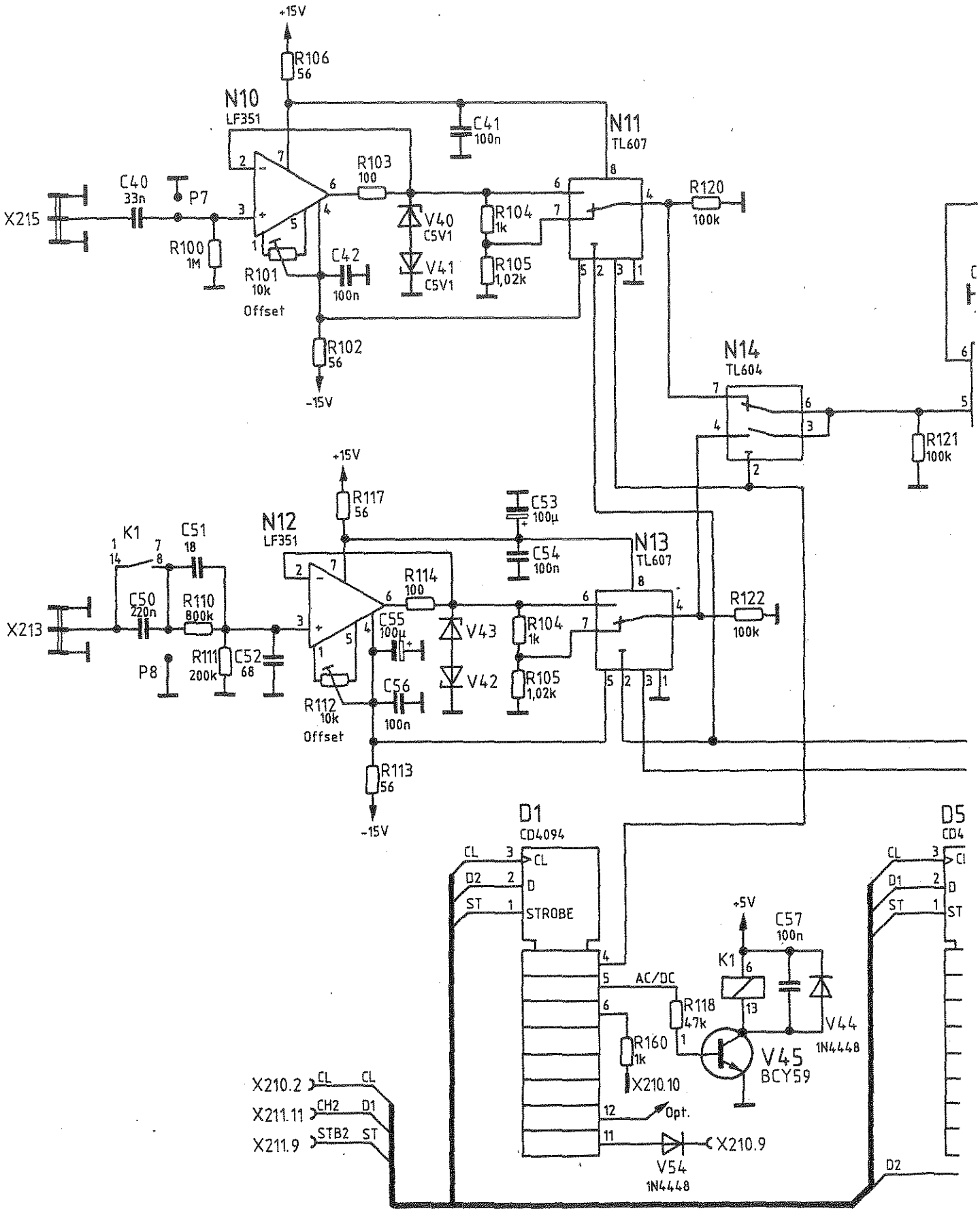


A		7.85	CO	D	35533	11.86	CO	1KGA	Tag	Name	Benennung
B	32954	8.86	CO	E	35547	5.87	IB	Bearb.	7.85	CO	
C	35533	8.86	CO	F	38951	7.87	LS	Gepr.			
And. Zust.	Änderungs-Mitteilung	Datum	Name	And. Zust.	Änderungs-Mitteilung	Datum	Name	Norm			

IWARZ

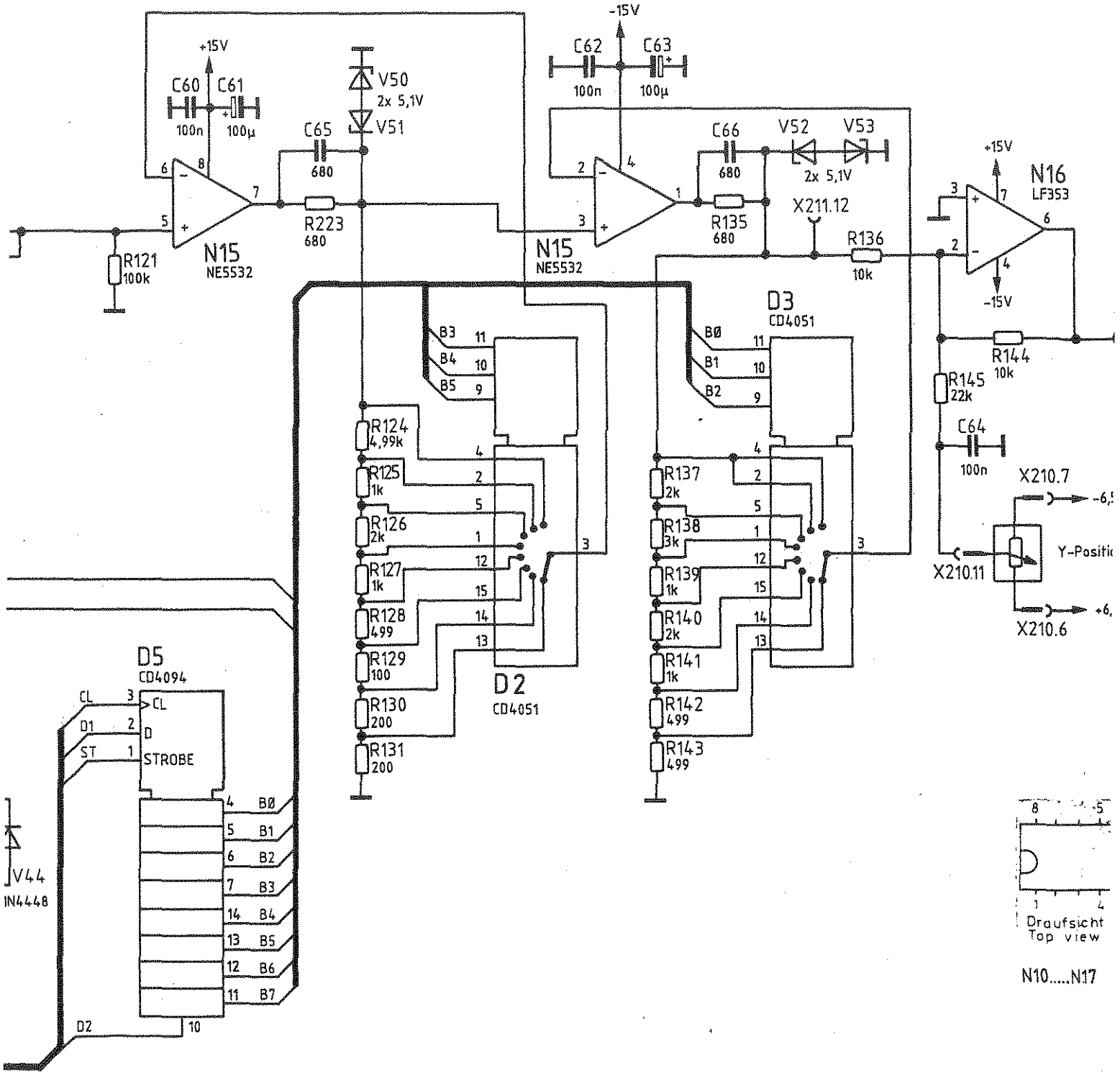


Benennung		Zeichn.-Nr.		Blatt-Nr
Scope	Z	803.1211 S		1 v 2 Bl
zu Gerät: CMT		reg. i. V. 802.2020 V	erste Z 803.1111	

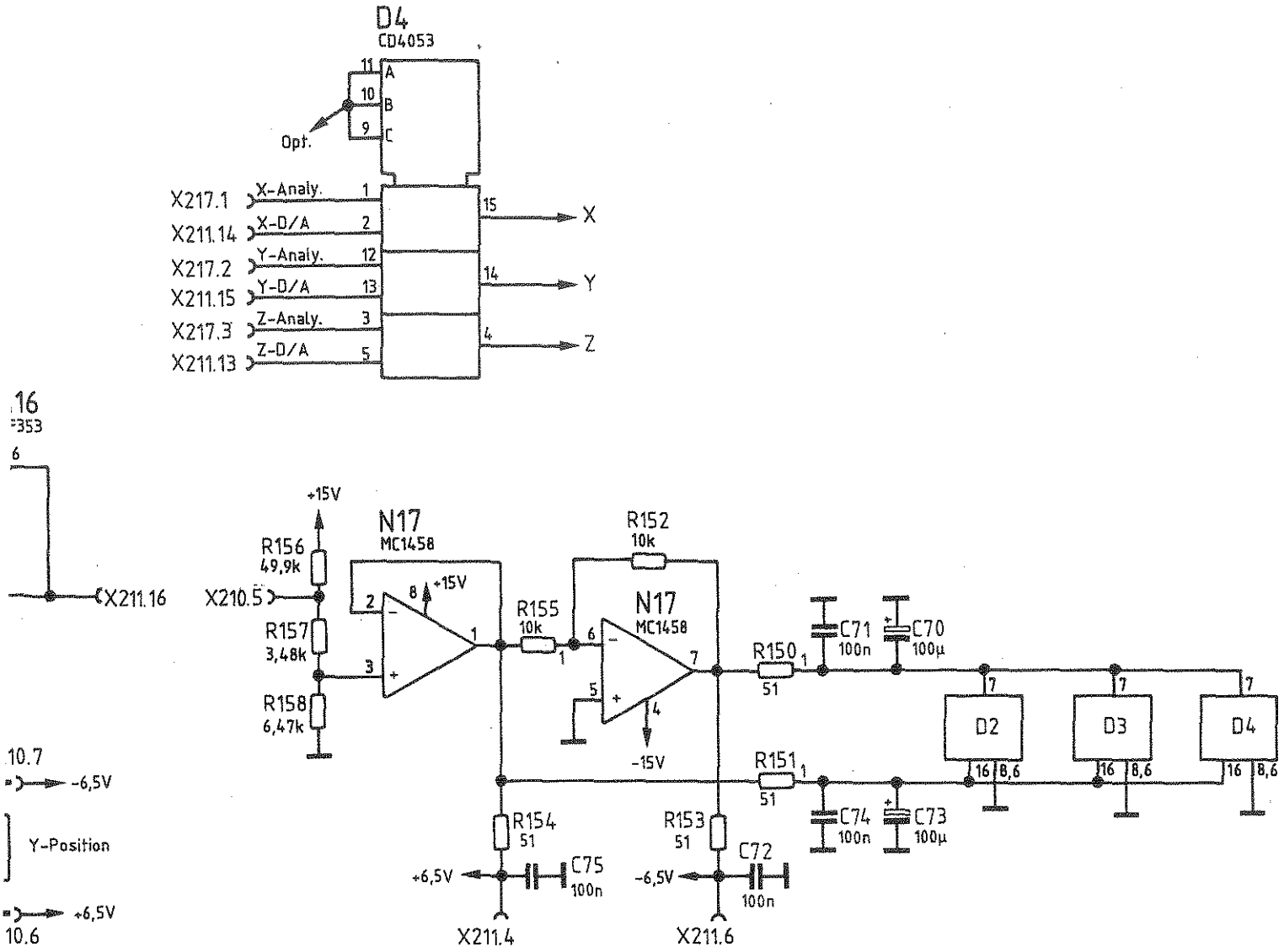


Zeichn.-Nr.

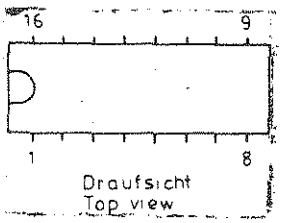
ROHDE



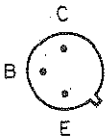
ROHDE&SCHWARZ	A		7.85	CO					1KSA	Tag	Nc
	B	32954	4.86	CO					Bearb.	7.85	C
									Gepr.		
	And. Zust.	Änderungs-Mitteilung	Datum	Name	And. Zust.	Änderungs-Mitteilung	Datum	Name	Norm		



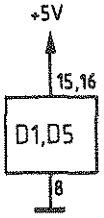
10.....N17



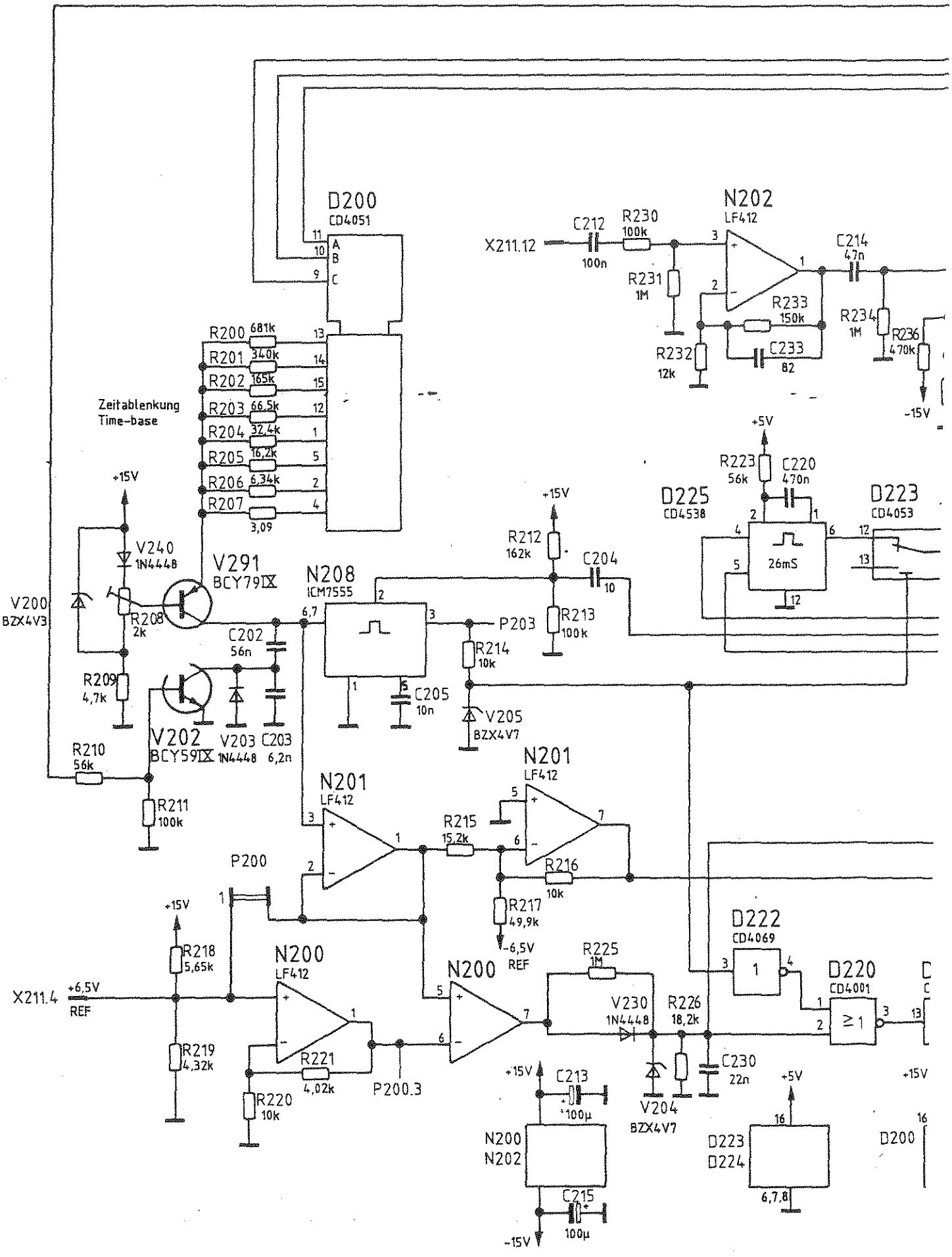
D1,D2,D3,D4,D5

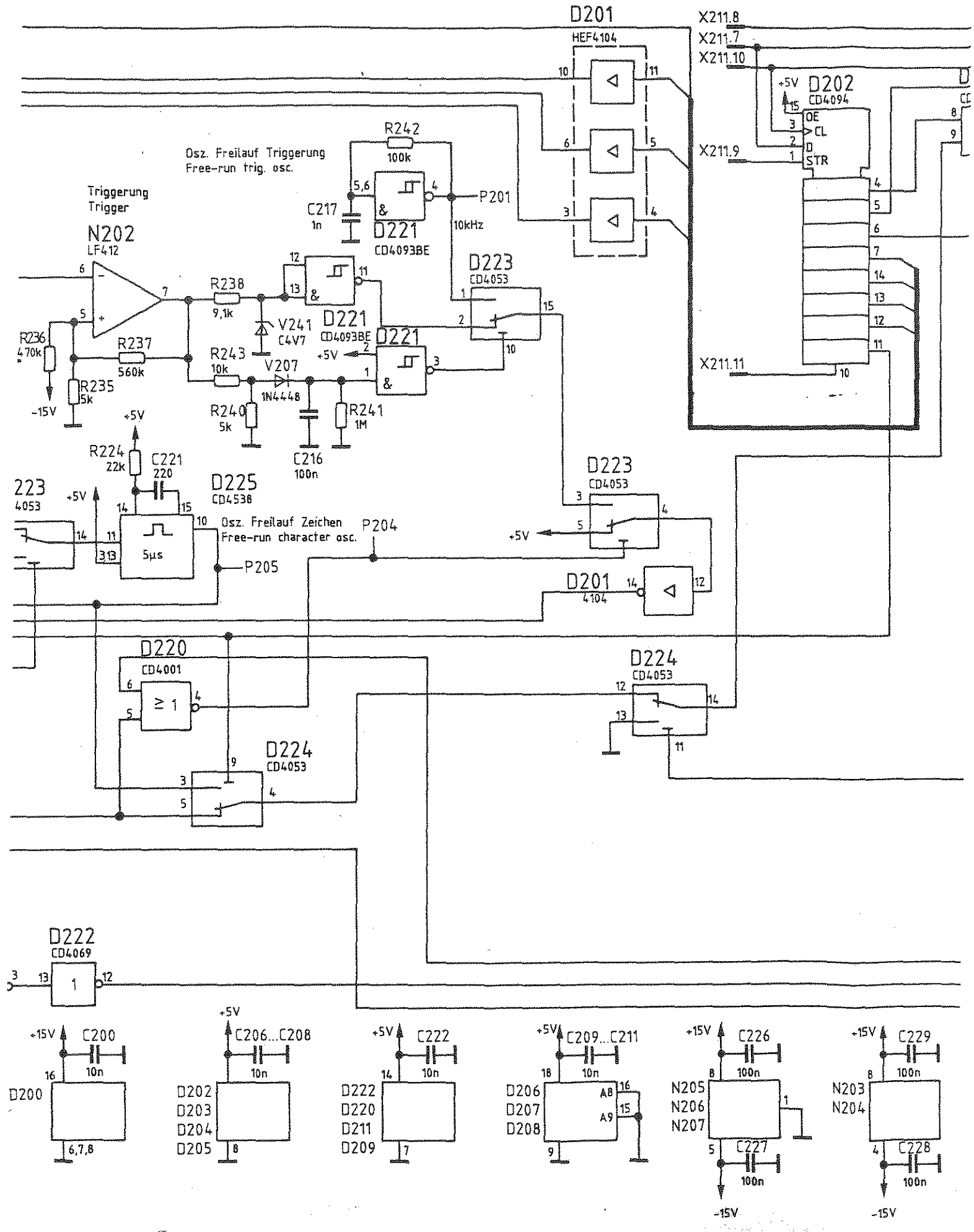


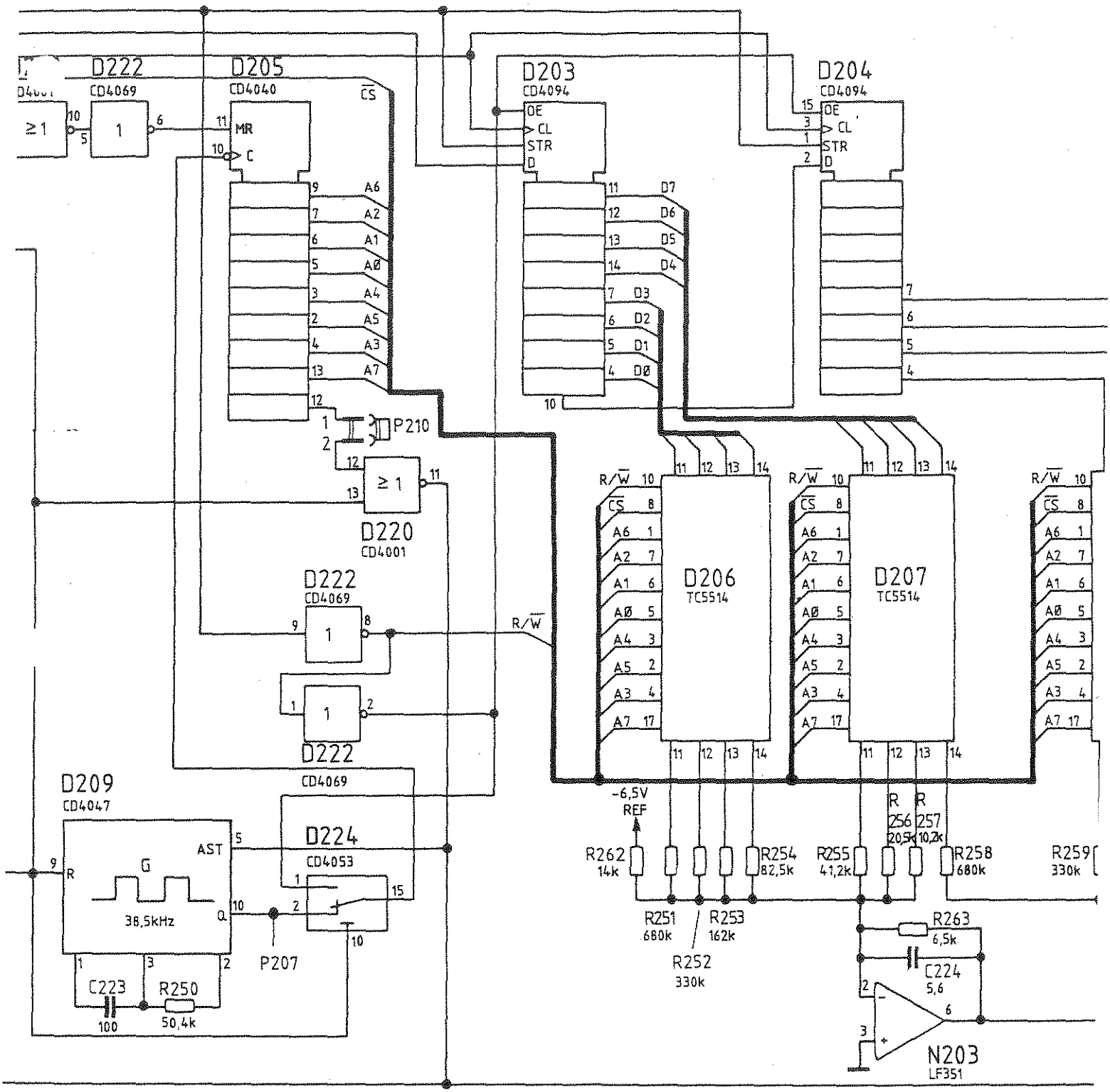
V45



Name	Benennung		Zeichn.-Nr.
CO	Scope	Z	803.1211 S
	zu Gerät: CMT	reg. i. V. 802.2020 V	erste Z. 803.1111

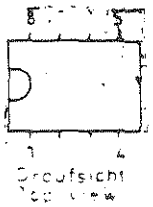

D200
CD4051
N202
LF412
X211.12
C212
100n
R230
100k
R231
1M
R232
12k
R233
150k
C233
82
C214
47n
R234
1M
R236
470k
-15V
Zeitablenkung
Time-base
R200 681k
R201 340k
R202 165k
R203 66,5k
R204 32,4k
R205 16,2k
R206 6,34k
R207
3,09
+15V
V240
1N4448
V291
BCY79IX
V200
BZX4V3
R208
2k
R209
4,7k
V202
BCY59IX
V203
1N4448
C202
56n
C203
6,2n
R210
56k
R211
100k
N208
ICM7555
R212
162k
C204
10
R213
100k
P203
R214
10k
C205
10n
V205
BZX4V7
+5V
R223
56k
C220
470n
D225
CD4538
D223
CD4053
26mS
N201
LF412
R215
15,2k
R216
10k
R217
49,9k
-6,5V
REF
P200
D222
CD4069
D220
CD4001
≥1
X211.4
+6,5V
REF
R218
5,65k
R219
4,32k
N200
LF412
R221
4,02k
R220
10k
P200.3
R225
1M
V230
1N4448
R226
18,2k
V204
BZX4V7
C230
22n
C213
100µ
C215
100µ
N200
N202
D223
D224
6,7,8
D200


D201
HEF4104
X211.8
X211.7
X211.10
X211.9
X211.11
D202
CD4094
OE
CL
D
STR
R242
100k
Osz. Freilauf Triggerung
Free-run trig. osc.
Triggerung
Trigger
N202
LF412
C217
1n
D221
CD4093BE
P201
10kHz
D223
CD4053
R238
9,1k
R236
470k
R237
560k
R235
5k
R243
10k
V241
C4V7
V207
1N4448
R240
5k
R241
1M
C216
100n
-15V
+5V
R224
22k
C221
220
D225
CD4538
223
4053
Osz. Freilauf Zeichen
Free-run character osc.
5µs
P204
P205
D201
4104
D220
CD4001
≥ 1
D224
CD4053
D222
CD4069
1
C200
10n
D200
6,7,8
C206...C208
D202
D203
D204
D205
C222
D222
D220
D211
D209
C209...C211
D206
D207
D208
A8
A9
C226
100n
N205
N206
N207
C227
C229
N203
N204
C228

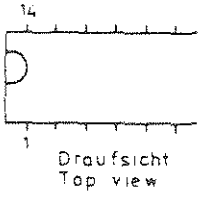


A		7.85	CO	D	35547	5.87	IB	1KSA	
B	32954	4.86	CO					Beard.	7.
C	35533	8.86	CO					Gepr.	
Änd. Aust.	Änderungs-Mitteilung	Datum	Name	Änd. Aust.	Änderungs-Mitteilung	Datum	Name	Norm	

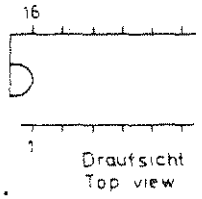
ROHDE & SCHWARZ



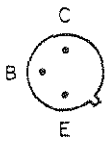
N200.....N208



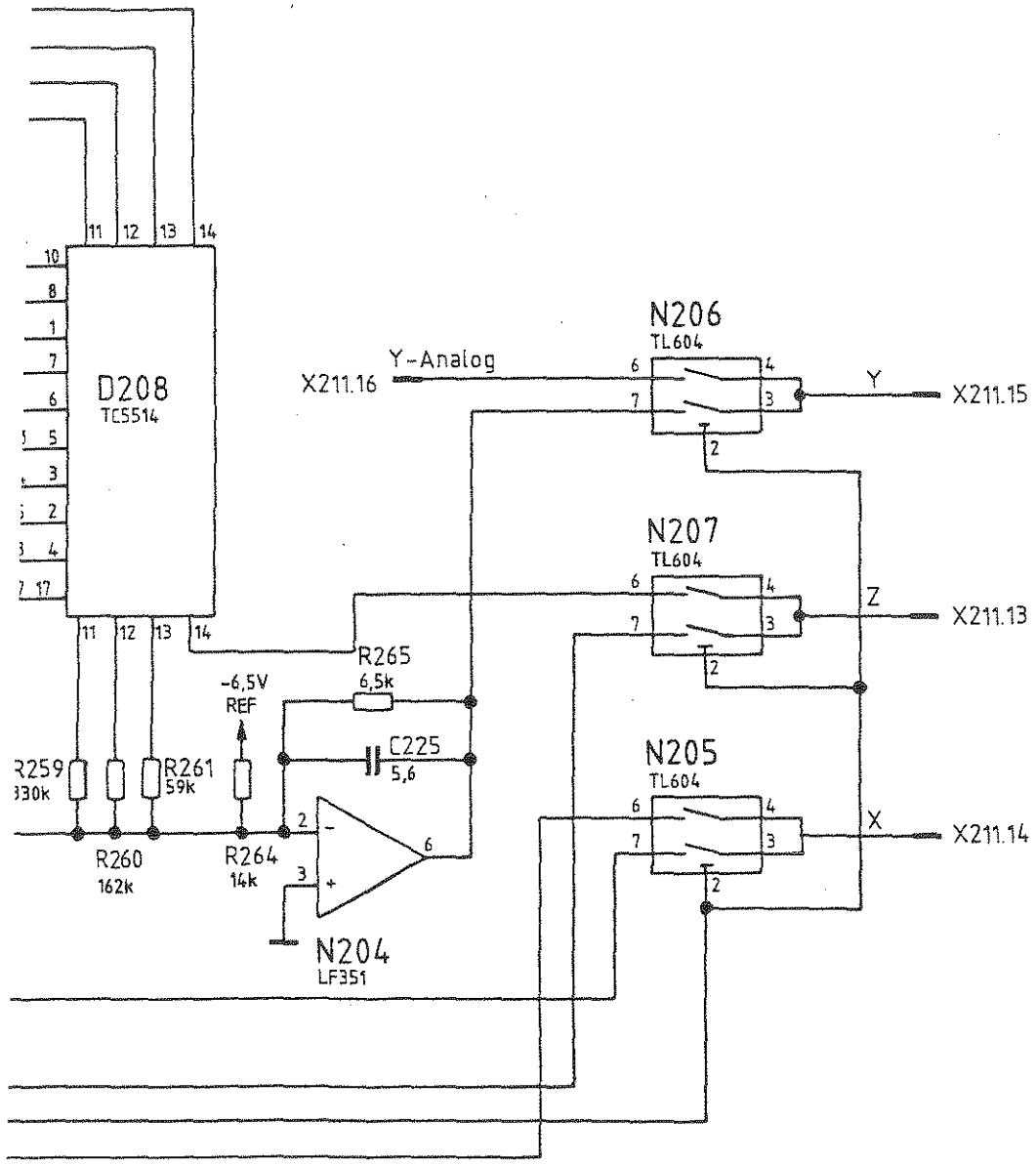
D209,D220,D221,D



D200.....D208
D223,D224,D225



V202
V291



Stromlauf gilt für VAR 02
Circuit diagram is valid for model 02

Tag	Name	Benennung			Zeichn.-Nr
7.85	CO	X/Y - Zeichenerzeugung X/Y - Marker generation		Z	803.1257 S
		z.u. Gerät CMT		reg. V	802.2020 V erste Z 80

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

RF Millivoltmeter Option CM-B8

803.6813.02

Printed in West Germany

Contents Page

5 Service Manual for RF Millivoltmeter Option CM-B8 .. 5.1

5.1 Function Description 5.1

5.2 Testing and Adjustment 5.2
5.2.1 Testing the Reference Generator 5.3
5.2.2 Replacing the Diodes in the Probe 5.3
5.2.3 Replacing the Diodes in the 10-V and 100-V Insertion Units 5.3

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for RF Millivoltmeter Option CM-B8

(See circuit diagram 803.6820 S)

5.1 Function Description

The functional principle of this option is based on the comparison of the rectified voltages of two circuits.

In addition to the meter rectifier for the RF voltage to be measured, the probe and the insertion unit each contain a reference rectifier of similar design to which an AC reference voltage generated in the instrument is applied. The difference between the two rectified voltages is further amplified in the instrument. Since the voltages from the rectifiers may be less than 1 µV, the input amplifier of the option is designed as a chopper-stabilized DC voltage amplifier. This consists of the chopper transistors V46 and V48, the amplifier V50 and N60, the synchronous rectifier D55, the transistor V65 and the amplifier N70. The generator D40 supplies the switching voltage for the chopping amplifier and the synchronous rectifier. The amplified voltage is applied to the feedback branch D25 via V80 and V81. Transistors V80 and V81 act like a rectifier which allows positive voltages to pass through but blocks negative voltages. This is necessary to stabilize the control loop.

The DC output voltage of transistors V80 and V81 is converted in D25 into an amplitude-proportional squarewave AC voltage with a frequency of 5 kHz. The switching voltage for D25 is provided by generator D30. The transformer T20 together with the capacitor C20 and the resistors R22 to R24 constitutes a dampened resonant circuit whose resonance frequency is 5 kHz and which converts the 5-kHz squarewave oscillation into a sinewave voltage. This voltage is amplified in the driver amplifier N10 and applied to the reference rectifier in the probe (or insertion unit) via transformer T1. The gain of this driver amplifier can be adjusted using R21 which sets the full-scale value of the display.

Because of the high gain of the control loop, the amplitude of the reference voltage is adjusted such that the difference between the rectified voltages becomes zero except for a small offset. Since the diodes in the meter and reference rectifiers are selected with the same characteristic, the rms values of the input voltage and the reference voltage become equal with the same waveform (sinewave).

The feedback circuit therefore produces a proportionality between the DC output voltage and the rms value of a sinewave input voltage. The display is therefore proportional to the rms value of a sinewave input voltage. The accuracy is largely dependent on the equality in the characteristics of the four diodes within a probe.

The input voltage taken from transistors V80 and V81 is applied to the A/D converter on the digital unit (802.4517.02) via the selectable amplifier N110 (0.20 dB) and the analog multiplexer on the analog unit (802.8412.02).

5.2 Testing and Adjustment

The ambient temperature must be between 20 and 25 °C and the instrument must have been switched on for at least 10 minutes.

The probe is used together with the BNC adapter (insertion adapter) as a URV probe. An insertion unit can also be used but a T-piece must be inserted so that the internal conductor is accessible for voltage measurements.

With a gain of 20 dB, first adjust the offset to 0 mV at N110. The gain of 20 dB at N110 is retained for the following adjustments.

Resonance adjustment

Apply a voltage with a frequency of 1 MHz and an amplitude V_{rms} = 1 V to the probe. Using R30, adjust the output voltage at X1.B29 to a minimum as exactly as possible.

Chopper adjustment

Disconnect the test voltage and set R38 fully clockwise. Measure the voltage at X3.14 using an oscilloscope and adjust the AC voltage component (approx. 22 Hz) to a minimum using R45.

Offset adjustment

Adjust R38 such that the output voltage at X1.B29 varies between 0 and 3 mV (a voltage must not be applied to the probe).

Gain adjustment

Apply a voltage with a frequency of 1 MHz, an amplitude of V_{rms} = 1 V ±1 mV and a distortion factor <0.3% to the probe. Adjust the output voltage at X1.B29 to 10.000 V ±10 mV using R21.

Fine adjustment for low RF voltages

Apply an AC voltage (1 MHz, 1.2 mV ±1%). Adjust the output voltage at X1.B29 to 12 mV using R38.

5.2.1 Testing the Reference Generator

The AC output voltage of the reference generator must be approx. 300 mV at X3.5 with a DC input voltage of 1 V at X3.13 (caution: internal impedance at test connector X3.5 = 10 kΩ.)

5.2.2 Replacing the Diodes in the Probe

If one or more of the diodes are destroyed because the permissible input voltage has been exceeded, all four diodes must be replaced. A set of four diodes can be ordered from Rohde & Schwarz under order number 243.9001. Replace as follows:

- Push back the cable bushing.
- Remove the fixing screw of the probe sleeve.
- Remove the probe sleeve in the cable direction.
- Replace the set of four diodes GL1.I to GL1.IV using tweezers.

!!! Do not solder, diodes are to be inserted !!!

If it is necessary to carry out soldering work on the probe, first remove the four diodes from their sockets to protect them from high temperatures.

5.2.3 Replacing the Diodes in the 10-V and 100-V Insertion Units

If one or more of the diodes are destroyed because the permissible input voltage has been exceeded, all four diodes must be replaced. A set of four diodes can be ordered from Rohde & Schwarz under order number 288.8304. Replace as follows:

- Unscrew the labelled cover. All four diodes are now accessible.
- Pull out the diodes GL1.III and GL1.IV. The connection wires are plugged into miniature sockets and are not to be soldered.
- The diodes Gl1.I and GL1.II are also plugged in. First pull the wire facing the coaxial part upwards out of the miniature socket; then pull the diode to the front and thus the other wire from the miniature socket located in the chamber partition.

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock Nr.	Blatt Page
	05	0587	ED HF-MILLIVOLTMETER RF MILLIVOLTMETER	803.6820.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CK 22NF+- 5%63V RD 8X18KS CAPACITOR SCHUEMANN CKS22000/5/63/400	024.4258	
C2	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C10	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C11	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C12	CC 33PF+-2%4X5NPO CAPACITOR VALVO 2222 678 10339	CC 087.6487	
C13	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C14	CK 220NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-422/0	CK 006.5056	
C20	CK 10NF+-1% 63V RD 7X18KS CAPACITOR SCHUEMANN CKS10000/1/63/40	024.4593	
C26	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C30	CC 1 NF+- 5%100V NPO VIEL CERAMIC CAPACITOR ERIE 8133-100-COG-1NF-J	CC 060.0894	
C40	CK 47NF+-20%100V4X9X11MKT CAPACITOR ITT 42515-12747	CK 087.0914	
C45	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C46	CC 1PF+-0,25PF3X4P100 CAPACITOR VALVO 2222 678 03108	CC 087.6170	
C50	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C51	CE 47UF+-20%10V6,3RDX5RAD ELECTROLYTIC CAPACITOR NATIONAL ECEA1AKS470	377.0308	
C55	CK 220NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-422/0	CK 006.5056	
C56	CE 22UF-10+50% 16V 9X13B ELECTROLYTIC CAPACITOR ROEDERST ELKO 22/16	CE 086.4368	
C60	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C61	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C63	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C65	CK 220NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-422/0	CK 006.5056	
C70	CC 33PF+-2%4X5NPO CAPACITOR VALVO 2222 678 10339	CC 087.6487	
C71	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C75	CC 2,2PF+-0,25PF3X4NPO CAPACITOR VALVO 2222 678 09228	CC 087.6341	
C80	CK 47NF+-20%100V4X9X11MKT CAPACITOR ITT 42515-12747	CK 087.0914	
C100	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C101	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C105	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C106	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C115	CE 22UF+-20%16V5RDX5RAD.A ELECTROLYTIC CAPACITOR NCC SRE 22UF/16V+-20%	358.6062	
C116	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
D25	BL CD4016BF 4XANALOGSCH ANALOG SWITCH RCA CD4016BF	BL 086.8040	
D30	BL CD4047AE MULTIVIBR. MULTIVIBRATOR RCA CD4047AE	BL 086.7221	
D40	BL CD4047AE MULTIVIBR. MULTIVIBRATOR RCA CD4047AE	BL 086.7221	
D55	BL CD4016BF 4XANALOGSCH ANALOG SWITCH RCA CD4016BF	BL 086.8040	
D110	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP {MJG}	BJ 213.4530	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D115	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
N10	BO LM308N PREC. OPAMP OPERATIONAL AMPLIFIER MOTOROLA LM308N	BO 247.7510	
N60	BO LM308N PREC. OPAMP OPERATIONAL AMPLIFIER MOTOROLA LM308N	BO 247.7510	
N70	BO LM308N PREC. OPAMP OPERATIONAL AMPLIFIER MOTOROLA LM308N	BO 247.7510	
N110	BO LF411CN JFET OPAMP OPERATIONAL AMPLIFIER NSC LF411CN	349.3058	
R1	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R10	RL 0,35W 12,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,1K-F-D	RL 083.1351	
R11	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R12	RL 0,35W 332 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/332OHM-F-D	RL 083.0255	
R13	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R14	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R20	RL 0,35W 51,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/51,1K-F-C	RL 083.1822	
R21	RS 0,5W20KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-203	RS 087.7577	
R22	RL 0,35W 30,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,1K-F-C	RL 083.1639	
R23	RL 0,35W 24,3KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/24,3K-F-C	RL 083.1574	
R24	RL 0,35W 30,1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/30,1K-F-C	RL 083.1639	
R26	RL 0,35W 1,21KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,21K-F-D	RL 083.0655	
R30	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-103	RS 247.7903	

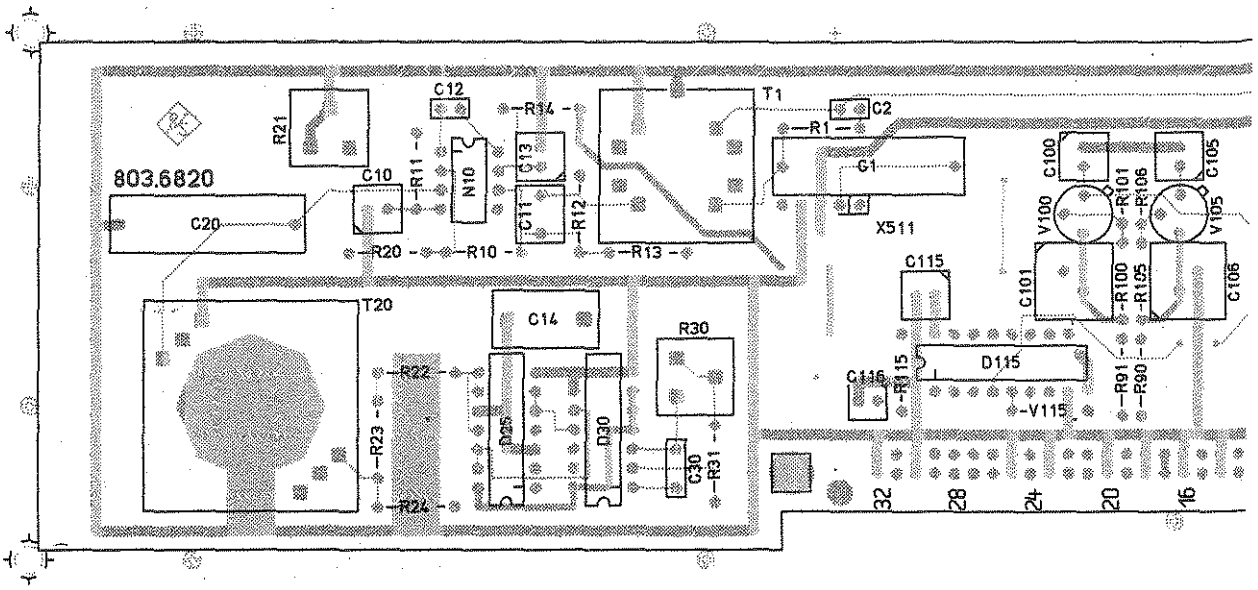
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R31	RL 0,35W 41,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/41,2K-F-C	RL 082.2319	
R35	RF 0,5 W 10 MOHM +-5% DEPOS.-CARBON RESISTOR RESISTA SK4/10M5%	007.1854	
R36	RL 0,35W562 OHM+-0,1%TK25 RESISTOR DRALORIC SMA/207/562/HM-B-E	RL 083.8662	
R37	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R38	RS 0,5W1MOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-105	RS 087.7602	
R40	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R45	RS 0,5W100KOHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F 100KOHM	RS 087.7583	
R46	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R47	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R48	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R49	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R50	RL 0,35W4,75MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 4,75MOHM 1% TK50	RL 099.8250	
R51	RL 0,35W 825 OHM+-1%TK50 RESISTOR DRALORIC SMA 0207/825OHM-F-C	RL 082.2502	
R52	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R53	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R55	RL 0,35W1,50MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 1,50MOHM 1% TK50	RL 099.8138	
R56	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R60	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R61	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R62	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R63	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R65	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R66	RF 0,5 W 10 MOHM +-5% DEPOS.-CARBON RESISTOR RESISTA SK4/10M5%	007.1854	
R70	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R71	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R75	RL 0,35W 43,2KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/43,2K-F-C	RL 083.1774	
R76	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R77	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R79	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R80	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R81	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R82	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R90	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R91	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R100	RL 0,35W 121KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/121K-F-C	RL 083.2070	
R101	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R105	RL 0,35W 121KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/121K-F-C	RL 083.2070	
R106	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	

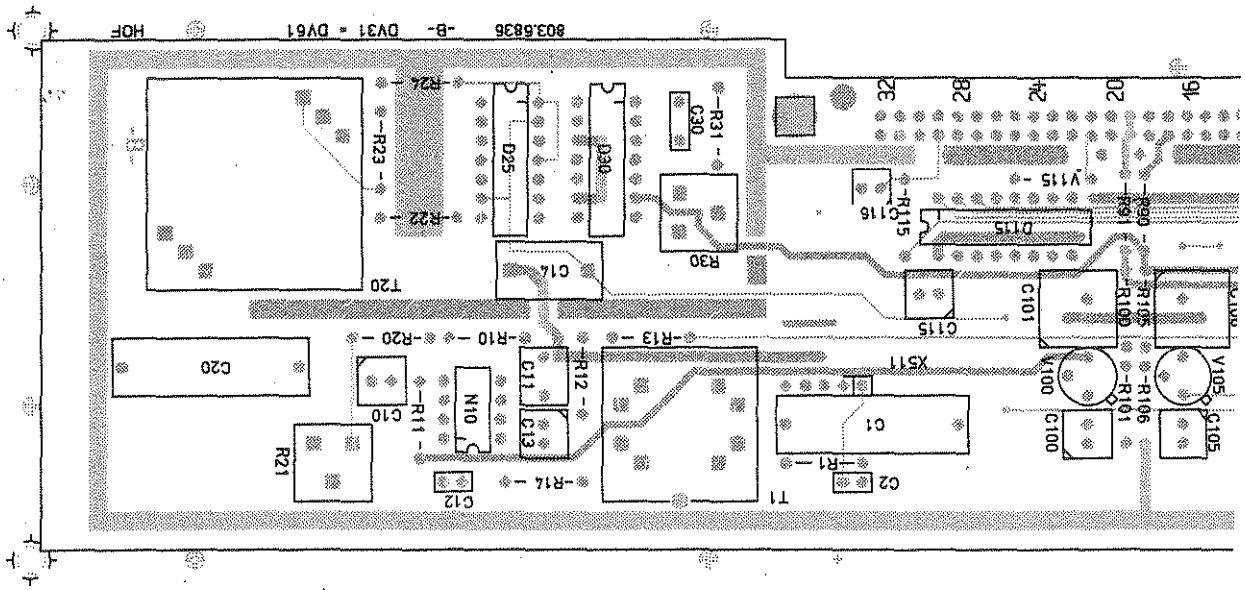
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R110	RS 0,5W20KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-203	RS 087.7577	
R111	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R112	RL 0,35W 9,09KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/9,09K-F-C	RL 082.2177	
R113	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R115	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
T1	LU UEBERTRAGER 1 TRANSFORMER 1	292.5641	
T20	LU UEBERTRAEGER 2	332.9335	
V35	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V36	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V45	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V46	AM 2N4117SELNKAN 40V FET FET INTERSIL 2N4117/R&S-LV	248.2486	
V47	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V48	AM 2N4117SELNKAN 40V FET FET INTERSIL 2N4117/R&S-LV	248.2486	
V50	AM 2N6485 NKAN-DUAL-FET FET INTERSIL 2N6485	292.5712	
V65	AM 2N6485 NKAN-DUAL-FET FET INTERSIL 2N6485	292.5712	
V75	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V76	AE BZX55/B11 0,5W Z-DI ZENER DIODE VALVO BZX55/B11	AE 012.2190	
V77	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V78	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V80	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V81	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	
V100	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	
V105	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V115	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	
X3	FR IC-FASSUNG 16 POLIG 16-PIN IC-SOCKET PRECICONT USO16T	FR 249.6091	
X4	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X511	FP WINKELSTECKERLEIST.36P ANGLE PIN CONNECTOR BERG 75168-113-36	FP 243.3578	
			- ENDE -

Ansicht und Leitungsfü
View of tracks on com



Ansicht und Leitungs
View of tracks on sol

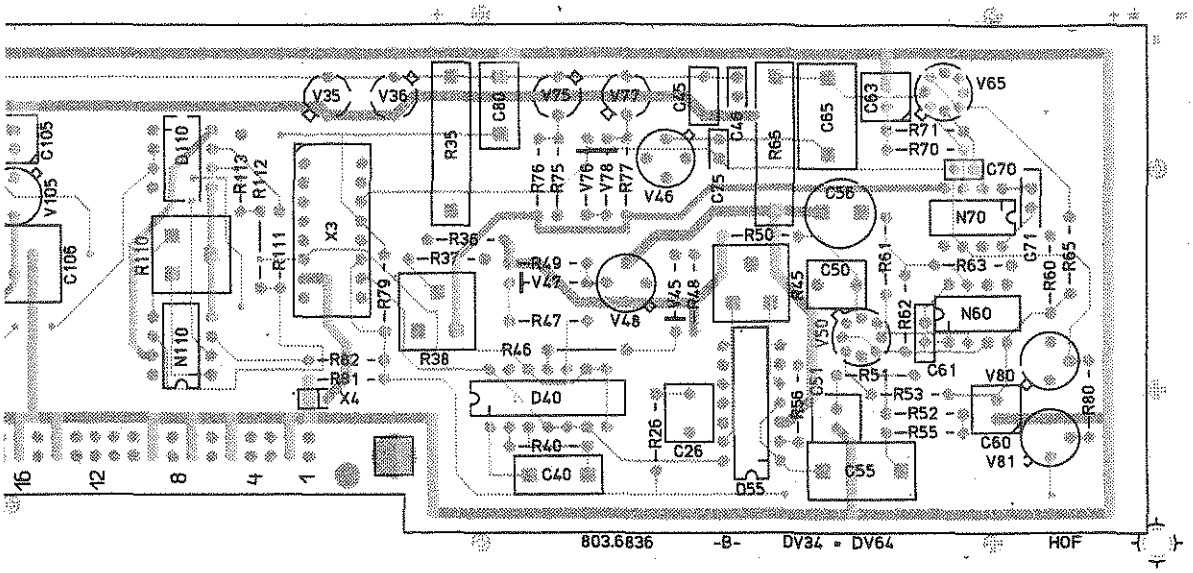


(hierzu HVC 250)

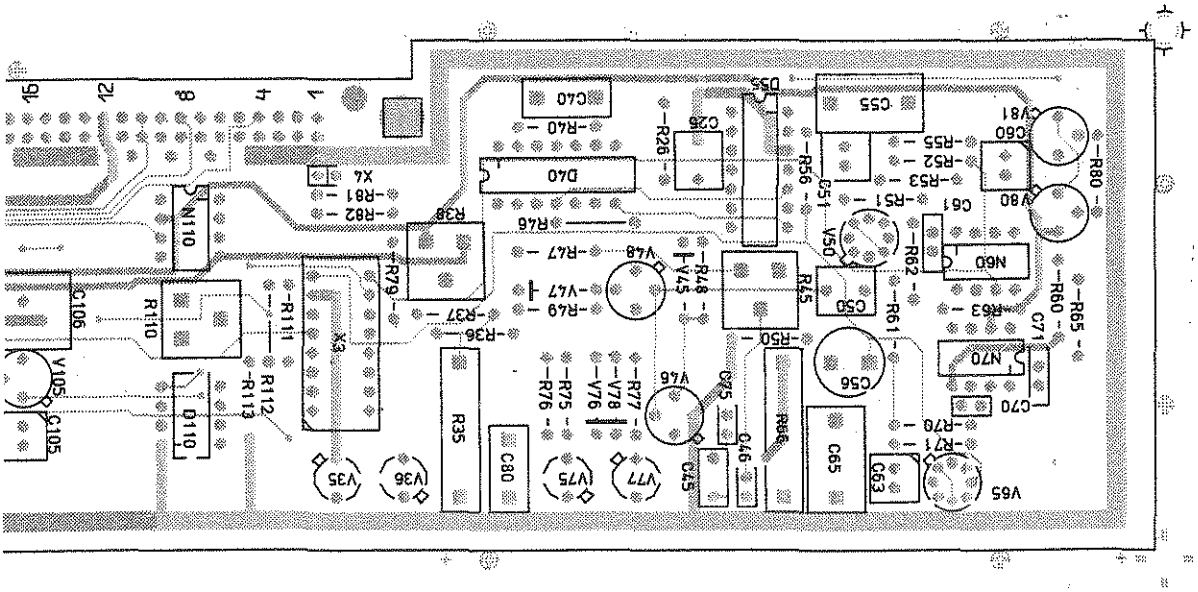
ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

ngsführung Bauteilseite
component side



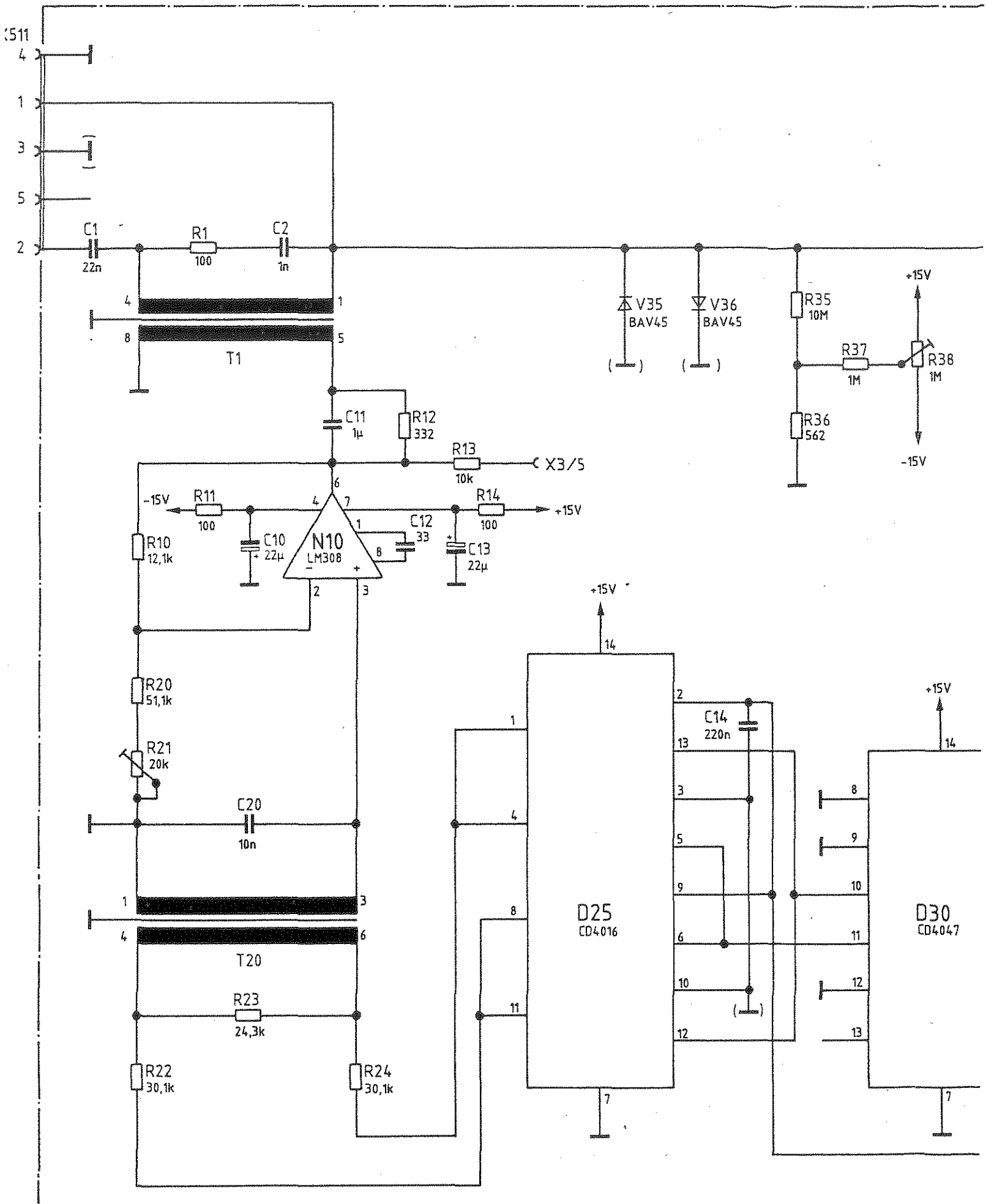
ungsführung Lötseite
solder side

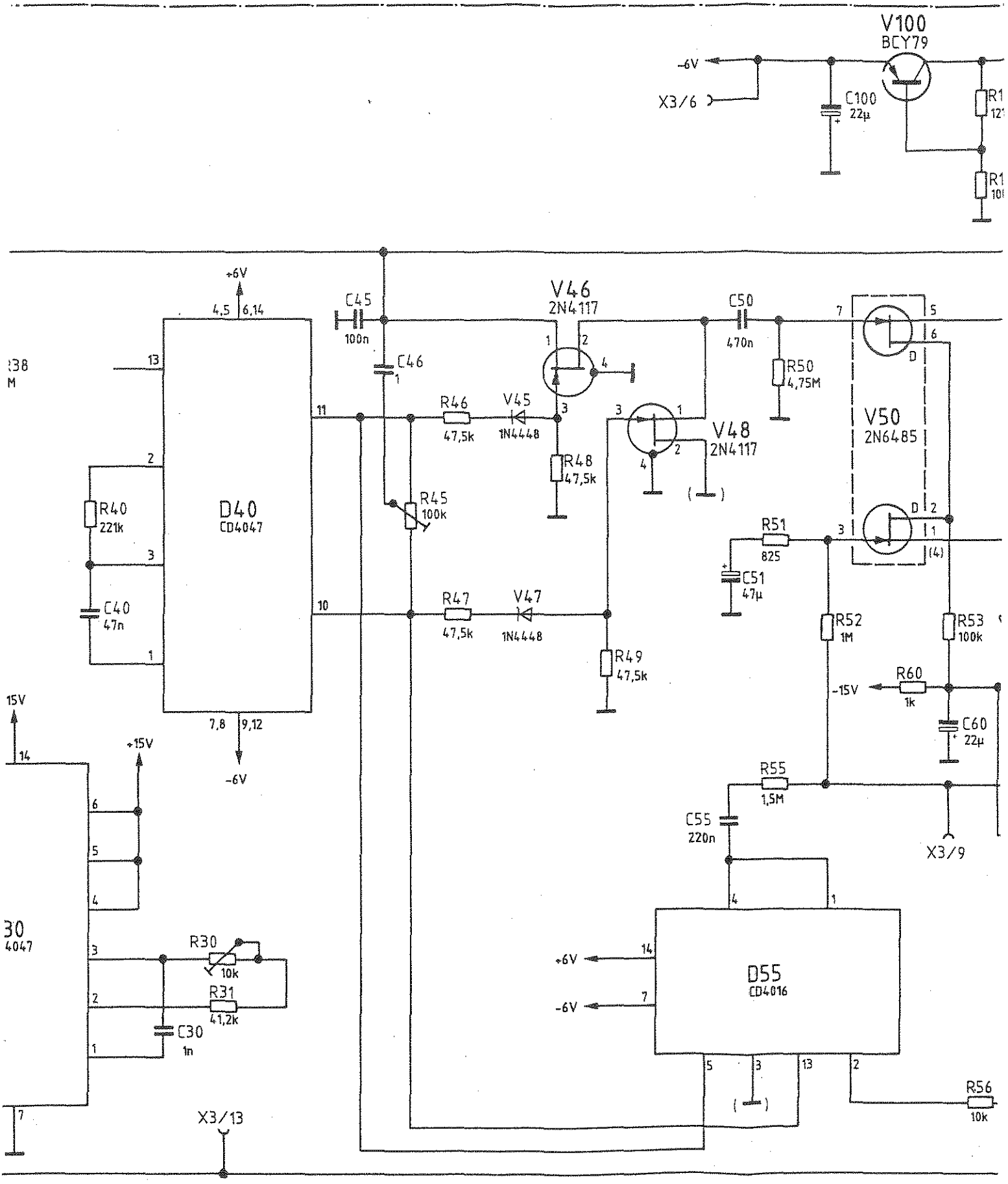


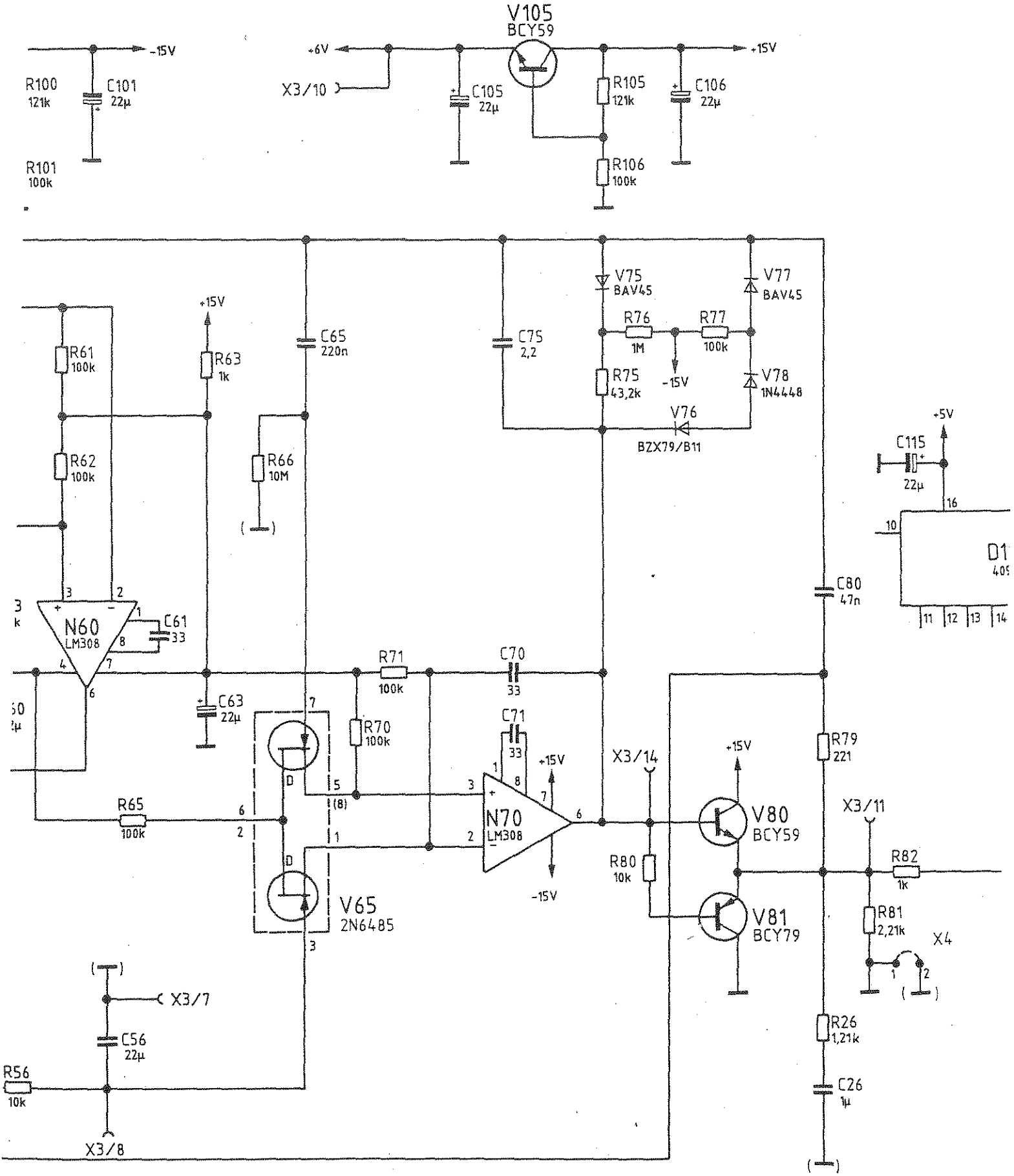
A		10.85	HO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
D	32 956	10.85	HO			Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	10.85	HO	HF-Millivoltmeter
				Gepr.			
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr.	803.6820.01
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CM-B8		reg. i. V. 803.6813V	erste Z.

Z

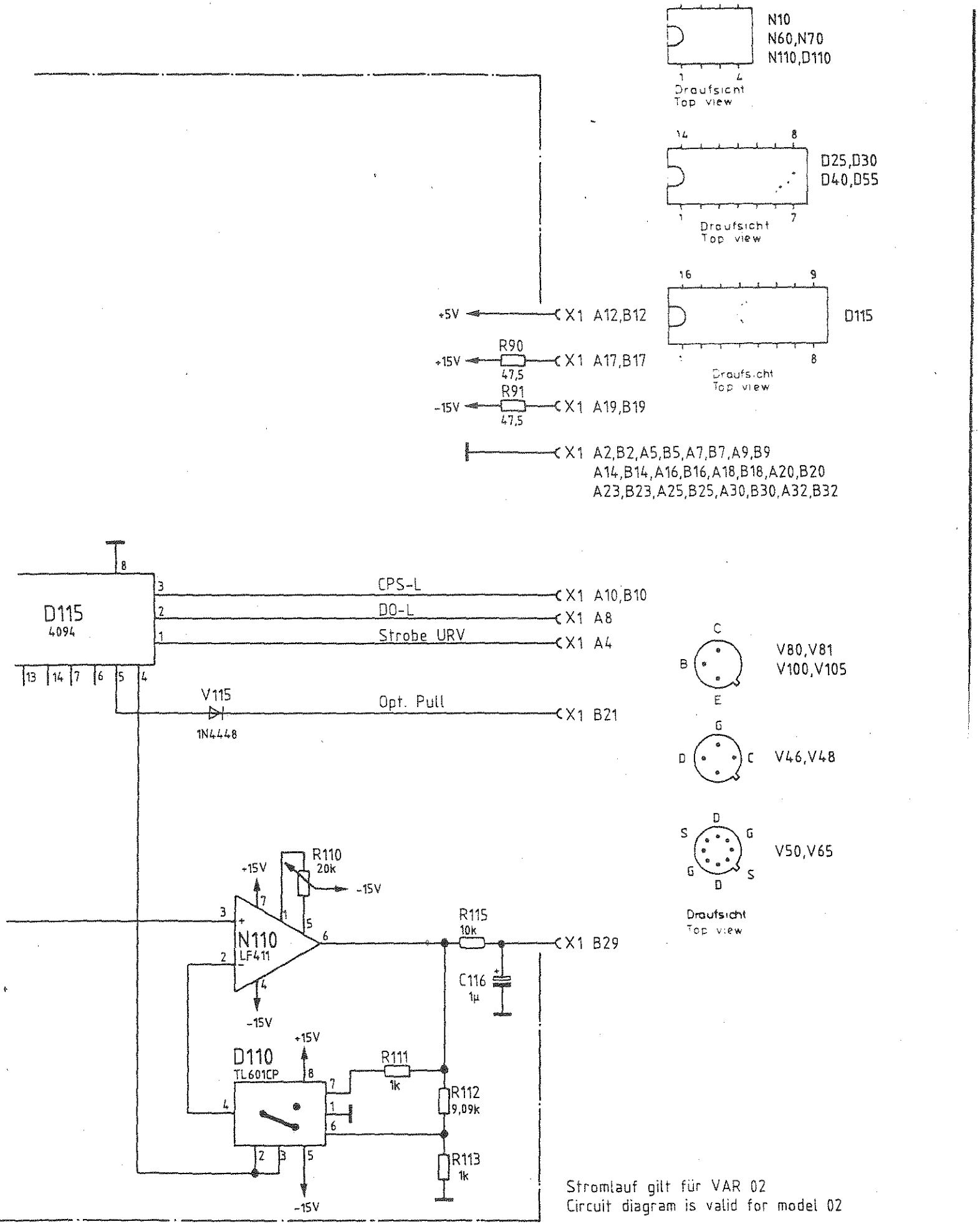
Blatt-Nr. 2 v. Bl.


C1
22n
R1
100
C2
1n
T1
V35
BAV45
V36
BAV45
R35
10M
R37
1M
R38
1M
R36
562
+15V
-15V
C11
1µ
R12
332
R13
10k
X3/5
-15V
R11
100
R14
100
+15V
R10
12,1k
C10
22µ
N10
LM308
C12
33
C13
22µ
R20
51,1k
R21
20k
C20
10n
T20
R23
24,3k
R22
30,1k
R24
30,1k
D25
CD4016
C14
220n
D30
CD4047


V100
BCY79
-6V
X3/6
C100
22µ
R1
12
R1
10
+6V
4,5
6,14
C45
100n
V46
2N4117
C50
470n
7
5
6
D
C46
1
R50
4,75M
V50
2N6485
R46
47,5k
V45
1N4448
V48
2N4117
R48
47,5k
R45
100k
D40
CD4047
R40
221k
C40
47n
R51
825
C51
47µ
(4)
R47
47,5k
V47
1N4448
R52
1M
R53
100k
R49
47,5k
R60
1k
-15V
C60
22µ
15V
+15V
7,8
9,12
-6V
R55
1,5M
C55
220n
X3/9
R30
10k
R31
41,2k
C30
1n
D55
CD4016
+6V
-6V
R56
10k
X3/13



ROHDE & SCHWARZ	A		7.85	CO					1KGA	Tag	Name
	B	38954	5.87	CO					Bearb	12.84	BT
									Gepr		
	Änd Aus	Änderungs-Mitteilung	Datum	Name	Änd Aus	Änderungs-Mitteilung	Datum	Name	Norm		



Stromlauf gilt für VAR 02
Circuit diagram is valid for model 02

Name	Benennung		Zeichn.-Nr	Blatt-N
BT	HF-Millivoltmeter RF-Millivoltmeter	Z	803.6820 S	
	zu Gera: CM-B8		reg. V: 803.6813 V	erste Z: 803.6813

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Transfer Memory Module CM-Z1

803.7510.02

Printed in West Germany

Contents

Page

5 Service Manual for Transfer Memory Module CM-Z1 ..... 5.1

5.1 Function Description 5.1
5.1.1 Interface to Instrument 5.2
5.1.2 RAM 5.2
5.1.3 Internal Interface 5.2
5.1.4 BUSY Display 5.4
5.1.5 Battery Supply 5.4

5.2 Testing and Adjustment 5.4

Component lists
Circuit diagrams
Component layout diagrams

(See circuit diagram 803.7532 S)

5.1 Function Description

This module is used to record and reproduce programmed instrument settings and data. The entered data are retained by a built-in battery supply, even if the module is not connected to the instrument, and can be read out again on the instrument or overwritten at any time.

The module can be divided into the following function units (see Fig. 5-1):

- Interface to instrument
- RAM
- Internal interface
- BUSY display
- Battery supply

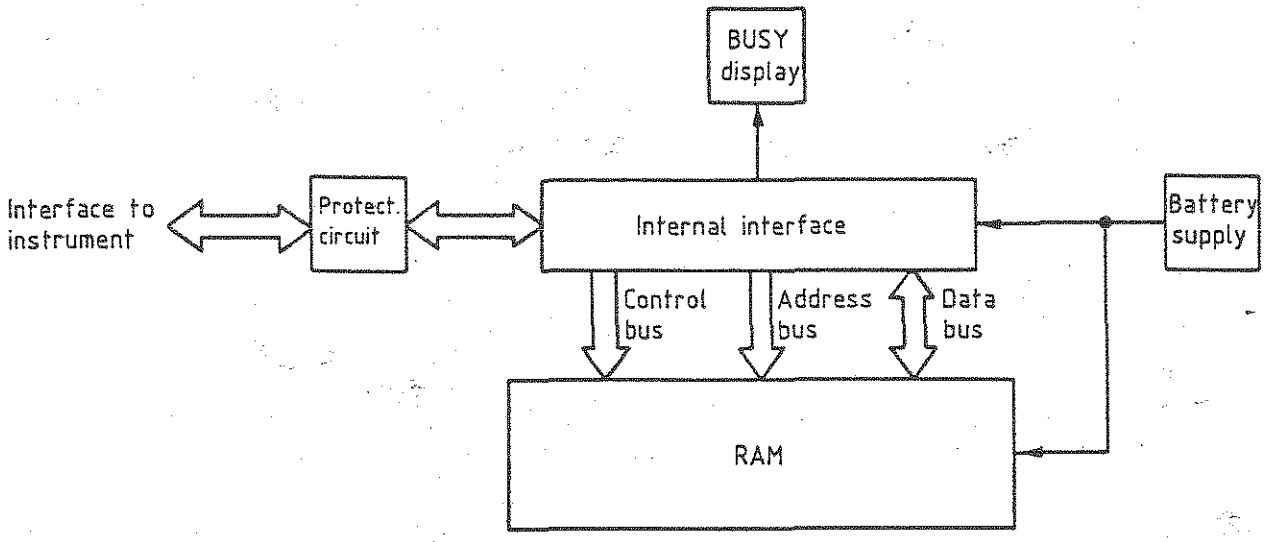


Fig. 5-1 Block diagram of the transfer memory

The reason for the transfer from blocks I to II and III to IV is that the address must be stable in the RAM when the change from "Disable" to "Read" or from "Read" to "Disable" takes place. The contents from AØ to A12 do not change within a cycle. A12 appears first on the data line and CS2 last. With block III, D7 appears first on the data line and DØ last.

5.1.4 BUSY Display

The BUSY display visibly indicates a read or write access to the transfer memory. Since the signal STREM is activated at least once with every read and write process, this signal can be used to drive an LED stage. The short intervals between two STREM pulses prevent the BUSY LED from flickering.

5.1.5 Battery Supply

The RAM is powered by a built-in back-up battery if the instrument power is missing. In addition, the section of the internal interface circuit which provides the control signals ($\overline{WE}$, $\overline{OE}$, CS2) for the RAM is also connected to the back-up supply. The RAM remains in the low power "Data hold" mode if CS2 = 0.

5.2 Testing and Adjustment

The module need not be adjusted. All tests should be carried out using Section 3.

ROHDE&SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	06	0287	ED TRANSFERSPEICHER TRANSFER MEMORY	803.7532.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C2	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C3	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C4	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
D1	BC HM6264LP15 8KX8B.SRAM SRAM HITACHI HM6264LP15	344.7410	
D2	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D3	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D4	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D5	BL CD4021BE 8BIT SH.REG SHIFT REGISTER RCA CD4021BE	BL 086.7096	
G1	EB 3,4V LITHIUM-BATTERIE LI BATTERY SAFT LS 3 CNA	565.1687	
P1	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P2	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
R1	RN 5X 22KOHM+-2%SIL 6 H5 RESISTOR NETWORK BOURNS 4306R-101-223	RN 470.6501	
R2	RL 0,21W 22,1KOHM+-1%TK50 RESISTOR RESISTA MK1 22K1 1% TK50	RL 092.1609	
R3	RL 0,21W 22,1KOHM+-1%TK50 RESISTOR RESISTA MK1 22K1 1% TK50	RL 092.1609	
R4	RN 4X 10KOHM+-2%SIL 8 H5 RESISTOR NETWORK BECKMAN MOD.764-3-10KOHM	RN 291.5154	
R10	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R11	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	

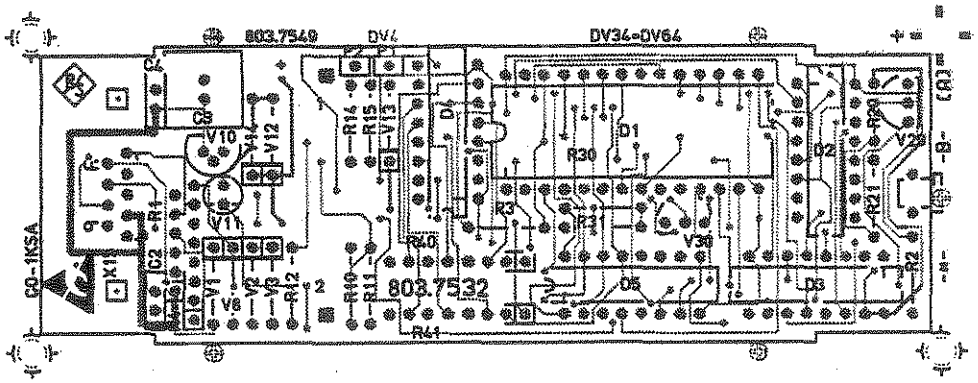
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R12	RL 0,35W20,00 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200HM-F-D	RL 082.9142	
R14	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R15	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R20	RL 0,21W 1,00KOHM+-1%TK50 RESISTOR RESISTA MK1 1K00 1% TK50	RL 092.1444	
R21	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R30	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R31	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R40	RN 4X6,8KOHM+-2% SIL 8 H5 RESISTOR NETWORK BOURNS 4308R-102-682	RN 212.8578	
R41	RN 4X6,8KOHM+-2% SIL 8 H5 RESISTOR NETWORK BOURNS 4308R-102-682	RN 212.8578	
V1	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
V2	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
V3	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
V8	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
V10	AK BC517 NPN 30V DARL. TRANSISTOR SIEMENS BC517	AK 282.2133	
V11	AF HLMP1700 LED RT RD3 LED HP HLMP1700	AF 099.9134	
V12	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
V13	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
V14	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	

ROHDE&SCHWARZ

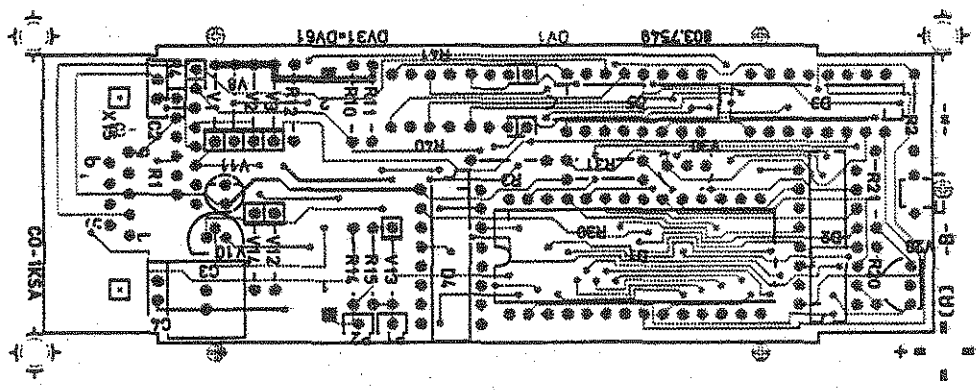
Änderungsindex Al	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
06	0287	ED TRANSFERSPEICHER TRANSFER MEMORY	803.7532.01 SA	3

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V20	AM VN10KM NKAN 60V FET MOS-FET SILICONIX VN10KM	AM 346.5820	
V30	AM VN10KM NKAN 60V FET MOS-FET SILICONIX VN10KM	AM 346.5820	
X15	FM STECKERLEISTE WINK.9P 9-PIN INSERT FCT F9P5-K45	FM 434.9340	
			- ENDE -

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



Ansicht und Leitungsführung Lötseite
View of tracks on solder side



(hierzu HVC 250)

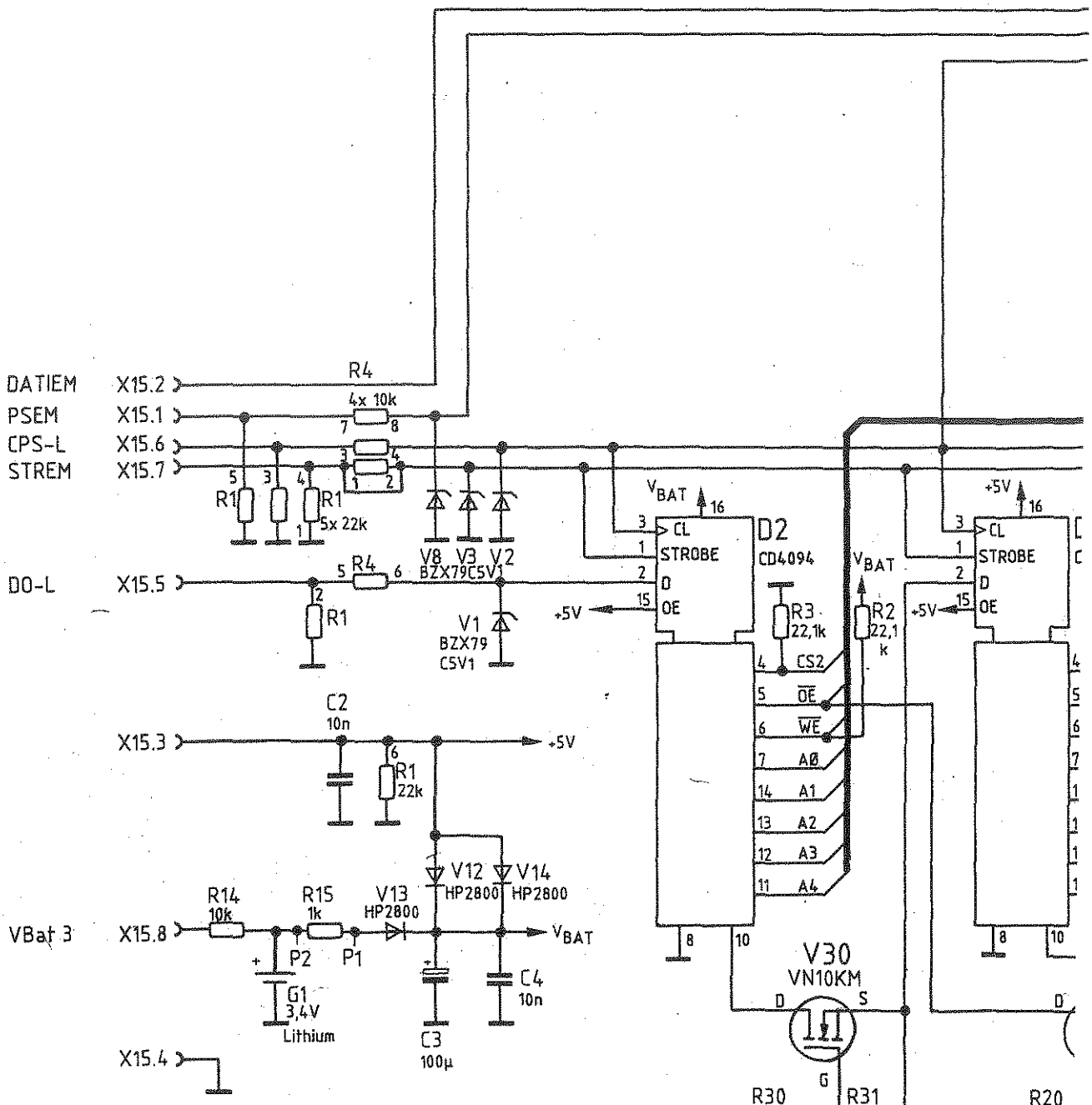
ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

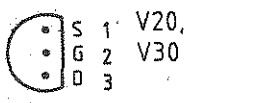
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

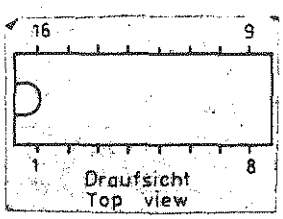
VARIANTENERKLÄRUNG/VERSION
VAR 02 – GRUNDAUSFÜHRUNG/BASIC MODEL

E	35523	01.87	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	01.87	CO	TRANSFERSPEICHER TRANSFER MEMORY
				Gepr			Z
				Norm			
And. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 803.7532.01 EE	Blatt-Nr. 2
				zu Gerät CM-Z1		reg. i. V. 803.7510 V	erste Z

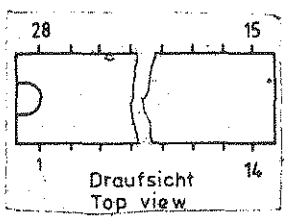
PE 096 2506 0781 ... Erich Feucht, München 07.6001.81



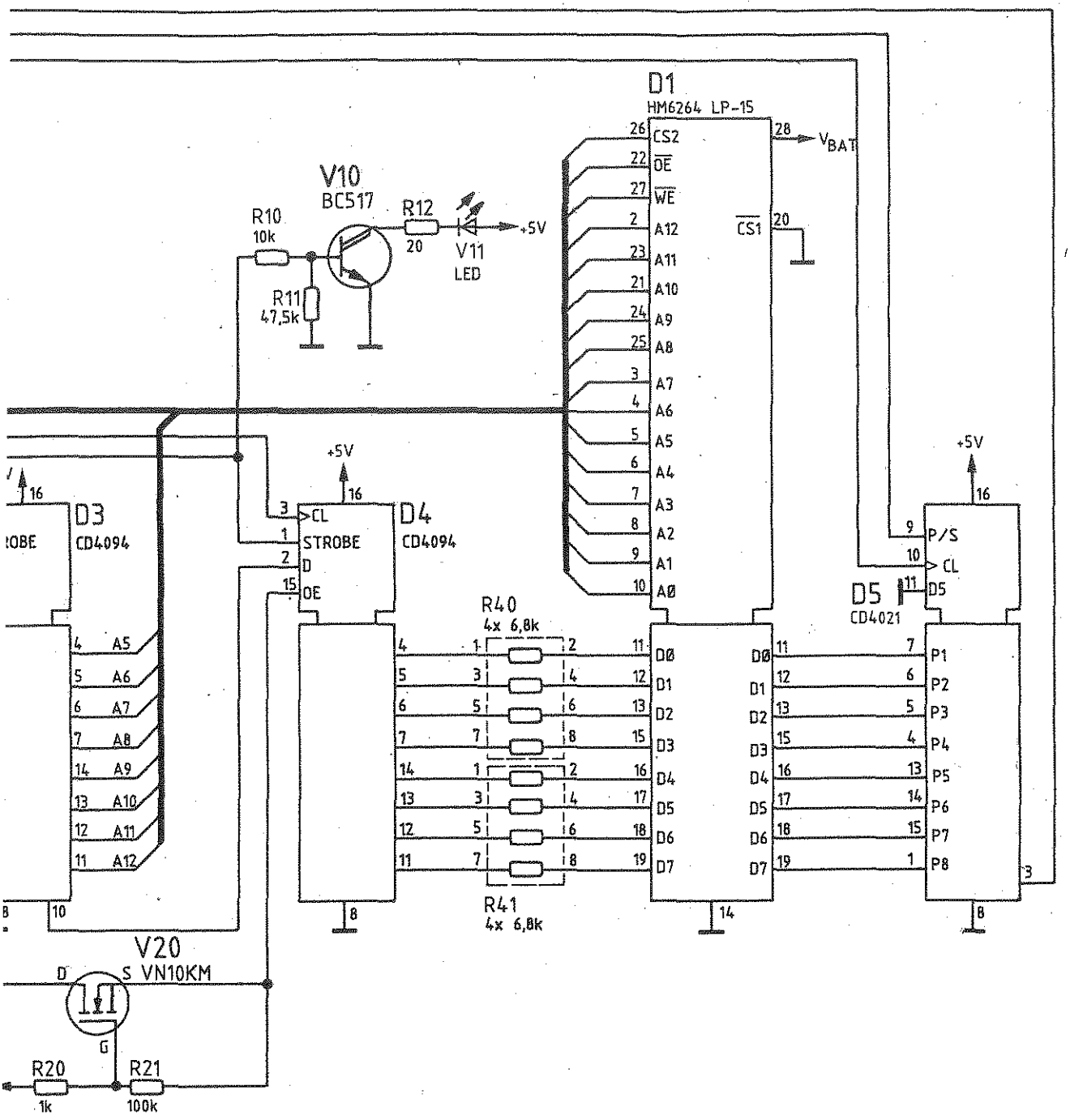




D2,D3,D4,D5



D1



Stromlauf gilt für VAR 02
Circuit diagram is valid for model 02

Stromlauf zu	CM-Z1 Transferspeicher Transfer memory	Z	Zeichn. Nr. 803.7532S1 reg. i.V. 803.7510 V erste Z. 000.0000

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

Duplex Modulation Meter Option CM-B9

803.5317.02

Printed in West Germany

Contents

Page

5 Service Manual for Duplex Modulation Meter Option CM-B9 ..... 5.1

5.1 Function Description 5.1
5.1.1 Output Frequency 5.1
5.1.2 VCXO Loop 5.1
5.1.2.1 Programmable Divider by N 5.2
5.1.2.2 Fractional Divider 5.3
5.1.3 RF Loop 5.3
5.1.4 Oktave Divider 5.4
5.1.5 Control and Diagnosis 5.4

5.2 Testing and Adjustment 5.6
5.2.1 Frequency Adjustment of RF Oscillators 5.6
5.2.2 Level Adjustment of RF Oscillators 5.6
5.2.3 Testing the RF Loop 5.7
5.2.4 Testing the Spurious FM 5.7
5.2.5 Testing the Frequency Dividers 5.7
5.2.6 Testing the VCXO Loop 5.8

5.3 Troubleshooting 5.8
5.3.1 Frequencies at the Output of the N Divider 5.8
5.3.2 DC Voltage Values 5.9
5.3.3 Signal Levels 5.9
5.3.4 Control Signals for Octave Divider 5.10
5.3.5 Control Signals for the M Divider 5.10
5.3.6 Bit Pattern 5.11

5.4 Interfaces 5.12

Component lists
Circuit diagrams
Component layout diagrams

(See circuit diagram 803.6020 S and block diagram)

5.1 Function Description

The duplex modulation meter replaces the mixing oscillator required to convert the RF to the IF which means that the instrument is able to transmit and receive simultaneously.

The module contains a frequency synthesizer which generates frequencies in the range from 31.25 MHz to 1000 MHz. Two phase locked loops are used for frequency synthesis. The individual loops are designated RF loop and VCXO loop; the RF loop generates the coarse grid and the VCXO loop the fine grid. The two phase locked loops are synchronized to a crystal reference frequency of 100 MHz in order to stabilize the output frequency. The reference frequency must be applied to the module.

5.1.1 Output Frequency

Three oscillators generate frequencies of 500 MHz to 1000 MHz; lower frequencies are obtained by dividing. The output frequency is calculated according to the following equation:

$$F_{out} = (0.2 \times M + 2 \times \frac{M}{N}) \times \frac{1}{T} \quad [MHz]$$

M = Coarse divider factor 2499 to 4999
N = Fine divider factor 16666 to 50000
T = Octave divider 1, 2, 4, 8, 16

5.1.2 VCXO Loop

The VCXO loop provides the reference frequency for the coarse control loop of the RF loop. A programmable frequency divider divides the externally applied 100-MHz reference frequency to values between 2 and 6 kHz; the voltage-controlled crystal oscillator (VCXO 10.002 MHz to 10.006 MHz) is fine-tuned via a phase locked loop in this frequency range. The output signal of the VCXO is mixed with 10 MHz derived from the 100-MHz reference frequency. The filtered mixture product (2 to 6 kHz) is applied to a phase detector whose output voltage tracks the VCXO. The VCXO frequency is adjusted to the frequency of approx. 50 kHz required for the coarse control loop by dividing.

The frequency range of the VCXO loop of 50.01 to 50.03 kHz has been selected such that the range of 1 step of the coarse control loop of 200 kHz is covered. The resolution of the total system results from the maximum change in frequency of the VCXO loop with a change in the divider factor N by 1. The most unfavorable value is with M at a maximum and N at a minimum and is approx. 36 Hz. Since the ranges of the coarse control loop and the VCXO loop overlap, the divider factors M and N must be adjusted optimally before triggering in order to minimize the frequency error.

5.1.2.1 Programmable Divider by N

The fractional method and the pulse swallow method are used simultaneously in this divider. D520 is a fast ECL prescaler which can divide by 10 or 11 and is provided with a control signal (:10 or :11) by the auxiliary divider D575, D585. The signal at the output of B12 with a frequency of approx. 10 MHz is applied to a monoflop to increase the pulse width and is then divided into the following two branches:

1. The programmable synchronous divider D540 to D560
2. The auxiliary divider D575, D585

The auxiliary divider is a shift register which shifts the data applied in parallel to the input with a 10-MHz clock in serial to the prescaler once during each AF clock and thus controls the division ratio 10:1 or 11:1.

The sequence described above represents the well-known pulse swallow method with frequency division. The fractional method is also implemented using the arrangement D590, D597 and D595.

The three components form an up-counter with programmable step sizes which generates an overflow signal at 256. The counter clock is the output signal of the synchronous prescaler (D540 to 560); the step size is applied by the memory IC D592 to the input of adder D595, D590. If an overflow results (pin 9), an additional "1" is written into the shift register operating as an auxiliary divider which causes a 1:10 divider cycle to be replaced at D520 by a 1:11 cycle. An additional 100-MHz period used in this manner increases the divider ratio N by an amount <1 (fractional method). Example: N = 200.1 is generated by dividing 9 times in succession by 200 and then once by 201.

5.1.2.2 Fractional Divider

A resolution of approx. 36 Hz (see Section 5.1.2) is insufficient for some applications. The module can therefore be extended by a fractional divider which expands the N divider factor by up to 255/256 yielding a resolution <1 Hz. The non-harmonics resulting from the principle used are a disadvantage and lead to a deterioration in the spurious FM.

The fractional divider consists of ICs D590, D595, D97; control takes place via D592 (see also Section 5.1.2.1).

5.1.3 RF Loop

The output frequency range of 500 to 1000 MHz is generated in the RF loop. This range is divided amongst three oscillators.

Range	f in MHz	Transistor
Osc. I	500 to 655	V30
Osc. II	655 to 825	V60
Osc. III	825 to 1000	V90

The oscillating transistor (BRF96) reduces the damping of a series resonant circuit by its negative impedance at the base. The inductance of the resonant circuit is implemented using a coaxial line to keep the microphony as small as possible. A voltage-variable diode is used for tuning; the tuning voltage is applied to the cathode of the voltage-variable diode via RF inductors. The output power of the oscillator is set with the adjustable constant current of the oscillating transistor. A switching stage with two transistors driven at TTL level switches the operating voltage on for the oscillator as well as a switching diode to decouple the RF in the forward direction.

The M divider is a programmable high-frequency divider with a fixed prescaler (D310) as well as a switchable prescaler (D315). The first prescaler (D310) divides the oscillator frequency by 4 down to 125 to 250 MHz. The second prescaler (D315) with the internal switchover 11/10 operates together with the so-called auxiliary counter (D330) as a decadic counter stage in the 4-digit M divider.

The prescaler 11/10 starts with a divider ratio 11:1. After 11 input pulses, the counters (D330 and D331) are simultaneously incremented by 1. If the 9 has been reached on the auxiliary counter (D330) this switches the prescaler (D315) to a divider ratio 10:1. The pulses divided by 10:1 are then only recorded by the main counter (D331, D332, D333). If these have also reached the 9, the prescaler is again set to 11:1 by a reset pulse and the other dividers to the entered divider ratio. A new counting cycle can then begin.

For example, if the divider factor is 2654, the auxiliary counter and the main counter count 4 pulses before the prescaler is switched from 11 to 10. The prescaler divides the input frequency by 10 for the remaining divider factor of the main counter (= 261). The input frequency must deliver 4 x 11 + (256-4) x 10 = 2564 pulses for the complete counting cycle, which corresponds to the above dividing factor.

The M divider must be loaded with the difference between the final counter value and the divider factor because it is an up-counter. An additional 10 input pulses are used because the loading of the counters uses one clock pulse and the prescaler is set to the dividing factor 10 during this time. For example, if the divider ratio M is to be 2654, (10009 - 2654)=7355 must be loaded into the counter. This value is stored in the shift registers (D360 and D365) in BCD code.

The output signal of approx. 50 kHz from the M divider is applied to the phase detector; the signal is then compared with the frequency from the VCXO loop and controls the oscillators via the subsequent integrator.

5.1.4 Octave Divider

The actual RF synthesizer only delivers frequencies in the range from 500 to 1000 MHz; lower frequencies must therefore be generated by dividing. The output signal of the oscillators is applied to the dividers via a buffer amplifier (N130). The octave divider consists of a 2:1 divider and three 4:1 dividers. These are connected such that divider ratios of 2, 4, 8 and 16 are produced. The output signals of the individual dividers are applied to the output amplifier via switching diodes.

Since the duplex modulation meter can only control the LO input of the mixer, filtering of the harmonics produced by dividing can be omitted. Subharmonics of the LO frequency may lead to undesirable non-harmonics, however, and all unrequired frequency dividers are therefore switched off.

5.1.5 Control and Diagnosis

The module is controlled via a serial data interface. The data for a complete setting (with fractionater) are stored in 8 shift registers (D360, D365, D2, D18, D550, D565, D580 and D592).

Five test points on the module can be called up by the multiplexer (D15) for diagnosis (self-test). The tuning voltages of the oscillators are also constantly monitored by window discriminators (N240, N440 and N660) and the loop OK line is set to LOW if the limits are violated.

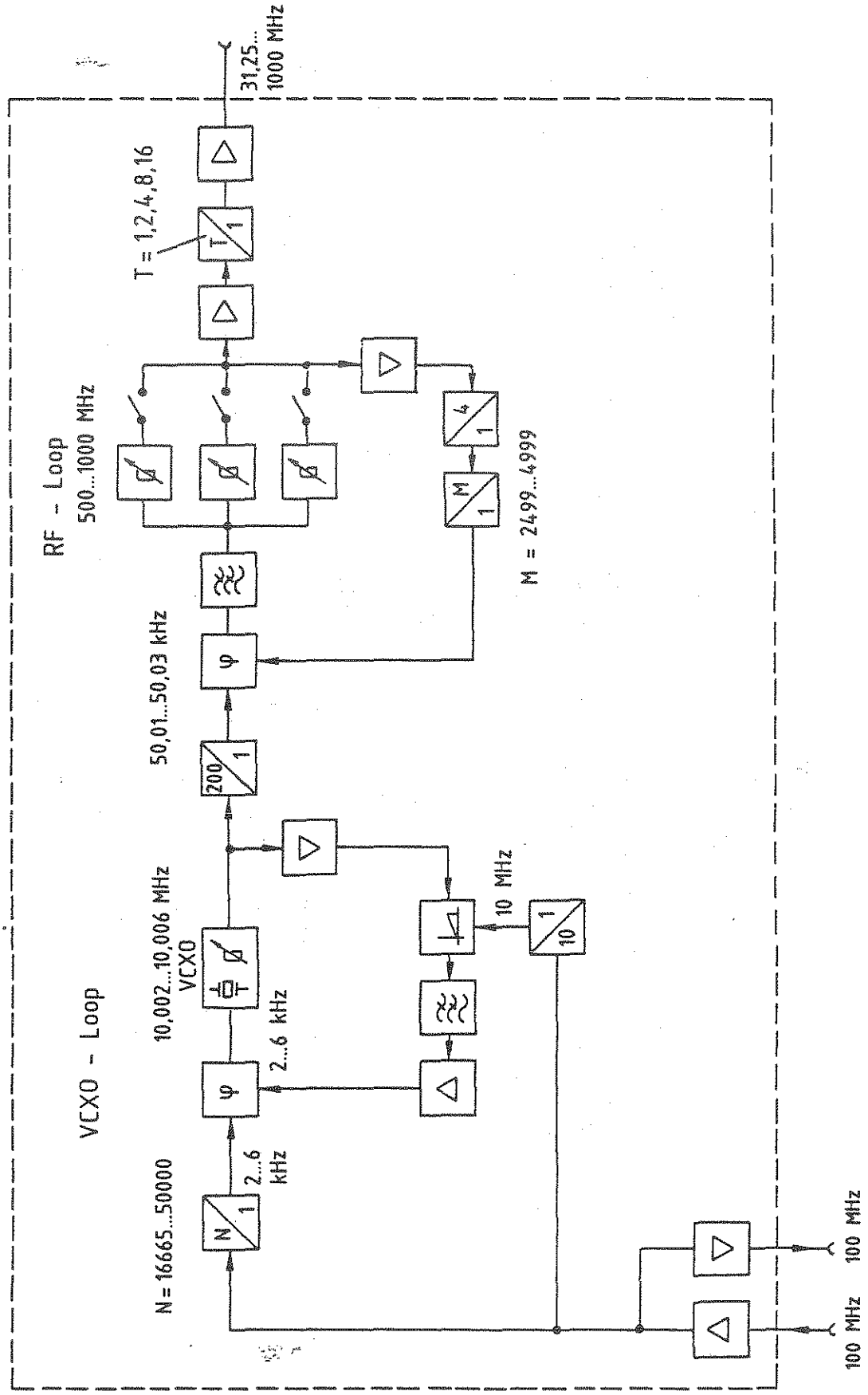


Fig. 5-1 Block diagram of the Duplex Modulation Meter

5.2 Testing and Adjustment

5.2.1 Frequency Adjustment of RF Oscillators

- Apply DC voltage of 2.5 V ± 0.1 V to X9/2.
- Connect an RF analyzer or frequency counter to X309.
- Adjust the frequency using trimmers C21, C51 and C81 according to the following table:

Instrument setting	Frequency at X309	Trimmer
520 MHz	500 MHz ± 5 MHz	C21
700 MHz	655 MHz ± 5 MHz	C51
900 MHz	825 MHz ± 5 MHz	C81

- Insert plug-in jumper X9, screw on cover. The control voltage can be measured through the hole provided in the RF shielding; the correct value should be 2.5 V ± 0.1 V for the following frequencies:

Frequency at X309	Trimmer
500 MHz	C21
655 MHz	C51
825 MHz	C81

5.2.2 Level Adjustment of RF Oscillators

- Apply DC voltage of 12 V ± 0.5 V to X9/2.
- Connect RF analyzer or power meter to X309.
- Adjust the frequency using trimmers R49, R79 and R109 according to the following table:

Instrument setting	Level at X309	Trimmer
520 MHz	-3 dBm ± 3 dB	R49
700 MHz	-3 dBm ± 3 dB	R79
900 MHz	-3 dBm ± 3 dB	R109

5.2.3 Testing the RF Loop

- Connect a frequency counter and a power meter to the RF terminator X309. Check the level and frequency with the following instrument settings.

- Frequency setting on instrument: 501 MHz
  654 MHz
  656 MHz
  824 MHz
  826 MHz
  1000 MHz

- The frequency must agree with the setting.

- The level must be -3 dBm ± 3 dB.

- The tuning voltage at X9/1 must be in the range 2.5 V to 20 V.

5.2.4 Testing the Spurious FM

The spurious FM must be tested with the module closed.

- Connect modulation analyzer to X309.

- Adjust frequencies on the instrument in the range from 500 to 1000 MHz and measure the spurious FM.

- The spurious FM (weighted to CCITT, RMS) must be <12 Hz.

5.2.5 Testing the Frequency Dividers

- Connect DC voltage source (2 V to 20 V) to X9/2.

- Connect RF analyzer to X309.

- Set the following frequencies on the instrument and sweep the complete voltage range in each case.

  f in MHz: 900, 700, 520, 450, 350, 260, 225, 175, 130, 113, 87, 65, 57, 44, 32.

- Check on the analyzer that no non-harmonics or subharmonics occur.

- The level must be -3 dBm ± 3 dB in the complete frequency range (approx. 30 MHz to 1000 MHz).

5.2.6 Testing the VCXO Loop

a) Instrument setting: frequency 500.1 MHz

- → The tuning voltage at X6 must be >3 V.
- → The frequency at X3 must be 10.002 MHz.

b) Instrument setting: frequency 500.3 MHz

- → The tuning voltage at X6 must be <12 V.
- → The frequency at X3 must be 10.006 MHz.

5.3 Troubleshooting

Troubleshooting can be readily carried out using the specified DC voltage values and signal levels. The inductors L30, L60 and L90 should be checked if the RF oscillators have a high microphony sensitivity. The inductors must be adhered firmly onto the circuit board.

5.3.1 Frequencies at the Output of the N Divider

The frequency of the N divider should be tested at P1 in the case of small frequency errors (<200 kHz).

a) Determination of M divider factor:

$$M = \mathrm{INT}\left(\frac{F_{OUT}}{50.01} \cdot 250\right)\ [\mathrm{MHz}]$$

b) Determination of N divider factor:

$$N = 2xM/(F_{OUT} - 0.2xM)\ [\mathrm{MHz}]$$

c) Determination of frequency at P1: $F_{P1} = 100\ \mathrm{MHz}/N$

5.3.2 DC Voltage Values

Emitter V30, V60, V90	-9 V ±1.5 V
X6	3 to 12 V
X9	2.5 to 20 V
P12	12 V ±1 V
P11	-11 V ±1,5 V
D140/6 (switched off)	<0.5 V
D160, D170, D180/2 (switched off)	<0.5 V
N400/3	2.5 V ±0.3 V
D260/6	8.6 V ±1 V
Emitter V230	6.8 V ±1 V

5.3.3 Signal Levels

N500/4	100 MHz	ECL
D510/5	10 MHz	ECL
P5	approx. 10 MHz	ECL
P6	approx. 10 MHz	TTL
D570/12	100.02 to 100.06 kHz	TTL
P1	2 to 6 kHz	TTL
P2	2 to 6 kHz	TTL
X3	10.002 to 10.006 MHz	approx. 4 V_{pp}
N260/3	2 to 6 kHz	50 to 150 mV_{pp}
X8	approx. 50 kHz	TTL
P3	approx. 50 kHz	TTL

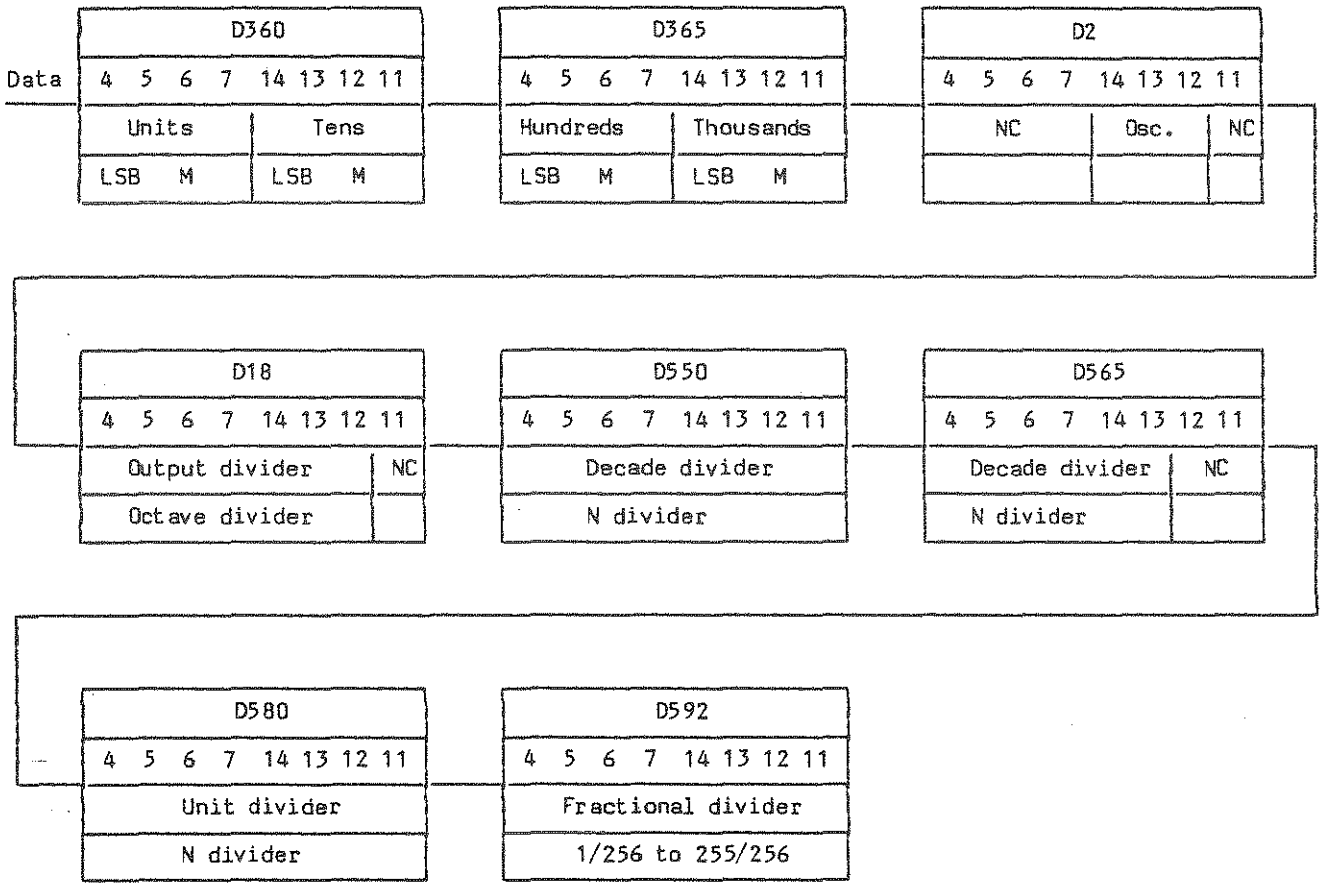
5.3.4 Control Signals for Octave Divider

Frequency at X309 in MHz	Control signals at D18						
	Pin 4	5	6	7	14	13	12
500 to 1000	0	1	1	1	1	0	0
250 to 500	1	0	1	1	1	1	0
125 to 250	1	1	0	1	1	0	1
62.5 to 125	1	1	1	0	1	1	0
31.25 to 62.5	1	1	1	1	0	0	1

5.3.5 Control Signals for the M Divider

Frequency at X309 in MHz	Control signals															
	D365								D360							
	Pin 11	12	13	14	7	6	5	4	11	12	13	14	7	6	5	4
802	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
801.8	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
801.6	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0
801.2	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0
800.4	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0
800	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0
798	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0
794	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
786	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
782	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0
762	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0
722	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0
642	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0
842	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0

5.3.6 Bit Pattern



Coaxial Interfaces

Pin	Frequency	Level
X931	100 MHz (input)	-3 dBm ±3 dB
X932	100 MHz (output)	800 mV_{pp}, ECL
X939	31.25 to 1000 MHz	-3 dBm ± 3dB

Multipoint connector X1:

A12, A13, B12, B13	+5-V power supply
A15, B15	+24-V power supply
A17, B17	+15-V power supply
A19, B19	-15-V power supply
A2, B2 A7, B7 A9, B9 A11, B11 A14, B14 A16, B16 A18, B18 A20, B20 A30, B30 A32, A32	Ground
A10, B10	Clock
A8	DATA
A6	STROBE
B21	Data programming
A23	Test voltages

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	Äl	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	01	0487	CM-P9 DUPLEX MODULAT.MET.	803.5317.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
A93	ED DUPLEX-MODULATIONS-M	803.6020.02	
W3	DX HF-KABEL W3 RF-CABLE W3	803.6688	
W21	DX HF-KABEL W21 RF-CABLE W21	803.6694	
			- ENDE -

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
B230	EQ 10,006 MHZCL30HC49-1D3 QUARTZ CRYSTAL UNIT QUARZKERAM N. R&S SACHNUMMER	EQ 090.2366	
C3	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C4	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C12	CE 10 UF+-20%25V 7X 5X11 ELECTROLYTIC CAPACITOR ERO-TANTAL ETR3-10/25	CE 023.5980	
C17	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C18	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C21	CT 13PF 7RDX13TK50 250V TRIMMER TEKELEC LUFTTRAT5400	CT 450.7283	
C22	CC 22PF+-10%100V2NPO CHIP CAPACITOR VITRAMON VJ0805A220KFA	CC 082.2931	
C25	CC 12PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A120JFA	CC 099.8744	
C26	CC 9PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A9RODFA	CC 099.8738	
C27	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C30	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5RODFA	CC 099.8696	
C31	CC 7PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A7RODFA	CC 099.8715	
C32	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C33	CC 7PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A7RODFA	CC 099.8715	
C35	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C40	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C41	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-4,7/20	CE 022.8110	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C48	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C49	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C50	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C51	CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER TEKELEC LUFTTRAT5200	CT 025.7367	
C52	CC 22PF+-10%100V2NPO CHIP CAPACITOR VITRAMON VJ0805A220KFA	CC 082.2931	
C53	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C54	CE 10UF -10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK10/63	CE 022.7650	
C55	CC 2PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A2ROCFA	CC 099.8673	
C56	CC 12PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A120JFA	CC 099.8744	
C57	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5RODFA	CC 099.8696	
C60	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C61	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C62	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C63	CC 4PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4ROCFA	CC 099.8680	
C65	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C70	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C71	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-4,7/20	CE 022.8110	
C81	CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER TEKELEC LUFTTRAT5200	CT 025.7367	
C82	CC 22PF+-10%100V2NPO CHIP CAPACITOR VITRAMON VJ0805A220KFA	CC 082.2931	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C84	CC 4PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4ROCFA	CC 099.8680	
C85	CC 4PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A4ROCFA	CC 099.8680	
C86	CC 5PF+-0,5PF50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A5RODFA	CC 099.8696	
C87	CC 2,3PF+-0,25PF50V2NPO CAPACITOR VITRAMON VJ0805A2R3CFA	CC 093.5566	
C88	CC 22PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A220JFA	CC 099.8396	
C89	CC 2PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A2ROCFA	CC 099.8673	
C92	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C93	CC 3PF+-0,25PF50V NPO1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A3ROCFA	CC 099.8350	
C95	CE 4,7UF+-20%20V 7X 4X 8 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR2-4,7/20	CE 022.8110	
C100	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C110	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C111	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C112	CE 100UF-10+50% 25V 13X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK100/25	CE 208.4007	
C116	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C120	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C123	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C124	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C125	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C126	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C131	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C132	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C133	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C134	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C135	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C140	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C141	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C142	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C143	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C144	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C145	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C146	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C160	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C161	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C162	CC 470PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A471JFA	CC 099.8515	
C163	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C164	CC 4,7NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y472KFA	CC 099.8450	
C165	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C166	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C168	CC 100NF+-10% 50V5K1200 C CAPACITOR VITRAMON VJ1812Y104KFA	CC 082.3473	
C170	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C171	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C172	CC 470PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A471JFA	CC 099.8515	
C173	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C174	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C175	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C180	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C181	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C182	CC 470PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A471JFA	CC 099.8515	
C183	CC 1NF+-10%50VX7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y102KFA	CC 099.8438	
C184	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C185	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C190	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C191	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C195	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C196	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C202	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C203	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	

095.0026-1186

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C210	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C211	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C220	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C221	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C222	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C223	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C225	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C226	CK 47NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,047UF/5%	CK 099.2917	
C230	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C231	CC 10NF-20+50%7X8R4000. CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C232	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C233	CC 100PF+-2%6X9NPO CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C250	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C251	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C255	CE 47UF -10+50% 63V 13X17 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK47/63	CE 022.7672	
C257	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C259	CE 100UF-10+50% 25V 13X13 ELECTROLYTIC CAPACITOR ROEDERST ELKOEK100/25	CE 208.4007	
C260	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C261	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	

085.0026-1186

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C262	CK 1UF+-10%50V5RM MKT CAPACITOR WIMA MKS2/50/1UF/10%	CK 099.2998	
C263	CK 220NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,22UF/5%	CK 099.2952	
C264	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C267			
C268	CE 47UF-10+50% 40V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 247 G	CE 006.7142	
C300	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C301	CK 10NF+-5%63V5RM MKT CAPACITOR WIMA FKS 2/100/0,01UF/5%	CK 099.2869	
C302	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C303	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C304	CC 100PF+-5%50V NPO 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206A101JFA	CC 099.8415	
C305	CE 470UF+-20%25V12,5X12,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-471U	803.0715	
C310	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C311	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C315	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C320	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C330	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
BIS/TO C335			
C340	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	
C341	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C343	CE 100UF-10+50% 16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00CB 310 D	CE 006.7165	
C358	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C359	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C366	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C380	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C390	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C400	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C401	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C402	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C410	CK 470NF+-10%160V27X7X17 WIMA MKP10 0,47UF160V 10%	803.0721	
C411	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C412	CK 470NF+-10%160V27X7X17 WIMA MKP10 0,47UF160V 10%	803.0721	
C426	CK 220NF+-10%160V18X7X14 MET.POLYPROP.CAPACITOR WIMA MKP10 0,22UF160V 10%	803.0496	
C501	CC 1NF+-10%200V5K1200VIEL CAPACITOR UNION CARB CK05BX102K	CC 068.4047	
C502	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C504	CC 10NF-20+50%7X8R4000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C510	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
C520	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C530	CC 6PF+-0,5PF50V NPO CERAMIC CHIP CAPACITOR VITRAMON VJ1206A6RODFA	CC 099.8709	

095.0026-1186

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C540	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C545	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C555	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C560	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C570	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C571	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C575	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C585	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C590	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C595	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C597	CC 10NF+-10%50V X7R 1206 CERAMIC CHIP CAPACITOR VITRAMON VJ1206Y103KFA	CC 099.8521	
C601	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C602	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
C603	LD FILT.40DB/10GHZ10A300V LOWPASS-FILTER ERIE 9900-001-6020	911.0705	
D2	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D18	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D50	BO LT337AH -ADJ0A5 VREGL VOLTAGE REGULATOR LIN.TECHN. LT337AH	803.6665	
D140	BL SP8605BDG 2:1DIVID UHF DIVIDER PLESSEY SP8605BDG	BL 092.9280	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D150	BO UA78M12HC+12V0A5 VREGL VOLTAGE REGULATOR FAIRCHILD MA78M12HC	BO 569.3155	
D160	BL CA3199E 4:1 DIVID DIVIDER RCA CA3199E	372.1106	
D162	BO CA3081F 7XN TR.ARRAY TRANSISTOR ARRAY RCA CA3081F	BO 455.0506	
D170	BL CA3199E 4:1 DIVID DIVIDER RCA CA3199E	372.1106	
D180	BL CA3199E 4:1 DIVID DIVIDER RCA CA3199E	372.1106	
D202	BL MM74HC00N 4X2IN.NAND QUAD 2-INPUT NAND GATE MOTOROLA MC74HC00N	BL 571.3194	
D210	BL MM74HC107N 2XJK-FF CL DUAL J-K FLIPFLOP W.CLEAR NSC MM74HC107N	BL 099.9534	
D250	BL SN74LS02N 4/2INP.NOR IC NOR GATE SN74LS02N TEXAS SN74LS020N	266.4658	
D255	BL MM74HC390N 2X4B.COUNT DUAL 4-BIT DECADE COUNTER NSC MM74HC390N	BL 099.9640	
D260	BO MC1496L MOD/DEMOD MODULATOR/DEMODULATOR MOTOROLA MC1496L	BO 473.9024	
D310	BL CA3199E 4:1 DIVID DIVIDER RCA CA3199E	372.1106	
D315	BL SP8647BDG10:1DIVID UHF DIVIDER PLESSEY SP8647BDG	BL 300.6747	
D320	BL 74F00PC 4X2IN.NANDG QUAD-NAND-GATE FAIRCHILD 74F00PC	BL 344.6659	
D330	BL 74F162PC BCD DEC.COUNT BCD DECADE COUNTER FAIRCHILD 74F162APC	BL 099.9892	
BIS/TO D333			
D358	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D359	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D360	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D365	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D380	BL MM74HC74N 2XD-FLIPFL DUAL D FLIP-FLOP NSC MM74HC74N	BL 571.3171	
D390	BL MM74HC107N 2XJK-FF CL DUAL J-K FLIPFLOP W.CLEAR NSC MM74HC107N	BL 099.9534	
D395	BL MM74HC00N 4X2IN.NAND QUAD 2-INPUT NAND GATE MOTOROLA MC74HC00N	BL 571.3194	
D510	BL MC10138L 4B.COUNTER COUNTER MOTOROLA MC10138L	BL 564.8407	
D520	BL SP8647BDG10:1DIVID UHF DIVIDER PLESSEY SP8647BDG	BL 300.6747	
D530	BL PC74HC123 2XMULTIVIB DUAL MONOST.MULTIVIBRATOR VALVO PC74HC123	BL 099.9540	
D540	BL 74F191PC U/D-BIN.CNT UP/DOWN BIN.-COUNTER FAIRCHILD 74F191PC	BL 344.6871	
D545	BL 74F191PC U/D-BIN.CNT UP/DOWN BIN.-COUNTER FAIRCHILD 74F191PC	BL 344.6871	
D550	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D555	BL 74F191PC U/D-BIN.CNT UP/DOWN BIN.-COUNTER FAIRCHILD 74F191PC	BL 344.6871	
D560	BL 74F191PC U/D-BIN.CNT UP/DOWN BIN.-COUNTER FAIRCHILD 74F191PC	BL 344.6871	
D565	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D570	BL PC74HC123 2XMULTIVIB DUAL MONOST.MULTIVIBRATOR VALVO PC74HC123	BL 099.9540	
D575	BL SN74LS165N 8BIT-S.REG. SN74LS165N 8BIT-S.REG. TEXAS SN74LS165N	353.3088	
D580	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D585	BL SN74LS165N 8BIT-S.REG. SN74LS165N 8BIT-S.REG. TEXAS SN74LS165N	353.3088	
L21	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L24	LD 0,39UH10%0,30OHM0,710A CHOKE DELEVAN DROSSEL1025-10	LD 067.2811	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L25	LD SPULE COIL	801.6422	
L26	LL SPULE	802.7474	802.6455
L30	LD SPULE COIL	801.6422	
L31	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L50	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L51	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L52	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L54	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L55	LD SPULE COIL	801.6422	
L56	LL SPULE	802.7422	802.6455
L60	LD SPULE COIL	801.6422	
L61	LD 0,22UH10%0,14OHM1,045A CHOKE DELEVAN DROSSEL1025-04	LD 067.2786	
L81	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L84	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L85	LD SPULE COIL	801.6422	
L86	LL SPULE	802.7516	802.6455
L90	LD SPULE COIL	801.6422	
L91	LD 0,15UH10%0,10OHM1,230A CHOKE DELEVAN DROSSEL1025-00	LD 067.2763	
L112	LD 1,20UH10%0,18OHM0,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L120	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L133	LD 100 UH10%8,00OHM0,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L140	LD 0,33UH10%0,22OHM0,830A CHOKE DELEVAN DROSSEL1025--08	LD 067.2805	
L145	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L146	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L163	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L166	LD 390 UH10%35,0OHM0,040A CHOKE DELEVAN DROSSEL1025-82	LD 067.3176	
L173	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L183	LD 470 UH10%42,0OHM0,036A CHOKE DELEVAN DROSSEL1025-84	LD 067.3182	
L230	LD 15,0UH10%2,80OHM0,157A CHOKE DELEVAN DROSSEL1025-48	LD 067.3001	
L255	LD 220 UH10%21,0OHM0,052A CHOKE DELEVAN DROSSEL1025-76	LD 067.3147	
L259	LD 10,0UH10%3,30OHM0,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	
N120	BM OM350 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM350	BM 334.4953	
N130	BM OM350 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM350	BM 334.4953	
N165	BM OM350 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM350	BM 334.4953	
N190	BO LM124J 4XL.P.OPAMP OPERATIONAL AMPLIFIER NSC LM124J	300.6353	
N195	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N220	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N260	BO LM311N COMPAR COMPARATOR NSC LM311N	BO 394.8755	
N300	BM OM345 ANTENNEN-VERST ANTENNA AMPLIFIER VALVO OM345	BM 285.1596	
N400	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF156J	BO 645.7251	
N500	BL MC10116L 3XL. RECEIV LINE RECEIVER MOTOROLA MC10116L	BL 282.3275	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
P1	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P2	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P3	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P5	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P6	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P11	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P12	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
P48	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
R12	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R25	RG 46,4 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 46,4OHM2% TK	006.8803	
R26	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R27	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R30	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R35	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R40	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R41	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R42	RL 0,35W 68,1 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/68,1OHM-F-D	RL 082.9636	
R43	RL 0,35W 3,24KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,24K-F-D	RL 082.6843	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R44	RL 0,35W 332 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/332OHM-F-D	RL 083.0255	
R45	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R47	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R48	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R49	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R50	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R56	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R57	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R60	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R65	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R70	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R71	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R72	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R75	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R77	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R78	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R79	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R86	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R87	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R90	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R95	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R100	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R101	RL 0,35W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R102	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R105	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R107	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R108	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R109	RS 0,5W500 OHM+-10%10X10X CERMET POTENTIOMETER T BOURNS 3386F-1-501	RS 247.7878	
R116	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R120	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R121	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R122	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R123	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R130	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R132	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R133	RL 0,35W 162 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/162OHM-F-D	RL 082.9971	
R134	RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 75,0OHM F T	RG 006.8855	
R135	RG 237 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 237OHM2% TK	006.8978	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R140	RG 422 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 422OHM2% TK	006.9039	
R141	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R142	RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 75,0OHM F T	RG 006.8855	
R157	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R159	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R160	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R161	RG 237 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 237OHM2% TK	006.8978	
R162	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R163	RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 75,0OHM F T	RG 006.8855	
R166	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R167	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R168	RG 38,3 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 38,3OHM2% TK	006.8784	
R169	RG 147 OHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB3216 147OHM2% TK	006.8926	
R170	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R171	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R172	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R173	RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 75,0OHM F T	RG 006.8855	
R180	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R181	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R182	RG 100 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 100OHM F T	RG 006.8884	
R183	RG 75,0 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 75,0OHM F T	RG 006.8855	
R190	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
BIS/TO R194			
R195	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R196	RG 10 KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 10,0KOHM FT	RG 007.0793	
R210	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R211	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R221	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R222	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R223	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R225	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	
R226	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R230	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R231	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R233	RL 0,35W 150 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/150OHM-F-D	RL 082.9942	
R234	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R235	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R236	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	

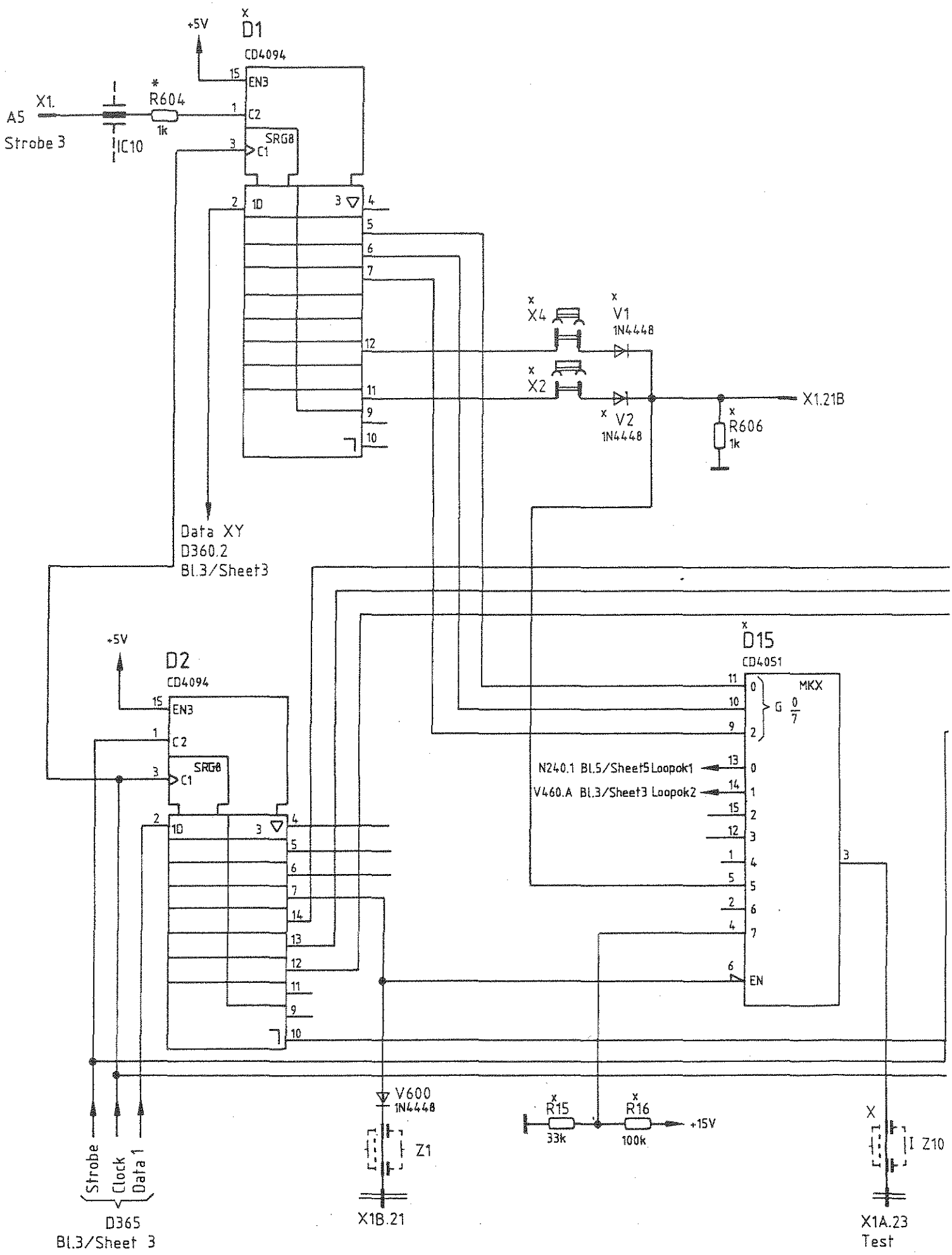
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R249	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R250	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R251	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R252	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R253	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R254	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R255	RL 0,35W 150 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/150OHM-F-D	RL 082.9942	
R256	RL 0,35W 6,81KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/6,81K-F-C	RL 082.2560	
R257	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	
R258	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R259	RL 0,35W 274 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/274OHM-F-D	RL 083.0178	
R260	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.1039	
R261	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR RESISTA MK2	RL 083.1039	
R262	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R263	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R264	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R265	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R266	RL 0,35W 100 OHM+-1%TK50 METALFILM-RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R267	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

095.0026-1186

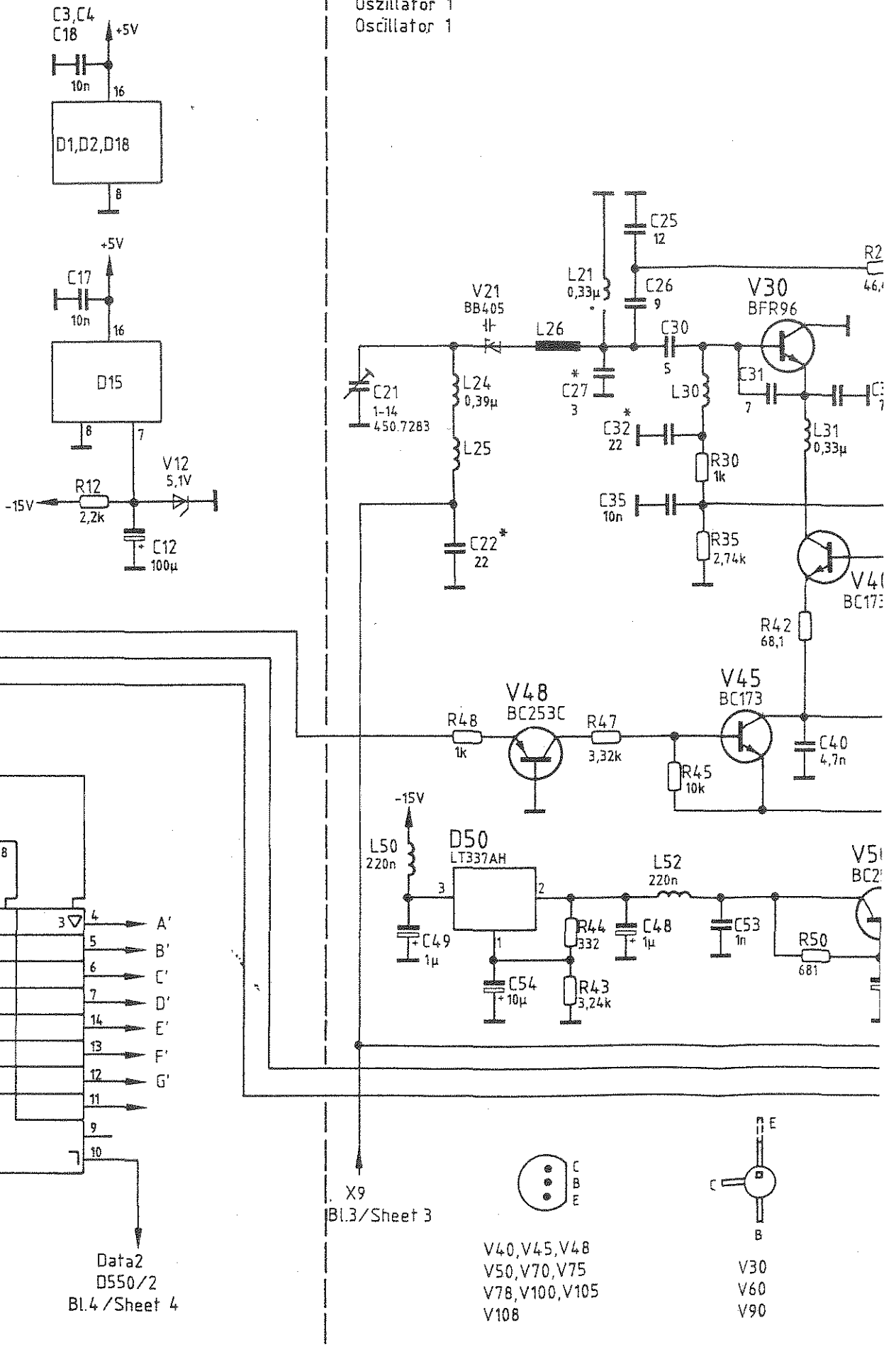
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R300	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R303	RG 82,5 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 82,5OHM F T	RG 006.8861	
R310	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R311	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R312	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R315	RL 0,35W 681 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/681OHM-F-D	RL 083.0490	
R316	RL 0,35W 1,50KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,50K-F-D	RL 083.0732	
R320	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R333	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R334	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R358	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R400	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R402	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R403	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R405	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R410	RL 0,35W 27,4KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/27,4K-F-C	RL 082.2583	
R411	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R425	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/15K-F-D	RL 083.1400	
R428	RL 0,35W 1,82KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1,82K-F-C	RL 082.2277	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R500	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
BIS/TO R504			
R510	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R511	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R520	RG 1,78KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 1,78KOHM 2%	007.0006	
R521	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R522	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R523	RG 681 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 681OHM F T	RG 006.9080	
R524	RG 1,47KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 1,47KOHM 2%	006.9980	
R530	RG 3,83KOHM+-2%TK200 1206 CHIP RESISTOR DRALORIC CGB 3216 3,83KOHM 2%	007.0693	
R570	RG 8,25KOHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 8,25KOHM FT	RG 007.0770	
R571	RG 825 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 825OHM F T	RG 006.7259	
R601	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
R602	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
R603	RG 1000 OHM+-1%TK100 1206 CHIP RESISTOR DALE CRCW1206 1,0KOHM F T	RG 006.7271	
V12	AE BZX79/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C5V1	AE 012.2449	
V21	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V30	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	
V40	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V45	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V48	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V50	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V51	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V60	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	
V70	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V75	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V78	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V81	AE BB405B 11/ 2PF CDI TUNING DIODE VALVO BB405B	AE 596.6839	
V90	AK BFR96 NPN 15V 75MA TRANSISTOR VALVO BFR96	AK 093.2738	
V100	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V105	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V108	AK BC253C PNP 25V 100MA TRANSISTOR INTERMETAL BC253C	010.2829	
V115	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V145	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V146	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V147	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V163	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V170	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	

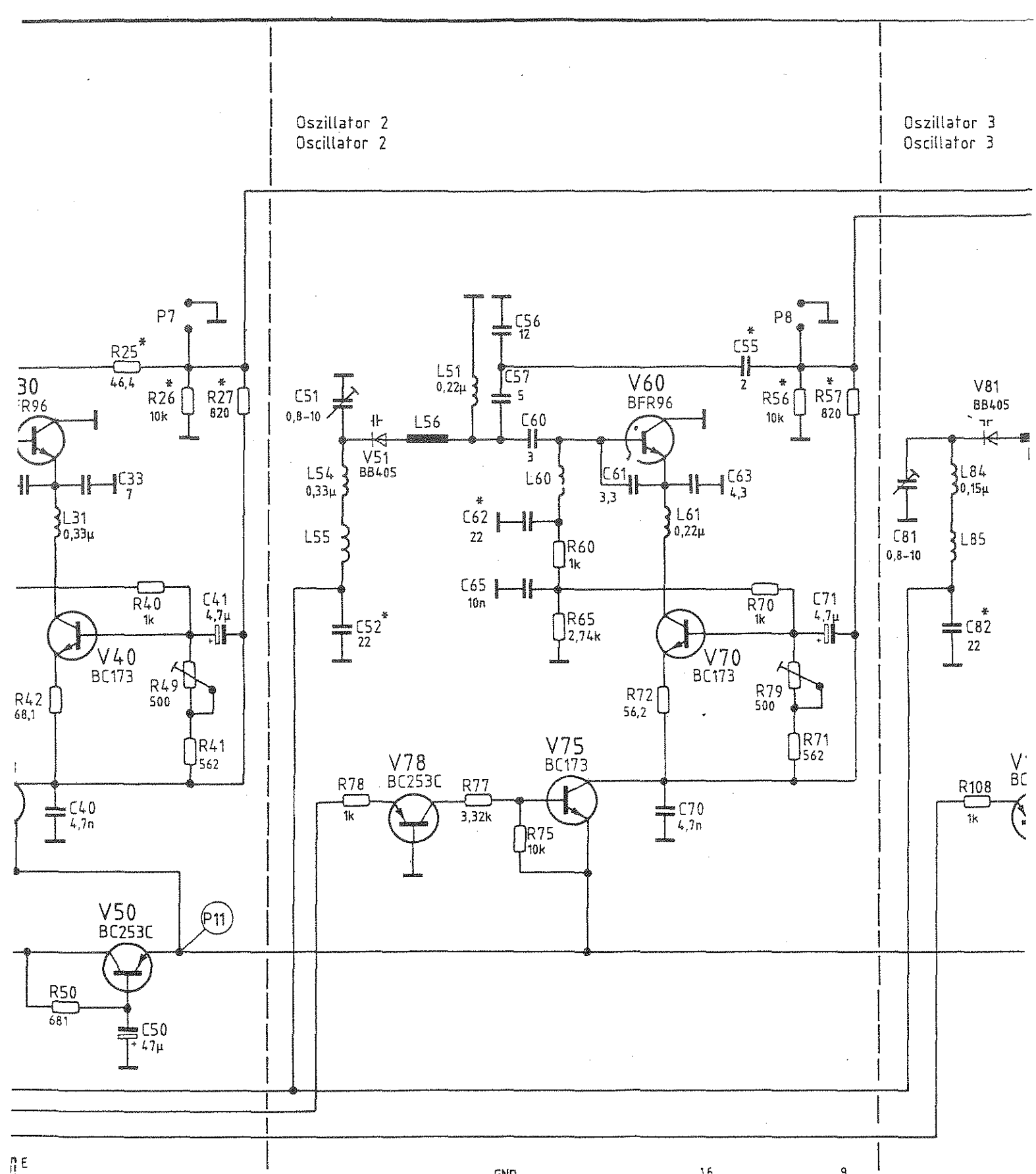

+5V
D1
CD4094
EN3
C2
SRG8
C1
1D
X1.
A5
Strobe 3
IC10
R604
1k
X4
X2
V1
1N4448
V2
1N4448
R606
1k
X1.21B
Data XY
D360.2
Bl.3/Sheet3
+5V
D2
CD4094
D15
CD4051
MKX
N240.1 Bl.5/Sheet5 Loopok1
V460.A Bl.3/Sheet3 Loopok2
EN
V600
1N4448
Z1
R15
33k
R16
100k
+15V
Z10
Strobe
Clock
Data 1
D365
Bl.3/Sheet 3
X1B.21
X1A.23
Test

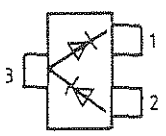
Oszillator 1
Oscillator 1



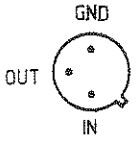
Oszillator 2
Oscillator 2

Oszillator 3
Oscillator 3

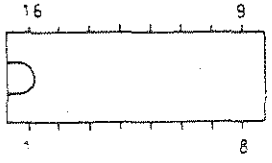




V115,V145,V175



D50

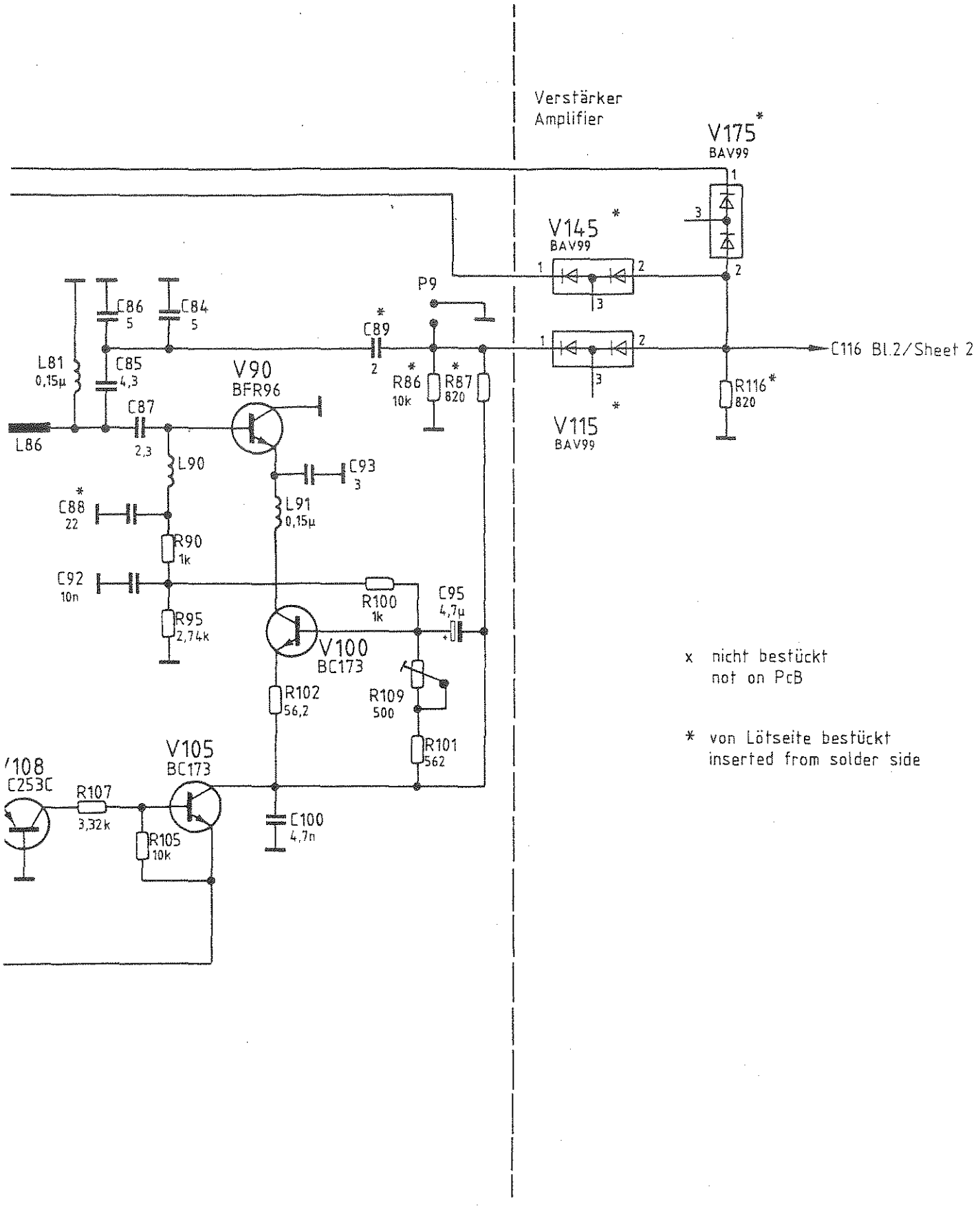


Draufsicht
Top view

D1,D2,D15,D18

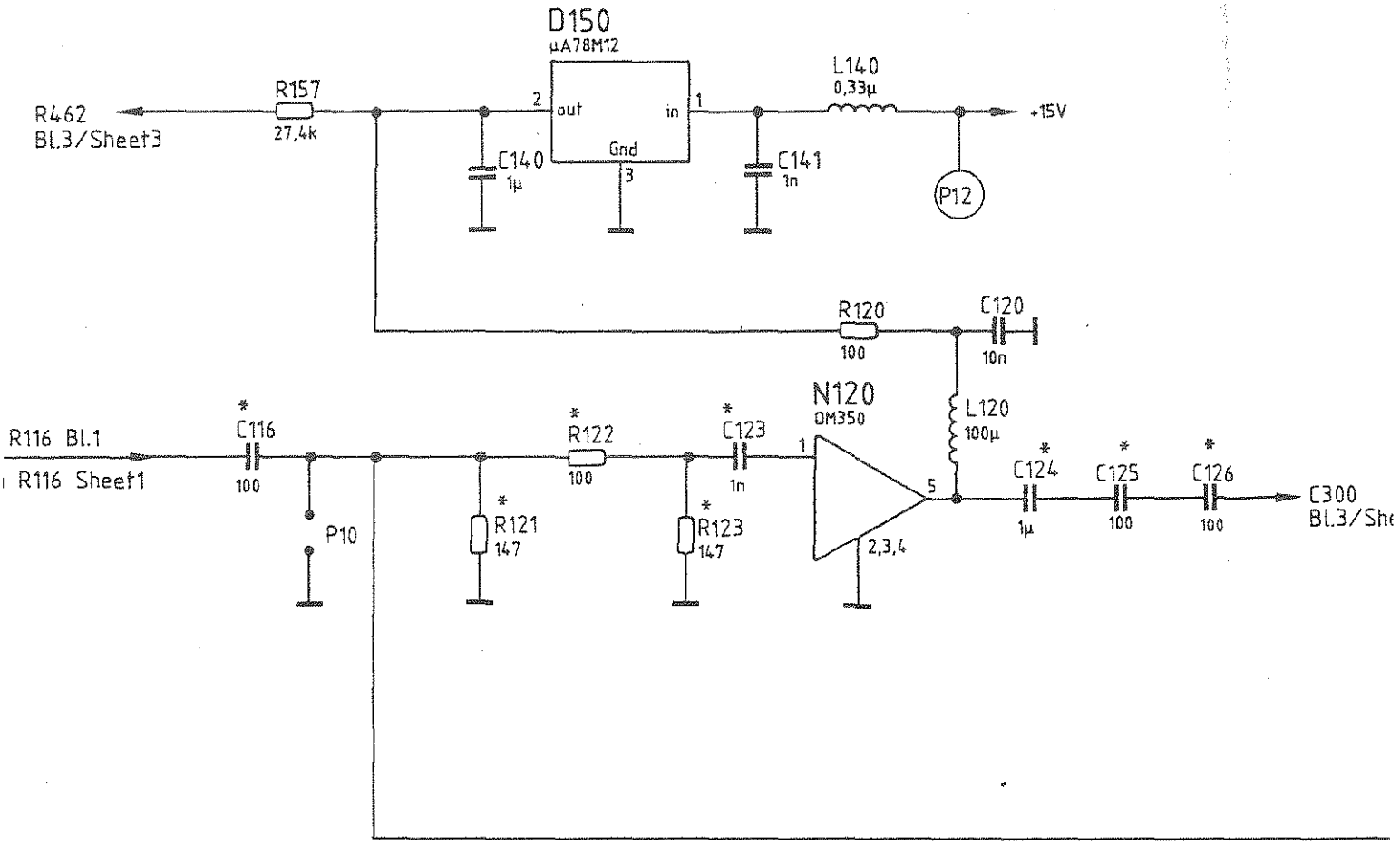
A		3.86	CO				
B	35529	8.86	CO				
C	38962	8.87	Co				
Änd.	Änderungs-Nr.	Datum	Name	Änd.	Änderungs-Nr.	Datum	Name

ROHDE&SCHWARZ



Stromlauf gilt für VAR 02
Circuit diagram is valid for model 02

1KSA	Tag	Name	Benennung		Zeichn.-Nr
Bearb	11.85	CO	Duplex-Modulationsmesser Duplex-Modulation Meter	Z	803.6020 S
Gepr					
Norm			zu Gerät CM-B9	reg. V 803.5317 V	erste Z

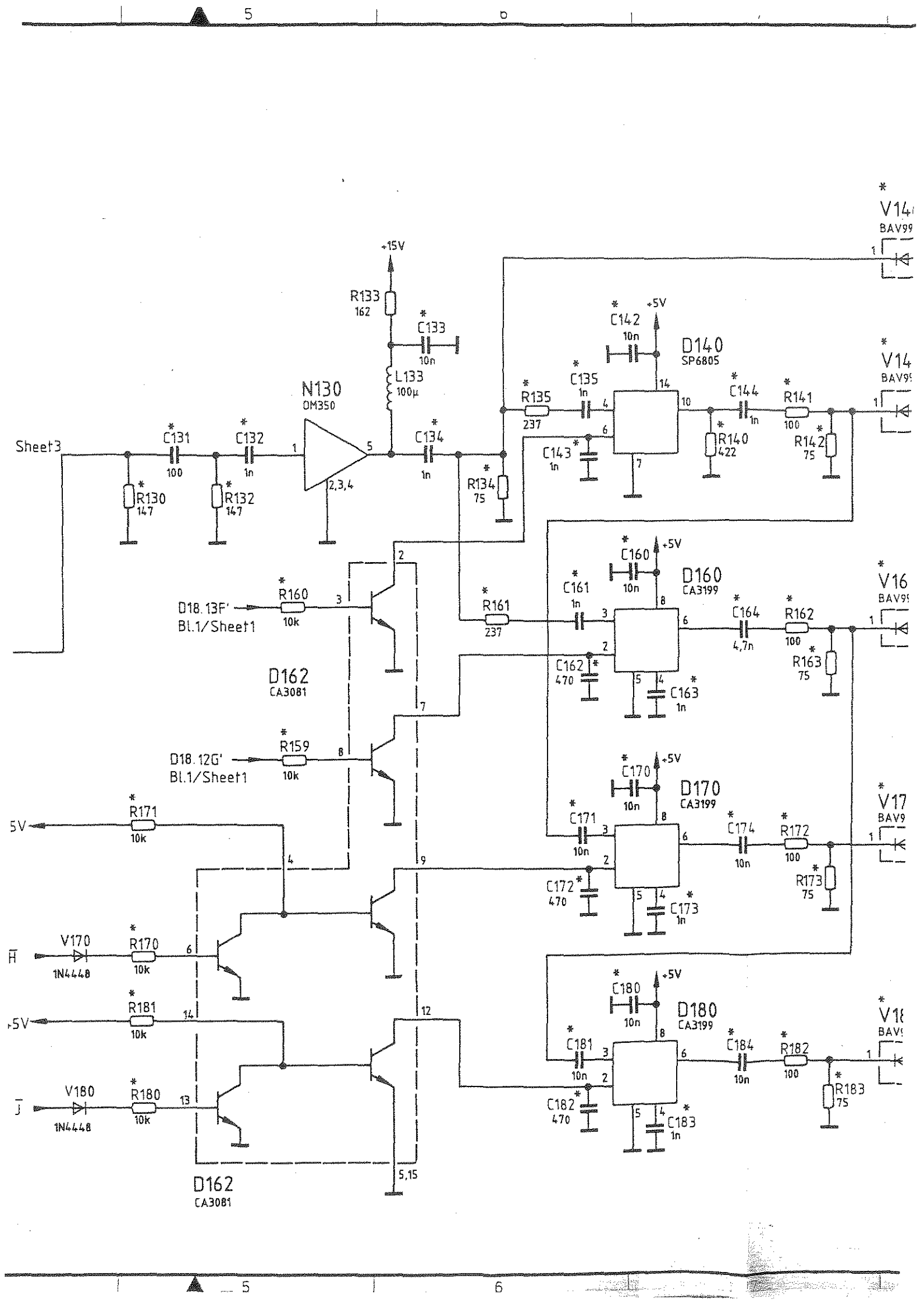

D150
µA78M12
R462
Bl.3/Sheet3
R157
27,4k
2
out
in
1
Gnd
3
C140
1µ
C141
1n
L140
0,33µ
+15V
P12
R120
100
C120
10n
N120
OM350
L120
100µ
R116 Bl.1
R116 Sheet1
C116
100
P10
R122
100
R121
147
C123
1n
R123
147
1
5
2,3,4
C124
1µ
C125
100
C126
100
C300
Bl.3/She

+5V

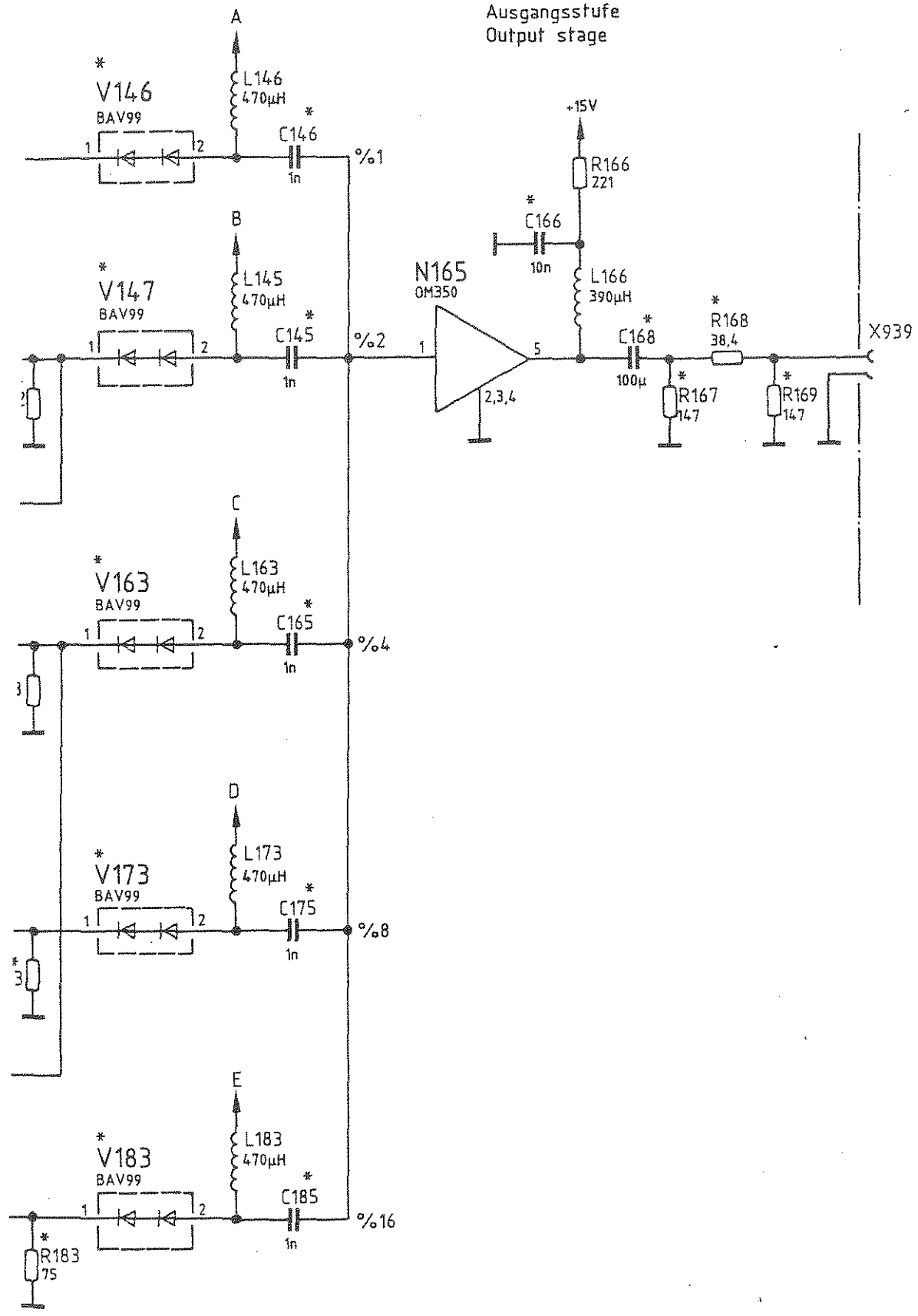
H

+5V

J


+15V
R133
162
C133
10n
L133
100µ
N130
OM350
Sheet3
C131
100
C132
1n
C134
1n
R130
147
R132
147
2,3,4
R134
75
R135
237
C135
1n
C142
10n
+5V
D140
SP6805
C143
1n
C144
1n
R141
100
R140
422
R142
75
V14
BAV99
D18.13F'
Bl.1/Sheet1
R160
10k
R161
237
C160
10n
D160
CA3199
C161
1n
C162
470
C163
1n
C164
4,7n
R162
100
R163
75
V16
D162
CA3081
D18.12G'
Bl.1/Sheet1
R159
10k
C170
10n
D170
CA3199
C171
10n
C172
470
C173
1n
C174
10n
R172
100
R173
75
V17
5V
R171
10k
H
V170
1N4448
R170
10k
5V
R181
10k
J
V180
1N4448
R180
10k
C180
10n
D180
CA3199
C181
10n
C182
470
C183
1n
C184
10n
R182
100
R183
75
V18
D162
CA3081
5,15

Ausgangsstufe
Output stage



D18.7 D' -
Bl.1/Sheet1

+5V -

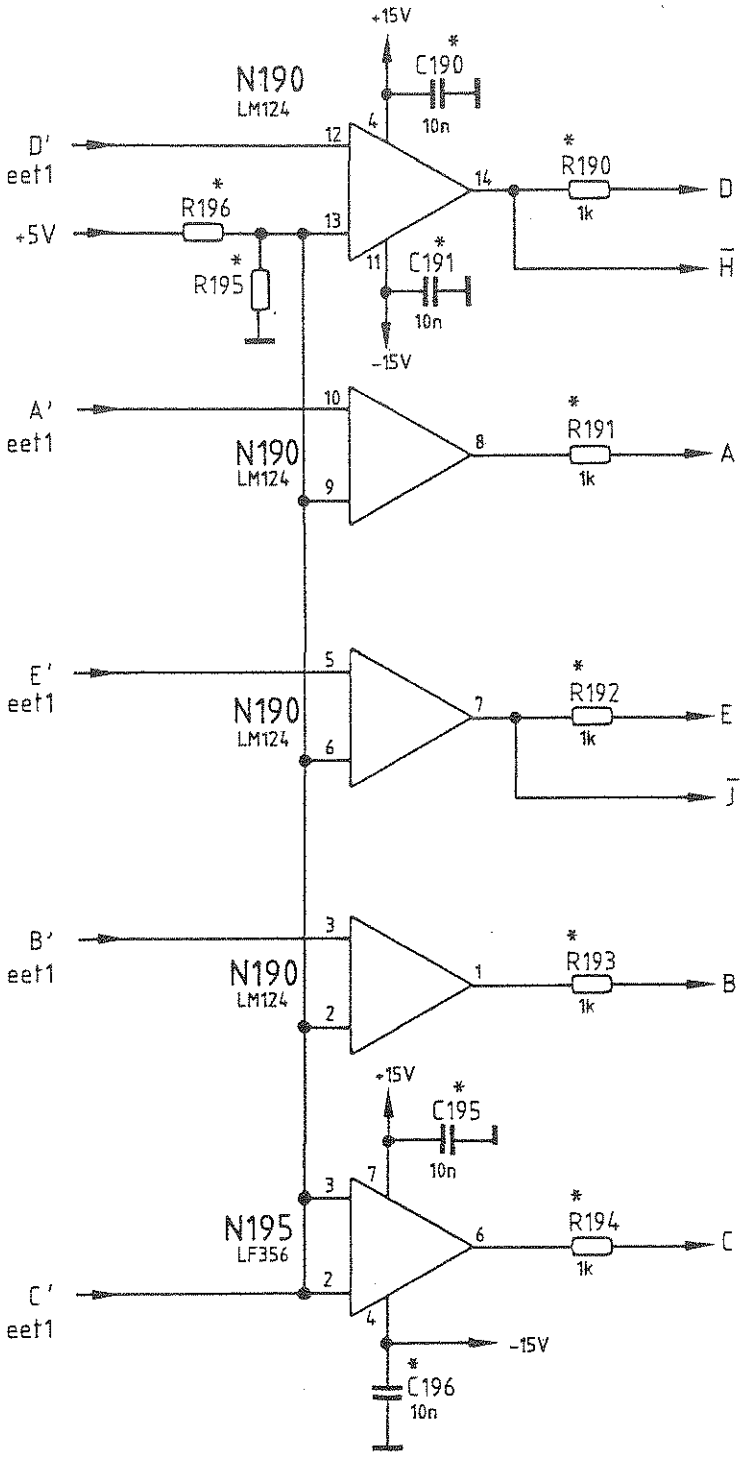
D18.4 A' -
Bl.1/Sheet1

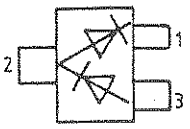
D18.14 E' -
Bl.1/Sheet1

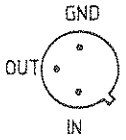
D18.5 B'
Bl.1/Sheet1

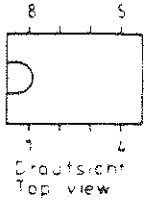
D18.6 C'
Bl.1/Sheet1

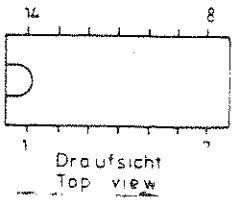
ROHDE&SCHWARZ	A		3.86	CO					1KSA
									Bearb.
									Gepr.
	Änd. Ausg.	Änderungs Mitteilung	Datum	Name	Änd. Ausg.	Änderungs Mitteilung	Datum	Name	Norm

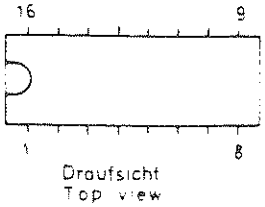






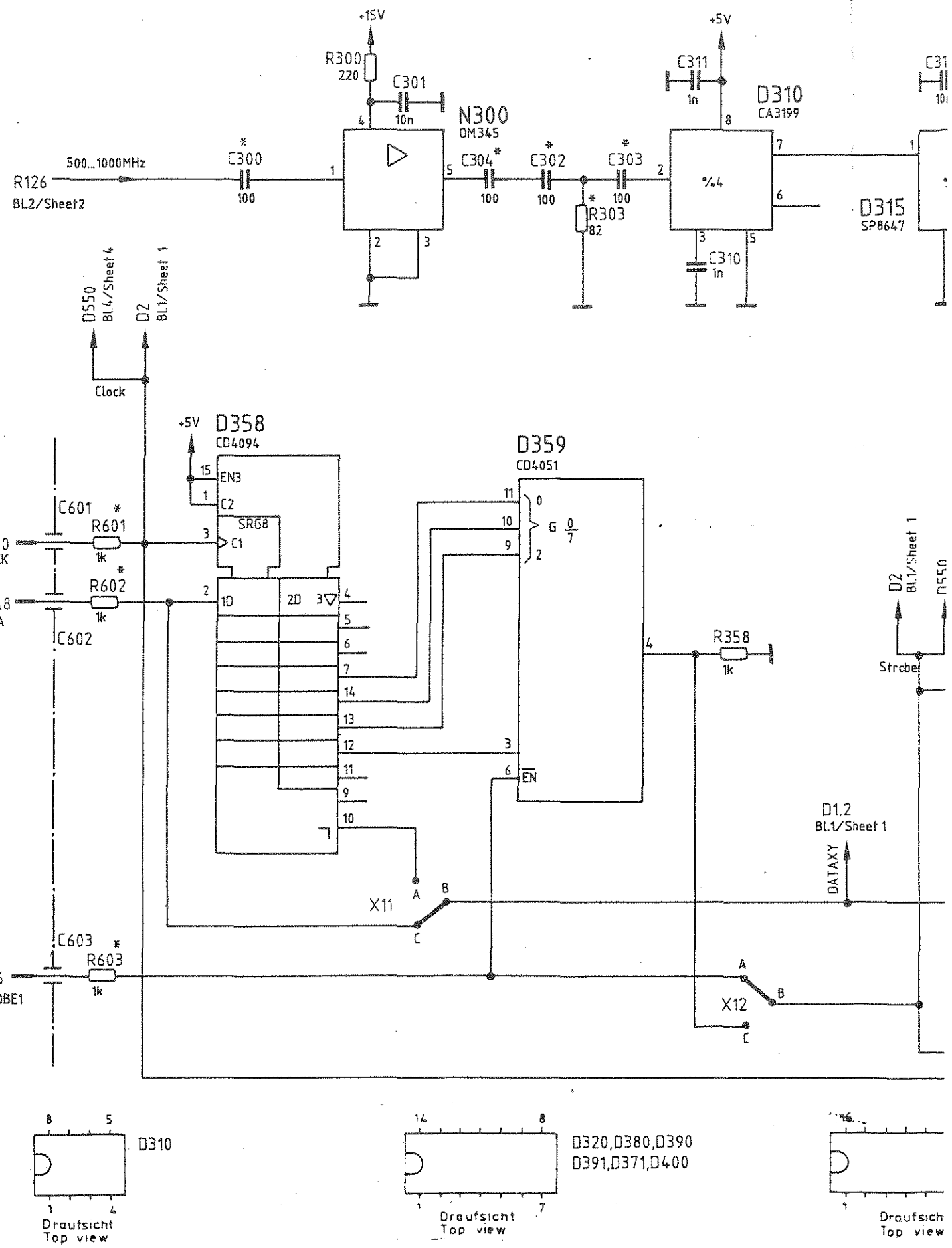


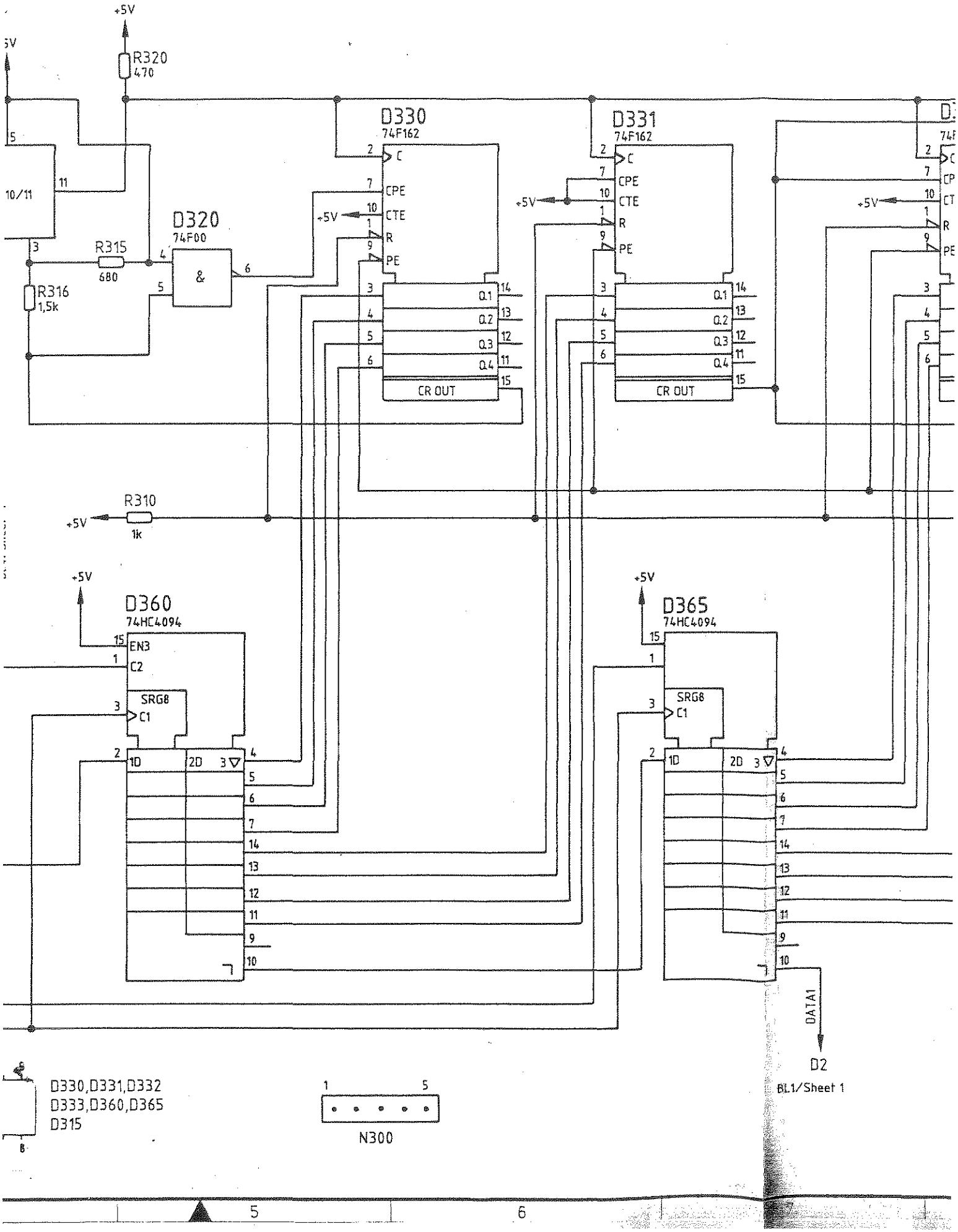


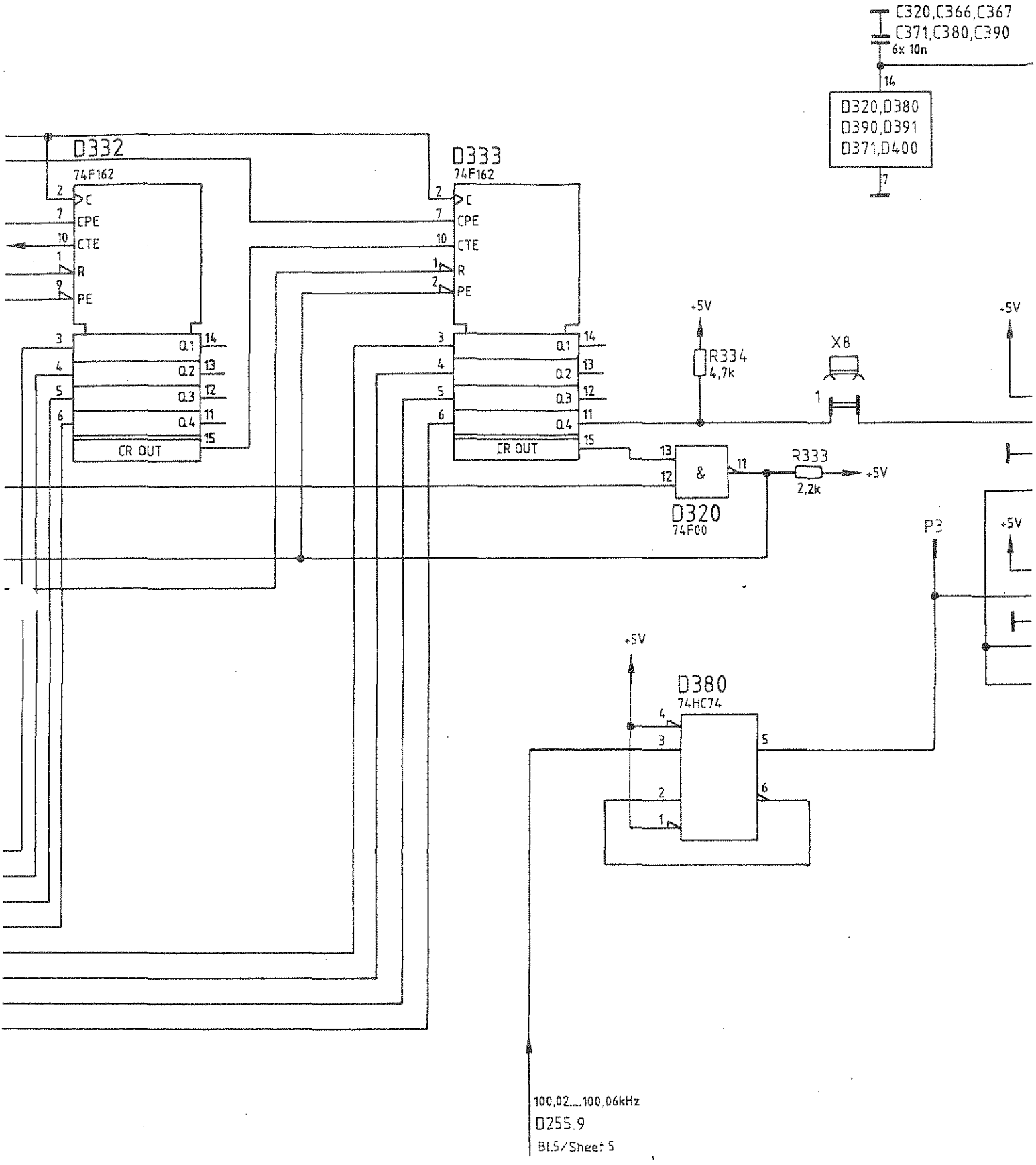


* von Lötseite bestückt
inserted from solder side

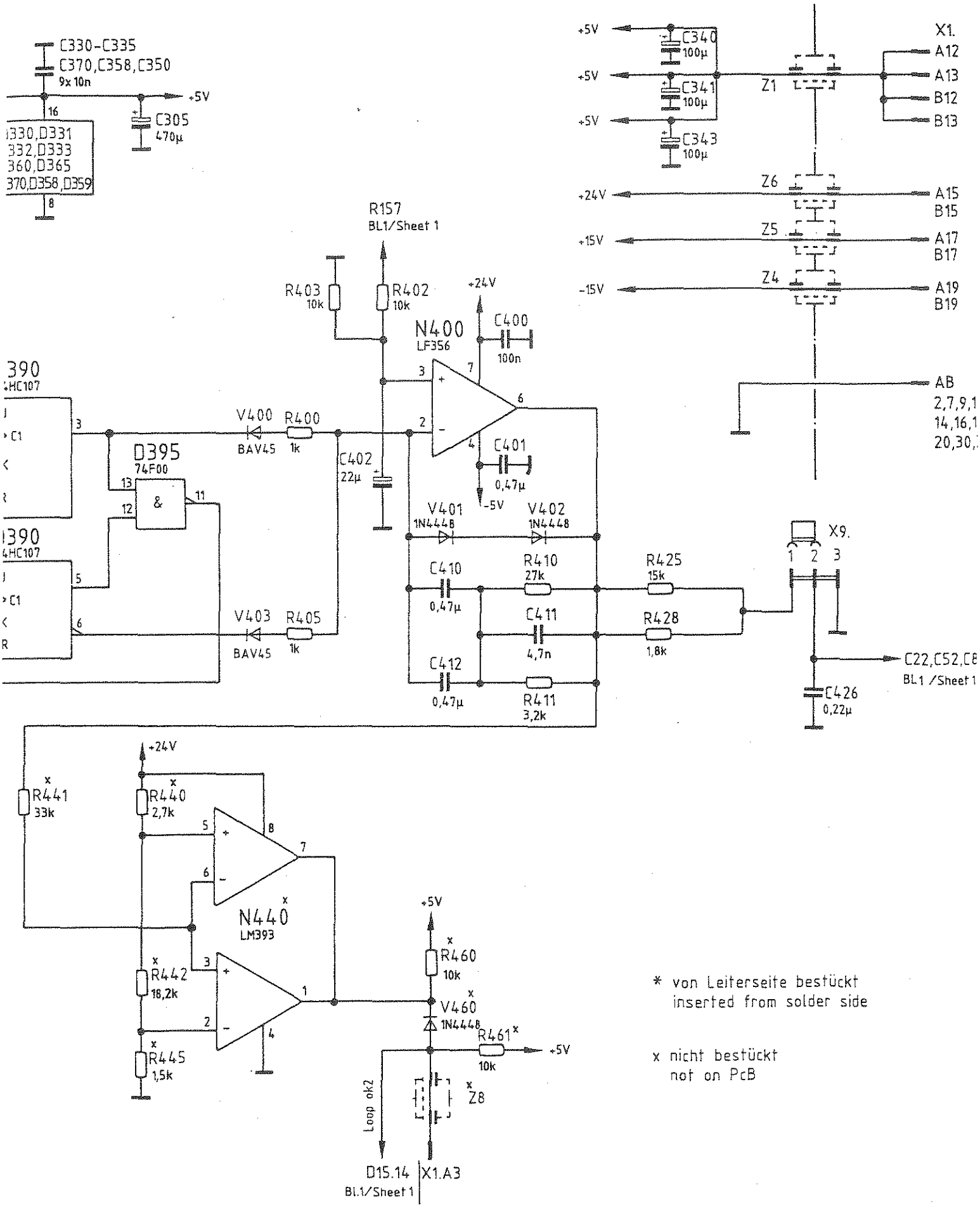
Tag	Name	Benennung		Zeichn.-Nr
11.85	CO	Duplex-Modulationsmesser Duplex-Modulation Meter	Z	803.6020 S
		zu Gerät CM-B9		reg. V 803.5317 V erste Z


+15V
R300
220
C301
10n
N300
OM345
+5V
C311
1n
D310
CA3199
500...1000MHz
R126
BL.2/Sheet2
C300
100
C304
100
C302
100
C303
100
R303
82
%4
C310
1n
D315
SP8647
D550
BL.4/Sheet 4
D2
BL.1/Sheet 1
Clock
+5V
D358
CD4094
EN3
C2
SRG8
C1
1D
2D
D359
CD4051
G 0/7
C601
R601
1k
AB10
CLOCK
C602
R602
1k
A8
DATA
R358
1k
Strobe
D1.2
BL.1/Sheet 1
DATAXY
X11
X12
C603
R603
1k
A6
STROBE1
D310
Draufsicht
Top view
D320,D380,D390
D391,D371,D400
Draufsicht
Top view
Draufsich
Top view


+5V
R320
470
D330
74F162
D331
74F162
D320
74F00
R315
680
R316
1,5k
10/11
C
CPE
CTE
R
PE
Q1
Q2
Q3
Q4
CR OUT
&
R310
1k
D360
74HC4094
D365
74HC4094
EN3
C2
SRG8
C1
1D
2D
DATA1
D2
BL1/Sheet 1
D330,D331,D332
D333,D360,D365
D315
N300



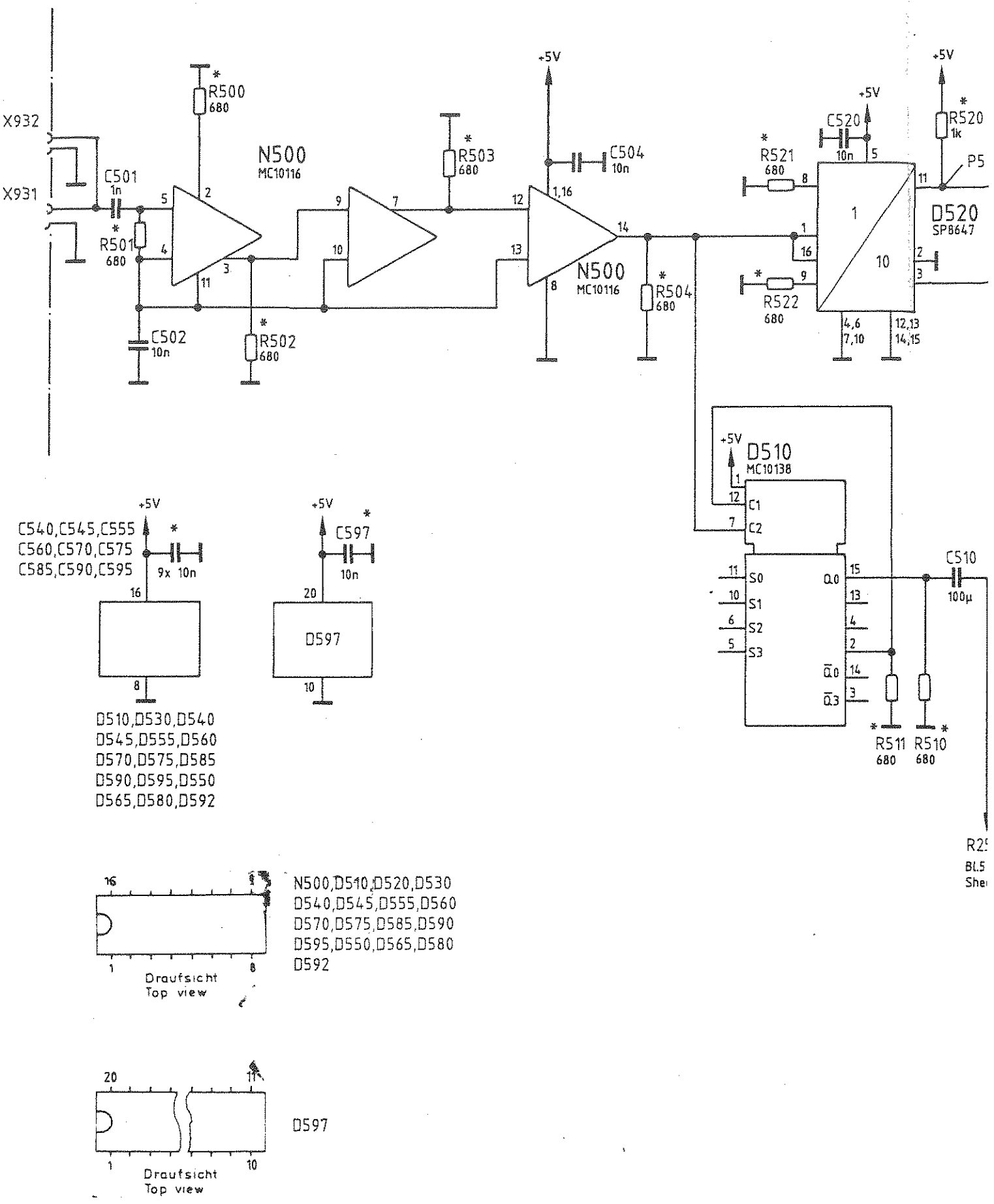
ROHDE & SCHWARZ	A		3.86	CO					1KSA	Tag
									Bearb	11.85
									Gepr	
	And Zust	Änderungs Mitteilung	Datum	Name	And	Änderungs Mitteilung	Datum	Name	Norm	



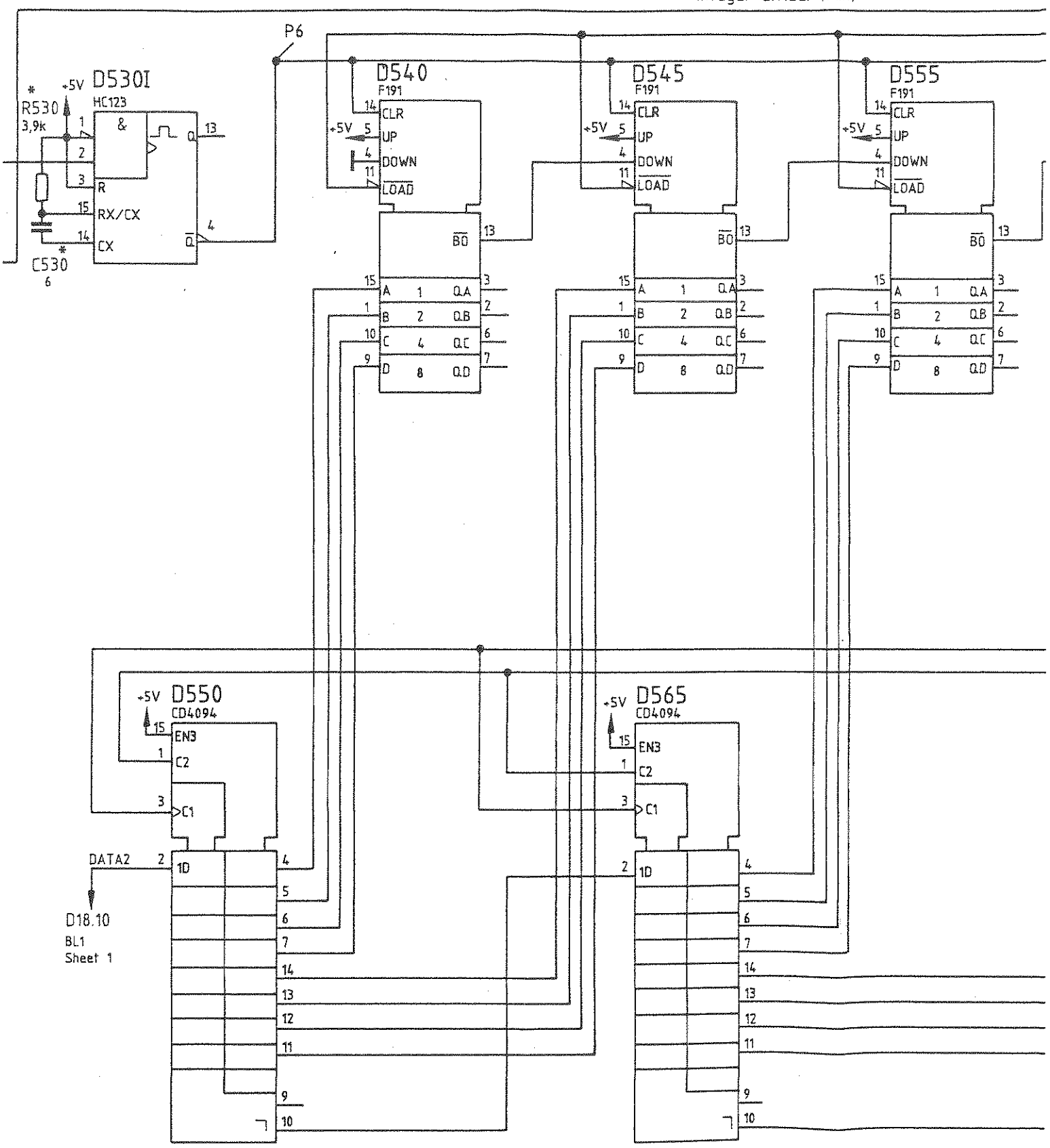
* von Leiterseite bestückt
inserted from solder side

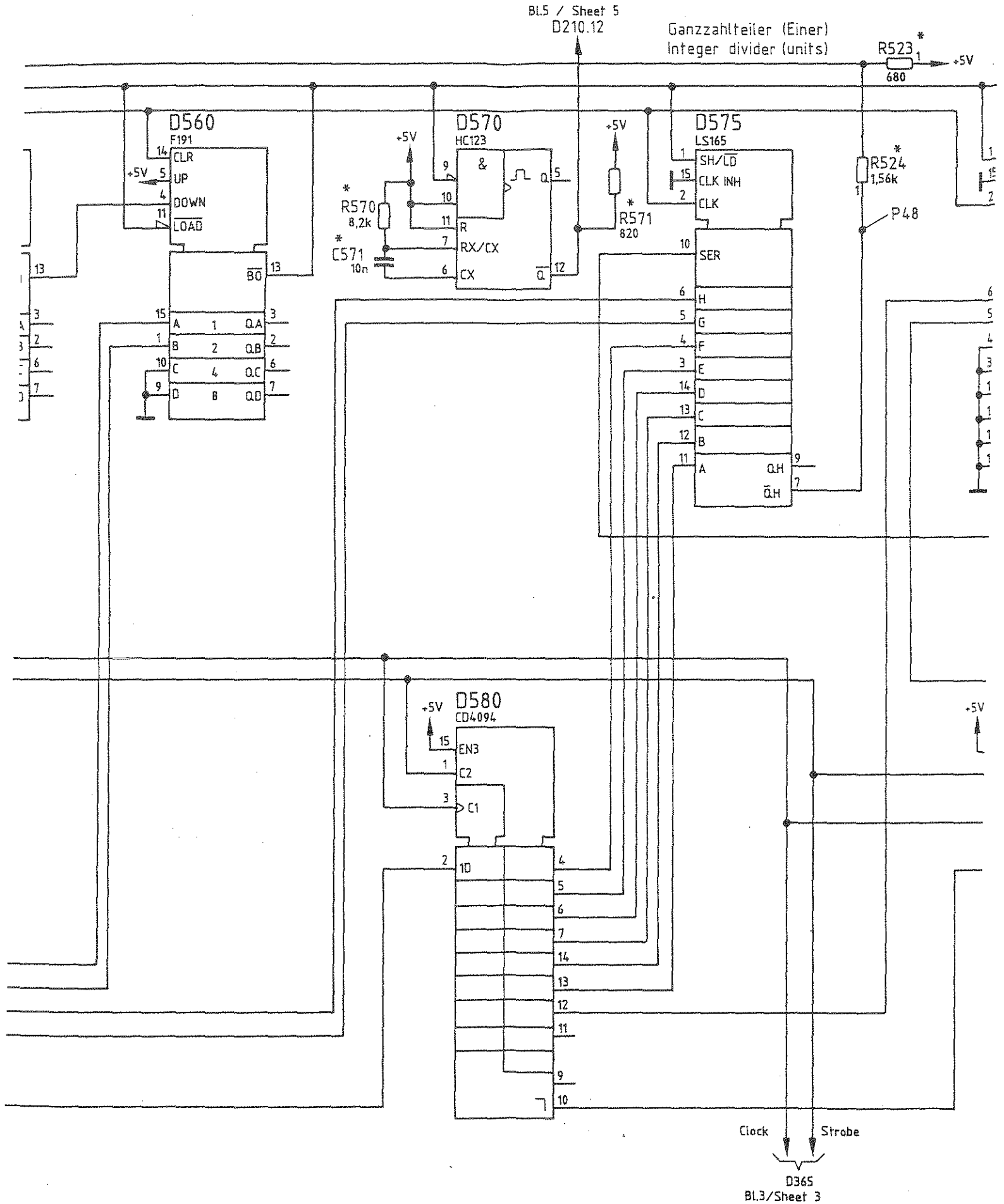
x nicht bestückt
not on PcB

Name	Benennung			Zeichn.-Nr	Blatt
CO	Duplex-Modulationsmesser Duplex-Modulation Meter	Z		803.6020 S	3
	zu Gerät CM-B9		reg. V	803.5317 V	erste Z


X932
X931
C501
1n
R501
680
R500
680
N500
MC10116
C502
10n
R502
680
R503
680
C504
10n
+5V
1,16
N500
MC10116
R504
680
C520
10n
R521
680
R522
680
R520
1k
P5
D520
SP8647
4,6
7,10
12,13
14,15
D510
MC10138
C1
C2
S0
S1
S2
S3
Q0
Q̄0
Q̄3
C510
100µ
R511
680
R510
680
C540,C545,C555
C560,C570,C575
C585,C590,C595
9x 10n
C597
10n
D597
D510,D530,D540
D545,D555,D560
D570,D575,D585
D590,D595,D550
D565,D580,D592
Draufsicht
Top view
N500,D510,D520,D530
D540,D545,D555,D560
D570,D575,D585,D590
D595,D550,D565,D580
D592
Draufsicht
Top view
D597

Ganzzahlteiler (Zehner)
Integer divider (ten)

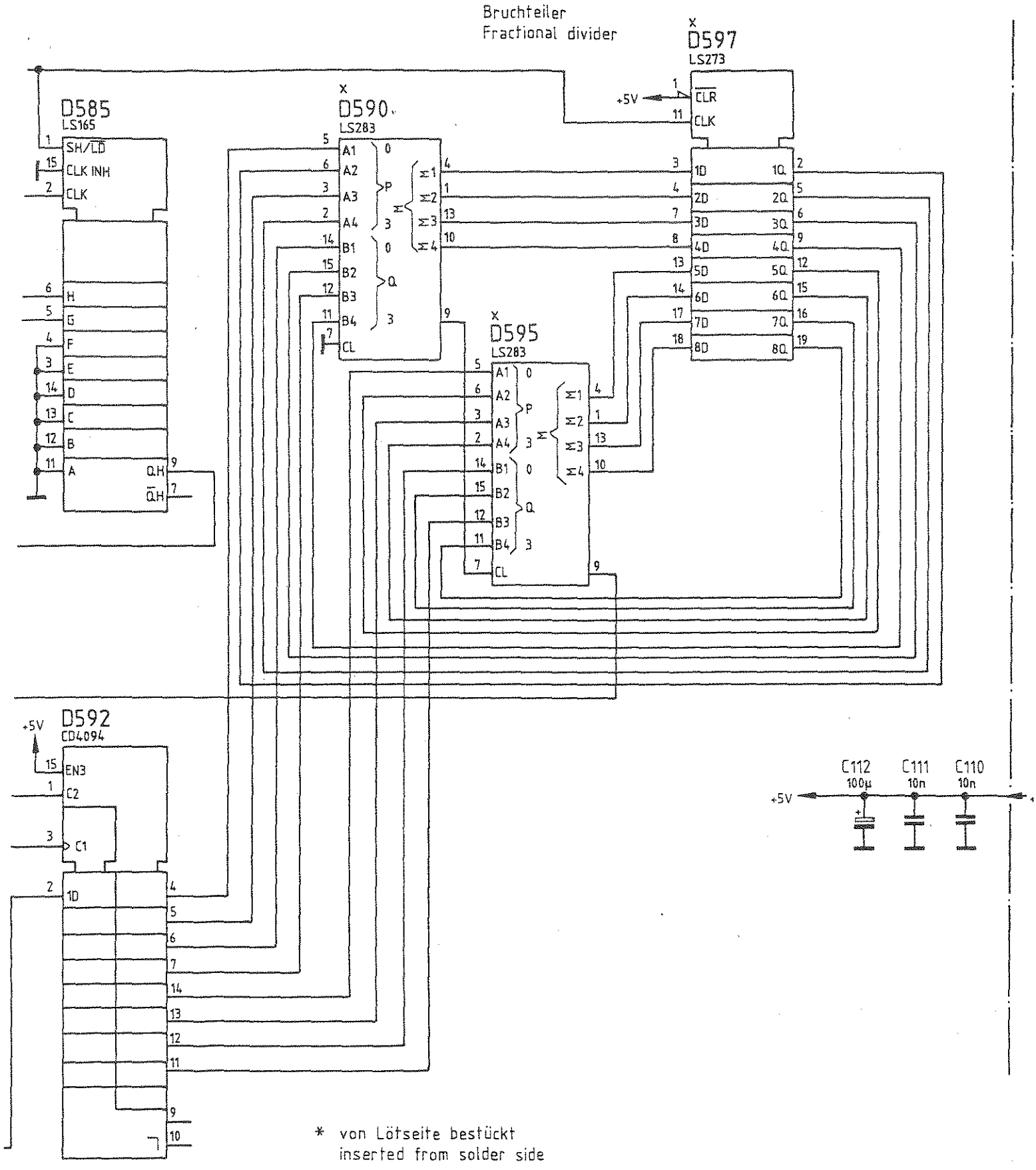




A		3.86	CO						1KSA	Tag
B	35529	8.86	CO						Bearb	11.85
C	38962	8.87	CO						Gepr	
Änd Zust	Änderungs-Mitteilung	Datum	Name	Änd Zust	Änderungs-Mitteilung	Datum	Name		Norm	

ROHDE&SCHWARZ

Bruchteiler
Fractional divider



* von Lötseite bestückt
inserted from solder side

x nicht bestückt
not on PcB

	Name	Benennung		Zeichn.-Nr
	CO	Duplex-Modulationsmesser Duplex-Modulation Meter	Z	803.6020 S
		zu Gerät CM-B9	reg. V 803.5317 V	erste Z.

Phasendetektor
Phase detector

+5V D210 74HC107
P1
D570.12
Bl.4
Sheet 4
V210 1N4448
R210 10k
V220 1N4448
C226 47n
R221 4,7k
C220 1µ
D202IV 74HC00
+5V D210
P2
V211 1N4448
R211 10k
N220 LF356
+15V
C221 10n
X6
R222 10k
+5V
C222 10n
-15V
C223 22µ
R211 10k
R225 1,8k

+15V
VCXO
D15.12
Bl.1
Sheet 1
R244 100k
R245 39k
R243 33k
R240 2,7k
R241 10k
R242 2,7k

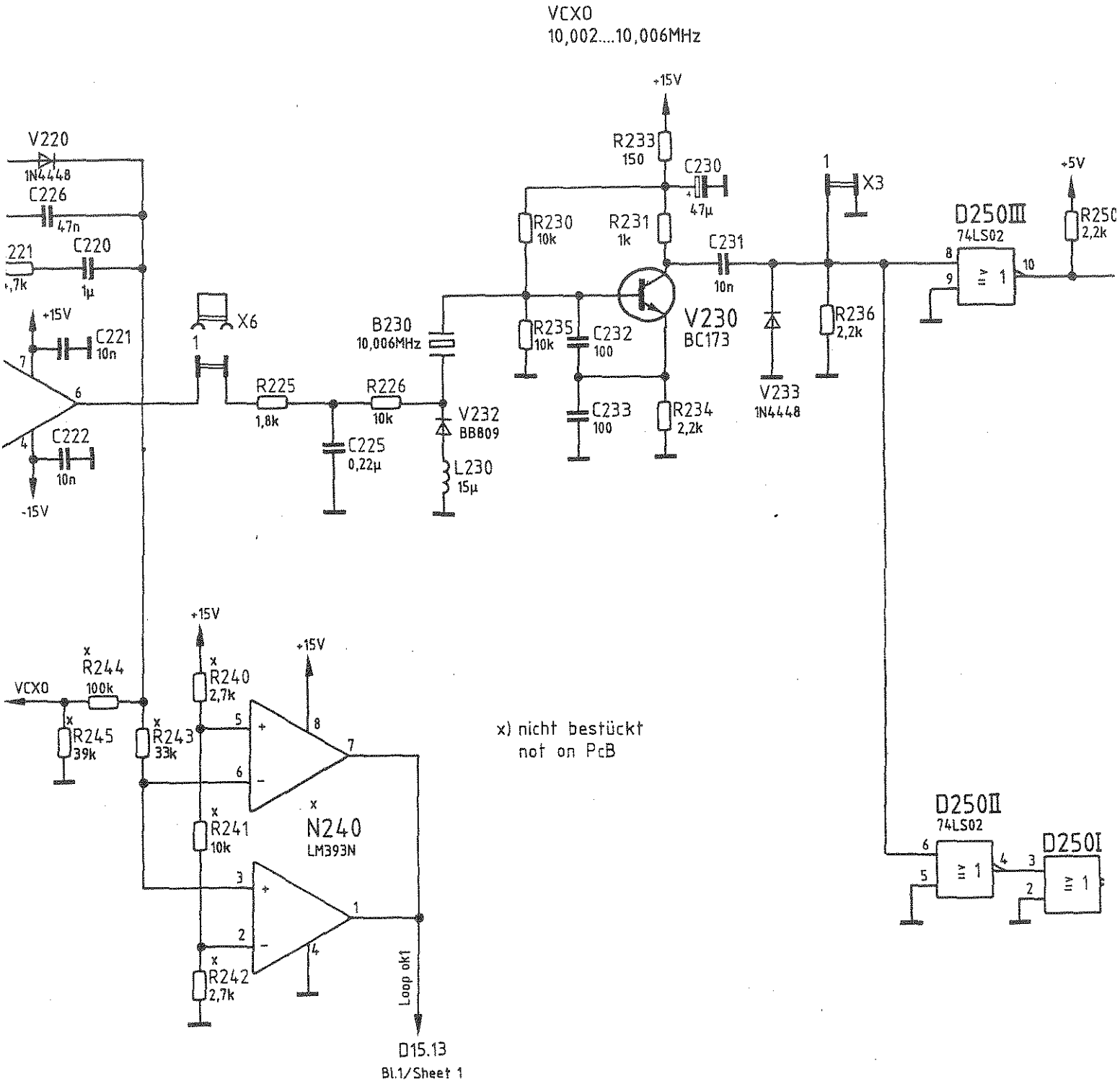
N220
N240
N260
Draufsicht
Top view

D202
D250
Draufsicht
Top view

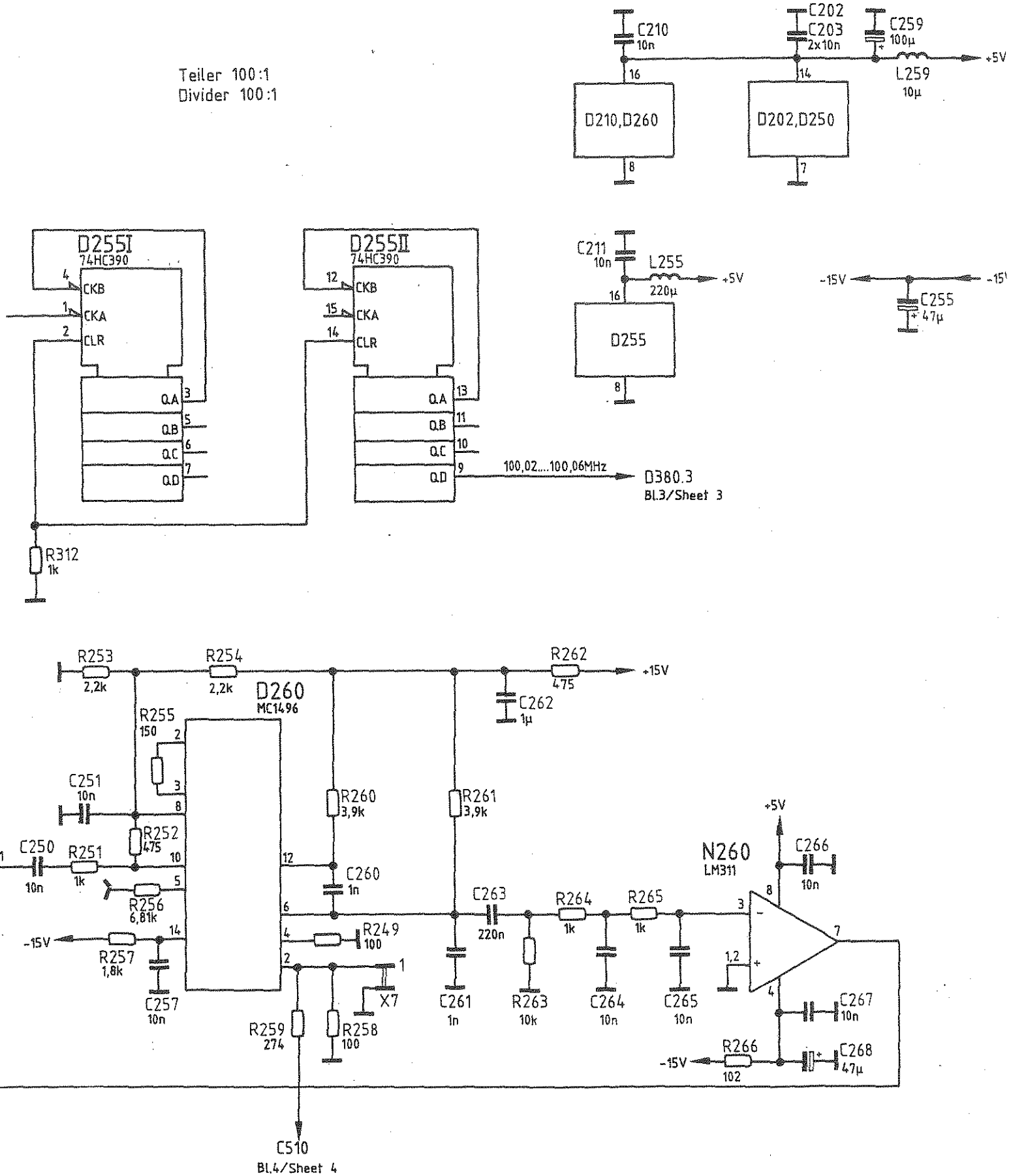
D210
D255
D260
Draufsicht
Top view

V230
C
B
E

ROHDE&S

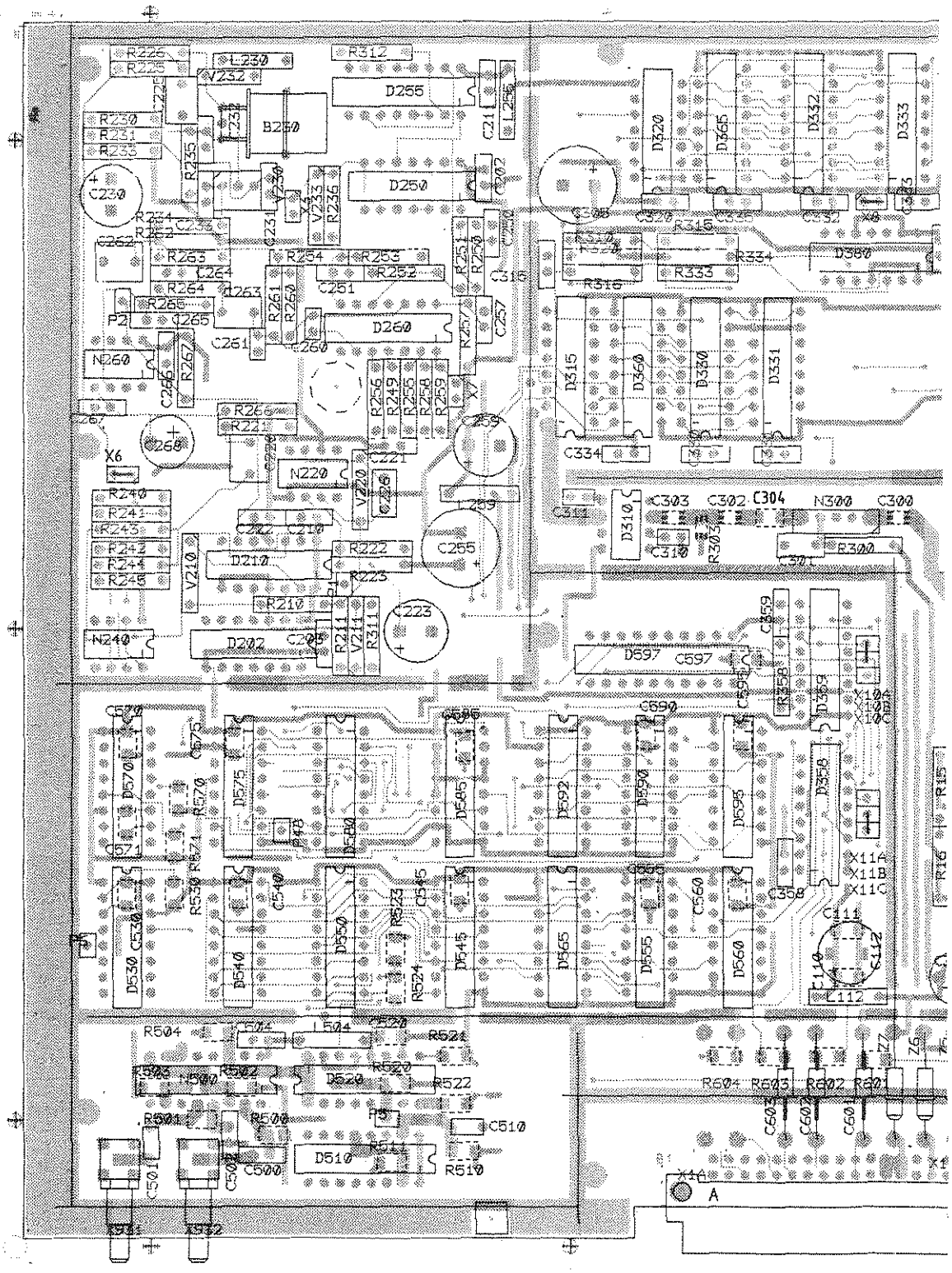


ROHDE&SCHWARZ	A		3.86	CO					1KSA
									Bearb.
									Gepr.
	And Zust	Änderungs-Mitteilung	Datum	Name	And Zust	Änderungs-Mitteilung	Datum	Name	Norm



ag	Name	Benennung		Zeichn.-Nr.
.85	CO	Duplex-Modulationsmesser Duplex-Modulation Meter	Z	803.6020 S
		zu Gerät: CM-B9	reg. i. V. 803.5317 V	erste Z.

Ansicht und Leitungsf
View of tracks on sold

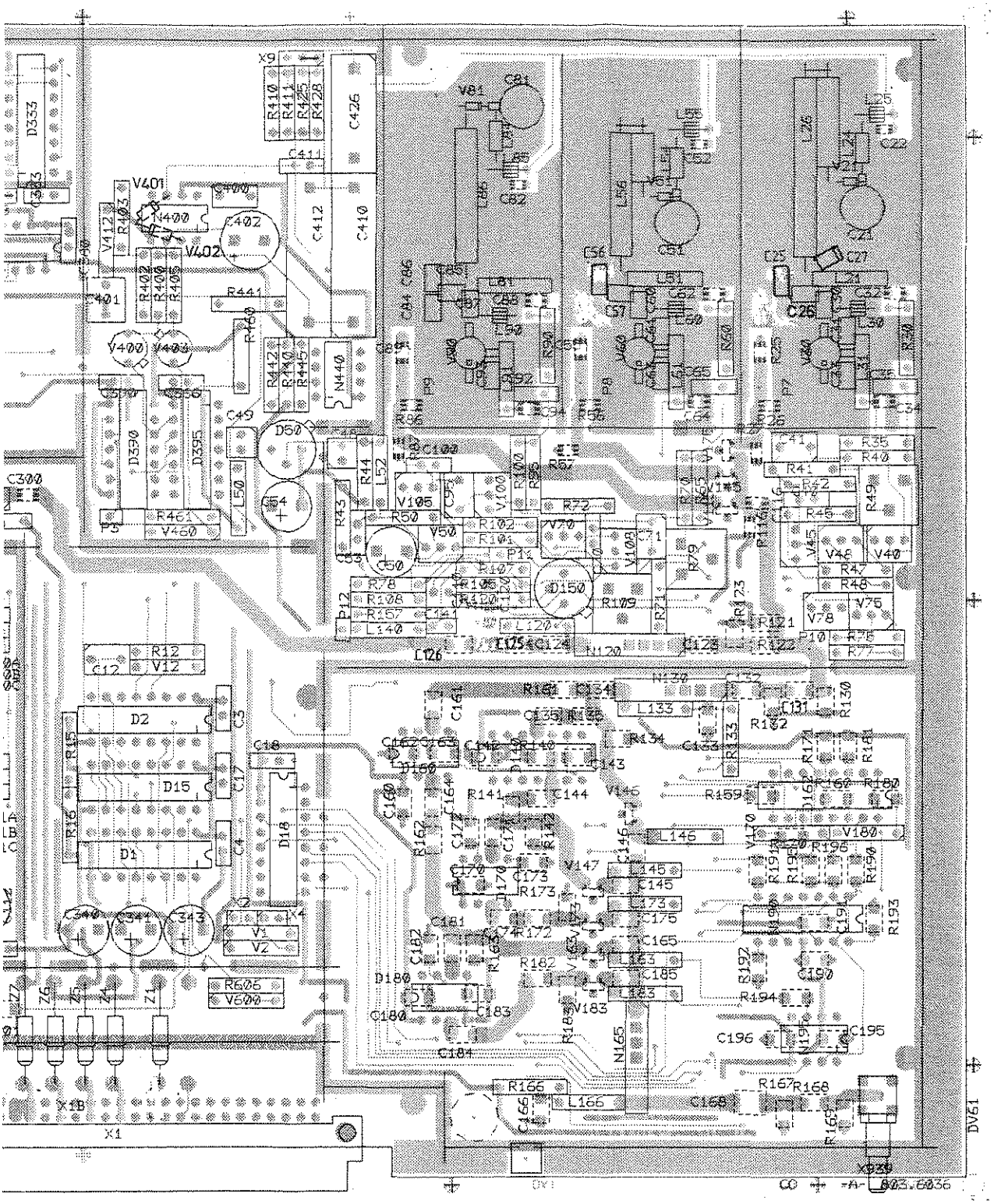


(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

ngsführung Lötseite
solder side



Änd. Zust.	Änderungs-Mitteilung	Tag	Name
A		10.85	COS
B	32938	3.86	CO

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

1KSA	Tag	Name
Bearb.	10.85	COS
Gepr.		
Norm		

Benennung

DUPLEX-MODULATIONSMESSER Z

ROHDE&SCHWARZ

zu Gerät CMT – B9

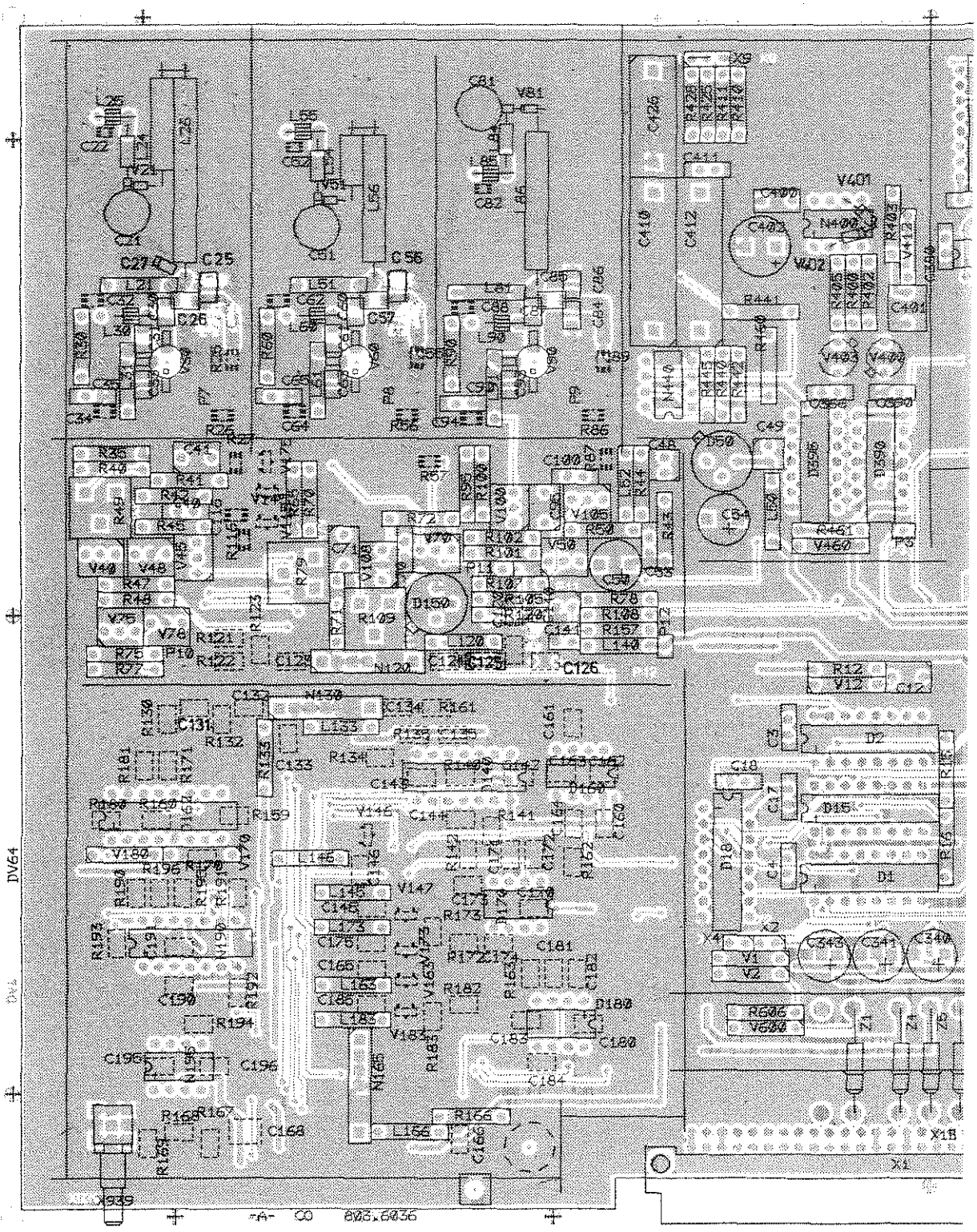
Zeichn.-Nr. 803.6020.01

Blatt-Nr. 2 v. B

reg. i. V. 803.5817 V

erste Z.

Ansicht und Leitung
View of tracks on c

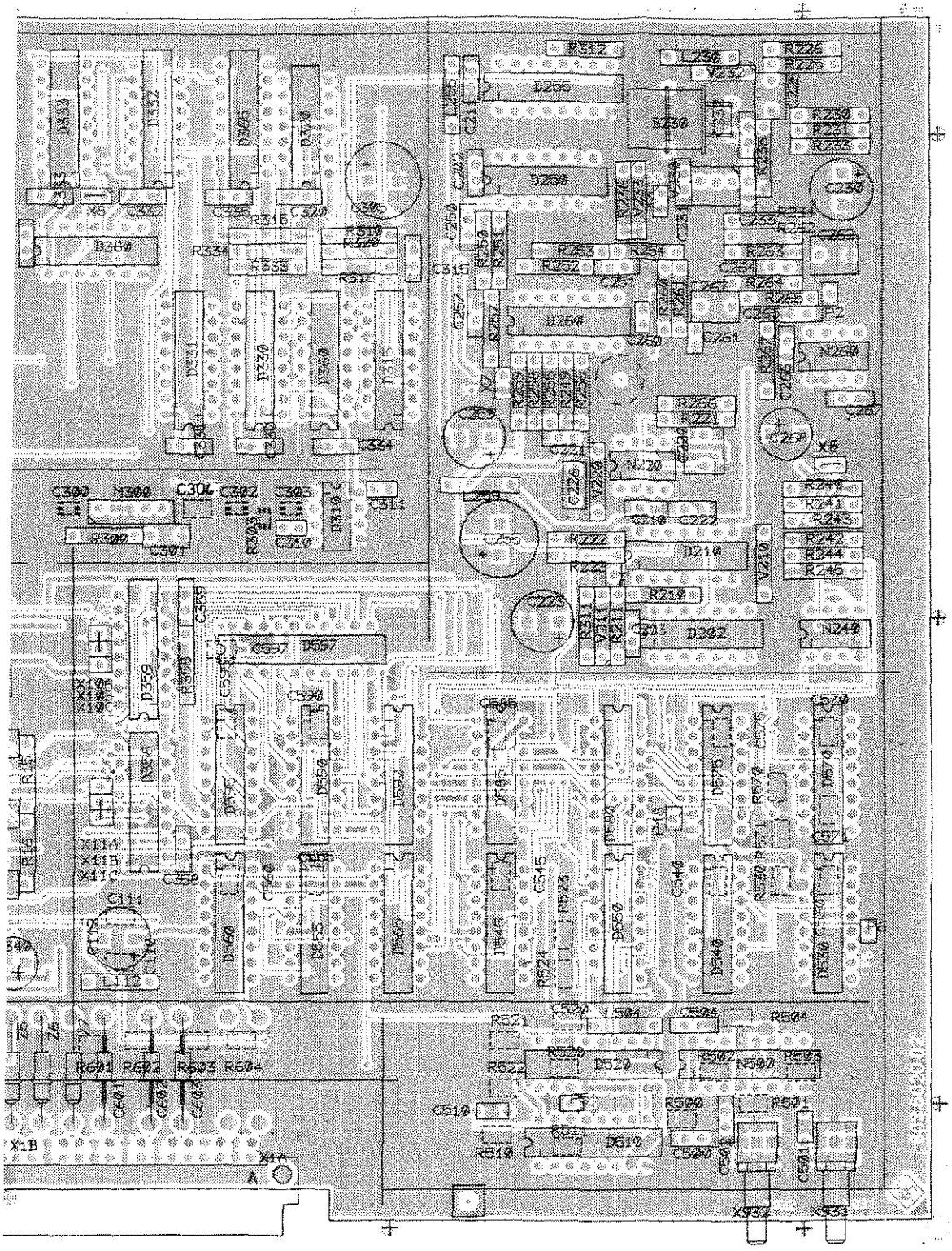


(hierzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling

ungsführung Bauteilseite
component side



Änd. Zust.	Änderungs-Mitteilung	Tag	Name
A		10.85	COS
B	32938	3.86	CO

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

1KSA	Tag	Name
Bearb.	10.85	COS
Gepr.		
Norm		

Benennung

DUPLEX-MODULATIONSMESSER | Z

ROHDE&SCHWARZ

zu Gerät CMT-B9

Zeichn.-Nr. 803.6020.01

Blatt-Nr. 3 v. Bl.

reg. i. V. 803.5317 V | erste Z.

ROHDE&SCHWARZ

SERVICE INSTRUCTIONS

DTMF Decoder Option CM-B11

803.4610.02

Printed in West Germany

Contents Page

5 Service Manual for DTMF Decoder Option CM-B11 ... 5.1

5.1 Function Description 5.1

5.2 Testing and Adjustment 5.2
5.2.1 Recording Status 5.2
5.2.1.1 Programming the Tone Sequence Length 5.2
5.2.1.2 Input Amplifier 5.2
5.2.1.3 Decoder Selection 5.2
5.2.1.4 Decoder 5.3
5.2.1.4.1 Oscillator Frequency 5.3
5.2.1.4.2 Output Code 5.3
5.2.1.5 Data Change 5.3
5.2.1.6 Sequence Control Signals 5.4
5.2.2 Read Status 5.4

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for DTMF Decoder Option CM-B11

(See circuit diagram 803.4627 S)

5.1 Function Description

This option processes double-tone sequences to DTMF. The received sequences are already decoded as they enter and the result is stored until called for processing by the microprocessor. The following criteria must first be entered:

a) - EST mode (early steering):
fast decoding without tone duration check

- STD mode (steering delayed):
normal decoding with suppression of too short tones

b) Number of tones in the expected sequence

A tone sequence can then enter the decoder via the input amplifier D1 (G = 0.5, 1, 2) where it is immediately decoded into a 4-bit wide word per tone. The decoder generates a data change pulse each time a word appears. This pulse acts on the clock input of shift register D20 (4 bit wide, 80 bit long) via switches D3, D30 and pulse shaper D25. Thus the word which has just been decoded is transferred to the shift register with each data change pulse.

Each data change pulse also increments the counter D23 which is blocked via switch D24 when the programmed length of the sequence has been reached. The flags TFOK and SCINT are then set to inform the microprocessor that the entered tone sequence has reached the expected length (interrupt possibility). Further information is available to the microprocessor by interrogating D22:

a) "Tone sequence running" is signalled at D22/5 by monoflop D25 by a Low level. The time constant has been selected such that it is retriggered by each data change in a valid sequence but drops out following an (invalid) pause of 700 ms.

b) If a further tone does not occur within 700 ms of the last tone, a High level at D22/5 and 6 signals that the tone sequence is finished.

The tone data are now present at the first locations of shift register D20. They must be completely shifted through by the microprocessor before they can be read. This is carried out with the decoder deactivated (D6 and D7 High, only High levels are shifted). With each shift pulse, the word present at the output of D20 is transferred in parallel to register D22 for serial output and the next word from D20 is shifted following the elapse of the time constant of D25 (1 µs). Thus 4 tone data and 3 sequence data are present with each serial output from D22 to the microprocessor.

5.2 Testing and Adjustment

The module cannot be adjusted. The following tests can be carried out.

5.2.1 Recording Status

D9/14 = H
D10/13 = L
D10/12 = L

5.2.1.1 Programming the Tone Sequence Length

D9/ 5	6	7	Number of double tones
L	L	L	3
H	L	L	4
L	H	L	5
H	H	L	6
L	L	H	7
H	L	H	8
L	H	H	9
H	H	H	10

5.2.1.2 Input Amplifier

At P3: input signal (tone sequence) amplified by factor G

D9/4	D10/11	G
L	L	0.5
L	H	1
H	L	2

5.2.1.3 Decoder Selection

D9/12	D9/13	Signal
H	H	Double-tone sequence at P9

5.2.1.4 Decoder

5.2.1.4.1 Oscillator Frequency

At D5/8: sinewave signal, f = 3.57 MHz

5.2.1.4.2 Output Code

At P11 (LSB)
P12
P13
P14 (MSB)

Bit pattern associated with each tone in a sequence, H and L depending on standard.

DTMF code

f_{Low} [Hz]	f_{High} [Hz]	Character	Output code Q4 14	Q3 13	Q2 12	Q1 11	Pin
697	1209	1	Ø	Ø	Ø	1	
697	1336	2	Ø	Ø	1	Ø	
697	1477	3	Ø	Ø	1	1	
770	1209	4	Ø	1	Ø	Ø	
770	1336	5	Ø	1	Ø	1	
770	1477	6	Ø	1	1	Ø	
852	1209	7	Ø	1	1	1	
852	1336	8	1	Ø	Ø	Ø	
852	1477	9	1	Ø	Ø	1	
941	1336	0	1	Ø	1	Ø	
941	1209	*	1	Ø	1	1	
941	1477	#	1	1	Ø	Ø	
697	1633	A	1	1	Ø	1	
770	1633	B	1	1	1	Ø	
852	1633	C	1	1	1	1	
941	1633	D	Ø	Ø	Ø	Ø	

5.2.1.5 Data Change

At P10: One TTL pulse per tone

D10/4 = H (EST mode): data change before appearance of associated 4-bit code at P11 to P14

D10/4 = L (STD mode): data change after appearance of associated 4-bit code at P11 to P14

At D25/10: as at P10 but pulses of equal duration, τ = 1 µs ±50%

5.2.1.6 Sequence Control Signals

	TFOK (X1.A4)	SCINT (X1.A22)	D22/5	D22/6
Standby	L	L	H	L
Tone sequence running	L	L	L	L
Programmed sequence length has been reached	H	H	L	L
Tone sequence finished	L	H	H	H

TFOK: H As soon as the programmed number of date changes has been reached
L 700 ms after start of last data change pulse

SCINT: H As soon as the programmed number of data change pulses has been reached
L With strobe for D8, D9, D10

D22/5: H 700 ms after start of last data change pulse
L As soon as a data change arrives and retriggering of D25 takes place with further data change

D22/6: H 700 ms after start of last data change pulse if the programmed number of data changes has been reached
L With strobe for D8, D9, D10

5.2.2 Read Status

D9/14 = L
D10/13 = H
D10/12 = H

At X1.B4 (DATIN):

Sequentially read tone data

With each P/$\overline{S}$ from microprocessor to X1.B8:

4 tone data (MSB first),
3 sequence data ("SCINT", "Counter Reset" and "Tone sequence finished").

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

R 29500 Bl. 2

ROHDE&SCHWARZ	ÄZ	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No.	Blatt Page
	12	0486	EE DTMF-AUSWERTER DTMF DECODER	803.4627.01 SA	1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C2	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C3	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C4	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C5	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C6	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C7	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C8	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
C9	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C20	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C24	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C26	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C27	CE 2,2UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK 2/63	CE 022.7637	
C28	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C29	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C30	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
C40	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C41	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C42	CE 100UF+-20%25V 8RDX9,5 ELECTROLYTIC CAPACITOR MATSUSHITA ECE-A1ESS-101	803.0580	
C43	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C44	CK 100NF+-5%63V5RM MKT CAPACITOR WIMA MKS/2/63/0,1UF/5%	CK 099.2930	
BIS/TO C47			
C71	CC 220PF+-2%6X7N750 CAPACITOR VALVO 2222 678 58221	CC 087.6941	
D1	BO LF156J BIFET OPAMP OPERATIONAL AMPLIFIER MOTOROLA LF 156 J	BO 645.7251	
D2	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D3	BL CD4052BE 2X4CH.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	
D5	BO MT8870BE DTMF RECEIVER DTMF RECEIVER MITEL MT8870BE	803.0744	
D6	BL SN74LS253N 2X4TO-1 MUX DUAL MULTIPLEXER TEXAS SN74LS253N	803.0738	
D7	BL SN74LS253N 2X4TO-1 MUX DUAL MULTIPLEXER TEXAS SN74LS253N	803.0738	
D8	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D9	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D10	BL CD4094BF 8BIT SH.REG SHIFT REGISTER RCA CD4094BF	BL 418.0064	
D20	BL AM2847PC 4X80B.SREG QUAD 80B. SHIFTREGISTER AMD AM2847PC	803.0750	
D22	BL CD4021BE 8BIT SH.REG SHIFT REGISTER RCA CD4021BE	BL 086.7096	
D23	BL CD4017BF DEC.COUNTER COUNTER RCA CD4017BF	BL 086.8057	
D24	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
D25	BL MC14528BCP 2X MONOFLOP MONOSTABLE MULTIVIBRATOR SSS SCL4528BE	BL 086.7315	

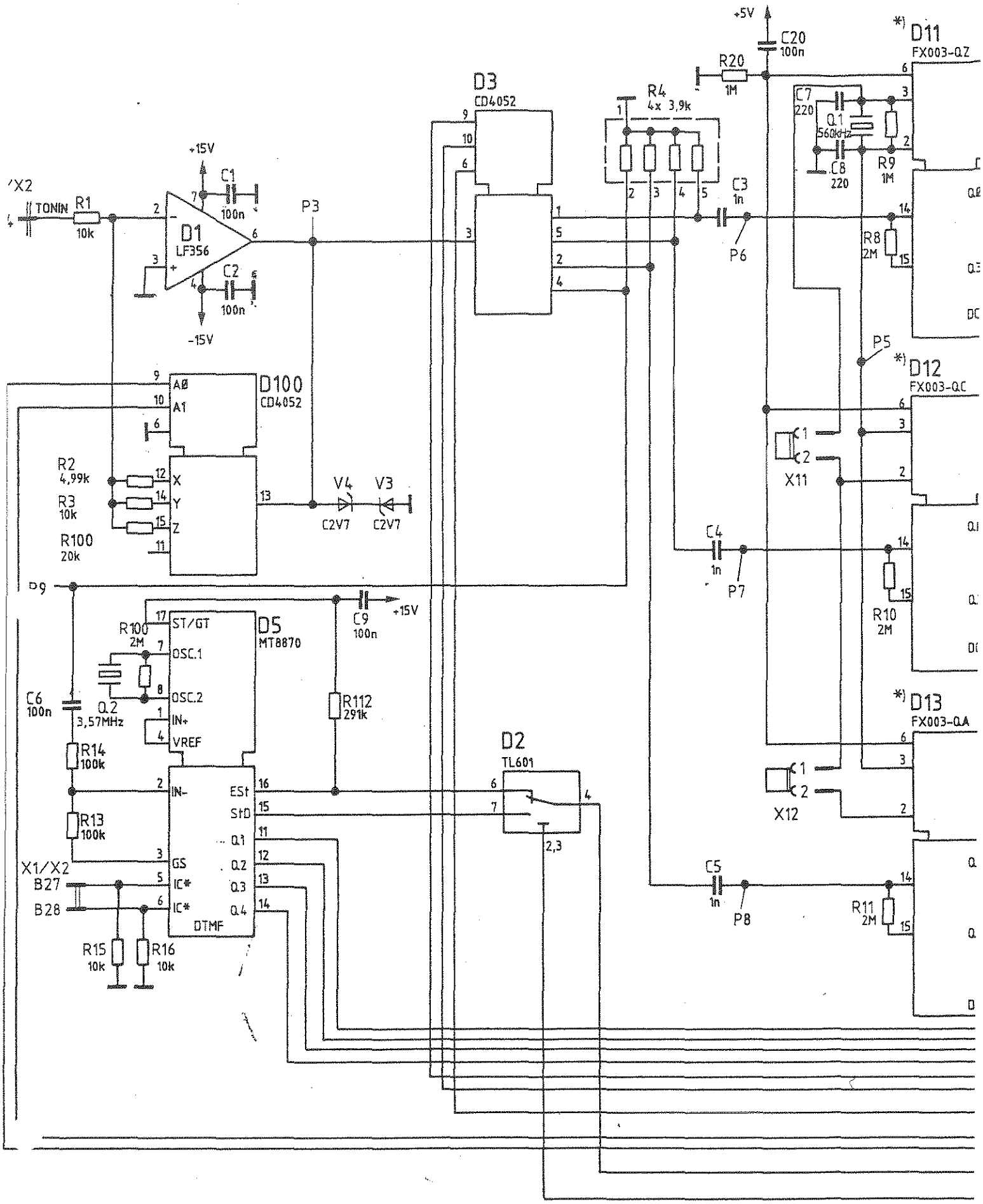
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D26	BL CD4013BF 2XD FLIPFL FLIPFLOP RCA CD4013BF	BL 086.8034	
D30	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D100	BL CD4052BE 2X4CH.MUX MULTIPLEXER/DEMULTIPLEXER MOTOROLA MC14052BCP	BL 243.1200	
P2	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
P3	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
P5	VL WIRE-WRAP PIN BERG NR. 75 403-001	VL 088.4507	
BIS/TO P14			
Q1	ER 560KHZKERAMIKRESONATOR 560KHZ CERAMIC RESONATOR MURATAERIE CSB560P	346.7081	
Q2	EQ 3,579545MHZ CL30 HC43U	EQ 091.0396	
R1	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R2	RL 0,35W 4,99KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,99K-F-D	RL 083.1116	
R3	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R4	RN 5X3,9KOHM+-2%SIL 6 H5 RESISTOR NETWORK BOURNS 4306R-101-392	RN 317.9273	
R8	RL 0,35W2,00MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,00MOHM 1% TK50	RL 099.8167	
R9	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R10	RL 0,35W2,00MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,00MOHM 1% TK50	RL 099.8167	
R11	RL 0,35W2,00MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,00MOHM 1% TK50	RL 099.8167	
R12	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R13	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R14	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	

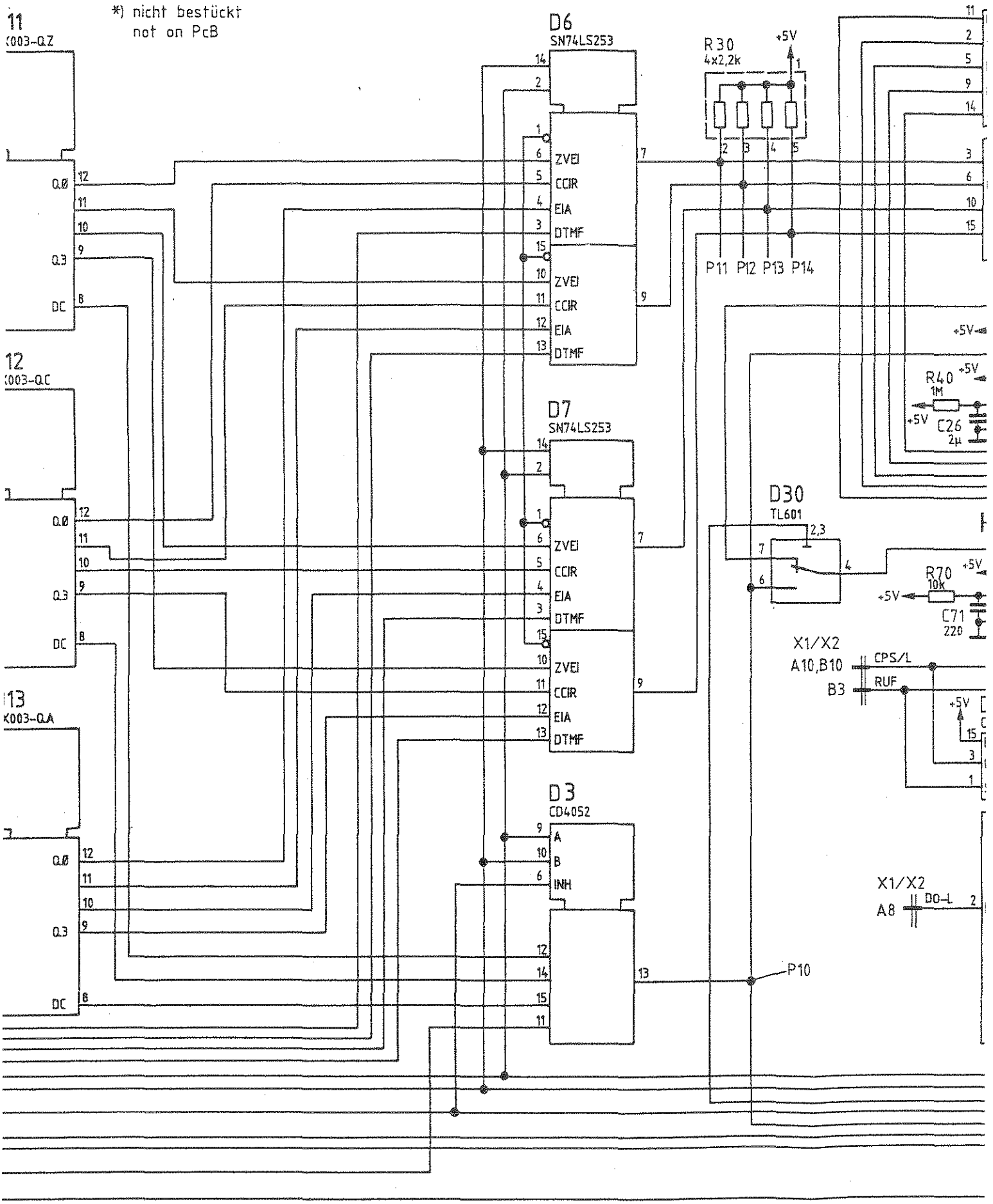
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R15	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R16	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R20	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R30	RN 5X2,2KOHM+-2% SIL6 H5 RESISTOR NETWORK BOURNS 4306R-101-222	RN 504.0174	
R35	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R40	RL 0,35W 1MOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1M-F-D	RL 082.7862	
R41	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R42	RL 0,35W20,00 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200HM-F-D	RL 082.9142	
R43	RL 0,35W 10,0 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/100HM-F-D	RL 082.8852	
R44	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R45	RL 0,35W20,00 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/200HM-F-D	RL 082.9142	
R70	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R100	RL 0,35W 20,0KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/20K-F-C	RL 083.1522	
R110	RL 0,35W2,00MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,00MOHM 1% TK50	RL 099.8167	
V1	AE BZX79/C9V1 0,5W Z-DI ZENER DIODE VALVO BZX79/C9V1	AE 012.2503	
V2	AE BZX79/C3V3 0,5W Z-DI ZENER DIODE ITT ZPD3,3	AE 012.2390	
V3	AE BZX55/C2V7 0,5W Z-DI ZENER DIODE AEG-TELEF. BZX55/C2V7	AE 086.8228	
V4	AE BZX55/C2V7 0,5W Z-DI ZENER DIODE AEG-TELEF. BZX55/C2V7	AE 086.8228	

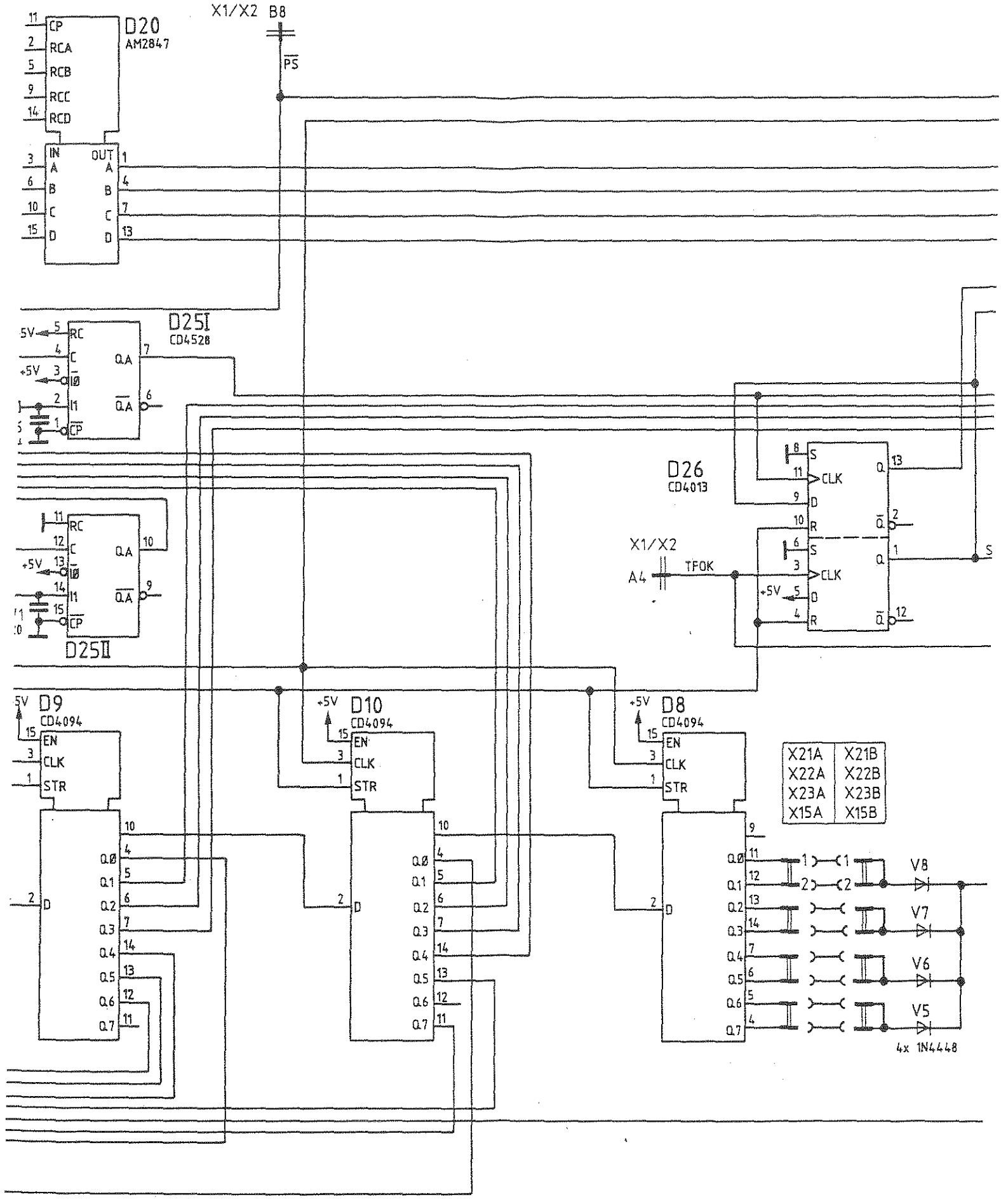
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V5	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448	AD 012.0700	
BIS/TO V8			
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	
X2	FP BUCHSENLEISTE64P.ABGEW PANDUIT 100-064-533/999	FP 099.0614	
X11	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X12	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X15A	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X15B	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X21A	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X21B	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X22A	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X22B	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X23A	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
X23B	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36	FP 242.3600	
			- ENDE -

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V173	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V175	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V180	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V183	AD BAV99 2X70V 0,1 A UDI DIODE VALVO BAV99	911.0092	
V210	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V211	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V220	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V230	AK BC173C NPN 25V 100MA TRANSISTOR INTERMETAL BC173C	010.4444	
V232	AE BB809 26/ 6PF CDI TUNING DIODE VALVO BB809	AE 092.9616	
V233	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V400	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V401	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V402	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
V403	AE BAV45 35V PICOAMP.DI LOW LEAKAGE DIODE VALVO BAV45	AE 252.5386	
V412	AE BZX79/C10 0,5W Z-DI ZENER DIODE VALVO BZX79/C10	AE 012.2510	
V600	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
W1	DX HF-KABEL	802.6578	802.6455
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	
X3	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	

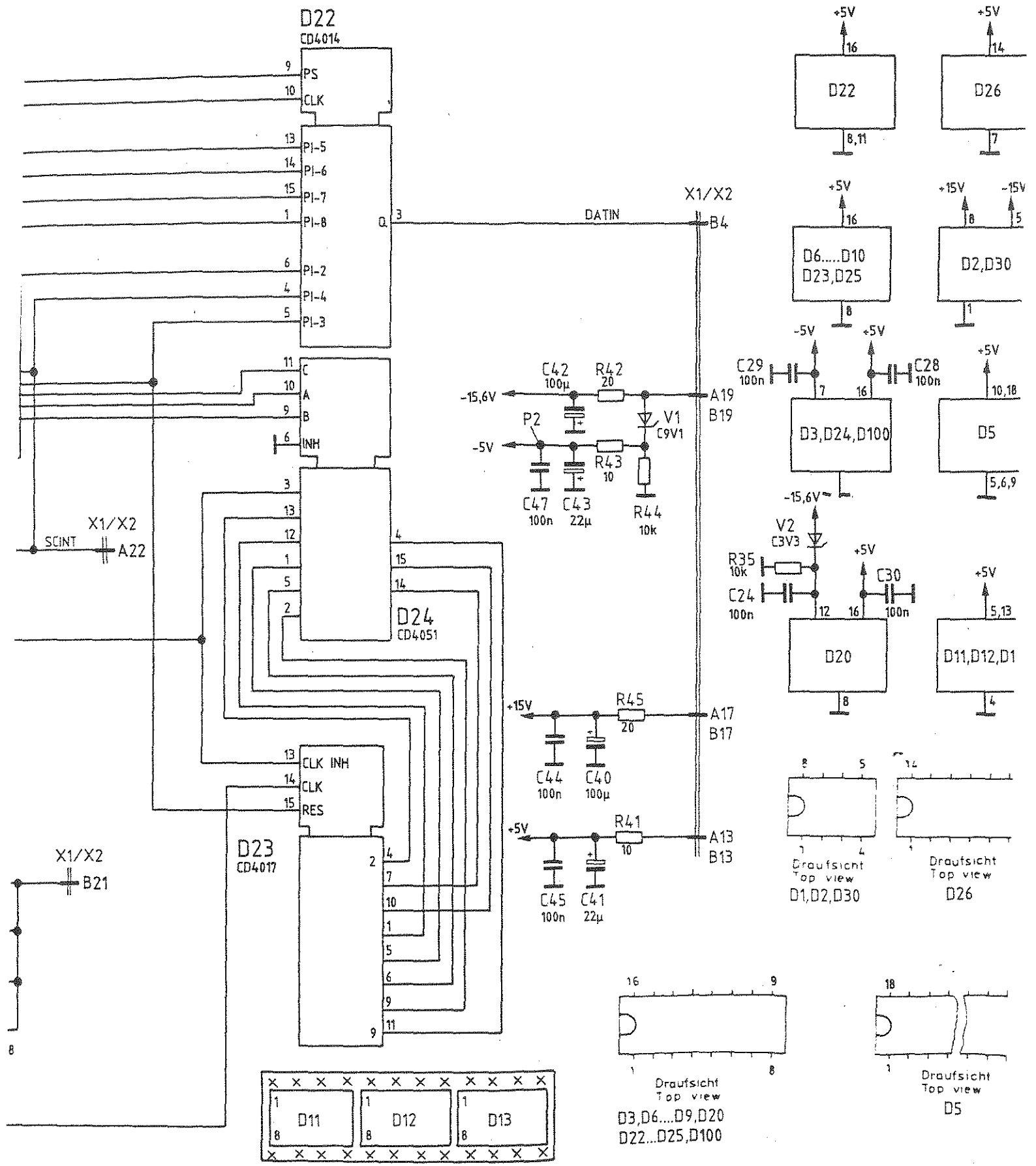
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X6	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
BIS/TO X9			
X931	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X932	FJ EINBAUSTECKER SYST.SMB ANGLE CONNECTOR ROSENBERG R&S-ZCHNG.602.8804	FJ 602.8804	
X939	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIALL R 112 669	FJ 249.9684	
X10A	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X10B	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X10C	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X11A	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X11B	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X11C	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
Z1	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z4	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z5	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z6	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
Z7	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
			- ENDE -


+5V
C20
100n
R20
1M
*)
D11
FX003-QZ
D3
CD4052
R4
4x 3,9k
C7
220
Q.1
560kHz
C8
220
R9
1M
C3
1n
P6
R8
2M
+15V
C1
100n
X2
TONIN
R1
10k
D1
LF356
C2
100n
-15V
P3
P5
*)
D12
FX003-QC
D100
CD4052
R2
4,99k
R3
10k
R100
20k
V4
C2V7
V3
C2V7
X11
C4
1n
P7
R10
2M
D9
C9
100n
+15V
R100
2M
D5
MT8870
C6
100n
Q.2
3,57MHz
R112
291k
*)
D13
FX003-QA
D2
TL601
R14
100k
R13
100k
X12
X1/X2
B27
B28
R15
10k
R16
10k
C5
1n
P8
R11
2M


*) nicht bestückt
not on PcB
D6
SN74LS253
D7
SN74LS253
D3
CD4052
R30
4x2,2k
+5V
P11 P12 P13 P14
R40
1M
C26
2µ
D30
TL601
R70
10k
C71
220
X1/X2
A10,B10
CPS/L
B3
RUF
X1/X2
A8
DO-L
P10
ZVEI
CCIR
EIA
DTMF
A
B
INH



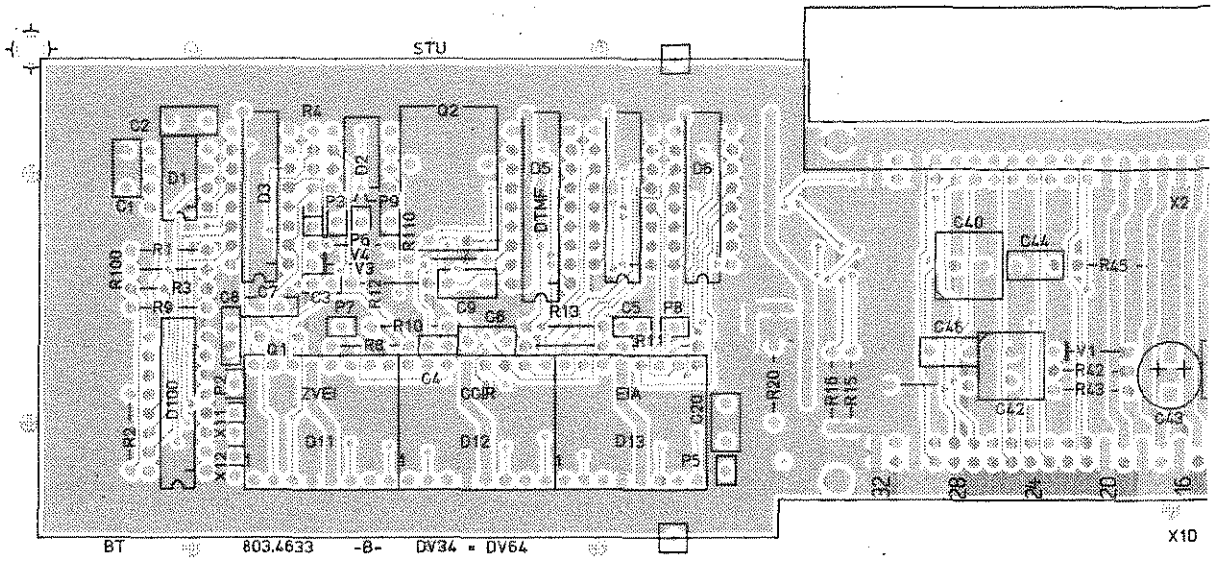
Klebekante für Druckerzeugnis - durch diese Zone möglichst nur Leitungen führen



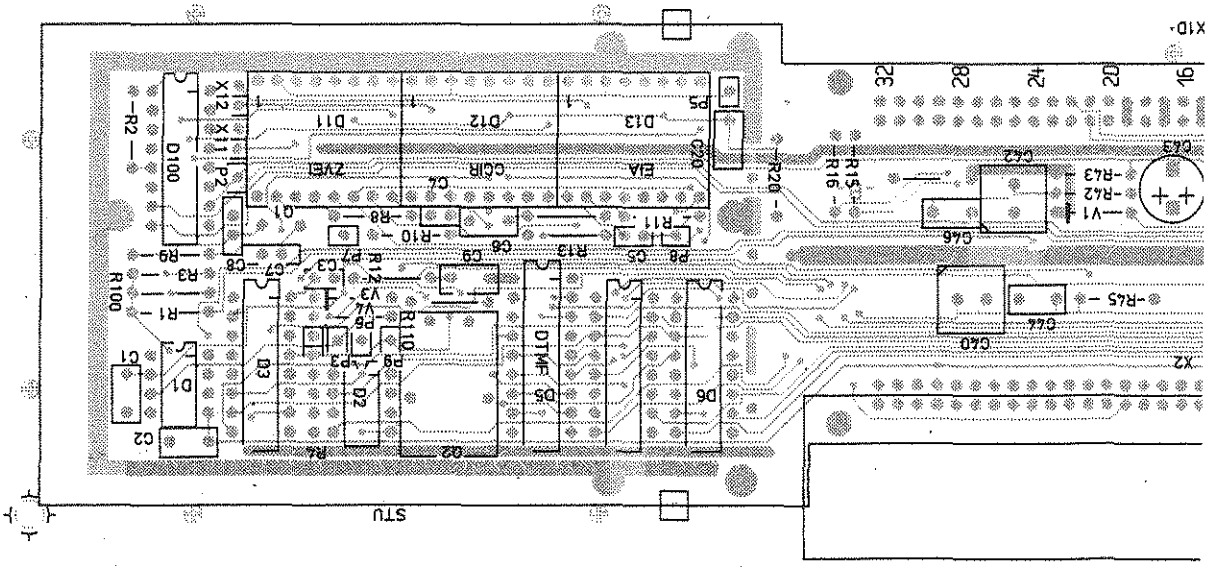
Stromlauf gilt für VAR 02 / Circuit diagramm is valid for model 02

Stromlauf zu	DTMF-Auswerter DTMF decoder	Z	Zeichn.-Nr.	B
CM-B11	reg. i. V. 803.4610 V	erste Z.	803.4627 S	V

Ansicht und Leitungsfü
View of tracks on comp

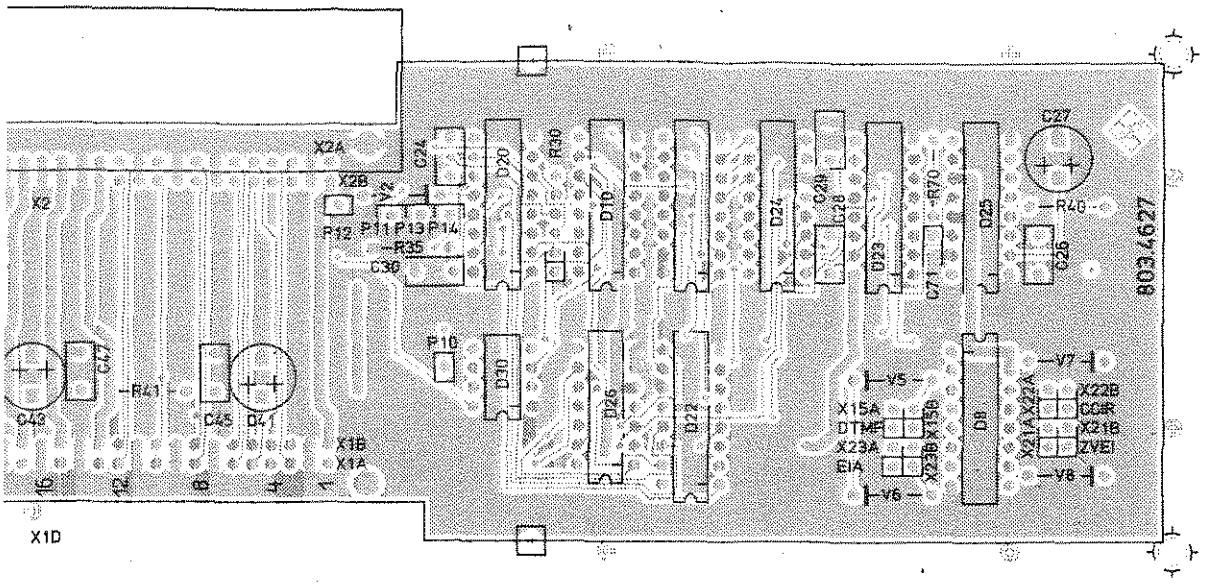


Ansicht und Leitungsfü
View of tracks on solde

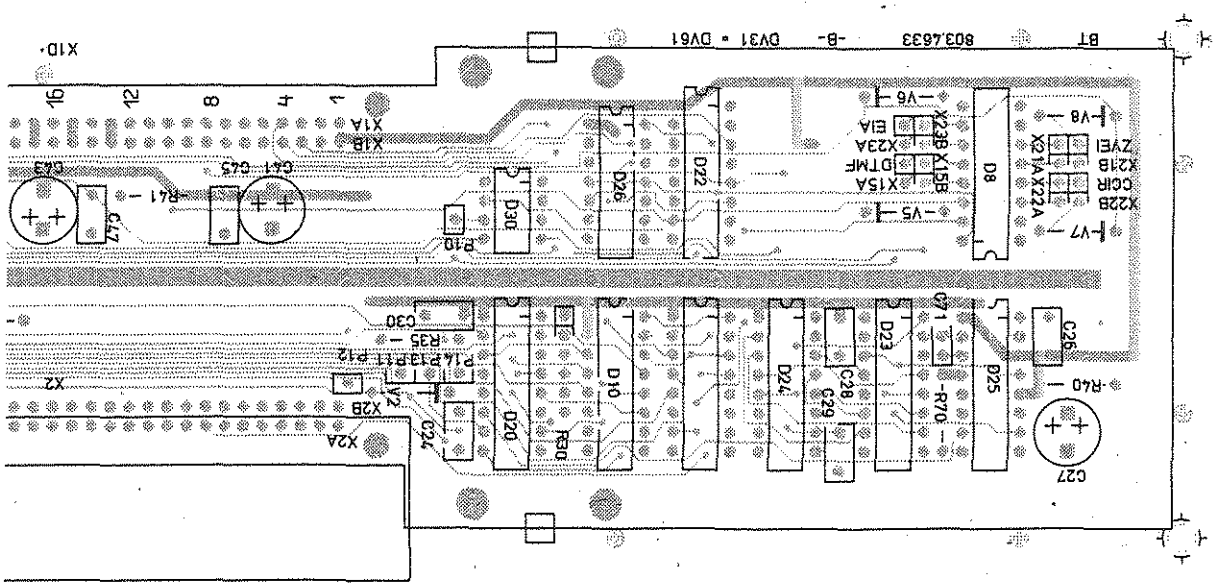


Achtung! MOS-Bauteile
Caution. MOS components

sführung Bauteilseite
omponent side



ysführung Lötseite
older side



B		03.85	BT	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KGA	Tag	Name	Benennung
				Bearb.	03.85	BT	DTMF-Auswerter DTMF decoder
				Gepr.			Z
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr.	Blatt-Nr.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät CM - B11		reg. i. V. 803.4610 V	803.4627 / 2 v. Bl. / erste Z.

ROHDE & SCHWARZ

SERVICE INSTRUCTIONS
Autorun Control/Printer Interface
Option CM-B5
803.3314.02

Printed in West Germany

Contents

		Page
5	Service Manual for Autorun Control/ Printer Interface Option CM-B5	5.1
5.1	Function Description	5.1
5.1.1	Interface	5.3
5.1.2	RAM	5.3
5.1.3	EPROM	5.3
5.1.4	Centronics Interface	5.4
5.1.5	Relay Interface	5.4
5.1.6	Battery Supply	5.5
5.2	Testing and Adjustment	5.5

Component lists
Circuit diagrams
Component layout diagrams

5 Service Manual for Autorun Control/Printer Interface Option CM-B5
(See circuit diagram 803.3320 S)

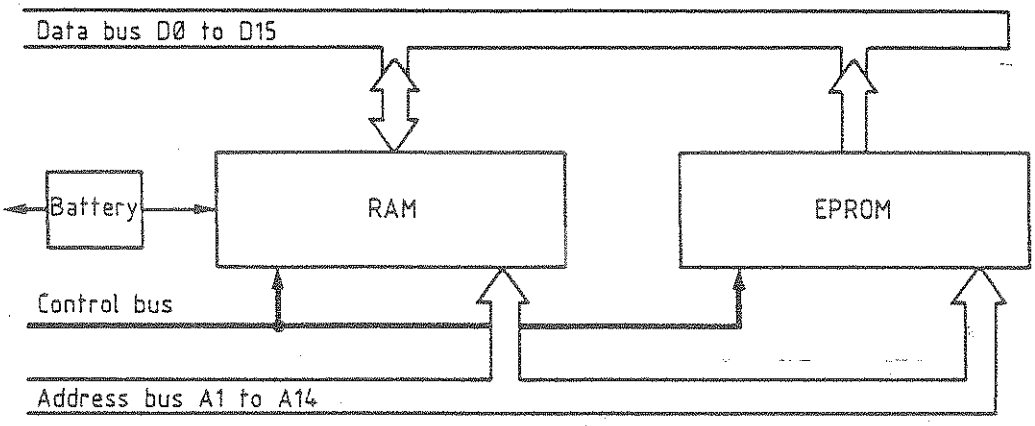
5.1 Function Description

When used in conjunction with the CMT, the option enables the following functions:

- Recording of programs and data for complex programmable routines.
- Setup of a Centronics interface.
- Setup of relay contacts which can be directly set by the user via the instrument keyboard.

The module can be divided into the following functional units (see Fig. 5-1):

- RAM
- EPROM
- Internal interface
- Centronics interface
- Relay group
- Battery supply



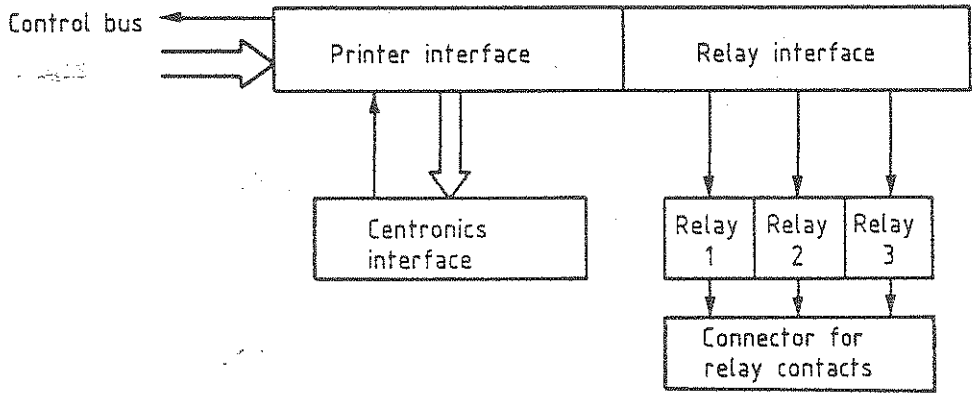


Fig. 5-1 Block diagram of the complete autorun control

5.1.1 Interface

The interface between the autorun control and the CMT comprises the following signal groups:

16-bit wide data bus
14-bit wide address bus] For the memory
7-bit wide control bus

6-bit wide control bus] For the internal interface

3 power supply lines

1 line to measure the battery voltage

The data and address busses enable communication between the memory on the autorun control and the controller of the CMT. The same applies to the control bus which supplies the memory control signals. This bus also contains special selection lines which are exclusively used for the memory ICs of the autorun control.

The control bus enables the controller to address the Centronics interface and the relays via the internal interface. A printer can also transmit a BUSY signal to the controller via this bus.

The three supply lines are used for +5 V, ground and the instrument battery voltage.

The battery voltage of the autorun control can be checked by the instrument via a special line.

5.1.2 RAM

The total storage capacity of the RAMs is 16 Kbyte. The circuitry used means that 8K words at 16 bit each are available for the controller. The RAMs are addressed via special chip select lines. The RAMs on the autorun control have a battery back-up.

5.1.3 EPROM

The storage capacity of the EPROMs is 32 Kbyte. As far as the controller is concerned, this memory comprises 16K words at 16 bit each. The EPROMs are addressed via special chip select lines.

5.1.4 Centronics Interface

This interface is addressed by the controller via a 2-byte serial-to-parallel converter (shift register). One byte provides the data for the printer. The controller uses one special line to inform the printer of the data validity (CENSTR). The BUSY signal of the printer is converted in the internal interface circuit into an interrupt signal for the controller and stored. The CENSTR signal resets this interrupt signal again.

Fig. 5-2 shows the assignment of the individual bits following serial-to-parallel conversion. The following signals are used for this conversion:

CPS-S	Clock
DO-S	Data
ABL	Strobe pulse

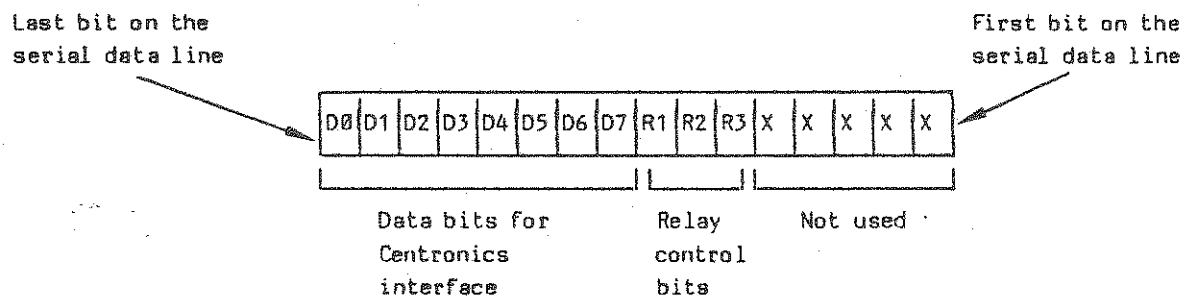


Fig. 5-2 Data at the output of the serial-to-parallel interface

5.1.5 Relay Interface

As can be seen in Fig. 5-2, the control bits for the 3 relays originate in the same shift register which also carries out the serial-to-parallel conversion of the data for the printer interface. Thus the clock, data and strobe are also identical with the signals in Section 5.1.4. The first 5 bits transmitted on the data line are not evaluated.

5.1.6 Battery Supply

A built-in battery buffers the CMOS-RAMs if the module is separated from the instrument. When connected to the instrument, the RAMs of the autorun control are fed by the power pack. With the instrument switched off, backup of the instrument and the autorun control CMOS-RAMs is handled either by the internal battery or the autorun control battery depending on which of the two batteries has a higher charge. Both batteries are used equally if the autorun control is left in the instrument.

5.2 Testing and Adjustment

Adjustment of the module is not necessary. All tests should be carried out using Section 3.

ROHDE & SCHWARZ
MÜNCHEN

Schaltteillisten
Stromläufe
Bestückungspläne

Parts lists
Circuit diagrams
Components plans

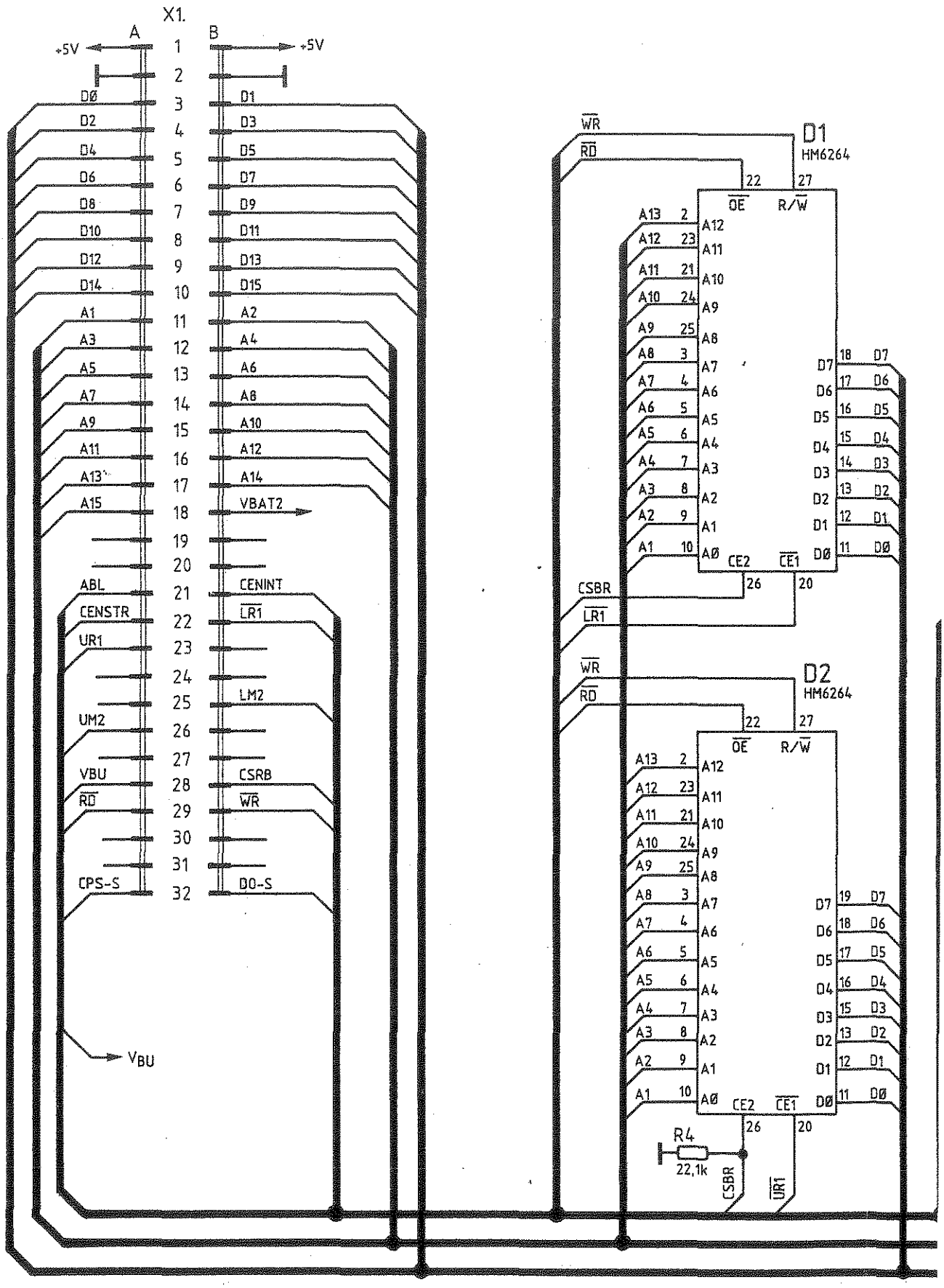
R 29500 Bl. 2

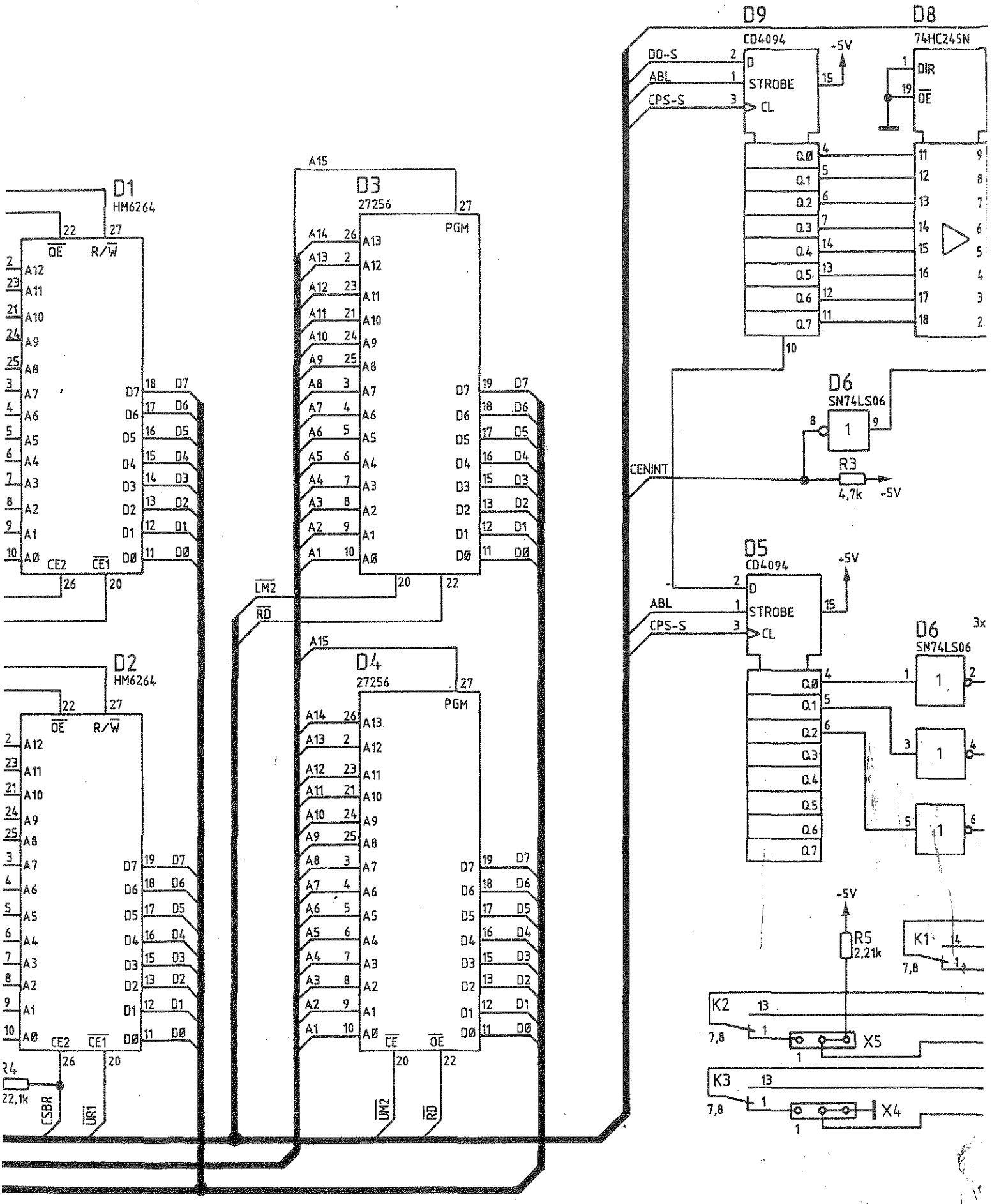
ROHDE&SCHWARZ	Äl	Datum / Date	Schaltteilliste für / Parts list for	Sachnummer / Stock No.	Blatt / Page
	12	0387	ED ABLAUFST./DRUCK.INTF. AUTO RUN CONTR/PRINT INTF	803.3320.01 SA	1

Kennzeichen / Component No.	Benennung/Beschreibung / Designation	Sachnummer / Stock No.	enthalten in / contained in
C1	CE 22UF-10+50% 63V 9X13 ELECTROLYTIC CAPACITOR ROEDERST EK 00 CB 222 J	CE 006.7120	
C2	CC 220NF+-10%50V7K1200VIE CERAMIC CAPACITOR UNION CARB CK06BX224K	CC 084.5515	
C4	CE 10UF+-20%35V 5RDX5 ELECTROLYTIC CAPACITOR NATION PAN ECE-A1VKS-100	803.0667	
C8	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB CK05BX104K	CC 084.5350	
D1	BC HM6264LP15 8KX8B.SRAM SRAM HITACHI HM6264LP15	344.7410	
D2	BC HM6264LP15 8KX8B.SRAM SRAM HITACHI HM6264LP15	344.7410	
D3	BC D27256 PROGRAM. PROM ENTHALTEN IN EPROM-SATZ INCLUDED IN SET OF EPROM 803.3866	803.3895	
D4	BC D27256 PROGRAM. PROM ENTHALTEN IN EPROM-SATZ INCLUDED IN SET OF EPROM 803.3866	803.3908	
D5	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
D6	BL SN7406N 6XINVERTER IC HEX INVERTER SN7406N TEXAS SN7406N	237.0487	
D8	BL MM74HC245N 8XB.TRANSC OCTAL TRI-ST.TRANSCEIVER MOTOROLA MC74HC245N	BL 571.3242	
D9	BL CD4094BE 8BIT SH.REG SHIFT REGISTER RCA CD4094BE	BL 586.7726	
G1	ED 3,4V LITHIUM-BATTERIE LI BATTERY SAFT LS 3 CNA	565.1687	
K1	SR 5 V 1XU DIL RELAY SIEMENS V23100-V4305-C000	SR 340.4551	
K2	SR 5 V 1XU DIL RELAY SIEMENS V23100-V4305-C000	SR 340.4551	
K3	SR 5 V 1XU DIL RELAY SIEMENS V23100-V4305-C000	SR 340.4551	

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R1	RL 0,35W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R2	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R3	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
R4	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R5	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R6	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
V1	AD 1N4448 75V 0,15A UDI DIODE TEXAS INST 1N4448 GEGURTET	AD 012.0700	
BIS/TO V3			
V4	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	
X1	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999	FP 084.6470	
X4	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X5	VL WIRE-WRAP PIN WIRE-WRAP PIN BERG NR. 75 403-003	VL 088.4542	
X25	FM BUCHSENLEISTE 36POL. CONNECTOR AMPHENOL 57LE-40360-27 CO	375.6550	
X26	FM WINKELBUCHSENL.9POL. FEMALE CONNECTOR FCT F9S5-K45	FM 243.1346	
X4B	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302	FP 491.7042	
X5B	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302	FP 491.7042	

- ENDE -

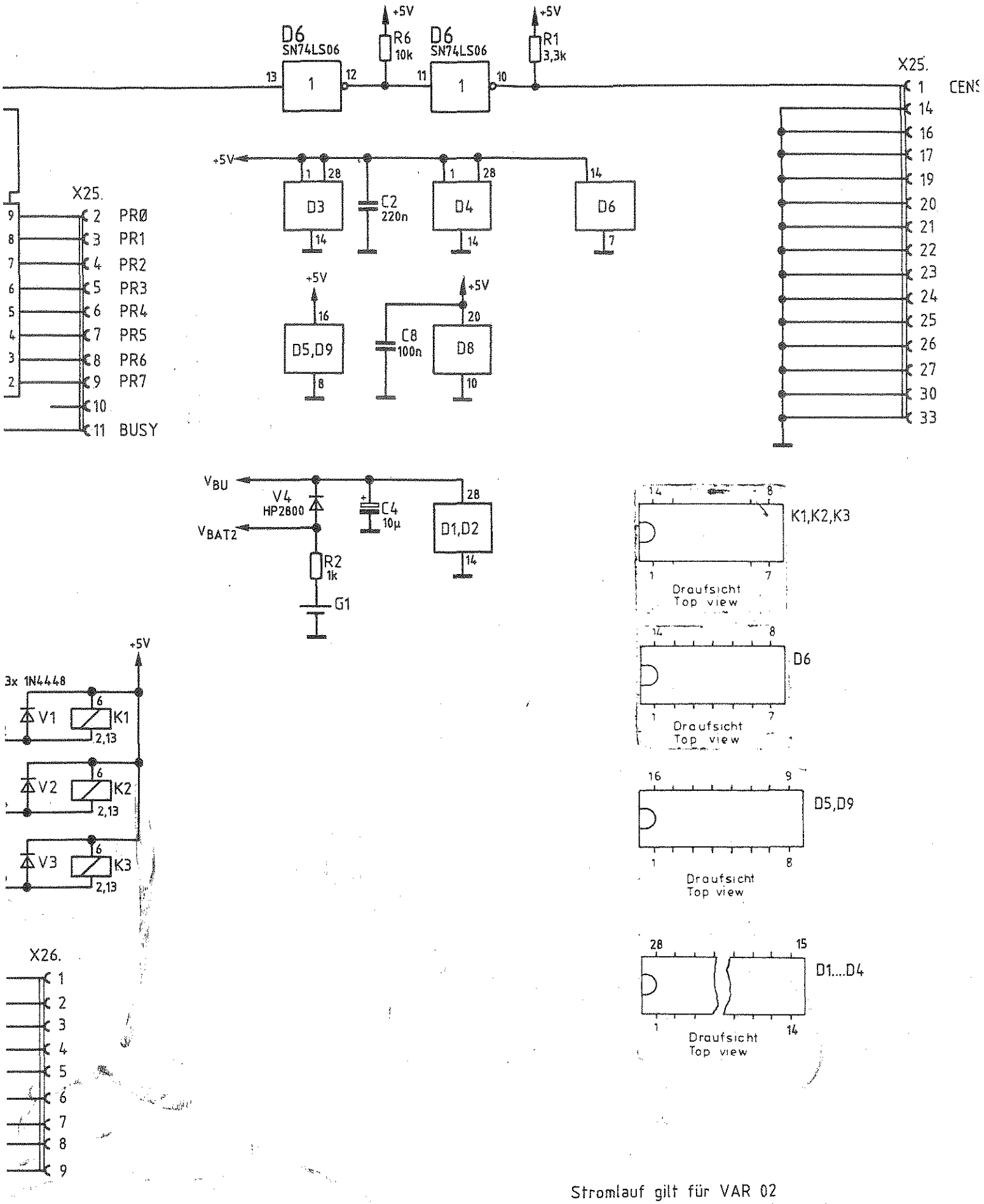

X1.
A
B
+5V
+5V
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
VBAT2
ABL
CENINT
CENSTR
LR1
UR1
LM2
UM2
CSRB
VBU
WR
RD
CPS-S
DO-S
VBU
D1
HM6264
D2
HM6264
OE
R/W
CE2
CE1
CSBR
R4
22,1k



A		7.85	CO					1KGA	Tag
B	35514	4.86	CO					Bearb.	4.85
C	35556	2.87	PR					Gepr.	
And Zust	Anderungs-Mitteilung	Datum	Name	And Zust	Anderungs-Mitteilung	Datum	Name	Norm	

ROHDE&SCHWARZ

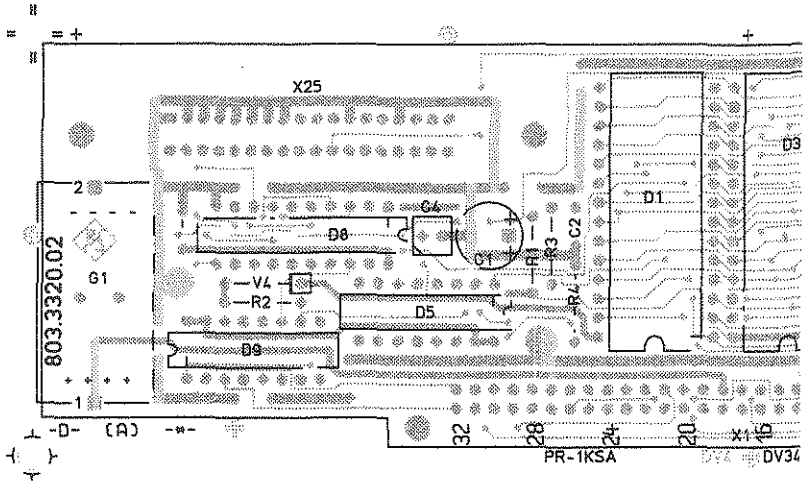
4 5 6



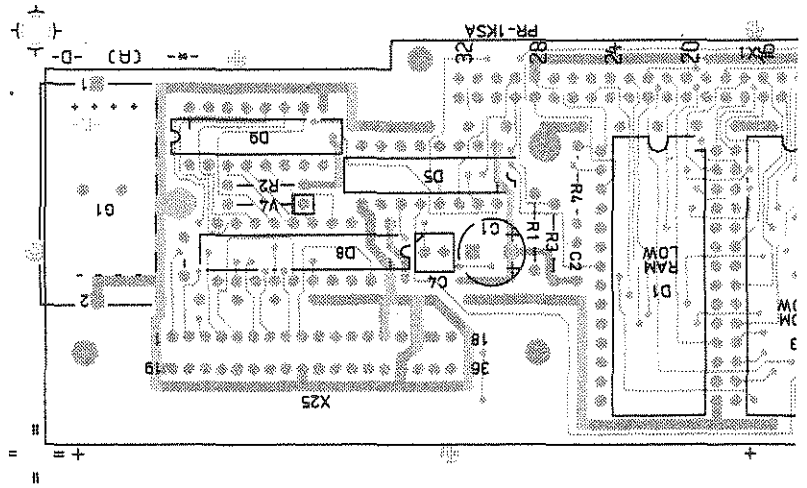
Stromlauf gilt für VAR 02
Circuit diagramm is valid for Model 02

Name	Benennung		Zeichn.-Nr.
CO	Ablaufsteuerung / Auto run control	Z	803.3320 S
	zu Gerät: CM-B5	reg. i. V. 803.3314 V	erste Z 803.332(

Ansicht und Leitungsfü
View of tracks on comp



Ansicht und Leitungsfü
View of tracks on solde

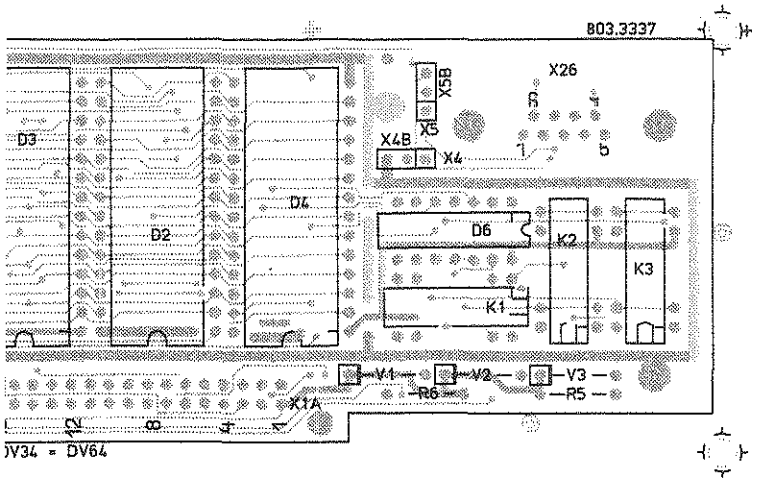


(herzu HVC 250)

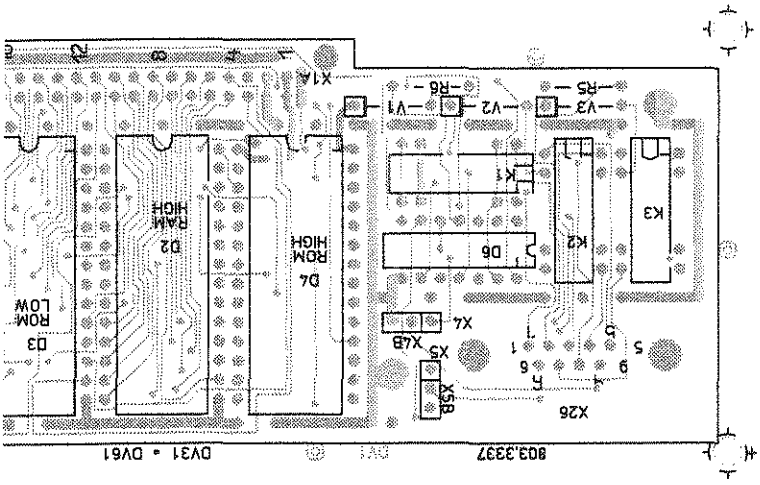
ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.

ATTENTION ESD!
Electrostatic sensitive devices require a special handling

führung Bauteilseite
ıponent side



führung Lötseite
ıer side



G	35556	02.87	PR	Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KSA	Tag	Name	Benennung
				Bearb.	02.87	PR	ABLAUFSTEUERUNG Z
				Gepr.			
				Norm			
				ROHDE&SCHWARZ		Zeichn.-Nr.	803.3320.01 EE
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät	CMT	reg. i. V.	803.3314 V
							Blatt-Nr. 2 v. Bl.
							erste Z.