



ROHDE & SCHWARZ

Instruments
Division

Service Manual

SIGNAL GENERATOR SMHU

0.1 to 4320 MHz

835.8011.52/.56/.58

VOLUME 1

The service manual consists of 3 volumes

Printed in the Federal
Republic of Germany

C

C

C

C

Contents

Service Manual

VOLUME 1	Order No.	Index
4 Service Manual for Complete Instrument	835.8011.52	
5 Service Instructions for the Individual PC Boards		
Display/Keyboard	819.1122.02	1
Switched-mode Power Supply	819.1568.02	2
Controller	819.2164.02	3
AF-Generator	819.3260.02	4
FRN-Synthesis	819.3860.02	5
Step Synthesis/FM	819.4944.02	6
Fixed Frequencies	819.6060.02	7
Summing Loops	819.7166.02	8
RF-Oscillators	819.8262.02	9
 VOLUME 2		
Filter Bank	819.9369.02	1
Output Section	820.0461.02	2
RF Amplifier 4.4 GHz	836.0766.02	3
Doubler	835.8763.02	4
Control	836.2269.02	5
Precision Attenuator	835.8234.02	6
Fast Hop Bus ¹⁾	1002.5558.02	7
Broadband Modulator ²⁾	1002.4251.02	8
Down Converter ²⁾	1002.3755.02	9
Spurious Response Detector	1013.5502.02	10
 VOLUME 3		
GMSK-Coder Option SMHU-B2 ²⁾	820.4350.02	1
DECT-Coder Option SMHU-B3 ²⁾	836.4010.02	2
ADC-Coder Option SMHU-B4 ²⁾	836.4161.02	3
CT-Coder Option SMHU-B5 ²⁾	836.4410.02	4
CDMA-Coder Option SMHU-B6 ²⁾	836.4661.02	5
TETRA-Coder Option SMHU-B7 ²⁾	836.3788.02	6

¹⁾ only with model 56 and 58

²⁾ only with model 58

(

(

(

(

Contents

Page

4	Service Manual for Complete Instrument	4.1
4.1	Function Description	4.1
4.1.1	RF Synthesis	4.1
4.1.2	Level Control and Amplitude Modulation	4.2
4.1.3	Frequency Modulation	4.2
4.1.4	Internal Modulation Sources	4.2
4.1.5	Controller	4.2
4.1.6	Self-monitoring and Diagnostics	4.2
4.1.7	Extensions for Model 56/58	4.2
4.2	Mechanical Design	4.3
4.2.1	List of Modules	4.3
4.3	Testing and Adjustment	4.3
4.3.1	Summary of Adjustment Points and Calibration Routines for the Complete Instrument	4.3
4.3.1.1	List of Feasible Adjustments	4.4
4.3.2	Adjustments and Calibration Routines following Module Repair or Replacement	4.5
4.4	Adjustment Points and Calibration Routines	4.6
4.4.1	Pulse Amplitude	4.6
4.4.2	AM 100 %	4.6
4.4.3	500-MHz Detector Linearity	4.6
4.4.4	4-MHz Detector Linearity	4.7
4.4.5	Level at Frequencies below 5 MHz	4.7
4.4.6	Calibration Routine for RF Level	4.7
4.4.7	Internal Reference Frequency	4.7
4.4.8	Calibration Routine for Presetting of Summing Loop 1	4.8
4.4.9	Calibration Routine for Special Function 7	4.8
4.4.10	Calibration Routine for Level before the Doubler	4.8
4.4.11	Calibration Routine for the I/Q Modulator (only model 58)	4.8

4.5	Troubleshooting	4.9
4.5.1	Self-monitoring	4.9
4.5.2	Built-in Diagnostics	4.9
4.6	Checking Modules with the Built-in Diagnostics Facility	4.12
4.6.1	Troubleshooting at Module Level	4.12
4.6.1.1	A 3 Keyboard/Display	4.12
4.6.1.2	A 4 Power Supply	4.12
4.6.1.3	A 5 Controller	4.12
4.6.1.4	A 6 AF Generator	4.12
4.6.1.5	A 7 FRN Synthesis	4.13
4.6.1.6	A 8 Step Synthesis/FM	4.13
4.6.1.7	A 10 Summings	4.13
4.6.1.8	A 11 RF Oscillators	4.13
4.6.1.9	A 12 Filter Bank	4.14
4.6.1.10	A 13 Output Section	4.14
4.6.1.11	A 163 Doubler	4.14
4.6.1.12	A 14 Broadband Modulator (only Model 58)	4.14
4.6.1.13	A 15 Converter (only Model 58)	4.14
4.6.2	Troubleshooting According to Type of Fault	4.15
4.6.2.1	Frequency Errors	4.15
4.6.2.2	Level Errors	4.15
4.6.2.3	AM Errors	4.15
4.6.2.4	FM/ΦM Errors	4.15
4.6.2.5	Harmonics Level Too High	4.15
4.6.2.6	Poor Spectral Purity (SSB Noise, residual FM)	4.16
4.6.2.7	List of Special Functions for Service Purposes	4.16
4.7	Retrofitting Options SMHU58 B-2/3/4/5	4.16
4.7.1	Installation	4.16
4.7.2	Adjustment	4.17

4 Service Manual for Complete Instrument

4.1 Function Description

(See function diagram 835.8011 FS)

The Signal Generator SMHU uses indirect synthesis to generate the output signal. All oscillators are synchronized in the unmodulated state to the (internal or external) reference frequency by means of phase locked loops so that the output signal has the same stability.

This type of synthesis generates frequencies from 1000 to 2160 MHz. Lower frequencies are generated by dividing or mixing with a synchronous fixed frequency.

Frequencies above 2.16 GHz are generated by means of a frequency doubler.

The output level is held constant by a fast control circuit which also generates the amplitude modulation. The control voltage is stored for the pulse modulation so that there are no limitations on the pulse width.

A frequency-modulated LC oscillator is used for frequency modulation instead of a crystal oscillator. The centre frequency of the LC oscillator is also synchronized to the reference frequency by means of a control circuit. This circuit also makes a drift-free FM DC mode possible.

4.1.1 RF Synthesis

The three oscillators which generate the frequency band of 1000 to 2160 MHz (module A 11, RF oscillators) are synchronized with the 25th to 54th harmonics of a reference signal of approx. 40 MHz which can be adjusted such that the changeover from the first harmonic used (the 25th) to the second used (the 26th) is continuous.

This reference signal is generated at 320 to 333 MHz, divided by 8 and used to generate the harmonics.

The reference frequency is synthesized in two stages in order to achieve high spectral purity.

The fine resolution is generated in a synthesis circuit with a fractional division factor with 8 places after the decimal point (module A 7, FRN synthesis). An 8:1 frequency division increases their spectral purity but limits the range of variation such that a further synthesis stage is required whose step size corresponds to the divided variation range (module A 8, step synthesis/FM stage). An initial summing loop (module A 10, summing loops) combines these signals and generates a frequency band of approx. 20 to 33 MHz. In a second summing loop (module A 10, summing loops), a fixed frequency of 300 MHz is added (from module A 9, fixed frequencies) which is generated in the unmodulated state by crystal oscillators. With FM, a frequency-modulated 40-MHz signal is also included (from module A 8, step synthesis/FM stage).

In order to retain the complete output frequency band, the RF oscillators are followed by an RF divider chain (in module A 13, output unit) which can set divider factors from 2 to 64 in steps of 2. Frequencies up to approx. 15 MHz can then be generated. A filter bank (module A 12) is provided because of the square-wave output signal of the dividers and contains lowpass filters at intervals of half an octave.

The filter bank applies the signal to the doubler (A163) which contains a level control element and three bandpass filters for suppressing harmonics and subharmonics.

The frequencies below 15 MHz are generated by mixing with a fixed frequency of 130 MHz from a crystal oscillator (on module A 9, fixed frequencies). There is a special function for switching over to a fixed frequency of 520 MHz. Thus frequencies up to 125 MHz can be generated by mixing. An FM deviation four times as large is thus possible in this band as a result of the smaller divider factor for generation of the RF frequency for the mixer.

4.1.2 Level Control and Amplitude Modulation

The level control and amplitude modulation functions are linked, the AM represents the AC voltage component of the target voltage for the amplitude control loop.

The level control element is an attenuator with PIN diodes which is driven by a PI controller (module A 13, output unit). The respective control voltage can be measured and stored digitally in order to obtain an exact output level with pulse modulation as well.

The output level is measured with a resistive directional coupler at the output of the 4.4 GHz RF Amplifier (A162). This ensures that level and output impedance are correct.

4.1.3 Frequency Modulation

The centre frequency of the modulated 40-MHz oscillator on module A 8 (step synthesis/FM stage) is stabilized by a slow control circuit so that the modulation contents are not influenced with FM AC. In the case of FM DC, the modulation contents are connected to the integrator of the control with the opposite phase to the measured value of the discriminator so that a correction signal is only generated if there is a deviation from the target value. The control loop remains closed and enables drift-free FM DC.

4.1.4 Internal Modulation Sources

The module A 6, AF synthesis, contains two generators, an AF synthesizer from 1 Hz to 100 kHz with a resolution of 1 Hz and a fixed-frequency generator which is switchable from 409.6 to 1024 Hz. Both generators can be used for both modulation modes and as an output signal at the AF connector. Thus e.g. simultaneous AM and FM with different modulation frequencies or internal two-tone modulation are possible.

4.1.5 Controller

The module A 5 (controller) controls all routines in the SMHU. The microprocessor calculates the settings for the modules from the data input from the keyboard/display (A 3) or from the IEC 625/IEEE 488 interface. It then passes them on via an internal serial data bus. All functions except the AC power switch can be remote-controlled. The device status can be polled using the talker function.

4.1.6 Self-monitoring and Diagnostics

All control loops trigger an alarm if the control voltages are out of range. The module A 5 (controller) contains an analog/digital converter with which 70 internal test points can be interrogated, thus enabling the fault to be limited to one particular module even before opening the instrument. The Service Kit SMGU-Z2 (cf. section 4.2) includes a computer program making intensive use of these internal measurement capabilities.

4.1.7 Extensions for Model 56/58

Model 56 contains the additional module fast hop bus (A191), which allows to address up to 4800 fast mode settings via an external interface (X192).

Model 58 includes two additional modules, a broadband modulator (A14) and a converter (A15).

The broadband modulator contains a PLL-controlled oscillator 2.24 GHz that can be broadband-modulated with a high deviation and furthermore an I/Q modulator. Various coders can be supplied as options which process the digital input data to form modulation signals for the I/Q modulator (e.g. for Gaussian minimum shift keying, GMSK).

This modulated signal is converted with an appropriate synthesis frequency to the output frequency range of 1 to 2000 MHz using a converter. In this frequency range broadband-FM, broadband-AM, I/Q modulation and digital types of modulations depending on the used coder are thus feasible.

4.2 Mechanical Design

The front panel, rear panel with power supply and a motherboard are fitted in a die-cast frame. The motherboard establishes the signal connections between the various modules which are inserted into it from above and held by guide rails. A locking assembly accessible from below prevents the modules from sliding out in transit. The RF connections are also located at the bottom. The RF amplifier (A162), the doubler (A163) and the precision attenuator (A18) are accommodated in a space at the side.

The Service Kit SMGU-Z2 contains all parts required to access the modules for servicing. It includes further a diskette with the diagnostic program SMSERVIC.BAS in R&S-Basic which

- * makes intensive use of the diagnostic test points for module tests

- * allows to perform many adjustments without any extra test equipment

- * is able to display frequency response curves of important functions.

4.2.1 List of Modules

A 2	Motherboard
A 3	Keyboard/display
A 4	Power supply
A 5	Controller
A 6	AF generator
A 7	FRN synthesis
A 8	Step synthesis/FM
A 9	Fixed frequencies
A 10	Summing loops
A 11	RF oscillators
A 12	Filter bank
A 13	Output section
A 14	Broadband modulator ¹⁾
A 15	Converter ¹⁾
A 18	Precision attenuator
A 162	RF amplifier 4.4 GHz
A 163	Doubler
A 191	Fast hop bus ²⁾

¹⁾ only with model 58

²⁾ only with models 56 and 58

4.3 Testing and Adjustment

4.3.1 Summary of Adjustment Points and Calibration Routines for the Complete Instrument

All these adjustments, with the exception of the calibration routine for RF level and adjustment of the internal reference frequency, can be performed with the diagnostic program contained in the Service Kit SMGU-Z2 without any extra test equipment.

Adjustment	On module	S. Section
Pulse amplitude	RF oscillators (A11)	4.4.1
AM 100 %	Output section (A13)	4.4.2
500-MHz detector linearity	RF amplifier (A162)	4.4.3
4-MHz detector linearity	Output section (A13)	4.4.4
Level below 5 MHz	Output section (A13)	4.4.5
Calibration routine for RF level		4.4.6
Internal reference frequency	Fixed frequencies (A9)	4.4.7
FM deviation	Step synthesis/FM (A8)	4.4.8
Calibration routine for presetting of summing loop 1		4.4.9
Calibration routine for special function 7		4.4.10
Calibration routine for the level before the doubler		4.4.11
Calibration routine for I/Q modulator (only with model 58)		4.4.11

4.3.1.1 List of Feasible Adjustments

The adjustments are listed in the sequence offered by the diagnostic program with the corresponding sections in the service manual:

Module	Part No.	Section	Adjustment element
RF oscillator	819.8262	5.2.2.2 5.2.2.4	R106 R164
FRN synthesis	819.3860	5.2.1	C70/C71
Step synthesis	819.4944	5.2.2.1	C211, C212
Summing loop 1		5.2.1	C31
Summing loop 2	819.7166	5.2.6	C285
RF oscillators	819.8262	5.2.1.1	C1, R202, C21, R203, C51, R203
Output section	820.0461	5.2.1.1	R404
Complete instrument SMHU	819.0010	4.4.3	R72, R85
RF amplifier 2 GHz	843.3450	5.2.1	R30
RF amplifier 4 GHz	836.0766	5.2.1	R72, R85
Output section	820.0461	5.2.2.1 5.2.2.3	R314 R362
AF generator	819.4944	5.2.6.3 5.2.6.5 5.2.2	R260 R125 R19
FM stage	819.4944	5.2.2.5 5.2.2.6 5.2.2.3 5.2.2.6 5.2.2.6	R39 R170 R30 R169 R171
Summing loops	819.7166	5.2.3	Special function 67
Complete instrument SMHU	835.8011	4.4.9	Special function 67
Doubler	835.8763	5.2	Special function 66

Module	Part No.	Section	Adjustment element
Complete instrument SMHU	835.8011	4.4.11	Special function 66
Complete instrument SMHU	835.8011	4.4.10	Special function 68
Complete instrument SMHU	835.8011	4.4.12	Special function 320 ¹⁾

¹⁾ only with model 58

4.3.2 Adjustments and Calibration Routines following Module Repair or Replacement

The calibration routine for the special function 7 (4.4.10) should be used each time a repair is made (instrument warmed-up), especially after work on the controller and on the modules from A11 onwards (RF oscillators). The adjustments in line with the following table must be performed before.

Replacement of module	Adjustment/calibration	S. Section
A 5 Controller	All the calibration routines	4.4.6 4.4.9 4.4.11 4.4.12
A 6 AF generator	AM 100 % Calibration routine for RF level	4.4.2 4.4.6
A 9 Fixed frequencies	Internal reference frequency	4.4.7
A 10 Summing loops	Pulse amplitude Calibration routine for A10	4.4.1 4.4.9
A 11 RF oscillators	Pulse amplitude Calibration routine for the level before the doubler	4.4.1
A 12 Filter bank	Calibration routine for the level before the doubler	4.4.11
A 13 Output section	AM 100 % 4-MHz detector linearity Level below 5 MHz Calibration routine for RF level Calibration routine for the level before the doubler	4.4.2 4.4.4 4.4.5 4.4.6
A 14 Broadband modulator ¹⁾ A 15 Converter ¹⁾	Calibration routine for the I/Q modulator	4.4.11
A 162 RF amplifier	500-MHz detector linearity Calibration routine for RF level	4.4.3 4.4.6
A 163 Doubler	Calibration routine for the level before the doubler	4.4.11

¹⁾ only with model 58

4.4 Adjustment Points and Calibration Routines

Caution!

Always switch the instrument off before removing or inserting modules. Replacing modules with the power switched on may lead to destruction of the data transfer modules.

4.4.1 Pulse Amplitude

- Make module A11 (RF oscillators) accessible using service adapter.
- Using special function 155 (diagnostics), measure the pulse amplitude at a frequency setting of 1020 MHz.
- Adjust for maximum voltage using potentiometer R106. It should be more than 3 V.

4.4.2 AM 100 %

This adjustment need only be carried out if the high modulation depths are inaccurate when AM is selected or if the dynamic range is insufficient when AM-square, 100 % is used.

- Make module A 13 (output unit) accessible using service adapter.
- Open cover on component side (opposite to front panel).
- Connect oscilloscope to test point P43.
- Set AM 100 % and AF 1 kHz on the SMHU.
- Use R403 to adjust the DC component such that the minimum of the sinewave signal touches the zero line. To achieve a high accuracy, use the complete screen or even better only display lower half of signal.

4.4.3 500-MHz Detector Linearity

The adjustment is made at the RF amplifier (A162). The tuning elements are accessible after removing the carrying handle.

First adjust AM distortion using potentiometer R72 (AM linear):

- Connect a power meter and a modulation analyzer with distortion meter to the RF output of the SMHU via a 6-dB power divider.
- Select an RF of 500 MHz and set a level of 1 dBm on the SMHU power meter.
- Switch on AM INT with 80% modulation depth at 1 kHz AF.
- Switch on special function 1 (uninterrupted level adjustment).
- Note the level on the power meter as the reference value.
- Adjust the AM distortion to a minimum (< 2%).
- Reduce the level on the SMHU by 10 or 20 dB. Check the reduction on the power meter and correct in the case of deviations > 1 dB, using R85 (U-DET linear). After both reductions repeat the distortion adjustment. Now set the linearity of the electronic level adjustment using potentiometer R85 (U-DET linear):
- Connect power meter to RF output connector.
- Set 500 MHz, 13 dBm, unmodulated on the SMGU and adjust the electronic level setting to 0 dB using special function 76. Measure the output level and note it as the reference value.
- Adjust the electronic level setting for -25 dB using special function 77 and measure the level again.
- Adjust the level to 25 ± 0.1 dB below the reference using R85. Repeat the adjustment until a difference in level of 25 ± 0.2 dB is achieved.

4.4.4 4-MHz Detector Linearity

- Make module A 13 (output unit) accessible using service adapter.
- Connect power meter to RF output connector.
- Set 4 MHz, 13 dBm, unmodulated on the SMHU and adjust the electronic level setting to 0 dB using special function 76. Measure the output level and note it as the reference value.
- Adjust the electronic level setting to -25 dB using special function 77 and measure the level again. If necessary, adjust the level to 25 ± 0.1 dB below the reference value using R314.

Repeat the adjustment until a difference in level of 25 ± 0.2 dB is achieved.

4.4.5 Level at Frequencies below 5 MHz

- Expose module A 13 (output unit) using service adapter.
- Connect power meter to RF output connector.
- Set 5.1 MHz, 0 dBm, unmodulated on the SMHU and switch off the level correction using special function 55.
- Measure the output level and note it.
- Reduce the frequency to 4.9 MHz and set the same level again ± 0.1 dB using potentiometer R362.
- **Caution: following this adjustment, always carry out the RF level calibration routine as in 4.4.6.**

4.4.6 Calibration Routine for RF Level

This calibration routine generates a correction table in the EEPROM of the controller by means of which the inaccuracies of the electronic level setting can be kept to a minimum by specifying a corresponding setpoint. The controller specifies the test points at which the setpoint is set using an accurate power meter.

- Connect power meter to RF output connector.
- Select calibration routine on SMHU using special function 51.
- Vary the level at each test point using the spinwheel until the power meter also displays the value shown on the left in the level display as accurately as possible. The correction value is then shown in the right half of the level display. The value is stored by pressing an ENTER/UNITS key; the next test point set. The bottom STEP key can be used to repeat the last test point is selected. The top STEP key can be used to skip a test point if a correction is unnecessary.

87 calibration points are gone through. The routine is automatically left after the last calibration point, or at any time using SHIFT PRESET.

4.4.7 Internal Reference Frequency

- Switch on internal reference on SMHU (RF INT/ON).
- Connect calibrated frequency counter to REF connector at rear of instrument.
- After a warm-up time of half an hour, set the nominal frequency using the trimmer INT. REF. 10 MHz on module A 9 (fixed frequencies). The adjustment can be carried out with the module fitted.

4.4.8 Calibration Routine for Presetting of Summing Loop 1

The VCO in the first summing loop is synchronized using a presetting. This is read from a table in the EEPROM of the controller (A5) where it can also be restored using a calibration routine. This is carried out by calling special function 67. The routine must be called following a repair or module replacement A9 (summing loops) and A5 (controller) or if the error message 67 appears when the STATUS key (with flashing LED) is pressed.

4.4.9 Calibration Routine for Special Function 7

In the case of level settings without control (special function 5, pulse modulation), special function 7 selects the control voltages from a table in the EEPROM of the controller. These values can be regenerated using special function 68 without additional instruments. This calibration routine should always be called following repairs on the controller (A5) and on all modules from A11 upwards (RF oscillators).

4.4.10 Calibration Routine for Level before the Doubler

Since the doubler comprises a level control element, the control element in the output section is set via a separate D/A converter such that the PIN modulator of the doubler is driven at a constant input level. For this purpose, a table is provided in the controller EEPROM. It can be overwritten with the calibration routine which uses the internal diagnostics facility, by calling up special routine 66. During the call, SPECIAL 66 appears in the left display, then the previous display is restored.

4.4.11 Calibration Routine for the I/Q Modulator (only Model 58)

With the built-in attenuator voltage sources and diagnostic means the I/Q modulator can be calibrated using a firmware routine. The calibration data are stored in an EEPROM in the controller. Without this calibration the specifications are not adhered to (see also in the operating manual, section 2.3.23). No valid values in the EEPROM (eg after a controller change) cause the status LED to flash and the error code 69 to be indicated upon a status query.

The calibration routine is called by entering special function 320. If hardware errors prevent the routine from being performed, error 71 is output.

4.5 Troubleshooting

4.5.1 Self-monitoring

An alarm is triggered on the controller - indicated by a flashing status LED - if the control voltage in a loop is out of range. One or more error codes are then displayed by pressing the status key. The error codes have the following meanings:

Error number	Meaning
40	40-MHz crystal oscillator (A9) asynchronous
41	130-MHz crystal oscillator (A9) asynchronous
42	FRN synthesis (A7) asynchronous
43	Step synthesis (A8) asynchronous
44	1st summing loop (A10) asynchronous
45	FM oscillator (A8) asynchronous
46	2nd summing loop (A10) asynchronous
47	RF oscillators (A11) asynchronous
48	Level control (A13) faulty
49	Coder clock frequency out of tolerance (only B2/B3/B4)
50	2.24-GHz loop out of sync (only SMHU58)
61	Data error in EPROM
62	Error in RAM
63	Error in a stored instrument setting
64	Error in a memory for special function 45
65	Error in the EEPROM level correction table
67	Error in the EEPROM table for presetting of A10
66	Error in the EEPROM table for level before the doubler
68	Error in the EEPROM table for special function 7
69	Error in I/Q modulator calibration values (only SMHU58)
70	Triggering of overvoltage protection
71	Calibration routine cannot be executed
72	Fault in ADC used for diagnostics
73	Fault in fast hop bus interface (only SMHU56/58)
74	Illegal fast hop bus address (only SMHU56/58)

Error messages 61 to 68 and 72 indicate faults in the controller (A5) if they cannot be eliminated by restoring or by calling the associated calibration routine. If a calibration routine cannot be executed because of a hardware error (error 71), the error must be looked for in the associated modules.

4.5.2 Built-in Diagnostics

In order to localize the errors more precisely, the following test points can be selected using special functions 101 to 199. The voltages listed are approximate values for a fault-free instrument. They are output in the right-hand display and can be read by a controller via the IEC 625/IEEE 488 interface. An extensive computer program facilitating troubleshooting and adjustment is included in the Service Kit SMGU-Z2 (see also section 4.3.1).

SF-No.	Test point	V _{min}	V _{max}	Unit
A 5 Controller				
101	Voltmeter	-40	+40	V
102	RAM battery	2	4	V
103	X voltage for sweep	0	10	V

A 6 AF synthesis				
109	Oscillator level	1.5	2.5	V
110	5-V reference	4.9	5.1	V
111	5-V supply	4.5	5.3	V
112	15-V supply	14.0	15.5	V
113	-15-V supply	-15.5	-14.0	V
114	AF output	-2	2	V
115	AMOD output	-6	6	V
116	FMOD output	-1.45	1.45	V

A 7 FRN synthesis				
117	PI controller output	-8	+8	V
118	VCO control voltage	2.0	18.0	V
119	Presetting voltage <i>3.2</i>	-4.2	-3.5	V
120	Oscillator level	0.4	0.8	V
121	Output level 3 to 3.6 MHz	0.2	0.5	V
122	40-MHz input	0.7	1.5	V
123	IF level	1.1	2.7	V
124	Supply	23	25	V

A 10 Summing loops				
141	SUM 1 presetting	1.6	21.6	V
142	SUM 1 tuning voltage	1.6	21.6	V
143	SUM 1 oscillator signal	0.3	1	V
144	SUM 2 tuning voltage	1.6	21.6	V
145	SUM 2 oscillator signal	0.05	0.3	V
146	SUM 2 sync signal	-0.5	1.5	V
147	SUM 2 IF signal	0.5	1.5	V
148	Pulse blanking divider signal	0.4	1.2	V

A 8 Step/FM				
125	Alarm (low-active) <i>3/4 mV</i>	3.5	5.3	V
126	Step tuning voltage	1	18	V
127	FM tuning voltage	2	13	V
128	Step synthesizer level	0.3	1.1	V
129	FM output level	0.2	0.6	V
130				V
131				V
132				V

A 11 RF oscillators				
149	Oscillator control voltage	1	22	V
150	RF level before sampler	0	0.11	V
151	RF amplifier supply	7.0	7.6	V
152	PLL alarm (high active)	-0.1	1.2	V
153	Sampler reference level	0.8	2.5	V
154	Sampler offset (adj.)	0.8	2.5	V
155	Sampler pulse level	3	10	V
156	Output level	20	220	mV

A 9 Fixed frequencies				
133	OCXO thermostat	5.5	6.5	V
134	40-MHz tuning voltage	1.2	19	V
135	135-MHz tuning voltage	1.2	19	V
136	130/520-MHz signal	0/0.2	0.7	V
137	300-MHz signal	0.3	0.8	V
138	40-MHz signal to FRN	0.3	1.2	V
139	40-MHz signal to FM	0.3	1.2	V
140	40-MHz signal to OPT	0.3	1.2	V

A 12 Filter bank				
157	-15-V supply	-15.5	-13.5	V
158	Output amplifier (N320)	13	15	V
159	Input amplifier (V4)	13	15	V
160	Mixer amplifier (V400)	13	15	V
161	5-V supply	4.5	5.3	V
162	Output level X123	0	250	mV
163	+15-V supply	14.0	15.5	V
164	Output level X122	0	250	mV

A 13 Output section				
165	Alarm signal (low-act.)	3.5	5.3	V
166	Modulator control voltage	-15	3	V
167	Detector >5 MHz	0	6	V
168	Output level X121	0/10	120	mV
169	Output level X131	0/10	600	mV
170	AM control value	-5	-0.4	V
171	Detector <5 MHz	0	6	V
172	Input voltage, pin modulator	-15	3	V

A 164 RF amplifier/doubler driver				
181	2/4-GHz identification (1 V = 4 GHz)	-0.1	1.2	V
182	10 V internal	9.8	10.2	V
183	Modulator control voltage	-0.7	10	V
184	Level before the doubler	1.0	5.0	V
185	Level after the doubler	0.5	2.0	V
186	Level of coh. carrier	-0.1	0.5	V
187	Converter output level	-0.1	5	V
188				V

A 14 Broadband modulation				
173	Model identification / option	-0,1	5.5	V
174	PLL GMSK coder clock	13/-1.5	-12	V
175	2.24-GHz oscillator level	0/50	250	mV
176	LO level, Q channel	0/50	400	mV
177	LO level, I channel	0/50	400	mV
178	Level X142 (I/Q)	0	100	mV
179	Level X141 (coh. carrier)	0/30	150	mV
180	PLL 2.24-GHz oscillator	13.2/+6	-6	V
189	I channel amplitude	0	22	V
190	Q channel amplitude	0	22	V
191	I channel offset comp. + carrier leak	6	10	V
192	Q channel offset comp.	0	10	V
193	Q channel phase	2.7	13.5	V
194	I channel phase	2.7	13.5	V
195	D/A BB-FM	0	3.3	V
196	Carr. leak. comp.	0	10	V

4.6 Checking Modules with the Built-in Diagnostics Facility

4.6.1 Troubleshooting at Module Level

Before setting the SMHU, the instrument should be set to a defined status without using special functions by pressing SHIFT PRESET. Diagnostics test points not referred to below should be within the limits specified in 4.5.2 independent of the settings. More information on troubleshooting at the modules can be found in Section 5 of the relevant module description.

The Service Kit SMGU-Z2 (cf. section 4.2) contains a computer program considerably facilitating troubleshooting. Without any extra test equipment hardly any instrument function can be checked using module-oriented test routines. Adjustments can be carried out easily and diagrams of important control voltages can be displayed.

4.6.1.1 A 3 Keyboard/Display

If the instrument does not react to keyboard entries even though the displays indicate an entry, first check that the instrument is not locked up by the remote control (IEC/IEEE bus) (best of all by removing the cable) or that a key is not stuck. If these are not the causes, refer to the service manual, modules A3 and A5.

4.6.1.2 A 4 Power Supply

The power supply has an independent self-monitoring facility and switches over to standby mode if overloading or internal faults (LED on front panel) occur.

In this case it is advisable to remove all modules apart from the controller and front panel and to switch the instrument on again. If the power supply again switches over to standby, check the power supply, controller and front panel (see Section 5). If the instrument can be switched on successfully, insert the modules again singly (with the instrument switched off) until one particular module causes the instrument to be switched off when it is switched on again. This module must then be examined more closely (see Section 5).

Caution!

Switching the set on and off without removing the fault may cause further damage.

In the case of modules inserted right at the front in the motherboard, test points 111, 112, 113 and 124 can be used to check whether the supply voltages still reach these modules.

4.6.1.3 A 5 Controller

Test point 101 is a voltmeter with autoranging. Voltages up to ± 40 V can be measured. The Service Kit SMHU-Z2 contains a probe for measuring voltages at test points in the modules which are not connected to the diagnostics system. The nominal values for the various modules are listed in the service manuals.

Test point 102 gives the voltage of the battery which supplies the RAM. If the voltage is below 3.3 V, the data may not be stored when the set is switched off.

Test point 103 gives the voltage for the output connector X-AXIS at the rear.

- Set any sweep with approx. 100 steps on the SMHU. Vary from the start frequency to the stop frequency in MAN mode and observe the displayed voltage. It must be proportional to the sweep steps, i.e. from 0 to 10 V.

4.6.1.4 A 6 AF Generator

Test points 114 to 116 are used for function checks.

- Set AF to 1 Hz, select squarewave, set AF LEVEL to 2 V, AM INT 100 % and FM INT to maximum deviation, e.g. 800 kHz at RF 600 MHz. The result display must now vary between the values given.

4.6.1.5 A 7 FRN Synthesis

Check the tuning of the oscillator using special function 118:

- ▶ Set RF 1070.0625 MHz on the SMHU, the displayed voltage should be 2.0 ± 1 V.
- ▶ Set RF 1072.0925 MHz on the SMHU, the displayed voltage should now be 18.0 ± 1.5 V.
- ▶ The voltage should have a ramp response when the frequency is varied between these limits.

4.6.1.6 A 8 Step Synthesis/FM

Check the tuning of the step synthesis oscillator using special function 126:

- ▶ First set 1001 MHz on the SMHU and then 1000.2 MHz. The displayed voltage should now be $4.0 + 1/2$ V.
- ▶ Set RF 1019.2 MHz on the SMHU. The displayed voltage should now be 17 ± 1 V.
- ▶ The voltage should increase in 15 steps when varying the frequency from the bottom to the top limit.

4.6.1.7 A 10 Summings

Check the VCO in the first loop using special function 142:

- ▶ Set RF 1000.5 MHz on the SMHU, the displayed voltage should be 2.5 ± 1 V.
- ▶ Set RF 1019.5 MHz on the SMHU, the displayed voltage should now be 17 ± 1 V.
- ▶ Set RF 1020.5 MHz on the SMHU, the displayed voltage should now be 5 ± 1 V.
- ▶ Set RF 1039.5 MHz on the SMHU, the displayed voltage should now be 20 ± 1 V.

Check the presetting:

- ▶ For all the following frequencies, first measure the preset voltage using special function 141 and then the tuning voltage using special function 142. The values should not differ by more than 0.3 V. If the difference is greater, a new calibration can be attempted using special function 67. If this leads to error message 71, the module must be examined more closely (see Section 5).

Test frequencies (in MHz):

1000.250,	1001.367,	1003.320,	1005.273,
1007.227,	1009.180,	1011.133,	1013.086,
1015.039,	1016.992,	1018.945,	1020.117,
1022.070,	1024.023,	1025.977,	1027.930,
1029.883,	1031.836,	1033.789,	1035.742,
1037.695,	1039.648,		

Check the VCO of the second summing loop using special function 144:

- ▶ Set RF 1000.5 MHz on the SMHU, the displayed voltage should be 2.5 ± 1 V.
- ▶ Set RF 1039.5 MHz on the SMHU, the displayed voltage should now be 19.5 ± 1 V.

4.6.1.8 A 11 RF Oscillators

Check the VCOs using the special function 149:

- ▶ Set RF 1000.5 MHz on the SMHU, the displayed voltage should be 1.5 ± 1 V.
- ▶ Set RF 1399.5 MHz on the SMHU, the displayed voltage should now be 21.5 ± 1 V.
- ▶ Set RF 1400.5 MHz on the SMHU, the displayed voltage should now be 1.5 ± 1 V.
- ▶ Set RF 1799.5 MHz on the SMHU, the displayed voltage should now be 21.5 ± 1 V.
- ▶ Set RF 1800.5 MHz on the SMHU, the displayed voltage should now be 1.5 ± 1 V.
- ▶ Set RF 2160 MHz on the SMHU, the displayed voltage should now be 20.5 ± 1 V.

4.6.1.9 A 12 Filter Bank

- ▶ To obtain an exact display for test points 162 and 164, disconnect cable W 162 from connector X162 on A13 (output section). The PLL is then interrupted and the maximum level can be measured at these test points.

A voltage >50 mV should be measured at test point 162 at RF 500 MHz and at test point 164 at RF 4 MHz.

4.6.1.10 A 13 Output Section

- ▶ Set RF 500 MHz, unmodulated, on the SMHU... At a level of 13 dBm, enter special functions 1 (interruption-free level setting) and 55 (switch off level correction).

The following voltages (± 0.05 V) must be found at test point 170:

Level	Voltage at test point 170
13 dBm	3.00 V
8 dBm	1.69 V
3 dBm	0.95 V
-2 dBm	0.53 V
-7 dBm	0.30 V

The same voltages must be found at test point 167, repeat the measurement there with RF 4 MHz.

- ▶ Set 13 dBm, unmodulated, on the SMHU and vary the RF over the complete range.

The voltage must remain within the defined limits at test point 166.

- ▶ To obtain a valid display for test points 168 and 169, disconnect cable W 162 from connector X162 on A13 (output section). The PLL is then interrupted and the maximum level can be measured at these test points.

A voltage >50 mV should be measured at test point 168 with RF 500 MHz and at test point 169 with RF 4 MHz.

4.6.1.11 A 163 Doubler

To check the doubler

- ▶ set frequencies from 2160 MHz to 4320 MHz, 0 dBm, unmodulated on the SMHU.

Voltages at test points 184 and 185 must be within the limits specified in 4.5.2.

The voltage at test point 183 is typically 1 to 3 V. If considerable deviations are noticed in one of the frequency ranges 2160 to 2720, 2720 to 3440, 3440 to 4320 Mz, it can be assumed that the bandpass filter for this range is defective.

4.6.1.12 A 14 Broadband Modulator (only Model 58)

To check the modulation oscillator

- ▶ switch on BB-FM with a deviation of 0 Hz after preset, select the diagnostic special function 175, nominal value 50 to 250 mV
- ▶ select the diagnostic special function 180, the displayed voltage must be between +6 and -6 V. It must jump to about 13 V upon switch-off and the settling process must be visible when switching the instrument on again.

The following table applies to testing the I and Q channels (with unchanged settings):

Special function	Nominal value	
176	50 to 400	mV
177	50 to 400	mV
179	30 to 100	mV
189	5 to 10	V
190	0 to 22	V
191	8.4 to 10	V
192	0 to 10	V
193	7 to 9	V
194	2.7 to 13.5	V
196	9.5 to 10.5	V

To test the deviation setting

- ▶ select special function 195, nominal value -10 to + 10 mV
- ▶ set deviation to 25 MHz, nominal value is now 1.5 ± 0.05 V
- ▶ set deviation to 50 MHz, nominal value is now 3.0 ± 0.1 V.

To test the output level

- ▶ set RF to 1950 MHz, level to 19 dBm, select special function 178, nominal value 30 to 100 mV..

4.6.1.13 A15 Converter (only Model 58)

To test the output level

- ▶ set RF to 10 MHz, level to 13 dBm, BB-FM to 0 kHz after preset
- ▶ select special function 187, nominal value 2.5 to 4.1 V
- ▶ select special function 186, nominal value 30 to 250 mV

4.6.2 Troubleshooting According to Type of Fault

For each type of fault, proceed in the given order, tracing the subassembly that may be causing the fault along the signal path. Troubleshooting may be done in the opposite direction.

4.6.2.1 Frequency Errors

A 9	Fixed frequencies
A 7	FRN synthesis
A 8	Step synthesis/FM
A 10	Summing loops
A 11	RF oscillators
A 13	Output section
A14	Broadband modulator (only model 58)
A15	Converter (only model 58)

The nominal frequency for each synthesis stage can be displayed using special functions 78 to 85 (see 4.6.2.7).

4.6.2.2 Level Errors

A 11	RF oscillators
A 13	Output section
A 12	Filter bank
A 163	Doubler
A 162	RF amplifier 4.4 GHz
A 18	Precision attenuator
A14	Broadband modulator (only model 58)
A15	Converter (only model 58)

4.6.2.3 AM Errors

A 6	AF generator
A 13	Output section
A 163	Doubler

4.6.2.4 FM/ΦM Errors

A 6	AF generator
A 8	Step synthesis/FM
A 9	Fixed frequencies
A 11	RF oscillators

4.6.2.5 Harmonics Level Too High

A 12	Filter bank
A 13	Output unit (RF <15 MHz)
A 163	Doubler
A 162	RF amplifier 4.4 GHz

4.6.2.6 Poor Spectral Purity (SSB Noise, residual FM)

See 4.6.2.1 if this error occurs when there is no modulation, or see 4.6.2.4 with FM/ Φ M.

4.6.2.7 List of Special Functions for Service Purposes

71	Display of firmware version number 2)
72	Display test (including LED test)
73	RAM test
74	EPROM test 1)
75	EEPROM test 1)
76	Set electronic level setting to 0 dB (do not change setting of mechanical precision attenuator in process). Special display in level/memory display 2)
77	Set electronic level setting to -25 dB, otherwise as in 76
78	Displays FRN frequency (A7) 2)
79	Displays step frequency (A8) 2)
80	Displays frequency of summing loop 1 (A10) 2)
81	Displays frequency of summing loop 2 (A10) 2)
82	Displays sampler frequency (A10) 2)
83	Displays harmonics of RFO synchronization (A11) 2)
84	Displays RF divider factor (A13) 2)
85	Displays undivided synthesis frequency 2)

- 1) The display only occurs if the ENTER/UNITS key is held down.
- 2) The display (and module setting) is cancelled as soon as any key is pressed.

4.7 Retrofitting Options SMHU58 B-2/3/4/5

4.7.1 Installation

Check the software status using SF 71; in the case of GMSK, DECT and ADC coder for versions below 3.0, the EPROMs on the controller module must additionally be replaced by the supplied EPROM set. The same applies to the CT coder for versions below 4.0. For versions 3.0 or later (4.0 with CT coder), only the coder has to be installed.

- Loosen the four countersunk screws in the rear parts of the feet and remove the feet. Shift the two instrument panels towards the rear and lift off. Loosen the two screws on the locking rails on the bottom of the instrument and push the rails towards the front panel. If the EPROMs are to be replaced, the controller module must be removed (1st module after the front panel). The cables need not be removed for this purpose. Remove the screws of the screening cover and replace the EPROMs on locations D135 and D140. Remount the screening cover and install the module, paying attention to the position of the ribbon cables.
- Remove the SMB cables on the bottom towards the broadband modulator (last module before the power supply), take out the module and remove the screening cover. Remove the screws from the fastening blocks of the coder. The optional coder is installed in the left chamber above the 4 SMB connectors. Engage the option into the hole in the screening panel using the grub screw, insert the connector, fit in the module and turn the screw into the fastening block opposite to the grub screw. Make sure that the choke L515 on component side of the broadband modulator is not damaged during assembly. It must then be possible to swivel the coder. Make sure that there are no short-circuits to the test points on the broadband modulator. Then fix the coder using the second fastening screw and mount the screening cover of the broadband modulator.

- In order to adjust the coder, insert the module on the service adapter (included in the service kit) to make the adjustment points accessible. Adjustment is not necessary for proper functioning of the coder, however it permits to improve the vector accuracy by max. 1 %.

If the respective coder has already been installed in the broadband modulator and adjusted, readjustment is not necessary. Otherwise, install the module and connect the SMB-type cables in the correct order (labelling motherboard).

Perform the following procedure only if the coder is to be adjusted.

4.7.2 Adjustment

- ▶ Connect the spectrum analyzer to the RF output of the SMHU58

Settings: CF 140 MHz, REF LEV 0 dBm, SPAN 677 kHz (with GMSK coder), SPAN 2.88 MHz (with DECT coder), SPAN 30.4 kHz (with ADC coder), SPAN 240 kHz (with CT coder).

- ▶ Do not perform adjustments with the upper screening cover of the broadband modulator removed. If the cover is not fitted with trimming bores, our central service will replace it by a new cover.
- ▶ Switch on the SMHU58, OP.2/3/4/5 must be displayed.

Perform the calibration routines and the adjustments only after an instrument warm-up period of about 10 minutes. The error messages Err. 68 and Err. 69 may occur.

- ▶ Then record the ALC table using SF 68 and calibrate the I/Q modulator using SF 320, which must not be followed by any error message.

Settings on the SMHU58: PRESET, RF 140 MHz, LEV 0 dBm, DM ON, F 15 with GMSK and DECT coder, F 3 with ADC coder.

The CLOCK and DATA inputs on the rear panel of the instrument remain open.

The spectrum of the RF carrier then consists of

the residual carrier at 140 MHz, the useful signal at $140 \text{ MHz} + df$ ($df = 67.7 \text{ kHz}$ with GMSK coder, $df = 288 \text{ kHz}$ with DECT coder, $df = 3.04 \text{ kHz}$ with ADC coder, $df = 24 \text{ kHz}$ with CT coder) and the unwanted sideband at $140 \text{ MHz} - df$.

- ▶ Then perform the adjustment according to the following table. It is useful to switch between modulation normal/inverted (SF 314/SF 313) and effect the adjustment such that with both settings the same values result.

Adjustment	GMSK coder	DECT coder	ADC coder	CT coder
Residual carrier f_0	R42, R62	R62, R74	R42, R62	R42, R62
Lower sideband $f_0 - df$	R74, C70	R42	R74	R74, C70

Typical values are

- -56 dBc for the residual carrier with all coders
- -56 dBc for the unwanted sideband with GMSK, ADC and CT coder and
- -50 dBc with the DECT coder.
- ▶ Fasten the adhesive label for the option on the upper cover of the module, remove the service adapter, install the broadband modulator and connect the SMB cables.
- ▶ Reassemble the instrument in the reverse order. Fasten the adhesive cable for the option identification on the rear panel above the serial number.

In the case of the options SMHU-B3/B4/B5 check whether "GMSK" or "DM" is printed on the identification plate. In the event that the text "GMSK" is still printed there, cover it with the label 836.4255 "DM".

- ▶ Switch on the instrument, OP.2/3/4/5 must be displayed.
- ▶ Calibrate the I/Q modulator using SF 320; no error message may be displayed any more after the calibration.

The provided calibration data and the stored instrument setups and fast mode data are not affected by the replacement of the EPROMs.



ROHDE & SCHWARZ

Liste mechanischer Teile

List of mechanical parts

Bilder und Erklärung zur Liste mechanischer Teile

Figures and explanation pertaining to list of
mechanical parts

C

C

C

C

Liste mechanischer Teile

Der SMHU ist in *R&S-Kompaktbauweise 90* aufgebaut.

Gehäusegröße:
4E, 1/1,T460

Maße über alles:
426,7 x 176,5 x 460 (B x H x T)

Ergänzungen:
19"-Adapter ZZA-94
Tragegriff, Nachrüstsatz
(falls ein zweiter Tragegriff gewünscht wird)

List of Mechanical Parts

The SMHU is designed in accordance with the *R&S design 90*.

Cabinet size:
4E, 1/1,T460

Overall dimensions:
426.7 x 176.5 x 460 (width x height x depth)

Accessories:
19"-Adapter ZZA-94
Carrying handle, retrofit set
(if a second carrying handle is desired)

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
1		1	Haube, oben 4E 1/1 T460 Cover, top	819.0426
2		1	Haube, unten 4E 1/1 T460 Cover, bottom	396.3815
3		1	Führungsschiene, rechts Guide rail, right	396.4757
4		1	Führungsschiene, links Guide rail, left	396.4763
5		1	Bedienhinweiskarte 1 User guide card 1	
6		1	Bedienhinweiskarte 2 User guide card 2	
7		1	Bedienhinweiskarte 3 User guide card 3	
8		2	Gerätefuß, vorne Instrument foot, front	396.4534
9		2	Aufstellfuß, unten Foot, bottom	396.4540
11		2	Gerätefuß, hinten Instrument foot, rear	396.4586
15		2	Seitenleiste T460 Side strip	396.3080

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
16		4	M3 x 6 DIN 965 A4	081.9378
17		1	Rückwandfuß, links 4E Rear-panel foot, left	396.4363
18		1	Rückwandfuß, rechts 4E Rear-panel foot, right	396.4157
19		4	Ansatzschr. M4 K.D 7985 Screw	396.4492
21		1	Tragegriff T... Carrying handle	396.3221
22		2	Griffbuchse Washer	396.3321
23		2	M4 x 10 DIN 965 A4	081.9478
24		2	Abdeckung, Griffseite Cover, handle side	396.3338
25		2	Abdeckung, Leerseite Cover, blank side	396.3344
30		1	Frontrahmen 4E 1/1 Front frame	396.2131
31		4	Seitenfuß Side foot	396.4692
32		2	Stapelnutabdeckung Cover for groove	396.4711
33		2	Frontgriff Front grip	
34		4	M4 x 8 DIN 965	396.1087
35		1	Rückrahmen 4E 1/1 Rear frame	396.2377
36		4	Rahmenschiene T460 Frame rail	396.2377
37		16	M3 x 8 DIN 965 A4	081.9384
40		4,95 m	HF-Dichtschnur RF seal	396.1035
50		1	Deckel Netzteil Cover for Power Supply Unit	819.1697
51		1	DIN 7985 - M2,5 x 6	088.0030

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
52		1	DIN 137 - A2,6 - A2	005.0280
53	A41	1	Gleichrichtung VAR 02 Rectification	819.1716.02
54		10	DIN 7985 - M3 x 6 - A4	081.9061
55		10	DIN 137 - A3 - A2	005.0296
56		10	DIN 125 - A3,2 - A4	082.4670
57		4	Mutter für Rückrahmen M3 Nut for rear frame	396.3167
58	A42	1	Schaltregler VAR 02 Switching regulator	819.1916.02
59		1	Deckel oben Cover, top	819.2070
60		2	DIN 7985 - M2,5 x 5 - A4	088.1543
61		2	DIN 137 - A2,6 - A2	005.0280
62		2	DIN 125 - A2,7 - A4	082.4663
65		1	Deckel unten Cover, bottom	819.2087
66		2	DIN 7985 - M2,5 x 10 - A4	088.0053
67		2	DIN 137 - A2,6 - A2	005.0280
70		1	Netzteilrahmen Frame for Power Supply Unit	819.1639
71		4	Zyl. Schr. M 2,5 x 5 A2 Screw	088.7693
72		4	DIN 137 - A2,6 - A2	005.0280
73		1	Winkel mit Haltefeder Angle with spring	819.1874

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
74		1	Winkel links Angle, left	819.1897
75		2	DIN 927 M 3 x 4	032.4447
76		2	DIN 137 - A3 - A2	005.0296
77		2	Durchf. Tülle 8 x 10 x 15 Feedthrough	099.3536
80	22	1	Netzfilter Chassis power plug with filter	819.1739
81		1	Kabelbinder Rd 1,6 bis 76 B 3,6 Cable clamp	015.9044
82		1	Schirmung Netzeingang Shielding power input	819.1651
83		4	DIN 7985 - M2,5 x 6 - A4	088.0030
84		4	DIN 137 - A2,6 - A2	005.0280
90		1	Kühlprofil Heat sink	819.1674
91		3	DIN 7985 M3 x 10 - A4	081.9084
92		3	DIN 137 - A3 - A2	005.0296
93		3	DIN 125 - A3,2 - A4	082.4670
94		8	Kombischraube M 2,5 x 8 Screw	071.5705
95		2	DIN 965 - M 3 x 6 - A4	081.9378
100		1	Rückplatte, engl. Rear plate	819.1597
101		2	Sicherungshalter GR Fuse holder	087.5022
102	52	1	Spannungsumschalter 115/220 Voltage selector	292.5387

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
103		2	DIN 7985 - M 3 x 8 - A4	081.9078
104		4	DIN 125 - A3,2 - A4	082.4670
105		2	DIN 137 - A3 - A2	005.0296
106		2	DIN 934 - M3 - A4	016.4398
110	Z1	1	Einbaust. mit Netzfilter 3A Power plug with filter	006.0977
111		2	DIN 965 - M3 x 8 - A4	081.9384
112		2	DIN 137 - A3 - A2	005.0296
113		2	DIN 125 A3,2 - A4	082.4670
114		2	DIN 934 - M3 - A4	016.4398
115	S1	1	Wippschalter 2polig Aus SW Rocker switch 2pole	553.2925
117		1	Flachstecker GR 6,3 Flat connector	543.6705
118		1	DIN 7985 - M4 x 8 - A4	081.9178
119		1	DIN 137 - A4 - A2	005.0315
120		1	DIN 433 - 4,3 - A4	082.4586
121		1	DIN 6797 - A4,3 - A2	016.2837
122		1	DIN 934 - M4 - A4	016.4400
124		1	Schutzkappe f. BNC-Buchse Protective cover for BNC socket	250.3840
125		1	Kombischraube M2,5 x 8 Screw	071.5705

Lfd. Nr.	Kenn- zeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
126	A4	1	Netzteil (Pos. 50...125) VAR 02 Power Supply Unit	819.1568.02
127		6	DIN 7985 - M3 x 8 - A4	081.9078
128		6	DIN 137 - A3 - A2	005.0296
129		6	DIN 125 - A3,2 - A4	082.4670
130		2	DIN 965 - M3 x 10 - A4	081.9390
131		2	Mutter für Rückrahmen M3 Nut for rear frame	396.3167
135		1	Buchsenträger hinten Socket support, rear	819.0326
136		4	DIN 965 - M3 x 8 - A4	081.9384
137	E1	1	Lüftereinheit Blower set	819.0332
138		4	DIN 7340 - B4 x 6 - M5 - E1D	031.2805
139		4	DIN 125 - A4,3 - A4	082.4686
140		4	DIN 7985 - M3 x 16 - A4	081.9103
141	X131 - X434	4	Einbaubuchse Syst. BNC Panel mounting socket BNC	099.9186
142		1	Lötöse 18 x 10 Solder tag	035.0813
145		1	Verschlußstopfen Stopper	528.8598
146		7	Verschlußstopfen Stopper	528.8500
147		1	Verschlußstopfen Stopper	681.744
148	W43	1	DX HF-Kabel W43 RF cable	820.3102

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
149		2	Verriegelungsschraube Lock screw	099.2830
155		1	Führungspl. links BL Guide panel, left	396.7185
156		1	Führungspl. rechts sw Guide panel, right	396.7179
157		20	Massefeder 4E Earth clip	396.7233
158		1	Stützplatte 4E Supporting plate	396.7779
159		2	DIN 965 - M3 x 10 - A4	081.9390
160		1	Sicherung für Führungsleisten Securing for guide rails	819.0484
161		2	DIN 7985 - M2,5 x 10 - A4	088.0053
162		2	DIN 137 - A2,6 - A2	005.0280
165	A2	1	Motherboard VAR 02	819.0910.02
166		2	Schiene Rail	819.0278
167		1	Zahnstange links Toothed rack, left	819.0284
168		1	Zahnstange rechts Toothed rack, right	819.0290
169		4	DIN 923 - M2,5 x 3 - 5,8 - A3P	088.0976
170		6	DIN 7985 - M3 x 6 - A4	081.9061
171		6	DIN 137 - A3 - A2	005.0296
172		6	DIN 125 - A3,2 - A4	082.4670
173		2	Querwand Transverse panel	819.0261

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
174		4	DIN 7985 - M2,5 x 6 - A4	088.0030
175		4	DIN 137 - A2,6 - A2	005.0280
176		4	Abstandsrohr Spacer	302.7740
177		4	DIN 7985 - M2,5 x 8 - A4	088.0047
178		4	DIN 137 - A2,6 - A2	005.0280
179		4	DIN 965 - M3 x 10 - A4	081.9390
180		4	DIN 7985 - M2,5 x 10 - A4	088.0053
181		4	DIN 137 - A2,6 - A2	005.0280
185	W17	1	DX-Kabel W17 Cable	820.3077
186	W18	1	DX-Kabel W18 Cable	820.3083
187	W1E	1	DX-Kabel W1E Cable	819.2158
188	X4		DX-Kabel X4 Cable	819.2135
189	W16		DX-Kabel W16 Cable	843.4040
191	A5	1	Rechner ohne Software Controller w/o software	819.2164.02
192	A6	1	NF-Generator AF generator	819.3260.02
193	A7	1	FRN-Synthese FRN synthesis	819.3860.02

Lfd. Nr.	Kenn- zeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
194	A8	1	Stepsynthese Step synthesis	819.4944.02
195	A9	1	Festfrequenzen Fixed frequencies	819.6060.02
196	A10	1	Summierschleifen Summing Loops	819.7166.02
197	A11	1	RF-Oszillator RF oscillator	819.8262.02
198	A12	1	Filtersatz Filter set	819.9369.02
199	A13	1	Ausgangsteil Output section	820.0461.02
200		1	Luftleitblech Cooling baffle	819.0461
205	W121	1	DX HF-Kabel W121 RF cable	820.2941
206	W41	1	DX HF-Kabel W41 RF cable	820.2987
207	W111	1	DX HF-Kabel W111 RF cable	820.2929
208	W122	1	DX HF-Kabel W122 RF cable	820.2958
209	W93	1	DX HF-Kabel W93 RF cable	820.2870
210	W162	1	DX HF-Kabel W162 RF cable	820.3002
211	W131	1	DX HF-Kabel W131 RF cable	820.2993
212	W123	1	DX HF-Kabel W123 RF cable	820.2964
213	W71	1	DX HF-Kabel W71 RF cable	820.2787
214	W81	1	DX HF-Kabel W81 RF cable	820.2812

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
215	W94	1	DX HF-Kabel W94 RF cable	820.2887
216	W101	1	DX HF-Kabel W101 RF cable	820.2906
217	W83	1	DX HF-Kabel W83 RF cable	820.2835
218	W72	1	DX HF-Kabel W72 RF cable	820.2793
219	W82	1	DX HF-Kabel W82 RF cable	820.2829
220	W91	1	DX HF-Kabel W91 RF cable	820.2858
224		1	Längswand Side panel	819.0255
225		8	DIN 965 - M3 x 8 - A4	081.9384
226		19	Führungsleiste f. GS 4E GR Guide rail	396.7427
227		20	DIN 965 - M3 x 8 - A4	081.9384
229		1	Buchsenträger vorne Socket support, front	819.0226
230		4	DIN 965 - M3 x 8 - A4	081.9384
231		1	Federplatte Spring plate	819.0249
232	X171 X172 X173	3	Einbaubuchse Syst. BNC Panel mounting socket BNC	099.9186
233		3	Lötöse 18 x 10 Solder tag	035.0813
235		1	Schirmwand Shielding panel	819.0232
236		6	DIN 965 - M2,5 x 6 - A4	088.0101

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
240		1	Halteblech Retaining plate	819.0384
241		1	Haltebügel Bracket	819.0378
242		2	DIN 965 - M2,5 x 6 - A4	088.0101
243		1	Versteifungsplatte Reinforcing plate	819.0361
244		3	DIN 7985 - M2,5 x 8 - A4	088.0047
245		3	DIN 137 - A2,6 - A2	005.0280
246		3	DIN 125 - A2,7 - A4	082.4663
247	A163	1	Verdopplermodul Doubler PCB	835.8763.02
248		11	DIN 7985 - M2,5 x 25 - A4	088.0099
249		11	DIN 137 - A2,6 - A2	005.0280
250	A162	1	HF-Verstärker 4,4 GHz RF Amplifier 4.4 GHz	836.0766.02
253	A164	1	Ansteuerplatte Control PCB	836.2269.02
254		3	DIN 7985 - M2,5 x 10 - A4	088.0053
255		3	DIN 137 - A2,6 - A2	005.0280
256		3	DIN 125 - A2,7 - A4	082.4663
257		1	Kühlklotz Heat sink	836.2317
258		2	Kombischraube M2,5 x 6 Screw	071.5040

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
260	W163	1	DX HF-Kabel W163 RF cable	836.3465
261	W164	1	DX HF-Kabel W164 RF cable	836.3459
262	A16	1	Erweiterung 4 GHz (Pos. 240 - Pos. 261) Extension 4 GHz	835.8711.02
263	W10	1	DX Kabel W10 Cable	836.1056
264	W30	1	DX Kabel W30 Cable	835.9318
265		3	DIN 965 - M2,5 x 6 - A4	088.0101
266		3	DIN 7985 - M2,5 x 10 - A4	088.0053
267		3	DIN 137 - A2,6 - A2	005.0280
268		3	DIN 125 - A2,5 - A4	082.4657
269		1	DIN 7985 - M2,5 x 6 - A4	088.0030
270		1	DIN 137 - A2,6 - A2	005.0280
271	A18	1	Eichleitung SMHU Precision Attenuator SMHU	835.8234.02
272		1	Bügel für Eichleitung Bracket for Precision Attenuator	819.0310
273		3	DIN 7340 - B4 x 6 - MS - E1P	031.2805
274		3	DIN 125 - A4,3 - A4	082.4686
275		3	DIN 7985 - M3 x 10 - A4	081.9084
276		2	DIN 7985 - M2,5 x 6 - A4	088.0030
277		2	DIN 137 - A2,6 - A2	005.0280

Lfd. Nr.	Kennzeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/Comp.No	Qty	Designation	Stock No.
278		2	DIN 965 - M2,5 x 6 - A4	088.0101
279	W181	1	DX HF-Kabel W181 RF cable	820.3060
280	W161	1	DX HF-Kabel W161 RF cable	820.3048
282	A3	1	Anzeige / Tastatur Display/ Keyboard	819.1122.02
283		1	Montageplatte Mounting plate	819.1239
284		13	DIN 965 - M2 x 16 - A4	081.9290
285		1	Beschriftungsplatte Identification plate	SMHU52: 835.8292 SMHU56: 835.8270 SMHU58: 835.8311
286		2	Senkschraube M1,6 x 3 lichtgr. Screw	396.1070
287		4	DIN 965 - M3 x 8 - A4	081.9384
288		4	Schei. Rd 3,1/7,2 H 1,8 CR Washer	396.5518
289		1	Führungskragen Guide frame	396.0897
290		1	Dreh. M. Mulde Rd 37 Rd 6 Rotary knob	078.1192
291		3	Fenster Window	801.1466
292	X1	1	Flachbandkabel Ribbon cable	820.3019

Gehäuse

Casing

Aufbau

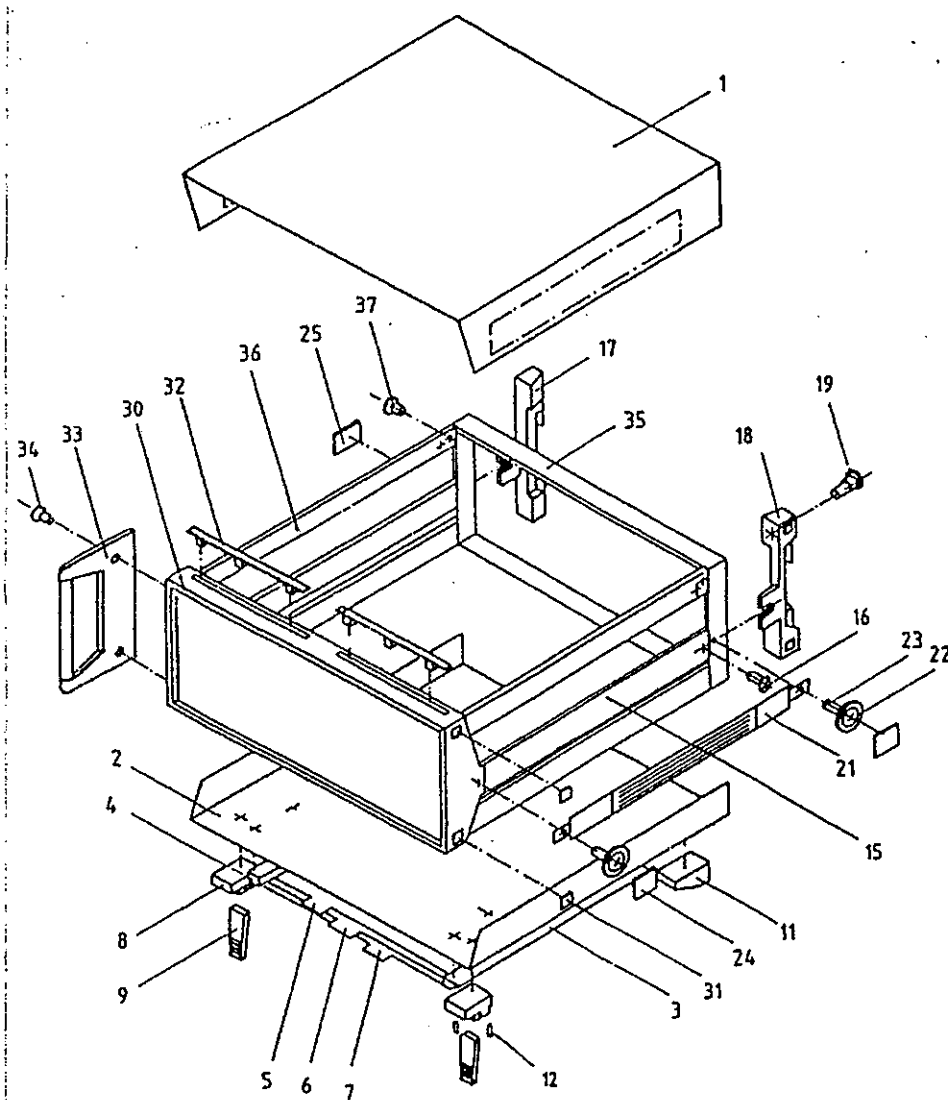
Der Aufbau besteht aus einer tragenden Aluminium-Druckguß-Rahmenkonstruktion mit gerätespezifischer Front-, Montage- und Rückplatte, die mit einer Ober- und Unterhaube (= Beplankung) ummantelt ist.

Construction

The construction consists of a self-supporting aluminium-cast frame with front, mounting and rear panel, top and bottom covers (= panelling).

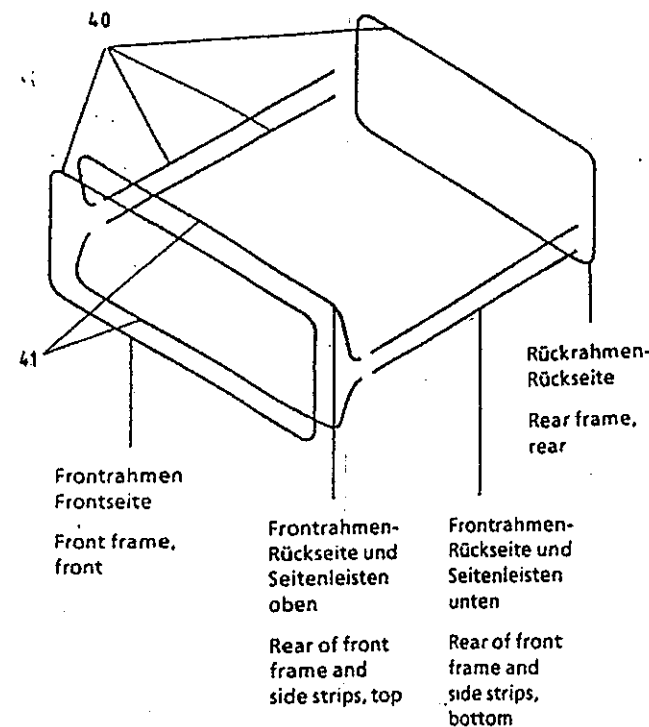
Rahmen und Beplankung:

Frame and panelling:



Dichtschnur (nur bei Geräten mit erhöhtem Schirmdämpfungsbedarf vorhanden) jeweils in die umlaufende Nut einlegen.

Insert the braided cord (provided only for instruments requiring a high degree of shielding) into the respective groove.



Die Dichtschnüre in der Frontrahmen-Frontseite und in der Rückrahmen-Rückseite müssen durch Klebepunkte in Abständen von ca. 80 mm fixiert werden. Dazu Klebepunkte mit ca. $\varnothing 2$ mm im Nutgrund anbringen und Dichtschnur aufdrücken.

Dauerhaft elastischen Kleber wie z.B. Si-Kautschuk 3145 RTV (R&S-Sachnr. WV 088.3152) verwenden.

Bei Geräten mit geteilten Rückplatten müssen beim Zusammenbau die Einzelelemente über die gesamte Gehäusebreite waagrecht zueinander ausgerichtet werden.

Ober- und Unterhaube müssen mit den Erhöhungen am Rückrahmen fixiert sein.

Achtung: bei hohen Rückwandfüßen (CMS) werden die Fixier-Erhöhungen verdeckt, hier Rückwandfüße erst anschrauben, wenn die Ober- u. Unterkante sicher in den Erhöhungen am Rückrahmen fixiert sind.

The braided cords in the front of front frame and rear of rear frame must be fixed by glued joints approx. every 80 mm. Make joints (\varnothing approx. 2 mm) on the bottom of the groove and press braided cord firmly on it.

Use a permanently elastic adhesive, such as Si-rubber 3145 RTV (R&S Part No. WV 088.3152).

Instruments with separate rear panels require the individual components to be adjusted to the same level over the complete instrument width.

Top and bottom cover must be fastened by way of the catches on rear frame.

Note that with high rear panel feet (CMS) the catches are concealed; here tighten the rear feet screws only after the top and bottom cover have been securely fitted into the catches.

Öffnen und Schließen des Gehäuses

Opening and closing the cabinet

Die gute Schirmdämpfung der Kompaktbauweise 90 erfordert häufige Kontaktstellen und hohe Paßgenauigkeit. In Verbindung mit einem leichten Anlagedruck, der mit dem Festziehen der Rückwandfußschrauben erreicht wird, erhält man einen straffen Sitz der Ober- und Unterhaube auf dem Rahmen.

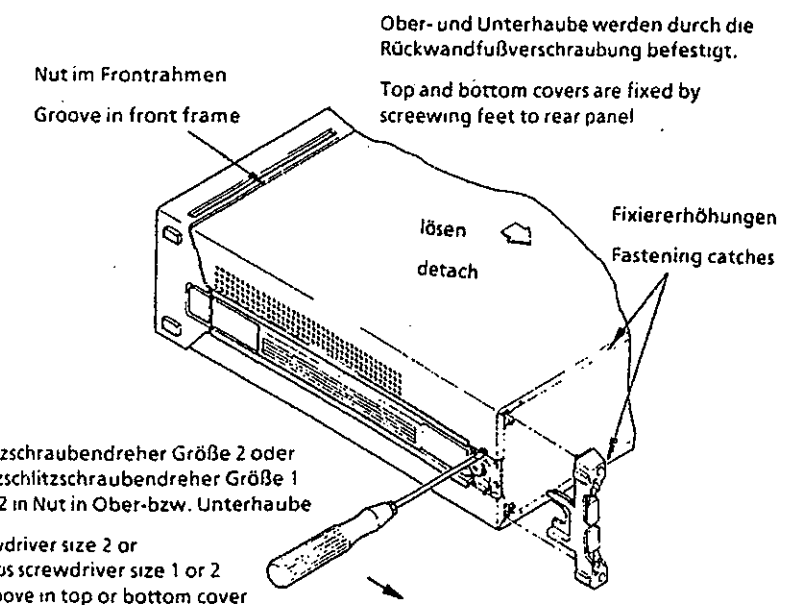
Zum Öffnen muß man die Rückwandfußverschraubung lösen und die Füße nach rückwärts abziehen (Schrauben bleiben im Fuß haften). Je nach Bedarf läßt sich nun Ober- bzw. Unterhaube ebenfalls nach rückwärts abnehmen. Sitzen die Hauben sehr fest, erleichtert man das Abziehen durch abwechselndes Hebeln in Pfeilrichtung mit einem Schraubenzieher an beiden Geräteseiten (siehe Bild).

Zum Schließen des Gehäuses werden erst die Frontkanten der Hauben in die umlaufende Nut des Frontrahmens und der Seitenleisten eingeführt und dann in die Erhöhungen am Rückrahmen bis Anschlag eingerastet. Das Gerät ist wieder geschlossen, wenn die Rückwandfüße eingeschoben und die Schrauben festgezogen sind.

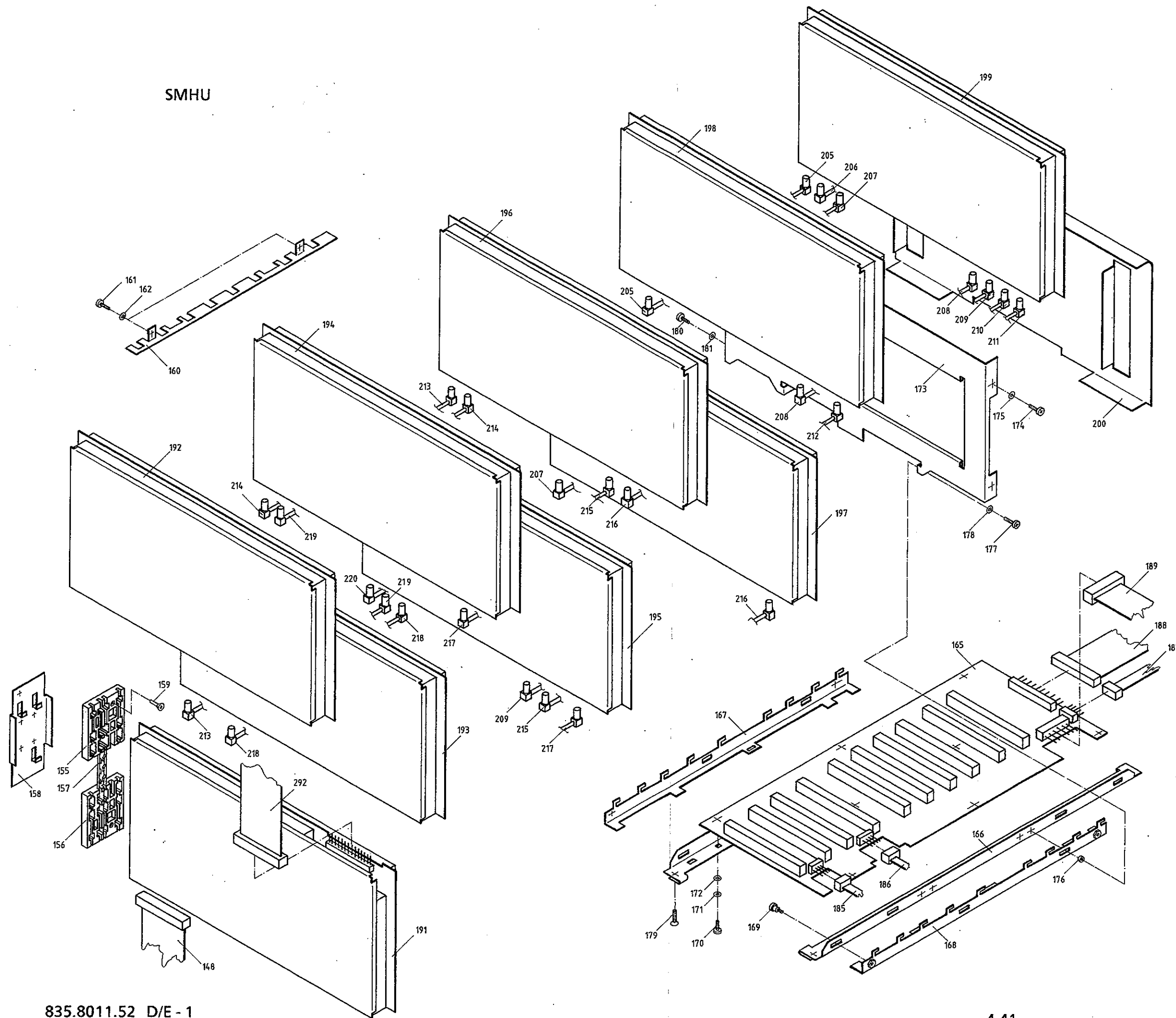
To obtain the high degree of shielding of design 90, many points of contact and accurate fitting are employed. When exerting a slight pressure by tightening the rear-panel feet, tight fitting of the top and bottom covers is ensured.

To open the cabinet, first undo the rear panel feet screws and withdraw the feet (captive screws). It is now possible to detach top and bottom cover if required. If the fitting of these cover plates is very tight, removal can be facilitated by alternately levering on both sides of the instrument using a screwdriver (see illustration).

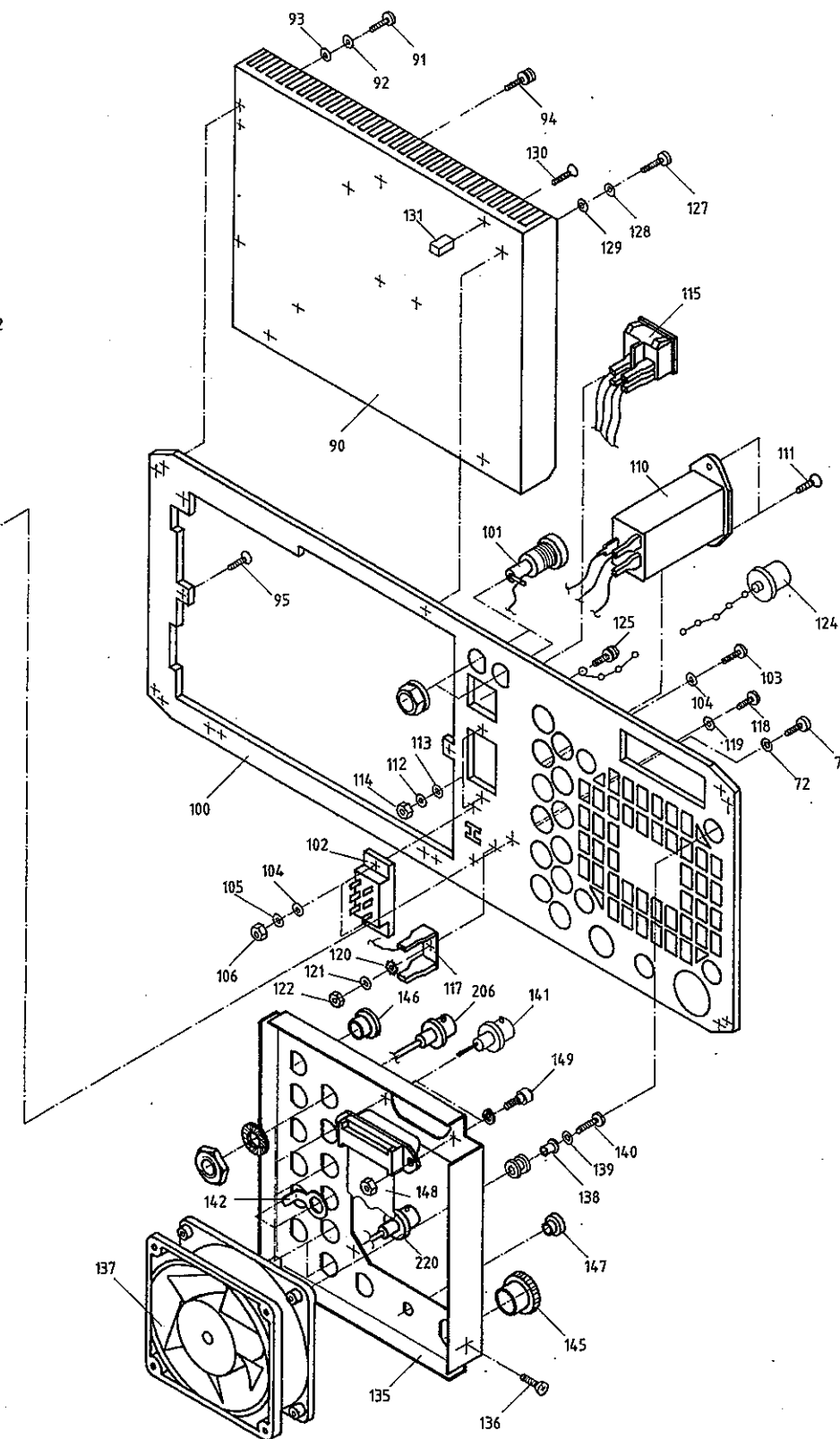
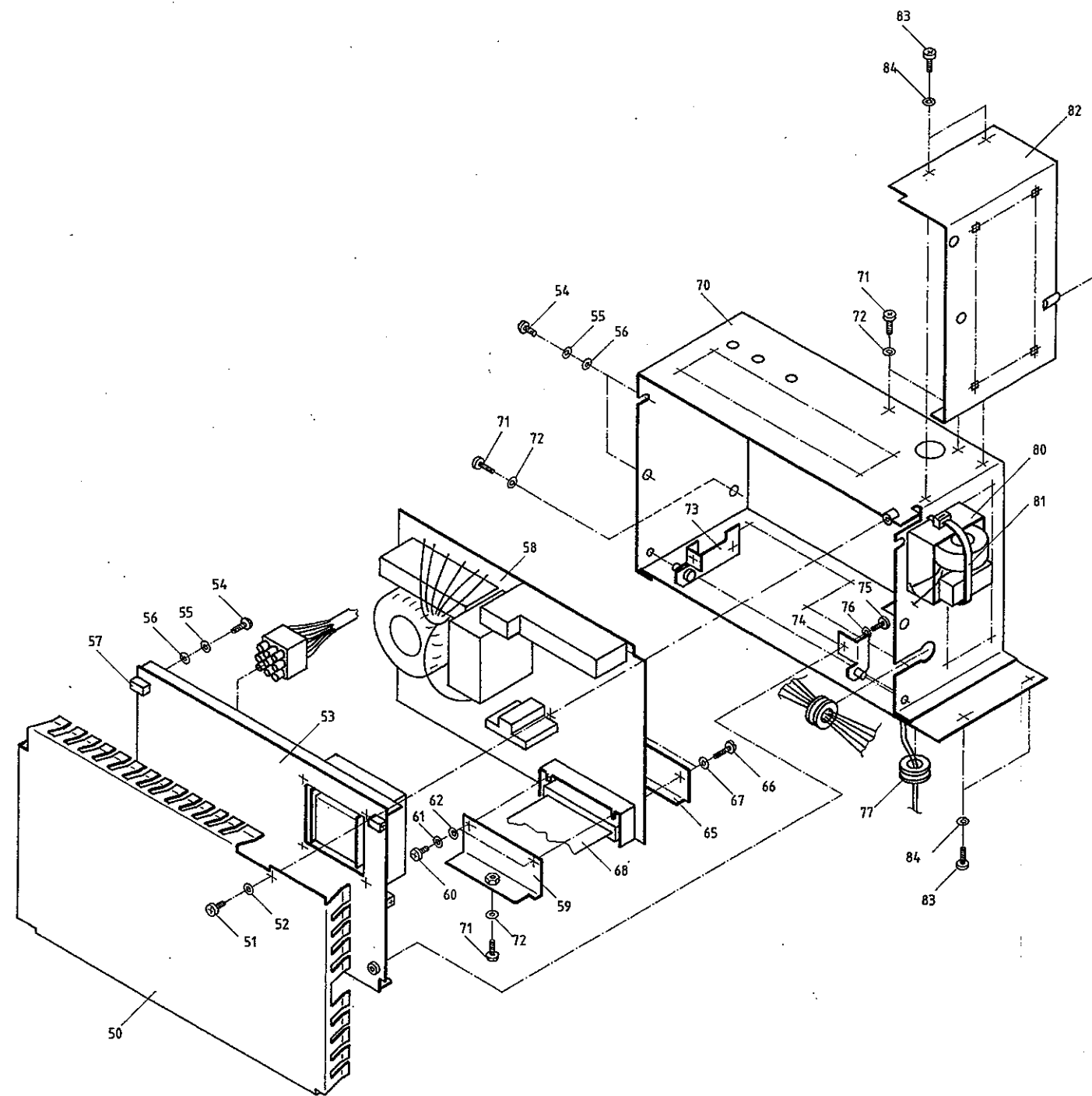
To close the cabinet, insert the front edges of the covers into the groove of the front frame and the side strips and lock them into the catches on the rear frame into detent position. The cabinet is closed when the rear-panel feet are inserted and the screws tightened.

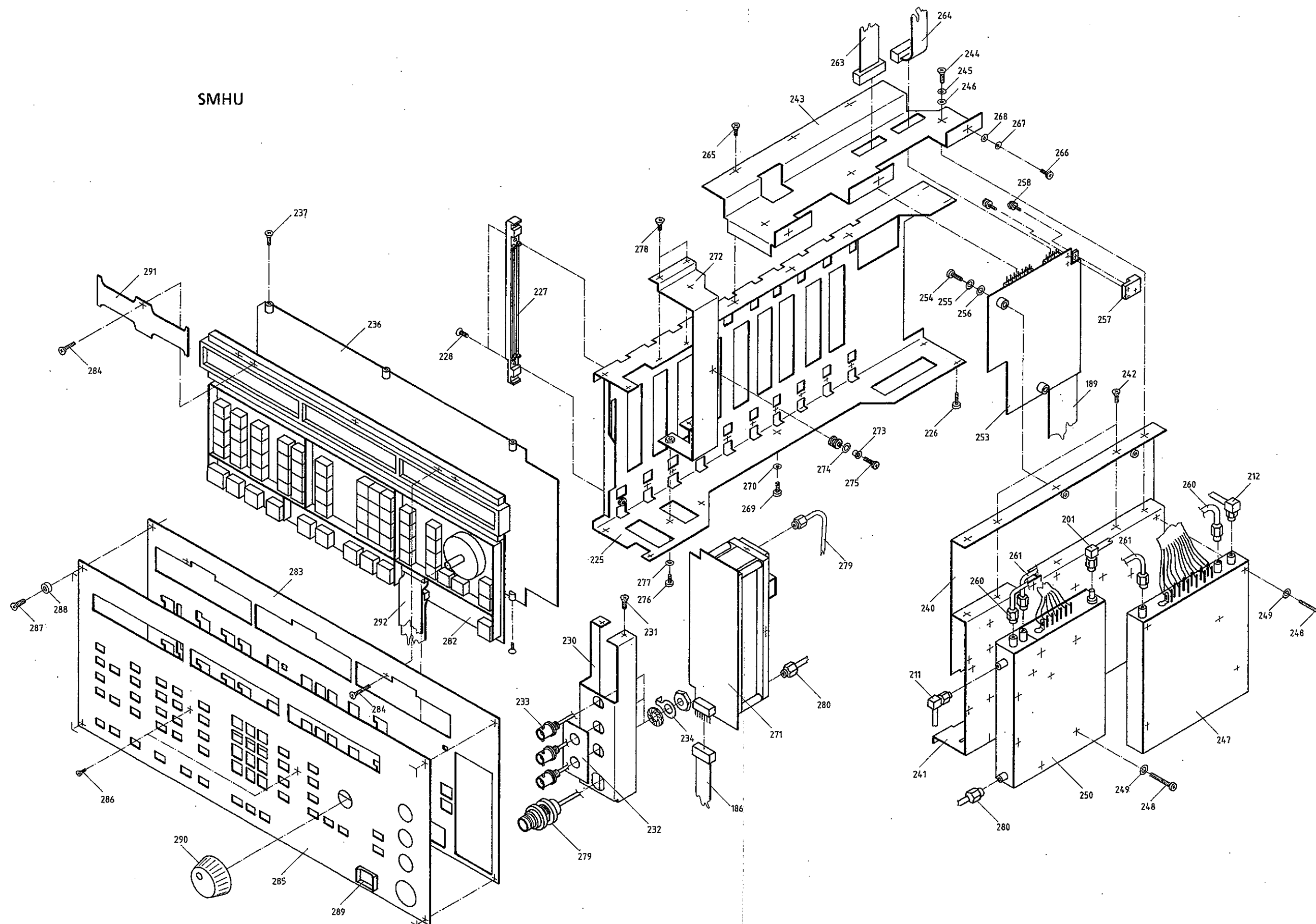


SMHU



SMHU





**Schlüsselliste
für Bauteile-Sachnummern
Code list
for component stock Nos.
Liste
des références des composants**

R&S-Schlüsselliste

R&S key list

Liste des symboles de référence R&S

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.

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.

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.

Teilefamilie	Art des Bauelementes	Parts family	Type of component	Familie	Type d'élément
A	Aktive Bauelemente, Halbleiter	A	Active components, semiconductors	A	Composants actifs, semiconducteurs
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	Fotohalbleiter, z.B. Foto-Diode, -Transistor, -Widerstand, Leuchtdiode	AF	Photo-semiconductor, e.g. resistor, diode, transistor, LED	AF	Semiconducteur photoélectrique, p.ex. diode, transistor, résistance photoél., DEL
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	Small-signal 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
AZ	Zubehör für Halbleiter u. Röhren	AZ	Accessories for semiconductors and valves	AZ	Accessoires pour semiconducteurs et tubes
B	Bausteine	B	PC boards, chips	B	Cartes imprimées, puces
BC	Integr. Schaltkreis (Microcomp.)	BC	Integrated circuit (interface, A/D)	BC	Circuit intégré (microprocesseur)
BD	R&S-Dünnschicht- und Dickschichtschaltung	BD	R&S thinfilm or thickfilm circuit	BD	Circuit R&S à couche mince ou épaisse
BG	R&S-spezifische Gate-Arrays	BG	R&S gate arrays	BG	Circuits intégrés prédiffusés R&S
BJ	Integrierter Schaltkreis (Interface, A/D-Wandler)	BJ	Integrated circuit (interface, A/D converter)	BJ	Circuit intégré (interface, convertisseur A/N)
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	Optoelektronischer Baustein, z.B. Anzeigeeinheit, Koppler	BP	Optoelectronic component, e.g. display, coupler	BP	Composant optoélectronique, 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
BZ	Zubehör	BZ	Accessories	BZ	Accessoires



Teile- familie	Art des Bauelementes	Parts family	Type of component	Famil- le	Type d'élément
F	Fassungen, Steckverbindungen	F	Sockets, connectors	F	Douilles, connecteurs
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	Hochspannungs-Steckverbindung	FU	HV plug and socket	FU	Connecteur pour haute tension
FV	Verbinder (z.B. AMP)	FV	Push-on connector	FV	Connecteur à enfichage
FZ	Zubehör für koax. Bauelemente	FZ	Accessories for coax. components	FZ	Accessoires pour composants coax.
H	Software	H	Software	H	Logiciel
HP	Software-Komponenten und Software-Module	HP	Rights to software components and software modules	HP	Droits d'utilisation de composants et modules logiciel
HS	Auf Informationsträger geladene Software	HS	Software data media	HS	Logiciel sur support d'information
J	Meßinstrumente	J	Indicators	J	Indicateurs
JD	Drehspul-Anzeigeeinstrument	JD	Moving-coil meter	JD	Galvanomètre à cadre mobile
JE	Dreheisen-Anzeigeeinstrument	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	Betriebsstundenzähler	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 (Kreuzspulinstrum.)	JQ	Ratiometer (cross coul)	JQ	Quotientmètre (à cadres croisés)
JU	Uhrwerk	JU	Clockwork	JU	Mouvement d'horlogerie
JW	Elektrodyn. Anzeigeeinstrument	JW	Electrodynamic meter	JW	Instrument électrodynamique
L	Induktivitäten, Magnetik	L	Inductors, magnetic components	L	Composants inductifs et magnétiques
LB	Blech- und Schnittbandkern mit Zubehör	LB	Laminated and C-cores with accessories	LB	Noyaux feuilletés et noyaux de type C, avec accessoires
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
LF	Ferritkern mit Zubehör	LF	Ferrite cores with accessories	LF	Noyaux en ferrite avec accessoires
LK	Karboneisenkern und elektrischer Kupferkern mit Zubehör	LK	Iron carbonyl slugs and copper slugs with accessories	LK	Noyaux en fer carbonyle et en cuivre, avec accessoires
LL	Luftspule	LL	Air-core coils	LL	Bobines à air
LM	Magnetband und -platte	LM	Magnetic tapes and disks	LM	Bandes et disques magnétiques
LS	Schirmbecher	LS	Screening cans	LS	Boîtiers de blindage
LT	Netztransformator	LT	Power transformer	LT	Transformateur secteur
LU	NF-Übertrager	LU	AF transformer	LU	Transformateur BF
LV	Variometer	LV	Variometer	LV	Variometre
LW	Wickelkörper, allgemein	LW	Coil formers, general	LW	Carcasses de bobine, en general



Zusammenstellung der lieferbaren Netzkabel
List of power cables available
Liste des câbles d'alimentation disponibles

Sach-Nr. Stock No. Référence	Schutzkontaktstecker nach: Earthed-contact connector: Fiche à contact de protection:	Vorzugsweise verwendet in: Preferably used in: Utilisé de préférence en:
DS 006.7013	BS 1363: 1967' 13A entspr. IEC 83: 1975 Standard B2 BS 1363: 1967' 13A complying with IEC 83: 1975 Standard B2 BS 1363: 1967' 13A suivant CEI 83: 1975 norme B2	Großbritannien Great Britain Grande-Bretagne
DS 006.7020	Typ 12 nach SEV-Vorschrift 1011.1059, Normblatt S 24 507 Type 12 complying with SEV regulation 1011.1059, standard sheet S 24 507 Type 12 suivant la norme SEV 1011.1059, feuille S 24 507	Schweiz Switzerland Suisse
DS 006.7036	Typ 498/13 nach USA-Vorschrift UL 498, bzw. IEC 83 Type 498/13 complying with US regulation UL 498 or with IEC 83 Type 498/13 suivant la norme E.U.A. UL 498 ou la norme CEI 83	USA / Kanada USA / Canada E.U.A. / Canada
DS 006.7107	Typ SAA3 10 A, 250 V, nach AS C112-1964 Ap. Type SAA3 10 A, 250 V, complying with AS C112-1964 Ap. Type SAA3 10 A, 250 V, suivant AS C112-1964 Ap.	Australien Australia Australie
DS 025.2365	DIN 49 441, 10 A, 250 V	Europa (ohne Schweiz) Europe (Switzerland not included) Europe (Suisse non comprise)


Cross-Reference List of Class Designation Letters

IEC Publication 113-2 (1971) Item Designations, Letter Codes
ANSI Y32.2-1975 (IEEE Std 315-1975), Section 22, Class Designation Letters


Note: The designation letters used in the R&S Manuals correspond to the letter codes of the IEC Standard identified in the first column!

IEC Publication 113-2 Terminology	Letter Code IEC Y32.2	IEC Publication 113-2 Terminology	Letter Code IEC Y32.2
Acoustical indicator	H LS	Magnetic tape recorder	D A
Adjustable resistor	R R	Maser	A A
Aerial	W E	Measuring equipment	P M
Amplifier	A AR	Microphone	B MK
Amplifier (with tubes)	A AR	Miscellaneous	E E
Arrester	F E	Modulator	U A
Assemblies	A A,U	Monostable element	D A,U
Auxiliary switch	S S	Motor	M B
Battery	G BT	Optical indicator	H DS
Distable element	D U,A	Oscillator	G Y,G
Brake	Y MP	Overvoltage discharge device	F F,E
Busbar	W W	Parabolic aerial	W E
Cable	W W	Photoelectric cell	B V
Cable balancing network	Z Z	Pickup	B PU
Capacitor	C C	Plug	X P
Changer	U A,B,G,MT	Pneumatic valve	Y MP
Circuit breaker	Q CB	Potentiometer	R R
Clutch	Y MP	Power switchgear	Q CB,S
Coder	U U,A	Protective device	F F
Compander	Z A	Pushbutton	S S
Connecting stage	S S	Quartz-oscillator	G Y
Contactors	K K	Recording device	P A,M
Control switch	S S	Register	D A,U,M
Converter	U A,U,MG	Relay	K K
Core, storage	D E	Resistor	R R
Crystal filter	Z FL	Resolver	B B
Crystal transducer	B Y	Rheostat	R R
Current transformer	T T	Rotating frequency generator	G G,MG
Delay device	D DL	Rotating generator	G G
Delay line	D DL	Selector	S S
Demodulator	U A	Selector switch	S S
Dial contact	S S	Semiconductor	V D,CR,Q
Diode	V D	Shunt (resistor)	R R
Dipole	W E	Signal generator	P A
Disconnecting plug	X P	Signaling device	H DS
Disconnecting socket	X X	Socket	X X
Discriminator	U A	Soldering terminal strip	X E,TB
Disk recorder	D A	Static frequency changer	U A
Dynamotor	B MG	Storage device	D A,U
Electrically operated mechanical device	Y MT	Subassembly	A A
Electronic tube	V V	Supply	G A,PS
Equalizer	Z EQ	Supply device	G A,PS
Filter	Z FL	Synchro	B B
Frequency changer	U A,B,G	Telegraph translator	U A
Fuse	F F	Terminal	X E
Gas discharge tube	V V	Terminal board	X TB
Generator	G G	Termination	Z AT
Heating device	E HR	Test jack	X E,J
Hybrid	Z Z	Testing equipment	P A
Indicating device	P DS	Thermistor	R RT
Induction coil	L L	Thermo cell	B A,TC
Inductors	L L	Thermoelectric sensor	B A
Integrating measuring device	P M,MT,Z	Thyristor	V Q
Inverter	U A,U,PS,MG	Transducer (nonelectrical quantity to electrical quantity)	B A,BT
Isolator	Q AT	Transformer	T T
Jumper wire	W W	Transmission path	W W
Laser	A MT,A	Transistor	V Q
Lighting device	E DS	Tube (electron)	V V
Limit switch	S S	Voltage transformer (potential)	T T
Limiter	Z MT,RE	Waveguide	W W
Line trap	L FL,MP,V	Waveguide directional coupler	W DC
Loudspeaker	B LS		
Magnetic amplifier	A AR		


Schaltteillisten
Stromläufe
Bestückungspläne
Part lists
Circuit diagrams
Components plans
Listes des pièces détachées
Schémas de Circuit
Plans des composants


Kennz. Comp. No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in	
A2	ED MOTHERBOARD MOTHERBOARD	0819.0932.02			0819.0055.01	
A3	ED ANZEIGE/TASTATUR DISPLAY/KEYBOARD NUR VAR/ONLY MOD: 52 56	0819.1122.02			0835.8040.01	
A3	ED ANZEIGE/TASTATUR DISPLAY/KEYBOARD NUR VAR/ONLY MOD: 58	0819.1122.04			0835.8040.01	
A4	ZJ NETZTEIL POWER SUPPLY	0819.1568.02			0819.0055.01	
A5	EE RECHNER OHNE SOFTWARE PROC.WITHOUT SOFTWARE NUR VAR/ONLY MOD: 52	0819.2164.02			0835.8040.01	
A5	EE RECHNER OHNE SOFTWARE COMPUTER WITHOUT SOFTWARE NUR VAR/ONLY MOD: 56 58	1002.5258.02			0835.8040.01	
A6	EE NF-GENERATOR AF-GENERATOR	0819.3260.02			0819.0055.01	
A7	EE FR-N-SYNTHESE FRN-SYNTHESIS	0819.3860.02			0819.0055.01	
A8	ZE STEPSYNTHESE/FM STEPSYNTHESIS/FM	0819.4944.02			0819.0055.01	
A9	EE FESTFREQUENZEN REFERENCE FREQUENCIES	0819.6060.02			0819.0055.01	
A10	EE SUMMIERSCHLEIFEN SUMMING LOOPS	0819.7166.02			0819.0055.01	
A11	EE RF-OSZILLATOR RF-OSCILLATOR	0819.8262.02			0819.0055.01	
A12	EE FILTERSATZ FILTER-MODULE	0819.9369.02			0819.0055.01	
A13	EE AUSGANGSTEIL OUTPUT-MODULE	0820.0461.02			0819.0055.01	
A14	EE BREITBANDMODULATOR BROADBANDMODULATOR NUR VAR/ONLY MOD: 58	1002.4251.02			0835.8040.01	
A16	ZE ERWEITERUNG 4GHZ EXTENSION UNIT	0835.8711.02			0835.8040.01	
A18	ZE EICHLITUNG (SMHU) ATTENUATOR (SMHU)	0835.8234.02			0835.8040.01	
A19	ED FAST HOP BUS FAST HOP BUS NUR VAR/ONLY MOD: 56 58	1002.5558.02			0835.8040.01	
E1	DX LUEFTEREINHEIT BLOWER UNIT	0819.0332.00			0819.0055.01	
W17	DY KABEL W17 CABLE	0820.3077.00			0836.3320.01	
W41	DV HF KABEL W41 RF-CABLE	0820.2987.00			0836.3265.01	
W43	DY HF-KABEL W43 RF-CABLE W3	0820.3102.00			0836.3320.01	
W71	DV HF KABEL W71 RF-CABLE	0820.2787.00			0836.3265.01	
W72	DV HF KABEL W72 RF-CABLE	0820.2793.00			0836.3265.01	
W81	DV HF KABEL W81 RF-CABLE	0820.2812.00			0836.3265.01	
W82	DV HF KABEL W82 RF-CABLE	0820.2829.00			0836.3265.01	
W83	DV HF KABEL W83 RF-CABLE	0820.2835.00			0836.3265.01	
W91	DV HF-KABEL W91 RF-CABLE	0820.2858.00			0836.3265.01	
W92	DV HF-KABEL W92 NUR VAR/ONLY MOD: 04	0836.3342.00			0836.3265.01	
W93	DV HF KABEL W93 RF-CABLE	0820.2870.00			0836.3265.01	
W94	DV HF KABEL W94 RF-CABLE	0820.2887.00			0836.3265.01	
W101	DV HF KABEL W101 RF-CABLE	0820.2906.00			0836.3265.01	
W111	DV HF KABEL W111 RF-CABLE	0820.2929.00			0836.3265.01	
W121	DV HF KABEL W121 RF-CABLE	0820.2941.00			0836.3265.01	
W122	DV HF-KABEL W122 RF-CABLE	0820.2958.00			0836.3265.01	
MENP5 502 3PUA		AI	Datum Date	Schalttafeliste für Parts list for	Sachnummer Stock No	Blatt-Nr Page
 ROHDE & SCHWARZ		24	04.02.98	GG SMHU SIGNALGENERATOR	0835.8011.01 SA	1+

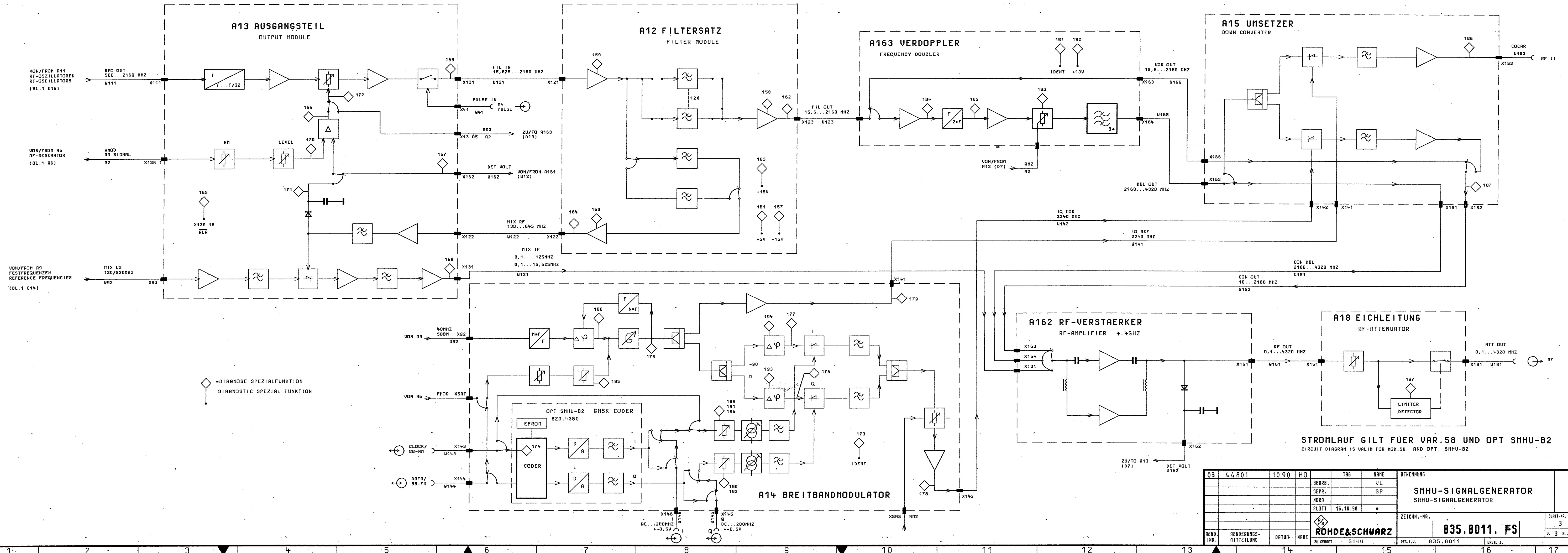
Kennz. Comp. No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
W123	DV HF KABEL W123 RF CABLE	0836.3271.00			0836.3265.01
W131	DV HF KABEL W131 RF CABLE	0836.3288.00			0836.3265.01
W141	DV HF-KABEL W141 NUR VAR/ONLY MOD: 04	0836.3359.00			0836.3265.01
W142	DV HF-KABEL W142 NUR VAR/ONLY MOD: 04	0836.3365.00			0836.3265.01
W143	DV HF-KABEL W143 NUR VAR/ONLY MOD: 04	0836.3371.00			0836.3265.01
W144	DV HF-KABEL W144 NUR VAR/ONLY MOD: 04	0836.3388.00			0836.3265.01
W145	DV HF-KABEL W145 RF CABLE W145 NUR VAR/ONLY MOD: 04	0836.3394.00			0836.3265.01
W146	DV HF-KABEL W146 NUR VAR/ONLY MOD: 04	0836.3407.00			0836.3265.01
W151	DW HF-KABEL W151 NUR VAR/ONLY MOD: 04	0836.3471.00			0836.3442.01
W152	DW HF-KABEL W152 NUR VAR/ONLY MOD: 04	0836.3488.00			0836.3442.01
W153	DV HF-KABEL W153 NUR VAR/ONLY MOD: 04	0836.3413.00			0836.3265.01
W161	DX HF KABEL W161 RF CABLE	0836.3313.00			0836.3336.01
W162	DV HF KABEL W162 RF CABLE	0836.3294.00			0836.3265.01
W163	DX HF KABEL W163 RF CABLE NUR VAR/ONLY MOD: 02	0836.3465.00			0836.3442.01
W164	DX HF KABEL W164 RF CABLE (SIEHE VGT) NUR VAR/ONLY MOD: 02	0836.3459.00			0836.3442.01
W165	DW HF-KABEL W165 NUR VAR/ONLY MOD: 04	0836.3494.00			0836.3442.01
W166	DW HF-KABEL W166 NUR VAR/ONLY MOD: 04	0836.3507.00			0836.3442.01
W181	DW HF KABEL W181 RF-CABLE W181	0820.3060.00			0836.3336.01
W196	DX HF KABEL W196 NUR VAR/ONLY MOD: 04	0820.3119.00			0836.3320.01
X171	FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU	FJ 0099.9186.00	ROSENBERGE	51K-503-200-N4	0819.0055.01
X172	FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU	FJ 0099.9186.00	ROSENBERGE	51K-503-200-N4	0819.0055.01
X173	FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU	FJ 0099.9186.00	ROSENBERGE	51K-503-200-N4	0819.0055.01
X431 ..434	FJ EINBAUBUCHSE SYST.BNC BNC-CONNECTOR UG 625CIU	FJ 0099.9186.00	ROSENBERGE	51K-503-200-N4	0819.0055.01

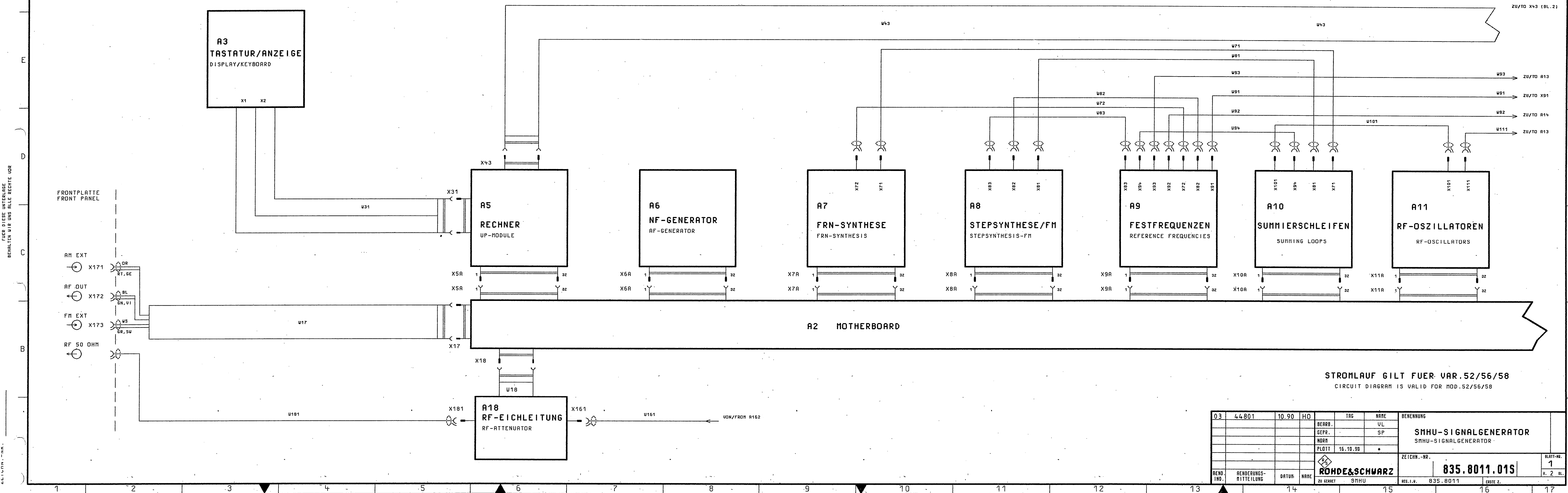
MENP5	502	3PUA	AI	Datum Date	Schaltteilliste für Parts list for	Sachnummer Stock No	Blatt-Nr Page
 ROHDE & SCHWARZ				24	04.02.98	GG SMHU SIGNALGENERATOR	0835.8011.01 SA 2~



 -DIAGNOSE SPEZIALFUNKTION
DIAGNOSTIC SPEZIAL FUNKTION

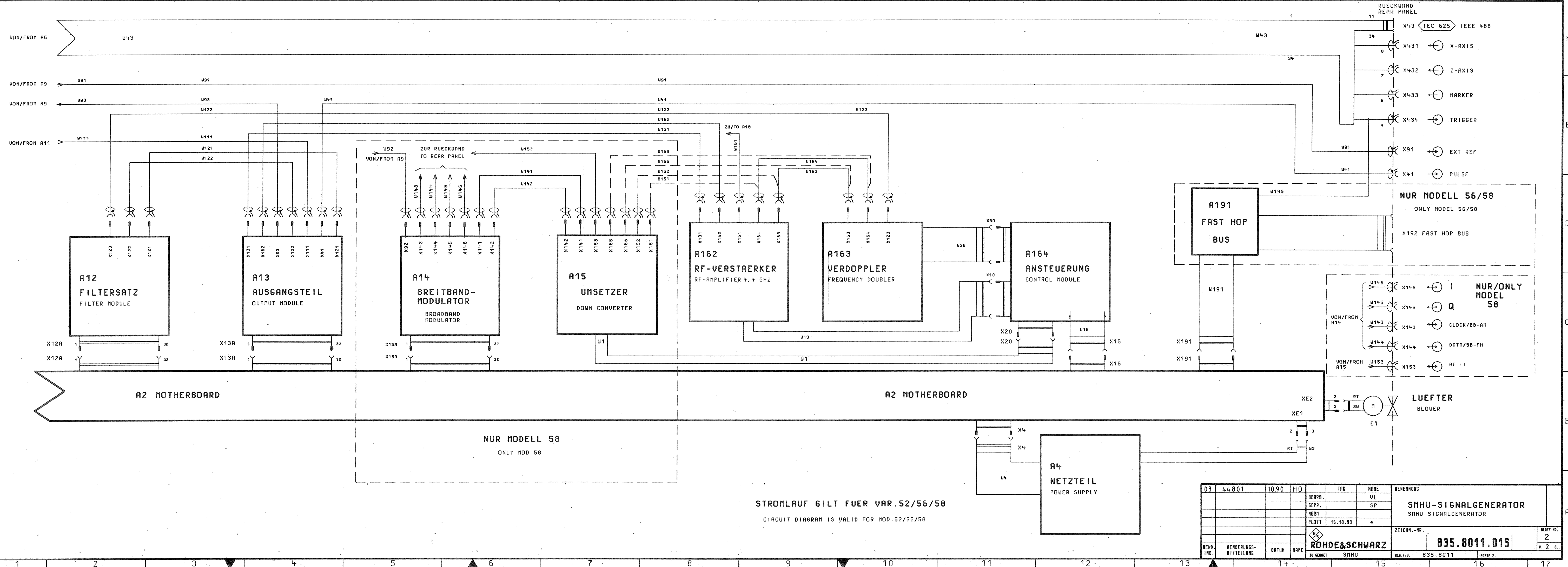
03	44801	10.90	HO		TAG	NAME	BENENNUNG				
					BEABD.	VL	SMHU-SIGNALGENERATOR SMHU-SIGNALGENERATOR				
					GEPR.	SP					
					NORM						
					PLOTT	18.10.90		*			
							ZEICHN.-NR.			BLATT-NR.	
					RHODE&SCHWARZ			835.8011. FS		2	
REND. IND.	ENDERUNGS- MITTEILUNG	DATUM "	NAME		ZU GERÄT	SMHU	REG. I.V.	835.8011	JERSTE Z.	v. 3'	BL.






03	44 801	10.90	HO		TAG	NAME	BENENNUNG			
					BEARB.	VL	SMHU-SIGNALGENERATOR SMHU-SIGNALGENERATOR			
					GEPR.	SP				
					NORM					
					PLÖTT	16.10.90				
					<div>RS</div> RONDE & SCHWARZ		ZEICHN.-NR.		BLATT-NR.	
							835.8011.015		1	
SEND. IND.	SENDERUNGS- MITTEILUNG	DATUM	NAME	ZU GERÄT SMHU			REG.-I.W.	835.8011	ERSTE Z.	V. 2. BL.

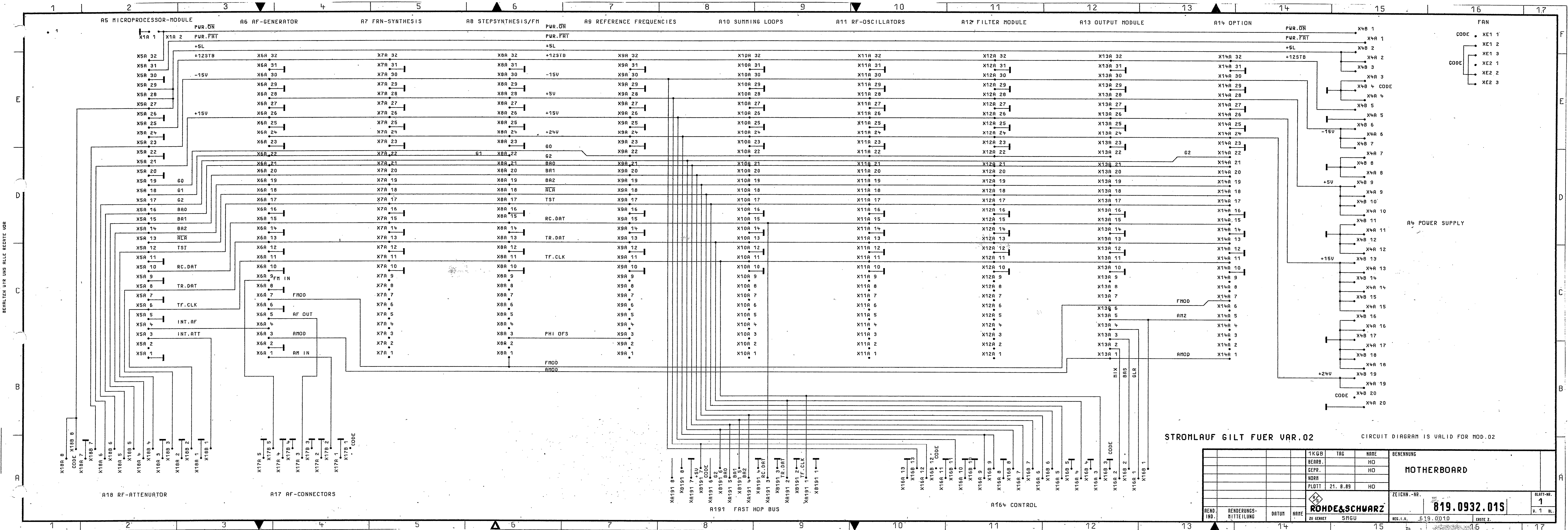
FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



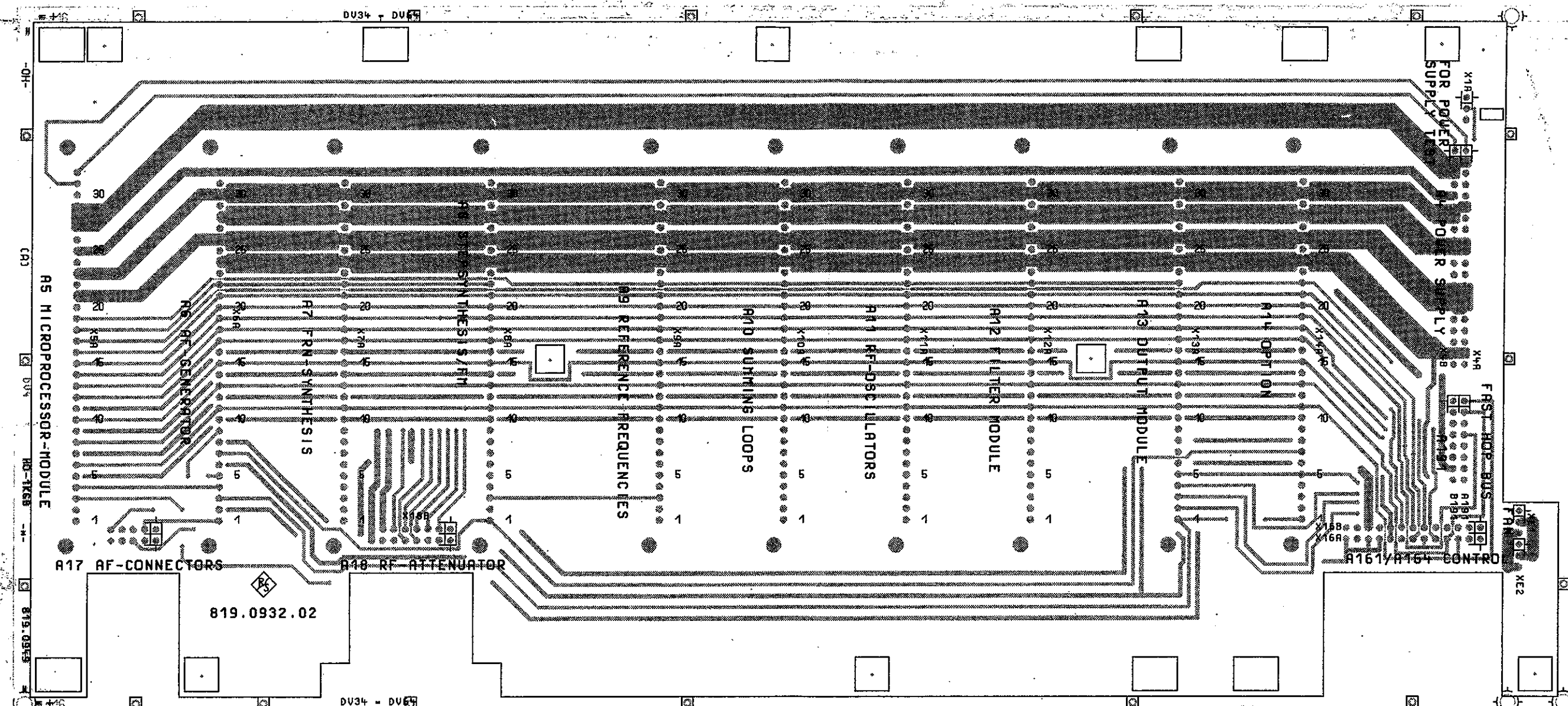
03	44801	10.90	HO		TAG	NAME	BENENNUNG
				BEARB.		VL	
				GEPR.		SP	
				NORM			
				PLOTT	16.10.90	*	
REND. IND.	RENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE & SCHWARZ		ZEICHN.-NR.	BLATT-NR.
				ZU GERÄT SMHU		835.8011.015	2
				REG. I.V. 835.8011		ERSTE Z.	2

Kennz. Comp. No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
XE1	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
XE2	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X1A	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 3-POLIG/PINS	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X10A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X11A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X12A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X13A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X14A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X16A	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 13-POLIG/PINS	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X16B	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 13-POLIG/PINS	FP 0087.9105.00	BINDER	742-5-11-0191-00-36	
X17A	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 5-POLIG/PINS	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X17B	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 5-POLIG/PINS	FP 0087.9105.00	BINDER	742-5-11-0191-00-36	
X18A	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 8-POLIG/PINS	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X18B	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 8-POLIG/PINS	FP 0087.9105.00	BINDER	742-5-11-0191-00-36	
X191A	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 8-POLIG/PINS	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X191B	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 8-POLIG/PINS	FP 0087.9105.00	BINDER	742-5-11-0191-00-36	
X4A	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 20-POLIG/PINS	FP 0243.3578.00	BINDER	742-5-11-0187-00-36	
X4B	FP STIFTL.WIN 36P.R2,54 ANGLE PIN CONNECTOR 20-POLIG/PINS	FP 0087.9105.00	BINDER	742-5-11-0191-00-36	
X5A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X6A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X7A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X8A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	
X9A	FP BUCHSENLEISTE 32POL. FEMALE MULTIPOINT CONNECT	FP 0514.4120.00	SIEMENS	V42254-B2201-B641	

MENP5	502 3PUA	AI	Datum Date	Schaltplanliste für Parts list for	Sachnummer Stock No	Blatt-Nr Page
 ROHDE & SCHWARZ	02	04.02.98	ED MOTHERBOARD	0819.0932.01 SA	1-	



Für diese Unterlage behalten wir uns alle Rechte vor.



Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

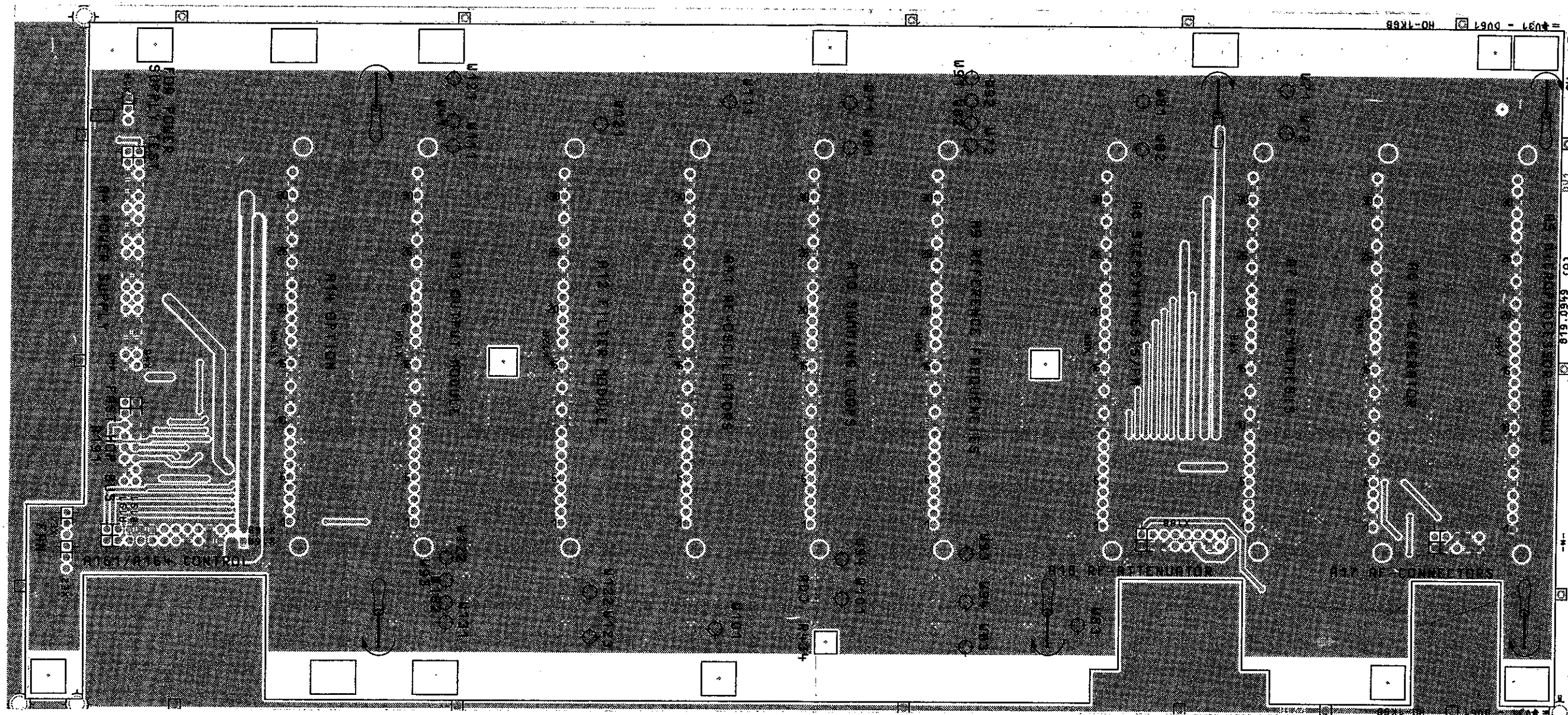
VARIANTENERKLAERUNG/VERSION
VAR02-GRUNDAUSFUEHRUNG/BASIC MODEL

05	12-97	EI	Maße ohne Toleranzangabe	Maßstab 1 : 1	
				Halbzeug, Werkstoff	
			MENP Tag Name	Benennung	
			Bearb. 08.89 HO	MOTHERBOARD	Z
			Gepr. 12-97 EI		
			Norm		
				Zeichn.-Nr. 819.0932.01 D	Blatt-Nr. 2+
				reg. i. V. 819.0010 V	v. 3 Bl.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät SMGU	erste Z.

(hierzu HVC 260)



ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

VARIANTENERKLAERUNG/VERSION
VAR02-GRUNDAUSFUEHRUNG/BASIC MODEL

05	12-97	EI	Maße ohne Toleranzangabe	Maßstab 1 : 1	Benennung MOTHERBOARD	Z	
				Halbzeug, Werkstoff			
			MENP	Tag	Name	Zeichn.-Nr. 819.0932.01	Blatt-Nr. 3
			Bearb.	08.89	HO		
			Gepr.	12-97	EI		
			Norm				
			ROHDE & SCHWARZ			reg. i. V. 819.0010 V	erste Z.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät SMGU			

(hierzu HVC 250)



ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.