

Repair Manual

DIGITALLY TUNED FILTER

FK 852P2

647.0019

DIGITALLY TUNED FILTER
FK 852P2

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5. Description of Function

See circuit diagram 647.0019 S for 5.1 to 5.8.

5.1 Received-signal Path ($0.4 < f < 1.5$ MHz)

In reception the RF signal from the antenna is fed via connector X52 to the lowpass filter L30 and C90, C91, which blocks the receive path against signals of more than 100 MHz. In the continuation of the signal path there are the relay contacts K35, K36 and K31, cables W5 and W6 plus a Cauey bandpass filter for the frequency range 0.4 to 30 MHz. The signal is then applied via break plug X1, the relay contact K30 (4,7), a Cauey lowpass filter, the relay contacts K20 (4,7) and K33 (1,4) and the coupling capacitor C30 to the 9-dB amplifier V25. The Cauey lowpass filter consists of the capacitors C120 through C127 plus the coils L14 and L15. Its cutoff frequency is at approx. 1.5 MHz. Amplifier V25 is a common-base circuit and compensates for the losses produced by the preceding filter. The boosted signal is then fed via cables W2 and W3 to connector X55, from where it is applied to the Tx/Rx Section GX 852P1.

5.2 Received-signal Path ($f = 1.5$ to 30 MHz)

When signals in the range 1.5 to 30 MHz are received, the signal path as far as the relay contact K30 (4,1) is identical to that of 5.1 above. However, in this case relay K30 is cut in and the received signal is applied via cable W8 to a filter made up of nine suboctaves.

Within these suboctaves the resonant frequency of the individual circuit can be tuned quasicontinuously. The combination of input and output capacitors produces a transformation of the low input and output impedance to high-impedance values.

In high-impedance filter circuits it is possible to achieve a substantial improvement in the quality of the individual filters. The groups of relays or capacitors are designated so that their relationship or association is easily recognized. For the lowest suboctave (1.5 to 2.1 MHz) for example, the relays K1 and K21 are always effective in conjunction with relay K11, which cuts in the corresponding inductance. Following this pattern therefore, the relays K9, K29 and K19 are cut in for the highest suboctave (24 to 30 MHz). The coupling capacitors C50, C60, C70 and C80 are cut in by the relays K38 and K48, K39 and K49. Relays K41 through K46 cut in the parallel capacitors C81 to C97, which are assigned to the suboctaves.

At the output of the filter the signal is fed via relay contact K20 (4,1), the 9-dB amplifier V25 and line W3 to connector X55, from where it is applied to the Tx/Rx Section GX 852P1.

5.3 Received-signal Path for Very Large RF Signals (> 5 V)

Following the input filter C90, C91 and L30 the received RF signal is fed via a fullwave rectifier to the input pins 6 and 7 of comparator N4. The reference input of the latter is pin 8.

When there are input voltages > 5 V on connector X52, comparator N4 will produce positive potential at its output 14, causing relay K36 to deenergize. The associated contacts K36 cut in the 40-dB attenuator R123 and R124. In this way the bandpass filter and sub-

(Continuation)---

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---(Continuation) Received-signal Path
for Very Large RF Signals (> 5 V)

sequent components are protected against overvoltages and possible destruction. For servicing purposes there is a testpoint MP1 on pin 14 of comparator N4.

5.4 Received-signal Path for
Frequencies < 400 kHz

When signals are received at frequencies of less than 400 kHz, the band-pass filter and amplifier V25 are bypassed by relay contact K31a (4,8).

5.5 RF Gain Control

The AGC voltage from the Tx/Rx Section GX 852P1 is applied via connector X51.a21 to pin 6 of amplifier N1. The reference voltage, which can be set with potentiometer R100, is fed to the amplifier at pin 5. The following amplifier N1.1 boosts the control voltage and takes it to the PIN diodes V60 and V61. Depending on the value of the control voltage the diodes will conduct and attenuate the received signal as much as 15 dB.

5.6 Transmitted-signal Path

The signal flow through the selective filter is almost the same in transmission as in reception, except that it is in the reverse direction of course. Proceeding from the Tx/Rx Section GX 852P1, the transmitted signal is fed in via connector X53 and applied via cable W1, contact K33 (7,4), the 9-dB amplifier V25, contact K20 (4,1), contact K30 (4,1) to the break plug X1. In the continuation of the signal path there are the Cauer bandpass filter, cable W6, contact K31b (13,9), cable W7 and connector X54. From there the signal is fed to the RF power amplifier. For the monitoring of the transmitted-signal path in the filter, part of the signal

is derived via amplifier N2 and rectifier V58 and applied to comparator N3. If the strength of the signal is sufficient, the Q output of comparator N3 goes from High to Low and a GO signal is output via connector X51.a5 to the Processor GS 852P1. The reference voltage of comparator N3 can be set with resistor R80.

5.7 Data Input

The Filter FK 852P2 is driven via connector X51, pins a6, a7, a9 and a19. Input a18 produces the T/R switchover.

Pins a10 to a16 are data inputs for setting the required filter band. The input data are fed to the D flipflops D1 to D4. The BCD/decimal decoder D5 converts the BCD code at its inputs 10 to 13 into a 1-out-of-19 output code. The line drivers D6 to D8 drive the switching transistors V1 to V9 and V13 to V21, and these switch the associated relays.

5.8 Test Mode

In the test mode, i.e. when the BITE signal from the Processor GS 852P1 is read in, the data input X51.a10, X51.a11 and the strobe-9 input X51.a9 are driven with a High level. The driver output D8.1 switches a Low level to comparator N4.12. The comparator output N4.14 is thus sent to +15 V. Relay K36 deenergizes and with its contacts cuts in the 40-dB attenuator R123 and R124. The driver output D8.3 energizes relay K35. Contact K35 (8,4) disconnects the receiving antenna from the signal path and contact K35 (9,13) enables the test path. Driver D8.3 also energizes relay K34, which cuts in the 20-dB attenuator R18 to R20 for level matching.

(Continuation)---

D I G I T A L L Y T U N E D F I L T E R
F K 8 5 2 P 2

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---(Continuation) Test Mode

In the test mode a 900-kHz line spectrum with a bandwidth of 30 MHz is fed as a simulated antenna signal through the Digitally Tuned Filter FK 852P2.

The test signal is fed from connector X56 via the 40-dB attenuator to the Caue bandpass filter. In continuation of this the signal is routed through the previously set filter band, the

9-dB amplifier V25, the 20-dB attenuator and output X55 to the Tx/Rx Section GX 852P1.

The test result is evaluated by the Processor GS 852P1. Upon termination of the test mode the processor will switch the HF transceiver back to the previously set operating status.

D I G I T A L L Y T U N E D F I L T E R
F K 8 5 2 P 2

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N O T E S

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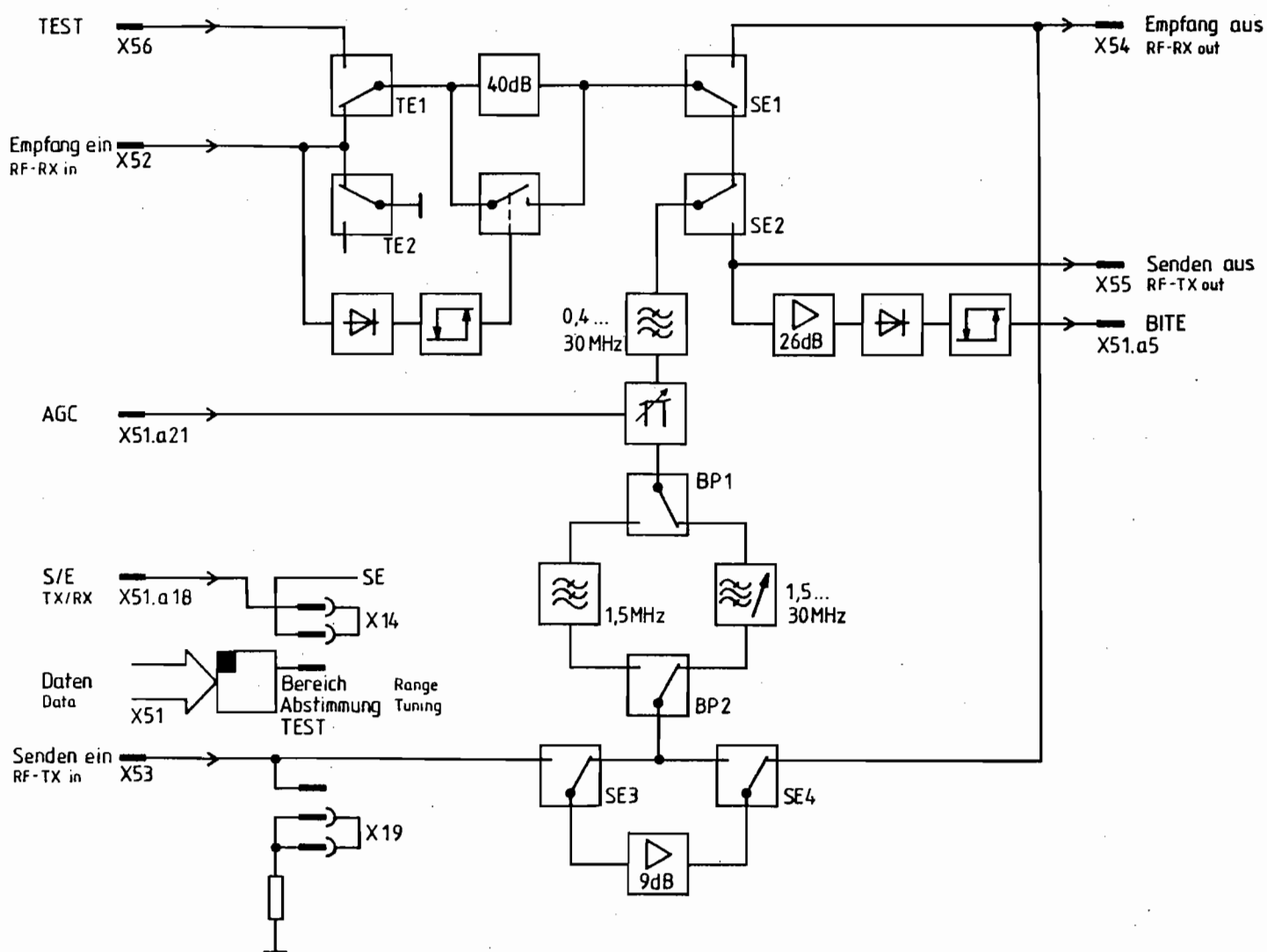


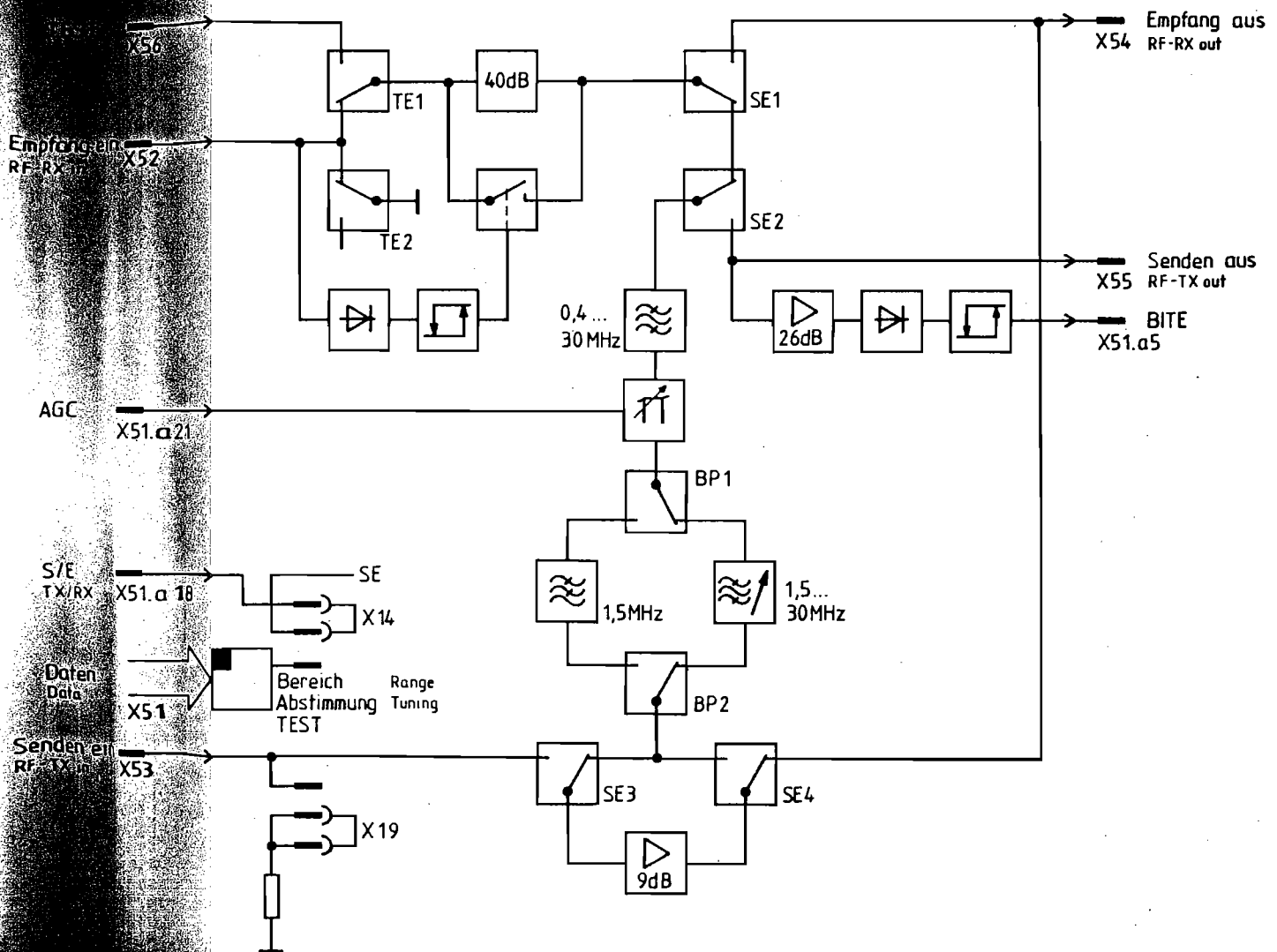
Fig. 5.1 Digitally Tuned Filter FK 852P2, Block Diagram

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6. Repair

See circuit diagram, parts list and component layouts in the appendix to this repair manual (list on page 0.2).

6.1 Preliminary Remarks

The repair of the Digitally Tuned Filter FK 852P2 consists of troubleshooting and fault elimination, of measurements, alignments and functional checks, of replacing assemblies and components as well as of a final inspection.

All the information required for repairing the filter down to component level is given in this section.

For all alignment work and measurements the filter has to be supplied with the operating voltages given in the circuit diagram 647.0019S.

All RF measurements on the filter are to be performed with the covers screwed down in place; if necessary, a special test cover must be produced for the purpose.

In RF measurement one must also ensure that cables and connections have the right characteristic impedance and that the connecting leads are as short as possible.

Among the components incorporated in the filter there are MOS, MOSFET and CMOS devices. Devices of this kind are extremely sensitive to high extraneous voltages. Static discharge can produce very high voltage spikes, which are capable of destroying these devices.

For this reason, when work is being carried out in the vicinity of these devices, i.e. unless a special CMOS work station is available, the following minimum requirements should be observed:

- conductive bench and floor coverings
- chair or stool with conductive coverings
- grounded, metallic work surface and conductive wrist-straps with a resistance of $> 200 \text{ kohms}$, $< 1 \text{ Mohm}$ plus an insulated lead and plug
- soldering irons with safety grounding
- all conductive surfaces, wrist-straps and work surfaces must be interconnected by insulated leads
- supply voltages must be disconnected when soldering is being performed

In general:

When performing any electrical or mechanical repairs on the Digitally Tuned Filter FK 852P2, only disassemble the unit to the extent necessary for the performing of these repairs.

6.1.1 Troubleshooting Instructions

Any fault that occurs should be localized with the aid of the troubleshooting flowchart given in 6.3.

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6.1.2 Restoring the Nominal Characteristics

Any component that is definitely proved to be defective - through use of the troubleshooting flowchart or by performing the alignments, measurements and functional checks - should only be replaced by a component that meets the specifications given in the parts list in the appendix to this repair manual.

Only in this way can the technical data be guaranteed that are given in section 1 of the user manual.

Once components have been replaced, it is absolutely essential that the final inspection detailed in chapter 6.6 is performed.

6.1.3 Spare Parts

All components and assemblies are subjected to strict quality assurance before they are allowed to be used in this item of equipment.

For components from outside suppliers, e.g. resistors, capacitors, diodes, transistors and integrated through to highly integrated circuits, R&S has set down its own delivery specifications for the purpose of ensuring maximum reliability. For this reason we recommend that only original spare parts are used, for replacing defective components.

When ordering a spare part, please state the following:

Type, ordering code and serial number of equipment, stock number of the parts list and designation plus stock number of the component concerned.

All of these details are to be found in the circuit diagram, parts list and components layout that accompany the manual.

6.1.4 Important User Information

The following contains details which are essential when referring to Part 6 "Repair". This is in order to prevent misunderstandings at a later stage.

- All voltage measurements are referred to ground, if not stated otherwise.

- Abbreviations in the text, such as ST1.2, BU3.5a and B6.7 are to be understood as follows:

Plug 1 - Pin 2

Socket 3 - Pin 5a

Integrated Circuit 6 - Pin7

- Every component mentioned is contained in Circuit Diagram 647.0019S. There are therefore no special references to this circuit diagram in the text.

- The repair of the Digitally Tuned Filter FK 852P2, model 02, is identical to the repair of model 05. Therefore in the following text no further reference is made to the different models.

6.2 Test Equipment

The test equipment given in the following list will be required for performing the repairs described in this section of the manual.

Equivalent items of test equipment can be used, of course, provided that their technical data are at least as good.

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6.2.1 List of Test Equipment

No.	Test equipment, required data	Recommended R&S unit	Ordering code
1	Mobile tester	SMFP 2	332.0015.53
2	Power signal generator, $V_{out} = 0$ to 10 V EMF into 50 ohms, 0.1 to 30 MHz		
3	Signal generator, 10 Hz to 30 MHz	SMK	348.0010.02
4	Test receiver, 9 kHz to 30 MHz -30 to +137 dB(μ V)	ESH 2	303.3030.52
5	Spectrum analyzer, 0.1 to 100 MHz, sensitivity > -80 dBm, level display range 80 dB		
6	RF millivoltmeter with RF insertion unit 10 V/50 ohms and precision termination 50 ohms	URV 4 URV-Z2 RNA	292.5012.03 288.8010.55 272.4510.50
7	Noise generator, 20 Hz to 30 MHz	SUF 2	282.8819.03
8	Digital multimeter	UDL 33	388.8011.02
9	2 RF attenuators, 0 to 10 dB	DPSP	334.6010.02
10	Power combiner, 0.1 to 30 MHz	DVS	342.1014.50
11	2 buffer amplifiers, A = 17 dB, $V_{out max} = 25$ dBm		
12	Polyscope, 0 to 30 MHz with 2 log amplifiers 2 demodulators VSWR bridge	SWOB 5 SWOB 5 E3 SWOB 5 Z1 ZRB 2	333.0019.53 349.3512.02 333.7513.52 373.9017.52
13	Service kit	KA 852 C1	648.8513.02

6.3 Troubleshooting Flowchart

6.3.1 General

The following troubleshooting flowchart (Fig. 6.1) covers troubleshooting as well as the elimination of faults in the Filter FK 852P2.

To make the troubleshooting as straightforward as possible, there

are, where necessary, cross-references to other measurements and procedures involved in repair. The given sequence for the troubleshooting should be adhered to so that faults can be detected and remedied as speedily and rationally as possible.

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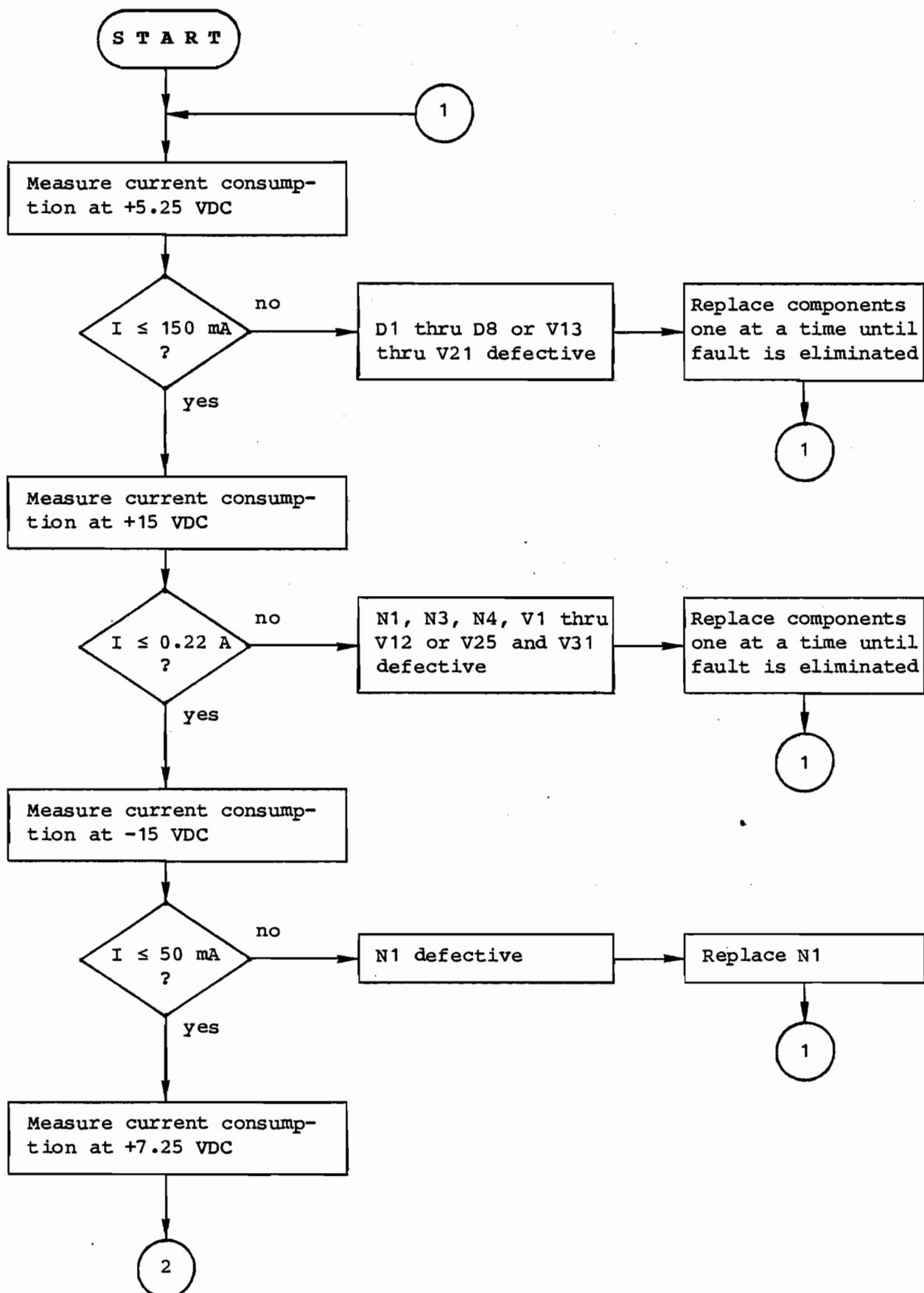


Fig. 6.1 Digitally Tuned Filter FK 852P2, Troubleshooting Flowchart
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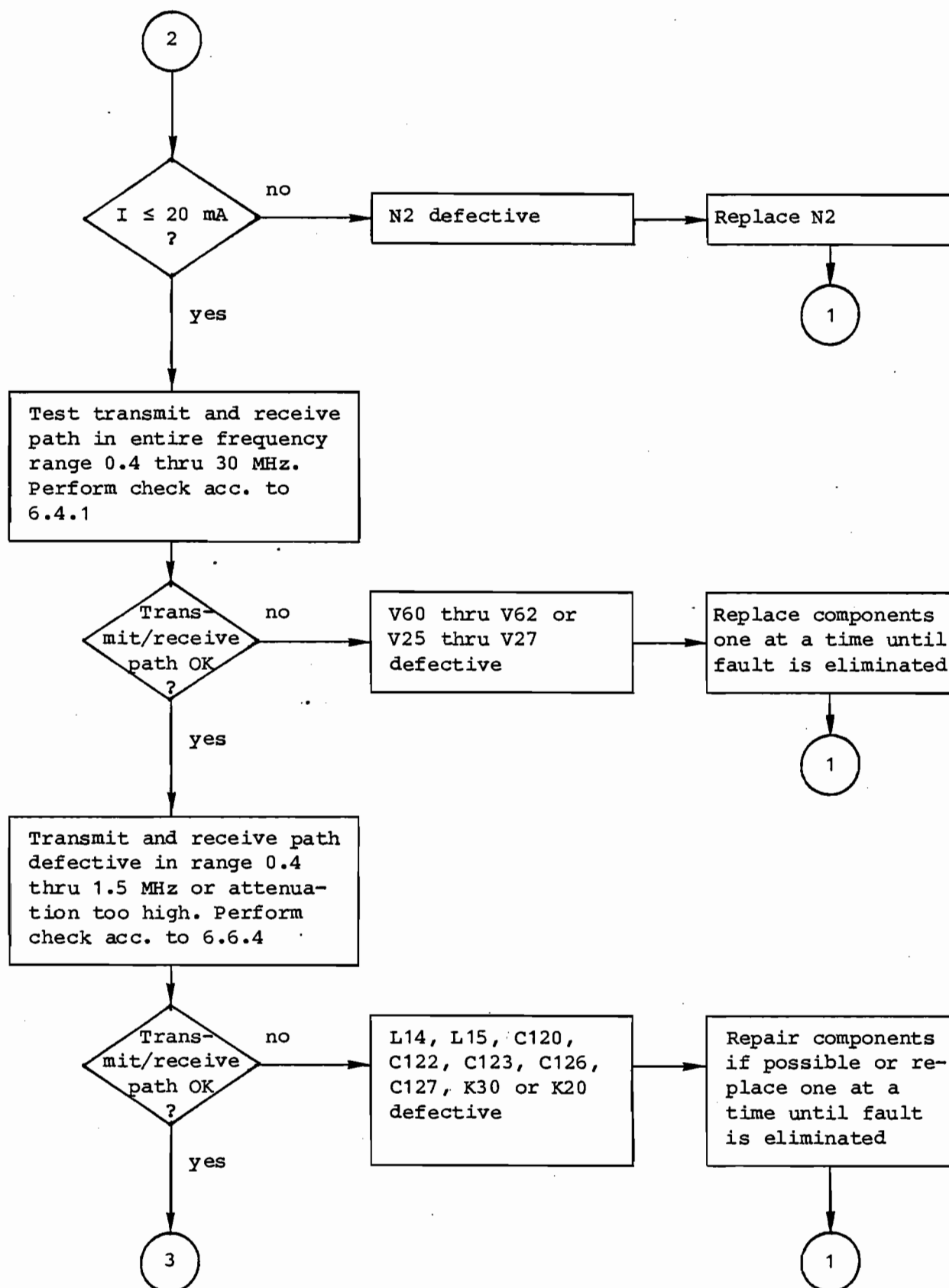


Fig. 6.1 Digitally Tuned Filter FK 852P2, Troubleshooting Flowchart
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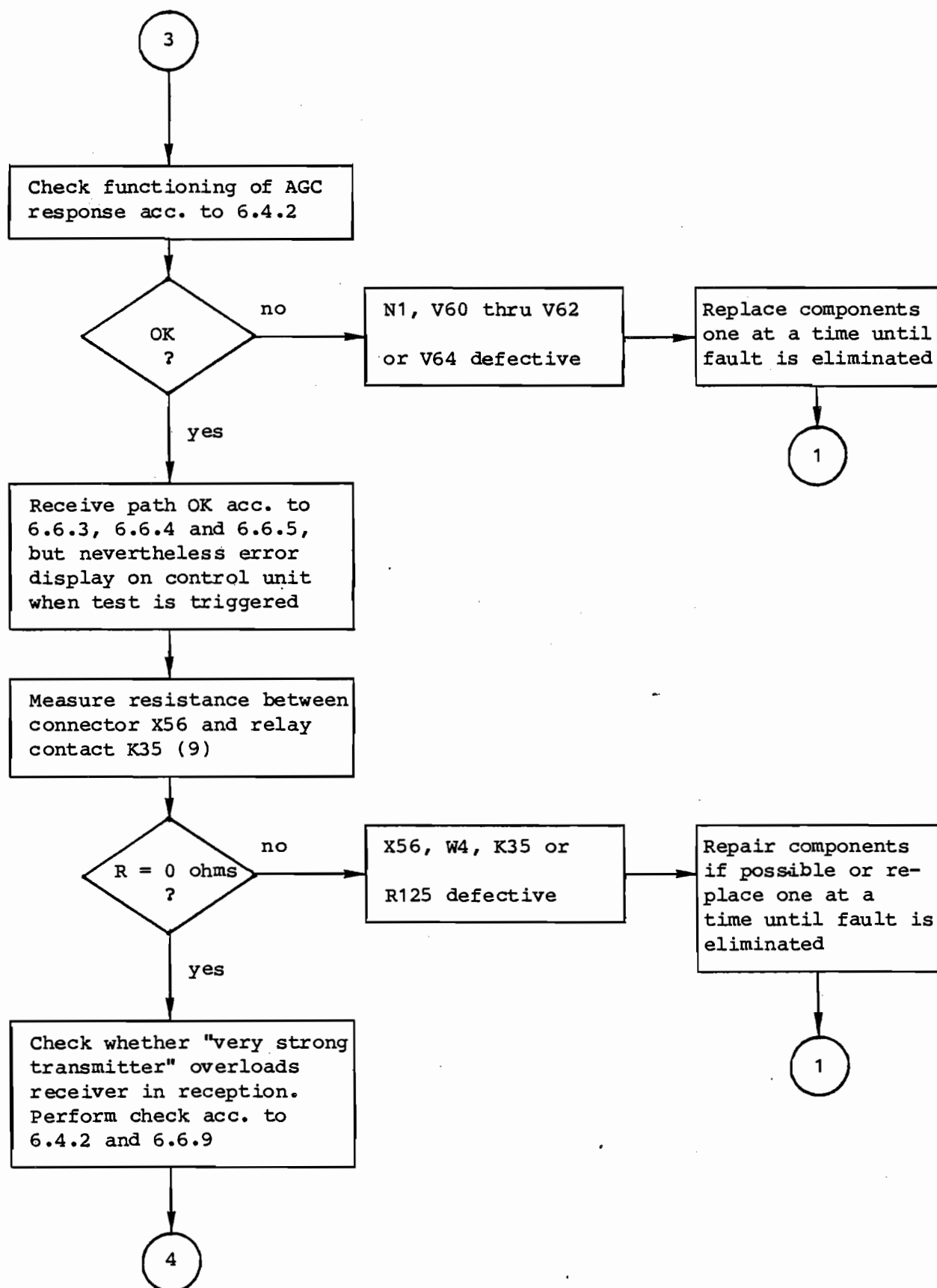


Fig. 6.1 Digitally Tuned Filter FK 852P2, Troubleshooting Flowchart
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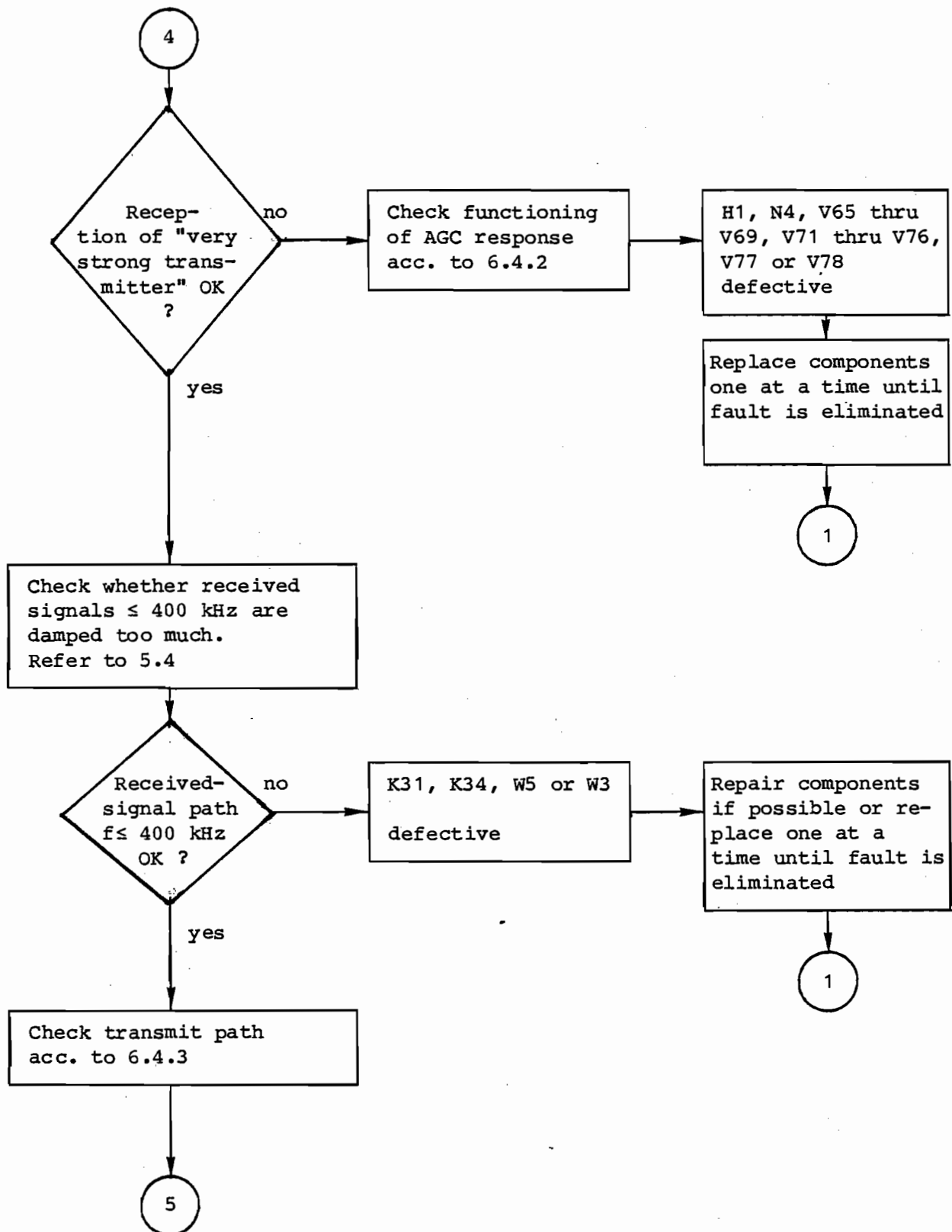


Fig. 6.1 Digitally Tuned Filter FK 852P2, Troubleshooting Flowchart
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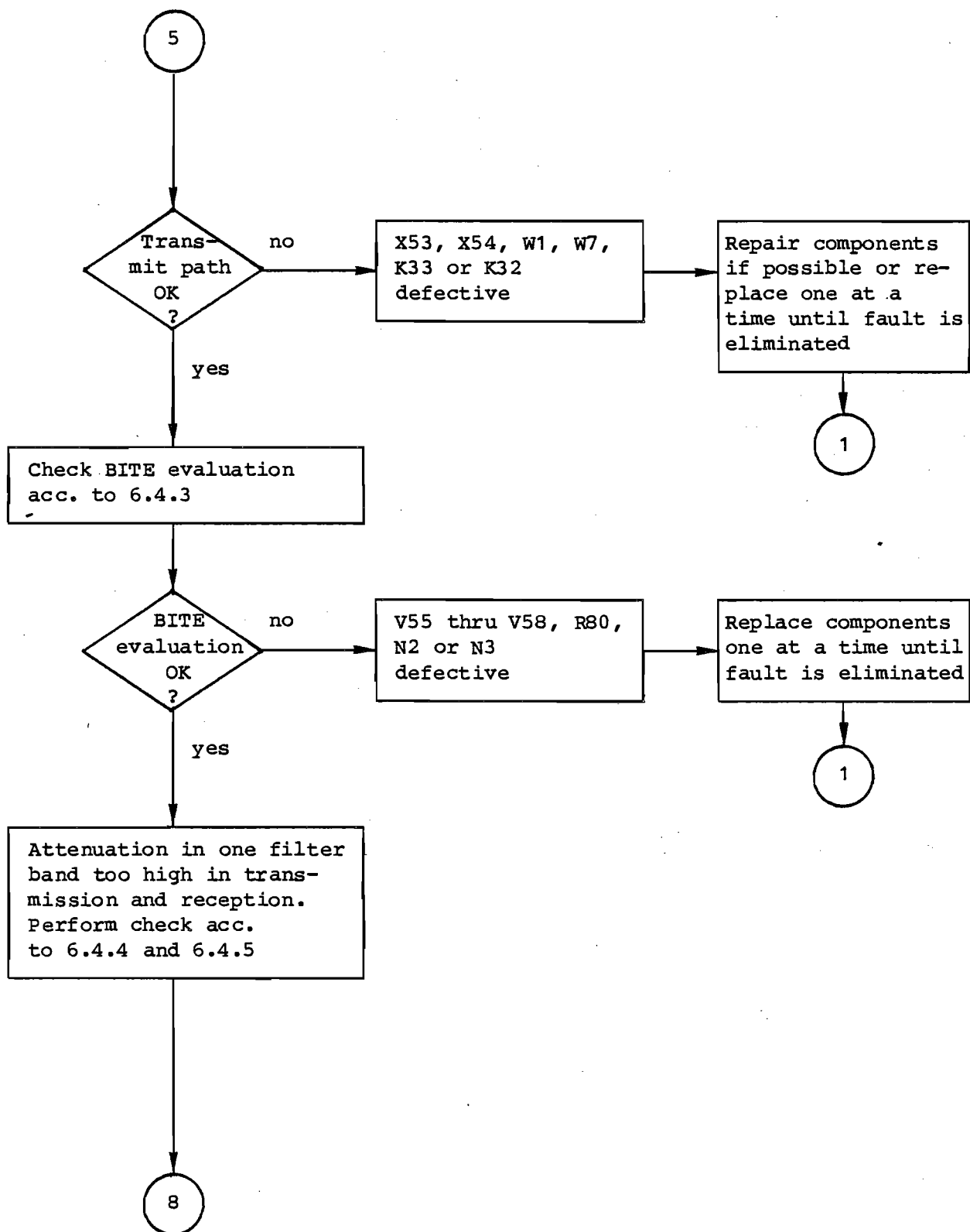
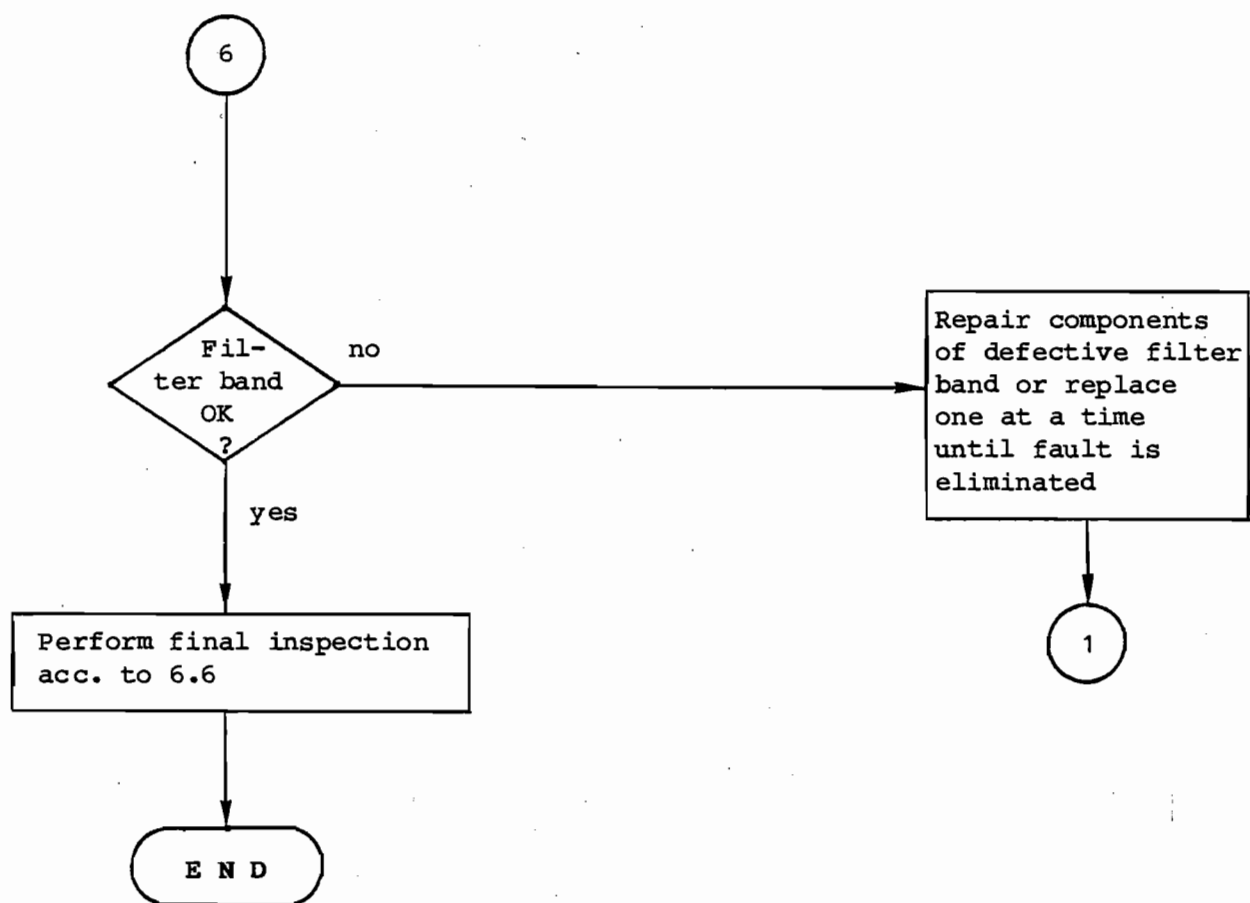


Fig. 6.1 Digitally Tuned Filter FK 852P2, Troubleshooting Flowchart
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Fig. 6.1 Digitally Tuned Filter FK 852P2, Troubleshooting Flowchart
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6.4 Measurements, Alignments and Functional Checks

The measurements, alignments and functional checks that are described below are the more detailed procedures to the instructions given in a condensed form in the troubleshooting flowchart. Consequently one will usually undertake these measurements, alignments and functional checks by branching out of the troubleshooting flowchart at a particular point. When the measurement, etc. has been performed, one returns to the troubleshooting flowchart at the same point where one previously left it.

If a fault has been clearly identified beforehand however, one can of course commence with one of these measurements, etc. directly.

For all of these measurements or tests it is assumed that the Digitally Tuned Filter FK 852P2 is properly adapted to an HF transceiver. For opening the filter, refer to 6.5.

6.4.1 Checking Gain

1. Set the OPERATION MODE switch on the control unit to Rx.
2. In the Filter FK 852P2 remove the break plug X18 and connect X82-X83.
3. The test setup is as in Fig. 6.6, but connect the VSWR bridge to connector X53 (level = 13 dBm) and the demodulator to connector X54.

Nominal value of gain in range 0.4 to 30 MHz:

$$A = 9 \pm 0.5 \text{ dB}$$

4. After testing, replace the break plug X18.

6.4.2 Setting AGC Response

1. Set the OPERATION MODE switch on the control unit to Rx and enter a frequency of 10000.0 kHz.
2. Connect a signal generator ($f = 10 \text{ MHz}$, $V_{\text{out}} = -70 \text{ dBm}$) to connector X52 and an RF millivoltmeter with an insertion unit to connector X55. (The connection between X55 and the Tx/Rx Section GX 852P1 must be retained.)
3. Connect a digital multimeter to connector X51.a21.
4. Increase the level of the signal generator until the digital multimeter displays $4 \pm 0.1 \text{ V}$ (response point).
5. Note the indication on the RF millivoltmeter for this condition. If necessary, correct the response point (-0.5 dB referred to the output level of the signal generator) using potentiometer R100. Then increase the RF level on connector X52 until the DMM displays $6 \pm 0.1 \text{ V}$.
6. Read the indication on the RF millivoltmeter. The difference between the two read levels produces the controlling attenuation.

Nominal value: $a \geq 15 \text{ dB}$

6.4.3 Setting BITE Threshold

1. Set the OPERATION MODE switch on the control unit to Tx and enter a frequency of 10000.0 kHz.
2. Connect the signal generator to connector X53 and a test receiver to connector X54.

(Continuation)---

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---(Continuation) Setting BITE
threshold

3. Set the signal generator to 10 MHz and increase its output level until there is a level of 7 dBm at output X54.
4. The BITE output, connector X51.a5, must switch to Low. Correct by means of potentiometer R80 if necessary.

6.4.4 Alignment of Tuning Capacitor

1. Set the OPERATION MODE switch on the control unit to Rx.
2. Connect the signal generator (approx. 0 dBm) to connector X52 and the test receiver to connector X55.
3. Set the signal generator to each of the frequencies given in Table 1. Set the same frequencies on the control unit.
4. Then, for 2115.0 kHz for example, adjust the indication on the test receiver to maximum using, for example, C181.

f (kHz)	Adjust to maximum with
2115.0	C181
2087.0	C81
2060.0	C82
2009.0	C83
1917.5	C84
1713.0	C86
1590.5	C85

6.4.5 Alignment of Bands

1. Set the OPERATION MODE switch on the control unit to Rx.
2. Connect the signal generator (approx. 0 dBm) to connector X52 and the test receiver to connector X55.
3. Set the signal generator to each of the frequencies given in Table 2. Set the same frequencies on the control unit.
4. Tune the resonant circuit of each band by adjustment with the toroidal-core or air-core coil at the lower band limit and adjustment of the trimmer capacitor at the upper band limit. In doing this the indication on the test receiver is to be brought to maximum.

Band	Frequency (kHz)	Adjust to maximum with
II	2138.0	L2
II	2976.0	C182
III	3023.0	L3
III	4230.0	C183
IV	4276.0	L4
IV	5972.0	C184
V	6046.0	L5
V	8460.0	C185
VI	8552.0	L6
VI	11904.0	C186
VII	12092.0	L7
VII	16920.0	C187
VIII	17104.0	L8
VIII	23808.0	C188
IX	24184.0	L9
IX	29700.0	C189

5. Following this alignment the coils must be retained again with cable binders.

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6.5 Replacing Components

Before components can be replaced, the filter has to be opened. Proceed as follows:

1. Remove the top RF cover after undoing the seven Phillips screws.
2. Remove the bottom RF cover after undoing the six Phillips screws.

Before the LC board can be removed, seven Philipps screws have to be undone. Then lift up the LC board (plugged connection).

Components are replaced by following usual workshop procedure. No special instructions are necessary for this.

When components have been replaced, proceed once again with the troubleshooting according to Fig. 6.1.

6.6 Final Inspection

After a repair has been carried out, the Filter FK 852P2 must be subjected to the following final inspection to ensure that its technical data can still be guaranteed.

If this final inspection does not prove satisfactory, the testing and troubleshooting following the flow-chart Fig. 6.1 will have to be performed again. Repeat the procedure as many times as is necessary to detect and remedy all faults.

6.6.1 Current Consumption

+15 VDC ≤ 220 mA
+5.25 VDC ≤ 150 mA
-15 VDC ≤ 50 mA
+7.25 VDC ≤ 20 mA

6.6.2 Gain

1. Set the OPERATION MODE switch on the control unit to Rx.
2. In the Filter FK 852P2 remove the break plug X18 and connect X82-X83.
3. The test set-up is as in Fig. 6.6, but connect the VSWR bridge to connector X53 (level = 13 dBm) and the demodulator to connector X54.

Nominal value of gain in range 0.4 to 30 MHz:

$$A = 9 \pm 0.5 \text{ dB}$$

4. After testing, replace the break plug X18.

6.6.3 Checking Bandpass

1. Set the OPERATION MODE switch on the control unit to Rx.
2. Arrange a test set-up acc. to Fig. 6.6.
3. Set the level of the signal generator to 0 dBm.
4. Remove break plug X11.

Nominal values of attenuation:

400 kHz $\leq f \leq 30$ MHz $a \leq 1$ dB
f = 45 MHz $a \geq 15$ dB
f = 50 MHz $a \geq 25$ dB
f = 90 MHz $a \geq 50$ dB

Note:

Fig. 6.2 illustrates the typical frequency response.

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6.6.4 Checking Signal Path ($0.4 < f < 1.5$ MHz)

1. Set the OPERATION MODE switch on the control unit to Rx.
2. Arrange a test set-up acc. to Fig. 6.6, but connect demodulator to connector X55 (level = 0 dBm).

Nominal values of attenuation in range 0.4 to 1.5 MHz:

$$a \leq 2.5 \text{ dB}$$

6.6.5 Filter Values

1. Set the OPERATION MODE switch on the control unit to Rx.
2. Arrange a test set-up acc. to Fig. 6.6, but connect filter output X55 in place of X1.
3. Set the level of the signal generator to 0 dBm.
4. Select a filter band acc. to table 2 in 6.4.5 and enter its centre frequency on control unit.

Example:

For band II set following on Poly-scope:

Lower band limit 2.138 MHz -14%

Upper band limit 2.976 MHz +14%

Nominal value at -14% frequency margin from lower limit frequency:

$$a \geq 15 \text{ dB}$$

Nominal value at +14% frequency margin from upper limit frequency:

$$a \geq 15 \text{ dB}$$

The reference value is the particular attenuation at the tuning frequency.

6.6.6 Checking Intermodulation

1. Arrange a test set-up acc. to Fig. 6.3.
2. Set the OPERATION MODE switch on the control unit to Rx.
3. Signal generator 1 set for $f_1 = 29.9$ MHz
4. Signal generator 2 set for $f_2 = 30$ MHz.
5. Tune level on connector X52 for each signal, f_1 and f_2 , to 7 dBm.

Margin of intermodulation products:

$$\geq 42 \text{ dB}$$

6.6.7 Checking Noise Figure

1. Arrange a test set-up acc. to Fig. 6.4.
2. Set the OPERATION MODE switch on the control unit to Rx.
3. Set level on noise generator to zero.
4. Tune test receiver to 10 MHz and insert a 3-dB attenuator pad.
5. Read indication on test receiver and note.
6. Then increase attenuation to 6 dB.
7. Increase level on noise generator until same reading is indicated on test receiver as previously.
8. Indication on noise generator produces noise figure F.

Nominal value at $f = 10$ MHz:

$$F \leq 3 \text{ kt}_0$$

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6.6.8 Checking AGC Response

Check the AGC response acc. to 6.4.2.

Check this at following frequencies:

$f = 1 \text{ MHz}$
 $f = 10 \text{ MHz}$
 $f = 29.9 \text{ MHz}$

6.6.9 Checking Overvoltage Protection

1. Arrange a test set-up acc. to Fig. 6.5.
2. Set the OPERATION MODE switch on the control unit to Rx.
3. Remove break connector X11 and terminate connector X1 with 50 ohms.
4. Measure at testpoint MP1 with digital multimeter.
5. Comparator N4 flips when output 14 (testpoint MP1) shows

 $\geq 15 \text{ VDC.}$

7. Afterwards re-insert break connector X11.

6.6.10 Checking BITE Threshold

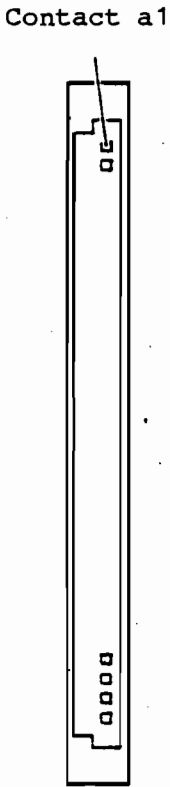
1. Set the OPERATION MODE switch on the control unit to Tx and enter a frequency of 10000.0 kHz.
 2. Connect the signal generator to connector X53 and a test receiver to connector X54.
 3. Set the signal generator to 10 MHz and increase its output level until there is a level of 7 dBm at output X54.
 4. The BITE output, connector X51.a5, must switch to Low. Correct by means of potentiometer R80 if necessary.
6. Nominal value of response threshold corresponds to RF voltage of 2.5 to 5 V on connector X52.

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6.7 External Interfaces

Plug X51	Pin	Signal designation/level
FP connector strip, 32-way, for printed circuits, 	a1 a2 a3 a4 a5 a6 a7 a8 a9 a10 a11 a12 a13 a14 a15 a16 a17 a18 a19 a20 a21 a22 a23 a24 a25 a26 a27 a28 a29 a30 a31 a32	Not used Not used Not used Not used BITE Selection (TTL) Strobe 3 (TTL) Strobe 4 (TTL) Not used Strobe 9 (TTL) Data 0 (TTL) Data 1 (TTL) Data 2 (TTL) Data 3 (TTL) Data 4 (TTL) Data 5 (TTL) Data 6 (TTL) Data 7 (TTL) Transmit Not used Not used AGC RF (0 to 6 V) Not used -15 VDC +5.3 VDC +5.3 VDC +7.25 VDC +7.25 VDC +15 VDC +15 VDC Ground Ground Ground

Plugs X52 thru X56	Pin	Signal designation/level
FJ fixed connector system SMB 	X52 X53 X54 X55 X56	HF Reception 1 HF Transmission 2 HF Transmission 1 HF Reception 2 Test spectrum

D I G I T A L L Y T U N E D F I L T E R
F K 8 5 2 P 2

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6.17/6.18 -

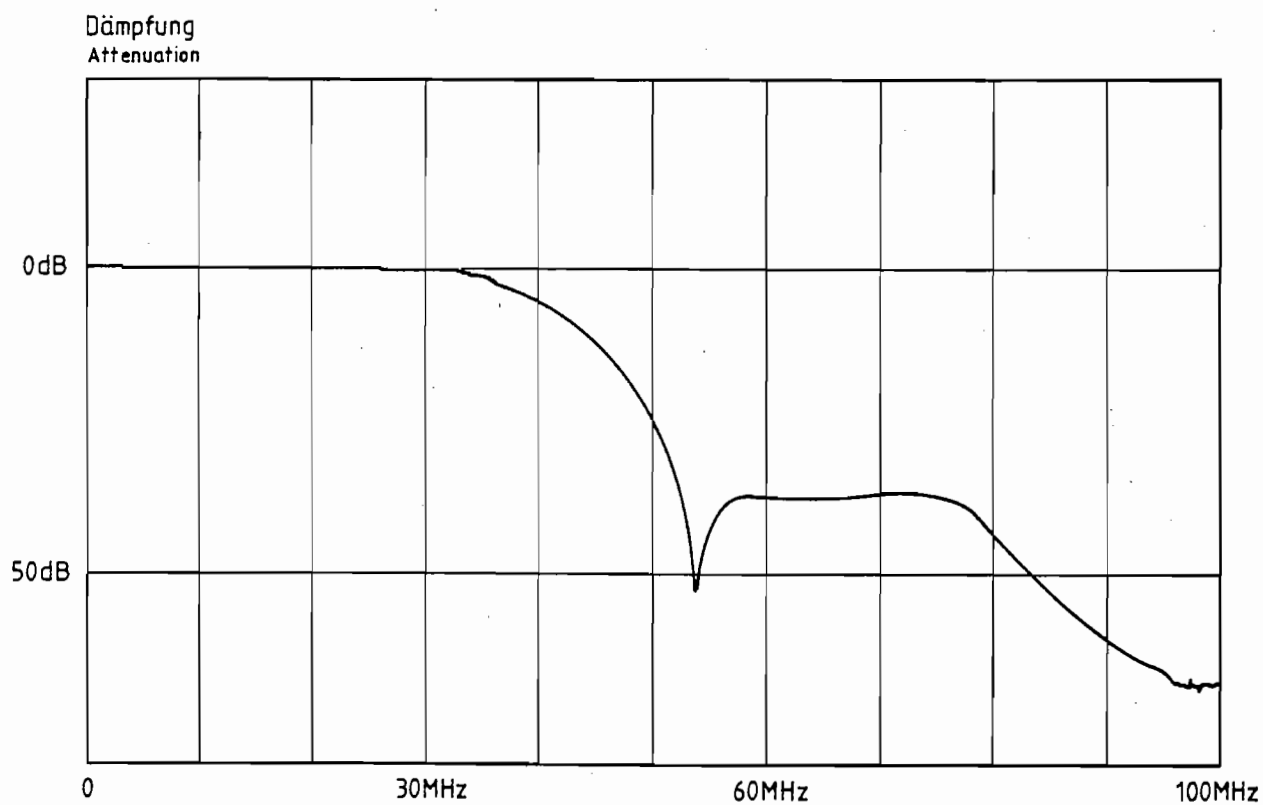


Fig. 6.2 Typical Frequency Response of Bandpass

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- 6.19/6.20 -

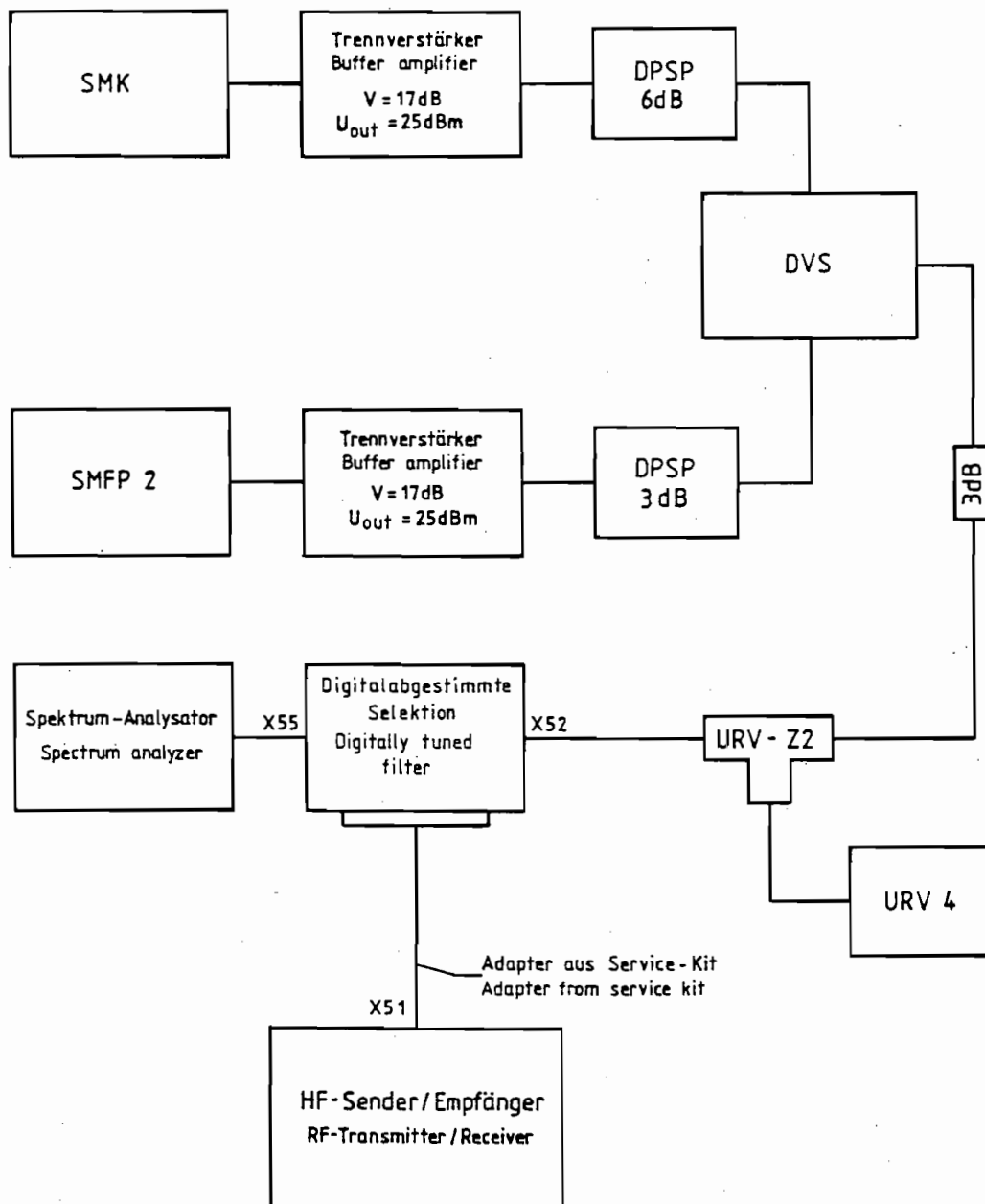


Fig. 6.3 Test Set-up for Measuring Intermodulation

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- 6.21/6.22 -

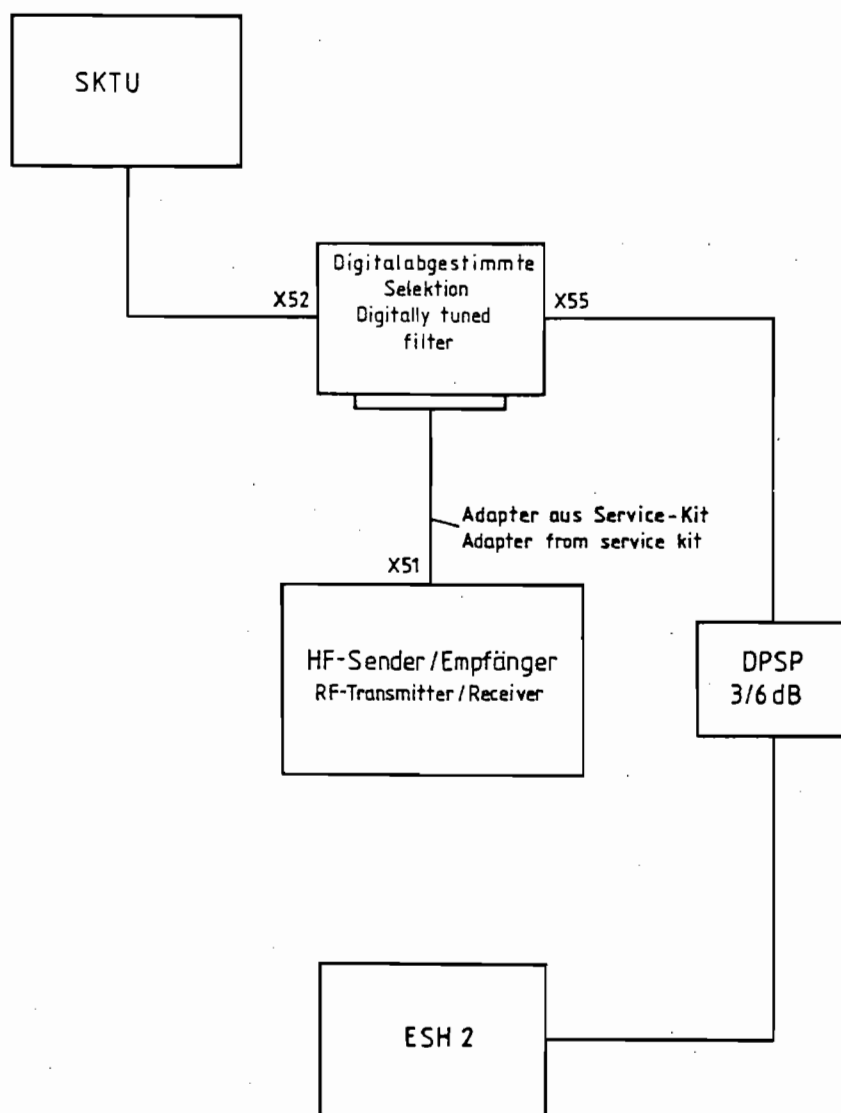


Fig. 6.4 Test Set-up for Measuring Noise Figure

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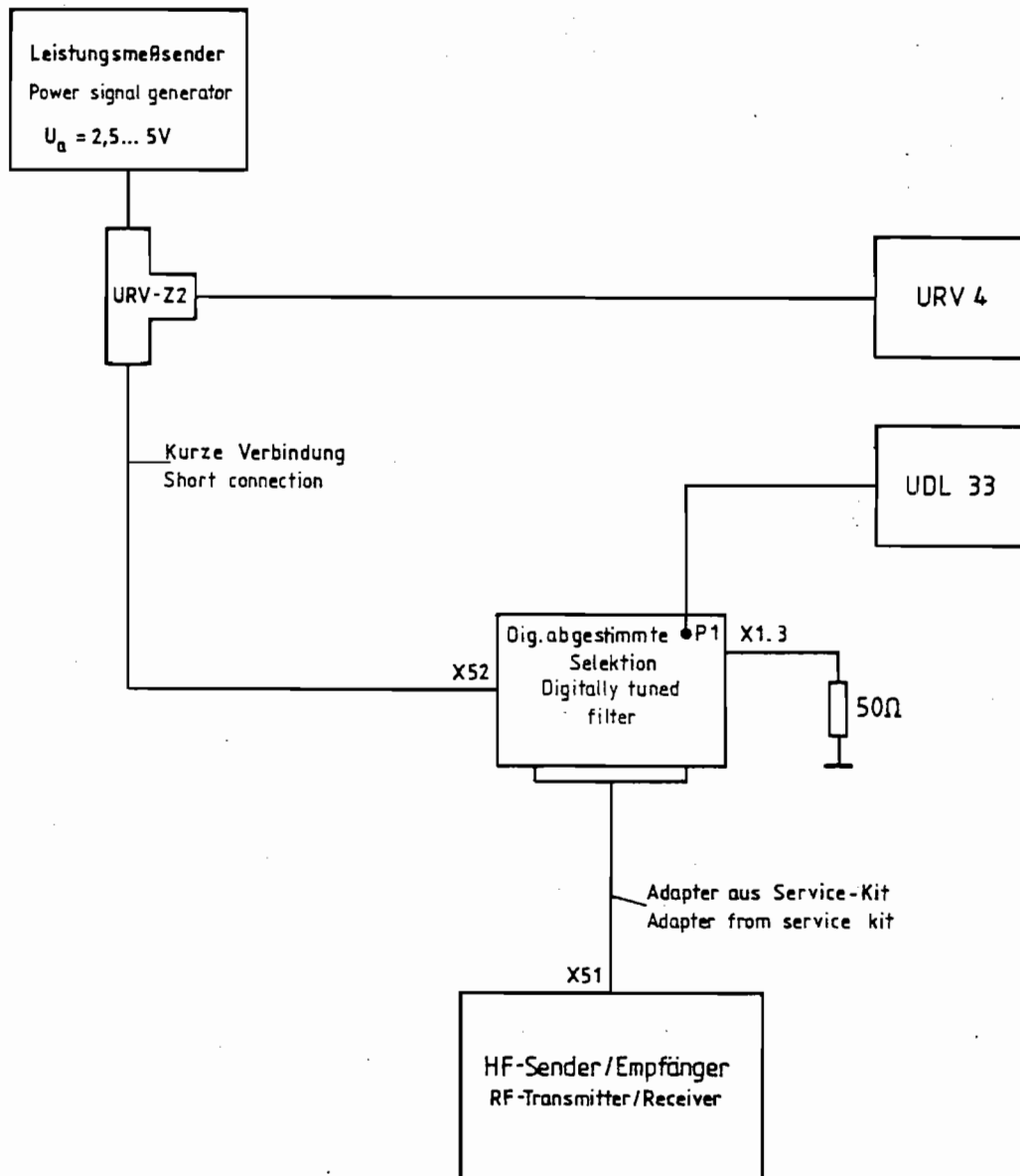


Fig. 6.5 Test Set-up for Overvoltage Protection

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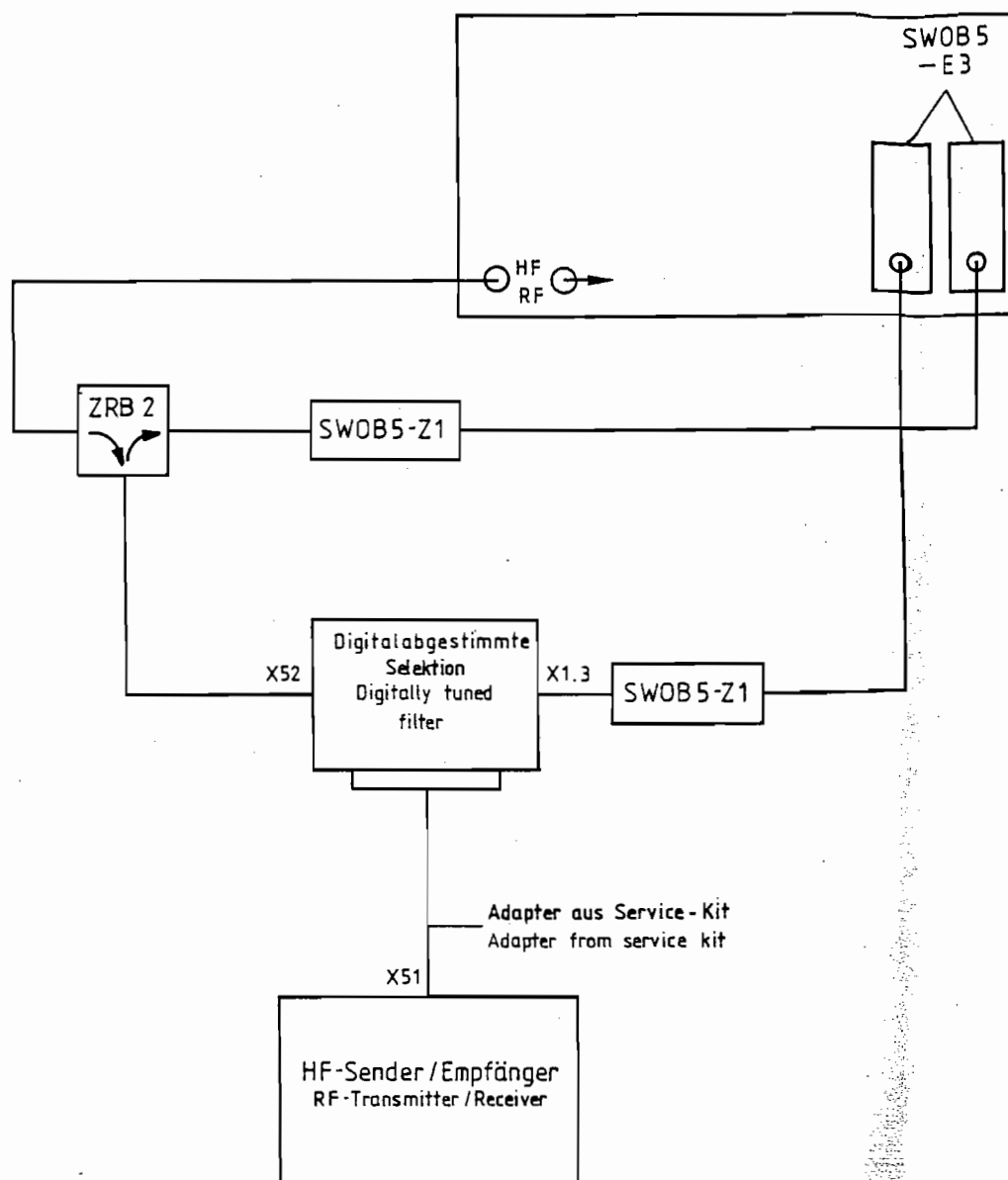
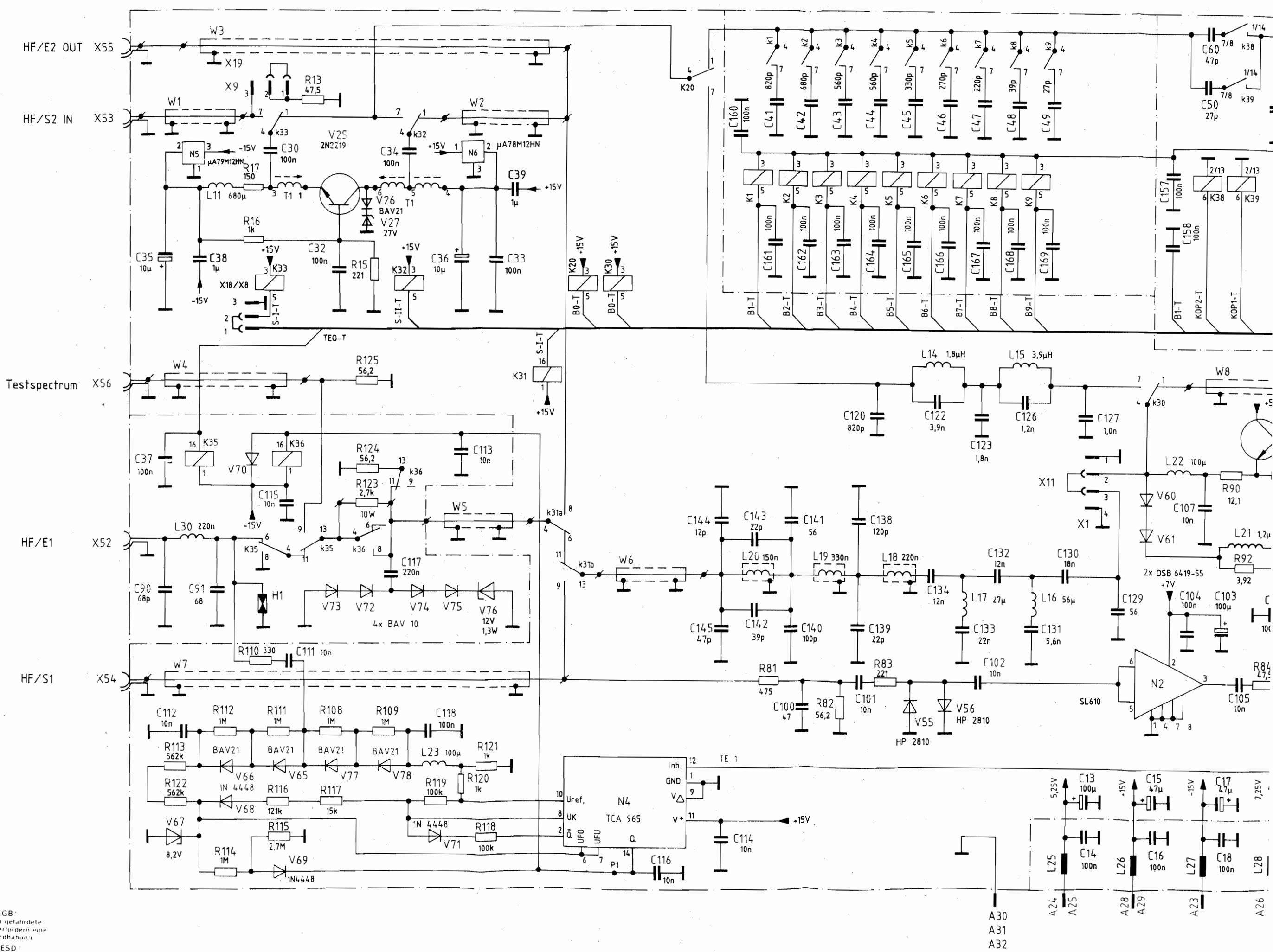


Fig. 6.6 Test Set-up for Measuring Bandpass



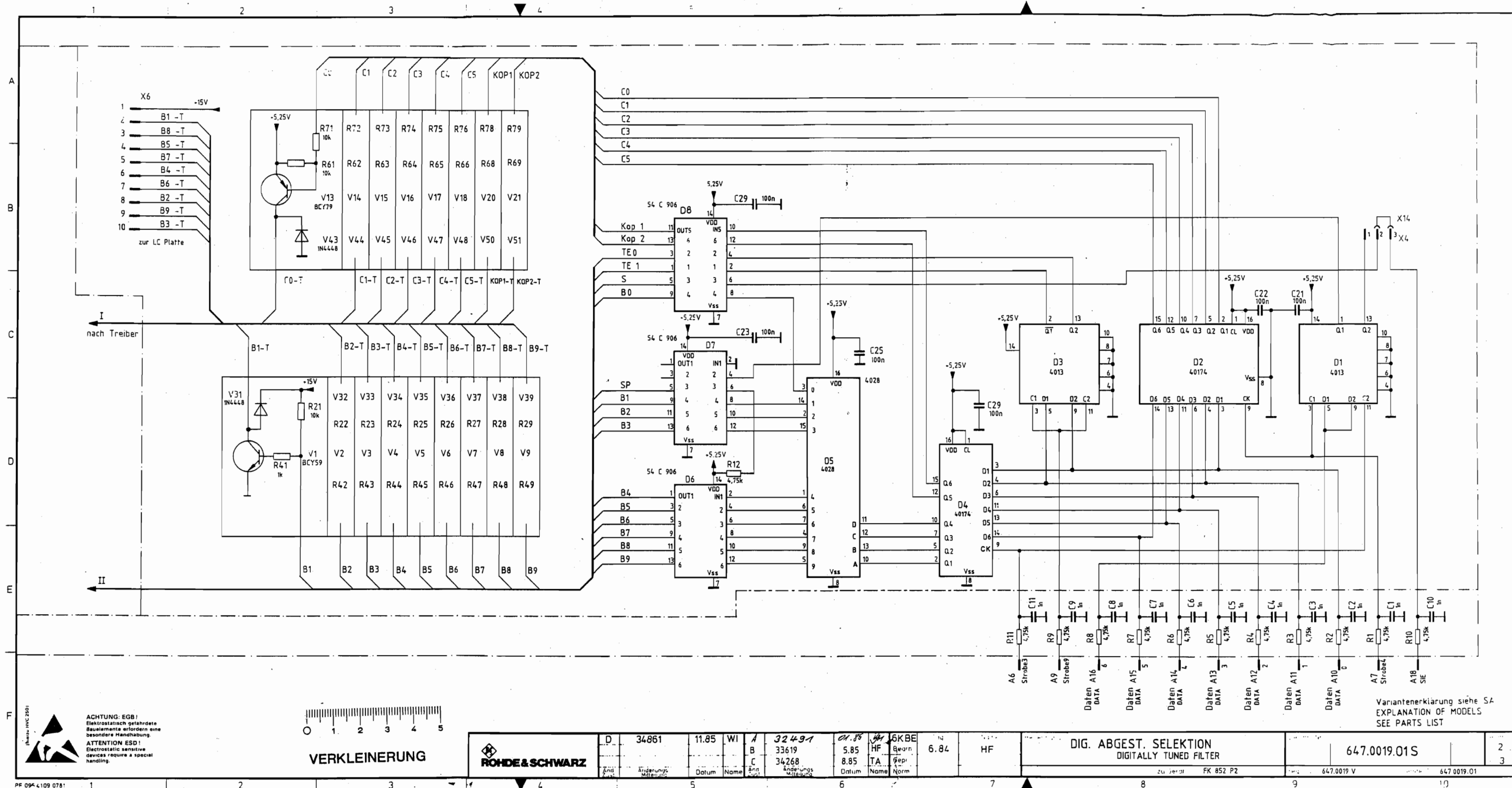
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Parts lists
Circuit diagrams
Components plans



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 Elektrostatisch gefährdete
 Bauelemente erfordern eine
 besondere Handhabung
 ATTENTION ESD
 Electrostatic sensitive
 devices require a special
 handling





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FK852P2 DIGIT.-TUN.FILTER

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG VAR 05 = AUSF.EK085		
A5.1	ED GRUNDPLATTE MAIN BOARD	647.0025.02	
A5.2	HIERZU STROML.647.0019 S ED LC-PLATTE LC BOARD HIERZU STROML.647.0019 S	647.0054.02	
W90	DX FLACHBANDKABEL 64POL. NUR VAR : 05	651.7550	
			- ENDE -

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enthalten in
contained in

-	VARIANTENERKL. / VERSIONS		
	VAR 02 = GRUNDAUSFUEHRUNG		
	MOD 02 = BASIC MODEL		
C1	CC 1NF+-10%100V5K1200VIEL CAPACITOR UNION CARB M39014/01-1397	CC 068.4047	
BIS/TO			
C11			
C13	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z	022.7550	
C14	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C15	CE 47UF -10+100%40V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7476-Z	022.7589	
C16	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C17	CE 47UF -10+100%40V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7476-Z	022.7589	
C18	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C20	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
BIS/TO			
C25			
C26	CC 1UF+-10%50V7K1200VIEL CAPACITOR UNION CARB M39014/02-1403	CC 084.5538	
C27	CC 1UF+-10%50V7K1200VIEL CAPACITOR UNION CARB M39014/02-1403	CC 084.5538	
C29	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C30	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C32	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C33	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C34	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C35	CE 10 UF+-20%25V 7X 5X11 ELECTROLYTIC CAPACITOR ERO-TANTAL ETR3-10/25	CE 023.5980	

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		13	0885		647.0025.01 SA	2
Kennzeichen Component No.	Benennung/Beschreibung Designation			Sachnummer Stock No.	enthalten in contained in	
C36	CE 10 UF+-20%25V 7X 5X11 ELECTROLYTIC CAPACITOR			CE 023.5980		
C37	ERO-TANTAL ETR3-10/25 CC 100NF+-10%50V5K1200VIE CAPACITOR			CC 084.5350		
C38	UNION CARB M39014/01-1433 CC 1UF+-10%50V7K1200VIEL CAPACITOR			CC 084.5538		
C39	UNION CARB M39014/02-1403 CC 1UF+-10%50V7K1200VIEL CAPACITOR			CC 084.5538		
C41	UNION CARB M39014/02-1403 CG 820PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9445		
C42	JAHRE 53.05 820PF+-0,5% CG 680PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9439		
C43	JAHRE 53.05 680PF+-0,5% CG 560PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9422		
C44	JAHRE 53.05 560PF+-0,5% CG 560PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9422		
C45	JAHRE 53.05 560PF+-0,5% CG 330PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9397		
C46	JAHRE 53.05 330PF+-0,5% CG 270PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9380		
C47	JAHRE 53.05 270PF+-0,5% CG 220PF+-1% 250V TK+100 MICA CAPACITOR			CG 006.9374		
C48	JAHRE 53.03 220PF+-1% CG 39 PF+-1PF 250V TK+100 MICA CAPACITOR			CG 006.9280		
C49	JAHRE 53.03 39PF+-1PF 250V CG 27 PF+-1PF 250V TK+100 MICA CAPACITOR			CG 006.9268		
C50	JAHRE 53.03 27PF+-1PF 250V CG 27 PF+-1PF 250V TK+100 MICA CAPACITOR			CG 006.9268		
C60	JAHRE 53.03 27PF+-1PF 250V CG 47 PF+-1PF 250V TK+100 MICA CAPACITOR			CG 006.9297		
C70	JAHRE 53.03 47PF+-1PF 250V CG 27 PF+-1PF 250V TK+100 MICA CAPACITOR			CG 006.9268		
C71	JAHRE 53.03 27PF+-1PF 250V CG 820PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9445		
C72	JAHRE 53.05 820PF+-0,5% CG 680PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9439		
C73	JAHRE 53.05 680PF+-0,5% CG 560PF+-0,5%250V TK+70 MICA CAPACITOR			CG 006.9422		
	JAHRE 53.05 560PF+-0,5%					
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C74	CG 560PF+-0,5%250V TK+70 MICA CAPACITOR JAHRE 53.05 560PF+-0,5%	CG 006.9422	
C75	CG 330PF+-0,5%250V TK+70 MICA CAPACITOR JAHRE 53.05 330PF+-0,5%	CG 006.9397	
C76	CG 270PF+-0,5%250V TK+70 MICA CAPACITOR JAHRE 53.05 270PF+-0,5%	CG 006.9380	
C77	CG 220PF+-1% 250V TK+100 MICA CAPACITOR JAHRE 53.03 220PF+-1%	CG 006.9374	
C78	CG 39 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 39PF+-1PF 250V	CG 006.9280	
C79	CG 27 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 27PF+-1PF 250V	CG 006.9268	
C80	CG 47 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 47PF+-1PF 250V	CG 006.9297	
C81	CT 9,2PF TAUCHTR.RD 7X12 AIR-TYPE TRIMMER TEKELEC LUFTTRAT5200	CT 025.7367	
BIS/TO			
C86			
C90	CG 68PF+-5%TKF14X5X3 250V CAPACITOR JAHRE 49.46/68/5/250	CG 417.8426	
C91	CG 68PF+-5%TKF14X5X3 250V CAPACITOR JAHRE 49.46/68/5/250	CG 417.8426	
C92	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C93	CG 18 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 18PF+-1PF 250V	CG 006.9245	
C94	CG 39 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 39PF+-1PF 250V	CG 006.9280	
C95	CG 10 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 10PF+-1PF 250V	CG 006.9216	
C96	CG 68 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 68PF+-1PF 250V	CG 006.9316	
C97	CG 82 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 82PF+-1PF 250V	CG 006.9322	
C98	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C99	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415	CC 068.4060	

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Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.	enthalten in contained in	
C100	CC 47PF+-10%200V5K1200VIE CAPACITOR UNION CARB M39014/01-1373		CC 084.5215		
C101	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C102	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C103	CE 100UF-10+100%16V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-A4107-Z		022.7550		
C104	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433		CC 084.5350		
C105	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C106	CC 1,5NF+-10%100V5K1200VI CERAMIC CAPACITOR UNION CARB M39014/01-1400		CC 060.2374		
C107	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C109	CE 33 UF+-20%10V 7X 5X11 ELECTROLYTIC CAPACITOR ERO-TANTAL TA-ELKOETR3-33/10		CE 087.0343		
C110	CC 1NF+-10%100V5K1200VIEL CAPACITOR UNION CARB M39014/01-1397		CC 068.4047		
C111	CK 10NF+-20%630V QUADER CAPACITOR ROEDERST MKT1822-310/6		CK 024.7763		
C112	CK 10NF+-20%630V QUADER CAPACITOR ROEDERST MKT1822-310/6		CK 024.7763		
C113	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C114	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C115	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C116	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR UNION CARB M39014/01-1415		CC 068.4060		
C117	CK 220NF+-20%100V QUADER PLASTIC-FOIL CAPACITOR ROEDERST MKT1822-422/0		CK 006.5056		
C118	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433		CC 084.5350		
C120	CC 820PF+- 5%100V NPO VIE CERAMIC CAPACITOR ERIE 8133-100COG-820PF		CC 060.0888		
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C122	CC 3,9NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-3,9NF-J	CC 060.0965	
C123	CC 1,8NF+- 5%100V NPO VIE CAPACITOR ERIE 8133-100-COG-1,8NF-J	CC 060.0920	
C126	CC 1,2NF+- 5%100V NPO VIE CAPACITOR ERIE 8133-100-COG-1,2NF-J	CC 060.0907	
C127	CC 1 NF+- 5%100V NPO VIEL CERAMIC CAPACITOR ERIE 8133-100-COG-1NF-J	CC 060.0894	
C129	CC 56PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C560J2G1CA	CC 060.0742	
C130	CK 18NF+-1%63V7,50AX13 KP CAPACITOR SIEMENS B33531-A5183-F	CK 099.1933	
C131	CC 5,6NF+- 5%100V NPO VIE CAPACITOR ERIE 8737-100-COG-5,6NF-J	CC 060.0988	
C132	CK 12NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5123-F	CK 340.6760	
C133	CK 22NF+-1%63V8X8X11 KP CAPACITOR SIEMENS B33531-A5223-F	CK 213.4553	
C134	CK 12NF+-1%63V7,5QUX13 KP CAPACITOR SIEMENS B33531-A5123-F	CK 340.6760	
C138	CC 120PF+- 5%100V NPO VIE CERAMIC CAPACITOR UNIONCARB C052C121J2G1CA	CC 060.0788	
C139	CC 22PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C220J2G1CA	CC 060.0694	
C140	CC 100PF+- 5%100V NPO VIE CERAMIC CAPACITOR UNIONCARB C052C101J2G1CA	CC 060.0771	
C141	CC 56PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C560J2G1CA	CC 060.0742	
C142	CC 39PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C390J2G1CA	CC 060.0720	
C143	CC 22PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C220J2G1CA	CC 060.0694	
C144	CC 12PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C120J2G1CA	CC 060.0665	
C145	CC 47PF+- 5%100V NPO VIEL CERAMIC CAPACITOR UNIONCARB C052C470J2G1CA	CC 060.0736	
C149	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	

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Kennzeichen Component No.		Benennung/Beschreibung Designation		Sachnummer Stock No.	enthalten in contained in
C157	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433		CC 084.5350		
BIS/TO C179					
D1	BL CD4013BF 2XD FLIPFL FLIPFLOP RCA CD4013BF		BL 086.8034		
D2	BL CD40174BF 6XD- FLIPFL FLIPFLOP RCA CD40174BF		BL 092.9474		
D3	BL CD4013BF 2XD FLIPFL FLIPFLOP RCA CD4013BF		BL 086.8034		
D4	BL CD40174BF 6XD- FLIPFL FLIPFLOP RCA CD40174BF		BL 092.9474		
D5	BL SCL4028BC BCD/DEC.DEC BCD/DECADE DECODER MOTOROLA MC14028BAL		BL 290.1178		
D6	BL MM54C906J 6XN-CH.BUFF N-CHANNEL BUFFER OD NSC MM54C906J		BL 418.0264		
BIS/TO D8					
H1	SU RD9,7X6 M.DRAHTANSCHL. SPARK-GAP VOLTAGE DISCHAR SIEMENS B1-A230		SU 210.6161		
K1	SN RELAIS 16V 1300 OHM RELAY SDS RELAIS RH-16V		SN 469.6676		
BIS/TO K9 K20					
BIS/TO K30 K31					
K32	SN GEPOLT 2XU 12V RELAY SDS DS2E-DC12V		645.6810		
K33	SN RELAIS 16V 1300 OHM RELAY SDS RELAIS RH-16V		SN 469.6676		
K35	SN GEPOLT 2XU 12V RELAY SDS DS2E-DC12V		645.6810		
K36	SN GEPOLT 2XU 12V RELAY SDS DS2E-DC12V		645.6810		
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
K38	SR 5V3600HM1MAL1RH-JC-GEH RELAY CLARE PRME 15005	SR 412.0027	
K39	SR 5V3600HM1MAL1RH-JC-GEH RELAY CLARE PRME 15005	SR 412.0027	
K41	SR 5V3600HM1MAL1RH-JC-GEH RELAY CLARE PRME 15005	SR 412.0027	
BIS/TO			
K46			
K48	SR 5V3600HM1MAL1RH-JC-GEH RELAY CLARE PRME 15005	SR 412.0027	
K49	SR 5V3600HM1MAL1RH-JC-GEH RELAY CLARE PRME 15005	SR 412.0027	
L11	LD 680 UH10%60,00HMO,030A CHOKE DELEVAN DROSSEL1025-88	LD 067.3201	
L14	LD 1,8UH+-2%0,6A0,740HM COIL JAHRE 74.11-1R80G	LD 283.2408	
L15	LD 3,9UH+-2% 7,2RDX14 HF-COIL JAHRE 74.11-3R90 TOL.+-2%	645.7439	
L16	LD 56UH+-2% 7,2RDX14 HF-COIL JAHRE 74.11-56R0 TOL.+-2%	645.7445	
L17	LD 27UH+-2%0,3A 2,75 OHM CHOKE JAHRE 74.11-27R0G	LD 567.3987	
L18	LD 0,22UH+-2% 2A0,035 OHM CHOKE JAHRE 74.11-R220G	523.7770	
L19	LD 0,33UH+-2% 2A 0,0650HM CHOKE JAHRE 74.11-R330G	LD 567.4019	
L20	LD 0,15UH+-2% 3,0A0,030HM CHOKE JAHRE 74.11-R150G	LD 567.4002	
L21	LD 1,20UH10%0,180HMO,620A CHOKE DELEVAN DROSSEL1025-22	LD 067.2870	
L22	LD 100 UH10%8,000HMO,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L23	LD 100 UH10%8,000HMO,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L24	LD 100 UH10%8,000HMO,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L25	LD 150UH BEI 0,17A 6,20HM CHOKE JAHRE 72.10-1500K	LD 026.4055	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
BIS/TO L28 L30	LD SPULE COIL	647.0831	
N1	B0 MC1558JG 2X OPAMP OPERATIONAL AMPLIFIER NSC LM1558J	B0 275.0816	
N2	B0 SL610CCM8 IF AMPL IF AMPLIFIER PLESSEY SL610CCM8	610.4110	
N3	B0 TCA965 FENSTER-DISKRIM DISCRIMINATOR SIEMENS TCA965	B0 279.2213	
N4	B0 TCA965 FENSTER-DISKRIM DISCRIMINATOR SIEMENS TCA965	B0 279.2213	
N5	B0 UA79M12HM-12V0A5 VREGL VOLTAGE REGULATOR FAIRCHILD MA79M12AM	645.7739	
N6	B0 UA78M12HM+12V0A5 VREGL VOLTAGE REGULATOR FAIRCHILD MA78M12HM	B0 580.9362	
R1	RL 0,35W 4,75KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/4,75K-F-D	RL 083.1097	
BIS/TO R12 R13	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R15	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R16	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R17	RD 1,2W 150 OHM+-3% WIRE WOUND RESISTOR SAGE 100QS150OHM+3%	RD 087.5345	
R21	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
BIS/TO R32 R41	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
BIS/TO R52 R53	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R55	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
R61	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
BIS/TO R66			
R68	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R69	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R71	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
BIS/TO R76			
R78	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R79	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R80	RS 0,5W1KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-102	RS 087.7560	
R81	RL 0,35W 475 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/475OHM-F-D	RL 083.0390	
R82	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D	RL 082.9571	
R83	RL 0,35W 221 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/221OHM-F-D	RL 083.0084	
R84	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,5OHM-F-D	RL 082.9507	
R85	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R86	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R87	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R89	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R90	RL 0,35W 12,10 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/12,10HM-F-D	RL 082.8930	
R91	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	

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13		0885		647.0025.01 SA	10
Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.	enthalten in contained in	
R92	RL 0,35W3,92 OHM+-1%TK50 METALFILMRESISTOR		RL 099.8009		
R93	RESISTA MK2 3,92 OHM 1% TK50 RL 0,35W 10,0KOHM+-1%TK50 RESISTOR		RL 083.1297		
R94	DRALORIC SMA0207/10K-F-D RL 0,35W 100KOHM+-1%TK50 RESISTOR		RL 082.1764		
R96	DRALORIC SMA0207/100K-F-C RL 0,35W 10,0KOHM+-1%TK50 RESISTOR		RL 083.1297		
R97	DRALORIC SMA0207/10K-F-D RL 0,35W 100KOHM+-1%TK50 RESISTOR		RL 082.1764		
R98	DRALORIC SMA0207/100K-F-C RL 0,35W 1KOHM+-1%TK50 RESISTOR		RL 082.2160		
R99	DRALORIC SMA0207/1K-F-C RL 0,35W 10,0KOHM+-1%TK50 RESISTOR		RL 083.1297		
R100	DRALORIC SMA0207/10K-F-D RS 0,5W10KOHM+-10%10X10X5 CERMET POTENTIOMETER T BOURNS 3386F-1-103		RS 247.7903		
R101	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR		RL 083.1297		
R102	DRALORIC SMA0207/10K-F-D RL 0,35W 4,75KOHM+-1%TK50 RESISTOR		RL 083.1097		
R103	DRALORIC SMA0207/4,75K-F-D RL 0,35W 4,75KOHM+-1%TK50 RESISTOR		RL 083.1097		
R104	DRALORIC SMA0207/4,75K-F-D RL 0,35W 4,75KOHM+-1%TK50 RESISTOR		RL 083.1097		
R108	DRALORIC SMA0207/4,75K-F-D RL 0,35W 1MOHM+-1%TK50 RESISTOR		RL 082.7862		
R109	DRALORIC SMA0207/1M-F-D RL 0,35W 1MOHM+-1%TK50 RESISTOR		RL 082.7862		
R110	RF 0,5W 330 OHM+-5% DEPOS.-CARBON RESISTOR		RF 007.1319		
R111	RESISTA SK4/330OHM5% RL 0,35W 1MOHM+-1%TK50 RESISTOR		RL 082.7862		
R112	DRALORIC SMA0207/1M-F-D RL 0,35W 1MOHM+-1%TK50 RESISTOR		RL 082.7862		
R113	DRALORIC SMA0207/1M-F-D RL 0,35W 562 KOHM+-1%TK50 RESISTOR		RL 083.2664		
R114	DRALORIC SMA0207/562K-F-C RL 0,35W 1MOHM+-1%TK50 RESISTOR		RL 082.7862		
	DRALORIC SMA0207/1M-F-D				
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		13	0885	647.0025.01 SA	11
Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.		enthalten in contained in
R115	RL 0,35W 2.74MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2.74MOHM+-1%TK50		RL 099.8980		
R116	RL 0,35W 121KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/121K-F-C		RL 083.2070		
R117	RL 0,35W 15,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/15K-F-D		RL 083.1400		
R118	RL 0,35W 68,1KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/68,1K-F-C		RL 082.2602		
R119	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C		RL 082.1764		
R120	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C		RL 082.2160		
R121	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C		RL 082.2160		
R122	RL 0,35W 562 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/562K-F-C		RL 083.2664		
R123	RD 10W 2,7KOHM+-3%IND.ARM WIRE WOUND RESISTOR DALE NH-10 2,7KOHM 3%		645.7416		
R124	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D		RL 082.9571		
R125	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,2OHM-F-D		RL 082.9571		
T1	LU UEBERTRAGER TRANSFORMER		647.0825		
V1	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX		AK 010.5163		
BIS/TO V12 V13	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX		AK 010.3777		
BIS/TO V18 V19	AK BCY59IX NPN 45V 200MA TRANSISTOR SIEMENS BCY59IX		AK 010.5163		
V20	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX		AK 010.3777		
V21	AK BCY79IX PNP 45V 200MA TRANSISTOR SIEMENS BCY79IX		AK 010.3777		

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		13	0885	647.0025.01 SA	12
Kennzeichen Component No.	Benennung/Beschreibung Designation			Sachnummer Stock No.	enthalten in contained in
V25	AK 2N2219A NPN 40V 800MA TRANSISTOR			AK 083.6953	
	VALVO 2N2219A				
V26	AD BAV21 250V 0,25A UDI DIODE			AD 082.6837	
	INTERMETAL BAV21				
V27	AE BZX55/B27 0,5W Z-DI ZENER DIODE			AE 615.9085	
	VALVO BZX55/B27				
V31	AD 1N4448 75V 0,15A UDI DIODE			AD 012.0700	
	VALVO 1N4448				
BIS/TO V48					
V50	AD 1N4448 75V 0,15A UDI DIODE			AD 012.0700	
	VALVO 1N4448				
V51	AD 1N4448 75V 0,15A UDI DIODE			AD 012.0700	
	VALVO 1N4448				
V52	AD 1N4448 75V 0,15A UDI DIODE			AD 012.0700	
	VALVO 1N4448				
V55	AE 5082-2800 SCHOTTKYDI DIODE			AE 012.9066	
	HEWLETT-P. 5082-2800				
BIS/TO V58					
V60	AE DSB6419-55 100V PINDI PIN DIODE			645.7345	
	ALPHA IND DSB 6419-55				
V61	AE DSB6419-55 100V PINDI PIN DIODE			645.7345	
	ALPHA IND DSB 6419-55				
V62	AK BC517 NPN 30V DARL. TRANSISTOR			AK 282.2133	
	TEXAS BC517				
V64	AE BZX55/B5V1 0,5W Z-DI ZENER DIODE			AE 262.5837	
	VALVO BZX55/B5V1				
V65	AD BAV21 250V 0,25A UDI DIODE			AD 082.6837	
	INTERMETAL BAV21				
V66	AD BAV21 250V 0,25A UDI DIODE			AD 082.6837	
	INTERMETAL BAV21				
V67	AE BZX55/B8V2 0,5W Z-DI ZENER DIODE			AE 012.2178	
	VALVO BZX55/B8V2				
V68	AD 1N4448 75V 0,15A UDI DIODE			AD 012.0700	
	VALVO 1N4448				
BIS/TO V71					
V72	AD BAV10 60V 0,3 A UDI DIODE			AD 012.9437	
	VALVO BAV10				
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Kennzeichen
Component No.Benennung/Beschreibung
DesignationSachnummer
Stock No.enthalten in
contained in

BIS/TO

V75

V76

AE BZT03/C12 3.2W Z-DI
ZENER DIODE

AE 007.4182

VALVO BZT03/C12

V77

AD BAV21 250V 0,25A UDI
DIODE

AD 082.6837

INTERMETAL BAV21

V78

AD BAV21 250V 0,25A UDI
DIODE

AD 082.6837

INTERMETAL BAV21

W1

DX KABEL
CABLE

647.0848

W2

DX KABEL
CABLE

647.0854

W3

DX KABEL
CABLE

647.0860

W4

DX KABEL
CABLE

647.0877

W5

DX KABEL
CABLE

647.0883

W6

DX KABEL
CABLE

647.0890

W7

DX KABEL
CABLE

647.0902

W8

DX KABEL
CABLE

647.0919

X4

FP INDIREKT. STECKERL. 36P.
PIN CONNECTOR
BERG 75160-102-36
3-POLIG

FP 242.3600

X6

FP STECKERLEISTE 10POL.
CONNECTOR 10POL.
PANDUIT 050-010-133 BC

FP 649.4428

X7

FP STECKERLEISTE 36POL.
PIN CONNECTOR
5-POLIG

FP 278.5477

X8

FP INDIREKT. STECKERL. 36P.
PIN CONNECTOR
BERG 75160-102-36
3-POLIG

FP 242.3600

X9

FP INDIREKT. STECKERL. 36P.
PIN CONNECTOR
BERG 75160-102-36
3-POLIG

FP 242.3600

X11

FP INDIREKT. STECKERL. 36P.
PIN CONNECTOR
BERG 75160-102-36
4-POLIG

FP 242.3600

F

X11

FP KURZSCHLUSSBUCHSE
SHORTING PLUG

FP 491.7042

PK 452-70302

X14

FP KURZSCHLUSSBUCHSE
SHORTING PLUG

FP 491.7042

PK 452-70302

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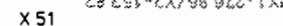
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X18	FP KURZSCHLUSSBUCHSE SHORTING PLUG	FP 491.7042	
X19	PK 452-70302 FP KURZSCHLUSSBUCHSE SHORTING PLUG	FP 491.7042	
X51	PK 452-70302 FP STECKERLEISTE 32POL. MULTIPOINT CONNECTOR	FP 514.4550	
X52	PANDUIT 100-232-033/999 FJ EINBAUSTECKER SYST.SMB FIXED CONNECTOR	FJ 063.5116	
BIS/TO X56	ROSENBERG 59S601-200D2		
			- ENDE -

647.0025.01 SA BL14-

8-5 8.8.5

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Variantenerklärung siehe SA
EXPLANATION OF MODELS
SEE PARTS LIST

J	34268	08.85	TA	Maße ohne Toleranzangabe	Maßstab 1 : 1			
K	34861	11.85	WI		Halbzeug, Werkstoff			
				6KBE	Tag	Name	Benennung Grundplatte MAIN BOARD Z	
				Bearb.	08.85	TA		
				Gepr.				
				Norm				
				 ROHDE & SCHWARZ		Zeichn.-Nr.	647.0025.01	Blatt-Nr. 2
Änd. Zust.	Änderungs- Mitteilung	Tag	Name			reg. i. V.		647.0019 V
				zu Gerät FK 852 P2				

647-000-299



Variantenerklärung siehe „A
EXPLANATION OF MODE.

J	34268	08.85	TA	Maße ohne Toleranzangabe		Maßstab 1 : 1			
K	34861	11.85	WI			Halbzeug, Werkstoff			
				6KBE	Tag	Name	Benennung Grundplatte MAIN BOARD Z		
				Bearb.	08.85	TA			
				Gepr.					
				Norm					
				 ROHDE & SCHWARZ			Zeichn.-Nr.		Blatt-Nr. 3
Änd. Zust.	Änderungs- Mitteilung	Tag	Name	zu Gerät FK 852 P2			reg. i. V. 647.0019 V	erste Z. 647.0019.01	
							647.0025.01	v. BI	

ATTENTION ESD!
Electrostatic sensitive
devices require a special
handling.



 ROHDE & SCHWARZ		ÄZ Datum Date	Schaltteilliste für Parts list for ED LC-PLATTE LC BOARD	Sachnummer Stock No. 647.0054.01 SA	Blatt Page 1
Kennzeichen Component No.	Benennung/Beschreibung Designation		Sachnummer Stock No.	enthalten in contained in	
-	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL				
C51	CG 33 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 33PF+-1PF 250V		CG 006.9274		
C52	CG 47 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 47PF+-1PF 250V		CG 006.9297		
C53	CG 33 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 33PF+-1PF 250V		CG 006.9274		
C54	CG 56 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 56PF+-1PF 250V		CG 006.9300		
C55	CG 100PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 100PF+-1PF 250V		CG 006.9339		
C56	CG 120PF+-1% 250V TK+100 MICA CAPACITOR JAHRE 53.03 120PF+-1% 250V		CG 006.9345		
C57	CG 100PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 100PF+-1PF 250V		CG 006.9339		
C58	CG 150PF+-1% 250V TK+100 MICA CAPACITOR JAHRE 53.03 150PF+-1% 250V		CG 006.9351		
C59	CG 180PF+-1% 250V TK+100 MICA CAPACITOR JAHRE 53.03 180PF+-1% 250V		CG 006.9368		
C63	CG 12 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 12PF+-1PF 250V		CG 006.9222		
C65	CG 10 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 10PF+-1PF 250V		CG 006.9216		
C67	CG 12 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 12PF+-1PF 250V		CG 006.9222		
C68	CG 10 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 10PF+-1PF 250V		CG 006.9216		
C69	CG 27 PF+-1PF 250V TK+100 MICA CAPACITOR JAHRE 53.03 27PF+-1PF 250V		CG 006.9268		
C180	CE 47UF -10+100%40V 11X13 ELECTROLYTIC CAPACITOR SIEMENS B41316-B7476-Z		022.7589		
C181	CT 20,8PFNORMAL 0/U 4ST AIR-TYPE TRIMMER TRONSER LUFTTR10111120020000		CT 025.7221		
BIS/TO C189					

647.0054.01 SA BL 1+

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Schaltteilliste für
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ED LC-PLATTE
LC BOARDSachnummer
Stock No.

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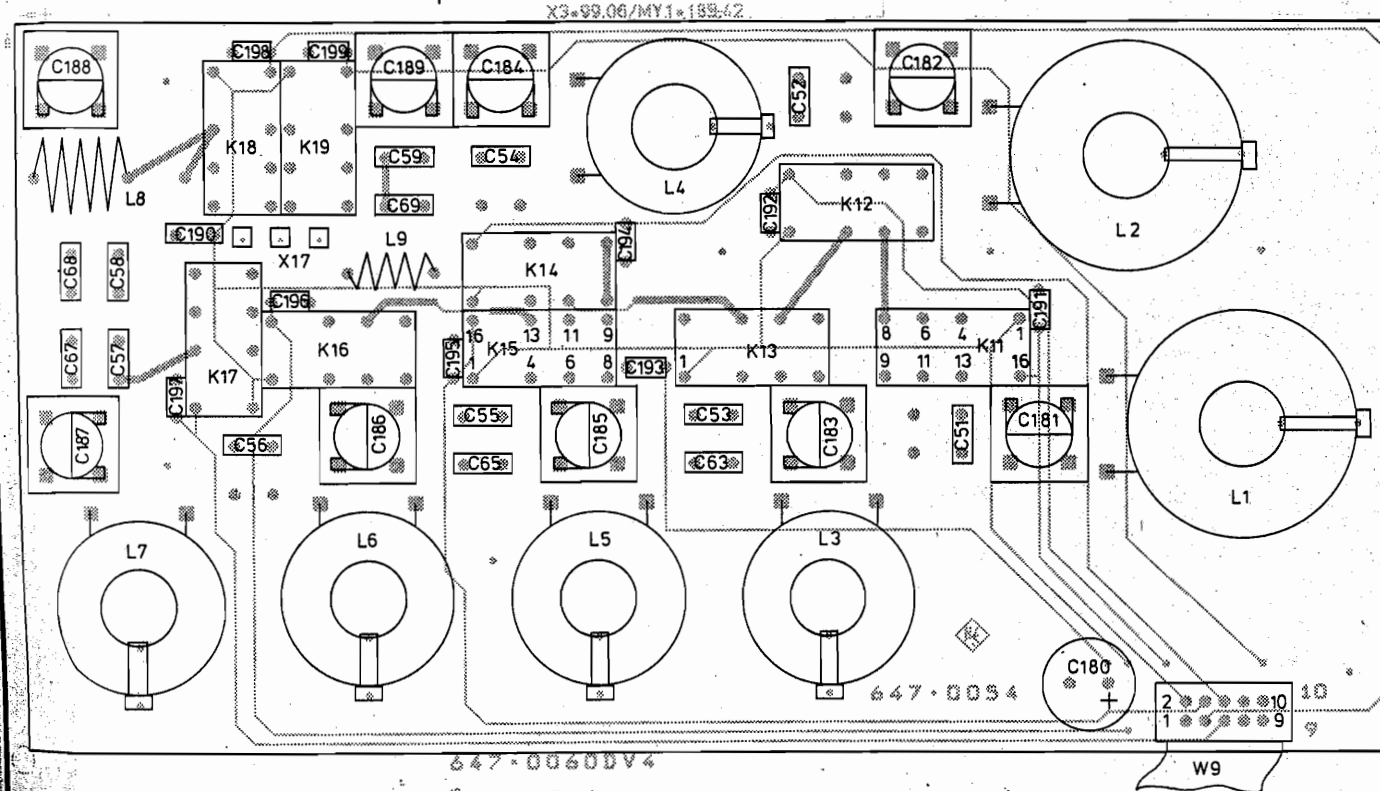
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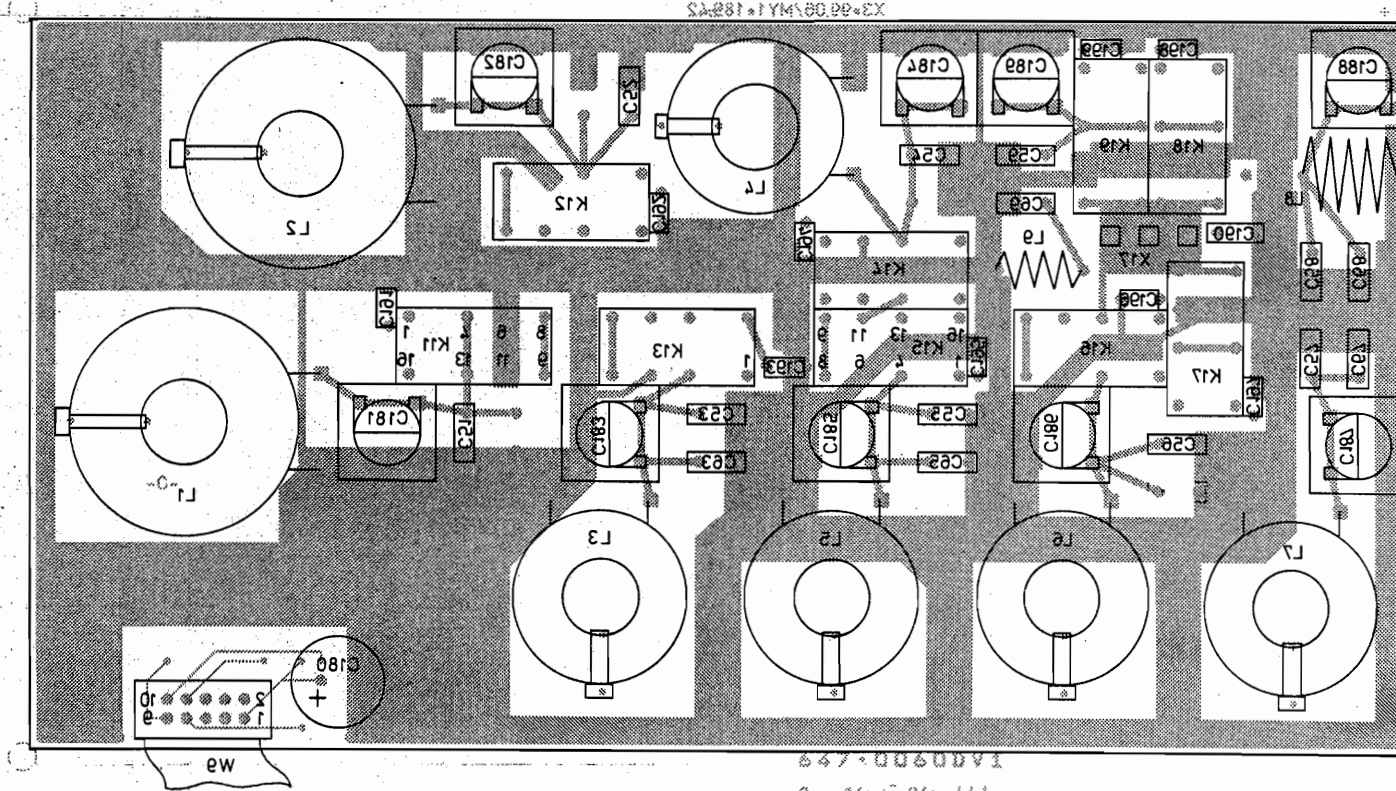
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
C190	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C191	UNION CARB M39014/01-1433 CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C192	UNION CARB M39014/01-1433 CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
BIS/TO C196 C197	UNION CARB M39014/01-1433 CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C198	UNION CARB M39014/01-1433 CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
C199	UNION CARB M39014/01-1433 CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
K11	SN GEPOLT 2XU 12V RELAY SDS DS2E-DC12V	645.6810	
BIS/TO K19			
L1	LD SPULE COIL	647.0725	
L2	LD SPULE COIL	647.0731	
L3	LD SPULE COIL	647.0748	
L4	LD SPULE COIL	647.0754	
L5	LD SPULE COIL	647.0760	
L6	LD SPULE COIL	647.0777	
L7	LD SPULE COIL	647.0783	
L8	LL SPULE COIL	647.0790	
L9	LL SPULE COIL	647.0802	
W9	DX FLACHLEITUNG RIBBON CABLE	647.0719	
X17	FP BUCHSE VERTIKAL P.V.1P SOCKET BERG 75377-001 3-POLIG	FP 278.5577	
- ENDE -			

647.0054.01 SA BL 2-

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



Ansicht und Leitungsführung Lötseite
View of tracks on solder side



Variationenerklärung siehe SA
EXPLANATION OF MODELS
SEE PARTS LIST

B	34861	11.85	WI	Maße ohne Toleranzangabe		Maßstab 1 : 1		
						Halbzeug, Werkstoff		
				6KBE	Tag	Name	Benennung LC - Platte LC - BOARD	
				Bearb.	5.84	HF		
				Gepr.				
				Norm				
				ROHDE & SCHWARZ		Zeichn.-Nr.	647.0054.01	
Änd. Zust.	Änderungs-Mitteilung	Tag	Name			reg. i. V.		
				zu Gerät FK 852 P2		647.0019V	erste Z.	647.0019.01
							Blatt-Nr. 2	v. Bl.

MOTOR-TUNED FILTER FK 852P4

Repair Manual

Part 5: Description of Function

- 5.1 -

5. Description of Function

(see circuit diagrams 647.2411.01S and 647.5310.01S)

5.1 HF Circuit

5.1.1 Received-signal Path

The received signal is fed into the Motor-tuned Filter FK 852P4 via plug X52 in the control circuit. Via relay K7 it is fed to the low-pass filter consisting of inductors L1, L2 and of capacitors C64 and C52. Controlled by relay K5 the signal leaves the control circuit via plug X11 resp. X12. The signal-path switching is frequency-dependent. For receive signals below 1 MHz the signal is applied to X11. For receive signals in the range of 1 to 30 MHz the signal is applied to plug X12. An audio transformer L3 is looped into the signal path to monitor the current of the antenna signal. For that purpose a voltage proportional to the antenna signal current is generated by winding 3-4 and resistor R148. This voltage is then rectified by diode V51 and fed to comparator N11.1.

For monitoring purposes the capacitive voltage divider C66 and C65 is coupling out a portion of the antenna signal voltage. This portion is rectified by diodes V52/V50 and then fed to the comparator N11.1. When the antenna signal current exceeds approx. 0.5 A or when the antenna signal voltage rises above 30 V, the antenna is automatically switched to ground for about 2 seconds. This is accomplished by the comparator N11.1 and the subsequent control circuit, consisting of monoflop D12, buffer D5.5 via triggering transistor N9 (12, 13 14) of relay K7. The switch-off time is determined by the R/C circuit R100 and C32. After 2 seconds a new comparison for overload detection is initialized.

With reception frequencies of less than 1 MHz, the signal is fed from plug X11 and socket X11 of the HF circuit, via the low-pass filter, consisting of coils L3, L4 and of capacitors C74 to C77 to the relay K6. From there it is fed via plug X55 to the Tx/Rx Section GX 852P4.

In order to protect the Tx/Rx section against extraneous noise signals in the pass-band of the low-pass filter ($f < 1$ MHz) there is a limiter circuit looped in, consisting of diodes V8 to V10. The limiter is activated by noise signals exceeding the V8 Zener voltage of 3.9 V. Due to the bias voltage of the Zener diode V8 intermodulation and noise results for signal voltages up to 2 V EMF are avoided.

With reception frequencies in the range of 1 to 30 MHz one of the five sub-ranges is switched on by relays K11 to K13 and K51 to K53. Cascading of the sub-ranges is performed in octave distance, i.e. the frequency range is doubled each time (1 to 2 MHz, 2 to 4 MHz up to 16 to 30 MHz).

The further explanation of the received-signal path is for sub-range 5 (16 to 30 MHz). However the remaining sub-ranges 1 to 4 function in a similar manner.

The reception signal is fed-in via relay K51 (9, 13) and then it is inductively coupled into the first oscillator L51. Tuning and coupling of the oscillators is performed by the 5-way variable capacitor C100. Next the re-

(Continuation)---

MOTOR-TUNED FILTER FK 852P4

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Part 5: Description of Function

- 5.2 -

---(Continuation) Received-signal Path

ception signal is inductively coupled out by the third resonator L53 and fed via relay K53 (9,13) and K4 (13, 11) to the noise and distortion-free amplifier stage V12. In this amplifier stage input attenuation of the filter is compensated for. The amplified signal is then fed via relay K6 and plug X55 to the Tx/Rx Section GX 852P1.

At the upper point of the first oscillator, connection 1 of the variable capacitor, an overvoltage discharge device H1 is connected. It ignites at a voltage of approx. 90 V and so prevents destruction of the first oscillator due to too high overvoltages. At ignition of H1 the flowing current causes a voltage on resistor R12. This voltage is rectified by diodes V1 and V2, filtered by capacitor C71 and fed via plug X10.1 to comparator N11.1 in the control circuit. In overload condition this voltage is used by the control circuit to periodically switch-off the antenna.

A further protection circuit, consisting of diodes V5 and V6 is provided at the output of the variable frequency filter 1 to 30 MHz. This circuit is activated whenever the rectified HF voltage exceeds the Zener voltage of diode V7. Therefore in reception the amplifier stage V12 is protected against destruction due to high voltages in the pass-band.

5.1.2 Transmitted-signal Path

In transmission the HF signal is routed in at plug X53 in the HF circuit. It is then fed via relay K4 (4, 8) to the noise and distortion-free amplifier stage V12. In here the HF signal is amplified to compensate for the transfer attenuation of the subsequent filter circuit.

Depending upon the transmission frequency the transmission signal is fed via one of the five band-pass filters to plug X12 in the control circuit. From there it is fed via relay K5 (4, 8) and via plug X54 to the HF amplifier.

A diode V53 on plug X54 measures the HF signal the result of which is fed to comparator N11.2. If the measured value is below a predetermined threshold voltage on N11.4 as defined by resistors R91 to R93 the comparator N11.2 generates a failure message (CM signal) for the processor of the HF transmitter/receiver or HF receiver.

5.1.3 Test-signal Path

After a test routine has been triggered on the Control Unit GB 853C1 of the HF transmitter/receiver or HF receiver a 900-kHz line spectrum, 30 MHz in width is fed from the synthesizer into the motor-tuned filter via plug X56.

This signal can be reduced with the 40-dB attenuator consisting of R149 to R151. It is fed through the complete received-signal path of the motor-tuned filter beginning at relay K1. The signal serves for fault detection.

5.2 Control Circuit

5.2.1 General

In the standard approach of a follow-on control circuit the control value results from the difference of the nominal and actual value sensors.

In difference to this the motor-tuned filter does not possess an actual value sensor.

(Continuation)---

MOTOR-TUNED FILTER FK 852P4

Repair Manual

Part 5: Description of Function

- 5.3 -

---(Continuation) General

Either after switch-on of the power supply or subsequent to a frequency change the variable capacitor is first driven by the stepping motor to the so-called HOME position. Thereby a defined actual value is produced that in turn is used to calculate the control value.

The numerical value of the difference between nominal and actual value corresponds to the number of steps for the stepping motor. The mathematical sign defines the direction of rotation.

5.2.2 Motor Control Circuit

After switch-on of the HF transmitter/receiver or following a frequency change the control circuit does not have any position data of the variable capacitor. Therefore the stepping motor is triggered so that it first drives to the so-called HOME position.

In the HOME position the slots of the two control disks, one on the motor axle and one on the variable capacitor axle are inside the light barriers U1 resp. U2. In order to position the stepping motor in the HOME position the slot inside the control disk on the variable capacitor axle is wider. Therefore when the stepping motor approaches the HOME position the light barrier U2 is released first. This causes the control circuit to slow down the stepping motor which continues with slow speed until the slot of the control disk on the motor axle releases also light barrier U1.

Based upon this defined HOME position the control circuit computes the direction of rotation and the number of pulses for the stepping motor to get the variable capacitor to the new position corresponding to the selected frequency.

The light barriers U3 and U4 are controlled by the control disk on the variable capacitor axle. They mark beginning and end of the turning range in order to prevent the variable capacitor from jamming against the mechanical final stop.

The stepping motor is controlled by the processor via Schmitt trigger D1 and Darlington transistors V42 to V45. The Darlington transistor V41 and the transistor N8 (8, 9 and 10) together form a constant-current source providing approx. 1 A. This constant-current source can be switched by the processor via Schmitt trigger D1.12 and driver D4.9. When the stepping motor has come to its final position a current flows through resistor R43, through the switched-through control transistors V42 to V45 and through winding 1 to 4 of the stepping motor. This current generates a braking moment that acts like locking the motor.

As the stepping motor operates in half-step mode 2000 steps are required to proceed through the complete rotary range from beginning to end. That means that a new tuning in the frequency range I (1 to 2 MHz) can only be accomplished if the frequency difference is > 500 Hz. This frequency difference is doubled from one range to the next higher range. Therefore in the range V (16 to 30 MHz) a new tuning can only be accomplished if the frequency difference is > 8 kHz.

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Part 5: Description of Function

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5.2.3 Relay Control Circuit

The relays of the motor-tuned filter are controlled by the Processor of the HF transmitter/receiver.

The control circuit receives the control signals for the range relays via plugs X51.b9 to .b13. The range relays switch-over the filters. The control signals are fed via Schmitt trigger D2 and driver D4 to the transistor arrays

N7 and N8. They then actually control the relays.

The control signals for the relays K1, K2 and K4 to K7 are generated by logic combination of the signals D0, D1, FB0E and transmit coming from the processor via plugs X51.a10, .a11, .b11, .b14 and .a18 together with the signal ÜL (overload).



ROHDE & SCHWARZ

Repair Manual

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647.2011.02/05

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Circuit Diagram	Motor-tuned Filter	647.2011.01S
Parts List	Motor-tuned Filter	647.2011.01SA
Parts List	Variable Capacitor + Gear	647.2192.00SA
Circuit Diagram	HF Circuit	647.2411.01S
Parts List	HF Circuit	647.2411.01SA
Component Layout	HF Circuit	647.2411.01, sh.2
Circuit Diagram	Control Circuit	647.5310.01S, sh.1 to 3
Parts List	Control Circuit	647.5310.01SA
Component Layout	Control Circuit	647.5310.01, sh. 2

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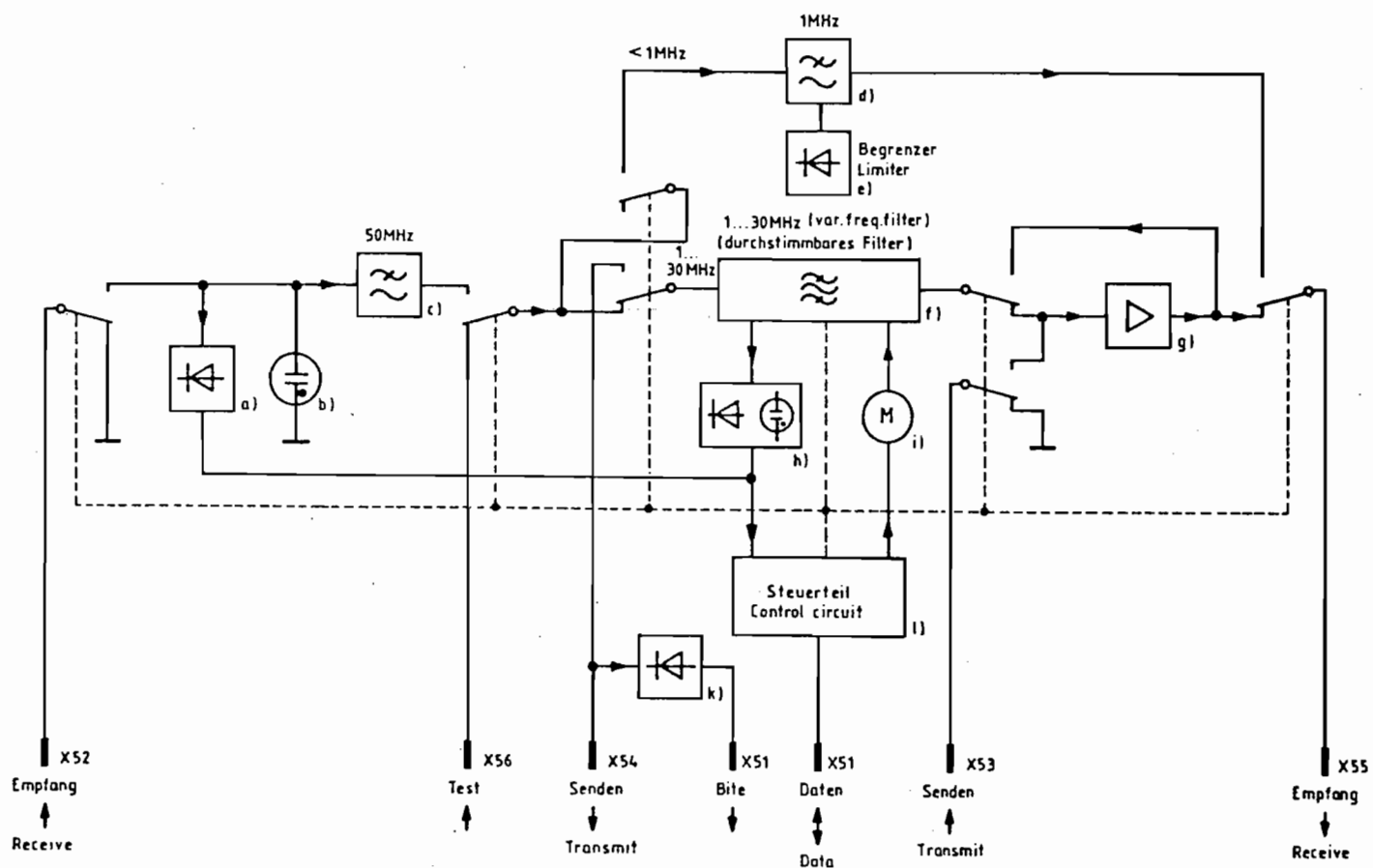


Fig. 5.1 Block Diagram

MOTOR-TUNED FILTER FK 852P4

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6. Repair

See circuit diagrams, parts lists and component layouts in the appendix to this repair manual (list on page 0.3).

6.1 Preliminary Remarks

The repair of the Motor-tuned Filter FK 852P4 consists of troubleshooting and fault elimination, of measurements alignments and functional checks, of replacing subassemblies and components as well as of a final inspection.

All the information required for repairing the motor-tuned filter down to component level is given in this part 6, repair.

For all alignment work and measurements the motor-tuned filter has to be supplied with the operating voltages given in the relevant circuit diagram.

All RF measurements on the filter are to be performed with the covers screwed down in place; if necessary, a special test cover must be produced for the purpose.

In RF measurements also ensure that cables and connections have the right characteristic impedance and that the connecting leads are as short as possible.

Among the components incorporated in the motor-tuned filter are MOS, MOSFET and CMOS devices. Devices of this kind are extremely sensitive to high extraneous voltages. Static discharge can produce very high voltage spikes, which are capable of destroying these devices.

For this reason, when work is being carried out in the vicinity of these devices, i.e. unless a special CMOS work station is available, the following minimum requirements should be observed:

- conductive bench and floor coverings
- chair or stool with conductive coverings
- grounded, metallic work surface and conductive wrist-straps with a resistance of $> 200 \text{ kohms}$, $< 1 \text{ Mohm}$ plus an insulated lead and plug
- soldering iron with safety grounding
- all conductive surfaces, wrist-straps and work surfaces must be interconnected by insulated leads
- supply voltage must be disconnected when soldering is being performed

6.1.1 Troubleshooting Instructions

Any fault that occurs should be localized with the aid of the troubleshooting flowcharts given in 6.3.

6.1.2 Restoring the Nominal Characteristics

Any component that is definitely proved to be defective - through use of the troubleshooting flowcharts or by performing the alignments, measurements and functional checks - should only be replaced by a component that meets the specifications given in the parts lists in the appendix to this repair manual.

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---(Continuation) Restoring the Nominal Characteristics

Only in this way can the technical data be guaranteed that are given in part 1 of the user manual.

Once components have been replaced, it is absolutely essential that the final inspection detailed in 6.6 is performed.

6.1.3 Spare Parts

All components and assemblies are subjected to strict quality assurance before they are allowed to be used in this item of equipment.

For components from outside suppliers, e.g. resistors, capacitors, diodes, transistors and integrated through to highly integrated circuits, R&S have set down their own delivery specifications for the purpose of ensuring maximum reliability. For this reason we recommend that only original spare parts are used, for replacing defective components.

When ordering a spare part, please state the following:

type, ordering code and serial number of equipment, stock number of the parts list and designation plus stock number of the component concerned.

All of these details are to be found in the circuit diagrams, parts lists and component layouts that accompany the manual.

6.1.4 Important User Information

The following contains details which are essential when referring to Part 6 "Repair". This is in order to prevent misunderstandings at a later stage.

- o All measurements are referred to ground, if not stated otherwise.
- o Abbreviations in the text such as X42.a2 and B2.7 are to be understood as follows:

Connector 42 - pin a2

Integrated circuit 2 - pin 7

- o The repair of the models 02, 03 and 04 is basically to be performed in the same manner. There are therefore no further references to the models in the following text.
- o The circuit diagrams on which the subsequent mentioned components can be found are referred to in the following troubleshooting flowcharts.

6.2 Test Equipment

The test equipment given in the following list will be required for performing the repairs described in this part of the manual.

Equivalent items of test equipment can be used, of course, provided that their technical data are at least as good.

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6.2.1 List of Test Equipment

No.	Test equipment, required technical data	Recommended R&S unit	Ordering code
1	Polyskop, 0 to 40 MHz with log. amplifier and demodulator	SWOB 5 SWOB 5 E3 SWOB 5 Z1	333.0019.53 349.3512.02 333.7513.52
2	2 Signal generators 0.1 to 40 MHz output level 0 to 13 dBm	SMK	348.0010.02
3	Vector analyzer 0.1 to 40 MHz with tuner 2 Insertion adapter Feed unit	ZPV ZPV-E2 ZPV-Z1 ZPV-Z2	291.4012.93 292.0010.02 292.2713.50 292.2913.50
4	Noise generator 1 to 40 MHz $R_i = 50$ ohms	SKTU	100.4688.50
5	Test Receiver 1 to 30 MHz	ESH 3	335.8017.52
6	RF Millivoltmeter 0.1 to 30 MHz 700 μ V to 100 V 10 V RF insertion unit	URV 4 URV-Z2	292.5012.03 288.8010.55
7	RF step attenuator 0 to 30 MHz 0 to 6 dB	DPSP	334.6010.02
8	Digital multimeter 0 to 30 V	UDL 33	388.8011.02
9	Power splitter/combiner 0.1 to 40 MHz	DVS	342.1014.50
10	Spectrum analyzer		
11	High-power Attenuator 30 dB / 100 W	RBU 100	100.8654.35
12	High-power Attenuator 3 dB / 80 W	RBU 80	100.8654.05
13	2 Termination 50 ohms/1 W	RNB	272.4910.50
14	HF Broadband amplifier 0 to 50 dBm $R_i = 50$ ohms		
15	HF Switch-over 1-way		
16	Power Supply 0 to 15 VDC / 2 A	NGPU 70/20	192.0055.92

(Continuation)---

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---(Continuation) List of Test Equipment

No.	Test equipment, required technical data	Recommended R&S unit	Ordering code
17	Power supply 0 to 10 VDC / 1 A	NGMD 35	117.7127.02
18	Service kit	KA 852C1	648.8513.02

6.3 Troubleshooting Flowchart**6.3.1** General

The following troubleshooting flowcharts (Fig. 6.1 to 6.5) cover troubleshooting as well as the elimination of faults in the Motor-tuned Filter FK 852P4.

To make the troubleshooting as straightforward as possible, there

are, where necessary, cross-references to other measurements and procedures involved in repair.

The given sequence for the troubleshooting should be adhered to so that faults can be detected and remedied as speedily and rationally as possible.

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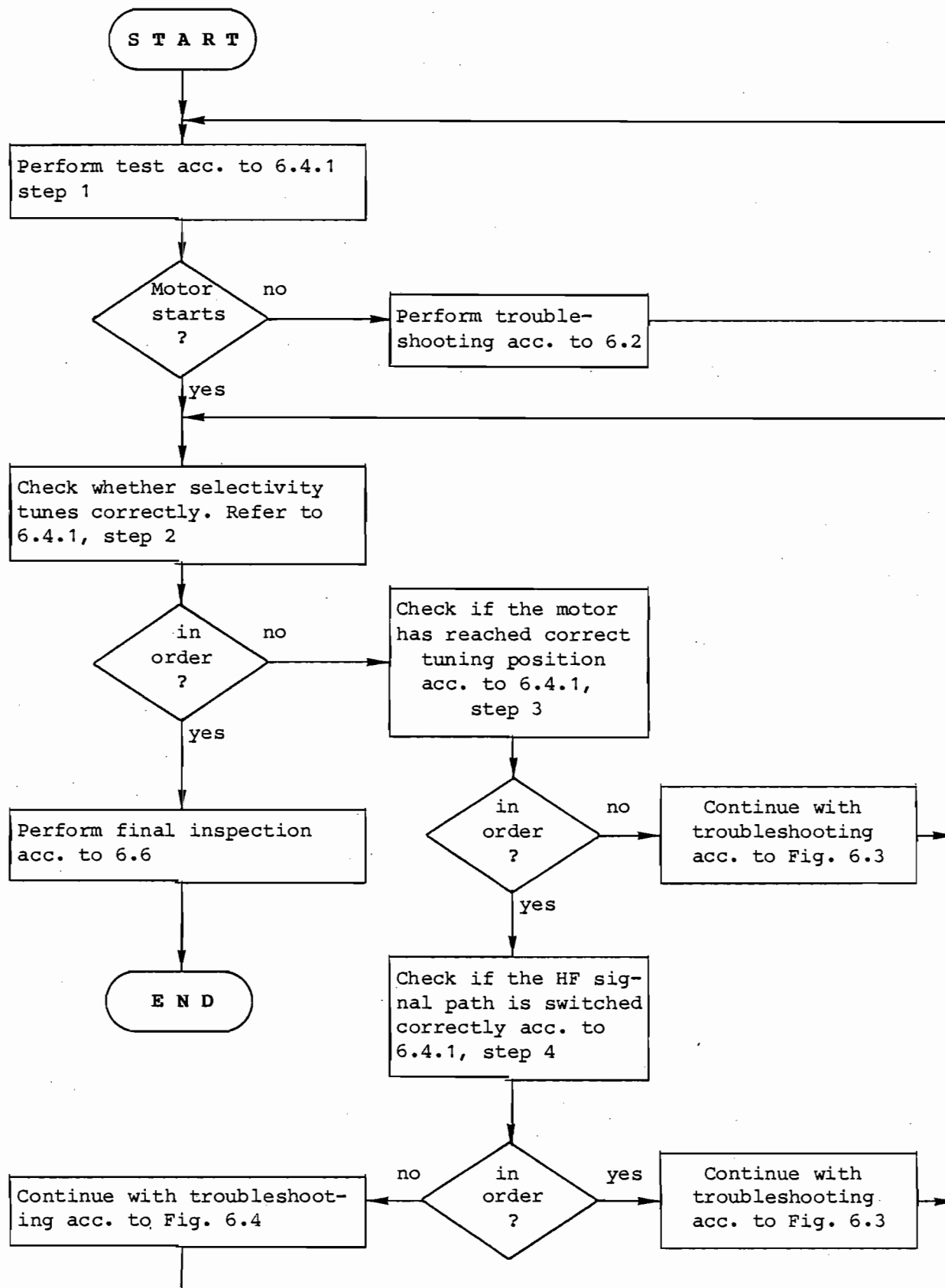


Fig. 6.1 Troubleshooting Flowchart

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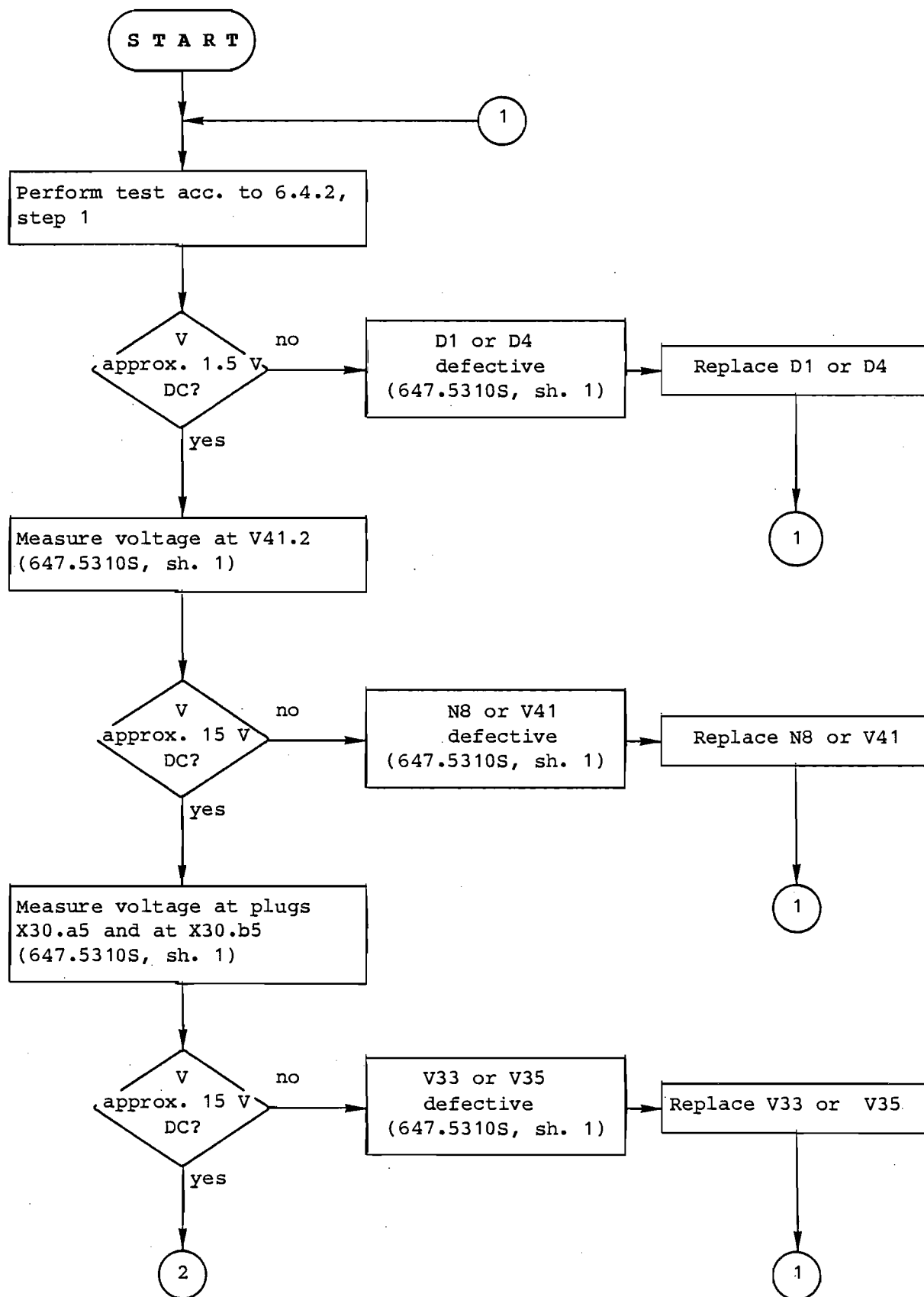


Fig. 6.2 Motor Control Circuit, Troubleshooting Flowchart
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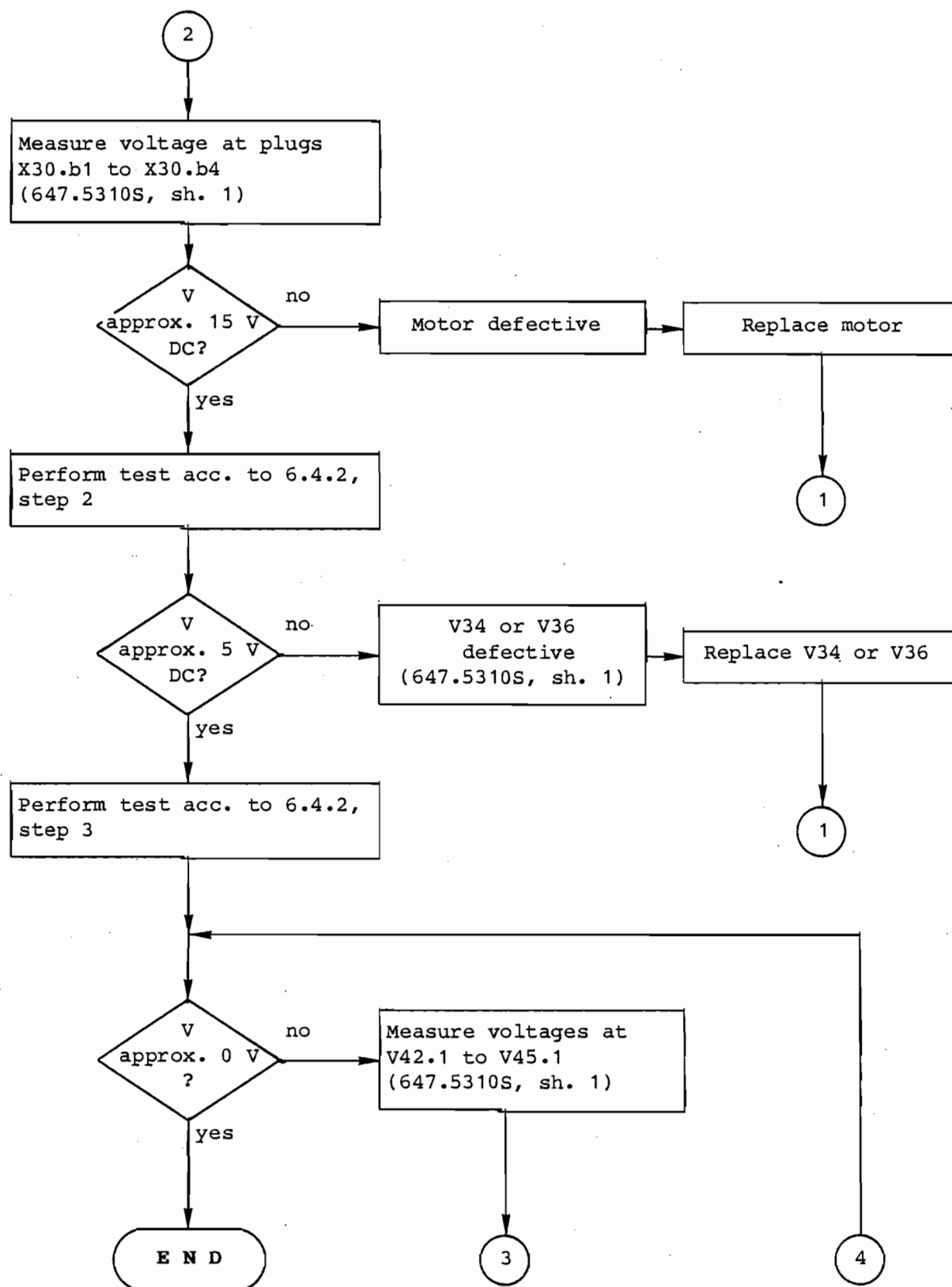
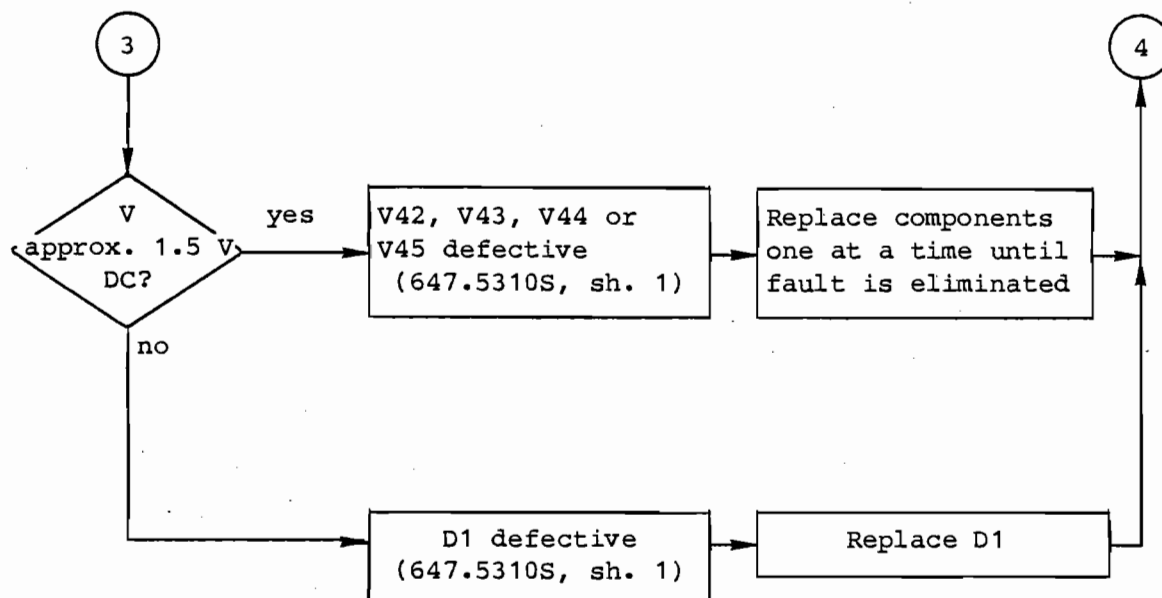


Fig. 6.2 Motor Control Circuit, Troubleshooting Flowchart
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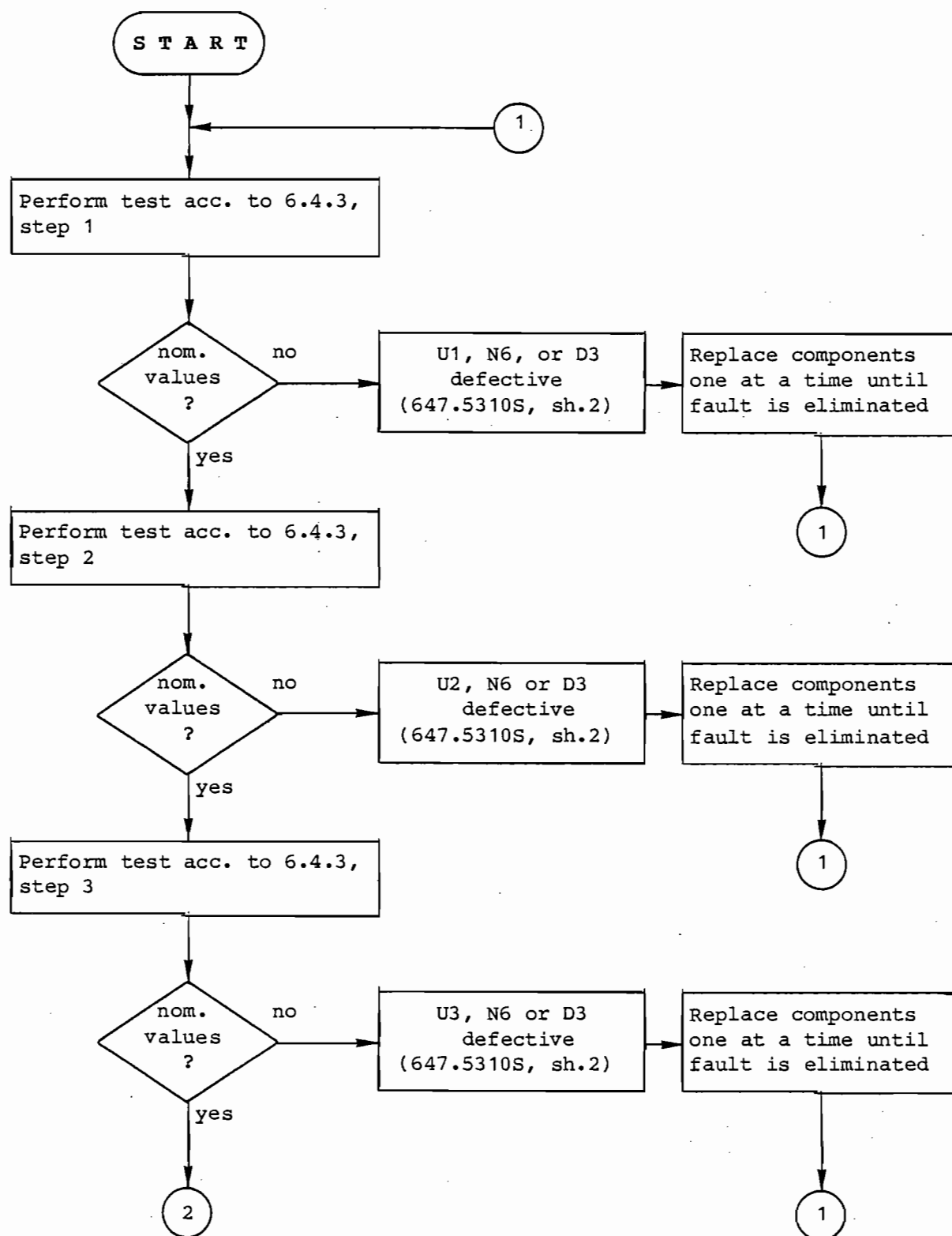
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Fig. 6.2 Motor Control Circuit, Troubleshooting Flowchart
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Fig. 6.3 Light Barrier Control Circuit, Troubleshooting Flowchart
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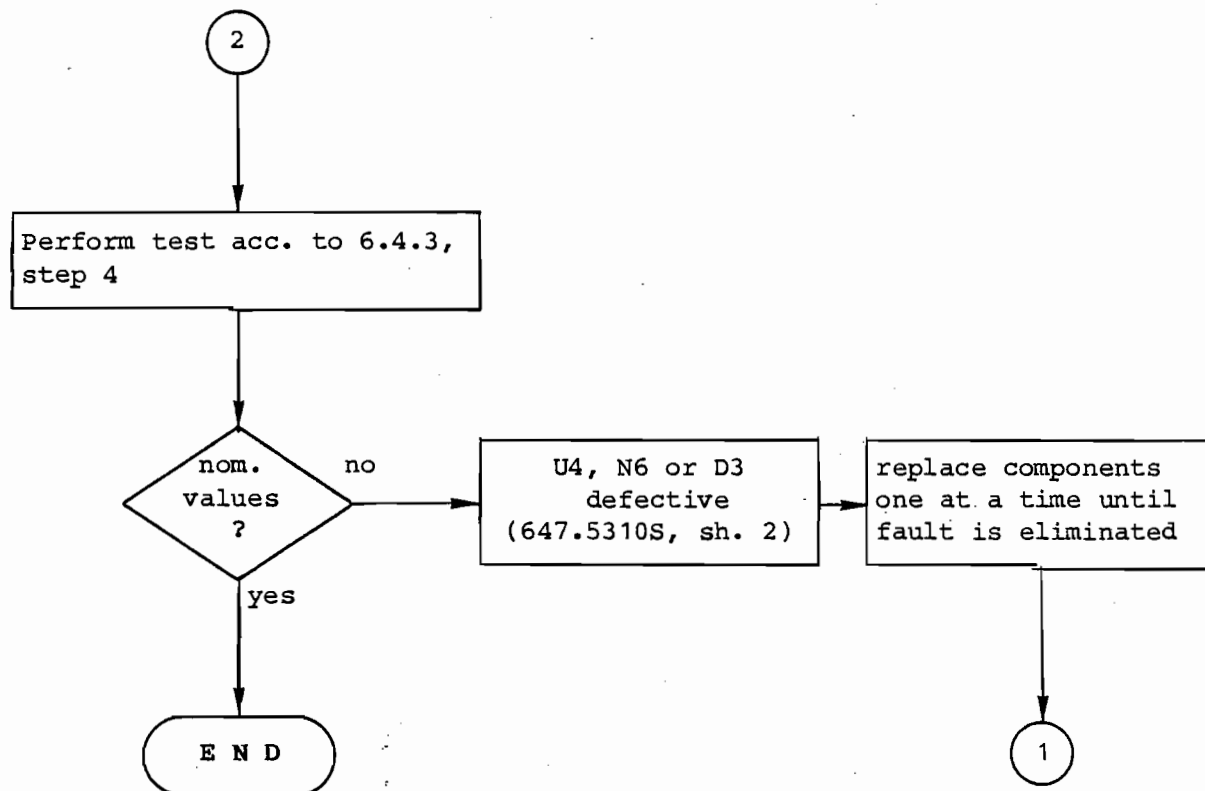


Fig. 6.3 Light Barrier Control Circuit, Troubleshooting Flowchart
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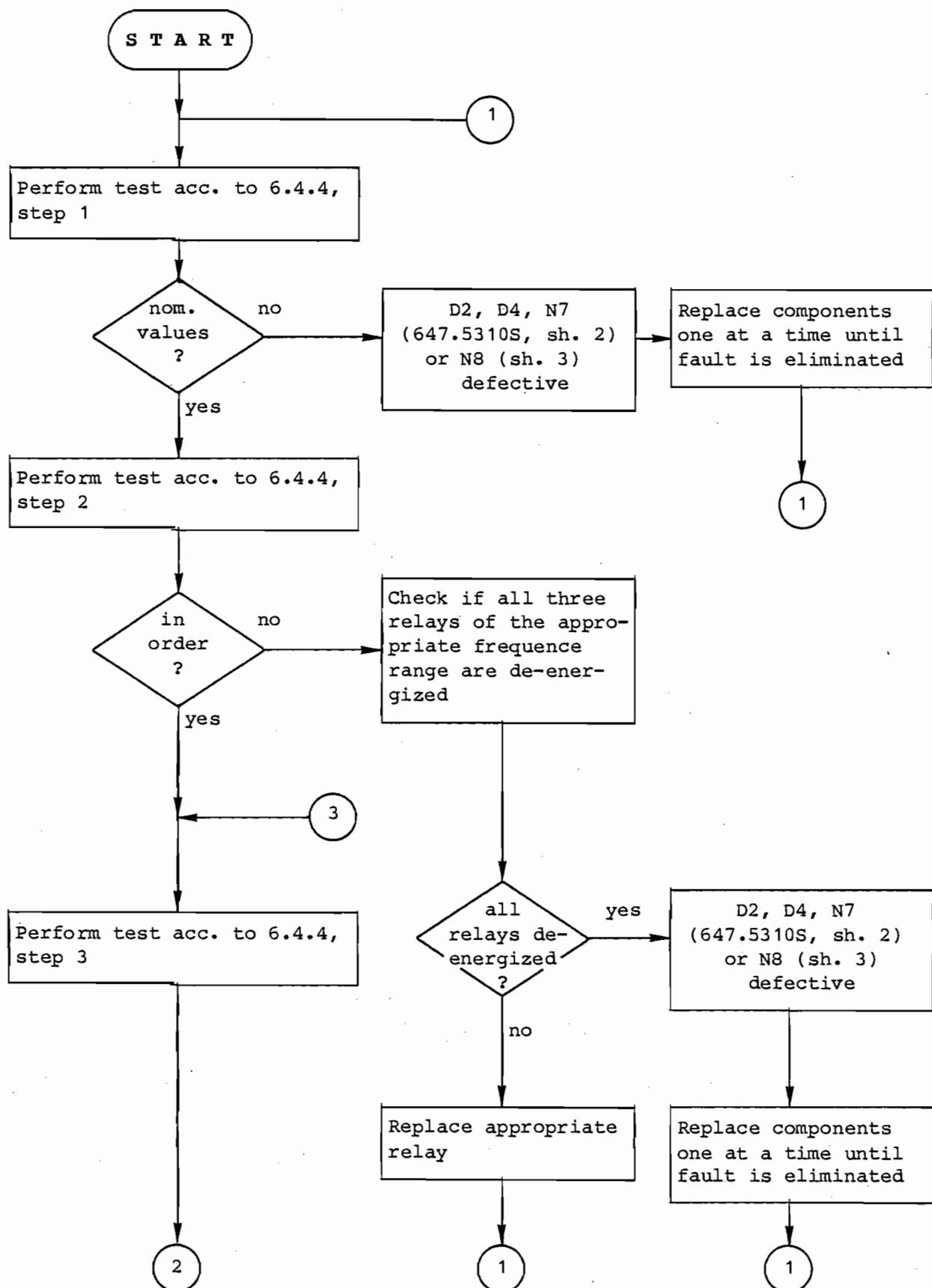


Fig. 6.4 Relay Control Circuit, Troubleshooting Flowchart
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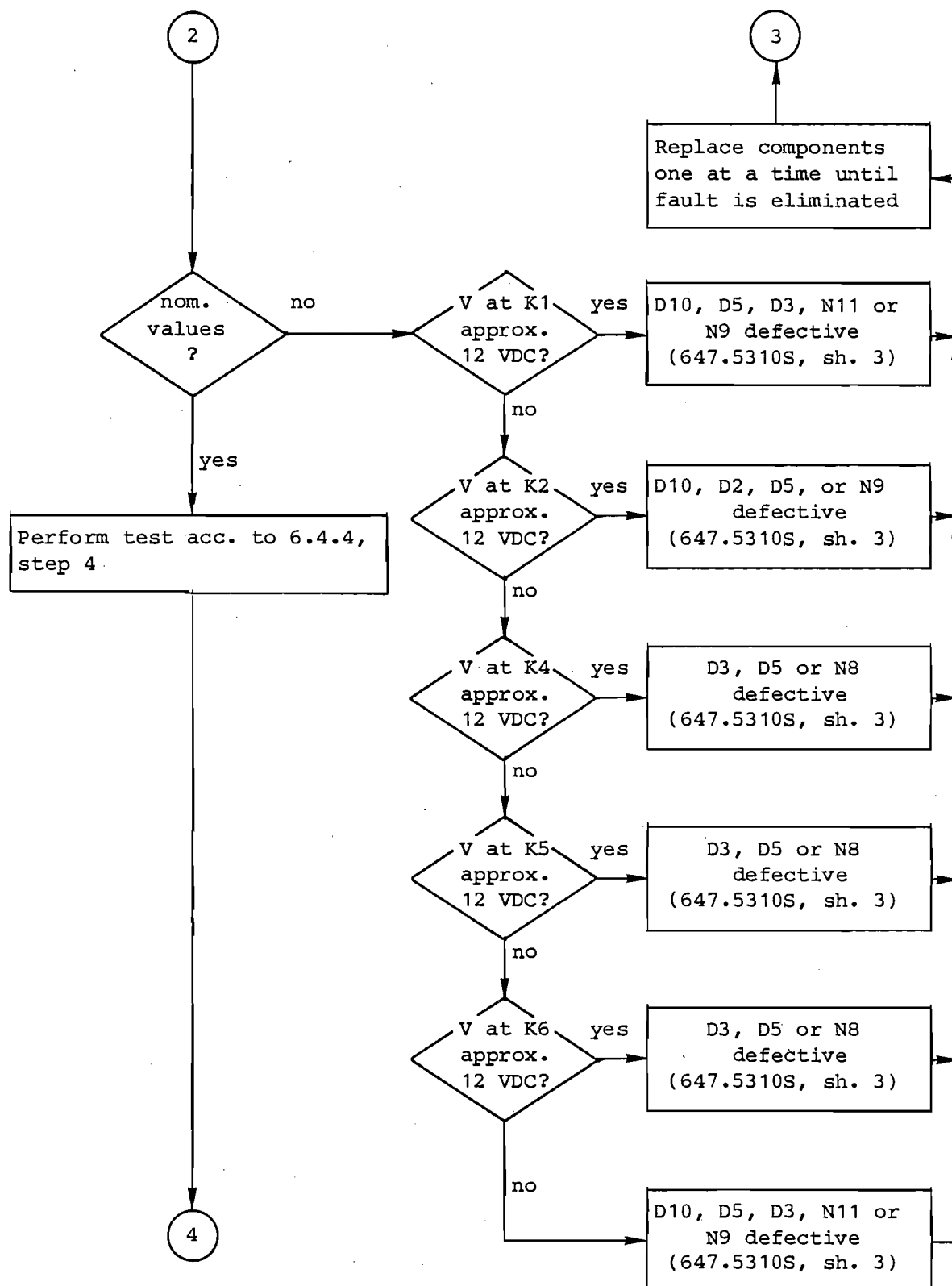
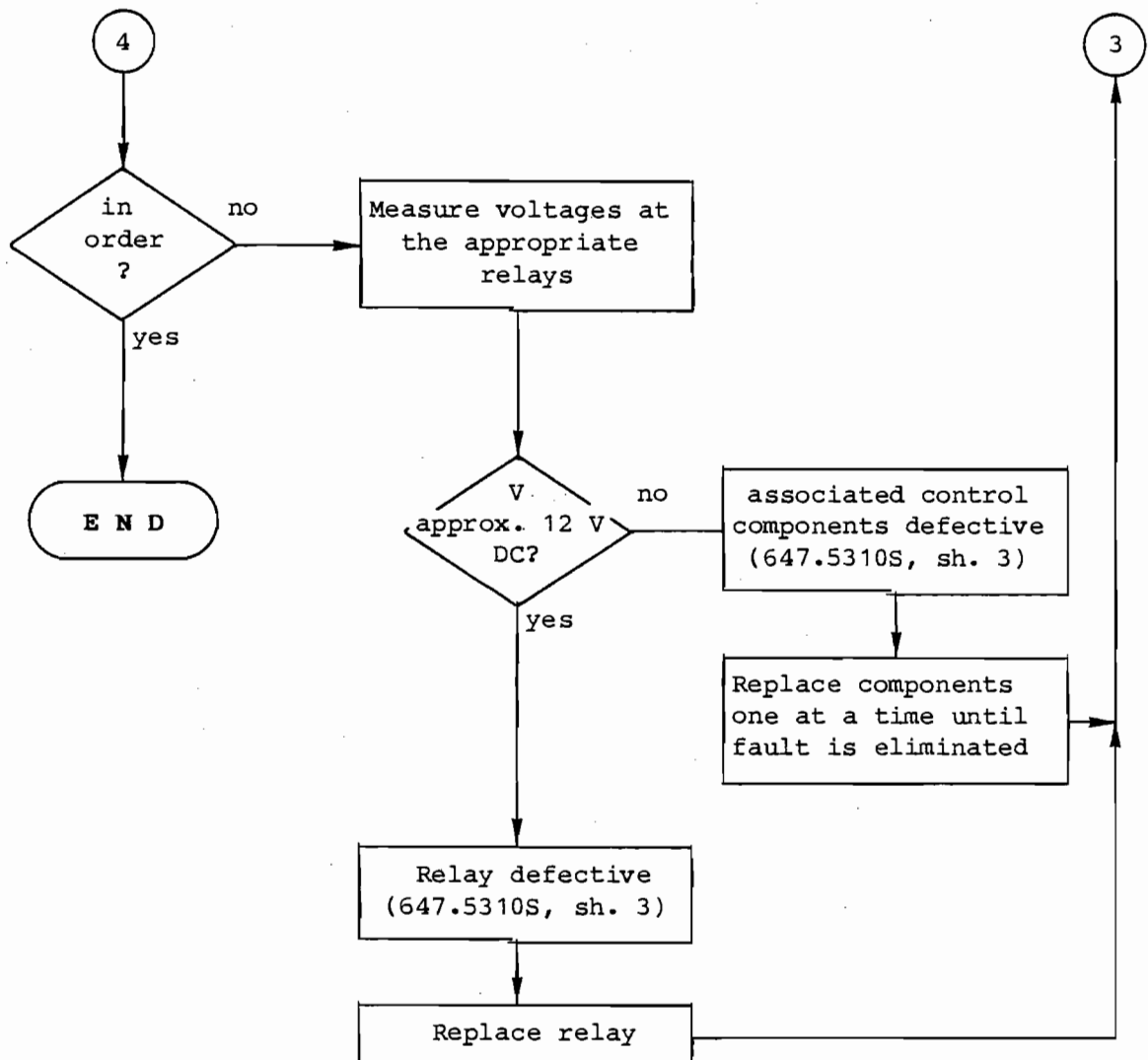


Fig. 6.4 Relay Control Circuit, Troubleshooting Flowchart
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Fig. 6.4 Relay Control Circuit, Troubleshooting Flowchart
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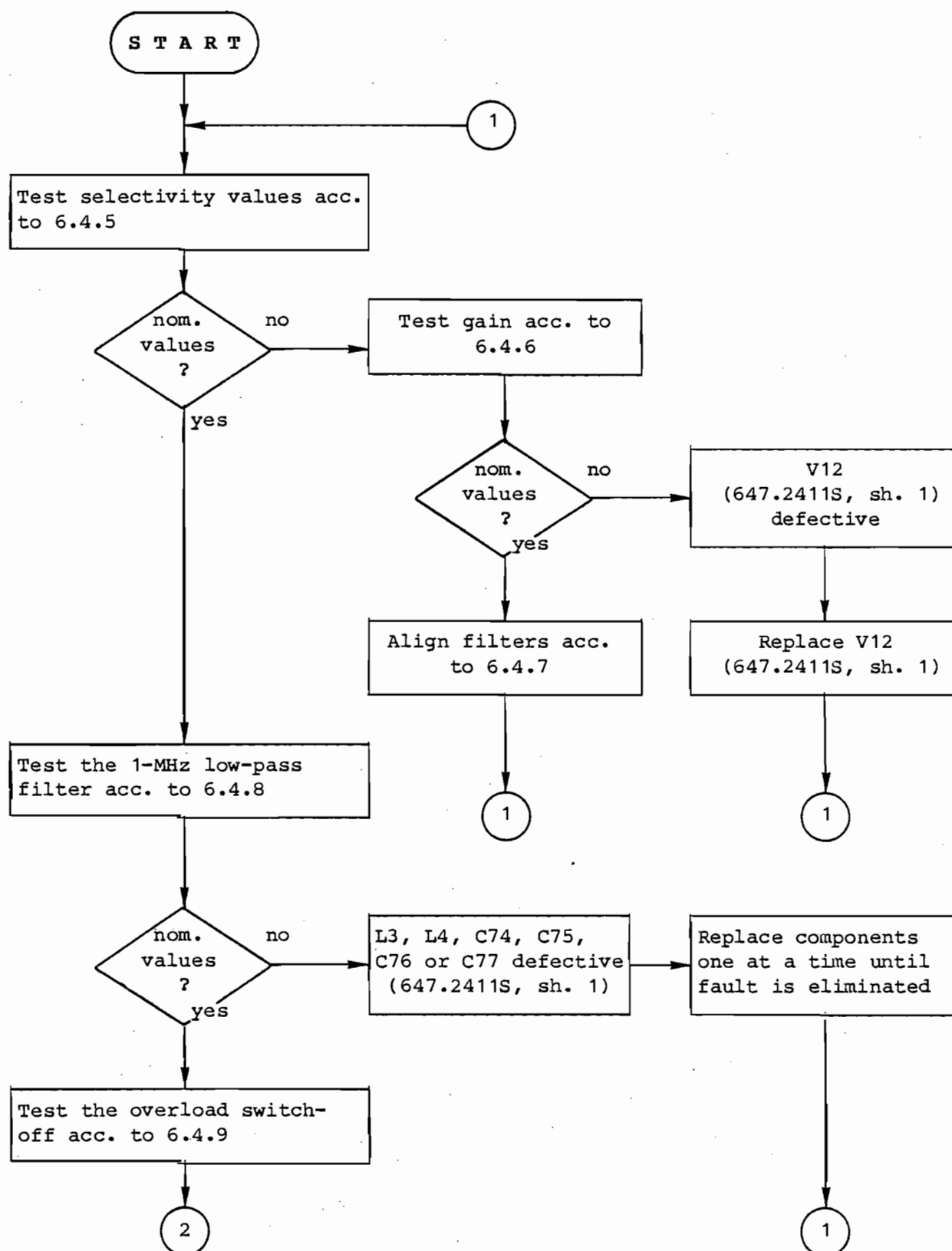
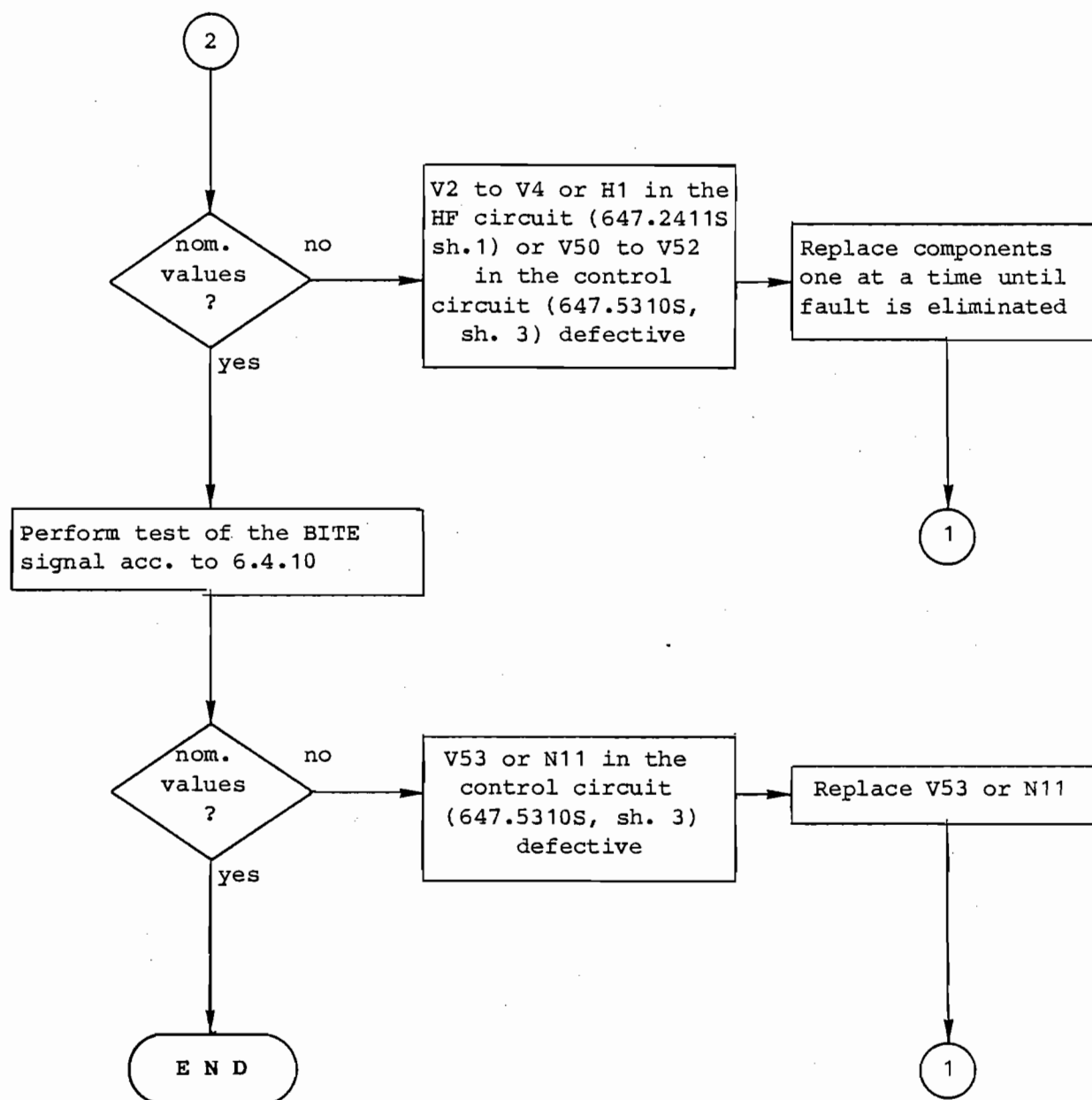


Fig. 6.5 HF Circuit, Troubleshooting Flowchart
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Fig. 6.5 HF Circuit, Troubleshooting Flowchart
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6.4 Measurements, Alignments and Functional Checks

The measurements, alignments and functional checks that are described below are the more detailed procedures to the instructions given in a condensed form in the troubleshooting flowcharts. Consequently one will usually undertake these measurements, alignments and functional checks by branching out of the troubleshooting flowchart at a particular point. On completion of these procedures continue with troubleshooting, returning to the respective point in the flowchart.

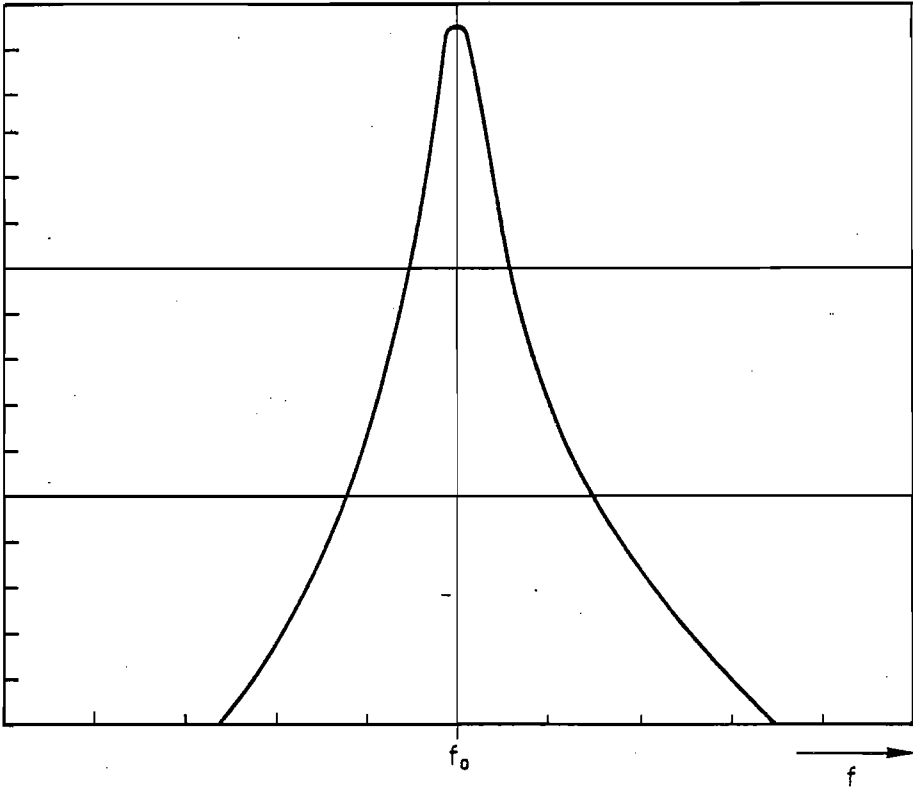
If a fault has been clearly identified beforehand however, you can of course commence with one of these measurements, etc. directly.

For all of these measurements or tests it is assumed that the Motor-tuned Filter FK 852P4 is properly adapted to an HF transmitter/receiver or HF receiver. For opening the motor-tuned filter refer to 6.5.

6.4.1 Checking the Motor-tuned Filter

1. Adapt the motor-tuned filter to a HF transmitter/receiver.
 - a) Set the OPERATION MODE switch on the control unit to Rx and select a frequency between 1 and 30 MHz.
 - b) Check if the motor starts to run.
2. Arrange a test set-up acc. to Fig. 6.13.
 - a) Set the OPERATION MODE switch on the control unit to Rx.
 - b) Set the SWOB 5 to an output level of 0 dB (0.5 V) and to a frequency range of 1 to 30 MHz.
 - c) Select one frequency out of each frequency range of the control unit and check the pass-band curve of the motor-tuned filter on the SWOB 5.

Maximum of the curve must be at the selected frequency.



(Continuation)---

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---(Continuation) Checking the Motor-tuned Filter

3. Ensure that the motor-tuned filter is adapted to an HF transmitter/receiver.

- a) Set the OPERATION MODE switch on the control unit to Rx and select a frequency of 1.5 MHz.
- b) Check whether the slots of the control disks on the motor and on the variable capacitor axles are in the light barriers U1 or U2 respectively.

4. CAUTION

For the following measurements the motor-tuned filter may not be adapted to an HF transmitter/receiver.

- a) Connect operating voltages as follows:

+5.3 VDC to plug X51.a25/.b25
+15 VDC to plug X51.a29/.b29
0 VDC to plug X51.a32/.b32

- b) Connect +5.3 VDC to plug X51.a18 and ground to plugs X51.b14, .a10, .a11 and to X10.1.

- c) Check whether relays K4 to K6 are energized.

- d) Connect +5.3 VDC to plug X51.b14 and ground to plugs X51.a10, .a11, .a18 and to X10.1.

- e) Check whether relays K1, K5, K6 and K7 are energized.

- f) Connect plugs X51.b14, .a10, .a11, .a18 and X10.1 to ground.

- g) Check whether relays K1 and K7 are energized.

6.4.2 Checking the Motor Control Circuit

CAUTION

For the following check the motor-tuned filter may not be adapted to an HF transmitter/receiver.

1. Connect operating voltages as follows:

+5.3 VDC to plug X51.a25/.b25
+15 VDC to plug X51.a29/.b29
0 VDC to plug X51.a32/.b32

- a) Connect +5.3 VDC to plug X51.b7 and to plugs X51.b3 to X51.b6.

- b) Measure voltage at V41.1.

Nominal value: approx. 1.5 VDC.

2. Connect +5.3 VDC to plugs X51.b3 to X51.b6 and ground to plug X51.b7.

- a) Measure voltages at plugs X30.b1 to X30.b4.

Nominal value: approx. 5 VDC.

3. Connect ground to plug X51.b7 and to X51.b3 up to X51.b6.

- a) Measure voltages at plugs X30.b1 to X30.b4.

Nominal value: approx. 0 VDC.

6.4.3 Checking the Light Barrier Control Circuit

CAUTION

For the following check the motor-tuned filter may not be adapted to an HF transmitter/receiver.

(Continuation)---

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---(Continuation) Checking the Light Barrier Control Circuit

Connect operating voltage as follows:

+5.3 VDC to plug X51.a25/.b25
+15 VDC to plug X51.a29/.b29
0 VDC to plug X51.a32/.b32

1. Manually rotate motor axle until the slot of the control disk is within the light barrier U1.

a) Measure voltage at plug X51.b15.

Nominal value: approx. 5 VDC

b) Manually rotate motor axle until the slot of the control disk is outside the light barrier U1.

c) Measure voltage at plug X51.b15.

Nominal value: approx. 0 VDC.

2. Manually rotate motor axle until the slot of variable capacitor control disk is within the light barrier U2.

a) Measure voltage at plug X51.b16.

Nominal value: approx. 5 VDC.

b) Manually rotate motor axle until the slot of the variable capacitor control disk is outside the light barrier U2.

c) Measure voltage at plug X51.b15.

Nominal value: approx. 0 VDC.

3. Manually rotate motor axle until the slot of the variable capacitor control disk is within the light barrier U3.

a) Measure voltage at plug X51.b17.

Nominal value: approx. 5 VDC.

b) Manually rotate motor axle until slot of variable capacitor control disk is outside the light barrier U3.

c) Measure voltage at plug X51.b17.

Nominal value: approx. 0 VDC.

4. Manually rotate motor axle until slot of variable capacitor control disk is within the light barrier U4.

a) Measure voltage at plug X51.b18.

Nominal value: approx. 5 VDC.

b) Manually rotate motor axle until slot of variable capacitor control disk is outside the light barrier U4.

c) Measure voltage at plug X51.b18.

Nominal value: approx. 0 VDC.

6.4.4 Checking the Relay Control Circuit

C A U T I O N

For the following check the motor-tuned filter may not be adapted to an HF transmitter/receiver.

Connect operating voltages as follows:

+5.3 VDC to plug X51.a25/.b25
+15 VDC to plug X51.a29/.b29
0 VDC to plug X51.a32/.b32

1. Connect ground to plugs X51.b9 to X51.b13.

(Continuation)---

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---(Continuation) Checking the Relay Control Circuit

- a) Measure voltages at plugs X10.2 to X10.6. a) Connect +5.3 VDC to plugs X51.a10 and X51.a9.
- Nominal values: approx. 0 VDC. b) Measure voltages at relays K1, K2 and at K4 to K7.
2. Individually and one after the other connect +5.3 VDC to plugs X51.b9 to X51.b13. Nominal values: approx. 0 VDC.
- a) Check if the appropriate relays of the relevant frequency range are energized. 4. Connect +5.3 VDC or 0 VDC to the plugs acc. to the table set out below.
3. Connect ground to plugs X51.b14, .a18, .a11 and to X10.1. a) Switch +5.3 VDC to plug X51.a9 and check if the relays given in the table are energized.

Connect X51.					Relay is energized						Associated control components
b14	a18	a10	a11	X10 .1	K1	K2	K4	K5	K6	K7	
0	1	0	0	0			X	X	X		D3, D5, N8
1	0	0	0	0	X			X	X	X	D3, D5, D10, D12, N8, N9, N11
1	0	1	0	0				X	X		D3, D5, N8
1	0	1	1	0		X		X	X		D2, D3, D5, D10, N8, N9
1	0	0	0	1	X			X	X		D3, D5, D10, N8, N9, N11
0	0	0	0	0	X					X	D3, D5, D10, D12, N9, N11
0	0	1	1	0		X					D2, D5, D10, N9
0	0	0	0	1	X						D3, D5, D10, N9, N11

1 = +5.3 VDC, 0 = 0 VDC, X = Relay is energized

6.4.5 Checking the Selectivity

1. Prepare test set-up acc. to Fig. 6.14.
2. Set the OPERATION MODE switch on the control unit to Rx.
3. Set the output level of the SMK to 10 dBm.

(Continuation)---

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---(Continuation) Checking the Selectivity

4. Set the HF transmitter/receiver, the SMK and the ZPV all to the same frequency acc. to the following table.
5. Store the gain as a reference value in the ZPV.
6. Set SMK and ZPV to same frequency acc. to column 2 to 5 and measure the selectivity values.

1	2	3	4	5
1,0000 1,9999	0,9 1,8	0,95 1,9	1,05 2,1	1,1 2,2
2,0000 3,9999	1,8 3,6	1,9 3,8	2,1 4,2	2,2 4,4
4,0000 7,9999	3,6 7,2	3,8 7,6	4,2 8,4	4,4 8,8
8,0000 15,9999	7,2 14,4	7,6 15,2	8,4 16,8	8,8 17,6
16,0000 29,9999	14,4 27,0	15,2 28,5	16,8 31,5	17,6 33,0

Note: All frequencies listed in MHz

Nominal values: Attenuation > 25 dB at 5 % distance of the set frequency
Attenuation > 40 dB at 10 % distance of the set frequency

6.4.6 Checking the Gain

1. Prepare test set-up acc. to Fig. 6.15.
2. Set OPERATION MODE switch on control unit to Rx.
3. Set output level of SMK to 10 dBm.
4. Set the HF transmitter/receiver to the following frequencies:
5. For each frequency measure the gain.

400 kHz	1.0000 MHz	2.0000 MHz
999 kHz	1.9999 MHz	3.9990 MHz
4.0000 MHz	8.0000 MHz	16.0000 MHz
7.9999 MHz	15.9999 MHz	29.9999 MHz

Nominal values:

$v = 0$ to -1 dB in the frequency range of 400 to 999 kHz.

$v = 0$ to $+3$ dB in the frequency range of 1 to 30 MHz.

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6.4.7 Alignment of the HF Circuit

1. Prepare test set-up acc. to Fig. 6.15.
2. Set OPERATION MODE switch on control unit to Rx.
3. Set output level of SMK to 10 dBm.
4. Unscrew and remove cover of the HF circuit.
5. Screw rotors of trimming capacitors C11 to C53 by 90° counterclockwise out of the stators.
6. Screw cover back in place.
7. Set HF transmitter/receiver to frequencies acc. to following table.
8. At the lower range limit adjust the 3 resonators of each sub-range to maximum output voltage by rotating the coil cores.
9. At the upper range limit adjust by rotating the trimming capacitors.
10. Repeat above adjustment at lower and upper range limit in turn until no further raise of maximum voltage can be reached.

CAUTION

Always perform last adjustment at the upper range limit using the trimming capacitors.

Sub-range	Frequency setting in MHz	Adjustment to maximum with		
		1st circuit	2nd circuit	3rd circuit
I	1.0000	L11	L12	L13
	1.9999	C11	C12	C13
II	2.0000	L21	L22	L23
	3.9999	C21	C22	C23
III	4.0000	L31	L32	L33
	7.9999	C31	C32	C33
IV	8.0000	L41	L42	L43
	15.9999	C41	C42	C43
V	16.0000	L51	L52	L53
	29.9999	C51	C52	C53

6.4.8 Alignment of the 1-MHz Low-pass Filter

1. Prepare test set-up acc. to Fig. 6.15.
2. Set OPERATION MODE switch on the control unit to Rx and set to a frequency of 500 kHz.
3. Set output level of SMK to 13 dBm.
4. Set frequencies of 1.0 MHz, 1.8 MHz and 2.8 MHz one after the other on the SMK.
5. For each frequency measure the attenuation.

Nominal values:

- a = - 1 dB for f < 1 MHz
a = -25 dB for f > 1.8 MHz
a = -50 dB for f > 2.8 MHz

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6.4.9 Checking the Overload Switch-off Circuit

1. Prepare test set-up acc. to Fig. 6.16.
2. Set OPERATION MODE switch on the control unit to Rx and select $f_M = 1.5$ MHz.
3. Set SMK to $f_M = 1.5$ MHz and to an output level of 0 dBm.
4. Set the HF switch to position 1-2.
5. Increase signal level of the amplifier until 791 mV is displayed on the URV.
6. Set ESH3 to a frequency of 1.5 MHz.
7. Set the HF switch to position 1-3.
8. Measure the periodical switch-off time.

Nominal value: 2 ± 0.4 s.

9. Repeat the above checks for the following f_M frequencies:

$f_M = 3$ MHz, 6 MHz, 12 MHz and 24 MHz.

6.4.10 Checking the BITE Signal

1. Prepare test set-up acc. to Fig. 6.17.
2. Set the OPERATION MODE switch on the control unit to Tx/Rx.
3. On the control unit select CW and low power.
4. Set the HF transmitter/receiver and the SMK to 1.5 MHz and on the AF adapter switch to carrier activation (PTT).
5. Set the output level of the SMK so that the URV displays a voltage of 500 mV.

6. Read voltage as indicated on the UDL33.

Nominal value: > 5 V.

7. Set the output level of the SMK so that the URV displays a voltage of 300 mV.
 8. Read voltage as indicated on the UDL33.
- Nominal value: < 0.3 V.
9. Repeat the above checks with the frequencies of $f = 15$ MHz and $f = 25$ MHz.

6.5 Replacement of Subassemblies and Components

6.5.1 Removal of Subassemblies

Preliminary work:

1. Loosen and remove nine screws on the HF circuit.
2. Take off cover of the HF circuit.
3. Loosen and remove seven screws on the control circuit.
4. Take off cover of the control circuit.

6.5.1.1 Variable Capacitor and Gearbox

1. Perform preliminary work acc. to 6.5.1.
2. First mark and then unsolder the 3 connection bands (9, Fig. 6.6) on the variable capacitor (10).

(Continuation)---

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---(Continuation) Variable Capacitor and Gearbox

3. Remove the cover of the variable capacitor after undoing the three retaining screws.
4. Pull off two sockets (4) from the control circuit above the stepping motor (5).
5. Undo two screws (7) on the angular piece (not on the rotary capacitor!).
6. Undo four screws (6).
7. Carefully take out variable capacitor and gearbox.

6.5.1.2 Stepping Motor

1. Perform preliminary work acc. to 6.5.1.
2. Pull off two sockets (4) from the control circuit above the stepping motor (5).
3. Undo four screws (11) on the stepping motor.
4. Undo two special screws on the motor axle inside the gearbox.
5. Take out stepping motor.

6.5.1.3 Control Circuit

1. Perform preparatory work acc. to 6.5.1.
2. Remove HF cables W11 (2, Fig. 6.6) and W12 (3) from the connectors.
3. Unbend flaps on the separating walls and lift off the two cables towards the top.
4. Pull off two sockets (4) from the control circuit above the stepping motor (5).

5. Undo six screws (1).

6. Take out control circuit towards the top.

6.5.1.4 HF Circuit

1. Perform preparatory work acc. to 6.5.1.
2. Unsolder the three connection bands (9, Fig. 6.6) from the variable capacitor (10).
3. Undo three screws and take off cover of the rotary capacitor.
4. Undo four screws (6).
5. Pull off two sockets (4) from the control circuit above the stepping motor (5).
6. Undo two screws (7) on the angular piece (not on the variable capacitor!).
7. Carefully withdraw variable capacitor and gearbox.
8. Remove HF cables W11 (2) and W12 (3) from the connectors.
9. Unbend flaps on the separating walls and lift off the two cables towards the top.
10. Undo nine screws (8).
11. Take out the HF circuit.

6.5.2 Reinstallation of Subassemblies

The installation of subassemblies is to be performed in the reverse order of the removal.

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6.5.2.1 Variable Capacitor and Gearbox

CAUTION

For alignment of the tuning range the rotors must be mounted in a line on the common axle. The 0° position can be attained if the rotors are turned in completely and if the rotor and stator edges are positioned in a line acc. to Fig. 6.7. This position is outside the tuning range.

For alignment of the tuning range proceed as follows:

1. Set the mechanical stop of the gearbox to mid position.
2. Adjust the control disk 1 to the middle of the light barrier acc. to Fig. 6.9 and screw tight.
3. Rotate the stepping motor 2 2/3 turns clockwise until the 0° marking is on the middle of the light barrier, acc. to Fig. 6.10.
4. Set rotor to 0° position. Rotate control disk 2 until the 0° marker is on the middle of the light barrier.
5. Fix control disk and gear.
6. Rotate the stepping motor clockwise up to the stop and check acc. to Fig. 6.12 if it securely blocks in that position.

6.5.3 Replacing Components

Components are replaced by following usual workshop procedure. No special instructions are necessary for this.

When components have been replaced proceed once again with the troubleshooting flowcharts according to Figs. 6.1 to 6.5.

6.6 Final Inspection

After a repair has been carried out, the Motor-tuned Filter FK 852P4 must be subjected to the following final inspection to ensure that its technical data can still be guaranteed.

If this final inspection does not prove satisfactory, the testing and troubleshooting following the flowcharts Fig. 6.1 to 6.5 will have to be performed again. Repeat the procedure as many times as is necessary to detect and remedy all faults.

6.6.1 Checking Intermodulation Distance in Transmission

1. Prepare test set-up according to Fig. 6.18.

Note:

At the motor-tuned filter use connector X53 for signal input and connector X54 for signal output.

CAUTION

Set both SMKs to the special function RCL-71.

2. Set the OPERATION MODE switch on the control unit to Tx/Rx.
3. Select on the control unit CW and low power.
4. Set the HF transmitter/receiver and the spectrum analyzer to a frequency of $f = 1.5 \text{ MHz}$.
5. Set the SMK (A) and the SMK (B) to the following frequencies:

$$\begin{aligned} f_1 &= \text{Measurement frequency} - 1 \text{ kHz} \\ f_2 &= \text{Measurement frequency} + 1 \text{ kHz} \end{aligned}$$

(Continuation)---

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---(Continuation) Checking the Intermodulation Distance in Transmission

6. Set the output levels of the SMKs so that the analyzer displays 7 dBm in both cases.

7. Read the D3 mixer product on the analyzer.

Nominal values: $a > 40$ dB

8. Repeat the above check with each of the following frequencies:

$f = 3$ MHz, $f = 6$ MHz, $f = 12$ MHz
and $f = 24$ MHz.

5. Read the D3 mixer product on the analyzer.

Nominal values: $a > 54$ dB.

6. Repeat the above check with each of the following frequencies:

$f = 3$ MHz, $f = 6$ MHz, $f = 12$ MHz
and $f = 24$ MHz.

6.6.2 Checking the Intermodulation Distance in Reception

1. Prepare test set-up acc. to Fig. 6.18.

Note:

On the motor-tuned filter use connector X52 for signal input and X55 for signal output.

CAUTION

Set both SMKs to the special function RCL-71.

2. Set the OPERATION MODE switch on the control unit to Rx.

3. Set the HF transmitter/receiver and the analyzer to a frequency of $f = 1.5$ MHz.

4. Set the SMK (A) and the SMK (B) to an output level of 3.5 dB and to the following frequencies:

$f_1 =$ Measurement frequency -1 kHz
 $f_2 =$ Measurement frequency +1 kHz

6.6.3 Checking the Noise Figure

1. Prepare the test set-up acc. to Fig. 6.19.

2. Set the OPERATION MODE switch on the control unit to Rx.

3. Set the control unit to a frequency of $f = 1.5$ MHz.

4. Set the DPSP to an attenuation level of 3 dB.

5. Note the reading on the ESH3.

6. Set the DPSP to an attenuation level of 6 dB and increase the output level of the SKTU until the previously noted value is indicated again on the ESH3.

7. Read the noise figure on the SKTU:

Nominal values: $F < 20$ kT₀

8. Repeat the above check with each of the following frequencies:

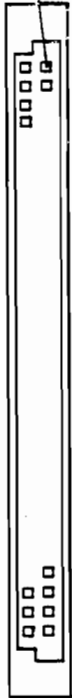
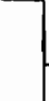
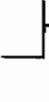
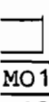
$f = 3$ MHz, $f = 6$ MHz, $f = 12$ MHz
and $f = 24$ MHz.

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6.7 External Interfaces

Connector X51	Pin	Signal designation/level
FP connector strip, 64-way, for printed cir- cuits, indirect Contact a1 	a 1	 not used
	a 2	
	a 3	
	a 4	
	a 5	BITE SELECTION (TTL)
	a 6	 not used
	a 7	
	a 8	 Strobe (TTL)
	a 9	
	a 10	D0 (TTL)
	a 11	D1 (TTL)
	a 12	 not used
	a 13	
	a 14	
	a 15	
	a 16	 TRANSMIT (TTL)
	a 17	
	a 18	 not used
	a 19	
	a 20	
	a 21	
	a 22	 +5.3 VDC
	a 23	
	a 24	 not used
	a 25	
	a 26	 +15 VDC
	a 27	
	a 28	 Ground
	a 29	
	a 30	
	a 31	
	a 32	 not used
	b 1	
	b 2	
	b 3	
	b 4	MO1E (TTL)
	b 5	MO2E (TTL)
	b 6	MO3E (TTL)
	b 7	MO4E (TTL)
	b 8	MOT (TTL)
	b 9	MES (TTL)
	b 10	FB1E (TTL)
	b 11	FB2E (TTL)
	b 12	FB3E (TTL)

(Continuation)---

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---(Continuation) External Interfaces

Connector X51 (Cont.)	Pin	Signal designation/level
	b 12	FB4E (TTL)
	b 13	FB5E (TTL)
	b 14	FB0E (TTL)
	b 15	LSM (TTL)
	b 16	LSH (TTL)
	b 17	LSA (TTL)
	b 18	LSE (TTL)
	b 19	
	b 20	not used
	b 21	
	b 22	
	b 23	
	b 24	
	b 25	+5.3 VDC
	b 26	
	b 27	not used
	b 28	
	b 29	+15 VDC
	b 30	
	b 31	Ground
	b 32	

Connector X52 to X56		Signal designation/level
FJ jack plugs,	X52	HF/receive 1
SMB system	X53	HF/transmit 2
	X54	HF/transmit 1
	X55	HF/receive 2
	X56	Test spectrum

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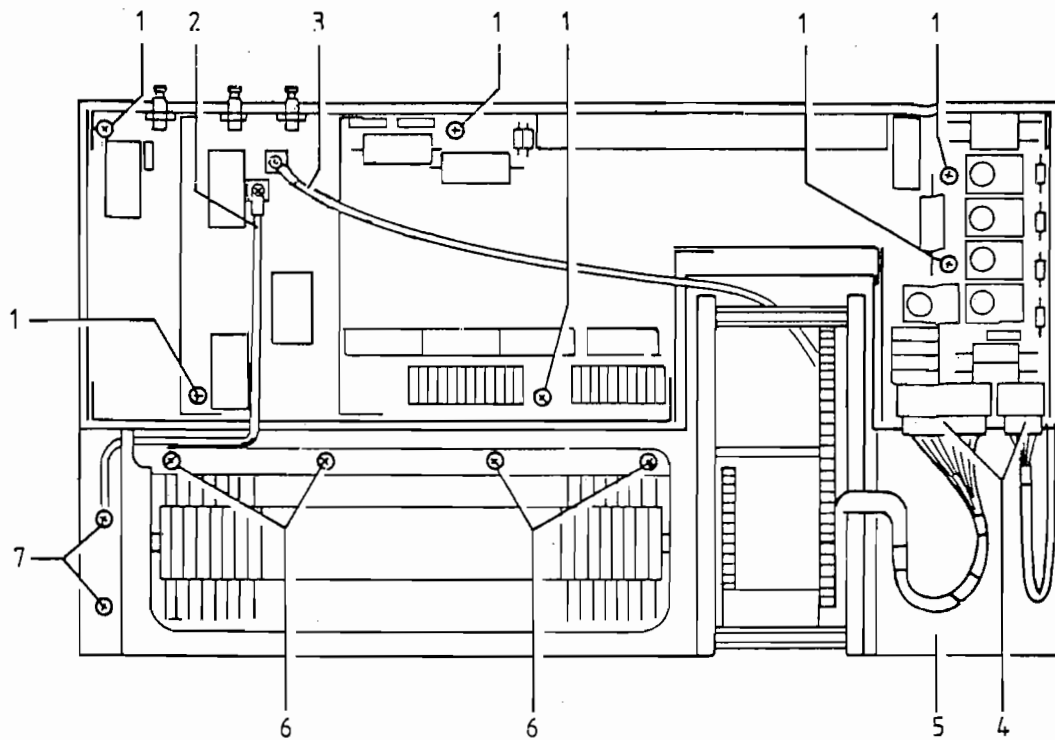
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NOTES

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View of the Control Circuit

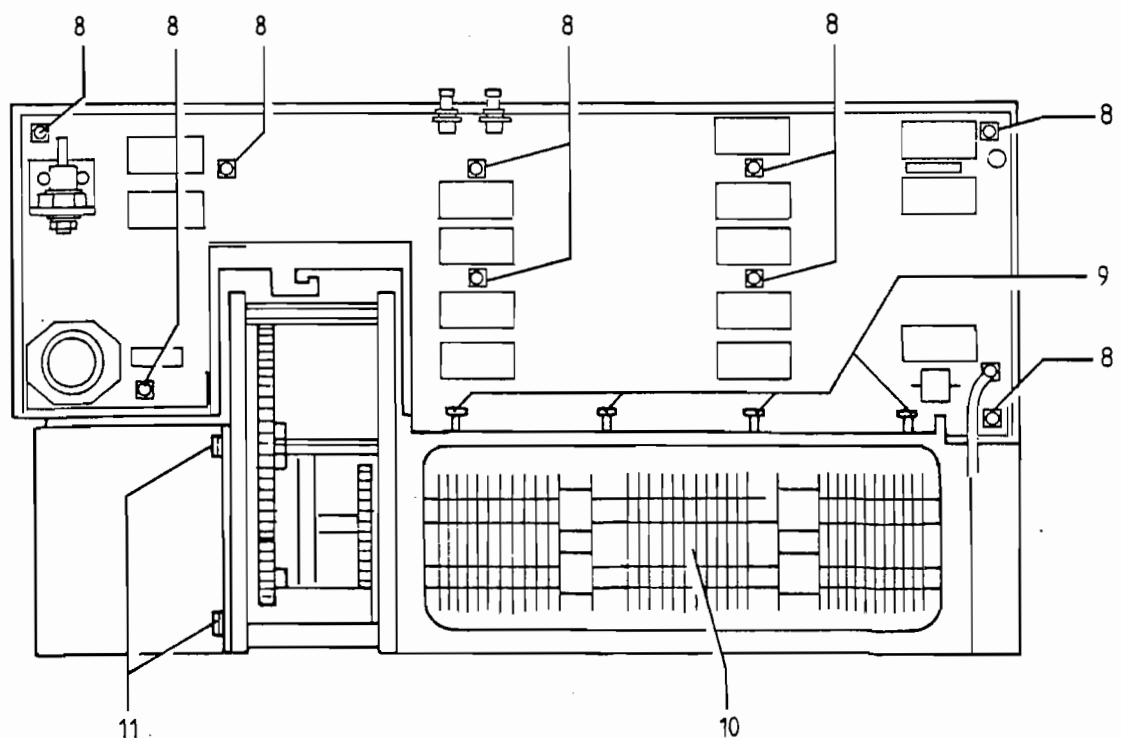


Fig. 6.6 Removal of Subassemblies

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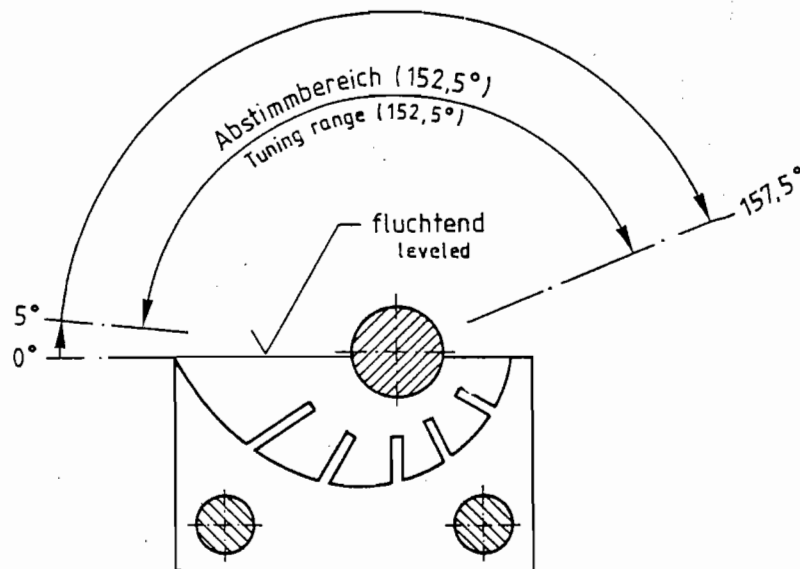


Fig. 6.7 Preadjustment of the Tuning Range

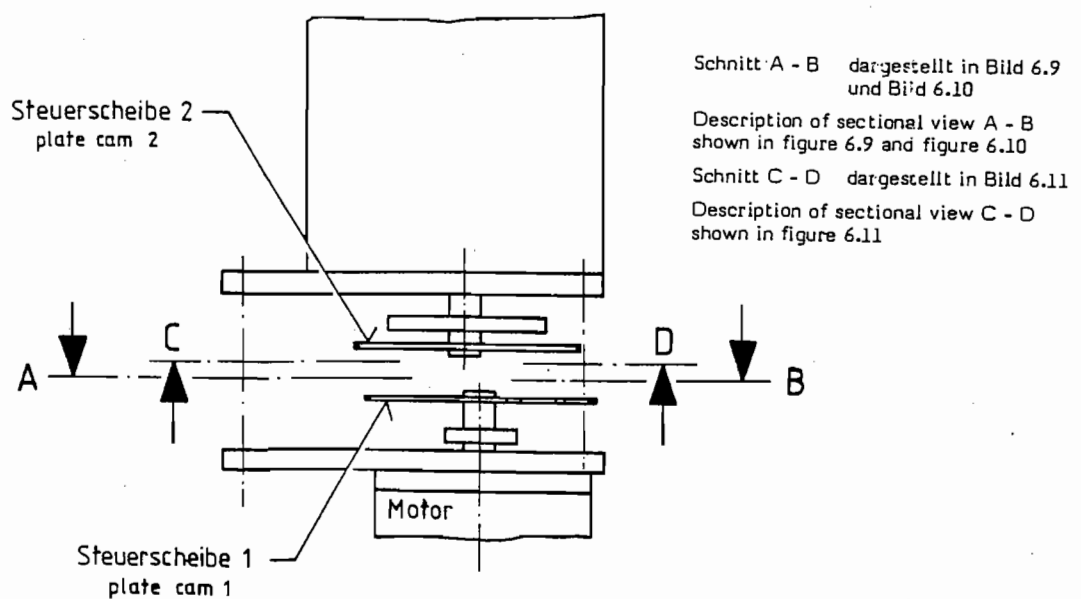


Fig. 6.8 Gearbox

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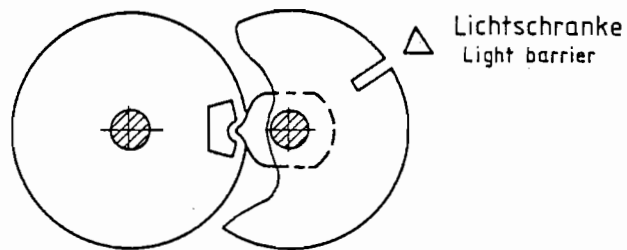


Fig. 6.9 Mechanical Stop

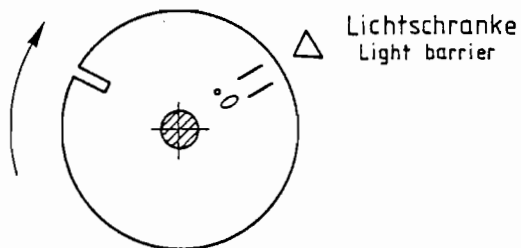


Fig. 6.10 Control Disk 1

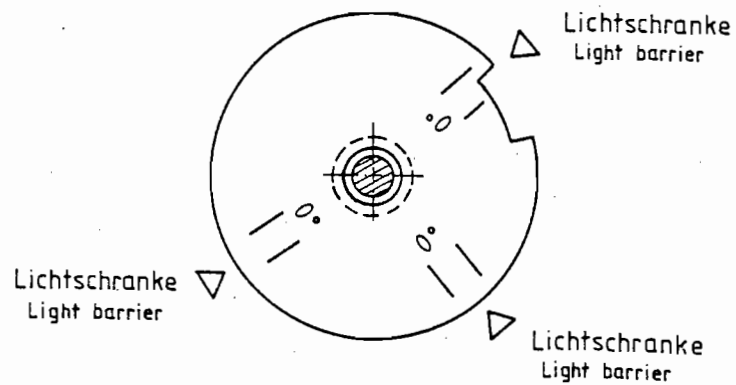


Fig. 6.11 Control Disk 2

MOTOR-TUNED FILTER
FK 852P4

Repair Manual
Part 6: Repair

- 6.35/6.36 -

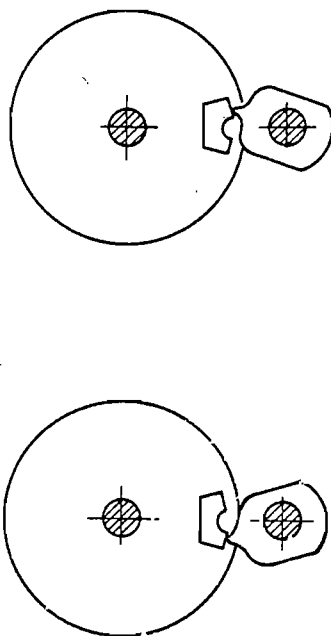


Fig. 6.12 Mechanical Final Stop

MOTOR-TUNED FILTER FK 852P4

Repair Manual
Part 6: Repair

- 6.37/6.38 -

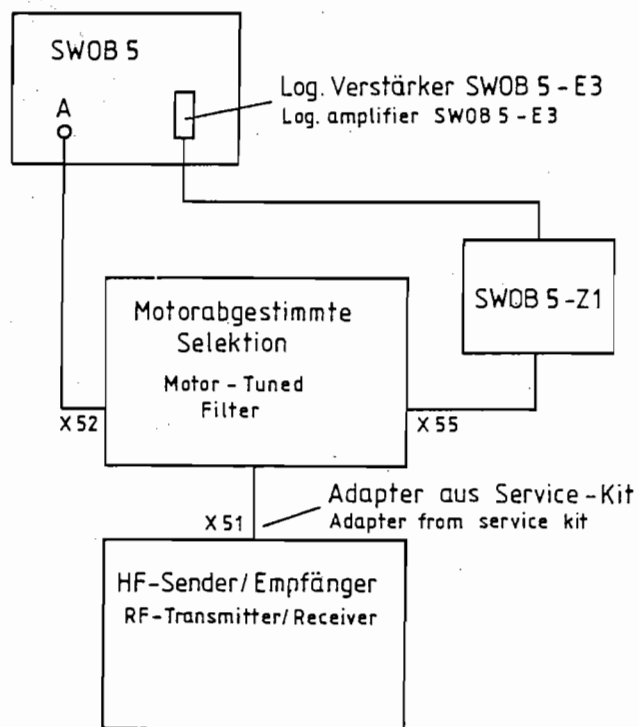


Fig. 6.13 Test Set-up for measuring Pass-band

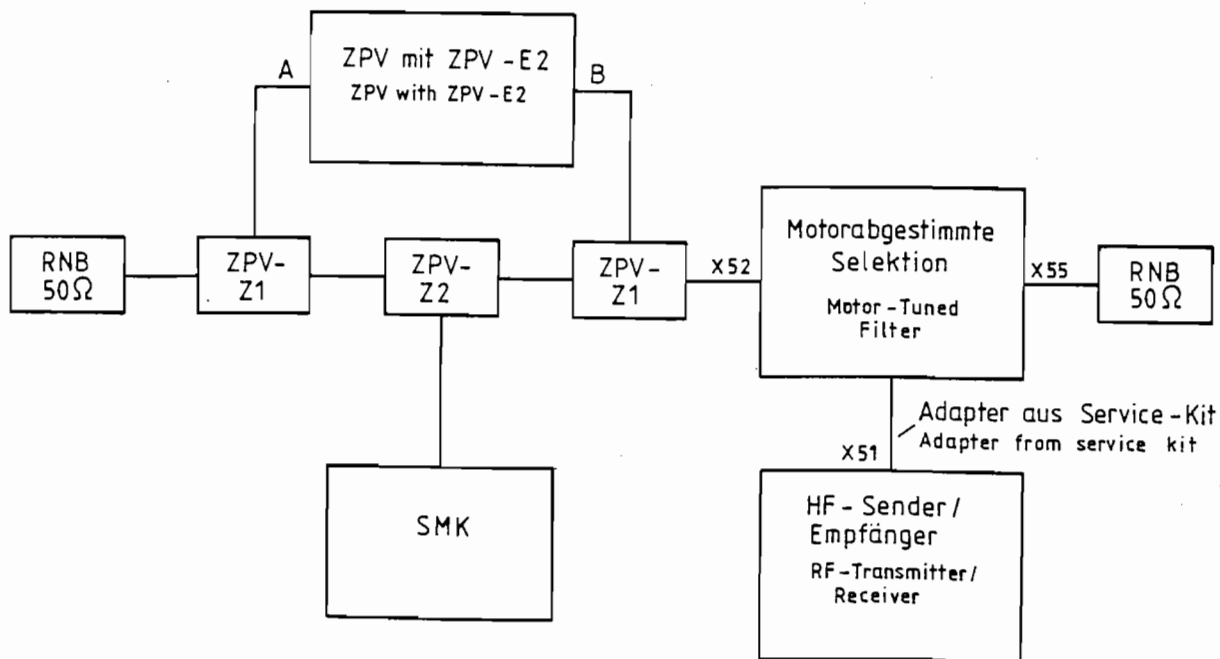


Fig. 6.14 Test Set-up for measuring Selectivity

MOTOR-TUNED FILTER FK 852 P 4

Repair Manual
Part 6: Repair

- 6.39/6.40 -

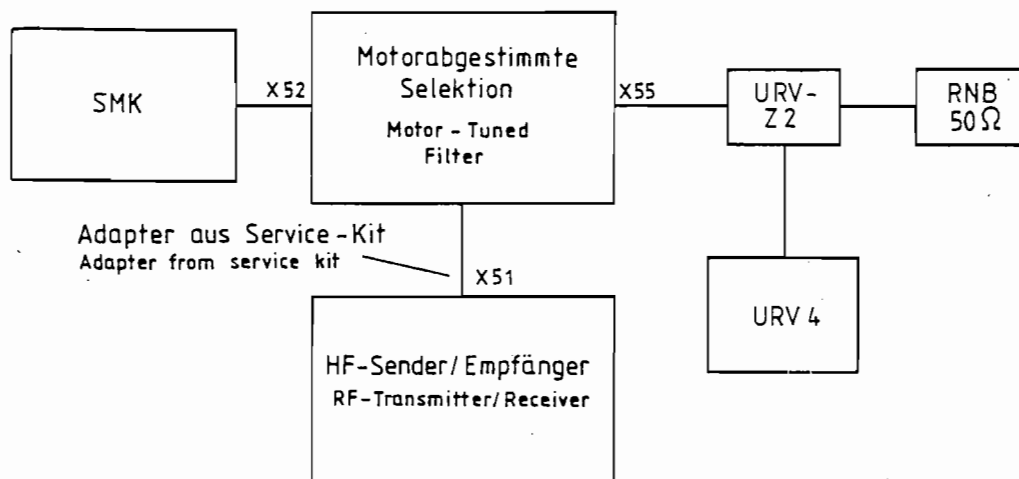


Fig. 6.15 Test Set-up for Checking the Gain, the HF Circuit and the 1-MHz Low-pass Filter

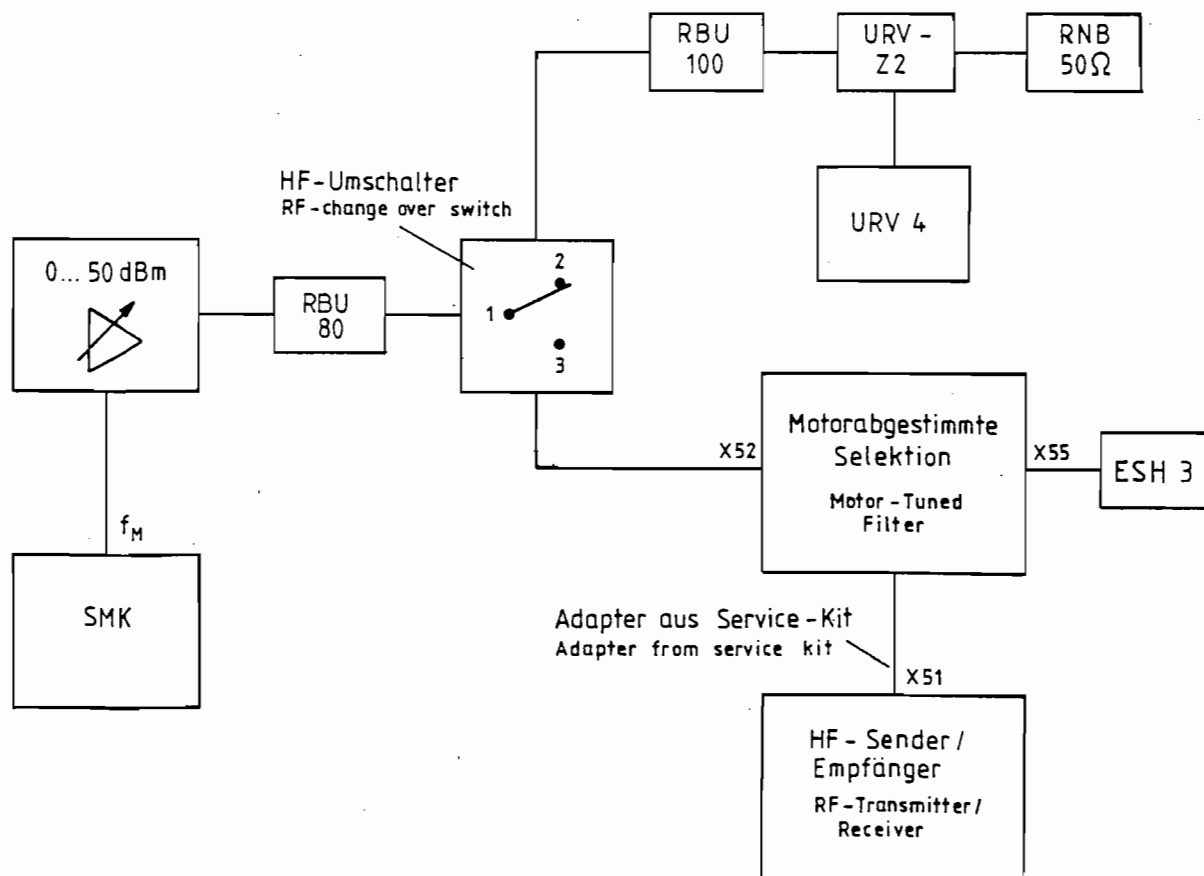


Fig. 6.16 Test Set-up for measuring Overload Switch-off

MOTOR-TUNED FILTER FK 852 P 4

Repair Manual
Part 6: Repair

- 6.41/6.42 -

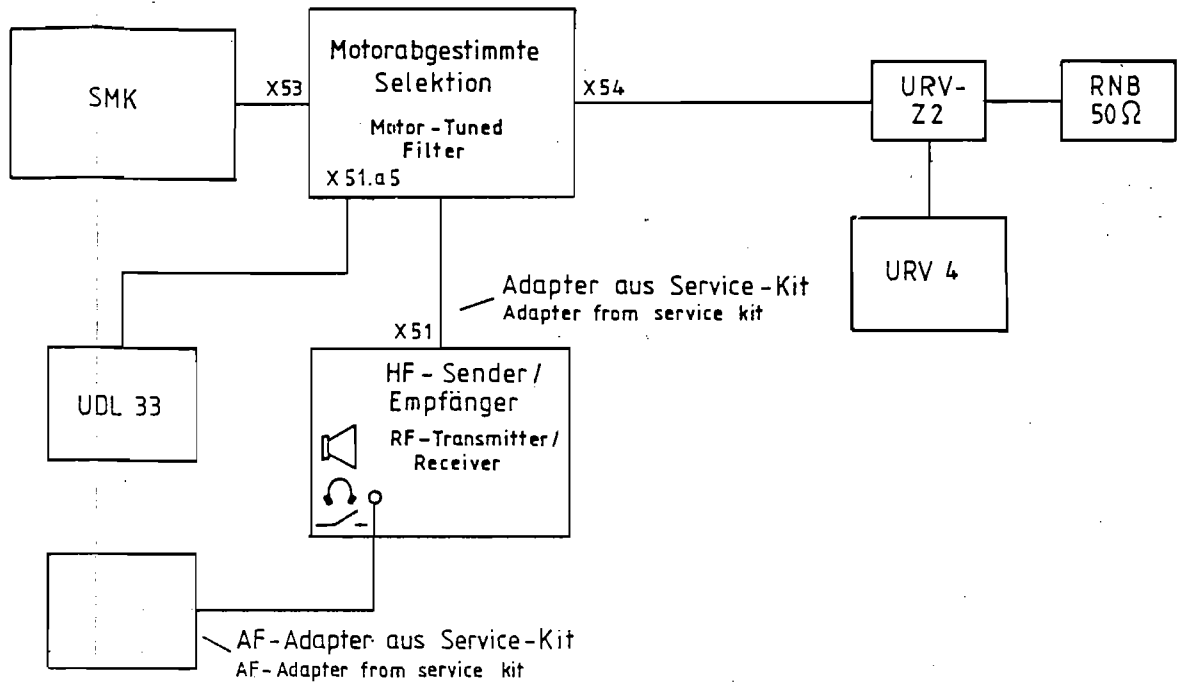


Fig. 6.17 Test Set-up for Test of the BITE signal

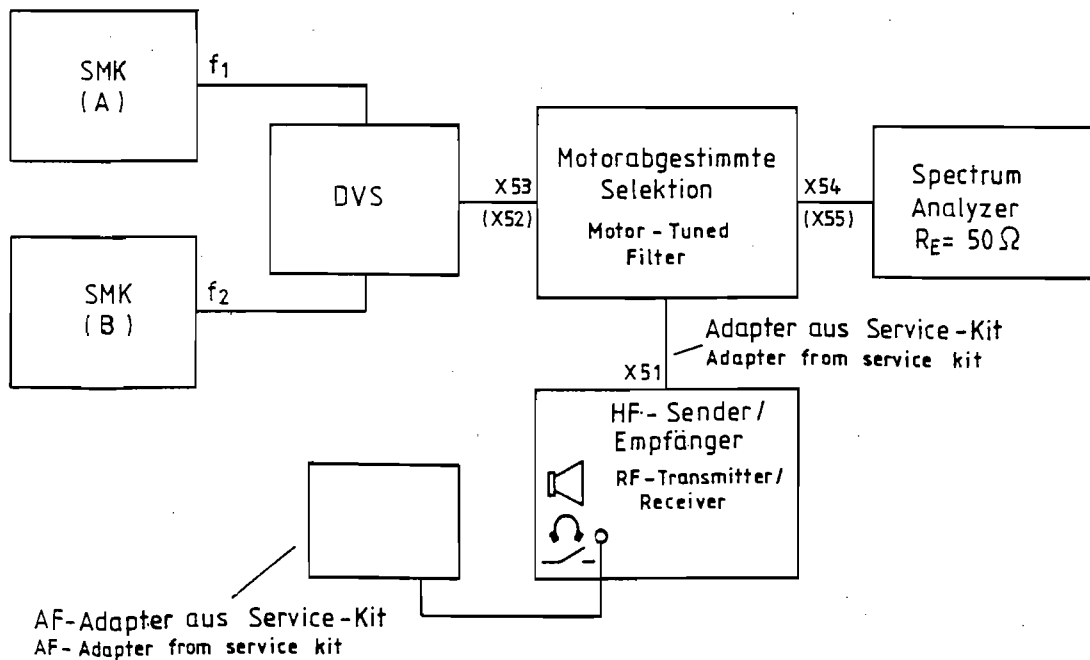


Fig. 6.18 Test Set-up for measuring Intermodulation Distance

MOTOR-TUNED FILTER
FK 852P4Repair Manual
Part 6: Repair

- 6.43/6.44 -

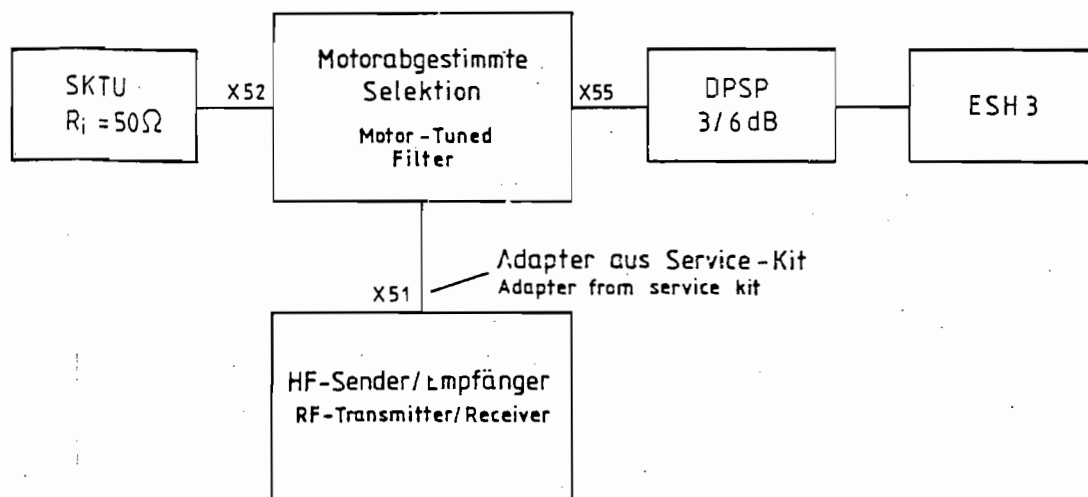


Fig. 6.19 Test Set-up for measuring Noise Figure

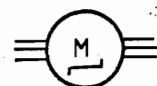


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MÜNCHEN

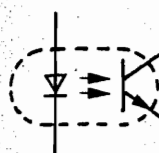
Schaltteillisten
Stromläufe
Bestückungspläne
Parts lists
Circuit diagrams
Components plans

A1 Drehko + Getriebe

VARIABLE CAPACITOR + GEAR
647.2192 eigene SA
SEPERATE PARTS LIST
siehe 647.5310 S
SEE



Blatt 1
SHEET 1



Blatt 2
SHEET 2

Drehko
VARIABLE CAPACITOR
siehe 647.2411 S
SEE

A2 HF-Teil

RF-CIRCUIT
647.2411 eigene S+SA
SEPERATE CIRCUIT DIAGRAM
AND PARTS LIST

<1MHz
1...30MHz

A3 Steuerteil

CONTROL CIRCUIT
647.5310 eigene S+SA
SEPERATE CIRCUIT DIAGRAM
AND PARTS LIST

Lichtschranken
LIGHT BARRIER

FREQUENZ BEREICHS-SCHALTER
FREQUENCY RANGE SWITCH

Motor Treiber
MOTOR DRIVER

Blatt 1 / SHEET1

Blatt2 / SHEET2

Blatt3 / SHEET3

Buchse und Stecker nicht
dargestellt.
PLUGS AND SOCKETS NOT ILLUSTRATED

A3 -Stecker /PLUG
A1/A 2 - Buchse/SOCKET

Variantenerklärung siehe SA
EXPLANATION OF MODELS
SEE PARTS LIST



R. SCHWARZ

AZ

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Stock No.Blatt
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0885

FK852P4 MOT. ABGEST. SELEKT
FK852P4 MOTOR-TUNED FILT.

647.2011.01 SA 1

Kennzeichen
Component No.Benennung/Beschreibung
DesignationSachnummer
Stock No.entw. wenn in
combination

•
VARIANTENERKL. / VERSIONS
VAR 02 = GRUNDAUSFUEHRUNG
MOD 02 = BASIC MODEL
VAR 05 = AUSF. EK085
MOD 05 = VERS. F. EK085

A1 ZM DREHKO + GETRIEBE
VARIABLE CAPACITOR + GEAR

647.2192

A2 ED HF-TEIL
RF CIRCUIT

647.2411.02

A3 ED STEUERTEIL
CONTROL CIRCUIT

647.5310.02

- ENDE -

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647.2011.01 SA BL 1-

**ROHDE & SCHWARZ**AZ
02
Datum
Date
0884Schaltteilliste für
Parts list for
DREHKO + GETRIEBE
VARIABLE CAPACITOR + GEARSachnummer
Stock No.

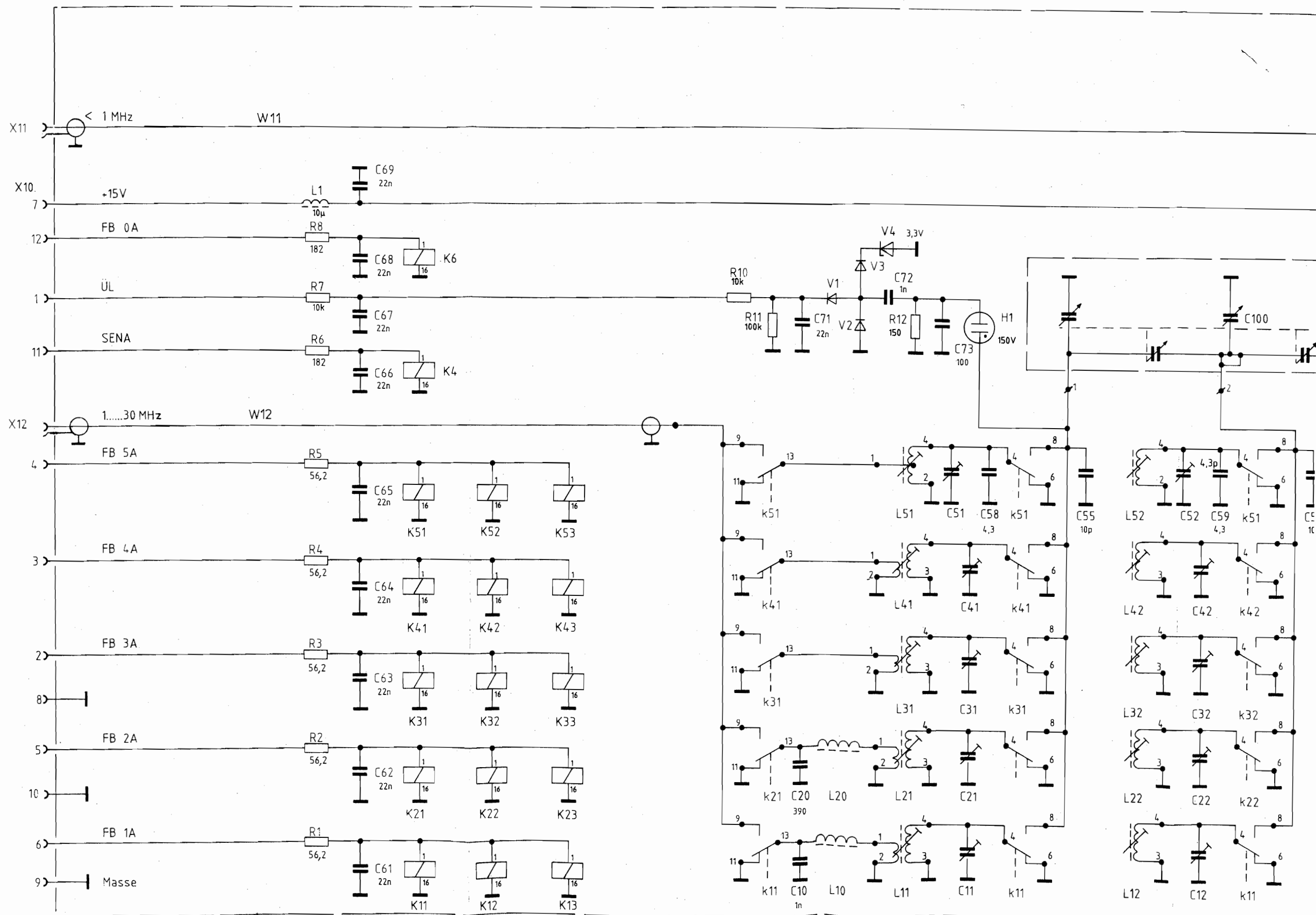
647.2192.00 SA

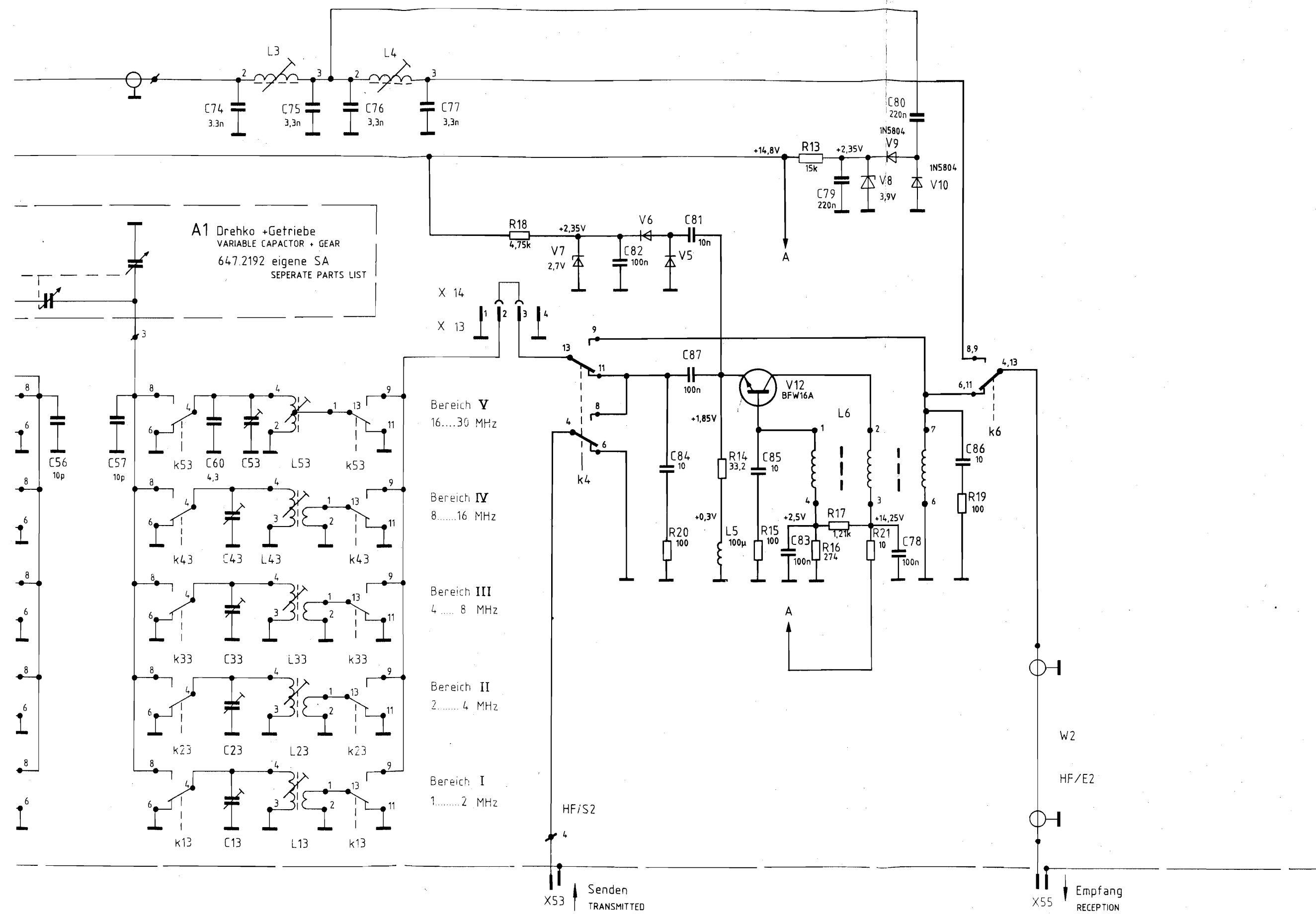
Blatt
Page

1

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
-	ZUGEH. STROML./CIRC. DIAGR. 647.2011 S		
C100	DREHKONDENSATOR VARIABLE CAPACITOR	647.2205	
M100	MOTOR	647.2392	
U1	BP H21A5 GABEL-LICHTSCHR. OPTICAL SWITCH H21A5 GENERAL-EL H21A5	BP 092.9668	
U2	BP H21A5 GABEL-LICHTSCHR. OPTICAL SWITCH H21A5 GENERAL-EL H21A5	BP 092.9668	
U3	BP H21A5 GABEL-LICHTSCHR. OPTICAL SWITCH H21A5 GENERAL-EL H21A5	LP 092.9668	
U4	BP H21A5 GABEL-LICHTSCHR. OPTICAL SWITCH H21A5 GENERAL-EL H21A5	BP 092.9668	
X30	BESTEHT AUS/CONSISTING OF BUCHSENLEISTE 647.5733 KONTAKTEINSATZ FP458.0194 CODIERSTIFT FP418.0041		647.2392
X40	BESTEHT AUS/CONSISTING OF BUCHSENKOERPER 647.5740 EINSATZ FP458.0194 CODIERSTIFT FP418.0041		647.2386

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Variantenerklärung siehe SA
EXPLANATION OF MODELS
SEE PARTS LIST

	A	33329	5.85	BM				6KBE	Tag	Name	Benennung	Zeichn.-Nr.	Blatt-Nr.
	B	33618	10.85	BM				Bearb.	19.01.84	BM			1
								Gepr.			HF-Teil /RF CIRCUIT	647.2411.01 S	1
													1 Bl.
And. Zust.	Anderungs-Mittelung	Datum	Name	And. Zust.	Anderungs-Mittelung	Datum	Name	Norm			zu Gerät: FK 852 P4	red. i. V. 647 2011.01V	erste Z. 647 2011.01



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ED HF-TEIL
RF CIRCUIT

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1

Kennzeichen
Component No.Benennung/Beschreibung
DesignationSachnummer
Stock No.analog
analog

.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL		
C10	CG 1NF+-0,5% 250V TKF MICA CAPACITOR JAHRE 53-1/1000PF/0,5/250	CG 023.1626	
C11	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C12	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C13	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C20	CG 390PF+-1% 250V TKF MICA CAPACITOR JAHRE 53-1/390PF/1/250	CG 023.1578	
C21	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C22	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C23	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C31	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C32	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C33	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C41	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C42	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C43	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C51	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C52	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C53	CT 9,3PF NORMAL 0/U 4ST AIR-TYPE TRIMMER	CT 025.7215	
C55	CC 10PF+-2,5%400V5NPO CAPACITOR VALVO 2222 654 10109	450.8196	
C56	CC 10PF+-2,5%400V5NPO CAPACITOR VALVO 2222 654 10109	450.8196	
C57	CC 10PF+-2,5%400V5NPO CAPACITOR VALVO 2222 654 10109	450.8196	
C58	CC 4,3PF+-0,25PF5NPO CAPACITOR STETTNER SDPL5;4,3PF/0,25NPO	450.6929	
C59	CC 4,3PF+-0,25PF5NPO CAPACITOR STETTNER SDPL5;4,3PF/0,25NPO	450.6929	

647.2411.01 SA BL 1+

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 ROHDE & SCHWARZ	AZ Datum Date 06 1185	Schalttailliste für Parts list for ED HF-TEIL RF CIRCUIT	Sachnummer Stock No. 647.2411.01	Blatt Page 2
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	on Order or Stocked
C60	CC 4,3PF+-0,25PF5NP0 CAPACITOR	450.6929	
C61	STETTNER SDPL5;4,3PF/0,25NP0 CC 22NF+-10%50VK1200VIELS CAPACITOR	CC 060.2445	
	UNION CARB M39014/01-1421		
BIS/TO			
C69			
C71	CC 22NF+-10%50VK1200VIELS CAPACITOR	CC 060.2445	
	UNION CARB M39014/01-1421		
C72	CC 1NF+-10%200V5K1200VIEL CAPACITOR	CC 068.4047	
	UNION CARB M39014/01-1397		
C73	CC 100PF+- 5%100V NPO VIE CERAMIC CAPACITOR	CC 060.0771	
	UNIONCARB C052C101J261CA		
C74	CG 3,3NF+-0,5% 250V TKG MICA CAPACITOR	CG 023.1684	
	JAHRE 53-2/3,3NF/0,5/250		
BIS/TO			
C77			
C78	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
	UNION CARB M39014/01-1433		
C79	CC 220NF+-10%50V7K1200VIE CERAMIC CAPACITOR	CC 084.5515	
	UNION CARB M39014/02-1395		
C80	CC 220NF+-10%50V7K1200VIE CERAMIC CAPACITOR	CC 084.5515	
	UNION CARB M39014/02-1395		
C81	CC 10NF+-10%100V5K1200VIE CERAMIC CAPACITOR	CC 068.4060	
	UNION CARB M39014/01-1415		
C82	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
	UNION CARB M39014/01-1433		
C83	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
	UNION CARB M39014/01-1433		
C84	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6429	
	VALVO 2222 678 09109		
C85	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6429	
	VALVO 2222 678 09109		
C86	CC 10PF+-0,25PF3X4NP0 CAPACITOR	CC 087.6429	
	VALVO 2222 678 09109		
C87	CC 100NF+-10%50V5K1200VIE CAPACITOR	CC 084.5350	
	UNION CARB M39014/01-1433		
H1	SU UEBERSPANNUNGSABL.150V ARRESTER 150V SIEMENS B1-C150/069-X157	SU 645.8412	



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3

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
K4	SN GEPOLT 2XU 12V RELAY	645.6810	
K6	SDS DS2E-DC12V SN GEPOLT 2XU 12V RELAY	645.6810	
K11	SDS DS2E-DC12V SN 12V 2MAL 21 AG RELAY	647.5756	
K12	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K13	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K21	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K22	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K23	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K31	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K32	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K33	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K41	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K42	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K43	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K51	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K52	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
K53	TAKAMISAWA RY-12W-OH-K SN 12V 2MAL 21 AG RELAY	647.5756	
L1	LD 10,0UH10%3,300HMO,144A CHOKE DELEVAN DROSSEL1025-44	LD 026.4184	

647.2411.01 SA BL 3+

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthaltene in contained in
L3	LD SPULE	647.2440	
L4	LD SPULE	647.2440	
L5	LD 100 UH10%8,000HMO,084A CHOKE DELEVAN DROSSEL1025-68	LD 067.3101	
L6	LD SPULE	647.5804	
L10	LL SPULE	647.2463	647.5033
L11	LD SPULE COIL	617.9301	
L12	LD SPULE COIL	617.9318	
L13	LD SPULE COIL	617.9301	
L20	LL SPULE	647.2470	647.5033
L21	LD SPULE COIL	617.9324	
L22	LD SPULE COIL	617.9330	
L23	LD SPULE COIL	617.9324	
L31	LD SPULE COIL	617.9347	
L32	LD SPULE COIL	617.9353	
L33	LD SPULE COIL	617.9347	
L41	LD SPULE COIL	617.9360	
L42	LD SPULE COIL	617.9376	
L43	LD SPULE COIL	617.9360	
L51	LD SPULE COIL	617.9382	
L52	LD SPULE COIL	617.9399	
L53	LD SPULE COIL	617.9382	
R1	RL 0,35W 56,2 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/56,20HM-F-D	RL 082.9571	
BIS/TO			
R5			
R6	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R7	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R8	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R10	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	


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Date

 Schalteilleiste für
Parts list for

 ED HF-TEIL
RF CIRCUIT

 Sachnummer
Stock No.

647.2411.01 SA

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Page

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 Kennzeichen
Component No.

 Benennung/Beschreibung
Designation

 Sachnummer
Stock No.

 enthalten in
contained in

R11

RL 0,35W 100KOHM+-1%TK50

RL 082.1764

RESISTOR

DRALORIC SMA0207/100K-F-C

R12

RL 0,35W 150 OHM+-1%TK50

RL 082.9942

RESISTOR

DRALORIC SMA0207/150OHM-F-D

R13

RL 0,35W 15,0KOHM+-1%TK50

RL 083.1400

RESISTOR

DRALORIC SMA0207/15K-F-D

R14

RL 0,35W 33,2 OHM+-1%TK50

RL 082.9359

RESISTOR

DRALORIC SMA0207/33,2OHM-F-D

R15

RL 0,35W 100 OHM+-1%TK50

RL 082.6543

DEPOS.-CARBON RESISTOR

DRALORIC SMA0207/100/HM-F-D

R16

RL 0,35W 274 OHM+-1%TK50

RL 083.0178

RESISTOR

DRALORIC SMA0207/274OHM-F-D

R17

RL 0,35W 1,21KOHM+-1%TK50

RL 083.0655

RESISTOR

DRALORIC SMA0207/1,21K-F-D

R18

RL 0,35W 4,75KOHM+-1%TK50

RL 083.1097

RESISTOR

DRALORIC SMA0207/4,75K-F-D

R19

RL 0,35W 100 OHM+-1%TK50

RL 082.6543

DEPOS.-CARBON RESISTOR

DRALORIC SMA0207/100/HM-F-D

R20

RL 0,35W 100 OHM+-1%TK50

RL 082.6543

DEPOS.-CARBON RESISTOR

DRALORIC SMA0207/100/HM-F-D

R21

RL 0,35W 10,0 OHM+-1%TK50

RL 082.8852

RESISTOR

DRALORIC SMA0207/100HM-F-D

V1

AD 1N4448 75V 0,15A UDI

AD 012.0700

DIODE

VALVO 1N4448

BIS/TO

V3

V4

AE BZX79/C3V3 0,5W Z-DI

AE 012.2390

ZENER DIODE

ITT ZPD3,3

V5

AD 1N4448 75V 0,15A UDI

AD 012.0700

DIODE

VALVO 1N4448

V6

AD 1N4448 75V 0,15A UDI

AD 012.0700

DIODE

VALVO 1N4448

V7

AE BZX55/C2V7 0,5W Z-DI

AE 086.8228

ZENER DIODE

AEG-TELEF. BZX55C2V7

V8

AE ZX3,9 5% 10W Z-DI

AE 012.3274

ZENER DIODE

INTERMETAL ZX3,9

V9

AG 1N5804 GL 100V 2A5

AG 453.4762

RECTIFIER

UNITRODE 1N5804

647.2411.01 SA BL 5+

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Datum
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RF CIRCUITSachnummer
Stock No.Blatt
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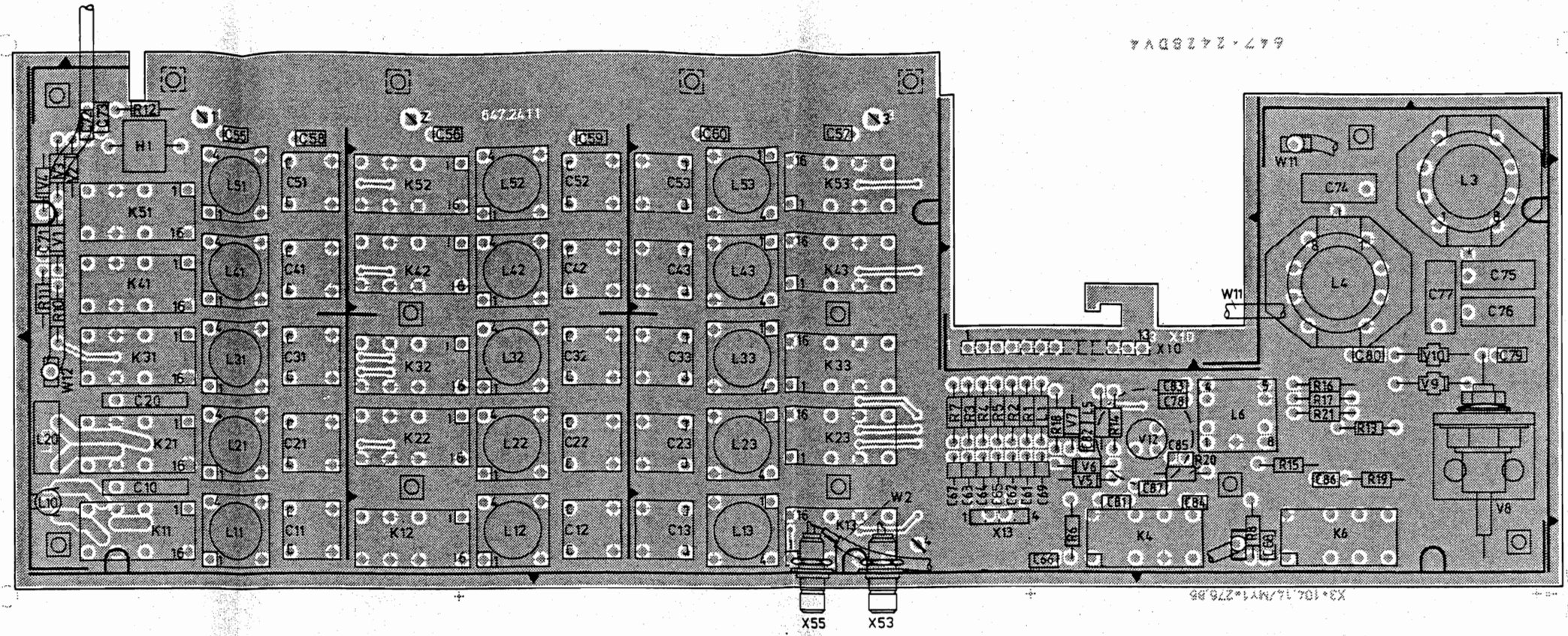
1185

647.2411.01 SA 6

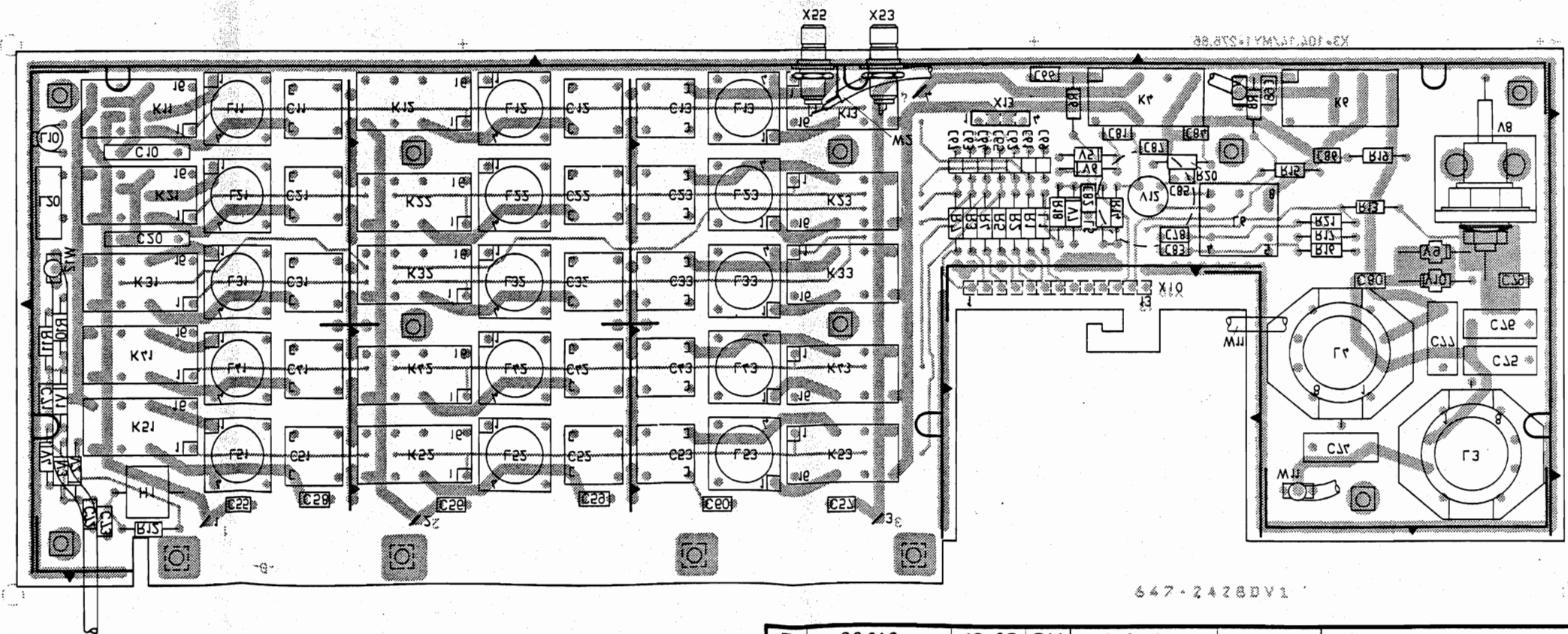
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthaltene contained in
V10	AG 1N5804 GL 100V 2A5 RECTIFIER	AG 453.4762	
V12	UNITRODE 1N5804 AK BFW16A NPN 40V >1GHZ TRANSISTOR VALVO BFW16A	AK 010.4644	
W2	DX HF-KABEL RF CABLE	647.2492	
W11	DX HF-KABEL RF CABLE	647.5579	
W12	DX HF-KABEL RF CABLE	647.5585	
X10	FP BUCHSENLEISTE 13POL. SOCKET CONNECTOR BERG 76323-213	FP 510.1391	
X13	FP STIFTLISTE 36POL. CONNECTOR BINDER 11-0169-00-36 4-POLIG	580.6034	
X14	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302	FP 491.7042	
X53	FJ EINBAUSTECKER SYST.SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	
X55	FJ EINBAUSTECKER SYST.SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	

- ENDE -

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side

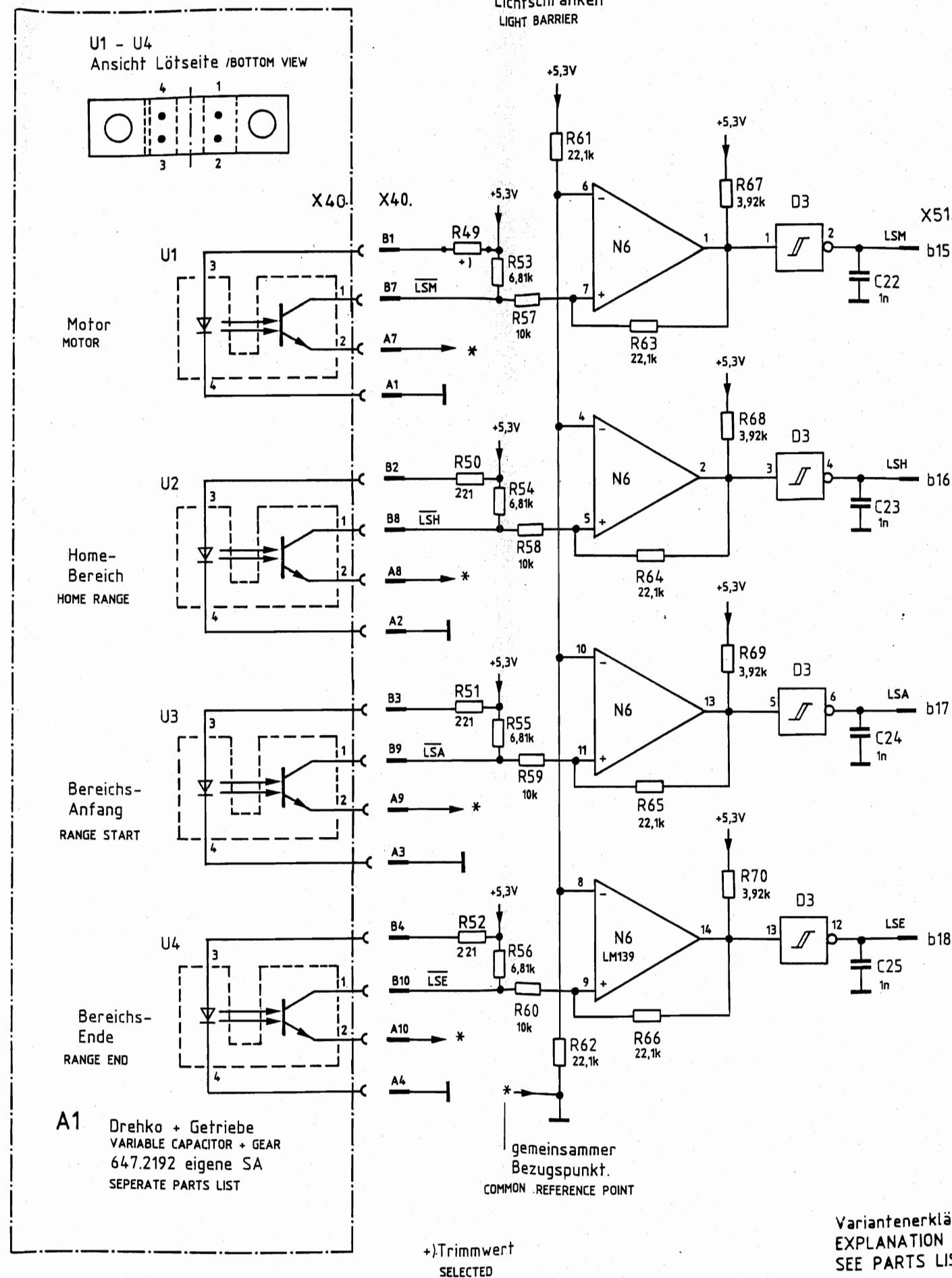


Ansicht und Leitungsführung Lötseite
View of tracks on solder side

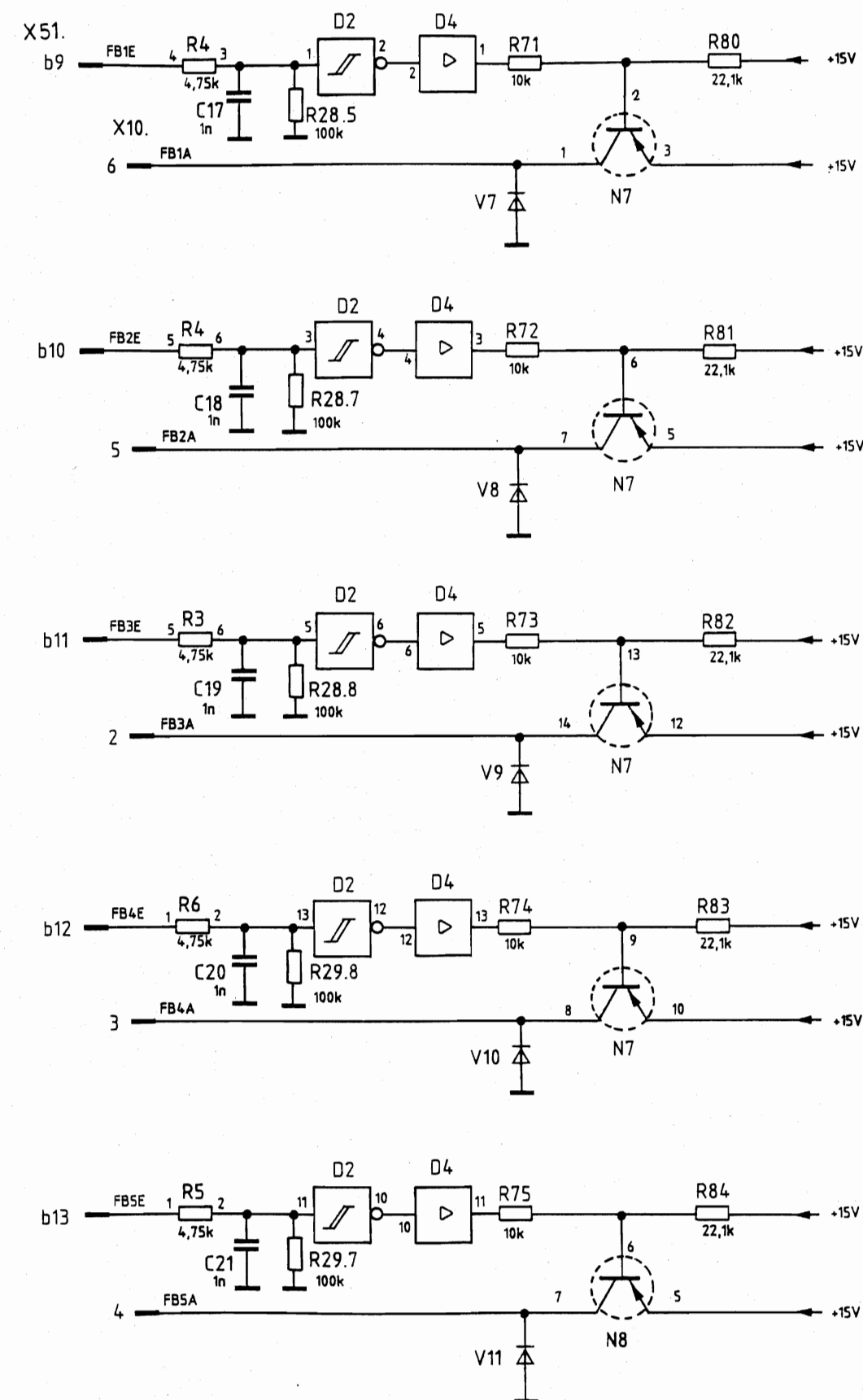


E	33 618	10.85	BM	Maße ohne Toleranzangabe		Maßstab 1 : 1				
						Halbzeug, Werkstoff				
				6KBE	Tag	Name	Benennung			Z
				Bearb.	10.85	BM	HF - Teil RF - CIRCUIT			
				Gepr.						
				Norm						
						Zeichn.-Nr.			Blatt-Nr.	
				ROHDE & SCHWARZ		647.2411.01			2	
Änd. Zust.	Änderungs-Mitteilung	Tag	Name	zu Gerät FK 852 PL		req. i. V. 647 2011 V		erste Z 647 2011		v. 2 BI

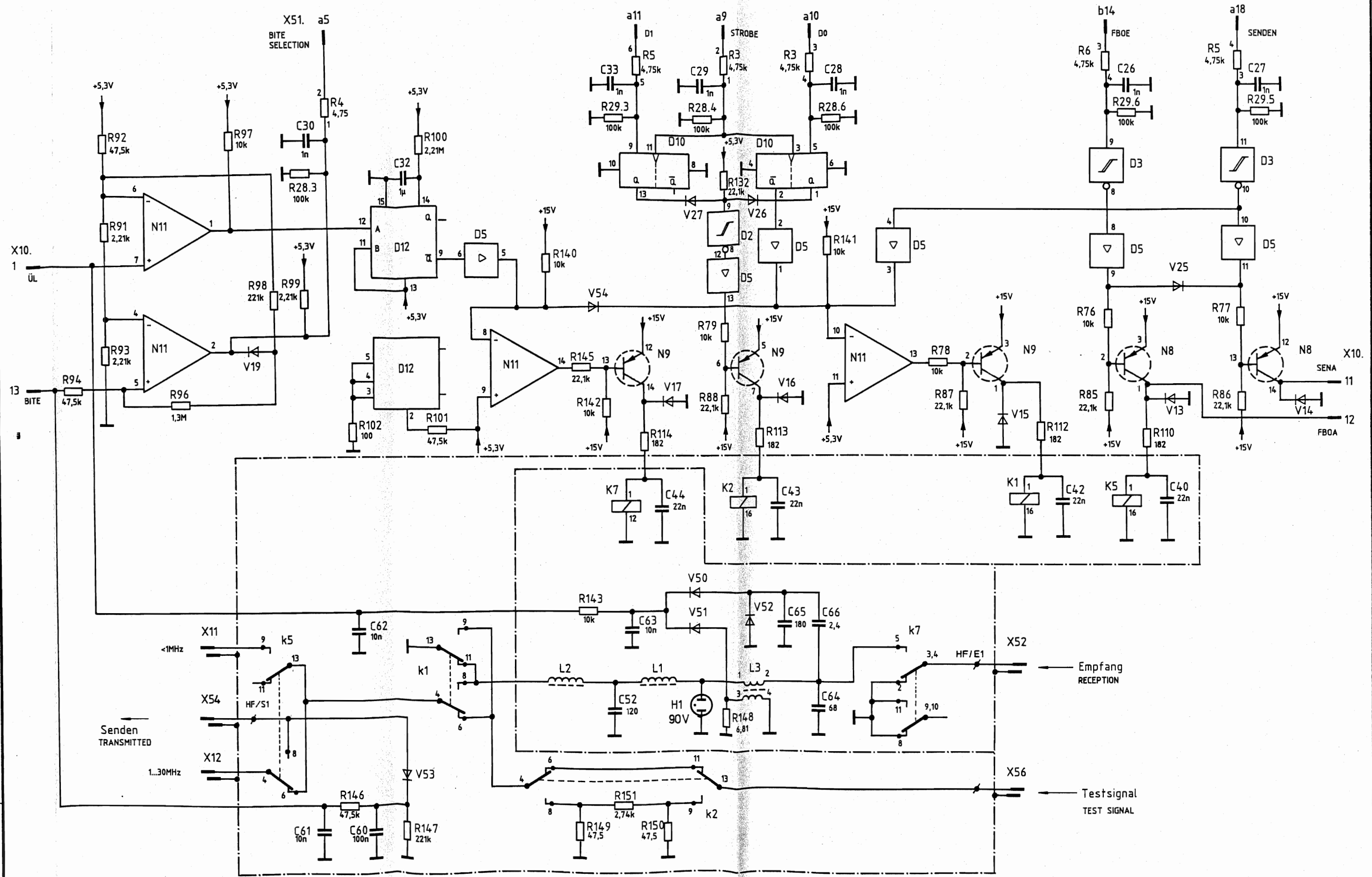
A
B
C
D
E
F



Frequenzbereich-Schalter
FREQUENCY RANGE SWITCH



A
B
C
D
E
F



A	33274	5.85	BM	6KBE	Tag	Name
B	33618	10.85	BM	Bearb.	1.85	BM
				Gepr.		

Benennung	Steuerteil
	CONTROL CIRCUIT

Zeichn.-Nr.	647.5310.01 S	Blatt-Nr.	3
rev. V	647 2011 01V	erste Z	647 2011 01



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD.02 = BASIC MODEL		
C1	CE 15 UF+-20%50V 8X18TA ELECTROLYTIC CAPACITOR ITT TAEK04320228215	CE 006.3430	
C2	CE 15 UF+-20%50V 8X18TA ELECTROLYTIC CAPACITOR ITT TAEK04320228215	CE 006.3430	
C3	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C4	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
C5	CE 4,7UF+-20% 100V 5X13FL ELECTROLYTIC CAPACITOR SPRAGUE 137D475X0,100C2	CE 451.7629	
BIS/TO			
C8			
C10	CC 1NF+-10%200V5K1200VIEL CAPACITOR UNION CARB M39014/01-1397	CC 068.4047	
BIS/TO			
C15			
C17	CC 1NF+-10%200V5K1200VIEL CAPACITOR UNION CARB M39014/01-1397	CC 068.4047	
BIS/TO			
C30			
C32	CC 1UF+-10%50V7K1200VIEL CAPACITOR UNION CARB M39014/02-1403	CC 084.5538	
C33	CC 1NF+-10%200V5K1200VIEL CAPACITOR UNION CARB M39014/01-1397	CC 068.4047	
C40	CC 22NF+-10%50VK1200VIELS CAPACITOR UNION CARB M39014/01-1421	CC 060.2445	
C42	CC 22NF+-10%50VK1200VIELS CAPACITOR UNION CARB M39014/01-1421	CC 060.2445	
C43	CC 22NF+-10%50VK1200VIELS CAPACITOR UNION CARB M39014/01-1421	CC 060.2445	
C44	CC 22NF+-10%50VK1200VIELS CAPACITOR UNION CARB M39014/01-1421	CC 060.2445	
C52	CC 120PF+- 5%100V NPO VIE CERAMIC CAPACITOR UNIONCARB C052C121J2G1CA	CC 060.0788	
C60	CC 100NF+-10%50V5K1200VIE CAPACITOR UNION CARB M39014/01-1433	CC 084.5350	
		647.5310.01 SA	BL 1+

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalt in contained in
L2	LL SPULE COIL	647.5791	
L3	LD SPULE	647.5827	
N6	B0 LM139J 4X COMPAR COMPARATOR	B0 455.2873	
N7	NSC LM139J B0 MHQ2907 4XP TR.ARRAY TRANSISTOR ARRAY MOTOROLA MHQ2907	B0 455.3992	
BIS/TO N9 N11	B0 LM139J 4X COMPAR COMPARATOR NSC LM139J	B0 455.2873	
R1	RN 3X4,7KOHM+-2% RESISTOR NETWORK BOURNS 4306R-102-472	647.5833	
BIS/TO R6 R22	RN 5X100KOHM+-2% RESISTOR NETWORK BOURNS 4306R-101-104	RN 099.2681	
R28	RN 7X100KOHM+-2% RESISTOR NETWORK BOURNS 4308R-101-104	RN 540.5737	
R29	RN 7X100KOHM+-2% RESISTOR NETWORK BOURNS 4308R-101-104	RN 540.5737	
R40	RL 0,35W 22,1KOHM+-1% RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R41	RL 0,35W 3,92KOHM+-1% RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1039	
R42	RD 3W 0,68 OHM+-3% WIRE-WOUND RESISTOR SAGE 1200SO,680HM+3%	RD 087.5051	
R43	RD 5W 4,7 OHM+-3% WIREWOUND RESISTOR DALE RH-5 4,70HM 3%	647.5610	
R44	RL 0,35W 1,21KOHM+-1% RESISTOR DRALORIC SMA0207/1,21K-F-D	RL 083.0655	
BIS/TO R47 R49	RL 0,35W 121 OHM+-1% RESISTOR DRALORIC SMA0207/1210HM-F-D	RL 082.9859	
R50	RL 0,35W 221 OHM+-1% RESISTOR DRALORIC SMA0207/2210HM-F-D	RL 083.0084	
BIS/TO R52 R53	RL 0,35W 6,81KOHM+-1% RESISTOR DRALORIC SMA 0207/6,81K-F-C	RL 082.2560	
		647.5310.01 SA	BL 3+

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 R. SCHNEIDER & SÖHNE	ÄZ Datum Date 12 1285	Schaltteilliste für Parts list for ED STEUERTEIL CONTROL CIRCUIT	Sachnummer Stock No. 647.5310.01 SA	Blatt Page 4
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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
BIS/TO R56 R57	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
BIS/TO R60 R61	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
BIS/TO R66 R67	RL 0,35W 3,92KOHM+-1%TK50 RESISTOR	RL 083.1039	
BIS/TO R70 R71	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
BIS/TO R79 R80	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
BIS/TO R88 R91	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R92	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R93	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R94	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R96	RL 0,35W 1,30MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 1,30MOHM 1% TK50	RL 099.8121	
R97	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R98	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R99	RL 0,35W 2,21KOHM+-1%TK50 RESISTOR DRALORIC SMA 0207/2,21K-F-C	RL 082.2477	
R100	RL 0,35W 2,21MOHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 2,21MOHM 1% TK50	RL 099.8173	
R101	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	



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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthaltene in contained in
R102	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R110	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R112	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R113	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R114	RL 0,35W 182 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/1820HM-F-D	RL 083.0010	
R132	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R140	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
BIS/TO R143 R145	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R146	RL 0,35W 47,5KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/47,5K-F-C	RL 083.1800	
R147	RL 0,35W 221 KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/221K-F-C	RL 083.2270	
R148	RL 0,35W 6,81 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 6,81 OHM 1% TK50	RL 099.8067	
R149	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,50HM-F-D	RL 082.9507	
R150	RL 0,35W 47,5 OHM+-1%TK50 RESISTOR DRALORIC SMA0207/47,50HM-F-D	RL 082.9507	
R151	RL 0,35W 2,74KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/2,74K-F-D	RL 083.0926	
V1	AE BZX85/C6V2 1,3W Z-DI ZENER DIODE THOMSON BZX85/C6V2	AE 092.8249	
V2	AE BZX85/C18 1,3W Z-DI ZENER DIODE THOMSON BZX85/C18	AE 092.8310	
V7 BIS/TO V11	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
V13	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
BIS/TO V16			
V17	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
V19	AE 5082-2800 SCHOTTKYDI DIODE	AE 012.9066	
V20	HEWLETT-P. 5082-2800 AE BZX85/C75 1,3W Z-DI ZENER DIODE THOMSON BZX85/C75	AE 092.8449	
BIS/TO V23			
V25	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
BIS/TO V27			
V33	AG 1N4007 GL1000V 1A0 RECTIFIER AEG-TELEF 1N4007	AG 013.0310	
BIS/TO V36			
V41	AL BDX34B PNP 80V DARL TRANSISTOR RCA BDX34B	AL 092.9339	
V42	AL BDX33B NPN 80V DARL TRANSISTOR RCA BDX33B	AL 092.9322	
BIS/TO V45			
V50	AD 1N4448 75V 0,15A UDI DIODE	AD 012.0700	
BIS/TO V54			
X10	FP STECKERLEISTE 36POL. PIN CONNECTOR 13-POLIG	FP 230.2103	
X11	FJ EINBAUSTECKER SYST.SMB PLUG SOCAPEX SX 02B.2005	FJ 063.5168	
X12	FJ EINBAUSTECKER SYST.SMB PLUG SOCAPEX SX 02B.2005	FJ 063.5168	
X30	FP WINKELVERBINDER 10POL ANGLE PIN CONNECTOR BERG 75789-101-10	FP 540.5743	
X40	FP WINKELVERBINDER 20POL ANGLE PIN CONNECTOR BERG 75789-101-20	FP 540.5750	
X50	FP STIFTLISTE 36POL. CONNECTOR BINDER 11-0169-00-36 2-POLIG	580.6034	

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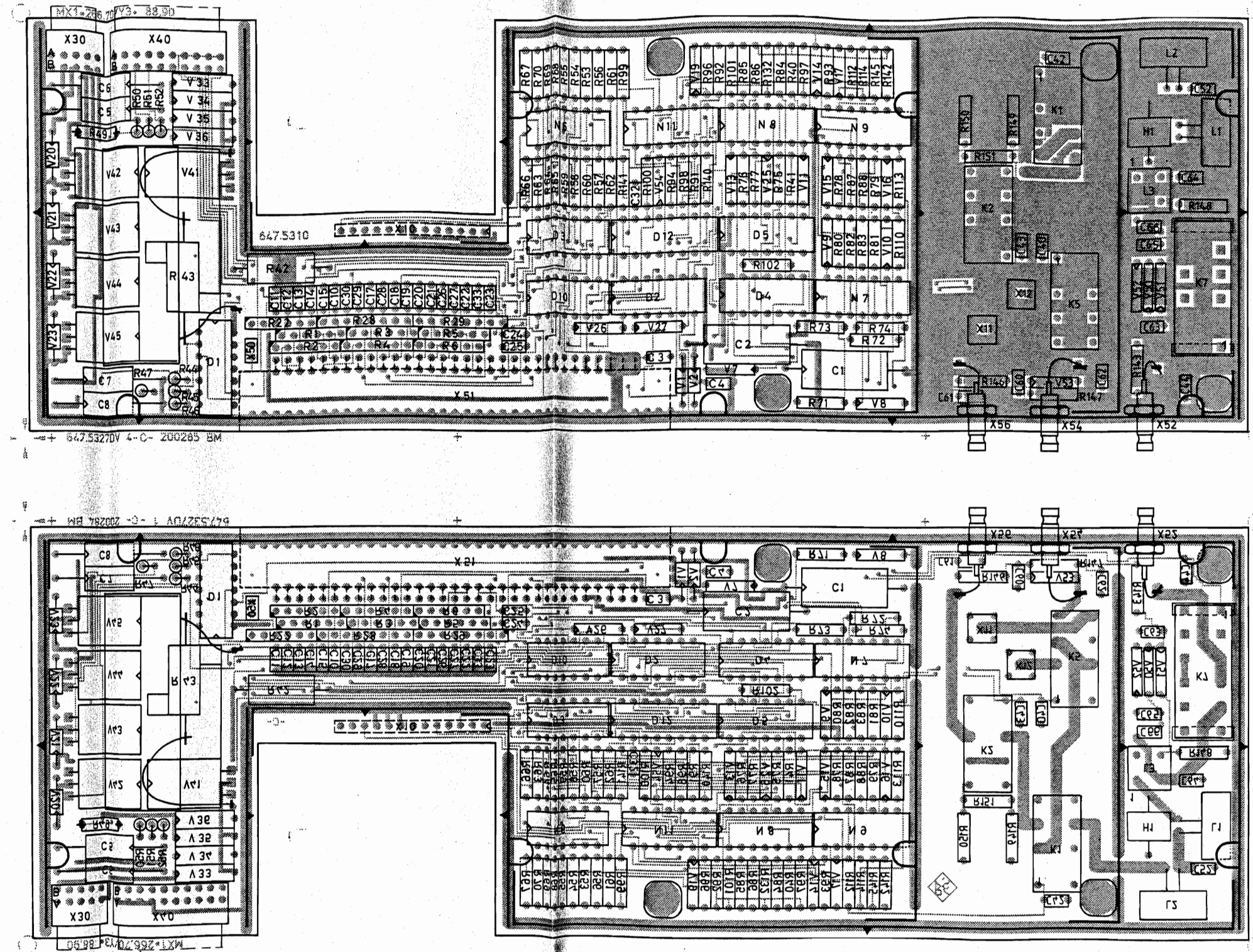
7

Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
X51	FP STECKERLEISTE 64P. ABGEW 64-PIN INSERT ERNI 9722.333.403.1	FP 565.1429	
X52	FJ EINBAUSTECKER SYST. SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	
X54	FJ EINBAUSTECKER SYST. SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	
X56	FJ EINBAUSTECKER SYST. SMB FIXED CONNECTOR ROSENBERG 59S601-200D2	FJ 063.5116	
			- ENDE -

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Ansicht und Leitungsführung Lötseite
View of tracks on solder side



G	35383	04.86	BM	Maße ohne Toleranzangabe		Maßstab 1 : 1				
						Halbzeug, Werkstoff				
				6KBH	Tag	Name	Benennung STEUERTEIL CONTROL CIRCUIT			Z
				Bearb.	04.86	BM				
				Gepr.						
			Norm							
Änder- Zust	Änderungs- Mitteilung	Tag	Name	 ROHDE & SCHWARZ		Zeichn.-Nr.		Blatt-Nr.		
						647.5310.01		2		
								v. Bl.		
				zu Gerät FK 85 P4		reg. i. V. 647 5010 V		erste Z 647 2011		



ROHDE & SCHWARZ

Repair Manual

TRACKING PROCESSOR

GS 085P1

651.9117

TRACKING PROCESSOR

GS 085P1

Repair Manual
Part 0: List of Contents

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2. Preparation for Use and Operation (see User Manual) .	2.1
3. Maintenance (see User Manual) .	3.1
4. Troubleshooting (see User Manual) .	4.1
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TRACKING PROCESSOR
GS 085P1

Repair Manual
Part 0: List of Contents

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Appendix *****

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Parts List of Tracking Processor	651.9117.01SA
Parts List of Tracking Processor	651.9130.01SA
Components Layout of Tracking Processor	651.9130.01, p. 2

5. Description of Function

5.1 Tracking Processor

(See Circuit Diagram 651.9117.01S, pages 1 to 4)

The Tracking Processor GS 085P1 is assigned to the motor-tuned Filter FK 852P4. From the frequency information that comes from the processor of VLF-HF Receiver EK 085 it generates the necessary driving signals for the motor-tuned filter.

The central unit of the tracking processor is the 8085 processor D13. The CPU contains a clock oscillator that produces the system timing of 3.072 MHz with control crystal B1 (6.144 MHz) and outputs this on pin 37.

The switch-on reset, which resets the CPU to a defined initial state, comes from the power supply via two pulse-shaping Schmitt triggers D2. Of the RST interrupt inputs of CPU D13, input RST 7.5 is used for the VALID interrupt and input RST 6.5 for the TIMER interrupt.

Demultiplexer D15 selects the least significant eight address lines from the multiplexed address data bus and feeds them to EPROM D16. In EPROM D16, which occupies the address area 0000H to 2FFFFH, the operating program of the tracking processor is stored. Address decoder D14 decodes address lines A13 to A15 and generates the CS signals for I/O ports D12, D17 and EPROM D16.

Data are transferred to the tracking processor via connectors X31.a1 to

.a4 and X31.b1 to .b4. The data format contains the 4-bit frequency information, a 3-bit address and the VALID signal. The frequency information is transmitted in byte-serial form, i.e. transmission is successive for the individual decades.

The 3-bit address indicates the decade for which the data are intended. The VALID signal indicates the validity of the data.

The logic circuit with gates D1 to D4 delays the address signals against the frequency information so that 1-out-of-8 decoder D5 is not enabled until the frequency data are steady-state. Decoder D5 then generates the transfer signals for flipflops D6 to D11, which store the frequency data. When the frequency data for all decades have thus been transmitted in succession, the data appear in parallel form at the outputs of flipflops D6 to D11, from where they are read into ports PA, PB and PC of I/O port D12.

From these frequency data CPU D13 then computes the number of driving pulses and the direction of rotation for the stepping motor in the motor-tuned filter. The control signals are output on ports PA and PC of I/O port D17. Via port lines PB0 to PB3 the answer-back of the motor-tuned filter is read in for the setting of the stepping motor.

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GS 085P1

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Part 5: Description of Function

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NOTES

TRACKING PROCESSOR
GS 085P1

Repair Manual

Part 5: Description of Function

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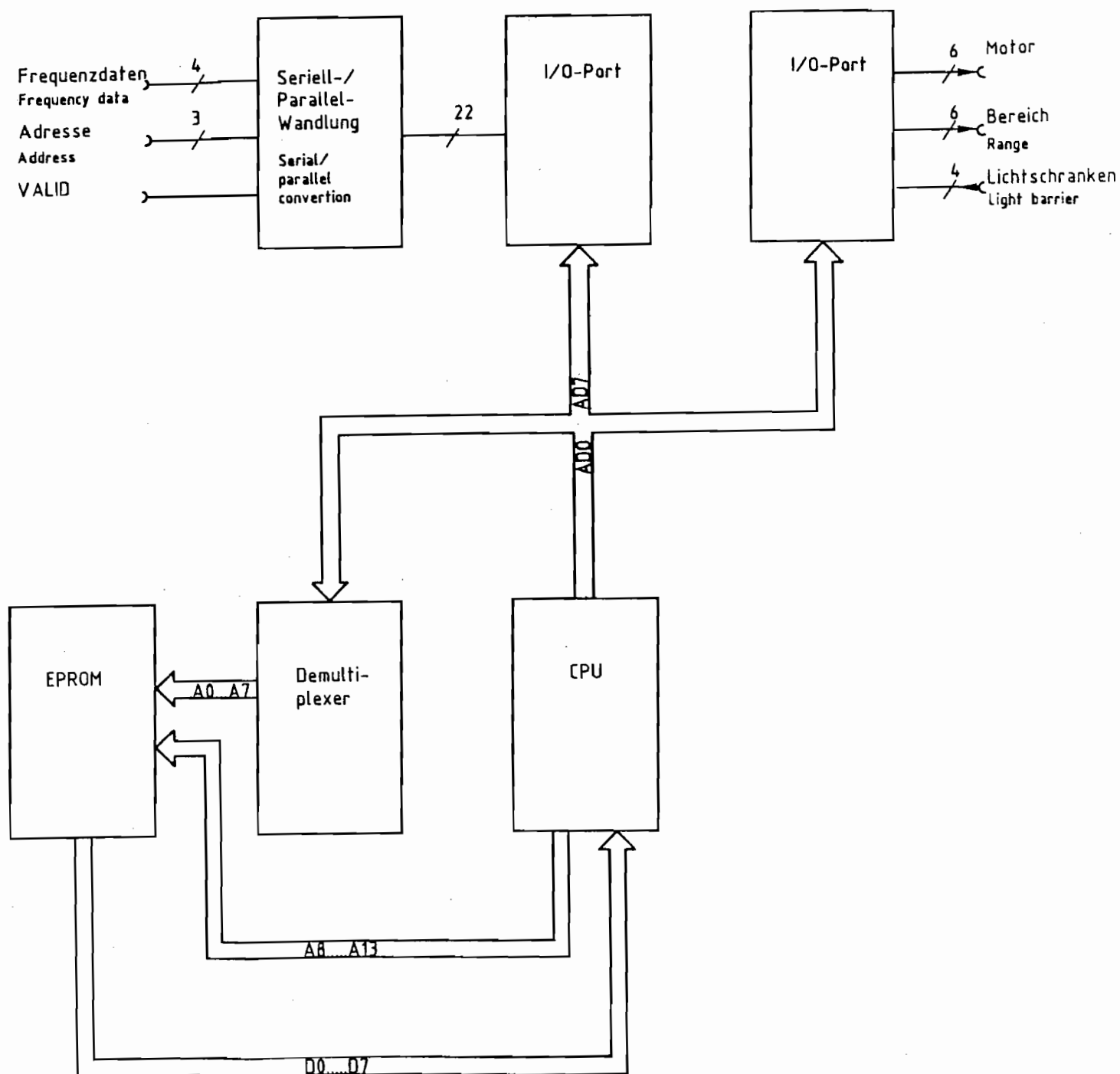


Fig. 5.1 Tracking Processor GS 085P1, Block Diagram



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MÜNCHEN

Schalteillisten
Stromläufe
Bestückungspläne
Parts lists
Circuit diagrams
Components plans

6. Repair

See Circuit Diagram, Parts List and Component Layout in the appendix to this repair manual (list on page 0.2).

6.1 Preliminary Remarks

The repair of Tracking Processor GS 085P1 consists of troubleshooting and fault elimination, of measurements and functional checks, of replacing components as well as of a final test.

All the information required for repairing the tracking processor down to component level is given in this section.

6.1.1 Troubleshooting Instructions

Any fault that occurs should be localized by checking the nominal values at the testpoints with the aid of the troubleshooting flowcharts in 6.3.

6.1.2 Restoring the Nominal Characteristics

Any component that is definitely proved to be defective - through use of the troubleshooting flowchart or by performing the measurements, alignments and functional checks - should only be replaced for a component that meets the specifications given in the parts list in the appendix to this repair manual.

Only in this way can the technical data be guaranteed that are given in section 1 of the user manual.

Once any components have been replaced, it is absolutely essential

that the final test of the tracking processor be performed as detailed in part 6.7.

6.1.3 Alignment

Following manufacture and before going into the test bay, the tracking processor is artificially aged according to requirement XNV 016.

This guarantees high stability of the nominal values once they have been set. If any non-aged components should be used in the course of repairs, a certain drift in individual values has to be expected.

For this reason it is advisable to perform an occasional check of the values given in 6.4.

6.1.4 Spare Parts

All components and subassemblies are subjected to strict quality control before they are installed in the tracking processor.

For components from outside suppliers, e.g. resistors, capacitors, diodes, transistors and integrated through to highly integrated circuits, R&S have set down their own delivery specifications for the purpose of ensuring maximum reliability. For this reason we recommend that only original spare parts be used as replacements for defective ones.

(Continuation)---

TRACKING PROCESSOR

GS 085P1

Repair Manual
Part 6: Repair

- 6.2 -

---(Continuation) Spare Parts

When ordering a spare part, please state the following:

type, ordering code and serial number of equipment, identity number of parts list and designation plus stock number of component.

All of these details are to be found in the circuit diagram, parts list and component layout attached to this manual.

6.1.5 Important User Information

The following points are important when carrying out any repairs. They are mentioned to avoid any misunderstandings.

- o All measurements are referred to ground, unless stated otherwise.

- o The abbreviations that appear in the text, e.g. X31.a1 and D5.2, are to be interpreted as follows:

X31.a1 connector X31, pin a1

D5.2 integrated circuit 5, pin 2

- o All components that appear in the following text and figures are entered in the circuit diagram 651.9117.01S, p. 1 to 4. Consequently the circuit diagram will not be continually referred to, instead only the appropriate page number will be mentioned.

- o For all alignments and measurements the tracking processor must be supplied with the operating voltages given in the circuit diagram.

- o Disconnect the operating voltage before undertaking any soldering work on the module or one of its subassemblies.

CAUTION CMOS!!!

- o Among the components installed in the tracking processor there are MOS, MOSFET and CMOS devices. Devices of this kind are extremely sensitive to high extraneous voltages. Static discharge can produce very high voltage spikes, which are capable of destroying these devices. Electrostatic charge is not felt until voltages exceed 3000 V. Sparks are only produced upwards of 5000 V. Less than 10 % of these values is enough to destroy semi-conductors, however, or to degrade their parameters, e.g. bipolar transistors (400 V), ECL and Schottky (300 V), VMOS and CMOS (150 V), MOSFETs (100 to 200 V). A person sitting at a workbench alone can produce approx. 500 V of static.

For this reason, when work is being carried out in the vicinity of these devices, i.e. unless a special CMOS workstation is available, the following minimum requirements should be observed;

- o conductive bench and floor coverings
- o chair or stool with conductive coverings
- o grounded, metallic work-surface, conductive wrist-straps with a resistance of $> 200 \text{ kohms} < 1 \text{ Mohm}$ plus an insulated lead and plug
- o soldering irons with safety grounding
- o all conductive surfaces, wrist-straps and work-surfaces must be interconnected by insulated leads
- o supply voltages must be disconnected before any soldering work is performed

TRACKING PROCESSOR

GS 085P1

Repair Manual

Part 6: Repair

- 6.3 -

6.2 Test Equipment and Special Tools

The test equipment and special tools specified in the following list will be required for performing the repairs described in this part of the manual.

Equivalent items of test equipment may be used, provided their technical data are as good as or better than those stated here.

6.2.1 Test Equipment List

Test equipment, required technical data	Recommended R&S unit	Ordering code
Logic analysis system with 24 analyzer channels, 20 MHz with 16-channel generator, 20 MHz and 8-channel general-purpose data driver	LAS	344.4010.02
	LAS-B6	345.8510.02
	LAS-Z7	345.9616.02
Frequency counter 10 MHz, sensitivity 10 mV		
Service kit	KA 085C1	699.4015.02

6.3 Troubleshooting Flowchart

The troubleshooting is based on the following premises:

- o the tracking processor has been pinpointed as defective
- o the operating voltages are present

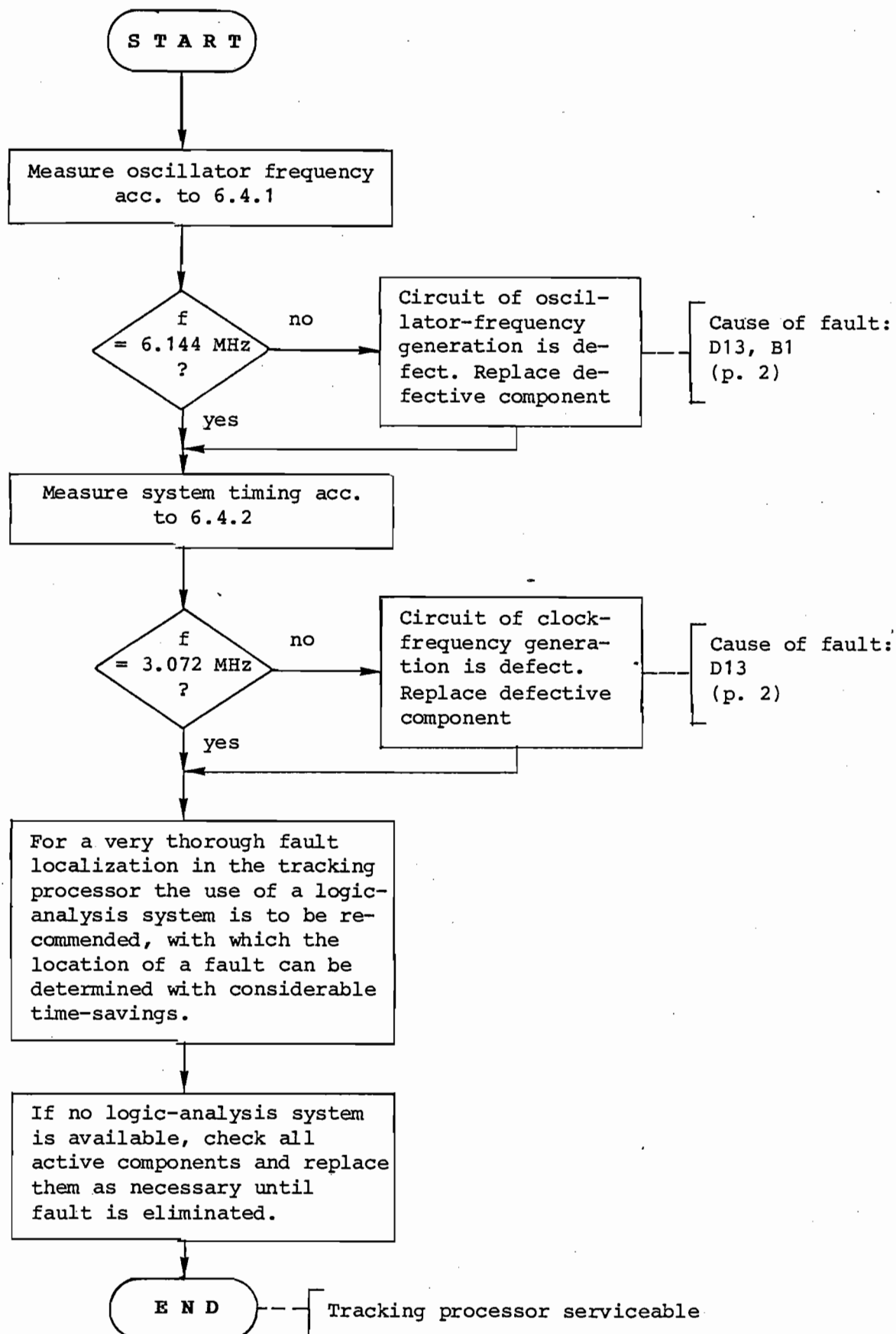
6.3.1 Troubleshooting: Tracking Processor

The troubleshooting described here clarifies the possible causes of interference in operation produced by a defective tracking processor.

- o For the following troubleshooting the tracking processor must be adapted in the receiver.

TRACKING PROCESSOR
GS 085P1Repair Manual
Part 6: Repair

- 6.4 -



6.4 Measurements and Functional Tests

6.4.1 Measurement of Oscillator Frequency

Measure oscillator frequency with frequency counter on D13.2 (p. 2).

Nominal value: $f = 6.144 \text{ MHz}$

1. Undo six screws (1, Fig. 6.1) and remove top cover (2) of housing.

2. Undo four screws (22) and remove bottom cover (13) of housing.

6.4.2 Measurement of System Timing

Measure system timing with frequency counter on D13.37 (p. 2).

Nominal value: $f = 3.072 \text{ MHz}$

6.6.1 Removal of Tracking Processor

1. Undo four screws (4 and 27, Fig. 6.1) marked red. Lift cassette (30), push it sideways as far as it will go and set down on mainframe.

2. Undo two screws (29) marked red on tracking processor (28) and four screws (3 and 25) on motor-tuned filter (26).

3. Detach ribbon cables on connectors X24 on control unit, X32 and X33.

4. Detach three HF cables from motor-tuned filter (26).

5. Withdraw motor-tuned filter and tracking processor sideways from cassette.

6.5 Setting and Alignment

No settings or alignments have to be made in the tracking processor. The available jumpers serve for testing purposes but are of no importance for troubleshooting.

6.6 Replacement of Assemblies

CAUTION!

Detach the power and battery cables before removing any subassemblies from the housing of the receiver.

Note:

With the desktop model the panelling has to be removed before the module can be removed/replaced. Proceed as follows:

6.6.2 Installation of Tracking Processor

The tracking processor is installed in the receiver in the reverse order of the removal described above.

TRACKING PROCESSOR
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6.7 Final Test

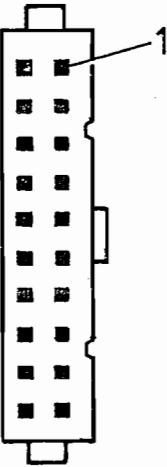
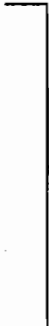
After a repair has been carried out, the Tracking Processor GS 085P1 must be subjected to a final test to ensure that its technical data can still be guaranteed.

A functional check is made in conjunction with the receiver to ensure that

they function correctly together.

If this final test does not prove satisfactory, the troubleshooting acc. to 6.3 will have to be performed again. Repeat the procedure as many times as is necessary to detect and remedy all faults.

6.8 External Interfaces

<u>External Interfaces</u>		
Connector	Contact	Signal designation/level
X24 20-way FP socket strip 	a1 a2 a3 a4 a5 a6 a7 a8 a9 a10 b1 b2 b3 b4 b5 b6 b7 b8 b9 b10	F1 F4 A1 A4 STROBE 9 D1 +5.3 VDC Ground Ground +16 VDC F2 F8 A2 Valid D0 Reset +5.3 VDC Ground -16 VDC +16 VDC
X32 64-way connector strip	a1 a2 a3 a4 a5 a6 a7 a8 a9 a10 a11 a12 a13 a14 a15 a16 a17 a18 a19 a20 a21 a22	 Not used STROBE 9 D0 D1  Not used

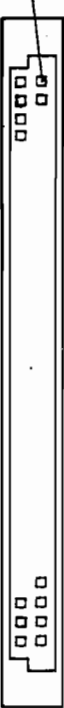
(Continuation)---

TRACKING PROCESSOR GS 085P1

Repair Manual
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---(Continuation) External Interfaces

External Interfaces		
Connector	Contact	Signal designation/level
X32 continued contact a1 	a23	-16 VDC
	a24	+5.3 VDC
	a25	+5.3 VDC
	a26	Not used
	a27	Not used
	a28	+16 VDC
	a29	+16 VDC
	a30	 Ground
	a31	
	a32	
	b1	Not used
	b2	Not used
	b3	MO1E
	b4	MO2E
	b5	MO3E
	b6	MO4E
	b7	MOT
	b8	MES
	b9	FB1E
	b10	FB2E
	b11	FB3E
	b12	FB4E
	b13	FB5E
	b14	FB0E
	b15	LSM
	b16	LSH
	b17	LSA
	b18	LSE
	b19	 Not used
	b20	
	b21	
	b22	 Not used
	b23	
	b24	
	b25	+5.3 VDC
	b26	Not used
	b27	Not used
	b28	+16 VDC
	b29	+16 VDC
	b30	 Ground
	b31	
	b32	

TRACKING PROCESSOR GS 085P1

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Part 6: Repair

- 6.9/6.10

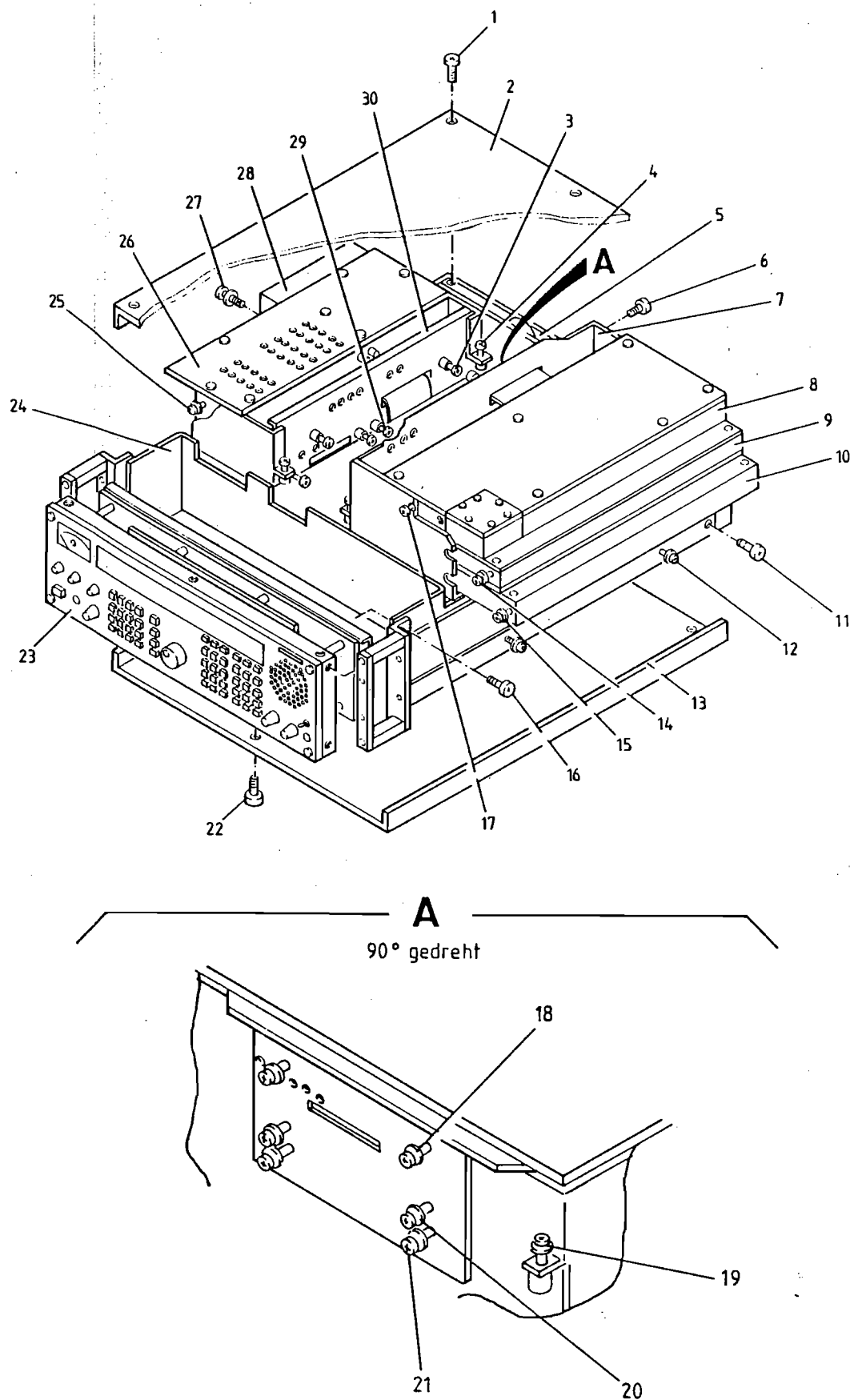
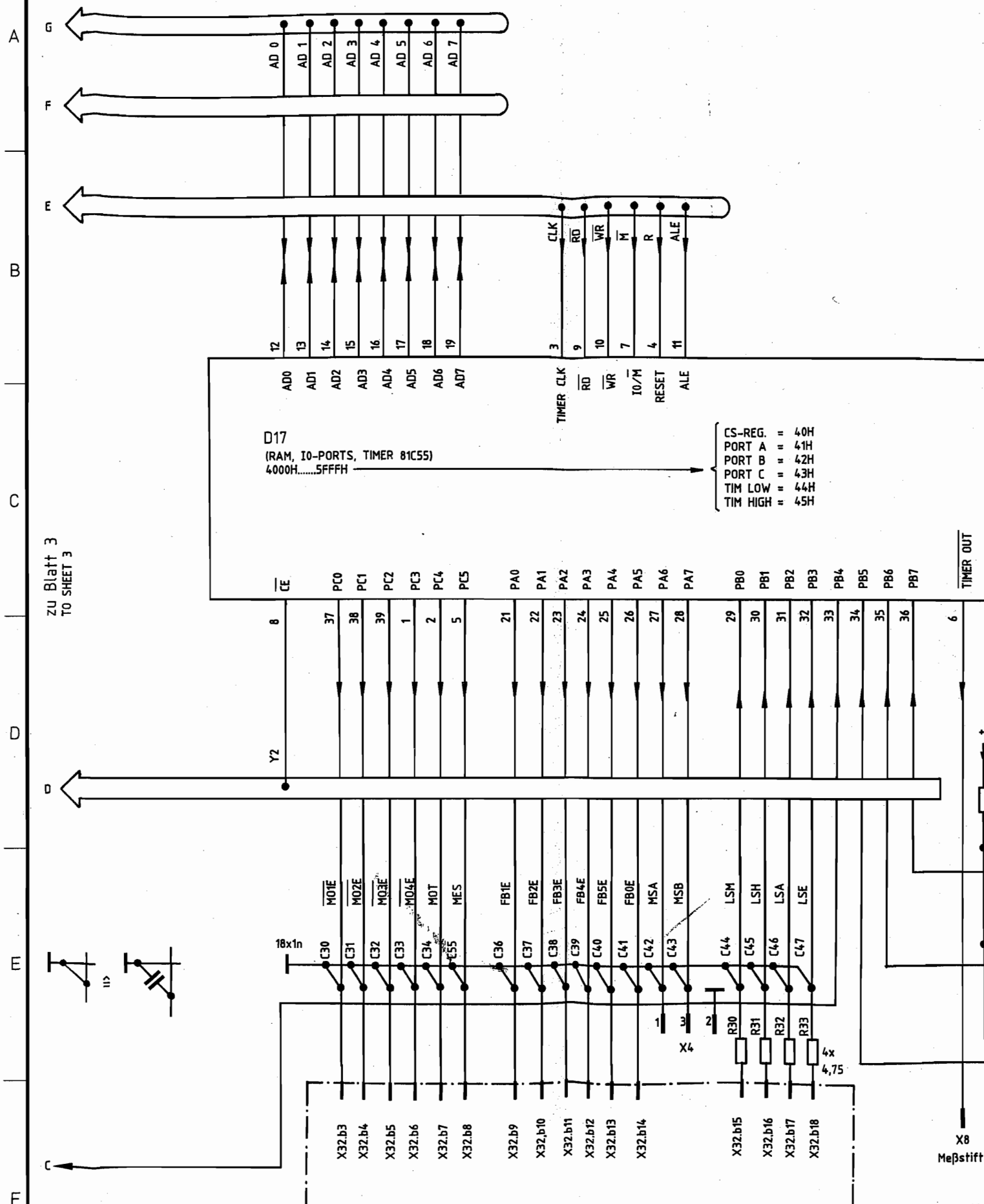


Fig. 6.1 Removal of Tracking Processor GS 085P1



	Type	+5,3V	$\perp$	C X
D1	14584	14	7	C101 100n
D2	14584	14	7	C102 100n
D3	4030	14	7	C103 100n
D4	14073	14	7	
D5	4028	16	8	C105 100n
D6	4076	16	8	
D7	4076	16	8	
D8	4076	16	8	C108 100n
D9	4076	16	8	
D10	4076	16	8	C110 100n
D11	4076	16	8	C111 100n
D12	81C55	40	20	C112 100n
D13	80C85	40	20	C113 100n
D14	74HC138	16	8	C114 100n
D15	74HC373	20	10	C115 100n
D16	27C64	28	14	C116 1µ
D17	81C55	40	20	C117 100n

CX von VCC nach VSS
CX FROM VCC TO VSS

A31.1 651.9130.01 Mitlaufsteuerung eigene SA
SEPERATE PARTS LIST

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



ROHDE & SCHWARZ

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Datum
Date

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Schalttailliste für
Parts list forGS085P1 MITLAUFSTEUERUNG
GS085P1 TRACKING PROC.Sachnummer
Stock No.

651.9117.01 SA

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Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in
.	VARIANTENERKL. / VERSIONS VAR 02 = GRUNDAUSFUEHRUNG MOD 02 = BASIC MODEL		
A31.1	ED MITLAUFSTEUERUNG HIERZU STROML. 651.9117 S SEE CIRC.DIAGR.651.9117 S	651.9130.02	
W30	DX FLACHBANDKABEL 64POL.	651.7566	
X33	FP BUCHSENLEISTE 64POL. CONNECTOR PANDUIT 120-064-435+100 000-	FP 566.1297	651.7566
X34	FP BUCHSENLEISTE 64POL. CONNECTOR PANDUIT 120-064-435+100 000-	FP 566.1297	651.7566
			- ENDE -

651.9117.01 SA BL 1-



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Date

Schaltteilliste für
Parts list for

ED MITLAUFSTEUERUNG

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1

Kennzeichen
Component No.

Benennung/Beschreibung
Designation

Sachnummer
Stock No.

enthalten in
contained in

•
VARIANTENERKL. / VERSIONS
VAR 02 = GRUNDAUSFUEHRUNG
MOD 02 = BASIC MODEL

B1 EQ 6,144 MHZ CL30PF HC43U
QUARTZ CRYSTAL UNIT

EQ 091.0221

C1 CC 1NF+-10%200V5K1200VIEL
CAPACITOR
UNION CARB CK05BX102K

CC 068.4047

BIS/TO

C4

C5 CC 220PF+-10%200V K1200VI
CAPACITOR
UNION CARB CK05BX221K

CC 060.1078

C6 CC 220PF+-10%200V K1200VI
CAPACITOR
UNION CARB CK05BX221K

CC 060.1078

C7 CC 220PF+-10%200V K1200VI
CAPACITOR
UNION CARB CK05BX221K

CC 060.1078

C8 CC 1NF+-10%200V5K1200VIEL
CAPACITOR
UNION CARB CK05BX102K

CC 068.4047

BIS/TO

C11

C20 CK 100NF+-5%63V5RM MKT
CAPACITOR

CK 099.2930

WIMA MKS/2/63/0,1UF/5%

C21 CK 1UF+-10%50V5RM MKT
CAPACITOR

CK 099.2998

WIMA MKS2/50/1UF/10%

C22 CC 15PF+-2%3X4NPO
CAPACITOR

CC 087.6441

VALVO 2222 678 10159

C23 CC 15PF+-2%3X4NPO
CAPACITOR

CC 087.6441

VALVO 2222 678 10159

C24 CK 100NF+-5%63V5RM MKT
CAPACITOR

CK 099.2930

WIMA MKS/2/63/0,1UF/5%

C30 CC 1NF+-10%200V5K1200VIEL
CAPACITOR
UNION CARB CK05BX102K

CC 068.4047

BIS/TO

C47

C50 CC 220PF+-10%200V K1200VI
CAPACITOR

CC 060.1078

UNION CARB CK05BX221K

C101 CK 100NF+-5%63V5RM MKT
CAPACITOR

CK 099.2930

WIMA MKS/2/63/0,1UF/5%

C102 CK 100NF+-5%63V5RM MKT
CAPACITOR

CK 099.2930

WIMA MKS/2/63/0,1UF/5%

651.9130.01 SA BL 1+

Für diese Unterlage behalten wir
uns alle Rechte vor

 ROHDE & SCHWARZ	AZ Datum Date 02 0286	Schaltteilliste für Parts list for ED MITLAUFSTEUERUNG	Sachnummer Stock No. 651.9130.01 SA	Blatt Page 2
Kennzeichen Component No.	Benennung/Beschreibung Designation	Sachnummer Stock No.	enthalten in contained in	
C103	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930		
C105	WIMA MKS/2/63/0,1UF/5% CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930		
C108	WIMA MKS/2/63/0,1UF/5% CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930		
C110	WIMA MKS/2/63/0,1UF/5% CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930		
BIS/TO				
C115				
C116	CK 1UF+-10%50V5RM MKT CAPACITOR	CK 099.2998		
	WIMA MKS2/50/1UF/10%			
C117	CK 100NF+-5%63V5RM MKT CAPACITOR	CK 099.2930		
	WIMA MKS/2/63/0,1UF/5%			
D1	BL MC14584BALD6XSCH.TRIGG SCHMITT TRIGGER	BL 522.4549		
	MOTOROLA MC1458BALD			
D2	BL MC14584BALD6XSCH.TRIGG SCHMITT TRIGGER	BL 522.4549		
	MOTOROLA MC1458BALD			
D3	BL CD4030BF 4X2IN.EXORG EXOR GATE	BL 086.8134		
	RCA CD4030BF			
D4	BL MC14073BAL 3X3IN. ANDG AND GATE	BL 418.0141		
	RCA CD4073BF			
D5	BL SCL4028BC BCD/DEC.DEC BCD/DECADE DECODER	BL 290.1178		
	MOTOROLA MC14028BAL			
D6	BL CD4076BE 4BIT-D-REG. D-REGISTER	BL 337.9479		
	RCA CD4076BE			
BIS/TO				
D11				
D12	BC MSM81C55RS I/O+TIM+RAM 2K-RAM INPUT/OUTPUT	BC 633.9025		
	OKI MSM81C55RS			
D13	BC MSM80C85A 8B.CPU CMOS CPU	BC 633.9019		
	OKI MSM80C8 5ARS			
D14	BL MM74HC138N 3/8L.DECOD 3-TO-8 LINE DECODER	BL 571.3165		
	MOTOROLA MC74HC138N			
D15	BL MM74HC373N 8XD-LATCH OCTAL D-TYPE LATCH TRIST.	BL 645.6726		
	TEXAS SN74HC373N			
D16	SOFTWARE N.BESTUECKUNGSP	653.2784.90		
D17	BC MSM81C55RS I/O+TIM+RAM 2K-RAM INPUT/OUTPUT	BC 633.9025		
	OKI MSM81C55RS			
651.9130.01 SA BL 2+				



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Schaltteilliste für
Parts list for

ED MITLAUFSTEUERUNG

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3

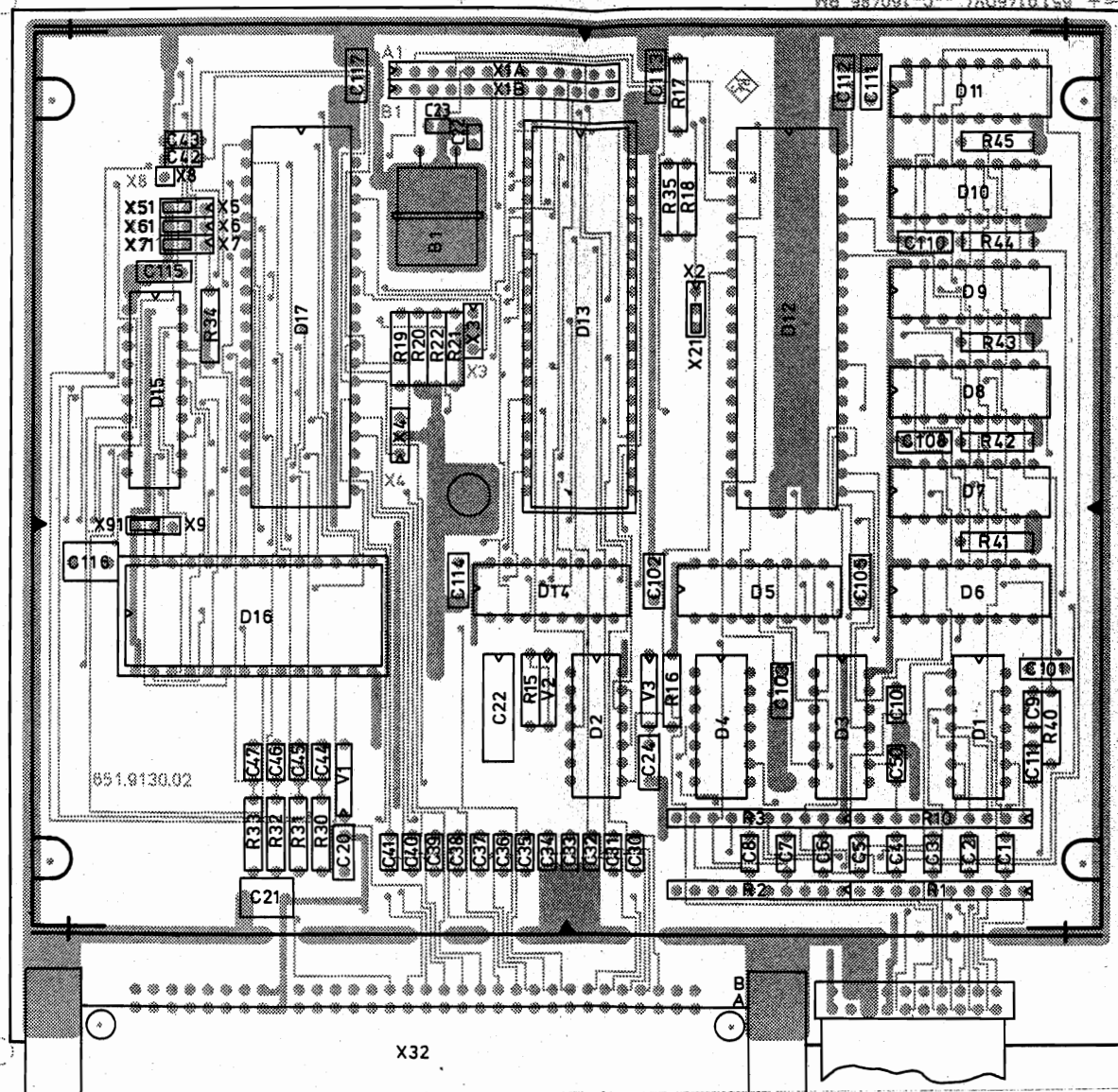
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R1	RN 5X3,9KOHM+-25SIL10 H5 RESISTOR NETWORK BOURNS 4310R-102-392	RN 504.0145	
R2	RN 5X3,9KOHM+-25SIL10 H5 RESISTOR NETWORK BOURNS 4310R-102-392	RN 504.0145	
R3	RN 9X22 KOHM+-2% SIL10 H5 RESISTOR NETWORK BOURNS 4310R-101-223	RN 344.6607	
R10	RN 5X3,9KOHM+-25SIL10 H5 RESISTOR NETWORK BOURNS 4310R-102-392	RN 504.0145	
R15	RL 0,35W 22,1KOHM+-1%TK50 RESISTOR DRALORIC SMA/207/22,1K-F-C	RL 083.1545	
R16	RL 0,35W 100KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/100K-F-C	RL 082.1764	
R17	RL 0,35W 1KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/1K-F-C	RL 082.2160	
R18	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R19	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R20	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R21	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R22	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
R30	RL 0,35W4,75 OHM+-1%TK50 METALFILMRESISTOR RESISTA MK2 4,75 OHM 1% TK50	RL 099.8021	
BIS/TO R33 R34	RL 0,35W 10,0KOHM+-1%TK50 RESISTOR DRALORIC SMA0207/10K-F-D	RL 083.1297	
R40	RL 0,35W 100 OHM+-1%TK50 DEPOS.-CARBON RESISTOR DRALORIC SMA0207/100/HM-F-D	RL 082.6543	
BIS/TO R45			
V1	AE BZX85/C6V2 1,3W Z-DI ZENER DIODE THOMSON BZX85/C6V2	AE 092.8249	
V2	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448	AD 012.0700	

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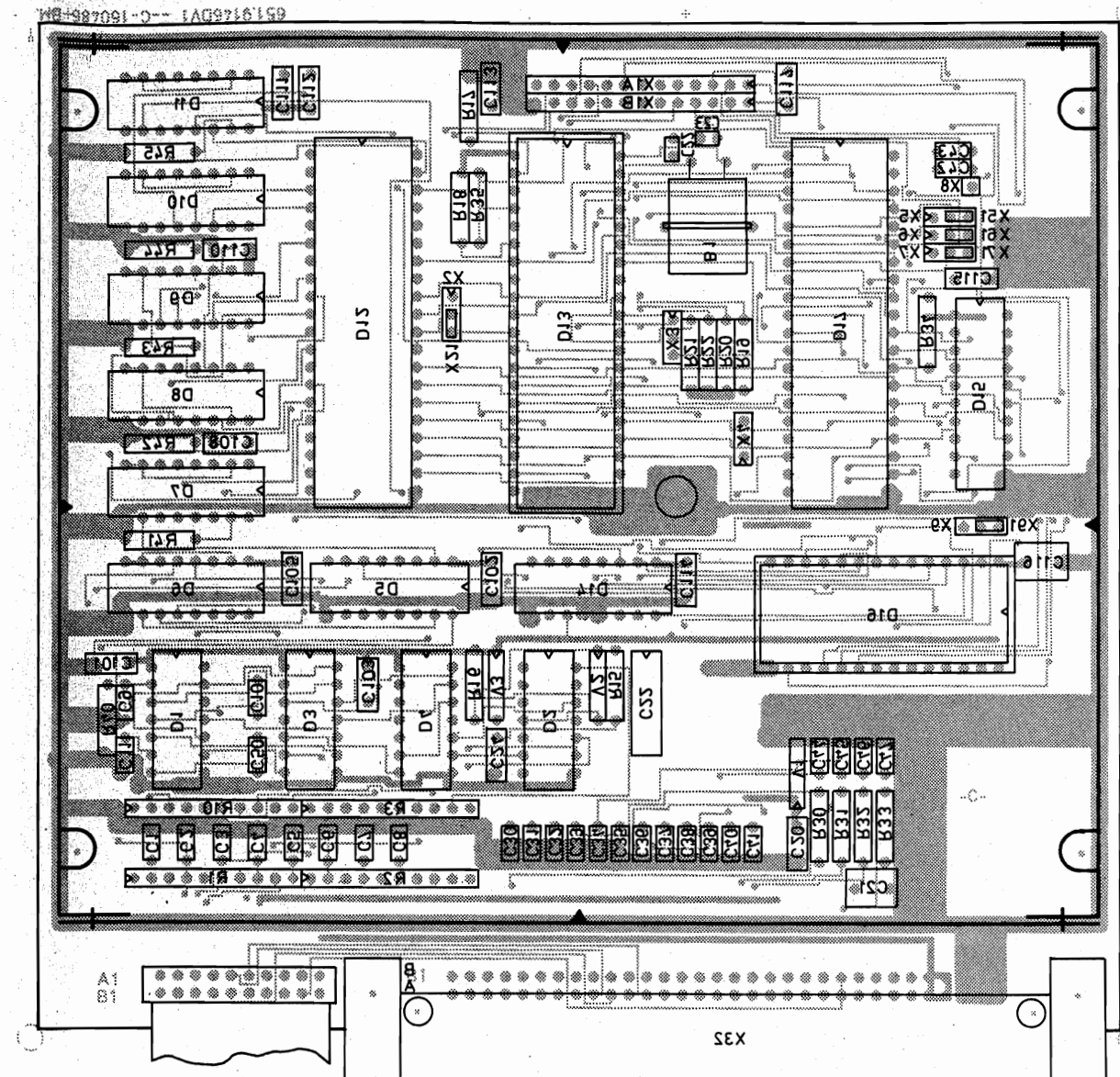
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 ROYDE & SCHWARZ		ÄZ Date	Datum Date	Schaltteilliste für Parts list for ED MITLAUFSTEUERUNG	Sachnummer Stock No.	Blatt Page
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Kennzeichen Component No.	Benennung/Beschreibung Designation			Sachnummer Stock No.	enthalten in contained in	
V3	AD 1N4448 75V 0,15A UDI DIODE VALVO 1N4448			AD 012.0700		
X1	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 2X13-POLIG			FP 242.3600		
X2	BESTEHT AUS/CONSISTING OF STECKER 242.3600 3-POL. BUCHSE 491.7042					
X3	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 3-POLIG			FP 242.3600		
X4	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36 3-POLIG			FP 242.3600		
X5	BESTEHT AUS/CONSISTING OF STECKER 242.3600 3-POL. BUCHSE 491.7042					
X6	BESTEHT AUS/CONSISTING OF STECKER 242.3600 3-POL. BUCHSE 491.7042					
X7	BESTEHT AUS/CONSISTING OF STECKER 242.3600 3-POL. BUCHSE 491.7042					
X8	FP INDIREKT.STECKERL.36P. PIN CONNECTOR BERG 75160-102-36			FP 242.3600		
X9	BESTEHT AUS/CONSISTING OF STECKER 242.3600 3-POL. BUCHSE 491.7042					
X21	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302			FP 491.7042		
X24	FP BUCHSENLEISTE 20P. CONNECTOR 20P. PANDUIT 050A-020-435A			FP 099.9440	651.7572	
X32	FP STECKERL.INDIR.64POLIG 64-PIN INSERT PANDUIT 100-064-033/999			FP 084.6470		
X51	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302			FP 491.7042		
X61	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302			FP 491.7042		
X71	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302			FP 491.7042		
X91	FP KURZSCHLUSSBUCHSE SHORTING PLUG PK 452-70302			FP 491.7042		
- ENDE -						
651.9130.01 SA BL 4-						

Ansicht und Leitungsführung Bauteilseite
View of tracks on component side



Ansicht und Leitungsführung Lötseite
View of tracks on solder side



Variationenerklärung siehe SA
EXPLANATION OF MODELS
SEE PARTS LIST

(hierzu HVC 250)



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

B	35701	04.86	BM	Maße ohne Toleranzangabe		Maßstab 1 : 1			
						Halbzeug, Werkstoff			
				6KBE	Tag	Name	Benennung MITLAUFSTEUERUNG TRACKING PROCESSOR		Z
				Bearb.	04.86	BM			
				Gepr.					
				Norm					
				 ROHDE & SCHWARZ			Zeichn.-Nr.		Blatt-Nr.
							651.9130.01		2
Änd. Zust.	Änderungs- Mitteilung	Tag	Name	zu Gerät GS 085 P1		reg. i. V. 651.9117 V		erste Z. 651.9117	
								v	Bl