

Pos	Ant	Förrådsbeteckning	Förrådsbenämning	Ursprungsbenämning	Ursprungsbezeichnung
1	1	M3743-558011	Radioprovare 558 MT		
2	1	M3743-558010	.Radioprovare 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-filer:	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-filer:	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.

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.

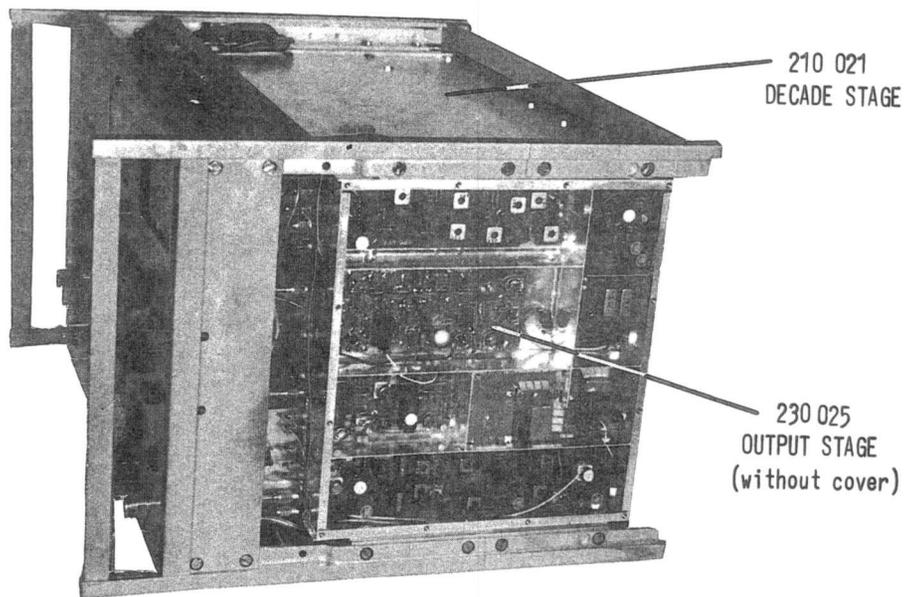
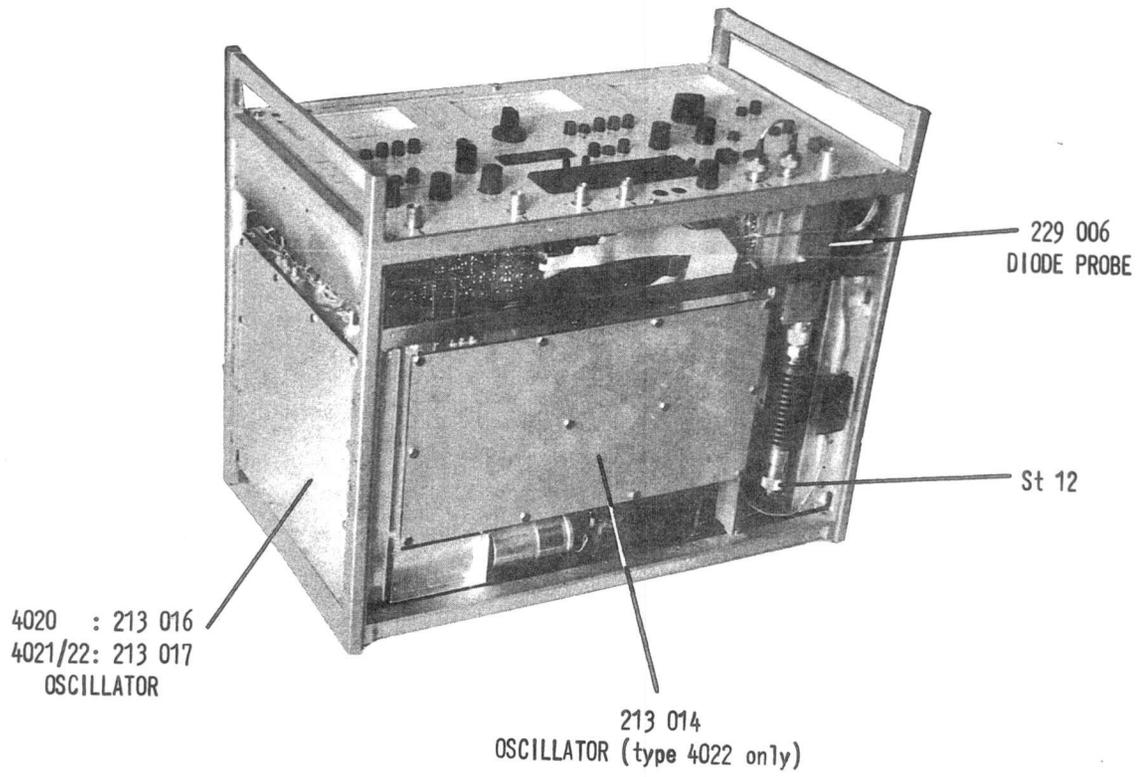
7. Crystal Stage 214 022 (fig. 3)

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.



CHECK POINTS FOR DC SUPPLY VOLTAGES

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

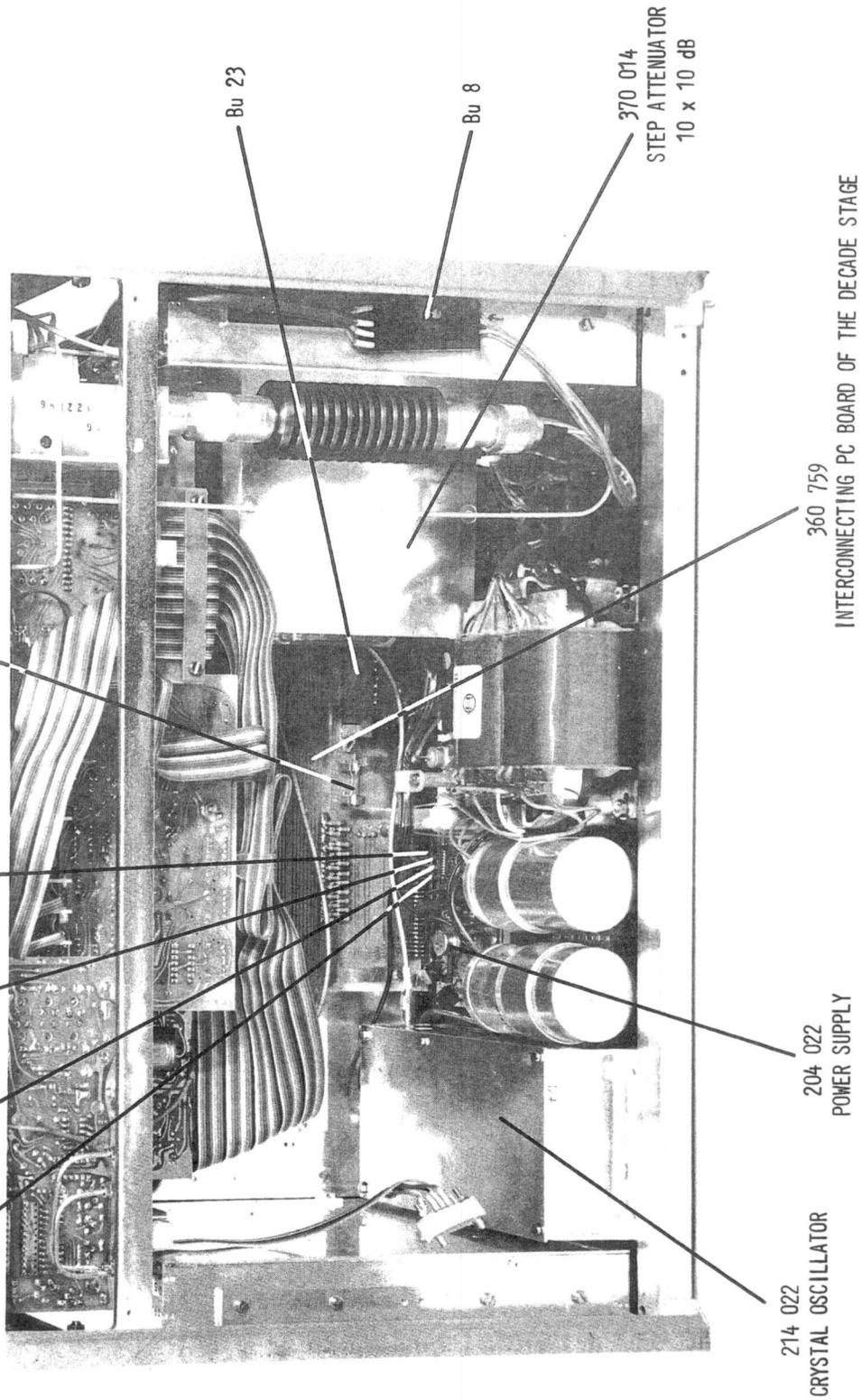


FIG. 3: BOTTOM VIEW

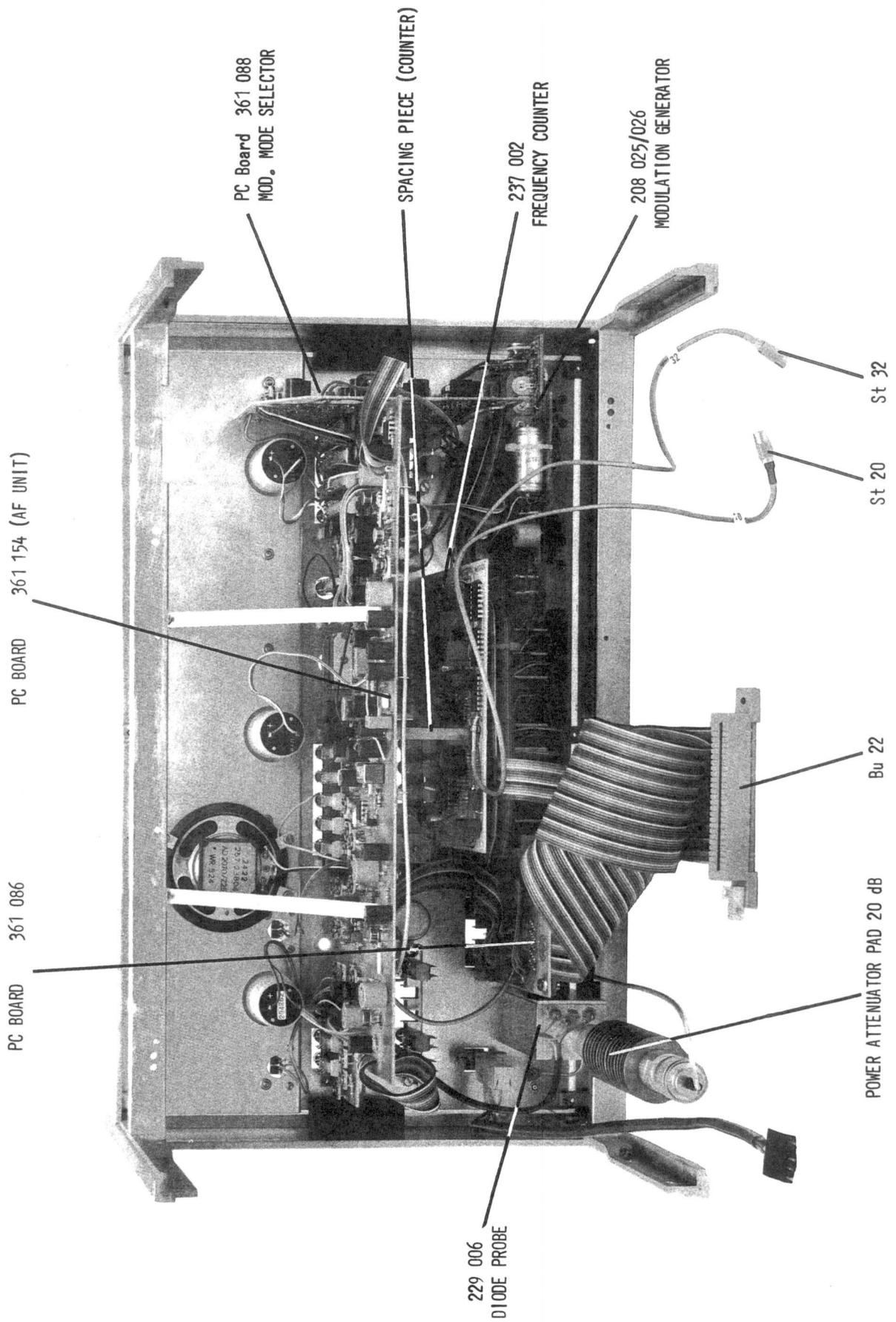


FIG. 4: CONTROL AND DISPLAY UNIT

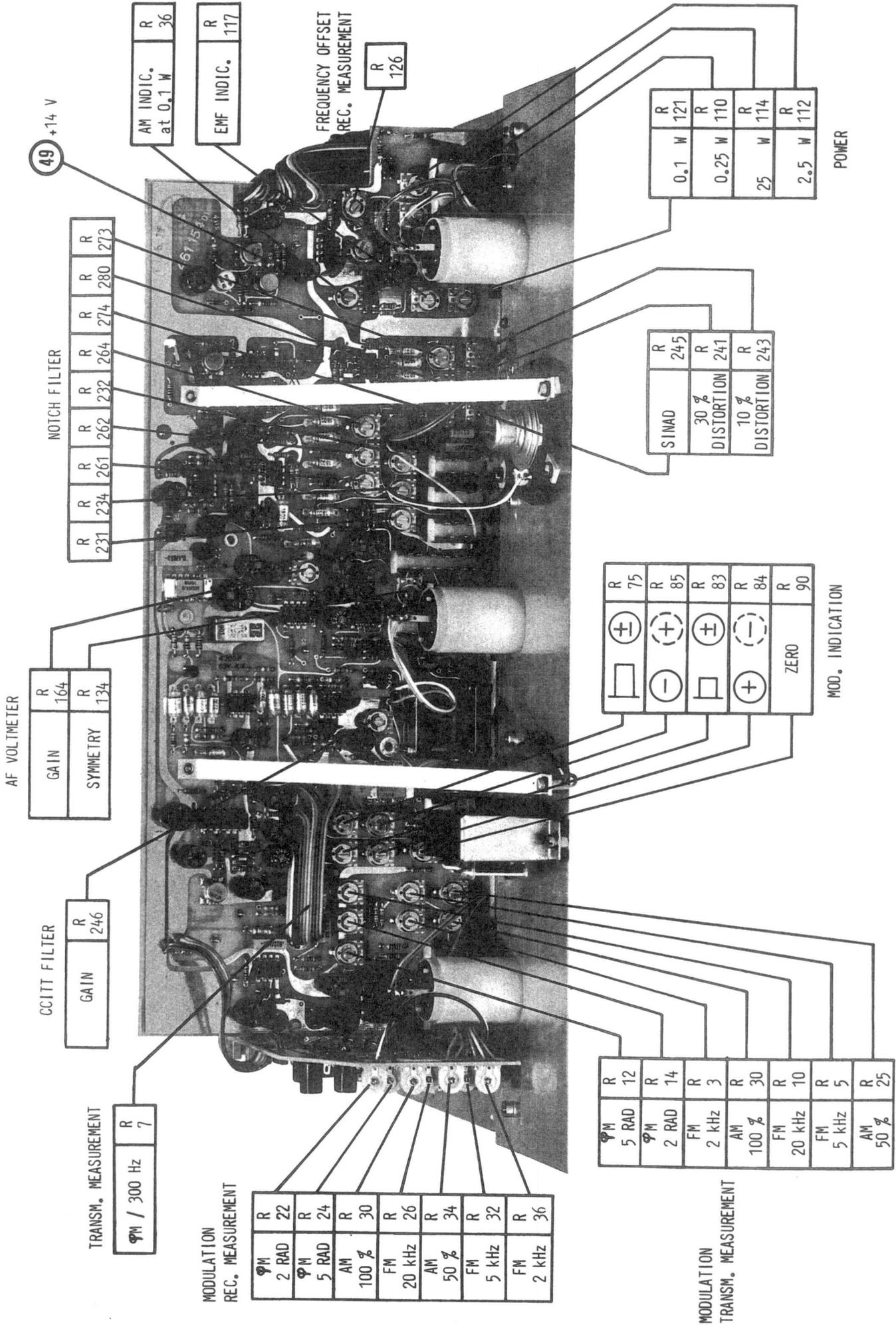


FIG. 5: ADJUSTMENT LOCATIONS OF THE CONTROL AND DISPLAY UNIT

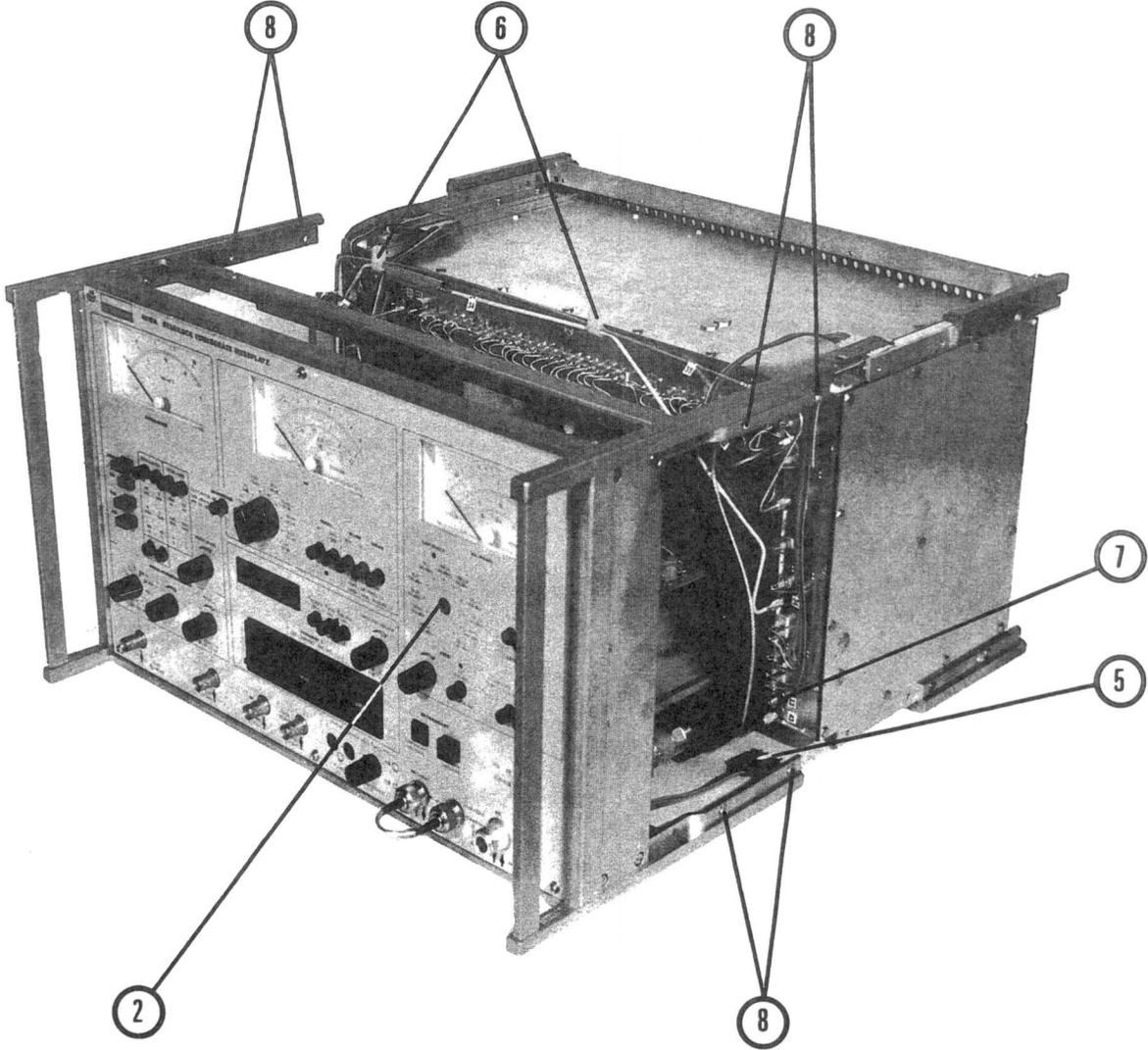


FIG. 6: REMOVING THE CONTROL AND DISPLAY UNIT

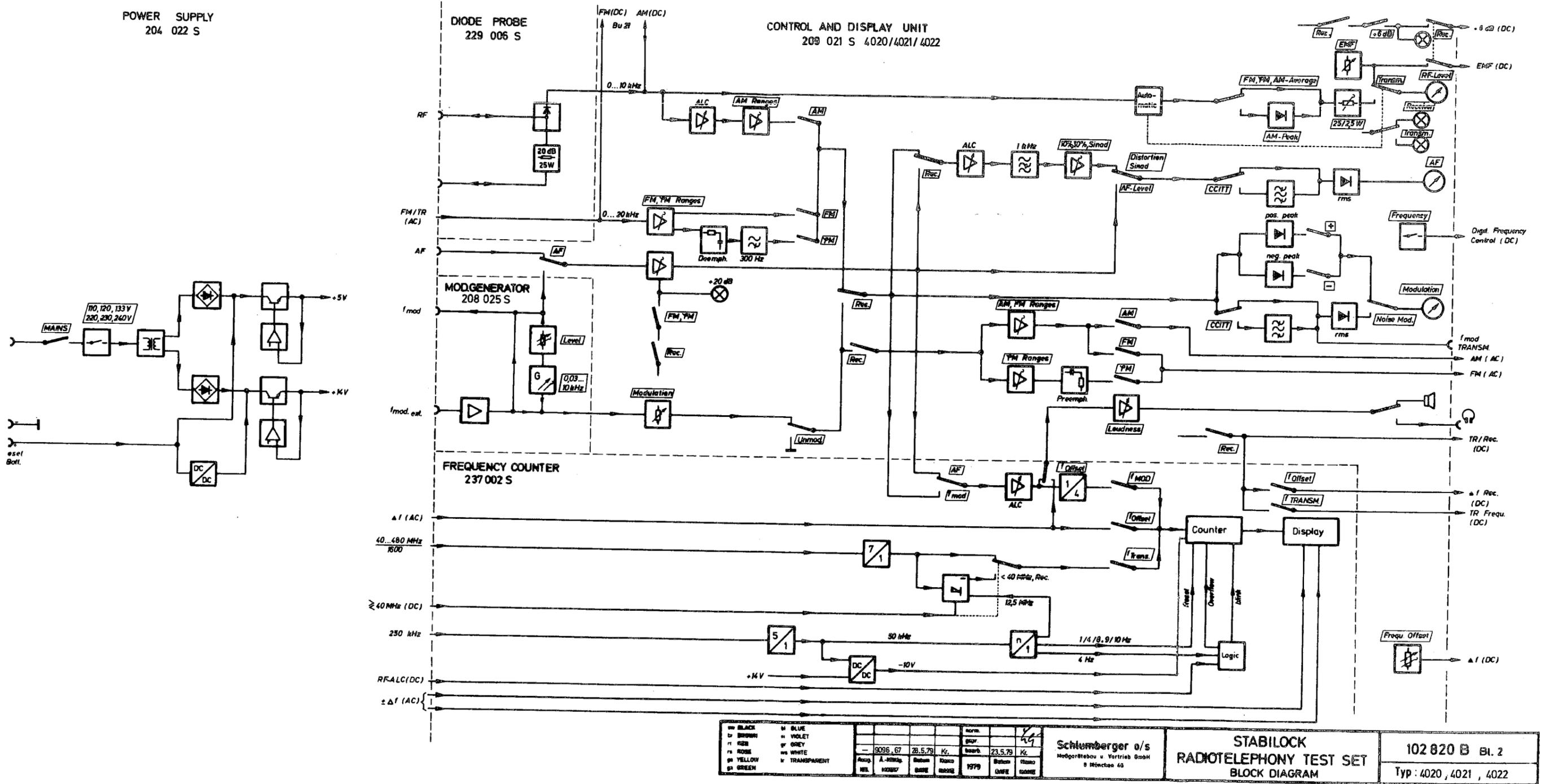
POWER SUPPLY
204 022 S

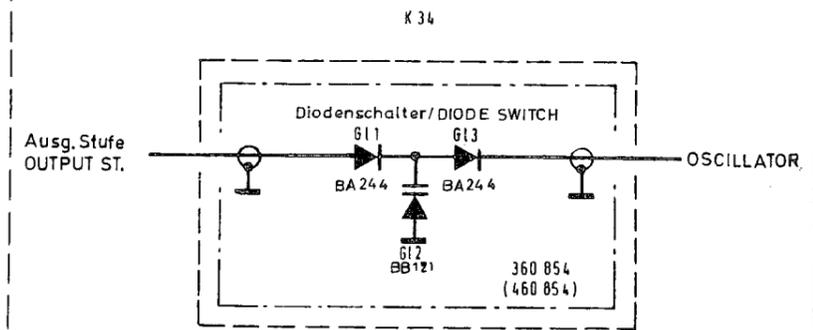
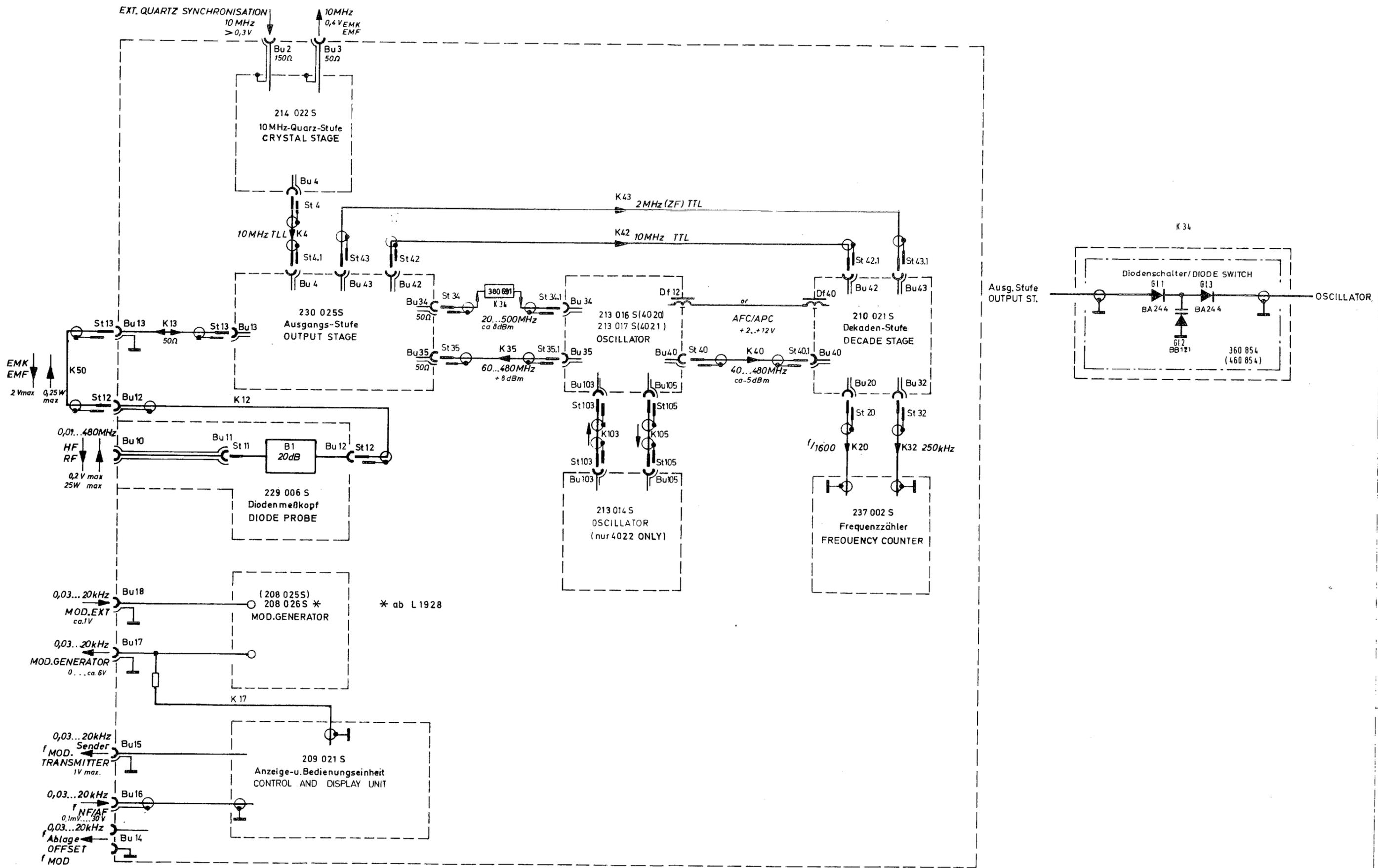
DIODE PROBE
229 006 S

CONTROL AND DISPLAY UNIT
209 021 S 4020/4021/4022

MODGENERATOR
208 025 S

FREQUENCY COUNTER
237 002 S





sw BLACK	bl BLUE					
br BROWN	vi VIOLET					
rt RED	gr GREY					
rs ROSE	ws WHITE					
ge YELLOW	tr TRANSPARENT					
gn GREEN						

01	9096.101	14.9.78	Eiler	norm		
	8028.76	10.10.78		gepr.		
Ausg.	A-Mittlg.	Datum	Name	Datum	Name	
ISS	MODIF.	DATE	NAME	DATE	NAME	

Schlumberger o/s
 Meßgerätebau u. Vertrieb GmbH
 8 München 46

STABILOCK
 Funkgeräte Meßplatz
RADIOTELEPHONY TEST SET

201 220S/201 221S/201 222 S
 Typ: 4020/4021/4022

(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:

Schlumberger	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).

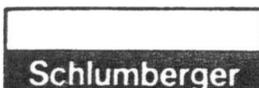
4. AF Voltmeter

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

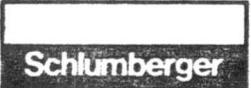
The decade stage is introduced to the positions of the decade switches. On REMOTE CONTROL mode the frequency must be set to 600 MHz (see operating manual 3.7).

	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 (229 606) 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>	<p>⓪ 40 Counter Bu 45/11 Bu 45/ 4</p>	<p>DC DC DC</p>	<p>— — —</p>	<p>+ 13,95+14,05 V " " " + 4,95.....+ 5,05 V</p>	<p>.....V V</p>										
	<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 / FM + 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 / FM + VOLTMETER Dist. 10%, 30%, SINAD				<p>Approx. same brightness, appropriate to depressed push buttons</p>	<p>.....ok</p>
Lamp	Depressed push buttons															
RECEIVER	RM (= RECEIVER MEASUREMENT)															
TRANSMITTER	TM (= TRANSMITTER MEASUREMENT)															
+ 6 dB	RM + TM + 6 dB + RM															
+20 dB	RM + FM / FM + VOLTMETER Dist. 10%, 30%, SINAD															

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



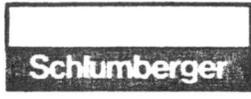
Issue	Alteration No.	Date	Name
02	0028. 29	27.3.1980	Morasch
01	9028. 32	5. 10.79	Karml

209 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>3. <u>Counter Display</u> Decade switch 600 MHz f OFFSET Knob FREQUENCY OFFSET depressed " " " " pulled</p>	Display	—	—	blinking + kHz - kHz	.....ok
	<p>4. <u>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>5. <u>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 " " " " " " " "	DC DC	— —	DC level between pins 47 and 49 0 V + 5 V	.....ok
		Bu 22 pin 14 " " " " " " " "			+ 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	0028.32	5.10.79	Karney

209 021 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>12. FM Modulation Ranges</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>FM, 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>FM 5 Rad ⊕ ⊖</p> <p>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

209 021 A

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>	I 1	1 kHz	—	2 kHz	..... kHz
			20 kHz	—	1.85 ... 2 kHz	..... kHz
			30 kHz	—	1.85 ... 2 kHz	..... kHz
		Bu 15	1 kHz	—	1 V ± 10 mV	..... ok
		I 1	0.3 kHz	R 24 →	4.8 ... 5.2 Rad	..... ok
		"	0.4 kHz	—	4.9 ... 5 Rad	..... ok
		"	1 kHz	—	4.9 ... 5 Rad	..... ok
		"	3 kHz	—	4.8 ... 5 Rad	..... ok
		"	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

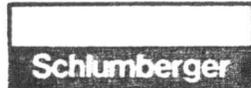
229 021 A

6/12
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>14. AF Millivoltmeter + CCITT</p> <p>Mod. Gen. → Volt meter (4020) → DVM</p> <p>or</p> <p>Mod. Gen. → Volt meter (4020) → Gen. → DVM</p> <p>DVM → Volt meter (4020)</p>					
	<p>AF, UNMOD VOLTMETER</p> <p>DVM 775 mV</p> <p>775 mV</p> <p>Voltm. Range</p> <p>0 dB</p> <p>0 dB</p>	1 2	1 kHz	R 164	0 dB	mV
	<p>AF, UNMOD</p> <p>24,5 V</p> <p>7,75 V</p> <p>2,45 V</p> <p>775 mV</p> <p>245 mV</p> <p>77,5 mV</p> <p>24,5 mV</p> <p>7,75 mV</p> <p>2,45 mV</p> <p>0,775 mV</p> <p>40 dB Attenuation pad on the AF in put</p> <p>30 dB</p> <p>20 dB</p> <p>10 dB</p> <p>0 dB</p> <p>- 10 dB</p> <p>- 20 dB</p> <p>- 30 dB</p> <p>- 40 dB</p> <p>- 50 dB</p> <p>- 60 dB</p>	1 2	1 kHz		0 dB ± 0,4 dB	dB
	<p>AF, RM, FM</p> <p>AF, RM, FM</p> <p>AF, RM, AM</p> <p>AF, TM, FM</p> <p>775 mV</p> <p>- 20 dB</p> <p>- 20 dB</p> <p>0 dB</p> <p>0 dB</p>				Indication 0 dB ± 0,4 dB	dB
	<p>AF, TM, FM</p> <p>245 mV</p> <p>- 10 dB</p> <p>0 dB</p> <p>0 dB</p> <p>0 dB</p>		0,03 kHz		- 0,5 dB related	dB
	<p>AF, RM, UNMOD, CCITT 775 mV</p> <p>775 mV</p> <p>0 dB</p> <p>0 dB</p> <p>0 dB</p> <p>0 dB</p>		0,3 kHz		± 0,2 dB to	dB
			10 kHz		± 0,2 dB	dB
			20 kHz		- 0,5 dB	dB
			0,8 kHz	R 264	0 dB	dB
			0,225 kHz		- 16	dB
			0,4 kHz		- 5,3	dB
			1 kHz		0	dB
			3 kHz		- 6	dB
			4 kHz		- 13	dB
					- 17	dB

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch
-	9028.77	5.10.79	Varmy

209 021 A

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
	Voltmeter button MOD pressed: RM, FM 19 kHz	I 1/I 2	1 kHz	—	0.9 ... 1 V	..... V
15. Distortion Meter						
AF Analyser with a Beat Frequency Oscillator e.g. Radiometer FRA 3	All alignments on the 1 V range of the AF millivoltmeter, and on RM, UNMOD, without CCITT			R 261, 264, 262, R 231, 232, 234, R 273, 274, 280 preset to mid-position		
	Check out of autom. level control:	28	1 kHz	—	690 ... 810 mV $\Delta V \leq 10 \text{ mV}$	..... mV
	Notchfilter pressed: fMOD + fTRANSM	27 (C 100)	6 kHz	Adjust sensitivity of analyser to —	+ 10 dBm Indication	..... mV
	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	..... ok
	Adjusting Ranges	I 2 " "	1 + 3 kHz " "	R 241 R 245 R 243	25 % - 12 dB 7 %	..... ok
		"	1 kHz	—	< 0,6 %	

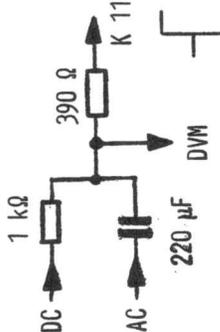
Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

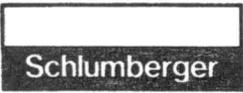
Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

209 021 A

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%	<p>On TRANSMITTER MEASUREMENT mode</p> <p>Replace discriminator signal from output stage (St 49/pin 5 or Bu 22/2) by a two tone AF generator.</p> <p>4020 - Setting</p> <p>1 kHz 3 kHz TM, 10 % Dist., without CCITT 999 mV 70 mV</p>	1 2	1 + 3 kHz	—	6.8 ... 7.2 % %										
	<p>16. Power Meter + AM</p> <p>Automatic Level Control</p>  <p>DC = + 3.5 ... + 11 V</p>	<p>DC</p> <p>DC</p> <p>DC</p> <p>DC</p> <p>DC</p>	<p>—</p> <p>—</p> <p>—</p> <p>—</p> <p>—</p>	<p>6.8 ... 7.2 V $\Delta U \leq 10 \text{ mV}$</p> <p>250 mW reading</p> <p>10 mW reading</p> <p>40 ± 1.2 mW</p> <p>2.5 W reading</p> <p>25 W reading</p>	<p>..... mW</p> <p>..... ok</p> <p>..... ok</p>											
	<p>Linearity, Power Measurement Ranges</p> <table border="1"> <tr> <td>DC level</td> <td>+ 3.8 V</td> </tr> <tr> <td>0.25 W Range</td> <td>+ 3.16 V</td> </tr> <tr> <td>2.5 W Range</td> <td>+ 3.32 V</td> </tr> <tr> <td>25 W Range</td> <td>+ 5.53 V</td> </tr> <tr> <td></td> <td>+ 11 V</td> </tr> </table>	DC level	+ 3.8 V	0.25 W Range	+ 3.16 V	2.5 W Range	+ 3.32 V	25 W Range	+ 5.53 V		+ 11 V	1 3				
DC level	+ 3.8 V															
0.25 W Range	+ 3.16 V															
2.5 W Range	+ 3.32 V															
25 W Range	+ 5.53 V															
	+ 11 V															

Adjustment and Test Procedure

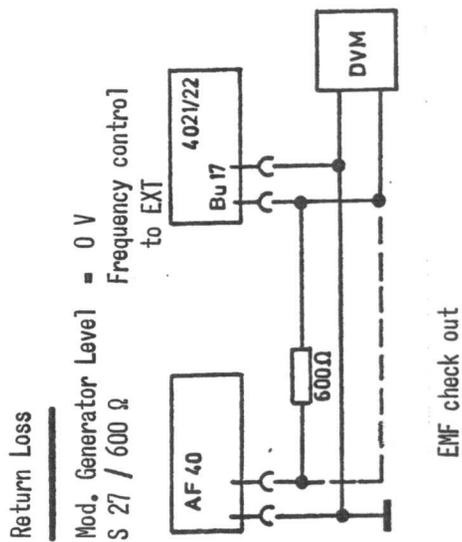
4020 series
CONTROL AND DISPLAY UNIT



Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

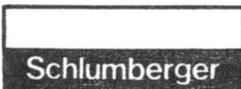
209 021 A	9/12 Sheet
-----------	---------------

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



Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch
	0028.23	5.10.78	Yarms

209 021 A

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>	LS 1 Bu 14	1 kHz 1 kHz	— —	sufficient loudness > 2 V	..... ok
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>	I 3 I 1/1 2	DC 1 kHz	— —	Power reading appr. 10 W if the test plug is connected to socket "RF PROBE/AUX OUTPUTS"	..... ok

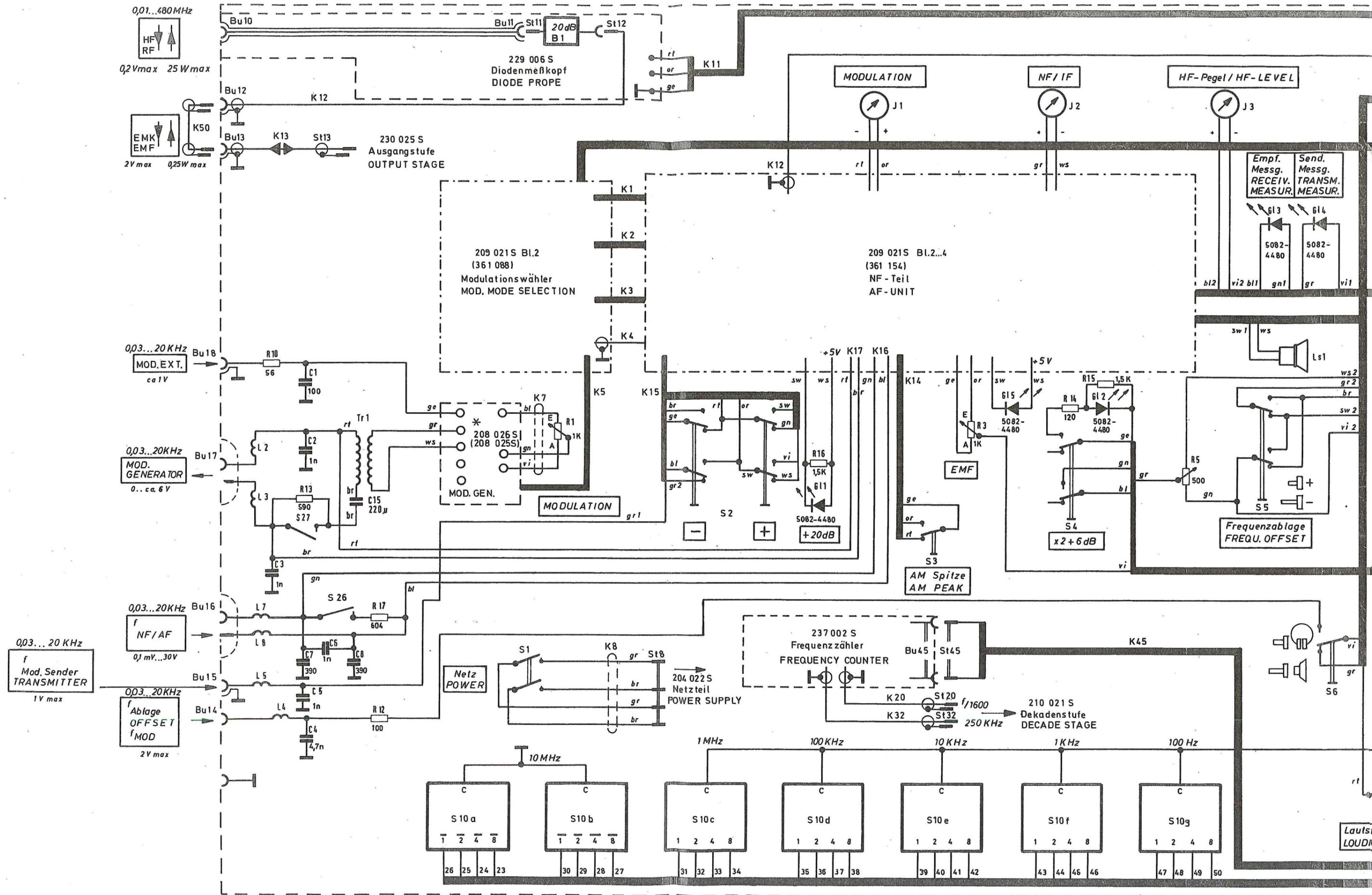
Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

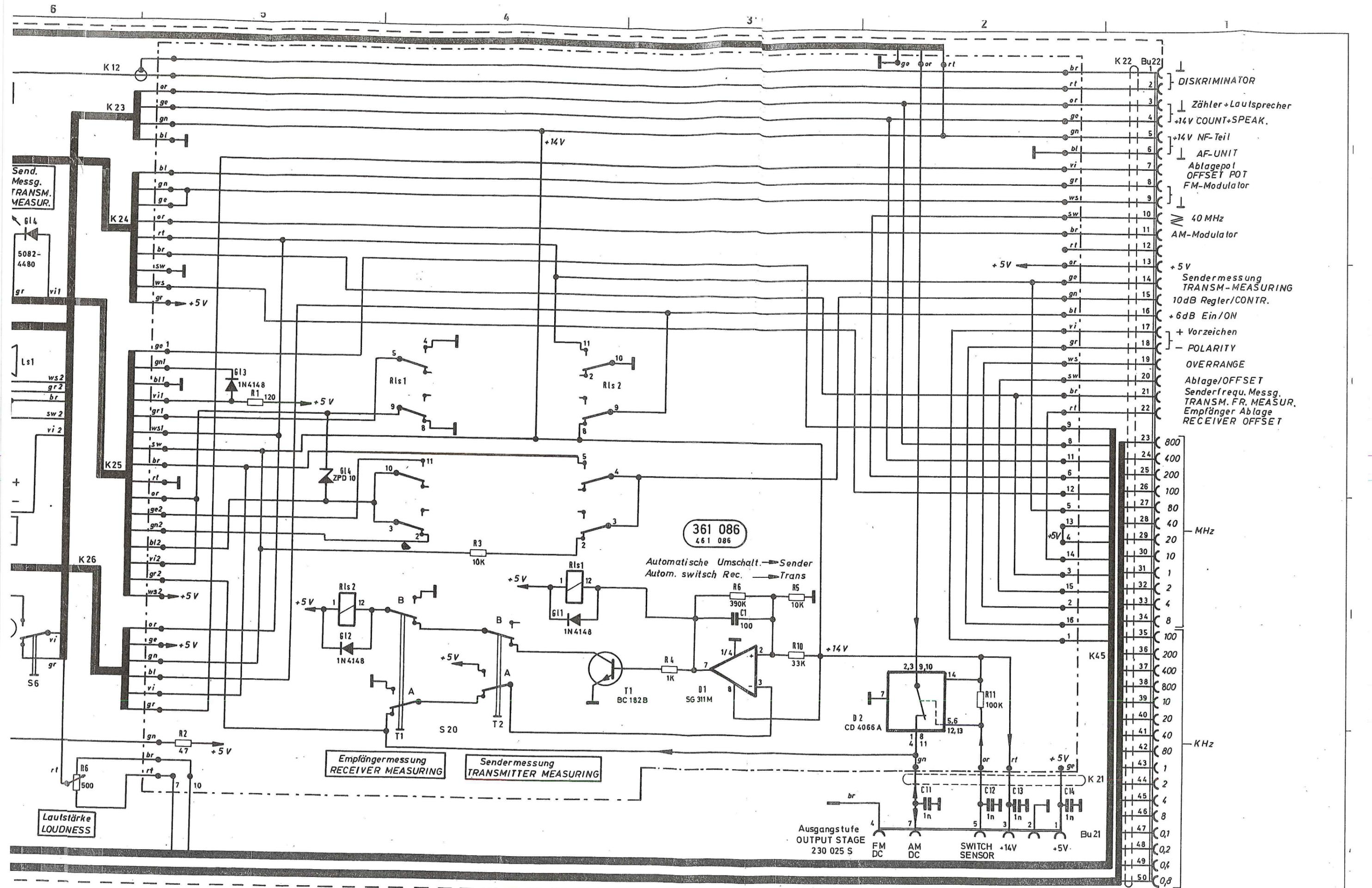
Schlumberger

Issue	Alteration No.	Date	Name
0028-29		27.3.1980	Morasch

209 021 A	12/12 Sheet
Replacement for	



* ab L1928
208 026 S

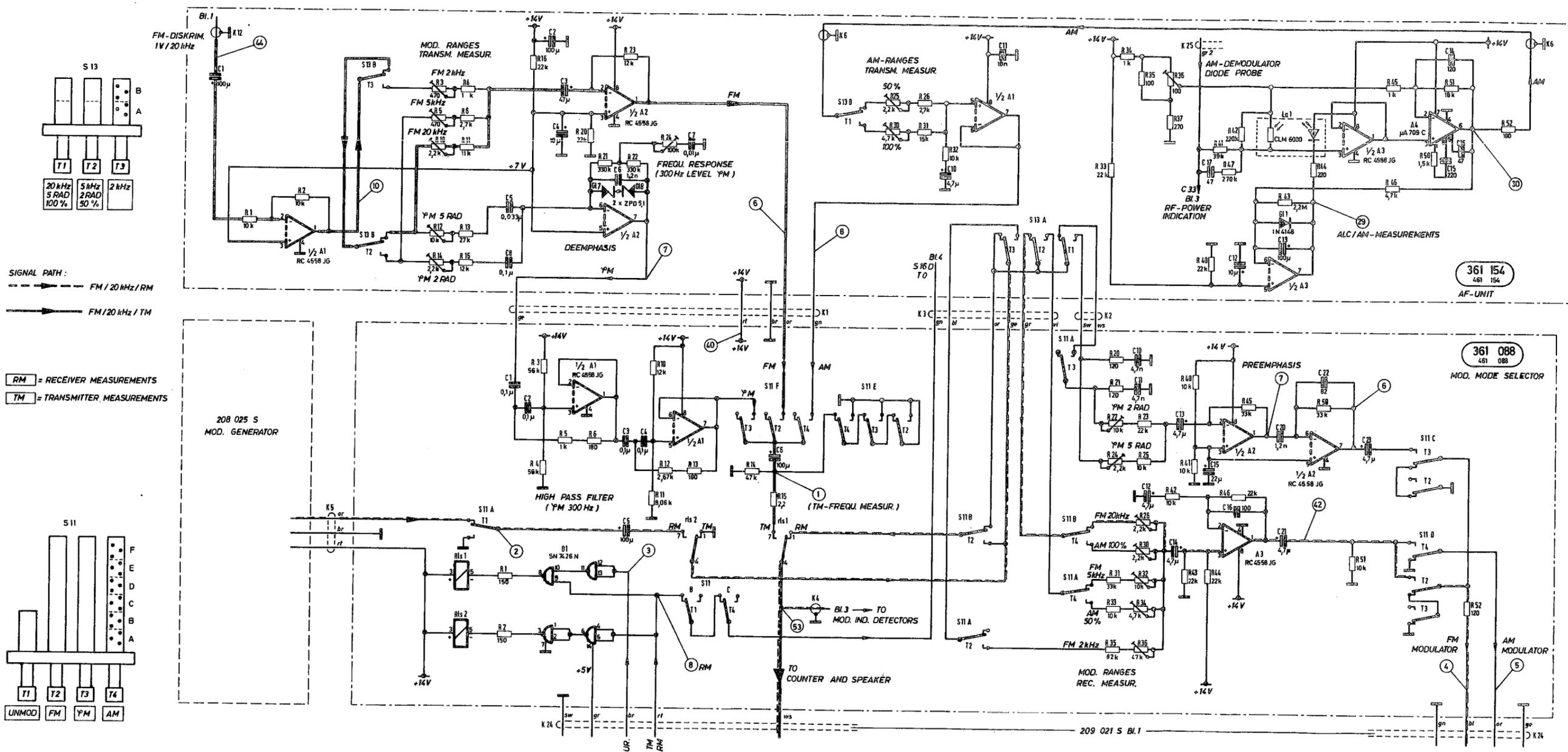


sw	BLACK	bl	BLUE	05	9028.54	9.8.79	Eiler	norm.		
br	BROWN	vi	VIOLET	04	9028.21	12.3.79	May	gepr.		
rt	RED	gr	GREY							
rs	ROSE	ws	WHITE							
ge	YELLOW	tr	TRANSPARENT							
gn	GREEN									

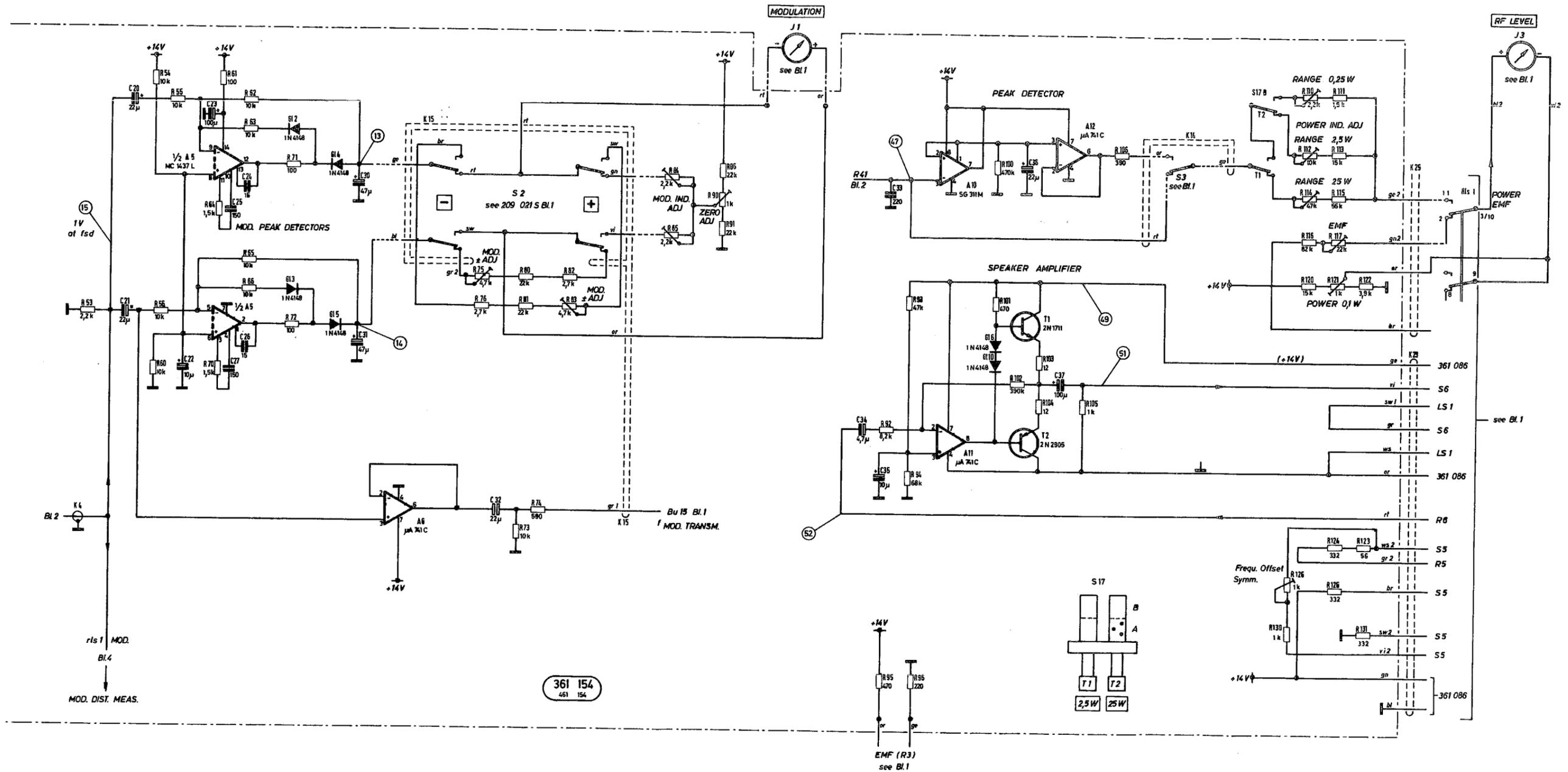
Schlumberger o/s
 Meßgerätebau u. Vertrieb GmbH
 8 München 46

CONTROL AND DISPLAY
 UNIT

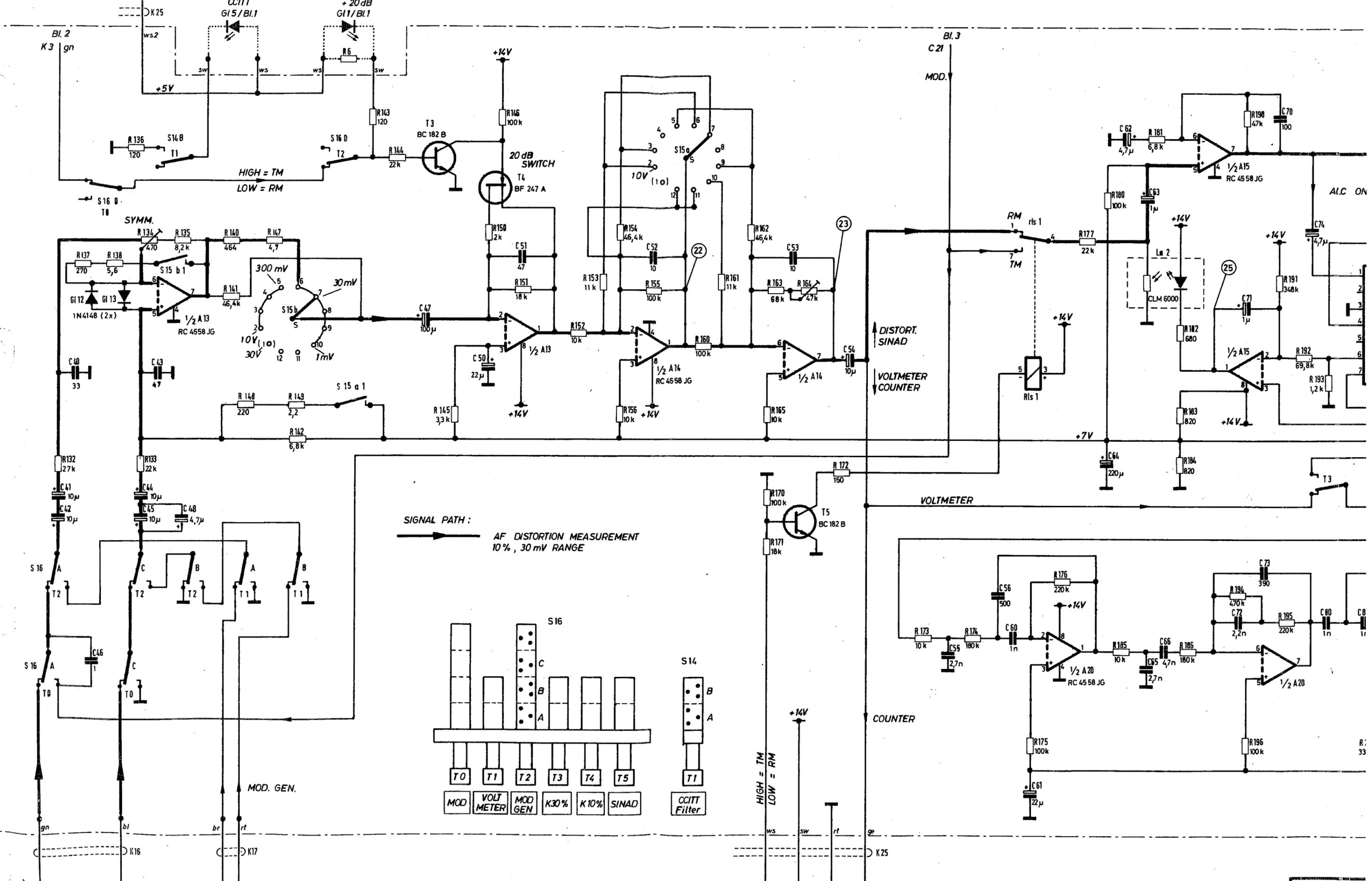
209 021 S Bl.1
 Typ: 4020



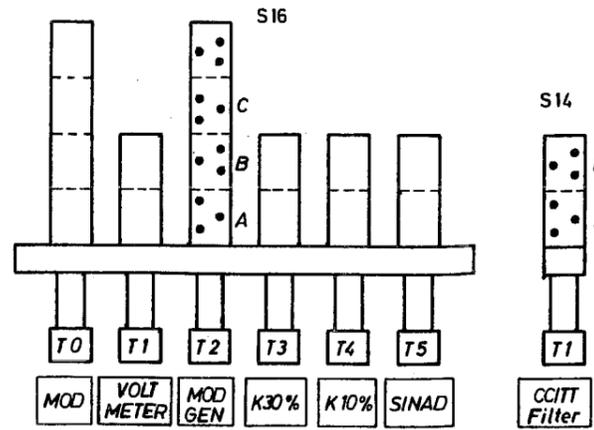
sw BLACK	bl BLUE	04 9028.35	4.5.79	Mo	norm.		Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	CONTROL AND DISPLAY UNIT	209 021 S Bl.2
br BROWN	vi VIOLET	03 9028.31	9.4.79	Kunze	gepr.	22.12.78			
rt RED	gr GREY	Ausg. A-Mittig	Datum	Name	bearb.				Typ: 4020
rs ROSE	ws WHITE	ISS. MODIF.	DATE	NAME					
gy YELLOW	tr TRANSPARENT								
gn GREEN									



sw BLACK	bl BLUE	01	9028.27	26.2.79	Mo	norm.		Schlumberger o/s Messgerätebau u. Vertrieb GmbH 8 München 46	CONTROL AND DISPLAY UNIT	209 021 S Bl.3 Typ: 4020
br BROWN	vi VIOLET	-	9028.7	17.1.79	Mo	bearb.	22.12.78			
rt RED	gr GREY	Aussg	A-Mittig	Datum	Name	Datum	Name			
rs ROSE	ws WHITE	ISS	MODIF.	DATE	NAME	DATE	NAME			
gr YELLOW	tr TRANSPARENT									
gn GREEN										



SIGNAL PATH :
 AF DISTORTION MEASUREMENT
 10% , 30 mV RANGE

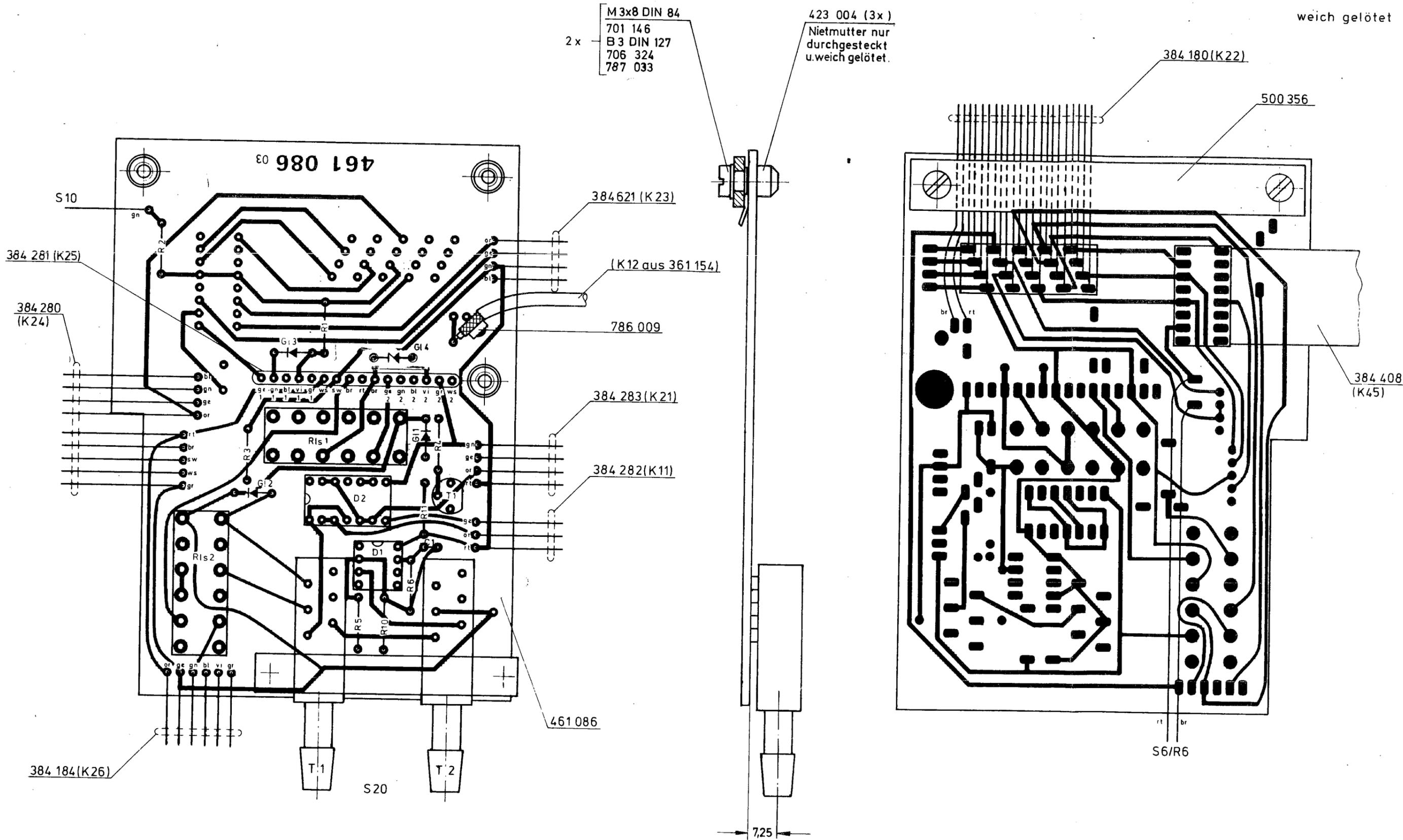


- sw BLACK
- br BROWN
- rt RED
- rs ROSE
- ge YELLOW
- gn GREEN

weich gelötet

M3x8 DIN 84
2x 701 146
B 3 DIN 127
706 324
787 033

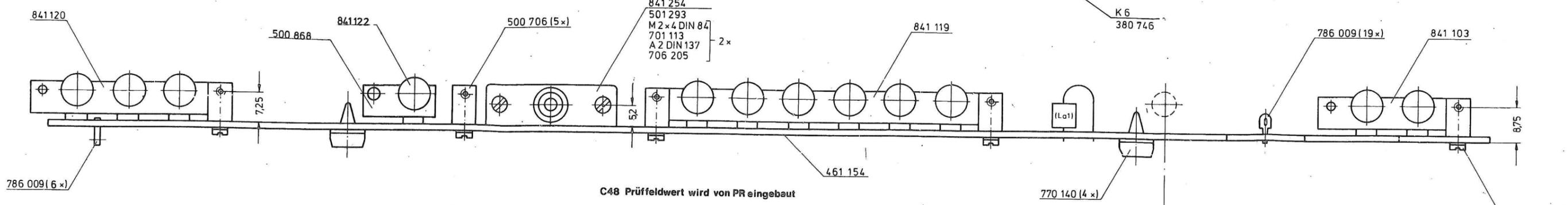
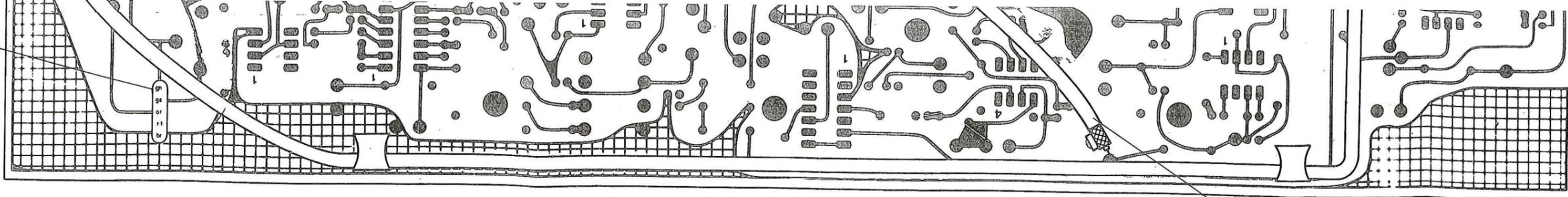
423 004 (3x)
Nietmutter nur
durchgesteckt
u. weich gelötet.



○ Kontrollmaß

902827 26.2.79 Mo		0.2		2:1		Schlumberger o/s	
80289 2.2.79 Mo						Bestückte Leiterplatte	
802896 21.11.78 Gz						361 086	
802884 18.12.78 Gz							

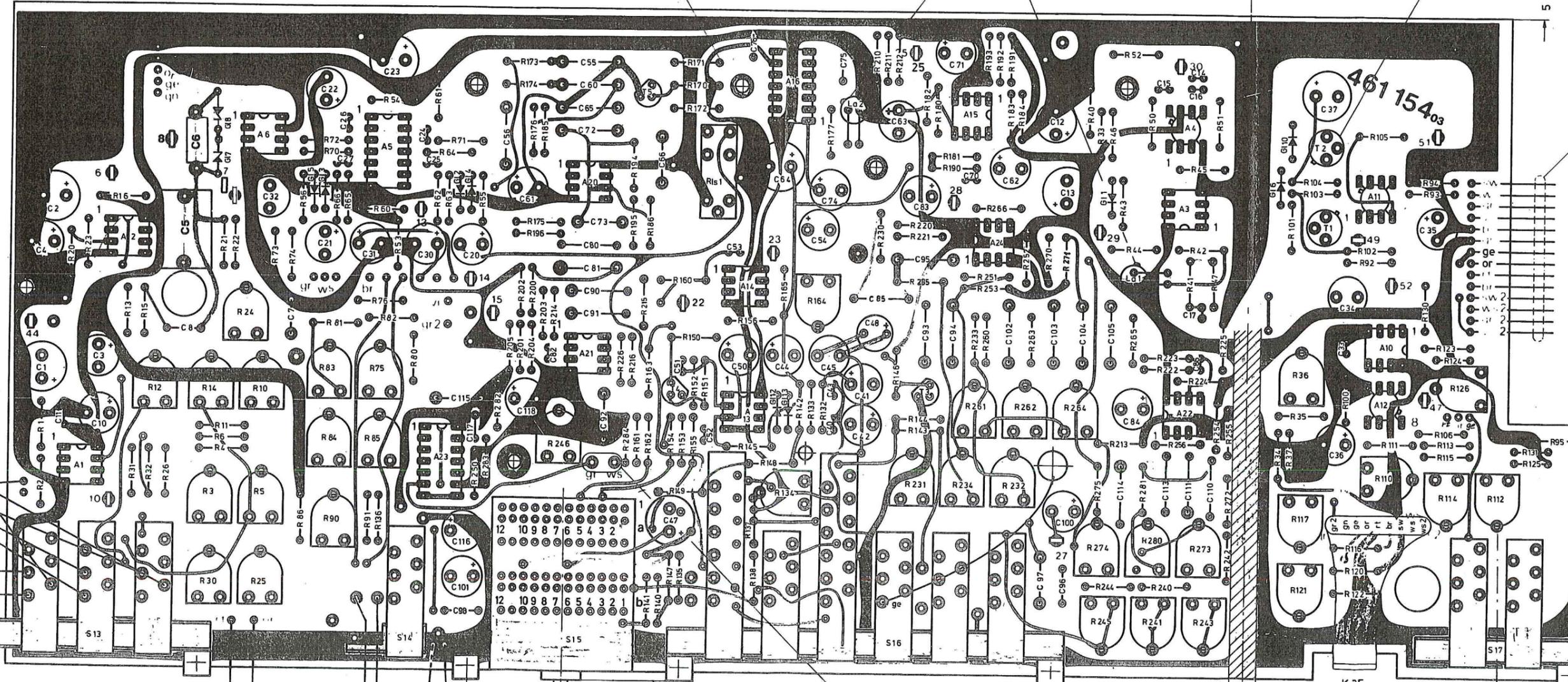
K1(384 620)
aus 361 088



C48 Prüffeldwert wird von PR eingebaut

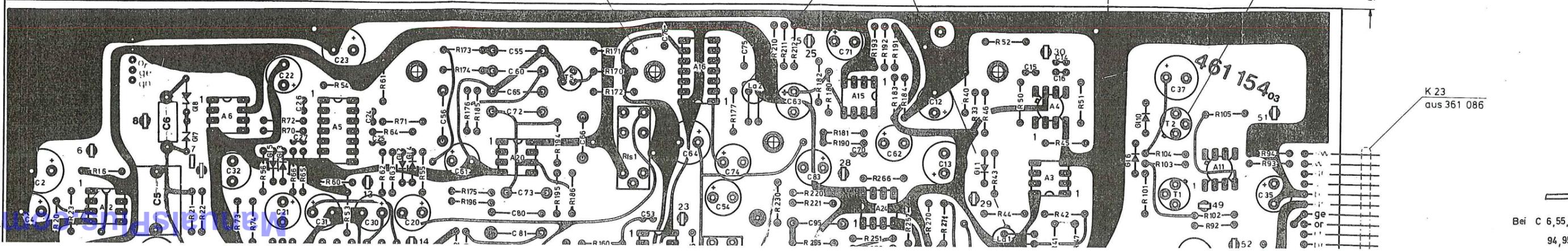
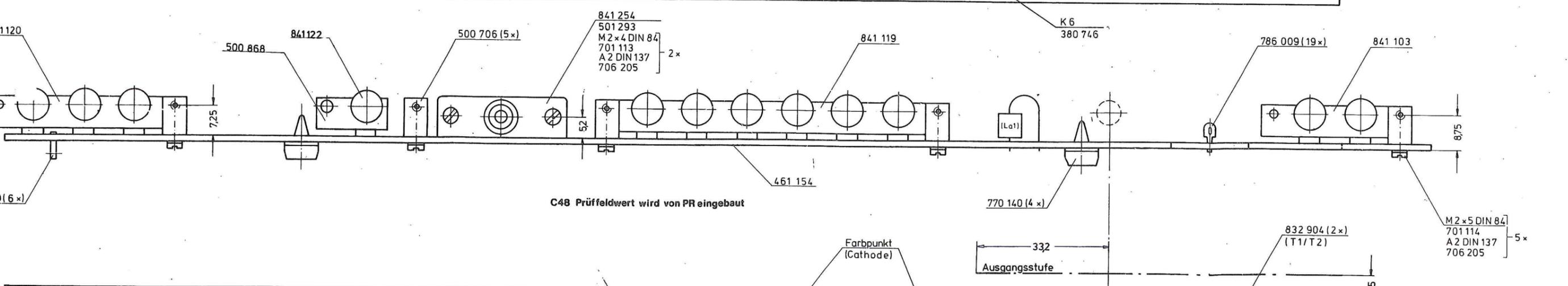
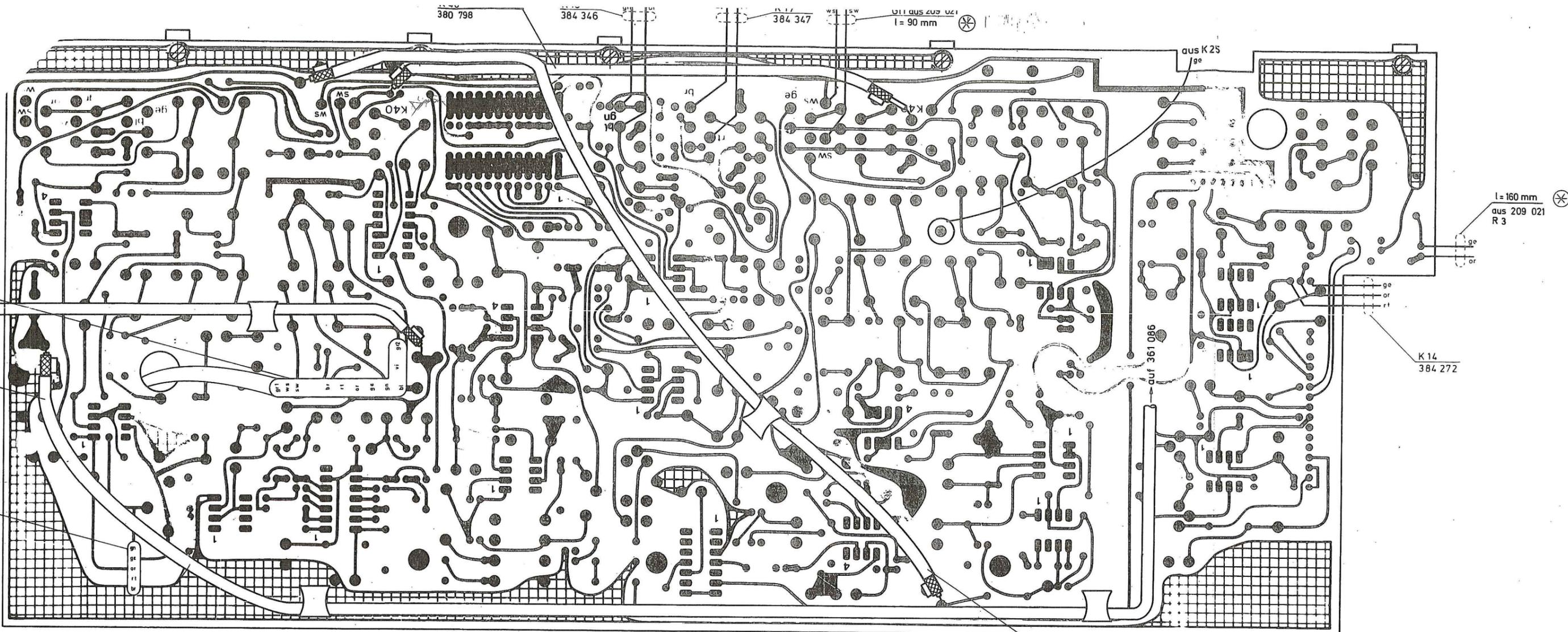
Farbpunkt
(Cathode)

Ausgangsstufe



K 23
aus 361 086

K 25
aus 361 086

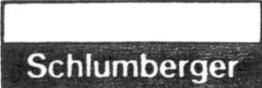


(see block circuit diagram 102 820 B for total instrument)

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



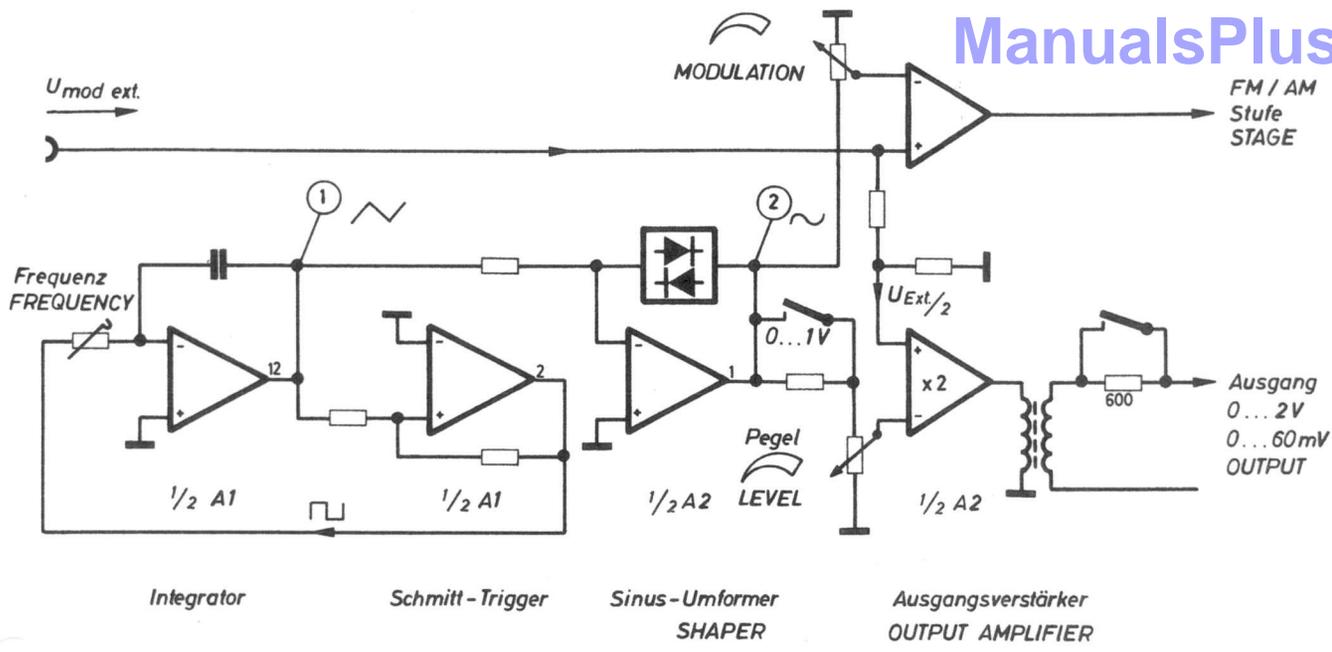
REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
AF Analyser (e.g. Radiometer FRA 3) Distortion-Analyser hp 333 A	<u>4. Distortion Factor Adjustment</u> S 18 : 1 kHz	①	1 kHz (2 kHz)	R 5	second harmonic < 1 mV	0,.....mV
	S 18 : 1 kHz, R102 fully clockwise, 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 ▪ : 30 Hz ...100 Hz, R 39 min. frequency R 102 fully clockwise, S 2 pressed	FM, 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	FM, AM- output	1 kHz	_____		
AF Generator 1 kHz 1 V	<u>7. Checkout of the 10 turn control potentiometer</u> S 18 : 0,3...1 kHz	FM, 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

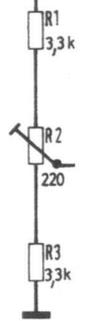
Issue	Alteration No.	Date	Name
		5.10.75	Xamm
	5028.7	3.1.78	X
	5028.8	11.5.78	Stu...

208 025 A



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.

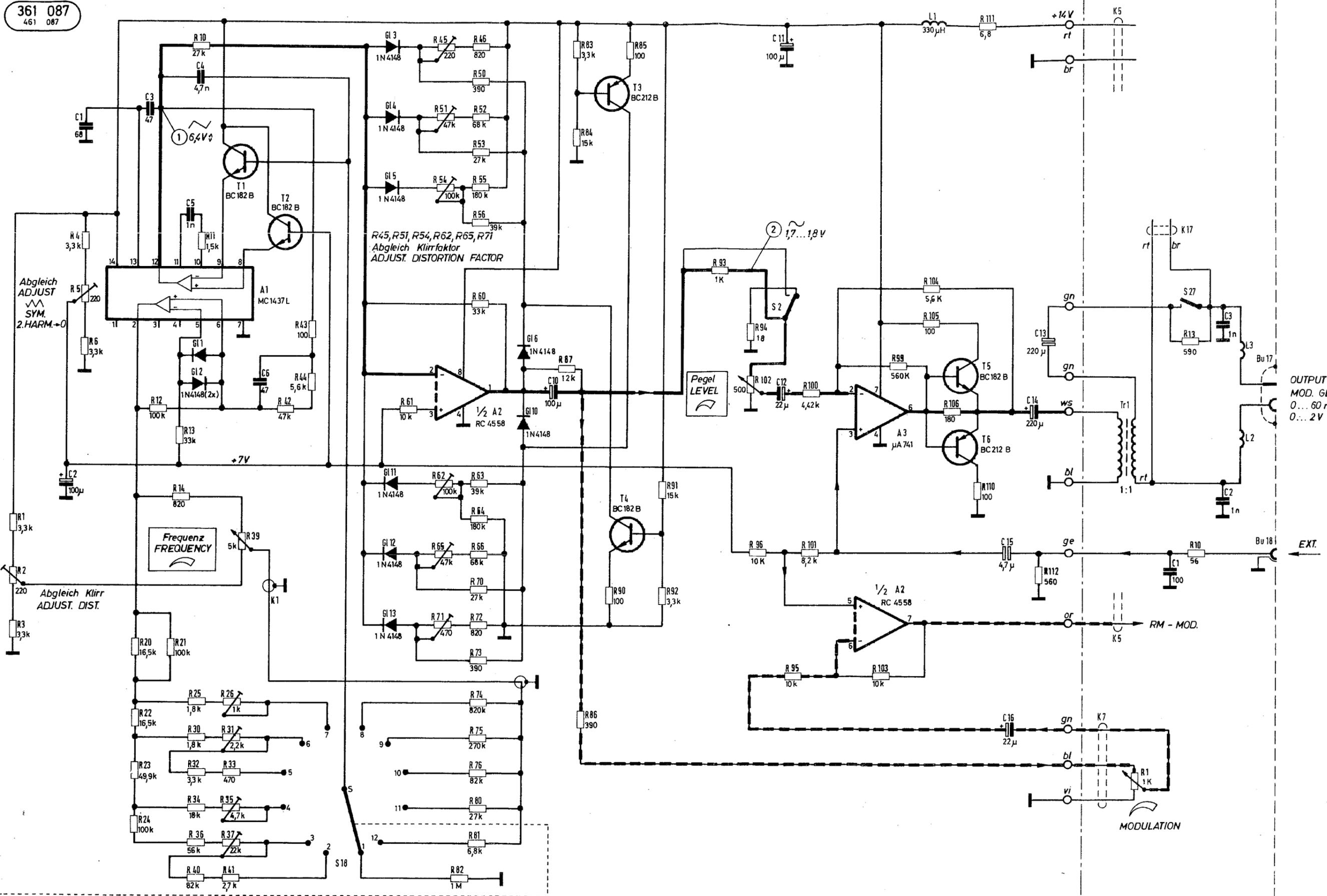
Abc
AD.
✓
SI
2.Hz



/ AM
fe
GE

gang
2V
60mV
PUT

361 087
461 087



OUTPUT
MOD. GEN.
0... 60 mV
0... 2V

EXT.

MODULATION

sw BLACK
br BROWN
rt RED
rs ROSE
ge YELLOW
gn GREEN

bl BLUE
vi VIOLET
gr GREY
ws WHITE
tr TRANSPARENT

norm.	gepr.				
9028.7	16.1.79	Mo	16.10.78	Kr.	
Ausg.	Ä.-Mittg.	Datum	Name	Datum	Name
ISS.	MODIF.	DATE	NAME	DATE	NAME
		1978			

Schlumberger o/s
Meßgerätebau u. Vertrieb GmbH
8 München 46

MODULATIONS GENERATOR

208 025 S

Typ: 4020

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

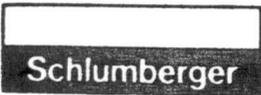
The fully integrated counter provides direct drive of the display in conventional Strobe method, for which it requires merely the counting frequency, the reset pulse, the transfer pulse (transfer of the counter status into the readout store) and the flashing frequency. Its negative feed voltage is generated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

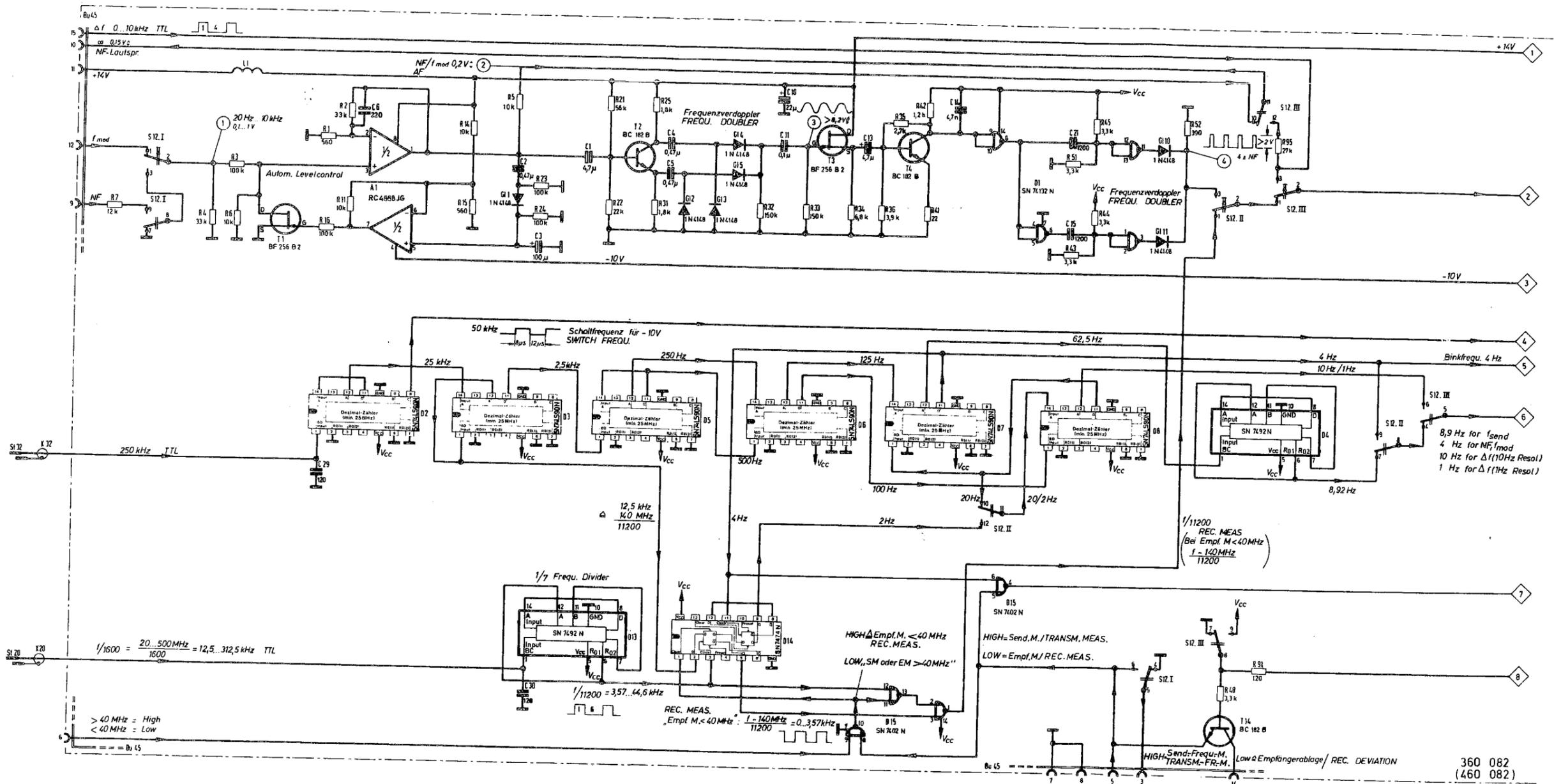
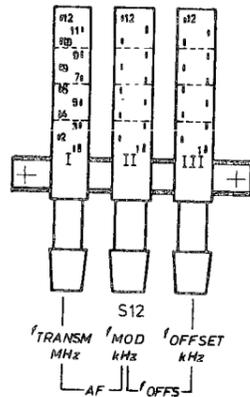
The frequency of the reset transfer pulse and flashing frequency is derived by frequency dividers from a 250 kHz signal having crystal accuracy and switching in accordance with the nature of the counting frequency. The flashing frequency is provided to the counter only when the RF amplitude in the oscillator 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:

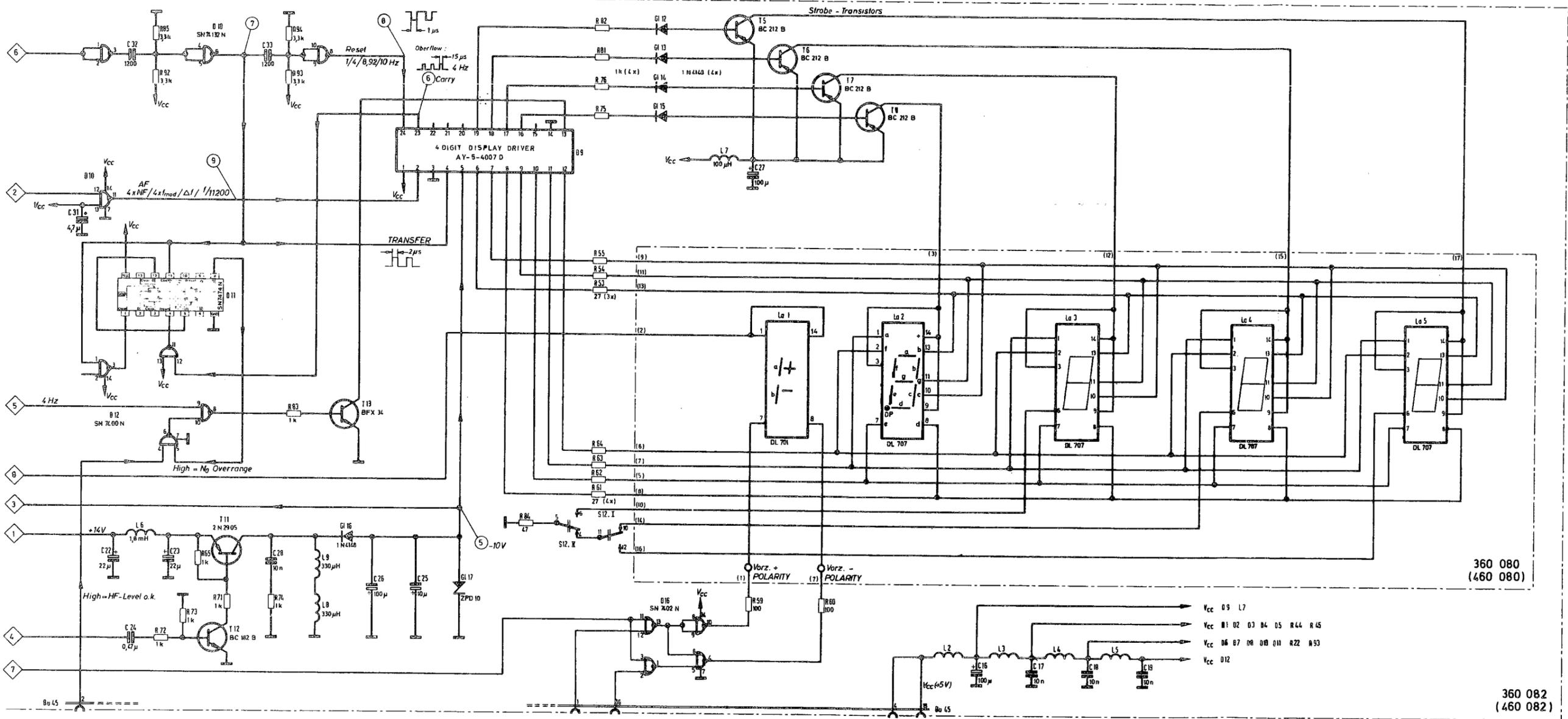
1. The modulation frequency f_{MOD} or the input frequency of the voltmeter is quadrupled by an input amplifier having automatic level control in 2 frequency doublers. Thus attaining a faster counter readout, (4 times/sec) for 1 Hz resolution.
2. The offset frequency " Δf (AC)" is presented directly.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

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

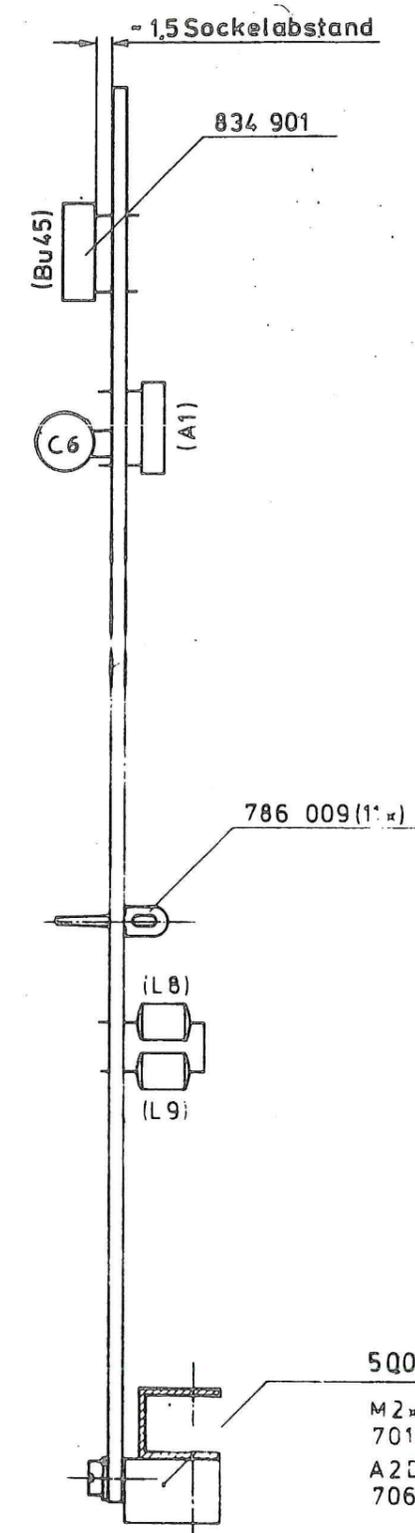
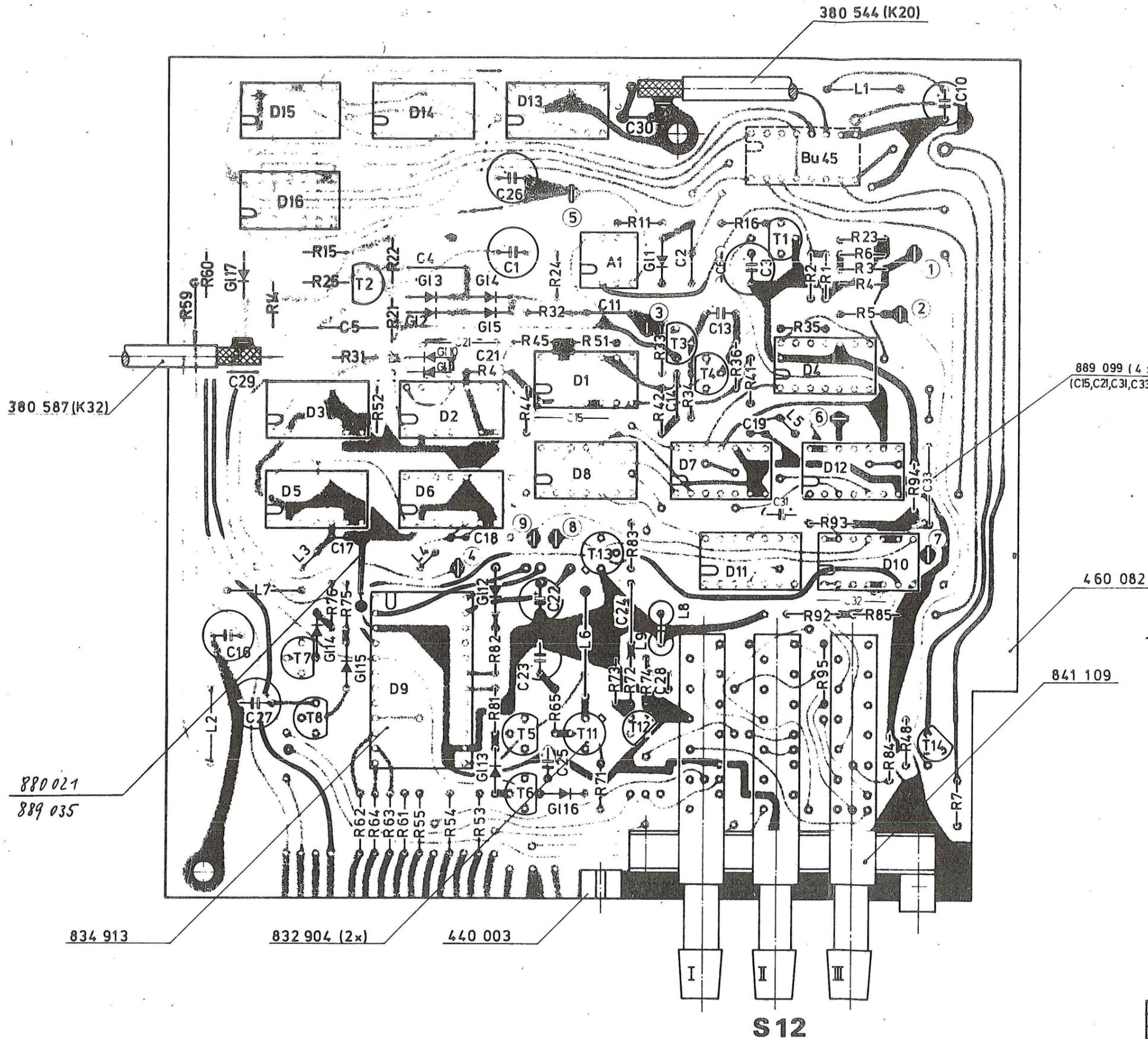
	Function Description	237 002 F	Sheet 1/1
	Type: 4020/21/22	Frequency Counter	Date 0979



sw BLACK	bl BLUE	11	7028,95	21.12.77	Wn	norm		Schlumberger o/s Messgerätebau u. Vertrieb GmbH 8 München 46	Frequenzzähler FREQUENCY COUNTER	237 002 S Bl. I
br BROWN	vl VIOLET	12	8028,5	9.1.78	Kc	gepr.	26.2.75			
rd RED	gr GREY	Ausg.	A.-Mitgl.	Datum	Name	1975	Datum			
rs ROSE	ws WHITE	ISS	MODIF.	DATE	NAME					Typ: 4010
gy YELLOW	tr TRANSPARENT									



05	8028.62	2.6.78	Kr.	norm		Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 66	Frequenzzähler FREQUENCY COUNTER	237 002 S Bl.2 Typ: 4010
04	5028.96	16.10.75	Kr.	spez.				
03	5028.93	30.9.75	Kr.	spez.	26.2.75			
Ans.	A. Hennig	Datum	Werk	1975	Zeichn.	Name		
Farb.	MSDF	DATE	NAME		DATE	NAME		



880 021
889 035

889 099 (4 x)
(C15,C21,C31,C33)

460 082

841 109

834 913 832 904 (2x) 440 003

S12

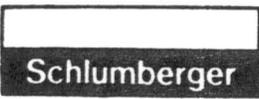
○ Kontrollmaß

20									
19									
18									Schlumberger o/s
17	9028.54	9.8.79	Eiler					1:1	Bestückte Leiterplatte
16	8028.62	2.8.78	K.						
15	8028.5	5.1.78	K.						
14	7028.84	30.11.77	Eiler						
13	7028.76	16.11.77	K.						
12	7028.2	16.11.77	K.						
11	5028.108	21.11.75	Eiler						360 082

(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	2
		140... 180 MHz	2
		420... 480 MHz	1 (3 subranges)
062801 to...062899	213 015	60... 100 MHz	2
		140... 180 MHz	2
		420... 480 MHz	1 (3 subranges)
072801 to 072882 072883 to ...	213 025 } 213 016 }	60... 100 MHz	2
		140... 180 MHz	2
		400... 480 MHz	1 (2 subranges)
4010 A | 4021			
052801 to 062899	213 013	40... 200 MHz	9
		420... 480 MHz	1 (3 subranges)
072801 to 072882 072883 to...	213 023 } 213 017 }	40... 200 MHz	9
		400... 480 MHz	1 (2 subranges)
4011 | 4022			
062801 to...062899	213 013	see 4010 A	11
	and 213 014	200... 420 MHz	
072801 to...	213 017 and 213 014	see 4010 A / 4021 see above	



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.

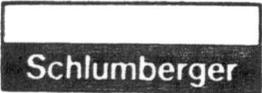
The RF signal is provided to the output amplifier through to the buffer amplifier, harmonic low pass filter and the combination circuitry. To generate 40 ... 60 MHz using a single oscillator circuit a double oscillator frequency of 80...120 MHz is generated and divided at the output by 2.

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.

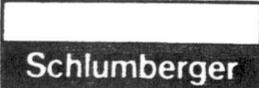
	Function Description	213 012 F	Sheet 2/3
	Type : 4020/21/22	Oscillator Stage	Date 0979

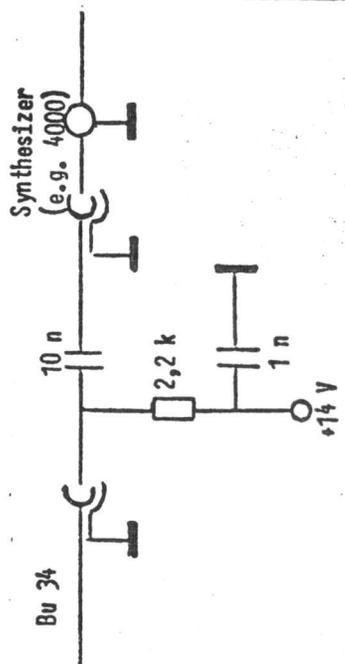
4. Output Amplifier

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.

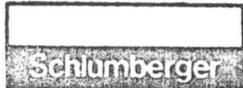
The output amplifier has 2 RF outputs: for the output stage with frequency response and high level and for the decade stage with higher frequency response and low level.

	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>Synthesizer (60...520 MHz)</p> <p>DVM</p> <p>Power Meter</p> <p>RF Analyser</p>	<p>RF Amplifier (360 885)</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



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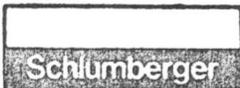
21.6.78 Schuh

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Synthesizer (60...520 MHz)	<u>RF Amplifier (360 895) - continued</u> <u>Output Level on Bu 35</u> $P_{IN} = -7 \text{ dBm on Bu 34}$	Bu 35	60...400 MHz		$P_{out} = +7, 8, \dots, +9 \text{ dBm}$	
DVM	$P_{IN} = -5 \text{ dBm on Bu 34}$	Bu 35	400...480 MHz		$P_{out} = +8, 8, \dots, +10 \text{ dBm}$	
Power Meter	DVM connected to DF 10 <u>Automatic Level Control</u> $P_{IN} = +2 \dots -12 \text{ dBm}$	DF 10	60...480 MHz		$P_{out} = +8 \dots +10 \text{ dBm}$ $P_{out} = +10, \dots, +12 \text{ dBm}$ VDC < 11 V	
	$P_{IN} = +2 \dots -6 \text{ dBm}$	Bu 35	60 MHz		$P_{out} = +7, 8, \dots, +9 \text{ dBm}$	
	<u>Command Line</u> : "RF present" "RF lacking"	Bu 35	500 MHz		$P_{out} = +8, 8, \dots, +10 \text{ dBm}$ $P_{out} = +8 \dots +10 \text{ dBm}$ $P_{out} = +10 \dots +12 \text{ dBm}$	
	<u>Output Level on Bu 40</u> $P_{IN} = -5 \text{ dBm on Bu 34}$ 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	
	<u>Harmonic Output</u>	Bu 40	20... 60 MHz 60...100 MHz 100...480 MHz		- 2 ... - 16 dBm - 2 ... - 12 dBm - 2 ... - 10 dBm	
RF Analyser		Bu 35	20...500 MHz		> 30 dBc	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



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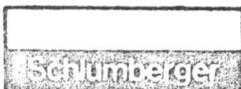
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Replacement for

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>L1 L1</p> <p>L21 L21</p>	<p>400 MHz 440 MHz</p> <p>440 MHz 480 MHz</p>		<p>> 4 VDC 0 V</p> <p>> 4 VDC 0 V</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>					

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



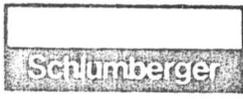
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Modulation meter Multimeter	<p><u>FM-Sensitivity Adjustment (PCB 350 089)</u></p> <p>Set approx. 10 kHz frequency deviation.</p> <p>Set 400 MHz and note 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>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

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Oscillator



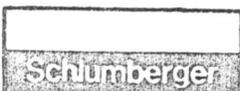
Issue	Alteration No.	Date	Name
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Multimeter	<p><u>RF-level</u></p> <p>Check DC-level on R39 (PCB 360 885)</p> <p>Tip: To get an lower DC-level, pull C25, C5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

Adjustment and Test Procedure

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Oscillator



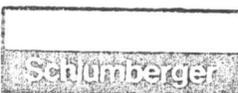
Issue	Alteration No.	Date	Name

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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}		\approx 0 % < 2 %	

Adjustment and Test Procedure

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Oscillator



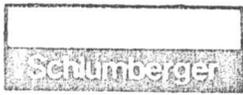
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>2. 2 MHz Frequency Offset on TRANSM. MEASUREMENT</p> <p>Depress: TRANSM. MEASUREMENT and f MOD</p> <p>(When checking without the Control and Display Unit, connect pin 21 of St 22 and DF 7 of the Decade Stage to ground).</p> <p>Set decade switch to</p> <p>49,999 59,999 79,999 99,999 119,999 MHz 139,999 159,999 179,999 199,999</p> <p>Check the "RF present" line at the same frequencies.</p>	RF DIRECT or Bu 35	51,999			
			61,999			
Noise Deviation Meter	<p>3. Noise Deviation</p> <p>FM</p> <p>φ M:</p>	RF DIRECT or Bu 35	40...199,99 MHz			
			201,999			
			as above		< 10,5 V	
					$V_{AFC} \leq 11,5 V$	
					Noise Dev. < 8 Hz CCITT weighted	
					Phase Dev. < 0,01 RAD CCITT weighted	

Adjustment and Test Procedure

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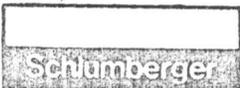
21.6.76 Schuh

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE																											
DVM Adjustable Power Supply 0...12 V	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>4. Oscillating conditions</p> <p>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.</p> <p><u>Caution:</u> Don't reconnect St 31 until the Power Supply is disconnected.</p> <p>Frequency setting</p> <table border="0"> <tr><td>40 MHz</td><td>40</td><td>■</td></tr> <tr><td>50</td><td>50</td><td>■</td></tr> <tr><td>60</td><td>60</td><td>■</td></tr> <tr><td>80</td><td>80</td><td>■</td></tr> <tr><td>100</td><td>100</td><td>■</td></tr> <tr><td>120</td><td>120</td><td>■</td></tr> <tr><td>140</td><td>140</td><td>■</td></tr> <tr><td>160</td><td>160</td><td>■</td></tr> <tr><td>180</td><td>180</td><td>■</td></tr> </table>	40 MHz	40	■	50	50	■	60	60	■	80	80	■	100	100	■	120	120	■	140	140	■	160	160	■	180	180	■	RF DIRECT or Bu 35	<p>< 40 MHz</p> <p>< 50</p> <p>< 60</p> <p>< 80</p> <p>< 100</p> <p>< 120</p> <p>< 140</p> <p>< 160</p> <p>< 180</p>	-----	< 1,2 V on AFC-Line	
40 MHz	40	■																															
50	50	■																															
60	60	■																															
80	80	■																															
100	100	■																															
120	120	■																															
140	140	■																															
160	160	■																															
180	180	■																															

Adjustment and Test Procedure

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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)	Oscillator 40...200 MHz (360 887) - continued 5. FM Sensitivity depending on Carrier Frequency $f_{mod} = 1 \text{ kHz}$ $V_{mod} = 3 \pm 0,05 \text{ V}_{rms}$ on St 51/1 or on DF 11 40...50 MHz Band Adjust deviation at both ends of the band Check deviation across whole band in 1 MHz steps. If necessary, adjust R 2 for equal positive and negative deviation accuracy. 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. Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT	RF DIRECT or Bu 35 ■ RF DIRECT and AFC-line (AFC-line = grey lead)	40,0 MHz 49,999 MHz 40...19,999 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 $\pm 3\%$ $V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} < 11,5 \text{ V}$	

Adjustment and Test Procedure

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Oscillator

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter AF Generator DVH	<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>	RF DIRECT or Bu 35	50,0 MHz 59,9 MHz	R 72 R 63 alternatively	$\Delta f = 20$ kHz $\Delta f = 20$ kHz	
		RF DIRECT and AFC-line	50...59,9 MHz	R 72	Accuracy $\pm 3\%$	
	<p>Settings: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT</p>	RF DIRECT and AFC-line	50,0 MHz 59,9 MHz	L 11 L 11	$V_{AFC} < 2,5$ V $V_{AFC} < 11,5$ V	
		(AFC-line = grey lead)				

Adjustment and Test Procedure

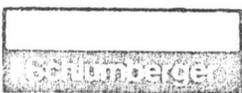
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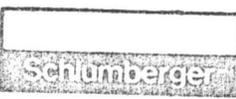
Replacement for



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>60...80 MHz Band</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>Settings: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT</p>	RF DIRECT or Bu 35	60,0 MHz 79,9 MHz	R 172 R 182 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
		RF DIRECT and AFC-line	60...79,9 MHz	R 172	Accuracy $\pm 3\%$	
		(AFC-line= grey lead)	60,0 MHz 79,9 MHz	L 43 L 43	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	

Adjustment and Test Procedure

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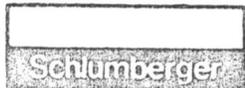
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>80...100 MHz Band</p> <p>Adjust deviation at both ends of the band</p> <p>Check 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>	RF DIRECT or Bu 35	80,0 MHz 99,9 MHz	R 231 R 222 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
		"	80...99,9 MHz	R 231	Accuracy $\pm 3\%$	
	<p>Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT</p>	RF DIRECT and AFC-line	80,0 MHz 99,9 MHz	L 55 L 55	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
		(AFC-line= grey lead)				

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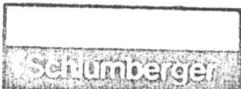
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Replacement for

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 (AFC-line-groy lead)	100...119,9 MHz	R 233	Accuracy $\pm 3\%$	
	Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT	RF DIRECT and AFC-line	100,0 MHz 119,9 MHz	L 61 L 61	$V_{AFC} \leq 2,5$ V $V_{AFC} \leq 11,5$ V	

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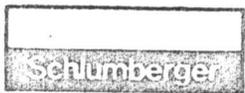
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Replacement for

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: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT</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	

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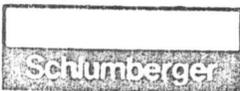
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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVH	<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>	<p>RF DIRECT or Bu 35</p> <p>"</p>	140,0 MHz	R 114 \uparrow	$\Delta f = 20$ kHz	
			159,9 MHz	R 123 \uparrow alternatively	$\Delta f = 20$ kHz	
			140...159,9 MHz	R 114 \uparrow	Accuracy $\pm 3\%$	
	<p>Setting: RECEIVERMEASUREMENT TRANSMITTERMEASUREMENT</p>	<p>RF DIRECT and AFC-line</p> <p>(AFC-line= grey lead)</p>	140,0 MHz	L 33 \uparrow	$V_{AFC} \leq 2,5$ V	
			159,9 MHz	L 33 \uparrow	$V_{AFC} \leq 11,5$ V	

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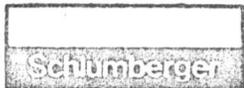
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	<p>Oscillator 40...200 MHz (360 887) - continued</p> <p>----- 160...180 MHz Band</p> <p>Adjust deviation at both ends of the band</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>	RF DIRECT or Bu 35	160,0 MHz 179,9 MHz	R 165 R 161 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	<p>Setting: RECEIVER MEASUREMENT</p> <p>TRANSMITTER MEASUREMENT</p>	RF DIRECT and AFC-line	160,0 MHz 179,9 MHz	L 41 L 41	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} < 11,5 \text{ V}$	
(AFC-line = grey lead)						

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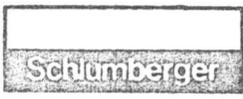
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Replacement for

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>180...200 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 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 $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT	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	
	Setting: TRANSMITTER MEASUREMENT	(AFC-line = grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



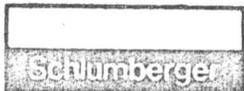
Issue	Alteration No.	Date	Name
		21.6.78	Schuh

213 017 A	18/19 Sheet
Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURE VALUE
Deviation Meter Distortion Meter	Oscillator 40...200 MHz (360 887) - continued 6. <u>Modulation Distortion</u> $f_{mod} = 1 \text{ kHz}$ $V_{mod} = 1,5 \text{ V}_{rms}$ on St 51/1 or on DF 11	RF DIRECT or Bu 35	40...199 MHz	-----	Dist. < 1,5 % at $\Delta f = 10 \text{ kHz}$	
RF Analyser 1200 MHz	7. <u>Harmonics</u>	"	40...199 MHz	-----	> 30 dBc	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator



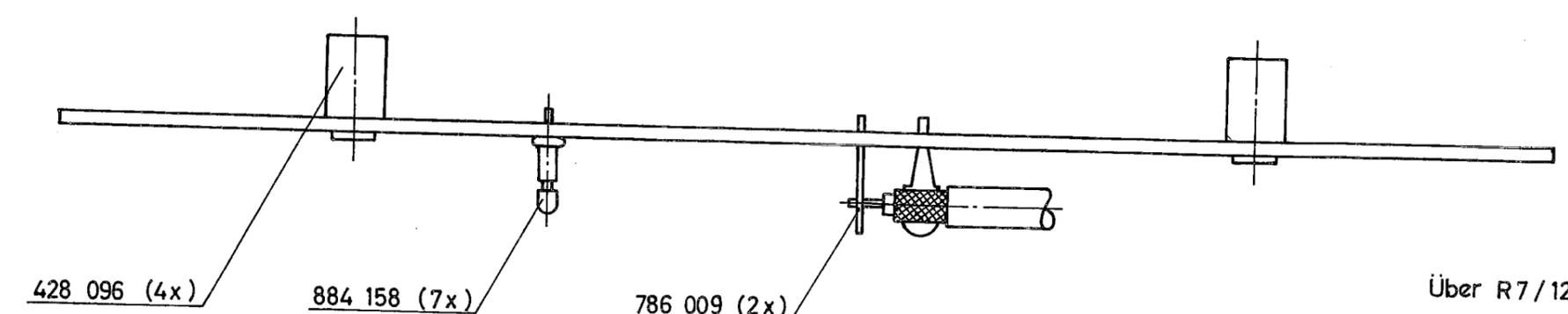
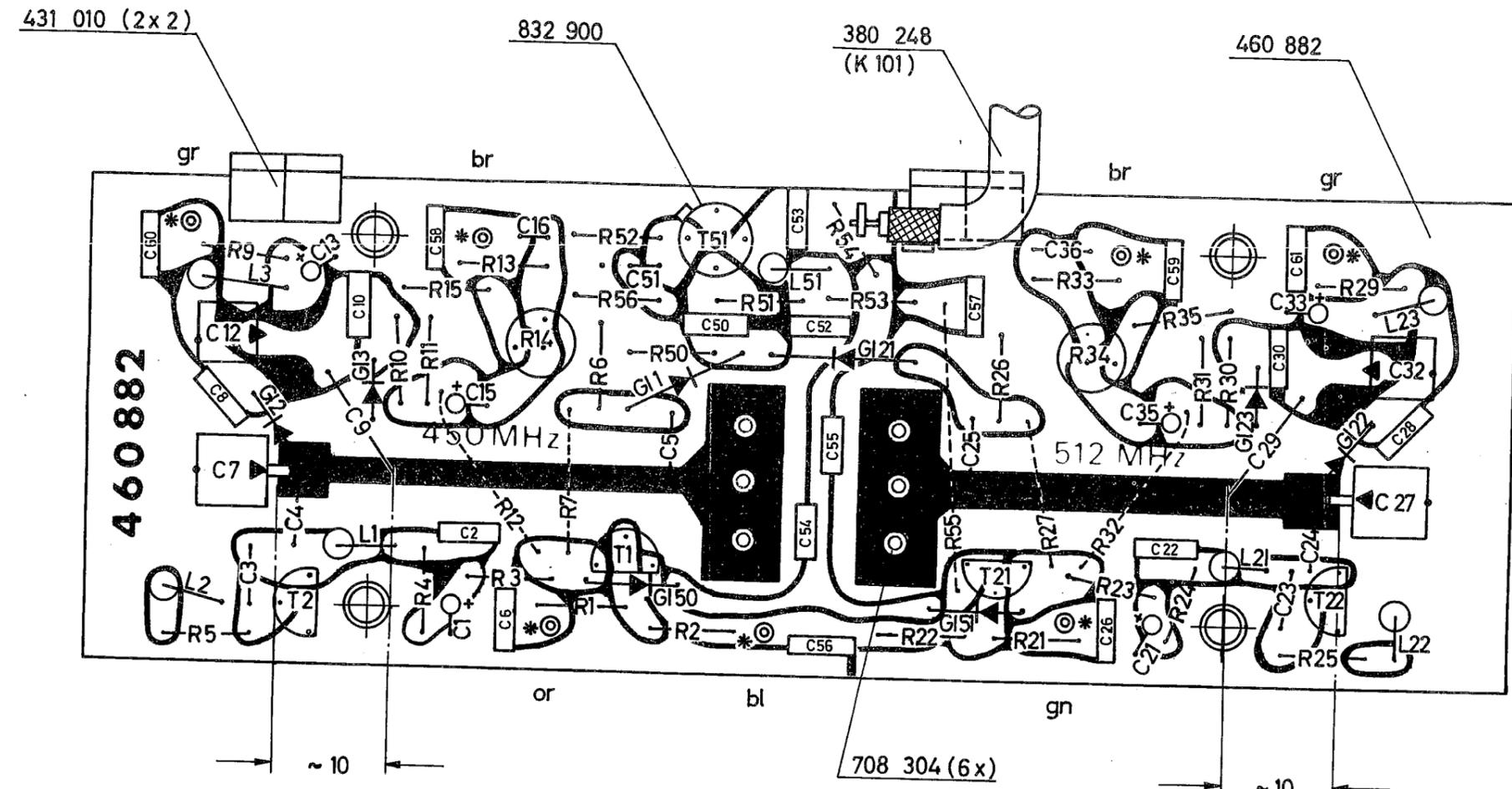
Issue	Alteration No.	Date	Name
		21.6.78	Schub

213 017 A

19/19
Sheet

Replacement for

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

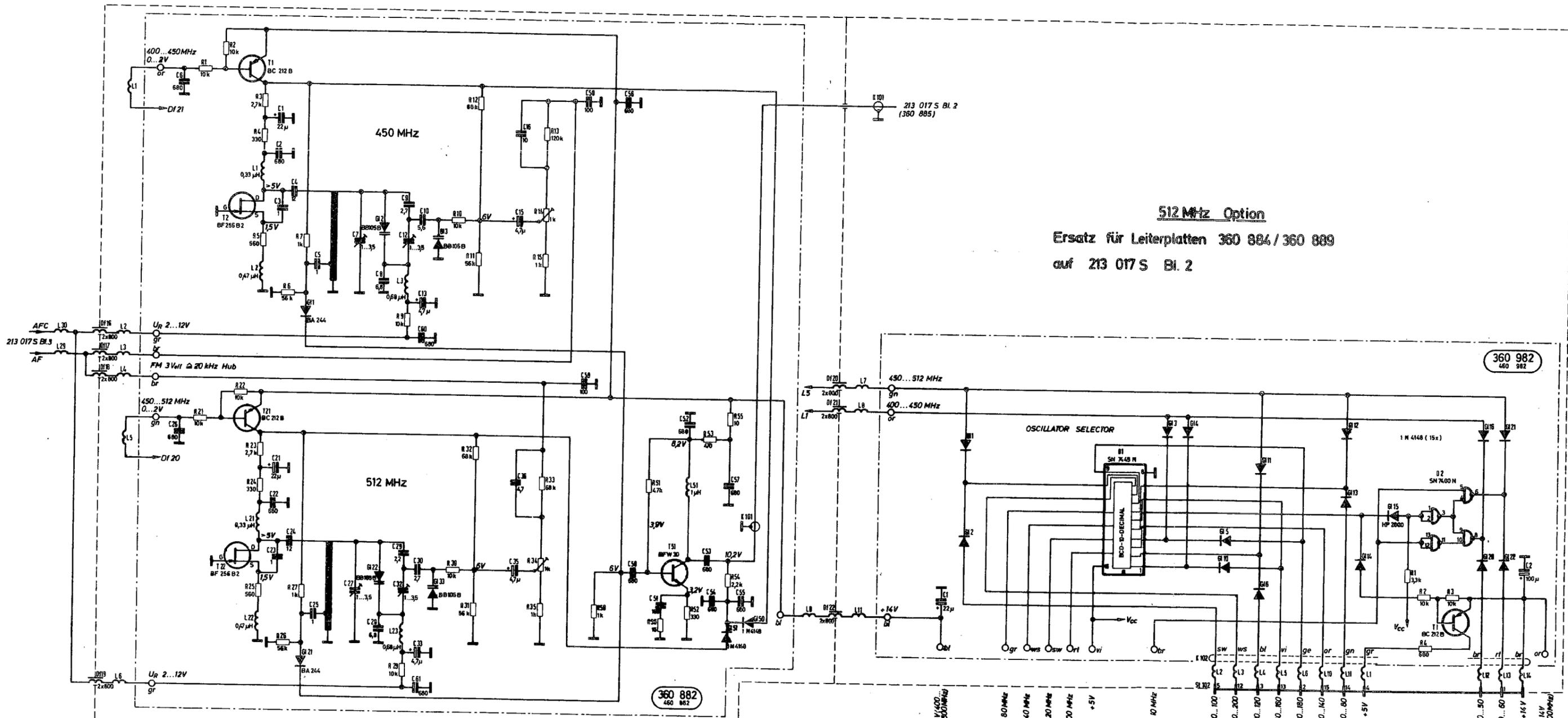


Über R7/12/27/32/55
 Schrumpfschlauch 787 029 aufgeschrumpft

* = Farbpunkt

1977 4.4.77 5.4. Kringelis	2:1	Schlumberger o/s <small>Melbparatur-Vertrieb GmbH</small>
		Bestückte Leiterplatte
		360 882

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

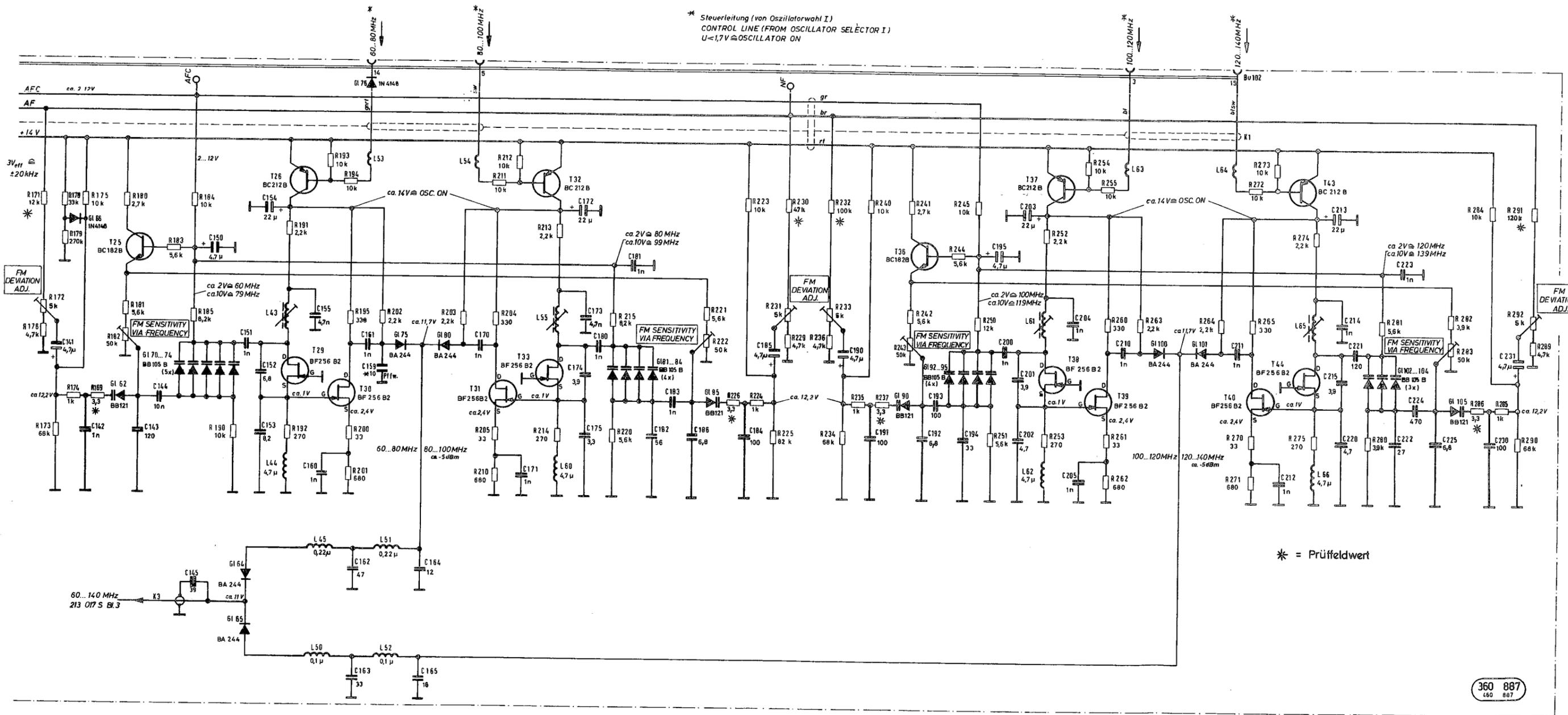


512 MHz Option
 Ersatz für Leiterplatten 360 884 / 360 889
 auf 213 017 S Bl. 2

360 882
 460 882

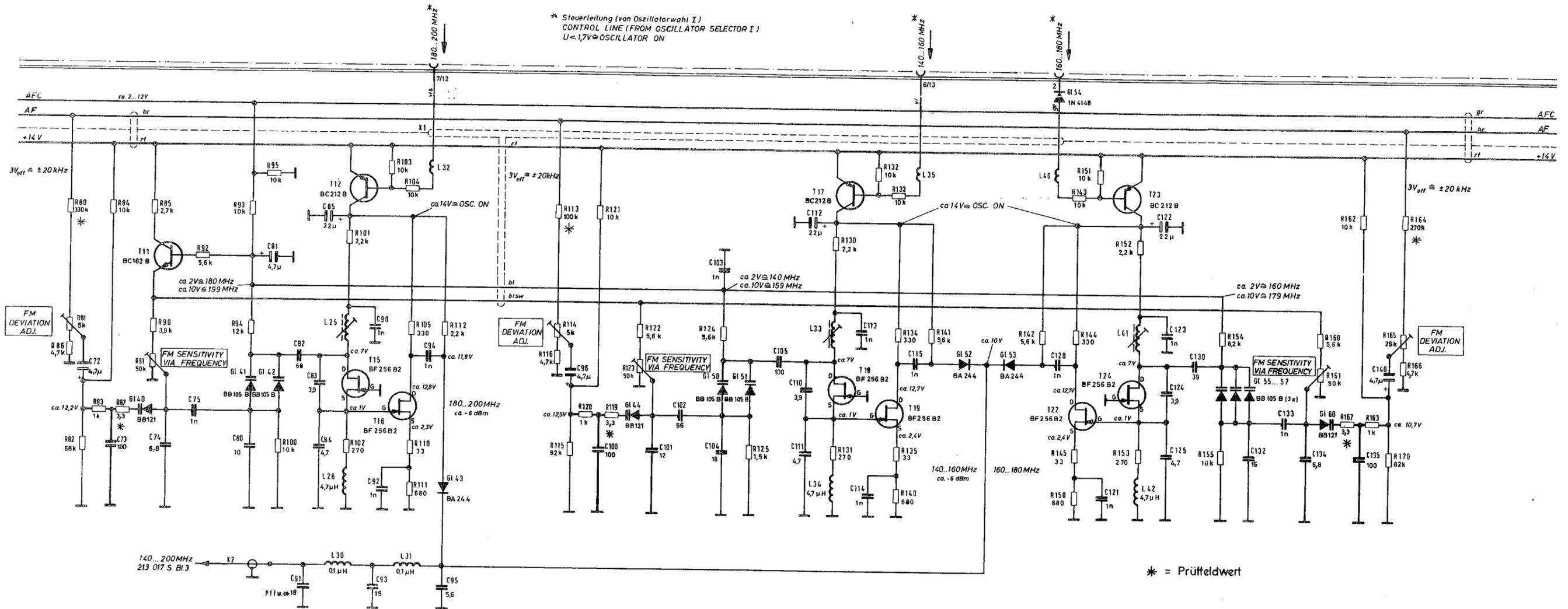
360 982
 460 982

sw BLACK	M BLUE	norm				Schlumberger o/s Halbleiterbau u. Vertrieb GmbH 8 München 48	OSCILLATOR (512 MHz Option)	213 017 S Bl. 6 Typ : 4010 A / 4011
br BROWN	vi VIOLET	gepr.						
ri RED	gr GREY	bestk.	31.3.77	kg.				
rs ROSE	wh WHITE	ISS.	ISS.	MODIF.	DATE	REUSE		
gn YELLOW	tr TRANSPARENT		1977	Datum	DATE	NAME		
gr GREEN								



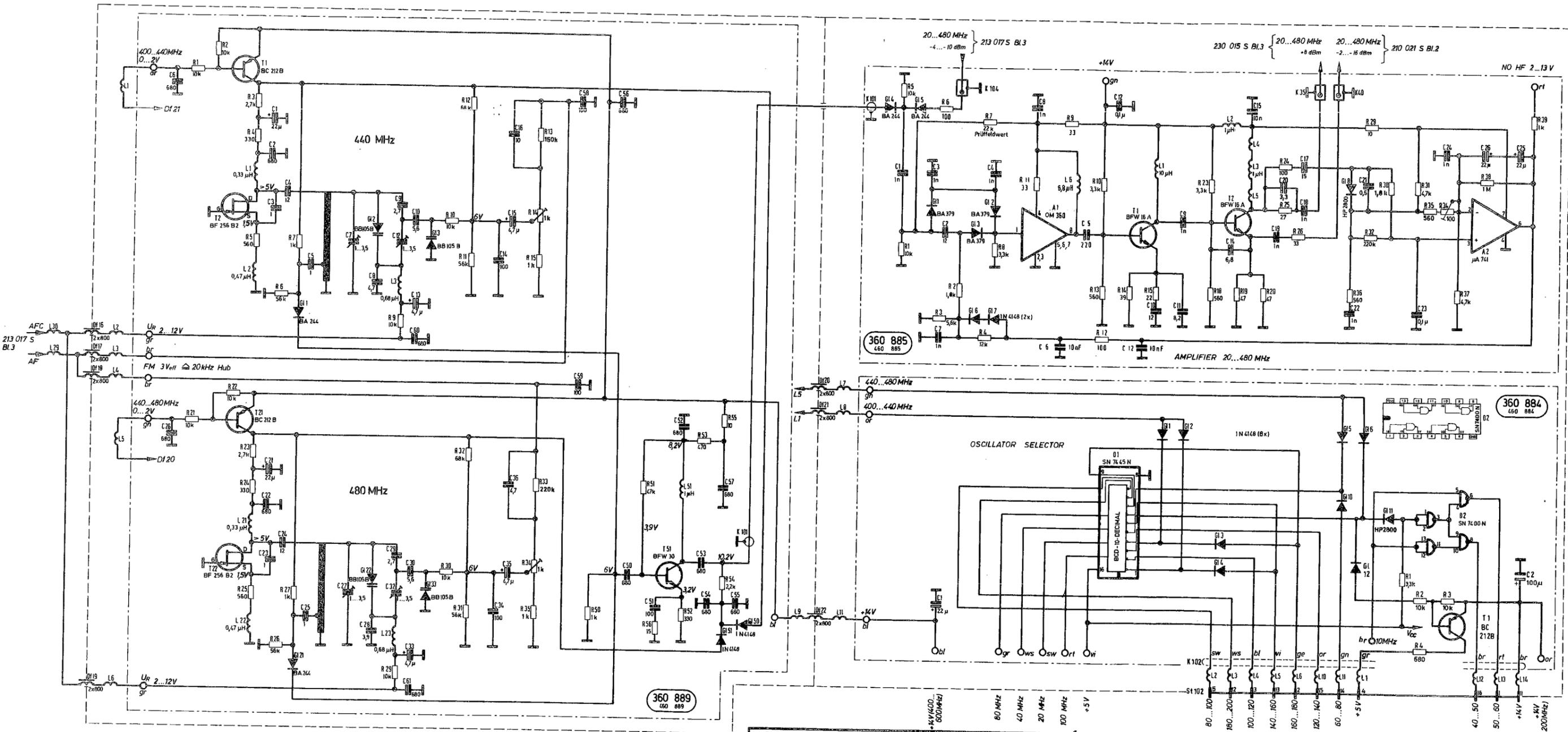
360 887
460 887

sw BLACK	n BLUE	br BROWN	rt RED	rs ROSE	ge YELLOW	gn GREEN	v VIOLET	gr GREY	ts WHITE	tr TRANSPARENT	
DB 6026.56		8.5.78	Wn	norm.	gepr.	bearb.	14.1.76	Kr	Schlumberger o/s Messgerätabau u. Vertrieb GmbH 8 München 46		
Ausg.	Ä-Mittig.	Datum	Name	1976	Datum	Name	OSCILLATOR			213 017 S Bl. 5	
ISS.	MODIF.	DATE	NAME		DATE	NAME	Typ: 4010 A/4011				



360 887
460 887

bw BLACK	bl BLUE	norm.				Schlumberger o/s Meßgerätekab. u. Vertrieb GmbH 8 München 46	OSCILLATOR	213 017 S Bl. 4
br BROWN	vl VIOLET	gopr.						
rt RED	gr GREY	beorb.	14.1.76	Kr.				
rs ROSE	ws WHITE	1976						
gr YELLOW	tr TRANSPARENT							
gn GREEN								

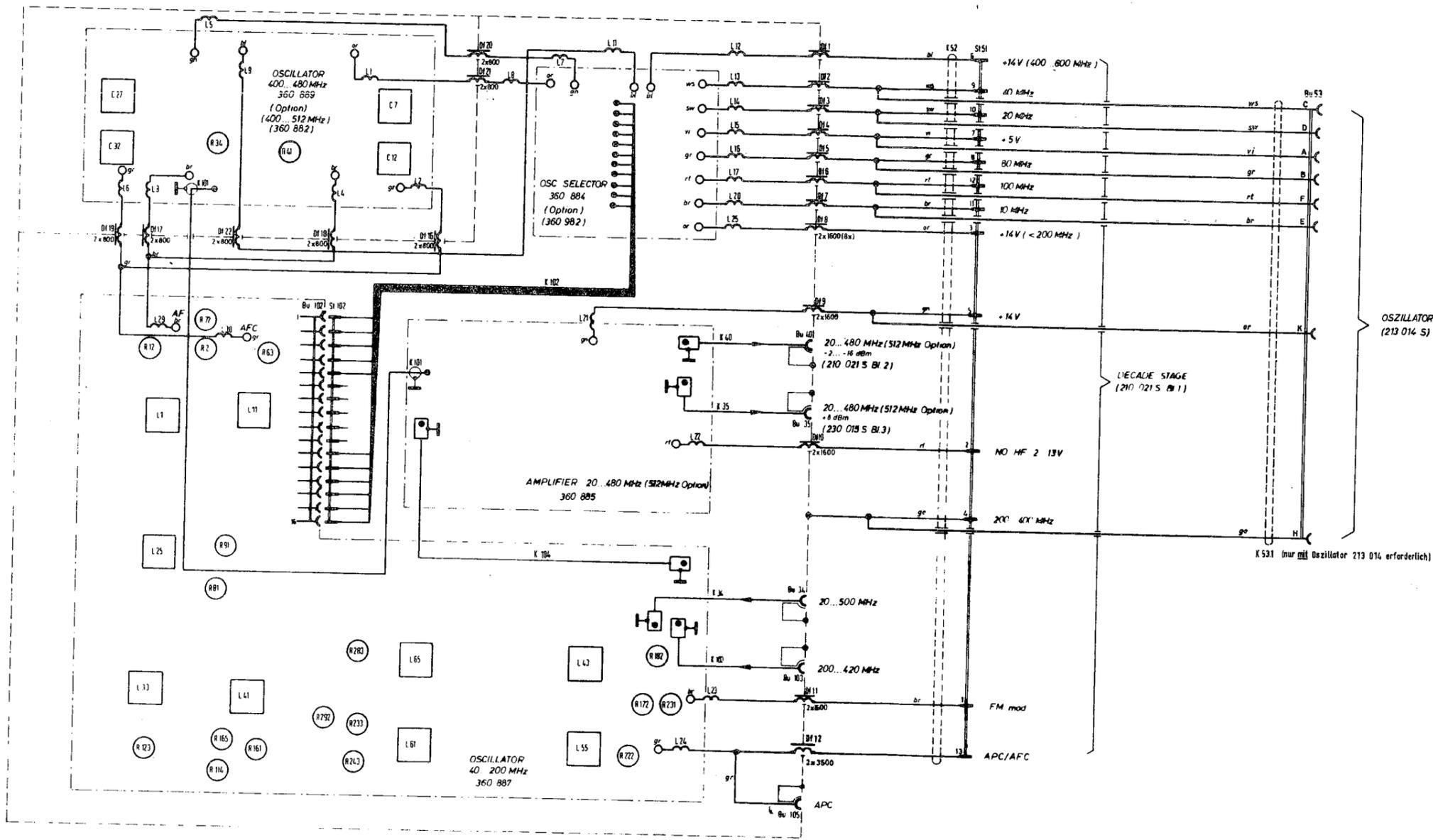


sw BLACK	bl BLUE	norm.							
br BROWN	vi VIOLET	gepr.							
rt RED	gr GREY	bearb.	14.1.75						
rs ROSE	ws WHITE	1975							
gy YELLOW	tr TRANSPARENT								
gn GREEN									

87 9028.48 23.7.75 Pi
 Ausg. A.-Mittig Datum Name
 ISS MODIF DATE NAME
 1975 Datum Name
 DATE NAME

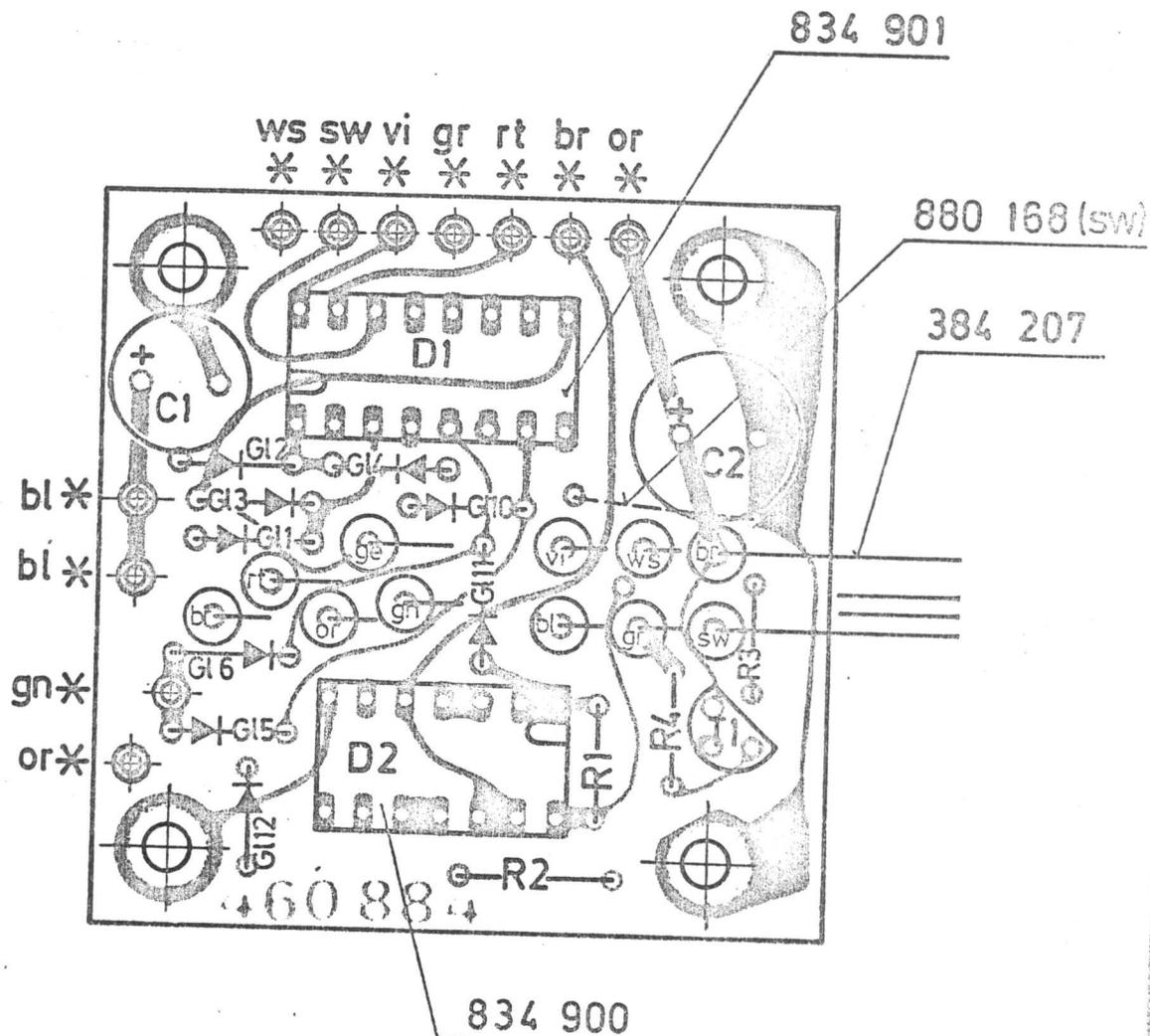
Schlumberger o/s
 Meßgerätebau u. Vertrieb GmbH
 8 München 46

OSCILLATOR
 Typ: 4010 A / 4011



* BLACK br BROWN r RED ro ROSE y YELLOW gr GREEN	bl BLUE v VIOLET gr GREY w WHITE tr TRANSPARENT	03 902863 12.9. Hi Ausg. A M. H. g. 55 MOD. DATE NAME	14.1 Kr 76 Datum Name DATE NAME	Schlumberger o s Maßstab: 1:1 Zeichnung: 14.1 Kr Datum: 12.9. Hi Name:	OSCILLATOR	213 017 S Bl. 1. Typ 4010 A, 4011
---	---	---	--	--	------------	--------------------------------------

weich gelötet



Diese Zeichnung ist unser Eigentum. Verwertung, insbesondere Vervielfältigung, ohne schriftliche Genehmigung ist strafbar und Schadensersatzpflichtig.

* = Farbpunkt

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

09				Rohteil	Freimaß toleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 45
08							
07				Werkstoff	± 0,2	2:1	Bestückte Leiterplatte
06							
05	8028 93	21.12.78	Mo	Oberfläche	1976	Datum	Name
04	6028 47	22.6.76	Eiler				
03				Ausgabe	bearb	24.6.	Name
02							
01							
				360 884			

7 6 5 4 3 2 1

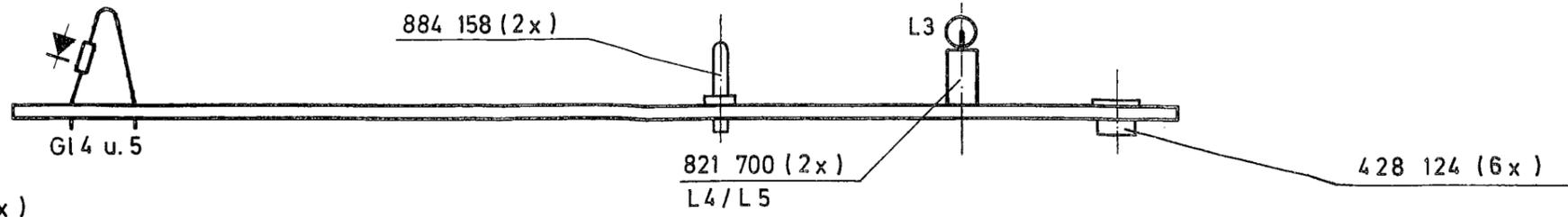
E

C

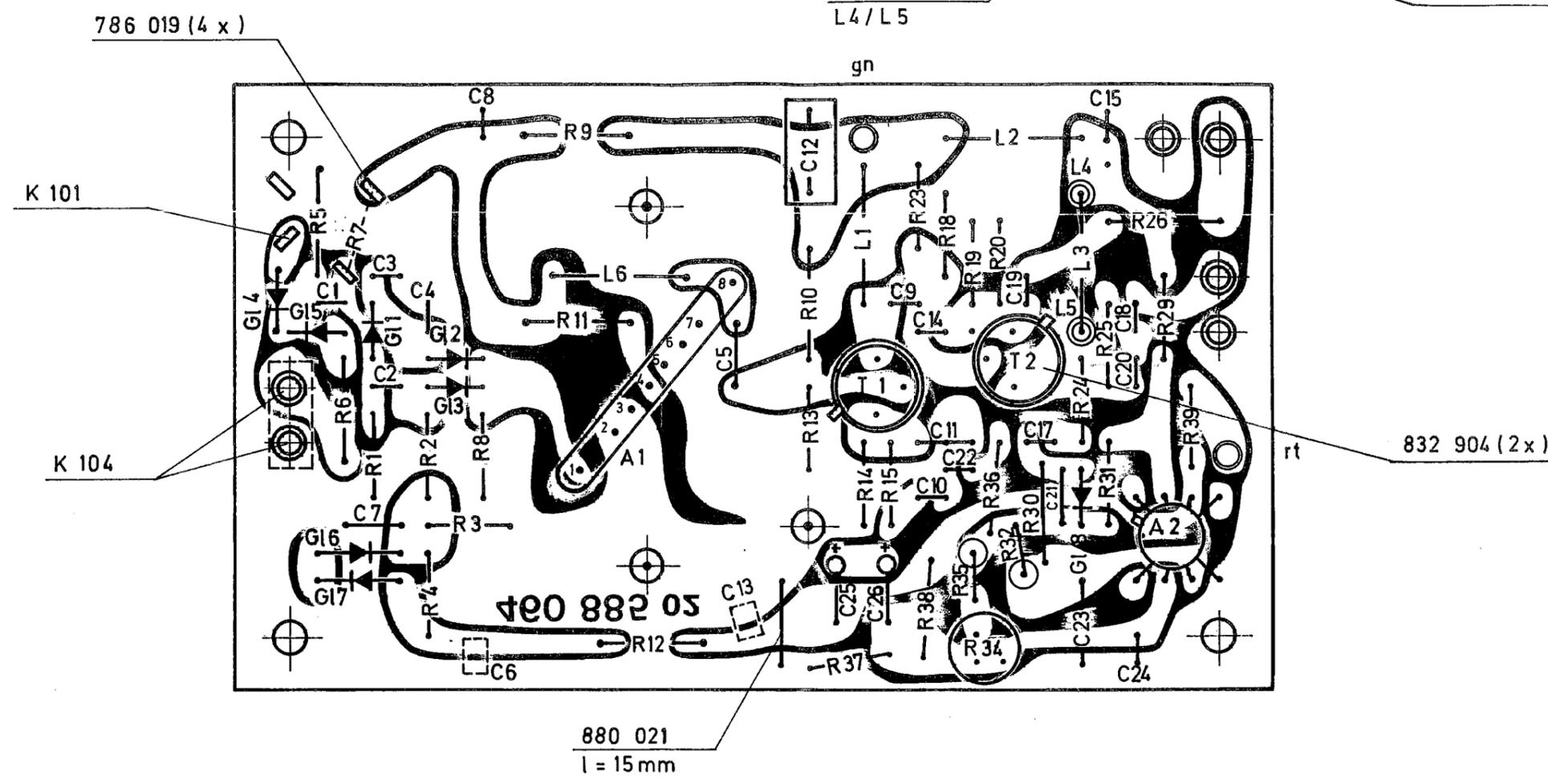
B

A

7 6 5 4



weich gelötet



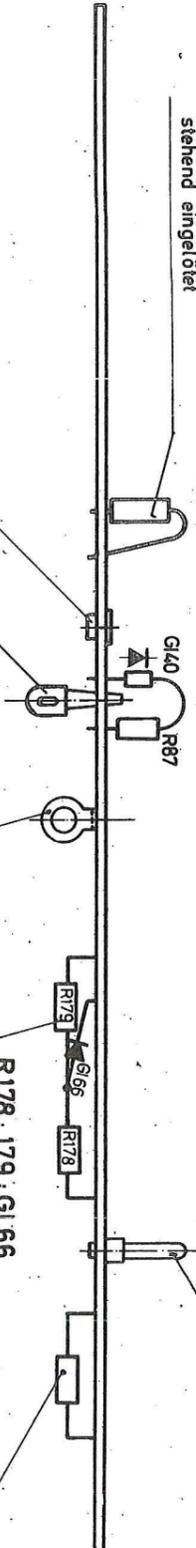
⊖ = Kontrollmaß

Rohlen		Freimaß Toleranzen	Maßstab: 2:1	Schlumberger o/s <small>Meßgerätee Bau u. Vertrieb GmbH München, FRG</small>
Werkstoff				
Oberfläche		1979 Datum	Name	Bestückte Leiterplatte
15 Ausgabel	9028.50 Andg. Mittig	26.7.79 Datum	Mo Name	
			gepr.	360 885
				Ersatz für

verw. in:
Gerät : 4010/4020

Schaltplanpositionierung ≅ 213 016S/017S / 360 885Sa

R1/23/24/34/L2/L5/L7/L103/115/132/133/143
151/160/171/193/194/211/212/232/254/255
272/273
stehend eingelötet



884 158 (4x)

428 124 (6x)

786 009 (8x)

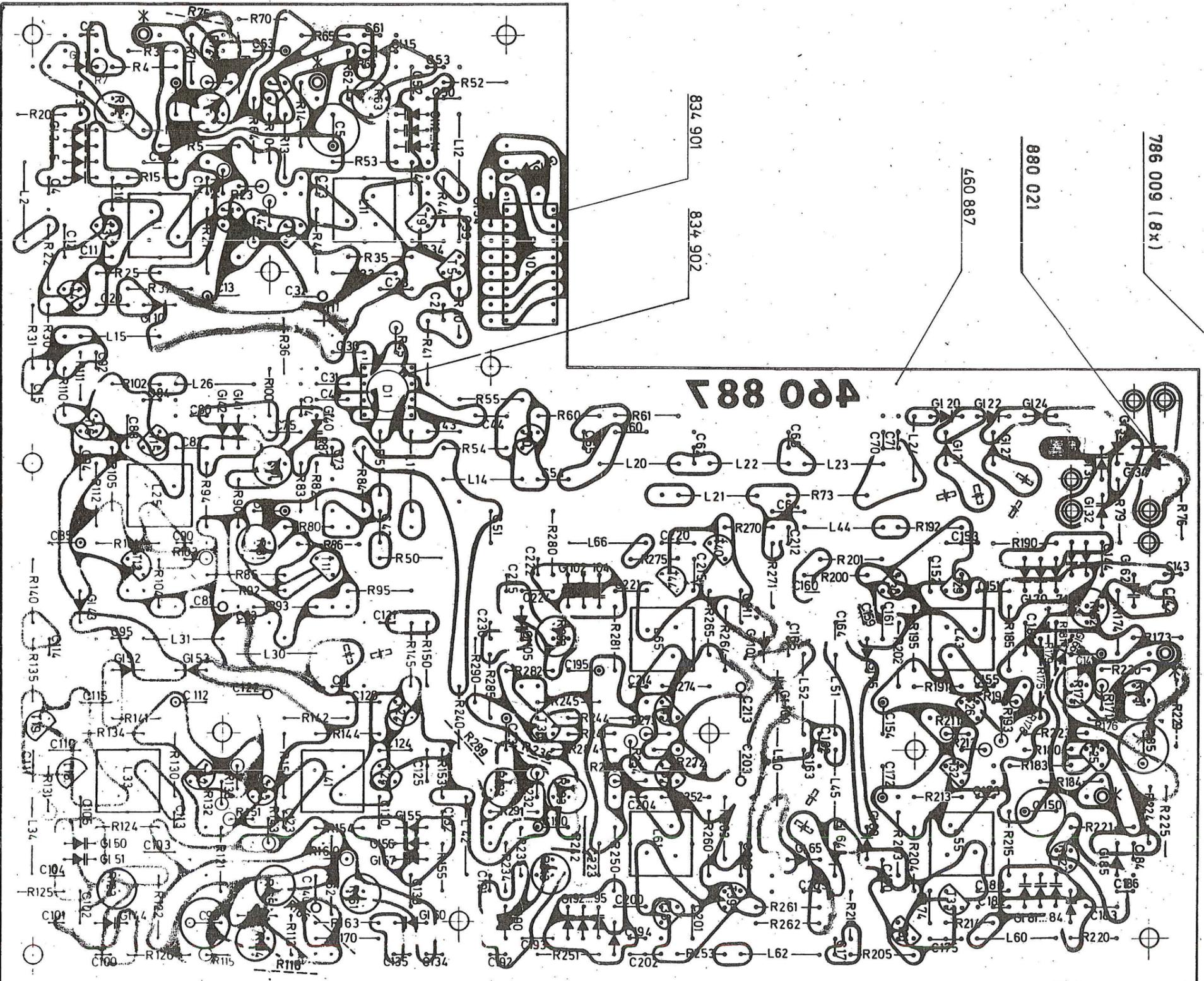
880 021

460 887

834 901

834 902

490 887



br

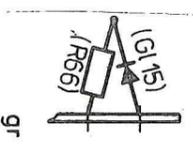
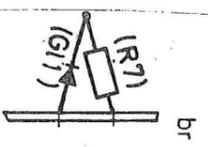
gr

786 002

R178, 179, G166
auf Leiterunterseite gelötet

R6, 75, 1
229, 2
auf Lei

R8/R9-u. G16
stumpf aufgelötet



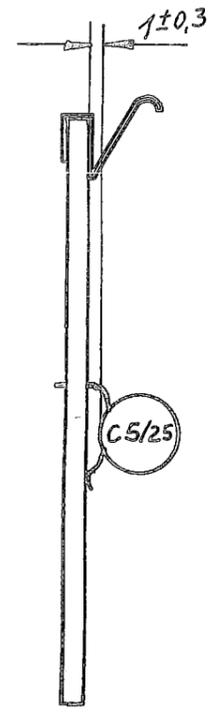
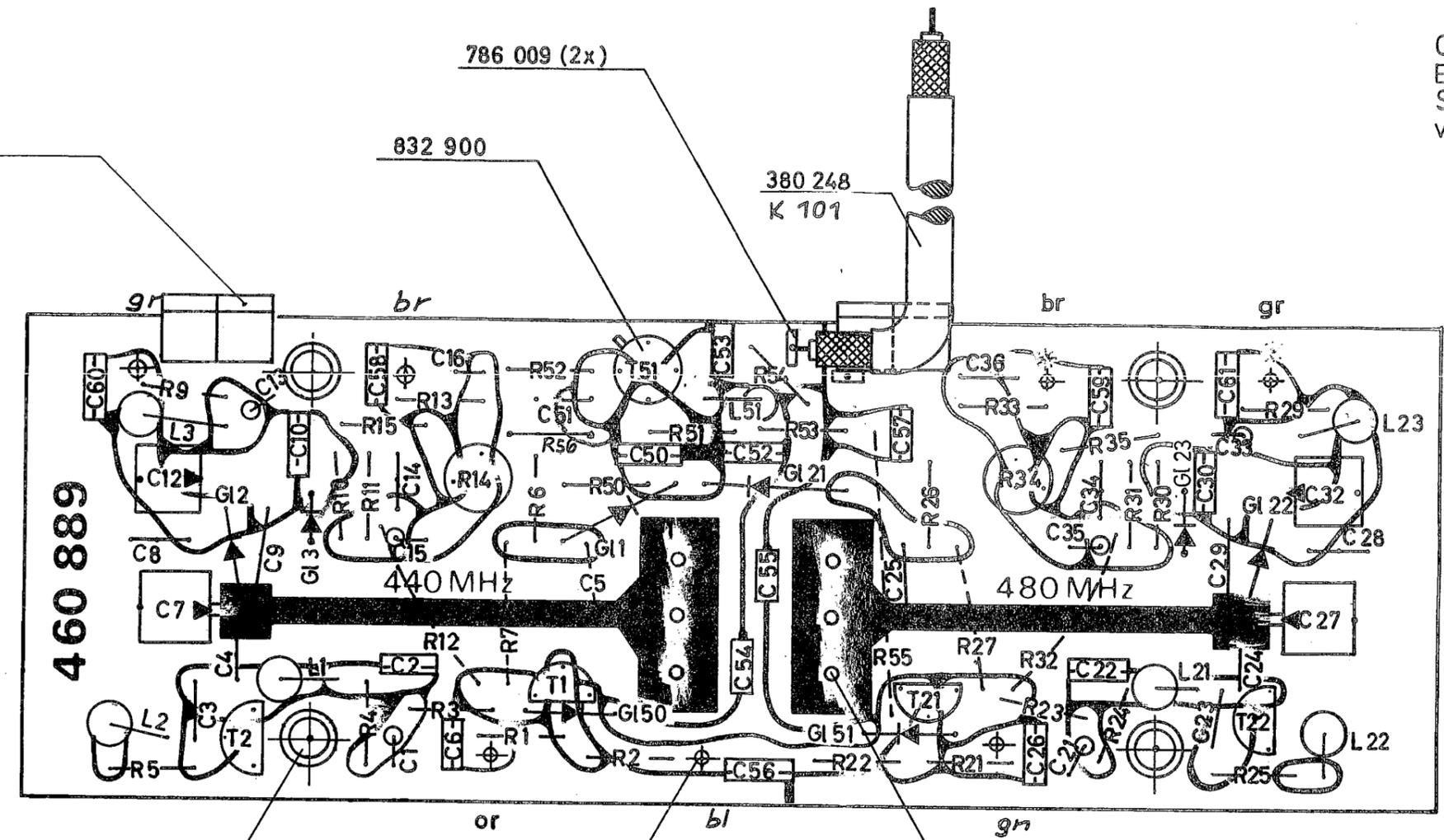
7 b 5 1 2 1

C7, C12, C27, C32 : ◀ ≙ Farbpunkt
Bauteile auf Unterseite mit
Schrumpfschlauch 787 029
versehen

431 010

832 900

380 248
K 101

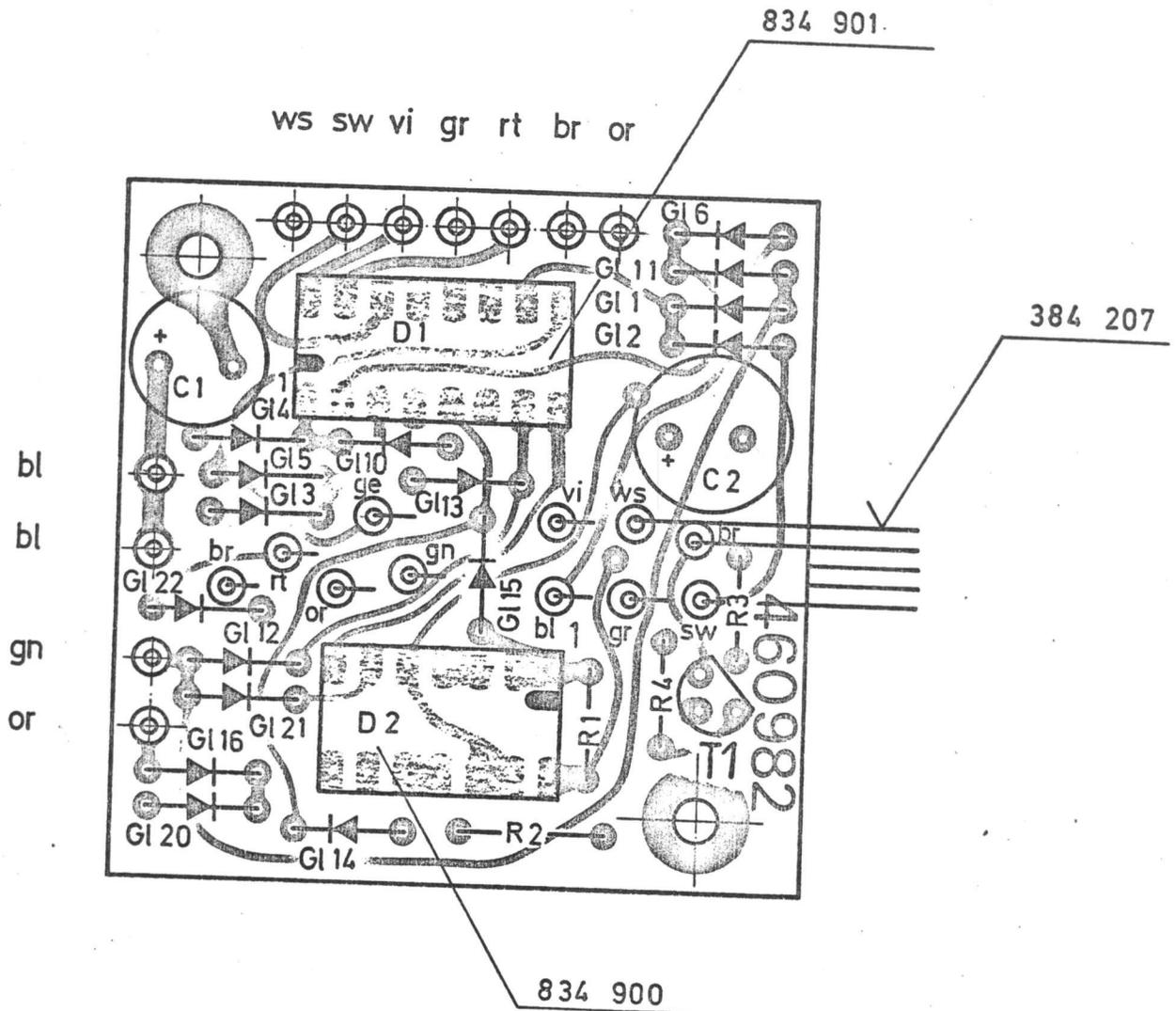


◻ = Kontrollmaß

10	Reihen	Freimaß	Maßstab	Schlumberger o/s <small>Meßgeräteeigenes Vertriebssymbol in Maßstab 1:1</small>
09		Toleranzwert	2:1	
08				Bestückte Leiterplatte
07	Werkstatt			
06				360 889
05				
04	9028.38 21.5. HJ			Ersatz für
03	9028.19			
02	6028.28 2.4.76. Eiler	1975 Datum	Name	
01	6028.2 12.1.76	4.12. Berger		
Aus	Arbeits	5.12.		
Abteil.	Mittel			

Schaltplanpositionierung ≙ 213 017 S
213016S / 360889 Sa

weich gelötet



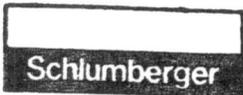
Schaltplanpositionierung Δ 213 016 / 213 017S / 360 884 Sa

09				Rohteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Meßgeräteeu u. Vertrieb GmbH 8 München 45
08					-	2:1	
07				Werkstoff			Bestückte Leiterplatte
06							
05							360 982
04							
03							
02	90244712.1279				1979	1312 79	
01				Oberfläche	1979	Morasch	
	App. Label	Änder. Mängel	Datum	Name			

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>- - - -</p> <p>C 52 / R 54 C 52 / R 54</p> <p>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	Harmel 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	-	< ± 3 %	
	9. <u>RF-Harmonics</u>	"	200 to 419,9 MHz	-	< 34 dB c	

Adjustment and Test Procedure

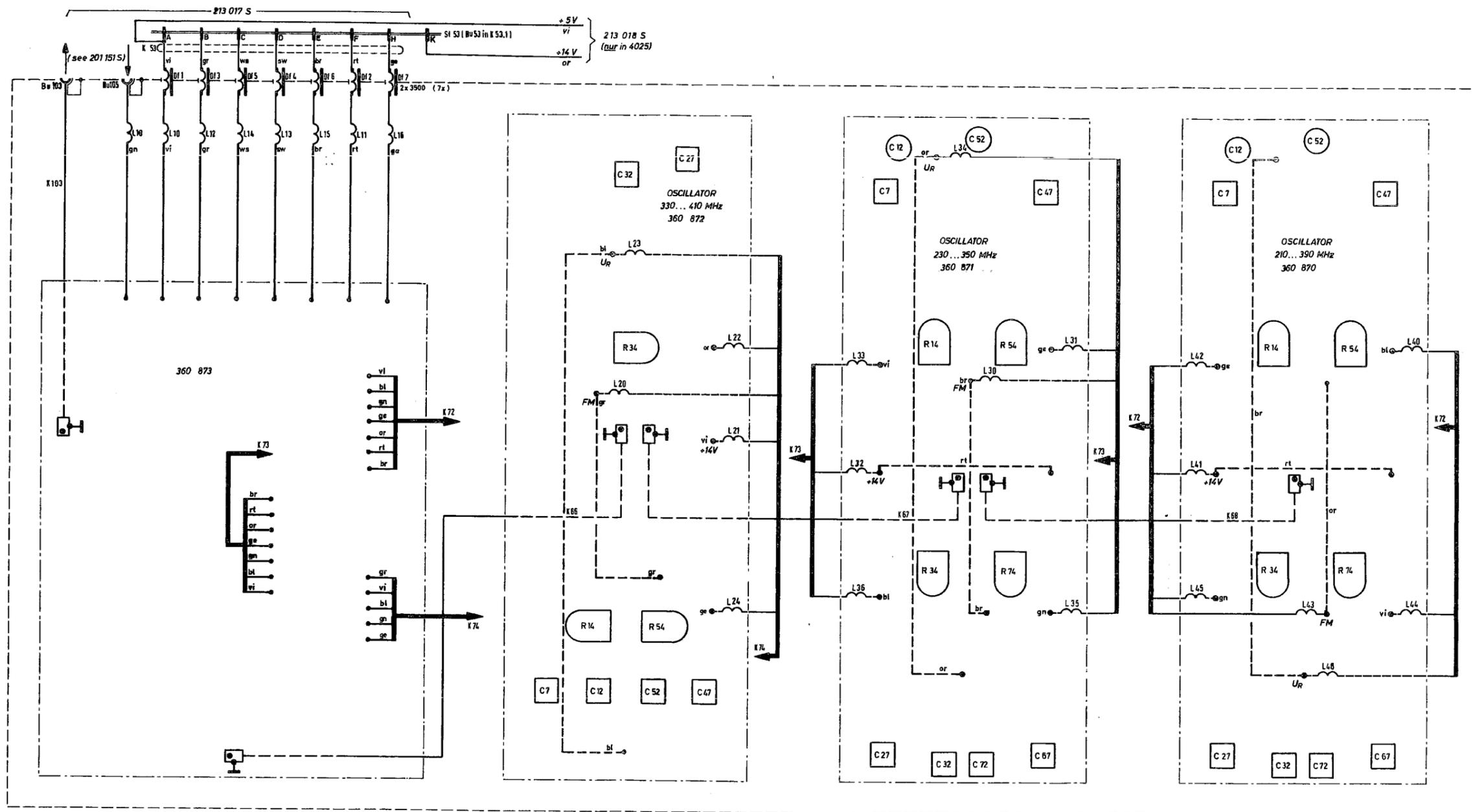
4022 (4011)
Oscillator

Schlumberger

Issue	Alteration No.	Date	Name
		5.10.79	Worm
01	602810	26.2.76	Schub

213 014 A

Replacement for



sw BLACK	bl BLUE	02 6028.20	9.3.76	Wn	norm.		Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	OSCILLATOR	213 014 S Bl.1
br BROWN	vi VIOLET	04 7028.63	12.2.77	H.	gespr.				
rt RED	gr GREY	03 6028.80	25.10.76	Kr.	besrb.	10.11.75			
rs ROSE	ws WHITE	Ausg.	A.-Mittlg.	Datum	Name	1975	Datum	Name	Typ : 4011
gs YELLOW	tr TRANSPARENT	ISS	MODIF	DATE	NAME	1975	DATE	NAME	

3Veff Δ 20 kHz Hub

2,1... 11,2V

3Veff Δ 20 kHz Hub

2,1... 11,2V

Bl. 2

Bl. 2

270 MHz

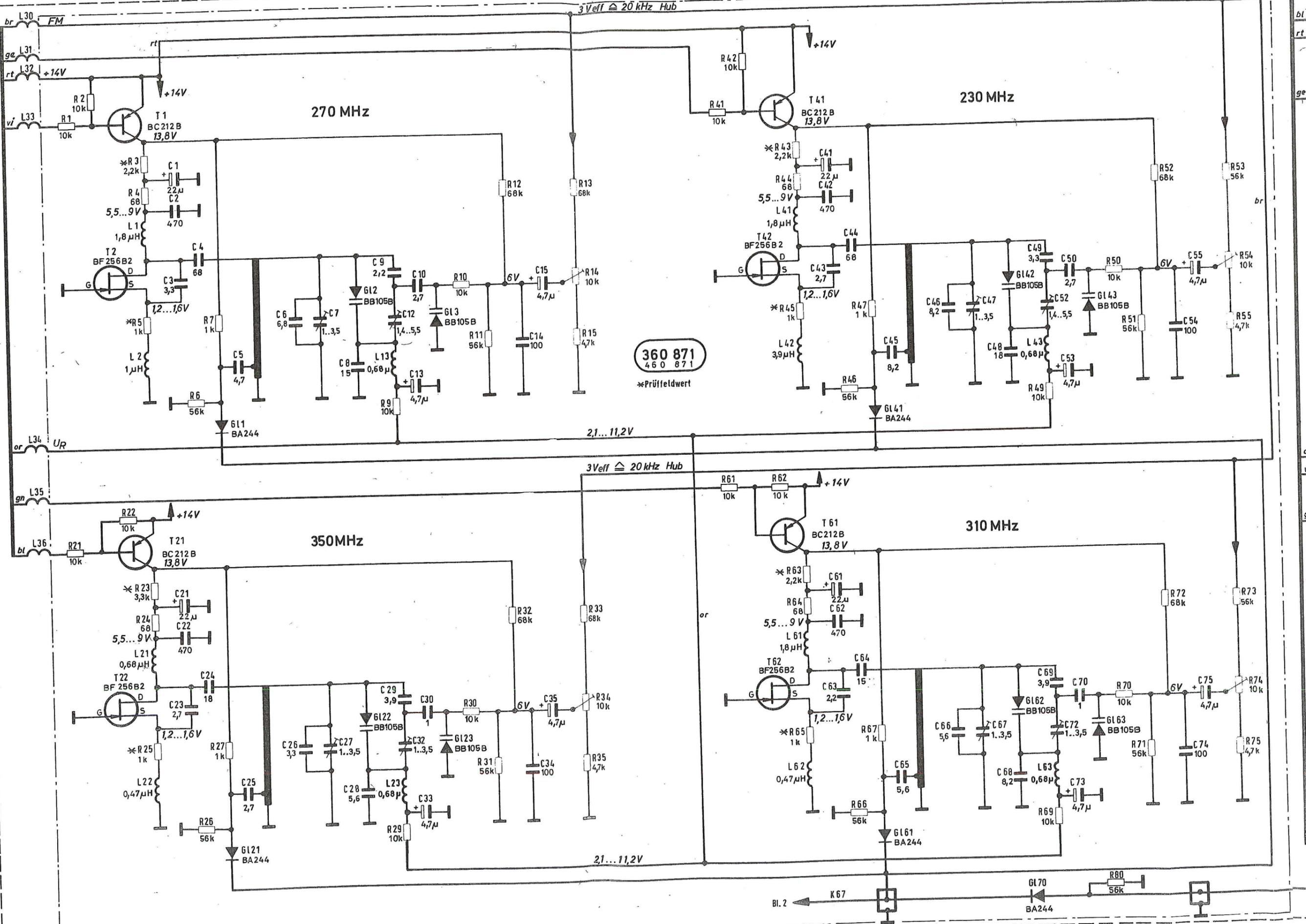
230 MHz

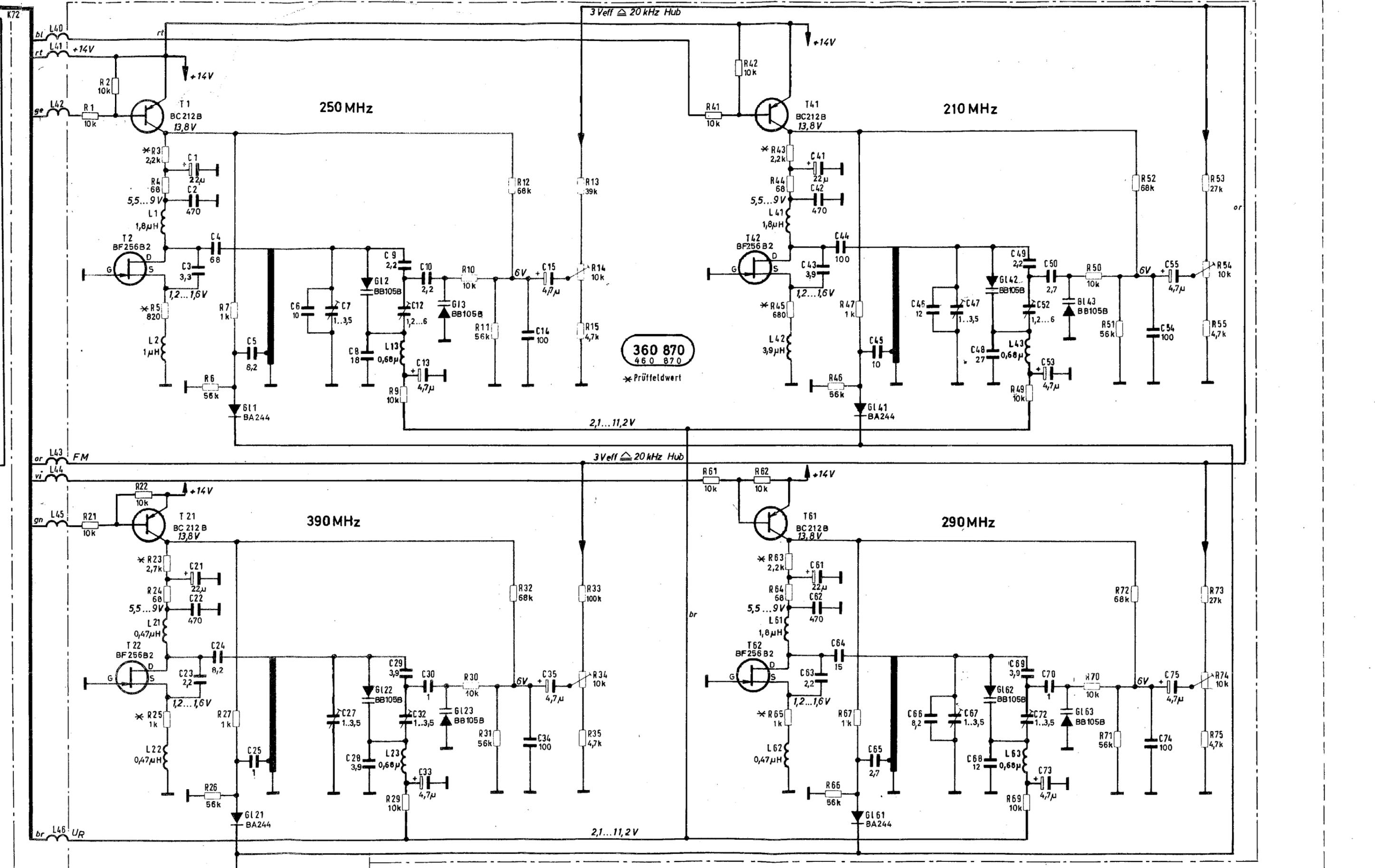
350 MHz

310 MHz

360 871
460 871

*Prüffeldwert





sw BLACK	bl BLUE	09 9024.15	26.1.78	Kr.	norm
br BROWN	vi VIOLET	08 7028.61	5.10.77	Wn	gepr
rt RED	gr GREY	07 7028.7	24.2.77	Wn	bearb
rs ROSE	ws WHITE				6.8.75
ge YELLOW	tr TRANSPARENT				Datum
gr GREEN					Name
		ISS	MODIF	DATE	NAME

Schlumberger o/s
 Meßgerätebau u. Vertrieb GmbH
 8 München 46

OSCILLATOR

213 014 S Bl.3

Typ: 4011

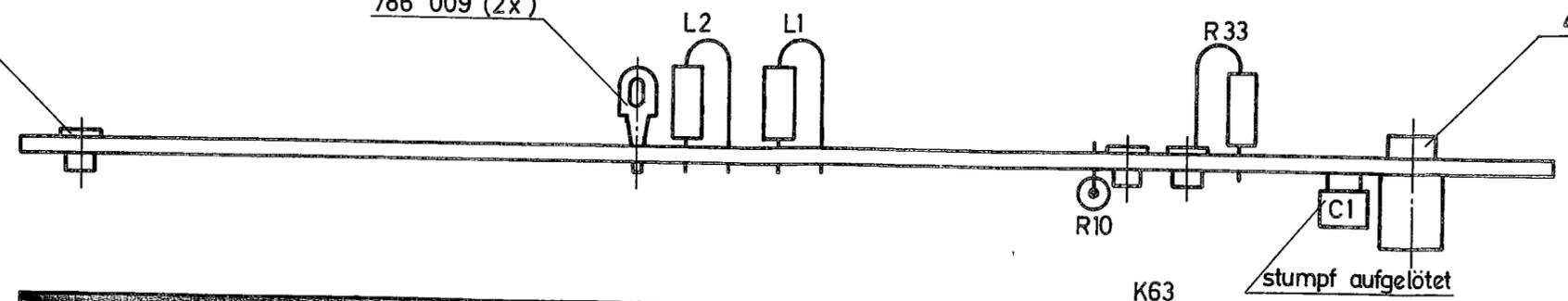
7 6 5 4 3 2 1

428 144 (4x)

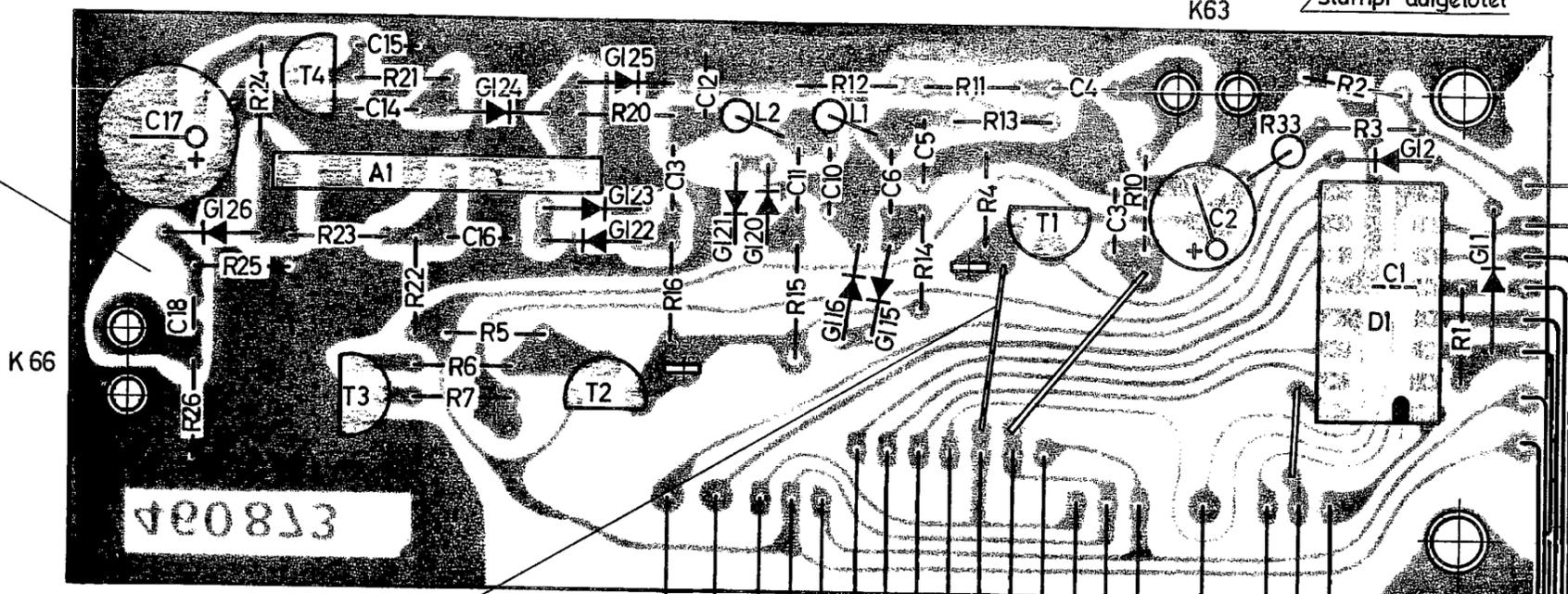
786 009 (2x)

428 096 (2x)

weich gelötet

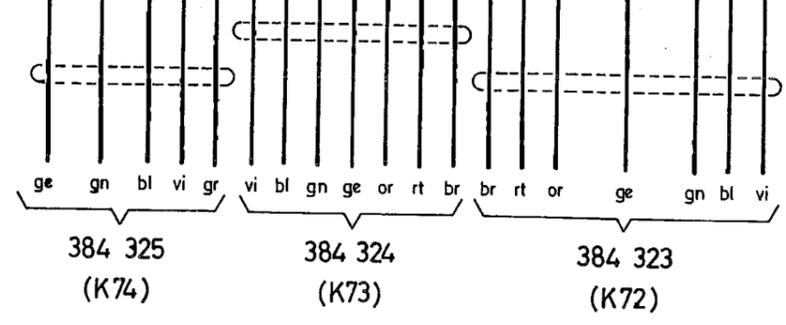


460 873



- 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

880 021 (3x)



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

Schaltplanpositionierung ≙ 213 014 S / 360 873 Sa

verwendet in : 375 217

Gerät : 4011

10		Prüfung		Formzahl		Maßstab	Schlumberger o/s
09				Teilenummer		2:1	
08							Bestückte Leiterplatte
07							
06		Werkstoff					360 873
05							
04	9024,25	15,2.79	Kr.				
03	6028,83	26.10.76	Kr.				
02							
01							
Ausgabe	Andg	Datum	Name	1976	26.10.76	Kringelis	

Diese Zeichnung ist unser Eigentum. Verantwortlich: Inbetriebnahme, Mängelhaftung, in anderer Art Straftat und Schadenersatzpflichtig

weich gelötet

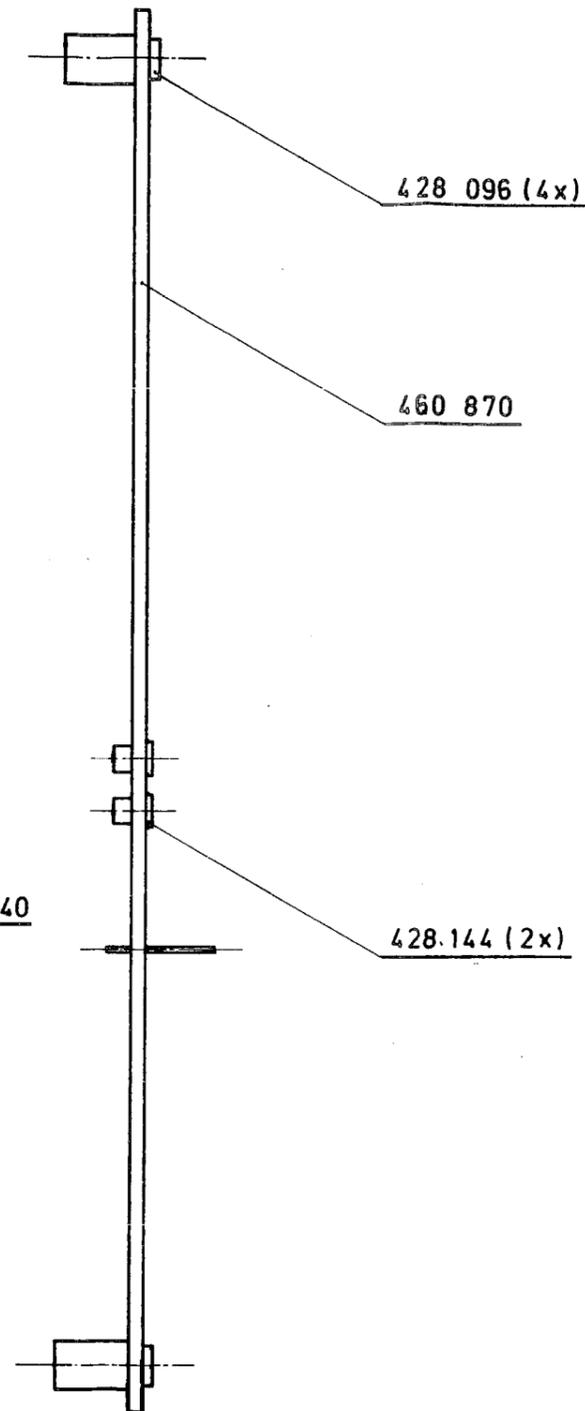
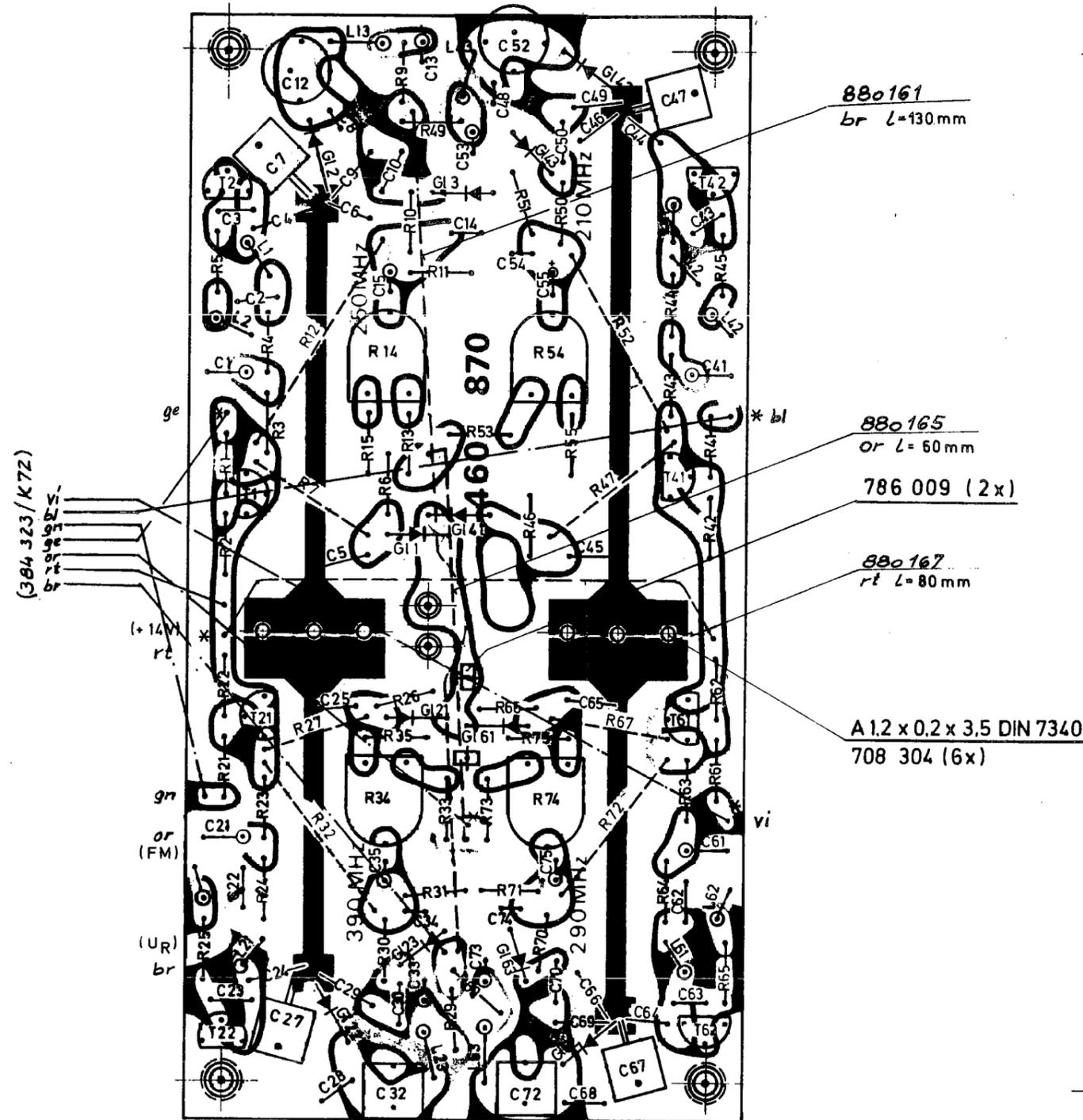
C7/C27/C47/C67

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.



* = Kabelbaumanschluß

○ Kontrollmaß

9028 36 8.5.75	Eiler				Schlumberger o/s
8028 73 13.10.75	Eiler				
8028 63 6.6.78	Eiler				Bestückte, Leiterplatte
6028 89 23.10.74	P.H.				
6028 19 5.8.76					360 870
6028 7 30.1.76					
6028 4 14.1.76					
5028 106 26.11.74	Eiler		19 75	Name	
5028 106 26.11.74			20 8	Eiler	
			8.9		

(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

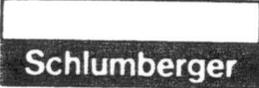
The control line " Δf Rec(DC)" permits the choice of three functions:

- 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 " $\Delta f(AC)$ " to the counter. The digital frequency discriminator generates TTL pulses on one of the two " $\pm \Delta f(AC)$ " 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 " $\Delta f(DC)$ " 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.

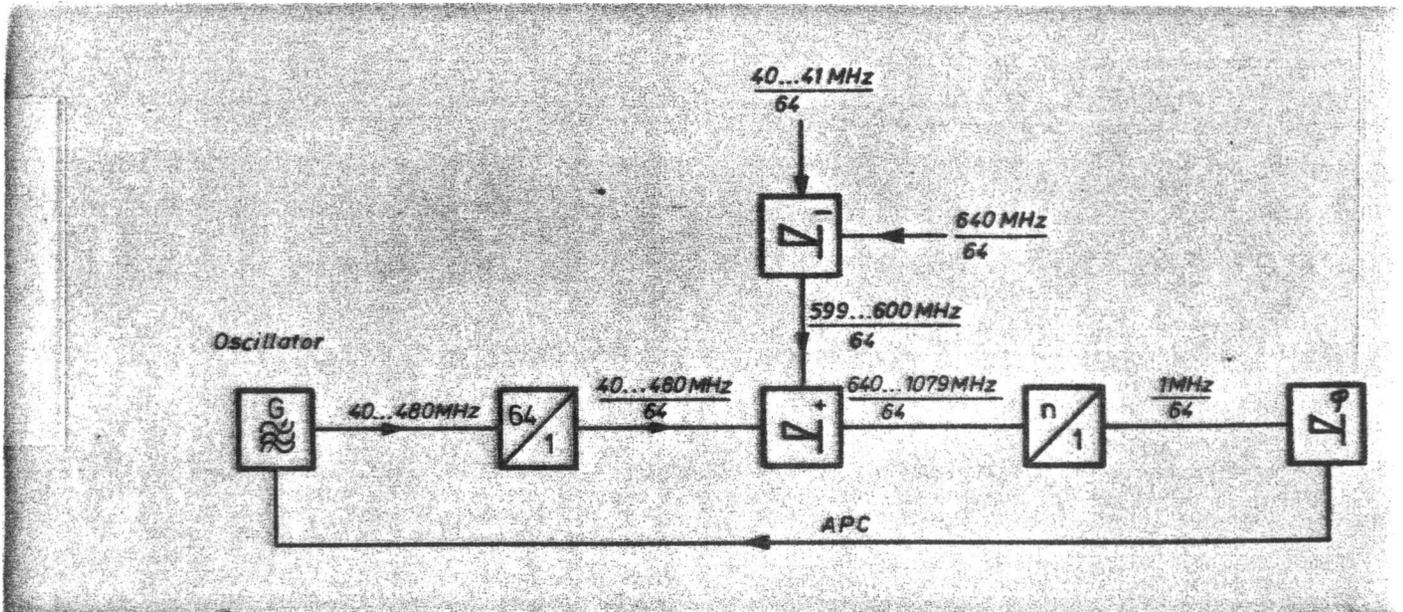
This arrangement permits digital adjustment of the oscillator frequency between 12.5 and 12.8125 MHz in increments of 10 000 (with a vernier offset of + approx. 100 increments).

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 $\frac{40...480}{1600}$ signal for counter frequency readout.

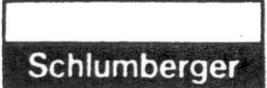
The following simplified block circuit diagram is meant to simplify understanding the mixed frequencies and adjustable frequency divider:



	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)".

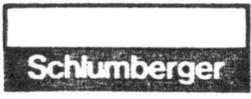
The output frequency of the divider is roughly controlled by a frequency control and with crystal accuracy using a phase control: if operation is still non sync the beat frequency at the output of the digital frequency discriminator (see frequency discriminator in vernier offset stage) provides control 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

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 62 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

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

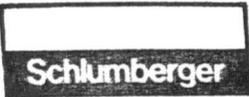


Issue	Alteration No.	Date	Name
01	8028.9	13.7.78	X
		10.8.78	St...

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.	Final Decade Stage - Frequency Control 210 021 S Bl.7 and Bl. 1: Decade switch connected to St 22 (or to Bu 5/Bl.1) Frequency setting 000 0000 32 64 96 99 Further settings, needed only for localizing of faults: 1 step = 625 Hz 01 02 03 04 05 06 07 08 09 10 20 30 40 50 60 70 80 90	62 7	2,50 2,52 2,54 2,56 2,561875 2,500625 1250 1875 2500 3125 3750 4375 5000 5625 2,50625 1250 1875 2500 3125 3750 4375 5000 5625		+ 0,80 ... 0,90 V + 1,00 ... 1,20 V + 1,20 ... 1,40 V + 1,25 ... 1,45 V 1, V	

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



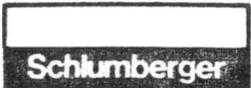
Issue	Alteration No.	Date	Name
C1	8028.9	13.1.78 12.5.75	X Shuh

210 021 A	2/11 Sheet
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
Mixer						
Decade switch Oscilloscope	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)	(2) (3) (53) (7) Bu 1	12,5 MHz 125 kHz 1,2125 MHz 12,2 MHz	DC level on (7) L 5 → P max at 12,125 MHz	60 ... 100 mV pp 60 ... 100 mV pp 1,2125 MHz - 34 ... - 38 dBm	.....mV.....mV pp.....dBm
		(53) Bu 1	1,25 MHz 12,5 MHz	DC level on (7) R 4 → P min at 12,5 MHz (appr. middle)	1,25 MHz - 70 ... - 90 dBm	.....dBm
		Bu 1	12,375 MHz		- 46 ... - 50 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product	.....ok.....dBm
		Bu 1	12,80 MHz		- 52 ... - 56 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product	.....ok.....ok
		(4)	12,80 MHz		1,7 ... 2,8 V (FM)	.....ok
	Oscilloscope with probe to (4) er Analyser with probe to (4) + 0,4 ... + 1,4 V to (7)	(4)	12,3 ... 12,8 MHz		Spurious products > 3,5 dB below	>dB

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
		12.5.78	Shuh

210 021 A	3/11 Sheet
Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Oscilloscope Power Supply	<p>Sample - Hold - Detector 210 021 S Bl. 5:</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 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 + 0,80 ... 0,90 V + 1,00 ... 1,20 V + 1,20 ... 1,40 V + 1,25 ... 1,45 V</p>	<p>.....ok</p> <p>.....μs</p> <p>.....ok</p> <p>.....ok</p> <p>1, .....V</p>

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

Schlumberger

Issue	Alteration No.	Date	Name
01	8028.9	13.1.78	X
		12.5.75	Shuh

210 021 A

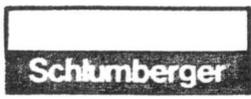
4/11
Sheet

Replacement for

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 V _{pp} Harmonics > 20 dBc Harmonics > 10 dBc	.....ok ok.....ok

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
01	8028.9	13.1.78	X
		12.5.75	Shub

210 021 A

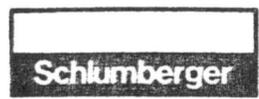
5/11
Sheet

Replacement for

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

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
01	8028. 9	13.1.78	X
		12.5.75	Stroh

210 021 A	6/11 Sheet
Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE	
Synthesizer	Frequency Divider and Frequency Comparison 210 021 Bl. 3:		15,625 kHz	—	Puls width 210 ... 270 ns 13 ... 19 µsns.....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)		15,625 kHz to 27,344	—	15,625 ... 27,344ok	
	Decade switch setting 520 ... 40 MHz (disconnected yellow lead) Change setting stepwise to smaller values. Stepwise increasing of output frequency must result.						
	Oscilloscope simultaneously (altern.) on	ge br ge br ge br ge	—	—	TTL = Output L or 0 (L=appr. 4 V) (0=appr. 0 V) 0 or L L 1 kHz 1 kHz Lok	
	Frequ. setting 400 0000 400 MHz, 0 dBm on Bu 40						
	464 MHz, 0 dBm on Bu 40	ge br ge br ge br ge	1,000 kHz	—	—	L continuous responseok
	336 MHz, 0 dBm on Bu 40						
	400 MHz, 0 dBm on Bu 40 Decade setting 410 ... 419 MHz	ge br ge br ge br ge	1,000 kHz	—	—	L continuous responseok
	Decade setting 410 ... 419 MHz						

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



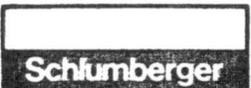
Issue	Alteration No.	Date	Name
0.1	8028.9	13.1.78	X
		12.5.75	Shuh

210 021 A	7/11 Sheet
Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Counter	Frequ. Offset/TRANSM. MEASUREMENT 210 021 S Bl. 6: 10 MHz TTL on Bu 42	360 234 D 1/5 - or	10,000 MHz	—	TTL 10 MHz	.....ok
Oscilloscope	"NO OFFSET" on REC. MEASUREMENT = 5 V on St 22/22 = 26	360 236 D 2/6 - ge	2,000 MHz	—	TTL 2 MHz	.....ok
Synthesizer	2 MHz TTL on Bu 43	360 234 1	10 kHz	(L 3 with tuning slug)	Puls 120...160 ns	.....ok
	2,01 MHz TTL on Bu 43	29 br 28 ws	10 kHz	—	TTL 10 kHz +3,5 ... 5 V	.....ok
	1,99 MHz TTL on Bu 43	360 234 R 3 = vi	10 kHz	—	1,5 ... 4,5V _{pp}	.....ok
	Frequency Multiplier	28 ws 29 br R 3 = vi	10 kHz	—	+3,5 ... 5V	.....ok
	"OFFSET ON" on REC. MEAS. = St. 22/22 resp. 26 connected to ground	26 gr 62 ge 3 4	2,53125 MHz	—	0 V	.....ok
	Decade switch: 000 0050	D 2/6 - ge	5,0625 MHz 10,125 MHz 2,025 MHz	L 2 → max. level L 3 → max. level	2,53125 MHz 4 ... 8 V _{pp} 5,5 ... 7 V _{pp} TTL 2,025 MHz	.....ok

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



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

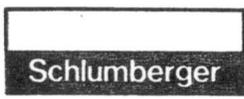
210 021 A

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE				
	<p>Continued</p> <ol style="list-style-type: none"> + 7 V on <input type="checkbox"/> 25 vs + 3,5 V on <input type="checkbox"/> 25 vs + 3,3 V on <input type="checkbox"/> 25 vs + 10,7 V on <input type="checkbox"/> 25 vs Repeat 2. and 3. + 6,85 V on <input type="checkbox"/> 25 vs + 7,15 V on <input type="checkbox"/> 25 vs <p>Repeat adjustment if 5. is off limits. Check if level at <input type="checkbox"/> 25 vs is also available at rear panel Bu 3. Autom. Frequency Control (AFC) 210 021 S Bl. 4:</p>	<input type="checkbox"/> v1 <input type="checkbox"/> <input type="checkbox"/>	0 Hz 10 kHz 10,5 ... 12,5kHz R 24 → equal frequency 210 ... 270 Hz	R 34 R 5 R 24 → equal frequency —	0 Hz 10 kHz 10,5 ... 12,5 kHz $\Delta f < 0,2 \text{ kHz}$ 210 ... 270 Hz $\Delta f < 5 \text{ Hz}$					
Decade switch	<p>Decade switch setting</p> <table border="1"> <tr><td>140 MHz</td></tr> <tr><td>30 MHz</td></tr> <tr><td>40 MHz</td></tr> <tr><td>199 MHz</td></tr> </table>	140 MHz	30 MHz	40 MHz	199 MHz	<input type="checkbox"/> 1 <input type="checkbox"/> 1 <input type="checkbox"/> 1 <input type="checkbox"/> 5	— — — 7,5 Hz (199-100 MHz / 64x800x256)	— — — —	+ 3,8 ... 4,8 V + 3,8 ... 4,8 V 0 ... +0,4 V Saw tooth with 256 steps step amplitude < 15 mV rising: < 200 mV decreasing: < 0,1 V V min: +1,4... V max: +1,8 Vokok
140 MHz										
30 MHz										
40 MHz										
199 MHz										
Oscilloscope	<p>Disconnect <input type="checkbox"/> 55 vs</p> <p>Re-connect <input type="checkbox"/> 55 vs</p>	T 11 Coll								

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
07	8028.9	13.7.78	X
		12.5.75	Schult

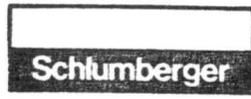
REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE	
DVM Counter	Sample - Hold - Detector (APC)	Decade switch setting	250 kHz	—	Saw tooth V min: 1 ... 2 V _{pp} V max: 8 ... 10 V _{pp} 12 ... 14 V _{pp} Puls width at 7V 0,3 ... 0,4 μs Same shape as on (2) V min: + 3,5 ... 5 V V max: + 9 ... 13 V	.....ok.....ok.....ok
	100,1 MHz on Bu 40 (-3 dBm)						(2)
	100 MHz on Bu 40 (-3 dBm)						(3)
	Control Amplifier						(4)
DVM Counter	Connect 1 ka between Df 40 and ground	102 MHz	102 - 100 64x703x256 = appr. 0,2 Hz corresp. to osc.ranges	—	0,2 Hz saw tooth: + 1 ... 1,4 V = V min + 12 ... 13 V = V max Synchronisation catching time: < 3 S typical: < 1 S	.....ok.....ok
	Connect Oscillator sub unit	40 ... 480 MHz	Bu 35				
<p>(It can be useful to carry out the synchronisation test, when the total instrument is available).</p> <p><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:</p> <p>Frequency settings RECEIVER MEASUREMENT Transmitter frequency measurement Offset frequency measurement</p>							

has to be checked on the complete instrument at the following operation modes:

at different Frequencies

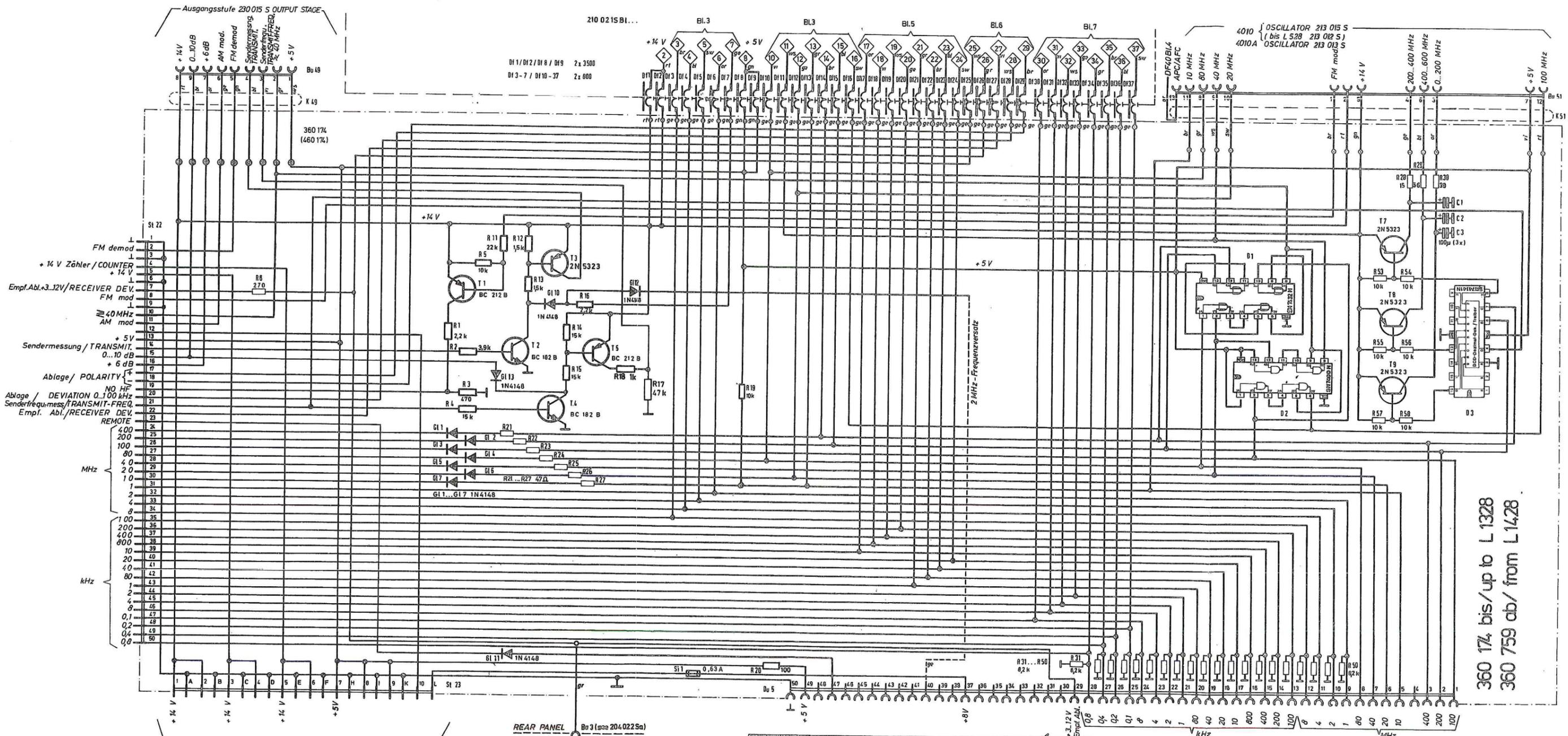
Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
01	8082.9	13.1.78	X
		12.5.75	Shuh

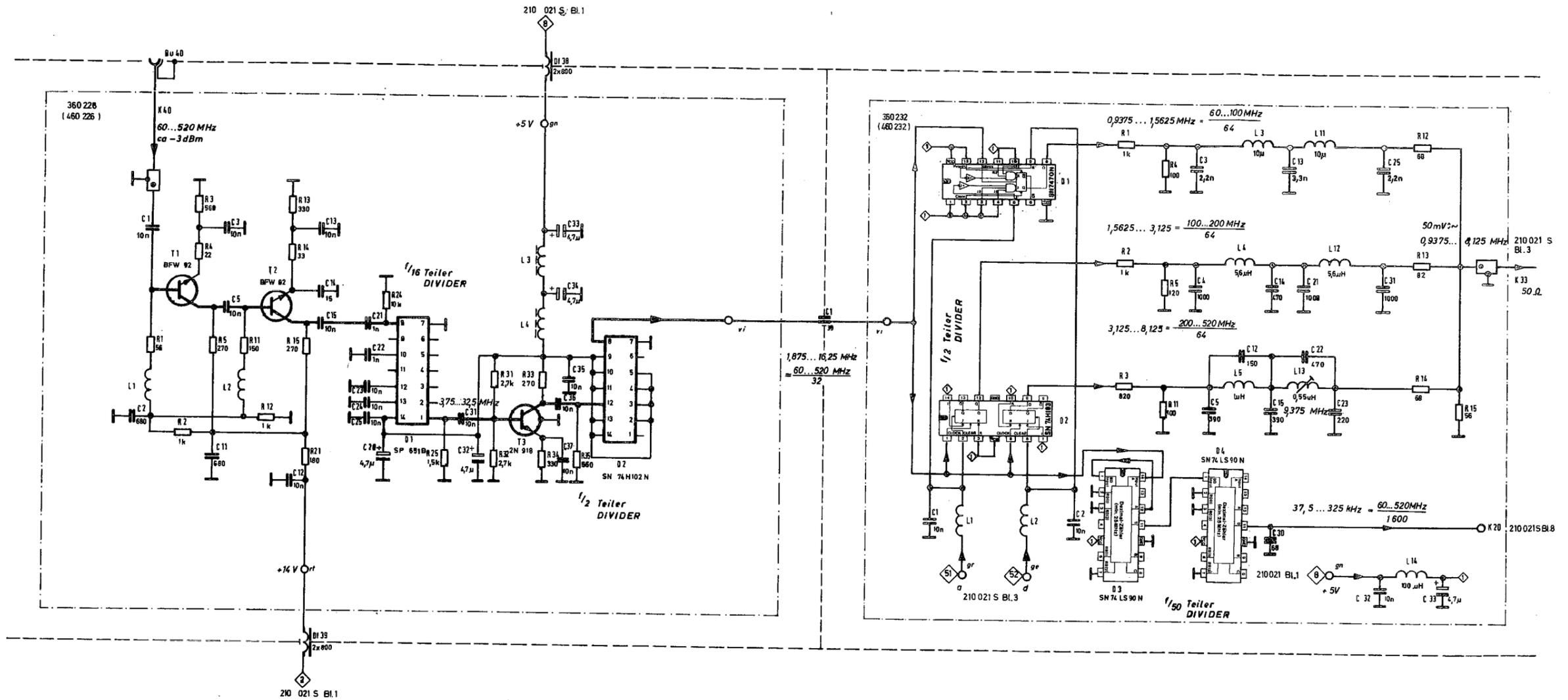
210 021 A	11/11 Sheet
Replacement for	



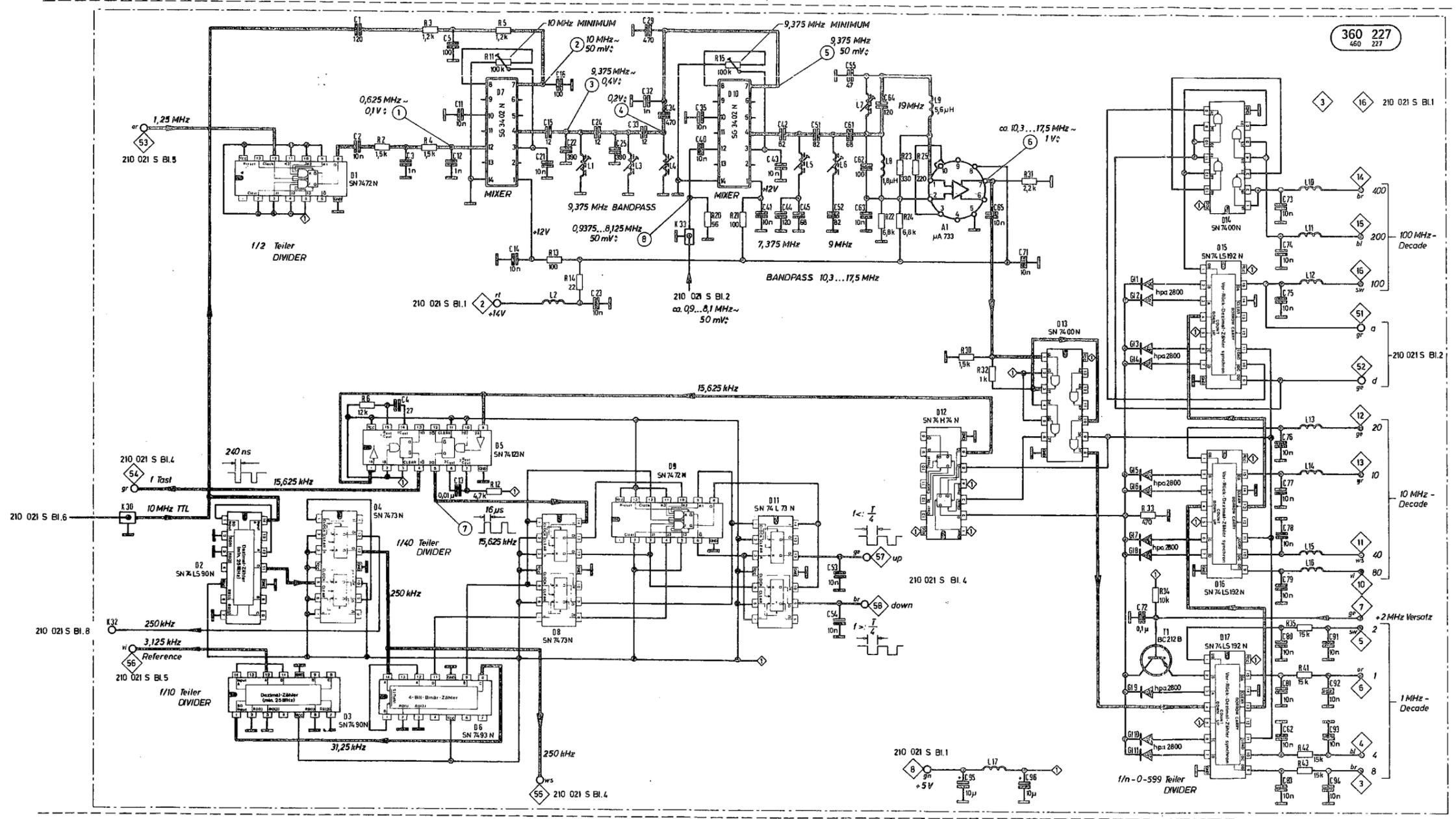
360 174 bis / up to L 1328
 360 759 ab / from L 1428

sw BLACK	bl BLUE	norm.				Schlumberger o/s Messgerätebau u. Vertrieb GmbH 8 München 46	Dekaden-Stufe DEKADE-STAGE	210 021 S Bl.1 Typ: 4010
br BROWN	vi VIOLET	gepr.						
rt RED	gr GREY	norm.	20	7020, 69	27.10.77			
rs ROSE	ws WHITE	bearb.						
ge YELLOW	tr TRANSPARENT	Ausg.	ISS.	Ä-Ärztig.	Datum	Name	Datum	Name
gn GREEN		MODIF.		DATE			DATE	

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

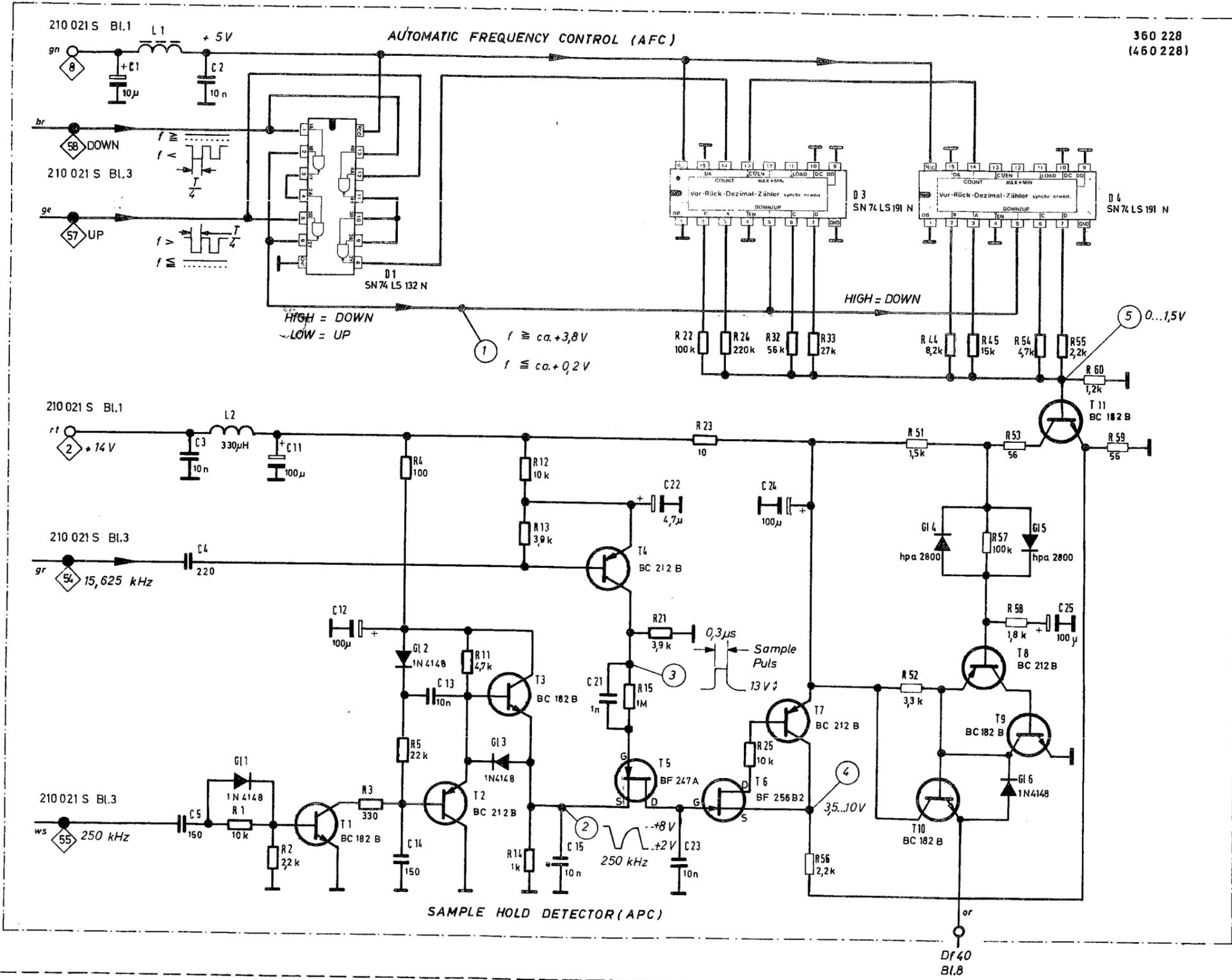


sw BLACK	bl BLUE	07	9028.67	25.9.73	Eiler	norm.		Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	Dekaden-Stufe DEKADE-STAGE	210 021 S Bl. 2	03
br BROWN	vi VIOLET	06	5028.100	11.11.76	Wn	gepr.	11.10.73				
rt RED	gr GREY	Ausg.	A-Mittlg.	Datum	Name	bepr.	Datum				
rs ROSE	ws WHITE	ISS.	MODIF.	DATE	NAME	neu.	DATE			Typ 4010	
gr YELLOW	tr TRANSPARENT										



360 227
460 227

sw BLACK	bl BLUE	13 8028.8	17.11.78	Ge	norm	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	Dekaden-Stufe 1 MHz Dekaden	210 021 S Bl. 3
br BROWN	vi VIOLET	12 7028.62	13.10.77	Kf	gepr.				1 MHz DECADES	Typ : 4010
rs RED	gr GREY	Ausg.	Datum	Name	Datum	Name		
rt ROSE	ws WHITE	ISS.	MODIF.		1977			
ge YELLOW	tr TRANSPARENT							

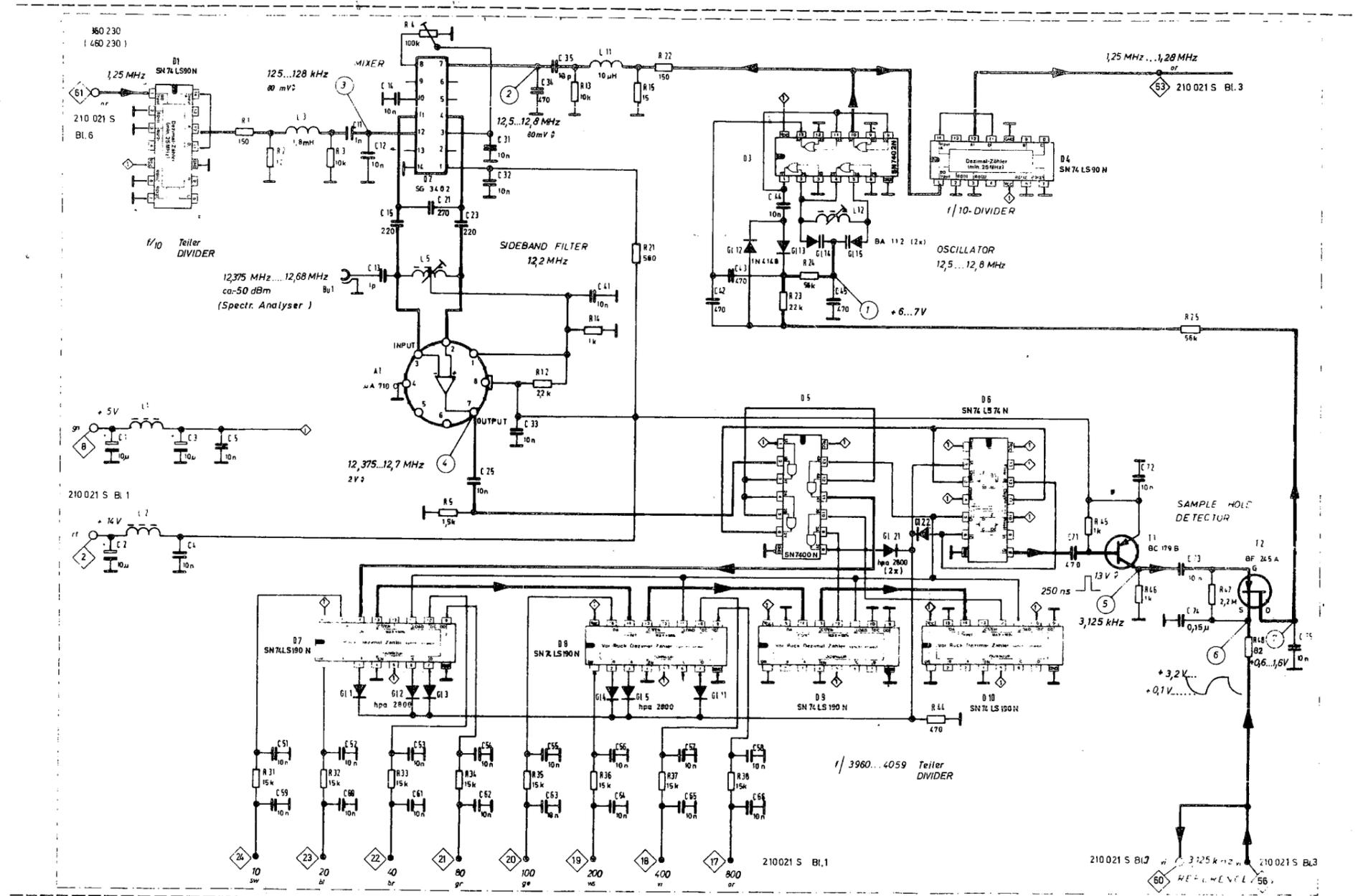


sw BLACK	bl BLUE	15	8028.67	14.7.78	Kr.	norm.	
br BROWN	vi VIOLET	14	7028.52	12.10.77	Wn	gepr.	
rt RED	gr GREY	13	7028.52	5.9.77	Kr.	bearb.	21.12.73
rs ROSE	ws WHITE						
ge YELLOW	tr TRANSPARENT						
gn GREEN							
		Ausg.	Ä.-Mittg.	Datum	Name	Datum	Name
		ISS.	MODIF.	DATE	NAME	DATE	NAME

Schlumberger o/s
Meßgerätebau u. Vertrieb GmbH
8 München 46

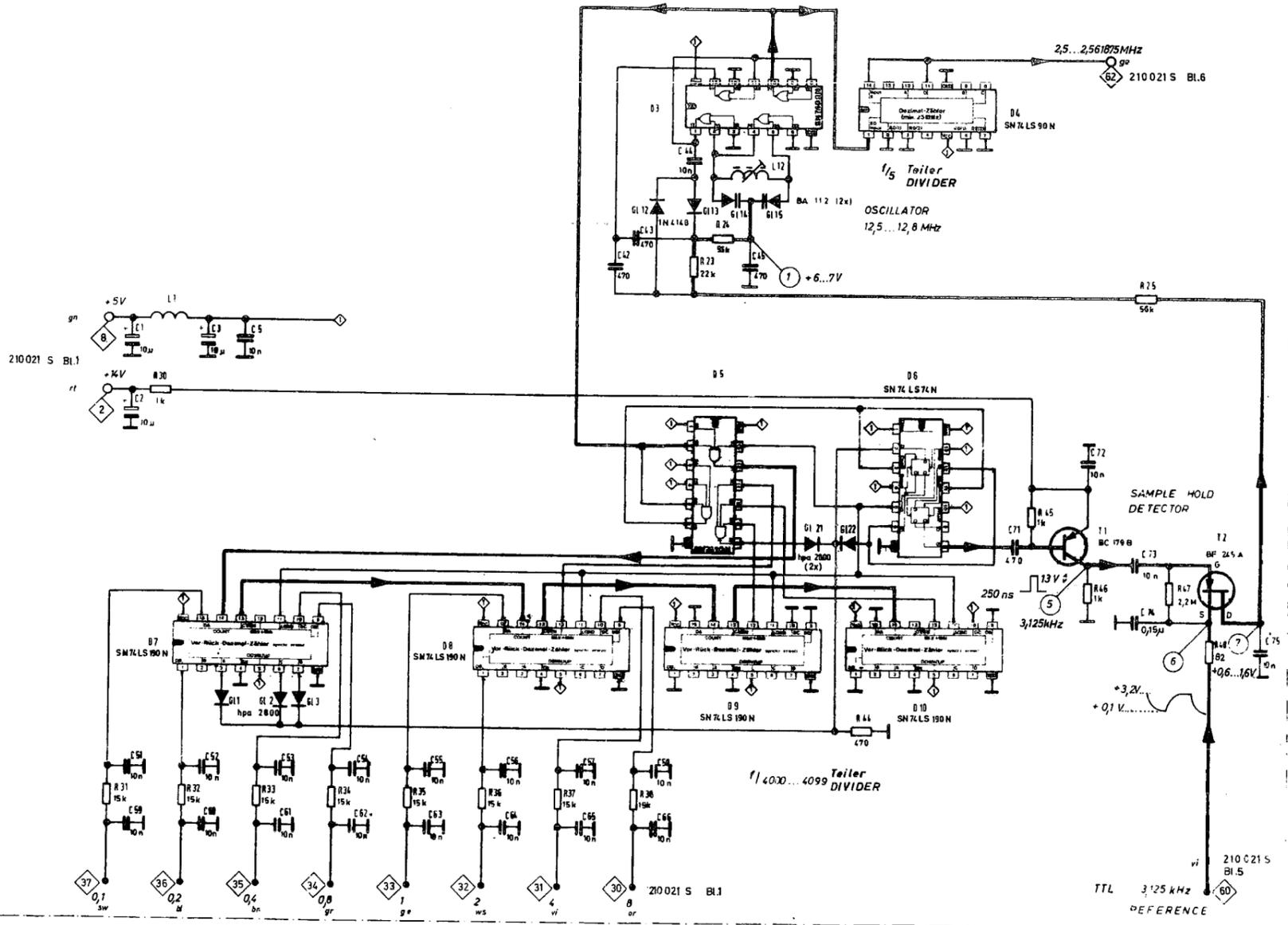
Dekaden-Stufe
DEKADE-STAGE

210 021 S Bl. 4 03
Typ: 4010



w BLACK b BROWN r RED s ROSE g YELLOW gn GREEN	bl BLUE v VIOLET gr GREY w WHITE tr TRANSPARENT	09 8028.27 23.278 Wn norm 08 6028.8 3.2.76 Kf. gepf. 07 4028.121 15.11.76 Kf. beauf. 20.9.73. Ned.	Ausg. A-Mittlg Datum Name ISS. MODIF DATE NAME	Schlumberger o/s Meßgerätebau w. Vertriebs GmbH 8 München 66	Dekaden-Stage DEKADE STAGE MIDDLE DECADES	210 021 S Bl. 5 Typ: 4010	03
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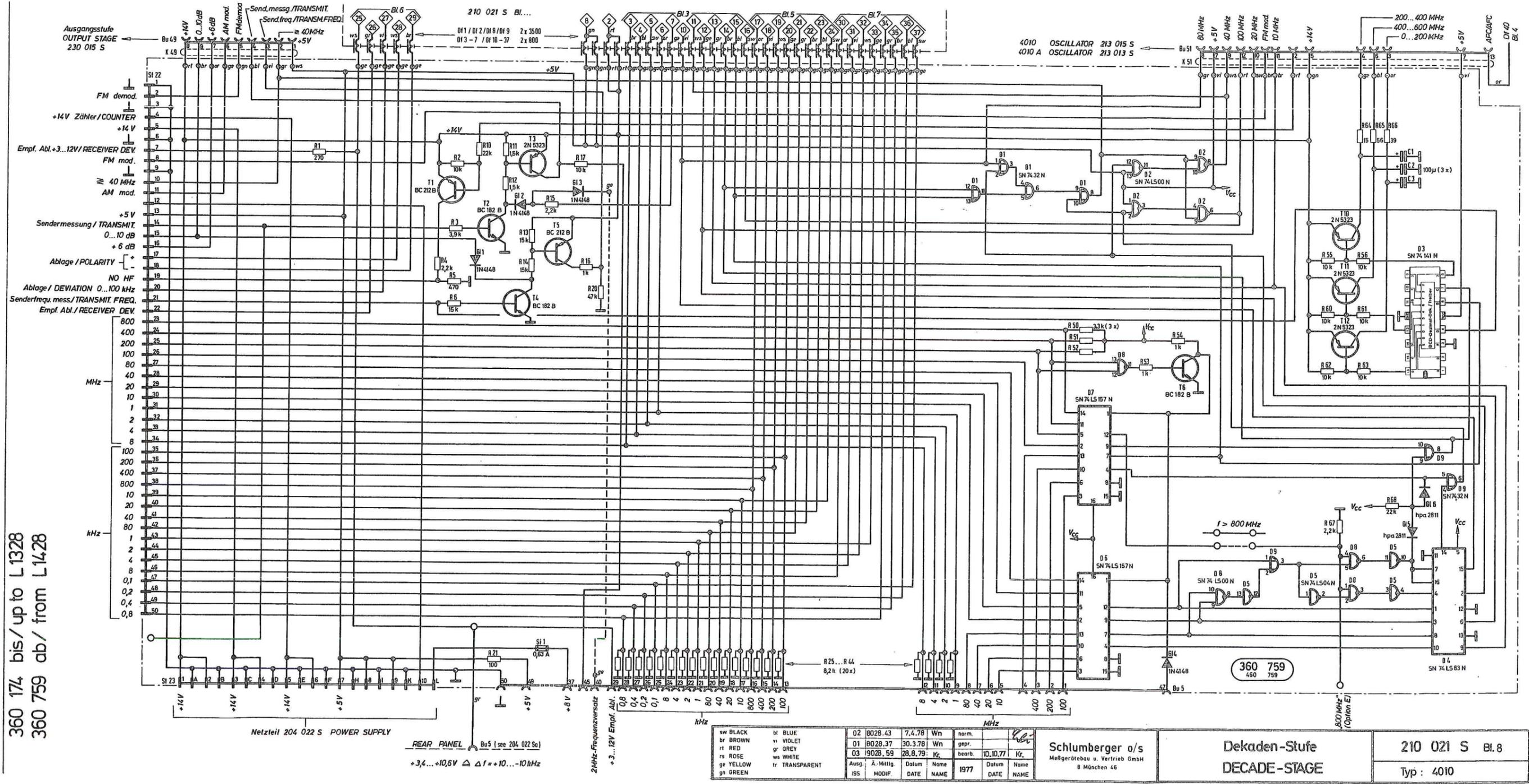
360 231
(460 231)



08 8028.27 23.2.78 Wn	norm	Le.	Schlumberger o/s Messgerätekau u. Vertrieb GmbH 8 München 48	Dekaden-Stufe Enddekaden DEKADE STAGE LASTDECADES	210 021 S Bl.7	03
06 6028.78 18.8.75 Wn	gepr	Neu				
07 6028.8 3.2.76 Kr	bepr	20.9.73				
Arzt	A-Jobst	Baum	Norm	Datum	Name	
HS	MSDF	DATE	NAME	DATE	NAME	

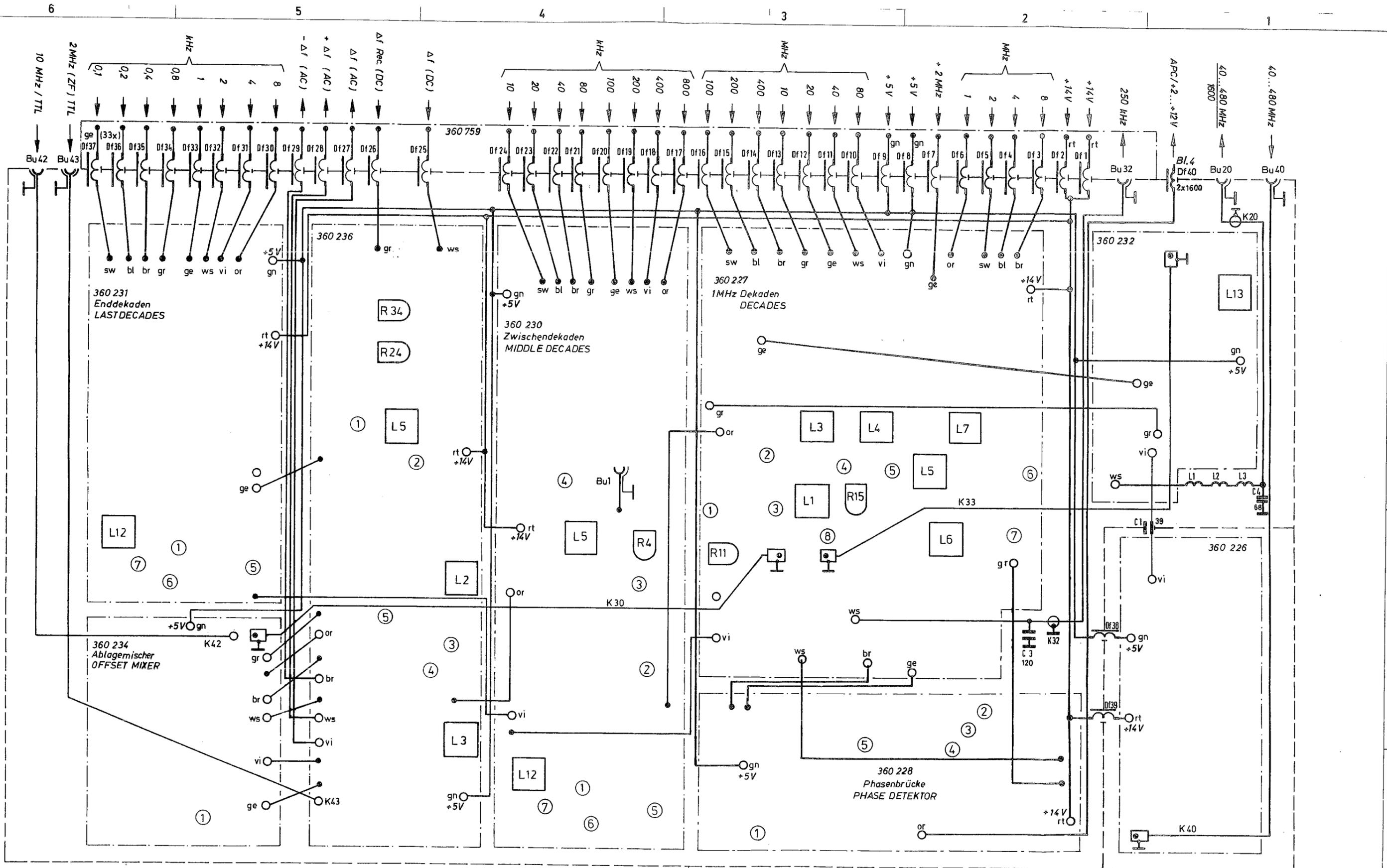
Typ: 4010

Skjema ej bra!



360 174 bis/ up to L1328
 360 759 ab/ from L1428

D7/13.
 Wn 1/2
 ok. på skjema,
 3.2k. = D7/12
 LD8/4.
 D8/11 7
 Skjema som jout
 Skjema



sw BLACK	bl BLUE	norm.			
br BROWN	vi VIOLET	gepr.			
rt RED	gr GREY	bearb.	3.4.74		
rs ROSE	ws WHITE	Ausg.			
ge YELLOW	tr TRANSPARENT	A.-Mittlg.			
gn GREEN		Datum			
		NAME			
		ISS.			
		MODIF.			
		DATE			
		NAME			

Schlumberger o/s
 Meßgeräteeu u. Vertrieb GmbH
 8 München 46

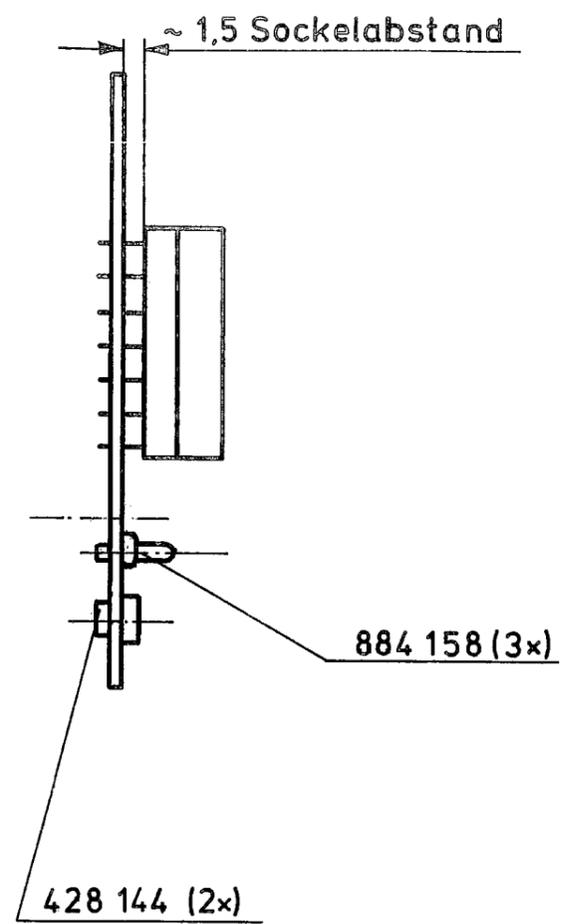
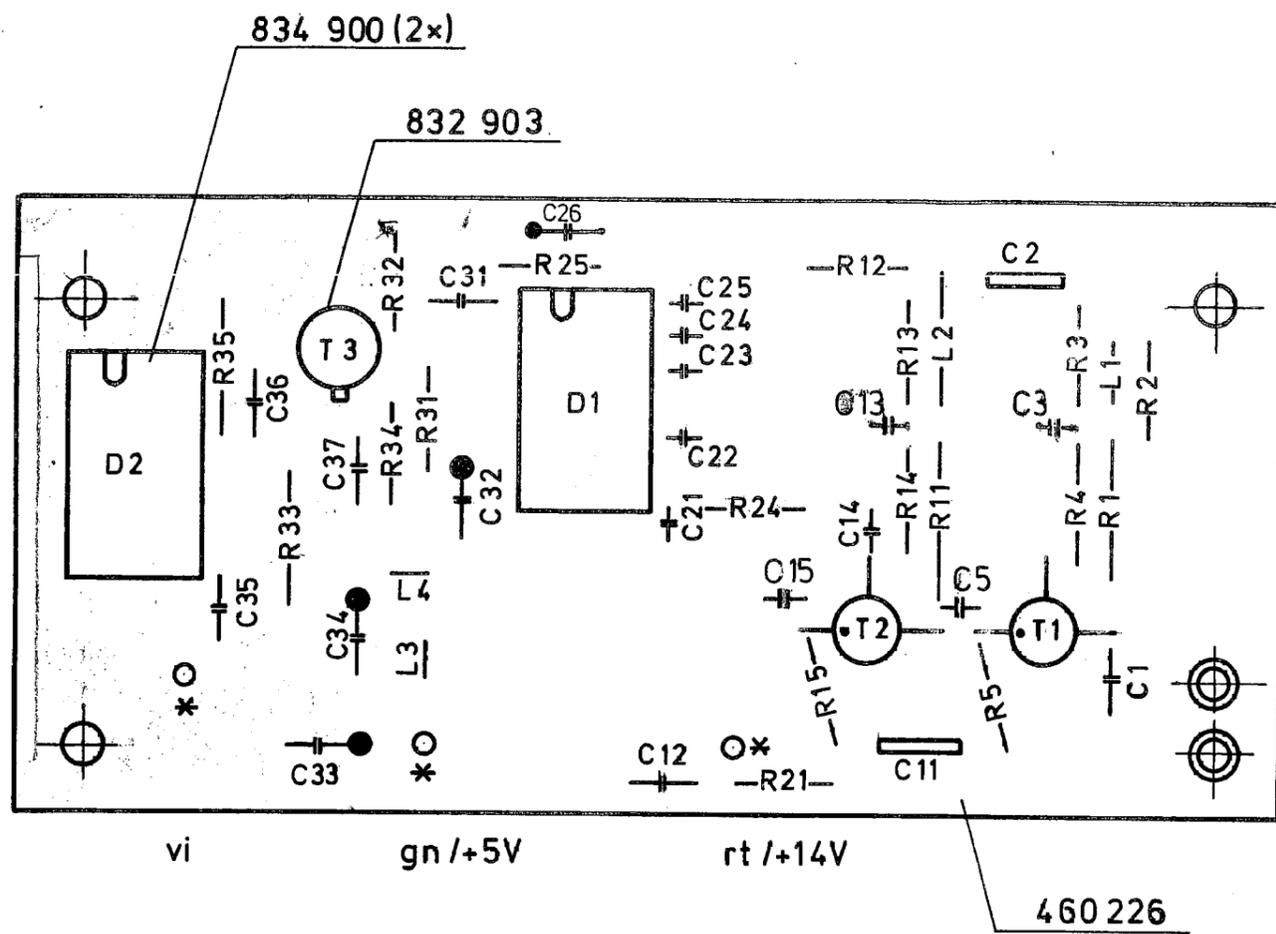
Dekaden-Stufe
 DECADE-STAGE

210 021 S Bl.9
 Typ: 4010

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

7 6 5 4 3 2 1

weich gelötet



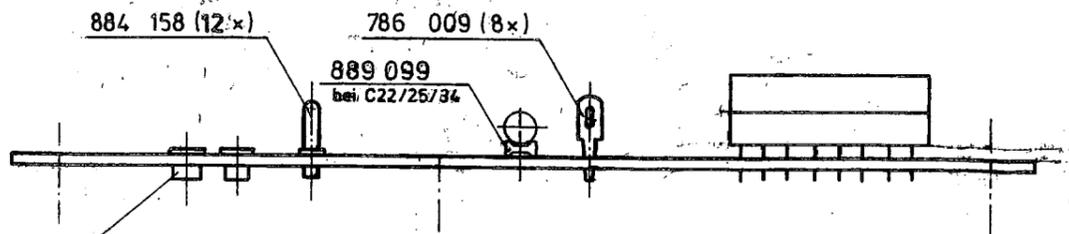
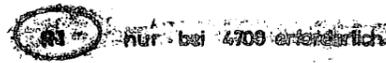
* = Farbpunkt

□ = Kontrollmaß

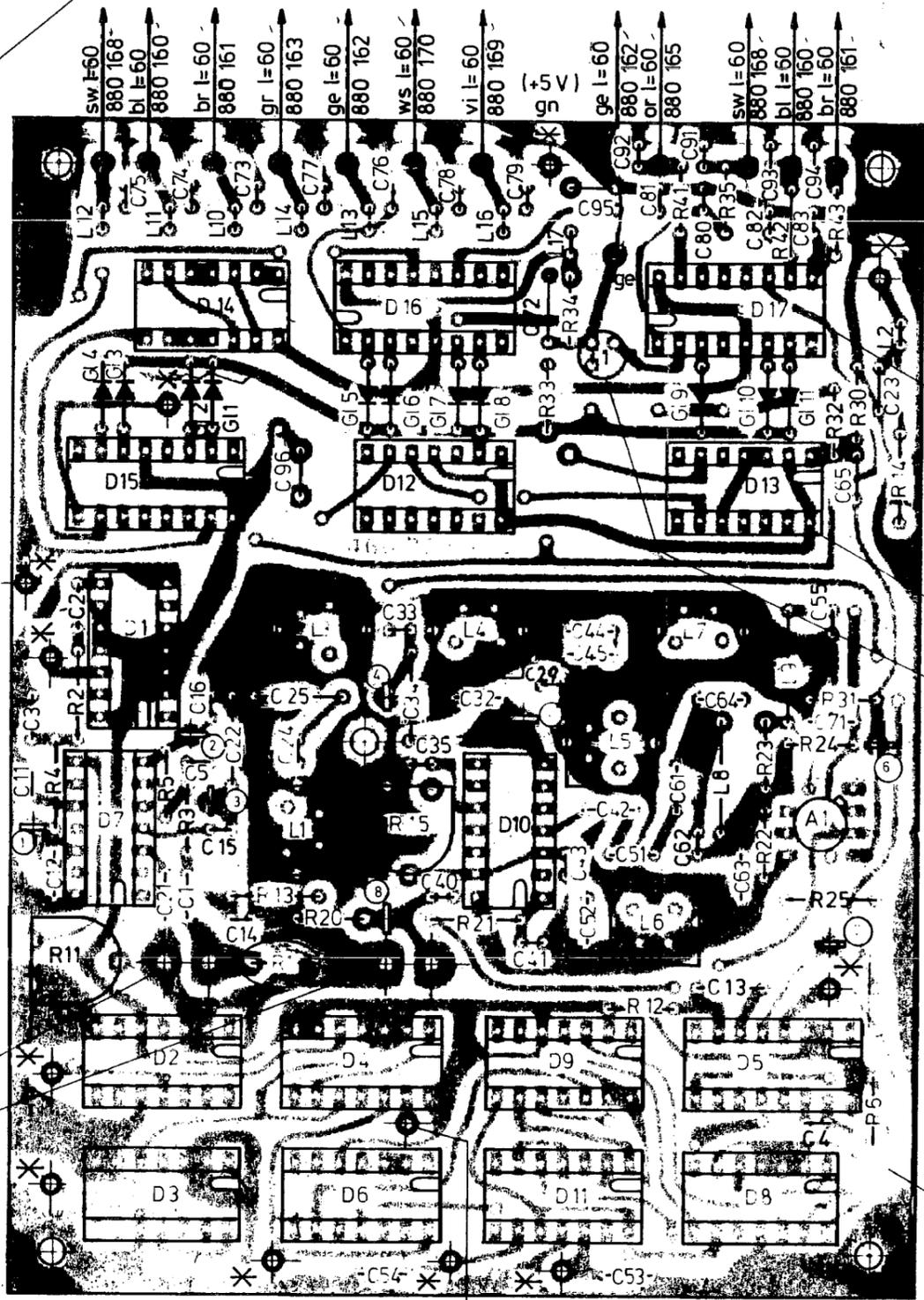
01				Schlumberger o/s Meßgerätekab. Vertrieb GmbH München 48		
02			2:1			
03					Bestückte Leiterplatte	
04	9028.67	25.9.79				Eiler
05	8028.92	13.12.78				Mo
06	5028.21	21.3.75		Le P.		
07				360 226		
08						
09						
10						
11						
12				Ersatz für		
13						
14						
15						
16						

Schaltplanpositionierung ≙ 210 021 S / 360 226 Sa Gerät: 4010 / 4020

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.



428 124 (4x)



Für C22, C25 und C34
Vorschrift 099 067 V

834 901 (4x)

834 900 (13x)

832 900

460 227

* = Farbpunkt

○ = Kontrollmaß

K 30

K 33

K 32

110	Druck:	Format:	Maßstab:	Schlumberger o/s
1		0,2	2:1	
1	Anzahl:			Bestückte Leiterplatte
1	0028 91 13.76 Mo			360 227
1	3028 87 14.18 Ge			
1	7028 53 8.07 K			
1	6028 102 9.12 76 Eller			
1	Andr. Datum Name	gr: 9.5.75 Le P		Ersatz für

weich gelötet

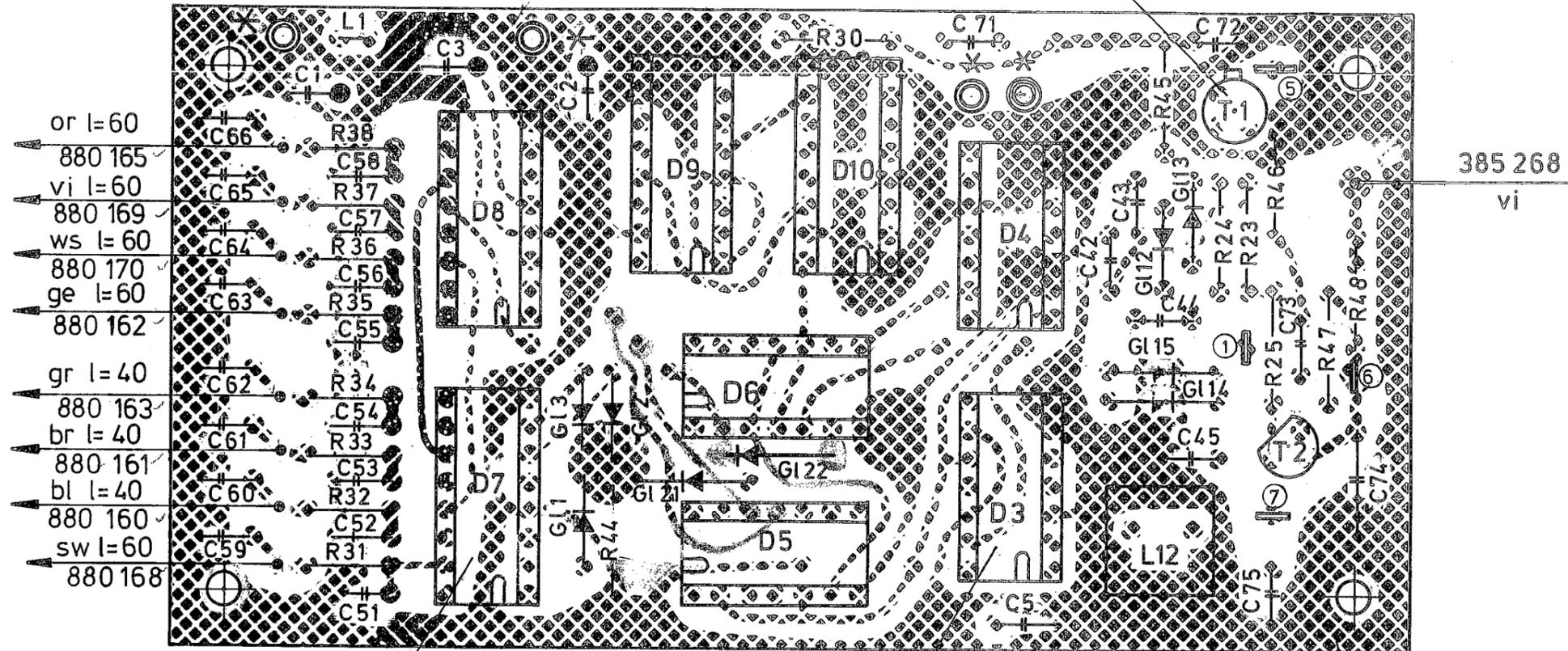
884 158 (4x)

gn (+5V)

rt (+14V)

832 900

or ge



385 268
vi

786 009 (4x)

834 901 (4x)

834 900 (4x)

460 231

* =Farbpunkt

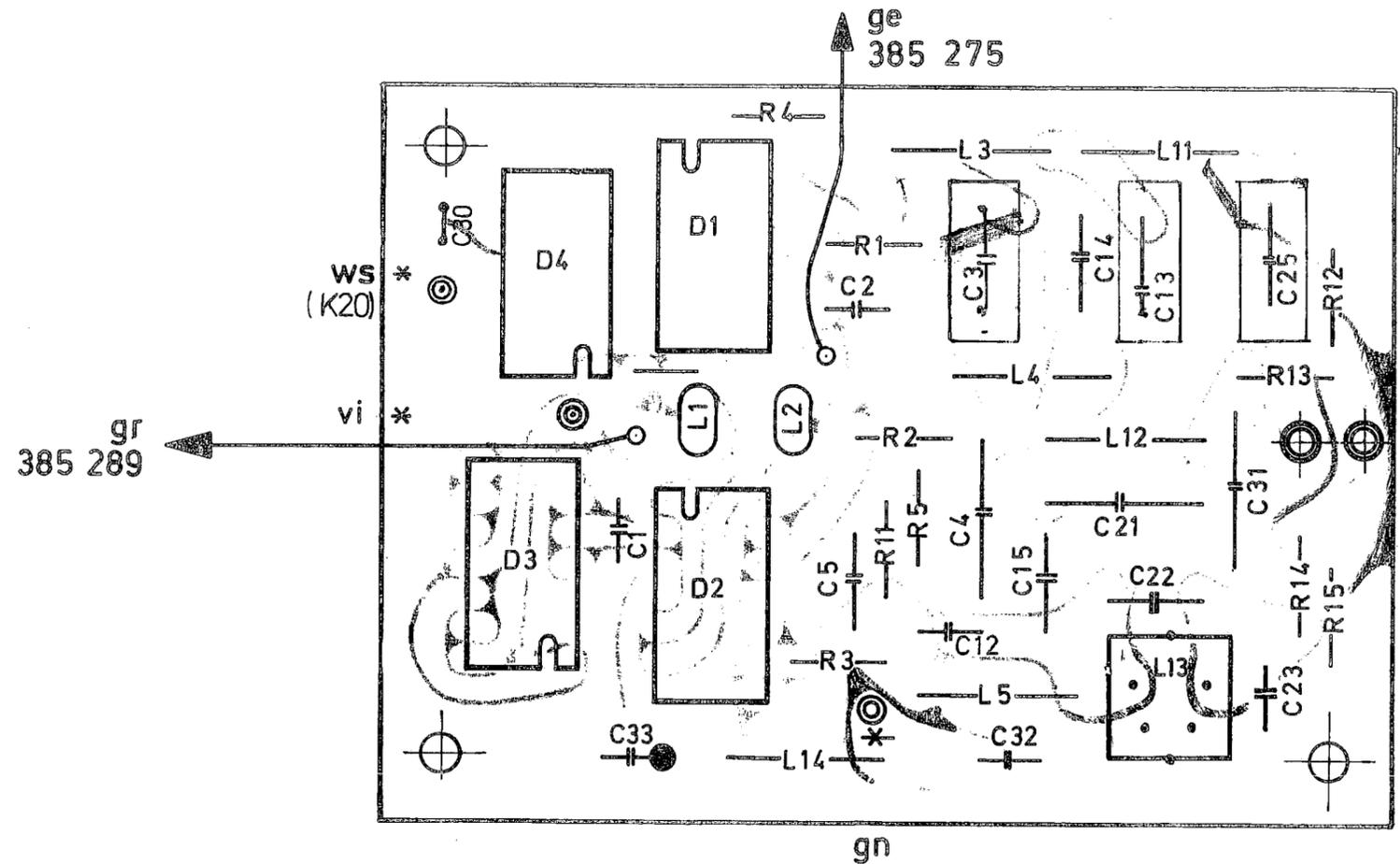
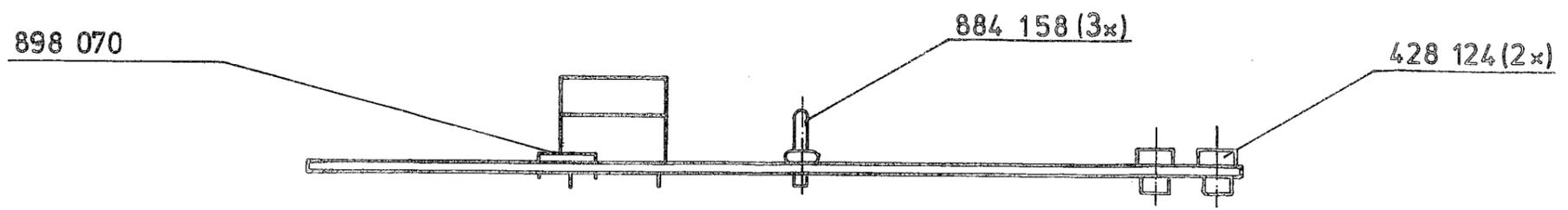
○ Kontrollmaß

10 9028.53 6.8.79 Eiler			Schlumberger o/s
09 8028.92 13.12.78 Mo			
08 6028.8 2.2.76 Koser			Bestückte Leiterplatte
07 5028.46 14.5.75 Eiler			
4028.106 13.10.74 EILER			360 231
4028.92 9.9.74 K.			
4028.48 4.4.74 B-JL			
40 47.11 10.2.76 Fährnd			
40 47.1 3.1.74 FAHRND			
3049.11 29.10.74 K.			
		2:1	
		9.10.73 Fährnd	
		26.10.73 JS	

Gerät: 4010/4020

Schaltplanpositionierung 210 020 S / 210 021 S / 360 231 Sa

weich gelötet



* = Farbpunkt

○ = Kontrollmaß

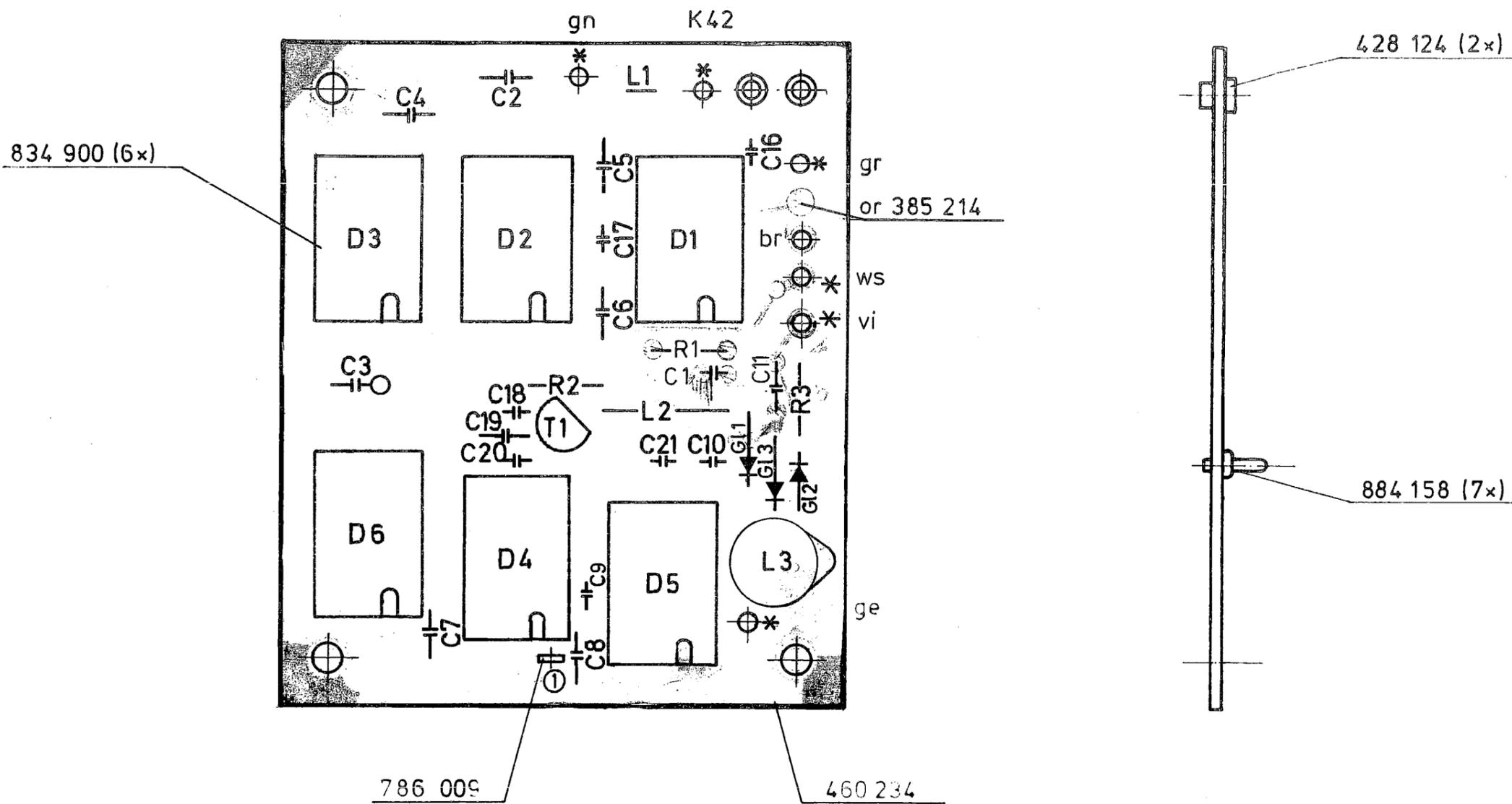
verwendet in: 210 021 Gerät: 4010 / 4020

Schaltplanpositionierung ≙ 210 021 S / 360 232 Sa

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09	8028.92	13.12.78	Mo			2:1	
08	7028.88	30.11.77	Eiler	Werkstoff			Bestückte Leiterplatte
07	6028.90	11.01.76	Leh				
06	6028.20	2.4.76	Eiler	Oberfläche		360 232	
05	6028.7	2.2.76	Eiler				
04	5028.106	25.11.75	Eiler			Ersatz für	
03	5028.97	23.10.75	Eiler				
02	5028.2	22.1.75	Eiler		Datum	Name	
01	40 28.104	11.10.74	Falch		2.2.74	Falch	
Ausgabe	Andg	Datum	Name		8.2.	Leh	

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

weich gelötet



* = Farbpunkt

○ Kontrollmaß

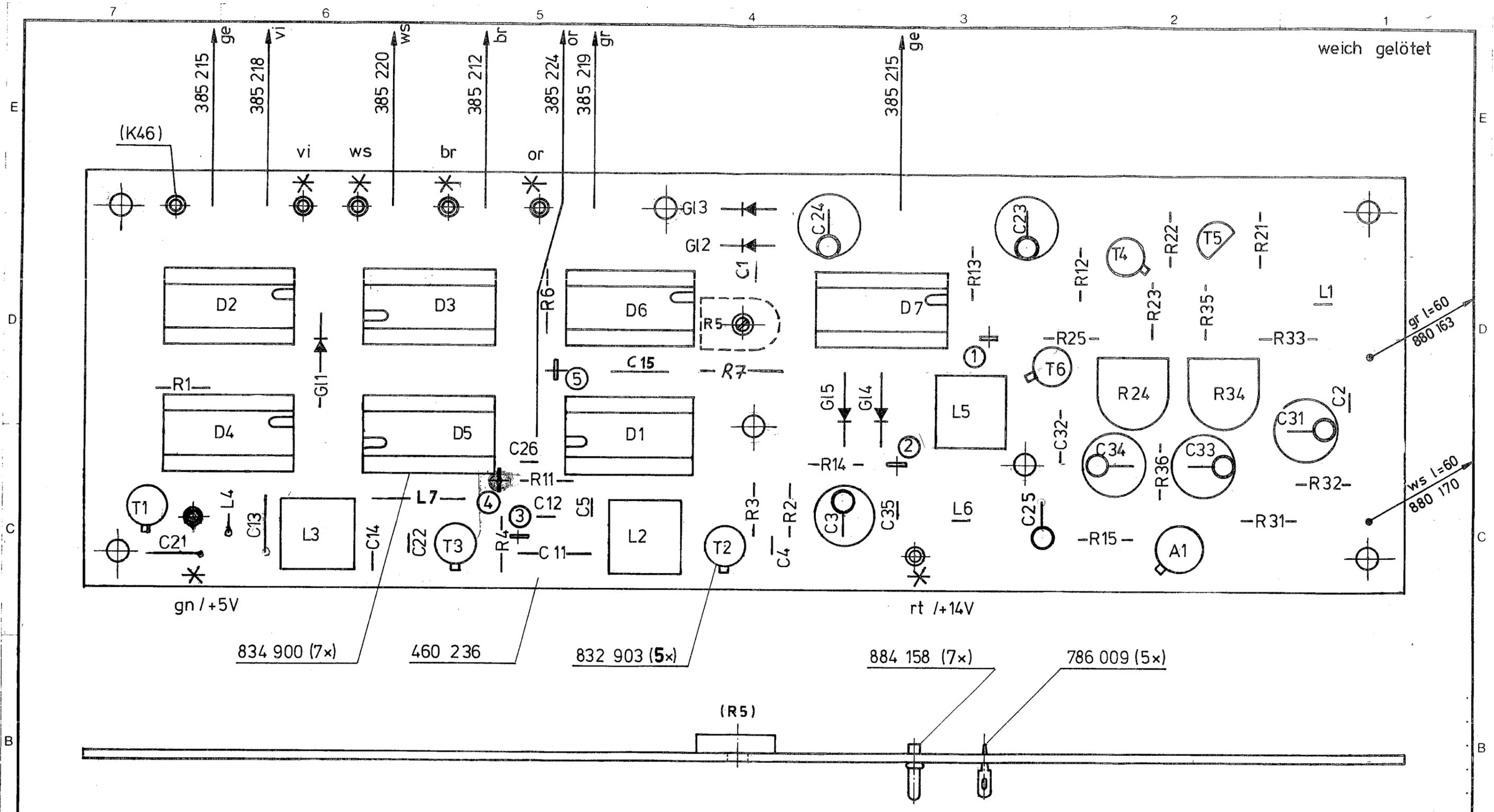
								Schlumberger o/s
								2:1
								Bestückte Leiterplatte
								Typ: Ablagemischer
								360 234

05	9028.53	6.8.79	Eiler
04	8028.92	13.12.78	Mo
03	5028.24	26.3.75	Le P.
	4028.100	15.10.74	Selg
	4028.48	4.4.74	B...

Schaltplanpositionierung 210 021S/360 234 Sa

Gerät: 4010/4020

5.2.74 F. ...



Schaltplanpositionierung \cong 210 021S / 360 236 Sa Gerät: 4010 / 4020

20				Rohteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46
19				Werkstoff	2:1	Bestückte Leiterplatte	
18							Oberfläche	Datum	Name
17				12	3028.53	6.8.79		Eiler
16				11	9094.43	9.5.79	Eiler
15				Ausgabe	Ändg-Mittlg	Datum	Name
14							
13							
12							
11							
10							
9							
8							
7							
6							
5							
4							
3							
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1							

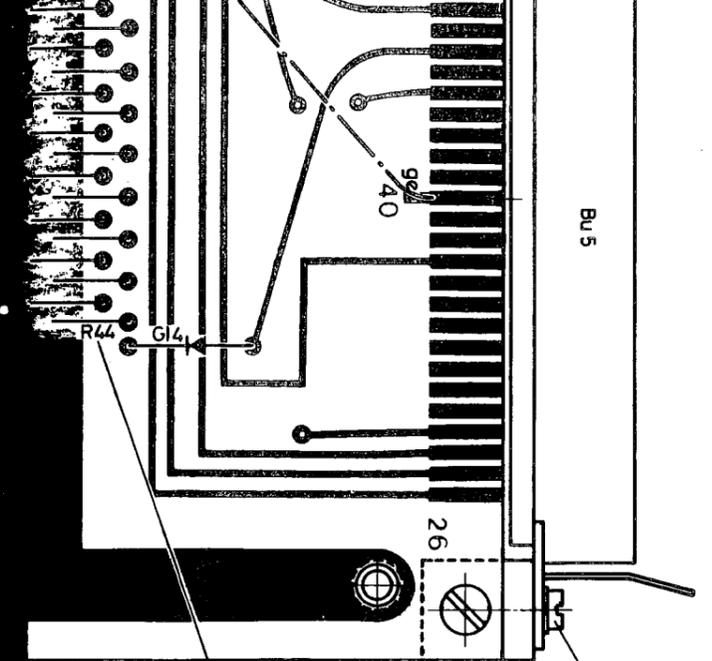
Schlumberger o/s
Meßgerätebau u. Vertrieb GmbH
8 München 46

Bestückte Leiterplatte

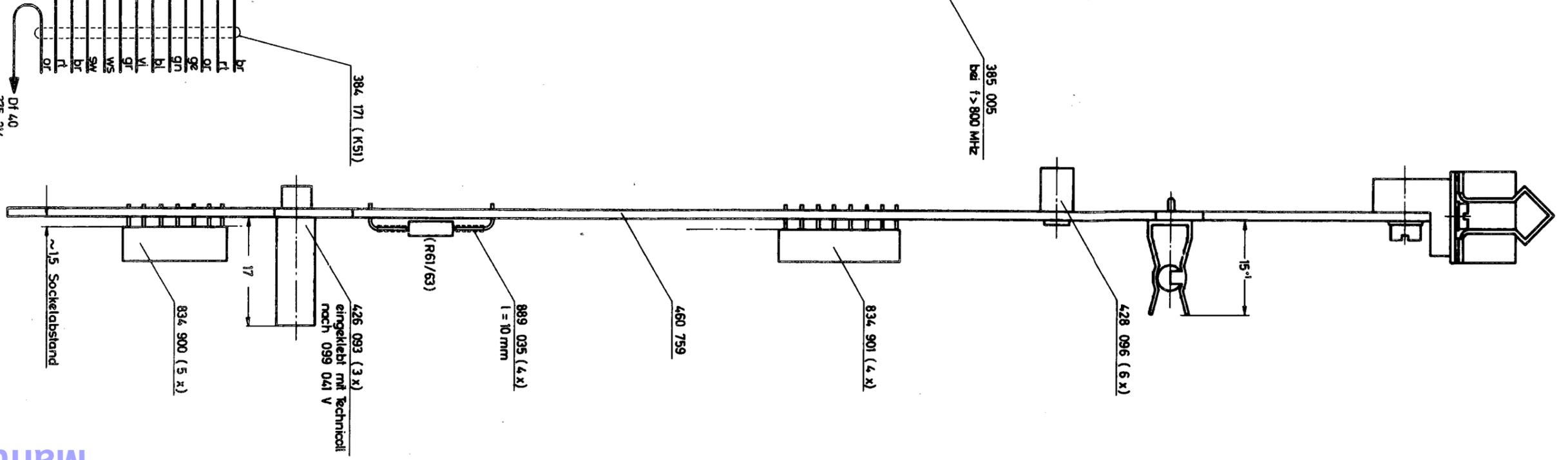
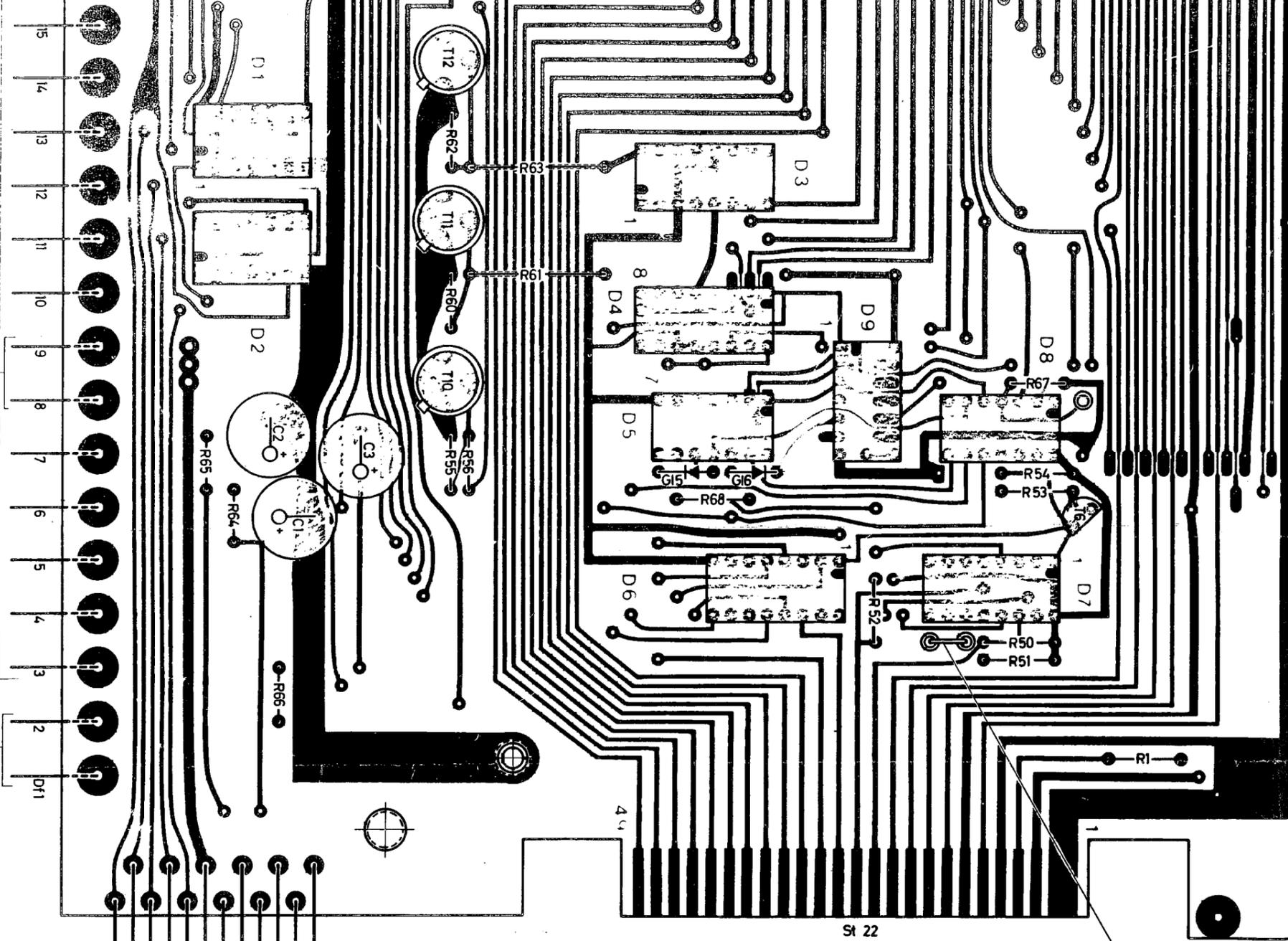
360 236

Ersatz für:

weich gelötet



884 207
 M 2 x 5 DIN 84
 701 114
 J22 DIN 6797
 706 102
 - 2 x



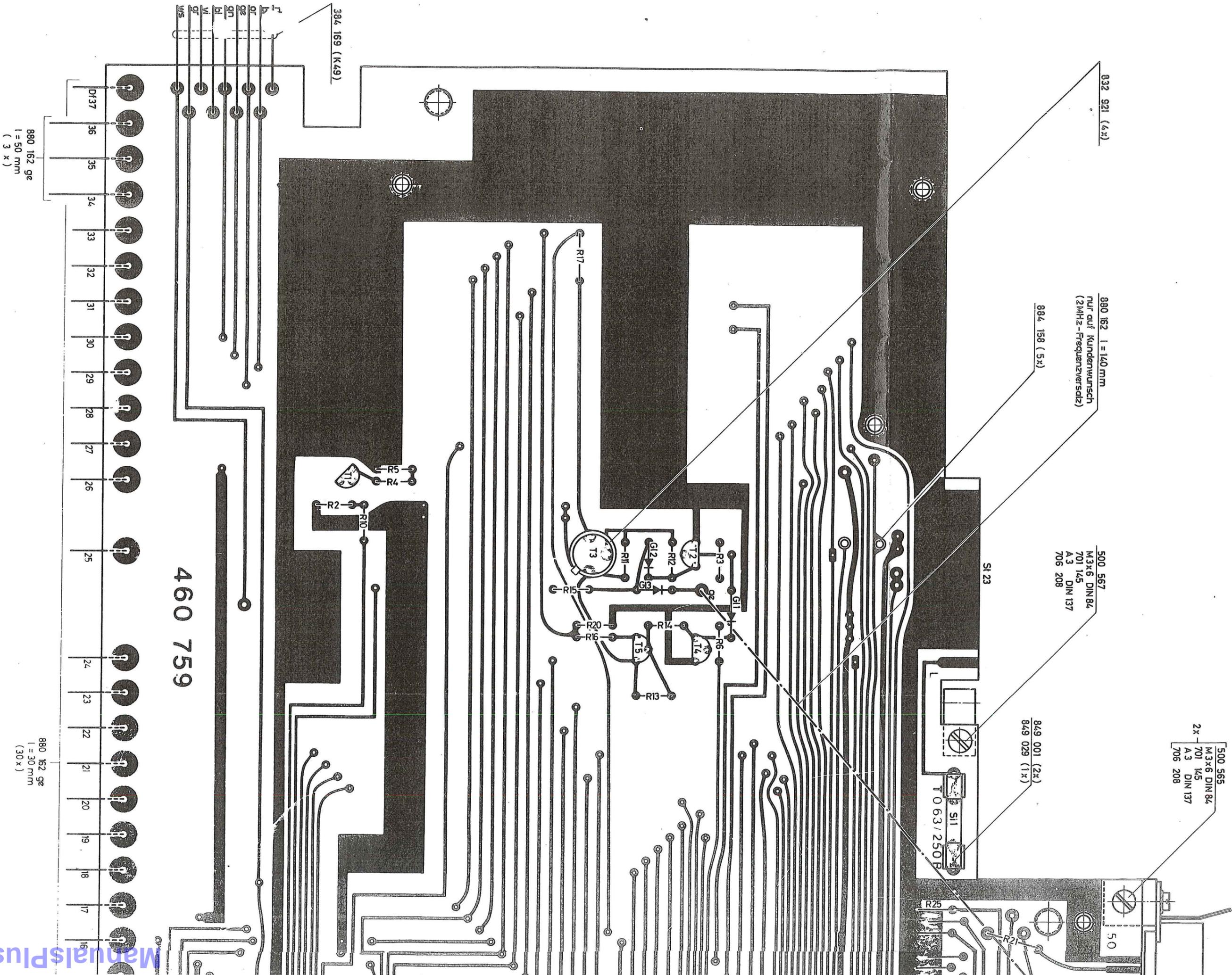
385 005
 bei f > 800 MHz

et in : 375 214

Gerät : 4010

9028 59 28.8.79 K.
 7028 95 24.11.77 K.
 7028 69 27.03.77 K.

1977	26.10.77	Kingsellis
2:1		
Schlumberger o/s		
Bestückte Leiterplatte		
360 759		



832 921 (4x)

880 162 l = 140 mm
nur auf Kundenwunsch
(2MHz-Frequenzversatz)

884 158 (5x)

500 567
M3x6 DIN84
701 145
A3 DIN 137
706 208

SI 23

849 001 (2x)
849 029 (1x)

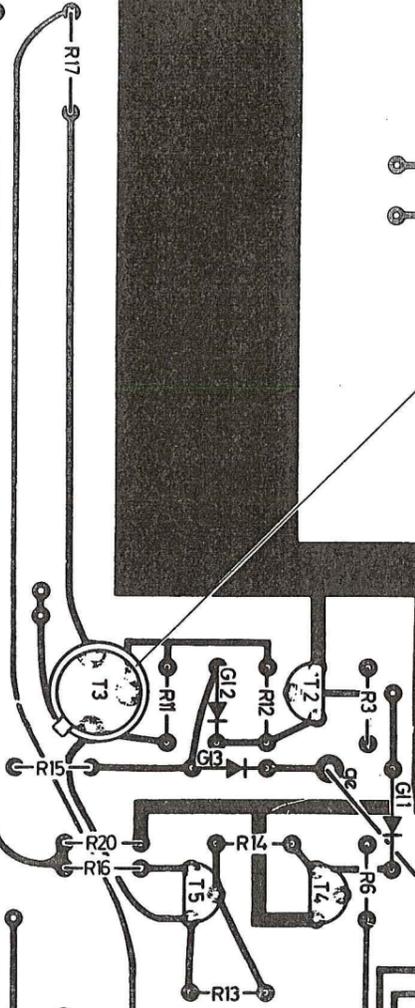
500 565
M3x6 DIN84
701 145
A3 DIN 137
706 208

R25

R21

50

SI 1
T0 63/250B



460 759

880 162 ge
l = 50 mm
(3 x)

880 162 ge
l = 30 mm
(30 x)

Schaltplanpositionierung ≙ 210 021 S / 360 759 Sa

verwendet

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

1. Receiver Measurement

The RF signal arriving from the oscillator stage is routed to the "RF direct" output through a AM modulator with ALF control and 2 variable attenuators for adjusting the EMF.

A mixer is included for the frequency range 0...40 MHz.

1.1 AM Modulator

Here, an auxiliary modulator which provides a signal level sufficient for satisfactory rectification is amplitude modulated in the usual way by means of the differential amplifier and feedback through "AM(AC)". This ideally modulated signal is then presented to a reference rectifier through a voltage attenuator, the former having the same properties as the EMF rectifier. The signals from the reference rectifier and the EMF rectifier than are applied to a differential amplifier, which controls a pin diode attenuator. This results in compensating non-linearities and temperature effects occurring during rectification of small RF levels.

The modulator output level is automatically controlled in non-modulated operation also and can be elevated by +6 dB by increasing reference level.

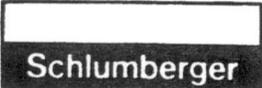
1.2 EMF Adjustment

The EMF level is adjusted by means of a mechanically switchable attenuator pad in 10 dB steps. For fine adjustment the DC voltage "EMF(DC)" controls a pin diode attenuator pad through a linearizing network according to the meter indication +2...-10 dB.

A 16 dB UHF amplifier is inserted when the 2V EMF range is selected.

1.3 0.....40 MHz Mixer

The fixed LO frequency of the ring mixer 140 MHz is derived directly from the crystal frequency by means of a frequency multiplier. The amplitude controlled synthesizer signal of 140...180 MHz is switched by a relais at the linear input, the de-mixed product being routed through a low pass filter and a RF amplifier to compensate the attenuation caused by the mixer.

	Function Description	230 025 F	Sheet 1/2
	Type: 4020/21/22	Output Stage	Date 0979

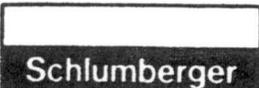
2. Transmitter Measurements

The AM Modulator and the EMF vernier control are adjusted to maximum level by the control and display unit to enable the subsequent IF mixer to fully present the synthesizer frequency. The transmitter signal for the other mixer input must be previously controlled to a suitable mixer input level in the input amplifier with its large difference in level (from 1 mV to 3.5 V). In this automatic level control circuit the rectifier diode on the amplifier output controls the input pin diodes, an additional control being provided for higher performance.

The ALC controlled transmitter signal is routed through the control line "TR Freq. (DC)" to the oscillator stage when measuring transmitter frequency. Switching diodes, placed inside of the connecting cable are also controlled by these means to eliminate cross-talk in other modes of operation.

2.1 The Intermediate Frequency

The mixed product is presented to the FM discriminator through various band filters and limiting amplifiers. A DC coupled discriminator output is led to the front panel socket AUX OUTPUTS. The active 20 kHz low pass filter at the output end supplies the demodulated signal "FM TR (AC)" through the decade stage to the meter circuitry. The squelch provided at the output end of the first limiting amplifier is provided with 2 chain inverters in parallel having different threshold levels. The chain inverter having the high sensitive threshold voltage provides a 2 MHz TTL signal even at low level input for frequency display through the decade stage. The chain inverter having low threshold sensitivity presents the IF to the following band pass filter once the level is sufficiently high to eliminate a noisy erroneous indication of modulation.

	Function Description	230 025 F	Sheet 2/2
	Type: 4020/21/22	Output Stage	Date 0979

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM Power Meter Frequency Analyser	<p>Frequency Multiplier 10140 MHz 230 025 S Bl. 4</p> <hr/> <p>Frequency setting: < 40 MHz</p> <p>(50Ω) Analyser to Bu 1</p> <p>Power Meter to Bu 1</p>	Bu 4 1 Bu 1 Bu 1	10 MHz DC 140 MHz 140 MHz	----- L 4 ----- -----	10 MHz TTL appr. 7,1 V Suppression of Spurious > 65 dB -3 to + 3 dBm	

Adjustment and Test Procedure

4020 series
OUTPUT STAGE

Schlumberger

Issue	Alteration No.	Date	Name
	0028, 29	27.3.80	Morasch

230 025 A

1/7
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM	<p><u>EMF and Power Indication Meter.</u></p> <p>Check out of mechanical zero setting</p> <p>Adjust Pointer to full-scale deflection by aid of the EMF control knob on the front panel and check potential at Df 3</p>	Df 3	DC	meter I 3 R 306 on 360 154	zero deflection 9,5 VDC	.....ok
	<p>Pre-set all trimmer potentiometers on 360 761 and 360 762 to mid-position, except R 34.</p> <p>R 34 adjust to 2/3 fully anti-clockwise.</p> <p>Pre-set C 9 to minimum capacity.</p> <p><u>Flatness of RF Signal</u></p> <p>Adjust EMF-indikation by front panel controls to +83 dBµW (+83 dBµW ≙ -30 dBm)</p>	RF output (11-socket)	40 to 200 MHz 400 to 479 MHz	R 42 / 360 761 R 72 / 360 762 Don't change R 42 if level is below -30 dBm R 21	- 30 dBm ± 0,4 dB - 30 dBm ± 0,4 dB	.....ok.....dB.....dB

Adjustment and Test Procedure

4020 series
OUTPUT STAGE

Schlumberger

Issue	Alteration No.	Date	Name
-	0028.29	26.3.1980	Morasch

230 025 A

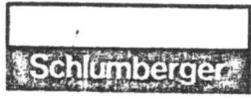
2/7
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Modulation Meter Dist. Analyser	<u>AM Distortion Adjustment</u> (Negative AM swing)	RF-socket (front panel) or RF DIRECT	479,99 MHz mod = 1 kHz	R 34 / 360 762 to minimum distortion at 95 % AM depth	< 2 % typical 1 %%
	Check RF Flatness again	"	39...479,9 MHz	R 72	- 30 dBm ± 0,4 dB	.....dB
(Signal Generator 140...180 MHz) RF Power Meter 0,01 ... 40 MHz (or RF Analyser)	Mixer (140...180) - 140 = 0...40 MHz <u>RECEIVER MEASUREMENT</u> Set EMF step attenuator to + 80 dBµV, Frequency setting 0,1 MHz " 0,01...39,9 MHz	Bu 13 "	C 6 mid-pos. 0,1 MHz 10 kHz...39,9MHz	R 2 C 6	- 30 dBm minimum Flatness (Notice low frequency cutoff of the Power Meter) Non harmonic Spurious Signals 0...25 MHz: > 63 dBc 25...40 MHz: > 53 dBc Harmonic Signals > 30 dBc	>.....dBc >.....dBc >.....dBc
Analysar	Set EMF control knob to 10 mV indication Pay attention to the following spurious signals, which can be expected: Signals with variable distance, passing the carrier at 28 MHz and at 35 MHz. 60 MHz signal, occurring when the carrier is set to 40 MHz.					
	<u>EMF + 6 dB Switch over</u> Press and depress " + 6 dB push button"	RF-socket	150 MHz 40 to 479,9 MHz	R 35 / 360 761 -----	+ 6 dB ± 0,4 dB + 6 dB ± 0,4 dB	.....dB.....dB
AC-DVM	<u>AM Depth Adjustment</u> at 70 % depth and f mod 1 kHz	Df 6 Socket RF or RF DIRECT	1 kHz 100 kHz...479,9 MHz	Control knob MODULATION to 70 % AM Indication R 44 (360 761)	2,1 VAC + 1 % 70 % ± 5 % AM DEPTH	.....V%
Modulation Meter						

Adjustment and Test Procedure

4020 series
OUTPUT STAGE



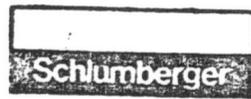
Issue	Alteration No.	Date	Name
	0028.29	27.3.80	Morasch



REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
RF Power meter	<p><u>Linearization of EMF Setting</u> Set attenuator on front panel to + 80 dBμV and EMF Control to indication</p> <p>+ 3 dB - 2 dB + 3 dB</p> <p>- 7 dB - 2 dB</p> <p>+ 4 dB + 3 dB</p> <p>19 mV + 2 dB 15 mV</p>	<p>RF-socket</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>180 MHz</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p> <p>"</p>	<p>R 72 R 65 Test</p> <p>R 63 Test</p> <p>R 45 Test</p> <p>R 53 R 53 Test</p>	<p>- 30 dBm - 35 dBm - 30 dBm</p> <p>- 40 dBm - 35 dBm</p> <p>- 29 dBm - 30 dBm</p> <p>9,5 mV into 50 Ω - 28 dBm 7,5 mV into 50 Ω</p> <p>Error < 0,1 dB</p>	<p>.....dB.....dB</p>
	<p><u>Power Flatness at meter deflections - 7 and + 5 dB</u> Attenuator setting to + 80 dBμV EMF meter deflection - 7 dB + 5 dB</p>	"	40 ... 479,9 MHz	check	<p>- 40 dBm ± 0,8 dB - 28 dBm ± 0,8 dB</p>	.....dB.....dB
	<p><u>Auxiliary Modulator (360 761)</u></p> <p>Disconnect the counter</p> <p>+ 6 dB not pressed</p>	<p>230 025 S</p> <p>B1.3</p> <p>②</p> <p>③</p>	<p>20 MHz</p> <p>-</p>	<p>R 35, 42, 44</p> <p>— Middle position</p> <p>L 1 L 3</p>	<p>— 20 MHz ± 100kHz</p> <p>Minimum of the AGC voltage</p> <p>+ 1 .....1,5 V</p>	+V

Adjustment and Test Procedure

4020 series
OUTPUT STAGE



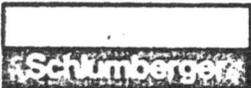
Issue	Alteration No.	Date	Name
01	0028.32	11.4.1980	Mo
-	0028.29	27.3.1980	Monasch

.....ok
..... V

MEASURED VALUE	REQUIRED VALUE	ADJUST	FREQUENCY	MEASURE POINT	PROCEDURE	REQUIRED TEST EQUIPMENT
		<p>L1/L2 → max. level</p> <p>4000 → Min. EMF (Sweeper)</p>	1,9...2,1 MHz	⑦	<p>IF-Amplifier 230 015 S Bl. 2 Test Assembly</p> <p>Sweep Generator: $f = 2 \text{ MHz}$, $\Delta f = \pm 100 \text{ kHz}$ Sweep Rate = 10 Hz EMF = 2 V RF Output Attenuator = $53...68 \text{ dB}$</p>	<p>Signal Generator/ Sweep Generator (e.g. Type 4000)</p> <p>Oscilloscope Adapter</p>

Adjustment and Test Procedure

4020 series
OUTPUT STAGE

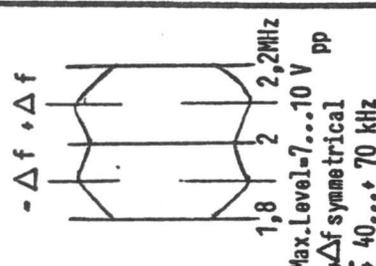
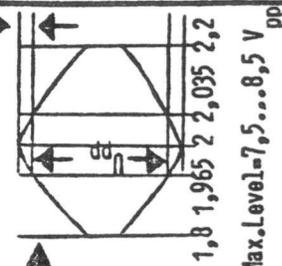


Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A

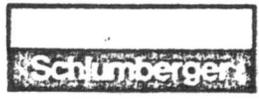
5/7
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>IF Limiter Amplifier (360 766)</p> <p>4000: 1 MHz, 2 V EMF, Attenuator = 0 dB Sweep Deviation ± 100 kHz, Sweep Rate = 10 Hz</p> <p>(Due to its high input level, the adapter is operating as a frequency doubler now. Available sweep deviation is increased to ± 200 kHz.)</p> <p>IF Discriminator (360 766)</p> <p>Set R 46 to mid position</p> <p>4000: 1,85...2,15 MHz, 2 V EMF, 0 dB, UNMOD without SWEEP</p> <p>Vernier adjustment:</p> <p>4000: 1 MHz, 2 V EMF, 0 dB, UNMOD, SWEEP ± 100 kHz</p>	<p>②</p>	<p>0,9...1,1 MHz (1,8...2,2 MHz)</p>	<p>L5, L11 → Max. Level (360 766)</p>	<p>$-\Delta f + \Delta f$</p> 	<p>.....V.....pp.....kHz</p>
		③	2 MHz	L12/L13 → Max. RF Level 7...9 V pp	+2...3 V	
		⑤	1,85MHz	L14 → Max. DC	+2...3 V	
		⑥	2,15 MHz	L15 → Max. DC	-2...3 V	
		③	1,8...2,2, MHz	L12/L13		<p>.....V.....pp</p>
		⑤	1,85 MHz	L14 → Max. DC	+ 2,4...2,8 V	0,.....V p
		⑥	2,15 MHz	L15 →	- 2,4...2,8 V	+2.....V
		④	2 MHz	L14 → VDC ₀ /2 L15 → VDC ₀ =0 V	VDC ₀ = 0 ... ± 0,2 V	-2.....V 0.....V

Adjustment and Test Procedure

4020 series
OUTPUT STAGE



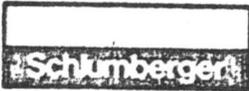
Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A	6/7 Sheet
Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>f_{mod} Amplifier (360 766)</p> <p>Calibrate precisely the frequency deviation 20 kHz at $f_{mod} = 1/10/20$ KHz of the signal generator (4000) before the following procedure.</p> <p>4000: 2 MHz, 2 V EMF, 0 dB, FM: $\Delta f = 20$ kHz</p>	DF 8	<p>$f_{mod} = 1$ kHz</p> <p>■ = 20 kHz</p> <p>■ 1 to 10 kHz</p> <p>■ 10 to 20 kHz</p> <p>$f_{mod} = 1$ kHz</p>	<p>R 82</p> <p>C 69</p> <p>---</p> <p>---</p> <p>---</p>	<p>1,00 V AC</p> <p>0,93 V AC</p> <p>0,97.....1,03 V AC</p> <p>0,9 .....1,1 V AC</p> <p>Distortion < 0,7% (CCITT weighted)</p>	<p>.....V</p> <p>.....V</p> <p>0.....%</p>
	<p><u>Squelch</u></p> <p>Test assembly as on sheet 5/7</p> <p>Signal Generator 4000: 2 MHz, 2 V EMF</p> <p>Output attenuator 53 ... 68 dB</p> <p>Select and adjust SWEEP MODE</p>	DF 8		R 18	<p>10 to 13 V pp</p> <p>(Squelch ON)</p>	

Adjustment and Test Procedure

4020 series
OUTPUT STAGE



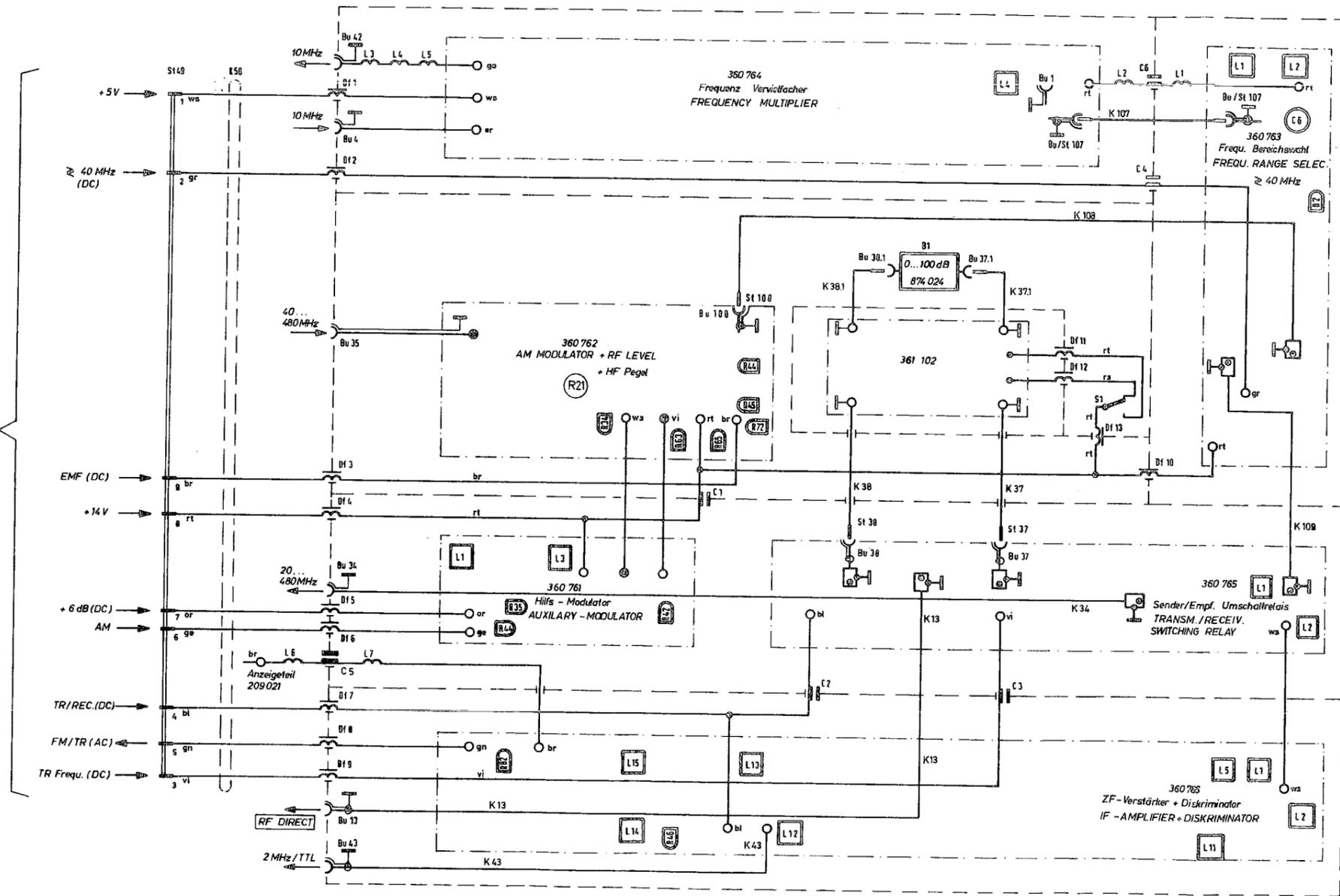
Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A

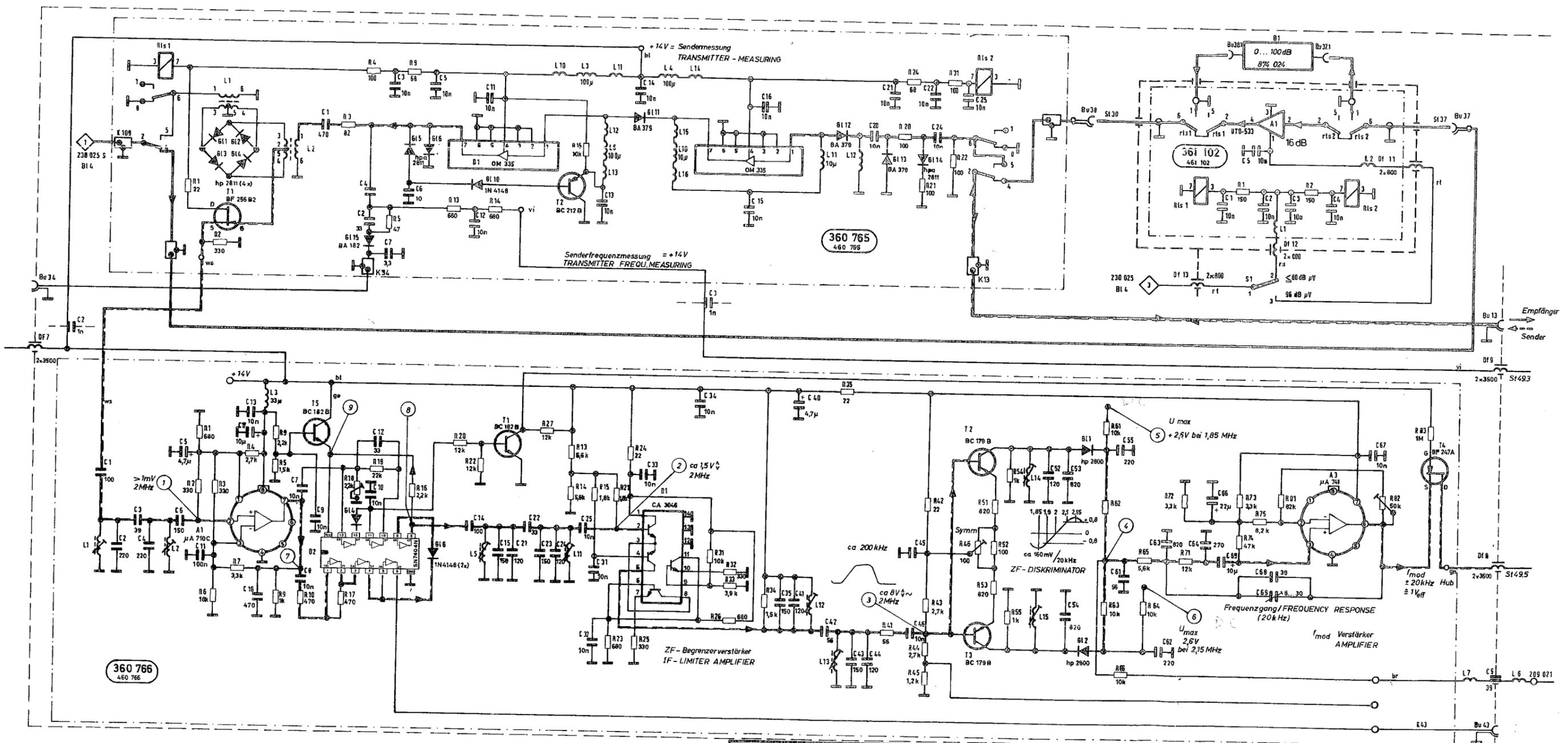
7/7
Sheet

Replacement for

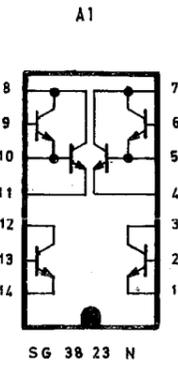
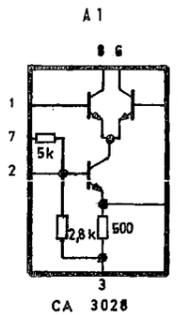
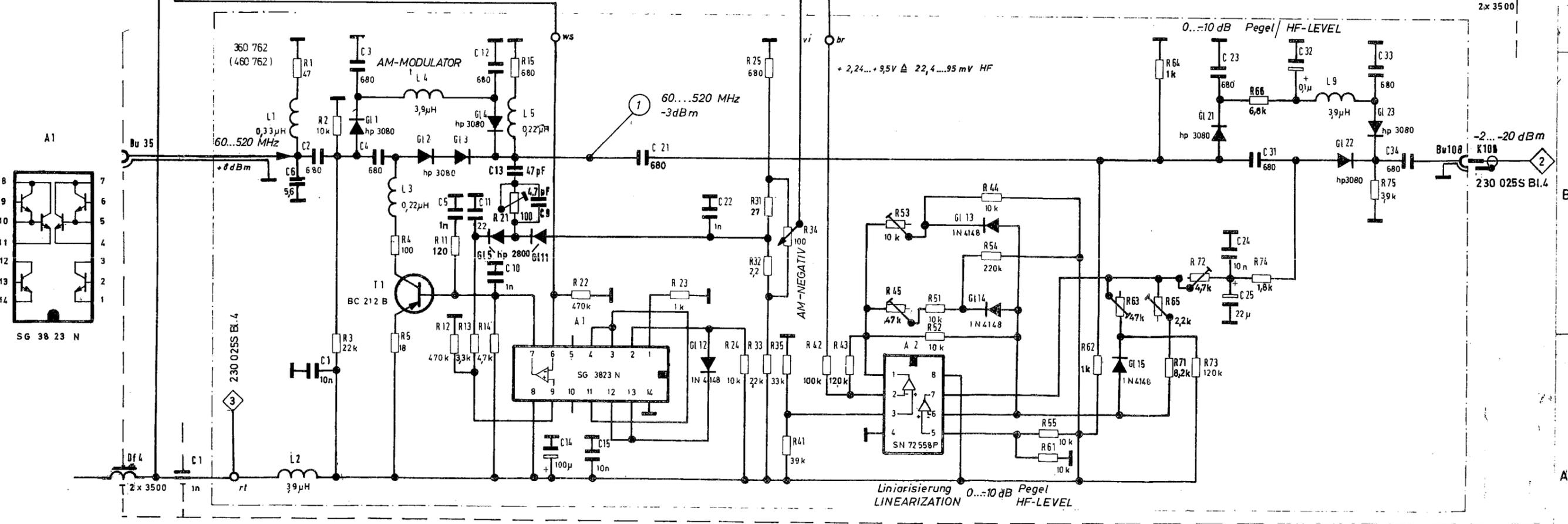
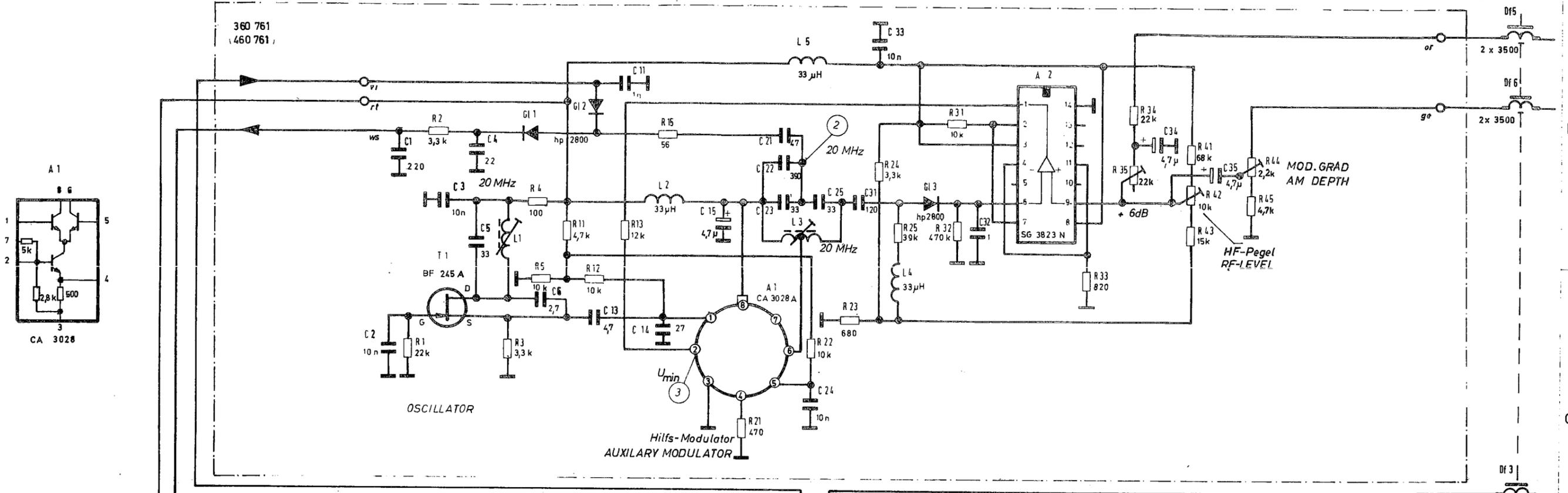
Dekadestufe
DECADE STAGE
210 021 S



sw BLACK	bl BLUE	04	9028.58	20.8.75	Erlert	norm.		Schlumberger o/s Messgeräteeu. u. Vertrieb GmbH 8 München 46	Ausgangsstufe OUTPUT-STAGE	230 025 S Bl.1 Typ: 4020
br BROWN	vi VIOLET	03	9028.50	27.7.75	Erlert	gepr.				
rt RED	gr GREY	Ausg.	Ä-Mittg.	Datum	Name	boorb.	28.9.78	Bichlm.		
rs ROSE	ws WHITE	ISS.	MODIF.	DATE	NAME	Datum	DATE	NAME		
ge YELLOW	tr TRANSPARENT									
gn GREEN										



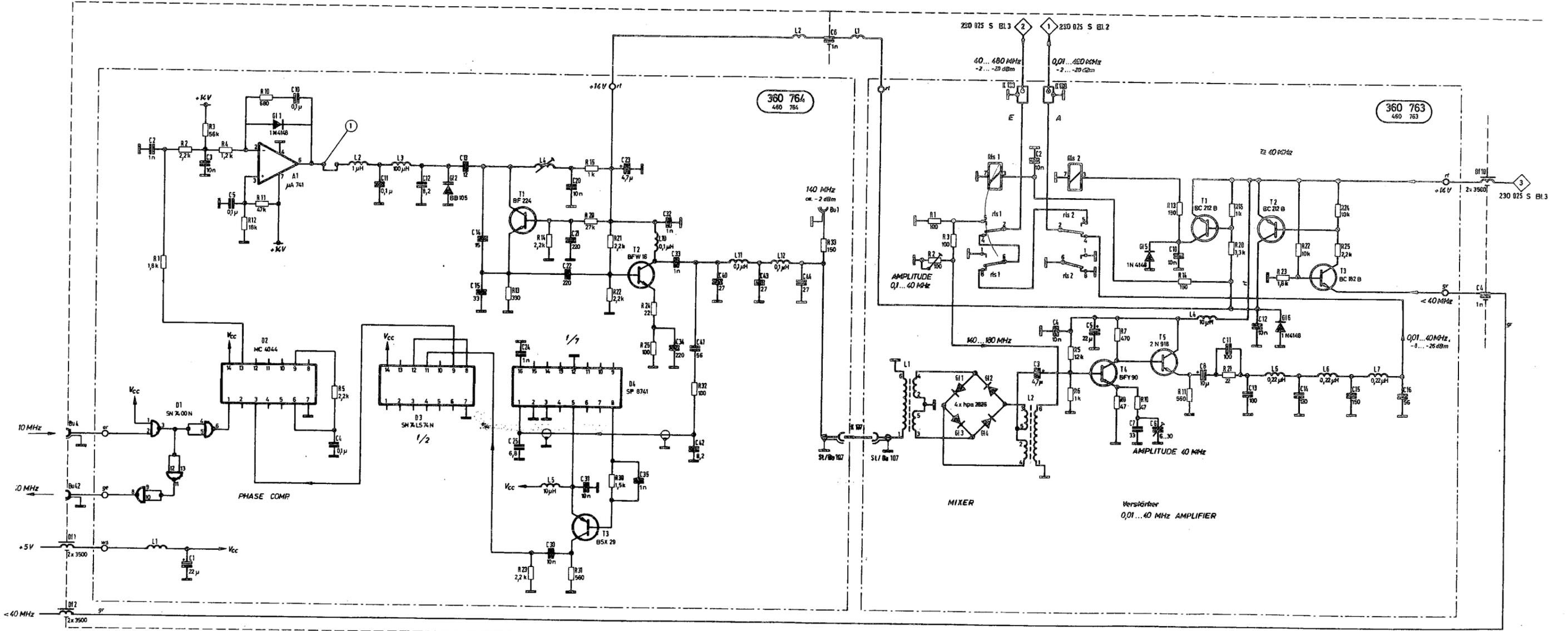
sw BLACK	bl BLUE	norm.				Schlumberger o/s Messgerätekab. u. Vertrieb GmbH 8 München 48	Ausgangsstufe OUTPUT-STAGE	230 025 S Bl.2
br BROWN	vi VIOLET	gopr.						
ri RED	gr GREY	bearb.	20.9.78	Bchim				
rs ROSE	ws WHITE	Ausg.	9028.42	3.7.79	Eller			
ge YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME	1978	DATE	NAME



sw BLACK	bl BLUE	norm	Schlumberger o.s Meßgerätekau u. Vertrieb GmbH 8 München 46	Ausgangsstufe OUTPUTSTAGE	230 025 S Bl. 3 Typ 4020
br BROWN	vi VIOLET	9epf			
rt RED	gr GREY	beard	11.10.78 Ge.		
rs ROSE	ws WHITE				
ge YELLOW	tr TRANSPARENT				
gn GREEN					

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schädensatzpflichtig.

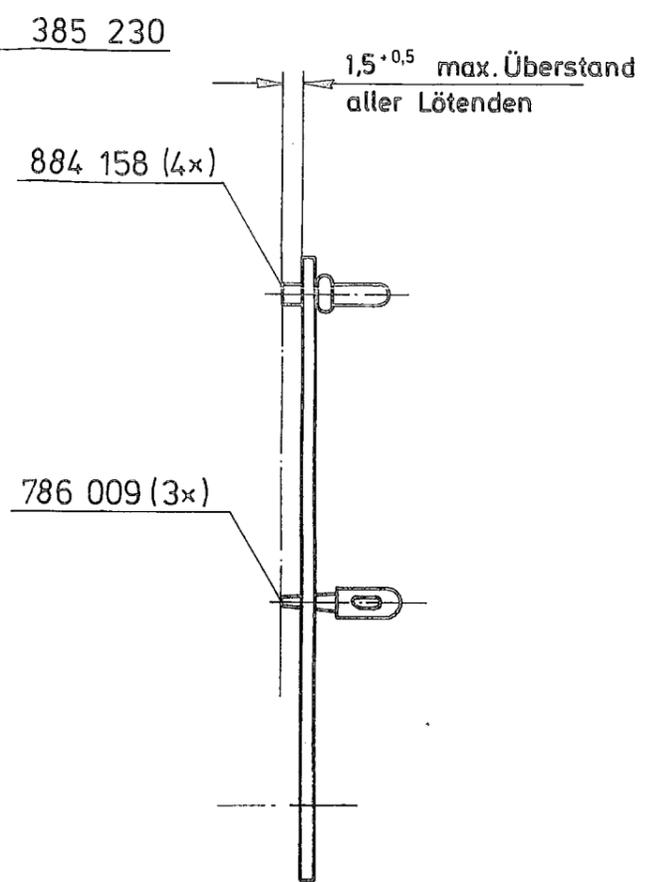
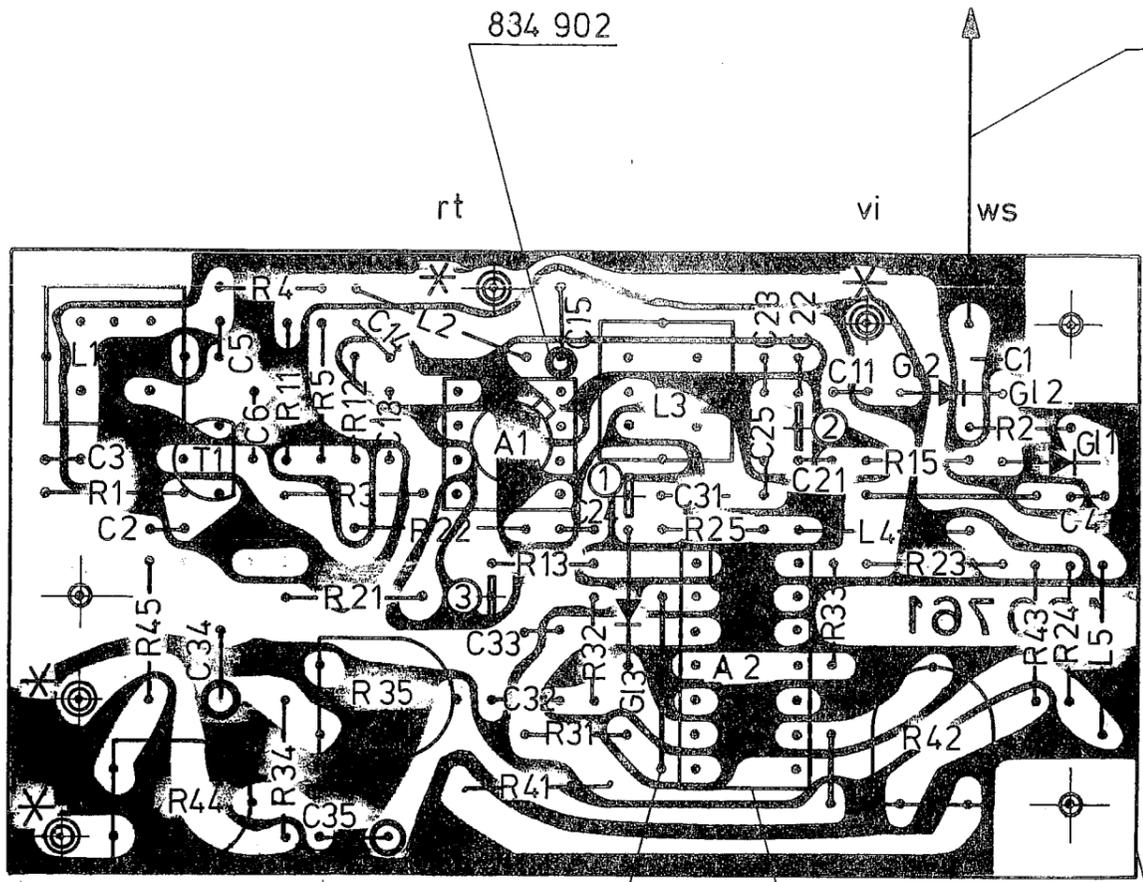
39055.



05	04	norm	Schlumberger o/s		Ausgangsstufe	230 025 S Bl. 4
03	9028.58	20.8.79	Eiler	289.78	Bichler	Typ: 4020
01	02	03	04	05	06	07
08	09	10	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	101	102	103	104	105

7 6 5 4 3 2 1

weich gelötet



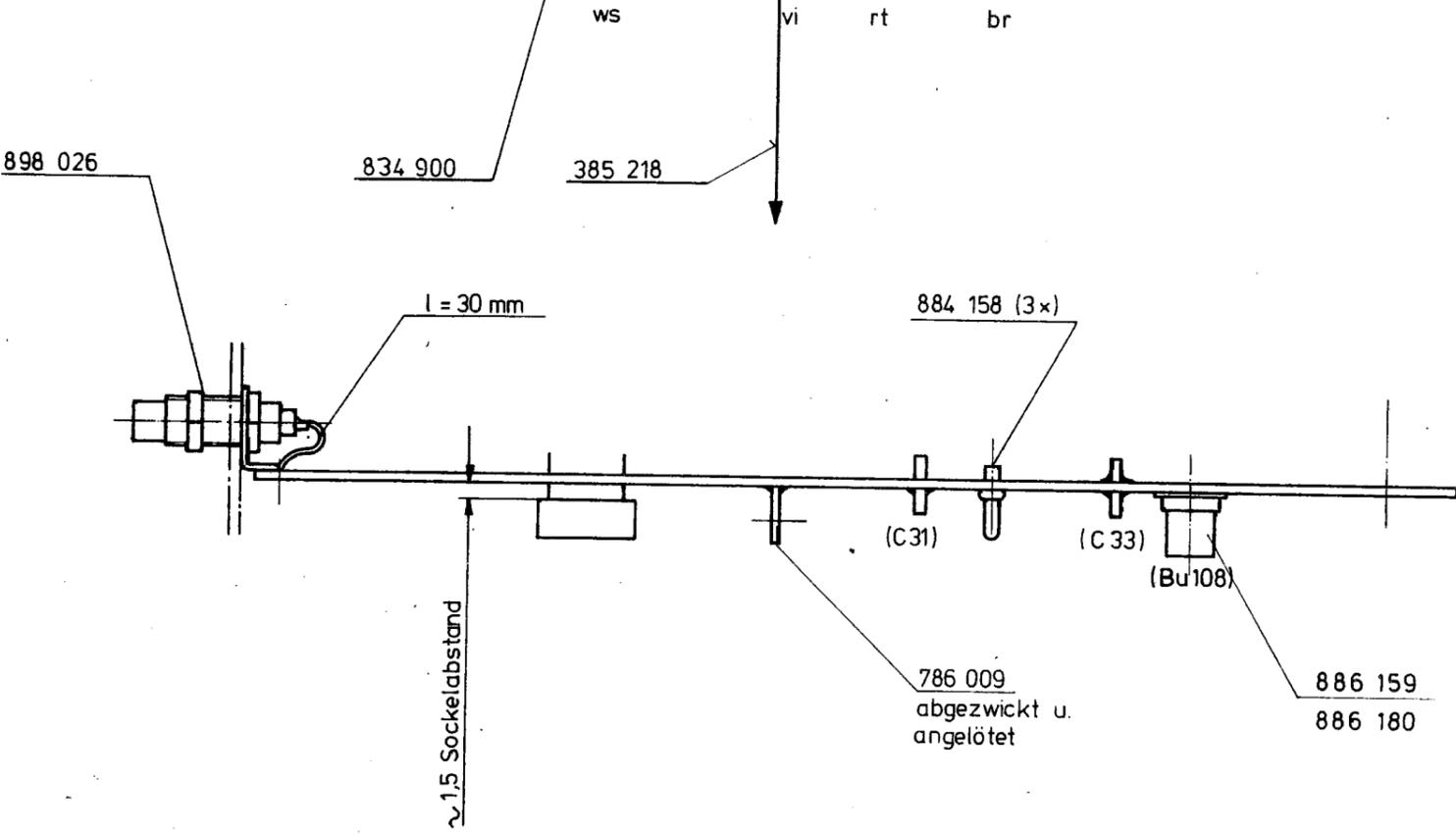
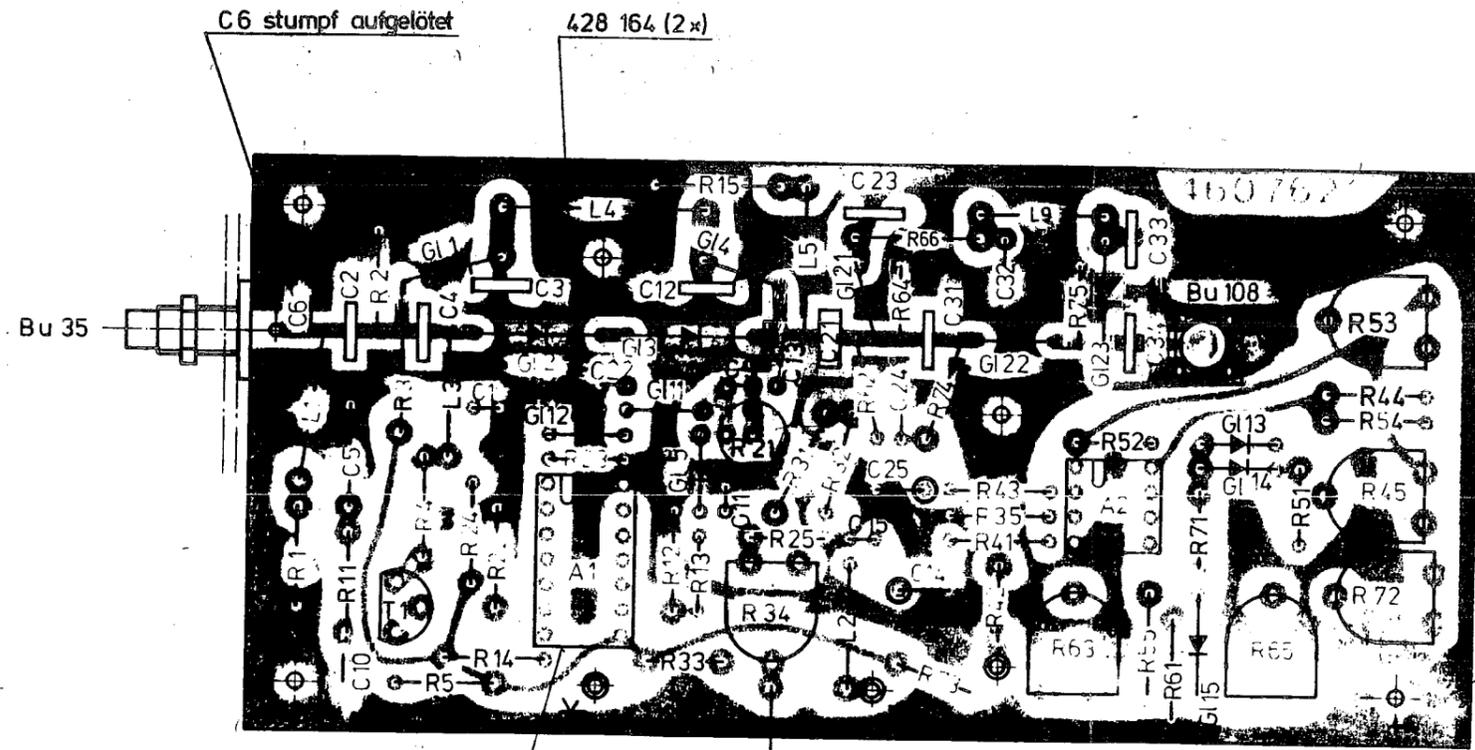
880 021 (3x) 834 900 460 761

✱ = Farbpunkt
 ○ = Kontrollmaß

verw. in: 375 205/216 / 226 | Gerät: 4010/4020
 Schaltplanpositionierung ≅ 230 015 S / 025 S / 360 761 Sa

10	Rente	Freimath	Maßstab	Schlumberger o/s
09		Jeranzler		
08				21
07				
06	Werkst.			Bestückte Leiterplatte
05				
04				360 761
03	802889 5.1278 Mo			
02	4028127 27.11.74 Eiler	Oberfläche	Datum	Name
01	4028111 24.10.74 Eiler		jez	1.2.74 LE P
Ausgabe	Andg. Mittg.	Datum	Name	
			gepr.	<i>Kel</i>
				Ersatz für

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



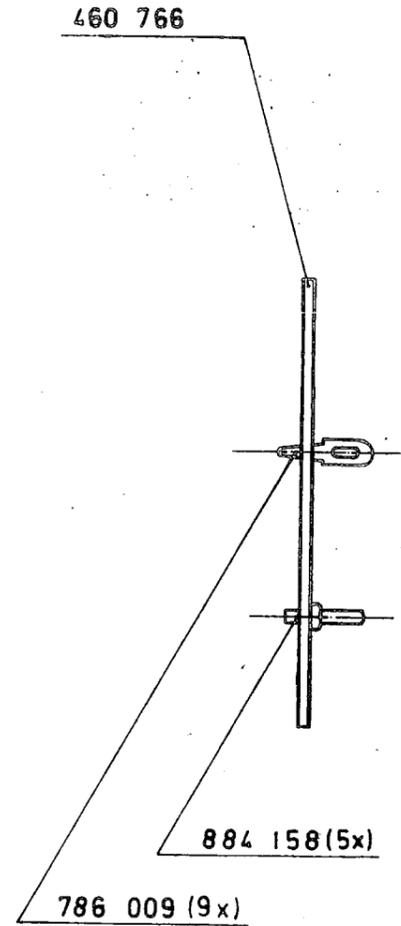
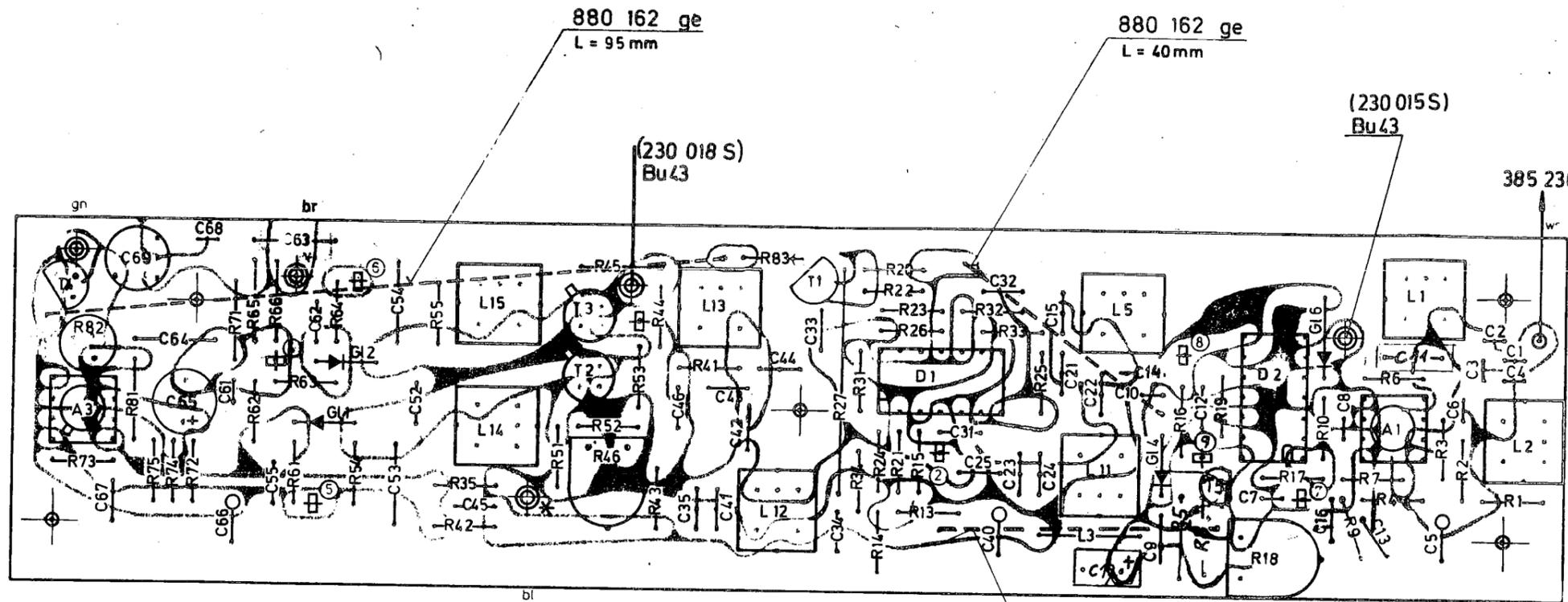
460 762

* = Farbpunkt
 O = Kontrollmaß

230 025 S
 Schaltplanpositionierung 230 015 S / 360 762 Sa

verwendet in: 375 205/216/226
 Gerät: 4010/4020

				Schlumberger o/s	
				2:1	
				Bestückte Leiterplatte	
12 9028 50 27778 Eier		11 002889 512 78 Mo		311,76 LE P	
Angg. Mittg. Name		Datei		Name	
				ke	
				360 762	



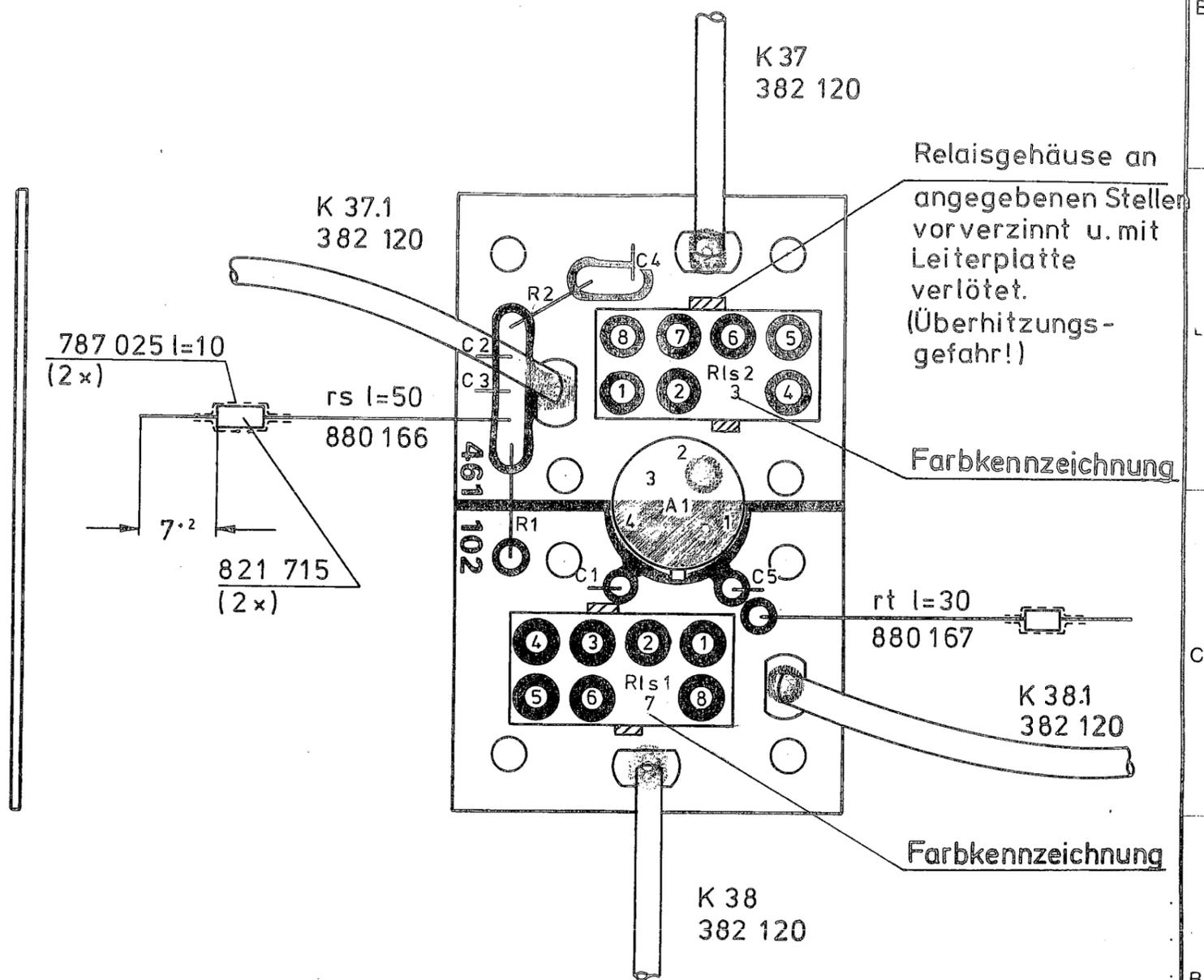
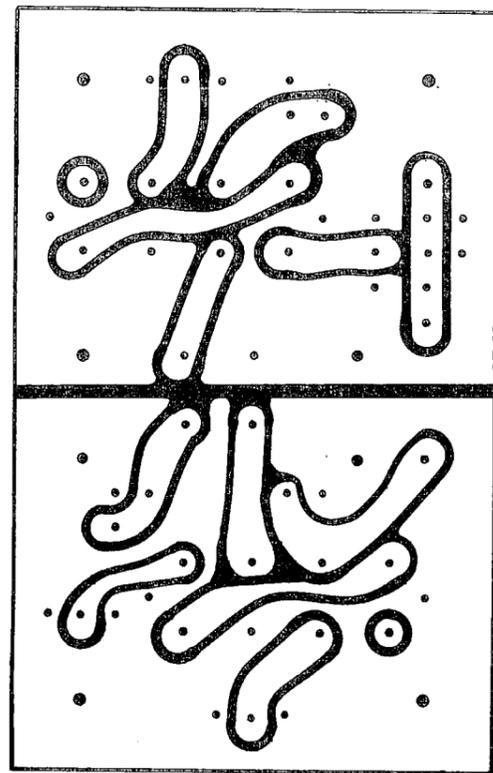
880 162 ge
L=40 mm

230 018 S / 230 025 S
Schaltplanpositionierung 230 015 S / 360 766 Sa

verwendet in: 375 216 / 375 205/225/462 Gerät 4010 / 4710A/4020

○ Kontrollmaß

15 9020.207.178 Ka		-0.2	1:1	Schlumberger a/s
14 802009 6 12.78 Mo				Bestückte, Leiterplatte
13 8020 71 3820/16				360 766
12 8020 94 437 Ka				
11 7020,26 1,5,77 Kr.		1975	14,5%	EILER
A. S. Amm.				



= Kontrollmaß

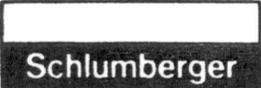
10								
09								
08								
07								
06								
05								
04								
03	0: 9028.41 28.6.79 Eiler							
02	7024.32							
01	8028.83 19.10.78 gl							
Ausgabel	Andg. Mittig	Datum	Name	Freigabe	Maßstab	Schlumberger o/s		
					2:1	Meßgerätekauz. Vertrieb GmbH		
						Bestückte Leiterplatte		
						361 102		
						Ersatz für		

verw. in: 375 223
Gerät : 4020

Schaltplanpositionierung \cong 230 025 S

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

An insulated pipe is inserted into the throughput coaxial to achieve a wide band, low impedance RF decoupling of the low reflection transmitter power to the rectifier diode. The fast rectification (provided by the AF feedback to the input capacity) permits demodulation of amplitude modulated signals. The symmetrical design of the amplifier suppresses temperature influences. The level-dependant negative feedback of the output amplifier compensates the lack of linearity of the rectifier diode under small RF level conditions.

	Function Description	229 006 F	Sheet 1/1
	Type: 4020/21/22	Diode Probe	Date 0979

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	<p>1. <u>Visual Inspection</u> Solder joints, screws, coaxial internal conductors etc. (screw on cover not earlier than 5.)</p>			R 3 → centre C 3 → Cmin		
Reflection test set e.g. ZWA 50 Ω precision termination	<p>2. <u>Reflection measurement</u> Test set-up and procedure see operating instructions. If the VSWR values can only be maintained to 500 MHz, probe to be stamped: Unsuitable for > 500 MHz, 4024, 4025^u</p>	Bu 10/11 Bu 10/11	100 ... 1000 MHz 100 ... 500 MHz 800 ... 960 MHz	without test obj. (merely 50Ω termin.) with probe +50 Ω termination with probe + 50 Ω termination	VSWR < 1,02 > 40 dB VSWR < 1,04 > 34 dB VSWR < 1,06 > 31 dB	1,0,.... dB 1,0,.... dB 1,0,.... dB
+ 14 V power supply precision DVM	<p>3. <u>Zero and Linearity at Low Power</u> + 14 V (± 4 mV) into DF 1 If +3 V not adjustable, compare DC values with service-able probe. Caution: If required, only replace G1 1, G12, G1 3 together (Trio or quartet with same diode characteristic)</p>	DF 2	DC for > 3,02 V remove R 7 = 1,5 MΩ	for R 3 [↑ 0 mW R 3 [↑ for 1 mW R 3 → for 0 mW	U max. > +3,02 V U min. < +2,98 V + 3,050 V 2,980 ... 3,020 V Note: The difference to +3 is proportional to the non-linearity up to approx. 10 W	.....ok V
RF generator e.g. FS 30 or equivalent (1 mW calibration socket of hp power meter 335 A also possible)	<p>4. <u>Limiting the LM 308</u> Apply +14 V via 10 kΩ across A 1/pin 3 or 30 W RF Accuracy requirement of 1 mW level is ± 0.2 dB</p>	DF 2	DC	-----	U = 11,3...11,8 V	11,.... V

Adjustment and Test Procedure

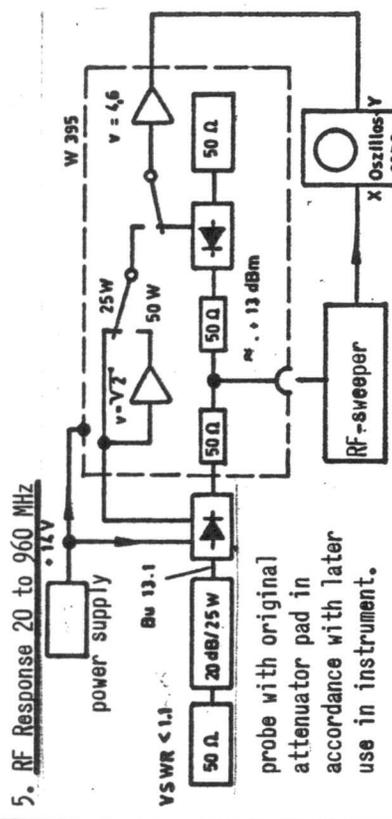
Issue	Alteration No.	Date	Name
03	9028.83	24.1.80	

4020 (4010) series from L 82851 Diode Probe

4901 from L 449

229 006 A
229 009 A

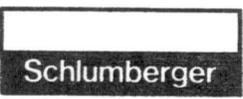
Schlumberger

REQUIRED TEST EQUIPMENT	PROCEDURE	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
<p>RF sweeper e.g. Wiltron 610 B (freq. limit < 1 dB)</p> <p>Oscilloscope</p> <p>Calibration aid W 395 with integral power splitter (hp 11667 A), 50 Ω termination (spinner 65 N50-0-11), reference probe with optimum frequency response special DC chopper</p> <p>DVM</p> <p>14 V power supply</p>	<p>5. RF Response 20 to 960 MHz</p>  <p>PROCEDURE</p> <p>This set-up permits precise comparison of the frequency response of a known probe with an unknown. Absolute calibration is of no use with this small RF level. The absolute deviation independent from frequency is compensated by a potentiometer control in W 395.</p> <p>The FET chopper provides alternate switching of both outputs at approx. 5 kHz, thus rendering the long-term drift of the complete test set-up unimportant.</p> <p>Since both probes have the same configuration, faulty measurements due to RF distortion, temperature fluctuations, VSWR error etc. are compensated by initial approximation. The mechanical balance of both probes to the power splitter (same N-N adapter) is important for measurement accuracy, the requirement being precise calibration of the reference probe in a special test set-up.</p> <p>The test set-up can be switched by the push/pull switch on the potentiometer 25 W (pressed) to 50 W (pulled) probe power rating.</p>	<p>20 to 960 MHz swept, unmodulated, sweep-time approx. 0.01 sec.</p>	<p>RF = approx. 13dBm (=+7 dBm on probe)</p> <p>W 395 pot C 3</p>	<p>$\Delta U \rightarrow$ Min. (wideband)</p> <p>20 to 200 MHz $\Delta U < 2,5$ mV ($\Delta P = 1\%$)</p> <p>200 to 500 MHz $\Delta U < 5$ mV ($\Delta P = 2\%$)</p> <p>800 to 960 MHz $\Delta U < 15$ mV ($\Delta P = 6\%$)</p>	

Adjustment and Test Procedure

4020 (4010) series from L 82851 Diode Probe
4901 from L 449

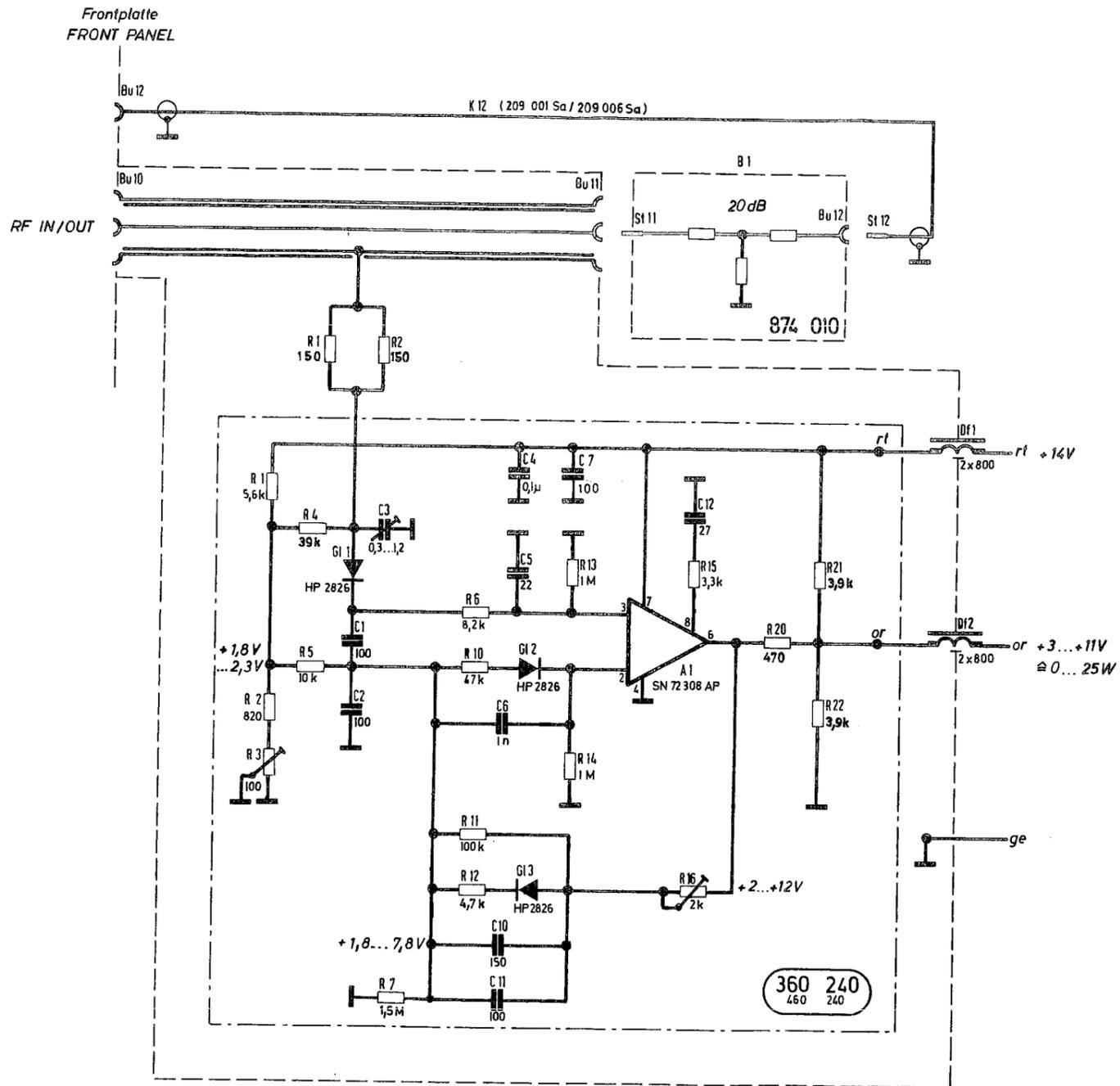
Issue	Alteration No.	Date	Name
03	9028, 93	24.1.80	



229 006 A
229 009 A

2/2
Sheet

Replacement for



sw BLACK	bl BLUE
br BROWN	vi VIOLET
rt RED	gr GREY
rs ROSE	ws WHITE
ge YELLOW	tr TRANSPARENT
gn GREEN	

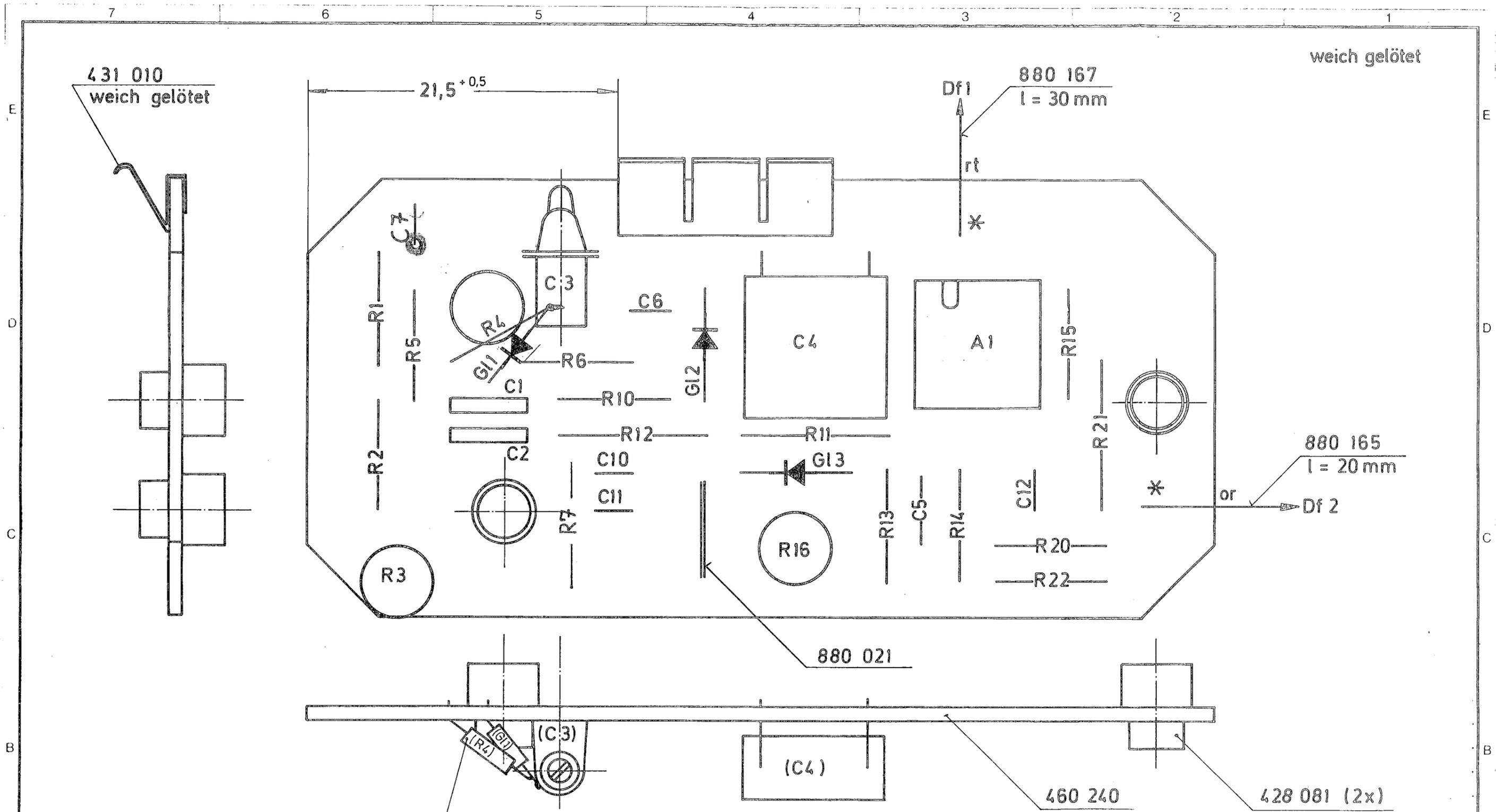
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03	7 028_68	27.10.77	Wn	gepr.	
Ausg.	Ä.-Mittlg.	Datum	Name	1976	Datum Name
ISS.	MODIF.	DATE	NAME		DATE NAME

Schlumberger o/s
 Meßgerätebau u. Vertrieb GmbH
 8 München 46

Diodenmeßkopf
 DIODE PROBE

229 006 S

Typ: 4010/4010A/4011/4011S/4710A



G11 und R4 so kurz
wie möglich angelötet

Kontrollmaß

10				Rohteil	Freimah toleranz	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46
09						4:1	
08							Bestückte Leiterplatte
07							
06				Werkstoff			360 240
05							
04	9028.14	1.2.77	Ke				Ersatz für
03	7049.15	10.8.77	Eiler	Oberfläche	1976	Datum	
02	6049.37	10.9.76	Ke		jez	16.6.	Name
01	6028.46	16.6.76	Eiler		bearb		EILER
Ausgabe	Ändg	Datum	Name		gepr		Ke

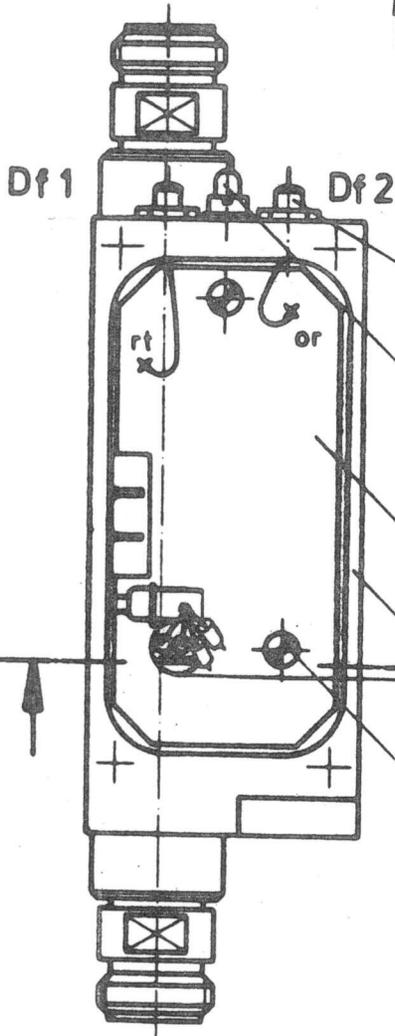
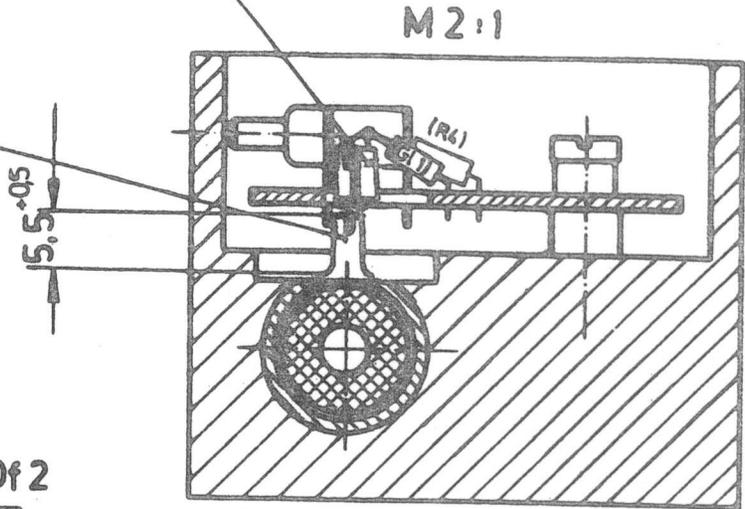
800 154 (2x) R1 / R2

weich gelötet

Widerstand und Diode so kurz wie möglich angelötet

786 009

abgewinkelt und gekürzt



816 044 (2x)

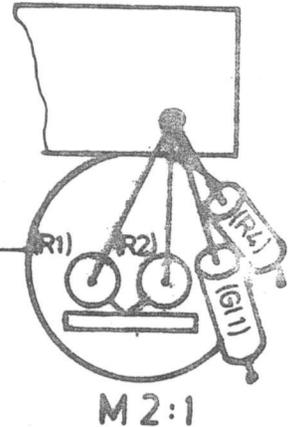
786 004
M3x4 DIN 84
701 143

J3.2 DIN 6797
706 105

360 240

300 430

M25x8 DIN 84
701 334
J2.7 DIN 67 97
706 106



2x

Schaltplanpositionierung $\hat{=}$ 229 006 S

Diese Zeichnung ist unser Eigentum. Verfertigung, unzulässige Vervielfältigung, Verbreitung an andere ist strafbar und schadenersatzpflichtig.

09				Rohrteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Meßgerätestbau u. Vertrieb GmbH 8 München 48
08					±0,2	1:1 (M 2:1)	
07				Werkstoff			Diodenmeßkopf Typ: 4010/4901
06							
05							300 435
04							
03	806.72	20.4.78	Eier				
02	8028.2	13.2.78	Mo				
01	4008.4	7.6.76	Eier	Oberfläche			
-	8028.2	16.3.78					
Aus.	Ändg.	Datum	Name		gk	Datum	Name
					boerb		

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

Due to the oscillator frequency, changing as a function of temperature the complete oscillator including the buffer amplifier and the temperature control circuit has to be accommodated in an oven ensuring constant temperature. Especially the crystal must be located thermally as close as possible to the heating transistor T 1 since this is the component most sensitive to temperatures in all the circuitry. The temperature resistances between the heater, sensor, outer wall, and the crystal must be calibrated so that a more or less balanced heat link results as far as this is possible with the relatively high thermal resistance of the crystal.

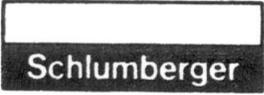
The NTC resistor R 1 is part of a resistance bridge upstream of a differential amplifier A 1 through which the heating current is controlled through T 1. The heating current is instantly corrected for even a slight change of temperature of R 1 in 360 770 to retrieve the balance of the resistance bridge. T 5 serves to limit the current when heating up (approx. 0.85 A). T 4 disables the heating current should no supply voltage be applied to A 1. T 1 would otherwise draw full current up to thermal death of the circuit.

The output signal of the oscillator is buffered through D 1 so that a change of load at both Bu 3 and Bu 2 influences the oscillator frequency by $<10^{-9}$. A back-acting location of phase at the oscillator due to external influences alters the oscillator frequency in inverse proportion to the operational Q of the oscillator.

Schlumberger	Function Description	214 022 F	Sheet 1/2
	Type: 4020/21/22	Crystal Oscillator	Date 0979

Coarse tuning (to a few tenths of a Hertz) is carried out by means of trimmer C 12, fine tuning (to a few hundredths of a Hertz) involving a change of varactor voltage (G1 1) is achieved by means of R 1 in 360 767. A change in frequency due to aging can be corrected up to 10 Hz using R 1. If optimum frequency stability is needed, it is recommended never to switch off the oscillator,

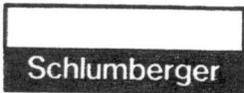
since renewed aging always occurs every time operation is interrupted, all the more so, the longer the crystal is out of circuit. In addition, shock and impact are to be avoided. The oscillator can be referenced to an external frequency through Bu 2 as long as this is not more than approx. 7 Hz off the oscillator frequency. In this case, the oscillator crystal acts as a filter.

	Function Description	214 022 F	Sheet 2/2
	Type : 4020/21/22	Crystal Oscillator	Date 0979

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Ammeter	<p>1. <u>Heating current</u> Apply ammeter between C1 and Df1 Disconnect red + 14V lead from C16, apply + 5V Insert red lead (apply + 14V)</p> <p>Leave ammeter on during the following measurements:</p> <p>2. <u>Oscillator</u> Set oscilloscope to DC coupled to D1/Pin1</p> <p>3. <u>Output buffer amplifier</u> Terminate Bu 3 with 50 Ω</p> <p>4. <u>Synchronizer buffer amplifier</u> 10 MHz; 0.6 V_{p-p} across Bu 2 Test at white lead/C 2</p>	Ammeter " MP 1 MP 1 R16/R20 Bu 4 Bu 3 C10/R10 C 2	DC DC approx. 10MHz DC approx. 10MHz approx. 10MHz approx. 10MHz 10 MHz "	----- ----- R 14 ----- ----- ----- ----- ----- -----	< 100 mA 800mA.....1000mA 2.5 V _{p-p} (min.) 2 V _{p-p} { Valley < +0.5 V Peak > +2.2 V 0.6 ... 0.9V _{p-p} TTL 0.8...1.5V _{p-p} { Valley < +0.5 V Peak > +2.2 V > 2.5 V _{p-p} (amplitude shiver can be ignored)	

Adjustment and Test Procedure

4020 (4010) series
10 MHz Crystal Oscillator



Issue	Alteration No.	Date	Name
		2.11.77	Urban
01	9028.5	8.1.79	Stuh

214 022 A

1/4 Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM	<p>5. <u>Varactor voltage</u> Turn R1 from stop to stop</p> <p>Set R1 to $U_{m\text{in}} + 1 \text{ V}$</p> <p>6. <u>Checking heating current</u> Heating current must be $< 750 \text{ mA}$ after 6 minutes running.</p>	Df 2	DC	-----	$\Delta V > 2 \text{ V}$ between +5.6 and +8.8V	...
Ammeter	<p>7. <u>Fine tuning frequency</u> Synchronize a 10MHz synthesizer (1Hz resolution) with a standard frequency (stability better than 10^{-8}). Use synthesizer output signal to externally trigger the oscilloscope. Connect oscilloscope to Bu 3 Fully turn up trimmer C 12 as for as it will go. Offset the synthesizer until the scope display freezes.</p>	Ammeter	DC	-----	750 mA	
Standard, oscilloscope, synthesizer	<p>$f_{\text{synth.}} - 10 \text{ MHz} \rightarrow 40 = \Delta f$</p>	Bu 3	10 MHz + Δf	C 12	$\Delta f > 40 \text{ Hz}$	

Adjustment and Test Procedure

4020 (4010) series
10 MHz Crystal Oscillator

Schlumberger

Issue	Alteration No.	Date	Name
		2.11.77	Urban

214 022 A

2/4
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DWM	Return C 12 as far as it will go and offset synthesizer to again freeze the oscilloscope display. 10 MHz - f _{synth.} > 40 Hz = Δf Return synthesizer to precisely 10MHz and more or less freeze the display using C12. R 1 to anti-clockwise stop R 1 to clockwise stop Set R 1 to freeze display If tuning range can not be established, change C 14 (tubular C). Reference value: approx. 1 pF/10Hz	Bu 3	10MHz - Δf	C 12	Δf > 40 Hz	
	8. <u>Synch. test</u> Apply synthesizer through distributor to Bu 2 and ext. Apply scope trigger input Apply 10MHz less 7 Hz to Bu 2/0.6 V p-p To test, reduce frequency until display rolls. Apply 10MHz + 7 Hz to Bu 2/0.6 V p-p By way of test, increase frequency until display rolls.	"	10MHz + Δf	C 12	Δf 0	
		"	10MHz - Δf	R 1	Δf > 8 Hz	
		"	10MHz + Δf	R 1	Δf > 8 Hz	
		"	10MHz + Δf	R 1	Δf → 0	
		MP 2	DC	---	< + 0.4 V	
		Bu 3	10 MHz - 7 Hz	---	Display must freeze (no shiver)	
		Bu 3	10 MHz + 7 Hz	---	Display must freeze (no shiver)	

Adjustment and Test Procedure

4020 (4010) series
10 MHz Crystal Oscillator

Schlumberger

Issue	Alteration No.	Date	Name
		2.11.77	Urban

214 022 A

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Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Temperature gauge Frequency Difference Meter (Tracor) and XY Recorder	<p>9. <u>Oven temperature</u> Apply temperature sensor directly alongside T 1 on mounting plate</p> <p>At R 4 = 2 kΩ At R 4 = 2.49 kΩ</p>	(T 1) (T 1)	---	---	73°C ± 4°C 67°C ± 4°C	
	<p>10. Reassemble the oscillator chassis, solder the supply leads an note date on the chassis Apply 8 weeks minimum aging time.</p>					
	<p>11. <u>Medium frequency stability</u> Apply voltage to test set up and the corresponding test object through a mains voltage stabilizer. Plot for 1 hour in range 10⁻⁸/cm at 10 min/cm chart speed. Take a 10% sample from production batch for a frequency stability record overnight (20 min/cm).</p>	Bu 3	---	---	Transient frequency peaks < ± 4.10 ⁻⁹	
	<p>12. <u>Final Test</u> Plot temperature coefficient against ΔT = 40°C in oven or cabinet.</p>	Bu 3	---	---	TK < 15.10 ⁻⁸ /40 K Aging < -5.10 ⁻⁹ /16 h	
	<p>13. After 3 hours turn-on time at room temperature turn R 1 to mid position</p>	Bu 3	10 MHz	C 12	10 MHz accuracy ±3.10 ⁻⁸	

Adjustment and Test Procedure

4020 (4010) series
10 MHz Crystal Oscillator

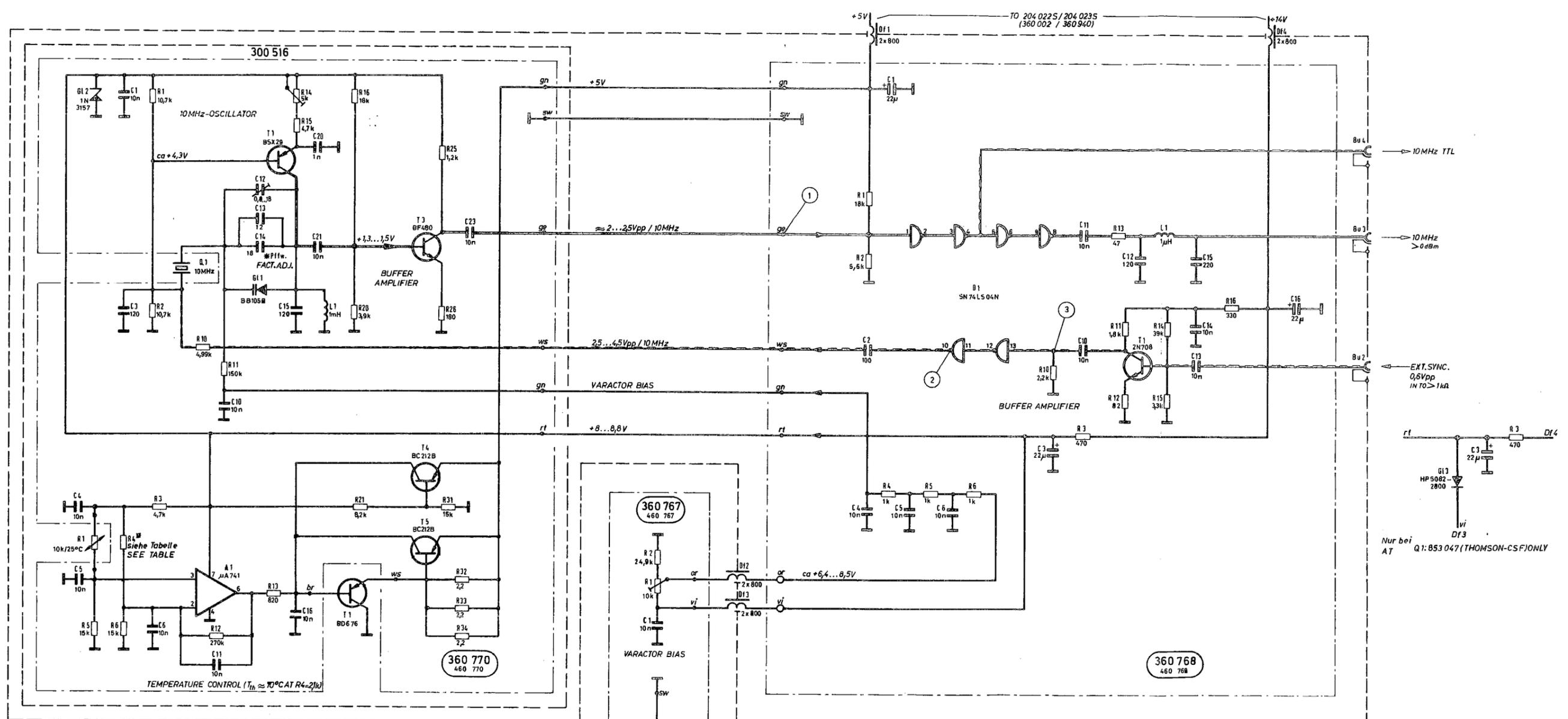
Schlumberger

Issue	Alteration No.	Date	Name
		8.4.73	X
01	9072.5	8.1.74	Ghub

214 022 A

4/4
Sheet

Replacement for



* bei Q1 = Metallquarz
Umkehrpunkt
INVERSION TEMP.

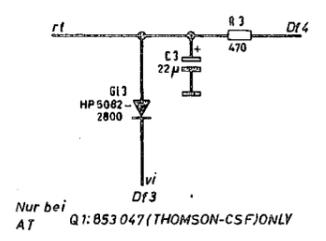
60 ... 61,5°C	R4
61,6 ... 65,0°C	2,67 k
65,1 ... 67,0°C	2,49 k
67,1 ... 68,5°C	2,21 k
68,6 ... 70,5°C	2,10 k

bei Q1 = Glasquarz
* R4 = 2,1 k

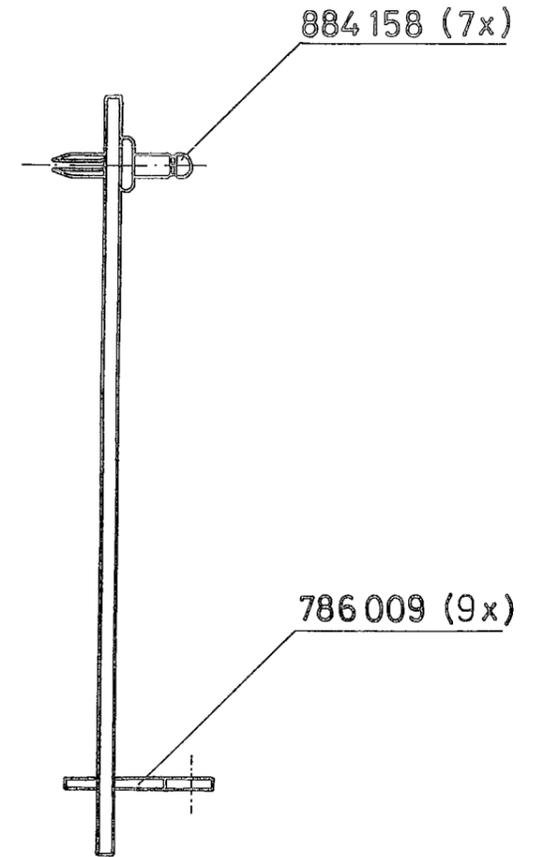
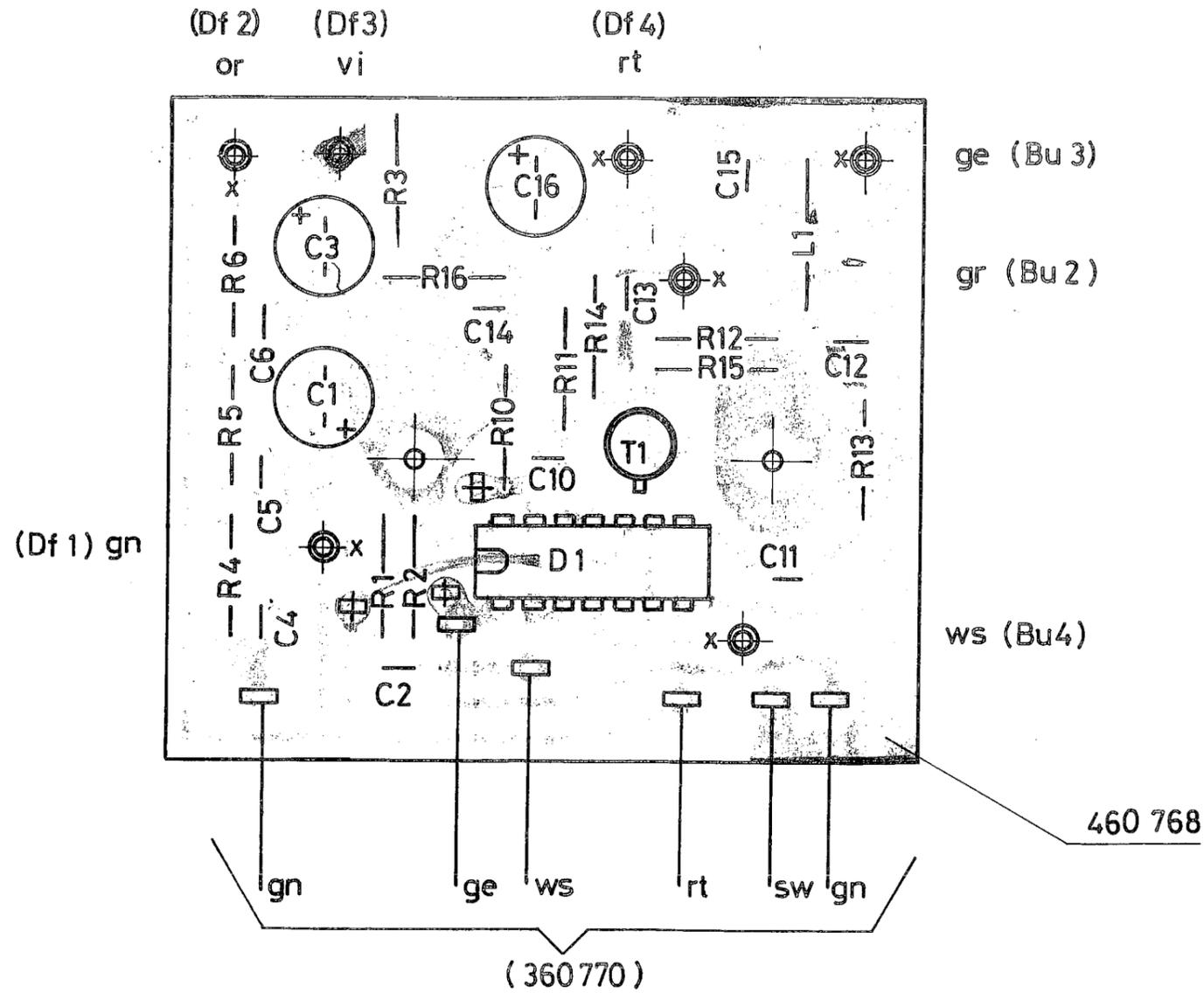
ab L 1728
Q1 = Glasquarz
R4 = 2,1 k

204 022S/204 023S
Bu23

10 3096.80	12.7.79	Mo	norm.			Schlumberger o/s Messgerätebau u. Vertrieb GmbH 8 München 48	10MHz CRYSTAL OSCILLATOR	214 022 S
09 3096.72	17.1.79	Eiler	gebr.	27.7.77					Typ: 4010/4011/4710
Ausg.	A-Mittg.	Datum	Name	Datum	Name			
ISS.	MODIF.	DATE	NAME	DATE	NAME			



weich gelötet



x = Farbpunkt

verwendet in: 375 222

Schaltplanpositionierung 214022S/360768 Sa

4020
Gerät: 4010/4011/4710

802890 8.12.78 Mo

8028.11 18.1.78 Eiler

7028.47 27.7.77

1977

26.7

Knobloch

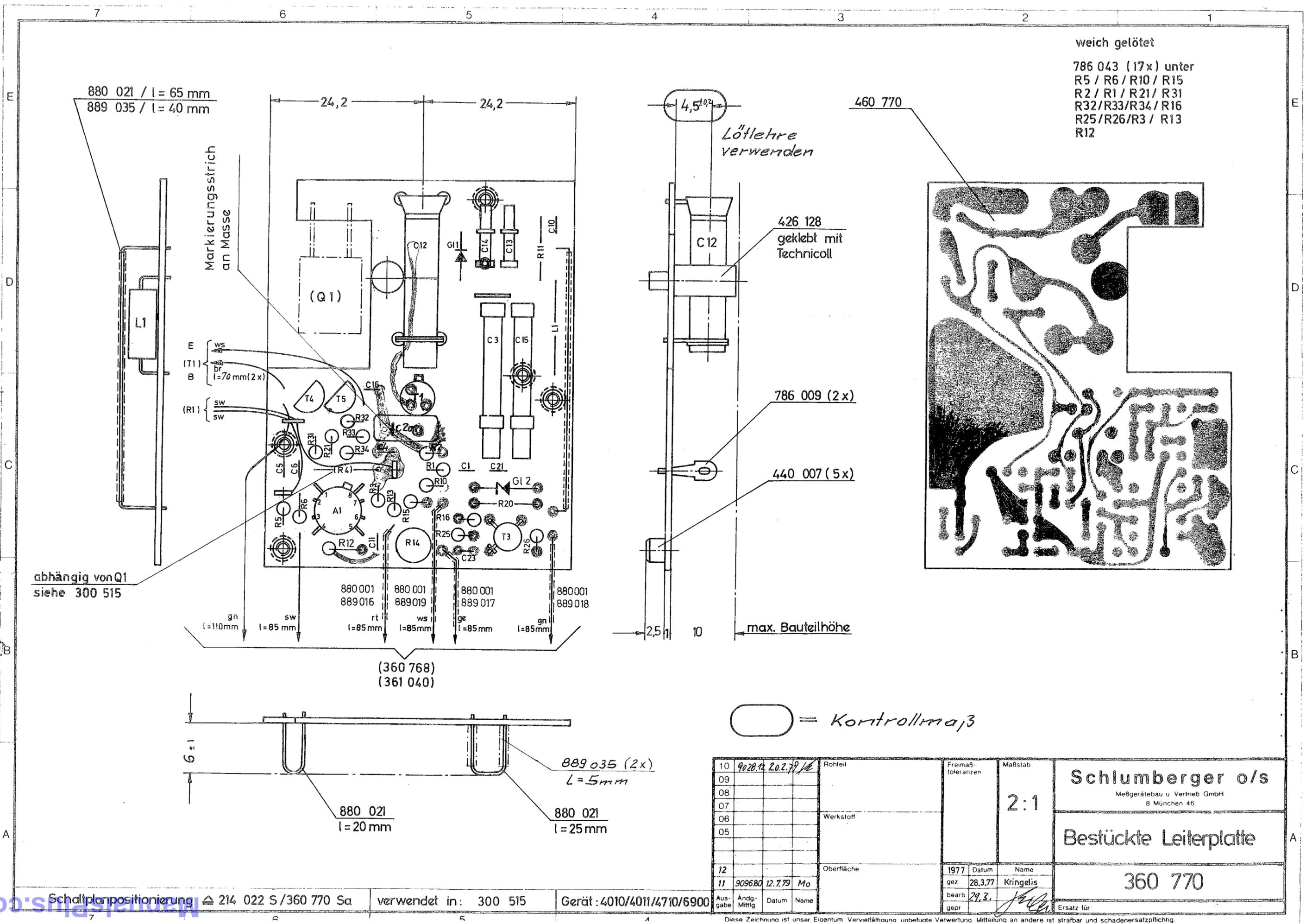
27.7

Schlumberger o/s

2:1

Bestückte Leiterplatte

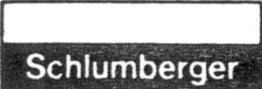
360 768



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

On AC power supply 4 primary windings of the mains transformer are connected to a voltage selector switch in accordance with the incoming mains voltage. The secondary voltages are rectified and stabilized by conventional means, current limiting being of the "fold back" type with heavily reduced maximum current under short circuit conditions. The unstabilized +8 V voltage serves to supply the external channel selector. The fusible wiresafeguard is located in the decade stage.

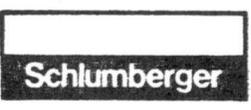
On external 12 V battery operation the battery voltage is made use of through a buffer diode directly as the upper voltage of the +5 V control circuit. For the +14 V control circuit the battery voltage is first of all elevated accordingly by means of a DC/DC converter. A resonant chopper circuit permits conversion of the battery voltage. An additional protective circuit ensures that the chopper transistors are not ruined by short circuit or non-oscillatory conditions.

	Function Description	204 022 F	Sheet 1/1
	Type : 4020/21/22	Power Supply	Date 0979

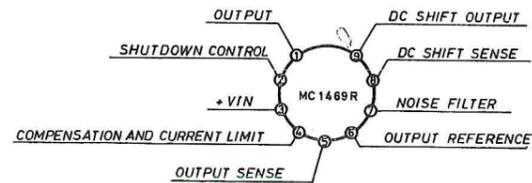
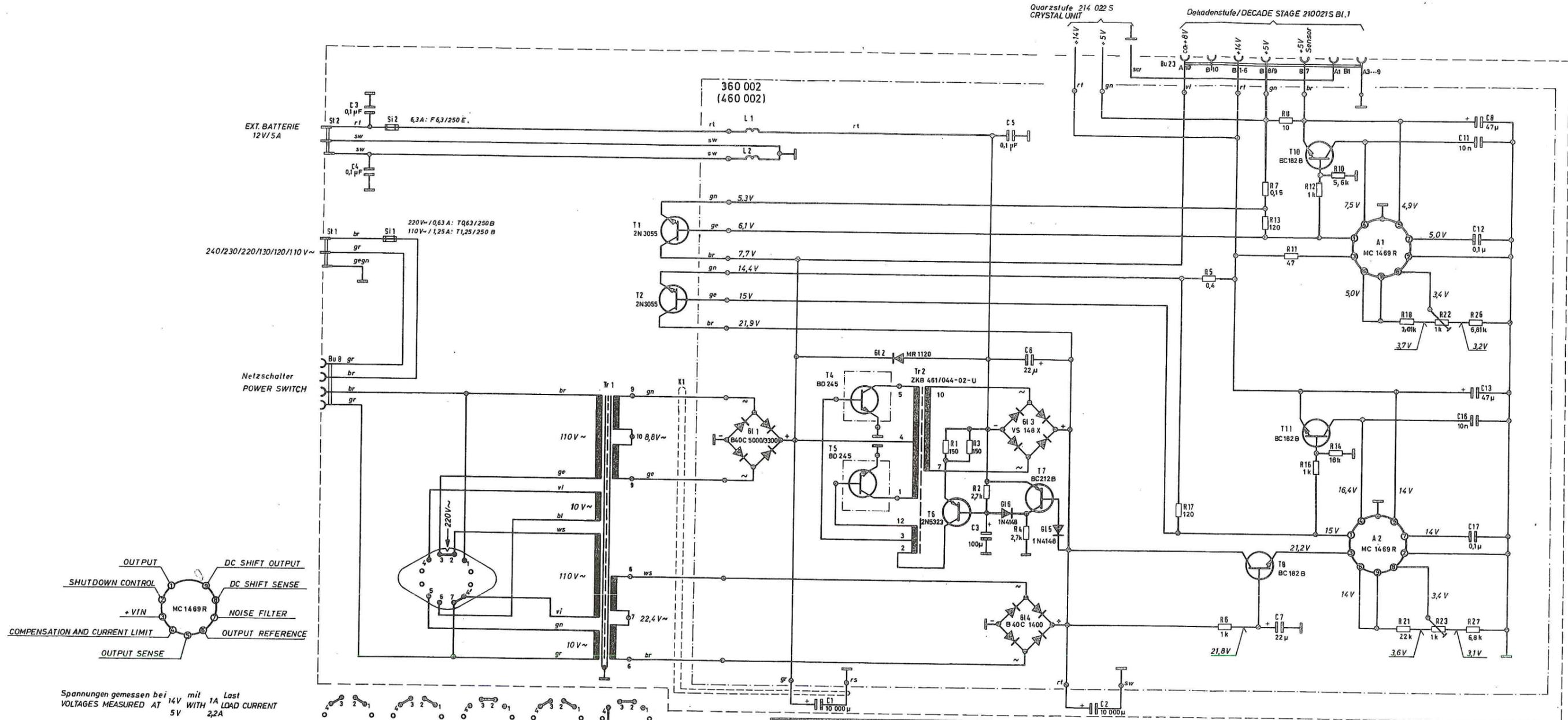
REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
6 A - Power Supply	<p><u>Mains Selector</u> Before changing Mains Selector position, mains must be switched off.</p> <p>Variable transformer and Mains Selector to 230 V 110 V 240 V 120 V 130 V 220 V</p> <p>Switch mains selector to the required position.</p> <p><u>DC - DC - Converter</u> Switch off mains + 10,8...15,6 V to St 2</p> <p><u>Current consumption hereby</u> ($V_{batt.} = 12 V$) (without crystal oscillator) Set load current exactly to 2,27 A at 5 V and simultaneously to 1 A at 14 V. Check start condition of the DC-converter: Switch power OFF → ON (Note: DC-Converter does not start oscillating, when the mains voltage is increased slowly)</p>	<p>Bu 23/A10 " " " " "</p> <p>Bu 23/B1 Bu 23/B8</p> <p>St 2 /Power Supply Bu 23/B1</p>	<p>— — — — — —</p> <p>— —</p> <p>— —</p>	<p>— — — — — —</p> <p>— —</p> <p>— —</p>	<p>+ 8 ... + 9 V " " " " "</p> <p>+ 14 V/ΔV < 20 mV + 5 V/ΔV < 30 mV</p> <p>+ 4,0 ... 4,7 A + 14 V</p>	<p>.....ok</p> <p>.....mV</p> <p>.....mV</p> <p>.....A</p>

Adjustment and Test Procedure

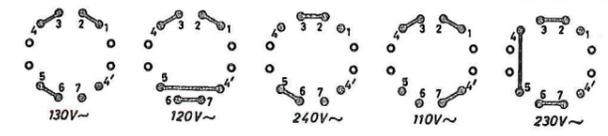
4020 (4010) series
POWER SUPPLY



Issue	Alteration No.	Date	Name
		8.10.73	Karmy
03	8028.44	1.4.78	K
02	6028.51	1.7.76	Kr.
04	5028.90	10.8.75	Kr.



Spannungen gemessen bei 14V mit 1A Last
 VOLTAGES MEASURED AT 14V WITH 1A LOAD CURRENT



sw BLACK	bl BLUE	09 8040.17	19.4.78	Wn	norm.			Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	Netzteil POWER SUPPLY	204 022 S Typ: 4010 A / 4011
br BROWN	vi VIOLET	08 8028.30	10.3.78	Wn	gepr.					
rt RED	gr GREY	07 7028.57	22.9.77	Mo	bearb.	14.4.75				
rs ROSE	ws WHITE									
go YELLOW	tr TRANSPARENT									
gn GREEN										

