ROHDE&SCHWARZ

Instruments
Division

Service Manual

TEST RECEIVER FOR DIGITAL MOBILE RADIO NETWORKS

ESVD

1026.5506.10

VOLUME 1

The service manual consists of 3 volumes

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6.1 Function Description

(cf. circuit diagram 1026.5506.01S)

6.1.1 Function of the Instrument

The ESVD is a triple heterodyne test receiver for the frequency range of 20 MHz to 1 GHz/2 GHz. Signal processing is carried out by 4 RF/IF modules and weighting modules, 2 synthesizer modules and a controller module. The block diagrams 1011.0490.01S and 1010.5001.01S illustrate the signal routing.

6.1.2 Description of the Block Diagram

(cf. circuit diagram 1026.5506.01S)

Attenuator (A60), VHF Preselector (A110)

Coming from the input socket 14 on the front panel the RF signal in the range 20 to 1000 MHz is applied via the input switchover to the attenuator, which is switchable in 10-dB steps from 0 to 120 dB. Via a 1-GHz lowpass for suppression of the oscillator noise voltage and improved image frequency attenuation the input signal is then applied to 1 fix-tuned and 5 tunable preselection filters of low passband attenuation. An integrated preamplifier with 10 dB amplification may be connected between preselection and first mixer. The RF signal is converted to the first IF 1354.7 MHz in the range 1374.7 MHz to 2354.7 MHz by means of the first oscillator in the high-level diode ring mixer following a diplexer. A broadband 50-Ω termination is ensured by another diplexer at the mixer IF gate. The following low-noise, bipolar IF amplifier with subsequent GaAs-FET buffer stage increases the signal level by 13 dB ensuring good decoupling from the subsequent IF filter. An overload detector monitors the output level of the first IF amplifier. The total amplification of this module is 2 to 4 dB.

UHF Preselector (A290; only if option ESVD-B2 is fitted)

When option ESVD-B2 is fitted, the RF signal is first transmitted from attenuator A60 to the coaxial relay K1 which connects through to the input X291 of the UHF preselector in the frequency range >1 GHz. A 1-GHz highpass filter is followed by four bandpass filters in stripline technique, which can be switched over via PIN diodes and into which a GaAs-Fet amplifier each is integrated to compensate for the insertion loss. The subsequent GaAs-Fet preamplifier, which can also be switched via PIN diodes, is followed by the 1st mixer where the RF signal is converted to the first UHF IF 394.7 MHz by means of the LO signal from the UHF synthesizer in the range 1394.7 to 2189.7 MHz. The IF part of the signal contains a two-stage amplifier, a triple-tuned circuit filter which is implemented by shortened λ/4-resonators and a 320-MHz notch filter to suppress the 2nd LO. An overload detector connected to the IF output of the 1st mixer via an isolating stage monitors the IF sum level. The total gain of the module is 10 to 14 dB.

2nd Mixer (A 130)

Via the triple-tuned circuit filter which is implemented by shortened $\lambda/4$-resonators and has a bandwidth of 5 MHz and the second low-noise IF amplifier the 1354.7-MHz IF signal from the VHF preselector is routed to the second high-level mixer, where it is converted to the second IF 74.7 MHz. The 1280-MHz LO signal required is generated in a VCO, which is synchronized with the 64-MHz reference frequency by means of a PLL and a step-recovery diode multiplier. The 74.7-MHz IF signal is applied to two amplifiers of identical design via a circuit LC filter with a bandwidth of 3 MHz and a 3-dB separating filter. To the panorama output with a bandwidth of 2 MHz an isolating stage for improvement of the reverse attenuation has been integrated.

The third mixer which converts the signal to the third IF 10.7 MHz is in the main signal path. The 64-MHz reference signal from the FRN synthesizer module which has been amplified in a driver stage serves as LO signal. The circuit filter with a bandwidth of 2 MHz holds off undesired signal portions from the subsequent 10.7-MHz signal processing. The total amplification of the module is 10 dB.

The module also contains a 64-MHz sine-wave generator with an output level of 90 dBµV and a pulse generator with an output level of 50 dBµV/MHz, the pulse frequency of which is selectable between 100 Hz and 100 kHz. During calibration of the receiver the generator signals are applied to the RF input via the switchover in the attenuator (A60). For servicing purposes the two generators may be switched on separately (cf. Section 6.1.3.3.c).

IF Selection Board (A170)

The 10.7-MHz IF signal is then connected by the fourth IF amplifier to the two main selection filters selectable via analog switches. The 10-kHz filter is a quadrupole crystal filter providing optimum settling response, the 120-kHz filter has been implemented by a double-tuned circuit LC filter. The signal level at the module input is monitored by an overload detector. Setting of the IF attenuation in four steps of 10 dB is performed at 2 cascaded amplifiers. The amplification of the subsequent calibration amplifier can be varied by ± 6 dB using a CPU-controlled 10-bit D/A converter. Thus, re-adjustment of the total amplification to the nominal value is carried out by taking into account the correction values determined in level calibration (cf. Section 3.2.3.12). The correction values can be switched off and the calibration amplifier can be manually set for servicing purposes (cf. Section 6.3.1.3.3.4). A two-pole crystal filter with a bandwidth of 16 kHz and an LC filter with a bandwidth of 120 kHz which are selectable via an analog switch are used as noise suppression filters. They are connected via a 12-dB buffer amplifier to the active envelope detector with a dynamic range of more than 70 dB and the output for the audio path also located on the detector board module.

Detector board (A180) / CPU board (A220)

The output signal of the envelope detector on the IF Selection Board passes to the average-value lowpass with 4 switchable time constants and the quasi-peak detector with the weigthing curves according to CISPR C and D and subsequent simulation of meter response. Then the signal is applied to the linear peak value detector. The DC voltage passes via the switchover for selection of the weighting mode and an additional 20-dB amplifier in the 30-dB operating range and is then applied to a temperature-compensated log module. The indication signal is subsequently applied to an isolating stage for decoupling the outputs of the boards. A DC voltage controlled by the CPU board via a D/A converter is added for transducer correction of the analog meter.

In the audio path, the 10.7-MHz IF signal is first amplified to a constant level by a gain-controlled amplifier and then demodulated in the A3 or the A0 demodulator. A PLL which is synchronized with the 100-kHz reference frequency generated in the FRN synthesizer generates the 10.7-MHz-A0 heterodyne signal. FM demodulation is performed in an on-board component. The audio signal supplied by the demodulators is amplified by an AF component.

I/Q Demodulator (A300; only if option ESVD-B1 is fitted)

Via a lowpass filter, the 394.7-MHz IF signal from the UHF preselector is routed to the 2nd mixer where it is converted from 320 MHz to the 2nd IF 74.7 MHz by means of the 2nd LO. A phase locked loop locked to the reference frequency of 64 MHz and a 320-MHz VCO generate the 2nd-LO signal. In the 74.7-MHz IF signal path a diplexer is followed by a bipolar IF amplifier and an adjustable attenuator pad to adjust the total gain of the UHF part of the signal.

In the I/Q signal path the 10.7-MHz signal supplied by the IF selection board is routed, via a PIN-diode attenuator controlled by the I/Q demodulator, to an active mixer where it is up-converted to 74.7 MHz. A bandpass filter for LO suppression is followed by the integrated I/Q demodulator which, among others, contains a controller IF amplifier as well as two active mixers. By means of a 149.4-MHz signal generated in a phase locked loop it provides the I and Q-signals which feed rear panel outputs X42 and X43 via OP buffer stages and after filtering by a lowpass filter.

Serial board control

Control of all synthesizers and signal-processing boards of the ESVS is based on a serial bus concept. This concept is particularly advantageous because of the increase in flexibility and reliability due to the considerably reduced amount of plug-in connections. Addressing of the boards and data transfer are realized via a 3-wire bus consisting of clock line, data line and strobe line. Each board is assigned at least one address. Fig. 6-1 illustrates the data format used:

- The first 4 bits of the first byte transferred initiate the self-test of the board (cf. Section 6.1.3)
- The last byte transferred is the address byte which is used for selection of the respective board.

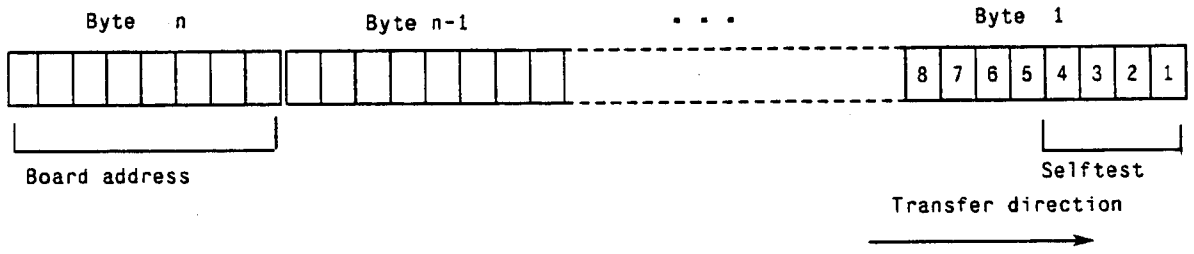


Fig. 6-1 Data format of the serial board control

Fig. 6-2 shows an example of the circuit for address decoding and serial-parallel conversion of the control signals, which is contained on each board.

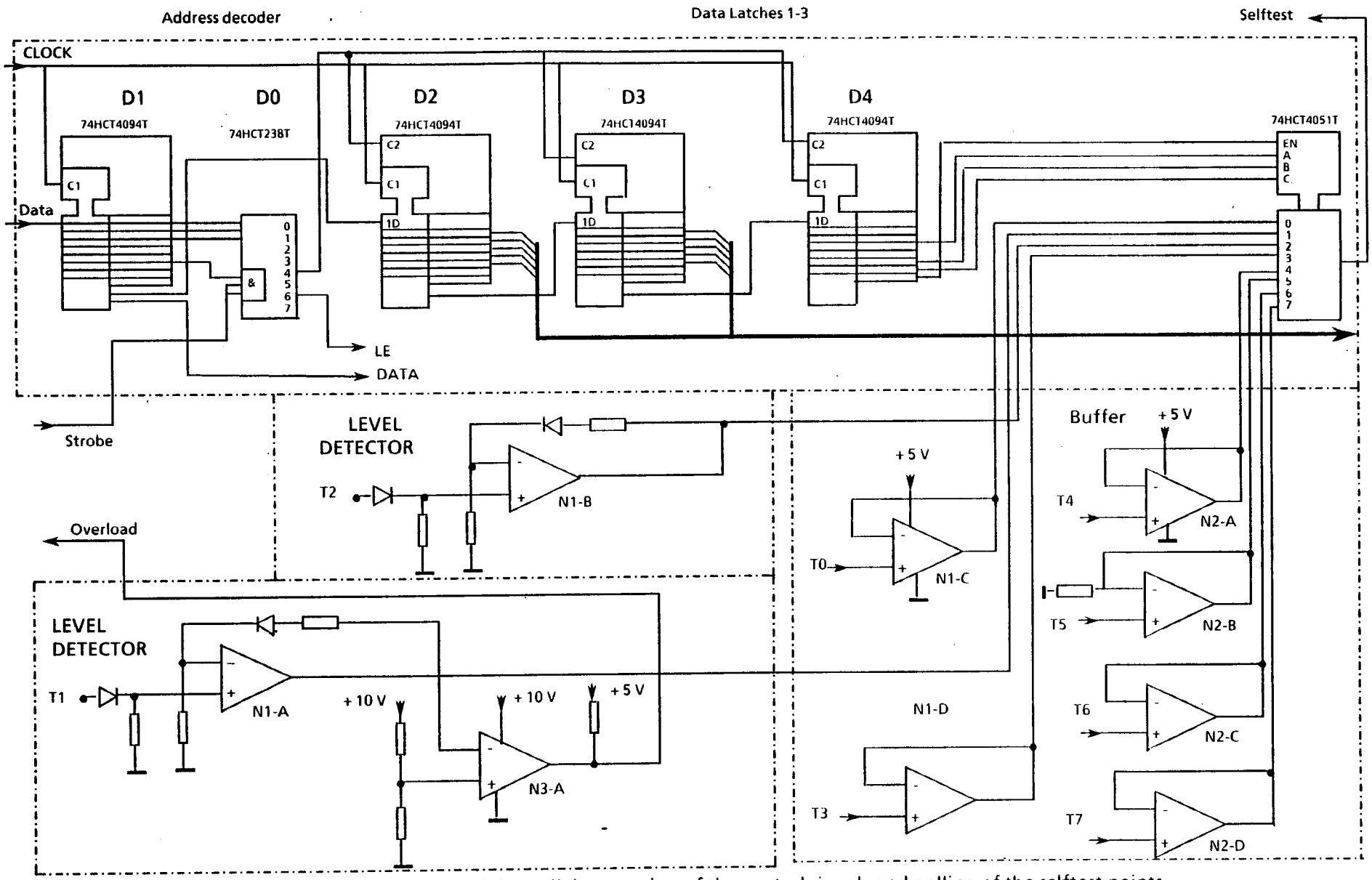


Fig. 6-2 Example of a circuit for address decoding, serial-parallel conversion of the control signals and polling of the selftest points

- All data transmitted are clocked into the shift registers D_2 to D_n on all boards.
- The last transferred byte of the bytes stored in the register D1 is interpreted as address by the decoder D0.
- The strobe signal which is sent to finish the serial data transfer causes only the shift registers D_2 to D_n of the addressed board to store the setting data in their output registers.

The *FRN synthesizer* module and the *IF amplifier* accomodate programmable dividers with integrated data registers. They are addressed by an individual address by means of the decoder D0 (outputs LE and Data in fig. 6-2).

6.1.3 Service and Selftest Functions

Localizing faults by means of selftest functions is achieved as follows:

Each synthesizer module as well as each signal module contain one or two 1-of-8 analog multiplexers being supplied with 16 test voltages max. via buffer operational amplifiers (N1 and N2 in figure 6-2). Various functions can be monitored:

- supply voltages generated onboard
- DC working points of amplifiers and oscillators
- oscillator tuning voltages in synthesizer loops
- signal levels by means of level detectors in the signal path
- mixer oscillator levels by means of LO level detectors

The test channel is selected via the serial board control. All test outputs of the modules are combined to one single line (selftest output in figure 6-2). The input of the A/D converter on the CPU board is provided with a switch. The test voltage is applied to this switch via a buffer OPAMP and tested in the test mode. All instrument settings required for checking a test function are made automatically (cf. Section 6.1.3.3).

A distinction should be made between

- permanent selftest functions
- the test for the user (user selftest) and
- the service test.

6.1.3.1 Permanent Selftest

The permanent selftest consists of control of the synthesizer loops and the operating voltages in the power supply unit.

a) Control of the synthesizer loops

All synthesizer loops in the instrument are checked as to whether the control voltages are within the permissible range. If this is not the case, a processor interrupt is triggered by the respective board. Another interrupt is generated when an external reference is applied to the receiver during operation.

All interrupt outputs are open-collector outputs and comprised in one single line (cf. block diagram 1011.2006S, Sheet 1). An interrupt thus causes all boards with synthesizer loops to be checked via the selftest whether the respective loop is o.k.. It is first checked, whether the interrupt was caused by an external reference applied to the receiver. Then, the remaining synthesizer loops are checked.

When the unlocked loop has been found, an error message is read out on the display. If a synthesizer interrupt occurs within the first 2 $^1/_2$ minutes after switching on the instrument, there is no error message in this period of time; when you try to calibrate or to start the selftest, the message "Wait for Warm up" is displayed. Reference oscillator A 320, which is stabilized by an oven-controlled crystal, requires this period to reach the rated temperature. If there is still an interrupt after this time, the corresponding error message is output. The waiting time can be eliminated for servicing purposes by entering special function 91 (cf. Section 6.1.3.3).

The following table shows the synthesizer loops and the associate error messages.

Table 6-1

Module	Error message
FRN Synthesizer	FRN Osc unlock
UHF Synthesizer	1st LO UHF unlock
2nd Mixer	2nd LO UHF unlock
320-MHz LO (ESVD-B1)	320 MHz LO unlock
149.4-MHz LO (ESVD-B1)	149.4 MHz LO unlock

The sequence in the table corresponds to the test sequence.

The error message "320 MHz LO unlock" is only displayed when the UHF preselector is fitted although the 320-MHz phase locked loop is situated on the I/Q demodulator module.

If no error occurs, the test is continued without a message.

b) Control of the supply voltages

The internal supply voltages are roughly controlled in the power supply unit. A detailed description of the voltage control functions is contained in the service instructions of the rear panel board. The correct function is indicated at the rear panel of the instrument by the Supply OK LED. If one of the supply voltages exceeds its tolerance, the instrument is switched off automatically within 3 seconds.

The receiver can be switched on again by pressing the ON switch.

A short voltage drop of the + 5-V supply voltage causes a reset of the controller. The receiver assumes the state upon power-on.

6.1.3.2 User Selftest

The user test is called by pressing the SELFTEST key.

A submenu is displayed which offers the following options:
- 01 Start Test
- 02 IF Gain Adj ON/OFF
- 03 Meter Adj ON/OFF
- 04 CAL Generator ON/OFF

The test functions available are described in Sections 4.2 and 4.3.

6.1.3.3 Service Selftest

The service selftest can be called via the special function 91 which allows for systematically checking specific boards or circuitry. The special function is not visible in the special function menu when deactivated. It can only be activated by entering the respective numbers.

The disabling of calibration and selftest (*01 Start Test*), which is effective for $2^1/_2$ minutes after switching on the instrument if there is a synthesizer interrupt, is cancelled by entering special function 91. Possibly, however, this leads to inaccurate calibration correction values or selftest voltages if the reference oscillator has not yet reached its rated temperature.

Upon calling the special function, an extended user selftest menu is displayed:

Menu for the service test:

01	Start Test	
02	IF Gain Adj	(ON/OFF)
03	Meter Adj	(ON/OFF)
04	CAL Generator	(ON/OFF)
05	CAL Corr	(ON/OFF)
06	LIN Corr	(ON/OFF)
07	Set Cal Amp	
08	QP CAL	
09	Board Test	
10	Board Test	(OFF)
11	Test at Time	(ON/OFF)
12	Printer	(ON/OFF)
13	Print CAL values	
14	List Errors	
16	Set Inp Att	
17	Synth. Error	(ON/OFF)
18	Trace IFPAS	(ON/OFF)
19	Set USER PORT	
20	Set ANTENNA CODE	
21	Lev 0.01 dB	(ON/OFF)
22	Set IF Att	

a) Total test (01 Start Test)

Upon calling the special function 91 *Start Test* initiates the service selftest. Sequence and extent of the test functions correspond to the user selftest described in Section 4.2.4 except for the extended CPU board test with detailed error notes (cf. Service Instruction CPU BOARD, Section 7.1). The components to be tested in the signal path can be looked up in the block diagram.

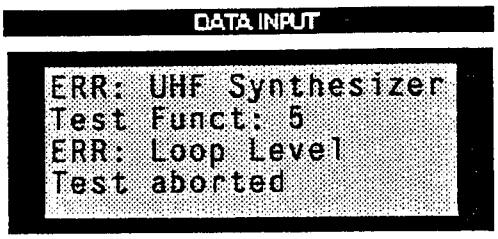
Differences between user and service selftest:

- Upon successful performance of the CPU board test the note
  LCD Test
  LED Test;
  is output in the DATA INPUT display; subsequently, all LCD segments and LEDs are controlled for 3 seconds.

- The user selftest indicates the board which caused the error.

- The service selftest additionally indicates the faulty test function and a detailed error message is output in the DATA INPUT display.

Example:



The test is aborted after the first error has been found and the message Test aborted is output in the DATA INPUT display. The error can be more exactly localized by means of the test function table contained in the service instructions of each board and by means of the service function *09 BOARD TEST* (cf. Section 6.1.3.3h). Section 6.3 describes troubleshooting by using the selftest functions.

In addition, all test results can be output via a connected printer (to be switched on via the service function *12 PRINTER*). A list is output for each board containing the tested voltages and a note about possible faults. This test is also aborted when the first error has been found and the message *Test aborted* is output.

Example:

```
   .
   .
IF SELECTION BOARD
Test Funct.              Voltage
    01                   2.5 V      (ERROR: .........)
    02                   1.7 V
    ....
    ....
    08                   3.0 V
FRN Synthesizer ok

DETECTOR BOARD
Test Funct.              Voltage
    01                   2.2 V
    02                   0.9 V      ERROR: AV Detector
    .
    .
    24
ERROR: Detector Board
etc.
```

b) Adjustment of the total gain (02 IF Gain Adj), Adjustment of the moving-coil meter (03 Meter Adj)

Refer to Section 4.3.4 for adjustment of the total gain and of the moving-coil meter.

c) Switching on the calibration generator (04 CAL Generator on/off)

The calibration generators can be switched on by calling the service function *04 CAL Generator (on)*. This function enables the user to switch on the sine-wave generator at a frequency of 64 MHz and an output level of 90 dBµV. When calling the special function 91 a pulse generator is additionally available for the user. Its output level is 50 dBµV/MHz. Thus, two signal sources are available which allow for checking the signal boards of the receiver. The pulse repetition frequency 100 Hz e.g. can be used to check the quasi-peak detector.

Operation:

- Select service function *04 CAL Generator*.
- Press one of the ENTER keys.
- Switch on the various pulse frequencies and the sine-wave generator as described below:

→ 100 Hz → 100 kHz → 64 MHz → OFF

For a correctly adjusted instrument the following level indications result:

Table 6-2 Level indication as a function of the calibration generator

Note: ***The values given in the table are valid when the total amplification has been adjusted to ± 0.1 dB using service function 02 (IF Gain Adj) and a total calibration was subsequently performed.***

ESVS settings			Cal Gen 64 MHz	Cal Gen 100 Hz	Cal Gen 100 kHz
Frequency: Detector: BW:	64 MHz AV 10 k/120 k	Cal Corr ON Cal Corr OFF	90 dBµV ± 0.1 dB 92 dBµV ± 0.2 dB	-- --	-- --
Frequency: Detector: BW: Vv.:	64 MHz AV 10 k/120 k on	Cal Corr ON Cal Corr OFF	90 dBµV ± 0.2 dB 90 to 94 dBµV	-- --	-- --
Frequency: Detector: BW:	100 MHz AV 10 k	Cal Corr ON Cal Corr OFF	-- --	-- --	28 to 31 dBµV 28 to 33 dBµV
Frequency: Detector: BW:	1000 MHz AV 10 k	Cal Corr ON Cal Corr OFF	-- --	-- --	26 to 30 dBµV 24 to 29 dBµV
Frequency: Detector: BW: Vv.:	1000 MHz AV 10 k/120 k on	Cal Corr ON Cal Corr OFF	-- --	-- --	26 to 30 dBµV 23 to 30 dBµV
Frequency: Detector:	100 MHz QP	Cal Corr ON Cal Corr OFF	-- --	20 dBµV ± 1 dB --	-- --
Frequency: Detector: BW:	100 MHz Pk 120 k	Cal Corr ON Cal Corr OFF	-- --	31.5 ± 2 dB 30 to 36 dBµV	-- --
Frequency: Detector: BW:	100 MHz Pk/MHz 120 kHz	Cal Corr ON Cal Corr OFF	-- --	50 dBµV ± 0.5 dB --	-- --
Frequency: Detector: BW:	2050 MHz AV 10 k	Cal.Corr ON Cal.Corr.OFF	-- --	-- --	27 to 31 dBµV 27.5 to 32.5 dBµV

d) Switching off the calibration correction (05 CAL Corr)

The stored correction values of the total calibration are no longer taken into account when entering *05 CAL Corr OFF*. They remain, however, stored and are active again upon switching off this service function. This is, e.g., required for final adjustment of the receiver.

Operation:

- Select *05 CAL Corr*.
- Press one of the ENTER keys

  The function is displayed in the DATA INPUT display with *OFF*.

  The calibration amplifier is set to 0 dB, independent of the receiver setting. It may, however, be set to any value by means of function *07 Set CAL Amp*.
- The correction values are taken into account again by pressing the ENTER key again.

The service function is disabled by selection of another service function, by entering EXIT or by selection of another menu.

e) Switching off the linearity correction (06 LIN Corr)

The service function *06 LIN Corr OFF* is selected, if the linearity correction values are not to be taken into account with measurement, which is, e.g., required for adjustment of the demodulator or the log module.

Operation:

- Select *LIN Corr*.
- Press one of the ENTER keys.

  The function is read out on the DATA INPUT display with *OFF*.
- The correction values are taken into account again when pressing the ENTER key again.

The service function is disabled by selection of another service function, by entering EXIT or by selection of another menu.

f) Setting the calibration amplifier (07 Set CAL Amp)

The calibration amplifier can be varied by ± 6 dB from the rated value of 0 dB in steps of 0.05 dB and 0.5 dB. It must be set to a specified value for adjustment purposes.

Operation:

- Select service function *07 Set CAL Amp*.
- Press one of the ENTER keys.

  The current amplification is indicated on the DATA INPUT display.
- Vary the amplification factor in steps of 0.05 dB using the cursor keys ← or →.
- Vary the amplification factor in 0.5-dB steps using the cursor keys ↑ or ↓.
- Disable the function by pressing ENTER again.

g) Quasi-peak calibration (08 QP CAL)

Calling the service function *08 QP CAL* subjects the reference frequency 100 MHz for QP bands C/D to a quasi-peak calibration. The setting for the calibration amplifier thus determined is retained until a variation of the receiver setting requires a new setting of the calibration amplifier.

Operation:

- Select service function *08 QP CAL*.
- Press ENTER.
  Quasi-peak calibration is performed.
  The menu of this service function is displayed until another menu is selected.

h) Board test (09 Board Test, 10 Board Test OFF)

The service function *09 BOARD TEST* is used for detailed check of individual onboard circuitry. Upon calling the function, the board can be selected from a list displayed on the DATA INPUT display. A further submenu allows for selecting between calling a specific test function (1 to n) or the complete board test. The service instructions of each board contain a list of the test functions, the test settings, the rated values and the possible error messages. When carrying out the complete board test, the test values for the individual test functions are output on a connected printer according to Section 6.1.3.3.a. Detection of an error does not lead to abortion of the test as with the start test. When an error message has been output, the next test function can be called by pressing ENTER or →. Upon pressing EXIT the menu of the boards is displayed again.

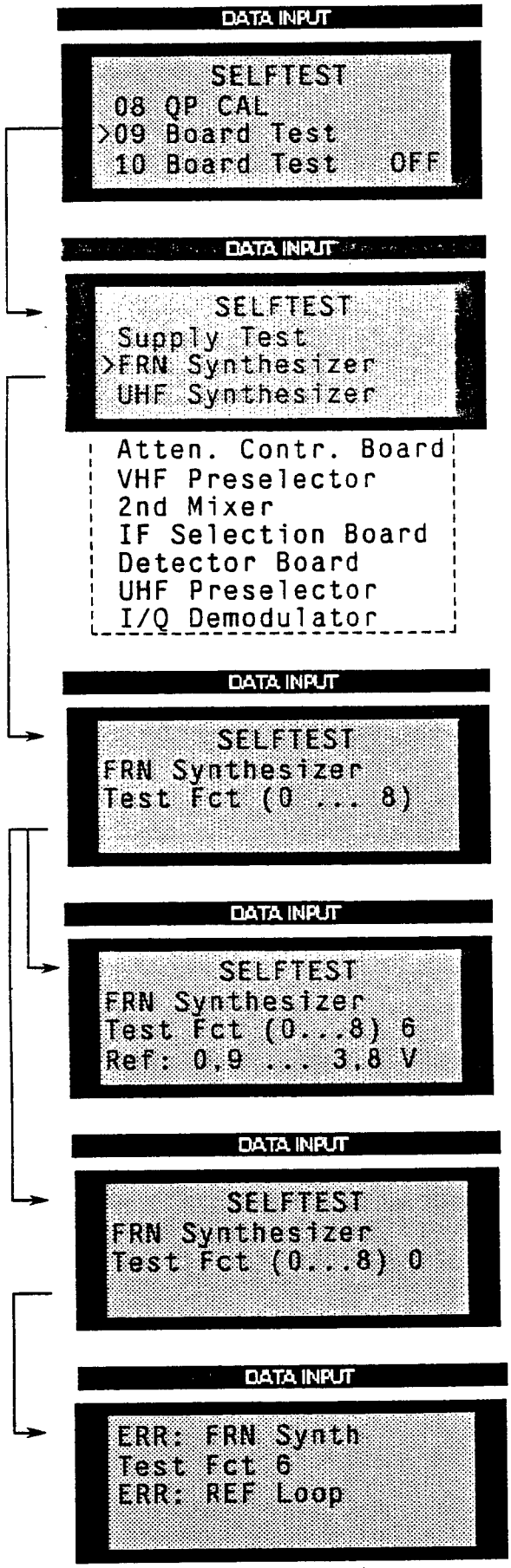
Note: *As is required for the start test of the complete instrument also the board test with the BOARD TEST function requires correct functioning of all boards connected in the signal path in order to get correct error messages. The function hierarchy of the boards is given below:*

1st Rear Panel
2nd CPU Board/Display Board
3rd FRN Synthesizer
4th UHF Synthesizer
5th Cal Generator 64 MHz (on 2nd Mixer board)
6th Attenuator Control Board
7th VHF Preselector
8th 2nd Mixer
9th IF Selection Board
10th Detector Board
11th UHF Preselector (if fitted)
12th I/Q Demodulator (if fitted)

Thus, a defective VHF Preselector may, e.g., cause error messages to occur with the board test of the 2nd Mixer, IF Selection Board or the Detector Board. As soon as a test function has been entered, the associate board settings are made and the test input of the A/D converter on the CPU board is activated; the test voltage applied to the A/D converter is tested at intervals of 100 ms and indicated in the LEVEL display (format: 0.000 to 1.999 V and 2.00 to 5.00 V).

All receiver parameters (such as frequency, RFAtt., CALGen., etc.) may be varied during the board selftest.

Operation:


DATA INPUT
SELFTEST
08 QP CAL
>09 Board Test
10 Board Test OFF
DATA INPUT
SELFTEST
Supply Test
>FRN Synthesizer
UHF Synthesizer
Atten. Contr. Board
VHF Preselector
2nd Mixer
IF Selection Board
Detector Board
UHF Preselector
I/Q Demodulator
DATA INPUT
SELFTEST
FRN Synthesizer
Test Fct (0 ... 8)
DATA INPUT
SELFTEST
FRN Synthesizer
Test Fct (0...8) 6
Ref: 0,9 ... 3,8 V
DATA INPUT
SELFTEST
FRN Synthesizer
Test Fct (0...8) 0
DATA INPUT
ERR: FRN Synth
Test Fct 6
ERR: REF Loop

SELFTEST 09 Board Test

The cursor key → is used to call the list of boards.

The display board and the rear panel are not subject to the board test. The boards may be selected using the cursor keys ↑ and ↓. The number of test functions depends on the module selected:

Supply Test	0 to 4
FRN Synthesizer	0 to 8
UHF Synthesizer	0 to 9
Attenuator Control Board	0 to 8
VHF Preselector	0 to 8
2nd Mixer	0 to 14
IF Selection Board	0 to 9
Detector Board	0 to 25
UHF Preselector	0 to 24
I/Q Demodulator	0 to 20

As soon as a test function has been selected (1 to n, Enter), the respective tolerance limits are indicated in display line four.

When calling test function 0, the complete board test is performed. The message *Board Test running* is displayed on the DATA INPUT display. If no error occurs, the message *(board name) ok* is output.

If a test voltage exceeds the tolerance, the number of the respective test function together with the associate error message is displayed. The test function remains enabled; the test voltage is indicated on the LEVEL display. The subsequent test function may only be called by pressing one of the ENTER keys or the → key. When all test functions have been executed, the message *Test complete* is displayed on the ESVS (in case of an error).

SELFTEST 10 Board Test off
The *Board Test* mode can be switched off using service function *10 Board Test off*. Besides, the *Board Test* is automatically aborted by procedures such as calibration, scan, start test, print, plot and RCL.

i) Selftest at a defined time (11 Test at Time)

The service function *11 Test at Time* starts the *start test* at a defined time. When switching on this service function, the user is requested in a submenu to enter the time. When this has been done, the service function assumes the *ON* state.

At the time entered the start test is initiated according to Section 6.1.3.3, except for the difference described below:

- The test is performed automatically and is not interrupted even in case of a defective board, i.e., release by the user with ENTER is not waited for.
- All test results are output on the display in a list. They remain displayed and can be looked at subsequently by scrolling of the display. They can also be output on a printer (printer on).
- Finally, the message *Instrument o.k.* or *Instrument defective* is output.

j) 12 Printer

The service function *12 PRINTER* is used to output all messages, which are displayed on the DATA INPUT display, on a connected printer.

Operation:

- Select service function *12 PRINTER*.
- Press one of the ENTER keys.
  The current state changes (OFF → ON, ON → OFF).

k) 13 Print CAL values

13 Print CAL values causes the correction values of the last total calibration to be output on the printer. Figure 6-3 shows a printout of calibration correction values by way of example.

```
CAL correction values for ESVD                    Date of printing: 05. Sep 92  17:04
FW Version 2.08                                   Date of last CAL: 04. Sep 92  07:04

                                          corr. value/dB
abs. reference at 64 MHz            :     -2.19
IF BW 120 kHz,
IF ATT 40 dB

gain offset, IF BW 10kHz            :     -0.07
gain offset, IF BW 300kHz           :     -0.31
gain offset, IF BW 1.5MHz           :     -0.27

gain offset, IF ATT 30dB            :      0.13
gain offset, IF ATT 20dB            :      0.13
gain offset, IF ATT 10dB            :      0.18
gain offset, IF ATT  0dB            :      0.13

linearity, 30 dB range
                  30dB              :      0.00 (reference)
                  20dB              :      0.28
                  10dB              :      0.28
                   0dB              :     -0.33

linearity, 60 dB range
                  60dB              :     -0.42
                  50dB              :      0.03
                  40dB              :      0.16
                  30dB              :      0.18
                  20dB              :      0.28
                  10dB              :      0.24
                   0dB              :     -0.38

Pk/MHz, IF BW  10kHz                :     -0.86
Pk/MHz, IF BW 120kHz                :     -1.35
Pk/MHz, IF BW 300kHz                :     -0.75
Pk/MHz, IF BW 1MHz :                       0.07

QP, Band C                          :     -0.90

                                          Preamp OFF      Preamp ON
frequency       20.0000MHz          :      -0.55           -1.41
                30.0000MHz          :      -0.69           -1.53
                40.0000MHz          :      -0.72           -1.69
                50.0000MHz          :      -0.71           -1.62
                51.2000MHz          :      -0.59           -1.52
                51.3000MHz          :      -0.10           -1.07
                60.0000MHz          :       0.03           -0.90
                64.1000MHz          :       0.21 (ref.)    -0.72
                70.0000MHz          :       0.43           -0.52
                80.1000MHz          :       0.76           -0.17
                90.0000MHz          :       0.68           -0.22
```

100.0000MHz	:	0.44	-0.49	760.0000MHz	:	3.08	3.13
110.0000MHz	:	0.10	-0.82	770.0000MHz	:	3.01	3.10
120.0000MHz	:	-0.07	-1.01	780.0000MHz	:	2.98	3.19
125.2000MHz	:	-0.04	-0.93	790.0000MHz	:	2.83	3.26
125.3000MHz	:	0.42	-0.34	800.1000MHz	:	2.81	3.34
130.0000MHz	:	0.45	-0.34	810.0000MHz	:	2.82	3.38
140.0000MHz	:	0.44	-0.25	820.0000MHz	:	2.86	3.41
150.0000MHz	:	0.52	-0.15	830.0000MHz	:	2.79	3.50
160.1000MHz	:	0.71	0.00	840.0000MHz	:	2.69	3.49
170.0000MHz	:	0.77	0.12	850.0000MHz	:	2.62	3.49
180.0000MHz	:	0.88	0.32	860.0000MHz	:	2.60	3.54
190.0000MHz	:	0.90	0.30	870.0000MHz	:	2.64	3.54
200.0000MHz	:	0.98	0.37	880.1000MHz	:	2.66	3.55
210.0000MHz	:	1.12	0.37	890.0000MHz	:	2.62	3.59
220.0000MHz	:	1.35	0.48	900.0000MHz	:	2.58	3.49
230.0000MHz	:	1.64	0.68	910.0000MHz	:	2.64	3.46
240.1000MHz	:	1.82	0.82	920.0000MHz	:	2.78	3.43
250.0000MHz	:	1.92	1.02	930.0000MHz	:	2.87	3.40
260.0000MHz	:	1.99	1.35	940.0000MHz	:	2.91	3.37
270.0000MHz	:	2.08	1.50	950.0000MHz	:	2.94	3.35
273.2000MHz	:	2.15	1.65	961.0000MHz	:	3.01	3.36
273.3000MHz	:	2.30	1.84	970.0000MHz	:	3.04	3.20
280.0000MHz	:	1.98	1.47	980.0000MHz	:	3.11	3.16
290.0000MHz	:	1.88	1.38	990.0000MHz	:	3.04	3.05
300.0000MHz	:	1.78	1.24	1000.0000MHz	:	2.99	3.10
310.0000MHz	:	1.68	1.24	1000.1000MHz	:	1.02	0.38
320.1000MHz	:	1.54	1.14	1010.0000MHz	:	1.14	0.59
330.0000MHz	:	1.50	1.14	1020.0000MHz	:	1.14	0.60
340.0000MHz	:	1.43	1.05	1030.0000MHz	:	1.11	0.50
350.0000MHz	:	1.35	0.90	1040.1000MHz	:	1.11	0.60
360.0000MHz	:	1.37	0.96	1050.0000MHz	:	1.04	0.54
370.0000MHz	:	1.41	0.83	1060.0000MHz	:	0.99	0.61
380.0000MHz	:	1.38	0.81	1070.0000MHz	:	1.01	0.53
390.0000MHz	:	1.43	0.83	1080.0000MHz	:	1.30	0.72
400.1000MHz	:	1.47	0.84	1090.0000MHz	:	1.58	1.04
410.0000MHz	:	1.48	0.90	1100.0000MHz	:	1.67	0.96
420.0000MHz	:	1.57	1.03	1110.0000MHz	:	1.68	0.82
430.0000MHz	:	1.65	1.05	1120.1000MHz	:	1.69	0.72
440.0000MHz	:	1.76	1.23	1130.0000MHz	:	1.71	0.54
450.0000MHz	:	1.83	1.41	1140.0000MHz	:	1.73	0.55
460.0000MHz	:	1.77	1.43	1150.0000MHz	:	1.71	0.56
470.0000MHz	:	1.68	1.32	1160.0000MHz	:	1.66	0.39
480.1000MHz	:	1.64	1.23	1170.0000MHz	:	1.52	0.46
490.0000MHz	:	1.61	1.13	1180.0000MHz	:	1.49	0.49
495.2000MHz	:	1.62	1.14	1190.0000MHz	:	1.44	0.53
495.3000MHz	:	1.37	1.05	1200.1000MHz	:	1.46	0.47
500.0000MHz	:	1.32	1.07	1210.0000MHz	:	1.36	0.45
510.0000MHz	:	1.36	1.04	1220.0000MHz	:	1.36	0.45
520.0000MHz	:	1.44	1.01	1230.0000MHz	:	1.47	0.42
530.0000MHz	:	1.45	0.89	1240.0000MHz	:	1.50	0.46
540.0000MHz	:	1.40	0.83	1249.9000MHz	:	1.60	0.56
550.0000MHz	:	1.35	0.73	1250.0000MHz	:	1.14	-0.07
560.1000MHz	:	1.27	0.59	1260.0000MHz	:	1.29	-0.01
570.0000MHz	:	1.32	0.61	1270.0000MHz	:	1.45	-0.01
580.0000MHz	:	1.42	0.62	1280.1000MHz	:	1.63	0.00
590.0000MHz	:	1.49	0.63	1290.0000MHz	:	1.67	0.05
600.0000MHz	:	1.64	0.81	1300.0000MHz	:	1.65	0.09
610.0000MHz	:	1.68	0.84	1310.0000MHz	:	1.58	0.06
620.0000MHz	:	1.77	0.94	1320.0000MHz	:	1.50	-0.06
630.0000MHz	:	1.73	0.97	1330.0000MHz	:	1.47	-0.09
640.1000MHz	:	1.73	0.94	1340.0000MHz	:	1.52	-0.13
650.0000MHz	:	1.78	0.96	1350.0000MHz	:	1.49	0.00
660.0000MHz	:	1.84	1.01	1360.1000MHz	:	1.41	0.02
670.0000MHz	:	1.91	1.09	1370.0000MHz	:	1.51	0.24
680.0000MHz	:	1.99	1.21	1380.0000MHz	:	1.66	0.39
690.0000MHz	:	2.32	1.48	1390.0000MHz	:	1.87	0.64
700.0000MHz	:	2.53	1.71	1400.0000MHz	:	1.98	0.76
710.0000MHz	:	2.66	1.93	1410.0000MHz	:	2.01	0.76
717.2000MHz	:	2.56	2.08	1420.0000MHz	:	2.00	0.90
717.3000MHz	:	2.86	2.94	1430.0000MHz	:	2.04	1.16
720.1000MHz	:	2.86	2.94	1440.0000MHz	:	2.07	1.29
730.0000MHz	:	2.86	3.07	1450.0000MHz	:	2.23	1.54
740.0000MHz	:	2.89	3.13	1460.0000MHz	:	2.35	1.84
750.0000MHz	:	2.99	3.16	1470.0000MHz	:	2.50	2.16

1480.0000MHz	:	2.60	2.45
1490.0000MHz	:	2.63	2.57
1500.0000MHz	:	2.68	2.49
1510.0000MHz	:	2.65	2.38
1520.1000MHz	:	2.66	2.34
1521.9000MHz	:	2.63	2.31
1522.0000MHz	:	0.33	-0.29
1530.0000MHz	:	0.36	-0.09
1540.0000MHz	:	0.45	0.30
1550.0000MHz	:	0.57	0.80
1560.0000MHz	:	0.55	0.85
1570.0000MHz	:	0.51	0.66
1580.0000MHz	:	0.33	0.42
1590.0000MHz	:	0.19	0.21
1600.1000MHz	:	0.03	0.02
1610.0000MHz	:	-0.10	-0.05
1620.0000MHz	:	-0.13	0.07
1630.0000MHz	:	-0.01	0.21
1640.0000MHz	:	0.06	0.32
1650.0000MHz	:	0.05	0.26
1660.0000MHz	:	0.00	0.35
1670.0000MHz	:	-0.08	0.47
1680.1000MHz	:	-0.11	0.62
1690.0000MHz	:	-0.02	0.75
1700.0000MHz	:	0.20	0.92
1710.0000MHz	:	0.35	0.96
1720.0000MHz	:	0.47	1.20
1730.0000MHz	:	0.77	1.45
1740.0000MHz	:	1.13	1.77
1750.0000MHz	:	1.48	1.87
1760.1000MHz	:	1.79	1.92
1770.0000MHz	:	1.96	1.93
1780.0000MHz	:	2.03	2.03
1790.0000MHz	:	2.14	2.19
1794.9000MHz	:	2.19	2.27
1795.0000MHz	:	1.23	1.01
1800.0000MHz	:	1.25	0.98
1810.0000MHz	:	1.31	1.00
1820.0000MHz	:	1.31	1.10
1830.0000MHz	:	1.44	1.32
1840.1000MHz	:	1.44	1.39
1850.0000MHz	:	1.57	1.58
1860.0000MHz	:	1.68	1.71
1870.0000MHz	:	1.94	2.06
1880.0000MHz	:	2.23	2.37
1890.0000MHz	:	2.27	2.46
1900.0000MHz	:	2.27	2.53
1910.0000MHz	:	2.33	2.66
1920.2000MHz	:	2.48	2.86
1930.0000MHz	:	2.49	3.09
1940.0000MHz	:	2.38	3.15
1950.0000MHz	:	2.41	3.48
1960.0000MHz	:	2.38	3.65
1970.0000MHz	:	2.50	3.75
1980.0000MHz	:	2.50	3.68
1990.0000MHz	:	2.63	3.80
2000.1000MHz	:	2.73	3.92
2010.0000MHz	:	2.92	4.17
2020.0000MHz	:	3.11	4.25
2030.0000MHz	:	3.33	4.32
2040.0000MHz	:	3.62	4.54
2050.0000MHz	:	3.89	4.58

Fig. 6-3 Printout of the calibration correction values (Example)

Operation:

- Select service function *13 Print CAL values*.
- Press one of the ENTER keys.
  The state of the service function is indicated with *ON*. The calibration correction values are output in the background to a connected printer. The receiver may be further operated. When the output has been terminated, the service function is switched off automatically.

l) 14 List Errors

The error messages which occur during operation are stored in the static RAM together with date and time. A maximum of 10 error messages can be stored. If more than 10 error messages occur, the most early one is deleted and replaced by the latest one.

The service function *14 LIST ERRORS* allows for reading out these messages chronologically with date and time on the DATA INPUT display. Only one error message at a time is read out. The ↑ and ↓ keys allow scrolling the individual messages.

Operation:

- Select service function *14 LIST ERRORS*.
- Press one of the ENTER keys.
  The error messages are displayed.

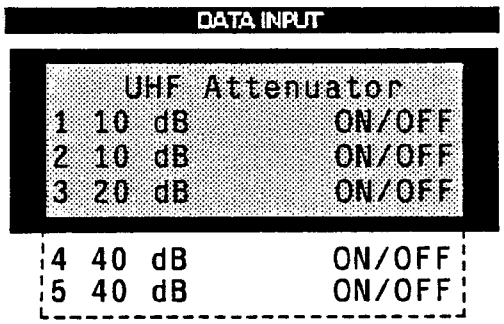
Output of the error messages can be aborted by EXIT or by entering a function which calls a menu (e.g. Self Test or Special Function).

m) Setting the RF attenuator pads separately (16 Set Inp Att)

For checking the attenuator it is required to switch the individual pads separately. This can be achieved using function *16 SET INP ATT*.

Operation:

- Select *16 Set Inp Att*.
- Press ENTER.
  The following submenu is displayed:



The individual attenuator pads are either *ON* or *OFF* according to the current attenuator setting. They can be varied by either locating the cursor on the respective position or by entering the respective number and pressing ENTER.

The service function is disabled by selecting another service function, by entering EXIT or by selection of another menu.

n) Switching off error messages of the synthesizers (17 Synth. Error)

For repair of a synthesizer it is sometimes suitable to switch off the output of error messages for the synthesizers. Function *17 SYNTH. ERROR* is intended to be used for this purpose. With this function selected the interrupt causing the respective error message is ignored.

Operation:

- Select service function *17 SYNTH ERROR*.
- Press one of the ENTER keys.

The current state is switched from OFF to ON or from ON to OFF (toggle switch).

The service function is disabled by selecting another service function, by entering EXIT or by selecting another menu.

o) Trace IFPAS traffic (18 Trace IFPAS)

Function *18 TRACE IFPAS* is provided for troubleshooting with boards setting. It is used to make the data communication traffic on the internal, serial bus visible. The data sent via the IFPAS by the controller are displayed. No information can be given about the reception of the data by the boards. Data are output in ASCII.

The serial interface must be connected to a printer, a personal computer or a terminal. When using a personal computer, e.g., the data could be filed, then decoded and the addresses could be read out on the screen in plain text.

Operation:

- Select function *18 Trace IFPAS*.
- Press one of the ENTER keys.
  The complete IFPAS traffic is output also at the serial interface. The function is identified by *ON* in the service menu. It is switched off again by pressing one of the ENTER keys again (toggle switch).

This service function is deactivated by selecting another service function, by entering EXIT or selection of another menu.

p) Setting the digital outputs of the USER PORT (19 Set USER PORT)

Service function *19 Set USER PORT* is used to test the digital outputs of the USER PORT (ports 1 to 8). All ports are either set to High or Low.

Operation:

- Select function *19 Set USER PORT*.
- Press one of the ENTER keys.
  The message *19 Set USER PORT low* is displayed. All ports assume the low level.
- Press one of the ENTER keys.
  The message *19 Set USER PORT hi* is displayed. All ports assume the high level.

The service function is deactivated by selection of another service function, another menu or by entering EXIT.

q) Setting the control outputs at the ANTENNA CODE connector (20 Set ANTENNA CODE)

Service function *20 Set ANTENNA CODE* is provided for testing the control outputs (FREQ 1 and FREQ 2) of the ANTENNA CODE socket. Both outputs are either set High or Low.

Operation:

- Select function *20 Set ANTENNA CODE*.
- Press one of the ENTER keys.
  The message *20 Set ANTENNA CODE* low is displayed. Both outputs have low levels.
- Press one of the ENTER keys.
  The message *20 Set ANTENNA CODE Hi* is displayed. Both output levels are high.

The service function is either disabled by selecting another function, by entering EXIT or by selecting another menu.

r) Level Resolution 0.01 dB (21 Lev 0.01 dB)

Internal processing of the level results is effected with a resolution of 0.01 dB. To facilitate adjustment, the level can be displayed with full resolution in the first line of the Data Input display. This eliminates the header line with all menus.

Operation:

- Select function *21 Lev 0.01 dB*.
- Press one of the ENTER keys. The function is displayed in the service menu with ON. The level is displayed with full resolution in the first line of the Data Input display (range -199.99 dB. to + 199.99 dB.). The unit is identical to the one in the Level display.
- Select function 21 again to switch off the service function and deactivate using Enter.

s) Manual setting of the IF attenuation (22 Set IF Att)

The IF attenuation can be set independent of the mode (Low Noise/ Low Distortion) and of the detector in order to check the IF attenuation steps.

Operation:

- Select *22 Set IF Att*.
- Press one of the ENTER keys.
  The current IF attenuation is displayed on the DATA INPUT display.
- The ↑ and ↓ keys can be used to vary the IF attenuation between 0 and 40 dB in steps of 10 dB.

The service function is terminated by selection of another service function, by entering EXIT or by selecting another menu.

6.2 Test Instruments and Utilities

Item	Type of instrument	Required specifications	suitable R&S instrument	Order No.	Application
1	Digital multimeter		UDS 5	349.1510.02	6.4.2; 6.4.3/4/5
2	Frequency counter	Accuracy > $1x10^{-10}$ Sensitivity < 10 mV			6.3.4.1; 6.4.9
3	Signal generator	Accuracy > $1x10^{-8}$	SMG with SMG-B1 option	801.0001.52 802.005.02	6.3.4.7; 6.4.2/3/4
4	Signal generator	100 kHz to 3710 MHz	SMHU	835.8011	6.3.4.4/5; 6.3.4.7; 6.4.3; 6.4.10
5	3-dB coupling	decoupling > 20 dB; 20 to 1000 MHz			6.3.4.7
6	6-dB attenuator		DNF	274.4110.50	6.3.4.7
7	10-dB attenuator		DNF	274.4210.50	6.3.4.7
8	Spectrum analyzer	100 kHz to 2400 MHz	FSB	848.0020.52	6.3.3; 6.3.4.3
9	RMS voltmeter		URE 2 with 50 Ω feed-through termination	350.3315.02	6.3.4.11
10	Power meter		URV5 with Insertion Unit URV5-Z2	349.80.12.02	6.3.4.11; 6.4.10
11	Pulse generator	3-standard pulse generator calibrated at 1 MHz to 80 dBµV/MHz ±0.1 dB			6.3.4.11
12	Attenuator set	Attenuation corrected, max. error (9 kHz to 30 MHz): 0.1 dB	RSP	831.315.02	6.3.4.12; 6.4.2/3/4
13	50-Ω feed-through termination	(9 kHz to 30 MHz)			6.4.3
14	Network analyzer	20 MHz to 3000 MHz			6.3.4.2

6.3 Troubleshooting

3 selftest functions are available for facilitating localization of faults.

- The user selftest described in section 4 allows for determination of the faulty board.
- The service selftest explained in Section 6.1.3.3.2 indicates the defective function unit on the respective board.
- The board test described in Section 6.1.3.3h allows for specific check of individual onboard circuitry. The tolerance limits of the test voltage which apply for the respective test setting are displayed upon calling the test function.
  The troubleshooting diagrams together with the error symptoms described in Section 6.3.1 to 6.3.4 are a further utility for localization of faults.

6.3.1 No Reaction or Faulty Reaction upon Switch-on

With all error reactions described below detailed troubleshooting is carried out using the diagrams given in Section 7.3 of the service instructions of the REAR PANEL board.

- The standby-LED does not light with mains supply, with power switch switched on and with switch-on in standby position.
- The Supply-OK-LED does not light 1 or 2 s after pressing the power-on switch with mains or internal or external battery operation.
- After power-on, the instrument is running for 2 to 3 s only.

Note: *If the standby LED blinks in case of internal or external battery supply and power switch 9 pressed, first check the voltage at the respective battery input (cf. Operating Manual Section 2.1.4)*

6.3.2 Error Message during Selftest

- Error on CPU board: see service instructions "CPU Board"
- Error in the signal processing or synthesizer: locate the error using the board test function (selftest 9) and the error location diagram in the service instruction of the respective board.

6.3.3 Error Message with Calibration

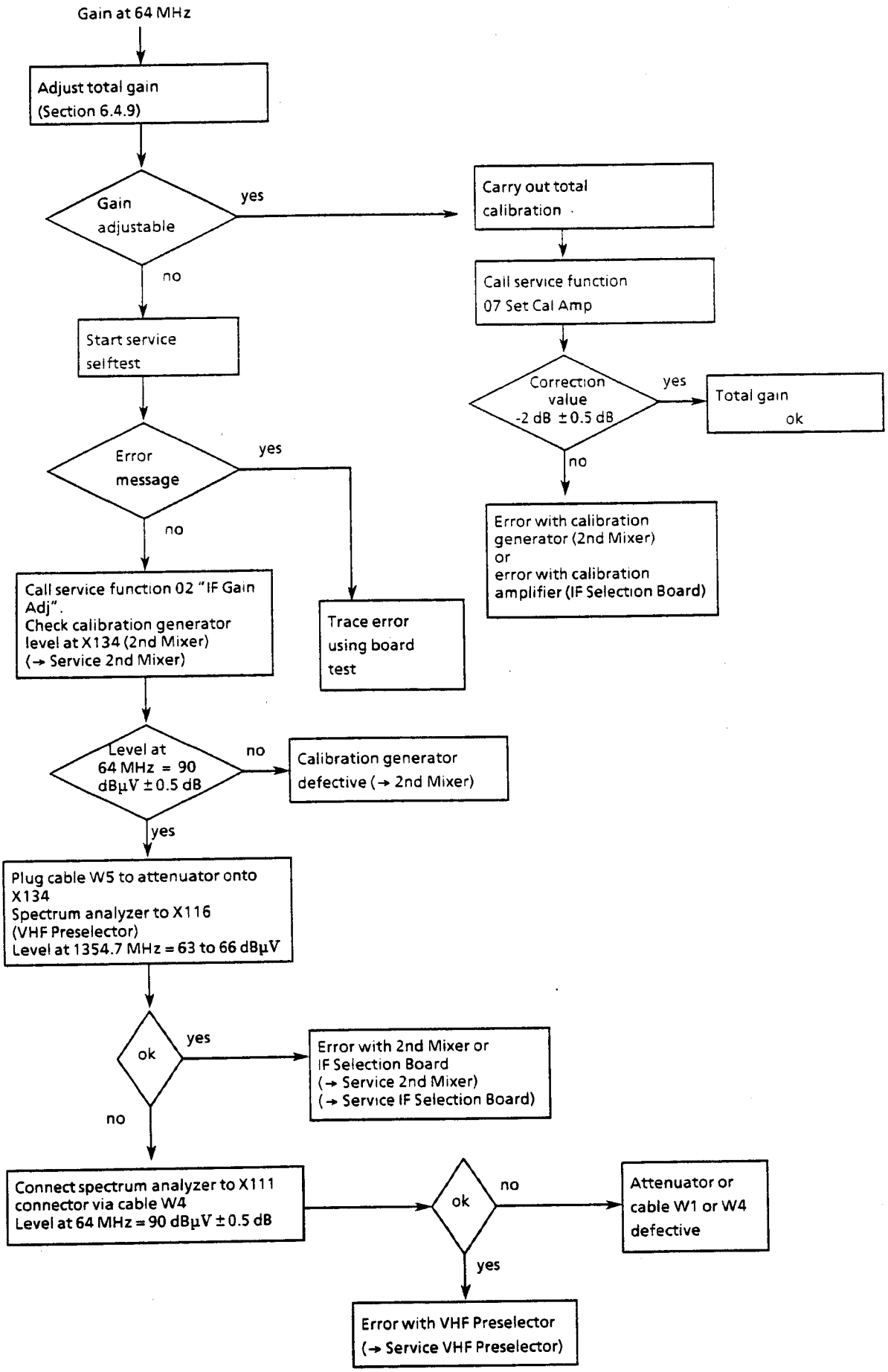
If one of the warnings or error messages described in Section 3.2.3.12.3 of the Operating Manual is displayed after a short or total calibration, it is useful to read out the calibration correction values on a connected printer using the service function *13 Print Cal Values* (cf. Section 6.1.3.3). If a correction value exceeds ±3dB, a *WARNING* is output; an *ERROR* message is output, if the ±6 dB limit is violated. The correction values resulting from the adjustment tolerances of the boards are, however, considerably smaller; fig. 6-3 shows a printout of the calibration correction with new boards at ambient temperature.

Troubleshooting:

★ Message: *WARN/ERR:Gain at 1 MHz*
Correction value: *abs reference at 1 MHz*
Rated value: *60 dBµV*

Setting of the receiver when receiving the correction value:

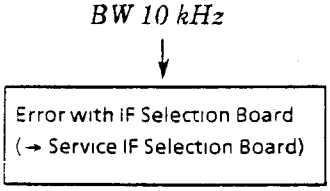
Frequency	64 MHz
IF bandwidth	120 kHz
Indication range	30 dB
RF attenuation	30 dB
IF attenuation	40 dB
Detector	AV
Measuring range	100 ms
Cal Gen	64 MHz ON


Gain at 64 MHz
Adjust total gain
(Section 6.4.9)
Gain adjustable
yes
no
Carry out total calibration
Call service function
07 Set Cal Amp
Correction value
-2 dB ±0.5 dB
yes
Total gain ok
no
Error with calibration generator (2nd Mixer)
or
error with calibration amplifier (IF Selection Board)
Start service selftest
Error message
yes
no
Trace error using board test
Call service function 02 "IF Gain Adj".
Check calibration generator level at X134 (2nd Mixer)
(→ Service 2nd Mixer)
Level at 64 MHz = 90 dBµV ±0.5 dB
no
Calibration generator defective (→ 2nd Mixer)
yes
Plug cable W5 to attenuator onto X134
Spectrum analyzer to X116
(VHF Preselector)
Level at 1354.7 MHz = 63 to 66 dBµV
ok
yes
Error with 2nd Mixer or IF Selection Board
(→ Service 2nd Mixer)
(→ Service IF Selection Board)
no
Connect spectrum analyzer to X111 connector via cable W4
Level at 64 MHz = 90 dBµV ±0.5 dB
ok
no
Attenuator or cable W1 or W4 defective
yes
Error with VHF Preselector
(→ Service VHF Preselector)

- Message: *WARN/ERR: Gain at BW 10 kHz*
  Correction value: *gain offset,IF BW 10 kHz*

  Setting of the receiver when receiving the correction values:

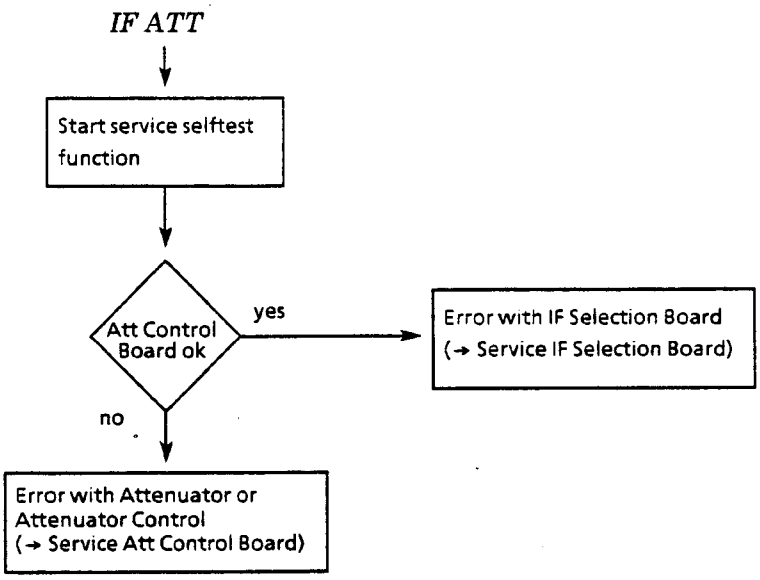
Frequency	64 MHz
RF attenuation	30 dB
IF attenuation	40 dB
IF bandwidth	10 kHz
Detector	AV
OP Range	30 dB
Cal Gen	64 MHz ON



- Message: *WARN/ERR: IF ATTENUATOR*
  Correction value: *gain offset,IF ATT 30/20/10/0 dB*

  Setting of the receiver when receiving the correction values:

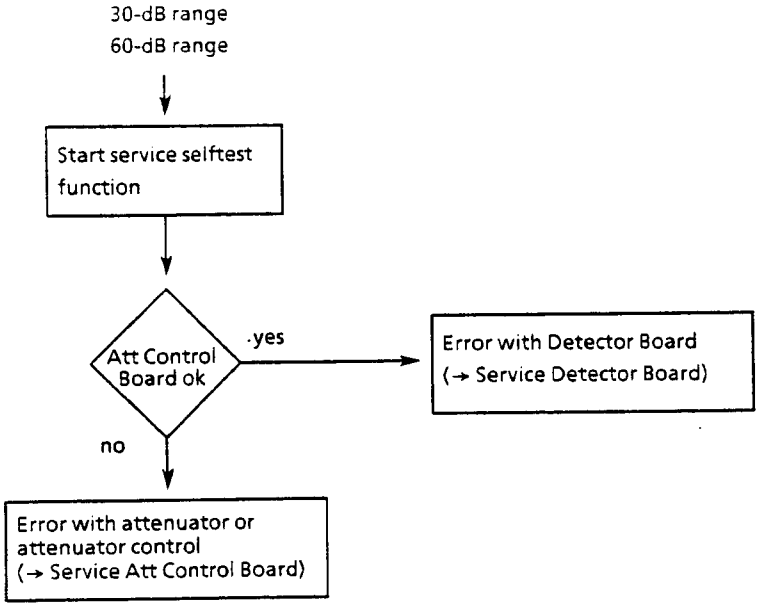
Frequency	64 MHz
RF attenuation	40 dB with IF ATT 30 dB
RF attenuation	50 dB with IF ATT 20 dB
RF attenuation	60 dB with IF ATT 10 dB
RF attenuation	70 dB with IF ATT 0 dB
IF bandwidth	10 kHz
Detector	AV
OP Range	30 dB
Cal Gen	64 MHz ON



- Message: *WARN/ERR: 30/60 dB Range*
  Correction value: *linearity, 30/60 dB range*

  Setting of the receiver when receiving the correction values:

Frequency	64 MHz
RF attenuation	40 to 70 dB (30-dB range)
RF attenuation	10 to 70 dB (60-dB range)
IF attenuation	40 dB (30-dB range)
IF attenuation	30 dB (60-dB range)
IF bandwidth	10 kHz
Detector	AV
OP Range	30 dB/60 dB
Meas. time	100 ms
Cal Gen	64 MHz ON

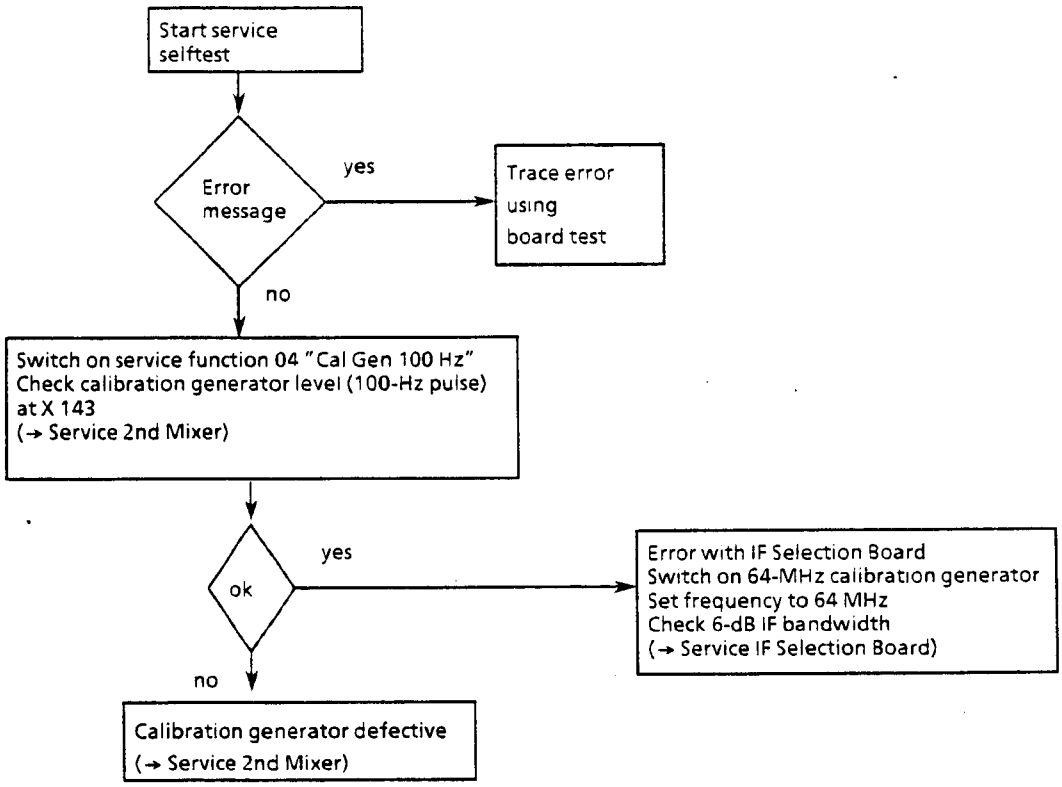


- Message: *WARN/ERR: PK/MHz*
  Correction value: *PK/MHz, IF BW 10 kHz, 120 kHz, 300 kHz or 1 MHz*
  Rated value: *50 dBµV*

  Setting of the receiver when receiving the correction value:

Frequency	100 MHz
RF attenuation	0 dB
IF attenuation	10 dB (IF BW 10 kHz)
IF attenuation	20 dB (IF BW 120 kHz)
IF bandwidth	10 kHz/120 kHz
Detector	PK
OP Range	30 dB
Meas. time	100 ms
Cal Gen	100 Hz ON

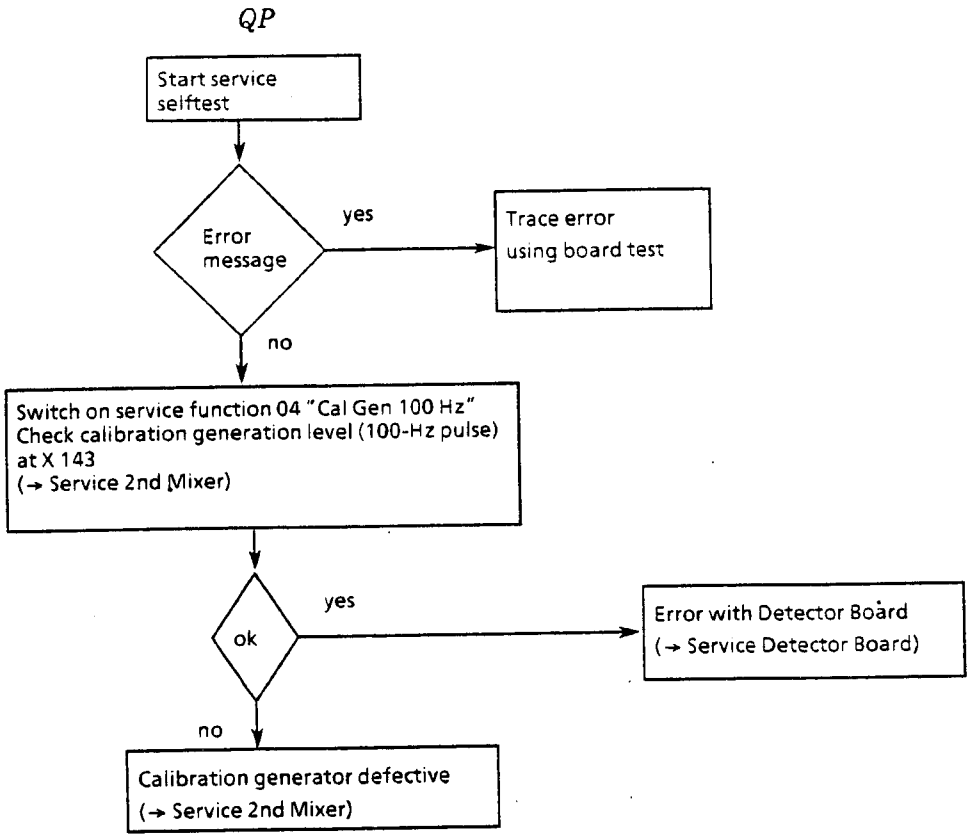
PK/MHz:



- Message: *WARN/ERR: QP*
  Correction value: *QP, Band C/D*
  Rated value: *20 dBµV*

  Setting of the receiver when receiving the correction values:

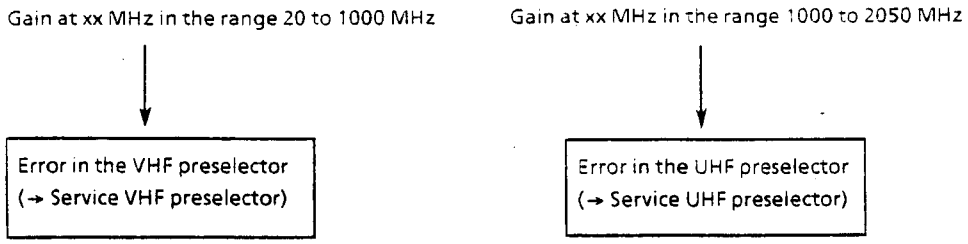
Frequency	100 MHz
RF attenuation	0 dB
IF attenuation	10 dB
IF bandwidth	120 kHz
Detector	QP
OP Range	30 dB
Meas. time	1 s
Cal Gen	100 Hz ON



- Message: *WARN/ERR: Gain at xx MHz*
  Correction value: *frequency*
  Rated value: *60 dBµV*

  Setting of the receiver when receiving the correction value:

RF attenuation	10 dB (without preamplifier)
RF attenuation	20 dB (with preamplifier)
IF attenuation	0 dB
IF bandwidth	10 kHz
Detector	AV
OP Range	60 dB
Meas. time	10 ms
Cal Gen	100 kHz ON

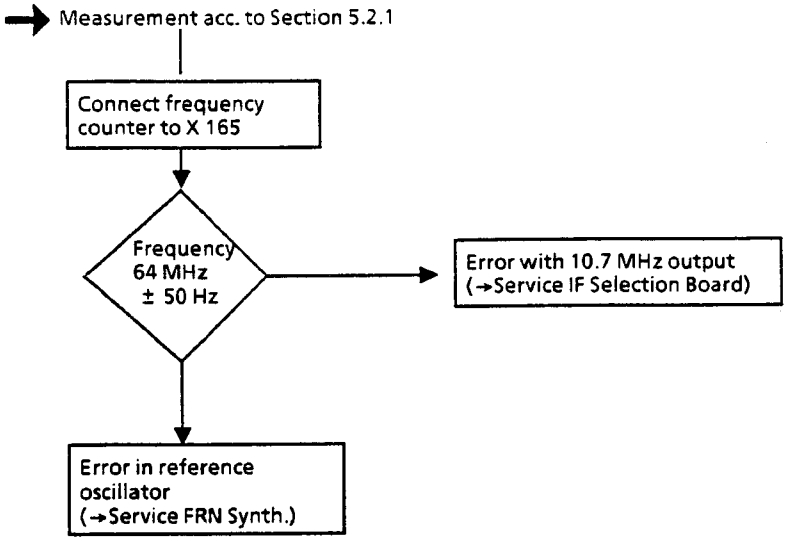


6.3.4 Error in Checking the Rated Specifications

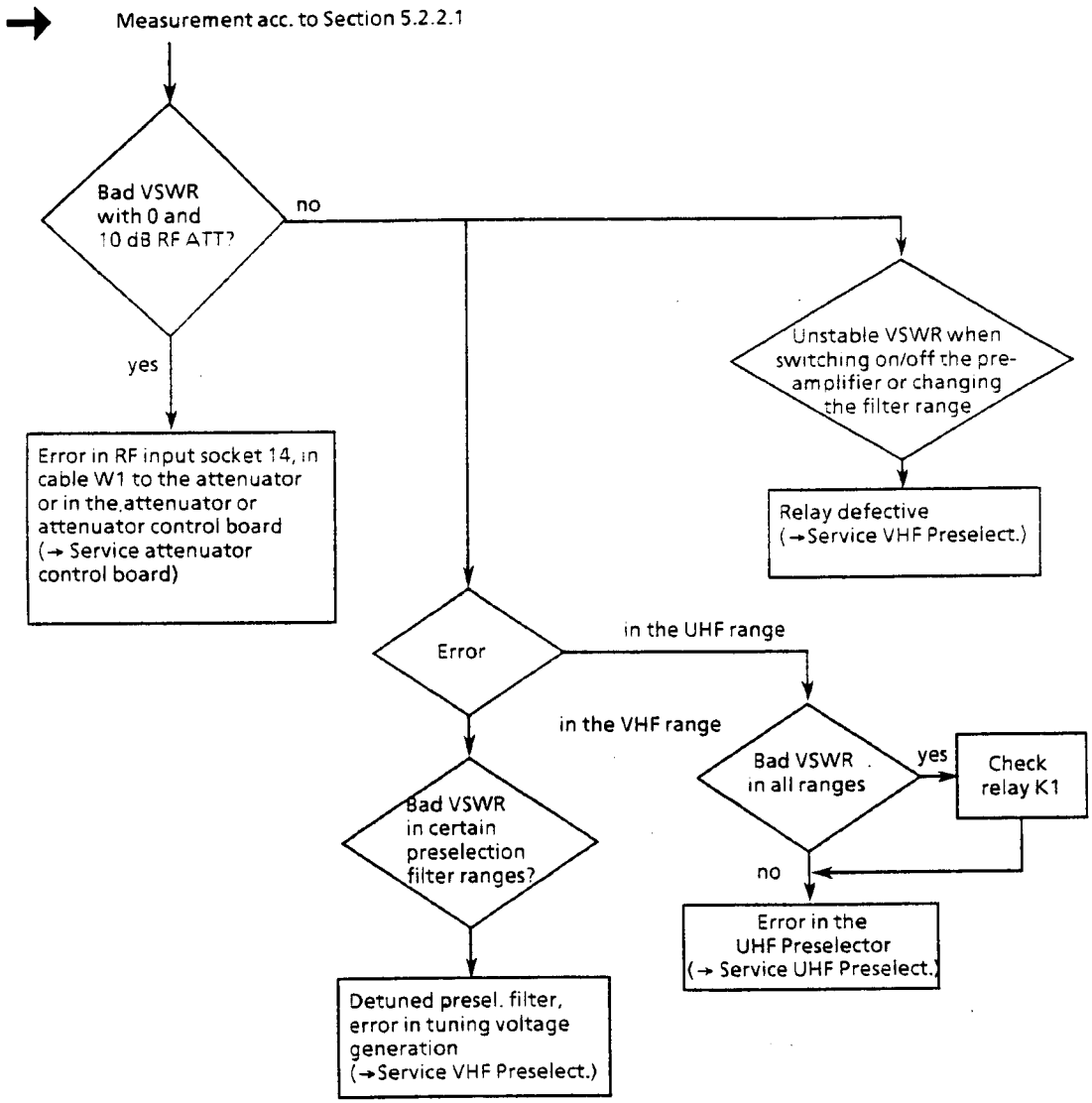
The following error descriptions assume that

- total calibration works correctly
- no synthesizer error message is output (cf. Section 4.2.3)
- no error occurs with service selftest.

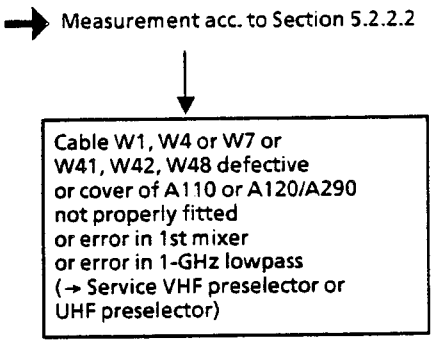
6.3.4.1 Frequency Accuracy



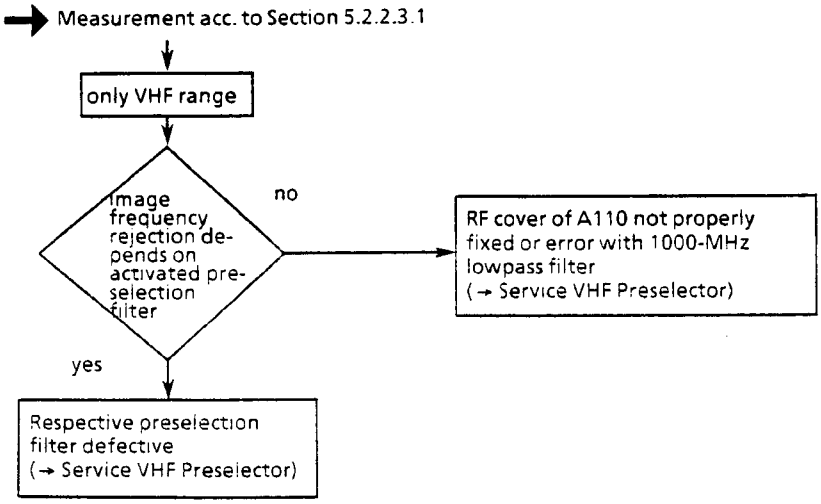
6.3.4.2 Input VSWR



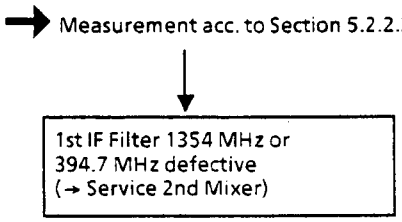
6.3.4.3 Oscillator Interference Voltage



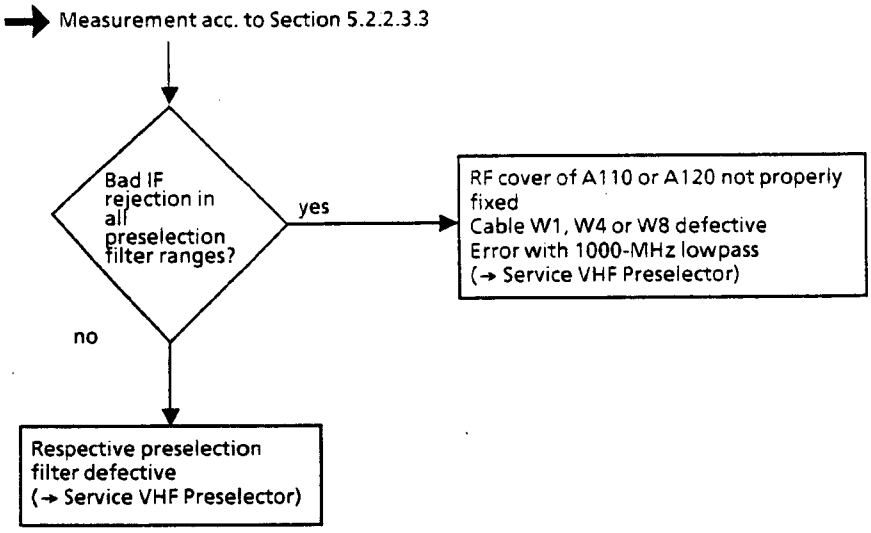
6.3.4.4 Noise Immunity, Rejection of 1st IF



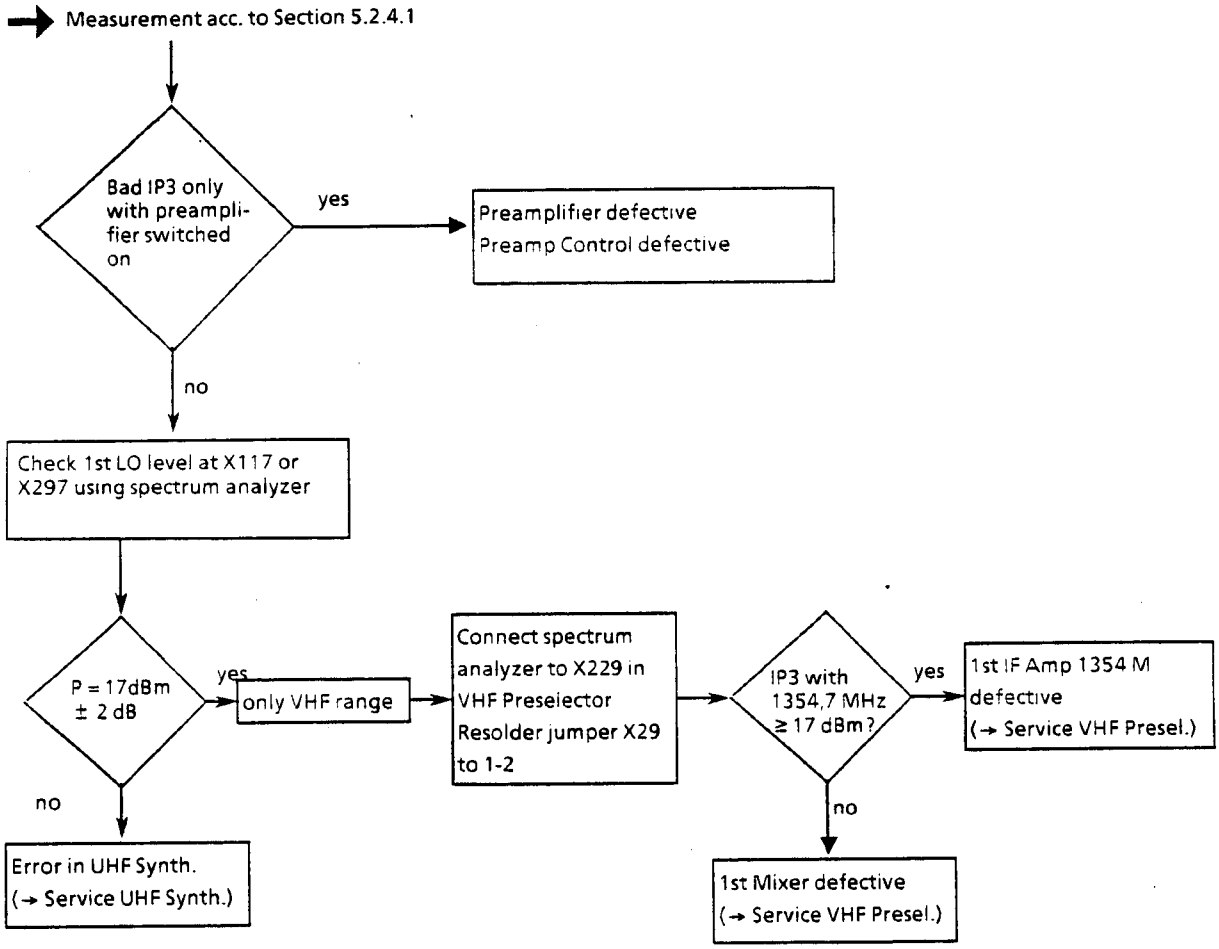
6.3.4.5 Noise Immunity, Rejection of 2nd IF



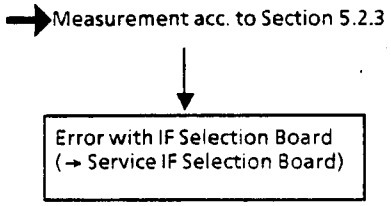
6.3.4.6 IF Rejection



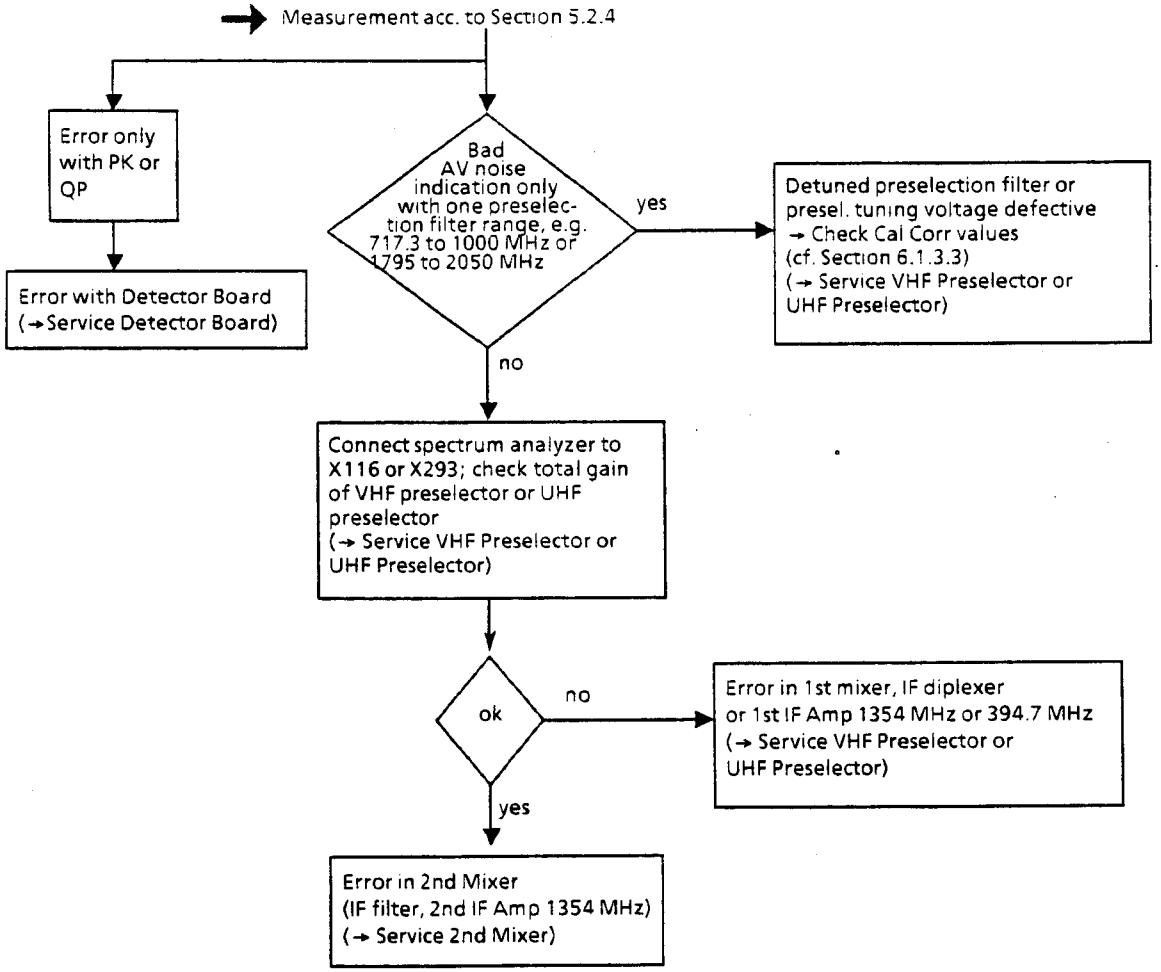
6.3.4.7 Non-linearities



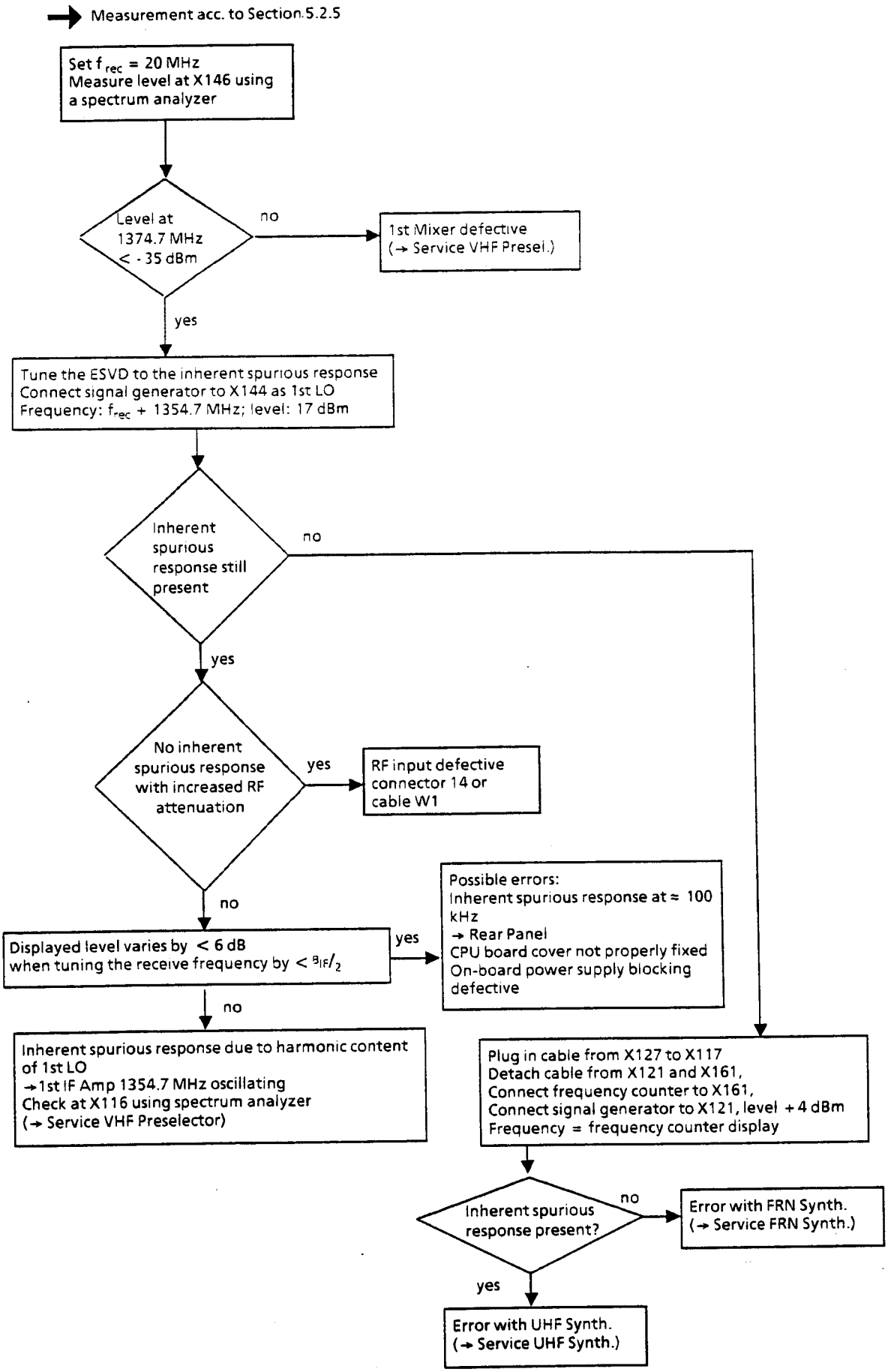
6.3.4.8 IF Bandwidths



6.3.4.9 Noise Indication



6.3.4.10 Inherent Spurious Response



6.3.4.11 Measuring Accuracy

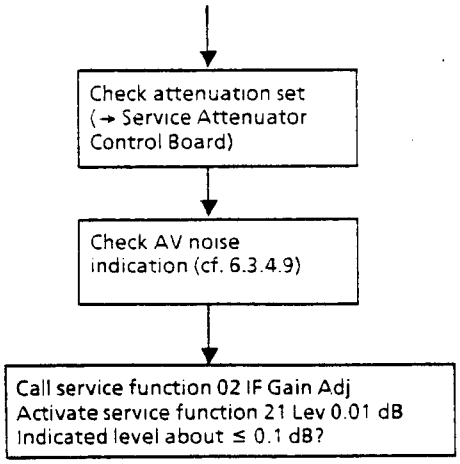
→ Measurement acc. to Section 5.2.6

a) Frequency response → Error with calibration generator → Service 2nd Mixer

b) Display mode PK and PK/MHz with pulse signals → Check IF bandwidths → Service IF Sel Bd

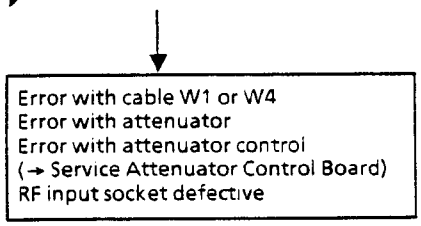
c) Display mode QP, QP evaluation wave → Error with detector board → Service detector board

d) Indication linearity



6.3.4.12 Accuracy of the Attenuator

→ Measurement to Section 5.2.6



6.4 Testing and Adjustment

Note: ***After replacing the board A160 (FRN SYNTHESIZER) it is not always necessary to adjust the reference oscillator acc. to Section 6.4.7, since all boards can be adjusted independent of each other as far as possible to ensure fast and easy service. The ESVD should be switched off before detaching or inserting boards.***

Before switching on the instrument, make sure that the position of the voltage selector is correct.

6.4.1 Setting of the -10-V Supply

a) Test instrument:

Digitalvoltmeter

b) Test setup:

Connect the digital voltmeter to the motherboard of the ESVS between X18/AC1 (ground) and the respective voltage connector at X18.

c) Test:

- Set the voltage at X18/AC5 at the power supply unit (top) to 10 V ± 1 mV using R35 and check the voltage at X18/AC4.
  Rated value ..... + 10 V ± 20 mV
- Check voltage at X18/AC2.
  Rated value ..... + 5.5 ± 0.1 V
- Check voltage at X18/AC3.
  Rated value ..... 12.8 to 14 V
- Check voltage at X18/AC6.
  Rated value ..... + 28 ± 30 mV

6.4.2 Checking the Linearities of Demodulator and Log Module

a) Test equipment:

Signal generator
Attenuator

b) Test setup:

ESVS settings:	Frequency	64 MHz
	Detector	AV
	Op. Range	60 dB
	Meas Time	100 ms
	IF BW	10 kHz
	Mode	Low Noise
	RF ATT	10 dB
Signal generator settings:	Frequency	64 MHz
	Level	70 dBµV

- Switch off all linearity correction values by calling service function *06 LIN CORR*.
- Connect the RF output of the signal generator to the attenuator.
- Connect the output of the attenuator to the RF input of the ESVS.
- Set attenuation to 0 dB.
- Using the service function *07 SET CAL AMP* set the calibration amplifier such that level indication on the ESVS is 70.3 dBµV.

c) Test:

- Increase the attenuation of the attenuator to 60 dB in 10-dB steps.
- Check level indication according to the table below:

Attenuation	Level indication on ESVS
0 dB	70.3 dBµV ±0.5 dB
10 dB	59.8 dBµV ±0.5 dB
20 dB	49.7 dBµV ±0.5 dB
30 dB	39.7 dBµV ±0.5 dB
40 dB	29.7 dBµV ±0.5 dB
50 dB	19.8 dBµV ±0.5 dB
60 dB	10.1 dBµV ±0.5 dB

- If the linearity is not adhered to, the envelope demodulator and the log amplifier must be re-adjusted (cf. Sections 6.4.3 and 6.4.4).

6.4.3 Adjustment of the Envelope Demodulator

a) Test equipment:

Signal generator
Attenuator (max.error: 0.1 dB)
Digital voltmeter UDS5

Note: *The negative input of the digital voltmeter must be connected to the ground of the board, when testing the board voltages!*

b) Test setup:

- Connect the RF output of the signal generator to the attenuator.
- Connect the RF input of the ESVS to the attenuator output.
- Set attenuation to 0 dB.
- Signal generator settings:

Frequency	64 MHz
Level	70 dBµV

- ESVS settings:

Detector	AV
Op. Range	60 dB
Meas Time	1 s
IF BW	10 kHz
Mode	Low Noise
RF ATT	10 dB

c) Test:

- Measure the voltage at X17C13 (VIDEO IN) on the IF Selection board using the digital voltmeter.
- Set the digital voltmeter to dc-coupling.
- Set attenuator to an attenuation of 0 dB.
- Using service function set the calibration amplifier such that the voltage at X17C13 ..... 4 V ± 0.1 V
- Store the voltage value (Shift Store).
- Set digital voltmeter to relative level measurement (Delta dB)
- Set an attenuation of 60 dB on the attenuator.
- Set relative level indication at dvm to ..... -60 dB ± 0.05 dB by means of 520 (DEMOD OFFSET)

6.4.4 Adjusting the Log Amplifier

a) Test equipment:

Cf. Section 6.4.3

b) Test setup:

Cf. Section 6.4.3

c) Test:

- Test the voltage at X18.C15 on the detector board using dvm.
- Repeat the adjustment described below until the voltages are accurately set with a tolerance of ± 1 mV:
- Set attenuator to 0 dB.
  Set voltage at X18.C15 on the detector board to ..... 4.654 V
  by means of R524 (LOG GAIN)
- Set attenuator to 60 dB.
  Set voltage at X18.C15 on the detector board to ..... 0.982 V
  by means of R524 (LOG REF)

6.4.5 Adjusting the Instrument to the Mechanical Zero

a) Test setup:

- Position the ESVS as suitable for operation with feet swung out.
- Switch off the receiver.

b) Test:

- Set the pointer of the meter to the mechanical zero point using the adjustment screw of the instrument.

6.4.6 Adjustment of the Instrument

The adjustment which is required after replacing the moving-coil meter or the board A180 (detector board) and carried out using the service function *03 METER ADJ* is described in Section 4.3.4.

6.4.7 Adjusting the Reference Oscillator

a) Test Equipment:

Frequency counter (Caesium standard)

b) Test setup:

- Connect the frequency counter at the 10-MHz REF OUTPUT at the rear panel.
- The receiver must be switched on for at least 15 minutes before carrying out the adjustment.

c) Adjustment:

- Set the frequency at the counter to ..... 10 MHz ± 0.01 Hz
  using R1 on the oven-controlled crystal oscillator

6.4.8 Adjustment of the Total Gain

a) Test Setup:

- Settings at the ESVD:
  Frequency: ..... < 1000 MHz
  Selftest functions IF GAIN ADJ: ..... ON

b) Measurement:

- Using R300, set the indicating level (digital) on the IF Selection Board
  to: ..... 90 dBµV ± 0.2 dB
  Selftest functions IF GAIN ADJ: ..... OFF

If Option ESVD-B2 is fitted:

- ESVD settings:
  Frequency: ..... > 1000 MHz
  Selftest functions IF GAIN ADJ: ..... ON
- Using R761, set the indicating level (digital) on the I/Q demodulator module
  to: ..... 30 dBµV ± 0.2 dB
  Selftest functions IF GAIN ADJ: ..... OFF

6.4.9 Total Overview List of All Adjustment Points

No.	Adjustment	Adjustment element	Module
1	-10 V SUPPLY	R35	A1
2	DEMOD OFFSET	R520	A170
3	LOG GAIN	R529	A180
4	LOG REF	R524	A180
5	METER FULL SCALE	R654	A180
6	METER ZERO 60 dB	R631	A180
7	METER ZERO 30 dB	R630	A180
8	VCXO TUNING	R368	A160
9	CAL GEN LEVEL	R183	A140
10	IF GAIN ADJ	R300	A170
11	IF GAIN ADJ	R761	A300
12	REF FREQ (DCXO)	R1	A320

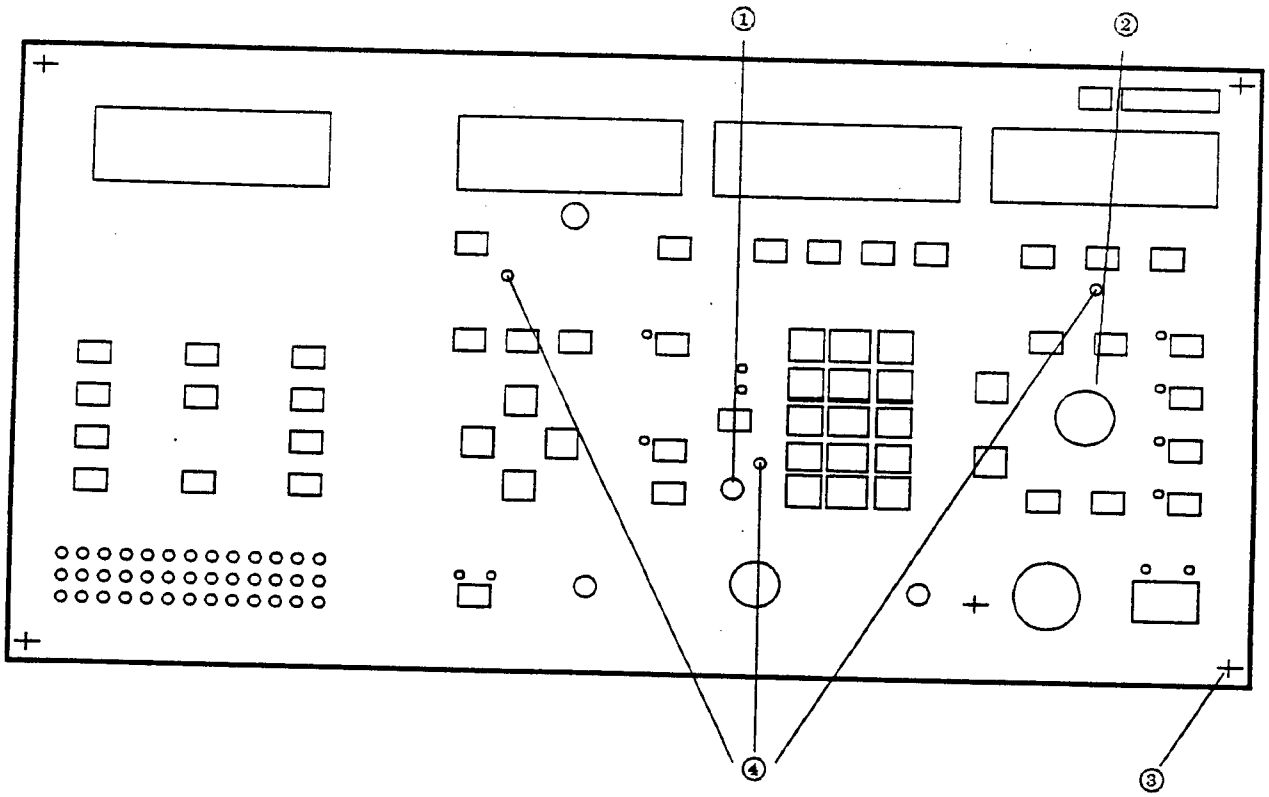
6.5 Assembly and Disassembly

6.5.1 Removal of the Rear Panel

Removal of the rear panel is explained in the Service Instructions of the REAR PANEL board.

6.5.2 Removal of the Front Panel

- Remove rotary knobs ① and ②.



- Remove front panel screws ③ (4x) und ④ (3x).
- Detach front panel.

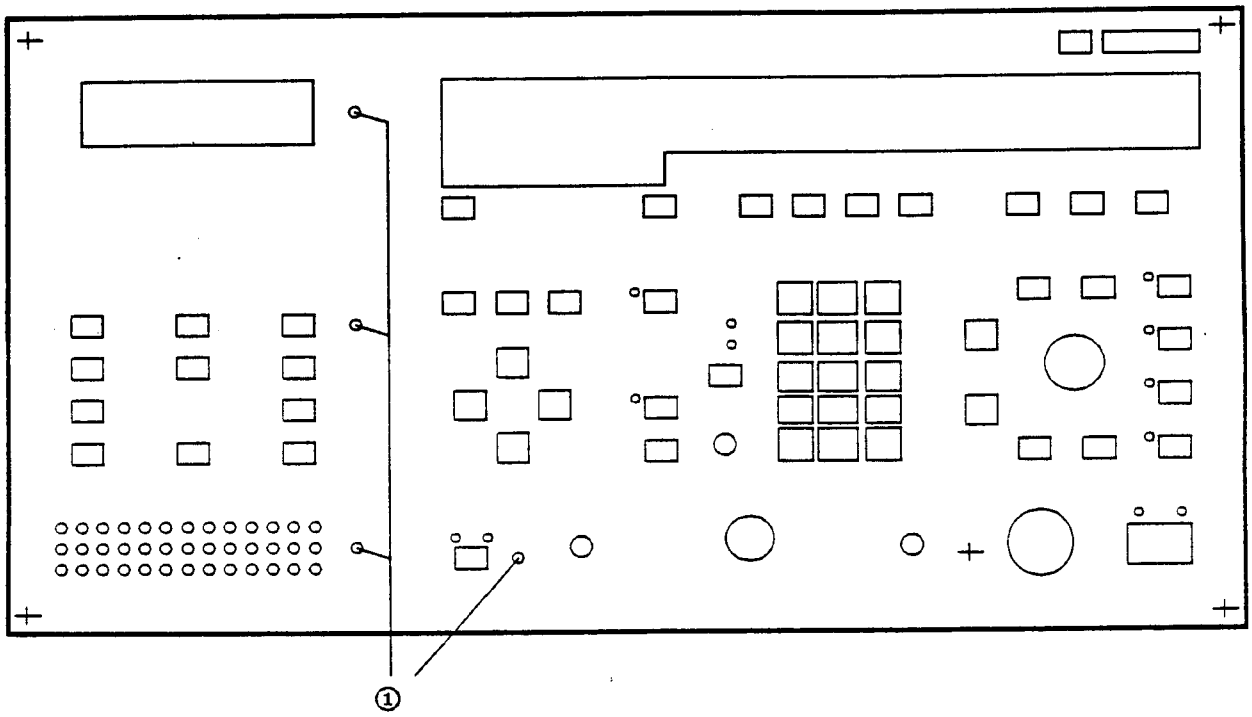


Bild 6-4

- Schrauben ① (Bild 6-4) lösen.

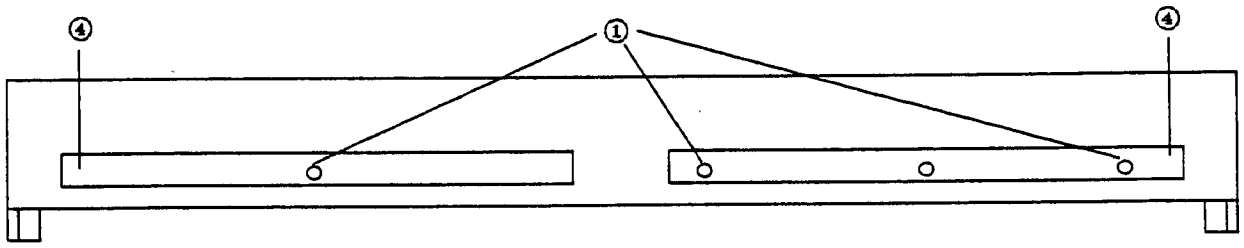


Bild 6-5 Gerät von oben gesehen

- Abdeckungen ④ entfernen.
- Schrauben ① entfernen.
- Gerät auf die Oberseite legen.

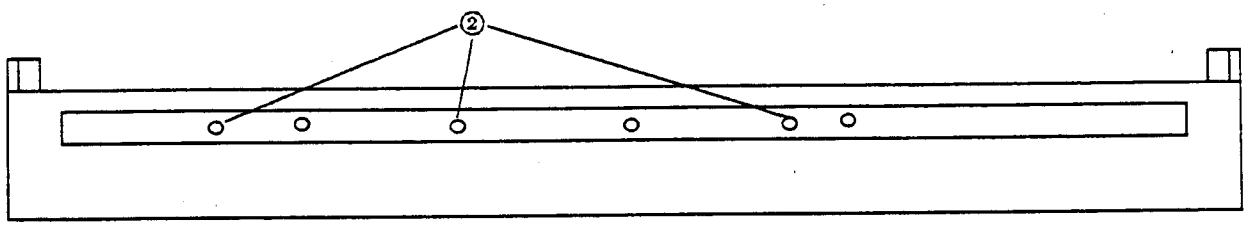


Bild 6-6 Gerät von unten gesehen

- Schrauben ② entfernen.
- Flachbandkabel W4 an A40-X4 und HF-Kabel an A140-X141 lösen.
- Gerät auf die Unterseite legen.
- Montageplatte nach vorne umklappen.

ROHDE&SCHWARZ

Liste mechanischer Teile
Bilder und Erklärung zur Liste mechanischer Teile
List of mechanical parts
Figures and explanation pertaining to list of mechanical parts
Liste des pièces mécaniques
Figures et définitions pour liste des pièces mécaniques

(R 48 010 - 1)
095.1000 Bl. 13

Liste mechanischer Teile

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

Gehäusegröße:
5E, 1 /1, T460

Maße über alles:
435,5 × 292,5 × 486,0 (B × H × T)

Ergänzungen:
19"-Adapter ZZA-95

List of mechanical parts

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

Cabinet size:
5E, 1 /1, T460

Overall dimensions:
435,5 × 292,5 × 486,0 (width × height × depth)

Accessories:
19"-Adapter ZZA-95

Lfd. Nr.	Kenn-zeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
1		1	Haube, oben 5E, 1 /1, T460 Cover, top	1002.9276
2		1	Haube, unten 5E, 1 /1, T460 Cover, bottom	1002.9282
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
12		8	Zapfen Pin	396.4634
15		2	Seitenleiste T460 Side strip	396.3080
16		4	M3x6 DIN965 A4	081.9378
17		1	Rückwandfuß, links 5E Rear-panel foot, left	396.4392
18		1	Rückwandfuß, rechts 5E Rear-panel foot, right	396.4186
19		4	Ansatzschr. M4 K. D7985 Screw	396.4492
21		2	Tragegriff T460 Carrying handle	396.3221

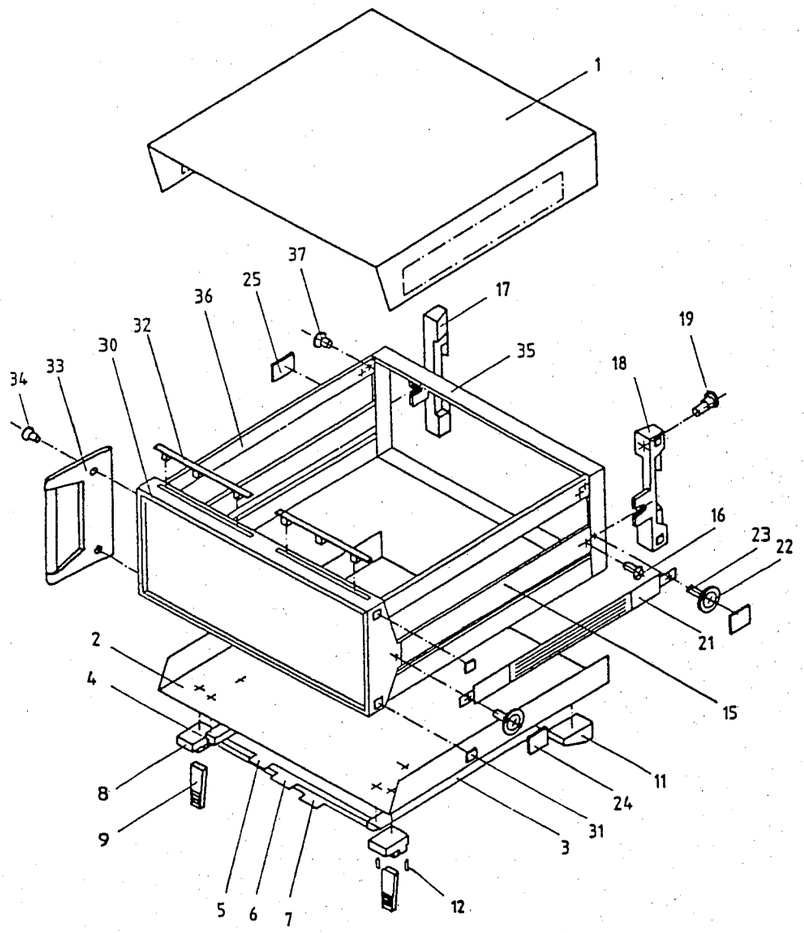
Lfd. Nr.	Kenn-zeichen	Menge	Benennung/Beschreibung	Sachnummer
No	Unit/ Comp.No	Qty	Designation	Stock No.
22		4	Griffbuchse Washer	396.3367
23		4	M4 x 10 DIN965 A4	081.9478
24		4	Abdeckung, Griffseite Cover, handle side	396.3350
30		1	Frontrahmen 5E 1/1 Front frame	396.2154
31		4	Seitenfuß Side foot	396.4692
32		2	Stapelnutabdeckung Cover for groove	396.4711
35		1	Rückrahmen 5E 1/1 Rear frame	396.2290
36		4	Rahmenschiene T460 Frame rail	396.2977
37		16	M3 x 8 DIN965 A4	081.9384
40		3,91M	HF-Dichtschnur O-Prof. 2,0 SI RF seal	396.1035
41		1,24 M	HF-Dicht. O-Prof. 2,7 SI RF seal	396.0916

Gehäuse

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.

Rahmen und Beplankung:



Casing

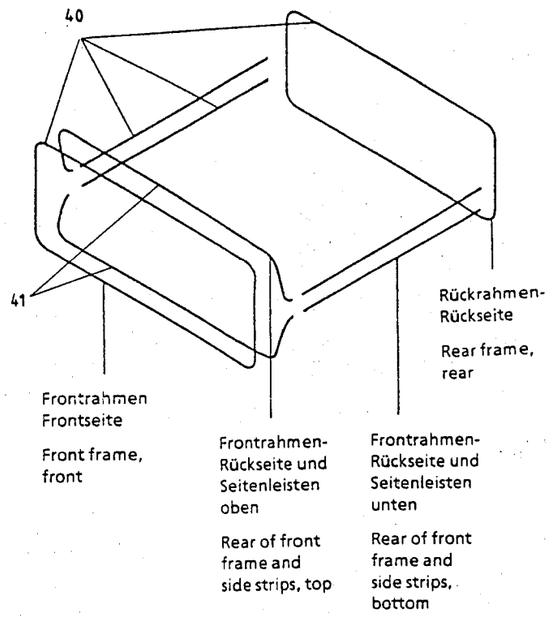
Construction

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

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. ø2 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 waagerecht 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 (ø 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

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).

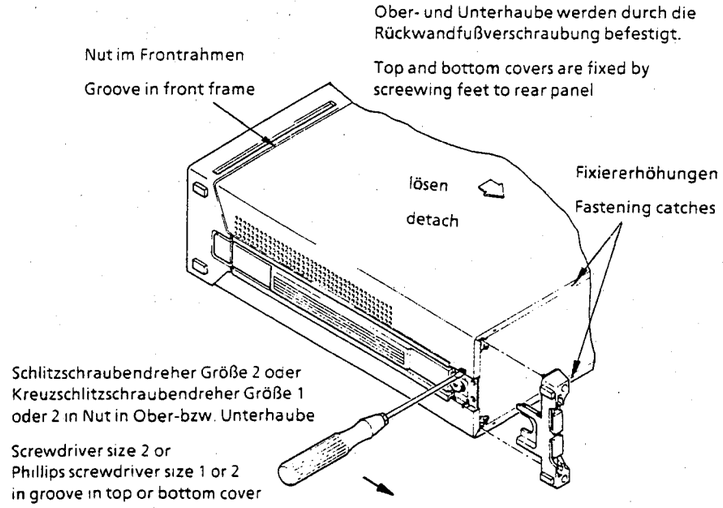
Zum ***Schließen*** des Gehäuses werden erst die Frontkanten der Hauben in die umlaufende Nut des Frontrahmens und der Seitenleisten eingeführt und dann in die Erhöhungen am Rückrahmen bis Anschlag eingerastet. Das Gerät ist wieder geschlossen, wenn die Rückwandfüße eingeschoben und die Schrauben festgezogen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

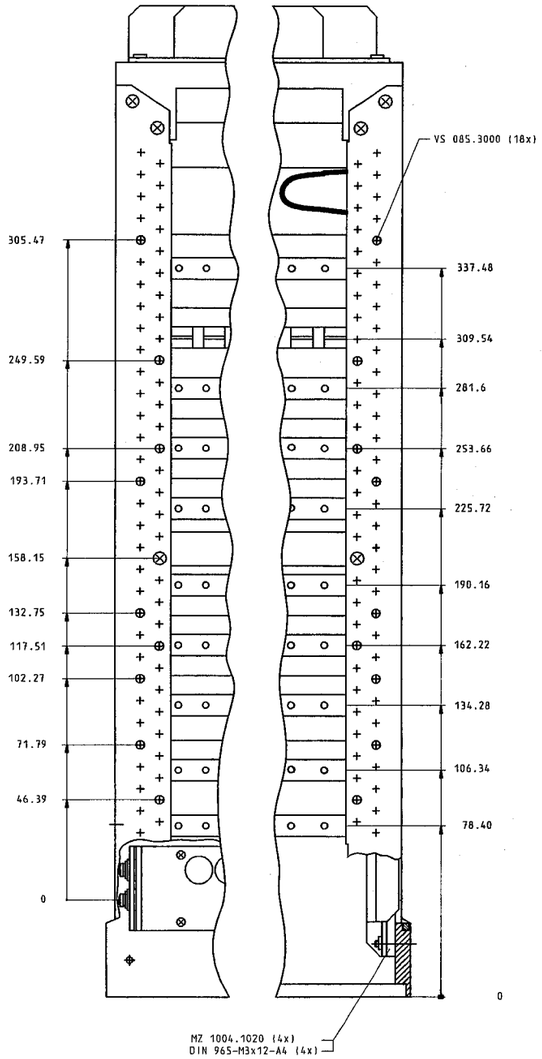
Opening and closing the cabinet

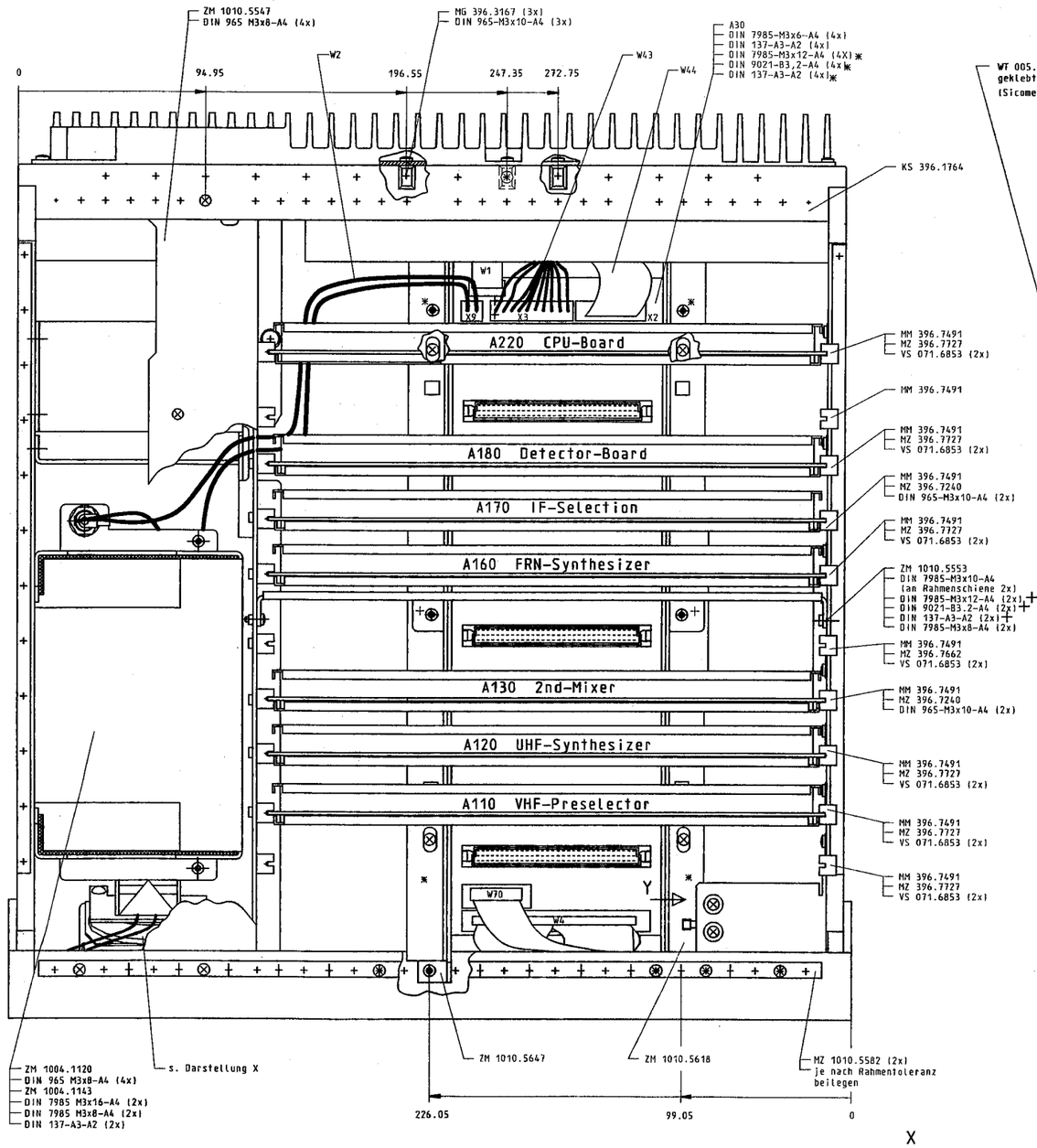
To obtain the high degree of shielding of design 90, many points of contact and accurate fitting are employed. When exerting a slight pressure by tightening the rear-panel feet, tight fitting of the top and bottom covers is ensured.

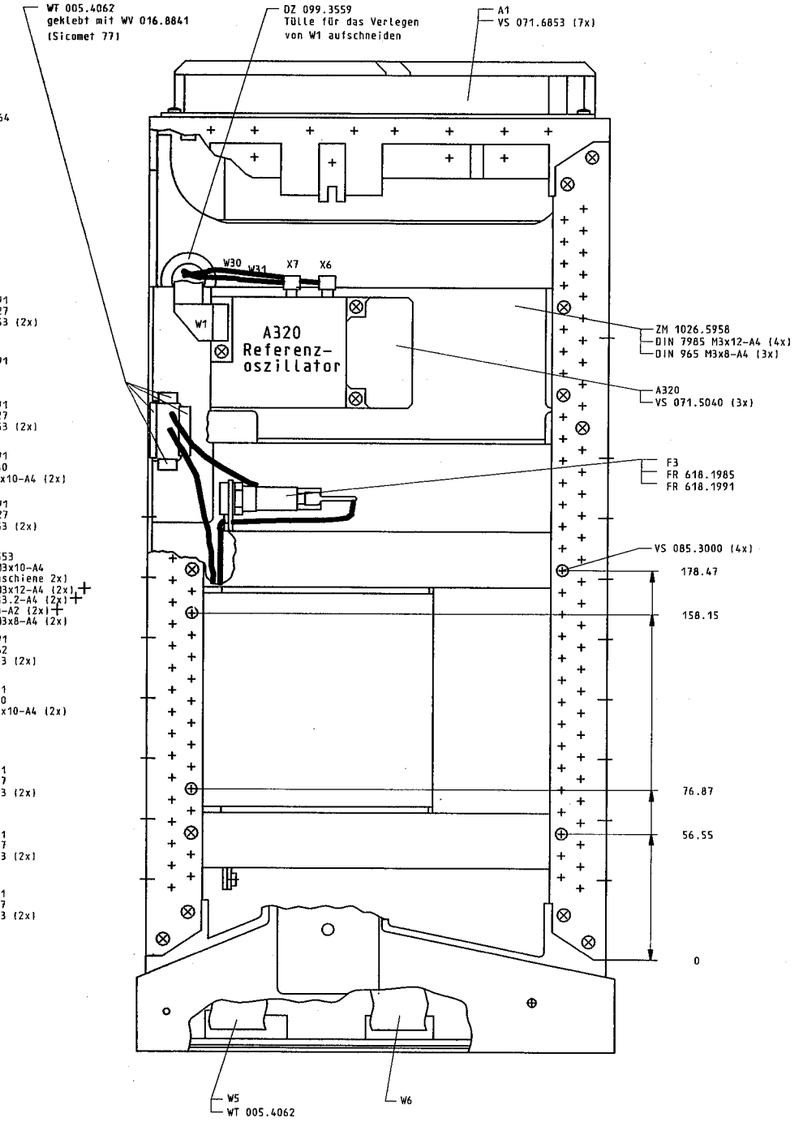
To ***open*** the cabinet, first undo the rear panel feet screws and withdraw the feet (captive screws). It is now possible to detach top and bottom cover if required. If the fitting of these cover plates is very tight, removal can be facilitated by alternately levering on both sides of the instrument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

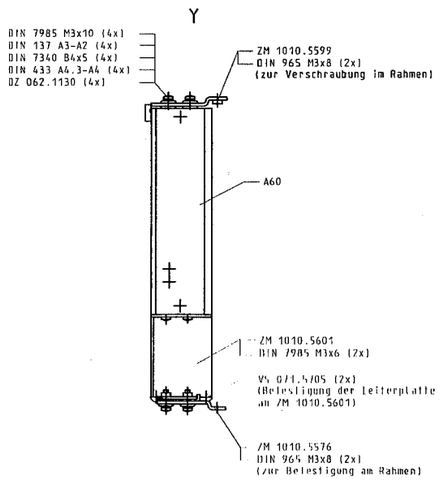
To ***close*** the cabinet, insert the front edges of the covers into the groove of the front frame and the side strips and lock them into the catches on the rear frame into detent position. The cabinet is closed when the rear-panel feet are inserted and the screws tightened.

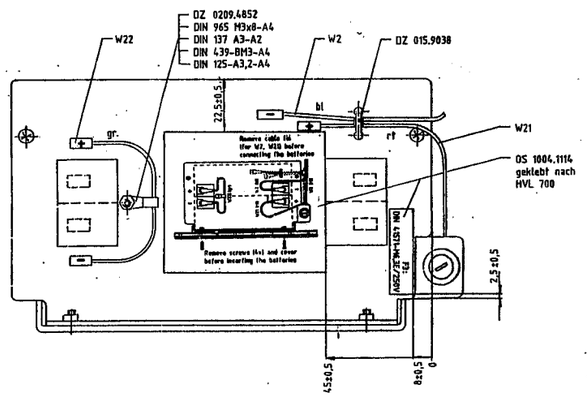








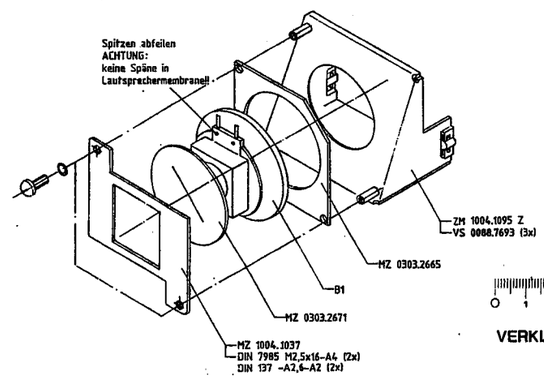




Fuer Batterieeinbau gilt Montageanweisung lt Batteriedeckel!
Beim Befestigen der Batteriekabel (W2, W21) darauf achten,
dass kein Kurzschluss entsteht!

X

Bei der Lautsprechermontage ist darauf zu achten, daß die Gummi-Platte 303.2665 nicht in den Lautsprecher B1 hineinragt. Gegebenenfalls Gummi-Platte über Klebepunkte fixieren.



Dichtschnureinlage nach 396.1841 fuer

Frontr. Rueckseite oben	(396.0916)	0.66	m
Frontr. Rueckseite unten	(396.0916)	0.58	m
Seitenleisten	(396.1035)	4x0.35	m
Frontplatte	(396.1035)	1.29	m
Rueckplatte	(396.1035)	1.22	m
Dichtschnur Ø2.7 gesamt	(396.0916)	1.24	m
Dichtschnur Ø2.0 gesamt	(396.1035)	3.91	m

In Kabelsatz 1026.5593 enthaltene
Kabel nach Steckerbeschriftung stecken

VERKLEINERUNG

				Masze ohne Toleranzangabe +/-0.2			Massstab		
							Werkstoff		
03	46345(11)	02.06.92	TF		Datum	Name	Benennung	Grundaufbau	
		. .		Bearb.	05.06.92	PA/TF			
		. .		Gepr.	. .				
				Norm					
				Abt.	1KEE				
				ROHDE&SCHWARZ			Zeichn.-Nr.	1026.5541.00	Blatt-Nr. 01 Bl.
Zust.	Aenderung	Datum	Name	zu Geraet ESVD			reg.i.V. 1026.5506.	ersetzt 1026.5506.	

Diese Zeichnung ist ein Rechnerausdruck, Aenderungen kommen nur durch aendern des Datensatzes erfolgen
Fuer diese Zeichnung behalten wir uns alle Rechte vor.

J2
DIN 7985 M2.5x12 (2x)
DIN 125 A2,7-A4 (2x)
DIN 137 A2,6-A2 (2x)
Kabel W1 nach Beschriftung stecken
Instrument zur Abgleichbohrung
in Frontplatte einmitten

VS 396.5518 (4x)
DIN 965 M3x8-A4 (4x)

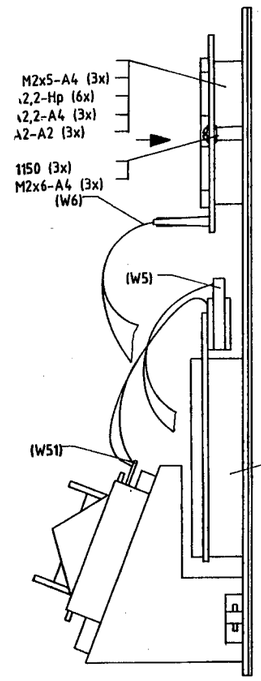
ZM 1026.5893
VS 396.1070 (3x)

OK 078.1192
(berührungsfrei zur
Frontplatte montiert)

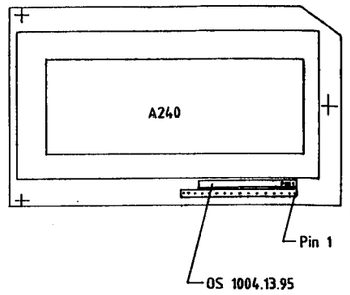
VS 088.7693 (14x)

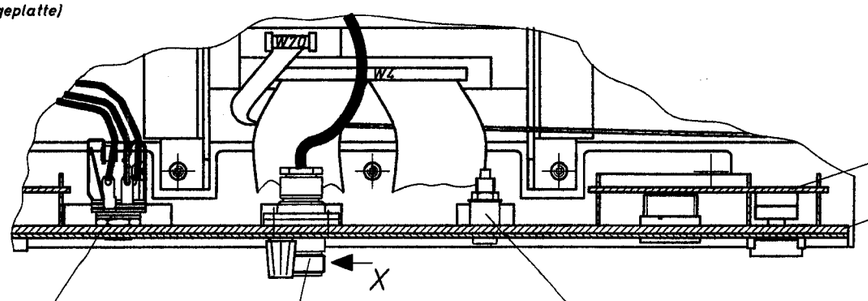
SB 396.0880

DIN 965 M3x8-A4 (3x)
(Verbindung Magazinwand-
Montageplatte)



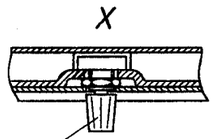
A50
VS 0088.7693 (4x)





A40
Kabel W1, W4, W5 u. W6 nach
Beschriftung stecken

ZM 1004.0847
DIN 965 M3x8-A4 (6x)



MP 840.0967
(berührungsfrei zur
Frontplatte montiert;
Befestigungsschraube soll bei
Mittelstellung des Patis unten sein.)

W3
(gesteckt auf
Displayboard X15)
bei Montage Kurz-
schluß zwischen
Klinkenstecker
u. Montageplatte
vermeiden.

W1 (enthalten in
Kabelsatz 1011.2135)
DIN 965 M3x6-A4 (4x)
MZ 1004.1108

MB 017.3208
MF 017.3214
DIN 137-A6-A2
VS 016.4800

Für diese Unterlage behalten
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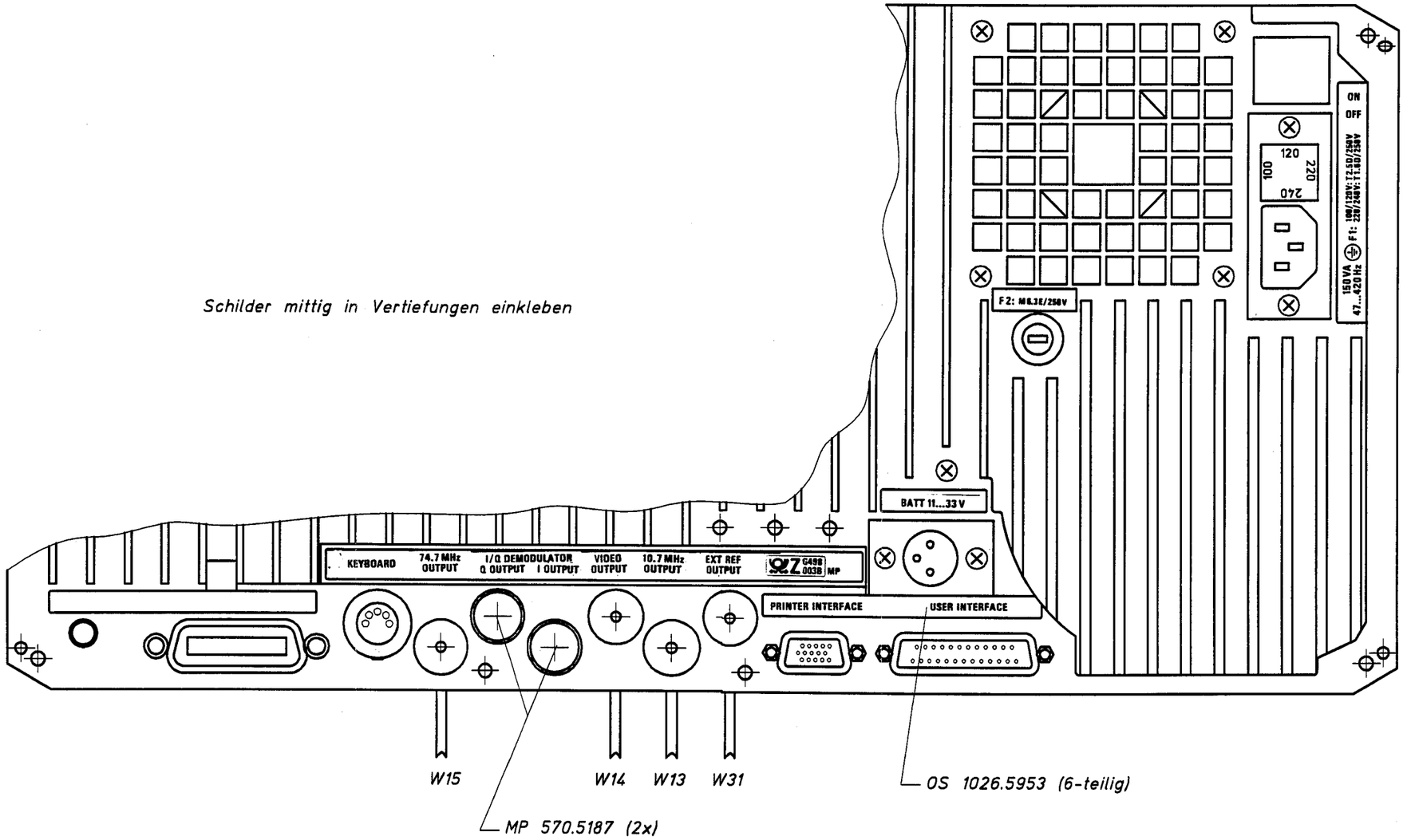
0 1 2 3 4 5

VERKLEINERUNG

01				Maße ohne Toleranzangabe		Maßstab	
						Halbzeug,Werkstoff	
				1KEE	Tag 02.91	Name TF/MS	Benennung: Grundaufbau
				Bearb.			
				Gepr.			
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE & SCHWARZ		Zeichn.-Nr. 1026.5541	Blatt-Nr. 2 v. 3 Bl.
				zu Gerät ESVD		reg. i. V. 1026.5506V	erste Z. 1026.5506

Für diese Unterlage behalten
wir uns alle Rechte vor.

Schilder mittig in Vertiefungen einkleben



Anzugsdrehmoment fur
W13, W14, W15 u. W31
ca. 100Nm

01				Maße ohne Toleranzangabe			Maßstab
							Halbzeug,Werkstoff
				1KEE	Tag	Name	Benennung
				Bearb.	02.91	MS/TF	Grundaufbau
				Gepr.			
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE & SCHWARZ			Zeichn.-Nr. 1026.5541 Blatt-Nr. 3 v. 3 Bl.
				zu Gerät ESVD			reg. i. V. 1026.5506V erste Z. 1026.5506

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

RF INPUT
HF-EINGANG
20 MHZ ... 2050 MHZ

X1 — W1 — X1

ATTENUATOR
EICHLEITUNG

0..120DB

X2 — W48 — RF SWITCH
HF-RELAIS

K1

W42 — X111 — FG-1 GHZ

20...51.3 MHZ
51.3...125.3 MHZ
125.3...273.3 MHZ
273.3...495.3 MHZ
495.3...717.3 MHZ
717.3...1000 MHZ

TEST
PRESET TUNING VOLTAGE

TUNING VOLTAGE
ABSTIMM-SPAN.

CAL GEN
(2ND MIXER)
EICH. GEN.

ATTENUATOR
A60

W41

TO SHEET 2
UHF PRESELECTOR
NACH BLATT 2

VH

STROMLAUF GILT FUER VAR.10
CIRCUIT DIAGRAM IS VALID FOR MOD.10

ACHTUNG!
ELEKTROSTATISCH EMPFINDLICHE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG!
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

03/00
AEND. IND.

ZEICHN.-NR.

A B C D E F

1 2 3 4 5 6 7

20...51.3 MHZ

51.3...125.3 MHZ

125.3...273.3 MHZ

273.3...495.3 MHZ

495.3...717.3 MHZ

717.3...1000 MHZ

TEST
PRESET TUNING
VOLTAGE

TUNING
VOLTAGE
ABSTIMM-SPAN.

TEST PREAMP BIAS
VORVERST. ARBEITSP.

PREAMP
G=10.5DB

TEST
PREAMP BIAS
VORVERST. ARBEITSP.

DIPLEXER

ZO

-1..-4DB

1ST IF
1. ZF
1354.7 MHZ

1ST MIXER
1. MISCHER
G=-7...-8DB

DIPLEXER

ZO

1ST IF AMP
1. ZF-VERST.
1354.7 MHZ
G=13DB

X116

+2...+4DB

W8

TO
SHEET 3
NACH BL. 3

TEST
1ST IF AMP BIAS
ARBEITSP.

OVERLOAD

TEST
1ST IF LEVEL
1. ZF-PEGEL

X117

1ST LO
1. LO
1374.7...2354.7 MHZ
P=17DBM +- 2DB

W7 (OR W39 WHEN OPTION ESVD-B2 INCLUDED)

FROM SHEET5 (OR 2)
VON BLATT 5 (ODER 2)

VHF PRESELECTOR

A110

STROMLAUF GILT FUER VAR.10

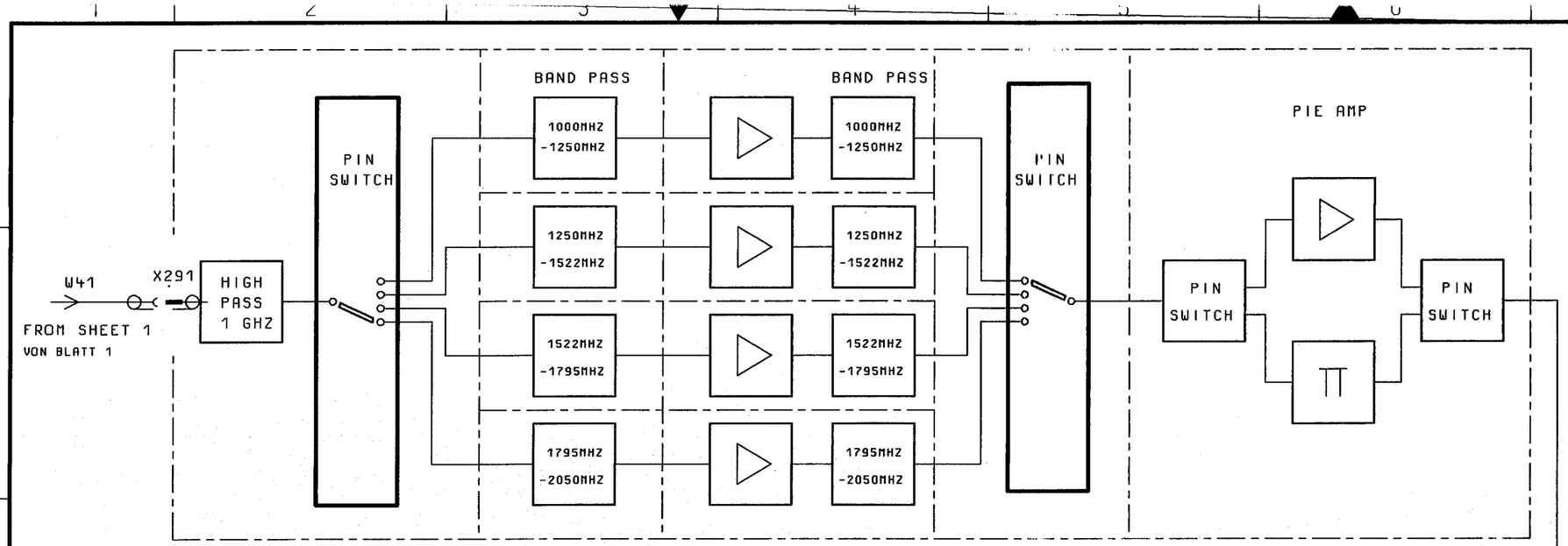
CIRCUIT DIAGRAM IS VALID FOR MOD.10

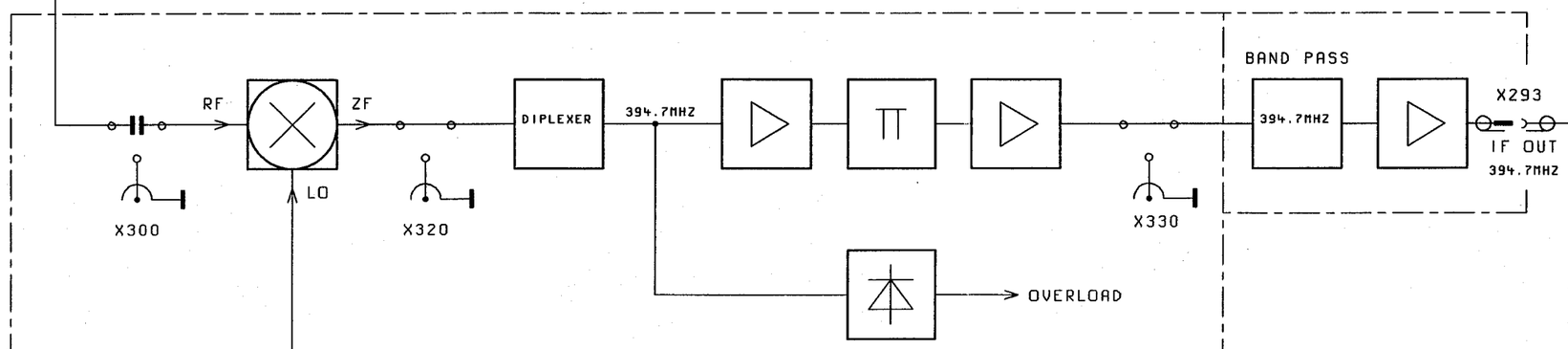
ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

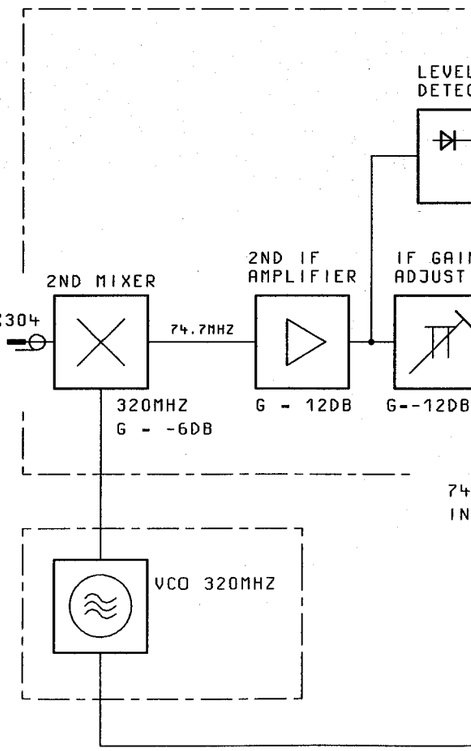
04/00		10.92	PF	1ESK	TAG	NAME	BENENNUNG
				BEARB.		PF	ESVD
				GEPR.		NG	
				NORM			
				PLOTT	29.10.92		
03/00	46345 (10)	10.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.5506.01S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD			BLATT-NR. 1 V. 7 BL.
				REG.I.V. 1026.5506			ERSTE Z.

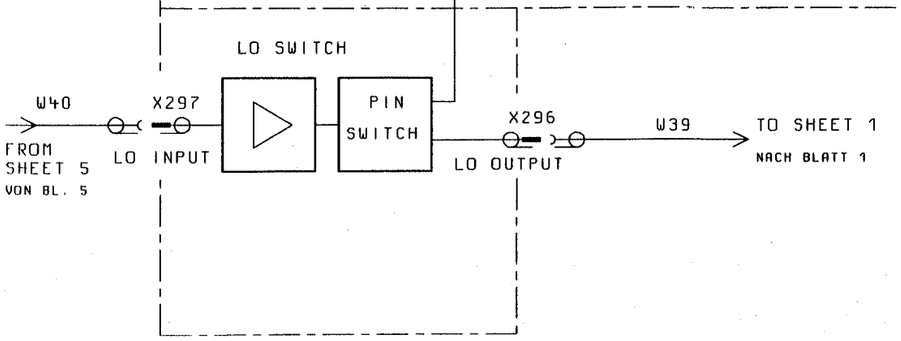
FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

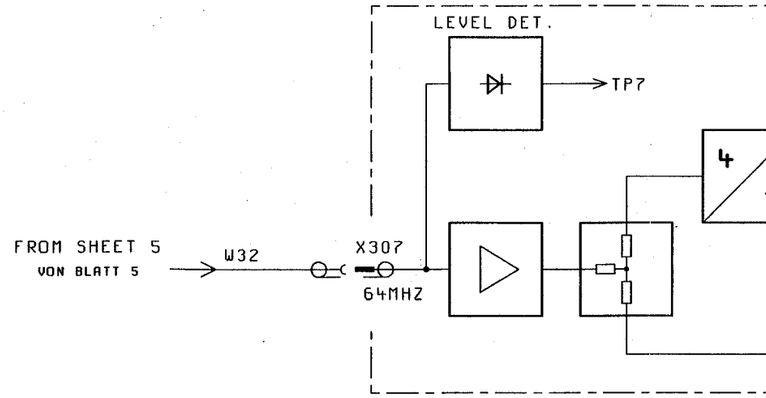
ZEICHN.-NR.





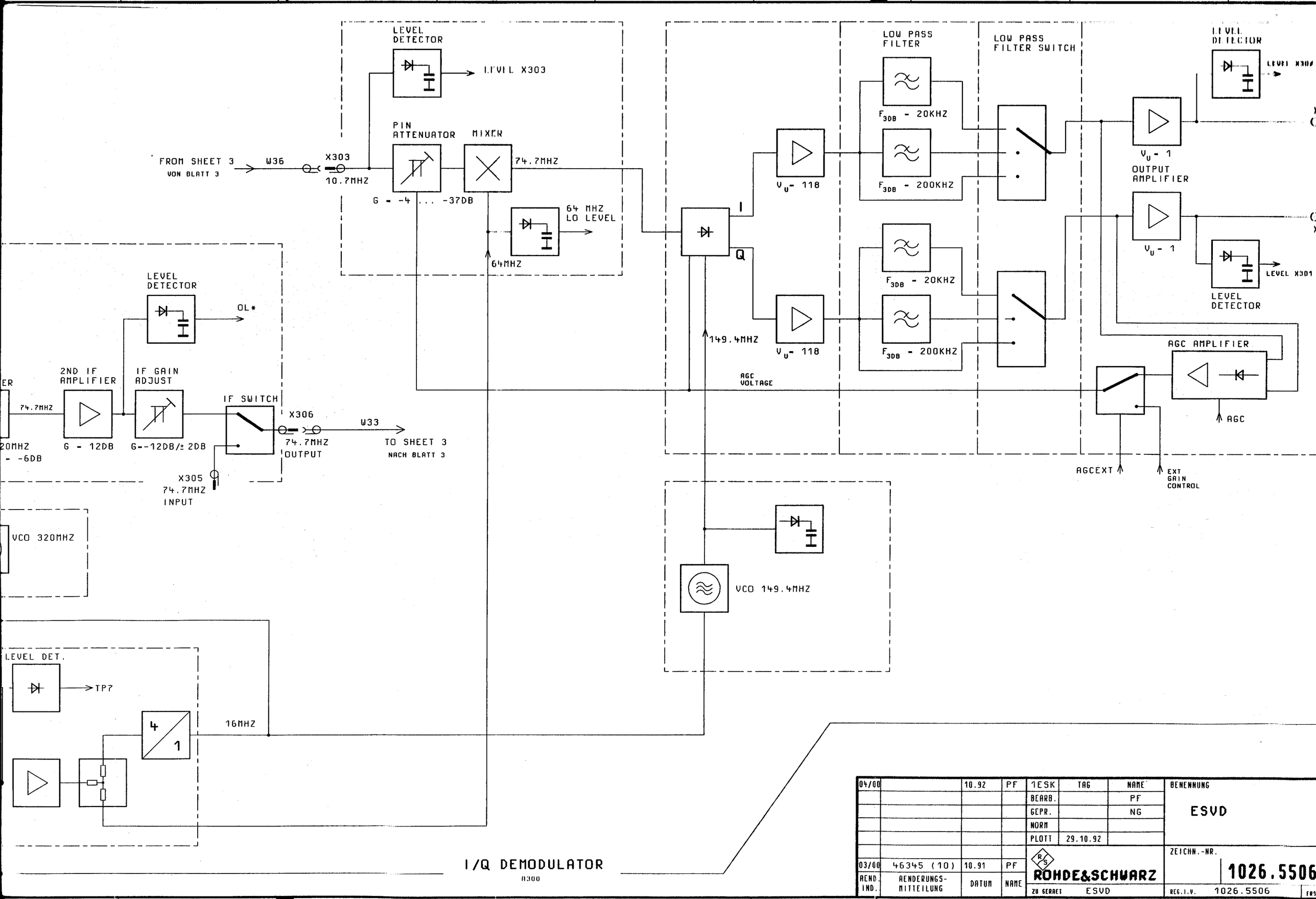






UHF PRESELECTOR

A290



I/Q DEMODULATOR

A300

04/00		10.92	PF	TESK	TAG	NAME	BENENNUNG
				BEARB.		PF	ESVD
				GEPR.		NG	
				NORM			
				PLOTT	29.10.92		
03/00	46345 (10)	10.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.5506
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD			REG.I.V. 1026.5506

LEVEL DETECTOR

LEVEL X303

PIN ATTENUATOR

MIXER

W10

X303

10.7MHZ

G = -4 ... -37DB

74.7MHZ

64 MHZ LO LEVEL

64MHZ

I

Q

V_U - 11dB

V_U - 11dB

LOW PASS FILTER

F_{3DB} - 20KHZ

F_{3DB} - 200KHZ

F_{3DB} - 20KHZ

F_{3DB} - 200KHZ

LOW PASS FILTER SWITCH

149.4MHZ

AGC VOLTAGE

LEVEL DETECTOR

LEVEL X302

X302

Q-OUTPUT X43

W35

V_U - 1

OUTPUT AMPLIFIER

I-OUTPUT X42

X301

W34

V_U - 1

LEVEL X301

LEVEL DETECTOR

AGC AMPLIFIER

AGC

AGCEXT

EXT GAIN CONTROL

ICH

X306

74.7MHZ OUTPUT

W33

TO SHEET 3

NACH BLATT 3

VCO 149.4MHZ

I/Q DEMODULATOR

A300

04/00		10.92	PF	TESK	TAG	NAME	BENENNUNG
				BEARB.		PF	
				GEPR.		NG	ESVD
				NORM			
				PLOTT	29.10.92		
03/00	46345 (10)	10.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.5506.01S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD			BLATT-NR. 2 v. 7 BL.
				REG.I.V. 1026.5506			FASTE Z.

FROM SHEET4
VON BL.4
2ND LO
2. LO
1280 MHZ

TEST
2ND IF AMP BIAS
ARBEITSPUNKT

TEST
IF PAN AMP BIAS
ARBEITSPUNKT

POWER
DIVIDER
LEISTUNGS-
TEILER

FROM
SHEET1
VON BL.1

W8

X137

G=-4.5DB
B= 4.5 MHZ

2ND IF
AMP 1354.7 MHZ
2. ZF-VERST.
G=13.5DB

2ND MIXER
G=-7.5DB
2. MISCHER

2ND IF
2. ZF
74,7 MHZ

B=3 MHZ
G=-2DB

G=-3DB

PANORAMA AMP
G=10DB

X131

G=10DB TO
RF INPUT
10DB ZUR
HF-EINGANG

3RD IF AMP
3. ZF-VERST.
G=13,6DB

3RD MIXER
G=-6DB

74,7 MHZ

10,7 MHZ

X132

W23

+2.5...+7DB

X136

FROM SHEET 2
VON BLATT 2

W33
(ONLY WHEN OPTION
ESVD-B1 INCLUDED)

TEST
3RD IF AMP BIAS
ARBEITSPUNKT

64 MHZ

2ND MIXER
A130

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

W23

X171

DIPLEXER

TEST
4TH IF AMP BIAS
ARBEITSPUNKT

IF FILTER
ZF-FILTER

B6DB-1MHZ

B6DB-400KHZ

B3DB-120 KHZ

B6DB-9,5 KHZ

TEST
5TH IF AMP BIAS
ARBEITSPUNKT

TEST
CAL AMP CONTROL VOLTAGE
VERST.-ABGLEICH

5TH IF AMP 10,7 MHZ
5. ZF-VERST.
G=33DB

IF GAIN ADJ
ZF-VERST. EINST.
G=-7+-3DB

IF ATTENUATOR
ZF-EICHLEITUNG
G=-20/-10/0
/+10/+20DB

CAL AMP
EICH. VERST.
G=12+-6DB

OVERLOAD

TEST
X171 LEVEL
PEGEL

Z0

G=-9DB

X173

W36

TO SHEET 2
NACH BLATT 2

10.7 MHZ
OUTPUT

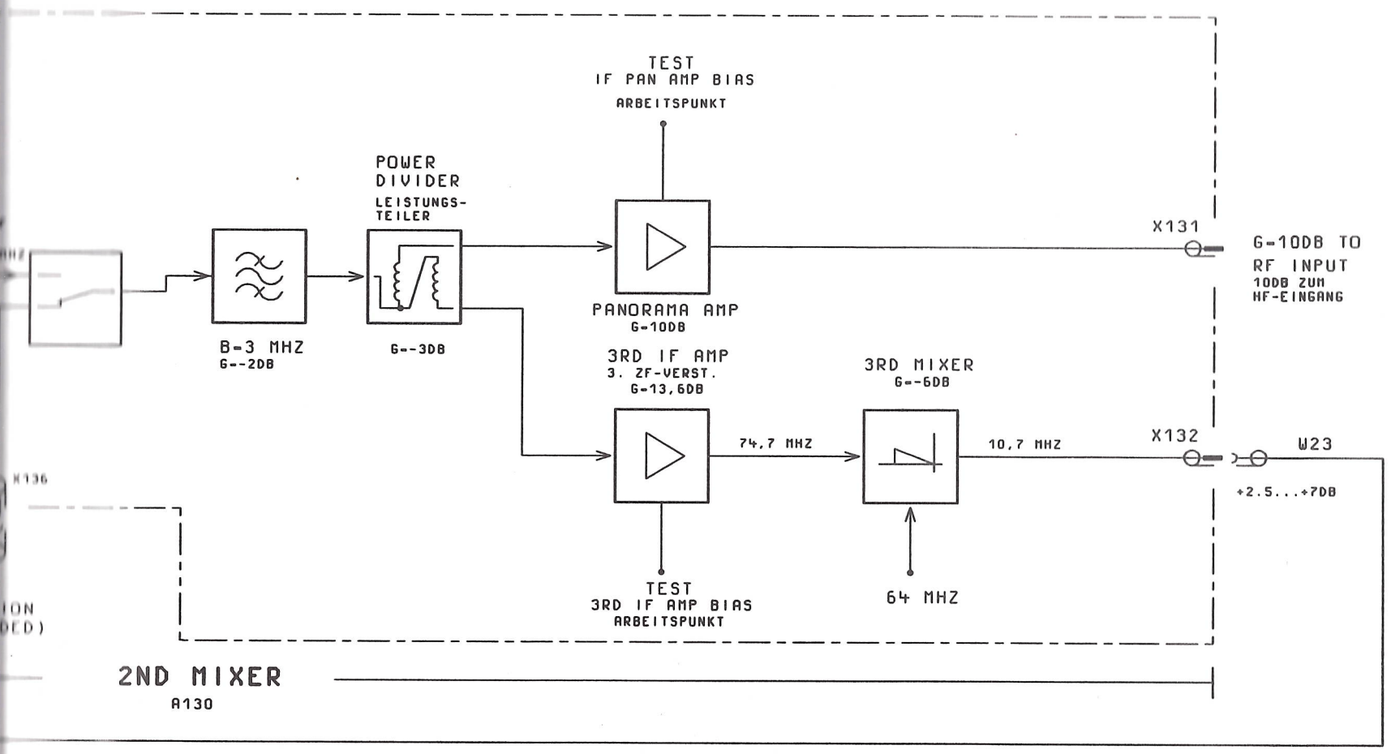
IF SELECTION BOARD
A170

04/00	
03/00	4634
AEND. IND.	AEND MITT

ZEICHN.-NR.

A B C D E F

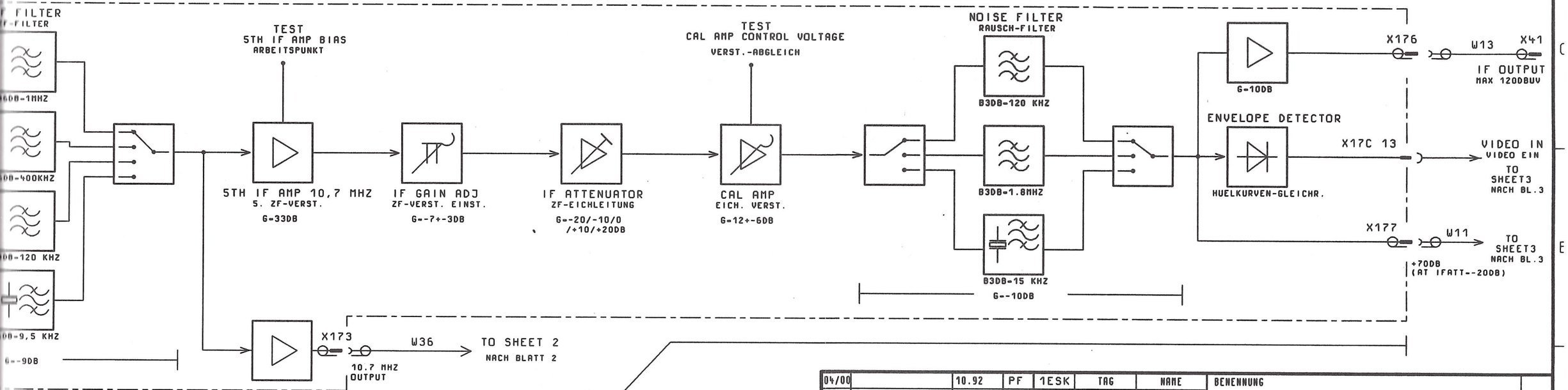
1 2 3 4 5 6 7 8



ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

STROMLAUF GILT FUER VAR.10

CIRCUIT DIAGRAM IS VALID FOR MOD.10



IF SELECTION BOARD
A170

04/00		10.92	PF	1ESK	TAG	NAME	BENENNUNG
				BEARB.		PF	ESVD
				GEPR.		NG	
				NORM			
				PLOTT	29.10.92		
03/00	46345 (10)	10.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.5506.01$ BLATT-NR. 3
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD			REG.I.V. 1026.5506 ERSTE Z. V. 7 BL.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

VIDEO OUTPUT
VIDEO AUSGANG
X46

TEST
BUFFER
TRENNSTUFE
X183
W14

TRANSDUCER
CORRECTION BY DAC
TRANSDUCERKORREKTUR UEBER
D/A-WANDLER
TEST
METER

AV DETECTOR
MITTELWERT-TIEFPASS
τ-100US, 1MS, 10MS, 100MS

30/60DB
TEST
LOG AMP
BUFFER
TRENNSTUFE
RECORDER OUTPUT
(USER PORT)
0...5V

VIDEO IN
VIDEO EIN
FROM SHEET 3
VON BLATT 3
X18A 13
10,7 MHZ
QP DETECTOR
SIMULATION
OF METER RESPONSE
INSTRUMENT-
NACHBILDUNG
TEST
30DB: 6-20DB
60DB: 6-0DB
LOG AMP
LOG. VERST.
TEST
LOG AMP
BUFFER
TRENNSTUFE
X18C 15
1...4.6V
X18A

PK DETECTOR
RESET
PK-ENTLADUNG

WIDE/NARROW
BREIT/SCHMAL
F3
A3
A0
W11
X187
FROM SHEET 3
VON BLATT 3
BUFFER AMP
TRENN-VERST.
AF GAIN
LAUTSTAERKE
AF AMP
NF-VERST.
X18C 12
100 KHZ
PLL
10,7 MHZ
(A0)

DETECTOR BOARD
A180

04/00	
03/00	46345
AEND. IND.	AENDER MITTEI

ZEICHN.-NR.

STROMLAUF GILT FUER VAR.10

CIRCUIT DIAGRAM IS VALID FOR MOD.10

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VIDEO OUTPUT
VIDEO AUSGANG
X46

X1A1
W14

TRANSDUCER CORRECTION BY DAC
TRANSDUCERKORREKTUR UEBER D/A-WANDLER

TEST

METER

BUFFER
TRENNSTUFE

RECORDER OUTPUT
(USER PORT)
0...5V

30/60DB

TEST
LOG AMP

TEST

30DB: G=20DB
60DB: G=0DB

LOG AMP
LOG. VERST.

TEST
LOG AMP

BUFFER
TRENNSTUFE

X18C 15

1...4.6V

X18A 16

V=0,9

A/D

12 BIT
TO PROCESSOR
ZUM PROZESSOR

SELFTEST
BUFFER AMP
SEBSTTEST
TRENNVERST.

TEST INPUT
TEST-EINGANG

CPU BOARD
A220

ATION
TER RESPONSE
TRUMENT-
HBILDUNG

AF AMP
NF-VERST.

GAIN
TSTAERKE

ARD

04/00		10.92	PF	TESK	TAG	NAME	BENENNUNG
				BEARB.		PF	ESVD
				GEPR.		NG	
				NORM			
				PLOTT	29.10.92		
03/00	46345 (10)	10.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.5506.01$
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD			BLATT-NR. 4 V. 7 BL.
				REG.I.V. 1026.5506			ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

W9

W32 → TO SHEET 2
NACH BLATT 2

X166
64 MHZ
P=7DBM +- 2DB

X167
64 MHZ

BUFFER
TRENNSTUFE

64 MHZ

REFERENCE
OSCILLATOR
REFERENZ-OSCIL.

70...74 MHZ

VCO

6...10.4 MHZ

REFERENCE
DIVIDER
REFERENZ-TEILER
M / 1

N.F / 1
FRACTIONAL
DIVIDER

PD
PHASE
DISCRIMINATOR
PHASEN-DISKRIMINATOR

TEST
TUNING VOLTAGE
ABSTIMM SPANNUNG

LOCK

FRN SYNTHESIZER
A160

X135
64 MHZ

BUFFER AMP
TRENN-VERST.

SRD MULTIPLIER
SRD MULTIPLIZIERER

PD
PHASE DETECTOR
PHASEN-DETEKTOR

VCO
1200 MH

2ND MIXER
A130

70...74 MHZ
4DBM +- 2DB

X161
W12
X121

BUFFER AMP
TRENN-VERST.

SRD MULTIPLIER
SRD MULTIPLIZIERER
X 19...32

SAMPLING
DETECTOR
ABTAST-DETEKTOR

INTEGRATOR

DIVIDER
TEILER
4 / 1

FREQUENCY
CONTROL

M-19...32

UHF SYNTHESIZER
A120

STROMLAUF GILT FUER VAR.10
CIRCUIT DIAGRAM IS VALID FOR MOD.10

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE
BAUELEMENTE ERFORDERN EINE
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

04/00	
03/00	46345
AEND. IND.	AENDER MITTEI

ZEICHN.-NR.

BUFFER AMP
TRENN-VERST.

SRD MULTIPLIER
SRD MULTIPLIZIERER

X135

64 MHZ

PD

PHASE DETECTOR
PHASEN-DETEKTOR

VCO

1280 MHZ

2ND LO AMP
2. LO-VERST.

2ND LO
2. LO
1280 MHZ
17DBM +- 2DB

TO SHEET 3
NACH BLATT 3

2ND MIXER
A130

BUFFER AMP
TRENN-VERST.

SRD MULTIPLIER
SRD MULTIPLIZIERER
X 19...32

VCO

70...74 MHZ
4DBM +- 2DB

X161

W12

X121

SAMPLING
DETECTOR
ABTAST-DETEKTOR

INTEGRATOR

1354.7..2354.7 MHZ

X127

W7 (OR W40 WHEN
OPTION ESVD-B2
INCLUDED)

1ST LO
1. LO
1374,7...2354,7 MHZ
17DBM +- 2DB

TO SHEET1(OR 2)
NACH BL.1(ODER 2)

DIVIDER
TEILER

4
1

PRESCALER
VORTEILER

1
4

FREQUENCY
CONTROL

M=19...32

TEST
TUNING VOLTAGE
ABSTIMM SPANNUNG

LOCK

UHF SYNTHESIZER
A120

STROMLAUF GILT FUER VAR.10
CIRCUIT DIAGRAM IS VALID FOR MOD.10

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE
BAUELEMENTE ERFORDERN EINE
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

04/00		10.92	PF	1ESK	TAG	NAME
				BEARB.		PF
				GEPR.		NG
				NORM		
				PLOTT	29.10.92	
03/00	46345 (10)	10.91	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GERAET ESVD

BENENNUNG
ESVD

ZEICHN.-NR. 1026.5506.01$
BLATT-NR. 5 v. 7 BL.
REG.I.V. 1026.5506 ERSTE Z.

FRONT PANEL

LCD DISPLAY
MENUE ENTRY
A240
1004.1408

16
(W6)

HARDKEY BOARD
A50
1004.2204
X5

(W51)
B1
2
16
(W5)

P1
LCD LEVEL
DISPLAY BOARD
A40
P2
LCD FREQ
J2 INSTR.
1003.1604
X15

50
(W4)
26
24

X3
ANTENNA CODE
X2
AF OUTPUT
W3
X1
RF INPUT
W1

MOTHERBOARD A30 1026.6248.02

X4
X8
X7
10
(W70)

ATTENUATOR
A60
1010.5999.02
X1 X3 X4 X2

OPTION
ESVD-B2
UHF
PRESELECTOR
A290
1026.9501.02
X291 X293 X297 X296

X29
X11
X12
X13
X30

VHF
PRESELECTOR
A110
1010.9394.02
X111 X116 X117

UHF
SYNTHESIZER
A120
1010.8198.02
X127 X121

2ND MIXER
A130
1010.9094.03
X137 X134 X131 X132 X135 X136

OPTION
ESVD-B1
I/Q DEMODULATOR
A300
1026.9001.02
X306 X304 X302 X301 X303 X30

W39
W40
W37
W7
W33
W9
W12
W23
W8
W4
W5

2
W48
W41
W49
W42
IN
NC
NO
K1
INCLUDED IN ESVD-B2

CIRCUIT DIAGRAM IS V

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1026.6248.02 ES 3

BATTERY

6V

W22

6V

2X 338.4012

BATTERIES ARE
RECOMMENDED ACCESSORY

+ W21 F3: DIN41571-M6,3E/250V

W2

X31

MOTHERBOARD A30 1026.6248.02

X3 W43 /10 X13

X2 W44 /20 X12

/6

X13 X30 X16 X17 X18 X31 X22

OPTION
ESVD-B1

2ND MIXER
A130
1010.9094.03
X121 X137 X134 X131 X132 X135 X136

I/Q DEMODULATOR
A300
1026.9001.02
X306 X304 X302 X301 X303 X307

FRN SYNTHESIZER
A160
1003.5300.02
X167 X166 X161 X164

IF SELECTION BOARD
A170
1010.8798.02
X173 X171 X176 X177

DETECTOR BOARD
A180
1010.8498.02
X187 X183

W1 /10

CPU BOARD
A220
1003.7202.02
X222 X221

W45 /40

W46 /26

W33 W32 W36 W11 W14 W34 W35 W13 W15 W31 W9 W12 W23

X3

OVEN CONTROLLED
CRYSTAL OSCILLATOR
ESVP-B1
A320 358.1119.04
X7 X6

W30

CIRCUIT DIAGRAM IS VALID FOR MOD.10

04/00		10.92	PF	TESK	TAG	NAM
				BEARB.		PF
				GEPR.		NO
				NORM		
				PLOTT	29.10.92	
03/00	46345 (10)	10.91	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWA		
				ZU GERAET	ESVD	

7 8 9 10 11 12 13 14

BATTERY

6V

W22

6V

2X 338.4012

+ W21 F3: DIN41571-M6,3E/250V

W2

BATTERIES ARE
RECOMMENDED ACCESSORY

X31

REAR PANEL

A1

1002.9753

X31 SUPPLY VOLTAGE

F1

100/120V:
DIN41571-T2.5D/250V

220/240V:
DIN41571-T1.6D/250V

X32 BATT. 11...33V

F2

DIN41571-M6.3E/250V

X35 KEYBOARD

X36 PRINTER INTERFACE

X37 USER INTERFACE

X38 IEC 625

X3 W43 /10 X13

X2 W44 /20 X12

/6

X16 X17 X18 X31 X22

FRN SYNTHESIZER
A160
1003.5300.02

IF SELECTION BOARD
A170
1010.8798.02

DETECTOR BOARD
A180
1010.8498.02

CPU BOARD
A220
1003.7202.02

W1 /10

X222 W45 /40 /25

X221 W46 /26

/15

X167 X166 X161 X164

X173 X171 X176 X177

X187 X183

W32 W36 W11

W14 W34 W35 W13 W15 W31

X46 VIDEO OUTPUT

X42 I OUTPUT

X43 Q OUTPUT

X41 10,7 MHZ OUTPUT

X45 74,7 MHZ OUTPUT

X44 EXT.REF OUTPUT

X3

OVEN CONTROLLED
CRYSTAL OSCILLATOR
ESVP-B1

A320 358.1119.04

W30

X7 X6

ALID FOR MOD.10

04/00		10.92	PF	TESK	TAG	NAME	BENENNUNG
				BEARB.		PF	ESVD
				GEPR.		NG	
				NORM			
				PLOTT	29.10.92		
03/00	46345 (10)	10.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.5506.01S BLATT-NR. 6 V. / BL.
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD			REG.I.V. 1026.5506 ERSTE Z.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

Rear Panel

1002.9753.02

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Circuit diagrams
Parts list
Plans

7 Testing and Repair of the Module

7.1 Function Description

(cf. circuit diagram 1002.9753 S)

The rear panel of the ESHS/ESVS is a compact unit containing the entire components for generation of the supply voltages required by the instrument. The power supply unit can be divided into 3 function units:

- The power transformer R1 in conjunction with the rectifier bridge V1, the external battery input X32 or the internal battery input X13.7 provide the raw voltage for operation of the switching power supply.
- The switching power supply generates the supply voltages +5 V, +12 V and the pre-stabilized voltages -11 V and +31 V from this raw voltage.
- The analog power supply unit provides the supply voltages ±10 V and +28 V required for operation of the analog boards.
  (Lead-through filter, blower, controlled by thermostatic switch on the motherboard)

The switching power supply unit and the analog power supply unit are located separately in closed chambers in order to prevent emission of RF interferences. All input and output voltages of the switching power supply unit pass through the lead-through filter.

7.1.1 Switching Power Supply

The Switching Power Supply module is located in the middle, big chamber of the rear panel. It contains the 3 switching regulators V51, V100 and V110 (cf. block diagram 1003.7702.01S, sheet 1) and the switch-on and monitoring logic which selects the operating mode of the power supply depending on the current source applied (cf. Operating Manual, Section 2).

7.1.1.1 Switch-on and Monitoring Logic

The switch-on and monitoring logic controls the relays K1 to K5 and activates the switching regulators V51, V100 and V110. It switches off the power supply unit, if an output voltage deviates from its rated value, e.g. caused by a short-circuit in the instrument, a defective switching regulator component or by a low input voltage due to a discharged battery.

a) Power-on with internal or external battery operation

The relays K1 to K5 are opened in the standby/off position of the ON switch 9 (front panel); the input voltage applied at X10.3 (EXT. BATT) or at X20.1 (INT. BATT) is not passed to the common input summation point X19 of the switching regulators. Only the SWITCH ON and SOURCE VOLTAGE MONITORING circuits are connected to the current sources via V112, V113 or R145, R160. The cutoff current flowing to ground of the reverse-biased transistors V122 and V123 or the voltage dividers R160, R161, R145, R146 can be neglected compared to the self-discharge current of the battery.

With the ON switch being pressed, X30.6 is connected to ground. The VMOS transistor V111 connects through and reduces the base potential of V123 such that V123 becomes low-impedance. The input X18.B3 of the RELAY POWER SUPPLY circuit is thus applied a voltage between 11 V and 32 V depending on the source connected, via V114. From this voltage, the voltage +5 V REL is generated in the linear controller V127, N111-C and the voltage +10 V REL is generated in the low-drop linear controller V124, V126, N111-A by means of the 1.2 V reference voltage component V128. +5 V REL and +10 V REL are used as reference and supply voltages for the switch-on logic.

The function unit SOURCE VOLTAGE MONITORING monitors the battery voltage applied at X10.3 or X20.1. The voltages are passed to the comparators N130-B, N130-C via the buffers N150-A and N150-B. The hysteresis by R166, V166 or R155 prevents the power supply unit from switching on with discharged battery.

- **Only internal battery operation:**

With exceeding the response threshold of N130-B the switching signal TH.INT. assumes high level (+ 5 V).

Since no other current source is connected, the switching signals TH.N and TH.E assume low level (0V). The output signal DE* of the FAULT SHUTDOWN monitoring logic (cf. Section 7.1.1.1d) assumes high level during the switch-on procedure. The internal-battery-status output X30.9 assumes high level, the LED H10 lights up, V181 connects through and the relay K1 picks up. V183 is also through-connected by D172-B, H20 lights up and K2 also picks up.

- **External battery operation:**

With exceeding the response threshold of N130-C the switching signal TH.E assumes high level. When no A.C. voltage is supplied, TH.N assumes low level such that even with internal battery connected K1 cannot pick up. V195 is through-connected via the ON delay R174, C174, D176-E/F, D178-A, the LED H50 lights up and K5 picks up.

- **Precharging the filter capacitors:**

The voltage U_E passed to K4.5/8 via K5 or K1 and K2 is monitored in the comparator N140-A. When exceeding the switching threshold U_E = 10 V, the comparator output N140.13 becomes high-impedance and C171 charges to + 5 V via R171. The input capacitors C49, C51, C70, C71, C80 and C81 of the switching regulators are precharged via the power resistor R3; all switching regulators are disabled via the inhibit inputs, K3 is open, thus, no current can flow into the instrument.

As soon as the voltage at C171 exceeds the response threshold of the Schmitt trigger D 176-C, V193 connects through, H40 lights up and K4 picks up. (cf. fig. 7-1)

If, with external battery operation, the input voltage U_E < 15 V, the step-down regulator V51 can no longer generate the output voltage + 12 V with high load currents, which is why it must be bypassed. The switchover threshold U_E = 15 V is monitored by the comparator N140-B. The hysteresis with R138 prevents K2 from continuously switching with external battery voltages around the switching threshold. With U_E < 15V, the switching signal U_E < 15V assumes high level, V183 is through-connected by D175-A and D172-A, H20 lights up and K2 picks up.

With the ON switch 9 pressed, the cathode of V121 is applied to ground. Thus, the switching signal OP* assumes low level. After K4 picked up, all inputs of the AND gate D175-B assume high level, such that V185 is through-connected via the delay circuit R170, C170, D176-A/B, H30 lights up and K3 picks up (cf. fig. 7-1). Simultaneously, the INH2 output X18.B2 assumes low level, thus initiating the switching regulator V100. V180 becomes high-impedance thus initiating the flyback converter V110. When U_E > 15 V with external battery operation, K2 is in normal position: the cathode of V179 is applied to U_E potential via the NC contact K2-D, which is why the INH1 output X18.B1 also assumes low level; thus, V51 is initiated, too.

The internal impedance of the battery connected is increased when the battery is nearly exhausted or due to ageing. With response of the relay K3 and capacitive + 12 V load this may lead to a short-time drop of the voltage U_E below the + 10V switching threshold of K4. The switching threshold of K4 is therefore decreased by R134, C134 and V134.

During the start-up period, the entire switch-on and monitoring logic is supplied via V123, the input voltage of the linear controller X18.B3 may thus be in the range from 11 to 33 V. To reduce the power

loss and to ensure that the switch-on logic and the instrument are supplied by the same source, the current supply of the relay power supply is provided by V115 when the +12V voltage is internally stable. N111-B monitors the +12V voltage and connects through V122 when the threshold is exceeded. Thus, the VMOS transistor V111 is reverse-biased and V123 does no longer conduct either.

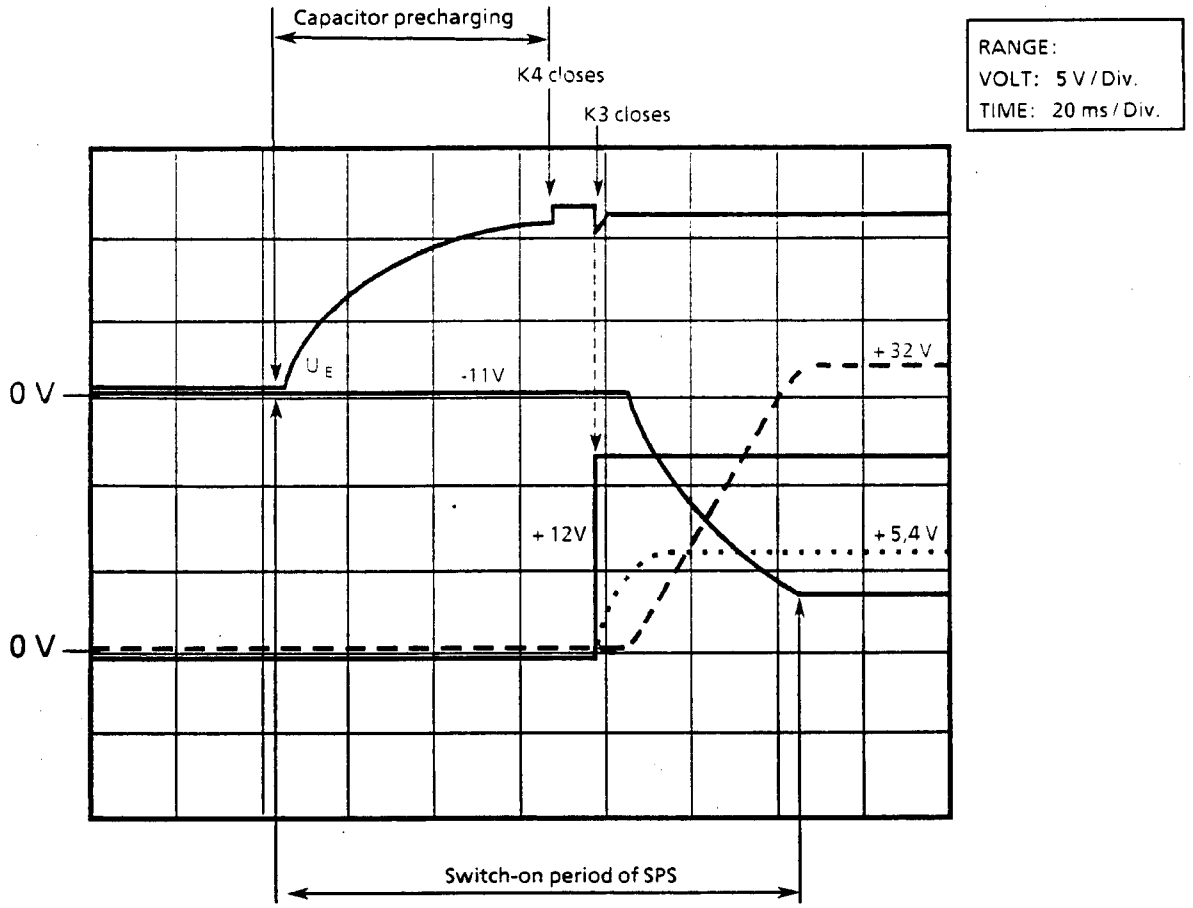


Fig. 7-1 Switch-on procedure with internal battery operation

- **Undervoltage indication**

If the internal or external battery voltage is below the switch-on threshold with switch-on, D171.6 assumes low level; the standby LED 37 connected to X30.3 blinks; the relays do not pick up. If the battery voltage drops below the switch-off threshold during operation, the relays K1 to K5 are de-energized; the standby LED blinks, too.

b) Switch-on with mains operation

The operation on mains supply differs from the battery operation modes by the additional standby function.

With the power connector 25 on the rear panel of the instrument switched on, the rectified raw voltage +24 V_{unreg} is first passed to the input X10.1. F10 prevents the power transformer from being destroyed by a short-circuit in the switching regulators. If the instrument is operated on external battery, the relay K5 is protected against short-circuits by V5 via the smoothing capacitor C5 during the switch-on period.

When the ON switch 9 is in standby position, the input voltage is routed via V117 and K3-D to the RELAY POWER SUPPLY. The comparator N130-A monitors the increase of the raw voltage and in case it exceeds the switching threshold switches on the relay K1 via D172-A, V181. Precharging of the input Cs of the switching regulators and addressing of K4 is carried out as with battery operation (cf. Section

7.1.1.1.a). X30.3 assumes high level, the standby LED 37 on the front panel lights up. X18.B1 assumes low level and thus, the 12-V switching regulator V51 is active and charges an internal battery connected to X20.1 via V60 and K1.

With the ON switch 9 pressed the switching signal OP* assumes low level, the standby LED 37 goes out and K3 switches on as with battery operation; the switching regulators V100 and V110 are activated. The NC contact K3-D opens thus ensuring that, upon termination of the switch-on procedure, the 12-V voltage is supplied to the switch-on and monitoring logic via V115 also with A.C. supply.

Table 7-1 SPS mode and condition of the relays depending on the current source

\+ : Relay contact in operated condition, i.e. switching regulator active LED Hxx is illuminated
– : Relay contact in normal condition, i.e. switching regulator inactive. LED Hxx is not illuminated
The relays are illustrated in normal condition in the circuit diagram.

Operating mode	K1 H10	K2 H20	K3 H30	K4 H40	K5 H50	V51	V100/ V110	N130 .13	N130 .14	N130 .1	N140 .13	N140 .14
INT Batt.	+	+	+	+	-	-	+	L	H	L	H	H
Ext. Batt. < 15 V	-	+	+	+	+	-	+	L	L	H	H	H
Ext. Batt. > 15 V	-	-	+	+	+	+	+	L	L	H	H	L
Mains; Standby	+	-	-	+	-	+	-	H	H*	L	H	L
Mains; On	+	-	+	+	-	+	+	H	H*	L	H	L

*): Only with int. batt. connected (Mod. 10)

c) Change of operating mode

- **External battery operation**

If the receiver is operated on external battery, the + 12V-switching regulator V51 is deactivated if U_{batt} < 15.5 V; the + 12V output X20.2 is directly connected to the input X10.3 via K3, K2 and K5. When the battery voltage exceeds the switchover threshold + 15.5 V, K2 opens; simultaneously, the INH1 output X18.B1 assumes low level; V51 is activated. The output voltage shortly drops below + 10 V. When the battery voltage drops below 14.5 V with V51 activated, K2 closes; the NC contact K2-D deactivates V51 via D180-D. No voltage dip occurs.

- **Battery-backed mains operation**

If a voltage dip occurs with mains operation, an uninterrupted switchover to internal battery operation is required. Therefore, with dropping input voltage at X10.1, the battery current is supplied to the switching regulators V100 and V110 via V3 until K2 bypasses the diode. When the A.C. voltage increases again, K2 opens with U_E > 15.5 V; the switching regulators are supplied by the mains again. V60 remains deactivated during the build-up time of the regulator V51 which is deactivated with internal battery operation; the + 12-V output is then supplied by the internal battery until V51 has reached the rated output voltage. No voltage dip occurs.

- **Changeover to external battery operation**

The changeover from mains or internal battery operation to external battery operation must not be uninterrupted, since the relay contacts K5-B/C would be destroyed with response of K5. Therefore, the drop of the input voltage at X10.1 is monitored for changeover from mains ot external battery operation (cf. fig. 7-2). When the voltage drops below the 12V-threshold, D175.8 assumes high level and charges C174. Without an active source applied, U_E continues dropping until U_E = 10 V; then the relays K3 and K4 open and the switching regulators are deactivated. With switch-off, the delay circuit for K3 is bypassed by means of V170. If the voltage in C174 reaches the threshold value of the Schmitt trigger, K5 picks up and charges the input capacitors of the switching regulators as with switch-on. The subsequent process corresponds to that during switch-on with external battery operation (cf. Section 7.1.1.1.a).

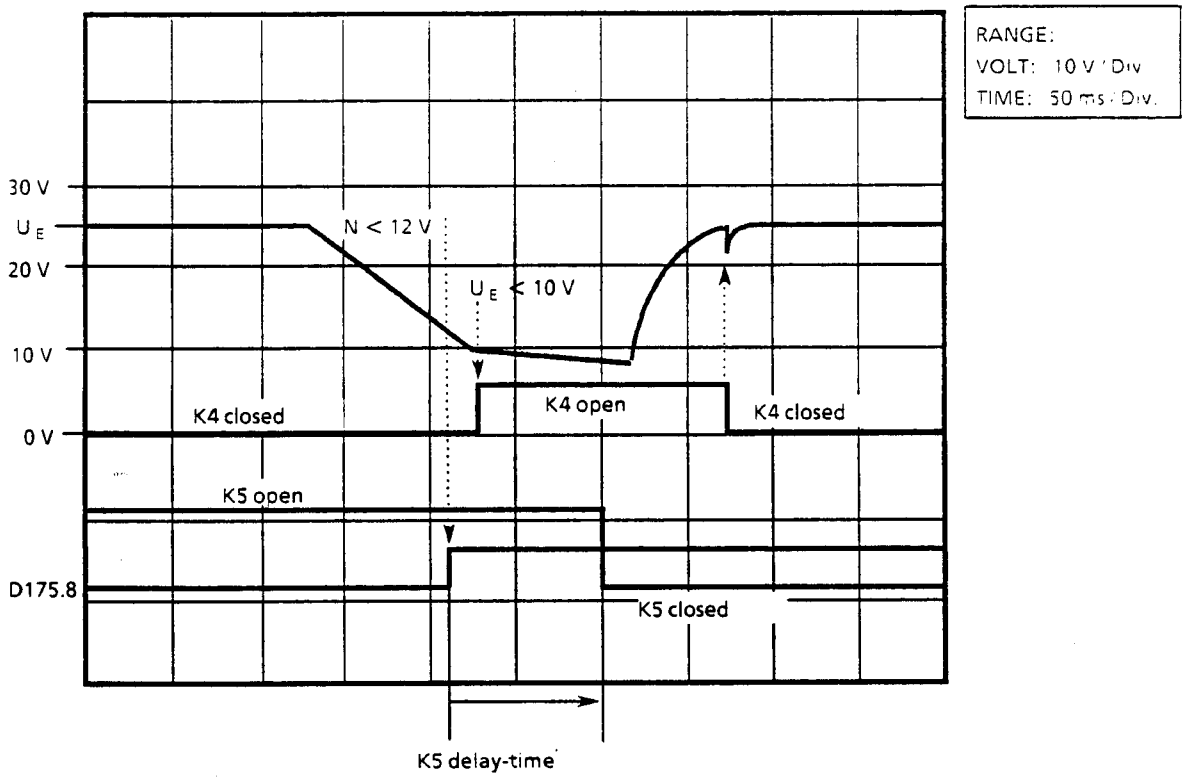


Bild 7-2Fig. Changeover from mains to external battery operation with V_{batt} = 24 V

The changeover from internal to external battery operation and vice versa is initiated by a voltage drop below the lower threshold value + 10.8 V at X20.1. It corresponds to the changeover to/from mains operation. With switch-off, the delay circuit for K5 is bypassed by means of the connection between D175.8 and D178.1.

d) Monitoring circuit

The FAULT SHUTDOWN circuitry monitors the switch-on procedure and deactivates the power supply if an error occurs during operation.

- **Switch-on monitoring**

When pressing the ON switch 9 D170.8 assumes high level; C190 is charged by means of R191. The monoflop D185-B is thus triggered and the flip-flop D190-A is set; the output DE* assumes high level and the switch-on procedure starts as described in Section 7.1.1.1a/b. When all output voltages of the analog power supply unit have reached their rated values (cf. Section 7.1.2) the POWER FAIL* input X30.7 assumes high level after approx. 1 s.

A high level at the reset* input D178.10 indicates that the 5.4 switching regulator, the output voltage of which is directly routed into the instrument, is working properly. The input D190.2 of the D flip-flop also assumes high level. After the time constant of approx. 2 s. determined by C185, D190 is triggered by the rising edge at pin 3 and accepts the high signal of pin 2. The level at output DE* remains high, the power supply unit remains switched on.

- **Switching on in case of a fault**

If a supply voltage does not reach its rated value, e.g., due to a short circuit in the instrument, the level at D190.2 remains low; thus, DE* assumes low level after 2 s caused by the positive edge at D190.3. The relays K2, K3, and K5 become de-energized; the instrument switches off (cf. fig. 7-3).

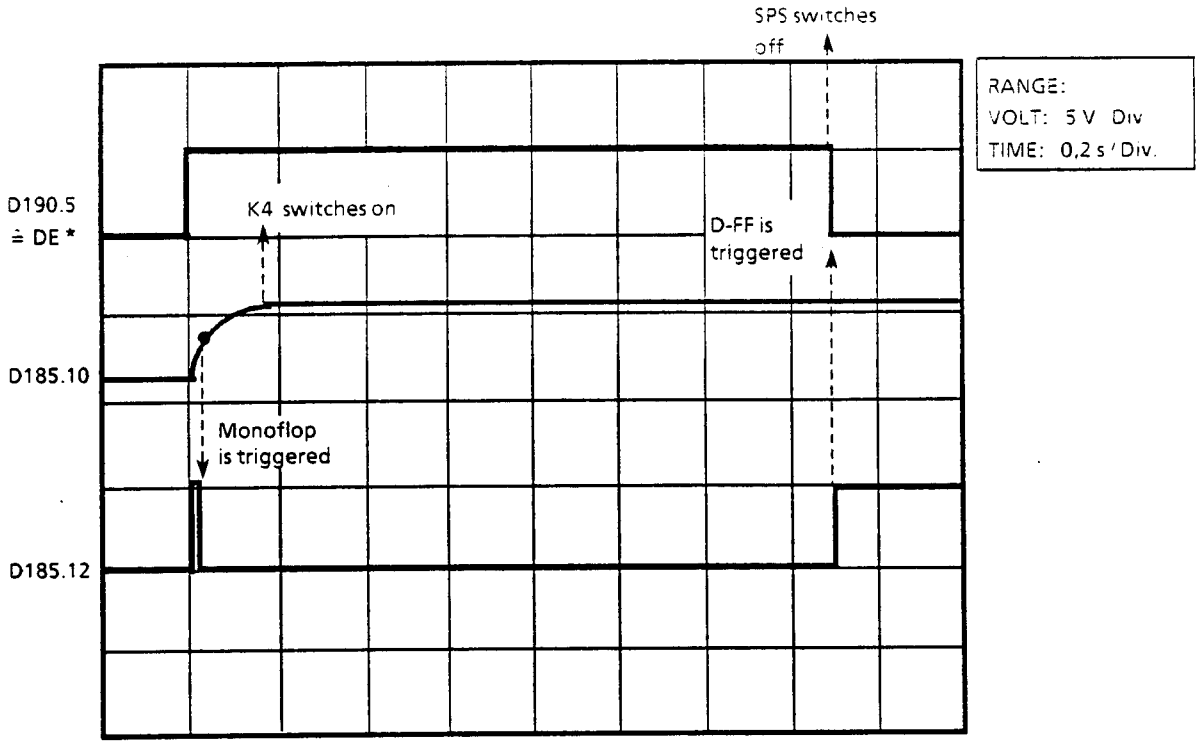


Fig. 7-3: Switch-on in case of a fault

- **Fault shutdown during operation**

If the current input from an output voltage of the analog power supply exceeds the maximum value during operation, e.g., caused by a short circuit in the instrument, the current limiting of the respective analog regulator responds without delay (cf. Section 7.1.2); X30.7 assumes low level. In case of a short circuit of the 5.4V output voltage, the internal (Mod. 02) or external (Mod. 03) current limiting of the switching regulator V100 also responds without delay; D178.10 assumes low level. The monoflop D185-B is triggered by the falling edge at pin 9. If the short circuit still remains after a period of 2 s, i.e., the level at D190.2 remains low, the output DE* assumes low level caused by the rising edge at D190.3. The instrument is switched off.

The time constant of the monoflop is selected such that the voltage dip which occurs, e.g., with changeover from A.C. supply to external battery operation, does not lead to disconnection of the power supply.

The monitoring logic can be disabled for service purposes by plugging the shorting jumper from X185.1/2 to X185.2/3.

7.1.1.2 Switching Regulators

The input voltage of the switching regulators V51, V100 and V110 may vary between 10.8 V and 33 V depending on the voltage source connected. It can be checked at the test point X19 (cf. circuit diagram 1003.7702.01S, sheet 2). The voltage source (mains, external or internal battery) is selected by the switch-on and monitoring logic (cf. Section 7.1.1.1). The switching frequency of all regulators is 100 kHz. The regulators are synchronized to avoid AF interferences. The 100-kHz sawtooth signal used for synchronization can be checked at test point X80. Fig. 7-4 illustrates the internal circuit of the integrated switching regulator component L296. The power circuit of the regulator can be disconnected by means of a switching signal at pin 6. The switching point of the internal current limit can be varied by the external elements via pin 4.

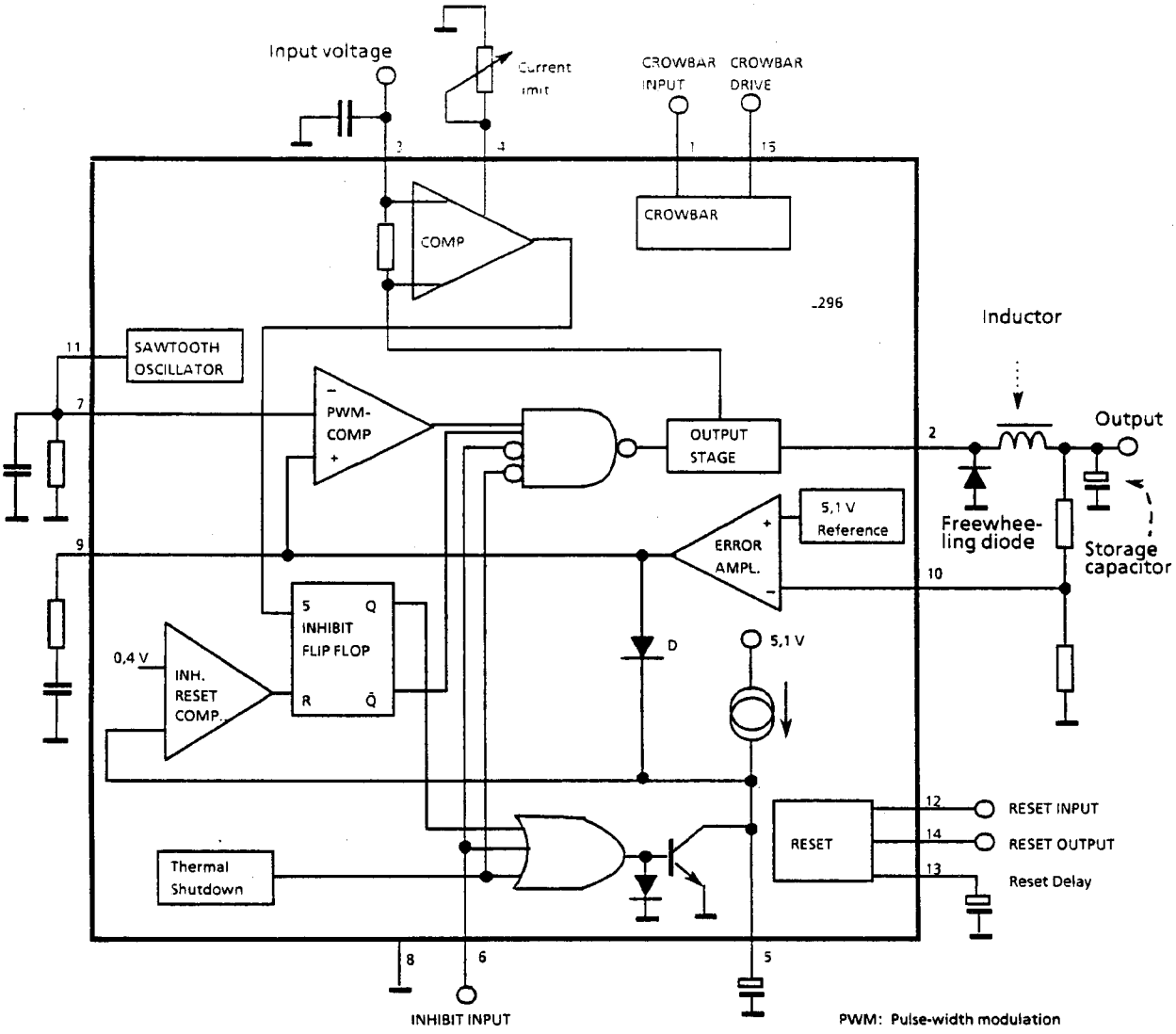


Fig. 7-4 Principle circuit of the switching regulators

a) Switching regulator + 5,4 V

The step-down regulator V100 generates the 5.4V supply voltage required for operation of the digital boards from the input voltage applied at X19. The input voltage passes to the integrated switching regulator V100 via the lowpass filter C80, L80, L81, which prevents the emission of noise voltages at the input of the switching power supply. The internal sawtooth generator, which provides an output signal at X80, generates the switching signal for the integrated power transistor. The frequency is determined by R81 and C83. The sawtooth signal is also used as reference for the switching regulators

V51 and V110. A square-wave signal is generated at X81. The amplitude of this signal depends on the input voltage at V100.3 and its duty cycle depends on the load current. The free-wheeling diode V94, the storage capacitor C90 and the input blocking capacitor C81 are routed to the common ground neutral GND2. The inductors L90 and L91 are designed in accordance with the permitted maximum load current (Mod 01: 4 A; Mod 03: 6 A). Mod 03 additionally contains the external switching transistor V90 and the external current limit N2-C, V96. The d.c. resistance of L91 is used as measuring shunt. The response threshold of the current limiting can be set using R91. In case of a short circuit of the internal or external switching transistor the thyristor V101 connects through and thus prevents the destruction of further components in the instrument.

b) Switching regulator + 12 V

The theory of operation corresponds to the description given in Section 7.1.1.2 a) except for the external current limiting fitted in Mod. 02. Since, with A.C. supply, the regulator charges the internal accumulator apart from generating the + 12V supply voltage, the output voltage is corrected depending on temperature and load current. The temperature inside the instrument is measured by means of an NTC resistor on the motherboard. As is illustrated in fig. 7-5, the output voltage can be determined according to the following formula:

$$U_{+12V} = 5{,}1\,V \cdot \frac{R_{53} + R_{55} \,//\, R_{NTC} \,//\, R_{CE(V55)}}{R_{53}}$$

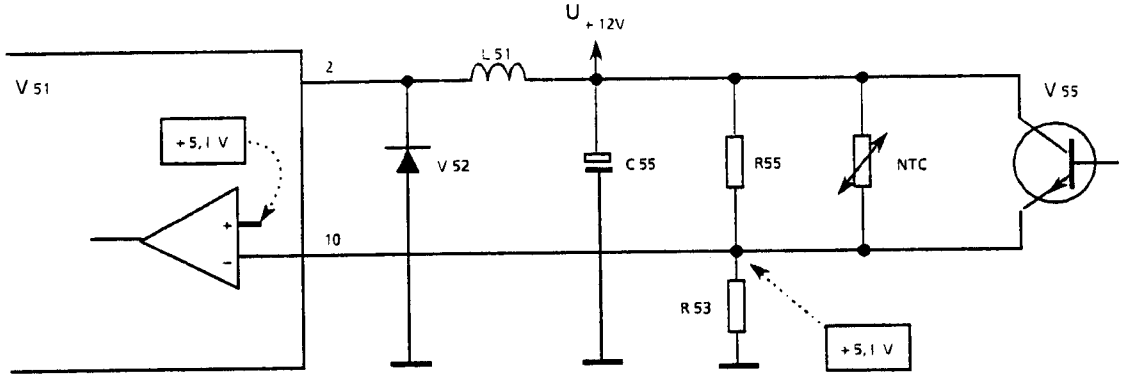


Fig. 7-5 Voltage regulation of the + 12V switching regulator depending on load current and temperature

N2-A and V55 are used to prevent that the sum of battery load current and + 12V load current exceed the maximum value of 4 A. Thus, operation of the instrument is possible with simultaneous charging of the battery.

c) Switching regulator -11 V/ + 31 V

The regulator V110 consisting of V74, C77 and T1 has the function of a flyback converter for generation of the negative supply voltage -11 V. In standby mode, the GND socket V110.8 is applied to ground potential; V110 is disabled by a positive voltage at pin 6. During operation, the negative output voltage -11 V is used as reference potential for the regulator. C72 is used to disconnect the d.c. voltage with a change of the reference potential; the correct d.c. operating point for the synchronization input is adjusted by the clamp circuit R70, R75 and V70. The + 31V-voltage is provided by the secondary winding of T1. Due to the increased rating of components with flyback-converter operation the efficiency of the -11V-regulator is lower than that of the two step-down regulators.

7.1.2 Analog Power Supply

The analog power supply generates the + 10 V, -10 V and + 28 V supply voltages required for operation of the analog boards from the voltages + 12 V, -11 V and + 31 V supplied by the switching power supply. Due to the high noise rejection of the analog regulators, the residual ripple of 100 Hz occurring with mains supply as well as the 100-kHz interferences emitted by the switching regulators are completely suppressed. All analog regulators have a fold-back current limitation responding without delay , which, in case of a short-circuit in the instrument, limits the short-circuit current to small values until response of the fault shutdown (cf. Section 7.1.1.1.d) and thus prevents sequential faults to occur in the instrument or power supply module.

7.1.2.1 Generation of Reference Voltage and -10V Regulator

The + 6.2V-reference voltage is generated in the temperature-compensated reference diode V5. N1-D serves as reference voltage buffer and simultaneously stabilizes the current by means of V5. V6 is used to ensure that the reference voltage correctly builds up independent of the input offset of N1-D.

The low-drop regulator V20, V21, N2-B generates the -10V voltage at X13.4 from the pre-stabilized -11V output voltage of the switching regulator. The separate Sense line -10 VS, which is connected on the motherboard to the -10V output voltage, compensates for voltage drops when the voltage is passed to the boards. V24 prevents the output voltage from unpermitted increase, when the Sense line is interrupted. C19, C23 and C25 improve the RFI suppression of the regulator. If the load current exceeds the limit established by R31, R32 and R33, the output of the OpAmp N2-A becomes positive and the diodes V21 and V20 are reverse-biased. R23 determines the short-circuit current and allows for restarting of the regulator upon elimination of the short-circuit.

7.1.2.2 Regulator + 10 V and + 28 V

The low-drop regulator V1, V2, N1-B generates the stabilized + 10V output voltage at X13.6 using the voltage at X22.3 in the range between 10.6 V and 15.5 V. The -10V Sense voltage serves as reference voltage at R16. Thus, the + 10 V and -10 V voltages build up symmetrically to the zero point with switch-on. The regulator function corresponds to that of the -10V regulator.
The integrated regulator N3 generates the + 28V output voltage at X12.5 from the + 31V voltage at X23.9/10. The + 10V Sense voltage is used as reference. The response threshold of the current limitation is determined by R42.

7.1.2.3 Voltage Monitoring

Coupling of the reference voltages of the individual regulators allows for monitoring of all output voltages in one window comparator. The monitoring window of the + 28V-output voltage has thus 2.8 times the value of the + -10V windows. The window comparator N4-A, N4-B gets its reference voltage from the identically built-up reference voltage source V50, N2-C and is thus enabled to monitor also the main reference voltage generated by V5 and N1-D.

N4-D is used to drive the visible "Supply ok" LED 37, which lights up as long as voltages are within the monitoring window.

The Power Fail signal, which assumes low level with tolerance violation and thus activates the fault shutdown of the switching power supply (see Section 7.1.1.1.1), can be disabled for service purposes by plugging the shorting jumper at X5.1/2 to X5.2/3.

7.2 Test Instruments and Utilities

Item	Type of instrument	Required specifications	Suitable R&S instrument	Order No.,	Appli cation
1	Digital voltmeter		UDS 5	349.1510.02	7.3
2	Storage oscilloscope	dual channel			7.3
3	Power supply module	0 to 32 V, 10 A	NGB	..	7.3 and 7.4
4	to Power supply module	0 to 15 V, 1 A	NGT20	..	7.3 and 7.4
5	Multimeter	Strommeßbrücke 10 A	UDL33	...	7.3 and 7.4
6	Variabler Lastwiderstand	0 to 20 Ω, 5 A		..	7.3 and 7.4

7.3 Troubleshooting

7.3.1 Tests Prior to Removal of the Rear Panel

Prior to removing the rear panel, it is advisable to first determine whether the fault occurred in the power supply module or whether another module inside the instrument is defective. Unless otherwise specified, it is assumed that the instrument is supplied from the mains.

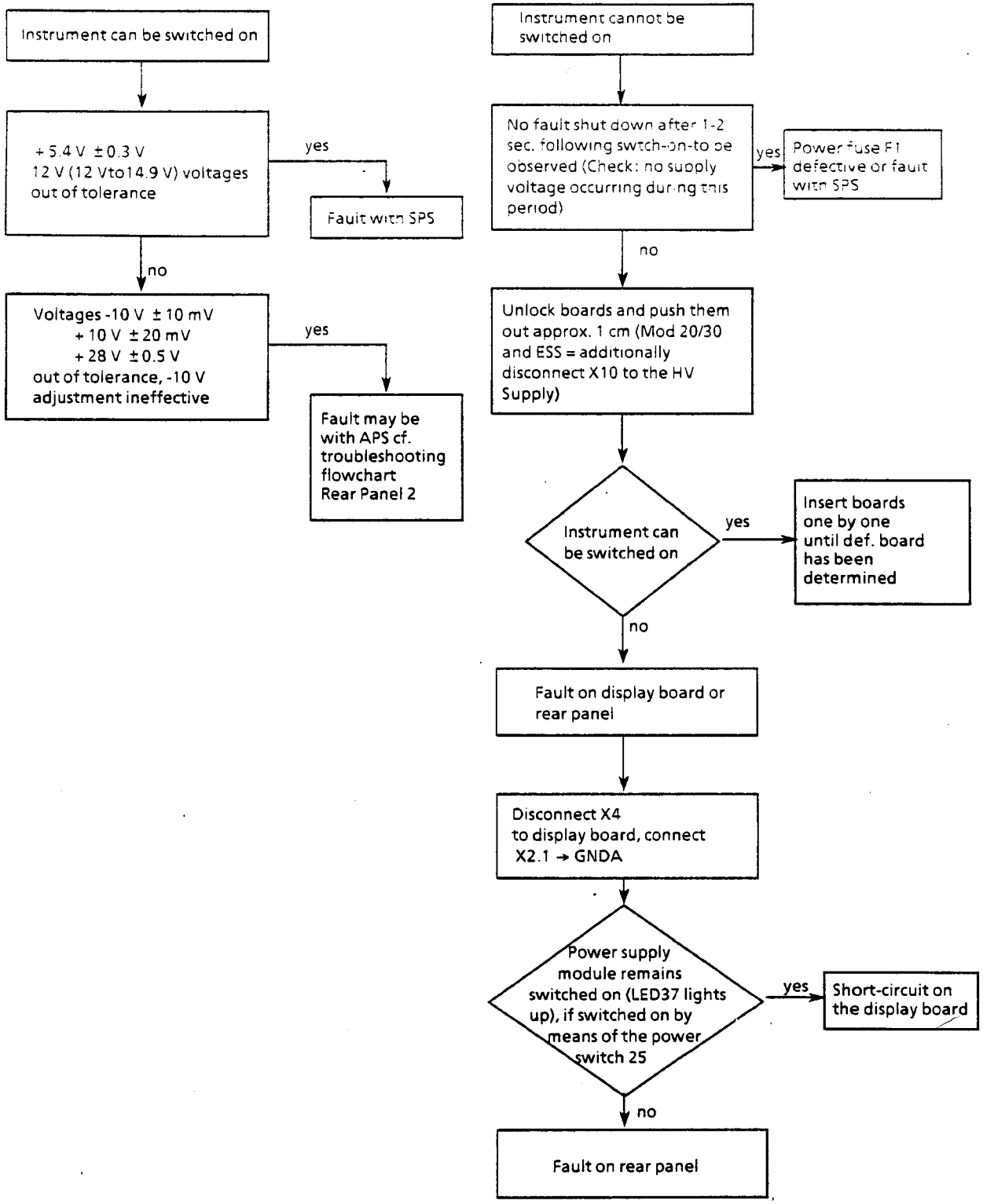


Fig. 7-6 Troubleshooting flowchart Rear Panel 1

7.3.2 Tests Subsequent to Removal of the Rear Panel

Removal of the rear panel is described in Section 7.6.

The subsequent tests are used to determine whether the error occured in the switching power supply or in the analog power supply module. Further troubleshooting in the analog power supply (APS) is described in Section 7.4.2. If the rear panel is to be operated without an instrument connected, the Sense lines X2.3, X2.4 must be connected to the + 10V/-10V outputs X3.5, X3.4 for performing tests in the APS. The power supply can be switched on by connecting the ON connector to GNDA. Correct functioning of the switching power supply can only be tested with loads connected.

Error description:
At least one of the voltages -10 V, + 10 V, + 28 V out of tolerance, power supply switches on for at least 1-2 s.

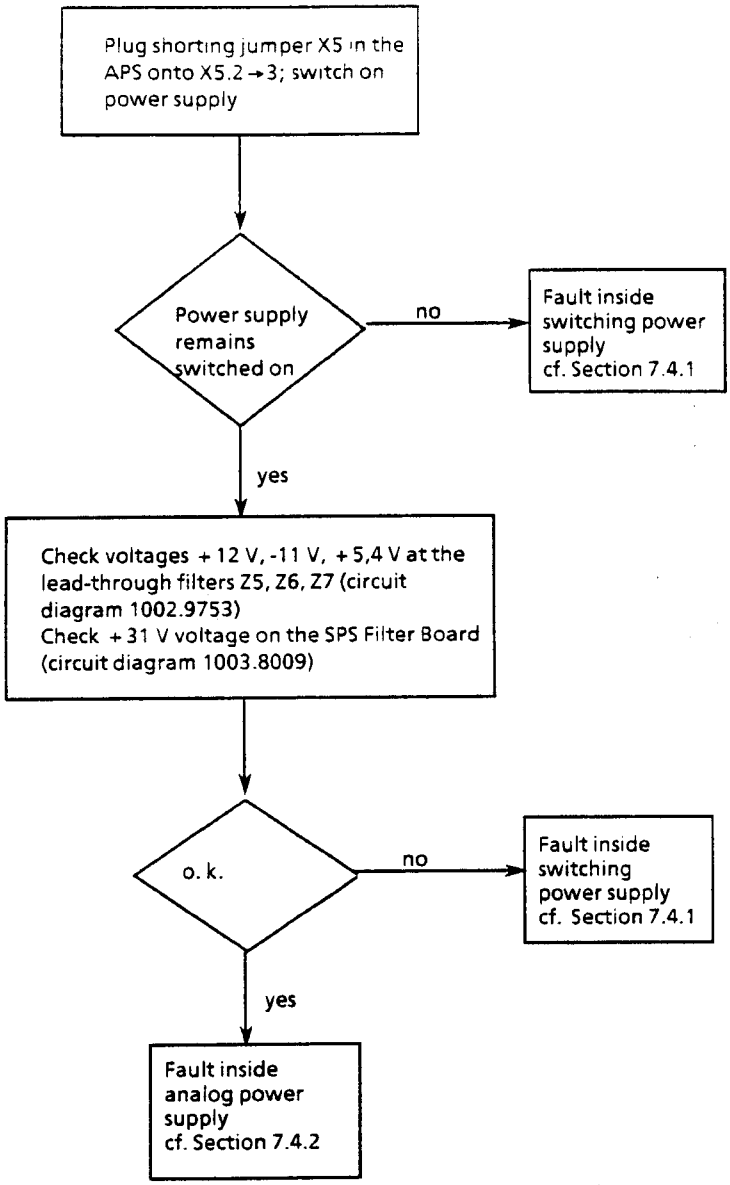


Fig. 7-7 Troubleshooting flowchart Rear Panel 2

7.3.3 Troubleshooting in the Switching Power Supply

For troubleshooting in the switching power supply it is assumed that the following input voltages are supplied: (+26 V to +32 V) at X10.1 with mains operation, external battery voltage at X10.3 with external battery operation, 12 V to 14.9 V at X20.1 with internal battery operation (only Mod. 02).

If an external power supply unit is used for generation of the battery voltages, the current limitation of this power supply must not respond with switch-on of the ESHS power supply.

The test connectors X18, X19, X81 are provided to accelerate the location of faults. If the switching power supply is to be operated outside the instrument, the ground neutral (GND1 to GND6) must be connected to the ground of the instrument housing.

The automatic fault shutdown can be disabled by plugging the shorting jumper X185 onto X185.2-3. This fact is assumed to apply with the subsequent troubleshooting flowcharts, unless otherwise specified.

If the power consumption exceeds 0.5 A with external battery operation at 24 V without load (connector X20 disconnected), an increased ON duration without fault shutdown may lead to sequential faults. If a fault has been found in one of the relays K1, K2 or 5, correct functioning of the precharging circuit of the filter capacitor should be checked (cf. Section 7.1.1.1.a). If the relays are in normal position, a resistance of 6,8 Ω ± 10 % can be measured by R3. If R3 is defective, the power supply can be switched on, however, the increase of the switch-on current will be leading to destruction of the relay contacts of K1, K2 and/or K5.

- **Fault description [1]:**

Power supply cannot be switched on, one or more output voltages are missing, LEDs H10 to H50 do not light up according to table 7.1

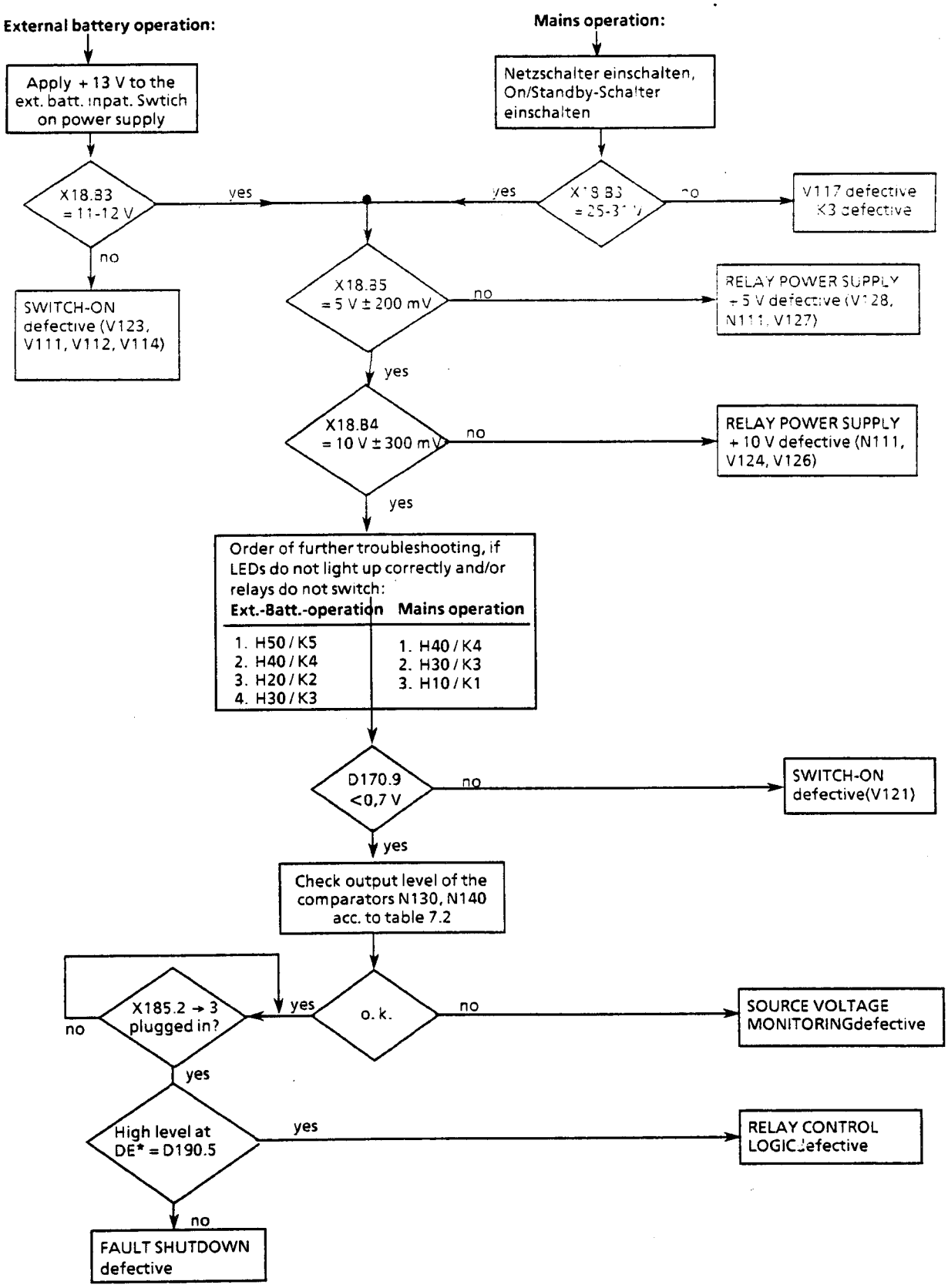


Fig. 7-8 Troubleshooting flow chart SPS1

- **Fault desription [2]:**

One or more output voltages are missing, LEDs H10 to H50 light up according to table 7.1

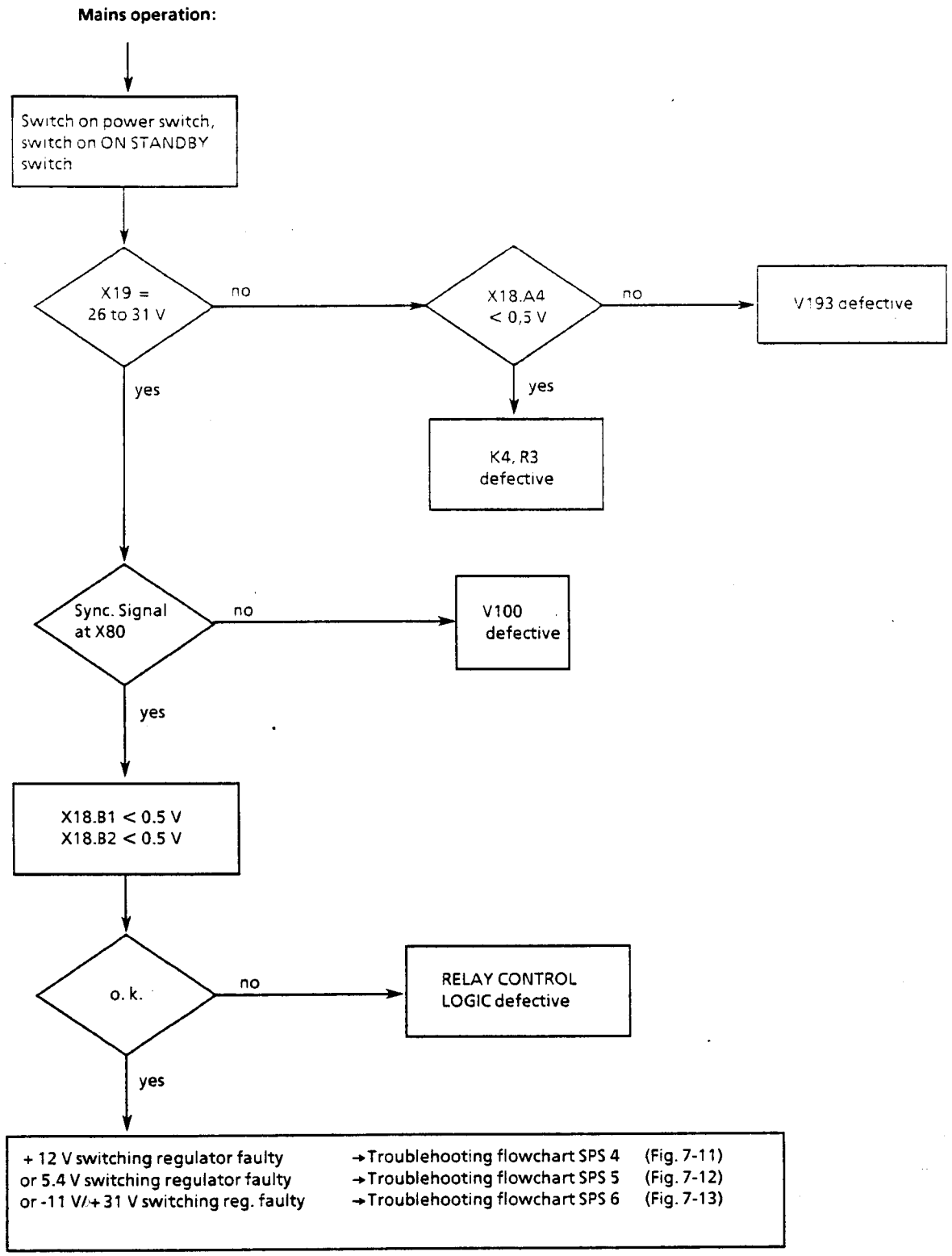


Fig. 7-9 Troubleshooting flowchart SPS2

- **Fault description [3]:**

The power supply cannot be switched off or Standby LED lights up with supply from internal or external battery and instrument switched off.

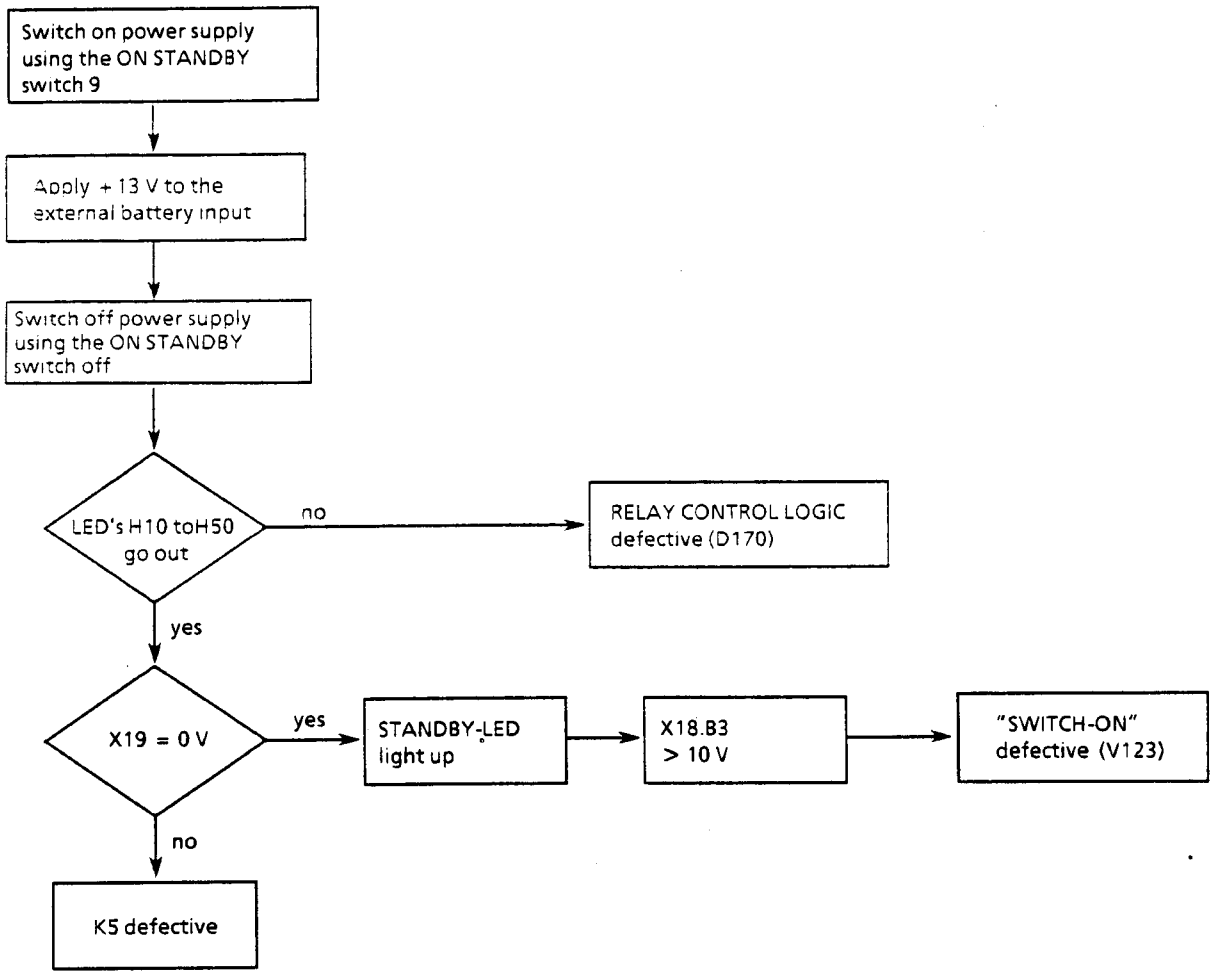


Fig. 7-10 Troubleshooting flowchart SPS3

- **Fault description [4]:**

With mains operation , the + 12V-voltage is outside the range 12 to 15.5V.

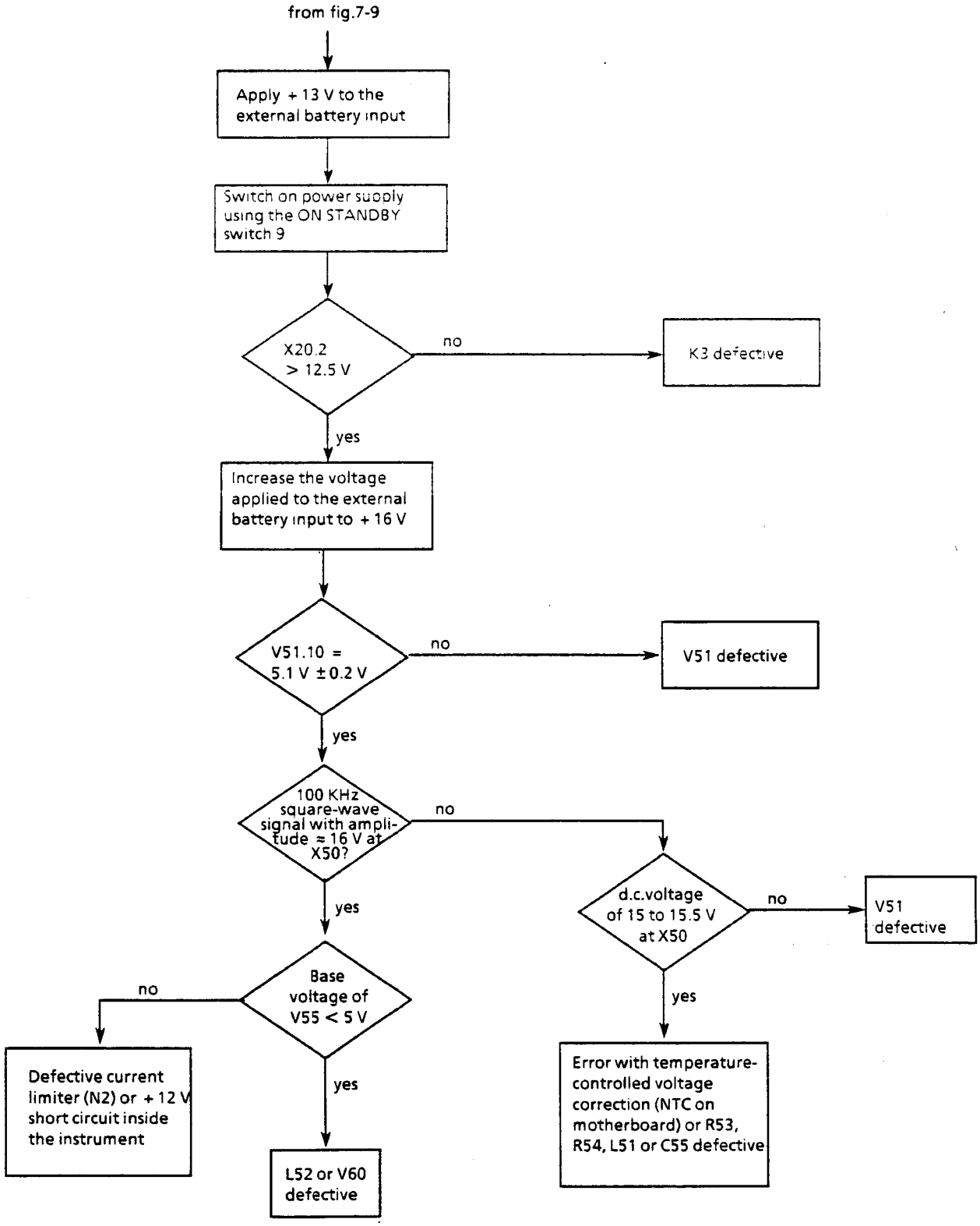


Fig. 7-11 Troubleshooting flowchart SPS4

- **Fault description [5]:**

The voltage + 5.4 V is outside the range 5.4 to ± 0.2 V.

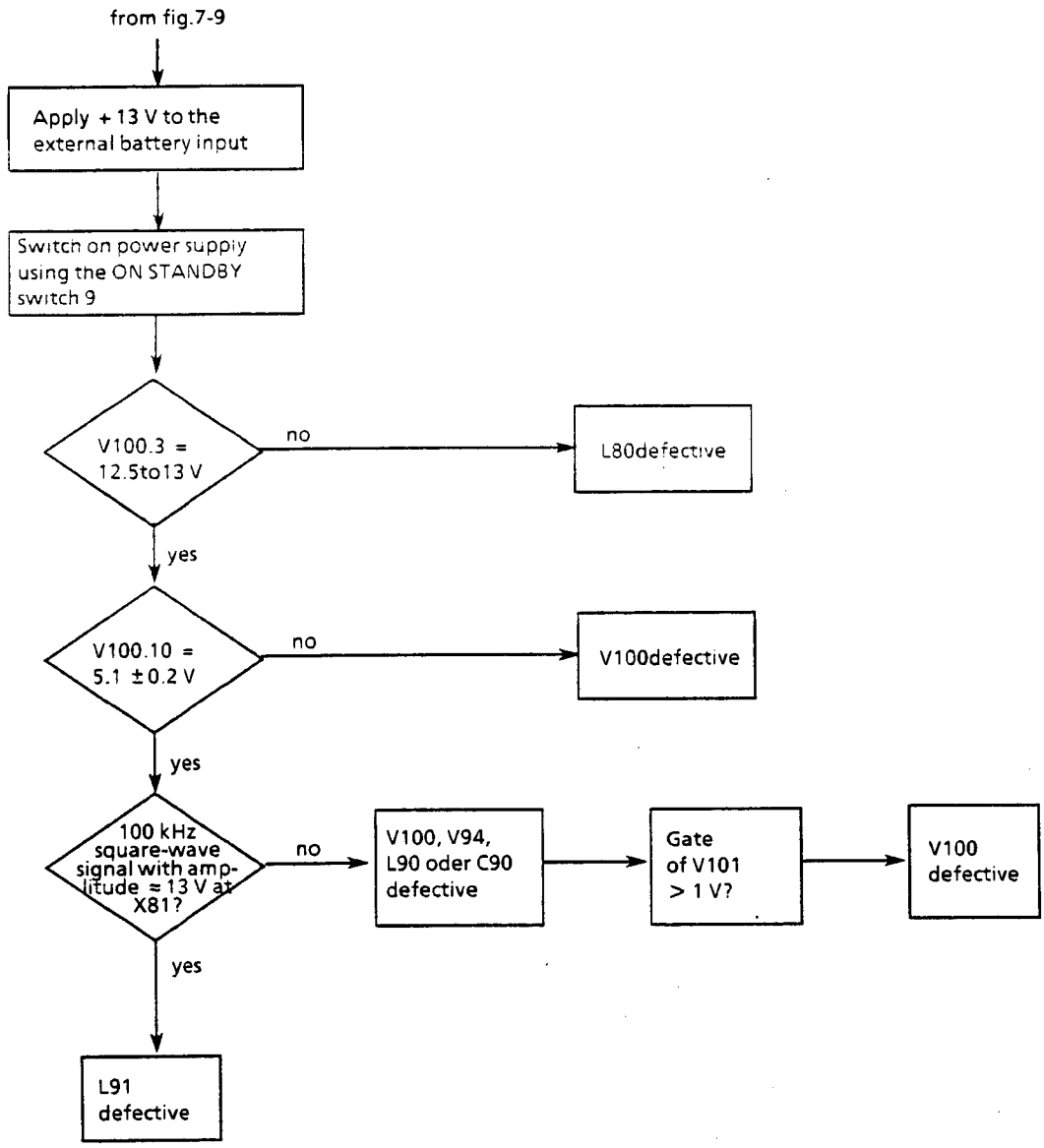


Fig. 7-12 Troubleshooting flowchart SPS5

- **Fault description [6]:**

The voltage -11V is outside the range -11V ± 0.2V or the +31V voltage is outside the range 30.5V to 32.5 V

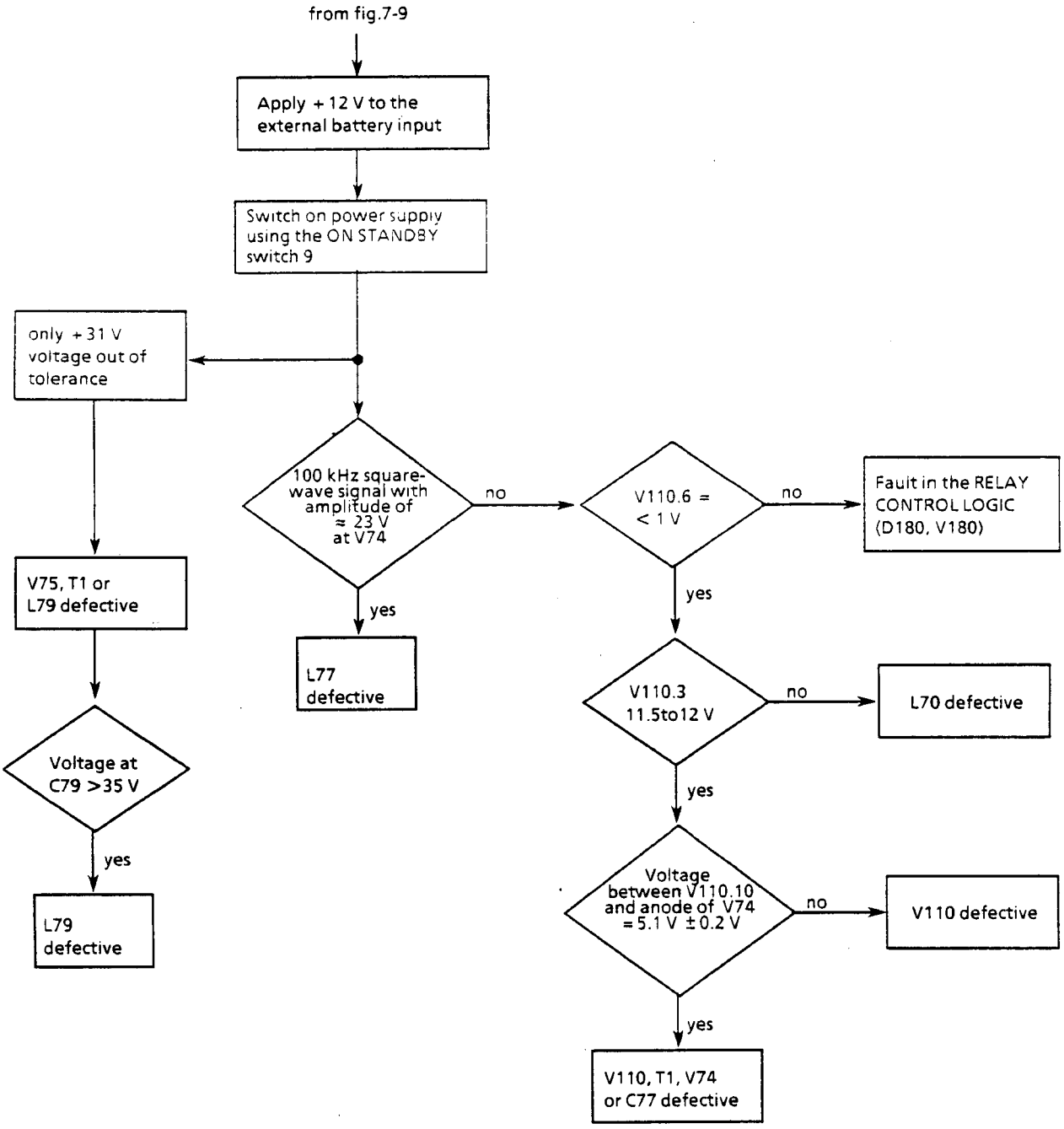


Fig. 7-13 Troubleshooting flowchart SPS6

7.3.4 Troubleshooting in the Analog Power Supply

First, the fault must be located to be in the analog power supply by means of the troubleshooting flowchart given in figure 7-3.

- **Fault description [1]:**

All voltages of ± 10 V and + 28 V out of tolerance, adjustment by means of R35 is ineffective.

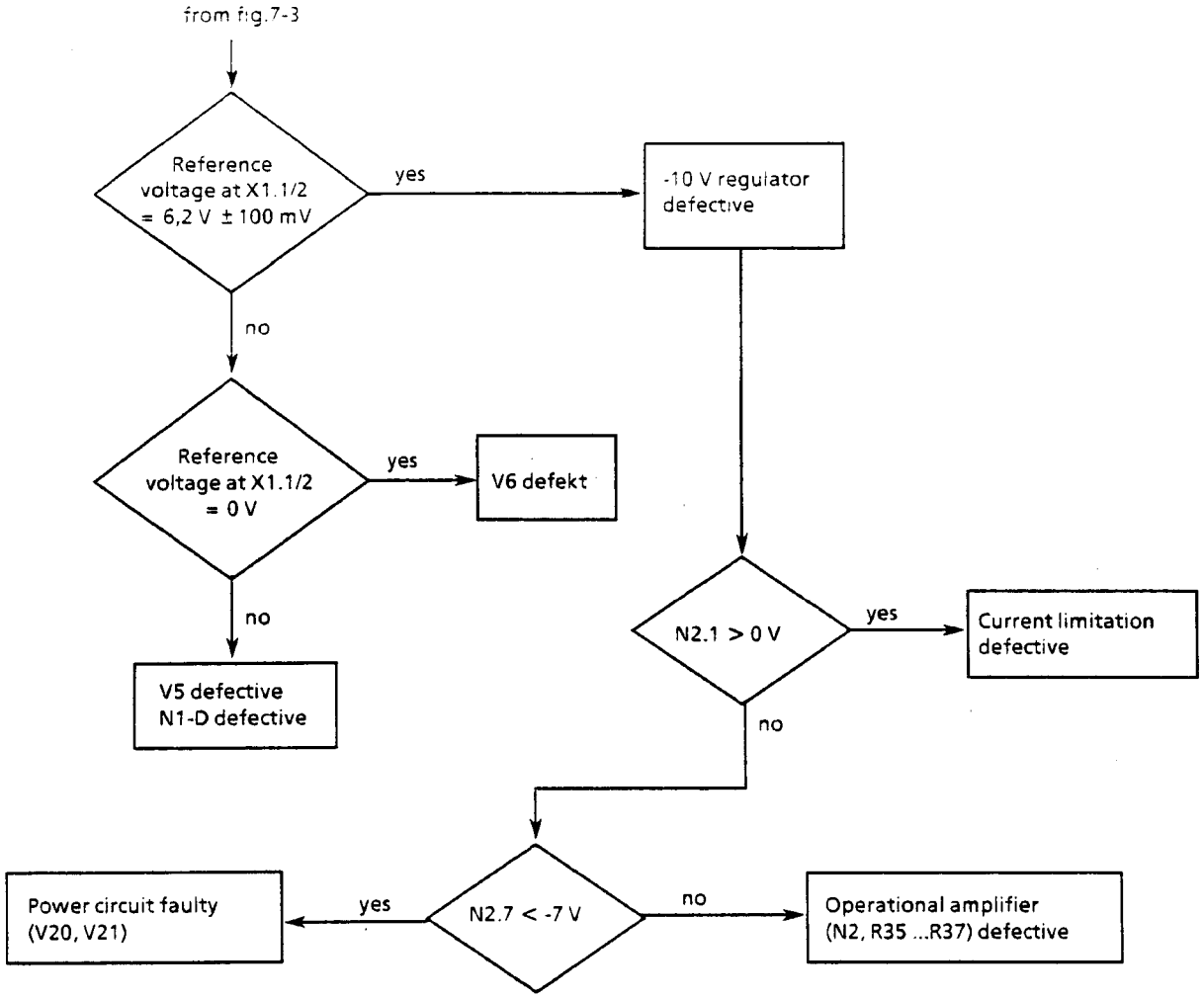


Fig. 7-14 Troubleshooting APS1

- **Fault description [2]:**

Voltages + 10V, + 28 V out of tolerance.

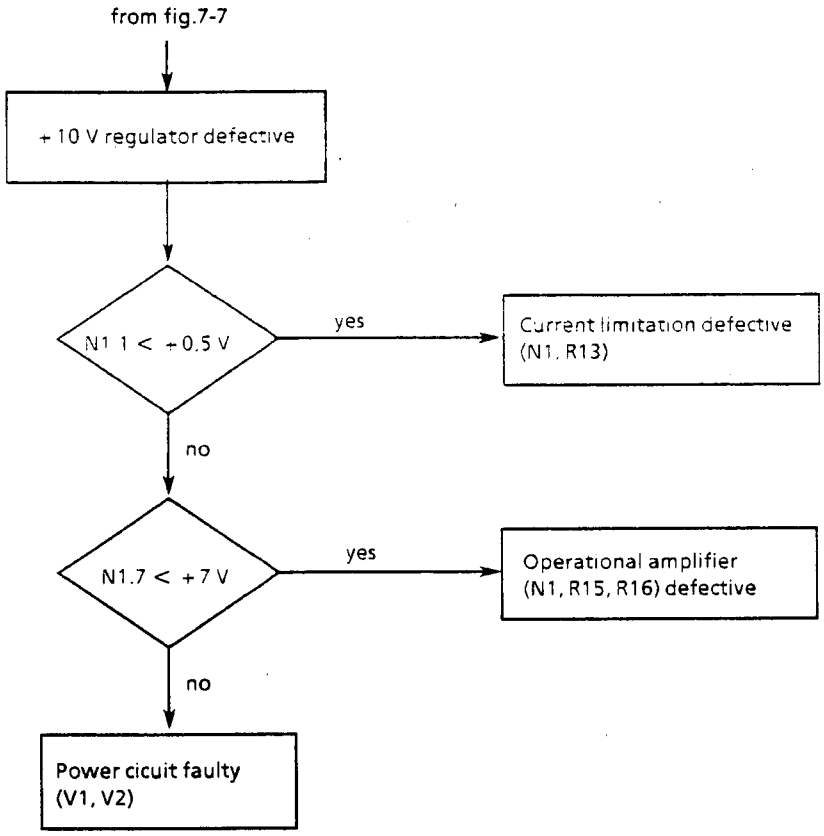


Fig. 7-15 Troubleshooting flowchart APS2

- **Fault description [3]:**

+ 28 V voltage out of tolerance.

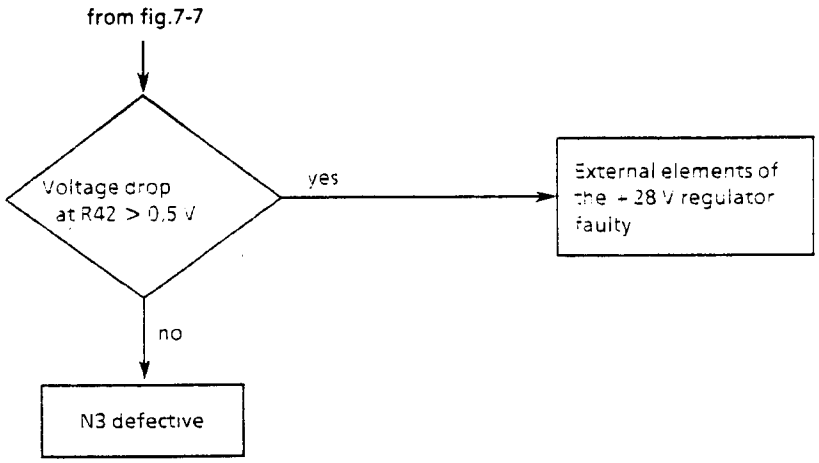


Bild 7-16 Fehlersuchdiagramm ANT3

- **Fault description [4]:**

"Supply ok" LED does not light up, level of "Power Fail" signal low, although voltages ± 10 V and + 28 V within the tolerance.

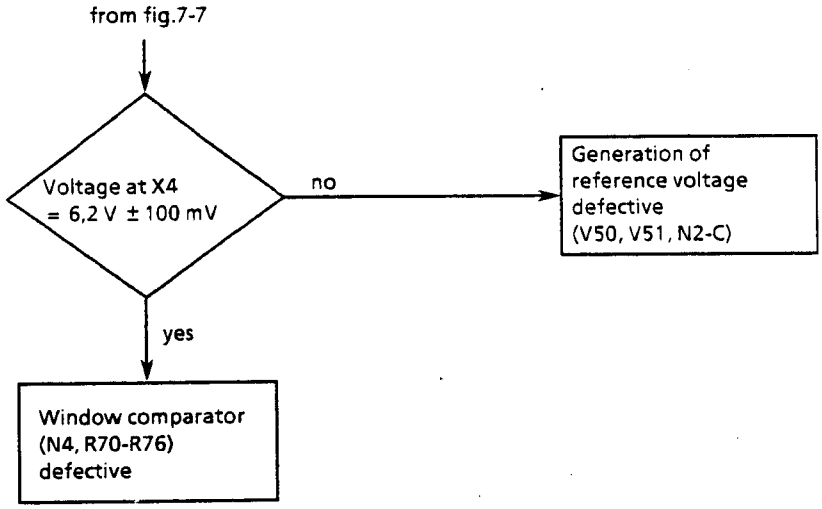
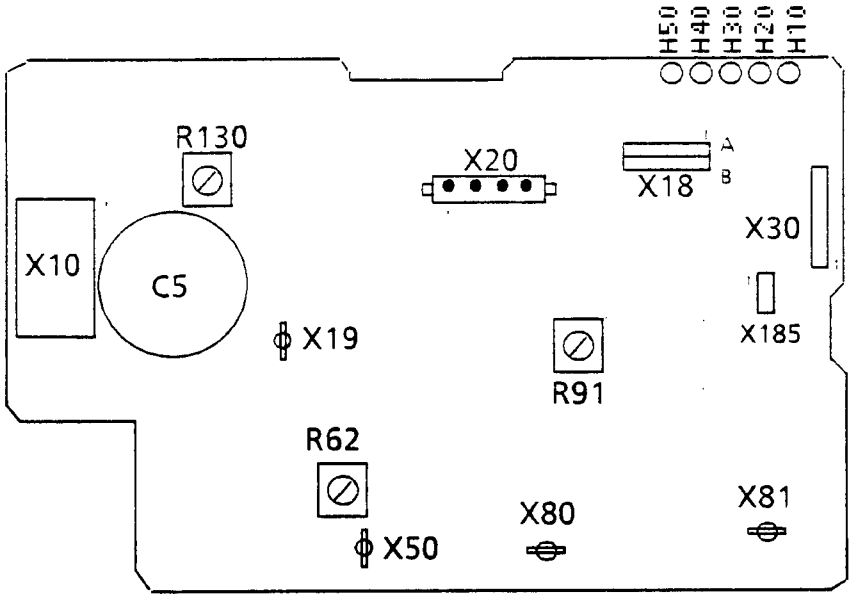


Fig. 7-17 Troubleshooting flowchart APS4

7.4 Testing and Adjustment

7.4.1 Switching Power Supply

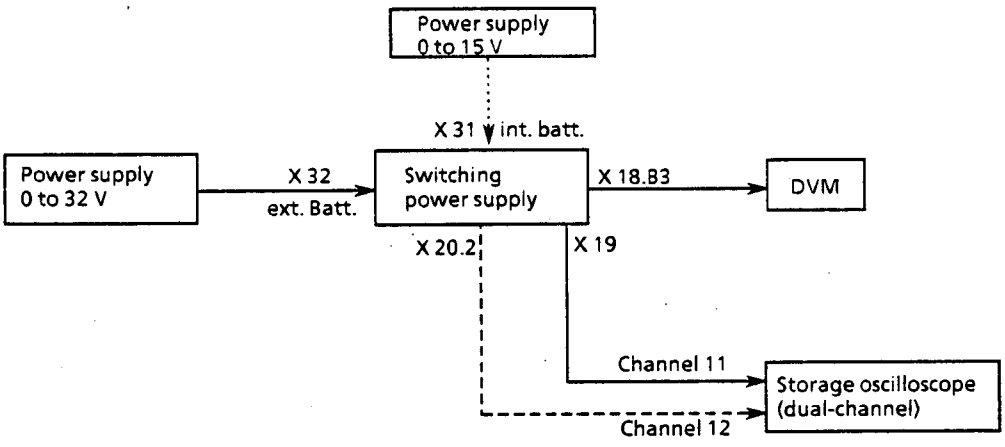
7.4.1.1 Location of Jumpers and Adjustment Points



7.4.1.2 Control Section

7.4.1.2.1 SWITCH-ON and RELAY POWER SUPPLY

a) Test setup:



b) **Presetting:**

Connect DVM to X18.B3, connect power supply unit to X32 (ext. batt.).

Set power switch on the rear panel and ON switch on the front panel to OFF.

c) **Measurement and adjustment:**

- Slowly increase the input voltage from 0 V to 10 V.
  The input current applied to the ext. batt. input remains ..... < 1 mA
  Voltage at X18.B3 ..... 0 V

- Switch on the instrument.
  Input current ..... 50 mA ± 20 mA
  The STANDBY LED blinks.
  Voltage at X18.B3 ..... 9.1 to 9.4 V

- Remove voltmeter from X18.B3 and connect to X18.B5.
  Set the voltage at X18.B5 to ..... 5 V ± 50 mV using R130.

7.4.1.2.2 RELAY CONTROL LOGIC and RELAY INTERFACE

a) **Test setup:**
(see Section 7.4.1.2.1)

b) **Presetting:**

Connect channel 1 of the storage oscilloscope (5V/Div; 20 ms/Div) to X19 and channel 2 to X20.2,
triggering on channel 2.
Plug shorting jumper onto X185.2 3.

c) **Measurement and adjustment:**

- Slowly increase the input voltage at X32 (ext. batt.)
  until the LEDs H20, H30, H40, H50 light up.
  The switch-on threshold is about ..... 11.8 V ± 0.1 V
  Input current applied to X32 (ext. batt.) ..... < 3 A
  The STANDBY LED goes out.
  14 is reverse-biased.

- Checking the switching times at the oscilloscope (fig. 7-18):
  t1 (capacitor charge time) ..... 60 ms ± 20 ms
  t2 (+ 12V switch-on delay) ..... 11 ms ± 3 ms

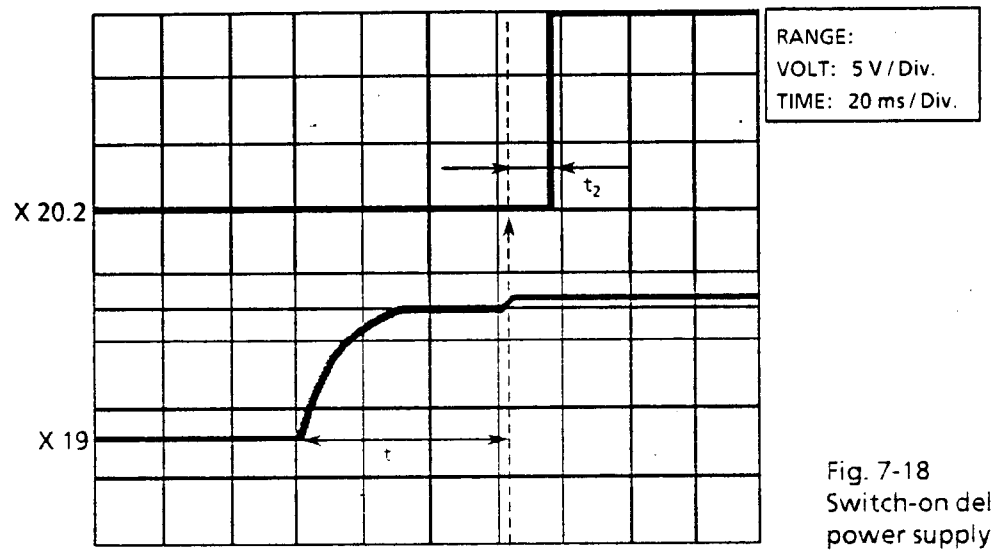


Fig. 7-18
Switch-on delay of the + 12 V power supply

- Reduce the voltage at X32 (ext. batt.), until the LEDs H20 to H50 go out.
  The switch-off threshold ..... 11.0 ± 0.1 V
  Switch off the instrument.

- Disconnect the power supply module from X32 (ext. batt.) and connect to X31 (INT. BATT).

- Slowly increase the input voltage from 0 to 11 V.
  The input current remains ..... 1 mA
  Measure the voltage at X18.B3 ..... 0 V

- Switch on the instrument.
  The STANDBY LED blinks.

- Slowly increase the input voltage at X31, **but do not exceed 15 V,**
  until the LEDs H10, H20, H30, H40 light up..
  Switch-on threshold ..... 11.8 V ± 0.1 V
  V114 is reverse-biased.

- Reduce the voltage at X31, until the LEDs H10 to H40 go out.
  Switch-off threshold ..... 10.6 V ± 0.2 V
  Switch off the instrument.

7.4.1.3 Power Section

7.4.1.3.1 SWITCHING REGULATOR + 5.4 V

a) Test setup:
(s. Section 7.4.1.2.1)

b) Presetting:

- Disconnect the power supply module from X31 and connect to X32 (ext. batt.).
  Set input voltage to + 12 V.
  Connect channel 1 (1V/Div) of the oscilloscope to X80
  d.c. coupling; 2 µs/Div; NON-STORE mode;
  connect channel 2 (5 V/Div) to X81,

triggering at channel 1.

Switch on the instrument.
Switch on service function 10 (LCD background illumination).

c) **Measurement and adjustment:**

- Period of the signal at X80 ..... 9 µs ,to 15 µs
  A stable square-wave signal without jitter is visible on channel 1 of the oscilloscope.

- Increase the input voltage at X32 (ext. batt.) from + 12 V to + 35 V.
  The square-wave signal on channel 2 does not have any jitter across the entire input voltage range.
  The voltage at X20.4 remains constant at ..... 5.35 V ± 0.1 V

- Set the input voltage at X32 (ext. batt.) to + 26 V ± 0.1 V

- Short-circuit X20.4 to GND via an ammeter.
  The short-circuit current (average value) remains ..... < 2 A

7.4.1.3.2 SWITCHING REGULATOR + 12 V

a) Test setup:
(s. Section 7.4.1.2.1)

b) **Presetting:**

Apply + 12 V to X32 (ext. batt.).
Connect channel 2 of the oscilloscope (5V/Div) to X50.
Connect voltmeter to X20.2.

c) **Measurement and adjustment:**

- Switch on the instrument.
  The LEDs H20 to H50 light up.
  The + 12 V switching regulator is not active (no square-wave signal visible on channel 2).

- Increase the input voltage at X32 (ext. batt.) until LED H20 goes out. The + 12 V switching regulator is active
  (Square-wave signal on channel 2 of the oscilloscope).
  Switch-on threshold ..... 15.5 V ± 0.2 V
  Output voltage at X20.2 ..... 12.6 V ± 0.2 V

- Reduce the voltage at X32 (ext. batt.) until the + 12 V switching regulator switches off.
  Switch-off threshold ..... 14.5 V ± 0.2 V

- Apply + 26 V to X32 (ext. batt.).
  Vary the input voltage at X32 (ext. batt.) in the range between 14.5 V and 35 V.
  No jitter visible with square-wave signal on channel 2 of the oscillscope.

- Disconnect power supply from X32 (ext. batt.).
  Switch off the instrument.
  Connect a variable power resistor 0 to 20 Ohms with a current handling capabilitiy of 5 A to X31 (INT. BATT.) via an ammeter.
  Set **R62** fully counterclockwise.

- Switch on power switch on the rear panel.
  Preset the load current at the power resistor to 4.2 A.

Set the voltage at X31 to 12 V ± 0.1 V with a load current of 4 A by means of **R62**.
If necessary, readjust load.

- Set load resistance to 0 Ω (short-circuit).
  Output current (average) ..... < 1 A

- Switch off the power switch.
  Remove the power resistor from X31.

7.4.1.3.3 SWITCHING REGULATOR -11 V/ + 32 V

a) Test setup:
(s. Section 7.4.1.2.1)

b) **Presetting:**

Apply + 12 V to X32 (ext. batt.).
Connect channel 2 of the oscilloscope (10 V/Div.) to the cathode of V74.

c) **Measurement and adjustment:**

- Switch on the instrument.

- Measure the voltage at X20.3 ..... -11 V ± 0.2 V
  Measure the voltage at X30.1/2 ..... 30.7 V to 32 V

- Vary the input voltage at X32 (ext. batt.) in the range between 11 V and 35 V.
  No jitter with square-wave signal on channel 2 of the oscilloscope.
  The voltages at X20.3 and at X30.1/2 remain within the tolerance limits.

- Short-circuit X20.3 to GND via an ammeter.
  Short-circuit current ..... < 1 A
  Switch off the instrument.

7.4.1.4 Complete Switching Power Supply

a) **Test setup:**
(s. Section 7.4.1.2.1)

b) **Presetting:**

- Connect channel 1 of the oscilloscope (5V/Div; d.c. coupling; 10 ms/Div; memory mode) to X19.
- Connect channel 2 (10 V/Div) to X18.A2.- Triggering on channel 2.
- Connect a charged + 12V accumulator to X31 (INT. BATT.).
- Press the power switch.

c) **Measurement and adjustment:**

Switch on the instrument.

- All SPS voltages (+ 12 V, + 5.4 V, -11 V, + 31 V) are within the tolerance limits.
- Switch off the power switch.
  The SPS switches over to the accumulator without interruption.
- Check the voltage characteristic at X19 on the oscilloscope (fig. 7-19).
- The voltage at X19 does not drop below 11 V.

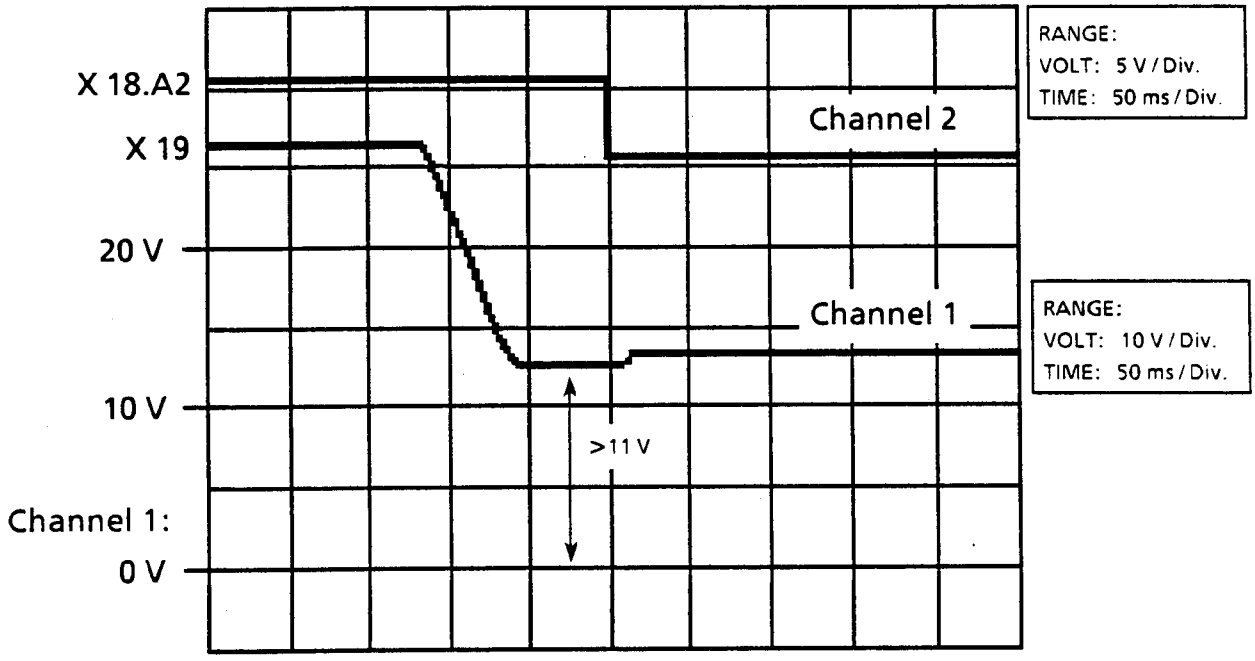


Fig. 7-19 Voltage characteristic at X19 with switchover from mains operation to accumulator

- Connect channel 2 of the oscilloscope (5V/Div.) to X20.2;
  triggering on channel 1.
- Switch power switch on again.
  The SPS switches over to mains operation again without interruption.

- Check of the voltage characteristic at X20.2 on the oscilloscope (fig. 7-20):

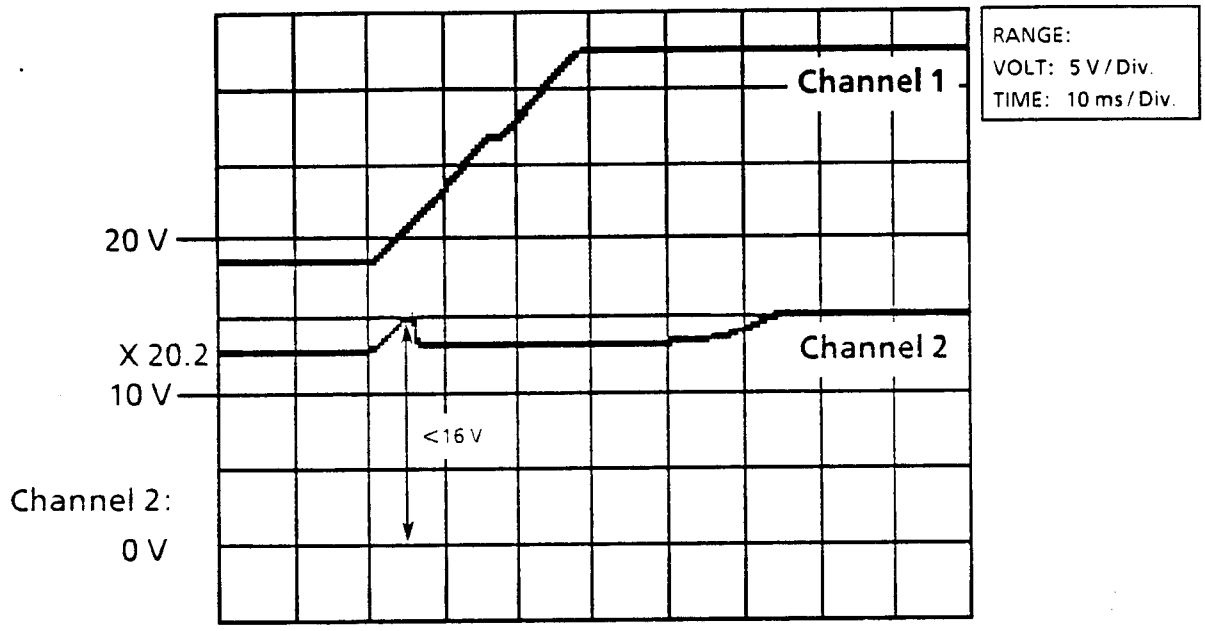


Fig. 7-20 Voltage at X20.2 with switchover from accumulator to mains operation

- The voltage at X20.2 does not exceed + 16 V.
- Set power supply module to an output voltage of + 30 V
  and connect to X32 (ext. batt.).
  Disconnect the accumulator.
- Switch off the power switch.
  The SPS switches over to external battery operation with an interruption.
- Check of the voltage characteristics at X19 and X20.2 on the oscilloscope (fig. 7-21):
- The voltage at X19 drops below 10 V.
  Switchover time t1 ..... < 500 ms

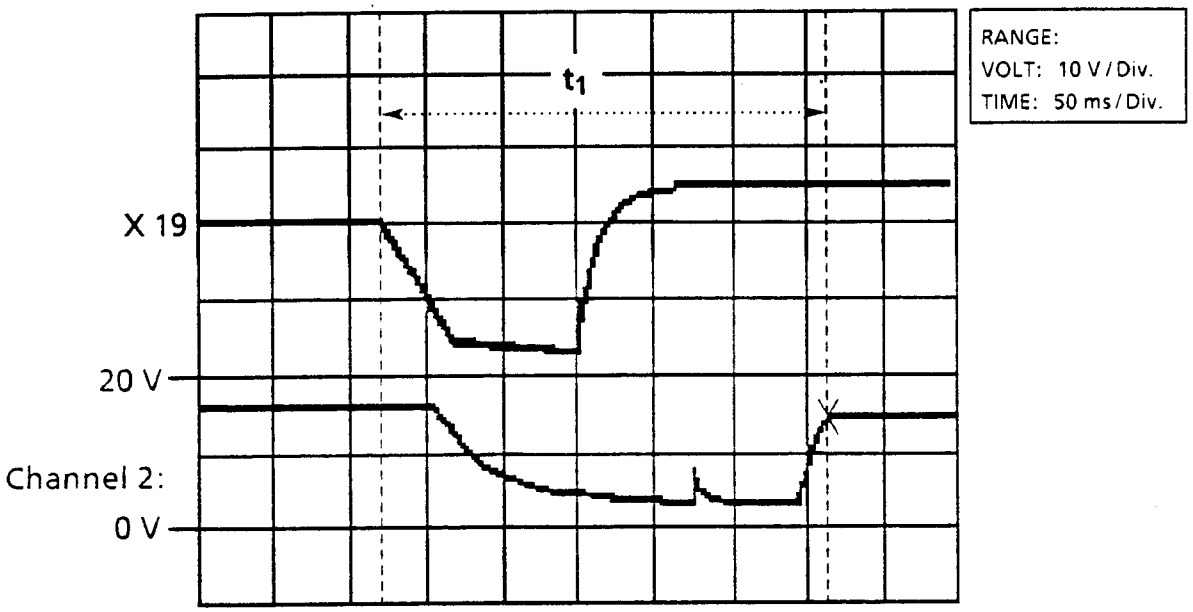


Fig. 7-21 Voltage at X19 with switchover from mains operation to external battery operation

- Reconnect the accumulator.
- Remove the power supply module from X32 (ext. batt.).
  The SPS switches over to the accumulator with interruption.
- Check of the voltage characteristics at X19 and X20.2 on the oscilloscope (fig. 7-22):
- The voltage at X20.2 drops below 10 V.
  Switchover time t2 ..... < 300 ms

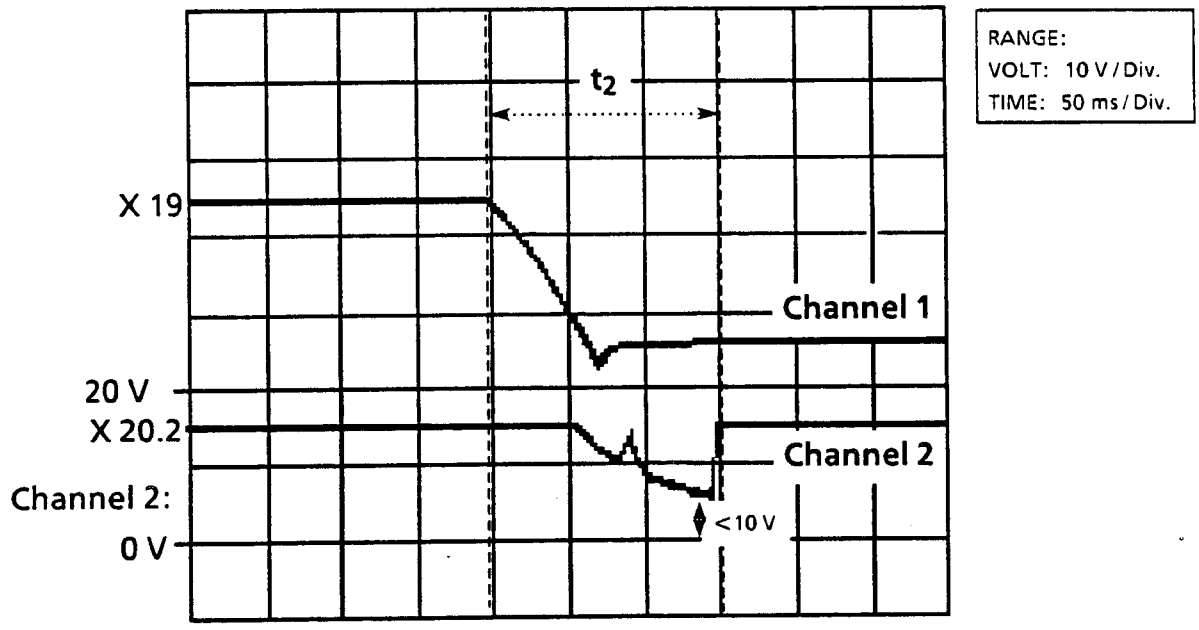


Fig. 7-22 Voltage at X19 with switchover from external battery operation to accumulator

- Disconnect the accumulator.
  Switch off the instrument.

7.4.1.5 FAULT SHUT DOWN

a) **Test setup:**
(s. Section 7.4.1.2.1)

b) **Presetting:**

Plug shorting jumper onto X185 1->2.
Short-circuit X30.7 to GND.
Connect power supply unit (+ 12 V) to X31.

c) **Measurement and adjustment:**

- Switch on the instrument.
  The SPS switches on for 1 to 2 s, then is automatically switched off again.

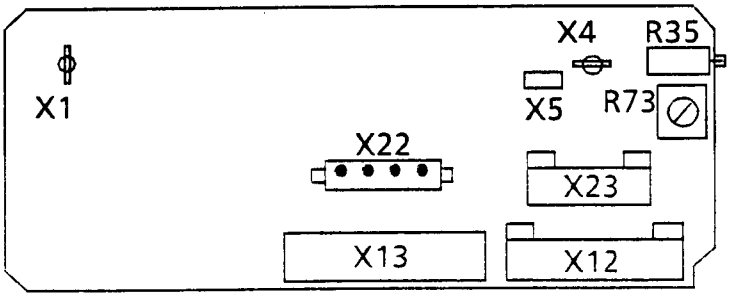
- Switch off the instrument.
  Remove short-circuit at X30.7.

- Switch on the instrument.
  All SPS voltages (+ 12 V, + 5.4 V, -11 V, + 31 V) appear.

- Short-circuit X20.4 to GND.
  The SPS shuts down after 1 to 2 s.

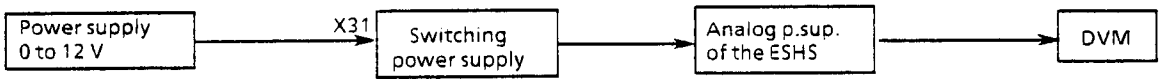
7.4.2 Analog Power Supply

7.4.2.1 Location of Jumpers and Adjustment Points



7.4.2.2 Regulators

a) Test setup:



DVM: Digital voltmeter

b) Presetting:

Remove shorting jumper from K1;
connect digital voltmeter to X1.1.
Plug shorting jumper onto X5.2 → 3.
Connect power supply module (+ 12 V) to X31.

c) Measurement and adjustment:

- Switch on the instrument.
  Reference voltage at X1.1 ..... 6.2 V ± 0.25 V

- Reduce the voltage at X31 until reaching the switch-off threshold.
  The reference voltage at X1.1 drops by ..... < 2 mV

- Plug shorting jumper onto X1.1 → 2.
- Adjust the voltage at X13.4 using **R35** to ..... -10 V ± 1 mV
  Voltage at X13.6 ..... 10 V ± 10 mV
  Voltage at X 12.5 ..... 28 V ± 30 mV
- Decrease the input voltage at X31 until reaching the switch-off threshold.
  The voltage at X13.6 drops by ..... < 5 mV

- Unlock the boards and press them out.
  The voltage at X13.4 changes by ..... < 2 mV
  The voltage at X13.6 changes by ..... < 2 mV
  The voltage at X12.5 changes by ..... < 20 mV

- Short-circuit X13.4 to ground using an ammeter.
  Short-circuit current ..... 50 to 300 mA
  Short-circuit X13.6 to ground using an ammeter.
  Short-circuit current ..... 100 mA to 500 mA

Short-circuit X12.5 to ground using an ammeter.
Short-circuit current ..... 50 mA to 70 mA

7.4.2.3 Voltage Monitoring Circuit

a) **Test setup:**
(s. Section 7.4.2.1)

b) **Presetting:**

Withdraw connectors X12 and X13 from the motherboard (The power supply cannot be switched on via the ON/STANDBY switch any longer).
Plug shorting jumper to X1.2 → 3.
Switch on the power switch.
Connect X12.6 to GNDA. The power supply switches on.

c) **Measurement and adjustment:**

- Measure the voltage at X4.1 ..... 6.25 V ± 0.25 V

- Apply a variable voltage between 9.5 V and 10.5 V to X12.3.
Use R73 to adjust the monitoring window such that the switching thresholds are symmetrical to + 10 V at X12.3.
If the voltage is within the window the LED 37 on the rear panel lights up.
Lower error limit ..... 9.67 V ± 50mV
Upper error limit ..... 10.34 V ± 50 mV

- Switch off the power supply and plug in X12 and X13 again.
Plug shorting jumper onto X5.1 → 2.
Plug shorting jumper onto X1.1 → 2.

- Switch on the power switch and the ON/STANDBY switch.
The LED 37 lights up.

7.5 Final Test

- Switch on the power switch 25.

Raw voltage at X10.1 with 220 V ±2V
at mains input ..... 33 V ± 2 V

- Switch on the ON/STANDBY switch 9.

The "Supply ok" LED on the rear panel lights up.

Voltage at X3.2 to X3.1 ..... 5.35 V ± 0.2 V
Voltage at X3.6 to X3.9 ..... 13.7 V ± 0.3 V
Voltage at X3.8 to X3.9 ..... 13.7 V ± 0.3 V
Voltage at X3.5 to X3.9 ..... + 10 V ± 50 mV
Voltage at X3.4 to X3.9 ..... -10 V ± 50 mV
Voltage at X2.5 to X3.10 ..... + 28 V ± 0.1 V

- Short-circuit X3.2 to X3.1.
  The power supply switches off after 1 to 2 sec. and remains switched off.

- Remove the short-circuit.
  The power supply remains switched off.

- Switch the ON/STANDBY switch off and then on again.
  The "Supply ok" LED 37 on the rear panel lights up.
  Short-circuit X3.5 to X3.10.
  The power supply switches off after 1 to 2 sec. and remains switched off.

- Remove the short-circuit.
  The power supply remains switched off.

- Disconnect the rear panel from the mains.
  Switch off the ON/STANDBY switch.

- Apply + 24 V to X32 (ext. batt.).
  Switch on the ON/STANDBY switch.
  The "Supply ok" LED must light up.

7.6 Removal and Installation

- Remove upper and lower cover (cf. Section 4).

- Disconnect the RF cables to the rear from the modules.

- Unscrew seven outer Philips screws on the rear panel.

- Carefully swing out the rear panel to the rear.

- For complete removal, unlock the two connectors to the motherboard and disconnect the connectors X2 and X3.
  Subsequently, separate the two flat-cable connectors to the CPU board by disconnecting the connectors X221 and X222.

- Unscrew the cover of the rear panel.

- When removing or installing the switching power supply panel or the analog power supply panel, be careful not to damage the heat-conducting foil below the power semiconductors.

7.7 External Interfaces

Pin	Name	Input/ Output	Range of values	Signal description
X2.1	ON*	I	0 ... 33 V	On/standby switch
X2.2	NTC2			NTC on motherboard
X2.3	+ 10 VS		+ 10 V ± 10 mV	Sense on motherboard
X2.4	- 10 VS	I	- 10 V ± 10 mV	Sense on motherboard
X2.5	+ 28 V	O	+ 28 V ± 100 mV max. 50 mA	
X2.6	STDBY	O	0 ... 5 V	Standby LED on Display Board
X2.7	INT. SUPPLY	O	0 ... 5 V	High when powered by int. battery
X2.8	RES*	O	HCT	Reset for CPU
X2.10	NTC2	I		NTC on motherboard
X3.1	GNDD			Digital ground
X3.2	+ 5 VD	O	+ 5.35 V ± 0.2 V max. 4 A	
X3.3	+ 5 VD	O	+ 5.35 V ± 0.2 V	
X3.4	- 10 V	O	- 10 V ± 50 mV max. 1.5 A	
X3.5	+ 10 V	O	+ 10 V ± 50 mV max. 2 A	
X3.6	+ 12 V	O	10.8 ... 15.5 V	max. 4 A
X3.7	+ 5 VA	O	+ 5.35 V ± 0.2 V	
X3.8	INT. BATT.	B	10.8 V ... 14.9 V	Connection for int. battery
X3.9	GNDA			Analog ground
X3.10	GNDA			Analog ground

ROHDE&SCHWARZ

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

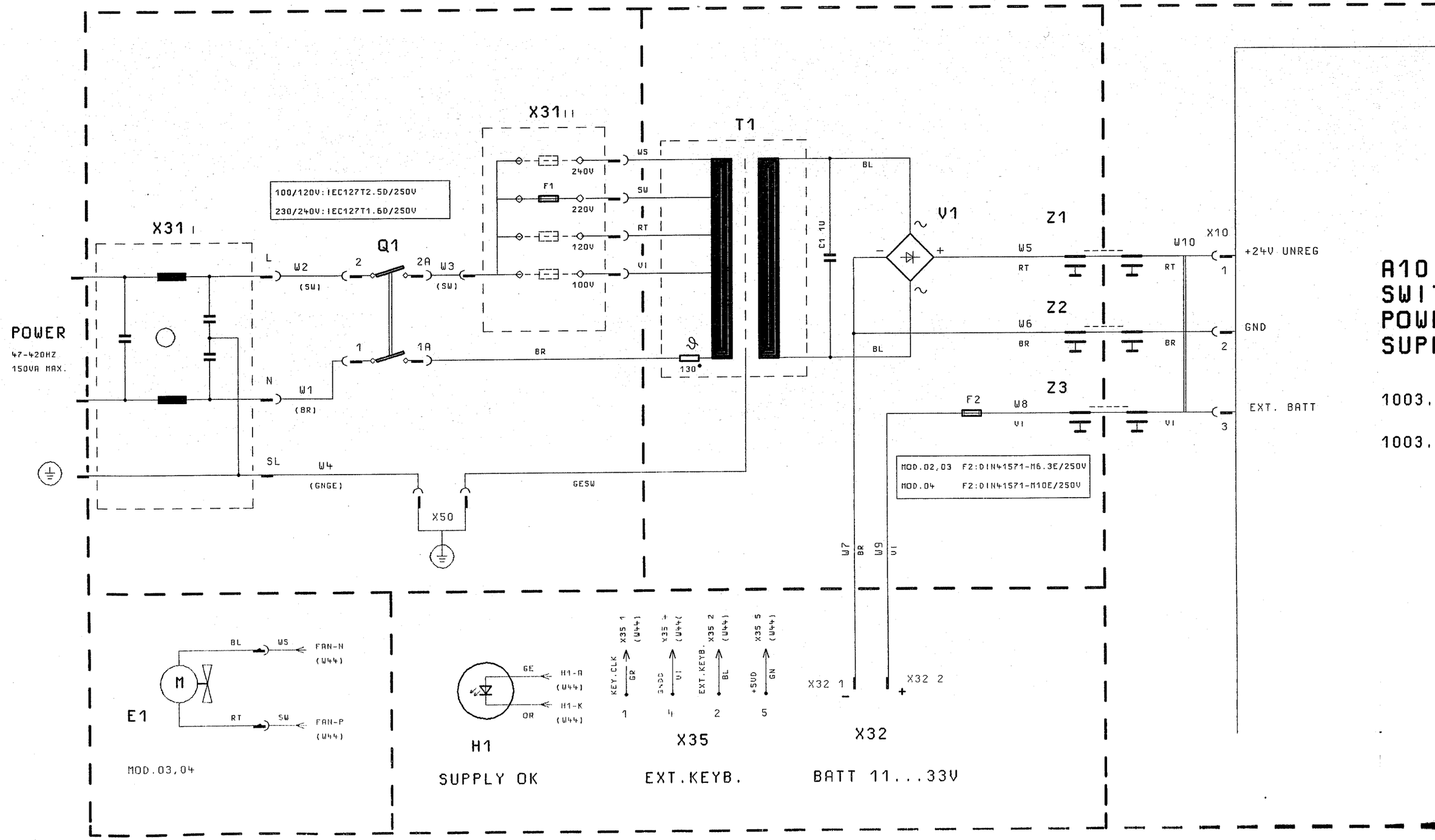
(R 29500 Bl. 2)
095.1000 Bl. 2

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = 5V4A MOD 02 = 5V4A VAR 03 = 5V4A MIT LUEFTER MOD 03 = 5V4A INCL.FAN VAR 04 = 5V6A MIT LUEFTER MOD 04 = 5V6A INCL.FAN				
..	ZUGEH.STROML./CIRC.DIAGR. 1002.9753 S				
A10	ED SWITCHING POWER SUPPLY SWITCHING POWER SUPPLY NUR VAR/ONLY MOD: 02 03 HIERZU STROML. 1003.7702 S SEE CIRC.DIAGR.1003.7702 S	1003.7702.02			
A10	ED SWITCHING POWER SUPPLY NUR VAR/ONLY MOD: 04 HIERZU STROML. 1003.7702 S SEE CIRC.DIAGR.1003.7702 S	1003.7702.03			
A15	EE SPS FILTER BOARD SPS FILTER BOARD HIERZU STROML. 1003.8009 S SEE CIRC.DIAGR.1003.8009 S	1003.8009.02			
A20	ED ANALOG POWER SUPPLY ANALOG POWER SUPPLY HIERZU STROML. 1003.8109 S SEE CIRC.DIAGR.1003.8109 S	1003.8109.02			
C1	CK 1UF+-5% 50V RD5,5H11,5 CAPACITOR	CK 099.2998	WIMA	MKS2/50/1UF/5%	
E1	ZE LUEFTER FAN NUR VAR/ONLY MOD: 03 04	1003.0066			
F1	SS SCHMELZ.T1,6IEC127-2/V FUSE FUER/FOR 220/240V FUER/FOR 100/120V SS SCHMELZS,T2,5D DIN41571 SS 0020.7575	SS 020.7500	WICKMANN	T1.6 NR.19181	
F2	SS SCHMELZS.M6,3EDIN41571 FUSE NUR VAR/ONLY MOD: 02 03	SS 020.7623	WICKMANN	DIN 41571....(TROP)	
F2	SS SCHMELZS.M10E DIN41571 FUSE NUR VAR/ONLY MOD: 04	SS 456.6114	WICKMANN	M10EDIN 41571TROP	
H1	AF HLMP4740 LED5 GN569N LED	AF 007.5266	HP	HLMP4740	
Q1	SK WIPPSCH.2POL.AUS SW SWITCH	SK 553.2925	MARQUARDT	1802.1102	
T1	LT RINGKERNTRAFO TRANSFORMER	1003.0050			
V10	AG 26MB10A 100V19A0 BRGL RECTIFIER	AG 475.0724	INT.RECT.	26MB10A	
W1	DX KABEL W1 CABLE W1	1002.9776			1002.9760
W2	DX KABEL W2 CABLE W2	1002.9782			1002.9760
W3	DX KABEL W3 CABLE W3	1002.9799			1002.9760
W4	DX KABEL W4 CABLE W4	1002.9801			1002.9760
W5	DX KABEL W5 CABLE W5	1002.9818			1002.9760
W6	DX KABELEINHEIT W6-W7 CABLE UNIT W6-W7	1002.9824			1002.9760
W7	DX KABELEINHEIT W6-W7 CABLE UNIT W6-W7	1002.9824			1002.9760
W8	DX KABEL W8 CABLE W8	1002.9830			1002.9760
W9	DX KABEL W9 CABLE W9	1002.9847			1002.9760

Für diese Unterlage behalten wir uns alle Rechte vor

Kennz. Comp.No.	Benennung Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bezeichnung Designation	enthalten in contained in
W10	DX KABEL W10 CABLE W10	1002.9853			1002.9760
W11	DX KABEL W11 CABLE W11	1002.9860			1002.9760
W12	DX KABEL W12 CABLE W12	1002.9876			1002.9760
W43	DX KABEL W43 CABLE W43	1002.9882			1002.9760
W44	DX KABEL W44 CABLE W44	1002.9899			1002.9760
W45	ED FILTER BOARD FILTER BOARD	1003.0120.02			
W46	DX KABEL W46 CABLE W46	1002.9918			1002.9760
X31	FN NETZFILT.M.SPANNUNGSW. FILTER	FN 099.3313	HEGNER&GLA	HGN369-2	
X32	FO EINBAUSTECKER 3POL. 3-PIN CONNECTOR	591.2006	BINDER	09-0257-00-03	
X35	FO EINBAUBUCHSE 5POL. PANEL SOCKET	082.7633	BINDER	680 09-0320-00-05	
X50	FV FLACHSTECKER GR 6,3 CONNECTOR	FV 543.6705	AMP	141878-2	
Z1	LD PI-FIL.45DB/10MHZ 10A PI-FILTER	332.4104	OXLEY	FLT5/P/26000	
Z2	LD PI-FIL.45DB/10MHZ 10A PI-FILTER	332.4104	OXLEY	FLT5/P/26000	
Z3	LD FILTER 15A 100VDC FILTER	493.9494	ERIE	9050-000-0000	
Z4 ..7	LD PI-FIL.45DB/10MHZ 10A PI-FILTER	332.4104	OXLEY	FLT5/P/26000	- ENDE -

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



CIRCUIT DIAGRAMM IS VALID FOR:

MOD 02 - 5V4A
MOD 03 - 5V4A INCL. FAN
MOD 04 - 5V6A INCL. FAN

A10 SWITCHING POWER SUPPLY

1003.7702.02 MOD.02,03

1003.7702.03 MOD.04

X10 W10

+24V UNREG — 1 — RT

GND — 2 — BR

EXT. BATT — 3 — VI

INT.SUPPLY
NTC 1
POWER FAIL *
ON *
RES *
NTC 2
STDBY
+31V
+31V

X30 — 9 8 7 6 5 4 3 2 1

A15 SPS FILTER BOARD

1003.8009.02

W23 — 1 3 4 2 5 7 6 9 10 — X23

INT.SUPPLY
NTC 1
POWER FAIL *
ON *
RES *
NTC 2
STDBY
+31V
+31V

X20 W11 Z4 W12 X22

INT. BATT — 1 — VI — RT — 2
+12V — 2 — VI — Z5 — 3
-11V — 3 — BL — Z6 — 1
+5.4V — 4 — GR — Z7 — 4

A20 ANALOG POWER SUPPLY

1003.8109.02

X12 W44

ON * — 1
NTC 1 — 2
+10VS — 3
-10VS — 4
+28V — 5
STDBY — 6
INT.SUPPLY — 7
RES * — 8
NTC 2 — 10
H1-K — 13
H1-A — 14

X35 5
X35 2
X35 4
X35 1
TO X35

FAN-N
FAN-P
TO E1

X13 W43

INT. BATT — +5VA — 1
+12V — +5VD — 2
-11V — +5VD — 3
+5.4V — -10V — 4
+12V — 5
+10V — 6
INT. BATT — 7
GNDD — 8
GNDA — 9
GNDA — 10

03/00	[illegible] (3)	08.92	RB	1ESK	TAG	NAML
				BEARB.		RB
				GEPR.		RB
				NORM		
				PLOTT	19.08.92	
02/00	[illegible] (9)	06.90	RB	ROHDE&SCHWARZ		
AEND. IND.	AENDERUNGS-BEZEICHNUNG	DATUM	NAME	ZU GERAET	ESHS30	

D
ITCHING
WER
PPLY

3.7702.02 MOD.02,03

3.7702.03 MOD.04

INT.SUPPLY
NTC 1
POWER FAIL *
ON *
RES *
NTC 2
STDBY
+31V
+31V

X30 9 8 7 6 5 4 3 2 1

A15
SPS FILTER BOARD
1003.8009.02

W23

1 3 4 2 5 7 6 9 10

INT.SUPPLY
NTC 1
POWER FAIL *
ON *
RES *
NTC 2
STDBY
+31V
+31V

X23

INT. BATT
+12V
-11V
+5.4V

X20 W11 Z4 Z5 Z6 Z7 W12 X22

1 RT — RT 2 INT. BATT
2 VI — VI 3 +12V
3 BL — BL 1 -11V
4 GR — GR 4 +5.4V

A20
ANALOG
POWER
SUPPLY
1003.8109.02

X12 W44 X2

ON * 1 — 1
NTC 1 2 — 2
+10VS 3 — 3
-10VS 4 — 4
+28V 5 — 5
STDBY 6 — 6
INT.SUPPLY 7 — 7
RES * 8 — 8
NTC 2 10 — 10
H1-K 13 — OR — 13 — H1-K
H1-A 14 — GE — 14 — H1-A

TO MOTHERBOARD
TO H1

X35 5 — GN — 15 — +5VD
X35 2 — BL — 16 — EXT.KEYB.
X35 4 — VI — 17 — GNDD
X35 1 — GR — 18 — KEY.CLK
FAN-N — WS — 19 — GNDA
FAN-P — SW — 20 — FAN

TO X35
TO E1
FROM MOTHERBOARD

X13 W43

+5VA 1 — OR — 7
+5VD 2 — GR — 2
+5VD 3 — GR — 3
-10V 4 — BL — 4
+12V 5 — VI — 6
+10V 6 — WS — 5
INT. BATT 7 — RT — 8
GNDD 8 — SW — 1
GNDA 9 — BR — 9
GNDA 10 — BR — 10

TO MOTHERBOARD

X3

03/00	3.7526 (3)	08.92	RB	TESK	TAG	NAME	BENENNUNG
				BEARB.		RB	REAR PANEL
				GEPR.		RB	
				NORM			
				PLOTT	19.08.92		
02/00	3.7526 (2)	06.90	RB	ROHDE&SCHWARZ			ZEICHN. NR. 1002.9753.01S
AEND. IND.	AENDERUNGS BEZEICHNUNG	DATUM	NAME				BLATT NR. 1

F E D C B

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

NTC
X30.4
X30.8
INT.BATT
X20.1
+12V
X20.2
ON *
X30.6
INT
K1
K3
+12V
V51
L51
V60
V52
C55
V55
N2-A
CURR. LIM. +12V
SWITCHING REG. +12V
E
INT.
N
V112
V113
V119
K3
V114
V123
V115
+12V
SWITCH ON
+10V REL
+5V REL
V124
V127
V128
N111
RELAY POWER SUPPLY
N
UE
X10.1
F10
V5
R3
X19
+24V
UNREG
C5
K4
K2
V3
K5
X10.3
EXT.BATT
E
SWITCHING REG. -11V/+31V
V74
V110
V75
T1
C77
C79
INH
SWITCHING REG. +5.4V
V90
V100
R88
L90
V94
C90
INH2
V96
N2-C
CURR. LIM. 5.4V
RES *
TH.N
INT.
N
E
N130-A
N130-B
U REF
U REF
TH.INT.
N140-A
N130-C
UE
U REF
U REF
TH.EXT.
N140-B
U REF
SOURCE
VOLTAGE
MONITORING
TH.UE<15V
TH.UE-10V
TH.
TH.
TH.
TH.UE<
OP
TH.UE
DE
+5.4V
X20.4
+31V
X30.1/2
-11V
X20.3
03
AEND.
IND.

ZEICHN.-NR. 1003.7702.01S

INT.BATT
X20.1

+12V
X20.2

ON *
X30.6

X30.9
INT.SUPPLY

INT

K1

K3

+12V

E

INT.

N

V112

V113

V119

K3

V114

V123

V115

+12V

SWITCH ON

+10V REL

+5V REL

V124

V127

V128

N111

RELAY POWER SUPPLY

INH1

INH2

V181

K1

+10VREL

V183

K2

+10VREL

V185

K3

+10VREL

V193

K4

+5VREL

K5

V195

+5VREL

RELAY INTERFACE

TH.N

TH.E

TH.INT

TH.UE < 15V

OP *

TH.UE-10V

DE *

RELAY CONTROL LOGIC

SWITCHING REG. -11V/+31V

V74

V110

V75

T1

C77

C79

INH

N

E

TH.N

INT.

N130-A

N130-B

TH.INT.

U REF

U REF

N140-A

N130-C

UE

TH.EXT.

U REF

U REF

N140-B

U REF

SOURCE
VOLTAGE
MONITORING

TH.UE<15V

TH.UE-10V

RES *

FAULT
SHUTDOWN

DE *

X30.3
STDBY

X30.7
POWER FAIL

					TAG	NAME
03				BEARB.	09.89	RB
				GEPR.		RB
				NORM		
				PLOTT	28. 3.91	*
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG

SWITCHING POWER SUPPLY

ROHDE&SCHWARZ

ZU GERAET ESHS 30

ZEICHN.-NR. 1003.7702.01S

BLATT-NR. 1

V. 4 BL.

REG.I.V. 1002.9001 ERSTE Z. 1002.9753

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X50 X19 R62 CUR. LIM. 12V X80

NTC 1
X30 8

NTC 2
X30 4

INT BATT
X20 1

SYNC

X50

V61
BZX79 C2V7

* C68
100N L

* C60 1U

INT.
SHEET3 E/3

K1-C K1-B

K3-

* R69
3K32 L

L49
25UH 3A

L51
100U

L52
25UH 3A

V51
L296

* V60
USD 845

* R63
10K L

* R64
20K L

R67
10R L

R61 * 825K L
** OR L

* C61
1N L

CURR.
LIM.
REF.

* R56
4K75 L

* R57
4K75 L

C62
1U 40V

* R62 100K

N2-A
LM224D-L

CUR. LIM
12V

* R65
10K L

* R66
20K L

R60
* 825K L
** OR L

* R54 10K L

V52
USD 845

** 6K81 .1%
* 17K8

C55
470U 63V

* 18K4 .1%

V56 MCR 69

C56
470U 63V

* V55
BC850B-L

* C57
22N L

* V57 BAS32-L

C49
220U 63V

C51
220U 63V

R52
15K L

C52
470P L

C53
33N L

C54
4U7 25V TA

C50
1N L

R53
** 4K87 .1%
* 8K25 .1%

INH1
SHEET4 D/5

GND 4

GND 1

GND 6

SWITCHING REGULATOR +12V

K2-B

K2-E

K2-C

V3 BYS27-45

R10 /V179
SHEET4 E/5

K2-D

R10 10K L

X19

+24V
UNREG.

C11
1U

F10

V5
USD 845

R3 6R8 2.4W

* F10:DIN41571-M6.3E/250V
** F10:DIN41571-M10E/250V

K4-B

K4-C

X10 1

C5
10NF 50V

GND

GND 4

X10 2

GND 5

K5-B K5-C

X10 3

EXT BATT

C10
1U

N
SHEET3 E/4

UE
SHEET3 C/10

E
SHEET3 E/3

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

N2-B
LM224D-L

N2-D
LM224D-L

L80
* 25U/3A
** 63U/6.3A

X80

SYNC

V100
L296

C83 2N2 L

R81
4K75 L

R83 15K L

C86 33N L

C85 680P L

C87 2U2 25U TA L

C88 2U2 25U TA L

C80
220U 63V

C81
470U 63V

INH2
SHEET4 D/12

GND

RES*
SHEET4 D/12

ZEICHN -NR 1003 7702 013

R62 CUR. LIM. 12V

X80

X81

R91 CUR. LIM. 5.4V

NTC 2
X30 4

INT BATT
X20 1

* C68 100N L

* R69 3K32 L

* V60 USD 845

R61 * 825K L
** DR L

* C61 1N L

C62 1U 40V

* R62 100K

CUR. LIM 12V

N2-A LM224D-L

* C60 1U

INT.
SHEET3 E/3

* K1-C
* K1-B
* K1-E

K3-E
K3-B
K3-C

+12V

SWITCHING REGULATOR -11/+32V

SYNC

L70 25UH 3A

V74 USD 845

V75 BYS21-90

C72 1N L

V110 L296

R70 20K L

R75 56K2 L

C70 220U 63V

C71 220U 63V

V70 BZX79C2V7

R71 15K L

C73 33N L

C74 4U7 25V TA L

R72 10K L

R73 5K62 L

R74 4K75 L

T1

GND 4

V110.6/R183
SHEET4 C/8

** V90 BUX 10P

X81

SWITCHING REGULATOR +5.4V

L80
* 25U/3A
** 63U/6.3A

X80

SYNC

C83 2N2 L

R81 4K75 L

V100 L296

** R88 1R5 1W

L90 * 100U/5A ** 100U/8A

L91 * 25U/3A ** 63U/6.3A

CURR. LIM. REF.

** R90 2K74 L

** C95 1U

** R94 47K5 L

R100 10K L

C91 470U 63V

V101 MCR 69

R95 2K L

** R91 200K CUR. LIM. 5.4V

** R92 100K L

** R97 10K L

** R98 10K L

C94 47N L

R99 200K L

5.1V

N2-C LM224D-L

V99 1N4689

GND 6

C80 220U 63V

C81 470U 63V

C86 33N L

R83 15K L

C85 680P L

C87 2U2 25V TA L

C88 2U2 25V TA L

R86 10K L

INH2
SHEET4 D/7

R65 681R L

R67 150R L

V94 USD 845

C90 1000U 25V

** V96 BC8508 L

** R93 33K2 L

** R96 10K L

GND 2

RES*
SHEET4 D/12

N2-D LM224D-L

CIRCUIT D

* MOD 02 - 4V

** MOD 03 - 4V

03	46342	04.
AEND. IND.	AENDERUNGS MITTEILUNG	DATU

X81

R91 CUR. LIM. 5.4V

ATT

K1-B

K1-E

K3-E

K3-B

K3-C

+12V

SWITCHING REGULATOR -11/+32V

SYNC

L70 25UH 3A

C72 1N L

V110 L296

R70 20K L

R75 56K2 L

V70 BZX79C2V7

C70 220U 63V

C71 220U 63V

GND 4

R71 15K L

C73 33N L

C74 4U7 25V TA L

R72 10K L

R73 5K62 L

R74 4K75 L

V110.6/R183

SHEET4 C/8

V74 USD 845

V75 BYS21-90

T1

L77 25UH 3A

C77 470U 63V

C78 470U 63V

L79 50UH 0.3A

C79 22U 63V

C82 22U 63V

C23 1U

C25 1U

C26 1U

X20 2 +12V

X20 3 -11V

X30 1 +31V

X30 2

GND 1

GND 2 GND 5 GND 6

SWITCHING REGULATOR +5.4V

** V90 BUX 10P

X81

L90 * 100U/5A ** 100U/8A

L91 * 25U/3A ** 63U/6.3A

** R88 1R5 1W

** R90 2K74 L

** C95 1U

** C94 47N L

** R97 10K L

** R98 10K L

** R91 200K CUR. LIM. 5.4V

** R92 100K L

CURR. LIM. REF.

** R94 47K5 L

R99 200K L

5.1V

R100 10K L

C91 470U 63V

R95 2K L

V101 MCR 69

R85 681R L

R87 150R L

V94 USD 845

C90 1000U 25V

** V96 BC850B-L

** R93 33K2 L

** R96 10K L

GND 6

C24 1U

X20 4 +5.4V

R27 10K L

C27 100N L

X30 5 RES*

CIRCUIT DIAGRAMM IS VALID FOR

* MOD 02 - 5V4A MODEL

** MOD 03 - 5V6A MODEL

03	46342	04.91	RB		TAG	NAME
				BEARB.	09.89	RB
				GEPR.		RB
				NORM		
				PLOTT	28. 3.91	*
ÄEND. IND.	ÄENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ		

BENENNUNG: SWITCHING POWER SUPPLY

ZEICHN.-NR.: 1003.7702.019

ZU GERÄT: [illegible] 30

ERS.V. 1002.9001

BLATT 2

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X18B 3

X18B 4

R130
+5V REL. ADJ

E
SHEET2 A/3

INT.
SHEET2 E/8

N
SHEET2 A/1

V112
BYS21-90

* V113
BYS21-90

V117
BAS32-L

V119
BZT03 12

K3-D

R111
68K1 L

R113
475K L

V114
BYS21-90

V123
BCX17-L

R112
332R L

V111
BSS123

V115
BYS21-90

+5VREL

+12V

R115
200R L

R116
20K L

V120
1N4690

V121
BAS32-L

OP*
SHEET4 B/1

X30 6
ON*

R117
100K L

R114
10K L

V122
BF420

N111-B
LM224D-L

R119
100K L

R118
100K L

+5VREL

R120
100K L

SWITCH-ON

+10VREL

X18B 3

X18B 4

C115
2U2 40V

V124
BC327-40

R121
1K L

C124
4U7 25V

R124
10K L

N111-A
LM224D-L

+5VREL

V126
BC850B-L

R123
475R L

C125
1U 40V

R122
432R L

R125
10K L

V125
BAS32-L

R142
10K L

V127
BDX77

R126
221R L

N111-C
LM224D-L

V128
ICL8069DCQ

R128
18K2 L

R129
100K L

R130
10K
5V REL. ADJ.

RELAY POWER SUPPLY

N111-D
LM224D-L

N130-D
LM339D-L

N140
LM3[illegible]

CIRCUIT DIAGRAMM IS VALID FOR

* MOD 02 - 5V4A MODEL

** MOD 03 - 5V6A MODEL

X18B 4

R130
+5V REL. ADJ

X18B 5

+10VREL

+5VREL

X18B 4

R142
10K L

V127
BDX77

X18B 5

C124
4U7 25V

R124
10K L

R125
10K L

R126
221R L

N111-C
LM224D-L

V128
ICL8069DCQ

R127
33K2 L

C127
4U7 25V

+5VREL

R128
18K2 L

R129
100K L

R130
10K
5V REL. ADJ.

RELAY POWER SUPPLY

N
SHEET2 A/1

TH.N
SHEET4 E/2

E
SHEET2 A/3

INT.
SHEET2 E/8

+5VREL

+10VREL

R133
10K L

R131
3K32

N130-A
LM339D-L

R132
2K21 L

R149
100K L

+10VREL

R160
475K L

N150-A
TL072ACD-L

R163
18K2 L

R161
475K L

R154
100K L

C164
100N L

+10VREL

+12V

R134
10K L

C134
220N L

V134
BYS21-90

R135
100K L

N140-A
LM339D-L

R136
100K L

R137
75K L

+5VREL

UE
SHEET2 A/2

R138
1M L

R139
10K L

R140
274K L

R141
130K L

N140-B
LM339D-L

N150-B
TL072ACD-L

R145
27K4 L

R157
100K L

R150
47K5 L

R152
10K L

R153
15K L

V150
1N4448

R146
9K09 L

R151
113K

C152
22N L

R154
10K

SOUR

TH.UE-15V
SHEET4 C/2

TH.UE-10V
SHEET4 B/2

N111-D
LM224D-L

N130-D
LM339D-L

N140-D
LM339D-L

N140-C
LM339D-L

ACHTUNG: ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
02	43540	11.89	RB
03	46342	04.91	RB

BEARB. 09
GEPR.
NORM
PLOTT 28.

ROHDE
ZU GERAET

X18B 5

+5VREL

X18B 5

C127
4U7 25V

R127
33K2 L

N
SHEET2 A/1

TH.N
SHEET4 E/2

E
SHEET2 A/3

INT.
SHEET2 E/8

+5VREL

+10VREL

R133
10K L

R131
3K32

N130-A
LM339D-L

R132
2K21 L

R149
100K L

+10VREL

R160
475K L

N150-A
TL072ACD-L

R161
475K L

R163
18K2 L

+5VREL

+10VREL

+5VREL

N130-B
LM339D-L

R167
10K L

R168
100K L

R165
10K L

V167
BAS32-L

TH.INT.
SHEET4 D/2

R164
100K L

C164
100N L

V166
BAS32-L

R166
121K L

+10VREL

N140-A
LM339D-L

+12V

R134
10K L

C134
220N L

R135
100K L

V134
BYS21-90

R136
100K L

R137
75K L

UE
SHEET2 A/2

+5VREL

R138
1M L

R139
10K L

R140
274K L

R141
130K L

N140-B
LM339D-L

+5VREL

+5VREL

N150-B
TL072ACD-L

R153
15K L

N130-C
LM339D-L

R156
47K5 L

R145
27K4 L

R157
100K L

R150
47K5 L

R152
10K L

TH.E
SHEET4 E/2

V150
1N4448

R146
9K09 L

R151
113K

C152
22N L

R154
10K L

R155
1M L

SOURCE VOLTAGE MONITORING

TH.UE-15V
SHEET4 C/2

TH.UE-10V
SHEET4 B/2

N140-C
LM339D-L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
02	43540	11.89	RB
03	46342	04.91	RB

	TAG	NAME
BEARB.	09.89	RB
GEPR.		RB
NORM		
PLOTT	28. 3.91	*

ROHDE&SCHWARZ
ZU GERAET ESHS 30

BENENNUNG
SWITCHING POWER SUPPLY

ZEICHN.-NR. 1003.7702.01S
BLATT-NR. 3 V. 4 BL.
REG.I.V. 1002.9001 ERSTE Z. 1002.9753

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

INT. SUPPLY
X30 9

X18B 1

INH1
SHEET2 D/3

X18B 2

INH2
SHEET2 B/9

V179/ R10
SHEET2 B/4

TH.N
SHEET3 E/12

D170-A
74HCT14T-L

D171-B
74HCT20T-L

D170-E
74HCT14T-L

D172-A
74HCT32T-L

V179
BAS32-L

R179 475K L

+5VREL

D172-B
74HCT32T-L

TH.E
SHEET3 C/16

D170-C
74HCT14T-L

D175-A
74HCT11T-L

D180-D
74HCT132T-L

X18B 1

X18B 2

+5VREL

D180-B
74HCT132T-L

R182
100K L

D180-C
74HCT132T-L

R181
47K5 L

V180
BC860B-L

R183
4K75 L

TH.INT.
SHEET3 E/16

D170-B
74HCT14T-L

D171-A
74HCT20T-L

D170-F
74HCT14T-L

D178-B
74HCT08T-L

R184
100K L

D180-A
74HCT132T-L

C184
4U7 10V TA L

DE*

D175-B
74HCT11T-L

V170 BAS32-L

D176-A
74HCT14T-L

R170
121K L

C170
220N L

D176-B
74HCT14T-L

TH.UE-15V
SHEET3 C/12

D170-D
74HCT14T-L

OP*
SHEET3 C/4

+5VREL

R171
681K L

D176-C
74HCT14T-L

C171
220N L

D176-D
74HCT14T-L

D170.8/ R191
SHEET4 F/5

TH.UE-10V
SHEET3 D/12

D178-C
74HCT08T-L

D172-D
74HCT32T-L

D175-C
74HCT11T-L

R174
475K L

C174
470N L

D176-E
74HCT14T-L

D176-F
74HCT14T-L

D178-A
74HCT08T-L

DE*

RELAY CONTROL LOGIC

X30 3
STDBY

R183/ V110.6
SHEET2 D/12

X18B 2

INH2

SHEET2 B/9

X18B 2

D180-C
74HCT132T-L

R182
100K L

R181
47K5 L

V180
BC860B-L

+5VREL

R183
4K75 L

R184
100K L

D180-A
74HCT132T-L

C184
4U7 10V TA L

D172-D
74HCT132T-L

MIN 1
MINAY

MIN1/ V110.6

X18A1-5

X18A 1

V181
* BC850B-L

* K1-A

+10VREL

* R180
4K75 L

* H10
HLMP1719

K1

* R177
1K L

* V182
BAS32-L

X18A 2

V183
BC850B-L

K2-A

+10VREL

R173
4K75 L

H20
HLMP1719

K2

R193
1K L

V184
BAS32-L

X18A 3

V185
BC850B-L

K3-A

+10VREL

R186
4K75 L

H30
HLMP1790

K3

R187
1K L

V186
BAS32-L

X18A 4

V193
BSR13-L

K4-A

+5VREL

R190
4K75 L

H40
HLMP1790

K4

R192
1K L

V191
BAS32-L

X18A 5

V195
BSR13-L

K5-A

+5VREL

R196
4K75 L

H50
HLMP1719

K5

R197
1K L

V196
BAS32 L

RELAY INTERFACE

POWER FAIL *

X30 7

R178
475K L

+5VREL

R191
100K L

C190
100N L

D185-A
74HCT221T-L

X185 1
X185 2
X185 3

D178-D
74HCT08T-L

RES*

SHEET2 A/8

+5VREL

+5VREL

C185
1U L

D185-B
74HCT221T-L

R185
2M2 L

+5VREL

D170-G
74HCT14T-L

D171-C
74HCT20T-L

D172-E
74HCT32T-L

D175-D
74HCT11T

D172-C
74HCT132T-L

D178-E
74HCT08T-L

D180-E
74HCT132T-L

D185-C
74HCT221T-L

+5VREL

CIRCUIT DIAGRAMM IS VALID FOR

* MOD 02 -5V4A MODEL
** MOD 03 - 5V6A MODEL

ACHTUNG! EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATICALLY SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

					TAG	NAME
03	46342	04.91	RB	BEARB.	09.89	RB
				GEPR.		RB
				NORM		
				PLOTT	28. 3.91	*
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ		
				ZU GERRET	ESHS 30	

X18A1-5

X18A 1

V181
* BC850B-L

* K1-A

+10VREL

* H10
HLMP1719

* R180
4K75 L

K1

* R177
1K L

* V182
BAS32-L

X18A 2

V183
BC850B-L

K2-A

+10VREL

H20
HLMP1719

R173
4K75 L

K2

R193
1K L

V184
BAS32-L

X18A 3

V185
BC850B-L

K3-A

+10VREL

H30
HLMP1790

R186
4K75 L

K3

R187
1K L

V186
BAS32-L

X18A 4

V193
BSR13-L

K4-A

+5VREL

H40
HLMP1790

R190
4K75 L

K4

R192
1K L

V191
BAS32-L

X18A 5

V195
BSR13-L

K5-A

+5VREL

H50
HLMP1719

R194
4K75 L

K5

R197
1K L

V196
BAS32-L

RELAY INTERFACE

POWER FAIL *

X30 7

R178
475K L

+5VREL

R191 /D170.8
SHEET4 B/3

R191
100K L

V190
BAS32-L

D185-A
74HCT221T-L

C190
100N L

D190-A
74HCT74T-L

DE*

X185 1
X185 2
X185 3

D178-D
74HCT08T-L

RES*
SHEET2 A/8

+5VREL

+5VREL

+5VREL

C185
1U L

D185-B
74HCT221T-L

D190-B
74HCT74T-L

R185
2M2 L

+5VREL

FAULT SHUTDOWN

D172-C
74HCT32T-L

+5VREL

D170-G
74HCT14T-L

D171-C
74HCT20T-L

D172-E
74HCT32T-L

D175-D
74HCT11T-L

C175
100N L

D176-G
74HCT14T-L

D178-E
74HCT08T-L

D180-E
74HCT132T-L

D185-C
74HCT221T-L

+5VREL

C195
4U7 25V

D190-C
74HCT74T-L

CIRCUIT DIAGRAMM IS VALID FOR

* MOD 02 -5V4A MODEL

** MOD 03 - 5V6A MODEL

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

IND.	ÄNDERUNGS MITTEILUNG	DATUM	NAME
03	46342	04.91	RB

	TAG	NAME
BEARB.	09.89	RB
GEPR.		RB
NORM		
PLOTT	28. 3.91	*

ROHDE&SCHWARZ
ZU GERÄT ESHS 30

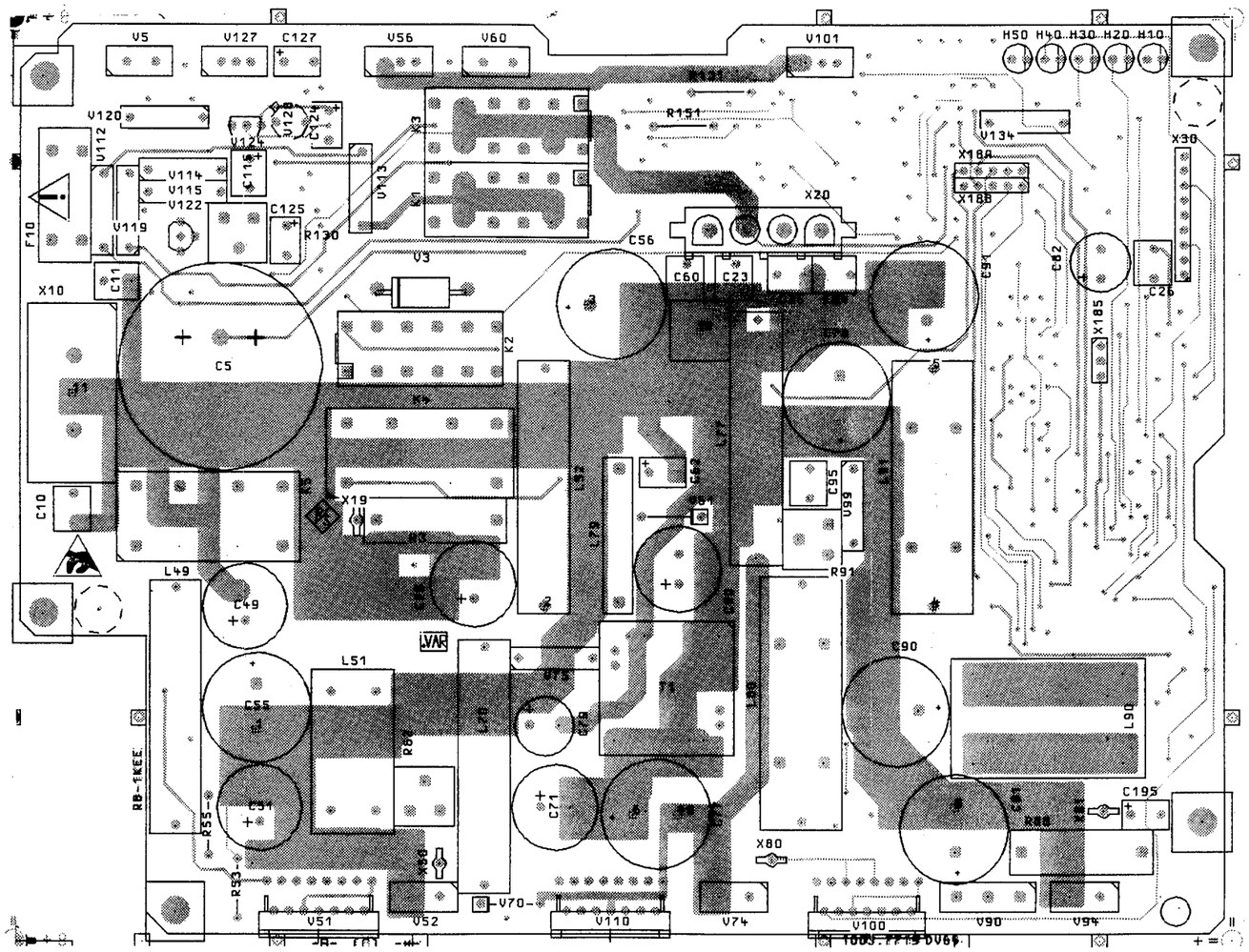
BENENNUNG
SWITCHING POWER SUPPLY

ZEICHN.-NR. 1003.7702.01S

BLATT-NR. 4 v. 4 BL.

MAT.V. 1002.9001 ÄNDR.Z. 1002.9753

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

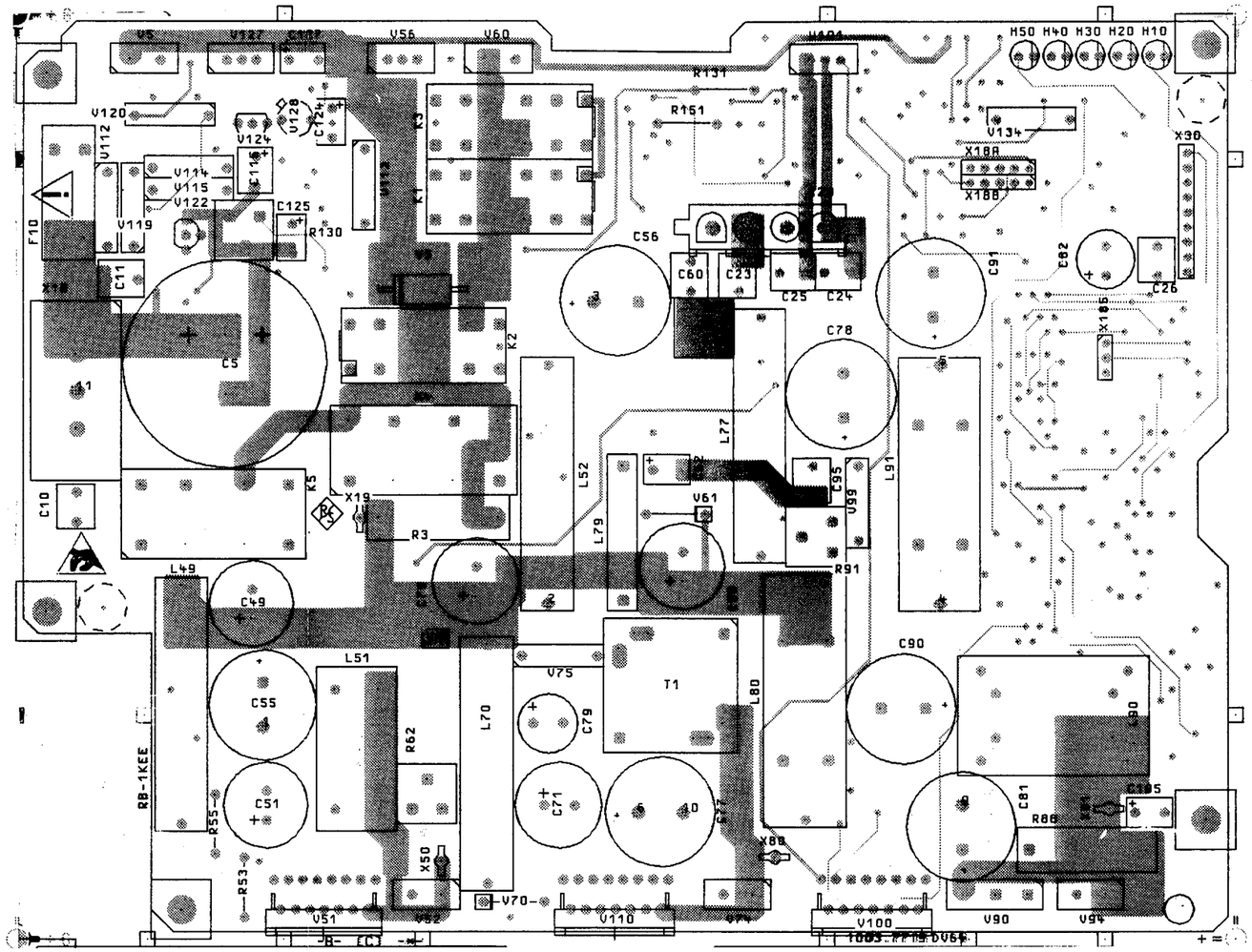


				Maße ohne Toleranzangabe		Maßstab 1:1	
						Halbzeug, Werkstoff	
				1KEE	Tag	Name	Benennung
				Bearb.	09.89	RB	Switching-Power-Supply
				Gepr.			
				Norm			
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE & SCHWARZ		Zeichn.-Nr 1003.7702	Blatt-Nr. 3 v. 6 Bl.
				zu Gerät ESHS 30		reg. i. V. 1002.9001	erste Z. 1002.9753

Für diese Unterlage behalten wir uns alle Rechte vor

Projektion Code E

Ansicht und Leitungsführung Bauteilseite
View of fracks on component side

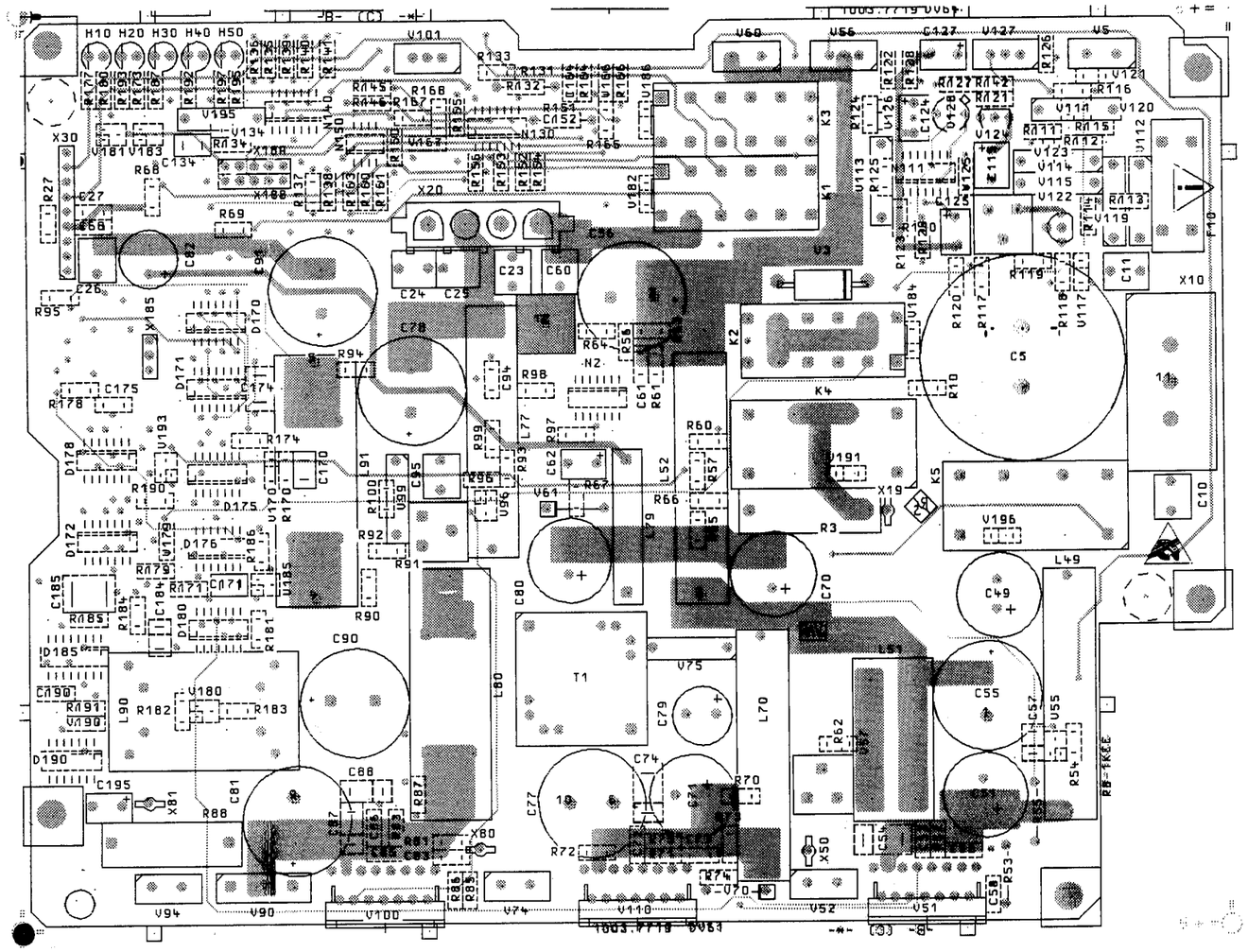


				Maße ohne Toleranzangabe	Maßstab 1:1
					Halbzeug, Werkstoff
				1KEE Tag Name	Benennung
				Bearb. 09.89 RB	Switching-Power-Supply
				Gepr.	
				Norm	
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ	Zeichn.-Nr. 1003.7702 Blatt-Nr. 4 v. 6 Bl.
				zu Gerat ESHS 30	reg. i. V. 1002.9001 erste Z. 1002.9753

Für diese Unterlage behalten wir uns alle Rechte vor

Projektion nach E

Ansicht und Leitungsführung Lötseite
View of tracks on solder side



Für diese Unterlage behalten wir uns alle Rechte vor.

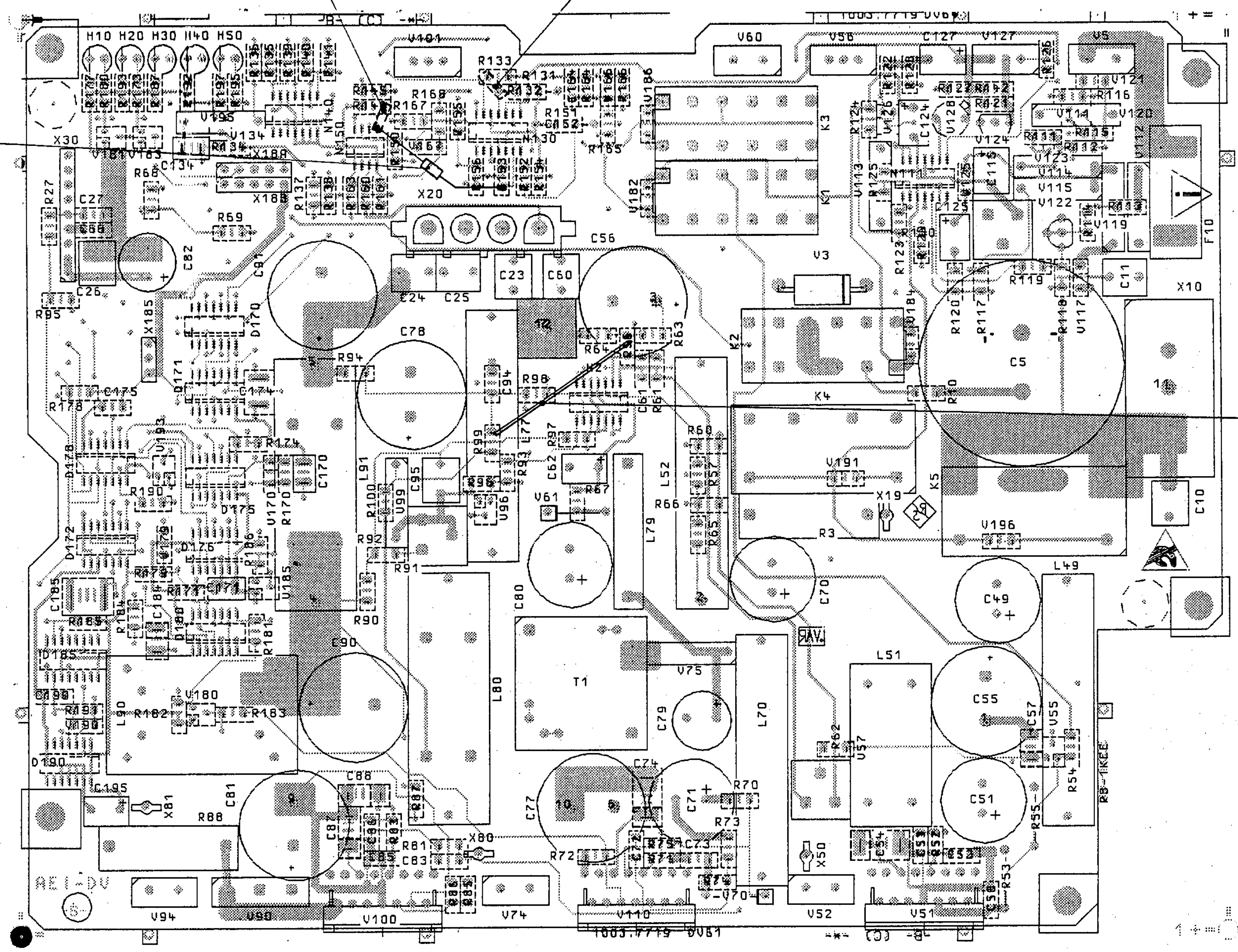
				Maße ohne Toleranzangabe		Maßstab 1:1	
						Halbzeug, Werkstoff	
				1KEE	Tag	Name	Benennung
				Bearb.	09.89	RB	Switching-Power-Supply
				Gepr.			
				Norm			
Änd. Zust	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr. 1003.7702	Blatt-Nr. 5 v. 6 Bl.
				zu Gerät ESHS 30		reg. i. V. 1002.9001	erste Z. 1002.9753

Projektion
Methode E

PF 095.2493-0781

07 6001 81

Ansicht und Leitungsführung Lötseite
View of tracks on solder side



Änd. Zust	Änderungs-Mitteilung	Tag	Name
02	43540	11.89	RB

Maße ohne Toleranzangabe

1KEE	Tag	Name
Bearb.	09.89	RB
Gepr.		
Norm		

Maßstab 1:1

Halbzeug, Werkstoff

Benennung

Switching-Power-Supply

ROHDE&SCHWARZ

zu Gerät ESHS 30

Zeichn.-Nr 1003.7702

reg. i. V. 1002.9001

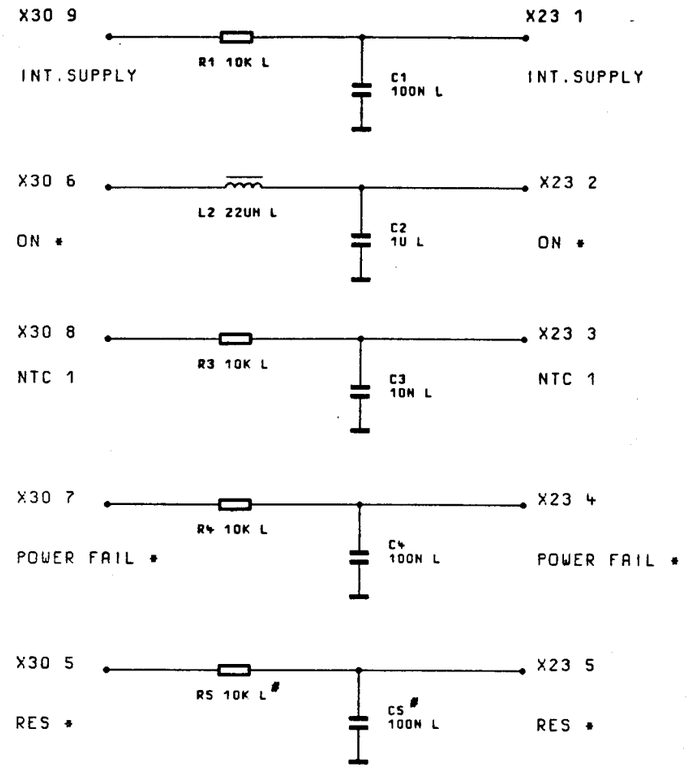
erste Z. 1002.9753

Blatt-Nr 6

v. 6 Bl

Für diese Unterlage behalten wir uns alle Rechte vor.

ISO-Projektion Methode E



\# - NOT FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

04/00	47326 (3)	08.92	RB	1ESK	TAG	NAME	BENENNUNG
				BEARB.		RB	SPS FILTER BOARD
				GEPR.		RB	
				NORM			
				PLOTT	18.08.92		
03/00	47299 (28)	07.92	RB	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.8009.01S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESHS30			REG.I V. 1002.9001 ERSTE Z 1002.9753

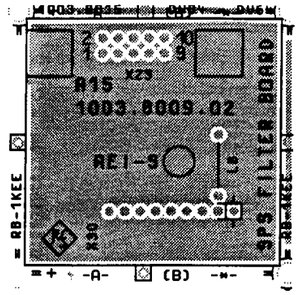
BLATT-NR. 1 V. 1 BL.

ZF ZEICHN.-NR. 1003.8009.01S

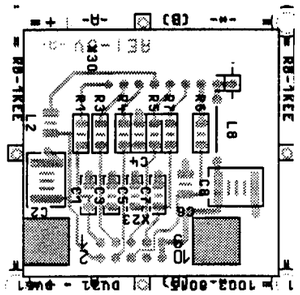
FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

Fur diese Unterlage behalten wir uns alle Rechte vor

Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side



VARIANTENERKLAERUNG/VERSION
VAR02-GRUNDAUSFUEHRUNG/BASIC MODEL

			Maße ohne Toleranzangabe	Maßstab 1 : 1	
				Halbzeug, Werkstoff	
			1KEE Tag / Name	Benennung	
			Bearb 07.89 RB	SPS-FILTER-BOARD	Z
			Gepr		
			Norm		
And. Zust.	Anderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ	Zeichn.-Nr. 1003.8009.01 Blatt-Nr 2 v 2 Bl
				zu Gerat ESHS 30	reg. i V 1002.9001 V erste Z 1002.9753

Methode E

RE 295 2506.0781

Erich Feucht, München 07.8001.81

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

+10V
X13.6

+10VS
X12.3

-10V
X13.4

-10VS
X12.4

+28V
X12.5

+31V
X23 9/10

-11V
X22.1

+12V
X22.3

V1

R3

N1

V2

R15

R16

+10V REGULATOR

V20

R31

N2

V21

R37

R36

-10V ADJ.

R37

-10V REGULATOR

+28V
REGULATOR
N3

X4

+6.2V

N4

X23.4
POWER FAIL

V50
REF 2

R71

R73
VOLTAGE MONITORING ADJUST

VOLTAGE MONITORING CIRCUIT

X1

+6.2V

V5
REF1

CIRCUIT DIAGRAM IS VALID FOR MOD.02

04					TAG	NAME	BENENNUNG
				BEARB.	03.91	RB	ANALOG POWER SUPPLY
				GEPR.		RB	
				NORM			
				PLOTT	15. 3.91	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.8109.01S
				ZU GERAET ESHS30			BLATT-NR. 1 v. 2 BL.
				PEG.I.V. 1002.9001		ERSTE Z.	

ZEICHN.-NR. 1003.8109.01 S

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

+5VD X13 2
+5VD X13 3
+5VA X13 1
GNDA X13 10
GNDA X13 9
GNDD X13 8
STDBY X12 6
RES * X12 8
NTC 1 X12 2
NTC 2 X12 10
ON * X12 1
INT.SUPPLY X12 7
INT. BATT. X13 7
+12V X13 5
+10V X13 6
+10VS X12 3

+5.4V X22 4
STDBY X23 6
RES * X23 5
NTC 1 X23 3
NTC 2 X23 7
ON * X23 2
X23 1 INT.SUPPLY
X22 2 INT.BATT.
X22 1 -11V
X22 3 +12V
X23 9 +31V
X23 10 +31V
X23 4 POWER FAIL *

-10V REGULATOR

V22 1N4007
V11 1N4007
V12 BAS32-L
R31 0R1 .8W
R13 0R1 .8W
V1 BDX78
C5 10N L
R10 15K L
R12 47K5 L
C10 100U 25V
V13 1N4007
N1-A LM224D-L
R1 475R L
R11 52K3 .1%
R18 200K L
GNDA
C2 10N L
+12V
V2 BC850B-L
V4 BAS32-L
R9 12K1 L
C1 100U 40V
R14 3M92
C4 10N L *
R2 100R L
R3 1K5 L
C3 10N L
C15 10N L
R15 22K1 .1%
V3 BAS32-L
N1-B LM224D-L
R7 4K75 L
R8 13K L
R6 2K43 L
N1-D LM224D-L
R5 301R L
V6 BZV55 C10
V5 1N827
N1-C LM224D-L
V20 BDX77
C21 10N L
R30 10K L
R32 30K1 L
N2-A LM224D-L
R17 332R L
C22 10N L
GNDA
C23 10N L
V10 BAS32-L
V21 BC860B-L
C20 100U 40V
N2-B LM224D-L
R24 12K1 L
R25 3K32 L
C19 10N L *
R21 100R L
R22 39K2 L
V14 BAS32-L
N2-D LM224D-L
R23 2M74 L

+10V REGULATOR

* NOT FITTED
C4, C19

R35
-10V ADJUST

X4

R73
VOLTAGE
MONITORING
ADJUST

-10V
X13 4

-10VS
X12 4

+28V
X12 5

-10V REGULATOR

+28V REGULATOR

VOLTAGE MONI

6,2V

X4 1

+31V

N3
UA723DM

+12V

+12V

V22
1N4007

V24
BAS32-L

R31
0R1 .8W

V20
BDX77

C21
10N L

R30
10K L

N2-A
LM224D-L

R32
39K1 L

C24
100U 25V

V23
1N4007

R17
332R L

C22
10N L

R33
130K L

GNDA

V10
BAS32-L

+12V

C23
10N L

N2-B
LM224D-L

V21
BC860B-L

R24
12K1 L

R25
3K32 L

R37
33K2 .1%

R36
20K .1%

R22
39K2 L

C19
10N L
*

R21
100R L

V14
BAS32-L

R23
2M74 L

N2-D
LM224D-L

R35
1K
-10V
ADJ.

R40
10K

R41
15K .1%

R42
10R L

C40
10N L

C41
100P L

V30
1N4007

R43
31K6 .1%

R45
200R L

R44
8K66 .1%

C42
47U 40V

R64
4K75 L

C10

GNDA

R63
13K L

N2-C
LM224D-L

V51
BZV55 C10

R61
2K43 L

R62
301R L

V50
1N827

R76
51K1 L

+12V

R75
10K L

C75
10U 10V

R70
3K24 .1%

N4-A
LM339D-L

R72
13K L

N4-C
LM339D-L

R71
47K5 .1%

GNDA

GNDA

FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD 02

06/00	42299 (.25)	22.06.97	HH	GEZ.	TAG
				BEARB.	
				GEPR	
				NORM	
				PRUEF	22.06.97
05/00	96142 (.11)	04.97	HH	ROHDE&SCHWARZ	
AEND. IND.	AENDERUNG MODIFICATION	DATUM	NAME		

R35
-10V ADJUST

X4

R73
VOLTAGE
MONITORING
ADJUST

-10V
X13 4

-10VS
X12 4

+28V
X12 5

H1 - A
X12 14

H1 - K
X12 13

+28V REGULATOR

+31V

N3
UA723DM

R40 10K .1%

R41 15K .1%

R42 10R L

C40 10N L

C41 100P L

V30 1N4007

R43 31K6 .1%

R45 200R L

C42 47U 40V

R44 MK66 .1%

GNDA

V24 BAS32-L

V23 1N4007

C24 100U 25V

R33 130K L

C25 10N L

R37 33K2 .1%

R36 20K .1%

R35 1K -10V ADJ.

VOLTAGE MONITORING CIRCUIT

6,2V

X4 1

+12V

V51 BZV55 C10

V50 1N827

R64 4K75 L

R63 13K L

R61 2K43 L

R62 301R L

N2-C
LM224D-L

R76 51K1 L

R75 10K L

R70 3K2+ .1%

R71 47K5 .1%

R72 13K L

R73 2K
VOLTAGE
MONITORING
ADJUST

C75 10U 10V

N4-A
LM339D-L

N4-B
LM339D-L

N4-C
LM339D-L

N4-D
LM339D-L

R77 1K L

R78 47K5 L

R79 82K5 L

R80 47K5 L

+5.4V

V78 1N4448

X5 1

X5 2

X5 3

POWER FAIL *

+5,4V

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: ESD!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47299 (25)	22.06.92	NL	IKEE	TAG	NAME
				BEARB.		NL
				GEPR.		RB
				NORM		
				PLOTT	22.06.92	
05/00	46342 (13)	04.91	NL			
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GRUPPE ESH530

BENENNUNG
ANALOG POWER SUPPLY

ZEICHN.-NR.
1003.8109.01S

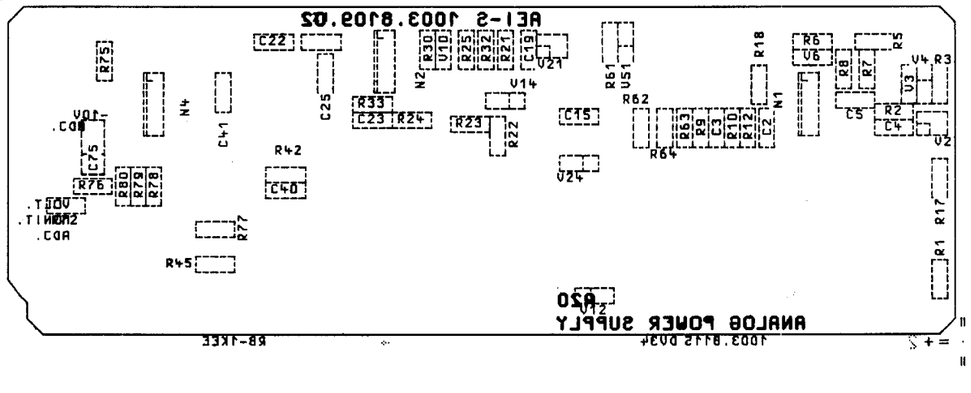
BLATT-NR. 2
V. 2 BL.

REG.I.V. 1002.9001

ERSTE Z.

Darstellung Loetseite

Bearbeitet nach HVN 000



DIESE ZEICHNUNG IST EIN RECHNERAUSDUCK, AENDERUNGEN KOENNEN NUR DURCH AENDERN DES DATENSATZES ERFOLGEN
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR

Variantenerklaerung / VERSION
VAR02 - Grundausfuehrung / BASIC MODEL

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

EINBAU UND BETRIEB NACH HVC 250

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME

MASSE OHNE TOLERANZANGABE
-0.2 MM

MASSSTAB 1 : 1

WERKSTOFF

	TAG	NAME
1KEE		
BEARB.	07.89	RB
GEPR.		RB
NORM		
PLOTT	18. 7.89	*

BENENNUNG
ANALOG POWER SUPPLY

Z

ROHDE&SCHWARZ

ZU GERAET ESHS30

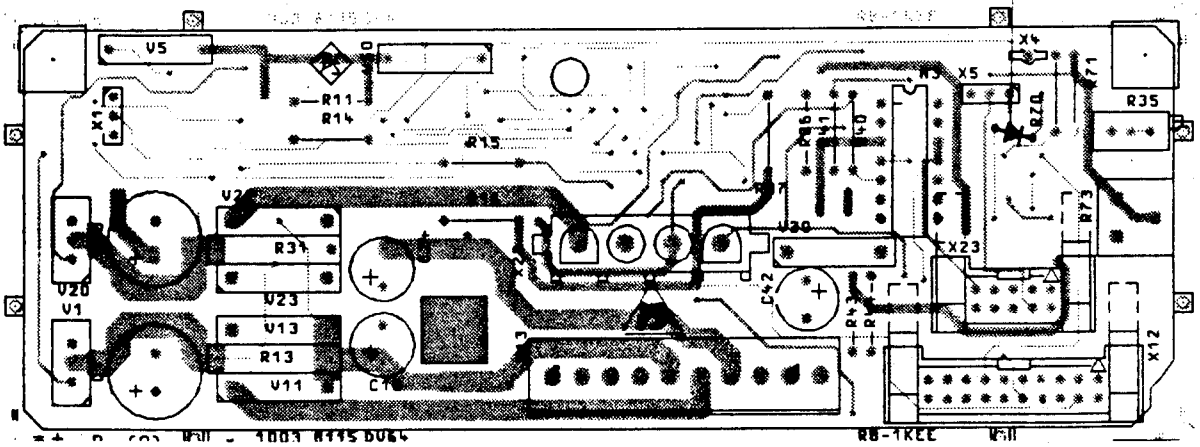
ZEICHN.-NR. 1003.8109.01 ED

BLATT-NR. 2 v. 3 Bl.

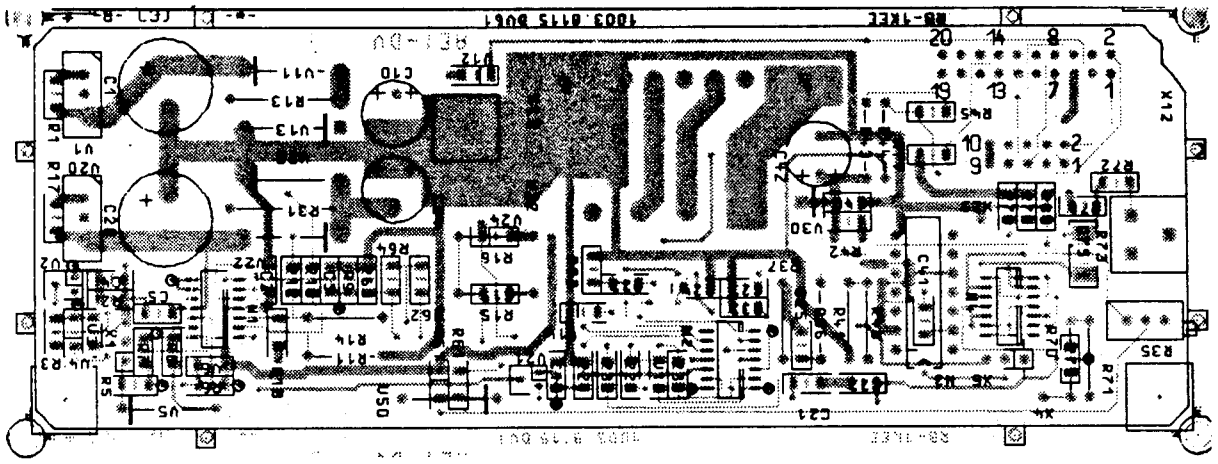
REG.I.V. 1002.9001 INDEX A 1002.9753

V78
V78.A to X5(1)
V78.K to N4(3)

Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side



NOT FITTED
C4, C19

(herzu HVC 250)

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung

ATTENTION ESD!
Electrostatic sensitive devices require a special handling

03	45 123 (2)	10.90	Rb
04	46342 (13)	04 91	NL

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

1KEE	Tag	Name
Bearb	07.89	RB
Gepr		
Norm		

Benennung

ANALOG-POWER-SUPPLY

Z

ROHDE & SCHWARZ

Zeichn.-Nr 1003.8109

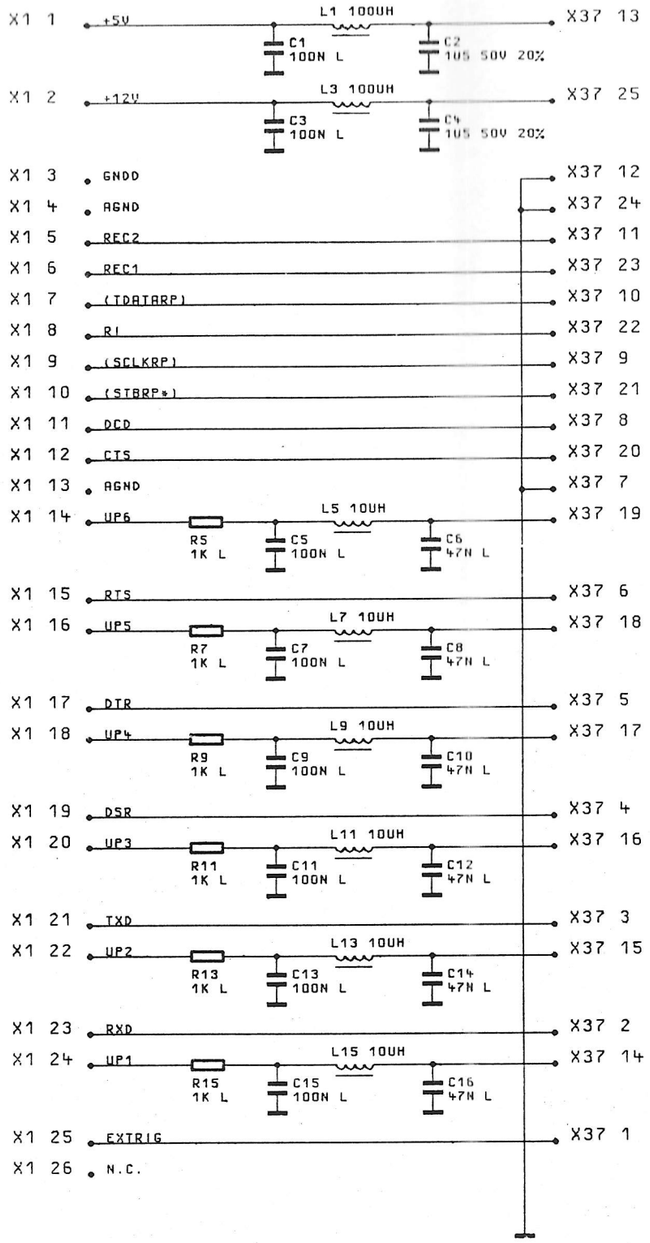
Blatt-Nr 3 v 3 Bl

zu Gerat ESHS 30

reg. V 1002.9001 V erste Z 1002.9753

And Zust	Anderungs-Mitteilung	Tag	Name

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



TO CPU BOARD

25PIN SUB-D
CONNECTOR
AT
REAR PANEL

SIGNAL NAMES IN BRACKETS
ARE NOT VALID IN ALL DEVICES

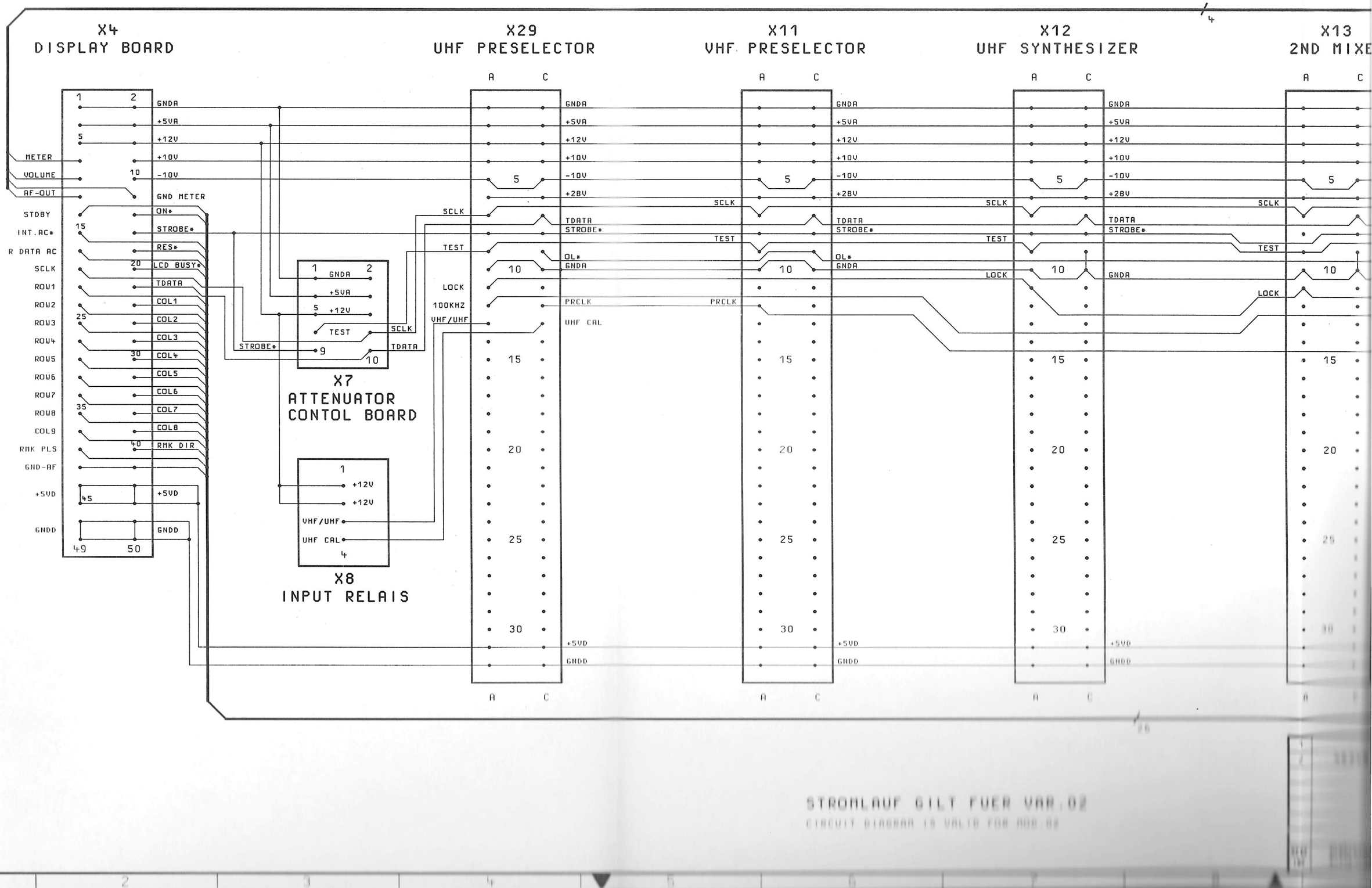
CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE
BAUELEMENTE ERFORDERN EINE
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

01/00		03.92	PF	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	FILTER BOARD
				GEPR.		PF	
				NORM			
				PLOTT	19.03.92		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.0120.01S
				ZU GERAET	ESHS30		BLATT-NR. 1
				PEG.I.V.	1002.9001	ERSTE Z.	V. 1 BL.

ZEICHN.-NR. 1003.0120.01 S

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR ROD.02

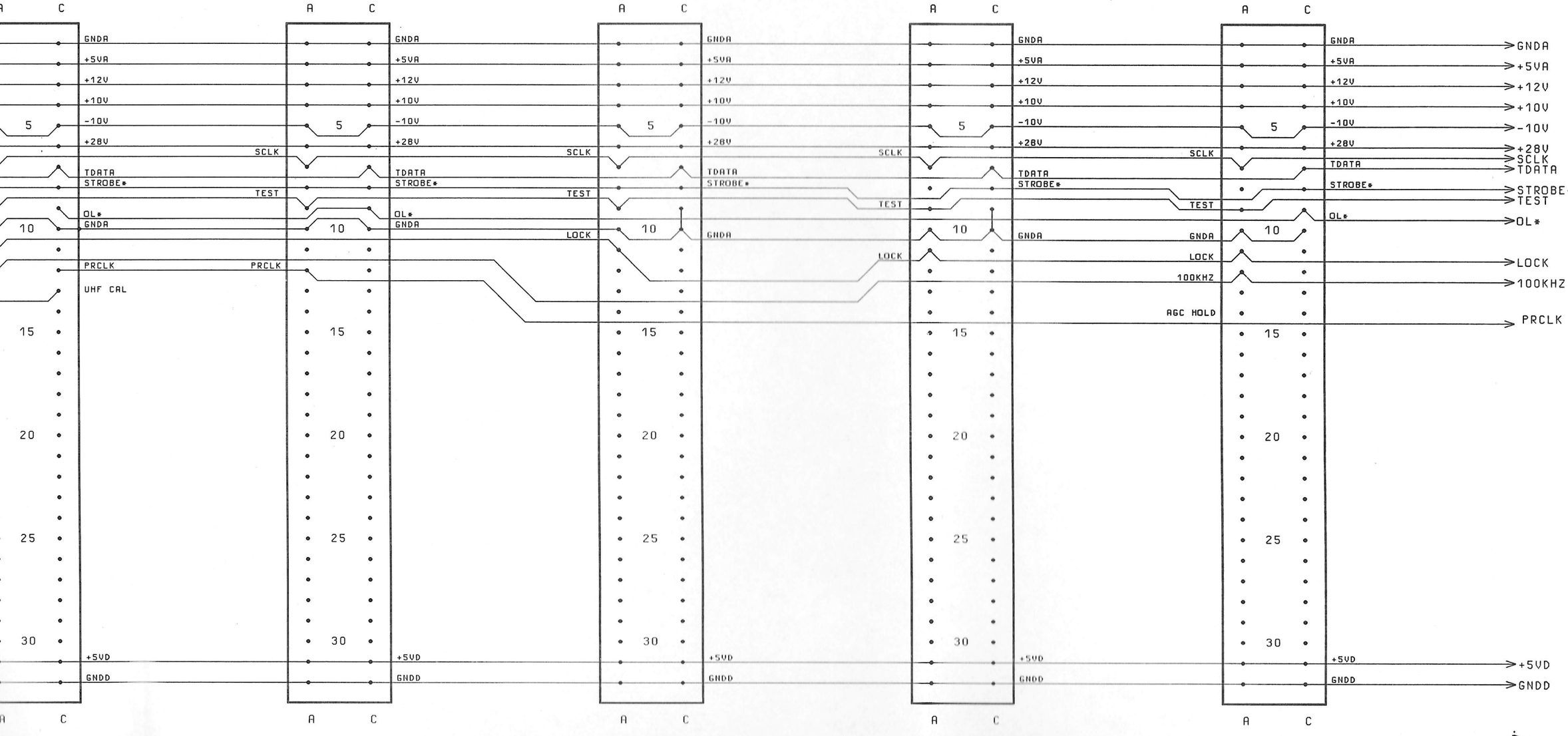
X29
RESELECTOR

X11
VHF PRESELECTOR

X12
UHF SYNTHESIZER

X13
2ND MIXER

X30
I/Q DEMODULATOR



/26

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

					TAG	NAME
1						
2	46345	04.91	NG	BEARB.		NG
				GEPR.		NG
				NORM		
				PLOTT	15. 4.91	*

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME

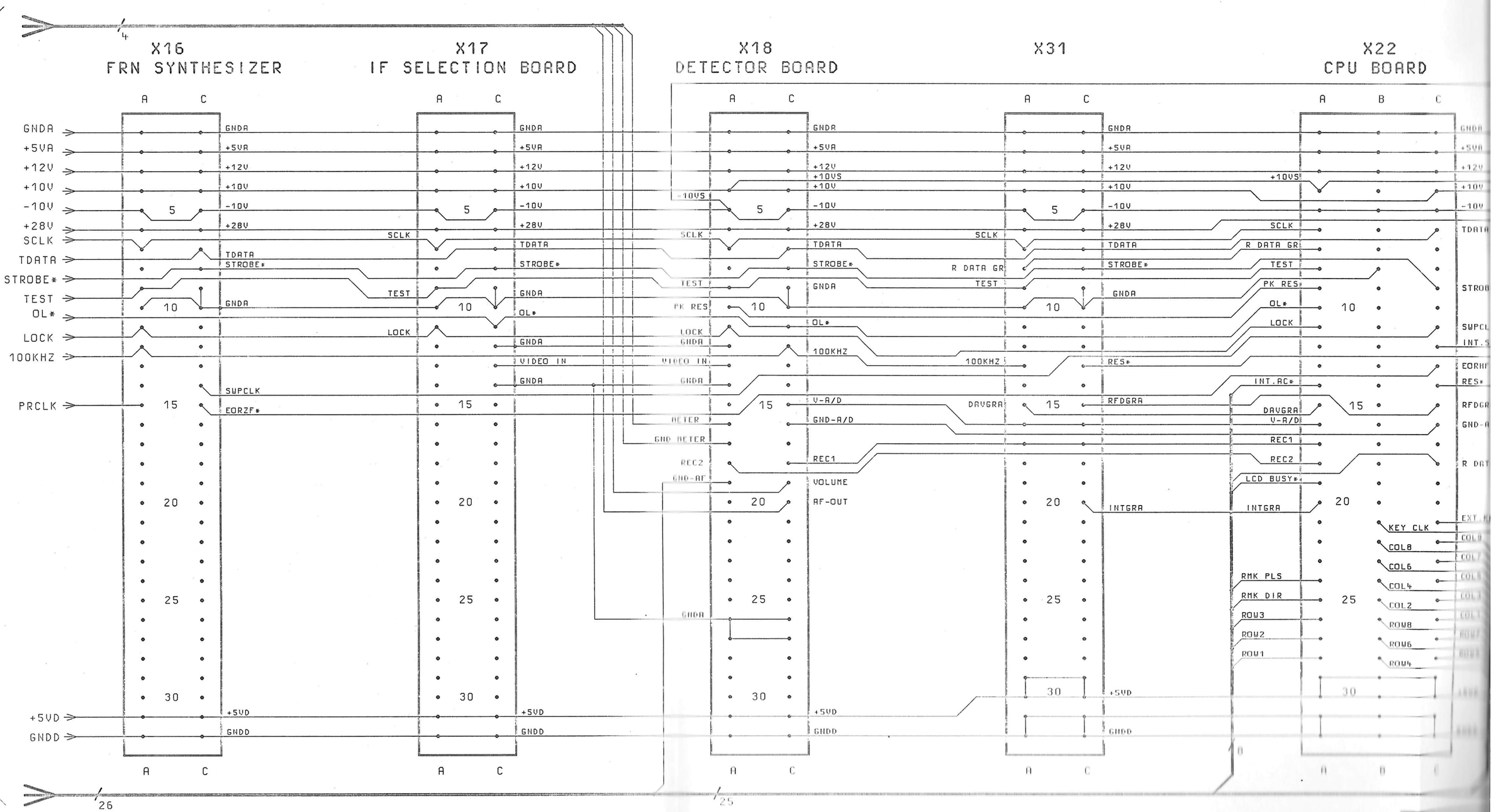
ROHDE&SCHWARZ
ZU GERAET ESVD

BENENNUNG
MOTHERBOARD

ZEICHN.-NR. 1026.6248.01S

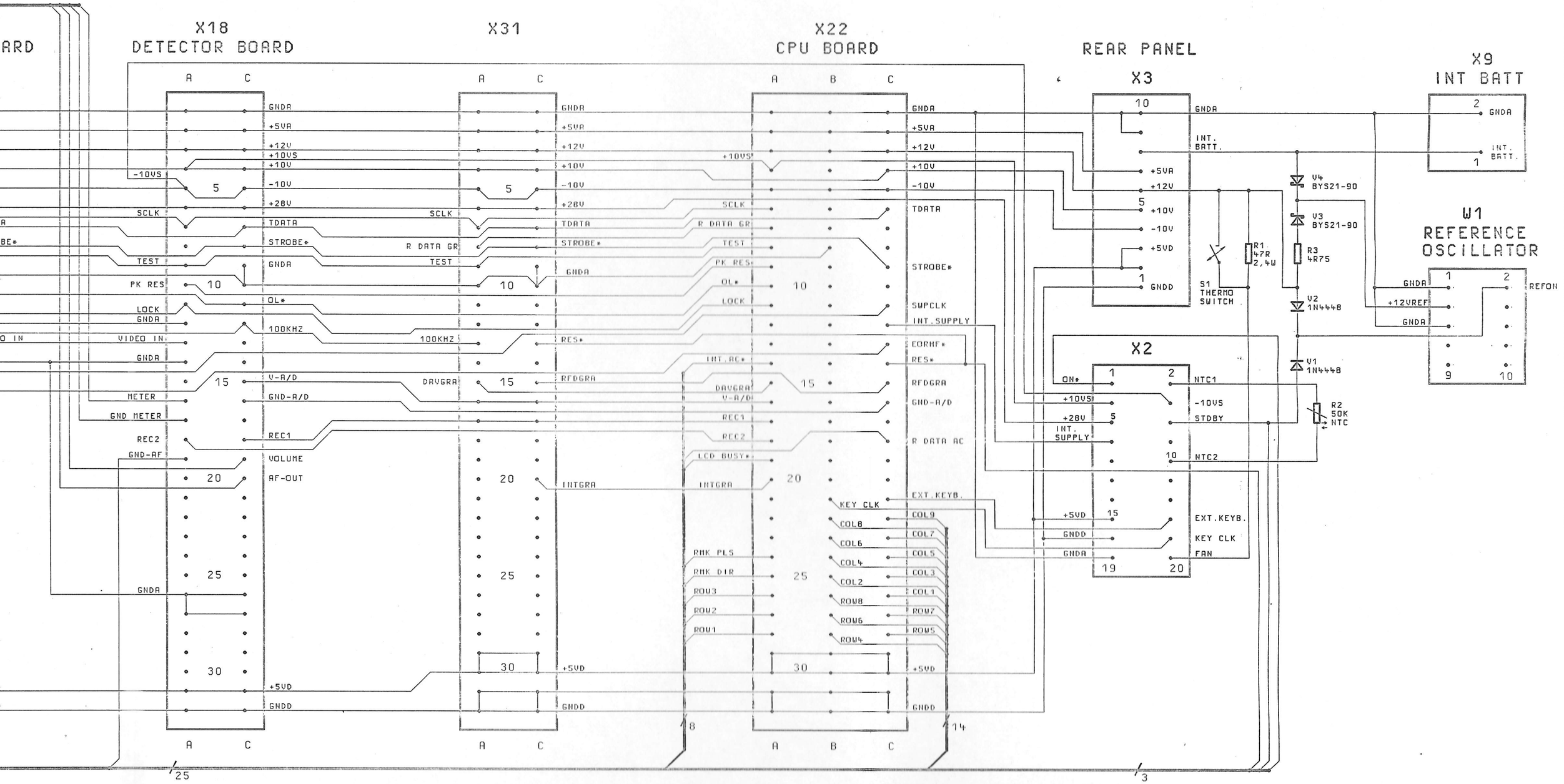
BLATT-NR. 1 V. 2 BL.

REG.I.V. 1026.5506 ERSTE Z.



STROMLAUF GILT FUER VAR.02

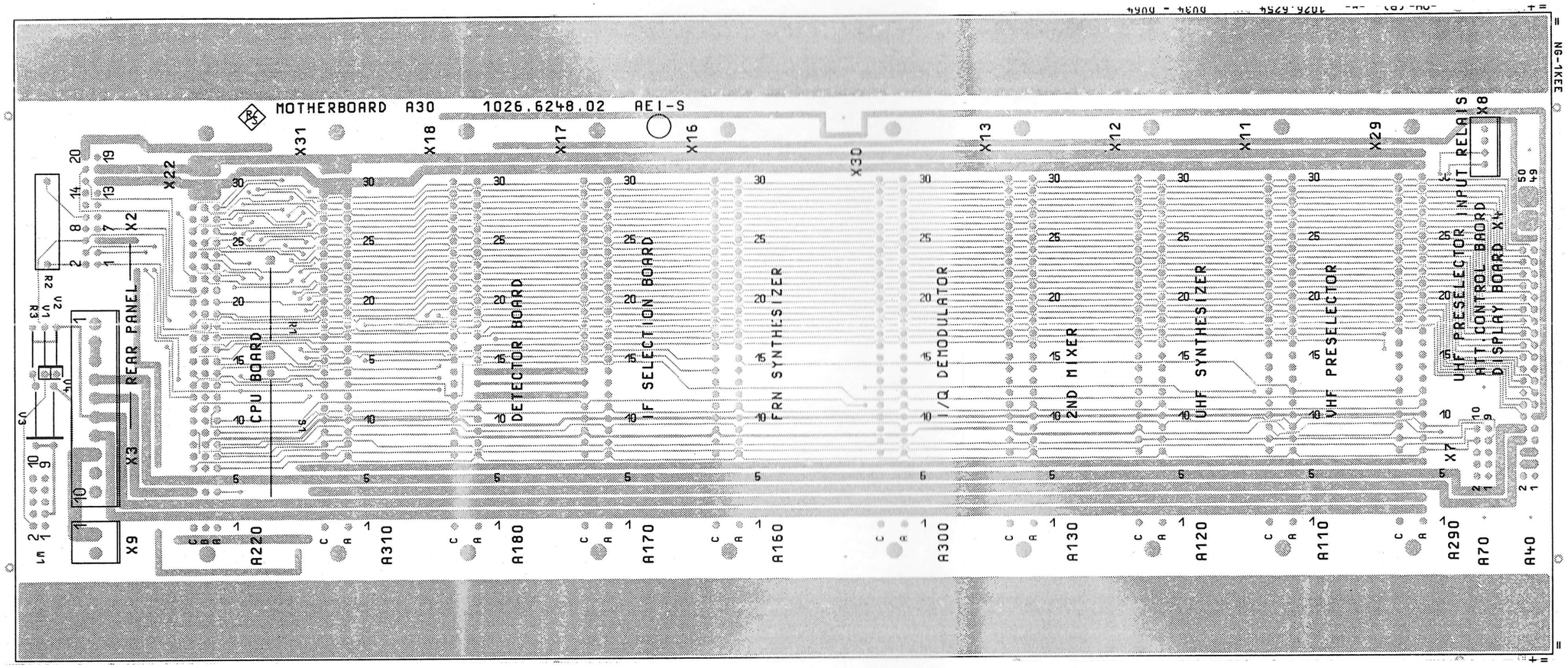
CIRCUIT DIAGRAM IS VALID FOR MOD.02



STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

1				1KEE	TAG	NAME	BENENNUNG
				BEARB.		NG	MOTHERBOARD
				GEPR.		NG	
				NORM			
				PLOTT	1. 2.91	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.6248.01S
				ZU GERAET ESVD			BLATT-NR. 2 v. 2 Bl.
				REG.I.V. 1026.5506			ERSTE Z.

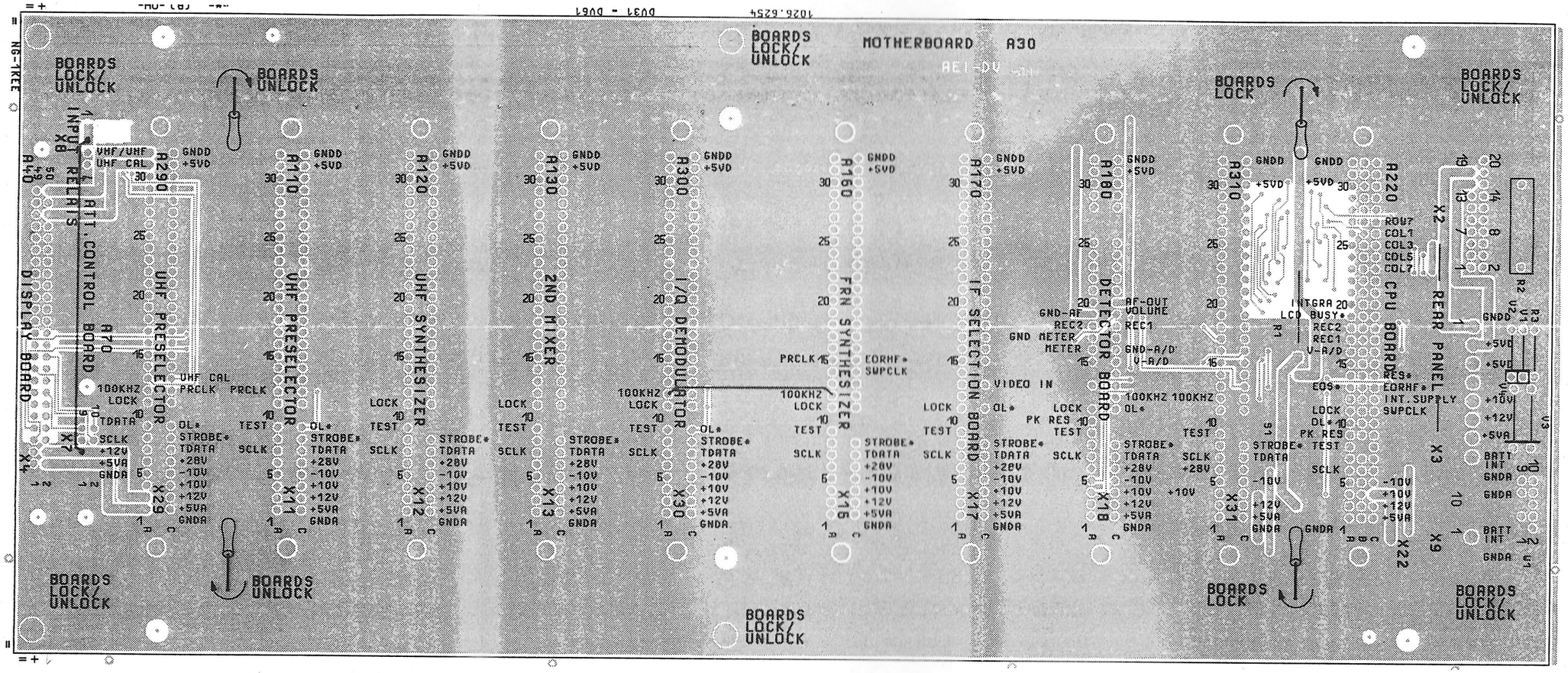


Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

01		02.91	NG	Maße ohne Toleranzangabe		Maßstab 1 : 1
						Halbzeug, Werkstoff
				1KEE	Tag	Name
				Bearb	02.91	NG
				Gepr		
				Norm		
Änd Zust	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Benennung MOTHERBOARD
				zu Gerät ESVD		Zeichn.-Nr 1026.6248
						reg. V 1026.5506 V

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Methode E



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

01		02.91	NG	Maße ohne Toleranzangabe		Maßstab 1 : 1
02	46345 (1)	03.91	NG			Halbzeug, Werkstoff
03	46345 (5)	04.91	NG			
				1KEE	Tag / Name	Benennung
				Bearb	02.91 NG	MOTHERBOARD
				Gepr		Z
				Norm		
And Zust	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr 1026.6248
				zu Gerät ESVD		reg. i. V. 1026.5506 V erste Z
						Blatt-Nr 3 v Bl

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ROHDE&SCHWARZ

SERVICE DOCUMENTS

Display Board

1003.1604.10

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7 Testing and Repair of the Module

7.1 Function Descritions

The Display Board consists of the subsequent components

- LCD module ENTRY
- LCD LEVEL and LCD FREQUENCY
- LEDs
- Key matri
- Rotary pulse generator
- POWER ON
- Analog instrument
- Coding socket
- Hardkey board/Softkey board
- Loudspeaker, headphones and volume control

7.1.1 Data Transmission and Data Enabling

The data are serially transmitted via the line T DATA IN (X4.22) to the address register D103-A first and then serially transferred into the registers D107-A (addressing of LCD ENTRY), D108-A, µPd7225 for LCD LEVEL and FREQUENCY, and into the chain D200-A, D201-A and D202-A (LEDs).

The last byte to be serially transmitted is always an address byte. The board addresses for the display board are between $8_{dec.}$ and $15_{dec.}$

Data enabling of the respective subassembly is realized at the register D104-A via one of the above addresses of the display board by means of a strobe* (active LOW, applied at X4.16 and generated by the CPU board).

7.1.2 The LCD MENU ENTRY

The entry LCD is controlled via two addresses, the register D108-A (10_{dec}) and the address of LCD ENTRY (9_{dec}).
Es wird in beiden Fällen 1 Datenbyte zusammen mit einem Adressbyte übertragen. Jede Übertragung wird mit einem Strobe* abgeschlossen.
The frequency of data transmission at LCD ENTRY is 2 MHz.
The data transmission frequency at D108-A is 4 MHz. The RS LCD MENU line (D108-A, pin4) is set (HIGH > 2 V, LOW < 0.8 V) in this register. The data for LCD ENTRY are transmitted subsequently. The data are shifted serially into the address register D103-A via the line X4.22 and from this register they are shifted serially into the register D107-A. From D107-A the data are read parallely into LCD ENTRY using a strobe*.

7.1.3 Addressing of LCD LEVEL and FREQUENCY

With power-on, the flip-flops of D109 and the counters of D203 are reset via the line X4.18. Thus, they are in a defined intial state.

Further initializations are effected via the firmware.

Addressing:

First, the address 12_{dec} or 13_{dec} is transmitted to address register D103-A at a clock frequency of 4 MHz. Initiated by a strobe*, the state of pin 6 of flip-flop D109-A (LEVEL) or pin 8 of flip-flop D109-B (FREQUENCY) changes and voltage changes from HIGH to LOW. This activates the counter D203A (LEVEL) or D203B (FREQUENCY). Across the next 8 clocks, the counter filters the bits in the address register D103-A. After the 8th clock, the counter is deactivated again by means of a NOR gate D205-B (LEVEL) or D205-A (FREQUENCY). Simultaneously with the 8th clock, the counter output CT3 (pin 14 at D203-B for LEVEL, pin 6 at D203-A for FREQUENCY) assumes HIGH level. Thus, the respective µPD7225 is enabled (outputs 6 and 8 of 74HCT00 D204 to inputs 10 of µPD7225 (CS*)) via the NAND gate D204-C (LEVEL) or D204-B (FREQUENCY).

Upon being enabled (CS* at pin 10 of µPD), the above-mentioned µPD7225 becomes busy* (LCD BUSY: line X4.20, active LOW), then assumes HIGH state again and data transmission begins. The software switches over the clock frequency from 4 MHz to 250 kHz. The subsequent data bytes, the first of which is already in the address register, are loaded into the LCD driver. After 8 clocks each, the µPD7225 becomes busy*, i.e. it evaluates the internal data. Data transmission to the µPD7225 is not possible during this period.

When all data have been transmitted to the driver, the board address 12_{dec} (LEVEL) or 13_{dec} (FREQUENCY) is loaded again. The final strobe* signal serves as reset signal for the counter D203A (LEVEL) or D203B (FREQUENCY) and resets the flip-flop D109-A (LEVEL) or D109-B (FREQUENCY), thus disabling the µPD7225 (HIGH potential at pin 10 of D1-A for LEVEL or at D2-A for FREQUENCY) and finishing transmission. The clock frequency is switched over again from 250 kHz to 4 MHz.

7.1.4 Background Illumination for LCD ENTRY, LEVEL and FREQUENCY

The background illumination depends on the content of the register D108-A. It is switched on and off via the special function 10 (SPEC FUNC 10). (LOW at D108-A, pin 5 → illumination off).

7.1.5 Die LEDs

The information for the LEDs is transmitted serially, 2 data bytes being transmitted via the address register D103 into the LED shift registers D200-A and D201-A, and then the address 11dec into D103-A. The strobe* pulse parallely enables the LED shift registers.

7.1.6 Key Matrix

The key matrix comprises 8 rows and 12 columns allowing for coding of 96 keys.

The rows of the key matrix are applied at X4.21, X4.23, X4.25, X40.1, X40.3, X40.5, X40.7 and X40.9.

The columns of the key matrix are applied at X4.24, X4.26, X40.2, X40.4, X40.6, X40.8, X40.10, X40.12 and X40.11.

Column 1 of the key matrix is applied to + 5V by R10, columns 2 and 3 are directly applied to the multipoint connector X5 to the hardkeyboard/softkeyboard.
When a key is pressed, the respective line and column connectors must be connected (cf. circuit diagram).

7.1.7 Hardkeyboard/ Softkeyboard

Columns 2 and 3 (X4.24 and X4.26) of the key matrix are directly connected to the multipoint connector X5 to X5.9 and X5.8 of the hardkeyboard/softkeyboard. The hardkeyboard/softkeyboard is directly connected to ROWS 1 to 7 of the key matrix via X5.1 to X5.7.

7.1.8 POWER ON Diode

The POWER ON diode lights up, when the instrument is switched on.

7.1.9 STANDBY Diode

The STANDBY diode lights up, when the power supply is connected

7.1.10 Control Knob

The control knob (RMK or KNOB) with the two Hall generators B1 and B2 provides the information direction of ***rotation*** and ***number of pulses*** in form of two pulse sequences: RMK__DIR and RMK__PLS. The pulse rate RMK__PLS is output at X40.13, the direction RMK__DIR at X40.14.

The rotary pulse (RMK__PLS) and the direction (RMK__DIR) must have different phases, the offset should be approx. 90°.
The rotary pulse serves as reference and must not change phase with slight movement of the control knob.

The direction of rotation changes phase with slight movement of the control knob without locking in, thus generating a pulse.

A pulse for RMK__PLS is only generated with a change of detent position

7.1.11 The Coding Socket

Connecting an antenna to the antenna code socket generates an interrupt (INT__AC*, i.e., LOW level at pin P101 or at line X4.15).

The interrupt is triggered since the comparator D101 detects, that the code at its 8-bit port P does no longer correspond to the code at its 8-bit port Q. The antenna data are read out by the firmware via the parallel-serial shift register D106-A. The interrupt is then inactive.

7.1.12 Volume

The voltage at X4.9 can be varied between 1.2 V and 9 V (against ground) by R247.

7.1.13 Analog Instrument

The 4-line-display versions contain the relay K50, the bridges R240 and R241 are not fitted. These versions are battery-backed.

7.2 Test Instrument and Utilities

Item	Type of instrument	Required specifications	Suitable R&S instrument	Order No.	Appli cation
1	Digital voltmeter	Tolerance < 1%	UDS 5	349.1510.02	7.3 and 7.4
2	Oscilloscope	100 MHz, dual-channel	BOL		7.3
3	Logic analyzer	> 20 MHz	LAS		7.3

7.3 Troubleshooting

7.3.1 Error with LCD ENTRY

- **No ENTRY display:**

- Check contrast using potentiometer **R110**
- Check brightness
- Check connection lines

- **Only 2 lines or special characters of the original character set readable:**

- Check line RS LCD MENU
- Check data lines of D107-A
- Check line EN LCD MENU D104-A, pin 14 → X6.8 → D107-A 1
- Check, whether the data line or the strobe* line are disconnected

7.3.2 Error with LCD LEVEL and FREQUENCY

- **No LEVEL or FREQUENCY display:**

- Check contrast using potentiometer **R201**
- Check connection between D204 pin 8/6 and pin 10 of µPD7225 (LEVEL/FREQUENCY)
- Check RESET line → If always LOW, check µPD7225 and CPU hardware
- Check BUSY line → If always LOW, check µPD7225 and CPU hardware. The two µPD7225 must never be activated simultaneously.
- Check voltage supply of the drivers

- **<u>Both</u> diplays (LEVEL and FREQUENCY) flickering or blurred:**

- Check SCLKFP line
- Check line LCD_SER_IN
- Check connection between D204 pin8/6 and pin 10 of µPD7225 (LEVEL/FREQUENCY)
- Check lines CS LCD FR (D104-A, pin 10 → D205-C pins 9 and 10 and D109-B pin 11) and CS LCD LV (D104-A, pin 11 → D205-D pins 11 and 12 and D109-A pin 3)
- Faulty addressing → Check IFPAS

- **<u>One</u> display (LEVEL or FREQUENCY) flickering or blurred:**

- Driver or associate circuit faulty (circuit diagram, sheet 3)
- Check CS* line of driver (pin 10)

- Check SCLKFP line
- Check connection between D204 pin 8/6 and pin 10 of µPD7225 (LEVEL/FREQUENCY)
- Check LCD_SER_IN
- Check line $\overline{CS}$ $\overline{LCD}$ FR (D104-A, pin 10 → D205-C pins 9 and 10 and D109-B pin 11) and CS LCD LV (D104-A, pin 11 → D205-D pins 11 and 12 and D109-A pin 3)

Note: *The LCD BUSY line is applied to test pin P220 (LOW < 0.8 V, HIGH > 2 V)*

- **No illumination:**

- Switch on illumination via SPEC FUNC 10
- Control brightness with background illumination switched on using potentiometer R104
- Check 5-V supply at D108-A pin 5

Note: *The voltage for brightness is applied at test pin P107 in the range 3.2 V to 4.9 V.*

7.3.3 Error with Key Matrix

- Entry via keys not possible:

- Check all connection lines to the hardkeyboard/softkeyboard
- A key got stuck, the corresponding row and column lines must be connected (cf respective ciruit diagram)
- Check interface X15 with regard to continuity and short circuits

7.3.4 Error with Rotary Knob

- **With rotating, direction of rotation is not indicated correctly (frequency display indicates faulty direction):**

- Hall probe B1 defective → replace

- **Frequency display only indicates one direction with rotation in any direction:**

- Hall probe B1 defective → replace

- **With rotation, either several pulses or no pulse triggered (frequency display varies irregularly and/or not according to the step size selected):**

- Hall probe B2 defective → replace

- **No pulse is triggered with rotation in any direction:**

- Hall probes B1 and B2 are either defective or soldered in in the wrong order → replace

7.3.5 Error with LEDs

- **Individual LEDs do not work correctly:**

- Check diodes and replace, if necessary

7.3.6 Errors with Coding Socket

- **Interrupt always active:**

- Check comparator IC D101-A and line AC LOAD (D104-A, pin 15 at D100-A, pin 11 and D105-A, pins 1 and 2)
- Check register 100-A

Note: *Use test pin P101 (LOW: < 0.8V; HIGH: > 2V).*

7.3.7 Further Troubleshooting

a) Testing the Serial Clock Frequency

The clock frequency can be tested either at X4.19 or at P102. The clock packages must include either 8 or 16 pulses. The clock packages are applied in the form of HIGH or LOW levels. When the instrument is switched on, pulse packages of 8 and/or 16 pulses must occur.
The frequency varies between 4 MHz and 250 kHz.
The levels correspond to digital levels (LOW < 0.8V, HIGH > 2V)

Test pin: **P102**

b) Testing the Strobe* Line

The levels correspond to digital levels (LOW < 0.8V, HIGH > 2V)
The line is active LOW.

Test pin: **P104**

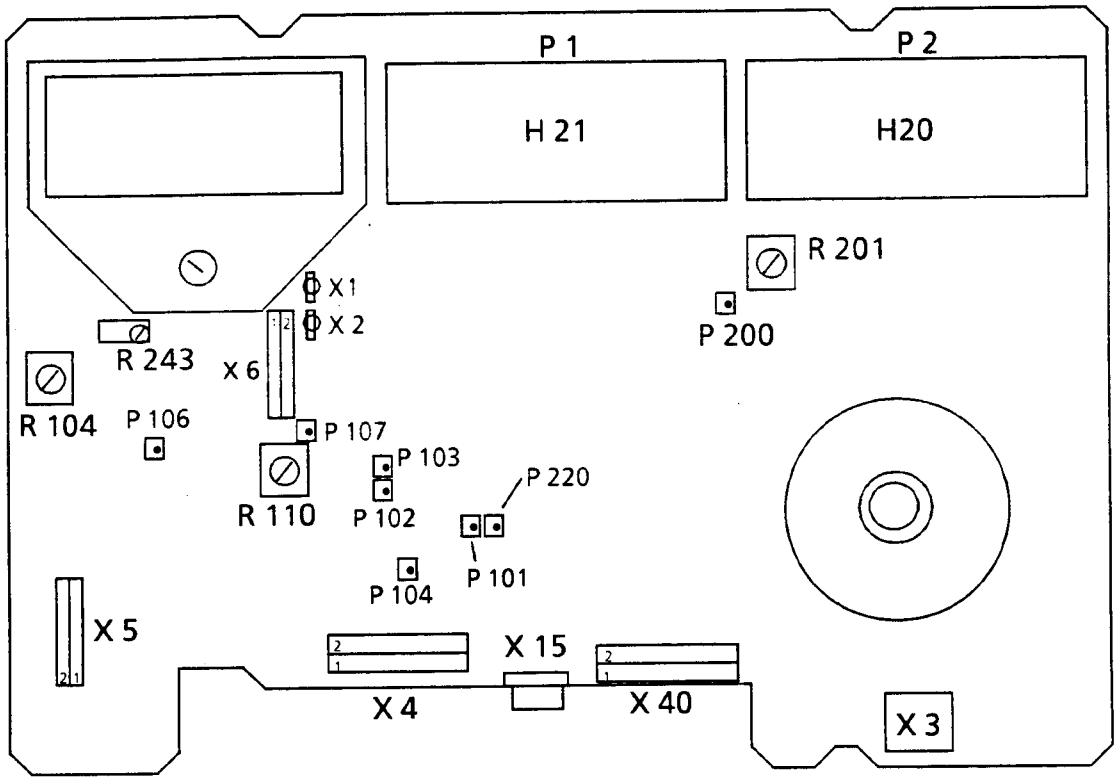
c) Testing the Serial Data Line

The serial data line can be tested either at X4.22 or at P103. The data are applied as digital HIGH and LOW levels (LOW < 0.8V, HIGH > 2V).

Test pin: **P103**

7.4 Testing and Adjustement

7.4.1 Location of Jumpers, Test Points and Adjustment Elements



7.4.2 List of Test pins and Potentiometers

Item	Meaning
P 101	INT AC
P 102	SCLKFP
P 103	T DATA FP
P 104	STROBE*
P 106	Brightness LCD MENU ENTRY
P 107	CONTRAST LCD MENU ENTRY
P 200	CONTRAST LCD LEVEL und FREQUENCY
P 220	LCD BUSY*
R 104	Brightness LCD MENU ENTRY
R 110	CONTRAST LCD MENU ENTRY
R 201	CONTRAST LCD LEVEL und FREQUENCY
R 243	Adjustment of Instrument

7.4.3 POWER ON Key

When pressing the POWER ON key the above LED lights up or goes out, thus indicating that the receiver is switched on or off.

7.4.4 Setting the Contrast at the LCD ENTRY

The contrast is adjusted at **R110**. It must be adjusted such that the non-addressed segments of the display matrix are no longer visible.

Note: *Test pin: P107 (Voltage: -4.0V to -8.0V)*

7.4.5 Setting the Brightness at the LCD ENTRY

With background illumination switched on (SPEC FUNC 10), brightness is adjusted via **R104**.

Note: *Voltage is supplied at test pin P106 (voltage: 3.8V to 4.2V)*

7.4.6 Setting the Contrast of LCDs LEVEL and FREQUENCY

The contrast is to be adjusted at **R201**. It must be adjusted such that the non-addressed fields optically disappear with normal view onto the LCD.

Note: *Test pin: P200*

7.4.7 Testing Head Phones and Loudspeakers

The interface X15 can be checked with regard to continuity and shorts.

7.4.8 Volume Control

The voltage at X4.9 can be varied between 1.2 and 9 volts against ground by means of **R247**.

7.4.9 Adjustment of the Analog Instrument (Battery-charge Lamp)

The battery-charge indicator is adjusted using **R243** with the key **S60** pressed.

Set the mechanical zero of the instrument
(with vertical position of the instrument).

Adjusting the battery-charge indicator:

- Apply a + 10.8V ± 50mV supply voltage at pin connector X.4.5 or X4.6.
- Apply instrument ground to pin connector X.4.12
- Set the pointer deflection on the instrument to the lower end of the bar for indication of the battery-charge BATT using **R243**.

7.5 Assembly and Disassembly

The potentiometers are accessible by unscrewing the cover of the display board. The test pins are only accessible by removing the board from the instrument according to the assembly instructions.

For testing, it must be reconnected to the receiver without cover.

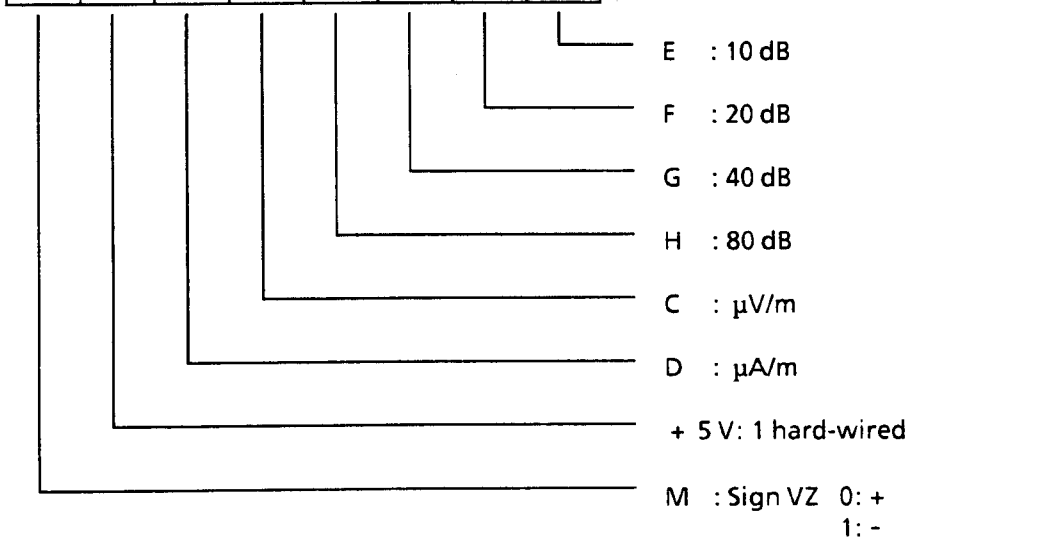
7.6 Description of Important Registers

7.6.1 Antenna Code Register D106

The relation between antenna code socket and register D106-A is as follows:

Bit 6 of D106-A is always applied HIGH potential.

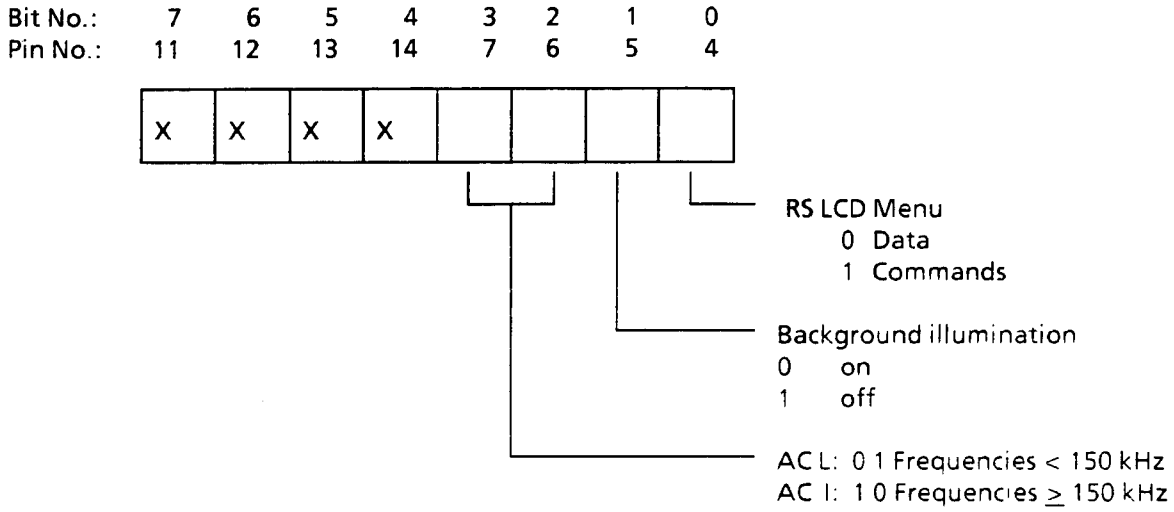
6	5	4	3	14	13	12	11	Pin no. of register D106-A
M		D	C	H	G	F	E	Name of code socket
7	6	5	4	3	2	1	0	Bit no. of register D106-A
1	1	1	1	1	1	1	1	Significance of bit with power-on
0	1	1	1	1	1	1	1	Example of a new register content



Bit significance:	0	aktiv
	1	inactive

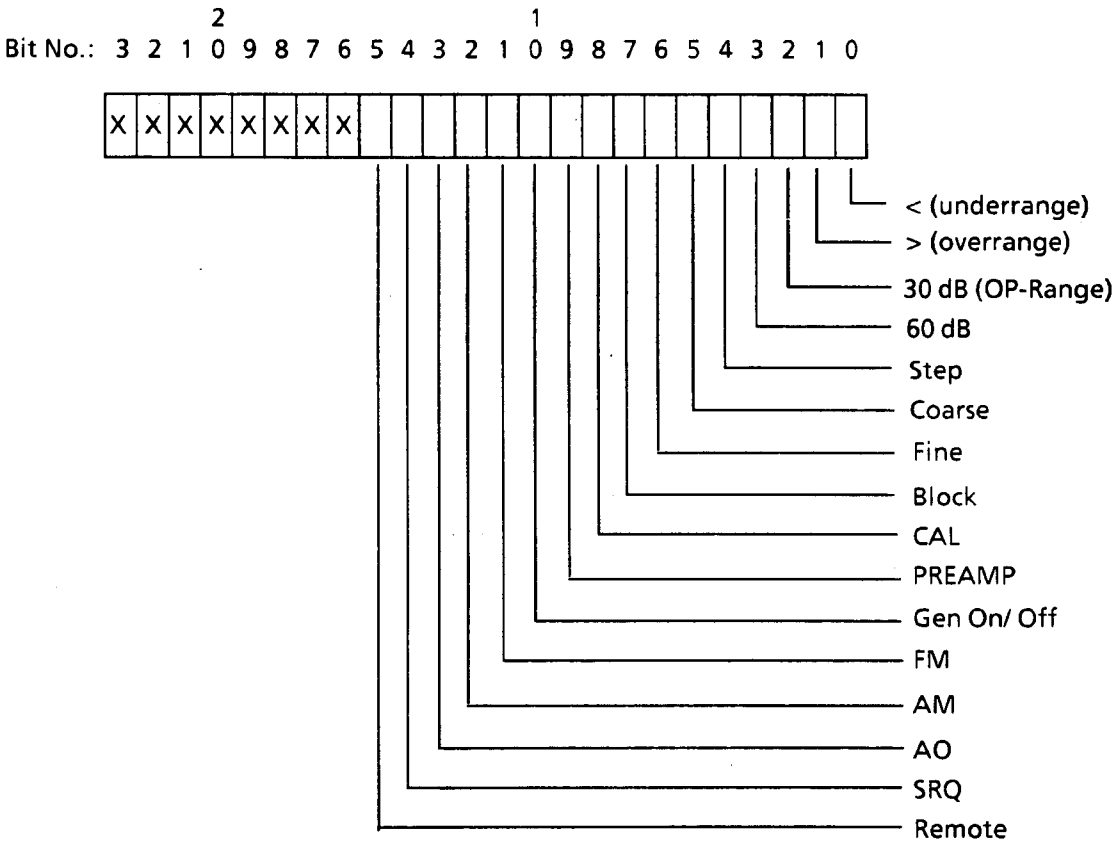
With power-on, the inputs of the antenna sockets E, F, G, H, C, D and M are applied HIGH potential.

7.6.2 Register D108-A



7.6.3 LED Registers

3 bytes, 1 byte not used
Address 11 $_{dec}$



Pin No.:	11	12	13	14	7	6	5	4	
Bit No.:	7	6	5	4	3	2	1	0	D200-A
	15	14	13	12	11	10	9	8	D201-A
	23	22	21	20	19	18	17	16	D202-A

7.7 Interface Table

Connector	Signal name	Specified range	Remark
X4.1	A Gnd		Analog ground
X4.2	A Gnd		Analog ground
X4.3	+ 5 V	5.4 V ± 50 mV 190 mA	Supply voltage
X4.4	+ 5 V	5.4 V ± 50 mV 190 mA	Supply voltage
X4.5	+ 12 V	12.4 V ± 0.2 V 120 mA	Supply voltage
X4.6	+ 12 V	12.4 V ± 0.2 V 120 mA	Supply voltage
X4.7	INSTR	0 ... 250 µA	
X4.8	+ 10 V	10 V ± 20 mV 100 mA	Supply voltage
X4.9	Volume	1.2 V ... 9 V	
X4.10	- 10 V	-10 V ± 20 mA 100 mA	Supply voltage
X4.11	NF OUT	± 4 V	
X4.12	Instr. Gnd	Ground	
X4.13	Standbye		
X4.14	ON / OFF		
X4.15	INT_AC*	HCT output High > 2 V Low < 0.8 V	Code-socket interrupt
X4.16	STROBE*		Strobe
X4.17	R_DATA_AC	HCT output	serial data output
X4.18	Reset*	HCT output	Reset
X4.19	SCLKFP	HCT output	Clock
X4.20	LCD BUSY*	HCT output	Busy line for LCD LEVEL a. LCD FREQUENCY
X4.21	ROW 1	HCT output	Key matrix
X4.22	T- DATA.FP	HCT output	serial data input
X4.23	ROW 2	HCT output	Key matrix
X4.24	COL 1	HCT output	Key matrix
X4.25	ROW 3	HCT output	Key matrix
X4.26	COL 2	HCT output	Key matrix
X40.1	ROW 4	HCT output	Key matrix
X40.2	COL 3	HCT output	Key matrix
X40.3	ROW 5	HCT output	Key matrix
X40.4	COL 4	HCT output	Key matrix
X40.5	ROW 6	HCT output	Key matrix
X40.6	COL 5	HCT output	Key matrix
X40.7	ROW 7	HCT output	Key matrix
X40.8	COL 6	HCT output	Key matrix
X40.9	ROW 8	HCT output	Key matrix
X40.10	COL 7	HCT output	Key matrix
X40.11	COL 9	HCT output	Key matrix
X40.12	COL 8	HCT output	Key matrix
X40.13	RMK_PLS	HCT output	Pulse of control knob
X40.14	RMK_DIR	HCT output	Direction of rotation

Connector	Signal name	Specified range	Remark
X40.15			
X40.16			
X40.17	+ 5 V D		Supply voltage
X40.18	+ 5 V D		Supply voltage
X40.19	+ 5 V D		Supply voltage
X40.20	+ 5 V D		Supply voltage
X40.21	DGnd		Ground
X40.22	DGnd		Ground
X40.23	DGnd		Ground
X40.24	DGnd		Ground
X5.1	ROW 1	HCT output	Key matrix
X5.2	ROW 2	HCT output	Key matrix
X5 3	ROW 3	HCT output	Key matrix
X5.4	ROW 4	HCT output	Key matrix
X5.5	ROW 5	HCT output	Key matrix
X5.6	ROW 6	HCT output	Key matrix
X5.7	ROW 7	HCT output	Key matrix
X5.8	COL 3	HCT output	Key matrix
X5.9	COL 2	HCT output	Key matrix
X5.12	Phones -		
X5.14	NF Out	± 4 V	
X5.15	+ 10 V		Supply voltage
X5.16	DGnd		Ground
X15.1			
X15.2	Phones -		
X15.4	NF Out	± 4 V	
X15.5	NF Out	± 4 V	
X15.6			
X6.1	Brightness		Brightness LCD ENTRY
X6.2	DGnd		Ground
X6.3	DGnd		Ground
X6.4	+ 5 V		Supply voltage
X6.5	Contrast		Contrast
		- 4.6 to - 2.25 mA	
X6.6	RS LCD MENUE	HCT output	
X6.7	R/W*	DGnd	Read/Write line
X6.8	Enable	HCT output	Enable line
X6.9	DB0	HCT output	Data line
X6.10	DB1	HCT- output	Data line
X6.11	DB2	HCT output	Data line
X6.12	DB3	HCT output	Data line
X6.13	DB4	HCT output	Data line
X6.14	DB5	HCT output	Data line
X6.15	DB6	HCT output	Data line
X6.16	DB7	HCT output	Data line

7.7.1 Abbreviations

The following abbreviations are used:

X4, X5, X6, X40,X15	:	Pin names
LCD LEVEL	:	Level display (cf. circuit diagram)
LCD FREQUENCY	:	Frequency display (cf. circuit diagram)
LCD MENU ENTRY	:	Entry LCD (cf. circuit diagram)
KNOB, RMK	:	Rotary pulse generator or rotary knob
CS*	:	Chip Select, active LOW, for several ICs
Strobe*	:	Data enabling upon termination of a data transmission, active LOW
HIGH	:	Voltage > 2 V
LOW	:	Voltage < 0.8 V

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

LCD MENU ENTRY
(ONLY MOD .10)

HARDKEY BOARD
(ONLY MOD .10)

SOFTKEY BOARD
(MOD .20 AND MOD .32)

W6

LCD LEVEL

LCD FREQUENCY

LEDS

W5

X15

SER DATA IN
SER DATA OUT
SER CLK
STROBE*

X4

SER. BUS INTER-FACE

SER BUS

2

7

ANTENNA CODE

INT AC*

X4

INSTRUMENT

+12V
INSTR
GND

X4

KNOB

RMK PLS
RMK DIR

X40

STANDBY ON/OFF

X4

KEYMATRIX

COLS
ROWS
COLS
12
8
ROWS

X40

CIRCUIT DIAGRAM IS VALID FOR:

MOD .10	ESHS10, ESVS10
MOD .32	ESHS20, ESHS30
	ESVS20, ESVS30, ESS

				IKEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	2.10.89	*

AEND. IND. | AENDERUNGS-MITTEILUNG | DATUM | NAME

ROHDE&SCHWARZ

ZU GERAET ESHS30

BENENNUNG

DISPLAY BOARD

ZEICHN.-NR. 1003.1604.01S

BLATT-NR. 1

REG.I.V. 1002.9001 | ERSTE Z.

ZEICHN.-NR.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.1604.01 S

X3
ANTENNA CODE

+5V
L30 1U2H
C31 10U
C30 10U

E 100B — R32 4K75 L — R31 475R — AC0 — C33 1N L — C32 1N L
F 200B — R34 4K75 L — R33 475R L — AC1 — C35 1N L — C34 1N L
G 400B — R36 4K75 L — R35 475R L — AC2 — C37 1N L — C36 1N L
H 800B — R38 4K75 L — R37 475R L — AC3 — C39 1N L — C38 1N L
C UV/M — R40 4K75 L — R39 475R L — AC4 — C41 1N L — C40 1N L
D UA — R42 4K75 L — R41 475R — AC5 — C43 1N L — C42 1N L
M VZ — R44 4K75 L — R43 475R L — AC7 — C45 1N L — C44 1N L
J — R46 4K75 L — R45 475R L — C47 1N L — C46 1N L
J-FREQ-1
L-FREQ-2
L — R48 4K75 L — R47 475R L — C49 1N L — C48 1N L
AC6 — R49 10K — +5V

D100-A 74HCT377T-L
R60 10K L
G1 1C2 2D
AC0 AC1 AC2 AC3 AC4 AC5 AC6 AC7 → Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7

D101-A 74HCT688T-L
R61 10K L
COMP G1 P Q P=Q
AC0 AC1 AC2 AC3 AC4 AC5 AC6 AC7

INT AC* P101
D204-A 74HCT00

SCLK* SHEET3 B/7
D105-A 74HCT00T-L
D106-A 74HCT165T-L
SR68 C3/→ G1(SHIFT) C2(LOAD)
R62 10K L +5V
AC0 AC1 AC2 AC3 AC4 AC5 AC6 AC7 → 3D 2D 3D

+5V
R101 10K
D103-A 74HCT4094T-L
C2 EN3 SRG C1/→
SCLKFP P102
T DATA FP P103
D104-A 74HCT238T-L
DX G0 G1

AC LOAD
R DATA AC
INT AC*
EN LCD MENU
SCLKFP

+5V
R102 4K75 L
R103 1K L
V100 BCP69-16
R104 10R
ILLUSW SHEETS F/1
BRIGHTNESS
P106
LED+
LED-
X6 1
X6 2

+5V
R105 10K
D107-A 74HCT4094T-L
QE0 QE1 QE2 QE3 QE4 QE5 QE6 QE7
CTRL LINES
LED STROBE
CS LCD LV
CS LCD FR
DATA

+5V
R108 10K
D108-A 74HCT4094T-L
AC J
AC L
SCLKFP

+10V
-10V
C22 10U
C27 10U
C21 10N L
C26 10N L
L20 1U2H
L102 1U2H
C20 10N L
C25 10N L
+10V*
+5VA
X4 1 X4 2 X4 3 X4 4 X4 8 X4 10

C50 220P L
C51 220P L
R50 100R L
R51 100R L
SCLKFP
T DATA FP
X4 19 X4 22

STROBE* P104
C52 220P L
R52 100R L
X4 16

C53 220P L
R53 100R
C54 220P L
X4 17

C55 220P L
R55 100R
C56 220P L
X4 15

SHIELD
HVC-WAND
HVC

+5V
C14 10N L
C13 100U
C12 220N
L11 1U2H
C10 100U
L10 1U2H

04/00 47294
REND. IND.

4 5 6 7 8 9 10 11 12

D101-A
74HCT688T-L
R61
10K L
INT AC* P101
D204-A
74HCT00
D105-A
74HCT00T-L
D106-A
74HCT165T-L
R62
10K L
+5V
R101
10K
D103-A
74HCT4094T-L
D104-A
74HCT238T-L
AC LOAD
R DATA AC
INT AC*
EN LCD MENU
SCLKFP
CTRL LINES
LED STROBE
CS LCD LV
CS LCD FR
DATA
AC ┐
AC L
SCLKFP
STROBE*
P104
C50 220P L
C51 220P L
C52 220P L
C53 220P L
C55 220P L
R50 100R L
R51 100R L
R52 100R L
R53 100R
R55 100R
C54 220P L
C56 220P L
SCLKFP
T DATA FP
SHIELD
HVC-WAND
HVC
C14 10N L
C13 100U
C12 220N
L11 1U2H
C11 220N
C10 100U

+5V
R102
4K75 L
R103
1K L
V100
BCP69-16
ILLUSW
SHEET5 F/1
R104
10R
BRIGHTNESS
P106

LCD-MODULE
MENU ENTRY
LED+ LED- VSS E RS R/W DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7 VO VDD
X6 1 2 3 8 6 7 9 10 11 12 13 14 15 16 5 4

+5V
CONTRAST
P107
R110
2K
R111
0R L
-10V

R105
10K
D107-A
74HCT4094T-L
R108
10K
D108-A
74HCT4094T-L
RS LCD MENU

+5V
R113
10K L
D113-B
R112
10K L
D113-A
S LCD-SER-IN
A7 SHEET3 B/1
A3 SHEET4 A/1
A4 SHEET3 E/1
A5 SHEET3 B/1
A1 SHEET4 A/1
A2 SHEET3 B/1

D105-D
74HCT00T-L
R270
10K

+5V
C113 10N L
D113-C
74HCT74T-L
C80 10N L
D100-B
74HCT377T
C81 10N L
D101-B
74HCT688T
C82 10N L
D103-B
74HCT4094T
C83 10N L
D104-B
74HCT238T
C84 10N L
D105-E
74HCT00T
C85 10N L
D106-B
74HCT165T
C86 10N L
D107-B
74HCT4094T
C87 10N L
D108-B
74HCT4094T

CIRCUIT DIAGRAM IS VALID FOR MOD 02

04/00	47299(5)	12.91	Pf	1KEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	17.12.91	

BENENNUNG
DISPLAY BOARD

ZEICHN.-NR.
1003.1604.01S

BLATT-NR.
2

ÄEND. IND. | ÄNDERUNGS-MITTEILUNG | DATUM | NAME

ROHDE&SCHWARZ
ZU GERÄT ESHS30

REG.-NR. 1002.9007

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.1604.01 S

LCD LEVEL

P220
LCD BUSY*

+5V

R267
47K5 L

R261
10K

R265
10K L

R206
200K L

D109-A
74HCT74T-L

D205-B
74HCT02T-L

D105-B
74HCT00T-L

D205-D
74HCT02T-L

D203-B
74HCT4520T-L

D204-C
74HCT00T-L

D1-A
UPD7225

P1

LCD-
MODULE
LEVEL

SHEET2 B/10 A4 → CS LCD LV

R262
10K

D109-B
74HCT74T-L

D205-A
74HCT02T-L

D203-A
74HCT4520T-L

D204-B
74HCT00T-L

D205-C
74HCT02T-L

D105-C
74HCT00T-L

R210
200K L

D2-A
UPD7225

P2

LCD-
MODULE
FREQUENCY

D204-D 74HCT00T-L

SHEET2 C/10 A7 → LCD SER IN
A2 → SCLKFP
SHEET2 B/10 A5 → CS LCD FR

SCLK*
SHEET2 F/4

R268
10K L

LCD BUSY*

RES*

C222
220P L

C220
220P L

R264
100R

R263
100R

C221
220P L

C224
10N L

C225
10N L

C226
10N L

C227
10N L

D109-C
74HCT74T

D203-C
74HCT4520T

D205-I
74HCT02T

D204-I
74HCT00T

P220
LCD BUSY*

R267
47K5 L

+5V

P1

LCD-

MODULE

LEVEL

LCD FREQUENCY

R210
200K L

D2-A
UPD7225

CS
C/D
SYNC
RESET
BUSY
CL1
CL2
COM0
COM1
COM2
COM3
SI
SCK
SO
S1
S10
S20
S30

P2

LCD-

MODULE

FREQUENCY

R262
10K

D109-B
74HCT74T-L

D205-A
74HCT02T-L

D203-A
74HCT4520T-L
CTR 4
CT=0

D204-B
74HCT00T-L

D205-C
74HCT02T-L

D105-C
74HCT00T-L

SCLK*

SHEET2 E/4

R268
10K L

LCD BUSY*

RES*

C222
220P L

C220
220P L

R264
100R

R263
100R L

C221
220P L

X4 20

X4 18

CONTRAST LCD

R200
47K5 L

R201
5K

C200
100N L

R202
5K62 L

R203
22K1 L

R204
100K L

R205 681K L

V200
BC850B-L

C201
100N L

N200-A
CA3240AE

P200

LCD BIAS

C202
1N L

C204
10N L

R207
100K L

C203
1N L

R208
100K L

D1-B
UPD7225

D1-C
UPD7225

R209
100K L

C205
1N L

C207
10N L

R211
100K L

C206
1N L

R212
100K L

D2-B
UPD7225

D2-C
UPD7225

R213
100K L

SCLKEP

A2
SHEET4
A/1

ACHTUNG: EGB!

ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!

ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

					1KEE	TAG	NAME
					BEARB.		PF
					GEPR.		PF
					NORM		
					PLOTT	8. 9.89	*
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME				

BENENNUNG

DISPLAY BOARD

ROHDE&SCHWARZ

ZU GERAET ESH3.30

ZEICHN. NR.

1003.1604.013

BLATT NR 3

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR.

ZEICHN.-NR. 1003.1604.01 S

HARDKEY/SOFTKEY BOARD S1...S12

LEDS

+5V

R214 10K

D200-A 74HCT4094T-L

C2 EN3 SRG C1/→ 1D 2D 3▽

H1 HLMP1700 … H16 HLMP1719

R215 562R … R231 562R

+5V

R223 10K

D201-A 74HCT4094T-L

+5V

R232 10K

D202-A * 74HCT4094T-L

SCLKFP

LED STROBE

DATA

A3 A1 A2

SHEET2 B/10

SHEET3 B/12

+5V

C270 10N L … C272 10N L

D200-B 74HCT4094T-L

D201-B 74HCT4094T-L

D202-B 74HCT4094T-L

* not fitted

KEYBOARD

X5 1 … X5 16

+10V

S13 ST 15 … S58 ST 15

ROW1 … ROW8

X4 21 X4 23 X4 25 … X40 1 … X40 9

+5V

R10 10K

COL1 … COL9

X4 24 X4 26 … X40 2 … X40 11

KNOB

+5V

R2 3K32 L

R1 3K32 L

B2 UGN-3020T

B1 UGN-3020T

C250 220P L

C251 220P L

R250 100R

R251 100R

C252 220P L

C253 220P L

24K PLS

24K DIR

HARDKEY/SOFTKEY BOARD

S1...S12

X5 1 X5 2 X5 3 X5 4 X5 5 X5 6 X5 7 X5 8 X5 9 X5 12 X5 14 X5 15 X5 16

+10V

H15 HLMP1719

R231 562R

S13 ST 15 S21 ST 15 S29 ST 15 S36 ST 15 S44 ST 15 S51 ST 15
S14 ST 15 S22 ST 15 S30 ST 15 S37 ST 15 S45 ST 15 S52 ST 15
S15 ST 15 S23 ST 15 S31 ST 15 S38 ST 15 S46 ST 15 S53 ST 15
S16 ST 15 S24 ST 15 S32 ST 15 S39 ST 15 S47 ST 15 S54 ST 15
S17 ST 15 S25 ST 15 S33 ST 15 S40 ST 15 S48 ST 15 S55 ST 15
S18 ST 15 S26 ST 15 S34 ST 15 S41 ST 15 S49 ST 15 S56 ST 15
S19 ST 15 S27 ST 15 S35 ST 15 S42 ST 15 S50 ST 15 S57 ST 15
S20 ST 15 S28 ST 15 S43 ST 15 S58 ST 15

KEYBOARD

+5V

R10 10K

ROW1 ROW2 ROW3 ROW4 ROW5 ROW6 ROW7 ROW8

X4 21 X4 23 X4 25

X40 1 X40 3 X40 5 X40 7 X40 9

COL1 COL2 COL3 COL4 COL5 COL6 COL7 COL8 COL9

X4 24 X4 26

X40 2 X40 4 X40 6 X40 8 X40 10 X40 12 X40 11

KNOB

+5V +5V

R2 3K32 L

R1 3K32 L

B2 UGN-3020T

B1 UGN-3020T

C250 220P L C251 220P L

R250 100R R251 100R

C252 220P L C253 220P L

RMK PLS RMK DIR

X40 13 X4C 14

INSTRUMENT

PYKO-U

X1 X2

R240 0R

not fitted R242 3K92

+5V

BATT S60 ST 15

K50-A TQ2-5V

K50-B TQ2-5V

K50-C TQ2-5V

R241 0R

R243 50K

C243 10N L

R244 30K1 L

GND-INST. INSTR. +12V STANDBY

X4 12 X4 7 X4 5 X4 6 X4 13

ON/OFF

+5V

R245 1K L

H50 HLMP1719 STANDBY

H51 HLMP1719 ON

S100

ON/OFF

X4 14

X40 15

X15 1 X15 2 X15 4 X15 5 X15 6

PHONES

SPEAKER

+10V*

R248 274R

C248 100N L

VOLUME

R247 2K2

R249 1K3 L

R246 392R L

VOLUME

X4 9

NF-OUT

X4 11

02	43559	03.90	NG	1KEE	TAG	NAME	BENENNUNG: DISPLAY BOARD
				BEARB.		PF	
				GEPR.		PF	
				NORM			
				PLOTT	7. 9.89	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.1604.01S
				ZU GERAET	ESHS30		REG.I.V. 1002.9001

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ILLUSW
SHEET2
E/8

R301
0R

ILLUMINATION INSTRUMENT

R302 68R1 L
R305 68R1 L
R309 68R1 L
R311 100R L

H301 H303 H305 H307 H309 H312 H314 H316 H318 H320 H322 H324
H302 H304 H306 H308 H310 H313 H315 H317 H319 H321 H323 H325

ILLUMINATION FREQUENCY-DISPLAY

R320 30R1
R321 30R1
R322 30R1

H20

36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

R323 30R1
R324 30R1
R325 30R1

ILLUMINATION LEVEL DISPLAY

R330 30R1
R331 30R1
R332 30R1

H21

36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

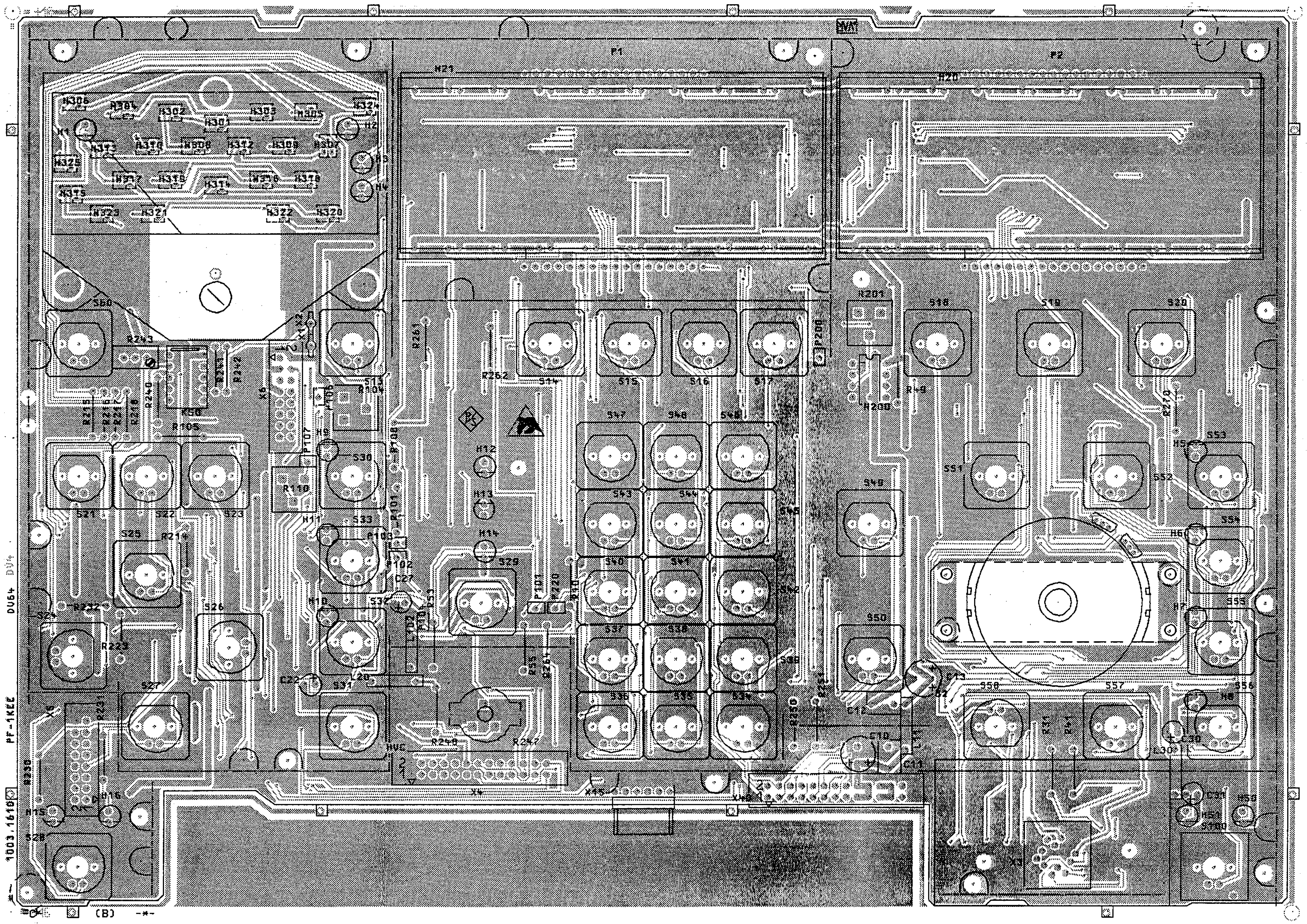
R333 30R1
R334 30R1
R335 30R1

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

03	45123 (14)	12.90	NL	IKEE	TAG	NAME	BENENNUNG
				BEARB.		PF	DISPLAY BOARD
				GEPR.		PF	
				NORM			
				PLOTT	2.10.89	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.1604.01 S
				ZU GERAET	ESHS30		BLATT NR. 5

ZEICHN.-NR. 1003.1604.01 S



Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

(hierzu HVC 250)

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

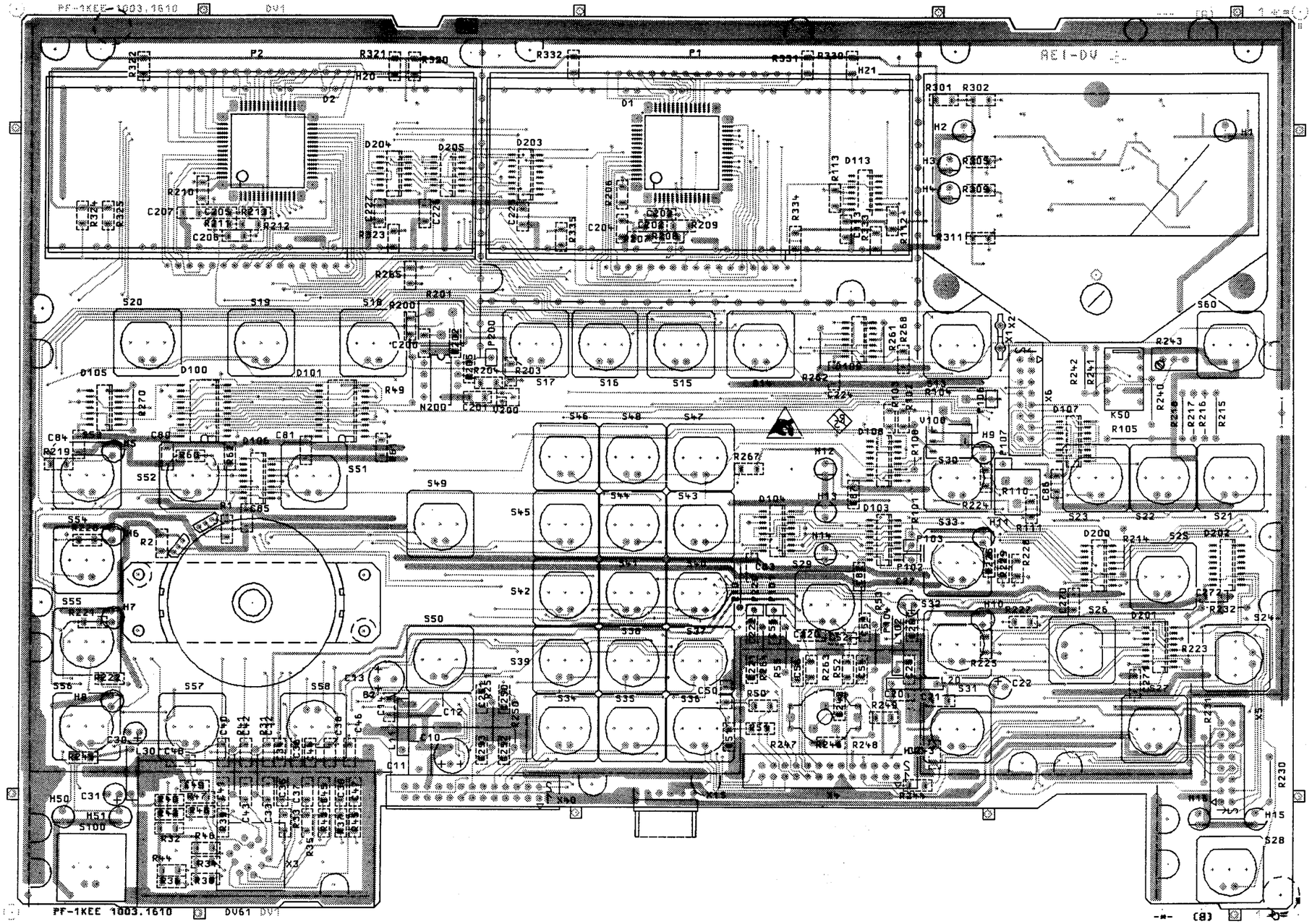
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

Maße ohne Toleranzangabe			Maßstab 1 : 1			
			Halbzeug, Werkstoff			
1KEE	Tag	Name	Benennung			
Bearb	01.90	PF	ED DISPLAY BOARD			Z
Gepr						
Norm						
ROHDE&SCHWARZ			Zeichn.-Nr.	1003.1604		Blatt-Nr. 3 v. 4 Bl.
zu Gerät	ESHS 30		reg. i. V	1002.9001 V	erste Z.	

Änd. Zust.	Änderungs-Mitteilung	Tag	Name

ISO-Projektion Methode E

Für diese Unterlage behalten wir uns alle Rechte vor



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

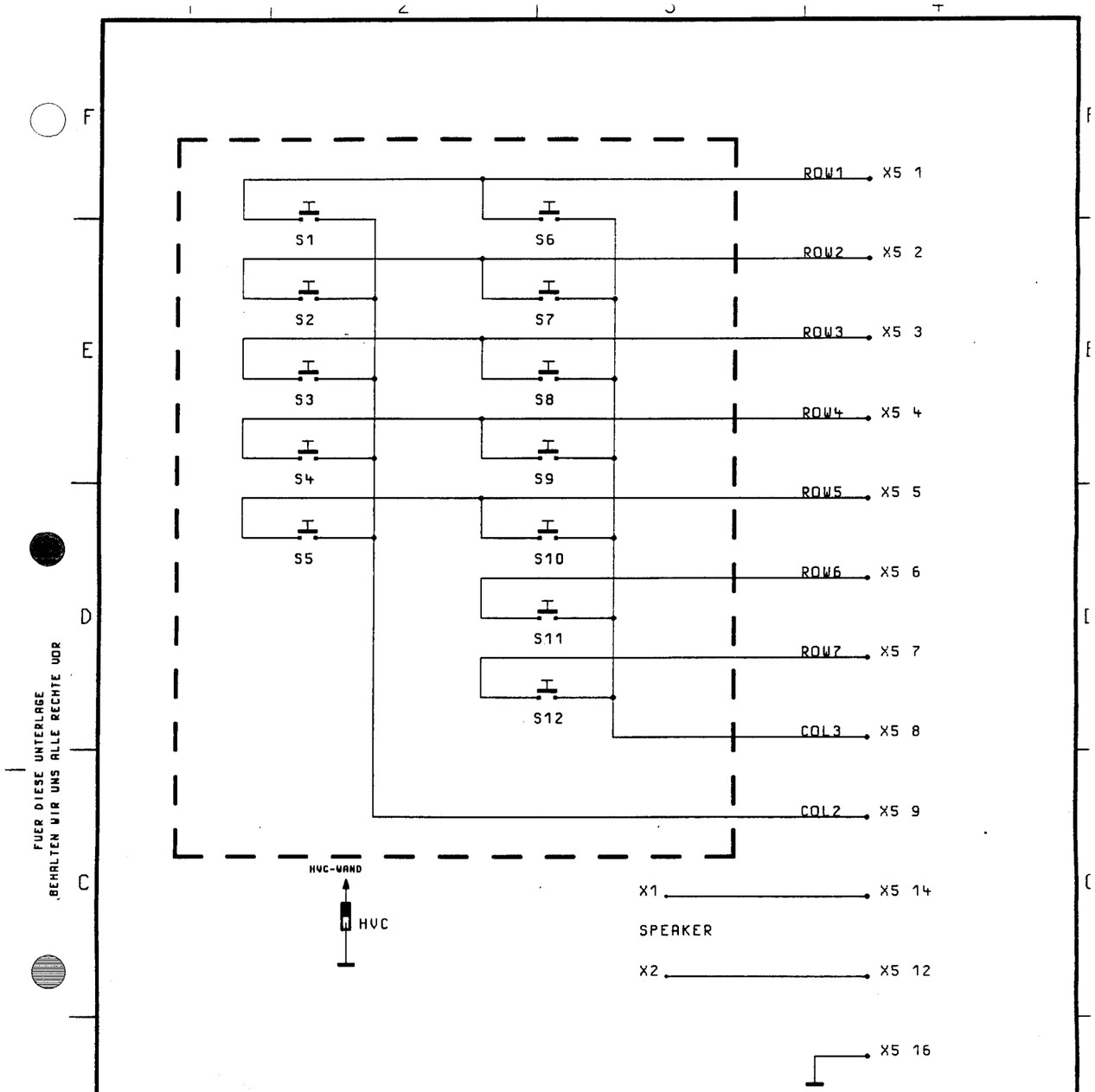
(hierzu HVC 250)

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

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

			Maße ohne Toleranzangabe	Maßstab 1 : 1	
				Halbzeug, Werkstoff	
			1KEE Tag Name	Benennung	
			Bearb 01.90 PF	ED DISPLAY BOARD	Z
			Gepr		
			Norm		
			ROHDE&SCHWARZ	Zeichn.-Nr. 1003.1604	Blatt-Nr. 4 v 4 Bl
And. Zust.	Änderungs-Mitteilung	Tag	Name	Zu Gerät ESHS 30	reg. V. 1002.9001 V erste Z.

PF 095.2493.0281



STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02.

				1KEE	TAG	NAME	BENENNUNG
				BEARB.		BU	HARDKEY BOARD
				GEPR.		BU	
				NORM			
				PLOTT	20. 7.89	3CD	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1004.2204.01S
				ZU GERAET	ESHS10		REG.I.V. 1004.0401

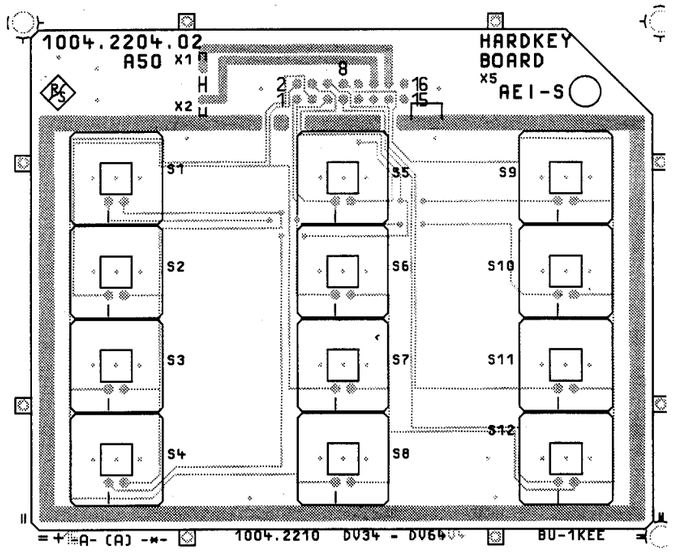
BLATT-NR. 1 V. 1 BL.

EPSTE Z.

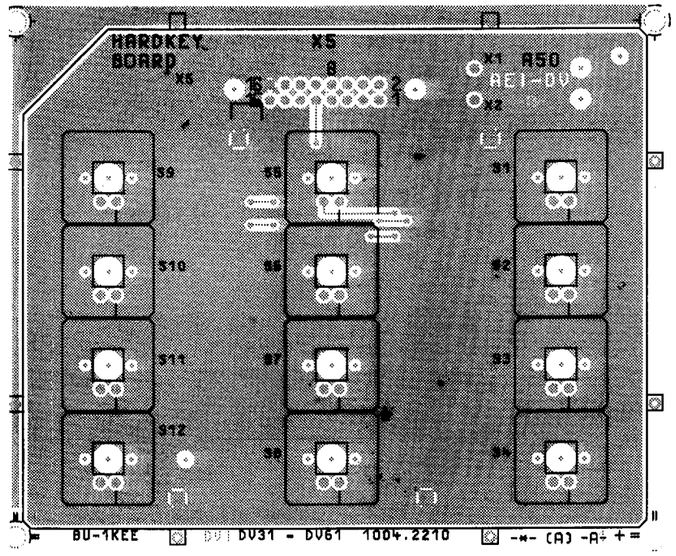
ZEICHN.-NR. 1004.2204.01 S

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side



VARIANTENERKLAERUNG/VERSION
VAR02-GRUNDAUSFUEHRUNG/BASIC MODEL

A		07.89	BU	Maße ohne Toleranzangabe	Maßstab 1 : 1	
03	43561(2)	04.90	BU		Halbzeug, Werkstoff	
				1KEE Tag Name	Benennung HARDKEY BOARD	Z
				Bearb 07.89 BU		
				Gepr		
				Norm		
				ROHDE&SCHWARZ	Zeichn.-Nr. 1004.2204.01	Blatt-Nr. 2
					reg. i. V. 1004.0401 V erste Z.	v
And. Zust	Änderungs-Mitteilung	Tag	Name	Bg Gerät ESHS 10		

Auf diese Unterlage behalten
wir uns alle Rechte vor

Projektion
Code E

ROHDE&SCHWARZ

SERVICE DOCUMENTS

FRN Synthesizer

1003.5300.02

Contents

		Page
7	**Testing and Repair of the Module**	7.1
7.1	**Function Description**	7.1
7.1.1	FRN Theory of Operation	7.1
7.1.2	Conditioning of the Reference Frequency	7.2
7.1.3	Reference Control Loop	7.3
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7.3	**Troubleshooting**	7.6
7.3.1	Selftest Functions and Troubleshooting Flowcharts	7.7
7.3.2	DC Voltages and Waveforms for Troubleshooting	7.11
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7.1 Function Description

The FRN synthesizer module is used for conditioning of the reference frequency. Besides, it contains an oscillator which generates the high frequency resolution of the instrument in a control loop by means of a fractional division ratio.

7.1.1 FRN Theory of Operation

In a fractional N divider, the VCO frequency is a fractional multiple of the reference frequency. This is achieved by periodically switching over the dividing factor from (N) to (N + 1). Thus, a particularly high frequency resolution is obtained in the control loop.

In an accumulator of the length L, an increment F is added subsequent to each output pulse. Each overflow of the accumulator initiates a switchover from the dividing factor N to (N + 1) for one output clock cycle. A residual offset R is the initial value for the next accumulator cycle.
Fig. 7-1 illustrates the block diagram of a fractional N divider.

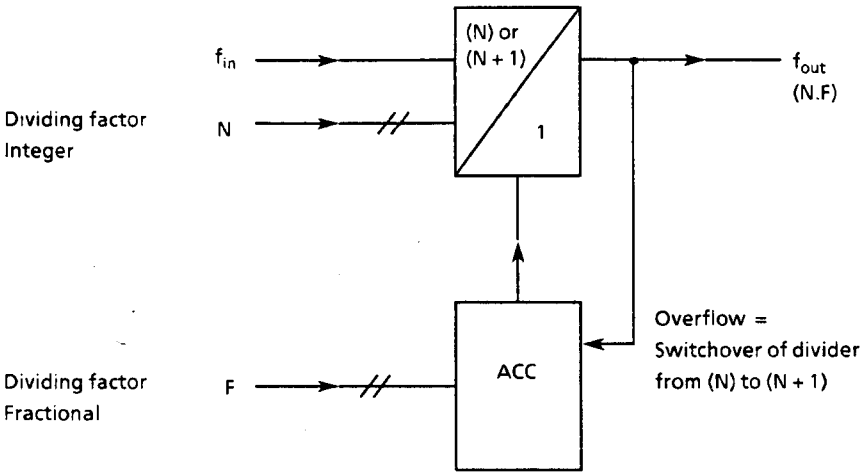


Fig. 7-1 Block diagram of a fractional N divider

Example:
N = 110, F = 20000, L = 10^5 (Adder has 5 decimals)

The intial value of the accumulator is assumed to be 0.
The dividing factor is 110 for 4 cycles, the dividing factor of the 5th cycle is 111 (due to the overflow of the accumuator from 90000 to 100000), the RESIDUAL OFFSET is 00000.
The average dividing factor is therefore:

$$\frac{(4 \times 110 + 1 \times 111)}{5} = 110{,}2 = N + \frac{F}{L}$$

Due to the periodical switchover between the dividing factors a phase error occurs subsequent to the phase detector which leads to unwanted modulation of the VCO. The suppression of nonharmonics is improved by 60 to 80 dB by means of compensation.
A current source which charges the integration capacitor from V_1 to V_2 is controlled by the output signal of the phase detector. This voltage is sampled by the sample-and-hold circuit. Thereupon, the compensation current sources discharge the integration capacitor again to V_1. The ON period of these current sources is controlled by the state of the adder, each decimal being assigned an individual current source. A bias current source provides a constant phase offset in the control loop.
Fig. 7-2 illustrates the voltage characteristic at the sample-and-hold circuit. In the sweep mode of the oscillator, the increment F is increased with each sweep cycle.

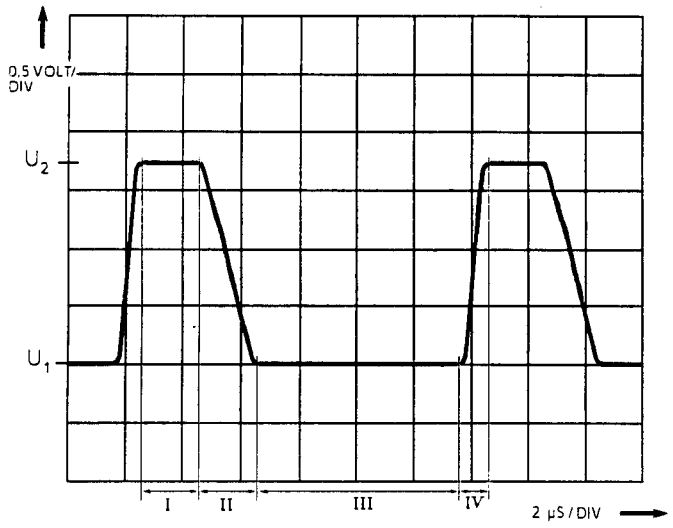


Fig. 7-2 Voltage characteristic of sample-and-hold circuit.

7.1.2 Conditioning of the Reference Frequency

The 64-MHz crystal oscillator (function block REF OSC) operates with the transistor V110 in a common-base circuit. An active filter containing V100, C100, R100 and R101 is provided for decoupling against influences by the operating voltage. The amplitude of oscillation is limited by means of the diode V101 and the resistors R105 and R106. The oscillator centre frequency can be adjusted using L114. The frequency is tuned by means of the capacity diodes V111 to V114.

The crystal oscillator is decoupled from the subsequent amplifier stages via the FET V130, which is designed as gate circuit.

The fixed frequencies required for this instrument are derived from this reference oscillator by multiplication or division.

4 paths are supplied with the reference signal:

- Subsequent to a further decoupling stage with V190 (FET designed as gate circuit) the signal is provided as reference signal at the output X167. This output is not used in the ESHS 10.

- After decoupling via V170 and V180 (FET as gate circuit), limitation by V181 and V182 and subsequent lowpass filtering usi g L181 to L183 or C183 to C186 the oscillator signal is used for mixing in the FRN control loop.

- After TTL signal conditioning by the transistor V150 designed as emitter circuit, the signal passes via the output drivers D151A or D151D and is subject to lowpass filtering by L161, L162, C157, C160, C162 or L161, L163, C158, C161, C163 and is then routed to the output sockets X165 or X166. These outputs are not used in the ESHS 10.

- The signal is passed to the 1:4 divider D52 in the function block REF DIVIDER via the gate D150D. The 16-MHz output signal of this divider is used as reference signal for the gate-array D50 (REFDIV).

7.1.3 Reference Control Loop

The gate-array REFDIV contains a serial interface for programming, dividers for generation of the fixed frequencies 100 kHz and 320 kHz (reference of other modules of the instrument) and a programmable divider for generating the reference frequency of the phase detector (function block PHASE DETECTOR) of the FRN control loop.

In the operating mode "external reference", the 64-MHz reference oscillator (REF. OSC.) is re-adjusted to an external reference frequency of 5 or 10 MHz via the gate-array REFDIV, the loop filter (REF LOOP FILTER) around the operational amplifier N60 and the analog switch D80 (EXT REFERENCE SELECTOR). With the operating mode "internal reference" selected, the control voltage is replaced by an adjustable bias voltage (VCXO TUNING). The window comparator N4C,D monitors the tuning voltage of the 64-MHz reference oscillator.

The external reference frequency is applied to the input socket X164. It is pulse-shaped in D41A-D and D40-A, filtered by the LC bandpass L40, amplified via the transistors in the emitter circuit V41, V42 and shaped to HCT level by the gate D40B. The switchover to the operating mode "external reference" depends on the level and is carried out in the function block LEVEL DETECTOR by the level detector V73, V74, C71 and the comparator N70.

When connecting or disconnecting an external reference, the monoflops D70A,B generate a pulse on the signal line lock* via the comparators N70A,B. This pulse signals the switchover between "internal reference" and "external reference" to the processor board.

7.1.4 FRN Control Loop

The VCO designed as Clapp circuit (function block 70 to 74.4 MHz VCO) with the FET V410 oscillates in the defined frequency range. The signal first passes via an isolating stage with the transistor V420 as common base and is then passed to the transistor amplifiers V210 (function block 70 to 74.4 MHz, OUTPUT AMP) and V220 (70 to 74.4 MHz BUFFER AMP). The output signal of V210 passes to the RF synthesizer module via the socket X161.

The output signal of V220 is mixed with the reference frequency of 64 MHz to the frequency range 6 to 10.4 MHz in the mixer B200 (function block MIXER). A bandpass filter is then provided for suppression of unwanted frequencies (function block BANDPASS FILTER 6 to 10.4 MHz). The output signal is passed to the transistor amplifiers V230 (6 to 10.4 MHz OUTPUT AMP) and V240, V250 (6 to 10.4 MHz BUFFER AMP).

The output signal of the amplifier V230 is applied to the output socket X163. This output is not used in the ESHS 10. The 6 to 10.4 MHz output signal of V250 is passed to the transistor amplifier V270 (function block FRACTIONAL DIVIDER).

The gate-array WOBDIV2 consists of an interface for data transmission, the fractional divider with 6-digit accumulator, the control logic for the compensation current sources of the first 4 fractionals, a further accumulator for the sweep mode of the FRN synthesizer in conjunction with the associate control logic.

V270 and the gates D270A-C are used for TTL shaping of the input signal for the gate array. The D-latches D290 and D291 synchronize the output signals to the input clock edges.

The JK flipflop D300A,B (function block PHASE DETECTOR) assumes the funciton of a frequency phase detector.

Four identically set up current sources designed as cascode circuit (function block CURRENT SOURCES) are realized by the bipolar transistors V323A-D, the FETs V324-V327 or the resistance-type array R323.

The currents are switched by means of the diode switches V321, V322, V330-V333 and V340-V349. The current-determining resistors or transistors are integrated on one array in order to achieve optimum thermal stability of the compensation.

The active filtering by means of V320, C320, R320 and R321 decouples the negative operating voltage of the current sources. R352 is used as current source for the phase detector (only active with frequency variations) the BIAS current source is realized by V356, R353-R355. Decoupling of the positive operating voltage is achieved by means of an active filter with V355, C335 R350 and R351.
The integrator consists of the active element N370 and the transistors V373 and V374 as complementary output driver. The integration time constant is determined by the currents of the current sources, the integration capacitor C376 and the negative feedback via R345 and C378. The non-inverting input of the operational amplifier is applied to stable potential which is generated by N360B and V361 as voltage source with low internal impedance (function block STABILISATION).

The operating voltage is supplied to the gate array WOBDIV2 and the phase detector via N360A and the transistor V360.

The sample-and-hold circuit with the MOSFET V380 as switch, the hold capacitor C385 and N385B as buffer is controlled by the gate array WOBDIV2 via the level converter V385 and samples the output voltage of the integrator.

The output voltage of the sample-and-hold circuit passes via the loop filter around N385A (function block FRN LOOP FILTER) to the control input of the 70 to 74.4 MHz VCO. The control time constant is determined by the lead-lag unit R391, R393, C393.
The control time constant is decreased by means of the diodes V395 and the resistor R392 in order to accelerate settling of the phase control loop after a change of frequency. The zener diode V393 is used to limit the negative control range of the operational amplifier N385A,B.

The window comparator N4A,B monitors the control voltage of the FRN PLL.

7.2 Required instruments

The test facilities listed in the table below are required for adjustment of the module inside the instrument:

Item	Type of instrument	Required specifications	Suitable R&S instrument
1	Frequency counter	with precise reference up to 100 MHz	
2	RF signal generator	10 MHz	SMG
3	Spectrum analyzer		FSA
4	RF level meter		URV5 tog. with URV-Z2
5	Multimeter		UDS 5
6	Power supply	0 to 30 V	NGT 35

7.3 Troubleshooting

Note:

Correct functioning of the modules DISPLAY BOARD, REAR PANEL, CPU BOARD is required for the automatic selftest of this board. The automatic test of the complete instrument is generally aborted if a measurement exceeds the predefined tolerance limits in order to avoid absurd error messages to be output. For further error location, the test functions can be called manually in the Board Test menu (cf. Section 6).
The automatic selftest does not allow for localization of each error occuring.
Refer to the troubleshooting flowchart for localization of those errors, which cannot be found by the automatic selftest.

- Press hardkey SELFTEST, call Board Test menu (SELFTEST 09).
- Select the FRN synthesizer module using the (UP) or (DOWN) keys.
- Call test function 0 to start the board test for the complete instrument. The test is interrupted when the first faulty test function occurs; it can, however, be continued by pressing the ENTER key (cf. Section 6).
- Enter the faulty test function and switch over to the manual test mode by pressing the ENTER key. If the fault is assumed to be in the FRN synthesizer and is not recognized by the automatic selftest, continue troubleshooting using the flowchart.
- The default setting for the FRN synthesizer as well as the additional settings for the respective test function (cf. table 7-1) are automatically set.
  The measured selftest voltage is output in the LEVEL display, the permissible tolerance limits are given in the DATA INPUT display.

Default setting:

Frequency: 16.3 MHz
Test points in the FRN synthesizer

7.3.1 Selftest Functions and Troubleshooting Flowcharts

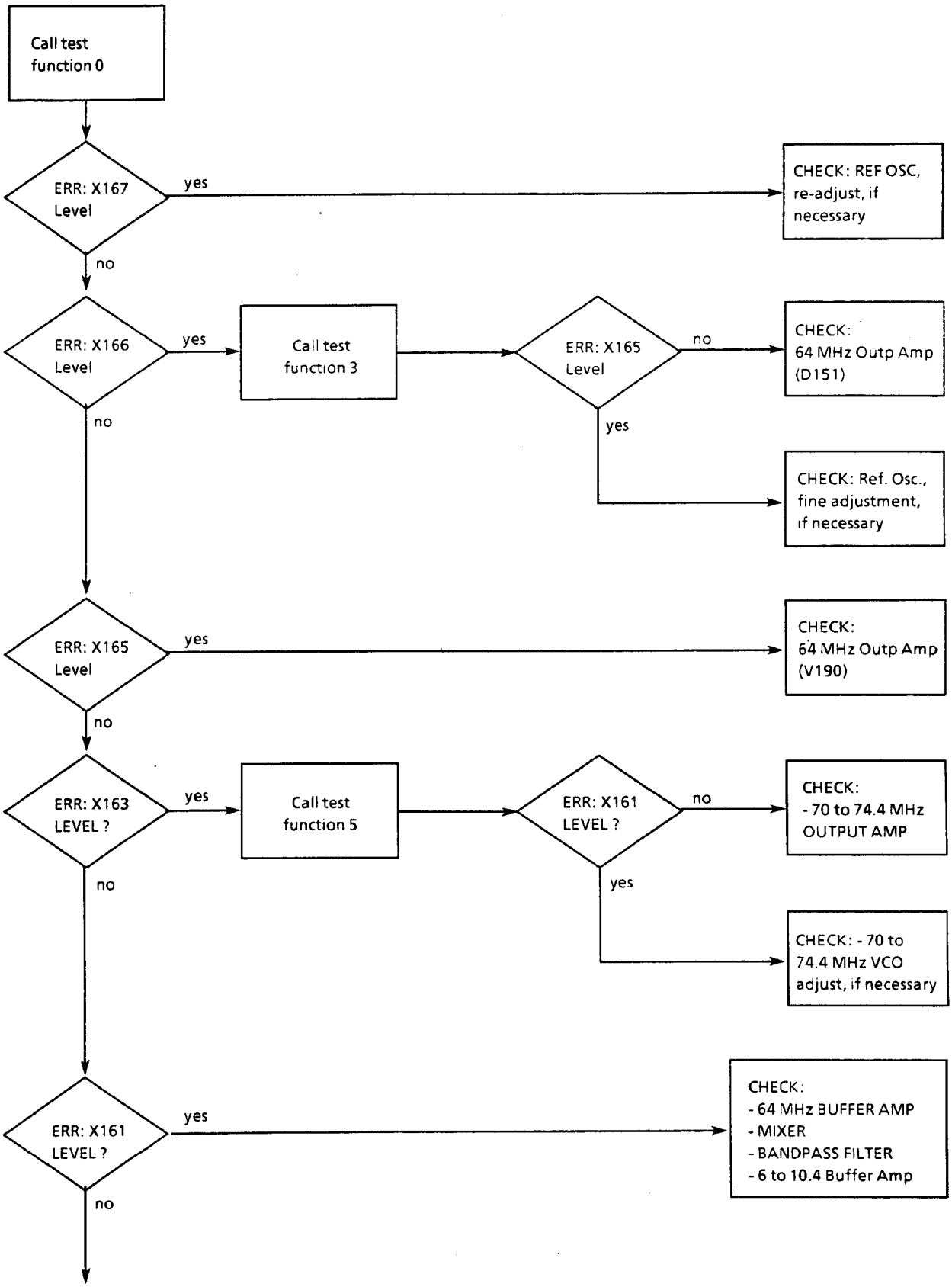
Table 7-1 Test functions of the FRN synthesizer

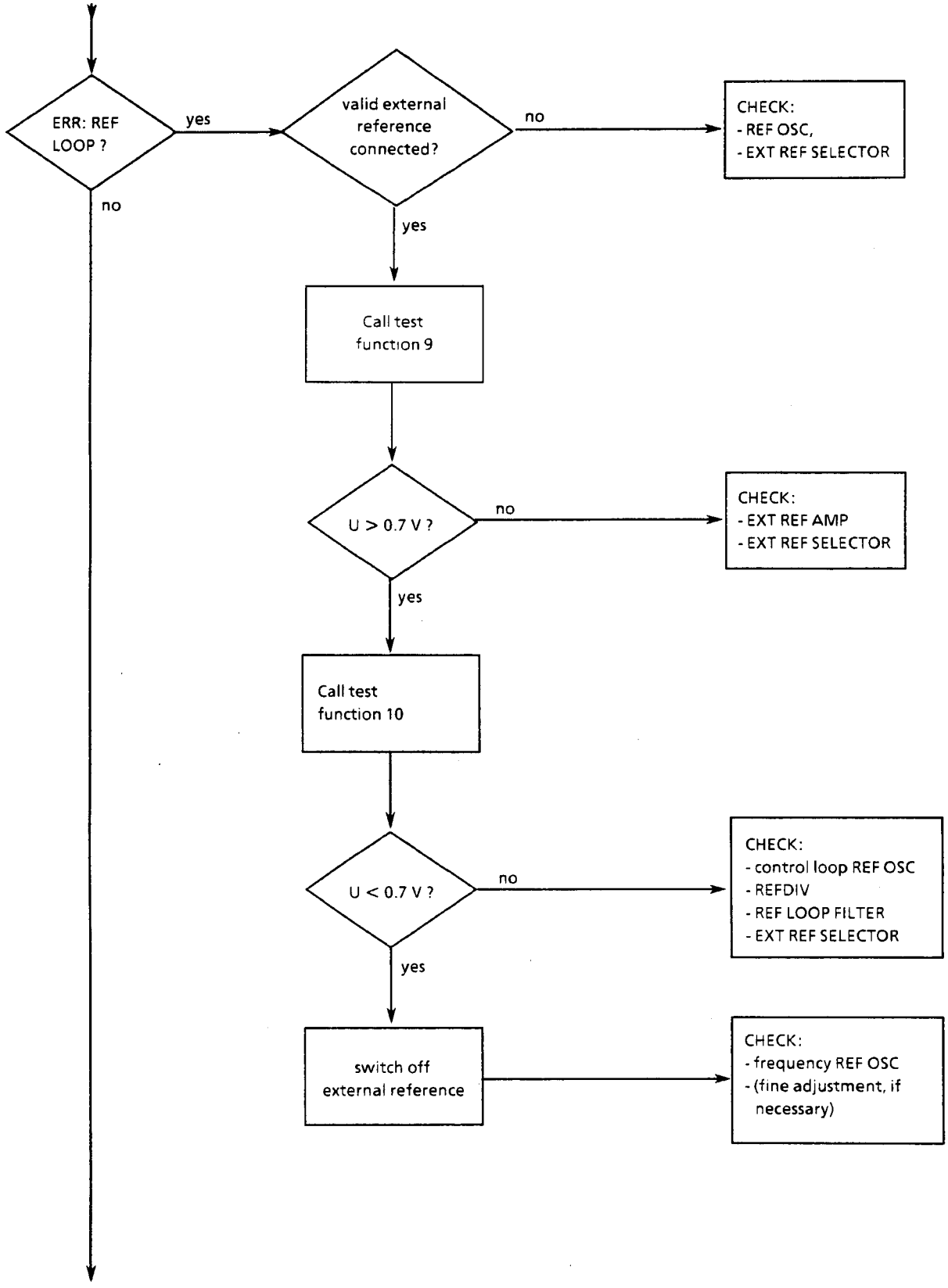
Test-function	Description	Setting TP = Test point	Rated value	Error message ERR:
0	Test 1 to 8	Test 1 to 8	Test 1 to 8	
1	64-MHz output	TP13	> 0.4 V	X167 Level
2	64-MHz output	TP12	> 0.4 V	X166 Level
3	64-MHz output	TP11	> 0.4 V	X165 Level
4	6 to 10.4 MHz output	TP9	> 0.1 V	X163 Level
5	70 to 74.7 MHz output	TP8	> 0.2 V	X161 Level
6	Ref Loop	TP1	0.9 to 3.8 V	Ref Loop
7	FRN Loop	TP0 WOBDIV-TF = 75 REFDIV-TF = 200	> 0.3 V	FRN Loop
8	FRN Loop	TP0 WOBDIV-TF = 130 REFDIV-TF = 200	< 3.8 V	FRN Loop
9	ext Ref Level	TP10	–	–
10	ext Ref	TP2	–	–

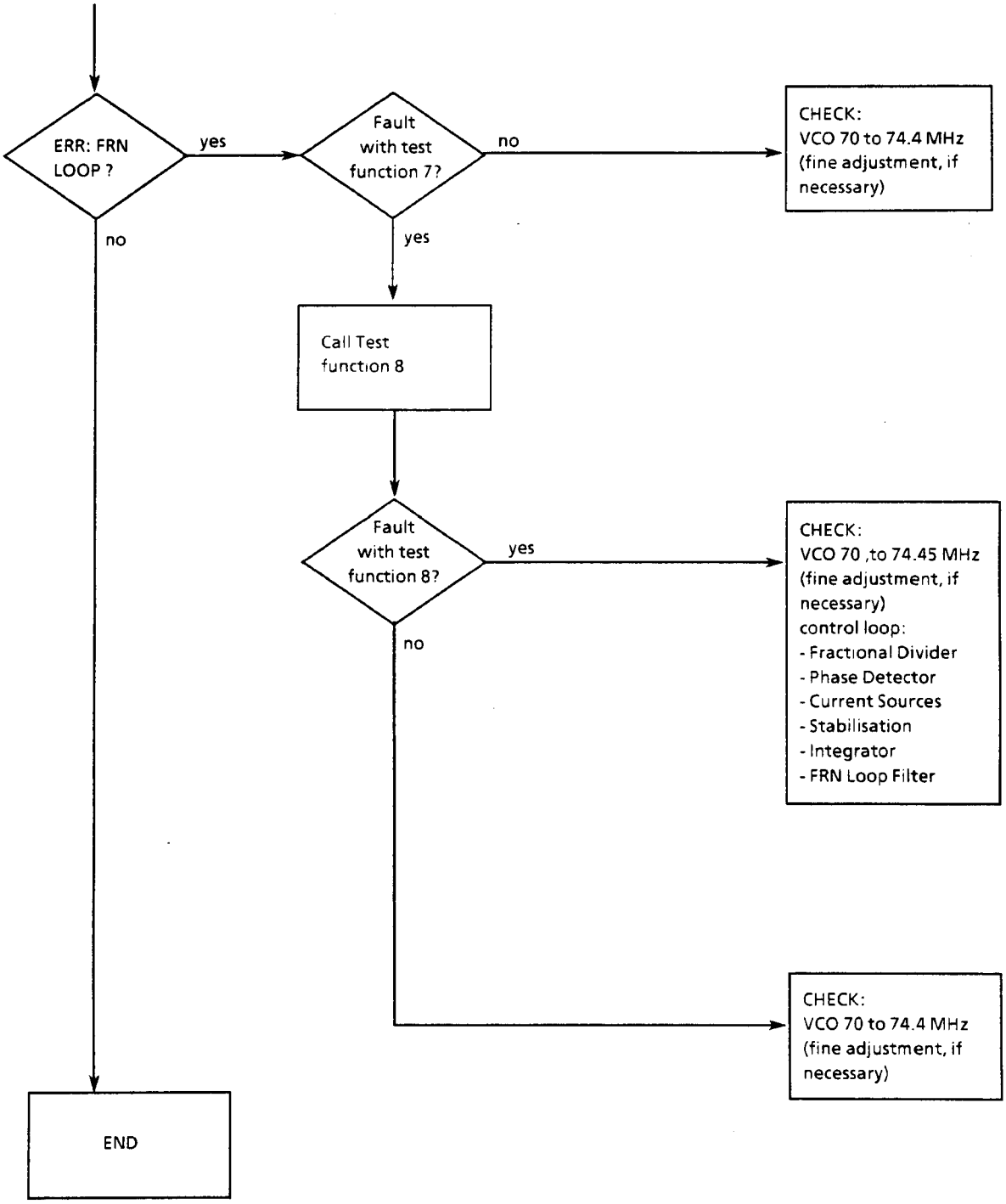
The test functions 9 and 10 are not processed when calling test function 0, since the levels indicated depend on an external signal.

- Plug the board onto the service kit EZ-xx.
- When the faulty test function has been determined, continue troubleshooting using the troubleshooting flowchart (Fig. 7-1).

Fig. 7-1 FRN Synthesizer: Troubleshooting Flowchart




ERR: REF LOOP ?
yes
no
valid external reference connected?
no
CHECK:
- REF OSC,
- EXT REF SELECTOR
yes
Call test function 9
U > 0.7 V ?
no
CHECK:
- EXT REF AMP
- EXT REF SELECTOR
yes
Call test function 10
U < 0.7 V ?
no
CHECK:
- control loop REF OSC
- REFDIV
- REF LOOP FILTER
- EXT REF SELECTOR
yes
switch off external reference
CHECK:
- frequency REF OSC
- (fine adjustment, if necessary)


ERR: FRN LOOP ?
yes
Fault with test function 7?
no
CHECK:
VCO 70 to 74.4 MHz
(fine adjustment, if necessary)
no
yes
Call Test function 8
Fault with test function 8?
yes
CHECK:
VCO 70 ,to 74.45 MHz
(fine adjustment, if necessary)
control loop:
- Fractional Divider
- Phase Detector
- Current Sources
- Stabilisation
- Integrator
- FRN Loop Filter
no
CHECK:
VCO 70 to 74.4 MHz
(fine adjustment, if necessary)
END

7.3.2 DC Voltages and Waveforms for Troubleshooting

All voltages indicated with amplifiers are d.c. working points.

Unscrew upper and lower cover of board. Set input frequency f = 15.3 MHz.

EXTERNAL REFERENCE AMPLIFIER

D40A Pin3 needle pulses, pulse width t ≈ 30 to 50 ns
(with ext. reference 10 MHz / 7 dBm connected)

V42.C	V_{ss} > 2.5 V (10 MHz) with oscilloscope

LEVEL DETECTOR

X70	V > 0.5 V (DC) with digital multimeter
X50.5	10 MHz HCT level with oscilloscope

REF DIVIDER

X50.1	16 MHz HCT level with oscilloscope
X51.5	Needle pulses, repetition rate 80 kHz

REF LOOP FILTER

X60	V ≈ -0.7 V (DC)	(no external reference connected)
	3 V ≤ V ≤ 7 V	(external reference 10.0 MHz / 7 dBm connected)

EXT REFERENCE SELECTOR

X80.1	V ≈ V_{tuning} (X81.1)	(no external reference connected)
	1.8 V ≤ V ≤ 7.6 V	(external reference 10.0 MHz / 7 dBm connected)

REF OSC (64-MHz Crystal Oscillator)

X100	V ≈ 9.0 ± 0.5 V	(DC)	with digital multimeter
V130.S	V ≈ 2.0 ± 1.0 V	(DC)	with digital multimeter
X140.2	p = 12 ± 2 dBm		with digital multimeter

64 MHz AMPLIFIERS

V150.C	V = 2.8 ± 0.5 V	(DC)	with digital multimeter
V170.S	V = 2.0 ± 1.0 V	(DC)	with digital multimeter
V180.S	V = 2.0 ± 1.0 V	(DC)	with digital multimeter
V190.S	V = 2.0 ± 1.0 V	(DC)	with digital multimeter

70 to 74,4 MHz AMPLIFIER

X200.2	p = 12 ± 2 dBm	with RF level meter

70 to 74,4 MHz BUFFER AMPLIFIER

V210.C	V = 6.0 ± 1.0 V (DC)	with digital multimeter
X201.2	p = 10 ± 2 dBm	with RF level meter

70 to 74,4 MHz BUFFER AMPLIFIER

V220.C	V = 5.6 ± 1.0 V (DC)	with digital multimeter

MIXER, BANDPASS FILTER

X210.2	p = 0 ± 2 dBm	with RF level meter
X230.2	p = -15 ± 2 dBm	with RF level meter

6 to 10,4 MHz BUFFER AMPLIFIER

V240.C	V = 5.3 ± 1.0 V (DC)	with digital multimeter
V250.C	V = 5.6 ± 1.0 V (DC)	with digital multimeter

6 to 10,4 MHz OUTPUT AMPLIFIER

V230.C	V = 5.7 ± 1.0 V (DC)	with digital multimeter

FRN control loop
Pulse frequency f = 80 kHz each

X280.2	f = 8 MHz HCT level	with oscilloscope
X290.4	HCT pulse (⌝⌞⌜)	
	Length ≈ 1.55 ± 0.1 µs	with oscilloscope
X291.1	HCT pulse (⌝⌞⌜)	
	Length ≈ 0.5 ± 0.1 µs	with oscilloscope
X291.2	HCT pulse (⌝⌞⌜)	
	Length ≈ 1.4 ± 0.1 µs	with oscilloscope

PHASE DETECTOR

Frequency of pulses f = 80 kHz

X300.2	HCT needle pulses(_⌐⌙_)	
	Length ≈ 25 ± 10 ns	with oscilloscope
X300.1	HCT pulse (_⌐⌙_)	
	Length ≈ 0.6 ± 0.1 µs	with oscilloscope

CURRENT SOURCES

V320.C	V = -10.0 ± 0.5 V	(DC)	with digital multimeter
V323.3,5,10,13	V = -5.3 ± 0.5 V	(DC)	with digital multimeter
V323.2	V = -4.7 ± 0.5 V	(DC)	with digital multimeter
V355.E	V = 10.0 ± 0.5 V	(DC)	with digital multimeter

STABILISATION

X360.1	V = 2.4 ± 0.2 V	(DC)	with digital multimeter
V360.E	V > 4.9 V	(DC)	with digital multimeter

INTEGRATOR

X370	trapezoidal voltage (f = 80 kHz) with oscilloscope, $V_{max} \approx 2.5 \pm 0.5$ V, $V_{min} \approx 0.75 \pm 0.5$ V

SAMPLE & HOLD

V385.C	Pulse, (+ 10V / -10 V), pulse duration approx. 20 ± 5 µs, repetition rate = 80 kHz

FRN LOOP FILTER

X380.1	V = 2.5 ± 0.5 V	with digital multimeter
X390.2	V = 11.5 ± 2.0 V	with digital multimeter

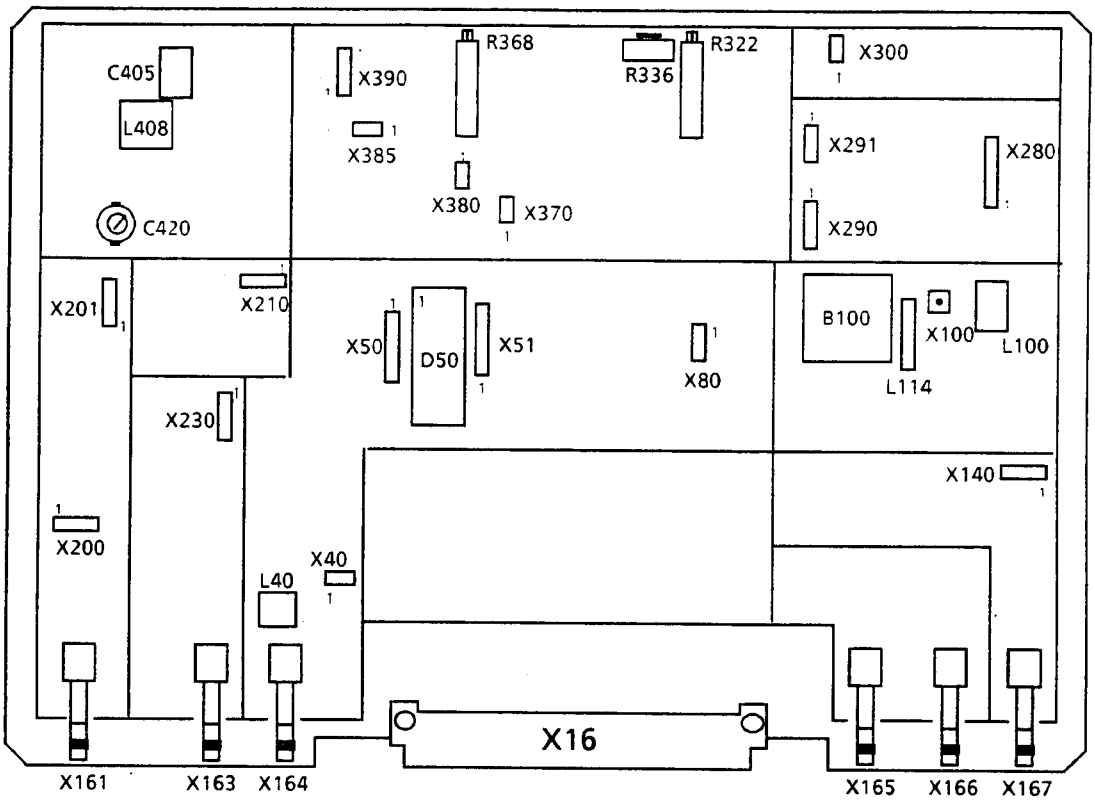
VCO

V360.S	V = 2.0 ± 1.0 V	(DC)	with digital multimeter
V360.D	V = 9.5 ± 1.0 V	(DC)	with digital multimeter

7.4 Testing and Adjustment

Important voltage and level values of the module are monitored by the selftest function.

7.4.1 Location of Jumpers, Test Points and Adjustment Elements



7.4.2 Reference Block

7.4.2.1 External Reference

Function check:

- Connect signal generator with a frequency of 10.0 MHz and a level of 7 dBm to X164
- Select FRN synthesizer test No. 10
  Check measuring value: V < 0.7 V (HCT LOW)
- Switch off level of signal generator
- Check measured value of test No. 10: V > 2.5 V (HCT HIGH)

- Connect signal generator with a frequency of 10.0 MHz and a level of 3 dBm to X164
- Select FRN synthesizer test No. 9
  Check measuring value : V > 0.7 V

Adjusting band filter L40

Adjustment is required when replacing the band filter L40.

Remove the upper screening cover for adjustment of the band filter L40!

- Connect signal generator 1.0 MHz / 3 dBm to X164
- Connect spectrum analyzer to X40 (signal: X40/1, ground: X40/2)

Setting:

Center 10 MHz, Span 4 MHz, ref. level 0 dBm - adjust to max. suppression of the 9 and 11 MHz sidebands of the 10 MHz carrier (cf. fig. 7-3)
(Level of 10 MHz carrier: P > -10 dBm, level 9, 11 MHz: P < -30 dBm)

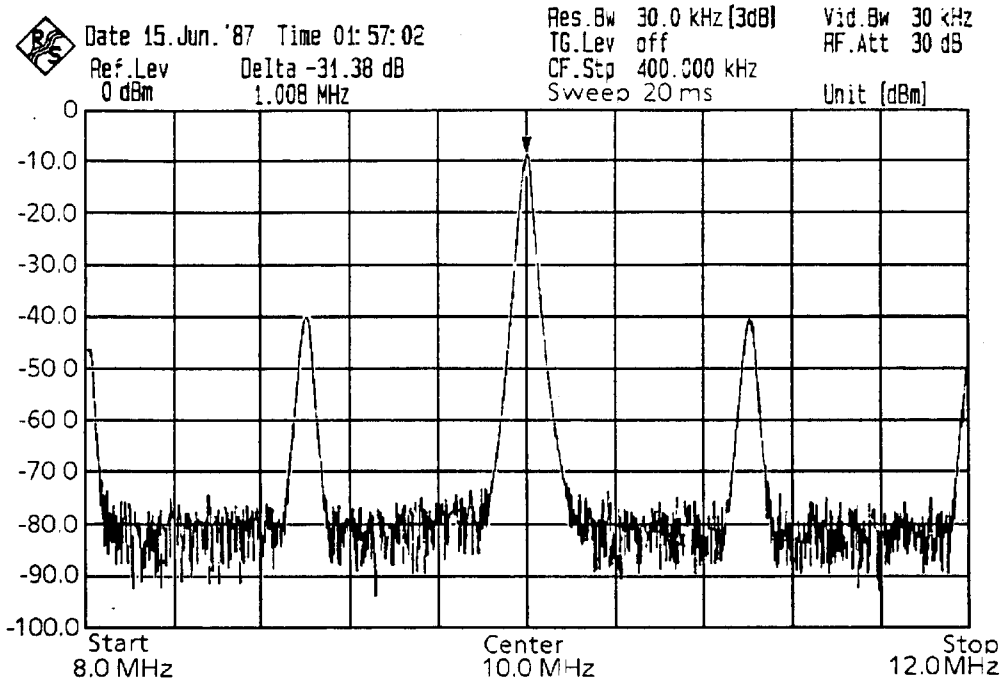


Fig. 7-3 Sidebands

7.4.3 REF OSC (64-MHz Crystal Oscillator)

Re-adjustment

Re-adjustment is required when replacing the quartz B110, the transistor V110, the coils L100, L114 or the capacity diodes V111 to V114.

Remove the upper screening cover for adjustment!

- Remove bridge X140
- Connect spectrum analyzer to X140.2,1

Setting: Center 64 MHz, span 1 MHz, ref. level 20 dBm

- Set 7.5 V at X80.1 using **R368**
- Set oscillator to the center of oscillation using **L100**
- Set 5.0 V ± 0.1 V at X80.1 using **R368**
- Check, if level at X140.2 is 12 ± 2 dBm using a spectrum analyzer
- Plug in bridge X140.2,3, fix screening cover to the board using screws
- Continue with fine adjustment of the reference frequency

Fine adjustment of the reference frequency

The fine adjustment is required, if synchronization by an external reference frequency is not possible, if the regulating range of the frequency regulator **R368** is not sufficient for adjustment to the rated frequency, or when a re-adjustment was carried out previously.

For this adjustment it is required that the instrument warms up for 1 hour

- Connect a frequency counter with exact reference to X167
- Select FRN synthesizer test No. 6, adjust **R368** until measured value of test No.1 V = 2.5 ± 0.05 V
- Adjust **L114** until measured frequency is 64 MHz ± 1 Hz

Checking the output levels of the 64-MHz OUTPUT AMPLIFIER

- Connect spectrum analyzer to X165
- Check level 7 ± 2 dBm
- Select FRN synthesizer test No. 3: measure V > 0.4 V

- Connect spectrum analyzer to X166
- Check level 7 ± 2 dBm
- Select FRN synthesizer test No. 2: measure V > 0.4 V

- Connect spectrum analyzer to X167
- Check level 7 ± 2 dBm
- Select FRN synthesizer test No. 1: measure V > 0.4 V

7.4.4 Reference Control Loop

Checking the reference control loop

- Connect frequency counter to X167
- Connect signal generator (frequency: 10.000000 MHz, level: 7 dBm)to X167
- Check the frequency 64.000000 MHz ± 10 Hz on the frequency counter
- Set signal generator to a frequency of 10.000050 MHz
- Check the frequency 64.000320 MHz ± 10 Hz on the frequency counter
- Select FRN synthesizer test No. 6: V < 3.8 V

7.4.5 Lock Detector

Checking the switchover between external and internal reference

- Connect 10.0 MHz /7 dBm signal generator to X167
- Connect oscilloscope to X16.A11 (Lock)
- Switch off signal generator level, a pulse (active low, pulse width 10 µs to 20 µs) must appear at X16.A11
- Switch on signal generator level, a pulse (active low, pulse width 10 µs to 20 µs) must appear at X16.A11

Checking the lock detector for VCXO

- Connect signal generator to X167
- Connect multimeter at X16.A11 (Lock*)
- Perform frequency/level fine adjustment and measurements acc. to the subsequent table:

Frequency	Level	Voltage
10.000 MHz	7 dBm	V > + 2.5 V (HCT High)
10.001 MHz	7 dBm	V < 0.7 V (HCT Low)
9.999 MHz	7 dBm	V < 0.7 V (HCT Low)

measure at X16.A11 (Lock*)

7.4.6 FRN-Block

7.4.6.1 70 to 74,4 MHz VCO

Re-adjusting the VCO

Re-adjustment of the VCO is required when replacing the transistor V410, the capacity diodes V400-V409, the capacitor C405 or the coil L408.

This adjustment requires the upper screening cover to be removed!

- Remove bridge X390
- Connect frequency counter with 50-Ohm terminator to X200.2
- Apply a voltage source with V = 2.0 ± 0.1 V to X390.3
- Adjust frequency to 69.5 ± 0.1 MHz using **C405**
- Apply voltage V = 20.0 ± 0.1 V to X390.3
- Check frequency 75.0 ± 0.5 MHz
- Apply voltage V = 10.0 ± 0.1 V to X390.3
- Connect RF level meter to X200.2
- Adjust level to 11 ± 1 dBM using **C420**
- Plug in bridges X200.2,3 and X390.1,2
- Fix screening cover to the board using screws
- Continue with fine adjustment of VCO

Fine adjustment of VCO

The fine adjustment is required subsequent to re-adjustment or when the error message "ERROR : FRN Loop" occurs.

- Select FRN synthesizer test No. 7, re-adjust C408 until test No. 0: V = 0.6 ± 0.1 V
- Select FRN synthesizer test No. 8 Check voltage test No. 0, V = < 3.8 V

Checking the output level with 70 to 74.4 MHz OUTPUT AMPLIFIER

- Set input frequency f = 15.300 MHz
- Connect spectrum analyzer to X161
  Setting: center 72 MHz, span 10 MHz, ref. level 10 dBm
- Adjust level at X161 to 4 ± 2 dBm using C420
- Select FRN synthesizer test No. 5, voltage V > 0.2 V

Checking the output level with 6 to 10.4 MHz OUTPUT AMPLIFIER

- Connect spectrum analyzer to X163
  Setting: center 8 MHz, span 10 MHz,
  ref. level 10 dBm
- Check, if level is 0 ± 2 dBm
- Select FRN synthesizer test No. 4, voltage V > 0.1 V

7.4.6.2 FRN Control Loop

Adjusting the secondary lines

- Set input frequency f = 16.560 MHz
- Connect spectrum analyzer to X161, setting: center 73 MHz
- Synchronize receiver to the spectrum analyzer via the input "external reference"
- Adjust secondary line at 73.000000 MHz (800 Hz) to Min. (typ. < -75 dBc) using **R335**
- Set spectrum analyzer to center 72.991 MHz
- Adjust secondary line at 72.992800 MHz (8 kHz) to Min. (typ. < -90 dBc) using **R336**

7.4.7 Lock Detector

Remove the upper screening cover for check of the lock detector

Checking:
- Remove bridge X390
- Apply the following voltages using voltage source at X390/3,4 and check the voltage at X16.A11 by means of a multimeter

Apply voltage at X390/3,4 and measure voltage at X16.A11

Voltage V	Logic Level
1.0 V ± 0.1 V	U < 0.7 V (HCT LOW)
10.0 V ± 0.1 V	U > 2.5 V (HCT HIGH)
25.0 V ± 0.1 V	U < 0.7 V (HCT LOW)

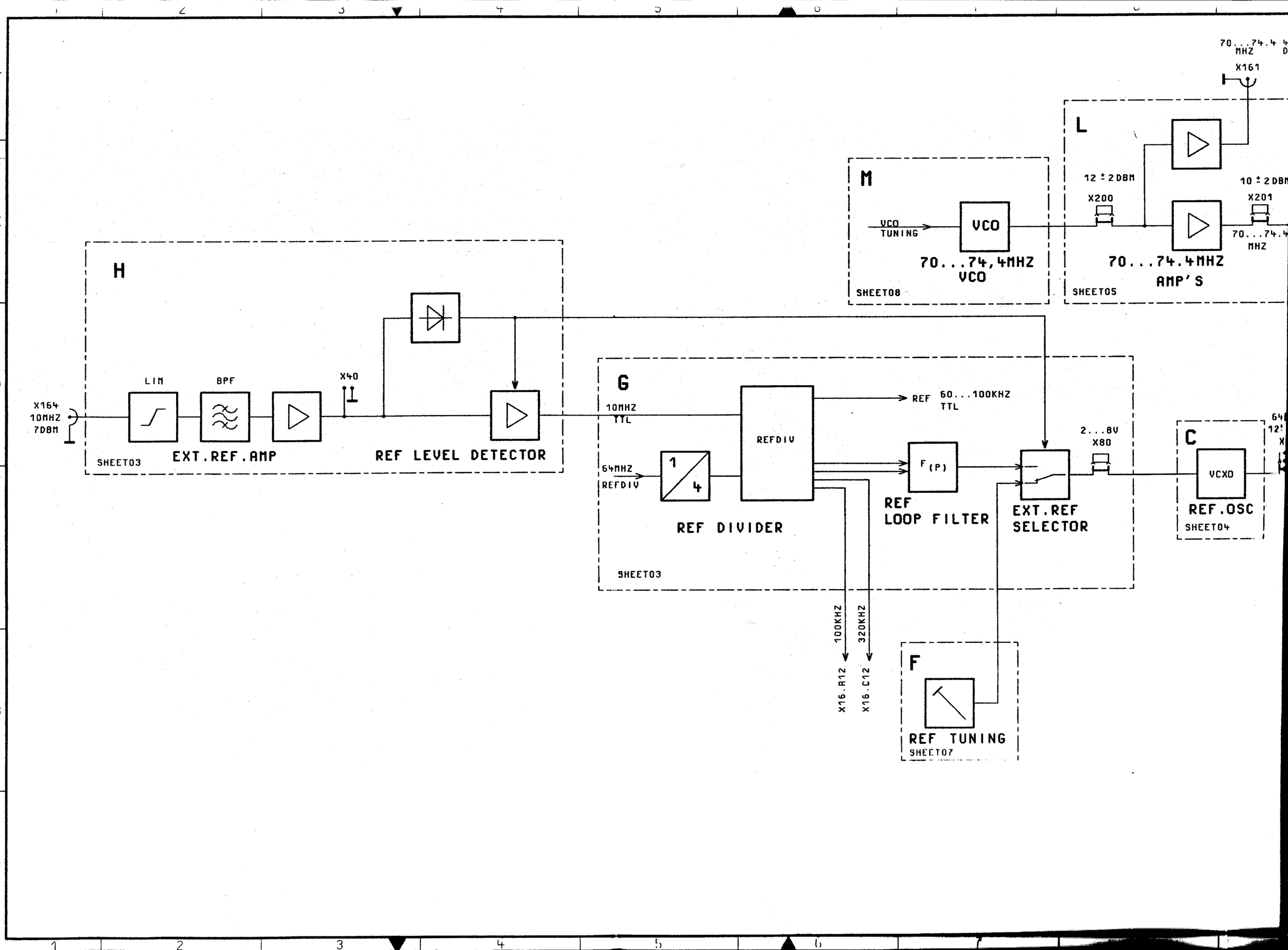
No sweep mode
(EORHF / PRCLK not used!)

7.5 Interfaces

Pin	Name	Input/Output	Origin/Destination	Specified range	Signal description
1 AC	AGnd			Analog ground	
2 AC	+ 5VA			5.4V ± 50mV	
4 AC	+ 10V			+ 10V ± 10mV	
5 AC	- 10V			-10V ± 10mV	
6 AC	+ 28V			+ 28V ± 0.2V	
7 A	SCLK	Input	CPU Board	HCT level	Serial data bus
7 C	TDATA	Input	CPU Board	HCT level	Serial data bus
8 C	STROBE*	Input	CPU Board	HCT level	Serial data bus
9 A	Test	Output	CPU Board	0 to 5 V	Selftest
11A	Lock*	Output	CPU Board	open Collector	Trap indicator
12A	100kHz	Output	IF Amplifier	HCT level	100 kHz Reference
12C	320kHz	Output	Detector Board	HCT level	320 kHz Reference
14C	SWPCLK	Input	CPU Board	HCT level	Sweep clock
15A	PRCLK	Output	not used		
15C	EORHF	Output	CPU Board	HCT level	Interrupt end of sweep
X161	70 to 74,4 MHz	Output	HF Synthesizer	4 ± 2 dBm	
X163	6 to 10,4 MHz	Output	not used	0 ± 2 dBm	
X164	Ext Ref	Input	Rear panel	10 MHz > 7 dB	Reference input
X165	64 MHz	Output	not used	64 MHz 7 ± 2 dBm	
X166	64 MHz	Output	not used	64 MHz 7 ± 2 dBm	
X165	64 MHz	Output	not used	64 MHz 7 ± 2 dBm	

FUER DIESE UNTERLAGEN BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.5300.01 S



70...74.4 MHZ 4±2 DBM
X161

6...10.4MHZ
0±2DBM
X163

L

12±2DBM
X200

10±2DBM
X201

70...74.4 MHZ

70...74.4MHZ AMP'S

SHEET05

K

MIXER

SHEET05

I

X230

6...10.4MHZ
-15±2DBM

6...10.4 MHZ AMP'S

SHEET05

M

VCO TUNING

VCO

70...74,4MHZ VCO

SHEET08

X210

64MHZ
-1±1DBM

64MHZ AMP'S

B

LIM

LPF

64MHZ REFDIV

SHEET04

D FRACTIONAL DIVIDER

WOBDIV

SAMPLE

BIAS

K1...K4

SHEET06

PD1

PD2

E

VCO/N

REF

PD

PHASE DETECTOR

SHEET06

SWPCLK

EORHF

PRCLK

X16.C14

X16.C15

X16.A15

REF 60...100KHZ TTL

REFDIV

VIDER

F(P)

REF LOOP FILTER

2...8V
X80

EXT.REF SELECTOR

C

64MHZ
12±2DBM
X140

VCXO

REF.OSC

SHEET04

100KHZ

320KHZ

X16.A12

X16.C12

F

REF TUNING

SHEET07

X165 64MHZ 7±2DBM

X166 64MHZ 7±2DBM

X167 64MHZ 7±2DBM

F

SAMPLE

PD1

PD2

SHEET06

06 45129 (10)

REND. IND.

6 7 8 9 10 11 12 13

74.4 4±2 DBM
MHZ
161
0 ± 2 DBM
X201
...74.4
MHZ

K
MIXER
SHEET05

6...10.4MHZ
0±2DBM
X163

I
X230
6...10.4MHZ
-15±2DBM
6...10.4 MHZ
AMP'S
SHEET05

X210
64MHZ
-1±1DBM

64MHZ
12±2DBM
X140

B
64MHZ AMP'S
LIM
LPF
64MHZ
REFDIV
SHEET04

D
FRACTIONAL
DIVIDER
WOBDIV
SHEET06

F
SAMPLE
BIAS
K1...K4
PD1
PD2
I
CURRENT
SOURCES
INT
INTEGRATOR
S&H
SAMPLE
&HOLD
F(P)
FRN LOOP
FILTER
2...25V
X390
VCO
TUNING
SHEET07

E
VCO/N
REF
PD
PHASE
DETECTOR
SHEET06

SWPCLK
EORHF
PRCLK
X16.C14
X16.C15
X16.A15

X165
64MHZ
7±2DBM
X166
64MHZ
7±2DBM
X167
64MHZ
7±2DBM

VERSIONS:

MOD02 = BASIC MODEL
MOD18 = BASIC MODEL 18MM

06	45123 (10)	12.90	NG	1KEE	TAG	NAME	BENENNUNG: FRN SYNTHESIZER
				BEARB.		NL	
				GEPR.		RB	
				NORM			
				PLOTT	28. 9.89	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.5300.01S
				ZU GERAET	ESHS30		REG.I.V. 1002.9001

BLATT-NR. 1 v. 8 Bl.

ERSTE Z.

DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

A

BOARD CONTROL

X16A 9 TEST
X16A 7 SCLK
X16C 7 TDATA
X16A 1 AGND
X16C 1
X16C 8 STROBE*
X16A 11 LOCK *
X16A 12 100KHZ
X16C 12 32OKHZ
X16C 14 SWPCLK
X16A 15 PRCLK
X16C 15 EORHF*
X16A 2 +5VA
X16C 2
X16A 4 +10V
X16C 4
X16A 5 -10V
X16C 5
X16A 6 +28V
X16C 6

R4 100R
R5 100R
R6 100R
R7 100R
R1 100R L
R2 100R L
R3 100R L
R10 100R
R11 100R
R9 100R
R12 100R
R13 100R

C11 220P L
C1 220P L *
C2 220P L *
C3 220P L *
C4 220P L *
C5 220P L *
C6 220P L *
C22 10N L
C23 10N L
C24 220P L
C25 100P L
C26 1N L
C28 1N L
C29 1N L
C30 10N L
C31 10N L
C32 10N L
C33 10N L
C34 560P L
C35 560P L
C36 560P L
C37 560P L
C13 10U
C14 10U
C15 10U
C16 10U

L9 1UH
L2 1U2H
L3 1U2H
L4 1U2H
L5 1U2H
L6 1U2H

D1-A 74HCT14T-L
D1-B
D1-C
D1-D
D1-F
D1-E
D1-G 74HCT14T-L

NSCLK SHEET02 C/15
LOCK SHEET02 D/13,15
100KHZ
32OKHZ
CLKWOB
PRCLK
EORHF*
SHEET02 E,F/15
+5V
+10V
-10V
+28V

ADRESSDECODER

+5V
R14 1K L
D2-A 74HCT4094T-L
D3-A 74HCT238T-L
R15 1K L
D5-A 74HCT4094T-L
ADR.: 16D 17D 18D
ENA-WOBDIV/A
ENA-REFDIV/A
NTDATA
SHEET02 D/15

C7 10N L
C8 10N L
C9 10N L
D2-B 74HCT4094T-L
D3-B 74HCT238T-L
D5-B 74HCT4094T-L

D6-A 74HC4051T-L
TEST0
TEST1
TEST2
TEST3
TEST4
TEST5
TEST6
TEST7

D6-B 74HC4051T-L
C10 10N L
D7-B 74HC4051T-L
C12 10N L

+28V
R17 100K L
R18 10K L
R19 30K1 L
R20 10K L
R21 10K L
TEST6
TEST5

+10V
+5V
R23 56K2 L
R24 100K L
R25 100K L
R26 100K L
TEST -10V
TEST EXT.REF
SHEET03 C/4
V10 BAS32-L
N1-A LM224D-L
N1-B LM224D-L
TEST7
TEST2

TEST X165
SHEET04 F/12

BOARD CONTROL

ADRESSDECODER

+5V

R15 1K L

D5-A 74HCT4094T-L

D3-A 74HCT238T-L

ADR.: 16D
17D
18D

ENA-WOBDIV/A
ENA-REFDIV/A
NTDATA
SHEET02 D/15

C9 10N L

D3-B 74HCT238T-L

D5-B 74HCT4094T-L

BOARD TEST

D6-A 74HC4051T-L

D7-A 74HC4051T-L

TEST0
TEST1
TEST2
TEST3
TEST4
TEST5
TEST6
TEST7

TEST8
TEST9
TEST10
TEST11
TEST12
TEST13
TEST14
TEST15

+28V

R17 100K L
R18 10K L
TEST6

+10V
R19 30K1 L
TEST5
R20 10K L

+5V
R21 10K L
TEST4
R22 10K L

+5V
R16 10K L *
TEST3
R29 10K L

+10V
R23 56K2 L
V10 BAS32-L
R24 100K L
TEST -10V
N1-A LM224D-L
TEST7

+5V
R25 100K L
TEST EXT.REF
SHEET03 C/4
R26 100K L
N1-B LM224D-L
TEST2

TEST REF-LOOP
SHEET02 D/14
SHEET03 B/15
N1-C LM224D-L
TEST1

TEST FRN-LOOP
SHEET02 D/12
SHEET07 B/17
N1-D LM224D-L
TEST0

TEST X165
SHEET04 F/12
N2-A LM224D-L
TEST11

TEST X164
SHEET03 D/2
N2-B LM224D-L
TEST10

TEST X163
SHEET05 E/11
N2-C LM224D-L
TEST9

TEST X161
SHEET05 C/3
N2-D LM224D-L
TEST8

R27 10K L
N3-A LM224D-L
TEST15

R28 10K L
N3-B LM224D-L
TEST14

TEST X167
SHEET04 B/12
N3-C LM224D-L
TEST13

TEST X166
SHEET04 E/12
N3-D LM224D-L
TEST12

LOCK DETECTOR

+5V

R31 15K L
C38 4N7 L
R34 1M L
R35 15K L

3,8V
N4-A LM339D-L
N4-C LM339D-L

R32 33K2 L
R36 27K4 L

0,3V
N4-B LM339D-L
N4-D LM339D-L

R30 10K L
TEST FRN-LOOP
SHEET02 A/7

C27 100N L
R33 3K32 L
R37 9K09 L

LOCK
SHEET02 D/4

L90 1U2H
L91 1U2H
L92 1U2H
L93 10UH

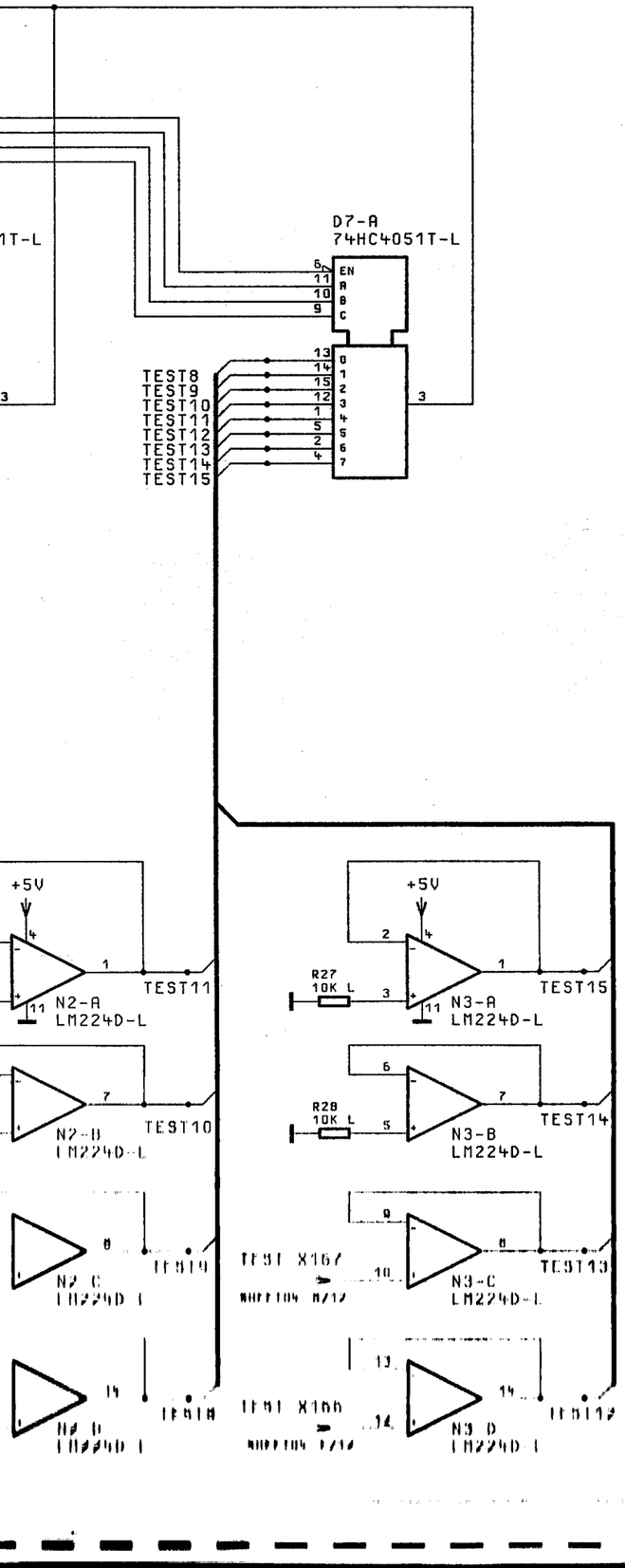
+5V
+5VG
+10V
+10VG
-10V
-10VG
+28V
+28VG

C90 10N L
C91 10N L
C92 10N L
C93 10N L
C94 10N L
C95 10N L
C96 10N L
C97 10N L

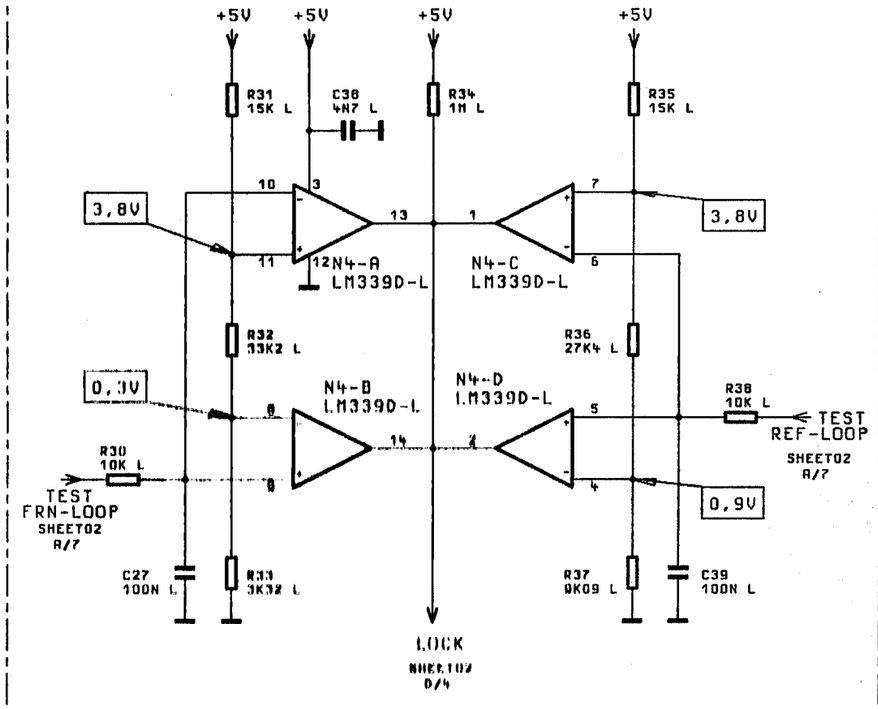
* NOT FITT

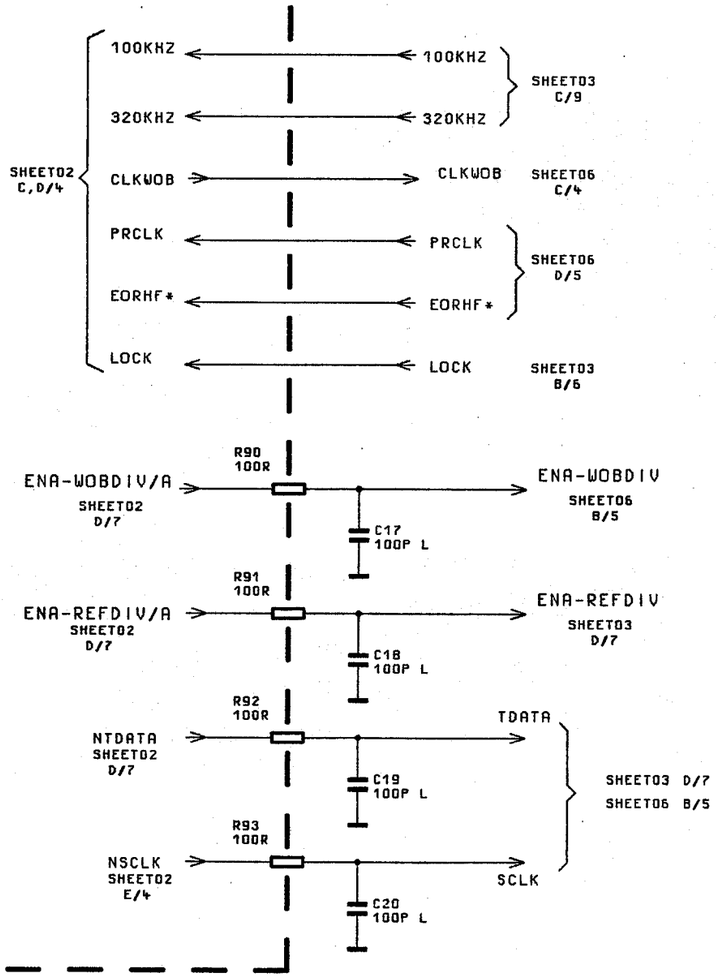
03	45105
06	45123
REND. IND.	RENDIRU MITTEIL

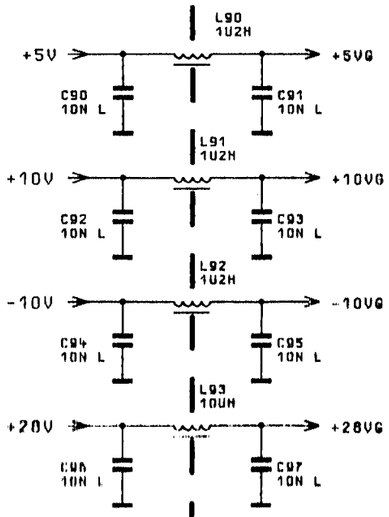
BOARD TEST



LOCK DETECTOR







* NOT FITTED

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
03	45105 (15)	07.90	NG
06	45123 (10)	12.90	NG

1KEE	TAG	NAME
BEARB.		NL
GEPR.		NL
NORM		
PLOTT	3.10.89	*

ROHDE&SCHWARZ
ZU GERAET ESHS30

BENENNUNG
FRN SYNTHESIZER

ZEICHN.-NR. 1003.5300.01S
BLATT-NR. 2 V. 8 BL.
REG.I.V. 1002.9001 ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

L40 X40

H

EXTERNAL REFERENCE AMPLIFIER

10MHZ/
7 DBM

X164 1
EXT.REF.

+5VG

R40
4K75 L

C40
1N L

C47
10P L

V40
BAS70-04-L

R42
1M L

C48
10N L

TEST X164
SHEET02 B/9

D41-A
74HCT00T-L

D41-B
74HCT00T-L

D41-D
74HCT00T-L

D41-C
74HCT00T-L

D40-A
74HCT00T-L

C43
5P6 L

C44
5P6 L

L40
2U7H

C45
1U

R47
475R L

R48
475R L

V43
HSMS2800

R43
2K43 L

C46
1N L

R45
2K43 L

V41
BCX70H-L

V42
BCX70H-L

R44
10K L

R46
1K L

REF LEVEL DETECTOR

TEST
EXT.REF
SHEET02 B/7

V72
BAS32-L

REF.SEL
SHEET03 D/15

C70
10P L

R71
75K L

N70-D
LM339D-L

V74
BAS32-L

V73
BAS32-L

C71
10N L

R70
1M L

V71
BAS32-L

V75
BAS32-L

R74
100K L

R570
10K L

R571
10K L

R572
10K L

R573
10K L

R72
22K1 L

C77
1N L

C76
1N L

D40-B
74HCT00T-L

R76
475R L

X40 1

X40 2

R77
51R1 L

D40-C
74HCT00T-L

D70-A
74HCT4538T-L

R574
10K L

N70-A
LM339D-L

LOCK
SHEET02
E/16

R575
10K L

N70-B
LM339D-L

D70-B
74HCT4538T-L

D40-D
74HCT00T-L

D40-E
74HCT00T-L

R75
22R1 L

C72
2U2 10V

C73
10N L

D41-E
74HCT00T-L

R578
22R1 L

C75
10N L

D70-C
74HCT4538T-L

N70-C
LM339D-L

R73
22R1 L

C74
10N L

G

SHEET04 F/9
64MHZ-REFDIV

REF D

64MHZ

R63
1K L

R64
1K L

D52-A
74AC74P L

D52-B
74AC74P L

* X50 6 X50 5 X50 4 X50 3 X50 2 X50 1

SCLK

TDATA

ENA-REFDIV

SHEET02 C,D/16

R50 1K L

R51 1K L

R53 1K L

10MHZ

R550
1K L

D54-A
74HCT74T-L

D54-B
74HCT74T-L

R551
1K L

D55-A
74HCT191T-L

CTR4

* NOT M

ZEICHN.-NR. 1003.5300.01 S

G

REF DIVIDER

SHEET04 F/9
64MHZ-REFDIV

SHEET06 E/9
REFG

+5VG

R63 1K L
R64 1K L
R65 1K L
W3

64MHZ

D52-A
74AC74P L

D52-B
74AC74P L

16MHZ

D51-A
74HCT74T-L

D50-B
REFDIV

R54 1K L

X50 6 X50 5 X50 4 X50 3 X50 2 X50 1

SCLK
TDATA
ENA-REFDIV
SHEET02 C,D/16

R50 1K L
R51 1K L
R53 1K L

X51 5
X51 4
X51 3
X51 2
X51 1

10MHZ

R550 1K L
D54-A
74HCT74T-L

R551 1K L
D55-A
74HCT191T-L

D54-B
74HCT74T-L

LOCK
SHEET02 E/16

R66 100R L
R69 100R L

100KHZ 320KHZ
SHEET02 F/16

R52 10K L
1,2M 10/10V

D53-A
74HCT191T-L

D51-B
74HCT74T-L

C51 10N L
R78 22R1 L
C66 1U
C50 47U
R66 22R1 L
R67 22R1 L
R79 22R1 L
R554 22R1 L
R555 22R1 L
C67 1U
C79 10N L
C554 10N L
C555 10N L
D52-C
74AC74P L
D53-B
74HCT191T-L
D54-C
74HCT74T-L
D55-B
74HCT191T-L

REF LOOP FILTER

+10VG
L60 10UH
C60 10N L
C61 10U
C68 10N L
C62 1U
C55 1U
R55 16K2 L
R57 16K2 L
R56 16K2 L
R58 16K2 L
R60 82K5 L
V61 BAS32-L
R62 1K L
N60 SE5534AFE
R61 82K5 L
C63 1U
C69 10N L
R59 2K21 L
C56 1U
C64 10U
L61 10UH
C65 10N L
-10VG

EXT. REFERENCE SELECTOR

R80 1K L
R81 1K L
C80 47U

* NOT FITTED

05	45123 (5)	11.90	NG	1KE.
06	45123 (10)	12.90	NG	BEARB
08	46342 (10)	04.91	NG	GEPR.
				NORM
				PLOTT
				RD
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GEN

X80

F DIVIDER

SHEET06 E/9
REFG

+5VG
R65 1K L
W3
D51-A 74HCT74T-L
16MHZ

D50-A REFDIV
+5VG
R54 1K L
VSS REFEN1 23
F2 REFOUT 22 → X51 5
F1 SDOUT 21 → X51 4
CLK PD2 20 → X51 3
SDIN PD1 19 → X51 2
LDEN VSS 18 → X51 1
TEST1 F32OK 17
TEST2 F100K 16
RESB F10K 15
REFEN2 F1K 14
REFEXT F100HZ 13
R68 100R L
R69 100R L
100KHZ
320KHZ
SHEET02 F/16

+5VG
V50 BAS32-L
R52 10K L
C78 1U/10V
D53-A 74HCT191T-L

C51 10N L
R78 22R1 L
C50 47U
D50-B REFDIV
C66 1U
R66 22R1 L
D51-C 74HCT74T-L
D51-B 74HCT74T-L
R67 22R1 L
C67 1U
D52-C 74AC74P L
R79 22R1 L
C79 10N L
D53-B 74HCT191T-L
R554 22R1 L
C554 10N L
D54-C 74HCT74T-L
R555 22R1 L
C555 10N L
D55-B 74HCT191T-L
+5VG

+10VG
C81 10N L
L80 10UH
C82 10N L
D80-B 74HC4053T

+10VG
N80-A TL072ACP
-10VG

REF LOOP FILTER

+10VG
L60 10UH
C60 10N L
C61 10U
C68 10N L
C62 1U
R60 82K5 L
C55 1U
R55 16K2 L
R57 16K2 L
R56 16K2 L
R58 16K2 L
C56 1U
V61 BAS32-L
R62 1K L
R59 2K21 L
N60 SE5534AFE
R61 82K5 L
C63 1U
C69 10N L
C64 10U
L61 10UH
C65 10N L
-10VG

EXT. REFERENCE SELECTOR

SHEET03 C/4
REF.SEL
+10VG
D80-A 74HC4053T
R82 100K L
X80 1
X80 2
MUXDX
1 3X1
2 3X2
2...8V
VCXO TUNING
C
SHEET04 C/1
R80 1K L
R83 51K1 L
R81 1K L
TUNING
SHEET07 E/11
C80 47U
R84 47K5 L
N80-B TL072ACP
R85 1K L
TEST REF-LOOP
SHEET02 A/7

OT FITTED

05	45123 (5)	11.90	NG	1KEE	TAG	NAME
06	45123 (10)	12.90	NG	BEARB.		NL
08	46342 (10)	04.91	NG	GEPR.		NL
				NORM		
				PLOTT	3.10.89	*
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG
FRN SYNTHESIZER

ROHDE&SCHWARZ
ZU GERAET ESHS30

ZEICHN.-NR. 1003.5300.01S
REG.I.V. 1002.9001
ERSTE Z.

BLATT-NR. 3
V. 8 BL.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.5300.01 S

L100 L114 X140

REF. OSC.

+10VC

L120 10UH L121 10UH

R101 4K75 L C101 4N7 L

V100 BCX70H-L

C100 47U R102 22R1 L

X100 *

B110 64MHZ X112 X113 X111 X110

+10VC

L100 260NH-T C110 220P L C111 100P L C112 22P N750

R103 10K L R105 1K5 C102 4N7 L C106 10U *

L115 5U6H

R115 332R L L113 4U7H

V101 HSMS2800-L

L114 260NH-T

R106 8K25 L C103 10N L

R110 33R2 L

4 X BB809 V111 V112 V113 V114

L110 F.P. V110 NE85632

C105 4N7 L

C115 1N L

R104 4K75 L C104 47U

R111 392R L C113 47P L R112 47R5 L C114 47P L

L111 4U7H L112 4U7H R113 332R L R114 332R L

C133 10N L C130 47P L L131 4U7H R131 5K62 L

V130 V310 L132 680NH C135 1N L C134 6P8 L

L130 220NH * C131 4N7 L R130 1K1 L -10VC

C116 1U

VCXO TUNING

R100 1K21 L

C SHEET03 C/16

+10VC -10VC

C125 10U 25V C121 10N L C123 10N L

L122 10UH L123 10UH

C122 10N L C124 10N L

+10VG -10VG

X140 1 X140 2 X140 3 X140 4

64MHZ 12 ±2 DBM

R140 18R2 L R141 301R L R142 301R L T140 R143 33R2 L R144 200R L

+10VC L142 10UH +10VB

C144 10N L C145 10N L

-10VC L143 10UH -10VB

C146 10N L C147 10N L

+5VB C143 10N L * C195 10U C196 10U * C142 10N L.

L141 10UH

+5V

B

D150-A 74ACOOT L D150-B 74ACOOT L D150-C 74ACOOT L

D151-B 74ACOOT L D151-C 74ACOOT L

+5VB

R148 22R1 L C148 4N7 L D150-E 74ACOOT L

R149 10R L C149 1U D151-E 1474ACOOT L

+5VB

R153 274R L R154 33K2 L R152 2K43 L C152 1N L

R150 33R2 C150 L1N L R155 33K2 L

V150 BFR92A-L R151 1K L

R159 100R L R160 100R L R161 100R L

+10VB

C171 4N7 L

R172 5K62 L L170 560NH R180 5K62 L

R170 33R2 L C170 1N L C172 6P8 L R173 30R1 L C173 1N L

R171 2K43 L R174 182R L R175 182R L R176 2K43 L

V170 U310

-10VB -10VB

+10VB

C191 4N7 L

R192 5K62 L L190 560NH R193 18R2 L

R190 47R5 L C190 1N L C192 6P8 L R194 301R L R195 301R L

R191 1K21 L

V190 U310

-10VB

* NOT FITTED

REND.	IND.
4	
5	
6	
7	

L114

X140

C

B

D150-A 74ACOOT L
D150-B 74ACOOT L
D150-C 74ACOOT L
D151-B 74ACOOT L
D151-C 74ACOOT L

+5VB

R148 22R1 L
C148 4N7 L
D150-E 74ACOOT L
R149 10R L
C149 1U
D151-E 74ACOOT L

64MHZ OUTPUT AMPLIFIER

+5VB
R153 274R L
R154 33K2 L
R152 2K43 L
C152 1N L
R150 33R2
C150 L1N L
R151 1K L
V150 BFR92A-L
R155 33K2 L

D150-D 74ACOOT L
R159 100R L
64MHZ-REFDIV SHEET03 E/7

R160 100R L
D151-D 74ACOOT L
C155 1N L
R162 20R L
L160 150NH
L162 150NH
R166 51R1 L
C157 47P L
C160 82P L
C162 47P L
R164 110R
R168 110R L

R161 100R L
D151-A 74ACOOT L
C156 1N L
R163 20R L
L161 150NH
L163 150NH
R167 51R1 L
C158 47P L
C161 82P L
C163 47P L
R165 110R L
R169 110R L

V160 BAS70-04-L
C164 10P L
C166 10N L
R156 1M L
TEST X165 SHEET02 C/9

64MHZ ZF-ANALY 7 ± 2DBM
X165 1

V161 BAS70-04-L
C165 10P L
C167 10N L
R157 1M L
TEST X166 SHEET02 A/10

X166 1
64MHZ 1.+2. MIXER 7 ± 2DBM

64MHZ BUFFER AMPLIFIER

+10VB
C171 4N7 L
R172 5K62 L
L170 560NH
R170 33R2 L
C170 1N L
C172 6P8 L
R173 10R1 L
C173 1N L
R171 2K43 L
R174 102R L
R175 102R L
R176 2K43 L
V170 U310
-10VB

+10VB
C180 4N7 L
R180 5K62 L
L180 560NH
C181 6P8 L
V180 U310
-10VB

+10VB
R181 909R L
V181
V182
R182 909R L
2 X BAS70-04-L
C182 1N L
R183 475R L

T180
C183 47P L
C184 82P L
C185 82P L
C186 47P L
L181 150NH
L182 150NH
L183 150NH
SHEET05 F/5

64MHZ OUTPUT AMPLIFIER

+10VB
C191 4N7 L
R192 5K62 L
L190 560NH
C192 6P8 L
R190 47R5 L
C190 1N L
R191 1K21 L
V190 U310
-10VB

R193 10R2 L
R194 301R L
R195 301R L

X167 1
64MHZ 3. MIXER 7 ± 2DBM

C193 10P L
V194 BAS70-04-L
C194 10N L
R196 1M L
TEST X167 SHEET02 B/10

C133 10N L
C130 47P L
L131 4U7H
R131 5K62 L
V130 U310
L132 680NH
C135 1N L
C134 6P8 L
L130 220NH
* C131 4N7 L
R130 1K1 L
-10VC

X140 1 X140 2 X140 3 X140 4
64MHZ 12 ±2 DBM

R140 18R2 L
T140
R143 33R2 L
R141 301R L
R142 301R L
R144 200R L

+10VC
L142 10UH
+10VB
C144 10N L
C145 10N L
-10VC
L143 10UH
-10VB
C146 10N L
C147 10N L

+5VB
C143 10N L
*
C195 10U
*
L141 10UH
C196 10U
*
C142 10N L
+5V

* NOT FITTED

					TAG	NAME
4	45105	08.90	NG			
5	45123	11.90	NG	BEARB.		NG
6	45123	12.90	NG	GEPR.		NL
7	45123	01.91	NG	NORM		
				PLOTT	24. 1.91	*
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME			

BENENNUNG

FRN SYNTHESIZER

ROHDE&SCHWARZ

ZU GERAET ESHS30

ZEICHN.-NR. 1003.5300.01S

BLATT-NR. 4

REG.I.V. 1002.9001

ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X200

+10VI

C228 10N L

L229 10UH

* C227 10U

C229 10N L

+10VL

W1

SHEET04 D/12

X230

+10VG

C230 10N L

C231 10N L

L231 10UH

+10VI

X210 1
X210 2
X210 3
X210 4

70...74.4MHZ BUFFER AMPLIFIER

+10VL

R206 200R L

C206 4N7 L

L205 4U7H

R205 681R L

C203 1N L

R204 5K62 L

C204 1N L

X200 1
X200 2
X200 3
X200 4

R200 90R9 L

R202 43R2 L

C202 1N L

R201 11R L

R203 1K L

V210 NE85632

E

SHEET08 D/12

70...74.4MHZ 12±2DBM

X201 1
X201 2
X201 3
X201 4

MIXER

64MHZ -1±1DBM

R210 301R L

R211 301R L

R212 18R2 L

B200 SRA1

RF
LO
IF

R207 18R2 L

R208 301R L

R209 301R L

R217 18R2 L

R215 301R L

R216 301R L

74...74.4MHZ 10 ±2 DBM

BANDPASS FILTER 6...10.4MHZ

L219 1U2H

L220 1U2H

R218 51R1 L

C219 390P L

C220 390P L

C218 180P L

L218 2U2H

L221 820NH

C222 560P L

X230 1
X230 2
X230 3
X230 4

R230 24R3 L

T230

6...10,4MHZ -15±2 DBM

70...74.4MHZ OUTPUT AMPLIFIER

+10VL

R226 332R L

C226 4N7 L

L226 4U7H

R224 562R L

V221 BAS70-04-L

C224 1N L

R225 5K62 L

C200 10P L

C225 1N L

C201 1N L

R220 90R9 L

R221 43R2 L

C221 1N L

R227 1M L

R222 10R L

R223 1K L

V220 BFR92A-L

L227 10UH L

X161 1

TEST X161

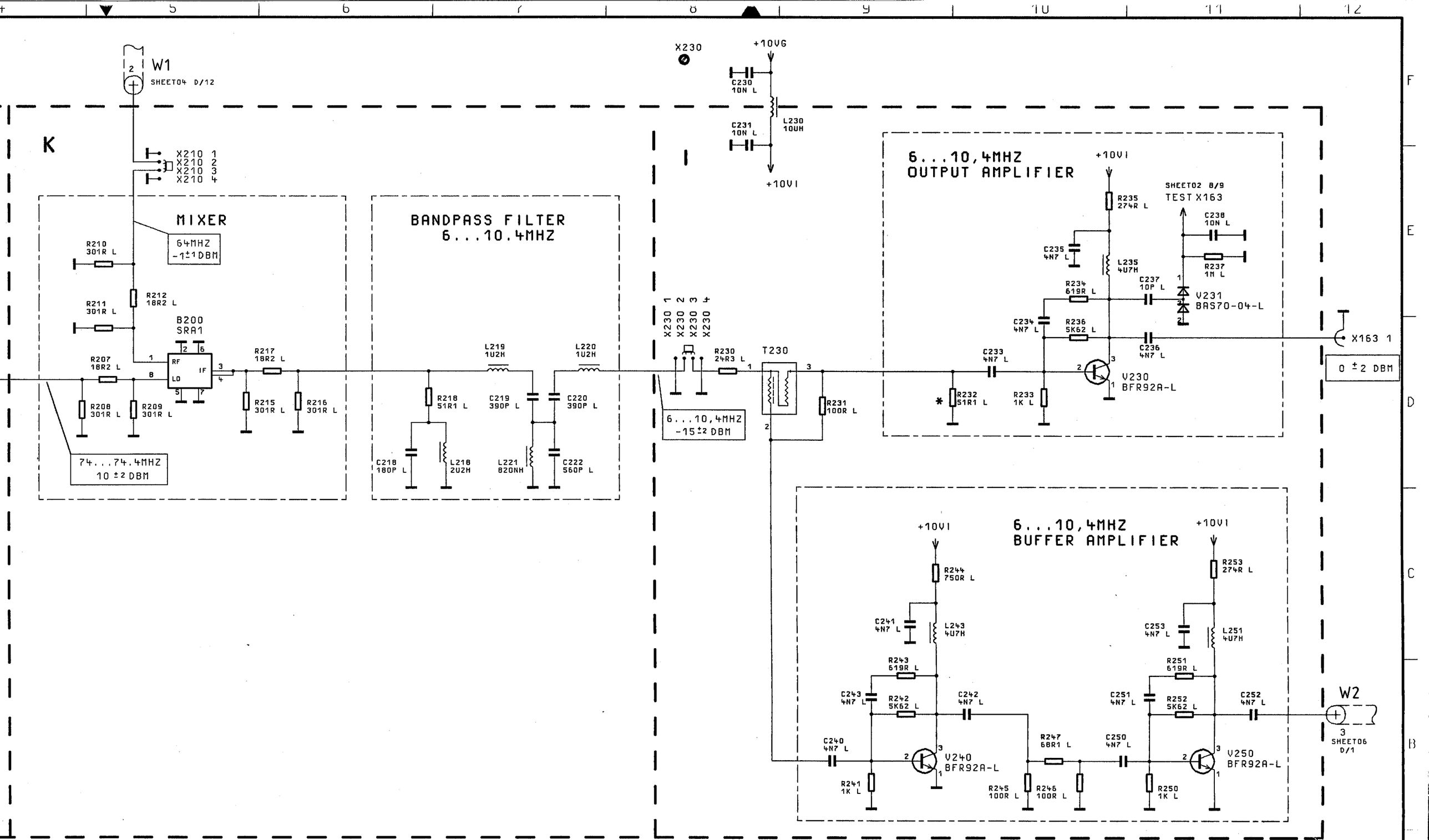
SHEET02 A/9

70...74MHZ 4 ± 2 DBM

* NOT FITTED

06	45123
AEND. IND.	AENDE MITT

ZEICHN.-NR. 1003.5300.01 S



06	45123 (10)	12.90	NG	1KEE	TAG	NAME	BENENNUNG
				BEARB.		NL	FRN SYNTHESIZER
				GEPR.		NL	
				NORM			
				PLOTT	29. 9.89	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.5300.01S
				ZU GERAET	ESHS30		BLATT-NR. 5
				REG.I.V.	1002.9001	ERSTE Z.	V. U. BL.

D

FRACTIONAL DIVIDER

+5VD

R274 1K L

D270-D 74HC00T-L

L270 10UH

C271 4N7 L

R273 47SR L

6...10,4MHZ

R272 2K L

C270 4N7 L

W2

SHEET05 B/12

V270 BFR92A-L

R270 75R L

R271 1K L

D270-A 74HC00T-L

R275 100R L

D270-B 74HC00T-L

R276 100R L

D270-C 74HC00T-L

D270-E 74HC00T-L

R277 22R1 L

C273 47U

R290 22R1 L

C290 47U

D290-B 74HCT564T-L

R291 22R1 L

C291 47U

D291-B 74HCT564T-L

R292 5R62 L

C280 47U

+5VWOB

D280 WOBDIV2

R280 1K L
R281 1K L
R282 1K L
R283 1K L

X280 2

X280 1

CLKWOB SHEET02 E/16

R284 47KR L

SHEET02 E/16

PRCLK
EORHF*
+5VWOB

ENA-WOBDIV
IDATA
MCLK
SHEET02 C,D/16

X280 3
X280 4
X280 5
X280 6
X280 7

D290-A 74HCT564T-L

R285 100R L

X290 1
X290 2
X290 3
X290 4

SHEET07
BIAS F/6
SAMPLE A/11
K1 E/1

D291-A 74HCT564T-L

R295 100R L

X291 1
X291 2
X291 3

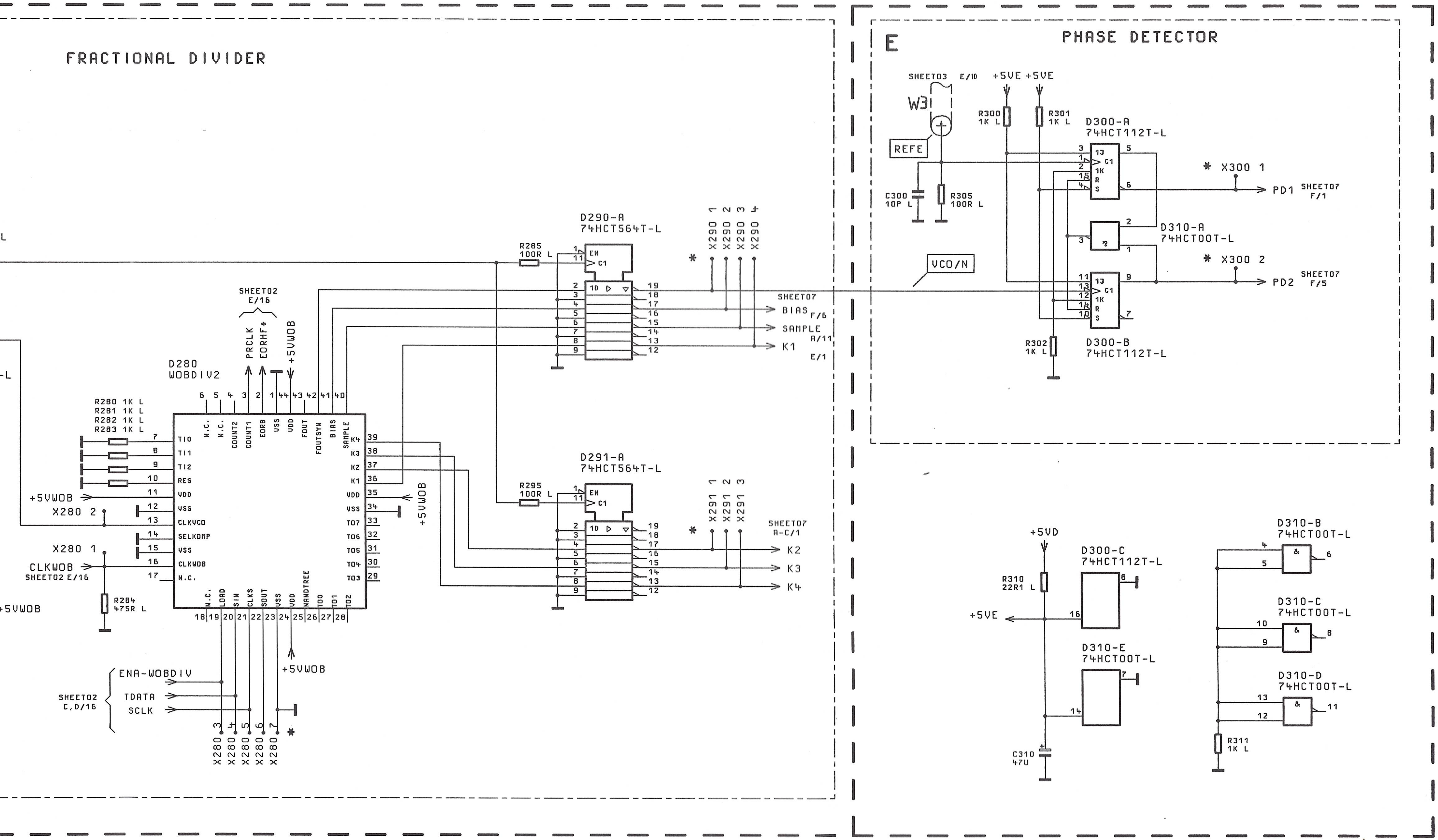
SHEET07 A-C/1
K2
K3
K4

* NOT FITTED

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.5300.01 S

06	4512.
AEND. IND.	AEN MIT



06	45123 (10)	12.90	NG	1KEE	TAG	NAME	BENENNUNG	
				BEARB.		NL	FRN SYNTHESIZER	
				GEPR.		NL		
				NORM				
				PLOTT	29. 9.89	*		
				ROHDE&SCHWARZ			ZEICHN.-NR. 1003.5300.01S	BLATT-NR. 6 v. 8 BL.
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET	ESHS30		REG.I.V. 1002.9001	ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

F

CURRENT SOURCES

PD1 ← SHEET06 E/11

K1 ← SHEET06 D/8

K2 ← SHEET06 C/8

K3 ← SHEET06 C/8

K4 ← SHEET06 C/8

V340 HSMS2800-L
V341 HSMS2800-L
V330 BAS32-L
V331 BAS32-L
V323-C MAT-04
R322-D 3K
R325 47R5 L
V324 V310
R326 47R5 L
C324 10N L

V332 BAS32-L
V342 HSMS2800-L
V343 HSMS2800-L
V333 BAS32-L
V323-B MAT-04
R322-A 3K
R327 47R5 L
V325 V310
R328 47R5 L
C325 10N L

V344 HSMS2800-L
V345 HSMS2800-L
V323-A MAT-04
R322-B 3K
R329 47R5 L
V326 V310
R330 47R5 L
C326 10N L

-10VF
V323-E MAT-04

V346 BAS32-L
V347 BAS32-L
1,4MA
V320 BCX71J-L
C320 10U
R320 4K75 L
R321 22R1 L
R322-C 3K
-5,3V
R324 4K75 L
V323-D MAT-04
R331 47R5 L
-4,7V
V327 V310
R332 47R5 L
C327 10N L
R323 68K1 L
R333 4K75 L
C333 100N L

V321 BAS32-L
V322 BAS32-L

R335
R336
+10VG
PD2 ← SHEET06 D/11
C399 10N L
L399 10UH
C398 10N L
+10VF
R350 2K21 L
R351 47R5 L
V355 BCX70H-L
C335 10U
R352 6K81 L
R353 4K75 L
R355 4K75 L
V356 BCX71J-L
R354 10K L

V348 BAS32-L
V349 BAS32-L

SHEET06 D/8 BIAS
V350 BAS32-L
V351 BAS32-L

R322-E 2K74
K1
R335 10K
R322-F 309R
R337 12K1 L

R322-H 30K1
K2
R336 10K STE
R322-G 309R
R338 13K L

R340 301K L
R341 301R L
R342 301K L
R343 301R L

+5VG
L364 10UH

STABILISATION

+10VF
+10VF
N360-A NE5532AFE
C363 100N L
V360 BST70A
C366 47U
R360 4K75 L
C361 10U
R363 47R5 L
R365 475R L
C364 100N L
-10VF
R367 475R L
R361 2K43 L
R364 47R5 L
R366 475R L
V361 BCX70H-L
C362 10U
N360-B NE5532AFE
R362 2K43 L
R359 0R L
C368 1U

INTEGRA

R345 10K L
V352 BAS70-04-L
C370 10U
N370 SE5534
C373 1P L
R344 2K21 L
C371 10U
2,4V
R346 221R L
C346 47U

SHEET06 D/8
BIAS

+5VG
C365 10N L
L364 10UH

R368

STABILISATION

+10VF
+10VF
N360-A NE5532AFE
C363 100N L
V360 BST70A
C366 47U
R360 4K75 L
C361 10U
R363 47R5 L
R365 475R L
C364 100N L
-10VF
R367 475R L
+5VD
C367 1U
R361 2K43 L
R364 47R5 L
R366 475R L
V361 BCX70H-L
C362 10U
N360-B NE5532AFE
R362 2K43 L
R359 0R L
C368 1U

REF TUNING

SHEET03 B/14
TUNING
+10VF
8,5V
R369 2K21 L
C369 47U
R368 10K
1,5V
R370 2K21 L
VCXO TUNING

+10VF
V356 BCX71J-L
R355 4K75 L
V350 BAS32-L
V351 BAS32-L
R342 301K L
R343 301R L

INTEGRATOR

R345 10K L
V352 BAS70-04-L
+10VF
C370 10U
R371 4K75 L
V373 BCX70H-L
C376 470P FKP
R373 10R L
N370 SE5534AFE
V371 BAS32-L
R375 10R L
V372 BAS32-L
R376 10R L
V374 BCX71J-L
R374 10R L
C373 1P L
C371 10U
R372 4K75 L
R344 2K21 L
2,4V
R346 221R L
C346 470
10VI

X370 1
X370 2

C378 2U2
R170 332R L
C170 47N L
C177 100P L
R377 47R5 L
V375 BAS32-L
V376 BAS32-L

SAMPLE & HOLD

R381 1K L
R386 332R L
N385-B TL072ACP
V380 SD210
V383 BAS32-L
C385 4N7
C383 3P3 L
+10VF
R380 47R5 L
R384 2K43 L
V381 HSMS2800-L
V382 BAS70-5 L
R382 2K43 L
R385 2K43 L
C301 100N L
V385 BCX70H-L
C382 47P L
R383 332R L
-10VF
C322 100N L
L322 10UH
C323 10N L
10VG

X380 1
X380 2

+28VG
L390 10UH
C391 10U 35V
R389 4K75 L
R387 4K75 L
R388 33K2 L
0...6V
L394 10UH
-10VF
+10VF
N386-A TL072ACP
-10VF

SAMPLE
HOLD
H/H

* NOT FITTED

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD 02

10/00	47299 (28)	07.92	SO
09/00	47299 (4)	11.91	RB
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME

+5VG

C365 10N L

L364 10UH

C366 47U

+5VD

C367 1U

V361 BCX70H-L

C368 1U

R368

X390

REF TUNING

SHEET03 8/14 TUNING

+10VF

R369 2K21 L

8,5V

C369 47U

R368 10K

1,5V

R370 2K21 L

VCXO TUNING

FRN LOOP FILTER

+28VG

C390 10N L

L390 10UH

C391 10U 35V

X385 1

X385 2

V395 BAS70-04-L

R390 10K L

R389 4K75 L

R387 4K75 L

R388 33K2 L

0...6V

N385-A TL072ACP

V393 06V2 L

C392 10U 35V

L394 100H

C394 10N L

-10VF

R391 10K L

R392 221R L

R393 100R L

C393 6U8

2...25V

L395 100R

C395 68N L

V397 HSMS2800-L

VCO TUNING

G

SHEET08 D/1

R396 1K L

R397 332R L

TEST FRN-LOOP

SHEET02 A/7

N386-B TL072ACP

R394 100R L

R395 475K L

+10VF

N386-A TL072ACP

-10VF

INTEGRATOR

+10VF

R371 4K75 L

V373 BCX70H-L

C376 470P FKP

R373 10R L

N370 SE5534AFE

V371 BAS32-L

R375 10R L

V372 BAS32-L

R376 10R L

R374 10R L

V374 BCX71J-L

R372 4K75 L

10VI

X370 1

X370 2

SAMPLE & HOLD

C378 2U2

R379 332R L

C379 47N L

C377 330P L

R377 47R5 L

V375 06V2 L

V376 06V2 L

R381 1K L

N385-B TL072ACP

R386 332R L

X380 1

X380 2

V380 SD210

V383 BAS32-L

C385 4N7

C383 3P3 L

R380 47R5 L

+10VF

R384 2K43 L

V381 HSMS2800-L

R385 2K43 L

C381 100N L

V382 07V5 L

R382 2K43 L

V385 BCX70H-L

R383 332R L

C382 47P L

-10VF

C322 100N L

C322 100H

C323 10N L

10VG

SAMPLE

SHEET06 D/H

* NOT FITTED

STROMLAUF GILT FUER VAR.02

EINHEIT BENÖTIGT ES NICHT FÜR OPT 02

10/00	47299 (28)	07.92	SO	ISEE	TAG	NAME
				BEARB.		RB
				GEPR.		NL
				NORM		
				PLOTT	15.07.92	
09/00	47299 (4)	11.91	RB			
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME			

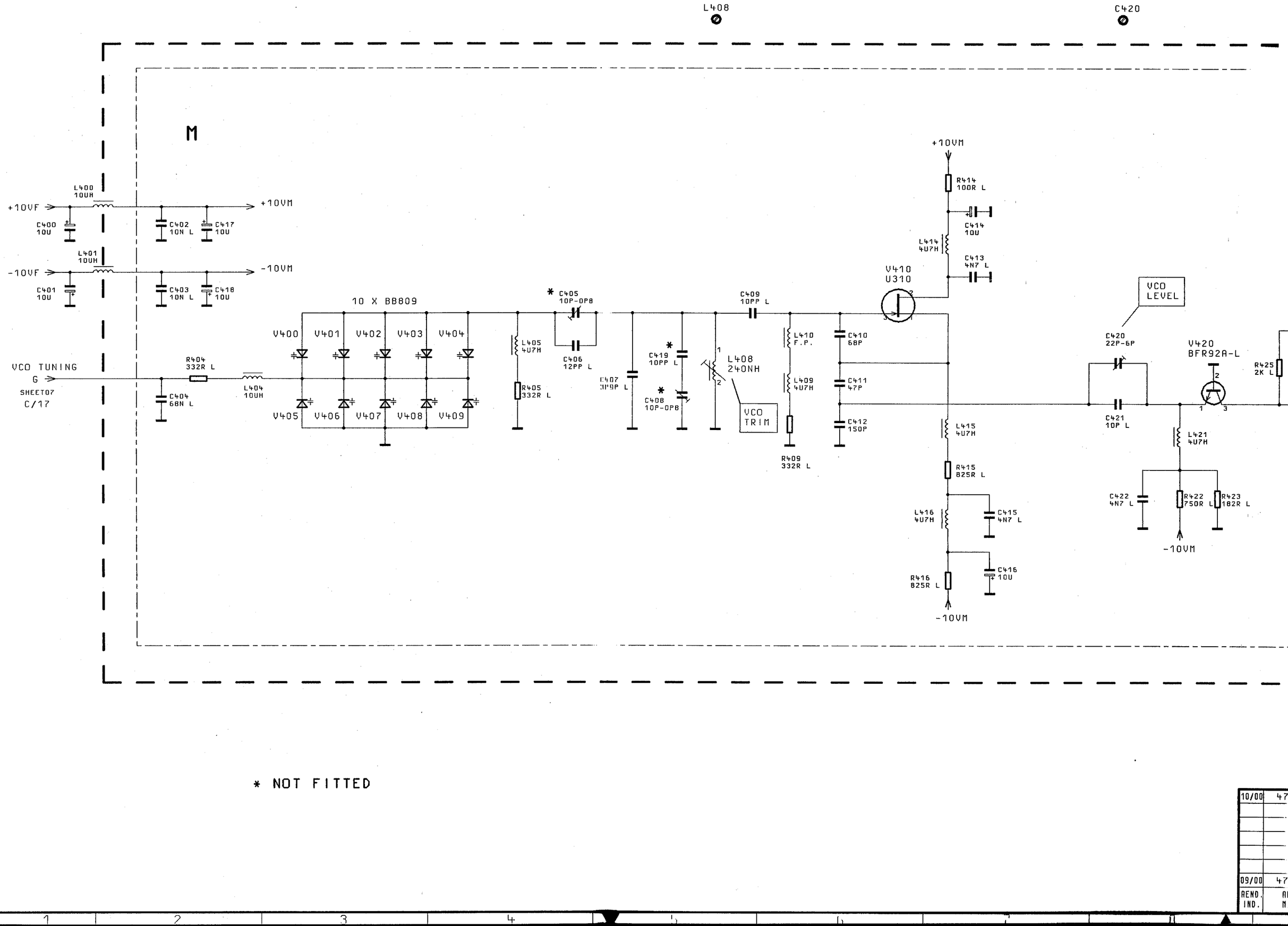
BENENNUNG: FRN SYNTHESIZER

ROHDE&SCHWARZ

ZU GERAET: ESHS30

ZEICHN.-NR: 1003.5300.01S

7



* NOT FITTED

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.5300.01 S

10/00	47	
09/00	47	
AEND. IND.	AI NI	

L408

C420

70...74.4 MHZ VCO

+10VM

R414 100R L

C414 10U

L414 4U7H

C413 4N7 L

V410 U310

* C405 10P-0P8

C406 12PP L

L405 4U7H

R405 332R L

C407 3P9P L

* C419 10PP L

* C408 10P-0P8

L408 240NH

VCO TRIM

C409 10PP L

L410 F.P.

L409 4U7H

R409 332R L

C410 68P

C411 47P

C412 150P

L415 4U7H

R415 825R L

L416 4U7H

C415 4N7 L

R416 825R L

C416 10U

-10VM

VCO LEVEL

C420 22P-6P

C421 10P L

V420 BFR92A-L

L421 4U7H

C422 4N7 L

R422 750R L

R423 182R L

-10VM

+10VM

R426 274R L

R425 2K L

L425 4U7H

C425 4N7 L

* C426 1P L

C427 1N L

L427 1USH

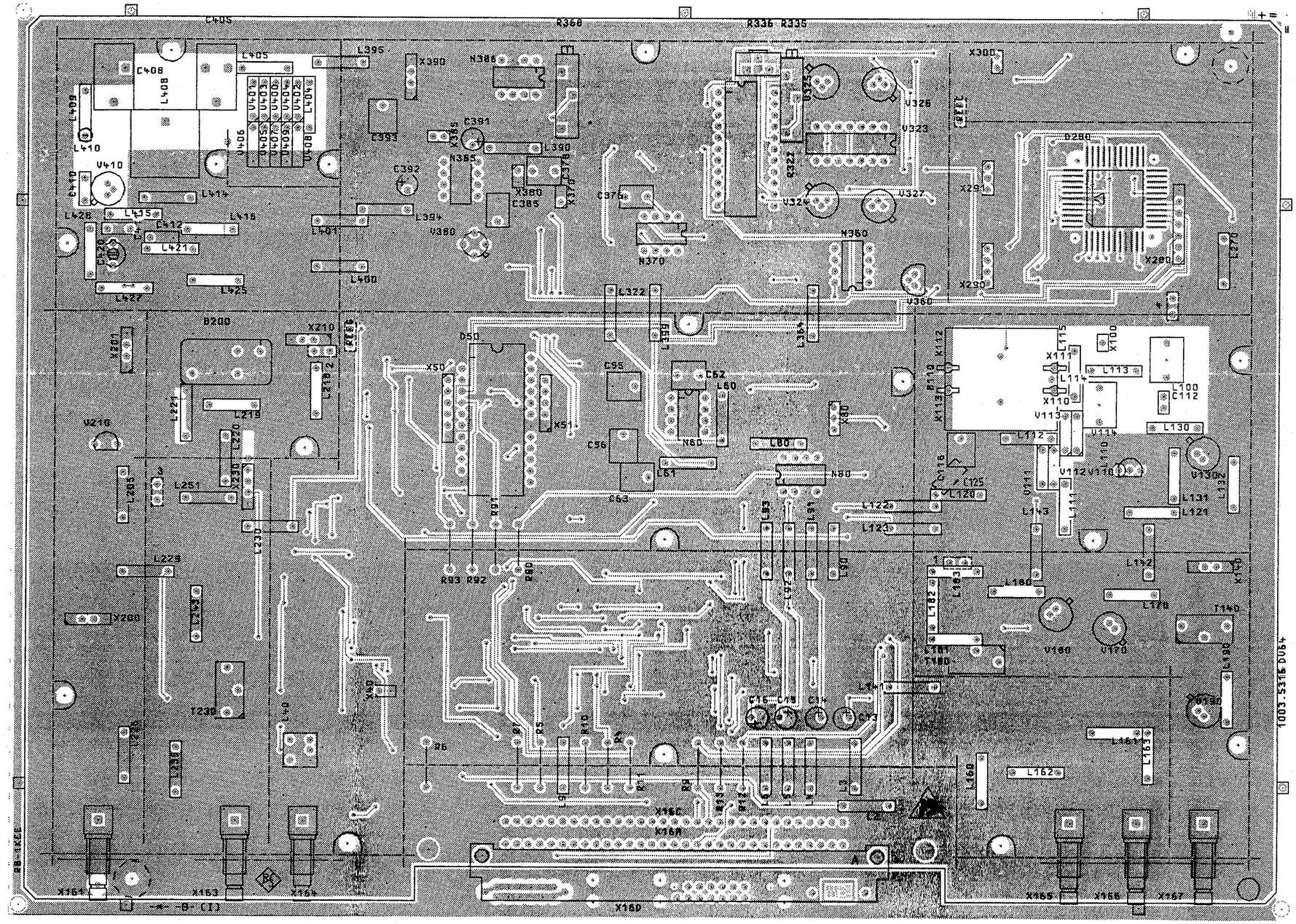
L428 330NH

C429 18P L

* C428 1P L

E SHEETOS D/1

10/00	47299 (28)	07.92	SO	1KEE	TAG	NAME	BENENNUNG
				BEARB.		RB	FRN SYNTHESIZER
				GEPR.		NL	
				NORM			
				PLOTT	15.07.92		
09/00	47299 (4)	11.91	RB	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.5300.01S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESHS30			BLATT-NR. 8 V. 8 BL.
							REG.I.V. 1002.9001 ERSTE Z. 1002.9018



Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

Not fitted
C1...C6, C408, R232, X50, X51,
X100, X280, X290, X291, X300,
X370, X380, X385, C419, C426,
C428, C405

(herzu HVC 250)

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

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

And. Zust	Änderungs-Mitteilung	Tag	Name
07	45123 (20)	01.91	NG

Maße ohne Toleranzangabe

1KEE	Tag	Name
Bearb	10.89	NG
Gepr		
Norm		

ROHDE&SCHWARZ

zu Gerat ESHS 30

Maßstab 1 : 1

Halbzeug, Werkstoff

Benennung
FRN SYNTHESIZER

Z

Zeichn.-Nr.
1003.5300

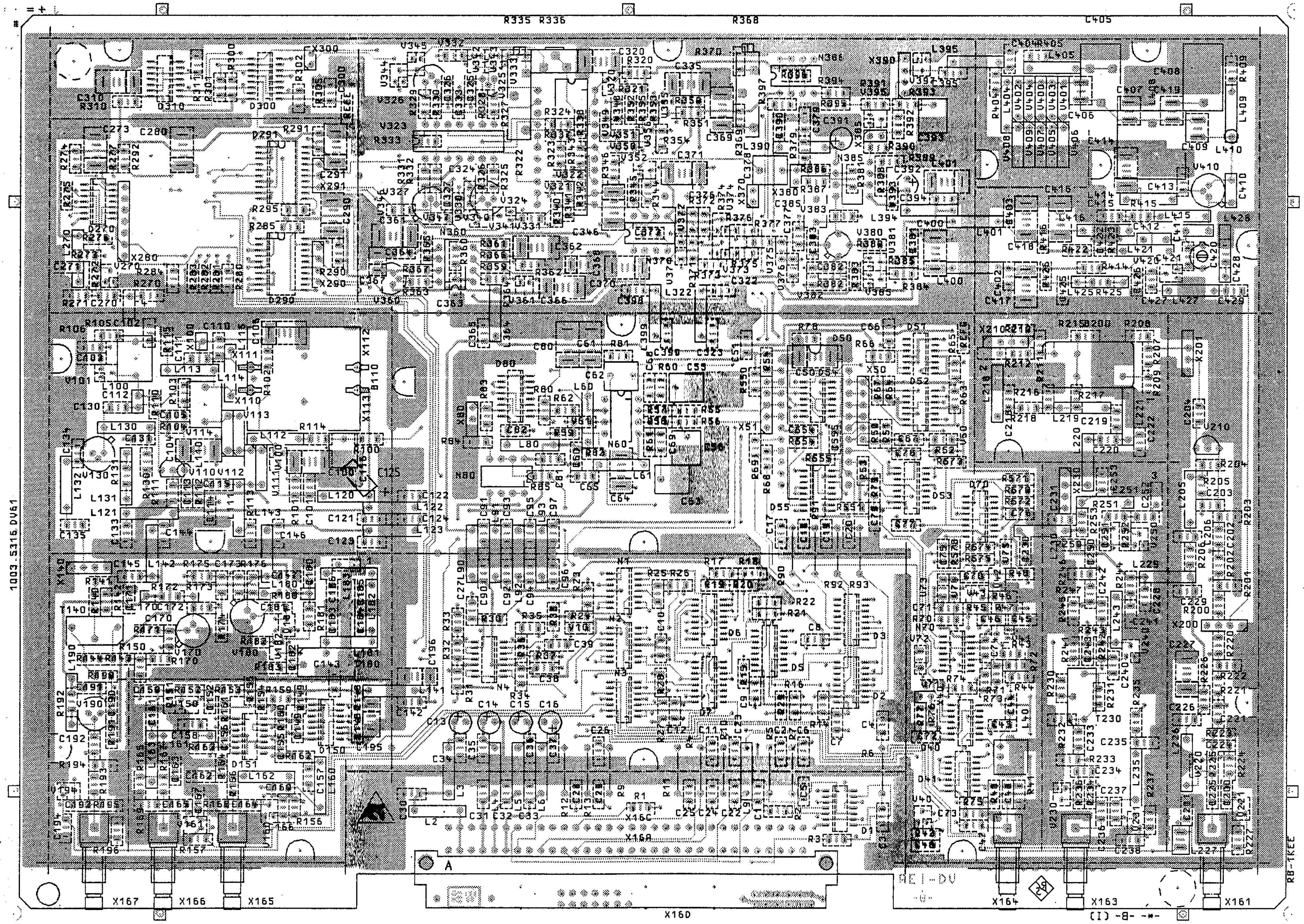
Blatt-Nr. 3
v. 4 Bl.

reg. i. v. 1002.9001 V

erste Z.

Für diese Unterlage behalten wir uns alle Rechte vor

Für diese Unterlage behalten wir uns alle Rechte vor



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

Not fitted
C1...C6, C408, R232, X50, X51, X100, X280, X290, X291, X300, X370, X380, X385, C419, C426, C428, C405

(hierzu HVC 250)

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

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

Änd. Zust	Änderungs-Mitteilung	Tag	Name
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Maße ohne Toleranzangabe		Maßstab 1 : 1	
		Halbzeug, Werkstoff	
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Bearb.	10.89	NG	FRN SYNTHESIZER — Z
Gepr.			
Norm			
ROHDE&SCHWARZ		Zeichn.-Nr. 1003.5300	Blatt-Nr. 4 v. 4 Bl.
zu Gerät	ESHS 30	reg. i. V 1002.9001 V	erste Z.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

CPU Board

1003.7202.02

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Circuit Diagrams
Parts Lists
Component Location Plans

7 Testing and Repair

Notes:

Board versions:

The loading of the boards varies for the different instrument models depending on their use. Only CPU Boards for the 20/30 models contain the floppy controller D78.

The boards of the preliminary series also differ from those of the final series mainly in the following points (A PCB of the preliminary series is marked by the modification index "C" whereas "F" stands for the final series. Furthermore for the final series the DIP switches are located on the external side of the shield next to the backup battery).

Concerned circuit elements	Final series, MI-F (DIP switches visible)	Preliminary series, MI-C (DIP switches under shielding cover)
Mimic for interrupt "INBAT" (ext./int. power supply).	D84-C	not available
Mimic for interrupt "LOWBAT*" (discharged back-up battery.	D89-C, D34	not available
Back-up of "RES*"	D89-D	not available
Switch-over of address ranges 60000H to 7FFFFH either as DRAM or flash memory	D30D	not available
Clock generation for MUART D59	divider by 6 (D62)	individual clock (B3, D57-A)
Buffer OPAMP between test input X22 A8 and A/D converter	N114	not available
Adjustment of real-time clock	Fixed capacitor C22	Trimmer C22
Driver device for V.24 interface (D63,D64)	D64 = LT1181	D63 = MAX239
Improved EMC, in particular to instrument bus X22 (VG plug connector). Value changes and additional RC filter sections		

Abbreviations used:

Abbreviation	Meaning	
MI- C	Modification index of PCB = "C":	board of preliminary series.
MI- F	Modification index of PCB = "F":	board of final series

Handle the boards with care:

- Prior to soldering works remove the plug-in jumper X3 (next to backup battery) in order to avoid short-circuiting the backup battery.

  Note: In this case all receiver data will get lost (CMOS RAM).

- The driver D184 for the instrument bus (IFPAS) is not short-circuit proof, i.e. this IC might be destroyed when operating the board with an extender cable.

Cold start, CMOS RAM reset, CPU power-up test

Perform a cold start (takes approx. 20 s) by switching on the instrument while holding down the "." key on the front panel in order to create a defined basic setting for troubleshooting. The "InIcOld" message is output on the Frequency display.

The CPU BOARD performs part of the self-test (see section 7.3, Troubleshooting) and resets the receiver to its default status (reset of the CMOS RAM variable). Any error that might occur during the cold start will be indicated by the message "ErrCPU" on the Frequency display, if possible.

The cold start routines are stored in the OTPROM D26, D27 and can thus be invoked even with a faulty flash memory firmware or with none at all.

There is a serious fault in the CPU BOARD when InI cOld" is not displayed although the display functions properly.

7.1 Theory of Operation

7.1.1 Overview

The CPU BOARD has the following purposes in the ESXS/ESXD series:

- Control of the analog boards in the receiver
- Analog/digital conversion of the measured level
- Processing and display of measured values
- Control of internal and external peripherals
  (internal : front panel keyboard, LC display, LEDs, etc.
  external : ext. keyboard, printer, IEC bus, V.24)

7.1.2 The CPU

The CPU consists mainly of the following units:

- Microprocessor Intel 80C186, D3
  (= 8086 + integrated interrupt controller,
  2 DMA channels, chip select logic, 3 timers and DRAM refresh support)
- 64-kbyte OTPROM ("One Time Programmable ROM") D26, D27
- 512-kbyte flash memory, D22,D23,D24,D25
- 384-[512-] kbyte dynamic RAM, D13,D14,D15,D16 (cf. annotation (1), next page)
- 64-kbyte static RAM in CMOS technology, battery-backed, D20,D21 ("CMOS RAM")
- Interrupt Controller 82C59, D56, "EXT.INTERRUPT CONTROLLER"
- Multifunction device 8256, D59, "MUART"
  (interrupt controller, serial standard interface, port lines and timer)
- Programmed logic device for DRAM refresh EP320, D8, "DRAM CONTROL"

The processor is operated with an 8-MHz system clock. The required 16-MHz clock (inverted and in-phase) is applied to the two clock inputs, pin 58 and pin 59 of the CPU.

The CMOS processor is operated in the so-called 'enhanced mode' supporting the generation of the line addresses required for the DRAM refresh. This mode is automatically set when connecting the RESET output of the CPU to the TEST*/BUSY input. With the use of an in-circuit emulator note that the 80C186 is not compatible with the NMOS processor 80186 in the 'enhanced mode' (as against in the 'compatible mode'). The use of an NMOS processor for emulation requires the emulation of the DRAM (addr. 00000h..5FFFFh).

Annotation (1) :

During operation 384 kbyte are available in the DRAM. 512 kbyte DRAM are loaded which can be addressed for use in the lab from MI-F onward after switching over the software via the port line "MEM_CONFIG", D65, pin 9. The overlapping flash memory area 60000H..7FFFFH is then however faded out.

Address and data bus:

As the 80C186 is fitted with a time-multiplexed address/data bus, the first sent addresses A0..A19 (as well as the status signal S2* for distinction between memory and I/O accesses) are stored temporarily.

The data bus transceivers D9, D10 decouple the CPU from the rest of the circuit. Storing the addresses itself, the MUART 8256,D59 is directly connected to the processor. For this reason the driver D9 which the MUART is connected to on CPU side must be disabled in the event of MUART accesses. Linking the tristate input of D9 to the chip select of the MUART PCS1* disables the driver.
The address multiplexers D11 and D12 of the DRAMS D13, D14, D15 and D16 are also directly connected to the processor.

7.1.3 Memory Chips

a) OTPROM D26, D27

Purpose — Boot ROM, basic initialisation, power-up selftest and flash memory programming.

Memory addr. — F0000h..FFFFFh (hex)

Decoding — UCS*, chip-select generated by the processor

Read signal — RD* from processor, buffered

b) CMOS RAM D20,D21

Purpose — static, battery-backed RAM retaining information even after switch-off of instrument. The memory contains instrument settings, static data or data of technical interest, such as operation time counter, flash memory programming cycles, switch-on/off cycles, etc.

Memory addr. — E0000h..EFFFFh (hex)

Decoding — Address decoder A19, A18, A17, A16 explicitly decoded. The processor signals A0 and BHE* are also part of the decoding in order to enable BYTE or WORD accesses, as required. The chip-select signal CSCM* is not directly connected to the RAMs in order to avoid activation upon switch-off of the instrument (loss of data might occur!). The interfacing circuitry MAX691, D34 ensures a HIGH potential at pin 12, CE*OUT when there is a drop in the + 5-V supply and hence, that the CMOS RAM remains deactivated. For this purpose the ICs D34, D32 and the RAMs are supplied by the backup battery.

Read signal — RD* from processor, buffered

Write signal — WR * from processor, buffered

c) FLASH MEMORY D22,D23,D24,D25

Purpose — actual program memory for the firmware, non-volatile, re-programmable in the circuit.

Memory addr. — A0000h..DFFFFh (hex) D24,D25 60000h..9FFFFh (hex) D22,D23

Decoding — Address decoder, A19, A18, A17 explicitly decoded; one CS* for each of D22, D23 and D24, D25 arranged in pairs.

Read signal — RD* from processor, buffered

Write signal — WR*, BHE* and A0 allow for byte-for-byte programming of the FLASH MEMORIES. During programming operations (and only then) the programming voltage of 12 V +/- 5% is applied to pin 1 (V_{pp}). During read operations the voltage at pin 1 is below 0.8 V.

d) DRAM D13,D14,D15,D16

Purpose — Main memory, dynamic RAMs with refresh.

Memory addr. — 00000h..5FFFFh (hex)

Decoding — Evaluation of A19 by EP320, D8.

Characteristic — The RAMs have a capacity of 512 kbyte, with only 384 kbyte being used because the processor address range is limited to 1 Mbyte. The range 60000 to 7FFFF overlaps with the adjacent flash memory. To avoid access conflicts, the read signal of the DRAM is controlled by the chip-select for D22, D23 (flash memory). For applications in the laboratory it is possible to address the overlapping range at the expense of the flash memory provided that MI = F. In normal mode this is never required, ie MEM_CONFIG, D65, pin 9 must always be LOW level.

Read signal — DRRD* ; as the DRAM has to some extent the same addresses as are included in the I/O address range, DRRD* is generated from the processor read RD* and the status S2* (selection between I/O and memory).

Write signal — DRWR* ; linking RD* with S2* as with the Read signal.

Refresh logic — Addressing and refreshing of the DRAMs is enabled by the CPU together with the programmed logic devices EP320,D8 and address multiplexers D11, D12.

7.1.4 Interrupt Design

The CPU BOARD contains 3 interrupt controllers:

- CPU-internal interrupt controller
- 82C59 ("EXT.INTERRUPT CONTROLLER")
- interrupt controller included in the 8256 ("MUART")

The 82C59 and 8256 are connected in cascade with the CPU-internal interrupt controller.
The INT output of the 82C59 is connected to the INT0 input of the CPU, pin 42 (INTA0*) of the CPU serving as interrupt acknowledge. The 8256 is connected to the INT1 input of the CPU, an interrupt acknowledge does not take place in this case. After an interrupt at INT1 the CPU explicitly reads the appertaining number from the MUART and subsequently branches to the appropriate interrupt service routine via "call".

a) "EXT. INTERRUPT CONTROLLER", 82C59, D56

This chip extends the number of CPU interrupt inputs by providing 8 interrupt inputs and passing the interrupts to the CPU-internal interrupt controller via a group output. After the interrupt acknowledge procedure the CPU reads the interrupt vector out of the 82C59 via the INTA0 line.

Interrupt sources for the 82C59 :

A/D converter	INTADC, pin 18
IEC BUS	INTIEC, pin 19
IFPAS	INTIFP, pin 20
UART	INTUAR, pin 21
Vector graphic board	INTGRA, pin 22
Real time clock	INTRTC, pin 23
Floppy controller	INTFDC, pin 24
External trigger	INTEXT, Pin 25

b) "MUART", 8256, D59

The multifunction chip extends the CPU by the following functions:

- serial interface (used for external keyboard)
- port lines (pin 24..39), In/Out configurable, pin 32 also acts as interrupt input.
- configurable timer
- additional interrupt input (EXINT, pin 16)

Each component of the MUART may trigger an interrupt which is evaluated by the MUART-internal interrupt controller and passed on to the CPU via INT1, if required. The interrupt source is subsequently determined by the CPU by reading a MUART register.

Table 7-1 Sources for interrupt input EXINT:

VG plug connector	Signal	Interrupt
X22 A 11	LOCK	Synthesizer locked/unlocked
X22 A10	D82 Pin 6	Overload, latched signal
X22 C 13	EORHF*	End of RF range
---	LOWBAT"	Low backup battery
X22 A 14	INTAC*	Interrupt Antenna Code socket
---	KBDSIM	Ext. keyboard auxiliary interrupt

The interrupt sources from table 7-1 are ORed with each other each triggering an EXINT, pin 16 of the MUART. The actual source can be determined by reading the port lines pin 25 to pin 31 of the MUART provided that the interrupt is pending long enough.

7.1.5 Extensions, Additional Logic

Internal instrument bus + keyboard controller (IFPAS)

The so-called IFPAS-984, D83 has the following functions:

1) serial control of the boards in the receiver (instrument bus)
2) controller for the front panel keys
3) controller for the rollkey on the front panel

a) Serial Board Control:

The CPU is connected to the IFPAS via a conventional 16-bit bus interface with read/write access. The IFPAS converts the parallel data from the CPU into a serial bit stream for board control.

Also conversion of a coming serial bit stream into parallel 16-bit words to the CPU is realised by the IFPAS.

The following four lines serve to connect the IFPAS to the instrument:

TDATA	(X22 C6) =	Transmit data to instrument
RDATA	=	Receive data from instrument (= pin 58 of IFPAS, which can be connected to 3 different sources via D86)
SCLK	(X22 A6) =	Clock for both transmission directions
STB*	(X22 C9) =	Strobe concluding any data transmission.

The three lines TDATA, SCLK and STB* are routed together via the motherboard to all boards. The unique board address the IFPAS provides each data package with allows evaluation by the addressed board after the strobe signal has been triggered. Number of data byte and transmission clock rate vary to a large extent depending on the board requirements and can be set by the CPU (max. clock rate = 4 MHz, which corresponds to the supplied IFPAS clock). The strobe signal is also triggered by the CPU via two port commands to REGISTER 2 (D76, cf. section 7.1.8).

For data reception the IFPAS sends the board address on TDATA and simultaneously applies a clock pulse to the shift register of the board selected before by the receive multiplexer D86 so that the desired data are read out. Here, too, transmission is concluded by the strobe.

Especially for control of the slow LEVEL and FREQUENCY displays the LCD BUSY* line is connected to the IFPAS test input (pin 56) allowing the CPU to delay the control of the IFPAS until the LC displays have processed the new data (polling a IFPAS register reflecting LCD BUSY*).

The outputs TDATARP, SCLKRP and STBRP have been designed as extension for control of external auxiliary devices via the USER INTERFACE. These outputs can be switched off by MSKRP. The suffix RP substitutes for "rear panel".

b) IFPAS controller function for the front panel keyboard.

8 lines and 9 column circuits directly connect the keyboard fitted in the display board to the IFPAS. Each of these circuits is connected to an RC combination (line circuits have a higher time constant than column circuits). Pressing any key causes the IFPAS to trigger an interrupt (INTIFP, pin 3 of D85) which in turn enables the CPU to read the key code of an IFPAS register within a time interval specified by the RC combination.

c) IFPAS controller function for the rollkey

The rollkey on the front panel serves to provide the IFPAS with the two informations "direction of rotation" (X22 A25) and "rotary pulse" (X22 A24). Each pulse (slightly notching rollkey movement) triggers an interrupt (same interrupt line as for front panel keyboard, see above). The CPU then evaluates a specific IFPAS register. The phase relation of the two rollkey signals determines the direction a knob rotation effects.

7.1.6 Backup Battery / Power-off Logic / System Reset

The backup battery serves to supply the CMOS RAM and the real-time clock (D28) with power-off logic (D34, D32) and supply voltage, respectively so that they can retain their information even after the receiver has been switched off. The power-off logic (D34) continuously switches over the supply voltage and chip-select of the CMOS RAM on each switch-on/off of the receiver and thus prevents the loss of data. The battery jumper (X3) has the purpose of isolating the battery for transport or storage of the board.

Discharge of the backup battery causes the monitoring circuit of the MAX691 to trigger an interrupt (only MI-F). A message is then read out on the display to inform the user. In this case the battery voltage is in the range 2.6 V to 3.0 V ensuring that the battery can be replaced in time since data might only get lost with a voltage of less than 2.0 V.

The MAX691 has also the function of triggering a power-on reset. Via the motherboard the reset signal RES* is passed to the other boards.

7.1.7 Real-time Clock

The real-time clock D28 has its own crystal B5 of its own. Supplied by a backup battery the clock continues to go even with the receiver being switched off. The clock is automatically re-initialised and started (but not set!) when "UBACK" is removed while the receiver is being switched off.

7.1.8 One-bit Switching Ports

The ICs D45, D76, D79 and D58 (REGISTER 1, REGISTER 2, REGISTER 4 and USER INTERFACE) on the CPU board serve for switchover of single TTL lines. All the ICs are of the 74HCT259-type. Via three address lines and one data line DB0, 8 outputs per IC can be set to "1" or "0" independently of each other.

The switching ports are for example used for deactivating the IEC bus interface, switching the A/D converter from test voltage to measurement voltage, controlling external devices, such as LISNs, etc.

7.1.9 Floppy Controller

The CPU boards of models 20/30 contain a floppy controller D78 (Intel 82077) for control of the built-in 3.5 inch disk drive. Communication between CPU and FDC is established via DMA channel and interrupt.

7.1.10 A/D Converter

A self-calibrating 12-bit converter with successive approximation is used (D91, CS5012, 24 µs conversion time). A/D conversion is initiated by a falling edge at pin 1 (HOLD), which is generated either by timer 1 of the CPU (TMRO1, D88 pin 4) or by writing on the I/O address of the A/D converter. The timer signal generates the sweep clock which is applied to the motherboard (SWCLK, X22 C11) and can be faded out using MSKTR1 (pin 5, D85). Via the MUART port (D59, pin 36) the CPU can sense the sweep clock. End of conversion is indicated by the EOC signal (D91, pin 38) which also serves as interrupt source. The CPU then reads in the measured value via D15..D4.
The 2-MHz operating clock of the A/D converter is derived from the 8-MHz CPU clock by way of division.

The RESET signal on power-up also originates from the CPU. During operation a software reset can be initiated at any time.

After every reset the A/D converter performs a self-calibration. The dual operational amplifier N110 generates together with V110, V111 the positive and negative supply voltages of +/- 5.022 V. To the inputs for the analog supply VA + (pin 25) and VA - (pin 30) the voltage is directly applied, the digital supply is decoupled from this voltage by 10 ohm, each (VD +, pin 11 und VD-, pin 36). The reference voltage for the unipolarly operated A/D converter is 4.524 V and provided by N111. The input voltage to be converted is applied either to the actual measurement input (V-A/D, X22 A16) or a test input (TEST, X22 A8) with the help of the FET switch N113. The subsequent operational amplifier N112 eliminates common-mode interferences on signal and ground lines and controls the analog input of the A/D converter at low impedance. The d.c. clamp diodes V90 and V91 serve to protect the analog input.

7.1.11 Interfaces to Peripherals

a) IEC BUS

For remote control of the receiver within a test setup and for plotter output an IEC bus interface is provided. In this case a NEC 7210 (D47) with bidirectional drivers SN75162 (D48) and SN75169 (D49) are used. Fast data exchange with the CPU is ensured by its DMA channel DRQ1. (DRQIEC is switched via the MUX D55, which also switches, as required, IRQADC from the A/D converter or DRQFDC from the floppy controller to the DMA channel 0 or 1 of the CPU). The IEC bus interrupt is supplied to the interrupt controller 82C59 (D56). The jumper X6 serves to select between two modes for bus driver control:

X6 1---2 3 with pass control
X6 1 2---3 without pass control

The complete IEC bus interface can be switched off electrically during battery operation in order to reduce current consumption. The ICs D47, D48 and D49 are switched off via the transistor V40 using signal IECPOW of D45, pin 6, if required. With the ICs being switched off, the bus drivers D43, D44 and D46 are also set to the high-impedance state in order to avoid destruction of the subsequent IEC bus interface by control in the dead state.

The CPU provides both the clock (CLK8MHZ) and the reset (RESET) for the IEC bus interface "7210". Also, the IEC bus controller can be explicitly reset even after the power-up reset (using RESIEC, pin 5, D45).

b) Centronics Printer Interface

For printer output use is made of the discretely designed PRINTER INTERFACE, which is a Centronics interface from the electrical point of view. The CPU sends data which have been buffered by D93 to the printer via the lower half of the data bus (unidirectional).
The following signals are also output to the printer:

PRIRES* (switch-on or explicit reset)
PRISTB* (strobe for data transfer)

The status signals coming from the printer

PRIACK*
PRIBUSY*
PRISEL*
PRIFAU*

can be read in one for one by the multiplexer D94. The PRIACK* signal (Printer Acknowledge) is additionally latched by the flip flop D82 (flip flop reset by CPU via D92 pin 6).

c) V.24 Interface

The V.24 interface can be used for a wide variety of purposes (data transfer during a firmware update, control of accessories, diagnostic output, connection of a terminal in the laboratory, etc.).The interface is made up of the UART 82510, D61 and the V.24 driver D63 or D64. As to the hardware the interface supports a bidirectional handshake by the lines CTS and DTR. The UART 82510 has its own baud rate clock B6, from which - starting at the highest baud rate of 115200 baud - lower transmission rates (eg 19200, 9600 baud) can be derived by setting the appropriate parameters. Depending on its use the UART is operated in interrupt or polling mode. Interrupt mode cannot be used for a firmware update since time-critical flash memory programming cannot be guaranteed in this mode.
The V.24 driver converts the level from V.24 to TTL and vice versa.

e) External Keyboard Connection

To provide another way of input the receiver offers a socket for connection of a MF-II keyboard. For serial transmission the signal lines KEY CLK (clock), X22 B21 and EXT KEYB (data) X22 C21 are already sufficient.
The keyboard interface consists of the UART included in 8256, D59 and some additional gates. The software is responsible for transmission of data.

The transmission clock for sending and receiving is supplied by the keyboard (RxC, TxC). The signal KEYDIR serves to switch the transmission direction on the EXT KEYB line by switching either to RxD, pin 19 or TxD, pin 23 of the MUART. Bidirectional use of the keyboard connections is made possible by NAND gates of the 74HCT03-type their outputs being in the tristate with the exception of the TRUE condition (ie both inputs are "high"). The tristate allows to connect two outputs with each other. A pull-up resistor generates the HIGH level at the output in the tristate. Via the MUART port lines P14, pin 35 and P10, pin 39 the clock and data lines can be kept in the defined '0' state (for identification of the keyboard).
The CPU is informed on the transmission of a character from the keyboard by the counter D40 via NMI with a delay of 8 clocks. For further processing of the character the interrupt KBDSIM which is triggered by the CPU and then passed to the MUART is used.

7.1.12 Service and Configuration Interface, Service RESET

The DIP switch S90 is used to code the receiver model in which the CPU board is integrated. S90 also serves to start self-test routines for servicing purposes.

Table 7-2 Settings of DIP switch S90

DB7 8	DB6 7	DB5 6	DB4 5	DB3 4	DB2 3	DB1 2	DB0 1	"x" = don't care
0	0	1	0	0	0	0	0	ESHS 10
0	0	0	1	0	0	0	0	ESHS20
0	0	1	1	0	0	0	0	ESHS30
0	0	0	0	1	0	0	0	ESVS 10
0	0	1	0	1	0	0	0	ESVS 20
0	0	0	1	1	0	0	0	ESVS 30
0	0	1	1	1	0	0	0	ESS
0	0	0	0	0	1	0	0	ESVD
0	1	x	x	x	x	x	x	LOW LEVEL BOARD TEST
1	0	x	x	x	x	x	x	HIGH LEVEL BOARD TEST
DB6/7		DB5 - DB2				DB1	DB0	

reserved

Debug mode for R&D

Model recognition

Self-test routines

Other settings are illegal combinations with indeterminate effects

The RESET INTERFACE serves to perform an explicit reset without having to switch off the supply voltage. For this purpose a short LOW pulse must be applied (eg by a short-circuit with X13.2). Subsequently, the receiver boots again.

7.2 Required Measuring Equipment

Item	Type of instrument	Required characteristics	Suitable R&S instrument	Order no.
1	Oscilloscope	100 MHz	BOL	374.2000.02
2	Printer with Centronics interface			
3	Printer cable for ESXS receiver family (accessories)			816.1767

7.3 Troubleshooting

The firmware includes self-test routines allowing to detect hardware errors with a certain severity level without requiring the use of additional equipment. Depending on the type of error the following steps must be taken:

If a test fails, call the next one making less demands on the hardware than the previous test.

1) **Callling the service self-test of the instrument by special function 91, menu point 1 START TEST:**

   Output: in plain text on the display, printer output depends on the model (optional) provided that printer output is selected in the service self-test menu.

2) **Calling the HIGH LEVEL BOARD TEST by DIP switch S90:**
   After having set the DIP switches turn off and on again the instrument in order to start the test.

   Output: Error code on Frequency display, irrespective of model, also logged on printer.

3) **Calling the LOW LEVEL BOARD TEST by DIP switch S90:**
   Requirement: The connector X223 to the floppy disk drive must be removed before this test in order to avoid wrong selection of the disk drive.
   After having set the DIP switches turn off and on again the instrument in order to start the test.

   Output: None, oscilloscope measurements are required.

The routines under 1) and 2) both test the listed components of the CPU Board, however differ in the manner they are invoked and in the output of measurement results.

Table 7-3 List of components tested under 1) and 2):

Error code	Element	Test
00	CMOS RAM	Non-destructive read/write test
01	DRAM	Non-destructive read/write test
02	Real time clock	Clock goes?
03	IFPAS	Data transmission Transmit = Receive o.k.?
04	Flash memory	Checksum of firmware in flash memory
06	MUART	Register read/write test, exemplary
07	EXT.INT.CONTROLLER	Register read/write test, exemplary
08	UART	Register read/write test, exemplary
09	Floppy controller	Register read/write test, exemplary

The LOW LEVEL BOARD TEST under 3) makes the least demands on the hardware. Outputs are not possible. In this test the CPU toggles the output ports listed in the following. Using an oscilloscope verify whether the port lines and all address and data lines switch between High and Low level. The CPU activity can be easily checked at X13.5 CPU RUN (next to backup battery) without the removal of the shielding cover. This port line, too must toggle continuously during the LOW LEVEL BOARD TEST.

Table 7-4 List of lines toggled by the CPU during LOW LEVEL BOARD TEST under 3) . Time characteristic is not of significance and often unperiodic.

IC	Circuit diagram sheet no.	Pin
D5, D6, D7	2	all address lines AO. A19
D9, D10	2	all data lines DBO. DB15
D41	4	7, 9, 10, 11, 12, 13, 14, 15
D45	4	4, 5, 6, 7, 9, 10, 11, 12
D58	5	4, 5, 6, 7, 9. 10, 11, 12
D59	5	34, 35, 39, not 33, "PROG"!
D75	5	2, 5, 6, 9, 12, 15, 16, 19
D76	6	4, 5, 6, 7, 9, 10, 11, 12,
D77	6	7, 9, 10, 11, 12, 13, 14, 15
D65	6	4, 5, 6, 7, 9, 10, 11, 12
D92	7	4, 5, 6, 7, 9, 10, 11, 12
D93	7	2,5,6,9,12,15,16,19

The line D59/33 (programming voltage for the flash memories) is not switched and must be set to zero potential.

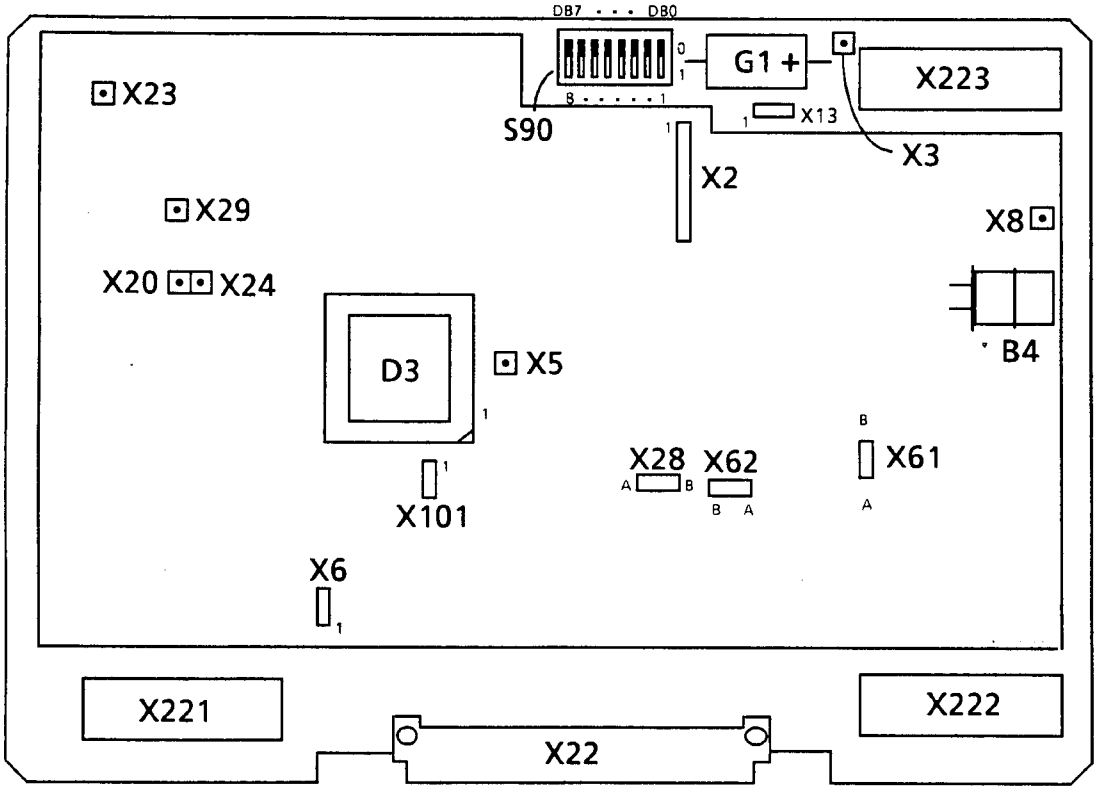
Table 7-5 Toggled IFPAS outputs

Signal	Plug-in contact X22	X222
STROBE*	C9	10
SCLK	A6, C19	9
TDATA	C6, C20	7

The letter "T" is continuously output on the V.24 interface, ie the lines TxD (X222 21) and DTR (X222 17) also toggle.

The output of the real-time clock (X28 A on sheet 3) supplies pulses in intervals of a second.

7.4 Location of Plug-in Jumpers, Test Points and Adjustment Elements



7.5 External Interfaces

Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X131	+5 V	Output		5 V ± 10 %	Supply voltage at reset interface
X132				0 V	Digital ground at reset interface
X133	RESSRC*	Input		TTL level	Low pulse = external reset for servicing purposes
X134	n. c.				
X135	CPU RUN	Output		TTL level	Signals "CPU runs", see LOW LEVEL BOARD TEST"

Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X22A 1 X22B 1 X22C 1 X22A 2 X22B 2 X22C 2	AGND			0 V	Analog ground
X22A 3	+ 12 V	Input		10.8 to 15.5 V	+ 12 V for flash memory programming
X22B 3		n. c.			
X22C 3		n. c.			
X22A 4	+ 10 VS	Input		+ 10 V ± 10 mV	+ 10 V reference "sensed line"
X22B 4		n. c.			
X22C 4	+ 10 V	Input		+ 10 V ± 10 mV	+ 10 V supply
X22A 5 X22B 5 X22C 5	-10 V	Input		-10 V ± 10 mV	- 10 V supply
X22A 6	SCLK	Output	Serial bus, Motherboard	TTL level	IFPAS clock
X22B 6		n. c.			
X22C 6	TDATA	Output	Serial bus, Motherboard	TTL level	IFPAS output data
X22A7	RDATAGRA	Input	Graphic board	TTL level	IFPAS input data of vector graphic
X22B 7		n. c.			
X22C 7	RDATA	Input	Demodulator board, Cal. generator	TTL level	IFPAS input data of adjacent boards
X22A 8	TEST	Input	Several boards	0 V to 5 V	Analog test voltage for self-test
X22B 8		n. c.			
X22C 8		n. c.			

Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X22A 9	PK RES	Output	Detector board	HCMOS level	Reset of peak detector
X22B 9		n. c.			
X22C 9	STROBE*	Output	Serial bus, Motherboard	HCMOS level	IFPAS strobe signal at the end of transmission
X22A 10	OL*	Input	Group input	TTL level	Overload interrupt
X22B 10		n. c.			
X22C 10		n. c.			
X22A 11	LOCK*	Input	Group input	TTL level	Synthesizer unlocked interrupt
X22B 11		n. c.			
X22C 11	SWCLK	Output	FRN synthesizer	HCMOS level	Synthesizer clock
X22A 12		n. c.			
X22B 12		n. c.			
X22C 12	INT.SUPPLY	Input	Power supply	TTL level	Interrupt signals internal battery supply
X22A 13		n. c			
X22B 13		n. c.			
X22C 13	EORHF*	Input	FRN synthesizer	TTL level	Error of scan stop frequency
X22A 14	INTAC*	Input	Antenna code socket	TTL level	Interrupt from front panel
X22B 14		n. c.			
X22C 14	RES*	Output	Several boards	HCMOS level	Central reset
X22A 15	DAVGRA	Input	Graphic board	TTL level	Handshake with graphic
X22B 15		n. c.			
X22C 15	RFDGRA	Input	Graphic board	TTL level	Handshake with graphics
X22A 16	V-A/D	Input	Detector board	-1 to 5 V	Level measurement voltage
X22B 16		n. c.			
X22C 16	GND-A/D		Detector board	0 V	Reference ground for V-A/D
X22A 17	REC1	Thr.-connect.	User port, X222 6	-1 to 5 V	Recorder output
X22B 17		n. c.			
X22C 17	OCXO-OFF	Output	Oven-contr. crystal reference	HCMOS level	Switching the oven-controlled crystal reference
X22A 18	REC2	Thr.-connect.	User port, X222 5	-1 to 5 V	Recorder output
X22B 18	SW 1	Output		TTL level	Common switching output
X22C 18	RDATAAC	Input	Antenna code socket	TTL level	Read antenna code
X22A 19	LCD BUSY*	Input	LC display, front panel	TTL level	Busy signal of LC display
X22B 19	SW 2	Output		TTL level	Common switching output
X22C 19	SCLKFP	Output	Serial bus, front panel	TTL level	IFPAS clock to front panel
X22A 20	INTGRA	Input	Graphic board	TTL level	Interrupt from graphics
X22B 20		n. c.			
X22C 20	TDATAFP	Output	Serial bus, front panel	TTL level	IFPAS data to front panel

Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X22A 21		n. c.			
X22B 21	KEY CLK	In-/output	External keyboard	TTL level	Bidirectional clock line for external keyboard
X22C 21	EXT. KEYB	In-/output	External keyboard	TTL level	Bidirectional data line for external keyboard
X22A 22		n. c.			
X22B 22	KEYCOL 8	Output	Keypad, front panel	TTL level	for keyboard matrix
X22C 22	KEYCOL 9	Output	Keypad, front panel	TTL level	for keyboard matrix
X22A 23		n. c.			
X22B 23	KEYCOL 6	Output	Keypad, front panel	TTL level	for keyboard matrix
X22C 23	KEYCOL 7	Output	Keypad, front panel	TTL level	for keyboard matrix
X22A 24	RMKPLS	Input	Rollkey, Frontpanel	TTL level	Rotary knob signal
X22B 24	KEYCOL 4	Output	Keypad, front panel	TTL level	for keyboard matrix
X22C 24	KEYCOL 5	Output	Keypad, front panel	TTL level	for keyboard matrix
X22A 25	RMKDIR	Input	Rollkey, Frontpanel	TTL level	Rotary knob signal
X22B 25	KEYCOL 2	Output	Keypad, front panel	TTL level	for keyboard matrix
X22C 25	KEYCOL 3	Output	Keypad, front panel	TTL level	for keyboard matrix
X22A 26	KEYROW 3	Input	Keypad, front panel	TTL level	for keyboard matrix
X22B 26	KEYROW 8	Input	Keypad, front panel	TTL level	for keyboard matrix
X22C 26	KEYCOL 1	Output	Keypad, front panel	TTL level	for keyboard matrix
X22A 27	KEYROW 2	Input	Keypad, front panel	TTL level	for keyboard matrix
X22B 27	KEYROW 6	Input	Keypad, front panel	TTL level	for keyboard matrix
X22C 27	KEYROW 7	Input	Keypad, front panel	TTL level	for keyboard matrix
X22A 28	KEYROW 1	Input	Keypad, front panel	TTL level	for keyboard matrix
X22B 28	KEYROW 4	Input	Keypad, front panel	TTL level	for keyboard matrix
X22C 28	KEYROW 5	Input	Keypad, front panel	TTL level	for keyboard matrix
X22A 29	+5 VD	Input			Digital supply
X22B 29	+5 VD	Input			Digital supply
X22C 29	+5 VD	Input			Digital supply
X22A 30	+5 VD	Input			Digital supply
X22B 30	+5 VD	Input			Digital supply
X22C 30	+5 VD	Input			Digital supply
X22A 31	DGND				Digital ground
X22B 31	DGND				Digital ground
X22C 31	DGND				Digital ground
X22A 32	DGND				Digital ground
X22B 32	DGND				Digital ground
X22C 32	DGND				Digital ground

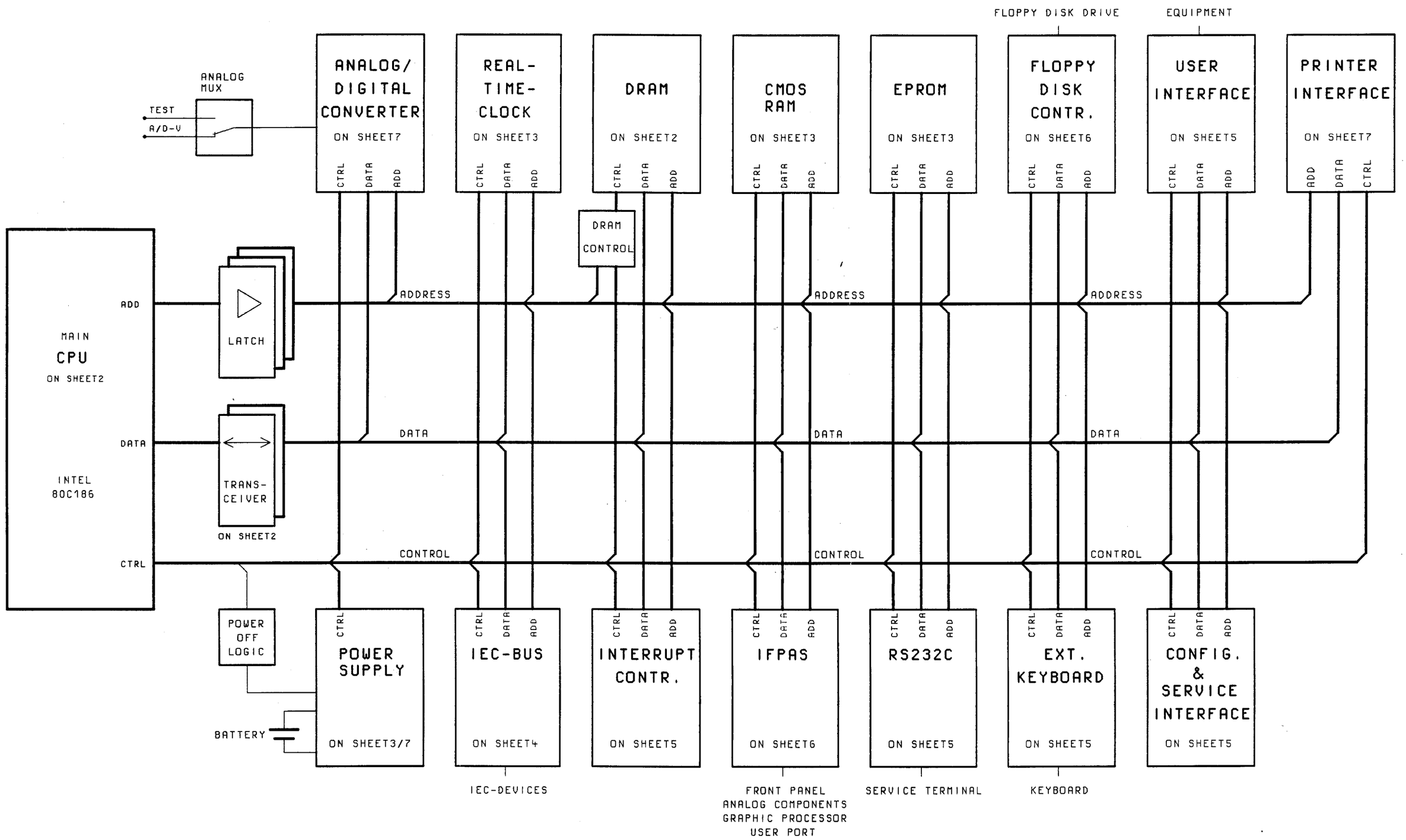
Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X221 1	AGND		Rear panel, connector	0 V	IEC BUS
X221 2	SHIELD		Rear panel, connector	0 V	IEC BUS
X221 3	AGND		Rear panel, connector	0 V	IEC BUS
X221 4	ATN	In-/output	Rear panel, connector	TTL	IEC BUS, Attention
X221 5	AGND		Rear panel, connector	0 V	IEC BUS
X221 6	SRQ	In-/output	Rear panel, connector	TTL	IEC BUS, Service Request
X221 7	AGND		Rear panel, connector	0 V	IEC BUS
X221 8	IFC	In-/output	Rear panel, connector	TTL	IEC BUS, Interface Clear
X221 9	AGND		Rear panel, connector	0 V	IEC BUS
X221 10	NDAC	In-/output	Rear panel, connector	TTL	IEC BUS, Not Data Accepted
X221 11	AGND		Rear panel, connector	0 V	IEC BUS
X221 12	NRFD	In-/output	Rear panel, connector	TTL	IEC BUS, Not ready for Data
X221 13	AGND		Rear panel, connector	0 V	IEC BUS
S221 14	DAV	In-/output	Rear panel, connector	TTL	IEC BUS, Data valid
X221 15	REN	In-/output	Rear panel, connector	TTL	IEC BUS, Remote enable
X221 16	EOI	In-/output	Rear panel, connector	TTL	IEC BUS, End of Identify
X221 17	IECD8	In-/output	Rear panel, connector	TTL	IEC BUS, Data 8
X221 18	IECD4	In-/output	Rear panel, connector	TTL	IEC BUS, Data 4
X221 19	IECD7	In-/output	Rear panel, connector	TTL	IEC BUS, Data 7
X221 20	IECD3	In-/output	Rear panel, connector	TTL	IEC BUS, Data 3
X221 21	IECD6	In-/output	Rear panel, connector	TTL	IEC BUS, Data 6
X221 22	IECD2	In-/output	Rear panel, connector	TTL	IEC BUS, Data 2
X221 23	IECD5	In-/output	Rear panel, connector	TTL	IEC BUS, Data 5
X221 24	IECD1	In-/output	Rear panel, connector	TTL	IEC BUS, Data 1
X221 25		n. c.			
X221 26		n. c.			

Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X222 1	+ 5 V	Output	Rear panel, connector	5 V ± 10 %	Supply voltage at user interface
X222 2	+ 12 VUP	Output	Rear panel, connector	10.8 to 15.5 V	Supply voltage at user interface
X222 3	DGND		Rear panel, connector	0 V	Digital ground
X222 4	AGND			0 V	Analog ground
X222 5	REC2	Thr.-connect.	X22A 18	-1 to 5 V	Recorder output
X222 6	REC1	Thr.-connect.	X22A 17	-1 to 5 V	Recorder output
X222 7	TDATARP	Output	Rear panel, connector	HCMOS	IFPAS data to user interface
X222 8		n. c			
X222 9	SCLKRP	Output	Rear panel, connector	HCMOS	IFPAS data to user interface
X222 10	STBRP*	Output	Rear panel, connector	HCMOS	IFPAS strobe to user interface
X222 11		n. c.			
X222 12	CTS	Input	Rear panel, connector	V.24 level (-3 to 15 V/ + 3 to + 15 V)	RS232-C, Clear to send
X222 13	AGND		Rear panel, connector	0 V	Analog ground
X222 14	UP6	Output	Rear panel, connector	HCMOS	User port output 6
X222 15	RTS	Output	Rear panel, connector	+ 5 V	RS232-C, Requ. to send
X222 16	UP5	Output	Rear panel, connector	HCMOS	User port output 5
X222 17	DTR	Output	Rear panel, connector	-10 V/ + 10 V	RS232-C, Data Terminal ready
X222 18	UP4	Output	Rear panel, connector	HCMOS	User port output 4
X222 19		n. c.			
X222 20	UP3	Output	Rear panel, connector	HCMOS	User port output 3
X222 21	TxD	Output	Rear panel, connector	-10 V/ + 10 V	RS232-C, Transmit Data
X222 22	UP2	Output	Rear panel, connector	HCMOS	User port output 2
X222 23	RxD	Input	Rear panel, connector	V.24 level (-3 to -15V/ + 3 to + 15V)	RS232-C, Receive Data
X222 24	UP1	Output	Rear panel, connector	HCMOS	User port output 1
X222 25	EXTRIG	Input	Rear panel, connector	TTL	Ext. trigger for scan control
X222 26	PRIFAU*	Input	Rear panel, connector	TTL	Error signal from printer
X222 27	PRIRES*	Output	Rear panel, connector	HCMOS	Reset to printer
X222 28	PRISEL	Input	Rear panel, connector	TTL	Select state of printer
X222 29	AGND*		Rear panel, connector	0 V	Analog ground
X222 30	PRIBUSY*	Input	Rear panel, connector	TTL	Busy state of printer
X222 31	PRIACK*	Input	Rear panel, connector	TTL	Acknowledge of printer
X222 32	PRIDAT7	Output	Rear panel, connector	HCMOS	Data 7, printer
X222 33	PRIDAT6	Output	Rear panel, connector	HCMOS	Data 6, printer
X222 34	PRIDAT5	Output	Rear panel, connector	HCMOS	Data 5, printer
X222 35	PRIDAT4	Output	Rear panel, connector	HCMOS	Data 4, printer
X222 36	PRIDAT3	Output	Rear panel, connector	HCMOS	Data 3, printer
X222 37	PRIDAT2	Output	Rear panel, connector	HCMOS	Data 2, printer
X222 38	PRIDAT1	Output	Rear panel, connector	HCMOS	Data 1, printer
X222 39	PRIDAT0	Output	Rear panel, connector	HCMOS	Data 0, printer
X222 40	PRISTB*	Output	Rear panel, connector	HCMOS	Strobe to printer

Pin	Name	In-/output	Origin/destin	Range of values	Signal description
X223 1	READY	Input	Floppy Ctrl., connector	TTL	Disk Change Signal
X223 2	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 3	SIDE ONE SEL	Output	Floppy Ctrl., connector	TTL	
X223 4	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 5	READY	Input	Floppy Ctrl., connector	TTL	Disk Change Signal
X223 6	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 7	WPROT	Input	Floppy Ctrl., connector	TTL	Write Protect
X223 8	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 9	TRK0	Input	Floppy Ctrl., connector	TTL	Track 00
X223 10	AGND		Floppy Ctrl., connector	0 V	Analog ground
223 11	WGATE	Output	Floppy Ctrl., connector	TTL	Write Gate
X223 12	AGND		Floppy Ctrl., connector	0 V	Analog ground
X22313	WDATA	Output	Floppy Ctrl., connector	TTL	Write Data
X223 14	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 15	STEP	Output	Floppy Ctrl., connector	TTL	
X223 16	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 17	DIR SEL	Output	Floppy Ctrl., connector	TTL	Direction Select
X223 18	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 19	MOTOR	Output	Floppy Ctrl., connector	0 V	Motor on
X223 20	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 21	DS2	n. c.	Floppy Ctrl., connector		
X223 22	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 23	DS1	n. c.	Floppy Ctrl., connector		
X223 24	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 25	DS0	Output	Floppy Ctrl., connector	TTL	Drive Select 0
X223 26	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 27	INDEX	Input	Floppy Ctrl., connector	TTL	
X223 28	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 29	DS3	n. c.	Floppy Ctrl., connector		
X223 30	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 31		n. c	Floppy Ctrl., connector		
X223 32	AGND		Floppy Ctrl., connector	0 V	Analog ground
X223 33	MODSEL	Output	Floppy Ctrl., connector	TTL	Mode Select
X223 34	AGND		Floppy Ctrl., connector	0 V	Analog ground

n.c. = not connected

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



Versions

VAR 02 = Basic Model
VAR 03 = Floppy Model

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

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AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
03	43559	04.90	PF
06	45105	07.90	PF

1KEE	TAG	NAME
BEARB.	04.90	PF
GEPR.		PF
NORM		
PLOTT	20. 4.90	*

BENENNUNG: CPU BOARD

ROHDE&SCHWARZ
ZU GERAET ESHS30

ZEICHN.-NR. 1003.7202.01S
REG.I.V. 1002.9001 ERSTE Z.

BLATT-NR. 1 v. 7 BL.

ZEICHN.-NR 1003.7202.01 S

B1
16MHZ OSZI

D88-C 74HCT86T-L

R20 2K21 L

D88-D

C4 100N L

X101 1
X101 2

R21 2K21 L

R8 4K75 L

R1 4K75 L

R3 4K75 L

R2 4K75 L

R17 4K75 L

C2 100N L

C1 100N L

+5V

CLOCK
INTER.
DMA
TIMER
BUS-UNIT

X1
X2
CLKOUT
NMI
INT0
INT1
INT2/INTA0
INT3/INTA1
DRQ0
DRQ1
TMR IN 0
TMR IN 1
TMR OUT 0
TMR OUT 1
RES
HOLD
TEST/BUSY
SRDY
ARDY
RESET
HLDA
S0
S1
S2
DEN
BHE
RD
WR
LOCK
ALE
DT/R

CLK8MHZ
INTA0*
INTA1*
TMR01
RES*
RESET
S0*
S1*
S2*
DEN*
BHE*
RD*
WR*
ALE
DT/R*

R86 4K7
R99 4K7 L

D104-B
74HCT125T-L

D104-D
74HCT125T-L

R13 4K7 L

CHIP-SELECT

UCS
LCS
MCS0/PEREQ
MCS1/ERROR
MCS2
MCS3
PCS0
PCS1
PCS2
PCS3
PCS4
PCS5/A1
PCS6/A2

UCS*
PCS0*
PCS1*
PCS2*
PCS3*
PCS5*
PCS6*

R14 4K7 L
R15 4K7 L

AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD15 AD16 AD17 AD18 AD19

D3
80C186-10

CPU

X5 1

R4 221R L
R5 221R L
R6 221R L
R7 221R L

D5-A
74F373
D6-A
74F373
D7-A
74F373

EN
C1
1D

SO* S1* S2* ADO AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD15 AD16 AD17 AD18 AD19
SL2*
A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A19

ADDRESS
LATCH

ALE

DRAM
CONTROL

D8
EP320D1

CLK8MHZ
CLK
DIS
ALE
BHE*
DRRD*
DRWR*
AO
A19
SO*
S1*
S2*
VCC
GND
RAS
CAS
PRRAS
WEL
WEH
MUXH
MUXL

R9 7X4K7

R10 4K7 L

D29-A
74F04

D30-B
74F32

PCS1*
DEN*
DT/R*

D9-A
74FCT245
D10-A
74FCT245

G
3EN1
3EN2

AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11 AD12 AD13 AD14 AD15
DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7 DB8 DB9 DB10 DB11 DB12 DB13 DB14 DB15

BUS
TRANSCEIVER

D104-E
74HCT125T-L
D5-B
74F373
D6-B
74F373
D7-B
74F373
D9-B
74FCT245
D10-B
74FCT245
D13-B
514256
D14-B
514256
D15-B
514256
D16-B
514256

C304 10N L
C305 10N L
C306 10N L
C307 10N L
C309 10N L
C310 10N L
C311 10N B
C314 10N B
C315 10N B
C316 10N B

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.7202.01 S

DRAM CONTROL

D8 EP320D1

R9 7X4K7

R12 9X4K7

D29-A 74F04

D30-B 74F32

D9-A 74FCT245

D10-A 74FCT245

BUS TRANSCEIVER

R10 4K7 L

D11 74FCT841 L

C311 10N L

R11 4K7 L

D12 74FCT841 L

C312 10N L

D13-A 514256

D14-A 514256

D15-A 514256

D16-A 514256

DRAM

(00000$_H$... 5FFFF$_H$)

D29-B 74F04

D17-A 74F32

D13-B 514256

D14-B 514256

D15-B 514256

D16-B 514256

D17-E 74F32

C314 10N B

C315 10N B

C316 10N B

C317 10N L

R20 221R L

D29-D

D29-E

DATA

ADDRESS

CONTROL

ALE

DRAMRD*

A19

ACHTUNG: EGB!

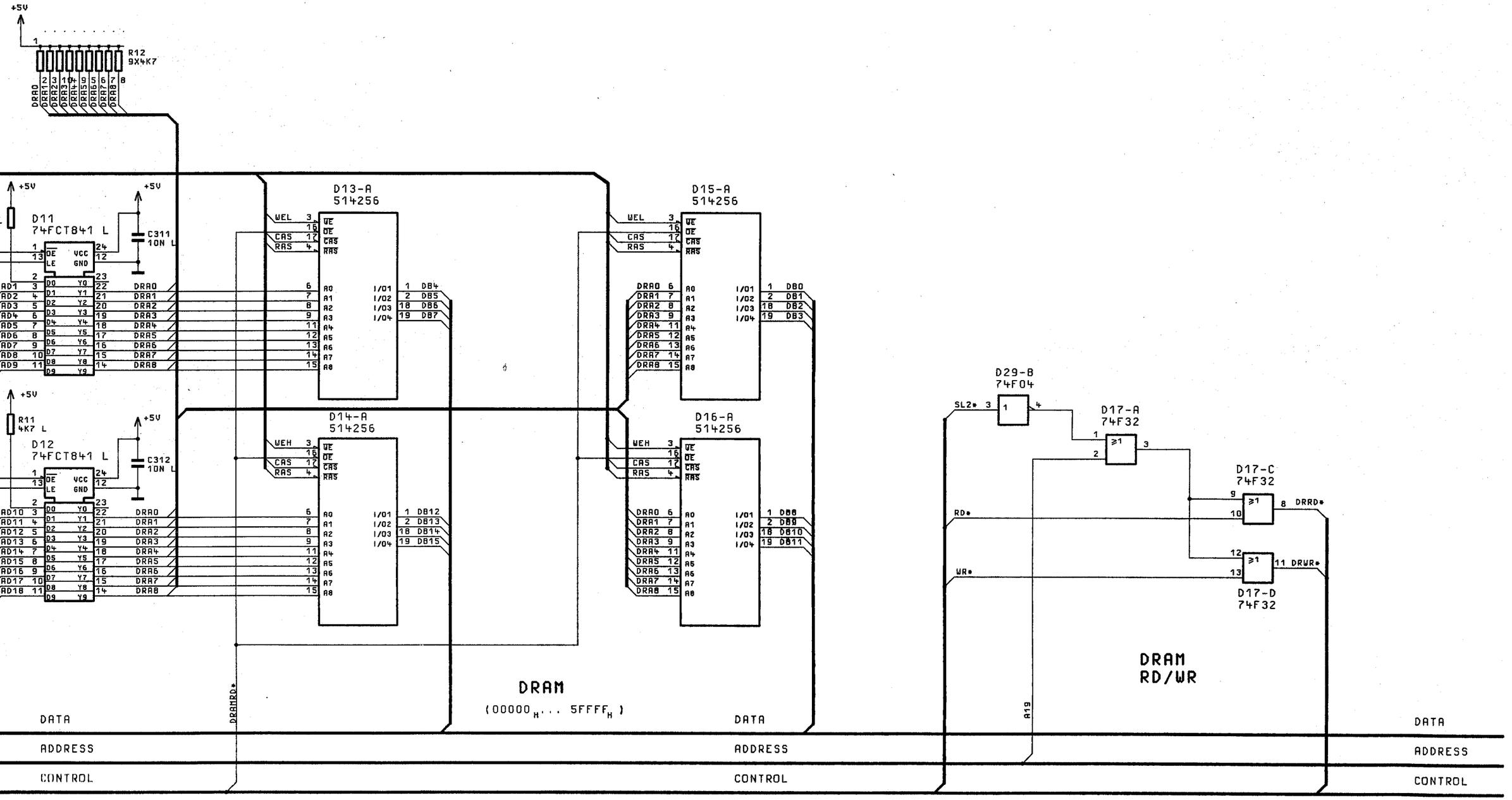
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

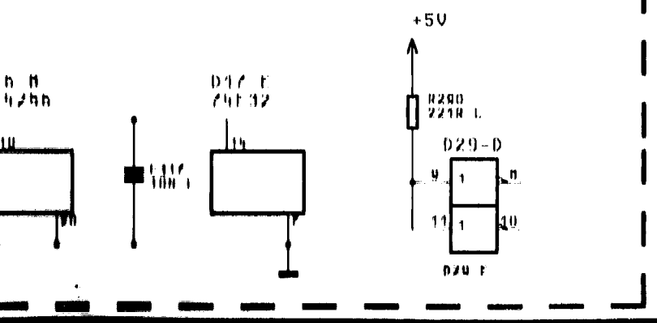
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IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME		
3	43559	04.90	PF		
6	45105	07.90	PF	BEARB.	
7	45105	08.90	PF	GEPR.	
8	45105	09.90	NG	NORM	
9	45105	09.90	PF	PLOTT	9.
11	46342(1)	02.91	Pf		

ROHDE ZU GERAET





ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
3	43559	04.90	PF
6	45105	07.90	PF
7	45105	08.90	PF
8	45105	09.90	NG
9	45105	09.90	PF
11	46342(1)	02.91	Pf

	TAG	NAME
BEARB.		PF
GEPR.		PF
NORM		
PLOTT	9. 1.91	*

ROHDE&SCHWARZ
ZU GERAET ESHS30

BENENNUNG
CPU BOARD

ZEICHN.-NR. 1003.7202.01S
REG.I.V. 1002.9001
MAPP NR. 2

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

BACKUP BATTERY

V1 HP2835

G1
3.4V 1AH

D34-A
MAX691

R37
150K L

R38
1M L

R35
1M L

OSC SEL
OSC IN
LE IN
WDI
PFF
V BATT
V OUT
RESET
CE OUT
BATT ON
VDD
LOWLINE
PFO
RESET

UBACK

CSCM*

+5V

R36
22K1 L

D89-D
74HCT125T-L

LOWBAT*
RESSRC*

RESSRC*

RES*

R31
4K7 L

D20-A
84256

D32-C
74HC32T-L

A0

WR*
RD*

D32-D
74HC32T-L

BHE*

D21-A
84256

CE1
WE
OE
A0 … A14
I/O1 … I/O8
DB0 … DB15

CMOS
RAM
(E0000$_H$...EFFFF$_H$)

DATA
ADDRESS
CONTROL

RES*

+12V

R151
1K L

V151
BCX17-L

VPP

R159
1K L

C159
4U7 25V

+10V*

R158
10K L

V156
BC860B-L

R156
10K L

V152
BC850B-L

R157
39K2 L

R153
100K L

R152
511R L

PROG

R155
10K L

V154
BC850B-L

R154
4K75 L

+5V

R28
4K7 L

D28
MSM6242

UBACK

C23
100N L

RD*
WR*
RES*
PC56*

ALE
RD
WR
CS1
CS0
VDD
GND
XT

B5
32.768KHZ

C21
22P

C22
22P L

A1 … A4
DB0 … DB3

STD
.P

REALTIME
CLOCK

+5V

R30
18K2 L

R83
4K75 L

D84-D
74HCT86T-L

X28A
X28B

INTRTC

D32-B
74HC32T-L

WR*
BHE*
A0

D32-A
74HC32T-L

D29-F
74F04

D30-A
74F32

DRRD*
DRAMRD*
RD*

UBACK

D32-E
74HC32T-L

D20-B
84256

D21-B
84256

C334
100N

C320
100N

C321
100N

+5V

D34-B
MAX691

C333
100N L

D22-B
28F010

D23-B
28F010

D24-B
28F010

D25-B
28F010

D26-B
27PC256

D27-B
27PC256

C322
100N

C324
10N

C325
10N

C326
10N

C327
10N

C328
10N

C329
10N

A

D22-A
28F010

D24-A
28F010

D32-B
74HC32T-L

D32-A
74HC32T-L

D29-F
74F04

D30-A
74F32

D23-A
28F010

D25-A
28F010

D31-A
74F138

D70-D
74F86D-L

D70-C
74F86D-L

D29-C
74F04

D30-D
74F32

D30-C
74F32

D84-D
74HCT86T-L

V151
BCX17-L

V152
BC850B-L

V154
BC850B-L

R159
1K L

C159
4U7 25V

R153
100K L

R152
511R L

R154
4K75 L

R30
18K2 L

R83
4K75 L

R39
221R

R43
221R L

X28A

X28B

VPP

+5V

UR*

BHE*

A0

INTRTC

DRRD*

DRAMRD*

RD*

A16

CSCM*

EPROM1
(60000$_H$...9FFFF$_H$)

EPROM2
(A0000$_H$...DFFFF$_H$)

(E0000$_H$...EFFFF$_H$)

DATA

ADDRESS

CONTROL

D24-B
28F010

D25-B
28F010

D26-B
27PC256

D27-B
27PC256

D29-G
74F04

D30-E
74F32

D31-B
74F138

C326 10N B

C327 10N B

C328 10N B

C329 10N L

C330 10N L

C331 10N L

ACHTUNG: EGB!

ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!

ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

RENO. IND.	RENDERUNGS-MITTEILUNG	DATUM	NAME	
3	43559	04.90	PF	
6	45105	07.90	PF	BEARB.
7	45105	08.90	PF	GEPR.
8	45105	09.90	NG	NORM
9	45105	09.90	PF	PLOTT
11	4634.2(1)	02.90	Pf	

RDH
ZU GRUND

D22-A
28F010

D23-A
28F010

EPROM1
(60000$_H$...9FFFF$_H$)

D24-A
28F010

D25-A
28F010

EPROM2
(A0000$_H$...DFFFF$_H$)

D26-A
27PC256

D27-A
27PC256

EPROM3
(F0000$_H$...FFFFF$_H$)

D31-A
74F138

D70-D
74F86D-L

D70-C
74F86D-L

D29-C
74F04

D30-D
74F32

D30-C
74F32

+5V

R39
221R

R43
221R L

MEM-CONFIG

A16

(E0000$_H$...EFFFF$_H$)

CSCN*

RD*

UCS*

DATA

ADDRESS

CONTROL

D24-A
74F04

D30-E
74F32

D31-B
74F138

C331
10N L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
3	43559	04.90	PF
6	45105	07.90	PF
7	45105	08.90	PF
8	45105	09.90	NG
9	45105	09.90	PF
11	46342(1)	02.90	Pf

	TAG	NAME
BEARB.		PF
GEPR.		PF
NORM		
PLOTT	10. 1.91	*

ROHDE&SCHWARZ
ZU GERAET ESHS30

BENENNUNG: CPU BOARD

ZEICHN.-NR. 1003.7202.01S

BLATT-NR. 3 V. 7 BL.

REG.I.V. 1002.9001 ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1003.7202.01 S

SCHI

D43-A
74HCT244T-L

D42-A
74HCT32T-L

D40-B
74HCT393T-L

D44-A
74HCT244T-L

D40-A
74HCT393T-L

D41-A
74HCT138T-L

D42-B
74HCT32T-L

D45-A
74HCT259T-L

D46-A
74HCT245T-L

D17-B
74F32

D50-B
74HCT08T-L

D39-F

D48-A
SN75162

D49-A
SN75160AN

D47-A
UPD7210C

IEC BUS

REGISTER 1

DATA
ADDRESS
CONTROL

D50-A
74HCT08T-L

D50-C
74HCT08T-L

D50-D
74HCT08T-L

D39-A

D39-G

V40
BCP69-16

D47-B
UPD7210C

D48-B
SN75162

D49-B
SN75160AN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

3	43
6	45
7	45
8	45
9	45
11	46
AEND. IND.	AEND MIT

SCHIRMWAND

X221 26 24 22 20 18 16 14 12 10 8 6 4 2
X221 25 23 21 19 17 15 13 11 9 7 5 3 1
IECD1 IECD2 IECD3 IECD4 EOI DAV NRFD NDAC IFC SRQ ATN SHIELD
IECD5 IECD6 IECD7 IECD8 REN
AGND AGND

A

244T-L
16 IECRS
18 IECCK
14 IECCS
12 IECRD
9 IECWR
5 IECRQ
7 IECR1
3 IECR2

244T-L
18
16
14
12
9
5 DRQIEC
7 INTIEC
3 IECDA

D39-F
13 12

X6 1
X6 2
X6 3

D48-A
SN75162
R1 2 1
12 EN1/G4
EN2/G5
EN3
6 1
5 4
HAT 14
HEOI 15
HSR 13
HRE 20
HIF 19
HDAV 16
HNDA 18
HNRF 17
R2
9 ATN
8 EOI
10 SRQ
3 REN
4 IFC
7 DAV
5 NDAC
6 NRFD

IECDRQ
IECINT

IECRS 4
IECCK 3
IECDA 7
IECCS 8
IECRD 9
IECWR 10
IECRQ 21
IECR1 22
IECR2 23
RS
CLK
DACK
CS
RD
WR
RS0
RS1
RS2
T/R1
T/R2
T/R3
INT
IFC
REN
ATN
SRQ
DRQ
1 R1
2 R2
5
11
24 HIF
25 HRE
26 HAT
27 HSR
6

D46-A
74HCT245T-L
DT/R* 4
19 G3
1 3EN1
3EN2
DB0 2
DB1 3
DB2 5
DB3 7
DB4 9
DB5 8
DB6 6
DB7 4
18 12
17 13
15 14
13 15
11 16
12 17
14 18
16 19
DO
D1
D2
D3
D4
D5
D6
D7

D45-A
74HCT259T-L
1
2
3
14
13
15
8M 0/7
G8
Z9 D
Z10 CLR
9,0D Q0 10,0R 4 DISIEC
9,1D Q1 10,1R 5 RESIEC
9,2D Q2 10,2R 6 IECPOW
9,3D Q3 10,3R 7 DRQSL0
9,4D Q4 10,4R 9 DRQSL1
9,5D Q5 10,5R 10 KEYDIR
9,6D Q6 10,6R 11 DISBATINT
9,7D Q7 10,7R 12 INBATACK

D17-B
74F32
5
≥1
6

DAIEC*
4
&
5 6
D50-B
74HCT08T-L

CSIEC*

D47-A
UPD7210C

D49-A
SN75160AN
19
3(1▽/2Q)
▽4 1
18 17 16 15 14 13 12
2 IECD1
3 IECD2
4 IECD3
5 IECD4
6 IECD5
7 IECD6
8 IECD7
9 IECD8

IEC BUS

REGISTER 1

DATA
ADDRESS
CONTROL

DATA
ADDRESS
CONTROL

+5V

D40-C
74HCT393T-L
C340 10N L
14
7

D41-B
74HCT138T-L
C341 10N L
16
8

D42-E
74HCT32T-L
C342 10N L
14
7

D43-B
74HCT244T-L
C343 10N L
20
10

+5V

D44-B
74HCT244T-L
C344 10N L
20
10

D45-B
74HCT259T-L
C345 10N L
16
8

D46-B
74HCT245T-L
C346 10N L
20
10

D50-E
74HCT08T-L
C350 10N L
14
7

D48-B
SN75162
C348 10N L
22
11

D49-B
SN75160AN
C349 10N L
20
10

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

3	43559	04.90	PF		TAG	NAME
6	45105	07.90	PF	BEARB.		PF
7	45105	08.90	PF	GEPR.		PF
8	45105	09.90	NG	NORM		
9	45105	09.90	PF	PLOTT	9. 1.91	*
11	46342(1)	02.91	Pf			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GERAET ESHS30

BENENNUNG
CPU BOARD

ZEICHN.-NR. 1003.7202.01S
BLATT-NR. 4 v. 7 BL.
REG.I.V. 1002.9001
ERSTE Z.

1 2 3 4 5 6 7 8 9 10 11 12
A B C D E F

A

X222

DC IN 1...3 ONLY MOD 04

D58-A 74HCT259T-L

D55-A 74HCT153T-L

D79-C 74HCT32T-L

R58..R63 6X 100R

C55..C62 8X 10N L

USER INTERFACE

D56-A MSM82C59A

EXT. INTERRUPT CONTROLLER

D59 8256

MUART

3.072 MHZ

D89-A 74HCT125T-L

D89-B 74HCT125T-L

D81-A 74HCT03T-L

D81-B 74HCT03T-L

D81-C 74HCT03T-L

D81-D 74HCT03T-L

D84-C 74HCT86T-L

D84-A 74HCT86T-L

D84-B 74HCT86T-L

D60-A 74HCT30T-L

D80-A 74HCT14T

D89-C

9X22K

KEYCLK SHEET4 E/1

OLACK SHEET7 C/3

KBDSIM

DATA

ADDRESS

CONTROL

D55-B 74HCT153T-L

D56-B MSM82C59A

D58-B 74HCT259T-L

D60-B 74HCT30T-L

D75-B 74HCT377T-L

D61-B 82510

D81-E 74HCT03T-L

D87-B 74HCT540T-L

D88-E 74HCT86T-L

D89-E 74HCT125T-L

D70-E 74F86D-L

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

X222 22 20 18 16 14

C55..C62 8X 10N L

X22B 21 KEY CLK
X22C 21 EXT.KEYB
X22A 11 LOCK*
X22C 13 EORHF*
X22A 14 INTAC*
X22A 10 OL*

X222 1 2 3 4 5 6 13 25

+5V +12VUP AGND AGND

REC1
REC2
MOD04: GAIN CONTROL

X22A 17 REC1
X22A 18 REC2
(GAIN CONTROL)

X222 21 23 15 12 17
TXD RXD RTS CTS DTR

R365 200R L

+5V

C61 100P L
C62 100P L
C64 560P L
R64 200R L
C63 100P L
C66 1N L
C65 560P L
R79 200R L
R70 0R L
R73 0R L
R78 200R L
R55 0R L
R56 22K1

D80-A 74HCT14T-L

EXTRIG

+5V +5V +5V +5V +5V

R96 10K L
R52 10K L
R97 10K L
R76 10K L
R77 10K L

D89-B 74HCT125T-L
D81-B 74HCT03T-L
D81-C 74HCT03T-L
D81-A 74HCT03T-L

KEYCLK
SHEET4 E/1

R67-A
R67-B
R67-C
R67-D
R67-E
R67-F
R67-G
R67-H
R67-I
9X22K

+5V

R381 4K75 L

D82-A 74HCT74T-L

OLACK
SHEET7 C/3

R66 10K L +5V

D81-D 74HCT03T-L

D60-A 74HCT30T-L

D70-A 74F86D-L

+5V

R53 10K L

D89-C

LOWBAT*
DISBATINT

LOCK*
OLSTAT
EORHF*
LOWBAT*
INTAC*
OLLATCH
KBDSIM
EXTRIG

KEYDIR
KBDSIM
INTEXT

DATA
ADDRESS
CONTROL

D62-A 74HCT93T-L

CTR DIV12 DIV8 CT=0

3.072MHZ

X62A X62B

+5V

B6 18.432MHZ

C368 100N L

X61A X61B

D61-A 82510

INTUAR
CSUAR*
RD*
WR*
RESET

A1 A2 A3

DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7

DCD RXD TXD DTR DSR RTS CTS RI

RECEIVE DATA
TRANSMIT DATA
DATA TERMINAL READY
CLEAR TO SEND

R361 10K L
R363 10K L
R362 10K L

+5V

R69 4R75

C366 10U 10V TA
C367 10U 10V TA
C364 10U 10V TA
C369 10U 25V TA
C371 100 25V TA

D63 LT1180
(D64 LT1181)

UART

REC2 OUT
TR1 IN
TR2 IN
REC1 OUT
TR1 OUT
TR2 OUT
REC2 IN
REC1 IN
N.C.
ON/OFF
C2-
C2+
V-
VCC
GND
V+
C1-
C1+

(*) PIN NO. IN BRACKETS ARE VALID F
FOR EITHER D63 OR D64

D75-B 74HCT377T-L
D61-B 82510
D81-E 74HCT03T-L
D87-B 74HCT540T-L
D88-E 74HCT86T-L
D89-E 74HCT125T-L
D70-E 74F86D-L
D62-B 74HCT93T-L
D84-E 74HCT86T-L

C375 10N L
C362 100N B
C381 10N L
C387 10N L
C388 10N L
C389 10N L
C370 10N L
C361 10N L
C383 10N L

13/00
12/00
MEND. IND.

6 7 8 9 10

REC1
REC2
MODO4: GAIN CONTROL
X22A 17 REC1
X22A 18 REC2
(GAIN CONTROL)
AGND
EXTRIG

RESET INTERFACE

X222
TXD
RXD
RTS
CTS
DTR
+5V
R365 200R L
C354 560P L
R366 200R L
RESSRC*
CPU RUN

S90-A
S90-B
S90-C
S90-D
S90-E
S90-F
S90-G
S90-H
DIL-SWITCH

D62-A 74HCT93T-L
3.072MHZ
X62A
X62B

D75-A 74HCT377T-L
CSRE3*
WR*
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
REGISTER 3
CPU RUN
X2 1
X2 2
X2 3
X2 4
X2 5
X2 6
X2 7
X2 8
X2 9
X2 10

D42-C 74HCT32T-L
RD*
CSRK*

D87-A 74HCT540T-L
DB7
DB6
DB5
DB4
DB3
DB2
DB1
DB0
R87A..I 9X 47K

CONFIGURATION& SERVICE INTERFACE

B6 18.432MHZ
C368 100N L
X61A
X61B

D61-A 82510
INTUAR
CSUAR*
RD*
WR*
RESET
A1
A2
A3
INT
CS
RD
WR
RESET
DCD
RXD
TXD
DTR
DSR
RTS
CTS
RI
A0
A1
A2
D0
D1
D2
D3
D4
D5
D6
D7
RECEIVE DATA
TRANSMIT DATA
DATA TERMINAL READY
CLEAR TO SEND
R361 10K L
R362 10K L
R363 10K L

R69 4R75
C366 10U 10V TA
C367 10U 10V TA
C364 10U 10V TA
C369 10U 25V TA
C371 10U 25V TA
R364 4K7 L

D63 LT1180
(D64 LT1181)
V+
VCC
GND
REG2 OUT
TA1 IN
TR2 IN
REG1 OUT
N.C.
C2-
C2+
V-
IN1 OUT
IN2 OUT
REG2 IN
REG1 IN
ON/OFF
TXD
DTR
RXD
CTS

UART

R381 4K75 L
D82-A 74HCT74T-L
D70-A 74F86D-L
R53 10K L
INTEXT

DATA
ADDRESS
CONTROL

(*) PIN NO. IN BRACKETS ARE VALID FOR LT1181
FIT EITHER D63 OR D64

D62-B 74HCT93T-L
D84-E 74HCT86T-L
C370 100N L
C361 100N L
C383 100N L

13/00	47299(23)	06.92	PF	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	CPU BOARD
				GEPR.		PF	
				NORM			
				PLOTT	09.06.92		
12/00	46342(6)	03.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1003.7202.01S
AEND. IND.	AENDERUNG MITTEILUNG	DATUM	NAME	ZU GERAET	ESHS30		BLATT-NR. 5 v. 7 BL.
				REG.I.V.	1002.9001		ERSTE Z.

X22C 17
OCXO-OFF ONLY MOD04

A

D76-A
74HCT259T-L

D79-D
74HCT32T-L

REGISTER 2

D77-A
74HCT138T-L

D79-B
74HCT32T-L

D70-B
74F86D-L

D79-A
74HCT32T-L

D65-A
74HCT259T-L

REGISTER 4

D78-A
82077

FDC

X8 1

MODESEL INUSE DS3 INDEX DS0 DS1 DS2 MOTOR DIR SEL STEP WDATA WGATE TRK0 WPROT RDATA SIDE ONE SEL READY

AGND

+5V

R382 150R L
R383 150R L
R384 150R L
R385 150R L
R386 150R L

B4
24MHZ
C70 22P L
C71 22P L

R75
4K7 L

R170
10K L

R33 4K7 L

C72
4N7 L

DATA
ADDRESS
CONTROL

D65-B
74HCT259T-L

D76-B
74HCT259T-L

D77-B
74HCT138T-L

D79-E
74HCT32T-L

D184-E
74F08-L

D85-E
74HCT00T-L

D86-B
74HCT153T-L

D98-E
74HCT00T-L

D78B 82077

C365 10N L
C374 10N L
C377 10N L
C379 10N L
C384 10N L
C385 10N L
C386 10N L
C388 10N L
C178 100N M

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

EE 8-4 -NR 1003.7202.24 S

MODESEL INUSE DS3 INDEX DS0 DS1 DS2 MOTOR DIR SEL STEP WDATA WGATE TRK0 WPROT RDATA SIDE ONE SEL READY

X223 33 31 29 27 25 23 21 19 17 15 13 11 9 7 5 3 1

X223 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2

AGND

X8 1

D78-A
82077

IDENT
TNVERT
RDV2
DRATE0
DRATE1
HIFIL
LOFIL
MFM
RESET
INT
DRQ
DACK
TC
RD
WR
CS
A0
A1
A2
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7

DENSEL
DS3
INDX
DS0
DS1
DS2
MEO
DIR
STEP
WRDATA
WE
TRK0
WP
RDDATA
HDSEL
DSKCHG

X1
X2

NC NC NC NC

+5V

R382 150R L
R383 150R L
R384 150R L
R385 150R L
R386 150R L

B4
24MHZ
C70 22P L
C71 22P L

X22A 19 LCD BUSY*
X22A 25 RMKDIR
X22A 24 RMKPLS

X22A 28 KEYROW 1
X22A 27 KEYROW 2
X22A 26 KEYROW 3
X22B 28 KEYROW 4
X22C 28 KEYROW 5
X22B 27 KEYROW 6
X22C 27 KEYROW 7
X22B 26 KEYROW 8

X22C 26 KEYCOL 1
X22B 25 KEYCOL 2
X22C 25 KEYCOL 3
X22B 24 KEYCOL 4
X22C 24 KEYCOL 5
X22B 23 KEYCOL 6
X22C 23 KEYCOL 7
X22B 22 KEYCOL 8
X22C 22 KEYCOL 9

+5V
R84-A R84-B R84-C R84-D R84-E R84-F R84-G R84-H R84-I
9X 3K3

+5V
R89 10K L
R90 10K L
R91 10K L

+5V
C183
10N L

C73..C81
9X100P

+5V
R85-A..-I
47K-ARRAY

C82..C89
8X10N L

AUSSERHALB DER
SCHIRMWAND

R142
1K L

R141
1K L

C141
100P L

C142
100P L

+5V
R144
100K L

C161
100P L

C162
100P L

D83
IFPAS-984

KC12 KC11 KC10 KC9 KC8 KC7 KC6 KC5 KC4 KC3 KC2 KC1

KR8 KR7 KR6 KR5 KR4 KR3 KR2 KR1

RMK.PLS
RMK.DIR
CLK.IN
TST.EN
TSC
CS
RD
WR
RS0
RS1
RES
TST.IN

CLK4MHZ
CSIFP*
RD*
WR*
A1
A2
RES*

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

DB15 DB14 DB13 DB12 DB11 DB10 DB9 DB8 DB7 DB6 DB5 DB4 DB3 DB2 DB1 DB0

SER.CLK
F32
SYS.CLK
RMK.OVRUN
WAIT
TFR.BUSY
T/R*
CLK.EDGE

KEY.INT
RMK.INT
TFR.INT
TST.MUX
TFR.CLK
TM.DATA
RC.DATA

+5V
R187
10K L

R88
10K L

FDC

IFPAS

DATA

ADDRESS

CONTROL

D85-E
74HCT00T-L

D86-B
74HCT153T-L

D98-E
74HCT00T-L

D78B 82077

C385
10N L

C386
10N L

C398
10N L

C378
10N B

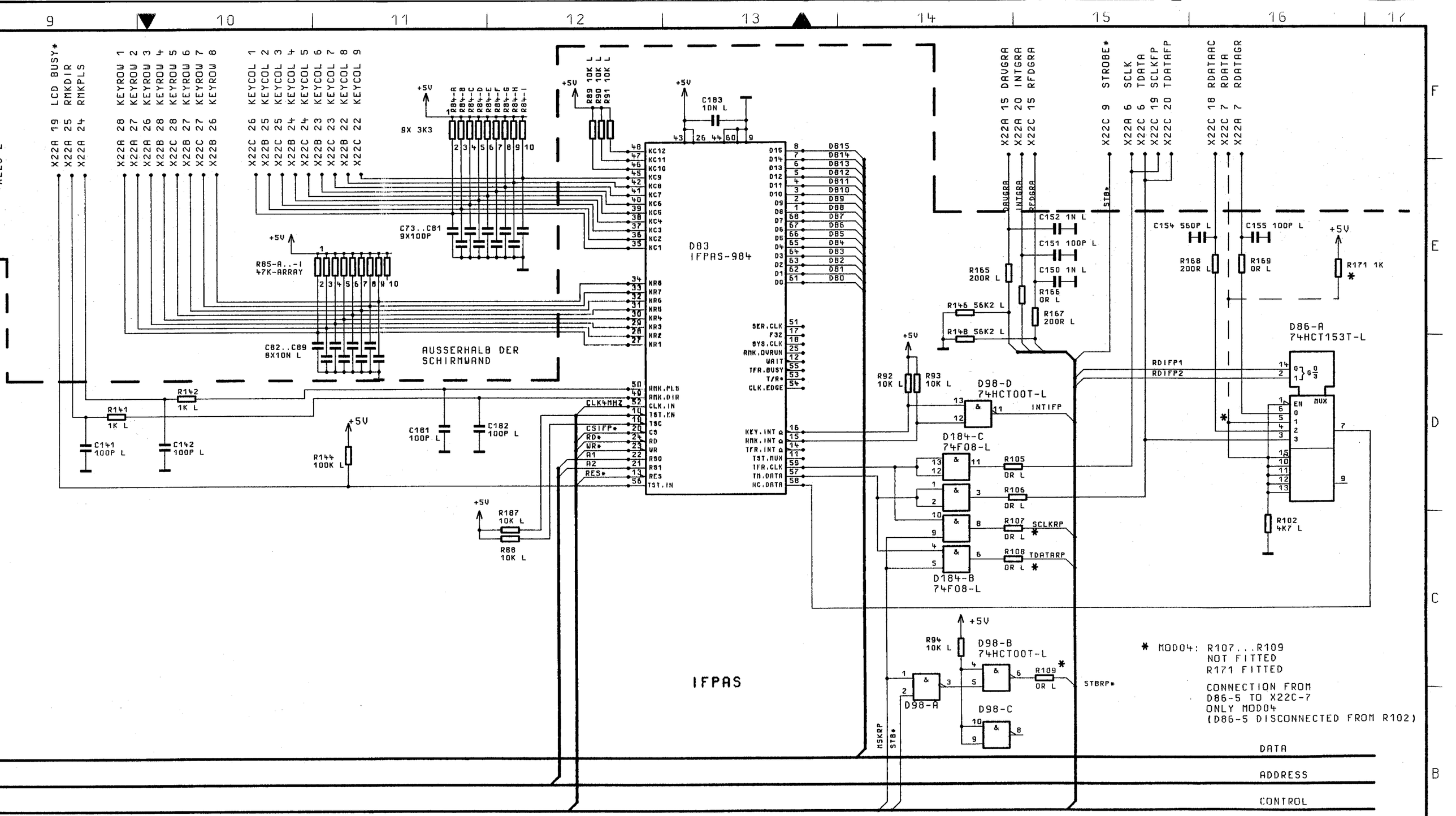
C376
100N B

AGND

13/00 47299(2)

12/00 46392(6)

AEND. IND. ÄNDERUNG MITTEILUNG



13/00	47299(23)	06.92	PF	1KEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	10.06.92	
12/00	46342(6)	03.91	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ

ZU GERAET ESHS30

BENENNUNG: CPU BOARD

ZEICHN.-NR. 1003.7202.01S

BLATT-NR. 6 v. 7 bl.

REG.I.V. 1002.9001 CASTE Z.

PRINTER INTERFACE

X222

D95-A 74HCT32T-L
D93-A 74HCT374T-L
R393 1K L
D92-A 74HCT259T-L
D95-B 74HCT32T-L
D95-C 74HCT32T-L
D95-D 74HCT32T-L
D95-E 74HCT32T-L
D96-A 74HCT03T-L
D96-B 74HCT03T-L
D96-C 74HCT03T-L
D96-D 74HCT03T-L
D96-E 74HCT03T-L
D80-C 74HCT14T-L
D80-D 74HCT14T-L
D80-E 74HCT14T-L
D80-F 74HCT14T-L
D80-G 74HCT14T-L
D82-B 74HCT74T-L
D82-C 74HCT74T-L
D94-A 74HCT251T-L
D88-A
D88-B 74HCT86T-L
D85-B 74HCT00T-L
D85-C 74HCT00T-L
D85-D 74HCT00T-L
D90-A 74HCT08T-L
D90-B 74HCT08T-L
D90-C 74HCT08T-L
D90-D 74HCT08T-L
D42-D 74HCT32T-L

PRIDAT7 PRIDAT6 PRIDAT5 PRIDAT4 PRIDAT3 PRIDAT2 PRIDAT1 PRIDAT0 PRISTB* PRIRES* PRIACK* PRIBUSY PRISEL PRIFAU*

R400 10K L
R401 10K L
R402 10K L
R403 10K L
AGND

+5V
R394 2K21 L
R395 2K21 L
R74 10K L
R380 4K7 L
R135 4K75 L
R136 4K75 L
R137 4K75 L
R138 4K75 L
R82 4K75 L

RESET
RES*
DB0
CSPDAT*
WR*
CSPORE*
CSPIRE*
RD*
PRIRES*
PRISTB*
PRIACK*
PRIBUSY
PRISEL
PRIFAU*
KBD-NMI-ENA* SHEET4 D/1
OLACK SHEETS C/9
KBDSIM

X22A 31 X22B 31 X22C 31 DGND
X22A 32 X22B 32 X22C 32
X22A 3 +12V
+12VUP
C134 10N L
L124 3U3H
C135 10U 25V
C136 10N L
+12V

X22C 14 RES*
X22C 12 INT.SUPPLY
X22A 9 PK RES
C161 100P L
C162 1N L
C163 100P L
R161 0R L
R162 200R L
R163 0R L
RES*
UNBAT
PKRES

X22C 11 SWPCLK
C160 100P L
R160 0R L

X22A 29 X22B 29 X22C 29 +5VD
X22A 30 X22B 30 X22C 30
C125 220N L
C137 560P
C120 220U 25V
AGND
L120 56UH
C121 220U 25V
C126 220N L
C127 560P L

TMRO1
MSKTR1
SWPCLK
INTRDC
RESET
RD*
PCS5*
A1
CLK2MHZ

C391 10N L
C392 10N L
C393 10N L
C394 10N L
C395 10N L
C396 10N L
C382 10N L

DATA
ADDRESS
CONTROL

PRINTER INTERFACE

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X22A 31 X22B 31 X22C 31 X22A 32 X22B 32 X22C 32 DGND

X22A 3 +12V

X22C 14 RES* X22C 12 INT.SUPPLY X22A 9 PK RES

X22C 11 SWPCLK

X22A 29 X22B 29 X22C 29 X22A 30 X22B 30 X22C 30 +5VD

X22A 8 TEST X22A 16 V-A/D X22C 16 GND-A/D

A

B

R403 10K L

AGND

C134 10N L

C135 10U 25V

C136 10N L

+12VUP

L124 3U3H

+12V

C161 100P L

C162 1N L

C163 100P L

R161 OR L

R162 200R L

R163 OR L

RES* LNBAT PKRES

C160 100P L

R160 OR L

C120 220U 25V

C125 220N L

C137 560P

AGND AGND

L120 56UH

C121 220U 25V

C126 220N L

C127 560P L

+5V

L125 47UH

+5VAD

+10VS

C110 10U

R110 10K .1%

R111 1K .1%

R112 9K09 .1%

R115 10K L

N110-A TL072ACP

+10V

-10V

C111 100N

AGND

C100 10U 10V

C96 100N L

R100 10R L

C95 100N L

C101 10U 25V

VA+

VD+

D91 CS5012

R103 10K L

R104 10K L

+5VAD

CAL

BW

TEST

VREF

GNDA

AIN

REFBUF

VD- GNDD VA-

R98 10K L

R101 10R L

C102 10U 10V

C97 100N L

C98 100N L

C103 10U 25V

C99 100N L

C105 10N L

C104 10U 10V

V90 HP8210

V91 HP8210

VII

ADC

C112 100N

N113-B TL191CN

N113-A TL191CN

+10V

-10V

R129 1K L

R95 47R5 L

N114 OP07CP

R116 1M L

C113 100N

AGND*

SWTAIN

D82-B 74HCT74T-L

D94-A 74HCT251T-L

MUX

A1 A2 A3

DB0

D42-D 74HCT32T-L

WR* PCS5*

D88-B 74HCT86T-L

TMR01 MSKTR1 SWPCLK

D85-B 74HCT00T-L

D90-A 74HCT08T-L

RESET RD* PCS5* CLK2MH7

D88-A

R82 4K75 L

+5V

D85-C 74HCT00T-L

INTADC

DATA

ADDRESS

CONTROL

D82-C 74HCT74T-L

R396 2K21 L

R388 4K75 L

D80-B

D96-D 74HCT03T-L

R291 4K7 L

D90-C

D90-B

D90-D 74HCT08T-L

R285 4K7 L

D85-A

D85-D 74HCT00T-L

A

D90-E 74HCT08T-L

C140 10N L

+10V +5VAD

C413 100N L

N113-C TL191CN

C414 100N L

C415 100N L

-10V

AGND

ACHTUNG!
ATTENTION

9 10 11 12 13 14 15 16 17

F E D C B A

X22A 8 TEST
X22A 16 V-A/D
X22C 16 GND-A/D

L125 47UH
+5VAD

C100 10U 10V
C96 100N L
R100 10R L
C95 100N L
C101 10U 25V
VA+
AGND

D91 CS5012

VD+ VA+ VD- GNDD VA-

DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7 DB8 DB9 DB10 DB11 DB12 DB13 DB14 DB15
SDATA SCLK RESET HOLD RD CS INTRLV AO CLKIN EOT EOC BP/UP

D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15

CAL BW TEST VREF GNDA AIN REFBUF

R103 10K L
R104 10K L
C105 10N L
C104 10U 10V
C90 100P L
V90 HP8210
V91 HP8210
C99 100N L
R98 10K L
R101 10R L
C102 10U 10V
C97 100N L
C98 100N L
C103 10U 25V
VA-

ADC

+10VS
R110 10K .1%
R111 1K .1%
R112 9K09 .1%
C110 10U
AGND

N110-A TL072ACP
+10V -10V
R113 47R5 L
R118 100R L
V111 BCX70H-L
R115 10K L
R117 10K L
N110-B TL072ACP
R114 47R5 L
V110 BCX71J-L
R119 100R L
X20 1 X24 1 X29 1
VA+ VA-

C111 100N L
R121 10K L
R120 100R L
N111 OP07CP
C112 100N L

N113-D TL191CN
N113-A TL191CN
R122 56K2 0.1%
R125 121R L
R124 56K2 0.1%
R127 121R L
R123 51K1 0.1%
R125 51K1 0.1%
C139 100N L
C140 100N L
R128 200R L
N112 OP07CP
X23 1
SWTRIN

N114 OP07CP
R129 1K L
R95 47R5 L
R116 1M L
C113 100N

X22A 1 X22B 1 X22C 1
AGND
AGND*

L121 47UH
+10V
X22C 4 +10V
C129 10N L
C122 10U 25V
C128 10N L
R143 1K L
C143 10N L
+10V*

L122 47UH
-10V
X22A 5 X22B 5 X22C 5
C131 10N L
C123 10U 25V
C130 10N L
C144 10N L -10V

L123 3U3H
+10VS
X22A 4 +10VS
C133 10N L
C124 10U 25V
C132 10N L
C145 10N L

D90-E 74HCT08T-L
+5V
+10V +5VAD
C140 100N L
C413 100N L
N113-C TL191CN
C414 100N L
C415 100N L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.

ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

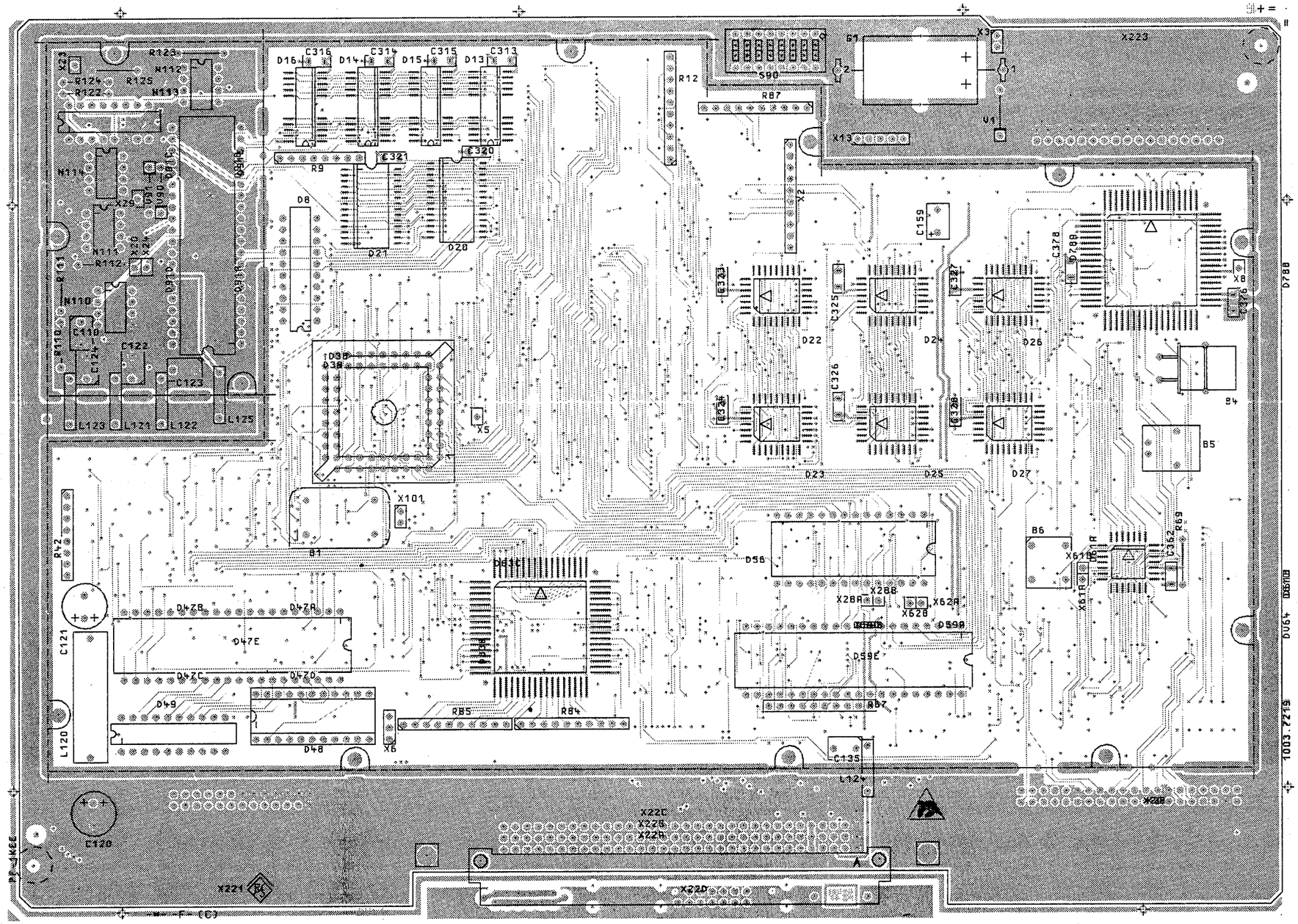
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7	45105	08.90	PF
8	45105	09.90	NG
9	45105	09.90	PF
11	46342(1)	02.91	Pf

	TAG	NAME
BEARB.		PF
GEPR.		PF
NORM		
PLOTT	9. 1.91	*

ROHDE&SCHWARZ
ZU GERAET ESHS30

BENENNUNG
CPU BOARD

ZEICHN.-NR. 1003.7202.01S
BLATT-NR. 7 V. 7 BL.
REG.I.V. 1002.9001
ERSTE Z.



Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

DV41

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

ATTENTION ESD !
Electrostatic sensitive devices require a special handling.

(hierzu HVC 250)

Änd. Zust.	Änderungs-Mitteilung	Tag	Name
15	46342(1)	02.91	Pf

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

1KEE	Tag	Name
Bearb	01.91	PF
Gepr.		
Norm		

Benennung: EE CPU BOARD

Z

ROHDE&SCHWARZ

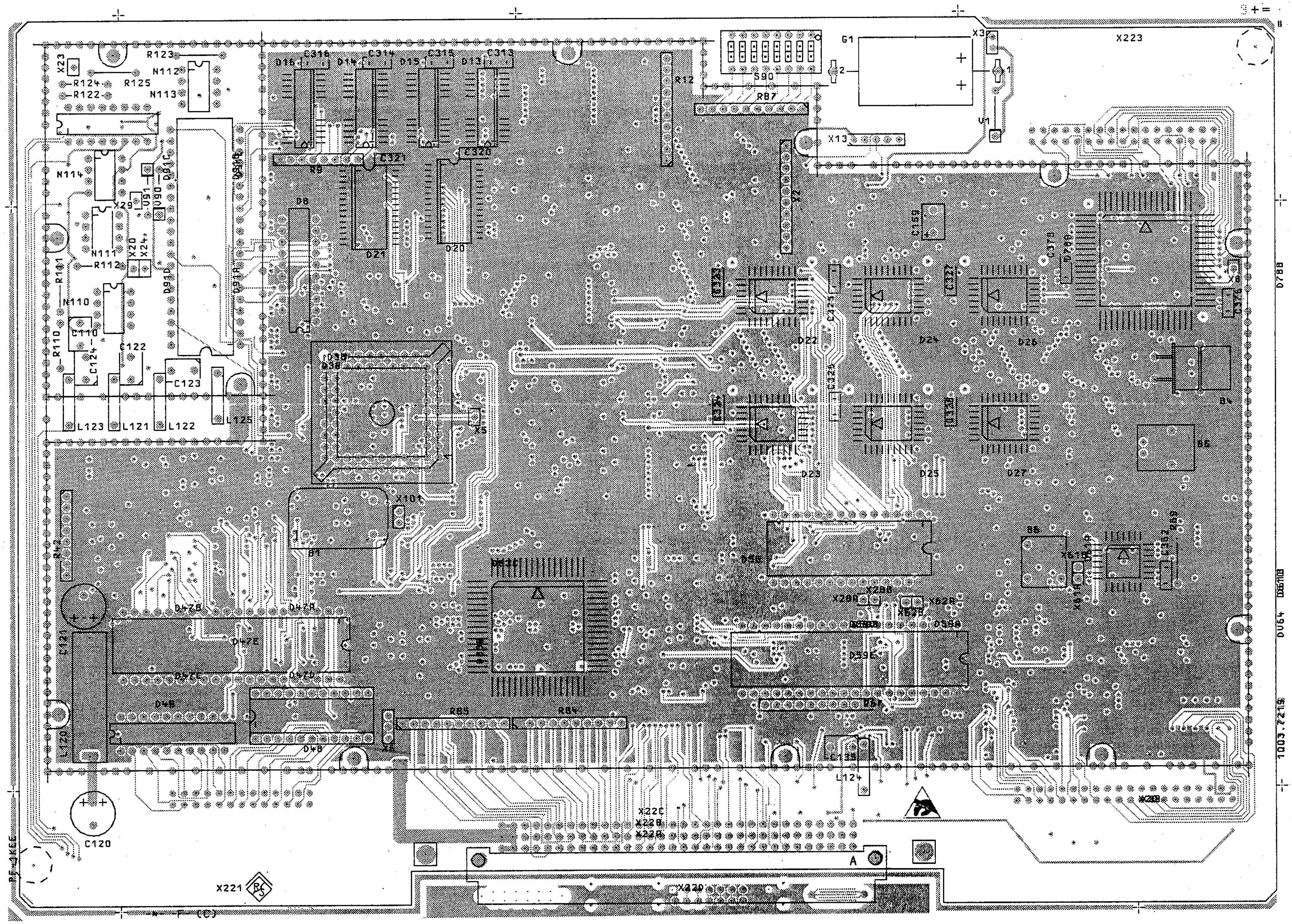
zu Gerät ESHS30

Zeichn.-Nr. 1003.7202

Blatt-Nr. 3 v. Bl.

Ers.f. V 1002.9001 V erste Z.

Für diese Unterlage behalten wir uns alle Rechte vor



Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

DV43

(hierzu HVC 250)

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

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

Änd Zust	Änderungs-Mitteilung	Tag	Name
15	43642(1)	02.91	Pf

Maße ohne Toleranzangabe		Maßstab 1 : 1
		Halbzeug, Werkstoff
1KEE	Tag	Name
Bearb	01.91	PF
Gepr		
Norm		

Benennung: EE CPU BOARD — Z

ROHDE & SCHWARZ

zu Gerat: ESHS30

Zeichn.-Nr.: 1003.7202

Blatt-Nr. 4 v. Bl.

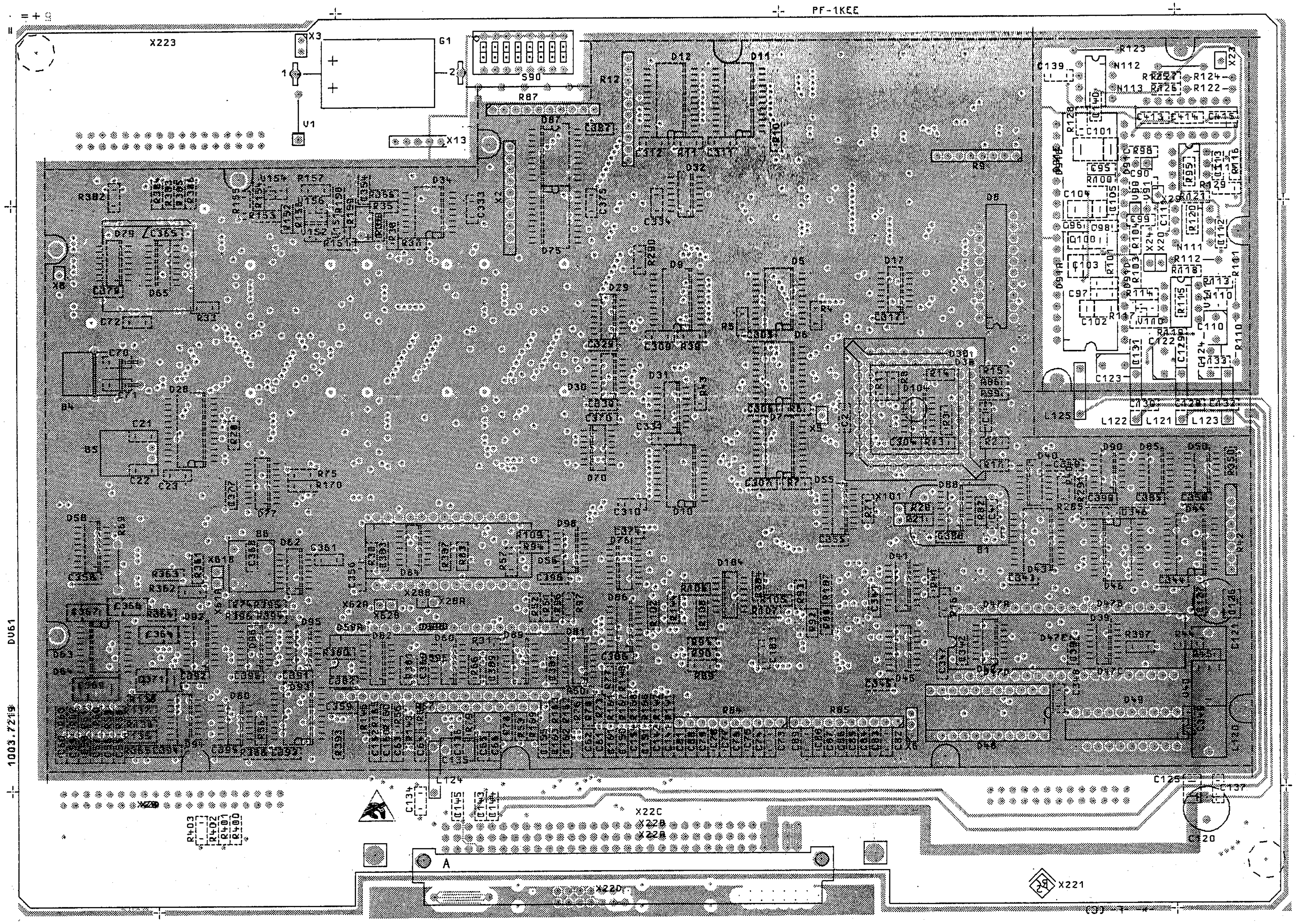
1002.9001 V — erste Z.

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ISO-Projektion Methode E

11 6107 87

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Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

DV13

ACHTUNG: EGB!
Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.
(hierzu HVC 250)

ISO-Projektion Methode E

Änd. Zust.	Änderungs-Mitteilung	Tag	Name
15	43642(1)	02.91	Pf

Maße ohne Toleranzangabe	Maßstab	1 : 1
	Halbzeug, Werkstoff	
1KEE	Tag	Name
Bearb.	01.91	PF
Gepr.		
Norm		

Benennung: EE CPU BOARD — Z

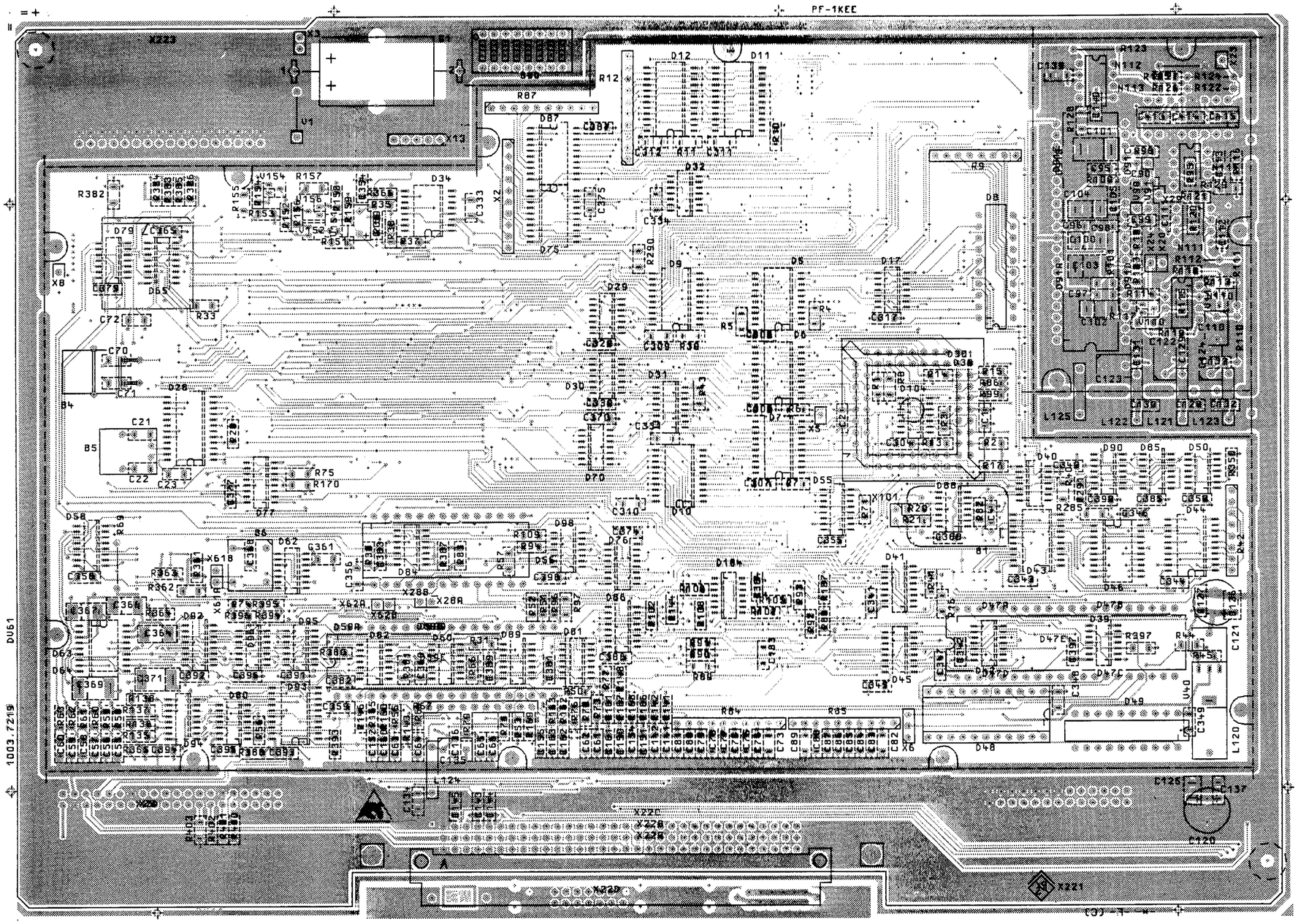
ROHDE&SCHWARZ

zu Gerät: ESHS30

Zeichn.-Nr.: 1003.7202

Blatt-Nr.: 5 v. Bl.

reg. i. V: 1002.9001 V — erste Z.



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

DV11

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

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

(nach HVC 250)

15	43642(1)	02.91	Pf	Maße ohne Toleranzangabe		Maßstab 1 : 1
						Halbzeug, Werkstoff
				1KEE	Tag	Name
				Bearb	01.91	PF
				Gepr		
				Norm		
And	Änderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ		Zeichn.-Nr 1003.7202
Zust				zu Gerat ESHS30		reg. i. V 1002.9001 V erste Z

Benennung: EE CPU BOARD — Z

Blatt-Nr 6 v Bl

11.6107.87

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Projektion Code E

ROHDE&SCHWARZ

SERVICE DOCUMENTS

Detector Board

1010.8498.02

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Parts lists

Circuit diagrams

Component location plans

7 Testing and Repair of the Detector Board Module

7.1 Functional Description

The detector board serves to process the video signal transferred from the IF Selection Board module (or from the IF-80-kHz module with the ESS) for the A/D converter and the analog instrument. Further, it demodulates the IF signal and supplies the AF signal for the loudspeaker or the headphones The module contains the weighting circuits for average, quasi-peak, peak and RMS value (mod 03), the log module and the control circuit for the instrument. Furthermore, it contains the demodulators required for A3, A0 and FM demodulation and the AF amplifier

The detector board module is used in test receivers ESVS, ESVB, ESVD and ESS. Hence not all functional groups are always loaded completely. The different loading versions are emphasized in the functional description and in the circuit diagrams The different test receivers are loaded with the following versions.

Test receiver	possible loading version
ESVS ESVD	1010 8498 Mod 02
ESVB ESS	1010 8498 Mod 03

7.1.1 Functional Description of the Display Unit

The video signal is transferred from input X18A13 to the weighting circuits for average, quasi-peak, peak and RMS value (only mod. 03) via X49. In the case of loading version mod. 03, analog switch D490 can switch over the video signal between X18A13 and X18A15. Buffer amplifier N400 provides the video signal to X183 for measuring purposes. An overload of the weighting circuits is detected by the overload detector (N405).

7.1.1.1 Average Detector

Average weighting is effected by means of an active lowpass filter (N470) with critical attenuation. By switching over analog switches D460, 470 the averaging time constants 0.1, 1, 10 and 100 ms can be set.

7.1.1.2 Quasi-Peak Detector

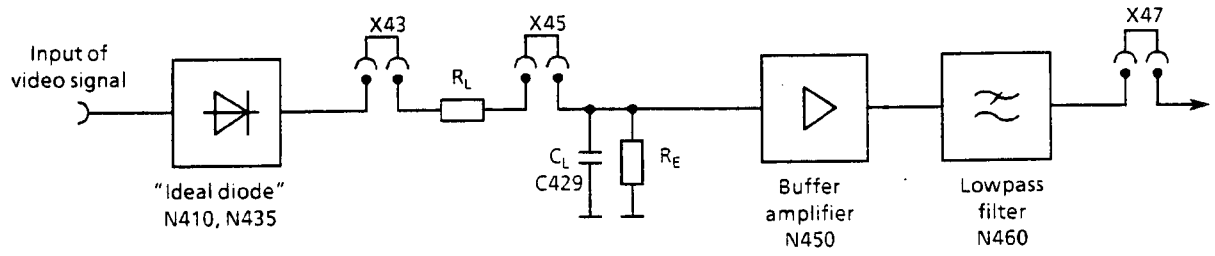


Fig. 7-1 Block diagram of the quasi-peak detector

The quasi-peak detector consists of a quasi-peak-responding rectifier and an instrument simulation.

The video signal controls "ideal diode" N410, 435. If the voltage at charging capacitor C429 is smaller than the video voltage, the output signal of the diode exactly follows the video signal and charges C_L via charging resistor R_L. During the rest of the time diodes V411, 412 are reverse-biased by the output voltage of N410 which thus prevents the discharge of the weighting circuit. Buffer amplifier N450 taps the voltage at the charging capacitor at high impedance to be processed further

The output signal of the quasi-peak-responding rectifier drives the critically coupled lowpass filter of second order N460, which simulates the time constant of the instrument according to CISPR Publication 16.

In the case of loading version mod. 03, the charging resistor (R_L) can be switched over by analog switches D420 A, B, and discharge resistor (R_E) by analog switches D420 C, D. Further, analog switches D450 B, C can switch over the time constant of the instrument simulation. This makes it possible to switch on the different charging and discharge time constants as well as instrument time constants required in CISPR Publication 16 with test receiver ESS.

If resistors R427 and R428 are switched on as charging resistors, the gain of buffer amplifier N450 is switched to V = 1.1 by analog switch D450A in order to compensate for the voltage drop at the charging resistor.

In order to achieve highest linearity of the weighting circuit, the offset voltages of N410, 435 have to be adjusted exactly using R410, the ones of N450, 460 using R460.

7.1.1.3 Peak Detector

The peak detector consists of buffer amplifier N200, peak-responding rectifiers N210, 240, V230, 231 as well as discharge circuits D260, 265, 270, 271, V205, 211, 215. The buffer amplifier decouples the other weighting circuits and drives the peak-responding rectifier. In the peak-responding rectifier, trans-impedance amplifier N210 compares the charging voltage at charging capacitor C211, which is buffered by amplifier V230, 231, N240, with the video signal. Via V207, 210 it recharges it until the charging voltage is equal to the video voltage. In the case of video voltages smaller than the voltage at C211, diodes V207, 210 are reverse-biased by N210 which thus prevents the discharge of the capacitor.

The amplifier, which consists of V230, 231 and N240, is a fast buffer amplifier. Due to its low input current it does not vary the voltage stored in the capacitor even in the case of small charging voltages and thus allows long hold times.

Switching logic D260, 265, 270 generates two pulses for discharging the peak-responding rectifier. At the beginning of the discharge, the clamp pulse switches on analog switches D271 A, D for 35 ms so that the input of the rectifier gets a negative input voltage via V205, by which diodes V207, 210 are reverse-biased. Within this time the reset pulse switches on analog switches D271 B, C and C211 is discharged via V211, V215. After storage capacitor C211 has been discharged, the clamp pulse releases the input again. In order to fulfill the high demands on linearity of the peak detector, the offset voltages have to be adjusted exactly using R202 and R237.

7.1.1.4 RMS Detector (Only Mod. 03)

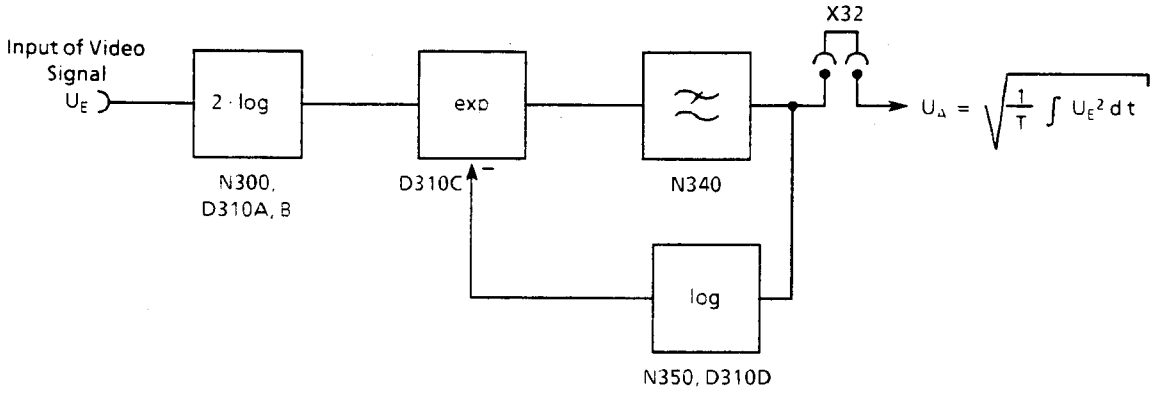


Fig. 7-2 Block diagram of the RMS detector

The RMS detector determines the RMS value of the video signal by means of an arithmetic circuit. First the logarithm of the video signal is determined by log module N300, D310A, B and multiplied by 2. Then transistor D310C subtracts the output signal of the detector, whose logarithm has been determined by log module N350, D310D, from this signal and exposes this signal again. The exposed signal is finally averaged by integration lowpass filter of second order N340. By switching over analog switches D320 and D330 the averaging time constants of the lowpass filter can be set to 0.1, 1, 10 and 100 ms.

Hence the RMS value of the video signal is provided for further processing at output X32 of the detector.

In order to achieve highest linearity of the weighting circuit, the offset voltage of N300 has to be exactly adjusted using R307, the ones of N340, 350 using R340.

Depending on the kind of weighting selected, the average, quasi-peak, peak or RMS signal is transferred to the input of meter amplifier N500 via analog multiplexer D500. When the 30-dB measuring range is selected, its voltage gain is V = 10, in the 60-dB measuring range V = 1.

7.1.1.5 Log Amplifier

The input voltage range of log modules N520, 530, V521 is 40 mV to 1.256 V in the 30-dB measuring range and 4 mV to 4V in the 60-dB measuring range. The reference voltage is adjusted using R524, the gain using R529. NTC resistor R526 compensates for the temperature effect of the two transistors forming a log module. Subsequently the output voltage of N530 is amplified by meter amplifier N535, which can be switched over using D530. Its gain is adjusted to .V = -2.18 in the 30-dB measuring range using R539 and is V = -1.07 in the 60-dB measuring range. Summing amplifier N540 adds a reference voltage, which can be switched over using D550 and is buffered by N550, to the output voltage of N535. Hence the output signal of the log amplifier is provided for further processing at the output of N540. The output voltage range is 1.2 to 4.2 V with a slope of 100 mV/dB in the 30-dB measuring range, in the 60-dB measuring range it is also 1.2 to 4.2 V, but with a slope of 50 mV/dB.

Meter amplifier N570 converts the output voltage range of the log amplifier of 1.2 to 4.2 V into the input voltage range of the A/D converter of 0.976 to 4.638 V.

7.1.1.6 Control Circuit for the Analog Instrument

The control circuit for the analog instrument consists of a track-and-hold circuit, a circuit for considering transducer factors, the instrument driver as well as driver circuits for the recorder outputs.

Track-and-hold amplifiers N610A, B receive their input signal via X57. When FET switch V611 is switched on, N610-A charges capacitor C610 exactly to the input voltage value which buffer amplifier N610B taps at high impedance at the charging capacitor. In the hold mode, V612 opens the FET switch and the voltage stored in the capacitor is provided at the buffer output.

Summing amplifier N610C adds a voltage which is set by D/A converter D620 to the output signal of the track-and-hold amplifier. This makes it possible to alter the level to be indicated at the instrument by +/- 6 dB in steps of 0.1 dB (0 dB = 60 digit). If the data word of D620 is increased by one digit, the indicating level decreases by 0.1 dB. FET switch V620 switches over the reference current of D620 as a function of the measuring range. The output current of the D/A converter is converted into a voltage, to which a reference voltage depending on the measuring range is added, by I/V converter N610D. Hence the electrical zero of the analog instrument can be adjusted in the 30-dB and 60-dB measuring range using R630 and R631 respectively.The control voltage for the instrument driver is provided at the output of N610C.

The instrument driver, which consists of differentiating amplifier N640C and the voltage-controlled power source N640D, supplies the indicating current for the analog instrument, which is situated on the Display Board module. In order to ensure an almost inertialess settling of the instrument, the inertia of the pointer deflection is compensated for by differentiating amplifier N640C. The transient response of the analog instrument is adjusted using R652. Power source N640D supplies the indicating current for the instrument. NTC R672 compensates for the temperature dependence of the instrument's internal resistance. Full-scale deflection is adjusted using R654.

The output voltages for the recorder outputs are supplied by amplifiers N640A, B. Amplifier N640B is a lowpass filter of second order with a time constant of 50 ms. It determines the transient response of the analog instrument.

7.1.2 Functional Description of the AF Demodulation Unit

The 10.7-MHz IF signal, whose level is monitored by level detector V100, 101, 102, is transferred from input X187 to analog switch D700. Depending on the kind of demodulation set, it switches the IF signal to the A3, A0 or FM demodulator and at the same time switches off the demodulators not required.

7.1.2.1 FM Demodulator

FM demodulator D720 contains a multi-stage limiter amplifier as well as an active demodulator. In the case of IF bandwidths larger than or equal to 100 kHz, N730A connects resonant circuit L727 as a discriminator. In the case of smaller bandwidths, it switches over to quartz discriminator B730.

7.1.2.2 A0/A3 Demodulator

For the demodulation of A3/A0 signals AM demodulator component D740 is used. The integrated controllable IF amplifiers and AGC circuits provide an IF signal of constant amplitude to pin 11. In order to suppress broad-band noise, the signal is limited in band by a ceramic filter and supplied to the active demodulator of D740. The A3-demodulated AF signal is decoupled at pin 12 to be processed further.

The 10.7-MHz LO signal required for A0 demodulation is generated by the limiter amplifiers of D760 connected as oscillators and quartz B766. In order to achieve the necessary frequency constancy of the oscillator signal, it is bound to the 100-kHz reference of the test receiver via PLLs V791, 794, D795, 796. The IF signal, which is limited in band and controlled, is amplified by V746 and symmetrically coupled into the active mixer of D760 via L760. It down-converts the IF signal into the baseband using the LO signal. The A0-demodulated AF signal is provided at pin 8 of D760.

7.1.2.3 AF Amplifier

In order to match the level to AF power amplifier N815, the output signals of the demodulators have to be preamplified. In the case of FM and IF bandwidths larger than 100 kHz, N800A amplifies signal FM-AF. In the case of A0,A3 or FM (IF bandwidth smaller than 100 kHz), the signals A0-AF, A3-AF or FM-AF are amplified by N800D, freed from noise components of higher frequency by active lowpass filter N800C and transferred to the AF power amplifier.

In order to increase the audibility of impulse noise superimposed on the noise in the QP type of indication, the linear video signal of N730B is highly amplified and transferred to N815 via V875, C875.

D780 and D810 switch the individual AF signals before they access AF amplifier N815. Its output power is set by means of the direct voltage at pin 7. The voltage buffered by N800B is supplied by the volume potentiometer, which is situated on the Display Board module. When the beeper is switched on, multivibrator D840A generates a saw-tooth signal which is also amplified by N815.

In order to save current, the supply voltage of N815 is switched off by FET switch V825 when the AF is switched off.

7.2 Test Instruments and Utilities

For testing and adjustment of the Detector Board module the following test instruments and utilities are required:

Item	Type of instrument	Specifications required	Suitable R&S instrument	Order no.
1	Signal generator		SMG	801.0001.52
2	Signal generator		AFG	377.2100.02
3	Digital multimeter		UDS5	345.1510.02
4	RF attenuator		RSP	831.3515.02
5	Storage oscilloscope		BOS	845.0007.02
6	50-Ω feed-through termination, 2 pieces		RAD	289.8966.00

7.3 Troubleshooting

Note: ***Correct functioning of the modules Display Board, Rear Panel, CPU Board, FRN Synthesizer, UHF Synthesizer, VHF Preselector, 2nd Mixer and IF Selection Board is required for the automatic test of this module and for troubleshooting. Since the automatic test is aborted on principle if a measurement exceeds the predefined tolerance limits in order to avoid absurd error messages, the test functions can be called manually in the Board Test menu (cf. Section 6.1.3.3 h) by means of external signals for further error location.***

- For further error location, call the Board Test menu (selftest 09).
- Select the Detector Board module using keys ↑ or ↓.
- Enter test function 0. The test of the module is executed.
- If an error occurs, enter the faulty test function and switch over to test mode by pressing the Enter key.

Certain errors (e.g. error in the AF demodulation unit) cannot be detected by means of the selftest. In this case the corresponding troubleshooting flowchart has to be selected on the basis of the error symptom.



If the module is operated via the service adapter outside the test receiver, small video signal voltages (<20 mV) are corrupted due to the voltage drop via the adapter lines (caused by mass flows). Possibly, the automatic selftest (test function 0) then erroneously displays an error message with test function 16. Thus test function 16 only supplies correct measuring results when the module is fitted.

The default setting for the Detector Board (cf. test-receiver default setting) as well as the setting for the respective test function (cf. table 7-1) are set automatically. The test voltage measured is displayed on the LEVEL display. The permissible tolerance limits are displayed on the DATA INPUT display.

- Remove the cover of the board.
- Plug the board onto the service kit.

Further troubleshooting should be performed according to the troubleshooting flowcharts. The error messages (ERR:) serve as entry points into the troubleshooting flowcharts. Check the serial interface (cf. Section 6.1.2) using table 7-3.

Default Setting of Test Receiver:

Frequency	64 MHz
RF attenuation	30 dB
Working range	60 dB
Detector	AV
Mode	LOW Noise
Transducer	0 dB
IF bandwidth	10 kHz
Preamplifier	off
Measuring time	10 ms
Calibrating generator	64 MHz on
Instrument	Track

Table 7-1 Test functions of board test Detector Board

Test function	Description of the test function	Additional settings of the test receiver	Rated value of the test voltage	Error message (ERR.:...)
0	Complete test of module	Test function 1 to 25 (30 with ESS, ESVB)	Test function 1 to 25 (30 with ESS, ESVB)	Test Function 1 to 25 (30 with ESS, ESVB)
1	Setting the video voltage at X49 to 4 V	Level out Cal .amplifier to rated value; measure T3	1.98 to 2.02 V	Video Input Level
2	Level of the 10.7-MHz signal at X187	Measure T0	>100 mV	IF Input Level
3	8.5-V supply voltage	Measure T1	2.5 to 3.16 V	8.5 V Supply
4	-5-V supply voltage	Measure T2	2.15 to 2.85 V	-5 V Supply
5	AV detector; time constant 0.1 ms; U (X49) = 4 V	Switch on time constant 0.1 ms wait 1ms measure T4	1.8 to 2.2 V	AV Detector
6	AV detector ; time constant 1 ms ; U (X49) = 4 V	Switch on time constant 1 ms ; wait 5 ms; measure T4	1.8 to 2.2 V	AV Detector
7	AV detector ; time constant 10 ms ; U (X49) = 4 V	Switch on time constant. 10 ms; wait 50 ms measure T4	1.8 to 2.2 V	AV Detector
8	AV detector ; time constant 100 ms ; U (X49) = 4 V	Switch on time constant 100 ms ; wait 500 ms measure T4	1.8 to 2.2 V	AV Detector

Test function	Description of the test function	Additional settings of the test receiver	Rated value of the test voltage	Error message (ERR.:...)
9	QP detector ; U (49) = 4 V	Switch on QP detector Wait 2 s ; Measure T4	1.8 to 2.2 V	QPK Detector
10	Log module with a working range of 60 dB ; U (X49) = 4 V	Measure T6	1.82 to 2.02 V	Log Amp
11	Log amplifier with a working range of 60 dB; U (X49) = 4 V	Measure T5	2.04 to 2.16 V	Log Amp / Shift
12	Linearity of AV detector ; U (X49) = 400 mV	RF attenuation 50 dB ; Measure T4	0.16 to 0.25 V	AV Detector
13	Linearity of QP detector ; U (X49) = 400 mV	Switch on QP detector RF attenuation 50 dB ; Wait 2 s Measure T4	0.16 to 0.25 V	QPK Detector
14	Discharge of PK detector; U (X49) = 4 V	Switch on PK detector Mode LD Discharge PK detector Wait 5 ms Measure T4	1.8 to 2.2 V	PK Detector
15	Hold time of PK detector; U (X 49) = 4 V after RF attenuation has been switched U (X 49) = 12.6 mV	Switch on PK detector Mode LD Mode LN Switch RF attenuation to 70 dB Do not discharge PK detector Wait 0.5 s Measure T4	1.8 to 2.2 V	PK Detector
16	PK detector ; U (X49) = 12.6 mV	Switch on PK detector RF attenuation 70 dB Discharge PK detector Wait 5 ms Measure T5	0.77 to 0.96 V *)	PK Detector *)
17	0/20-dB amplifier U (X 49) = 0.4 V	RF attenuation 50 dB 30-dB working range Measure T6	1.8 to 2.0 V	0/20 dB Amp
18	Log amplifier with a working range of 30 dB U (X 49) = 40 mV	RF attenuation 70 dB 30-dB working range Measure T5	1.5 to 1.7 V	Log Amp/Shift
19	Meter amplifier for the A/D converter U (X 49) = 40 mV	RF attenuation 70 dB 30-dB working range Measure level	88 to 92 dBµV	Shift Amp
20	Control circuit for the analog instrument with a display range of 60 dB U (X 49) = 4 V	Measure T7	1.72 to 2.03 V	Meter Transd.
21	Control circuit for the analog instrument with a working range of 30 dB U (X49) = 0.126 V	Switch on 30-dB working range RF attenuation 60 dB Measure T7	1.68 to 2.07 V	Meter Transd.

*) (The voltage value indicated in the LEVEL display is only valid until approx. 10 s after entering test function 16. For this reason, the voltage value has to be read directly after calling the test function!)

Test function	Description of the test function	Additional settings of the test receiver	Rated value of the test voltage	Error message (ERR:...)
22	Control circuit for the analog instrument with a working range of 30 dB; U (X 49) = 0.126 V	Switch on 30-dB working range RF attenuation 60 dB Measure T7 and store measured value (Ut) Set transducer factor to -5 dB Measure T7	Ut - (0.15 to 0.35 V)	Meter Transd.
23	Control circuit for the analog instrument with a working range of 60 dB U (X49) = 4 V	Measure T7 and store measured value (Ut) Set transducer factor to -5 dB Measure T7	Ut - (0.05 to 0.2 V)	Meter Transd
24	Track-and-hold amplifier U (X49) = 4 V; after the RF attenuation has been switched U (X49) = 12.6 mV	Switch track-and-hold amplifier to HOLD Switch RF attenuation to 80 dB Measure T7	> 1.72 V	Meter Hold
25	Track & Hold-Verstärker U (X49) = 4 V; after the RF attenuation has been switched U (X 49) = 12.6 mV	Switch track-and-hold amplifier to HOLD Switch RF attenuation to 80 dB Measure T7 Switch track-and-hold amplifier to TRACK Measure T7	< 0.8 V	Meter Hold
26 (only ESS, ESVB)	RMS detector; Time constant 0.1 ms; U (X49) = 4 V	Switch on RMS detector; Switch on time constant 0.1 ms Wait 1 ms Measure T4	1.8 to 2.2 V	RMS Detector
27 (only ESS, ESVB)	RMS detector; Time constant 1 ms; U (X49) = 4 V	Switch on RMS detector; Switch on time constant 1 ms Wait 5 ms Measure T4	1.8 to 2.2 V	RMS Detector
28 (only ESS, ESVB)	RMS detector; Time constant 10 ms; U (X49) = 4 V	Switch on RMS detector; Switch on time constant 10 ms Wait 50 ms Measure T4	1.8 to 2.2 V	RMS Detector
29 (only ESS, ESVB)	RMS detector; Time constant 100 ms; U (X49) = 4 V	Switch on RMS detector; Switch on time constant 100 ms Wait 500 ms Measure T4	1.8 to 2.2 V	RMS Detector
30 (only ESS, ESVB)	Linearity RMS detector U (X49) = 400 mV	Switch on RMS detector Switch on time constant 0.1 ms RF attenuation 50 dB Wait 1 ms Measure T4	0.16 to 0.25 V	RMS Detector

7.3.1 Troubleshooting Flowcharts

In the case of errors of the Detector Board, a first distinction is made between errors of the display unit and of the AF demodulator unit. For troubleshooting in the display unit there are four troubleshooting flowcharts and in the AF demodulator unit two troubleshooting flowcharts part of which are subdivided further.

a) Test Setup

- Remove the cover of the module.
- Plug the module onto the service kit
- Connect the signal generator with the attenuator.
- Connect the output of the attenuator with the Detector Board via a 50-Ω feed-through termination and a shielded cable (for connection point see troubleshooting flowcharts).
- Connect the signal generator with X187 of the module via 50-Ω feed-through termination.

b) Presetting

Signal generator:

Output signal: ..... direct voltage



Set output voltage such that with an attenuation of the attenuator of A = 0 dB 4V ± 100 mV are applied at the respective input of the module.
In the case of A = 60 dB, 4 mV ± 100 µV would have to be applied.

However, due to voltage drops caused by mass flows these small signal voltages are invalidated. For this reason, with the different attenuations of the attenuator the output voltage of the signal generator must be set such that the correct voltage level (see the following table) is applied at the connecting point on the Detector Board in each case. The output voltage is determined as follows:

- ***Plug in shielded cable into the connecting point on the Detector Board (connect ground of the attenuator to the mass point at the connecting point, e.g. X49.2, 3 (ground))***
- ***Set attenuations according to the following table and set the output voltage of the generator such that the voltage tolerance at the connecting point required in the table is observed. Note down the output voltage of the generator for the corresponding attenuation.***

Attenuation of the attenuator	Voltage at the connecting point
0 dB	4 V ± 50 mV
10 dB	1.26 V ± 15 mV
20 dB	0.4 V ± 5 mV
30 dB	0.126 V ± 1.5 mV
40 dB	40 mV ± 0.5 mV
50 dB	12.6 mV ± 0.15 mV
60 dB	4 mV ± 0.05 mV

- ***If the attenuation of the attenuator is switched in troubleshooting or in testing and adjustment, the output voltage of the generator must be set to the value determined before.***

Signal generator:

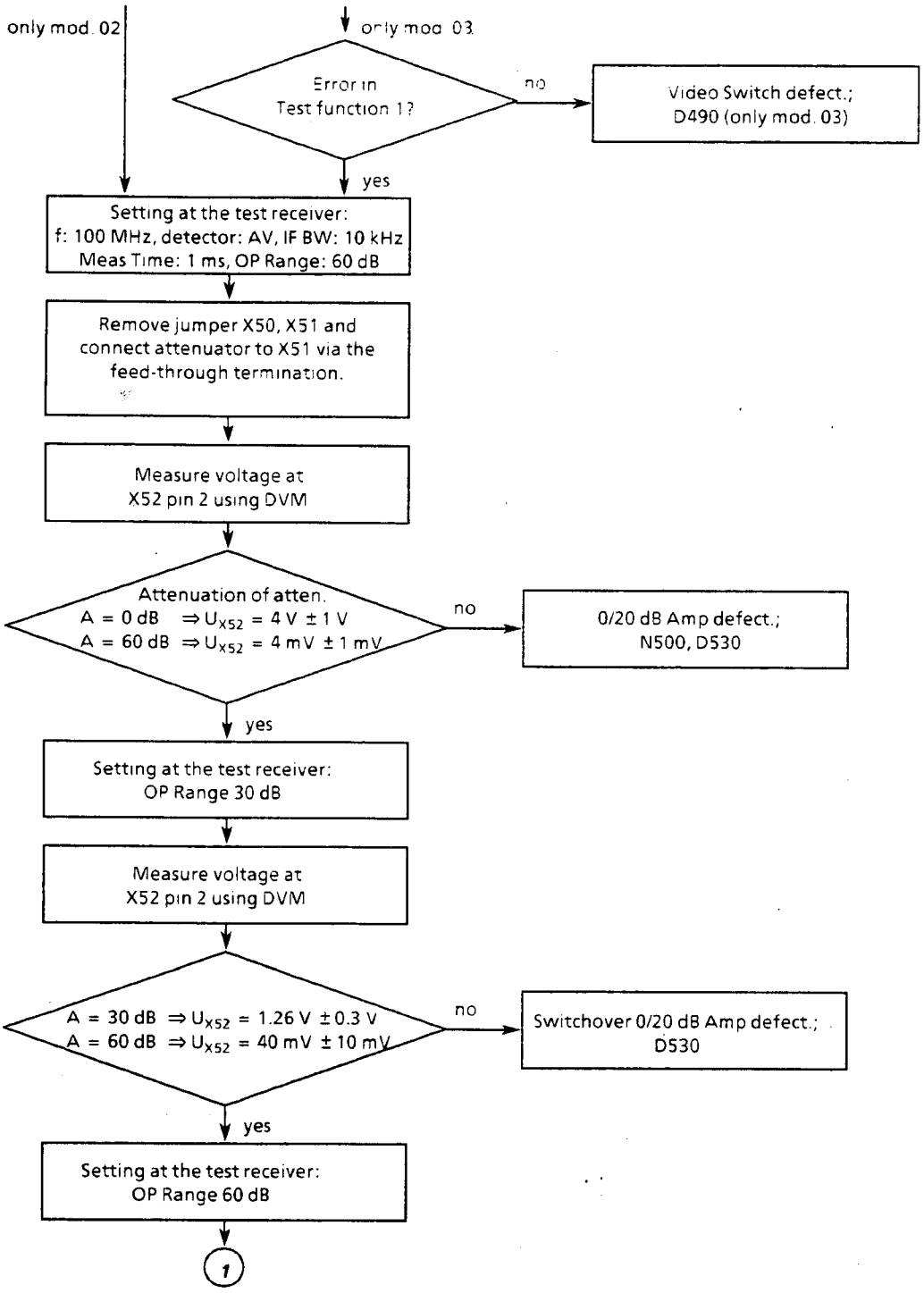
Frequency: ..... 10.7 MHz
Output level: ..... 110 dBµV

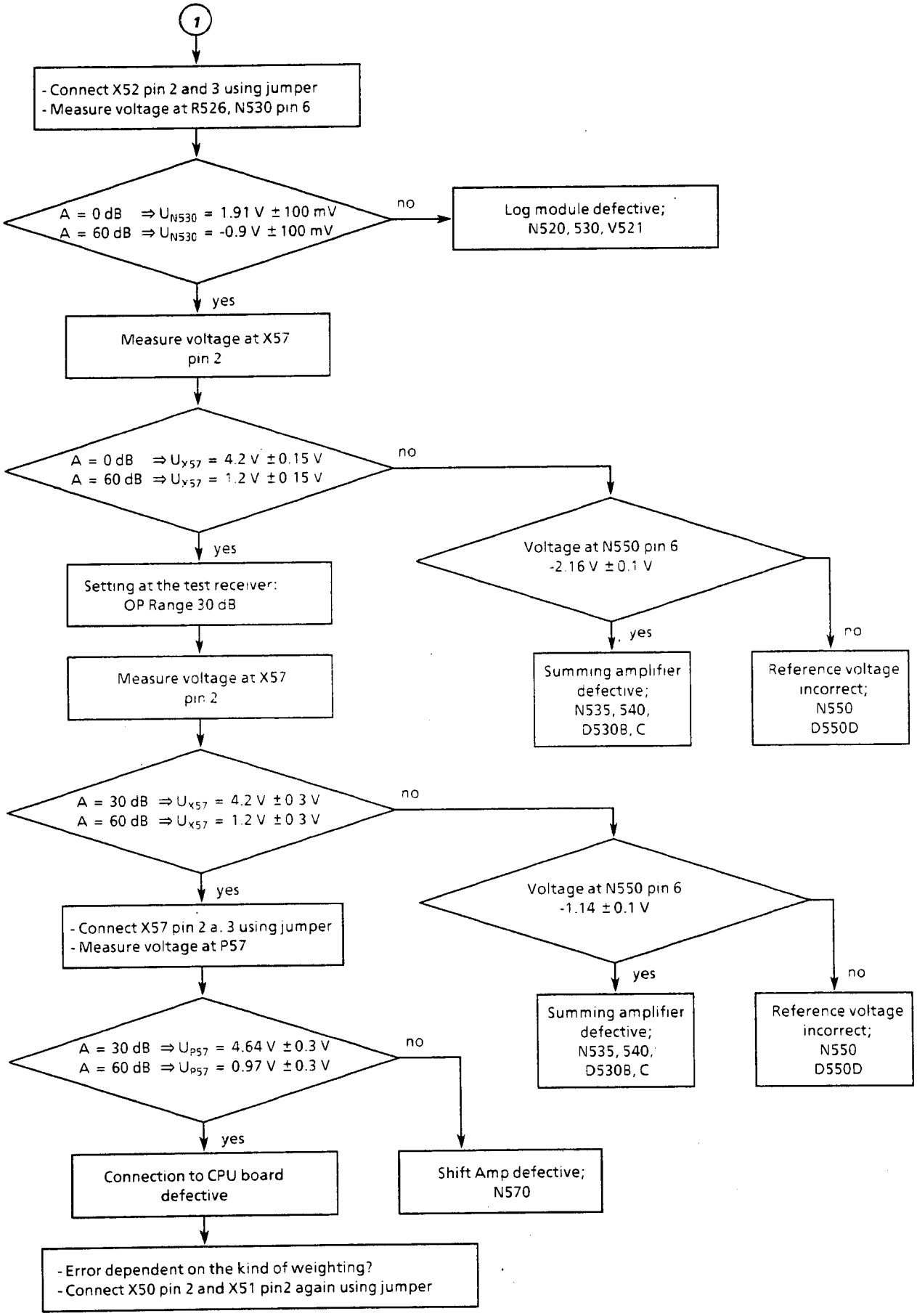
7.3.1.1 Errors of the Display Unit

Linearity Error Independent of the Kind of Weighting

Error message of the board test: Err. Test function 1, 10, 11, 17, 18, 19

Test setup as described under Section 7.3.1




1
- Connect X52 pin 2 and 3 using jumper
- Measure voltage at R526, N530 pin 6
A = 0 dB ⇒ U_N530 = 1.91 V ± 100 mV
A = 60 dB ⇒ U_N530 = -0.9 V ± 100 mV
no
Log module defective; N520, 530, V521
yes
Measure voltage at X57 pin 2
A = 0 dB ⇒ U_X57 = 4.2 V ± 0.15 V
A = 60 dB ⇒ U_X57 = 1.2 V ± 0 15 V
no
Voltage at N550 pin 6 -2.16 V ± 0.1 V
yes
Summing amplifier defective; N535, 540, D530B, C
no
Reference voltage incorrect; N550 D550D
yes
Setting at the test receiver: OP Range 30 dB
Measure voltage at X57 pin 2
A = 30 dB ⇒ U_X57 = 4.2 V ± 0 3 V
A = 60 dB ⇒ U_X57 = 1.2 V ± 0 3 V
no
Voltage at N550 pin 6 -1.14 ± 0.1 V
yes
Summing amplifier defective; N535, 540, D530B, C
no
Reference voltage incorrect; N550 D550D
yes
- Connect X57 pin 2 a. 3 using jumper
- Measure voltage at P57
A = 30 dB ⇒ U_P57 = 4.64 V ± 0.3 V
A = 60 dB ⇒ U_P57 = 0.97 V ± 0.3 V
no
Shift Amp defective; N570
yes
Connection to CPU board defective
- Error dependent on the kind of weighting?
- Connect X50 pin 2 and X51 pin2 again using jumper

Linearity Errors Depending on the Kind of Weighting

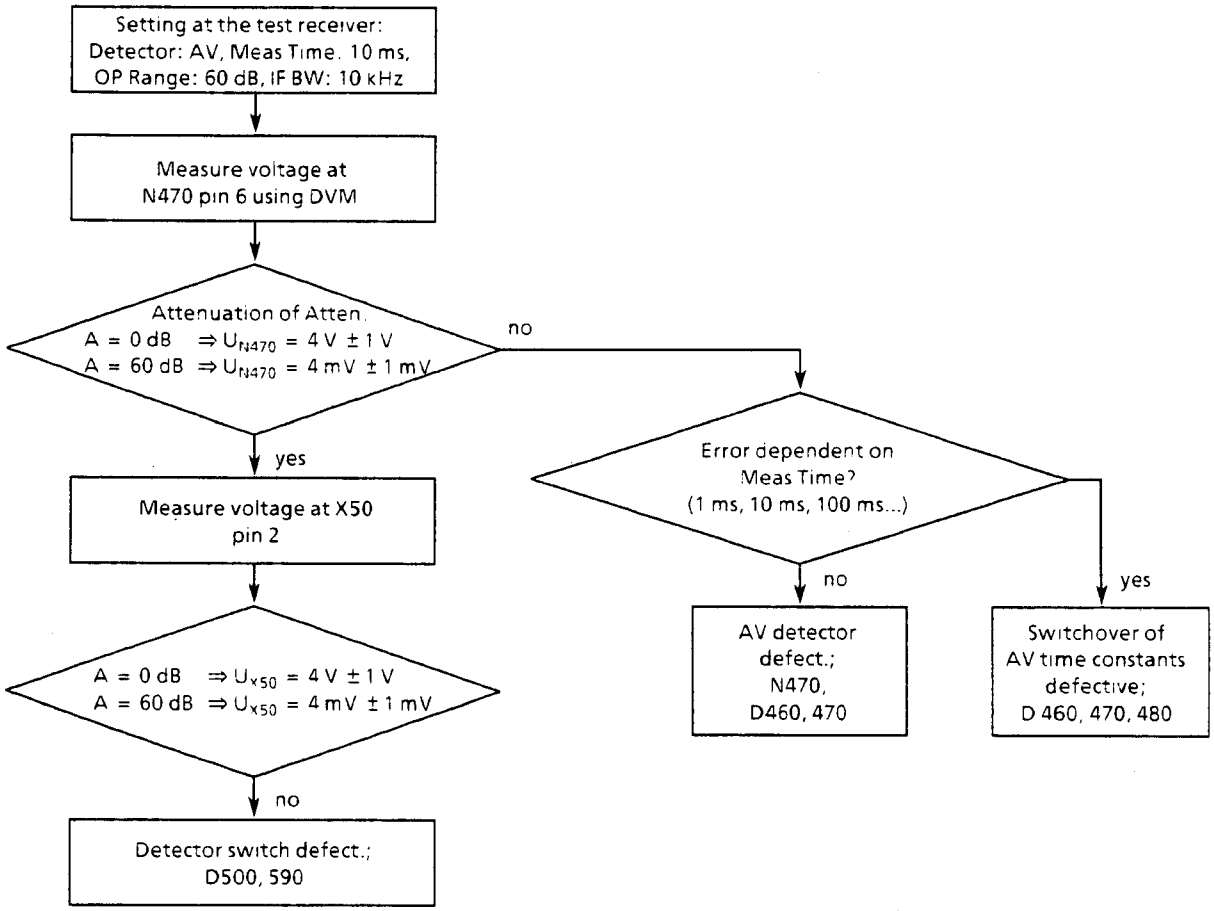
In the following the assumption is made that at least in one kind of weighting the correct level is indicated.

Test setup as described under Section 7.3.1

- Remove jumper X49 and connect the attenuator with X49 pin 2, 3 (ground!) via feed-through termination.

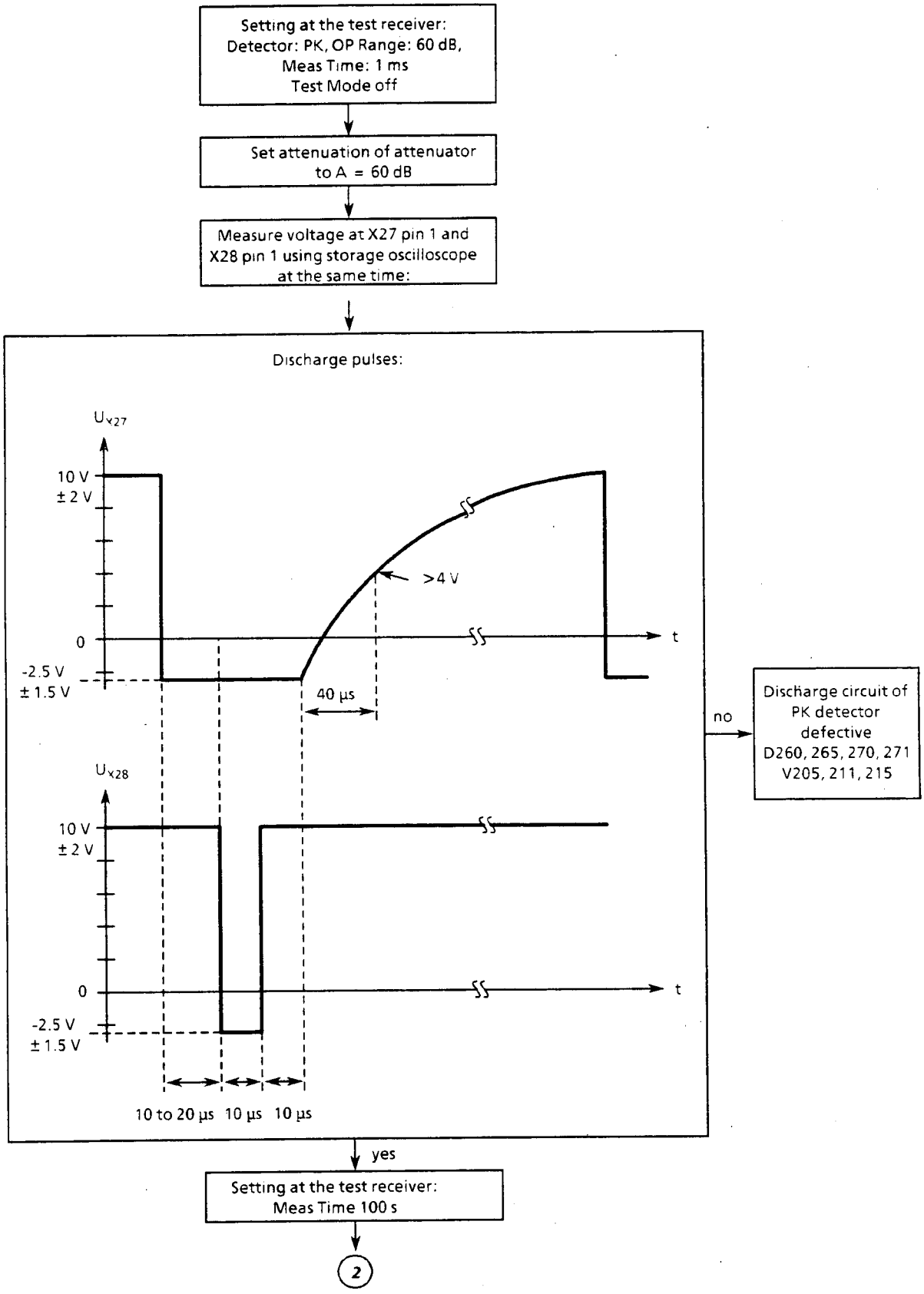
Linearity Error With AV Weighting

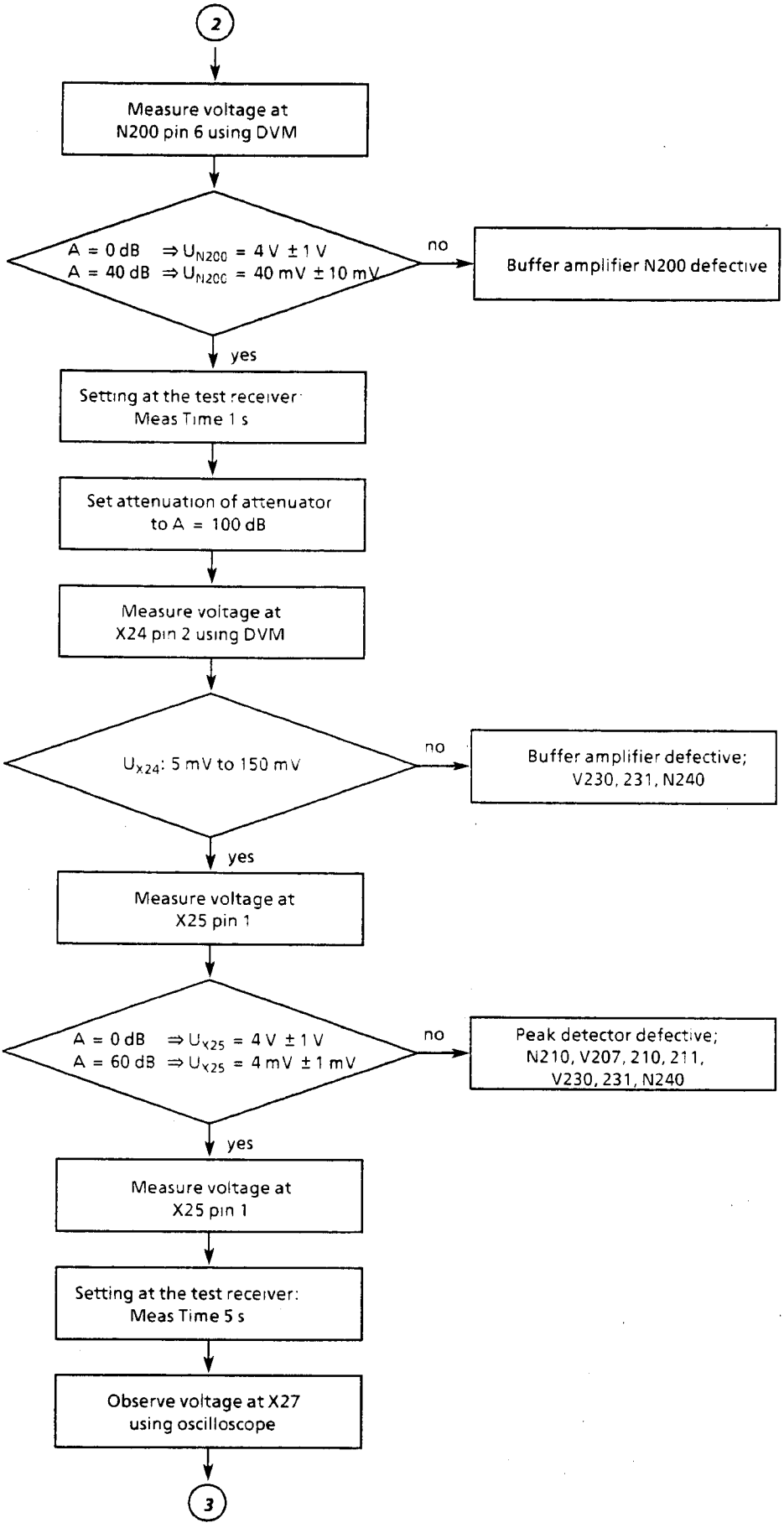
Error message of the board test: Err.: 5, 6, 7, 8, 12

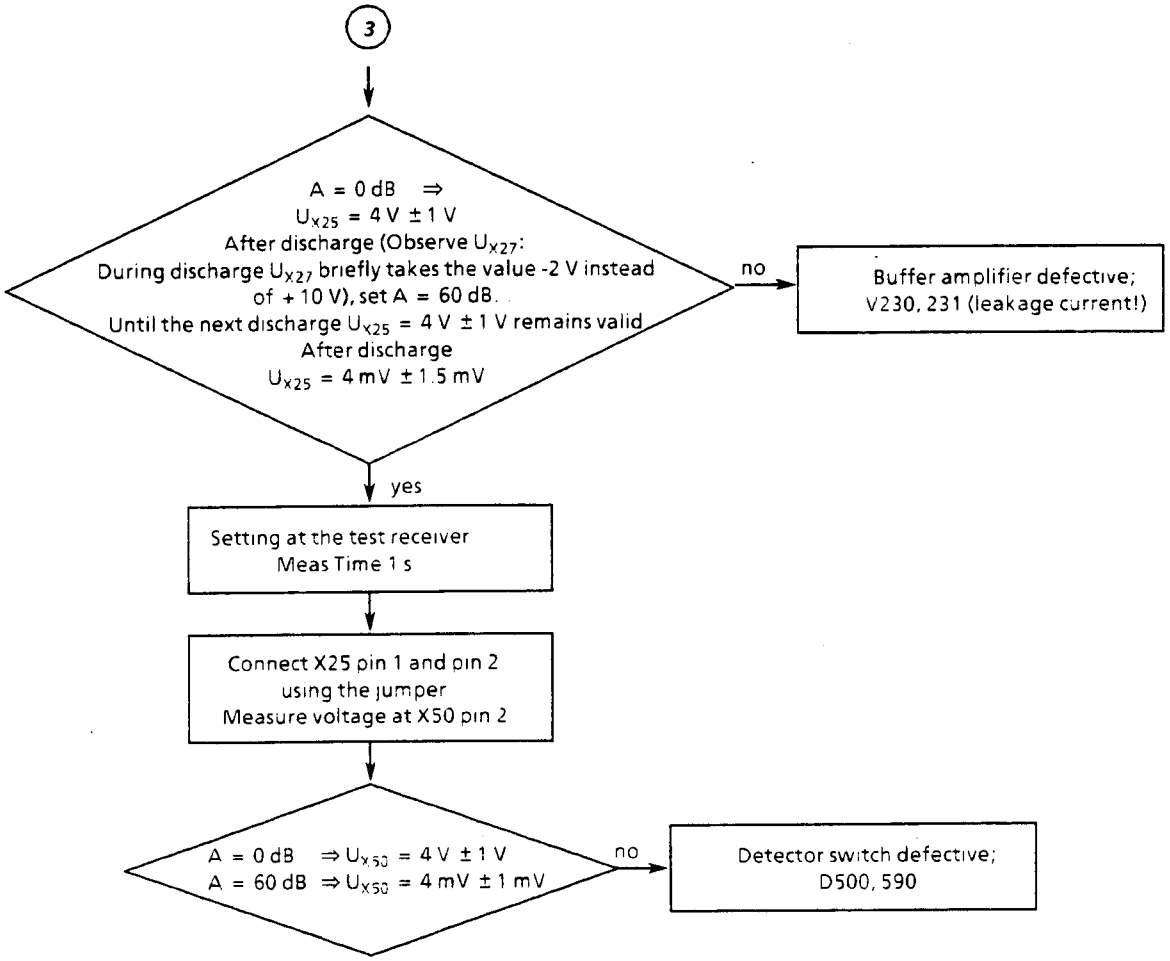


Linearity Error With PK Weighting

Error message of the board test: Err.: 14, 15, 16

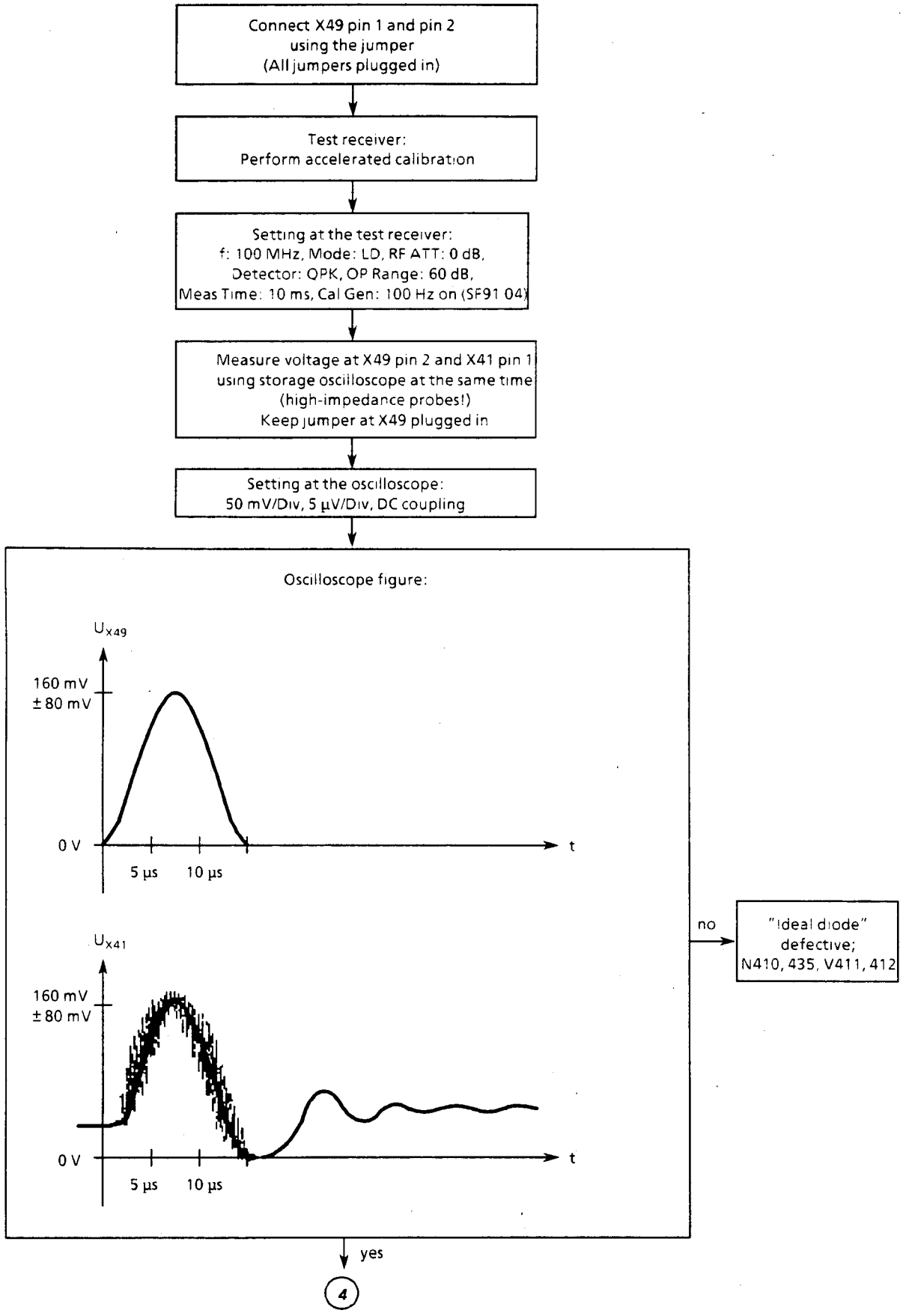


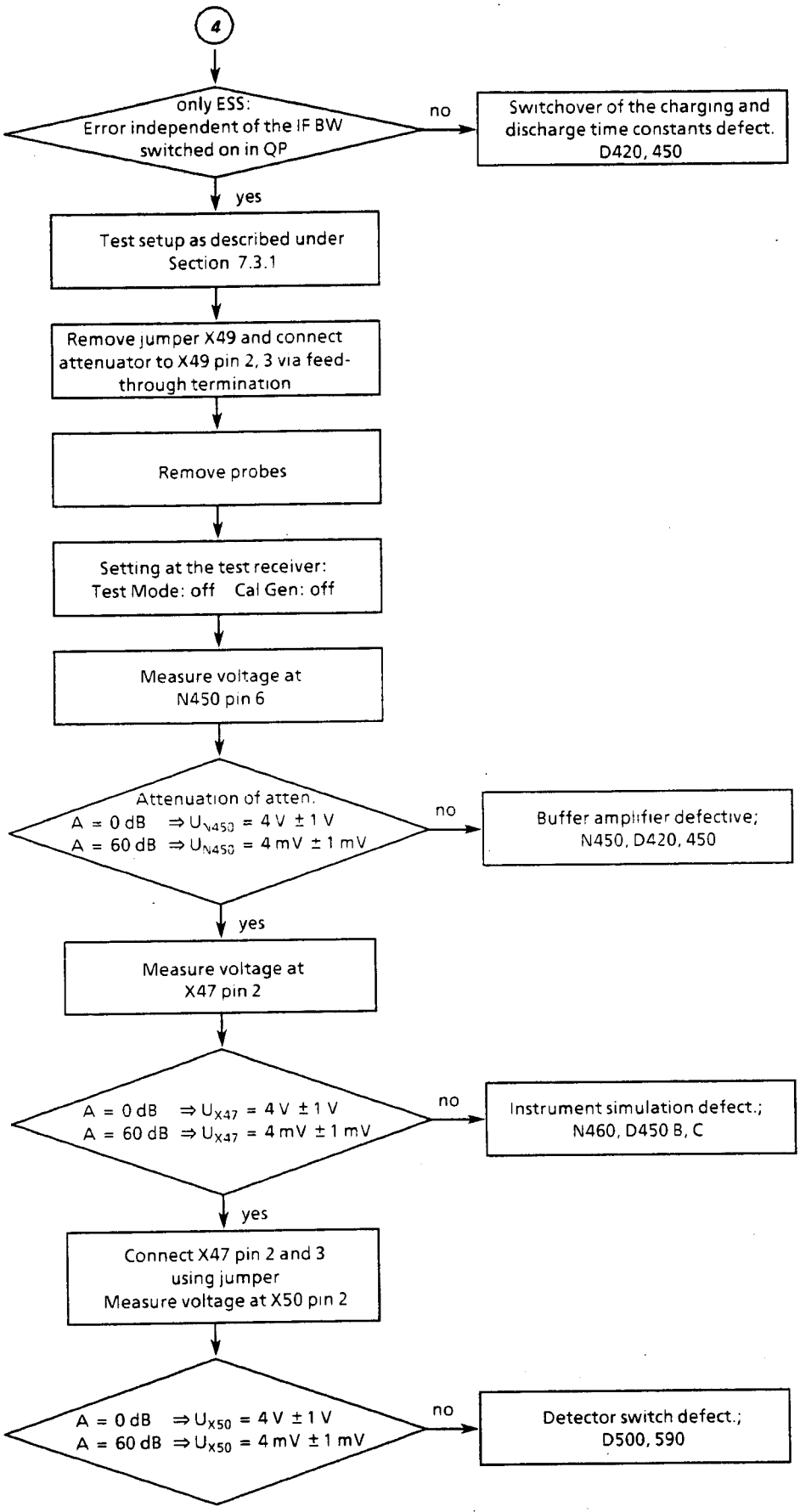

2
Measure voltage at N200 pin 6 using DVM
A = 0 dB ⇒ U_{N200} = 4 V ± 1 V
A = 40 dB ⇒ U_{N200} = 40 mV ± 10 mV
no
Buffer amplifier N200 defective
yes
Setting at the test receiver: Meas Time 1 s
Set attenuation of attenuator to A = 100 dB
Measure voltage at X24 pin 2 using DVM
U_{X24}: 5 mV to 150 mV
no
Buffer amplifier defective; V230, 231, N240
yes
Measure voltage at X25 pin 1
A = 0 dB ⇒ U_{X25} = 4 V ± 1 V
A = 60 dB ⇒ U_{X25} = 4 mV ± 1 mV
no
Peak detector defective; N210, V207, 210, 211, V230, 231, N240
yes
Measure voltage at X25 pin 1
Setting at the test receiver: Meas Time 5 s
Observe voltage at X27 using oscilloscope
3


3
A = 0 dB ⇒
U_{X25} = 4 V ± 1 V
After discharge (Observe U_{X27}:
During discharge U_{X27} briefly takes the value -2 V instead of + 10 V), set A = 60 dB.
Until the next discharge U_{X25} = 4 V ± 1 V remains valid
After discharge
U_{X25} = 4 mV ± 1.5 mV
no
Buffer amplifier defective;
V230, 231 (leakage current!)
yes
Setting at the test receiver
Meas Time 1 s
Connect X25 pin 1 and pin 2
using the jumper
Measure voltage at X50 pin 2
A = 0 dB ⇒ U_{X50} = 4 V ± 1 V
A = 60 dB ⇒ U_{X50} = 4 mV ± 1 mV
no
Detector switch defective;
D500, 590

Linearity Error With QP Weighting

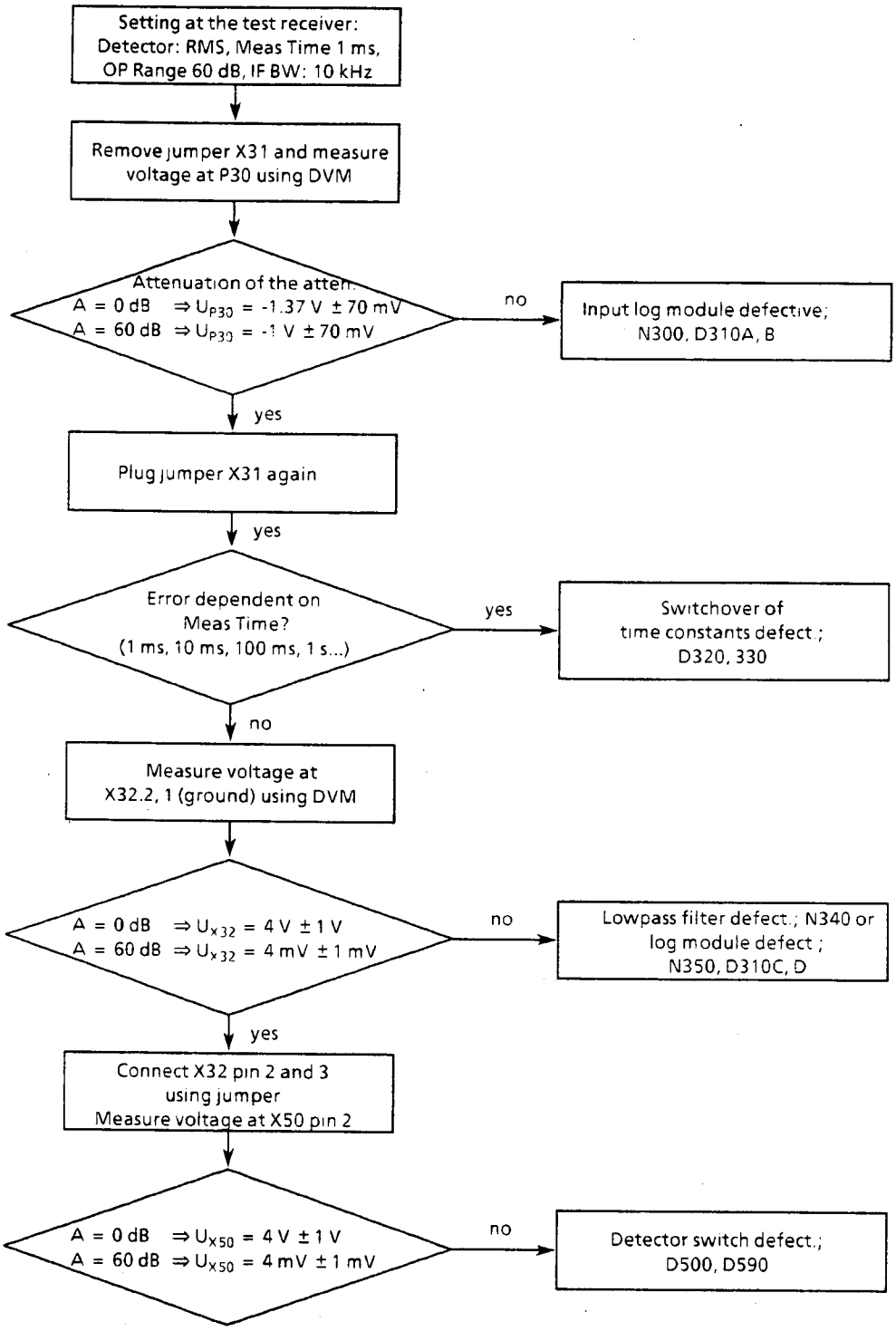
Error message of the board test: Err.: 9, 13




4
only ESS:
Error independent of the IF BW switched on in QP
no
Switchover of the charging and discharge time constants defect.
D420, 450
yes
Test setup as described under Section 7.3.1
Remove jumper X49 and connect attenuator to X49 pin 2, 3 via feed-through termination
Remove probes
Setting at the test receiver:
Test Mode: off Cal Gen: off
Measure voltage at N450 pin 6
Attenuation of atten.
A = 0 dB ⇒ U_N450 = 4 V ± 1 V
A = 60 dB ⇒ U_N450 = 4 mV ± 1 mV
no
Buffer amplifier defective;
N450, D420, 450
yes
Measure voltage at X47 pin 2
A = 0 dB ⇒ U_X47 = 4 V ± 1 V
A = 60 dB ⇒ U_X47 = 4 mV ± 1 mV
no
Instrument simulation defect.;
N460, D450 B, C
yes
Connect X47 pin 2 and 3 using jumper
Measure voltage at X50 pin 2
A = 0 dB ⇒ U_X50 = 4 V ± 1 V
A = 60 dB ⇒ U_X50 = 4 mV ± 1 mV
no
Detector switch defect.;
D500, 590

Linearity Error With RMS Weighting (Only Mod. 03)

Error messages of the board test: Err: 26, 27, 28, 29, 30

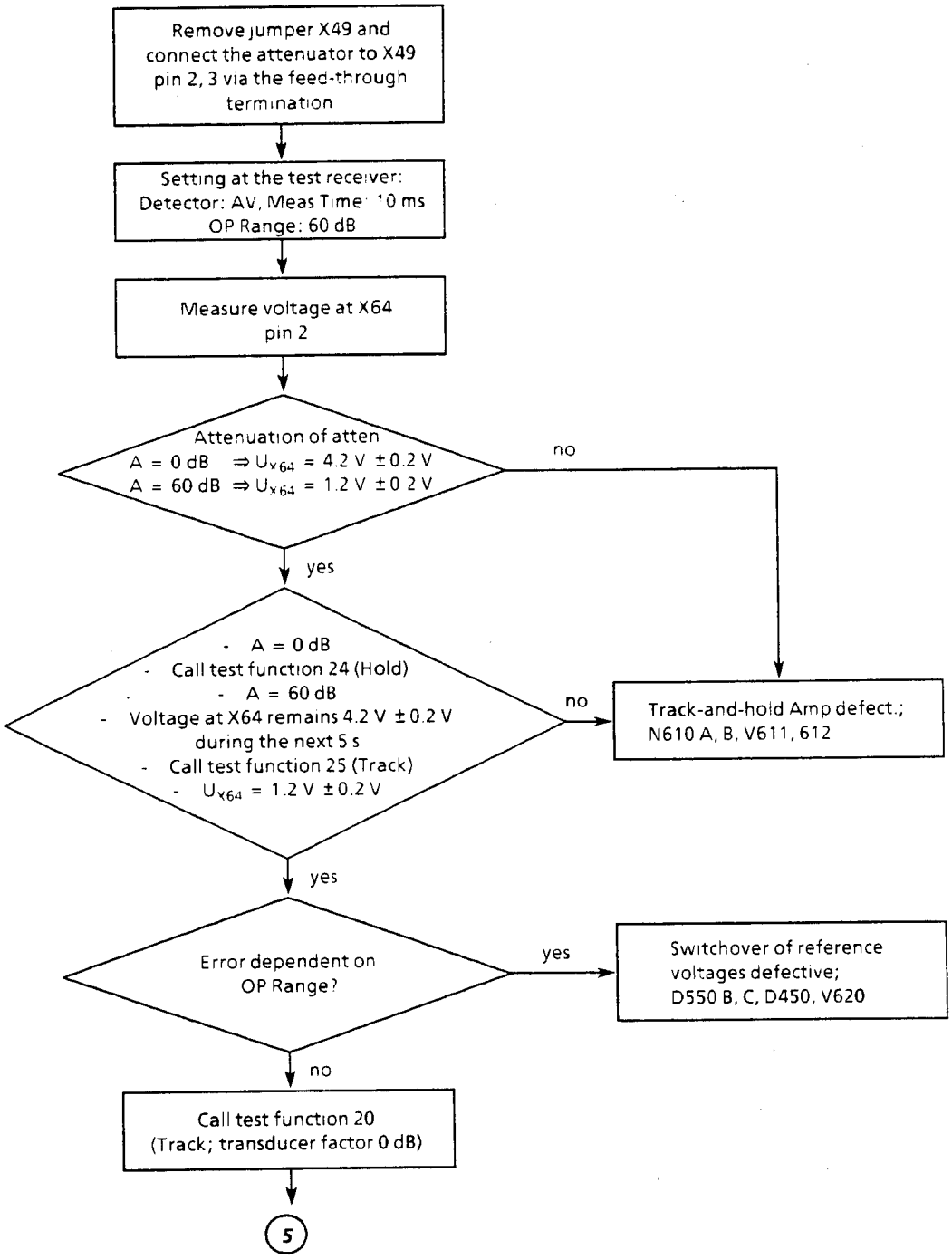


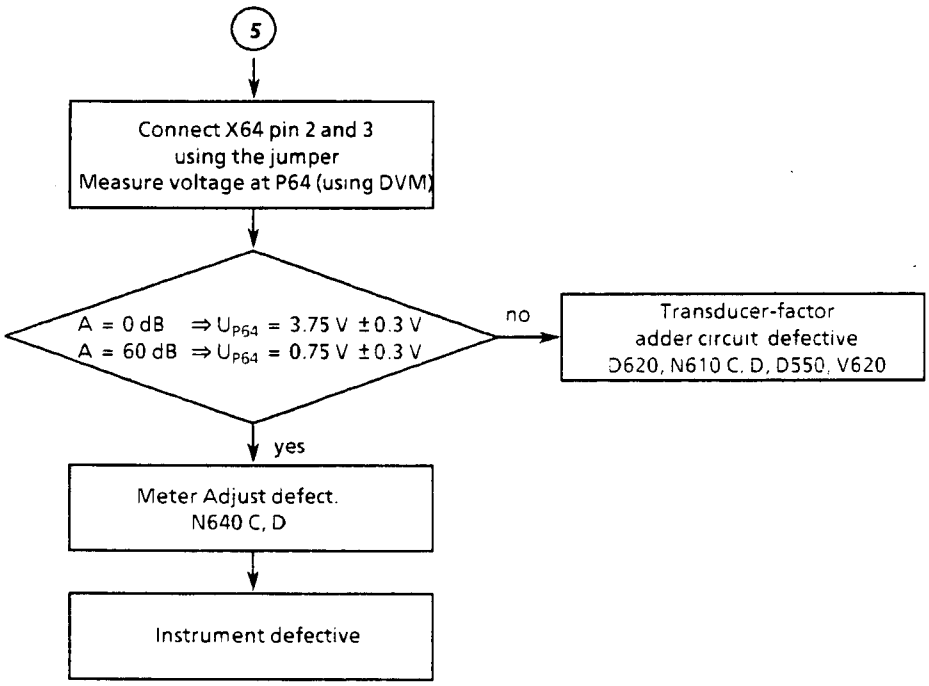
Linearity Errors of the Analog Instrument

In the following the assumption is made that the level at the LEVEL display is indicated correctly.

Error messages of the board test: Err: 20, 21, 22, 23, 24, 25

Test setup as described under Section 7.3.1.

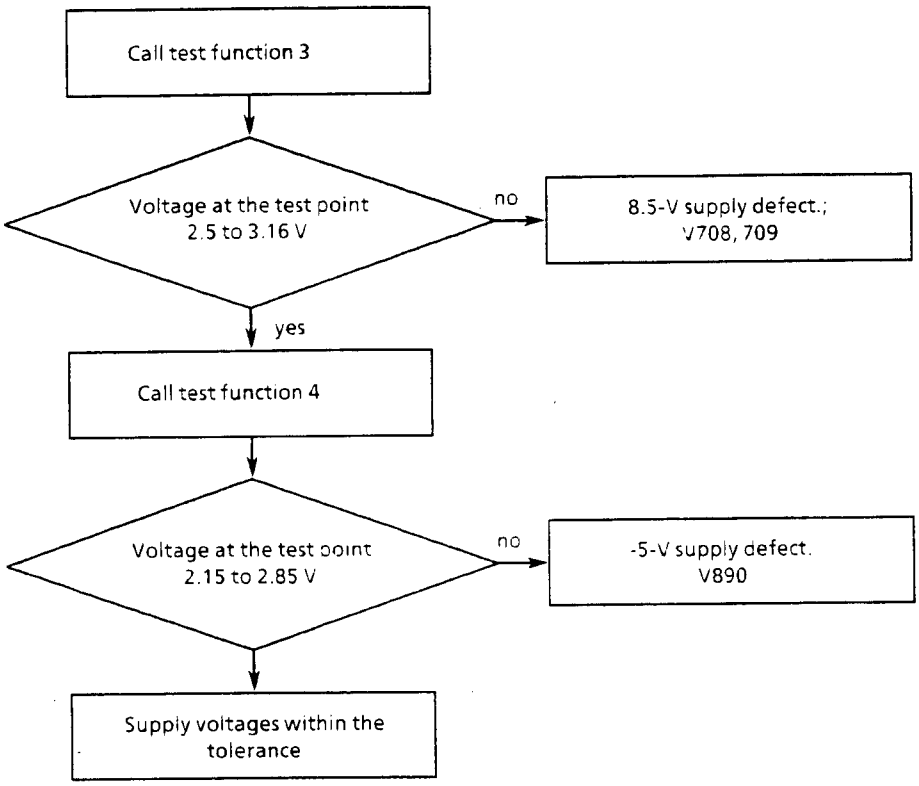



5
Connect X64 pin 2 and 3
using the jumper
Measure voltage at P64 (using DVM)
A = 0 dB ⇒ U_{P64} = 3.75 V ±0.3 V
A = 60 dB ⇒ U_{P64} = 0.75 V ±0.3 V
no
Transducer-factor
adder circuit defective
D620, N610 C, D, D550, V620
yes
Meter Adjust defect.
N640 C, D
Instrument defective

7.3.1.2 Errors of the AF Demodulation Unit

Error messages of the board test: Err: Test function 3, 4

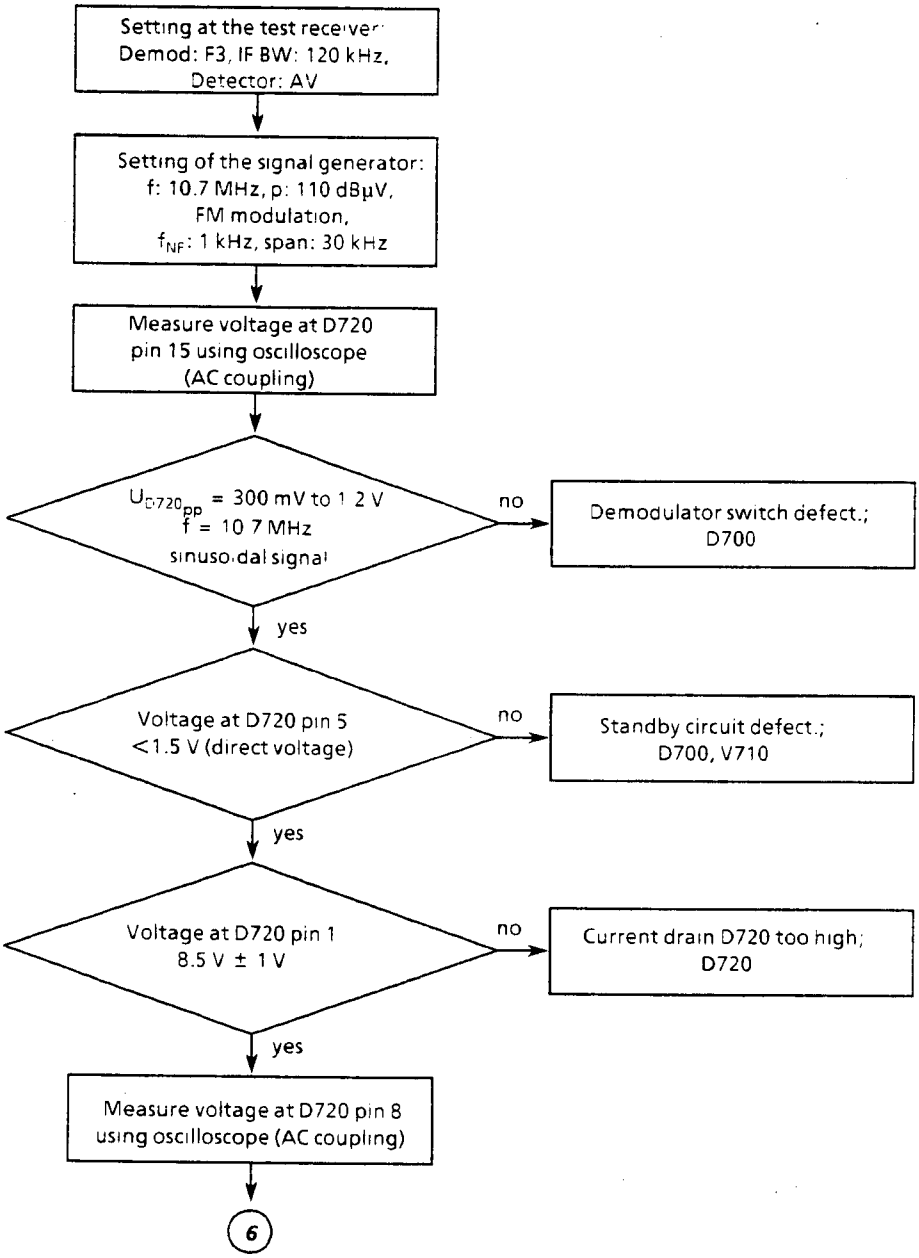
Before troubleshooting the supply voltages should be checked as follows:

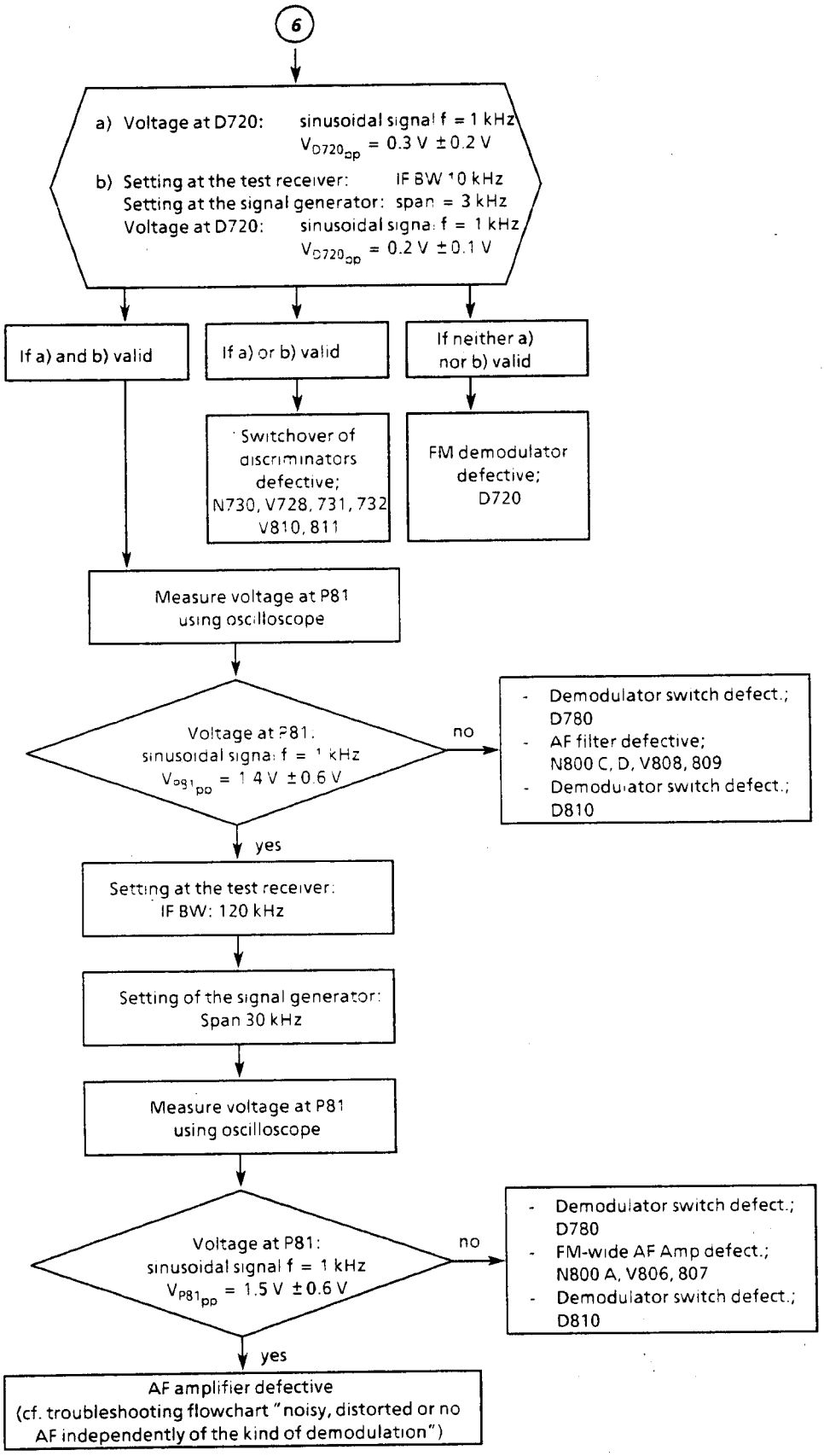


Errors of the AF Demodulation Unit Dependent on the Kind of Demodulation

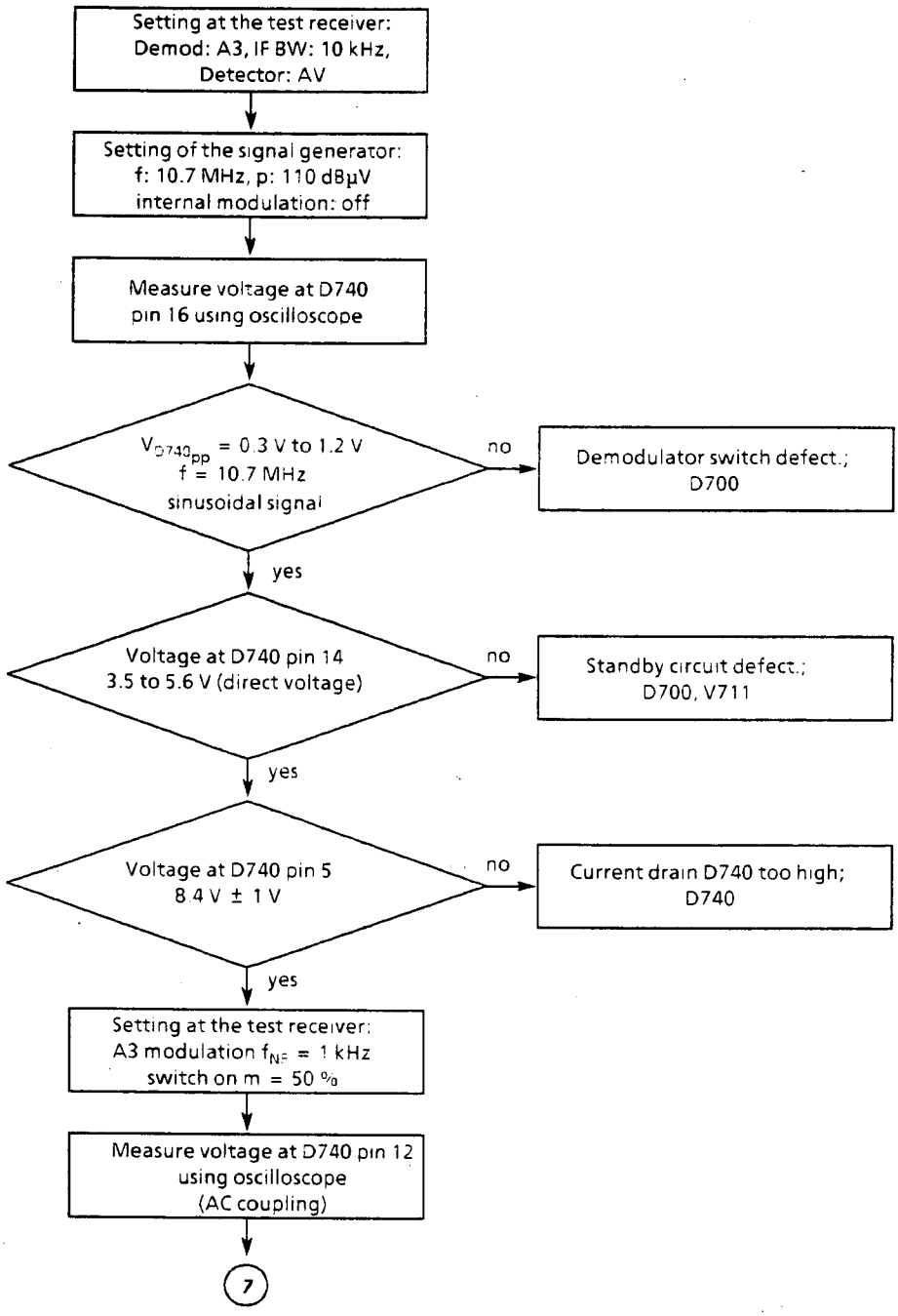
Test setup as described under Section 7.3.1.

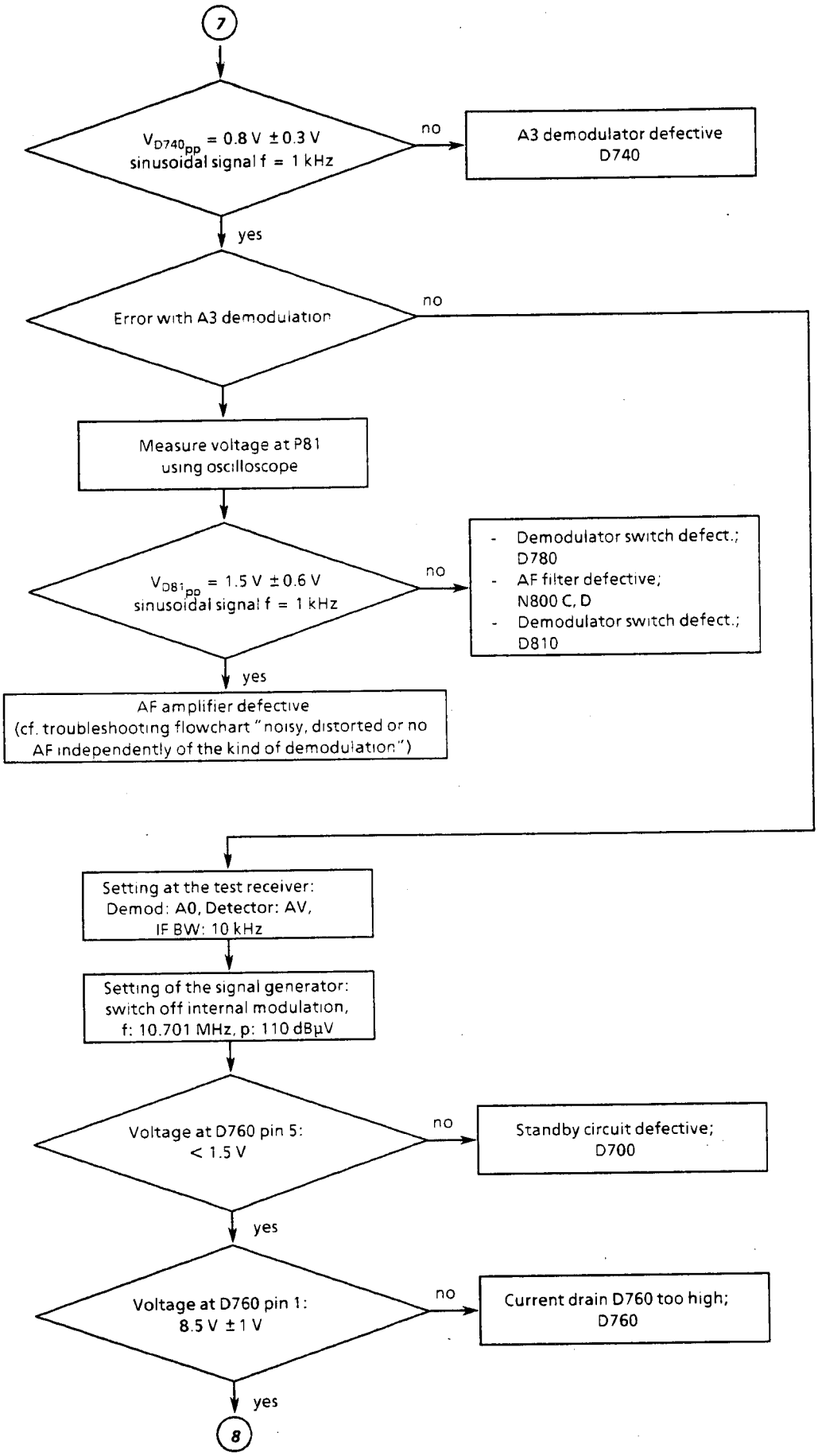
Noisy, distorted or no AF with FM demodulation

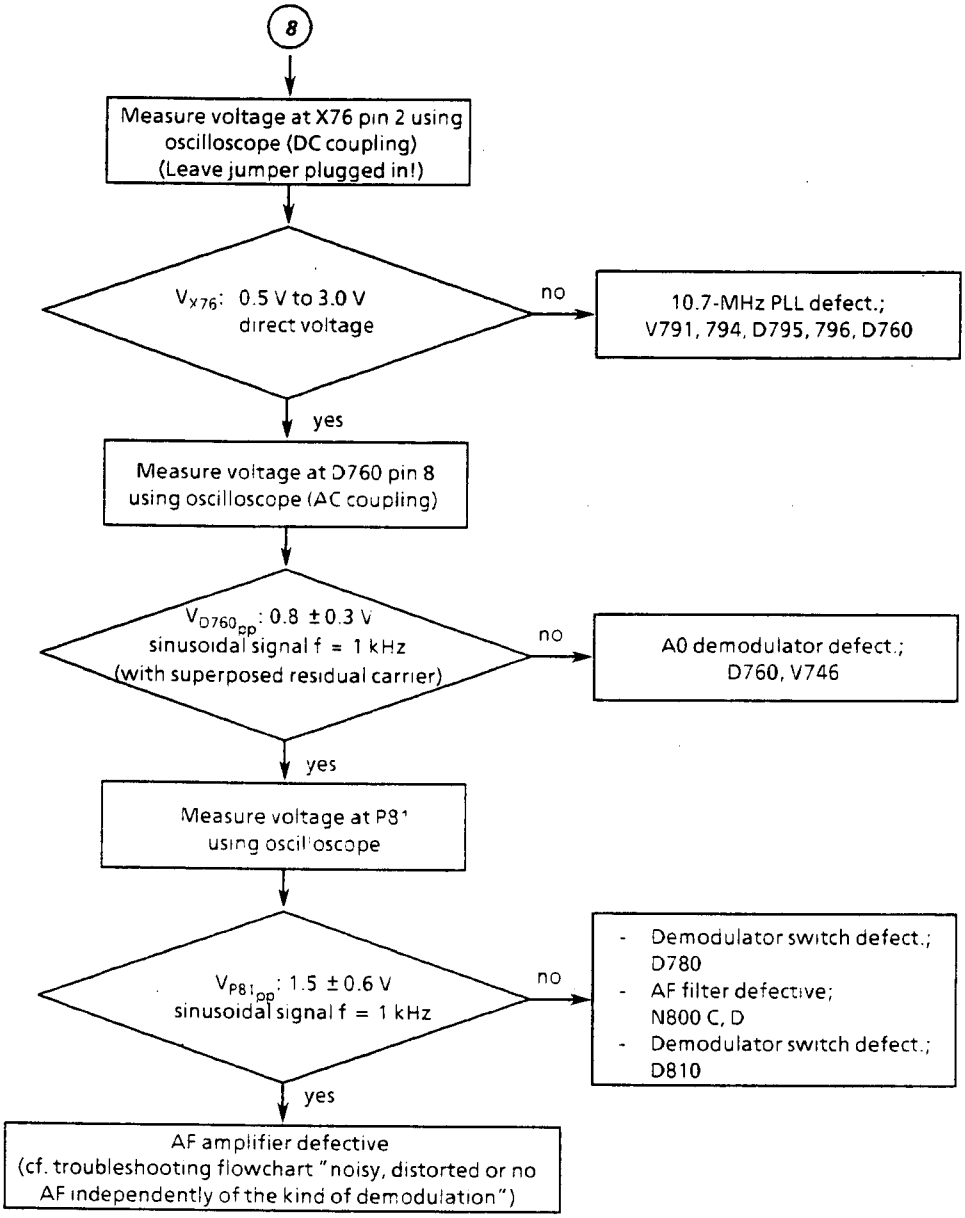



6
a) Voltage at D720: sinusoidal signal f = 1 kHz
$V_{D720_{pp}}$ = 0.3 V ±0.2 V
b) Setting at the test receiver: IF BW 10 kHz
Setting at the signal generator: span = 3 kHz
Voltage at D720: sinusoidal signal f = 1 kHz
$V_{D720_{pp}}$ = 0.2 V ±0.1 V
If a) and b) valid
If a) or b) valid
If neither a) nor b) valid
Switchover of discriminators defective; N730, V728, 731, 732 V810, 811
FM demodulator defective; D720
Measure voltage at P81 using oscilloscope
Voltage at P81: sinusoidal signal f = 1 kHz
$V_{P81_{pp}}$ = 1.4 V ±0.6 V
no
- Demodulator switch defect.; D780
- AF filter defective; N800 C, D, V808, 809
- Demodulator switch defect.; D810
yes
Setting at the test receiver: IF BW: 120 kHz
Setting of the signal generator: Span 30 kHz
Measure voltage at P81 using oscilloscope
Voltage at P81: sinusoidal signal f = 1 kHz
$V_{P81_{pp}}$ = 1.5 V ±0.6 V
no
- Demodulator switch defect.; D780
- FM-wide AF Amp defect.; N800 A, V806, 807
- Demodulator switch defect.; D810
yes
AF amplifier defective (cf. troubleshooting flowchart "noisy, distorted or no AF independently of the kind of demodulation")

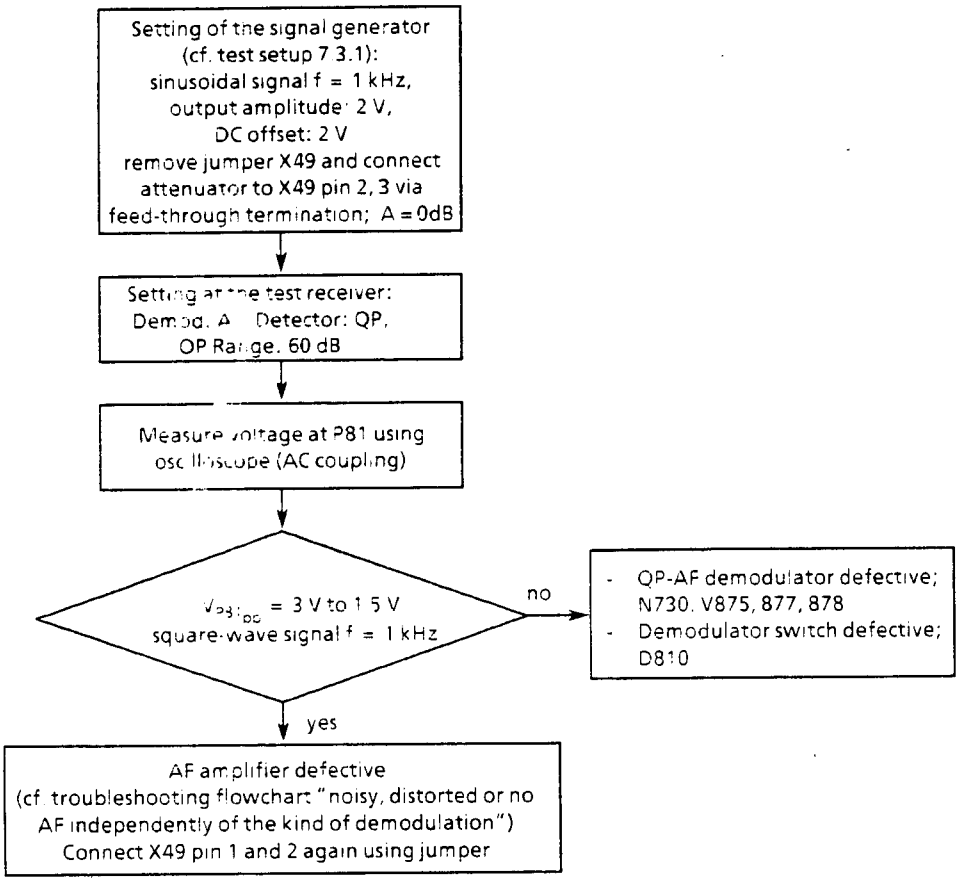
Noisy, distorted or no AF with A0/A3 demodulation




7
$V_{D740_{pp}}$ = 0.8 V ±0.3 V
sinusoidal signal f = 1 kHz
no
A3 demodulator defective
D740
yes
Error with A3 demodulation
no
Measure voltage at P81
using oscilloscope
$V_{D81_{pp}}$ = 1.5 V ±0.6 V
sinusoidal signal f = 1 kHz
no
- Demodulator switch defect.; D780
- AF filter defective; N800 C, D
- Demodulator switch defect.; D810
yes
AF amplifier defective
(cf. troubleshooting flowchart "noisy, distorted or no AF independently of the kind of demodulation")
Setting at the test receiver:
Demod: A0, Detector: AV,
IF BW: 10 kHz
Setting of the signal generator:
switch off internal modulation,
f: 10.701 MHz, p: 110 dBµV
Voltage at D760 pin 5:
< 1.5 V
no
Standby circuit defective;
D700
yes
Voltage at D760 pin 1:
8.5 V ±1 V
no
Current drain D760 too high;
D760
yes
8

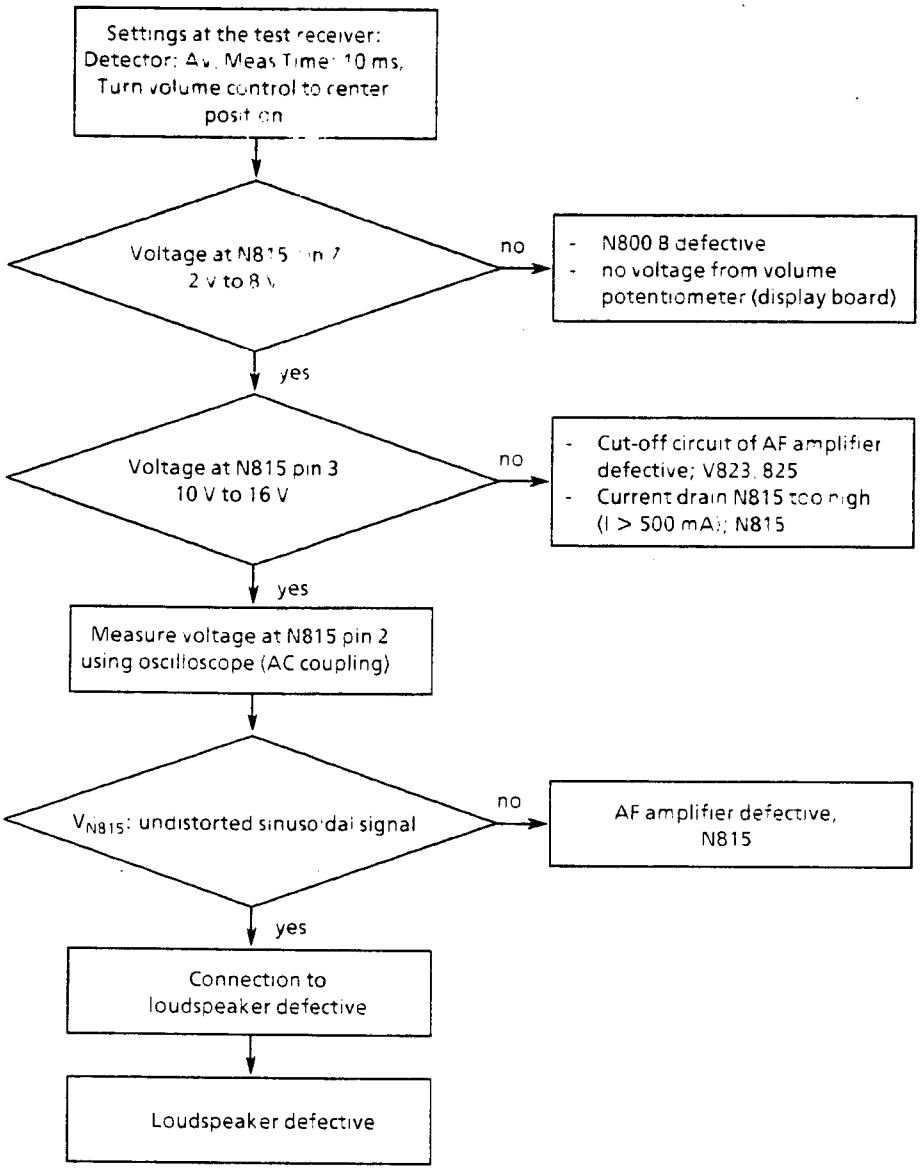

8
Measure voltage at X76 pin 2 using oscilloscope (DC coupling) (Leave jumper plugged in!)
V_{X76}: 0.5 V to 3.0 V direct voltage
no
10.7-MHz PLL defect.; V791, 794, D795, 796, D760
yes
Measure voltage at D760 pin 8 using oscilloscope (AC coupling)
$V_{D760_{pp}}$: 0.8 ±0.3 V sinusoidal signal f = 1 kHz (with superposed residual carrier)
no
A0 demodulator defect.; D760, V746
yes
Measure voltage at P81 using oscilloscope
$V_{P81_{pp}}$: 1.5 ±0.6 V sinusoidal signal f = 1 kHz
no
- Demodulator switch defect.; D780
- AF filter defective; N800 C, D
- Demodulator switch defect.; D810
yes
AF amplifier defective (cf. troubleshooting flowchart "noisy, distorted or no AF independently of the kind of demodulation")

No AF in the QP Kind of Display



Noisy, Distorted or No AF Independently of the Kind of Demodulation

Carry out troubleshooting as with faulty A3 demodulation first (until the message "AF amplifier defective").

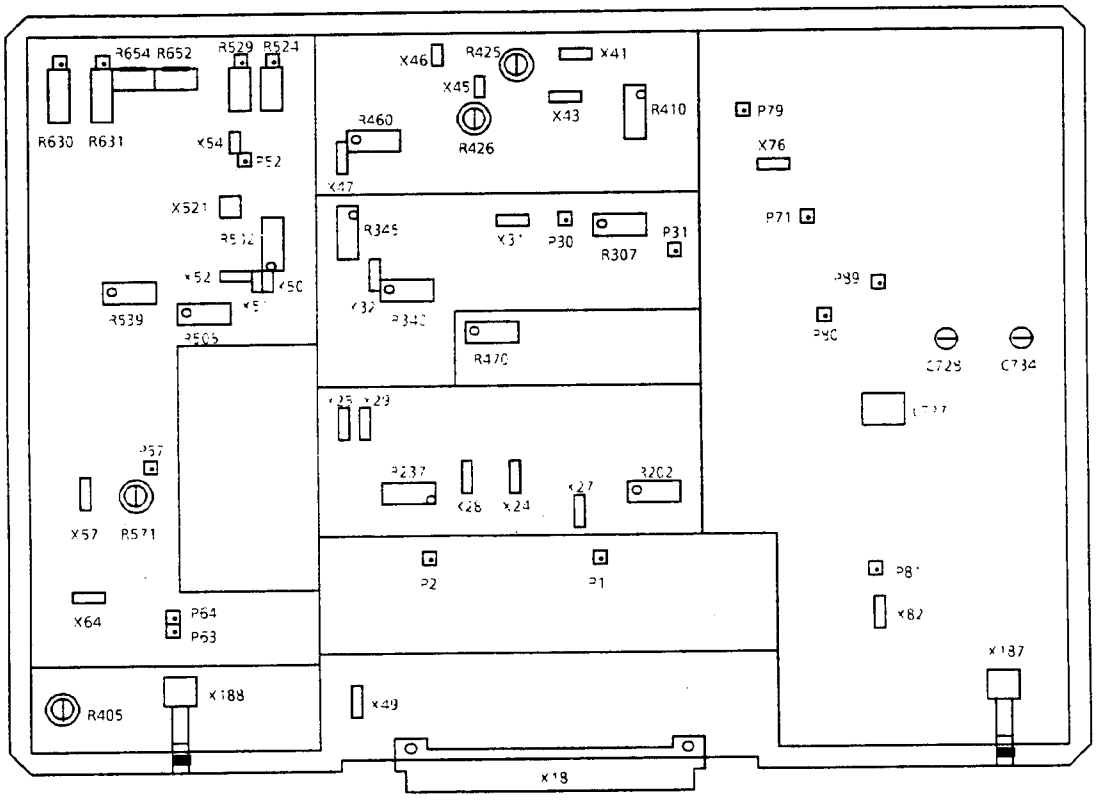


7.4 Testing and Adjustment

Operate the board via the service kit outside the instrument. Screw off the RF cover at the component side.

- Test setup and presetting cf. 7.3.1 Troubleshooting.
- Connect the output of the attenuator to the Detector Board with X49 pin 2 and pin 3 (ground) via a 50-Ω feed-through termination and a shielded cable.

7.4.1 Location of Jumpers, Test Points and Adjustment Elements



7.4.2 Power Supply

The supply voltages have to be measured at the adapter of the board and not at the power supply unit (e.g. + 10 V at X18 AC4).

Testing the supply voltages:

+ 10 V	± 50 mV	max. 250 mA
− 10 V	± 50 mV	max. 250 mA
+ 5.4 V	± 100 mV	max. 30 mA
+ 12 V	-1.2 to + 3 V	max. 200 mA
+ 28 V	± 1 V	max. 4 mA

- Testing the -5-V power supply
  Voltage at P89: ..... - 5 V ± 0.3 V

- Testing the + 8.5-V power supply
  Voltage at P71: ..... 8.5 V ± 0.3 V

7.4.3 Testing and Adjustment of the AF Demodulation Unit

- Settings at the signal generator:

  Form of signal: ..... Sinus
  Frequency: ..... 1 kHz
  Amplitude: ..... 2 V
  Offset: ..... 2 V

7.4.3.1 A3 Demodulator

- Connect oscilloscope to P81
- Setting at the oscilloscope:
  0.2 V/Div, 0.2 ms/Div
- Settings at the signal generator:
  Internal modulation (AM): ..... switch on
  f_{mod}: ..... 1 kHz
  m: ..... 50 %
- Setting at the test receiver:
  Demod: A3
  Detector: ..... AV
  IF BW: ..... 10 kHz
- Signal voltage at the oscilloscope: ..... undistorted sinusoidal signal, V_{P81} = 1.5 V_{ss} ± 0.3 V
- Set level of signal generator to 45 dBµV
- Signal voltage at the oscilloscope: ..... undistorted sinusoidal signal, V_{P81} = 1.5 V_{ss} ± 0.3 V

7.4.3.2 A0 Demodulator

- Setting at the test receiver:
  Demod: A0
- Measure voltage at X76 using oscilloscope (leave jumper plugged in!)
- Setting at the oscilloscope:
  DC coupling, 0.5 V/Div, 2 ms/Div
- Signal voltage at the oscilloscope: ..... direct voltage, V_{P76} = 1.5 V ± 0.7 V
- Connect oscilloscope to P81
- Setting at the oscilloscope:
  0.2 V/Div, 0.2 ms/Div
- Settings at the signal generator:
  Internal modulation: ..... switch off
  Frequency: ..... 10.701 MHz
  Output level: ..... 110 dBµV
- Adjust signal voltage at P81 to maximum using L760
- Signal voltage at the oscilloscope: ..... undistorted sinusoidal signal, V_{P81} = 1.5 V_{ss} ± 0.3 V
- Set level of signal generator to 45 dBµV
- Signal voltage at the oscilloscope: ..... undistorted sinusoidal signal, V_{P81} = 1.5 V_{ss} ± 0.3 V

7.4.3.3 FM Demodulator

- Connect oscilloscope to P81
- Setting at the oscilloscope:
  0.2 V/Div, 0.2 ms/Div
- Settings at the signal generator:
  Frequency: ..... 10.7 MHz
  Internal modulation: ..... FM
  Frequency span: ..... 3 kHz
  f_{mod}: ..... 1 kHz
  Output level: ..... 110 dBµV
- Setting at the test receiver:
  Demod: F3
  IF BW: ..... 10 kHz
- Set signal voltage at P81 to maximum by alternately adjusting C728 and C734
- Signal voltage at the oscilloscope: ..... undistorted sinusoidal signal, V_{P81} = 1.4 V_{ss} ± 0.3 V
- Set level of signal generator to 45 dBµV
- Signal voltage at the oscilloscope: ..... undistorted sinusoidal signal, V_{P81} = 1.4 V_{ss} ± 0.3 V
- Setting at the test receiver:
  IF BW: ..... 120 kHz
- Settings at the signal generator:
  Frequency span: ..... 30 kHz
  Output level: ..... 110 dBµV
- Adjust signal voltage at P81 to maximum using L727 and at the same time adjust signal form to a sinusoidal signal as undistorted as possible.

- Signal voltage at the oscilloscope: ..... sinusoidal signal, V_{P81} = 1.5 V_{ss} ± 0.3 V
- Set level of signal generator to 45 dBµV
- Signal voltage at the oscilloscope: ..... sinusoidal signal, V_{P81} = 1.5 V_{ss} ± 0.3 V
- Set level of signal generator to 110 dBµV.

7.4.3.4 AF Amplifier and Cut-Off Circuit of the AF Amplifier

- Settings of the test receiver and signal generator like Section 7.4.3.3
- Connect oscilloscope to X18C20
- Settings at the oscilloscope:
  0.5 V/Div, 0.5 ms/Div
- Set signal voltage at the oscilloscope to 2 V_{ss} using volume control
  Figure on the oscilloscope screen: ..... sinusoidal signal f = 1 kHz
- Setting at the test receiver:
  Demod: ..... off
- voltage at X18C20: ..... 0 V ± 0.1 V

7.4.3.5 Beeper

- Special Function 13; Beeper on
- Setting of the signal generator:
  Internal FM modulation ..... switch off
- Setting at the test receiver
  Demod: ..... FM
  Test Mode: ..... off
- Connect pin LOCK A160A11 at the motherboard to ground for at least 3 s.
- A short beep is to be heard.

7.4.3.6 QP-AF Demodulator

- Connect oscilloscope to P81
- Setting at the oscilloscope:
  0.5 V/Div, 0.2 ms/Div, AC coupling
- Setting at the test receiver:
  Demod: A3
  Detector: ..... QP
- Set attenuator to an attenuation of 0 dB.
- Signal voltage at the oscilloscope: ..... distorted, square-wave signal, V_{P81} = 3 V ± 1 V

7.4.4 Testing and Adjustment of the Display Unit

The adjustment of the display unit has to be performed briskly and without breaks.

- Test setup and presettings as described under 7.4.
- Setting at the test receiver:
  Demod: ..... off

7.4.4.1 Video Switch (Only Mod. 03)

- Measure voltage at X49.1 using DVM (leave jumper plugged in).
- Call board test Detector Board
- Call test function 1
- Voltage at X49: ..... 4 V ± 0.5 V
- Settings at the test receiver:
  Test Mode: ..... off

only ESS:

- Open line X18A15 of the service adapter to the test receiver
- Connect X18A15 of the Detector Board to + 5 V (X18AC2)
- Setting at the ESS:
  Frequency: ..... 1 kHz
- Voltage at X49: ..... + 5.4 V ± 0.5 V
- Through-connect line X18A15 of the adapter again

7.4.4.2 Overload Detector

- Set attenuator to an attenuation of 0 dB.
- The Overload indication in the LEVEL display is not illuminated
- Remove the 50-Ω feed-through termination at the output of the attenuator from the test setup and connect the signal generator with X49 directly ($V_{X49} > 6.5$ V).
- The Overload indication on the LEVEL display is illuminated
- Insert feed-through termination again.

7.4.4.3 Video Amplifier

- Set attenuator to 0 dB
- Connect digital voltmeter to X183 via shielded cable
- Voltage at X183: ..... 4 V ± 200 mV
- Store voltage value
- Switch digital voltmeter to relative level measurement
- Set attenuator to an attenuation of 60 dB
- Set relative level to -60 dB ± 0.05 dB using R405
- Set attenuator to an attenuation of 50 dB
- Relative level at X183: ..... - 50 dB ± 0.2 dB
  (if the level is without the tolerance with an attenuation of 50 dB, potentiometer R405 is not in center position and hence the offset setting range of N400 is exceeded.)

7.4.4.4 Average Detector

- Remove jumper X50,X51.
- Connect digital voltmeter to X50 pin1 (ground), pin2 via shielded cable
- Set BOARD TEST DETECTOR BOARD
- Enter test function 5
- Set attenuator to an attenuation of 0 dB
- Voltage at X50: ..... 4 V ± 200 mV
- Switch DVM to relative level measurement
  relative level: ..... 0 dB ± 0.1 dB
- Enter test functions 6, 7, 8 successively and measure the level after the display value has steadied
  relative level: ..... 0 dB ± 0.1 dB
- Set attenuator to an attenuation of 60 dB
- Enter test function 5
- Adjust relative level to -60 dB ± 0.02 dB (setting accuracy) using R470
- Enter test functions 6, 7, 8 successively and measure the level after the display value has steadied
  relative level at X50: ..... -60 dB ± 0.1 dB

7.4.4.5 Quasi-Peak Detector

- Remove jumpers at X43 and X45
- Measure resistance between X43 pin2 and X45 pin1 using digital multimeter
- Enter test function 9
- Adjust resistor to 1020 Ω ± 5 Ω using R425

only ESS:

- Setting at the ESS:
  Frequency: ..... 1 MHz
  Detector: ..... QP
- Adjust resistor to 1470 Ω ± 5 Ω using R426
- Setting at the ESS:
  Frequency: ..... 100 kHz
- Resistance is ..... 72.4 kΩ ± 1 kΩ
- Setting at the test receiver:
  Frequency: ..... 100 MHz

- Connect X43 pin 1/2 and X45 pin 1/2 using the jumpers again
- Connect X46 pin 1/2 using a jumper
- Connect digital voltmeter to X50 pin1 (ground) and pin 2 via shielded cable
- Adjust voltage at X50 to 0 V ± 20 µV using R460
  (Wait until the display value has steadied >5 s)
- Remove jumper at X46 again
- Enter test function 9
- Set attenuator to an attenuation of 0 dB
- Voltage at X50: ..... 4 V ± 200 mV
- Store measured value
- Switch DVM to relative level measurement
- Set attenuator to an attenuation of 60 dB
- After the display value has steadied, adjust relative level to -60 dB ± 0.02 dB (setting accuracy) using R410

Testing the linearity of the QP DETECTOR according to the following table (Wait until the display value has steadied):

Attenuation of the attenuator	rel. level at X50
0 dB	0 dB ± 0.2 dB
10 dB	-10 dB ± 0.2 dB
20 dB	-20 dB ± 0.2 dB
30 dB	-30 dB ± 0.2 dB
40 dB	-40 dB ± 0.2 dB
50 dB	-50 dB ± 0.2 dB
60 dB	-60 dB ± 0.2 dB

only ESS:

- Setting at the ESS:
  Frequency: ..... 1 MHz
- Set attenuator to an attenuation of 60 dB
- Relative level at X50 ..... -60 dB ± 0.4 dB
  (Wait until the display value has steadied t > 5 s)
- Setting at the ESS:
  Frequency: ..... 100 kHz
- Relative level at X50 ..... -60 dB ± 0.4 dB
  (Wait until the display value has steadied t > 5 s)
- Set attenuator to an attenuation of 0 dB
- Relative level at X50 ..... 0 dB ± 0.3 dB
  (Wait until the display value has steadied t > 5 s)
- Setting at the ESS:
  Frequency: ..... 1 MHz
- Relative level at X50 ..... 0 dB ± 0.3 dB
  (Wait until the display value has steadied t > 5 s)
- Setting at the ESS:
  Frequency: ..... 100 MHz

7.4.4.6 Peak Detector

- Set attenuator to an attenuation of 100 dB
- Settings at the test receiver:
  Test Mode: ..... off
  Detector: ..... PK
  Meas Time: ..... 1 s
  OP Range: ..... 60 dB
- Rotate R237 anti-clockwise as far as possible
- Measure voltage at X24 pin 2 using digital voltmeter and set to 35 mV ± 5 mV using R237
- Setting at the test receiver:
  Meas Time: ..... 0.5 s
- Set measurement rate of digital voltmeter to < 100 ms
- Connect digital voltmeter to X50 pin1 (ground) and pin 2 via shielded cable
- Set attenuator to an attenuation of 0 dB
- Voltage at X50: ..... 4 V ± 200 mV
- Store measured value and switch digital voltmeter to relative level measurement
- Set attenuator to an attenuation of 60 dB
- Set relative level at X50 to - 60 dB ± 0.1 dB (setting accuracy) using R202
- Setting at the test receiver:
  Meas Time: ..... 5 s
- Observe voltage at X28 pin1 using oscilloscope (during discharge V_{X28} takes the value of - 2 V instead of 10 V for approx. 10 ms)
- Directly after discharge (observe V_{X28}) the attenuator is to be set to an attenuation of 70 dB.
- During the 5 seconds until the next discharge the voltage at X50 is: ..... -60 dB ± 0.5 dB

Testing the linearity of the PK detector:

- Setting at the test receiver:
  Meas Time: ..... 0.5 s

(after changing the attenuation, wait 1 s).

Attenuation of the attenuator	rel. level at X50
0 dB	0 dB ± 0.2 dB
10 dB	-10 dB ± 0.2 dB
20 dB	-20 dB ± 0.2 dB
30 dB	-30 dB ± 0.2 dB
40 dB	-40 dB ± 0.2 dB
50 dB	-50 dB ± 0.2 dB
60 dB	-60 dB ± 0.2 dB

- Switch digital voltmeter back to normal measurement rate

7.4.4.7 RMS Detector (only Mod. 03)

- Set attenuator to an attenuation of 100 dB
- Connect oscilloscope to P30
- Setting at the oscilloscope: ..... 0.1 V/Div, 1 ms/Div, DC coupling
- Set board test Detector Board
- Enter test function 26
- Set R307 such that the voltage at P30 is still negative.
- Set attenuator to an attenuation of 10 dB
- Enter test function 5
- Connect digital voltmeter to X50 pin 1 (ground) and pin 2 via shielded cable
- Voltage at X50: ..... 1.26 V ± 50 mV
- Switch DVM to relative level measurement
  Relative level: ..... 0 dB ± 0.1 dB
- Enter test function 26
- Adjust relative level to 0 dB ± 0.05 dB (setting accuracy) using R345
- Set attenuator to an attenuation of 60 dB
- Adjust relative level at X50 to -50 dB ± 0.05 dB (setting accuracy) using R340
- Enter test functions 27, 28, 29 successively and measure level after the display value has steadied
  Relative level at X50: ..... -50 dB ± 0.2 dB
- Set attenuator to an attenuation of 10 dB
- Enter test functions 27, 28, 29 successively and measure level after the display value has steadied
  Relative level at X50: ..... 0 dB ± 0.1 dB
- Enter test function 26

- Testing the linearity of the RMS detector according to the following table:

Attenuation of the attenuator	rel. level at X50
0 dB	10 dB ± 0.5 dB
10 dB	0 dB ± 0.3 dB
20 dB	-10 dB ± 0.3 dB
30 dB	-20 dB ± 0.3 dB
40 dB	-30 dB ± 0.3 dB
50 dB	-40 dB ± 0.3 dB
60 dB	-50 dB ± 0.3 dB

- Connect X50 pin 2 and X51 pin 2 again using the jumper

7.4.4.8 0/20-dB Amplifier

- Enter test function 5
- Set the attenuator to an attenuation of 0 dB
- Remove jumper at X52
- Connect digital voltmeter to X52 pin 1 (ground) and pin 2 via shielded cable and measure voltage
  Voltage at X52: ..... 4 V ± 200 mV
- Store measured value and switch digital voltmeter to relative level measurement
- Set attenuator to an attenuation of 60 dB
- Adjust relative level to -60 dB ± 0.02 dB (setting accuracy) using R505
- Setting at the test receiver:
  OP Range: ..... 30 dB
- Relative level at X52 ..... -40 dB ± 0.5 dB
- Connect X52 pin2 and pin3 by means of jumper again

7.4.4.9 Log Amplifier

- Enter test function 5
- Remove jumpers at X54 and X52
- Connect X521 pin1 and pin2 and X52 pin3 and pin4 by means of jumpers
- Connect digital voltmeter to P52, measure and adjust to 0 V ± 10 µV (setting accuracy) using R532
- Remove jumpers at X521 and X52
- Connect X54 pin1 and Pin2 and X52 pin2 and pin3 by means of jumpers again
- Connect digital voltmeter to X57 pin2 and measure voltage
- Set attenuator to an attenuation of 40 dB
- Set voltage at X57 to 2.2 V ± 10 mV using R524

Repeat the following adjustment until the voltages are set to an accuracy of ± 1 mV:

- Set attenuator to an attenuation of 0 dB
- Set voltage at X57 to 4.213 V using R529
- Set attenuator to an attenuation of 60 dB
- Set voltage at X57 to 1.204 V using R524
- Setting at the test receiver:
  OP Range: ..... 30 dB
- Set the attenuator to an attenuation of 30 dB
- Set voltage at X57 to 4.2 V ± 2 mV using R539
- Setting at the test receiver:
  OP Range: ..... 60 dB
- Testing the linearity of the LOG. AMP. according to the following table

Attenuation of the attenuator	Voltage at X57
0 dB	4.213 V ± 25 mV
10 dB	3.69 V ± 25 mV
20 dB	3.185 V ± 25 mV
30 dB	2.685 V ± 25 mV
40 dB	2.185 V ± 25 mV
50 dB	1.69 V ± 25 mV
60 dB	1.205 V ± 25 mV

- Setting at the test receiver:
  OP Range: ..... 30 dB
- Testing the linearity of the LOG. AMP. in the 30-dB measuring range according to the following table:

Attenuation of the attenuator	Voltage at X57
30 dB	4.2 V ± 50 mV
40 dB	3.19 V ± 50 mV
50 dB	2.19 V ± 50 mV
60 dB	1.2 V ± 50 mV

- Connect X57 pin2 and pin3 using jumper

7.4.4.10 Shift AMP

- Enter test function 5
- Set the attenuator to an attenuation of 0 dB
- Measure voltage at P57 using digital voltmeter and adjust to 4.654 V ± 1 mV (setting accuracy) using R571

7.4.4.11 Track-And-Hold Circuit

- Remove jumper at X64
- Set attenuator to an attenuation of 0 dB
- Enter test function 20 (Track)
- Connect digital voltmeter to X64 pin2
  Voltage at X64 ..... 4.2 V ± 100 mV
- Enter test function 24 (Hold)
- Set attenuator to an attenuation of 60 dB
- Voltage at X64 remains, during the next 10 s, at ..... 4.2 V ± 0.2 V
- Enter test function 25 (Track)
- Voltage at X64 ..... 1.2 V ± 0.1 V
- Connect X64 pin2 and pin3

7.4.4.12 Control Circuit for the Analog Instrument

- Enter test function 25 (Track, 0-dB transducer factor)
- Set attenuator to an attenuation of 0 dB
- Connect digital voltmeter to P64
- Measure voltage at P64 and, using R631, set to ..... 3.75 V ± 10 mV
- Set attenuator to an attenuation of 30 dB
- Setting at the test receiver:
  OP Range: ..... 30 dB
- Set voltage at P64 to 3.75 V ± 10 mV using R630
- Enter test function 22 (-5-dB transducer factor)
- Voltage at P64 ..... 3.25 V ± 30 mV
- Enter test function 23 (OP Range 60 dB, -5-dB transducer factor)
- Set the attenuator to an attenuation of 0 dB
- Voltage at P64 ..... 3.5 V ± 30 mV

7.4.4.13 Testing the Recorder Outputs

- Enter test function 25 (0-dB transducer factor, Track)
- Set the attenuator to an attenuation of 0 dB
- Voltage at X18A18 ..... 3.75 V ± 200 mV
- Voltage at X18C18 ..... 3.75 V ± 200 mV

7.4.4.14 Testing the Test Voltages

- Connect X49 pin 1 and 2 using a jumper
- Plug the Detector Board onto the service kit
- Connect X187 to X177 of the IF Selection Board
- Connect digital voltmeter to X18A9
- Enter the test functions indicated in the table successively and check the respective voltage values at the test points:

Test function	Voltage at X18A9
2	> 100 mV
3	2.5 V to 3.16
4	2.15 V to 2.85
1	2.0 V ± 50 mV
5	1.8 V to 2.2 V
11	2.04 V to 2.16 V
10	1.82 V to 2.02 V
20	1.72 V to 2.03 V

7.4.4.15 Instrument Driver and Analog Instrument

The instrument driver has to be adjusted especially to the respective analog instrument. The adjustment in the receiver is described in Section 4.3.3 of the operating manual.

7.5 Final Test

After repair/adjustment of the board, the selftest should be performed with the board fitted into the test receiver in order to judge whether the adjustment is correct and all jumpers are plugged in correctly.

- Mount upper and lower cover of the board
- Mount board into the receiver
- Connect all RF cables
- Enter test function 0 (board test Detector Board)
- The selftest is executed without error message (Detector board o.k.).

7.6 External Interfaces

Table 7-3 Contents of the data registers of the serial interface.

Setting at the test receiver	D5 Pin 11	12	13	14	7	6	5	4	D6 Pin 11	12	13	14	7	6	5	4	D4 Pin 11	12	13	14	7	6	5	4	D8 PIN 4
Detector																									
AV	X	X	L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
QP (ESVS, ESVB, ESVD)	X	X	H	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
QP (ESS f<150 kHz)	X	X	H	H	L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	L
QP (ESS f: 150 kHz...<30 MHz)	X	X	H	H	L	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
QP (ESS f>30 MHz)	X	X	H	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
PK	X	X	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
RMS (only ESS, ESVB)	X	X	L	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
Meas Time																									
=< 2ms (IF BW = 120kHz)	L	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
5-20ms (IF BW = 120kHz)	L	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
50-200ms (IF BW = 120kHz)	H	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
= >500ms (IF BW = 120KHz)	H	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
OP Range																									
60 dB	X	X	X	X	X	X	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
30 dB	X	X	X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
Meter Track	X	X	X	X	X	X	X	L	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
Hold	X	X	X	X	X	X	X	H	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
Demod																									
A3	X	X	X	X	X	X	X	X	X	X	X	X	L	L	X	L	X	X	X	X	X	X	X	X	H
A0	X	X	X	X	X	X	X	X	X	X	X	X	L	H	X	L	X	X	X	X	X	X	X	X	H
F3 (IF BW < 100KHz)	X	X	X	X	X	X	X	X	X	X	X	X	H	L	X	L	X	X	X	X	X	X	X	X	H
F3 (IF BW < 100KHz)	X	X	X	X	X	X	X	X	X	X	X	X	H	L	X	L	X	X	X	X	X	X	X	X	H
off	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H	X	X	X	X	X	X	X	X	H
Beeper on	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H	L	X	X	X	X	X	X	X	X	H
off	X	X	X	X	X	X	X	X	X	X	X	X	X	X	L	X	X	X	X	X	X	X	X	X	H
Test point T0	X	X	X	X	X	X	X	X	L	L	L	L	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T1	X	X	X	X	X	X	X	X	L	L	L	H	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T2	X	X	X	X	X	X	X	X	L	L	H	L	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T3	X	X	X	X	X	X	X	X	L	L	H	H	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T4	X	X	X	X	X	X	X	X	L	H	L	L	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T5	X	X	X	X	X	X	X	X	L	H	L	H	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T6	X	X	X	X	X	X	X	X	L	H	H	L	X	X	X	X	X	X	X	X	X	X	X	X	H
Test point T7	X	X	X	X	X	X	X	X	L	H	H	H	X	X	X	X	X	X	X	X	X	X	X	X	H
Transducer factor																									
- 6.0 dB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H	H	H	H	L	L	L	H
- 5.9 dB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H	H	H	L	H	H	H	H
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									H
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									H
0.0 dB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	L	H	H	H	H	L	L	H
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									H
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									H
5.9 dB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	H	H
6.0 dB	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	L	L	L	L	L	L	L	H
only ESS:																									
IF BW > 3 kHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	H
IF BW < 3 kHz	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	L

Table 7-4 external interfaces

Pin	Name	Input/ Output	Origin/destination	Specified range	Signal description
X 18.AC 1	GNDA	I	REAR PANEL X3.10	0 V	Analog ground
X 18.AC 2	+ 5 VA	I	REAR PANEL X3.7	5.2 to 5.6 V	Supply voltage
X 18.AC 3	+ 12 V	I	REAR PANEL X3.6	10.8 to 16 V	Supply voltage
X 18.AC 4	+ 10 V	I	REAR PANEL X3.5	9.98 to 10.02 V	Supply voltage
X 18.AC 5	- 10 V	I	REAR PANEL X3.4	- 9.99 to 10.01 V	Supply voltage
X 18.AC 6	+ 28 V	I	REAR PANEL X2.5	28 V ± 100 mV	Supply voltage
X 18.A 7	SCLK	I	CPU BOARD X22A6	HCT level	Clock pulse
X 18.C 7	TDATA	I	CPU BOARD X22C6	HCT level	Data
X 18.C 8	STROBE*	I	CPU BOARD X22C9	HCT level	Strobe
X 18.A 9	TEST	O	CPU BOARD X22A8	0 V to 5 V	Selftest
X 18.A 10	PK - PES	I	CPU BOARD X22A9	HCT level	PK-detector reset
X 18.C 11	OL*	O	CPU BOARD X22A10	HCT level	Overload
X 18.A 12	GNDA	I	REAR PANEL X3.10	0 V	Analog ground
X 18.C 12	100 KHz	I	FRN SYNTHESIZER X16A12	HCT level	100-kHz clock pulse
X 18.A 13	VIDEO IN	I	IF SELECTION BOARD X17C13	0 to 4 V	Video signal
X 18.A 14	GNDA	I	REAR PANEL X3.10	0 V	Analog ground
X 18.A 15	VIDEO DSP	I	IF 80 kHz X9C15	0 to 4 V	Video signal
X 18.C 15	V - A/D	O	CPU BOARD X22A16	1 to 5 V	Input signal for A/D converter
X 18.A 16	Meter	O	DISPLAY BOARD X4 7	0 to 300 µA	Indicating current for instrument
X 18.C 16	GND - A/D	O	CPU BOARD X22C16	0 V	Ground for A/D converter
X 18.A 17	GND - Meter	O	DISPLAY BOARD X4 12	0 to 300 µA.	Ground for instrument
X 18.A 18	REC 2	O	CPU BOARD X22A18	-1 to 5 V	Recorder output
X 18.C 18	REC 1	O	X22A17	-1 to 5 V	Recorder output
X 18.A 19	GND - AF	O	DISPLAY BOARD X40.15	0 V	Ground for loudspeaker
X 18.C 19	VOLUME	O	DISPLAY BOARD X4.9	0 to 8 V	Voltage from the volume potentiometer
X18C20	AF - OUT	O	DISPLAY BOARD X4.11	-4 to 4 V	AF output
X18AC26	GNDA	I	REAR Panel X3.10	0 V	Analog ground
X18AC27	GNDA	I	REAR Panel X3.10	0 V	Analog ground
X183	VIDEO OUTPUT	O	REAR Panel VIDEO OUTPUT	0 to 4 V	Video output
X187	IF INPUT	I	IF SELECTION BOARD X177	10.7 MHz 50 to 110 dBµV	10.7-MHz IF input

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

C (1-5)

AV DETECTOR

T_{AV} -100µS,1MS,10MS,100MS

PEAK DETECTOR

RESET

QPK DETECTOR

SIMULATION OF METER RESPONSE

QPK C/D; QPK A/B(ONLY MOD .03)

RMS DETECTOR (ONLY MOD.03 + .04)

$\frac{1}{T}\int_0^T (F(T))^2\,DT$

T_{AV} -100µS,1MS,10MS,100MS

AV

PK

QPK

RMS

DETECTOR SWITCH

AV,PK,QPK,RMS

T4

60DB: 4MV...4V
30DB: 40MV...1,26V

0/20DB AMP

30DB/60DB

X50/51

X52

LOG AMP

T6

T5

X57

SHIFT AMP

TRACK AND HOLD AMP

TRACK/HOLD

X64

60DB: 1,2...4,2V
30DB: 1,2...4,2V

4MV...4V

VIDEO OUTPUT
X183

VIDEO AMP

G-1

(ONLY MOD .03)

VIDEO DSP (MOD 03)
X18A 15:
DSP-NF (MOD 04)

VIDEO SWITCH

4MV...4V

X49

T3

VIDEO IN
X18 A13

VIDEO

ESVS

SHEET 3-7

\# ONLY FITTED IN MOD 04

* NOT FITTED IN MOD 04

AMUX1
X18C 28

AMUX2
X18C 29

AMUX3
X18A 28

V-A/D1

B (1-2)

AF DEMODULATOR

IF LEVEL DETECTOR

TO

FM DEMODULATOR

FM WIDE/NARROW

A3 DEMODULATOR

A0 DEMODULATOR

DEMODULATOR SWITCH

FM NARROW,FM WIDE
A0,A3

50...110DBµV

IF INPUT
X187

100KHZ
X18 C12

PLL

10,7MHZ

FM
FM
A3
A0

DEMODULATOR SWITCH

FM NARROW,FM WIDE
A0,A3

FM WIDE AF AMP

AF FILTER

QPK AF DEMODULATOR

VIDEO

DEMODULATOR SWITCH

FM NARROW,FM WIDE
A0,A3,QPK

BEEP ON/OFF

BEEPER
F-700HZ

P81

MOD.02+.03

X82

MOD.04

DSP-NF

AF AMP

VOLUME

AF-OUT
X18 C20

GND-AF
X18 A19

* NOT FITTED IN MOD 04

SHEET 8-9

09/00

AEND. IND.

DETECTOR

-100µS,1MS,10MS,100MS

K DETECTOR

RESET

DETECTOR

SIMULATION OF METER RESPONSE

QPK C/D; QPK A/B(ONLY MOD .03)

S DETECTOR (ONLY MOD.03 + .04)

$\frac{1}{T}\int_0^T (F(T))^2\,DT$

-100µS,1MS,10MS,100MS

AV

PK

QPK

RMS

DETECTOR SWITCH

T4

AV,PK,QPK,RMS

X50/51

0/20DB AMP

30DB/60DB

X52

LOG AMP

T6

T5

60DB: 4MV...4V
30DB: 40MV...1,26V

X57

TRACK AND HOLD AMP

TRACK/HOLD

X64

60DB: 1,2...4,2V
30DB: 1,2...4,2V

SHIFT AMP

P57

60DB: 0,98...4,64V
30DB: 0,98...4,64V

V-A/D1

T7

METER TRANSD. CORRECTION

P64

0...5V

SIMULATION OF METER RESPONSE

REC AMP

G-1

METER ADJUST

REC2
X18 A18

0...5V

REC1
X18 C18

0...5V

METER
(FRONT PANEL)

0...250µA

METER
X18 A16

GND METER
X18 A17

D
A

\# ONLY FITTED IN MOD 04

* NOT FITTED IN MOD 04

A/D-CONVERTER INPUT MULTIPLEXER

AMUX1
X18C 28

AMUX2
X18C 29

AMUX3
X18A 28

X1

V-A/D
X18C 15

FOR MOD02 03

V-A/D1

AF DEMODULATOR

FM WIDE AF AMP

DEMODULATOR SWITCH

FM

FM

A3

A0

FM NARROW,FM WIDE
A0,A3

AF FILTER

QPK AF DEMODULATOR

VIDEO

DEMODULATOR SWITCH

FM NARROW,FM WIDE
A0,A3,QPK

BEEP ON/OFF

BEEPER
F-700HZ

P81

MOD.02+.03

X82

MOD.04

DSP-NF

AF AMP

VOLUME

AF-OUT
X18 C20

GND-AF
X18 A19

SPEAKER
(FRONT PANEL)

* NOT FITTED IN MOD 04

VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S BLATT-NR. 1
				ZU GERAET ESVS30			REG.I.V. 1010.5001 ERSTE Z. 1010.5099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8498.01 S

P1,P2

X18A 1 — GNDA
X18C 1

SCLK X18A 7 — R1 100R L — D1-A 74HCT14T-L — D1-B 74HCT14T-L — C2 220P L — R5 100R — C3 220P L
TDATA X18C 7 — R2 100R L — D1-C 74HCT14T-L — D1-D 74HCT14T-L — C4 220P L — R6 100R — C5 220P L
STROBE* X18C 8 — R3 100R L — D1-E 74HCT14T-L — D1-F 74HCT14T-L — C6 220P L — R7 100R — C7 220P L
TEST X18A 9 — R4 100R — C1 220P L

X18A 2 +5VA — X18C 2 — D1-G — C10 100N — C11 100N L — R9 24R3 — V1 BST70 — +5V
C22 2U2 25V TA L * — R23 100K L

X18A 3 +12V — X18C 3 — C8 100N — +12V

X18A 4 +10V — X18C 4 — L2 1U2H — C12 100N — C13 100N L — +10V
L4 1UH — C14 100N — C15 100N L — +10V(REF)

X18A 5 -10V — X18C 5 — L3 1U2H — C16 100N — C17 100N L — -10V
L5 1UH — C18 100N — C19 100N L — -10V(REF)

X18A 27 — X18C 27 — GNDA

X18A 6 +28V — X18C 6 — L6 47UH — C25 100N — C27 100N L — +28V

X18A 10 PK RES — R8 1K — C28 270P L — PK-RES

X18C 11 OL* — R20 1K — C20 100P — OL*

X18A 12 — GNDA
X18C 12 100KHZ — R24 1K — C24 330P L — 100KHZ

X18A 13 VIDEO IN — VIDEO-IN

X18A 14 — GNDA
X18C 15 — V-A/D — V-A/D
X18A 16 METER — METER

X18C 16 — GND-A/D
X18A 17 — GND METER — GND-METER

X18A 18 REC2 — R22 1K — C23 10N — REC2 MOD.04:R22,C23 NOT FITTED

X18C 18 REC1 — R21 1K — C21 10N — REC1

X18C 19 VOLUME — L7 1UH — C25 10N — VOLUME

X18A 19 GND-AF — GND-AF
X18C 20 AF OUT — AF-OUT
X18A 15 VIDEO DSP/NF DSP — R43 0R — VIDEO-DSP R43 ONLY MOD.03
R44 0R — NF-DSP R44 ONLY MOD.04

X18C 28 DCIN1 — L40 100UH — C40 680N — DCIN1
X18C 29 DCIN2 — L41 100UH — C41 680N — DCIN2
X18A 28 DCIN3 — L42 100UH — C42 680N — DCIN3

X18A 26
X18C 26 — GNDA

A

BOARD CONTROL

ADRESSDECODER

+5V — R10 10K L — D2-A 74HCT4094T-L (C2, EN3, SRG, C1/→, 1D, 2D 3▽)
D3-A 74HCT238T-L (DX, G, &)

DATA LATCHES 1-3

+5V — R11 10K L — D4-A 74HCT4094T-L — D0 D1 D2 D3 D4 D5 D6
+5V — R12 10K L — D5-A 74HCT4094T-L — HOLD E30 QPK0 QPK1 EPK0 EPK1 E0 E1
+5V — R14 10K L — D8-A 74HCT4094T-L — V1D MUX0 MUX1

E30

+5V
N30-E — C30 100N — D2-B — C31 100N — D3-B — C32 100N — D4-B — N31-E
C36 100N — D8-B — C33 100N — D5-B — C34 100N — D6-B — C35 100N — D7-B

SHEET8 E/4 T0 — R30 1K L
SHEET9 A/5 T1
SHEET9 B/3 T2 — R28 47K5 L — VIDEO — R29 47K5 L
SHEET6 E/3 T4 — R32 100K L
SHEET6 C/10 T5 — R31 100K L
SHEET6 E/7 T6
SHEET7 E/8 T7

+10V(REF) — R620 2K .1% — D620-A DAC08 (D0–D6, LSB, MSB, VLC, IOUT, IOUT, COMP) — R621 2K .1% — P1
C623 1U 25V TA L — IOUT — P2
60DB 6V
30DB 2V

D620-B DAC08 — +10V — C620 100N — C621 100N L — -10V — C622 10N L

+10V(REF) — R622 4K99 .1%

D450-D DG411DY-L — V620 BST 70 — R629 100K L — R623 1K49 .1% — R624 7K5 .1% — C624 100N L — +10V

METER TRANSD. CORRECTION

* NOT FITTED

VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

09/00
AEND. IND.

P1,P2

BOARD CONTROL

ADRESSDECODER

DATA LATCHES 1-3

BOARD TEST

+5V

R10 10K L

D2-A 74HCT4094T-L

D3-A 74HCT238T-L

R11 10K L

D4-A 74HCT4094T-L

R12 10K L

D5-A 74HCT4094T-L

R14 10K L

D8-A 74HCT4094T-L

R13 10K L

D6-A 74HCT4094T-L

D7-A 74HC4051T-L

HOLD
E30
QPK0
QPK1
EPK0
EPK1
E0
E1

VID
MUXD0
MUXD1

AF-ON/OFF
BEEP
DEMOD.D0
DEMOD.D1

N30-E C30 100N L D2-B C31 100N L D3-B C32 100N L D4-B N31-E

C36 100N L D8-B C33 100N L D5-B C34 100N L D6-B C35 100N L D7-B

SHEET8 T0 → R30 1K L → N30-A LM224D-L

SHEET8 T1 → N30-B LM224D-L

SHEET8 T2 → N31-C LM224D-L

VIDEO → R28 47K5 L

R29 47K5 L

SHEET6 T4 → N30-D LM224D-L

SHEET6 T5 → R32 100K L → N31-A LM224D-L

SHEET6 T6 → R31 100K L → N31-B LM224D-L

SHEET7 T7 → N31-D LM224D-L

T0* T1* T2* T3* T4* T5* T6* T7*

AF-ON/OFF SHEET9 E/9
BEEP SHEET9 E/7
DEMOD.D0 SHEET8 D/2 SHEET9 D/2
DEMOD.D1
HOLD SHEET7 D/1
E30 SHEET6 C/3
QPK0 QPK1 SHEET5 C/8
EPK0 EPK1 SHEET6 B/1
E0 E1 SHEETS B/5

MUXD1 MUXD1 SHEET6 B/2
MUXD0 MUXD0 SHEET6 B/2
VID VID SHEET5 C/1
VIDEO VIDEO SHEET3 E/3
IOUT IOUT SHEET8 D/5
+5V +5V
+10V +10V
-10V -10V
+10V(REF) +10V(REF)
-10V(REF) -10V(REF)
+12V +12V
+28V +28V
OL* OL* SHEET5 B/4
V-A/D V-A/D SHEET6 D/12
REC1 REC1 SHEET7 D/11
REC2 REC2 SHEET7 B/11
METER GND-METER SHEET7 E/11
VOLUME VOLUME SHEET9 C/9
100KHZ 100KHZ SHEET3 B/2
AF-OUT AF-OUT SHEET9 D/11
PK-RES PK-RES SHEET3 C/2
GND-AF GND-AF SHEET9 D/11
VIDEO-IN VIDEO-IN SHEETS D/1
VIDEO-DSP VIDEO-DSP SHEETS C/1

METER TRANSD. CORRECTION

D620-A DAC08

+10V(REF) R620 2K .1%

R621 2K .1%

P1

C623 1U 25V TA L

IOUT

P2

60DB 6V
30DB 2V

D620-B DAC08

+10V

C622 10N L

C621 100N L

C620 100N L

-10V

+10V(REF) R622 4K99 .1%

D450-D DG411DY-L

V620 BST 70

R629 100K L

R623 1K49 .1%

R624 7K5 .1%

C624 100N L

+10V

* NOT FITTED

VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
09/00	47296	05.92	SO

	TAG	NAME
1KEN		
BEARB.		SO
GEPR.		NG
NORM		
PLOTT	07.05.92	

BENENNUNG

DETECTOR BOARD 2

ROHDE&SCHWARZ

ZU GERAET ESVS30

ZEICHN.-NR. 1010.8498.01S

BLATT NR 2

REG.I.V. 1010.5001

ERSTE Z. 1010.5099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8498.01 S

C (1)

PK DETECTOR

R202 X27 X24 X28

+10V R240 10R L +10VE
C240 10U 25V TA L

-10V R241 10R L -10VE
C241 10U 25V TA L

+10V R255 10R L +10VF
C257 1U 25V
C255 100N L

-10V R256 10R L -10VF
C256 100N L

+10VE
R202 1K
PEAK OFFSET
4MV...4V
VIDEO
SHEET2 D/12
SHEET5 C/3
R200 1K L
N200 LT1028 CJ8
-10VE
R205 475R L
V205 BAS32-L
X27 1
X27 2
CLAMP

+10VE
C200 100N L
R206 100R L
V208 J174
V206 HSMS2800-L
V207 HSMS2800-L
R210 1M L
R214 2M7 L
N210 AD844BQ
C201 100N L
-10VE

V210 BAV45
X24 1
X24 2
R211 R212 R213 3X12R1
V211 BAV45
C211 20N FKP
R221 47K5 L
V215 HSMS2800-L
R220 51R1 L

V230 BSV81
V231 BSV81
V235 BC850B-L
R235 1K L

+10VF
R272 2K L
C272 15N L

D271-A DG411DY-L
D271-D DG411DY-L
D271-C DG411DY-L
D271-B DG411DY-L

X28 2
X28 1
RESET

+5V
R265 10K L
PK-RES
SHEET2 8/12
D265-A 74HCT74T-L

+5V
R266 10K L
100KHZ
SHEET2 8/12
D260-A 74HCT161T-L
CTR4
CT=15

D270-A 74HCT00T-L
D270-B 74HCT00T-L
D270-C 74HCT00T-L
D270-D 74HCT00T-L

+10VF
R290 2K L

+5V
C260 100N L
D260-B 74HCT161T-L
D265- 74HCT

10V1

REND. IND.

R202 X27 X24 X28 R237 X25,X29

PK DETECTOR

+10VE
R202 1K
PEAK OFFSET
N200 LT1028 CJ8
-10VE
R205 475R L
V205 BAS32-L
X27 1
X27 2
CLAMP
+10VE
C200 100N L
R206 100R L
V208 J174
V206 HSMS2800-L
V207 HSMS2800-L
R210 1M L
R214 2M7 L
N210 AD844BQ
C201 100N L
-10VE
V210 BAV45
X24 1
X24 2
R211 R212 R213 3X12R1
V211 BAV45
C211 20N FKP
R221 47K5 L
V215 HSMS2800-L
R220 51R1 L
X28 2
X28 1
RESET
V230 BSV81
V231 BSV81
R230 110R L
+10VE
V235 BC850B-L
V236 BC850B-L
R235 1K L
R237 2K
R236 1K L
BUFFER OFFSET
-10VE
NOT FITTED
R239 200R L
R238 162R L
+10VE
N240. AD844BQ
-10VE
R243 100R L
R242 2K L
X29 1
X29 2
X25 1
X25 2
4MV...4V
PK-OUTPUT
SHEET6 D/1

R272 2K L
C272 15N L
D271-A DG411DY-L
D271-D DG411DY-L
+10VF
R290 2K L
D271-C DG411DY-L
D271-B DG411DY-L
V287 07V5 L
C287 10U 25V TA L
R291 2K L
-10VF

+5V C260 100N L
D260-B 74HCT161T-L
+5V C265 100N L
D265-C 74HCT74T-L
+5V C270 100N L
D270-E 74HCTOOT-L
+10VF +5V C275 100N L
D271-E DG411DY-L
-10VF
+5V D265-B 74HCT74T-L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS
MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
REND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S
				ZU GERAET	ESVS30		BLATT-NR. 3 v. 15 Bl.
				REG.I.V.	1010.5001	ERSTE Z.	1010.5099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

R307 P31 P30 X31

C (2)

RMS DETECTOR

RMS OFFSET 1

R307 20K

-10V(REF) R306 51K1 L

R308 51K1 L +10V(REF)

R310 332R L

R311 1M L

C311 100N L

D310-A CA3127E

D310-B CA3127E

P30

V300 BAV45

C304 1P8 L

P31

R305 10K L

4MV...4V

VIDEO

SHEETS C/4

+10VB

C302 100N L

R300 20K L

N300 OPA627

R304 2K L

R301 2K74 L

C303 100N L

C301 100P L

-10VB

D310-C CA3127E

X31 1

X31 2

C325 10N L

D320-A DG411DY-L

D320-B DG411DY-L

D320-C DG411DY-L

D320-D DG411DY-L

TAV1

TAV2

TAV3

TAV4

C320 1N5 100V 1% FKP

C321 15N

C322 150N

C323 1U5 50V MKT

TAV1-TAV4

SHEETS B/7

R329 75K

D330-A DG411DY-L

D330 DG411

TAV1

C330 1N5 100V 1% FKP

C331 15N

R330 75K

D310-D CA3127E

R350 2K L

V350 BAV45

D310-E CA3127E

-10VB

D320-E DG411DY-L

+10VB

+5V

C319 100N L

D330-E DG411DY-L

C329 100N L

CIRCUIT DIAGRAM IS ONLY VALID FOR MOD .03 (ESS)
MOD .04 (ESN)

ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE
BEHANDELN

09/00

AEND. IND.

ZEICHN.-NR. 10108498.01 S

P30 X31 R340 R345 X32

RMS DETECTOR

D320-A DG411DY-L
D320-B DG411DY-L
D320-C DG411DY-L
D320-D DG411DY-L

TAV1 TAV2 TAV3 TAV4

C320 1N5 100V 1% FKP
C321 15N
C322 150N
C323 1U5 50V MKT

R329 75K

D330-A DG411DY-L
D330-B DG411DY-L
D330-C DG411DY-L
D330-D DG411DY-L

TAV1 TAV2 TAV3 TAV4

C330 1N5 100V 1% FKP
C331 15N
C332 150N
C333 1U5 50V MKT

+10VB
R340 100K
RMS OFFSET 2

R330 75K
R331 10K L

N340 LT1012

X32 1 X32 2 X32 3

4MV...4V
RMS-OUTPUT
SHEET6 D/1

R341 51K1 L
-10VB

R345 1K
RMS SLOPE

R342 4K75

D310-C CA3127E
X31 1
X31 2
C325 10N L

D310-D CA3127E

N350 OP07CP
-10VB
R350 2K L
V350 BAV45
C350 100P L
+10VB

-10VB

D320-E DG411DY-L
+10VB +5V
C319 100N L
-10VB

D330-E DG411DY-L
+10VB +5V
C329 100N L
-10VB

TAV1-TAV4
SHEET5 B/7

RCUIT DIAGRAM IS ONLY VALID FOR MOD .03 (ESS)
MOD .04 (ESN)

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
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09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
AEND. IND.	ÄNDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S
				ZU GERÄT ESVS30			BLATT-NR. 4 v. 15 BL.
				MEG.I.V. 1010.5001			ERSTE Z. 1010.5099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN -NR. 10139459.01 S

X49

VIDEO OUTPUT
R405 X183 1
4MV...4V

X41 X43

C (3)

+10V → R490 10R L → +10VB
C490 10U 25V TA L

-10V → R491 10R L → -10VB
C491 10U 25V TA L

VIDEO AMP.

R402 100R
R401 909R L
VIDEO OFFSET
R405 50K
R404 22K1 L
C405 10P L
C404 100N L
C406 100N L
+10V
-10V
N400 NE5534D-L
R400 100K L

VIDEO SWITCH

ONLY FITTED
IN MOD .02 +.04

R495 0R L
VIDEO-IN
SHEET2 B/12
VIDEO-DSP
SHEET2 B/12
VID
SHEET2 D/12
D490-A
DG419-L
ONLY FITTED
IN MOD .03

4MV...4V

VIDEO
SHEET2 D/12
SHEET3 E/3

OVERLOAD DETECTOR

+10V(REF)
+10V
C408 100N L
R406 51K1 L
6V
R408 10K L
OL*
SHEET2 C/12
N405 LM211D-L
R407 75K L
C407 1U 25V TA L

QPK D

-10VB
N435 OPA627
V435 J174
+10VB
V410 HSMS2800-L
+10V
R411 10R L
C411 100N L
QPK-OFFSET
R410 20K
C412 10U 25V TA L
R417 100R L
V411 HSMS2800-L
R413 1K L
N410 AD844BQ
C413 100N L
C418 33N L
V412 BAV45
C414 10U 25V TA L
R414 10R L
R418 10R L
R420 10R L
-10V

X41 1 2
X43 1 2

QPKC/D
C/10
QPKB
C/11
R419 2K L

R429 35R7 L
D420-A DG411DY-L
D420-B DG411DY-L
R421
R423 750R L
R422
R424 221R L
R427 33K2 L
R428 39K2 L

QPKO
SHEET2 E/12
QPK1
SHEET2 E/12
R480 10K L

AV DETECTOR

SHEET2 E/12
E0
E1
D480-B 74HCT139T-L
R481 10K L
TAV1
TAV2
TAV3
TAV4
SHEET4 D/5 9
R461 100K L

C461 1N 100V 1% FKP
C462 10N
C463 100N
C464 1U
C465 1N 100V 1% FKP
C466 10N
C467 100N
C468 1U
D460-A DG411DY-L
D460-B DG411DY-L
D460-C DG411DY-L
D460-D DG411DY-L
R462 100R L

R410 X41 X43 R425,R426 X45 R470 X46

QPK DETECTOR

NOT FITTED IN MOD.04:
R427,R428,R435

SIMULATION

-10VB
N435 OPA627
V435 J174
+10VB
V410 HSMS2800-L
QPK-OFFSET
R410 20K
R417 100R L
V411 HSMS2800-L
V412 BAV45
N410 AD844BQ
C418 33N L
C414 10U 25V TA L
R418 10R L
R420 10R L
X41 1 X41 2
R419 2K L
X43 1 X43 2
QPKC/D C/10
QPKB C/11
R429 35R7 L *
D420-A DG411DY-L
R421
R423 750R L
QPKC/D ADJUST R425 500R
D420-B DG411DY-L *
R422 *
R424 221R L *
R426 1K *
QPKB ADJUST
R427 33K2 L *
R428 39K2 L *
X45 1 X45 2
X46 2 X46 1
C429 680N
R430 432K L
R432 301K L
R431 75K L
D420-C DG411DY-L *
D420-D DG411DY-L *
R433 200K L *
R436 150K L *
R434 10K L
+5V
R482 100K L
V480 BAS32-L
V481 BAS32-L
QPK0 SHEET2 E/12
QPK1 SHEET2 E/12
D480-A 74HCT139T-L
R480 10K L
QPKC/D D/?
QPKB D/?
QPKA
N450 LT1008
+10VB
C451 33P L
R453 162K L
R451 1K L
R452 270K
R435 10K L *
-10VB
D450-A DG411DY-L
D450-B DG411DY-L
QPKC/D C/10
R454 270K
QPKC/D C/10

* NOT FITTED IN MOD.02

R422,R424,R426,R427,R428,
R433,R435,R436,R482,V480,
V481,D420,C420,C492,C493,
C494,R492,R494

ETECTOR

D480-B 74HCT139T-L
TAV1
TAV2
TAV3
TAV4
SHEET4 D/5-9
C461 1N 100V 1% FKP
C462 10N
C463 100N
C464 1U
D460-A DG411DY-L
D460-B DG411DY-L
D460-C DG411DY-L
D460-D DG411DY-L
C465 1N 100V 1% FKP
C466 10N
C467 100N
C468 1U
D470-A DG411DY-L
D470-B DG411DY-L
D470-C DG411DY-L
D470-D DG411DY-L
R462 100K L
R461 10K L
AV OFFSET
+10VB
R470 20K
N470 OP07CP
-10VB
- NO OUTPUT

+5V
+10VB
C420 100N L
C450 100N L
C460 100N L
D420-E DG411DY-L
D450-E DG411DY-L
D460-E DG411DY-L

VERSIONS

11/00	47327 (3)	08.
10/00	47296(40)	06.
AEND. IND.	AENDERUNGS-MITTEILUNG	DD

R425,R426 X45 R470 X46 R460 X47

PK DETECTOR

QPKC/D ADJUST R425 500R

X45 1 X45 2

*R426 1K

QPKB ADJUST

C429 680N

R430 432K L

R432 301K L

R431 75K L

+5V

R482 100K L

D480-A 74HCT139T-L

V480 BAS32-L

V481 BAS32-L

R480 10K L

QPKA

QPKB D/7

QPKC/D D/7

X46 2 X46 1

R434 10K L

R433 * 200K L

R436 * 150K L

D420-C * DG411DY-L

D420-D * DG411DY-L

D450-A DG411DY-L

+10VB C451 33P L

N450 LT1008

R435 * 10K L

-10VB

R451 1K L

R453 162K L

R452 270K

D450-B DG411DY-L

QPKC/D C/10

NOT FITTED IN MOD.04:

R427,R428,R435

* NOT FITTED IN MOD.02

R422,R424,R426,R427,R428, R433,R435,R436,R482,V480, V481,D420,C420,C492,C493, C494,R492,R494

SIMULATION OF METER RESPONSE

C454 1U MKT

OFFSET R460 20K

R454 270K

QPKC/D C/10

D450-C DG411DY-L

R457 274K L

+10VB

R456 10K L

R455 162K L

C455 1U MKT

N460 LT1012

-10VB

X47 1 X47 2 X47 3

4MV...4V

QPK-OUTPUT SHEET6 C/2

1% FKP

D470-A DG411DY-L

D470-B DG411DY-L

D470-C DG411DY-L

D470-D DG411DY-L

AV OFFSET R470 20K

+10VB

N470 OP07CP

4MV...4V

AV-OUTPUT SHEET6 D/2

D420-E DG411DY-L

D450-E DG411DY-L

D460-E DG411DY-L

D470-E DG411DY-L

D480-C 74HCT139T-L

+10V

R492 100R L

C492 100N L

C493 100N L

D490-B * DG419-L

C494 100N L

R494 100P L

-10V

VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
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11/00	47327 (3)	08.92	SO	NAME	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	17.08.92		
10/00	47296(40)	06.92	NL				ZEICHN.-NR. 1010.8498.01S
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ZU GERAET	ESVS30		BLATT-NR. 5 v. 15 BL.
				REG.I.V.	1010.5001	ERSTE Z.	1010.5099

ROHDE&SCHWARZ

10 11 12 13 14 15 16 17

X50,X51 R505 X52 R524,R532 P52,X521 X54 R529 R539

C (4)

DETECTOR SWITCH

T4 SHEET2 C/8
R501 47K5 L
R502 47K5 L

D500-A DG411DY-L
PK-OUTPUT SHEET3 E/12
PK

D500-D DG411DY-L
AV-OUTPUT SHEET5 A/11
AV

D500-C DG411DY-L
RMS-OUTPUT SHEET4 D/12
R594 0R L
RMS
R594 ONLY FITTED IN MOD .02

D500-B DG411DY-L
QPK-OUTPUT SHEET5 D/17
QPK

D590-A 74HCT139T-L
SHEET2 E/12 EPK0 EPK1
R595 10K L
→ AV, RMS, PK, QPK SHEET9 D/7

D590-B 74HCT139T-L
SHEET2 C/9 MUXD0 MUXD1
R599 10K L
→ MUX1, MUX2, MUX3, MUX4

4MV...4V

0/20 DB AMP.

+10VK R505 20K AMP OFFSET
N500 OP27GZ
X50 1 X50 2 X51 2 X51 1
-10VK
V503 BAS32-L
R503 20K 0.1%
E30 SHEET2 E/12
D530-D DG413DY-L
R504 2K1B .1%
D530-A DG413DY-L
E30 SHEET2 E/12

LOG. AMP.

LOG REF
+10V(REF) R523 100K L C523 10N L
R524 1K
3 X BAS32-L
V530 V531 V532
R531 100R L
C530 47P L
T6 SHEET2 B/8
R525 3K92 L
60DB:-0,9V...1,9V
30DB: 0V...1,4V
LOG ADJUST
D530-B DG413DY-L
E30 SHEET2 E/12
D530-C DG413DY-L
R537 15K .1%
R538 442R
R539 1K
R540 15K L
R541 1K .1%
R543 511R L
N530 OP15FJ
+10VC -10VC
R535 14K5 .1%
N535 OP07CP
R526 10K
R527 6K49
R528 3K74
R536 7K5 L
TEST 1-2
X52 1 X52 2 X52 3 X52 4
X521 1 X521 2
60DB: 4MV...4V
30DB: 40MV...1,25V
V520 BAV45
C520 8P2 L
V521-A MAT01AH
V521-B MAT01AH
X54 1 X54 2
TEST 1/2
LOG OFF.
P52
R520 3K92 L
N520 OP15EZ
R521 100R L
R532 100K
-10VC LOG OFFSET
R522 3K01 L
V522 BAV45
R529 100R
LOG GAIN
R530 162R L
-10V(REF)
R553 1K69 .1%
R554 75K9 0.1%
R552 10K .1%
R556 1K .1%
D550-D DG413DY-L
R550 43R2 L
R551 68K1 0.1%
E30 SHEET2 E/12
-10V(REF)
R555 10K L
C550 100N L
N550 OP07CP
+10VC -10VC
60DB
30DB

+10V +10VK
R533 10R L
+5V C531 100N L
C532 40Z 25V
C533 40Z 25V
R534 10R L
-10VK -10V
D530-E DG413DY-L

+10VC -10VC
N515-E DG441DY-L

+10VC +5V C500 100N L
D500-E DG411DY-L
-10VC

+5V C595 100N L
D590-C 74HCT139T-L

+10VC +5V C551 100N L
D550-E DG413DY-L
-10VC

D550-A DG413DY-L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS
MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

09/00	472
AEND. IND.	AEN NR

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8498.01 S

R505 X52 R524,R532 P52,X521 X54 R529 R539 X57 R571 P57

LOG. AMP.

LOG REF

+10V(REF) R523 100K L C523 10N L R524 1K

3 X BAS32-L

V530 V531 V532 R531 100R L C530 47P L → T6 SHEET2 B/8

60DB:-0,9V...1,9V
30DB: 0V...1,4V

R525 3K92 L

N530 OP15FJ

R526 10K R527 6K49 R528 3K74

TEST 1-2 X521 1 X521 2

60DB: 4MV...4V
30DB: 40MV...1,26V

V520 BAV45 C520 8P2 L

X52 1 X52 2 X52 3 X52 4

V521-A MAT01AH V521-B MAT01AH

LOG OFF. P52

X54 1 X54 2 TEST 1#2

R529 100R LOG GAIN R530 162R L

R520 3K92 L N520 OP15EZ R521 100R L R522 3K01 L V522 BAV45 R532 100K

-10VC LOG OFFSET

R535 14K5 .1% R536 7K5 L N535 OP07CP

R537 15K .1% R538 442R

D530-B DG413DY-L D530-C DG413DY-L E30 SHEET2 E/12

LOG ADJUST 30

R539 1K R540 15K L R541 1K .1% R543 511R L

V540 HSMS2800-L R542 1K .1% N540 OP07CP

60DB: 1,2V...4,2V
30DB: 1,2V...4,2V

-10V(REF) R553 1K69 .1% R554 75K9 0.1% R555 10K L R552 10K .1% C550 100N L

D550-D DG413DY-L R550 43R2 L R551 68K1 0.1% E30 SHEET2 E/12

N550 OP07CP R556 1K .1%

60DB:-2,16V
30DB:-1,14V

SHIFT AMP.

+10V(REF) +10VC 0.4V

R570 9K53 C570 100N L R571 100R V-AID ADJUST R572 348R -10VC

N570-A TL074ID-L R573 1M L R575 169K R577 8K25 .1%

60DB: 0,98...4,64V
30DB: 0,98...4,64V

R580 10K .1% R578 8K25 .1% R574 1M L R576 169K R581 10K .1%

N570-B TL074ID-L N570-C TL074ID-L N570-D TL074ID-L

V-A/D1

X57 1 X57 2 X57 3

INST SHEET7 D/2 R582 47K5 L R583 47K5 L T5 SHEET2 B/8

INPUT MULTIPLEXER

ONLY FITTED IN MOD.04 EXCEPT R517

R517 0R L ONLY IN MOD.02+ MOD.03

V516 BAS32-L R516 511R L C518 100N L C519 100N L -10VC N510-A OP400GS

P57 V-A/D SHEET2 C/12

N510-B N510-C N510-D

R510 1K L R511 1M L R512 1K L R513 1M L R514 1K L R515 1M L

DCIN1 DCIN2 DCIN3 V-A/D1

MUX1 MUX2 MUX3 MUX4

N515-A N515-B N515-C N515-D

-10V R591 22R1 L C591 2U2 25V TA L → -10VC

+10V R590 22R1 L C590 2U2 25V TA L → +10VC

+5V C595 100N L D590-C 74HCT139T-L D550-E DG413DY-L

+10VC +5V C551 100N L D550-E DG413DY-L -10VC

D550-A DG413DY-L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS
MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

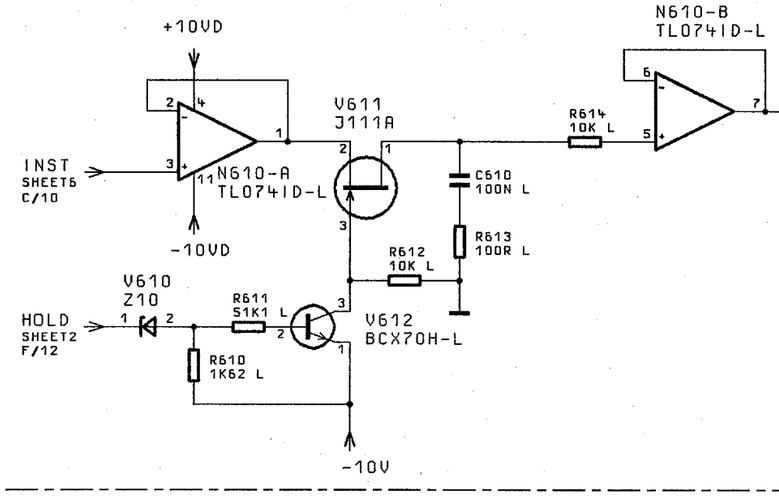
09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG: DETECTOR BOARD 2
				BEARB.		SO	
				GEPR.		NG	
				NORM			
				PLOT	07.05.92		
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S BLATT NR. 6 v. 15 Bl.
				ZU GERAET	ESVS30		REG.I.V. 1010.5001 ERSTE Z. 1010.5099

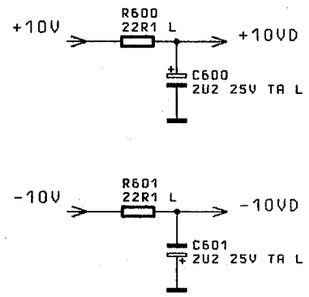
FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

X64 P63 R630 R631 P64

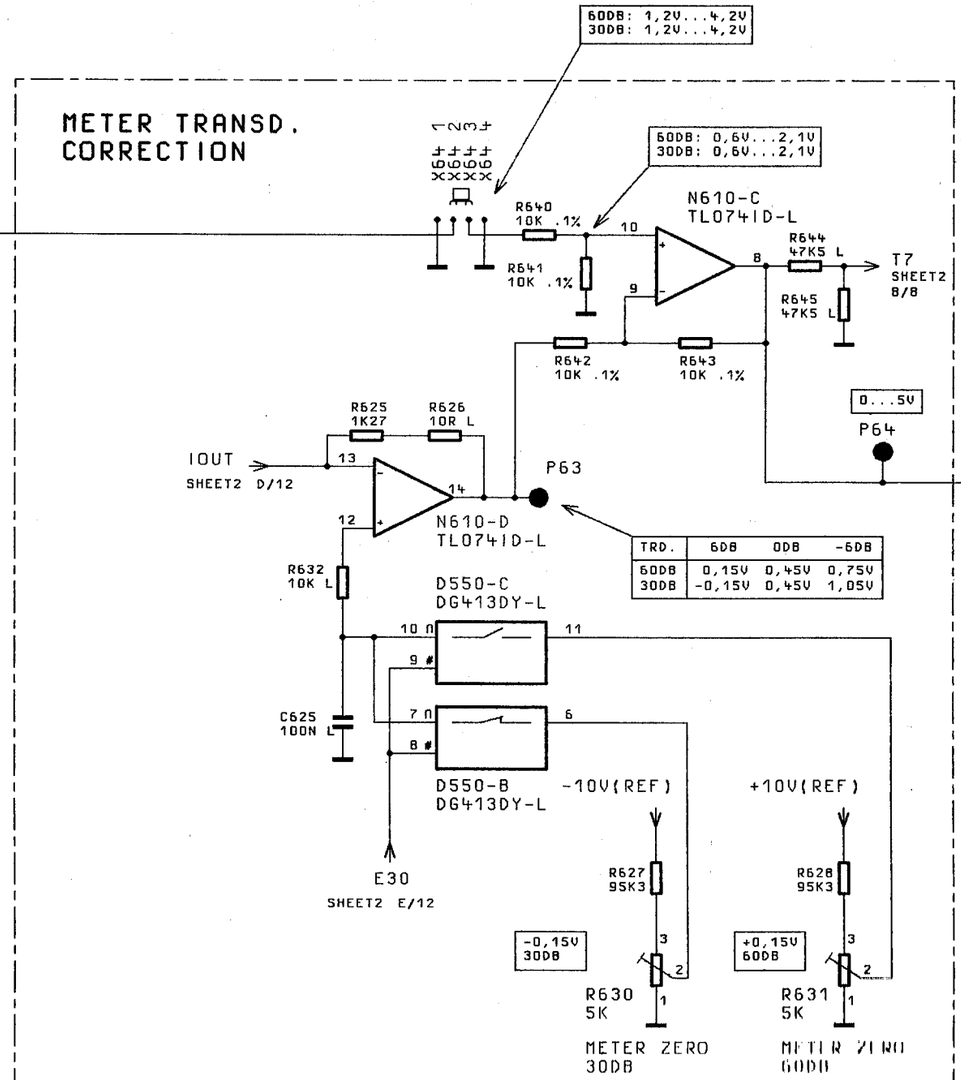
C (5)

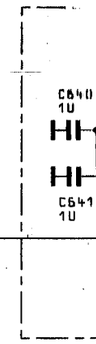
TRACK AND HOLD AMP.





METER TRANSD. CORRECTION





VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

ZEICHN.-NR. 1010.8498.01 S

09/00

AEND. IND.

X64 P63 R630 R631 P64 R652 R654

METER TRANSD. CORRECTION

6DDB: 1,2V...4,2V
3DDB: 1,2V...4,2V

6DDB: 0,6V...2,1V
3DDB: 0,6V...2,1V

X64 1 2 3 4 5 6 7 8 9 10

R640 10K .1%
R641 10K .1%
R642 10K .1%
R643 10K .1%
R644 47K5 L
R645 47K5 L

N610-C TL074ID-L

T7 SHEET2 B/8

0...5V
P64

IOUT SHEET2 D/12

R625 1K27
R626 10R L
R632 10K L

N610-D TL074ID-L

P63

TRD.	6DB	0DB	-6DB
6DDB	0,15V	0,45V	0,75V
3DDB	-0,15V	0,45V	1,05V

D550-C DG413DY-L
D550-B DG413DY-L

C625 100N L

E30 SHEET2 E/12

-10V(REF)
+10V(REF)

R627 95K3
R628 95K3

-0,15V 3DDB
+0,15V 6DDB

R630 5K
R631 5K

METER ZERO 30DB
METER ZERO 60DB

METER ADJUST

METER SPEED
R652 50K

C640 1U
C641 1U
R650 332R L
R651 43K2 L
R653 11K L

METER FULL SCALE
R654 2K

N640-C TL074ID-L

R656 13K L

N640-D TL074ID-L

R670 3K57 L
R671 1K43
R672 2K
R673 698R

0...250UA

METER SHEET2 B/12
GND-METER SHEET2 B/12

RECORDER AMP.

+10VD
-10VD

N640-A TL074ID-L

REC1 SHEET2 B/12

SIMULATION OF METER RESPONSE T - 50MS

C660 1U
C661 1U
R660 49K9
R661 49K9
R662 100K L
R663 10K L
R664 0R L

N640-B TL074ID-L

REC2 SHEET2 C/12

NOT FITTED IN MOD.04
EXCEPT R662,R664,N640
R664 ONLY MOD.04

VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S BLATT-NR. 7 v. 15 BL.
				ZU GERAET	ESVS30		REG.I.V. 1010.5001 ERSTE Z. 1010.5099

AF DEMODULATOR

B(1)

IF LEVEL DETECTOR

NOT FITTED IN MOD .04
EXCEPT R103

+10V
L101 4U7H
V100 J310
C100 4N7 L
C101 4N7 L
C102 4N7 L
V102 HSMS 2800
V101 HSMS 2800
R100 1M L
R101 1K L
R103 1M L
C103 4N7 L
TO SHEET2 D/8

DEMODULATOR SWITCH

NOT FITTED IN MOD .04

DEMOD.D0 SHEET8 F/12
DEMOD.D1 SHEET8 F/12
D700-A 74HC4052T-L
MUXDX
R709 10K L
IF INPUT
X187 1
C700 150P L
L703 4U7H L
50...110 DBUV
NOT FITTED IN MOD.04

D700-B 74HC4052T-L
C703 100N L
C704 100N L

D795-B 74HCT40103T-L
C795 100N L
C796 100N L

D796-B HCT4046

A3 DEMODULATOR

V711 BAS32-L
R743 2K L
+5V
C743 100N L
C741 100N L
R742 1K
C742 100N L
C740 100N L
B743 SFE-10.7
V746 J310
C746 100P L
R747 1M L
R748 1K L
C748 4N7 L
C744 1U 10V
R744 6K19 L
R745 2K L
A3-AF SHEET9 D/2

D740 TEA6200
NC DECOUPL NC GND IF INP.2 IF INP.1 STBY DEMOD IN DEMOD OUT IF OUT
VCC DECOUPL NC NC VCC NC AGC DECOUPL VREF DECOUPL NC
C754 100N L
C750 10U 25V
C749 100N L
+8.5V
R754 10R L
C753 100N L
C752 10U 25V
V740 03V3 L
C751 10U 25V

NOT FITTED IN MOD 04

AF DEMODULATOR

+10VL
N730-A TL072ACD-L
FMN SHEET9 E/2
R725 30K1 L
+10V
R726 10K L
-10VL
R727 100R L
V728 BA682-L
L728 100UH
R728 3K92 L
L727
R723 1K
C724 100N
C723 100N L
V710 BAS32

AO DEMODULATOR

NOT FITTED IN MOD .04

C766 10P L
L765 150H
V765 BB405B
B766 10.7MHZ
C765 220P
R765 1K L
R766 100K L
C767 1N L

10.7MHZ PLL

+5V
C791 100N L
V791 BCX70H-L
R791 1K L
R794 1K L
R793 4K32 L
C790 15P L
V794 BCX70H-L
R790 6K81 L
R792 1K L
D795-A 74HCT40103T-L
P79
NOT FITTED IN MOD .04
R795 10K L
R796 10K L
R798 10K L
R799 10K L
CP PL TE PE MR P0 P1 P2 P3 P4 P5 P6 P7 TC
100KHZ SHEET2 B/12
D796-A HCT4046
PLL 4046A SIGN COMP CX CX RX RX VCO INH PC01 PC02 PC03 PP VCO
R797 10K L
C797 100N L

VERSIONS

09/00	4729
AEND. IND.	AEND. NITI

P79
X76

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8498.01 S

P79 X76 C728,L727 C734,L760

AF DEMODULATOR

FM DEMODULATOR
NOT FITTED IN MOD .04

+10VL
N730-A
TL072ACD-L
FMN
SHEET9
E/2
+10V
R725
30K1 L
R726
10K L
-10VL
R727
100R L
V728
BA682-L
L728
100UH
R728
3K92 L
R735 3K92 L
C727
4N7 L
B730
V731
BA682-L
V732
BA682-L
L730
22UH
C728
3P5..10P
L731
22UH
C734
3P5..10P
C729
4N7 L
R729 3K92 L
L727
C726
18P L
L732
100UH
+8.5V
R730
10R L
C730
100N L
C738
10P L
C731
10U
25V
C735
10P L
C736
4N7 L
C737
4N7 L
R723 1K L
C723
100N L
C724
100N L
C725
100N L
D720
TDA1576
AMP OUTP.1
AMP OUTP.2
DEMOD INP.1
DEMOD INP.2
VCC
DECOUPL
FEEDB.
INP.1
INP.2
DEMOD OUTP.2
DEMOD OUTP.1
MUTING IN
GND
SSO2
SSO1
STBY
VREF
MUTING OUT
C733
1U 10V
R733
0R L
C732
100P L
R734
10K L
C739
1N L
FM-AF
SHEET9
D/2
V710 BAS32-L
R720
10K L
R721
2K74 L
R722
2K21 L

A3 DEMODULATOR
V711 BAS32-L
R743
2K L
+5V
C743
100N L
C741
100N L
C742
100N L
R742
1K
C740
100N L
B743
SFE-10.7
V746
J310
C746
100P L
R747
1M L
R748
1K L
C748
4N7 L
R744
6K19 L
C744
1U 10V
R745
2K L
A3-AF
SHEET9
D/2
D740
TEA6200
DECOUPL NC GND IF INP.2 IF INP.1 STBY DEMOD IN DEMOD OUT IF OUT
DECOUPL NC NC VCC NC AGC DECOUPL VREF DECOUPL NC
C754
100N L
C752
10U
25V
V740
03V3
C751
10U
25V
C750
10U
25V
C749
100N L
NOT FITTED IN MOD 04

A0 DEMODULATOR
NOT FITTED IN MOD .04
L760
R760
10R L
+8.5V
C760
100N L
C761
10U
25V
C766
10P L
L765
15UH
V765
BB405B
B766
10.7MHZ
C765
220P
R765
1K L
R766
100K L
C767
1N L
C768
10N L
X76 1
X76 2
X76 3
X76 4
D760
TDA1576
AMP OUTP.1
AMP OUTP.2
DEMOD INP.1
DEMOD INP.2
VCC
DECOUPL
FEEDB.
INP.1
INP.2
DEMOD OUTP.2
DEMOD OUTP.1
MUTING IN
GND
SSO2
SSO1
STBY
VREF
MUTING OUT
C770
1U 10V
R770
8K25 L
C771
100P L
R771
3K32 L
C771
NOT FITTED
A0-AF
SHEET9
D/2
R762
10K L
R763
2K74 L
R764
2K21 L

D795-A
74HCT40103T-L
+5V
P79
NOT FITTED IN MOD .04
100KHZ SHEET2 B/12
R795
10K L
R796
10K L
R798
10K L
R794
1K L
V794
BCX70H-L
R799
10K L
CP PL TE PE MR
PO P1 P2 P3 P4 P5 P6 P7 TC
D796-A
HCT4046
PLL 4046A
SIGN COMP CX CX RX RX VCO INH
PCO1 PCO2 PCO3 PP VCO
R797
10K L
C797
100N L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS
MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S
				ZU GERAET	ESVS30		BLATT-NR. 8 v. 15 BL.
				REG.I.V.	1010.5001	ERSTE Z.	1010.5099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

P89 P71,P80

B (2)

AF DEMODULATOR

DEMODULATOR SWITCH
NOT FITTED IN MOD .04

+5V
R810 10K L
FMN SHEET8 F/7
V811 BAS32-L
V810 BAS32-L
DEMOD.D0 SHEET2 F/12
DEMOD.D1 SHEET2 F/12
D780-A 74HC4052T-L
R811 10K L
A3-AF SHEET8 D/6
A0-AF SHEET8 B/12
FM-AF SHEET8 D/12
MUXDX

QPK AF DEMODULATOR
NOT FITTED IN MOD .04

R873 27K4 L
C875 10N L
R877 10K L
R872 162R L
C870 100N L
VIDEO
R870 3K92 L
R871 100K L
N730-B TL072ACD-L
V875 BAS32-L
V877 03V3 L
V878 03V3 L
C876 100N L
CISPR AF

AF FILTER

R801 392K L
P80
R800 100K L
N800-D TL074ID-L
R805 10K L
R806 9K09 L
C802 1N5 L
N800-C TL074ID-L
R802 27K4 L
R803 27K4 L
R804 10K L
C803 1N5 L
R809 0R L
V808 03V3 L
V809 03V3 L
NOT FITTED IN MOD .04 EXCEPT N800,R801,R806
R809 ONLY IN MOD.04

FM WIDE AF AMP

+10V
R860 33R2 L
C860 2U2 25V TA
+10VL
R808 100K L
R807 24K3 L
N800-A TL074ID-L
C861 2U2 25V TA
-10VL
R861 33R2 L
-10V
V806 3V3
V807 3V3
R807,V806,V807 NOT FITTED IN MOD .04

-5V GENERATION
NOT FITTED IN MOD .04 EXCEPT R892,R893

+10V
R894 47K5 L
T2 SHEET2 C/9
-10V
V890 BCX71J-L
P89
R893 47K5 L
-5VA
R890 4K32 L
R892 47K5 L
C892 22U 10V
C890 4U7 25V
R891 5K62 L

8,5V GENERATION
NOT FITTED IN MOD .04 EXCEPT R710

+12V
R708 1K L
V708 BCP68-16
P71
+8,5V (2,83V)
T1 SHEET2 C/8
R711 20K L
V709 B9V1
C708 10U 25V.C.
R710 10K L

BEEPER

BEEP SHEET2 F/12
D840-A 74HCT132T-L
R841 10K L
R842 2K21 L
C842 1U
R843 1K L
C843 150N L
R844 243K L
R845 4K75 L
C845 100N L
C820 2N2 L

DEMODULATOR SWITCH
NOT FITTED IN MOD .04

QPK SHEET6 B/2
D810-A 74HC4052T-L
MUXDX

D840-B 74HCT132T-L
D840-C 74HCT132T-L
D840-D 74HCT132T-L
R840 10K L
+5V
C840 100N L
C780 100N L
D840-E 74HCT132T-L

ACHTUNG: ESD!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS

MODD2 : F5V5
MODD3 : F5V
MODD4 : F4N

09/00	47
AEND. IND.	

ZEICHN.-NR. 1010.8498.01 S

AF DEMODULATOR

P71,P80 · P81 · X82

AF DEMODULATOR
TED IN MOD .04

R872 162R L · R873 27K4 L · C875 10N L · R877 10K L · C870 100N L · R870 3K92 L · R871 100K L · N730-B TL072ACD-L · V875 BAS32-L · V877 03V3 L · V878 03V3 L · C876 100N L · CISPR AF

LTER

R801 392K L · P80 · R805 10K L · R806 9K09 L · C802 1N5 L · N800-C TL074ID-L · R802 27K4 L · R803 27K4 L · R804 10K L · C803 1N5 L · R809 0R L · N800-D TL074ID-L · V808 03V3 L · V809 03V3 L

TED IN MOD .04 EXCEPT N800,R801,R806 · R809 ONLY IN MOD.04

DE AF AMP

+10V · R860 33R2 L · C860 2U2 25V TA · +10VL · R808 100K L · R807 24K3 L · N800-A TL074ID-L · C861 2U2 25V TA · -10VL · R861 33R2 L · -10V · V806 3V3 · V807 3V3

06,V807
TED IN MOD .04

V GENERATION
FITTED IN MOD .04 EXCEPT R710

V708 BCP68-16 · T1 · +8.5V · (2.83V) · SHEET2 C/8 · P71 · R711 20K L · R710 10K L · V709 B9V1

BEEPER

BEEP SHEET2 F/12 · D840-A 74HCT132T-L · R841 10K L · R842 2K21 L · C842 1U · R843 1K L · C843 150N L · R844 243K L · R845 4K75 L · C845 100N L · C820 2N2 L

DEMODULATOR SWITCH
NOT FITTED IN MOD .04

QPK SHEET6 B/2 · D810-A 74HC4052T-L · MUXDX

AF AMP

+28V · +12V · AF-ON/OFF SHEET2 F/12 · R822 33K2 L · V823 BCX70H-L · R824 30K1 L · V825 2N6659 · R823 33K2 L · C824 2U2 · C825 100N L · C826 470U 25V · C827 470U 25V · GND-AF SHEET2 B/12 · R820 5K62 L · C828 1U · C821 100N L · R828 221K L · FOR MOD.04 · P81 · N815 TDA1013 · C811 100N L · AF INP · LEVEL ATT. · AF AMP. · AF OUT · C631 470U 25V · R831 1R8 · AF-OUT SHEET2 B/12 · C830 100N L · R830 3R32 · NF-DSP · R817 0R · C817 10N L · C817 NOT FITTED · VOLUME SHEET2 B/12 · R815 10K L · R816 10K L · C816 100N L · N800-B TL074ID-L · GND-AF

D840-B 74HCT132T-L · D840-C 74HCT132T-L · D840-D 74HCT132T-L · R840 10K L

+5V · -5VA · C840 100N L · C780 100N L · C781 100N L · C812 100N L · C813 100N L · C780,C781,C812,C813 NOT FITTED IN MOD.04 · D840-E 74HCT132T-L · D780-B 74HC4052T-L · D810-B 74HC4052T-L

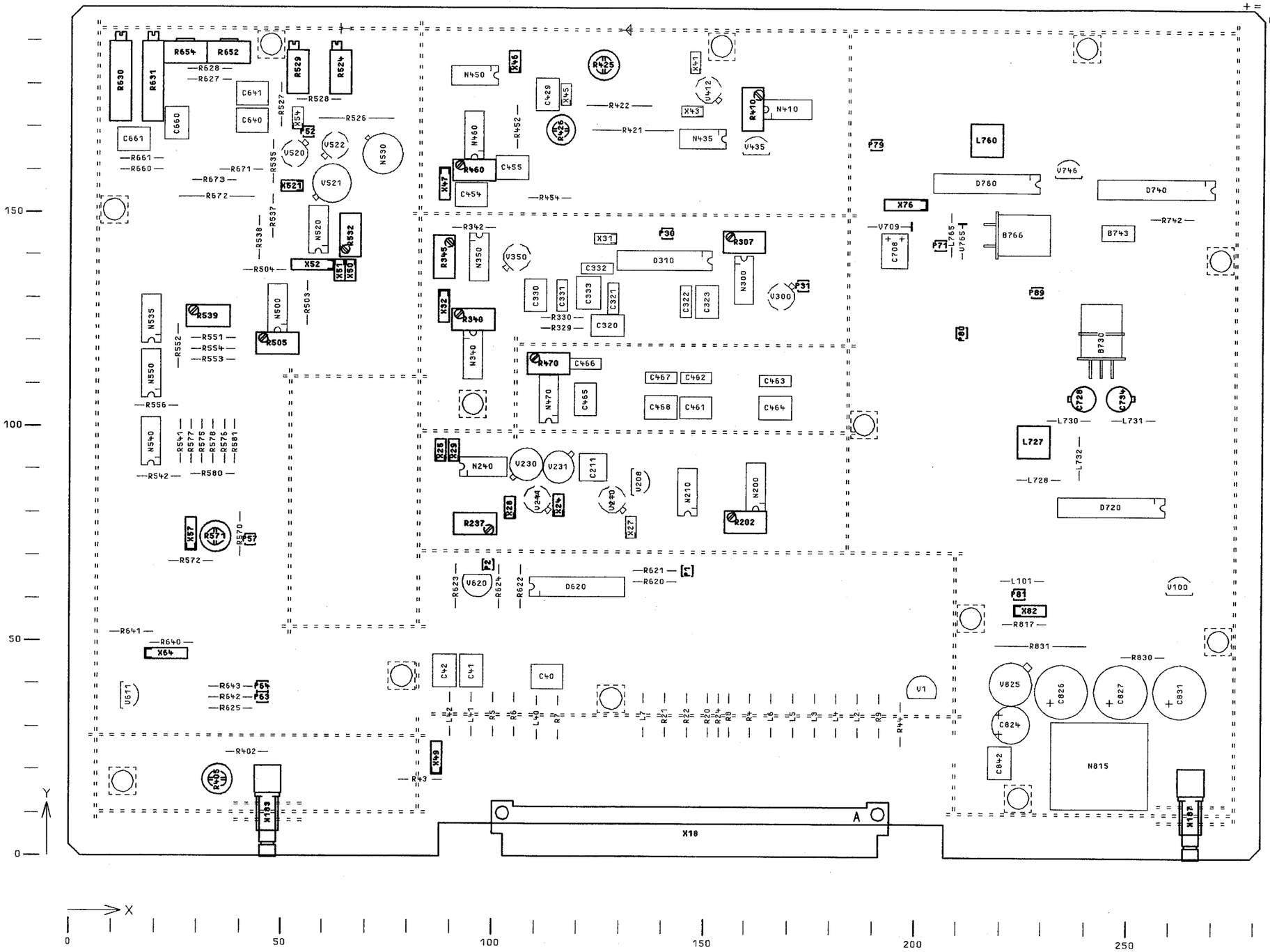
ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS

MOD02 : ESVS
MOD03 : ESS
MOD04 : ESN

09/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG
				BEARB.		SO	DETECTOR BOARD 2
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01S · BLATT-NR. 9 · V. 15 BL.
				ZU GERAET ESVS30			REG.I.V. 1010.5001 · ERSTE Z. 1010.5099

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.
DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK. RENDERUNGEN KOENNEN NUR DURCH RENDERN DES ORTENSATZES ERFOLGEN

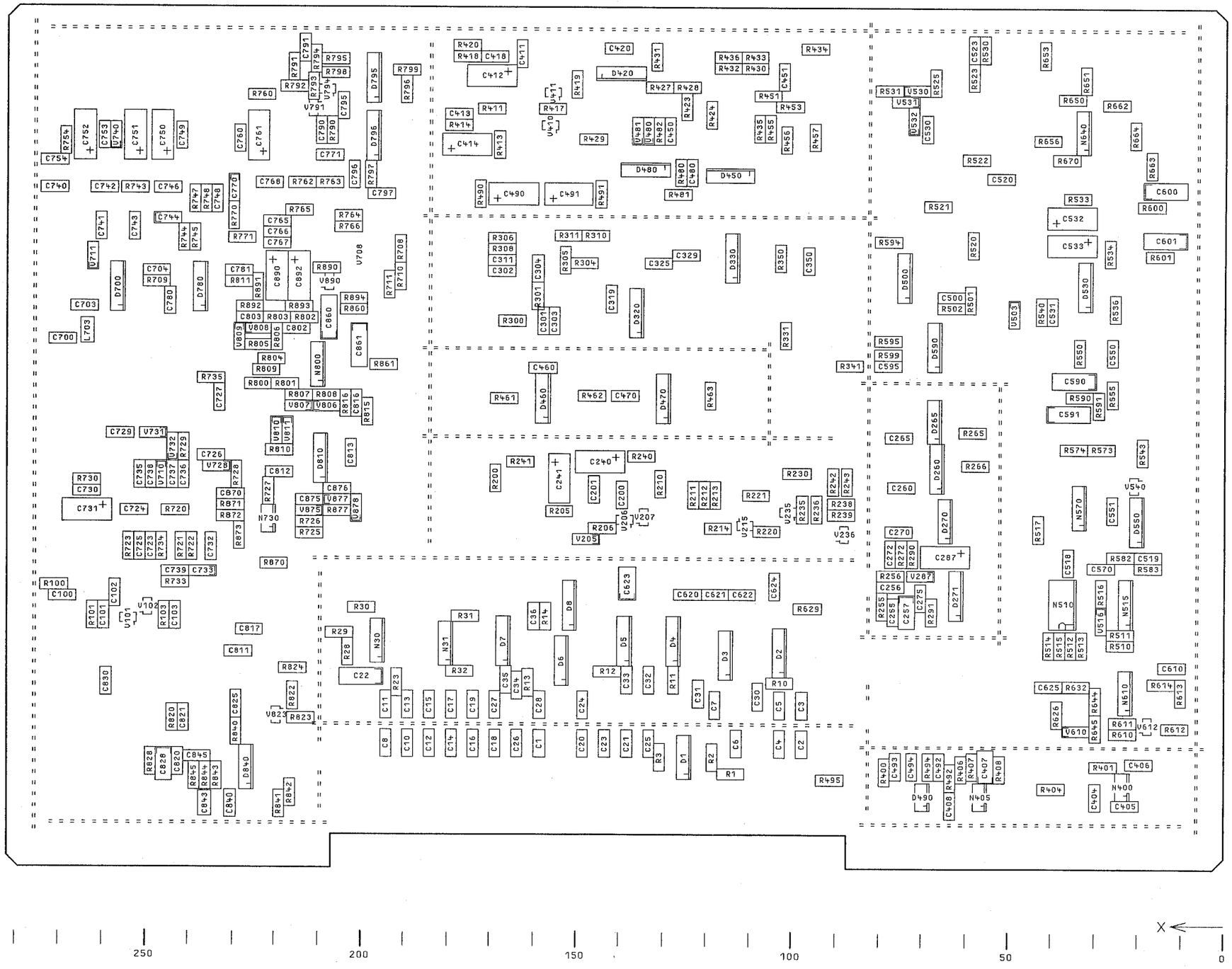


DARSTELLUNG SEITE B
VIEW ON SIDE B

VERKLEINERUNG

07/00	47296	05.92	SO	1KEN	TAG	NAME	BENENNUNG: DETECTOR BOARD 2
				BEARB.		SO	Z
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
05/00	46349	10.91	NG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01 EE
REND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVS30			BLATT-NR. 1+
				REG.I.V. 1010.5001			ERSTE Z. 1010.5099

DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, RENDERUNGEN KOENNEN NUR DURCH RENDERN DES DATENSATZES ERFOLGEN
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR



DARSTELLUNG SEITE A
VIEW ON SIDE A

VERKLEINERUNG

07/00	47296	05.92	SO	ZEICHN.	TAG	NAME	BENENNUNG: DETECTOR BOARD 2 — Z
				BEARB.		SO	
				GEPR.		NG	
				NORM			
				PLOTT	07.05.92		
05/00	46349	10.91	NG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8498.01 EE — BLATT-NR. 2-
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVS30			REG.I.V. 1010.5001 ERSTE Z. 1010.5099

ROHDE&SCHWARZ

SERVICE DOCUMENTS

I/Q Demodulator

1026.9018.02

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7 Testing and Repair of the I/Q Demodulator Module

7.1 Function Description

The I/Q demodulator module accomodates circuits for I/Q demodulation of the 10.7-MHz IF signal provided by the IF selection board and for further processing of the 394.7-MHz IF signal from the UHF Preselector.

It can be subdivided into 5 function blocks:

- The **reference conditioning** block generates the reference signals for the 320-MHz and the 149.4-MHz synthesizers.
- The **320-MHz synthesizer** block contains the 320-MHz VCO, the associate PLL and the LO driver for the 2nd mixer.
- The **149.4-MHz synthesizer** contains the 149.4-MHz VCO and the associate PLL for generation of the LO signal for the I/Q demodulator.
- The **394.7-MHz signal path** block comprises the input lowpass filter, the 2nd mixer and the 2nd IF amplifier, the actual I/Q demodulator, the AGC control as well as the output amplifiers and lowpass filters for the I/Q signals.
- The **I/Q demodulator** group includes the PIN-diode attenuator, the 10,7-MHz/74,7-MHz mixer, the actual I/Q demodulator, the AGC control as well as the output amplifiers and lowpass filters for the I/Q signals.

7.1.1 Reference Conditioning

The 64-MHz reference signal (by the "FRN Synthesizer") is supplied to the I/Q demodulator via the socket X307.

The input amplifier V100 (function block ref buffer 1) decouples the signal and supplies it to the function block power split, where the reference is passed to the function blocks miser and ref buffer 2.

The transistor amplifier V130 amplifies the signal, which is then amplified to AC level in D140A (function block ref divider); subsequently, it is divided to an internal reference frequency of 16 MHz in D160.

The gates D150B and C distribute the 16-MHz reference to the two synthesizers (149.4 MHz and 320 MHz).

7.1.2 149,4-MHz Synthesizer

The VCO designed as Clapp circuit (function block VCO 149.4 MHz) with the transistor V260 oscillates in the specified frequency range. The signal first passes via an isolating stage with the transistor V270 and is then divided and passed to the decoupling amplifier V285 (function block power split) and the lowpass L293 to L297, C293 and C294 (for suppression of unwanted harmonics). The output signal of the lowpass is further processed in the function block IQ demodulator.

The output of the transistor amplifier V285 is applied to the integrated component D200 (function block Ref & LO divider) and divided to an output frequency of 100 kHz.

Both signals are compared in the phase detector D220 (function block phase detector) and are routed via the PLL loop filter N240 (function block loop filter) to a correction signal which is generated in order to reach the rated frequency of the 149.4-MHz VCO.

7.1.3 320-MHz Synthesizer

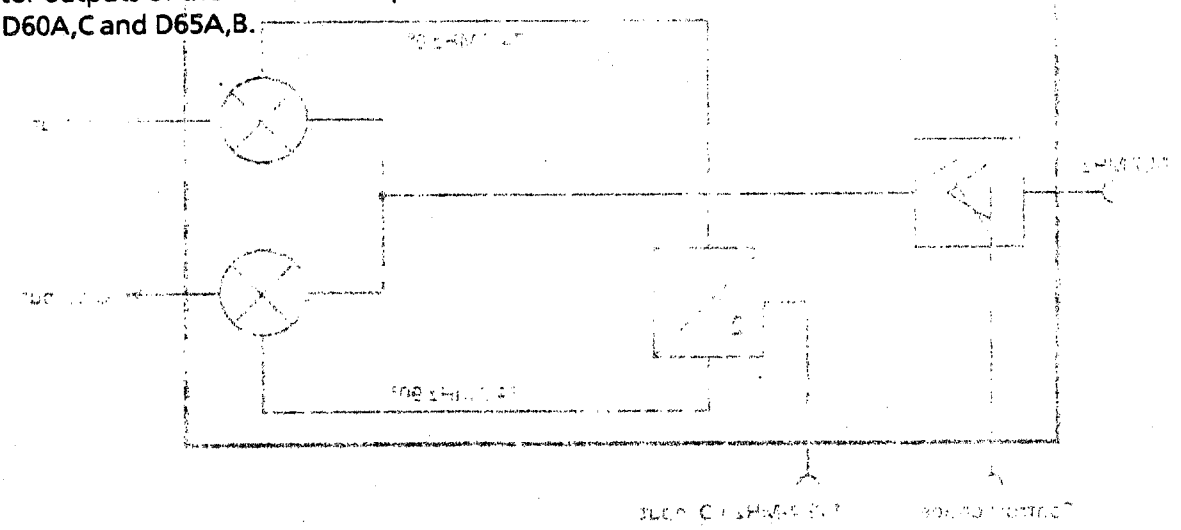
The VCO (function block VCO 320 MHz) with the transistor V455 oscillates in the specified frequency range. The signal is first passed via an isolating stage with the transistor V460 and is then divided and passed via the function block power split to the amplifiers V480 (function block buffer amp) and V471.

The amplifier V471 decouples the signal and passes it on to the 17-dBm mixer B720 (function block 2nd mixer).

The output signal of the transistor amplifier V480 is passed via an attenuator and a lowpass filter to the IC D400 (function block LO divider) and is then divided to a frequency of 80 MHz. After the level has been increased by means of V400 and D432C, the signal is divided to an output frequency of 16 MHz in the component D420A and compared to the reference signal of 16 MHz (of the function block ref divider) in the phase detector D430 (function block phase detector).

The output signals of the phase detector are routed via the PLL loop filter N430 (function block loop filter) for re-adjustment of the 320-MHz VCO to its rated frequency.

The tuning voltages of both synthesizers pass to the window comparators N50A,B/ N50C,D. The open-collector outputs of the window comparators are connected to the lock output signal (X30A11) via the gates D60A,C and D65A,B.



7.1.4 394.7-MHz Signal Path

The 394.7-MHz output signal of the UHF preselector board passes via the 1-GHz stripline lowpass B700 for suppression of harmonics of the 320-MHz LO signal to the input of the 2nd mixer. The high-level diode mixer B720 converts the input signal to the third intermediate frequency 74.7 MHz. Broad-band termination of the IF gate is achieved by the diplexer L730, 731, C730, 731, R730, 731. The 74.7-MHz signal at the output of the diplexer is amplified by the 2nd IF large-signal amplifier V740. The working point of the dual negative feedback amplifier designed as emitter circuit is stabilized by V741. The 2nd IF level detector V770, C771, N770 at the output of the IF amplifier controls the level of the IF signal. Overload of the signal path is recognized by the overload detector N780, V785.

The 74.7-MHz output signal of the 2nd IF amplifier passes via the adjustable attenuator R760 to R763 to the IF output X306 of the module. The amplification of the IF signal can be set by varying the potentiometer R761, in order to compensate for scatterings of the total amplification of the UHF and IF signal processing caused by the components.

If an input frequency ≤ 1 GHz is set on the ESVD, the 394.7-MHz signal path is not used. In this case, the ± 10-V and the 5-V voltage supply for the 304.7-MHz signal path and the 320-MHz frequency conditioning of the supply switch N30, V20, 22, 23, 24 are switched off in order to save current.

7.1.5 I/Q Demodulator

The 10.7-MHz IF signal of the IF selection board, the level of which is controlled by the level detector V520, V521 passes via X303 to the PIN-diode attenuator V511 to V513. The amplifier N500B controls its attenuation in the range between 4 and approx. 37 dB.

The output signal of the attenuator controls the active mixer N530 via X50. It converts the 10.7-MHz signal to the intermediate frequency 74.7 MHz using the 64-MHz LO signal. The subsequent IF filter with a 3-dB bandwidth of 2.6 MHz suppresses the unwanted mixing components and the 64-MHz oscillator signal.

The filtered IF signal is symmetrically injected into the I/Q demodulator circuit D600 via T560. Fig. 7-1 illustrates the block diagram of the component:

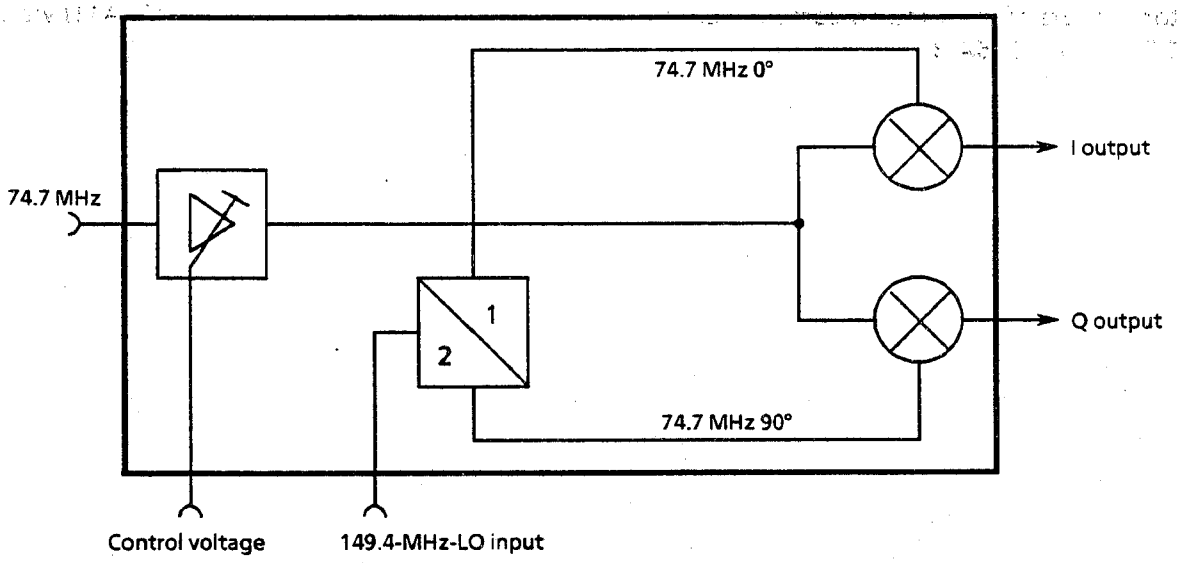


Fig. 7-1 Block diagram of the I/Q-demodulator circuit D600

D600 contains the function blocks mentioned below:

- a tunable IF amplifier with a tuning range of 60 dB,
- the generation of the 74.7-MHz LO signal: two 74.7-MHz LO signals with a phase offset of 90° are generated by division of the 149.4-MHz LO signal,
- the mixers, which down-convert the 74.7-MHz IF signal to 0 Hz with the 74.7-MHz LO signal, thus creating the I and Q signals.

Subsequently, the I-signal and/or the Q-signal are picked off at high impedance at the outputs of D600 and amplified by N610 and N615 and/or N620 and N625. The frequency-dependent phase error is compensated for using C621, the frequency-independent phase error is compensated for using R607. Exact matching of the amplification in the I and Q signal paths is effected using R616. The offset voltages of the operational amplifiers are adjusted using R613 and R623.

The quasi-peak rectifier R640, 641, V640, 641 measures the peak value of the I/Q signal and stores it in the charging capacitor C645. The discharging time constant is determined by R645. The control amplifier N650B taps the detected voltage at C645 at high impedance. Its output voltage is used to adjust the amplification of the AGC amplifier of D600 and the attenuation of the PIN-diode attenuator such that the peak of the I/Q signal is constant. The active lowpass filters N670 and N680 have a 3-dB cutoff frequency of 200 kHz and suppress the broad-band noise of the I/Q demodulator and drive the I/Q outputs X301/X302.

7.2 Test Instruments and Utilities

The test instruments and utilities listed below are required for testing and adjustment of the I/Q demodulator board:

Item	Type of instrument	Required specifications	Suitable instrument	Order No.
1	Signal generator		SMK	
2	Signal generator		SMH	845.4002.52
3	Network analyzer	100 Hz to 100 MHz	e.g. HP 3577 A	
4	Digital voltmeter		UDS5	349.1510.02
5	Network analyzer	1 to 1000 MHz	e.g. HP 8753 B	
6	Spectrum analyzer		FSA	804.8010.52
7	Power splitter		RVZ	800.6612.52
8	Power supply	0 to 20 V	NGT20	117.7133.02
9	Oscilloscope		BOL	374.2000.02

7.3 Troubleshooting

Note: ***Correct functioning of the modules Display Board, Rear Panel, CPU Board, FRN Synthesizer, VHF Preselector, UHF Preselector, 2nd Mixer and IF Selection Board is required for the automatic selftest. For further error localization using external signals, the test functions can be called manually in the Board Test menu (cf. Section 6).***

Removal of the screening covers causes the frequency-determining components of the two synthesizers to be detuned, which is why the "Board Test (test function 0)" for error localization should be performed with screening covers being fixed by screws.

If removal of the screening covers is required for further troubleshooting, L252 and L452 must be readjusted (as described in Section 7.5.1 "Adjustment").

- Call the selftest menu "Board Test" (SF91, 09) for further error localization.
- Select the I/Q demodulator module using the keys ↓ and ↑.
- Enter test function 0. The board test runs.
- If an error message is output, enter the indicated test function and switch over to the test mode by pressing one of the ENTER keys.

The required basic setting for the I/Q demodulator (see below) as well as the basic setting for the respective test function (cf. table 7-1) are set automatically. The measured test voltage is output on the LEVEL display. The permissible tolerance limits are output on the DATA INPUT display.

Further troubleshooting is carried out using the troubleshooting flowcharts. The error messages (ERR:) are used as entry points to the troubleshooting diagrams.

Check the serial interface (cf. Section 6.1.2) using the tables 7-4 and 7-5.

Basic setting:

Frequency:	64,02 MHz
RF attenuation:	0 dB
Mode:	LOW NOISE
Detector:	AV
IF bandwidth:	300 kHz
Preamplifier:	off
Calibration generator:	64 MHz on

Table 7-1 Test function of the I/Q demodulator board test

Test function	Description of the test function	Additional settings of the test receiver	Rated value of the test voltage	Error message (ERR:)
0	complete board test	Test function 1 to 20	Test function 1 to 20	Test function 1 - 20
1	+ 5-V power supply	Measure test point 19	2.1 V to 2.9 V	+ 5V Supply
2	64-MHz level at X307	Measure test point 7	>0.3 V	X307 Level
3	64-MHz LO level	Measure test point 12	>0.15 V	64M LO Level
4	Level of the 16-MHz reference	Measure test point 6	>3 V	16M Ref Level
5	Tuning voltage of the 149.4-MHz VCO	Measure test point 0	1.0 V to 3.6 V	149.4M Loop
6	Lock detector of the 149.4-MHz PLL	Measure test point 4	>2 V	149.4M LO unlock
7	149.4-MHz LO Level	Measure test point 2	>0.7 V	149.4M LO Level
8	Supply Switch + 5 V	Switch on UHF range Measure test point 16	2.1 V to 2.9 V	Supply Switch
9	Supply Switch + 10 V	Switch on UHF range Measure test point 17	2.1 V to 2.9 V	Supply Switch
10	Supply Switch – 10 V	Switch on UHF range Measure test point 18	2.0 V to 2.8 V	Supply Switch
11	Tuning voltage of the 320-MHz VCO	Set f = 2 GHz Wait for 0.5 s Measure test point 3	1.0 V to 3.6 V	320M Loop
12	Lock detector of the 320-MHz PLL	Set f = 2 GHz Wait for 0.5 s Measure test point 1	>2 V	320M LO unlock
13	320-MHz-LO Level	Set f = 2 GHz Wait for 0.5 s Measure test point 3	>0.7 V	320M LO Level
14	10.7-MHz level at X303	Measure test point 10	0.12 V to 5 V	X303 Level
15	Reference voltage of the AGC	Measure test point 13	0.8 V to 1.4 V	I/Q Demod AGC
16	Control voltage of the AGC with 0 dB RF attenuation	Measure test point 11	1.9 V to 3.1 V	I/Q Demod AGC
17	Control voltage of the AGC with 40 dB RF attenuation	Switch RF attenuation to 40 dB Measure test point 11	3 V to 5 V	I/Q Demod AGC
18	Voltage level at the Q-output X302	Measure test point 14	1.5 V to 2.5 V	X302 Level
19	Voltage level at the I-output X301	Measure test point 15	1.5 V to 2.5 V	X301 Level
20	Operating point of the 2nd IF amplifier	Switch on UHF range Measure test point 9	1.95 V to 4 V	2nd IF Amp Bias

7.3.1 Troubleshooting Flowcharts

Test setup for troubleshooting:

- Remove both RF covers.
- Plug the module into the service kit.
- Connect the module to the test receiver via the RF cables

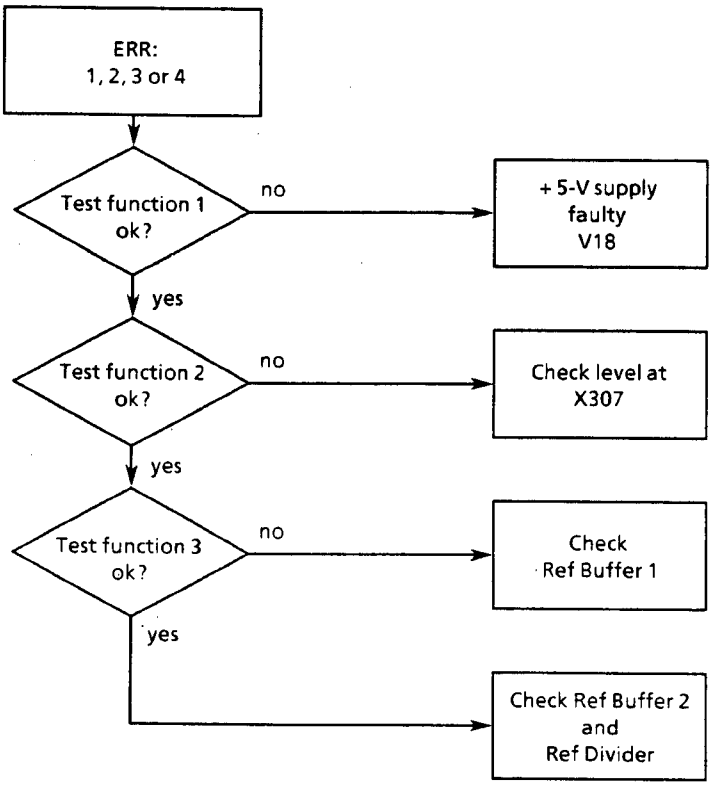


Fig. 7-2 Troubleshooting flowchart for reference conditioning

Error messages during board test, ERR: 5, 6, 7

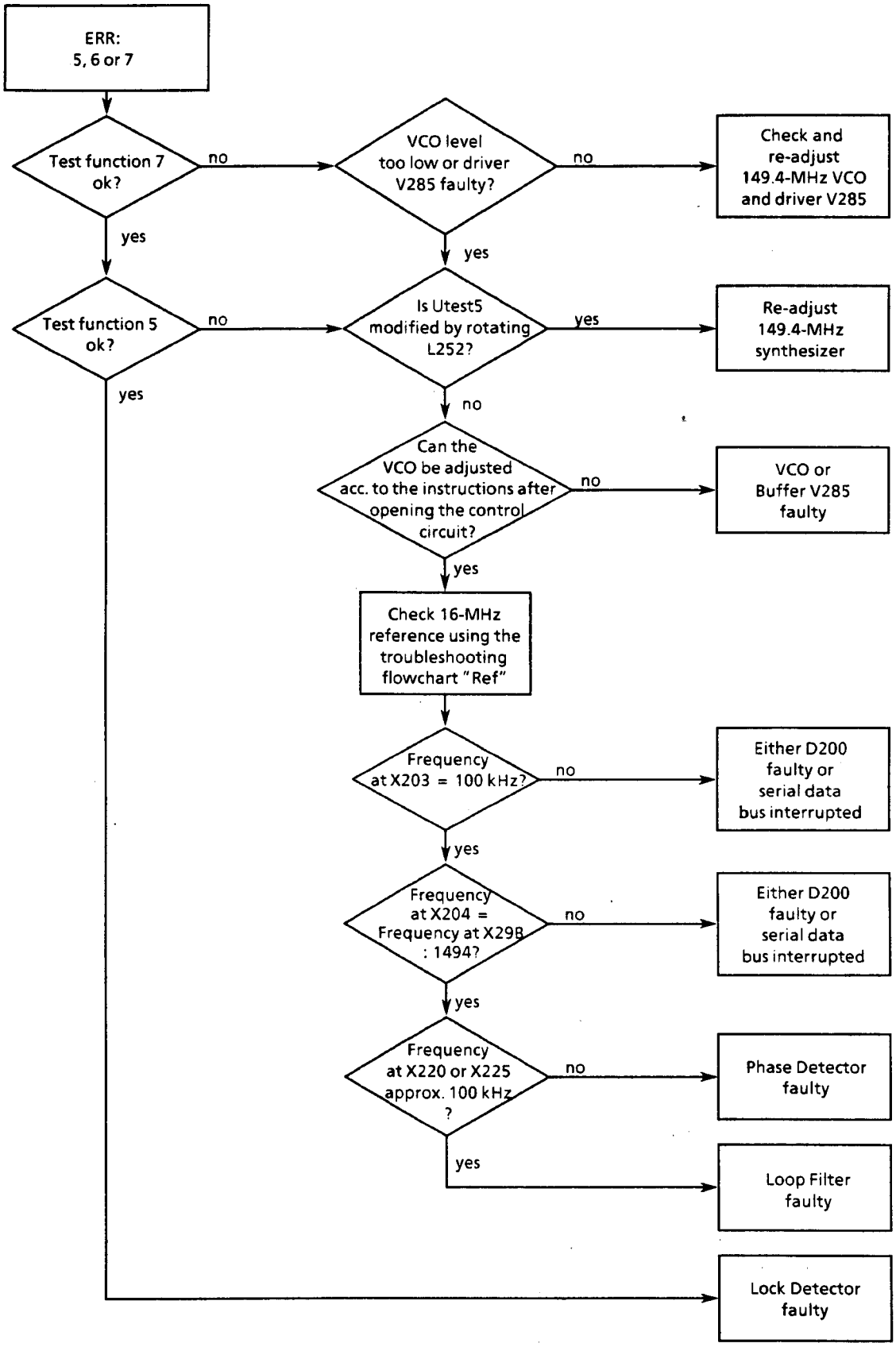


Fig. 7-3 Troubleshooting flowchart for 149.4-MHz synthesizer

Error messages during board test, ERR: 8, 9, 10, 11, 12, 13

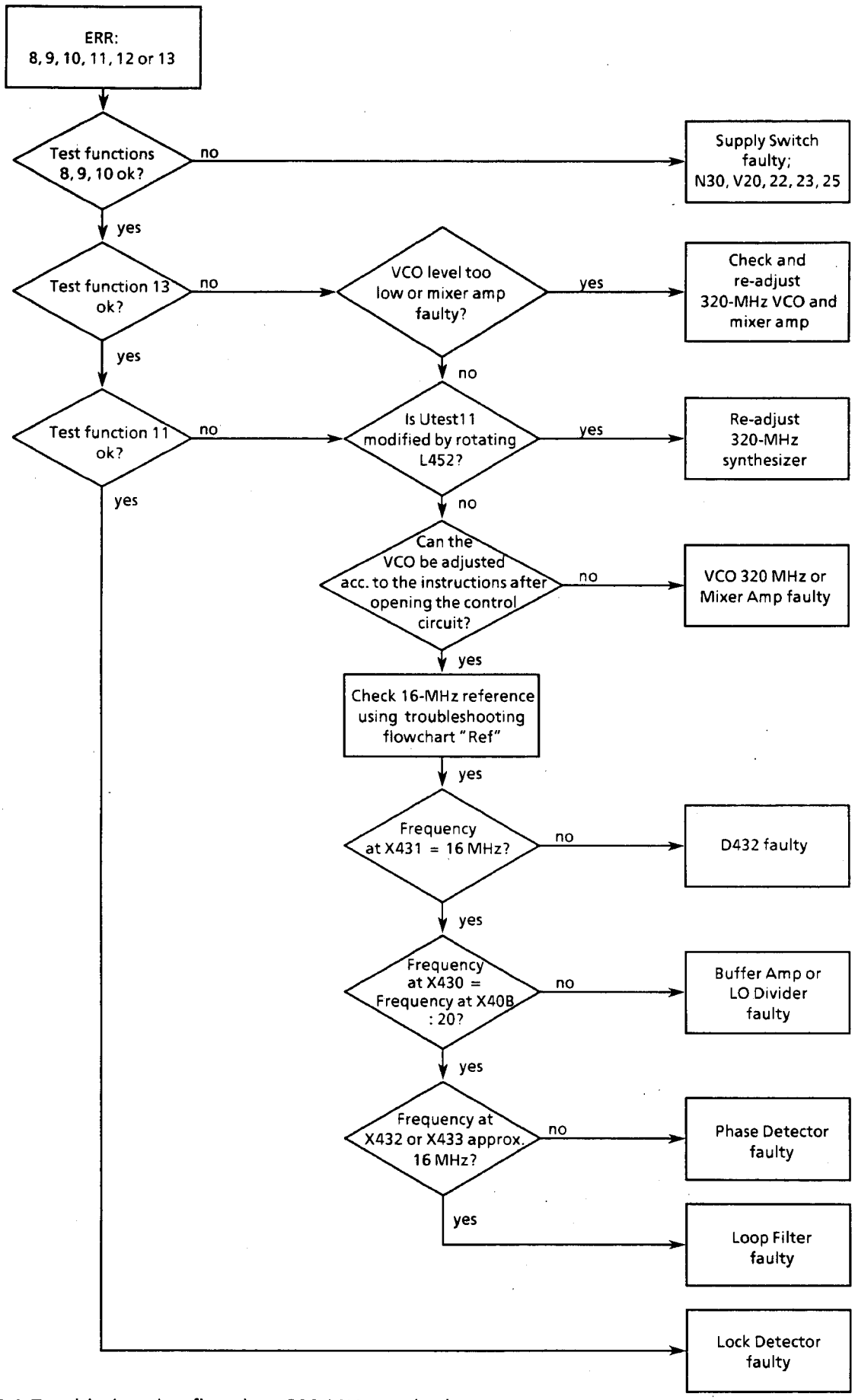


Fig. 7-4 Troubleshooting flowchart 320-MHz synthesizer

Error messages during board test, ERR: 14, 15, 16, 17, 18, 19

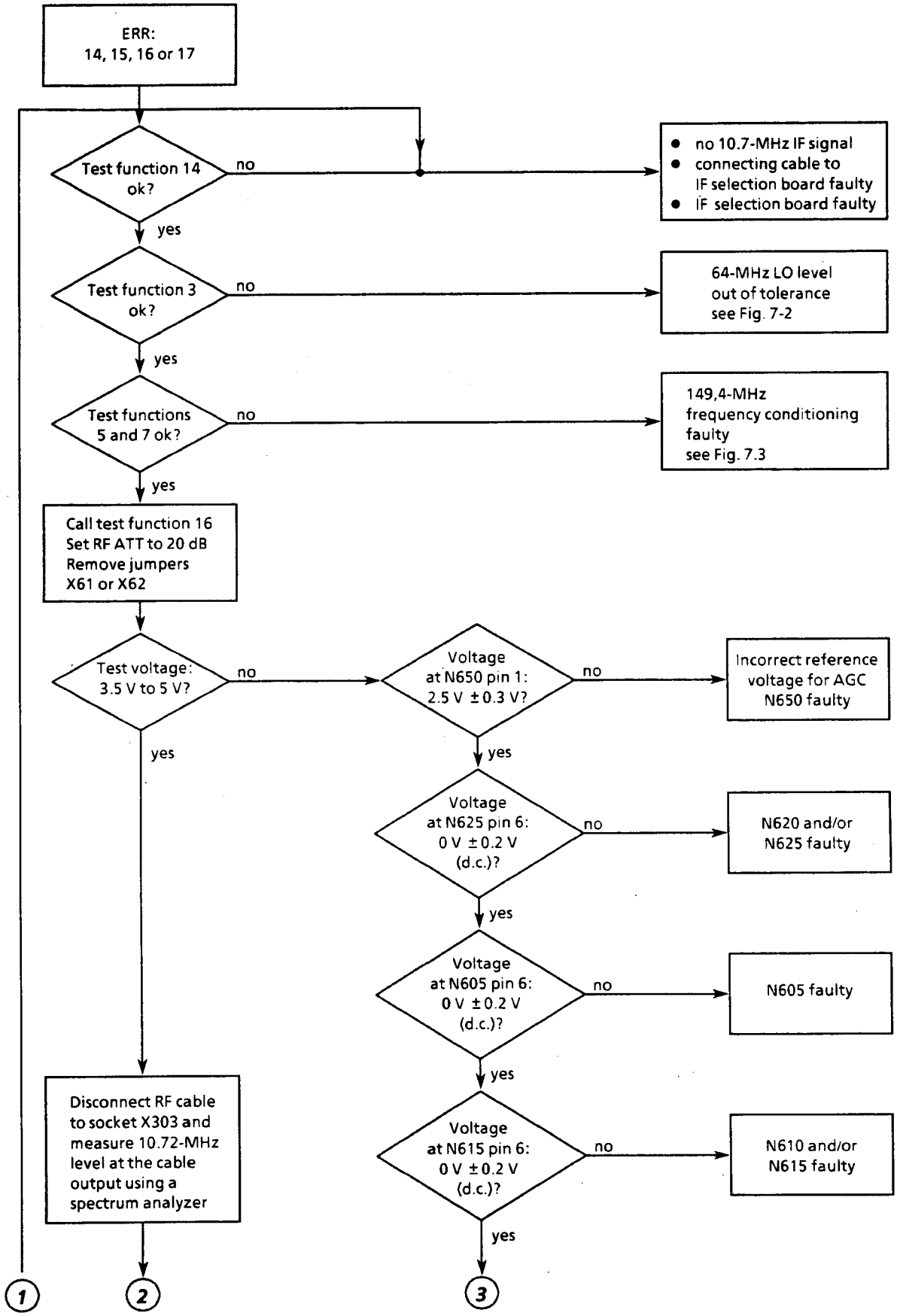


Fig. 7-5a Troubleshooting flowchart for I/Q demodulator

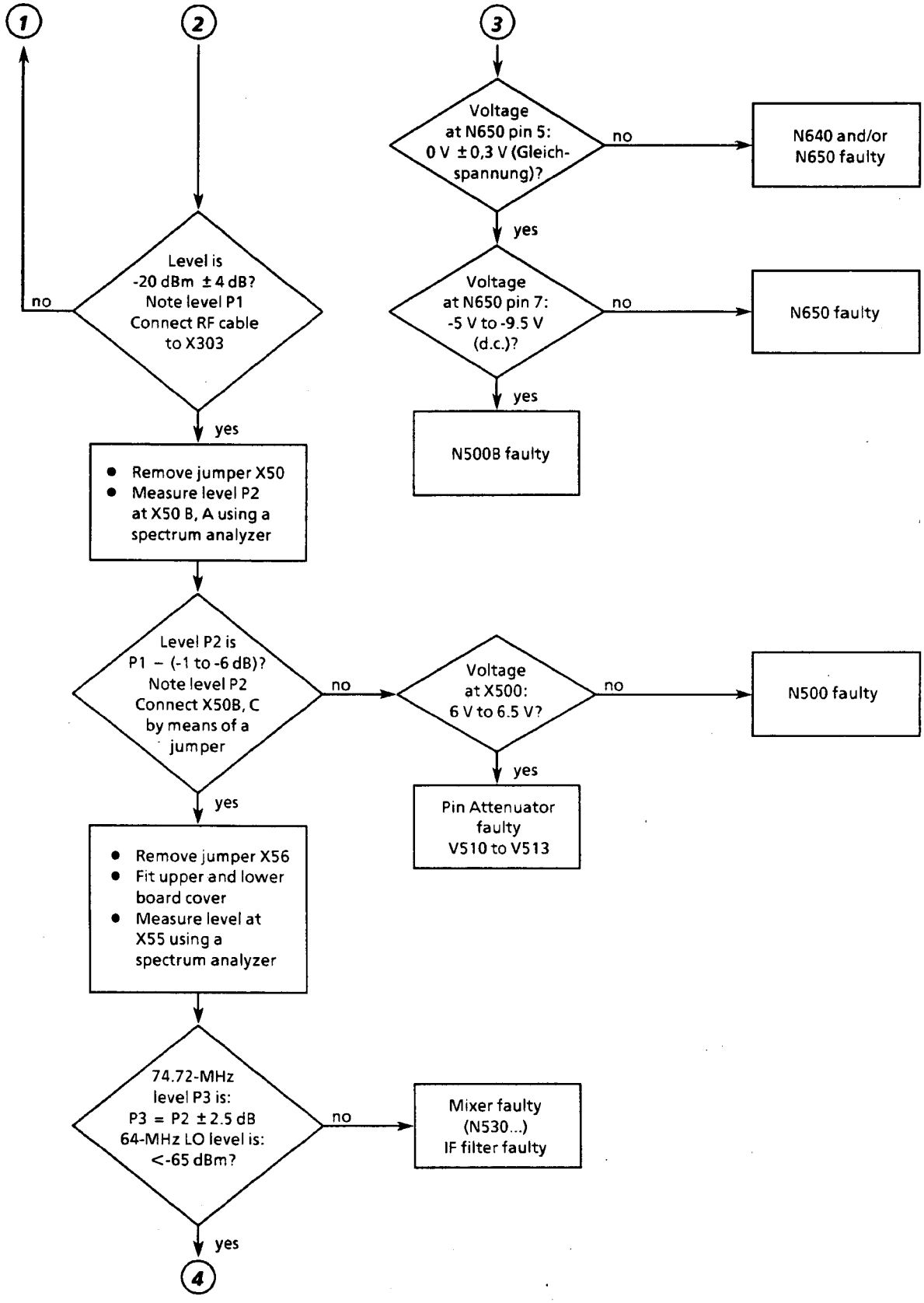


Fig. 7-5b Troubleshooting flowchart for I/Q demodulator (continuation)

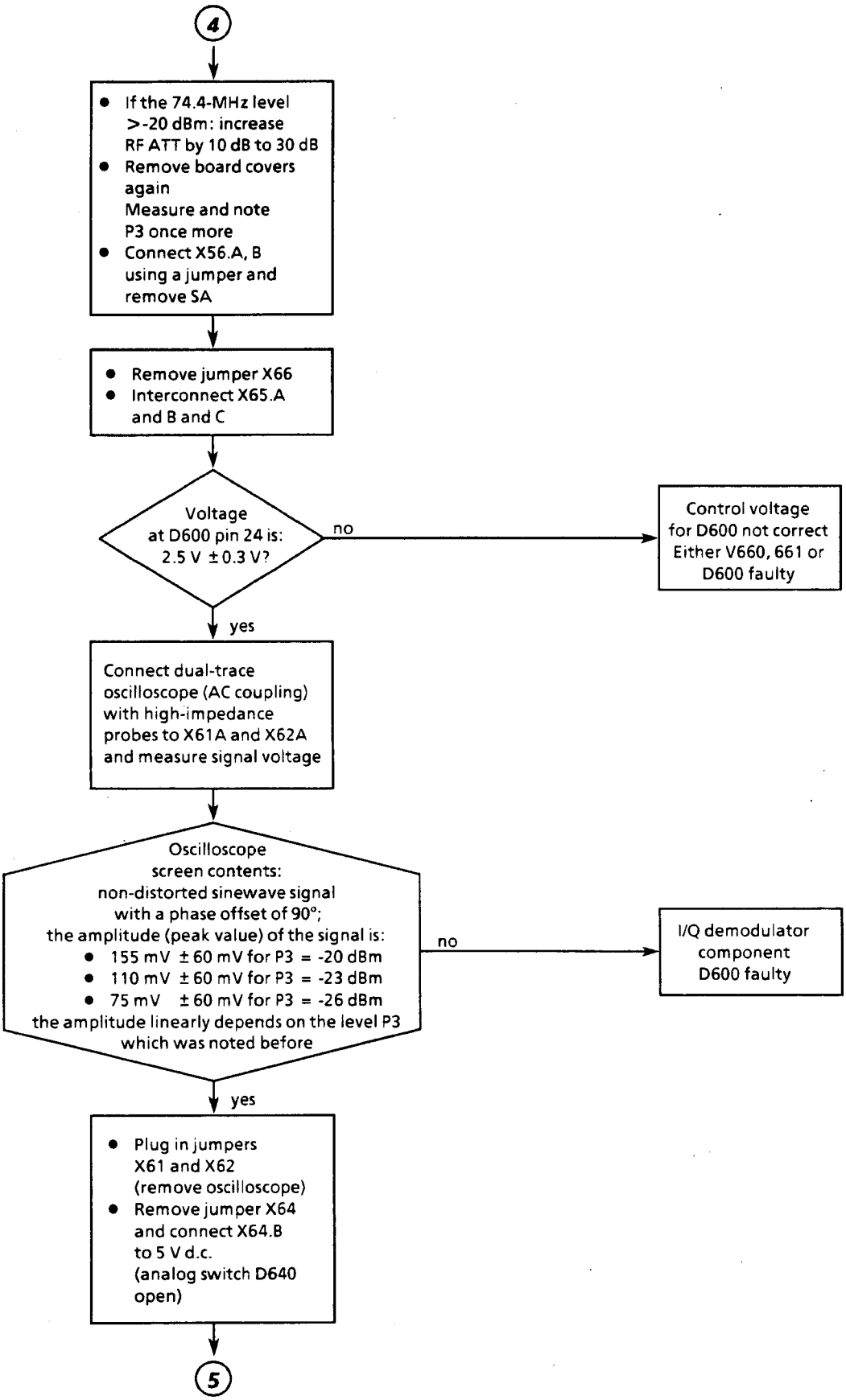


Fig. 7-5c Troubleshooting flowchart for I/Q demodulator (continuation)

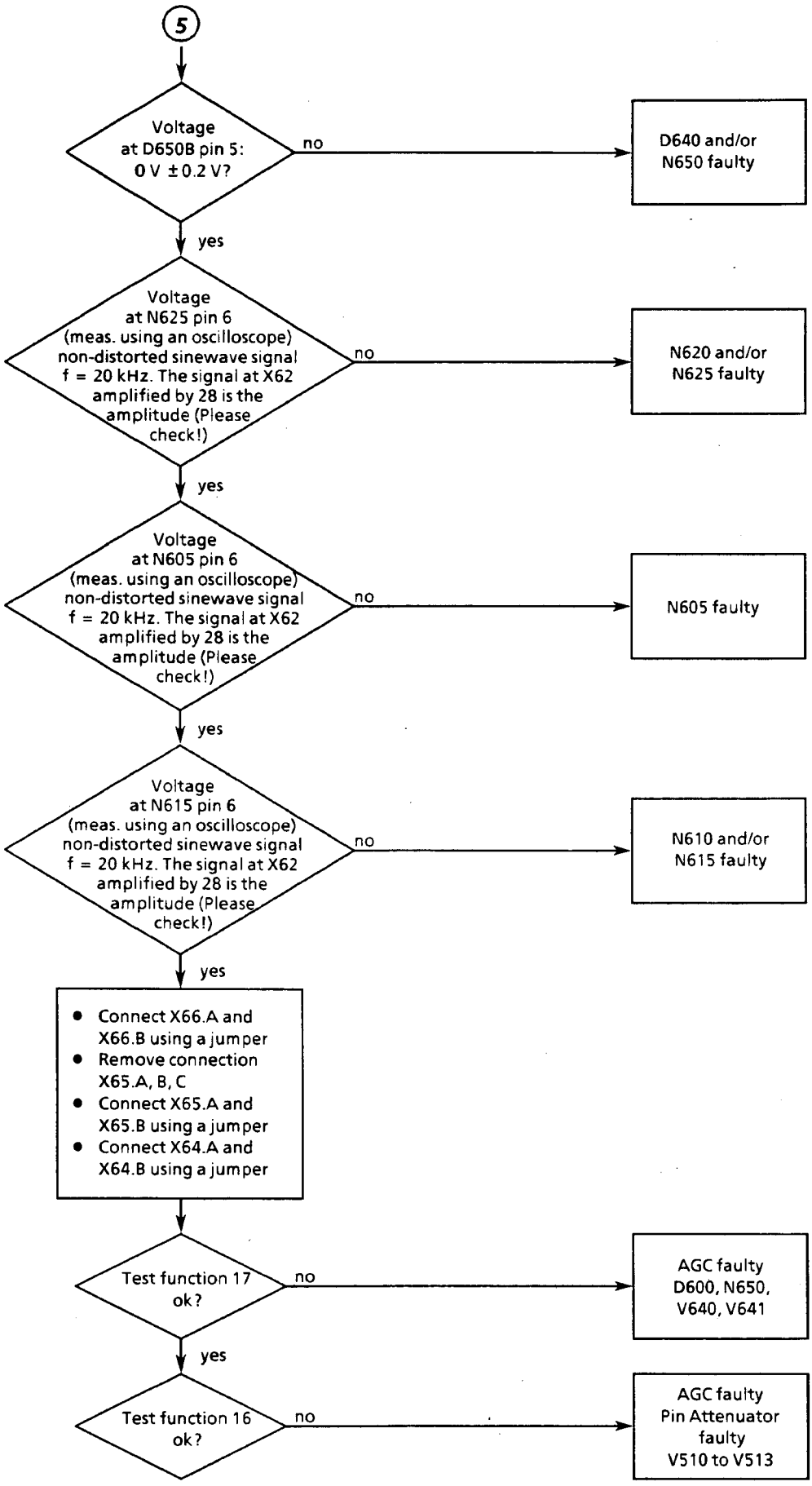
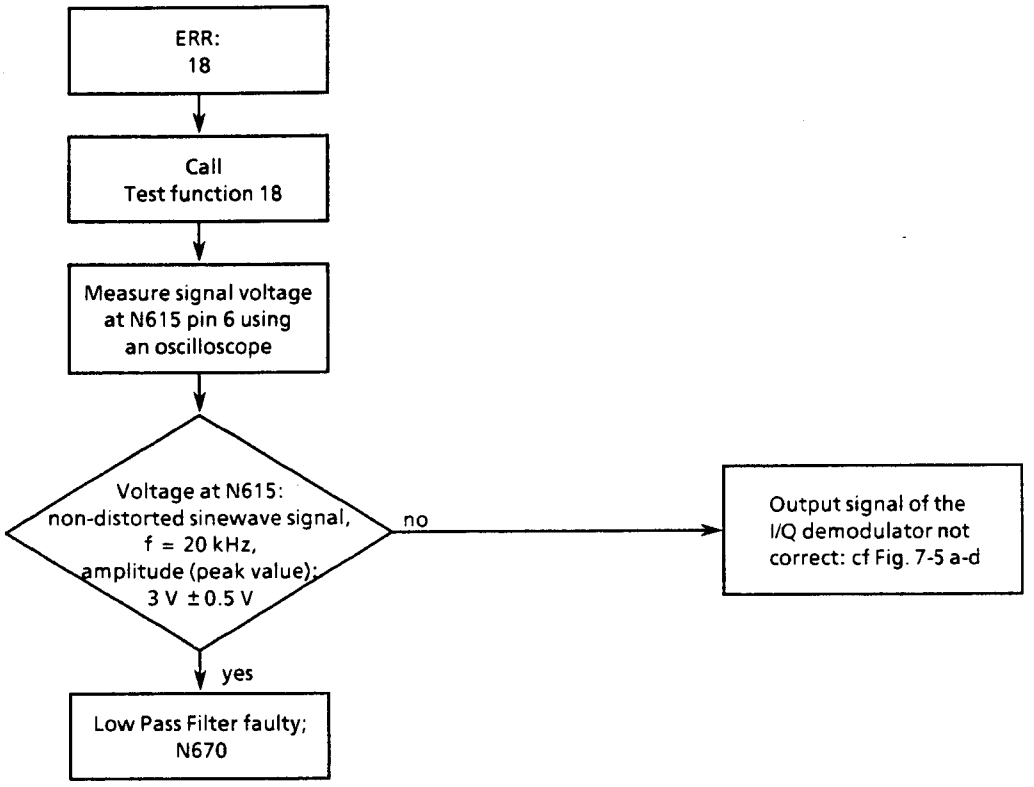


Fig. 7-5d Troubleshooting flowchart I/Q demodulator (continuation)



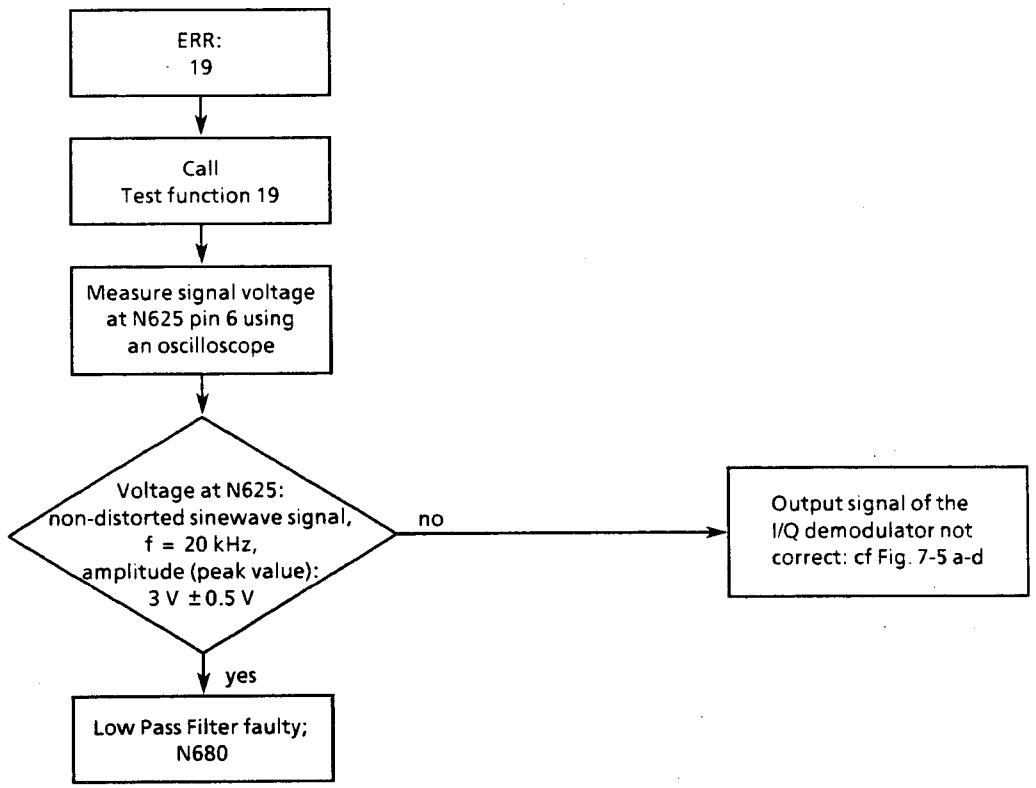


Fig. 7-5e Troubleshooting diagram for I/Q demodulator (continuation)

Error messages during board test, ERR: 20

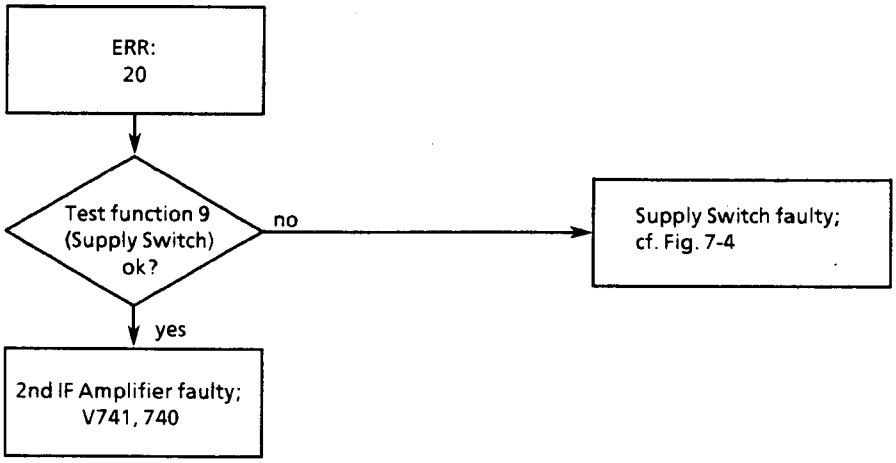
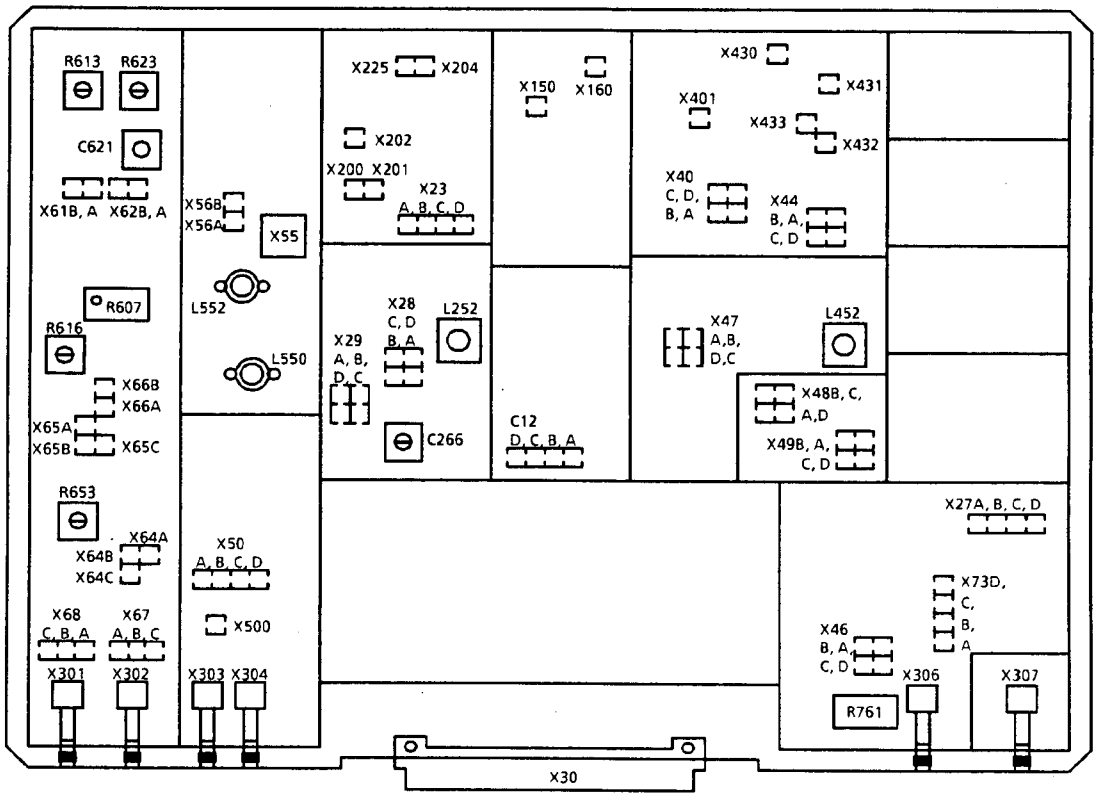


Fig. 7-6 Troubleshooting flowchart for 394.7-MHz signal path

7.4 Testing and Adjustment

- Operate the board outside the instrument by connecting it to the service kit.
- Connect FRN synthesizers X167 and X307 using an RF cable.
- Unscrew the RF cover on the component side.
- Switch on test receiver.

7.4.1 Location of Jumpers, Test Points and Adjusting Elements



7.4.2 Power Supply

The supply voltages must be measured on the adapter of the board and not on the power supply unit (e.g. + 10 V at X30AC4).

Testing the supply voltages:

+ 10 V ± 50 mV max. 450 mA
− 10 V ± 50 mV max. 250 mA
+ 5,4 V ± 100 mV max. 300 mA

- Call test function 1 of the board test
  The test voltage is ..... 2.5 V ± 0.4 V

Testing the supply switch:

- Call test function 8 of the board test
  The test voltage is ..... 2.5 V ± 0.4 V
- Call test function 9 of the board test
  The test voltage is ..... 2.5 V ± 0.4 V
- Call test function 10 of the board test
  The test voltage is ..... 2.4 V ± 0.4 V

7.4.3 Testing and Adjustment of Frequency Conditioning

7.4.3.1 Testing the reference conditioning

- Remove jumper X12
- Connect spectrum analyzer to X12B,A (ground),
  the 64-MHz level at X12 is: ..... -7 dBm ± 1 dBm
- Connect X12.B,C again using a jumper
- Call test function 2 of the board test,
  the test voltage is: ..... >0.45 V
- Call test function 3 of the board test,
  the test voltage is: ..... >0.3 V
- Call test function 4 of the board test,
  the test voltage is: ..... >3 V

7.4.3.2 Testing and Adjustment of the 149.4-MHz Synthesizer

- Remove jumper X29
- Connect spectrum analyzer to X29.B,A (ground)
- Remove jumper X23
- Apply 4 V ± 0.1 V from a power supply to X23.C,D
- Settings on the spectrum analyzer:
  Center Freq.: ..... 149.4 MHz
  Span: ..... 1 MHz
- Adjust L252 such that the frequency at X29.B,A is 149.4 MHz ± 0.1 MHz
- Adjust C266 such that the 149.4-MHz level at X29 is -17 dBm ± 1 dBm
- Call test function 7 of the board test
  The test voltage is: ..... > 0.8 V
- Connect X23.B,C using a jumper
- Call test function 5 of the board test
- Adjust L252 such that the test voltage is 2 V ± 0.1 V
  The frequency at X29 is: ..... 149.4 MHz
- Measure level of the secondary lines with 149.3 MHz and 149.5 MHz
  The level of the secondary lines is: ..... < 70 dBc
- Connect X29.B,C by a jumper

7.4.3.3 Testing and Adjustment of the 320-MHz Synthesizer

- Call test function 11 of the board test
- Remove jumper X49
- Connect spectrum analyzer to X49.B,A (ground)
- Remove jumper X44
- Apply 4 V ± 0.1 V from a power supply to X44.C,D (ground)
- Settings on the spectrum analyzer:
  Center Freq.: ..... 320 MHz
  Span: ..... 5 MHz
- Adjust L452 such that the frequency at X49 is 320 MHz ± 0.2 MHz
  The 320-MHz level at X49 is: ..... > 16 dBm
- Call test function 13 of the board test
  The test voltage is: ..... > 0.8 V
- Connect X44.B,C by means of a jumper
- Call test function 11 of the board test
- Adjust L452 such that the test voltage is 2 V ± 0.1 V
  The frequency at X49 is: ..... 320 MHz ± 0.01 MHz
- Connect X49.B,C using a jumper

7.4.4 Testing the LOCK detector

7.4.4.1 Testing the LOCK detector of the 149.4-MHz Synthesizer

- Remove jumper X23
- Measure the voltage at X30.A11 (LOCK) using a digital voltmeter

- Apply 4 V ± 0.1 V provided by a power supply to X23.C,D (ground)
- Call test function 5 of the board test
  The test voltage is: ..... 2 V ± 0.1 V
- Call test function 6 of the board test
  The test voltage is: ..... >2 V
  The voltage at X30.A11 is: ..... >2 V

- Apply 8 V ± 0.1 V from a power supply to X23.C,D
- Call test function 5 of the board test
  The test voltage is: ..... >3.5 V
- Call test function 6 of the board test
  The test voltage is: ..... <0.5 V
  The voltage at X30.A11 is: ..... <0.5 V

- Apply 1 V ± 0.1 V from a power supply to X23.C,D
- Call test function 5 of the board test
  The test voltage is: ..... 0.5 V ± 0.1 V
- Call test function 6 of the board test
  The test voltage is: ..... <0.5 V
  The voltage at X30.A11 is: ..... <0.5 V

- Connect X23.B,C by means of a jumper

7.4.4.2 Testing the LOCK Detector of the 320-MHz Synthesizer

- Remove jumper X44
- Measure the voltage at X30.A11 (LOCK) using a digital voltmeter

- Apply 4 V ± 0.1 V from a power supply to X44.C,D (ground)
- Call test function 11 of the board test
  The test voltage is: ..... 2 V ± 0.1 V
- Call test function 12 of the board test
  The test voltage is: ..... >2 V
  The voltage at X30.A11 is: ..... >2 V

- Apply 8 V ± 0.1 V provided by a power supply to X44.C,D (ground)
- Call test function 11 of the board test
  The test voltage is: ..... >3.5 V
- Call test function 12 of the board test
  The test voltage is: ..... <0.5 V
  The voltage at X30.A11 is: ..... <0.5 V

- Apply 1 V ± 0.1 V from a power supply to X44.C,D (ground)
- Call test function 11 of the board test
  The test voltage is: ..... 0.5 V ± 0.1 V
- Call test function 12 of the board test
  The test voltage is: ..... <0.5 V
  The voltage at X30.A11 is: ..... <0.5 V
- Call test function 5 of the board test
  The voltage at X30.A11 is: ..... >2 V
- Connect X44.B,C using a jumper

7.4.5 Testing and Adjustment of the I/Q Demodulator Unit

Test setup:

Adjustment of the I/Q demodulator unit requires the chamber containing the IF filter to be covered by a screening cover also from the component side. The cover may only have openings for adjustment of the coils L550 to 552 and for connection of X55 and it must be tightly closed with the screening panel of the IF filter (good ground contact).

7.4.5.1 Testing and Adjustment of the Active Mixer and the IF Filter

- Remove jumper X50
- Connect signal generator to X50.C,D (ground)
- Setting of the signal generator:
  Frequency: ..... 10.7 MHz
  Level: ..... -20 dBm
- Remove jumper X56 and subsequently fix screening cover (see above)
- Connect input of the spectrum analyzer (SA) to X55 using a screened coaxial test lead
- Set center frequency of the SA to 74.7 MHz
- Adjust 74.7 MHz level to maximum using L550 and L552
- Set center freq. of the SA to 64 MHz
- Adjust 64-MHz level to minimum using L551
  The 64-MHz level at X55 is: ..... <-85 dBm
- Set center freq. of the SA to 74.7 MHz
- Set span of the SA to 1 MHz

- Adjust 74.7-MHż level again to maximum using L550 and L552
  The 74.7-MHz level at X55 is: ..... -20 dBm ± 1,5 dBm
- Set frequency of the signal generator to 11 MHz
  The 75-MHz level at X55 is: ..... -20 dBm ± 2 dB
- Set frequency of the signal generator to 10.4 MHz
  The 74.4-MHz level at X55 is ..... -20 dBm ± 2 dB
- Connect X50.B,C using a jumper
- Remove SA, test lead and screening cover
- Connect X56.A,B using a jumper
- Fix screening cover again for further adjustment

7.4.5.2 Adjustment of the Offset Voltages of the I/Q Amplifiers

- Remove jumpers X61 and X62
- Measure the voltage at X65.A by means of a digital voltmeter and adjust to 0 V ± 5 mV using R613
- Measure the voltage at X68.A by means of a digital voltmeter and adjust to 0 V ± 5 mV using R623
- Connect X61.A,B again using a jumper
- Connect X62.A,B again using a jumper

7.4.5.3 Testing and Adjustment of the Amplitude and Phase Errors of the I/Q Demodulator

A network analyzer is used for measuring the magnitude and amplitude errors between the I and Q outputs.

Prior to adjustment, the signal generator and the network analyzer must be synchronized with the test receiver. This is achieved by connecting the 10-MHz reference output of the receiver to the reference inputs of the signal generator and the network analyzer.

Since the phase accuracy of the network analyzer changes according to changes of the operating time, a warm-up period of the instrument (> 1 h) is required before calibration of the test setup! Besides, calibration should be checked several times.

- Presetting of the network analyzer:
  Center Freq.: ..... 20 kHz
  Span: ..... 10 Hz
  Res. Bw.: ..... 10 Hz
  Sweep Time: ..... 5 s

  Channel 1:
  Input: ..... A/R
  Display Function: ..... Log. Magnitude
  Scale: ..... 1 dB/Div.

  Channel 2:
  Input: ..... A/R
  Display Function: ..... Phase
  Scale: ..... 1 Deg./Div.

Calibration of the test setup:

- Connect the output of the signal generator to the input of the power splitter
- Connect the outputs of the power splitter to the A and R input of the network analyzer using two coaxial cables of the same length
- Setting of the signal generator:
  Frequency: ..... 60 kHz
  Level: ..... 0 dBm
- Set center freq. of the network analyzer to 60 kHz
- Calibrate channel 1 of the network analyzer to 0 dB
- Calibrate channel 2 of the network analyzer to 0 deg

Test setup:

- Remove jumper X50
- Set output level of the signal generator to -30 dBm
- Connect signal generator to X50.C,D (ground)
- Connect X67.B,C using a jumper
- Connect X68.B,C using a jumper
- Connect the A-input of the network analyzer to X301
- Connect the R-input of the network analyzer to X302
  (the connecting cables to the network analyzer should have the same length)
- Connect X65.B,C using a jumper

Measurement:

steps a) and b) described below should be repeated until the subsequent tolerances are kept to:

Step a) $\phi < 0.2$ deg, $\Delta dB < 0.1$ dB
Step b) $\phi < 1$ deg

Step a):

- Set frequency of the signal generator to 10.72 MHz
- Set center freq. of the network analyzer to 20 kHz
- Adjust phase difference between the I-signal and the Q-signal to -90 deg ± 0.1 deg using R607
- Adjust the magnitude difference between the I-signal and the Q-signal to 0 to 0.05 dB using R616
- Set frequency of the signal generator to 10.680 MHz
- Measure phase difference $\phi 1$
- Measure magnitude difference $\Delta dB1$
- Set phase difference to the subsequent value using R607: $\phi = (90 + \phi 1)/2$
- Note ϕ
- Set magnitude difference to the subsequent value using R616: $\Delta dB = (\Delta dB1)/2$
- Note ΔdB

Step b):

- Set frequency of the signal generator to 10.8 MHz
- Set center freq. of the network analyzer to 100 kHz
- Measure phase difference $\phi 0$
- Set frequency of the signal generator to 10.6 MHz
- Measure phase difference$\phi 1$
- Set phase difference to the subsequent value using C621: $\phi = \phi 1 + (-\phi 0 - \phi 1)/2$

- Subsequent to adjustment, connect X65.A,B and X50.C,B via jumpers.

7.4.5.4 Checking the AGC of the I/Q Demodulator

Test setup:

- Connect signal generator to X303
- Set output level of the signal generator to 13 dBm
- Set frequency of the signal generator to 10.72 MHz
- Connect X67.B,C via jumper
- Connect X68.B,C via jumper
- Connect A-input of the network analyzer to X301
- Connect R-input of the network analyzer to X302
  (the connecting cables to the network analyzer should have the same length)
- Setting of the network analyzer see 7.4.5.3.

Measurement:

- Set the level of the signal generator to 2 dBm
- Call test function 14 of the board test
  The test voltage is: ..... 0.7 V to 1.4 V
- Call test function 15 of the board test
- The test voltage is ..... 1.25 V ± 50 mV
- Set the level of the signal generator to 13 dBm
- Measure the voltage at X67.A using an oscilloscope
- Voltage at X67: ..... non-distorted sinewave signal, f = 20 kHz, U_s = 2.8 V ± 0.1 V
- Call test function 18 of the board test
  The test voltage is: ..... 2.15 V ± 0.3 V
- Measure the voltage at X68.A using an oscilloscope
- Voltage at X68: ..... non-distorted sinewave signal, f = 20 kHz, U_s = 2.8 V ± 0.1 V
- Call test function 19 of the board test
  The test voltage is: ..... 2.15 V ± 0.3 V

- Connect oscilloscope to X30.A9
- Call test function 16 of the board test
- Set center freq. of the network analyzer to 20 kHz
- Set level of the signal generator according to table 7-2 and check the phase and amplitude differences between the I and the Q-signal and check the test voltage (test function 16 and oscilloscope)

Table 7-2

Signal generator level	Level difference	Amplitude difference	Test voltage
+ 19 dBm	– 90 ± 0.3 deg	0 ± 0.2 dB	< 2 V, d.c.
+ 13 dBm	– 90 ± 0.2 deg	0 ± 0.15 dB	< 2 V, d.c.
– 27 dBm	– 90 ± 0.2 deg	0 ± 0.15 dB	---
– 37 dBm	– 90 ± 0.3 deg	0 ± 0.2 dB	> 3.5 V, d.c.
– 47 dBm	– 90 ± 0.3 deg	0 ± 0.2 dB	> 3.5 V, d.c.
– 67 dBm	– 90 ± 1.8 deg	0 ± 0.3 dB	> 3.5 V, d.c.
– 87 dBm	– 90 ± 3.0 deg	0 ± 0.4 dB	> 3.5 V, d.c.

- Set the level of the signal generator to -10 dBm
- Set the frequency of the signal generator to 10.71 MHz
- Set the center freq. of the network analyzer to 10 kHz
- Measure the voltage at X67.A using an oscilloscope
- Voltage at X67: ..... non-distorted sinewave signal, f = 10 kHz, U_s = 2.8 V ± 0.2 V
- Connect X64.B,C by means of a jumper
- Apply X30.A14 to + 5 V potential
- Voltage at X67: ..... square-wave signal, f = 10 kHz, U_s > 6 V
- Connect X64.A,B again by means of a jumper
- Set the center freq. of the network analyzer f and the signal generator frequency f0 = 10.7 MHz + f according to the table below and check the phase and amplitude differences between the I and the Q-signal

Table 7-3

f	Level difference	Amplitude difference
10 kHz	– 90 ± 0.4 deg	0 ± 0.15 dB
20 kHz	– 90 ± 0.2 deg	0 ± 0.15 dB
50 kHz	– 90 ± 0.4 deg	0 ± 0.30 dB
80 kHz	– 90 ± 0.7 deg	0 ± 0.40 dB
100 kHz	– 90 ± 1.0 deg	0 ± 0.50 dB
150 kHz	– 90 ± 2.0 deg	0 ± 0.60 dB
200 kHz	– 90 ± 3.0 deg	0 ± 0.70 dB

- Connect X67.A,B using a jumper
- Connect X68.A,B using a jumper

7.4.6 Checking the 394.7-MHz Signal Path

7.4.6.1 Checking the Separating Filter, the 2nd IF Amplifier and IF Gain Adjust

- Setting the network analyzer:
  Start Freq.: ..... 1 MHz
  Stop Freq.: ..... 1 GHz
  Power: ..... -10 dBm
  Log. Sweep

  Channel 1:
  s11 measurement
  Scaling ..... 10 dB/Div

  Channel 2:
  s21 measurement
  Scaling ..... 1 dB/Div

- Calibrate network analyzer

Test setup:

- Remove jumper X72
- Connect output of the network analyzer to X72.C,D (ground)
- Connect input of the network analyzer to X306

Measurement:

- Call test function 20 of the board test
  The test voltage is: ..... 2,9 V ± 0,3 V
- Set R761 to centre position
- s11 is: ..... > 18 dB in the frequency range 1 MHz to 1 GHz
- Measure s21 at 74.7 MHz
- Set s21 between -2 dB and + 2 dB using R761
- Set s21 to 0 dB using R761
- Remove network analyzer and connect X72.B,C using a jumper

7.4.6.2 Checking the Lowpass and the 2nd Mixer

Test setup:

- Call test function 20 of the board test
- Connect signal generator to X304
- Setting of the signal generator:
  Frequency: ..... 394.7 MHz
  Output level: ..... -10 dBm
- Connect spectrum analyzer to X306

Measurement:

- The 74.7-MHz level at X306 is: ..... - 17 dBm ± 1 dB

7.4.6.3 Checking the Level Detector and the Overload Detector

- Test setup as described under 7.4.6.2
- Measure voltage at X30C9 using a dvm
- Set level of the signal generator to + 0.7 dBm
- Voltage at X30C9 ..... >4 V
- Increase the output level of the signal generator to 6.7 dBm in steps of 1 dB
- Voltage at X30C9 ..... >4 V
- Set output level of the signal generator to + 9.7 dBm
- Voltage at X30C9 ..... <1 V

7.5 Final Check

7.5.1 Final Adjustment of the Frequency Conditionings

After re-assembly of the module, the frequency conditioning oscillators must be adjusted once again.

Test setup:

- Fit upper and lower board covers
- Plug the board onto the service kit
- Connect the module to the test receiver via the RF cable

Adjustment:

- Call test function 5 (board test I/Q demodulator)
- Adjust L252 such that the test voltage is 2 V ± 0.1 V
- Call test function 11 of the board test
- Adjust L452 such that the test voltage is 2 V ± 0.1 V

7.5.2 Final Check

Only, if ESVD-B2 option is fitted (2-GHz frequency extension):

- Fit the module to the receiver and adjust total gain according to Section 4.3.4

Generally notice, when reassembling the module:

Subsequent to reassembly of the module, the selftest of the board should be performed in order to check, if all jumpers and connecting cables were plugged in and no adjustment errors were made.

- Install the module into the test receiver
- Perform total calibration
- Call test function 0 (board test I/Q demodulator)

The selftest runs and all test functions are o.k.

Table 7-4 Contents of the Data Registers of the Serial Interface

Function	D32 Pin 11	D32 Pin 12	D32 Pin 13	D32 Pin 14	D32 Pin 7	D32 Pin 6	D32 Pin 5	D32 Pin 4
f < 1000 MHz	X	X	X	X	X	X	X	0
f > 1000 MHz	X	X	X	X	X	X	X	1
Test point TP0	0	0	0	0	0	0	0	X
Test point TP1	0	0	0	0	0	0	1	X
Test point TP2	0	0	0	0	0	1	0	X
Test point TP3	0	0	0	0	0	1	1	X
Test point TP4	0	0	0	0	1	0	0	X
Test point TP5	0	0	0	0	1	0	1	X
Test point TP6	0	0	0	0	1	1	0	X
Test point TP7	0	0	0	0	1	1	1	X
Test point TP8	0	0	0	1	0	0	0	X
Test point TP9	0	0	0	1	0	0	1	X
Test point TP10	0	0	0	1	0	1	0	X
Test point TP11	0	0	0	1	0	1	1	X
Test point TP12	0	0	0	1	1	0	0	X
Test point TP13	0	0	0	1	1	0	1	X
Test point TP14	0	0	0	1	1	1	0	X
Test point TP15	0	0	0	1	1	1	1	X
Test point TP16	0	0	1	0	0	0	0	X
Test point TP17	0	0	1	0	0	0	1	X
Test point TP18	0	0	1	0	0	1	0	X
Test point TP19	0	0	1	0	0	1	1	X

7.6 External Interfaces

Table 7-5 External Interfaces

Pin	Name	Input/ Output	Origin/destination	Specified range	Signal description
X30.AC1	GNDA	E	Rear Panel X3.10	0 V	Analog ground
X30AC2	+5VA	E	Rear Panel X3.7	5.2 V to 5.6 V	Supply voltage
X30AC4	+10V	E	Rear Panel X3.5	9.9 V to 10.1 V	Supply voltage
X30AC5	-10V	E	Rear Panel X3.4	-9.9 V to -10.1 V	Supply voltage
X30A7	SCLK	E	CPU Board X22A6	HCT level	Clock
X30C7	TDATA	E	CPU Board X22C6	HCT level	Data
X30C8	STROBE*	E	CPU Board X22C9	HCT level	Strobe
X30A9	TEST	A	CPU Board X22A8	0 V to 5 V	Selftest
X301	I-OUTPUT	A	Rear Panel I/Q Demodulator I Output	EMK: 2 V_{RMS}	I/Q Demodulator IO utput
X302	O-OUTPUT	A	Rear Panel I/Q Demodulator Q Output	EMK: 2 V_{RMS}	I/Q Demodulator Q Output
X303	10,7 MHz In	E	IF Selection Board X173	10.7 MHz max. +13 dBm	10.7-MHz IF input
X304	394,7 MHz In	E	UHF Preselector X293	394.7 MHz max. 8 dBm	394.7-MHz IF input
X306	74,7 MHz Out	A	2nd Mixer X136	74.7 MHz max. 4 dBm	74.7-MHz IF output
X307	64 MHz Input	E	FRN Synthesizer X167	64 MHz 7 dBm ±2 dB	Input for 64-MHz reference

DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

SHEET8
M, N

X304
394.7MHZ

IF LOW PASS FILTER
F_G - 1GHZ
G - -1DB

2ND MIXER
320MHZ
G - -6DB

74.4MHZ

DIPLEXER

2ND IF AMPLIFIER
G - 12DB

IF GAIN ADJUST
G - -8DB/±3DB

LEVEL DETECTOR

TP8

OVERLOAD DETECTOR
OL*

X306
74.7MHZ

SHEET6
H, I

X303
10.7MHZ

PIN ATTENUATOR
G - -4 ... -37DB

MIXER

74.7MHZ

IF FILTER
G - 0DB

LEVEL DETECTOR
TP10

TP12

64MHZ

TP11

TP13

SHEET5
F, G

VCO 320MHZ

MIXER AMP
TP2

BUFFER AMP

PRESCALER
4/1

DIVIDER
5/1

PD

LOOP FILTER

SHEET4
D, E

VCO 149.4MHZ

ATTENUATOR
149.4MHZ
-10±2DBM

BUFFER AMP

PROG. DIVIDER
1494/1

PROG. DIVIDER
160/1

100K

16MHZ

SHEET3
B, C

LEVEL DET.
TP7

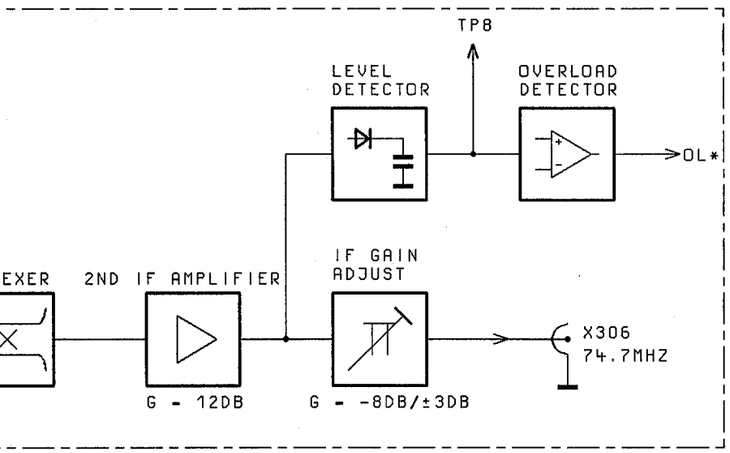
X307
64MHZ

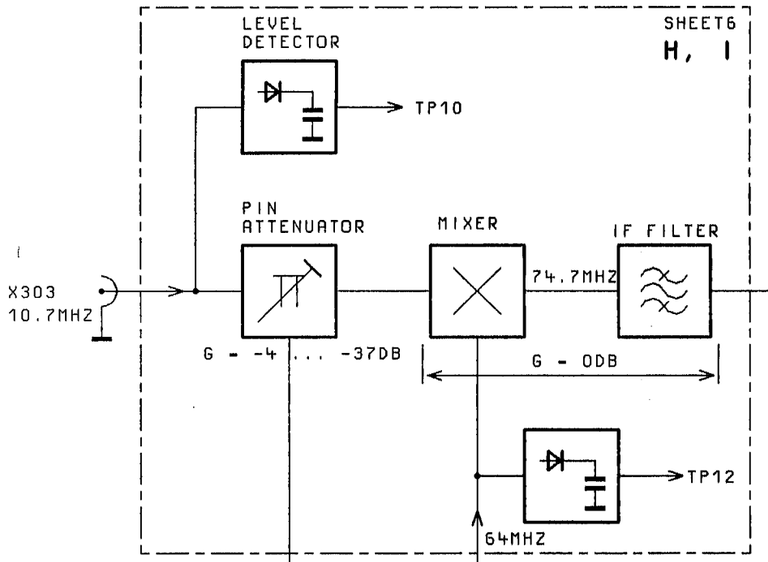
4/1

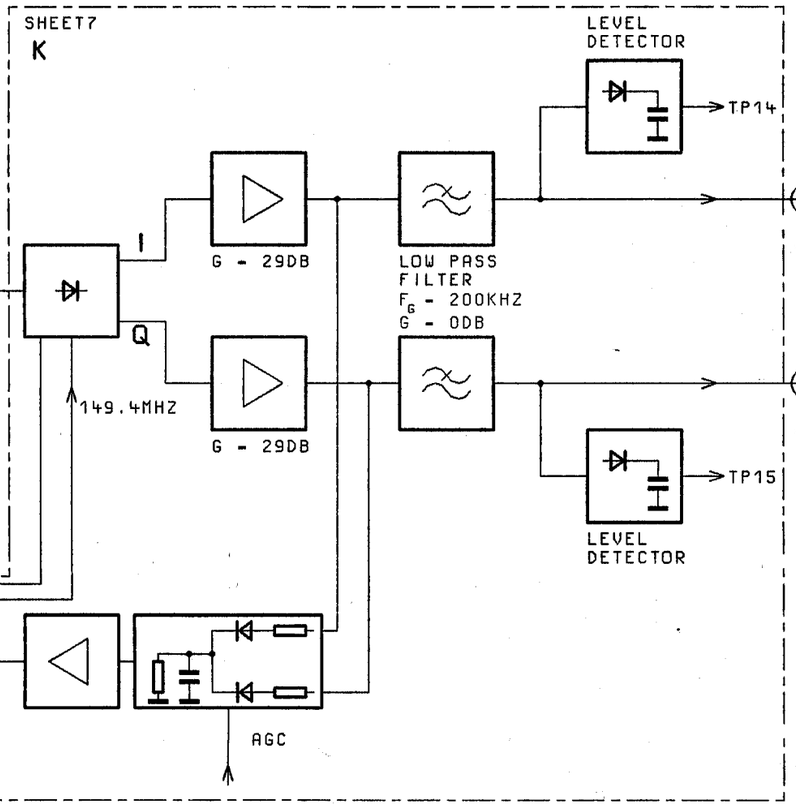
STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

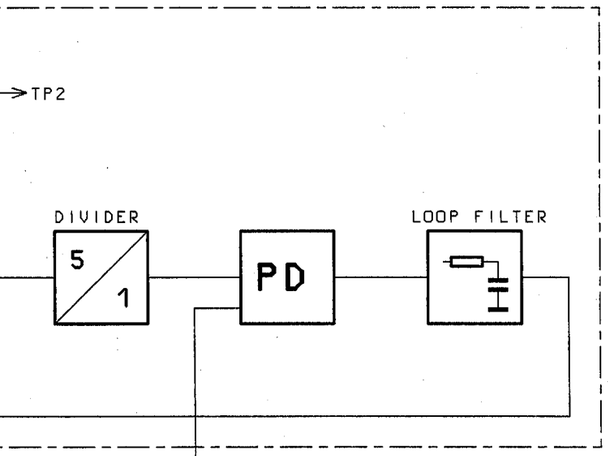
ACHTUNG! ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

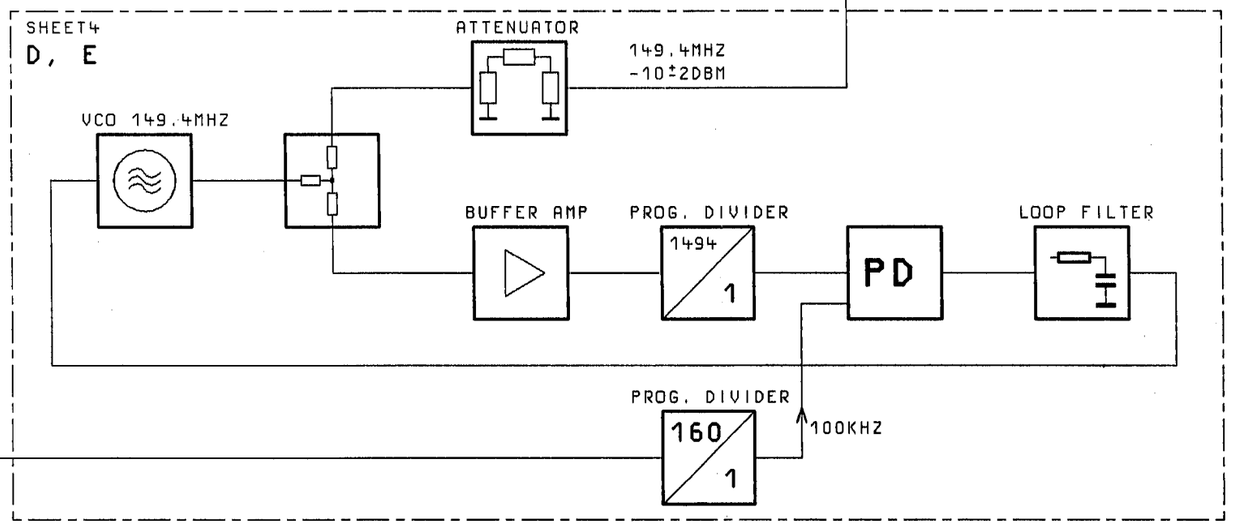
01	46356
03	47292
AEND. IND.	ÄNDERUNG MITTEIL

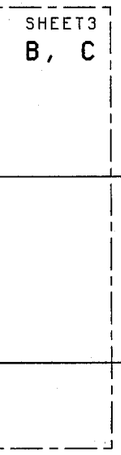












16MHZ

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
01	46356 (5)	07.91	BU
03	47292 (6)	08.91	NG

1KEE	TAG	NAME
BEARB.		BU
GEPR.		BU
NORM		
PLOTT	19. 3.91	BAU

ROHDE&SCHWARZ

BENENNUNG: I/Q DEMODULATOR

ZEICHN. NR. 1026.9018.01 S

BLATT-NR. 1

ERSATZ F. 1026.9001.01

ZU BENUTZ 1 MOD.01

BOARD CONTROL

SUPPLY SWITCH

ADRESSDECODER

X30A 9 TEST
X30A 7 SCLK
X30C 7 TDATA
X30C 8 STROBE*
X30C 9 OL*
OL*
X30A 1 GNDA
X30C 1
X30A 2 +5VA
+5VA
X30C 2
X30A 4 +10V
+10V
X30C 4
X30A 5 -10V
-10V
X30C 5
X30A 11 LOCK
X30A 14 AGC HOLD

R1 100R L
R2 100R L
R3 100R L
R4 100R
R5 100R
R6 100R
R7 100R
R8 1K
R9 1M L
R11 1M L
R15 100R

C1 220P L
C2 220P L
C3 220P L
C4 220P L
C5 220P L
C6 220P L
C7 220P L
C8 220P L
C10 10N L
C11 10N L
C12 10N L
C13 10N L
C14 10N L
C15 220P L
C20 560P L
C21 560P L
C22 560P L
C25 10U 50V
C26 10U 50V
C27 10U 50V

L1 1UH
L3 1U2H
L4 1U2H
L5 1U2H

D1-A 74HCT14T-L
D1-B
D1-C
D1-D
D1-E
D1-F
D1-G 74HCT14T-L

D30-A 74HCT4094T-L
D31-A 74HCT238T-L
D32-A 74HCT4094T-L
D39-A 74HCT138T-L
D30-B
D31-B
D32-B

R28 1K L
R29 1K L
C30 10N L
C31 10N L
C32 10N L

ADR 132 D
133 D
ADR 132 D

DATA
STR
CLK
SHEET4 D/1

D0
D1
D2
D3
D4
D5

R39 1K L

VHF/UHF SELECT
SHEET2 D/13
L - VHF
H - UHF

V18 BST70A
R16 10K L
R17 10K L
R18 100K L
TEST19 SHEET2 E/12

V20 BCP69-16-B
V22 BCP68-16-B
V23 BC860B-L
V25 BCP69-16-B
R20 4K75 B
R21 1K L
R22 4K75 B
R23 2K21 L
R24 1K L
R25 4K75 B
R26 2K21 L
R27 1K L
R38 475R L
N30-A LM339D-L
N30-B LM339D-L
N30-C LM339D-L
N30-D LM339D-L
N30-E

R30 30K1 L
R31 10K L
R32 10K L
R33 16K2 L
R34 10K L
R35 10K L
R36 10K
R37 10K L

+10VS
TEST17 SHEET2 E/12
TEST18 SHEET2 E/12
-10VS
+5VS
TEST16 SHEET2 E/12

N40-A LM224D-L
N40-B LM224D-L
N40-C LM224D-L
N40-D LM224D-L
N40-E
N41-E
N42-E
N43-E

TESTO
TEST1
TEST2
TEST3
TP4 SHEET2 C
TP5 SHEETS D
TP6 SHEET3 D
TP7 SHEET3 F
TP0 SHEET4 B/6
TP1 SHEET2 C/15
TP2 SHEET4 C/12
TP3 SHEETS B/4

OL* SHEET8 E/11
LOCK SHEET2 C/15
AGC HOLD SHEET7 E/7

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1026.9018.01S

BOARD TEST

DATA
STR
CLK
SHEET4 D/1

2-A
HCT4094T-L

R 132 D

D0
D1
D2

VHF/UHF
SELECT
SHEET2 D/13

L - VHF
H - UHF

D39-A
74HCT138T-L

D3
D4
D5

+5V
R39
1K L

D40-A
74HC4051T-L

D41-A
74HC4051T-L

D42-A
74HC4051T-L

TEST0
TEST1
TEST2
TEST3
TEST4
TEST5
TEST6
TEST7
TEST8
TEST9
TEST10
TEST11
TEST12
TEST13
TEST14
TEST15
TEST16
TEST17
TEST18
TEST19

TP0 SHEET4 B/6 — N40-D LM224D-L
TP1 SHEET2 C/15 — N40-A LM224D-L
TP2 SHEET4 C/12 — N40-B LM224D-L
TP3 SHEET5 B/4 — N40-C LM224D-L
TP4 SHEET2 C/15 — N41-A LM224D-L
TP5 SHEET5 D/12 — N41-B LM224D-L
TP6 SHEET3 D/8 — N41-D LM224D-L
TP7 SHEET3 E/2 — N41-C LM224D-L
TP8 SHEET8 E/8 — N42-C LM224D-L
TP9 SHEET8 E/6 — N42-D LM224D-L
TP10 SHEET6 B/4 — N42-A LM224D-L
TP11 SHEET6 E/2 — N42-B LM224D-L
TP12 SHEET3 E/3 — N43-A LM224D-L
TP13 SHEET7 E/4 — N43-B LM224D-L
TP14 SHEET7 D/9 — N43-D LM224D-L
TP15 SHEET7 C/9 — N43-C LM224D-L

N40-E
N41-E
N42-E
N43-E

D39-B C39 10N L
D40-B C40 10N L
D41-B C41 10N L
D42-B C42 10N L

R38 475R L
+10VS
R30 30K1 L
TEST17 SHEET2 E/12
R31 10K L
R32 10K L
TEST18 SHEET2 E/12
R33 16K2 L
-10VS
+5VS
R34 10K L
TEST16 SHEET2 E/12
R35 10K L
R36 10K
R37 10K L

N30-B LM339D-L
N30-C LM339D-L
N30-D LM339D-L

LOCK DETECTOR

+5V
R51 15K L
R54 100K L
R55 100K L
3,8V
0,9V
R52 27K4 L
R53 9K09 L
R50 10K L
TP3 SHEET5 B/4
C50 100N L
N50-A LM339D-L
N50-B LM339D-L
L1 SHEET2 D/13
L2 SHEET2 C/13

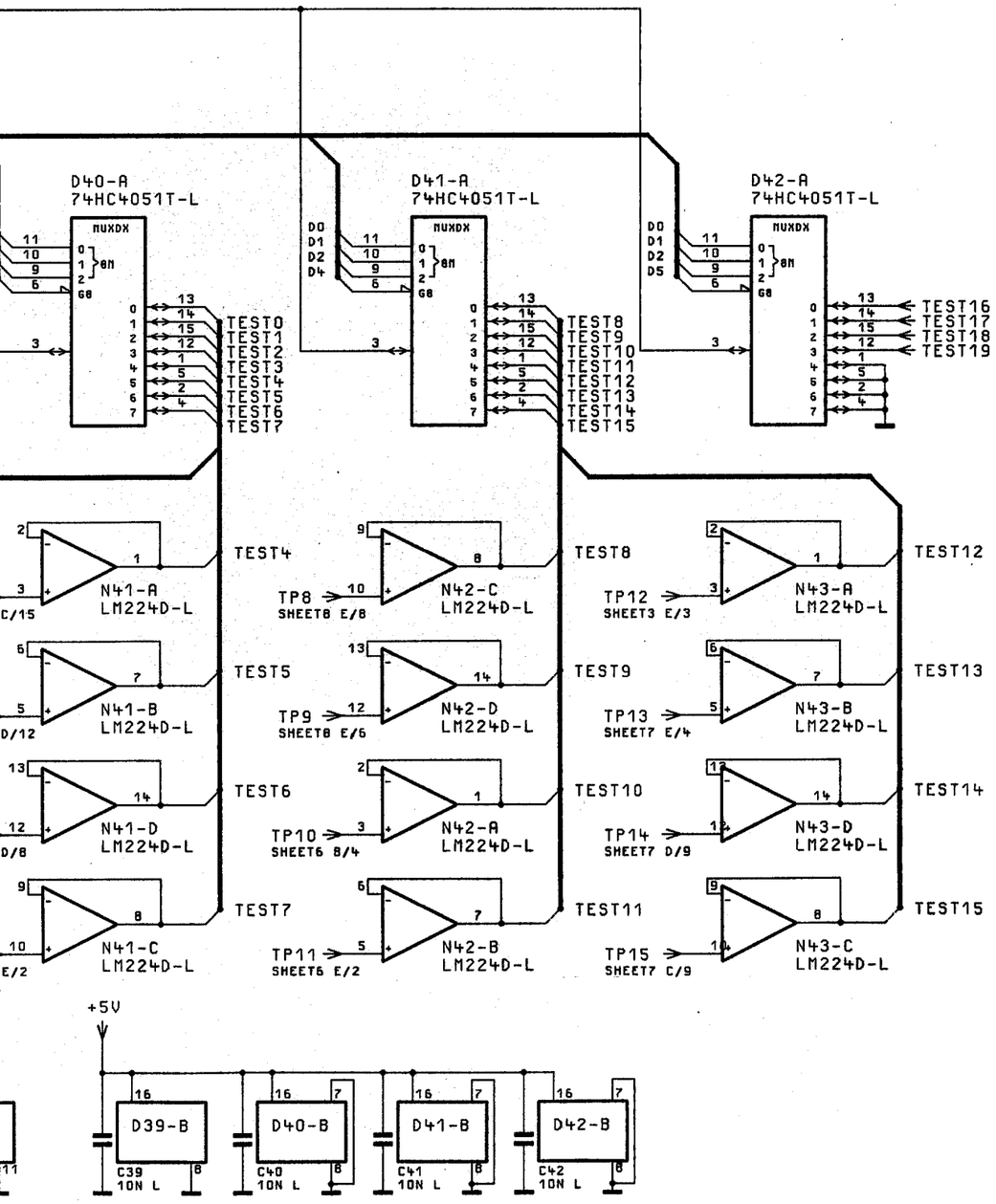
L1 SHEET2 D/14
L2 SHEET2 D/14
VHF/UHF SELECT SHEET2 D/7
D60-A 74HCT02T-L
D60-B 74HCT02T-L
D60-C 74HCT02T-L
D65-A 74HCT
D65-B
D65-C
D65-D
D60-E
D65-E
C60 10N L
C65 10N L

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

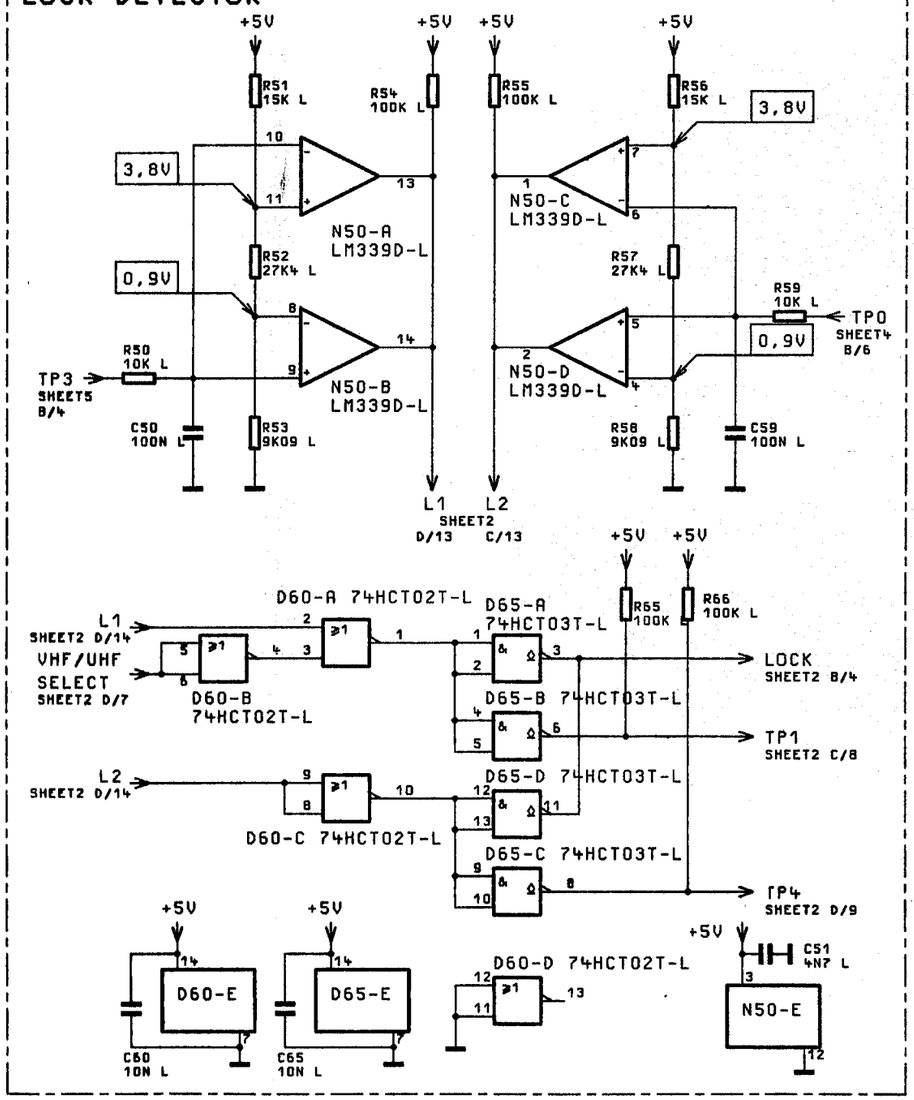
ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NA
02/00	47292 (2)	07.91	N
01/00	46356 (5)	02.07.91	B

BOARD TEST



LOCK DETECTOR



STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

02/00	47292 (2)	07.91	NG	1KGB	TAG	NAME	BENENNUNG
				BEARB.		BU	I/Q DEMODULATOR
				GEPR.		BU	
				NORM			
				PLOTT	23.07.91		
01/00	46356 (5)	02.07.91	BU	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9018.01S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD-B1			BLATT-NR. 2 v. 8 BL.
				REG.I.V. 1026.9001			ERSTE Z. 1026.9001

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1026.9018.01 S

X12 X150 X160

TP7 SHEET2 B/9 | TP12 SHEET2 D/11 | LO64 SHEET6 A/6

B

REF BUFFER 1

V115 BAS70-04-L

C116 10N L | R116 1M L | +10VB | R108 100R L | C103 10N L | L100 10UH L | C115 10P L | R107 681R L | C102 1N L | R106 5K62 L | C101 1N L

X307 1 64MHZ | W1A 1 | W1B 1 | R102 110R L | C100 1N L | R100 75R L | R101 75R L | R103 1K L | V100 BFR193-L | R104 10R L | R105 10R L

+5V | L180 4U7H | +5VB | C180 10N L | C181 10N L | L181 4U7H | +10VE | +10VB | C182 10N | C183 10N L

POWER SPLIT

W2A 1 | X12D X12C X12B X12A

R125 1M L | R123 90R9 L | C121 1N L | R124 82R5 L | R122 90R9 L | C120 10P L | V120 BAS70-04-L | R126 51R1 L

L120 | R121 200R L | R120 51R1 L | R129 68R1 L | R127 100R L | R128 100R L

C

+5VB | L183 4U7H | +5VC | C186 10N L | C187 10N L

REF BUFFER 2

+10VB | R135 100R L | C133 10N L | L130 10UH L | R132 681R L | C131 1N L | C132 1N L | R131 5K62 L | C130 1N L | V130 BFR193-L | R130 1K L | R133 10R L | R134 10R L

REF DIVIDER

R165 10R L | D150-B 74AC00SC-L | REF1 SHEET4 E/3

R166 10R L | D150-C 74AC00SC-L | REF2 SHEET5 C/1

V170 BAS70-04-L | R167 10R L | C170 10P L | D150-D 74AC00SC-L | R171 1M L | C171 10N L | TP6 SHEET2 C/8

64MHZ AC PEGEL | 16MHZ AC PEGEL

+5VC | R144 33K2 L | R145 33K2 L | X150 | R146 10R L | D150-A 74AC00SC-L | R160 1K L | R161 1K L | X160 | D160-A 74AC74SC-L | D160-B 74AC74SC-L

+5VC | R150 10R L | R163 10R L | C150 10N L | D150-E | D160-C | C163 10N L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

02/00	47292 (2)	07.91	NG	1KGB	TAG	NAME	BENENNUNG
				BEARB.		BU	I/Q DEMODULATOR
				GEPR.		BU	
				NORM			
				PLOTT	23.07.91		
01/00	46356 (5)	02.07.91	BU	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9018.01S BLATT-NR. 3
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVD-B1			ARCHIV 1026.9001 INDEX A 1026.9001

PLL 149,4MHZ

X200 X201 X202 X203 X204 X220 X225 X23 L252

REF & LO DIVIDER

REF1 SHEET3 E/8
R202 51R1 L
R203 150R L
C202 1N L
+5VD
R209 10R L
C209 10U 10V TA L
X201
R201 1K L
C201 10U 10V TA L
C200 1N L
X200
LO1 SHEET4 C/12
R200 51R1 L
R205 100R L
CLK SHEET2 F/7
R206 100R L
DATA SHEET2 F/7
R207 100R L
STR SHEET2 F/7
X203
X204
D200 MB1501-L
FIN LD GND VCC VR X2 X1 R
DO CLOCK DATA LE FC FR FP P

LOOP FILTER

X220
R220 3K57 L
R221 3K57 L
C221 100P L
C222 3N3 63V 1% FKP
C220 3N3 63V 1% FKP
R222 47K5 L
+10VD
R228 1M L
R240 10R L
C240 10U 25V TA L
X225
R225 3K57 L
R226 3K57 L
R227 47K5
C227 100P L
C225 3N3 63V 1% FKP
C241 10U 25V TA L
R241 10R L
-10VD
C228 3N3 63V 1% FKP
R229 * 100K L
N240 OP07CS8-L
R242 100R L
C242 100P L
V242 BAS32-L
R243 10K L
C243 10N L
R244 10K L
TPO SHEET2 E/15,D/8
X23A X23B X23C X23D

PHASE DETECTOR

D220-B 74HCT74T-L
D230-C 74HCT00T-L
D220-A 74HCT74T-L
R218 1K L
R219 1K L
+5VD

E

L245 4U7H
+10VD
+10VE
C247 10N L
C246 10N L
L246 4U7H
-10VD
-10VE
C249 10N L
C248 10N L

VCO 149,4 MHZ

+10VE
R260 100R L
C261 10U 25V TA L
FREQUENCY ADJUST
L260 2U2H
C260 1N8 L
LEVEL ADJUST
V260 BFR193-L
R250 1K L
C251 4P7 L
L252 130NH T
C253 6P8 L
C255 12P L
C265 4P7 L
R266 75R L
L250 2U2H
V250 BB620-L
C252 1P L
L253 2U2H
C256 12P L
L262 2U2H
R265 100R L
R253 332R L
C250 100P L
R262 825R L
C262 1N8 L
C263 10U 25V TA L
R263 825R L
R267 100R L
-10VE
L243 2U2H

L244 4U7H
+5VC
+5VD
C244 10N L
C245 10N L

+10VE -10VE
C296 10N L
C298 10N L
L295 4U7H
L296 4U7H
C295 10N L
C297 10N L
+10V -10V

+5VD
R216 10R L
R230 10R L
C217 10U 10V
C231 10U 10V
D220-C
D230-E
C216 10N L
C230 10N L

D230-B D230-A D230-D

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZE CHN -NR 1026.9018.01 S

* NOT FITTED
STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR VAR.02

06/00
05/00
REND. IND.

X220
X225

X23

L252

C266

X28

X29

PLL 149,4MHZ

E

L245 4U7H
+10VD
+10VE
C247 10N L
C246 10N L
L246 4U7H
-10VD
-10VE
C249 10N L
C248 10N L

LOOP FILTER

X220
R220 3K57 L
R221 3K57 L
C221 100P L
C220 3N3 63V 1% FKP
R222 47K5 L
C222 3N3 63V 1% FKP
+10VD
R228 1M L
R240 10R L
C240 10U 25V TA L
X225
R225 3K57 L
R226 3K57 L
R242 100R L
N240 OP07CS8-L
C241 10U 25V TA L
R241 10R L
C225 3N3 63V 1% FKP
R227 47K5
C227 100P L
C228 3N3 63V 1% FKP
-10VD
C242 100P L
V242 BAS32-L
R243 10K L
C243 10N L
R244 10K L
TP0 SHEET2 E/15,D/8
R229 * 100K L
X23A X23B X23C X23D
L243 2U2H

VCO 149,4 MHZ

+10VE
R260 100R L
C261 10U 25V TA L
FREQUENCY ADJUST
L260 2U2H
C260 1N8 L
LEVEL ADJUST
V260 BFR193-L
R250 1K L
C251 4P7 L
L252 130NH T
C253 6P8 L
L253 2U2H
C255 12P L
C256 12P L
L250 2U2H
V250 BB620-L
C252 1P L
R253 332R L
C250 100P L
C265 4P7 L
R266 75R L
C266 20P-5P B
L262 2U2H
R265 100R L
R267 100R L
C267 3P9 L
R262 825R L
C262 1N8 L
C263 10U 25V TA L
R263 825R L
-10VE
+10VE
R275 274R L
C272 10N L
L270 2U2H L
R272 681R L
C270 1N L
R271 5K62 L
C271 1N L
V270 BFR193-L
R270 1K L
R273 10R L
R274 10R L
X28A X28B X28C X28D

POWER SPLIT

L293 100NH L
L294 100NH L
L297 100NH L
W3A 1
LO 149,4 SHEET7 C/1
C293 33P L
C294 27P L
X29A X29B X29C X29D
R296 68R1 L
R295 150R L
R294 68R1 L
+10VE
R288 274R L
C285 10N L
R281 16R2 L
L288 2U2H L
R280 16R2 L
R285 681R L
R282 16R2 L
C284 1N L
C286 1N L
R284 5K62 L
LO1 SHEET4 E/1
C283 1N L
V285 BFR193-L
C290 10P L
R283 1K L
R286 10R L
R287 10R L
V290 BAS70 04-L
TP2 SHEET2 C/8
C291 10N L
R291 1M L

+10VE
C296 10N L
L295 4U7H
C295 10N L
+10V
-10VE
C298 10N L
L296 4U7H
C297 10N L
-10V

D230-B
D230-A
D230-D

* NOT FITTED
STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: LGBI
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESDI
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47292 (17)	06.92	PF		TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	23.06.92	
05/00	47292 (16)	01.92	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ

BENENNUNG
I/Q DEMODULATOR

ZEICHN. NR.
1026.9018.01S

BLATT NR. 4

X40 X430 X431 X432 X433 X401 X44 L452

F

LO DIVIDER

+5VF
L401 4U7H L
C400 2N2 L
C408 10U 10V
D400 UPB585G-L
LO2 SHEET5 B/12
C401 2N2 L
C402 2N2 L
C403 2N2 L
C404 2N2 L
R401 51R1 L
+10VF
R404* 100R L
C405 4N7 L
L400* 10UH L
R403 5K11 L
C406 OR L
R407 150R L
R408* 33K2 L
R402 5K62 L
R405 OR L
R406 OR L
V400 BFR193-L
X401
D432-C 74AC00SC-L
R420 1K L
R421 1K L
D420-A 74F192-L
CTR DIV10
R422 1K L
+5VF
R430* 1K L

G

+5VF L444 1U2H +5VG
C444 10N L
C445 10N L
L445 4U7H
+10VF +10VG
C446 10N L
C447 10N L
L446 4U7H
-10VF -10VG
C448 10N L
C449 10N L

VCO 320MHZ

+10VG
L455 47UH
C454 10N L
R454 100R L
C456 10U 25V TA L
R451 1K L
R453 1K L
L453 2U2H L
FREQUENCY ADJUST
L452 130NH T
C455 10N L
R452 1K L
V455 BFR193-L
L451 2U2H
R450 332R L
C451 2P2 L
C468 8P2 L
C450 1N L
C452* 1P8 L
C467 1P L*
V450 BB620-L
C459 4P7 L
C453 4P7 L
C457 8P2 L
R458 35R7 L
C458 1N L
R456 511R L
R459 150R L
R457 150R L
R463 100R L
C461 10U 25
C462 10N
R460 681R L
L460 2U2H
C460 47P L
R461 5K62 L
C464 1N L
V460 BFR19
R462 1K L
R464 10R L

PHASE DETECTOR

REF2 SHEET3 D/8
R443 100R L
D432-A 74AC00SC-L
X430
D430-B 74ACT74M-L
X432
D431-C 74ACT00M-L
X431
D430-A
X433
R431 1K L
R432 1K L
+5VF

LOOP FILTER

+10VF
R438 10R L
C438 10U 25V TA L
C436
C437 22N 63V 1% FKP
C432 4N7 FKP
C442 4N7 FKP
L433 4U7H L
R433 51R1 L
R435 51R1 L
R440 511R L
R436 51R1 L
L434 4U7H L
R434 51R1 L
C435*
C433 4N7 FKP
C443 4N7 FKP
R437 511R L
N430 SE5534AFE
R441 100R L
C440 1N L
C439 10U 25V TA L
R439 10R L
C434 22N 63V 1% FKP
-10VF
V440 BAS32-L
X44A X44B X44C X44D
TP3 SHEET2 C/8,E/13
R442 10K L
R444 10K L
C441 10N L
L450 2U2H

+5VF
L420 4U7H L
R426 10R L
R427 10R L
R429 10R L
C420 10N L
D420-B
C427 10U 10V
C430 10N L
D430-C
C428 10U 10V
C431 10N L
D431-E
C429 10N L
D432-E

D431-A D431-B D431-C D431-D D432-A D432-B

+5VG +10VG -10VG
C491 10N L
C493 10N L
C495 10N L
L490 10U2H
L491 10U2H
L492 10U2H

* NOT FITTED

STROMLAUF GILT FUER VAR.02

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

06/00 05/00 AI NO. IND.

X44 L452 X48 X47 X49

+5VF +5VG +10VF +10VG -10VF -10VG

L444 1U2H
C444 10N L
C445 10N L
L445 4U7H
C446 10N L
C447 10N L
L446 4U7H
C448 10N L
C449 10N L

G

+5VF
R420 1K L
R421 1K L
D420-A 74F192-L
CTR DIV10
C3
G1
G2
R
2+
1-
2CT=0
1CT=9
32-C ACOOSC-L
R422 1K L
+5VF
* R430 1K L

MIXER AMP

+10VG +10VG
R474 2K74 L
V470 BC860B-L
R477 56R2 L
C473 10N L
C471 10U 25V TA L
C474 10U 10V TA L
C472 4N7 L
L474 2U2H
R475 7K5 L
L475 *
C475 1N L
C470 100P L
R476 1K L
L476 22NH L
V471 BFR193-L
R472 33R2 L
R473 274R L
X48D X48C X48B X48A
C476 10P L
V475 BAS70-04-L
R479 200K L
C477 10N L
R478 100K L
X49A X49B X49C X49D XXXXX
320MHZ SHEET8 B/3
TP5 SHEET2 D/9

VCO 320MHZ

+10VG
L455 47UH
C454 10N L
R454 100R L
C456 10U 25V TA L
R451 1K L
R453 1K L
L453 2U2H L
C455 10N L
R452 1K L
V455 BFR193-L
FREQUENCY ADJUST
L452 130NH
T
L451 2U2H
R450 332R L
C451 2P2 L
C468 8P2 L
C450 1N L
V450 BB620-L
C452 1P8 L *
C467 1P L *
C457 8P2 L
C459 4P7 L
C453 4P7 L
R456 511R L
R458 35R7 L
R459 150R L
C458 1N L
R457 150R L

+10VG
R463 100R L
C461 10U 25V TA L
C462 10N L
R460 681R L
L460 2U2H L
C460 47P L
R461 5K62 L
C464 1N L
V460 BFR193-L
R462 1K L
R464 10R L
R465 10R L

POWER SPLIT

R471 51R1 L
T470
R470 200R L
R480 51R1 L

BUFFER AMP

+10VG
R485 100R L
C482 10U 25V TA L
C483 10N L
L480 2U2H
R483 681R L
C481 47P L
R484 5K62 L
C484 1N L
R490 68R1 L
L485 22NH L
C480 1N L
R488 100R L
R489 100R L
C485 15P L
C486 15P L
R481 221R L *
R482 1K L
V480 BFR193-L
R486 10R L
R487 10R L
X49C X49D X49A X49B XXXXX
LO2 SHEETS E/1

FILTER

+10VF
R438 10R L
C438 10U 25V TA L *
C436
C437 22N 63V 1% FKP
R440 511R L
C442 4N7 FKP
L433 4U7H L
R435 51R1 L
R436 51R1 L
L434 4U7H L
*C435
C443 4N7 FKP
R437 511R L
N430 SE5534AFE
R441 100R L
C440 1N L
C439 10U 25V TA L
R439 10R L
C434 22N 63V 1% FKP
-10VF
V440 BAS32-L
X44A X44B X44C X44D
R442 10K L
TP3 SHEET2 C/8,E/13
R444 10K L
C441 10N L
L450 2U2H

+5VG +10VG -10VG
C491 10N L
C493 10N L
C495 10N L
L490 1U2H
L491 4U7H
L492 4U7H
C490 10N L
C492 10N L
C494 10N L
+5VS +10VS -10VS

D431-A D431-B D431-D D432-B D432-D

* NOT FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47292 (17)	06.92	PF		TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	23.06.92	
05/00	47292 (14)	01.92	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ

BENENNUNG: I/Q DEMODULATOR

ZEICHN. NR. 1026.9018.013

BLATT NR 5

X500 X50 L550 L551

H I

AGC

+10VH1
R504 6K19 L
3,6V
R505 3K57 L
R500 47K5 L
TP11 SHEET2 C/10
R501 47K5 L
N500-B NE5532D-L
R502 2K21 L
R503 1K L
UAGC SHEET7 E/4
L500 100UH

PIN ATTENUATOR

X303 1 10,7MHZ IN
13DBM...-89DBM
C512 27N L
V510 5082-3081
C513 27N L
V511 BA389
X500 6,2V
+10VH1
C514 10N L
R512 33K2 L
R514 432R L
R515 392R
V512 BA389
V513 BA389
R513 56K2 L
N500-A NE5532D-L
C515 10N L

X50A X50B X50C X50D

MIXER

+10VH
L530 10UH
C532 10N L
R532 511R L
C535 1N L
R533 1K L
C530 10N L
C536 10N L
R530 51R1 L
N530 S042P
C531 10N L
R531 51R1 L
C534 10N L
R535 51R1 L
R534 100R L
C533 10N L
R536 51R1 L

W2B 1

L551 530NH T
C551 12P N150
C550 82P N150
L550 53NH T
L552 30NH

IF FIL

LEVEL DETECTOR

+10VH
V521 BAS70-04-L
TP10 SHEET2 C/10
R521 511R L
C522 1N L
V520 U310
C523 1N L
R524 1M L
C520 100P L
C521 1N L
R520 100K L
R522 511R L
R523 121R L

+10VH
R510 10R L
C510 10U 25V TA L
+10VH1
N500-C
C511 10U 25V TA L
R511 10R L
-10VH

+5VH +10VH -10VH
C545 10N L
C547 10N L
C549 10N L
L544 4U7H
L545 4U7H
L546 4U7H
C544 10N L
C546 10N L
C548 10N L
+5V +10V -10V

02/00
01/00
AEND. IND.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

X50

L550 L551 L552

X56
X55

MIXER

+10VH

L530
10UH

C532
10N L

R532
511R L

C535
1N L

R533
1K L

C530
10N L

C536
10N L

R530
51R1 L

R531
51R1 L

C531
10N L

N530
S042P

C534
10N L

R535
51R1 L

R534
100R L

C533
10N L

R536
51R1 L

W2B 1

LO64
SHEET3 E/4

X50A
X50B
X50C
X50D

IF FILTER

L551
530NH T

C550
82P N150

L550
53NH T

C551
12P N150

L552
30NH T

C552
120P N150

C553
12P N150

C554
18P

X56A
X56B

X55 1

T560

IFI

IFIX

SHEET7
C/2

+10VH

R510
10R L

C510
10U 25V TA L

+10VH1

12

N500-C

C511
10U 25V TA L

R511
10R L

-10VH

+5VH +10VH -10VH

C545
10N L

C547
10N L

C549
10N L

L544
4UZH

L545
4UZH

L546
4UZH

C544
10N L

C546
10N L

C548
10N L

+5V +10V -10V

C/10

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

02/00	47292 (2)	07.91	NG	1KGB	TAG	NAME
				BEARB.		BU
				GEPR.		BU
				NORM		
				PLOTT	23.07.91	
01/00	46356 (5)	02.07.91	BU			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG

I/Q DEMODULATOR

ROHDE&SCHWARZ

ZU GERAET ESVD M1

ZEICHN.-NR. 1026.9018.013

BLATT NR 6

X61 X66 X62 X65 R613 R623 R616 R607 R653 X64

K

+10VD R630 10R L +10VK C630 4U7 25V TA L
+10VH R690 10R L +10VL C690 4U7 25V TA L
-10VD R631 10R L -10VK C631 4U7 25V TA L
-10VH R691 10R L -10VL C691 4U7 25V TA L
+5VH L635 4U7H +5VK C635 10N L C636 10N L

AGC

X66A X66B UAGC SHEET6 E/3 N650-B TL072ACD-L R646 1K L R660 5K11 L R656 33K2 L R655 3K92 L
V660 4V7 L
V661 5082-2810
TP13 SHEET2 C/11 R657 100K L C658 10N L R658 100K L
X65A X65B X65C N650-A TL072ACD-L R652 1K L R651 10K L C651 100N L
R645 1M L C645 220N L +10VN
D640-A DG419-L X64A X64B X64C
R653 * RTR 50K B R650 30K1 L +10VN
V640 BAS32-L V641 BAS32-L R640 511R L R641 511R L
AGC HOLD SHEET2 B/4

+10V C632 4U7 25V TA L C633 4U7 25V

I/Q DEMODULATOR

+5VK R602 10R L C602 10U 10V TA L
D600 PMB2400-L
SHEET6 C/11 IFI IFIX
LO 149,4 SHEET4 E/12 W3B 1 C600 10N L C601 10N L R600 51R1 L
X61A X61B C610 100N
X62A X62B C620 100N
C614 8P2 L R615 5K11 L R614 5K11 L
N610 AD744KR-L R611 100K L C611 5P6 L R612 1M L R613 2M B -10VK
C624 8P2 L R625 5K11 L
N620 AD744KR-L R621 100K L C621 10P-3P B R622 1M L R623 2M B -10VK
I/Q PHASE MATCH
R616 500R B R617 243R L R618 5K11 L
I/Q GAIN MATCH
N615 AD744KR-L -10VK
R627 392R L R628 5K11 L
N625 AD744KR-L -10VK
R605 5K11 L R606 5K11 L
R607 10K
I/Q PHASE OFFSET
N605 AD744KR-L R608 2K43 L -10VK C605 10P L

LOW PASS

R674 1K L +10VL
N670 AD844BQ R670 909R L R671 3K92 L R672 100R L C670 470P 100V C671 220P 100V R673 100K -10VL
R684 1K L +10VL
N680 AD844BQ R680 909R L R681 3K92 L R682 100R L C680 470P 100V C681 220P 100V R683 100K -10VL

* NOT FITTED

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

02/00 03 01/00 AEND. IND.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1026.9018.01 S

X66 X65 R613 R623 R616 R607 R653 X64 X67 X68

AGC

UAGC SHEET6 E/3
N650-B TL072ACD-L
R660 5K11 L
R656 33K2 L
R655 3K92 L
R646 1K L
R645 1M L
C645 220N L
+10VN
D640-A DG419-L
X64A X64B X64C
AGC HOLD SHEET2 B/4
R653 * RTR 50K B
V640 BAS32-L
V641 BAS32-L
R640 511R L
R641 511R L
X65A X65B X65C
N650-A TL072ACD-L
R652 1K L
R650 30K1 L
+10VN
R651 10K L
C651 100N L
R657 100K L
TP13 SHEET2 C/11
C658 10N L
R658 100K L

+10VH
+5VK
+10VN
C632 4U7 25V TA L
R632 33R2 L
R642 200R L
C640 100N L
N650-C
D640-B
C633 4U7 25V TA L
R633 33R2 L
-10VH

C614 8P2 L
R616 500R B
R617 243R L
R618 5K11 L
R615 5K11 L
R614 5K11 L
+10VK
I/Q GAIN MATCH
N610 AD744KR-L
R611 100K L
C611 5P6 L
R612 1M L
2R613 2M B
-10VK
N615 AD744KR-L
C624 8P2 L
R625 5K11 L
R624 5K11 L
N620 AD744KR-L
R621 100K L
C621 10P-3P B
R622 1M L
2R623 2M B
R627 392R L
R628 5K11 L
R605 5K11 L
R606 5K11 L
C605 10P L
R607 10K
I/Q PHASE OFFSET
N605 AD744KR-L
R608 2K43 L

LOW PASS FILTER

R674 1K L
+10VL
N670 AD844BQ
R670 909R L
R671 3K92 L
R672 100R L
C670 470P 100V
C671 220P 100V
R673 100K
-10VL
R675 43R2
R676 5K11 L
V676 BAS32-L
R677 511K
C677 10N L
TP14 SHEET2 C/11
R678 5K11 0.1%
R679 51R1 L
X67A X67B X67C
X302 1 I/Q DEMODULATOR Q-OUTPUT

R684 1K L
+10VL
N680 AD844BQ
R680 909R L
R681 3K92 L
R682 100R L
C680 470P 100V
C681 220P 100V
R683 100K
-10VL
R685 43R2
R686 5K11 L
V686 BAS32-L
R687 511K
C687 10N L
TP15 SHEET2 B/11
R688 5K11 0.1%
R689 51R1 L
X68A X68B X68C
X301 1 I/Q DEMODULATOR I-OUTPUT

TED

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB! ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN KEINE BESONDERE HANDHABUNG.
ATTENTION ESD! ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

02/00	47292 (2)	07.91	NG	1KGB	TAG	NAME
03	47292 (6)	08.91	NG	BEARB.		BU
				GEPR.		BU
				NORM		
				PLOTT	23.07.91	
01/00	46356 (5)	02.07.91	BU			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GERAET 1 SVD 81

BENENNUNG
I/Q DEMODULATOR

ZEICHN.-NR. 1026.9018.01 S
BLATT NR. 7
MFG.I.V. 1026.9001 ERSTE Z. 1026.9001

4 5 6 7 8 9 10 11 12

X72 X73 X76

F E D C B A

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZE C-A.-NR. 1026.9018.01S

M

+5VS → +5VM
+10VS → +10VM
-10VS → -10VM

L790 4U7H
C790 10N L
C791 10N L
C796 1U 25V
L791 4U7H
C792 10N L
C793 10N L
C797 1U 25V
L792 4U7H
C794 10N L
C795 10N L
C798 1U 25V

N

LOW - PASS 1GHZ

B700
INCLUDED IN LAYOUT

X304 1 — W4A 1 — W4B 1 — TP 2

394,7MHZ IN

17DBM ± 1DB
320MHZ
SHEETS E/12
394,7MHZ

2ND IF AMPLIFIER

+10VM
C745 1U 25V TA L
R745 10K L
R746 9K09 L
R747 121R L
R748 100K L
TP9 SHEET2 C/10
V741 BC860B-L
C742 4N7 L
R744 1K L
R749 100K L
C746 100N L
C743 100N L
L740 4U7H
L741 4U7H
C741 4N7 L
R740 243R
R741 13R L
C747 4N7 L
C740 4N7 L
V740 NE85637 L
R742 16R2 L
R743 16R2 L

X73A X73B X73C X73D

2ND IF LEVEL DETECTOR

TP8 SHEET2 D/10
+5VM
V771 BAS70-04-L
R774 4K75 L
C770 1N L
V770 HSMS2800-L
R773 10K L
N770-A TL072ACD-L
R771 150R L
R770 10K L
C771 22P L
R772 1M L
N770-B
+10VM
C772 100N L
N770-C
C773 100N L
-10VM

X76A X76B X76C X76D

2ND MIXER

B720 SRA1H
LO RF IF
L730 100NH L
C730 47P L
R730 51R1 L
R731 51R1 L
L731 100NH L
C731 47P L
C732 2P7 L
R732 51R1 L

X72A X72B X72C X72D

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR VAR.02

ACHTUNG: ESD!
ELECTROSTATICALLY SENSITIVE DEVICES
OBSERVE HANDLING PRECAUTIONS!
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
OBSERVE HANDLING PRECAUTIONS

04/00 ALTND. IND.

1 2 3 4 5 6 7 8

X72 X73 X76 R761

2ND IF AMPLIFIER

+10VM
C745 1U 25V TA L
R745 10K L
R746 9K09 L
R747 121R L
R748 100K L
TP9 SHEET2 C/10
C746 100N L
R744 1K L
V741 BC860B-L
R749 100K L
C742 4N7 L
C743 100N L
L740 4U7H
L741 4U7H
C741 4N7 L
R740 243R
R741 13R L
C747 4N7 L
C740 4N7 L
V740 NE85637 L
R742 16R2 L
R743 16R2 L

X73A X73B X73C X73D

2ND IF LEVEL DETECTOR

TP8 SHEET2 D/10
+5VM
V771 BAS70-04-L
R774 4K75 L
C770 1N L
V770 HSMS2800-L
R773 10K L
N770-A TL072ACD-L
R771 150R L
R770 10K L
C771 22P L
R772 1M L
N770-B
+10VM
C772 100N L
N770-C
C773 100N L
-10VM

OVERLOAD DETECTOR

+5VM
R780 10K L
N780-A NE521D-L
V785 BCX70H-L
R785 2K21 L
OL* SHEET2 D/3
R786 2K21 L
R788 1K L
R789 1K L
R781 100R L
R783 9K09 L
R784 0R L
+10VM
C780 10N L
R782 909R L
+10VM -10VM
V780 5V1 L
V781 5V1 L
C781 100N L
N780-B
C782 100N L

IF GAIN ADJUST

R760 15R L
R761 100R STE
R762 56R2 L
R763 121R L
X306 1 74,7MHZ OUTPUT

X76A X76B X76C X76D

B720 SRA1H
L730 100NH L
C730 47P L
R730 51R1 L
R731 51R1 L
L731 100NH L
C731 47P L
C732 2P7 L
R732 51R1 L
X72A X72B X72C X72D

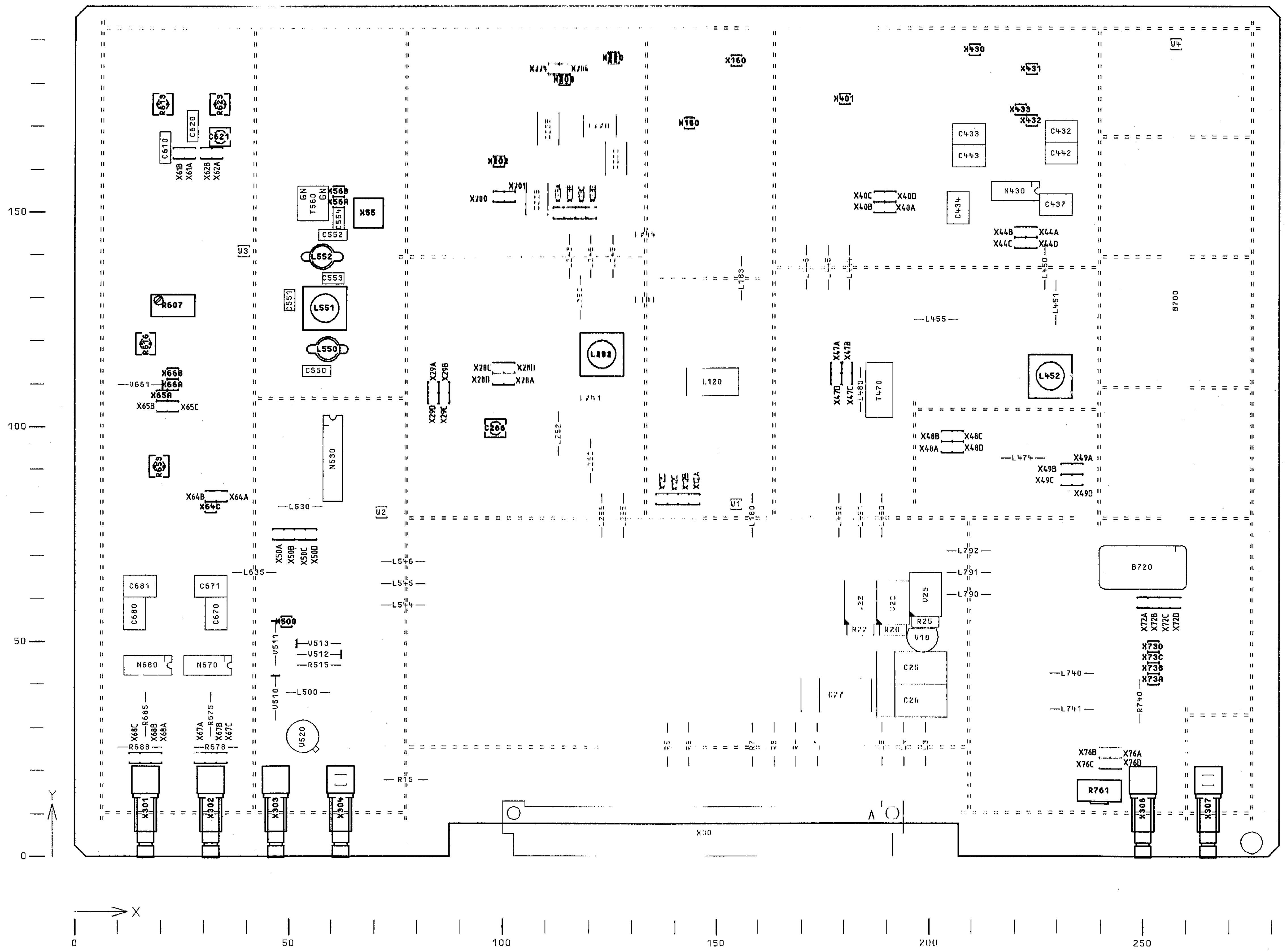
D MIXER

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: [GB]
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION [GB]
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

05/00	47292 (14)	01.92	PF	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	I/Q DEMODULATOR
				GEPR.		PF	
				NORM			
				PLOTT	17.01.92		
04/00	47292 (7)	09.91	PF	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9018.01S
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ZU GERAET	ESVD-B1		BLATT-NR. 8
				REG.I.V.	1026.9001	ERSTE Z.	1026.9001

4 5 6 7 8 9 10 11 12



DARSTELLUNG SEITE B

VIEW ON SIDE B

VERKLEINERUNG

0 1 2 3 4 5

01	46356(5)	07.91	BU
ÄND. IND.	ÄNDERUNGS-MITTEILUNG	DATUM	NAME

1KGB | TAG | NAME

BEARB. | | BU

GEPR. | | BU

NORM

PLOTT | 01.07.91

ROHDE&SCHWARZ

BENENNUNG

I/Q DEMODULATOR

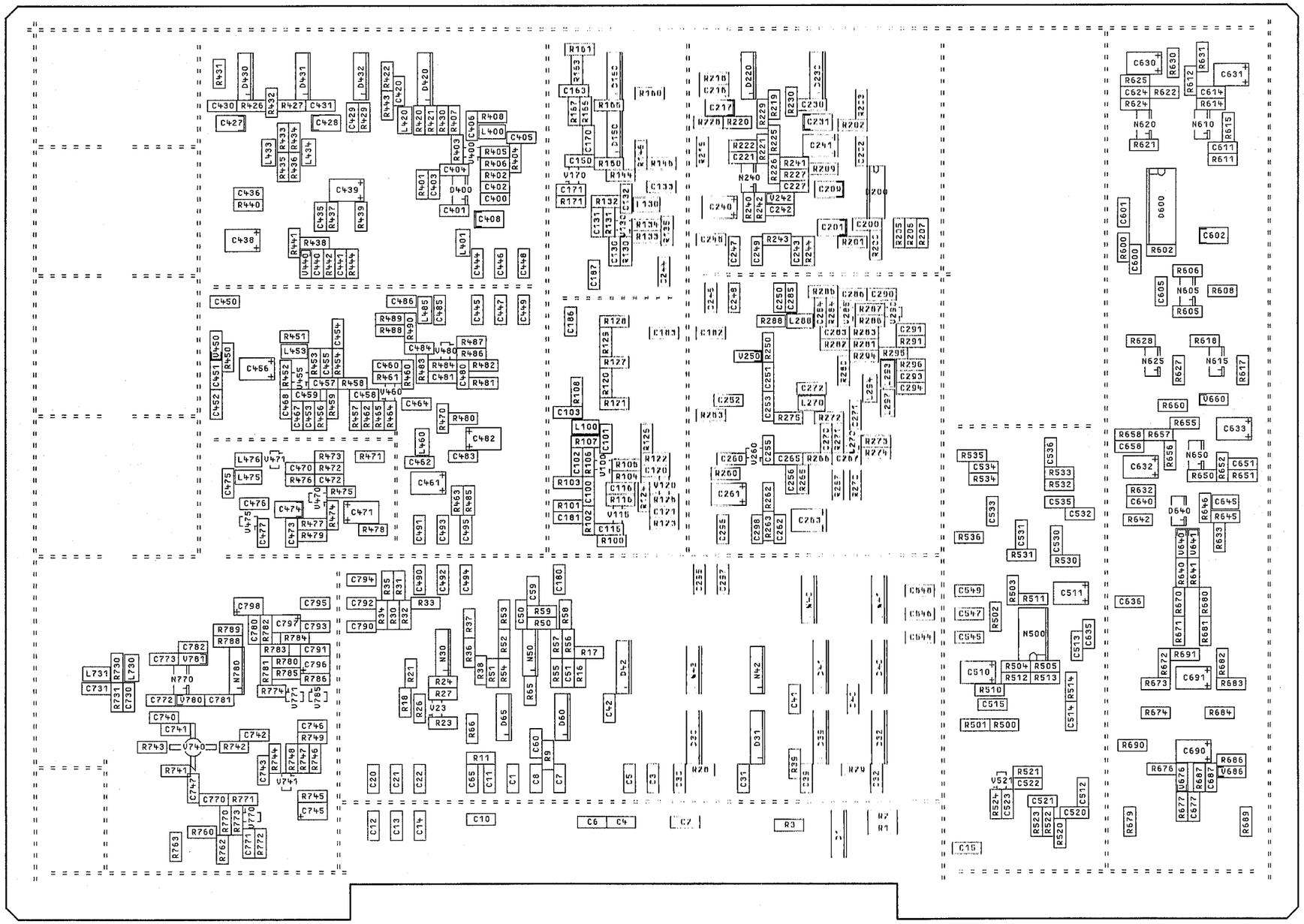
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ZEICHN. NR.

1026.9018.01 EE

1+

DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, RENDERUNGEN KOENNEN NUR DURCH RENDERN DES DATENSATZES E
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.



DARSTELLUNG SEITE A

VIEW ON SIDE A

VERKLEINERUNG

02/00	46356 (7)	08.07.91	BU	1KGD	TAG	NAME	BENENNUNG: I/Q DEMODULATOR
				GEZ.		BU	
				GEPR.		BU	
				NORM			
				PLOT	09.07.91		
01/00	46356 (7)	07.07.91	BU	ROHDE&SCHWARZ			SACHNR 1026.9018.01 / EE / BLATT 2
AEND	AENDERUNG	DATUM	NAME	MUENCHEN			MASS 1026.900

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

SHEET8
M, N

X304
394.7MHZ

IF LOW PASS FILTER
F_G - 1GHZ
G - -1DB

2ND MIXER
320MHZ
G - -6DB

74.4MHZ

DIPLEXER

2ND IF AMPLIFIER
G - 12DB

IF GAIN ADJUST
G--12DB/± 2DB

LEVEL DETECTOR

TP8

OVERLOAD DETECTOR
OL*

IF SWITCH

X305
74.7MHZ
INPUT

X306
74.7MHZ
OUTPUT

SHEET5
F, G

VCO 320MHZ

MIXER AMP

TP2

BUFFER AMP

PRESCALER
4
1

DIVIDER
5
1

PD

LOOP FILTER

LEVEL DET.

SHEET3
B, C

TP7

X307
64MHZ

16MHZ

LEVEL DETECTOR

TP10

PIN ATTENUATOR

MIXER

X303
10.7MHZ

G - -4 ... -37DB

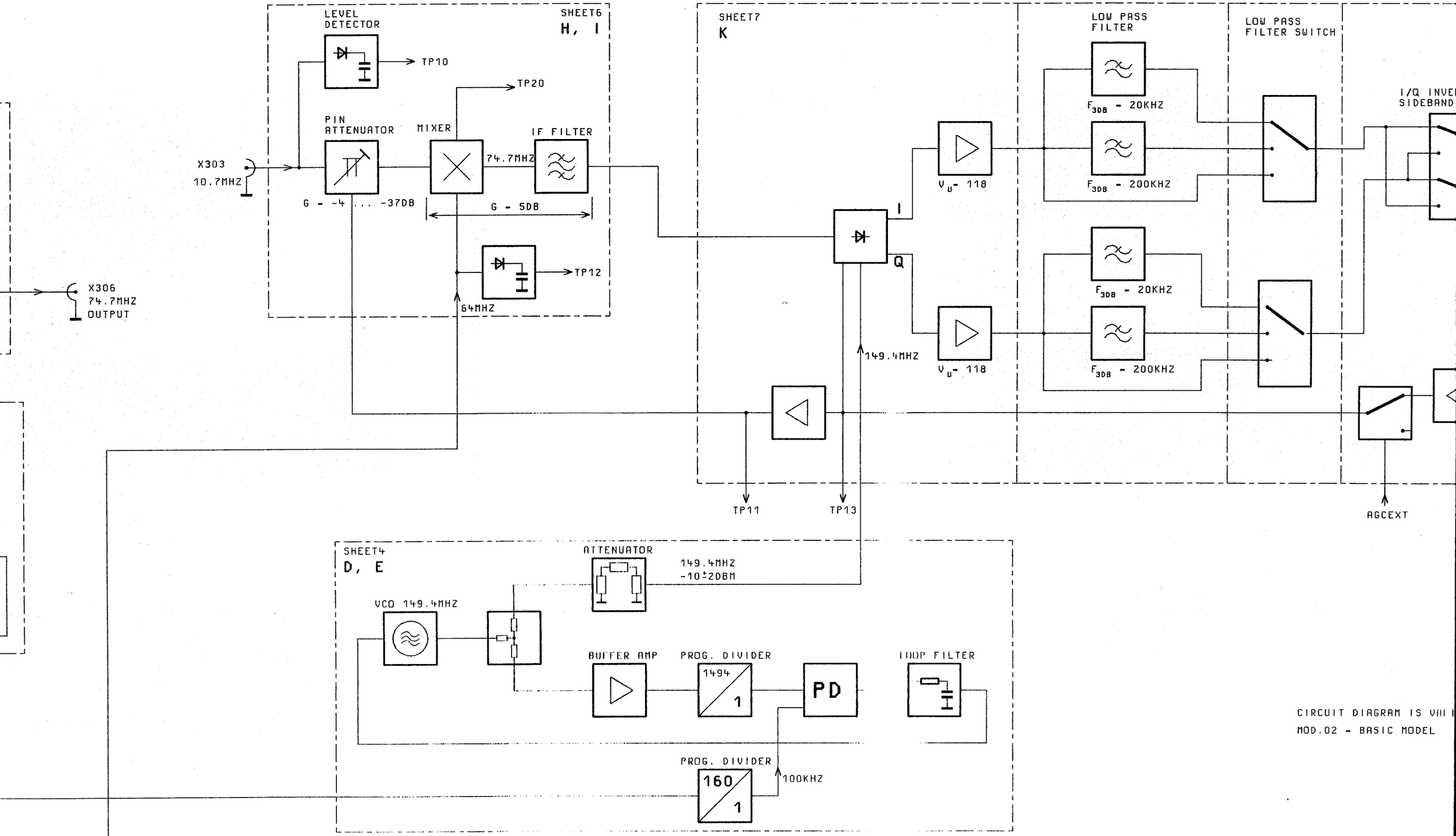
74.7MH

G - 5DB

64MHZ

SHEET4
D, E

VCO 149.4MHZ



CIRCUIT DIAGRAM IS VAL
MOD.02 - BASIC MODEL

06/00	47292 (Leo)	25.05.97
05/00	47292 (14)	01.97
AEND. IND.	AENDERUNGS NACHWEIS	DATUM

SHEET6
H, I

TP20

IF FILTER

MHZ

5DB

TP12

SHEET7
K

I

Q

V_U - 118

V_U - 118

149.4MHZ

LOW PASS FILTER

F_{3DB} - 20KHZ

F_{3DB} - 200KHZ

F_{3DB} - 20KHZ

F_{3DB} - 200KHZ

LOW PASS FILTER SWITCH

I/Q INVERTED SIDEBAND SWITCH

V_U - 1
OUTPUT AMPLIFIER

V_U - 1

LEVEL DETECTOR

TP14

X302
I/Q DEMODULATOR
Q-OUTPUT

X301
I/Q DEMODULATOR
I-OUTPUT

TP15

LEVEL DETECTOR

AGC

AGCEXT

TP11

TP13

ATTENUATOR

149.4MHZ
-10±2DBM

BUFFER AMP

PROG. DIVIDER
1494
1

PD

LOOP FILTER

PROG. DIVIDER
160
1

100KHZ

CIRCUIT DIAGRAM IS VALID FOR MOD.02
MOD.02 - BASIC MODEL

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47292 (Lw)	25.05.92	SMO	IKEN	TAG	NAME
				BEARB.		SM
				GEPR.		SM
				NORM		
				PLOTT	11.06.92	
05/00	47292 (14)	01.92	PF			
AEND. IND.	AENDERUNGS ATTENTION	DATUM	NAME			

BENENNUNG
I/Q DEMODULATOR
I/Q DEMODULATOR

ROHDE&SCHWARZ

ZEICHN.-NR.
1026.9353.01S

BLATT-NR.
1

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1026.9353.01 S

A

BOARD CONTROL

X30A 9
TEST

R4 100R
C1 220P L

X30A 7
SCLK

R1 100R L
D1-A 74HCT14T-L
D1-B
C2 220P
R5 100R
C3 220P L

X30C 7
TDATA

R2 100R L
D1-C
D1-D
C4 220P
R6 100R
C5 220P L

X30C 8
STROBE*

R3 100R L
D1-F
D1-E
C6 220P
R7 100R
+5V
C7 220P L

X30C 9
OL*
OL*

R9 1M L
R8 1K
C8 220P L
OL* SHEET8 E/11

X30A 1
GNDA
X30C 1

X30A 2
+5VA
X30C 2

+5VA
D1-G 74HCT14T-L
C12 10N L
L3 1U2H
C20 560P L
C25 10U 50V
V18 BST70A
+5V
R16 10K L
R18 100K L
R17 10K L
TEST19 SHEET2 E/12

X30A 4
+10V
X30C 4

+10V
C13 10N L
L4 1U2H
C21 560P L
C26 10U 50V
+10V

X30A 5
-10V
X30C 5

-10V
C14 10N L
L5 1U2H
C22 560P L
C27 10U 50V
-10V

+5V
R11 1M L

X30A 11
LOCK

C10 10N L
L1 1UH
C11 10N L
LOCK SHEET2 C/15

X30A 14
GAIN CONTROL

R15 100R
C16 10N L
C15 220P L
GAIN SHEET7 E/4

ADRESSDECODER

JUMPER POSITION:
ESVD: SHORT X3B-X3C
ESU : SHORT X3A-X3B

+5V
R28 1K L
D30-A 74HCT4094T-L
D31-A 74HCT238T-L
X3A X3B X3C

+5V
R29 1K L
D32-A 74HCT4094T-L

DO D1 D2

+5V
R41 1K L
D33-A 74HCT4094T-L

IQINV
LP1
LP2
LP3
AGCEXT
IFSWI

DATA
STR
CLK
SHEET4 D/1

+5V
C30 10N L
D30-B
C31 10N L
D31-B
C32 10N L
D32-B
C33 10N L
D33-B

VHF/UHF SELECT
SHEET2 D/13
L - VHF
H - UHF

D39-A 74HCT

+5V
R39 1K L

TP0 SHEET4 B/6
N4 LM

TP1 SHEET2 C/15
N4 LM

TP2 SHEET4 C/12
N4 LM

TP3 SHEET5 B/4
N4 LM

+5V
N40-E
N41

SUPPLY SWITCH

R38 221K L
C38 10N L
+5V
R42 221K L
N30-A LM339D-L
V38 BAS32-L

+10V
V20 BCP69-16-B
R20 4K75 B
R21 1K L
N30-B LM339D-L
+10VS
R30 30K1 L
R31 10K L
TEST17 SHEET2 E/12

R23 2K L
V23 BC860B-L
R27 1K L
V22 BCP68-16-B
R22 4K75 B
R26 2K21 L
N30-C LM339D-L
R32 10K L
R33 16K2 L
TEST18 SHEET2 E/12

-10V
-10VS

V25 BCP69-16-B
R25 4K75 B
R24 1K L
N30-D LM339D-L
+5VS

+5V +10V
R36 221K L
C37 10U 50V AL B
R34 10K L
TEST16 SHEET2 E/12

V37 BAS32 L
R37 221K L
R35 10K L

+10V
N30-E

BOARD CONTROL

DATA
STR
CLK
SHEET4 D/1

+5V
R29 1K L
D32-A 74HCT4094T-L
C2 EN3 SRG C1/→ 1D 2D 3▽
D0 D1 D2

D31-A 74HCT238T-L
DX G 0/7 &

+5V
R41 1K L
D33-A 74HCT4094T-L
IQINV LP1 LP2 LP3 AGCEXT IFSWI

D31-B C32 10N L D32-B C33 10N L D33-B

VHF/UHF SELECT
SHEET2 D/13
L - VHF
H - UHF

SUPPLY SWITCH

R38 221K L
C38 10N L
+5V R42 221K L
N30-A LM339D-L
V38 BAS32-L

V20 BCP69-16-B
R21 1K L
N30-B LM339D-L
R30 30K1 L
R32 10K L
R31 10K L
TEST17 SHEET2 E/12

R23 2K L
V23 BC860B-L
R27 1K L
V22 BCP68-16-B
R26 2K21 L
N30-C LM339D-L
TEST18 SHEET2 E/12
R33 16K2 L

-10VS

+5VS

V25 BCP69-16-B
R24 1K L
N30-D LM339D-L
+5V +10V
C37 10U 50V AL B
R36 221K L
R34 10K L
TEST16 SHEET2 E/12
R35 10K L
V37 BAS32-L
R37 221K L

+10V
N30-E

BOARD TEST

D39-A 74HCT138T-L
+5V R39 1K L
D3 D4 D5

D40-A 74HC4051T-L
D41-A 74HC4051T-L
D42-A 74HC4051T-L
+5V R40 1K L
MUXDX 8M G8
TEST0 TEST1 TEST2 TEST3 TEST4 TEST5 TEST6 TEST7
TEST8 TEST9 TEST10 TEST11 TEST12 TEST13 TEST14 TEST15

TP0 SHEET4 B/6 → N40-D LM224D-L → TEST0
TP1 SHEET2 C/15 → N40-A LM224D-L → TEST1
TP2 SHEET4 C/12 → N40-B LM224D-L → TEST2
TP3 SHEET5 B/4 → N40-C LM224D-L → TEST3
TP4 SHEET2 C/15 → N41-A LM224D-L → TEST4
TP5 SHEET5 D/12 → N41-B LM224D-L → TEST5
TP6 SHEET3 D/8 → N41-D LM224D-L → TEST6
TP7 SHEET3 E/2 → N41-C LM224D-L → TEST7
TP8 SHEET8 E/8 → N42-C LM224D-L → TEST8
TP9 SHEET8 E/6 → N42-D LM224D-L → TEST9
TP10 SHEET6 B/4 → N42-A LM224D-L → TEST10
TP11 SHEET6 E/2 → N42-B LM224D-L → TEST11
TP12 SHEET3 E/3 → N43-A LM224D-L → TEST12
TP13 SHEET7 E/4 → N43-B LM224D-L → TEST13
TP14 SHEET7 D/9 → N43-D LM224D-L → TEST14
TP15 SHEET7 C/9 → N43-C LM224D-L → TEST15

+5V
N40-E N41-E N42-E N43-E

+5V
D39-B C39 10N L
D40-B C40 10N L
D41-B C41 10N L
D42-B C42 10N L

CIRCUIT DIAGRAM IS VALID FOR MOD.02
MOD.02 - BASIC MODEL

ACHTUNG: EGMI
ELEKTROSTATISCH BEEINFLUSSBARE BAUELEMENTE BEFINDEN SICH IN DIESEM GERÄT
ATTENTION EGMI
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

BOARD TEST

D40-A 74HC4051T-L

D41-A 74HC4051T-L

D42-A 74HC4051T-L

+5V

R40 1K L

TEST0 TEST1 TEST2 TEST3 TEST4 TEST5 TEST6 TEST7

TEST8 TEST9 TEST10 TEST11 TEST12 TEST13 TEST14 TEST15

TP16 TP17 TP18 TP19 TP20

N40-D LM224D-L
N40-A LM224D-L
N40-B LM224D-L
N40-C LM224D-L

TEST0 TP4 SHEET2 C/15 N41-A LM224D-L
TEST1 TP5 SHEET5 D/12 N41-B LM224D-L
TEST2 TP6 SHEET3 D/8 N41-D LM224D-L
TEST3 TP7 SHEET3 E/2 N41-C LM224D-L

TEST4 TP8 SHEET8 E/8 N42-C LM224D-L
TEST5 TP9 SHEET8 E/6 N42-D LM224D-L
TEST6 TP10 SHEET6 B/4 N42-A LM224D-L
TEST7 TP11 SHEET6 E/2 N42-B LM224D-L

TEST8 TP12 SHEET3 E/3 N43-A LM224D-L
TEST9 TP13 SHEET7 E/4 N43-B LM224D-L
TEST10 TP14 SHEET7 D/9 N43-D LM224D-L
TEST11 TP15 SHEET7 C/9 N43-C LM224D-L

N41-E N42-E N43-E

+5V

D39-B C39 10N L
D40-B C40 10N L
D41-B C41 10N L
D42-B C42 10N L

LOCK DETECTOR

+5V

R51 15K L
R54 100K L
R55 100K L
R56 15K L

3,8V
0,9V

N50-A LM339D-L
N50-B LM339D-L
N50-C LM339D-L
N50-D LM339D-L

R52 27K4 L
R53 9K09 L
R57 27K4 L
R58 9K09 L
R59 10K L
R50 10K L
C50 100N L
C59 100N L

TP3 SHEET5 B/6
TP0 SHEET4 B/4

L1 SHEET2 D/13
L2 SHEET2 C/13

D60-A 74HCT02T-L
D60-B 74HCT02T-L
D60-C 74HCT02T-L
D60-D 74HCT02T-L

D65-A 74HCT03T-L
D65-B 74HCT03T-L
D65-C 74HCT03T-L
D65-D 74HCT03T-L

R65 100K
R66 100K L

L1 SHEET2 D/14
L2 SHEET2 D/14
VHF/UHF SELECT SHEET2 D/7

LOCK SHEET2 B/4
TP1 SHEET2 C/8
TP4 SHEET2 D/9

D60-E
D65-E
N50-E

C60 10N L
C65 10N L
C51 4N7 L

CIRCUIT DIAGRAM IS VALID FOR MOD.02
MOD.02 - BASIC MODEL

ACHTUNG! ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE BEI BERÜHRUNG SIND ENTSPRECHENDE VORSCHRIFTEN ZU BEACHTEN.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47297 (1e)	25.05.97	SMI	ERS.	TAG	NAME	BENENNUNG
				BEARB.		SM	I/Q DEMODULATOR
				GEPR.		SM	I/Q DEMODULATOR
				NORM			
				FREIG.	11.06.97		
05/00	47297 (1d)	01.97	PI	ROHDE&SCHWARZ			ZEICHN. NR. 1026.9353.019
ÄEND. IND.	ÄNDERUNGS MITTEILUNG	DATUM	NAME				BLATT NR. 2

MOD.1.0 1026.9001 MOD.2. 1026.9001

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X12 X150 X160

TP7 SHEET2 B/9
TP12 SHEET2 D/11
LO64 SHEET6 A/6

B

REF BUFFER 1

V115 BAS70-04-L
C116 10N L
R116 1M L
+10VB
R108 100R L
C103 10N L
L100 100H L
C115 10P L
R107 681R L
C102 1N L
R106 5K62 L
C101 1N L
X307 1
64MHZ
W1A 1
W1B 1
R102 110R L
C100 1N L
V100 BFR193-L
R100 75R L
R101 75R L
R103 1K L
R104 10R L
R105 10R L

+5V
L180 4U7H
+5VB
C180 10N L
C181 10N L
L181 4U7H
+10VE
+10VB
C182 10N L
C183 10N L

W2A 1
X12D
X12C
X12B
X12A

POWER SPLIT

R125 1M L
R123 90R9 L
C121 1N L
R124 82R5 L
R122 90R9 L
C120 10P L
V120 BAS70-04-L
R126 51R1 L
L120
R121 200R L
R120 51R1 L
R129 68R1 L
R127 100R L
R128 100R L

C

+5VB
L183 4U7H
+5VC
C186 10N L
C187 10N L

REF BUFFER 2

+10VB
R135 100R L
C133 10N L
L130 100H L
R132 681R L
C131 1N L
C132 1N L
R131 5K62 L
C130 1N L
V130 BFR193-L
R130 1K L
R133 10R L
R134 10R L

REF DIVIDER

R165 10R L
D150-B 74AC00SC-L
REF1 SHEET4 E/3
R166 10R L
D150-C 74AC00SC-L
REF2 SHEET5 C/1
V170 BAS70-04-L
R167 10R L
C170 10P L
C171 10N L
R171 1M L
D150-D 74AC00SC-L
TP6 SHEET2 C/8

64MHZ AC PEGEL
16MHZ AC PEGEL
+5VC
R144 33K2 L
R145 33K2 L
R146 10R L
X150
D150-A 74AC00SC-L
R160 1K L
R161 1K L
X160
D160-A 74AC74SC-L
D160-B 74AC74SC-L

CIRCUIT DIAGRAM IS VALID FOR MOD.02
MOD.02 - BASIC MODEL

+5VC
R150 10R L
R163 10R L
C150 10N L
D150-E
D160-C
C163 10N L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
06/00	47292 (20)	25.05.92	SMO
05/00	47292 (14)	01.92	PF

	TAG	NAME
ERSTELLT		SM
BEARB.		SM
GEPR.		SM
NORM		
PLOTT	11.06.92	

ROHDE&SCHWARZ
ZU GEHOERT CSUP 81

BENENNUNG
I/Q DEMODULATOR
I/Q DEMODULATOR

ZEICHN.-NR. 1026.9353.01S
BLATT NR 3

ZEICHN.-NR 1026.9353.02 S

X200 X201 X203 X202 X204 X220 X225 X23 L252

PLL 149,4MHZ

REF & LO DIVIDER

R202 51R1 L
R203 150R L
REF1 SHEET3 E/8
C202 1N L
+5VD
R209 10R L
X202
X201
R201 1K L
C209 10U 10V TA L
C201 10U 10V TA L
C200 1N L
X200
LO1 SHEET4 C/12
R200 51R1 L
R205 100R L
CLK SHEET2 F/7
R206 100R L
DATA SHEET2 F/7
R207 100R L
STR SHEET2 F/7
X203
X204
D200 MB1501-L

FIN LD GND VCC VR X2 X1 DO CLOCK DATA LE FC FR FP R P

PHASE DETECTOR

D220-B 74HCT74T-L
D230-C 74HCT00T-L
D220-A 74HCT74T-L
R218 1K L
R219 1K L
+5VD

LOOP FILTER

X220
R220 3K57 L
R221 3K57 L
C220 3N3 63V 1% FKP
C221 100P L
R222 47K5 L
C222 3N3 63V 1% FKP
+10VD
R228 * 1M L
R240 10R L
C240 10U 25V TA L
X225
R225 3K57 L
R226 3K57 L
C225 3N3 63V 1% FKP
R227 47K5
C227 100P L
C228 3N3 63V 1% FKP
N240 OP07CS8-L
R242 100R L
C241 10U 25V TA L
R241 10R L
-10VD
R229 * 1M L
X23A X23B X23C X23D
L243 2U2H
C242 100P L
V242 BAS32-L
R243 10K L
C243 10N L
R244 10K L
TP0 SHEET2 E/15,D/8

VCO 149,4 MHZ

+10VE
R250 100R L
C261 10U 25V TA L
FREQUENCY ADJUST
L260 2U2H
C260 1N8 L
LEVEL ADJUST
R250 1K L
C251 4P7 L
L252 130NH T
V260 BFR193-L
C253 6P8 L
L253 2U2H
C255 12P L
C265 4P7 L
R266 75R L
C266 20P
L250 2U2H
V250 BB620-L
C252 1P L
R253 332R L
C256 12P L
L262 2U2H
R265 100R L
R262 825R L
R267 100R L
C262 1N8 L
C263 10U 25V TA L
R263 825R L
-10VE
C250 100P L

E

L245 4U7H
+10VD +10VE
C247 10N L
C246 10N L
L246 4U7H
-10VD -10VE
C249 10N L
C248 10N L

L244 4U7H
+5VC +5VD
C244 10N L
C245 10N L

+10VE -10VE
C296 10N L
C298 10N L
L295 4U7H
L296 4U7H
C295 10N L
C297 10N L
+10V -10V

+5VD
R216 10R L
R230 10R L
C217 10U 10V
C231 10U 10V
D220-C
D230-E
C216 100N
C230 100N

D230-B
D230-A
D230-D

* NOT FITTED

CIRCUIT DIAGRAM TO BE USED FOR MODE 0.2 / MODE 0.1
MODE 0.2 DIGITAL MODEL
MODE 0.1 ESM MODEL

FÜR DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

X220 X225 X23 L252 C266 X28 X29

PLL 149,4MHZ

E

L245 4U7H
+10VD C247 10N L
+10VE C246 10N L
L246 4U7H
-10VD C249 10N L
-10VE C248 10N L

LOOP FILTER

X220
R220 3K57 L
R221 3K57 L
C221 100P L
C222 3N3 63V 1% FKP
C220 3N3 63V 1% FKP
R222 47K5 L
+10VD
R228 * 1M L
R240 10R L
C240 10U 25V TA L
X23A X23B X23C X23D
X225
R225 3K57 L
R226 3K57 L
N240 OP07CS8-L
R242 100R L
L243 2U2H
C225 3N3 63V 1% FKP
R227 47K5
C227 100P L
C241 10U 25V TA L
C242 100P L
V242 BAS32-L
R241 10R L
-10VD
C228 3N3 63V 1% FKP
R243 10K L
R229 * 1M L
C243 10N L
R244 10K L
TP0 SHEET2 E/15,D/8

VCO 149,4 MHZ

+10VE
R260 100R L
C261 10U 25V TA L
FREQUENCY ADJUST
L252 130NH T
L260 2U2H
C260 1N8 L
LEVEL ADJUST
V260 BFR193-L
R250 1K L
C251 4P7 L
C253 6P8 L
L253 2U2H
C255 12P L
C256 12P L
L250 2U2H
V250 BB620-L
C252 1P L
C250 100P L
C265 4P7 L
R266 75R L
C266 20P-5P B
C267 3P9 L
R265 100R L
R267 100R L
L262 2U2H
R262 825R L
C262 100P L
L263 10U 25V TA L
R263 825R L
-10VE
+10VE
R275 274R L
C272 10N L
L270 2U2H L
R272 681R L
C270 1N L
R271 5K62 L
C271 1N L
X28A X28B X28C X28D
V270 BFR193-L
R270 1K L
R273 10R L
R274 10R L

POWER SPLIT

L293 100NH L
L294 100NH L
L297 100NH L
W3A 1
LO 149,4 SHEET7 E/1
C293 33P L
C294 27P L
X29A X29B X29C X29D
R296 68R1 L
R295 130R L
R294 68R1 L
+10VE
R288 274R L
C285 10N L
R281 16R2 L
L288 2U2H L
R280 16R2 L
R285 681R L
R282 16R2 L
C284 1N L
R284 5K62 L
C286 1N L
LO1 SHEET4 E/1
C283 1N L
V285 BFR193-L
C290 10P L
R283 1K L
R286 10R L
R287 10R L
V290 BAS70 04-L
TP2 SHEET2 E/8
C291 10N L
R291 1M L

+10VE C296 10N L
-10VE C298 10N L
L295 4U7H
L296 4U7H
C295 10N L
C297 10N L
+10V
-10V

* NOT FITTED

CIRCUIT DIAGRAM IS VALID FOR MOD.02 / MOD.03

MOD.02 - BASIC MODEL

MOD.03 - ESN MODEL

ACHTUNG! LDB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESDI
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

D230-B D230-A D230-D

07/00	47315 (04)	22.10.92	PF	1ESK	TAG	NAME	BENENNUNG
				BEARB.		PF	I/Q DEMODULATOR
				GEPR.		PF	I/Q DEMODULATOR
				NORM			
				PLOTT	21.10.92		
06/00	47292 ( )	25.05.92	SMO				ZEICHN. NR.
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			1026.9353.018

1 2 3 4 5 6 7 8 9 10 11

X40 X430 X431 X432 X433 X401 X44 L452

F

LO DIVIDER

LO2 SHEETS B/12

X40A X40B X40C X40D

C400 2N2 L, L401 47UH L, C408 10U 10V, D400 UPB585G-L

C401 2N2 L, C402 2N2 L, C403 2N2 L, C404 2N2 L

R401 51R1 L, R402 5K62 L, R403 5K11 L, R404* 100R L, C405* 4N7 L, L400* 100UH L, R405 0R L, R406 0R L, C406 10N L, R407 150R L, R408* 33K2 L, V400 BFR193-L, X401

D432-C 74AC00SC-L

R420 1K L, R421 1K L, D420-A 74LS192-L

R422 1K L

+5VF, +10VF, -10VF

R430* 1K L

L444 1U2H, L445 4U7H, L446 4U7H

C444 10N L, C445 10N L, C446 10N L, C447 10N L, C448 10N L, C449 10N L

+5VG, +10VG, -10VG

G

VCO 320MHZ

L455 47UH, C454 10N L, R454 100R L, C456 10U 25V TA L, R451 1K L, R453 1K L, L453 2U2H L, C455 10N L, L452 130NH T, FREQUENCY ADJUST

L451 2U2H, R450 332R L, C451 2P2 L, C452 1P8 L*, C468 8P2 N750, C467 1P L*, C450 1N L, V450 BB620-L

R452 1K L, V455 BFR193-L, C459 4P7 N150, C453 4P7 N150, C457 8P2 L, R458 35R7 L, C458 1N L, R456 511R L, R459 150R L, R457 150R L, R462 1K L, V460 BFR193-L

R463 100R L, C461 10U 25V TA L, C466 10N L, L460 2U2H L, R460 681R L, C460 47P L, R461 5K62 L, C464 1N L, R464 10R L, R465 10W L

PHASE DETECTOR

REF2 SHEET3 D/8

R443 100R L, D432-A 74AC00SC-L, X430, D430-B 74ACT74M-L, X432

D431-C 74ACT00M-L

D430-A, X431, X433

R431 1K L, R432 1K L, +5VF

LOOP FILTER

C438 10U 25V TA L, R438 10R L, C436, R440 511R L, C437 22N 63V 1% FKP

C432 4N7 FKP, C442 4N7 FKP, L433 4U7H L, R435 51R1 L, R433 51R1 L

R436 51R1 L, L434 4U7H L, C433 4N7 FKP, C443 4N7 FKP, C435*, R437 511R L, C439 10U 25V TA L, R439 10R L, C434 22N 63V 1% FKP, -10VF

N430 SE5534AFE

R441 100R L, C440 1N L, V440 BAS32-L

X44A X44B X44C X44D

TP3 SHEET2 C/8,E/13, R442 10K L, R444 10K L, C441 10N L

L450 2U2H

+5VG +10VG -10VG

C491 10N L, C493 10N L, C495 10N L, L490 4U7H, L491 4U7H, L492 4U7H, C490 10N L, C492 10N L, C494 10N L

+5VF

L420 4U7H L, R426 10R L, R427 10R L, R429 10R L

C420 10N L, D420-B, C427 10U 10V, C430 10N L, D430-C, C428 10U 10V, C431 10N L, D431-E, C429 10N L, D432-E

D431-A, D431-B, D431-D, D432-B, D432-D

CIRCUIT DIAGRAM IS VALID FOR MOD.02 / MOD.03

MOD.02 = DUAL MODE

MOD.03 = ESM MODE

* NOT FITTED

F
E
D
C
B
A

1 2 3 4 5 6 7 8

FÜR DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X44 L452 X48 X47 X49

G

+5VF +5VG +10VF +10VG -10VF -10VG

L444 1U2H
C444 10N L
C445 10N L
L445 4U7H
C446 10N L
C447 10N L
L446 4U7H
C448 10N L
C449 10N L

+5VF
R420 1K L
R421 1K L
D420-A 74LS02-L
C10 D1V10
C3 2+
G1 1-
G2
R
R422 1K L
3D
2CT=0
1CT=9
+5VF
R430 1K L *

MIXER AMP

+10VG +10VG
R474 2K74 L
V470 BC860B-L
R477 56R2 L
C473 10N L
C471 10U 25V TA L
C474 10U 10V TA L
C472 4N7 L
L474 2U2H
L475
C475 1N L
R475 7K5 L
C470 100P L
R476 1K L
L476 22NH L
V471 BFR193-L
320MHZ SHEET8 B/3
R472 33R2 L
R473 274R L
C476 10P L
V475 BAS70-04-L
X48D X48C X48B X48A
R479 200K L
C477 10N L
R478 100K L
TP5 SHEET2 D/9

VCO 320MHZ

+10VG
L455 4U7H
C454 10N L
R454 100R L
C456 10U 25V TA L
R451 1K L
R453 1K L
L453 2U2H L
R455 10N L
FREQUENCY ADJUST
L452 130NH T
L451 2U2H
R450 332R L
C451 2P2 L
C468 8P2 N750
C450 1N L
V450 BB620-L
C452 1P8 L
C467 1P L
V455 BFR193-L
C459 4P7 N150
C453 4P7 N150
C457 8P2 L
R456 511R L
R458 150R L
C458 1N L
R457 150R L

+10VG
R463 100R L
C461 10U 25V TA L
C462 10N L
L460 2U2H L
R460 681R L
C460 47P L
C464 1N L
R461 5K62 L
V460 BFR193-L
R462 1K L
R464 10R L
R465 10R L

POWER SPLIT

R471 51R1 L
T470
R470 200R L
R460 51R1 L

BUFFER AMP

+10VG
R485 100R L
C482 10U 25V TA L
C483 10N L
L480 2U2H
R483 681R L
C481 47P L
R484 5K62 L
C484 1N L
R490 68R1 L
L485 22NH L
C480 1N L
R488 100R L
R489 100R L
C485 15P L
C486 15P L
V480 BFR193-L
R481 221R L *
R482 1K L
R486 10R L
R487 10R L
X47C X47B X47A
LO2 SHEET5 E/1

FILTER

+10VF
R438 10R L
C438 10U 25V TA L *
C436
C442 4N7 FKP
R440 511R L
C437 22N 63V 1% FKP
R435 51R1 L
R436 51R1 L
C435 *
R437 511R L
C443 4N7 FKP
N430 SE5534AFE
R441 100R L
C440 1N L
C439 10U 25V TA L
R439 10R L
C434 22N 63V 1% FKP
-10VF
V440 BAS32-L
X44A X44B X44C X44D
R442 10K L
TP3 SHEET2 C/8,E/13
R444 10K L
C441 10N L
L450 2U2H

+5VG +10VG -10VG
C491 10N L
C493 10N L
C495 10N L
L490 1U2H
L491 4U7H
L492 4U7H
C490 10N L
C492 10N L
C494 10N L
+5VS +10VS -10VS

D431-A D431-B D431-D D432-B D432-D

CIRCUIT DIAGRAM IS VALID FOR MOD.02 / MOD.03
MOD.02 = BASIC MODEL
MOD.03 = ISM MODEL

* NOT FITTED

ACHTUNG: ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE FREIGEBEN FÜR BESONDERE BEHANDLUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

07/00	42315 (04)	22.10.92	PF	DESK	TAG	NAME	DENENNUNG
				BEARB.		PF	I/Q DEMODULATOR
				GEPR.		PF	I/Q DEMODULATOR
				NORM			
				PLOTT	21.10.92		
06/00	42292 ( )	25.05.92	SIGO	ROHDE&SCHWARZ			TECHN. NR. 1026.9353.013
AEND. IND.	ÄNDERUNGS MITTEILUNG	DATUM	NAME				BLATT NR 5

X500 X50 L550 L551

H

AGC

+10VH1

R504 6K19 L — 3.9V — R505 4K32 L

TP11 SHEET2 C/10 — R500 47K5 L — R501 47K5 L

N500-B NE5532D-L (pins 11, 7, 8)

R502 1K5 L — R503 1K L — UAGC SHEET7 E/4

L500 100UH

PIN ATTENUATOR

X303 1 10,7MHZ IN

13DBM...-89DBM

C512 27N L — V510 BA389 — V514 BA389 — V511 BA389 — C513 27N L

+10VH1

C514 10N L — 6,2V — X500 — R512 33K2 L — R513 56K2 L

R514 432R L — V513 BA389 — V512 BA389

R515 392R — C515 10N L

N500-A NE5532D-L

X500A X500B X500C X500D

MIXER

+10VH

R570 5K11 L — V571 BCX70H-L — V572 1N4689 — TP20

C570 100N L — V570 8V2 L — R572 20K L

L530 10UH — 7.5V

C532 10N L

R532 511R L — C535 1N L — R533 1K L

C530 10N L — C536 10N L

R530 51R1 L — C537 * — R531 51R1 L — C531 10N L

N530 TDA6130

C534 10N L — R535 51R1 L

R534 162R L — C533 10N L — R536 51R1 L

W2B 1

L551 430NH T — C551 18P — L550 53NH T — L552 53NH T — C550 68P

IF FILTE

* NOT FITTED

LEVEL DETECTOR

+10VH

R521 511R L — C522 1N L — V521 BAS70-04-L — TP10 SHEET2 C/10

V520 U310 — C520 100P L — C521 1N L — C523 1N L — R524 1M L

R520 100K L — R522 511R L — R523 121R L

+10VH1 — R510 10R L — C510 10U 25V TA L

N500-C

C511 10U 25V TA L — R511 10R L

-10VH

+5VH +10VH -10VH

C545 C547 C549 10N L

T545 T546 T547 T548 T549 T550

C544 C546 C548 100N L

DG/DD — DS/DD — AEND. — IND.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

EE CAV AR 1026.9353.01 S

X50

L550 L551 L552

X56
X55

MIXER

+10VH

R570 5K11 L

V571 BCX70H-L

V572 1N4689

TP20

C570 100N L

V570 8V2 L

R572 20K L

L530 10UH

7.5V

C532 10N L

R532 511R L

C535 1N L

R533 1K L

C530 10N L

C536 10N L

X50A X50B X50C X50D

R530 51R1 L

C537 *

N530 TDA6130

C531 10N L

R531 51R1 L

C534 10N L

R535 51R1 L

R534 162R L

C533 10N L

R536 51R1 L

W2B 1

L064 SHEET3 C/4

C/10

+10VH

R510 10R L

C510 10U 25V TA L

+10VH1

12

N500-C

C511 10U 25V TA L

R511 10R L

-10VH

+5VH +10VH -10VH

C545 10N L C547 10N L C549 10N L

L544 4UZH L545 4UZH L546 4UZH

C544 10N L C546 10N L C548 10N L

+5V +10V -10V

IF FILTER

L551 430NH T

C550 68P

L550 53NH T

C551 18P

L552 53NH T

C554 22P

C552 68P

C553 * 12P N150

X56A X56B

X55 1

T560

IFI

IFIX

SHEET7 C/2

* NOT FITTED

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

CIRCUIT DIAGRAM IS VALID FOR MOD.02

MOD.02 = BASIC MODEL

06/00	[illegible] (RO)	25.05.92	SMO	TKEN	TAG	NAME	BENENNUNG
				BEARB.		SM	I/Q DEMODULATOR
				GEPR.		SM	I/Q DEMODULATOR
				NORM			
				PLOTT	11.06.92		
05/00	[illegible] (14)	01.92	PI	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9353.01S
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ZU GERAET ESVD B1			REG.I.V. 1026.9004

4 5 6 7 8 9 10 11

X61 X66 X62 X65 R613 R623 R616 R607 R653 X64

K

AGC

+10VD R630 10R L +10VK C630 4U7 25V TA L
+10VH R690 10R L +10VL C690 4U7 25V TA L
-10VD R631 10R L -10VK C631 4U7 25V TA L
-10VH R691 10R L -10VL C691 4U7 25V TA L
+5VH L635 4U7H +5VK C635 10N L C636 10N L

UAGC SHEET6 E/13
X66A X66B
D640-A DG419-L
AGCEXT SHEET 2 D/8
GAIN SHEET 2 B/4
R660 5K11 L
V660 4V7 L
V661 5082-2810
N650-B TL072ACD-L
R646 1K L
R656 33K2 L
R655 3K92 L
R657 100K L
TP13 SHEET2 C/11
C658 10N L
R658 100K L
X65A X65B X65C
N650-A TL072ACD-L
R652 1K L
R651 10K L
C651 100N L
+10VN
R653 * RTR 50K B
R650 30K1 L
R645 10M
C645 220N
X64A X64B X64C
AGC SHEET7 E/13

+10VK
N800-C AD712AQ
N820-C AD712AQ

20KHZ LOW PASS FILTER
R800 2K L
R801 9K09 L
R802 100R L
C801 1N FKP 1%

200KHZ LOW PASS FILTER
R810 2K L
R811 9K09 L
R812 100R L
C811 100P FKP 1%

20KHZ LOW PASS FILTER
R820 2K L
R821 9K09 L
R822 100R L
C821 1N FKP 1%

200KHZ LOW PASS FILTER
R830 2K L
R831 9K09 L
R832 100R L
C831 100P FKP 1%

I/Q DEMODULATOR

+5VK
R602 10R L
C602 10U 10V TA
D600 PMB2400-L
IFI SHEET6 C/11
IFIX
LO 149,4 SHEET4 E/12
W3B 1
C600 10N L
C601 10N L
R600 51R1 L

C614 4P7 L
R614 8K25 L
C610 2U2 050V MKT
X61A X61B
N610 AD744KR-L
R611 8K25 L
R612 * 1M L
R613 * 2M B
-10VK I/Q PHASE MATCH
C621 6P-2P5 B

I/Q GAIN MATCH R616 100R B
R618 432R L
R615 3R92 L
N615 AD844BQ
C615 10P L
P61

C620 2U2 050V MKT
X62A X62B
N620 AD744KR-L
R624 8K25 L
R621 8K25 L
R622 * 1M L
R623 * 2M B
R628 475R L
R627 3R92 L
N625 AD844BQ
C625 10P L
P62

C606 * 10P L
R605 5K11 L
R606 5K11 L
R607 * 2K
I/Q PHASE OFFSET
N605 AD744KR-L
R608 2K49 L
C605 10P L

BENALTEN WIR UNS ALLE RECHTE VOR

X65 R613 R623 R616 R607 R653 X64

R645 10M C645 220N X64A X64B X64C AGC SHEET7 E/13

R646 1K L

R655 3K92 L X65A X65B X65C R657 100K L C658 10N L

N650-A TL072ACD-L

+10VN R653 * RTR 50K B R652 1K L R651 10K L C651 100N L R650 30K1 L

+10VK N800-C AD712AQ N820-C AD712AQ -10VK

20KHZ LOW PASS FILTER

C803 2N2 FKP 1% R803 5K11 L R800 2K L R801 9K09 L R802 100R L C801 1N FKP 1% N800-A AD712AQ

200KHZ LOW PASS FILTER

C813 220P FKP 1% R813 5K11 L R810 2K L R811 9K09 L R812 100R L C811 100P FKP 1% N800-B AD712AQ

20KHZ LOW PASS FILTER

C823 2N2 FKP 1% R823 5K11 L R820 2K L R821 9K09 L R822 100R L C821 1N FKP 1% N820-A AD712AQ

200KHZ LOW PASS FILTER

C833 220P FKP 1% R833 5K11 L R830 2K L R831 9K09 L R832 100R L C831 100P FKP 1% N820-B AD712AQ

I/Q GAIN MATCH R616 100R B R618 432R L R615 3R92 L +10VK N615 AD844BQ -10VK C615 10P L

R613 * 2M B

R628 475R L R627 3R92 L +10VK N625 AD844BQ -10VK C625 10P L

R623 * 2M B

C606 * 10P L R605 5K11 L R606 5K11 L +10VK C605 10P L N605 AD744KR-L 10VK

P61

P62

LOW PASS FILTER SWITCH

L - ON
H - OFF

N815-C DG411DY-L LP3 SHEET2 D/8

N815-A DG411DY-L LP1 SHEET2 D/8

N815-D DG411DY-L LP2 SHEET2 D/8

N825-A DG411DY-L LP1 SHEET2 D/8

N825-D DG411DY-L LP2 SHEET2 D/8

N825-C DG411DY-L LP3

+10VK N815-E N825-E -10VK

+10VK N830-E DG413DY-L -10VK

I/Q INVERTED SIDEBAND SWITCH

N830-A DG413DY-L N830-D DG413DY-L N830-B DG413DY-L N830-C DG413DY-L

IQINV SHEET2 D/8

AGC SHEET7 E/7

V640 BAV45 V641 BAV45 R640 511R L R641 511R L

* NOT FITTED

CIRCUIT DIAGRAM IS VALID FOR MOD.02 / MO

MOD.02 - BASIC MODEL

MOD.03 - ESN MODEL

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

X67
X68

N820-C AD712AQ

-10VK

C803 2N2 FKP 1%
R803 5K11 L
N800-A AD712AQ
C813 220P FKP 1%
R813 5K11 L
N800-B AD712AQ

C823 2N2 FKP 1%
R823 5K11 L
N820-A AD712AQ
C833 220P FKP 1%
R833 5K11 L
N820-B AD712AQ

N815-C DG411DY-L
LP3 SHEET2 D/8
N815-A DG411DY-L
LP1 SHEET2 D/8
N815-D DG411DY-L
LP2 SHEET2 D/8
N825-A DG411DY-L
LP1 SHEET2 D/8
N825-D DG411DY-L
LP2 SHEET2 D/8
N825-C DG411DY-L
LP3 SHEET2 D/8

LOW PASS FILTER SWITCH

L - ON
H - OFF

+10VK
N815-E
N825-E
10VK
+10VK
N830-E DG413DY-L
-10VK

N815-B DG411DY-L
N825-B DG411DY-L

AGC SHEET7 F/7
V640 BAV45
V641 BAV45
R640 511R L
R641 511R L

I/Q INVERTED SIDEBAND SWITCH

N830-A DG413DY-L
N830-D DG413DY-L
N830-B DG413DY-L
N830-C DG413DY-L
IQINV SHEET2 D/8

+10VH
+10VN
+5VK
R642 200R L
R632 33R2 L
C632 4U7 25V TA L
N650-C
D640-B
C640 100N L
C633 4U7 25V TA L
R633 33R2 L
-10VH
-10VN

LOW PASS FILTER

R674 1K L
+10VL
* R672
C670 2U2 050V MKT
R673 5K11
N670 AD844BQ
-10VL
R675 43R2
R676 5K11 L
V676 BAS32-L
R677 511K
C677 10N L
TP14 SHEET2 C/11
R678 5K11 0.1%
R679 51R1 L
X67A
X67B
X67C
X302 1
I/Q DEMODULATOR
Q-OUTPUT

R684 1K L
+10VL
* R682
C680 2U2 050V MKT
R683 5K11
N680 AD844BQ
-10VL
R685 43R2
R686 5K11 L
V686 BAS32-L
R687 511K
C687 10N L
TP15 SHEET2 B/11
R688 5K11 0.1%
R689 51R1 L
X68A
X68B
X68C
X301 1
I/Q DEMODULATOR
I-OUTPUT

* NOT FITTED

CIRCUIT DIAGRAM IS VALID FOR MOD.02 / MOD.03

MOD.02 - BASIC MODEL

MOD.03 - ESN MODEL

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE BEFINDEN SICH
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

07/00	47316 (04)	23.10.02	PF	ERSK	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				FREIG	21.10.02	
06/00	47292 ( )	28.06.02	PMD			
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME			

BENENNUNG
I/Q DEMODULATOR
I/Q DEMODULATOR

ROHDE&SCHWARZ
AV REGEL. ESVD 81

ZEICHN. NR. 1026.9353.018
BLATT NR 7

X73 X72 X76 R761

M

+5VS L790 4U7H +5VM
C790 10N L
C783 10P L MINI
C791 10N L
C784 10P B MINI
C796 1U 25V

+10VS L791 4U7H +10VM
C792 10N L
C793 10N L
C786 10P B MINI
C797 1U 25V TA L

-10VS L792 4U7H -10VM
C794 10N L
C795 10N L
C788 10P L MINI
C798 1U 25V

+10V +10V
C902 10P L MINI

-10V -10V
C903 10P L MINI

2ND IF AMPLIFIER

+10VM
C745 1U 25V TA L
R745 10K L
R746 9K09 L
R747 121R L
R748 100K L
TP9 SHEET2 C/10
R744 1K L
V741 BC860B-L
R749 100K L
C746 100N L
C742 4N7 L
C743 100N L
C744 10P L MINI
L740 4U7H
L741 4U7H
C741 4N7 L
R740 243R
R741 13R L
C747 4N7 L
C740 4N7 L
V740 NE85639 L
R742 16R2 L
R743 16R2 L

2ND IF LEVEL DETECTOR

TP8 SHEET2 D/10
C774 10P L MINI
+5VM
V771 BAS70-04-L
R774 4K75 L
C770 1N L
V770 HSMS2800-L
R773 10K L
N770-A TL072ACD-L
R771 150R L
R770 10K L
C771 22P L
R772 1M L
N770-B
+10VM
C772 100N L
N770-C
C773 100N L
-10VM

N900-C LM224D-L
N900-D LM224D-L

+10V
IF SU
CONTR
R900 30K1 L
IFSWI SHEET2 D/8
R902 100R L
N900-A LM224D-L
C900 10P L MINI
R905 100R L
C901 100N L
N900-B LM224D-L
R901 10K L

IF GAIN ADJUST

R760 15R L
R761 100R STE
R762 56R2 L
R763 121R L

X73A X73B X73C X73D
X76A X76B X76C X76D

N

LOW - PASS 1GHZ

B700
INCLUDED IN LAYOUT
X304 1
W4A 1
W4B 1
TP
394,7MHZ IN

17DBM ± 1DB
320MHZ SHEET5 E/12
394,7MHZ

B720 SRA1H
LO RF IF
C720 4P3 L MINI
X72A X72B X72C X72D

L730 100NH L
C730 47P L
R730 51R1 L
R731 51R1 L
L731 100NH L
C731 47P L
C732 2P7 L
R732 51R1 L

2ND MIXER

CIRCUIT DIAGRAM IS VALID FOR MOD.02
MOD.01 = BASIC MODEL

ELECTROSTATIC SENSITIVE DEVICES
OBSERVE PRECAUTIONS FOR HANDLING

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1026.9353.01 S

X72 X76 R761

+10VM
R747 121R L
R748 100K L
R749 100K L
C743 100N L
C746 100N L
C748 10P L MINI
C747 4N7 L
V740 NE85639 L
R743 16R2 L
TP9 SHEET2 C/10

2ND IF LEVEL DETECTOR

TP8 SHEET2 D/10
C774 10P L MINI
+5VM
V771 BAS70-04-L
R774 4K75 L
C770 1N L
R770 10K L
R771 150R L
V770 HSMS2800-L
C771 22P L
R772 1M L
R773 10K L
N770-A TL072ACD-L
N770-B
+10VM
C772 100N L
N770-C
C773 100N L
-10VM

OVERLOAD DETECTOR

+5VM
R780 10K L
N780-A NE521D-L
V785 BCX70H-L
R785 2K21 L
R786 2K21 L
C789 10P L MINI
OL* SHEET2 D/3
R788 1K L
R789 1K L
R781 100R L
R783 9K09 L
R784 0R L
+10VM
C780 10N L
R782 909R L
+10VM -10VM
V780 5V1 L
V781 5V1 L
C781 100N L
N780-B
C782 100N L

N900-C LM224D-L
N900-D LM224D-L
+10V
N900-E
-10V

IF SWITCH CONTROL

+10V
R900 30K1 L
IFSWI SHEET2 D/H
C900 10P L MINI
C901 100N L
R901 10K L
N900-A LM224D-L
R902 100R L
R903 2K74 L
V903 BAS32-L
ENA-HF B/10
N900-B LM224D-L
R905 100R L
R906 2K74 L
V906 BAS32-L
ENA-UHF

IF GAIN ADJUST

R760 15R L
R761 100R STE
R762 56R2 L
R763 121R L
X76A X76B X76C X76D

IF SWITCH

C922 10N L
L921 10U L
V922 BA682-L
C921 10N L
V921 BA682-L
ENA-HF D/9
C924 10N L
L923 10U L
V924 BA682-L
C923 10N L
V923 BA682-L
C927 1P L MINI
C925 10N L
L925 10U L
C926 1P L MINI
R925 2K74 L
X306 1 74,7MHZ OUTPUT
74,7MHZ X305 1

B720 SRA1H
LO IF RF
L730 100NH L
C730 47P L
R730 51R1 L
R731 51R1 L
X72A X72B X72C X72D
L731 100NH L
C731 47P L
C732 2P7 L
R732 51R1 L
MIXER

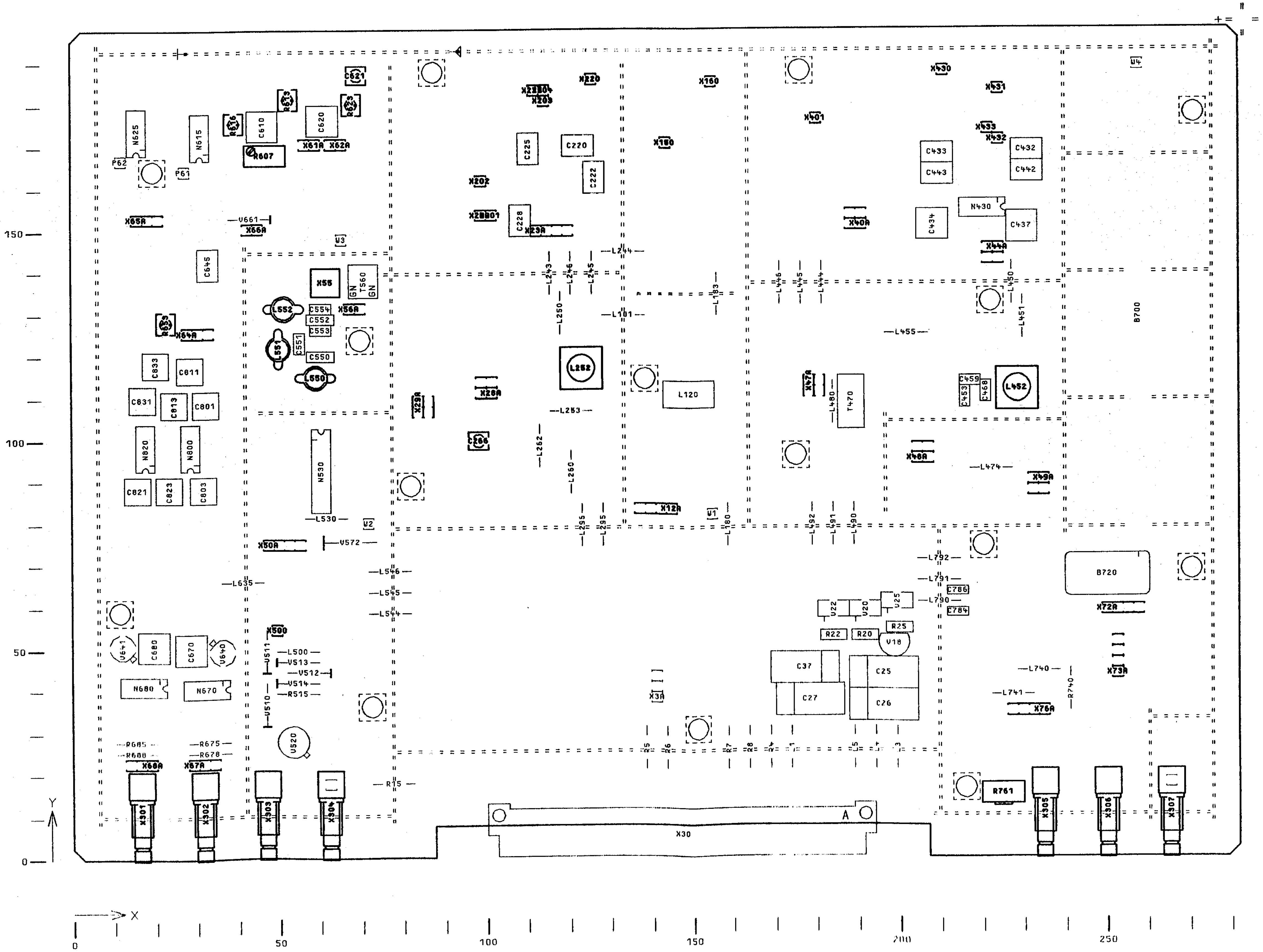
CIRCUIT DIAGRAM IS VALID FOR MOD.02
MOD.02 - BASIC MODEL

ACHTUNG: ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE. UMGANG NUR IN ESD-GESCHÜTZTER UMGEBUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES. REGARD A SPECIAL HANDLING.

06/00	47292 (20)	25.05.92	SMO	ZEICH.	TAG	NAME
				BEARB.		SM
				GEPR.		SM
				NORM		
				PLOTT	11.06.92	
05/00	47292 (19)	01.92	PT	ROHDE&SCHWARZ		
ÄEND. IND.	ÄNDERUNGS MITTEILUNG	DATUM	NAME			

BENENNUNG
I/Q DEMODULATOR
I/Q DEMODULATOR

ZEICHN. NR. 1026.9353.01S
BLATT NR 8



DARSTELLUNG SEITE B

VIEW ON SIDE B

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE
BAUELEMENTE ERFORDERN EINE
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

BINDENDE ANGABEN UEBER VARIANTEN,
TRIMMWERTE BAUTEILWERTE UND
NICHT BESTUECKTE BAUTEILE SIEHE SA.

FOR BINDING INFORMATION ON MODELS,
TRIMMING AND COMPONENTS VALUES AND
NONFITTED COMPONENTS SEE PARTS LIST.

0 1 2 3 4 5

VERKLEINERUNG

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
05/00	47292(20)	16.04.97	PF

	TAG	NAME
1KEN		
BEARB.		SM
GEPR.		SM
NORM		
PLOTT	11.06.92	

ROHDE&SCHWARZ

ZU GERAET FSVD-B1

BENENNUNG

I/Q DEMODULATOR

I/Q DEMODULATOR

Z

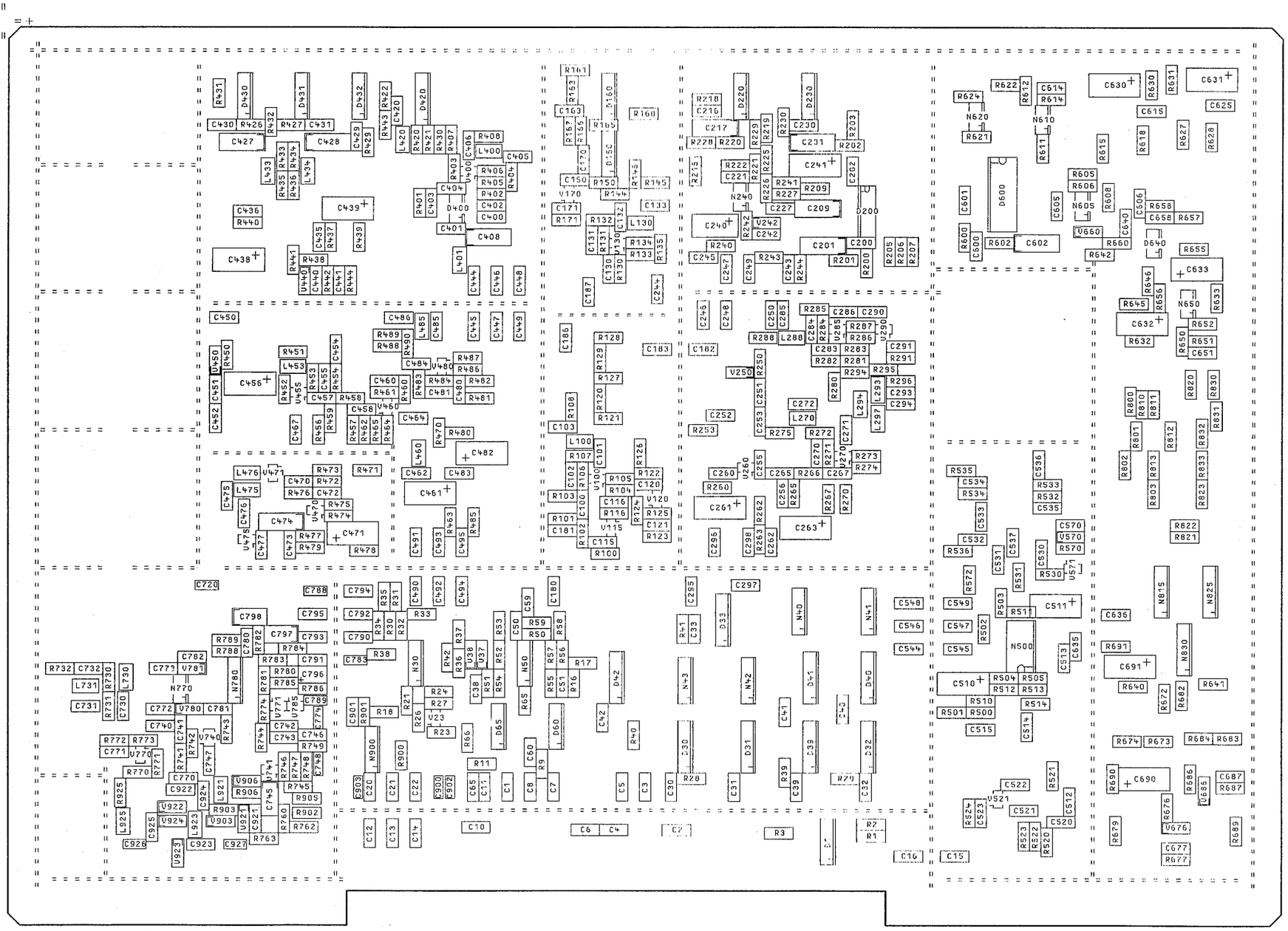
ZEICHN.-NR. 1026.9353.01 EE

BLATT-NR. 1+ BL.

REG.I.V. 1026.9001

... EIN RECHNERAUSDRUCK, AENDERUNGEN KOENNEN NUR DURCH AENDERN DES DATENSATZES ERFOLGEN

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ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

BEIBEHALT UNSERER ANGABEN UEBER VERFAHREN, ERZEUGNISSE, BAUELEMENTE UND NICHT BESTEHENDER SCHUTZRECHTE STEHT UNS FUER BEMUSTUNG, UNTERWEISUNG UND LIEFERMOEGLICHKEIT VON MUSTERN, ERZEUGNISSE UND BAUELEMENTEN STEHT PAPIER FREI.

VERKLEINERUNG
0 1 2 3 4 5

DS/DO	47292(20)	16.04.92	PF	1KEN	1AG	NAME	BENENNUNG
				BEARB.		SM	I/Q DEMODULATOR
				GEPR.		SM	I/Q DEMODULATOR
				NORM			Z
				PLOTT	11.06.92		
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9353.01 EE BLATT-NR. 2+
				MUENCHEN	FSVD-01		REG.I.V. 1026.9001 FORTSETZ.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

Input Attenuator

1010.5999.02

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7 Testing and Repair of the Module Input Attenuator

7.1 Function Description

The Input Attenuator consists of the UHF Attenuator and the Attenuator Control Board.

The UHF Attenuator contains 9 bistable relays with integrated attenuator pads and switches.

The Attenuator Control Board contains the control for the input attenuator. It can be subdivided into the function blocks Board Control and Relay Interface:

The Board Control contains the control, the generation of the switching pulse width for the bistable relays and the detection of an external pulse-proof attenuator pad.

The Relay Interface contains the power switches for relay control.

7.2 UHF Attenuator

The attenuator must NOT be opened!

In the case of a fault, it is to be sent to the R&S service centre.

7.2.1 Assignment of the Relays in the UHF Range

The individual relays are assigned the following functions:

Table 7-1 Assignment of relays in the UHF range

Relay	Position	Meaning
RS1	0 (= off) 1 (= on)	Attenuator in operation 50-Ω termination
RS2	0 1	Receiver operation Calibration
RS3	0 1	Without isolating capacitor, no protection against high interference pulses Normal operation with isolating capacitor
RS4	0 1	10-dB attenuator pad off 10-dB attenuator pad on
RS5	0 1	10-dB attenuator pad off 10-dB attenuator pad on
RS6	0 1	20-dB attenuator pad off 20-dB attenuator pad on
RS7	0 1	20-dB attenuator pad off 20-dB attenuator pad on
RS8	0 1	20-dB attenuator pad off 20-dB attenuator pad on
RS9	0 1	40-dB attenuator pad off 40-dB attenuator pad on

The assignment of the relays and the set attenuation can be obtained from the following table:

Table 7-2 Assignment of relays and set attenuation in the UHF range

Attenuation	RS4	RS5	RS6	RS7	RS8	RS9	V1
0 dB	0	0	0	0	0	0	0
10 dB	1	0	0	0	0	0	0
20 dB	1	1	0	0	0	0	0
30 dB	1	0	1	0	0	0	0
40 dB	1	1	1	0	0	0	0
50 dB	1	1	0	1	0	0	0
60 dB	1	1	1	1	0	0	0
70 dB	1	0	1	1	1	0	0
80 dB	1	1	1	1	1	0	0
90 dB	1	0	1	1	0	1	0
100 dB	1	1	1	1	0	1	0
110 dB	1	0	1	1	1	1	0
120 dB	1	1	1	1	1	1	0

If the option ESVS-B1 is installed (pulse-proof attenuator pad), the following assignment is valid:

Table 7-3 Assignment of relays and the set attenuation in the UHF range with option installed

Attenuation	RS4	RS5	RS6	RS7	RS8	RS9	V1
0 dB	0	0	0	0	0	0	0
10 dB	0	0	0	0	0	0	1
20 dB	0	1	0	0	0	0	1
30 dB	0	0	1	0	0	0	1
40 dB	0	1	1	0	0	0	1
50 dB	0	1	0	1	0	0	1
60 dB	0	1	1	1	0	0	1
70 dB	0	0	1	1	1	0	1
80 dB	0	1	1	1	1	0	1
90 dB	0	0	1	1	0	1	1
100 dB	0	1	1	1	0	1	1
110 dB	0	0	1	1	1	1	1
120 dB	0	1	1	1	1	1	1

The assignment of relays RS1 to RS3 can be seen from the following table:

Table 7-4 Assignment of relays RS1 to RS3

Operating Mode	RS1	RS2	RS3	Attenuation setting acc. to
Calibration	1	0	1	Table 7-2
Receiver operation	0	1	1	Table 7-2 or Table 7-3

In the case of the receiver calibration, the assignment according to Table 7-2 applies to relays RS4 to RS9 and V1 irrespective of whether the option is installed.

7.2.2 Assignment of the Relays in the RF Range (only in model ESS)

In the RF range, the attenuation is set in the RF module. The signal received by the antenna socket is just passed on by the input attenuator. The following setting for receiver operation and calibration of the receiver applies to the input attenuator (irrespective of whether the option ESVS-B1 is installed):

Table 7-5 Assignment of relays RS1 to RS3

Operating Mode	RS1	RS2	RS3	RS4-RS9	V1
Calibration	1	0	1	all 1	0
Receiver operation	0	1	1	all 1	0

7.3 Attenuator Control Board

7.3.1 Board Control

The board is coupled to the serial instrument bus via the ICs D1-D5. When the board is controlled, the data are transferred to the output latches of ICs D3A and D4A, the transfer pulse being extended at the same time to a defined relay pulse duration of approx. 20 ms using monoflop D35A.

A voltage of approx. 2.5 V is applied at D6-A pin 1. By connecting the external pulse-proof attenuator pad (option) X80.3 and X80.4 are short-circuited and the voltage at D6-A pin 1 decreases to approx. 0 V. This voltage can be polled by the CPU board in the selftest, which also permits to determine whether the external attenuator pad is connected.

The RC network (R1, C1) of transistor V1 delays the voltage rise on the board when the instrument is switched on and reduces loading of the power supply by the startup current.

7.3.2 Relay Interface

The 10 identical ICs D20-A to D29-A each contain a H-bridge as power switch. Both paths of this bridge are controlled independently of each other by the inputs "IN1" and "IN2" and can be switched high-impedance at the same time by a signal applied at the "Enable" input.

The inputs IN1 and IN2 are driven with opposite phase by the inverting drivers D31-A and D32-A. The transfer pulse of the board control actively switches the H-bridge drivers for approx. 20 ms and then back to high-impedance state. During this period, the bistable relay assumes its new state.

The assignment of the switches and the relays can be obtained from the following table:

Table 7-6 Assignment of switches and relays

Switch	Relay	Meaning
D20-A	RS1	Attenuator in operation/50-Ω termination
D21-A	RS2	Calibration switch
D22-A	RS3	Isolating capacitor
D23-A	RS4	10-dB attenuator pad
D24-A	RS5	10-dB attenuator pad
D25-A	RS6	20-dB attenuator pad
D26-A	RS7	20-dB attenuator pad
D27-A	RS8	20-dB attenuator pad
D28-A	RS9	40-dB attenuator pad
D29-A	V1	10-dB attenuator pad (Option)

If the option ESVS-B1 (pulse-proof attenuator pad) is installed, the option (V1) is connected instead of the first 10-dB attenuator pad (RS4) with appropriate programming.

7.4 Troubleshooting

7.4.1 Automatic Selftest

The automatically running test of this board is executed prior to the tests of the subsequent boards. Proper functioning of these subsequent boards and the calibration of the signal path cannot yet be assumed at this point in time.

For checking the function of the attenuator, various settings are permuted for the attenuation 50 dB and the respective levels measured with the calibration generator switched on. If the measured values comply with each other, the attenuator functions properly, otherwise troubleshooting is continued with 7.5.2.

7.4.2 Testing using the Service Function

This troubleshooting procedure assumes proper functioning of the signal and evaluation boards.

The attenuator pads of the attenuator can be individually set using the service function 16 "SET INP ATT".

For troubleshooting, the attenuator pads are individually set with the calibration generator switched on, and a check is made as to whether the level readout complies with the attenuator pad currently cut in.

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1010.9694.02 ATTENUATOR CONTROL BOARD A70

X80

1 2 3 4 5 6 7 8 9 10 11 12 13 14

800.9870

K1 K2 K3 K4 K5 K6 K7

Z10 Z11 Z12 Z13 Z14 Z15 Z16

C13 C14 C18 C19 C22 C23 C24 C25 C4 C5 C6 C7

X1

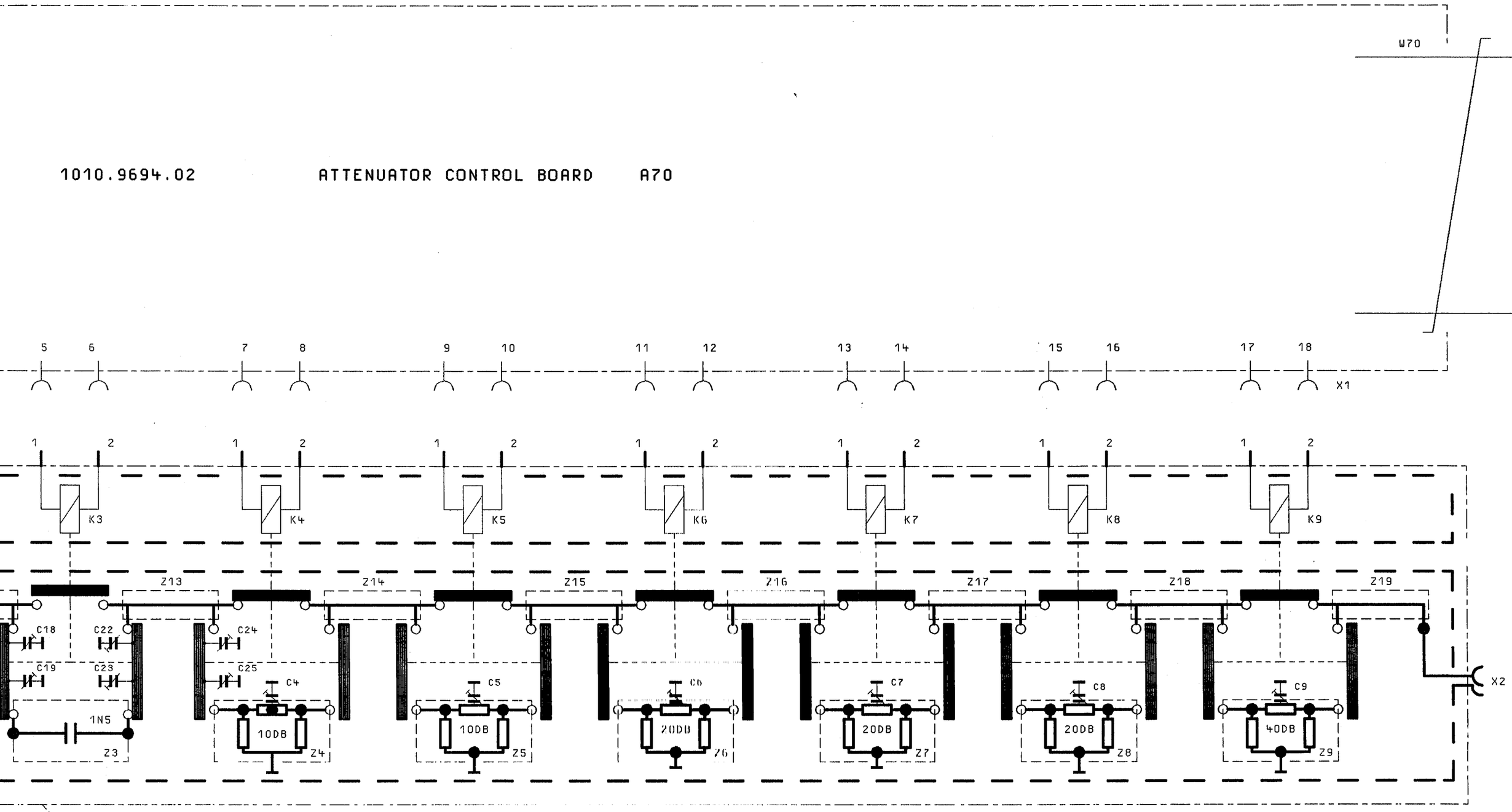
500HM Z1 Z2 1N5 Z3 10DB Z4 10DB Z5 20DB 20DB

800.9857

X3 X4

ATTENUATOR 1010.6014

1010.9694.02 ATTENUATOR CONTROL BOARD A70

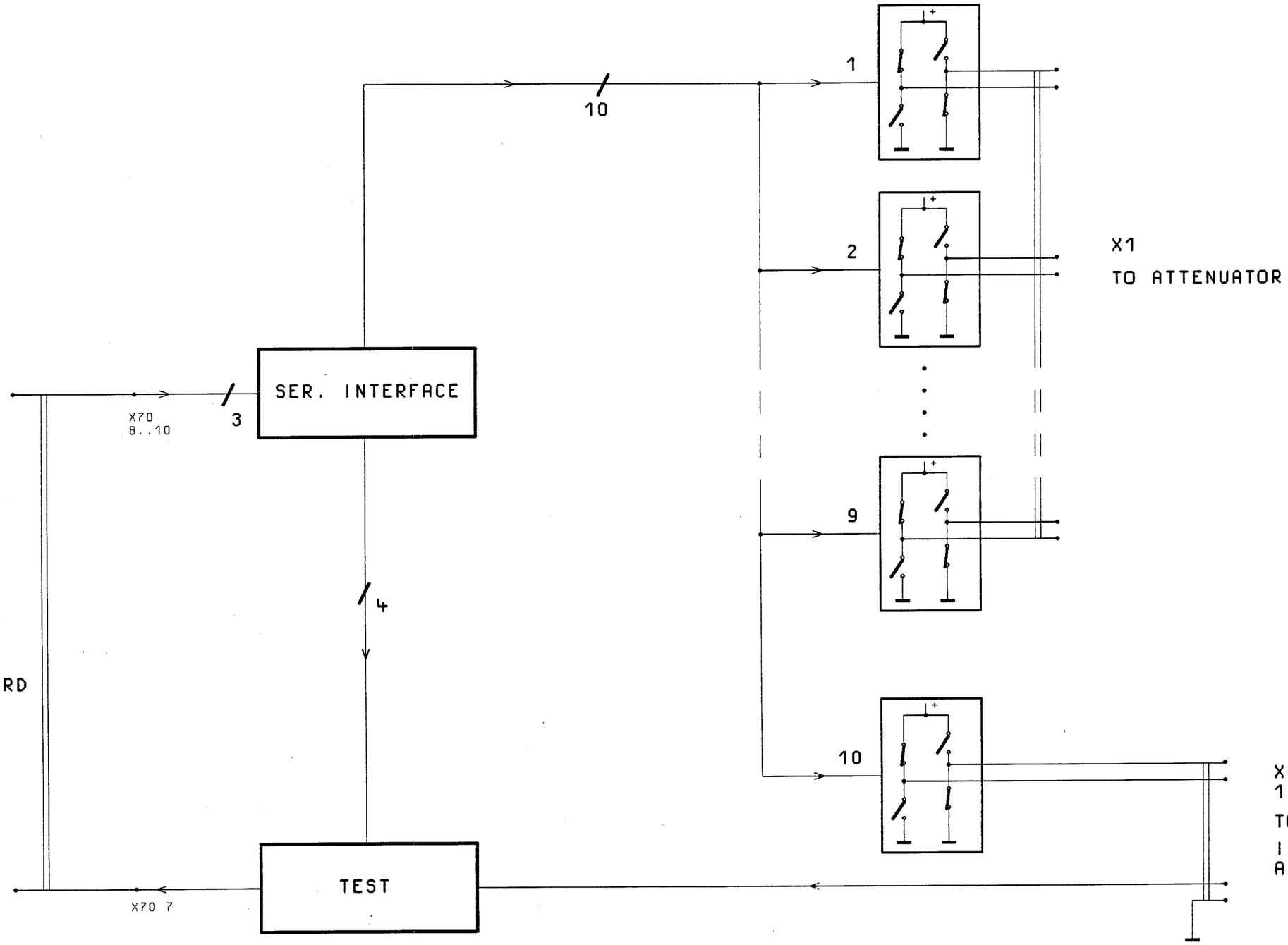


ATTENUATOR 1010.6014

CIRCUIT DIAGRAM IS VALID FOR MOD.02

02/00	46349(16)	07.91	Pf	1KEE	TAG	NAME	BENENNUNG
				BEARB.		NG	INPUT ATTENUATOR
				GEPR.		NG	
				NORM			
				PLOTT	15.07.91		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.5999.01S
				ZU GERAET	ESVS30		BLATT-NR. 1 v. 1 BL.
				REG.I.V.	1010.5001	ERSTE Z.	

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CIRCUIT DIAGRAM IS VALID FOR MOD.02

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
01			

1KEE	TAG	NAME
BEARB.	10.90	RB
GEPR.		RB
NORM		
PLOTT	22.10.90	RB

ROHDE&SCHWARZ
ZU GERAET ESH30

BENENNUNG
ATTENUATOR CTRL BOARD

ZEICHN.-NR. 1010.9694.01 S

ZEICHN.-NR. 1010.9694.01 S

AENDT NR. 1

NORM-LIEF. 1010.5001

BOARD CONTROL

RELAIS INTER

W70

X70 5 — +12V — +12VA

X70 6

C1 10U

V1 RFP12P10

V2 BAS32-L

R1 100K L

X70 3 — +5V — +5VA

X70 4

R3 10R L

C3 10U

+5VA +5VA +5VA

R11 274K B

C11 100N B

R12 10K B

D34-A 74HCT4538T-B

20MS

D31-A 74HCT540T-B

R50 10R B

Z1 Z2 Z3 Z4 Z5 — Z1* Z2* Z3* Z4* Z5*

+5VA

R13 10K B

D3-A 74HCT4094T-B

C2 EN3 SRG C1/→

4 Z1 5 Z2 6 Z3 7 Z4 14 Z5 13 Z6 12 Z7 11 Z8

9 10

+5VA

R14 10K B

D4-A 74HCT4094T-B

4 Z9 5 V1 6 7 14 T1 13 T2 12 T3 11 T4 9 10

X70 9 — STROBE

D1-A 74HCT14T-B

R4 100R B

D1-B

+5VA

R15 10K B

D2-A 74HCT4094T-B

X70 8 — SCLK

D1-C

R5 100R B

D1-D

D5-A 74HCT238T-B

X70 10 — FDATA

D1-F

R6 100R B

D1-E

ADR.:21D

X70 1

X70 2

X70 7 — TEST

D6-A 74HC4051T-B

MUXDX

T1 T2 T3 T4

+5VA +5VA +12VA

R8 10K B R9 10K B R10 10K L

R19 10K L R20 10K L R21 2K74 L

R7 1K B

C7 220P B

Z1* R30 100R B

Z1 R31 100R B

Z2* R32 100R B

Z2 R33 100R B

Z3* R34 100R B

Z3 R35 100R B

Z4* R36 100R B

Z4 R37 100R B

Z5* R38 100R B

Z5 R39 100R

+12VA

C30 470U D20-B

C32 470U D21-B

C33 470U D22-B

C34 470U D23-B

C35 470U D24-B

C36 470U D25-B

C37 470U D26-B

C39 470U D27-B

D28-B

D29-B

+5VA

D1-G

D31-B

D32-B

D2-B

D3-B

D4-B

D5-B

D6-B

D34-B

D34-C

STROM

CIRCUIT

02/00

REND. IND.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

RELAIS INTERFACE

D34-A
74HCT4538T-B

C11 100N B
R12 10K B
+5VA
20MS

D3-A
74HCT4094T-B
R13 10K B

D4-A
74HCT4094T-B
R14 10K B

D5-A
74HCT238T-B

ADR.:21D

D6-A
74HC4051T-B
+5VA +5VA +12VA
R7 1K B
C7 220P B
R8 10K B
R9 10K B
R10 10K L
R19 10K L
R20 10K L
R21 2K74 L

D31-A
74HCT540T-B
R50 10R B

D32-A
74HCT540T-B

D20-A L6201-L
C50 100N L
R30 100R B
R31 100R B
X1 2
X1 1

D21-A L6201-L
C51 100N L
R32 100R B
R33 100R B
X1 4
X1 3

D22-A L6201-L
C52 100N L
R34 100R B
R35 100R B
X1 6
X1 5

D23-A L6201-L
C53 100N L
R36 100R B
R37 100R B
X1 8
X1 7

D24-A L6201-L
C54 100N L
R38 100R B
R39 100R B
X1 10
X1 9

D25-A L6201-L
C55 100N L
R40 100R B
R41 100R B
X1 12
X1 11

D26-A L6201-L
C56 100N L
R42 100R B
R43 100R B
X1 14
X1 13

D27-A L6201-L
C57 100N L
R44 100R B
R45 100R B
X1 16
X1 15

D28-A L6201-L
C58 100N L
R46 100R B
R47 100R B
X1 18
X1 17

D29-A L6201-L
C59 100N L
R48 100R B
R49 100R B
V51 BAS32-B
R51 100R B
R52 3R7 B
X80 1
X80 2
X80 3
X80 4

+12VA: C36 470U, C37 470U, C39 470U
D26-B, D27-B, D28-B, D29-B
+5VA: D5-B, D6-B, D34-C, D34-B

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STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

02/00	46349(16)	07.91	Pf	1KEE	TAG	NAME
				BEARB.		RB
				GEPR.		RB
				NORM		
				PLOTT	29.07.91	

BENENNUNG: ATTENUATOR CTRL BOARD

ROHDE&SCHWARZ
ZU GERAET E9930

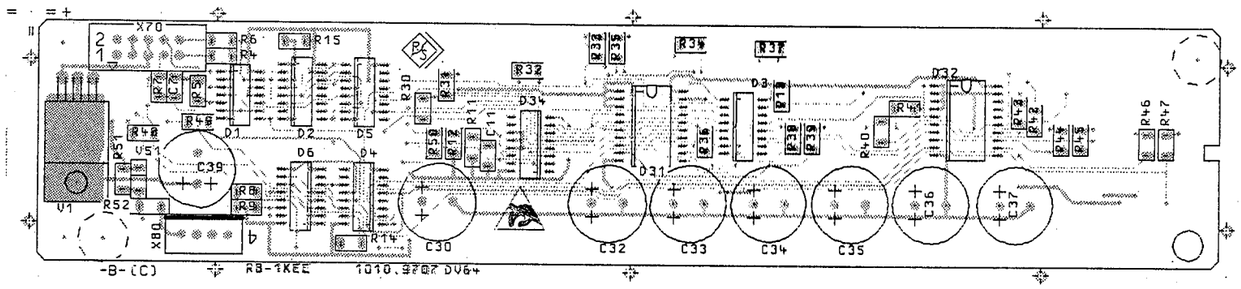
ZEICHN.-NR. 1010.9694.01S

BLATT-NR. 2 v. 2 BL.

REND. IND. | AENDERUNGS-MITTEILUNG | DATUM | NAME

REG.I.V. 1010.5001 | ERSTE Z.

Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

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Elektrostatisch gefährdete Bauelemente erfordern eine besondere Handhabung.
ATTENTION ESD!
Electrostatic sensitive devices require a special handling.
(hierzu HVC 250)

01				Maße ohne Toleranzangabe		Maßstab 1 : 1	
						Halbzeug, Werkstoff	
				1KEE	Tag 10.90	Name Rb	Benennung ATTENUATOR CTRL BOARD
				Bearb			Z
				Gepr			
				Norm			
And. Zust	Anderungs-Mitteilung	Tag	Name	ROHDE&SCHWARZ			Zeichn.-Nr 1010.9694 Blatt-Nr 3 v 3 Bl
				zu Gerat ESVS30			Ers. f. 1010.5001 V Ersatz f.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

VHF Preselector

1010.9394.02

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7 Testing and Repair of the Module VHF Preselector

7.1 Function Description

7.1.1 Function within the Instrument

The "VHF Preselector" module converts the RF signal between 20 and 1000 MHz into the 1st intermediate frequency 1354.7 MHz. This board accomodates one fix-tuned preselection filter and 5 tunable ones, a switchable 10-dB preamplifier, the 1st mixer and the low noise 1st-IF amplifier. The working points of the amplifier and the signal level can be tested using the selftest functions.

7.1.2 Detailed Function Description

(cf. circuit diagram 1010.9394.02S sheets 1 to 5)

Input filter

The RF signal applied to the board input X111 via the attenuator and the input switchover (cf. block diagram of the receiver, Section 6.1) is passed to a 20-MHz highpass filter for suppression of high-energy, low-frequency noise pulses. The subsequent lowpass filter of 9th order increases the IF rejection and suppression of the oscillator noise voltage.

Switchover of the preselection filters (Filter Control)

Good matching of the insertion losses of the preselection bandpasses is achieved by the cascaded structure of the filter switchover. In the upper filter range (BP 6), the signal is only applied to the relay K110-A, in the next lower range (BP 5) it is applied to the relays K110-A and K111-A. C107 to C112 are used for compensating the inductivity of the switching contacts. If one of the filter ranges 1-4 is switched on, the signal passes via K110-A, K111-A and one of the PIN diodes V120 to V123 to the respective bandpass.

The use of bi-stable relays for K110 and K111 considerably reduces the power consumption of the control circuit. The switchover signals are routed from the decoder D15-A via C115 or C110 , via N110-C or N110-B and via the driver stages V110, V111 or V117, V118 to the relays.

If, e.g., filter 6 is switched off, both connectors of C115 are applied to zero potential, N110.8 is applied to zero potential, too, and no current flows through K110-B. When filter 6 is switched on, D15.9 assumes high level (+ 5 V) and the short, positive pulse at N110.10 shortly connects V110 through and thus, the relay switches. If filter 6 is switched off again, the negative pulse at N110.10 connects through the transistor V111 and the relay switches over.

The switching diodes V120 to V127 are controlled by the OpAmps N20-A to N20-D, the latter being supplied by ± 10 V in order to prevent intermodulation distortions. If, e.g., bandpass 3 is switched on, V122 becomes low-impedance, V120, V121 and V123 are reverse-biased by a high reverse voltage, while V124 to V126 also become low-impedance.

The filter switchover at the output of the preselection filters is set up likewise.

Preselection filters (BP1 to BP6)

In the frequency range of 20 to 51.3 MHz, a fix-tuned bandpass filter of 5th order made up of discrete elements is used. The two-pole bandpass filters 2 (51.3 to 125.3 MHz) and 3 (125.3 to 273.3 MHz) with capacitive base coupling which are also consisting of discrete elements are tuned through. Tuning and coupling of the two series circuits are varied. The filters 4 (273.3 to 495.3), 5 (495.3 to 717.3 MHz) and 6 (717.3 to 1000 MHz) which are set up identically consist of resonators of reduced capacity. Capacity diodes with small tolerance provide for synchronism of the circuits.

Tuning Voltage

The tunable bandpass filters BP2 to BP6 have different tuning characteristics. The frequency information (A0 to A7, B1 to B6) transferred from the CPU board to the data registers D12 and D13 via the serial bus is used for addressing the OTPROM D18. The appropriate tuning voltage required for the selected filter range and the frequency is generated by the 10-bit D/A converter D19 with N21-A/B from the digital word (O0 to O9) at the respective address. In addition, N21-C and D generate voltages for tuning the base coupling of the bandpasses 5 and 6. The tuning voltage can be checked by means of the selftest.

The timers D16 and D17 can be programmed with the step size to avoid that, with fast scan, the complete frequency information must be transferred with each step. Thus, the next tuning voltage step is automatically initiated by each clock pulse at X11.A12 (PRCLK) supplied by the FRN synthesizer.

RF Preamplifier

Between preselection and 1st mixer, the integrated preamplifier N210 can be switched on via the relays K202 and K203. The + 5-V operating voltage is supplied to the amplifier via V230 or V235. The relay control corresponds to the switchover of the preselection filters. The attenuation equalizer C243, C253, L232, R230-232 compensates for the drop of the frequency response occurring with high frequencies.

1st Mixer and Diplexer

The preselection filters are followed by a highpass-lowpass separating filter which reduces the frequency dependence of the mixed attenuation by means of the broadband 50-Ω termination of the IF signal generated in the mixer. The board A120 (UHF synthesizer) supplies the LO signal between 1374.7 and 2354.7 MHz at a level of + 17 dBm to the mixer B200. The diplexer following the IF gate improves the intermodulation characteristics.

1st IF Amplifier

The 1354.7 MHz IF signal passes via the lowpass path of the diplexer to the low-noise IF amplifier V250. The stripline matching network L251, L252, L255-258 transforms the signal to the complex impedance required for minimum noise figure at the base. The transformation L253, L259 is used for output matching. The transistor V255 stabilizes the d.c. working point. The collector current of V250 can be checked by means of the selftest.

1st IF Level Detector

The level detector at the output of the 1st IF amplifier realized by a low-capacity Schottky diode checks, whether the 1st mixer or the IF amplifier are overloaded by broadband signals or by sinewave signals beyond the test channel. The detection voltage of the detector V270, C272 is supplied to the comparator N25 via the fast buffer OpAmp. The threshold voltage at the reference input N25.1 of the comparator is varied depending on the preselection filter range. The monoflop D26-A stretches the overload signal of the comparator N25 in case of short-time overload pulses. The processor is initiated to increase the attenuation in autorange mode via the overload output X11.C9.

During the selftest, the 64-MHz calibration generator signal generated by the board A130 (2nd mixer) is applied to the board input X111 with a level of 90 dBµV. The resulting IF signal level at the IF output X116 is also measured by the level detector V270, C272 and passed to the selftest output X11.A9 via N270 and N28-C, thus allowing for testing the complete signal path.

7.2 Test Instruments and Utilities

Item	Type of instrument	Required Specifications	Suitable instrument	R&S order No.
1	Digital voltmeter		UDS5	349.1510.02
2	Network analyzer	10 MHz to 4 GHz		
3	Spectrum analyzer	100 kHz to 1,5 GHz	FSA	804.8010.52
4	Signal generator	20 to 1000 MHz	SMG	801.0001.52
5	Pulse generator	90 dBµV/MHz	Schwarzbeck IGU 2912	

7.3 Troubleshooting

Note: ***Correct functioning of the modules Display Board, Rear Panel, CPU Board, FRN Synthesizer, UHF Synthesizer and of the calibration generator on the 2nd Mixer board is required for the automatic selftest of this module. The automatic selftest of the complete instrument is generally aborted, if a measurement exceeds the predefined tolerance limits in order to avoid absurd error messages. For further error location using external signals, the test functions can be called manually in the Board Test menu (cf. Section 6).***

The automatic selftest does not allow for localization of each error occurring. Refer to the troubleshooting flowchart (fig. 7-1) for localization of those errors, which cannot be found by the automatic selftest.

- Press hardkey SELFTEST, call Board Test menu (SELFTEST 09).
- Select the VHF preselctor module using the ↑ or ↓ keys.
- Call test function 0 to start the board test for the complete instrument. The test is interrupted when the first faulty test function occurs; it can, however, be continued by pressing the ENTER key (cf. Section 6).
- Enter the faulty test function and switch over to the manual test mode by pressing the ENTER key. If the fault is assumed to be in the VHF preselector and is not recognized by the automatic selftest, continue troubleshooting using the flowchart, fig. 7-1.
- he default setting for the VHF preslector as well as the additional settings for the respective test function (cf. table 7-1) are automatically set. The measured selftest voltage is output in the LEVEL display, the permissible tolerance limits are given in the DATA INPUT display.

Default setting:	Frequency	64 MHz
	RF attenuatio	0 dB
	Preamplifier	on
	Calibration gen.	64 MHz on

Table 7-1 Test functions of the VHF Preselector

Test function	Description	Setting TP = test point	Rated value	Error message ERR:
0	Tests 1-8	Tests 1-8	Test 1-8	
1	Supply Test + 10 V	TP4	2.2 to 2.8 V	Supply + 10 V
2	Supply Test - 10 V	TP2	2.2 to 2.8 V	Supply - 10 V
3	Supply of preamplifier	TP7	2.3 to 2.9 V	Preamp Supply
4	Working point 1st IF Amp	TP6	2.6 to 2.8 V	1st IF Amp Bias
5	Tuning voltage test	Freq. 51.3 MHz; TP3	0.1 to 0.2 V	Presel Tuning Volt.
6	Tuning voltage test	Freq. 999.3 MHz; TP3	2.42 to 2,.2 V	Presel Tuning Volt.
7	Overload threshold	TP1	0.6 to 1.7 V	OL-Threshold
8	Level at board output	TP5	0.1 to 1.2 V	1st IF Level

TP = Test points of the VHF preselector

- Plug the board onto the service kit EZ-xx.
- When the faulty test function has been determined, continue troubleshooting using the troubleshooting flowchart (Fig. 7-1). The serial interface can be checked using table 7-2.

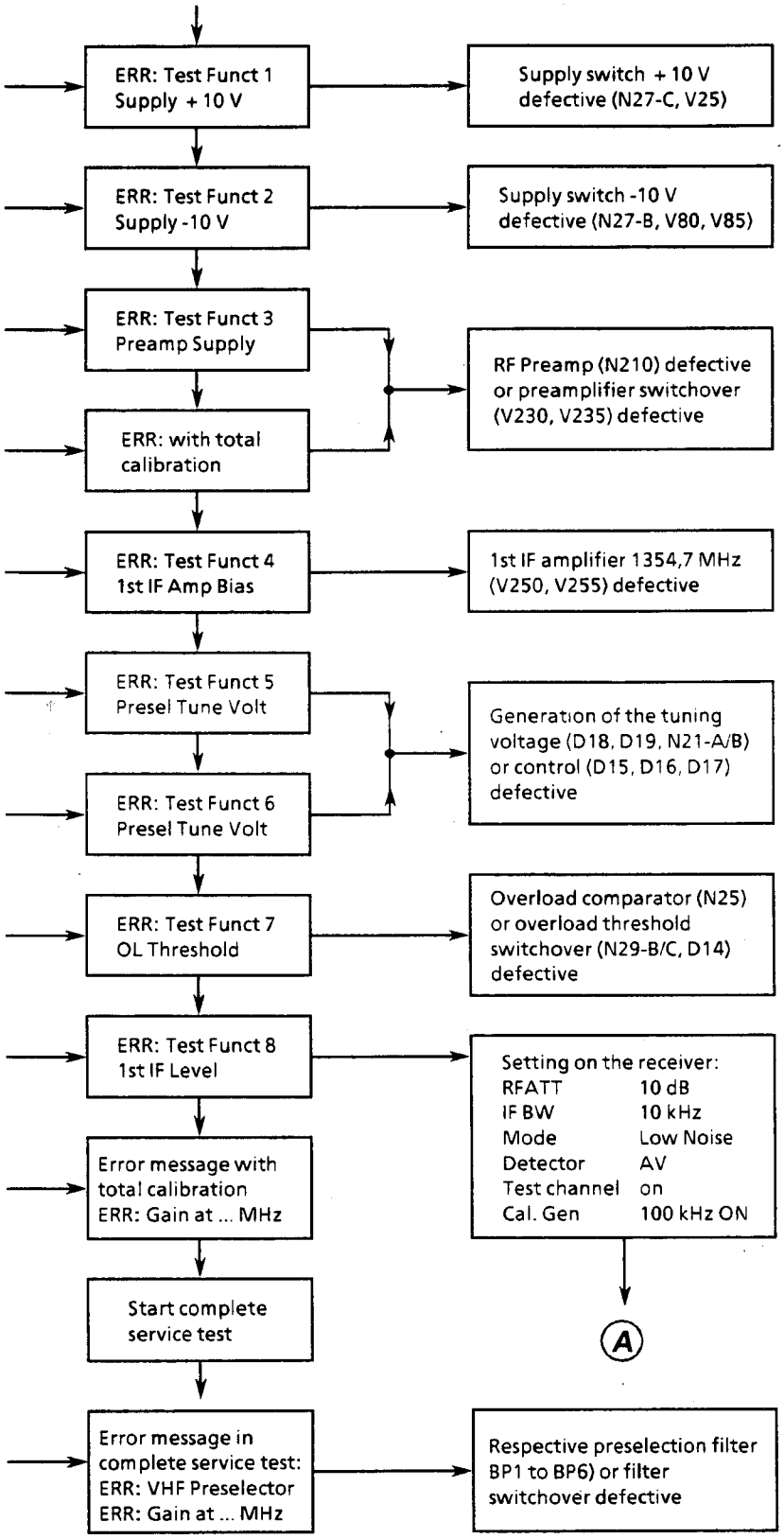


Fig. 7-1a Troubleshooting flowchart VHF preselector

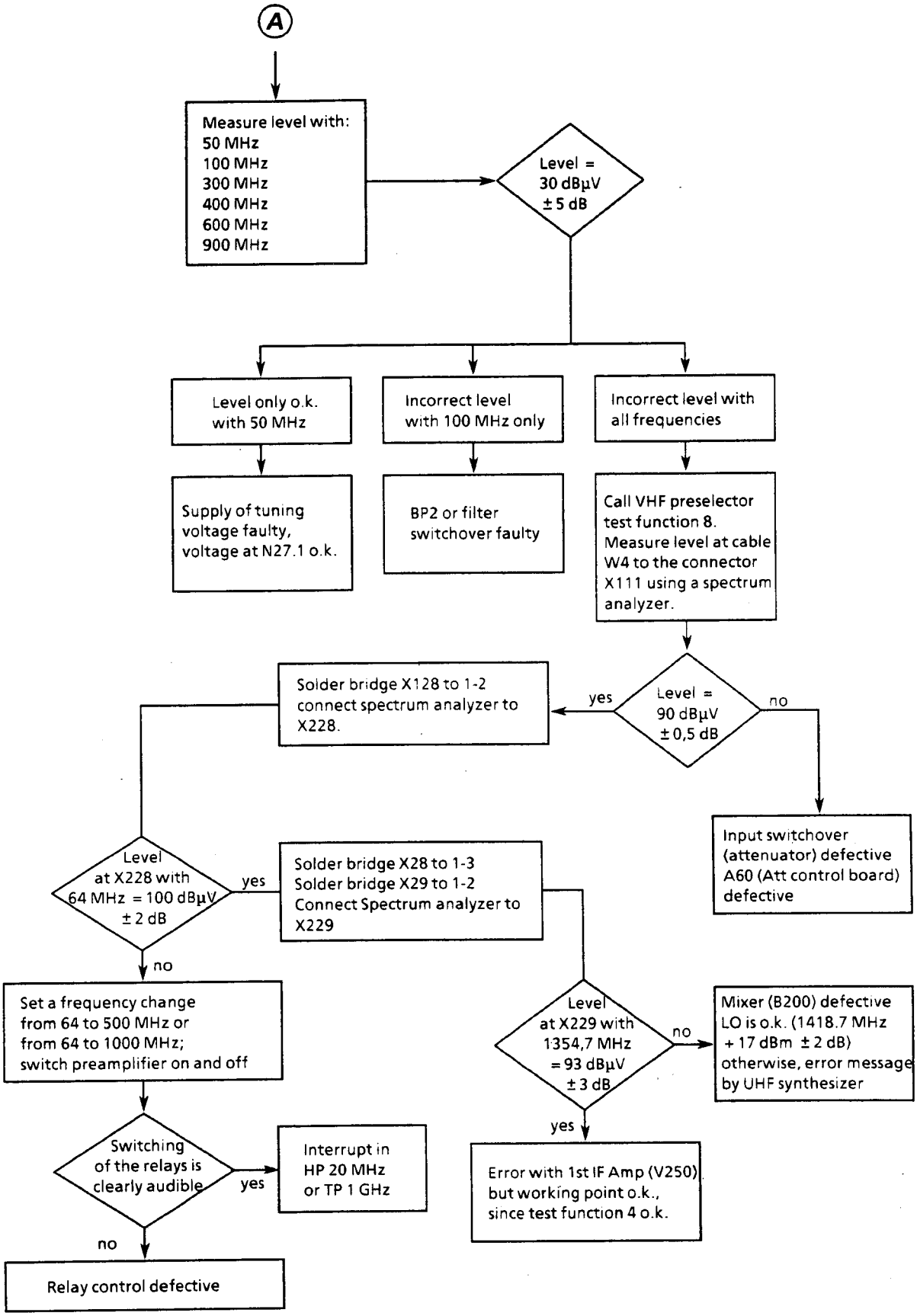


Fig. 7-1b Troubleshooting flowchart VHF preselector

7.4 Testing and Adjustment

Operate the board outside the instrument by connecting it to the service kit EZ-8.

The cover on the side of the conductive trace must be fitted for adjustment.

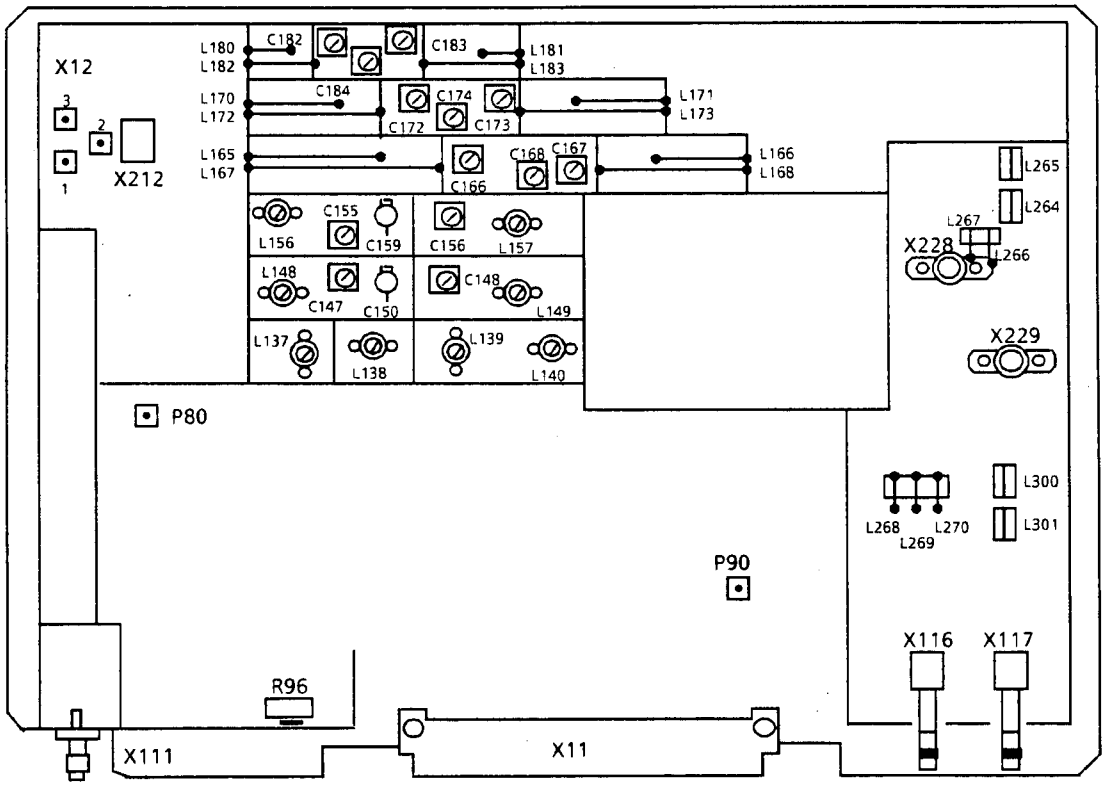
The resonator chambers must be covered for adjustment of the filters BP4 - BP6.

All supply voltages must be disconnected when soldering on the board.

All measurements with the network analyzer require a 10-dB attenuator pad with a return loss > 30 dB to be connected to the test cable at port 2. The attenuator pad must be connected directly to the respective test point.

Unless otherwise mentioned, all test functions called via the selftest function *09 BOARD TEST* access test points in the VHF preselector.

7.4.1 Location of Soldering Jumpers, Test Points and Adjustment Elements



7.4.2 Power Supply

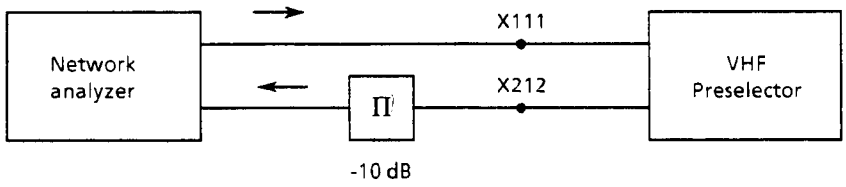
Connector	Voltage	Current
X11.AC2	+ 5.4 V ± 200 mV	50 ... 60 mA
X11.AC4	+ 10 V ± 20 mV	50 ... 70 mA
X11.AC5	-10 V ± 20 mV	10 ... 20 mA
X11.AC6	+ 28 V ± 50 mV	< 5 mA

Testing the supply switch:

Measure the voltage at P90 using a dvm ..... 9.7 to 10 V
Measure the voltage at P80 using a dvm ..... -9.7 to -10 V
Test function 1 (+ 10 V supply) ..... 2.2 to 2.8 V
Test function 2 (– 0 V supply) ..... 2.2 to 2.8 V

7.4.3 Testing and Adjustment of the 20-MHz Highpass and the 1-GHz Lowpass

a) Test setup



b) Presettings

Setting on the network analyzer:

Input: S11/S21
Frequency: ..... 10 MHz to 1.4 GHz

c) Measurement and adjustment

- Solder out soldering bridge at 12.3 and solder in at X12.2.

- Adjust the 1-GHz lowpass to ground by varying the distance between the inductors L101 - L104.
  Return loss at X111 ..... > 20 dB
  S21 in the frequency range 20 MHz to 1 GHz ..... > - 0.8 dB
  S21 at 1354.7 MHz ..... < -35 dB

7.4.4 Testing the Generation of the Tuning Voltage

a) Presetting

Setting on the receiver:

Board Test: ..... Test function 6 (Tuning voltage)

b) Measurement

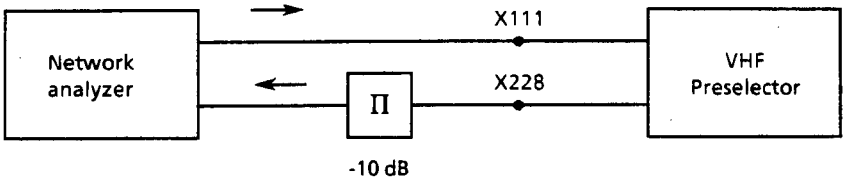
Frequency	Selftest voltage
51.3 MHz	0.17 V ± 20 mV
123.3 MHz	2.23 V ± 50 mV
125.3 MHz	0.18 V ± 20 mV
271.3 MHz	2.33 V ± 50 mV
273.3 MHz	0.34 V ± 20 mV
493.3 MHz	1.99 V ± 50 mV
495.3 MHz	0.57 V ± 20 mV
715.3 MHz	2.39 V ± 50 mV
717.3 MHz	0.71 V ± 20 mV
999.3 MHz	2.52 V ± 50 mV

Measure the voltages at N21.7/8/14 with the frequency set to 999.3 MHz using a dvm:

N21.7 ..... 25.2 V ± 100 mV
N21.8 ..... 15.1 V ± 200 mV
N21.14 ..... 15.9 V ± 200 mV

7.4.5 Testing and Adjustment of the Bandpass Filters BP1 to BP6

a) Test setup



b) Presettings

Setting on the network analyzer:

Input: S11/S21
Frequency: ..... 15 MHz to 65 MHz
Scale S21: ..... 1 dB/Div

Setting on the receiver:
Frequency: ..... 20 MHz

c) Measurement amd adjustment

- Solder bridge from X12.3 to X12.1
- Solder bridge from X28.1 to X28.2

- Adjust BP1 using L137 to L140.
  Return loss in the frequency range 20 to 51.3 MHz ..... > 19 dB
  S21 in the frequency range 20 to 51.3 MHz ..... > -1.0 dB
  S21 in the frequency range 1.3 to 4 GHz ..... < -50 dB

Setting on the network analyzer:

Frequency: ..... 30 MHz to 150 MHz
Scale S21: ..... 10 dB/Div

Setting on the receiver:

Frequency: ..... 51.3 to 125.3 MHz

- **Adjusting BP2:**
  The filter is adjusted at 51.3 MHz using the coils L148 and L149. L148 and L149 should be symmetrical, if possible.
  Fine adjustment is performed at 125.3 MHz using C147 and C148.
  C150 maximizes the return loss in the centre of the filter.
  Tune the filter across the complete range and repeat adjustment, if necessary.
  Return loss in the frequency range 51.3 to 125.3 MHz ..... > 15 dB
  S21 in the frequency range 51.3 to 125.3 MHz ..... > -1.5 dB
  S21 in the frequency range 1.3 to 4 GHz ..... < -50 dB
  6-dB bandwidth at 51.3 MHz ..... 25 to 35 MHz

Setting on the network analyzer:

Frequency: ..... 80 MHz to 350 MHz
Scale S21: ..... 10 dB/Div

Setting on the receiver:

Frequency: ..... 125.3 to 273.3 MHz

- **Adjusting BP3:**
  The filter is adjusted at 125.3 MHz using the coils L156 and L157. L156 and L157 should be symmetrical, if possible.
  Fine adjustment is performed at 273.3 MHz using C155 and C156.
  C159 maximizes the return loss in the centre of the filter.
  Tune the filter across the complete range and repeat adjustment, if necessary.
  Return loss in the frequency range 125.3 to 273.3 MHz ..... >15 dB
  S21 in the frequency range 125.3 to 273.3 MHz ..... >-3 dB
  S21 in the frequency range 1.3 to 4 GHz ..... <-50 dB
  6-dB bandwidth at 125.3 MHz ..... 55 to 65 MHz

Setting on the network analyzer:

Frequency: ..... 200 MHz to 600 MHz
Scale S21: ..... 10 dB/Div

Setting on the receiver:

Frequency: ..... 273.3 to 495.3 MHz

- **Adjusting BP4:**
  Adjust bandwidth to 70 MHz with cover fitted and frequency set to 495.3 MHz by varying the distance between the coupling coils L165, L166 and L167, L168.
  Fine adjustment is performed at 273.3 MHz using C166 and C167.
  Use C168 to set the return loss.
  Tune the filter across the complete range and repeat adjustment, if necessary.
  Return loss in the frequency range 273.3 MHz to 495.3 MHz ..... >15 dB
  S21 in the frequency range 273.3 MHz to 495.3 MHz ..... >-3.8 dB
  S21 in the frequency range 1.3 to 4 GHz ..... <-50 dB
  6-dB bandwidth at 495.3 MHz ..... 65 to 75 MHz

Setting on the network analyzer:

Frequency: ..... 400 MHz to 800 MHz
Scale S21: ..... 10 dB/Div

Setting on the receiver:

Frequency: ..... 495.3 to 717.3 MHz

- **Adjusting BP5:**
  Adjust bandwidth to 65 MHz with cover fitted and frequency set to 717.3 MHz by varying the distance between the coupling coils L170, L171 and L172, L173.
  Fine adjustment is performed at 495.3 MHz using C172 and C173.
  Use C174 to set the return loss.
  Tune the filter across the complete range and repeat adjustment, if necessary.
  Return loss in the frequency range 495.3 MHz to 717.3 ..... >15 dB
  S21 in the frequency range 495.3 to 717.3 MHz ..... >-3.0 dB
  S21 in the frequency range 1.3 to 4 GHz ..... <-50 dB
  6-dB bandwidth at 717.3 MHz ..... 60 to 70 MHz

Setting on the network analyzer:

Frequency: ..... 600 MHz to 1100 MHz
Scale S21: ..... 10 dB/Div

Setting on the receiver:

Frequency: ..... 717.3 to 1000 MHz

- **Adjusting BP6 and the mixer-input diplexer-lowpass path:**
  Adjust bandwidth to 90 MHz with cover fitted and frequency set to 1000 MHz by varying the distance between the coupling coils L180, L181 and L182, L183.
  Fine adjustment is performed at 717.3 MHz using C182 and C183.
  Use C184 to set the return loss.
  Tune the filter across the complete range and repeat adjustment, if necessary.
  After the bandpass adjustment, adjust L264 and L265 to a minimum passband attenuation at 1 GHz.
  Return loss in the frequency range 717.3 MHz to 1000 MHz ..... >15 dB
  S21 in the frequency range 717.3 to 1000 MHz ..... >-3.7 dB
  S21 in the frequency range 1.3 to 4 GHz ..... <-50 dB
  6-dB bandwidth at 1000 MHz ..... 80 to 100 MHz

7.4.6 RF Preamplifier

a) Test setup

cf. Section 7.4.5

b) Presettings

Setting on the network analyzer:

Input: S11/S21
Frequency: ..... 15 MHz to 65 MHz
Scale S21: ..... 1 dB/Div

Setting on the receiver:

Frequency: ..... 20 MHz

c) Measurement and adjustment

Amplification increases by 10.8 ± 0.5 dB with switch-on of the preamplifier in the frequency range 20 MHz to 51.3 MHz.
Return loss in the range 20 MHz to 51.3 MHz ..... > 15 dB

Setting on the network analyzer:

Input: S11/S21
Centre frequency: ..... 1 GHz
Span: ..... 20 MHz
Scale S21: 1dB/Div

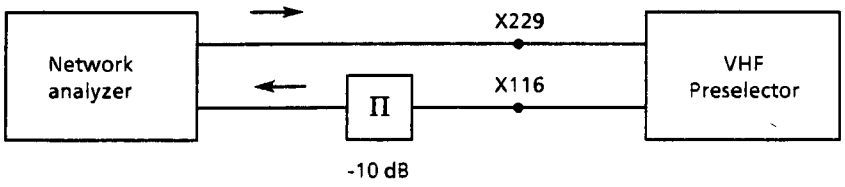
Setting on the receiver:

Frequency: ..... 1000 MHz

- Fix cover to BP6 using screws.
- Amplification increases by 10.5 + - 0.5 dB with switch-on of the preamplifier at 1 GHz.
  Return loss at 1 GHz ..... > 12 dB
- Switch off preamplifier

7.4.7 IF Diplexer, 1st IF Amplifier

a) Test setup



- Solder bridge from X29.2 to X29.3

b) Presettings

Setting on the network analyzer:

Input: S11/S21
Frequency: ..... 0,8 to 4 GHz

Setting on the receiver:

Board Test: ..... Test function 4 (1st IF Amp Bias)

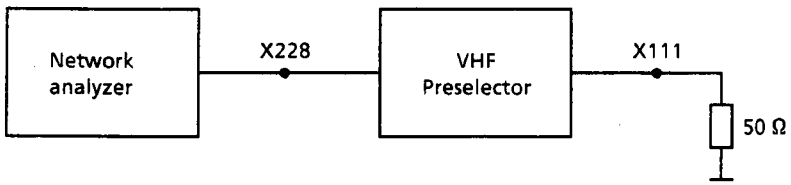
c) Measurement and adjustment

- Selftest voltage ..... 2.7 V ± 50 mV
- Adjust lowpass path of the diplexer using L300 and L301.
- Adjust highpass path using L268, L269 and L270.

  Return loss at 1354.7 MHz ..... > 20 dB
  Return loss in the range 2 to 3.5 GHz ..... > 14 dB
  S21 at 1354.7 MHz ..... > 12.6 dB
  S21 at 1750 MHz ..... < 0 dB

7.4.8 1st Mixer, Highpass Path of Input Diplexer

a) Test setup



- Solder bridge from X28.1 to X28.2

  Connect 50-Ω termination to X111.

b) Presettings

Setting on the network analyzer:

Input: S11
Frequency: ..... 0.8 to 4 GHz

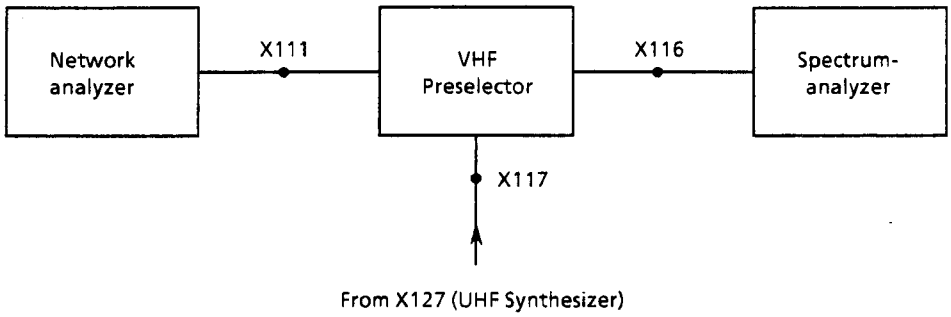
Setting on the receiver:

Frequency: ..... 1000 MHz

c) Measurement and adjustment

- Fix cover to BP6 using screws.
- Use L266 and L267 to adjust return loss
  in the range 2.7 GHz to 3.7 GHz to ..... > 12 dB
- Solder bridge from X28.1 to X28.3
- Solder bridge from X29.1 to X29.3

d) Test setup



▸ Connect X127 (UHF Synthesizer) to X117 (VHF Preselector)

e) Presettings

Setting on the signal generator:

Frequency: ..... 20 MHz
Level: ..... -10 dBm

Setting on the spectrum analyzer:

Frequency: ..... 1354.7 MHz
Span: ..... 1 MHz

Setting on the receiver:

Frequency: ..... 20 MHz

f) Measurement and adjustment

▸ Level at spectrum analyzer ..... -5 dBm ± 1 dB

Setting on the signal generator:

Frequency: ..... 1000 MHz
Level: ..... -10 dBm

Setting on the receiver:

Frequency: ..... 1000 MHz

▸ Fix cover to BP6 using screws.
Level at spectrum analyzer ..... -7.5 dBm ± 1 dB

7.4.9 1st IF Level Detector, Overload Detector

a) Test setup

Connect X127 (UHF Synthesizer) and X117 (VHF Preselector).
Connect X116 (VHF Preselector) and X137 (2nd Mixer).

b) Presetting

Setting on the pulse generator:

Level: ..... 50 dBµV
Pulse frequency: ..... 100 Hz

Setting on the receiver:

Frequency: ..... 950 MHz
Detector: ..... QP
OP Range: ..... 60 dB
Mode: ..... Low Dist.

c) Measurement and adjustment

- Increase the output level of the pulse generator until reaching 1-dB compression point ..... 50 to 54 dBµV

- Adjust R96 such that the overload field in the level display just lights up.

  Set input frequency to 400 MHz.
  Determine 1-dB compression point. The overload field lights up -3 dB to 0 dB before reaching the compression point.

  Set input frequency to 100 MHz.
  Determine 1-dB compression point. The overload field lights up -5 dB to 0 dB before reaching the compression point. Disconnect pulse generator.

Setting on the receiver:

Board Test: ..... Test function 8 (1st IF Level)

Selftest voltage ..... >450 mV

7.5 Final Test

After repair has been terminated, check correct functioning of the module. It is assumed that all the other boards in the ESVS have been adjusted correctly.

- Warm up the instrument for 15 minutes.
- Adjust total gain according to Section 4.3.4.
- Perform a complete re-calibration.
- Call service function 13 Print Cal Values and print out the calibration correction values (cf. section 6).
- Permissible tolerances:

abs reference:	-2 dB ± 0.2 dB	
frequency:	20 to 125.2 MHz:	-2 to + 1 dB
	125.3 to 717.2 MHz:	0 to + 2.5 dB
	717.3 to 1000 MHz:	+ 1.5 to + 3.5 dB

- Subsequently, check the AV noise indicator at an IF bandwidth of 10 kHz with and without preamplifier (cf. Section 5.2.4).

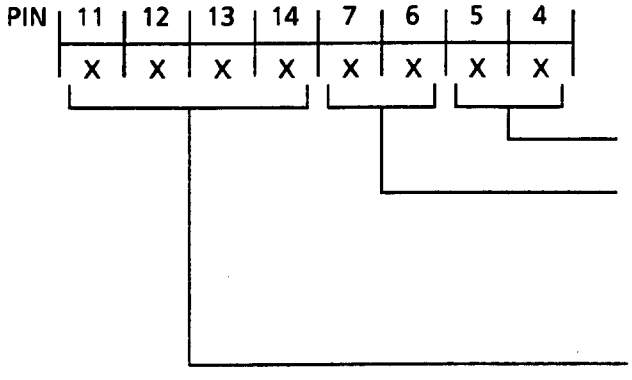
7.6 External Interfaces

Table 7-2 External Interfaces

Connector	Name	Origin/Destination	Direction	Specified range	Remark
A7	SCLK		I	HCT input	Clock for ser. bus
A9	TEST		O	0 to 5 V	Selftest output
A12	PRCLK		I	HCT input	Clock for tuning of the preselection
AC1	AGND		I/O	Analog ground	
AC2	+ 5 V A		I	5.4 V ± 200 mV	Supply voltage
AC4	+ 10 V		I	+ 10 V ± 20 mV	Supply voltage
AC5	– 10 V		I	- 10 V ± 10 mV	Supply voltage
AC6	+ 28 V		I	+ 28 V ± 0.3 V	Supply voltage
C7	TDATA		I	HCT-Eingang	Serial data bus
C8	Strobe*		I	HCT-Eingang	Active Low
C9	OL*		O	HCT-Ausgang	Overload
X111	VHF Input	Attenuator	I	-20 to 90 dBµV fe = 20 to 1000 MHz	VHF Input
X117	LO Input	UHF Synthesizer	I	17 dBm ± 2 dB f = 1354.7 to 2354.7 MHz	1. LO Input
X116	IF Output	2nd Mixer	O	f = 1354.7 MHz g = 3.0 dB ± 3 dB referred to X111 (without preamplifier) g = 14.0 dB ± 3 dB to X111 (without preamplifier)	ZF Output

Contents of the data register

Table 7-3 Data register D14



	1	X	X	X	Selftest off
Test point 7	0	1	1	1	RF PREAMP BIAS
Test point 6	0	1	1	0	1ST IF AMP BIAS
Test point 5	0	1	0	1	1ST IF LEVEL
Test point 4	0	1	0	0	+ 10 V SUPPLY
Test point 3	0	0	1	1	TUNING VOLTAGE
Test point 2	0	0	1	0	-10 V SUPPLY

Table 7-4 Data register D13

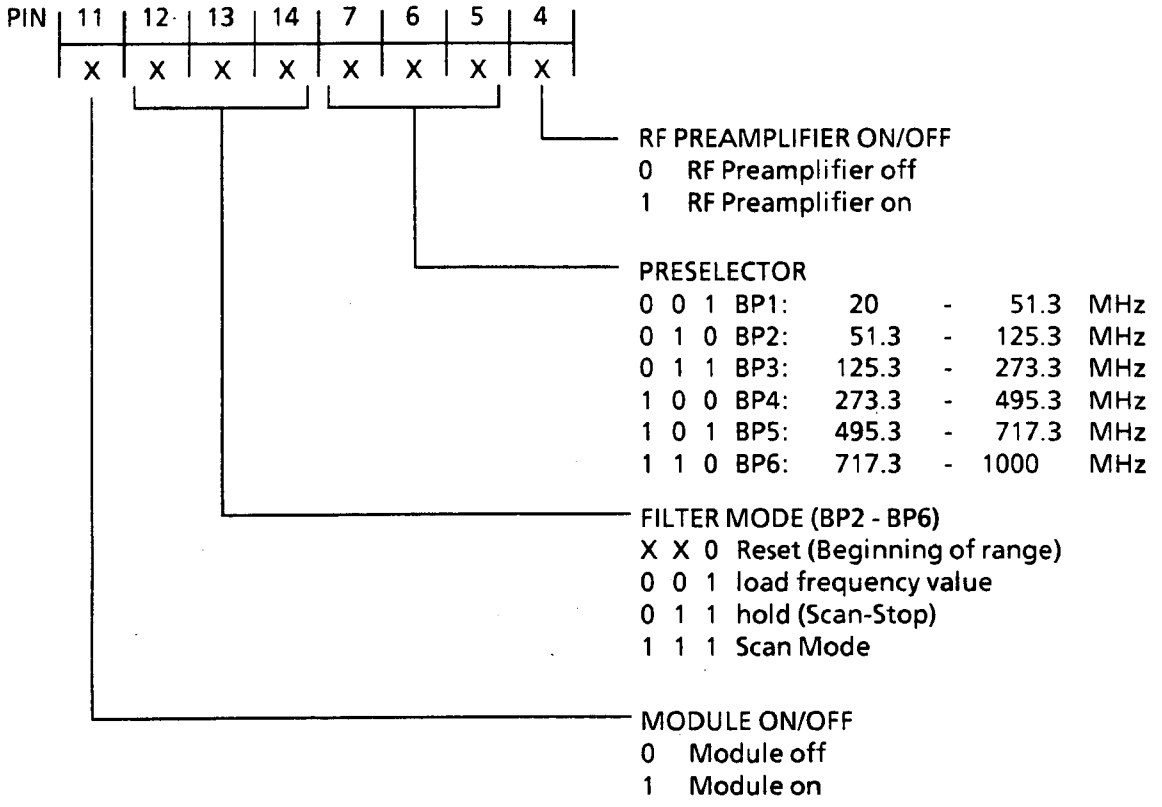
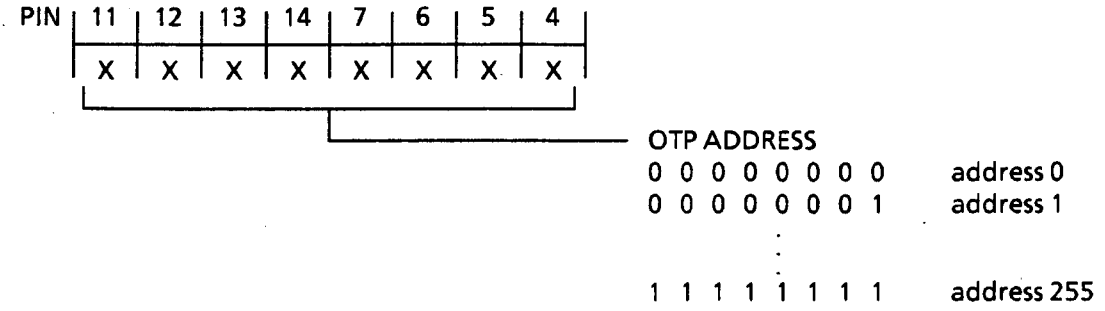


Table 7-5 Data register D12



Adress decimal	BP2 f [MHz]	BP3 f [MHz]	BP4 f [MHz]	BP5 f [MHz]	BP6 f [MHz]
0	51.3	125.3	273.3	495.3	717.3
1	53.3	127.3	275.3	497.3	719.3
2	55.3	129.3	277.3	499.3	721.3
.	.	.	.	.	.
.	.	.	.	.	.
36	123.3	197.3	345.3	567.3	789.3
37	125.3	199.3	347.3	569.3	791.3
.	---	.	.	.	.
.	---	.	.	.	.
73	---	271.3	419.3	641.3	863.3
74	---	273.3	421.3	643.3	865.3
.	---	---	.	.	.
.	---	---	.	.	.
110	---	---	493.3	715.3	937.3
111	---	---	495.3	717.3	939.3
.	---	---	---	---	.
.	---	---	---	---	.
140	---	---	---	---	997.3
141	---	---	---	---	999.3

The frequency of the filters is updated every 2 MHz. With the frequencies indicated in the table, tuning is processed. Through initialization of the module, the OTP address is set to zero.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

SHEET2 A

OVERLOAD DETECTOR

X11C 9 OL*

BOARD TEST BUFFER

X11A 9 TEST

X11A 7 SCLK
X11C 7 IDATA
X11A 8 STROBE*

BOARD CONTROL

/4

BOARD TEST

-10V ON/OFF

+10V ON/OFF

1ST IF PREAMP BIAS

RF PREAMP BIAS

SUPPLY SWITCH

X11A 4 +10V
X11C 4

+10V ON/OFF

/3

X11A 5 -10V
X11C 5

-10V ON/OFF

X11A 2 +5V
X11C 2

+5V

X11A 6 +28V
X11C 6

+28V

X11A 1 AGND
X11C 1

/3

FILTER SELECTION

/6

/4

A0...A7

TUNING VOLTAGE

/6

X11A 12 PRCLK

TUNING VOLTAGE

E,F,G BP6

H,I,J BP5

K,L,M BP4

N,O BP3

P,R BP2

S,T U BP1

/6

SHEET5

X 1ST IF LEVEL DETECTOR

1ST IF LEVEL

V PREAMP CONTROL

W 10DB

RF PREAMP

X28

1ST MIXER

X29

DI-PLEXER

X 1ST IF AMP

12DB

IF OUTPUT X116

X228

X229

VHF INPUT
20...1000MHZ
X111

20MHZ B

C 1GHZ

D X12

X212

FILTER CONTROL

SHEET3

V, W

FILTER CONTROL

SHEET4

1ST LO INPUT
X117

17DBM +/-2DB

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
09/00	47296 (29)	03.92	RB
07/00	47296 (1)	10.91	BU

1KEE	TAG	NAME
BEARB.		RB
GEPR.		RB
NORM		
PLOTT	25.03.92	

ROHDE&SCHWARZ

ZU GERAET ESVS30

BENENNUNG

VHF PRESELECTOR

ZEICHN.-NR. 1010.9394.01S

BLATT-NR. 1

V. 6 BL.

REG.I.V. 1010.5001

ZEICHN.-NR. 1010.9394.01 S

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

R96 R96 P80 P90 R95

X11A 12 PRCLK — R4 100R — C36 1N L — C7 1N L — V13 BAS32-L — V10 BAS32-L — V14 BAS32-L — R14 47K5 L — +5VA

X11A 7 SCLK — D1-A 74HCT14T-L — D1-B 74HCT14T-L — R1 100R L — R5 100R — C1 220P L — C2 220P L — R10 475K L — V11 BAS32-L

X11C 7 TDATA — D1-C 74HCT14T-L — D1-D 74HCT14T-L — R2 100R L — R6 100R — C3 220P L — C4 220P L — V16 BAS32-L

+5VA — R16 47K5 L — V17 BAS32-L

X11A 8 STROBE* X11C 8 — D1-F 74HCT14T-L — D1-E 74HCT14T-L — R3 100R L — R7 100R — C5 220P L — C6 220P L

X11A 9 TEST — R8 100R — C40 100P L — C38 220P L

X11C 9 OL* — L9 10UH — C41 100P L — C39 100P L

X11A 2 +5V X11C 2 — L2 1U2H — L3 1U2H — +5VA — C33 10N L — D1-G — C8 10N L — C12 1N8 L — C16 10U 35V

X11A 4 +10V X11C 4 — L4 1U2H — +10VA — C9 10N L — C13 1N8 L — C17 10U 35V

X11A 5 -10V X11C 5 — L5 1U2H — -10VA — C10 10N L — C14 1N8 L — C18 10U 35V

X11A 6 +28V X11C 6 — L6 4U7H — +28VA — C11 10N L — C15 1N8 L

X11A 1 AGND X11C 1

BOARD CONTROL

+5VA — R20 1K L

ADRESSDECODER — D10-A 74HCT4094T-L — D11-A 74HCT238T-L — ADR.: 20H 32D — D11/7 D26/11

+5VA — R22 1K L

DATA LATCHES — D12-A 74HCT4094T-L — A0 A1 A2 A3 A4 A5 A6 A7

+5VA — R23 1K L — D13-A 74HCT4094T-L — B1 B2 B3 B4 B5 B6

+5VA — R24 1K L — D14 74HCT4094T-L

RF PREAMP SHEET5 A/2

ON/OFF
H - POWER ON
L - POWER OFF

OVERLOAD DETECTOR

+5VA — R83 1M L — N27-A LM339D-L — R80 47K5 L — +5VA — V75 BC850B-L — R86 10K L — R84 1K L — C85 100N L — R85 33K2 L — D26-A 74HCT123T-L

SUPPLY SWITCH

+5VA — R93 22K1 L — R94 22K1 L

+10VA — R90 — P90 +10V ON/OFF — +10V ON/OFF — N27-C LM339D-L — R91 10K L — V25 BCX17-L — R92 3K32 L

P80 -10V ON/OFF — V80 BSR13-L — R89 10K L — R88 4K75 L — R79 4K75 L — R78 — +10VA — N27-B LM339D-L — R87 10K L — V85 BC860B-L — -10VA

TP2 -10V SUPPLY — -10V ON/OFF

BOARD TE

R74 100K L — R76 47K5 L — R77 100K

+10V -10V — V26 4U7 L — V27 4U7 L — 1ST IF LEVEL SHEET6 C/6 — C62 100N L — C63 100N L — N25-A NE521D-L — N25-B NE521D-L — COMP

D21 D 74HCT74T-L — D26 B 74HCT123T-L — N29-C LM339D-L — N29-B LM339D-L — R95 100K — R96 100K

R96 P90 P80
R95

DATA LATCHES

D12-A
74HCT4094T-L

D13-A
74HCT4094T-L

D14-A
74HCT4094T-L

+5VA

R22 1K L

R23 1K L

R24 1K L

RF PREAMP
SHEETS A/2

A0 A1 A2 A3 A4 A5 A6 A7

B1 B2 B3 B4 B5 B6

D11/7
D26/11

R.: 20H
32D

D24-A
74HCT4052T-L

+10VA

R97 10K L
R103 10K L
R99 10K L

R100 3K32 L
R101 4K32 L
R102 3K92 L

D2
D3
R96
D24/3

TPO
R298
SHEET6 B/9
R279
SHEET6 C/9
TP10

R9
10K L

SELFTEST

D25-A
74HCT4051T-L

D25/13
D21/5

B1...B6

A0...A7

ON/OFF
H - POWER ON
L - POWER OFF

SUPPLY SWITCH

+5VA
+10VA

R93 22K1 L
R94 22K1 L

N27-C
LM339D-L

N27-B
LM339D-L

R90 *
R91 10K L
R92 3K32 L
R87 10K L
R88 4K75 L
R89 10K L
R79 4K75 L
R78 *

V25
BCX17-L

V80
BSR13-L

V85
BC860B-L

P90
+10V ON/OFF
+10V
ON/OFF

P80
-10V ON/OFF

-10VA

TP2
-10V SUPPLY

-10V
ON/OFF

BOARD TEST BUFFER

TP8
1ST IF AMP
BIAS
SHEET6
D/6

R66 100K L
R67 47K5 L

N28-D
LM224D-L

TP7
RF PREAMP
BIAS
SHEET6
D/4

R69 100K L

N29-A
LM224D-L

R51 100K L
R50 100K L

TP5
1ST IF
LEVEL
SHEETS C/6

N28-C
LM224D-L

TP4
+10V
SUPPLY

R64 100K L
R65 33K2 L

N28-B
LM224D-L

C75 22P L
R75 100K L
R74 100K L
R77 100K L
R76 47K5 L

N29-D
LM224D-L

TP3
TUNING
VOLTAGE
N21/7
SHEET3
B/1

R62 90K9 L
R63 10K L

N28-A
LM224D-L

D21-A
74HCT74T-L

D21/5
D25/13

D26-B
74HCT123T-L

R70 1K L
R72 1K L
C72 1N L

D26/11
D11/7

N29-C
LM224D-L

R104 51K1 L
R95 50K
C48 4N7 L
R48 100R L

N29-B
LM224D-L

R88 100R L
C90 4N7 L

OL THRESHOLD
TP1

OL- 10 DB THRESHOLD

R96 100K
R96
D24/3

OL THRESHOLD

* NOT FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: ESD!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	DATUM	NAME
09/00	47296	
07/00	42296	

D16/2
D17/2
SHEET3
D/1

D24-A
74HCT4052T-L

D14-A
74HCT4094T-L

+10VA

R97 10K L
R103 10K L
R99 10K L
R100 3K32 L
R101 4K32 L
R102 3K92 L

R96
D24/3

R9
10K L

TP0
R298
SHEET6 B/9
R279
SHEET6 C/9
TP10

SELFTEST

D25-A
74HCT4051T-L

D25/13
D21/5

B1...B6
A0...A7
SHEET3
D/1

+5VA
D21-C
74HCT74T-L

+5VA
D24-B
74HCT4052T-L

+5VA
C20 10N L
D10-B
C21 10N L
D11-B
C22 10N L
D12-B
C23 10N L
D13-B
C24 10N L
D14-B
C31 10N L
D26-C
C30 10N L
D25-B

TEST BUFFER

TP8
1ST IF AMP
BIAS
SHEET6
D/6

R66
100K L
R67
47K5 L

N28-D
LM224D-L

TP7
RF PREAMP
BIAS
SHEET6
D/4

R69
100K L

N29-A
LM224D-L

R51
100K L
R50
100K L

TP5
1ST IF
LEVEL
SHEET5 C/6

N28-C
LM224D-L

TP4
+10V
SUPPLY

R64
100K L
R65
33K2 L

N28-B
LM224D-L

C75 22P L
R75 100K L

TP3
TUNING
VOLTAGE

N21/7
SHEET3
B/1

R62
90K9 L
R63
10K L

N28-A
LM224D-L

N29-D
LM224D-L

N27-D
LM339D-L

D21-B
74HCT74T-L

THRESHOLD

* NOT FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

09/00	47296 (29)	03.92	RB	IKEE	TAG	NAME
				BEARB.		RB
				GEPR.		RB
				NORM		
				PLOTT	19.05.92	
07/00	47296 (1)	10.91	BU			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ

BENENNUNG
VHF PRESELECTOR

ZEICHN. NR.
1010.9994.018

BLATT NR 2

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

A

FILTER SELECTION

+5VA +10VA

R30 10K L

R31 10K L

N20-A LM224D-L

-10VA

N20-B LM224D-L

N20-C LM224D-L

N20-D LM224D-L

+5VA

R25 1K L

D15-A 74HCT238T-L

R26 1K L

B1 B2 B3

FIL1 SHEET4 A/5 SHEETS A/4

FIL2 SHEET4 A/5 SHEETS A/5

FIL3 SHEET4 A/5 SHEETS A/4

FIL4 SHEET4 A/6 SHEETS A/4

FIL5 SHEET4 A/4 SHEETS B/6

FIL6 SHEET4 A/4 SHEETS B/8

B1...B6 SHEET2

A0...A7 SHEET 2

TUNING VOLTAGE

+5VA

R27 1K L

D16-A 74HCT161T-L

B4 B5 B6

V10 SHEET2 F/3

A0 A1 A2 A3

D17-A 74HCT161T-L

R29 1K L

A4 A5 A6 A7

D18-A 27C210-150NS

R28 1K L

R32 1K L

D19-A AD7533CD

-10VA +28VA

R34 100R L

R39 100R L

C46 10U 35V

C34 10N

C45 10U

R33 39R2 L

C35 22P L

R41 475K L

R40 301K L

N21-A LM224D-L

N21-B LM224D-L

R56 100K L

R57 332K L

R58 162K L

R59 100K L

R60 182K L

R61 121K L

-10VA

C42 22P L

R36 7K5 L

R35 100K L

C50 10N

N21-C LM224D-L

R45 10K L

UK5 SHEET4 E/10

-10VA

C43 22P L

R38 24K3 L

R37 100K L

C51 10N

N21-D LM224D-L

R46 10K L

UK6 SHEET4 E/10

R47 562R L

UA SHEET4 C/9 D/9 E/9 F/9

TUNING VOLTAGE

R62 SHEET2 B/10

+5VA

D15-B C25 10N L

D16-B C26 10N L

D17-B C27 10N L

D18-B C28 10N L

+10VA

D19-B C29 10N L

09/00	47296 (29)	03.92	RB	1KEE	TAG	NAME	BENENNUNG
				BEARB.		RB	VHF PRESELECTOR
				GEPR.		RB	
				NORM			
				PLOTT	25.03.92		
07/00	47296 (1)	10.91	BU	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9394.01 S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVS30			REG.I.V. 1010.5001 BLATT 4 BLAETTER 3

ZEICHN.-NR. 1010.9394.01 S

FILTER CONTROL

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.9394.01 S

LP 1GHZ

W2A 1

X212 1

X12

C106 1P8P B

L104

C189 *

C105 3P9P B

L103

C188 2P7P B

C104 1P5P B

L102

C103 3P9P B

C187 *

L101

C102 1P8P B

C101 220P B

L100 390NH

C100 220P B

HP 20MHZ

X111 1
RF INPUT
20-1000MHZ

W28 1

K110-A UM1

C108 1P2 B

C109 1P L

C107 1P L

K111-A UM1

C110 1P2 L

C111 1P L

+10VD

N110-A LM224D-L

R108 1K L

-10VD

C112 1P8 L

C121 10N L

R130 0R L

K110-B UM1

R192 274R L

L120 4U7H

C197 10N L

R122 825R L

V190 BAS32-L

V120 BA483

V121 BA483

V123 5082-3043

R400 4K75

C400 1N L

V124 5082-3379

C196 1P L

C175 *

C130 1N L

C113 100N L

L113 1UH L

C134 10N L

+10VD

N110-D LM224D-L

R190 100K L

R191 15K L

R131 0R L

K111-B UM1

V125 5082-3379

V126 5082-3379

V127 5082-3379

V122 5082-3043

L193 2U2H

C128 10N L

C139 1P5 L

C131 1N8 L

R110 10R L

+10VD

-10VD

V110 BC850B-L

V111 BC860B-L

C117 100N L

L117 1UH L

C146 10N L

R116 10R L

V117 BC850B-L

-10VD

+10VD

V118 BC860B-L

R112 562K L

N110-C LM224D-L

R114 332K L

R113 100K L

C115 27N L

C116 10N L

N110-B LM224D-L

R118 562K L

R120 332K L

R119 100K L

C119 27N L

C120 10N L

R111 100K L

R117 100K L

R115 2K21

R121 2K21

C136 10N L

C320 10N L

C132 10N L

C133 10N L

L191 4U7H

C124 10N L

L190 10UH

C122 10N L

C125 10N L

C127 10N L

C129 10N L

+10VD ON/OFF

-10VD ON/OFF

FIL6 SHEET2 D/6 SHEET4 B/8

FIL5 SHEET2 D/6 SHEET4 B/6

FIL1 SHEET2 E/16 SHEET4 A/5

FIL2 SHEET2 E/16 SHEET4 A/4

FIL3 SHEET2 E/16 SHEET4 A/3

FIL4 SHEET2 E/16 SHEET4 A/1

C191 10U 35V

C192 10N L

L195 1U2H

C190 10N L

C194 10U 35V

C195 10N L

L196 1U2H

C193 10N L

L192 2U2H

C126 10N L

L180

L182

V180 BB405B

Z180

R180 100K I

C182 3P-1P7 B

C180 2P4

V182 BB405B

SHEET2 H/

L170

L172

V170 BB405B

Z170

R170 100K I

C172 10P-3P B

C170 3P1

C174 3P-1P7 B

V172 BB40

SHEET2 B/

L165

L167

V164 BB909B

Z164

R164 100K I

C166 20P-5P B

V167 BB909B

V168 BB909B

L155

L156 54NH-T

C155 3P-1P7 B

V155 BB909B

R154 100K

V158 BB909B

V157 BB909B

C147 10P-3P B

V144 BB909B

V145 BB909B

L147

L148 76NH-T

V146 BB909B

V150 BB620 B

V151 BB620 B

V152 BB620 B

V153 BB620 B

C150 22P-6P

L135

L130 287NH I

C138 30P L

* NOT FITTED

STROMLAUF GILT FUER VAR.02

ACHTUNG !
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE
BEACHTEN !
ATTENTION !
ELECTROSTATIC SENSITIVE DEVICES
OBSERVE PRECAUTIONS !

09/00
07/00
ALND
IND.

FILTER CONTROL

E - G BP6
717,3 - 1000 MHZ

H - J BP5
495,3 - 717,3 MHZ

K - M BP4
273,3 - 495,3 MHZ

N - O BP3
125,3 - 273,3 MHZ

P - R BP2
51,3 - 125,3 MHZ

S - U BP1
20 - 51,3 MHZ

BP6 SHEET4 E/1
BP5 SHEET4 E/1
BP4 SHEET4 D/1
BP3 SHEET4 D/1
BP2 SHEET4 C/1
BP1 SHEET4 B/1

FIL5 SHEET2 D/6 SHEET4 B/6
FIL1 SHEET2 E/16 SHEET4 A/5
FIL2 SHEET2 E/16 SHEET4 A/4
FIL3 SHEET2 E/16 SHEET4 A/4
FIL4 SHEET2 D/16 SHEET4 A/3

* NOT FITTED

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

09/00	47296 (29)	03.92	RB	1KEE	TAG	NAME	BENENNUNG
				BEARB.		RB	VHF PRESELECTOR
				GEPR.		RB	
				NORM			
				PLOTT	25.03.92		
07/00	47296 (1)	10.91	BU				ZEICHN.-NR. 1010.9394.01S
AEND. IND.	AENDERUNG MITTEILUNG	DATUM	NAME	ZU GERAET	ESVS30		BLATT NR 4
				REG.T.V.	1010.5001		

ROHDE&SCHWARZ

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

FILTER CONTROL

W

V

BP6
SHEET3 F/12

BP5
SHEET3 E/12

BP4
SHEET3 D/12

BP3
SHEET3 C/12

BP2
SHEET3 B/12

BP1
SHEET3 B/12

BP OUT
SHEETS F/1

C230 *

K201-A UM1

C232 1P2 L
C312 1P2 L
C233 1P L
C234 1P L
C313 1P L
W38
W3A

K200-A UM1

C231 1P8 L
R240 0R L
C311 1P8 L

K200-B UM1

K201-B UM1

R241 0R L
C246 100N L
L241 1UH
C217 10N L
R209 10R L

C307 *

V200 5082-3043
V202 5082-3043
V204 BA483
V206 BA483
V201 5082-3379
V203 5082-3379
V205 5082-3379
V207 5082-3379

R405 4K75 L
R406 4K75 L
R407 4K75 L
R408 4K75 L
C405 1N L
C406 1N L
C407 10N L
C408 10N L

C212 10N L
L200 4U7H
R200 825R L
L213 1UH L
C213 100N L
C310 10N L
R203 10R L

L201 2U2H
C204 10N L
C309 1P L
C201 1N8 L
L202 2U2H
C206 10N L
C202 10N L
L203 4U7H
C208 10N L
C203 100N L
L204 10UH

C205 10N L
C207 10N L
C209 10N L
C210 10N L

C229 10N L
R204 274R L
V208 BAS32-L

+10VV
-10VV

V211 BC850B-L
V212 BC860B-L
V213 BC850B-L
V214 BC860B-L

R205 562K L
R206 100K L
N200-A LM224D-L
R207 332K L
C215 27N L
C216 10N L
R208 2K21 L
R227 100K L

R201 100K L
R202 15K L
N260-C LM224D-L
R211 562K L
N200-B LM224D-L
R213 332K L
R212 100K L
C219 27N L
C220 10N L
R228 100K L
R214 2K21 L

C304 10N L
C305 10N L

FIL5
SHEET2 D/6
SHEET3 A/4

FIL6
SHEET2 D/6
SHEET3 A/3

FIL4
SHEET2 D/16
SHEET3 A/6

FIL3
SHEET2 E/16
SHEET3 A/5

FIL2
SHEET2 E/16
SHEET3 A/5

FIL1
SHEET2 E/16
SHEET3 A/5

+5VA
+10V
ON/OFF
-10V
ON/OFF

L280 1U2H
L281 1U2H
L282 1U2H
C280 10N L
C281 10N L
C282 10N L
C284 10N L
C283 10U 35V
C285 10N L
C287 10N L
C286 10U 35V

+5VV
+10VV
-10VV

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

* NOT FITTED

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
09/00	47296 (29)	03.92	RB
07/00	47296 (1)	10.91	BU

1KEE	TAG	NAME
BEARB.		RB
GEPR.		RB
NORM		
PLOTT	25.03.92	

ROHDE&SCHWARZ
ZU GERAET CSVS30

BENENNUNG
VHF PRESELECTOR

ZEICHN.-NR. 1010.9394.01 S
BLATT-NR. 5
REG.I.V. 1010.5001

ZEICHN.-NR. 1010.9394.01 S

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

W

BP OUT
SHEET4 F/8

K202-A
UM1

RF PREAMPLIFIER

K203-A
UM1

C235 1P2 L
C242 1P2 L
C339 1P2 L
C340 1P5 L
C236 1P L
C237 1N8 L
N210 MAR-7 L
C238 1N8 L
C243 8P2 L
C253 *
R231 10R L
R230 10R L
C240 1P L
C252 1P8 L
L230 407H
C244 10N L
R234
R232 100R L
L232 (*)
R68 61K9
C64 10N L
R244 20R
C248 10U 10V TA L

TP7
RF PREAMP BIAS
SHEET2 C/8

X

X228
X28
B200
ROK-186MH
X229
X29

L265
L264
C265 2P2 L
C266 1P2 L
C267 1P L
L266
L267 *
R267 100R L
R268 100R L

1ST MIXER

W1A 1

L300
L301
C270 1P2 L
C254 1P L
C249 1P L
C269 1P L
L270
L269
C268 1P5 L
L268
R251 100R L
R250 100R L

DIPLEXER

1ST IF LEVEL DETECTOR

-10VX
C274 47ON L
N270 AD744KR-L
L271 1UH L
V270 HSMS2820-L
C276 100P
R276 10K L
R272 1M L
C272 3P3 L
C271 4P7 L
C273 47ON L
+10VX

TP5
1ST IF LEVEL
SHEET2 B/9 B/5

PREAMP CONTROL

R242 0R L
K202-B
UM1
C247 100N L
L242 1UH
C221 10N L
R215 10R L

R243 0R L
K203-B
UM1
C245 100N L
L243 1UH
C225 10N L
R221 10R L

V

V215 BC850B-L
C222 10N L
-10VV
+10VV
V220 BC860B-L
R217 562K L
N200-D LM224D-L
R219 332K L
R218 100K L
C223 27N L
C224 10N L
R220 2K21 L

V221 BC850B-L
C226 10N L
-10VV
+10VV
V222 BC860B-L
R223 562K L
N200-C LM224D-L
R225 332K L
R224 100K L
C227 27N L
C228 10N L
R226 2K21 L

V230 BC860B-L
C241 1N8 L
R236 10K L
R235 100K L
+5VV
R237 47K5 L
R238 100K L
V235 BC850B-L

+10VV
N260-A LM224D-L
-10VV
N260-B LM224D-L
N260-D LM224D-L
R265 100K L

W1B 1

+10VX
-10VX
C291 10N L
C292 10N L
L290 100H
L291 100H
L290 100H
L291 100H

C306 10N L

RF PREAMP
SHEET2 E/8

(*) INCLUDED IN LAYOUT

* NOT FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

09/00	4729
07/00	4729
AEND. IND.	NEUE AUSGABE

AENDERUNG VORBEHALTEN 3322.537.01.3

X

K203-A
UM1
14
11
8
C240
1P L
C252
1P8 L

X228
X28
2
1
3
X229
X29
2
B200
ROK-186MH
1 3 4 6 7
RF
IF
LO
5
8 9 10 12
11
1
3
L265
L264
C265
2P2 L
C266
1P2 L
C267
1P L
L266
L267
*
R267
100R L
R268
100R L
1ST MIXER
W1A 1
L300
L301
C270
1P2 L
C254
1P L
C249
1P L
L270
DIPLEXER
C269
1P L
L269
C268
1P5 L
L268
R251
100R L
R250
100R L

1ST IF LEVEL DETECTOR
-10VX
C274
470N L
N270
AD744KR-L
4
1
+
3
L271
1UH L
V270
HSMS2820-L
3
2
TP5
1ST IF
LEVEL
SHEET2
8/9
B/5
6
5
8
7
2
R272
1M L
C272
3P3 L
C271
4P7 L
C273
470N L
+10VX

1ST IF AMPLIFIER
L262
560NH
R255
4K75 L
C256
1N L
C255
1N L
C250
220P L
(*)
L255
(*)
L256(*)
L251
(*)
L260
(*)
L258
(*)
L257
(*)
L252
(*)
C257
10U
10V
3
V255
BC860B-L
2
1
R254
2K74 L
R257
10K L
V250
NE85635
4
3 1
2
+10VX
R258
51R1 L
L253
(*)
1 ST IF AMP
BIAS
L263
560NH
L259
(*)
C258
1N L
C259
1NP L
C251
220P L
C276
100P L
SHEET2 D/9
N275
MSA1104-L
4
3
1
2
C275
10P L
R275
221R L
R276
10K L
L275
220NH L
-10VX
R280
2K74 L
R277
75R L
+10VX
R292
10K L
R282
432R L
R281
11R L
R293
2K21 L
C292
1N L
C295
100P L
C277
1N L
L297
220NH L
R294
3K32 L
R278
47K5 L
V295
BC860B-L
3
2
1
R295
10K L
+10VX
R296
6K81 L
R279
47K5 L
TP10
R299
47K5 L
N280
CGY50-L
4
1
3
2
D24.15
SHEET2
D/9
LEVEL BUFFER
BIAS
R298
47K5 L
L295
220NH L
C296
100P L
R284
162R L
TP9
R297
68R1 L
C294
4U7 25V TA L
C293
1N L
R283
33R2 L
D24.14
SHEET2
D/9
IF BUFFER BIAS
+10VX
R285
162R L
X116 1
IF OUTPUT
1354.7 MHz

+10VV
2
4
1
N260-A
LM224D-L
11
-10VV
3
6
7
5
N260-B
LM224D-L
13
14
12
N260-D
LM224D-L
R265
100K L

BC860B-L
R236
10K L
235
0K L
3
2
1
88
0K L
V235
BC850B-L

W1B 1
X117 1
1ST LO INPUT

+10VX
-10VX
C291
10N L
C297
10N L
L290
102H
L291
102H
C290
10N L
C298
10N L
+10V
ON/OFF
-10V
ON/OFF

T FUER VAR.02
VALID FOR MOD.02

HTUNG: EGB!
ROSTATISCH GEFAEHRDETE
EMENTE ERFORDERN EINE
SONDERE HANDHABUNG.
ENTION ESD!
STATIC SENSITIVE DEVICES
RE A SPECIAL HANDLING

09/00	47296 (29)	03.92	RB	1KEE	TAG	NAME
				BEARB.		RB
				GEPR.		RB
				NORM		
				PLOTT	19.05.92	
07/00	47296 (1)	10.91	BU			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG
VHF PRESELECTOR

ROHDE&SCHWARZ
ZU GERAET ESVS30

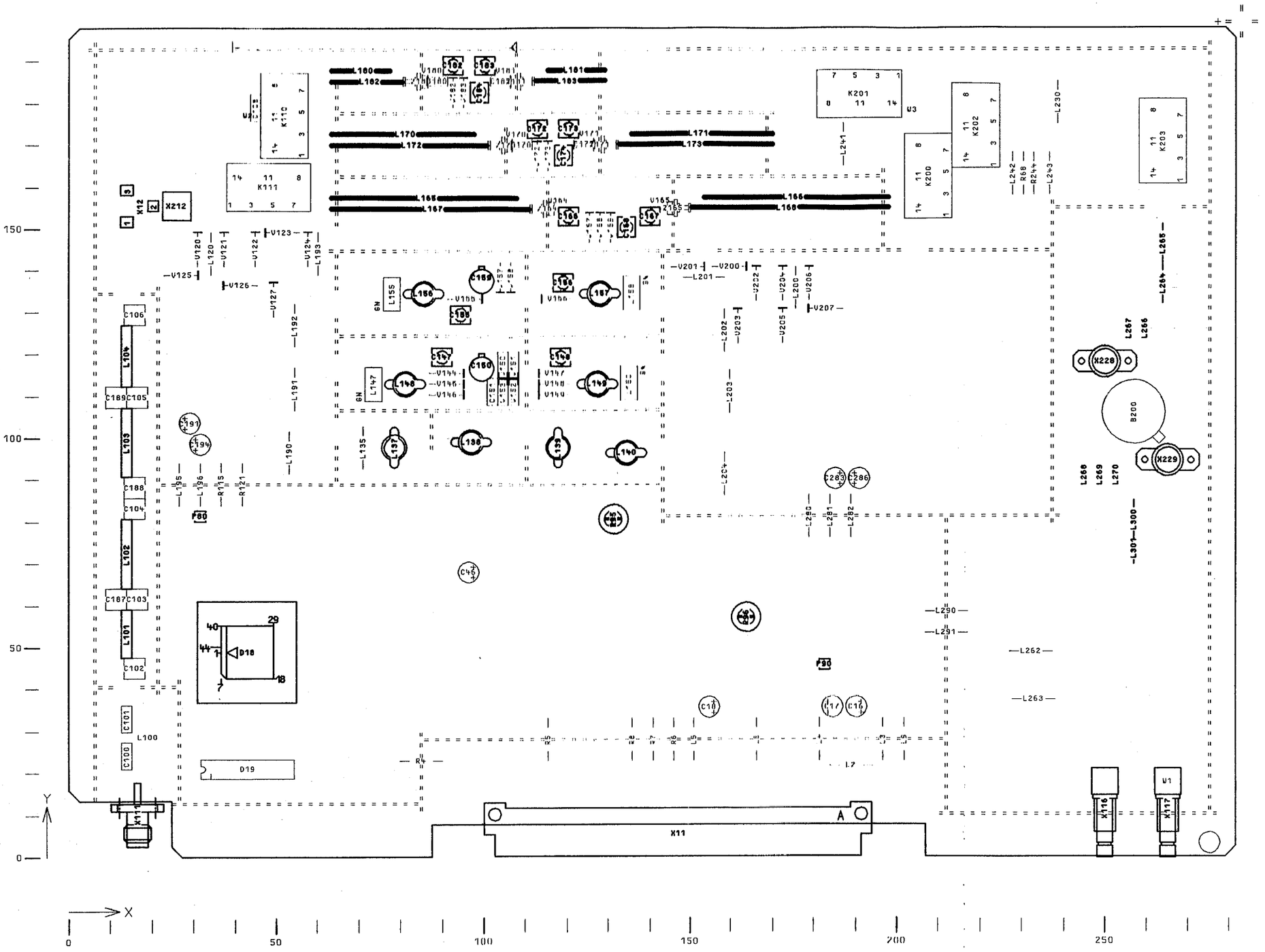
ZEICHN.-NR.
1010.9394.01S

REG.I.V. 1010.5001
ERSTE Z.

BLATT NR
6

5 6 7 8 9 10 11 12

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.
DIESE ZEICHNUNG IST EIN RECHNERRUSDRUCK. AENDERUNGEN KOENNEN NUR DURCH AENDERN DES ORTENSATZES ERFOLGEN

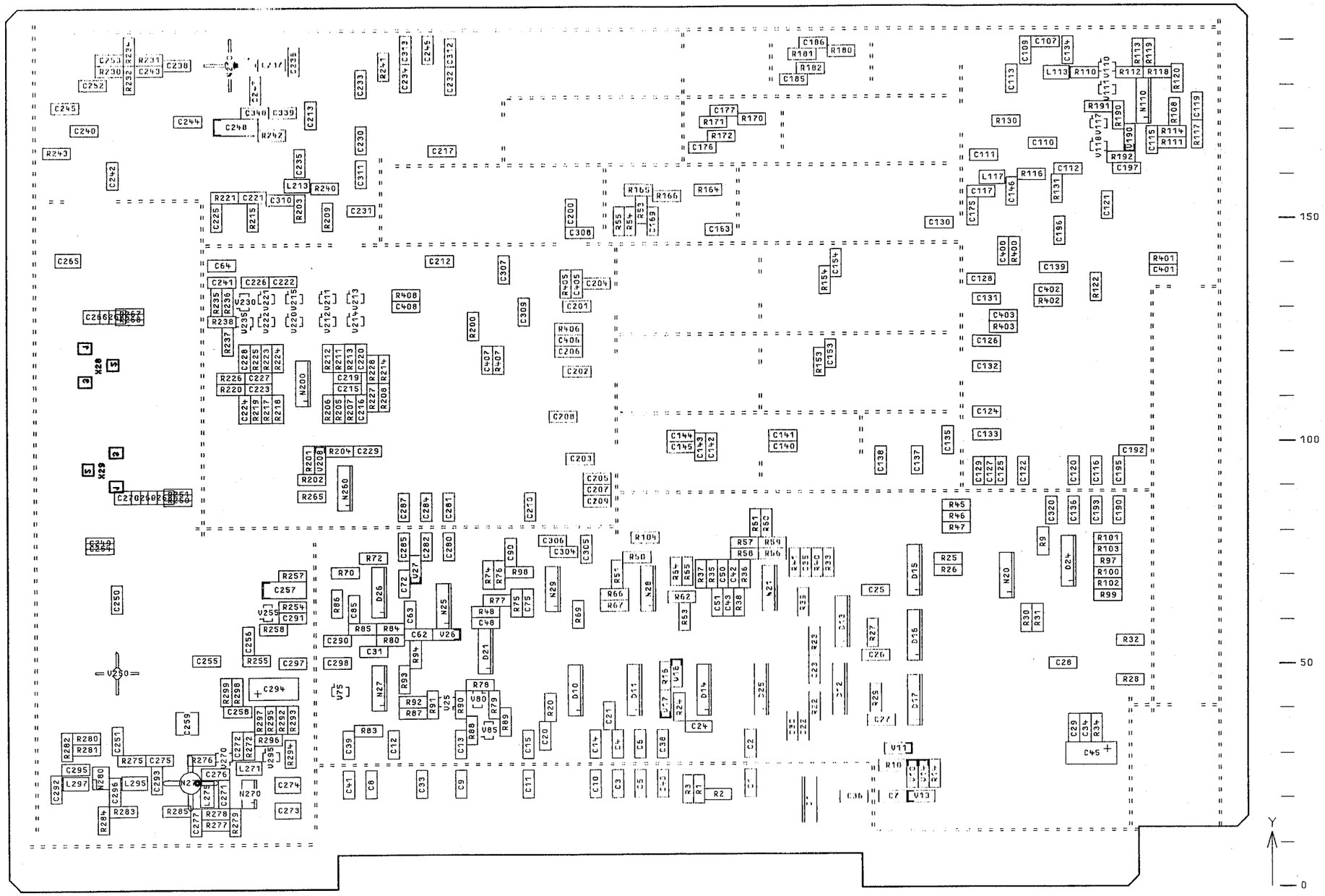


DARSTELLUNG SEITE B
VIEW ON SIDE B

VERKLEINERUNG

17/00	42296 (29)	03.92	RB	1KEE	TAG	NAME	BENENNUNG		
				BEARB.		RB	VHF PRESELECTOR		Z
				GEPR.		RB			
				NORM					
				PLOTT	09.04.92				
10/00	42296 (1)	10.91	HH	ROHDE&SCHWARZ			ZEICHN.-NR.	BLATT-NR.	
AENDG IND.	AENDERUNG AUFTRAGSNR.	DATUM	NAME	ZU WERKST 159530			1010.9394.01	EE	1+
							REG.L.V. 1010.5001	KOPIE Z. 1010.5001	V. BL.

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.
DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK. RENDERUNGEN KOENNEN NUR DURCH RENDERN DES DATENSATZES ERFOLGEN



DARSTELLUNG SEITE A
VIEW ON SIDE A

VERKLEINERUNG

12/00	42296 (29)	03.92	RB	ERSTE	TAG	NAME	BENENNUNG: VHF PRESELECTOR
				BEARB.		RB	Z
				GEPR.		RB	
				NORM			
				FREIG.	09.04.92		
10/00	42296 (1)	10.91	001	ROHDE&SCHWARZ			ZEICHN. NR. 1010.9394.01 EE BLATT-NR. 2+
BLATT-NR.	BENENNUNG	DATUM	NORM				

ALLE RECHTE BEI ROHDE & SCHWARZ

ROHDE&SCHWARZ

SERVICE DOCUMENTS

UHF Preselector

1026.9518.02

Contents

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7.1.2	Detailed Function Description	7.1
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Circuit diagrams

Component plans

7 Testing and Repair of the UHF Preselector Module

7.1 Function Description

7.1.1 Function within the Instrument

The UHF Preselector is used for first filtering of the signals between 1000 and 2050 MHz applied to the input socket of the receiver and to convert them to the first intermediate frequency 394.7 MHz. The module accomodates 4 switchable preselection filters. an add-on preamplifier. the 1st mixer. the first IF amplifier and the first IF filter.

7.1.2 Detailed Function Description
(cf. circuit diagram 1026.9518.01S)

High Pass 1 GHz

The 1 GHz input highpass (C200, C201, L201 included in layout) protects the module against strong interferences of the VHF range.

Filter Selection

The two filter selection blocks pass the input signal to one of the four input bandpasses using pin diodes and pass it on from the output of the filters to the add-on preamplifier.

Band Pass

For preselection, the UHF Preselector contains four fix-tuned bandpass filters, which can be switched on alternatively according to the frequency set. The four bandpasses are set up identically. They only have different passbands. Each path begins with a seven-pole interdigital filter (BPX-1). This first bandpass is followed by the bandpass amplifier. The amplification of the bandpass amplifiers is between 7 dB and 10 dB. They are switched on or off together with the respective bandpass filters. Subsequent to the bandpass amplifier, the signal is again filtered by a three-pole interdigital filter (BPX-2), thus ensuring the wanted far-off selectivity. The resistors R247 to R249 and R267 to R269 compensate for the different amplifications of the individual paths. Each of the bandpass amplifiers (N240, N250, N260, N270) contains an individual transistor for working point setting which keeps the current and the voltage at the amplifier constant.

Pre Amp

The add-on preamplifier (N520) is set up identically to the bandpass amplifiers. It is connected into the signal path via pin diodes. The preamplifier amplifies by 8 to 9 dB on an average. When the preamplifier is switched off, the signal is attenuated by 1.5 dB by the attenuator R510 to R512. Thus, a level difference of approx. 10 dB is obtained.

Mixer (B300)

The first mixer (B300) converts the filtered input signal which is in the frequency range between 1000 and 2050 MHz to the first intermediate frequency 394.7 MHz. The mixer output is terminated by a diplexer. The capacitor C325 in conjunction with the layout coils L321, L322 forms a 400-MHz lowpass. It filters the wanted sideband out of the mixed spectrum. C321 together with the terminators R310, R311 terminate the upper sideband thus preventing further unwanted intermodulations. With an input frequency of 1000 MHz to 1795 MHz, the LO frequency is 394.7 MHz above the input frequency. If the input frequency is in the range from 1795 to 2050 MHz, the LO frequency is 394.7 MHz below the input frequency.

1st ZF Amp

The first IF amplifier consists of two amplifiers (N395, N330) which are connected to each other via the attenuator pad R397 to R399. The circuitries of the two amplifiers are similar to those of the bandpass amplifiers. They amplify the 394.7-MHz IF signal by 12.5 dB (Mod 02). The Mod 03 version contains the 3-dB attenuator R337...R339, which is why the amplification is only 9.7 dB.

Buffer Amp

Apart from the 1st IF Amp, the IF signal is amplified in parallel by the amplifiers N315, N318. They are not connected into the signal path but only provide the required level at the overload diode V360.

BP 394.7 MHz

The first IF filter BP 394.7 MHz is a three-pole coaxial filter. Its 6-db bandwidth is 5 MHz in the Mod 02 version. Coupling is effected by means of slots in the casing. In the Mod 03 version, its 3-db bandwidth is 10 MHz and coupling is effected by the capacitors C372 to C379.

Low Pass, Notch (Filter Cavity L)

The 400-MHz lowpass L345, L346, C345 suppresses high-frequency interferences which might pass via the bandpass. Appropriate IF rejection of the 2nd IF is obtained by means of the 245.3-MHz notch filter (L347, C346).

Output Amp

The output amplifier N300 amplifies the 394.7-MHz IF signal by 11 dB. The circuitry is identical to that of the 1st IF Amp.

LO Switch

The LO signal (1374.7 MHz to 2354.7 MHz) is passed from the UHF synthesizer to the socket X297 of the UHF Preselector. The level is 16 dBm ±3 dB. N440 amplifies the LO signal only by 1 to 5 dB, since it already works in the compression range. If the input frequency is within the VHF range (20 MHz to 1000 MHz) of the receiver, the LO signal is routed via the PIN switch V450 and the socket X296, from which it is then passed via a coaxial cable to the VHF Preselector. If the receiver operates in the UHF range (1000 MHz to 2050 MHz), the LO signal passes via the PIN diode V460 to the mixer B300.

7.2 Test Instruments and Utilities

Item	Type of instrument	Required specifications	Suitable R&S instrument	Order No.	Application
1	Oszilloscope				
2	Voltmeter		UDS5	349.1510.02	
3	Spectrum analyzer		FSA	804.8010.52	
4	Network analyzer	1 MHz to 2000 MHz			
5	Signal generator	1000 to 1190 MHz	SMH	845.4002.52	

7.3 Troubleshooting

Note: ***Correct functioning of the modules Display Board, CPU Board, Rear Panel, FRN Synthesizer and UHF Synthesizer is required for the automatic selftest of this module. For further error location using also external signals, the test functions can be called manually in the Board Test menu (cf. Section 6).***

Due to the limited circuitry, the automatic selftest does not allow for localization of each error occuring. Refer to the troubleshooting flowchart (fig. 7-1) for localization of those errors, which cannot be found by the automatic selftest.

- For further locating of faults or with errors, which are not realized by the automatic test, call the Board Test menu (09 Selftest).
- Select the UHF Preselector using the keys ↓ or ↑.
- Enter the faulty test function and switch over to the test mode by pressing the ENTER key.

The default setting for the UHF Preselector as well as the default setting for the respective test function (cf. table 7-1) are set automatically. The measured selftest voltage is output in the LEVEL display. The permissible tolerance limits are given in the DATA INPUT display or on the screen.

If the option ESVD-B2 is fitted, the test function 20 of the IIQ demodulator must be checked in addition to the test functions of the UHF Preselector.

Default setting:

Frequency: ..... 1040 MHz
Cal Generator: ..... 100 kHz ON
Pre Amp: ..... OFF
RF ATT: ..... 0 dB

Test points in the UHF Preselector

Table 7-1 Test functions

Test function	Description	Setting TP = test point	Rated value	Error message
0	Tests 1 to X		Tests 1 to 24	Tests 1 to 24
1	1st LO level	TP0	0.1 to 2.5 V	1st LO Level
2	Overload detector voltage	Pre Amp: ON TP1	0.0 to 1.0 V	IF Level 394.7 M
3	Coaxial relay: UHF	TP2	>1.5 V	VHF/UHF Switch
4	Coaxial relay: VHF	900 MHz TP2	<0.2 V	VHF/UHF Switch
5	Current into both IF amplifiers	TP3	1.3 to 2.1 V	IF Amp Bias
6	Output amplifier	TP4	0.7 to 1.1 V	Output Amp Bias
7	All BP buffer amplifiers switched off. Current into BP buffer amplifiers + current into preamplifier.	TP5 Byte 3: XXLH HHHH	<150 mV	Amp Switch
8	All BP buffer amplifiers switched off. + current into preamplifier.	TP6 Byte 3: XXLH HHHH	1.8 to 2.2 V	Pin Diodes
9	All BP buffer amplifiers switched off. – current into preamplifier.	TP7 Byte 3: XXLH HHHH	1.6 to 2.2 V	Pin Diodes
10	All BP buffer amplifiers switched off. Preamplifier switched on. Current into pre Amp.	TP5 Byte 3: XXHH HHHH	0.7 to 1.1 V	Pre Amp
11	All BP buffer amplifiers switched off. Preamplifier switched on. + current into preamplifier.	TP6 Byte 3: XXHH HHHH	1.7 to 2.2 V	Pin Diodes
12	All BP buffer amplifiers switched off. Preamplifier switched on. – current into preamplifier.	TP7 Byte 3: XXHH HHHH	1.6 to 2.1 V	Pin Diodes
13	Bandpass 1 on. Current in BP1 buffer amplifier	TP5 Byte 3: XXLL HHHL	0.7 to 1.1 V	BP1 Amp
14	Bandpass 1 on. + current into preamplifier.	TP6 Byte 3: XXLL HHHL	1.4 to 1.9 V	Pin Diodes
15	Bandpass 1 on. – current into preamplifier.	TP7 Byte 3: XXLL HHHL	2.4 to 2.9 V	Pin Diodes

Test function	Description	Setting TP = test point	Rated value	Error message
16	Bandpass 2 on. Current in BP2 buffer amplifier.	TP5 Byte 3: XXLL HHLH	0.7 to 1.1 V	BP2 Amp
17	Bandpass 2 on. + current in pin diodes.	TP6 Byte 3: XXLL HHLH	1.4 to 1.9 V	Pin Diodes
18	Bandpaß 2 ein. – current in pin diodes.	TP7 Byte 3: XXLL HHLH	2.4 to 2.9 V	Pin Diodes
19	Bandpass 3 on. Current in BP3 buffer amplifier.	TP5 Byte 3: XXLH HLHH	0.7 to 1.1 V	BP3 Amp
20	Bandpass 3 on. + current in pin diodes.	TP6 Byte 3: XXLH HLHH	1.4 to 1.9 V	Pin Diodes
21	Bandpass 3 on. – current in pin diodes.	TP7 Byte 3: XXLH HLHH	2.4 to 2.9 V	Pin Diodes
22	Bandpass 4 on. Current in BP4 buffer amplifier.	TP5 Byte 3: XXLH LHHH	0.7 to 1.1 V	BP4 Amp
23	Bandpass 4 on. + current in pin diodes.	TP6 Byte 3: XXLH LHHH	1.4 to 1.9 V	Pin Diodes
24	Bandpass 4 on. – current in pin diodes.	TP7 Byte 3: XXLH LHHH	2.4 to 2.9 V	Pin Diodes

If one of the tolerances is exceeded, the message "ERR: UHF Preselector" is output. In this case, the selftest is not aborted, since the VHF receiver function may still be o.k.

- Remove both RF covers.
- Plug the board onto the service kit.

Continue troubleshooting using the troubleshooting flowchart (fig. 7-1). Check the serial interface (cf. Section 6.1.2) using the table 7-2.

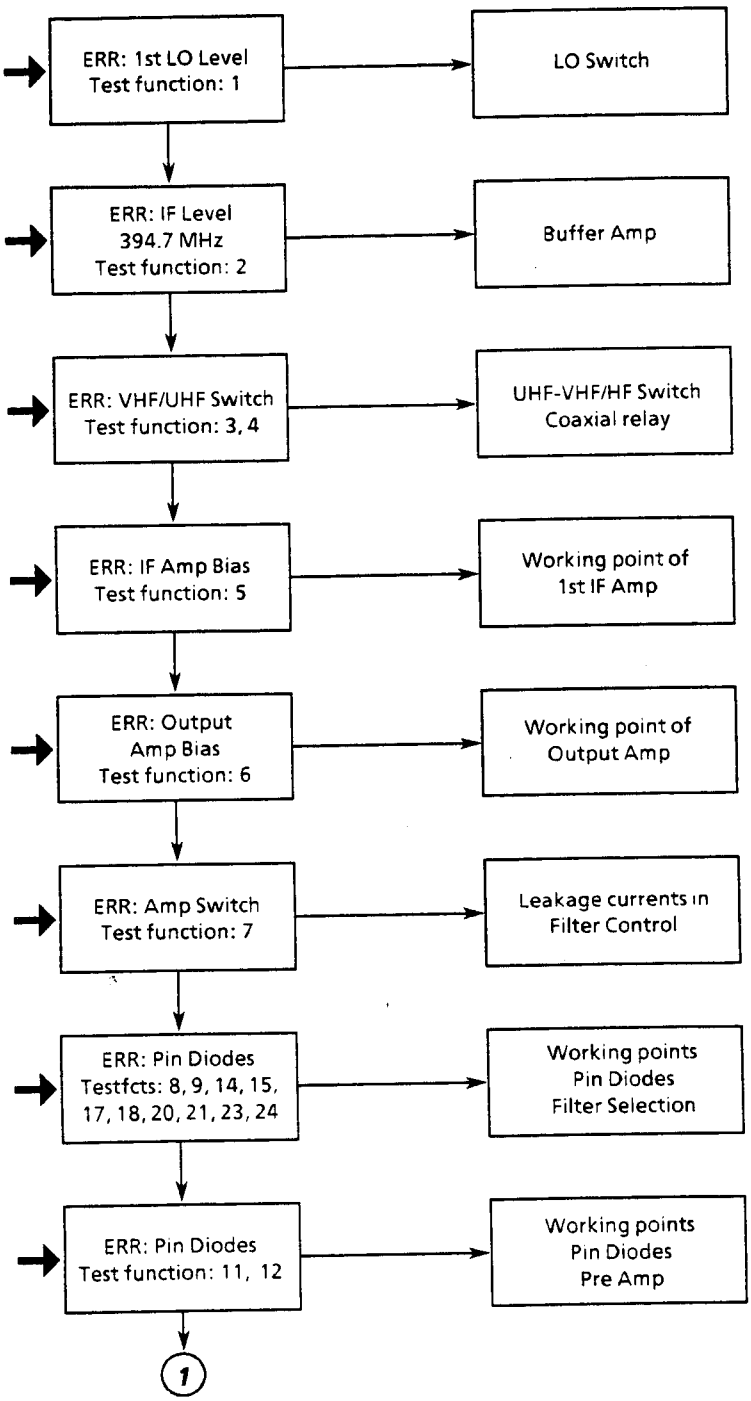


Fig. 7-1a Troubleshooting flowchart

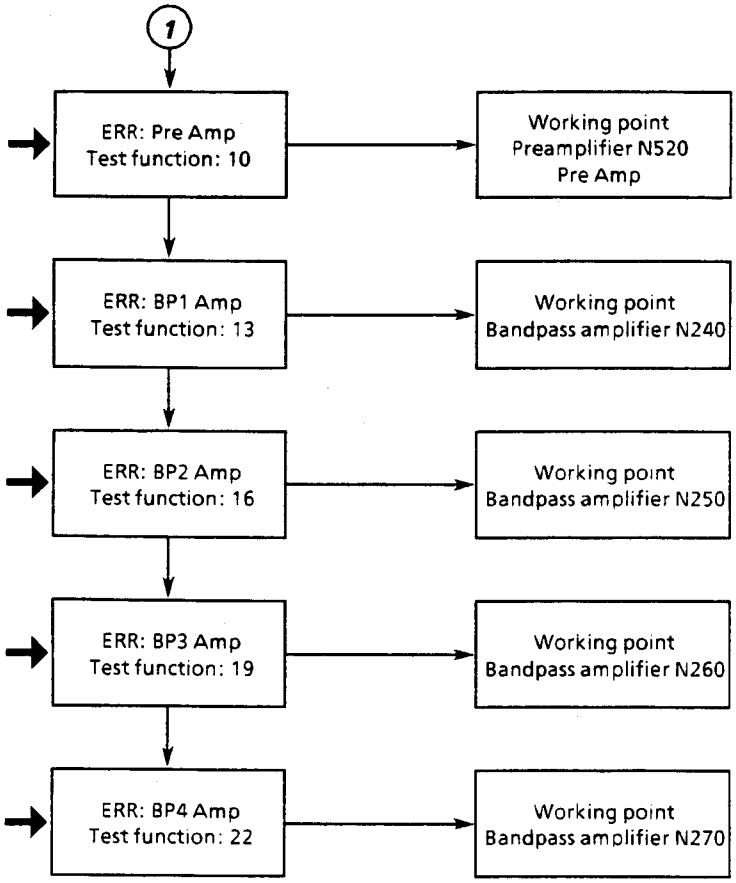
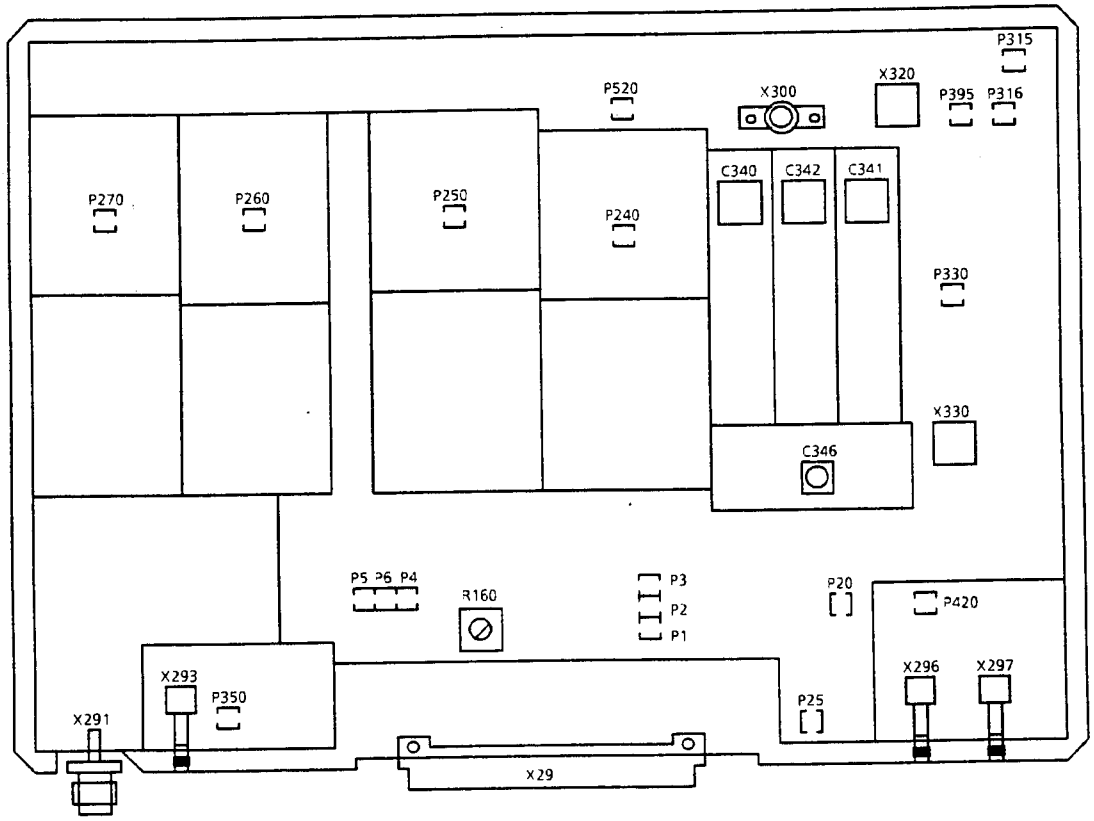


Fig. 7-1b Troubleshooting flowchart

7.4 Testing and Adjustment

Operate the board outside the instrument by connecting it to the service kit. Both RF covers may be removed.

7.4.1 Location of Jumpers, Test Points and Adjustment Elements



7.4.2 Supply Switch

- Setting on the receiver: see default setting

Measurement:

- Voltage at test point
  - P1: ..... 5.2 V ± 200 mV
  - P2: ..... – 9.80 V ± 200 mV
  - P3: ..... 9.80 V ± 200 mV
- Current with
  - + 10 V: ..... 500 mA ± 50 mA
  - – 10 V: ..... 175 mA ± 40 mA
  - + 5 V: ..... 5.5 mA ± 2 mA

- Setting on the test receiver:
  Frequency ..... 900 MHz

Measurement:

- Voltage at test point
  P1: ..... 5.20 V ± 200 mV
  P2: ..... < 100 mV
  P3: ..... < 100 mV
- Current with
  + 10 V: ..... 75 mA ± 20 mA
  − 10 V: ..... 26 mA ± 5 mA
  + 5 V: ..... 2 mA ± 2 mA

7.4.3 Checking the Input Selection

7.4.3.1 Working Points of the Bandpass Amplifiers (N240, N250, N260, N270) and the Preamplifier

- Setting on the test receiver: ..... Test function 7

Measurement:

Display readout: ..... < 150 mV

The display output is a measure for the total current of the + 10V-supply to the amplifiers N240, N250, N260, N270, N520.

The actual value of this total current is obtained by measuring the voltage difference between the test points P5 and P2 and dividing this value by 5 Ω.
The typical voltage difference for this test function is: ..... < 10 mV

Voltage at test points P240, P250, P260, P270, P520: ..... < 100 mV

- Setting on the test receiver: ..... Test function 10

Measurement:

Display readout: ..... 0.7 to 1.1 V

Typical voltage difference between P5 and P2: ..... 260 mV

Voltage at test points
P240, P250, P260, P270: ..... < 100 mV
P520: ..... 4.3 V ± 200 mV

▸ Setting on the test receiver: ..... Test function 13

Measurement:

Display readout: ..... 0.7 to 1.1 V

Typical voltage difference between P5 and P2: ..... 260 mV

Voltage at test points
P250, P260, P270: ..... < 100 mV
P240: ..... 4.3 V ± 200 mV

▸ Setting on the test receiver: ..... Test function 16

Measurement:

Display readout: ..... 0.7 to 1.1 V

Typical voltage difference between P5 and P2: ..... 260 mV

Voltage at test points
P240, P260, P270: ..... < 100 mV
P250: ..... 4.3 V ± 200 mV

▸ Setting on the test receiver: ..... Test function 19

Measurement:

Display readout: ..... 0.7 to 1.1 V

Typical voltage difference between P5 and P2: ..... 260 mV

Voltage at test points
P240, P250, P270: ..... < 100 mV
P260: ..... 4.3 V ± 200 mV

▸ Setting on the test receiver: ..... Test function 22

Measurement:

Display readout: ..... 0.7 to 1.1 V

Typical voltage difference between P5 and P2: ..... 260 mV

Voltage at test points
P240, P250, P260: ..... < 100 mV
P270: ..... 4.3 V ± 200 mV

7.4.3.2 Working Points of the PIN-Switch Filter Selection

▸ Setting on the test receiver: ..... Test function 8

Measurement:

Display readout: ..... 1.8 to 2.2 V

The display output is a measure for the total current of the + 10V-supply into the pin diodes of the two filter selection blocks and into the pin diodes of the PreAmp block.The actual value of this total current is obtained by measuring the voltage difference between the test points P4 and P2 and dividing this value by 5 Ω.
The voltage difference for this test function is typically: ..... 545 mV

Voltage at V200 pin2: ..... -6.45 V
Voltage at V210 pin2, V220 pin2: ..... 0 V
Voltage at V201 pin3: ..... -7.40 V
Voltage at V200 pin3, V210 pin 3, V220 pin3: ..... 0.85 V
Voltage at V211 pin3, V221 pin3: ..... 0.85 V

Voltage at V282 pin2: ..... -6.45 V
Voltage at V280 pin2, V285 pin2: ..... 0 V
Voltage at V283 pin3: ..... -7.40 V
Voltage at V280 pin3, V282 pin3, V285 pin3: ..... 0.85 V
Voltage at V281 pin3, V286 pin3: ..... 0.85 V

▸ Setting on the test receiver: ..... Test function 9

Measurement:

Display readout: ..... 1.6 to 2.2 V

The display output is a measure for the total current of the + 10V-supply into the pin diodes of the two filter selection blocks and into the pin diodes of the PreAmp block.The actual value of this total current is obtained by measuring the voltage difference between the test points P6 and P3 and dividing this value by 5 Ω. The voltage difference for this test function is typically: ..... 470 mV

Voltages at the pin diodes are given under test function 8.

▸ Setting on the test receiver: ..... Test function 11

Measurement:

Display readout: ..... 1.7 to 2.2 V

Typical voltage difference between P4 and P2: ..... 545 mV
Voltage at V500 pin2, V530 pin2: ..... -6.45 V
Voltage at V500 pin3, V530 pin3: ..... -7.40 V
Voltage at V510 pin3, V531 pin3: ..... 0.85 V
Voltages at the pin diodes V200 to V286 are given under test function 8.

▸ Setting on the test receiver: ..... Test function 12

Measurement:

Display readout: ..... 1.6 to 2.2 V
Typical voltage difference between P6 and P3: ..... 470 mV
Voltages at the pin diodes are given under test function 11.

▸ Setting on the test receiver: ..... Test function 14

Measurement:

Display readout: ..... 1.4 to 1.9 V

Typical voltage difference between P4 and P2: ..... 460 mV
Voltage at V210 pin2: ..... 0 V
Voltage at V200 pin2, V220 pin2: ..... -6.45 V
Voltage at V200 pin3, V220 pin3: ..... -7.40 V
Voltage at V201 pin3, V210 pin3: ..... 0.85 V
Voltage at V211 pin3, V221 pin3: ..... 0.85 V

Voltage at V285 pin2: ..... 0 V
Voltage at V282 pin2, V280 pin2: ..... -6.45 V
Voltage at V282 pin3, V280 pin3: ..... -7.40 V
Voltage at V283 pin3, V285 pin3: ..... 0.85 V
Voltage at V286 pin3, V281 pin3: ..... 0.85 V

▸ Setting on the test receiver: ..... Test function 15

Measurement:

Display readout: ..... 2.4 to 2.9 V

Typical voltage difference between P6 and P3: ..... 700 mV
Voltages at the pin diodes as under test function 14.

▸ Setting on the test receiver: ..... Test function 17

Measurement:

Display readout: ..... 1.4 to 1.9 V

Typical voltage difference between P4 and P2: ..... 460 mV
Voltage at V210 pin2: ..... 0 V
Voltage at V200 pin2, V220 pin2: ..... -6.45 V
Voltage at V200 pin3, V221 pin3: ..... -7.40 V
Voltage at V201 pin3, V210 pin3: ..... 0.85 V
Voltage at V211 pin3, V220 pin3: ..... 0.85 V

Voltage at V285 pin2: ..... 0 V
Voltage at V282 pin2, V280 pin2: ..... -6.45 V
Voltage at V282 pin3, V281 pin3: ..... -7.40 V
Voltage at V283 pin3, V285 pin3: ..... 0.85 V
Voltage at V286 pin3, V280 pin3: ..... 0.85 V

▸ Setting on the test receiver: ..... Test function 18

Measurement:

Display readout: ..... 2.4 to 2.9 V

Typical voltage difference between P6 and P3: ..... 700 mV
Voltages at the pin diodes are given under test function 17.

▸ Setting on the test receiver: ..... Test function 20

Measurement:

Display readout: ..... 1.4 to 1.9 V

Typical voltage difference between P4 and P2: ..... 460 mV
Voltage at V220 pin2: ..... 0 V
Voltage at V200 pin2, V210 pin2: ..... -6.45 V
Voltage at V201 pin3, V210 pin3: ..... -7.40 V
Voltage at V200 pin3, V211 pin3: ..... 0.85 V
Voltage at V220 pin3, V221 pin3: ..... 0.85 V

Voltage at V280 pin2: ..... 0 V
Voltage at V282 pin2, V285 pin2: ..... -6.45 V
Voltage at V283 pin3, V285 pin3: ..... -7.40 V
Voltage at V282 pin3, V286 pin3: ..... 0.85 V
Voltage at V280 pin3, V281 pin3: ..... 0.85 V
Voltages at pin diodes V500 to V531 are given under test function 8.

▸ Setting on the test receiver: ..... Test function 21

Measurement:

Display readout: ..... 2.4 to 2.9 V

Typical voltage difference between P6 and P3: ..... 700 mV
Voltages at the pin diodes as under test function 20.

▸ Setting on the test receiver: ..... Test function 22

Measurement:

Display readout: ..... 1.4 to 1.9 V

Typical voltage difference between P4 and P2: ..... 460 mV
Voltage at V220 pin2: ..... 0 V
Voltage at V200 pin2, V210 pin2: ..... -6.45 V
Voltage at V201 pin3, V211 pin3: ..... -7.40 V
Voltage at V200 pin3, V210 pin3: ..... 0.85 V
Voltage at V220 pin3, V221 pin3: ..... 0.85 V

Voltage at V280 pin2: ..... 0 V
Voltage at V282 pin2, V285 pin2: ..... -6.45 V
Voltage at V283 pin3, V286 pin3: ..... -7.40 V
Voltage at V282 pin3, V285 pin3: ..... 0.85 V
Voltage at V280 pin3, V281 pin3: ..... 0.85 V
Voltages at pin diodes V500 to V531 are given under test function 8.

▸ Setting on the test receiver: ..... Test function 23

Measurement:

Display readout: ..... 2.4 to 2.9 V

Typical voltage difference between P6 and P3: ..... 700 mV
Voltages at the pin diodes as under test function 20.

7.4.3.3 Passband Curves of the Input Filters

Test setup:

- Connect network analyzer to X291 and X300.
- Remove C541 and fit C540.

- Setting on the test receiver ..... default setting

Measurement:

- Cover the two cavities labelled "1000 MHz - 1250 MHz" using a metal sheet.
  Amplification in the passband: ..... 1000 MHz to 1250 MHz
  0 dB ± 1.5 dB
  Return loss at X291 ..... < -13 dB

- Setting on the test receiver:
  Frequency: ..... 1300 MHz

Measurement:

- Cover the two cavities labelled "1250 MHz - 1522 MHz" using a metal sheet.
  Amplification in the passband: ..... 1250 MHz to 1522 MHz
  0 dB ± 1.5 dB
  Return loss at X291 ..... < -13 dB

- Setting on the test receiver:
  Frequency: ..... 1600 MHz

Measurement:

- Cover the two cavities labelled "1522 MHz - 1795 MHz" using a metal sheet.
  Amplification in the passband: ..... 1522 MHz to 1795 MHz
  0 dB ± 1.5 dB
  Return loss at X291 ..... < -13 dB

- Setting on the test receiver:
  Frequency: ..... 2000 MHz

Measurement:

- Cover the two cavities labelled "1795 MHz - 2050 MHz" using a metal sheet.
  Amplification in the passband: ..... 1795 MHz to 2050 MHz
  -1 dB ± 1.5 dB
  Return loss at X291 ..... < -13 dB

- Setting on the test receiver:
  Frequency: ..... 2000 MHz
  Pre Amp: ..... ON

Measurement:

- Cover the two cavities labelled "1795 MHz - 2050 MHz" using a metal sheet.
  Amplification in the passband: ..... 1795 MHz to 2050 MHz
  +9 dB ± 2 dB
  Return loss at X291 ..... < -13 dB

- Remove C540 and fit C541 again.

7.4.3.4 Mixer B300

Test setup:

- Remove C540 and C541.
- Connect the socket X300 to the RF input (pin 11) of the mixer B300 using a 10-pF SMD-capacitor.
- Solder X321 (connection of socket X320 and mixer)
- Connect transmitter to X300.
- Connect spectrum analyzer to X320.
- Setting on the test receiver:
  Frequency: ..... 1040 MHz
- Setting on the transmitter:
  Frequency: ..... 1040 MHz
  Level: ..... -30 dBm

The UHF Synthesizer module supplies the LO signal to X297
Level: ..... 16 dBm ± 3 dB
Frequency: ..... 1434.7 MHz

Measurement:

The converted signal is provided at the socket X320:
Frequency: ..... 394.7 MHz
Level: ..... -38 dBm ± 1.5 dB

- Reset the modifications carried out on the board.

7.4.3.5 IF Amplifier

Test setup:

- Setting on the test receiver: ..... Test function 5

Measurement:

Display readout: ..... 1.3 V to 2.1 V
Voltage at test points P395, P330: ..... 4.3 V ± 200 mV

Test setup:

- Solder X321 (connecting socket X320 and IF amplifier)
- Remove C339, fit C338
- Connect network analyzer to X320 and X330

Measurement:

Amplification at 400 MHz:
Mod 02: ..... + 12.5 dB ± 0.5 dB (ESVD)
Mod 03: ..... + 9.7 dB ± 0.5 dB (ESN)

Reflection at X320 at
400 MHz: ..... < -13 dB
1200 MHz: ..... > -5 dB
>2500 MHz: ..... < -10 dB

- Reset modifications carried out on the board

7.4.3.6 394.7 MHz Bandpass with Output Amp

Test setup:

- Setting on the test receiver: ..... Test function 6

Measurement:

Display readout: ..... 0.7 V to 1.1 V
Voltage at test point P350: ..... 4.4 V ± 200 mV

Test setup:

- Remove C330, connect the socket X330 to the bandpass 394.7 MHz using a 100-pF SMD capacitor.
- Connect network analyzer to X330 and X293.
- Tightly press an elastic metall sheet on the 394.7-MHz bandpass.

Measurement:

Mod02:
Centre frequency: ..... 394.7 MHz
6-dB bandwidth: ..... 5.6 MHz ± 0.5 MHz
Passband amplification: ..... + 6.7 dB ± 1 dB
Return loss at X330: ..... < -15 dB

Mod03:
Centre frequency: ..... 394.7 MHz
3-dB bandwidth: ..... 10.0 MHz ± 0.8 MHz
Passband amplification : ..... + 7.8 dB ± 1 dB
Return loss at X330: ..... < -15 dB

- Reset the modifications carried out on the board.

7.4.3.7 LO Switch

Test setup:

- Setting on the test receiver: ..... Test function 1

The UHF synthesizer module supplies the LO signal at X297

Level: ..... 16 dBm ± 3 dB
Frequency: ..... 1434.7 MHz

Measurement:

Display readout: ..... 0.1 V to 2.5 V
Voltage at test point P420: ..... 4.4 V ± 0.5 V
Voltage at V460 pin2: ..... -6.5 V
Voltage at V460 pin3: ..... -7.5 V
Voltage at V450 pin3: ..... 0.85 V

Test setup:

- Setting on the test receiver:
  Frequency: ..... 900 MHz
- Connect spectrum analyzer to X296.

The UHF synthesizer module supplies the LO signal at X297

Level: ..... 16 dBm ± 3 dB
Frequency: ..... 2254.7 MHz

Measurement:

Level at X296: ..... 18 dB ± 3 dB
Voltage at test point P420: ..... 4.4 V ± 0.5 V
Voltage at V460 pin2: ..... -6.6 V
Voltage at V460 pin3: ..... 0.87 V
Voltage at V450 pin3: ..... -7.6 V

7.4.3.8 UHF-VHF/HF Switch

Outside the board, there is a coaxial relay next to the attenuator which passes the input signal from the RF input socket either to the VHF or UHF Preselector. This relay is controlled by the transistor V51 on the UHF Preselector.

Test setup:

- Setting on the test receiver: ..... Test function 3 (relay condition UHF)

Measurement:

Display readout: ..... >1.5 V
Voltage at test point X29A.13 ..... >12 V

If the voltage at X29A.13 is only 5 V ± 1 V, the lead to the coaxial relay is disconnected.
If the voltage at X29A.13 is below 4 V, the fault must be around V51.

Test setup:

- Setting on the test receiver: ..... Test function 4 (relay condition VHF)

Measurement:

Display readout: ..... < 0.2 V
Voltage at test point X29A.13 ..... < 0.4 V

Check the correct relay condition by measuring the transmission loss.

Test setup:

- Setting on the test receiver: ..... Test function 3 (relay condition UHF)
- Connect network analyzer to the RF input of the test receiver. Unscrew the coaxial cable from the socket X291 of the UHF Preselector and connect to the network analyzer.

Measurement:

Transmission loss 0 Hz to 2000 MHz: ..... <1 dB
Return loss ..... < -20 dB

Test setup:

- Setting on the test receiver: ..... Test function 4 (relay condition VHF)
- Connect network analyzer to the RF input of the test receiver. Unscrew the coaxial cable from the socket X111 of the VHF Preselector and connect to the network analyzer.

Measurement:

Transmission loss 0 Hz to 2000 MHz: ..... <1 dB
Return loss ..... < -20 dB

7.5 Final Adjustment

Both board covers must be fitted.

Continuity test of boards

Test setup:

- Setting on the test receiver: ..... Test function 3
- Connect transmitter to X291:
  Frequency: ..... 1040 MHz
  Level: ..... -47 dBm
- Connect spectrum analyzer to X293.

Measurement:

Level at X293: ..... -35 dBm ± 2 dB
Frequency at X293: ..... 394.7 MHz

Adjustment of 245.3-MHz series resonant circuit

Test setup:

- Setting on the test receiver: ..... Testfunktion 3
- Connect transmitter to X291:
  Frequency: ..... 1189.4 MHz
  Level: ..... 3 dBm
- Connect spectrum analyzer to X293.

Measurement:

Level at X293: ..... < -82 dBm
Frequency at X293: ..... 245.3 MHz
Use C346 for adjustment.

Overload adjustment

Test setup:

- Setting on the test receiver:
  Frequency: ..... 1005 MHz
- Connect transmitter to X291:
  Frequency: ..... 1040 MHz
- Socket X293 open.

Measurement:

The overload LCD must light up at a transmitter level of 3 dBm and go out again at a level of 2 dBm.
Adjust using R160.

Table 7-2 Contents of the data register D32-A

Function	Pin 11	Pin 12	Pin 13	Pin 14	Pin 6	Pin 5	Pin 4
Test function 1	0	0	0	0	0	0	1
Test function 4	0	0	1	0	1	1	0
Test function 7	0	1	0	1	0	0	1
Test function 10	0	1	0	1	0	0	1
Test function 17	0	1	1	0	0	0	1
Test function 21	0	1	1	1	0	0	1
Test function 24	0	1	1	1	0	0	1
Test function OFF	1	X	X	X	X	X	X

Table 7-3 Contents of the data register D33-A

Function	Pin 13	Pin 14	Pin 7	Pin 6	Pin 5	Pin 4
Test function 1	0	0	1	1	1	0
Test function 4	X	X	X	X	X	X
Test function 7	X	1	1	1	1	1
Test function 10	1	1	1	1	1	1
Test function 17	0	0	1	1	0	1
Test function 21	0	1	1	0	1	1
Test function 24	0	1	0	1	1	1
Test function OFF	X	X	X	X	X	X

Data register D32-A

Pin 11: Selftest off

Pin 12: ⌝
Pin 13: Test points TP0 to TP7
Pin 14: ⌟

Pin 6: LO switchover: 0: UHF
1: VHF

Pin 5: Coaxial relay (UHF-VHF/HF Switch) 0: UHF
1: VHF

Pin 4: Module on

Data register D33-A

Pin 13: Preamplifier on

Pin 14: Filter Selection 0: BP1 or BP2 on
1: BP3 or BP4 on

Pin 7: Bandpass 4 off

Pin 6: Bandpass 3 off

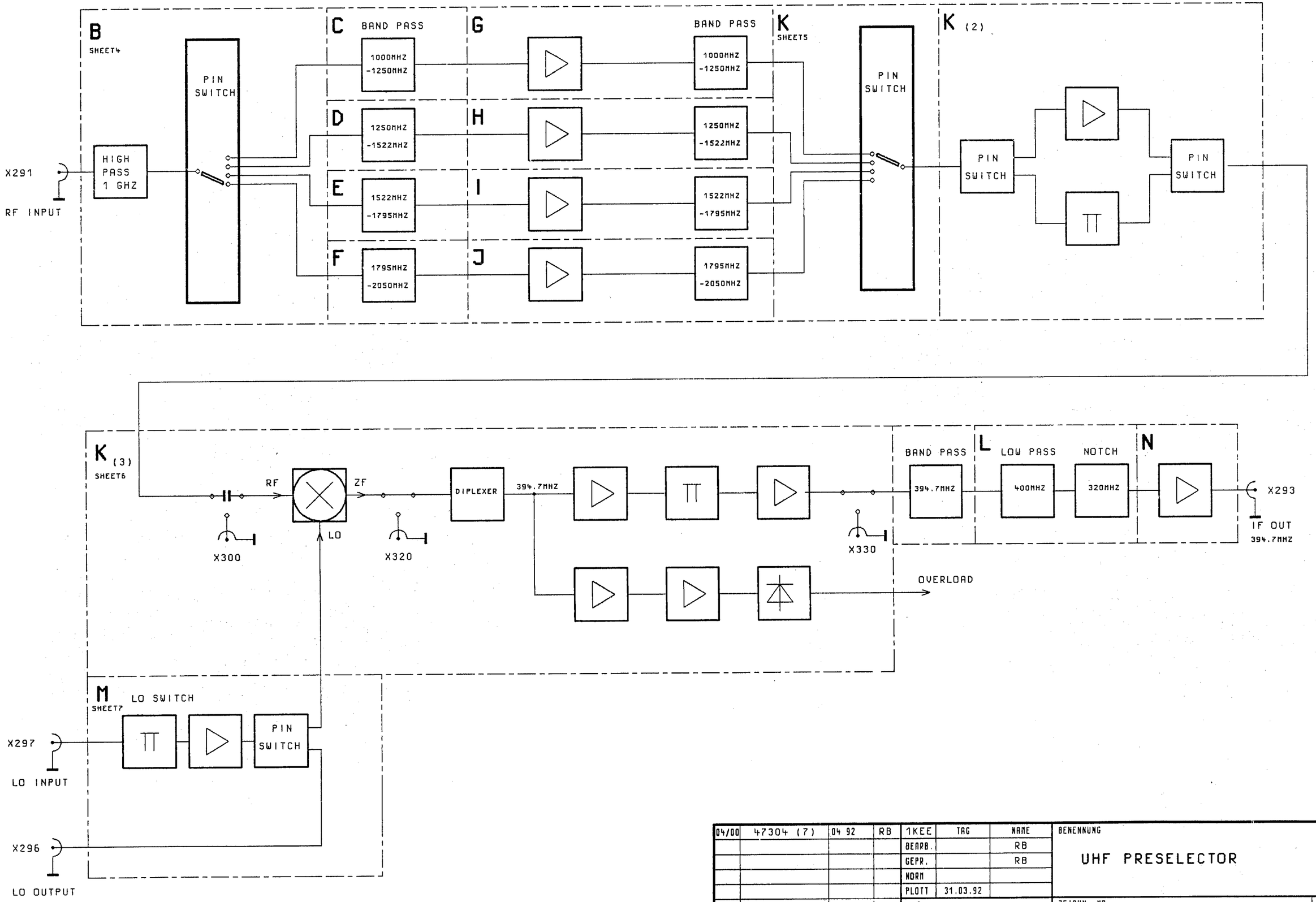
Pin 5: Bandpass 2 off

Pin 4: Bandpass 1 off

7.6 External Interfaces

Pin	Name	Input/ Output	Origin/Destination	Specified range	Signal description
A7	SCLK	I		HCT input High > 2 V Low < 0.8 V	Clock for ser. bus
A9	TEST	O		0 to 5 V	Selftest output
A11	LOCK	O		Open collector	Lock-in indication Aktive low
A1, C1	AGND	I		Analog ground	
A2, C2	+ 5 VA	I		5.4 V ± 50 mV	+ 5 V analog
A3, C3	+ 12 V	I		10.8 to 15 V	
A4, C4	+ 10 V	I		+ 10 V ± 10 mV	
A5, C5	– 10 V	I		– 10 V ± 20 mV	
C7	TDATA	I		HCT input High > 2 V Low < 0.8 V	Serial data bus
C8	STROBE*	I		HCT input High > 2 V Low < 0.8 V	Aktive low
C11	OL*	O		Open collector Low < 0.8 V	overload
X291	RF INPUT	I	Coaxial relay	1000 MHz to 2050 MHz	UHF input
X293	IF OUT 394.7 MHz	O	I/Q Demodulator	394.7 MHz	ZF output
X296	LO OUTPUT	O	VHF Preselector	1374.7 to 2354.7 MHz 16 dBm ± 2 dB	LO output
X297	LO INPUT	I	UHF Synthesizer	1374.7 to 2354.7 MHz 17 dBm ± 2 dB	LO input

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



04/00	47304 (7)	04 92	RB	1KEE	TAG	NAME
				BEARB.		RB
				GEPR.		RB
				NORM		
				PLOTT	31.03.92	
03/00	47304 (3)	01 92	RB			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ

ZU GERAET ESVD-B2

BENENNUNG

UHF PRESELECTOR

ZEICHN.-NR. 1026.9518.01S

BLATT-NR. 1 v. 7 BL.

PEG.I.V. 1026.9501 ERSTE Z. 1026.9501

ZEICHN.-NR. 1026.9519.01S

P1-P3

BOARD CONTROL

X29A 9 TEST
X29A 7 SCLK
X29C 7 TDATA
X29C 8 STROBE*
X29C 9 OL*
X29A 1 GNDA
X29C 1
X29A 2 +5VA
X29C 2
X29A 4 +10V
X29C 4
X29A 5 -10V
X29C 5
X29A 13 VHF/UHF

R4 100R
R1 100R L
R5 100R
R2 100R L
R6 100R
R3 100R L
R7 100R
L2 1U2H
L3 1U2H
L5 1U2H
L6 1U2H
L7 1U2H

C1 220P L
C2 220P L
C3 220P L
C4 220P L
C5 220P L
C6 220P L
C7 220P L
C8 100P L
C9 100P L
C12 10N L
C20 10N L
C14 10N L
C22 10N L
C15 10N L
C23 10N L
C16 10N L
C24 10N L

D1-A 74HCT14T-L
D1-B
D1-C
D1-D
D1-E
D1-F
D1-G 74HCT14T-L

OL* SHEET2 B/6

+5V
+10V
-10V

ADRESSDECODER

ADR 130D

D30-A 74HCT4094T-L
D31-A 74HCT238T-L
D32-A 74HCT4094T-B
D33-A 74HCT4094T-B
R30 1K B
R32 1K L
R33 1K L
D30-B
D31-B
D32-B
D33-B
C30 10N L
C31 10N L
C32 10N L
C33 10N L

B1
B2
B3
B4
B12
PRE

SUPPLY SWITCH

R36 221K L
R45 221K L
R46 221K L
N30-D
C69 10N L
V69 BAS32-L
P1
P2
P3
V21 BCP69-16-B
+10VA
R23 1K L
C25 100N L
R22 22K1 B
N30-B
V22 BCP68-16-B
R25 4K75 L
R24 4K75 B
V23 BC860B-L H - OFF L - ON
R27 10K L
R26 2K21 L
-10VA
N30-C
R37 221K L
N30-A LM339D-B
R38 1M L
R34 47K5 L
R35 10K L
C35 4U7 25V TA B
V36 BAS32-L
OVL SHEET6 B/11
OL* SHEET2 D/3

UHF-VHF/HF SWITCH

R49 10K B
V52 BAS32-B
R50 221R B
V50 BC850B-B
V51 BCP68-16-B
N50-A LM224D-B
R55 47K5 L
R28 47K L
R24 100K L
C29 10N L

R42 100K L
TP0 SHEET7 D/8
R40 100K
TP1 SHEET6 D/11
TP2 SHEET7 B/9
TP3 SHEET7 B/10

SHEET3 A-F/3

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS : MOD 02 - ESVD
MOD 03 - ESN

04/00
03/00
AEND. IND.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

LEITUNGS-NR. 1020.5518.01S

P1-P3

P20 P25

BOARD CONTROL

ADRESSDECODER

D30-A
74HCT4094T-L

ADR 130D

D31-A
74HCT238T-L

D32-A
74HCT4094T-B

D33-A
74HCT4094T-B

+5V

R32 1K L

R33 1K L

B1
B2
B3
B4
B12
PRE

D30-B C31 10N L

D31-B C32 10N L

D32-B C33 10N L

D33-B

SHEET3 H-F/3

BUFFER

D40-A
74HC4051T-B

MUXDX

TEST0
TEST1
TEST2
TEST3
TEST4
TEST5
TEST6
TEST7

C40 10N L

N40-E

N41-E

D40-B

V40 HSMS2800-L

R42 100K L

TP0
SHEET7
D/8

N40-D
LM224D-B

V41 HSMS2800-L

R40 100K L

TP1
SHEET6
D/11

N40-A

TP2
SHEET2
B/9

N40-B

TP3
SHEET2
B/10

N40-C

N41-A
LM224D-B

TP4
SHEET2
B/10

N41-B

TP5
SHEET3
D/1

N41-D

TP6
SHEET3
E/1

N41-C

TP7
SHEET3
C/1

A (1)

-10VA

L70 100NH

-10VM

C70 10P B MINI

C71 10P B MINI

+10VM

C72 10P B MINI

L72 100NH

C73 10P B MINI

UHF-VHF/HF SWITCH

R36 221K L

P1

N30-D

R45 221K L

C69 10N L

V69 BAS32-L

R46 221K L

P2

+10VA

R22 22K1 B

R23 1K L

N30-B

N30-A
LM339D-B

R38 1M L

OL*
SHEET2
D/3

R34 47K5 L

OVL

SHEET6
B/11

+10V

C35 4U7 25V TA B

R35 10K L

V36 BAS32-L

R37 221K L

N30-C

V23 BC860B-L L - ON H - OFF

R25 4K75 L

R27 10K L

P3

-10VA

R26 2K21 L

R49 10K B

V52 BAS32-B

R50 221R B

V50 BC850B-B

V51 BCP68-16-B

N50-A
LM224D-B

V60 BAS32-L

R51 887R L

V62 BC860B-B

LO1
SHEET7
E/8

V61 BAS32-L

R47 887R L

V63 BC860B-B

LO2
SHEET7
C/8

R55 47K5 L

R54 47K5 L

R24 470K L

R28 100K L

C29 10N L

N50-B

TP2
SHEET2 B/9

N50-C

N50-D

R70 82K5 L

R71 221K L

R73 100K L

TP3
SHEET2
C/9

R75 82K5 L

R74 100K L

TP4
SHEET2
E/10

R77 82K5 L

R72 82K5 L

R76 221K L

R79 82K5 L

R78 221K L

R83 10K L

R84 10K L

R85 10K L

R81 10R L

R88 10R L

R82 10R L

R89 10R B

+10VA

+10V

N50-E

-10V

P20

+10VK

P25

VERSIONS : MOD 02 - ESVD
MOD 03 - ESN

04/00	47304 (2)	04.92	RB	1KEE	TAG	NAME	BENENNUNG
				BEARB.		RB	UHF PRESELECTOR
				GEPR.		RB	
				NORM			
				PLOTT	02.04.92		
03/00	47304 (3)	01.92	RB	ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9518.01S
AEND. IND.	AENDERUNG MITTEILUNG	DATUM	NAME	ZU GERAET	ESVD-B2		BLATT-NR. 2 v. 7 BL.
				REG.I.V.	1026.9501	ERSTE Z.	1026.9501

1 2 3 4 5 6 7 8 9 10 11 12

A B C D E F

FILTER CONTROL

A (2)

P4-P6

R160

N100-A
LM224D-L

R112 82K5 L
R110 221K L
+10VA
R101 10K L
R181 10R B
R125 10R L
P4
R100 100K L
R111 82K5 L
R120 10K L
TP6 SHEET2 D/10
R116 221K L
R105 82K5 L

N100-B

+10VA
R162 10R L
R126 10R L
P5
R102 100K L
R113 82K5 L
R121 10K L
TP5 SHEET2 D/10
R117 221K L
R107 82K5 L

N100-C

R103 82K5 L
P6
R114 221K L
R105 10K L
R127 10R L
R163 10R B
R104 100K L
R115 82K5 L
R122 10K L
TP7 SHEET2 C/10
R118 221K L
-10VA
R108 82K5 L

N130-A
LM224D-L

B1
V154 BAS32-B
R150 274R B
V140 BC8608-B
R132 10K B
V150 6V8 L
R140 10K L
V141 BC8608-L

N130-B

B2
V155 BAS32-B
R151 274R B
V142 BC8608-B
R133 10K B
V151 6V8 L
R141 10K L
V143 BC8608-L

N130-C

B3
V156 BAS32-B
R152 274R B
V144 BC8608-B
R134 10K B
V152 6V8 L
R142 10K L
V145 BC8608-L

N130-D

B4
V157 BAS32-B
R153 274R B
V146 BC8608-B
R135 10K B
V153 6V8 L
R143 10K L
V147 BC8608-L

N150-A
LM224D-L

B12
V134 BAS32-L
R154 274R L
V148 BC8608-L

N150-B

V135 BAS32-B
R155 274R B
V149 BC8608-B
R155 274R B

SHEET2 5

+10VA
N100-E
N150-E
N130-E
-10VA

+5V
R130 47K5 L
R131 47K5 L

+10V
R161 47K5 L
C160 10N L
R160 10K

N100-D

OLREF SHEET6 C/8

C228 10P L MINI

P100 BP1
P101 AMP1
BP2
AMP2
BP3
AMP3
P103 BP4
P104 AMP4
BP12
BP34
SHEET4

C140 10P L MINI
C141 10P L MINI
C142 10P L MINI
C143 10P L MINI
C231 10P L MINI

N150-C
LM224D-L

V175 BAS32-L
P220 PREON SHEETS E/3
R170 274R B
V170 BC8608-L
R171 10K B
V173 6V8 L
R177 10K B
V171 BC8608-B
P207 PREAMP SHEETS E/5
V176 BAS32-L

PRE

N150-D

R172 274R B
V172 BC8608-L
PREOFF SHEETS C/3

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VERSIONS : MOD 02 - ESVD
MOD 03 - ESN

04/00	47304 (7)	04 92	RB	1KEE	TAG	NAME	BENENNUNG
				DEAPR.		RB	UHF PRESELECTOR
				GEPR.		RB	
				NORM			
				PLOTT	02.04.92		
03/00	47304 (3)	01 92	RB				ZEICHN. NR. 1026.9518.013
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			BLATT-NR. 3 v. 7 BL.
				ZU GERAET ESVD-02			MFG LV 1026.9501 MFG A 1026.9501

ZEICHN.-NR. 1026.9518.01S

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

P240
P250
P260
P270

B FILTER SELECTION

BP1 SHEET3 E/8
BP2 SHEET3 E/8
BP3 SHEET3 D/8
BP4 SHEET3 D/8
BP12 SHEET3 D/8
BP34 SHEET3 D/8

L190 100NH
L191 100NH
L192 100NH
L193 100NH
L194 100NH
L195 100NH

C161 470P L
C162 470P L
C163 470P L
C164 470P L
C165 470P L
C166 470P L
C179 10P L MINI
C176 10P L MINI
C180 10P B MINI
C181 10P B MINI
C182 10P B MINI
C183 10P B MINI
C184 10P B MINI
C185 10P B MINI
C190 10P B MINI
C191 10P B MINI
C192 10P B MINI
C193 10P B MINI
C194 10P B MINI
C195 10P B MINI
C171 470P L
C172 470P L
C173 470P L
C174 470P L
C175 470P L
C176 470P

P102
P105

RF INPUT
X291 1

C200 3P3P B
C201 3P3P B
L201 INCLUDED IN LAYOUT
L200 47NH B
C202 10P B MINI
R200 274R B

BBP1
BBP2
BBP3
BBP4
BBP12
BBP34

R220 274R L
R221 47R5 B
R222 47R5 B
R223 47R5 B
R210 47R5 B
R211 47R5 B
R212 47R5 B
R213 274R L

C222 10P B
C229 10P B MINI
L222 47NH B
L221 47NH B
C225 10P B MINI
C226 10P B MINI
C232 10P B
C221 10P B
C230 10P B MINI
L223 47NH B
C223 10P B
C224 10P B MINI
L220 47NH B
C217 10P B MINI
C218 10P B MINI
L212 47NH B
C211 10P B
C213 10P B MINI
L210 47NH B
C210 10P B
C206 10P B
C214 10P B MINI
L211 47NH B
C219 10P B MINI
L213 47NH B
C215 10P B MINI
C212 10P B
C207 10P B
C220 10P B MINI
P205
P202

V200 BAR14-B
V201 BAR14-B
V220 BAR14-B
V221 BAR14-B
V210 BAR14-B
V211 BAR14-B

W1A 2
W1B 2
W2A 2
W2B 2

C

B220
BP1-1
1000MHZ...1250MHZ

D

B221
BP2-1
1250MHZ...1522MHZ

E

B222
BP3-1
1522MHZ...1795MHZ

F

B223
BP4-1
1795MHZ...2050MHZ

BP INCLUDED IN LAYOUT

G

AMP1 SHEET3 E/8
P210
-10VA
C241 10P B MINI
C242 10K B
R240 2K21 L
R242 10K B
R243 3K32 B
R244 6K81 L
R245 10K B
R246 100R B
P201
C246 10P B MINI
C209 4U7 25V TA L
C245 1N L
C235 10P B MINI
L240 47NH B
C240 10P B MINI
V240 BC860B-B
P240
C243 10P B MINI
L241 47NH B
C244 10P B MINI
N240 CGY50-B
B270
BP1-2
1000MHZ...1250MHZ

H

AMP2 SHEET3 D/8
P208
P211
-10VA
C251 10P B MINI
C252 10K B
R250 2K21 L
R252 10K B
R253 3K32 B
R254 6K81 L
R255 10K B
R256 100R B
C256 10P B MINI
C216 4U7 25V TA L
C255 1N L
C257 10P B MINI
L250 47NH B
C250 10P B
V250 BC860B-B
P250
C253 10P B MINI
L253 47NH B
C254 10P B
N250 CGY50-B
B271
BP2-2
1250MHZ...1522MHZ

I

AMP3 SHEET3 D/8
-10VA
C261 10P B MINI
C262 10K B
R260 2K21 L
R262 10K B
R263 3K32 B
R264 6K81 L
R265 10K B
R266 100R B
C266 10P B MINI
C310 4U7 25V TA L
C267 1N L
C265 10P B MINI
L260 47NH B
C260 10P B
V260 BC860B-B
P260
C263 10P B MINI
L261 47NH B
C264 10P B
N260 CGY50-B
B272
BP3-2
1522MHZ...1795MHZ

J

AMP4 SHEET3 D/8
P209
-10VA
C299 10P L MINI
C272 10K B
R270 2K21 B
R272 10K B
R273 3K32 B
R274 6K81 L
R275 10K B
R276 100R L
P204
C276 10P L MINI
C311 4U7 25V TA L
C268 1N L
C302 10P B MINI
L270 47NH B
C270 10P B
C271 10P B
V270 BC860B-B
P270
C273 10P B MINI
L271 47NH B
C274 10P B
C275 10P B
N270 CGY50-B
B273
BP4-2
1795MHZ...2050MHZ

BP INCLUDED IN

VERSIONS : MOD 02 - LSVD
MOD 03 - LSN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE BEACHTEN
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES

04/00
03/00
AI ND
IND

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN -NR. 1225.9518.01S

P240
P250
P260
P270

C

B220
BP1-1
1000MHZ...1250MHZ

W1A 2
W1B 2

V220
BAR14-B

V221
BAR14-B

D

B221
BP2-1
1250MHZ...1522MHZ

W2A 2
W2B 2

E

B222
BP3-1
1522MHZ...1795MHZ

V210
BAR14-B

V211
BAR14-B

C212 10P B
C207 10P B

F

B223
BP4-1
1795MHZ...2050MHZ

G

C241 10P B MINI
R242 10K B
R240 2K21 L
R243 3K32 B
R244 6K81 L
R245 10K B
AMP1 SHEET3 E/8
P201
C246 10P B MINI
P240
R246 100R B
C209 4U7 25V TA L
P210
-10VA
C235 10P B MINI
C245 1N L
V240 BC860B-B
C243 10P B MINI
L240 47NH B
L241 47NH B
C240 10P B MINI
C244 10P B MINI
N240 CGY50-B
B270
BP1-2
1000MHZ...1250MHZ
R249 10R B
R247 432R B
R248 432R B

H

C251 10P B MINI
R252 10K B
R250 2K21 L
R253 3K32 B
R254 6K81 L
R255 10K B
AMP2 SHEET3 D/8
C256 10P B MINI
P250
R256 100R B
C216 4U7 25V TA L
P208
P211
-10VA
C257 10P B MINI
C255 1N L
V250 BC860B-B
C253 10P B MINI
L250 47NH B
L253 47NH B
C250 10P B
C254 10P B
N250 CGY50-B
B271
BP2-2
1250MHZ...1522MHZ
R267 4R75 B
R268 1K B
R269 1K B

I

C261 10P B MINI
R262 10K B
R260 2K21 L
R263 3K32 B
R264 6K81 L
R265 10K B
AMP3 SHEET3 D/8
C266 10P B MINI
P260
R266 100R B
C310 4U7 25V TA L
-10VA
C265 10P B MINI
C267 1N L
V260 BC860B-B
C263 10P B MINI
L260 47NH B
L261 47NH B
C260 10P B
C264 10P B
N260 CGY50-B
B272
BP3-2
1522MHZ...1795MHZ

J

C299 10P L MINI
R272 10K B
R270 2K21 B
R273 3K32 B
R274 6K81 L
R275 10K B
AMP4 SHEET3 D/8
P204
C276 10P L MINI
P270
R276 100R L
C311 4U7 25V TA L
P209
-10VA
C302 10P B MINI
C268 1N L
V270 BC860B-B
C273 10P B MINI
L270 47NH B
L271 47NH B
C274 10P B
C270 10P B
C271 10P B
C225 10P B
N270 CGY50-B
B273
BP4-2
1795MHZ...2050MHZ

K (1)

FILTER SELECTION

BP1
SHEET3 E/8
P200

C256 10P B
C247 10P B
C280 10P L MINI
R280 47R5 L
L280 47NH B
C281 10P B MINI
R284 274R B
C285 10P B MINI
L282 47NH B
BP12 SHEET3 D/8
V280 BAR14-B
C286 10P L MINI
C284 10P B
C249 10P B
R282 47R5 B
L283 47NH B
C287 10P B MINI
V281 BAR14-B
L281 47NH B
C282 10P B MINI
C248 10P B
R281 47R5 B
C283 10P B MINI
BP2
SHEET3 E/8
C288 10P B
V282 BAR14-B
W3A 2
MIX IN
SHEET5 C/1
V283 BAR14-B
L284 47NH B
C289 10P B MINI
R283 274R B
BP3
SHEET3 D/8
C291 10P B MINI
C269 10P B
R290 47R5 B
C292 10P B MINI
L293 47NH B
C297 10P B MINI
L290 47NH B
C277 10P B
R293 47R5 B
C279 10P B
C298 10P B MINI
V285 BAR14-B
C296 10P B
C233 10P L MINI
V286 BAR14-B
C295 10P B MINI
L292 47NH B
BP34
SHEET3 D/8
L291 47NH B
C293 10P B MINI
R292 274R B
R291 47R5 B
C294 10P B MINI
C278 10P B
P203
BP4
SHEET3 D/8
C259 10P B

BP INCLUDED IN LAYOUT

BP INCLUDED IN LAYOUT

VERSIONS : MOD 02 - ESVD
MOD 03 - ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

04/00	42304 (7)	04 92	RB	1KEE	TAG	NAME	BENENNUNG
				BEARB.		RB	UHF PRESELECTOR
				GEPR.		RB	
				NORM			
				PLOTT	31.03.92		
03/00	42304 (3)	01 92	RB	ROHDE&SCHWARZ			ZEICHN. NR. 1026.9518.01S
AEND. IND.	AENDERUNG MITTEILUNG	DATUM	NAME	ZU GERÄT ESVD-B2			BLATT-NR. 4 V. 7 BL.
				NÄCHSTE Z. 1026.9501			ERSTE Z. 1026.9501

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

PRE AMP

K (2)

P520

X300

X321

X320

PREAMP
SHEET3 C/8

PREON
SHEET3 C/8

PREON
SHEETS E/3

-10VA

P130

P107

P120

R524 6K81 B

R525 10K L

R526 100R L

R521 2K21 B

R522 3K32 L

R520 10K L

C522 1N B

V520 BC860B-L

C525 10P L MINI

C526 4U7 25V TA B

C521 10P L MINI

C524 10P L MINI

L251 47NH L

L524 47NH L

C530 10P L MINI

C531 10P L MINI

L530 47NH L

R530 47R5 B

C535 10P B MINI

C536 10P B MINI

C537 10P L MINI

R540 274R B

L540 47NH L

C540 * 10P L MINI

C541 10P L MINI

C505 10P L MINI

C510 10P L

C511 10P L

R504 274R B

R505 47R5 L

L506 47NH L

C504 10P L MINI

C506 10P L MINI

L504 47NH L

N520 CGY50-L

V500 BAR14-L

V510 BAR14-L

V530 BAR14-L

V531 BAR14-L

C500 10P L

C501 10P L

W38 2

MIX-IN
SHEET4 D/11

C507 10P L MINI

L507 47NH L

C513 10P L

C512 10P L

R508 47R5 L

C508 10P L MINI

P106

PREOFF
SHEET3 B/8

R510 10R L

R511 432R L

R512 432R L

C532 10P L

C533 10P L

L538 47NH L

C538 10P B MINI

R438 47R5 L

C539 10P L MINI

P206

PREOFF
SHEET5 C/3

B300
ROK-186MH

L321
INCLUDED IN LAYOUT

L322
INCLUDED IN LAYOUT

ZF 394.7MHZ
SHEET6 D/2

X321

X320 1

C321 1P L MINI

C325 4P7P B

R310 100R L

R311 100R L

W4R 2

MIX-LO
SHEET7 D/8

* NOT FITTED

VERSIONS :
MOD 02 - ESVD
MOD 03 - ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
04/00	47304 (7)	04 92	RB
03/00	47304 (3)	01 92	RB

1KEE	TAG	NAME
BEARB.		RB
GEPR.		RB
NORM		
PLOTT	31.03.92	

ZU GEPRUEFT: ESVD-B2

BENENNUNG: UHF PRESELECTOR

ROHDE&SCHWARZ

ZEICHN.-NR. 1026.9518.01S

BLATT-NR. 5 V. 7 BL.

REG.I.V. 1026.9501 ERSTE Z. 1026.9501

ZEICHN.-NR. 1026.9518.01S

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

P395 P315 P316 P330 X330 C340 C342 C341

K (3)

1 ST ZF AMP

-10VA +10VK -10VA +10VK

C390 10P B MINI
R390 10K B
R391 2K21 L
R393 3K32 B
R394 6K81 L
V395 BC860B-B
R395 10K B
C391 10P B MINI
R396 100R B
C392 1N L
C393 4U7 25V TA L
P395
L391 1UH B
L396 1UH B
C395 100P B
N395 CGY50-B
C396 100P B
R397 47R5 B
R398 150R B
R399 150R B
C326 100P B

C328 10P B MINI
P230
R328 10K B
R327 2K21 L
R331 6K81 L
V330 BC860B-B
R332 10K B
C332 10P B MINI
R330 3K32 B
P330
R333 100R B
C330 1N L
C333 4U7 25V TA L
L326 1UH B
L335 1UH B
N330 CGY50-B
C337 100P B
** R339
C339 100P L
** R337
** R338
* C338 100P L
X330 1

BP 394,7MHZ

C340 9P C342 9P C341 9P
C372 1P L C375 1P L C376 1P L C379 1P L
C373 1P5 L C374 2P2 L C377 2P2 L C378 1P5 L
L340 L341 L342 L343 L344
L345 INCLUDED IN LAYOUT
C345 4P7P

ZF 394.7 MHZ
SHEETS C/8

BUFFER AMP

+10VA +10VA
N315 MAR-3 B
R315 221R B
C315 10P B
R316 121R B
P315
C316 100P B
N318 MAR-3 B
R317 121R B
P316
C317 100P B
R318 1K L
V360 HSMS2800-B
C360 4P7 L
R361 1M L

+10VA
C365 100N L
C361 4P7 L
N360 AD744KR-B
C366 100N L
-10VA

OLREF
SHEET 3 E/8
C363 10N L
N370-A NE521D-B
COMP
+10VA
V370 4V7 B
C370 100N L
N370 B

**	MOD 02	MOD 03
R337	*	332R
R338	*	332R
R339	0R	15R

MOD 02
C372 - C379 NOT FITTED

VERSIONS :
MOD 02 - ESVD
MOD 03 - ESN

* NOT FITTED

ACHTUNG: ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE FACHGERECHT EIN- BZW. AUSBAUEN.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

05/00 47 11
04/00 47 11
REND. IND. ALNO ALLI

P316 P330 X330 C340 C342 C341 C346 -10VM C350 10P B MINI P350 +10VM C357 10P B MINI

BP 394,7MHZ

L

N

OUTPUT AMP

-10VA +10VK

C328 10P B MINI
R328 10K B
R327 2K21 L
R331 6K81 L
V330 BC860B-B
R332 10K B
R330 3K32 B
C330 1N L
C332 10P B MINI
R333 100R B
C333 4U7 25V TA L
L326 1UH B
L335 1UH B
R397 47R5 B
R399 150R B
C326 100P B
C337 100P B
** R339
** R337
** R338
C339 100P L
* C338 100P L
N330 CGY50-B
X330 1

C340 9P C342 9P C341 9P
C372 1P L C375 1P L C376 1P L C379 1P L
C373 1P5 L C374 2P2 L C377 2P2 L C378 1P5 L
L340 L341 L342 L343 L344

L345 INCLUDED IN LAYOUT
L346 INCLUDED IN LAYOUT
C345 4P7P B
C346 3P-1P7 B
C347 100P L
L347
W5A 1 W5B 1

L350 100NH L357 100NH
R352 6K81 L V350 BC860B-B R355 10K B
C349 10P B MINI C356 10P B MINI
R349 10K B R356 100R B
R348 2K21 L R350 3K32 B C351 1N L C358 4U7 25V TA L
L348 1UH B L349 1UH B
C354 100P B
N350 CGY50-B
X293 1
IF OUT 394,7MHZ

TP1
SHEET2 D/9

D380-B 74HCT123T-B
R383 1K L

+10VA
N318 MAR-3 B
C316 100P B
R317 121R B
C317 100P B
P316
R318 1K L
V360 HSMS2800-B
C360 4P7 L
R361 1M L
C365 100N L C361 4P7 L
C366 100N L
-10VA
N360 AD744KR-B
C363 10N L
OLREF SHEET 3 E/H

N370-A NE521D-B
COMP A/# 1,2
+10VA -10VA
V370 4V7 B V371 5V1 B
C370 100N L C371 100N L
N370-B

V380 BAS32-B
V381 BAS32-B
R380 1K B
+5V
R381 33K2 B C381 100N B
D380-A 74HCT123T-B
R385 10K B
OVL SHEET2 B/7
+5V C380 10N L D380-C
R386 22K1 L C382 100N L

02	MOD 03
	332R
	332R
	15R

NOT FITTED

* NOT FITTED

ACHTUNG: ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ENTHALTEN. BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES. REQUIRE A SPECIAL HANDLING

05/00	47304 (10)	05 92	RB	ERSTELL.	TAG	NAME	BENENNUNG
				BEARB.		RB	UHF PRESELECTOR
				GEPR.		RB	
				NORM			
				PLOTT	19.05.92		
04/00	47304 (7)	04 92	RD	ROHDE&SCHWARZ			ZEICHN. NR. 1026.9518.01S
AEND. IND.	AENDERUNG MITTEILUNG	DATUM	NAME	ZU GERAET ESVD-B2			BLATT-NR. 6 V. 7 BL.
				REG.I.V. 1026.9501		ERSTE Z. 1026.9501	

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

M

LO SWITCH

-10V

+10V

P420

C420 10P L MINI

C425 10P L MINI

L410 100NH

L415 100NH

C410 10P L MINI

C416 10P L MINI

R414 10K B

R415 18K2 L

R410 10K L

R411 2K21 B

R412 3K32 L

R417 182R L

R418 182R B

C412 1N B

V415 BC860B-B

C418 10P B MINI

C419 4U7 25V TA B

C411 10P L MINI

L411 47NH L

L418 47NH L

LO INPUT

X297 1

C437 4P7 L

C438 10P L

R436 51R1 L

R439 51R1 L

N440 CGY50-L

* C440 10P L

C441 10P L

L470 100NH

LO1

SHEET2 C/9

C470 10P L MINI

C471 10P L MINI

R460 47R5 L

C461 10P L MINI

L460 47NH L

V460 BAR14-L

C462 10P L

W48 2

MIX-LO

SHEETS 8/5

* C463 10P L

C465 1P L

R437 1K L

TPO

SHEET2 D/9

V466 HSMS2810-L

C466 47P L

R466 100K B

R465 221R L

L455 100NH

LO2

SHEET2 B/9

C455 10P L MINI

C456 10P L MINI

R450 47R5 L

C450 10P L MINI

L450 47NH L

C451 10P L

L445 47NH L

V450 BAR14-L

X296 1

LO OUTPUT

C443 10P L MINI

* C452 10P L

R443 274R L

* NOT FITTED

VERSIONS :

MOD 02 - ESVD

MOD 03 - ESN

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
04/00	47304 (7)	04 92	RB
03/00	47304 (3)	01 92	RB

1KEE	TAG	NAME
BEARB.		RB
GEPR.		RB
NORM		
PLOTT	06.04.92	

ROHDE&SCHWARZ

ZU GERAET ESVD-B2

BENENNUNG

UHF PRESELECTOR

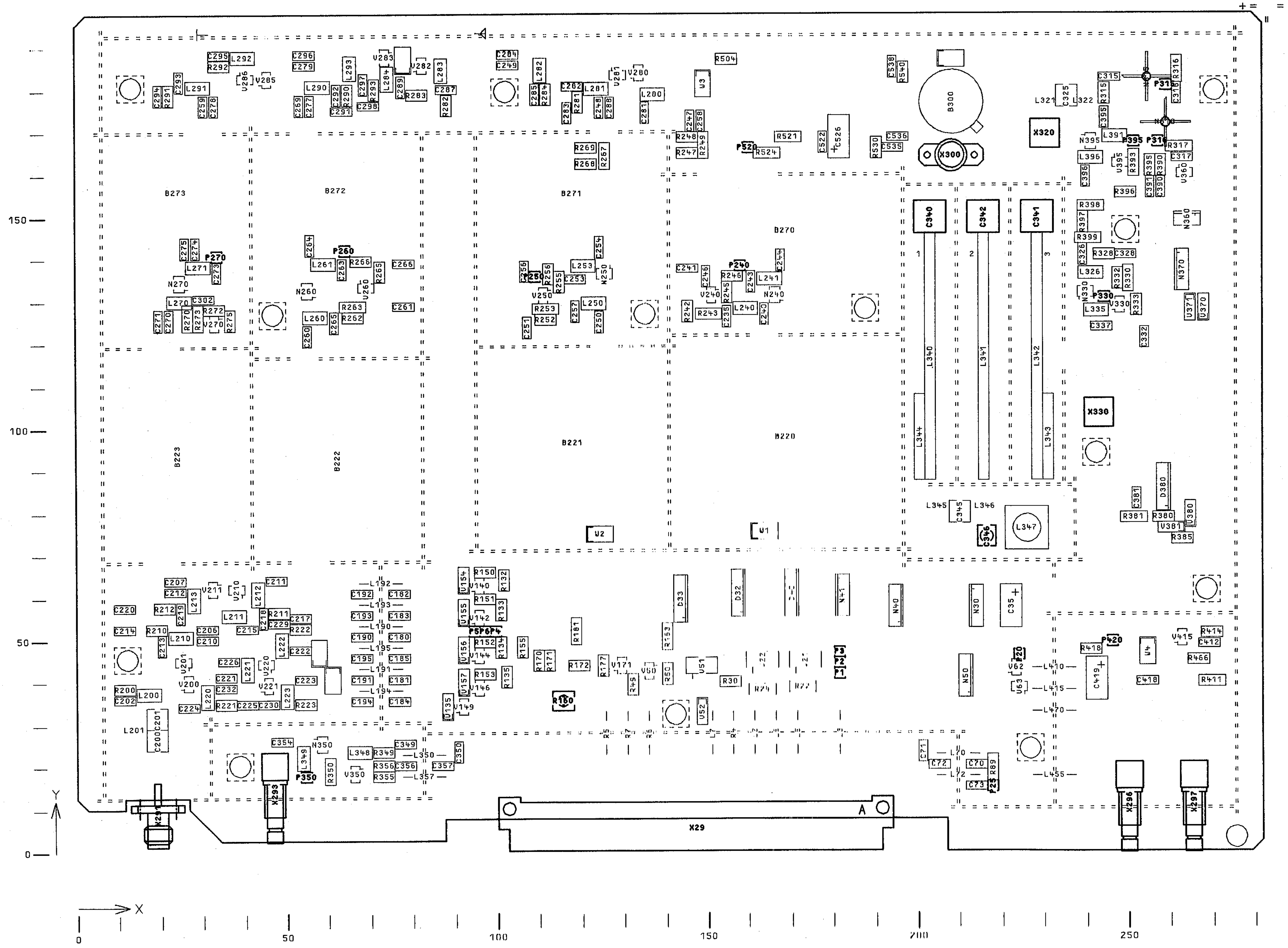
ZEICHN.-NR. 1026.9518.01S

BLATT-NR. 7 v. 7 BL.

REG.I.V. 1026.9501 ERSTE Z. 1026.9501

ZEICHN.-NR. 1026.9518.01S

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.
DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, AENDERUNGEN KOENNEN NUR DURCH AENDERN DES DATENSATZES ERFOLGEN



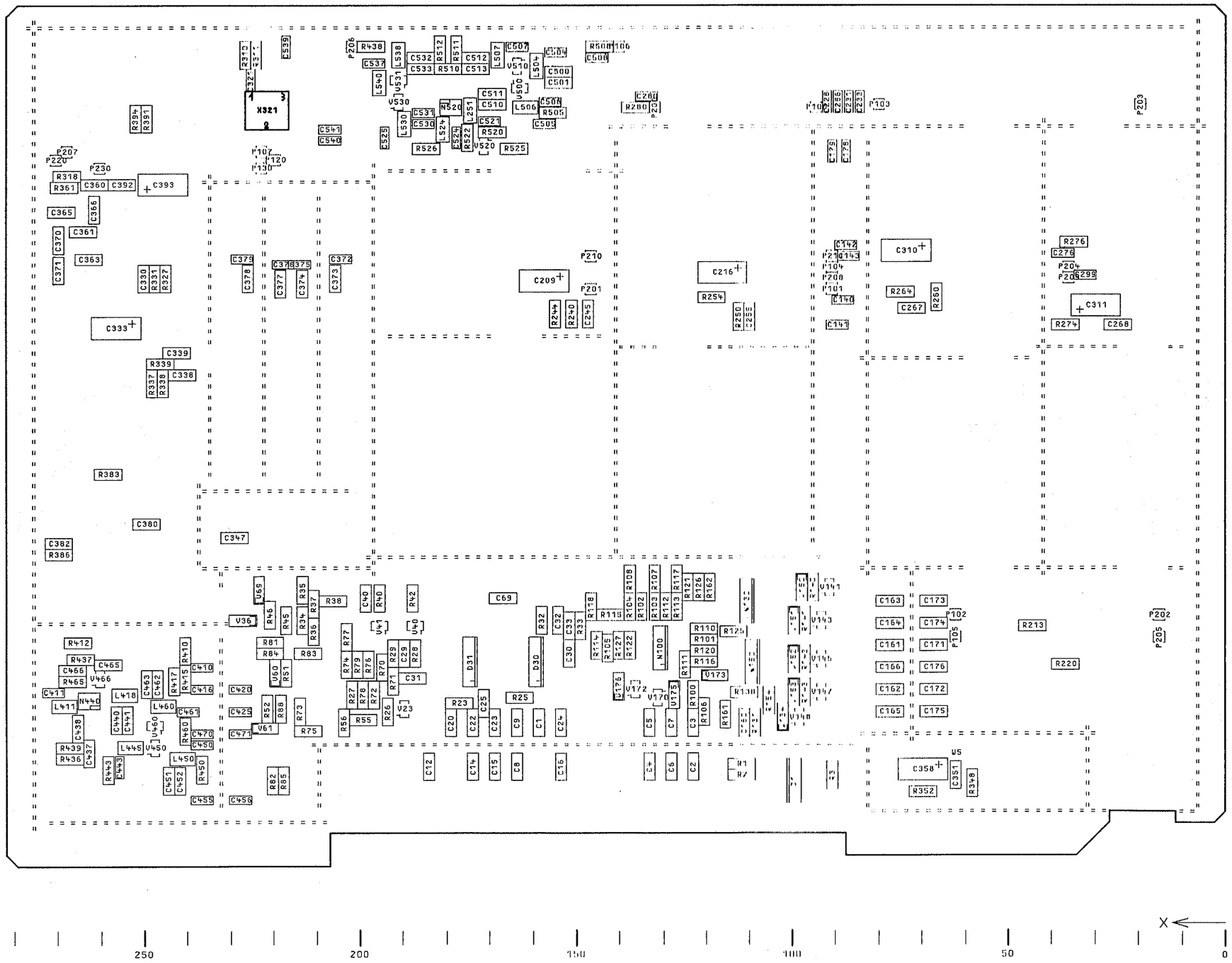
DARSTELLUNG SEITE B

VIEW ON SIDE B

0 1 2 3 4 5

VERKLEINERUNG

05/00	47304 (10)	04.92	RD	TAGE	TAG	NAME	BENENNUNG
				BEARB.		RD	UHF PRESELECTOR
				GEPR.		RD	Z
				NORM			
				PLOTT	07.04.92		
07/00 AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ	ZU GEHOERT ESVD-B2		ZEICHN.-NR. 1026.9518.01 EE
							REG.I.V. 1026.9501 — ERSTE Z. 1026.9501 — BLATT NR. 1+



DARSTELLUNG SEITE A
VIEW ON SIDE A

VERKLEINERUNG
0 1 2 3 4 5

05/00	47304 (10)	04.92	RB	1KEE	TAG	NAME	BENENNUNG	
				BEARB.		RB	UHF PRESELECTOR	Z
				GEPR.		RB		
				NORM				
				PLOTT	07.04.92			
02/00				ROHDE&SCHWARZ			ZEICHN.-NR. 1026.9518.01 EE	BLATT-NR. 2+
ÄND. IND.	ÄNDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERÄT ESVD-82			REG.I.V. 1026.9501 ERSTE Z. 1026.9501	V. BL.

DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, ÄNDERUNGEN KOENNEN NUR DURCH ÄNDERN DES DATENSATZES ERFOLGEN
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

UHF Synthesizer

1010.8198.02

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7 Testing and Repair of the Module UHF Synthesizer

7.1 Function Description

7.1.1 Function Inside the Instrument

The UHF synthesizer module provides the first LO signal for converting the receive frequency to the first intermediate frequency. In a phase-locked loop, the reference frequency (70 to 74.4 MHz) is multiplied by the factor M (19 to 32). Thus, a frequency of 1374.7 to 2354.7 MHz is available at the output of the UHF synthesizer. For this purpose, the module contains two control loops: an analog phase-locked loop with a sampling detector for synchronization to a multiple of the reference frequency (sampling loop) and a digital control loop for locking onto the selected spectral line (frequency control).

7.1.2 Detailed Function Description

(See circuit diagram 1010.8198.01S, sheets 1 to 5 and 1010.8446.01S)

7.1.2.1 Sampling Loop

The analog phase-locked loop consists of the following function blocks:

SRD multiplier, sampling detector, integrator, loop filter, buffer with level control, VCO and lock detector.

SRD Multiplier

The reference frequency (70 to 74.4 MHz) applied at X121 is amplified by the amplifier stages V71 and V74 and, using the step recovery diode (SRD) V81, transformed into a narrow pulse, which is used as switching signal for the sampling detector. The amplifier stage V75 provides the reference signal for the digital control loop.

Sampling Detector

Using the line transformer T2, the pulse is balanced and taken to the diode quad V106 to V109. Thus, the oscillator signal fed in at X55 is sampled. Therefore, the output of the detector provides a voltage reflecting the phase difference between oscillator signal and sampling signal.

Integrator

Integrator N150 uses the detector voltage to produce a control voltage, which synchronizes the oscillator to a multiple of the sampling frequency. In order to load the sampling detector only little, the FET preliminary stage V130 is connected ahead of the control amplifier N150. V140 provides an intermediate frequency signal for the unlock detector.

Loop Filter

The control voltage generated by N150 still contains remains of the sampling frequency, which are suppressed by the lowpass filter L154, C154, L155, C155, L156. Following the complementary emitter follower V160, V150, the control signal is available from a source with low internal impedance.

The RC network R165, R166, C166 determines the gain of the control loop, the gain being switched over with V165 in the highest synthesizer range (2244 to 2354.7 MHz) for adaptation to the VCO slope.

Lock Detector

The window comparator N170 is used to check whether the control voltage lies within the permissible range. In the case of an error, the LOCK line switches to low.

VCO 1374 to 2355 MHZ

The oscillator is implemented as negative-impedance type. With its negative impedance, the oscillator transistor V1 reduces damping of an oscillator circuit at the emitter. For tuning, the antiserially connected varicaps V2, V3 are used, which are connected in parallel with the strip line L. Using V460, the VCO is operated with an adjustable constant current.

Buffer, Level Control

Part of the VCO signal is decoupled via a line coupler and is taken back to the sampling detector via the five-stage decoupling amplifier V205, V210, V230, V240, V250. In order to obtain a constant phase detector slope, the output level of the decoupling amplifier is controlled. For this purpose, the level is detected using V260 and a control signal produced using N270. The PIN diode limiter V225 is used as the control element.

7.1.2.2 Frequency Control

Since the sampling detector is not frequency-sensitive, a digital control loop is connected in parallel with this PLL. This control loop is only cut in during lock-in and cut off again after synchronization of the PLL to the desired multiple of the reference frequency.

The frequency control loop consists of the following function blocks:

Divider 1:4, frequency control, current source, prescaler 1:4, lowpass filter, highpass filter and unlock detector.

Divider 1:4, frequency control, current source, prescaler 1:4

The frequency control loop mainly consists of the programmable PLL device N401. The latter contains several dividers, which can be programmed via a serial data bus, and a digital phase detector (Fig. 7-1). N401 receives the reference signal divided by 4 by D400 as well as the VCO signal divided by 4 by B180. N401 divides both signals by 64, the VCO signal is additionally divided by the multiplier factor M.

In the digital phase detector, the signals are compared with each other, and a switching signal is generated. Depending on the sign of the frequency difference, a current is fed into integrator N150 of the phase-locked loop until the oscillator has locked on the correct multiple of the reference frequency. With the aid of D410 and D415, a switching signal is additionally produced from the lock signal of the PLL device N401, so that the control current flowing into the integrator is reduced at low frequency differences by opening switch N420C. To this end, the reference frequency of the digital phase detector is suppressed using D410-A and D415-B. At the output of D415-B, a squarewave signal is thus obtained, whose frequency corresponds to the difference between the two input signals. Using the digital highpass filter D410-B, D415-A, the analog switch D420-C is closed from a frequency difference of approx. 3.5 kHz onwards.

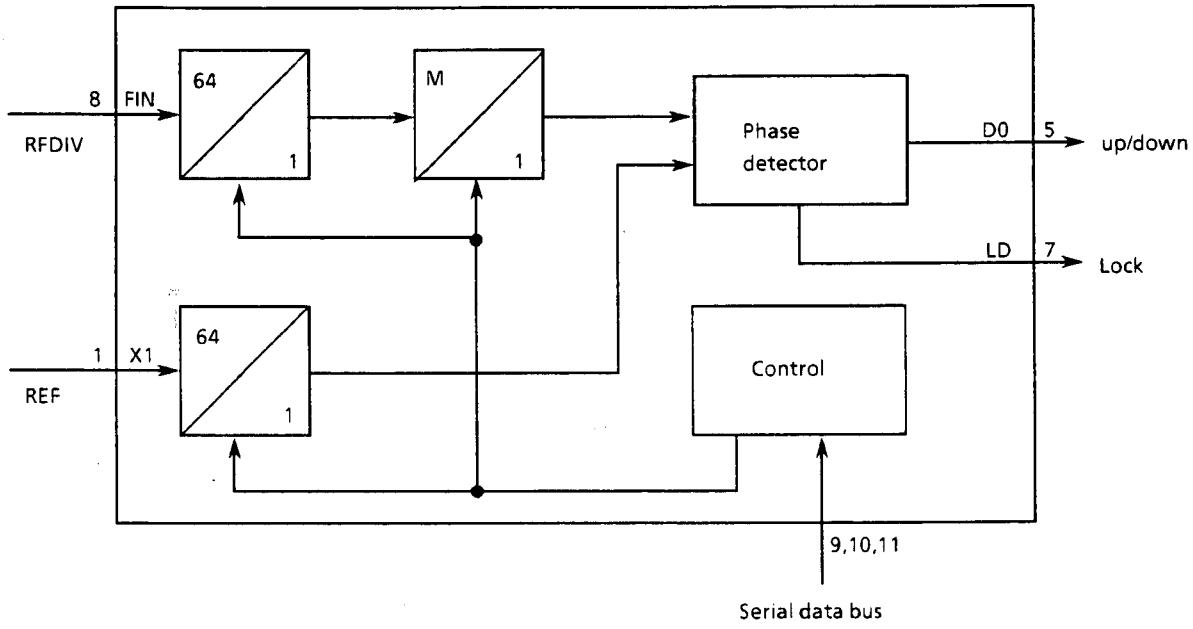


Fig. 7-1 Block diagram of N401

Low Pass Filter, High Pass Filter, Unlock Detector

If the phase-locked loop has not locked, the sampling detector provides an output signal containing an AC voltage component, whose frequency corresponds to the differential frequency referred to the nearest spectral line. The lowpass filter is used to limit this signal to half the reference frequency first, since an unlocked state of the phase-locked loop can be recognized by evaluation of this spectral component. The active highpass filter suppresses low-frequency signals in order not to activate the frequency control loop in the case of frequency deviations which lie within the lock-in range of the phase-locked loop. Besides, the higher-frequency components are amplified more, since the sensitivity of the sampling detector decreases with increasing differential frequency. D430 produces a switching signal, which is taken to the digital highpass filter D440-A, D445-A. If the differential frequency is too big, the digital control loop is cut in via monoflop D445-B (switch-off delay) and the LOCK line switched to low using V440. When the phase-locked loop has locked and the delay has expired, the frequency control loop is cut off until the frequency is changed again.

Output Amplifier

The oscillator signal is amplified by the integrated amplifier B175 and taken to the LO output X127. The oscillator signal is available at the output X125 with a level of approx. -13 dBm.

Board Control, Buffer

The board control changes the serial data into parallel data bytes, the serial data bus is connected through to N401. The last 8 bits contain the board address. If the content of D2-A complies with the permanently wired board address (23), the data in D4-A are connected to its outputs by the strobe pulse and stored, and the data in the PLL device N401 are transferred. The analog switch D6-A permits test points to be selected and connected to test output X12A.9. Buffer N2, N4 is used to decouple the test signals.

Supply Switch, Regulator -5V/ + 5V/ + 8V

The board can be switched off by Supply Switch. The supply voltages are cut off by reverse-biasing transistors V10, V11, V13 and switching off the reference voltages of the voltage regulators. With N1-A and V35, the voltage regulator produces a low-noise voltage of + 5 V from + 5 VA for the HCT components, and, with N1-B, V40 and N1-C, the supply voltages for the output amplifier N175. V45 and V46 make sure that the positive supply voltages is only cut in when the negative voltage is available in order to protect the GaAs FET amplifier.

7.2 Measuring Instruments and Auxiliary Equipment

Item	Type of instrument	Specifications	Appropriate R&S device	Order No.	Use
1	Digital voltmeter	DC 0 to 30 V	UDS 5	349.1510.02	7.4.2 7.4.6
2	Power supply	0 to 28 V	NTG 35	191.2019.02	7.4.3 7.4.4 7.4.6
3	Frequency counter	... 50 MHz Resolution 1 Hz			
4	Oscilloskope	100 MHz	BOL	374.2000.02	7.4.4 7.4.5
5	Spectrum analyzer	... 2,5 GHz	FSB		

7.3 Troubleshooting

Note: ***As a prerequisite for the automatically running selftest of this board, the rear panel, display board, CPU board and FRN synthesizer must function properly. In order to avoid unfounded error messages, automatic testing of the complete instrument is always aborted after exceeding of the tolerance has been detected for the first time. For further locating of faults with the aid of externally applied signals, the test functions in the menu Board Test (see section 6) can be manually called up.***

Due to the limited circuitry for the selftest, not all faults can be found in the automatic test. In this case, the troubleshooting chart (Fig. 7-2) also serves to locate the fault.

- Call up SELFTEST, menu Board Test (09 Selftest).
- Select the UHF synthesizer using the keys ↓ and ↑.
- Start the complete board test by selecting test function 0. The test stops with the first faulty test function, but can be continued by pressing the Enter key (see section 6).
- Enter the faulty test function and switch to the test mode by pressing the Enter key. If a fault is supposed to lie in the UHF Synthesizer, which cannot be detected by the selftest, continue troubleshooting using the chart in Fig. 7-2.
- The valid basic setting for the UHF synthizer and the basic setting for the respective test function (see Table 7-1) is automatically set.

  The measured selftest voltage is indicated on the LEVEL display. The permissible tolerance limits are read out on the DATA INPUT display.

Table 7-1 Test functions

Test functions	Description	Setting TP = Test point	Nominal value	Error message
0	Test 1 to 9 Module test	Test 1 to 9	Test 1 to 9	
1	Supply test 5 V	TP 5	2.4 to 2.6 V	ERR: Supply 5 V
2	Supply test 8 V	TP 4	1.3 to 3 V	ERR: Supply 8 V
3	Multiplier test	TP 0	> 0.5 V	ERR: Level X121
4	VCO test	TP 1	> 0.5 V	ERR: Level X127
5	Buffer test output level	TP 3	0.35 to 0.45 V	ERR: Loop Level
6	Control voltage	TP 6	< 1.6 V	ERR: Level Contr.
7	Tuning voltage test lower limit, f = 20 MHz	TP 2	>.,2 V	ERR: 1 st LO Loop
8	Tuning voltage test upper limit, f = 1000 MHz	TP 2	< 3.4 V	ERR: 1 st LO Loop
9	Lock Test	TP 7	< 1 V	ERR: 1 st LO Loop

Basic setitng: Frequency: 20 MHz

- Remove RF cover on the component side.
- Insert the board on the service kit.

For further troubleshooting use the troubleshooting chart (Fig. 7-2).
The serial interface is to be checked according to Table 7-2.

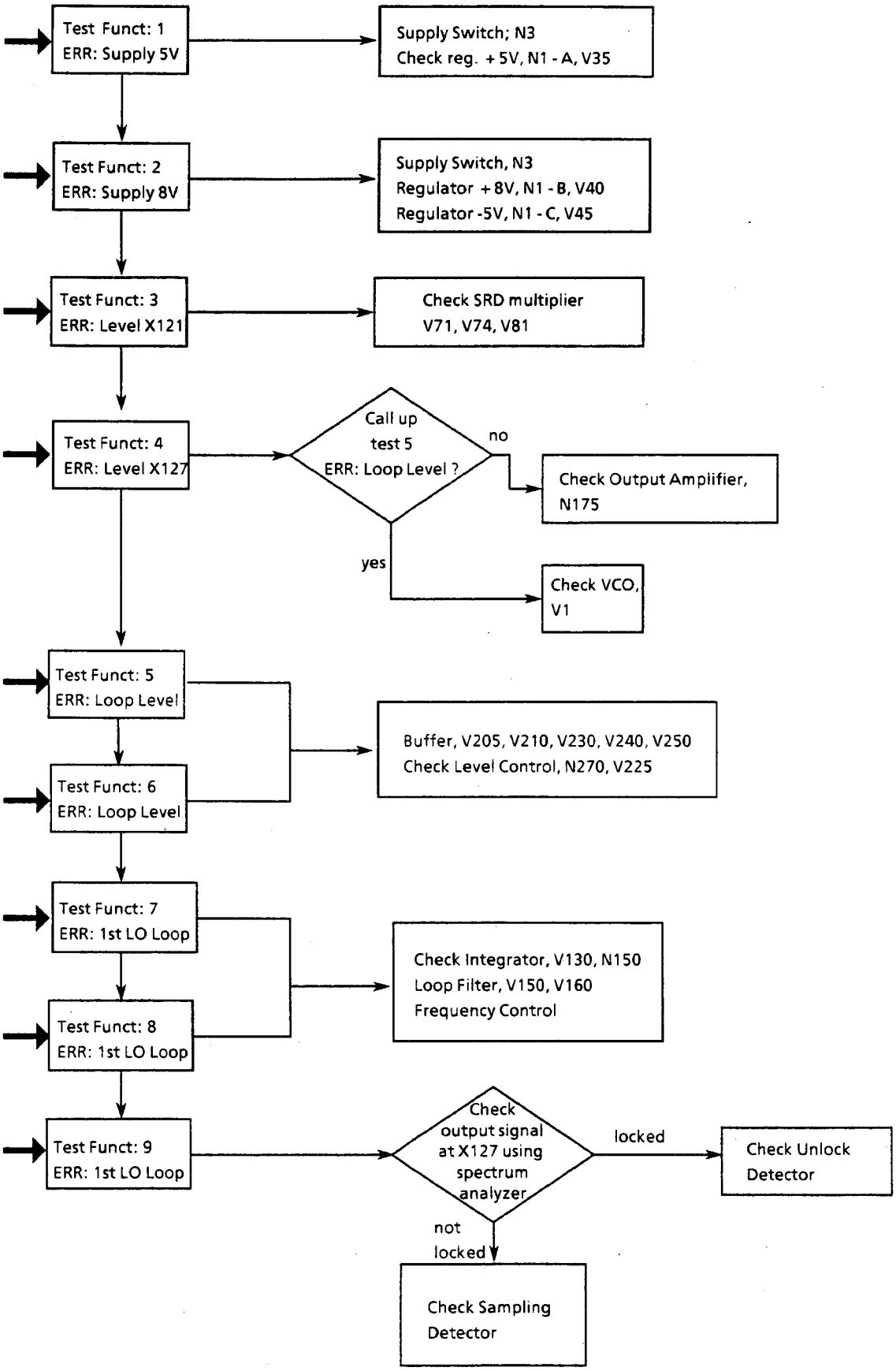
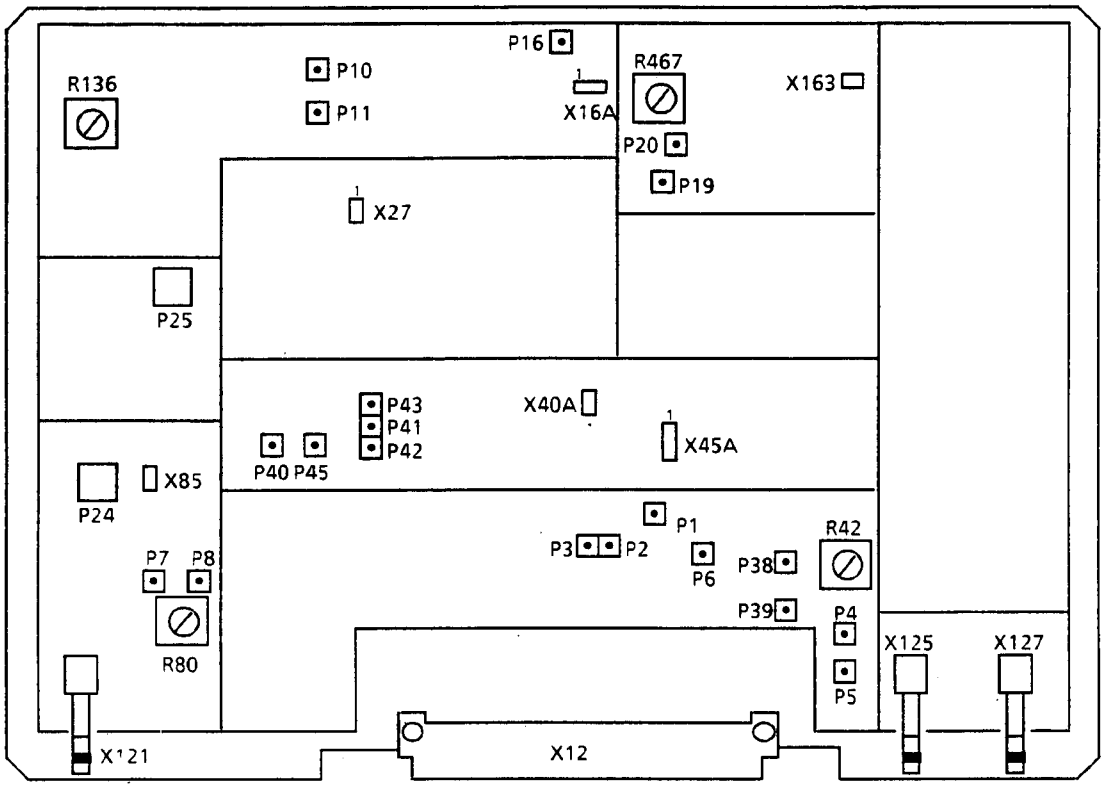


Fig. 7-2 Troubleshooting chart

7.4 Testing and Adjustment

Operate the board outside the instrument via the ESVS service kit.
Unscrew both RF covers.

7.4.1 Position of Jumpers, Test Points and Adjustment Devices



7.4.2 Supply Switch, Regulator -5 V/ + 5 V/ + 8 V

Voltage at P1: ..... 9.6 V ± 0.2 V
Voltage at P2: ..... -9.9 V ± 0.1 V
Voltage at P3: ..... 28 V ± 0.2 V

- Set voltage at P4 to 7.0 V ± 0.1 V using R42.
  Voltage at P5: ..... -4.9 V ± 0.1 V
  Voltage at P6: ..... 4.9 V ± 0.1 V

- Activate test 1.
  Selftest voltage: ..... 2.5 V ± 0.1 V

- Activate test 2.
  Selftest voltage: ..... 1.75 V ± 0.1 V

7.4.3 VCO 1374 to 2355 MHz, Lock Detector

a) Test setup

- Connect voltmeter to P19, P20.
- Remove jumper X16 and apply a tuning voltage of 1 V to X16.2
- Connect spectrum analyzer to P18.

b) Measurements and Adjustment

- Use R467 to set a voltage of 0.4 V ± 10 mV at P19, P20.
- Activate test 7 (tuning volt.).
  Selftest voltage: ..... 0.14 V ± 50 mV
- Tune VCO until tuning voltage 24 V is reached.
  Level at P18 in the range 1300 MHz to 2400 MHz: ..... -18 dBm ± 4 dB
  There must not be any spurious over the entire tuning range.
- If necessary, bend wire jumper L4 such that there are no spurious and the VCO starts to oscillate properly.

  Caution: The VCO must also oscillate with 0 V tuning voltage!

- Quit selftest menu.
- Increase tuning voltage to 26 V.
  Message on the DATA INPUT display: ..... 1st LO UHF unlock
- Set tuning voltage to 0 V.
  Message on display: ..... 1st LO UHF unlock

7.4.4 Output Amplifier

a) Test setup

- Connect analyzer to X127.
- Connect voltmeter to P38, P39.

b) Measurements and Adjustment

- Set VCO to 2350 MHz with tuning voltage.
- Use R42 to set output level at X127 to 16 dBm + 1 dB.
  Maximum permissible voltage at P38, P39: ..... < 230 mV
- Activate test 4.
  Selftest voltage: ..... > 0.5 V
- Tune VCO.
  Output level in the range 1300 MHz to 2400 MHz: ..... 16 dBm ± 2 dB

7.4.5 Buffer, Level Control

a) Test setup

- Remove R119, solder in R257.
- Connect analyzer to P25.

b) Measurements

- Tune VCO to 2350 MHz.
  Level at P25: ..... 4 dBm ± 1 dB
- Remove R257, solder in R119.
- Activate test 5.
- Tune VCO.
  Selftest voltage in the range 1300 MHz to 2400 MHz: ..... 0.4 V ± 50 mV
- Activate test 6.
  Selftest voltage: ..... < 1.6 V

7.4.6 SRD Multiplier

a) Test setup

- Remove C85, solder in C84.
- Connect analyzer to P24.

b) Measurements and Adjustment

- Use R80 to set voltage between P7, P8 to 0.8 V ± 10 mV.
  Pulse spectrum at P24 must be flat in the range up to 2400 MHz.
- Pulse level of 1300 to 2400 MHz: ..... -10 dBm ± 2 dB
  if necessary, adjust using R80.
- Activate test 3.
  Selftest voltage: ..... > 0.5 V
- Remove C84, solder in C85

7.4.7 Sampling Detector, Loop Filter

a) Test setup

- Connect oscilloscope probe to P10.
- Connect analyzer to X127.
- Remove jumper X40 and X45.

b) Presettings

Setting on receiver: ..... frequency 85.3 MHz

c) Measurements and Adjustment

- Tune VCO to 1368 MHz.
- Detune VCO by ± 1 MHz.
  Observe AC voltage at P10.
  Maximum value: ..... 700 mVpp ± 100 mV
- Set tuning voltage to 12 V.
- Connect digital voltmeter to P10, P11.
- Adjust offset to 0 V ± 10 mV using R136.

7.4.8 Frequency Control

a) Presettings

Setting on receiver: ..... frequency 85.3 MHz

b) Measurements

- Connect X45.2 with X45.3.

  Measure signal at P40.
  Readout on oscilloscope: ..... TTL, 18 MHz

  Measure signal at P41.
  Readout on oscilloscope: ..... 4.5 Vpp, 281.25 kHz

- Tune VCO to 1440 MHz ± 1 MHz.

  Measure signal at P42 (M = 20).
  Readout on oscilloscope: ..... 4.5 Vpp, 281 kHz ± 300 Hz

  Signal at P43: ..... HCT-High

- Tune VCO to 1400 MHz.

  Signal at P43: ..... HCT-Low
  Voltage at X40.1: ..... -9 V ± 1 V

- Tune VCO to 1480 MHz.

  Signal at P43: ..... HCT-Low
  Voltage at X40.1: ..... + 9 V ± 1 V

7.4.9 Unlock Detector

a) Presettings

Setting on receiver ..... frequency: 85.3 MHz

b) Measurements

- Tune VCO to 1440 MHz.
- Detune VCO by ± 1 MHz.
  Voltage at X45.1: ..... HCT-High
- Connect jumper X17 and X40.
  Voltage at X45.1: ..... HCT-Low
- Plug jumper X45 to X45.1-2.

7.5 Final Test

a) Test setup

- Fasten the cover with screws, connect analyzer to X127.
- Check output frequency and output level at the following frequencies:

Receive frequency	M	UHF Synthesizer X 127
20 MHz	19	1374.7 MHz
100 MHz	20	1454.7 MHz
150 MHz	21	1504.7 MHz
200 MHz	22	1554.7 MHz
300 MHz	23	1654.7 MHz
400 MHz	24	1754.7 MHz
450 MHz	25	1804.7 MHz
500 MHz	26	1854.7 MHz
600 MHz	27	1954.7 MHz
700 MHz	28	2054.7 MHz
750 MHz	29	2104.7 MHz
800 MHz	30	2154.7 MHz
850 MHz	31	2204.7 MHz
900 MHz	32	2254.7 MHz

- Output level: ..... 16 dBm ± 2 dB

Synthesizer ranges:

f_E / MHz	M	F_{LO} / MHz
20.000 to 51.2999	19	1374.700 to 1405.9999
51.300 to 125.2999	20	1406.000 to 1479.9999
125.300 to 199.2999	21	1480.000 to 1553.9999
199.300 to 273.2999	22	1554.000 to 1627.9999
273.300 to 347.2999	23	1628.000 to 1701.9999
347.00 to 421.2999	24	1702.000 to 1769.9999
421.300 to 495.2999	25	1770.000 to 1849.9999
495.300 to 569.2999	26	1850.000 to 1923.9999
569.300 to 643.2999	27	1924.000 to 1997.9999
643.300 to 717.2999	28	1998.000 to 2071.9999
717.300 to 791.2999	29	2072.000 to 2145.9999
791.300 to 865.2999	30	2146.000 to 2219.9999
865.300 to 889.2999	31	2220.000 to 2243.9999
889.300 to 1000.0000	32	2244.000 to 2354.7000

Table 7-2 Contents of data register D4

Function	Pin 4	Pin 5	Pin 6	Pin 14	Pin 13	Pin 12	Pin 11
Board on	1	X	X	X	X	X	X
New divider setting	X	1	X	X	X	X	X
Control bandwidth f_E > 889.3 MHz	X	X	1	X	X	X	X
Selftest off	X	X	X	1	X	X	X
Test point 0 (Test function 3)	X	X	X	0	0	0	0
Test point 1 (Test function 4)	X	X	X	0	0	0	1
Test point 2 (Test function 7 und 8)	X	X	X	0	0	1	0
Test point 3 (Test function 5)	X	X	X	0	0	1	1
Test point 4 (Test function 2)	X	X	X	0	1	0	0
Test point5 (Test function 1)	X	X	X	0	1	0	1
Test point 6 (Test function 6)	X	X	X	0	1	1	0
Test point 7 (Test function 9)	X	X	X	0	1	1	1

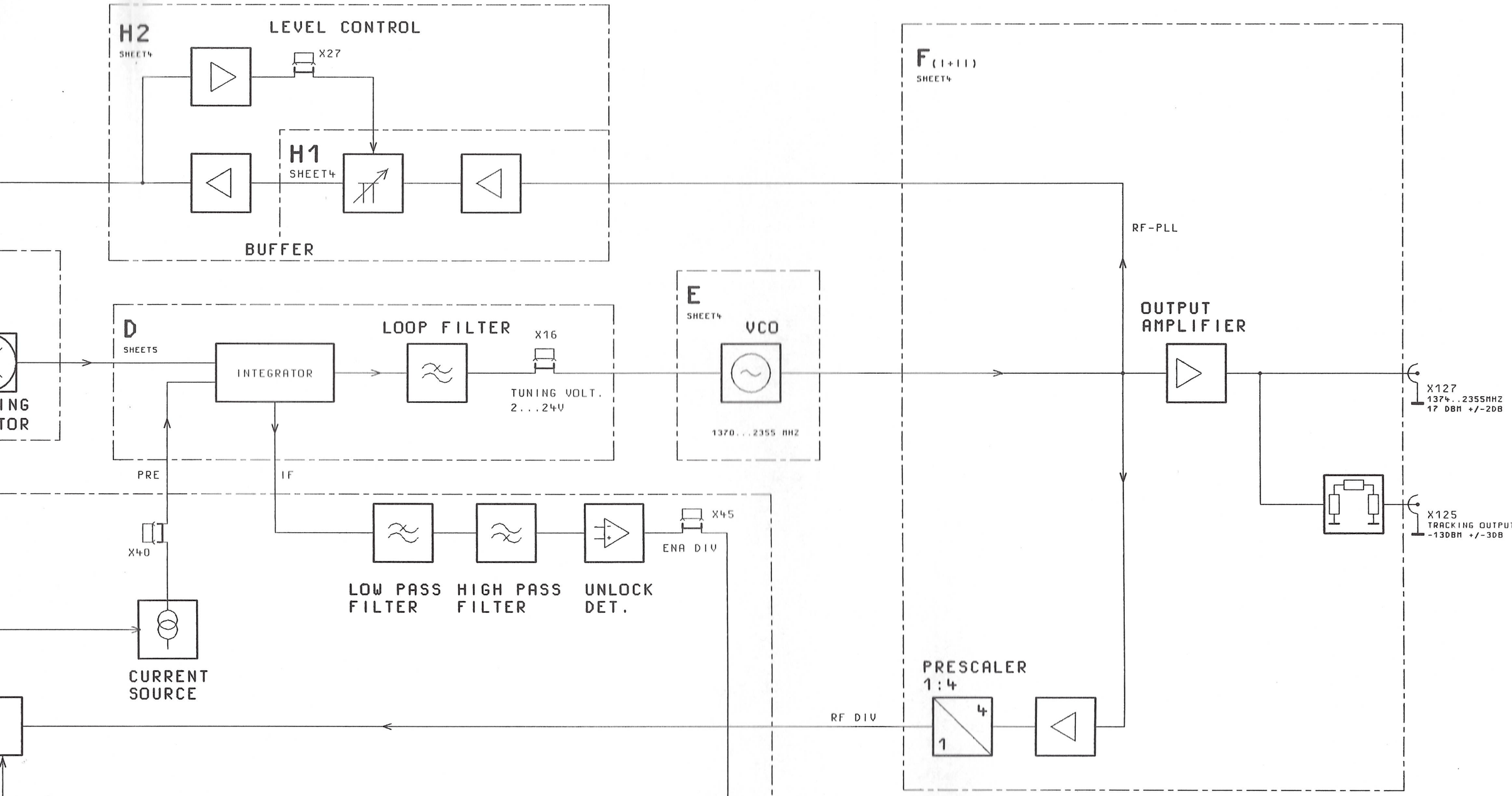
7.6 External Interfaces

Pin	Name	Input/ output	Origin/destination	Value range	Signal description
X 12.A 1	AGND	I			Analog ground
X 12.C 1	AGND	I			Analog ground
X 12.A 2	+ % VA	I		5.2 to 5.6 V	Supply
X 12.C 2	+ 5 VA	I		5.2 to 5.6 V	Supply
X 12.A 3	+ 12 V	I		10.8 to 15.5 V	Supply
X 12.C 3	+ 12 V	I		10.8 to 15.5 V	Supply
X 12.A 4	+ 10 V	I		9.98 to 10.02 V	Supply
X 12.C 4	+ 10 V	I		9.98 to 10.02 V	Supply
X 12.A 5	- 10 V	I		- 9.99 to 10.01 V	Supply
X 12.C 5	- 10 V	I		- 9.99 to 10.01 V	Supply
X 12.A 6	+ 28 V	I		28 V	Supply
X 12.C 6	+ 28 V	I		28 V	Supply
X 12.A 7	SCLK	I		HCT level	Clock
X 12.A 11	Lock	O		0 to 5.6 V	Lock
X 12.A 9	Test	O		0 to 5 V	Selftest
X 12.C 7	TDATA	I		HCT level	Data
X 12.C 8	STROBE	I		HCT level	Strobe
X 121	INPUT	I	FRN Synthesizer	70 to 74.4 MHz 2 to 4 dBm	Reference
X 125	TRACKING OUTPUT	O	UHF Tracking Generator	-16 to -10 dBm	LO signal for tracking generator
X 127	LO	O	VHF Preselector	1374.7 to 2354.7 MHz 14 to 18 dBm	1.LO

BEHALTEN WIR UNS ALLE RECHTE VOR

H2
SHEET4
LEVEL CONTROL
X27
H1
SHEET4
BUFFER
RF
B
SHEETS
SRD MULTIPLIER
X19...32
X121
INPUT
70...74MHZ
4DBM +/-2DB
C
SHEETS
SAMPLING
DETECTOR
D
SHEETS
LOOP FILTER
INTEGRATOR
X16
TUNING VOLT.
2...24V
E
SHEET4
VCO
1370...2355 MHZ
F
SHEET4
REF
PRE
IF
G
SHEET3
X40
X45
ENA DIV
LOW PASS
FILTER
HIGH PASS
FILTER
UNLOCK
DET.
CURRENT
SOURCE
P40
4
1
DIVIDER 1: 4
FREQUENCY
CONTROL
M- 19..32
RF DIV
PRE
1:4
1

11/00	47296(
10/00	47296(
REND. IND.	ÄNDERUNG



11/00	47296(12)	11.91	PF	1KEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	14.11.91	
10/00	47296(11)	11.91	PF			
REND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG: UHF SYNTHESIZER

ROHDE&SCHWARZ

ZU GERAET ESVS30

ZEICHN.-NR. 1010.8198.01S

BLATT-NR. 1 v. 9 BL.

REG.I.V. 1010.5001 ERSTE Z. 1010.5099

A (1)

X12A 9
TEST
R4 100R
C36 220P L

X12A 7
SCLK
R1 100R L
D1-A 74HCT14T-L
D1-B 74HCT14T-L
R5 100R
C1 220P L
C2 220P L

X12C 7
TDATA
R2 100R L
D1-C 74HCT14T-L
D1-D 74HCT14T-L
R6 100R
C3 220P L
C4 220P L

X12C 8
STROBE*
R3 100R L
D1-E 74HCT14T-L
D1-F 74HCT14T-L
R7 100R
C5 220P L
C6 220P L

X12A 11
LOCK
L9 1UH
LOCK
SHEET3 B/1
C11 10N L
C12 10N L
R23 1M L
+5V

X12A 1
AGND
X12C 1

X12A 2
+5V
X12C 2
L2 1U2H
L3 1U2H
D1-G 74HCT14T-L
C13 10N L
C18 560P L
C23 10N L
C28 10U
+5V

X12A 3
+12V
X12C 3
L1 1U2H
+12V
C14 10N L
C19 560P L
C24 10N L
C29 10U

X12A 4
+10V
X12C 4
L4 1U2H
+10V
C15 10N L
C20 560P L
C25 10N L
C30 10U

X12A 5
-10V
X12C 5
L5 4U7H
-10V
C16 10N L
C21 560P L
C26 10N L
C31 10U

X12A 6
+28VA
X12C 6
L6 4U7H
C17 10N L
C22 560P L
C27 10N L
C32 10U

BOARD CONTROL

+5V
R8 1K L
ADRESSDECODER
D2-A 74HCT4094T-L
ADR 17H
D3-A 74HCT238T-L

+5V
R9 1K L
DATA LATCHES
D4-A 74HCT4094T-L

D10-I

SELFTEST
D6-A 74HC4051T-L

D2-B 74HCT4094T-L
D3-B 74HCT238T-L
D4-B 74HCT4094T-L
D6-B 74HC4051T-L
+5V
C7 10N L
C8 10N L
C9 10N L
C10 10N L

SUPPLY SWITCH

P1
+10V ON/OFF
+10VA
V10 BCP69-16-B
R10 2K21 L
R15 4K75 L

P2
-10V ON/OFF
-10VA
V11 BCP68-16-BM
R11 4K75 L
R17 4K75 L

P3
+28V ON/OFF
+28VA
V13 BC860B-B
R13 4K75 L
R19 4K75 L

R12 2K21 L
R34 10K L
V12 BCB60B-I
I = ON
H = OFF

N3-B LM339D-L
L = ON
H = OFF
R20 22K1 L
R21 22K1 L
N3-A
L = OFF
H = ON

N3-C LM339D-L
L = ON
H = OFF

N3-D LM339D-L

H = POWER ON
L = POWER OFF

11/00
10/00
ALSO IND.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8198.01 S

P1-3

BOARD CONTROL

ADRESSDECODER

+5V
R8 1K L
D2-A 74HCT4094T-L
ADR 17H
D3-A 74HCT238T-L

DATA LATCHES

+5V
R9 1K L
D4-A 74HCT4094T-L

SELFTEST
D6-A 74HC4051T-L

D2-B 74HCT4094T-L
D3-B 74HCT238T-L
D4-B 74HCT4094T-L
D6-B 74HC4051T-L
+5V
C7 10N L
C8 10N L
C9 10N L
C10 10N L

D10-A PC74HC4050T-L
D10-B
D10-C
D10-D
D10-E
D10-F
D10-G
R50 100R
R51 100R
R52 100R
R53 100R
R68 100R
C50 220P L
C51 220P L
C52 220P L
C53 220P L
C68 220P L
C54 220P L
C55 220P L
C56 220P L
C57 220P L
C69 220P L
R54 10K L
R67 22K1 L
R60 1K L
C60 10N L
+5VA
V50 BC860B-L

DATA SHEET4 A/3
STROBE1 SHEET4 A/3
CLOCK1 SHEET4 A/3
D1 SHEET5 B/4
LBW-G SHEET7 C/1
SRD SHEET3 B/8
LO SHEET6 C/1
TUNING-G SHEET7 D/1
BUFFER-G SHEET7 C/11

BUFFER

N2-A LM224D-L
R26 10K L
R25 10K L
N2-B
R27 10K L
R29 10K L
N2-C
R28 10K L
N2-D
R30 10K L
N4-A LM224D-L
R61 30K1 L
+8VA
R62 10K L
N4-B
R63 10K L
R64 10K L
N4-C
R95 100R L
C95 470P L
LEVEL-G SHEET7 B/12
N4-D
R65 10K L
TP7 SHEET3 C/1
D2 SHEET3 D/1

SRD
LO
TUNING
BUFFER

SUPPLY SWITCH

+10V
-10V
+28V
P1 +10V ON/OFF
P2 -10V ON/OFF
P3 +28V ON/OFF
V10 BCP69-16-B
V11 BCP68-16-BM
V12 BC860B-L
V13 BC860B-B
R10 2K21 L
R11 4K75 L
R13 4K75 L
R15 4K75 L
R17 4K75 L
R19 47K5 L
R12 2K21 L
R34 10K L
N3-A
N3-B LM339D-L
N3-C LM339D-L
N3-D LM339D-L
R20 22K1 L
R21 22K1 L
L - ON
H - OFF
H - POWER ON
L - POWER OFF

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

11/00	4729G(12)	11.91	PF	1KEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	14.11.91	
10/00	4729G(11)	11.91	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG: UHF SYNTHESIZER

ROHDE&SCHWARZ
ZU GEHOERT FSV30

ZEICHN.-NR. 1010.8198.01S
REG.I.V. 1010.5001
BLATT NR 2

4 5 6 7 8 9 10 11 12

P38,P39 R42 P4-P6

REGULATOR -5V/+5V/+8V

A (2)

R31 10K B — P38 — +12V

P39 — R39 2R21 B

N1-D LM224D-L (13, 12, 14) — R108 10K B

R32 200K B — R33 10K B — R104 10K B

V38 BAS32-L — V39 BAS32-L

R56 2K21 L — V41 BD140 — 5...10V

V40 BC850-L — R66 100R L

R40 2K74 L — N1-B LM224D-L (6, 5, 7) — R41 1K L

R42 10K LO LEVEL — R43 10K L

C42 10U 25V TA B

V45 BCP69-16-B — R44 4K75 L — P4 — +8VA

R45 1K L — V46 10V0 L — P5 — -5VA

R49 10K L — P6 — +5VA

V47 BAS32-L

-10VA — R46 7K5 L — R47 10K L — C47 10U 25V

N1-C LM224D-L (9, 10, 8) — R48 2K74 L — -5V

+10V — R35 10K L — R37 2K74 L — R36 10K L — C35 1U 25V TA L

+10V — +5V — N1-A LM224D-L (2, 4, 3, 11, 1) — R38 47R5 L — V35 BCP68-16-L — -10V

D2 — SHEET2 D/12

L - OFF

H - ON

LOCK TEST

+5VA — R103 10K L

V100 BC860B-B — R102 10K L — R101 4K75 L — R100 4K75 B — +5VA

N100-B — N100-C — N100-D — R104 10K L — R105 10K L — R106 100K L — R107 1K L

+10VA

N100-A — N100-E LM339D-B

TP7 — SHEET2 C/12

LOCK — SHEET2 D/4

R93 100R L — C93 470P — LOCK-G — SHEET5 C/8

SRD — SHEET2 E/12

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8198.01 S

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
13/00	47296(32)	04.92	RB
12/00	47296(21)	03.92	RB

1KEE	TAG	NAME
BEARB.		PF
GEPR.		PF
NORM		
PLOTT	23.04.92	

BENENNUNG: UHF SYNTHESIZER

ROHDE&SCHWARZ — ZU GERAET ESVS30

ZEICHN.-NR. 1010.8198.01S — MAPP NR. 3 — V. DV NR.

REG.-V. 1010.5001 — ERSTE Z. 1010.6044

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

P45 P40 - P42 P43

G (1)

DIVIDER 1:4

+5VG

R401 475R L

R402 475R L

D400-A 74AC74-L

D400-B 74AC74-L

R400 51R1 L

REF 70...74MHZ

SHEET8 B/4

ENADIV

SHEET5 C/8
SHEET6 C/1

C403 470P L

C402 10N L

CURRENT SOURCE

+10VG

D405-B 74HC00T-L

D405-C 74HC00T-L

D420-A DG411-L

H - UP

L-DOWN

D405-D 74HC00T-L

D420-B DG411-L

L-UP

R405 475R L

C404 100P L

V405 2V7 L

R406 0R L

-10VG

FREQUENCY CONTROL

+5VG

P43

L-FAST

R415 475R L

D415-B 74HC74T-L

R416 475R L

D415-A 74HC74T-L

D450-A 74HC00T-L

ENAPRE*

SHEET5 B/8

R404 1M L

P40

D405-A 74HC00T-L

+5VG

C401 100N L

N401 MB 1501 PF

D410-A 74HC123T-L

D410-B 74HC123T-L

R411 1K L

R412 16K2 L

C412 150P L

R413 1K L

R414 68K1 L

C414 10N L

D420-D DG411-L

R460 1K L

D440-B 74HC74T-L

R461 1K L

D430-C 74HC02T-L

R462 1K L

D430-D 74HC02T-L

+5VA L450 40?H +5VG

C480 470P L

C450 10N L

RFDIV 338...588MHZ W1A 1

SHEET6 B/12

R408 100K L

P45

P41 P42

-10VA L451 40?H -10VG

C481 470P L

C451 10N L

+10VA L452 1U2H +10VG

C482 470P L

C452 10N L

+28VA L453 40?H +28VG

C483 470P L

C453 10N L

CLOCK1 DATA STROBE1

SHEET2 E-F/12

+5VG

R403 2K21 L

D400-C 74AC74-L

D405-E 74HC00T-L

D410-C 74HC123T-L

D415-C 74HC74T-L

D430-E 74HC02T-L

D440-C 74HC74T-L

D445-C 74HC123T-L

D450-I 74HC00T-L

C400 10N L

C405 10N L

C410 10N L

C415 10N L

C430 10N L

11/00
10/00
AI NO
IND.

ZEICHN.-NR. 1010.8198.01S

P43

X40

1:4

CURRENT SOURCE

+10VG

D405-B 74HC00T-L

D405-C 74HC00T-L

D420-A DG411-L

H - UP

L-DOWN

D405-D 74HC00T-L

D420-B DG411-L

R405 475R L

C404 100P L

L-UP

V405 2V7 L

R406 0R L

-10VG

R419 47K5 L

R421 5K62 L

X40B

D420-C DG411-L

PRE SHEET9 F/4

+5VG

R415 475R L

D415-B 74HC74T-L

R416 475R L

D415-A 74HC74T-L

P43

L-FAST

D405-A 74HC00T-L

D450-A 74HC00T-L

ENAPRE* SHEETS 8/8

D410-B 74HC123T-L

D410-A 74HC123T-L

R411 1K L

R412 16K2 L

C412 150P L

R413 1K L

R414 68K1 L

C414 10N L

D420-D DG411-L

R460 1K L

D440-B 74HC74T-L

R461 1K L

D430-C 74HC02T-L

D430-D 74HC02T-L

R462 1K L

+5VG

+10VG

R420 2R21 L

C420 10N L

C421 10N L

D420-E DG411-L

C422 10N L

-10VG

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

D405-E 74HC00T-L

D410-C 74HC123T-L

D415-C 74HC74T-L

D430-E 74HC02T-L

D440-C 74HC74T-L

D445-C 74HC123T-L

D450-E 74HC00T-L

C410 10N L

C415 10N L

C430 10N L

C440 10N L

C445 10N L

C450 10N L

11/00	47296(12)	11.91	PF	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	UHF SYNTHESIZER
				GEPR.		PF	
				NORM			
				PLOTT	14.11.91		
10/00	47296(11)	11.91	PF	R&S ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8198.01S
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVS30			REG.I.V. 1010.5001 ERSTE Z. 1010.5001

BLATT NR. 4

X45

G (2)

LOW PASS FILTER

IF
SHEET9 D/4

R430 22R1 L
L430 100NH
L431 270NH
L432 309H
C429 270P L
C431 120P L
R432 475R L

HIGH PASS FILTER

+5VG
V430 2N2369A
C432 100P L
C433 100P L
R433 10K L
R431 10K L
C434 10N L
R434 5K62 L
-10VG
C435 150P L
R435 475R L
R436 22K1 L
+5VG
C437 10N L
R437 274R L
R438 475R L
V435 2N2369A

UNLOCK DETECTOR

R439 9K09 L
D430-B 74HC02T-L
D430-A 74HC02T-L
R429 3K01 L
R449 562R L
+5VG
R440 475R L
+5VG
D440-A 74HC74T-L
D445-A 74HC123T-L
+5VG
R441 1K L
R442 15K L
C442 330P L
R445 1K L
C446 4N7 L
D450-B 74HC00T-L
+5VG
R446 1K L
R447 110K L
C447 100N L
D445-B 74HC123T-L
D450-C 74HC00T-L
STROBE1
SHEET2 F/12
D1
SHEET2 E/16
V440 BC850B-L
R443 4K75 L
+5VG
X45A X45B X45C
R448 4K75 L
D450-D 74HC00T-L
LOCK-G
SHEET3 C/8
ENADIV
SHEET4 E/1
ENAPRE*
SHEET4 C/6

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8198.01S

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
11/00	47296(12)	11.91	PF
10/00	47296(11)	11.91	PF

1KEE	TAG	NAME
BEARB.		PF
GEPR.		PF
NORM		
PLOTT	14.11.91	

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
UHF SYNTHESIZER

ZEICHN.-NR. 1010.8198.01S
BLATT NR 5
REG.I.V. 1010.5001

P19
P20

R467
VCO BIAS

P18

E

F1

A121

VCO

TUNING-VOLT.
SHEET5 B/13

L160
100NH

C160
1N L

C163
100P L

X160

X163

X162

X165

C164 1U 25V TA L

P19 P20

L161
100NH

+10VD

R469
10R L

C165
100P L

C162
100P L

C167
100P L

C168
100P L

R465
2K74 L

VCO BIAS

* R468
1K L

R467
2K

V460
BC850B-L

R466
1K L

R464
33R2 L

OUTPUT AMPLIFIER

A170

R176
100R B

R177
100R B

P18 1

+8VF

C177
1N B

C179
470P L

C175
56P B

C176
56P B

R179
200R B

L179

N175
UPG101B

R171
432R B

R172
100R B

R173
110R B

C178
1N B

-5VF

* C181
2P7 B

C183
6P8P B

R183
1K B

R182
1M B

C182
47P B

PRESCALER 1:4

R175
0R B

R190
4K75

C185
1N L

V191
BC850B-B

R191
4K75 B

C190
1N B

R189
301R B

R187
16K2 B

R188
16K2 B

C191
1N B

C188
10P B

V188
0142085

C192
1N B

R196
100R

SHEET2 E/12
LO

C194
470P

C196
100P

C200
2P7 L

RF-PLL
SHEET7 D/1

L210
1UH

ENADIV
SHEET4 E/1

C209
470P L

C210
470P L

L197
4U7H

-5VA

C262
470P

C197
10N L

C237
2P7 L

-5VF

L198
4U7H

+5VA

C258
470P

C198
10N L

C238
2P7 L

+5VF

L199
1U2H

+8VA

C259
470P

C199
10N L

C239
2P7 L

+8VF

* NOT FITTED

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR VAR.02

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8198.01S

13/08

12/08
ALSO IN0

P18

F1

OUTPUT AMPLIFIER

+8VF

C177 1N B

C179 470P L

C175 56P B

C176 56P B

R179 200R B

L179

N175 UPG101B

A170

1

3

2

4

R176 100R B

R177 100R B

P18 1

R171 432R B

R172 100R B

R173 110R B

C178 1N B

-5VF

* C181 2P7 B

C183 6P8P B

C184 1P B

R183 1K B

R182 1M B

C182 47P B

3

V184 HSMS2810-B

2

R184 221R B

F 2

X127 1

LO 1374...2355MHZ 17DBM

R165 1K B

X125 1

TRACKING OUTPUT

R180 100R B

R181 110R B

PRESCALER 1:4

R193 OR

+5VF

C186 1N L

C193 100U 35V

V191 BC850B-B

R190 4K75

R191 4K75 B

V192 BC860B-B

C185 1N L

C190 1N B

R175 OR B

R189 301R B

U180 UPB585G

R187 16K2 B

R188 16K2 B

C195 1N B

W1B 1

RFDIV SHEET4 C/1

C191 1N B

C188 10P B

V188 BF42085

C192 1N B

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

13/00	4229(32)	04.92	RB	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	UHF SYNTHESIZER
				GEPR.		PF	
				NORM			
				PLOTT	23.04.92		
12/00	4229(21)	03.92	RD	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8198.01S
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ZU GERAET	ESVS30		BLATT NR 6
				REG.I.V.	1010.5001		ERSTE Z. 1010.5001

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

H 1

H 2

BUFFER

+10VH

L201 100NH

L205 100NH

L220 100NH

L230 100NH

C201 1N L

C211 1N L

C227 1N L

C247 1N B

R201 51R1 L

C202 1N L

R203 475R B

R211 475R B

R227 432R B

R245 221R B

LOCK-G
SHEET3 C/8

R280 100R

LOCK-H
SHEET9 D/8

C286 470P L

C276 100P L

TUNING-G
SHEET2 D/16

R281 100R

TUNING-H
SHEET9 C/8

C287 470P L

C277 100P L

RF-PLL
SHEET6 C/1

C204 6P8 B MINI

R208 16K2 B

R204 16K2 B

R205 27R4 B

R206 35R7 B

R207 27R4 B

C206 10P B MINI

C207 1P B MINI

V205 AT42085

R212 10K B

R213 10K B

C222 10P B MINI

V225 BAR14-1 B

R225 432R B

R223 432R B

C223 100N B

V210 AT42085

C225 1P B MINI

R226 7K5 B

R228 7K5 B

C230 10P B MINI

V230 AT42085

R241 180R-IND.ARM

R240 10K B

C241 1N B

V240 AT420H

R242 33R2 B

R243 33R2 B

C242 1P B MINI

LBW-G
SHEET2 E/12

R279 100R

LBW-H SHEET9 E/8

C289 470P L

C279 470P L

+28VG

L280 4U7H

+28VH

C290 470P L

C280 10N L

+10VG

L281 1U2H

+10VH

C291 470P L

C281 10N L

-10VG

L282 4U7H

-10VH

C292 470P L

C282 10N L

LEVEL CONTROL

+10VH

R266 475K B

V265 BSMS2810-B

C260 1P B

R261 1K B

C261 15P M

V260 BSMS2810 B

R260 100R B

-10VH

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
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* NOT FITTED

X27

H 2

C211 1N L
L205 100NH
L220 100NH
R211 475R B
R212 10K B
R213 10K B
C222 10P B MINI
V225 BAR14-1 B
R207 27R4 B
R206 35R7 B
C207 1P B MINI
V210 AT42085
R223 432R B
C223 100N B
R225 432R B

C227 1N L
L230 100NH
R227 432R B
R226 7K5 B
R228 7K5 B
C230 10P B MINI
C225 1P B MINI
V230 AT42085

C247 1N B
L245 100NH
R245 221R B
R241 160R-IND.ARM
R240 10K B
C241 1N B
C245 56P B
V240 AT42085
R242 33R2 B
R243 33R2 B
C242 1P B MINI
C243 1P B MINI

C248 1N B
R255 357R B
R256 357R B
R251 160R-IND.ARM
R250 10K B
C250 1N B
C255 100P B
V250 AT42085
R252 24R3 B
R253 24R3 B
C252 1P5 B MINI
C253 1P5 B MINI

W2A 1
RF
SHEET6 B/9

LEVEL CONTROL

+10VH
R266 475K B
C263 100P B
V265 HSMS2810-B
R272 100K B
R271 475R B
C274 220N B
+10VH
C270 100N L
R268 47K5 B
N270 LF156J
C265 100P B
R269 56K2 B
X27A
X27B
+10VH
C271 100N L
C260 1P B
R261 1K B
V260 HSMS2810-B
C261 15P B
C264 100P B
R270 1K21 B
-10VH
V28 BAS32-B
R267 221K B
-10VH
R275 221R B
R276 30K1 B
R277 10K B

R278 100R
C278 100P
C288 470P L
BUFFER-G
SHEET2 D/12

R273 100R
C273 100P
C283 470P L
LEVEL-G
SHEET2 C/12

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11/00	47296(12)	11.91	PF	1KEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	14.11.91	
10/00	47296(11)	11.91	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
UHF SYNTHESIZER

ZEICHN.-NR.
1010.8198.01S

REG.I.V. 1010.5001

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8198.01S

R80 P7 P8
SRD BAIS

P24

B SRD MULTIPLIER

+10VB → P7

R83 1K L

P8

R80 20K

SRD BIAS

C80 100N L

R77 332R B

+5VB

R73 150R L

R71 5K11 L

C73 47P L

V73 5082-2810

T70

C71 1N L

X121 1

INPUT
70...74 MHZ
4DBM

R70 75R L

V71 BFR92A-L

R72 5K62 L

R74 332R B

L74 1U2H

C74 1N B

V74 BFQ34-T

R75 162R B

R76 4R75 B

L80 10NH

C77 12P B

V81 HP-0840

C85 33P B

X84 X85 X87 X86

T2

C84 33P B
ONLY FITTED
FOR ADJUSTMENT

P24 1

C81 1P B

R86 100K B

R85 47K5 B

R84 182K B

C83 100P B

V82 HSMS2810-B

R87 110R B

+5VB

R81 150R L

R79 5K11 L

C79 1N L

V75 BFR92A-L

R78 5K62 L

+10VB

-10VB

+5VB

C89 10N L

C86 10N L

C87 10N L

C88 10N L

C96 10U 25V TA L

C97 10U 25V TA L

C98 10U 25V TA L

R89 100R

L86 1U2H

L87 22UH

L88 22UH

C72 470P L

C75 470P L

C76 470P L

C78 470P L

REF
SHEET4 E/1

SRD
SHEET2 E/12

+10VA

-10VA

+5VA

C

A122
SAMPLER

* C107 10N B

* R112 7K5 B

-10VB

C109 8P B

R116 100R B

C110 8P B

* R120 7K5 B

+10VB

* C111 10N B

R115,R116,R119
C109,C110
INCL. IN ED 1010.8469.02 (A122

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11/00
10/00
AEND. IND.

R80 P7 P8
SRD BAIS

P24

P25

+10VB

P7

R83
1K L

P8

R80
20K

SRD BIAS

C80
100N L

R77
332R B

R74
332R B

L74
1U2H

C74
1N B

V74
BFQ34-T

L80
10NH

R75
162R B

R76
4R75 B

C77
12P B

V81
HP-0840

C65
33P B

X84
X85
X87
X86

T2

C84
33P B
ONLY FITTED
FOR ADJUSTMENT

P24 1

C81
1P B

R86
100K B

R85
47K5 B

R84
182K B

C83
100P B

V82
HSMS2810-B

R87
110R B

C

SAMPLING DETECTOR

A122
SAMPLER

4X5082-2810

C107
10N B

C108
1U 25V TA B

R112
7K5 B

R113
8K25 B

+10VB

R114
1K

R115 47R5 B

C109
8P B

R116
100R B

C110
8P B

R117 100R B

R118 100R B

V106
V107
V108
V109

R119 47R5 B

C113
3P B MINI

C114
1P B MINI

DET. VOLT.
SHEET9 D/1

R123
301R B

R121
1K

R119
16R2 B

R129
301R B

R120
7K5 B

R122
8K25 B

+10VB

C111
10N B

C112
10U 25V TA B

R257
16R2 B

P25 1

ONLY FITTED
FOR ADJUSTMENT

R115,R116,R119
C109,C110
INCL. IN ID 1010.8969.02 (A122)

W28 1

R1
SHEET17 D/11

+10VB
C89
10N L
R89
100R
C72
470P L
SRD
SHEET2 E/12

+10VB
C86
10N L
C96
10U 25V TA L
L86
1U2H
C75
470P L
+10VA

-10VB
C87
10N L
C97
10U 25V TA L
L87
22UH
C76
470P L
-10VA

+5VB
C88
10N L
C98
10U 25V TA L
L88
22UH
C78
470P L
+5VA

EF
4 E/1

STROMLAUF GILT FUER VAR.02

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* NOT FITTED

11/00	4296(17)	11.91	PF	TKEE	TAG	NAME
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				GEPR.		PF
				NORM		
				PLOTT	14.11.91	
10/00	4296(11)	11.91	PF			
AEND. IND.	AENDERUNG AUFGRUND MUSTERUNG	DATUM	NAME			

BENENNUNG: UHF SYNTHESIZER

ROHDE&SCHWARZ

ZEICHN.-NR. 1010.8198.01S

BLATT NR 6

ZU GERAET ESVS30

REG.I.V. 1010.5001

ERSTE Z. 1010.5004

R136 OFFSET

P10,P11

P16

PRE
SHEET3 E/10

D

INTEGRATOR

+10VD

R132 475R L
R138 100K L
C138 1U
R137 3K32 L
OFFSET
R136 10K
C136 100N L
V130-A U431
V130-B U431
DET. VOLT.
SHEET8 D/11
R130 475R B
R131 100K B
R133 2K L
R134 47K5 L
R135 3K32 L
C133 1U
-10VD
R145 100R L
P10
R148 1K L
R149 1K L
R140 221R L
V140 2N2369A
P11
C141 3N3 L
C142 3N3 L
IF SHEET5 E/1
R141 681R L
C143 1U
V141 BZV55 C5V1 L
-10VD
R139 2K L
R152 332R L
C152 8N2 L
R151 475K L
+28VD
C150 100N L
N150 SE5534AFE
C149 1U
C151 100N L
R144 2K74 L

LOOP FILTER

+28VD
R164 10R L
C161 10U 35V MINI
R161 22R1 L
V160 BC850B-L
R154 47R5 L
L154 560NH
L155 820NH
L156 560NH
C154 82P L
C155 82P L
R160 100R L
R156 47R5 L
C156 56P L
R162 1K L
R158 10R L
V150 BC860B-L
R169 22K1 L
R167 22R1 L
R124 10R L
R125 56R2 L
R165 301R L
R166 33R2 L
C166 47U 35V TA
X16A
X16B
R170 130K L
-10VD
R127 10K L
V170 BC850B-L
P16
V165 J111
2...24V
V164 2V7 L
V166 2V7 L
R128 100R
C128 100P L
C118 470P L
LBW-H
SHEET7 C/2
TUNING-VOLT.
SHEET6 F/1
LOCK-H
R475 100R
C475 100P L
C500 470P L
SHEET7 E/2
TUNING-H
R476 100R
C476 100P L
C501 470P L
SHEET7 D/2
+28VH
L477 47UH
C477 10N L
C502 470P L
+10VH
L478 1U2H
C478 10N L
C503 470P L
-10VH
L479 47UH
C479 10N L
C504 470P L

LOCK DETECTOR

+10VD
R157 301K L
N170-A LM339D-L
0.25...3.2V
R158 162K L
N170-B LM339D-L
R159 20K L
R163 10K L

N170-C LM339D-L
N170-D LM339D-L

STROMLAUF GILT FUER VAR.02

CIRCUIT DIAGRAM IS VALID FOR MOD.02

ACHTUNG: EGB!
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11/00	47296(12)	11.91	PF	1KEE	TAG	NAME
				BEARB.		PF
				GEPR.		PF
				NORM		
				PLOTT	14.11.91	
10/00	47296(11)	11.91	PF			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GERAET ESV930

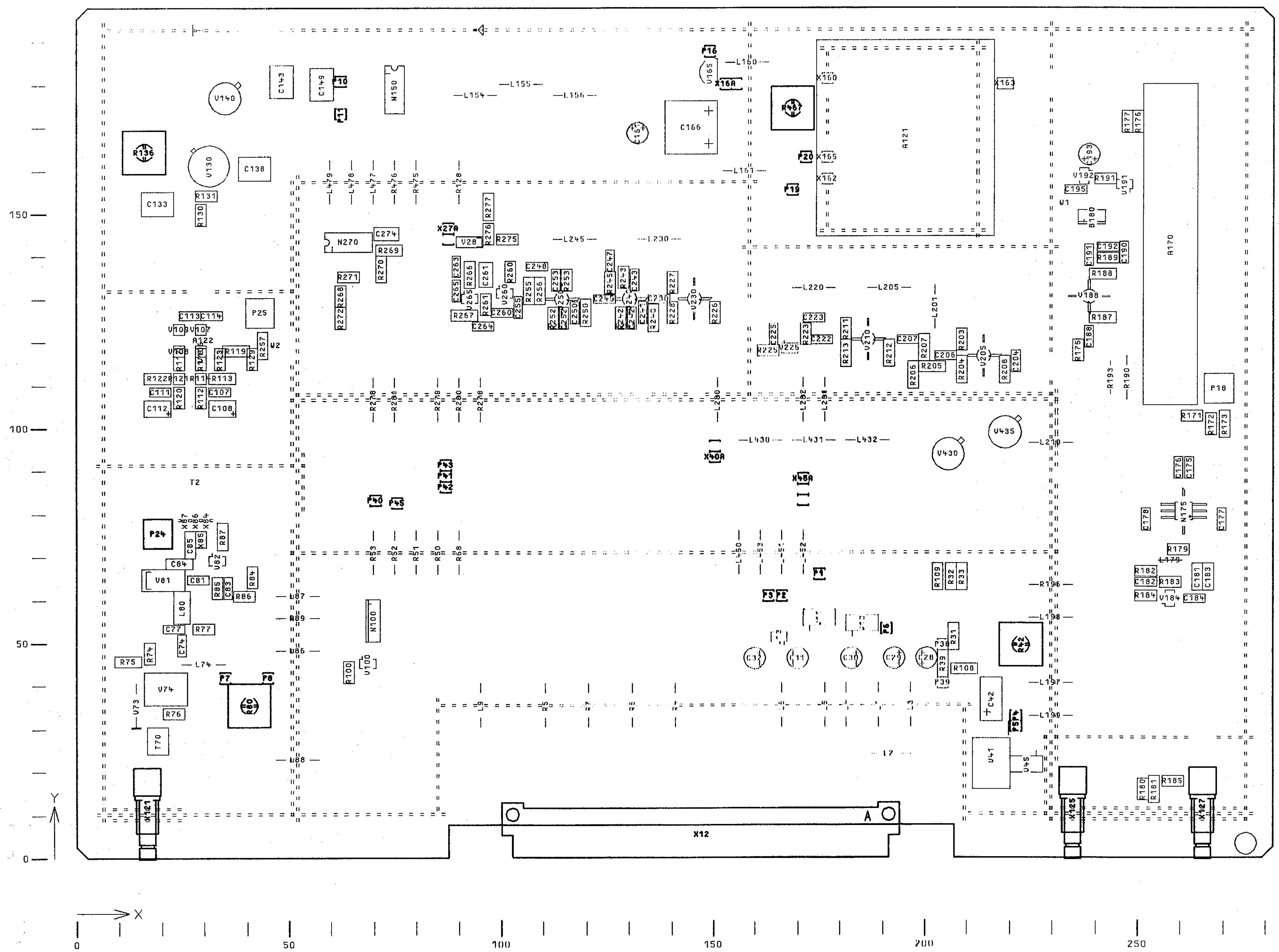
BENENNUNG
UHF SYNTHESIZER

ZEICHN.-NR. 1010.8198.01S

ZEICHN.-NR. 1010.8198.01S
BLATT NR. 9
V. 4 BL.
REG.I.V. 1010.6001

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

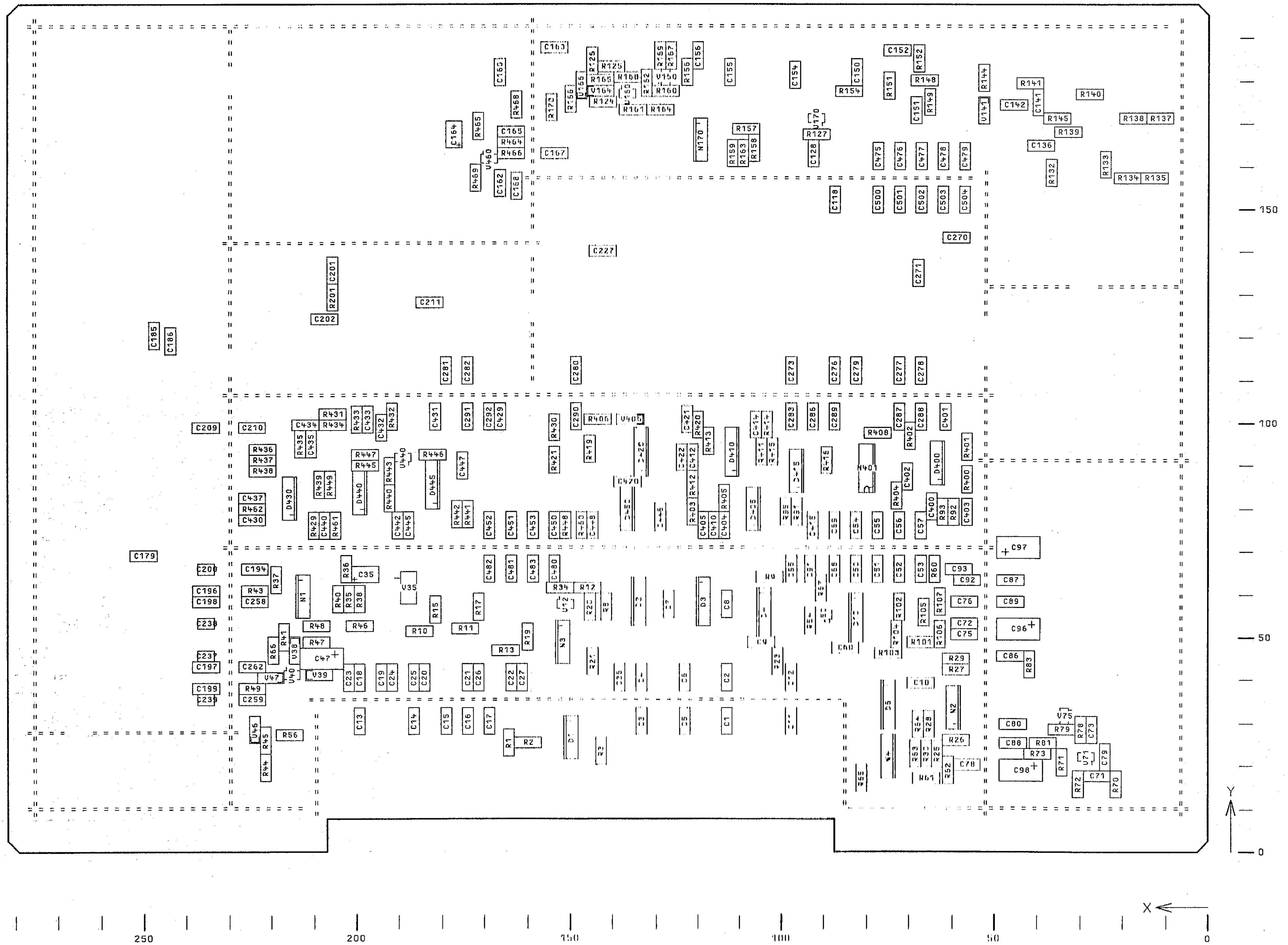
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.
DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, AENDERUNGEN KOENNEN NUR DURCH AENDERN DES DATENSATZES ERFOLGEN



DARSTELLUNG SEITE B
VIEW ON SIDE B

VERKLEINERUNG

08/00	47296(15)	12.91	PF	TAG	NAME	BENENNUNG	
				BEARB.	PF	UHF SYNTHESIZER	Z
				GEPR.	PF		
				NORM			
				PLOTT 09.12.91			
07/00	46359(12)	09.91	NG	ROHDE&SCHWARZ		ZEICHN. NR 1010.8198.01 EE	BLATT 1+
AEND. INDEX	AENDERUNGSMITTEILUNG	DATUM	NAME			1010.5001 ... 1010.5009	



DARSTELLUNG SEITE A

VIEW ON SIDE A

0 1 2 3 4 5

VERKLEINERUNG

08/00	47296(15)	12.91	PI	1KCE	TAG	NAME	BENENNUNG	
				BEARB.		PF	UHF SYNTHESIZER	Z
				GEPR.		PF		
				NORM				
				PLOTT	09.12.91			
07/00	46199(12)	09.91	NG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8198.01 EE	BLATT-NR. 2+
AEND IND	AENDERUNGS MITTEILUNG	DATUM	NAME	ZU GEHOERT C9V530			REG.I.V. 1010.5001 ERSTE Z. 1010.5099	V. BL.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

2nd Mixer

1010.9094.02

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Part lists
Circuit diagrams
Component plans

7 Testing and Repair of the Module 2nd Mixer

7.1 Function Description

7.1.1 Function Inside the Instrument

The purpose of the "2nd Mixer" board is to convert the first intermediate frequency of 1354.7 MHz to the second intermediate frequency of 74.7 MHz and then to the third IF of 10.7 MHz. For this purpose, the board contains the necessary IF amplifier, the IF filter and the 2nd and 3rd mixer as well as the 2nd local oscillator. Besides, the board accommodates the calibration generator for receiver calibration.

7.1.2 Detailed Function Description

(See circuit diagram 1010.9094.01S Sheets 1 to 6 and 1010.9371.01S or 1010.9894.01S)

7.1.2.1 Second LO

The 2nd LO signal (1280 MHz) is obtained by multiplication of the 64-MHz reference. To this end, a VCO is synchronized with the multiplied reference frequency in a phase-locked loop.

64 MHz Buffer

The reference signal applied to X135 by the FRN synthesizer is amplified with V400 and taken via the power divider T400 to the 64-MHz multiplier and the 3rd LO amplifier.

SRD Multiplier, Phase Detektor, Loop Amplifier

The reference signal coming from the 64-MHz buffer is amplified by V200 and transformed into a narrow pulse using the step-recovery diode V205. This pulse is used as a switching signal for mixer B220, which is connected up as a phase detector. The VCO signal applied at the RF gate is sampled. At the output, a signal is available, which reflects the phase difference between oscillator signal and reference.

From the detector voltage, the integrator N250 generates a control voltage, which synchronizes the oscillator to a multiple of the reference frequency.

VCO 1280 MHz, Buffer Amplifier, 2nd LO Amplifier

The VCO is implemented as negative-impedance type. With its negative impedance, the oscillator transistor V271 reduces damping of the resonant circuit L272, C271, V270 at the base. The tuning diode V270 is used for tuning. The output power of the oscillator is set by the oscillator transistor by means of the constant current adjustable by V280. The amplifier stage V272 is used to decouple the VCO signal.

The oscillator signal is amplified using the 2nd LO amplifier V130 and taken to the 2nd mixer B110. Part of the LO signal is decoupled via the voltage divider R120, R121 and taken back to the phase detector via the buffer amplifier N230, N235.

Lock Detector

Restricted by the tuning range, the VCO can only synchronize to 1280 MHz (= 20*f_{ref}). Since the mixer used as phase detector is not frequency-sensitive, it is necessary to make sure that the VCO is once tuned in the lock-in range of the phase-locked loop. In the locked state, B220 provides a DC voltage at the IF gate, which is compensated for by the offset voltage which can be varied using R52. In the unlocked state, the output voltage of the control amplifier continuously decreases due to the positive offset voltage. If it falls below a limit value of approx. 4 V, a current is applied with V260 to the non-inverting input of the control amplifier via comparator N260-A, causing the tuning voltage to increase again. By discharging of C251, a sawtooth-shaped search voltage of approx. 200 Hz is generated at the output of N250. At the same time, the LOCK line is switched to 0 V via comparators N260B to D and N50-C if the reference is missing or the permissible tuning voltage limits are exceeded, a LOCK interrupt being triggered in this way.

7.1.2.2 Signal Path

IF Filter 1354,7 MHz, 2nd IF Amplifier

The first IF signal is applied at X137 and taken to the 2nd IF amplifier V101 via the 1st IF filter made up of three circuits. The 3-dB bandwidth of the IF filter is 4.8 MHz. The amplifier is matched with strip line elements in terms of noise at the input and in terms of power at the output.

2nd Mixer, IF Switch, 74,7 MHz Bandpass Filter

The amplified IF signal is taken to the RF gate of the second mixer B110 and is converted to the second intermediate frequency of 74.7 MHz by the 1280-MHz LO signal. The IF gate is terminated by C110, L110, R110 and R111 for the second sideband. Diode switch V150 to V153 permits to connect the second intermediate frequency or a 74.7-MHz signal applied at X136 (first IF of RF range in the ESS, second IF of UHF range in the ESVD) to the 74.7-MHz signal path.

The following 74.7-MHz IF filter made up of three circuits features a 3-dB bandwidth of 3.8 MHz. Power divider T300 splits up the IF signal between the third IF amplifier and the IF panorama amplifier.

3rd IF Amplifier, IF Panorama Amplifier

The third IF amplifier V335 and the IF panorama amplifier V325 are designed as double negative-feedback amplifiers connected up in a common-emitter circuit. V330 and V320 are used to stabilize the bias. At the output of the IF amplifier, the trap for the image frequency of the 3rd IF consisting of C335, L332, C337 and L333 is provided. Via C338, L444 and R340, the RF gate of the 3rd mixer is terminated with 50 Œ for high frequencies. The IF panorama signal is taken via buffer amplifier V380 to the panorama output X131.

3rd LO Amplifier, 3rd Mixer

The 64-MHz reference signal is amplified by V355 and used as 3rd LO signal. V350 is used for setting the bias. The signal fed in at the RF gate is converted to the 3rd intermediate frequency of 10.7 MHz using mixer B370 and taken to output X132.

7.1.2.3 Calibration Generator

For receiver calibration, a 64-MHz sinewave signal and a pulse signal with a pulse repetition rate of 100 Hz or 100 kHz, respectively, are available.

64 MHz Output Amplifier, Level Control

The 64-MHz signal is directly derived from the 64-MHz reference. The signal is taken via amplifier N480 to level detector V480-A. The rectified RF signal is tapped off with high impedance using the FET operational amplifier N440-A. V480-B in the feedback path is used for temperature compensation. The detector signal is compared with the nominal value adjustable using R454 by means of differential amplifier N440-B, and the differential voltage is applied to control amplifier N440-C. With N440-D, a temperature-dependent correction voltage is additionally applied at the differential amplifier. The output signal of the control amplifier is used to set a current through the PIN diode V471. Thus, the output level of amplifier N480 is controlled using the π-attenuator pad R472, V471, R473. The output signal is taken via the attenuator pad R483 to R485 to the GaAs FET switch N490.

100 kHz, Divider 1:1000

The control signal for the pulse generator is also derived from the 64-MHz reference frequency. To this end, the 64-MHz signal is applied to gate D500-A via buffer amplifier V500 and converted to TTL level. The two D-flip-flops D501-A,B and the dividers D502-A and D503-A are used to divide the signal by 640, producing a 100-kHz squarewave signal with a duty cycle of approx. 1:3. Depending on the selected repetition frequency, either the divider 1:1000 consisting of D503-B and D504-A,B is cut in and the 100-Hz signal is connected to the pulse generator via gates D505-A,B, or the divider is disabled and the 100-kHz signal is directly applied to the pulse generator via D505-D,B.

Pulse Generator

The AC monoflop D1-A changes the control signal into a sharp-edged squarewave signal with a pulse duration of approx. 100 ns. Using switching transistors V1 and V2, a sharp-edged switching signal with 15 Vpp is produced, which is taken to the step-recovery diode V3. The latter transforms the switching signal into a narrow pulse, which is differentiated with C8. Thus, a broadband pulse spectrum is produced with a spacing of 100 Hz or 100 kHz. The output signal is taken via the frequency-dependent attenuator pad R9, R10, R11, C9 to the GaAs FET switch N490.

Board Control, Board Test

The board control changes the serial data into data bytes. The last 8 bits contain the board address. If the content of D30-A complies with the permanently wired board address (33), the data in D32-A and D33-A are connected to their outputs and stored by the strobe pulse. The analog switches D40-A and D41-A permit test points to be selected and connected to test output X13A.9. Buffers N40, N41 and N42 are used for decoupling the test signals.

2nd LO Control, Level Shift

When using the 74.7-MHz IF input, the 1280-MHz oscillator and the 2nd IF amplifier are cut off by reverse-biasing transistors V51 and V52. The function block Level Shift is used to produce the switching voltages for the PIN diode switch (IF switch) and the GaAs FET switch N490.

7.2 Measuring Instruments and Auxiliary Equipment

Item	Type of instrument	Specifications	Appropriate R&S device	Order No.	Use
1	Signal generator	20 to 1360 MHz	SMH	845.4002.52	7.4.3, 7.4.8, 7.4.10.2.3, 7.4.11.1, 7.4.11.2
2	Spectrum analyzer	20 to 1360 MHz	FSA	804.8010.52	7.4.8, 7.4.9, 7.4.10.2.3
3	Scalar network analyzer	10 to 1360 MHz	ZWOB2	857.0007 02	7.4.2, 7.4.3, 7.4.4, 7.4.5, 7.4.6, 7.4.7, 7.4.11.2
4	Level meter	20 to 1000 MHz Accuracy < 0.1 dB	NRV with NRV-Z5	828.2511.02 828.3818.02	7.4.3, 7.4 10.1, 7.4.10.2.3
5	Digital voltmeter		UDS5	349.1510.02	7.4.8, 7.4.9
6	Oszilloscope, 10:1 probe	100 MHz			7.4.10.2.1
7	Test receiver	20 to 2000 MHz	ESVD	1026.5506.10	7.4.10.2.2, 7.4.10.2.3
8	Standard pulse generator acc. to CISPR standard, e.g. Schwarzbeck IGU 2912	20 to 1000 MHz			7.4.10.2.2
9	Power supply unit	0 to 10 V	NGT20	192.7133.02	7.4.9
10	50-Ω termination SMB				7.4.2, 7.4.6

7.3 Troubleshooting

Note: ***As a prerequisite for the automatically running selftest of this board, the rear panel, display board, CPU board FRN synthesizer, VHF preselector, UHF synthesizer and the TP6 on the IF selection board must function properly. In order to avoid unfounded error messages, automatic testing of the complete instrument is always aborted after exceeding of the tolerance has been detected for the first time. For further locating of faults with the aid of externally applied signals, the test functions in the menu Board Test (see section 6) can be manually called up.***

Due to the limited circuitry for the selftest, not all faults can be found in the automatic test. In this case, the troubleshooting chart (Fig. 7-1) also serves to locate the fault.

- Call up SELFTEST, menu Board Test (Selftest 09).
- Select the 2nd mixer using the keys ↑ and ↓.
- Start the complete board test by selecting test function 0. The test stops with the first faulty test function, but can be continued by pressing the Enter key (see section 6).
- Enter the faulty test function and switch to the test mode by pressing the Enter key. If a fault is supposed to lie in the 2nd mixer, which cannot be found by the selftest, continue troubleshooting using the chart in Fig. 7-1.

Die gültige Grundeinstellung für den 2nd Mixer sowie die Grundeinstellung für die jeweilige Testfunktion (s. Tabelle 7-1) wird automatisch eingestellt.Am Display LEVEL erscheint die gemessene Selbsttestspannung. Am Display DATA INPUT erscheinen die zulässigen Toleranzgrenzen.

Basic setting:
Frequency: ..... 64 MHz
RF attenuation: ..... 0 dB
Op. range: ..... 60 dB
Preamplifier: ..... On
Calibration generator: ..... 64 MHz on

Table 7-1 Test functions

Test-funct.	Description	Setting	Nominal value	Error message
0	Test 1 to 13 Board test	Test 1 to 13	Test 1 to 13	
1	64-MHz reference	TP0	> 0.7 V	X 135 Level
2	Multilpier test	TP1	> 0.1 V	SRD Mult.
3	VCO test	TP2	150 to 1000 mV	2nd LO Level
4	Buffer test	TP3	80 to 500 mV	Loop Level
5	Tuning voltage test	TP4	2 to 3.5 V	2nd LO Loop
6	Lock test	TP11	> 2.5 V	2nd LO Loop
7	Calibration generator test	TP9	0.15 to 0.25 V	X134 Level
8	Control voltage test	TP10	0.1 to 1 V	Level Control
9	Bias of 2nd IF ampl. 1354,7 MHz	TP 5	2.5 to 2.9 V	2nd IF Amp. Bias
10	Bias of 3rd IF ampl. 74.7 MHz	TP7	2.75 to 3 V	3rd IF Amp. Bias
11	Level after 3rd IF amplifier	TP 8	100 to 850 mV	IF 74,7 MHz Level
12	3rd LO level	TP6	> 0.8 V	3rd LO Level
13	Level after 3rd mixer	TP6 on IF Selection Board	130 to 850 mV	X132 Level
14	Pulse generator variant: Var. 0 = pulse gen. No. 1010.9371 Var. 1 = pulse gen. No. 1010.9894 1 GHz Var. 2 = pulse gen. No. 1010.9894 2 GHz	TP12, TP13, TP14	<2.5 V = Low >2.5 V = High The decimal value is output on the DATA INPUT display, with TP 12 = MSB	Var.: __
15	Switch on 74.7-MHz input (RF/UHF range)			

- Remove RF cover on the component side.
- Insert board on the service kit.

For further troubleshooting use the troubleshooting chart (Fig. 7-1). The serial interface (see section 6.1.2) is to be checked according to Tables 7-2 and 7-3.

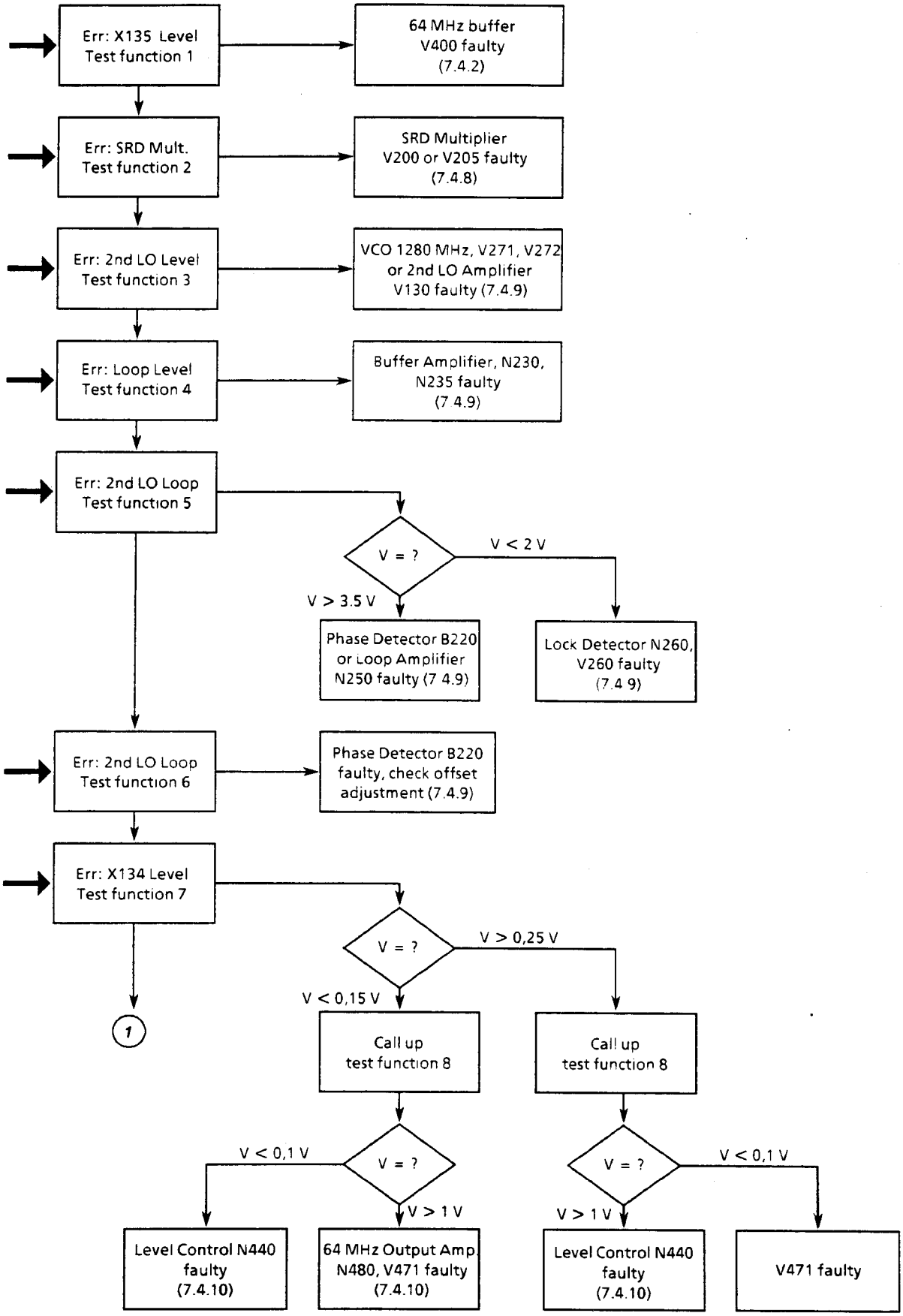


Fig. 7-1a Troubleshooting chart

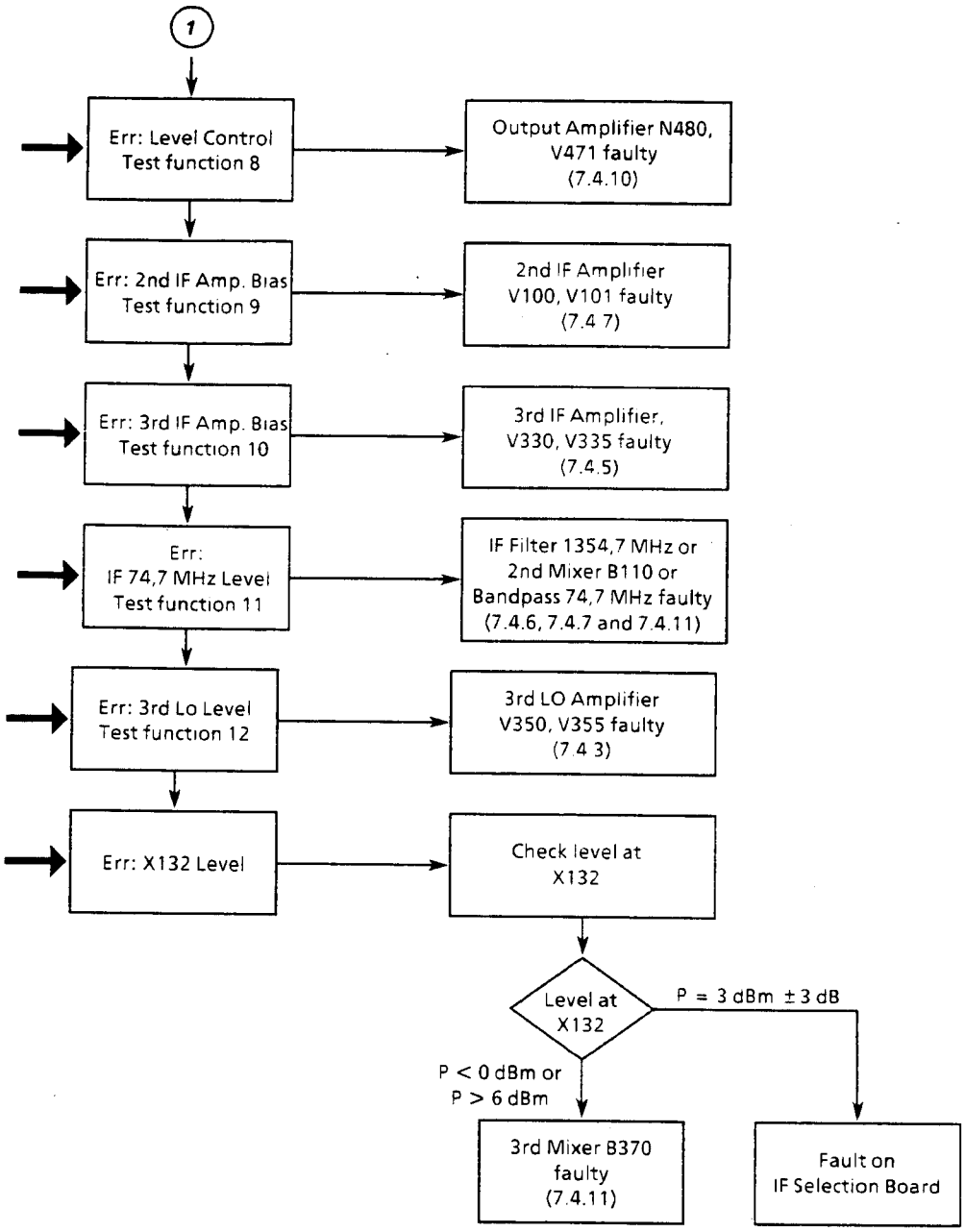
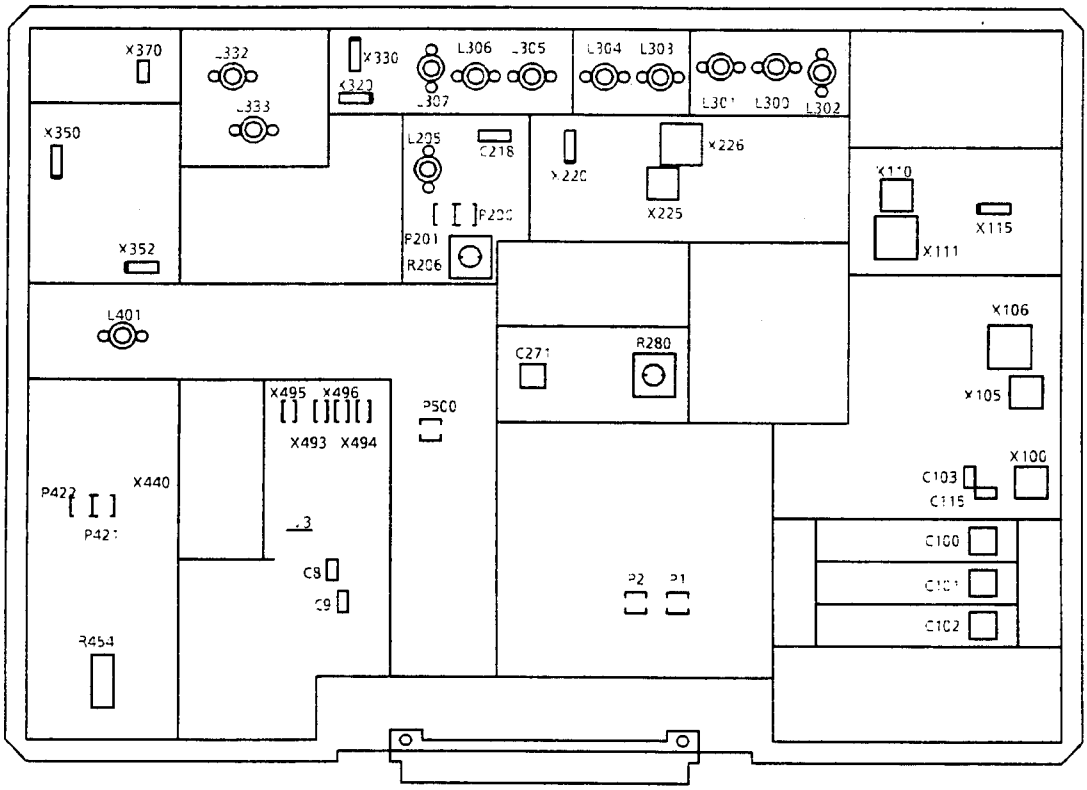


Fig. 7-1b Troubleshooting chart

7.4 Testing and Adjustment

Operate the board outside the instrument using the ESVS service kit. Unscrew the RF cover on the component side.

7.4.1 Position of Jumpers, Test Points and Adjustment Devices



7.4.2 64 MHz Buffer

a) Test setup

- Terminate X135 with 50 Ω.
- Connect network analyzer to X352.2.

b) Measurement and Adjustment

- Use L401 to adjust to maximum return loss at 64 MHz.
  S_{22} ..... < -15 dB

7.4.3 3rd LO Amplifier

a) Test setup

- Connect network analyzer to X350.2.

b) Measurement and adjustment

- Connect jumper X352.
- Use L352 to adjust to maximum return loss at 64 MHz.
  S_{22} ..... < -20 dB
- Apply 64 MHz, 7 dBm at X135.
- Connect power meter to X350.2
  Level ..... 17 dBm ± 2 dB
- Connect jumper X350.
- Select board test 2nd mixer, test function 1 (64-MHz buffer).
  Selftest voltage on display ..... > 0.5 V
- Select test function 2 (3rd LO level)
  Selftest voltage ..... > 0.9 V

7.4.4 IF Panorama Amplifier

a) Test setup

- Connect network analyzer to X320.3 and X131.

b) Measurement and adjustment

- at 74.7 MHz:
  S_{21} ..... 11.5 dB ± 0.5 dB
  S_{11} ..... < -15 dB
  S_{22} ..... < -12 dB

7.4.5 3rd IF Amplifier

a) Test setup

- Close upper cover (test cover).
- Connect network analyzer to X330.3 and X370.2.

b) Measurement and adjustment

- Select test function 10 (bias 3rd IF amp.).
  Selftest voltage ..... 2.89 V ± 50 mV
- Use L333 to adjust pole of S21 to 53.3 MHz.
  S_{21} at 53.3 MHz ..... < -15 dB

- Use L332 to adjust to maximum return loss (S11) at 74.7 MHz.
  S_{11} at 74.7 MHz ..... < - 20 dB
  S_{21} at 74.7 MHz ..... 14 dB ± 0.5 dB

7.4.6 74,7-MHz Bandpass Filter

a) Test setup

- Close upper test cover.
- Connect jumpers X370, X320 and X330.
- Terminate X132 with 50 Ω.
- Connect network analyzer to X136 and X131.

b) Presettings

- Set frequency to 1 MHz on receiver (ESS) or select test function 15 (ESVS, ESVD).

c) Measurements and adjustment

- Use L300 to L307 to adjust filter.
  S_{21} at 74.7 MHz ..... 6.4 dB ± 0.5 dB
  S_{11} in the range 74.7 ± 1 MHz ..... <-20 dB
  B_{3dB} ..... 3.8 MHz ± 100 kHz

7.4.7 IF Filter 1354,7 MHz, 2nd IF Amp.

a) Test setup

- Close upper test cover.
- Connect network analyzer to X137 and X105.
- Resolder jumper X106 from 2 to 3.

b) Presettings

- Set frequency to 100 MHz.
- Select test function 9 (bias 2nd IF amp.).

c) Measurements and adjustment

- Selftest voltage ..... 2.70 V ± 100 mV

- Measure voltages at P1, P2.
  Voltage at P1 ..... 9.8 V ± 0.1 V
  Voltage at P2 ..... -9.9 V ± 0.1 V

- Use C100 to C102 to adjust to minimum attenuation.
  S_{21} ..... 8.7 dB ± 0.5 dB
  S_{11} at 1354.7 ± 1 MHz ..... < -15 dB
  B_{3dB} ..... 4.6 MHz ± 200 kHz

- Jumper X106 in original position (1 → 3)

7.4.8 SRD Multiplier

a) Test setup

- Connect spectrum analyzer to X220.2.
- Apply 64 MHz, 3 dBm at X135.
- Connect voltmeter to P200, P201.

b) Presettings

- Use R206 to set a voltage of 700 mV.
- Unscrew the core of L205.

c) Measurements and adjustment

- Screw in the core of L205 until the multiplier just starts to oscillate (observe spectrum at X220.2).
- Increase 64-MHz level at X135 to 7 dBm.
- Use C218 to adjust the maximum of the spectrum to 1280 MHz.
- Check the voltage at P200, 201 and readjust, if necessary.
  Level at X220.2 at 1280 MHz ..... -2 dBm ± 2 dB
- Select test function 2 (SRD multiplier).
  Selftest voltage ..... > 100 mV

7.4.9 VCO 1280 MHz, 2nd LO Amp., Buffer Amp.

a) Test setup

- Cover the oscillator chamber at the top.
- Connect spectrum analyzer to X110, resolder jumper X111 from 1 to 2.
- Apply a DC voltage of 5.5 V to X250.2.

b) Presettings

- Set frequency to 100 MHz.
- Turn R280 to center position.
- Select test function 4.

c) Measurements and adjustment

Selftest voltage ..... 2.75 V ± 0.1 V

- Use C271 to set VCO to 1280 MHz ± 1 MHz.
- Use R280 to adjust output level to 17 dBm ± 1 dB.
- Resolder jumper X110 from 1 to 3.
- Select test function 3.
  Selftest voltage ..... > 0.2 V
- Connect spectrum analyzer to X225 and resolder jumper X226 from 1 to 2.
  Level at X225 at 1280 MHz ..... 2 dBm ± 2 dB

- Select test function 4.
  Selftest voltage ..... 100 mV ± 50 mV
- Quit board test menu, switch off test mode.
- Vary voltage at X250.2.
- For $V_{X250.2} < 4$ V: ..... after 5 s error message "2nd LO UFH Unlocked" on receiver.
- For $4 V < V_{X250.2} < 6.7$ V: ..... no error message.
- For $V_{X250.2} > 6.7$ V: ..... error message "2nd LO UFH Unlocked"
- Increase voltage at X250.2 to 10 V. There must not be any spurious over the entire tuning range.
- Connect jumper X250.
- Resolder jumper X226 from 1 to 3.
- Connect spectrum analyzer to X110.
- Apply 64 MHz, 7 dBm at X135.
- Connect voltmeter to P250.
- Set voltage at P250 to 0 V using R252.
- VCO locks to 1280 MHz; if this is not the case, use R252 to make the PLL lock.
- Increase the voltage at P250 using R252 until the PLL unlocks. Note the voltage value.
- Switch off 64-MHz reference.
- Reduce the voltage at P250 until the search is aborted, i.e. there is no AC voltage component at P250. Note the voltage value.
- Take the average from the two values, add 0.3 V and set this value at P250 using R252. The difference between the two values must be greater than 1.6 V!
- Select test function 11 (lock test):
  Selftest voltage ..... < 2.5 V, 2. LO unlocked.
- Switch on again the 64-MHz reference:
  Selftest voltage ..... < 2.5 V, 2. LO locked.

7.4.10 Calibration Generator

7.4.10.1 64-MHz Generator

a) Test setup

- Apply 64 MHz, 7 dBm at X135.
- Connect power meter to X134.

b) Presettings

Settings on the receiver:
Frequency: ..... 64 MHz
Calibration generator: ..... 64 MHz on (Selftest 04)

c) Measurement and adjustment

- Set output level to -17 dBm ± 0.05 dB using R454.

- Select test function 7.
  Selftest voltage ..... 0.2 V ± 50 mV

- Select test function 8.
  Selftest voltage ..... 0.1 to 0.8 V

7.4.10.2 Pulse Generator

7.4.10.2.1 Testing the Control

a) Test setup

- Connect oscilloscope to P500 or X495.

b) Presettings

Settings on the receiver:
Frequency: ..... 64 MHz
Calibration generator: ..... Pulse 100 kHz on (Selftest 04)

c) Measurements

Level at P500 ..... 100 kHz, HCT level
Level at X495 ..... 100 kHz, HCT level

- Switch calibration generator to 100 Hz pulse repetition frequency (selftest 04).
  Level at X495 ..... 100 Hz, HCT level

7.4.10.2.2 Adjustment at 100 Hz Pulse Repetition Frequency

a) Test Setup

- Connect standard pulse generator or X134 to RF input of test receiver.

b) Presettings

Settings on the ESXS:
Frequency: ..... 64 MHz
Calibration generator: ..... 100 Hz Pulse on (Selftest 04)

Settings on the test receiver (ESVD):
Frequency: ..... 100 MHz
RF attenuation: ..... 0 dB
IF bandwidth: ..... 1 MHz
Mode: ..... Low Distortion
Op. Range: ..... 60 dB
Indication mode: ..... Peak
Measuring time: ..... 0,5 s
0,01-dB indication(Selftest 21, Level Res 0,01 dB): ..... on

Settings on the standard pulse generator:
Pulse repetition frequency: ..... 100 Hz
Pulse level: ..... 50 dBµV/MHz

c) Measurements and adjustment

- Connect standard pulse generator to test receiver and measure level at 100 MHz.
- tore indication value(= $P_{100\,Hz}$).
- Connect X134 to test receiver.
- Use C8 to set the pulse level such that the indication value $P_{100\,Hz}$ ± 0,1 dB is obtained again.

7.4.10.2.3 Adjusting the Frequency Response

a) Test setup

- Connect signal generator or X134 to test receiver.

b) Presettings

Settings on the ESXS:
Frequency: ..... 64 MHz
Calibration generator: ..... 100 kHz Pulse on

Settings on the test receiver:
RF attenuation: ..... 10 dB
IF bandwidth: ..... 10 kHz
Mode: ..... Low Distortion
Op. Range: ..... 60 dB
Indication mode: ..... AV
Measuring time: ..... 100 ms
0,01-dB indication (Selftest 21): ..... on

c) **Measurements and adjustment**

Mod02: 1-GHz pulse generator:

- Calibrate test receiver at 100 and 1000 MHz using signal generator and level meter.
- Measure level of pulse generator at 100 MHz and note the measured value (= $P_{100\ MHz}$).
- Measure level of pulse generator at 1000 MHz and adjust to the value $P_{100\ MHz}$ - 1 dB using C9 (adjustment tolerance ± 0,1 dB).
- Select selftest function 14.

  Readout on display DATA INPUT: Var. 0, R40...R42 nicht bestückt (Mod02)
  S-Nr. 1010.9371.02
  or Var. 1, R40 bestückt (Mod02)
  S-Nr. 1010.9894.02

Mod03: 2-GHz Pulse generator:

- Calibrate test receiver at 100, 1000 and 1999 MHz using signal generator and power meter.
- Measure level of pulse generator at 100 MHz and note the measured value (= $P_{100\ MHz}$).
- Measure level of pulse generator at 1999 MHz. Adjust the level to the value P100 MHz -1 dB by varying the length of the wire of the step-recovery diode V3. Lengthening the wire increases the level, shortening reduces the level. Allow the diode to cool down after soldering.
- Measure level of pulse generator at 1000 MHz and adjust to the value $P_{100\ MHz}$ -1 dB using C9.
- Check the generator level again at 1999 MHz. If necessary, repeat the adjustment at 1000 and 1999 MHz until the nominal level of ± 0.1 dB is obtained.
- Select selftest function 14.
  Readout on display DATA INPUT: Var. 2, R41 bestückt (Mod03)

7.4.11 Complete Board

7.4.11.1 RF/UHF Range

a) Test setup

- Fasten the upper cover with screws.
- Connect signal generator to X136.

b) Presettings

Settings on the ESXS:
Select selftest function 15.

Setting on the test receiver:
Frequency: ..... 74.7 MHz
Level: ..... -10 dBm

c) Measurement

- Level at X132 at 10.7 MHz ..... -7 dBm ± 1 dB
- Select test function 11.
  Selftest voltage: ..... > 100 mV

7.4.11.2 VHF Range

a) Test setup

- Connect network analyzer to X137 to X132.

b) Presettings

Setting on the ESXS:
Switch off test mode

Setting on the scalar network analyzer:
Center Freq.: ..... 1354.7 MHz
Span: ..... 10 MHz
Input: S11, S21

c) Measurements and adjustment

- Check passband curve, if necessary, readjust using C102.
- Connect signal generator to X137 and apply a signal with -10 dBm at 1354.7 MHz.
- Measure level at X132 using spectrum analyzer at 10.7 MHz.
  Level at X132: ..... - 5.5 dBm ± 1 dB

7.5 External Interfaces

Pin	Name	I/O	Origin/destination	Specified Range	Signal Description
X13.A1	AGND	I			Analog ground
X13.C2	AGND	I			Analog ground
X13.A2	+5 VA	I		5.2 to 5.6 V	Supply
X13.C2	+5 VA	I		5.2 to 5.6 V	Supply
X13.A4	+10 VA	I		9.98 to 10.02 V	Supply
X13.C4	+10 VA	I		9.98 to 10.02 V	Supply
X13.A5	-10 VA	I		-9.99 to -10.01 V	Supply
X13.C5	-10 VA	I		-9.99 to -10.01 V	Supply
X13.A7	SCLK	I		HCT-Pegel	Clock
X13.C7	TDATA	I		HCT-Pegel	Data
X13.C8	STROBE*	I		HCT-Pegel	Strobe
X13.A9	TEST	O		0 to 5 V	Selftest
X13.A11	LOCK	O		0 to 5.6 V	LOCK
X131	PANORAMA OUT	O	Rear Panel or IF Analysis	74.7 MHz	Panorama output
X132	3RD IF OUT	O	IF Selection Board	10.7 MHz	Output 3rd ZF
X134	CAL OUTPUT	O	Attenuator	Pulse: 100 Hz, 100 kHz, 50 dBµV/MHz. Sine: 64 MHz, 90dBµV	Output Calibration generator
X135	64 MHz IN	I	FRN Synthesizer	64 MHz, 5 to 9 dBm	Reference
X136	IF INPUT 74,7 MHz	I	HF Module or I/Q Demodulator	74.7 MHz	IF input 74.7 MHz
X137	IF INPUT 1354,7 MHz	I	VHF Preselector	135.7 MHz	IF input 1354.7 MHz

Table 7-2 Contents of data register D32

Function	Pin 11	Pin 12	Pin 13	Pin 14 D4	Pin 7 D3	Pin 6 D2	Pin 5 D1	Pin 4 D0
VHF range	X	X	X	X	X	X	X	1
RF/UHF range	X	X	X	X	X	X	X	0
Calibration generator off	X	X	X	0	0	0	0	X
64-MHz sinewave generator on	X	X	X	0	0	0	1	X
Pulse generator 100 kHz on	X	X	X	0	1	1	0	X
Pulse generator 100 Hz on	X	X	X	1	0	1	0	X

Table 7-3 Contents of data register D33, selftest

Function	Pin 11	Pin 12	Pin 13	Pin 14	Pin 7	Pin 6	Pin 5	Pin 4
Selftest off	1	X	X	X	X	X	X	X
Test point 0 64-MHz reference	0	X	X	X	0	0	0	0
Test point 1 SRD multiplier	0	X	X	X	0	0	0	1
Test point 2 Level of 2nd LO	0	X	X	X	0	0	1	0
Test point 3 Level at phase detector	0	X	X	X	0	0	1	1
Test point 4 Tuning voltage	0	X	X	X	0	1	0	0
Test point 5 Bias of 2nd IF amplifier	0	X	X	X	0	1	0	1
Test point 6 Level of 3rd LO	0	X	X	X	0	1	1	0
Test point 7 Bias of 3rd IF amplifier	0	X	X	X	0	1	1	1
Test point 8 Level after 3rd IF amplifier	0	X	X	X	1	0	0	0
Test point 9 Output level of 64-MHz calibration generator	0	X	X	X	1	0	0	1
Test point 10 Control voltage of 64-MHz calibration generator	0	X	X	X	1	0	1	0
Test point 11 Lock monitoring	0	X	X	X	1	0	1	1
Test point 12 Pulse generator detection, LSB	0	X	X	X	1	1	0	0
Test point 13 Pulse generator detection	0	X	X	X	1	1	0	1
Test point 14 Pulse generator detection, MSB	0	X	X	X	1	1	1	0
Test point 15 Board identification	0	X	X	X	1	1	1	1

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X136
IF INPUT
74,7MHZ

X137
IF INPUT
1354,7MHZ

IF FILTER
1354,7MHZ

2ND
IF AMPL.

B SHEET3

X105

2ND

C

1280MHZ, 2DBM

BUFFER
AMPLIFIER

X225

X135
64MHZ IN

64MHZ
BUFFER

O SHEET6

SRD
MULTIPLIER

F SHEET4

X220

PD

PHASE
DETECTOR

G SHEET4

LOOP
AMPLIFIER

X250

4...6V

LOCK
DETECTOR

H SHEET4

VCO
1280MHZ

I SHEET4

2ND
LO AMPL.

E SHEET3

VARIANTENERKLAERUNG/VERSIONS

VAR02/MOD02: 1GHZ PULSGENERATOR/PULSE GENERATOR
VAR03/MOD03: 2GHZ PULSGENERATOR/PULSE GENERATOR

IF FILTER
1354,7MHZ

B SHEET3

2ND
IF AMPL.

X105

X115

2ND MIXER

X110

C SHEET3

17DBM

IF SWITCH

D SHEET3

74,7MHZ
BANDPASS
FILTER

J1..
J3
SHEET5

X320

K SHEET5

IF PA
AMPLI

X330

M SHEET5

3RD
IF AMP

1280MHZ, 2DBM

BUFFER
AMPLIFIER

25

PD

PHASE
DETECTOR

SHEET4

LOOP
AMPLIFIER

X250

4...6V

LOCK
DETECTOR

H SHEET4

VCO
1280MHZ

I SHEET4

2ND
LO AMPL.

E SHEET3

64MHZ
7DBM

X352

7DBM

L SHEET5

64MHZ
0DBM

64MHZ OUTPUT
AMPLIFIER

R SHEET6

X440

LEVEL CONTROL

Q SHEET6

640
1

100KHZ

S SHEET6

9 10 11 12 13 14 15 16 17

F E D C B A

X115

ID MIXER

X110

SHEET3

17DBM

IF SWITCH

D SHEET3

74,7MHZ BANDPASS FILTER

J1..
J3

SHEET5

X320

K SHEET5 IF PANORAMA AMPLIFIER

X131
PANORAMA OUT

X330

M SHEET5 3RD IF AMPLIFIER

X370

X375

N SHEET5 3RD MIXER

X132
3RD IF OUT

64MHZ
7DBM

X352

7DBM

X350

17DBM

3RD
LO AMPLIFIER

L SHEET5

64MHZ
0DBM

64MHZ OUTPUT AMPLIFIER

R SHEET6

-17DBM

X134
CAL OUTPUT

PULSE GENERATOR

A131

P SHEET6

X440

LEVEL CONTROL

Q SHEET6

P500

640

1

100KHZ

1000

1

DIVIDER 1:1000

S SHEET6

06/00	47296 (4)	10.91	PF	1KEE	TAG	NAME	BENENNUNG
				DEARB.		PF	2ND MIXER
				GEPR.		PF	
				NORM			
				PLOTT	15.10.91		
05/00	46349	05.91	NG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9094.01S
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ZU GEHÖRT	ESVS30		BLATT-NR. 1 V. 6 BL.
				REG.I.V.	1010.5001	ERSTE Z.	1010.5099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

BOARD CONTROL

X13A 9
TEST
R4 100R
C1 220P L

X13A 7
SCLK
R1 100R L
D1-A 74HCT14T-L
D1-B
C2 220P L
R5 100R
C3 220P L

X13C 7
TDATA
R2 100R L
D1-C
D1-D
C4 220P L
R6 100R
C5 220P L

X13C 8
STROBE*
R3 100R L
D1-F
D1-E
C6 220P L
R7 100R
C7 220P L

ADRESSDECODER

+5V
R30 1K L
D30-A 74HCT4094T-L
C2 EN3 SRG C1/→ 1D 2D 3▽
ADR 21H
D31-A 74HCT238T-L
DX G0 G7
&
+5V
R32 1K L
D32-A 74HCT4094T-L
+5V
R33 1K L
D33-A 74HCT4094T-L
D0 D1 D2 D3 D4

+5V
C30 10N L D30-B
C31 10N L D31-B
C32 10N L D32-B
C33 10N L D33-B

D42-A 74HCT00T-L
D42-B
D42-C
D42-D

X13A 1
AGND
X13C 1

X13A 2
+5VA
X13C 2
D1-G 74HCT14T-L
L3 4U7H
C12 10N L
C20 560P L
C25 10U
+5V

X13A 4
+10V
X13C 4
L4 1U2H
C13 10N L
C21 560P L
C26 10U
+10V

X13A 5
-10V
X13C 5
L5 1U2H
C14 10N L
C22 560P L
C27 10U
-10V

+5V
R8 1M L
X13A 11
LOCK *
L1 1UH
C10 10N L
C11 10N L
LOCK
SHEET2 D/13

N40-E
N41-E
N42-E

N40-A LM224D-L
TP0 SHEET6 D/5
TESTO

N40-B
TP1 SHEET4 D/2 A/7
TEST1

N40-C
TP2 SHEET3 D/8
TEST2

N40-D
TP3 SHEET4 B/1
TEST3

VARIANTENERKLAERUNG/VERSIONS

VAR02/MOD02: 1GHZ PULSGENERATOR/PULSE GENERATOR
R40 BESTUECKT/FITTED
R41 NICHT BESTUECKT/NOT FITTED

VAR03/MOD03: 2GHZ PULSGENERATOR/PULSE GENERATOR
R40 NICHT BESTUECKT/NOT FITTED
R41 BESTUECKT/FITTED

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

ZEICHN.-NR. 5334.015

BOARD CONTROL

ADRESSDECODER

ADR 21H

D31-A
74HCT238T-L

D32-A
74HCT4094T-L

D33-A
74HCT4094T-L

R32
1K L

R33
1K L

+5V

D0
D1
D2
D3
D4

C31
10N L

C32
10N L

C33
10N L

D31-B

D32-B

D33-B

BOARD TEST

D40-A
74HC4051T-L

D41-A
74HC4051T-L

D42-A
74HCT00T-L

D42-B

D42-C

D42-D

TEST0
TEST1
TEST2
TEST3
TEST4
TEST5
TEST6
TEST7
TEST8
TEST9
TEST10
TEST11
TEST12
TEST13
TEST14
TEST15

N40-E
N41-E
N42-E

D40-B

D41-B

D42-E

C40
10N L

C41
10N L

C42
10N L

R40 4K75 B
R41 4K75 B
R42 1K B *
R43 4K75 B
R44
R45
R46
R47
4X10K

R38
10K B

R39
10K B

N40-A
LM224D-L

N41-A
LM224D-L

N42-A
LM224D-L

N40-B

N41-B

N42-B

N40-C

N41-C

N42-C

N40-D

N41-D

N42-D

TP0
SHEET6
D/5

TP1
SHEET4
D/2
A/7

TP2
SHEET3
D/8

TP3
SHEET4
B/1

TP4
SHEET4
C/7

TP5
SHEET3
C/6

TP6
SHEET5
D/12

TP7
SHEET8
F/7

TP8
SHEET5
F/9

TP9
SHEET6
A/8

TP10
SHEET6
B/6

TP11
SHEET4
B/6

2ND LO

+10V

R48
150K L

R50
30K1 L

R49
100K L

R51
10K L

TP11
SHEET4 B/6

DO

R60
30K1 L

N60-E

R63
10K L

-10V

N60
LM22

* NOT FITTED

BOARD TEST

D40-A 74HC4051T-L
D41-A 74HC4051T-L
TEST0 TEST1 TEST2 TEST3 TEST4 TEST5 TEST6 TEST7
TEST8 TEST9 TEST10 TEST11 TEST12 TEST13 TEST14 TEST15

D40-B C40 10N L
D41-B C41 10N L
D42-E C42 10N L

+5V
R40 4K75 B, R41 1K B *, R42 1K B *, R43 4K75 B
R44 R45 R46 R47 4X10K
TEST12 TEST13 TEST14 TEST15

R38 10K B, R39 10K B

N41-A LM224D-L — TEST4 — TP8 SHEET5 F/9 — N42-A LM224D-L — TEST8
N41-B — TEST5 — TP9 SHEET6 A/8 — N42-B — TEST9
N41-C — TEST6 — TP10 SHEET6 B/6 — N42-C — TEST10
N41-D — TEST7 — TP11 SHEET4 B/6 — N42-D — TEST11

2ND LO CONTROL

+10V
R48 150K L, R50 30K1 L, R49 100K L, R51 10K L
N50-A LM339D-L
N50-B
N50-C
N50-D
R52 10K L, R53 5K62 L, R54 10K L, R55 4K75 L, R56 4K75 L, R57 2K21 L, R58 1K L
V50 BC860B-L
V51 BC850B-B
V52 BCP69-16-B
TP11 SHEET4 B/6
LOCK SHEET2 B/4
P1 +10V ON/OFF
P2 -10V ON/OFF
-10V
+10VA
-10VA
SHEET 3,4
D0

D1,D2 SHEET6 B/2
D3,D4 SHEET6 F/12

LEVEL SHIFT

+10V
R60 30K1 L
N60-A LM224D-L
N60-B
N60-C
N60-D
N60-E
R61 10K L
NA1 100R L, NA2 100R L, NA3 100R L, NA4 100R L
C60 100P L, C61 100P L, C62 100P L, C63 100P L
V60 BAS32 L, V61 BAS32 L
V62 04V7 L, V63 04V7 L
R64 10K L, R65 10K L
D0, D1, D2
-10V

ENA-VHF
ENA-HF
SHEET3 D/11 C/11
CAL-A
CAL-B
SHEET6 C/16
+5V
+10V
-10V

* NOT FITTED

06/00	47296(4)	10.91	PI	TECH.	ING.	NAME: PI
				GEPR.		PI
				NORM		
				PRÜFT	16.10.91	
05/00	46344	06.91	NG			
ÄND. IND.	ÄNDERUNGEN MITTEILUNG	DATUM	NAME			

BENENNUNG: 2ND MIXER

ROHDE&SCHWARZ

ZEICHN.-NR. 1010.9094.01S

BLATT-NR. 2 v. 6 BL.

REG.I.V. 1010.5001 ERSTE Z. 1010.6099

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

C100 C101 C102 X100 R103 X105 X110 X115 R133

B — IF FILTER 1354,7MHZ

X137 1
IF INPUT
1354,7MHZ

C100 C101 C102
C140 L105 L106 L107 C141
3 X OP35-3P5

C103 220P B
C115 220P B *
* X100 1

2ND IF AMPLIFIER

V101
NE85635

C108 220P B
X106
X105 1

C109 100P B

C104 1N B
L100 1UH B
C105 1N B

V100
BC860B-B

R100 1K B
C106 10U 10V TA B

R105 100K B
TP5
SHEET2
B/9

R106 47K5 B
C107 10N B

C116 10N B

R107 2K74 L
R104 47R5 B

R101 11K B
* R103 5K
IF GAIN

+10VB

X136 1
IF INPUT
74,7MHZ

W1B 1
SHEET3 B/9

+10VB
C160 10N L
L160 1U2H
+10VA

C — 2ND MIXER

C110 8P2 L
R110 100R L
L110 100NH
R111 100R L

B110
TFM15-830
RF
IF
LO

L111 100NH
L112 100NH
C112 4P7 L

X110 1
X111
17DBM

E — 2ND LO AMPLIFIER

PLL
SHEET4
B/2

R120 68R1 B
C121 1P B
R123 1K B
TP2
SHEET2
C/8

R121 68R1 B
C120 220P B
V120
HSMS
2800
C122 47P B
R124 1M B

R122 221R B
C134 10N B
C133 10N B
R131 47R5 B
+10VI

C130 100P B
LO LEVEL
R132 100R B
R133 5K *
R135 2K21 L

V130
NE85637 B
R130 1K B
V131
BC860B
R134 10K B

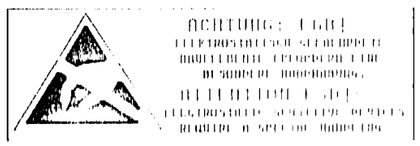
C131 100P B
C132 10U 10V TA B

C135 220P B
LOAMP
1280MHZ
SHEET4 D/12
C136 2P7 B

+10VI
+10VI

VARIANTENERKLAERUNG/VERSIONS

VAR02/MOD02: 1GHZ PULSGENERATOR/PULSE GENERATOR
VAR03/MOD03: 2GHZ PULSGENERATOR/PULSE GENERATOR



* NOT FITTED

R103 X105 X110 X115 R133

2ND IF AMPLIFIER

V101 NE85635

C108 220P B

X106

X105 1

C109 100P B

C104 1N B

L100 10UH B

C105 1N B

V100 BC860B-B

R100 1K B

C106 10U 10V TA B

R105 100K B

TP5 SHEET2 B/9

R106 47K5 B

C107 10N B

C116 10N B

R107 2K74 L

R104 47R5 B

R101 11K B

* R103 5K

IF GAIN

+10VB

60 N L

C 2ND MIXER

B110 TFM15-830

RF IF LO

X110 1

X111

17DBM

C110 8P2 L

R110 100R L

L110 100NH

R111 100R L

L111 100NH

L112 100NH

C112 4P7 L

E 2ND LO AMPLIFIER

PLL SHEET4 B/2

R120 601R B

C121 1P B

R123 1K B

TP2 SHEET2 C/8

R121 68R1 B

C120 220P B

V120 HSMS 2800

C122 47P B

R124 1K B

R122 221R B

C134 100P B

R131 47R5 B

C133 10N B

+10V1

C130 100P B

R132 100R B

R135 2K21 L

R133 5K *

V130 NE85637 B

R130 1K B

V131 BC860B

R134 10K B

C131 100P B

C132 100U 100P 10 B

C135 220P B

LOAMP 1280MHZ SHEET4 D/12

C136 2P7 B

+10V1

+10V1

D IF SWITCH

C150 10N L

V150 BA682-L

L150 10UH L

R150 2K74 L

L155 10UH B

ENA-VHF SHEET2 C/16

+8V - ON
-8V - OFF

C151 10N L

C155 10N B

V155 BAS32-L

C156 10N L

V151 BA682-L

R151 2K74 L

L151 10UH L

C152 10N L

IF 74,7MHZ SHEET5 C/1

V152 BA682-L

V153 BA682-L

L152 10UH L

R152 2K74 L

L157 10UH B

ENA-HF SHEET2 C/16

+8V - ON
-8V - OFF

C153 10N L

C157 10N B

C158 10N L

V156 BAS32-L

C154 10N L

W1A 1 SHEET3 B/2

* NOT FITTED

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	92.996 (4)	10.91	PF	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	2ND MIXER
				GEPR.		PF	
				NORM			
				PLOTT	15.10.91		
05/00	96.191	05.91	HG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9094.01S
AEND. IND.	AENDERUNG NACHTRAG	DATUM	NAME	70 GMPH1 E-5050.10			BLATT NR. 3
				REG.T.V. 1010.5001		ERSTE Z. 1010.5[illegible]	

L205 R206 P200, P201 C218 X220, X225 P250 R252 X250

F

SRD MULTIPLIER

+10VF
R203 200R L
C201 10N L
L200 407H L
R201 619R L
C213 1N L
R208 3K92 L
C205 1N L
L205 76NH T
L206 10NH
L207 10NH
C218 5-1P5 B
C217 1P B MINI
C200 1N L
REF 2ND LO
64MHZ 7DBM
SHEET6 D/5
V200 NE85632
R200 1K L
C206 100P L
C215 470PP L
R202 12R1 L
R209 4R75 L
C214 1N L
+10VF P200
R205 100R L
P201
R206 2K
SRD BIAS
C216 10N B
R207 475R B
V205 5082-0112
+10VH
L212 1U2H
+10VF
C212 100N L
TP1
SHEET2 B/8
R212 100R B
R211 47K5 B
C210 1P B
R213 1M B
C211 100P B
V210 HSMS 2800
R214 100R B

G

PHASE DETECTOR

X220 X220 X220 X220
B220 TFM2
LO RF IF
C221 4P7 B
R220 51R1 B
X225 1
X226
1280MHZ 2DBM

H

LOOP AMPLIFIER

-10VH
P250
OFFSET
R252 50K
C253 10N L
R254 4K75 L
C250 150P L
L251 220NH
R250 274R L
R253 43R2 L
C257 22N L
C252 100N L
+10VH
C254 100N L
R251 10K L
C251 1U 050V MKT
C255 100N L
-10VH
N250 SE5534AFE
4...7V
R255 100R L
V250 HSMS 2800
C258 4N7 L
X250 1 2
X250
L250 220NH
L270 1UH
L271 100NH
C270 220P L

I

LOCK DETECTOR

R266 100R L
2V...3,5V
+10VH
R261 100K L
L260 1U2H
+10VH
+10VI
C261 10N L
L261 1U2H
-10VH
-10VI
C262 10N L
V260 BC860B-L
N260-A LM339D-L
R260 10K L
R263 150K L
SHEET2 C/9
TP4
C263 1N L
R262 100K L
R267 1K L
+10VH
+10VH
N260-B
3,5V
R264 33K2 L
2V
TP11
SHEET2 B/10 E/12
C260 10N L
N260-C
+10VH
N260-D
R265 100P I
R268 100P I
R266 100P I
C266 470P I
R269 1K I
TP1

BUFFER AMPLIFIER

+10VI
L231 100NH B
C231 1N B
C232 1N B
L230 100NH B
L232 100NH B
N230 MAR-7 B
N235 MAR-7 B
SHEET3 D/7
PLL
C230 100P B
R231 301R B
R235 68R1 B
C234 100P B
R232 301R B
C233 100P B
R233 100R B
R234 100R B
C235 100P B
1280MHZ -10DBM
R238 100R B
R236 100R B
C237 3P3
TP3
SHEET2 C/8
C238 100P B
R237 1M B
C236 100P B
V235 HSMS2800-B
+10VI
+10VI

VARIAN
VARO2/
VARO3/

05/00	
07	47796
05/00	
AEND. IND.	

BEHALTEN WIR UNS ALLE RECHTE VOR

X220, X225 · P250 · R252 · X250 · C271 · R280

G H I

PHASE DETECTOR

B220 TFM2 (LO, IF, RF)

X220 X2200 X2201 X2202

L250 220NH

C221 4P7 B

X225 1 — X226

R220 51R1 B

1280MHZ 2DBM

LOOP AMPLIFIER

-10VH

P250

OFFSET

R252 50K

C253 10N L

R254 4K75 L

R250 274R L

L251 220NH

C250 150P L

R251 10K L

C251 1U 050V MKT

R253 43R2 L

C257 22N L

C252 100N L

+10VH

C254 100N L

C255 100N L

-10VH

N250 SE5534AFE

R255 100R L

4...7V

V250 HSMS 2800

C258 4N7 L

LOCK DETECTOR

R266 100R L

2V...3,5V

R261 100K L

+10VH

V260 BC860B-L

N260-A LM339D-L

R260 10K L

R267 1K L

R263 150K L

C263 1N L

R262 100K L

SHEET2 C/9 TP4

N260-B

N260-C

N260-D

3,5V

2V

R264 33K2 L

R265 4K75 L

R268 100R L

C256 470P L

R269 1K L

TP11 SHEET2 B/10 E/12

C260 10N L

TP1 SHEET2 B/8

L260 1U2H

C261 100N L

-10VH

+10VI

-10VI

VCO 1280MHZ

L270 10H

L271 100NH

C270 220P L

C271 OP35-3P5

V270 BB405B

L272

C272 4P3 B MIN

C274 2P3 B MIN

C275 3P2 B MIN

V271 NE85637 B

R270 1K82 B

R271 4K75 B

R272 4K75 B

R273 51R1 B

C276 1P5 B MIN

L275

R274 100R B

R275 182R B

C277 56P B

R279 16R2 B

V272 NE85637 B

C278 10P B

C279 10N B

R276 221R B

R277 301R B

R278 301R B

LOAMP 1280MHZ SHEET3 B/7

L280 100NH

C285 100P B

R280 5K

VCO-BIAS

R281 7K5 B

V280 BC850B-B

R282 4K75 B

R283 100R

L286 1U2H

C286 10N L

C287 10N L

L287 1U2H

+10VA -10VA

* NOT FITTED

VARIANTENERKLAERUNG/VERSIONS

VAR02/MOD02: 1GHZ PULSGENERATOR/PULSE GENERATOR
VAR03/MOD03: 2GHZ PULSGENERATOR/PULSE GENERATOR

ACHTUNG: ESD!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47296 (4)	10.91	PT	1KEE	TAG	NAME	BENENNUNG
07	47296 (21)	02.92	NL	BEARB.		PF	2ND MIXER
				GEPR.		PF	
				NORM			
				PLOTT	15.10.91		
05/00	96969	05.91	RG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9004.01
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME				

PG 1.0 1010.5001

L300-L302 L303,L304 L305-L307 X320,X330 L332,L333

74,7MHZ BANDPASS FILTER

J1 J2 J3

L300 105NH T L301 180NH T L303 180NH T L304 180NH T L305 105NH T L306 180NH T

IF 74,7MHZ
SHEET3 C/11

C301 12P N150 C302 12P N150 C303 15P N150

L302 54NH T L307 54NH T

C305 100P C306 100P C310 120P C307 100P C308 100P C311 120P

T300 (-3DB)

R300 100R

X320 1 X320 2 X320 3 X320 4

X330 1 X330 2 X330 3 X330 4

K IF PANORAMA AMPLIFIER

PANORAMA OUT X131 1

W2A 1 W2B 1

TP7 SHEET2 B/9 C/10

+10VO +10VK

L243 1U2H C243 10N L

C324 1U 25V TA B

R320 10K B R326 9K09 B R327 130R

V320 BC860B-B

R321 1K B C322 4N7 B C323 100N B

L320 4U7H L L321 4U7H L

C321 4N7 L R322 243R R323 13R L C326 4N7 L

C320 4N7 L

V325 NE85637 L

R324 16R2 L R325 16R2 L

R383 22R1 L C380 2N2 L

R380 221R L R381 221R L

L384 1UH L C384 10N L

L381 270NH C381 1P8 L C382 15P L R385 619R L C383 27P L

V380 U310

L380 3U3H R384 51R1 L

C241 100P L R242 100R L

M 3RD IF AMPLIFIER

+10VM

C334 1U 25V TA L

R331 10K L R332 9K09 L R333 130R R334 100K L

V330 BC860B-L

R330 1K L C332 4N7 L C333 100N L L330 4U7H L L331 4U7H L

R335 100K L C335 100N L

C331 4N7 L R336 301R R337 24R3 L C336 18P L332 260NH T

C330 4N7 L

V335 NE85637 L

L333 370NH T C337 22P

R338 12R1 T R339 12R1 T

L244 1U2H C244 10N L

C242 100P L R243 100R L

C245 2P7 L R245 100K L

V245 HSMS2800-L

C246 10N L R246 1M L

C247 100P L R247 100R L

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

VARIANTENERKLAERUNG/VERSIONS

VAR02/MOD02: 1GHZ PULSGENERATOR/PULSE GENERATOR
VAR03/MOD03: 2GHZ PULSGENERATOR/PULSE GENERATOR

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.9094.01S

00/00 07/00 AEND IND

L305-L307 X320,X330 L332,L333 X352 X370 L352 X350

PANORAMA OUT X131 1

W2A 1 W2B 1

TP7 SHEET2 B/9 TP8 C/10

+10VO +10VO

K IF PANORAMA AMPLIFIER

+10VK

L384 10U L
C384 10N L
L381 270NH
C381 1P8 L
C382 15P L
C383 27P L
R385 619R L
V380 U310
L380 303H
R384 51R1 L
C380 2N2 L
C241 100P L
C240 100P B
R242 100R L
R241 100R B
C324 1U 25V TA B
L243 1U2H
C243 10N L
R320 10K B
R326 9K09 B
R327 130R
V320 BC860B-B
R321 1K B
C322 4N7 B
C323 100N B
L320 407H L
L321 407H L
C321 4N7 L
R322 243R
R323 13R L
C326 4N7 L
R383 22R1 L
C320 4N7 L
R380 221R L
R381 221R L
V325 NE85637 L
R324 16R2 L
R325 16R2 L

L 3RD LO AMPLIFIER

+10VO

TP6 SHEET12 B/9

C355 1U 25V TA L
R351 10K L
R352 3K92 L
V350 BC860B-L
R353 75R L
C352 4N7 L
R350 1K L
C353 4N7 L
L350 407H L
L351 407H L
C351 4N7 L
R354 562R L
C354 4N7 L
C356 18P
L352 170NH T
C350 4N7 L
V355 BFG97-L
R355 30R1 L
R356 30R1 L
R361 100K L
R360 1M L
C361 1N L
V360 BAS32-L
C360 10P L
V361 BAS32-L
17DBM
64MHZ 7DBM
3RD LO SHEET6 D/5
X352 X355 X352 X355
X350 X350

J3

L305 105NH T
L306 180NH T
T300 (-3DB)
C303 15P N150
L307 54NH T
C311 120P
R300 100R
X320 4
X320 3
X320 2
X320 1
X330 1
X330 2
X330 3
X330 4

M 3RD IF AMPLIFIER

+10VM

C334 1U 25V TA L
R331 10K L
R332 9K09 L
R333 130R
R334 100K L
V330 BC860B-L
R330 1K L
C332 4N7 L
C333 100N L
L330 407H L
L331 407H L
C331 4N7 L
R336 301R
R337 24R3 L
C336 18P
L332 260NH T
C330 4N7 L
V335 NE85637 L
C337 22P
L333 370NH T
R338 12R1 L
R339 12R1 L
C242 100P L
R243 100R L
C244 10N L
L244 102H
C245 2P7 I
R245 100K I
V245 BSM52800 I
C246 10N L
R246 1M L
C247 100P L
R247 100R L
C338 10P I
L334 1000H
R340 51R1 I

N 3RD MIXER

B370 SRA1H
W3A 1
W3B 1
3RD IF OUT
X132 1
X370 X370 X370 X370

SIONS
SE GENERATOR
SE GENERATOR

08/00	97296 (40)	06.92	NI	IKEE	TAG	NAME
				BEARB.		RB
				GEPR.		PF
				NORM		
				PLOTT	26.06.92	
07/00	97296 (21)	02.92	NI	ROHDE&SCHWARZ		
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAM	AD BEARB.	ESVS30	

BENENNUNG: 2ND MIXER

ZEICHN.-NR.: 1010.9094.01S

BLATT NR 5

REG.I.V. 1010.5001 ERSTE Z. 1010.5001

DIESE UNTERLAGE
BEHÄLTEN WIR UNS ALLE RECHTE VOR

O

64MHZ BUFFER

-10VO
+10VO
L410 1U2H
-10V
C410 10N L
L401
P421
P422
L411 1U2H
C411 10N L
R408 200R L
C402 4N7 L
L400 4U7H L
64MHZ ODBM
CAL SHEET6 E,D/6
R401 43R2 L
R403 274R L
R406 619R L
C401 1N L
R407 3K92 L
C403 1N L
L401 76NH T
T400 -3DB
SHEET5 D/8
3RD LO
64MHZ 7DBM
R402 43R2 L
C400 1N L
C404 33P L
R412 100R L
REF 2ND LO
SHEET4 D/1
C407 1N L
W4A 1
R400 1K5 L
R404 274R L
R405 1K L
V400 NE85632
R409 16R2 L
C405 100P L
R410 100K L
TPO SHEET2 C/8
64MHZ IN
X135 1
W4B 1
V401 HSMS2800-L
C406 10N L
R411 1M L
64MHZ 7DBM

S

100KHZ

+10V
L503 1U2H
C503 10N B
+5VA
R501 100R L
R502 33K2 L
R504 1K L
C501 4N7 L
D500-A 74ACTOOM-L
D501-A 74ACT74M-L
D501-B 74ACT74M-L
R505 1K L
CTR DIV16
CT=0
64MHZ, ODBM
L500 560NH
C502 6P8 L
CAL SHEET6 E/2
C500 1N L
R500 475R L
V500 U310
R503 10K L
D502-A 74HCT393I

R

64MHZ OUTPUT AMPLIFIER

64MHZ, ODBM
CAL SHEET6 E/2
R471 68R1 L
V471 BAR14-1 L
C473 1N L
R470 100R L
R472 221R L
R473 221R L
C471 10N L
N480 MAR-7 L
R480 68R1 L
R481 100R I.

Q

CAL. GENERATOR CONTROL

+10VQ
R420 30K1 L
D2
SHEET2 D/16
D1
N420-A LM339D-L
N420-B
N420-C
N420-D
L420 1U2H
C420 10N L
L421 1U2H
C421 10N L
R421 10K L
L-ON
R423 2K21 L
R424 10K L
R428 10K L
R426 4K75 L
V422 BCX17-L
V420 BC860B-L
P421
P422
R425 10K L
V423 BC850B-L
R429 4K75 L
-10VQ

LEVEL CONTROL

X440 1
X440 2
R462 10R L
C465 10N L
N440-E
C460 10U 35V MINI
C462 10N L
R457 100K L
V441 BAS32-L
TP10 SHEET2 B/10
R441 100K L
C440 10N I
R440 20K I
R443 10K I
N440-D
V440 BAS32-I
N440-C
R442 20K I
R444 10K I
R445 10K I
C441 47N I
R443 100R I
N440-B
R446 221K L
TP9 SHEET2 B/10
C480 10N I
R450 10K I
R451 511R I
C481 10N

P421 P422 +10V X440 R454 P500

L503 1U2H

S

C503 10N B

+5VA

100KHZ

R501 100R L
R502 33K2 L
R504 1K L

C501 4N7 L

64MHZ, 0DBM

L500 560NH

C502 6P8 L

CAL SHEET6 E/2

C500 1N L

R500 475R L

V500 U310

R503 10K L

D500-A 74ACT00M-L

D501-A 74ACT74M-L

D501-B 74ACT74M-L

R505 1K L

D502-A 74HCT393T-L

R506 1K L

D503-A 74HCT390T-L

DIVIDER 1:1000

P500

D503-B 74HCT390T-L

R507 1K L

D504-A 74HCT390T-L

R508 1K L

D504-B 74HCT390T-L

SHEET2 D/16
ENA 100HZ D4
ENA 100KHZ D3

D505-A 74HCT00T-L

D505-C

D505-D

L411 1U2H

C411 10N L

T400 -3DB

SHEET5 D/8
3RD LO

R412 100R L

64MHZ 7DBM

REF 2ND LO

SHEET4 D/1

TP0 SHEET2 C/8

C406 10N L

R411 1M L

P

64MHZ OUTPUT AMPLIFIER

64MHZ, 0DBM

CAL SHEET6 E/2

R471 68R1 L

V471 BAR14-1 L

C473 1N L

R470 100R L

R472 221R L

R473 221R L

C471 10N L

N480 MAR-7 L

L480 10UH L

C480 5P6 L

*C481 100P L

R480 68R1 L

R481 100R L

L481 1UH L

R482 100R L

C483 10N L

V480-A HSMS 2825

C482 10N

V480-B HSMS 2825

64MHZ -17DBM

R484 130R L

R483 274R L

R485 68R1 L

R

+10VQ

C494 470P L

-10VQ

C495 470P L

LEVEL CONTROL

P421

V422 BCX17-L

P422

R425 10K L

V423 BC850B-L

V420 BC860B-L

R429 4K75 L

-10VQ

R462 10R L

C465 10N L

N440-E

C460 10U 35V MINI

C462 10N L

R457 100K L

V441 BAS32-L

N440-D

TP10 SHEET2 B/10

R456 162K L

R441 100K L

C440 10N L

R440 20K L

V440 BAS32-L

N440-C

R444 10K L

R445 10K L

R442 2K7 L

R443 100R L

C441 47N L

X440 1
X440 2

R455 10K L

C461 10U 35V MINI

* R450 10K L

* R451 511R L

OUTPUT LEVEL R454 10K

R449 221K L

N440-B

R448 22K1 L

R447 22K1 L

R446 221K L

R452 51K1 L

R453 51K1 L

TP9 SHEET2 B/10

C450 10N L

C451 10N L

V460 BAS32-L

N440-A TL074ACD-L

R460 1M L

R461 1M L

C464 10N

C463 10N

* NOT FITTED

9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17

R454 P500

DIVIDER 1:1000

D503-A 74HCT390T-L
D503-B 74HCT390T-L
D504-A 74HCT390T-L
D504-B 74HCT390T-L
P500
R506 1K L
R507 1K L
R508 1K L
CTR CT=0 DIV2 DIV5 CT

SHEET2 D/16
ENA 100HZ D4
ENA 100KHZ D3

D505-A 74HCT00T-L
D505-B
D505-C
D505-D

+5V
L520 1U2H
C520 1N L
+5VS
C504 1N L
C505 1N L
R509 100R

D2 SHEET2 E/6
R520 4K75 L
R521 4K75 L
R510 2R21 L
V520 BC850B-L
V521 BCX17-L

D502-B 74HCT393T-L CTR DIV16 CT=0 CT
R512 1K L
+5VA
C516 10U

C510 10N L
C511 10N L
C512 10N L
D500-E
D501-C
D502-C
R511 2R21 L
C513 10N L
C514 10N L
C515 10N L
C517 10U
D503-C
D504-C
D505-E

D500-B 74ACT00M-L
D500-C
D500-D
R513 1K L

P

64MHZ -17DBM
L480 1UH L
C480 5P6 L
*C481 100P L
R484 130R L
R483 274R L
R485 68R1 L
L481 1UH L
R482 100R L
C482 1DN
V480-A HSMS 2825
V480-B HSMS 2825
C461 10U 35V MINI

OUTPUT LEVEL R454 10K
N440-A TL074ACD-L
R448 22K1 L
R447 22K1 L
R452 51K1 L
R453 51K1 L
C451 10N L
V460 BAS32-L
R460 1M L
R461 1M L
C464 10N
C463 10N

+10VQ
-10VQ
C494 470P L
C495 470P L
C496 10N L
C490 10N L
L490 100H

X495 100HZ/100KHZ
A131
+10V
-10V PULSE GENERATOR
+5V
X494 X496 X493
X490 X491 X492

N490-A SW-239
*C493 1P L
X134 1 CAL OUTPUT
C491 1N L
C492 1N L
L491 10UH L
L492 10UH L
CAL-B
CAL-A
SHEET2 B/16
W5 1
R492 0R L
R490 * 432R L
R491 * 432R L
N490-B

* NOT FITTED

VARIANTENERKLAERUNG/VERSIONS

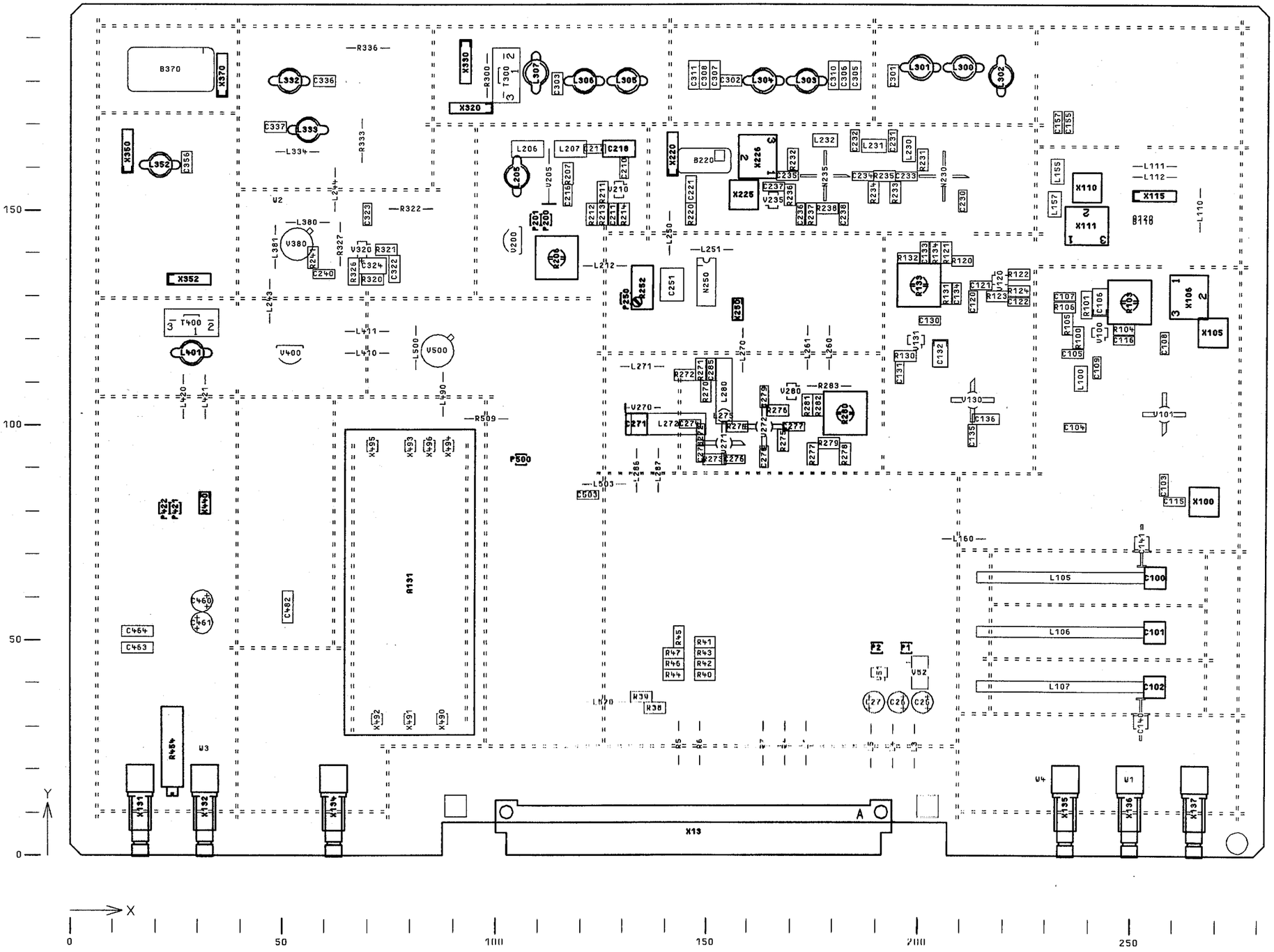
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A131: 1010.9071

VAR03/MOD03: 26HZ PULSGENERATOR/PULSE GENERATOR
A131: 1010.9094

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

06/00	47296 (4)	10.91	PT	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PT	2ND MIXER
				GEPR.		PT	
				NORM			
				PLOTT	15.10.91		
05/00	46349	05.91	NG	ROHDE&SCHWARZ			ZEICHN. NR. 1010.9094.01S
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	AU GENAU	E9V930		BLATT NR. 6
							NEG.I.V. 1010.5001 ERSTE Z. 1010.5099

DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, AENDERUNGEN KOENNEN NUR DURCH AENDERN DES DATENSATZES ERFOLGEN
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.



DARSTELLUNG SEITE B
VIEW ON SIDE B

VERKLEINERUNG

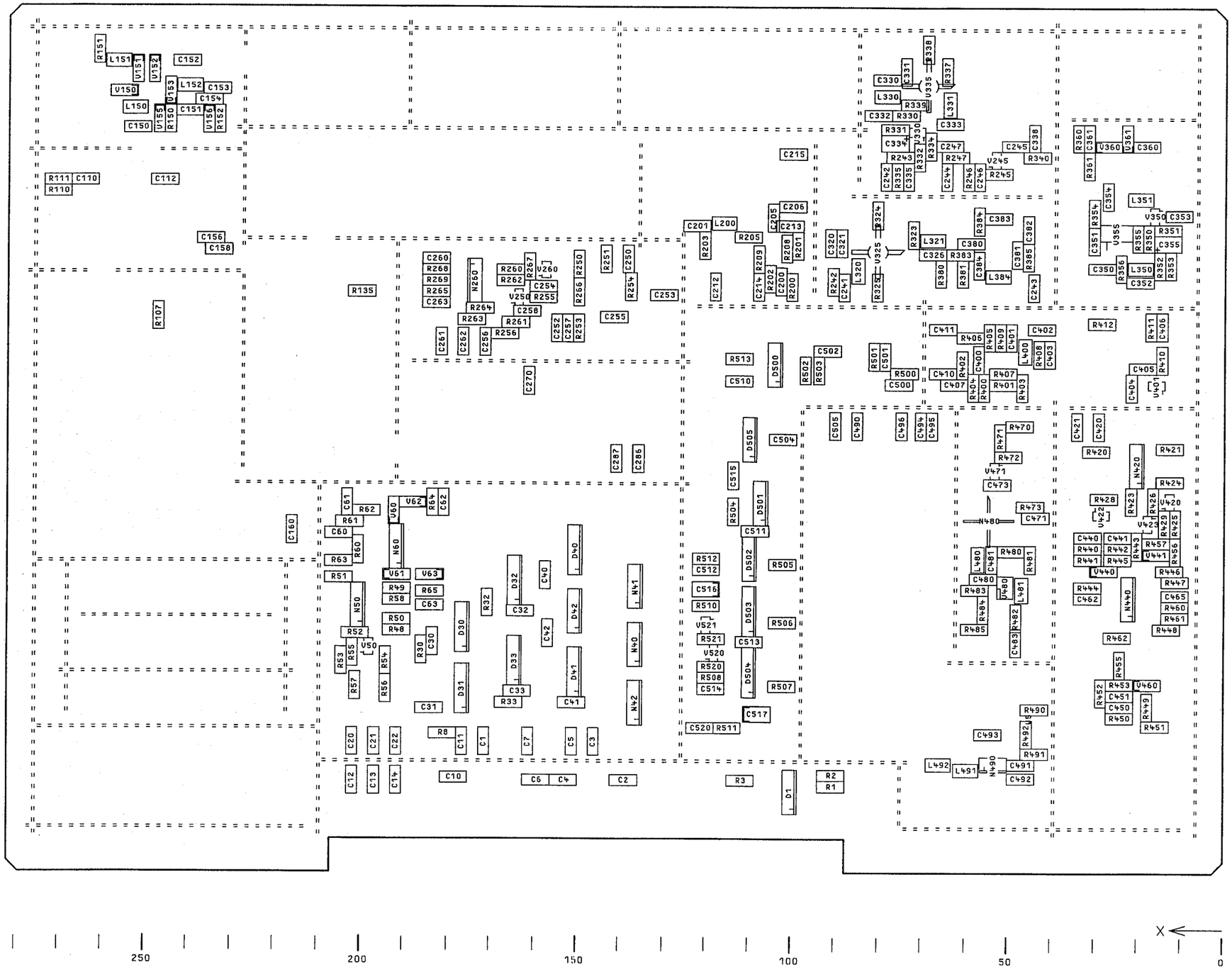
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				GEPR.		NG
				NORM		
				PLOTT	26.08.91	
01/00	46144	08.91	NG			
AEAO IND.	AENDERUNGS MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
EU 4004.1 TAV030

BENENNUNG: 2ND MIXER
Z

ZEICHN.-NR.: 1010.9094.01 EE
BLATT-NR.: 1+
V. BL.
ERS.Z.V. 1010.5001
ERSTE Z. 1010.5099

DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, RENDERUNGEN KOENNEN NUR DURCH RENDERN DES DATENSATZES ERFOLGEN
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.

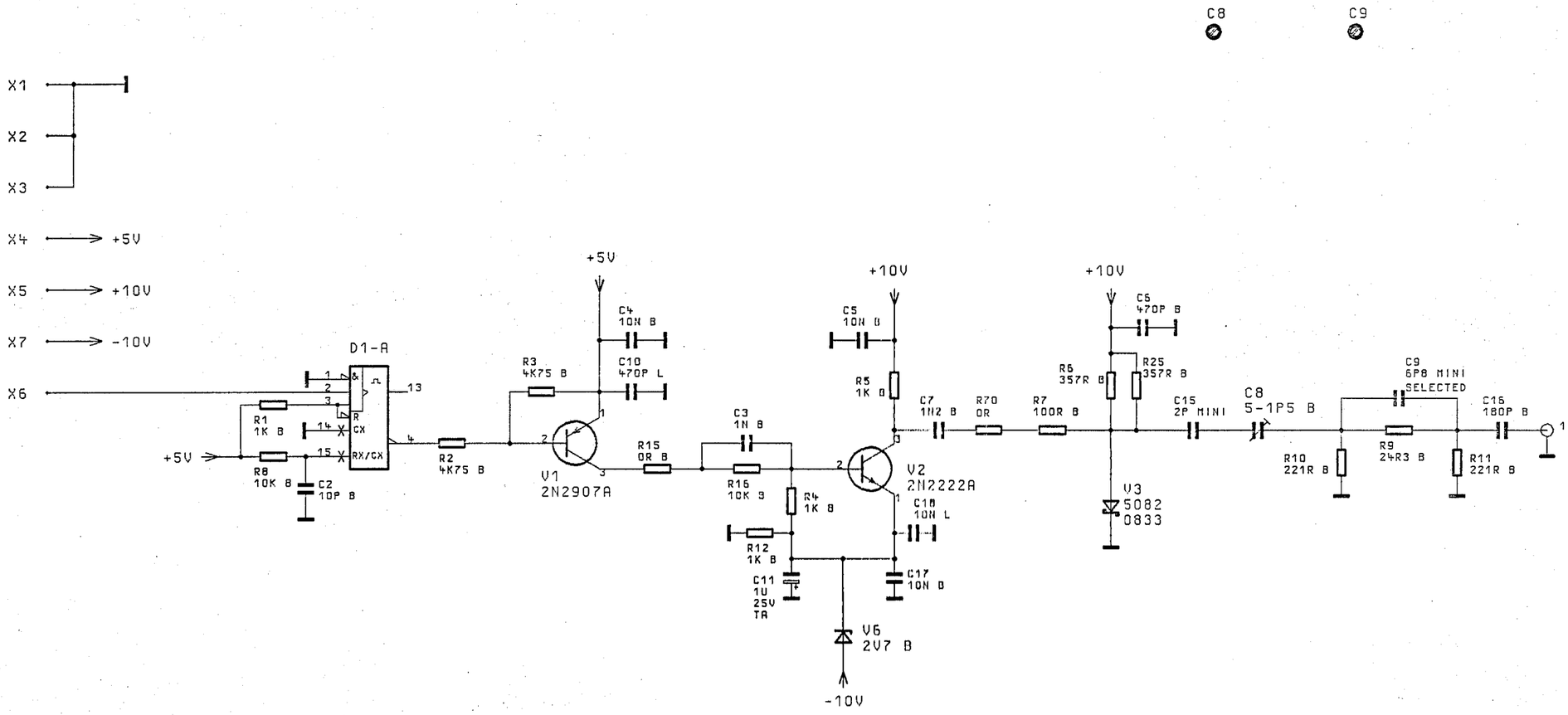


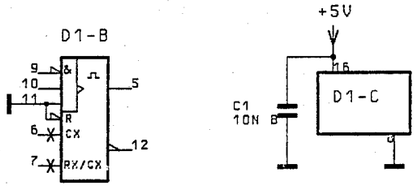
DARSTELLUNG SEITE A
VIEW ON SIDE A

VERKLEINERUNG
0 1 2 3 4 cm

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				BEARB.		NG	
				GEPR.		NG	
				NORM			
				PLOTT	25.08.91		
07/00	46349	05.91	NG	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9094.01 EE
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ZU GERAET ESVS30			BLATT-NR. 2+ V. BL.
				REG.I.V. 1010.5001		ERSTE Z. 1010.5099	

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR





VARIANTENERKLAERUNG/VERSIONS

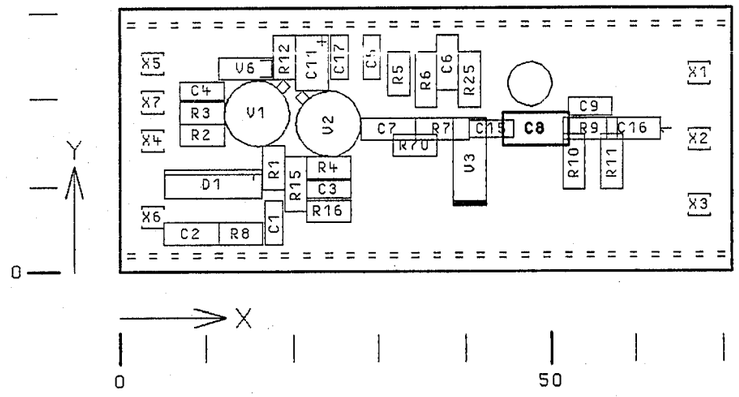
VAR02/MOD02: 1GHZ
VAR03/MOD03: 2GHZ

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

01/00	47296(6)	10.91	PF	1KEE	TAG	NAME	BENENNUNG
				BEARB.		PF	PULSE GENERATOR
				GEPR.		PF	
				NORM			
				PLOTT	21.10.91		
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9894.01 S
				ZU GERAET	ESU30		BLATT-NR. 1 V. 1 BL.
				REG.I.V.	1010.5001	ERSTE Z.	1010.9894

ZEICHN.-NR. 1010.9894.01 S

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR
DIESE ZEICHNUNG IST E... ZEICHNERAUSDUCK, AENDERUNGEN KOENNEN NUR DURCH AEN... DES DATENSATZES ERFOLGEN



DARSTELLUNG SEITE B
VIEW ON SIDE B

/01	47296(6)	10.91	PF
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME

1KEE	TAG	NAME
BEARB.		PF
GEPR.		PF
NORM		
PLOTT	21.10.91	

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
PULSE GENERATOR

Z

ZEICHN.-NR. 1010.9894.01 ED

BLATT NR. 1+

REG.I.V. 1010.5001 ERSTE Z.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

IF Selection Board

1010.9820.02

Contents

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Parts lists

Circuit diagrams

Component location plans

7 Testing and Repair of the IF Selection Board Module

7.1 Function Description

The description refers to modules of stock numbers 1010.8798.02 and 1010.9820.02.

The IF Selection Board contains the circuits for further processing the 10.7-MHz IF signal transferred from the 2nd mixer. It can be divided up into two functional groups:

The first group contains the 10.7-MHz IF amplifier, the main selection filters, the IF attenuation switch, the calibration amplifier, the noise elimination filters as well as the decoupling amplifiers for the IF outputs.

The 2nd group contains the envelope rectifier for rectifying the 10.7-MHz signal.

The IF Selection Board module is used in test receivers ESVS, ESVD, ESVB as well as ESS. For this reason not all functional groups are always loaded. Further, crystal filters can be loaded optionally instead of the LC filters with modules of stock number 1010.9820. The different loading versions are emphasized in the function description and in the circuit diagrams. The different test receivers are loaded with the following versions:

Test receiver	Possible loading versions
ESVS ESVS Vers. 31	1010.8798 mod. 02 1010.9820 mod. 02 1010.9820 mod. 12
ESS	1010.8798 mod. 03 1010.9820 mod. 03
ESVD	1010.9820 mod. 04
ESVB	1010.9820 mod. 06

7.1.1 10.7-MHz Signal Processing

7.1.1.1 Diplexer and 4th IF Amplifier

The 10.7-MHz output signal of the third mixer on the 2nd mixer module is transferred to the input of the module via X171. The diplexer terminates the mixer at a large bandwidth. IF Overload Detector V100, N102, N103, N100 monitors the input level at 138.7 MHz in the high-pass filter path of the diplexer.

The 10.7-MHz signal at the output of the low-pass filter path is amplified by the 4th IF amplifier V112, which has a high dynamic range. The operating point of the double feedback amplifier acting as a common emitter is stabilized by V110.

7.1.1.2 Main Selection

The main selection filters are switched into the IF signal path via pin diode switches. The differences in attenuation of the filters optimized with respect to settling are compensated for by potentiometers R161, R182, R636 as well as R230.

Crystal filter B145 is loaded with a 6-dB bandwidth of 9.5 kHz and the triple-tuned-circuit LC filter with a 3-dB bandwidth of 120 kHz with all instrument versions. The 6-dB bandwidth of 120 kHz results from cascading this filter with the 120-kHz noise selection filter which follows later and has a 3-dB bandwidth of 120 kHz as well.

A quadruple-tuned-circuit LC filter with a 3-dB bandwidth of 300 kHz or a quadruple-tuned-circuit LC filter with a 6-dB bandwidth of 1 MHz can be connected additionally with ESVD and ESVB. Further, the output signal of the main selection is amplified by 10 dB by trans-impedance amplifier N290 and transferred to X173 for further processing.

In the case of the ESS, the 1-MHz bandpass filter, which has already been mentioned with the ESVD, is loaded as well. A double-tuned-circuit LC filter with a 2-dB bandwidth of 100 kHz can be switched into the signal path in addition. Its insertion loss is compensated for by filter amplifier V205 whose operating point is stabilized by V207. Cascading the 120-kHz main and noise selection filters, which also have a 2-dB bandwidth of 100 kHz, with this 100-kHz filter results in a 6-dB bandwidth of 100 kHz.

In the case of the ESVB, a quadruple-tuned-circuit LC filter with a 1.5-dB bandwidth of 1.5 MHz is loaded instead of the 1-MHz bandpass filter. A double-tuned-circuit LC filter with a 0.75-dB bandwidth of 1.5 MHz is switched into the signal path in addition. Cascading these filters with the 1.5-MHz noise selection filter, which follows later and has a 0.75-dB bandwidth of 1.5 MHz as well, results in the 3-dB bandwidth of 1.5 MHz. As with the ESVD, trans-impedance amplifier N290 transfers the output signal of the main selection to X173 amplified by 10 dB.

In the case of the ESVS Vers. 31, the IF Selection Board of stock number 1010.9820 mod. 12 is fitted. Here crystal filter B800 with a 3-dB bandwidth of 50 kHz is loaded instead of the 100-kHz filter.

In the case of IF Selection Boards of stock number 1010.8798, the main selection filters are not switched independently of the noise selection filters. Due to an altered control circuit with all other modules this is possible there.

In the case of IF Selection Boards of stock number 1010.9820, crystal filters can be loaded optionally instead of the LC bandpass filters (special bandwidths).

7.1.1.3 5th IF Amplifier and IF Attenuation Switch

Subsequently the IF signal is transferred to the 5th IF amplifier, which compensates for the insertion loss of the IF filters, via X160 and X250. The operating point of this Darlington amplifier V250, 251 is stabilized by V255. Its output voltage is increased by 13 dB at R300, 301 by the 50-Ω-to-1000-Ω impedance transformation C301, 302, L300, 301. Trans-impedance amplifier N300, whose gain can be switched to 0, 10 or 20 dB by switching over feedback resistors R305 and R306, 307, taps the IF signal voltage at high impedance at R300. By adjusting potentiometer R300, the gain of the IF signal can be set in order to compensate for variations of the total gain of RF and IF signal processing, which are due to the components (cf. Section 6, Total Adjustment of Instrument). The output signal of N300 is attenuated by 0 dB or 20 dB by the switchable attenuator pads R312, 313, V310, 311. Thus the IF attenuation can be varied by maximally 40 dB in steps of 10 dB.

7.1.1.4 Calibration Amplifier

The calibration amplifier is again realized with a trans-impedance amplifier N350. Its gain can be set digitally to 12 dB ± 6 dB by D/A converter D370 by varying the feedback resistance, which results from the RF resistance of the two pin diodes V355, 356. Voltage-controlled power source N360B, C, V360 impresses the necessary direct current into the pin diodes. The characteristic of the calibration amplifier is adjusted using R370 and R377. NTC resistor R361 compensates for the temperature effect of the diodes so as to make the set gain of the calibration amplifier independent of the operating temperature.

In the case of the ESS, the output signal of N350 is amplified by 6 dB by N320 and transferred to X174.

7.1.1.5 Noise Selection and Output Amplifier

Buffer amplifier V400 has a voltage gain of 1 and drives the noise selection filters with low delay distortion, which are switched into the signal path by analog multiplexers D410, 450, at an impedance of 1 kΩ.

In the case of test receivers ESVD and ESS, a double-tuned-circuit LC filter with a 3-dB bandwidth of 1.8 MHz can be connected in addition to the crystal filter with a 3-dB bandwidth of 16 kHz and the double-tuned-circuit LC filter with a 3-dB bandwidth of 120 kHz respectively. In the case of test receiver ESVB, a double-tuned-circuit LC filter with a 0.75-dB bandwidth of 1.5 MHz is loaded instead of the 1.8-MHz bandpass filter.

The differences in attenuation of the noise selection filters are adjusted using R431 and R445.

The filtered IF signal is tapped at high impedance and amplified by amplifier N450. NTC resistor R463 compensates for the temperature effect of the transmission amplification of the module. Subsequently the output signal of the amplifier is fed to the linear demodulator or transferred to X177, decoupled via attenuator pads. Buffer amplifier N455 transfers the IF signal to X176 for measuring purposes.

7.1.2 Envelope Rectifier

Complementary cascode circuits V500, 501 and V502, 503 impress a current proportional to the input voltage at high impedance into rectifier diodes V515. Parallel resonant circuit L515, C516, 517, which is adjusted to 10.7 MHz, compensates for the output capacitance of the cascode as well as stray capacitance. The d.c. operating point is stabilized by amplifier N510-A. The following active lowpass filter (N540) amplifies the rectified IF signal present at R515, 516 and filters out the high-frequency IF signal components. The slight decrease of the voltage gain of the cascode for small input levels is compensated for by increasing the gain of the lowpass filter using V530, 531 and R534. The offset voltage of the lowpass filter is adjusted using R520.

7.2 Test Instruments and Utilities

For testing and adjusting the IF Selection Board module, the following test instruments and utilities are required:

Item	Type of Instrument	Specifications required	Suitable instrument	R&S order no.
1	Signal generator		SMG	801.0001.52
2	Network analyzer	Frequency range: 1 MHz to 100 MHz	e.g. HP 3577 A	
3	Digital voltmeter		UDS5	349.1510.02
4	Spectrum analyzer		FSA	804.8010.52
5	50-Ω terminating resistance		RAD	289.8966.00

7.3 Troubleshooting

Note: ***Correct functioning of the modules Display Board, Rear Panel, CPU Board, FRN and UHF Synthesizer, VHF Preselector, 2nd Mixer and Detector Board is required for the automatic test of this module and for troubleshooting. Since the automatic test is aborted on principle if a measurement exceeds the predefined tolerance limits in order to avoid absurd error messages, the test functions can be called manually in the Board Test menu (cf. Section 6.1.3.3.h) by means of external signals for further error location.***

- For further location of faults, call the "Board Test" selftest menu (09 Selftest).
- Select the IF SELECTION BOARD module using keys ↑ or ↓.
- Enter test function 0. The test of the module is executed.
- In the case of an error message, enter the test function indicated and switch over to the test mode by pressing one of the Enter keys.

The required default setting for the IF Selection Board (see below) as well as the default setting for the respective test function (cf. table 7-1) are set automatically. The measured test voltage is indicated on the LEVEL display. The permissible tolerance limits are output on the DATA INPUT display.

Further troubleshooting should be performed according to the troubleshooting flowcharts. The error messages (ERR:) as well as error messages from total calibration serve as entry points into the troubleshooting flowcharts. Check the serial interface (cf. Section 6.1.2) using tables 7-3 and 7-4.

ESVS, ESVD, ESS default setting:

Frequency:	64 MHz
RF attenuation:	0 dB
IF attenuation:	40 dB
Calibration amplifier:	0 dB
IF bandwidth:	10 kHz
Preamplifier:	off
Calibration generator:	64 MHz on

Table 7-1 Test functions of board test IF Selection Board

Test function	Description	Settings	Rated value	Error message
0	Complete test of module Test function 1 to 8 (+ test function 10 ESS, ESVB, ESVS Vers. 31) (+ test function 11 with ESVD with loaded option ESVD-B1)	Test function 1 to 8 (+ Test function 10 ESS, ESVB, ESVS Vers. 31) (+ test function 11 with ESVD with loaded option ESVD-B1)	Test function 1 to 8 (+ test function 10 ESS, ESVB, ESVS Vers. 31) (+ test function 11 with ESVD with loaded option ESVD-B1)	Test function 1 to 8 (+ test function 10 ESS, ESVB, ESVS Vers. 31) (+ test function 11 with ESVD with loaded option ESVD-B1)
1	-5-V voltage generation	Measure T0	2.2 to 2.8 V	Supply -5 V
2	Operating point of the 4th IF amplifier	Measure T3	1.75 to 4.0 V	4th IF Amp Bias
3	Operating point of the 5th IF amplifier	Measure T4	1.65 to 2.45 V	5th IF Amp Bias
4	Control of the calibration amplifier	Measure T5	0.25 to 1.30 V	Cal Amp
5	10.7-MHz level at X171	Switch on preamplifier Measure T6	0.13 to 0.85 V	X171 Level
6	10.7-MHz level at X177	Calibration amplifier -2 dB Measure T0 on the Detector Board	0.13 to 0.85 V	X177 Level
7	Setting the video voltage at the demodulator output to 4 V	Level out calibration amplifier to the rated value at T2 Measure T2	1.98 to 2.02 V	Demodulator
8	Checking the linearity of the demodulator: after switching the RF ATT, a level of 20 dB less at the demodulator output	Level out calibration amplifier to the rated value at T2 Switch RF ATT to 20 dB Measure T2	1.98 to 2.02 V 0.16 to 0.25 V	Demodulator
9	Recognition of loaded special bandwidths	Measure T7	> 1.5 V < 0.5 V	no special BW special BW
10 (only ESS, ESVB, ESVS Vers. 31)	Operating point of the IF-filter amplifier	Measure T1	0.7 to 3.9 V	Filter Amp Bias
11 (only ESVD + Opt. ESVD-B1)	10.7-MHz level at X173	IF bandwidth: 300 kHz T10 on the module Measure I/Q demodulator	0.12 to 4 V	X173 Level

7.3.1 Troubleshooting Flowcharts

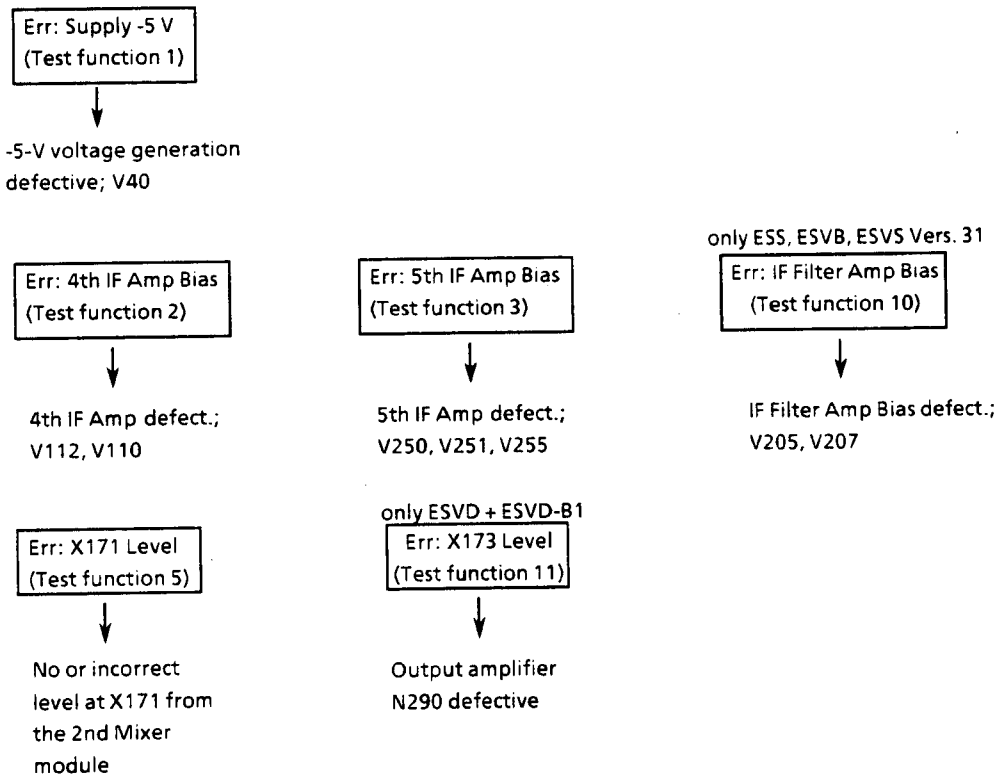
For troubleshooting with the IF Selection Board, the table of the correction values in total calibration should be used (cf. Section 6.1.3.3.k).

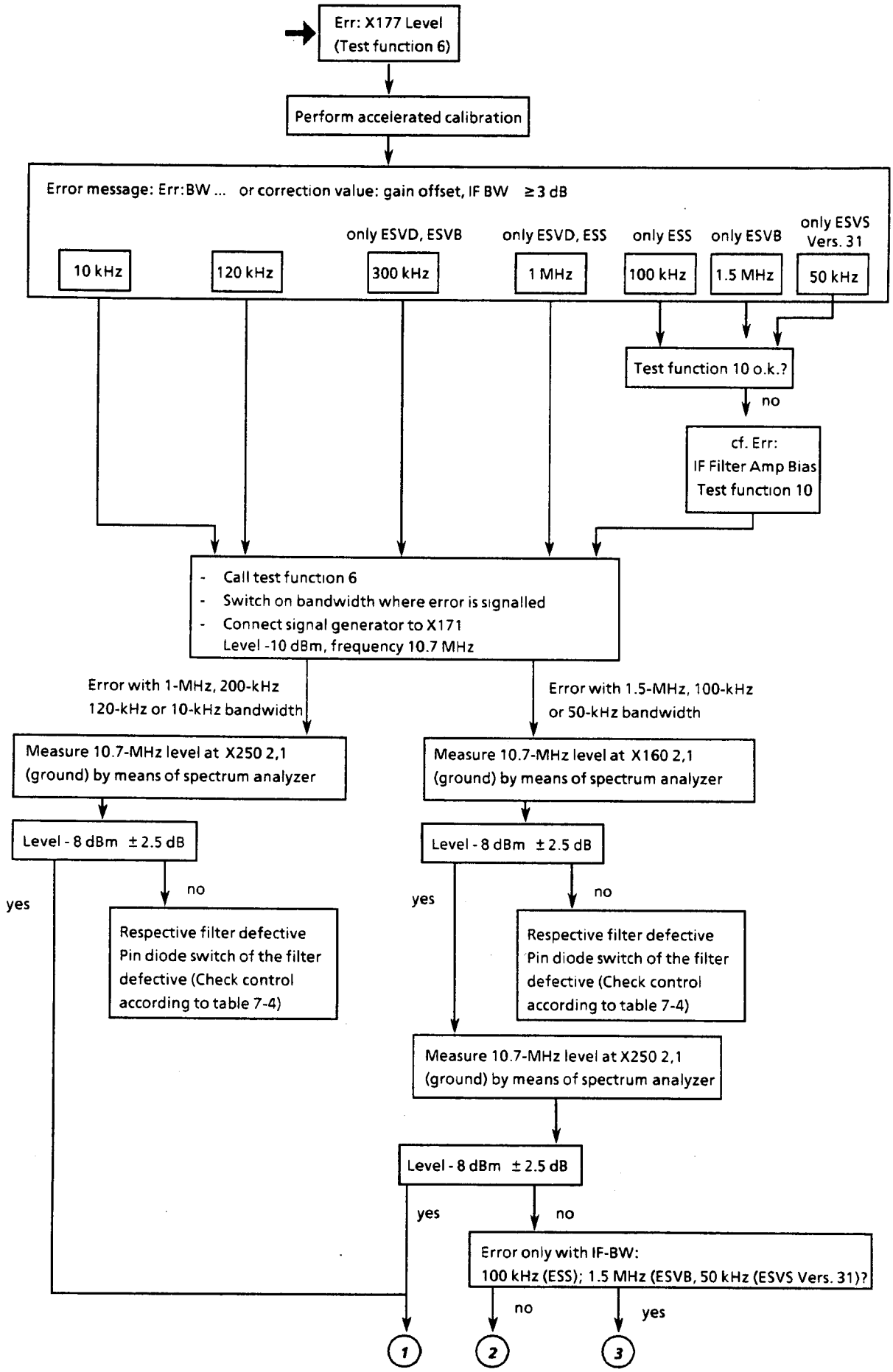
Test Setup in Troubleshooting

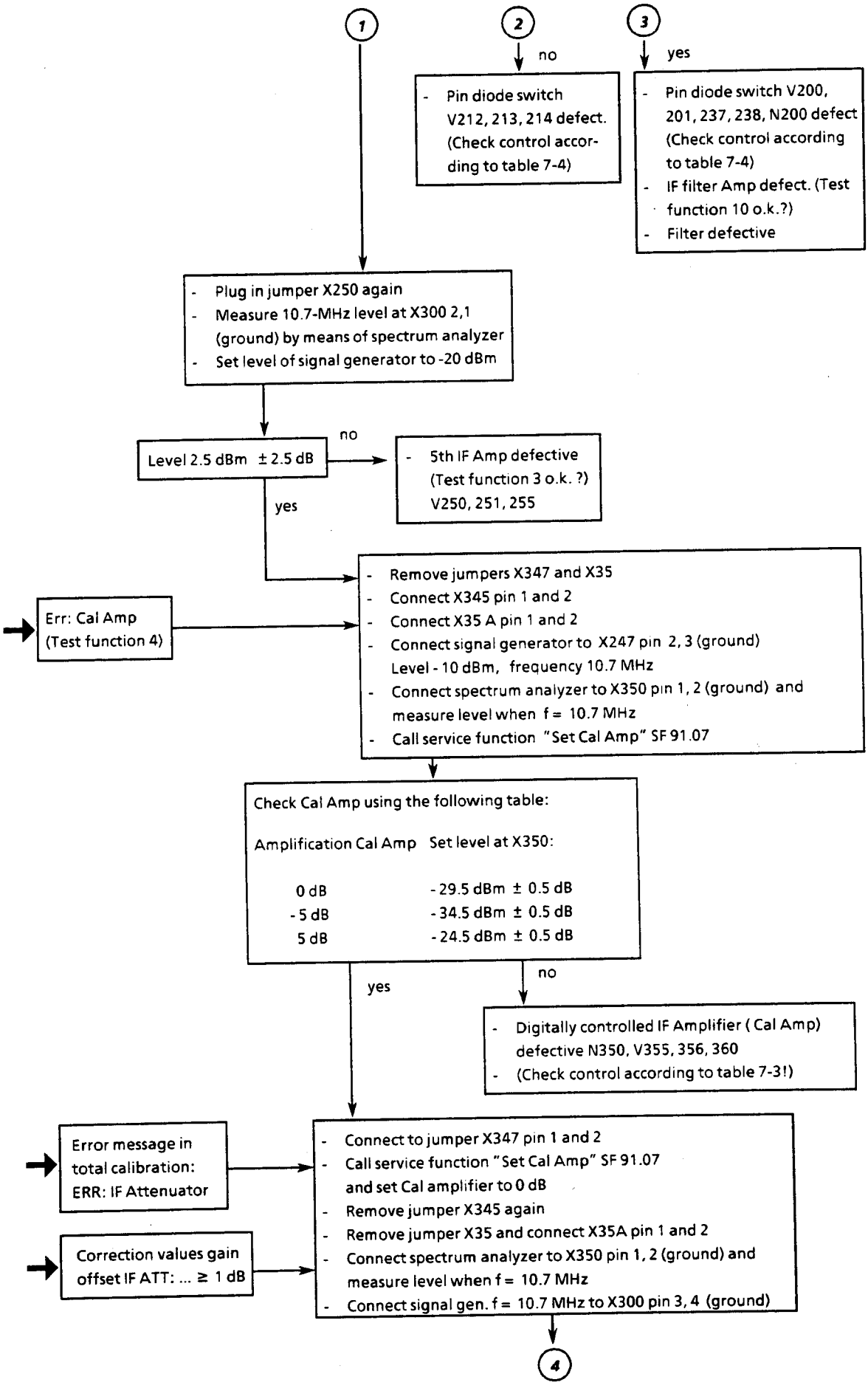
- Remove upper cover of the module
- Plug module onto the service kit
- Connect module to the test receiver via the RF cabling

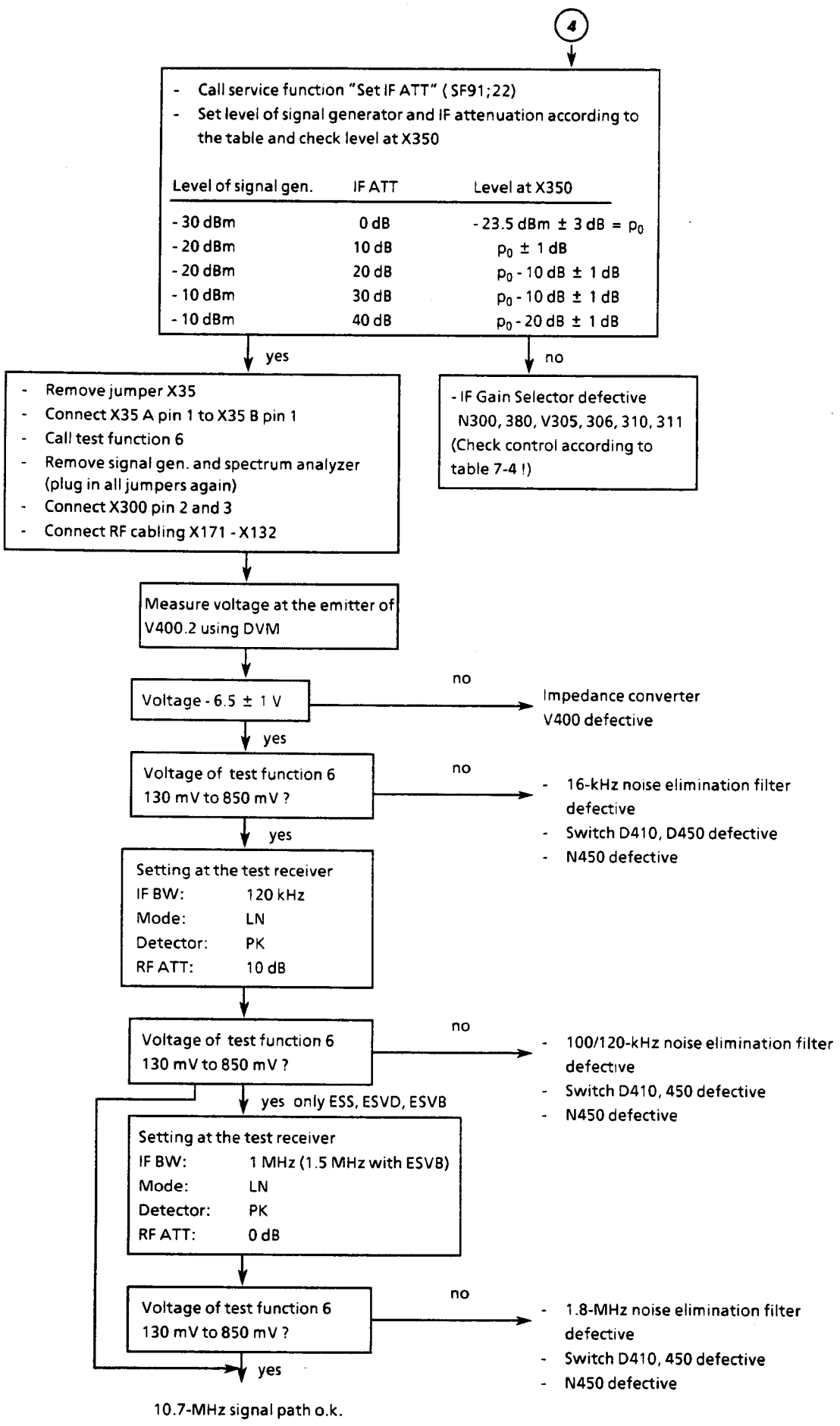
Note: After every work at the main or noise selection filters these have to be readjusted according to Section Testing and Adjustment!

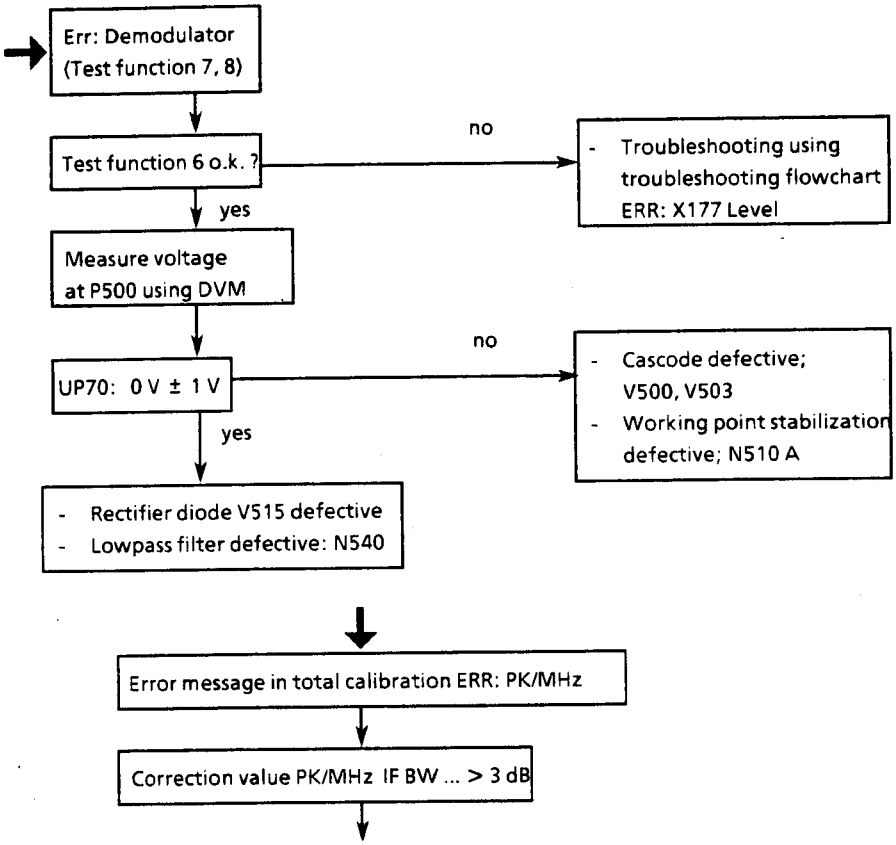
After terminating troubleshooting, all jumpers have to be plugged in correctly again!




Err: X177 Level
(Test function 6)
Perform accelerated calibration
Error message: Err:BW ... or correction value: gain offset, IF BW ≥3 dB
10 kHz
120 kHz
only ESVD, ESVB
300 kHz
only ESVD, ESS
1 MHz
only ESS
100 kHz
only ESVB
1.5 MHz
only ESVS Vers. 31
50 kHz
Test function 10 o.k.?
no
cf. Err:
IF Filter Amp Bias
Test function 10
- Call test function 6
- Switch on bandwidth where error is signalled
- Connect signal generator to X171
Level -10 dBm, frequency 10.7 MHz
Error with 1-MHz, 200-kHz
120-kHz or 10-kHz bandwidth
Error with 1.5-MHz, 100-kHz
or 50-kHz bandwidth
Measure 10.7-MHz level at X250 2,1
(ground) by means of spectrum analyzer
Measure 10.7-MHz level at X160 2,1
(ground) by means of spectrum analyzer
Level - 8 dBm ±2.5 dB
Level - 8 dBm ±2.5 dB
yes
no
Respective filter defective
Pin diode switch of the filter
defective (Check control
according to table 7-4)
yes
no
Respective filter defective
Pin diode switch of the filter
defective (Check control
according to table 7-4)
Measure 10.7-MHz level at X250 2,1
(ground) by means of spectrum analyzer
Level - 8 dBm ±2.5 dB
yes
no
Error only with IF-BW:
100 kHz (ESS); 1.5 MHz (ESVB, 50 kHz (ESVS Vers. 31)?
no
yes
1
2
3


1
2
3
no
yes
- Pin diode switch V212, 213, 214 defect. (Check control according to table 7-4)
- Pin diode switch V200, 201, 237, 238, N200 defect (Check control according to table 7-4)
- IF filter Amp defect. (Test function 10 o.k.?)
- Filter defective
- Plug in jumper X250 again
- Measure 10.7-MHz level at X300 2,1 (ground) by means of spectrum analyzer
- Set level of signal generator to -20 dBm
Level 2.5 dBm ± 2.5 dB
no
- 5th IF Amp defective (Test function 3 o.k. ?) V250, 251, 255
yes
Err: Cal Amp (Test function 4)
- Remove jumpers X347 and X35
- Connect X345 pin 1 and 2
- Connect X35 A pin 1 and 2
- Connect signal generator to X247 pin 2, 3 (ground) Level - 10 dBm, frequency 10.7 MHz
- Connect spectrum analyzer to X350 pin 1, 2 (ground) and measure level when f = 10.7 MHz
- Call service function "Set Cal Amp" SF 91.07
Check Cal Amp using the following table:
Amplification Cal Amp Set level at X350:
0 dB -29.5 dBm ± 0.5 dB
-5 dB -34.5 dBm ± 0.5 dB
5 dB -24.5 dBm ± 0.5 dB
yes
no
- Digitally controlled IF Amplifier (Cal Amp) defective N350, V355, 356, 360
- (Check control according to table 7-3!)
Error message in total calibration: ERR: IF Attenuator
Correction values gain offset IF ATT: ... ≥ 1 dB
- Connect to jumper X347 pin 1 and 2
- Call service function "Set Cal Amp" SF 91.07 and set Cal amplifier to 0 dB
- Remove jumper X345 again
- Remove jumper X35 and connect X35A pin 1 and 2
- Connect spectrum analyzer to X350 pin 1, 2 (ground) and measure level when f = 10.7 MHz
- Connect signal gen. f = 10.7 MHz to X300 pin 3, 4 (ground)
4


4
- Call service function "Set IF ATT" (SF91;22)
- Set level of signal generator and IF attenuation according to the table and check level at X350
Level of signal gen. IF ATT Level at X350
- 30 dBm 0 dB - 23.5 dBm ± 3 dB = p0
- 20 dBm 10 dB p0 ± 1 dB
- 20 dBm 20 dB p0 - 10 dB ± 1 dB
- 10 dBm 30 dB p0 - 10 dB ± 1 dB
- 10 dBm 40 dB p0 - 20 dB ± 1 dB
yes
no
- Remove jumper X35
- Connect X35 A pin 1 to X35 B pin 1
- Call test function 6
- Remove signal gen. and spectrum analyzer (plug in all jumpers again)
- Connect X300 pin 2 and 3
- Connect RF cabling X171 - X132
- IF Gain Selector defective N300, 380, V305, 306, 310, 311 (Check control according to table 7-4 !)
Measure voltage at the emitter of V400.2 using DVM
Voltage - 6.5 ± 1 V
no
Impedance converter V400 defective
yes
Voltage of test function 6 130 mV to 850 mV ?
no
- 16-kHz noise elimination filter defective
- Switch D410, D450 defective
- N450 defective
yes
Setting at the test receiver
IF BW: 120 kHz
Mode: LN
Detector: PK
RF ATT: 10 dB
Voltage of test function 6 130 mV to 850 mV ?
no
- 100/120-kHz noise elimination filter defective
- Switch D410, 450 defective
- N450 defective
yes only ESS, ESVD, ESVB
Setting at the test receiver
IF BW: 1 MHz (1.5 MHz with ESVB)
Mode: LN
Detector: PK
RF ATT: 0 dB
Voltage of test function 6 130 mV to 850 mV ?
no
- 1.8-MHz noise elimination filter defective
- Switch D410, 450 defective
- N450 defective
yes
10.7-MHz signal path o.k.

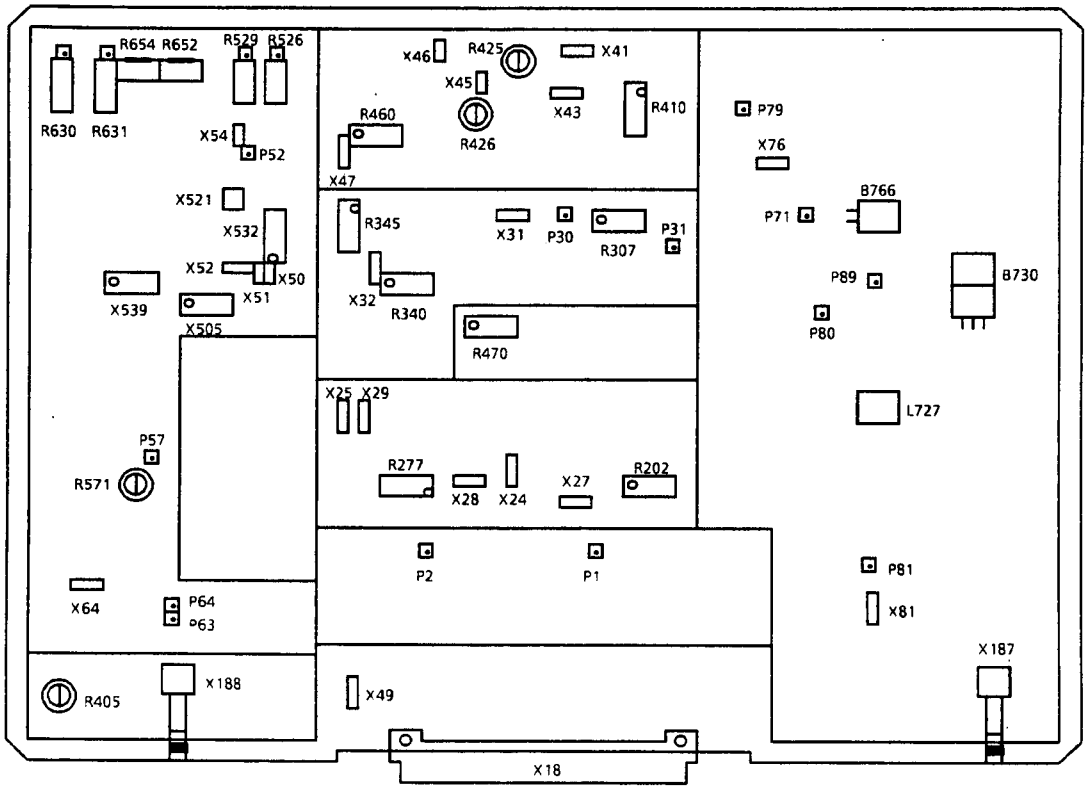


Bandwidth of the respective (IF BW) main and/or noise selection filter out of tolerance. Perform adjustment according to 7.4 Testing and Adjustment.

7.4 Testing and Adjustment

Operate the module via the ESVS service kit outside the instrument. Screw off the RF cover at the component side.

7.4.1 Location of Jumpers, Test Points and Adjustment Elements



7.4.2 Power Supply

The supply voltages have to be measured at the adapter of the module and not at the power supply unit (e.g. + 10 V at X17AC4).

Testing the supply voltages:

+ 10 V ± 100 mV	max. 200 mA
– 10 V ± 100 mV	max. 150 mA
+ 5,4 V ± 100 mV	max. 60 mA

Testing the -5-V power supply:

- Voltage at P40 ..... - 5 V ± 0.4 V
- Call test function 1
- Selftest voltage is ..... 2.5 V ± 0.3 V

7.4.3 Testing the Overload Detectors

a) Test Setup

- Connect signal generator to X171
- Settings at the signal generator:
  Frequency ..... 138.7 MHz,
  Level ..... -7 dBm

b) Measurement

- The OVERLOAD indication on the level display is not illuminated
- Increase the level of the signal generator in steps of 1 dB
  until the OVERLOAD indication in the LEVEL display is illuminated
- Overload threshold ..... 1 dBm ± 2 dB
- Set level of signal generator: ..... 1 dBm
- Call test function 5
- Selftest voltage ..... 0.19 V to 0.26 V

7.4.4 Testing the 4th IF Amplifier

a) Test Setup

Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Span ..... 3 MHz
Output level ..... -10 dBm
Measurement ..... S21 measurement,
Resolution ..... 1 dB/Div

- Calibrate network analyzer to 0 dB
- Remove jumper X110
- Connect output of the network analyzer to X171
- Connect input of the network analyzer to X110.2,1(ground)

b) Measurement

- Call test function 2
- Test voltage ..... 2.6 to 3.3 V
- Gain X171-X110 ..... 10.7 dB ± 0.3 dB
- Connect X110.2, 3 to the jumper again

7.4.5 Testing and Adjustment of the Main Selection Filters

- Call test function 9
- Test voltage ..... 0 to 0.1 V → special bandwidths are loaded
- Test voltage ..... 2.6 to 2.8 V → special bandwidths are not loaded

a) Test Setup

- Remove jumpers X110 and X250

Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Output level ..... -10 dBm
Channel 1: ..... S21 measurement, 1 dB/Div
Channel 2: ..... S21 delay measurement, Resolution depending on the filter (see the following table)

Table 7-2 Settings of the network analyzer as a function of the filter bandwidth

Filter bandwidth	Span	Resolution in delay measurement
9.5 kHz	20 kHz	5 µs/Div
50 kHz (only ESVS Vers. 31)	100 kHz	5 µs/Div
100 kHz (only ESS)	200 kHz	100 ns/Div
120 kHz	200 kHz	100 ns/Div
300 kHz (only ESVD a. ESVB)	1 MHz	100 ns/Div
1 MHz (only ESS a. ESVD)	3 MHz	40 ns/Div
1.5 MHz (only ESVB)	3 MHz	100 ns/Div

- Calibrate network analyzer
- Connect the output of the network analyzer to X110.3,4 (ground)
- Connect the input of the network analyzer to X250.2,1 (ground)

c) Measurement and Adjustment

9.5-kHz Filter:

Setting at the test receiver:

IF BW 10 kHz

- Set C145 and C146 to minimal attenuation with round passband curve.

Variation of the group delay within the 3-dB bandwidth ..... ≤ 15 µs

Centre frequency ..... 10.7 MHz ± 1 kHz
6-dB bandwidth ..... 10 kHz ± 0.5 kHz
Insertion loss ..... -9.2 dB ± 0.5 dB
(Note down measured value).

120-kHz Filter:

Setting at the test receiver:
IF BW 120 kHz

- Set L163, L169 and L174 to minimal attenuation with round passband curve.

  Variation of the group delay within
  the 2-dB bandwidth ..... ≤ 300 ns

  Centre frequency ..... 10.7 MHz ± 2.5 kHz
  3-dB bandwidth ..... 124 kHz ± 7 kHz

- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R161 at ± 0.1 dB.
- Check the rated values again.

50-kHz Filter (only ESVS Vers. 31):

- Call test function 10
- Test voltage ..... 0.7 to 1.4 V
- Adjust the 120-kHz filter first (see above).

Setting at the test receiver:

IF BW 50 kHz

- Adjust C801 and C802 to minimal attenuation and minimal ripple of the attenuation in the passband. (The group delay does not have to be considered!)

  Centre frequency ..... 10.7 MHz ± 2 kHz,
  of the 3-dB bandwidth ..... 50 kHz ± 10 kHz
  6-dB bandwidth ..... 60 kHz ± 6 kHz

- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R230 at ± 0.1 dB.
- Check the rated values again.

100-kHz Filter (only ESS):

- Call test function 10
- Test voltage ..... 0.7 to 1.4 V
- Adjust the 120-kHz filter first (see above).

Setting at the test receiver:

IF BW 100 kHz

- Set L230 and L235 to minimal attenuation with round passband curve.

  Variation of the group delay within
  the 2-dB bandwidth ..... ≤ 300 ns

  Centre frequency ..... 10.7 MHz ± 2.5 kHz,
  4-dB bandwidth ..... 104 kHz ± 6 kHz

- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R230 at ± 0.1 dB.
- Check the rated values again.

300-kHz Filter (only ESVD and ESVB):

Setting at the test receiver:

IF BW 300 kHz

- Set L184, L188, L191 and L194 to minimal attenuation with round passband curve.
- Variation of the group delay within the 3-dB bandwidth ..... ≤ 200 ns

  Centre frequency ..... 10.7 MHz ± 20 kHz
  6-dB bandwidth ..... 400 kHz ± 25 kHz
- The insertion loss at 10.3 MHz and 11.1 MHz is larger than the insertion loss at 10.7 MHz by at least 20 dB.
- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R182 at ± 0.1 dB.
- Check the rated values again.

1-MHz Filter (only ESS and ESVD):

Setting at the test receiver:

IF BW 1 MHz

- Set L650, L657, L663 and L670 to minimal attenuation with round passband curve.
- Variation of the group delay within the 3-dB bandwidth ..... ≤ 80 ns

  Centre frequency ..... 10.7 MHz ± 50 kHz
  6-dB bandwidth ..... 1 MHz ± 70 kHz
- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R636 at ± 0.1 dB.
- Check the rated values again.

1.5-MHz Filter (only ESVB):

- Call test function 10
- Test voltage ..... 0.7 to 1.4 V

Setting at the test receiver:

IF BW 1.5 MHz

- Remove jumpers X110, X160 and X250.
- Connect the output of the network analyzer to X160.2, 1 (ground).
- Connect the input of the network analyzer to X110.3, 4 (ground).
- Channel 2 of the network analyzer: ..... S11 measurement, 10 dB/Div
- Adjust L650, L657, L663 and L670 to minimal attenuation and S11 < -20 dB.
- Centre frequency ..... 10.7 MHz ± 50 kHz
  1.5-dB bandwidth ..... 1.5 MHz ± 100 kHz
- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R636 at ± 0.1 dB.

- Connect X160 pin 2 and pin 3 to a jumper again.
- Connect the output of the network analyzer to X110.3, 4 (ground).
- Connect the input of the network analyzer to X250.2, 1 (ground).
- Set R230 to centre position.
- Adjust L230 and L235 to minimal attenuation.
- Centre frequency ..... 10.7 MHz ± 50 kHz
  2.25-dB bandwidth ..... 1.5 MHz ± 100 kHz
- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R230 at 0.1 dB.
- Connect X110.2,3 to a jumper again.
- Connect X250.2,3 to a jumper again.

7.4.6 Testing the Output Amplifier (only ESVD and ESVB)

a) Test setup:

Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Span ..... 1 MHz
Output level ..... -20 dBm
Measurement ..... S21 measurement
Resolution ..... 1 dB/Div

- Calibrate network analyzer to 0 dB.
- Remove jumpers X250 and X300.
- Connect 50-Ω terminating resistance to X300 Pin 2,1 (ground).
- Connect the output of the network analyzer to X250.3,4 (ground).
- Connect the input of the network analyzer to X173.

b) Measurement:

- Gain X250-X173 ..... 10 dB ± 0.5 dB
- Connect X250.2,3 to a jumper again.
- Connect X300.2,3 to a jumper again.

7.4.7 Testing the 5th IF Amplifier

a) Test Setup

Settings at the network analyzer:

Centre frequency	10.7 MHz
Span	3 MHz
Output level	-20 dBm
Measurement	S21 measurement
Resolution	1 dB/Div

- Calibrate network analyzer to 0 dB.
- Remove jumpers X250 and X300.
- Connect the output of the network analyzer to X250.3,4 (ground).
- Connect the input of the network analyzer to X300.2,1 (ground).

b) Measurement

- Call test function 3.
- Test voltage ..... 1.9 to 2.6 V
- Gain X250-X300 ..... 20.5 dB ± 0.4 dB
- Connect X250.2,3 to a jumper again.
- Connect X300.2,3 to a jumper again.

7.4.8 Testing and Adjustment of the Calibration Amplifier

a) Test Setup

Settings at the network analyzer:

Centre frequency	10.7 MHz
Span	3 MHz
Output level	-10 dBm
Measurement	S21 measurement
Resolution	1 dB/Div

- Calibrate network analyzer to 0 dB.
- Remove jumpers X347 and X35.
- Connect X345.1,2 and X35A.1,2 to jumpers.
- Connect the output of the network analyzer to X347.2,3 (ground).
- Connect the input of the network analyzer to X350.1,2 (ground).

b) Measurement:

- Call test function "Set Cal Amp" (SF91;07)
  (Note: If a gain G is entered with test function "Set Cal Amp", the actual gain of the trans-impedance amplifier is N350: G + 12 dB)

Repeat the following adjustment until the respective gain is set to an accuracy of 0.1 dB:

- Set the gain of the Cal Amp to + 6 dB,
  set gain X347-X350 to -13.5 dB using R377.
- Set the gain of the Cal Amp to -6 dB,
  set gain X347-X350 to -25.5 dB using R370.
- Set the gain of the Cal Amp to 0 dB.
- Call board test IF Selection Board.
- Call test function 4.
- Test voltage ..... 0.25 to 1.3 V.
- Remove jumpers X345 and X35A.1,2.
- Connect X347.1,2 and X35A.pin1 to X35B.pin1.

7.4.9 Testing and Adjustment of the IF Attenuation Switch

a) Test Setup

Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Span ..... 3 MHz
Output level ..... -30 dBm
Measurement ..... S21 measurement
Resolution ..... 1 dB/Div

- Calibrate network analyzer to 0 dB.
- Remove jumpers X300 and X35.
- Connect X35A.1,2 to a jumper.
- Connect the output of the network analyzer to X300.3,4 (ground).
- Connect the input of the network analyzer to X350.1,2 (ground).
- Call test function "Set Cal Amp" (SF91;07).
- Set the gain of the Cal Amp to -2 dB.

b) Measurement:

- Call test function "Set IF ATT" (SF91;22).
- Set IF attenuations according to the following table and adjust or check the attenuation steps. The output level of the network analyzer is to be set accordingly as well.

Output level of the network analyzer	IF ATT	Adjustment using	Rated value of gain X300-X350
-10 dBm	40 dB	R300	-35.5 dB ± 0.1 dB
-10 dBm	30 dB	R306	-25.5 dB ± 0.1 dB
-20 dBm	20 dB	R305	-15.5 dB ± 0.1 dB
-20 dBm	10 dB	----	-5.5 dB ± 0.3 dB
-30 dBm	0 dB	----	+4.5 dB ± 0.3 dB

- Remove jumper X35A.1,2
- Connect X300.2,3 and X35A.pin1 to X35B.pin1.

7.4.10 Testing the Output Amplifier (only ESS Mod.03)

a) Test Setup

- Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Span ..... 3 MHz
Output level ..... -20 dBm
Measurement ..... S21 measurement
Resolution ..... 1 dB/Div

- Calibrate network analyzer to 0 dB.
- Remove jumper X35.
- Connect X360.1,2.
- Connect the output of the network analyzer to X35B.1,2 (ground).
- Connect the input of the network analyzer to X174.

b) Measurement

- Gain X35B-X174 ..... 6 dB ± 1 dB
- Connect X35A.pin1 to X35B.pin1.
- Remove jumper at X360.

7.4.11 Testing and Adjustment of the Noise Selection Filters

a) Test Setup

- Remove jumper X35.
- Connect X360.1,2.

Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Output level ..... -10 dBm,
Channel 1: ..... S21 measurement, 1 dB/Div
Channel 2: ..... S21 delay measurement, Resolution depending on the filter (see the following table)

Filter bandwidth	Span	Resolution in delay measurement
16 kHz	30 kHz	5 µs/Div
100 /120 kHz	200 kHz	100 ns/Div
1.8 MHz (only ESS, ESVD a. ESVB)	3 MHz	40 ns/Div

- Calibrate network analyzer.
- Connect the output of the network analyzer to X35B.1,2 (ground).
- Connect the input of the network analyzer to X176.

b) Measurement and Adjustment:

16-kHz Filter:

Setting at the test receiver:

IF BW 10 kHz

- Set C411 and C412 to minimal attenuation with round passband curve.

Variation of the group delay within the 3-dB bandwidth	≤ 10 µs
Centre frequency	10.7 MHz ± 1 kHz
3-dB bandwidth	16 kHz ± 2.5 kHz
Insertion loss	-1.4 dB ± 1 dB (Note down measured value).

100/120-kHz Filter:

Setting at the test receiver:

IF BW 120 kHz

- Set L422 and L428 to minimal attenuation with round passband curve.

Variation of the group delay within the 1.5-dB bandwidth	≤ 450 ns
Centre frequency	10.7 MHz ± 2.5 kHz
3-dB bandwidth	120 kHz ± 7 kHz
2-dB bandwidth	100 kHz ± 6 kHz.

- Adjust the insertion loss of the filter to the one of the 16-kHz filter using R431 at ± 0.1 dB.
- Check the rated values again.

1.8-MHz Filter (only ESS and ESVD):

Setting at the test receiver:

IF BW 1 MHz

- Set L440 and L442 to minimal attenuation with round passband curve.

Variation of the group delay within the 3-dB bandwidth	≤ 120 ns
Centre frequency	10.7 MHz ± 50 kHz
3-dB bandwidth	1.8 MHz ± 250 kHz

- Adjust the insertion loss of the filter to the one of the 16-kHZ filter using R445 at ± 0.1 dB.
- Check the rated values again .

1.5-MHz Filter (only ESVB):

Setting at the test receiver:

IF BW 1.5 MHz

- Adjust L440 and L442 to minimal attenuation.
  Centre frequency ..... 10.7 MHz ± 50 kHz
  0.75-dB bandwidth ..... 1.5 MHz ± 100 kHz
- Adjust the insertion loss of the filter to the one of the 9.5-kHz filter using R445 at ± 0.1 dB.
- Check the rated values again.
- Connect the input of the network analyzer to X177.
- Gain X35-X177 is -16 dB ± 3 dB.
- Remove jumper X360 again.
- Connect X35A.pin 1 to X35B. pin 1.

7.4.12 Testing and Adjustment of the Envelope Rectifier

a) Test Setup

- Remove jumper X35.
- Connect X360.1,2.
- Connect signal generator to X35B.1,2 (ground).
- Measure voltage at X17C13 using digital voltmeter (Connect ground of DVM to X17C12).

Setting at the test receiver:
IF BW 10 kHz

b) Measurement

- Set output level of the signal generator to 9 dBm ± 0.1 dB
- Voltage at X17C13 ..... 4 V ± 0.5 V
- Store measured value and switch DVM to relative level measurement
- Switch off the output level of the signal generator
- Set relative voltage level to -90 dB ± 1 dB using R520
- Set output level of the signal generator to -51 dBm ± 0.1 dB
- Adjust relative voltage level to maximum using C516
- Set relative voltage level to -60 dB ± 0.1 dB using R520
- Check the linearity of the demodulator using the following table:

Level of signal generator	Relative voltage level
+9 dBm	0 dB ± 0.1 dB
-1 dBm	-10 dB ± 0.2 dB
-11 dBm	-20 dB ± 0.2 dB
-21 dBm	-30 dB ± 0.3 dB
-31 dBm	-40 dB ± 0.35 dB
-41 dBm	-50 dB ± 0.45 dB
-51 dBm	-60 dB ± 0.1 dB

- Set the output level of the signal generator to 9 dBm.
- Call test function 7.
- The test voltage is 2 V ± 0.3 V.
- Remove jumper X360.
- Connect X35A pin1 to X35B pin1.

7.5 Final Test

After carrying out repair work, the filter bandwidths of the overall module should be checked again. Subsequently the total gain of the test receiver as well the offset of the envelope rectifier have to be adjusted with the module fitted into the instrument. Proper functioning of the IF Selection Board can then be checked after a total calibration with the help of the correction values printed out.

7.5.1 Testing the Filter Bandwidths

a) Test Setup

- Call test function "Set Cal Amp" (SF91;07).
- Set Cal amplifier to -2 dB.
- Mount the upper cover of the module.

Settings at the network analyzer:

Centre frequency ..... 10.7 MHz
Output level ..... -25 dBm,
Channel 1 ..... S21 measurement, 1 dB/Div
Channel 2 ..... S21 delay measurement, Resolution depending on the filter (see the following table)

Filter bandwidth	Span	Resolution in delay measurement
9.5 kHz	20 kHz	5 µs/Div
50 kHz (only ESVS Vers. 31)	100 kHz	5 µs/Div
100 kHz (only ESS)	200 kHz	100 ns/Div
120 kHz	200 kHz	100 ns/Div
400 kHz (only ESVD)	1 MHz	100 ns/Div
1 MHz (only ESS&ESVD)	3 MHz	40 ns/Div
1.5 MHz (only ESVB)	6 MHz	100 ns/Div

- Calibrate network analyzer
- Connect the output of the network analyzer to X171
- Connect the input of the network analyzer to X176

b) Measurement

10-kHz Bandwidth:

Setting at the test receiver:

IF BW 10 kHz

- Call test function "Set IF Att" (SF 91.22)
- Set IF attenuation to 40 dB
- Variation of the group delay within
  the 3-dB bandwidth ..... ≤ 15µs

  Centre frequency ..... 10.7 MHz ± 1 kHz
  6-dB bandwidth ..... 9.5 kHz ± 0.4 kHz
  Gain ..... 16.5 dB ± 2 dB
  (Note down measured value).
- Set the span of the network analyzer to 1 MHz and calibrate network analyzer.
- The insertion loss for frequencies >10.8 and < 10.6 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

120-kHz Bandwidth:

Setting at the test receiver:

IF BW 120 kHz

- Call test function "Set IF Att" (SF91;22).
- Set IF attenuation to 40 dB.
- Variation of the group delay within
  the 3-dB bandwidth ..... ≤ 450 ns

  Centre frequency ..... 10.7 MHz ± 6 kHz
  6-dB bandwidth ..... 122 kHz ± 6 kHz
  Gain corresponds to the one with a bandwidth of 10 kHz ..... ± 0.2 dB
- Set the span of the network analyzer to 5 MHz and calibrate network analyzer.
- The insertion loss for frequencies >11.7 and < 9.7 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

100-kHz Bandwidth (only ESS):

Setting at the test receiver:

IF BW 100 kHz

- Call test function "Set IF Att" (SF91;22).
- Set IF attenuation to 40 dB.
- Variation of the group delay within the 3-dB bandwidth ..... ≤ 300 ns

  Centre frequency ..... 10.7 MHz ± 5 kHz
  6-dB bandwidth ..... at 100 kHz ± 6 kHz
  Gain corresponds to the one with a bandwidth of 10 kHz ..... ± 0.2 dB.
- Set the span of the network analyzer to 5 MHz and calibrate network analyzer.
- The insertion loss for frequencies > 11.7 and < 9.7 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

50-kHz Bandwidth (only ESVS Vers. 31):

Setting at the test receiver:

IF BW 50 kHz

- Call test function "Set IF Att" (SF91;22).
- Set IF attenuation to 40 dB.
- Variation of the group delay within the 3-dB bandwidth ..... 50 kHz ± 10 kHz

  Centre frequency ..... 10.7 MHz ± 2 kHz
  6-dB bandwidth ..... 60 kHz ± 6 kHz
  Gain corresponds to the one with a bandwidth of 10 kHz ..... ± 0.2 dB.
- Set the span of the network analyzer to 2 MHz and calibrate network analyzer.
- The insertion loss for frequencies > 10.8 and < 10.6 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

300-kHz Filter (only ESVD):

- Call test function "Set IF Att" (SF91;22).
- Set IF attenuation to 40 dB.

Setting at the test receiver:

IF BW 300 kHz.

- Variation of the group delay within the 3-dB bandwidth ..... ≤ 200 ns

  Centre frequency ..... 10.7 MHz ± 20 kHz
  6-dB bandwidth ..... 400 kHz ± 20 kHz
  Gain corresponds to the one with a bandwidth of 10 kHz ..... ± 0.2 dB.
- Set the span of the network analyzer to 10 MHz and calibrate network analyzer.
- The insertion loss for frequencies > 13.7 and < 7.7 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

1-MHz Filter (only ESS and ESVD):

Setting at the test receiver:

IF BW 1 MHz

- Call test function "Set IF Att" (SF91;22)
- Set IF attenuation to 40 dB
- Variation of the group delay within the 3-dB bandwidth ..... ≤ 80 ns

  Centre frequency ..... 10.7 MHz ± 50 kHz
  6-dB bandwidth ..... 1 MHz -80/ + 20 kHz
  Gain corresponds to the one with a bandwidth of 10 kHz ..... ± 0.2 dB.
- Set the span of the network analyzer to 15 MHz and calibrate network analyzer.
- The insertion loss for frequencies > 15.2 and < 6.2 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

1.5-MHz Filter (only ESVB):

Setting at the test receiver:

IF BW 1.5 MHz

- Call test function "Set IF Att" (SF91;22)
- Set IF attenuation to 40 dB
- Centre frequency ..... 10.7 MHz ± 50 kHz
  3-dB bandwidth ..... 1.5 MHz ± 100 kHz
  6-dB bandwidth ..... 1.8 MHz ± 100 kHz
  Gain corresponds to the one with a bandwidth of 10 kHz ..... ± 0.2 dB.
- Set the span of the network analyzer to 15 MHz and calibrate network analyzer.
- The insertion loss for frequencies > 14.2 and < 7.2 MHz is larger than the insertion loss at the centre frequency by at least 80 dB.

7.5.2 Adjustment of the Envelope Rectifier

Due to voltage drops on the adapter, the offset of the envelope rectifier can be adjusted incorrectly. Hence it must be checked again with the module fitted into the overall unit.

a) Test Setup

- Connect digital voltmeter to X17C13 and X17C12 (ground) on the motherboard of the test receiver.
- Call test function 7 (board test; IF Selection Board).

b) Measurement:

- Voltage at X17C13 ..... 4 V ± 0.2 V
- Store measured value and switch digital voltmeter to relative level measurement.
- Switch RF ATT at the test receiver to 60 dB.
- Set relative voltage level to -60 dB ± 0.1 dB using R520.

7.5.3 Final Check

- Fit the module into the receiver and adjust total gain (cf. Section 6.4.8).
- Carry out total calibration.
- Print out the calibration values (cf. Section 6.1.3.3 k)

Permissible tolerances:

abs. reference at 64 MHz, IF BW 120 kHz, IF ATT 40 dB	-2 dB ± 0.5 dB
gain offset, IF BW 10 kHz	< ± 0.4 dB
gain offset, IF BW 50 kHz (only ESVS Ver. 31)	< ± 0.4 dB
gain offset, IF BW 100 kHz (only ESS)	< ± 0.4 dB
gain offset, IF BW 300 kHz (only ESVD)	< ± 0.4 dB
gain offset, IF BW 1 MHz (only ESS a. ESVD)	< ± 0.4 dB
gain offset, IF BW 1.5 MHz (only ESVS)	< ± 0.4 dB
gain offset, IF ATT 30 dB	< ± 0.3 dB
gain offset, IF ATT 20 dB	< ± 0.3 dB
gain offset, IF ATT 10 dB	< ± 0.3 dB
gain offset, IF ATT 0 dB	< ± 0.3 dB
Pk/MHz, IF BW 10 kHz	< ± 2 dB
Pk/MHz, IF BW 50 kHz (only ESVS Vers. 31)	< ± 2 dB
Pk/MHz, IF BW 100 kHz (only ESS)	< ± 2 dB
Pk/MHz, IF BW 120 kHz	< ± 2 dB
Pk/MHz, IF BW 300 kHz (only ESVD)	< ± 2 dB
Pk/MHz, IF BW 1 MHz (only ESS a. ESVD)	< ± 2 dB
Pk/MHz, IF BW 1.5 MHz (only ESVB)	< ± 2 dB

7.6 External Interfaces

Table 7-3 Contents of the data registers of the serial interface for controlling the calibration amplifier

Setting of Calibration amplifier G	D5 Pin 11 12 13 14 7 6 5 4	D4 Pin 11 12 13 14 7 6 5 4
-6 dB	X X X X X X 0 0	0 1 1 1 1 0 0 0
-5 dB	X X X X X X 0 0	1 0 0 1 1 0 0 1
-4 dB	X X X X X X 0 0	1 0 1 1 1 1 1 1
-3 dB	X X X X X X 0 0	1 1 1 0 1 0 0 1
-2 dB	X X X X X X 0 1	0 0 0 1 1 0 0 1
-1 dB	X X X X X X 0 1	0 1 0 0 1 1 1 1
0 dB	X X X X X X 0 1	1 0 0 0 1 1 0 1
+1 dB	X X X X X X 0 1	1 1 0 1 0 0 1 1
+2 dB	X X X X X X 1 0	0 0 1 0 0 1 0 0
+3 dB	X X X X X X 1 0	1 0 0 0 0 0 0 0
+4 dB	X X X X X X 1 0	1 1 1 0 0 1 1 1
+5 dB	X X X X X X 1 1	0 1 0 1 1 1 1 0
+6 dB	X X X X X X 1 1	1 1 1 0 0 1 1 0

(Note: The gain of the calibration amplifier can be set in steps of 0.05 dB by the computer. The non-linear characteristic is stored in the processor memory. The table indicates the control of the calibration amplifier in steps of 1 dB. If a gain G is entered with test function "Set Cal Amp", the actual gain of the trans-impedance amplifier is N350: G + 12 dB).

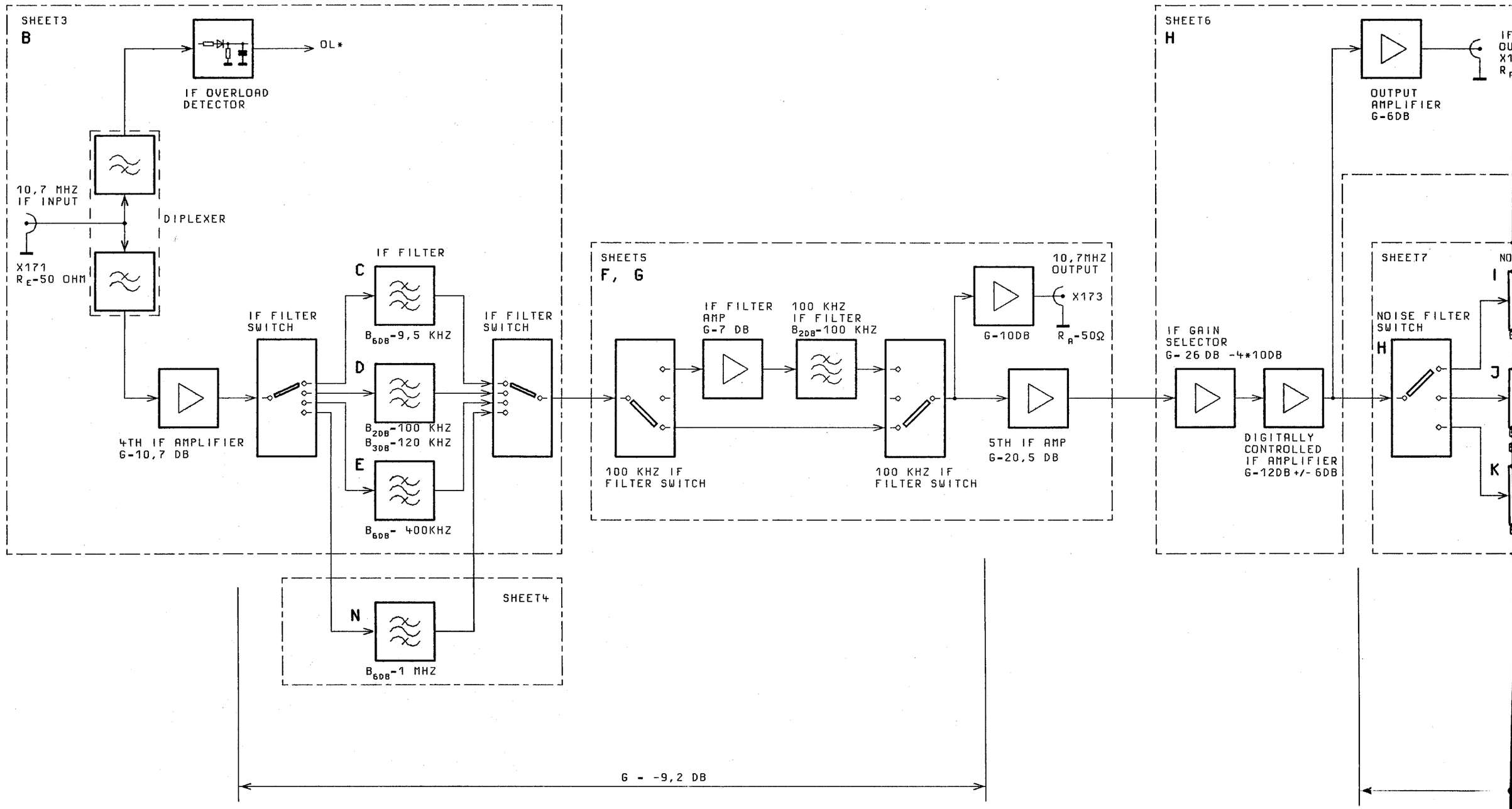
Table 7-4 Contents of the data registers of the serial interface

Setting at the test receiver	D7 Pin								D6 Pin							
	11	12	13	14	7	6	5	4	11	12	13	14	7	6	5	4
Test point T0	0	0	0	0	X	X	X	X	X	X	X	X	X	X	X	X
Test point T1	0	0	0	1	X	X	X	X	X	X	X	X	X	X	X	X
Test point T2	0	0	1	0	X	X	X	X	X	X	X	X	X	X	X	X
Test point T3	0	0	1	1	X	X	X	X	X	X	X	X	X	X	X	X
Test point T4	0	1	0	0	X	X	X	X	X	X	X	X	X	X	X	X
Test point T5	0	1	0	1	X	X	X	X	X	X	X	X	X	X	X	X
Test point T6	0	1	1	0	X	X	X	X	X	X	X	X	X	X	X	X
Test point T7	0	1	1	1	X	X	X	X	X	X	X	X	X	X	X	X
IF bandwidth:																
10 kHz	X	X	X	X	0	0	X	X	X	0	0	0	0	0	X	X
100 kHz (50 kHz)	X	X	X	X	0	1	X	X	X	0	0	1	0	1	X	X
120 kHz	X	X	X	X	1	0	X	X	X	0	1	0	0	1	X	X
300 kHz	X	X	X	X	X	X	X	X	X	0	1	1	1	X	X	X
1 MHz (1.5 MHz)	X	X	X	X	1	1	X	X	X	1	X	X	1	X	X	X
IF attenuation:																
0 dB	X	X	X	X	X	X	0	1	0	X	X	X	X	X	X	X
10 dB	X	X	X	X	X	X	0	0	1	X	X	X	X	X	X	X
20 dB	X	X	X	X	X	X	1	1	0	X	X	X	X	X	X	X
30 dB	X	X	X	X	X	X	1	0	1	X	X	X	X	X	X	X
40 dB	X	X	X	X	X	X	1	1	1	X	X	X	X	X	X	X

Table 7-5 External interfaces

Pin	Name	I/O	Origin/ Destination	Specified Range	Signal Description
X17AC1	GNDA	I	REAR PANEL X3.10	0 V	Analog ground
X17AC2	+ 5VA	I	REAR PANEL X3.7	5.2 V to 5.6 V	Supply voltage
X17AC4	+ 10V	I	REAR PANEL X3.5	9.9 V to 10.1V	Supply voltage
X17AC5	10V	I	REAR PANEL X3.4	-9.9 V to - 10.1V	Supply voltage
X17A7	SCLK	I	CPU BOARD X22A6	HCT level	Clock pulse
X17C7	TDATA	I	CPU BOARD X22C6	HCT level	Data
X17C8	STROBE*	I	CPU BOARD X22C9	HCT level	Strobe
X17A9	TEST	O	CPU BOARD X22A8	0 V to 5 V	Selftest
X17C11	OL*	O	CPU BOARD X22A10	HCT level	Overload
X17C12	GNDA	I	REAR PANEL X3.10	0 V	Analog ground
X17C13	VIDEO IN	O	DETECTOR BOARD X18A13	0 to 4 V	Video signal
X17C14	GNDA	I	REAR PANEL X3.10	0 V	Analog ground
X171	10.7 MHz IF INPUT	I	2nd MIXER X132	10.7 MHz, max.108 dBµV	10.7 MHz IF signal
X173 (only ESVD and ESVB)	10.7 MHz OUTPUT	O	I/Q DEMODULATOR X303	10.7 MHz max. 120 dBµV	Output towards the I/Q demodulator
X174 (only ESS)	IF NARROW BW OUTPUT	O	LF MODULE X84	10.7 MHz max. 120 dBµV	Output towards the LF module
X176	IF NARROW OUT	O	REAR PANEL IF OUTPUT	10.7 MHz max. 120 dBµV	IF output
X177	IF OUTPUT	O	DETECTOR BOARD X187	10.7 MHz max. 110 dBµV	Output towards the detector board

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR



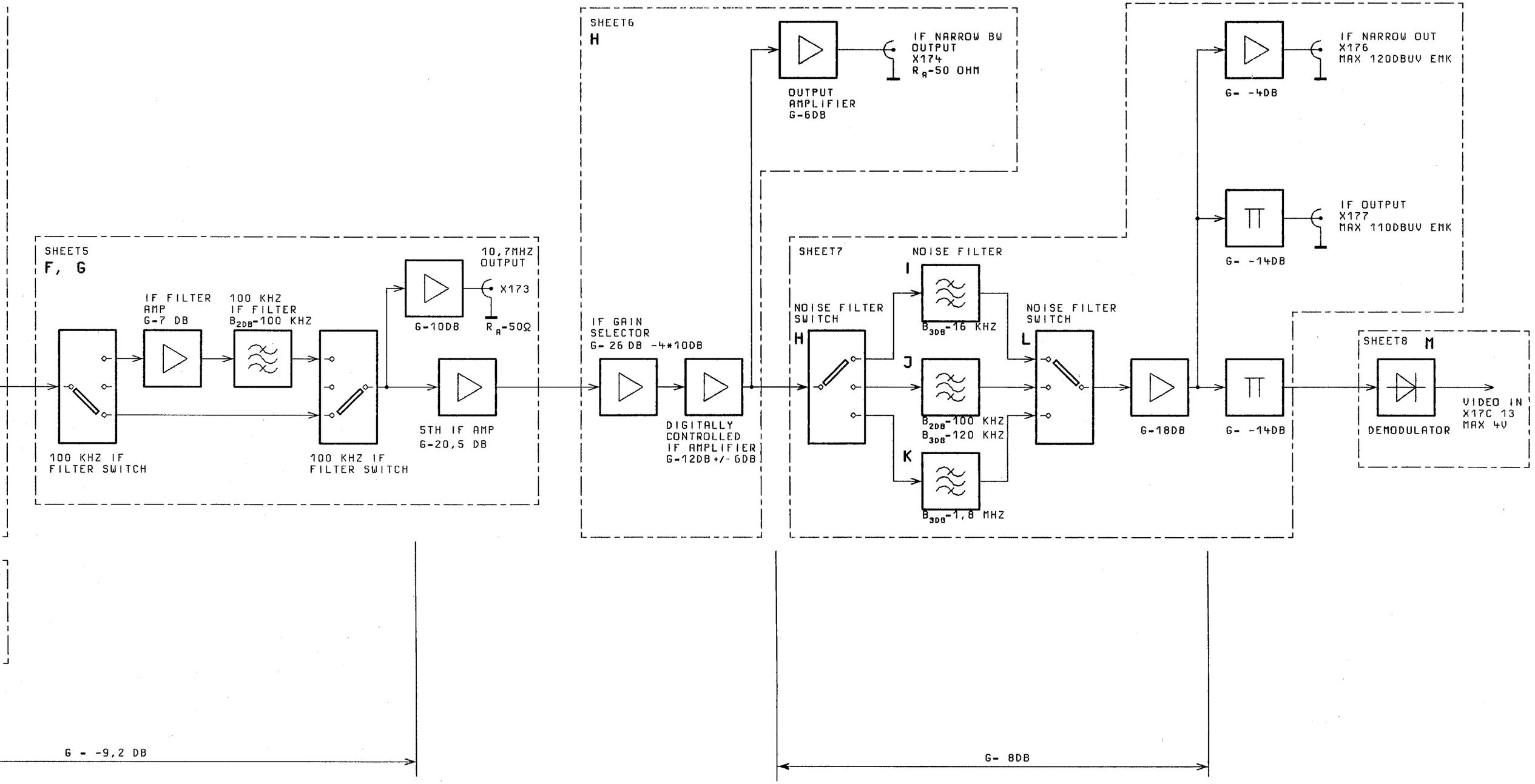
MOD02: BANDWIDTHS 100 KHZ, 400 KHZ AND 1 MHZ NOT FITTED
MOD03: BANDWIDTH 400KHZ NOT FITTED
MOD04: BANDWIDTH 100KHZ NOT FITTED

VERSIONS

MOD02 - ESVS
MOD03 - ESS
MOD04 - ESVD

ACHTUNG: ESD!
ELEKTROSTATISCH GEFAEHRDETE
BAUELEMENTE ERFORDERN EINE
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

AEND. IND.	AE NI
07/00	



MOD02: BANDWIDTHS 100 KHZ, 400 KHZ AND 1 MHZ NOT FITTED
MOD03: BANDWIDTH 400KHZ NOT FITTED
MOD04: BANDWIDTH 100KHZ NOT FITTED

VERSIONS

MOD02 - ESVS
MOD03 - ESS
MOD04 - ESVD

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
07/00	47296 (10)	11.91	NL

1KEE	TAG	NAME
BEARB.		NL
GEPR.		PF
NORM		
PLOTT	08.11.91	

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
IF SELECTION BOARD

ZEICHN.-NR. 1010.9820.015
REG.I.V. 1010.5001
BLATT-NR. 1 v. 8 BL.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

P40

BOARD CONTROL

ADRESSDECODER

DATA LATCHES 1-4

X17A 1
X17C 1
GNDA

X17A 7
SCLK

X17C 7
TDATA

X17C 8
STROBE*

X17A 9
TEST

X17A 2
X17C 2
+5VA

X17A 4
X17C 4
+10V

X17A 5
X17C 5
-10V

X17C 11
OL*

X17C 12

X17C 13
VIDEO IN

X17C 14

D1-A 74HCT14T-L
D1-B 74HCT14T-L
D1-C 74HCT14T-L
D1-D 74HCT14T-L
D1-E 74HCT14T-L
D1-F 74HCT14T-L
D1-G 74HCT14T-L

R1 100R L
R2 100R L
R3 100R L
R4 1K
R5 100R
R6 100R
R7 100R
R20 1K

C1 220P
C2 220P
C3 220P L
C4 220P
C5 220P L
C6 220P
C7 220P L
C10 100N
C11 100N L
C12 100N
C13 100N L
C14 100N
C15 100N L
C16 100N
C17 100N L
C18 100N
C19 100N L
C20 100P

L1 1U2H
L2 1U2H
L3 1U2H
L4 1U2H
L5 1U2H

+5V
+10V
+10VREF
-10V
-10VREF
OL*
VIDEO IN

D2-A 74HCT4094T-L
D3-A 74HCT238T-L
D4-A 74HCT4094T-L
D5-A 74HCT4094T-L
D6-A 74HCT4094T-L
D7-A 74HCT4094T-L

R10 10K L
R11 10K L
R12 10K L
R13 10K L
R14 10K L

D0 D1 D2 D3 D4 D5 D6 D7 D8 D9
E0 E1 E2 E3 E4

A0
SHEET6 C/1

D2-B 74HCT4094T-L
D3-B 74HCT238T-L
D4-B 74HCT4094T-L
D5-B 74HCT4094T-L
D6-B 74HCT4094T-L
D7-B 74HCT4094T-L
D8-B 74HC4051T-L

C30 100N L
C31 100N L
C32 100N L
C33 100N L
C34 100N L
C35 100N L
C36 100N L

N31-E LM124J

T0 SHEET2 B/6
T1 SHEET5 D/5
T2 SHEET8 C/8
T3 SHEET3 C/4
T4 SHEET5 E/12
T5 SHEET6 C/8
T6 SHEET3 E/4

R30 10K L
R31 10K L
R32 10K L
R33 10K L

-5V GENERATION

V40 BCX71J-L
V45 BAS32-L

R40 47K5
R41 4K32 L
R42 5K62 L
R45 51K1 L
R46 51K1 L

C40 10U 10V TA L
C41 4U7 10V TA L

-5V
TO SHEET2 C/8
+10V

* NOT FITTED

VERSIONS

MODUL 1505
MODUL 1506

ACHTUNG! ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE
BAUGRUPPEN BERÜHREN NUR AN
GEERDETEM ARBEITSPLATZ.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES
HANDLING AT GROUNDED WORKPLACE

07/00 4
DI.NO. IND.

P40

X10

BOARD CONTROL

+5V

ADRESSDECODER

R10 10K L

D2-A 74HCT4094T-L

D3-A 74HCT238T-L

DATA LATCHES 1-4

R11 10K L

D4-A 74HCT4094T-L

R12 10K L

D5-A 74HCT4094T-L

R13 10K L

D6-A 74HCT4094T-L

R14 10K L

D7-A 74HCT4094T-L

A0 SHEET6 C/1

BOARD TEST

D8-A 74HC4051T-L

T0* T1* T2* T3* T4* T5* T6* T7*

R35 10K L

R34 10K L

X10 1 X10 2 X10 3

A1 A2 E0 E1 E2 E3 E4 SHEET 6 B/1 SHEET7 D/3 C/9 SHEET3 D/6 C/9 SHEET 3 E/6

D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 SHEET6 C/6

D2-B 74HCT4094T-L

D3-B 74HCT238T-L

D4-B 74HCT4094T-L

C30 100N L C31 100N L C32 100N L C33 100N L C34 100N L C35 100N L C36 100N L

D5-B 74HCT4094T-L

D6-B 74HCT4094T-L

D7-B 74HCT4094T-L

D8-B 74HC4051T-L

N31-F LM124J

R30 10K L T0 SHEET2 D/6

R31 10K L T1 SHEET2 D/5

R32 10K L T2 SHEET2 C/8

R33 10K L T3 SHEET2 C/4

T4 SHEET2 C/12

T5 SHEET2 C/8

T6 SHEET2 C/4

N30-A LM224D-L

N30-B LM224D-L

N30-D LM224D-L

N30-C LM224D-L

N31-A LM124J

N31-B LM124J

N31-C LM124J

N31-D LM124J

* N30

T0* T1* T2* T3* T4* T5* T6*

+5V +5V

-5V -5V

+10V +10V

-10V -10V

OL* OL* SHEET 3 D/5

VIDEO IN VIDEO IN SHEET8 C/8

-5V GENERATION

-10V

P40

V40 BCX71J-L

-5V

R41 4K32 L

R40 47K5 L

C40 10U 10V TA L

R45 51K1 L

TO SHEET2 C/8

C41 4U7 10V TA L

R42 5K62 L

R46 51K1 L

V45 BAS32-L

+10V

* NOT FITTED

VERSIONS

MODO2 ESVS

MODO3 ESS

ACHTUNG! ESD!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

07/00	47296 (10)	11.91	NL	1KEE	TAG	NAME
				BEARB.		NL
				GEPR.		PF
				NORM		
				PLOTT	08.11.91	
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ		
				ZU GERAET	ESVS30	

BENENNUNG

IF SELECTION BOARD

ZEICHN.-NR. 1010.9820.015

BLATT-NR. 2

REG.I.V. 1010.5001

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X111

B

DIPLEXER

10.7 MHZ IF INPUT
X171 1
RE-500HM

C100 56P L
L101 330NH
R100 51R1 L
L108 330NH
C108 68P L

IF OVERLOAD DETECTOR

+10V
L100 47UH
C101 4N7 L
V100 J310
C102 4N7 L
V103 HSMS2800-L
T6 SHEET2 B/9
R103 100K L
R101 1K L
V102 HSMS2800-L
C103 10P L
R104 1M L
+10V
R105 90K9 L
R107 1K L
C105 100N L
R106 2K L
-10V
+10V
C106 100N L
C107 100N L
N100 LM211D-L
OL* SHEET 2 C/12

4TH IF-AMPLIFIER

C116 1U 25V TA L
R115 10K L
R116 9K09 L
+10V
V110 BC860B-L
R117 130R L
R118 100K L
T3 SHEET2 B/9
C113 100N L
R119 100K L
R114 1K L
C112 4N7 L
L111 47UH
X110 1 2 3 4
X110
L110 47UH
C110 4N7 L
C111 4N7 L
R110 24R3 L
R111 221R L
C114 4N7 L
V112 NE85637-L
R112 20R L
R113 20R L

C

IF FILTER SWITCH

D131-B 74HCT32T-L
+10V
V140 BAS32-L
C135 100N L
+5V
R130 10K L
R132 1K L
R140 2K74 L
N130-A LM224D-L
C136 100N L
-10V
C130 100N L
R131 10K L

E4
SHEET2 E/12

X SHEETS E/1

D130-A 74HCT139T-L
E2
E3
SHEET2 E/12

D131-C 74HCT32T-L
D135-C 74HCT08T-L
N130-B LM224D-L
V160 BAS32-L
R160 2K74 L
D131-D 74HCT32T-L

D131-A 74HCT32T-L

C160 10N L

N130-C LM224D-L
V180 BAS32-L
R180 2K74 L

N130-D LM224D-L
V630 BAS32-L
R630 2K74 L

D

D130-B 74HCT139T-L
D135-B 74HCT08T-L
D135-A 74HCT08T-L
D135-D 74HCT08T-L
+5V
D130-C 74HCT139T-L
D135-C 74HCT08T-L
D131-C 74HCT32T-L

Z:\DMN,-NK, 1010.3826.01 5

R182 R161 L602 L163 C145 L610

IF FILTER

IF FILTER SWITCH

D131-B 74HCT32T-L
+10V
V140 BAS32-L
C135 100N L
+5V
R130 10K L
R132 1K L
N130-A LM224D-L
R140 2K74 L
C136 100N L
-10V
C130 100N L
R131 10K K

E4
SHEET2 E/12

X SHEETS E/1

D130-A 74HCT139T-L
D131-C 74HCT32T-L
D135-C 74HCT08T-L
N130-B LM224D-L
V160 BAS32-L
E2
E3
SHEET2 E/12
R160 2K74 L
D131-D 74HCT32T-L
D131-A 74HCT32T-L
N130-C LM224D-L
V180 BAS32-L
C160 10N L
R180 2K74 L
N130-D LM224D-L
V630 BAS32-L
R630 2K74 L
FI-400KHZ SHEET4 E/1
FI-1MHZ SHEET4 D/1

+10V C106 100N L
OL* SHEET 2 C/12
N100 LM211D-L
C107 100N L
-10V

C

9,5 KHZ

C141 10N L
L142 100UH
L141 100UH
V142 BA682-L
C142 10N L
R145 43R2 L
L144 3U3H
B145 10.7 MHZ
L140 100UH
V143 BA682-L
R142 130R L
R144 130R L
C144 68P
C145 20P-4PS
C146 20P-4PS
R141 1K3 L
R600 *
C600 *
R602 *
C603 *
C604 *
R610 *
C611 *
L600 *
C601 *
L602-A *
C605 *
L610-A *
C606 *
C607 *
C608 *
C612 *
C613 *
C614 *
C615 *

D

100 KHZ/120 KHZ

C161 10N L
L162 100UH
L161 100UH
R162 N20R 3.8%
C164 4P7
C163 12P
C168 22P
V161 BA682-L
C162 10N L
120KHZ GAIN MATCH
R165 681R L
R161 20R
R166 681R L
R163 47R5 L
C165 27P
C166 100P
C167 1N5
L163-A 15UH
V162 BA682-L
FI-IN SHEET4 C/1

* NOT FITTED

D130-B 74HCT139T-L
D135-B 74HCT08T-L
R135 10K L
D135-A 74HCT08T-L
R136 10K L
D135-D 74HCT08T-L
R137 10K L
+5V
D135-E 74HCT08T-L
D130-C 74HCT139T-L
C137 100N L
D131-C 74HCT32T-L

VERSIONS

MOD02 ESVS
MOD03 ISS
MOD04 ISVD

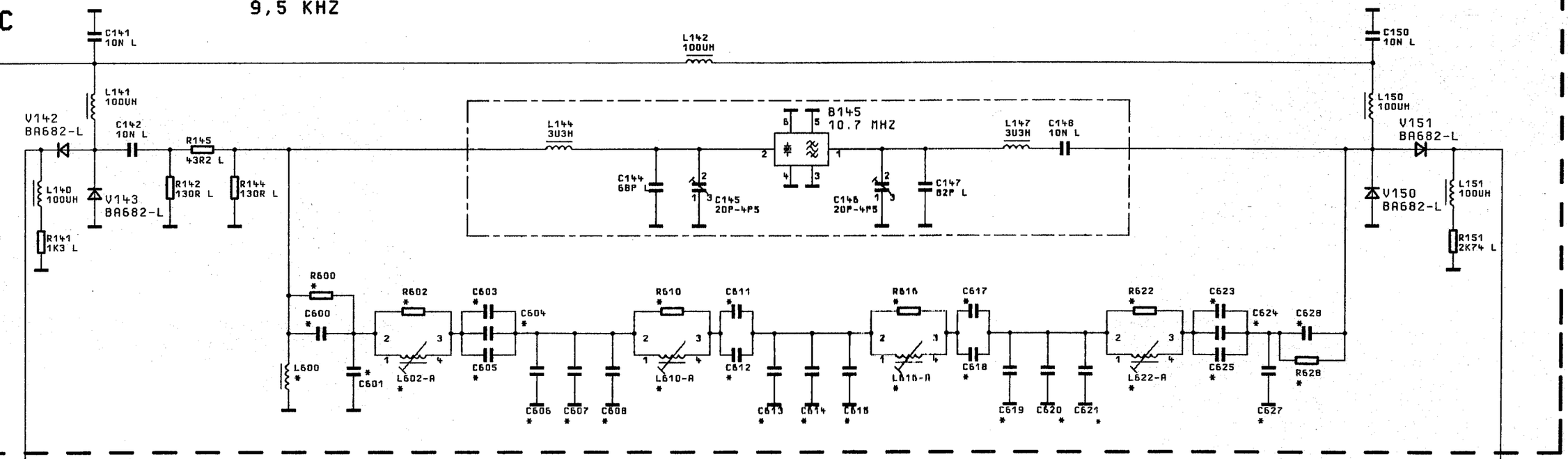
MOD02: V180, R180, V630, R630 NOT FITTED
MOD03: V180, R180 NOT FITTED

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

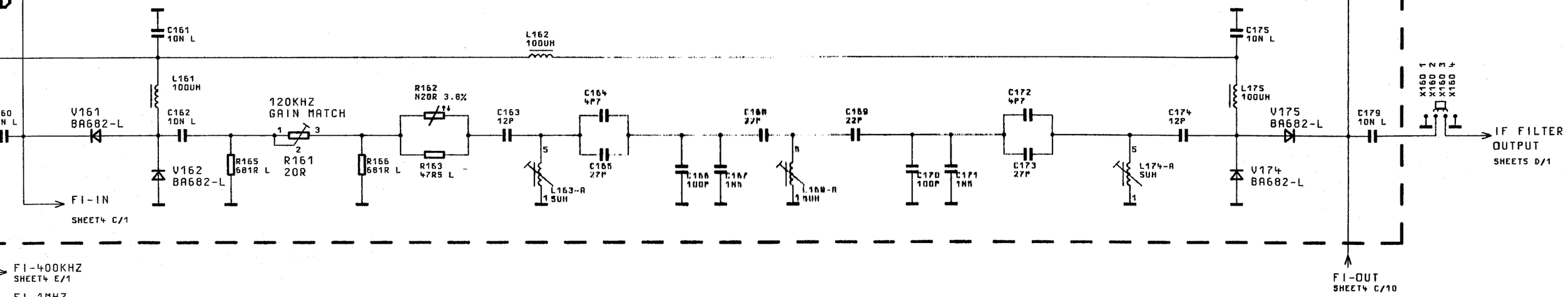
R182 R161 L602 L163 C145 L610 C146 L169 L616 L622 L174 X161

IF FILTER

9,5 KHZ



100 KHZ/120 KHZ



FI-400KHZ
SHEET4 E/1

FI-1MHZ
SHEET4 D/1

FI-OUT
SHEET4 C/10

* NOT FITTED

VERSIONS

MOD02 ESVS
MOD03 ESS
MOD04 ESVD

MOD02: V180, R180, V630, R630 NOT FITTED
MOD03: V180, R180 NOT FITTED

ACHTUNG! EGB!
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

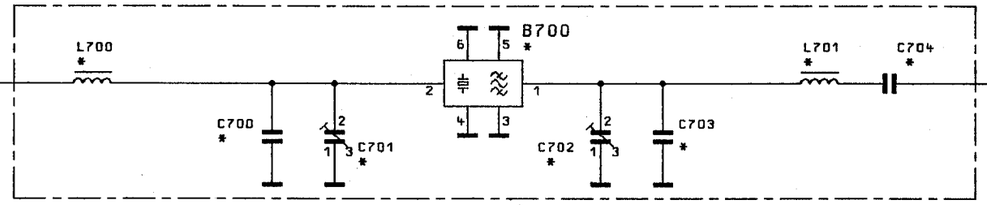
07/00	47296 (10)	11.91	NI	1KEE	TAG	NAME	BENENNUNG
				BEARB.		NL	IF SELECTION BOARD
				GEPR.		PF	
				NORM			
				PLOTT	08.11.91		
REND. IND.	RENDERUNGEN MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9820.013 BLATT NR. 3
				EW 8KAMEL	FMV830		NEG.I.V. 1010.5001 LABEL A.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

R182 R636 L650 L184 L657 L188 L663 L191 L670 L194
C643 C646

E IF FILTER

ONLY VAR04,06
VAR05



FI-400KHZ
SHEET3 8/9

C180 10N L
L180 100UH
V181 BA389
400KHZ GAIN MATCH
C181 10N L
R182 20R
V182 BA682-L
R181 TRIMMWERT/ SELECTED
R183 TRIMMWERT/ SELECTED

L181 100UH

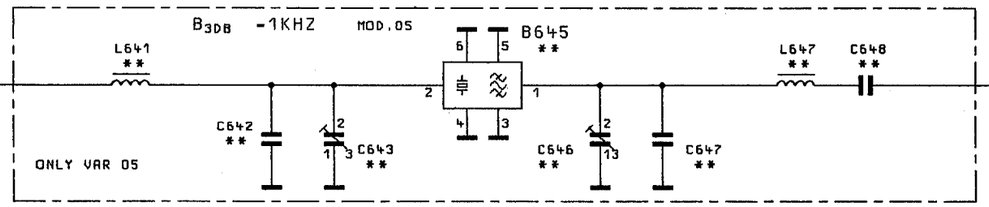
B_{6DB}=400 KHZ MOD.04,06 $B_{2,2DB}$=250KHZ MOD.05

R191 R188 OR L R190 C183 L183 C184 R184 L184-A C185 C186 C120 C187 680P C121 C188 R185 L188-A C182 C189 C126 C190 C122 56P L TRIMMWERT/ SELECTED C191 R186 L191-A C123 C192 C127 C193 680P C124 C194 R187 L194-A C195 C196 C125

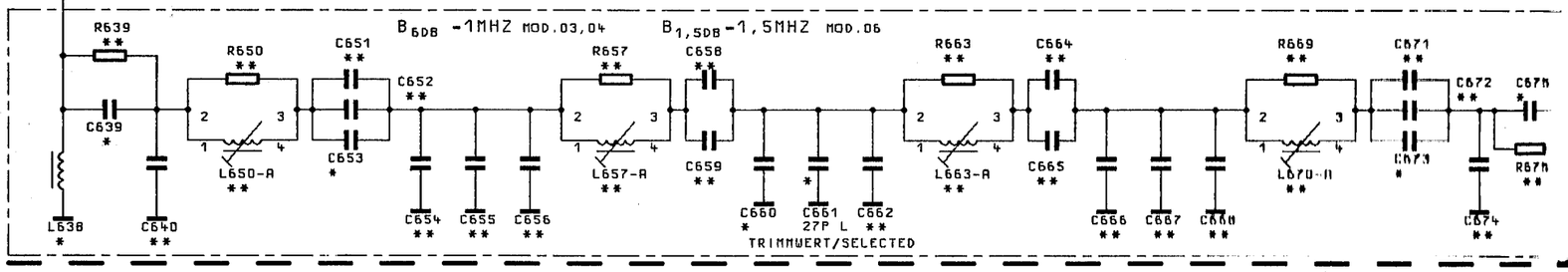
FI-1MHZ
SHEET3 8/9

C632 10N L
L633 100UH
L632 100UH
V631 BA389
C634 10N L
R636
FI-IN
SHEET3 8/9
R635
R637
V632 BA682-L

B_{3DB} -1KHZ MOD.05



B_{6DB} -1MHZ MOD.03,04 $B_{1,5DB}$-1,5MHZ MOD.06



N NOT FITTED MOD.02,12

VERSIONS

MOD02 ESVS	MOD02: COMPONENTS WITH NUMBER 180...199, 631...681 AND C120...C125 NOT FITTED
MOD03 ESS	MOD03: COMPONENTS WITH NUMBER 180...199 AND C120...C125 NOT FITTED
MOD04 ESVD	
MOD05 ESN	MOD05: COMPONENTS WITH NUMBER C121,C122,C124,C184,C197 NOT FITTED R184,R185,R186,R187 NOT FITTED
MOD06 ESVB	MOD06: COMPONENTS WITH NUMBER C654,C666,R650,R657,R663,R669 NOT FITTED
MOD12 ESVS WITH 50KHZ-FILTER	MOD12: COMPONENTS WITH NUMBER 180...199, 631...681 AND C120...C125 NOT FITTED

* NOT FITTED

** VARIANTE BESTUECKUNG, SIEHE 1010.9820.01 S0

ACHTUNG! LGM!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ENTHALTEN SIND
BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATICALLY SENSITIVE DEVICES
REQUIRE A SPECIAL HANDLING

08/00 07/00 AEND. IND.

ZEICHN.-NR. 1010.9820.01 S

L650 L184 L657 L188 L663 L191 L670 L194
C643 C646

B700
L700 L701 C704
C700 C701 C702 C703

L181 100UH

B_{6DB}=400 KHZ MOD.04,06 $B_{2,2DB}$=250KHZ MOD.05

R188 0R L
C183 C184 C185 C186 C187 680P C120 C121 C188
R184 L184-A
R185 L188-A C182 C189 C126 C190 C122 56P L TRIMMWERT/SELECTED C191
R186 L191-A C123 C192 C127 C193 680P C124 C194
R187 L194-A C195 C196 C125 C197
C199 10N L L198 C198 R189 0R L V198 BA682-L V197 BA682-L

L633 100UH
C680 10N L L680 100UH V681 BA682-L V680 BA682-L
FI-OUT
SHEET3 8/16

B_{3DB} -1KHZ MOD.05
B645
L641 L647 C648 C642 C643 C646 C647
ONLY VAR 05

B_{6DB} -1MHZ MOD.03,04 $B_{1,5DB}$-1,5MHZ MOD.06
R650 C651 C652 C653 C654 C655 C656 L650-A C640
R657 C658 C659 L657-A C660 C661 27P L C662 TRIMMWERT/SELECTED
R663 C664 C665 L663-A C666 C667 C668
R669 C671 C672 C673 C674 C675 R675 L670-A

1...681 AND C120...C125 NOT FITTED
C120...C125 NOT FITTED

+,C184,C197 NOT FITTED
,R186,R187 NOT FITTED
0,R657,R663,R669 NOT FITTED
1...681 AND C120...C125 NOT FITTED

* NOT FITTED
** VARIANTE BESTUECKUNG, SIEHE 1010.9820.01 90

ACHTUNG! (GB)
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION (SD)
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

08/00	47296 (40)	07.92	NL	1KEE	TAG	NAME
				BEARB.		NL
				GEPR.		NL
				NORM		
				PLOTT	01.07.92	
07/00	47296 (21)	03.92	NL			
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME			

BENENNUNG
IF SELECTION BOARD

ROHDE&SCHWARZ
ZEICHN.-NR. 1010.9820.01S
BLATT-NR. 4 v. 8 BL.
AU GERAET ESVS30
REG.I.V. 1010.5001 ERSTE Z.

R230 L230 C801 C802 L235

H — 2ND IF FILTER SWITCH

+5V
R203 10K L
R272 **
R202 **
C202 100N L
R204 10K L
N200-B LM224D-L
R201 2K74 L
V202 BAS32-L
SHEET3 B/9 **
ONLY MOD06
FI-1.5MHZ
R273 **
N200-C LM224D-L
R219 2K74 L
R274 **
V210 BAS32-L
X
SHEET 3 D/7 **
ONLY MOD03/05/12
R275 1K B
ONLY MOD03,05,06,12
+2,5V
SHEET6 E/3

F — IF FILTER AMP

C205 10N L
L201 100UH
C207 1U 10V TA L
+10V
R207 1K3 L
R208 7K5 L
V207 BC860B-L
R209 221R L
R206 1K L
R210 100K L
SHEET 2 C/9
T1
C204 10N L
C209 100N
R211 100K L
100KHZ GAIN MATCH
L202 100UH
L205 68UH
C206 4N7 L
R205 162R L
C208 10N L
R230 **
R216 5R62 L
V200 BA682-L
C203 10N L
V205 NE85639 L
R800 **
R801 **
L200 100UH
V201 BA682-L
R200 2K74 L
R214 **
R215 **
R217 **
ONLY MOD03,05,06,12

IF FILTER

L203 100UH
B_{3DB} - 3KHZ MOD.05
B_{3DB} - 50KHZ MOD.12
ONLY MOD05,12
B800
L800 3U3H
L801 3U3H
C804 10N L
C800 68P L
20P-4P5 C801
20P-4P5 C802
C803 689 L
B_{2DB} -100KHZ MOD03
$B_{0,75DB}$-1,5MHZ MOD06
ONLY MOD03,06
C230 **
C231 **
C232 **
C233 **
C234 **
C235 **
C236 **
C237 **
C238 **
C240 **
L230-A **
L235-A **
C239 10N L
L237 100UH
V238 BA682-L
V237 BA682-L
ONLY MOD03,12 ,05,06

IF FILTER OUTPUT
SHEET3 C/16
C270 10N L

G

ONLY MOD02,04
R270 0R L
V212 BA682-L
V214 BA682-L
ONLY MOD02,04
R271 0R L
V213 BA682-L
L210 100UH
V212-V214 L210,C210 ONLY MOD03,05,06,12
C210 10N L

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.9820.01 S

VERSIONS:

* NOT FITTED
** VARIANTE BESTUECKUNG, SIEHE 1010.9820.01 SA

MOD02 - ESVS	MOD02: COMPONENTS WITH NUMBER 200...241 AND 290...295, X173, W2 NOT FITTED
MOD12 - ESVS WITH 50KHZ-FILTER	MOD12: COMPONENTS WITH NUMBER R217,C232,C230,C231,L230,C233,C234,C235,L235 C237,C238,C240,R270,R271 NOT FITTED
MOD03 - ESS	MOD03: COMPONENTS WITH NUMBER 290...295, X173, R270 AND R271 NOT FITTED
MOD04 - ESVD	MOD04: COMPONENTS WITH NUMBER 200...241 NOT FITTED
MOD05 - ESN	MOD05: COMPONENTS WITH NUMBER C230...C238,C240,R270,R271,L230,L235 NOT FITTED
MOD06 - ESVB	MOD06: COMPONENTS WITH NUMBER C234,R202,R217,R270,R271 NOT FITTED

ACHTUNG! FOLGT DIESEM SYMBOL BEFINDEN SICH BAUELEMENTE DIE BESONDERE HANDHABUNG ERFORDERN

ATTENTION! COMPONENTS MARKED WITH THIS SYMBOL REQUIRE A SPECIAL HANDLING

08/00		
07/00		
AEND. IND.		

R230 L230 C801 C802 L235 X250

IF FILTER

IF FILTER AMP

C207 1U 10V TA L
+10V
R207 1K3 L
R208 7K5 L
R209 221R L
V207 BC860B-L
R206 1K L
R210 100K L
SHEET 2 C/9 → T1
C204 10N L
C209 100N
R211 100K L
100KHZ GAIN MATCH
L202 100UH
L205 68UH
C206 4N7 L
R205 162R L
C208 10N L
R230 **
R216 5R62 L
V205 NE85639 L
R800 **
R801 **
R214 **
R215 **
R217 **

12

L203 100UH

B 3DB - 3KHZ MOD.05
B 3DB - 50KHZ MOD.12
ONLY MOD05,12
B800
L800 3U3H
C800 68P
20P-4P5 C801
20P-4P5 C802
C803 689 L
L801 3U3H
C804 10N L

B 2DB -100KHZ MOD03
B 0,75DB -1,5MHZ MOD06
ONLY MOD03,06
C230 **
C231 **
C232 **
C233 **
C234 **
C235 **
C236 **
C237 **
C238 **
C240 **
L230-A **
L235-A **

C239 10N L
L237 100UH
V238 BA682-L
V237 BA682-L
ONLY MOD03,12 ,05,06
C249 10N L
X250 1 X250 2 X250 3 X250 4
L238 100UH
R238 2K74 L

5TH IF AMP

+5V
C257 1U 10V TA L
R254 3K2 L
R255 18K2 L
V255 BC860B-L
R256 24R3 L
R253 1K L
C254 4N7 L
R257 100K L
C255 4N7 L
R258 100K L
L252 47UH
L253 47UH
C253 4N7 L
C260 10N L
5TH IF AMP OUTPUT → SHEET6 D/1
L250 180NH
C252 10N L
R252 562R L
V250 NE85639 L
C250 39P L
C251 39P L
V251 NE85639 B
L251 680NH
R251 51R1 L
R261 681R L
C261 10P L
R260 681R L
R262 5R62 B
R263 5R62 B

T4 SHEET2 B/9

G

ONLY MOD02,04
R270 0R L
V212 BA682-L
V214 BA682-L
ONLY MOD02,04
R271 0R L
V213 BA682-L
L210 100UH
C210 10N L
V212-V214 L210,C210 ONLY MOD03,05,06,12

IF OUTPUT AMP

C292 R292 10N L 39R2 L
R291 221R L
ONLY MOD04,05,06
+10V
C295 100N L
R293 332R L
C290 100P L
R295 43R2
W28 1
W28 2
W2
X173 1 10.7 MHZ OUTPUT
R A-50Ω
N290 AD844BQ
R290 100K L
L291 *
C291 *
C296 100N L
-10V

ESTUECKUNG, SIEHE 1010.9820.01 SA

NTS WITH NUMBER 200...241 AND 290...295, X173, W2 NOT FITTED
NTS WITH NUMBER R217,C232,C230,C231,L230,C233,C234,C236,L235 C237,C238,C240,R270,R271 NOT FITTED
NTS WITH NUMBER 290...295, X173, R270 AND R271 NOT FITTED
NTS WITH NUMBER 200...241 NOT FITTED
NTS WITH NUMBER C230...C238,C240,R270,R271,L230,L235 NOT FITTED
NTS WITH NUMBER C234,R202,R217,R270,R271 NOT FITTED

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

08/00	47296 (40)	07.92	NL	1KEE	TAG	NAME
				BEARB.		NL
				GEPR.		NL
				NORM		
				PLOTT	01.07.92	
07/00	47296 (21)	03.92	NL			
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

BENENNUNG: IF SELECTION BOARD

ROHDE&SCHWARZ
ZU GERAET ESVS30

ZEICHN.-NR. 1010.9820.01 S
BLATT-NR. 5 V. 8 BL.
REG.I.V. 1010.5001 ERSTE Z.

X300 R300 R305 R306 R377 X370 R370 P36 X348

H

+10V → R390 10R → +10VB
C390 2U2 25V TA L

-10V → R391 10R → -10VB
C391 2U2 25V TA L

IF GAIN SELECTOR

X300 1 2 3 4

5TH IF AMP OUTPUT
SHEETS D/12

C301 180P L
L301 5U6H
R308 301R L
IF GAIN ADJUST
R300 500R
L300 1U5H
C302 33P L
R301 200R L

+10V
C315 100N L
N300 EL2020CN
C316 100N L
-10V
R302 475R L
R303 30R1 L
C314 10N L
L304 47UH
R304 2K74 L

C307 10N L
C308 10N L
R310 3K57 L
V310 BA483
R312 909R 0.1%
R311 4K75 L
V311 BA483
C309 10N L
R313 100R .1%
L310 100UH
C312 10N L

V305 BA483
G20 ADJUST
R305 50R
V306 BA483
R306 100R
G10 ADJUST
R307 130R L
C305 10N L
C306 10N L

+5V
A0
SHEET 2 E/8
R380 10K L
R382 1K L
N380-B LM224D-L
R385 200R L
C381 100N L
R381 10K L
+10V
C382 100N L
N380-A LM224D-L
R386 200R L
A1
SHEET 2 F/12
C383 100N L
-10V
R387 200R L
N380-C LM224D-L
A2
SHEET 2 F/12

DIGITALLY CONTROLLED IF AMPLIFIER

X347 1 2 3
X345 2 1
R345 51R1 L

C310 1N L
R375 10K L
C375 100N L
N360-D TL074ACD-L
+10VREF
R377 10K
REFERENCE 1 ADJUST
R376 4K75 L
R374 1K L

X370 1 2 3 4
R366 10K L
P36
R365 10K L
N360-B TL074ACD-L
N360-C TL074A

R371 332R L
C370 15P L
RFB REF
OUT1
OUT2
N360-A TL074ACD-L
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9
LSB MSB
D370-A AD7533CD
SHEET2 ED/11

R369 1K L
C367 100N L
OFFSET ADJUST
R367 10K L
R370 200R
R366 10K L
+10VREF
-10VREF

R330 47K5 L
T5
SHEET 2 N/
R331 47K5 L

MOD02 COMPONENTS C325 - C329 , W1
MOD02 W1 NOT FITTED

13 14 12
N380-D LM224D-L

+10VB
N360-E TL074ACD-L
-10VB
+10VB
D370-B AD7533CD

VERSIONS:
MOD02 - ESVS
MOD03 - ESS

ACHTUNG! LADI
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE
BEACHTEN SIE SPEZIELLE HANDHABUNG
ATTENTION! CMOS
ELECTROSTATIC SENSITIVE DEVICES
OBSERVE PRECAUTIONS FOR HANDLING

AEND. IND.	DATUM
06/00	472
08	472

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.9820.01 S

R306 R377 X370 R370 P36 X348 X36

DIGITALLY CONTROLLED IF AMPLIFIER

C315 100N L
C316 100N L
N300 EL2020CN
C307 10N L
C308 10N L
R310 3K57 L
V310 BA483
R312 909R 0.1%
R311 4K75 L
V311 BA483
R313 100R .1%
C309 10N L
L310 100UH
C312 10N L
L304 47UH
R304 2K74 L
V306 BA483
R306 100R
G10 ADJUST
R307 130R L

C310 1N L

R375 10K L
C375 100N L
+10VREF
N360-D TL074ACD-L
R377 10K
REFERENCE ADJUST
R374 1K L
R376 4K75 L
R371 332R L
C370 15P L
N360-A TL074ACD-L
D370-A AD7533CD
SHEET2 ED/11

X370 1 2 3 4
R366 10K L
N360-B TL074ACD-L
R369 1K L
C367 100N L
OFFSET ADJUST
R370 200R
R367 10K L
R368 10K L
+10VREF -10VREF

P36
R365 10K L
N360-C TL074ACD-L
R330 47K5 L
T5
SHEET 2 B/9
R331 47K5 L
V360 J310
R360 4K81 .1%
R361 N10K 3.8%
R362 2K29 .1%
R363 15R L

X347 1 2 3
R345 51R1 L
X345 2 X345 1
R347 100K L

N350 EL2020CN
+10V
C358 100N L
-10V
C359 100N L
R350 475R L
C355 27N L
L355 47UH
C356 100N L
V355 5082-3081
V356 5082-3081
C357 27N L

R353 51R1 L
X350 1 2
R351 909R L
X35A 2 X35B 2
X35A 1 X35B 1
R352 51R1 L
X360 1 X360 2

NOISE FILTER INPUT
SHEET7 C/1

C325 10N L

OUTPUT AMPLIFIER

R328 182R L
C329 10N L
-10V +10V
C326 100N L
C328 100N L
R326 47SR L
R325 475K L
N320 EL2020CN
R327 43R2
C327 10N L
W1A 1
W1
W1A 2
X174 1
IF NARROW BW OUTPUT RA-500HM

MOD02 COMPONENTS C325 - C329 , R325 - R328 , N320 NOT FITTED
MOD02 W1 NOT FITTED

N380-D LM224D-L
+10VB N360-E TL074ACD-L -10VB
+10VB D370-B AD7533CD

VERSIONS:

MOD02 - ESVS
MOD03 - ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
06/00	47296 (10)	11.91	NL
08	47296 (40)	07.92	NL

1KEE	TAG	NAME
BEARB.		NL
GEPR.		PF
NORM		
PLOTT	08.11.91	

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
IF SELECTION BOARD

ZEICHN.-NR. 1010.9820.01S
BLATT NR. 6 V. II III
REG.I.V. 1010.5001 ERSTE Z.

L440 C411 L422 L442 C412 R445 L428 R431

NOISE FILTER

H

I — 16 KHZ

R410 1K21 L
R411 3K92 L
B410 10.7MHZ BANDP.
C410 15P L
L410 5U6H
C411 10P-3P5
L411 22UH
L412 22UH
C414 4P7 L
C412 10P-3P5
R412 392R
R413 4K75
C413 8P2 L
L413 5U6H

L

NOISE FILTER SWITCH

+10V
C401 10N L
R400 15K L
R402 1K L
C402 10N L
C400 10N L
R408 100R L
V400 BF374
R401 3K92 L
C408 10N L
R403 511R L
-10V
SHEET2 F/12
EO
E1
C404 10N L
C405 10N L
D410-A 74HC4051T-L
MUXDX
8M
6B

NOISE FILTER INPUT
SHEET6 D/12

J — 100 KHZ/120 KHZ

R422 30K1 L
L420 3U3H
C420 33P
R420 N20R 3.8%
R421 51R1 L
C421 4P7
C422 4P7
L422-A 5UH
C423 33P
C426 3N3
C427 33P
L428-A 5UH
C429 4P7
C430 4P7
L430 2U7H
C431 47P
120KHZ GAIN MATCH
R431 200R
R432 681R L
R430 121R L

NOISE FILTER SWI

D450-A 74HC4051T-L
MUXDX
8M
6B
C450 10N L
C451 10N L
EO
SH
E1
N450
EL2
R455 475K L
R460 162R

K — 1,8 MHZ

R437 *
R438 *
R439 0R L
R440 2K L
L440-A 1U6H-T
C440 100P
C441 18P
C442 18P P100
C443 100P
C444 22P
R442 2K L
L442-A 1U6H-T
R444 121R L
1MHZ GAIN MATCH
R445 200R
R446 681R I

C406 10N L
+5V
-5V
C407 10N L
D410-B

M

L

+10V
R470 10R
+10VA
C471 2U2 25V TA L
-10V
R471 10R
-10VA
C472 2U2 25V TA L

+5V
-5V
R452 100R L
R453 100R L
C452 100N L
C453 100N L
D450-B

MOD02 COMPONENTS WITH NUMBER 439 - 446 NOT FITTED

* NOT FITTED

VERSIONS :

MOD02 - [illegible]
MOD01 - [illegible]
MOD00 - [illegible]

07/00

REND. IND.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR
ZEICHN.-NR. 1010.9820.01 S

+40 C411 L422 L442 C412 R445 L428 R431

NOISE FILTER

16 KHZ

R410 1K21 L
R411 3K92 L
L410 5U6H
C411 10P-3P5
L411 22UH
B410 10.7MHZ BANDP.
L412 22UH
C414 4P7 L
C412 10P-3P5
R412 392R
R413 4K75
C413 8P2 L
L413 5U6H

100 KHZ/120 KHZ

L420 3U3H
R420 N20R 3.8%
R421 51R1 L
C421 4P7
C422 4P7
C423 33P
L422-A 5UH
C426 3N3
C427 33P
L428-A 5UH
C429 4P7
C430 4P7
L430 2U7H
C431 47P
120KHZ GAIN MATCH
R431 200R
R432 681R L
R430 121R L

K 1,8 MHZ

R438 *
R439 0R L
R440 2K L
L440-A 1U6H-T
C440 100P
C441 18P
C442 18P P100
C443 100P
C444 22P
R442 2K L
L442-A 1U6H-T
R444 121R L
1MHZ GAIN MATCH
R445 200R
R446 681R L

L

NOISE FILTER SWITCH

D450-A 74HC4051T-L
MUXDX
C450 10N L
C451 10N L
E0 SHEET2 F/12
E1

R465 100R L
R466 24R3 L
DEMODULATOR INPUT MAX. 110DBUV SHEET8 C/1

R468 619R L
R469 150R L
X177 1 IF OUTPUT MAX. 110DBUV EMK

+10VA
C460 100N L
N450 EL2020CN
R455 475K L
C461 100N L
-10VA
R454 475R L
R460 182R L
R461 47R5 L
R463 100R *
C463 10N L

+10VA
C454 100N L
N455 EL2020CN
R473 182R L
R474 301R L
C455 100N L
-10VA
R458 475R L
R472 *
C457 10N L
R459 43R2
X176 1 IF-NARROW OUT MAX 120DBUV EMK

MOD02 COMPONENTS WITH NUMBER 439 - 446 NOT FITTED

* NOT FITTED

VERSIONS :

MOD02 - ESVS
MOD03 - ESS
MOD04 - ESVD

ACHTUNG: [GB]
ELEKTROSTATISCH GEFÄHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION [GB]
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

07/00	47296 (10)	11.91	NL	1KEE	TAG	NAME	BENENNUNG
				BEARB.		NL	IF SELECTION BOARD
				GEPR.		PF	
				NORM			
				PLOTT	08.11.91		
AEND. IND.	ÄNDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9820.01S
				ZU GERÄT ESVS30			REG.I.V. 1010.5001 ERSTE Z.

BLATT NR. 7 V. (1) BL.

P500

C516

R520

M

DEMODULATOR

DEMODULATOR INPUT
50..110DBUV
SHEET7 D/11

+10V

L508 56UH
C506 2U2 25V TA L
C504 10N L
L503 56UH
C508 4N7
R508 25R5
C500 10N L
R502 332R L
V500 MRF5160 L
R504 1K L
C511 560P L
R517 10R L
R500 1K62 L
R540 100R L
V501 MRF5160 L
P500
C502 10N L
R505 2K L
V502 MRF3866 L
C503 10N L
R541 100R L
R501 1K62 L
C512 560P L
R506 1K L
R518 10R L
C501 10N L
V503 MRF3866 L
R503 332R L
L504 56UH
R509 25R5
C505 10N L
C509 4N7
C507 2U2 25V TA L
L513 56UH
R513 1K L
C513 100N L
L509 56UH
-10V

C515 22N L
L515 10UH
C516 10P-3P5
C517 5P6 L
V515 HSMS2825-L
R511 1K L
R512 10K L
R510 1M L
R514 10K L
C510 1U 050V MKT
N510-A TL072ACD-L

N510-B TL072ACD-L

+10VC +10V
R550 47R5 L
C550 2U2 25V TA L
N510-C
C551 2U2 25V TA L
R551 47R5 L
-10V -10VC

V530 HSMS2800-L
V531 HSMS2800-L
+10VC
C532 10P L
R530 4K75 L
R534 27K4 L
C544 10N L
R524 1K82 L
R525 1K82 L
C530 39P L
R533 2K43 L
R532 2K43 L
R531 4K75 L
C533 10P L
C545 10N L
-10VC
+10VREF
R521 18K2 L
DEMOD. OFFSET
R520 5K .4W SPI
R522 18K2 L
-10VREF
R528 348K
C520 10N L
R515 100R L
R516 100R L
N540 OPA627
R552 51K1 L
R553 51K1 L
VIDEO IN MAX. 4V
SHEET2 B/12
T2
SHEET 2 C/8

* NOT FITTED

VERSIONS :
MOD02 ESVS
MOD03 ESS
MOD04 ESVD

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
07/00	47296 (10)	11.91	NL

1KEE	TAG	NAME
BEARB.		NL
GEPR.		PF
NORM		
PLOTT	08.11.91	

ROHDE&SCHWARZ
ZU GERAET ESVS30

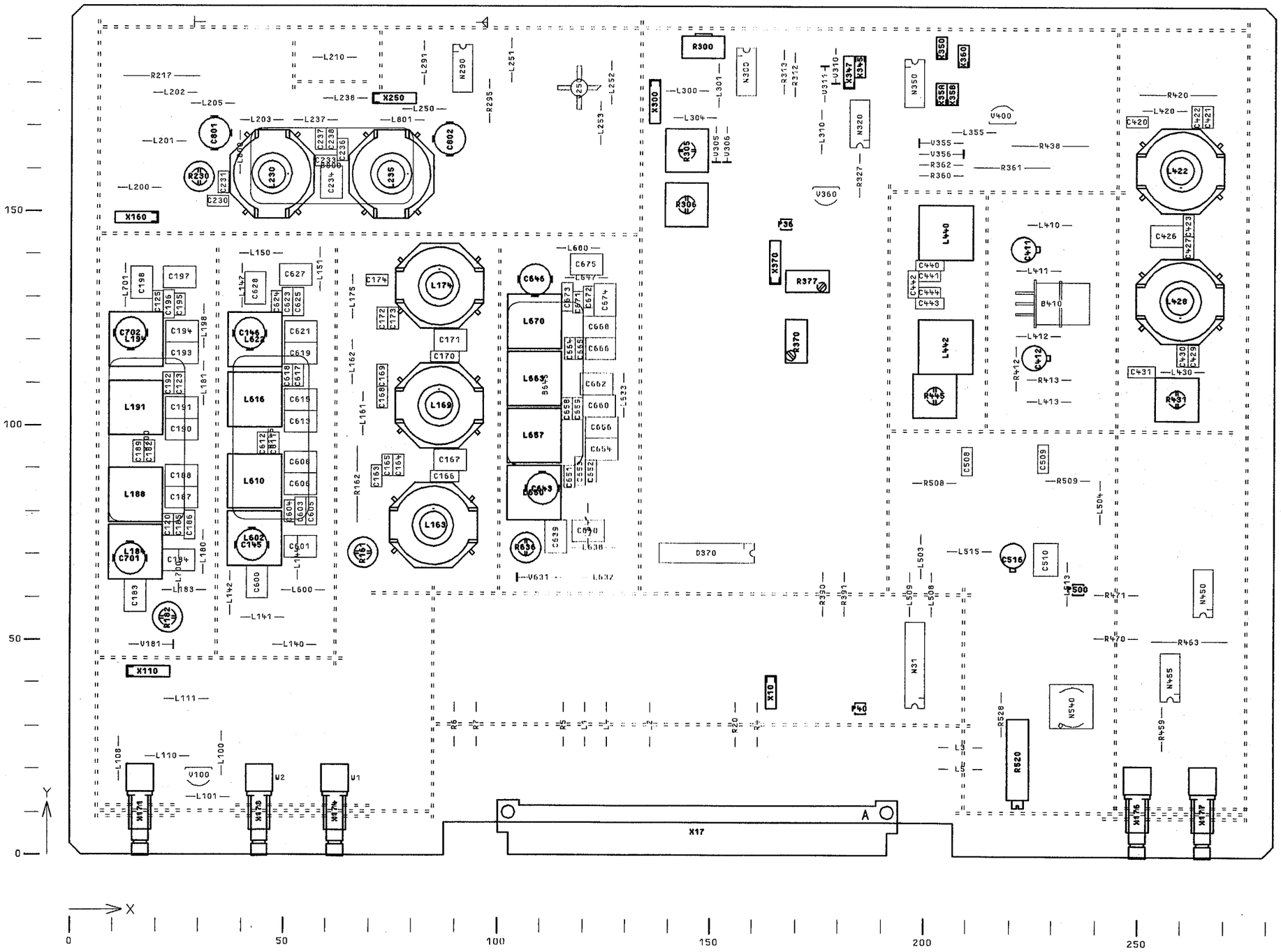
BENENNUNG
IF SELECTION BOARD

ZEICHN.-NR. 1010.9820.01S
BLATT-NR. 8 V. 8 BL.
REG.I.V. 1010.5001 ERSTE Z.

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.9820.01 S

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR.
DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, AENDERUNGEN KOENNEN NUR DURCH AENDERN DES DATENSATZES ERFOLGEN



DARSTELLUNG SEITE B
VIEW ON SIDE B

VERKLEINERUNG

AEND. IND.	AENDERUNG/ MITTEILUNG	DATUM	KARL
06/00	47296 (10)	11.91	NL

1KEE	TAG	NAME
BEARB.		NL
GEPR.		PF
NORM		
PLOTT	11.11.91	

ROHDE&SCHWARZ
ZU GEWALT ESV930

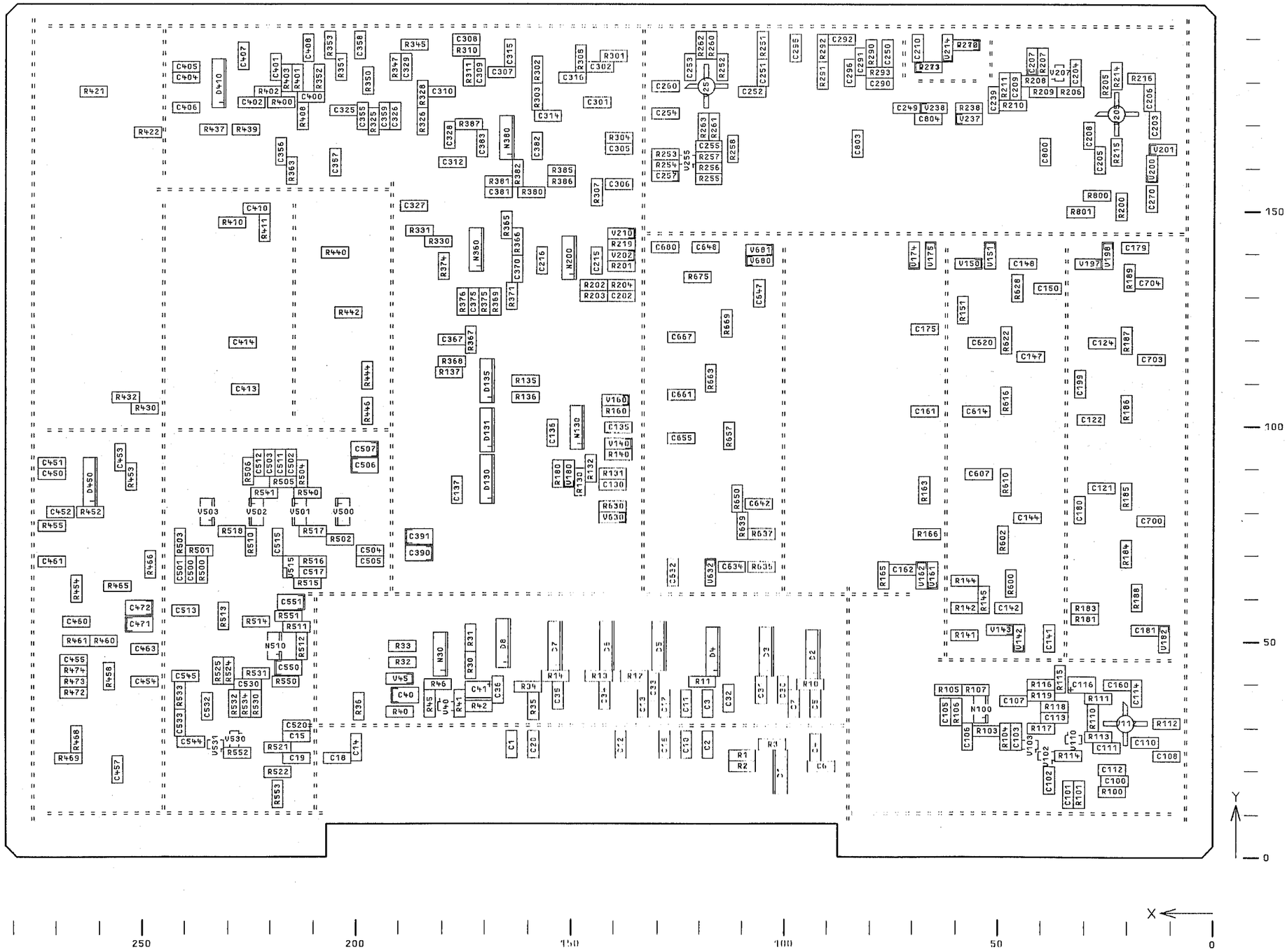
BENENNUNG: IF SELECTION BOARD

Z

ZEICHN.-NR. 1010.9820.01 EE

BLATT NR. 1+

REG.I.V. 1010.5001 ERSTE V.



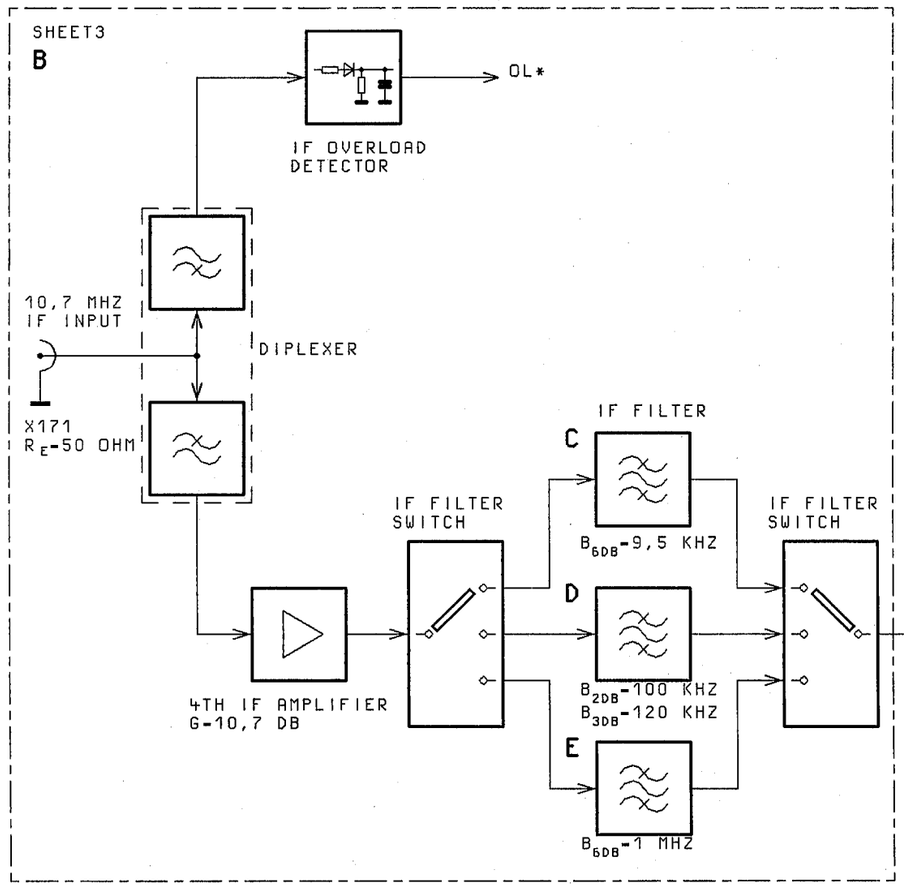
DARSTELLUNG SEITE A
VIEW ON SIDE A

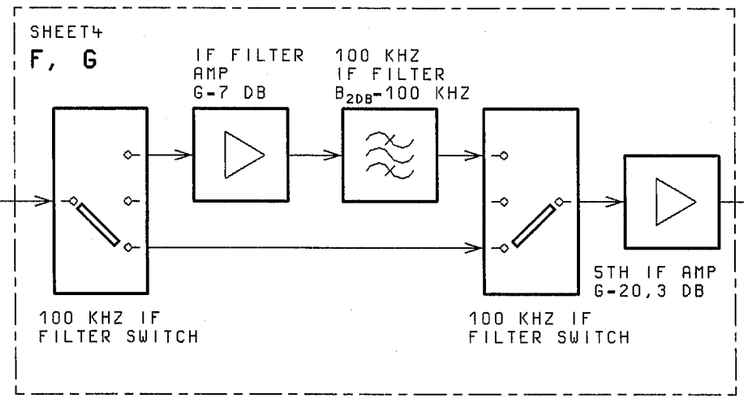
VERKLEINERUNG

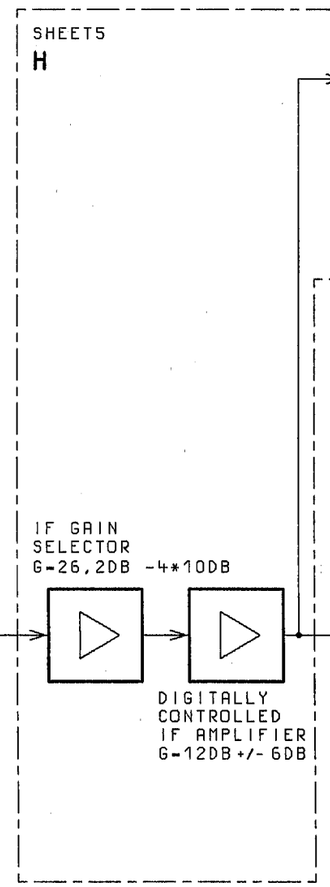
06/00	47296 (10)	11.91	NL	NAME	DATE	NAME	BENENNUNG: IF SELECTION BOARD Z
				GEZ.		NI	
				GEPR.			
				NORM		NI	
				PRÜFT	11.11.91	PI	
ÄND.-IND.	ÄNDERUNGEN/ÄNDERUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.9820.01 EE 2+

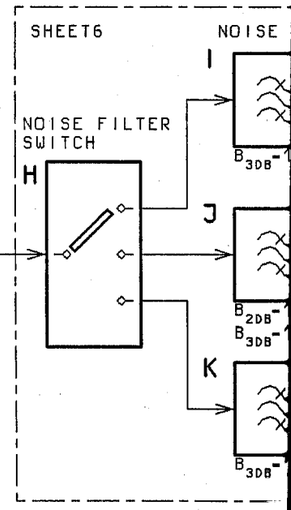
DIESE ZEICHNUNG IST EIN RECHNERAUSDRUCK, RENDERUNGEN KOENNEN NUR DURCH RENDERN DES DATENSATZES ERFOLGEN
DIESE ZEICHNUNG BERECHTIGT WEDER ZUR VERVIELFÄLTIGUNG NOCH ZUR WEITERGABE AN DRITTE OHNE UNSERE AUSDRÜCKLICHE GENEHMIGUNG. WIDERRECHTLICHE VERWENDUNG ODER MITTEILUNG DES INHALTS VERPFLICHTET ZU SCHADENERSATZ. ALLE RECHTE VORBEHALTEN.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR









G - -9,2 DB

MOD02: BANDWIDTHS 100 KHZ AND 1 MHZ NOT FITTED

VERSIONS

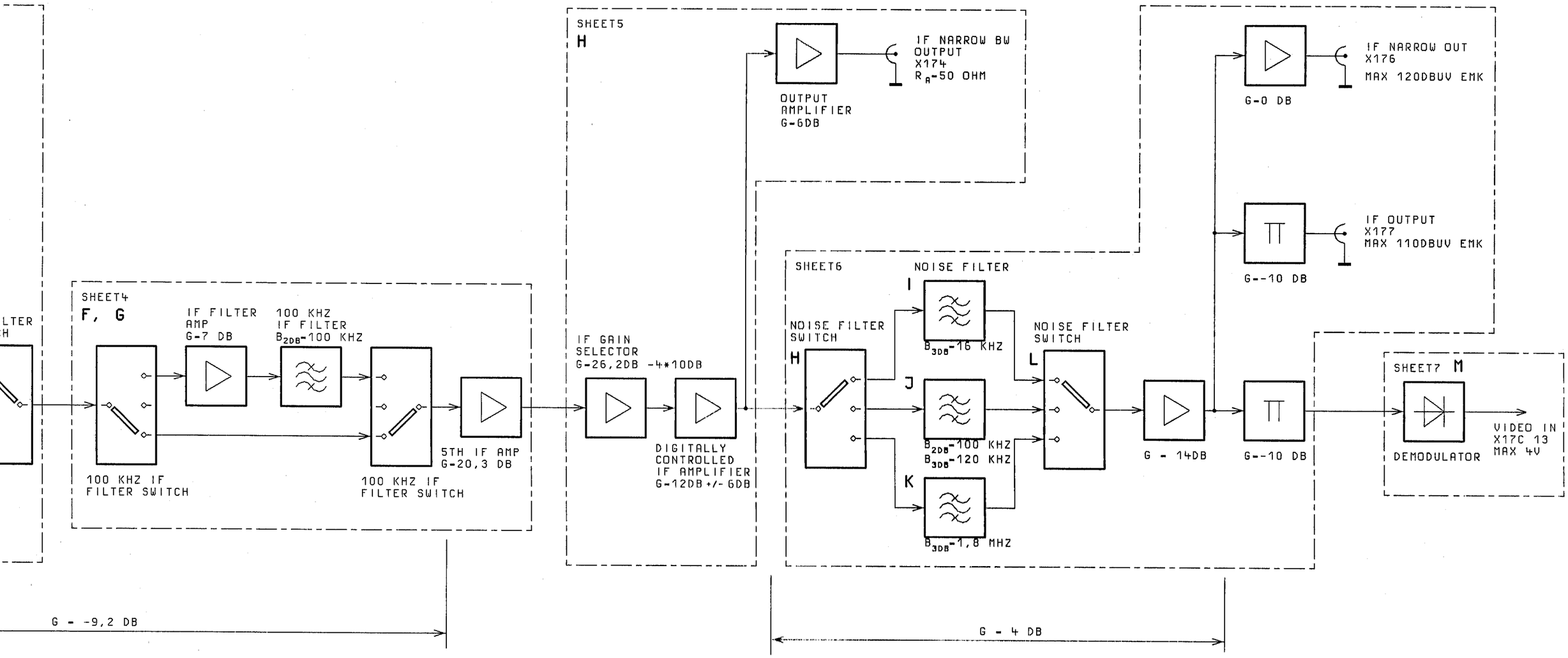
MOD02 - ESVS

MOD03 - ESS

ACHTUNG! ESD!
ELEKTROSTATISCH GEFÄHRDETE
BAUELEMENTE ENTHALTEN EINE
GEGENSTAND HANDHABUNG.
ATTENTION ESD!
ELECTROSTATICALLY SENSITIVE DEVICES
DEMAND A SPECIAL HANDLING

03	4033
REND. IND.	

ZEICHN.-NR. 1010.8798.01 S



MOD02: BANDWIDTHS 100 KHZ AND 1 MHZ NOT FITTED

VERSIONS

MOD02 - ESVS
MOD03 - ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

03	46337	04.91	Pf		TAG	NAME
				BEARB.		PF
				GEPR.		BU
				NORM		
				PLOTT	8. 4.91	*
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ		
				ZU GERAET	ESVS30	

BENENNUNG: IF SELECTION BOARD

ZEICHN.-NR. 1010.8798.01S

BLATT-NR. 1 v. 8 Bl.

REG.I.V. 1010.5001 ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

P40

X17A 1
X17C 1
GNDA

X17A 7
SCLK
R1 100R L
D1-A 74HCT14T-L
D1-B 74HCT14T-L
C2 220P L
R5 100R
C3 220P L

X17C 7
TDATA
R2 100R L
D1-C 74HCT14T-L
D1-D 74HCT14T-L
C4 220P L
R6 100R
C5 220P L

X17C 8
STROBE*
R3 100R L
D1-F 74HCT14T-L
D1-E 74HCT14T-L
C6 220P L
R7 100R
C7 220P L

X17A 9
TEST
R4 1K
C1 220P L

X17A 2
X17C 2
+5VA
D1-G 74HCT14T-L
C10 100N L
L1 1U2H
C11 100N L
+5V

X17A 4
X17C 4
+10V
C12 100N L
L2 1U2H
C13 100N L
+10V

L3 1U2H
C14 100N L
C15 100N L
+10VREF

X17A 5
X17C 5
-10V
C16 100N L
L4 1U2H
C17 100N L
-10V

L5 1U2H
C18 100N L
C19 100N L
-10VREF

X17C 11
OL*
R20 1K
C20 100P L
OL*

X17C 12

X17C 13
VIDEO IN
VIDEO IN

X17C 14

BOARD CONTROL

ADRESSDECODER

+5V
R10 10K L
D2-A 74HCT4094T-L
D3-A 74HCT238T-L

DATA LATCHES 1-4

R11 10K L
D4-A 74HCT4094T-L
R12 10K L
D5-A 74HCT4094T-L
R13 10K L
D6-A 74HCT4094T-L
R14 10K L
D7-A 74HC

A0 SHEET5 B/1

D2-B 74HCT4094T-L
D3-B 74HCT238T-L
D4-B 74HCT4094T-L
C30 100N L
C31 100N L
C32 100N L

C33 100N L
C34 100N L
C35 100N L
C36 100N L
D5-B 74HCT4094T-L
D6-B 74HCT4094T-L
D7-B 74HCT4094T-L
D8-B 74HC4051T-L

N31-E LM124J

TO SHEET2 B/6
T0 R30 10K L
T1 R31 10K L SHEET4 D/5
T2 R32 10K L SHEET7 C/8
T3 R33 10K L SHEET3 C/4
T4 SHEET4 E/12
T5 SHEET5 C/8
T6 SHEET4 E/4
* R36

-5V GENERATION

-10V
P40
V40 BCX71J-L
R41 4K32 L
R40 47K5 L
C40 10U 10V TA L
R45 51K1 L
-5V
TO SHEET2 C/9
C41 4U7 10V TA L
R42 5K62 L
R46 51K1 L
V45 BAS32-L
+10V

* NOT FITTED

VERSIONS

BEACHTUNG: EGAL!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE
MOGELIJK ELEKTROSTATISCH GEVOELIGE BAUELEMENTEN
ATTENTION: EGAL!
ELECTROSTATICALLY SENSITIVE DEVICES
MAY BE PRESENT

P40

X10

BOARD CONTROL

ADRESSDECODER

DATA LATCHES 1-4

BOARD TEST

+5V

R10 10K L

D2-A 74HCT4094T-L

D3-A 74HCT238T-L

R11 10K L

D4-A 74HCT4094T-L

R12 10K L

D5-A 74HCT4094T-L

R13 10K L

D6-A 74HCT4094T-L

R14 10K L

D7-A 74HCT4094T-L

A0 SHEET5 B/1

D8-A 74HC4051T-L

T0* T1* T2* T3* T4* T5* T6* T7*

R34 10K L

R35 10K L

X11

X10 1 X10 2 X10 3

A1 A2 E2 E3 → SHEET 5 B/1, SHEET 3 D/6, SHEET 6 D/3, C/9

D0 D1 D2 D3 D4 D5 D6 D7 D8 D9 → SHEETS B/7

D2-B 74HCT4094T-L

D3-B 74HCT238T-L

D4-B 74HCT4094T-L

C30 100N L

C31 100N L

C32 100N L

C33 100N L

C34 100N L

C35 100N L

C36 100N L

D5-B 74HCT4094T-L

D6-B 74HCT4094T-L

D7-B 74HCT4094T-L

D8-B 74HC4051T-L

N31-E LM124J

R30 10K L

T0 SHEET2 B/6

R31 10K L

T1 SHEET4 D/5

R32 10K L

T2 SHEET7 C/8

R33 10K L

T3 SHEET3 C/4

T4 SHEET4 E/12

T5 SHEET5 C/8

T6 SHEET3 E/4

* R36

N30-A LM224D-L

N30-B LM224D-L

N30-D LM224D-L

N30-C LM224D-L

N31-A LM124J

N31-B LM124J

N31-C LM124J

N31-D LM124J

T0* T1* T2* T3* T4* T5* T6*

+5V +5V

-5V -5V

+10V +10V

-10V -10V

OL* OL* SHEET 3 D/5

VIDEO IN VIDEO IN SHEET 7 C/8

-5V GENERATION

-10V

P40

V40 BCX71J-L

R41 4K32 L

R40 47K5 L

C40 10U 10V TA L

R45 51K1 L

-5V

T0 SHEET2 C/9

C41 4U7 10V TA L

R42 5K62 L

R46 51K1 L

V45 BAS32-L

+10V

* NOT FITTED

VERSIONS

MODO2 ESVS

MODO3 ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
05	46337	04.91	Pf

	TAG	NAME
BEARB.		PF
GEPR.		BU
NORM		
PLOTT	8. 4.91	*

BENENNUNG: IF SELECTION BOARD

ROHDE&SCHWARZ

ZU GERAET ESVS30

ZEICHN.-NR. 1010.8798.01S

BLATT NR 2

REG.I.V. 1010.5001

ERSTE V.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

X111

B

DIPLEXER

10.7 MHZ IF INPUT
X171 1
RE-500HM

C100 56P L
L101 330NH
R100 51R1 L
L108 330NH
C108 68P L

IF OVERLOAD DETECTOR

+10V
L100 47UH
C101 4N7 L
V100 J310
C102 4N7 L
V103 HSMS2800-L
T6 SHEET2 B/9
R103 100K L
R101 1K L
V102 HSMS2800-L
C103 10P L
R104 1M L
R105 90K9 L
R107 1K L
C105 100N L
R106 2K L
-10V
+10V
C106 100N L
C107 100N L
N100 LM211D-L
OL* SHEET 2 C/12

4TH IF-AMPLIFIER

C116 1U 25V TA L
R115 10K L
R116 9K09 L
+10V
V110 BC860B-L
R117 130R L
R118 100K L
T3 SHEET2 B/9
C113 100N L
R114 1K L
R119 100K L
C112 4N7 L
L111 47UH
X110 1 X110 2 X110 3 X110 4
X111
L110 47UH
C110 4N7 L
C111 4N7 L
R110 15R L
R111 221R L
C114 4N7 L
V112 NE85637-L
R112 20R L
R113 20R L

IF FILTER SWITCH

+10V
V140 BAS32-L
C135 100N L
R140 2K74 L
+5V
R130 10K L
R132 1K L
N130-A LM224D-L
C136 100N L
-10V
C130 100N L
R131 10K L

X SHEET 4 E/1
D130-A 74HCT139T-L
E2
E3
SHEET 2 F/12
D135-C 74HCT08T-L
N130-B LM224D-L
V160 BAS32-L
R160 2K74 L

C160 10N

N130-C LM224D-L
V180 BAS32-L
R180 2K74 L

D130-B 74HCT139T-L
D135-B 74HCT08T-L
D135-B 74HCT08T-L
D135-D 74HCT08T-L

X111

R182 R161 L184 L163 C145 L188

IF FILTER

LOAD DETECTOR

T6 SHEET2 B/9

+10V

C106 100N L

R103 100K L

+10V

R104 1M L

R105 90K9 L

R107 1K L

C107 100N L

R106 2K L

-10V

OL* → SHEET 2 C/12

N100 LM211D-L

AMPLIFIER

→ T3 SHEET2 B/9

X111

IF FILTER SWITCH

+10V

C135 100N L

V140 BAS32-L

+5V

R130 10K L

R132 1K L

N130-A LM224D-L

R140 2K74 L

C136 100N L

-10V

C130 100N L

R131 10K L

X SHEET 4 E/1

D130-A 74HCT139T-L

E2

E3

SHEET 2 F/12

D135-C 74HCT08T-L

N130-B LM224D-L

V160 BAS32-L

R160 2K74 L

N130-C LM224D-L

V180 BAS32-L

R180 2K74 L

C — 9,5 KHZ

C141 10N L

L142 100UH

L141 100UH

V142 BA682-L

C142 10N L

R145 43R2 L

L144 3U3H

L140 100UH

V143 BA682-L

R142 130R L

R144 130R L

C144 68P L

C145 20P-4P5

R141 1K3 L

D — 100 KHZ/120 KHZ

C161 10N L

L162 100UH

L161 100UH

C160 10N L

V161 BA682-L

C162 10N L

120KHZ GAIN MATCH

R162 N20R 3.8%

C163 12P

C164 4P7

V162 BA682-L

R165 681R L

R161 20R

R166 681R L

R163 47R5 L

C165 27P

L163-A 1.5UH

C166 100P

E — 1 MHZ

C180 10N L

L181 100UH

L180 100UH

V181 BA389

C181 10N L

1MHZ GAIN MATCH

R188 0R L

C183 *

R184 30K1 L

C186 *

C120 1U

R185 15K L

C182 15P

V182 BA682-L

R181 *

R182 20R

R183 *

L183 *

C184 *

L184-A 6U2H

C187 220U

C121 *

C188 220P

L188-A 6U2H

C189 27P

C190 *

D130-B 74HCT139T-L

D135-B 74HCT08T-L

R135 10K L

D135-A 74HCT08T-L

R136 10K L

D135-D 74HCT08T-L

R137 10K L

+5V

D130-C 74HCT139T-L

D135-E 74HCT08T-L

C137 100N L

N130-D LM224D-L

VERSIONS

MOD02 ES99

MOD03 E99

MOD02: COMPONENTS WITH NUMBER 180 - 199 NOT FITTED
C120 - C125 NOT FITT

* NOT FITTED

ACHTUNG:
ELEKTROSTATISCH
BAUELEMENTE EINH
BESONDERE ANN
ATTENTION
ELECTROSTATIC SENS
REQUIRE A SPECIA

5 6 7 8 9 10 11 12

R182 R161 L184 L163 C145 L188 C146 L169 L191 L194 L174 X161

IF FILTER

9,5 KHZ

C141 10N L
L141 100UH
V142 BA682-L
C142 10N L
R145 43R2 L
L142 100UH
L144 3U3H
B145 10.7 MHZ
L147 3U3H
C148 10N L
C150 10N L
L150 100UH
V151 BA682-L
L140 100UH
R141 1K3 L
V143 BA682-L
R142 130R L
R144 130R L
C144 68P L
C145 20P-4P5
C146 20P-4P5
C147 82P L
V150 BA682-L
L151 100UH
R151 2K74 L

100 KHZ/120 KHZ

C161 10N L
L161 100UH
V161 BA682-L
C162 10N L
120KHZ GAIN MATCH
R162 N20R 3.8%
R163 47R5 L
C163 12P
C164 4P7
C165 27P
L163-A 1 5UH
C166 100P
C167 1N5
C168 22P
L164-A 1 5UH
C169 22P
C170 100P
C171 1N5
C172 4P7
C173 27P
L174-A 5UH
C174 12P
C175 10N L
L175 100UH
V175 BA682-L
V174 BA682-L
C179 10N L
X160 1 X160 2 X160 3 X160 4 X161
IF FILTER OUTPUT
SHEET4 D/1
V162 BA682-L
R165 681R L
R166 681R L

1 MHZ

C180 10N L
L180 100UH
V181 BA389
C181 10N L
1MHZ GAIN MATCH
R182 20R
R183 *
L183 *
R188 0R L
C183 *
C184 *
R184 30K1 L
L184-A 6U2H
C185 *
C186 *
C120 39P
C187 220P
C121 *
C188 220P
R185 15K L
L188-A 6U2H
C182 15P
C189 27P
C190 *
C122 120P
C191 680P
R186 15K L
L191-A 6U2H
C123 15P
C192 27P
C193 220P
C124 *
C194 220P
R187 30K1 L
L194-A 6U2H
C195 *
C196 *
C125 39P
C197 *
C198 *
R189 0R L
L198 100UH
C199 10N L
V198 BA682-L
V197 BA682-L
V182 BA682-L
R181 *
R183 *
L183 *
C184 *

MOD02: COMPONENTS WITH NUMBER 180 - 199 NOT FITTED
C120 - C125 NOT FITTED

* NOT FITTED

VERSIONS

MOD02 ESVS
MOD03 ESS

ACHTUNG: ESD!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

04	46337	04.91	Pf		TAG	NAME
				BEARB.		PF
				GEPR.		BU
				NORM		
				PLOTT	8. 4.91	*
AEND. IND.	AENDERUNGS MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ		

BENENNUNG: IF SELECTION BOARD

ZEICHN. NR. 1010.8798.013 BLATT NR 3

NORM 1010.6001

14 N130-D LM224D L

X200 R230 L230 L235

F

100KHZ IF FILTER SWITCH

N200-B LM224D-L

+5V

R203 10K L

R202 1K L

R204 10K L

C202 100N L

R201 2K74 L

V202 BAS32-L

R219 2K74 L

V210 BAS32-L

N200-C LM224D-L

X
SHEET 3 D/7

C205 10N L

L201 100UH

IF FILTER AMP

C207 1U 10V TA L

+10V

R207 1K3 L

R208 7K5 L

V207 BC860B-L

R209 221R L

R206 1K L

R210 100K L

T1
SHEET2 C/9

C204 10N L

C209 100N L

R211 100K L

L202 100UH

L205 68UH

C206 4N7 L

R205 162R L

C208 10N L

R216 5R62 L

V205 NE85637-L

R217 N100R 3.5%

R214 33R2 L

R215 33R2 L

L203 100UH

100KHZ IF FILTER

R230 20R
100KHZ GAIN MATCH

C230 4P7

C231 4P7

C233 33P

C234 3N3

C236 33P

C237 4P7

C238 4P7

L230-A 5UH

L235-A 5UH

L237 100UH

V237 BA682-L

IF FILTER OUTPUT
SHEET3 C/16

C270 10N L

V200 BA682-L

L200 100UH

R200 2K74 L

V201 BA682-L

C203 10N L

+10V

C215 100N L

N200-A LM224D-L

C216 100N L

-10V

N200-D LM224D-L

G

R270 OR L

V212 BA682-L

V214 BA682-L

R271 OR L

V213 BA682-L

L210 100UH

C210 10N L

MOD02 COMPONENT WITH NUMBER 200 - 241 NOT FITTED
MOD03 R270,R271 NOT FITTED

VERSIONS:

MOD02 - ESVS

MOD03 - ESS

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8798.01 S

05 40

AEND. IND.

R230 L230 L235 X250

IF FILTER AMP

C207 1U 10V TA L
+10V
R207 1K3 L
R208 7K5 L
R209 221R L
V207 BC860B-L
R206 1K L
R210 100K L
T1 SHEET2 C/9
C204 10N L
C209 100N
R211 100K L
L202 100UH
L205 68UH
C206 4N7 L
R205 162R L
C208 10N L
R216 5R62 L
V205 NE85637-L
R214 33R2 L
R215 33R2 L
R217 N100R 3.5%

L203 100UH

100KHZ IF FILTER

R230 20R
100KHZ GAIN MATCH
C230 4P7
C231 4P7
C233 33P
C234 3N3
C236 33P
C237 4P7
C238 4P7
L230-A 5UH
L235-A 5UH

C239 10N L
L237 100UH
V238 BA682-L
V237 BA682-L
C249 10N L
L238 100UH
R238 2K74 L

5TH IF AMP

+5V
C257 1U 10V TA L
R254 43K2 L
R255 18K2 L
V255 BC860B-L
R256 24R3 L
R257 100K L
T4 SHEET2 B/9
R253 1K L
C254 4N7 L
C255 4N7 L
R258 100K L
L252 47UH
L253 47UH
C253 4N7 L
X250 1 X250 2 X250 3 X250 4
X251
C260 10N L
5TH IF AMP OUTPUT SHEET5 D/1
L250 180NH
C252 10N L
R252 562R L
V250 NE85637-B
C250 39P L
C251 39P L
L251 680NH
R251 51R1 L
R260 681R L
R261 681R L
V251 NE85637-L
R262 5R62 L
R263 5R62 L

R270 OR L
R271 OR L
V214 BA682-L
V212 BA682-L
V213 BA682-L
L210 100UH
C210 10N L

MOD02 COMPONENT WITH NUMBER 200 - 241 NOT FITTED
MOD03 R270,R271 NOT FITTED

VERSIONS:

MOD02 - ESVS
MOD03 - ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
05	46337	04.91	Pf

	TAG	NAME
BEARB.		PF
GEPR.		BU
NORM		
PLOTT	8. 4.91	*

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
IF SELECTION BOARD

ZEICHN.-NR. 1010.8798.01S
BLATT NR 4 V. 11
REG.I.V. 1010.5001 ERSTE Z.

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8798.01 S

X301 R300 R305 R306 R377 X370 R370 P36 X348

H

+10V → R390 10R → +10VB
C390 2U2 25V TA L

-10V → R391 10R → -10VB
C391 2U2 25V TA L

IF GAIN SELECTOR

X300 1 X300 2 X300 3 X300 4 X301

5TH IF AMP OUTPUT
SHEET4 D/12

C301 180P L
L301 5U6H
L300 1U8H
C302 33P L
R300 1K
IF GAIN ADJUST
R301 100R

+10V
C315 100N L
N300 EL2020CN
-10V
C316 100N L
R302 475R L
R303 30R1 L
C314 10N L
L304 47UH
R304 2K74 L

C307 10N L
C308 10N L
R310 3K57 L
V310 BA483
R312 909R 0.1%
R311 4K75 L
V311 BA483
R313 100R .1%
C309 10N L
L310 100UH
C312 10N L
C310 10N L

V305 BA483
G20 ADJUST
R305 50R
V306 BA483
R306 100R
G10 ADJUST
R307 130R L
C305 10N L
C306 10N L

+5V
R380 10K L
R382 1K L
N380-B LM224D-L
R385 200R L
A0
SHEET 2 E/8
C381 100N L
R381 10K L
+10V
C382 100N L
N380-A LM224D-L
R386 200R L
A1
SHEET 2 F/12
C383 100N L
-10V
R387 200R L
N380-C LM224D-L
A2
SHEET 2 F/12

DIGITALLY CONTROLLED IF AMPLIFIER

X347 1 X347 2 X347 3 X348
X345 X345
R345 51R1 L

R375 10K L
C375 100N L
N360-D TL074ACD-L
+10VREF
R377 10K
R374 1K L
REFERENCE ADJUST
R376 4K75 L

X370 1 X370 2 X370 3 X370 4 X371
R365 10K L
P36
N360-B TL074ACD-L
R366 10K L
R371 332R L
C370 15P L
RFB REF
LSB OUT1 OUT2 MSB
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9
D370-A AD7533CD
SHEET2 E0/11
N360-A TL074ACD-L
R369 1K L
C367 100N L
OFFSET ADJUST
R367 10K L
R370 200R
R368 10K L
+10VREF
10VREF
R330 47K5 L
R331 47K5 L
T5
SHEET 2

MODUL COMPONENTS C325 - C329 , R
MODUL NOT FITTED

VERSION 1
MODUL = PAL
MODUL = SECAM

N360-D TL074ACD-L
+10V
-10V
D370-A AD7533CD

R306 R377 X370 R370 P36 X348 X36

DIGITALLY CONTROLLED IF AMPLIFIER

C315 100N L
N300 EL2020CN
C316 100N L
-10V
L304 47UH
R304 2K74 L
V306 BA483
R306 100R
G10 ADJUST
R307 130R L
C308 10N L
C307 10N L
R310 3K57 L
V310 BA483
R312 909R 0.1%
R311 4K75 L
V311 BA483
R313 100R .1%
C309 10N L
L310 100UH
C312 10N L
C310 10N L
R375 10K L
C375 100N L
+10VREF
N360-D TL074ACD-L
REFERENCE ADJUST
R377 10K
R374 1K L
R376 4K75 L
R371 332R L
C370 15P L
N360-A TL074ACD-L
D0 D1 D2 D3 D4 D5 D6 D7 D8 D9
LSB MSB
RFB REF OUT1 OUT2
D370-A AD7533CD
SHEET2 ED/11
X370 1 X370 2 X370 3 X370 4
X371
R366 10K L
N360-B TL074ACD-L
R365 10K L
P36
N360-C TL074ACD-L
R330 47K5 L
T5
SHEET 2 B/9
R331 47K5 L
R360 4KB1 .1%
R361 N10K 3.8%
R362 2K29 .1%
R363 15R L
OFFSET ADJUST
R367 10K L
R370 200R
R368 10K L
C367 100N L
+10VREF
-10VREF
X347 1 X347 2 X347 3
X348
X345 2 X345 1
R345 51R1 L
R347 475K L
N350 EL2020CN
+10V
C358 100N L
-10V
C359 100N L
R350 475R L
C355 27N L
L355 47UH
C356 100N L
V355 5082-3081
V356 5082-3081
C357 27N L
V360 J310
R353 51R1 L
X350 1 X350 2
R351 909R L
X35A 2 X35B 2
X36
X35A 1 X35B 1
R352 51R1 L
X360 1 X360 2
NOISE FILTER INPUT
SHEET6 C/1
C325 10N L
OUTPUT AMPLIFIER
R328 182R L
C329 10N L
-10V
+10V
R325 475K L
C326 100N L
C328 100N L
R326 475R L
N320 EL2020CN
R327 43R2
C327 10N L
X327
W1
X328
X174 1
IF NARROW BW OUTPUT RA-500HM

MOD02 COMPONENTS C325 - C329 , R325 - R328 , N320 NOT FITTED
MOD02 W1 NOT FITTED

N380-D LM224D-L
+10VB
N360-E TL074ACD-L
-10VB
+10VB
D370-B AD7533CD

VERSIONS:

MOD02 - ESVS
MOD03 - ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

					TAG	NAME
04	46337	04.91	Pf	BEARB.		PF
				GEPR.		BU
				NORM		
				PLOTT	8. 4.91	*
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME			

ROHDE&SCHWARZ
ZU GERAET ESVS30

BENENNUNG
IF SELECTION BOARD

ZEICHN.-NR. 1010.8798.01S
REG.I.V. 1010.5001 ERSTE Z.
BLATT NR 5 V. 11

L440 C411 L422 L442 C412 R445 L428 R431

NOISE FILTER

16 KHZ

R410 1K21 L
R411 3K92 L
B410 10.7MHZ BANDP.
C410 15P L
L410 5U6H
C411 10P-3P5
L411 22UH
L412 22UH
C414 4P7 L
C412 10P-3P5
R412 392R
R413 4K75
C413 8P2 L
L413 5U6H

NOISE FILTER SWITCH

+10V
C401 10N L
C404 10N L
E2
SHEET2 F/12 E3
C405 10N L
D410-A 74HC4051T-L
MUXDX
8M
G8
R400 15K L
R402 1K L
C402 10N L
C400 10N L
NOISE FILTER INPUT
SHEETS D/12
R408 100R L
V400 BF374
R401 3K92 L
R403 511R L
C408 10N L
-10V

100 KHZ/120 KHZ

L420 3U3H
R420 N20R 3.8%
R421 51R1 L
C420 33P
C421 4P7
C422 4P7
C423 33P
L422-A 5UH
C426 3N3
C427 33P
L428-A 5UH
C429 4P7
C430 4P7
L430 2U7H
C431 47P
120KHZ GAIN MATCH
R431 200R
R432 681R L
R430 121R L

NOISE FILTER S

D450-A 74HC4051T-L
MUXDX
8M
G8
C450 10N L

1,8 MHZ

R437 *
R438 *
R439 0R L
C406 10N L
+5V
-5V
C407 10N L
D410-B
R440 2K L
L440-A 1U6H-T
C440 100P
C441 18P
C442 18P P100
C443 100P
C444 22P
R442 2K L
L442-A 1U6H-T
R444 121R L
1MHZ GAIN MATCH
R445 200R
R446 681R L

M L

+10V
R470 10R
+10VA
C471 2U2 25V TA L
-10V
R471 10R
-10VA
C472 2U2 25V TA L

+5V -5V
R452 100R L
R453 100R L
C452 100N L
C453 100N L
D450-B

MOD02 COMPONENTS WITH NUMBER 439 - 446 NOT FITTED

* NOT FITTED

VERSIONS :
MOD02 = FUNK
MOD01 = FUNK

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR. 1010.8798.01 S

L440 C411 L422 L442 C412 R445 L428 R431

NOISE FILTER

16 KHZ

R410 1K21 L
R411 3K92 L
L410 5U6H
C411 10P-3P5
L411 22UH
B410 10.7MHZ BANDP.
L412 22UH
C414 4P7 L
C412 10P-3P5
R412 392R
R413 4K75
C413 8P2 L
L413 5U6H

100 KHZ/120 KHZ

L420 3U3H
R420 N20R 3.8%
C421 4P7
C423 33P
C427 33P
C429 4P7
L430 2U7H
C420 33P
R421 51R1 L
C422 4P7
L422-A 5UH
C426 3N3
L428-A 5UH
C430 4P7
C431 47P
120KHZ GAIN MATCH
R431 200R
R432 681R L
R430 121R L

K 1,8 MHZ

R438 *
R439 0R L
R440 2K L
L440-A 1U6H-T
C440 100P
C441 18P
C442 18P P100
C443 100P
C444 22P
R442 2K L
L442-A 1U6H-T
R444 121R L
1MHZ GAIN MATCH
R445 200R
R446 681R L

L

NOISE FILTER SWITCH

D450-A 74HC4051T-L
MUXDX
C450 10N L
E2 SHEET2 F/12
E3
C451 10N L

R465 100R L
R466 47R5 L
DEMODULATOR INPUT MAX. 110DBUV SHEET7 C/1

R468 332R L
R469 150R L
X177 1 IF OUTPUT MAX. 110DBUV EMK

+10VA
C460 100N L
N450 EL2020CN
R455 475K L
C461 100N L
-10VA
R454 475R L
R461 0R L
R460 150R L
R463 N1K 3.8%
C463 10N L

+10VA
C454 100N L
N455 EL2020CN
C455 100N L
-10VA
R458 475R L
C457 10N L
R459 43R2
X176 1 IF-NARROW OUT MAX 120DBUV EMK

MOD02 COMPONENTS WITH NUMBER 439 - 446 NOT FITTED

* NOT FITTED

VERSIONS :

MOD02 - ESVS

MOD03 - ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

05	46337	04.91	Pf		TAG	NAME	BENENNUNG
				BEARB.		PF	IF SELECTION BOARD
				GEPR.		BU	
				NORM			
				PLOTT	8. 4.91	*	
AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME	ROHDE&SCHWARZ			ZEICHN.-NR. 1010.8798.01S
				ZU GERAET	ESVS30		BLATT-NR. 6
				REG.T.V.	1010.5001	ERSTE Z.	V. 8 BL.

P500

C516

R520

M

DEMODULATOR

+10V

L508 56UH

C506 2U2 25V TA L

C504 10N L

L503 56UH

C508 4N7

R508 25R5

C500 10N L

R502 332R L

V500 MRF5160 L

C511 560P L

R504 1K L

R517 10R L

R500 1K62 L

R540 100R L

V501 MRF5160 L

P500

C502 10N L

DEMODULATOR INPUT 50..110DBUV

SHEET 6 C/11

R505 2K L

V502 MRF3866 L

C503 10N L

R541 100R L

C512 560P L

R506 1K L

R501 1K62 L

R518 10R L

C501 10N L

V503 MRF3866 L

R503 332R L

L504 56UH

R509 25R5

C505 10N L

C509 4N7

C507 2U2 25V TA L

L513 56UH

R513 1K L

C513 100N L

L509 56UH

-10V

C515 22N L

L515 10UH

C516 10P-3P5

C517 8P0 L

V515 HSMS2825-L

R511 1K L

R512 10K L

R510 1M L

R514 10K L

C510 1U 050V MKT

N510-A TL072ACD-L

N510-B TL072ACD-L

+10VC +10V

R550 47R5 L

C550 2U2 25V TA L

N510-C

C551 2U2 25V TA L

R551 47R5 L

-10V -10VC

V530 HSMS2800-L

V531 HSMS2800-L

+10VC

C532 10P L

C544 10N L

R530 4K75 L

R534 27K4 L

R524 1K82 L

R525 1K82 L

C530 39P L

R533 2K43 L

R532 2K43 L

N540 OPA627

C533 10P L

C545 10N L

-10VC

VIDEO IN MAX. 4V

SHEET 2 C/12

T2

SHEET 2 C/8

R552 51K1 L

R553 51K1 L

+10VREF

R521 18K2 L

DEMOD. OFFSET

R520 5K .4W SPI

R522 10K2 L

-10VREF

R531 4K75 L

R528 348K

C520 10N L

R519 100R L

R516 100R L

* NOT FITTED

VERSIONS :

MOD02 ESVS

MOD03 ESS

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ENTNEHMEN SIE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME

	TAG	NAME
BEARB.		BU
GEPR.		BU
NORM		
PLOTT	17.10.90	*

BENENNUNG

IF SELECTION BOARD

ROHDE&SCHWARZ

ZEICHN. NR. 1010.8798.01S

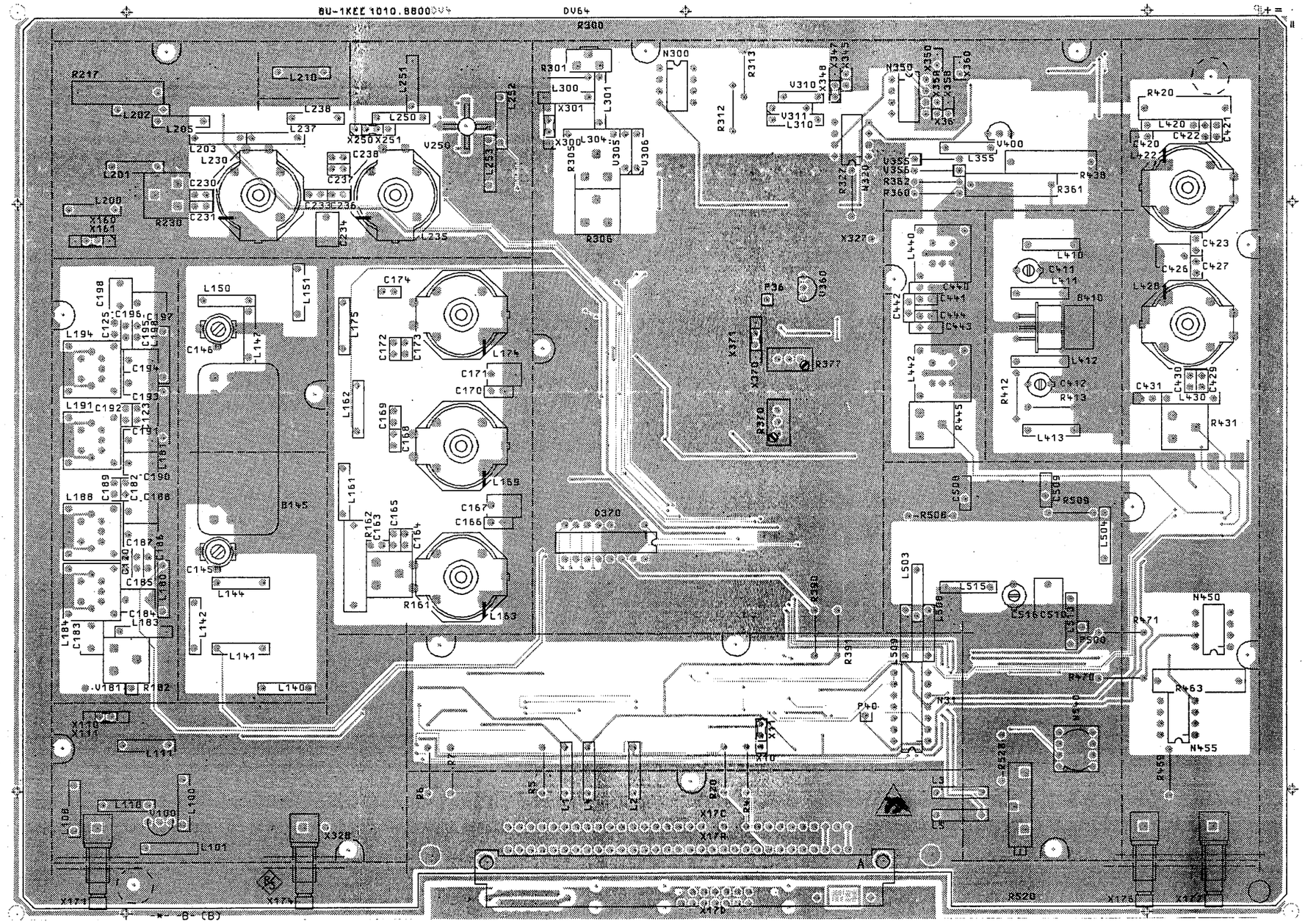
BLATT-NR. 7

V. 7 BL.

DR.I.N. 1010.8001

FUER DIESE UNTERLAGE BEHALTEN WIR UNS ALLE RECHTE VOR

Für diese Unterlage behalten wir uns alle Rechte vor



Ansicht und Leitungsfuehrung Bauteilseite
View of tracks on component side

Not fitted:
C121, C124, C183 bis C186, C190,
C195 bis C198, L183, R36, R437, R438
R181, R183

(hierzu HVC 250)

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

ATTENTION ESD!
Electrostatic sensitive devices require a special handling.

Änd. Zust.	Änderungs-Mitteilung	Tag	Name
01			
02	45128 (13)	01.91	BU

Maße ohne Toleranzangabe

Maßstab 1 : 1

Halbzeug, Werkstoff

	Tag	Name
1KEE		
Bearb.	11.90	BU
Gepr.		
Norm		

Benennung: IF SELECTION BOARD

Z

ROHDE&SCHWARZ

zu Gerät ESVS30

Zeichn.-Nr. 1010.8798

Blatt-Nr. 3

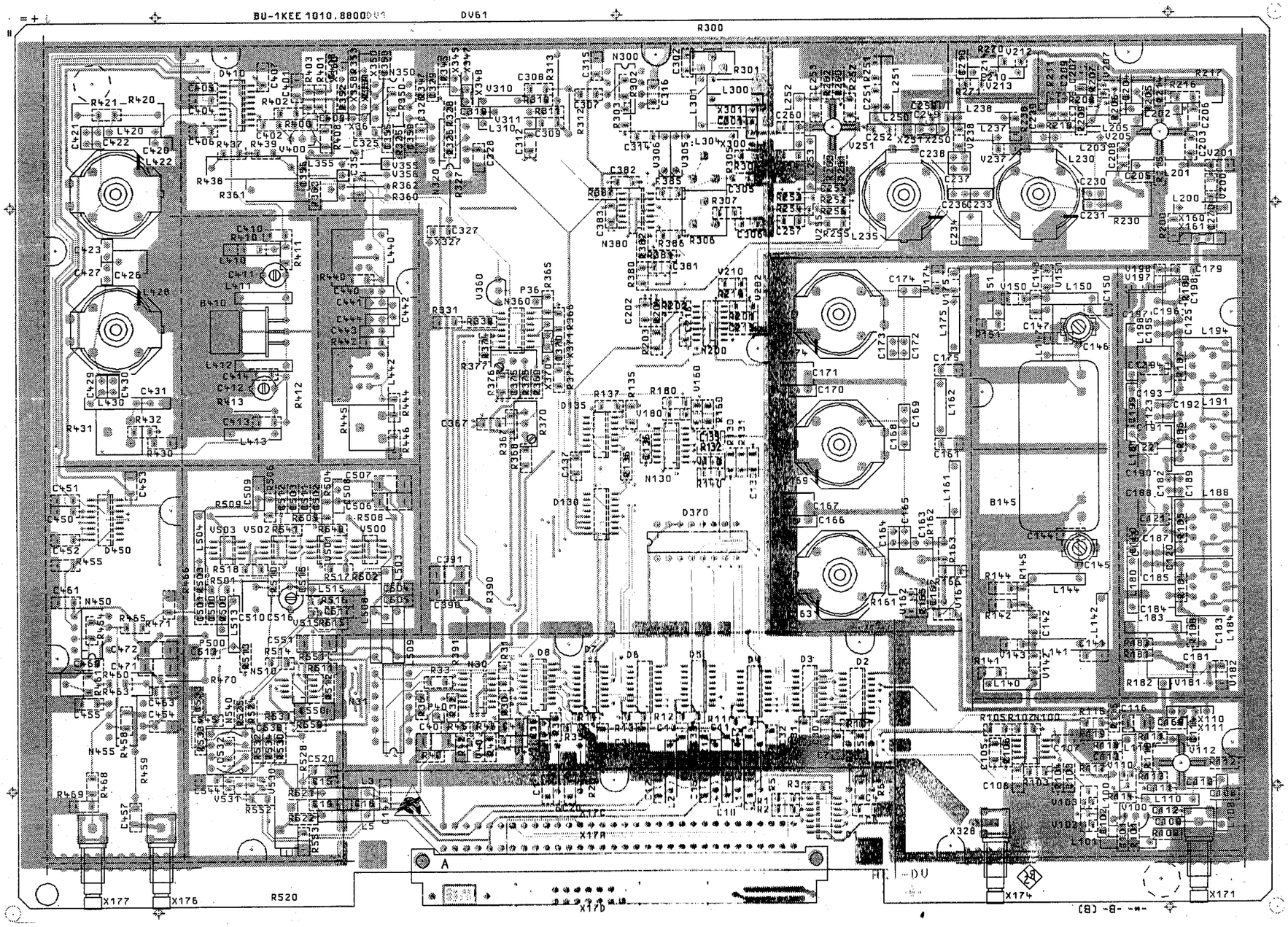
v. Bl.

reg. i. V. 1010.5001 V

erste Z.

ISO-Projektion Methode E

Für diese Unterlage behalten wir uns alle Rechte vor



Ansicht und Leitungsfuehrung Loetseite
View of tracks on solder side

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

02	45128 (13)	12.90	Bu.	Maße ohne Toleranzangabe	Maßstab 1 : 1
					Halbzeug, Werkstoff
				1KEE / Tag / Name: Bearb 11.90 BU; Gepr; Norm	Benennung: IF SELECTION BOARD — Z
				ROHDE&SCHWARZ	Zeichn.-Nr. 1010.8798 — Blatt-Nr. 4 — v. Bl.
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät ESVS30	reg. Nr. 1010.5001 V — erste Z.

ROHDE&SCHWARZ

SERVICE DOCUMENTS

Oven-Controlled Crystal Oscillator ESVP-B1

358.1119.02

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7.1	**Function Description**	7.1
7.2	**Test Instruments and Utilities**	7.1
7.3	**Testing and Adjustment**	7.2
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7.3.2	Power Supply	7.2
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7.3.4	Adjusting the Output Frequency	7.3
7.3.5	Checking the Power Stability	7.3
7.3.6	Checking the Long-term Stability	7.3
7.4	**External Interfaces**	7.4

Part lists

Circuit diagrams

Component plans

7 Testing and Repair of the Module Oven-Controlled Crystal Oscillator ESVP-B1

7.1 Function Description

The main module of the ESVP-B1 option is the oven-controlled crystal oscillator B1. Its output frequency can be adjusted using potentiometer R1. The output signal of the crystal oscillator is boosted to TTL level by buffer stages V11 and V23 and given to outputs X1/X7 and X2/X6 after having been decoupled by the NAND gates D21. The lowpass filters at the output of D21/II and D21/III suppress the harmonics of the 10-MHz output frequency and simultaneously produce an internal impedance of 50 Ω. The output signal at X1/X7 can be switched off by relay K31 (only with model 02, low level (0 V) at X3/2). The supply voltage of the complete module is switched off at the same time via V51/V72/V73. After repositioning jumper X4 (connecting pin 2 to pin 3), the connectors X1/X7 and X2/X6 are interconnected.

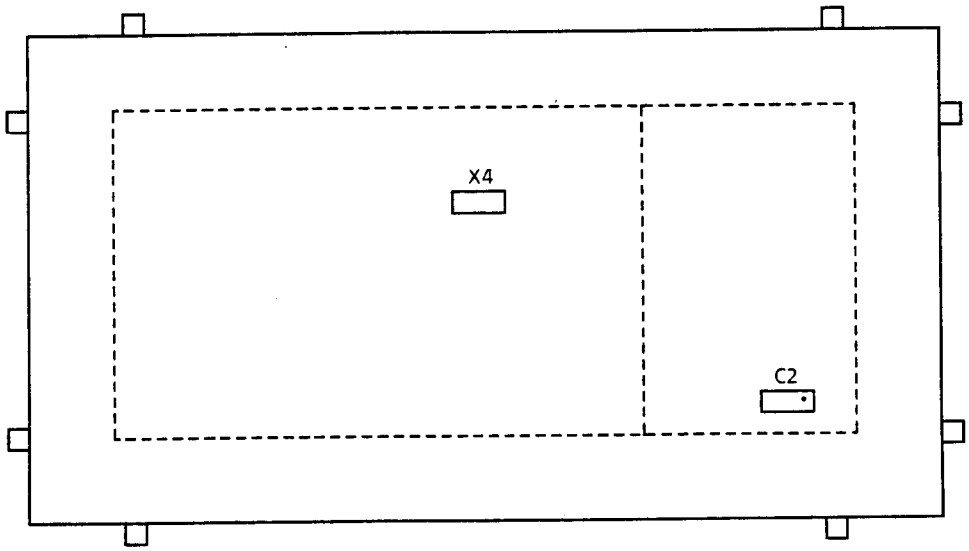
7.2 Test Instruments and Utilities

Item	Type of instrument	Required specifications	Suitable R&S instrument	Order No.
1	Caesium frequency standard		XSC	299.4011.02
2	Difference frequency multiplier			
3	RF voltmeter	10 MHz	URE	342.1214.02
4	Digital multimeter		UDL33	388.8011.02

7.3 Testing and Adjustment

The module has to be adjusted after a warm-up period of 30 days.

7.3.1 Location of Jumpers, Test Points and Adjustment Elements



7.3.2 Power Supply

Connection	Voltage	Current
X3/3	+ 12 V ± 100 mV	85 mA
D21/Pin14	+ 5 V ± 200 mV	---
X3/1,5	ground	---

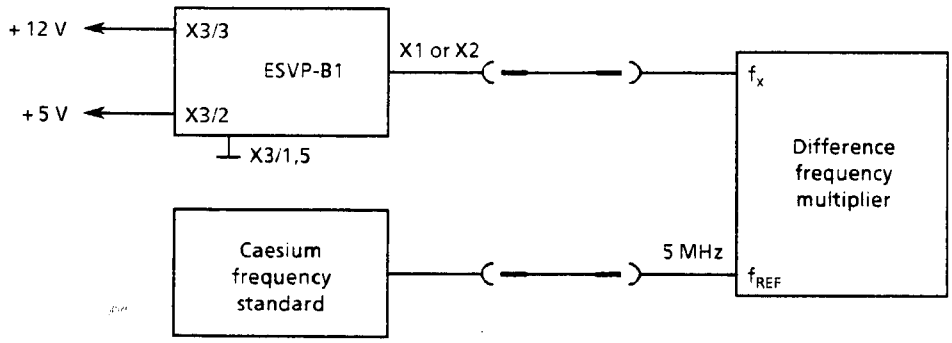
7.3.3 Checking the Output Level

- Connect RF voltmeter to X1/X7 or X2/X6.
- Connect pin 1 to pin 2 at jumper X4.
- Apply high level (+ 5 V) at X3/2.

The output voltage at the RF voltmeter is ..... >0.5 V at 50 Ω

7.3.4 Adjusting the Output Frequency

Test setup:



- Adjust the relative frequency error $\Delta f/f_0$ using R1 to ..... $< 1 \times 10^{-9}$

7.3.5 Checking the Power Stability

Make this check within three days from the adjustment of the output frequency (see section 7.3.4).

Test setup: see section 7.3.4.

Check the output frequency after a warm-up period of 30 minutes at an ambient temperature of 25 °C.

Deviation from the rated frequency of 10 MHz: ..... $< 1 \times 10^{-8}$

7.3.6 Checking the Long-term Stability

Test setup: see section 7.3.4.

Measure the long-term stability after a warm-up period of 30 days.

At a constant temperature,
the frequency drift $\Delta f/f_0$ is ..... $< 5 \times 10^{-10}$/day

7.4 External Interfaces

Pin	Name	Input / Output	Origin/ Destination	Specified Range	Signal Description
X3.1 X3.5	GND				Ground
X3.3	+ 12 V	Input	Power supply	10 to 15 V	Supply voltage
X3.2	REF ON	Input	Power supply	HCT level	High: OCXO switched on
X1 X7	REF OUT	Output	Synthesizer	10 MHz ± 1 Hz; P > 7 dBm	
X2 X6	REF IN/OUT	Input/ Output	Rear panel socket/ synthesizer	**Model 02:** a) Ref ON = High: 10 MHz ± 1 Hz P = 7 dBm b) Ref ON = Low: Signal which has been connected through from X1/X7 **Model 04:** 10 MHz ± 1 Hz P = 7 dBm	

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig

ROHDE & SCHWARZ · MÜNCHEN

gezeichnet	2.02	GR		
bearbeitet	03.84	PF		
geprüft				
normgepr				

Änd.	Nr	Datum	Name
A	33679	07.08.86	PA
B	38911	08.89	NG
04	45113 (2)	02.91	NG
05	45113 (5)	03.92	RB

C1 10µ · L2 1,2µ · L1 1,2µ · C2 10n · B1 OCXO-02 · R1 20k · C11 1µ · R11 10k · R12 56,2 · R13 1k · C12 1µ · R16 10 · L11 3,3µ · C14 120 · R14 100 · C15 220 · L12 10µ · R 17 10k · V11 BFY 90 · V23 BF 247 · C21 1µ · R22 10k · C22 10n · R35 1k · R21 510 · V21 1N 4448 · V22 1N4448 · R23 1k · R24 330 · R25 392 · D21 I · D21 II · D21 III · R26 392 · R27 392 · C31 10n · C32 10n · L33 · L34 0,56µ · L35 0,82µ · L36 0,82µ · C35 560 · C36 560 · C33 390 · C34 390 · K31* · * VAR04 · X7 10MHz Ref. Ausg. 532. 9789 · X1 · X4 · X2 10MHz Ref. Ausg./ Eingang · X6 · V41 * · X3 1,5 · +12V · * C16 1N2 · code · * L16 1,2µ · C71 100µ · R71 1k · V72 2N2222 A · R72 3,92k · V71 1N4448 · V73 BC 327 · *R74 · C17 1N2 · C73 10n · C72 10n · R73 * · L41 1,2µ · D21 74F00 · C51 1µ · L51 3,3µ · R61 2,74k · V51 2N2222 A · V61 B5V6 · C61 1µ · +12V

358. 1154

V51 V72 V73 V11 V23

K31

D21

* VAR02 = GRUNDAUSFÜHRUNG / Basic Version
R73,R74= 1k
K31 = SR 456.9865
V41 = 1N4448
L16, C16, C17 not fitted

* VAR04 = ESVD AUSFÜHRUNG / ESVD VERSION
R73 = 100k
R74 = 10k
K31,V41 = NOT FITTED
L16, C16, C17 fitted

Stromlauf zu Ofenquarzreferenz ESVP-B1
Oven-controlled Crystal Oscillator.

Z

Zeichn. Nr. 358. 1119.01 | S

reg. i.V. 358. 1119V | erste Z. ——

FUER DIESE UNTERLAGE
BEHALTEN WIR UNS ALLE RECHTE VOR

ZEICHN.-NR.

C1 10U 25V TA L
L2 1U2H
C21 1U 50V HDK M
L1 1U2H
C2 10N L
R11 10K L
R16 10R L
L11 3U3H
C12 1U 50V HDK M
R13 1K L
R12 56R2 L
C14 120P L
V23 BF247A
C22 10N L
R1 20K
B1 OCXO
C11 1U 50V HDK M
V11 BFY90
R14 100R L
C15 220P L
L12 10UH
R17 10K L
R21 511R L
V21 BAS32-L
R22 10K L
R27 392R L
D21-C 74F00D-L
C32 10N L
L35 560NH
L36 820NH
K31-A
X6 1
C35 560P L
C36 390P L
D21-A 74F00D-L
R35 1K L
V22 BAS32-L
R25 392R L
R23 562R L
R24 332R L
D21-B 74F00D-L
C31 10N L
L33 560NH
L34 820NH
K31-B
X7 1
R26 392R L
C33 560P L
C34 390P L

+12VREF
X3 3
L65 1U2H
C65 4N7 L
C66 4N7 L
C71 100U
R71 10K L
L41 1U2H
V41 BAS32-L
X3 1
X3 5
R72 3K92 L
V71 BAS32-L
V73 BCP69-16-L
REF ON
X3 2
R74 10K L
V72 BC850B-L
K31-C TQ2-12V
C73 10N L
C72 10N L
R73 100K L
CODED
X3 4
R61 2K74 L
V51 BCP68-16-L
V61 5V6 L
C61 1U 10V TA L
P1
X6 2
X6 3
X6 4
X6 5
X7 2
X7 3
X7 4
X7 5
OCXO OFF
X3 6
R79 10K L
R80 10K L
V80 BC850B-L
X3 7
X3 8
X3 9
X3 10
C80 10N L
R81 100K L
L51 3U3H
C51 1U 50V HDK M
D21-D 74F00D-L
D21-E 74F00D-L
R90 1K L

STROMLAUF GILT FUER VAR.02
CIRCUIT DIAGRAM IS VALID FOR MOD.02

V23
ALTERNATIVE TYP
BF247A
J310

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

03/00	----------	05.92	BG		TAG	NAME
				BEARB.		BG
				GEPR.		BG
				NORM		
				PLOTT	18.05.92	

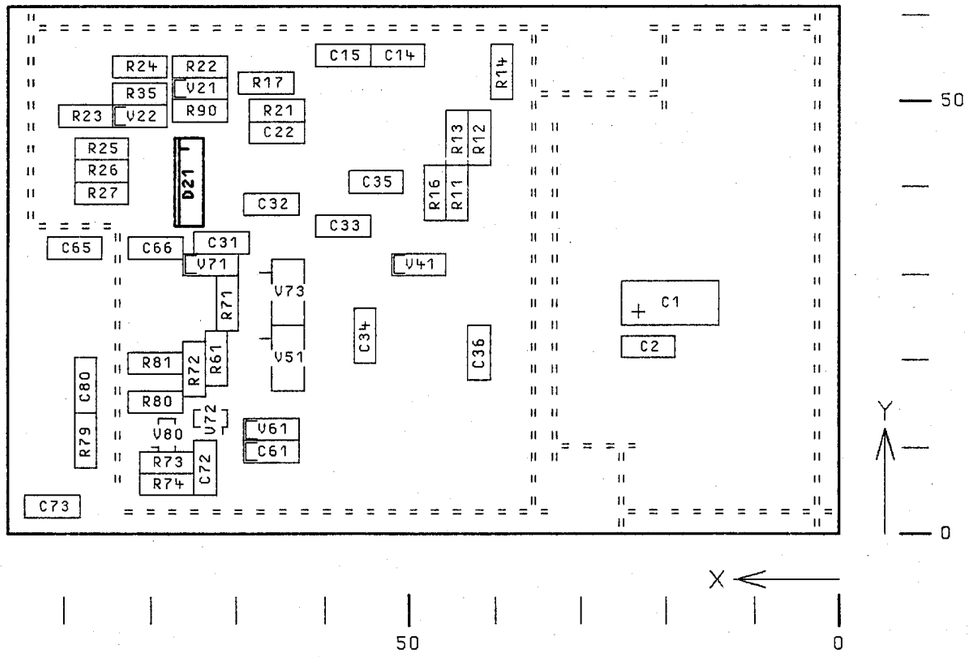
AEND. IND. | AENDERUNGS-MITTEILUNG | DATUM | NAME

ROHDE&SCHWARZ
ZU GERAET ESS-B1

BENENNUNG
REFERENCE OSCILLATOR

ZEICHN.-NR. 1026.7480.01S
BLATT-NR. 1
V. 1 BL.
REG.I.V. 1026.7250 | ERSTE Z.

DIESE ZEICHNUNG IST U
FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR
RECHNERAUSDUCK, AENDERUNGEN KOENNEN NUR DURCH REP
DES DATENSATZES ERFOLGEN



DARSTELLUNG SEITE A
VIEW ON SIDE A

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

BINDENDE ANGABEN UEBER VARIANTEN, TRIMMWERTE, BAUTEILWERTE UND NICHT BESTUECKTE BAUTEILE SIEHE SA.

FOR BINDING INFORMATION ON MODELS, TRIMMING AND COMPONENTS VALUES AND NONFITTED COMPONENTS SEE PARTS LIST.

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02/00	----------	04.92	BG

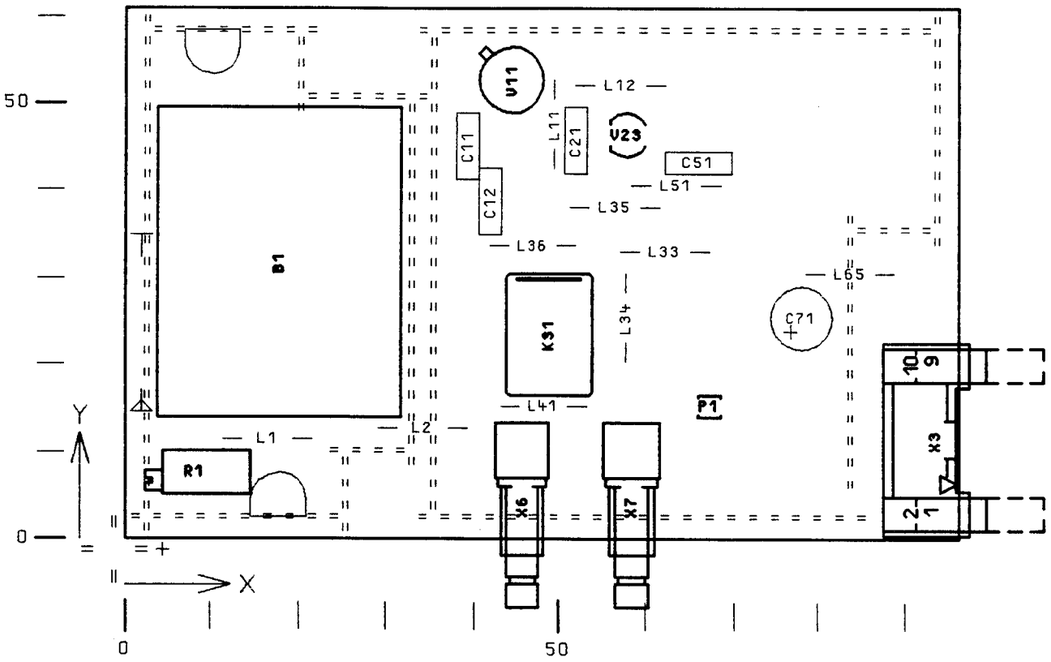
	TAG	NAME
BEARB.		BG
GEPR.		BG
NORM		
PLOTT	18.05.92	

ROHDE&SCHWARZ
ZU GERAET ESS-B1

BENENNUNG
REFERENCE OSCILLATOR
Z

ZEICHN.-NR. 1026.7480.01
BLATT-NR. 2-
V. BL.
REG.I.V. 1026.7250
ERSTE Z.

FUER DIESE ZEICHNUNG BEHALTEN WIR UNS ALLE RECHTE VOR
DIESE ZEICHNUNG IST EIN TECHNERAUSDUCK, RENDERUNGEN KOENNEN NUR DURCH RENDF'' DES DATENSATZES ERFOLGEN



DARSTELLUNG SEITE B
VIEW ON SIDE B

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
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AEND. IND.	AENDERUNGS-MITTEILUNG	DATUM	NAME
03/00	----------	05.92	BG
02/00	----------	04.92	BG

	TAG	NAME
BEARB.		BG
GEPR.		BG
NORM		
PLOTT	18.05.92	

ROHDE&SCHWARZ
ZU GERAET ESS-B1

BENENNUNG
REFERENCE OSCILLATOR
Z

ZEICHN.-NR. 1026.7480.01
BLATT-NR. 1+
V. BL.
REG.I.V. 1026.7250
ERSTE Z.