



**ROHDE & SCHWARZ**

Service manual

**SWEEP GENERATOR**  
**0.4 ... 2500 MHz**  
**SWP**

339.0010.02

VOLUME II

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## 4. Service Instructions for the Complete Sweep Generator SWP

### 4.1 Circuit Description

(See block diagram 4-1)

#### 4.1.1 Generator Section

##### 4.1.1.1 RF Generator

The YIG oscillator which can be swept over the range 4.2 to 6.7 GHz controls the LO port of the mixer in the converter. A 4.2-GHz signal is available at the RF input of the mixer. It is derived in the converter from the 10-MHz reference.

The IF signal (0.4 to 2500 MHz) is boosted in the broadband amplifier. After amplification, the signal is applied via the level detector and the Attenuator Option SWP-B7 to the RF output 29.

The rectified voltage of the level detector is boosted in the control and modulation amplifier. The control voltage thus obtained controls the PIN controller in the 4.2-GHz path of the converter so that the source voltage (EMF) at the RF output 29 is kept constant. The control amplifier can be switched over to the ALC EXT input 19 in order to use external level detectors with a positive rectified voltage.

##### 4.1.1.2 Synchronizer

The Synchronizer Option SWP-B1 permits crystal-referenced frequency setting in 1-kHz steps with minimum residual FM. For this purpose, the RF generator and consequently the YIG oscillator is locked to the 99-to-121-MHz reference oscillator in the analog section using a fast PLL. The reference oscillator, in turn, is locked to the 10-MHz reference using a slow PLL.

During narrowband sweeping over the range 0.1 to 20 MHz, the YIG oscillator is switched off and the reference oscillator is converted down by mixing it with a 100-MHz signal from the converter. This signal is applied to the 0.1-to-20-MHz input of the broadband amplifier. Levelling of the 100-MHz signal is accomplished using a dual gate MOS-FET control element.

The RF signal required for synchronization is derived from the broadband amplifier and applied to the synchronizer RF section where it is processed for controlling the programmable dividers in the digital section.

For the slow PLL, the RF signal is converted to 20 to 700 MHz. Depending on the frequency, it is either connected through directly or mixed with 1200 MHz or 1800 MHz.

For the fast PLL, a signal between 0.1 MHz and 70 MHz is required. This is obtained either by connecting the RF voltage through or dividing the converted auxiliary frequency by 10.

The conversion frequencies 1200 MHz and 1800 MHz are derived from a 600-MHz signal which is supplied by the converter.

#### 4.1.1.3 Modulation

##### a) AM/FM

A common modulation amplifier with digital level setting for modulation depth and frequency deviation is provided on the control and modulation amplifier board for AM and FM.

The modulation voltage is fed into the RF level control as an additional control quantity for AM.

The modulation signal is applied to the FM tuning coil of the YIG oscillator in FM operation without synchronization. In FM operation with synchronization, it is applied to the reference oscillator in the synchronizer analog section.

Level sweeping is a special case of AM. The sawtooth used for sweeping is applied to the input of the modulation amplifier.

##### b) Pulse modulation

A Schmitt trigger which actuates an RF switch in the converter is provided on the control and modulation amplifier board for external pulse modulation. The modulation signal switches the 4200-MHz signal.

This same switch is driven with a 1-kHz squarewave signal in the internal pulse modulation mode, the 1-kHz squarewave signal being derived from the 10-MHz reference.

Moreover, this switch is used for blanking the RF output signal during return trace and for switching off the RF output signal (OFF 28).

#### 4.1.2 Microprocessor Control

The microprocessor board comprises the microprocessor system. It listens and talks to the user via the keyboard/display and IEC bus and controls all device setups.

The majority of the sub-units function independently. All they require are the setting data from the microprocessor. Only the marker and synchronizer boards require microprocessor control during sweeping depending on the operating mode.

The sub-units are controlled via a separate bus system comprising eight address and data lines each. It is only active during device setting and when calling up data.

Each option is identified by diode coding which is constantly checked by the microprocessor so that options may be included in the operation of the SWP.

A self-test program (cf. sections 4.1.7, 4.4 and operating manual) is provided to determine device failure or facilitate error location. All device settings are stored in a battery backed-up CMOSRAM.

#### 4.1.3 Keyboard/Display

For keyboard operation, an integrated keyboard chip is used which provides debounce of the keys and encoding without microprocessor control. If a key is pressed, the chip issues an interrupt.

A second identical chip signals to the microprocessor if there are any changes at the output of the up/down counter which is controlled from the tuning spin wheel.

Moreover, the two keyboard chips are used for multiplex control of the seven-segment displays and light bars. All individual LEDs are statically driven.

The unstabilized voltage of the 5.2-V supply of the digital sub-units powers the LED displays with the exception of the small seven-segment displays which are powered from the stabilized 5.2-V supply.

#### 4.1.4 Sweep Control

The sweep control circuit produces the sawtooth voltages for the X deflection on a display screen, for sweeping the YIG oscillator or the reference oscillator (Synchronizer Option) and for level sweeping.

For this purpose, a 12-bit up/down counter driven with a clock frequency corresponding to the forward or return sweep time is provided. It is followed by a D/A converter, at the output of which the digitally approximated sawtooth voltage with constant amplitude is available.

From this a sawtooth voltage with adjustable amplitude is obtained for selection of the frequency sweep, using a multiplying D/A converter. A digitally adjustable DC voltage is superimposed on the sawtooth voltage with adjustable amplitude for fixing the start frequency. The forward/return sweep signal is used for blanking the RF during return sweep in the appropriate operating mode.

The sweep control permits either automatic or manual operation as well as line-synchronous or single sweep.

#### 4.1.5 Frequency Markers

##### 4.1.5.1 Generation

As described in section 4.1.4, the deflection sawtooth voltage is obtained with the aid of a counter and following D/A converter, i.e. each count is assigned to a point on the frequency or X axis. A 10-bit address for the 1-kbyte RAM marker memory on the marker board is derived from the counter. All the storage locations corresponding to a marker frequency are at high level.

The memory contents are read out synchronously with the frequency sweep by sending the 10-bit counter addresses and are available at the marker output 26. Asynchronously with the readout process, the processor may gain access to the memory (read or write) to enable marker display.

##### 4.1.5.2 Variable Markers

###### a) Operation without synchronization

In operation without synchronization, the markers are assigned to the tuning sawtooth of the YIG oscillator with the aid of the counter address from the sweep control board.

###### b) Operation with synchronization

In conjunction with the SWP-B1 Option, crystal-referenced variable markers are produced. For this purpose, the output frequency of the SWP is determined

by means of a counter, the gate of which is momentarily opened during a frequency sweep. Since the counter functions as an integrator, the count corresponds to the frequency which the SWP produces over half the period the counter gate is open.

During each sweep, a marker is counted. In narrow-band sweeping ( $\Delta f \leq 1$  MHz), first the first marker, then the second marker, etc. (maximum of six) are counted. A new cycle starts following the last marker.

In broadband sweeping, the start frequency is typically counted during the first sweep, the first marker during the second sweep, subsequently again the start frequency and then the second marker, etc.

For sweep times  $> 1$  s, the sweep oscillator is tuned step-by-step and synchronized at each step. The markers can, therefore, be defined through interpolation. This applies to both narrowband and broadband sweep.

#### 4.1.5.3 Harmonic Markers

The harmonic markers are produced in the SWP-B9 Option. For this purpose, a 1-MHz, 10-MHz or 100-MHz spectrum is derived from a 10-MHz crystal in the Harmonic Marker Option or the 100-MHz converter signal and mixed with the swept RF voltage coupled out from the broadband amplifier. The intermediate frequency is amplified at 100 kHz and 1 MHz, rectified and converted into a TTL signal which is stored in a marker memory as described in section 4.1.5.1. The memory contents are modified by the processor according to the operating conditions and written into the marker memory on the marker board for output. With sweep times of 20 ms to 1 s, the memory contents are updated after approximately every 5 s. If the sweep time is  $> 1$  s, the TTL signal of the Harmonic Marker Option is available at the marker output 26 without having undergone any modifications from the processor.

A further mixer in conjunction with an external RF generator permits generation of a frequency marker. Basically, the intermediate frequency is processed as described above with the exception that updating takes place approximately every second.

#### 4.1.6 Power Supply

To avoid disturbances, a conventional power supply is used (not a switching power supply). It provides seven stabilized, two unstabilized DC voltages and an auxiliary AC voltage (approximately 5.5 V, X75) for line-synchronous sweep.

The primary and secondary power transformer circuits are fused. All stabilized voltages are continuous-shortcircuit-proof (not simultaneously).

a) Stabilized DC voltages

	Pin assignment	Dominant loads
- 15 V	X72/ $\perp$ X64	Analog sub-units (operational amplifiers)
-5.2 V	X63/ $\perp$ X71	ECL chips, YIG output stages (FM coil)
+5.2 V	X70/ $\perp$ X71	YIG output stages (FM coil)
+5.2 V	X66/ $\perp$ X67	Microprocessor, digital sub-units
+ 15 V	X65/ $\perp$ X64	Analog sub-units (operational amplifiers)
+ 24 V	X61/ $\perp$ X60	Heating YIG oscillator, Reference Oscillator Option SWP-B11
+ 24 V	X68/ $\perp$ X60	Broadband amplifier

The 5.2-V supply of the microprocessor is overload-protected. It is monitored by means of a red LED.

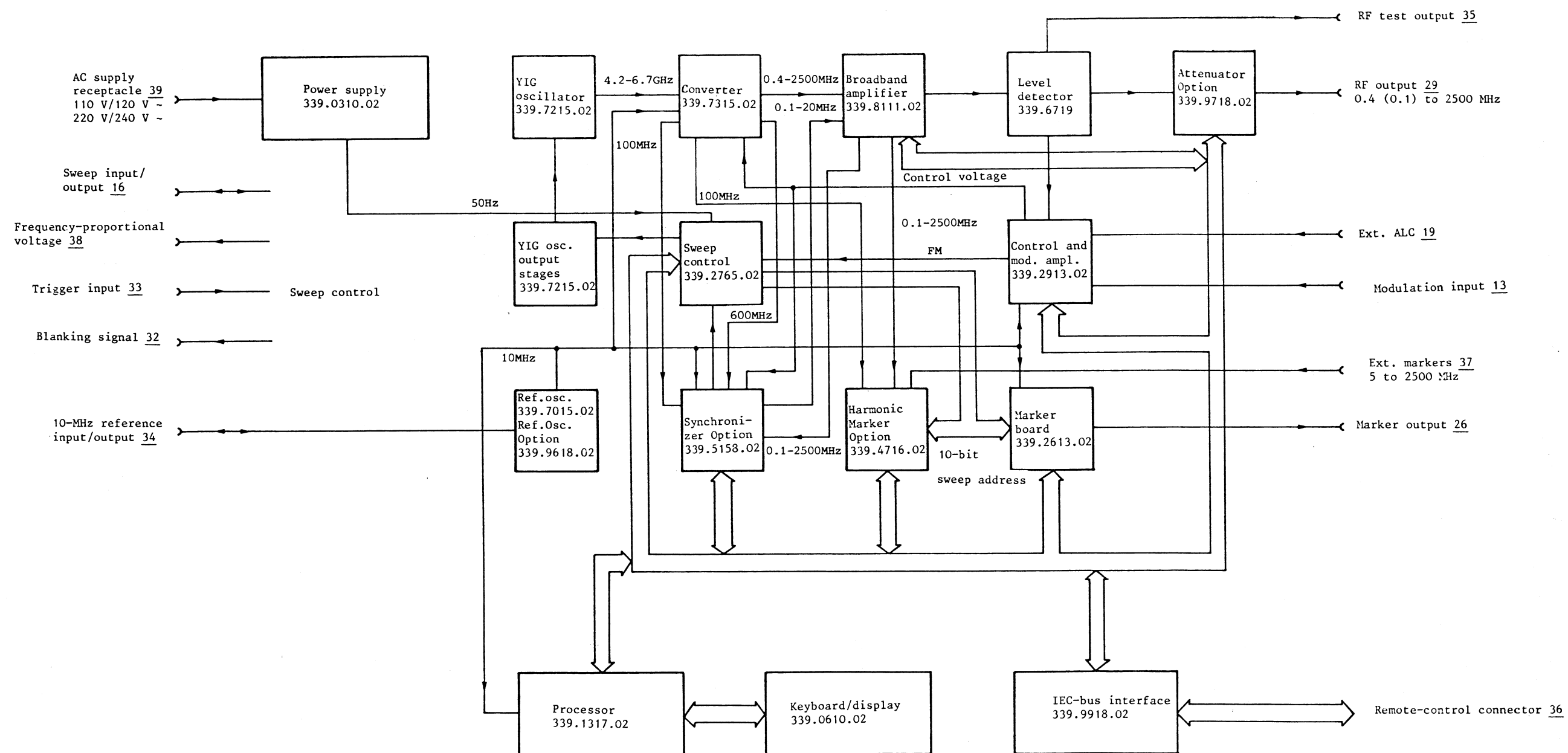
b) Unstabilized DC voltages

	Pin assignment	Dominant loads
+13/ 9 V	X74/ $\perp$ X73	LED displays and lamps on the front panel
+20/16 V	X69/ $\perp$ X62	YIG output stages (main coil)

The first voltage specification refers to no-load operation and the second to full-load operation.

#### 4.1.7 Self-test Hardware

The self-test hardware is accommodated on the marker board. It permits 25 test points of the SWP to be monitored. Each test point can be switched to an A/D converter via a multiplexer. Suitable rectifiers are provided on some circuit boards to cover high-frequency test values. The test points together with the instructions for troubleshooting are listed in section 4.4.1.





## 4.2 Mechanical Construction

The mechanical design of the SWP is based on a mainframe with separate RF unit. The circuit board wiring is generally accomplished via a motherboard in both the RF unit and the mainframe. The latter is a multilayer motherboard. The high-frequency lines are primarily flexible coaxial cables fitted with SMC connectors. The location of the batteries for the CMOS memory can be seen from Fig. 2-7 in the operating manual.

### 4.2.1 Mainframe

#### a) PC boards

All PC boards of the mainframe with the exception of the keyboard/display and the power supply are provided with two 48-way connectors for connection to the motherboard. The PC boards on which high RF levels are produced are enclosed in shielding cases. The PC boards not shielded are identified by colour-coded clips and board guides. In the case of PC boards enclosed in shielding cases, the colour of the print on the cover matches with that of the board guides. These PC boards are mechanically secured by means of a supporting plate (cf. operating manual, sections 2.5.1 and 2.5.3).

#### b) Keyboard/display

The keyboard and the LEDs are mounted on a PC board behind the front panel. The magnetically locked rotary knob is also mounted there. On the second PC board behind the front one, mainly the control circuits are mounted. Electrical connection to the motherboard is established by means of a flat cable.

#### c) Power supply

The power supply board and the fuse board are incorporated into the rear panel. After removal of the lower cover panel, access can be gained to the fuse board on which the fuses for the secondary transformer circuit are provided. The fuse for the primary transformer circuit is provided in the voltage selector 40 on the rear panel, which in turn is mechanically coupled with the AC supply receptacle 39.

The integrated voltage regulators are connected to the rear panel by means of a rail for cooling purposes.

The toroidal power transformer is provided with EMI shielding. All supply lines are connected to the power supply by means of sockets and plugs. A red LED prominently located on the power supply board signals if the +5.2-V supply voltage for the microprocessor and the digital sub-units is present. The two brackets for supporting the adapter boards are mounted on the shielding wall in front of the power supply.

d) Blower

The blower is mounted on the rear panel behind the compartment for the RF unit. The air flow is directed such that the air is sucked out of the SWP. Thus an air filter is not required.

4.2.2 RF Unit

The withdrawal of the RF unit is described in the operating manual, section 2.5.2.

All PC boards with the exception of the YIG oscillator output stages are housed in RF-proof cassettes. The YIG oscillator is shielded against magnetic disturbances using mumetal. For the same reason, the upper cover of the converter cassette is made of steel.

To ensure satisfactory cooling, the broadband amplifier is arranged in the air flow of the blower.

The transistors V20, V40, V60, V70 and V80 are soldered onto brass blocks screwed to the lower cover (heat sink). For repair purposes, the brass blocks with the transistors can be removed after unsoldering the base and emitter leads and loosening two retaining screws.

The level detector is mounted as shown in Fig. 2-7 in the operating manual.

Mounting and removal of the attenuator is described in the operating manual, section 2.5.2.

For improved cooling in the Synchronizer Option area, an air baffle is provided beside the broadband amplifier.

## 4.3 Checking and Adjustment Procedures

### 4.3.1 Checking

Prior to checking initiate self-test to get hints for further checking and troubleshooting (see sections 2.3.12 and 4.4).

Then make performance check according to section 3.2 in the operating manual.

### 4.3.2 Adjustment

#### a) RF output level

The adjustment is to be made without the Attenuator Option SWP-B7. If the Attenuator Option is fitted, disable it as follows:

- Apply RF level of 10 dBm.
- Insert link X24 on control board.

The control board forms part of the keyboard/display 339.0610. Setting controls R40 and R58 are provided on the control and modulation amplifier board 339.2913.

Adjustment procedure:

Settings on the SWP:

- CW mode 100 MHz.
- No modulation.
- RF level 10 dBm.

Test setup:

- Connect RF power meter to RF output 29.

Adjustment:

- Adjust the RF level to 10 dBm with R40.
- Apply RF level of 0 dBm. Adjust with R58.
- Repeat adjustment at 10 dBm until there is no deviation (the potentiometers influence each other).

b) Frequency adjustment

The setting controls R2 and R7 required for this purpose are provided on the board 339.7215 (YIG oscillator output stages).

Settings on the SWP:

- Switch on SWP (this resets the frequency correction CORR).
- Synchronizer off (if Synchronizer Option is fitted).
- CW mode 10 MHz.
- RF level 10 dBm.
- No modulation.

Test setup:

- Connect the frequency counter to the RF output 29.

Adjustment:

- Allow the SWP to warm up at least 15 min.
- Adjust frequency to 10 MHz  $\pm 500$  kHz with R7.
- Set the SWP to 2500 MHz.
- Adjust the frequency to 2500 MHz  $\pm 500$  kHz with R2.

NOTE: When adjusting the frequency to 10 MHz, make sure that the adjustment is made in the "right direction": apply 11 MHz - the frequency must increase.

c) Narrowband sweeping

The setting control R26 required for this purpose is provided on the board 339.7215 (YIG oscillator output stages).

Settings on the SWP:

- Synchronizer off (if Synchronizer Option is fitted).
- START/STOP mode 90 to 110 MHz.
- RF level 10 dBm.
- Internal sweep 10 s.
- Return sweep blanked.
- No modulation.

Test setup:

→ Connect RF spectrum analyzer to RF output 29.

Adjustment:

→ Adjust sweep width to 20 MHz with R26.

#### 4.4 Troubleshooting

Troubleshooting is greatly simplified thanks to the automatic self-test (cf. operating manual). The execution of the test program is indicated on the display 1 which reads out SELF. If a fault is detected, FAIL XX is read out on the display 2, XX (2-digit hexadecimal figure) referring to the defective board (see list in section 4.4.1). Display 3 reads out the state of the A/D converter which monitors the test points: YY is the serial test number which is followed by ZZ corresponding to the converter result.

Since the level present at the RF output 29 is temporarily +10 dBm during the test routine, make sure that the load connected can withstand this RF power (caution with some thermal power meters). Otherwise terminate the RF output with 50  $\Omega$ .

For testing the modulation level, a sinewave signal of 1 kHz and 1 V  $\pm 10$  mV is to be applied to the modulation input 13.

#### 4.4.1 List of Faults in Self-test

##### a) Fault on marker board 339.2613.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
00	0		TEST A	A/D converter D95 measures its own offset 10-MHz ref. signal missing (negative voltage for A/D converter)

##### b) Fault on power supply board 339.0310.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
01	1		VD5-P	+5.2-V supply for microprocessor and digital sub-units faulty
03	2		VL9/13	+13/9-V supply for LED displays and indicator lamps on the front panel faulty
04	3		V15-P	+15-V supply for analog sub-units (operational amplifiers) faulty
05	4		V15-N	-15-V supply for analog sub-units (operational amplifiers) faulty
06	5		VA5-P	+5.2-V supply for the YIG output stages (FM coil) faulty
07	6		VA5-N	-5.2-V supply for the ECL chips and YIG output stages (FM coil) faulty
08	7		VV24-P	+24-V supply for the broadband amplifier faulty
09	8		VHTR24-P	+24-V supply for the Reference Oscillator Option SWP-B11 and heating of the YIG oscillator faulty
0A	9		VTUNE 16/20-P	+20/16-V supply for the YIG output stages (main coil) faulty
10	A		TEST F	Batteries for the supply of the CMOS-RAM run down

In the column with the hints for troubleshooting, only the dominant loads are referred to.

c) Fault on converter board 339.7315.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
21	1B		TEST 1	100-MHz oscillator not synchronized
22	1C		TEST 0	600/4200-MHz multiplier control defective:  Excessive level: multiplier does not function - no load at 600-MHz amplifier  Insufficient level: 600-MHz path faulty

d) Fault on sweep control board 339.2765.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
30	1D	50 MHz CW syn- chronization off	TEST 6	] Tuning voltage (YIG main coil) faulty
30	1E	1250 MHz CW syn- chronization off	TEST 6	
30	1F	2500 MHz CW syn- chronization off	TEST 6	
31	20	Counter D3 to D5 reset	TEST 9	Pin 3 of counter chip D3 outside tolerance limits for low level (SWEEP ADDR 0-P)
31	21	Counter D3 to D5 set to 1	TEST 9	Pin 3 of counter chip D3 outside tolerance limits for high level
32	22	Counter D3 to D5 set to 4095	TEST 8	X deflection voltage at wrong value
33	23	Counter D3 to D5 set to 4095 $\Delta f = 20 \text{ MHz}$	TEST 7	Tuning voltage (YIG FM coil) faulty

e) Fault on broadband amplifier board 339.8111.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
40	24		BBA OFF	Broadband amplifier switched off due to over-heating (temperature at cooling lid > approx. 85°C) or overvoltage on +24-V supply (> approx. 26.5 V)

f) Fault on control and modulation amplifier board 339.2913.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
20	1A		TEST 2	10-MHz reference level incorrect (only in control and modulation amplifier)
41	25	10 MHz/0 dBm	TEST 3	RF level 0 dBm outside tolerance
41	26	100 MHz/0 dBm	TEST 3	
41	27	500 MHz/0 dBm	TEST 3	
41	28	1000 MHz/0 dBm	TEST 3	
41	29	1800 MHz/0 dBm	TEST 3	
41	2A	2500 MHz/0 dBm	TEST 3	
43	2B	10 MHz/10 dBm	TEST 3	RF level 10 dBm outside tolerance
43	2C	100 MHz/10 dBm	TEST 3	
43	2D	500 MHz/10 dBm	TEST 3	
43	2E	1000 MHz/10 dBm	TEST 3	
43	2F	1800 MHz/10 dBm	TEST 3	
43	30	2500 MHz/10 dBm	TEST 3	
45	31	2500 MHz/10 dBm	TEST 5	RF level control voltage outside tolerance
50	32	External modulation signal 1 kHz/1 V $\pm$ 10 mV	TEST 4	Modulation level incorrect



g) Fault in Synchronizer Option SWP-B1 339.5158.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
62	35	400 kHz synchronized	TEST D	] Tuning of reference oscillator (VCO) on analog circuit board 339.5164.02 faulty (no synchronization)
62	36	10 MHz synchronized	TEST D	
62	37	20 MHz synchronized	TEST D	

h) Fault in Harmonic Marker Option SWP-B9 339.4716.02

Error code Display <u>2</u>	Test No. Display <u>3</u>	Test conditions	Test line	Hints for troubleshooting
80	39		TEST E	1-MHz harmonic marker generation faulty
81	3A		TEST E	10-MHz harmonic marker generation faulty
82	38		TEST E	100-MHz harmonic marker generation faulty

i) Fault messages and limit values

Error code Display 2	Test No. Display 3	Input* X3	Input voltage [V] *		A/D converter input*		Display*	
			min.	max.	min.	max.	min.	max.
00	0	-	0	0.02	0	0.02	00	03
01	1	C14	4.75	5.25	1.92	2.12	CC	E2
03	2	C15	8.0	12.0	1.20	1.82	7F	C2
04	3	C3	14.6	15.4	1.86	1.97	C5	D2
05	4	A4	-15.4	-14.6	0.19	0.31	14	21
06	5	C1	4.75	5.35	1.86	2.11	C5	E1
07	6	A2	-5.35	-4.95	0.68	0.81	48	56
08	7	C13	23.5	24.5	2.04	2.13	D8	E3
09	8	A13	23.5	24.5	2.04	2.13	D8	E3
0A	9	A14	12.0	18.0	1.37	2.07	91	DC
10	A	C12	> 2.16	-	> 1.28	-	88	FF
20	1A	A6	> 1.8	-	> 1.8	-	BF	FF
21	1B	C5	4.2	6.3	0.63	0.96	42	65
22	1C	A5	0.39	2.0	0.39	2.0	29	D5
30	1D	A8	-0.55	-0.05	2.24	2.36	EE	FA
30	1E	A8	-5.1	-4.7	1.24	1.34	83	8F
30	1F	A8	-10.2	-9.4	0.11	0.30	0B	20
31	20	C9	0	0.64	0	0.25	00	1A
31	21	C9	> 2.50	-	> 0.95	-	64	FF
32	22	A9	9.5	10.1	2.11	2.26	E0	F1
33	23	C8	-8.25	-7.75	0.15	0.22	0F	18
41	25	C6	0.4	0.55	0.44	0.55	2A	3C
41	26	C6	0.4	0.55	0.44	0.55	2A	3C
41	27	C6	0.4	0.55	0.44	0.55	2A	3C
41	28	C6	0.4	0.55	0.44	0.55	2A	3C
41	29	C6	0.4	0.55	0.44	0.55	2A	3C
41	2A	C6	0.4	0.55	0.44	0.55	2A	3C
43	2B	C6	1.55	1.85	1.55	1.85	A4	C5
43	2C	C6	1.55	1.85	1.55	1.85	A4	C5
43	2D	C6	1.55	1.85	1.55	1.85	A4	C5
43	2E	C6	1.55	1.85	1.55	1.85	A4	C5
43	2F	C6	1.55	1.85	1.55	1.85	A4	C5
43	30	C6	1.55	1.85	1.55	1.85	A4	C5
45	31	C7	-5.0	10	0.78	1.57	52	D1
50	32	A7	5.5	6.1	1.77	1.97	BC	D2
62	35	C11	4.5	6.5	1.55	1.71	A4	B6
62	36	C11	8.0	10.0	1.82	1.99	C1	D4
62	37	C11	11.5	13.5	2.10	2.26	DF	F1
80	39	A12	> 2.0	-	> 0.58	-	3D	FF
81	3A	A12	> 2.0	-	> 0.58	-	3D	FF
82	3B	A12	> 0.3	-	> 0.09	-	09	FF

\* Marker panel 339.2613

#### 4.5 Measuring Instruments Required

Item	Instrument	Performance rating	R&S Order No.	Used in *)
1	Spectrum analyzer	0.1 to 5000 MHz Dynamic range > 70 dB IF output		A6 A32, A33 4.3
2	Counter	100 kHz to 2500 MHz Input up to 100 MHz: 1 M $\Omega$ Accuracy 1 x 10 <sup>-9</sup>		A5, A6 A7 4.3
3	Modulation analyzer	100 kHz to 2500 MHz Residual FM (CCITT) < 3 Hz	FAM + item 1 334.2015.53 FAM-B2 334.4918.04 FAM-B6 334.5614.02 FAM-B7 334.5514.02 FAM-B8 334.5714.02	A5 A6 A7 A34 A39 4.3
4	Power meter	100 kHz to 2.5 GHz/50 $\Omega$		A5 4.3
5	RF milli-voltmeter	100 kHz to 700 MHz	URV 4 292.5012.02	A5
6	AF generator	100 Hz to 1 MHz with TTL output	SPN 336.3019.02	A9 A10
7	Signal generator	10 MHz/0.5 V/50 $\Omega$	SMS 302.4012.24	
8	Oscilloscope	0 to 100 MHz Sensitivity: 2 mV/div 2 channels		A1, A2, A4, A5, A6, A7, A9, A10, A11, A20, A32, A33
9	Digital voltmeter	100 mV to 100 V	UDL 4 346.7800.02	All chips
10	Ammeter	Current range $\geq$ 6 A		A11
11	Power supply	0 to 20 V/1 A	NGT 20 117.7133.02	A1, A3, A5, A6, A7, A9, A10, A20, A33, A39
12	DC feed unit		ZPV-Z6 265.3512.02	A32

\*) "A.." is the subassembly identification as specified in circuit diagrams  
339.0010 S and 339.6519 S.

Item	Instrument	Performance rating	R&S Order No.	Used in *)
13	Feed-through termination	50 $\Omega$	RAD 289.8966.00	A33
14	Crystal filter	Centre frequency 10.7 MHz Bandwidth 5 to 10 kHz I/O impedance 50 $\Omega$		A5
15	Signature analyzer			A1, A2

\*) "A.." is the subassembly identification as specified in circuit diagrams 339.0010 S and 339.6519 S.

## R&S-Schlüsselliste

Die R&S-Schaltteillisten nennen in der Spalte "Benennung/Beschreibung" die technischen Daten der Bauelemente in Kurzform. Die Art des Bauelements (z. B. Schicht-, Draht-Widerstand usw.) beschreiben die 2 Kennbuchstaben vor der "Benennung" (evtl. auch vor der "Sachnummer"), die nachfolgend erklärt werden. In Ersatzteil-Bestellungen an R&S ist stets die Angabe der vollständigen Sachnummer erforderlich.

## R&S key list

The R&S Parts Lists give the technical data of the components in short form in the column "Benennung/Beschreibung" (designation). The type of component (e.g. depos.-carbon resistor, wire-wound resistor etc.) is indicated by 2 identification letters before the designation, possibly also before the "Sachnummer" (order number), which are explained below. When ordering spare parts from R&S, the complete order number must always be specified.

## Liste des symboles de référence R&S

La colonne «Désignation/description» des listes de pièces de R&S indique les caractéristiques des éléments sous forme abrégée. Le type d'élément (p. ex. résistance à couche, résistance bobinée etc. ...) est décrit par les deux lettres précédant la désignation (et éventuellement le numéro de référence), dont voici l'explication. Prière d'indiquer le numéro de référence («Sachnummer») complet dans toute commande de pièces de rechange.

Kenn- buchst.	Art des Bauelementes	Identif.- letter	Type of component	Sym- bole	Type d'élément
<b>A</b>	<b>Aktive Bauelemente, Halbleiter</b>	<b>A</b>	<b>Active components, semiconductors</b>	<b>A</b>	<b>Composants actifs, semiconducteurs</b>
AD	Universaldiode, z.B. Gleichrichter, Sperrdiode	AD	General-purpose diode, e.g. rectifier, high-resistance diode	AD	Diode d'usage général, p.ex. redresseur, diode à haute résistance
AE	Spezialdiode, z.B. Tunnel-, Kapazitäts-, Zener-Diode	AE	Diode (special), e.g. tunnel diode, varactor, Zener diode	AE	Diode spéciale, p.ex. diode tunnel, varactor, diode Zener
AF	Fotoelement, z.B. Foto-Diode, -Transistor, -Widerstand, Leuchtdiode	AF	Light-sensitive component, e.g. resistor, diode, transistor; LED	AF	Composant photoélectrique, p.ex. diode, transistor, résistance photoél., D.E.L.
AG	Leistungs-Gleichrichter, z.B. Thyristor, Triac, Selengleichrichter	AG	Power rectifier, e.g. thyristor, triac, selenium rectifier	AG	Redresseur de puissance, p.ex. thyristor, triac, redresseur au sélénium
AK	Kleinsignal-Transistor	AK	Low-power transistor	AK	Transistor faible puissance
AL	Leistungs-Transistor	AL	High-power transistor	AL	Transistor grande puissance
AM	Spezial-Transistor, z.B. FET, MOSFET	AM	Transistor (special), e.g. FET, MOS-FET	AM	Transistor spécial, p.ex. TEC, MOSTEC
AP	Peltier-, Hall-Element	AP	Peltier element, Hall element	AP	Element Peltier, élément Hall
AR	Röhre für Empfänger, Verstärker, Gleichrichter	AR	Valve for receiver, amplifier, rectifier	AR	Tube pour récepteur, amplificateur, redresseur
AS	Spezialröhre, z.B. Senderröhre, EW-Widerstand, Stabilisator	AS	Valve (special), e.g. for transmitter; baretter, ballast valve	AS	Tube (spécial), p.ex. pour émetteur, résistance fer-hydrogène, ballast
AT	Katodenstrahlröhre, z.B. Bildröhre, Ziffern-Anzeigeröhre	AT	Cathode ray tube, e.g. picture tube, digital indicator tube	AT	Tube à rayon cathodique, p.ex. tube à image, tube à affichage numérique
AW	Spannungs- oder temperaturabhängiger Widerstand	AW	Voltage- or temperature-dependent resistor	AW	Varistance ou thermistance
<b>B</b>	<b>Bausteine</b>	<b>B</b>	<b>PC boards, chips</b>	<b>B</b>	<b>Cartes imprimées, puces</b>
BC	Integr. Schaltkreis (Microcomp.)	BC	Integrated circuit (interface, A/D)	BC	Circuit intégré (microprocesseur)
BD	R&S-Dünnschichtschaltung	BD	R&S thinfilm circuit	BD	Circuit à couche mince R&S
BG	Gerätebaugruppe	BG	Subassembly	BG	Sous-ensemble
BJ	Integr. Schaltkreis (Interface, A/D-Wandler)	BJ	Integrated circuit (interface, A/D converter)	BJ	Circuit intégré (interface, convertisseur A/N)
BK	Kernspeicher, Magnetspeicher	BK	Core memory, magnetic memory	BK	Mémoire à tores, mémoire magnétique
BL	Log. Schaltkreis z.B. DTL, TTL, HTL, ECL, C-MOS	BL	Logic circuit, e.g. DTL, TTL, HTL, ECL, C-MOS	BL	Circuit logique, p.ex. DTL, TTL, HTL, ECL, C-MOS
BM	Hybridbaustein, z.B. Mischer, Tuner, Modulator	BM	Hybrid chip, e.g. mixer, tuner, modulator	BM	Puce hybride, p.ex. mélangeur, tuner, modulateur
BO	Analogschaltkreis, z.B. Operationsverstärker	BO	Analog circuit, e.g. operational amplifier	BO	Circuit analogique, p.ex. amplificateur opérationnel
BP	Optobaustein, z.B. Anzeigeeinheit, Koppler	BP	Optoelement, e.g. display, coupler	BP	Élément optique, p.ex. afficheur, coupleur
BS	Schalt- und Steuerbaustein, elektronischer Sensor	BS	Switching and control modul, electronic sensor	BS	Modul de commutation et de commande, sonde électronique
BV	Stromversorgung, Übersp.-Schutz	BV	Power pack, protective circuit	BV	Alimentation, protection surcharge



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Kenn- buchst.	Art des Bauelementes	Identif.- letter	Type of component	Sym- bole	Type d'élément
<b>C</b>	<b>Kondensatoren</b>	<b>C</b>	<b>Capacitors</b>	<b>C</b>	<b>Condensateurs</b>
CB	Bypass-, Durchf.-Kondensator	CB	Bypass capacitor, feed-through capacitor	CB	Condensateur bypass, condensateur de traversée
CC	Keramischer Kondensator	CC	Ceramic capacitor	CC	Condensateur céramique
CD	Drehkondensator	CD	Variable capacitor	CD	Condensateur variable
CE	Elektrolytkondensator	CE	Electrolytic capacitor	CE	Condensateur électrolytique
CG	Glimmerkondensator	CG	Mica capacitor	CG	Condensateur au mica
CH	Sperrschichtkondensator	CH	Semiconductor capacitor	CH	Condensateur semiconducteur
CK	Kunstfolienkondensator	CK	Synthetic-foil capacitor	CK	Condensateur à feuille synthétique
CL	Ker. Hochsp.-Kondensator	CL	HV capacitor (ceramic)	CL	Condensateur HT céramique
CM	Metallpapier-Kondensator	CM	MP capacitor	CM	Condensateur à papier métallisé
CN	Kondensatornetzwerk	CN	Capacitor network	CN	Réseau capacitif
CP	Papierkondensator	CP	Paper capacitor	CP	Condensateur au papier
CS	Störschutzkondensator	CS	Interference-suppression capacitor	CS	Condensateur anti-parasite
CT	Trimmkondensator	CT	Trimmer capacitor	CT	Condensateur ajustable
CV	Vakuum-Kondensator	CV	Vacuum capacitor	CV	Condensateur à vide
<b>D</b>	<b>Drähte, Leitungen</b>	<b>D</b>	<b>Wires, lines</b>	<b>D</b>	<b>Fils, lignes</b>
DD	Schalt- und Wickeldraht	DD	Hook-up or winding wire	DD	Fil de câblage, fil de bobinage
DF	Flachleitung, Litze	DF	Flat multiple line, stranded wire	DF	Ligne plate, ligne torsadée
DG	Abgeschirmte Leitung	DG	Shielded line	DG	Ligne blindé
DH	Koaxialkabel	DH	Coaxial line	DH	Ligne coaxiale
DN	Antenne	DN	Antenna	DN	Antenne
DS	Anschlußkabel (mehradrig)	DS	Connecting cable, multicore	DS	Câble de connexion (multiconducteur)
<b>E</b>	<b>Elektrische Teile</b>	<b>E</b>	<b>Electric parts</b>	<b>E</b>	<b>Organes électriques</b>
EB	Blei-, NC-Akku, Batterie	EB	Lead or alkaline accumulator, battery	EB	Accumulateur Pb/NC, batterie
EF	Glühlampe, Leuchte	EF	Incandescent lamp, pilot lamp	EF	Lampe à incandescence, voyant
EG	Glimmlampe, Entladungslampe	EG	Glow lamp, discharge lamp	EG	Lampe à luminescence, lampe à décharge
EK	Kontakt-Streifen, -Feder	FK	Contact clip, contact spring	EK	Lame de contact, ressort de contact
EL	Lautspr., Kopfhörer, Mikrofon	EL	Loudspeaker, headphones, microphone	EL	Haut-parleur, casque, microphone
EM	Motor, Hubmagnet, Drehfeldsystem	EM	Motor, lifting magnet, synchro system	EM	Moteur, électro-aimant de levage, système synchro
EO	Oszillator, z.B. Quarzoszillator	EO	Oscillator, e.g. crystal oscillator	EO	Oscillateur, p.ex. oscillateur à quartz
EP	Tief-, Band-, Hochpaß, Bandsperre, Diskriminator	EP	Lowpass, bandpass, highpass filter, band-stop filter, discriminator	EP	Filtre passe-bas, passe-bande, passe-haut, suppression de bande, discriminateur
EQ	Schwing-, Filter-Quarz	EQ	Oscillator or filter crystal	EQ	Quartz oscillateur, quartz de filtre
ER	Resonator, piezoelektr./magnetostruktiv	ER	Resonator, piezoelectric/magnetostrictive	ER	Résonateur piézo-électrique/magneto-strictif
ES	Passive SHF-Bauteile	ES	Passive SHF-components	ES	Composant SHF passif
ET	Thermostat	ET	Thermostat	ET	Thermostat
EV	Lüfter, Gebläse	EV	Ventilator, blower	EV	Ventilateur, soufflerie
<b>F</b>	<b>Fassungen, Steckverbindungen</b>	<b>F</b>	<b>Sockets, connectors</b>	<b>F</b>	<b>Douilles, connecteurs</b>
FA	Dezifix/Prezifix A	FA	R&S coaxial connector Dezifix/Precifix A	FA	Dezifix, Prezifix A
FB	Dezifix B	FB	R&S coaxial connector Dezifix B	FB	Dezifix B
FC	Dezifix C	FC	R&S coaxial connector Dezifix C	FC	Dezifix C
FD	Dezifix D	FD	R&S coaxial connector Dezifix D	FD	Dezifix D
FE	Dezifix E/J	FE	R&S coaxial connector Dezifix E/J	FE	Dezifix E/J
FF	Dezifix F	FF	R&S coaxial connector Dezifix F	FF	Dezifix F



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Kenn- buchst.	Art des Bauelementes	Identif.- letter	Type of component	Sym- bole	Type d'élément
FG	Koax-Umrüstsatz	FG	Coaxial screw-in assembly	FG	Ensemble vissable coaxial
FH	Koax-Übergang auf Fremdsystem	FH	Coaxial adapter	FH	Adaptateur coaxial
FJ	BNC-Systemteil	FJ	BNC screw-in assembly	FJ	Ensemble vissable BNC
FK	Koaxial-UHF-Systemteil	FK	Coaxial UHF screw-in assembly	FK	Ensemble vissable coaxial UHF
FM	Mehrfachstecker, Buchsenleiste	FM	Multipoint connector	FM	Connecteur multiple
FN	Netz-Steckverbindung	FN	AC-supply connector	FN	Connecteur secteur
FO	Runde Mehrfach-Steckverbindung	FO	Round multipoint connector	FO	Connecteur multipoles rond
FP	Druckschalt.-Steckverbindung	FP	Multipoint connector for PC boards	FP	Connecteur multipoles pour cartes imprimées
FR	Fassung für Lampe, Sicherung, usw.	FR	Socket for lamp, fuse, etc.	FR	Douille pour lampe, fusible etc.
FT	Schwachstrom-Steckverbindung	FT	LV plug and socket	FT	Connecteur pour faible courant
FU	Hochsp.-Steckverbindung	FU	HV plug and socket	FU	Connecteur pour haute tension
FV	Verbinder (z.B. AMP)	FV	Push-on connector	FV	Connecteur à enfichage
<b>J</b>	<b>Meßinstrumente</b>	<b>J</b>	<b>Indicators</b>	<b>J</b>	<b>Indicateurs</b>
JD	Drehspul-Anzeiginstrument	JD	Moving-coil meter	JD	Galvanomètre à cadre mobile
JE	Dreheisen-Anzeiginstrument	JE	Moving-iron meter	JE	Galvanomètre à fer mobile
JF	Frequenzmesser	JF	Frequency meter	JF	Fréquencemètre
JG	Drehspulinstrument mit Gleichrichter	JG	Moving-coil meter with rectifier	JG	Galvanomètre à cadre mobile avec redresseur
JH	Betriebstundenzähler	JH	Operating-hours counter	JH	Compteur d'heures de fonctionnement
JJ	Impulszähler	JJ	Pulse counter	JJ	Compteur d'impulsions
JK	Kleinst-Instrument, z.B. Abstimmanzeiger	JK	Mini-instrument, e.g. tuning indicator	JK	Petit indicateur, p.ex. indicateur d'accord
JM	Mechanisches Zählwerk	JM	Mechanical counter	JM	Compteur mécanique
JP	Projektions-Instrument (Leuchtziffer)	JP	Digital display	JP	Afficheur numérique
JQ	Quotientenmesser (Kreuzspul-instrument)	JQ	Ratiometer (cross coil)	JQ	Quotientmètre (à cadres croisés)
JS	Spiegelgalvanometer	JS	Reflecting galvanometer	JS	Galvanomètre à miroir
JU	Uhrwerk	JU	Clockwork	JU	Mouvement d'horlogerie
JW	Elektrodyn. Anzeiginstrument	JW	Electrodynamic meter	JW	Instrument électrodynamique
<b>L</b>	<b>Induktivitäten, Magnetik</b>	<b>L</b>	<b>Inductors, magnetic components</b>	<b>L</b>	<b>Composants Inductifs et magnétiques</b>
LC	Keramische Spule	LC	Ceramic coil	LC	Bobine céramique
LD	Netz-, HF-Drossel, Df-Filter	LD	Choke, lead-through filter	LD	Self de choc, filtre de traversée
LE	Einzelkreis, Bandfilter	LE	Single tuned circuit, bandpass filter	LE	Circuit accordé, filtre passe-bande
LP	Permanentmagnet	LP	Permanent magnet	LP	Aimant permanent
LT	Netztransformator	LT	Power transformer	LT	Transformateur secteur
LU	NF-Übertrager	LU	AF transformer	LU	Transformateur BF
LV	Variometer	LV	Variometer	LV	Variomètre
<b>R</b>	<b>Widerstände</b>	<b>R</b>	<b>Resistors</b>	<b>R</b>	<b>Résistances</b>
RD	Drahtwiderstand	RD	Wire-wound resistor	RD	Résistance bobinée
RF	Kohleschicht-Widerstand	RF	Carbon-film resistor	RF	Résistance à couche de carbone
RG	Metallglasur-Widerstand	RG	Metal-coated resistor	RG	Résistance à couche métallique
RJ	Metalloxyd-Widerstand	RJ	Metal-oxide resistor	RJ	Résistance à oxyde métallique
RL	Metallfilm-Widerstand	RL	Metal-film resistor	RL	Résistance à film métallique
RM	Widerstandsdraht	RM	Resistance wire	RM	Fil de résistance
RN	Widerstandsnetzwerk	RN	Resistor network	RN	Réseau de résistance
RR	Draht-Potentiometer	RR	Wire-wound potentiometer	RR	Potentiomètre bobiné
RS	Schicht-Potentiometer	RS	Carbon-film potentiometer	RS	Potentiomètre à couche



Kenn- buchst.	Art des Bauelementes	Identif.- letter	Type of component	Sym- bole	Type d'élément
RT	Dämpfungsglied, Abschluß- widerstand	RT	Attenuator, termination	RT	Atténuateur, charge
RV	Drahtwiderstand mit Abgriff	RV	Wire-wound resistor, tapped	RV	Résistance bobinée à prise
RW	Wendelpotentiometer	RW	Helical potentiometer	RW	Potentiomètre hélicoidal
<b>S</b>	<b>Schalter, Relais, Sicherungen</b>	<b>S</b>	<b>Switches, relays, fuses</b>	<b>S</b>	<b>Commutateurs, relais, fusibles</b>
SB	Drucktastenschalter	SB	Pushbutton switch	SB	Commutateur à touche
SD	Drehschalter	SD	Rotary switch	SD	Commutateur rotatif
SF	Kontaktfedersatz	SF	Spring contact assembly	SF	Jeu de ressorts de contact
SH	HF-Koaxialschalter, -Relais, -Teiler	SH	Coaxial RF switch, RF relay, RF attenuator	SH	Commutateur RF coaxial, relais RF, atténuateur RF
SK	Kipp-, Wipp- und Schiebeschalter	SK	Toggle switch, slide switch	SK	Commutateur à bascule, à glissière
SL	Leistungsschalter Netz/HF	SL	AC supply switch, high-power RF switch	SL	Commutateur secteur, de puissance RF
SM	Mikroschalter	SM	Microswitch	SM	Microrupteur
SN	Elektromagnet, Relais	SN	Electromagnetic relay	SN	Relais électromagnétique
SP	Leistungsrelais, Luftschütz	SP	Power relay, air-type contactor	SP	Relais de puissance, contacteur à air
SR	Reedrelais	SR	Reed relay	SR	Relais reed
SS	Sicherung, Schutzschalter	SS	Fuse, automatic cut-out	SS	Fusible, coupe-circuit automatique
ST	Thermoschalter	ST	Thermal circuit breaker	ST	Disjoncteur thermique
SU	Überspannungs-Ableiter	SU	Arrester	SU	Eclateur
SW	Wechselrichter, Näherungsschalter	SW	Inverter (DC-AC), proximity switch	SW	Inverseur (DC-AC), commutateur de proximité
SZ	Zeitschalter	SZ	Time switch	SZ	Interrupteur horaire
<b>V</b>	<b>Verbindungselemente</b>	<b>V</b>	<b>Connecting elements</b>	<b>V</b>	<b>Eléments de raccordement</b>
VK	Klemme, Klemmleiste	VK	Clamp, terminal strip	VK	Pince, réglette à bornes
VL	Lötöse, Stützpunkt	VL	Soldering lug	VL	Cosse à souder
VS	Schraube, Mutter, Scheibe	VS	Screw, nut, washer	VS	Vis, écrou, disque

#### Farbcode für Widerstände und Kondensatoren / Colour code for resistors and capacitors / Code couleur pour résistances et condensateurs

##### Anmerkung:

Die Wertangabe der weitgehend miniaturisierten Bauelemente erfolgt überwiegend durch Farbkennzeichnungen, deren Bedeutung der nachfolgenden Tabelle entnommen werden kann.

##### Note:

The electrical values of the largely miniaturized components are mainly identified by a colour code, the meaning of which can be taken from the table below.

##### Remarque:

Les valeurs électriques des composants fort miniaturisés sont indiquées dans la plupart des cas par un code couleur dont voici l'explication:

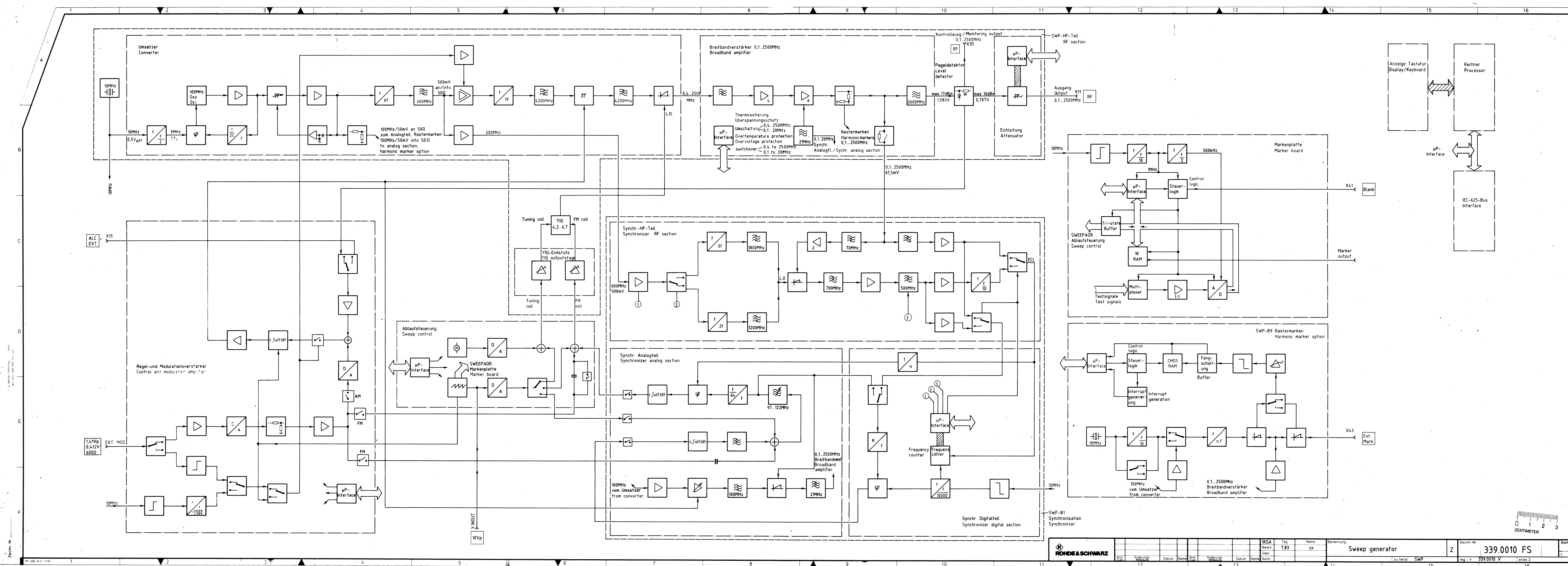
Farbe/Colour/Couleur	A	B	C	D	Anordnungsbeispiele für Examples for Exemple pour	Definition* / Définition*
Schwarz/Black/Noir	-	0			Widerstände (R)	Kennzeichen A (Bauteilfarbe/1. Farbring) = 1. Zahl; Marking A (body colour or first coloured ring) = 1st digit; Repérage A (couleur du corps ou 1er anneau) = 1er chiffre;
Braun/Brown/Marron	1	1	0	± 1%	Resistors (R)	Kennzeichen B (Bauteilende/2. Farbring) = 2. Zahl; Marking B (body end or second coloured ring) = 2nd digit; Repérage B (bout du corps ou 2e anneau) = 2e chiffre;
Rot/Red/Rouge	2	2	00	± 2%	Résistance (R)	Kennzeichen C (Punkt/3. Farbring) = 3. Zahl = Zahl der Nullen; Marking C (dot or third coloured ring) = number of zeroes; Repérage C (point ou 3e anneau) = nombre de zéros;
Orange/Orangé	3	3	000			Kennzeichen D (Punkt/4. Farbring) = Toleranz des Nennwerts in %. Marking D (Fehlendes Kennzeichen für D bedeutet +20%) Repérage D (point ou 4e anneau) = tolérance en % de la valeur nominale. (L'absence du repérage D signifie ± 20%)
Gelb/Yellow/Jaune	4	4	0000			
Grün/Green/Vert	5	5	00000	± 0.5%		
Blau/Blue/Bleu	6	6	000000			
Violett/Violet	7	7	-			
Grau/Gray/Gris	8	8	-			
Weiß/White/Blanc	9	9	-			
Gold/Doré	-	-	-	± 5%		
Silber/Silver/Argenté	-	-	-	± 10%		
Ohne Farbe/No colour/ Pas de couleur	-	-	-	± 20%		



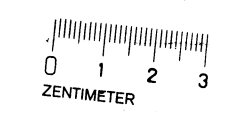
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ROHDE & SCHWARZ				1KGA				Tag				Name				Benennung				Zeichn.-Nr.				Blatt-Nr.			
				7.83				co				Sweep generator				Z				339.0010 FS				v			
												zu Gerät				SWP				reg. v. v.				339.0010 V			
																				erste Z.							



**ROHDE & SCHWARZ**ÄZ Datum  
Date

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Schaltteilliste für  
Parts list for  
SWP SWEEP GENERATORSachnummer  
Stock No.

339.0010.01 SA

Blatt  
Page

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
A	ZUGEHÖRIGER STROMLAUF 339.0010 S		339.1017.01
A1	ED RECHNER I COMPUTER I FUER VAR/FOR MOD.02,04,32	339.1317.02	
A3	ED MARKENPLATTE MARKER BOARD FUER VAR/FOR MOD.02,04,32	339.2613.02	
A9	ED ABLAUF-STEUERUNG SEQUENCE CONTROL FUER VAR/FOR MOD.02,04,32	339.2765.02	
A10	ED REGEL U. MOD. VERST. CONTR. A. MOD. AMPLIFIER FUER VAR/FOR MOD.02,04,32	339.2913.02	
A11	NETZTEIL POWER SUPPLY FUER VAR/FOR MOD.02,04 ***** NETZTEIL/POWER SUPPLY 339.0310.32 FUER VAR/FOR MOD.32	339.0310.02	
A20	FRONTPLATTE FRONT PANEL FUER VAR/FOR MOD.02 ***** FRONTPLATTE 339.0610.04 FUER VAR 04 FRONT PANEL 339.0610.04 FOR MOD.04 ***** FRONTPLATTE/FRONT PANEL 339.0610.32 FUER VAR/FOR MOD.32	339.0610.02	
A30	HF-TEIL RF SECTION FUER VAR/FOR MOD.02,32 ***** HF-TEIL 339.6519.04 FUER VAR 04 RF SECTION 339.6519.04 FOR MOD.04	339.6519.02	
A102	EPROMSATZ SET OF EPROMS FUER VAR/FOR MOD.02,32	339.1617	
A104	EPROMSATZ 04 SET OF EPROMS FUER VAR/FOR MOD.04	339.1746	
E1	EV 119X119X38 34L/S 220V BLOWER PAPST 4580 N	EV 339.4216	
G1	EB 1,5V RUNDZELLE R6 MIGN BATTERY DURACELL MN1500	EB 017.0109	
G2	EB 1,5V RUNDZELLE R6 MIGN	EB 017.0109	



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339.0010.01 SA

2

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
	BATTERY DURACELL MN1500		
R51	RF 0,25W100 OHM +-5% RESISTOR DRALORIC LCA0207/+-5%100	RF 069.1012	339.1017.01
R52	RD 1,2W 100 OHM+-3% WIRE WOUND RESISTOR SAGE 1000S/100OHM/3%	RD 082.6420	339.1017.01
R53	RD 1,2W 47 OHM+-3% WIRE-WOUND RESISTOR SAGE 1000S/470HM/3%	RD 082.0680	339.1017.01
R54	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%1,0K	RF 069.1029	339.1017.01
V52	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	339.1017.01
W2	KABEL CABLE	339.9024	
W6	KABEL CABLE	339.4280	
W11	KABEL CABLE	339.4339	
W30	KABEL CABLE ENTHALTEN IN 339.4297 INCLUDED IN 339.4297	339.4416	339.4297
W31	KABEL CABLE ENTHALTEN IN 339.4297 INCLUDED IN 339.4297	339.4422	339.4297
W32	KABEL CABLE ENTHALTEN IN 339.4297 INCLUDED IN 339.4297	339.4439	339.4297
W100	KABEL CABLE	339.1081	339.1017.01
W101	KABEL CABLE	339.1098	339.1017.01
W102	KABEL CABLE	339.1100	339.1017.01
X1	FP BUCHSENLEISTE 48POL. PANDUIT 100-348-463P	FP 099.0943	339.1017.01
X2	FP BUCHSENLEISTE 48POL. PANDUIT 100-348-463P	FP 099.0943	339.1017.01
X3	FP BUCHSENLEISTE 48POL. PANDUIT 100-348-463P	FP 099.0943	339.1017.01
X4	FP BUCHSENLEISTE 48POL. PANDUIT 100-348-463P	FP 099.0943	339.1017.01
X5	FP BUCHSENLEISTE 32POL. PANDUIT 100-332-403 PFOSTEN	FP 099.0937	339.1017.01
BIS/TO X10			

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SWP SWEEP GENERATORSachnummer  
Stock No.

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3

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X35	FJ EINBAUBUCHSE SYST.N FIXED SOCKET N RADIAL R.161 323-049	FJ 290.8695	339.9024
X36	FJ EINBAUBUCHSE SYST.BNC FIXED BNC SOCKET,50 OHM SPINNER BN292700	FJ 017.6607	
X40	FJ EINBAUBUCHSE SYST.BNC FIXED BNC SOCKET,50 OHM SPINNER BN292700	FJ 017.6607	
X41	FJ EINBAUBUCHSE SYST.BNC FIXED BNC SOCKET,50 OHM SPINNER BN292700	FJ 017.6607	
X42	FJ EINBAUBUCHSE SYST.BNC FIXED BNC SOCKET,50 OHM SPINNER BN292700	FJ 017.6607	
X50	BESTEHT AUS/CONSISTING OF FP 243.3578 + FP 087.9105		339.1017.01
X52	BESTEHT AUS/CONSISTING OF FP 243.3578 + FP 087.9105		339.1017.01
X54	BESTEHT AUS/CONSISTING OF FP 243.3578 + FP 087.9105		339.1017.01
X58	BESTEHT AUS/CONSISTING OF FP 243.3578 + FP 087.9105		339.1017.01
X60	FV FLACHSTECKER 2,8X0,8 FLAT PLUG 2,8X0,8 VOGT 3775A/0,8/MS-S18	FV 279.1998	339.1017.01
BIS/TO X75 X90	FP WINKELSTECKERLEIST.36P CONNECTOR BERG 75168-113-36	FP 243.3578	339.1017.01
X91	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	339.1017.01
X94	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	339.1017.01
X101	FP BUCHSENLEISTE 48POL. PANDUIT 100-348-463P	FP 099.0943	339.1017.01
BIS/TO X110 X150	FJ EINBAUSTECKER SYST.SMB PLUG RADIAL	FJ 063.5168	339.1017.01
BIS/TO X155 X201	BESTEHT AUS/CONSISTING OF 2X FP 242.3600		339.1017.01
X203	BESTEHT AUS/CONSISTING OF FP 243.3578 + FP 087.9105		339.1017.01
X380	BESTEHT AUS/CONSISTING OF FP 243.3578 +		339.1017.01

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Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in

X381

FP 087.9105  
BESTEHT AUS/CONSISTING OF  
FP 243.3578 +  
FP 087.9105

339.1017.01

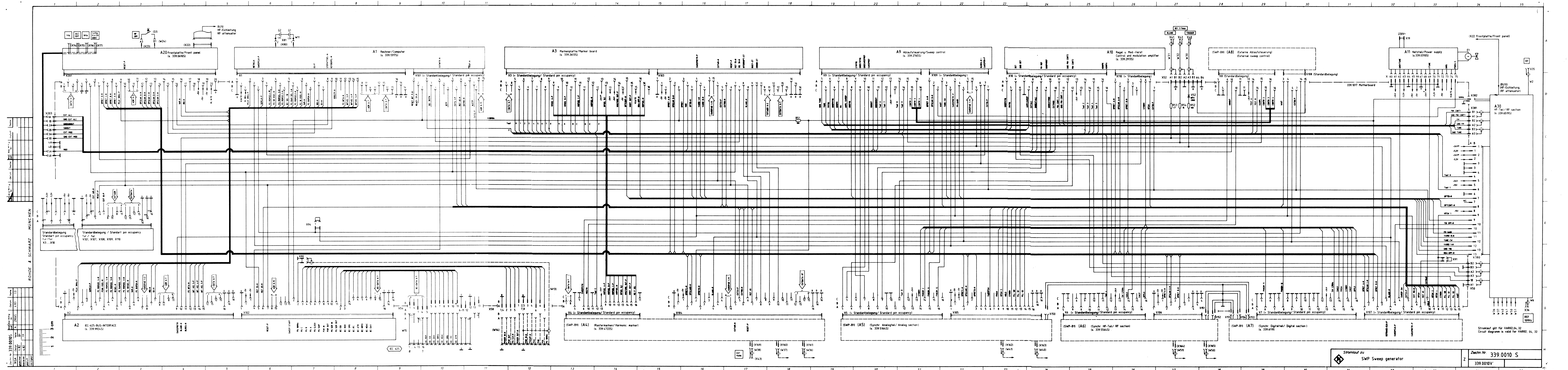
X382

FJ EINLOET-WINKELST.SMC  
MALE SOLDERING CONNECTOR  
ROSENBERG P.112 665

FJ 080.6523

339.1017.01

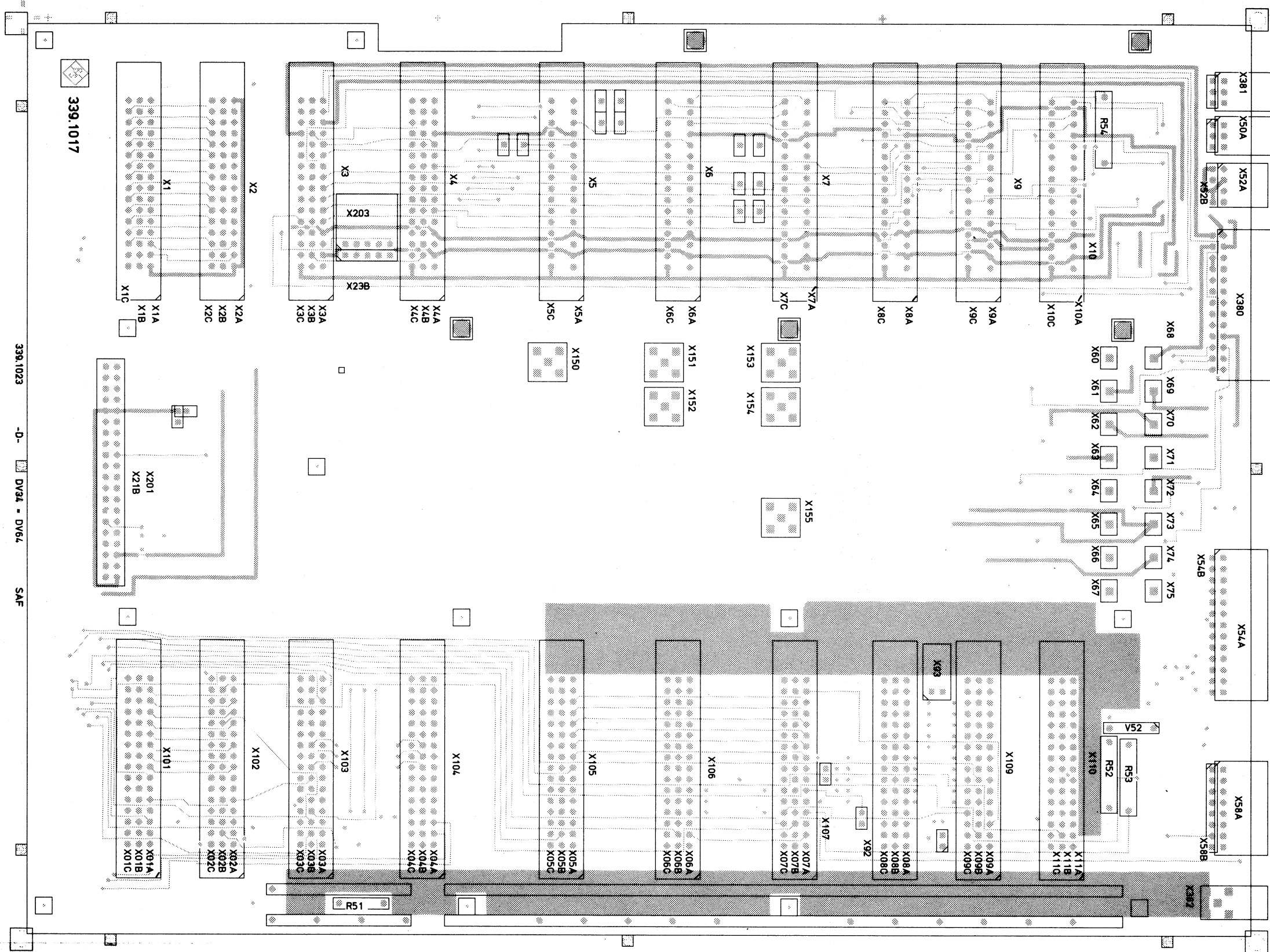
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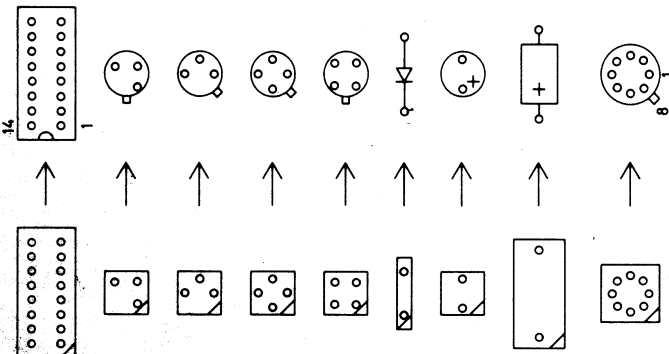


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Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side



Symbol/schlüssel

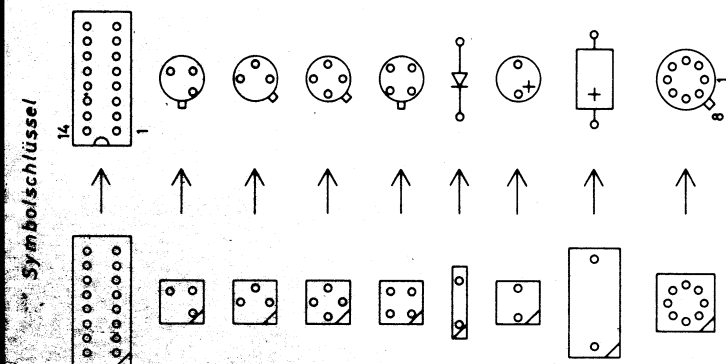



Achtung! MOS - Bauteile  
Caution. MOS components

G	30467	10.83	GN	Maße ohne Toleranzangabe	Maßstab 1 : 1	Benennung <b>MOTHERBOARD</b>	Z
					Halbzeug, Werkstoff		
				1KGE Tag Name	Benennung		Blatt-Nr. 2
				Bearb. 10.83 GN			
				Gepr. Norm			
					Zeichn.-Nr. <b>339.1017</b>		v. Bl.
					reg. i. V. 339.0010 V erste Z. 339.0010		
And. Zust.	Änderungs- Mitteilung	Tag	Name	zu Gerät SWP			

F

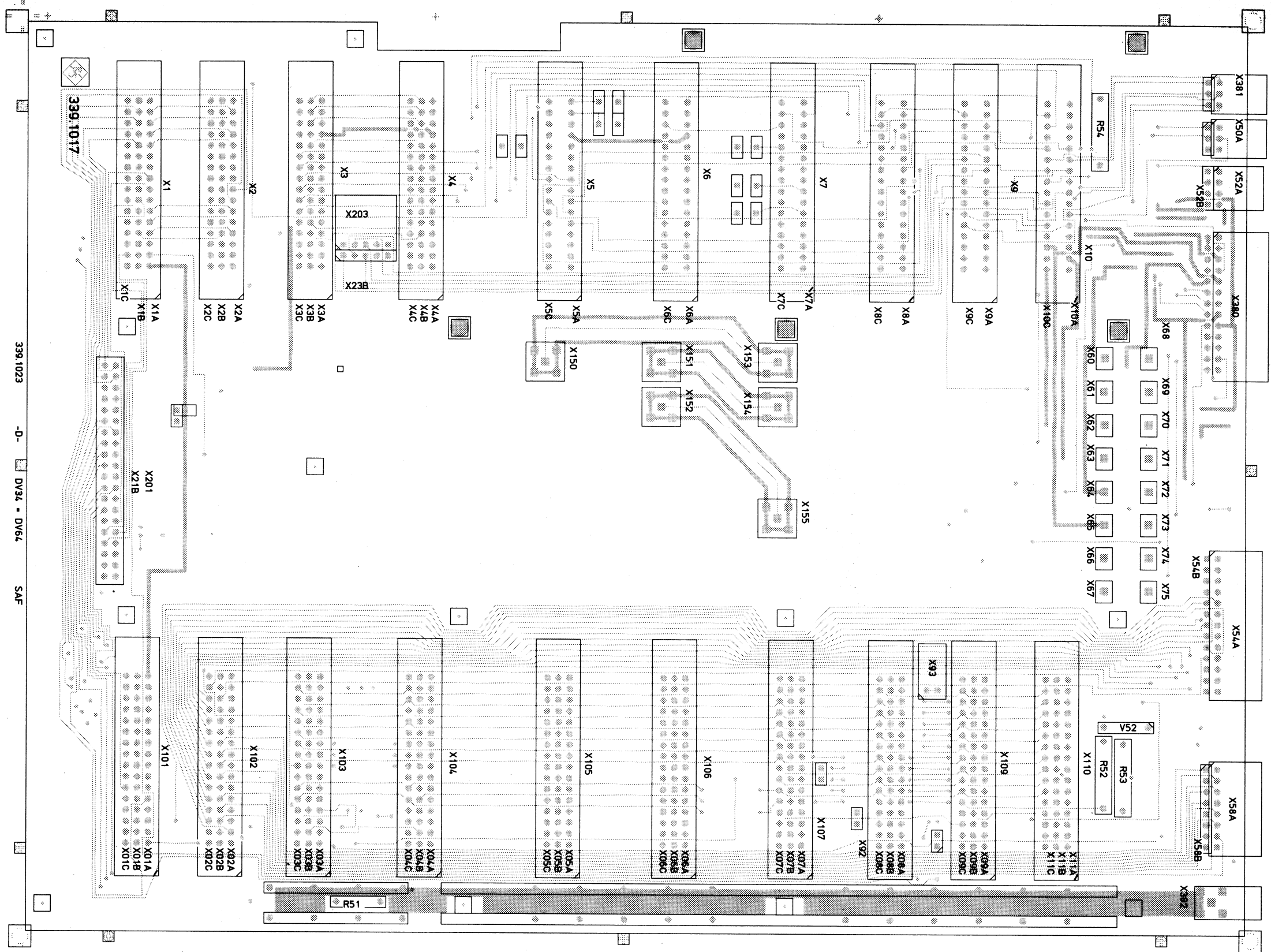
**SAF**



G	30467	10.83	GN	Maße ohne Toleranzangabe		Maßstab 1 : 1				
						Halbzeug, Werkstoff				
				1KGE	Tag	Name	Benennung  <b>MOTHERBOARD</b>			<b>Z</b>
				Bearb.	10.83	GN				
				Gepr.						
				Norm						
						Zeichn.-Nr.		Blatt-Nr.		
				<b>ROHDE &amp; SCHWARZ</b>		339.1017		3		
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät S W P		reg. i. V. 339.0010 V		erste Z. 339.0010		
								v. Bl.		



Ansicht und Leitungsführung Bauteilseite Innenlage  
View of tracks on component side

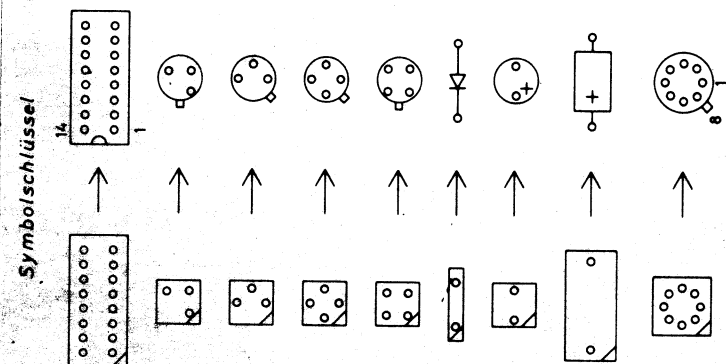


339.1023

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DV34 - DV64

SAF



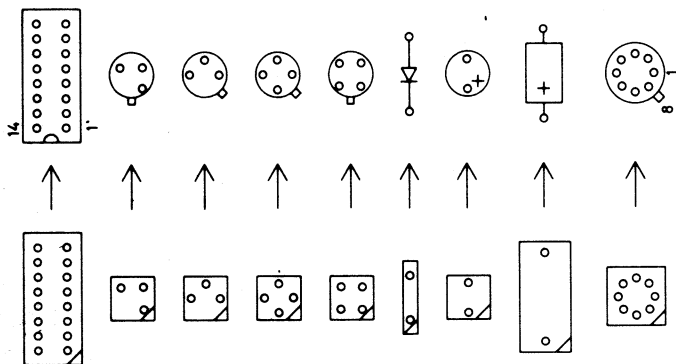
Achtung! MOS - Bauteile  
Caution. MOS components

G	30467	10.83	GN	Maße ohne Toleranzangabe		Maßstab 1 : 1		Benennung	Z
						Halbzeug, Werkstoff			
				1KGE	Tag	Name	Benennung		Blatt-Nr. 4
				Bearb.	10.83	GN	MOTHERBOARD		
				Gepr.					
				Norm					v. Bl.
And. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät SWP		Zeichn.-Nr. 339.1017		reg. i. V. 339.0010 V	erste Z. 339.0010

**ROHDE & SCHWARZ**

rc, .tion  
ode E

### Symbolschlüssel



Achtung! MOS-Bauteile  
Caution. MOS components

[illegible]



ROHDE &amp; SCHWARZ

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Date

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Schaltteilliste für  
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HF-TEIL  
RF SECTIONSachnummer  
Stock No.

339.6519.01 SA

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
A	ZUGEH.STROML./CIRC.DIAGR. 339.6519 S		339.6819.01
A32	ED BREITBANDVERSTAERKER BROADBAND AMPLIFIER FUER VAR/FOR MOD.02	339.8111.02	
A33	ED UMSETZER CONVERTER FUER VAR/FOR MOD.02	339.7315.02	
A34	ED YIG-OSZ.ENDSTUFEN YIG-OSC.OUTPUT STAGES FUER VAR/FOR MOD.02	339.7215.02	
A35	ED REFERENZ REFERENCE FUER VAR/FOR MOD.02	339.7015.02	
A36	BD PEGELDETEKTOR DUENNSCHICHT-SPEZ.TEIL SPEC.THIN-FILM CIRC.	914.4601	
A39	EO 4,15..6,75GHZ-YIG-OSZ. 4,15..6,75GHZ-YIG-OSCILL. SIVERS LAB R&S-ZCHNG.339.8892	339.8892	
C308	CC 10NF-20+50X7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	339.6819.01
R31	RF 0,25W100 OHM +-5% RESISTOR DRALORIC LCA0207/+-5%100	RF 069.1012	339.6819.01
W1	HF-KABEL RF CABLE	339.6654	
W3	KABEL CABLE ENTHALTEN IN 339.9030 INCLUDED IN 339.9030	339.9047	339.9030
W4	KABEL CABLE ENTHALTEN IN 339.9030 INCLUDED IN 339.9030	339.9053	339.9030
W5	KABEL CABLE ENTHALTEN IN 339.9030 INCLUDED IN 339.9030	339.9060	339.9030
W8	KABEL CABLE	339.9082	
W9	KABEL CABLE	339.9099	
W10	KABEL CABLE	339.9101	
W12	KABEL CABLE	339.9118	
W60	KABEL CABLE ENTHALTEN IN 339.6848 INCLUDED IN 339.6848	339.6854	339.6848
W61	KABEL	339.6860	339.6848

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RF SECTION

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
W62	CABLE ENTHALTEN IN 339.6848 INCLUDED IN 339.6848 KABEL	339.6877	339.6848
W63	CABLE ENTHALTEN IN 339.6848 INCLUDED IN 339.6848 KABEL	339.6890	339.6819.01
W65	CABLE KABEL CABLE	339.6883	339.6819.01
X11	FJ EINBAUBUCHSE SYST.N FIXED SOCKET N	FJ 290.8695	339.6654
X31	RADIAL R.161 323-049 FP BUCHSENLEISTE 32POL. PANDUIT 100-332-403 PFOSTEN	FP 099.0937	339.6819.01
BIS/TO X34			
X306	FP WINKELSTECKERLEIST.36P CONNECTOR	FP 243.3578	339.6819.01
X308	BERG 75168-113-36 BESTEHT AUS/CONSISTING OF FP 243.3578 + FP 087.9105		339.6819.01
X380	BUCHSENEINHEIT CONNECTOR UNIT	339.6831	339.6819.01
			- ENDE -

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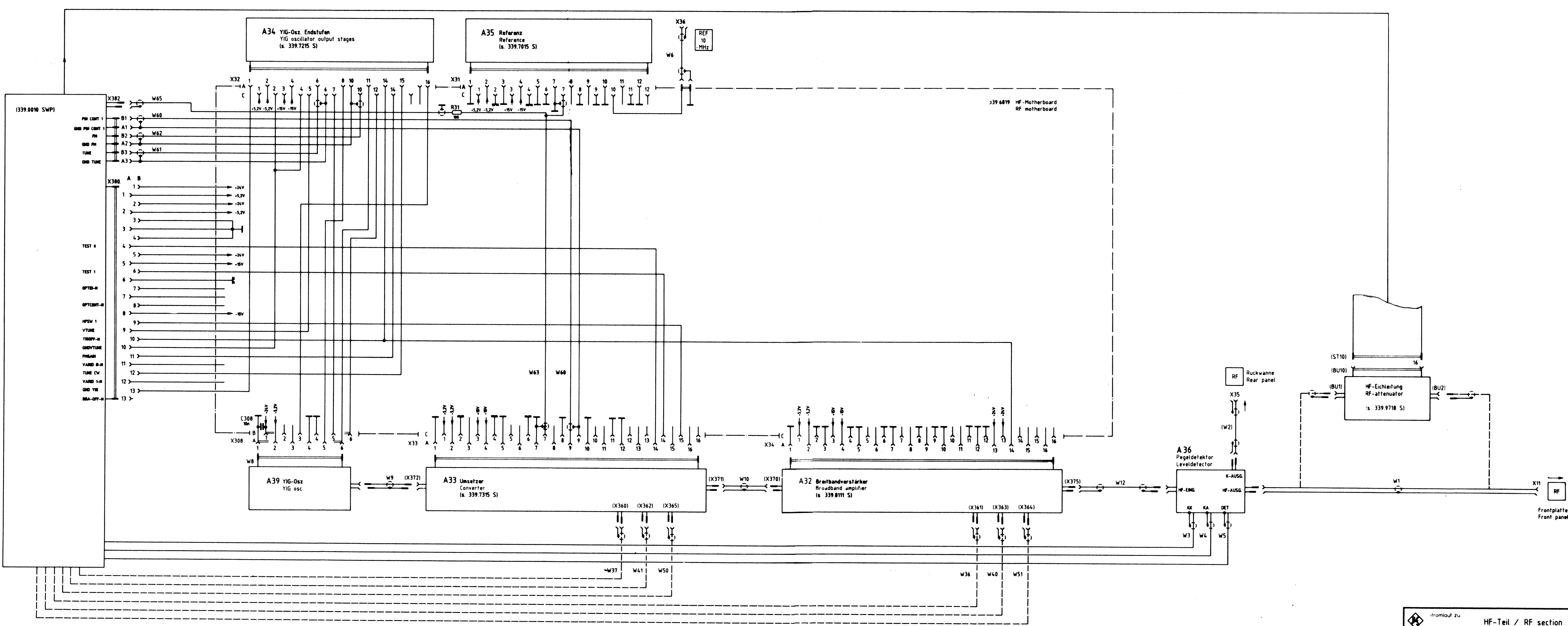
Name	
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And-Zust.	
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And. Mdlg. Nr.	
And-Zust.	

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Name	C0
Datum	4.83
And. Mdlg. Nr.	29065
And-Zust.	A
Name	gu
Datum	8.82
geprüft	co
normgepr.	

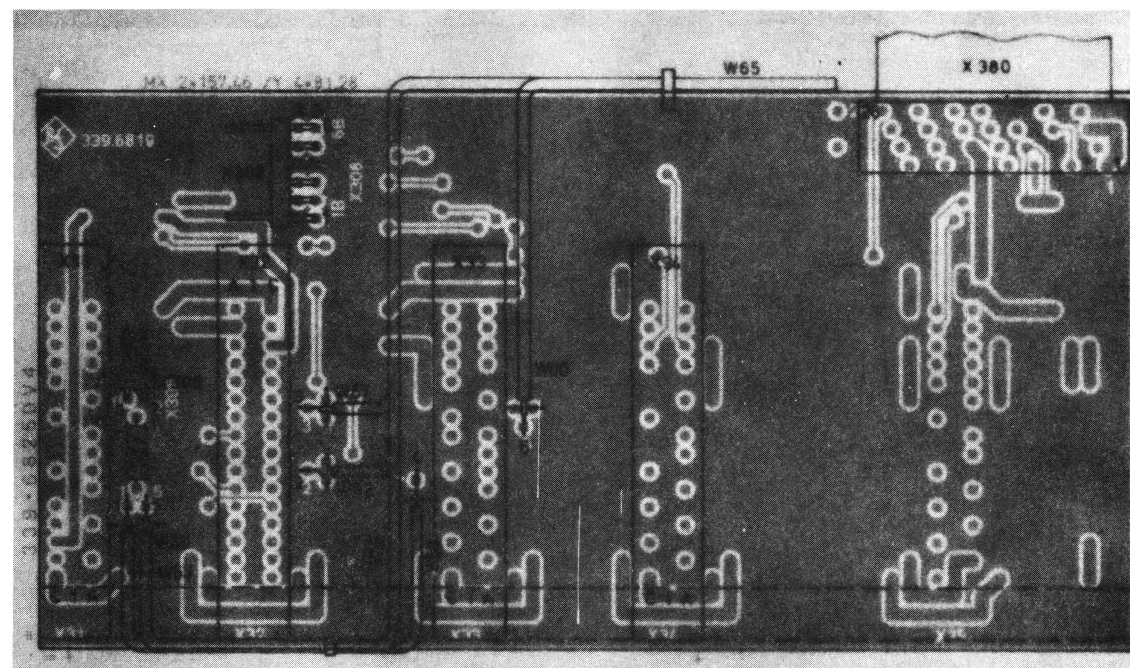
Zeichn.-Nr. 339.6519 S



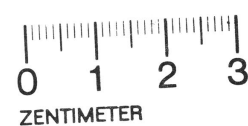
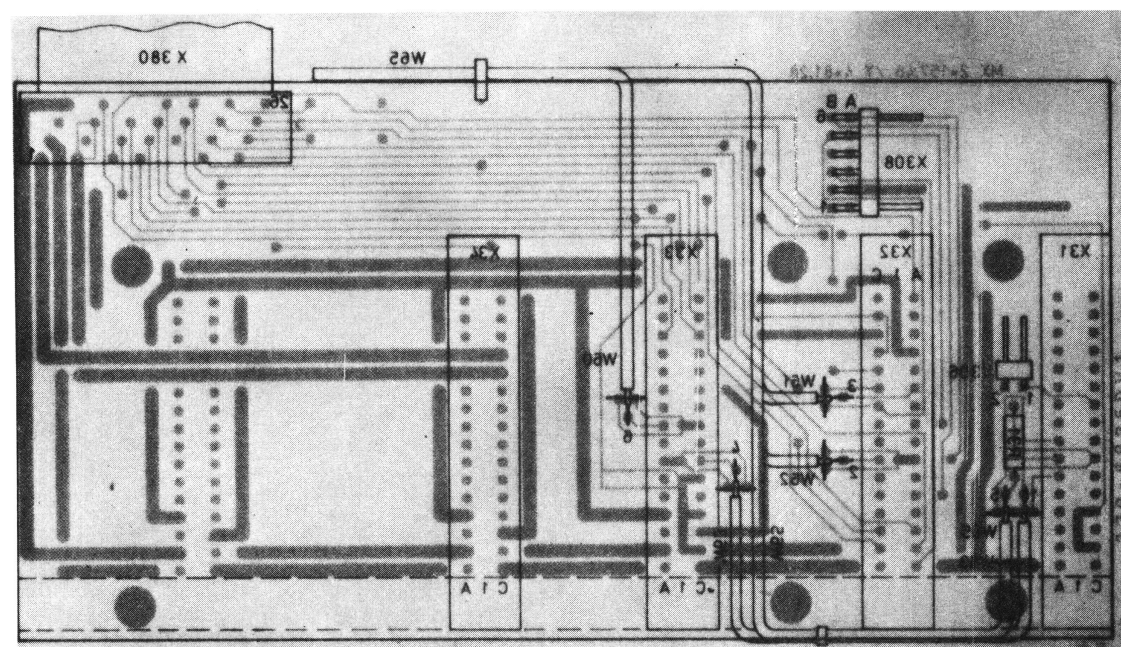
Stromlauf zu	HF-Teil / RF section	Zeichn. Nr.	339.6519 S	Blatt Nr.	
SWP	reg. V 339.6519 V	erste Z			



Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side



Ansicht und Leitungsführung Lotseite  
View of tracks on solder side



Versorg.-Nr.		vG-Sachnr.	
B	26.10.81	IB	Maße ohne Toleranzangabe
		Maßstab 1 : 1	
		Halbzeug, Werkstoff	
		1GMG	Tag Name
		Bearb.	26.10.81 IB
		Gepr.	
		Norm	
		Benennung	
		HF - Motherboard RF motherboard	
		Zeichn.-Nr.	
		339.6819	
		Blatt-Nr. 2	
And. Zust.	Anderungs-Mitteilung	Tag	Name
		zu Gerät SWP	
		reg. v. 339.6519V	
		erste Z. 339.6519	



**ROHDE & SCHWARZ**

SERVICE INSTRUCTIONS

Converter

339.7315.02

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## 5. Service Instructions for Converter 339.7315.02

(See circuit diagram 339.7315 S)

### 5.1 Circuit Description

A crystal-referenced fixed frequency of 4200 MHz is produced on the converter board and after mixing it with the frequency of the YIG oscillator 339.8892 (4200 to 6700 MHz), the IF (400 kHz to 2500 MHz) is obtained.

Before it is applied to the mixer, the amplitude of the 4200-MHz signal is varied by means of a PIN controller (RF level control and amplitude modulation). The signal generator output voltage is blanked (RF OFF key, blanking of return sweep, pulse modulation) via the control line X33.15C (TTL levels).

The fixed frequency is produced from the 10-MHz reference signal in three steps (see block diagram):

- a) a 100-MHz oscillator is synchronized with a 10-MHz reference source via a PLL;
- b) the 100-MHz signal is multiplied to 600 MHz, amplified and
- c) multiplied to 4200 MHz.

re: a) The 100-MHz Colpitts oscillator consists of L2, C5, C6||C7. The drain current of the FET V5 is kept constant by a current source (V17). A varicap (V2) is used for frequency tuning and the tuning characteristic  $f(V)$  is linearized by means of the capacitors C2, C3 and C4. The oscillator signal is coupled out via C11 and subsequently amplified in V20,MP1.

The transistor V45 together with C48 functions as a peak-value rectifier keeping the voltages at the outputs X360 (to the marker board) and X362 (to the synchronizer) constant via the control transistor V47 and the PIN diode V28. The amplitude is adjusted by means of the potentiometer R51.

After amplification in the transistor V203 to ECL level, the 100-MHz signal is divided down to 10 MHz by means of D211. At the output of V215, the TTL signal is available (MP3) which is then applied to D223 where it is divided down to 5 MHz (MP4).

The 10-MHz reference signal is fed into the converter via X33.7C. At the output of the transistor stage V221, the TTL signal is available which is applied to D223 where it is divided down to 5 MHz (MP5).

Both 5-MHz signals are compared in the phase comparator D225. The output signals provide the control voltage for the 100-MHz oscillator via a PI controller (N235) and a low-pass filter.

re: b) The output signal of the transistor stage V42 is applied to the step-recovery diode V62 via a matching network. The step-recovery diode V62 operates in the shunt mode. The 600-MHz signal is filtered out from the frequency spectrum ( $n \times 100$  MHz) using the series-resonant circuit L63, C63 and the following three-section band-pass filter made up of helix resonators (L71 to L75, C70 to C75). The resonators are under-critically coupled and are adjusted by means of C70, C72 and C74.

After amplification in V104, the 600-MHz signal is available at the output X365 with a level of approximately +6 dBm (to synchronizer). The TTL signal for pulse modulation is fed into the converter via X33.15C. It controls the RF amplifier stage V89 via the transistor V249.

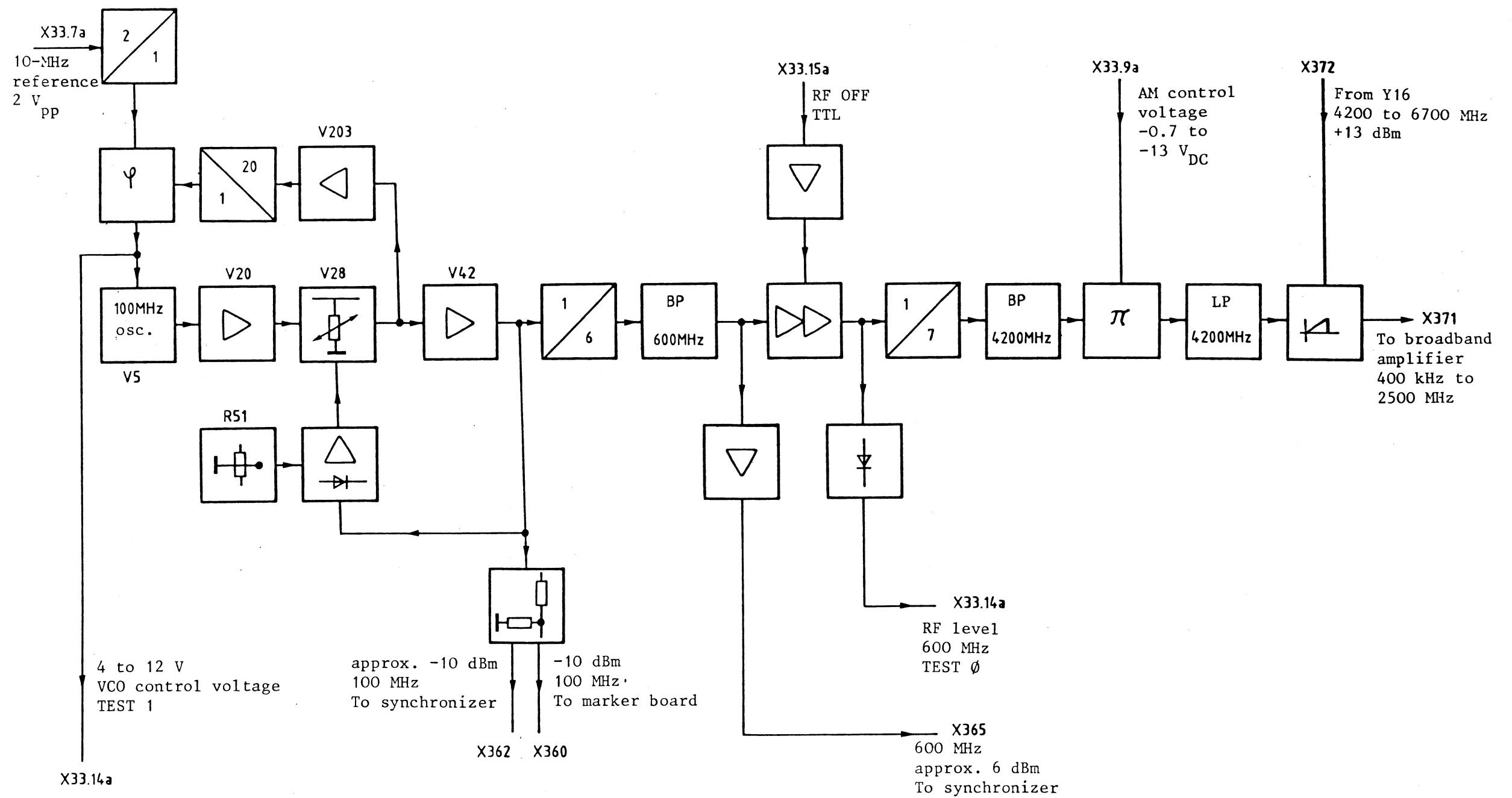
The 600-MHz signal is applied via the transistor stage V89 to the power stage V90 which controls the 600/4200-MHz multiplier (V114). The amplitude of this signal is rectified by means of V96 and output via X33.14A (600 MHz TEST  $\emptyset$ ).

re: c) The 600/4200-MHz multiplier uses a step-recovery diode which operates in the shunt mode (V114). Matching network and output coupling of the RF signal partly use microstrips. The fixed frequency of 4200 MHz is filtered out from the frequency spectrum ( $n \times 600$  MHz) with the aid of the band-pass filter which is of microstrip design and consists of five parallel-coupled  $\lambda/4$  resonators.

Slanted partitions prevent the development of cavity resonances at frequencies below 10 GHz. Ferrites are provided to damp components of higher frequency.

The control voltage for level control and amplitude modulation is fed into the converter via X33.9A.

The RF signal available at the output of the 4200-MHz band-pass filter is attenuated by the PIN controller (V121, V125, V126) and is applied to the RF input of the mixer U1 via a low-pass filter (printed components). The mixer is of microstrip design and uses ceramic as a substrate. The LO voltage from the YIG oscillator (4200 to 6700 MHz) is applied via X372. The IF signal (400 kHz to 2500 MHz) is brought out at X371.



Block diagram of the converter

## 5.2 Checking and Adjustment Procedures

For checking and adjustment, the upper cover must always be closed. Connect 10-MHz reference.

### 5.2.1 100-MHz Oscillator

The tuning voltage is brought out at X33.14C and should be between +4 V and +12 V. If the tuning voltage is greater than 12 V, the control range of the PI controller is exceeded, i.e. the oscillator is no longer synchronized. If the tuning voltage is below 4 V, the noise spectrum of the oscillator signal rises. Adjust for voltage of approximately 9 V by varying the capacitance of C1.

### 5.2.2 100-MHz Outputs X360 and X362

Connect spectrum analyzer with 50- $\Omega$  input.

The level should be > -12 dBm at 100 MHz.

The level can be varied by means of R51:

Turn R51 fully anticlockwise.

Then turn clockwise until the output level is down 0.4 dB (gain reserve).

The harmonics should be down > 20 dB and the non-harmonic spurious responses down > 50 dB.

### 5.2.3 600-MHz Output X365

Connect spectrum analyzer with 50- $\Omega$  input.

The level should be between +6 dBm and +10 dBm at 600 MHz.

The harmonics should be down > 30 dB and the non-harmonic spurious responses down > 70 dB.

Adjust the output level to maximum using C74, C72 and C70 (adjustment of 600-MHz band-pass filter).

### 5.2.4 Residual FM

Connect deviation meter with 50- $\Omega$  input to output X365.

Measure residual FM over frequency range from 30 Hz to 20 kHz and weight according to CCIR (quasi-peak). It should be < 30 Hz.

### 5.2.5 600-MHz Power Amplifier

The DC voltage at X33.14A (TEST  $\emptyset$ ) should be between +0.5 V and +2 V.

#### 5.2.6 Dynamic Range of PIN Controller

Connect spectrum analyzer to X371.

Set the output frequency on the SWP to 100 MHz.

Remove the link at X2 and feed DC voltage  $V_{\text{test}}$  to the left pin.

At  $V_{\text{test}} = 0$  V, the output level should be  $> -12$  dBm at 100 MHz.

At  $V_{\text{test}} = -10$  V, it should be between  $-45$  dBm and  $-55$  dBm.

#### 5.2.7 Mixer Frequency Output

Connect spectrum analyzer to X371.

Remove link at X2.

The level of the output signal should be  $> -20$  dBm over the frequency range from 400 kHz to 2500 MHz.

#### 5.2.8 Harmonics and Non-harmonic Spurious Responses

Connect spectrum analyzer to X371.

Remove link at X2.

Feed in (negative) DC voltage at the left pin so that the level of the output signal is  $-20$  dBm. The harmonics should be down  $> 42$  dB over the frequency range from 400 kHz to 2 GHz and the non-harmonic spurious responses down  $> 50$  dB. Over the frequency range from 2 GHz to 2.5 GHz, the harmonics should be down  $> 42$  dB and the non-harmonic spurious responses down  $> 42$  dB.

#### 5.2.9 Pulse Modulation

Apply 100-kHz squarewave with TTL level and a rise and fall time of  $< 10$  ns to the modulation input of the SWP.

Connect oscilloscope in parallel.

Connect the second channel of the oscilloscope with 50- $\Omega$  insertion unit to X371.

Set the output frequency on the SWP to 100 MHz.

The rise and fall times of the RF signal (10% and 90% points) should be  $< 100$  ns. The delay times should be  $< 200$  ns.

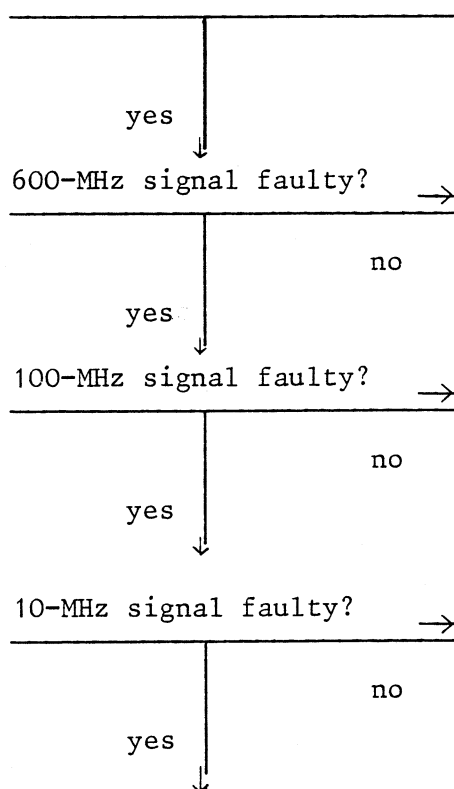
### 5.3 Troubleshooting

The converter must always be operated with the upper cover closed since the 600-MHz and 4200-MHz band-pass filters can only be properly adjusted if the cover is closed. Moreover, the VCO control voltage varies with the spacing between cover and coil L2.

The lower cover can be removed from output X371 during all measurements except for harmonic and non-harmonic spurious response measurements.

Prior to more intensive troubleshooting, check the current drain at the various supply voltages (for nominal values see circuit diagram).

Output signal faulty?

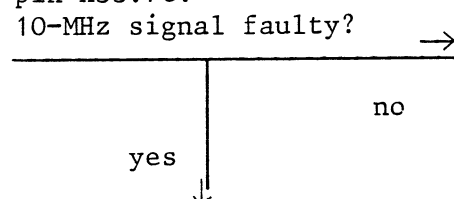


Level ..... a)  
Frequency ..... b)  
Harmonics ..... c)  
Non-harmonic spurious response .... d)

Level ..... e)  
Frequency ..... f)  
Harmonics ..... g)  
Non-harmonic spurious response .... h)  
Residual FM ..... i)

Frequency ..... k)  
Level ..... l)  
Harmonics ..... m)  
Non-harmonic spurious response .... n)  
Residual FM ..... o)

Withdraw converter from chassis  
and measure at motherboard  
pin X33.7C:



Level ..... p)  
Frequency ..... q)  
Residual FM ..... r)

Fault is probably on  
reference board

- a) Check output power of YIG oscillator  
 RF level 600 MHz (TEST Ø)?  
 DC voltage at the test points 13, 11 and 10?  
 Pulse modulation input X33.15C at low TTL level?  
 Check diodes V121, V122, V125 and V126
- b) Check YIG oscillator frequency and level  
 $f_{\text{YIG}} = f_{\text{SWP output}} + 4.2 \text{ GHz}$
- c) Check mixer connections  
 Check mixer diode quad by means of ohmmeter  
 (To do so, unsolder twisted line on PC board and unscrew cable of YIG oscillator)
- d) Same as under c), but  
 check ferrites and sealing of covers  
 (proper rest on HVC walls)
- e) Check 600-MHz filter adjustment  
 Check DC voltage at MP12  
 Check 100/600-MHz multiplier
- f) Same as under e)
- g) Check 600-MHz filter adjustment  
 Check DC voltage at the test points 12, 10 and 11
- h) Check 600-MHz filter adjustment  
 Check proper seating of covers  
 Check supply voltages for RF components
- i) Residual FM < 5 Hz at 100 MHz?  
 Yes: replace diode V62  
 No: continue with o)
- k) VCO control voltage?  
 Turn potentiometer R51 fully counterclockwise  
 Measure RF voltage at MP1  
 Measure DC voltages at the test points 1, 6, 7, 8, 9

5-MHz TTL signals present at MP5 (Ref.) and 4 (Osc.)?

100-MHz ECL level at MP2?

50-MHz TTL level at MP3?

- 1) Turn potentiometer R51 fully counterclockwise, then clockwise:  
the level must decrease by about 15 dB.  
Check performance of peak-value rectifier V45, level control V46,  
control transistor V47 and PIN diode V28.  
(The level control can be disabled (level at maximum) by  
inserting a link at X2.)
- m) Measure oscillator RF voltage at MP1  
Check DC voltages at the test points 1, 6, 7, 8
- n) 5-MHz spectrum: check low-pass filter connected after PI controller  
10-MHz spectrum: check low-pass filter connected after PI controller  
+5-V supply o.k.?  
Other spectra: Check 600-MHz band-pass filter and multiplier
- o) VCO control voltage?  
Oscillator coil (microphony)?  
Replace FET V5  
Check current source V17 (MP7)
- p) Check amplifier stage V221
- q) Same as under p) but in addition check D223
- r) Same as under q) but in addition check pins on motherboard;  
operate SWP without processor and synchronizer and measure  
residual FM



#### Particular faults:

- Considerable increase in noise spectrum  $\pm 50$  to 150 kHz from carrier caused by unduly high PLL gain. Increase VCO control voltage by increasing the capacitance of the trimmer C1.
- Sidebands of varying levels 0.5 to 50 MHz from carrier caused by improperly adjusted multipliers (wrong input or output impedance, wrong operating point).  
Readjust 600-MHz band-pass filter.  
Check current supply to the multiplier diodes.  
Check C113.
- Unduly strong 10-MHz sidebands ( $< 50$  dB from carrier) if modulation input signal (X33.15C) is not within the TTL tolerance limits.
- Dynamic range of PIN controller inadequate at high modulation frequencies: check C121.
- Dynamic range of PIN controller inadequate:  
Limiting of envelope in the modulation mode even though the output level of +10 dBm is reached: check the diodes V125 and V126 and the respective diode switching circuit.
- At an SWP output level of -10 dBm, the control current of the PIN controller should be between 50 and 100 mA (remove link at X3 and connect ammeter). If this is not the case, check diode V121.
- High harmonic content and non-harmonic spurious responses are caused by the mixer. Measure according to 5.2.7 and 5.2.8.  
If the measured values are correct, check the cable connection to the broadband amplifier, the broadband amplifier and the cable to the level detector.



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contained in

C1	TRIMMWERT / SELECTED		
C2	CC 100PF 2% N750/IB 3R0HR CERAMIC CAPACITOR DRALORIC N750/100/2RR3X12LC	CC 006.1596	
C3	CC 33PF 2% NPO/IB 3R0HR CERAMIC CAPACITOR DRALORIC NPO/33/2RR3X12LC	CC 006.1250	
C4	CC 27PF+-2%4X5NPO CAPACITOR VALVO 2222 678 10279	CC 087.6470	
C5	CC 56 PF 1% NPO/IA 3 R0HR CERAMIC CAPACITOR DRALORIC NPO/IA56/1RD3X14LC	CC 022.2393	
C6	CC 8PF NPO/IB 3R0HR CERAMIC CAPACITOR DRALORIC NPO/8/0,25RR3X10LC	CC 006.1180	
C7	CC 56 PF 1% NPO/IA 3 R0HR CERAMIC CAPACITOR DRALORIC NPO/IA56/1RD3X14LC	CC 022.2393	
C8	CC 4,7NF+-20%100V K6000VI CERAMIC CAPACITOR ERIE 8123-100-Z5U-4,7NF	CC 060.1261	
C9	CE 100UF-10+100%25V 13X13 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK100/25	CE 208.4007	
C11	CC 2,2PF+-0,25PF3X4P100 CAPACITOR VALVO 2222 678 03228	CC 087.6212	
C17	CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELKO EK47/16	CE 022.7543	
C26	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C27	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C40	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C42	CC 10PF+-0,25PF3X4N750 CAPACITOR VALVO 2222 678 57109	CC 087.6787	
C43	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C44	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C45	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C48	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C58	CC 47PF+-2%5X6NPO	CC 087.6506	

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C60	CAPACITOR VALVO 2222 678 10479 CC 47PF+-2%5X6NP0	CC 087.6506	
C61	CAPACITOR VALVO 2222 678 10479 CC 47PF+-2%5X6NP0	CC 087.6506	
C62	CAPACITOR VALVO 2222 678 10479 CC 150PF+-2%5X6N750	CC 087.6929	
C63	CAPACITOR VALVO 2222 678 58151 CC 2,2PF+-0,25PF3X4NP0	CC 087.6341	
C64	CAPACITOR VALVO 2222 678 09228 CC 1,8PF+-0,25PF3X4P100	CC 087.6206	
C65	CAPACITOR VALVO 2222 678 03188 CC 1NF+8C-20%R4000 TRAP	CC 086.7515	
C66	CERAMIC CAPACITOR DRALORIC TRE7LCE10C0/2080%R40 CC 1,5NF-20+80%R100C0TRAP	CC 082.1712	
C70	CAPACITOR STETTNER TEFK7,15C0/2080E9000 CT 3,0PF INVAR-ROTOR 6X10	CT 066.7661	
C71	TUBULAR TRIMMER VALVO ROHRT222280220001		
C72	KONDENSATOR 0,6PF 2,5X2,8 CT 3,0PF INVAR-ROTOR 6X10	093.5772 CT 066.7661	
C73	TUBULAR TRIMMER VALVO ROHRT222280220001		
C74	KONDENSATOR 0,8PF 2,5X3,7 CT 3,0PF INVAR-ROTOR 6X10	093.5895 CT 066.7661	
C75	TUBULAR TRIMMER VALVO ROHRT222280220001		
C81	KONDENSATOR 0,6PF 2,5X2,8 CC 2,2PF+-0,25PF3X4NP0	093.5772 CC 087.6341	
C82	CAPACITOR VALVO 2222 678 09228 CC 3,9PF+-0,25PF3X4NP0	CC 087.6370	
C83	CAPACITOR VALVO 2222 678 09398 CC 68PF+-10%50V2NP0 CHIP	CC 082.7362	
C90	CAPACITOR VITRAMON VJ0805A680KFA CC 10PF+-0,25PF3X4N750	CC 087.6787	
C91	CAPACITOR VALVO 2222 678 57109 CC 10PF+-0,25PF3X4N750	CC 087.6787	
C92	CAPACITOR VALVO 2222 678 57109 CC 10PF+-0,25PF3X4N750	CC 087.6787	
C96	CAPACITOR VALVO 2222 678 57109 CC 10PF+-0,25PF3X4N750	CC 087.6787	
C97	CAPACITOR VALVO 2222 678 57109 CC 82PF+-10%100V3NP0 CHIP	CC 082.3096	

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C98	CAPACITOR VITRAMON VJ1005A820KFB CC 1NF+-10%63V K2000	CC 022.0784	
C100	CERAMIC CAPACITOR VALVO 2222 63051 102 CC 2,2PF+-0,25PF3X4NPO	CC 087.6341	
C101	CAPACITOR VALVO 2222 678 09228 CC 3,9PF+-0,25PF3X4NPO	CC 087.6370	
C104	CAPACITOR VALVO 2222 678 09398 CC 12PF+-2%3X4N150	CC 087.6606	
C113	CAPACITOR VALVO 2222 678 34129 CC 3,6PF+-0,25PF50V2NPO	CC 093.5614	
C121	CAPACITOR VITRAMON VJ0805A3R6CFA CC 10NF+-10% 50V WSR CHIP	CC 093.2180	
C122	CAPACITOR VITRAMON VJ0504Y103KFA CC 5,2PF+-0,25PF50V2NPO	CC 093.5650	
C130	CAPACITOR VITRAMON VJ0805A5R2CFA CC 5,2PF+-0,25PF50V2NPO	CC 093.5650	
C152	CAPACITOR VITRAMON VJ0805A5R2CFA CE 100UF-10+100%25V 13X13	CE 208.4007	
C153	ELECTROLYTIC CAPACITOR ROEDERST ELKOEK100/25 CC 1NF+80-20%R4000 TRAP	CC 086.7515	
C154	CERAMIC CAPACITOR DRALORIC TRE7L0E1000/2080%R40 CC 1,5NF-20+80%R10000TRAP	CC 082.1712	
C155	CAPACITOR STETTNER TEFK7,1500/2080E9000 CC 1NF+80-20%R4000 TRAP	CC 086.7515	
C156	CERAMIC CAPACITOR DRALORIC TRE7L0E1000/2080%R40 CC 1,5NF-20+80%R10000TRAP	CC 082.1712	
C157	CAPACITOR STETTNER TEFK7,1500/2080E9000 CC 1NF+80-20%R4000 TRAP	CC 086.7515	
C158	CERAMIC CAPACITOR DRALORIC TRE7L0E1000/2080%R40 CC 1,5NF-20+80%R10000TRAP	CC 082.1712	
C160	CAPACITOR STETTNER TEFK7,1500/2080E9000 CC 1NF+-10%100V2K1200CHIP	CC 082.7385	
C161	CAPACITOR VITRAMON VJ0805Y102KFA CC 1,5NF-20+80%R10000TRAP	CC 082.1712	
C162	CAPACITOR STETTNER TEFK7,1500/2080E9000 CE 100UF-10+100%16V 11X13	CE 022.7550	
C170	ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z CC 1NF+80-20%R4000 TRAP	CC 086.7515	

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C171	CERAMIC CAPACITOR DRALORIC TRE7LOE1C00/2080XR40 CC 1,5NF-20+80XR10000TRAP	CC 082.1712	
C173	CAPACITOR STETTNER TEFK7,1500/2080E9000 CC 1NF+80-20XR4000 TRAP	CC 086.7515	
C174	CERAMIC CAPACITOR DRALORIC TRE7LOE1000/2080XR40 CC 1,5NF-20+80XR10000TRAP	CC 082.1712	
C175	CAPACITOR STETTNER TEFK7,1500/2080E9000 CE 100UF-10+100X25V 13X13	CE 208.4007	
C200	ELECTROLYTIC CAPACITOR ROEDERST ELK0EK100/25 CC 10NF-20+50X7X8R6000	CC 087.7525	
C206	CAPACITOR VALVO 2222 63051 64051103 CE 100UF-10+100X16V 11X13	CE 022.7550	
C207	ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z CC 10NF-20+50X7X8R6000	CC 087.7525	
C211	CAPACITOR VALVO 2222 63051 64051103 CC 100PF+-2X4X5N750	CC 087.6906	
C212	CAPACITOR VALVO 2222 678 58101 CE 100UF-10+100X16V 11X13	CE 022.7550	
C215	ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z CC 10NF-20+50X7X8R6000	CC 087.7525	
C220	CAPACITOR VALVO 2222 63051 64051103 CC 10PF+-0,25PF3X4N750	CC 087.6787	
C225	CAPACITOR VALVO 2222 678 57109 CE 100UF-10+100X16V 11X13	CE 022.7550	
C226	ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z CC 10NF-20+50X7X8R6000	CC 087.7525	
C231	CAPACITOR VALVO 2222 63051 64051103 CC 82PF+-2X4X5N750	CC 087.6893	
C232	CAPACITOR VALVO 2222 678 58829 CK 150NF+-20X100V QUADER	CK 006.5040	
C233	PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-415/0 CK 150NF+-20X100V QUADER	CK 006.5040	
C234	PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-415/0 CC 82PF+-2X4X5N750	CC 087.6893	
C235	CAPACITOR VALVO 2222 678 58829 CC 10NF-20+50X7X8R6000	CC 087.7525	
C236	CAPACITOR VALVO 2222 63051 64051103 CC 4,7PF+-0,25PF3X4NP0	CC 087.6387	


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contained in

C237	CAPACITOR VALVO 2222 678 09478 CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
C238	VALVO 2222 63051 64051103 CE 100UF-10+100%25V 13X13 ELECTROLYTIC CAPACITOR	CE 208.4007	
C240	ROEDERST ELK0EK100/25 CC 1NF+-10%63V K2000 CERAMIC CAPACITOR	CC 022.0784	
C241	VALVO 2222 63051 102 CC 1,2NF+-10%4X5R2000 CAPACITOR	CC 087.7031	
C250	VALVO 2222 63051 122 CC 10NF+-10% 50V3K1200 CH CAPACITOR VITRAMON VJ1005Y103KFB	CC 082.3344	
D211	BL SP8647BDG TEILER:10/11 IC 10:1 DIVIDER SP8647BDG PLESSEY SP8647BDG	BL 300.6747	
D223	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N TEXAS SN74LS74N	BL 266.7934	
D225	BL 11C44DC PHASE/FREQ.DET IC PHASE FREQU.DET.11C44D FAIRCHILD 11C44PC	BL 300.9481	
L1	LD 4,70UH10%1,200HMO,239A CHOKE	LD 067.2940	
L2	DELEVAN DROSSEL1025-36 SPULE	339.7409	
L5	LD 2,70UH10%0,550HMO,355A CHOKE	LD 067.2911	
L7	DELEVAN DROSSEL1025-30 LD 2,70UH10%0,550HMO,355A CHOKE	LD 067.2911	
L28	DELEVAN DROSSEL1025-30 LD 2,70UH10%0,550HMO,355A CHOKE	LD 067.2911	
L42	DELEVAN DROSSEL1025-30 LD 220 UH10%21,00HMO,052A CHOKE	LD 067.3147	
L44	DELEVAN DROSSEL1025-76 LD 0,18UH10%0,120HM1,120A CHOKE	LD 067.2770	
L58	DELEVAN DROSSEL1025-02 LD 0,047 UH 10% CHOKE	249.5995	
L60	INDUSTRIA BAUREIHE1025,0,047 LD 0,047 UH 10% CHOKE	249.5995	
L61	INDUSTRIA BAUREIHE1025,0,047 LD 0,047 UH 10% CHOKE	249.5995	
L65	INDUSTRIA BAUREIHE1025,0,047 SPULE	339.8257	



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L66	COIL LD 1,50UH10%0,220HMO,560A CHOKE DELEVAN DROSSEL 1025-24	LD 067.2886	
L71	SPULE	339.7867	
L73	SPULE	339.7373	
L75	COIL		
L82	SPULE	339.7873	
	LD 0,27UH10%0,160HMO,975A CHOKE DELEVAN DROSSEL1025-06	LD 067.2792	
L83	LD 0,27UH10%0,160HMO,975A CHOKE DELEVAN DROSSEL1025-06	LD 067.2792	
L90	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L91	LD 0,27UH10%0,160HMO,975A CHOKE DELEVAN DROSSEL1025-06	LD 067.2792	
L92	LD 0,27UH10%0,160HMO,975A CHOKE DELEVAN DROSSEL1025-06	LD 067.2792	
L96	LD 0,27UH10%0,160HMO,975A CHOKE DELEVAN DROSSEL1025-06	LD 067.2792	
L104	LD 0,047 UH 10% CHOKE INDUSTRIA BAUREIHE1025,0,047	249.5995	
L105	LD 0,27UH10%0,160HMO,975A CHOKE DELEVAN DROSSEL1025-06	LD 067.2792	
L120	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
L121	LD 10GHZ 50DB100V10A4RDX9 LEAD THROUGH FILTER ERIE R&S-ZCHNG.451.4636	LD 451.4636	
L122	SPULE	339.7415	
L123	COIL		
L123	SPULE	339.7421	
L130	COIL		
L130	SPULE	339.7415	
L150	COIL		
	LD 10GHZ/50DB100V10A 0.FL LOWPASS FILTER ERIE R&S-ZCHNG.099.5445	LD 099.5445	
L151	LD 10GHZ/50DB100V10A 0.FL LOWPASS FILTER ERIE R&S-ZCHNG.099.5445	LD 099.5445	
L154	LD 1,50UH10%0,220HMO,560A CHOKE DELEVAN DROSSEL 1025-24	LD 067.2886	
L156	LD 1,50UH10%0,220HMO,560A CHOKE DELEVAN DROSSEL 1025-24	LD 067.2886	
L158	LD 1,50UH10%0,220HMO,560A	LD 067.2886	



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L160	CHOKE DELEVAN DROSSEL 1025-24 LD 1,50UH10%0,220HMO,560A	LD 067.2886	
L170	CHOKE DELEVAN DROSSEL 1025-24 LD 1,50UH10%0,220HMO,560A	LD 067.2886	
L173	CHOKE DELEVAN DROSSEL 1025-24 LD 1,50UH10%0,220HMO,560A	LD 067.2886	
L220	CHOKE DELEVAN DROSSEL 1025-24 LD 22,0UH10%3,300HMO,114A	LD 067.3024	
L240	CHOKE DELEVAN DROSSEL 1025-52 LD 27,0UH10%3,500HMO,140A	LD 067.3030	
L241	CHOKE DELEVAN DROSSEL 1025-54 LD 22,0UH10%3,300HMO,114A	LD 067.3024	
L255	CHOKE DELEVAN DROSSEL 1025-52 SPULE	339.8257	
L260	COIL LD 10GHZ/50DB100V10A 0.FL LOWPASS FILTER ERIE R&S-ZCHNG.099.5445	LD 099.5445	
N235	BO SE5534AFE OP-AMP. IC OP.AMPLIFIER SA5534AFE SIGNETICS SE5534AFE	BO 301.3335	
R1	RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R5	DALORIC LCA0207/+5%1,0K RF 0,25W330 OHM +-5% RESISTOR	RF 069.3315	
R7	DALORIC LCA0207/+5%330 RL 0,13W 221 OHM+-1%TK50 RESISTOR	RL 092.1367	
R8	RESISTA MK1 2210HM 1% TK50 RF 0,25W680 OHM +-5% RESISTOR	RF 069.6814	
R15	DALORIC LCA0207/+5%680 RL 0,13W 15,0KOHM+-1%TK50 RESISTOR	RL 092.1580	
R16	RESISTA MK1 15K 1% TK50 RL 0,13W 47,5KOHM+-1%TK50 RESISTOR	RL 092.1644	
R18	RESISTA MK1 47K5 1% TK50 RF 0,25W 12KOHM +-5% RESISTOR	RF 069.1235	
R20	DALORIC LCA0207/+5%12K RF 0,25W6,8KOHM +-5% RESISTOR	RF 069.6820	
R22	DALORIC LCA0207/+5%6,8K RF 0,25W820 OHM +-5% RESISTOR DALORIC LCA0207/+5%820	RF 069.8217	

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R26	RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R27	DRALORIC LCA0207/+5%1,0K RL 0,13W 56 OHM2% UNGEW. RESISTOR	RL 092.5927	
R29	RESISTA MK1 560HM 2% UNGEW. RF 0,25W 24 OHM +-5% RESISTOR	RF 069.2402	
R30	DRALORIC LCA0207/+5%24 RF 0,25W 18 OHM +-5% RESISTOR	RF 069.1806	
R41	DRALORIC LCA0207/+5%18 RF 0,25W5,6KOHM +-5% RESISTOR	RF 069.5624	
R42	DRALORIC LCA0207/+5%5,6K RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R43	DRALORIC LCA0207/+5%1,0K RF 0,25W390 OHM +-5% RESISTOR	RF 069.3915	
R44	DRALORIC LCA0207/+5%390 RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R45	DRALORIC LCA0207/+5%100 RF 0,25W 12KOHM +-5% RESISTOR	RF 069.1235	
	DRALORIC LCA0207/+5%12K		
BIS/TO			
R50			
R51	RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386X1-103	RS 247.7526	
R53	RF 0,25W470 OHM +-5% RESISTOR	RF 069.4711	
R54	DRALORIC LCA0207/+5%470 RF 0,25W470 OHM +-5% RESISTOR	RF 069.4711	
R55	DRALORIC LCA0207/+5%470 RF 0,25W 56 OHM +-5% RESISTOR	RF 069.5601	
R56	DRALORIC LCA0207/+5%56 RF 0,25W 56 OHM +-5% RESISTOR	RF 069.5601	
R61	DRALORIC LCA0207/+5%56 RL 0,25W 887 OHM+-1%TK50 RESISTOR	RL 083.0578	
R65	DRALORIC SMA0207/8870HM-F-D RF 0,25W4,7KOHM +-5% RESISTOR	RF 069.4728	
R66	DRALORIC LCA0207/+5%4,7K		
R80	TRIMMWERT / SELECTED RF 0,05W 16,97 OHM+-1% RESISTOR	075.5200	
R81	RESISTA R&S-ZCHNG.WFS 22 RF 0,05W 16,97 OHM+-1% RESISTOR	075.5200	
	RESISTA R&S-ZCHNG.WFS 22		


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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R82	RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R84	DRALORIC LCA0207/+5%1,0K RF 0,25W5,6KOHM +-5% RESISTOR	RF 069.5624	
R89	DRALORIC LCA0207/+5%5,6K RF 0,25W390 OHM +-5% RESISTOR	RF 069.3915	
R90	DRALORIC LCA0207/+5%390 RF 0,25W1,2KOHM +-5% RESISTOR	RF 069.1229	
R91	DRALORIC LCA0207/+5%1,2K RF 0,25W330 OHM +-5% RESISTOR	RF 069.3315	
R95	DRALORIC LCA0207/+5%330 RF 0,25W 12KOHM +-5% RESISTOR	RF 069.1235	
R96	DRALORIC LCA0207/+5%12K RF 0,25W220 OHM +-5% RESISTOR	RF 069.2219	
R97	DRALORIC LCA0207/+5%220 RF 0,25W 15 OHM +-5% RESISTOR	RF 069.1506	
R98	DRALORIC LCA0207/+5%15 RD 1,2W 82 OHM+-3% WIRE-WOUND RESISTOR	RD 451.4994	
R100	SAGE 1000S/820HM/3% RF 0,05W 16,97 OHM+-1% RESISTOR	075.5200	
R105	RESISTA R&S-ZCHNG.WFS 22 RF 0,25W5,6KOHM +-5% RESISTOR	RF 069.5624	
R106	DRALORIC LCA0207/+5%5,6K RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R107	DRALORIC LCA0207/+5%1,0K RF 0,25W390 OHM +-5% RESISTOR	RF 069.3915	
R112	DRALORIC LCA0207/+5%390 RF 0,25W1,8KOHM +-5% RESISTOR	RF 069.1829	
R113	DRALORIC LCA0207/+5%1,8K RL 0,13W 82 OHM2% UNGEW. RESISTOR	RL 092.5940	
R121	RESISTA MK1 820HM 2% UNGEW. RF 0,25W1,8KOHM +-5% RESISTOR	RF 069.1829	
R122	DRALORIC LCA0207/+5%1,8K RF 0,25W560 OHM +-5% RESISTOR	RF 069.5618	
R125	DRALORIC LCA0207/+5%560 RD 1,2W 82 OHM+-3% WIRE-WOUND RESISTOR	RD 451.4994	
R200	SAGE 1000S/820HM/3% RL 0,13W 47 OHM2% UNGEW. RESISTOR	RL 092.5910	339.7438
	RESISTA MK1 470HM 2% UNGEW.		



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R202	RF 0,25W3,9KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,9K	RF 069.3921	
R203	RF 0,25W1,8KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,8K	RF 069.1829	
R205	RF 0,25W 10 OHM +-5% RESISTOR DRALORIC LCA0207/+5%10	RF 069.1006	
R206	RF 0,25W470 OHM +-5% RESISTOR DRALORIC LCA0207/+5%470	RF 069.4711	
R207	RF 0,25W 33 OHM +-5% RESISTOR DRALORIC LCA0207/+5%33	RF 069.3309	
R210	RF 0,25W 56 OHM +-5% RESISTOR DRALORIC LCA0207/+5%56	RF 069.5601	
R211	RF 0,25W470 OHM +-5% RESISTOR DRALORIC LCA0207/+5%470	RF 069.4711	
R217	RF 0,25W910 OHM +-5% RESISTOR DRALORIC LCA0207/+5%910	RF 069.9113	
R218	RF 0,25W240 OHM +-5% DEPOS.-CARBON RESISTOR DRALORIC LCA0207/+5%240	RF 069.2419	
R221	RF 0,25W 39KOHM +-5% RESISTOR DRALORIC LCA0207/+5%39K	RF 069.3938	
R222	RF 0,25W330 OHM +-5% RESISTOR DRALORIC LCA0207/+5%330	RF 069.3315	
R227	RF 0,25W270 OHM +-5% RESISTOR DRALORIC LCA0207/+5%270	RF 069.2719	
R228	RF 0,25W270 OHM +-5% RESISTOR DRALORIC LCA0207/+5%270	RF 069.2719	
R229	RF 0,25W180 OHM +-5% RESISTOR DRALORIC LCA0207/+5%180	RF 069.1812	
R230	RF 0,25W180 OHM +-5% RESISTOR DRALORIC LCA0207/+5%180	RF 069.1812	
R231	RF 0,25W3,9KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,9K	RF 069.3921	
R232	RF 0,25W820 OHM +-5% RESISTOR DRALORIC LCA0207/+5%820	RF 069.8217	
R233	RF 0,25W3,9KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,9K	RF 069.3921	
R250	RF 0,25W 68KOHM +-5% RESISTOR DRALORIC LCA0207/+5%68K	RF 069.6837	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R251	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R252	RF 0,25W8,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%8,2K	RF 069.8223	
R253	RF 0,25W680 OHM +-5% RESISTOR DRALORIC LCA0207/+5%680	RF 069.6814	
R254	RF 0,25W 15KOHM +-5% RESISTOR DRALORIC LCA0207/+5%15K	RF 069.1535	
R255	RF 0,25W680 OHM +-5% RESISTOR DRALORIC LCA0207/+5%680	RF 069.6814	
U1	BD MISCHER MIXER DUENNSCHICHT-SPEZ.TEIL SPEC.THIN FILM CIRUIT	914.4201	
V2	AE BB209 21/ 3PF CDI TUNING DIODE SIEMENS BB209	AE 475.1708	
V5	AM BF247A NKAN 25V FET FET TEXAS BF247A	AM 247.6536	
V17	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
V20	AK BFR15A NPN 12V 30MA TRANSISTOR SIEMENS BFR15A	AK 451.4320	
V28	AE BA182 BER.SCH.DIOD.VHF DIODE VALVO RA182	AE 012.0523	
V42	AK BFR15A NPN 12V 30MA TRANSISTOR SIEMENS BFR15A	AK 451.4320	
V45	AK 2N2369A NPN 40V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
V46	AK 2N2369A NPN 40V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
V47	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX	AK 010.3777	
V62	AE 5082-0180 50V STEPR.DI DIODE HEWLETT-P. 5082-0180	AE 012.9443	
V82	AK BFR35A NPN 15V 35MA TRANSISTOR SIEMENS BFR35A	AK 911.0040	
V83	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448	AD 012.0700	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V84	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	
V90	HEWLETT-P. 5082-2800 AK BFR96 NPN 20V 5GHZ TRANSISTOR	AK 093.2738	
V96	VALVO BFR96 AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	
V104	HEWLETT-P. 5082-2800 AK BFR35A NPN 15V 35MA TRANSISTOR	AK 911.0040	
V114	SIEMENS BFR35A AE 5082-0840 15V STEPR. DI DIODE	AE 300.6830	
V121	HEWLETT-P. 5082-0840 AE 5082-3140 150V PINDI PIN DIODE	264.0490	
V122	HEWLETT-P. 5082-3140 AE BZX55/C3V3 0,5W Z-DI ZENER DIODE	AE 012.2390	
V125	ITT ZPD3,3 AE 5082-3080 100V PINDI PIN DIODE	AE 012.8718	
V126	HEWLETT-P. 5082-3080 AE 5082-3080 100V PINDI PIN DIODE	AE 012.8718	
V203	HEWLETT-P. 5082-3080 AK BFR15A NPN 12V 30MA TRANSISTOR	AK 451.4320	
V210	SIEMENS BFR15A AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
V215	VALVO 1N4448 AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
V216	SIEMENS BCY79IX AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
BIS/TO V218	VALVO 1N4448		
V220	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
V221	VALVO 1N4448 AK BCY59IX NPN 45V 200MA TRANSISTOR	AK 010.5163	
V249	SIEMENS BCY59IX AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
V250	SIEMENS BCY79IX AE BZX55/C7V5 0,5W Z-DI ZENER DIODE	AE 012.2484	
W1	VALVO BZX55/C7V5 HF-KABEL	339.7396	
W2	HF CABLE HF-KABEL	339.7380	

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Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in

	RF-CABLE		
X1	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X2	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X3	FP WINKELSTECKERLEIST.36P CONNECTOR BERG 75168-113-36	FP 243.3578	
X33	FP STECKERLEISTE 32POL. ERNI 9722.303.470.1	FP 565.8100	
X360	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIAL R 112 669	FJ 249.9684	
X362	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIAL R 112 669	FJ 249.9684	
X365	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIAL R 112 669	FJ 249.9684	
X371	FJ KAB.EINBAUST.SMCFUT-85 CONNECTOR SPINNER BN750500	FJ 017.6188	339.7380

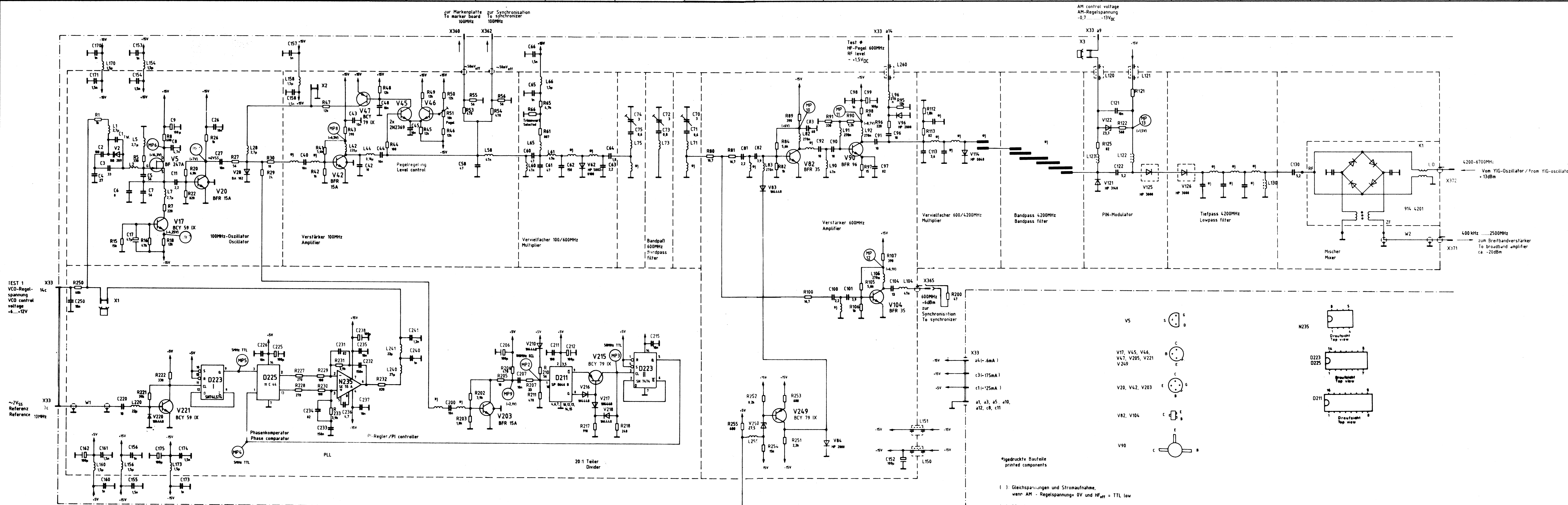
- ENDE -

Name	
Dr.	
And. Mdg. Nr.	
And. Zust.	
Datum	
And. Mdg. Nr.	
And. Zust.	

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wir uns die Rechte vor

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Name	
Dr.	
And. Mdg. Nr.	
And. Zust.	
Datum	
And. Mdg. Nr.	
And. Zust.	
Name	
Dr.	
And. Mdg. Nr.	
And. Zust.	
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And. Mdg. Nr.	
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Dr.	
And. Mdg. Nr.	
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And. Mdg. Nr.	
And. Zust.	



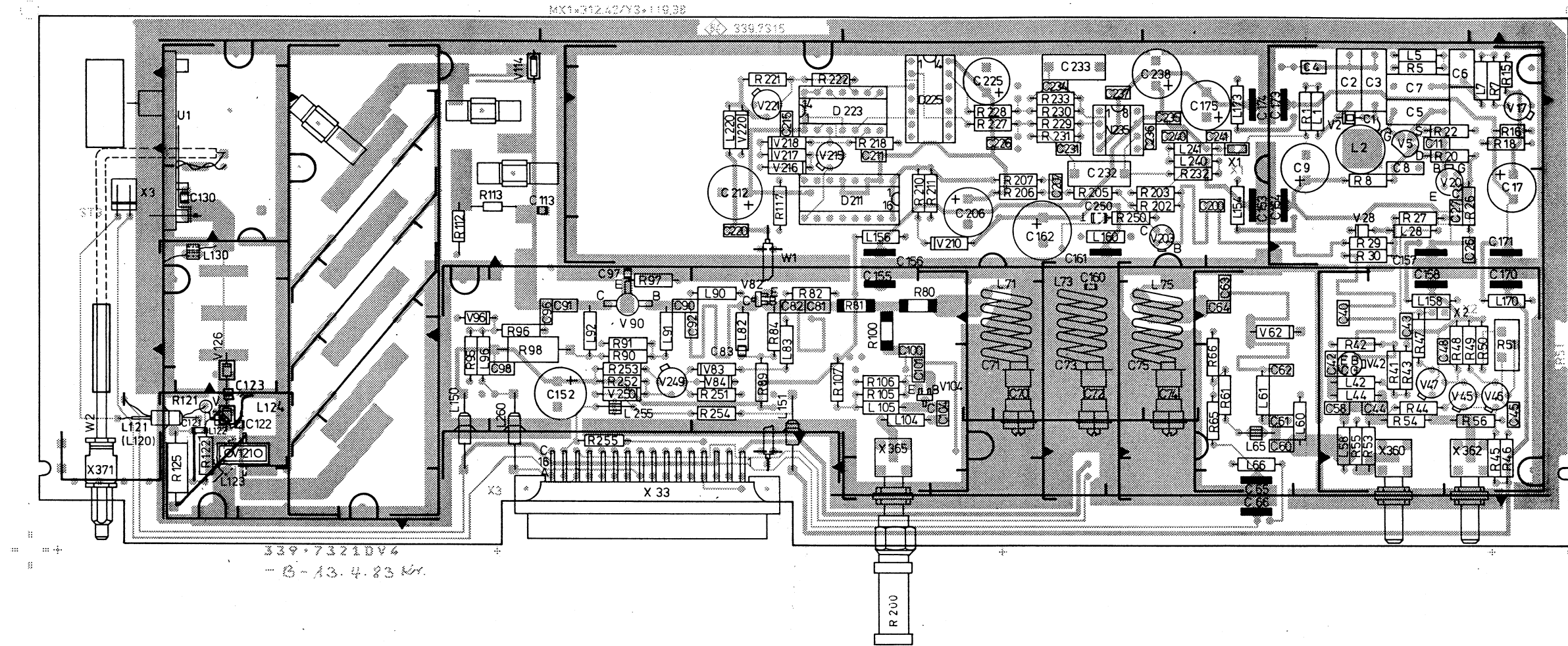
\*gedruckte Bauteile  
printed components


1) Gleichspannungen und Stromaufnahme,  
wenn AM - Regelspannung= 0V und HF<sub>eff</sub> = TTL low

2) DC voltage and current drain  
if AM control voltage= 0V and RF<sub>eff</sub> = TTL low

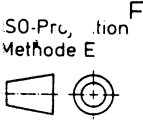
Stromlauf zu	Umsetzer Converter	Zeichn.-Nr.	Blatt-Nr.
reg. V	339. 6519 V	erste Z	339.6519
			339. 7315 S
			v. Bl.

Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side



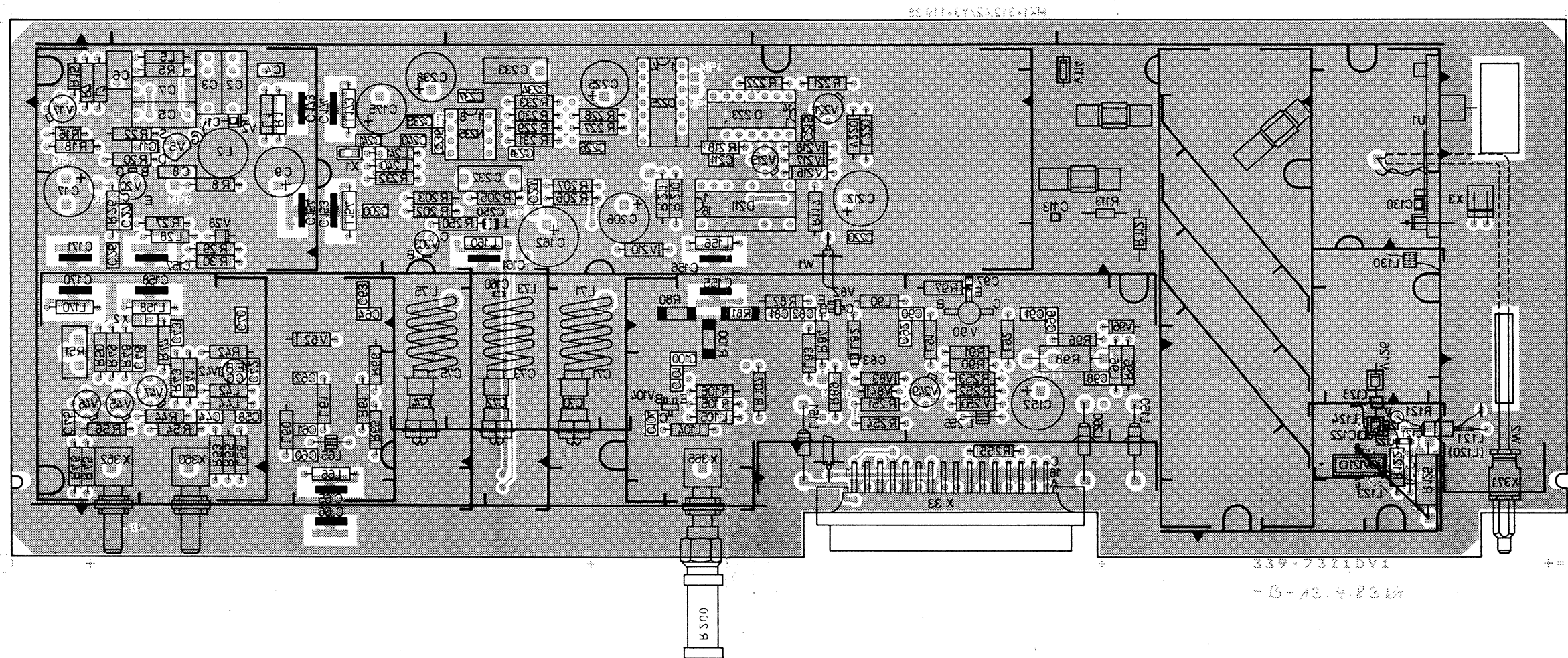
G	29065	4.83	CO	Maße ohne Toleranzangabe	Maßstab 1:1		
H	30 527	08.83	GN		Halbzeug, Werkstoff		
				1 GMG	Tag	Name	Benennung  Umsetzer Converter  Z
				Bearb.	4.83	CO	
				Gepr.			
				Norm			
						Zeichn.-Nr.	Blatt-Nr. 2
				ROHDE & SCHWARZ		339.7315	
Änd. Zust.	Anderungs- Mitteilung	Tag	Name	zu Gerät SWP		reg. i. V. 339.6519 V	erste Z 339.6519
							v Bl.


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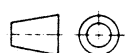
Ansicht und Leitungsführung Lotseite  
View of tracks on solder side



G	29065	4.83	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1		Halbzeug, Werkstoff		
H	30 527	08.83	GN							
						Benennung  Umsetzer Converter		Z		
				1GMG	Tag					Name
				Bearb	4.83					CO
				Gepr						
				Norm						
				 <b>ROHDE &amp; SCHWARZ</b>		Zeichn. Nr.		Blatt-Nr.		
						339.7315		3		
And Zust	Anderungs- Mitteilung	Tag	Name	zu Gerät SWP		reg. V 339.6519 V		erste Z 339.6519		

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**ROHDE & SCHWARZ**

SERVICE INSTRUCTIONS

YIG Oscillator Output Stages

339.7215.02

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## 5. Service Instructions for YIG Oscillator Output Stages 339.7215.02

(See circuit diagram 339.7215 S)

### 5.1 Circuit Description

For a better understanding, the YIG oscillator 339.8892 is also covered by this circuit description.

#### 5.1.1 YIG Oscillator

The YIG oscillator supplies an RF signal of between 4.2 to 6.7 GHz with a level of +13 dBm +3 dBm. Frequency tuning is effected by means of the current through the YIG main coil (TUNE).

In addition, the oscillator frequency can be varied by means of the current through the YIG FM coil (FM). The operating temperature of the oscillator is controlled by an internal PTC resistor (HTR).

#### 5.1.2 YIG Oscillator Output Stages

This PC board carries the control circuits for the main and the FM coil, and the cut-off circuit for the YIG oscillator supply voltage. If a low TTL signal is applied to X32.14A (YIG-OFF-N), the oscillator supply voltage is cut off through V6.

The control amplifier of the FM control circuit supplies a current (X32.11A, X32.12C) that is proportional to the voltage applied to X32.10C. The current is measured with the aid of R36 and adjusted to the nominal value through N20. Modulation deviation is adjusted by means of R26. The steepness of the FM tuning curve can be switched over by a factor of 1:8 using D20 (X32.14C).

The control amplifier of the YIG main coil control circuit supplies a current (X32.8A, X32.7C) that is proportional to the voltage applied to X32.6A. The current is measured with the aid of R15 and adjusted to the nominal value through N1. Minimum coil current ( $f_{YIG} = 4.2 \text{ GHz}$ ) is adjusted by means of R7 and the steepness of the tuning curve can be adjusted by means of R2.

To minimize the residual FM in the SWP modes CW and narrowband FM, C5 is connected in parallel with R8 (narrows down bandwidth) and an RC combination (R14, C8) in parallel with the YIG main coil (high TTL level at X32.15A).

## 5.2 Checking and Adjustment Procedures

When checking and adjusting the YIG oscillator output stages, the oscillator must be in working order.

### 5.2.1 YIG Oscillator (RF Output)

- > Remove PC board "YIG oscillator output stages".
- > Feed +15 V into X32.16A. Check current drain (for nominal values see circuit diagram).
- > Connect DC power supply to X32.8A (+) and X32.7C (-).
- > Connect spectrum analyzer to RF output.
- > Set frequency and measure current:

f	4.2 GHz	6.7 GHz
I <sub>nominal</sub>	210 mA ±10%	335 mA ±10%

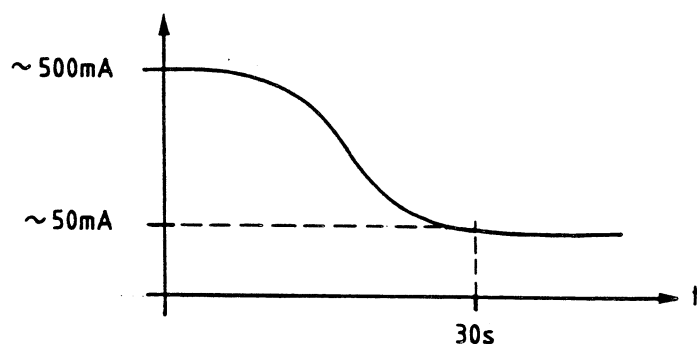
Over the frequency range 4.2 to 6.7 GHz, the output level must be between +13 dBm and +16 dBm, non-harmonic spurious signals must be down > 60 dB and harmonics must be down > 12 dB.

- > Set oscillator frequency to 4.2 GHz.
- > Connect DC power supply (I = 133 mA) to X32.11A (+) and X32.12C (-).  
The oscillator frequency must differ by 10 MHz ±20%.

#### Heating

- > Pull out +24-V plug (X61) from power supply.
- > Establish connection via ammeter.
- > Switch off SWP at least 10 min.
- > Remove reference board.

After switching the SWP back on again, a current as shown below must flow.



### 5.2.2 PC Board "YIG Oscillator Output Stages"

The main and the FM coil are driven with negative voltage.

Unless stated otherwise, X32.14A (YIG-OFF-N) must be at high TTL level and 0 V at X32.6A (TUNE) with reference to ground (X32.6C).

Connect spectrum analyzer to RF output of the YIG oscillator.

#### 5.2.2.1 Main Coil Control

--> Adjust YIG frequency to 4.200 GHz by means of R7.

--> Apply -10.000 V to X32.6A (TUNE) with reference to ground (X32.6C).

--> Adjust YIG frequency to 6.700 GHz by means of R2.

#### 5.2.2.2 FM Coil Control

--> Apply 0 V to X32.10C (FM) with reference to ground (X32.10A).  
X32.14C (FM GAIN) must be at low TTL level.

--> Measure frequency by means of spectrum analyzer.

--> Apply -10.000 V to X32.10C (FM) with reference to ground (X32.10A).  
The oscillator frequency must differ by +25 MHz  $\pm$ 50 kHz (adjust by means of R26).

--> Apply high TTL signal to X32.14C.  
The frequency deviation must be 3.125 MHz when changing from 0 to -10.000 V at X32.10C.

#### 5.2.2.3 Supply Voltage Cut-off

--> Apply low TTL signal to X32.4A (YIG-OFF-N).  
0 V must be present on the +15-V supply line of the YIG oscillator.

#### 5.2.2.4 Residual FM

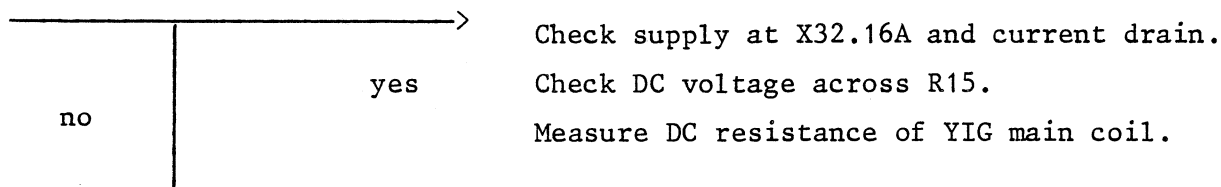
The residual FM of the YIG oscillator and its reduction by applying a high TTL signal to X32.15A (TUNE CW) can be measured at the SWP output. The SYNC button on the SWP front panel must not be pressed during the measurement. The residual FM should be < 3 kHz (X32.15A at high TTL level) over the frequency range from 30 Hz to 20 kHz (off tune from carrier) and with quasi-peak weighting (CCIR).

### 5.3 Troubleshooting

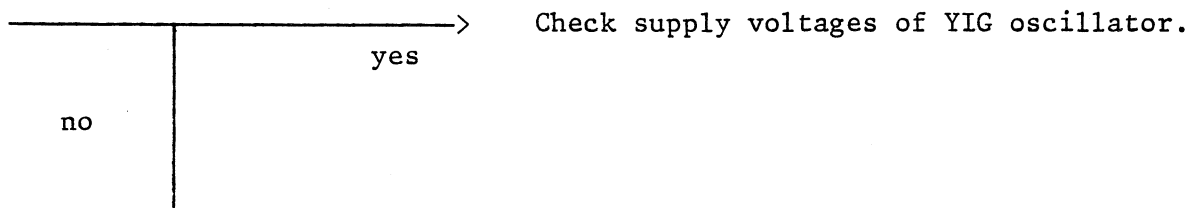
After unscrewing the cable from the YIG oscillator to the converter (339.7315, connector X372), the YIG frequency can no longer be synchronized. The SYNC button on the front panel must not be pressed.

Connect spectrum analyzer to YIG output.

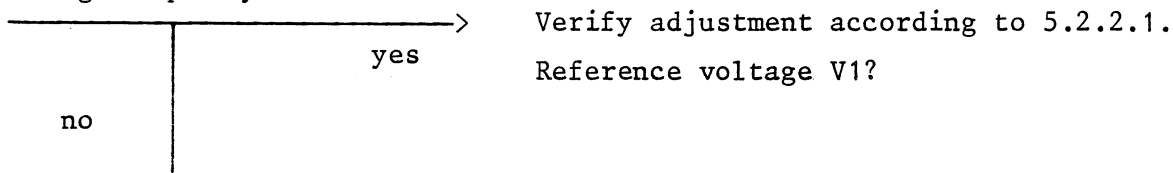
No RF signal present?



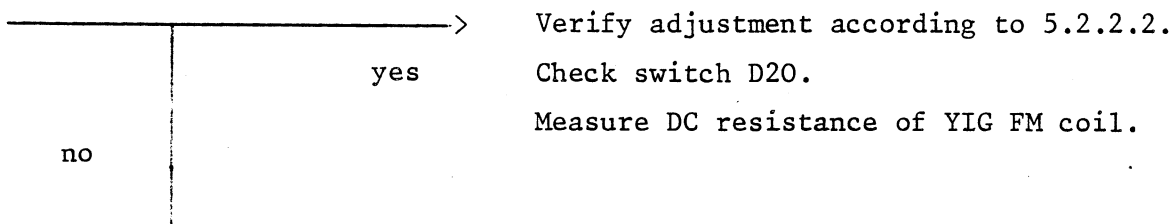
Inadequate RF level?



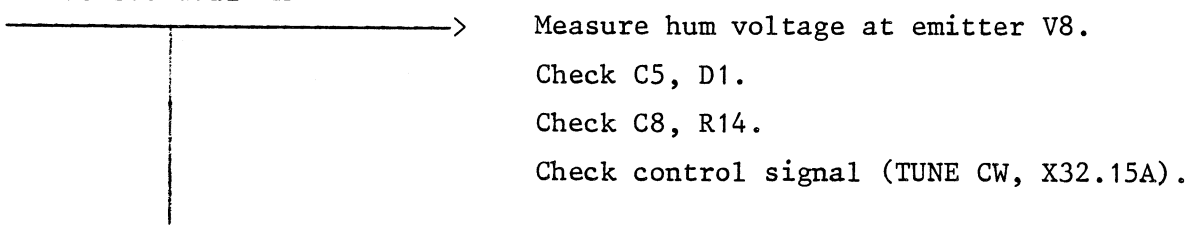
Wrong frequency?



Faulty frequency modulation?



Undue residual FM





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ED YIG-OSZ.-ENDSTUFEN  
YIG-OSC. OUTPUT STAGESSachnummer  
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
C2	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
C3	CC 100PF+-2%6X9NP0 CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C4	CE 100UF+-20% 15V 6X15FL ELECTROLYTIC CAPACITOR	CE 290.1203	
C5	CE 3,3UF+-20%35V 7X 5X11 ELECTROLYTIC CAPACITOR	CE 087.9386	
C6	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C7	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
C8	CE 33 UF+-20%10V 7X 5X11 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR3-33/10	CE 087.0343	
C13	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C20	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
C21	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
C22	CC 4,7PF+-0,25PF3X4NP0 CAPACITOR VALVO 2222 678 09478	CC 087.6387	
C23	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
C24	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
D1	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D20	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
N1	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N20	BO LM218JG OP-AMPL. IC OPERATION AMPLIFIER LM NSC LM218J-8	BO 300.6482	
R1	RL 0,25W 8,87KOHM+-1%TK50	RL 083.1268	

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ED YIG-OSZ.-ENDSTUFEN

YIG-OSC. OUTPUT STAGES

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R2	RESISTOR DRALORIC SMA0207/18,87K-F-D RS 0,75W 5KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-5 KOHM+-10%	RS 037.7380	
R3	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R4	RF 0,25W 100 OHM +-5% RESISTOR DRALORIC LCA0207/+5%100	RF 069.1012	
R5	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R6	RL 0,25W 2,61KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,61K-F-D	RL 083.0903	
R7	RS 0,75W 2KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-2 KOHM+-10%	RS 037.7373	
R8	RL 0,25W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R9	RF 0,25W 10 OHM +-5% RESISTOR DRALORIC LCA0207/+5%10	RF 069.1006	
R10	RF 0,25W 100KOHM +-5% RESISTOR DRALORIC LCA0207/+5%100K	RF 069.1041	
R11	RL 0,25W 562 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/562OHM-F-D	RL 083.0461	
R12	RL 0,25W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
R13	RF 0,25W 10 OHM +-5% RESISTOR DRALORIC LCA0207/+5%10	RF 069.1006	
R14	RF 0,25W 120 OHM +-5% RESISTOR DRALORIC LCA0207/+5%120	RF 069.1212	
R15	RD 3W 6,8 OHM+-3% WIRE WOUND RESISTOR SAGE 1200S6,8OHM+3%	RD 087.5080	
R16	RF 0,25W 3,3KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,3K	RF 069.3321	
R17	RF 0,25W 3,3KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,3K	RF 069.3321	
R18	RF 0,25W 3,3KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,3K	RF 069.3321	
R19	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R20	RF 0,25W 1,8KOHM +-5%	RF 069.1829	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R25	RESISTOR DRALORIC LCA0207/+5%1,8K RL 0,25W 75,0KOHM+-1%TK50	RL 083.1916	
R26	RESISTOR DRALORIC SMA/207/75K-F-C RS 0,75W 100KOHM+-10% CERM	RS 037.7438	
R27	DEPOS.-CARBON POTENTIOMET BOURNS 30G6P-1-100KOHM+-10% RF 0,25W 1KOHM +-5%	RF 069.1029	
R28	RESISTOR DRALORIC LCA0207/+5%1,0K RL 0,25W3,48KOHM+-0,1%T25	RL 084.2180	
R29	RESISTOR RL 0,25W24,9KOHM+-0,1%T25	RL 084.3829	
R30	RESISTOR DRALORIC SMA/207/24,9K-B-E RF 0,25W1,8KOHM +-5%	RF 069.1829	
R31	RESISTOR DRALORIC LCA0207/+5%1,8K RF 0,25W 47 OHM +-5%	RF 069.4705	
R32	RESISTOR DRALORIC LCA0207/+5%47 RF 0,25W1,8KOHM +-5%	RF 069.1829	
R33	RESISTOR DRALORIC LCA0207/+5%1,8K RF 0,25W220 OHM +-5%	RF 069.2219	
R34	RESISTOR DRALORIC LCA0207/+5%220 RF 0,25W 2,2 OHM+-5%	RF 073.8730	
R35	RESISTOR DRALORIC LCA0207/+5%2,2 RF 0,25W 2,2 OHM+-5%	RF 073.8730	
R36	RESISTOR DRALORIC LCA0207/+5%2,2 RD 3W 6,8 OHM+-3%	RD 087.5080	
R40	WIRE WOUND RESISTOR SAGE 1200S6,80HM+3% RF 0,25W 10KOHM +-5%	RF 069.1035	
R41	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5%	RF 069.1035	
R42	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5%	RF 069.1035	
R45	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5%	RF 069.1035	
R46	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5%	RF 069.1035	
R50	RESISTOR DRALORIC LCA0207/+5%10K RL 0,25W 3,01KOHM+-1%TK50	RL 083.0961	
V1	RESISTOR DRALORIC SMA0207/3,01K-F-D BO AD581J 10V-REF.SPG.QU.	BO 300.6347	



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Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in

V2

IC CONSTANT TO STABILIZE  
ANALOG-DEV AD581J  
AL BD679 NPN 80V DARL  
TRANSISTOR

AL 339.4139

V3

SIEMENS BD679  
AD 1N4151 50V 0,2 A UDI  
DIODE

AD 012.0723

V4

AEG-TELEF 1N4151  
AD 1N4151 50V 0,2 A UDI  
DIODE

AD 012.0723

V5

AEG-TELEF 1N4151  
AK BCY59IX NPN 45V 200MA  
TRANSISTOR

AK 010.5163

V6

SIEMENS BCY59IX  
AK BC327-40 PNP 45V 800MA  
TRANSISTOR

AK 303.9518

V7

INTERMETAL BC327-40  
AE BZX55/C10 0,5W Z-DI  
ZENER DIODE

AE 012.2510

V8

VALVO BZX55/C10  
AL BD679 NPN 80V DARL  
TRANSISTOR

AL 339.4139

V20

SIEMENS BD679  
AD 1N4151 50V 0,2 A UDI  
DIODE

AD 012.0723

V21

AEG-TELEF 1N4151  
AD 1N4151 50V 0,2 A UDI  
DIODE

AD 012.0723

V22

AEG-TELEF 1N4151  
AK BSV16-16 PNP 60V1000MA  
TRANSISTOR

AK 083.5905

V23

SIEMENS BSV16-16  
AK BSX46-16 NPN 60V1000MA  
TRANSISTOR

AK 010.6847

V40

VALVO BSX46-16  
AK BCY79IX PNP 45V 200MA  
TRANSISTOR

AK 010.3777

V45

SIEMENS BCY79IX  
AK BCY59IX NPN 45V 200MA  
TRANSISTOR

AK 010.5163

X32

SIEMENS BCY59IX  
FP STECKERLEISTE 32POL.  
ERNI 9722.303.470.1

FP 565.8100

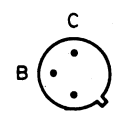
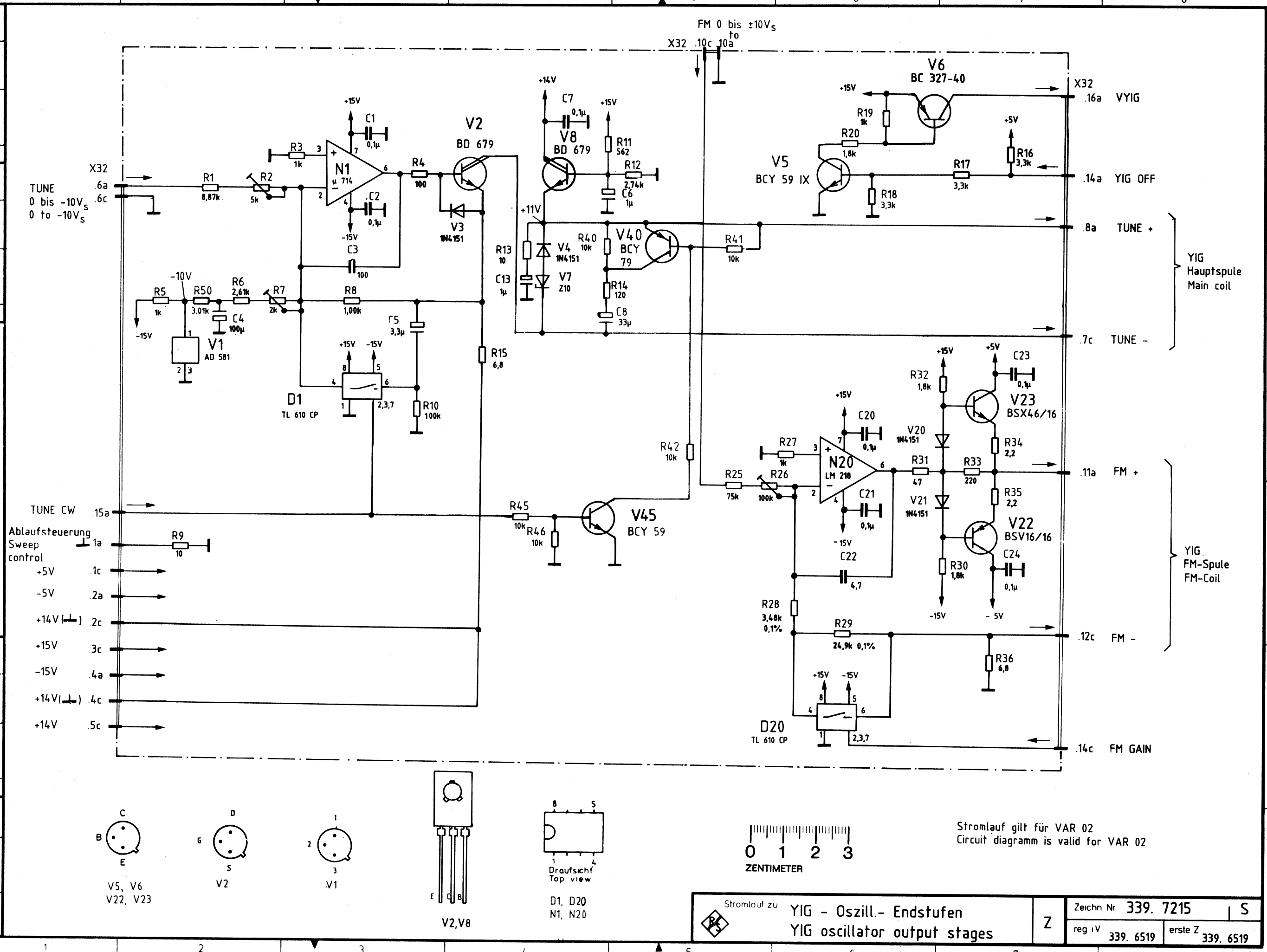
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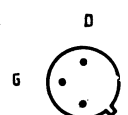
ROHDE & SCHWARZ MÜNCHEN

Name	CO
Datum	4.83
Ans. Nr.	29065
Ans. Zusc.	A
Name	Gr
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Ans. Nr.	09.81
Ans. Zusc.	
gezeichnet	
geprüft	
normgepr.	

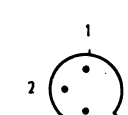
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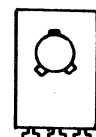
V5, V6  
V22, V23



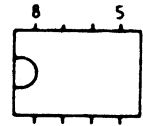
V2



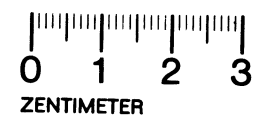
V1



V2, V8



D1, D20  
N1, N20

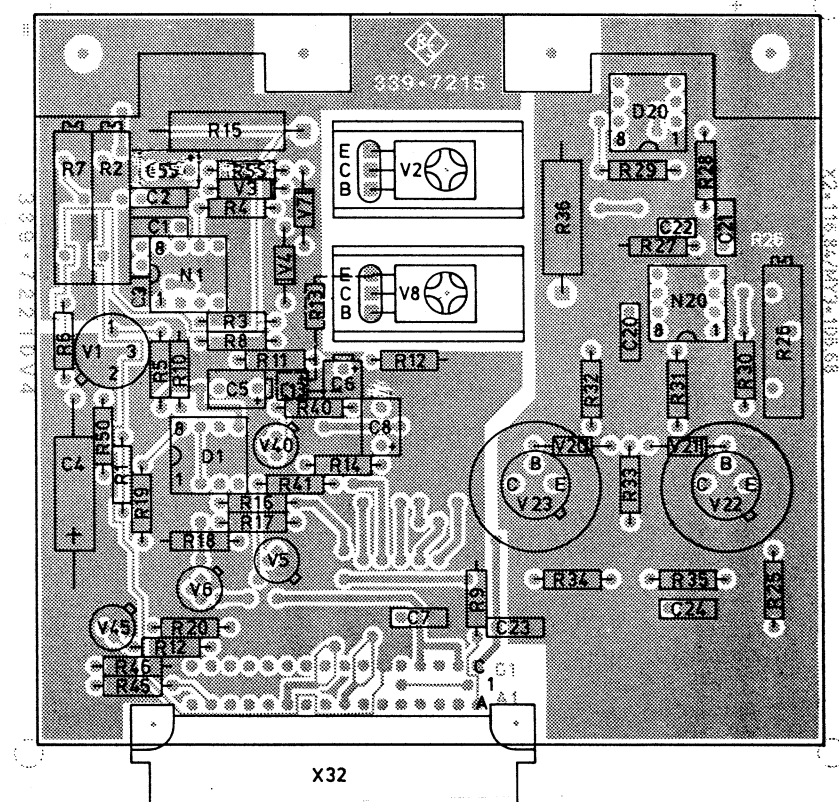


Stromlauf gilt für VAR 02  
Circuit diagramm is valid for VAR 02

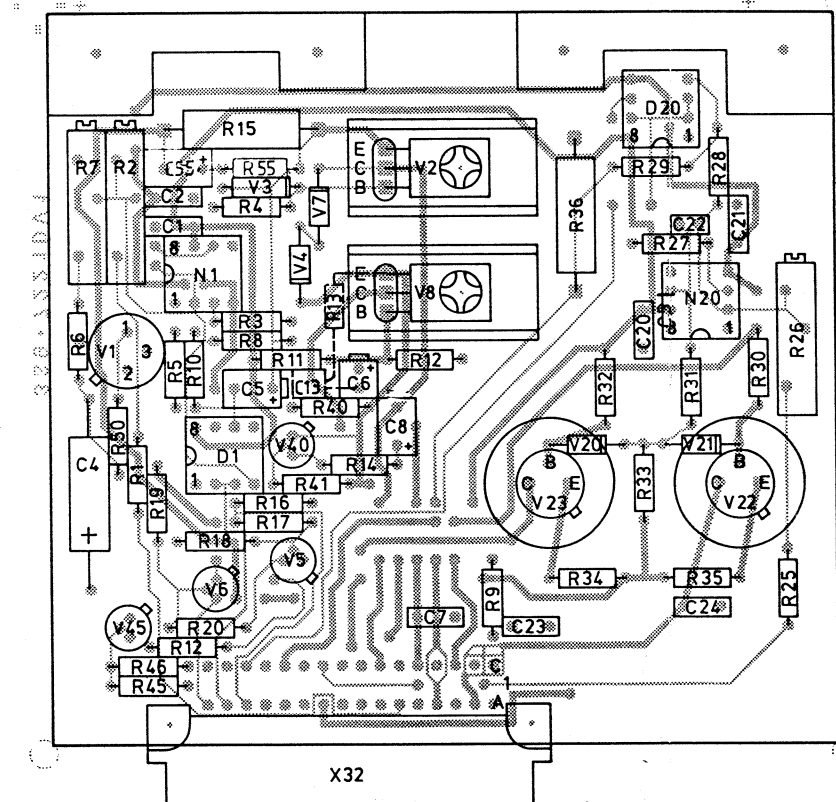
	Stromlauf zu YIG - Oszill.- Endstufen YIG oscillator output stages	Z	Zeichn. Nr 339. 7215		S
			reg. iV 339. 6519	erste Z 339. 6519	


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Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side



Ansicht und Leitungsführung Lötseite  
View of tracks on solder side



Versorg-Nr						VG-Sachnr	
C		18.12.81	GS	Maße ohne Toleranzangabe		Maßstab 1 : 1	
G	29065	4.83	CO			Halbzeug, Werkstoff	
H	30 527	08.83	GN				
				1GMG	Tag	Name	Benennung  YIG -Oszillator -Endstufen YIG oscillator output stages
				Bearb	18.12.81	GS	
				Gepr			
				Norm			
				 ROHDE & SCHWARZ MÜNCHEN			Zeichn-Nr
							339.7215
							Blatt-Nr
							2
And Zust	Anderungs- Mitteilung	Tag	Name	zu Gerät SWP		reg. V 339.6519V	erste Z 339.6519



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SERVICE INSTRUCTIONS  
Reference Oscillator  
339.7015.02

Printed in West Germany

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<u>5.</u>	<u>Service Instructions for Reference Oscillator 339.7015.02</u>	<u>..... 5.1</u>
5.1.	Circuit Description .....	5.1
5.2.	Checking and Adjustment Procedures .....	5.1
5.3.	Troubleshooting .....	5.1

## 5. Service Instructions for Reference Oscillator 339.7015.02

(See circuit diagram 339.7015 S)

### 5.1 Circuit Description

The 10-MHz oscillator contains the transistor V1 and the crystal Q1 which provides selective feedback between collector and emitter.

The oscillator frequency can be varied by a small amount using C4. Output coupling is effected via a capacitive divider (C5, C6).

After removing the links BR1 and BR2, a temperature-controlled crystal oscillator (option) can be inserted. The reference frequency is brought out at X31.7C.

The TTL reference signal is available at X31.10C (if BR4 is inserted) and is applied via the cable W6 to socket REF 10 MHz on the rear panel of the SWP.

If an external reference is to be used with the SWP, remove BR5 and connect the link BR4 between the inner pins (see circuit diagram).

### 5.2 Checking and Adjustment Procedures

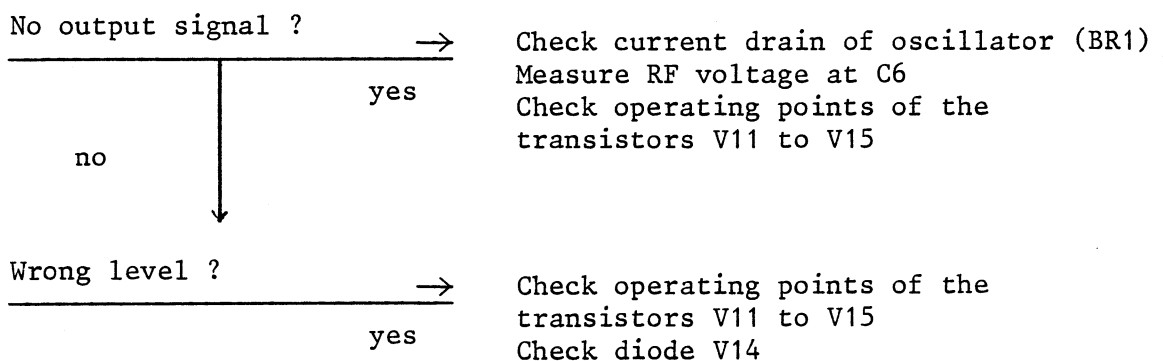
→ Connect frequency counter and oscilloscope to X31.10C and X31.7C.

→ Adjust C4 for frequency of 10 MHz  $\pm 1$  ppm.

With no load connected to the output, the amplitude at X31.7C must be between  $V_{pp} = 1.5$  V and 2.0 V. The DC component must correspond to about the negative peak voltage.

A TTL signal must be available at X31.10C.

### 5.3 Troubleshooting







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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CK 100NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-410/0	CK 006.5033	
C2	CK 220PF+-2,5%63V 4,5RD PLASTIC-FOIL CAPACITOR SIEMENS B 31063-A 5221-H 000	CK 060.4719	
C3	CK 39PF+-5%160V 5,5RDX12 CAPACITOR SIEMENS B31861-J139C-J TRIMMWERT	CK 087.4584	
C4	CT 30 PF N750 STEH.ABGL. DISC TRIMMER STETTNER 10S-TRIK021-10/40N75	CT 025.7050	
C5	CK 68PF+-2%160V5RDX12 KS CAPACITOR SIEMENS B31861-J1680-6000	CK 137.0940	
C6	CK 220PF+-2,5%63V 4,5RD PLASTIC-FOIL CAPACITOR SIEMENS B 31063-A 5221-H 000	CK 060.4719	
C11	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C12	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C13	CC 100PF+-2%4X5N75C CAPACITOR VALVO 2222 678 58101	CC 087.6906	
C14	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C15	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C21	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C22	CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR ROEDERST ELK0 EK47/16	CE 022.7543	
C23	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C25	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C26	CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR SIEMENS B4136-B7226-Z	CE 022.7572	
C27	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
L1	LD 33,0UH10%3,40OHMO,130A CHOKE DELEVAN DFOSSSEL 1025-56	LD 067.3047	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L20	LD 5,60UH10%1,800HMO,195A CHOKE	LD 067.2957	
L21	DELEVAN DROSSEL1025-38 LD 15,0UH10%2,800HMO,157A CHOKE	LD 067.3001	
L22	DELEVAN DROSSEL1025-48 LD 15,0UH10%2,800HMO,157A CHOKE	LD 067.3001	
	DELEVAN DROSSEL1025-48		
Q1	EQ 10,000MHZ CL30 HC-18/U CRYSTAL 10 MHZ QUAKE QUARZGDD61000M10	055.6746	
R1	RF 0,25W100KOHM +-5% RESISTOR	RF 069.1041	
	DRALORIC LCA0207/+5%100K		
R2	RF 0,25W220 OHM +-5% RESISTOR	RF 069.2219	
	DRALORIC LCA0207/+5%220		
R11	RF 0,25W220 OHM +-5% RESISTOR	RF 069.2219	
	DRALORIC LCA0207/+5%220		
R12	RF 0,25W3,9KOHM +-5% RESISTOR	RF 069.3921	
	DRALORIC LCA0207/+5%3,9K		
R13	RF 0,25W6,8KOHM +-5% RESISTOR	RF 069.6820	
	DRALORIC LCA0207/+5%6,8K		
R14	RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R15	RF 0,25W270 OHM +-5% RESISTOR	RF 069.2719	
	DRALORIC LCA0207/+5%270		
R16	RF 0,25W2,7KOHM +-5% RESISTOR	RF 069.2725	
	DRALORIC LCA0207/+5%2,7K		
R17	RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R18	RF 0,25W220 OHM +-5% RESISTOR	RF 069.2219	
	DRALORIC LCA0207/+5%220		
R21	RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R22	RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R23	RF 0,25W 10 OHM +-5% RESISTOR	RF 069.1006	
	DRALORIC LCA0207/+5%10		
R24	RF 0,25W 51 OHM +-5% RESISTOR	RF 069.5101	
	DRALORIC LCA0207/+5%51		
R26	RF 0,25W330 OHM +-5%	RF 069.3315	



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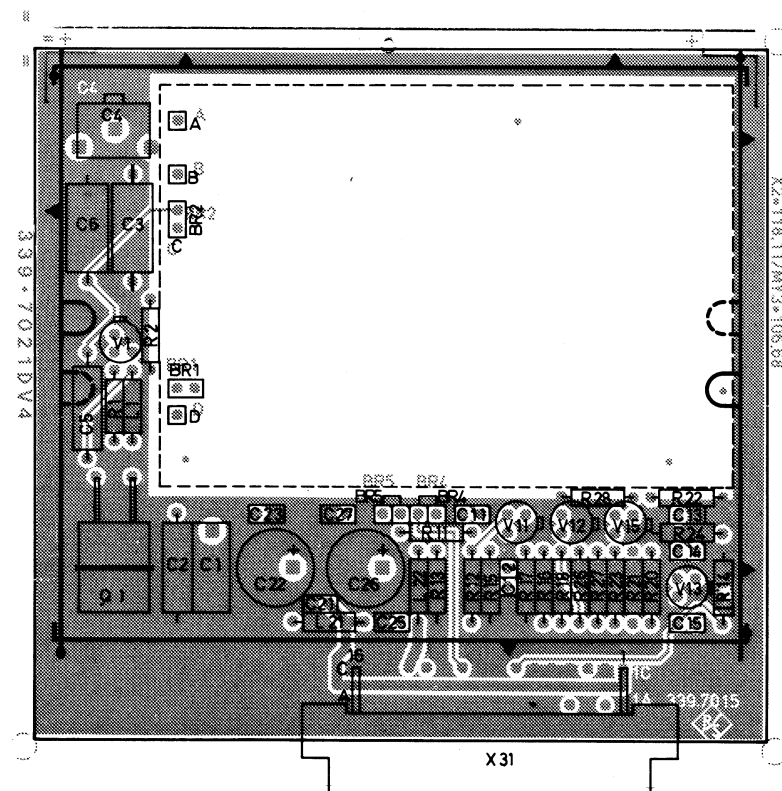
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R27	RESISTOR DRALORIC LCA0207/+5%330 RF 0,25W 22 OHM +-5%	RF 069.2202	
R28	RESISTOR DRALORIC LCA0207/+5%22 RF 0,25W 51 OHM +-5%	RF 069.5101	
V1	RESISTOR DRALORIC LCA0207/+5%51		
V11	AK 2N2369A NPN 40V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
V12	AK 2N2369A NPN 40V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
V13	AK 2N2369A NPN 40V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
V15	AK 2N2369A NPN 40V 200MA TRANSISTOR VALVO 2N2369A	AK 010.4680	
X31	FP STECKERLEISTE 32POL. ERNI 9722.303.470.1	FP 565.8100	

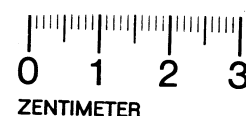
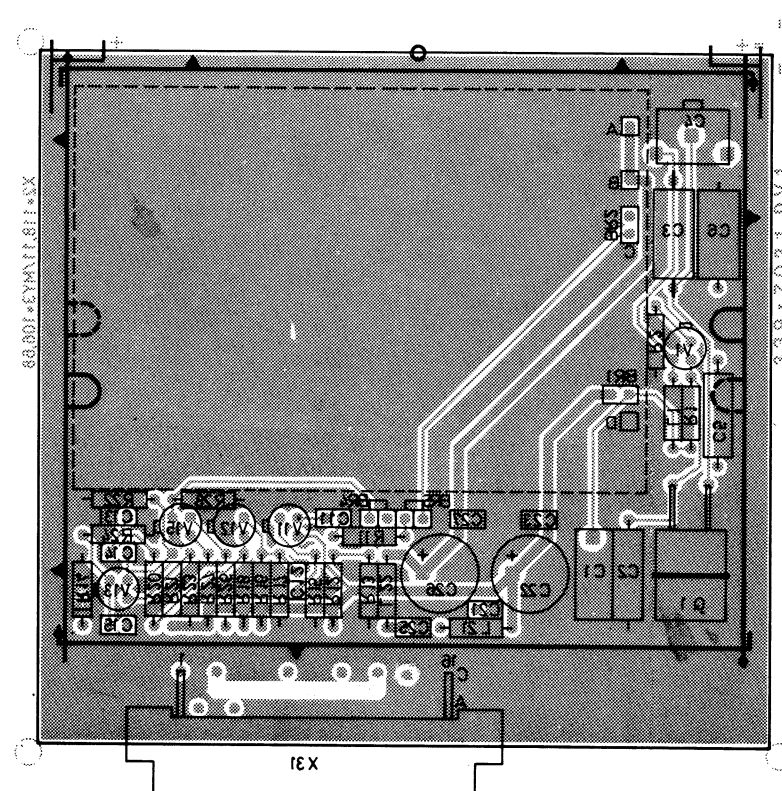
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Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side



Ansicht und Leitungsführung Lötseite  
View of tracks on solder side



Versorg.-Nr.		VG-Sachnr.	
A	29065	4.11.81	IB
C	4.83	CO	
Maße ohne Toleranzangabe		Maßstab 1 : 1	
		Halbzeug, Werkstoff	
1GMG		Tag	Name
Bearb.		4.11.81	IB
Gepr.			
Norm			
		Benennung	
		Referenz	
		Reference	
		Z	
And. Zust.		Blatt-Nr.	
Änderungs-Mitteilung		2	
Tag		v. Bl.	
Name		Zeichn.-Nr.	
		339.7015	
zu Gerät. SWP		reg. i. V. 339.6519V	
		erste Z. 339.6519	



**ROHDE & SCHWARZ**

SERVICE INSTRUCTIONS

Broadband Amplifier

339.8111.02

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## 5. Service Instructions for Broadband Amplifier 339.8111.02

(See circuit diagram 339.8111 S)

### 5.1 Circuit Description

The broadband amplifier 339.8111.02 (Fig. 5-1) operates over the frequency bands 0.4 to 2500 MHz (typical gain  $45 \pm 5$  dB) and 0.1 to 20 MHz (typical gain 30 dB). The maximum output level is 17 dBm.

The last stages of the 5-stage amplifier use two parallel paths for low (0.1 to 900 MHz) and high frequencies (900 to 2500 MHz) making for optimum utilization of the transistors.

The operating points of all RF transistors are kept constant ensuring stable linearity. Switchover from 0.1-to-20-MHz mode to 0.4-to-2500-MHz mode is accomplished with the aid of a TTL signal which activates the transistor switches concerned in the power supply. In addition, protective circuits are provided which monitor the supply line and heat sink (lower cover) switching off the supply line in case of overvoltage or overtemperature.

Functional groups of the broadband amplifier

#### a) Preamplifier

The signal is applied via the input X370 and the 0.4-MHz high-pass filter comprising L1, C1 and the input impedance of the preamplifier to the first stage N1. Both the N1 and the N2 are integrated microwave circuits.

#### b) Driver stages

The two discrete microstrip-driver stages (V20, V40) act as feedback amplifiers at low frequencies. The feedback resistances are disabled at higher frequencies by suitable reactances which at the same time ensure correct matching.

The operating points of the driver transistors V20 and V40 are kept constant by means of transistors V27 and V47.

#### c) Output stages

The output stages operate over the ranges 0.1 to 900 MHz and 900 to 2500 MHz three transistors being used for each range.

The stages in the low-frequency path are feedback amplifiers. Their operating points are kept constant by means of the transistors V115, V135 and V155.



The frequency response in the high-frequency path is minimized by adequate matching which is accomplished with the aid of networks consisting of capacitors and microstrip lines. Frequency combining filters consisting of R60, L60, L61 and C60 and of L160 and C90 are used to interconnect the output amplifiers.

The low-frequency output stage branch has a second input (X363) for feeding in a signal between 0.1 and 20 MHz. The higher frequencies are limited by means of L106.

d) 2500-MHz low-pass filter

A microstrip Chebychev low-pass filter with a cut-off frequency of 2500 MHz is connected to the main output X375. The coupling networks connected to the input of the low-pass filter feed the auxiliary outputs X364 and X361.

e) Coupling network for synchronization

The synchronizer option (SWP-B1) requires different control levels in the different frequency ranges. This is achieved by means of three parallel paths:

- L161 and R160 for the range of 0.1 to approx. 300 MHz.
- R165 for the ranges up to 1.7 GHz and from 1.9 GHz.
- Bandpass filters W3, W4, Z1 with switching diodes V163 and V164 for the range of 1.7 to 1.9 GHz (the switching voltages for the diodes are applied via X364).

f) 0.1-to-20-MHz/0.4-to-2500-MHz switch

When switching over to the 0.1-to-20-MHz range, only the stages V110, V130 and V150 are connected to the supply voltage (+24 V) by the switching transistor V180. For total range coverage, the V254 is connected through in addition so that all amplifier stages are energized. If a protective circuit has responded, both switching transistors are cut off and the amplifier is deenergized (see f)).

The switching signal YIGOFF-N is applied via X34/14A to comparator N210IV. If it is high (TTL level), the 0.4-to-2500-MHz range is activated. The logic circuit D250 interlinks the control signal with the protective circuits.

g) Protective circuits

Overvoltage protection

Comparator N210II monitors the supply voltage (+24 V). If it is exceeded by approximately 10%, the amplifier is disconnected from the supply voltage through the switching transistors V180 and V254.

Overtemperature protection

The PTC resistor R243 is mounted on the lower cover (heat sink). It exhibits a high impedance at about 85°C which causes the comparator N210I to respond switching off the broadband amplifier through V180 and V254.

If one of the two protective circuits has responded, the return signal BBVOFF-N at X34/14C goes low.

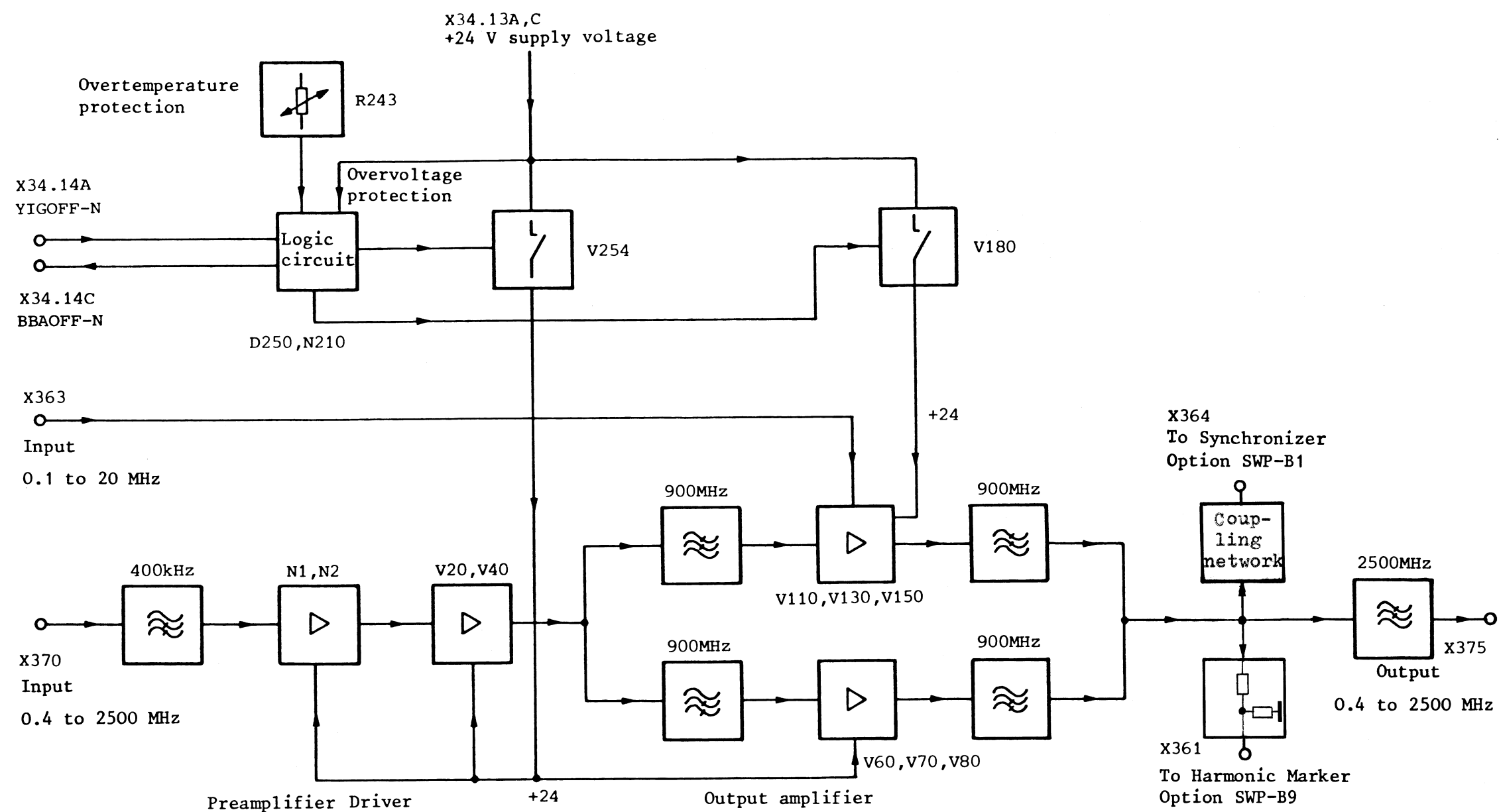


Fig. 5-1 Block diagram of broadband amplifier 339.8111.02

## 5.2 Checking and Adjustment Procedures

No trimming facility is available in the broadband amplifier.

Prior to switching on, check that the heat sink (lower cover) is mounted properly. Operation without the lower cover will give rise to defects after a short time.

The DC values can be measured without the upper cover. It must however be on for exact measurement of the RF performance specifications. For this purpose, make sure that the cover screws are tightened down all the way to prevent parasitic oscillations.

The amplitudes of these oscillations may reach magnitudes that will damage the transistors. For this reason, none of the outputs may be connected to any of the inputs.

### 5.2.1 Checking the DC Values

Feed supply voltage of +24 V  $\pm 0.1$  V to pin X34/13A,C.

#### a) Operating points

--> Apply a high TTL signal to pin X34/14A.

The DC voltages measured must be equal to the listed values  $\pm 10\%$ .

Measure at the listed test points to ground.

All test points are accessible from the components side.

Stage	DC values	
	$U_{11}$	$U_C$
N1	5.4 V	
N2	5.4 V	
V20		18.0 V
V40		18.0 V
V60		18.5 V
V70		18.5 V
V80		18.5 V
V110		14.2 V
V130		14.2 V
V150		13.2 V

b) Function YIGOFF-NX

TTL signal at X34/14A	$V_{MP1}$	$V_{MP1}$
High	approx. 22.9 V	approx. 23 V
Low	approx. 0 V	approx. 23 V

c) Overvoltage protection and overtemperature protection

--> Connect 3.9-k $\Omega$ /0.2-V resistor between pin X34/14C and 5-V power supply.

--> Apply a high TTL signal to X34/14A.  
Level at X34/14C (BBVOFF-N) goes high.

Overvoltage protection

- > Remove link X1.
- > Connect power supply unit ( $V_{out\ max} \geq 28\ V$ ) to X1.1.
- > Observe voltages at MP1, MP2 and BBVOFF-N.
- > Slowly increase voltage at X1.1. At 26.2 V  $\pm 5\%$ , the overvoltage protection must respond, i.e.  $V_{MP1} \approx V_{MP2} \approx 0\ V$ . BBVOFF-N goes low.

Overtemperature protection

- > At heat sink temperature  $< 75^{\circ}C$ : remove link X2.  
Overtemperature protection must respond, i.e.  $V_{MP1} \approx V_{MP2} \approx 0\ V$ . BBVOFF-N goes low.

### 5.2.2 Checking the RF Performance

--> Feed supply voltage of 24 V  $\pm 0.1$  V to pin X34.13A,C.

#### a) Gain

Frequency range 0.1 to 20 MHz

--> Apply a low TTL signal to pin X34/14A.

--> Connect sweep generator ( $Z = 50 \Omega$ ) with -17 dBm level to X363.

--> Connect detector ( $Z = 50 \Omega$ ) of display unit to output X375.

Gain = typ. 30 dB. It must not be less than 27 dB.

--> Connect detector to output X361.

The nominal level is approximately 32 dB below that of X375.

--> Connect detector to output X364; level as in Fig. 5-2.

Frequency range 0.4 to 2500 MHz

--> Apply a high TTL signal to pin X34/14A.

--> Connect sweep generator ( $Z = 50 \Omega$ ) with -37 dBm level to X370.

--> Connect detector ( $Z = 50 \Omega$ ) to output X375.

Gain = typ. 45 dB  $\pm 5$  dB. It must not be less than 37 dB.

--> Connect detector to output X361.

The nominal level is approximately 32 dB below that of X375.

--> Connect DC Feed Unit ZPV-Z6 and detector to X364.

--> Apply +15 V across 1.27 k $\Omega$  (at X364); level as in Fig. 5-2.

--> Apply -15 V across 1.27 k $\Omega$ ; level as in Fig. 5-3.

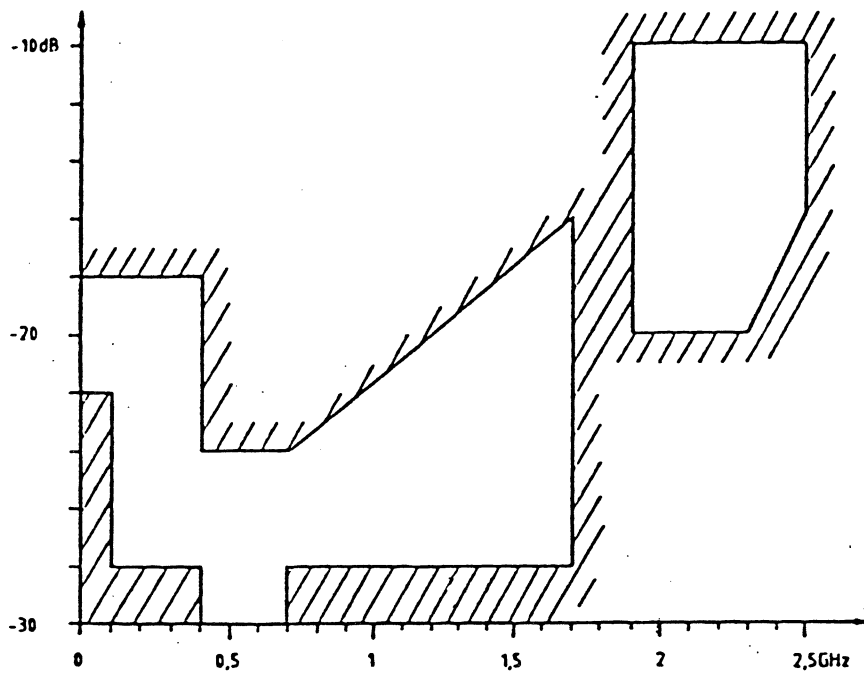


Fig. 5-2 Level tolerance chart: output coupling for synchronization with bandpass filter switched off

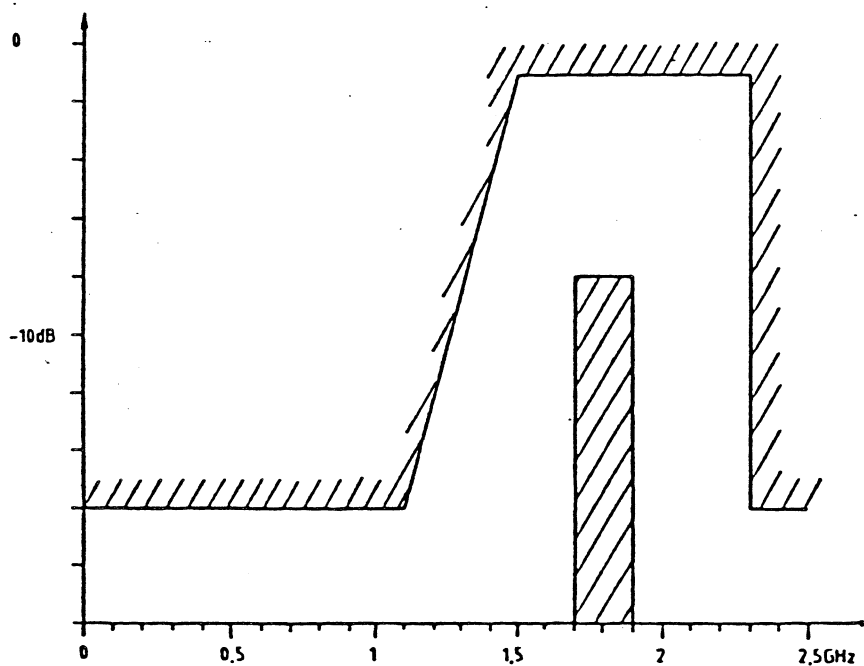


Fig. 5-3 Level tolerance chart: output coupling for synchronization with bandpass filter switched on

## b) Harmonics

For measuring the harmonic content, use of a test setup according to Fig. 5-2 is recommended which, except for the attenuator pad d, is identical for the ranges 0.1 to 20 MHz and 0.4 to 2500 MHz.

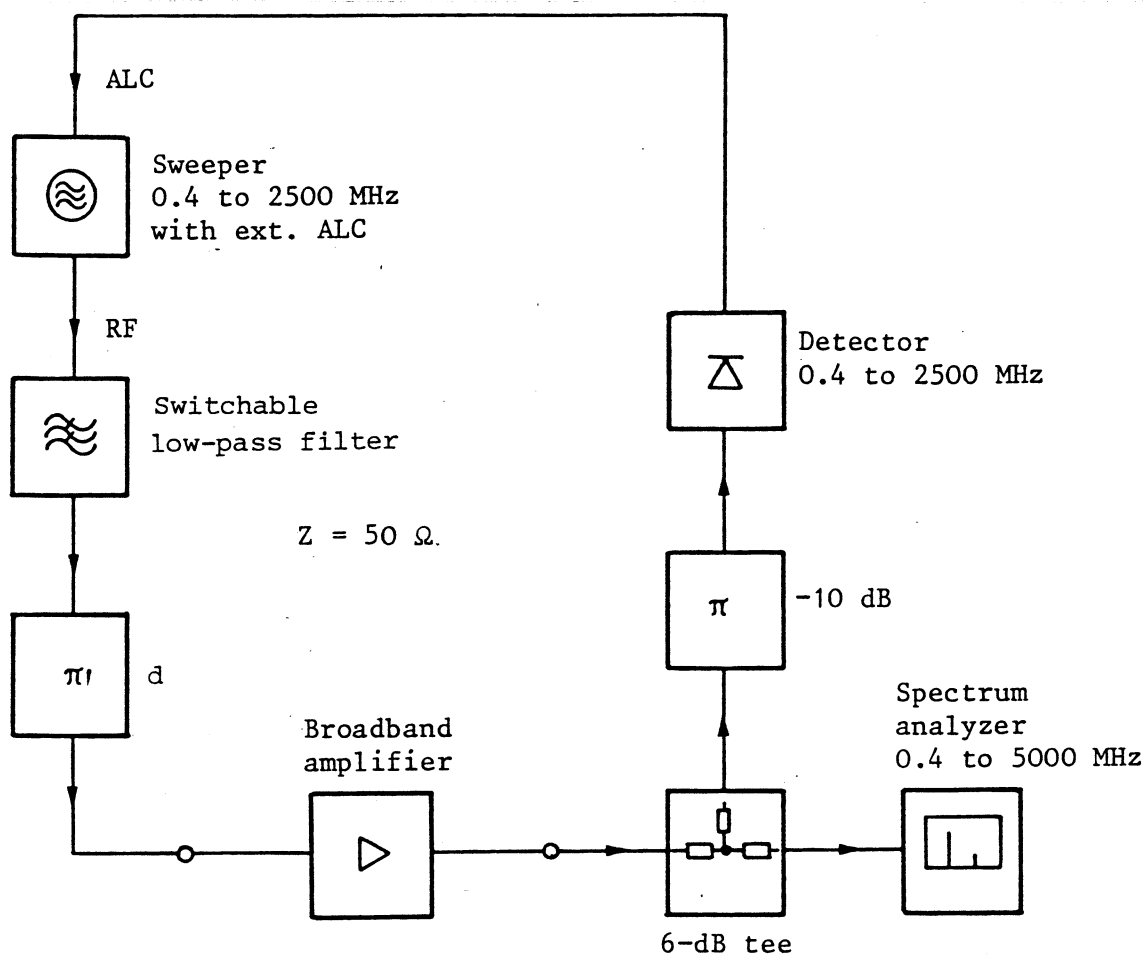


Fig. 5-4 Measuring the harmonic content



0.1 to 20 MHz

- > Apply a low TTL signal to pin X34/14A.
- > Attenuator pad d = 0 dB (omit).
- > Connect sweeper directly to X363.
- > Upper cut-off frequency of switchable low-pass filter according to frequency range.

0.4 to 2500 MHz

- > Apply high TTL signal to X34/14A.
- > Connect attenuator pad d = -10 dB to X370.
- > Upper cut-off frequency of switchable low-pass filter according to frequency range.

Adjust ALC of the sweeper so that a level of 10 dBm is obtained on the spectrum analyzer.

The harmonic content is typically  $< -40$  dB at all frequencies. It should be  $\leq -36$  dB.

### 5.3 Troubleshooting

The possible trouble sources are basically

- > No output signal
- > Inadequate amplification
- > Undue frequency response
- > High harmonic content
- > Parasitic oscillations.

For troubleshooting, first check the DC values according to 5.2.1. In most cases, this will already allow to locate the error. If this is not so, make RF performance check according to 5.2.2.

Particular errors

- > No output signal (no DC voltages present):  
link X2 is not in position.
- > Amplification decreases at frequencies > 900 MHz:  
output stage V60, V70 or V80 defective.
- > Amplifier acts as a high-pass filter:  
coupling capacitor at input or output of amplifier stage defective  
(capacitance loss as contact face has come off).
- > High harmonic content at frequencies > 900 MHz:  
output stage V60, V70 or V80 defective.
- > Parasitic oscillations at low frequencies:  
capacitance loss of capacitor in feedback branch of a stage.

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C483

Schaltteilliste für

Parts list for

ED BREITBANDVERSTÄRKER

ERODABAND AMPLIFIER

Sachnummer  
Stock No.

339.8111.01 SA

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Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in

C1

CC 6,8NF+-10% 50V3K1200 C  
CAPACITOR

CC 082.3321

C2

VITRAMON VJ1005Y682KFB  
CC 100NF+-10% 50V5K1200 C  
CAPACITOR

CC 082.3473

C3

VITRAMON VJ1812Y104KFA  
CC 100NF+-10% 50V5K1200 C  
CAPACITOR

CC 082.3473

C6

VITRAMON VJ1812Y104KFA  
CC 2,6PF+-0,25PF50V2NPO  
CAPACITOR

CC 093.5572

C20

VITRAMON VJ0805A2R6CFA  
CC 27NF+-10% 50V3K6000CHIP  
CAPACITOR

CC 082.3609

C21

VITRAMON VJ1005Y273KFB  
CC 2,3PF+-0,25PF50V2NPO  
CAPACITOR

CC 093.5566

C26

VITRAMON VJ0805A2R3CFA  
CC 1,5NF-20+80%R10000TRAP  
CAPACITOR

CC 082.1712

C27

STETTNER TEFK7,1500/2080E9000  
CE 1UF +-20%35V 4X 8TA  
ELECTROLYTIC CAPACITOR

CE 006.3230

C28

ITT TA-ELK04320227110  
CC 1,5NF-20+80%R10000TRAP  
CAPACITOR

CC 082.1712

C34

STETTNER TEFK7,1500/2080E9000  
CC 100NF+-10% 50V5K1200 C  
CAPACITOR

CC 082.3473

C35

VITRAMON VJ1812Y104KFA  
CC 2,6PF+-0,25PF50V2NPO  
CAPACITOR

CC 093.5572

C40

VITRAMON VJ0805A2R6CFA  
CC 27NF+-10% 50V3K6000CHIP  
CAPACITOR

CC 082.3609

C41

VITRAMON VJ1005Y273KFB  
CC 2,3PF+-0,25PF50V2NPO  
CAPACITOR

CC 093.5566

C46

VITRAMON VJ0805A2R3CFA  
CC 1,5NF-20+80%R10000TRAP  
CAPACITOR

CC 082.1712

C47

STETTNER TEFK7,1500/2080E9000  
CE 1UF +-20%35V 4X 8TA  
ELECTROLYTIC CAPACITOR

CE 006.3230

C48

ITT TA-ELK04320227110  
CC 1,5NF-20+80%R10000TRAP  
CAPACITOR

CC 082.1712

C54

STETTNER TEFK7,1500/2080E9000  
CC 100NF+-10% 50V5K1200 C  
CAPACITOR

CC 082.3473

C60

VITRAMON VJ1812Y104KFA  
CC 3,2PF+-0,25PF50V2NPO  
CAPACITOR

CC 093.5595

C61

VITRAMON VJ0805A3R2CFA  
CC 1,1PF+-0,1PF 50CV 3X3X  
CAPACITOR

CC 467.8413

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Parts list for  
ED BREITBANDVERSTÄRKER  
BROADBAND AMPLIFIERSachnummer  
Stock No.

339.8111.01 SA

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C62	ATC ATC100-B-1R1-B-P500 CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C63	STETTNER TEFK7,1500/2080E9000 CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C64	STETTNER TEFK7,1500/2080E9000 CE 100NF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8156	
C69	ERO-TANTAL TA-ELKOETR1-0,1/35 CC 3,2PF+-0,25PF50V2NPO CAPACITOR	CC 093.5595	
C70	VITRAMON VJ0805A3R2CFA CC 2,3PF+-0,25PF50V2NPO CAPACITOR	CC 093.5566	
C72	VITRAMON VJ0805A2R3CFA CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C73	STETTNER TEFK7,1500/2080E9000 CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C74	STETTNER TEFK7,1500/2080E9000 CE 100NF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8156	
C79	ERO-TANTAL TA-ELKOETR1-0,1/35 CC 3,2PF+-0,25PF50V2NPO CAPACITOR	CC 093.5595	
C80	VITRAMON VJ0805A3R2CFA CC 2,6PF+-0,25PF50V2NPO CAPACITOR	CC 093.5572	
C82	VITRAMON VJ0805A2R6CFA CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C83	STETTNER TEFK7,1500/2080E9000 CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C84	STETTNER TEFK7,1500/2080E9000 CE 100NF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8156	
C90	ERO-TANTAL TA-ELKOETR1-0,1/35 CC 4,7PF+-0,5PF100V3NPO C CAPACITOR	CC 082.2977	
C102	VITRAMON VJ1005A4R7DFB CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	
C103	VITRAMON VJ1812Y104KFA CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C108	AEROVOX CKR05BX104KL CC 27NF+-10%50V3K6000CHIP CAPACITOR	CC 082.3609	
C110	VITRAMON VJ1005Y273KFB CC 1,5NF-20+80%R10000TRAP CAPACITOR	CC 082.1712	
C111	STETTNER TEFK7,1500/2080E9000 CE 1UF +-20%35V 4X 8TA ELECTROLYTIC CAPACITOR	CE 006.3230	

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 Schaltteilliste für  
 Parts list for  
 ED BREITBANDVERSTÄRKER  
 BROADBAND AMPLIFIER

 Sachnummer  
 Stock No.

339.8111.01 SA

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3

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C112	ITT TA-ELK04320227110 CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C120	STETTNER TEFK7,1500/2080E9000 CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	
C128	VITRAMON VJ1812Y104KFA CC 27NF+-10% 50V3K6000CHIP CAPACITOR	CC 082.3609	
C130	VITRAMON VJ1005Y273KFB CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C131	STETTNER TEFK7,1500/2080E9000 CE 1UF +-20%35V 4X 8TA ELECTROLYTIC CAPACITOR	CE 006.3230	
C132	ITT TA-ELK04320227110 CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C140	STETTNER TEFK7,1500/2080E9000 CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	
C148	VITRAMON VJ1812Y104KFA CC 27NF+-10% 50V3K6000CHIP CAPACITOR	CC 082.3609	
C150	VITRAMON VJ1005Y273KFB CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C151	STETTNER TEFK7,1500/2080E9000 CE 1UF +-20%35V 4X 8TA ELECTROLYTIC CAPACITOR	CE 006.3230	
C152	ITT TA-ELK04320227110 CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C160	STETTNER TEFK7,1500/2080E9000 CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	
C161	VITRAMON VJ1812Y104KFA CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	
C162	VITRAMON VJ1812Y104KFA CC 100NF+-10% 50V5K1200 C CAPACITOR	CC 082.3473	
C180	VITRAMON VJ1812Y104KFA CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	
C185	SIEMENS B4136-B7226-Z CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	
C200	SIEMENS B4136-B7226-Z CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C201	STETTNER TEFK7,1500/2080E9000 CC 1,5NF-20+80ZR10000TRAP CAPACITOR	CC 082.1712	
C202	STETTNER TEFK7,1500/2080E9000 CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C210	SIEMENS B4136-B7226-Z CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C211	AEROVOX CKR05BX104KL CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C220	AEROVOX CKR05BX104KL CC 1,5NF+-10%4X5R2000 CAPACITOR	CC 087.7048	
C221	VALVO 2222 63051 152 CC 1,5NF+-10%4X5R2000 CAPACITOR	CC 087.7048	
C230	VALVO 2222 63051 152 CC 1,5NF+-10%4X5R2000 CAPACITOR	CC 087.7048	
C231	VALVO 2222 63051 152 CC 1,5NF+-10%4X5R2000 CAPACITOR	CC 087.7048	
C240	VALVO 2222 63051 152 CC 10UF+-10%50V7K1200VIEL CAPACITOR	CC 084.5538	
C244	AEROVOX CKR06BX105KL CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C260	AEROVOX CKR05BX104KL CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	
C270	SIEMENS B4136-B7226-Z CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	
D250	SIEMENS B4136-B7226-Z		
	BL CD4011BF 4X2IN.NANDG NAND GATE RCA CD4011BF	BL 517.7572	
L1	SPULE COIL	339.8240	
L2	SPULE COIL	339.8240	
L5	SPULE COIL	339.8257	
L6	SPULE COIL	339.8257	
L9	LD 15, CUH10%2,800HMC,157A CHOKER DELEVAN DROSSEL1025-48	LD 067.3001	
L10	SPULE COIL	339.8263	
L11	SPULE COIL	339.8170	
L12	SPULE COIL	339.8170	
L23	SPULE COIL	339.8240	
L24	SPULE COIL	339.8257	

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BROADBAND AMPLIFIER

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Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in

L25

LD 560 UH 10% LACK  
JAHRE HFDR71.20.560CK

249.8836

L26

SPULE  
COIL

339.8240

L35

SPULE  
COIL

339.8170

L36

SPULE  
COIL

339.8170

L43

SPULE  
COIL

339.8240

L44

SPULE  
COIL

339.8257

L45

LD 560 UH 10% LACK  
JAHRE HFDR71.20.560CK

249.8836

L46

SPULE  
COIL

339.8240

L60

SPULE  
COIL

339.8186

L61

SPULE  
COIL

339.8186

L62

SPULE  
COIL

339.8240

L63

SPULE  
COIL

339.8240

L72

SPULE  
COIL

339.8240

L73

SPULE  
COIL

339.8240

L82

SPULE  
COIL

339.8240

L83

SPULE  
COIL

339.8240

L106

LD 0,27UH10%0,16CHMO,975A  
CHOKE  
DELEVAN DROSSEL1025-06

LD 067.2792

L110

SPULE  
COIL

339.8257

L111

SPULE  
COIL

339.8257

L112

LD 560 UH 10% LACK  
JAHRE HFDR71.20.560CK

249.8836

L130

SPULE  
COIL

339.8257

L131

SPULE  
COIL

339.8257

L132

LD 560 UH 10% LACK  
JAHRE HFDR71.20.560CK

249.8836

L150

SPULE  
COIL

339.8257

L151

SPULE  
COIL

339.8257

L152

LD 560 UH 10% LACK  
JAHRE HFDR71.20.560CK

249.8836

L160

SPULE  
COIL

339.8186

L161

LD 0,33UH10%0,220HMC,830A  
CHOKE

LD 067.2805

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
L162	DELEVAN DROSSEL1025--08 SPULE COIL	339.8240	
L163	LD 220 UH10%21,00HMC,052A CHOKE	LD 067.3147	
L200	DELEVAN DROSSEL1025-76 LD 0,15UH10%0,100HM1,230A CHOKE	LD 067.2763	
L220	DELEVAN DROSSEL1025-00 LD 47,0UH10%4,500HMC,110A CHOKE	LD 067.3060	
L230	DELEVAN DROSSEL1025-60 LD 47,0UH10%4,500HMC,110A CHOKE	LD 067.3060	
L231	DELEVAN DROSSEL1025-60 LD 15,0UH10%2,800HMC,157A CHOKE	LD 067.3001	
L232	DELEVAN DROSSEL1025-48 SPULE COIL	339.8257	
L233	SPULE COIL	339.8240	
N1	YAM-102 7DB/0,1-2500 MHZ DUENNSCHICHT-SPEZ.-TEIL	914.3405.02	
N2	YAM-102 7DB/0,1-2500 MHZ DUENNSCHICHT-SPEZ.-TEIL	914.3405.02	
N210	BO LM139D/883B 4/COMPARAT LM139D/883B 4/COMPARAT NSC LM139D/883B	581.0175	
R1	RL 0,13W 47,5 OHM+-1%TK50 RESISTOR	RL 092.1267	
R2	RESISTA MK1 47,50HM 1% TK50 RL 0,13W 47,5 OHM+-1%TK50 RESISTOR	RL 092.1267	
R11	RESISTA MK1 47,50HM 1% TK50 RL 0,13W 56 OHM2% UNGEW. RESISTOR	RL 092.5927	
R12	RESISTA MK1 560HM 2% UNGEW. RG 0,125W 470OHM+-2% CHIP CHIP RESISTOR	339.8863	
R20	MSJ WA-4 4700HM2%ANSCHL. RG 0,125W 820OHM+-2% CHIP CHIP RESISTOR	339.8870	
R21	MSI WA-4 8200HM2%ANSCHL. RG 0,125W 820OHM+-2% CHIP CHIP RESISTOR	339.8870	
R22	MSI WA-4 8200HM2%ANSCHL. RG 0,075W 39 OHM+-2% CHIP CHIP RESTOR	339.8840	
R25	MSJ WA-4 390HM2%ANSCHL. RD 1,2W 27 OHM+-3% WIRE-WOUND RESISTOR	RD 083.7208	
R26	SAGE 1000S/270HM/3% RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	

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R27	DRALORIC LCA0207/+5%2,2K RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R28	DRALORIC LCA0207/+5%100 RL 0,25W11,00 OHM+-1%TK50 RESISTOR	RL 082.8898	
R29	DRALORIC SMA0207/110HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R30	DRALORIC SMA0207/1,21K-F-D RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R35	DRALORIC SMA/207/22,1K-F-C RL 0,13W 56 OHM2% UNGEW. RESISTOR	RL 092.5927	
R36	RESISTA MK1 560HM 2% UNGEW. RG 0,125W 470OHM+-2% CHIP CHIP RESISTOR	339.8863	
R40	MSJ WA-4 470OHM2%ANSCHL. RG 0,125W 820OHM+-2% CHIP CHIP RESISTOR	339.8870	
R41	MSI WA-4 820OHM2%ANSCHL. RG 0,125W 820OHM+-2% CHIP CHIP RESISTOR	339.8870	
R42	MSI WA-4 820OHM2%ANSCHL. RG 0,075W 39 OHM+-2% CHIP CHIP RESTOR	339.8840	
R45	MSJ WA-4 390HM2%ANSCHL. RD 1,2W 27 OHM+-3% WIRE-WOUND RESISTOR	RD 083.7208	
R46	SAGE 100CS/270HM/3% RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R47	DRALORIC LCA0207/+5%2,2K RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R48	DRALORIC LCA0207/+5%100 RL 0,25W11,00 OHM+-1%TK50 RESISTOR	RL 082.8898	
R49	DRALORIC SMA0207/110HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R50	DRALORIC SMA0207/1,21K-F-D RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R51	DRALORIC SMA/207/22,1K-F-C PF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R52	DRALORIC LCA0207/+5%47K RF 0,25W4,7KOHM +-5% RESISTOR	RF 069.4728	
R53	DRALORIC LCA0207/+5%4,7K RF 0,25W820 OHM +-5% RESISTOR	RF 069.8217	
R54	DRALORIC LCA0207/+5%820 RF 0,25W1,5KOHM +-5% RESISTOR	RF 069.1529	

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R55	DRALORIC LCA0207/+5%1,5K RF 0,25W100 OHM +5% RESISTOR	RF 069.1012	
R56	DRALORIC LCA0207/+5%100 RF 0,25W 47KOHM +5% RESISTOR	RF 069.4734	
R57	DRALORIC LCA0207/+5%47K RF 0,25W4,7KOHM +5% RESISTOR	RF 069.4728	
R58	DRALORIC LCA0207/+5%4,7K RF 0,25W820 OHM +5% RESISTOR	RF 069.8217	
R59	DRALORIC LCA0207/+5%820 RF 0,25W1,5KOHM +5% RESISTOR	RF 069.1529	
R60	DRALORIC LCA0207/+5%1,5K RL 0,13W 47 OHM2% UNGEW. RESISTOR	RL 092.5910	
R62	RESISTA MK1 470HM 2% UNGEW. RF 0,25W2,2KOHM +5% RESISTOR	RF 069.2225	
R63	DRALORIC LCA0207/+5%2,2K RD 1,2W 22 OHM+-3% WIRE WOUND RESISTOR	RD 067.0583	
R64	SAGE 1000S/220HM/3% RF 0,25W100 OHM +5% RESISTOR	RF 069.1012	
R65	DRALORIC LCA0207/+5%100 RL 0,25W19,10 OHM+-1%TK50 RESISTOR	RL 082.9120	
R66	DRALORIC SMA0207/19,10HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R67	DRALORIC SMA0207/1,21K-F-D PL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R68	DRALORIC SMA/207/22,1K-F-C RL 0,25W19,10 OHM+-1%TK50 RESISTOR	RL 082.9120	
R69	DRALORIC SMA0207/19,10HM-F-D RG 0,125W 22 OHM+-2% CHIP CHIP-RESISTOR	339.8834	
R71	MSI WA-4-2%-22-VERZINNT RF 0,25W100 OHM +5% RESISTOR	RF 069.1012	
R72	DRALORIC LCA0207/+5%100 RF 0,25W2,2KOHM +5% RESISTOR	RF 069.2225	
R73	DRALORIC LCA0207/+5%2,2K RD 1,2W 22 OHM+-3% WIRE WOUND RESISTOR	RD 067.0583	
R74	SAGE 1000S/220HM/3% RF 0,25W100 OHM +5% RESISTOR	RF 069.1012	
R75	DRALORIC LCA0207/+5%100 RL 0,25W19,10 OHM+-1%TK50 RESISTOR	RL 082.9120	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R76	DRALORIC SMA0207/19,10HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R77	DRALORIC SMAC207/1,21K-F-D RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R78	DRALORIC SMA/207/22,1K-F-C RL 0,25W19,10 OHM+-1%TK50 RESISTOR	RL 082.9120	
R79	DRALORIC SMA0207/19,10HM-F-D RG 0,125W 22 OHM+-2% CHIP CHIP-RESISTOR	339.8834	
R82	MSI WA-4-2%-22-VERZINNT RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R83	DRALORIC LCA0207/+5%2,2K RD 1,2W 22 OHM+-3% WIRE WOUND RESISTOR	RD 067.0583	
R84	SAGE 100CS/220HM/3% RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R85	DRALORIC LCA0207/+5%100 RL 0,25W19,10 OHM+-1%TK50 RESISTOR	RL 082.9120	
R86	DRALORIC SMA0207/19,10HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R87	DRALORIC SMAC207/1,21K-F-D RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R88	DRALORIC SMA/207/22,1K-F-C RL 0,25W19,10 OHM+-1%TK50 RESISTOR	RL 082.9120	
R100	DRALORIC SMA0207/19,10HM-F-D RL 0,13W 33 OHM2% UNGEW. RESISTOR	RL 092.5891	
R101	RESISTA MK1 330HM 2% UNGEW. RL 0,13W 33 OHM2% UNGEW. RESISTOR	RL 092.5891	
R102	RESISTA MK1 330HM 2% UNGEW. RL 0,13W 27 OHM2% UNGEW. RESISTOR	RL 092.5885	
R105	RESISTA MK1 270HM 2% UNGEW. RL 0,13W 33 OHM2% UNGEW. RESISTOR	RL 092.5891	
R106	RESISTA MK1 330HM 2% UNGEW. RL 0,13W 39 OHM2% UNGEW. RESISTOR	RL 092.5904	
R109	RESISTA MK1 390HM 2% UNGEW. RL 0,13W 180 OHM2% UNGEW. RESISTOR	RL 092.5985	
R110	RESISTA MK1 180OHM 2% UNGEW. RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R112	DRALORIC LCA0207/+5%2,2K RD 1,2W 60 OHM+-3% WIRE-WOUND RESISTOR	RD 082.6414	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R114	SAGE 1000S/600HM/3% RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R115	DRALORIC LCA0207/+5%100 RL 0,25W11,00 OHM+-1%TK50 RESISTOR	RL 082.8898	
R116	DRALORIC SMA0207/110HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R117	DRALORIC SMA0207/1,21K-F-D RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R125	DRALORIC SMA/207/22,1K-F-C RL 0,13W 33 OHM2% UNGEW. RESISTOR	RL 092.5891	
R129	RESISTA MK1 330HM 2% UNGEW. RL 0,13W 150 OHM2% UNGEW. RESISTOR	RL 092.5979	
R130	RESISTA MK1 1500HM 2% UNGEW. RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R132	DRALORIC LCA0207/+5%2,2K RD 1,2W 60 OHM+-3% WIRE-WOUND RESISTOR	RD 082.6414	
R134	SAGE 1000S/600HM/3% RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R135	DRALORIC LCA0207/+5%100 RL 0,25W11,00 OHM+-1%TK50 RESISTOR	RL 082.8898	
R136	DRALORIC SMA0207/110HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	
R137	DRALORIC SMA0207/1,21K-F-D RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R145	DRALORIC SMA/207/22,1K-F-C RL 0,13W 33 OHM2% UNGEW. RESISTOR	RL 092.5891	
R149	RESISTA MK1 330HM 2% UNGEW. RL 0,13W 180 OHM2% UNGEW. RESISTOR	RL 092.5985	
R150	RESISTA MK1 1800HM 2% UNGEW. RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R152	DRALORIC LCA0207/+5%2,2K RD 1,2W 60 OHM+-3% WIRE-WOUND RESISTOR	RD 082.6414	
R154	SAGE 1000S/600HM/3% RF 0,25W100 OHM +-5% RESISTOR	RF 069.1012	
R155	DRALORIC LCA0207/+5%100 RL 0,25W18,20 OHM+-1%TK50 RESISTOR	RL 082.9107	
R156	DRALORIC SMA0207/18,20HM-F-D RL 0,25W 1,21KOHM+-1%TK50 RESISTOR	RL 083.0655	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R157	DRALORIC SMA0207/1,21K-F-0 RL 0,25W 22,1KOHM+-1%TK50 RESISTOR	RL 083.1545	
R158	DRALORIC SMA/207/22,1K-F-C RL 0,25W18,20 OHM+-1%TK50 RESISTOR	RL 082.9107	
R160	DRALORIC SMA0207/18,20HM-F-0 RG 0,125W 1KOHM+-2% CHIP CHIP RESISTOR	339.8886	
R161	MSJ WA-4 1K 2% ANSCHL. RG 0,125W 1KOHM+-2% CHIP CHIP RESISTOR	339.8886	
R162	MSJ WA-4 1K 2% ANSCHL. RG 0,125W 56 OHM+-2% CHIP CHIP RESISTOR	339.8857	
R163	MSJ WA4 56 OHM 2% RG 0,125W 56 OHM+-2% CHIP CHIP RESISTOR	339.8857	
R165	MSJ WA4 56 OHM 2% RL 0,13W 1,50KOHM+-1%TK50 RESISTOR	RL 092.1467	
R180	RESISTA MK1 1K5 1% TK50 RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R181	DRALORIC LCA0207/+5%47K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R183	DRALORIC LCA0207/+5%10K RF 0,25W470 OHM +-5% RESISTOR	RF 069.4711	
R184	DRALORIC LCA0207/+5%470 RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R185	DRALORIC LCA0207/+5%1,0K RF 0,25W 27 OHM +-5% RESISTOR	RF 069.2702	
R186	DRALORIC LCA0207/+5%27 RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R187	DRALORIC LCA0207/+5%47K RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R201	DRALORIC LCA0207/+5%47K RF 0,25W3,6KOHM +-5% RESISTOR	RF 069.3621	
R202	DRALORIC LCA0207/+5%3,6K RF 0,25W3,6KOHM +-5% RESISTOR	RF 069.3621	
R210	DRALORIC LCA0207/+5%3,6K RL 0,25W 182 KOHM+-1%TK50 RESISTOR	RL 083.2193	
R211	DRALORIC SMA0207/182K-F-C RL 0,25W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	
R212	DRALORIC SMA/207/47,5K-F-C RL 0,25W 56,2KOHM+-1%TK50 RESISTOR	RL 082.2231	

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R213	DRALORIC SMA0207/56,2K-F-C RL 0,25W 47,5KOHM+-1%TK50 RESISTOR	RL 083.1800	
R214	DRALORIC SMA/207/47,5K-F-C RF 0,25W100KOHM +-5% RESISTOR	RF 069.1041	
R220	DRALORIC LCA0207/+5%100K RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R221	DRALORIC LCA0207/+5%47K RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R230	DRALORIC LCA0207/+5%47K RF 0,25W470KOHM +-5% RESISTOR	RF 069.4740	
R231	DRALORIC LCA0207/+5%470K RF 0,25W 33KOHM +-5% RESISTOR	RF 069.3338	
R232	DRALORIC LCA0207/+5%33K RF 0,25W180KOHM +-5% RESISTOR	RF 069.1841	
R233	DRALORIC LCA0207/+5%180K RF 0,25W100KOHM +-5% RESISTOR	RF 069.1041	
R240	DRALORIC LCA0207/+5%100K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R241	DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R242	DRALORIC LCA0207/+5%10K RF 0,25W220 OHM +-5% RESISTOR	RF 069.2219	
R243	DRALORIC LCA0207/+5%220 RK KALTL 120 OHM 3,3W PTC-RESISTOR	RK 008.0980	
R244	SIEMENS KALTLEITERP350-D1 RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R245	DRALORIC LCA0207/+5%10K RF 0,25W6,2KOHM +-5% RESISTOR	RF 069.6220	
R246	DRALORIC VCA0207/+5%6,2K RF 0,25W6,2KOHM +-5% RESISTOR	RF 069.6220	
R250	DRALORIC VCA0207/+5%6,2K RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R251	DRALORIC LCA0207/+5%47K RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
R252	DRALORIC LCA0207/+5%47K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R253	DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	



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R254	DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R255	DRALORIC LCA0207/+5%10K RF 0,25W 47KOHM +-5% RESISTOR	RF 069.4734	
	DRALORIC LCA0207/+5%47K		
V20	TRANS.VORSTUFE	339.8770	
V27	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V30	AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
	AEG-TELEF 1N4151		
V40	TRANS.VORSTUFE	339.8770	
V47	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V50	AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
	AEG-TELEF 1N4151		
V60	TRANS.ENDSTUFE	339.8786	
V65	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V66	AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
	AEG-TELEF 1N4151		
V70	TRANS.ENDSTUFE	339.8786	
V75	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V76	AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
	AEG-TELEF 1N4151		
V77	AK 2N2222A NPN 40V 800MA TRANSISTOR	AK 010.5405	
	VALVO 2N2222A		
V78	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V80	TRANS.ENDSTUFE	339.8786	
V85	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V86	AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
	AEG-TELEF 1N4151		
V87	AK 2N2222A NPN 40V 800MA TRANSISTOR	AK 010.5405	
	VALVO 2N2222A		
V88	AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
	SIEMENS BCY79IX		
V110	AK BFQ34 NPN 18V 3GHZ TRANSISTOR	AK 337.8295	

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V115	VALVO B FQ34 AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
V116	SIEMENS BCY79IX AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
V130	AEG-TELEF 1N4151 AK B FQ34 NPN 18V 3GHZ TRANSISTOR	AK 337.8295	
V135	VALVO B FQ34 AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
V136	SIEMENS BCY79IX AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
V150	AEG-TELEF 1N4151 AK B FQ34 NPN 18V 3GHZ TRANSISTOR	AK 337.8295	
V155	VALVO B FQ34 AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	
V156	SIEMENS BCY79IX AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
V164	AEG-TELEF 1N4151 AE MA47047 200V PINDI PIN DIODE	AE 450.7060	
V165	MICROWAVE MA47047 AE MA47047 200V PINDI PIN DIODE	AE 450.7060	
V180	MICROWAVE MA47047 AL 2N4919 PNP 60V 1A0 TRANSISTOR	AL 010.0361	
V181	VALVO B D236 AK BCY59IX NPN 45V 200MA TRANSISTOR	AK 010.5163	
V182	SIEMENS BCY59IX AK BCY59IX NPN 45V 200MA TRANSISTOR	AK 010.5163	
V184	SIEMENS BCY59IX AG 1N400 GL 50V 1A0 RECTIFIER	013.0033	
V201	TEXAS 1N4001 AE BZX55/B10 0,5W Z-DI ZENER DIODE	AE 289.4302	
V240	VALVO BZX55/B10 AD 1N4151 50V 0,2 A UDI DIODE	AD 012.0723	
V245	AEG-TELEF 1N4151 AE BZX75C2V1 STABISTOR ZENER DIODE	AE 086.8270	
V251	VALVO BZX75C2V1 AK BCY59IX NPN 45V 200MA TRANSISTOR	AK 010.5163	
V253	SIEMENS BCY59IX AK BCY79IX PNP 45V 200MA TRANSISTOR	AK 010.3777	




**ROHDE & SCHWARZ**

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Date

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 Schalteilliste für  
Parts list for  
EC BREITBANDVERSTÄRKER  
BROADBAND AMPLIFIER

 Sachnummer  
Stock No.

339.8111.01 SA

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V254	SIEMENS BCY79IX AL ED233 NPN 45V 2AO TRANSISTOR VALVO ED233	AL 010.0784	
W1	KABEL CABLE	339.8292	
W2	KABEL CABLE	339.8305	
W3	KABEL CABLE	339.8457	339.8434
W4	KABEL CABLE	339.8457	339.8434
X1	FP INDIREKT STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X2	FP INDIREKT STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X34	FP STECKERLEISTE 32POL. ERNI 9722.303.470.1	FP 565.8100	
X361	FJ EINBAUSTECKER SYST.SMC PLUG RADIAL 112554	FJ 070.0151	
X363	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIAL R 112 669	FJ 249.9684	
X364	FJ EINBAUSTECKER SYST.SMC PLUG RADIAL 112554	FJ 070.0151	
X370	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIAL R 112 669	FJ 249.9684	
X375	FJ EINBAUWINKELST. SMC ANGLE CONNECTOR RADIAL R 112 669	FJ 249.9684	
Z1	TRIMMWERT / SELECTED DUENNFILM SPECIALTEIL SPEC.THIN FILM CIRCUIT		339.8434
			- ENDE -

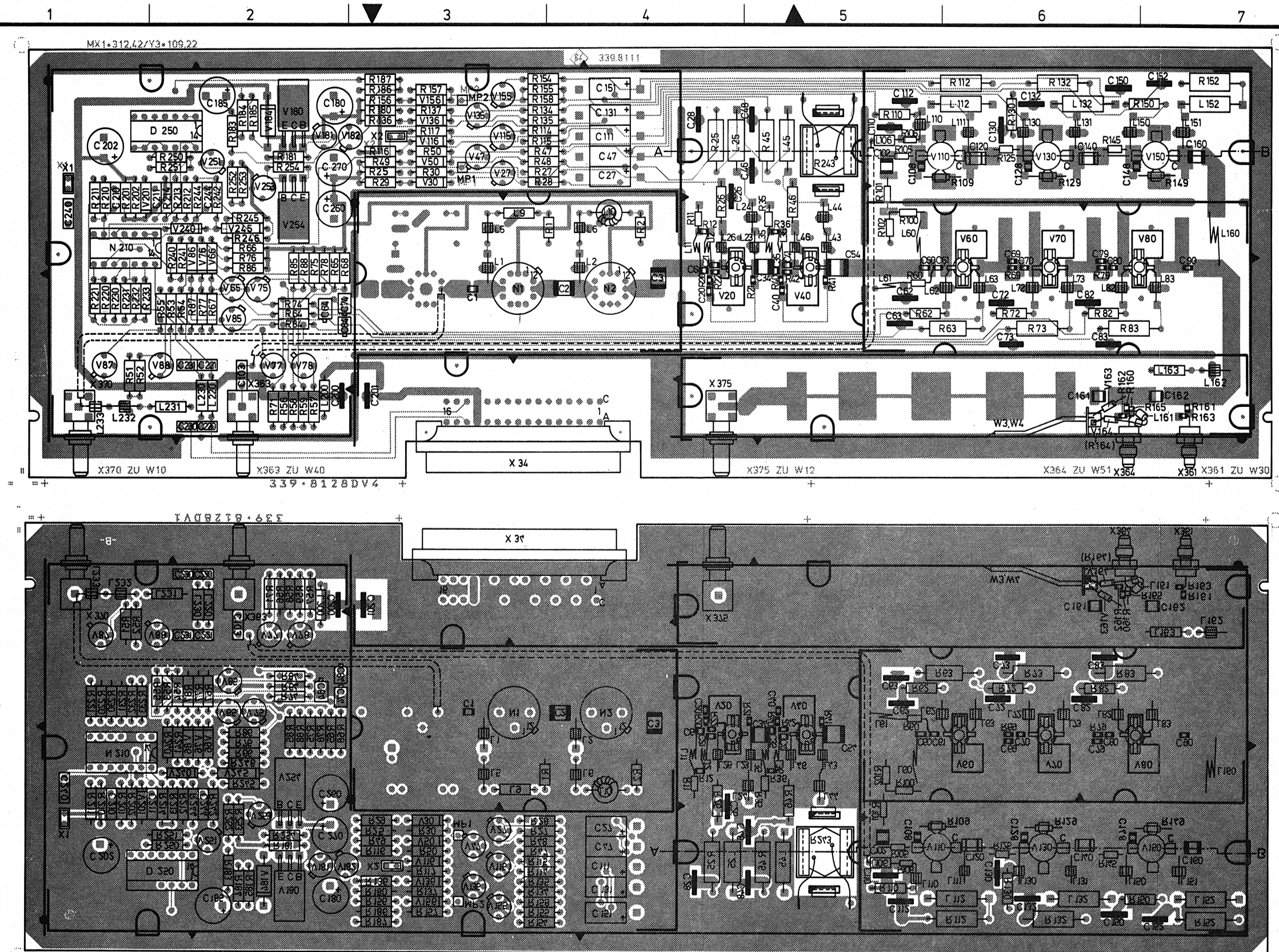
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uns alle Rechte vor

Für diese Zeichnung behalten wir uns alle Rechte vor

• PF 0 95 3531-0379



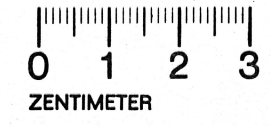





Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side

Ansicht und Leitungsführung Lötseite  
View of tracks on solder side

Für diese Unterlage behalten wir uns alle Rechte vor.



C	29065	4.83	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1			
						Halbzeug, Werkstoff			
				1GMG	Tag	Name	Benennung		Z
				Bearb.	4.83	CO	Breitbandverstärker		
				Gepr.					
				Norm					
				 <b>ROHDE &amp; SCHWARZ</b>			Zeichn.-Nr.		Blatt-Nr.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät SWP			339.8111		2
							reg. i. V. 339.6519 V		v. Bl.
							erste Z. 339.6519		



**ROHDE & SCHWARZ**

SERVICE INSTRUCTIONS

Level Detector

339.6719.02

## Table of Contents

5.	<u>Service Instructions for Level Detector 339.6719.02</u> .....	5.1
5.1	Circuit Description .....	5.1
5.2	Checking and Adjustment Procedures .....	5.1
5.3	Troubleshooting .....	5.3

## 5. Service Instructions for Level Detector 339.6719.02

(See circuit diagram 339.6519 S)

### 5.1 Circuit Description

The level detector produces a control voltage that is proportional to the RF voltage present at X2. To this end, it contains a peak-responsive rectifier consisting of the diode V1 and the capacitors C1, C2 and C3.

To prevent any reactive effect onto the RF path, the rectifier is connected via the attenuator R4, R5 and R6. R7 and R8 suppress resonances that are caused by the shielded cable at the control voltage output DET.

The RF path runs via R1 which constitutes the source impedance of the RF generator to output X3. The monitoring output X1 is connected via R2 and R3.

Diode V2 is used for compensation of the temperature effect of the level detector which is accomplished in the control amplifier.

### 5.2 Checking and Adjustment Procedures

The level detector has no adjustment facilities.

Carry out all tests at an ambient temperature of 24°C and with the cover closed.

#### a) Checking the frequency response

For checking the frequency response, use of test setup shown in Fig. 5-1 is recommended.

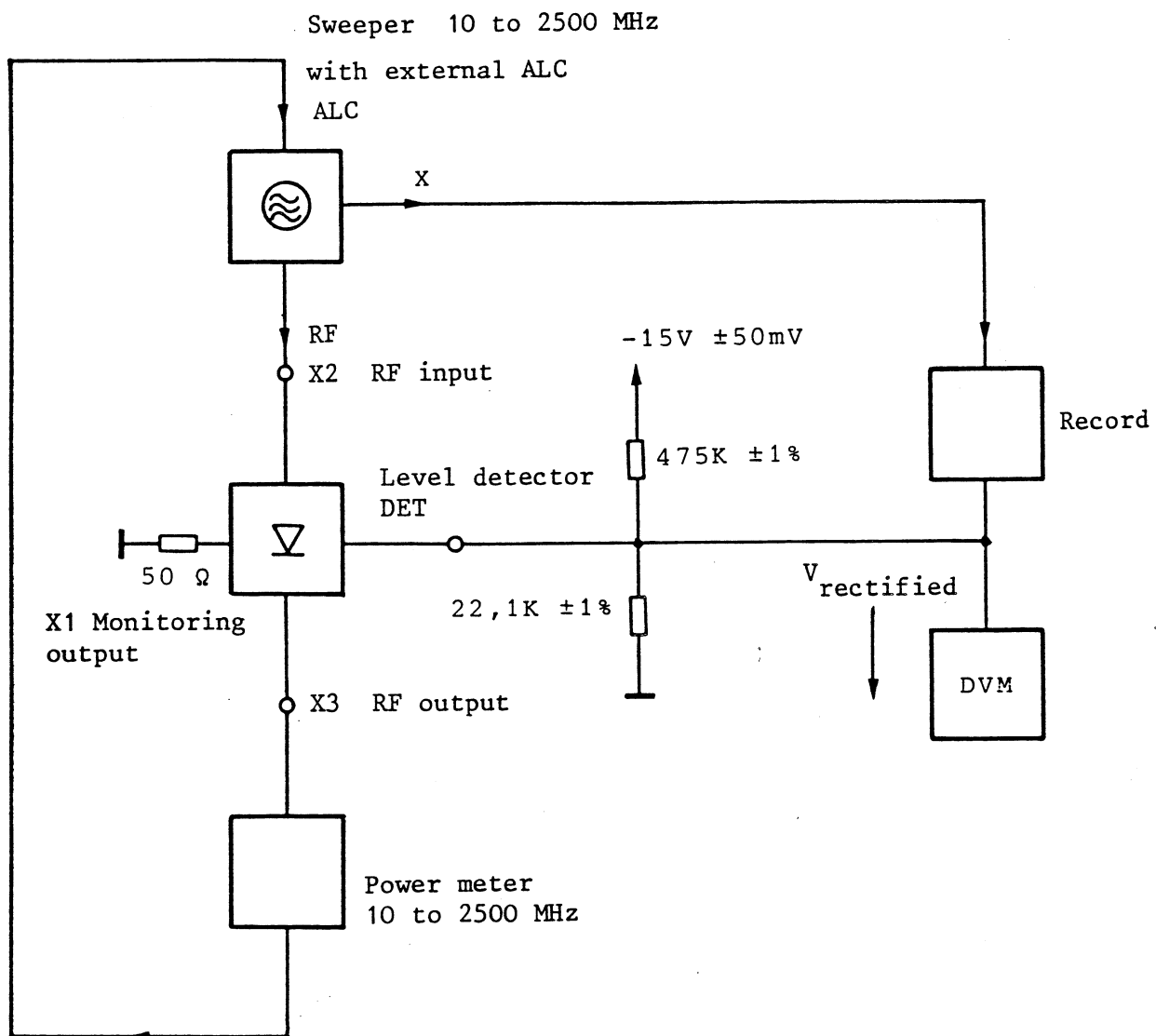


Fig. 5-1 Checking the frequency response

- > Select CW mode on sweeper ( $Z = 50 \Omega$ ) and set 100 MHz.
- > Adjust ALC for 0 dBm RF power at X3.
- > Measure DC voltage  $V_{\text{rectified}}$  at DET by means of DVM:  
 $V_{\text{rectified}} = -27.5 \text{ mV} \pm 5.5 \text{ mV}$ .
- > Sweep through frequency range 10 to 2500 MHz:  
 Maximum deviation  $\pm 0.7 \text{ dB}$  (reference: 100 MHz)



b) Checking the monitoring output X1

--> Terminate RF output X3 with 50  $\Omega$ .

--> Connect sweep generator ( $Z = 50 \Omega$ ) to RF input X2.

--> Connect detector ( $Z = 50 \Omega$ ) with display unit to monitoring output X1.  
The attenuation is approximately 32 dB over the range 0.1 to 2500 MHz.

c) Checking the balancing diode

--> Check characteristics of diode V2 by means of ohmmeter.

COMP A: anode V2

COMP C: cathode V2

### 5.3 Troubleshooting

For troubleshooting, carry out tests according to section 5.2.

Replace defective level detector. Repair is not possible.





**ROHDE & SCHWARZ**

SERVICE INSTRUCTIONS

Sweep Control

339.2765.02

Printed in West Germany

## Table of Contents

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## 5. Service Instructions for Sweep Control 339.2765.02

(See circuit diagram 339.2765 S)

### 5.1 Circuit Description

A sawtooth voltage of constant amplitude with variable rise and fall time is produced in a digital way on the sweep control board (U1). This voltage is applied via a multiplying D/A converter (U5) which adjusts the amplitude of the sawtooth either to the FM tuning coil of the YIG oscillator or to the main tuning coil of the YIG oscillator or to the reference oscillator of the Synchronizer Option. In N13, a DC voltage which is varied by two D/A converters (U6, U7) is added and likewise applied to the main tuning coil.

A synchronous 12-bit up/down counter (D3, D4, D5) forms the heart of the sweep control. It is followed by a D/A converter (U1). The counter is either clocked by the SWEEP CLOCK for the forward trace of the sawtooth signal or by the RETRACE CLOCK for the retrace via a multiplexer (D2/I), dependent on the output of the D flip-flops D6/I.

The following modes are provided:

- a) automatic sweep of the sawtooth voltage with start/stop function from the microprocessor
- b) line-synchronous sweep (V10, D40/VI, D40/IV, D6/II)
- c) single sweep triggered from front-panel key or external trigger input (D40/VI, D40/IV, D6/II)
- d) manual sweep of the sawtooth voltage (controllable via rotary knob or step keys)

The forward/retrace signal (SWEEP RETRACE) which is available as BLANK signal at a socket on the rear panel for external purposes is in addition applied to a multiplexer (D2/II) permitting another three operating modes to be selected:

- a) Blanking of the RF output voltage during the sweep retrace
- b) No blanking during sweep or CW operation
- c) Permanent blanking, i.e. RF output switched off.

The switches D10 and D11 permit the sawtooth signal of constant amplitude either to be connected through to the 12-bit D/A converter U5 and the external bidirectional X input/output, or an external deflection signal to be applied there.

The multiplying D/A converter U5 is used for adjusting the sawtooth amplitude and consequently the sweep width. The switches D24 to D27 which are considered in the feedback of the operational amplifier N10 to eliminate their forward resistance apply the sweep signal either to the main tuning coil of the YIG oscillator for sweep widths above 20 MHz or to the FM tuning coil for sweep widths below 20 MHz or to the reference oscillator on the synchronizer analog section board.

To determine the start frequency, a DC reference voltage (N1) adjustable in least increments is required at the main tuning coil of the YIG oscillator. This DC reference voltage is summed up at the operational amplifier. Exact start frequency adjustment is accomplished by a quasi 18-bit D/A converter which consists of two 10-bit D/A converters which overlap by two bits.

An AC- or DC-coupled (D30, C40) FM signal which is processed on the control and modulation amplifier board is added to the output signal intended for the FM tuning coil in the operational amplifier N15. This may also be the case with the synchronization signal SYN YIG supplied by the synchronizer analog section.

The microprocessor interface of the sweep control board consists of

- six WRITE ports (D45 to D50)  
to control the switches and D/A converters
- the data bus receiver D51 and
- the address decoder (D40/I and II, D41, D42).

The assigned address range extends from

hexadecimal 50 to 55 (D45 corresponding to 50H) \*  
(D46 corresponding to 51H)  
(D47 corresponding to 52H)  
(D48 corresponding to 53H)  
(D49 corresponding to 54H)  
(D50 corresponding to 55H)

\* H stands for hexadecimal

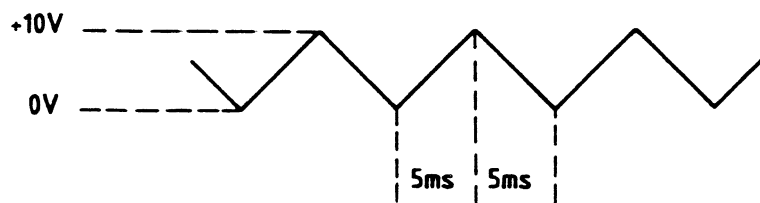
## 5.2 Checking and Adjustment Procedures

### a) Setup

- Remove D45 to D50 from their sockets and replace by eight coding switches;  
all coding switches at low level. \*
- Feed all supply voltages via connector strips with standard wiring to PC board (see control and modulation amplifier board). \*
- RESET pin (X109.6C) at low level. \*
- Apply 50-Hz sinewave voltage of approximately  $10\text{ V}_{\text{rms}}$  via 4.7-k $\Omega$  resistance to X109.2C.
- Apply 820-kHz clock with TTL level to X109.3C and X109.4C. \*

### b) Checking the digital sawtooth generation

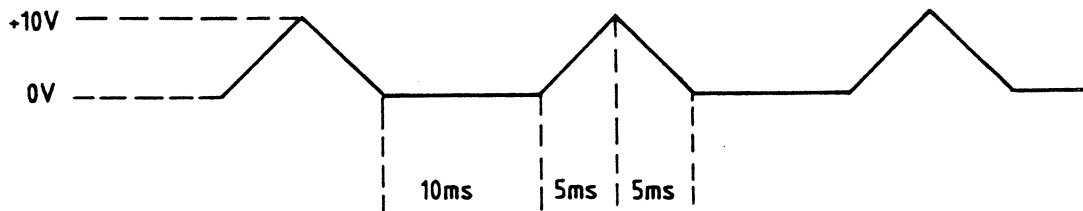
- Connect DVM to MP1:  $-10\text{ V} \pm 30\text{ mV}$
- Set port 54H (D49) to 30H;  
Connect oscilloscope to MP2: 0 V
- Set port 54H (D49) to 31H (= AUTO mode);  
connect oscilloscope to MP2:



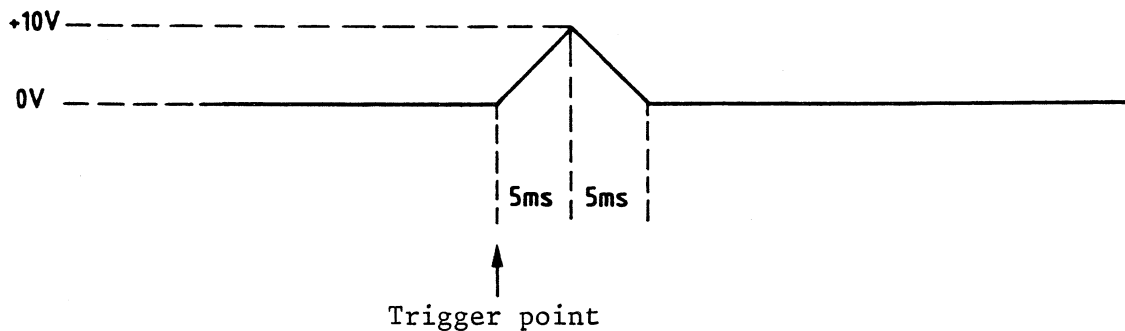
- Set port 54H (D49) to 33H and port 55H (D50) to COH (= LINE mode);  
connect oscilloscope to MP2:  
the following stationary pattern must be displayed on the screen of the oscilloscope if triggered externally with the 50-Hz signal at X109.2C:

---

\* Not applicable when using test program for testing the Sweep Generator SWP.



- Set port 54H (D49) to 33H and port 55H (D50) to 00H (=SINGLE mode);  
connect oscilloscope to MP2:  
by setting port 55H to 40H, the following single sweep is activated:



- Set port 54H (D49) to 31H;  
connect oscilloscope to X109.6B:  
TTL signal with 10 ms period and 50% duty cycle (high level corresponding to forward sweep and low level corresponding to sweep retrace).
- Set port 54H (D49) successively to 39H and 3DH;  
connect oscilloscope to X109.6B: high and low level, respectively.
- Set port 54H (D49) to 31H and port 52H (D47) to 20H;  
connect oscilloscope to X9.11A:



c) Checking the sawtooth amplitude

- Set port 54H (D49) to 31H, port 52H (D47) to 02H, port 50H (D45) to FBH and port 55H (D50) to 18H;  
connect DVM and oscilloscope to X9.10C:  
 $V_{pp} = 7.07$  V sawtooth amplitude and  $V_{DC} = 3.54$  V on the DVM.

d) Checking the output for the YIG FM tuning coil

- Set port 54H (D49) to 31H, port 52H (D47) to 04H, port 50H (D45) to FBH and port 55H (D50) to 18H;  
connect DVM and oscilloscope to MP6 (or X9.7C):  
sawtooth amplitude:  $V_{pp} = 8$  V  
DC voltage: -4 V.
- Set port 52H (D47) to 12H;  
feed +7.07 and -7.07 V into X9.6A from power supply unit;  
connect DVM to MP6 (or X9.7C): -4 V and +4 V, respectively.

e) Checking the output for the YIG main tuning coil

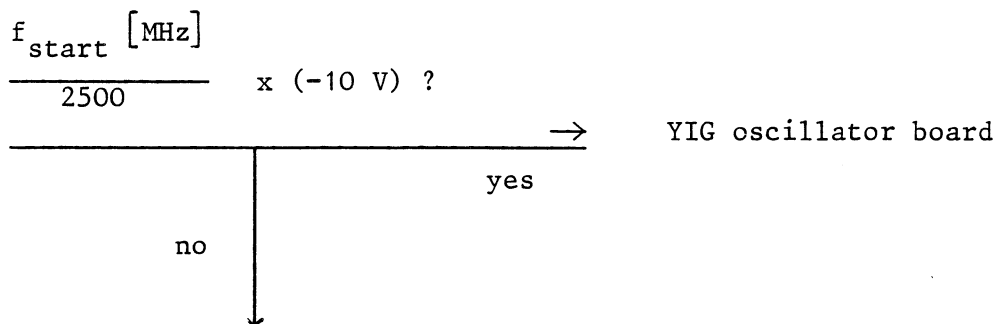
- Set port 51H (D46) to FFH and port 52H (D47) to C2H;  
connect DVM to MP5 (or X9.5C): -10 V  $\pm 50$  mV.
- Set port 51H (D46) to 00H, port 52H (D47) to 02H, port 53H (D48) to 80H and port 54H (D49) to 31H;  
insert shorting link BR1;  
connect DVM to MP5: -10 V  $\pm 5\%$ ;  
remove shorting link BR1.
- Set port 52H (D47) to 08H, port 53H (D48) to 00H;  
connect DVM and oscilloscope to MP5 (or X9.5C):  
sawtooth amplitude:  $V_{pp} = 10$  V  
DC voltage: -5 V.
- Set port 52H (D47) to 01H;  
connect DVM and oscilloscope to MP5 (or X9.5C):  
sawtooth amplitude:  $V_{pp} = 1$  V  
DC voltage: -0.5 V

### 5.3 Troubleshooting

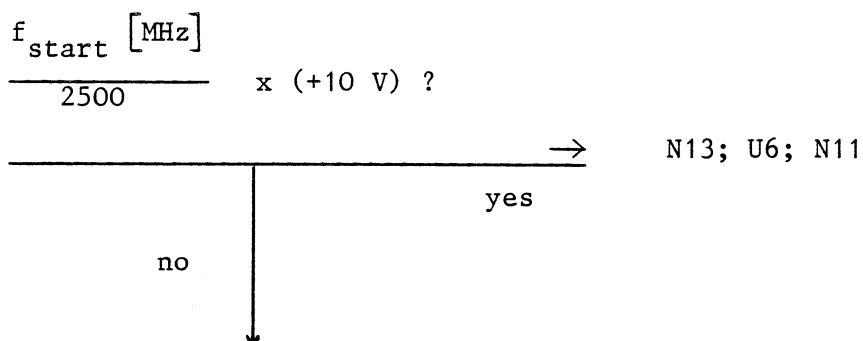
Troubleshooting is only possible when apart from the Sweep Control the rest of the Sweep Generator SWP is in perfect working order.

#### 5.3.1 Incorrect Setting of Start Frequency or Centre Frequency

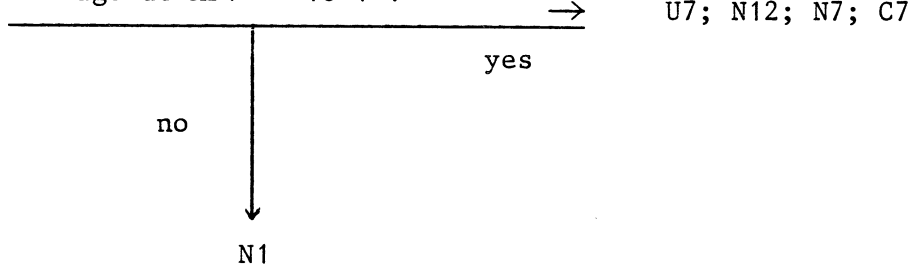
Voltage at MP5 =



Voltage at MP4 =

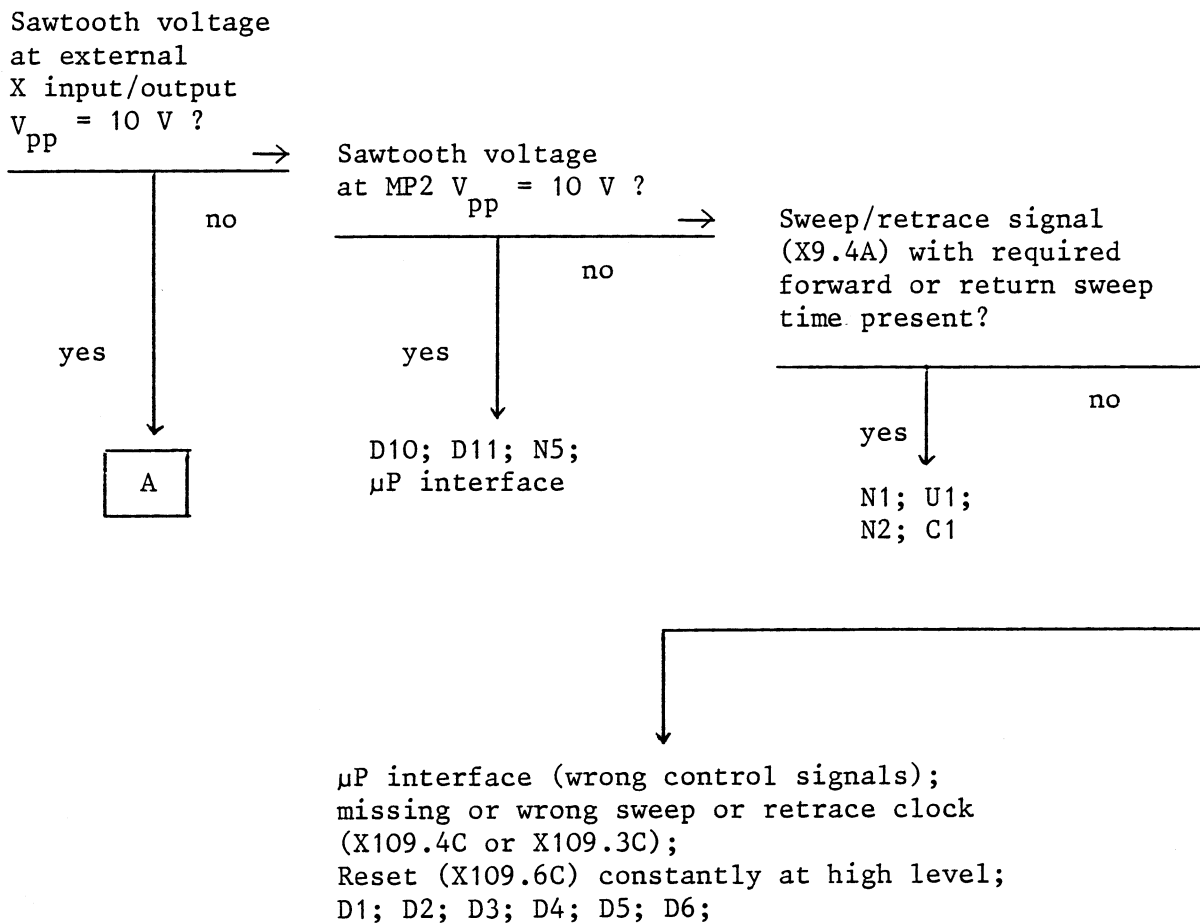


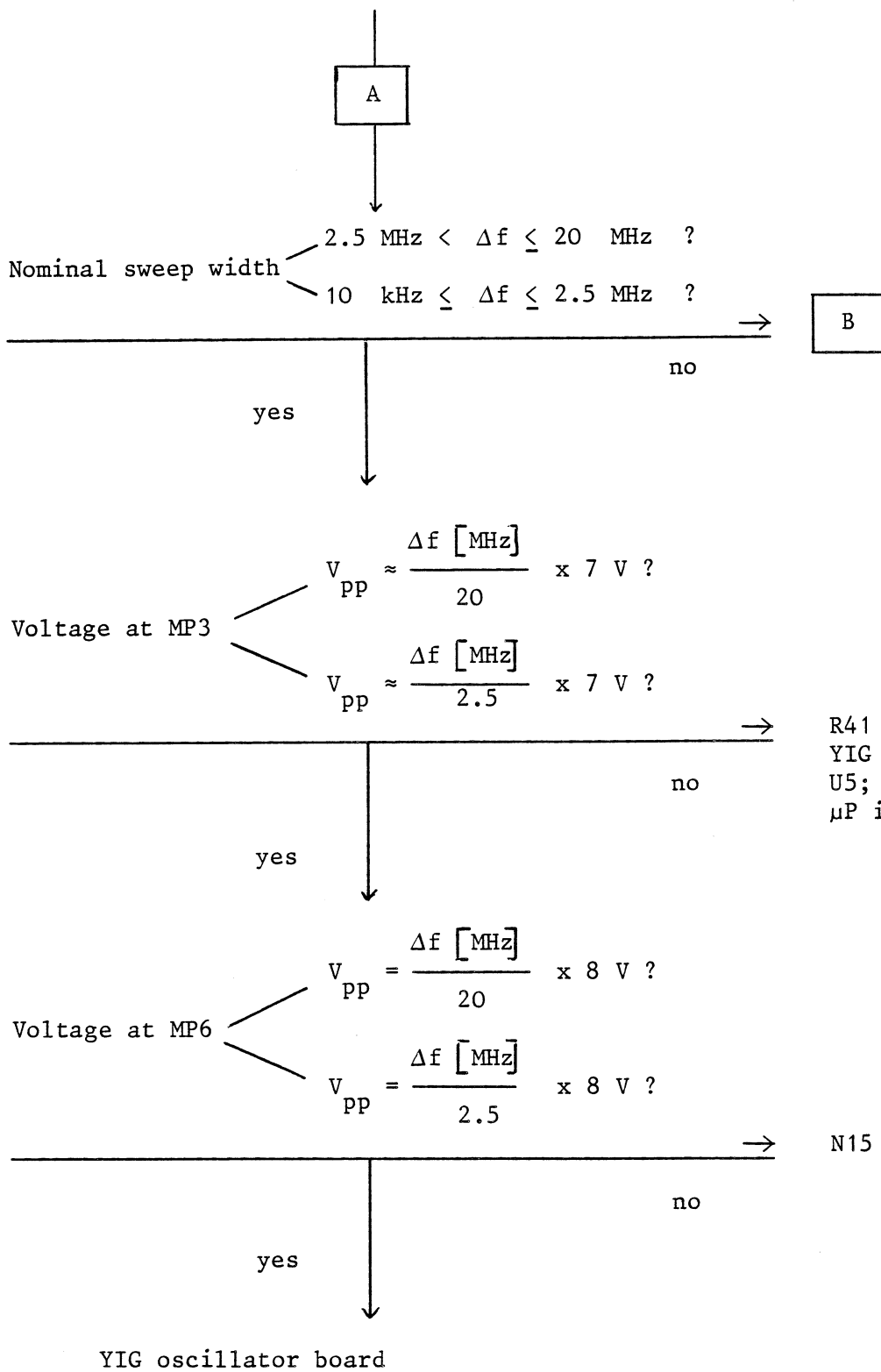
Voltage at MP1 = -10 V ?

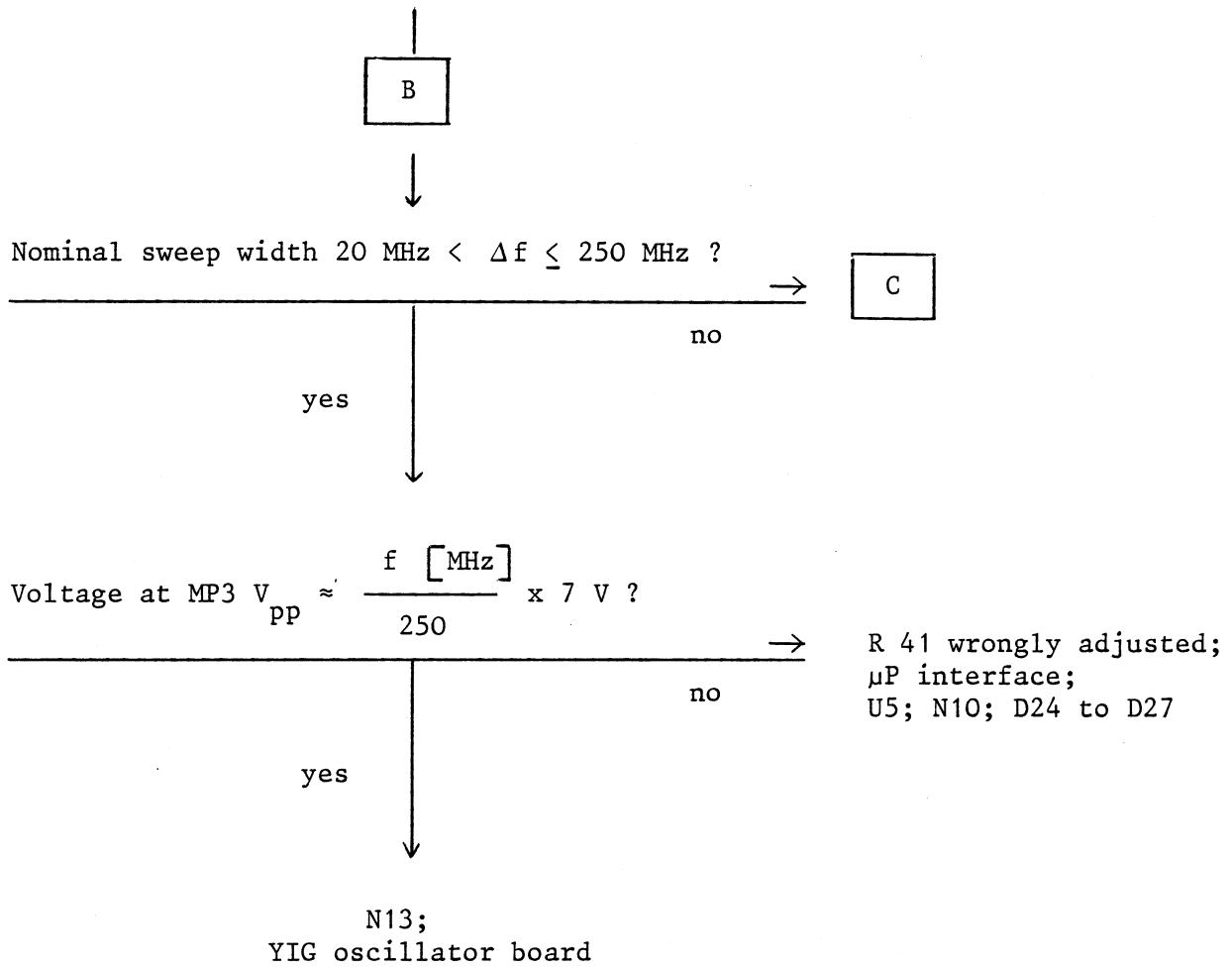




### 5.3.2 Incorrect Setting of Stop Frequency or Sweep Width







C



Nominal sweep width  $250 \text{ MHz} < \Delta f \leq 2500 \text{ MHz}$  ?

yes



Voltage at MP3  $V_{PP} \approx \frac{\Delta f \text{ [MHz]}}{2500} \times 7 \text{ V} ?$

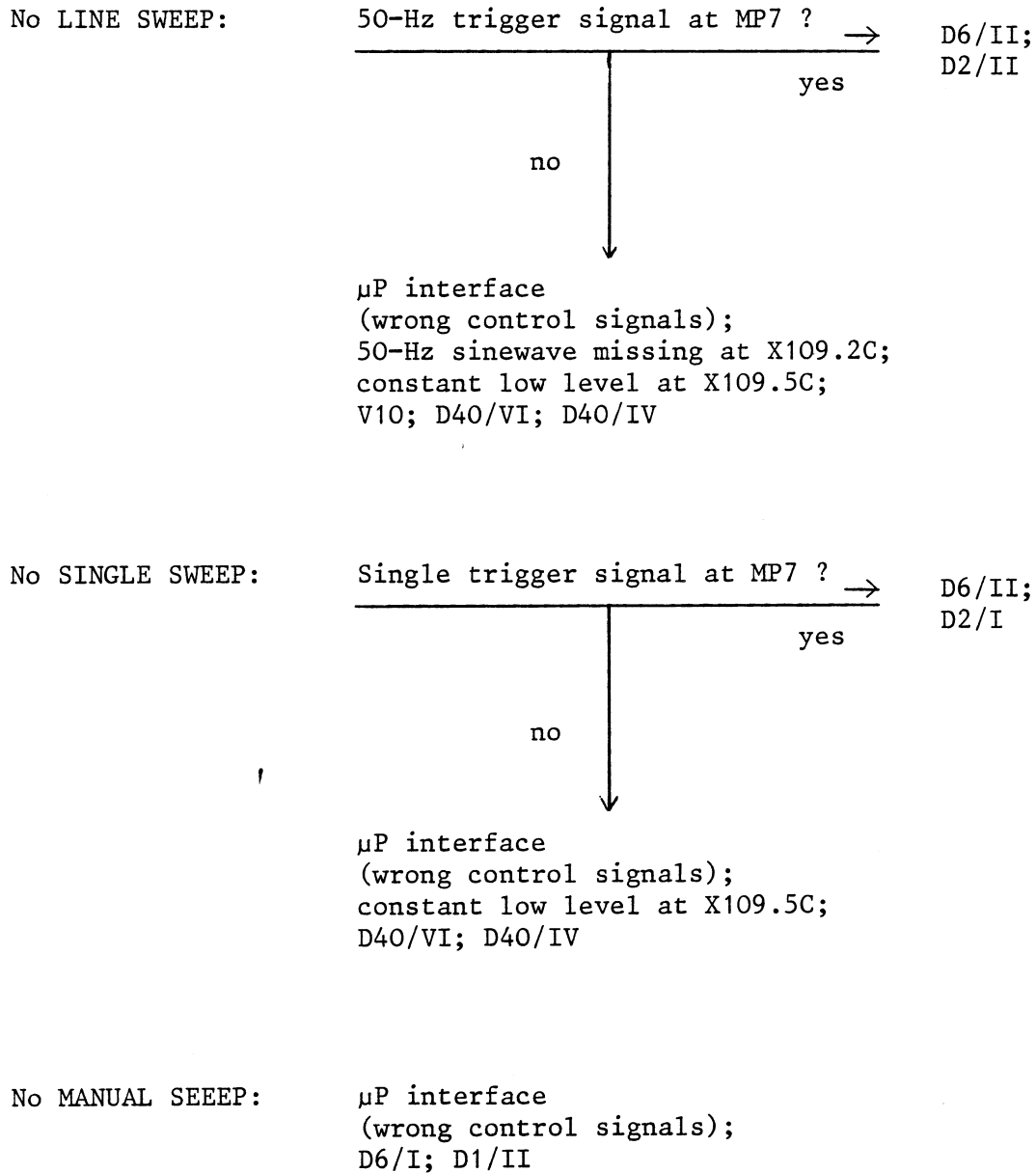
no

yes

N13;  
YIG oscillator board

R41 wrongly adjusted;  
 $\mu$ P interface;  
U5; N10; D24 to D27

### 5.3.3 Irregularities in LINE, SINGLE or MANUAL mode





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DesignationSachnummer  
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contained in

C1

CC 100PF+-2X6X9NPO  
CAPACITOR

CC 087.6541

VALVO 2222 678 10101

C2

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C3

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C4

CC 10NF-20+50X7X8R6000  
CAPACITOR

CC 087.7525

VALVO 2222 63051 64051103

C5

CC 10NF-20+50X7X8R6000  
CAPACITOR

CC 087.7525

VALVO 2222 63051 64051103

C6

CC 100PF+-2X6X9NPO  
CAPACITOR

CC 087.6541

VALVO 2222 678 10101

C7

CE 100UF-15+50X30V 6X24FL  
ELECTROLYTIC CAPACITOR

CE 453.7426

ERO-TANTAL MIL-ETAH3100/30

C10

CE 1,0UF+-20X35V 5X 4X 7  
ELECTROLYTIC CAPACITOR

CE 022.8185

ERO-TANTAL TA-ELKOETR1-1/35

C11

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C12

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C13

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C15

CK 100NF+-20X100V QUADER  
PLASTIC-FOIL CAPACITOR

CK 006.5033

ROEDERST MKT1822-410/0

C16

CK 100NF+-20X100V QUADER  
PLASTIC-FOIL CAPACITOR

CK 006.5033

ROEDERST MKT1822-410/0

C20

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C21

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C24

CC 470PF+-10X3X4R2000  
CAPACITOR

CC 087.6993

VALVO 2222 63051 471

C35

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C36

CC 100NF+-10X100V K1200VI  
CERAMIC CAPACITOR

CC 060.1149

AEROVOX CKR06BX104KL

C40

CK 100NF+-20X100V QUADER  
PLASTIC-FOIL CAPACITOR

CK 006.5033



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C41	ROEDERST MKT1822-410/C CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C42	AEROVOX CKR06BX104KL CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C50	AEROVOX CKR06BX104KL CK 220NF+-20% 63V QUADER CAPACITOR	CK 024.6944	
C51	ROEDERST MKT1822-422/06 CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C52	AEROVOX CKR06BX104KL CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C60	AEROVOX CKR06BX104KL CK 1,0UF+-10% 63V QUADER CAPACITOR	CK 024.6973	
C61	ROEDERST MKT1822-510/06/10% CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C62	AEROVOX CKR06BX104KL CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C63	AEROVOX CKR06BX104KL CC 6,8PF+-0,25PF3X4NPO CAPACITOR	CC 087.6406	
C65	VALVO 2222 678 09688 CK 100NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR	CK 006.5033	
C80	ROEDERST MKT1822-410/0 CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	
C81	SIEMENS B4136-B7226-Z CE 22UF -10+100%40V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7572	
C83	SIEMENS B4136-B7226-Z CC 1,5PF+-0,25PF3X4P100 CAPACITOR	CC 087.6193	
C90	VALVO 2222 678 03158 CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C91	AEROVOX CKR06BX104KL CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C92	AEROVOX CKR06BX104KL CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C93	AEROVOX CKR06BX104KL CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR	CC 060.1149	
C100	AEROVOX CKR06BX104KL CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7543	
C101	ROEDERST ELKO EK47/16 CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7543	

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Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in

	ROEDERST ELKO EK47/16		
D1	EL SN74LS11N 3/3INP. AND IC AND GATE SN74LS11N TEXAS SN74LS11N	BL 266.4135	
D2	BL SN54LS51J 2XAND+NOR-G. IC AND NOR GATE SN54LS51J TEXAS SN54LS51J	BL 549.3937	
D3	BL SN74LS191N ZAEHLER IC COUNTER TEXAS SN74LS191N	BL 250.2721	
D4	BL SN74LS191N ZAEHLER IC COUNTER TEXAS SN74LS191N	BL 250.2721	
D5	BL SN74LS191N ZAEHLER IC COUNTER TEXAS SN74LS191N	BL 250.2721	
D6	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N TEXAS SN74LS74N	BL 266.7934	
D10	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D11	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D24	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D25	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D26	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D27	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D30	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D40	BL SN74LS240N 8XINV.DRIV. IC 8XINV.DRIVER SN74LS240 TEXAS SN74LS240N	BL 282.9196	
D41	BL SN74LS30N 8/INP.NAND IC NAND GATE SN74LS30N TEXAS SN74LS30N	BL 266.2049	
D42	BL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8 TEXAS SN74LS138N	BL 510.1379	
D45	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
D46	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
D47	BL SN74LS273N 8BIT-D-REG.	BL 214.8998	





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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D48	8BIT-D-REGISTER TEXAS SN74LS273N BL SN74LS273N 8BIT-D-REG.	BL 214.8998	
D49	8BIT-D-REGISTER TEXAS SN74LS273N BL SN74LS273N 8BIT-D-REG.	BL 214.8998	
D50	8BIT-D-REGISTER TEXAS SN74LS273N BL SN74LS273N 8BIT-D-REG.	BL 214.8998	
D51	8BIT-D-REGISTER TEXAS SN74LS273N BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER TEXAS SN74LS244N	BL 092.8984	
L100	LD 2,70UH10%0,550HMO,355A CHOKE DELEVAN DROSSEL1025-30	LD 067.2911	
N1	BO AD581J 10V-REF.SPG.QU. IC CONSTANT TO STABILIZE ANALOG-DEV AD581J	BO 300.6347	
N2	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N5	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N7	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N8	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N10	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N11	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N12	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N13	BO UA714HC PRAEZ.OP-AMP IC OP.AMPL.UA714HC FAIRCHILD UA714HC	BO 333.2834	
N15	BO LF356H BIFET-OP.AMP BO LF356H BIFET-OP.AMP. AMD LF356H	BO 333.5879	
R1	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%1,0K	RF 069.1029	
R2	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%2,2K	RF 069.2225	
R4	RF 0,25W 10KOHM +-5%	RF 069.1035	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R5	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W4,7KOHM +-5%	RF 069.4728	
R6	RESISTOR DRALORIC LCA0207/+5%4,7K RF 0,25W4,7KOHM +-5%	RF 069.4728	
R7	RESISTOR DRALORIC LCA0207/+5%4,7K RF 0,25W 10KOHM +-5%	RF 069.1035	
R9	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5%	RF 069.1035	
R10	RESISTOR DRALORIC LCA0207/+5%10K RL 0,25W 750 OHM+-1%TK50	RL 082.2360	
R15	RESISTOR DRALORIC SMA0207/750OHM-F-C RF 0,25W 10KOHM +-5%	RF 069.1035	
R16	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W150 OHM +-5%	069.1512	
R17	RESISTOR DRALORIC LCA0207/+5%150 RF 0,25W150 OHM +-5%	069.1512	
R20	RESISTOR DRALORIC LCA0207/+5%150 RF 0,25W 1KOHM +-5%	RF 069.1029	
R21	RESISTOR DRALORIC LCA0207/+5%1,0K RF 0,25W 1KOHM +-5%	RF 069.1029	
R22	RESISTOR DRALORIC LCA0207/+5%1,0K RF 0,25W100KOHM +-5%	RF 069.1041	
R24	RESISTOR DRALORIC LCA0207/+5%100K RF 0,25W220 OHM +-5%	RF 069.2219	
R25	RESISTOR DRALORIC LCA0207/+5%220 RF 0,25W 1 MOHM +-5%	RF 069.1058	
R26	RESISTOR DRALORIC LCA0207/+5%1,0M RF 0,25W 1KOHM +-5%	RF 069.1029	
R27	RESISTOR DRALORIC LCA0207/+5%1,0K RL 0,25W32,8KOHM+-0,1%T25	RL 084.4054	
R28	RESISTOR RF 0,25W 1KOHM +-5%	RF 069.1029	
R29	RESISTOR DRALORIC LCA0207/+5%1,0K RL 0,25W10,9KOHM+-0,1%T25	RL 084.3135	
R30	RESISTOR DRALORIC SMA0207/10,9K-B-E RL 0,25W4,99KOHM+-0,1%T25	RL 084.2480	
R40	RESISTOR DRALORIC SMA0207/4,99K-B-E RL 0,25W4,87KOHM+-0,1%T25	RL 084.2468	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R42	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
R45	RF 0,25W3,3KOHM +-5% RESISTOR DRALORIC LCA0207/+5%3,3K	RF 069.3321	
R46	RF 0,25W100 OHM +-5% RESISTOR DRALORIC LCA0207/+5%100	RF 069.1012	
R49	RL 0,25W14,2KOHM+-0,1%T25 RESISTOR	RL 084.3358	
R50	RL 0,25W1,42KOHM+-0,1%T25 RESISTOR	RL 083.9430	
R51	RL 0,25W3,52KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/3,52K-B-E	RL 084.2197	
R52	RL 0,25W3,52KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/3,52K-B-E	RL 084.2197	
R53	RL 0,25W3,52KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/3,52K-B-E	RL 084.2197	
R54	RL 0,25W3,52KOHM+-0,1%T25 RESISTOR DRALORIC SMA0207/3,52K-B-E	RL 084.2197	
R55	RL 0,25W38,3KOHM+-0,1%T25 RESISTOR	RL 084.4183	
R56	RL 0,25W49,9KOHM+-0,1%T25 RESISTOR DRALORIC SMA/207/49,9K-B-E	RL 084.4402	
R57	RF 0,25W100KOHM +-5% RESISTOR DRALORIC LCA0207/+5%100K	RF 069.1041	
R58	RL 0,25W100KOHM+-0,1%TK25 RESISTOR DRALORIC SMA0207/100K-B-E	RL 084.4983	
R59	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R60	RL 0,125W69,8KOHM+-1%TK50 RESISTOR	RL 086.3878	
R61	DALE MF1/10 69,8K 1%TK50 RL 0,25W75,9KOHM+-0,1%T25 RESISTOR DRALORIC SMA/207/75,9K-B-E	RL 084.4754	
R62	RF 0,25W 1 MOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0M	RF 069.1058	
R65	RL 0,25W100KOHM+-0,1%TK25 RESISTOR DRALORIC SMA0207/100K-B-E	RL 084.4983	
R66	RF 0,25W 47 OHM +-5% RESISTOR DRALORIC LCA0207/+5%47	RF 069.4705	
R67	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.		enthalten in contained in	
R70	RF 0,25W 1CKOHM +-5% RESISTOR DRALORIC LCA0207/+-5%10K	RF 069.1035			
R71	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%1,0K	RF 069.1029			
R72	RL 0,25W 487 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/487K-F-C	RL 083.2606			
R80	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%10K	RF 069.1035			
R81	RL 0,25W 1 KOHM+-0,1%TK25 RESISTOR DRALORIC SMA0207/1K-B-E	083.9146			
R82	RL 0,25W909 OHM+-0,1%TK25 RESISTOR DRALORIC SMA/207/909OHM-B-E	RL 083.9069			
R83	RL 0,25W2KOHM+-0,1%TK25 RESISTOR DRALORIC SMA0207/2,00K-B-E	RL 083.9723			
R84	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%1,0K	RF 069.1029			
R86	RF 0,25W100 OHM +-5% RESISTOR DRALORIC LCA0207/+-5%100	RF 069.1012			
R87	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%1,0K	RF 069.1029			
R88	RF 0,25W 47 OHM +-5% RESISTOR DRALORIC LCA0207/+-5%47	RF 069.4705			
R100	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+-5%1,0K	RF 069.1029			
U1	BJ AD7531 12B-D/A -CONV D/A-CONVERTER ANALOG-DEV AD7531KN	BJ 300.6324			
U5	BJ AD7541KN 12B-D/A -CONV D/A-CONVERTER MPS MP-7621/7541KN	BJ 356.0467			
U6	BJ AD7520 10B-D/A -CONV D/A-CONVERTER ANALOG-DEV AD7520KN	BJ 300.6499			
U7	BJ AD7520 10B-D/A -CONV D/A-CONVERTER ANALOG-DEV AD7520KN	BJ 300.6499			
V1	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151	AD 012.0723			
V2	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151	AD 012.0723			
V3	AD 1N4151 50V 0,2 A UDI	AD 012.0723			

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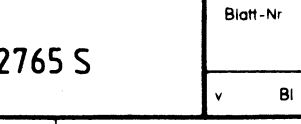
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V4	DIODE AEG-TELEF 1N4151 AD 1N4151 50V 0,2 A UDI	AD 012.0723	
V5	DIODE AEG-TELEF 1N4151 AD 1N4151 50V 0,2 A UDI	AD 012.0723	
V6	DIODE AEG-TELEF 1N4151 AD 1N4151 50V 0,2 A UDI	AD 012.0723	
V7	DIODE AEG-TELEF 1N4151 AE 5082-2800 SCHOTTKYDI	AE 012.9066	
V8	DIODE HEWLETT-P. 5082-2800 AE 5082-2800 SCHOTTKYDI	AE 012.9066	
V9	DIODE HEWLETT-P. 5082-2800 AD 1N4151 50V 0,2 A UDI	AD 012.0723	
V10	DIODE AEG-TELEF 1N4151 AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX	AK 010.5163	
X1	FP INDIREKT-STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X9	FP STECKERLEISTE 32POL. ERNI 9722.303.470.1	FP 565.8100	
X109	FP STECKERLEISTE 48POL. PANDUIT 100-348-063P	FP 099.0908	

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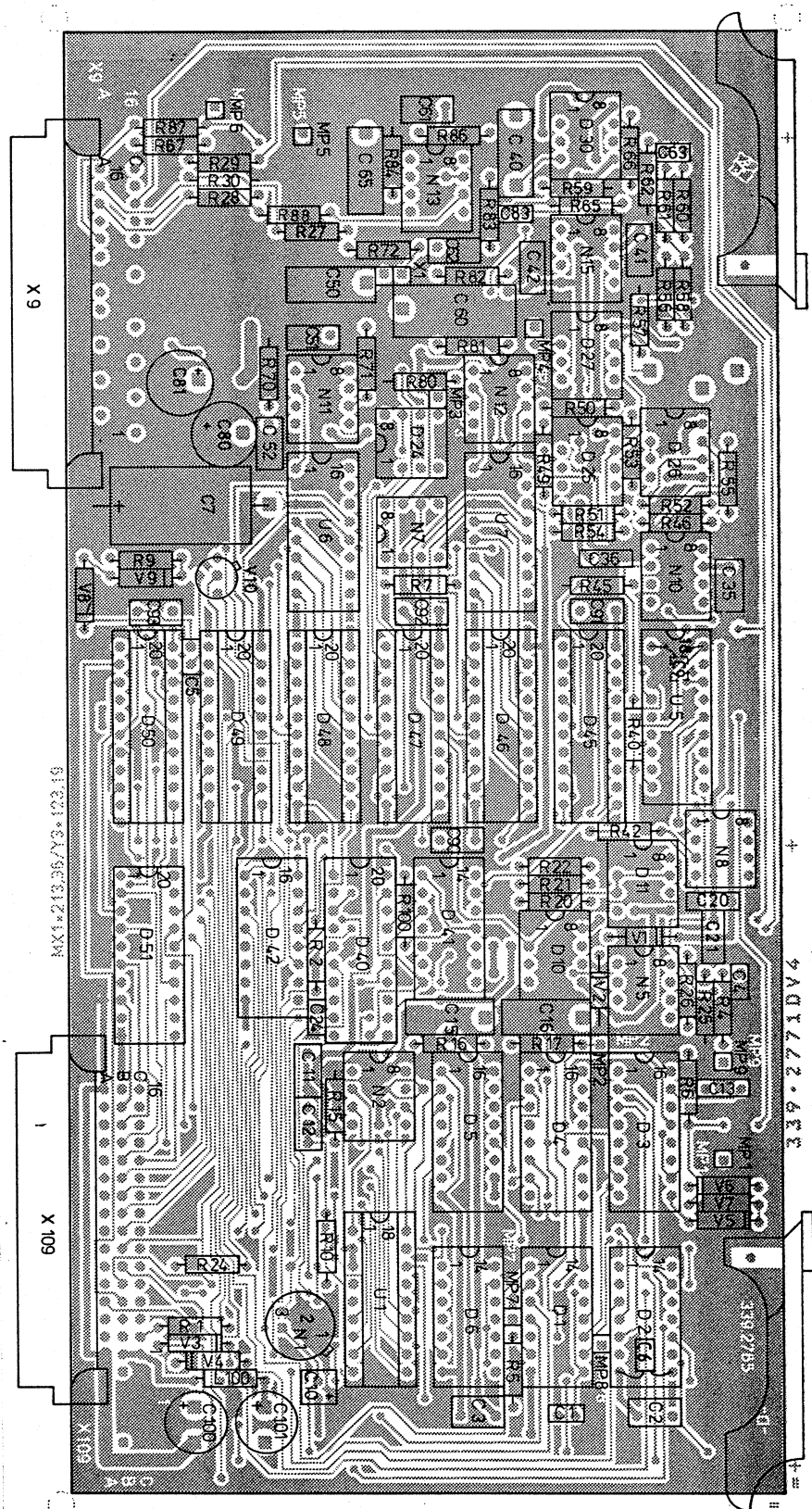
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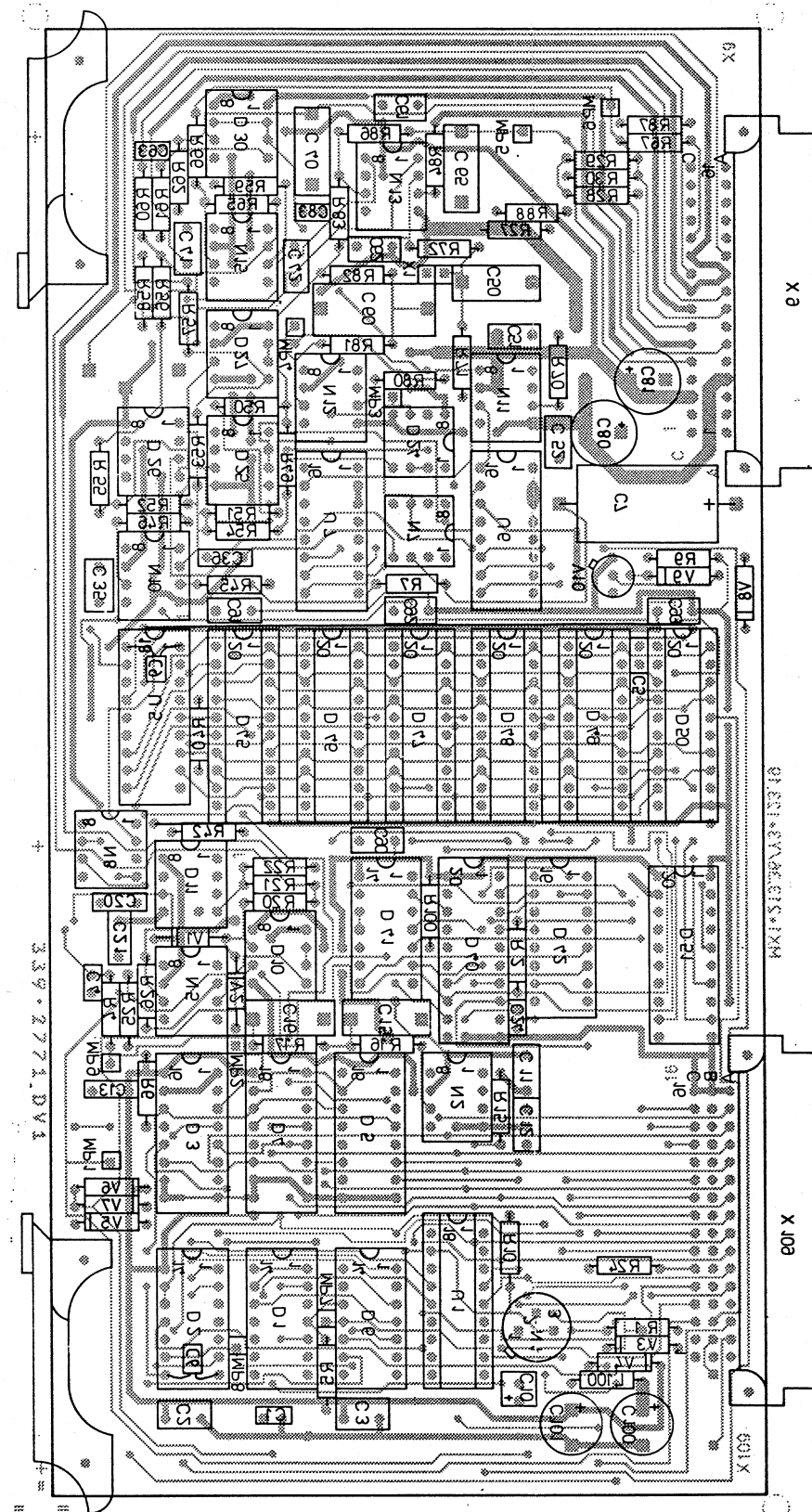



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Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side



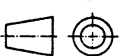
Ansicht und Leitungsführung Lötseite  
View of tracks on solder side



G	29065	1.83	CO	Maße ohne Toleranzangabe		Maßstab 1 : 1				
H	30 467	08.83	GN			Halbzeug, Werkstoff				
				1GME	Tag	Name	Benennung  Ablaufsteuerung Sweep control			Z
				Bearb.	1.83	CO				
				Gepr.						
				Norm						
				 <b>ROHDE &amp; SCHWARZ</b>		Zeichn.-Nr.			Blatt-Nr.	
						339.2765			2	
Änd. Zust.	Änderungs- Mitteilung	Tag	Name	zu Gerät SWP		reg. i. V. 339.0010V			erste Z. 339.0010	
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ROHDE & SCHWARZ

ISO-Projektion  
Methode E





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SERVICE INSTRUCTIONS

Control and Modulation Amplifier

339.2913.02



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## 5. Service Instructions for Control and Modulation Amplifier 339.2913.02

(See circuit diagram 339.2913 S)

### 5.1 Circuit Description

The control and modulation amplifier board comprises four functional groups:

- a) Control amplifier for RF level control and amplitude modulation
- b) Modulation amplifier for AM and FM including digital level adjustment (modulation depth and frequency deviation, respectively)
- c) Generation of internal 1-kHz pulse modulation and processing of the external pulse modulation signal and BLANK REQUEST signal (RF blanking during sweep retrace)
- d) Microprocessor interface as controller.

#### 5.1.1 RF Level Control

The control amplifier of the RF amplitude control loop (N5) is designed as a PI controller (R37, C7) to cover a wide bandwidth. The control input is a variable DC voltage delivered by the 10-bit D/A converter U2 (= RF level adjustment), on the one hand, and a modulation signal applied via the switch D8 in the AM mode, on the other. The controlled quantity is applied from the level detector and from the external ALC input via the switch D13 and an amplifier (N6) to the controller.

With start frequencies  $< 10$  MHz or  $< 1$  MHz, the capacitors C14, C15 are connected in parallel with the basic charging capacitor of the RF rectifier circuit in the level detector via D14, D15. The resistors R77, R79 determine the quiescent current through the RF detector diode to X10.6A (DET). At the same time, they in conjunction with R58, R59 also determine the current through the compensation diode of the level detector via KOMP A and KOMP K so that the rectified voltage available at pin 7 of the switch D13 is largely temperature-compensated on account of the anti-serial connection of the two diodes.

The control loop is closed via the broadband amplifier and the PIN diode modulator provided on the converter board. Because of the highly non-linear characteristics of the PIN diode modulator and the level detector, the variable of the controller is applied to a correction network consisting of

V4, V5 and R31 to R35 before acting on the control path (PIN diode modulator) via the impedance transformer V3 and X10.11A (PIN CONT 1).

### 5.1.2 Modulation Amplifier

In the AM and FM modes, the external modulation signal fed in at X10.10C (EXT MOD) - nominal voltage  $V_p = 1.41 \text{ V}$  - is applied via the switch D2 to the wideband operational amplifier N1 where it is amplified to  $V_p = 7.25 \text{ V}$ .

It is also possible to apply the sawtooth signal normally used for sweeping via the switch D1 to the input of the amplifier N1 (= level sweep mode). The multiplying 10-bit D/A converter U1 permits the modulation depth or frequency deviation to be selected in 1000 steps between 0 and 100% or 0 and 10 MHz (address 1000 at U1 corresponds to  $V_p = 7.07 \text{ V}$  at the output of N2).

To achieve a still higher resolution below 10% modulation depth or 1 MHz frequency deviation, 10/1 gain switchover is effected via D7. In the AM mode, the phase-correct modulation signal is applied from the output of the following buffer amplifier N3/I via the switch D8 to the RF level control.

In the FM mode, the switch D17 permits the selection of an in-phase or anti-phase modulation signal (of significance only in conjunction with the Synchronizer Option). The FM signal is applied via the outputs X10.5C (FM YIG) and X10.9A (FM REF) depending on the switch position of D16 either to the FM tuning coil of the YIG oscillator or the modulated reference oscillator in the synchronizer analog section.

### 5.1.3 Pulse Modulation and RF Blanking

Pulse modulation is possible in two ways:

- a) External PM via the EXT MOD input, the Schmitt trigger gate D5/I, the switching gate D6/II and the triple NAND gate D6/III to the output HFSW (fed to the RF switch on the converter board).
- b) Internal PM with 1-kHz squarewave signal (50% duty cycle) derived by division (D3, D4) from the 10-MHz crystal reference (input F 10 MHz-S) via the triple NAND gate D6/III to the output HFSW. The BLANK REQUEST signal which is applied via the third input of D6/III switches the RF at the output of the SWP off at low level (e.g. sweep operation with blanked retrace) and at the same time provides a defined output (approximately -7 V) of the control amplifier N5 via the inverter D5/VIII and the switch D12.

The switch D9 prevents unwanted jumps of the output N5 to the positive limit during RF voltage blanking.

During pulse modulation, a high integration capacitance (C9) is connected to the control amplifier N5 which keeps the amplifier output voltage and consequently the RF level constant during blanking.

#### 5.1.4 Microprocessor Interface

The microprocessor interface consists of

- four write ports (D28 to D31)  
to control the switches and D/A converters
- the data bus receiver (D27) and
- the address decoder (D25, D26, D5/IV, D5/VI).

The assigned address range extends from

hexadecimal 30 to 33 (D28 corresponding to 30H)\*  
(D29 corresponding to 31H)  
(D30 corresponding to 32H)  
(D31 corresponding to 33H)

\*) H stands for hexadecimal

## 5.2 Checking and Adjustment Procedures

### Setup:

- Set potentiometers R6, R40, R58 and R66 to mid-position (approximately 7.5 turns from the right or the left stop)
- Remove D28 to D31 from their sockets and replace by eight coding switches each; all coding switches at low level<sup>\*</sup>
- Feed all supply voltages via connector strips with standard wiring to PC board<sup>\*</sup>

X110.1BC	: +5.2 V
X110.16ABC, X110.1A	: $\perp$
X10.3C	: +15 V
X10.3A, X10.4C	: $\perp$
X10.4A	: -15 V
X10.1C	: +5.2 V
X10.1A, X10.2C	: $\perp$
X10.2A	: -5.2 V

- Connect Schottky diode between X10.16C (anode) and X10.16A (cathode)<sup>\*</sup>

### 5.2.1 RF Level Control

- Set port 30H (D28) to FFH and port 31H (D29) to COH;  
connect DVM to MP5: adjust R66 for -10 V  $\pm$ 50 mV
- Apply low signal to X110.5A;  
connect DVM to X110.7A: high level;  
connect DVM to X10.12C: approximately -7 V;  
load resistance 100  $\Omega$ /2 W (to ground);  
connect DVM to X10.11A: approximately -5.7 V
- Apply high signal to X110.5A and feed +0.6 V into input X10.6A;  
connect DVM to X110.7A: low level;  
connect DVM to pin 6/D9: adjust R40 for 0 V  $\pm$ 100 mV
- Set port 31H (D29) to C4H and feed +0.5 V into input X10.8A;  
connect DVM to MP4: +1 V

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<sup>\*</sup> Not applicable when using test program for testing the Sweep Generator SWP

### 5.2.2 Modulation Amplifier

- Apply 1-kHz sinewave voltage ( $V_{\text{rms}} = 1 \text{ V} \pm 0.1\%$ ) to the modulation input X10.10C;  
Connect DVM (AC voltage measurement range) to MP1:  
 $V_{\text{rms}} = 5.125 \text{ V} \pm 0.3\%$
- Connect DVM to MP1: adjust R6 for  $0 \text{ V} \pm 1 \text{ mV}$
- Set port 32H (D30) to FAH,  
connect DVM and oscilloscope to MP2:  $V_{\text{rms}} = 5 \text{ V} \pm 0.4\%$   
DC voltage offset  $< 5 \text{ mV}$
- Connect DVM and oscilloscope to MP3:  $V_{\text{rms}} = 5 \text{ V} \pm 0.5\%$   
DC voltage offset  $< 10 \text{ mV}$
- Connect oscilloscope to X10.5C:  
signal must be in phase with the input signal (1 kHz sinewave)
- Apply low level to X110.6A;  
connect oscilloscope to X10.5C:  
phase of signal must be opposite to that of input signal
- Set port 31H (D29) to 02H;  
connect DVM and oscilloscope to X10.5C:  $V_{\text{rms}} = 0.5 \text{ V} \pm 0.5\%$   
DC voltage offset  $< 5 \text{ mV}$
- Set port 31H (D29) to 20H;  
connect DVM and oscilloscope to X10.9A:  $V_{\text{rms}} = 5 \text{ V} \pm 0.5\%$   
DC voltage offset  $< 10 \text{ mV}$
- Set port 30H (D28) to FFH;  
set port 31H (D29) to COH;  
set port 33H (D31) to 01H;  
feed +0.6V into input X10.6A;  
apply high signal to X110.5A;  
connect oscilloscope to pin 6/D9: 1-kHz sinewave signal,  
 $V_{\text{pp}} = \text{approximately } 1.2 \text{ V}$
- Apply 1-kHz modulation signal ( $V_{\text{rms}} = 1 \text{ V}$ ) to input X10.7C;  
set port 31H (D29) to 01H and port 33H (D31) to 02H;  
connect DVM (AC voltage measurement range) to MP1:  
 $V_{\text{rms}} = 5.25 \text{ V} \pm 0.3\%$

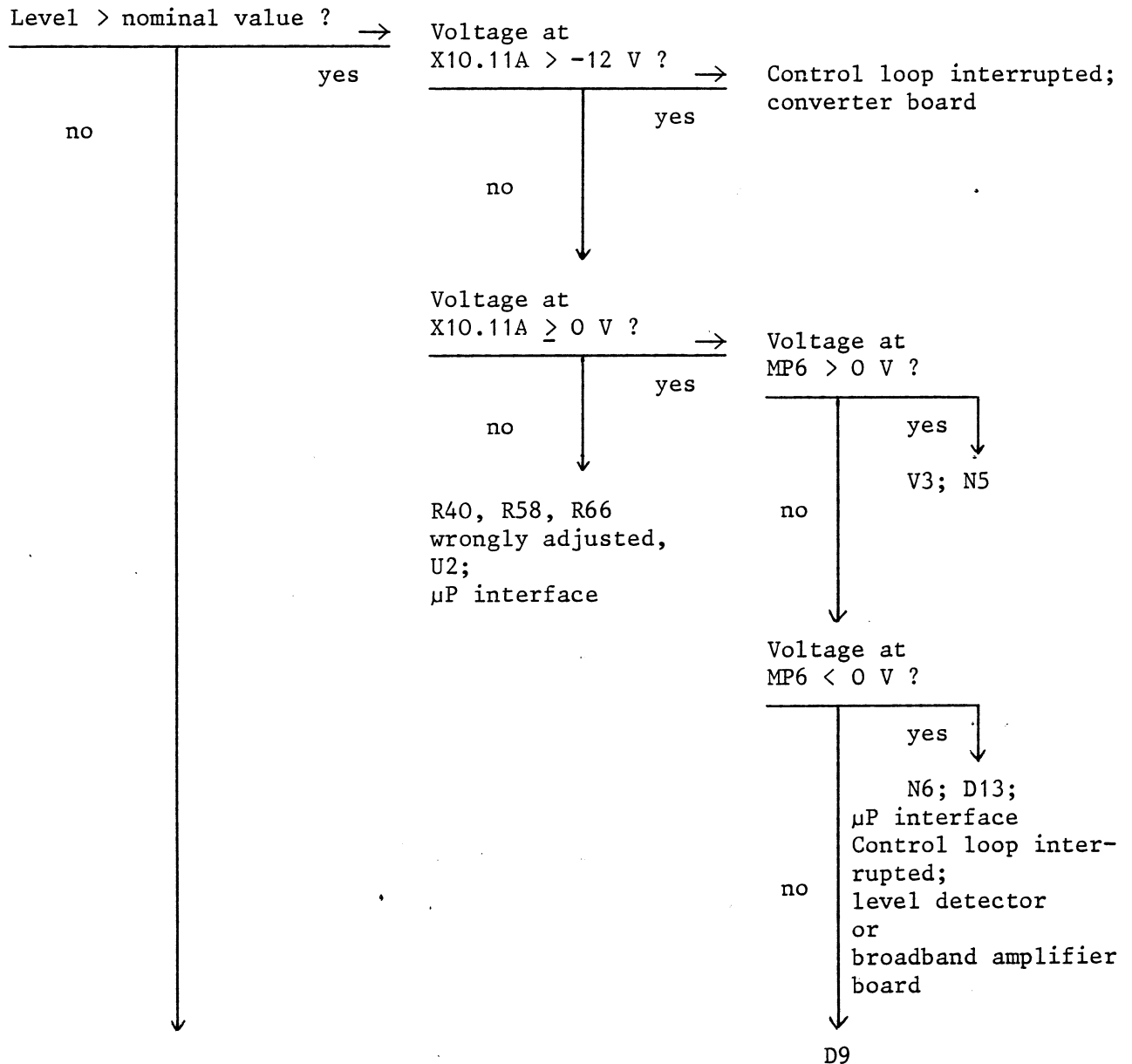
### 5.2.3 Pulse Modulation

- Set port 31H (D29) to 10H;  
apply 10-MHz sinewave voltage ( $V_{\text{rms}} = 0.5 \text{ V}$ ) to input 110.2C;  
connect oscilloscope to MP8: 1-kHz squarewave signal (TTL level) with  
50% duty cycle
- Apply 10-kHz clock signal (TTL level) to input X10.10C;  
set port 31H (D29) to 09H;  
apply high signal to X110.5A;  
connect oscilloscope to X110.7A: antiphase 10-kHz clock (TTL level)

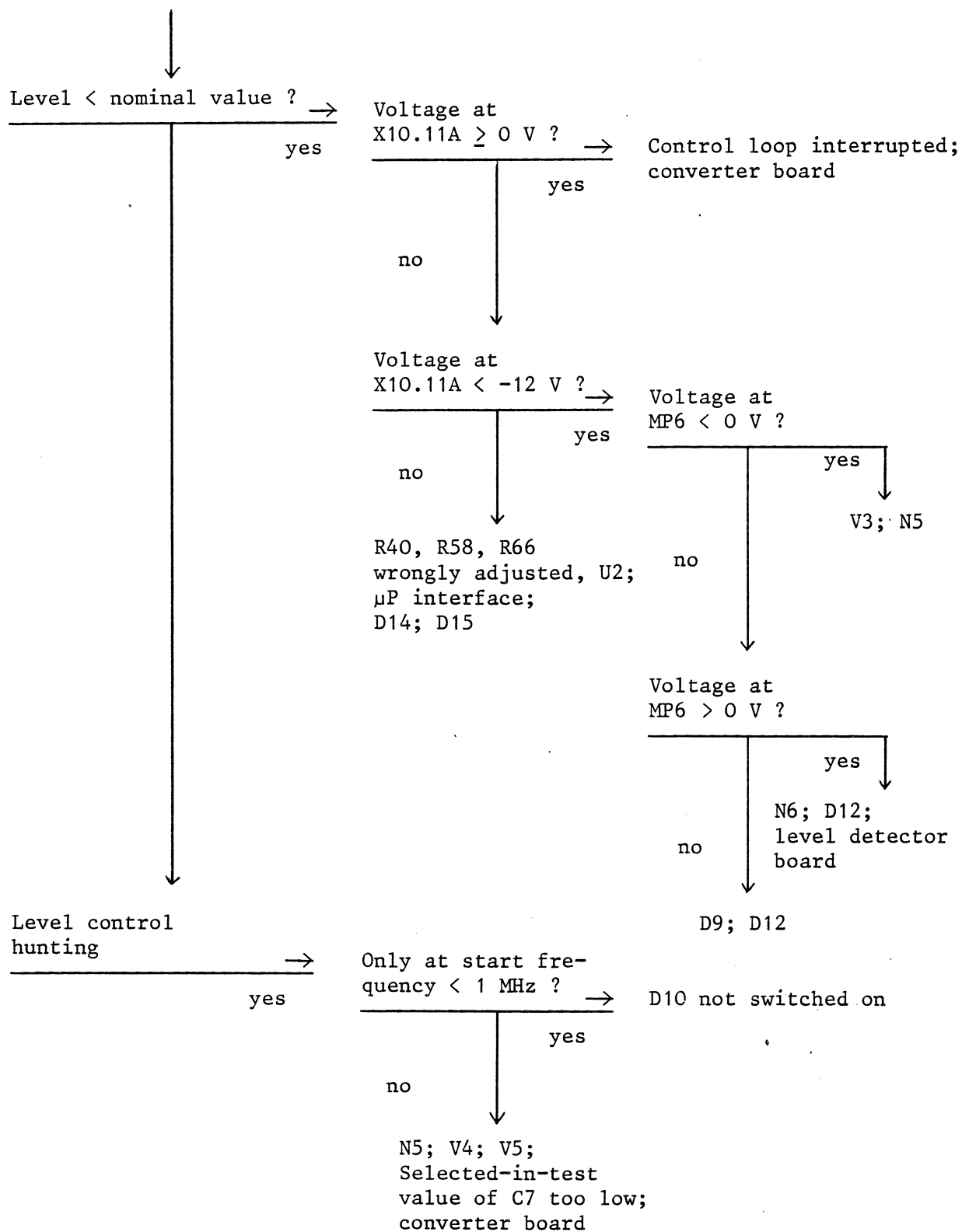
### 5.3 Troubleshooting

Troubleshooting is only possible when apart from the Control and Modulation Amplifier the rest of the Sweep Generator SWP is in perfect working order.

#### 5.3.1 RF Level Control

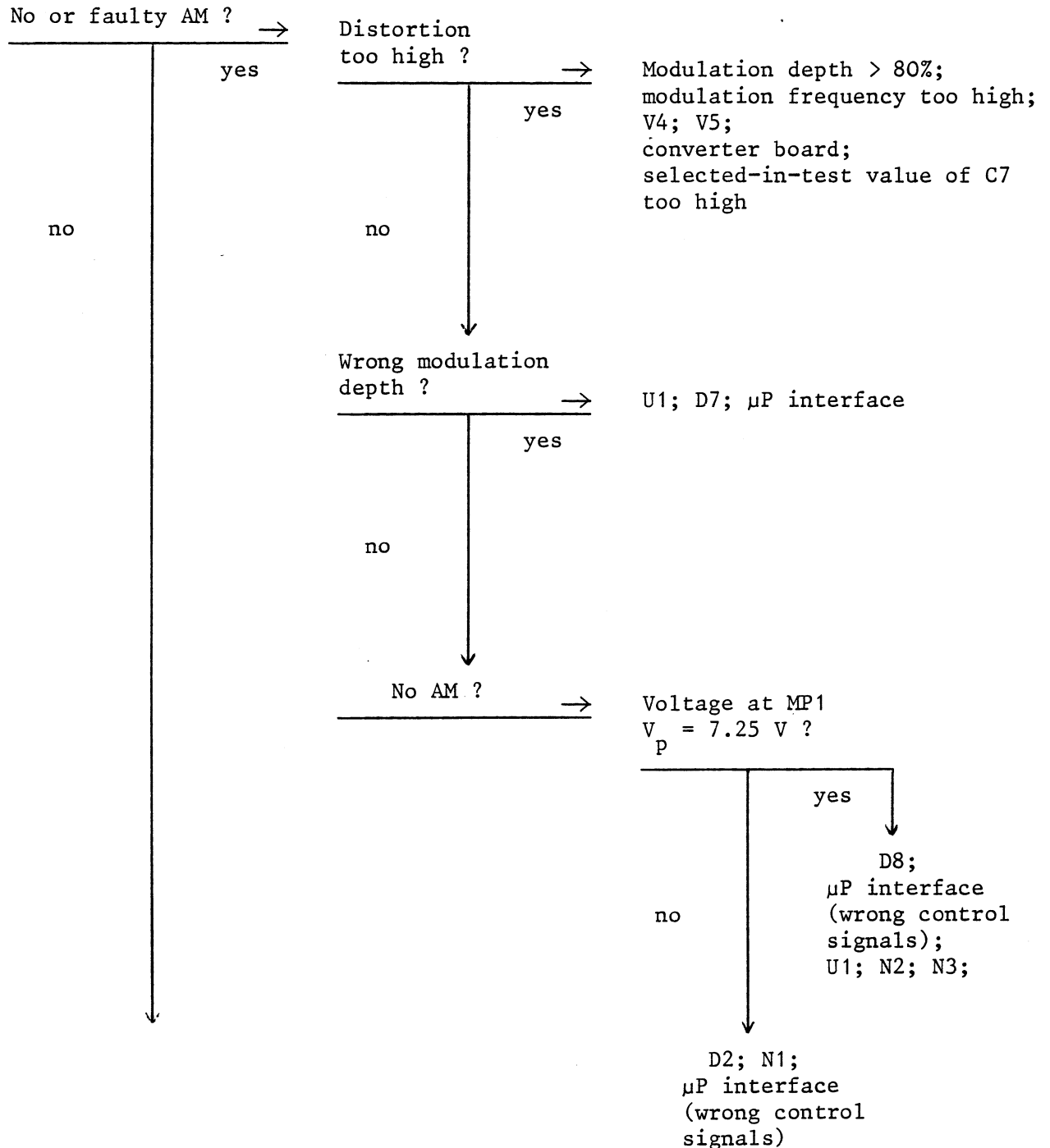


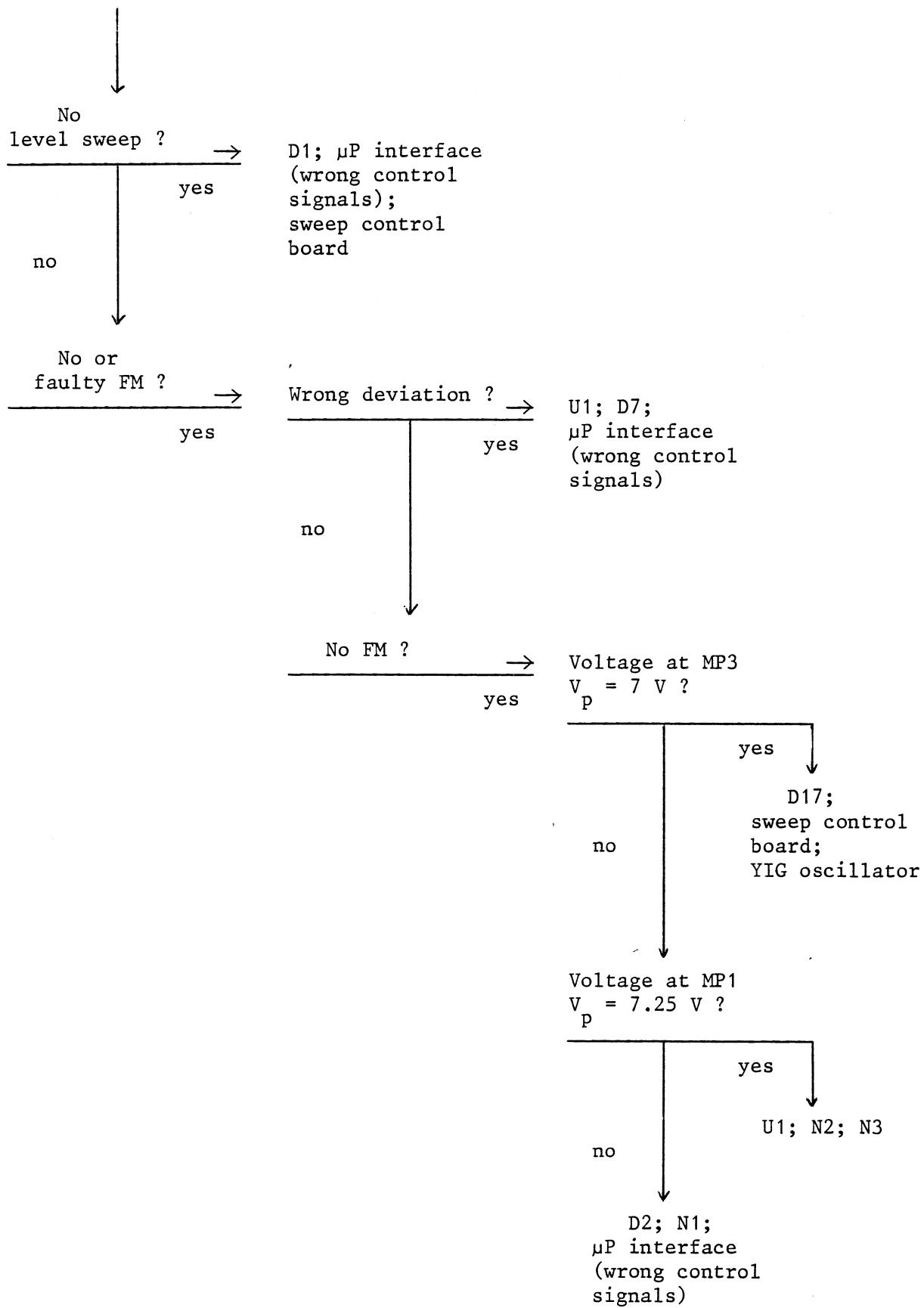




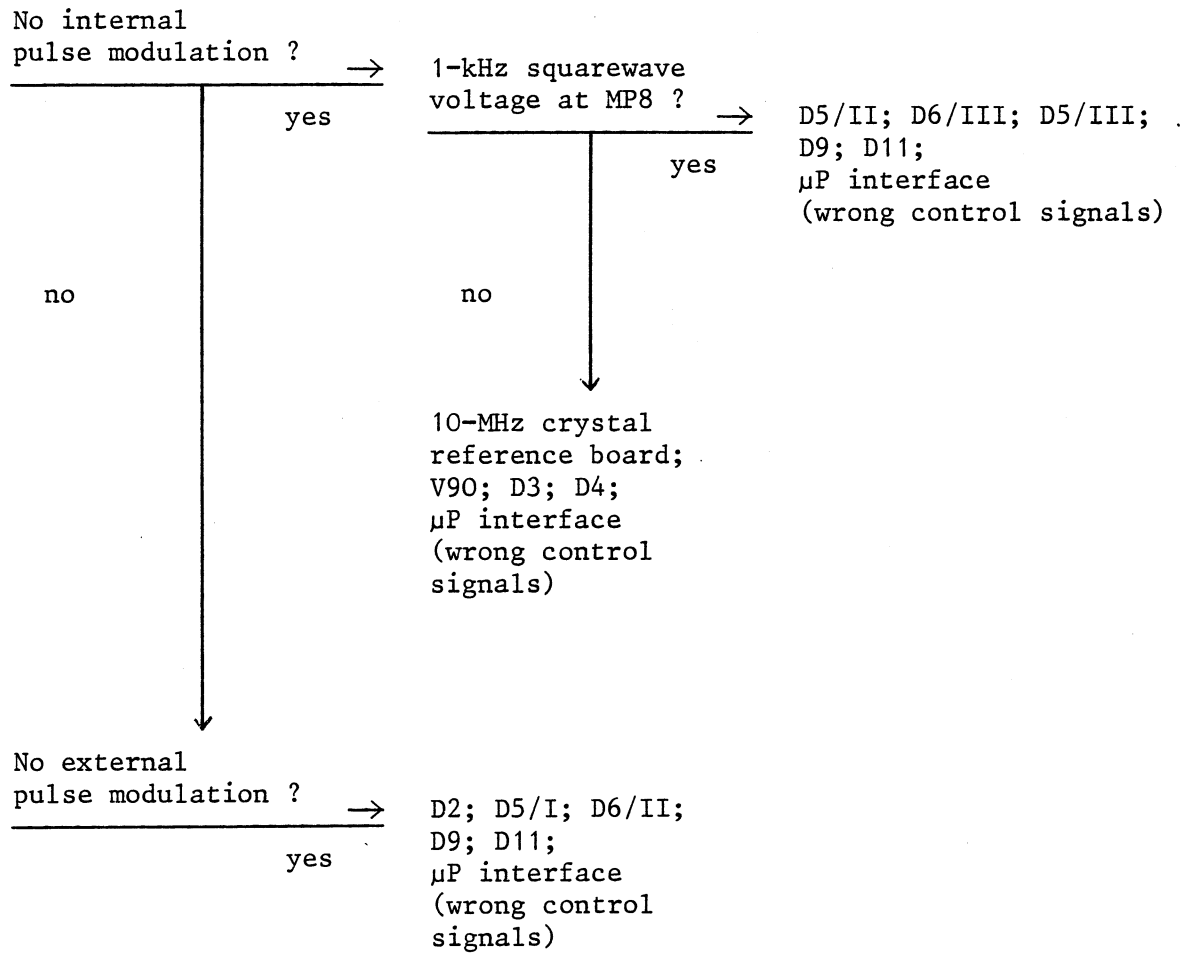
### 5.3.2 Modulation Amplifier

Apply AF signal ( $V_p = 1.41$  V) to external modulation input.





### 5.3.3 Pulse Modulation





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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
C2	CC 1NF+-10%63V K2000 CERAMIC CAPACITOR VALVO 2222 63051 102	CC 022.0784	
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	
C7	TRIMMWERT / SELECTED		
C8	CC 680PF+-10%4X5R2000 CAPACITOR VALVO 2222 63051 681	CC 087.7019	
C9	CK 100NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-410/0	CK 006.5033	
C10	CC 100PF+-2%6X9NP0 CAPACITOR VALVO 2222 678 10101	CC 087.6541	
C11	CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
C12	TRIMMWERT / SELECTED		
C13	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR1-1/35	CE 022.8185	
C14	CC 4,7NF+-10%6X9R2000 CAPACITOR VALVO 2222 63051 472	CC 087.7102	
C15	CC 470PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 471	CC 087.6993	
C17	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C18	CK 470NF+-5%63V5RM MKT CAPACITOR WIMA MKS2/63/0,47UF/5%	CK 099.2975	
C20	CC 100NF+-10%100V K1200VI CERAMIC CAPACITOR AEROVOX CKR06BX104KL	CC 060.1149	
BIS/TO			
C35			
C36	CC 470PF+-10%3X4R2000 CAPACITOR VALVO 2222 63051 471	CC 087.6993	
C37	CE 22UF -10+100%40V 9X13 ELECTPOLYTIC CAPACITOR SIEMENS B4136-B7226-Z	CE 022.7572	
C38	CE 22UF -10+100%40V 9X13	CE 022.7572	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C39	ELECTROLYTIC CAPACITOR SIEMENS B4136-B7226-Z CE 22UF -10+100%40V 9X13	CE 022.7572	
C40	ELECTROLYTIC CAPACITOR SIEMENS B4136-B7226-Z CE 22UF -10+100%40V 9X13	CE 022.7572	
C41	ELECTROLYTIC CAPACITOR SIEMENS B4136-B7226-Z CE 47UF -10+100%16V 9X13	CE 022.7543	
C42	ELECTROLYTIC CAPACITOR ROEDERST ELKO EK47/16 CE 47UF -10+100%16V 9X13	CE 022.7543	
C80	ELECTROLYTIC CAPACITOR ROEDERST ELKO EK47/16 CC 10NF-20+50%7X8R6000 CAPACITOR VALVO 2222 63051 64051103	CC 087.7525	
D1	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D2	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D3	BL SN74LS390N 2X DEC.COUNT IC DECADE COUNTER SN74LS3 TEXAS SN74LS390N	BL 300.6760	
D4	BL SN74LS390N 2X DEC.COUNT IC DECADE COUNTER SN74LS3 TEXAS SN74LS390N	BL 300.6760	
D5	BL SN74LS240N 8X INV.DRIV. IC 8X INV.DRIVER SN74LS240 TEXAS SN74LS240N	BL 282.9196	
D6	BL SN74LS10N 3/3 INP.NAND IC NAND GATE SN74LS01N TEXAS SN74LS10N	BL 266.4670	
D7	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D8	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D9	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D10	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D11	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D12	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D13	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	

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CONTR. A. MOD. AMPLIFIER

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D14	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D15	BJ TL610CP 1X ANALOGSCH ANALOG SWITCH TEXAS TL610CP	BJ 339.4122	
D16	EJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D17	BJ TL601CP 2X ANALOGSCH ANALOG SWITCH TEXAS TL601CP	BJ 213.4530	
D25	BL SN74LS30N 8/INP. NAND IC NAND GATE SN74LS30N TEXAS SN74LS30N	BL 266.2049	
D26	BL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8 TEXAS SN74LS138N	BL 510.1379	
D27	BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER TEXAS SN74LS244N	BL 092.8984	
D28	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
D29	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
D30	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
D31	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
L1	LD 3,30UH10%0,85CHMO,285A CHOKE DELEVAN DROSSEL1025-32	LD 067.2928	
N1	BO LF356H BIFET-OP. AMP BO LF356H BIFET-OP. AMP. AMD LF356H	BO 333.5879	
N2	BQ LF356H BIFET-OP. AMP BO LF356H BIFET-OP. AMP. AMD LF356H	BO 333.5879	
N3	BO LF353BH 2XBIFET-OPAMP. IC OP. AMPL. LF353BH NSC LF353BH	BO 282.5210	
N4	BO LM308AH PRAEZ. OP-AMP. IC OPERATION AMPLIFIER NSC IC-LM308AH	BO 257.4788	
N5	BO LF156H BIFET-OP. AMP. BO LF156H BIFET-OP. AMP. AMD LF156H	BO 333.5862	
N6	BO LF356H BIFET-OP. AMP BO LF356H BIFET-OP. AMP. AMD LF356H	BO 333.5879	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R1	RL 0,25W604 OHM+-0,1%TK25 RESISTOR	RL 083.8727	
R2	DRALORIC 0207 604 OHM 0,1% RF 0,5 W 470 OHM +-5% DEPOS.-CARBON RESISTOR	RF 007.1331	
R3	RESISTA SK4/470OHM5% RL 0,25W 100KOHM+-1%TK50 RESISTOR	RL 082.1764	
R4	DRALORIC SMA0207/100K-F-C RL 0,25W10,0KOHM+-0,1%T25 RESISTOR	RL 084.3064	
R5	DRALORIC SMA0207/10K-B-E RL 0,25W41,7KOHM+-0,1%T25 RESISTOR	RL 084.4254	
R6	RS 0,75W 100KOHM+-10% CERM DEPOS.-CARBON POTENTIOMET	RS 037.7438	
R7	BURNS 3006P-1-100KOHM+-10% RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R8	DRALORIC LCA0207/+5%1,0K RL 0,25W 909 OHM+-1%TK50 RESISTOR	RL 083.0584	
R9	DRALORIC SMA0207/909OHM-F-0 RL 0,25W8,98KOHM+-0,1%T25 RESISTOR	RL 084.2974	
R10	DRALORIC SMA0207/8,98K-B-E RL 0,25W 1 KOHM+-0,1%TK25 RESISTOR	083.9146	
R11	DRALORIC SMA0207/1K-B-E RF 0,25W 1 MOHM +-5% RESISTOR	RF 069.1058	
R15	DRALORIC LCA0207/+5%1,0M RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R17	DRALORIC LCA0207/+5%1,0K RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R18	DRALORIC LCA0207/+5%1,0K RL 0,25W2KOHM+-0,1%TK25 RESISTOR	RL 083.9723	
R19	DRALORIC SMA0207/2,00K-B-E RL 0,25W2KOHM+-0,1%TK25 RESISTOR	RL 083.9723	
R21	DRALORIC SMA0207/2,00K-B-E RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R22	DRALORIC LCA0207/+5%10K RF 0,25W470 OHM +-5% RESISTOR	RF 069.4711	
R30	DRALORIC LCA0207/+5%470 RF 0,5 W 27 OHM+-5% DEPOS.-CARBON RESISTOR	RF 007.1183	
R31	RESISTA SK4/270HM5% RF 0,25W6,8KOHM +-5% RESISTOR	RF 069.6820	
R32	DRALORIC LCA0207/+5%6,8K RF 0,25W1,2KOHM +-5%	RF 069.1229	



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		10 0483		339.2913.01 SA	5
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in		
R33	RESISTOR DRALORIC LCA0207/+5%1,2K RF 0,25W6,8KOHM +-5%	RF 069.6820			
R34	RESISTOR DRALORIC LCA0207/+5%6,8K RF 0,25W 18KOHM +-5%	RF 069.1835			
R35	RESISTOR DRALORIC LCA0207/+5%18K RF 0,25W5,6KOHM +-5%	RF 069.5624			
R36	RESISTOR DRALORIC LCA0207/+5%5,6K RF 0,25W 47 OHM +-5%	RF 069.4705			
R37	RESISTOR DRALORIC LCA0207/+5%47 RF 0,25W560 OHM +-5%	RF 069.5618			
R38	RESISTOR DRALORIC LCA0207/+5%560 RF 0,25W 1KOHM +-5%	RF 069.1029			
R39	RESISTOR DRALORIC LCA0207/+5%1,0K RL 0,25W1,10KOHM+-0,1%T25	RL 083.9223			
R40	RESISTOR RS 0,75W 1KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET	RS 037.7367			
R41	BOURNS 3006P-1-1 KOHM+-10% RL 0,25W14,0KOHM+-0,1%T25	RL 084.3341			
R42	RESISTOR DRALORIC SMA0207/14,0K-B-E RL 0,25W7,06KOHM+-0,1%T25	RL 084.2774			
R43	RESISTOR RL 0,13W 475 OHM+-1%TK50	RL 092.1409			
R44	RESISTA MK1 4750HM 1% TK50 RF 0,25W 1KOHM +-5%	RF 069.1029			
R46	RESISTOR DRALORIC LCA0207/+5%1,0K RL 0,25W 10,0KOHM+-1%TK50	RL 083.1297			
R47	RESISTOR DRALORIC SMA0207/10K-F-D RL 0,25W 4,75KOHM+-1%TK50	RL 083.1097			
R48	RESISTOR DRALORIC SMA0207/4,75K-F-D RF 0,25W 1KOHM +-5%	RF 069.1029			
R55	RESISTOR DRALORIC LCA0207/+5%1,0K RF 0,25W 1KOHM +-5%	RF 069.1029			
R56	RESISTOR DRALORIC LCA0207/+5%1,0K RF 0,25W 47 OHM +-5%	RF 069.4705			
R57	RESISTOR DRALORIC LCA0207/+5%47 RL 0,25W 22,1KOHM+-1%TK50	RL 083.1545			
R58	RESISTOR DRALORIC SMA/207/22,1K-F-C RS 0,75W 1MOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-1 MOHM+-10%	037.7473			


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Stock No.

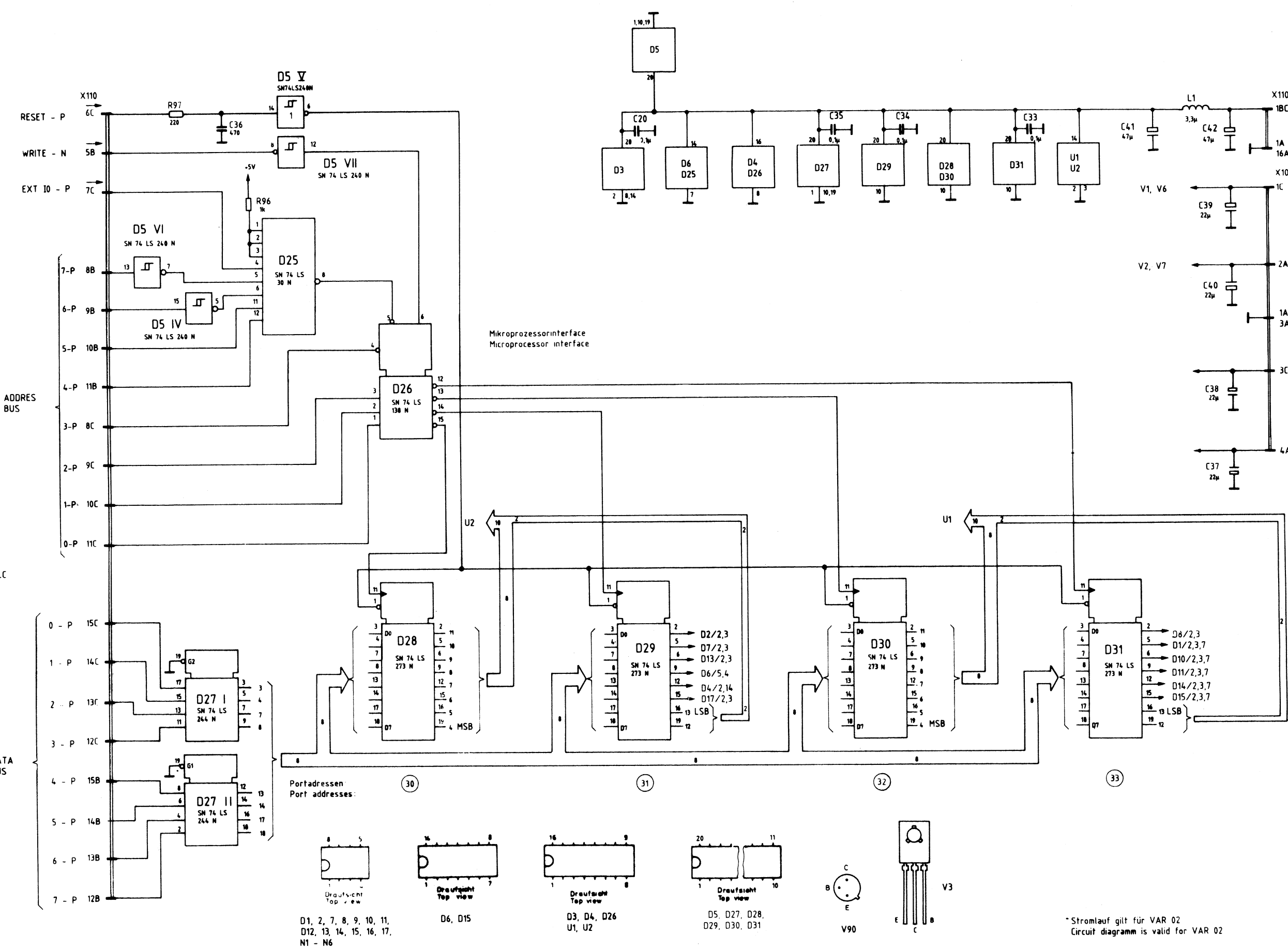
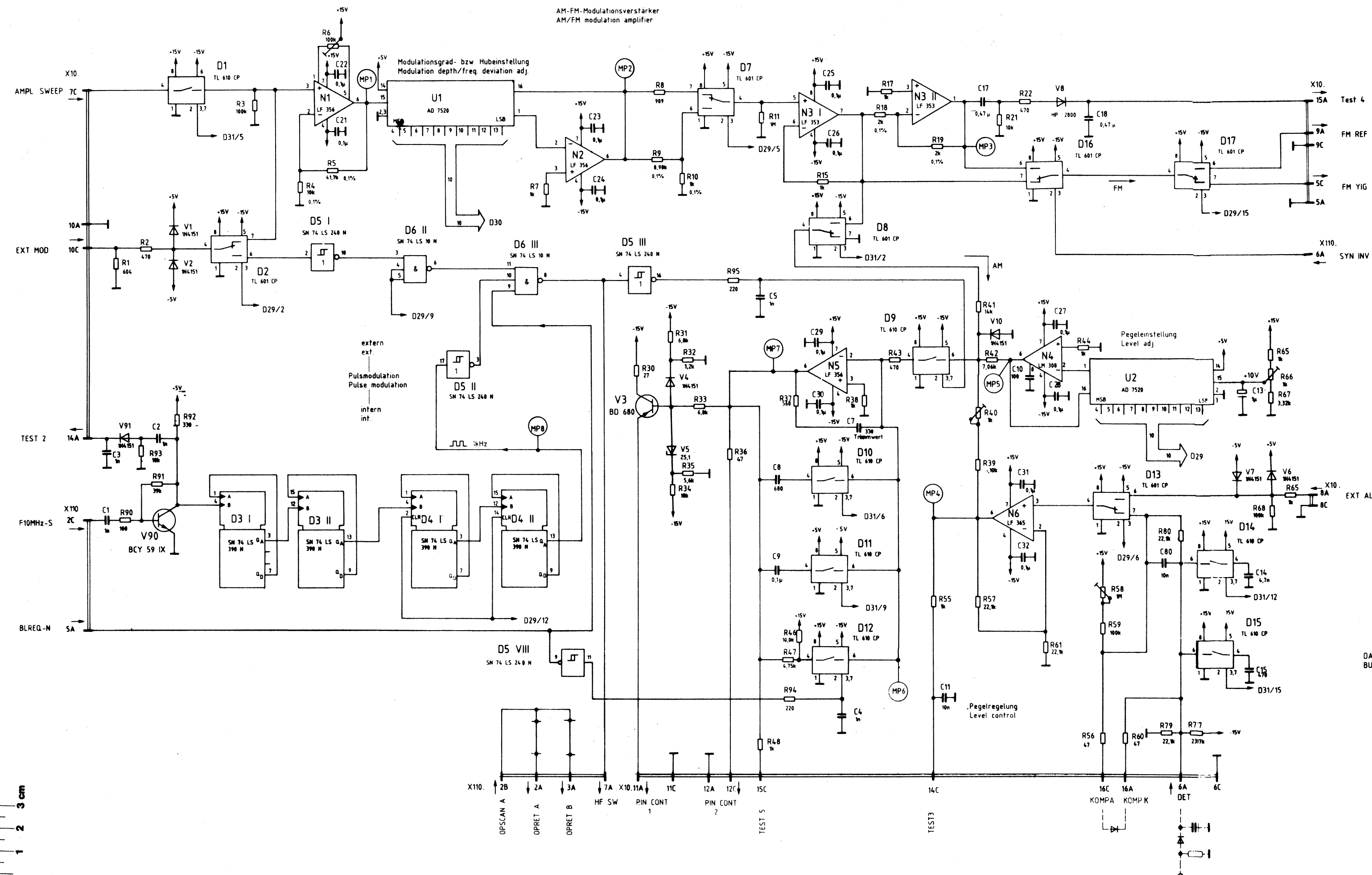
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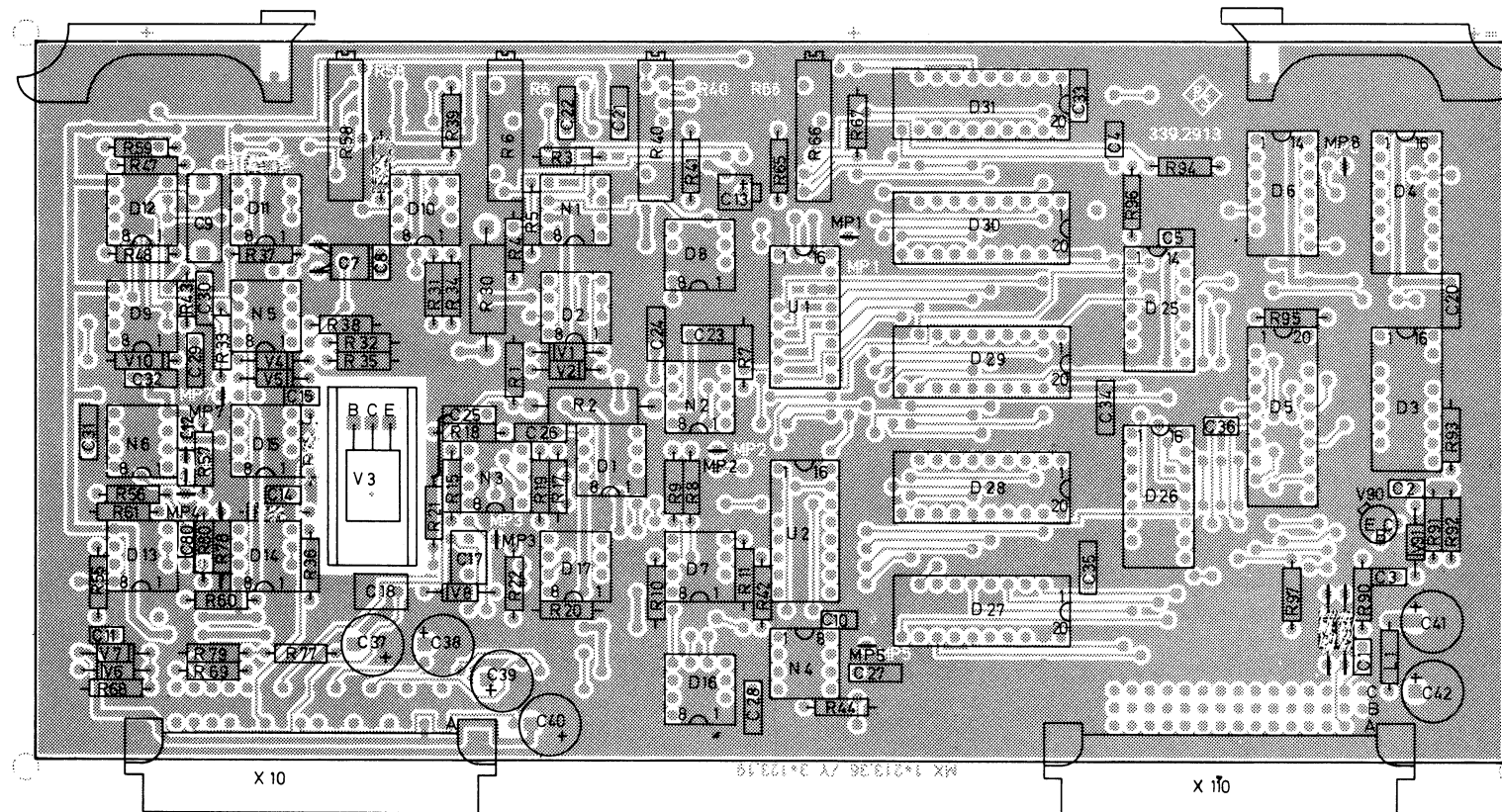
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R59	RL 0,25W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R60	RF 0,25W 47 OHM +-5% RESISTOR DRALORIC LCA0207/+5%47	RF 069.4705	
R61	RL 0,25W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R65	RL 0,25W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R66	RS 0,75W 1KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-1 KOHM+-10%	RS 037.7367	
R67	RL 0,25W 3,32KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/3,32K-F-D	RL 083.0990	
R68	RF 0,25W 100KOHM +-5% RESISTOR DRALORIC LCA0207/+5%100K	RF 069.1041	
R69	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R77	RL 0,25W 237 KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/237K-F-C	RL 083.2306	
R78	TRIMMWERT / SELECTED		
R79	RL 0,25W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R80	RL 0,25W 22,1KOHM+-0,1%T25 RESISTOR	RL 084.3729	
R90	RF 0,25W 100 OHM +-5% RESISTOR DRALORIC LCA0207/+5%100	RF 069.1012	
R91	RF 0,25W 39KOHM +-5% RESISTOR DRALORIC LCA0207/+5%39K	RF 069.3938	
R92	RF 0,25W 330 OHM +-5% RESISTOR DRALORIC LCA0207/+5%330	RF 069.3315	
R93	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
R94	RF 0,25W 220 OHM +-5% RESISTOR DRALORIC LCA0207/+5%220	RF 069.2219	
R95	RF 0,25W 220 OHM +-5% RESISTOR DRALORIC LCA0207/+5%220	RF 069.2219	
R96	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R97	RF 0,25W 220 OHM +-5% RESISTOR DRALORIC LCA0207/+5%220	RF 069.2219	

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		10 0483		339.2913.01 SA	7
Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.	enthalten in contained in	
U1	BJ AD7520 10B-D/A -CONV D/A-CONVERTER ANALOG-DEV AD752CKN		BJ 300.6499		
U2	BJ AD7520 10B-D/A -CONV D/A-CONVERTER ANALOG-DEV AD752CKN		BJ 300.6499		
V1	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
V2	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
V3	AL BD680 PNP 80V DARL TRANSISTOR VALVO BD680		335.9659		
V4	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
V5	AE BZX55/C5V1 0,5W Z-DI ZENER DIODE VALVO BZX55/C5V1		AE 012.2449		
V6	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
V7	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
V8	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800		AE 012.9066		
V10	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
V90	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX		AK 010.5163		
V91	AD 1N4151 50V 0,2 A UDI DIODE AEG-TELEF 1N4151		AD 012.0723		
X10	FP STECKERLEISTE 32POL. ERNI 9722.303.470.1		FP 565.8100		
X110	FP STECKERLEISTE 48POL. PANDUIT 100-348-C63P		FP 099.0908		
- ENDE -					



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Ansicht und Leitungsführung Bauteilseite  
View of tracks on component side

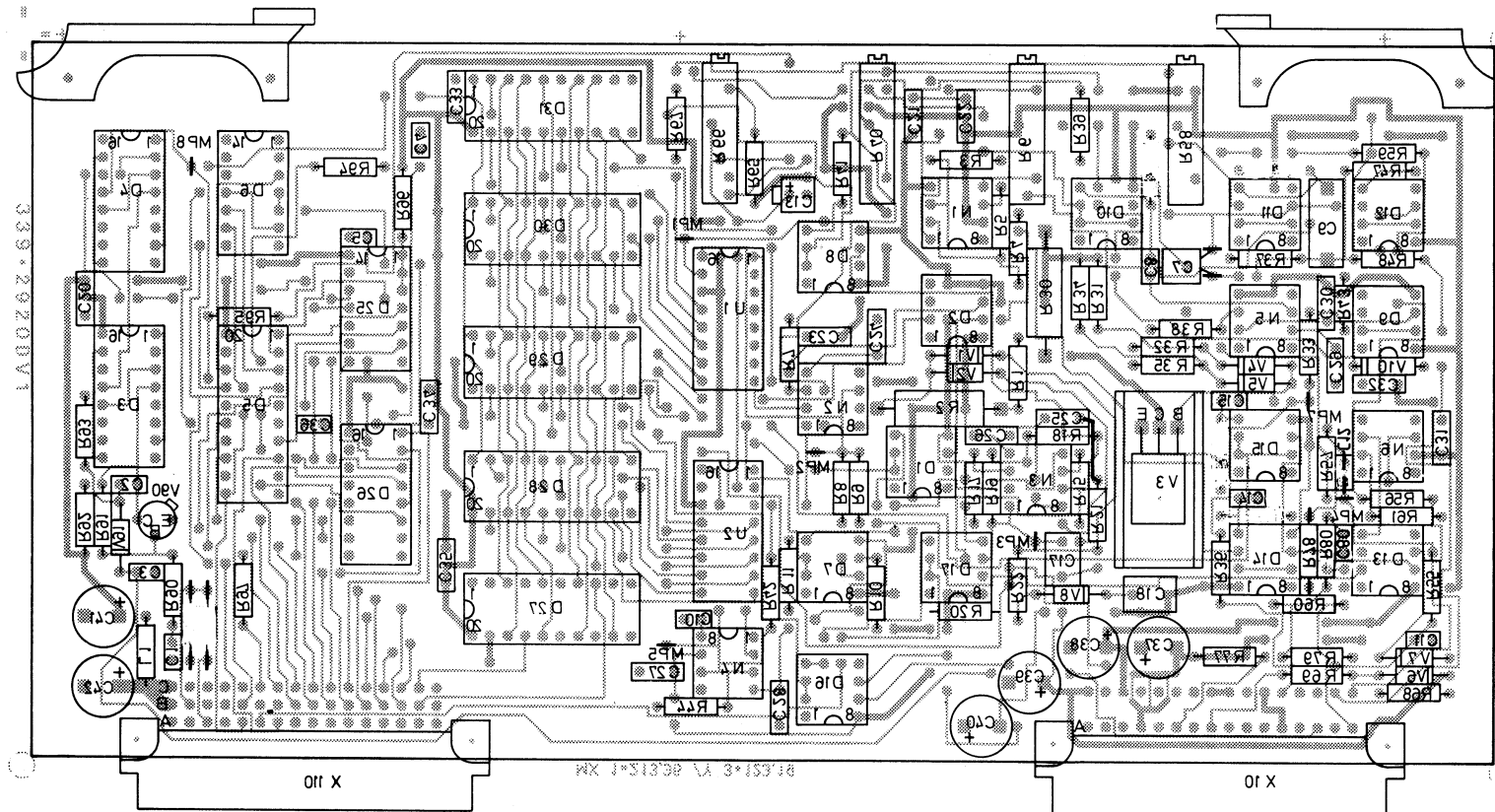


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Versorg.-Nr.		VG-Sachnr.	
A	29065	26.11.81	GS
E		4.83	CO
Maße ohne Toleranzangabe		Maßstab 1 : 1	
Halbzeug, Werkstoff			
GMG	Tag	Name	Benennung
Bearb.	26.11.81	GS	Regel u. Modulat.-Verstärker
Gepr.			Control a. modulation amplifier
Norm			
ROHDE & SCHWARZ MÜNCHEN		Zeichn.-Nr.	
zu Gerät. SWP		339.2913	
And. Zust.	Anderungs-Mitteilung	Tag	Name
reg. i. V. 339.0010V		erste Z. 339.0010	
Blatt-Nr. 2		v. BI.	

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Ansicht und Leitungsführung Lötseite  
View of tracks on solder side



0 1 2 3  
ZENTIMETER

Versorg.-Nr.		VG-Sachnr.	
A	29065	26.11.81	GS
E		4.83	CO
Maße ohne Toleranzangabe		Maßstab 1 : 1	
		Halbzeug, Werkstoff	
1GMG		Tag	Name
Bearb.		26.11.81	GS
Gepr.			
Norm			
Benennung		Regel u. Modulat.-Verstärker	
		Control a. modulation amplifier	
Z			
ROHDE & SCHWARZ MÜNCHEN		Zeichn.-Nr.	
zu Gerät. SWP		339.2913	
reg. i. V. 339.0010V		erste Z. 339.0010	
Blatt-Nr. 3		v. Bl.	



**ROHDE & SCHWARZ**

SERVICE INSTRUCTIONS

Processor Board

339.1317.02

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5.	<u>Processor Board 339.1317.02</u> .....	5.1
5.1	Circuit Description .....	5.1
5.2	Checking and Adjustment Procedures .....	5.2
5.3	Troubleshooting .....	5.2

Spare parts lists

Circuit diagrams

Components location plans



## 5. Processor Board 339.1317.02

(See circuit board 339.1317 S)

### 5.1 Circuit Description

The processor board contains the processor 8085 A, the clock frequency of which (3.072 MHz) is produced by means of the crystal B1 (6.144 MHz). A wait state is provided for the I/O cycles.

Furthermore, the processor board contains the address decoders:

EPROM range ..... 0000H to DFFFH

RAM range ..... E000H to EFFFH

Memory-mapped I/O range ..... F000H to FFFFH

(Control port No. XX corresponds to the memory address FFXXH.)

The address decoders decode the EPROM range in 8-kbyte blocks (EPROM Type 2764) and the RAM range in 2-kbyte blocks (RAM Type 5510). The two decoded lines for the address ranges A000H to BFFFH and C000H to DFFFH are linked via a WIRED-OR. In this way, a 16-kbyte EPROM on the IEC-bus PC board is activated.

The 2-kbyte RAM (E000H - EFFFH) is provided on the processor board and is battery backed-up (2 x 1.5 V Mignon). Chip D99 is used for checking the battery voltage. The switching threshold of the chip D99 can be set by means of the resistor R101.

The chip D84 (ICL 8212) switches the processor on and off and the CMOS RAM over to battery back-up. The D84 monitors the primary voltage of the 5-V supply. The switching threshold can be set by means of R79.

The quintuple counter chip D70 (AM 9513) is also provided on the processor board. Counters 4 and 5 of this chip are used for generation of the clock for the sweep control board, namely counter 4 for the forward sweep and counter 5 for the return sweep, the 10 MHz of the counter divided down to 5 MHz serving as input frequency (D67).

Counters 1, 2 and 3 are used for generation of processor-specific clocks. The input frequency used for this purpose is the processor frequency of 3.072 MHz. The outputs 2 and 3 of the counter are connected to the input RST7.5 of the processor.

## Assignment of the control ports:

I/O ports 00 to 07 processor-specific (counter 2913)

08 to 0F

10 to 17 IEC bus

18 to 1F

20 to 27 keyboard

28 to 2F

30 to FF separate bus for the control ports of the functional groups of the sweeper. This control bus is decoupled by means of an RC network and moreover only active if one of its addresses is activated.

## 5.2 Checking and Adjustment Procedures

The only point of adjustment refers to the activation of the processor reset when falling below the unstabilized input voltage for the digital 5-V supply voltage (VLED8/12P).

Adjust the potentiometer R79 so that the output at IC D84 (ICL 8212) goes from Low (< 0.5 V) to High (> 1 V) (no TTL level, voltage up to about 1/2 VLED possible) if the voltage VLED8/12P at pin X1.1B drops to 8 V.

## 5.3 Troubleshooting

Signature analysis is used for troubleshooting. There are two modes for signature generation:

Free-running signature for processor bus test

Insert the link X50 between 2 and 3 and disconnect the processor bus at the link X51. This cuts off the transceivers for the I/O bus and the internal processor bus as well as the bus to the EPROMs or RAMs and the counter. As a result, the processor scans all addresses from 0000H to FFFFH after having received the command 7FH (MOV A,A) via buffer D18 (LS244). Thus the signatures of the address bus can be checked. To this end, connect the signature analyzer to X151.

EPROM-controlled signature analysis

Insert the link X61 between 2 and 3. The links X50 and X51 must be in normal position. If the processor and the software function properly, the LED H32 blinks at intervals of 1 s (1 s on, 1 s off).

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
B1	EQ 6,144 MHZ CL30PF HC42U QUAKE R&S-ZCHNG.EQ091.2018	091.2024	
C8	CC 220PF+-2%6X7N750 CAPACITOR	CC 087.6941	
C10	VALVO 2222 678 58221 CC 470PF+-10%3X4R2000 CAPACITOR	CC 087.6993	
	VALVO 2222 63051 471		
BIS/TO C17			
C22	CC 470PF+-10%3X4R2000 CAPACITOR	CC 087.6993	
	VALVO 2222 63051 471		
BIS/TO C29			
C40	CC 220PF+-2%6X7N750 CAPACITOR	CC 087.6941	
	VALVO 2222 678 58221		
C41	CC 220PF+-2%6X7N750 CAPACITOR	CC 087.6941	
	VALVO 2222 678 58221		
C65	CC 470PF+-10%3X4R2000 CAPACITOR	CC 087.6993	
	VALVO 2222 63051 471		
C82	CC 10NF-20+50%7X8R6000 CAPACITOR	CC 087.7525	
	VALVO 2222 63051 64051103		
C93	CE 2,2UF+-20%20V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8104	
	ERO-TANTAL TA-ELKOETR-2,2/20		
C100	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		
C101	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR	CE 022.7550	
	SIEMENS B41316-A4107-Z		
C102	CC 100NF+-10%5GV5K1200VIE CAPACITOR	CC 084.5350	
	AEROVOX CKR05BX1C4KL		
BIS/TO C112			
D1	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N	BL 266.7934	
	TEXAS SN74LS74N		
D3	BL SN74LS04N 6/INVERTER HEXINVERTER	BL 266.2010	
	TEXAS SN74LS04N		
D4	BL SN74LS02N 4/2INP.NOR IC NOR GATE SN74LS02N	BL 266.4658	
	TEXAS SN74LS020N		
D5	BL SN74LS240N 8XINV.DRIV. IC 8XINV.DRIVER SN74LS240	BL 282.9196	
	TEXAS SN74LS240N		
D8	BL SN74LS08N 4/2INP.AND	BL 266.4664	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D10	IC AND GATE SN74LS08N TEXAS SN74LS08N BC P8085A 8BIT-CPU CPU INTEL P8085A	BC 335.8930	
D15	BL SN74LS373N 8BIT-D-REG. BL SN74LS373N 8BIT-D-REG. TEXAS SN74LS373N	BL 336.7543	
D16	BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER TEXAS SN74LS244N	BL 092.8984	
D18	BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER TEXAS SN74LS244N	BL 092.8984	
D20	EL SN74LS245N 8XBUS-TRSCV IC 8XBUS TRSCV SN74LS245N TEXAS SN74LS245N	BL 300.8833	
D21	BL SN74LS245N 8XBUS-TRSCV IC 8XBUS TRSCV SN74LS245N TEXAS SN74LS245N	BL 300.8833	
D25	BL SN74LS04N 6/INVERTER HEXINVERTER TEXAS SN74LS04N	BL 266.2010	
D26	EL SN74LS08N 4/2INP.AND IC AND GATE SN74LS08N TEXAS SN74LS08N	BL 266.4664	
D28	BL SN74LS00N 4/2INP.NAND IC NAND GATE SN74LS00N TEXAS SN74LS00N	BL 266.4641	
D30	BL SN74LS30N 8/INP.NAND IC NAND GATE SN74LS30N TEXAS SN74LS30N	BL 266.2049	
D31	BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER TEXAS SN74LS244N	BL 092.8984	
D40	BL SN74LS10N 3/3INP.NAND IC NAND GATE SN74LS01N TEXAS SN74LS10N	BL 266.4670	
D41	BL SN54LS51J 2XAND+NOR-G. IC AND NOR GATE SN54LS51J TEXAS SN54LS51J	BL 549.3937	
D42	BL SN74LS00N 4/2INP.NAND IC NAND GATE SN74LS00N TEXAS SN74LS00N	BL 266.4641	
D50	EL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8 TEXAS SN74LS138N	BL 510.1379	
D52	EL SN74LS145N BCD/DEZ.DEC IC DECODER SN74LS145N TEXAS SN74LS145N	BL 291.4335	
D60	BC TC5516P 2048X8BIT-RAM RAM TOSHIBA TC5516AP	BC 570.6848	
D69	EL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N TEXAS SN74LS74N	BL 266.7934	
D70	BC AM9513DC TIMING-CONTR.	BC 339.4039	



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D71	TIMING CONTROLER AMD AM9513DC BL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8	BL 510.1379	
D72	TEXAS SN74LS138N BL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8	BL 510.1379	
D73	TEXAS SN74LS138N BL SN74LS10N 3/3INP.NAND IC NAND GATE SN74LS01N	BL 266.4670	
D74	TEXAS SN74LS10N BL SN74LS27N 3/3INP.NORGA IC NOR GATE SN74LS27N	BL 266.9514	
D81	TEXAS SN74LS27N BL SN74LS32N 4/2INP.OR IC OR GATE SN74LS32N	BL 266.4687	
D84	TEXAS SN74LS32N BO ICL8212 VOLTAGE-DETEKT ICL8212 VOLTAGE-DETEKT	BO 339.4045	
D99	INTERSIL ICL8212CPA BO ICL8212 VOLTAGE-DETEKT ICL8212 VOLTAGE-DETEKT	BO 339.4045	
H32	INTERSIL ICL8212CPA AF HLMP1503 LED GN RD3 LED	AF 252.5570	
L100	HEWLETT-P. HLMP1503 LD UKW-DR.Z=750 OHM 50MHZ CHOKE	LD 026.4578	
R1	VALVO 431202036641 RN 7X2,2KOHM+-2%5IL 8 H5 RESISTOR NETWORK	RN 540.5666	
R8	BOURNS 4308R-101-222 RF 0,25W 47 OHM +-5% RESISTOR	RF 069.4705	
R10	DRALORIC LCA0207/+5%47 RF 0,25W 47 OHM +-5% RESISTOR	RF 069.4705	
BIS/TO R17	DRALORIC LCA0207/+5%47		
R20	RN 7X2,2KOHM+-2%5IL 8 H5 RESISTOR NETWORK	RN 540.5666	
R22	BOURNS 4308R-101-222 RF 0,25W 47 OHM +-5% RESISTOR	RF 069.4705	
BIS/TO R29	DRALORIC LCA0207/+5%47		
R30	RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
R31	DRALORIC LCA0207/+5%10K RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
	DRALORIC LCA0207/+5%10K		



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R32	RF 0,25W560 OHM +-5% RESISTOR DRALORIC LCA0207/+5%560	RF 069.5618	
R40	RF 0,25W 47 OHM +-5% RESISTOR DRALORIC LCA0207/+5%47	RF 069.4705	
R41	RF 0,25W 47 OHM +-5% RESISTOR DRALORIC LCA0207/+5%47	RF 069.4705	
R52	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R53	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R60	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
R61	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R65	RF 0,25W100 OHM +-5% RESISTOR DRALORIC LCA0207/+5%100	RF 069.1012	
R66	RF 0,25W 39KOHM +-5% RESISTOR DRALORIC LCA0207/+5%39K	RF 069.3938	
R67	RF 0,25W330 OHM +-5% RESISTOR DRALORIC LCA0207/+5%330	RF 069.3315	
R68	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R69	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R70	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R71	RF 0,25W680 OHM +-5% RESISTOR DRALORIC LCA0207/+5%680	RF 069.6814	
R72	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R79	RS 0,75W10KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-10 KOHM+-10%	RS 037.7396	
R81	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
R82	RF 0,25W100 OHM +-5% RESISTOR DRALORIC LCA0207/+5%100	RF 069.1012	
R83	RF 0,25W120KOHM +-5% RESISTOR DRALORIC LCA0207/+5%120K	RF 069.1241	



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R84	RF 0,25W 15KOHM +-5% RESISTOR DRALORIC LCA0207/+5%15K	RF 069.1535	
R85	RF 0,25W 2,2MOHM+-5% RESISTOR DRALORIC LCA0207/+5%2,2M	RF 069.1941	
R86	RF 0,25W4,7KOHM +-5% RESISTOR DRALORIC LCA0207/+5%4,7K	RF 069.4728	
R87	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
BIS/TO			
R91			
R92	RF 0,25W 1KOHM +-5% RESISTOR DRALORIC LCA0207/+5%1,0K	RF 069.1029	
R93	RF 0,25W 56KOHM +-5% RESISTOR DRALORIC LCA0207/+5%56K	RF 069.5630	
R94	RF 0,25W270 OHM +-5% RESISTOR DRALORIC LCA0207/+5%270	RF 069.2719	
R95	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
R96	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
R97	RF 0,25W 10KOHM +-5% RESISTOR DRALORIC LCA0207/+5%10K	RF 069.1035	
R98	RF 0,25W100KOHM +-5% RESISTOR DRALORIC LCA0207/+5%100K	RF 069.1041	
R99	RF 0,3 W 10MOHM+-5% RESISTOR BEYSCHLAG SBC0309/10M5%	074.0904	
R100	RF 0,25W100KOHM +-5% RESISTOR DRALORIC LCA0207/+5%100K	RF 069.1041	
R101	RS 0,75W25KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET BOURNS 3006P-1-25 KOHM+-10%	RS 037.7415	
R102	RF 0,25W2,2KOHM +-5% RESISTOR DRALORIC LCA0207/+5%2,2K	RF 069.2225	
V60	AK BC327-40 PNP 45V 800MA TRANSISTOR INTERMETAL BC327-40	AK 303.9518	
V61	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448	AD 012.0700	
V62	AE 5082-2800 SCHOTTKYDI DIODE HEWLETT-P. 5082-2800	AE 012.9066	

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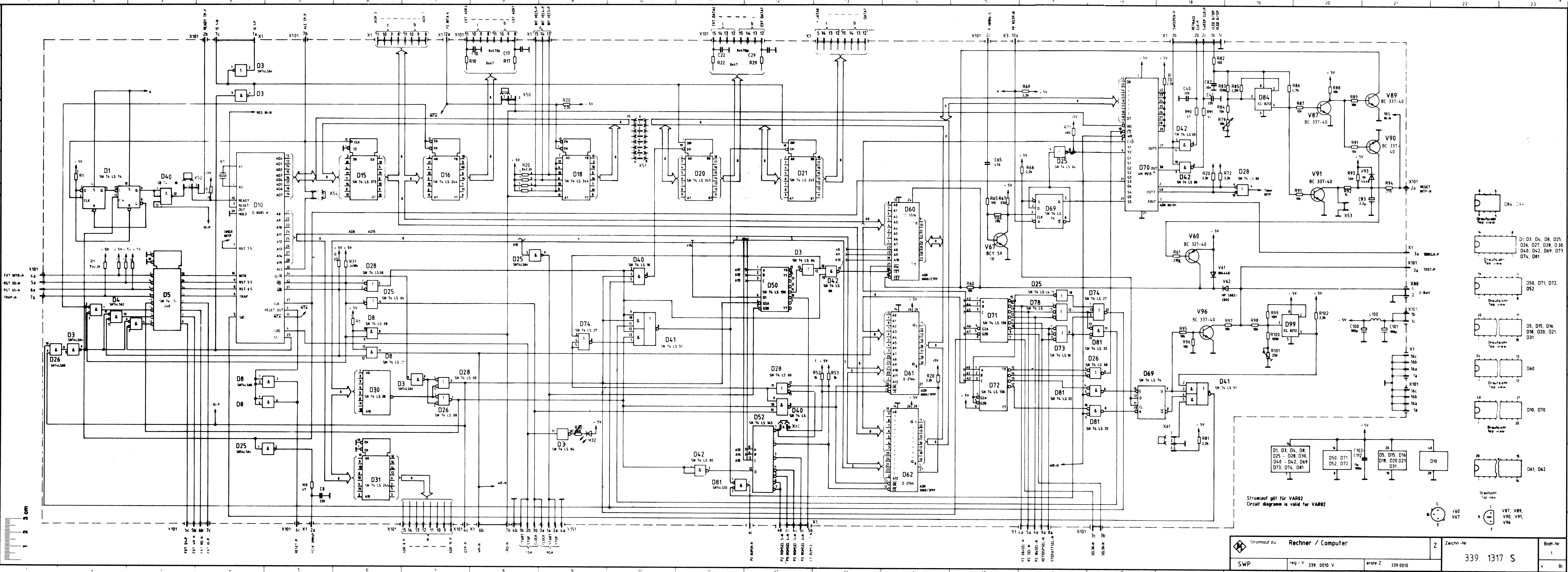
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V67	AK BCY59IX NPN 45V 200MA TRANSISTOR	AK 010.5163	
V87	SIEMENS BCY59IX AK BC337-40 NPN 45V 800MA TRANSISTOR	AK 303.9524	
V89	INTERMETAL BC337-40 AK BC337-40 NPN 45V 800MA TRANSISTOR	AK 303.9524	
V90	INTERMETAL BC337-40 AK BC337-40 NPN 45V 800MA TRANSISTOR	AK 303.9524	
V91	INTERMETAL BC337-40 AK BC337-40 NPN 45V 800MA TRANSISTOR	AK 303.9524	
V93	INTERMETAL BC337-40 AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
V96	VALVO 1N4448 AK BC337-40 NPN 45V 800MA TRANSISTOR	AK 303.9524	
X1	INTERMETAL BC337-40 FP STECKERLEISTE 48POL. PANDUIT 100-348-063P	FP 099.0908	
X50	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X51	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X52	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X53	FP WINKELSTECKERLEIST.36P CONNECTOR BERG 75168-113-36	FP 243.3578	
X54	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X60	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X61	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	
X80	FP WINKELSTECKERLEIST.36P CONNECTOR BERG 75168-113-36	FP 243.3578	
X101	FP STECKERLEISTE 48POL. PANDUIT 100-348-063P	FP 099.0908	
X151	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36	FP 242.3600	

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SERVICE INSTRUCTIONS

IEC-bus Interface

339.9918.02

Printed in West Germany

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## 5. IEC-bus Interface 339.9918.02

(See circuit diagram 339.9924 S)

### 5.1 Circuit Description

The circuit board contains two functional groups:

- IEC-bus control and
- EPROM/RAM extension

The chip D9 (8291A) is used for the IEC-bus interface. It contains the complete logic that is necessary for the IEC-bus operation. The chips MC3448A are used as bus drivers. The drivers which function as transmitters to the bus are operated in open-collector mode.

At the processor end, the IEC-bus interface is fitted with a bus transceiver as well as an address decoder for controlling a read and a write port. Five bits of the read port are applied to a multi-way connector for setting the standard value for the IEC-bus address. The setting of a link corresponds to a 0 bit in the address. This address is, however, only used if no valid address is present in the battery backed-up RAM.

Bit 6 of the write port is used as a switchover signal for the memory bank. During this process, pin 26 (A13) of modules D31, D32 and D34 is switched, thus obtaining further address ranges of 4000H to 5FFFH, 6000H to 7FFFH and 8000H to 9FFFH if 16-kbyte EPROMs are used. Two write port bits are used as Enable for the GET (Group Execute Trigger) command of the IEC-bus interface as well as for the interrupt of the IEC-bus chip (bit 0).

The memory extension consists of four 28-pin mounting locations for 8-kbyte EPROMs (2764) or 16-kbyte EPROMs (27128) and a 24-pin mounting location for the 2-kbyte RAMs.

Address decoders for the EPROM extensions are as follows:

	Bank switch address space	
D31	4000H - 5FFFH	4000H - 5FFFH
D32	6000H - 7FFFH	6000H - 9FFFH
D34	8000H - 9FFFH	8000H - 9FFFH
D33	A000H - DFFFH	(16 k)

Address decoder for the RAM extension:

D35 E800H - EFFFH

This RAM range is not battery backed-up.

In addition, a transistor amplifier for 10 MHz is provided on the circuit board. The input of the amplifier consists of a  $\pi$ -filter for the rejection of harmonics of the input signal.

## 5.2 Checking and Adjustment Procedures

The IEC-bus interface cannot be adjusted.

## 5.3 Troubleshooting

Signature analysis is used for troubleshooting (see processor board).



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A2	ED IEC-625-BUS-INTERFACE	339.9924.02	
W15	KABEL	339.9976	339.9960
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Sachnummer

enthalten in

C1	CC 390PF+-10%3X4R2000 DRALORIC EDPU3X4/390/10%R2000	CC 087.6987	
C2	CC 470PF+-10%3X4R2000 DRALORIC EDPU3X4/470/10%R2000	CC 087.6993	
C3	CC 33PF+-2%3X4N750	CC 087.6841	
C4	CC 33PF+-2%3X4N750	CC 087.6841	
C5	CC 1NF+-10%63V K2000 DRALORIC EDPU4X5/63V1000/10%	CC 022.0784	
C6	CC 100NF+-10%100V K1200VI AEROVOX CKR06BX104KL	CC 060.1149	
C7	CE 100UF-10+100%16V 11X13 SIEMENS B41316-A4107-Z	CE 022.7550	
C8	CE 100UF-10+100%16V 11X13 SIEMENS B41316-A4107-Z	CE 022.7550	
C9	CC 100NF+-10%100V K1200VI AEROVOX CKR06BX104KL	CC 060.1149	
C10	CC 100NF+-10%100V K1200VI AEROVOX CKR06BX104KL	CC 060.1149	
C11	CC 100NF+-10%100V K1200VI AEROVOX CKR06BX104KL	CC 060.1149	
C13	CC 100NF+-10%100V K1200VI AEROVOX CKR06BX104KL	CC 060.1149	
D1	BL SN74LS245N 8XBUS-TRSCV TEXAS SN74LS245N	BL 300.8833	
D2	BL SN74LS244N 8XBUS-TREIB TEXAS SN742S244N	BL 092.8984	
D3	BL SN74LS138N DEMUX 1:8 TEXAS SN74LS138N	BL 510.1379	
D4	BL SN74LS04N 6/INVERTER TEXAS SN74LS040N	BL 266.2010	
D5	BL SN74LS08N 4/2INP.AND TEXAS SN74LS08N	BL 266.4664	
D6	BL SN74LS32N 4/2INP.OR TEXAS SN74LS32N	BL 266.4687	
D7	BL SN74LS74AN 2/D-FLIPFL. TEXAS SN74LS74N	BL 266.7934	
D8	BL SN74LS26N 4/2INP.NAND TEXAS SN74LS26N	BL 280.7567	
D9	BJ P8291A JEC-BUS-INTERF. INTEL P2891A	BJ 099.4978	
D10	BJ MC3448AL 4XBUS-TRANSC. MOTOROLA MC3448AL-S TEMP.BER.	BJ 565.1464	
D11	BJ MC3448AL 4XBUS-TRANSC. MOTOROLA MC3448AL-S TEMP.BER.	BJ 565.1464	
D12	BJ MC3448AL 4XBUS-TRANSC. MOTOROLA MC3448AL-S TEMP.BER.	BJ 565.1464	
D13	BJ MC3448AL 4XBUS-TRANSC. MOTOROLA MC3448AL-S TEMP.BER.	BJ 565.1464	
D14	BL SN74LS273N 8BIT-D-REG. TEXAS SN74LS273N	BL 214.8998	
D15	BL SN74LS244N 8XBUS-TREIB TEXAS SN742S244N	BL 092.8984	
D21	BL SN74LS390N 2XDEC.COUNT TEXAS SN74LS390N	BL 300.6760	
D22	BC C8251A UNIV.INTERFACE	BC 086.9847	

Diese Unterlage ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadensersatzpflichtig.

Kennzeichen	Benennung / Beschreibung	Sachnummer	enthalten in
D23	INTEL C8251 BL SN74LS04N 6/INVERTER	BL 266.2010	
D24	TEXAS SN74LS040N BL SN74LS32N 4/2INP.0R	BL 266.4687	
D25	TEXAS SN74LS32N BJ MC3448AL 4XBUS-TRANSC.	BJ 565.1464	
D26	MOTOROLA MC3448AL-S TEMP.BER. BJ MC3448AL 4XBUS-TRANSC.	BJ 565.1464	
	MOTOROLA MC3448AL-S TEMP.BER.		
L1	LD 5,60UH10%1,800HMO,195A	LD 067.2957	
L2	DELEVAN DROSSEL1025-38 LD 10,0UH10%3,300HMO,144A	LD 026.4184	
L3	DELEVAN DROSSEL1025-44 LD UKW-DR-Z=750 OHM 50MHZ	LD 026.4578	
	VALVO 431202036641		
R1	RF 0,25W220 OHM +-5%	RF 069.2219	
R2	DRALORIC LCA0207/+5%220	RF 069.2225	
R3	RF 0,25W2,2KOHM +-5%	RF 069.1035	
	DRALORIC LCA0207/+5%2,2K		
R4	RF 0,25W 10KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%10K		
R5	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R6	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R7	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R8	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R9	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R10	RF 0,25W 1KOHM +-5%	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R15	RF 0,25W2,2KOHM +-5%	RF 069.2225	
	DRALORIC LCA0207/+5%2,2K		
R16	RF 0,25W820 OHM +-5%	RF 069.8217	
	DRALORIC LCA0207/+5%820		
R17	RF 0,25W820 OHM +-5%	RF 069.8217	
	DRALORIC LCA0207/+5%820		
R18	RF 0,25W 56 OHM +-5%	RF 069.5601	
	DRALORIC LCA0207/+5%56		
R19	RF 0,25W 82 OHM +-5%	RF 069.8200	
	DRALORIC LCA0207/+5%82		
R25	RF 0,25W 1KOHM +-5%	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R26	RF 0,25W 1KOHM +-5%	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R27	RF 0,25W 1KOHM +-5%	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
R28	RF 0,25W 1KOHM +-5%	RF 069.1029	
	DRALORIC LCA0207/+5%1,0K		
T1	AK 2N2222A 40V0,8A300MHZ	AK 010.5405	



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ÄZ Datum

03 0482

Schaltteilliste für

ED IEC-625-BUS-INTERFACE

Sachnummer

339.9924.01 SA

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Kennzeichen

Benennung / Beschreibung

Sachnummer

enthalten in

VALVO 2N2222A

X2

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PANDUIT

FP 099.0908

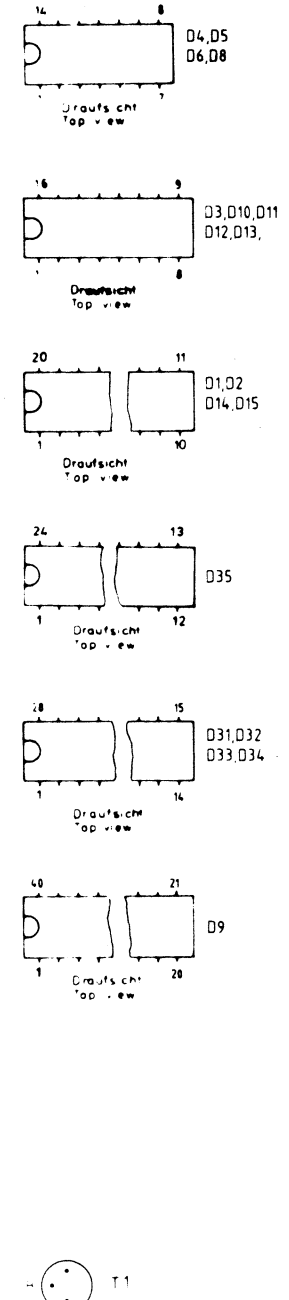
X102

FP STECKERLEISTE 48POL.  
PANDUIT

FP 099.0908

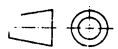
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ISO-Projektion  
Methode E



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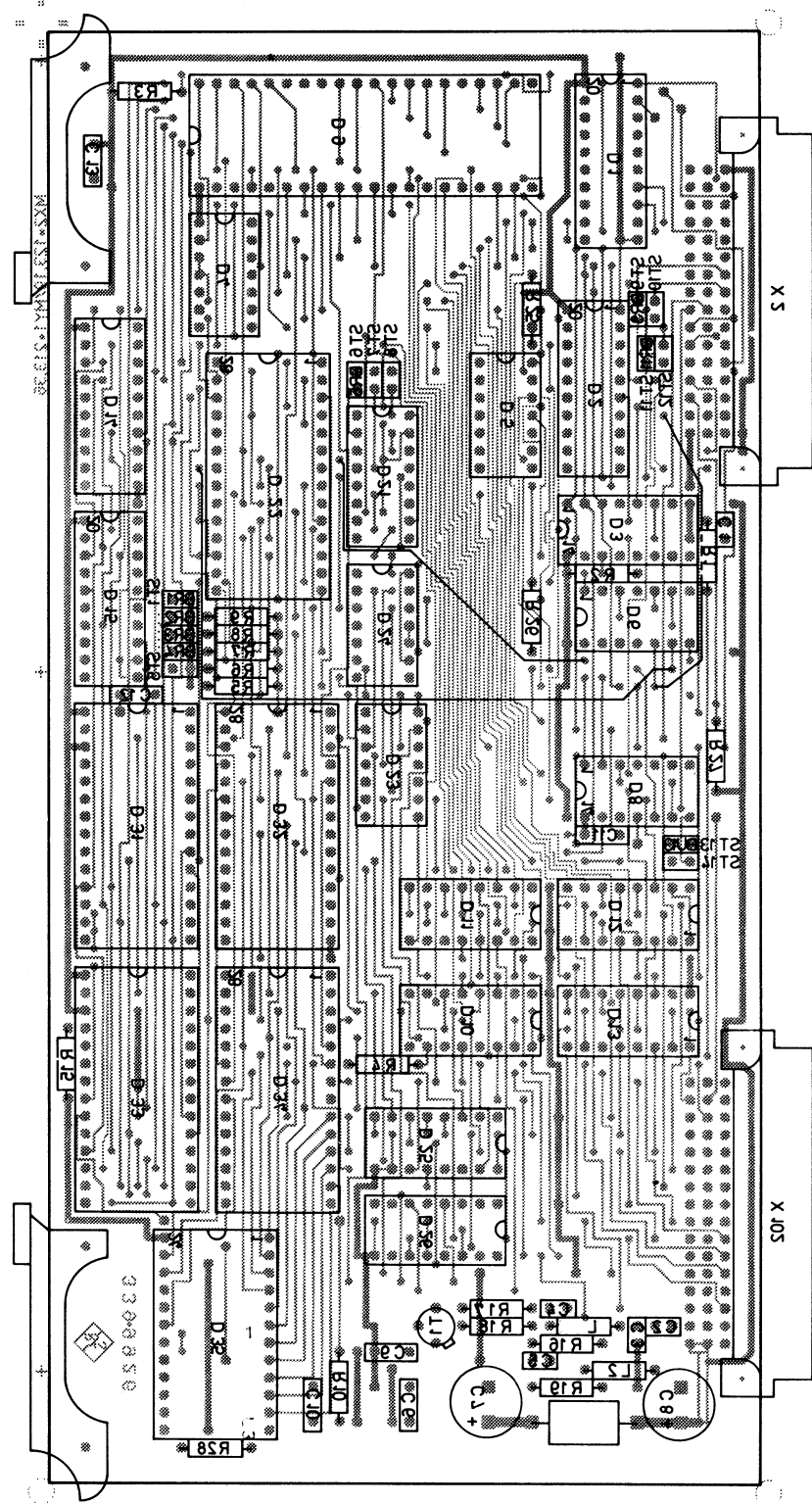
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SERVICE INSTRUCTIONS

Marker Board

339.2613.02

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## 5. Service Instructions for Marker Board 339.2613.02

(See circuit diagram 339.2613 S)

### 5.1 Circuit Description

The marker board is sub-divided into two mutually independent functional groups which are controlled from the microprocessor via an interface.

--> Functional group for storing six variable frequency markers  
(marker section)

--> Functional group for monitoring 25 test points in the SWP  
(self-test).

The interface to the microprocessor consists of the I/O ports with the addresses 38H to 3FH (H stands for hexadecimal) and the two address decoders D11 and D12. D11 decodes the Read port and D12 the Write port addresses. The microprocessor access of the marker board is initiated by activating the signal SEL38-N (X103.C7) which corresponds to the decoded high-order five bits of the address bus. Decoding of the low-order three bits is therefore sufficient for the individual I/O ports.

#### 5.1.1 Marker Section

If the marker section is not accessed by the microprocessor, the contents of the 1K CMOS RAM (D5) is read out in synchronization with the sweep process of the SWP and is available at output MKR (X103.B3).

The resolution of the marker location over the entire frequency sweep width is 10 bits (SWEEPAD2-P-SWEEPAD11-P). This 10-bit address is sent via the two tri-state drivers D1 and D2 to the address bus of the memory.

This readout operation is controlled from the flip-flops D21I and D21II which together act as monoshot: if a fixed address is present at D5 (CMOS-RAM), the RESET inputs of D21I/II are enabled causing the output to go active high (TTL) for one clock period (1  $\mu$ s) of the 1-MHz clock signal (starting on the falling edge). By gating this output signal with the one-half clock period of the 1-MHz clock, signal CS-N is obtained and the CMOS-RAM selected. The memory contents read out is buffered in the flip-flop D30II which is statically reset during the return sweep by the signal SWEEPRETR-N (X103A4).



Asynchronously with the readout operation described above processor can access the marker store (reading or writing). In either case, access is effected by time-serial transfer of two bytes to the ports with the decimal addresses 38H and 39H (D3 and D4) which are used as 8- and 4-bit registers with tri-state outputs.

Processor access of the marker store (D5) is controlled by the two flip-flops D22I and D22II which function in the same manner as D21I/II. Transfer of the first byte resets and transfer of the second byte enables this circuit. In case of a read instruction, the store contents is buffered in the flip-flop D30I. Logic gating prevents the sweep-synchronous readout from being affected by the microprocessor access of the marker store.

#### 5.1.2 Self-test

By selecting a suitable control byte in the 8-bit register D85 (port address 3AH), one of the inputs of the four multiplexers D80 to D83 is connected to the input of the A/D converter D95 via an impedance transformer (N91/I). The clock of the A/D converter is 500 kHz (D98II). The conversion process is triggered by the flip-flops D90I and D90II.

The reference voltage is supplied via the impedance transformer N91/II.

The negative supply voltage for the A/D converter is produced with the aid of the 500-kHz clock and a transistor circuit (V102, V103).

This 500-kHz clock remains disabled as long as the self-test is not activated.

## 5.2 Checking and Adjustment Procedures

No adjustment need be made in the marker section. As to the self-test functional group, it is sufficient to adjust the reference voltage for the A/D converter at test point X2.10 to  $2.4 \text{ V} \pm 0.01 \text{ V}$  by means of potentiometer R94.

Checking the interface signals for the marker section:

--> 10-MHz clock	(X103C2)		
--> SWEEPAD1-P	(X103A15)	}	The addresses must change in synchronization with the sweep process
--> SWEEPAD2-P to SWEEPAD11-P	(X103A14 to X103A5)		

These interface signals ensure synchronous readout.

### 5.3 Troubleshooting

#### 5.3.1 Faulty Synchronous Readout

- > 1-MHz clock (X2.2)
- > CS-N (D5/1)

#### 5.3.2 Faulty Processor Access of Marker Section

- > SEL38-N (X103.C7)
- > EXTWR-N (X103.B5) writing
- > EXTRD-N (X103.B6) reading
- > EXTDATA0-P to  
EXTDATA7-P (X103.B12 to C15)
- > EXTAD0-P to  
EXTAD2-P (X103C9 to C11)
- > WR38-N (D3/11) }  
--> WR39-N (D4/7) } produce negative active pulse  
at X2.8
- > Switchover processor address <- -> sweep address  
(D3/1, D4/1,2, D1/1,19, D2/1)

This switchover can be brought about statically by removing the link X10 and inputting at X2.6.

### 5.3.3 Faulty Processor Access of the Self-test Functional Group

--> SEL38-N	(X103.C7)	
--> EXTWR-N	(X103.B5)	writing in
--> EXTRD-N	(X103.B6)	reading out
--> EXTDATA0-P to EXTDATA7-P	(X103.B12 to C15)	
--> EXTAD0-P to EXTAD2-P	(X103C9 to C11)	
--> 1-MHz clock	(X2.2)	
--> 500-kHz clock	(D98/9)	
--> Reference voltage	(X2.10/ = 2.4 V $\pm$ 0.01 V	
--> Supply voltage approx. -3 V	( $\perp$ C104)	
--> SC-N	(D88/8)	
--> RD3A-P	(D95/2)	

The polarity in the active state is indicated with all TTL signal designations:

- > P active high level
- > N active low level

Checking is only possible during the program run. Otherwise the EPROM-controlled signature analysis can be used for troubleshooting on the marker board (see signature list).

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 Schalteilliste für  
 Parts list for  
**ED MARKENPLATTE**  
**MARKER BOARD**

 Sachnummer  
 Stock No.

339.2613.01 SA

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C1	CC 470PF+-10%3X4R2000 CAPACITOR	CC 087.6993	
C10	VALVO 2222 63051 471 CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7543	
C11	ROEDERST ELKO EK47/16 CE 47UF -10+100%16V 9X13 ELECTROLYTIC CAPACITOR	CE 022.7543	
C15	ROEDERST ELKO EK47/16 CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
	AEROVOX CKR05BX104KL		
BIS/TO			
C20			
C96	CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8185	
C100	ERO-TANTAL TA-ELKOETR1-1/35 CC 100PF+-2%4X5N750 CAPACITOR	CC 087.6906	
C103	VALVO 2222 678 58101 CE 1,0UF+-20%35V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 022.8185	
C104	ERO-TANTAL TA-ELKOETR1-1/35 CE 6,8UF+-20% 6V 5X 4X 7 ELECTROLYTIC CAPACITOR	CE 087.9270	
C135	CC 180PF+-2%6X7N750 CAPACITOR	CC 087.6935	
C137	VALVO 2222 678 58181 CC 180PF+-2%6X7N750 CAPACITOR	CC 087.6935	
	VALVO 2222 678 58181		
D1	BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER	BL 092.8984	
D2	TEXAS SN74LS244N BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER	BL 092.8984	
D3	TEXAS SN74LS244N BL SN74LS374N 8BIT-D-REG. IC 8BIT-D-REGISTER	BL 282.9696	
D4	TEXAS SN74LS374N BL SN54LS173AJ 4/D-FLIPFL SN54LS173AJ FLIFLOP	BL 343.9877	
D5	TEXAS SN54LS173AJ BC TC5508P 1024X1BIT-RAM RAM	BC 343.9202	
D11	TOSHIBA TC5508P BL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8	BL 510.1379	
D12	TEXAS SN74LS138N BL SN74LS138N DEMUX 1:8 DEMULTIPLEXER 1:8	BL 510.1379	
D17	TEXAS SN74LS138N BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N	BL 266.7934	
	TEXAS SN74LS74N		



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Schaltteilliste für  
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MARKER BOARDSachnummer  
Stock No.

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
D20	BL SN74LS08N 4/2INP. AND IC AND GATE SN74LS08N TEXAS SN74LS08N	BL 266.4664	
D21	BL SN74LS107AN 2/JK-FLIPF IC FLIP-FLOP SN74LS107AN TEXAS SN74LS107AN	BL 300.6453	
D22	BL SN74LS107AN 2/JK-FLIPF IC FLIP-FLOP SN74LS107AN TEXAS SN74LS107AN	BL 300.6453	
D26	BL SN74LS00N 4/2INP. NAND IC NAND GATE SN74LS00N TEXAS SN74LS00N	BL 266.4641	
D30	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N TEXAS SN74LS74N	BL 266.7934	
D35	BL SN74LS290N DEC. COUNTER IC DECADE COUNTER SN74LS2 TEXAS SN74LS290N	BL 300.6447	
D80	BL CD4051BE 8CH. MUX MULTIPLEXER RCA CD4051BE	BL 339.4174	
BIS/TO			
D83			
D84	BL SN74LS245N 8XBUS-TRSCV IC 8XBUS TRSCV SN74LS245N TEXAS SN74LS245N	BL 300.8833	
D85	BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N	BL 214.8998	
D86	BL SN74LS04N 6/INVERTER HEXINVERTER TEXAS SN74LS04N	BL 266.2010	
D87	BL SN74LS04N 6/INVERTER HEXINVERTER TEXAS SN74LS04N	BL 266.2010	
D88	BL SN74LS00N 4/2INP. NAND IC NAND GATE SN74LS00N TEXAS SN74LS00N	BL 266.4641	
D90	BL SN74LS107AN 2/JK-FLIPF IC FLIP-FLOP SN74LS107AN TEXAS SN74LS107AN	BL 300.6453	
D95	BJ ZN427J-8 8B-A/D -CONV A/D-CONVERTER FERRANTI ZN427J-8	BJ 343.8841	
D96	BL SN74LS244N 8XBUS-TREIB IC 8XBUS DRIVER TEXAS SN74LS244N	BL 092.8984	
D98	BL SN74LS74AN 2/D-FLIPFL. IC FLIP-FLOP SN74LS74N TEXAS SN74LS74N	BL 266.7934	
D100	BJ SN75452BP 2X NAND DRIV NAND DRIVER TEXAS SN75452P	BJ 224.3424	
D110	BL CD4066BE 4XANALOGSCH ANALOG SWITCH RCA CD4066BE	BL 290.3906	
D120	BL SN74LS244N 8XBUS-TREIB	BL 092.8984	

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Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.	enthalten in contained in
D130	IC 8XBUS DRIVER TEXAS SN74LS244N BL SN74LS273N 8BIT-D-REG. 8BIT-D-REGISTER TEXAS SN74LS273N		BL 214.8998	
L1	LD 2,70UH10%,550HMO,355A CHOKE DELEVAN DROSSEL1025-30		LD 067.2911	
N91	BO CA3240AE BIMOS DUAL OP IC OPERATION AMPLIFIER RCA CA3240AE		BO 302.7040	
R1	RF 0,25W100 OHM +-5% RESISTOR		RF 069.1012	
R2	DRALORIC LCA0207/+-5%100 RF 0,25W 39KOHM +-5% RESISTOR		RF 069.3938	
R3	DRALORIC LCA0207/+-5%39K RF 0,25W330 OHM +-5% RESISTOR		RF 069.3315	
R10	DRALORIC LCA0207/+-5%330 RF 0,25W 10KOHM +-5% RESISTOR		RF 069.1035	
R11	DRALORIC LCA0207/+-5%10K RF 0,25W 10KOHM +-5% RESISTOR		RF 069.1035	
R20	DRALORIC LCA0207/+-5%10K RF 0,25W2,7KOHM +-5% RESISTOR		RF 069.2725	
R21	DRALORIC LCA0207/+-5%2,7K RF 0,25W 1KOHM +-5% RESISTOR		RF 069.1029	
R22	DRALORIC LCA0207/+-5%1,0K RF 0,25W330 OHM +-5% RESISTOR		RF 069.3315	
R23	DRALORIC LCA0207/+-5%330 RF 0,25W100 OHM +-5% RESISTOR		RF 069.1012	
R25	DRALORIC LCA0207/+-5%100 RF 0,25W 1KOHM +-5% RESISTOR		RF 069.1029	
BIS/TO R28 R30	DRALORIC LCA0207/+-5%1,0K RL 0,25W 75,0KOHM+-1%TK50 RESISTOR		RL 083.1916	
R31	DRALORIC SMA/207/75K-F-C RL 0,25W 51,1KOHM+-1%TK50 RESISTOR		RL 083.1822	
R32	DRALORIC SMA/207/51,1K-F-C RL 0,25W 60,4KOHM+-1%TK50 RESISTOR		RL 083.1851	
R33	DRALORIC SMA0207/60,4K-F-C RL 0,25W 39,2KOHM+-1%TK50 RESISTOR		RL 083.1745	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R34	DRALORIC SMA/207/39,2K-F-C RL 0,25W 88,7KOHM+-1%TK50 RESISTOR	RL 083.1974	
R35	DRALORIC SMA/207/88,7K-F-C RL 0,25W 13,0KOHM+-1%TK50 RESISTOR	RL 083.1368	
R36	DRALORIC SMA0207/13,0K-F-D RL 0,25W 93,1KOHM+-1%TK50 RESISTOR	RL 083.1997	
R37	DRALORIC SMA/207/93,1K-F-C RL 0,25W 8,87KOHM+-1%TK50 RESISTOR	RL 083.1268	
R38	DRALORIC SMA0207/18,87K-F-D RL 0,25W 93,1KOHM+-1%TK50 RESISTOR	RL 083.1997	
R39	DRALORIC SMA/207/93,1K-F-C RL 0,25W 8,87KOHM+-1%TK50 RESISTOR	RL 083.1268	
R40	DRALORIC SMA0207/18,87K-F-D RL 0,25W 88,7KOHM+-1%TK50 RESISTOR	RL 083.1974	
R41	DRALORIC SMA/207/88,7K-F-C RL 0,25W 11,5KOHM+-1%TK50 RESISTOR	RL 083.1339	
R42	DRALORIC SMA0207/11,5K-F-D RL 0,25W 88,7KOHM+-1%TK50 RESISTOR	RL 083.1974	
R43	DRALORIC SMA/207/88,7K-F-C RL 0,25W 16,2KOHM+-1%TK50 RESISTOR	RL 083.1439	
R44	DRALORIC SMA0207/16,2K-F-D RL 0,25W 78,7KOHM+-1%TK50 RESISTOR	RL 083.1939	
R45	DRALORIC SMA0207/78,7K-F-C RL 0,25W 71,5KOHM+-1%TK50 RESISTOR	RL 083.1897	
R46	DRALORIC SMA0207/71,5K-F-C RL 0,25W 38,3KOHM+-1%TK50 RESISTOR	RL 083.1739	
R47	DRALORIC SMA0207/38,3K-F-C RL 0,25W 140 KOHM+-1%TK50 RESISTOR	RL 083.2106	
R48	DRALORIC SMA0207/140K-F-C RL 0,25W 86,6KOHM+-1%TK50 RESISTOR	RL 083.1968	
R49	DRALORIC SMA/207/86,6K-F-C RL 0,25W 15,4KOHM+-1%TK50 RESISTOR	RL 083.1416	
R50	DRALORIC SMA0207/15,4K-F-D RL 0,25W 68,1KOHM+-1%TK50 RESISTOR	RL 082.2602	
R51	DRALORIC SMA 0207/68,1K-F-C RL 0,25W 32,4KOHM+-1%TK50 RESISTOR	RL 083.1668	
R52	DRALORIC SMA0207/32,4K-F-C RL 0,25W 51,1KOHM+-1%TK50 RESISTOR	RL 083.1822	





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 ED MARKENPLATTE  
 MARKER BOARD

 Sachnummer  
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
*R53	DRALORIC SMA/207/51,1K-F-C RL 0,25W 4,75KOHM+-1%TK50 RESISTOR	RL 083.1097	
R54	DRALORIC SMA0207/4,75K-F-D RL 0,25W 78,7KOHM+-1%TK50 RESISTOR	RL 083.1939	
R55	DRALORIC SMA0207/78,7K-F-C RL 0,25W 28,0KOHM+-1%TK50 RESISTOR	RL 083.1600	
R56	DRALORIC SMA/207/28,0K-F-C RL 0,25W 110 KOHM+-1%TK50 RESISTOR	RL 083.2041	
R57	DRALORIC SMA0207/110K-F-C RL 0,25W 88,7KOHM+-1%TK50 RESISTOR	RL 083.1974	
R58	DRALORIC SMA/207/88,7K-F-C RL 0,25W 13,7KOHM+-1%TK50 RESISTOR	RL 082.6608	
R59	DRALORIC SMA0207/13,7K-F-D RL 0,25W 140 KOHM+-1%TK50 RESISTOR	RL 083.2106	
R60	DRALORIC SMA0207/140K-F-C RL 0,25W 681 KOHM+-1%TK50 RESISTOR	RL 083.2735	
R61	DRALORIC SMA0207/381K-F-C RL 0,25W 1MOHM+-1%TK50 RESISTOR	RL 082.7862	
R62	DRALORIC SMA0207/1M-F-D RL 0,25W 71,5KOHM+-1%TK50 RESISTOR	RL 083.1897	
R63	DRALORIC SMA0207/71,5K-F-C RL 0,25W 29,4KOHM+-1%TK50 RESISTOR	RL 083.1622	
R64	DRALORIC SMA0207/29,4K-F-C RL 0,25W 93,1KOHM+-1%TK50 RESISTOR	RL 083.1997	
R65	DRALORIC SMA/207/93,1K-F-C RL 0,25W 8,66KOHM+-1%TK50 RESISTOR	RL 083.1251	
R66	DRALORIC SMA0207/8,66K-F-D RL 0,25W 90,9KOHM+-1%TK50 RESISTOR	RL 083.1980	
R67	DRALORIC SMA0207/90,9OHM-F-C RL 0,25W 61,9KOHM+-1%TK RESISTOR	RL 082.6120	
R68	DRALORIC SMA 0207/61,9K-F-C RL 0,25W 38,3KOHM+-1%TK50 RESISTOR	RL 083.1739	
R69	DRALORIC SMA0207/38,3K-F-C RL 0,25W 61,9KOHM+-1%TK RESISTOR	RL 082.6120	
R70	DRALORIC SMA 0207/61,9K-F-C RL 0,25W 38,3KOHM+-1%TK50 RESISTOR	RL 083.1739	
R71	DRALORIC SMA0207/38,3K-F-C RL 0,25W 61,9KOHM+-1%TK RESISTOR	RL 082.6120	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R72	DRALORIC SMA 0207/61,9K-F-C RL 0,25W 38,3KOHM+-1%TK50 RESISTOR	RL 083.1739	
R73	DRALORIC SMA0207/38,3K-F-C RL 0,25W 78,7KOHM+-1%TK50 RESISTOR	RL 083.1939	
R74	DRALORIC SMA0207/78,7K-F-C RL 0,25W22,6KOHM+-1%TK50 RESISTOR	RL 082.2219	
R75	DRALORIC SMA0207/22,6K-F-C RL 0,25W85,6KOHM+-0,1%T25 RESISTOR	RL 084.4854	
R76	RL 0,25W 15,4KOHM+-1%TK50 RESISTOR	RL 083.1416	
R80	DRALORIC SMA0207/15,4K-F-D RF 0,25W 10KOHM +-5% RESISTOR	RF 069.1035	
	DRALORIC LCA0207/+5%10K		
BIS/TO			
R85			
R86	RL 0,13W 1,0KOHM2% UNGEW. RESISTOR	RL 092.6075	
	RESISTA MK1 1K 2% UNGEW.		
R89	RL 0,25W 51,1KOHM+-1%TK50 RESISTOR	RL 083.1822	
R90	DRALORIC SMA/207/51,1K-F-C RF 0,25W8,2KOHM +-5% RESISTOR	RF 069.8223	
R91	DRALORIC LCA0207/+5%8,2K RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R92	DRALORIC LCA0207/+5%2,2K RF 0,3 W 10MOHM+-5% RESISTOR	074.0904	
R93	BEYSCHLAG SBC0309/10M5% RL 0,25W 4,02KOHM+-1%TK50 RESISTOR	RL 083.1045	
R94	DRALORIC SMA0207/4,02K-F-D RS 0,75W10KOHM+-10% CERMET DEPOS.-CARBON POTENTIOMET	RS 037.7396	
R95	BOURNS 3006P-1-10 KOHM+-10% RF 0,25W2,2KOHM +-5% RESISTOR	RF 069.2225	
R96	DRALORIC LCA0207/+5%2,2K RF 0,25W 68KOHM +-5% RESISTOR	RF 069.6837	
R97	DRALORIC LCA0207/+5%68K RF 0,25W390 OHM +-5% RESISTOR	RF 069.3915	
R98	DRALORIC LCA0207/+5%390 RF 0,25W 1KOHM +-5% RESISTOR	RF 069.1029	
R99	DRALORIC LCA0207/+5%1,0K RF 0,25W3,3KOHM +-5% RESISTOR	RF 069.3321	
R100	DRALORIC LCA0207/+5%3,3K RF 0,25W1,8KOHM +-5%	RF 069.1829	

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Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.		enthalten in contained in
R101	RESISTOR DRALORIC LCA0207/+5%1,8K RF 0,25W6,8KOHM +-5%		RF 069.6820		
R102	RESISTOR DRALORIC LCA0207/+5%6,8K RF 0,25W 10 OHM +-5%		RF 069.1006		
R103	RESISTOR DRALORIC LCA0207/+5%10 RF 0,25W 15KOHM +-5%		RF 069.1535		
R110	RESISTOR DRALORIC LCA0207/+5%15K RF 0,25W 10KOHM +-5%		RF 069.1035		
R135	RESISTOR DRALORIC LCA0207/+5%10K RF 0,25W 51 OHM +-5%		RF 069.5101		
R136	RESISTOR DRALORIC LCA0207/+5%51 RF 0,25W 51 OHM +-5%		RF 069.5101		
R137	RESISTOR DRALORIC LCA0207/+5%51 RF 0,25W 1KOHM +-5%		RF 069.1029		
V1	RESISTOR DRALORIC LCA0207/+5%1,0K				
V10	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX		AK 010.5163		
V11	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX		AK 010.3777		
V12	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448		AD 012.0700		
V102	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448		AD 012.0700		
V103	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX		AK 010.3777		
V104	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX		AK 010.5163		
V105	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448		AD 012.0700		
X1	VL WIRE-WRAP PIN BERG NR. 75 403-001		VL 088.4507		
X2	FP INDIREKT.STECKERL.36P. MALE MULTIPOINT CONNECTOR BERG 75160-102-36		FP 242.3600		
X3	10 KONTAKTE FP STECKERLEISTE 48POL. PANDUIT 100-348-063P		FP 099.0908		

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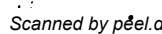
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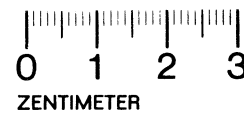
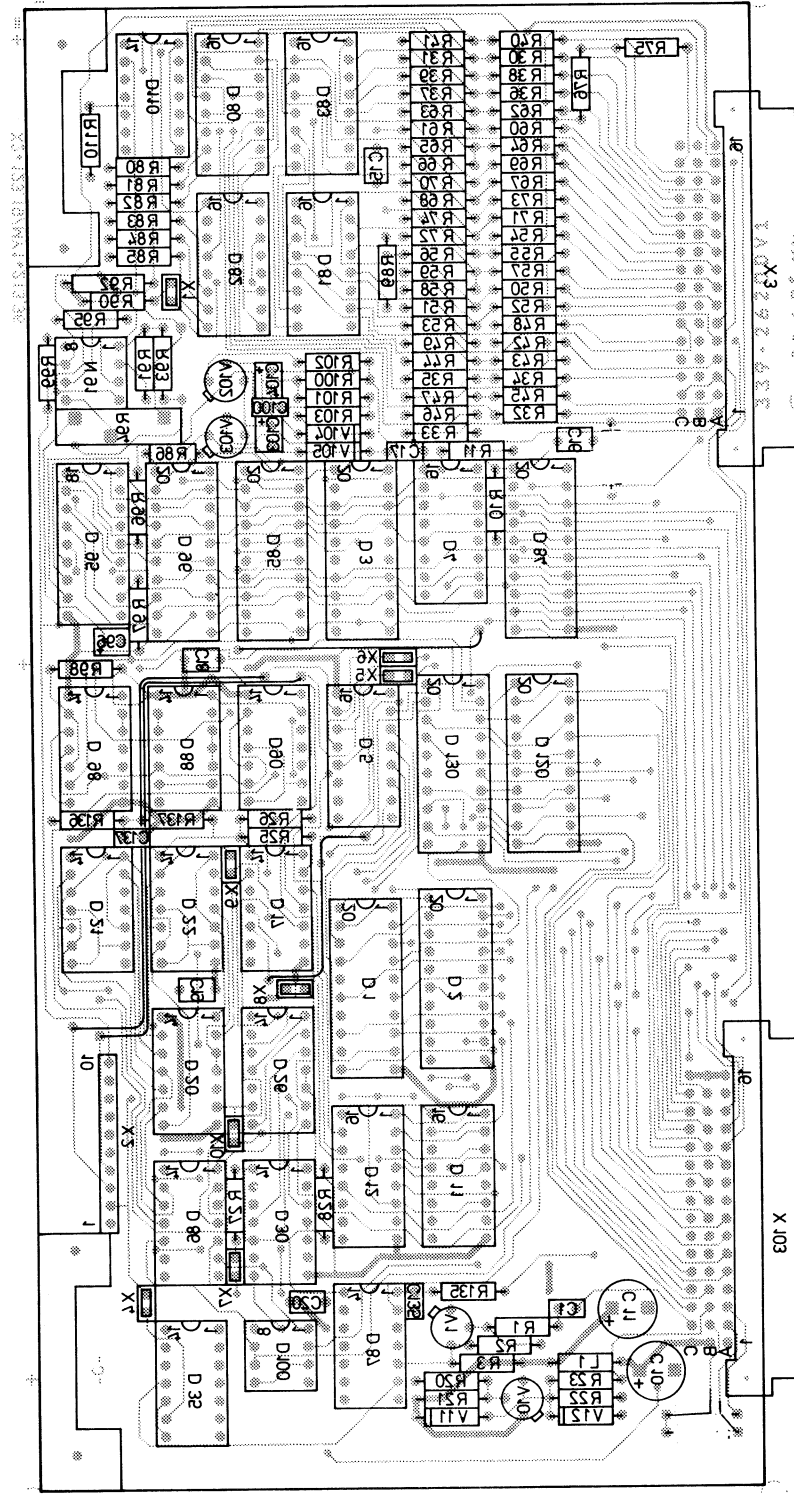
Schaltteilliste für  
Parts list for  
**ED MARKENPLATTE**  
**MARKER BOARD**Sachnummer  
Stock No.**339.2613.01 SA**Blatt  
Page**8**Kennzeichen  
Component No.Benennung/Beschreibung  
DesignationSachnummer  
Stock No.enthalten in  
contained in**X4****BIS/TO****X10****X103****VL WIRE-WRAP PIN**  
**BERG NR. 75 403-001****FP STECKERLEISTE 48POL.**  
**PANDUIT 100-348-063P****VL 088.4507****FP 099.0908****- ENDE -**


Zeichen	339 2613 S	And Zust	And Mitg Nr	Datum	Name
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gezeichnet		...	27065		
bearbeitet					
geprüft					
normgepr					



ISO-Projektion  
Methode E

Ansicht und Leitungsführung Lötseite  
View of tracks on solder side



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						Halbzeug, Werkstoff				
				1GMG	Tag	Name	Benennung  Markenplatte Marker board			Z
				Bearb.	1.83	C0				
				Gepr.						
				Norm						
				 <b>ROHDE &amp; SCHWARZ</b>			Zeichn.-Nr.		Blatt-Nr.	
							339.2613		2	
Änd. Zust.	Änderungs- Mitteilung	Tag	Name	zu Gerät SWP			reg. i. V. 339.0010 V		erste Z. 339.0010	
									v. BL	