

Pos	Ant	Förrådsbeteckning	Förrådsbenämning	Ursprungsbenämning	Ursprungs-beteckning
1	1	M3743-558011	Radioprovarare 558 MT		
2	1	M3743-558010	.Radioprovarare 558	Stabilock Funkgeräte Messplatz	SCHIN-STABILOCK 4011S
	1	M3743-558109	..Beskrivning handhav		
	1	M3743-558119	..Beskrivning service		
3	1	M1812-127020	..Nätkabel		
Tillbehör:					
4	1	M3437-558149	.Högeffektdämpare		SCHIN-40110
5	1	M3743-558169	.Övergångsbygel		SCHIN-380398
6	1	M3743-558159	.Övergångsbygel		SCHIN-380615
7	1	M3743-558189	.Mätkabel		
8	1	M3743-558199	.Transportlåda		SCHIN-770060

DATA

Mottagarmätningar	
Frekvensområde:	0,01...479,9999 MHz
Frekvensinställning:	Digital
Frekvensnoggrannhet:	1×10^{-7} efter 10 min vid 20°C
Frekvensdrift:	$1 \times 10^{-8}/24t$ efter 8 veckor uppv
Utspänning:	0,025 uV...19 mV EMK
	Direktutgång 0,5 uV...380 mV EMK
Impedans:	50 ohm
LF-oscillator:	0,3/0, 4/1/2, 7/3/4, 8 och 0,03...10 kHz
Amplitudmodulering:	0...100 %
Frekvensmodulering:	0...20 kHz
Fasmodulering:	0...5 rad
LF-voltmeter:	0...30 V
Frekvensområde:	30 Hz...20 kHz
Mätoggrannhet:	$\pm (5 \% + 1,5 \% \text{ av fsk})$ vid 1 kHz
Distorsionsmeter:	
Frekvens:	1 kHz $\pm 1 \%$
Mätområde:	0...20 %
Inspänning:	10 mV...30 V
Mätoggrannhet:	$\pm (12 \% + 1,5 \% \text{ av fsk}) + \text{egendis.}$
Egendistorsion:	< 0,5 %
SINAD-meter:	
Frekvens:	1 kHz $+ 1 \%$
Mätområde:	6,12 och 20 dB markeringar
Inspänning:	10 mV...30 V
Mätoggrannhet	6 dB: $\pm 1 \text{ dB}$, 12 dB: $\pm 2 \text{ dB}$, 20 dB: $\pm 3 \text{ dB}$
CCITT-filter:	Inkopplingsbart vid deviations- eller LF-mätning
Sändarmätningar	
Ektmeter:	
Frekvensområde:	1,5...480 MHz
Mätområde:	0,2...100 W
Mätoggrannhet:	$\pm (7 \% + 0,5 \% \text{ av fsk})$ 4...200 MHz. Frekvensgång $< \pm 3 \%$ inom 1,5...480 inom 1,5...480 MHz
Moduleringsmeter AM:	
Moduleringsfrekvens:	30 Hz...10 kHz
Mätområde:	0...100 %
Mätosäkerhet:	$\pm (5 \% + 1,5 \% \text{ av fsk})$ vid 1 kHz
Moduleringsmeter FM:	(även fasmodulering 0...5 rad)
Frekvensområde:	20...479,9999 MHz
Deviation:	0...20 kHz
Moduleringsfrekvens:	30 Hz...20 kHz
Mätosäkerhet:	$\pm (3 \% + 1,5 \% \text{ av fsk})$ vid 1 kHz
Stördeviation:	< 9 Hz (CCITT)
CCITT-filter:	Inkopplingsbart vid deviations- eller LF-mätning

DATA

Övrigt

Strömförsörjning:

Nät

220 V -15...+ 10 %. 50 VA

Yttre batteri

+ 12 V/ca 4,5 A

I drift: + 5...+ 40[°] C

Dimensioner:

534 x 450 x 460 mm (inkl militär låda)

Vikt:

31 kg

SERVICE INSTRUCTIONS

STAGE LOCATIONS

1. Immediate access is provided to the following stages subsequent to screwing off the covers without any further disassembly (figs. 1 and 2, page 4/8):

<u>Oscillator Stage</u>	213 016 / 213 017	l. h. instrument side
<u>Decade Stage</u>	211 021	instrument top
<u>Output Stage</u>	230 025	r. h. instrument side
<u>Supplementary Oscillator Stage on 4011</u>	213 014	instrument bottom

A 6 mm Allen key is required to open up these stages.

2. The Power Supply 204 022 is located directly on the inside of the instrument rear panel (fig. 3). Use test points recommended in fig. 3 for checking supply voltages. These test points as well as the fuse for the power supply of the Channel Selector Type 4932 are accessible subsequent to removal of the instrument bottom cover. To facilitate repair work on the Power Supply the instrument rear panel can be hinged open after having removed the 4 Phillips head screws connecting the bottom and top frame.

Should the Power Supply need to be operated in the hinged open position the connector St 8 (to mains switch fig. 3) must be disconnected and a two pole short-circuiting link (HNK 898 030) used instead of the mains switch.

3. The Control and Display Unit 209 021 contains the following assemblies apart from the control and display components (see fig. 4):

Modulation Selector	Board 361 088
AF Unit	Board 361 154
Receiver/Transmitter	
Test Changeover	Board 361 086
Frequency Counter	Circuit diagram 237 002
Modulation Generator	Circuit diagram 208 025/026
Diode Probe	Circuit diagram 229 006

All calibrating controls of Boards 361 088 and 361 154 are accessible from above after removing the outer covers with the aid of a long calibrating screwdriver.

SERVICE INSTRUCTIONS

STAGE LOCATIONS

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<u>Decade Stage</u>	211 021	instrument top
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Receiver/Transmitter	
Test Changeover	Board 361 086
Frequency Counter	Circuit diagram 237 002
Modulation Generator	Circuit diagram 208 025/026
Diode Probe	Circuit diagram 229 006

All calibrating controls of Boards 361 088 and 361 154 are accessible from above after removing the outer covers with the aid of a long calibrating screwdriver.

The location of the calibrating controls is shown in fig. 5, the arrangement of the calibrating components of all other stages being indicated in the corresponding chapters. The Control and Display Unit can be separated from the rear instrument unit to carry out major repairs on the AF Unit or on the Modulation Selector which is, however, not necessary for repairs to be carried out on the Modulation Generator, Frequency Counter and Diode Probe.

Instructions for removing the Control and Display Unit from the rear instrument section (see fig. 6):

- 1) Remove all four cover sheets
- ② Screw off adjustment knob for step attenuator
- 3) Loosen jack 22 (see fig. 4) after having removed the lock screw on the jack.
- 4) Disconnect plugs St 20 and St 32 (fig. 4)
- ⑤ Disconnect jack Bu 8 (see also fig. 3)
- ⑥ Disconnect two cable clamps
- ⑦ Disconnect cable from jack Bu 13
- ⑧ Remove 4 x 2 slotted head screws on case frame
- 9) Pull two instrument halves apart

4. Modulation Generator 208 025/026 (fig. 4)

All calibrating controls are accessible from the bottom of the instrument after having removed the floor cover. For location of calibrating components see drawing 361 087 chapter 4.

To remove the modulation generator take off front panel by removing six Phillips head screws and pulling off all control knobs.

After having removed the 3 central mounting nuts on the controls of the modulation generator the latter can be removed from the rear.

5. Should the Frequency Counter 237 002 (fig. 4) need to be removed for instrument repairs, front panel must also be removed (see instructions for 4. above).

Three screws remain to be loosened after having removed a spacing piece to the printed circuit board 361 154 located above, the three screws being necessary to mount the counter to the assembly plate. Depending on the serial number of the instrument these screws are accessible either from the front or rear of the assembly plate. In the latter instance disassembly of the counter is considerably facilitated when the rear panel of the instrument (power supply) is previously removed (necessitating removal of 8 screws).

6. Diode Probe 229 006 (fig. 1)

Remove by screwing off front panel (see 4) and loosening the two assembly plate screws together with a further screw connecting the bottom frame having previously screwed off plug St 12.

7. Crystal Stage 214 022 (fig. 3)

The crystal stage can be removed from underneath after having loosened the 4 Phillips head screws in the instrument rear panel.

8. 10 x 10 dB Step Attenuator 370 014 (fig. 3)

To remove the step attenuator take off the rear panel (necessitating removal of 8 Phillips head screws connecting bottom and top frame) and then remove adjustment knob and screening can (2 or 3 slotted head screws).

The step attenuator can then be removed after having disconnected the cable connections.

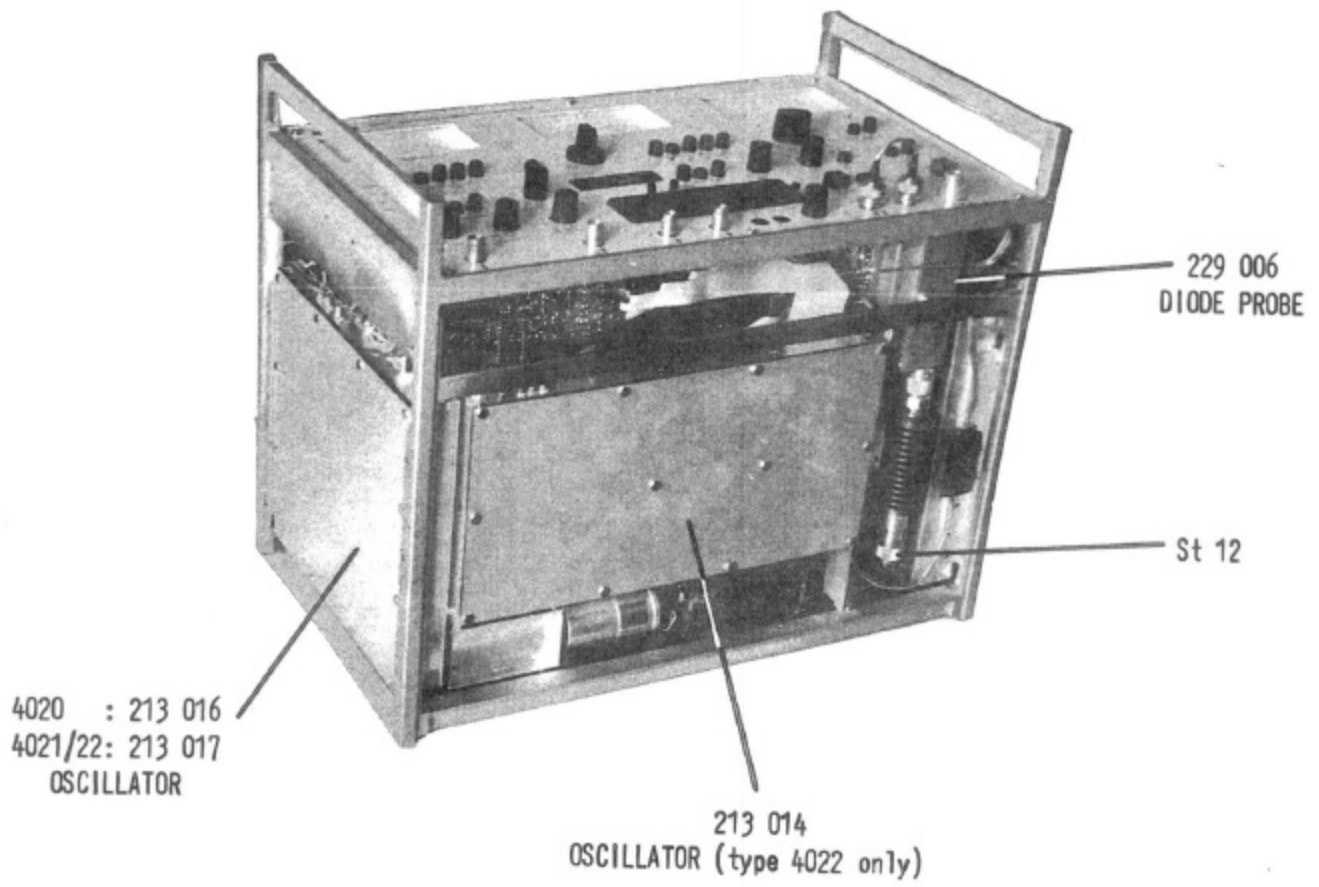


FIG. 1

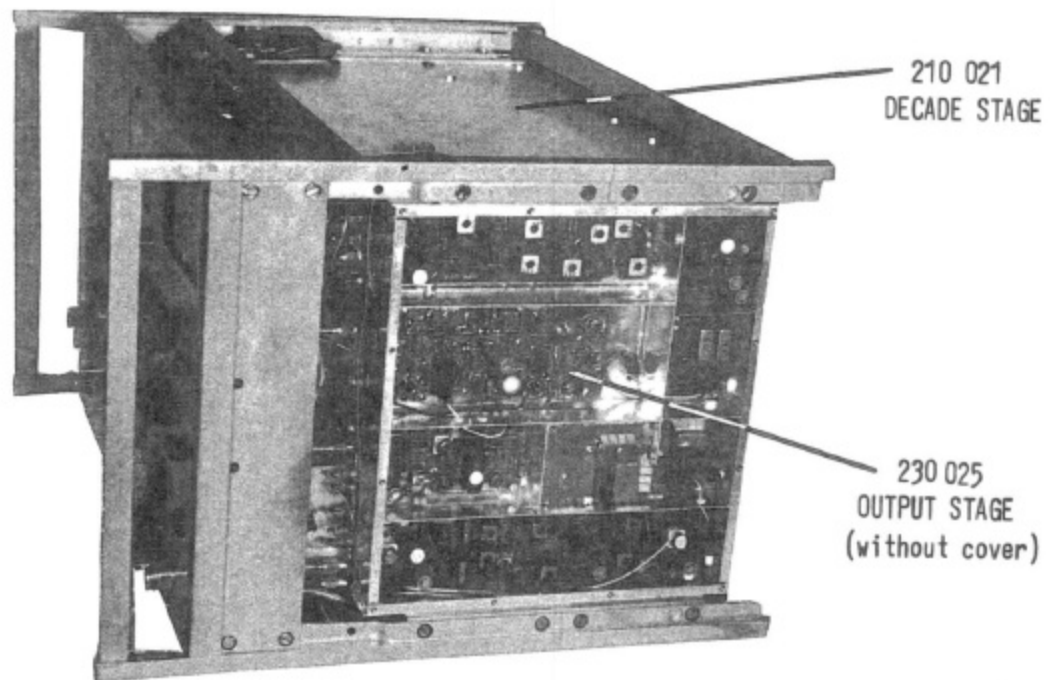
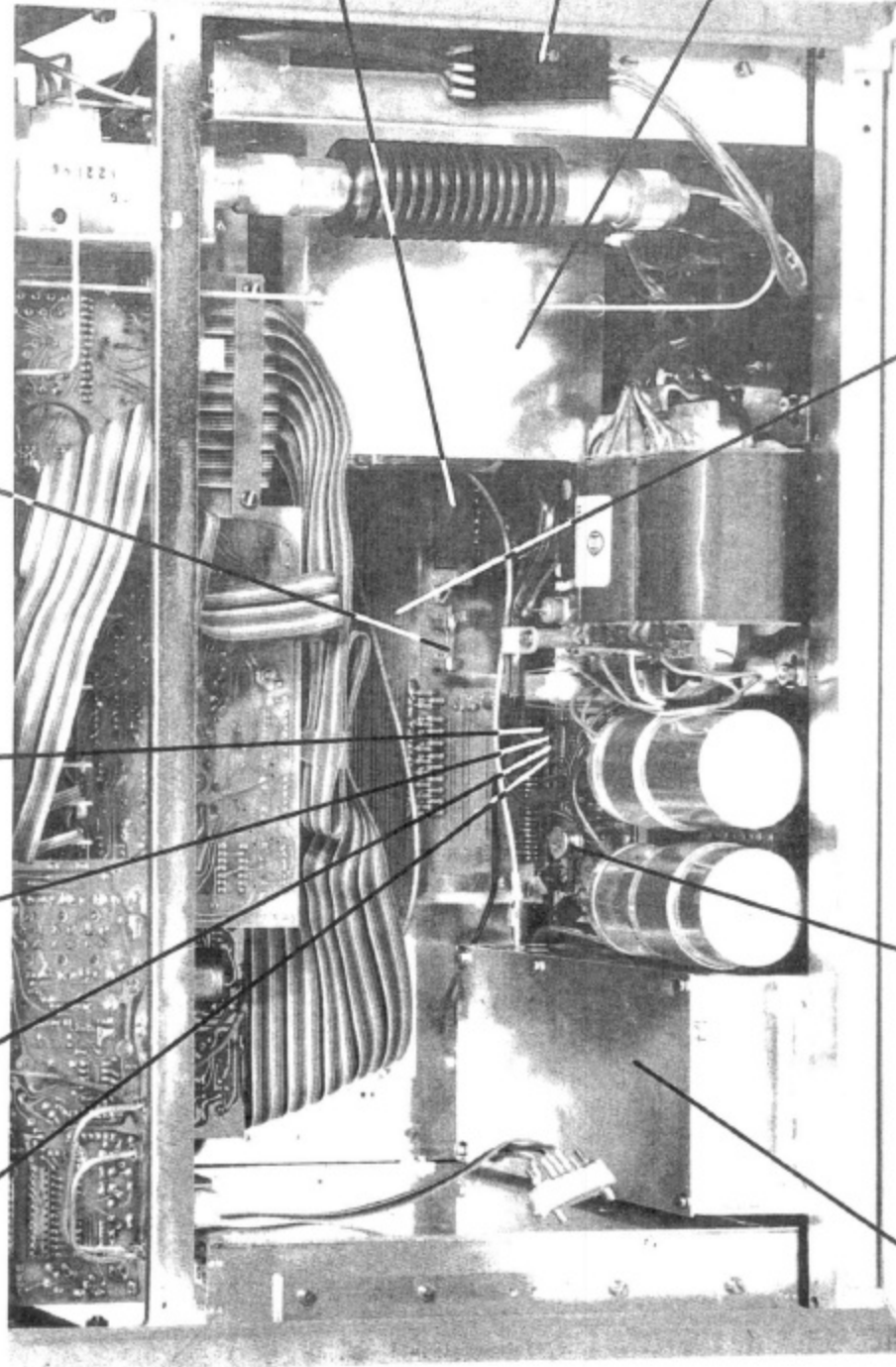


FIG. 2

CHECK POINTS FOR DC SUPPLY VOLTAGES

LEAD COLOR: brown +5 V (Sensor)
green +5 V
red +14 V
violet ca. +8 V

FUSE FOR CHANNEL SELECTOR TYPE 4932



Bu 23

Bu 8

370 014
STEP ATTENUATOR
10 x 10 dB

360 759

INTERCONNECTING PC BOARD OF THE DECADE STAGE

204 022
POWER SUPPLY

214 022
CRYSTAL OSCILLATOR

FIG. 3: BOTTOM VIEW

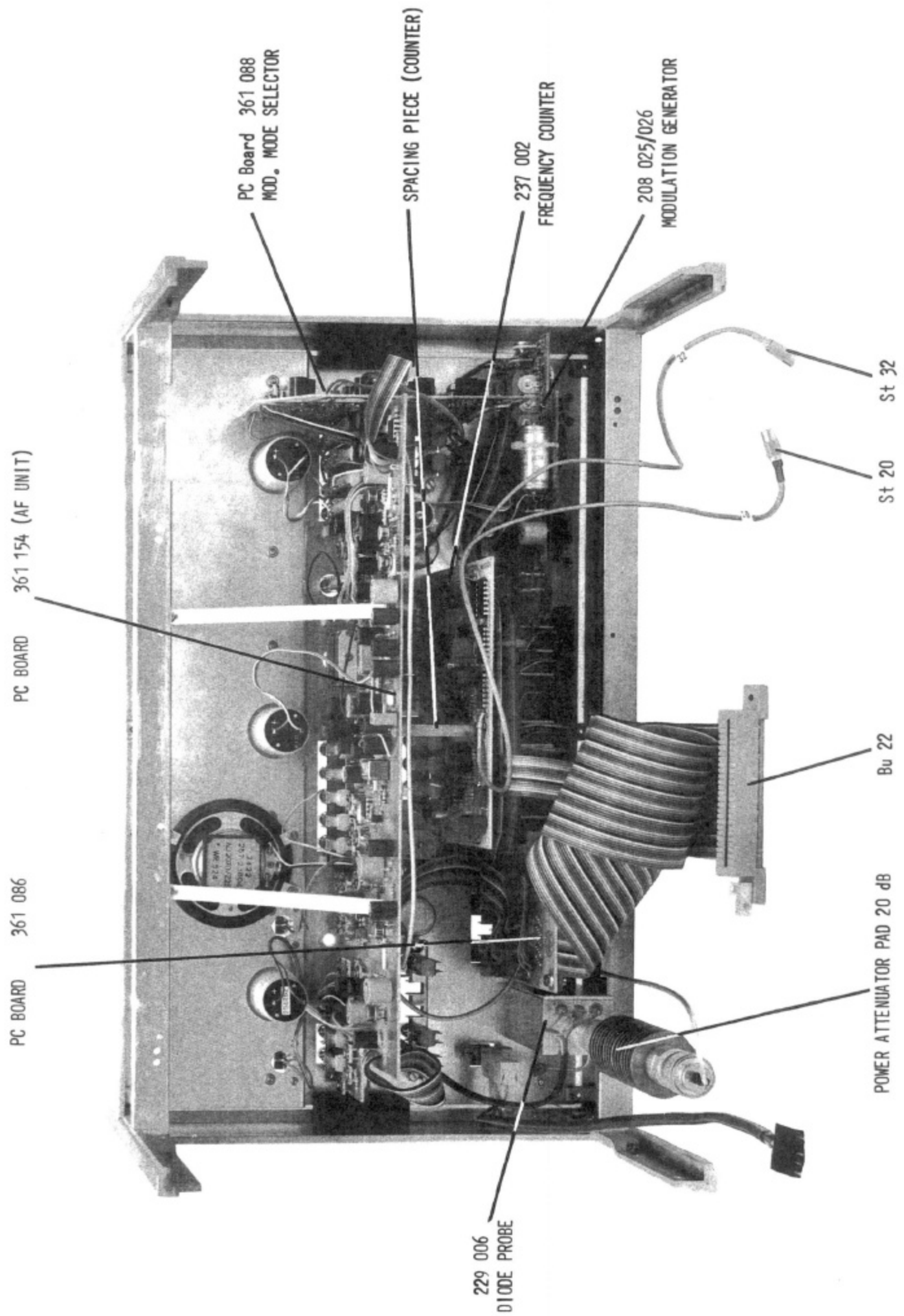


FIG. 4: CONTROL AND DISPLAY UNIT

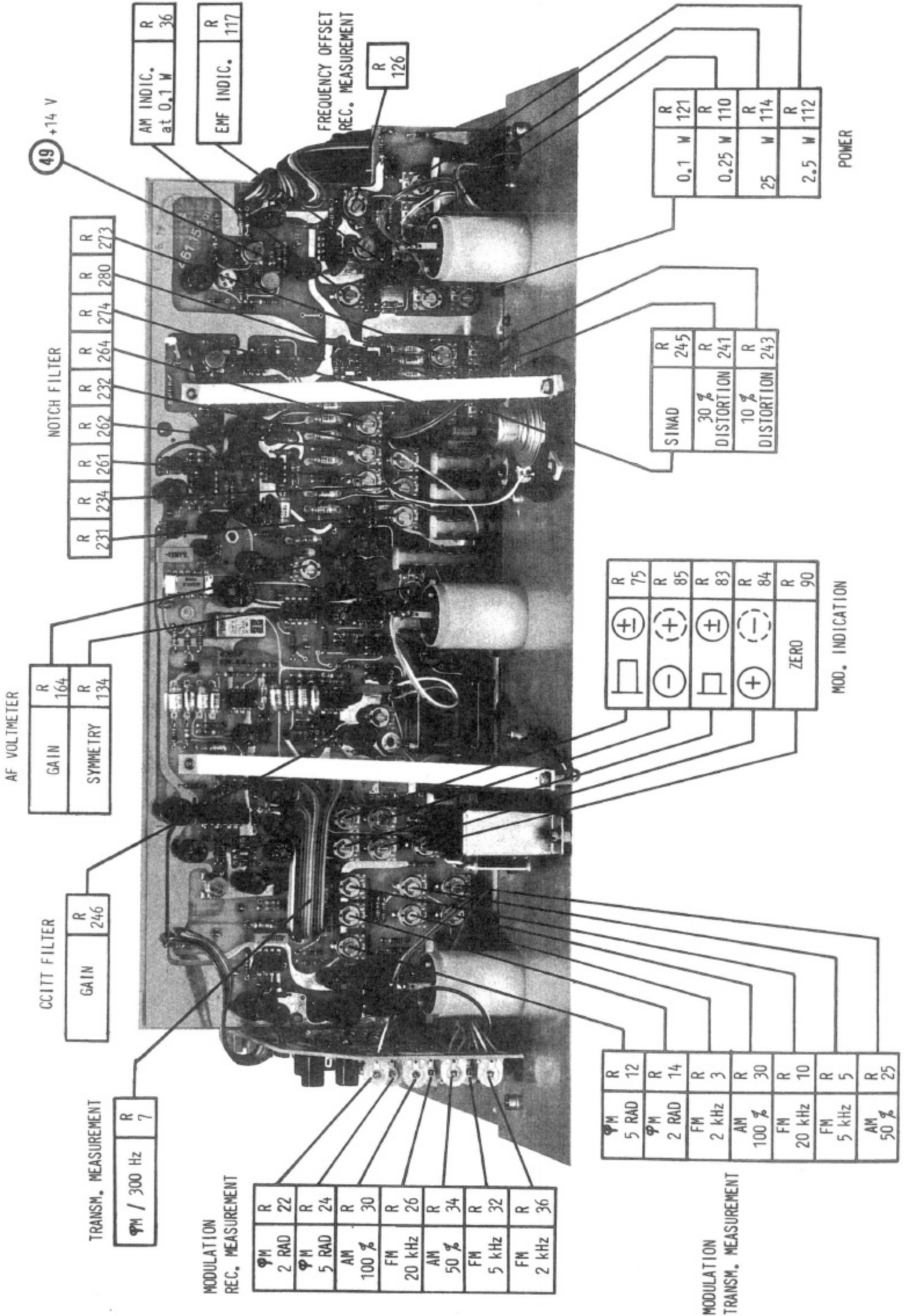


FIG. 5: ADJUSTMENT LOCATIONS OF THE CONTROL AND DISPLAY UNIT

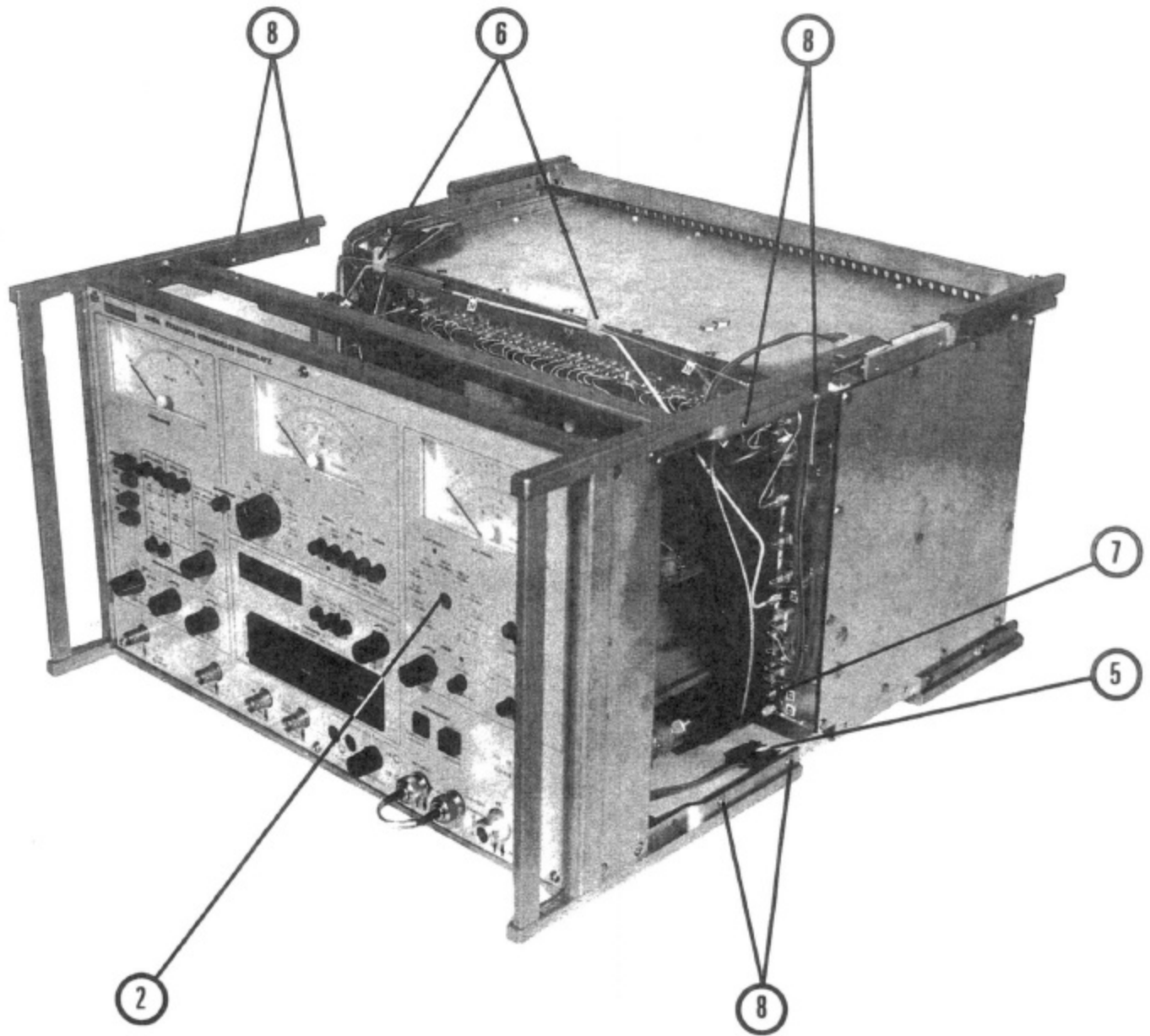
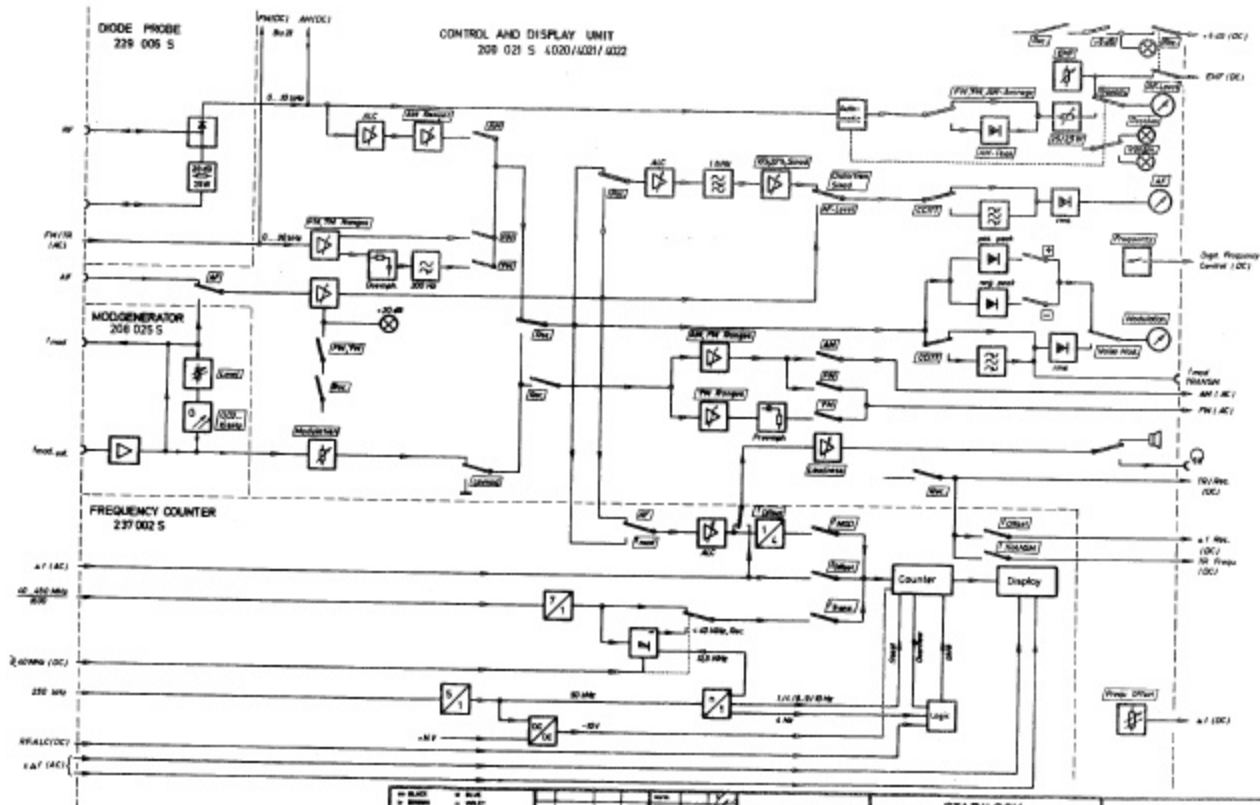
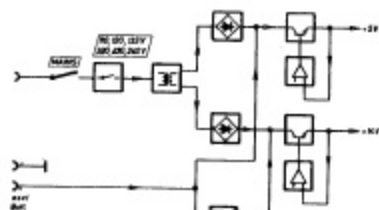


FIG. 6: REMOVING THE CONTROL AND DISPLAY UNIT

POWER SUPPLY
204 022 S

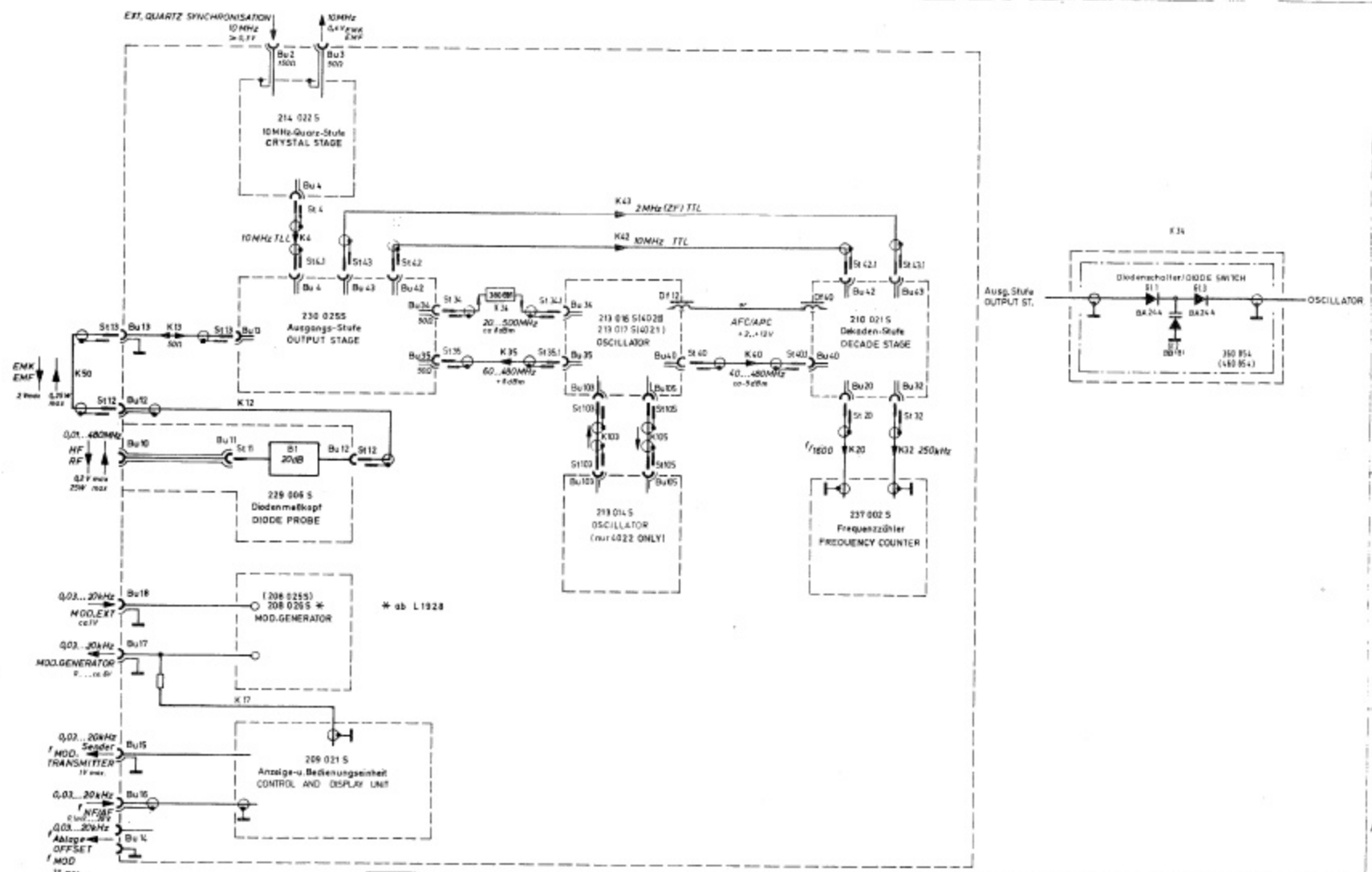


NO.	NAME	TYPE	VALUE	NO.	NAME	TYPE	VALUE
1	RESISTOR	100K	100K	10	RESISTOR	100K	100K
2	RESISTOR	100K	100K	11	RESISTOR	100K	100K
3	RESISTOR	100K	100K	12	RESISTOR	100K	100K
4	RESISTOR	100K	100K	13	RESISTOR	100K	100K
5	RESISTOR	100K	100K	14	RESISTOR	100K	100K
6	RESISTOR	100K	100K	15	RESISTOR	100K	100K
7	RESISTOR	100K	100K	16	RESISTOR	100K	100K
8	RESISTOR	100K	100K	17	RESISTOR	100K	100K
9	RESISTOR	100K	100K	18	RESISTOR	100K	100K

Schwenberger a/s
Industripark • 4020 Bielefeld
1. Oktober 61

STABILOCK
RADIOTELEPHONY TEST SET
BLOCK DIAGRAM

102 820 B BH. 2
Typ. 4020, 4021, 4022



sch. BLACK	bl. BLUE	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK
br. BROWN	gr. GREEN	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK
rot. RED	gr. GREEN	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK
rosa. PINK	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK
gelb. YELLOW	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK
sch. GREEN	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK	sch. BLACK

07	JUN 1971	104 74	10/71	10/71	10/71
Aussp.	A. Mörig	Druck	M. H. H.	Datum	10/71
OS	MODP	DAT	NAM	DAT	NAM

Schlumberger o/s
 Radiotelephon v. Versuchsaussp.
 8 Wochen 14

STABLOCK
 Funkgeräte Meßplatz
RADIOTELEPHONY TEST SET

2012205/2012215/2012225
 Typ: 4020/4021/4022

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(See block circuit diagram 102 820 B for total instrument)

1. RF Level

On receiver measurements the potentiometer voltage required for vernier adjustment of the EMF is indicated on the meter, the signal light (see also output stage) lighting up when the level is increased by +6 dB.

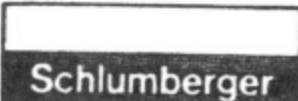
On transmitter measurements the DC provided by the diode probe is provided directly to the meter through the range selector (25 W/ 2, 5 W). Peak rectification is included only when indicating AM peak power. The switch-over to transmitter measurement mode can also be performed automatically, when the transmitter exceeds 50 mW.

In duplex operation the EMF adjustment and all other functions of the instrument are the same as for receiver measurements with the exception that the power indication corresponds to that of transmitter measurement. The signal lamp for transmitter measurement is lighting.

2. Modulation

On receiver measurements the AF provided by the modulation generator is provided for the meter indication to a positive or negative peak rectifier through the continuous modulation adjustment. This AF is also provided through various range and type modulation switches to the AM modulator in the output stage "AM(AC)" or to the FM modulator in the oscillator stage "FM(AC)". On phase modulation the amplitude of the low frequencies is reduced by 6 dB per octave in the preamplifier circuit.

On transmitter measurements the AF signal provided by the demodulators (see also probe or output stage) is passed through various range and modulation type selectors and rectified and indicated as for receiver measurements. In addition, use can also be made of a more sensitive interference modulation indication with RMS rectifier and CCIT weighting filter (see operating instructions 4.15). Two special circuit arrangements require particular mention:

	Function Description	209 021 F	Sheet 1/2
	Type: 4020/21/22	Control and Display Unit	Date 0979

a) Automatic level control (ALC) on AM

The mean DC provided at the output of the diode probe is used to control the intensity of a luminous diode in an optocoupler and thus the resistance of a photo resistor in the LF input attenuator. This control maintains the mean DC output constant despite fluctuations of the input level thus ensuring that the LF amplitude is directly proportional to the AM depth of modulation.

b) ϕ M-deemphasis and 300 Hz high pass filter

Contrary to the preemphasis circuit the amplitude of low frequencies is increased by 6 dB per octave in the deemphasis circuit. An active 300 Hz high pass filter eliminates any disturbances due to the frequencies elevated <300 Hz.

3. Distorsion Meter

The distorsion meter is provided with the demodulation signal on transmitter measurements or the AF voltmeter signal on receiver measurements, the output amplitude being maintained constant in an ALC circuit (same as on AM measurements) employing an optocoupler and LF rectifier. Due to the selective suppression of the 1 kHz fundamental in the following, 3-stage 1 kHz band stop filter (active notch filter) merely the distorsion and noise components remain which subsequent to range switching and RMS rectification are indicated directly as distorsion or SINAD ratio. The insertable CCITT filter is explained in detail in the operating manual (4.15).

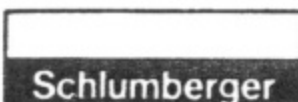
4. AF Voltmeter

The AF voltmeter operates together with the range switches and operation amplifiers in the usual way, the meter indication comprising elements of the distorsion meter such as CCITT filter and rectifier.

Sensitivity is automatically 20 dB down on receiver measurements and ϕ M/FM modulation.

5. Digital Frequency Adjustment

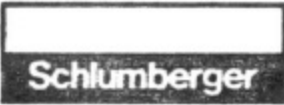
The decade stage is introduced to the positions of the decade switches. On REMOTE CONTROL mode the frequency must be set to 600 MHz (see operating manual 3.7).

	Function Description	209 021 F	Sheet 2/2
	Type: 4020/21/22	Control and Display Unit	Date 0979

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE										
DVM	<p>The Control and Display Unit must be connected to the other units of the instrument. Modulation Generator (208 025/26), Diode Probe (229 006) and Frequency Counter (237 002) must be completely adjusted (see concerning chapters) and mounted to the Control and Display Unit. For fault locations, it can be useful, to place the electrically connected Counter outside of the instrument. Check mechanical zero deflection of the indicating instruments I1 (MODULATION), I 2 (AF) and I 3 (RF-LEVEL).</p>				ok										
	<p>1. <u>Rail Voltages 209 021 S Bl. 2 + 3</u></p>	(40) (49) Counter Bu 45/11 Bu 45/4	DC DC DC	— — —	+ 13,95+14,05 V " " + 4,95.....+ 5,05 VVV										
	<p>2. <u>Signal Lamps</u></p> <table border="1"> <thead> <tr> <th>Lamp</th> <th>Depressed push buttons</th> </tr> </thead> <tbody> <tr> <td>RECEIVER</td> <td>RM (= RECEIVER MEASUREMENT)</td> </tr> <tr> <td>TRANSMITTER</td> <td>TM (= TRANSMITTER MEASUREMENT)</td> </tr> <tr> <td>+ 6 dB</td> <td>RM + TM + 6 dB + RM</td> </tr> <tr> <td>+20 dB</td> <td>RM + FM / 4PM + VOLTMETER Dist. 10%, 30%, SINAD</td> </tr> </tbody> </table>	Lamp	Depressed push buttons	RECEIVER	RM (= RECEIVER MEASUREMENT)	TRANSMITTER	TM (= TRANSMITTER MEASUREMENT)	+ 6 dB	RM + TM + 6 dB + RM	+20 dB	RM + FM / 4PM + VOLTMETER Dist. 10%, 30%, SINAD				Approx. same brightness, appropriate to depressed push buttonsok
Lamp	Depressed push buttons															
RECEIVER	RM (= RECEIVER MEASUREMENT)															
TRANSMITTER	TM (= TRANSMITTER MEASUREMENT)															
+ 6 dB	RM + TM + 6 dB + RM															
+20 dB	RM + FM / 4PM + VOLTMETER Dist. 10%, 30%, SINAD															

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



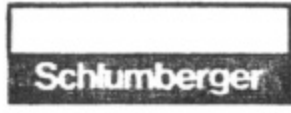
Issue	Alteration No.	Date	Name
02	0028. 29	27.3.1980	Morasch
01	9028. 32	5. 10.79	Karner

209 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p><u>3. Counter Display</u> Decade switch 600 MHz f OFFSET Knob FREQUENCY OFFSET depressed " " " pulled</p>	Display	—	—	blinking + kHz - kHz	.....ok
	<p><u>4. Frequency Setting</u> Push buttons RM and f TRANSM. pressed Check 100 kHz to 100 MHz Decade 0, 1, 2, ..., 9, (within specified 4020 frequency ranges) Connect 10 MHz output on rear panel to RF DIRECT socket on front panel. Depress TM + f OFFSET push buttons Check 10,0000 to 10,0999</p>	"	0,1 ... 479,9 MHz	—	correct frequency	
	<p>Decade switch to 900 (> 800) MHz " " " 0 (< 800) MHz</p>	"	+ 0...+99,9 kHz	—	Counter displays offset frequency to 10 MHz	.....ok
	<p><u>5. Control Lines to RF Section</u> Only for fault locations Depressed push buttons TM RM TM / + 6 dB RM TM TM / f TRANSM. RM / f OFFSET TM / "</p>	Remote control socket on rear panel " " " Bu 22 pin 14 " " " pin 16 " " " pin 21 " " " pin 22 " " "	DC DC	— —	DC level between pins 47 and 49 0 V + 5 V + 5 V 0 V + 14 V 0 V 0 V + 5 V 0 V + 5 V	.....ok

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



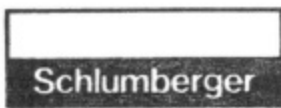
Issue	Alteration No.	Date	Name
02	0028.29	27.3.1980	Morasch
01	3028:32	5.10.79	Karmy

209 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>10. <u>RM Modulation Ranges</u></p> <p>Modulation generator 1 kHz</p> <p>push button RM, FM, 20 kHz</p> <p>" " " " 5 kHz</p> <p>" " " " 2 kHz</p> <p>" " " " ϕM, 5 Rad</p> <p>" " " " 2 Rad</p> <p>" " " " AM, 100 %</p> <p>" " " " 50 %</p>	<p>(15)</p> <p>Bu 22/8</p> <p>" "</p> <p>" "</p> <p>Bu 22/11</p> <p>" "</p>	<p>1 kHz</p> <p>" "</p> <p>" "</p> <p>" "</p> <p>" "</p> <p>" "</p>	<p>R 1 (ϕModulation^a)</p> <p>R 26</p> <p>R 32</p> <p>R 36</p> <p>R 24</p> <p>R 22</p> <p>R 30</p> <p>R 34</p>	<p>1 V \pm 1 mV</p> <p>3 V \pm 20 mV</p> <p>750 mV \pm 4 mV</p> <p>300 mV \pm 2 mV</p> <p>750 mV \pm 4 mV</p> <p>300 mV \pm 2 mV</p> <p>3 V \pm 20 mV</p> <p>1.5 V \pm 10 mV</p>	<p>.....ok</p>
	<p>11. <u>RM Modulation Frequency Response</u></p> <p>4020 Settings (RM)</p> <p>AM, " = 80 % (I_1), f = 1 kHz</p> <p>" " " " " " f = 50 Hz</p> <p>" " " " " " f = 10 kHz</p> <p>ϕM, 3 Rad (I_1), f = 0,3 kHz</p> <p>" " " " " " f = 1 kHz</p> <p>" " " " " " f = 6 kHz</p> <p>FM, Dev. = 16 kHz (I_1), f = 1 kHz</p> <p>" " " " " " f = 50 Hz</p> <p>" " " " " " f = 300 Hz</p> <p>" " " " " " f = 10 kHz</p> <p>" " " " " " f = 20 kHz</p>	<p>Output stage</p> <p>St 49/pin 5</p> <p>or</p> <p>Bu 22/11</p> <p>" "</p> <p>Oscillator</p> <p>stage St 51/1</p> <p>or Bu 22/8</p> <p>" "</p> <p>" "</p> <p>" "</p> <p>" "</p> <p>" "</p>	<p>1 kHz</p> <p>50 Hz</p> <p>10 kHz</p> <p>0,3 kHz</p> <p>1 kHz</p> <p>6 kHz</p> <p>1 kHz</p> <p>50 Hz</p> <p>300 Hz</p> <p>10 kHz</p> <p>20 kHz</p> <p>1 kHz</p> <p>1 kHz</p> <p>50 Hz</p> <p>300 Hz</p> <p>10 kHz</p> <p>20 kHz</p>	<p>as on 1 kHz \pm 0,1 V</p> <p>" " " " \pm 0,1 V</p> <p>133 ... 137 mV</p> <p>445 ... 455 mV</p> <p>2,67...2,73 V</p> <p>2,35...2,45 V</p> <p>as on 1 kHz \pm 0,2 V</p> <p>" " " " \pm 0,1 V</p> <p>" " " " \pm 0,1 V</p> <p>" " " " \pm 0,2 V</p>	<p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p> <p>.....mV</p> <p>.....mV</p> <p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p>	
AF - Generator	<p>AF - Generator appr. 0.8 V on EXT. Input:</p> <p>FM, Dev. = 16 kHz (I_1), f = 1 kHz</p> <p>" " " " " " f = 50 Hz</p> <p>" " " " " " f = 300 Hz</p> <p>" " " " " " f = 10 kHz</p> <p>" " " " " " f = 20 kHz</p>	<p>" "</p> <p>" "</p> <p>" "</p> <p>" "</p> <p>" "</p>	<p>1 kHz</p> <p>1 kHz</p> <p>50 Hz</p> <p>300 Hz</p> <p>10 kHz</p> <p>20 kHz</p>	<p>reading 16 kHz</p> <p>2,35...2,45 V</p> <p>as on 1 kHz \pm 0,2 V</p> <p>" " " " \pm 0,1 V</p> <p>" " " " \pm 0,1 V</p> <p>" " " " \pm 0,2 V</p>	<p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p> <p>2, .....V</p>	

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



Issue	Alteration No.	Date	Name
01	0028,29	27.3.1980	Morasch
	9028,27	5.10.75	Kammy

209 021 A

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>12. <u>TM Modulation Ranges</u></p> <p>Disconnect the FM/TR(AC) signal from the Output Stage (230 025 S B1. 1/green wire DF 8 → St 49/5) and replace it by the output signal of the Mod. Generator</p> <p>4020-push buttons actuated Level on St 59/pin 5 or Bu 22/2</p>					
	<p>FM, 20 kHz, ⊕ ⊖</p> <p>5 kHz, ⊕ ⊖</p> <p>2 kHz, ⊕ ⊖</p>	<p>I₁</p> <p>1 V</p> <p>250 mV</p> <p>200 mV</p>	<p>•</p> <p>•</p> <p>•</p>	<p>R 10 →</p> <p>R 5 →</p> <p>R 3</p>	<p>full scale deflection</p> <p>full scale deflection</p> <p>full scale deflection</p>	.....ok
	<p>φM, 5 Rad ⊕ ⊖</p> <p>2 Rad ⊕ ⊖</p>	<p>250 mV</p> <p>100 mV</p>	<p>•</p> <p>•</p>	<p>R 12 →</p> <p>R 14 →</p>	<p>full scale deflection</p> <p>full scale deflection</p>	
	<p>φM, 5 Rad ⊕ ⊖</p> <p>2 Rad ⊕ ⊖</p> <p>1 Rad ⊕ ⊖</p> <p>0.5 Rad ⊕ ⊖</p>	<p>75 mV</p> <p>100 mV</p> <p>250 mV</p> <p>750 mV</p> <p>2,5 V</p>	<p>0,3 kHz</p> <p>0,4 kHz</p> <p>1 kHz</p> <p>3 kHz</p> <p>10 kHz</p>	<p>R 7 →</p> <p>—</p> <p>—</p> <p>—</p>	<p>4,8 ... 5,2 Rad</p> <p>4,9 ... 5 Rad</p> <p>4,9 ... 5 Rad</p> <p>4,8 ... 5 Rad</p>	.....ok

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
01	0028,29	27.3.1980	Morasch

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE																																																																								
Millivoltmeter AF Generator	<p>13. <u>FM Modulation Frequency Response</u></p> <p>4020 Settings (TM) AF Generator level on St 59/5 or Bu 22/2</p> <table border="1"> <tr> <td>FM, Δf</td> <td>2 kHz</td> <td>(+) (-)</td> <td>100 mV</td> <td>1 kHz</td> <td>—</td> <td>2 kHz</td> <td>..... kHz</td> </tr> <tr> <td>FM</td> <td>"</td> <td>(+) (-)</td> <td>"</td> <td>"</td> <td>—</td> <td>1.85 ... 2 kHz</td> <td>..... kHz</td> </tr> <tr> <td>"</td> <td>"</td> <td>(+) (-)</td> <td>"</td> <td>"</td> <td>—</td> <td>1.85 ... 2 kHz</td> <td>..... kHz</td> </tr> <tr> <td>"</td> <td>20 kHz</td> <td>(+) (-)</td> <td>1 V</td> <td>"</td> <td>—</td> <td>1 V ± 10 mV</td> <td>..... ok</td> </tr> <tr> <td>φM</td> <td>5 Rad</td> <td>(+) (-)</td> <td>75 mV</td> <td>0.3 kHz</td> <td>R 24</td> <td>4.8 ... 5.2 Rad</td> <td>..... ok</td> </tr> <tr> <td>"</td> <td>"</td> <td>(+) (-)</td> <td>100 mV</td> <td>0.4 kHz</td> <td>—</td> <td>4.9 ... 5 Rad</td> <td>..... ok</td> </tr> <tr> <td>"</td> <td>"</td> <td>(+) (-)</td> <td>250 mV</td> <td>1 kHz</td> <td>—</td> <td>4.9 ... 5 Rad</td> <td>..... ok</td> </tr> <tr> <td>"</td> <td>"</td> <td>(+) (-)</td> <td>750 mV</td> <td>3 kHz</td> <td>—</td> <td>4.8 ... 5 Rad</td> <td>..... ok</td> </tr> <tr> <td>"</td> <td>"</td> <td>(+) (-)</td> <td>2.5 V</td> <td>10 kHz</td> <td>—</td> <td>4.8 ... 5 Rad</td> <td>..... ok</td> </tr> </table>	FM, Δf	2 kHz	(+) (-)	100 mV	1 kHz	—	2 kHz kHz	FM	"	(+) (-)	"	"	—	1.85 ... 2 kHz kHz	"	"	(+) (-)	"	"	—	1.85 ... 2 kHz kHz	"	20 kHz	(+) (-)	1 V	"	—	1 V ± 10 mV ok	φM	5 Rad	(+) (-)	75 mV	0.3 kHz	R 24	4.8 ... 5.2 Rad ok	"	"	(+) (-)	100 mV	0.4 kHz	—	4.9 ... 5 Rad ok	"	"	(+) (-)	250 mV	1 kHz	—	4.9 ... 5 Rad ok	"	"	(+) (-)	750 mV	3 kHz	—	4.8 ... 5 Rad ok	"	"	(+) (-)	2.5 V	10 kHz	—	4.8 ... 5 Rad ok					
		FM, Δf	2 kHz	(+) (-)	100 mV	1 kHz	—	2 kHz kHz																																																																					
		FM	"	(+) (-)	"	"	—	1.85 ... 2 kHz kHz																																																																					
		"	"	(+) (-)	"	"	—	1.85 ... 2 kHz kHz																																																																					
		"	20 kHz	(+) (-)	1 V	"	—	1 V ± 10 mV ok																																																																					
		φM	5 Rad	(+) (-)	75 mV	0.3 kHz	R 24	4.8 ... 5.2 Rad ok																																																																					
		"	"	(+) (-)	100 mV	0.4 kHz	—	4.9 ... 5 Rad ok																																																																					
		"	"	(+) (-)	250 mV	1 kHz	—	4.9 ... 5 Rad ok																																																																					
		"	"	(+) (-)	750 mV	3 kHz	—	4.8 ... 5 Rad ok																																																																					
		"	"	(+) (-)	2.5 V	10 kHz	—	4.8 ... 5 Rad ok																																																																					

Adjustment and Test Procedure

4020 series
CONTROLAND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
01	0028,29	27.3.1980	Morasch

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Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
AF Analyser with a Beat Frequency Oscillator e.g. Radiometer FRA 3	Balance Adjustment AF, RM, UNMOD (without CCITT)	I 2	1 kHz	R 134	> 60 dB	..... dB
	Readjust R 164 775 mV at voltmeter input balance ←→ unbalance		1 kHz 20 kHz 50 kHz	R 164 — (C 48)	0 dB > 40 dB > 60 dB	..... dB dB dB
	Voltmeter button MOD pressed: RM, FM 19 kHz	I 1/1 2	1 kHz	—	0.9 ... 1 V	..... V
AF Analyser with a Beat Frequency Oscillator e.g. Radiometer FRA 3	<u>15. Distortion Meter</u>			R 261, 264, 262, R 231, 232, 234, R 273, 274, 280 preset to mid-position		
	All alignments on the 1 V range of the AF millivoltmeter, and on RM, UNMOD, without CCITT					
	Check out of autom. level control:	28	1 kHz	—	690 ... 810 mV $\Delta V \leq 10$ mV	..... mV mV
	Notchfilter pressed: fMOD + fTRANSM	27 (C 100)	6 kHz	Adjust sensitivity of analyser to —	+ 10 dBm Indication	
	1) Adjust 3 potentiometers at a time alternately in small increments for every attenuation pole frequency.		1000 ± 1 Hz 985 ± 1 Hz 1010 ± 1 Hz	R 261, 264, 262, — R 231, 232, 234, — R 273, 274, 280 —	< - 75 dBm " "	.....ok
Two Tone AF Gen. e.g. AF 40 S	2) Repeat adjustment, if result is bad.		975...1015 Hz 982...1013 Hz	— —	< - 40 dBm < - 55 dBm clear to recognize: 3 poles at 985/1000/1010 Hz	-dBm -dBm.....ok
	<u>Adjusting Ranges</u>	I 2	1 + 3 kHz	R 241 R 245 R 243	25 % - 12 dB 7 %	.....ok
	Two tone signal 1 kHz 999 mV 3 kHz 259 mV 70 mV		1 kHz	—	< 0,6 %	
	ca. 1 V 1 kHz, Dist. < 0,3 %		1 kHz	—		

Adjustment and Test Procedure

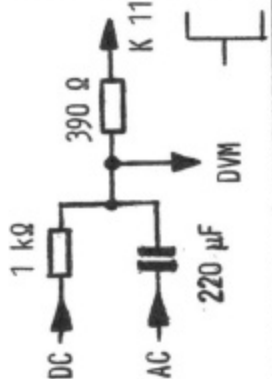
4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
01	0028,29	27.3.1980	Morasch

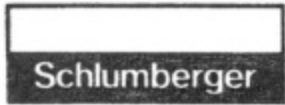
209 021 A

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Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Transmitter 0 ... 25 W 120 MHz capable of being AM modulated, Dist. < 1%	On TRANSMITTER MEASUREMENT mode Replace discriminator signal from output stage (St 49/pin 5 or Bu 22/2) by a two tone AF generator. 4020 - Setting 1 kHz | 3 kHz TM, 10% Dist., without CCITT 999 mV 70 mV	1 2	1 + 3 kHz	—	6.8 ... 7.2 % %
	16. Power Meter + AM Automatic Level Control DC = + 3.5 ... + 11 V 	30	DC	—	6.8 ... 7.2 V $\Delta U \leq 10 \text{ mV}$	
	Linearity, Power Measurement Ranges DC level + 3.8 V + 3.16 V + 3.32 V + 5.53 V + 11 V 0.25 W Range 2.5 W Range 25 W Range	1 3	DC	alternatively R 110 R 121 — R 112 R 114	250 mW reading 10 mW reading 40 ± 1.2 mW 2.5 W reading 25 W reading	..... mW ok ok

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



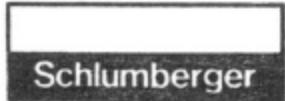
Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

209 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
AM	4020	DC level				
	TM, AM, 100% (+) (-)	1.5 V	1 kHz	R 36	Same AM reading appr. 80%	..... ok
	" " (+) (-)	0.3 V	"			..... ok
	TM, AM, 100% (+) (-)	1.5 V	"	R 30	80%	..... ok
	" " (+) (-)	0.75 V	"	R 25	40%	..... ok
	TM, AM, 100% (+) (-)	1.5 V	30 Hz		72 ... 84% %
	" " (+) (-)	"	0.3 kHz		76 ... 84% %
	" " (+) (-)	"	1 kHz		" " %
	" " (+) (-)	"	10 kHz		" " %
	Inherent AM Distortion					
4020	DC level					
	TM, AM, 50% (+) (-) DIST - 10%	0.03 V	1 kHz		7.5 ... 8.5% (AM) %
	TM, AM, 50% (+) (-) DIST - 10%	"	1 kHz		< 1% (DIST) %
Peak Power Indication						
4020	DC level					
TM, 25 W, AM, Peak	2.23 V	1 kHz	I 3		18.5 ... 21.5 W	..... W
" " " "	"	30 Hz	"		" "	..... W

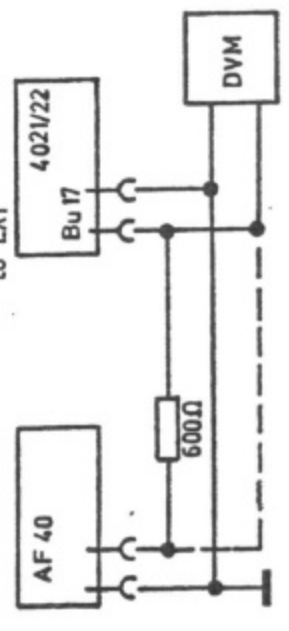
Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



Issue	Alteration No.	Date	Name
01	0028,29	27.3.1980	Morasch
	0028,29	5.10.79	Karwa

209 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
30 kHz Distortion Meter	17. <u>Modulation Generator Output RM</u> Check output level and distortion with the own millivoltmeter	1 2	1 kHz	Set level to " 0 ... 30 mV "	0 ... > 30 mV	..... ok
	Load	"	"	" 0 ... 2 V "	0 ... > 2 V %
	Ro < 6 Ω	"	"	2 V	5 V Dist. < 1 %	..... ok
	< 6 Ω	"	"	—	4.976 V " < 1 %	..... ok
	600 Ω	"	"	—	25 V +40 mV " < 1 %	..... ok
	600 Ω	"	"	—	5 V " < 1 %	..... ok
	200 Ω	"	"	—	5 V (< 5 %)	..... V
	200 Ω	"	50 Hz	—	> 1 MΩ across output contacts and ground	..... ok
	Test for ungrounded output	Bu 17	DC	—		
	Return Loss Mod. Generator Level = 0 V S 27 / 600 Ω Frequency control to EXT	Bu 17	100 Hz 1 kHz 10 kHz 100 kHz	1 V	0,5 V ± 75 mV = 16,5 dB	.....mV
4021/22		Bu 17 S 1				

Adjustment and Test Procedure

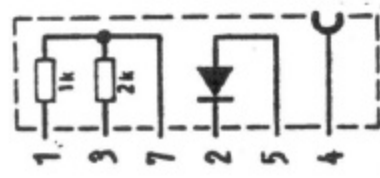
4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
01	0028. 29	27.3.1980	Morasch
	0028. 27	0.10.78	Verma

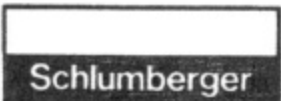
209 021 A

11/12
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>18. <u>Loudspeaker</u></p> <p>Pull and turn up control knob for loudness until sound overdriving becomes audible. Press knob, but do not turn.</p>	<p>LS 1 Bu 14</p>	<p>1 kHz 1 kHz</p>	<p>— —</p>	<p>sufficient loudness > 2 V</p>	<p>..... ok</p>
Test plug	<p>19. <u>RM / TM Automatic</u></p> <p>Test plug</p>  <p>RM + TM not pressed</p> <p>Appr. 100 mV at 20 kHz FM</p>	<p>1 3 1 1/1 2</p>	<p>DC 1 kHz</p>	<p>— —</p>	<p>Power reading appr. 10 W if the test plug is connected to socket RF PROBE/AUX OUTPUTS</p>	<p>..... ok</p>

Adjustment and Test Procedure

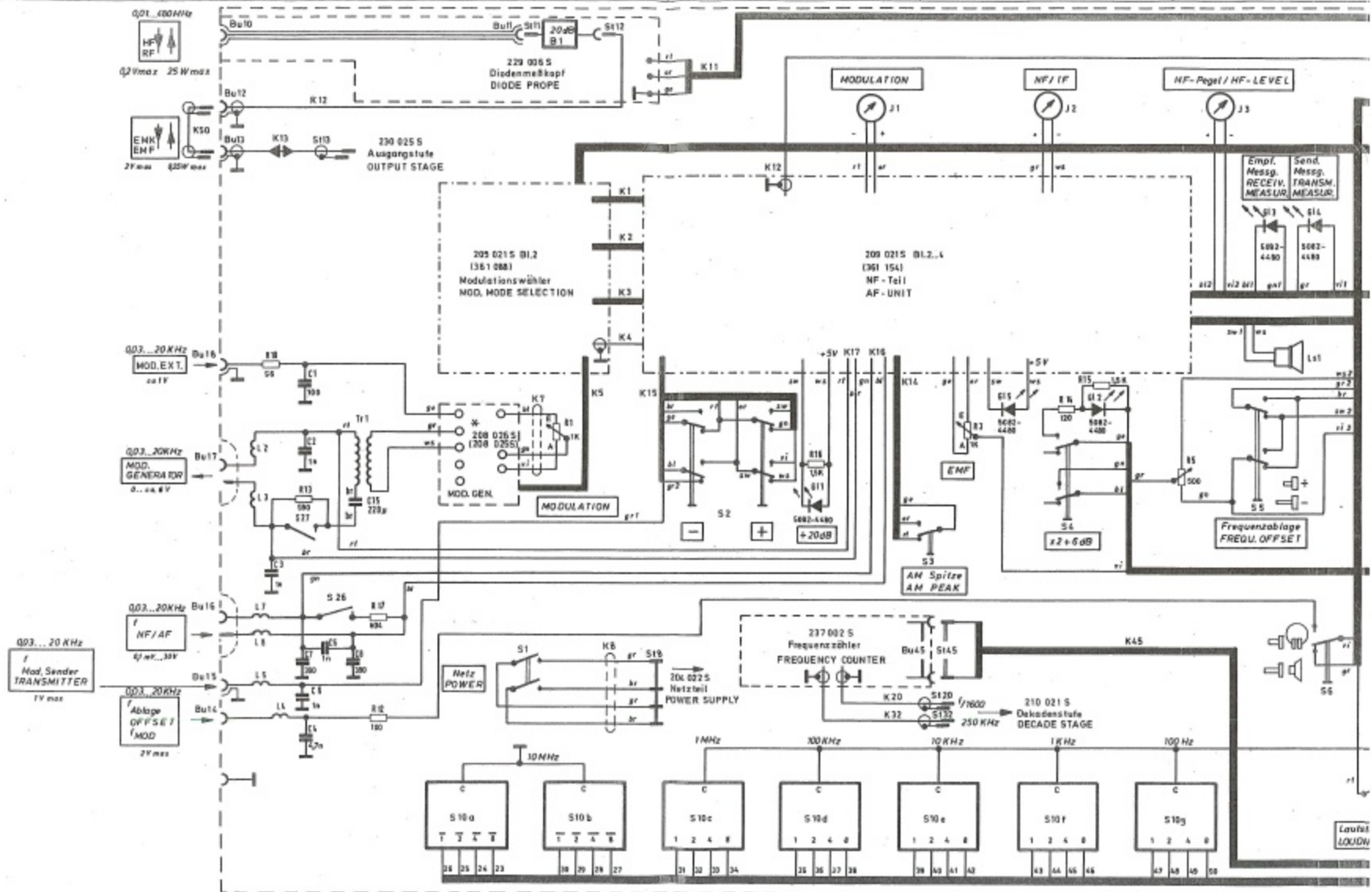
4020 series
CONTROL AND DISPLAY UNIT



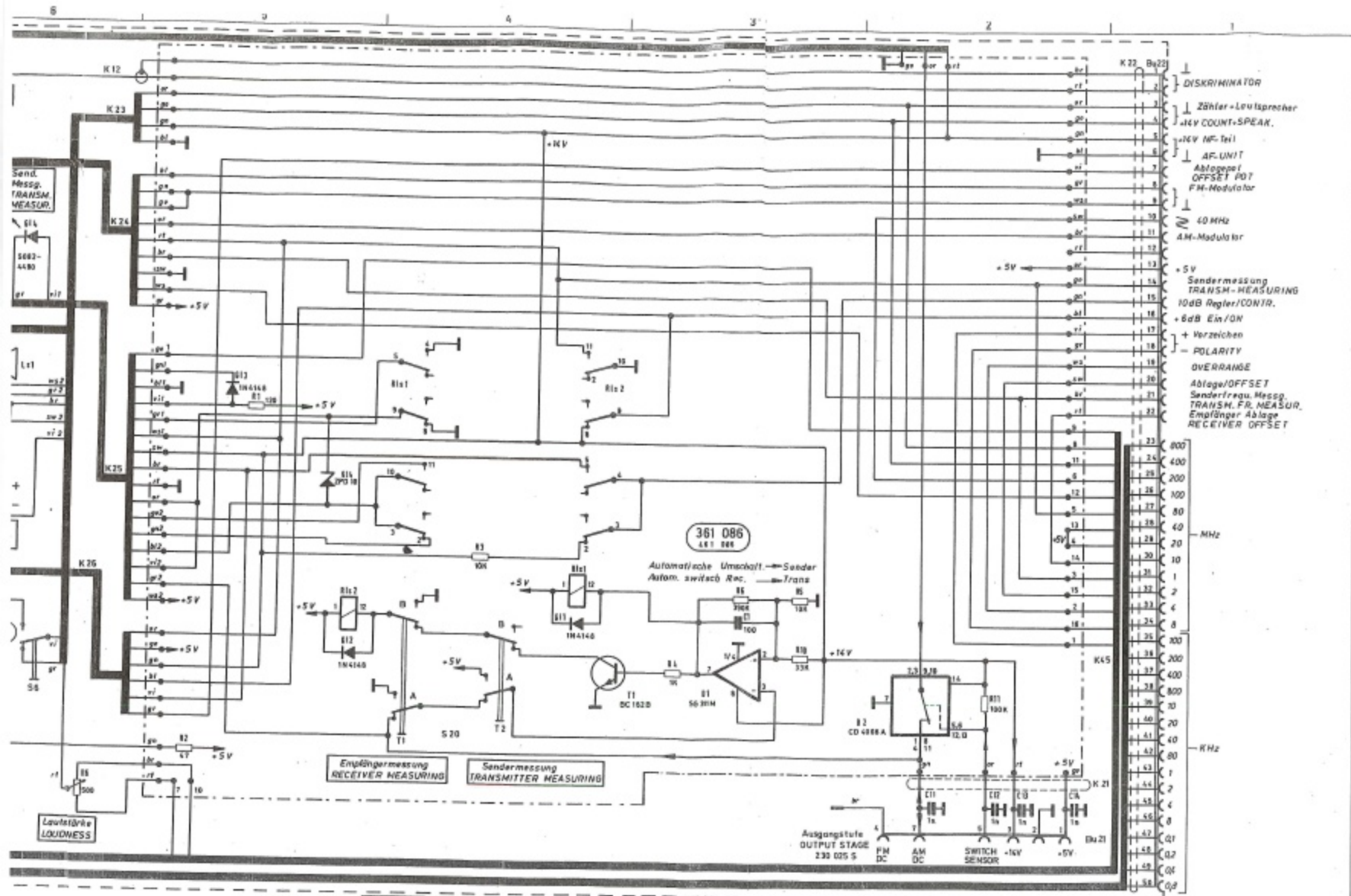
Issue	Alteration No.	Date	Name
	0028.29	27.3.1980	Morasch

209 021 A	12/12 Sheet
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Replacement for



* ab L1928
208 026 S



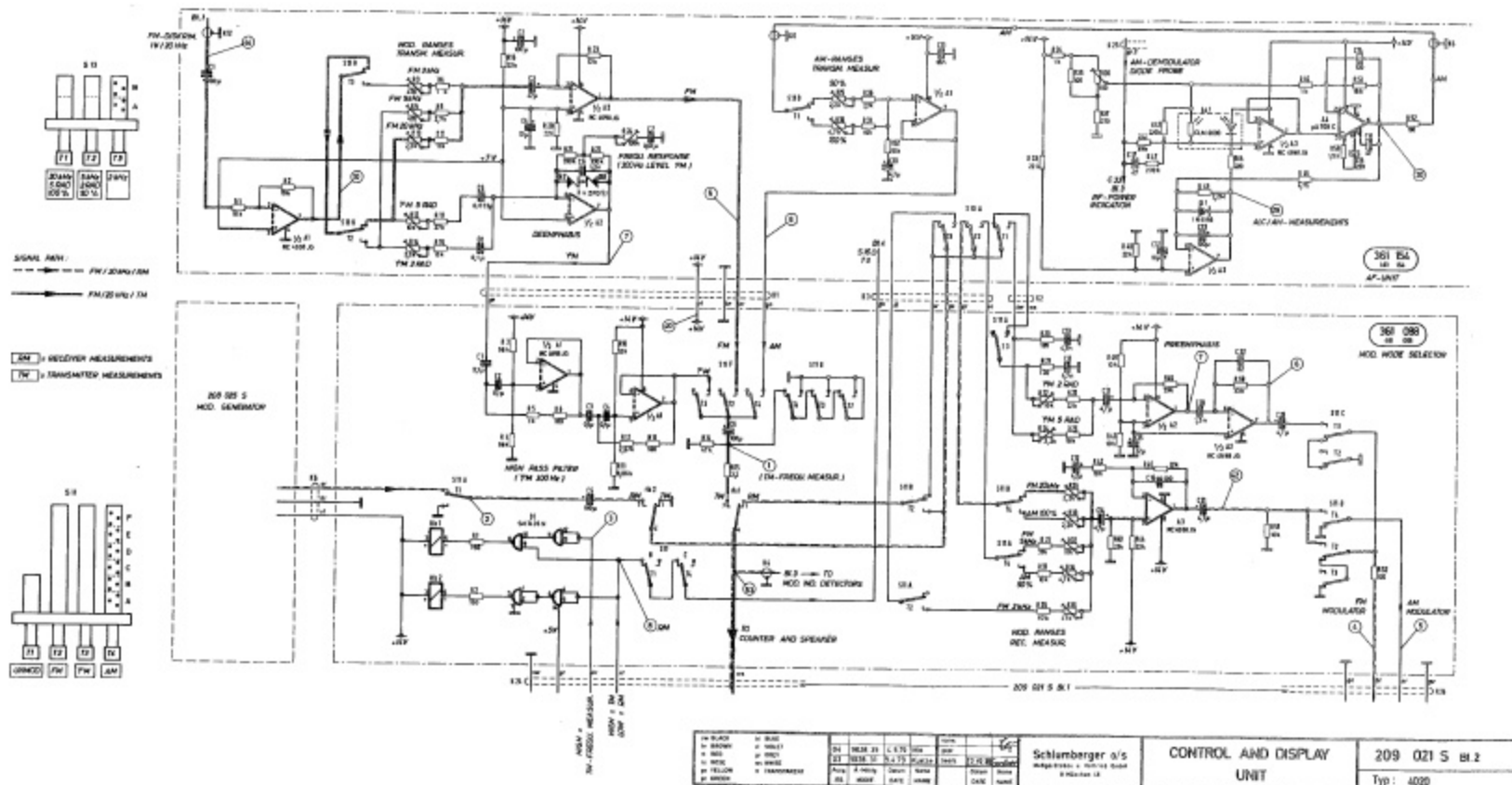
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br	BRAUN	br	BRAUN
rd	ROT	rd	ROT
rs	ROSS	rs	ROSS
gl	GRÜN	gl	GRÜN
gr	GRAY	gr	GRAY
wh	WEISS	wh	WEISS
yl	GELB	yl	GELB
grn	GRÜN	grn	GRÜN
tr	TRANSPARENT	tr	TRANSPARENT

DS	2090	48	9.8.79	W/er					
Qty.	9019	2	21.1.79	Msp.					
Artig.	A. Messg.	Ordn.	Name	Name					
104	MSPF.	047C	NAME	DATE	NAME				

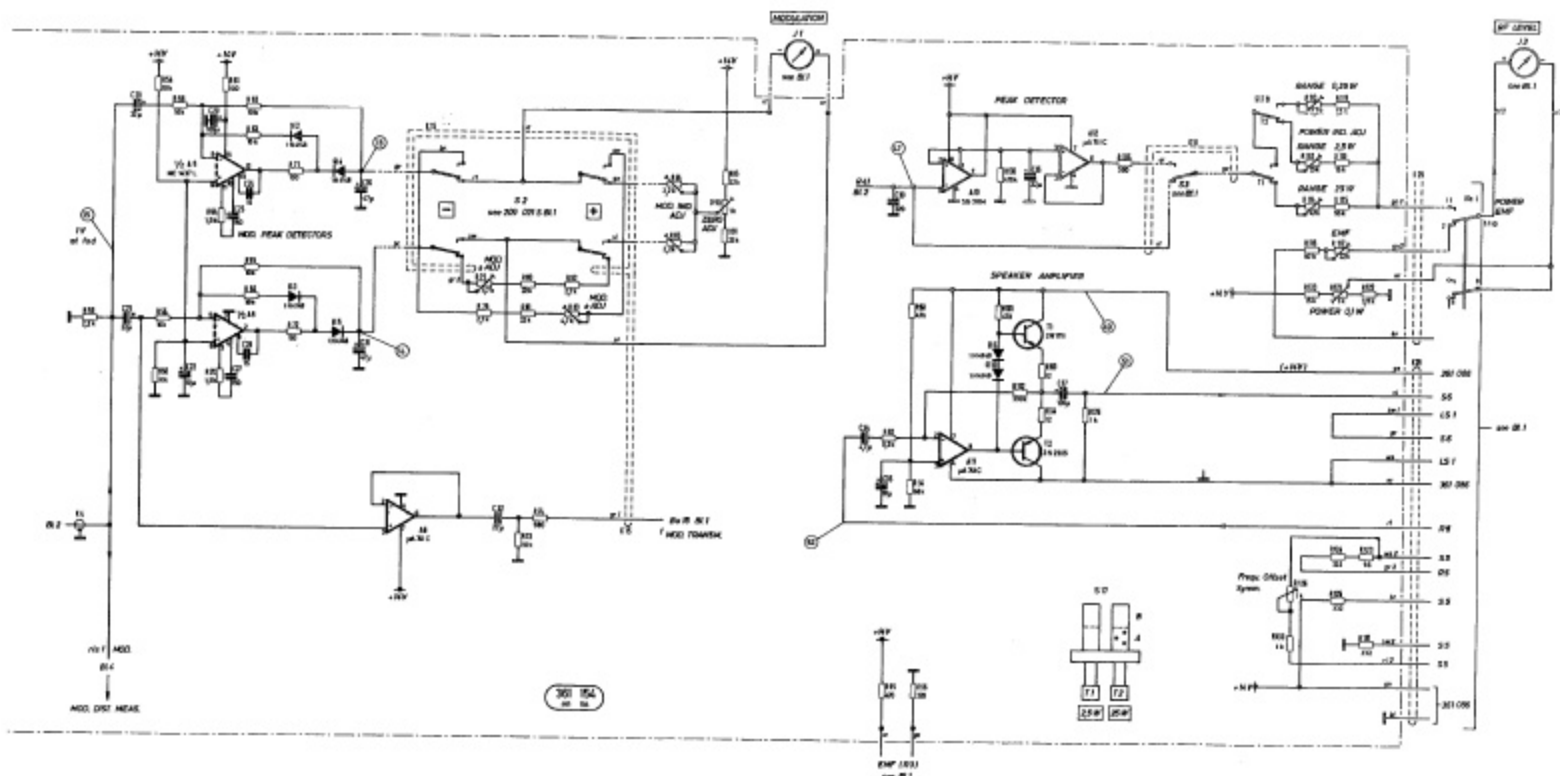
Schlumberger o/s
 Wädgölsbach u. Vertriebs GmbH
 8 München 48

CONTROL AND DISPLAY
 UNIT

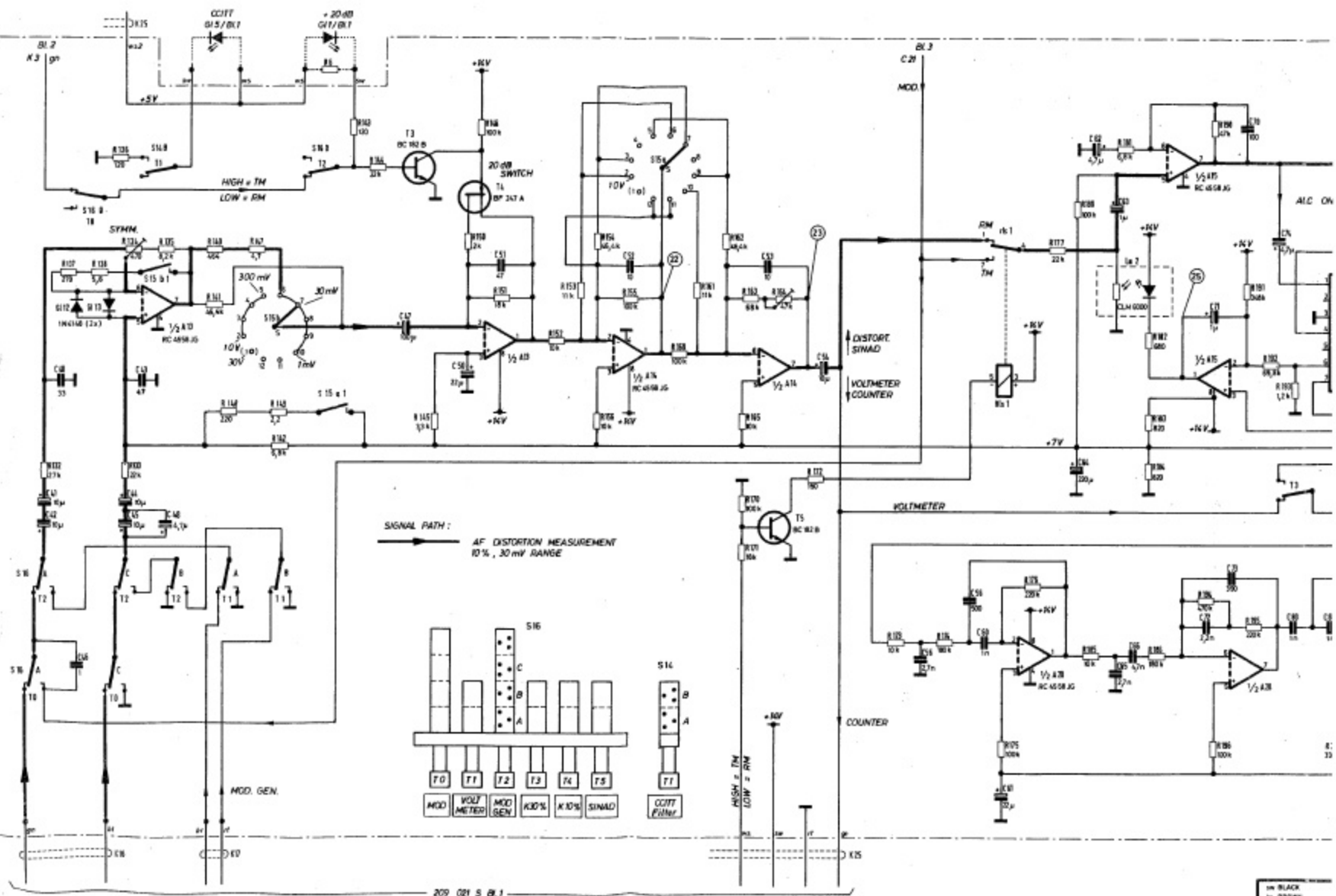
209 021 S Bl.1
 Typ : 4020

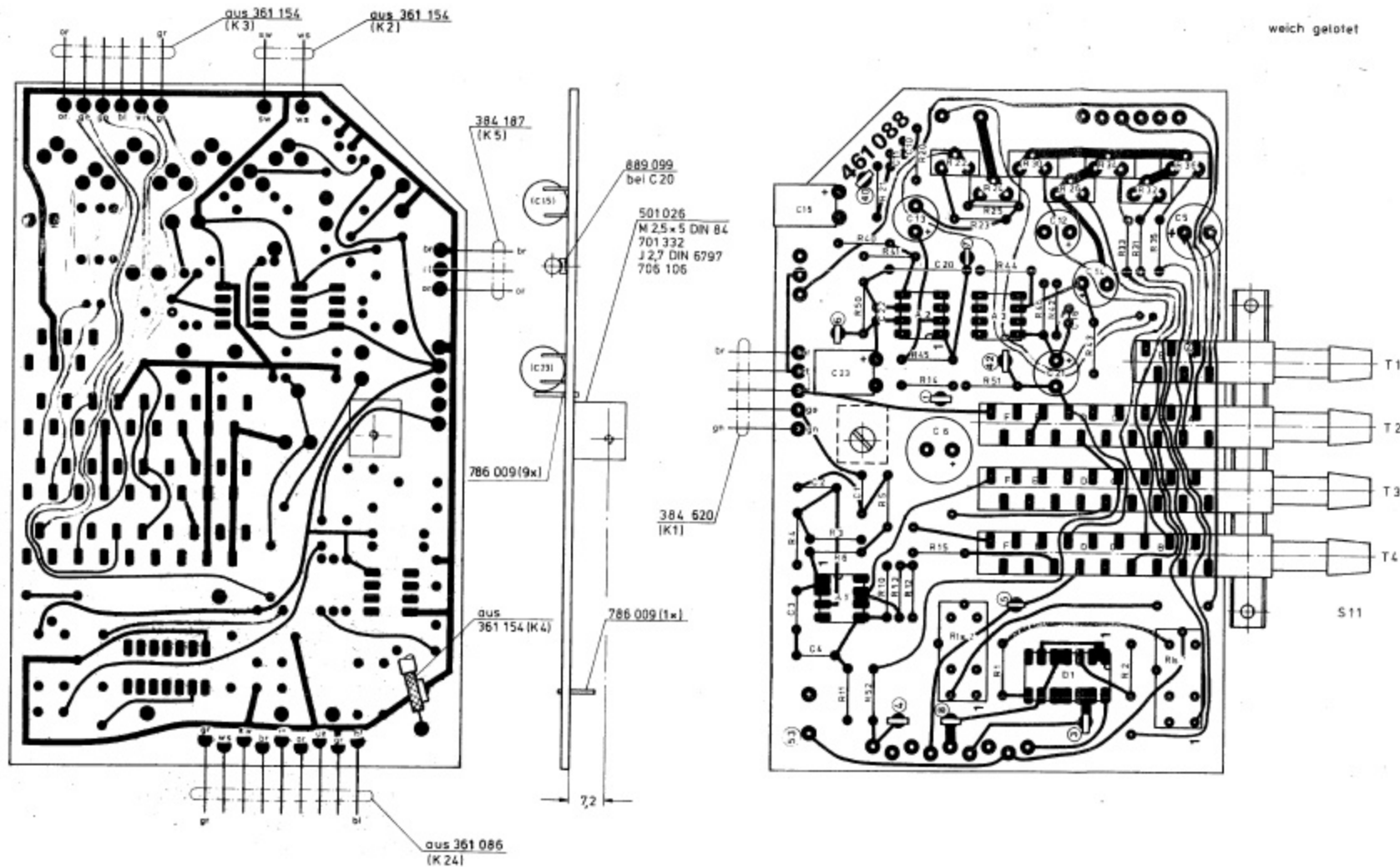


Schlumberger a/s		CONTROL AND DISPLAY UNIT		209 021 S bl.2	
Indep. Press. & Control Equip. Division Ltd.		UNIT		Typ: 4020	



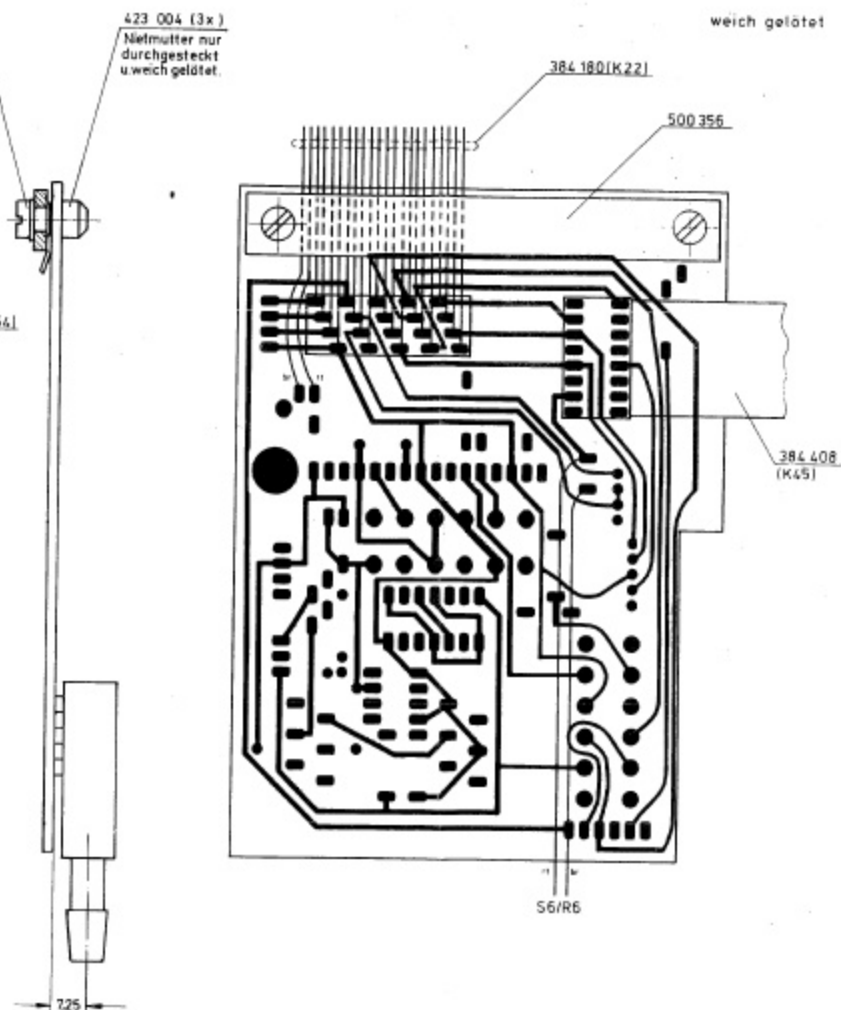
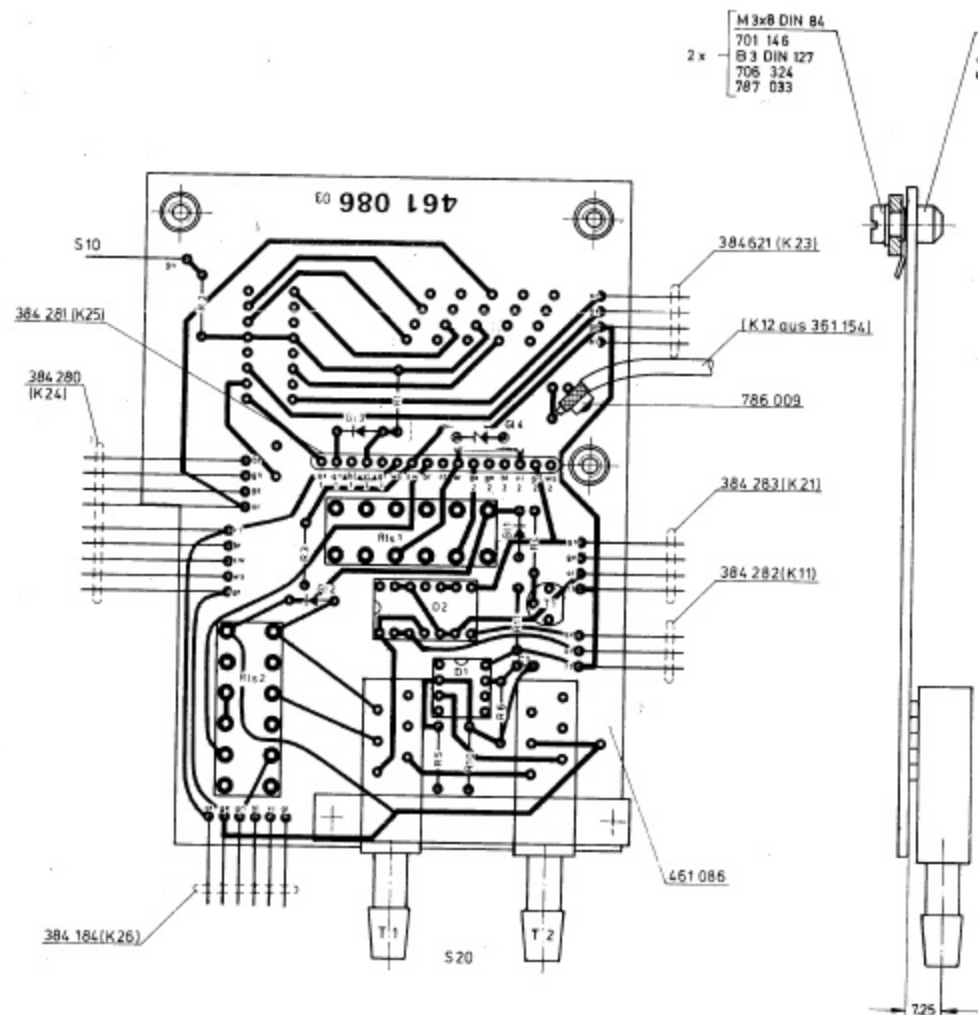
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○ = Kontrollmaß

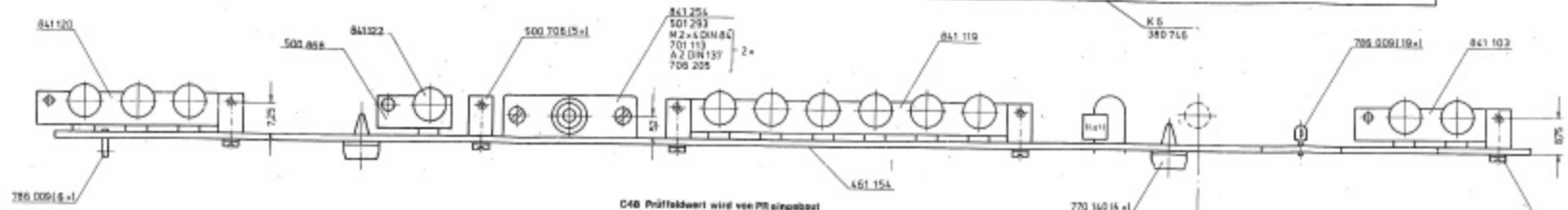
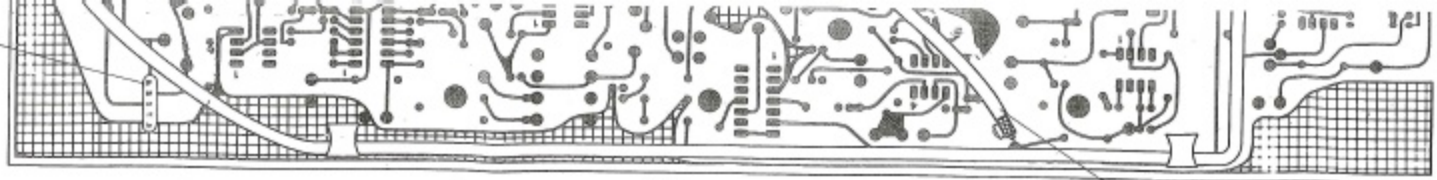
110					Schlumberger o/s Werkzeug- u. Normen-Shop
109					
108					Bestückte Leiterplatte
107					
106					361 088
105					
104	Bestückungsliste			±0.2	2:1
103	104				
102	105				361 088
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47	160				
46	161				361 088
45	162				
44	163				361 088
43	164				
42	165				361 088
41	166				
40	167				361 088
39	168				
38	169				361 088
37	170				
36	171				361 088
35	172				
34	173				361 088
33	174				
32	175				361 088
31	176				
30	177				361 088
29	178				
28	179				361 088
27	180				
26	181				361 088
25	182				
24	183				361 088
23	184				
22	185				361 088
21	186				
20	187				361 088
19	188				
18	189				361 088
17	190				
16	191				361 088
15	192				
14	193				361 088
13	194				
12	195				361 088
11	196				
10	197				361 088
9	198				
8	199				361 088
7	200				
6	201				361 088
5	202				
4	203				361 088
3	204				
2	205				361 088
1	206				



○ Kontrollmaß

<small> 361 086 02/85 361 086 02/85 361 086 02/85 </small>	0.2	2:1	Schlumberger o/s
			Bestückte Leiterplatte
			361 086

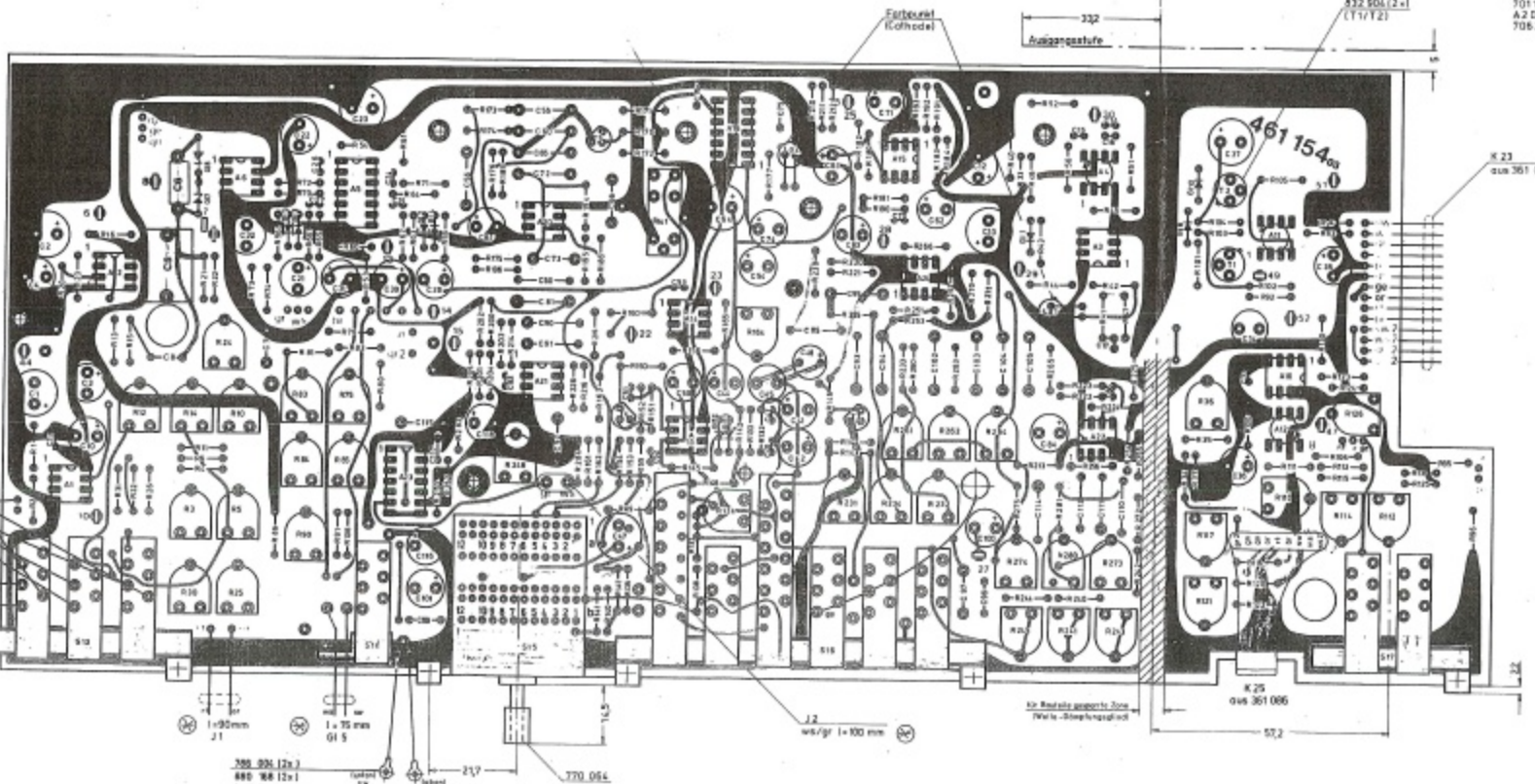
K11384.5201
aus 261086



C40 Prüfkabelfort wird von P8 angebracht

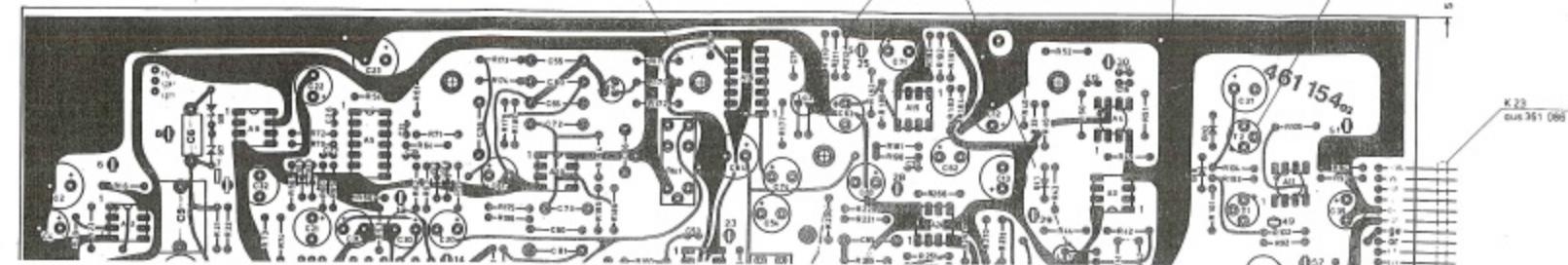
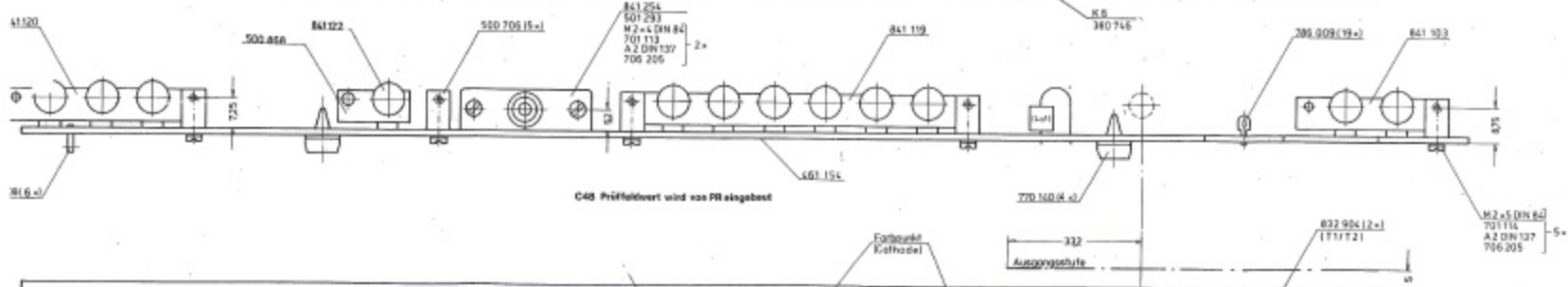
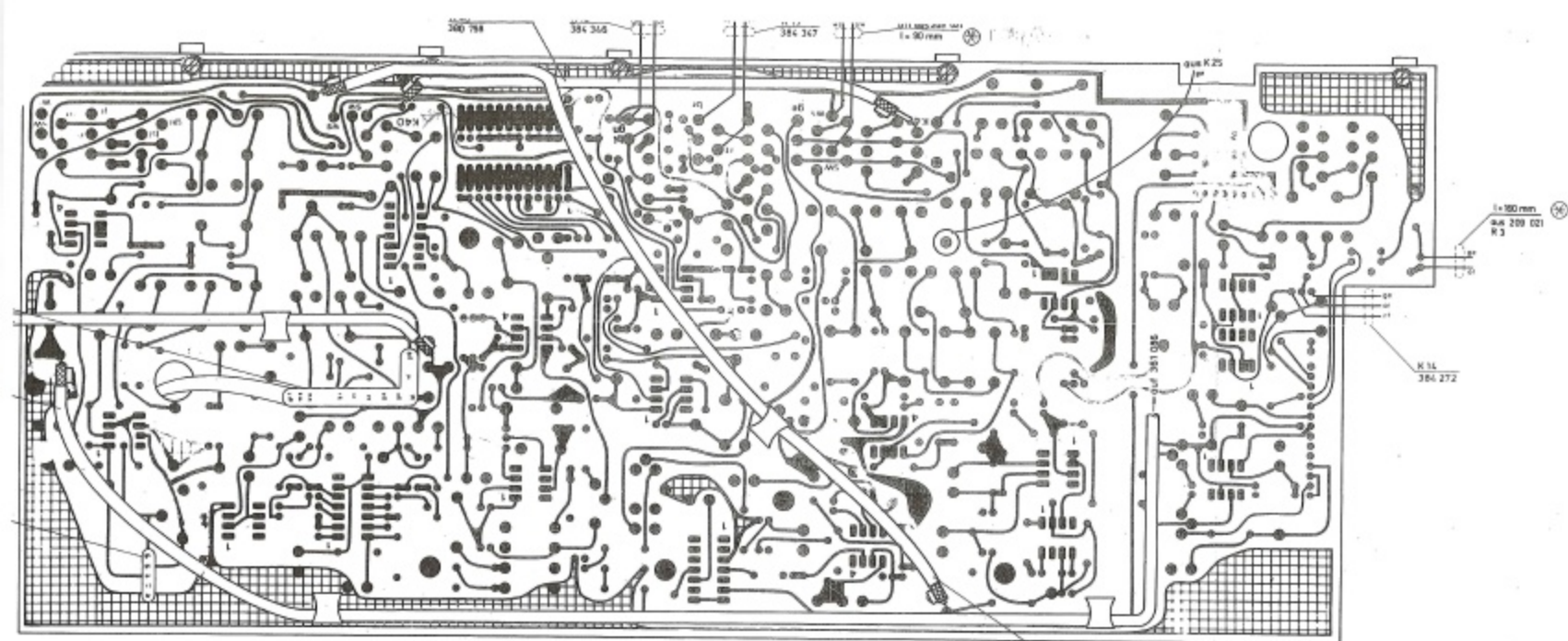
770 160(5x)

M2-5 DIN 84
701 154
A2 DIN 137
706 205



284 220(1x)
28 372(1x) 2

780 004 (2x)
880 768 12x1
1x 110 mm
1x 92 mm 21
1x 75 mm 61 5
770 054

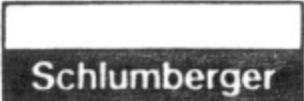


(see block circuit diagram 102 820 B for total instrument)

The frequency of the ramp generator is dictated by resistors for switching and vernier adjustment. An operation amplifier the feedback of which is a function of signal level converts the ramp signal into a low distortion sinusoidal signal. The external output level can be continuously adjusted in two ranges.

Besides internal modulation also external or simultaneous internal and external modulation is possible. The external modulation depends on the level of the external AF generator.

The source impedance of the symmetrical transformer output can be switched to 600Ω or $< 6 \Omega$.

	Function Description	208 025 / 026 F	Sheet 1/1
	Type : 4020/21/22	Modulation Generator	Date 0979

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	Preset all adjustment potentiometer to middle position apply +14 V ± 10 mV to the rail pin. Select R ₀ < 6 Ω, terminate with 600 Ω.					
DVM Oscilloscope	<p>1. <u>Integrator + Schmitt - Trigger</u></p> <p>S 18 : 1 kHz (S 18 = Freq. range switch)</p> <p>For troubleshooting only:</p> <p>S 18 : Ext. connect + 14 V to S 18 slider (T1/C4)</p> <ul style="list-style-type: none"> ▢ " " " ▢ " 0 V " " ▢ " " " " 	<p>①</p> <p>① A 1/Pin 2</p> <p>① A 1/Pin 2</p>	<p>approx. 1 kHz</p> <p>▢</p> <p>▢</p> <p>▢</p>	<p>▢</p> <p>▢</p> <p>▢</p> <p>▢</p>	<p>6,5 ± 0,5 V_{pp}</p> <p>0..... ± 2 V</p> <p>+ 12..... ± 14 V</p> <p>0..... ± 2 V</p>	<p>..... V_{pp}</p> <p>.....ok</p>
	<p>2. <u>Sinus Shaping Network</u></p> <p>S 18 : 1 kHz</p> <p>▢ " , R 102 fully clockwise, S 2 pressed</p>	<p>FM, AM- output</p> <p>Mod. Gen.- output</p>	<p>approx. 1 kHz</p> <p>▢</p>	<p>▢</p> <p>▢</p>	<p>approx. 4 V distorted</p> <p>"</p>	<p>.....ok</p>
Counter	<p>3. <u>Frequency Adjustment</u> (+ 14 V ± 10 mV !)</p> <p>S 18 : 6 kHz</p> <ul style="list-style-type: none"> ▢ 3 kHz ▢ 2,7 kHz ▢ 1 kHz ▢ 0,4 kHz ▢ 0,3 kHz 	<p>FM, AM output</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>6 kHz</p> <p>3 kHz</p> <p>2,7 kHz</p> <p>1 kHz</p> <p>0,4 kHz</p> <p>0,3 kHz</p>	<p>R 26</p> <p>R 31</p> <p>R 35</p> <p>R 37</p>	<p>6 kHz</p> <p>3 kHz</p> <p>2,7 kHz ± 0,5 %</p> <p>1 kHz</p> <p>0,4 kHz</p> <p>0,3 kHz</p>	<p>.....kHz</p> <p>.....kHz</p> <p>.....kHz</p> <p>.....kHz</p> <p>.....kHz</p> <p>.....kHz</p>

Adjustment and Test Procedure

4020 series
MODULATION GENERATOR

Schlumberger

Issue	Alteration No.	Date	Name
01	9022-78 .5022.87	25.10.79 11.9.75	Harry Stüh

208 026 A

1/2 Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM Oscilloscope	Preset all adjustment potentiometer to middle position apply +14 V ± 10 mV to the rail pin. Select R _o < 6 Ω, terminate with 600 Ω.					
	1. <u>Integrator + Schmitt - Trigger</u>	Ⓚ	approx. 1 kHz	_____	5,5 ± 0,5 V pp	..... V pp
	S 18 : 1 kHz (S 18 - Freq. range switch)			_____	0..... ± 2 V	
	For troubleshooting only:	Ⓚ		_____	+ 12..... ± 14 V	
	S 18 : Ext. connect + 14 V to S 18 slider (T1/C2)	Ⓚ		_____	0..... ± 2 V	.....ok
	2. <u>Sinus Shaping Network</u>					
	S 18 : 1 kHz	FM,AM- output	approx. 1 kHz	_____	approx. 4 V distorted	.....ok
	▪▪▪ , R 102 fully clockwise, S 2 pressed	Mod.Gen.- output		_____		
Counter	3. <u>Frequency Adjustment</u> (+ 14 V ± 10 mV)	Mod. Gen. output				
	S 18 : 6 kHz	▪	6 kHz	R 26	6 kHz	.....kHz
	▪ 3 kHz	▪	3 kHz	R 31	3 kHz	.....kHz
	▪ 2,7 kHz	▪	2,7 kHz	R 35	2,7 kHz	.....kHz
▪ 1 kHz	▪	1 kHz	R 37	1 kHz	.....kHz	
▪ 0,4 kHz	▪	0,4 kHz		0,4 kHz	.....kHz	
▪ 0,3 kHz	▪	0,3 kHz		0,3 kHz	.....kHz	

Adjustment and Test Procedure

4020 series
MODULATION GENERATOR

Issue	Alteration No.	Date	Name
		5.10.75	Karim

208 025 A

1/2
Sheet



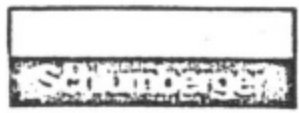
REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
AF Analyser (e.g. Radiometer FRA 3) Distortion- Analyser hp 333 A	<u>4. Distortion Factor Adjustment</u> S 18 : 1 kHz	①	1 kHz (2 kHz)	R 5	second harmonic < 1 mV	0,.....mV
	S 18 : 1 kHz, R102 fully clockwise, S2 pressed	Mod.Gen. output	1 kHz	R 45 + R 71 R 51 + R 65 R 54 + R 62 in couples repeated R 2	Dist. < 0,35 %%%
	S 18 : 1...3 kHz R 39 min. frequency	■	780...900 Hz	_____	Dist. < 3 % Dist. < 3 %%%
	S 18 : 30...100 Hz R 39 min. frequency ■ : 3... 10 kHz R 39, 10 kHz	■ ■	< 30 Hz 10 kHz	_____	1,65...1,85 V 2 ...2,3 V 30 ... 35 mV 1,7 ...2,3 V	.....V.....V.....mV.....V
Dist. Analyser used as a level meter	<u>5. Output Level</u> S 18 : 1 kHz Mod.Gen. output loaded with 220 n S 18 : 1 kHz R 102 fully clockwise, S 2 pressed ■ ■ ■ ■ ■ , S 2 pulled ■ 30 Hz ...100 Hz, R 39 min. frequency R 102 fully clockwise, S 2 pressed	FH,AM- output Mod.Gen.- output ■ ■	1 kHz ■ ■ < 30 Hz	_____	1 V (= input level)	.....ok
	<u>6. Ext. Mod - Input</u> S 18 : ext. 1 kHz, 1 V applied to the ext Mod input	FH,AM- output	1 kHz	_____	1 V (= input level)	.....ok
Oscilloscope	<u>7. Checkout of the 10 turn control potentiometer</u> S 18 : 0,3...1 kHz	FH,AM- output	0,3 ... 1 kHz	turn R 39 slowly over the whole range	no frequency jumping from 0,3 to 1 kHz	.....ok

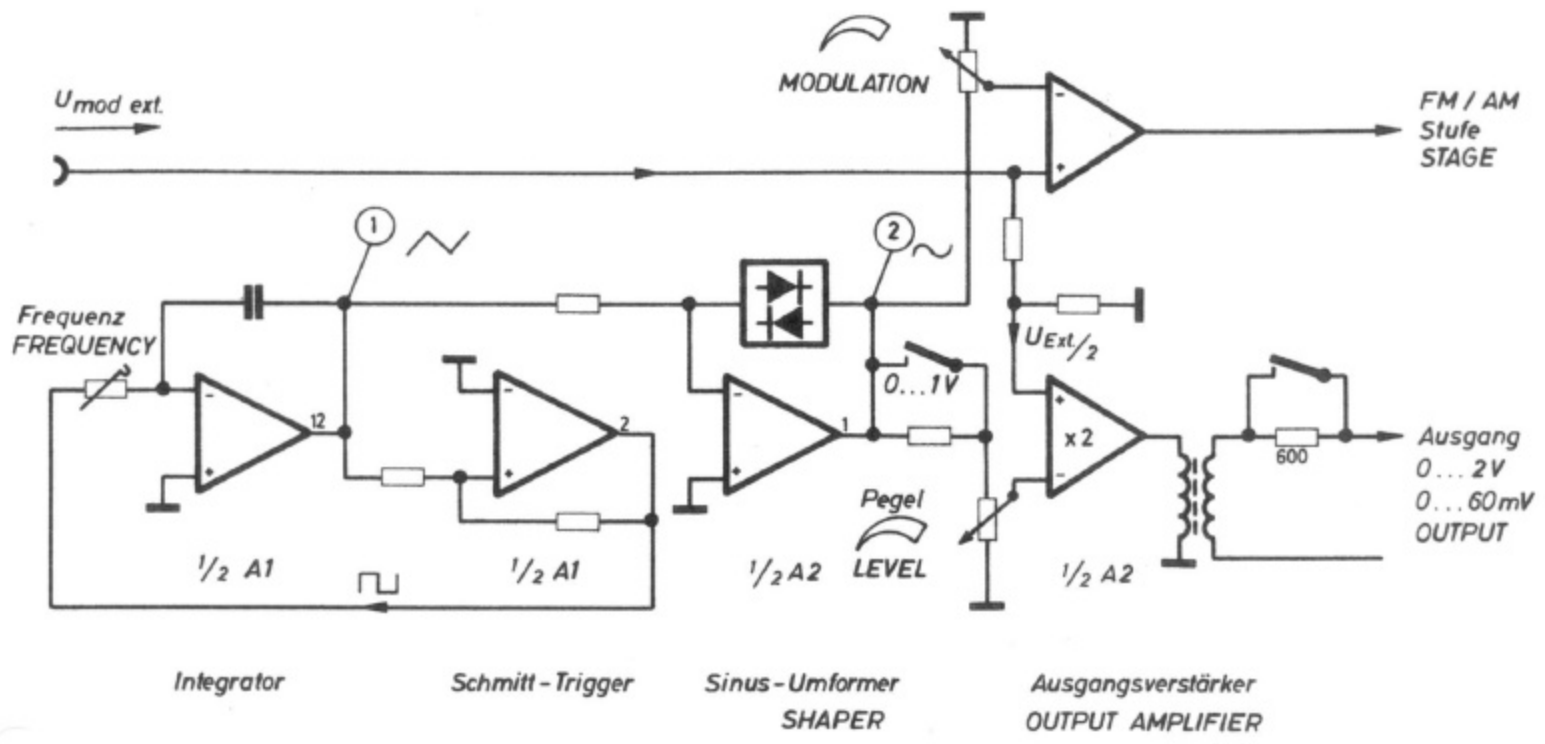
Adjustment and Test Procedure

4020 series
MODULATION GENERATOR

208 025 A

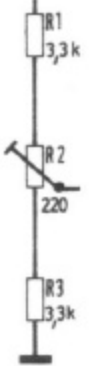
Issue	Alteration No.	Date	Name
		5.10.75	Xamm
	5028.7	3.1.78	X
	5028.7	11.9.75	Ed. W.





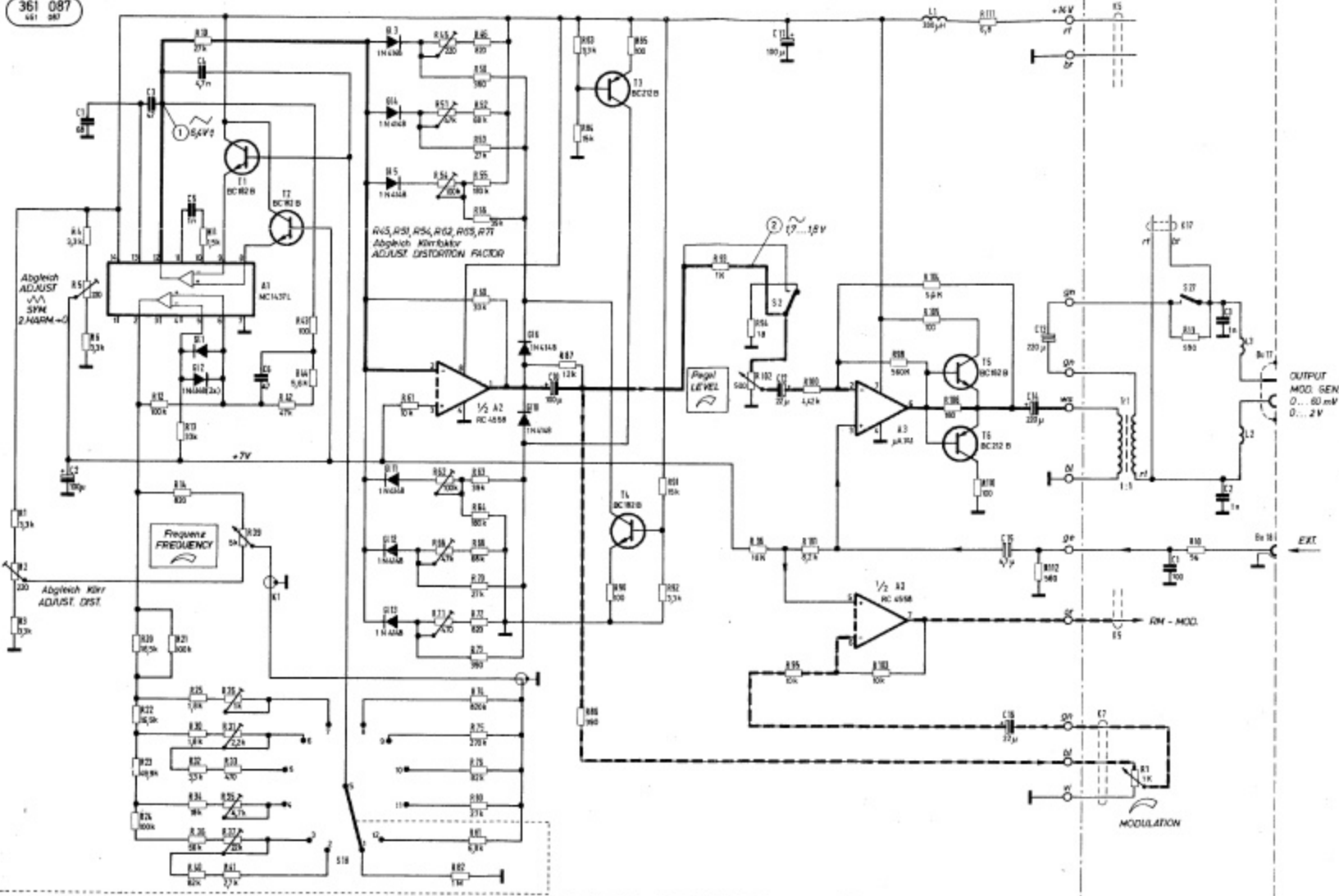
Bereich RANGE	Frequenz FREQUENCY
2	0,3 kHz
3	0,4 kHz
4	1,0 kHz
5	2,7 kHz
6	3,0 kHz
7	6,0 kHz
8	0,03 ... 0,1 kHz
9	0,1 ... 0,3 kHz
10	0,3 ... 1,0 kHz
11	1,0 ... 3,0 kHz
12	3,0 ... 10,0 kHz
1	EXT. MOD.

Abg.
AD.
✓
S1
2.H.



361 087

451 987



— BLACK
□ DOWN
— RED
□ GREY
— ROSE
□ YELLOW
— GREEN

□ BLUE
□ VIOLET
□ GREY
— WHITE
□ TRANSPARENT

Art-Nr.	Gr.	Best-Nr.	Name	Gr.
9028 7	16.1.79	No		
Art-Nr.	Gr.	Best-Nr.	Name	Gr.
95	MODIF.	DATG.	NAME	1578
Best-Nr.	Datum	Name	Datum	NAME

Schlumberger o/s
Melfertstraße 4, Betrieb Gmbh
D-8 München 45

MODULATIONS GENERATOR

208 025 S

Typ: 4020

(See block circuit diagram 102 820 B for total instrument)

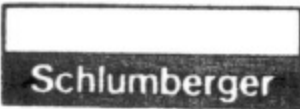
The fully integrated counter provides direct drive of the display in conventional Strobe method, for which it requires merely the counting frequency, the reset pulse, the transfer pulse (transfer of the counter status into the readout store) and the flashing frequency. Its negative feed voltage is generated by a DC/DC converter from +5 V.

The frequency of the reset transfer pulse and flashing frequency is derived by frequency dividers from a 250 kHz signal having crystal accuracy and switching in accordance with the nature of the counting frequency. The flashing frequency is provided to the counter only when the RF amplitude in the oscillator stage ("RF-ALC") is too low or on overflow readout, i. e. >9999.

The counting frequency is conditioned by various means depending on the mode of operation:

1. The modulation frequency f_{MOD} or the input frequency of the voltmeter is quadrupled by an input amplifier having automatic level control in 2 frequency doublers. Thus attaining a faster counter readout, (4 times/sec) for 1 Hz resolution.
2. The offset frequency " $\Delta f (AC)$ " is presented directly. (Depending on resolution, the reset frequency is 10 or 1 Hz.)
3. When establishing transmitter frequencies or indicating synthesizer frequency > 40 MHz the frequency $\frac{40 \dots 480 \text{ MHz}}{1600}$ is presented divided by 7 as the counter frequency.

When indicating the synthesizer frequency < 40 MHz the frequency $\frac{140 \dots 180 \text{ MHz}}{1600}$ is de-mixed using a D Flip Flop analogous to de-mixing in the output stage and in the counter stage also.

	Function Description	237 002 F	Sheet 1/1
	Type: 4020/21/22	Frequency Counter	Date 0979

PROCEDURE

For carrying out the test procedure, the counter can be placed outside of the instrument.
Connect Bu 35, St 32 and St 20 to the instrument.
Caution! MOS-Counter D 9 is highly sensitive against electrostatic potentials. Exercise normal MOS handling procedures.

Check negative Supply Potential

Counter Functions

Mod. Generator switched to ext.
AF Voltmeter range in 1 mV position
button UNMOD pressed

10 MHz Output on rear panel connected
to HF DIRECT socket
AF Voltmeter range in 1 mV position

fOFFSET Control fully pressed
anti-clockwise pulled
(+,- sign blinks) pulled

FM, Range 5 kHz, Deviation 0,5 kHz
Modulation generator 30 Hz
1 kHz
9,9 kHz
10,1 kHz

Mod. mode switch to UNMOD,
Modul. Generator output connected to
AF Millivoltmeter input f_{AF} Range = 1 mV
Signal: 1 kHz, appr. 0,2 mV

REQUIRED TEST EQUIPMENT

4021 (4010 A)
Dig. Voltmeter
(Oscilloscope
for trouble
shooting)

REQUIRED VALUE

-9.....-11 V
on 5 360 082

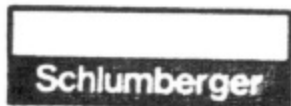
MEASURED VALUE

.....V

RECEIVER MEASUREMENT	TRANSM. MEASUREM.	Frequ. Setting	f _{TRANSM}	f _{MOD}	f _{Abt.}	Counter indication	Loud Speaker	MEASURED VALUE
X		020,0000 MHz	X			020,0	Noise	.....ok
X		140,0000 MHz	X			140,0	"	.....ok
X		479,0000 MHz	X			479,0	"	.....ok
X		600,0000 MHz	X			000,0	"	.....ok
		-----				blinks		.....ok
	X	010,1010	X		X	010,0	Noise	.....ok
	X				X	-01,00	10,1 kHz	.....ok
	X	010,0010	X		X	blinks		.....ok
	X	"		X	X	-01,00	1 kHz	.....ok
	X	009,9990	X	X	X	-1,000	1 kHz	.....ok
					X	+1,000	1 kHz	.....ok
X		009,9990			X	+00,2..	appr. 250Hz	.....ok
X		"			X	-00,2..	"	.....ok
X		"			X	- 0,2..	"	.....ok
X		009,9990		X		0,030	30 Hz	.....ok
X		"		X		1,000	1 kHz	.....ok
X		"		X		9,900	9,9kHz	.....ok
X		"		X		0,100	10,1kHz	.....ok
						blinks		.....ok
X		009,9990	X			1,000	1 kHz	.....ok

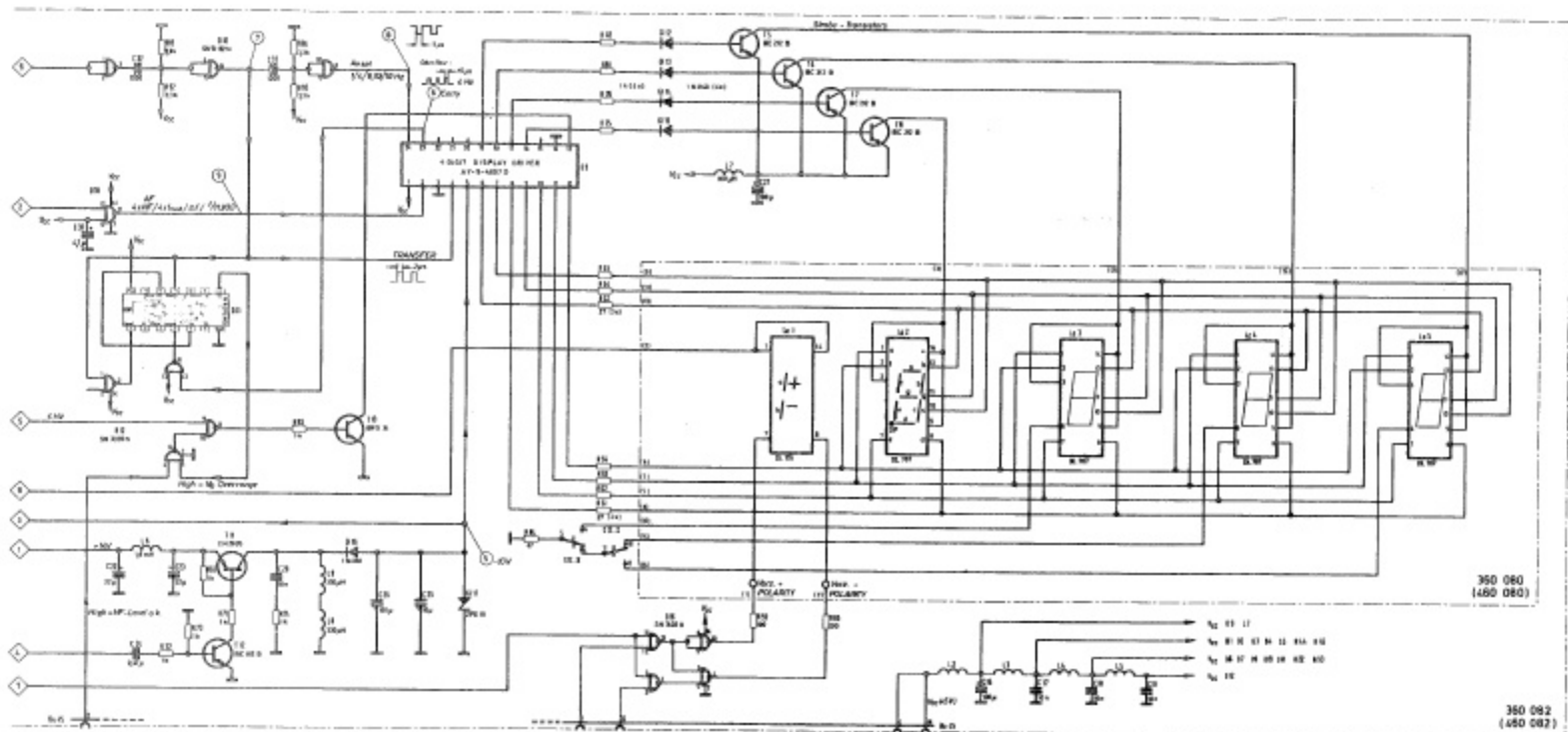
Adjustment and Test Procedure

4020 (4010) series
Frequency Counter

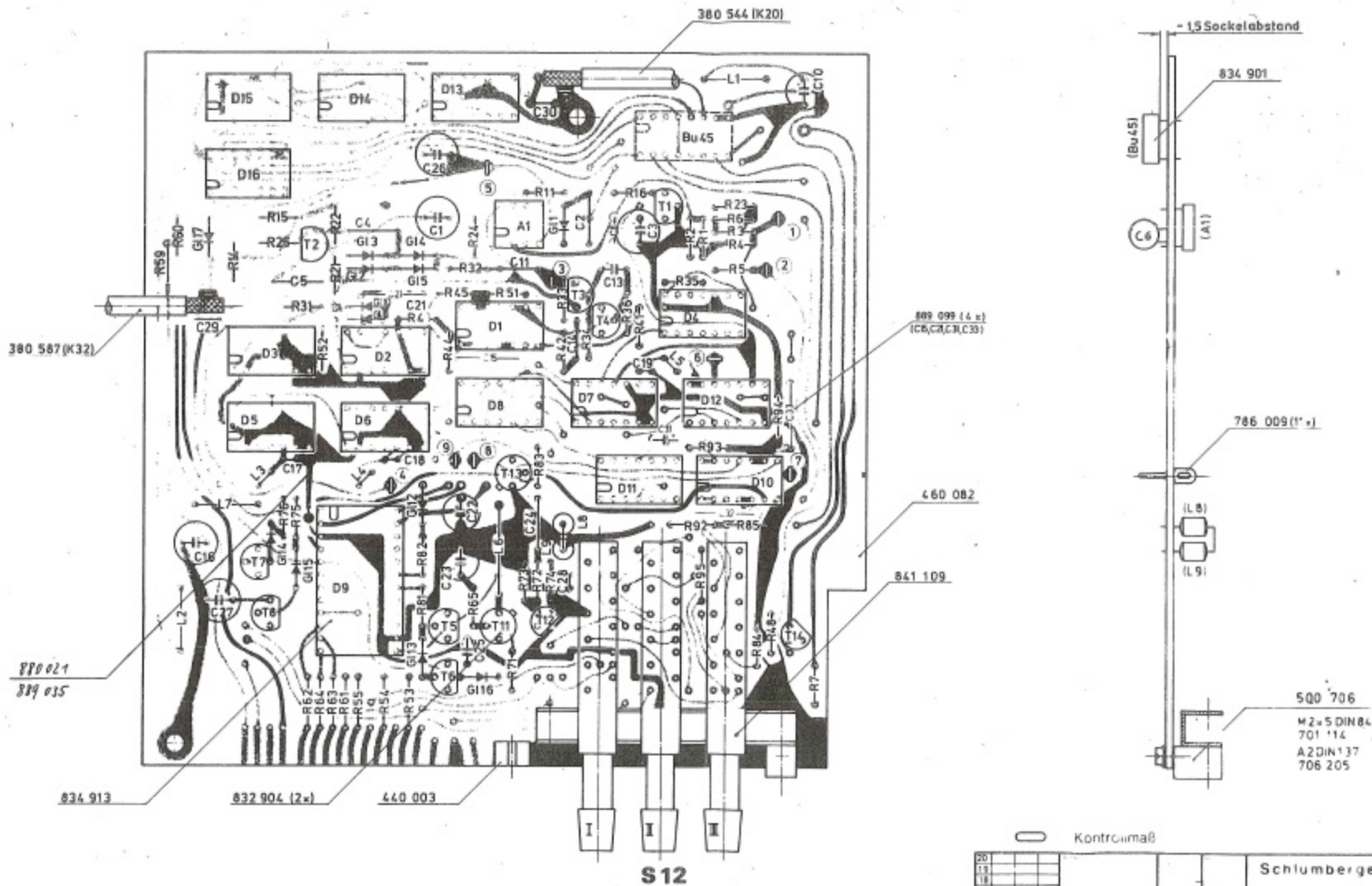


Issue	Alteration No.	Date	Name
		12.5.78	Schulz
		8.10.79	Warmy

237 002 A



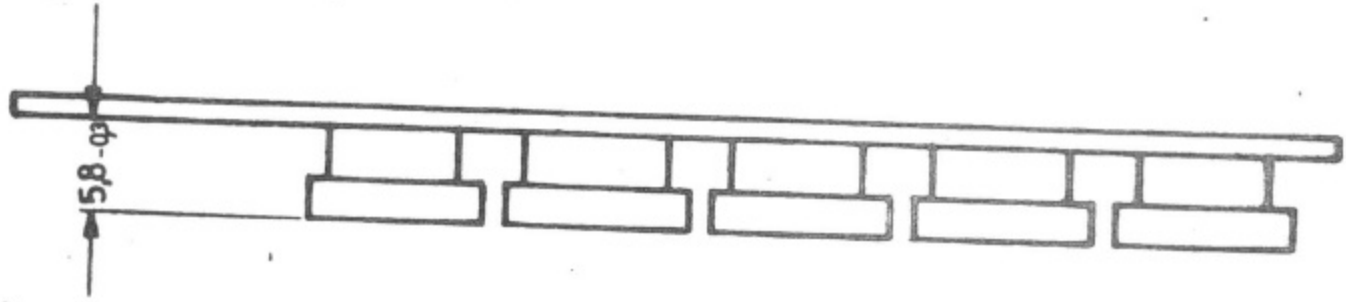
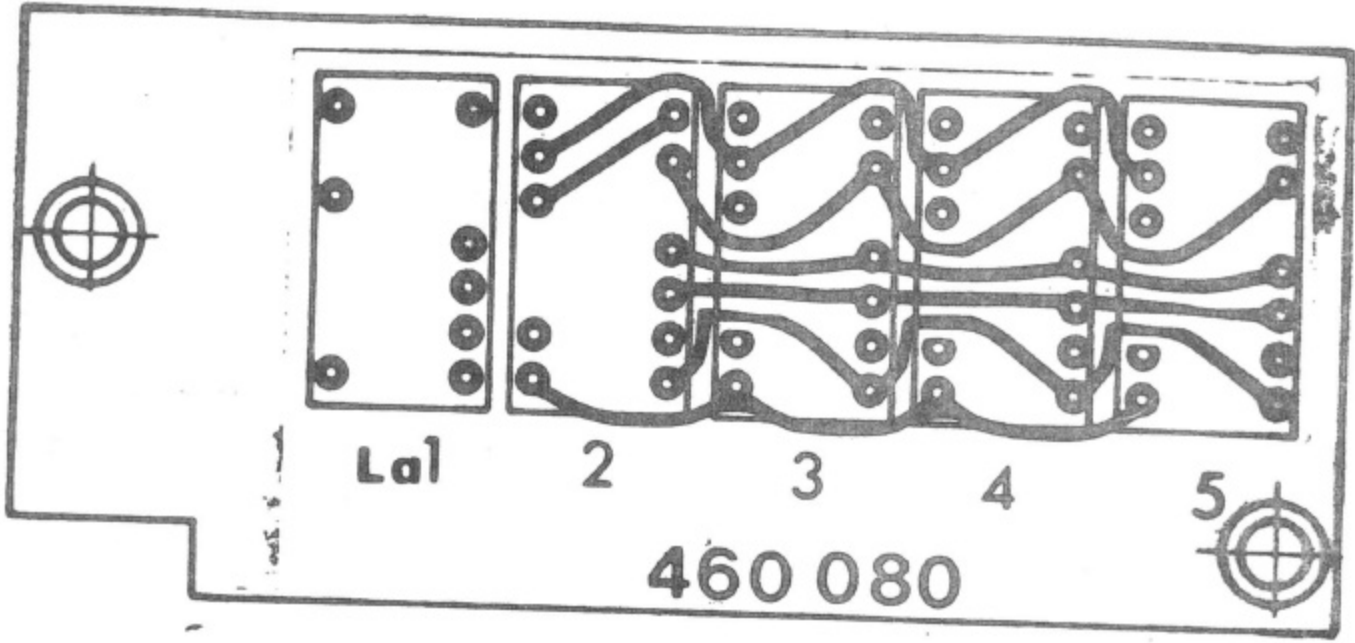
00 BLACK 01 BROWN 02 RED 03 ORANGE 04 YELLOW 05 GREEN 06 BLUE 07 VIOLET 08 WHITE 09 UNK.	10 100 Ω 11 1K Ω 12 10K Ω 13 100K Ω 14 1M Ω 15 10M Ω 16 100M Ω 17 1G Ω 18 10G Ω 19 100G Ω 20 1T Ω 21 10T Ω 22 100T Ω 23 1PT Ω 24 10PT Ω 25 100PT Ω 26 1000PT Ω 27 10000PT Ω 28 100000PT Ω 29 1000000PT Ω 30 10000000PT Ω 31 100000000PT Ω 32 1000000000PT Ω 33 10000000000PT Ω 34 100000000000PT Ω 35 1000000000000PT Ω 36 10000000000000PT Ω 37 100000000000000PT Ω 38 1000000000000000PT Ω 39 10000000000000000PT Ω 40 100000000000000000PT Ω 41 1000000000000000000PT Ω 42 10000000000000000000PT Ω 43 100000000000000000000PT Ω 44 1000000000000000000000PT Ω 45 10000000000000000000000PT Ω 46 100000000000000000000000PT Ω 47 1000000000000000000000000PT Ω 48 10000000000000000000000000PT Ω 49 100000000000000000000000000PT Ω 50 1000000000000000000000000000PT Ω 51 10000000000000000000000000000PT Ω 52 100000000000000000000000000000PT Ω 53 1000000000000000000000000000000PT Ω 54 10000000000000000000000000000000PT Ω 55 100000000000000000000000000000000PT Ω 56 1000000000000000000000000000000000PT Ω 57 10000000000000000000000000000000000PT Ω 58 100000000000000000000000000000000000PT Ω 59 1000000000000000000000000000000000000PT Ω 60 10000000000000000000000000000000000000PT Ω 61 100000000000000000000000000000000000000PT Ω 62 1000000000000000000000000000000000000000PT Ω 63 100PT Ω 64 1000PT Ω 65 100PT Ω 66 1000PT Ω 67 100PT Ω 68 1000PT Ω 69 100PT Ω 70 1000PT Ω 71 100PT Ω 72 1000PT Ω 73 100PT Ω 74 1000PT Ω 75 100PT Ω 76 1000PT Ω 77 100PT Ω 78 1000PT Ω 79 100PT Ω 80 1000PT Ω 81 100PT Ω 82 1000PT Ω 83 100PT Ω 84 1000PT Ω 85 100PT Ω 86 1000PT Ω 87 100PT Ω 88 1000PT Ω 89 100PT Ω 90 1000PT Ω 91 100PT Ω 92 1000PT Ω 93 100PT Ω 94 1000PT Ω 95 100PT Ω 96 1000PT Ω 97 100PT Ω 98 1000PT Ω 99 100PT Ω 100 1000PT Ω	Schlumberger o/s Multiplex- & Vertriebsteil 8 Oktober 68	Frequenzzähler FREQUENCY COUNTER	237 002 S II.2 Typ 400
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S12

20				1:1	Schlumberger o/s
19					Bestückte Leiterplatte
18					
17					
16					
15					360 082
14					
13					
12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					

weich gelötet



Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwendung, Mitteilung an andere ist strafbar und schadenverursachend.

Schaltplanpositionierung : 360 080 Sa / 237 002 S

09	Einteil	Freigebl. Ansprachen	Maßstab	Schlumberger o/s Meßgeräteaab. - Vertrieb GmbH H. München 45
08				
07	Werkstoff	2:1	Bestückte Leiterplatte	360 080
06				
05	Drehzahl	2%	Datum	Name
04				
03	Ausgabe	21.1.	beort.	K =
02				
01	20.11.77 20.11.77 20.11.77			

(See block circuit diagram 102 820 B for total instrument)

1. Type survey

Instrument ser. number	Type of oscillators	Frequency ranges	Number of sub oscillators
4010 | 4020			
012801 to 052850	213 012	60... 100 MHz 140... 180 MHz 420... 480 MHz	2 2 1 (3 subranges)
062801 to...062899	213015	60... 100 MHz 140... 180 MHz 420... 480 MHz	2 2 1 (3 subranges)
072801 to 072882 072883 to ...	213 0 25 } 213 016 }	60... 100 MHz 140... 180 MHz 400... 480 MHz	2 2 1 (2 subranges)
4010 A | 4021			
052801 to 062899	213 013	40... 200 MHz 420... 480 MHz	9 1 (3 subranges)
072801 to 072882 072883 to...	213 023 } 213 017 }	40... 200 MHz 400... 480 MHz	9 1 (2 subranges)
4011 | 4022			
062801 to...062899	213 013 and 213 014	see 4010 A 200... 420 MHz	11
072801 to...	213 017 and 213 014	see 4010 A / 4021 see above	

Schlumberger	Function Description	213 012 F	Sheet 1/3
	Type: 4020/21/22	Oscillator Stage	Date 0979

3. Oscillators

The frequency of the LC or power circuit can be tuned by at least 22 MHz by means of the varactor diodes, the necessary automatic phase control voltage from the decade stage controlling the oscillator frequency to the required value. Due to this very slow frequency control the FM modulation - and also the internal interference modulation - is not eliminated.

By means of additional varactor diodes each oscillator can be frequency modulated by the AF signal "FM(AC)". The adjustable coupling of the FM diode and the APC DC voltage compensates the RF response of the FM sensitivity.

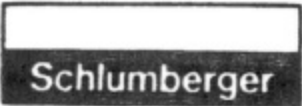
The RF signal is provided to the output amplifier through to the buffer amplifier, harmonic low pass filter and the combination circuitry. To generate 40 ... 60 MHz using a single oscillator circuit a double oscillator frequency of 80...120 MHz is generated and divided at the output by 2.

The oscillator frequency of the 420...480 MHz oscillator is adjusted by the switching diodes in 3 sub ranges (420...440, 440...460, 460...480 MHz).

2. Oscillator Selection

The digital frequency setting commands of the 10 MHz and 100 MHz decade are (after slightly code modification in the decade stage) applied to the oscillator selector, this supplying only the corresponding oscillator with +14 V. The switching diodes too of the RF combination are then either reversed or forward.

In the "transmitter frequency measurement" mode no oscillator is oscillating and the RF combination passes the transmitter signal received from the output stage to the output amplifier.

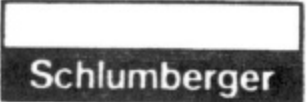
	Function Description	213 012 F	Sheet 2/3
	Type : 4020/21/22	Oscillator Stage	Date 0979

4. Output Amplifier

The RF rectifier in the amplifier output controls the constant output amplitude using the pindiode attenuator pad on the amplifier input.

The ALC control voltage exceeds the normal voltage range should the RF amplitude not be sufficient causing the counter to flash through the RF-ALC (DC) line.

The output amplifier has 2 RF outputs: for the output stage with frequency response and high level and for the decade stage with higher frequency response and low level.

	Function Description	213 012 F	Sheet 3/3
	Type: 4020/21/22	Oscillator Stage	Date 0979

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
<p>DVM</p>	<p>Oscillator Selector (PCB 360 884)</p> <p>Check, that only the oscillator appropriate to the frequency setting on front panel and to the following list is switched on.</p> <p>Frequency setting</p> <p>40... 49,99 MHz 50... 59,99 MHz 60... 79,99 MHz 80... 99,99 MHz 100...119,99 MHz 120...139,99 MHz 140...159,99 MHz 160...179,99 MHz 180...199,99 MHz</p>	<p>St 102/1 ■ /16 ■ /14 ■ /5 ■ /3 ■ /15 ■ /13 ■ /2 ■ /12</p>			<p>on ■ ■ ■ ■ ■ ■ ■ ■ ■</p> <p>* on = < 1,7 V off = > 2,5 V</p>	

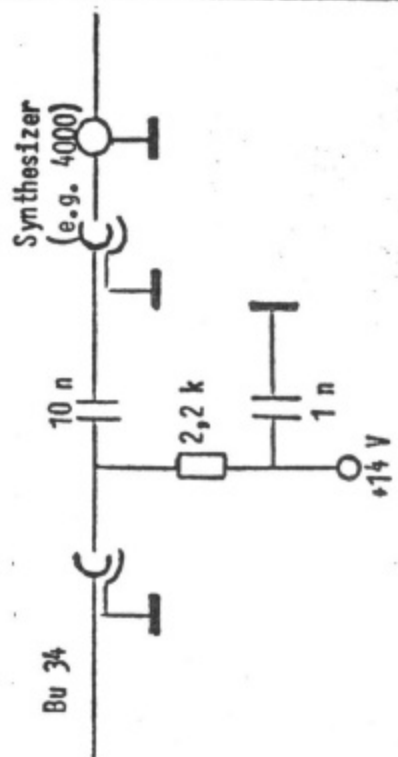
Adjustment and Test Procedure

4021 (4010 A)
Oscillator



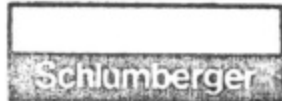
Issue	Alteration No.	Date	Name

213 017 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
<p>Synthesizer (60...520 MHz)</p> <p>DVM</p> <p>Power Meter</p> <p>RF Analyser</p>	<p><u>RF Amplifier (360 885)</u></p> <p>Connect the Synthesizer to Bu 34 by use of the following coupling circuit. Thus the RF signal is provided through a diode switch on PCB 360 887 to the RF amplifier.</p>  <p>To avoid excessive frequency response keep leads short.</p>					

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



Issue	Alteration No.	Date	Name

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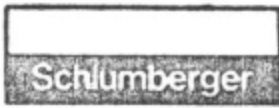
21.6.76 Schick

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Synthesizer (60...520 MHz)	RF Amplifier (360 885) - continued Output Level on Bu 35 $P_{IN} = -7$ dBm on Bu 34	Bu 35	60...400 MHz		$P_{out} = +7,8...+9$ dBm $P_{out} = +8,8...+10$ dBm	
DVM	$P_{IN} = -5$ dBm on Bu 34	Bu 35	400...480 MHz		$P_{out} = +8$... +10 dBm $P_{out} = +10...+12$ dBm	
Power Meter	DVM connected to DF 10 Automatic Level Control $P_{IN} = +2$ -12 dBm $P_{IN} = +2$ - 6 dBm	DF 10	60...480 MHz		VDC < 11 V	
	Command Line : RF present* RF lacking*				$P_{out} = +7,8...+9$ dBm $P_{out} = +8,8...+10$ dBm $P_{out} = +8$... +10 dBm $P_{out} = +10$... +12 dBm	
	Output Level on Bu 40 $P_{IN} = -5$ dBm on Bu 34 For this measurement a 50 Ω load must be connected to Bu 35	DF 10	60...500 MHz		VDC < 11,5 V VDC > 11,5 V	
		Bu 40	20... 60 MHz 60...100 MHz 100...480 MHz		- 2 ... - 15 dBm - 2 ... - 12 dBm - 2 ... - 10 dBm	
RF Analyser	Harmonic Output	Bu 35	20...500 MHz		> 30 dBc	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



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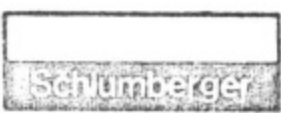
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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DC-Multimeter	<p><u>1. Oscillator Selector (PCB 360 889)</u></p> <p>Set frequency 400 MHz and check supply voltage at L1 Set 440 MHz and check at L1</p> <p>Set 440 MHz and check at L21 Set 480 MHz and check at L21</p> <p><u>2. Frequency Alignment</u></p> <p>Set 439,9 MHz. Press the TRANSMITTER MEASUREMENT button. Adjust C12, C32, R14, R34 to mid-position Adjust C7 to get 11,4 V on the Up-Line (AFC) Set 400 MHz and check AFC again</p> <p>Set 479,9 MHz and adjust C27 Set 440 MHz and check again</p>	L1 L1	400 MHz 440 MHz		> 4 VDC 0 V	
		L21 L21	440 MHz 480 MHz		> 4 VDC 0 V	
		Up-Line ■	439,9 MHz 400 MHz	C7	11,4 VDC > 2 VDC	
		Up-Line ■	479,9 MHz 440 MHz	C27	11,4 VDC > 2 VDC	

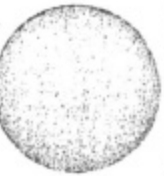
Adjustment and Test Procedure

4021 (4010 A)
Oscillator



Issue	Alteration No.	Date	Name

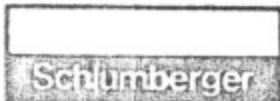
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Modulation meter Multimeter	<p><u>FM-Sensitivity Adjustment (PCB 360 089)</u></p> <p>Set approx. 10 kHz frequency deviation.</p> <p>Set 400 MHz and note deviation on the modulation meter.</p> <p>Set 439,9 MHz and adjust C12 to get equal deviation as at 400 MHz</p> <p>Adjust R10 to exact 10 kHz deviation Check deviation at 2 MHz frequency spacing</p>	<p>Mod. meter</p> <p>■</p> <p>■</p>	<p>400 MHz</p> <p>439,9 MHz</p> <p>400...439,9MHz</p>	<p>C12</p> <p>R10</p>	<p>10 kHz dev. appr.</p> <p>exact value as above</p> <p>10 kHz \pm 5 %</p>	
	<p>Set 440 MHz and note deviation on the modulation meter.</p> <p>Set 479,9 MHz and adjust C32 to get equal deviation as at 440 MHz.</p> <p>Adjust R34 to exact 10 kHz deviation Check deviation at 2 MHz frequency spacing</p>	<p>■</p> <p>■</p> <p>■</p>	<p>440 MHz</p> <p>479,9</p> <p>440... 479,9MHz</p>	<p>C32</p> <p>R34</p>	<p>10 kHz dev. appr.</p> <p>exact value as above</p> <p>10 kHz \pm 5 %</p>	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



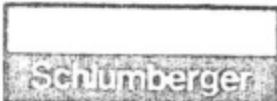
Issue	Alteration No.	Date	Name
		21.6.76	Schuh



REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Multimeter	<u>RF-level</u> Check DC-level on R39 (PCB 360 885) Tip: To get an lower DC-level, pull C25, C5 towards transistor <u>Oscillating conditions</u> Interrupt the AFC-line (UR) and replace it by + 0,5 VDC. Chance FEI if no oscillation occurs under this condition.	R39	DC		< 6 VDC	
Modulation meter	<u>Noise deviation</u> Check unwanted FM- and PM-deviation		439,9 MHz 479,9 MHz		< 8 Hz/9 mRad	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



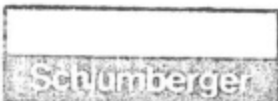
Issue	Alteration No.	Date	Name

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Mod. Meter Distortion Analyser	<u>FM-Distortion</u> Check FM distortion at 20 kHz deviation and 1 kHz f_{mod}		400... 479 MHz		< 1,5 %	
AF Voltmeter	<u>AF-Frequency Response</u> Check frequency response at 10 kHz deviation		1 kHz f_{mod} 10 kHz f_{mod}		± 0 % < 2 %	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



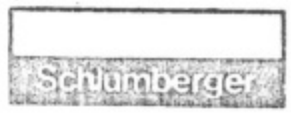
Issue	Alteration No.	Date	Name

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM Adjustable Power Supply 0...12 V	Oscillator 40...200 MHz (360 887) - continued 4. Oscillating conditions Interrupt the automatic frequency control by disconnecting St 31. Connect an adjustable DC potential to the AFC-line (grey lead to 360 887) and find the smallest DC potential at which oscillating occurs. <u>Caution:</u> Don't reconnect St 31 until the Power Supply is disconnected. Frequency setting 40 MHz 50 " 60 " 80 " 100 " 120 " 140 " 160 " 180 "	RF DIRECT or Bu 35	< 40 MHz < 50 " < 60 " < 80 " < 100 " < 120 " < 140 " < 160 " < 180 "	-----	< 1,2 V on AFC-line	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
AF Generator DVM (Deviation Meter calibrated by means of the Bessel function)	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>5. FM Sensitivity depending on Carrier Frequency</p> <p>$f_{mod} = 1 \text{ kHz}$ $V_{mod} = 3 \pm 0,05 \text{ V}_{rms}$ on St 51/1 or on DF 11</p> <p>40...50 MHz Band</p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 1 MHz steps. If necessary, adjust R 2 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 1) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p> <p>Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT</p>	RF DIRECT or Bu 35 RF DIRECT and AFC-line (AFC-line = grey lead)	40,0 MHz 49,999 MHz 40...49,999 MHz 40 MHz 49,9 MHz	R 2 R 12 alternatively R 12 L 1 L 1	 $\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$ Accuracy $\pm 3\%$ $V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	

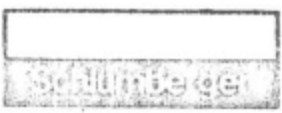
Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Issue	Alteration No.	Date	Name

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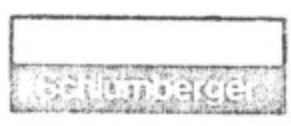
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter AF Generator DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p><u>50...60 MHz Band</u></p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 1 MHz steps. If necessary, adjust R 72 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 11) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p>	<p>RF DIRECT or Bu 35</p> <p>"</p>	50,0 MHz	R 72	$\Delta f = 20 \text{ kHz}$	
			59,9 MHz	R 63 alternatively	$\Delta f = 20 \text{ kHz}$	
	<p>Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT</p>	<p>RF DIRECT and AFC-Line</p> <p>(AFC-line= grey lead)</p>	50...59,9 MHz	R 72	Accuracy $\pm 3\%$	
			50,0 MHz	L 11	$V_{AFC} \leq 2,5 \text{ V}$	
			59,9 MHz	L 11	$V_{AFC} \leq 11,5 \text{ V}$	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



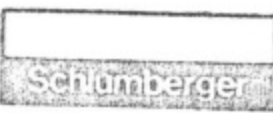
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Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p><u>60...80 MHz Band</u></p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 steps. If necessary, adjust R 172 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L43) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p> <p>Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT</p>	RF DIRECT or Bu 35	60,0 MHz 79,9 MHz	R 172 R 182 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
			60...79,9 MHz	R 172	Accuracy $\pm 3\%$	
		RF DIRECT and AFC-line	60,0 MHz 79,9 MHz	L 43 L 43	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
		(AFC-line= grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



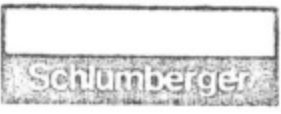
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVH	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p><u>80...100 MHz Band</u></p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 steps. If necessary, adjust R 231 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 55) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p> <p>Settings: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT</p>	RF DIRECT or Bu 35	80,0 MHz 99,9 MHz	R 231 R 222 alternatively	$\Delta f = 20$ kHz $\Delta f = 20$ kHz	
		"	80...99,9 MHz	R 231	Accuracy $\pm 3\%$	
		RF DIRECT and AFC-line	80,0 MHz 99,9 MHz	L 55 L 55	$V_{AFC} \leq 2,5$ V $V_{AFC} \leq 11,5$ V	
		(AFC-line= grey lead)				

Adjustment and Test Procedure

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Oscillator



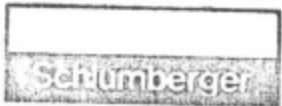
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURE VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360887) - continued</p> <p>100...120 MHz Band</p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 MHz steps. If necessary, adjust R 233 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 61) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p>	RF DIRECT or Bu 35	100,0 MHz 119,9 MHz	R 233 R 243 alternatively	$\Delta f = 20$ kHz $\Delta f = 20$ kHz	
		RF DIRECT and AFC-line	100...119,9 MHz	R 233	Accuracy $\pm 3\%$	
	<p>Setting: RECEIVER MEASUREMENT</p> <p>TRANSMITTER MEASUREMENT</p>		100,0 MHz 119,9 MHz	L 61 L 61	$V_{AFC} \leq 2,5$ V $V_{AFC} < 11,5$ V	
		(AFC-line = grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



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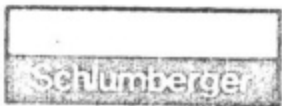
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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p><u>120...140 MHz Band</u></p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 MHz steps. If necessary, adjust R 292 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 65) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p>	RF DIRECT or Bu 35	120,0 MHz	R 292	$\Delta f = 20$ kHz	
			139,9 MHz	R 283 alternatively	$\Delta f = 20$ kHz	
		"	120...139,9 MHz	R 292	Accuracy $\pm 3\%$	
	<p>Setting: RECEIVER MEASUREMENT</p> <p> TRANSMITTER MEASUREMENT</p>	RF DIRECT and AFC-line	120,0 MHz	L 65	$V_{AFC} \leq 2,5$ V	
		(AFC-line= grey lead)	139,9 MHz	L 65	$V_{AFC} \leq 11,5$ V	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



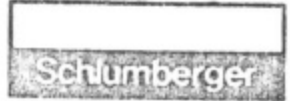
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Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>----- 140...160 MHz Band -----</p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 MHz steps. If necessary, adjust R 114 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 33) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p>	RF DIRECT or Bu 35	140,0 MHz	R 114	$\Delta f = 20 \text{ kHz}$	
			159,9 MHz	R 123 alternatively	$\Delta f = 20 \text{ kHz}$	
			140...159,9 MHz	R 114	Accuracy $\pm 3\%$	
	<p>Setting: RECEIVERMEASUREMENT</p> <p>TRANSMITTERMEASUREMENT</p>	RF DIRECT and AFC-line	140,0 MHz	L 33	$V_{AFC} < 2,5 \text{ V}$	
		(AFC-line= grey lead)	159,9 MHz	L 33	$V_{AFC} < 11,5 \text{ V}$	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



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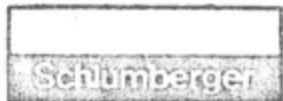
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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>160...180 MHz Band</p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 MHz steps. If necessary, adjust R 165 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 41) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p> <p>Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT</p>	<p>RF DIRECT or Bu 35</p> <p>"</p> <p>RF DIRECT and AFC-Line</p> <p>(AFC-line= grey lead)</p>	<p>160,0 MHz</p> <p>179,9 MHz</p> <p>160...179,9 MHz</p> <p>160,0 MHz</p> <p>179,9 MHz</p>	<p>R 165 R 161 alternatively</p> <p>R 165</p> <p>L 41 L 41</p>	<p>$\Delta f = 20$ kHz $\Delta f = 20$ kHz</p> <p>Accuracy $\pm 3\%$</p> <p>$V_{AFC} \leq 2,5$ V $V_{AFC} \leq 11,5$ V</p>	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



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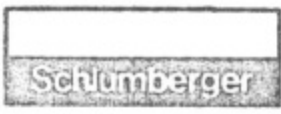
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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p><u>180...200 MHz Band</u></p> <p>Adjust deviation at both ends of the band</p> <p>Check deviation across whole band in 2 MHz steps. If necessary, adjust R 81 for equal positive and negative deviation accuracy.</p> <p>If adjusting to the specified accuracy $\pm 3\%$ is not possible across entire band, the oscillator tuning (L 25) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.</p>	RF DIRECT or Bu 35	180,0 MHz 199,9 MHz	R 81 R 91 alternatively	$\Delta f = 20$ kHz $\Delta f = 20$ kHz	
		"	180...199,9 MHz	R 81	Accuracy $\pm 3\%$	
	<p>Setting: RECEIVER MEASUREMENT</p> <p> TRANSMITTER MEASUREMENT</p>	RF DIRECT and AFC-line	180,0 MHz 199,9 MHz	L 25 L 25	$V_{AFC} < 2,5$ V $V_{AFC} < 11,5$ V	
		(AFC-line= grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
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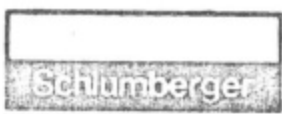
REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURE VALUE
Deviation Meter Distortion Meter	Oscillator 40...200 MHz (360 887) - continued 5. Modulation Distortion $f_{mod} = 1 \text{ kHz}$ $V_{mod} = 1,5 \text{ V}_{rms}$ on St 51/1 or on DF 11 7. Harmonics	RF DIRECT or Bu 35	40...199 MHz 40...199 MHz	----- -----	Dist. < 1,5 % at $\Delta f = 10 \text{ kHz}$ > 30 dBc	
RF Analyser 1200 MHz						

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

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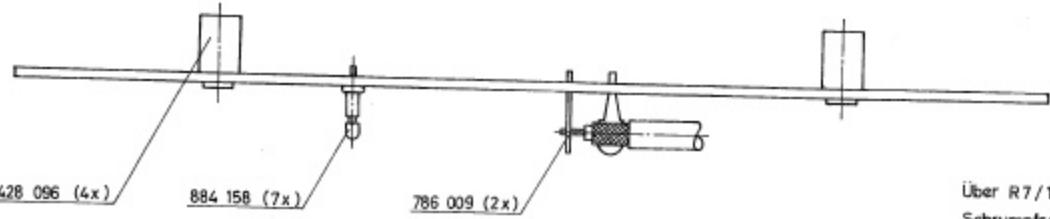
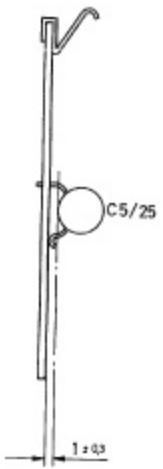
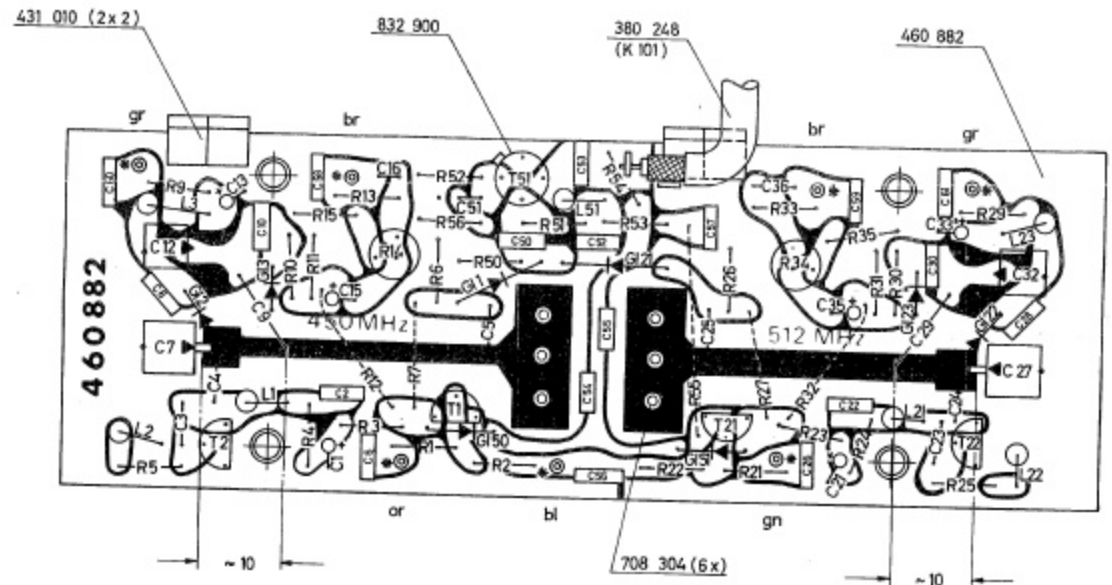
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Replacement for

weich gelötet
 C7/C12/C27/C32
 ◀ = Farbpunkt



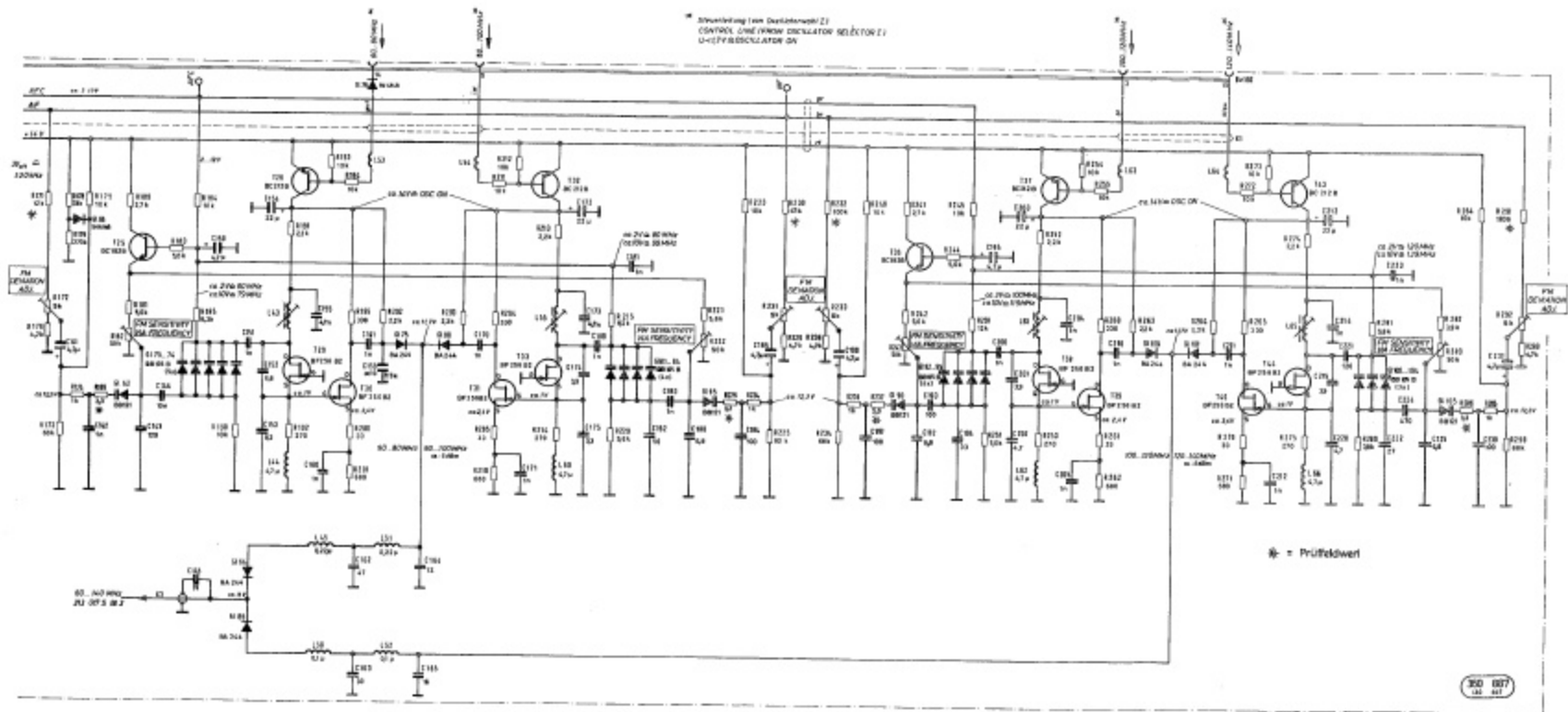
Über R7/12/27/32/55
 Schrumpfschlauch 787 029 aufgeschumpft

* = Farbpunkt

		2:1	Schlumberger o/s
			Bestückte Leiterplatte
			360 882
1977 4.77 5.4	Kringelis		

Schaltplanpositionierung ▲ 213 016/017 S/360 882 Sa verwendet in : 375 200/211 Gerät : 4010/4010A/4011

Abwandlung von Schaltplan 21
 CONTROL LINE FROM OSCILLATOR SELECTOR
 U-1777 REGULATOR ON



* = Prüfswert

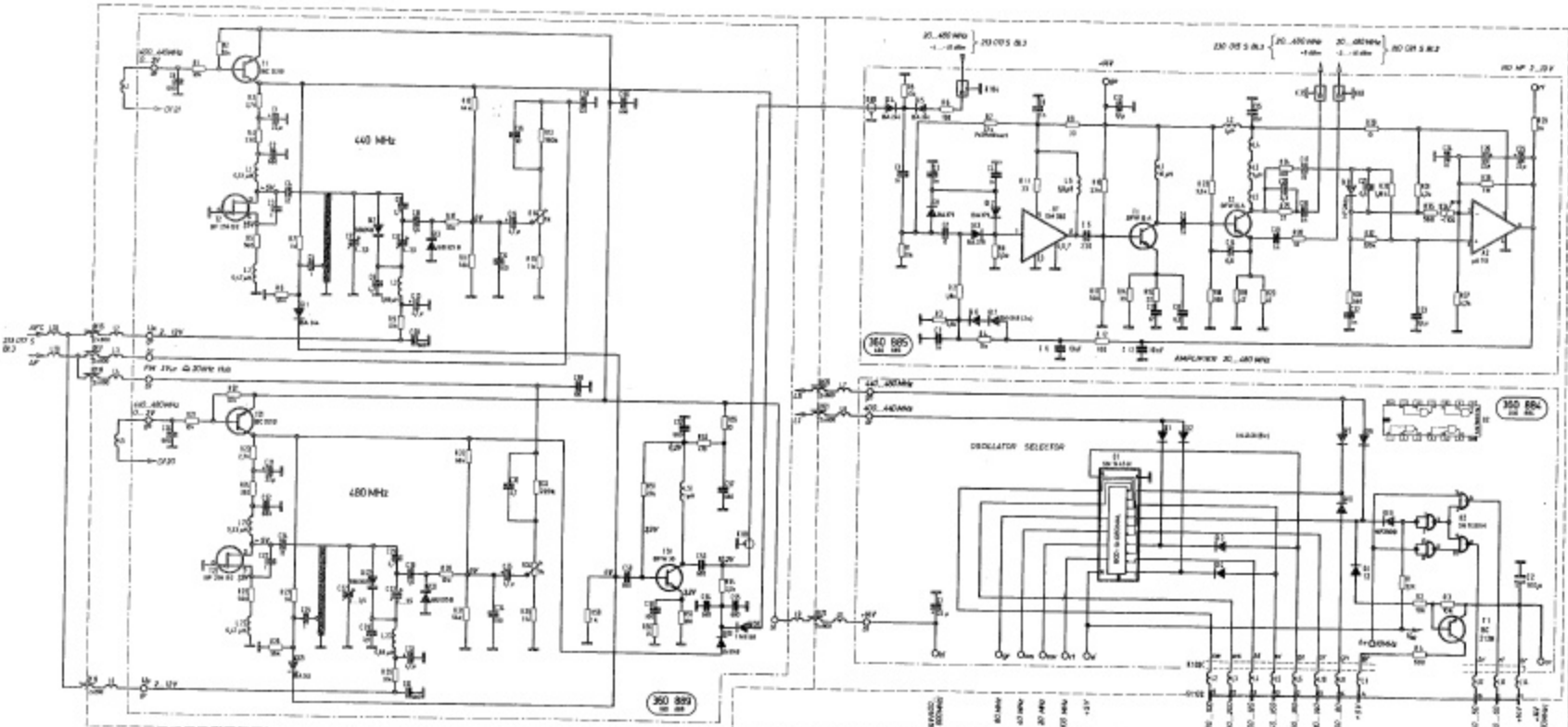
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121 001

10	100	1000	10000	100000	1000000	10000000	100000000	1000000000
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1	10	100	1000	10000	100000	1000000	10000000	100000000
1	10	100	1000	10000	100000	1000000	10000000	100000000
1	10	100	1000	10000	100000	1000000	10000000	100000000
1	10	100	1000	10000	100000	1000000	10000000	100000000
1	10	100	1000	10000	100000	1000000	10000000	100000000
1	10	100	1000	10000	100000	1000000	10000000	100000000
1	10	100	1000	10000	100000	1000000	10000000	100000000

Schünberger o's
 Schünberger o's
 1. November 1951

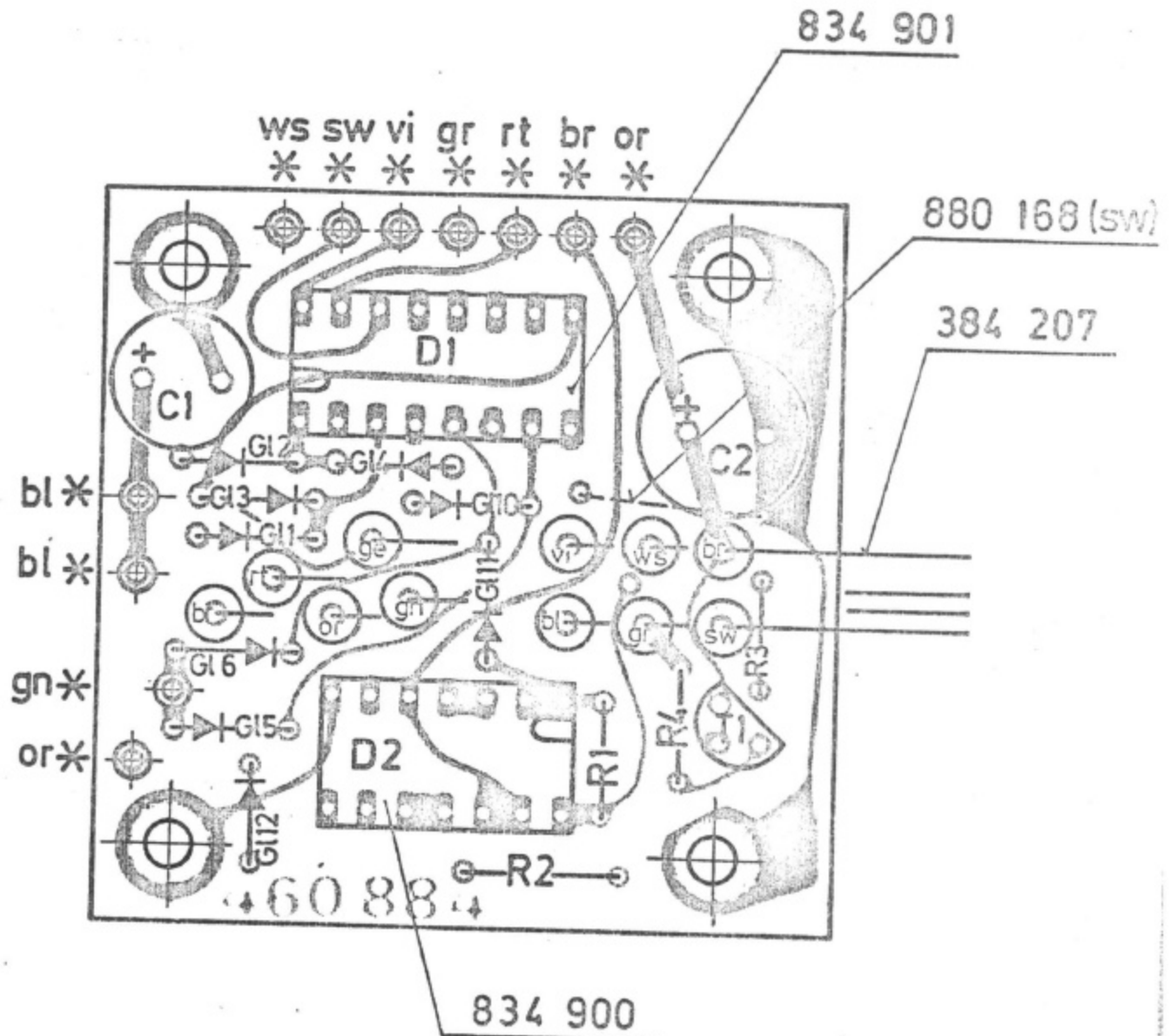
OSCILLATOR

213 017 S 25
 Typ: 400 A / 401



* 0 OHM * 0.1K * 10 OHM * 0.2K * 100 OHM * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M		* 0.1K * 0.1K * 0.2K * 0.2K * 0.5K * 0.5K * 1K * 1K * 10K * 10K * 100K * 100K * 1M * 1M	
W 103112 2001 71 103112 2001 71 103112 2001 71 103112 2001 71		Schumberger o's 1 München 18		OSCILLATOR		213 017 S BK.2 Typ. 430 A / 401									

weich gelötet

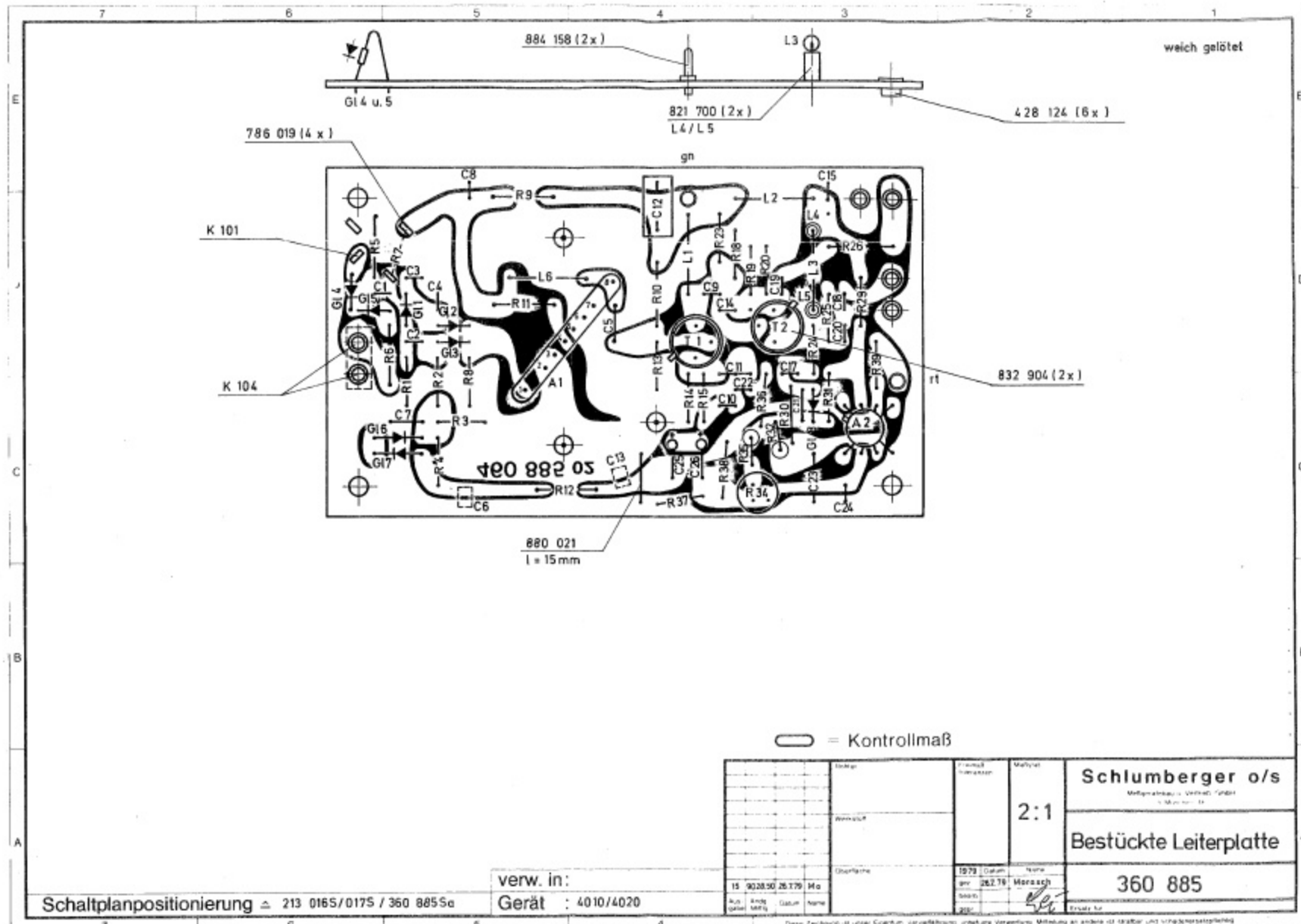


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* = Farbpunkt

Schaltplanpositionierung Δ 213 016 S / 213 017 S 360 884 Sa

09				Rohrteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 45
08					± 0,2	2:1	
07				Werkstoff			Bestückte Leiterplatte
06							
05	8028.93	21.12.78	Mo				360 884
04	6028.47	22.6.78	Eiler				
03							
02							
01				Oberfläche	1976 Datum	Name	
Ausgabe	Angg. Mittig	Datum	Name		gez 22.6.	Eiler	
					bearb 24.6.	<i>[Signature]</i>	



weich gelötet

⊖ = Kontrollmaß

Zeichn. Nr. 15 902850 25.179 Mo Bau- und Maßstab	Datum 26.7.76 Name Morasch	Maßstab 2:1	Schlumberger o/s <small>Motoren- und Schaltgerätekonzern</small> <small>Postfach 10 16</small>
			Bestückte Leiterplatte 360 885
verw. in: Gerät : 4010/4020		1976 26.7.76 Morasch <small>Erstellt für</small>	

Schaltplanpositionierung Δ 213 016S/017S / 360 885Sc

R1/230/24, 24, 42, 45, 76, 103, 115, 132, 133, 176, 3
 151, 160, 171, 183, 196, 211, 212, 232, 254, 255
 272, 273
 external signals



066, 156 (4x1)

428, 324 (6x1)

786 009 (8x1)

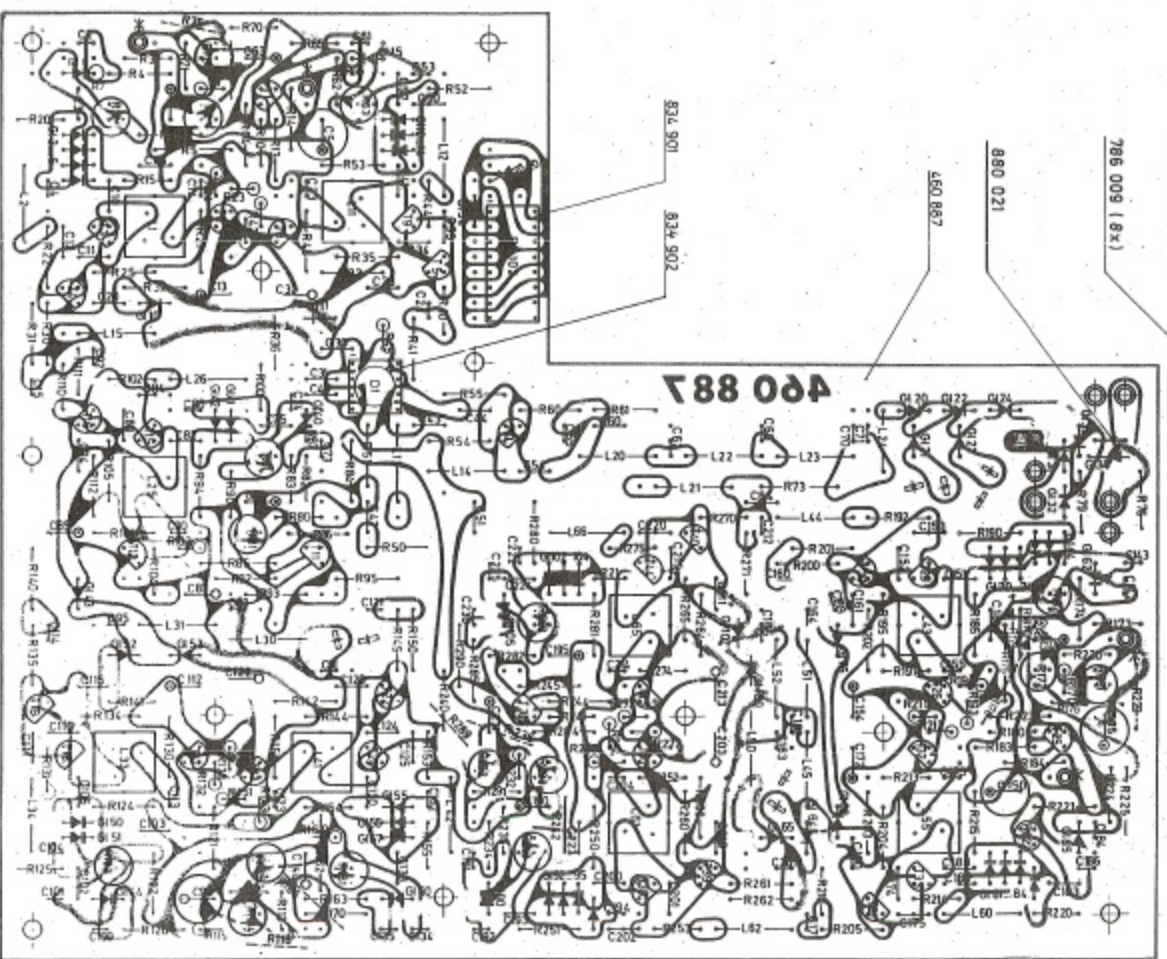
890 021

460 867

490 887

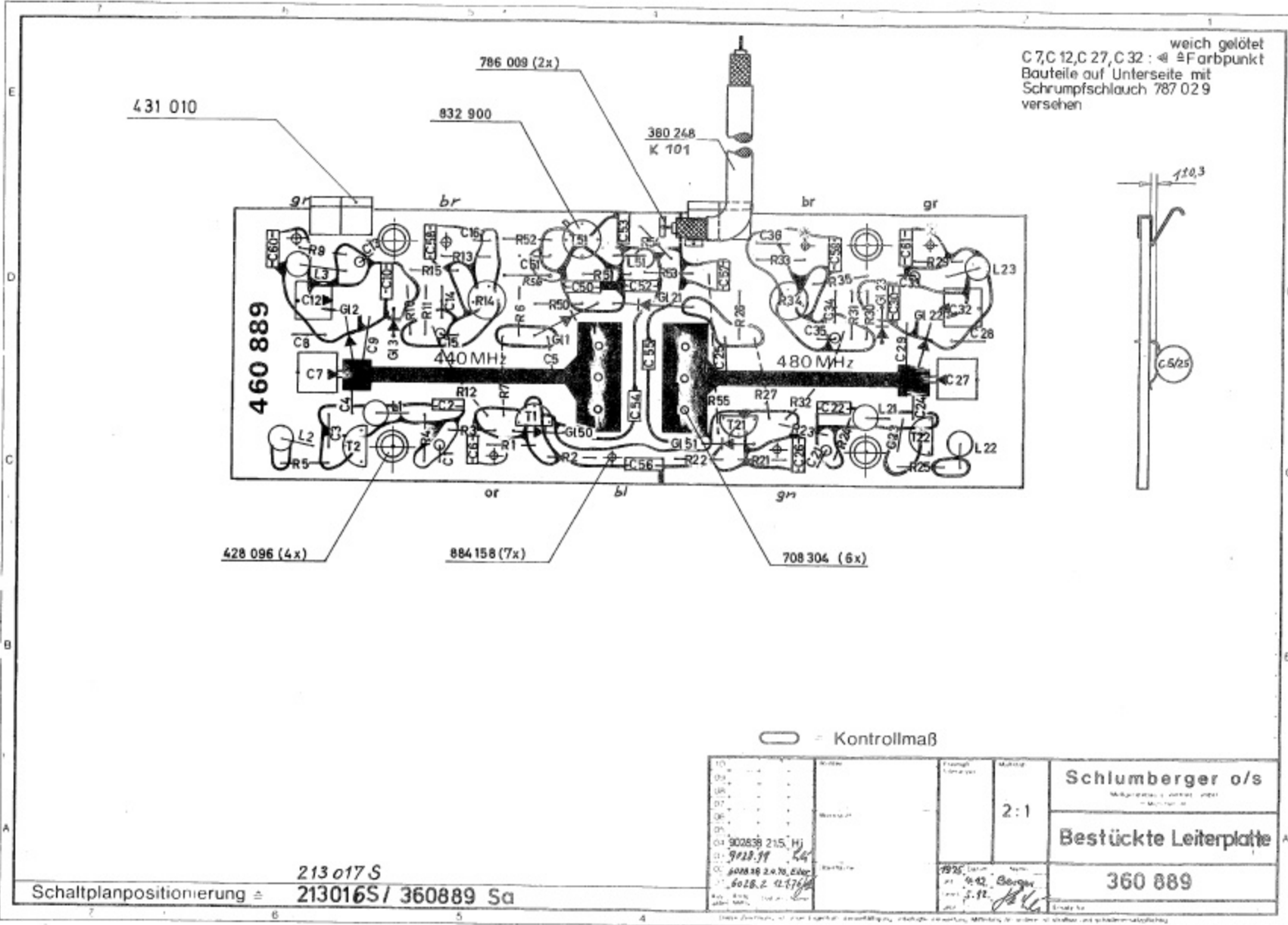
834 901

834 902



R6, 75, 1
 229, 21
 auf Lei



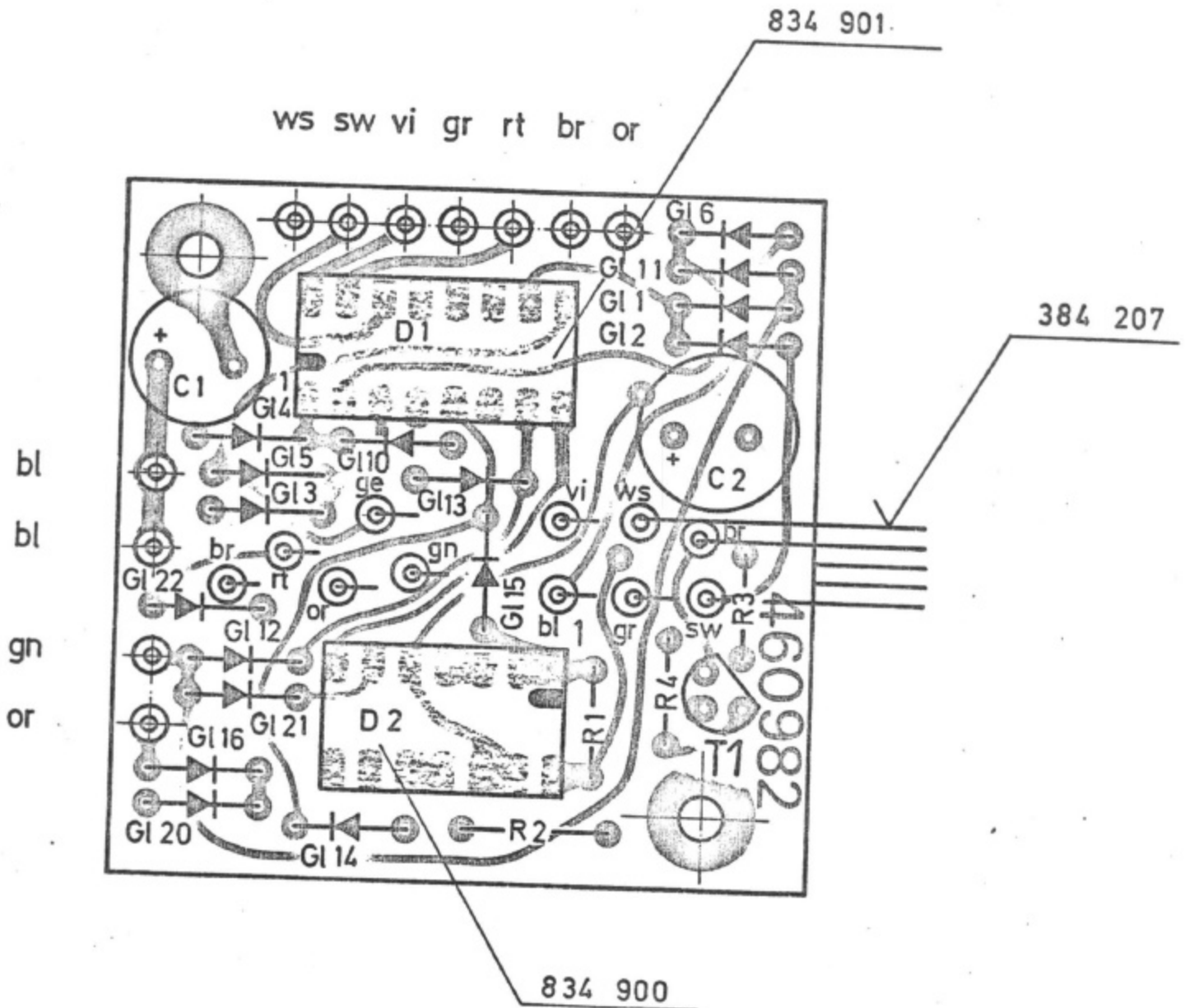


weich gelötet
 C 7, C 12, C 27, C 32 : Δ \neq F arbpunkt
 Bauteile auf Unterseite mit
 Schrumpfschlauch 787 029
 versehen

= Kontrollmaß

10					Schlumberger o/s Mikroelektronik & Messtechnik München
09					
08					2:1
07					
06					Bestückte Leiterplatte
05					
04	900839	215	HJ		360 889
03	9018	39	24		
02	602816	2.0.70	Edw		3.11. Berger
01	6018.2	0.1.76			
213 017 S Schaltplanpositionierung Δ 213016S / 360889 Sa					360 889 Einzelkarte

weich gelötet



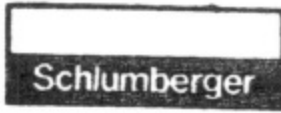
Schaltplanpositionierung Δ 213 016 / 213 017S / 360 884 Sa

09				Reihenteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Messgerätekaufl. Vertrieb GmbH München 45
08					-	2:1	
07				Werkstoff			Bestückte Leiterplatte
06							
05							360 982
04							
03							
02	9024	12.12.79	ka		1979	1312 79	Morasch
01				Oberfläche			
	Ausgabe	Änderung	Datum	Name			

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM Multimeter	<p>1. <u>Oscillator Selector (PC Boards 360 870, 871, 872)</u></p> <p>Set Frequency 210 MHz and check supply Voltage at L 41 (360 870)</p> <p>Change frequency in 20 MHz steps and check voltage at corresponding points of the other sub oscillators.</p>	L 41	210 MHz 230 MHz 250 MHz		> 5 VDC > 5 VDC	
	<p>2. <u>Switch-over to 213 017 oscillator (360 873)</u></p> <p>Check DC-voltage at the middle conductor of the RF-cable K 103 (R 10 on 360 873)</p>		200- 419,9 MHz < 200 MHz > 420 MHz		> 10 VDC < 1 VDC < 1 VDC	
	<p>3. <u>Low pass filter change over (360 873)</u></p> <p>Set 200 MHz, and check potential of Emitter of T 2. Change frequency</p>	T2/Emitter	200 MHz 300 MHz 400 MHz		> 10 VDC < 1 VDC < 1 VDC	
	<p>4. <u>Frequency Alignment (360 870, 71, 72)</u></p> <p>Adjust trimmer capacitors C 12, C32 ... C 62 to mid-position. Select the RECEIVER MEASUREMENT mode. Set 219, 999 MHz and adjust C 47 to get 10 V on the U_R-Line (AFC).</p> <p>Change frequency in steps of 20 MHz and adjust trimmer capacitors of the other sub oscillators in the same way.</p>	① on 360 872	219,999 MHz 239,999 MHz 419,999 MHz	C 47 / 360 870 C 47 / 360 871 C 7 / 360 872	10 VDC 10 VDC 10 VDC	

Adjustment and Test Procedure

4022 (4011)
Oscillator



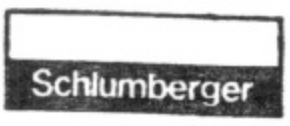
Issue	Alteration No.	Date	Name
		5.10.79	Kana

213 014 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
4000, 4901 or other Modulation Meter	<p>Check AFC-potential at other ends of the frequency sub ranges.</p> <p>5. <u>FM-Sensitivity adjustment (360870, 71, 72)</u></p> <p>Adjust C 52 in order to get the same deviation at both ends of the frequency sub ranges. Adjust R 54 to get 20 kHz FM deviation.</p>	<p>① on 360 872</p> <p>RF-out</p>	<p>200 MHz 220 240 ⋮ 400 MHz</p> <p>200...219,999MHz 220...239,999</p> <p>400...419,999MHz</p>	<p>- - - - - C 52 / R 54 C 52 / R 54 C 12 / R 14</p>	<p>> 2,2 VDC > 2,2 " > 2,2 " > 2,2 VDC</p>	

Adjustment and Test Procedure

4022 (4011)
Oscillator



Issue	Alteration No.	Date	Name
01	602810	5.10.73 26 2 76	Harm/ Schub

213 014 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
4000, 4901 or other Modulation Meter and Distortion Analyser	6. <u>Modulation Distortion</u> $f_{mod} = 1$ kHz FM-Deviation 20 kHz	RF	200 to 419,9 MHz	-	Dist. < 1 %	
	7. <u>Unwanted Noise Deviation</u> Phase deviation Frequency deviation	" "	" "	- -	< 8m Rad < 7 Hz	
	8. <u>Modulation Frequency Response</u>	"	$f_{mod} =$ 300 Hz to 10 kHz	-	< \pm 3 %	
	9. <u>RF-Harmonics</u>	"	200 to 419,9 MHz	-	< 34 dB c	

Adjustment and Test Procedure

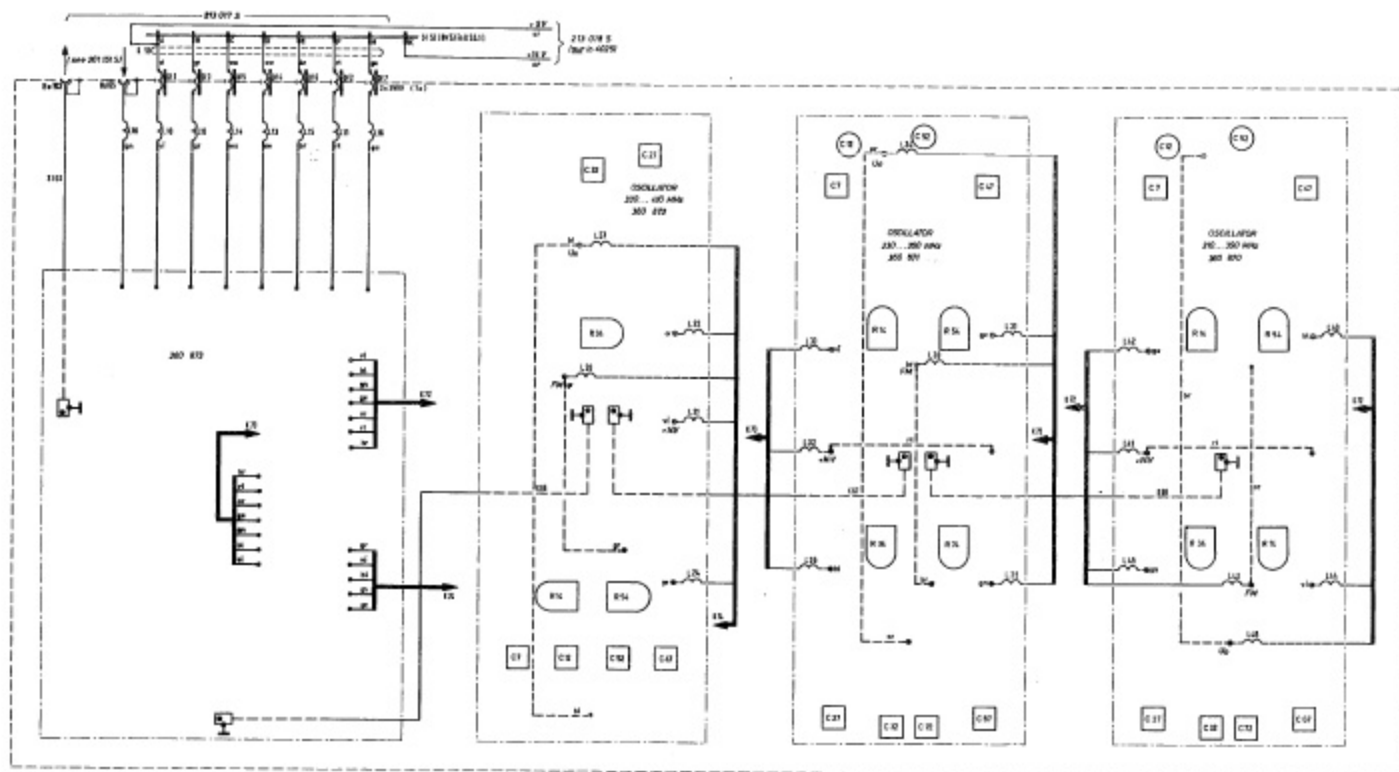
4022 (4011)
Oscillator

Schlumberger

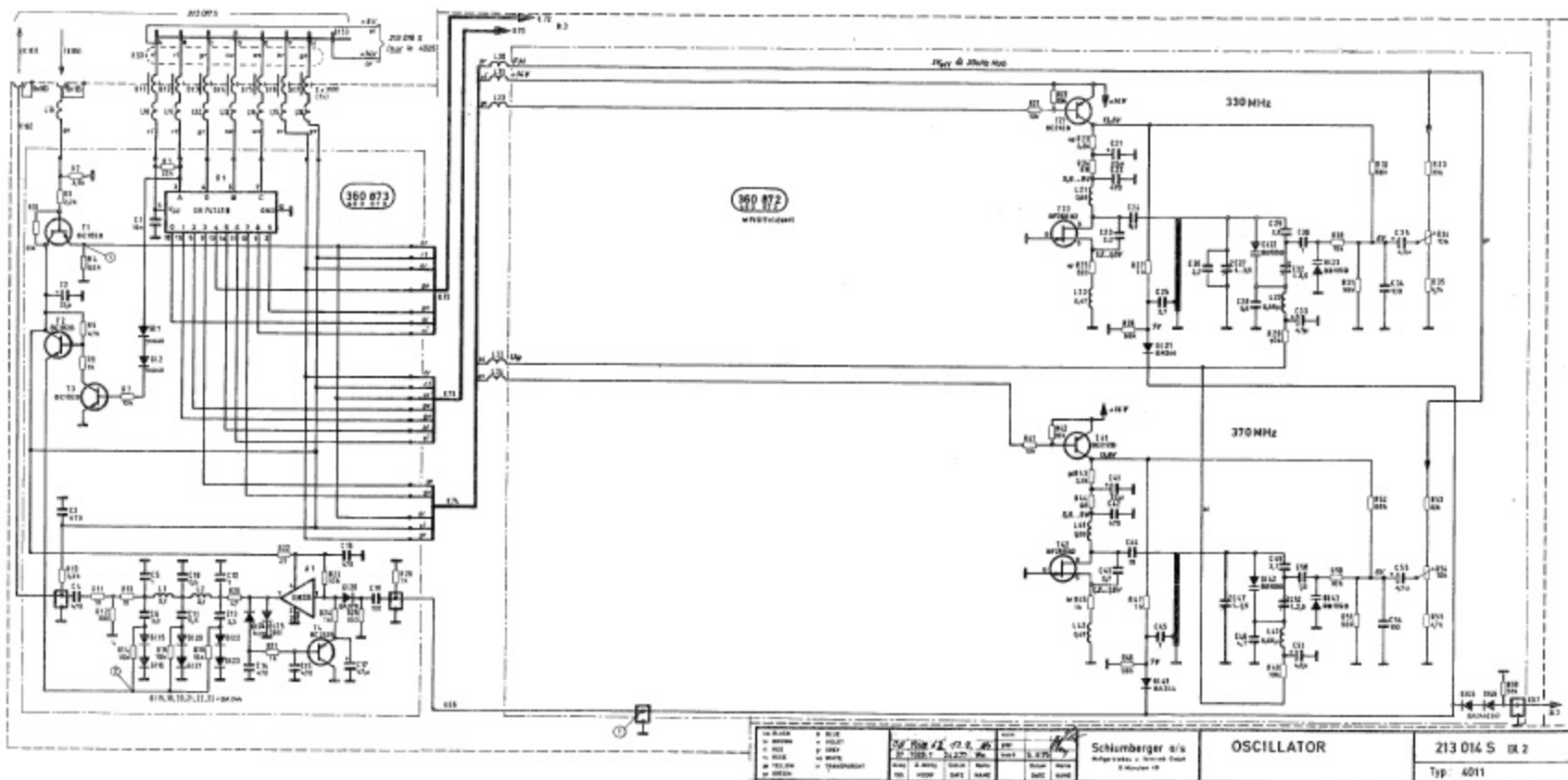
Issue	Alteration No.	Date	Name
01	602R10	5.10.79	Schub

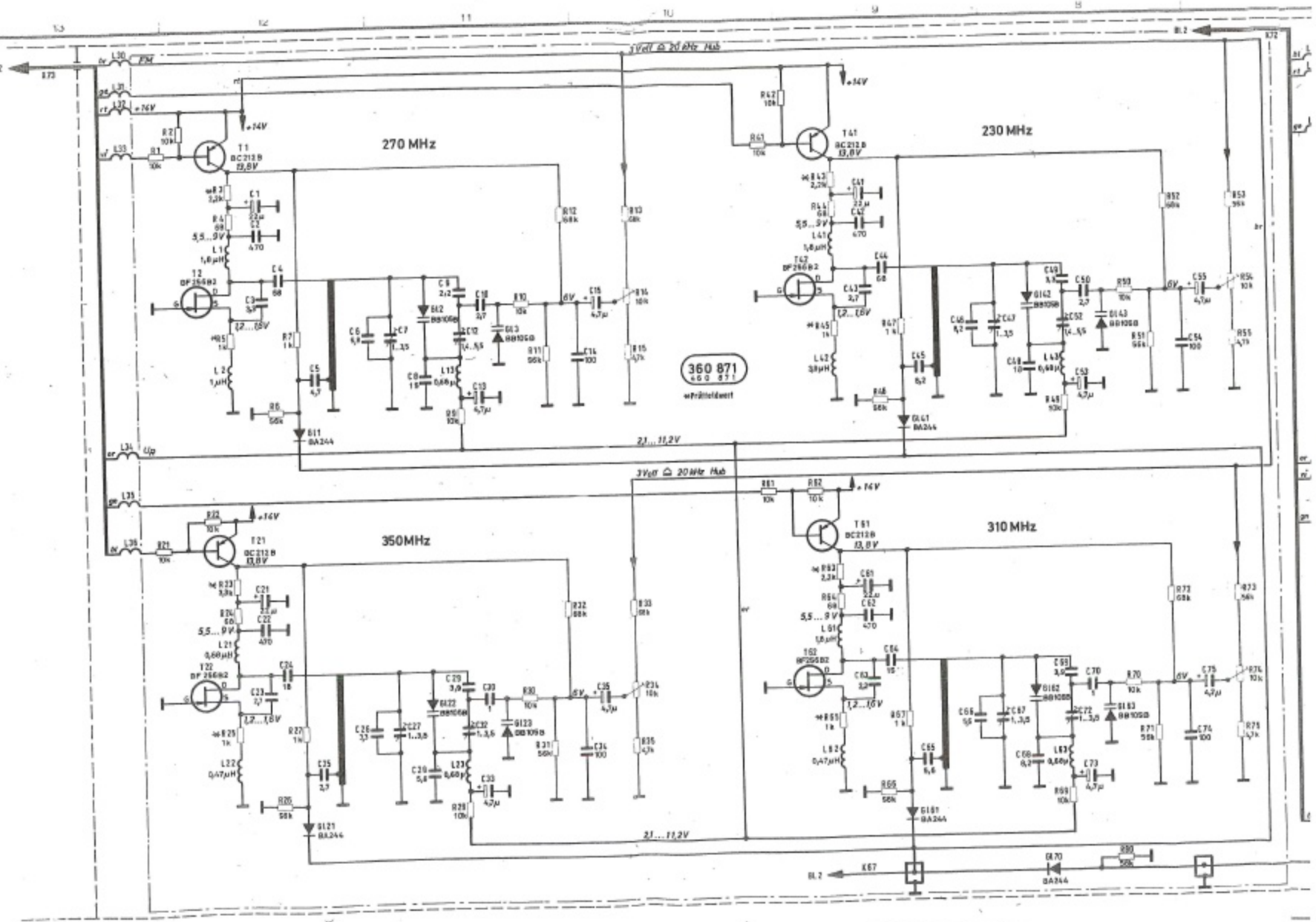
213 014 A

3/3
Sheet



■ BLACK □ WHITE ○ HOLE △ POINT ▽ POINT ⊕ POSITIVE ⊖ NEGATIVE	■ BLUE □ WHITE ○ HOLE △ POINT ▽ POINT ⊕ POSITIVE ⊖ NEGATIVE	20 200V 20 200V 20 200V 20 200V 20 200V 20 200V 20 200V 20 200V	20 200V 20 200V 20 200V 20 200V 20 200V 20 200V 20 200V 20 200V	20 200V 20 200V 20 200V 20 200V 20 200V 20 200V 20 200V 20 200V	Schlumberger o/s Polytechnicum v. Dresden 1911	OSCILLATOR	213 014 S ex. 1 Typ: 4011
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270 MHz

230 MHz

350 MHz

310 MHz

360 B71
400 B71
w/ritoldest

1V/10 20MHz Mab

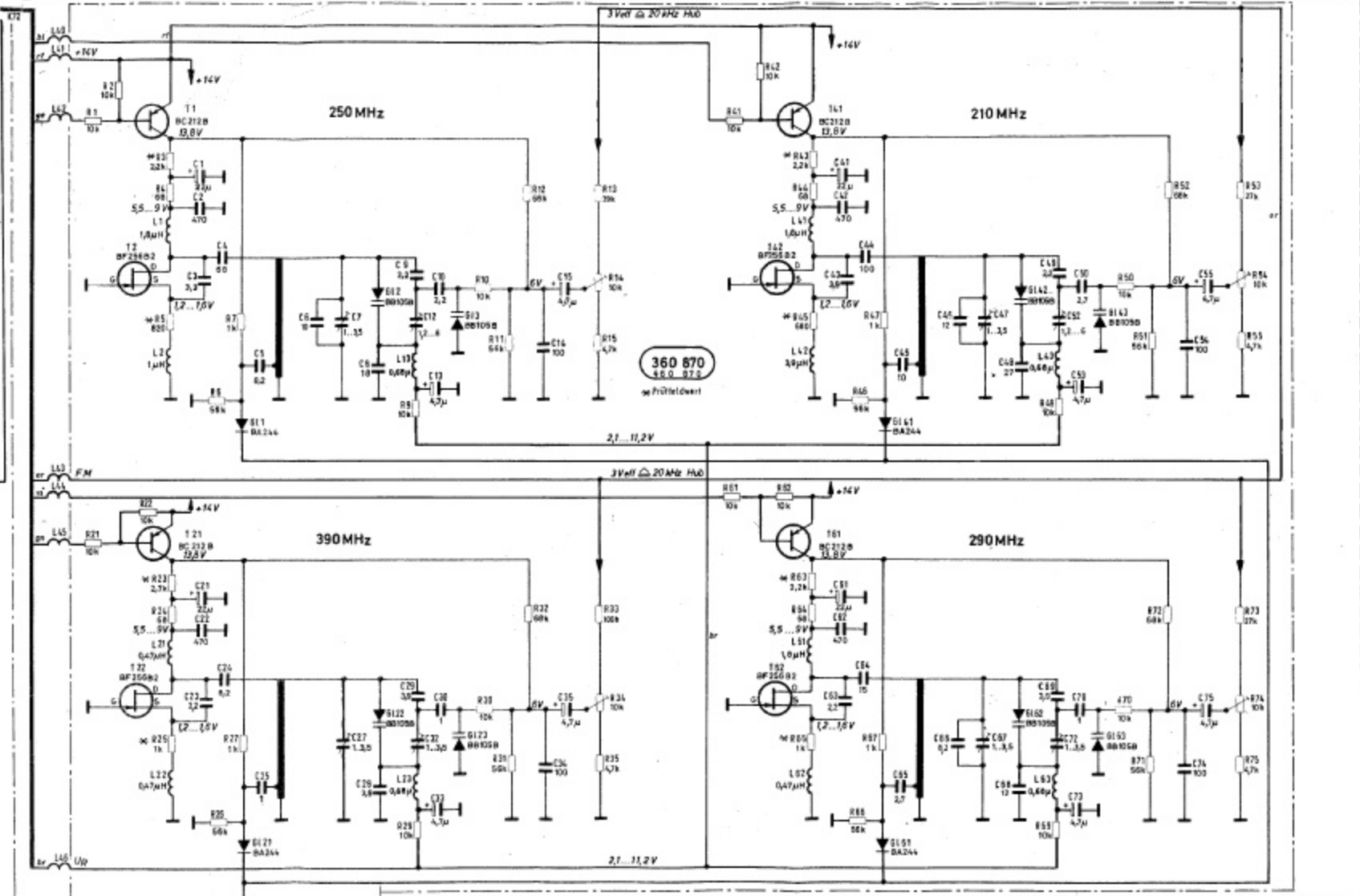
2V... 11,2V

3V/10 20MHz Mab

2V... 11,2V

B1.2

B1.2



* GRÜNE
 * BROWN
 * ROT
 * VIOLET
 * WEISS
 * SCHWARZ
 * GELB
 * BLAU
 * ROT
 * VIOLET
 * WEISS
 * SCHWARZ
 * GELB
 * BLAU

09 9004 15 26.1.79 KL
 08 7028 65 5.10.79 WH
 07 7028 7 24.2.77 Wk
 Artz A-M75 Datum Name
 Nr. MOSE DAF NAME
 DATE NAME

Schlumberger o/s
 Multiplex- u. Breitband
 München 48

OSCILLATOR

213 014 S Bl.3

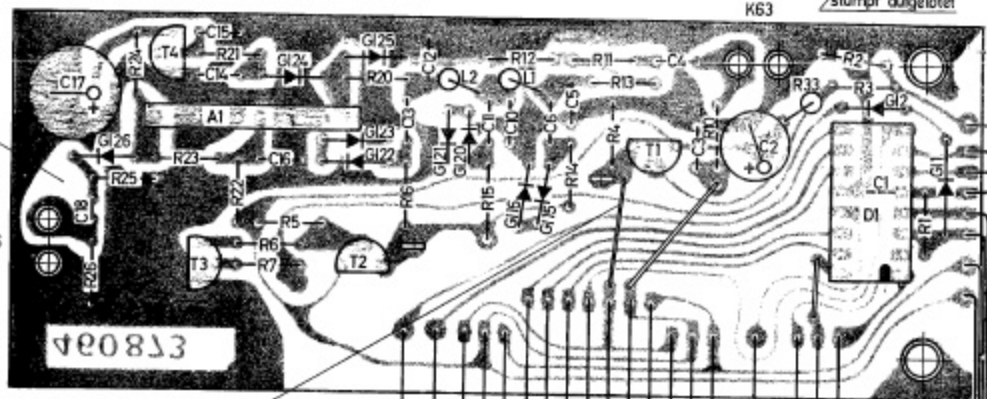
Typ: 4011

428 144 (4x)

786 009 (2x)

428 096 (2x)

weich gelötet



460 873

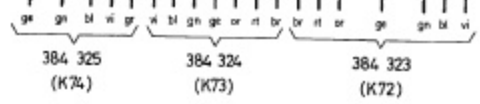
K66

880 021 (3x)

K63

stumpf aufgelötet

- gn l = 90 mm
- ws l = 90 mm
- sw l = 90 mm
- vi l = 100 mm
- gr l = 80 mm
- rt l = 80 mm
- br l = 60 mm
- ge l = 75 mm



Litzenenden 3*2 mm
 abisoliert und verzinkt
 821 715
 785 025 l = 12 mm } 8x

Schaltplanpositionierung e 213 014 S / 360 873 Sa

verwendet in : 375 217

Gerät : 4011

11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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2:1

Schlumberger o/s

Bestückte Leiterplatte

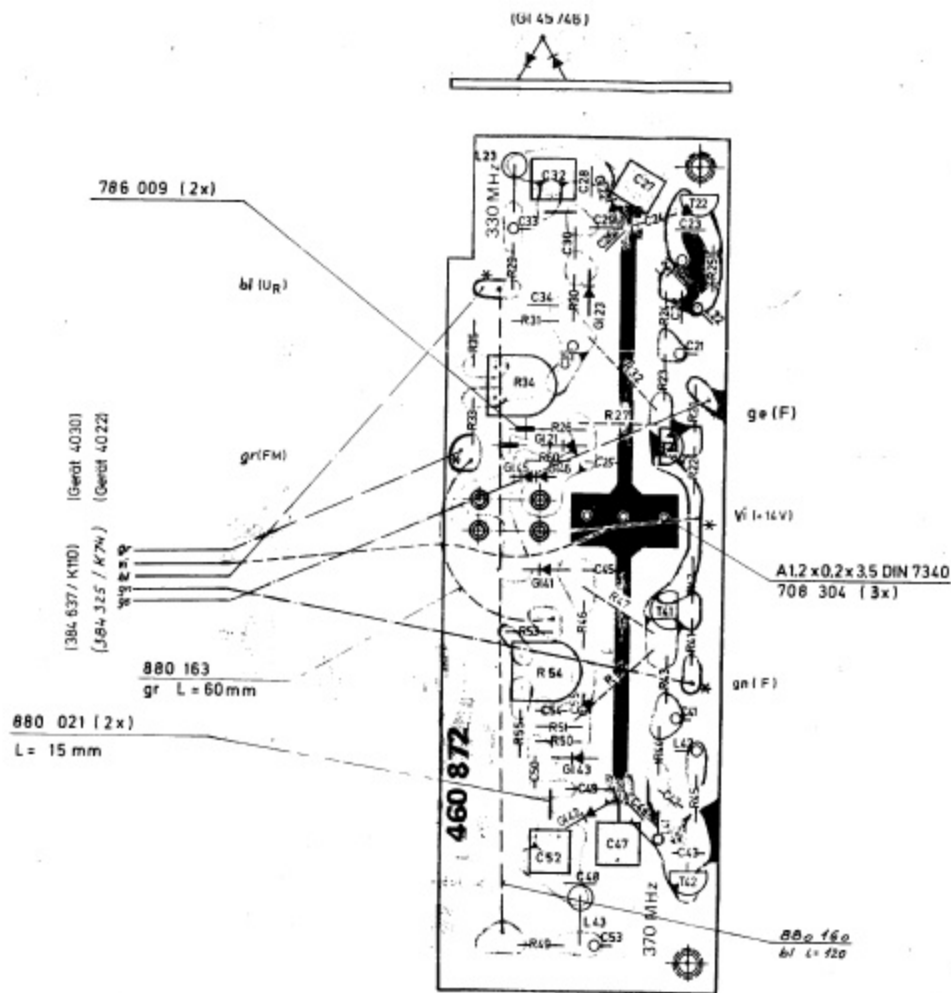
360 873

1976

26.01.76

Kriegels

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weich gelötet

C27 / C17

Farbpunkt an
Leiterzug

C32 / C52

Farbpunkt an
Brücke

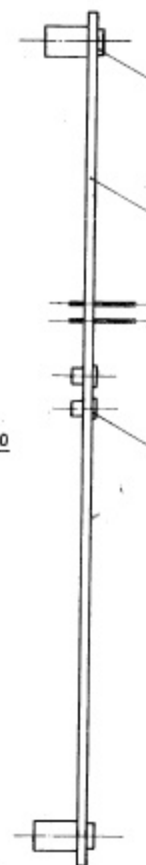
428 096 (2x)

Drahtenden von R27, R32,
R47 und R52 mit
889 035 überzogen

460 872

L2, L22, L23, L41, L42, L43
C17, C27, C32, C52
auf der Leiterplatte aufliegend

428 144 (4x)



* = Kabelbaumanschluß

○ = Kontrollmaß

NO.	Rev.	Änderung	Datum	Ursache	Gezeichnet	Geprüft	Freigegeben	Werk
10								
11								
12								
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19								
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48								
49								
50								

Schlumberger o/s
Schlumberger - Schlumberger
360 872

Bestückte Leiterplatte

360 872

1:1

0.2

2:1

11 880 160

12 880 021

13 880 163

14 880 160

15 880 021

16 880 163

17 880 160

18 880 021

19 880 163

20 880 160

21 880 021

22 880 163

23 880 160

24 880 021

25 880 163

26 880 160

27 880 021

28 880 163

29 880 160

30 880 021

31 880 163

32 880 160

33 880 021

34 880 163

35 880 160

36 880 021

37 880 163

38 880 160

39 880 021

40 880 163

41 880 160

42 880 021

43 880 163

44 880 160

45 880 021

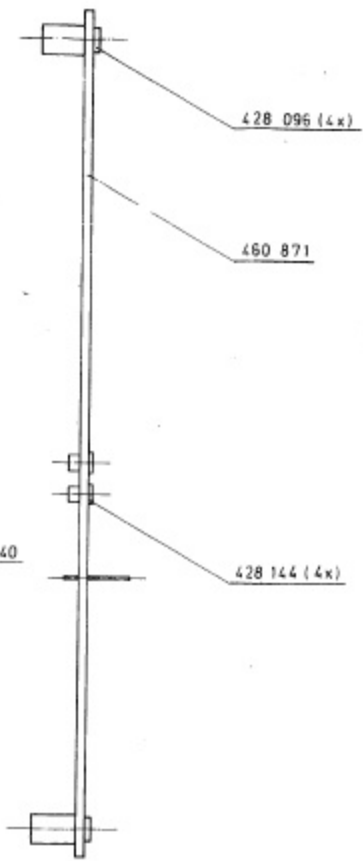
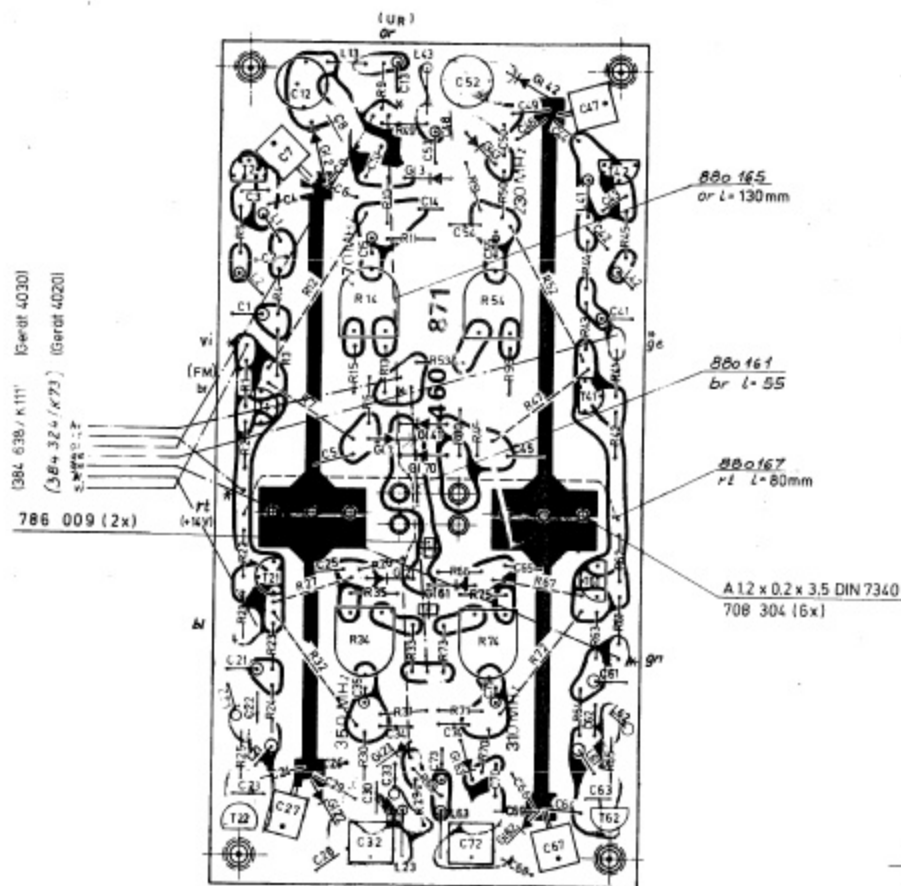
46 880 163

47 880 160

48 880 021

49 880 163

50 880 160



weich gelötet

C7 / C27 / C47 / C67
 Farbpunkt an
 Leiterzug

C32 / C72
 Farbpunkt an
 C30 bzw. C70

Drahtenden von R7, R12,
 R27, R32, R47, R52, R67
 und R72 mit 889 035 überzogen

L1, L2, L13, L21, L22, L23
 L41, L42, L43, L61, L62, L63
 C7, C27, C32, C47, C67, C72
 auf der Leiterplatte aufliegend

* = Kabelbaumanschluß
 ○ = Kabelleitung

10	20000	0,2	2:1	Schlumberger o/Ä
09	10000	0,2	2:1		Bestückte, Leiterplatte
08	10000	0,2	2:1	360 871
07	10000	0,2	2:1	
06	10000	0,2	2:1	
05	10000	0,2	2:1	
04	10000	0,2	2:1	
03	10000	0,2	2:1	
02	10000	0,2	2:1	
01	10000	0,2	2:1	

weich gelötet

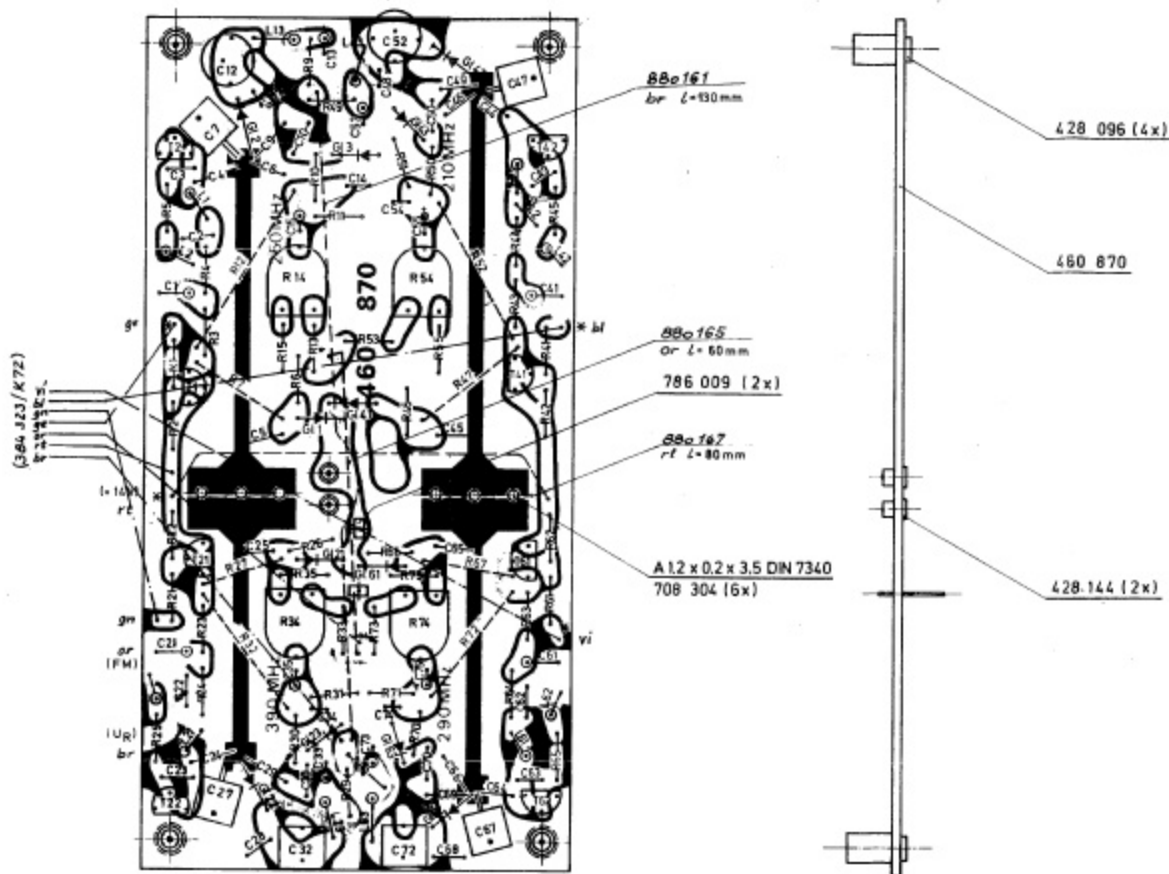
C7/C27/C47/C67

Farbpunkt an
Leiterzug

C32/C72
Farbpunkt an
Brücke

Drahtenden von R7, R12, R27,
R32, R47, R52, R67 und R72
mit 889 035 überzogen

L1/L2/L13/L21/L22/L23
L41/L42/L43/L61/L62/L63
C7/C27/C32/C47/C67/C72
auf der Leiterplatte aufliegend.



* = Kabelbaumschluß

○ Kontrollmaß

Schlumberger o/s			
360 870	0.2	2:1	Bestückte, Leiterplatte
			360 870

(See block circuit diagram 102 820 B for total instrument)

1. 0.1 kHz/1kHz decade (final stage)

The oscillator frequency is crystal stabilized by means of a variable frequency divider and a phase bridge. The BCD frequency adjustment of the 100 Hz and 1kHz decade results in the dividing ratio of 4000... 4099, thus permitting digital adjustment of the oscillator frequency between 12.5 and 12.8125 MHz increments of 100×3.125 kHz.

2. Vernier offset

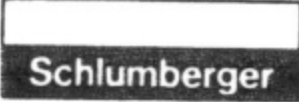
The control line " $\Delta f \text{ Rec}(\overline{\text{DC}})$ " permits the choice of three functions:

- a) Provision of the final decade frequency with and without division and without offset
- b) Establishing the frequency offset with respect to 2 MHz IF. The IF of approx. 2 MHz provided by the output stage is compared to a 2 MHz signal having crystal accuracy in a mixer and frequency discriminator, the former providing the absolute offset frequency in the form of " $\Delta f(\text{AC})$ " to the counter. The digital frequency discriminator generates TTL pulses on one of the two " $\pm \Delta f(\text{AC})$ " lines depending on whether the offset is positive or negative for the \pm display of the counter
- c) Generating a frequency with continuously adjustable offset to final decade frequency.

The 1/5 divided oscillator frequency is provided to the mixer and frequency discriminator. The reference frequency of approx. 2 MHz at the other mixer input is derived through the frequency divider and multiplier from the final decade. The mixer and discriminator output signals are used for counter displays (same as on IF comparison). These output signals are simultaneously converted into a DC voltage which is a measure for the frequency offset.

This DC voltage is stabilized by the automatic frequency control loop to a set point value which is provided through " $\Delta f(\text{DC})$ " from the potentiometer control.

The 1/8 divided oscillator frequency is then routed to the intermediate decade instead of the final decade frequency.

	Function Description	210 021 F	Sheet 1/3
	Type: 4020/21/22	Decade Stage	Date 0979

3. 10 kHz/100 kHz decade (intermediate decade)

The APC loop operates as for the final decade, the 1/100 divided final decade frequency - with or without offset - being included in an additional mixer in the APC loop of the intermediate decade.

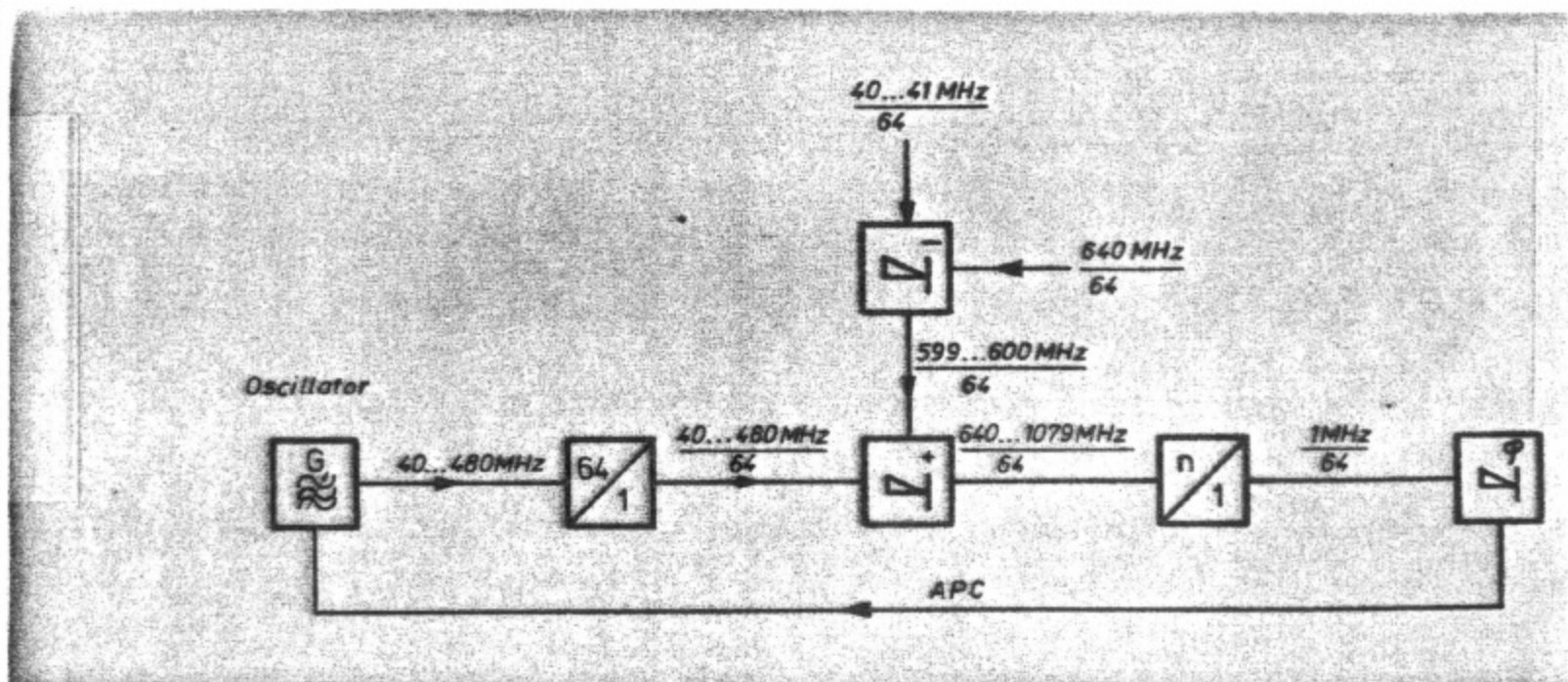
This arrangement permits digital adjustment of the oscillator frequency between 12.5 and 12.8125 MHz in increments of 10 000 (with a vernier offset of \pm approx. 100 increments).

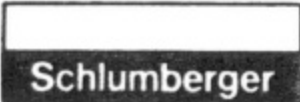
4. 1/10/100 MHz decade (main control loop)

The RF signal provided by the oscillator stage is divided 1/32 down stream of the limiting amplifier. This is followed by three 1/2 frequency dividers in parallel each with an output low pass filter. Depending on the frequency range only one branch is operative to obtain a signal free of harmonics for the subsequent mixer.

Independent of the above arrangement a 1/50 frequency divider provides the $\frac{40 \dots 480}{1600}$ signal for counter frequency readout.

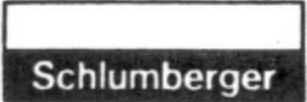
The following simplified block circuit diagram is meant to simplify understanding the mixed frequencies and adjustable frequency divider:



	Function Description	210 021 F	Sheet 2/3
	Type : 4020/21/22	Decade Stage	Date 0979

The output of the intermediate decade is included in the main control loop by two mixers, each of which is followed by band pass filters to suppress unwanted mixer products. The division ratio of the subsequent frequency divider is dictated by the slightly modified digital frequency adjustment of the 1-, 10- and 100 MHz decade. Independent of this the division ratio is increased by 2 (automatic IF offset) on transmitter measurements using the control line "TR Rec (DC)".

The output frequency of the divider is roughly controlled by a frequency control and with crystal accuracy using a phase control: if operation is still non sync the beat frequency at the output of the digital frequency discriminator (see frequency discriminator in vernier offset stage) provides control of a counter to cause the counter to count up or down depending on whether the frequency offset is positive or negative. The DC voltage change is accordingly subsequent to the digital analogue converter and controls the RF oscillator frequency to minimum frequency offset through the APC loop until the phase bridge operating in parallel is able to take over the remainder of the control.

	Function Description	210 021 F	Sheet 3/3
	Type : 4020/21/22	Decade Stage	Date 0979

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

Issue	Alteration No.	Date	Name
01	8028.9	13.1.78	R

210 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Power Supplies + 5 V / 2 A + 14 V / 0,2 A	The Decade Stage can be pre-checked as an independent unit up to 95 %.					
Dig. Voltmeter	<u>Supply Voltages 210 021 S Bl. 1:</u> connect + 5 V to St 23 " + 14 V to St 23	8 2			4,95 ... 5,05 V 0,8 ... 1 A 13,95 ... 14,05 V 90 ... 110 mA	.....A.....mA
10 MHz-Crystal oscillator with TTL - output Counter	<u>Frequency Divider 210 021 S Bl. 3:</u> apply 10 MHz TTL to Bu 42 (Frequency measurements up to approx. 30 MHz can be carried out, by using the probe of an oscilloscope in connection with a high sensitivity counter)	Bu 32 56 vi	250 kHz 3,125 kHz		250 kHz 3,125 kHz	.....ok
Power Supply 0 ... 3 V	<u>Final Decade Stage 210 021 S Bl. 7:</u> apply + 0,60 V to 7	1 62 ge	2,5 MHz	L 12	Digitalvoltmeter + 5,7 ... + 6,6 V 2,5 MHz	.....V.....ok
Oscilloscope	<u>Sample-Hold-Detector</u> disconnect 10 MHz from Bu 42 connect + 0,60 V to 7 apply 10 MHz to Bu 42 Disconnect the Power Supply from 7	5 6 52 ge 7	3,125 MHz 2,5 MHz		12 ... 14 V Puls width at + 6 V 0,2 ... 0,3 µs +3 ... +4 V 0 ... +0,2 V 2,5 MHz + 0,60 V	.....ok.....µs.....ok

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Decade switch, wired as shown on 209 001 S Bl.1 (S 10/Bu 22) = Replacement for Frequency Control switch on front panel when the Decade Stage is adjusted without use of the Control and Display Unit.	<p><u>Final Decade Stage - Frequency Control 210 021 S Bl.7 and Bl.1:</u></p> <p>Decade switch connected to St 22 (or to Bu 5/Bl.1)</p> <p>Frequency setting 000 0000</p> <p>32 64 96 99</p> <p>Further settings, needed only for localizing of faults:</p> <p>1 step = 625 Hz</p> <p>01 02 03 04 05 06 07 08 09 10 20 30 40 50 60 70 80 90</p>	<p>62</p> <p>7</p>	<p>2,50 2,52 2,54 2,56 2,561875</p> <p>2,500625 1250 1875 2500 3125 3750 4375 5000 5625</p> <p>2,50625 1250 1875 2500 3125 3750 4375 5000 5625</p>		<p>+ 0,80 ... 0,90 V + 1,00 ... 1,20 V + 1,20 ... 1,40 V + 1,25 ... 1,45 V</p>	1, V

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4020 (4010) series
DECADE STAGE

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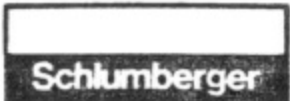
Issue	Alteration No.	Date	Name
01	8022.9	13.1.78	X
		12.5.75	Shuh

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Power Supply 0 ... 3 V Dig. Voltmeter	Intermediate Decade - Oscillator 210 021 S Bl. 5 and Bl. 1: + 0,60 V on (7)	(1) (53) er	1,25 MHz	L 12	Digital-Voltmeter + 5,7 ... + 6,6 V → 1,25 MHz	.....V
Decade switch Oscilloscope	<u>Mixer</u> Decade switch to St 22 Frequency setting: 000 0000 R 4 fully anti-clockwise and - 0,2 V connected to (7) (Resolution 200 kHz) Analys. to Bu 1 approx. + 0,60 V on (7) (Mixture product 12,5 - 0,125 = 12,375 MHz) approx. + 1,6 V on (7)	(2) (3) (53) (7) Bu 1 (53) Bu 1 Bu 1	12,5 MHz 125 kHz 1,2125 MHz 12,2 MHz 1,25 MHz 12,5 MHz 12,375 MHz	DC Level on (7) L 5 → P max at 12,125 MHz DC Level on (7) R 4 → P min at 12,5 MHz (appr. middle)	60 ... 100 mV pp 60 ... 100 mV pp 1,2125 MHz - 34 ... - 38 dBm 1,25 MHz - 70 ... - 90 dBm - 46 ... - 50 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product - 52 ... - 56 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product 1,7 ... 2,8 V (FM) pp Spurious products > 3,5 dB below	.....mV.....mVpp.....mVpp.....dBm.....dBm.....ok.....dBm.....ok.....ok >dB
	Oscilloscope with probe to (4) er Analyser with probe to (4) (7) + 0,4 ... + 1,4 V to (7)	(4) (4)	12,80 MHz 12,3 ... 12,8 MHz			

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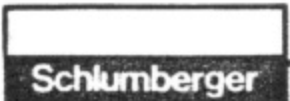


Issue	Alteration No.	Date	Name
		12.5.75	Schuh

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Oscilloscope Power Supply	<p><u>Sample - Hold - Detector 210 021 S Bl. 5:</u></p> <p>Remove 10 MHz from Bu 42 + 0,60 V on (7)</p> <p>10 MHz to Bu 42 + 5 V on (26) (#NO OFFSET# Command)</p> <p>Disconnect Power Supply from (7)</p> <p><u>Frequency Control</u></p> <p>Connect decade switch to St 22</p> <p>Setting: 000 0000 3200 6400 9600</p> <p>Further settings, needed only for localizing of faults</p> <p>1 step = 312,5 Hz:</p> <p>0100 0200 0400 0800 1000 2000 4000 8000</p>	(5) (6) (7) 53 53 7	3,125 kHz 1,25 MHz 1,25 MHz 1,26 1,27 1,28 1,28122 1,2503125 06250 12500 25000 1253125 56250 62500 75000	— (L 12) —	<p>12 ... 14 V_{pp}</p> <p>Puls width at + 6 V</p> <p>0,2 ... 0,3 μs</p> <p>+3 ... +4 V</p> <p>0 ... +0,2 V</p> <p>+ 0,60 V</p> <p>1,25 MHz</p> <p>+ 0,60 V</p> <p>+ 0,80 ... 0,90 V</p> <p>+ 1,00 ... 1,20 V</p> <p>+ 1,20 ... 1,40 V</p> <p>+ 1,25 ... 1,45 V</p>	<p>.....ok</p> <p>.....μs</p> <p>.....ok</p> <p>.....ok</p> <p>1,V</p>

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01	8028.9	13.1.78	X
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0.1	8028.9	13.1.78	X
		12.5.75	Flauk

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DECADE STAGE

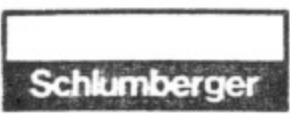
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Synthesizer 20...520MHz Counter 0...20 MHz	RF / 32 - Divider 210 021 S Bl. 2: approx. 0 dBm on Bu 40 : 10 MHz 20 MHz 32 MHz 160 MHz 320 MHz 400 MHz 480 MHz 520 MHz Same procedure at +10 dBm on Bu 40 from 10 to 520 MHz -10 dBm on Bu 40 from 15 to 500 MHz (from 400 to 500 MHz in 10 MHz-steps) f/50 - Divider approx. 0 dBm on Bu 40: 20 MHz 160 MHz 520 MHz f/2 - Divider	Output vi Bu 20	15 ... 500 MHz	—	TTL: 0,3125 MHz 0,625 1 5 10 12,5 15 16,25 0,46875 ... 15,625 MHz TTL: 12,5 kHz 100 325	.....ok.....ok.....ok.....ok
Decade switch Spectrum Analyser 0...110 MHz	Input frequency Decade switch setting on Bu 40 Checking control lines gr 51 ge 52	Analyser 50 Ω - in shunt with K 33	3,125...8,125MHz 1,625...3,125 0,625...1,625	L 13 → min.Level at 9,375 MHz (3. Harmonic)	- 30...- 40 dB	.....ok
Oscilloscope	200 MHz 200...520 100...200 40...100 200...520 100...200 64...100 40...64	Oscillo- scope to K 33 Analyser 50 Ω - in shunt with K 33	3,125...8,125MHz 1,625...3,125 0,625...1,625 3,125...8,125MHz 1,625...3,125 1 ...1,625 0,625...1	— — — — — — — —	40... 60 Vpp Harmonics > 20 dB Harmonics > 10 dBc	.....ok.....ok

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Decade switch	MHz - Decades, Mixer D 7 210 021 S Bl. 3: Freq. Setting 000 0000	②	10 MHz	—	40 ... 60 mV _{pp}	.....ok
Oscilloscope	Analysér via probe	④	625 kHz	—	80 ... 120 mV _{pp}	.....ok
Spectrum Analyser with probe	Analysér via probe	⑤	9,375 MHz	R 11 → middle pos. L 1, L 3, L 4 → max. level at 9,375 MHz	150 ... 250 mV _{pp}	.....mV _{pp}
	Oscilloscope via probe	④	9,375/10 MHz	L 4 → max. level R 11 → min. level at 10 MHz		
	Mixer D 10	⑤	9,375 MHz	—	50 ... 100 mV _{pp}	.....mV _{pp}
Synthesizer	Analysér via probe on ⑥ approx. 0 dBm on Bu 40	⑥	9,375 MHz	R 15 → min. level	ca. = 70 dbc	>dB
	Decade switch setting	"	8,75 MHz	L 6 → min. level	"	>dB
	0 MHz	"	7,125 MHz	L 5 → min. level	"	>dB
	40 MHz	"	16,85 MHz	L 7 → max. level	ca. = 30 dbc	>dB
	144 MHz	"	10,3...16,85 MHz	—	spurious products	>dB
	480 MHz	"	10 ... 10,3 MHz	—	> 20 dbc	>dB
	approx. 58...480 MHz	"	—	—	> 14 dbc	>dB
	40... 60 MHz (perhaps correction by L 4) Oscilloscope on ⑥	"	10 ... 16,85 MHz	—	1,5 ... 2,5 V _{pp}	>V _{pp}
	40...480 MHz	"	9,375 MHz	R 15	< 0,1 V _{pp}	>V _{pp}
	0 MHz	"	—	—	—	>V _{pp}

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE	
Synthesizer	Frequency Divider and Frequency Comparison 210 021 Bl. 3:	54 7	15,625 kHz	—	Puls width 210 ... 270 ns 13 ... 19 μs	.....ns.....μs
	520 MHz approx. 0 dBm on Bu 40 Frequency setting 520 0000						
	(When the OSCILLATOR sub unit is not used, connect 10 ka between pin 6 of Bu 5 and +5 V rail)	7	15,625 kHz to 27,344	—	15,625 ... 27,344	.....ok
	Decade switch setting 520 40 MHz (disconnected yellow lead 57) Change setting stepwise to smaller values. Stepwise increasing of output frequency must result.						
	Oscilloscope simultaneously (altern.) on 57 58	57 ge 58 br	—	—	TTL = Output L or 0 (L=appr. 4 V) (0=appr. 0 V) 0 or L	.....ok
	Frequ. setting 400 0000 400 MHz, 0 dBm on Bu 40						
	464 MHz, 0 dBm on Bu 40	57 ge	—	—	L	.....ok
	336 MHz, 0 dBm on Bu 40	58 br	1,000 kHz	—	1 kHz		
	400 MHz, 0 dBm on Bu 40 Decade setting 410 ... 419 MHz	57 ge 58 br	—	—	—	Lok
		57 ge	1,000 kHz	—	1 kHz		
		58 br	—	—	L	.....ok
		57 ge	—	—	L continuous response		

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



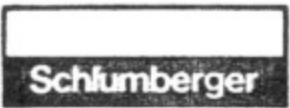
Issue	Alteration No.	Date	Name
0.1	8028.9	13.4.78	X
		12.5.75	Shuh

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Counter	Frequ. Offset/TRANSM. MEASUREMENT 210 021 S Bl. 6:					
Oscilloscope	10 MHz TTL on Bu 42 NO OFFSET ²⁶ on REC. MEASUREMENT = 5 V on St 22/22 = ²⁶	360 234 D 1/5 = or	10,000 MHz	—	TTL 10 MHz	.....ok
Synthesizer	2 MHz TTL on Bu 43	360 236 D 2/6 = ge	2,000 MHz	—	TTL 2 MHz	.....ok
	2,01 MHz TTL on Bu 43	360 234 ①	" "	—	Puls 120....160 ns	.....ok
	1,99 MHz TTL on Bu 43	²⁹ br ²⁸ vs	10 kHz	(L 3 with tuning slug)	TTL 10 kHz +3,5 5 V	.....ok
	Frequency Multiplier	360 234 R 3 = vi	10 kHz	—	1,5 ....4,5Vpp	.....ok
	OFFSET ON ²⁶ on REC. MEAS. = St. 22/22 resp. connected to ground Decade switch: 000 0050	²⁸ ws ²⁹ br R 3 = vi	10 kHz	—	+3,5 ... 5V TTL 10 kHz	.....ok
		²⁶ gr ⁵² ge	2,53125 MHz	—	2,53125 MHz	.....ok
		③ ④	5,0625 MHz	L 2 → max. level	4 ... 8 Vpp	.....ok
		D 2/6 = ge	10,125 MHz	L 3 → max. level	5,5 ... 7 Vppok
			2,025 MHz	—	TTL 2,025 MHzok

Adjustment and Test Procedure

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Issue	Alteration No.	Date	Name
0.1	8028.9	13.1.78	X
		12.5.78	Schub

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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Power Supply 14 V Potentiometer 10 kn Oscilloscope Counter DVM	Oscillator 210 021 S Bl. 5: +5 V on (2)	(1) D 5/6 or 61	10,04 MHz 10,04 MHz 1,255 MHz	L 5 → — L 5 →	10,04 MHz approx. 10,04 MHz 1,255 MHz	.....ok.....ok.....ok
	Mixer 26 (grey) to ground 25 (white) disconnected Decade switch: 000 0050 +3,2 V on (2) +9 V on (2)	(1) (1)	8,6... 9,2 MHz 10,8... 11,5 MHz	— —	8,6 ... 9,2 MHz 10,8 ... 11,5 MHz	.....ok.....ok.....ok
	Vernier Offset on RECEIVER MEASUREMENT R 34/ R 24 middle position +2 V on increase DC level on 25 slowly, until f on decrease DC level on 25 slowly, until f on	R 3 = vi 27 vi 27 vi 25 ws 27 vi 27 vi 25 ws	approx. 200 kHz 10 ... 14 kHz 10 ... 14 kHz	L 3 → max. level symmetrical — — — — —	2 ... 3,5 V pp High or Low 10 ... 14 kHz +2,5 ... +3,3 V High or Low 10 ... 14 kHz +11 ... +11,5 V	.....Vpp.....Vpp.....ok

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

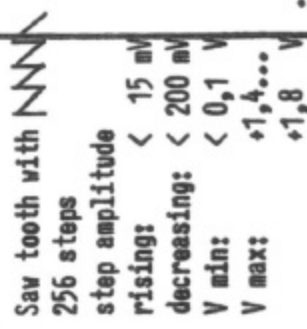
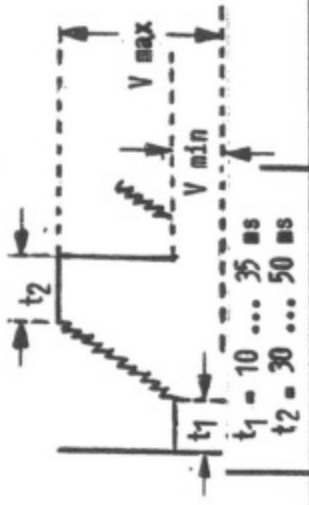


Issue	Alteration No.	Date	Name
GA	8028.9	13.1.78	X
		12.5.75	Schuh

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	Continued 1. + 7 V on $\diamond 25$ vs 2. + 3,5 V on $\diamond 25$ vs 3. + 3,3 V on $\diamond 25$ vs 4. Repeat 2. and 3. 5. + 6,85 V on $\diamond 25$ vs + 7,15 V on $\diamond 25$ vs Repeat adjustment if 5. is off limits. Check if level at $\diamond 25$ vs is also available at rear panel Bu 3. Autom. Frequency Control (AFC) 210 021 S Bl. 4:	$\diamond 27$ vi	0 Hz 10 kHz 10,5 ... 12,5 kHz 210 ... 270 Hz	R 34 R 5 R 24 \rightarrow equal frequency	0 Hz 10 kHz 10,5 ... 12,5 kHz $\Delta f < 0,2$ kHz 210 ... 270 Hz $\Delta f < 5$ Hz	
Decade switch	Decade switch setting 140 MHz 30 MHz 40 MHz 199 MHz	① ① ① ⑤	7,5 Hz $\left(\frac{199-100 \text{ MHz}}{64 \times 800 \times 256} \right)$		+ 3,8 ... 4,8 V + 3,8 ... 4,8 V 0 ... +0,4 V	.....ok.....ok
Oscilloscope	Disconnect $\diamond 55$ vs Re-connect $\diamond 55$ vs	T 11 Coll			Saw tooth with  256 steps step amplitude rising: < 15 mV decreasing: < 200 mV V min: < 0,1 V V max: +1,4... +1,8 Vok
						

Adjustment and Test Procedure

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DECADE STAGE

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Issue	Alteration No.	Date	Name
01	8028, 9	13.7.78	X
		12.5.75	Schult

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	Sample - Hold - Detector (APC)					
	Decade switch setting					
	100,1 MHz on Bu 40 (-3 dBm)	②	250 kHz	—	Saw tooth V min: 1 ... 2 V _{pp} V max: 8 ... 10 V _{pp}	.....ok
	100 MHz on Bu 40 (-3 dBm)	③	15,625 kHz	—	12 ... 14 V _{pp} Puls width at 7V 0,3 ... 0,4 μs	.....ok
	Control Amplifier	④	appr. 36 Hz	—	Same shape as on ② V min: + 3,5 ... 5 V V max: + 9 ... 13 V	.....ok
DVM Counter	Connect 1 ka between Df 40 and ground	Df 40	$\frac{102 - 100}{54 \times 703 \times 256}$ = appr. 0,2 Hz	—	0,2 Hz saw tooth: + 1 ... 1,4 V = V min + 12 ... 13 V = V max	.....ok
	Connect Oscillator sub unit 40 ... 480 MHz	Bu 35	corresp. to osc.ranges	—	Synchronisation catching time: < 3 S typical: < 1 S	.....ok
	(It can be useful to carry out the synchronisation test, when the total instrument is available). <u>Note:</u> The function of the interconnecting PC board 360 174 has to be checked on the complete instrument at the following operation modes: Frequency settings RECEIVER MEASUREMENT Transmitter frequency measurement Offset frequency measurement					

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

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01	8032.9	13.9.78	X
		12.5.75	Schub

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