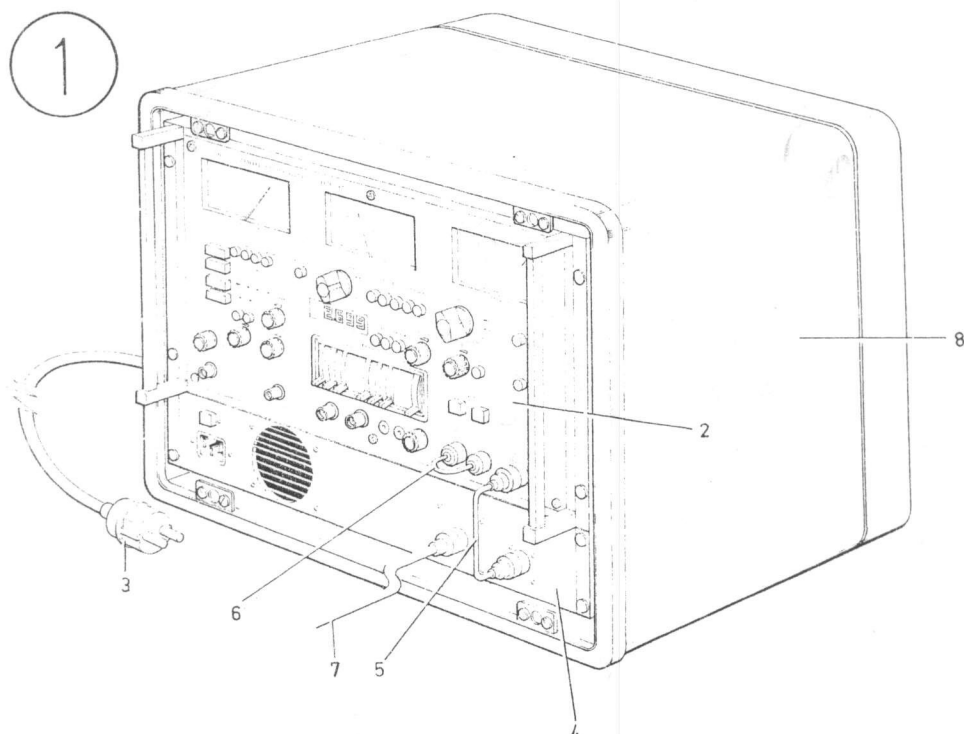




Pos	Ant	Förrådsbeteckning	Förrådsbenämning	Ursprungsbenämning	Ursprungs-beteckning
1	1	M3743-558011	Radioprovare 558 MT		
2	1	M3743-558010	.Radioprovare 558	Stabilock Funkgeräte Messplatz	SCHIN-STABILOCK 4011S
	1	M3743-558109	..Beskrivning handhav		
	1	M3743-558119	..Beskrivning service		
3	1	M1812-127020	..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:	1×10^{-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
Mätonoggrannhet:	$\pm (5 \% + 1,5 \% \text{ av fsk})$ vid 1 kHz
Distorsionsmeter:	
Frekvens:	1 kHz $\pm 1 \%$
Mätområde:	0...20 %
Inspänning:	10 mV...30 V
Mätonoggrannhet:	$\pm (12 \% + 1,5 \% \text{ av fsk}) + \text{egendis.}$
Egendistorsion:	< 0,5 %
SINAD-meter:	
Frekvens:	1 kHz $\pm 1 \%$
Mätområde:	6,12 och 20 dB markeringar
Inspänning:	10 mV...30 V
Mätonoggrannhet:	6 dB: ± 1 dB, 12 dB: ± 2 dB, 20 dB: ± 3 dB
CCITT-filter:	Inkopplingsbart vid deviations- eller LF-mätning
Sändarmätningar	
Ektmeter:	
Frekvensområde:	1,5...480 MHz
Mätområde:	0,2...100 W
Mätonoggrannhet:	$\pm (7 \% + 0,5 \% \text{ av fsk})$ 4...200 MHz. Frekvensgång < $\pm 3 \%$ inom 1,5...480 inom 1,5...480 MHz
Moduleringsmeter AM:	
Moduleringsfrekvens:	30 Hz...10 kHz
Mätområde:	0...100 %
Mätosäkerhet:	$\pm (5 \% + 1,5 \% \text{ av fsk})$ vid 1 kHz
Moduleringsmeter FM:	(även fasmodulering 0...5 rad)
Frekvensområde:	20...479,9999 MHz
Deviation:	0...20 kHz
Moduleringsfrekvens:	30 Hz...20 kHz
Mätosäkerhet:	$\pm (3 \% + 1,5 \% \text{ av fsk})$ vid 1 kHz
Stördeviation:	< 9 Hz (CCITT)
CCITT-filter:	Inkopplingsbart vid deviations- eller LF-mätning



DATA

Övrigt

Strömförsörjning:

Nät

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

Yttre batteri

+ 12 V/ca 4,5 A

I drift: + 5...+ 40° C

Dimensioner:

534 x 450 x 460 mm (inkl militär låda)

Vikt:

31 kg

SERVICE INSTRUCTIONS

STAGE LOCATIONS

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

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

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

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

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

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

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

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

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.

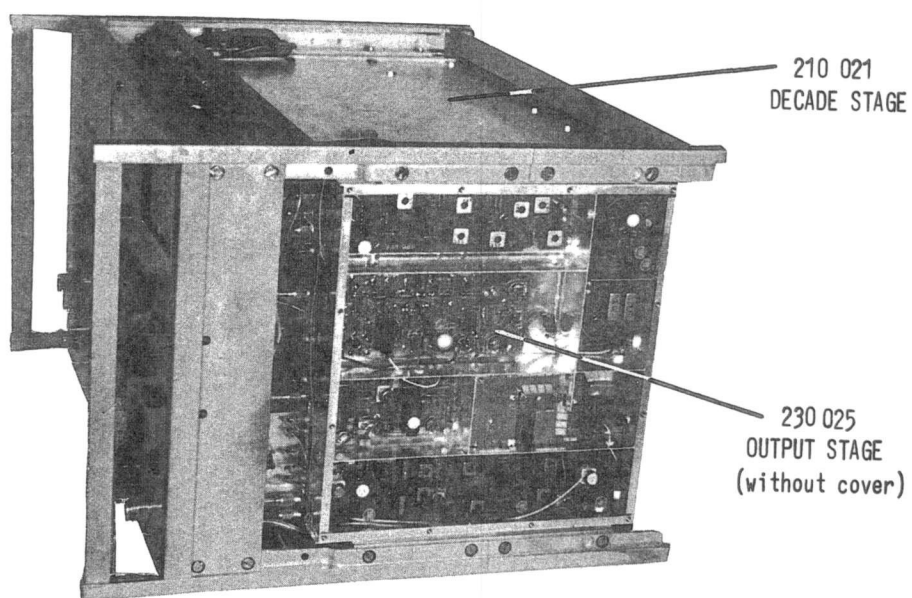
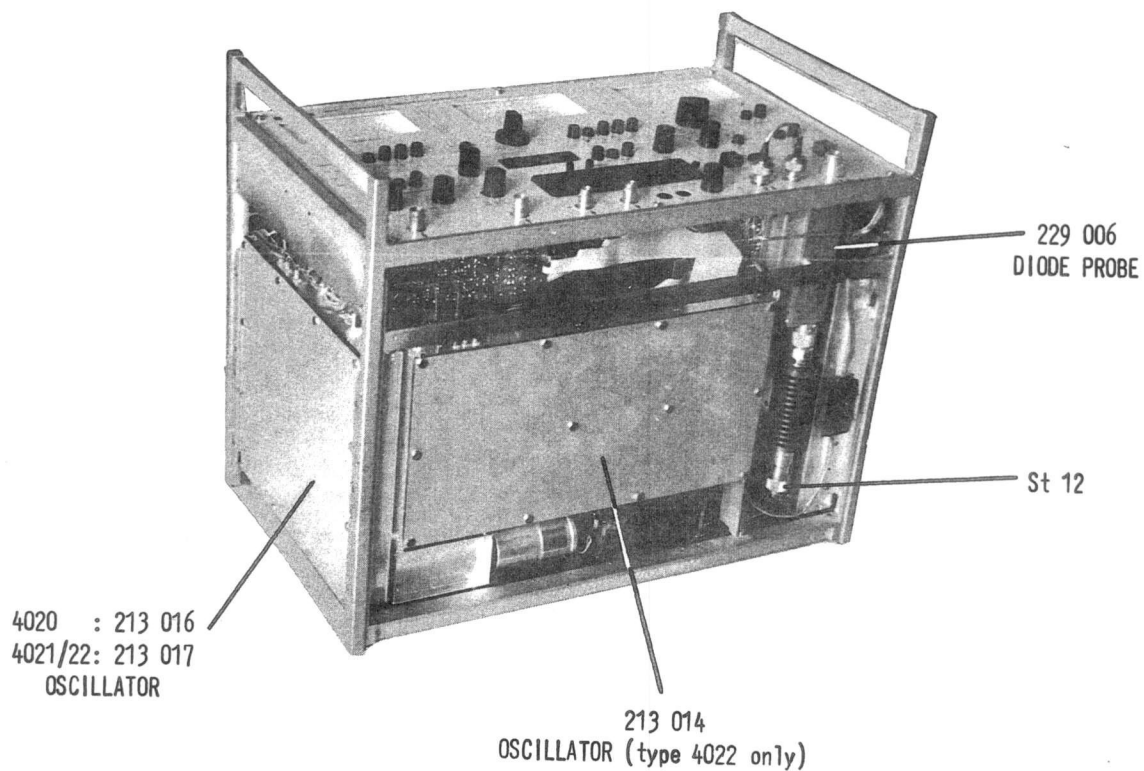
7. Crystal Stage 214 022 (fig. 3)

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

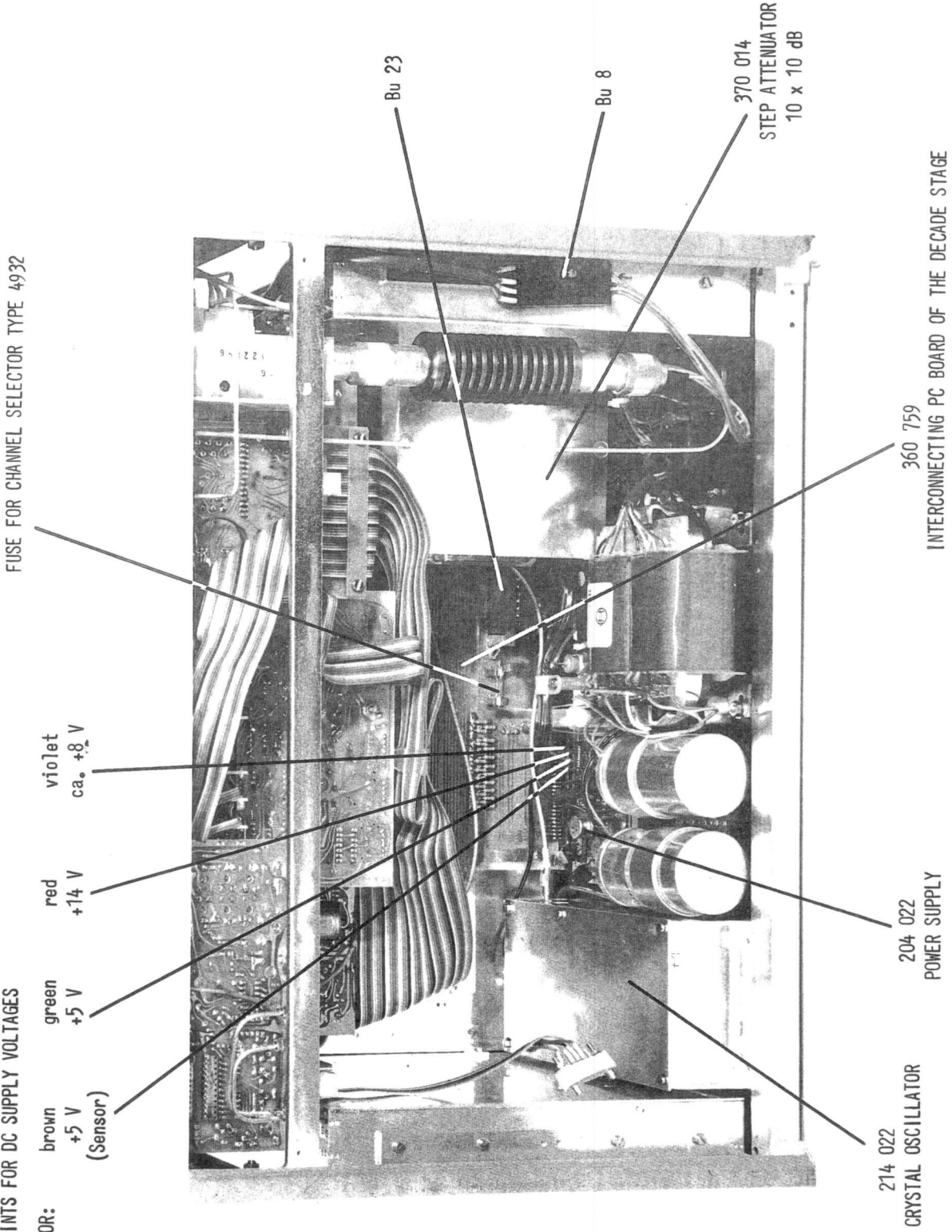


FIG. 3: BOTTOM VIEW

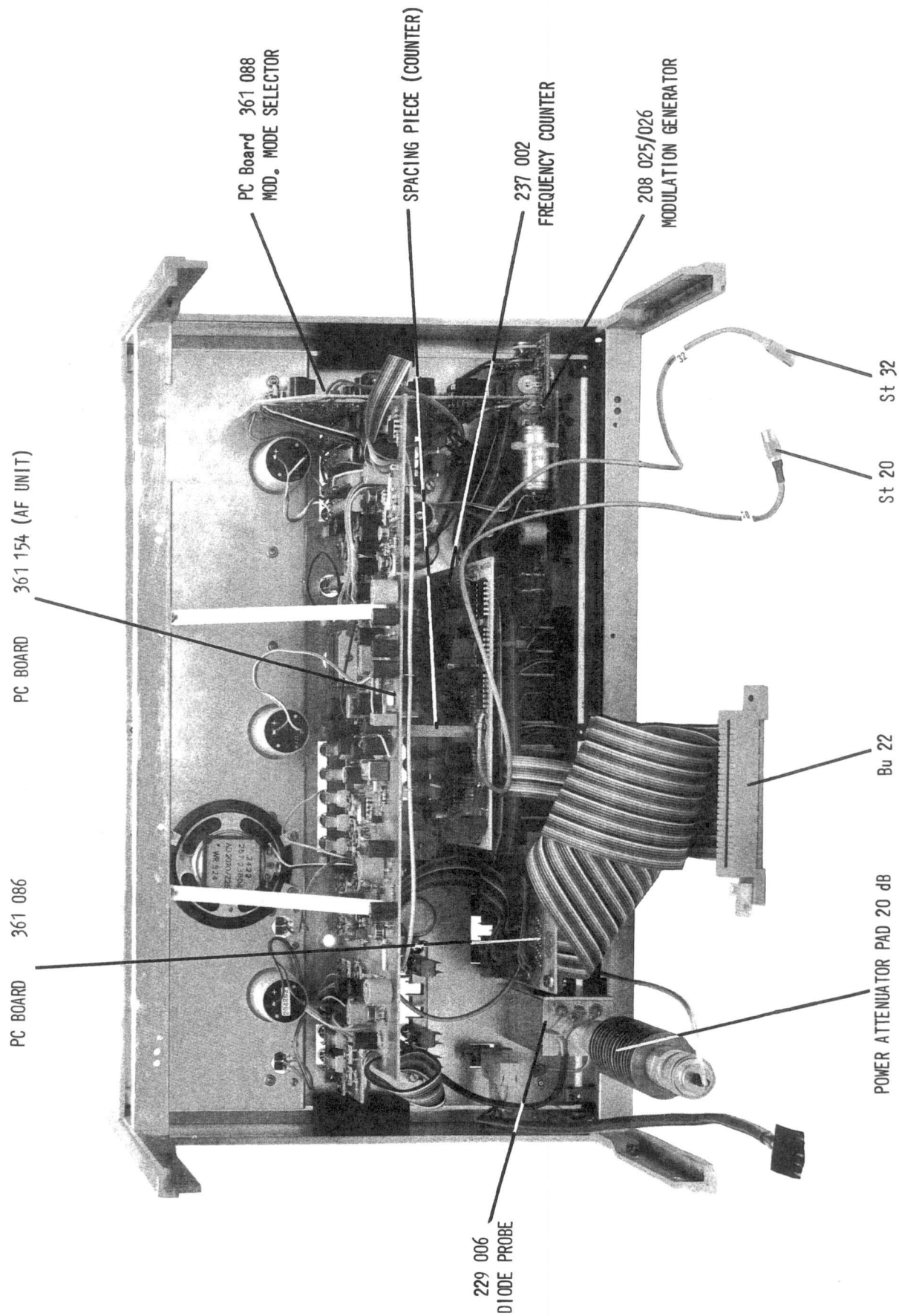


FIG. 4: CONTROL AND DISPLAY UNIT

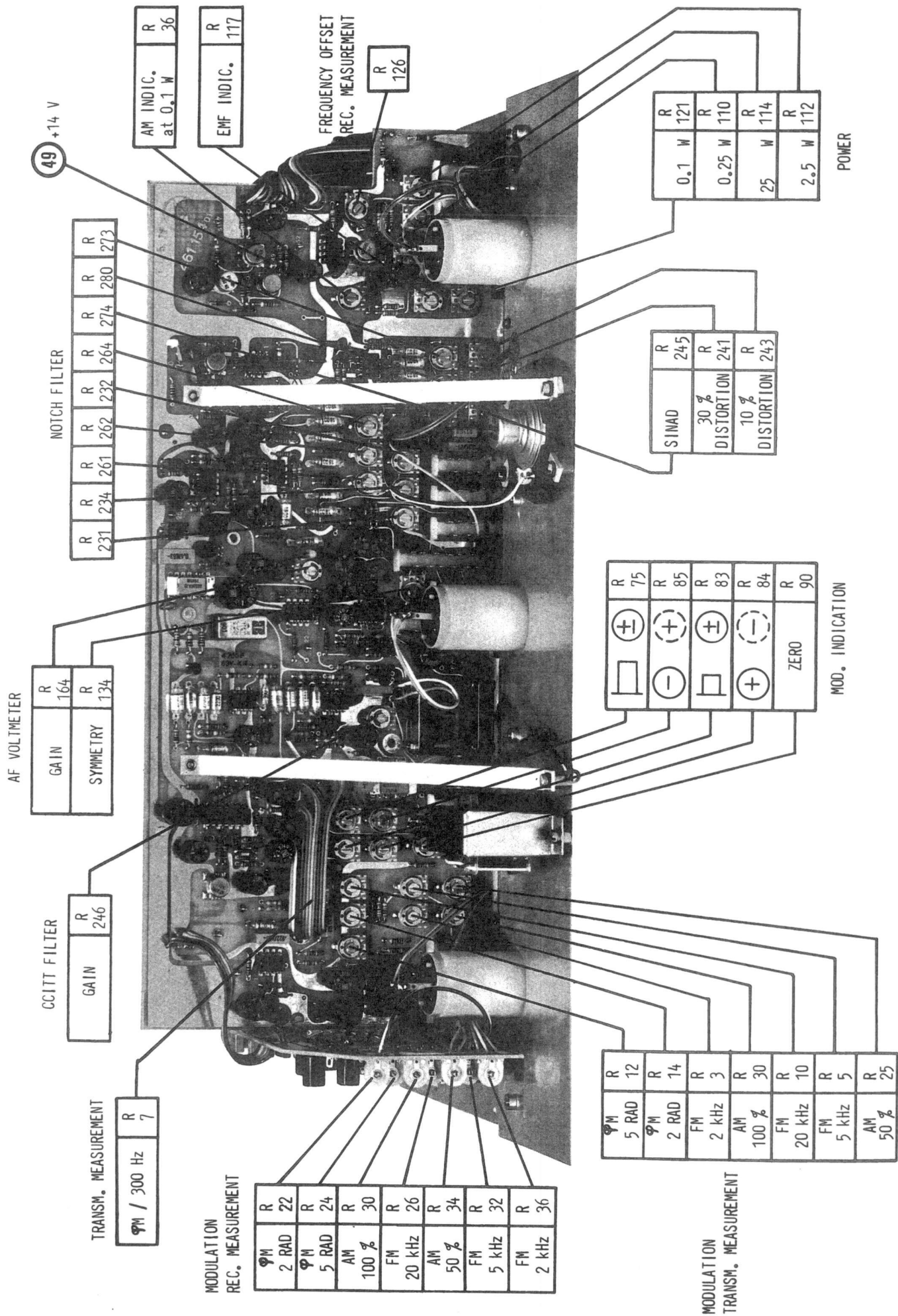


FIG. 5: ADJUSTMENT LOCATIONS OF THE CONTROL AND DISPLAY UNIT

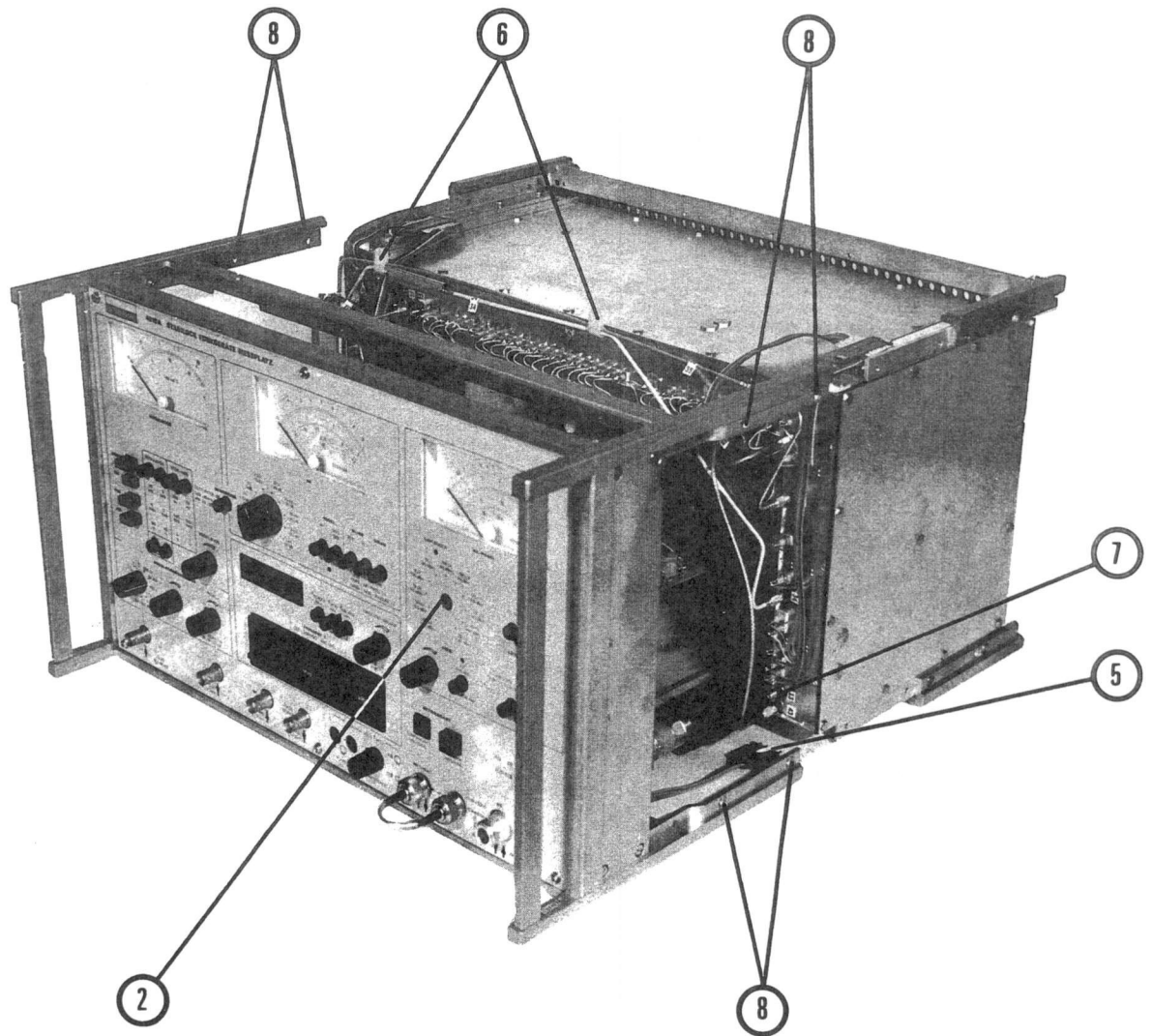


FIG. 6: REMOVING THE CONTROL AND DISPLAY UNIT

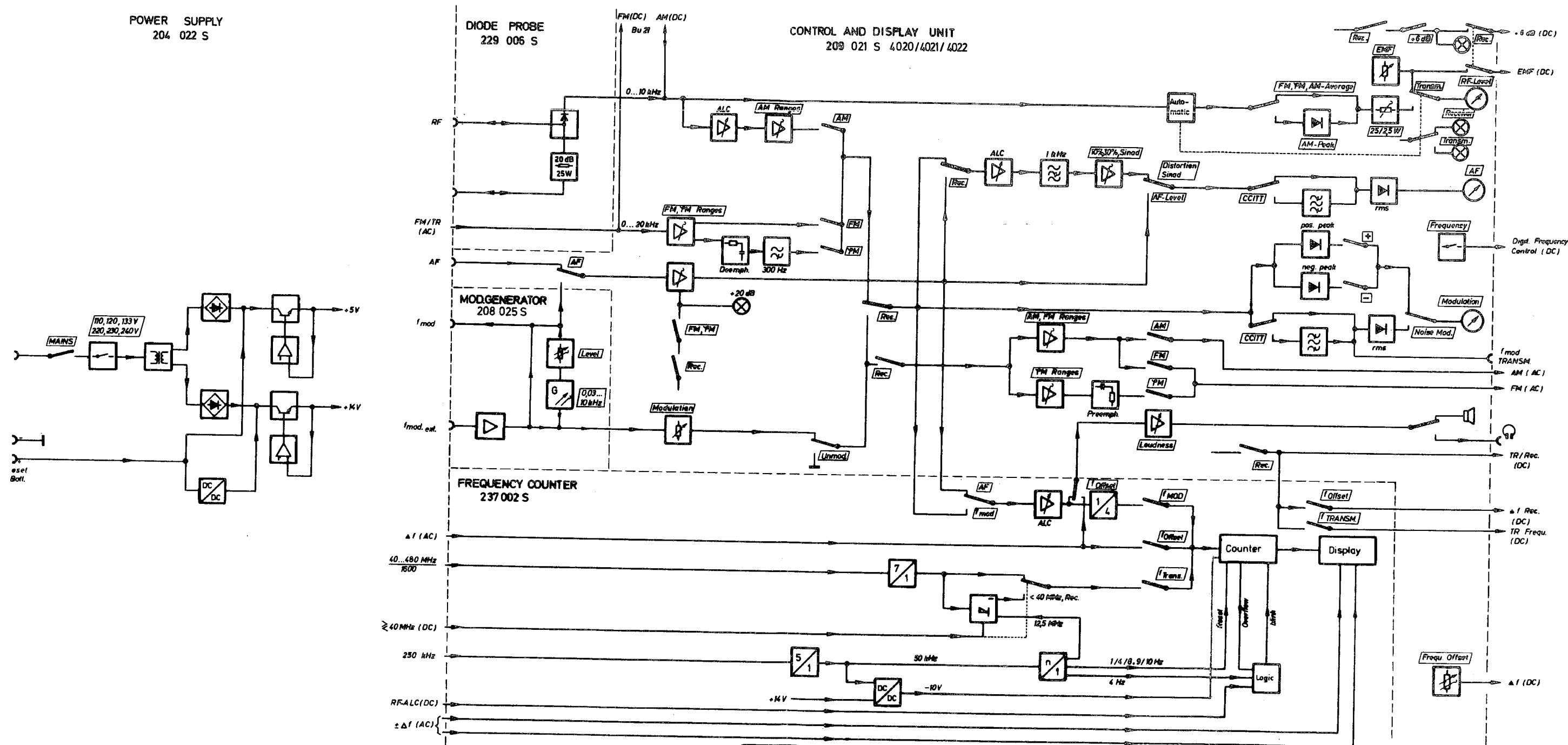
POWER SUPPLY
204 022 S

DIODE PROBE
229 006 S

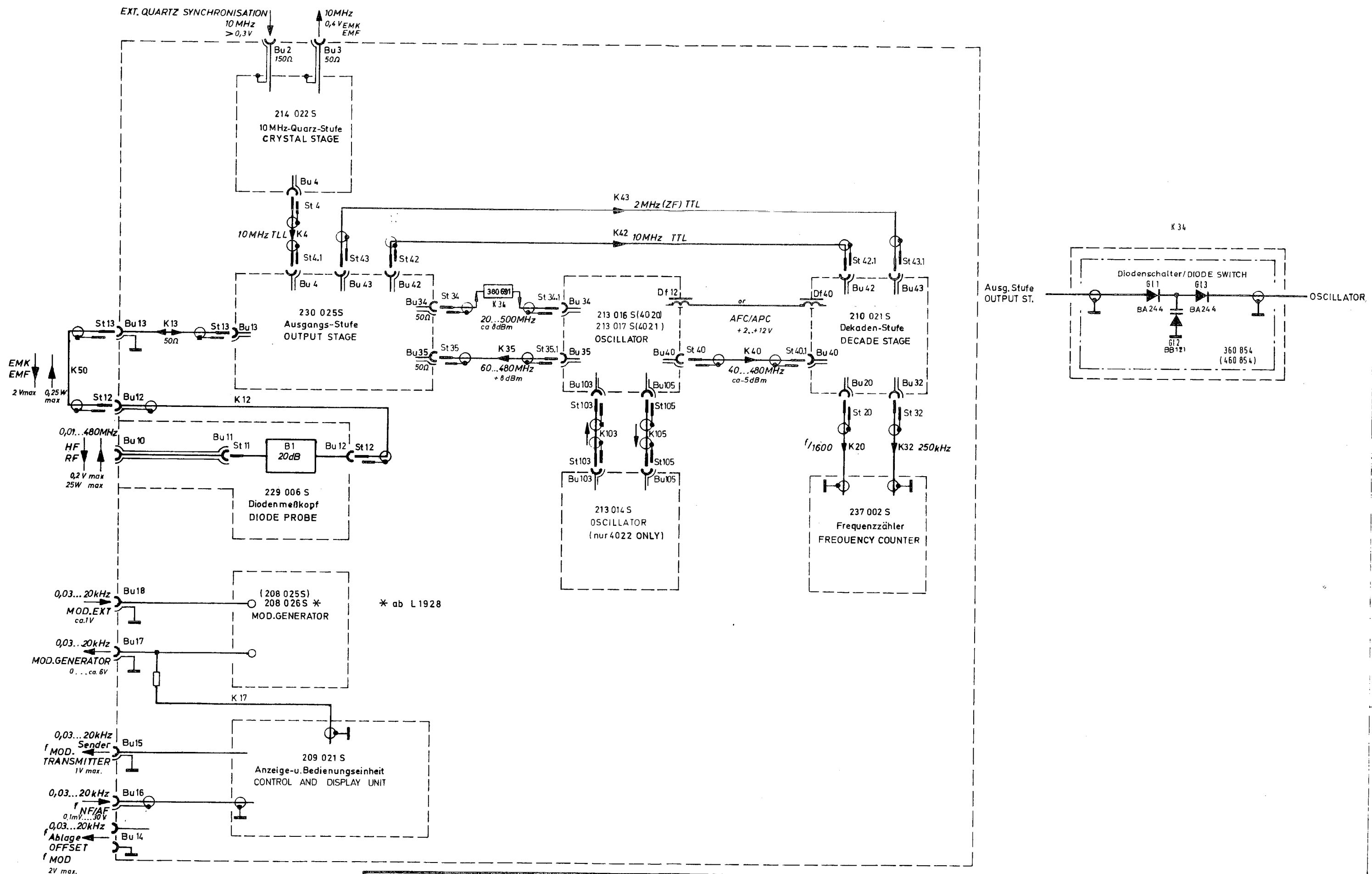
CONTROL AND DISPLAY UNIT
209 021 S 4020/4021/4022

MOD. GENERATOR
208 025 S

FREQUENCY COUNTER
237 002 S



BLACK	BLUE	norm	9095, 67	23,579	K ₁	23,579	K ₂	Schlumberger o/s	STABILOCK	102 820 B Bl. 2
BROWN	VIOLET	disp	9095, 67	23,579	K ₁	23,579	K ₂	Modortrieb u. Vertrieb GmbH	RADIOTELEPHONY TEST SET	Typ: 4020, 4021, 4022
RED	GREY	norm	9095, 67	23,579	K ₁	23,579	K ₂	8 München 60	BLOCK DIAGRAM	
ORANGE	WHITE	disp	9095, 67	23,579	K ₁	23,579	K ₂			
YELLOW	TRANSPARENT	norm	9095, 67	23,579	K ₁	23,579	K ₂			
GREEN		disp	9095, 67	23,579	K ₁	23,579	K ₂			



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	1/2	gepr.		
Ausg.	A-Mittlg.	Datum	Name	bearb.	10.10.78	G.e.
ISS	MODIF.	DATE	NAME			

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

STABILOCK
Funkgeräte Meßplatz
RADIOTELEPHONY TEST SET

201220S/201221S/201222S

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.

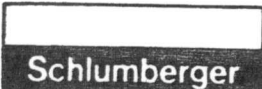
On transmitter measurements the DC provided by the diode probe is provided directly to the meter through the range selector (25 W/ 2, 5 W). Peak rectification is included only when indicating AM peak power. The switch-over to transmitter measurement mode can also be performed automatically, when the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

	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).

Schlumberger	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	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).					ok									
	1. <u>Rail Voltages 209 021 S Bl. 2 + 3</u>	(40) (49) Counter Bu 45/11 Bu 45/ 4	DC DC DC	— — —	+ 13,95 ...+14,05 V " " + 4,95...+ 5,05 V	VV									
	2. <u>Signal Lamps</u> <table><tr><th>Lamp</th><th>Depressed push buttons</th></tr><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 / φM + VOLTMETER Dist. 10%, 30%, SINAD</td></tr></table>	Lamp	Depressed push buttons	RECEIVER	RM (= RECEIVER MEASUREMENT)	TRANSMITTER	TM (= TRANSMITTER MEASUREMENT)	+ 6 dB	RM + TM + 6 dB + RM	+20 dB	RM + FM / φ M + VOLTMETER Dist. 10%, 30%, SINAD				Approx. same brightness, appropriate to depressed push buttons
Lamp	Depressed push buttons														
RECEIVER	RM (= RECEIVER MEASUREMENT)														
TRANSMITTER	TM (= TRANSMITTER MEASUREMENT)														
+ 6 dB	RM + TM + 6 dB + RM														
+20 dB	RM + FM / φ M + 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	Karmm

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

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
02	0028.29	27.3.1980	Morasch
01	9028:32	5.10.79	Karney

209 021 A

2/12
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	6. <u>Control Lines within the Control and Display Unit</u> Depressed push buttons: RM / f TRANSM. TM	40 PCB 088 3 PCB 088 K25/R171	DC " "	 = = =	 0 V L + 5 V H + 5 V H	
	7. <u>EMF Indicating Instrument</u> push button RM depressed	Bu 22/15 " " I ₃	DC " " =	EMF Control Knob on front panel: R 3 fully clockwise R 3 fully anti-clockwise set to → and R 117 →	+ 9,6 ... +10,5 V + 1,7 ... + 2,2 V + 9,50 ± 0,01 V full scale deflection ± 19 mV EMF	ok
	8. <u>FREQUENCY OFFSET Control on REC. MEASUREMENT</u> (Potentiometer R 5 on front panel) R 5 fully clockwise, pulled " " fully anti-clockwise, pressed " " " " All potentials must be symmetrical with respect to + 7 V Repeat test.	Bu 22/7 " " " "	DC " " " "	R 126 →	+ 10,7 V (= +7,3,7) + 3,3 V (= +7-3,7) + 6,85V (= +7-0,15) + 7,15V (= +7,0,15)	ok
	9. <u>Peak Responding Rectifier for Modulation Indication</u> push button RM, UNMOD, ⊕, 20 kHz depressed " " " " " " " " Mod. Generator 1 kHz, RM, FM, f MOD push button RM, FM, ⊕, 20 kHz " " " " " " " " 20 kHz pressed ⊕ ⊖ not pressed	15 I ₁ " " " " 15 I ₁ " " "	AC DC " 1 kHz = = = =	R 90 → " " " R 1 (Modulation) → R 85 → R 84 → R 83 → R 75 →	0 V I ₁ = 0 } alternating I ₁ = 0 } 1 V ± 1 mV I ₁ = full scale deflection " " " "	ok

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
02	0028.29	27.3.1980	Marasch
01	5028: 25	5.10.75	Harun

209 021 A

3/12
Sheet

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

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

209 021 A

4/12
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	12. <u>IM Modulation Ranges</u> 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 4020-push buttons actuated Level on St 59/pin 5 or Bu 22/2					
	FM, 20 kHz, ⊕ ⊖ " 5 kHz, " " " 2 kHz, " "	1 V 250 mV 200 mV	" " "	R 10 → R 5 → R 3 →	full scale deflection full scale deflection full scale deflection	ok
	φM, 5 Rad ⊕ ⊖ " 2 Rad " "	250 mV 100 mV	" "	R 12 → R 14 →	full scale deflection full scale deflection	
	φM, 5 Rad ⊕ ⊖ " " " " " " " " " " " " " " " "	75 mV 100 mV 250 mV 750 mV 2,5 V	" " " " "	0,3 kHz 0,4 kHz 1 kHz 3 kHz 10 kHz R 7 → — — —	4,8 ... 5,2 Rad 4,9 ... 5 Rad 4,9 ... 5 Rad 4,8 ... 5 Rad	ok

ManualsPlus.com

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	13. <u>FM Modulation Frequency Response</u>					
	4020 Settings (TM)					
	AF Generator level on St 59/5 or Bu 22/2					
	FM, Δf 2 kHz ⊕ ⊖	I 1	1 kHz	—	2 kHz	 kHz
	FM " ⊕ ⊖	"	20 kHz	—	1.85 ... 2 kHz	 kHz
	" " ⊕ ⊖	"	30 kHz	—	1.85 ... 2 kHz	 kHz
	" 20 kHz ⊕ ⊖	Bu 15	1 kHz	—	1 V ± 10 mV	 ok
	φM 5 Rad ⊕ ⊖	I 1	0.3 kHz	R 24 —	4.8 ... 5.2 Rad	
	" " ⊕ ⊖	"	0.4 kHz	—	4.9 ... 5 Rad	
	" " ⊕ ⊖	"	1 kHz	—	4.9 ... 5 Rad	
	" " ⊕ ⊖	"	3 kHz	—	4.9 ... 5 Rad	
	" " ⊕ ⊖	"	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

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	14. AF Millivoltmeter + CCITT					
	AF, UNMOD VOLT METER DVM 775 mV 775 mV 0 dB 0 dB Voltm. Range	1 2	1 kHz	R 164	0 dB	 mV
	AF, UNMOD 24,5 V 7,75 V 2,45 V 775 mV 245 mV 77,5 mV 24,5 mV 7,75 mV 2,45 mV 0,775 mV 40 dB Attenuation pad on the AF in put 30 dB 20 dB 10 dB 0 dB -10 dB -20 dB -30 dB -40 dB -50 dB -60 dB -20 dB -20 dB 0 dB 0 dB	1 2	1 kHz		0 dB ± 0,4 dB	 dB
	AF, RM, FM AF, RM, FM AF, RM, FM AF, TM, FM 775 mV " " " -20 dB -20 dB 0 dB 0 dB	"	"	" + 20 dB	Indication 0 dB ± 0,4 dB	 dB
	AF, TM, FM 245 mV " " " -10 dB 0 dB 0 dB 0 dB 0 dB	"	0,03 kHz	"	-0,5 dB related to	 dB
	AF, RM, UNMOD, CCITT 775 mV " " " 0 dB 0 dB 0 dB 0 dB 0 dB -10 dB	"	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 ... -20 dB	 dB
		"	0,4 kHz		-5,3 ... -7,3 dB	 dB
		"	1 kHz		0 ... +2 dB	 dB
		"	3 kHz		-6 ... -8 dB	 dB
		"	4 kHz		-13 ... -17 dB	 dB

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

209 021 A

7/12
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
AF Analyser with a Beat Frequency Oscillator e.g. Radiometer FRA 3	Balance Adjustment AF, RM, UNMOD (without CCITT)	I 2	1 kHz	R 134	> 60 dB	 dB
	Readjust R 164 775 mV at voltmeter input balance $\longleftrightarrow$ 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 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 $\Delta V \leq 10$ mV	 mV mV
Two Tone AF Gen. e.g. AF 40 S	Notchfilter pressed: fMOD + fTRANSM	(27) (C 100)	6 kHz	Adjust sensitivity of analyser to $\longrightarrow$ + 10 dBm Indication		
	1) Adjust 3 potentiometers at a time alternatively in small increments for every attenuation pole frequency.	" " "	1000 $\pm$ 1 Hz 985 $\pm$ 1 Hz 1010 $\pm$ 1 Hz	R 261, 264, 262, R 231, 232, 234, R 273, 274, 280	< - 75 dBm " "	ok
	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	dBmdBmok
	Adjusting Ranges	I 2 " "	1 + 3 kHz " "	R 241 R 245 R 243	25 % - 12 dB 7 %	ok
		"	1 kHz	—	< 0,6 %	

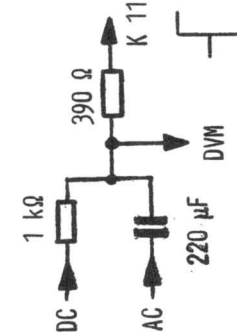
Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

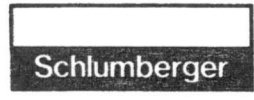
Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

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

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT



Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

[illegible]

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

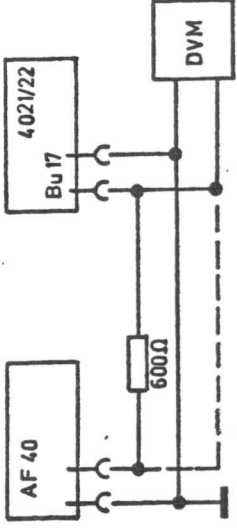
Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch
-	9028.33	5.10.79	Harm

209 021 A

10/12
Sheet

Replacement for

Schlumberger

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
30 kHz Distortion Meter	17. <u>Modulation Generator Output</u> RM					
	Check output level and distortion with the own millivoltmeter			Set level to		
		1 2	1 kHz	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
4021/22	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

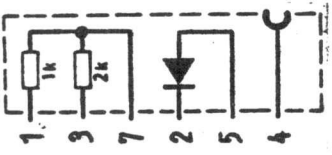
4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
01	0028, 29	27.3.1980	Morasch
	0028, 29	5.10.78	Warms

209 021 A

11/12
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	18. <u>Loudspeaker</u> Pull and turn up control knob for loudness until sound overdriving becomes audible. Press knob, but do not turn.	LS 1 Bu 14	1 kHz 1 kHz	— —	sufficient loudness > 2 V	 ok
	19. <u>RM / TM Automatic</u> Test plug  RM + TM not pressed Appr. 100 mV at 20 kHz FM	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

209 021 A

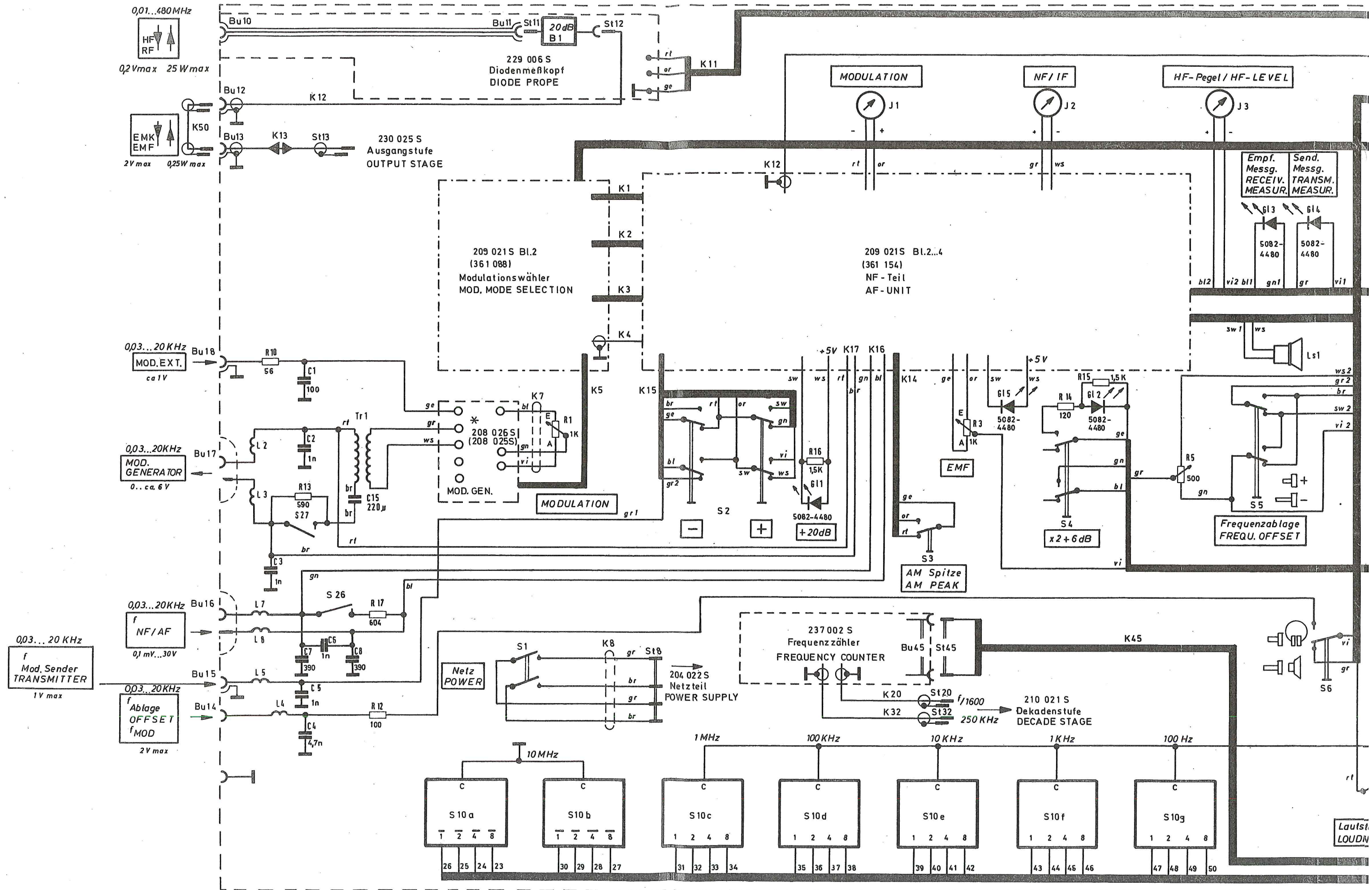
12/12
Sheet

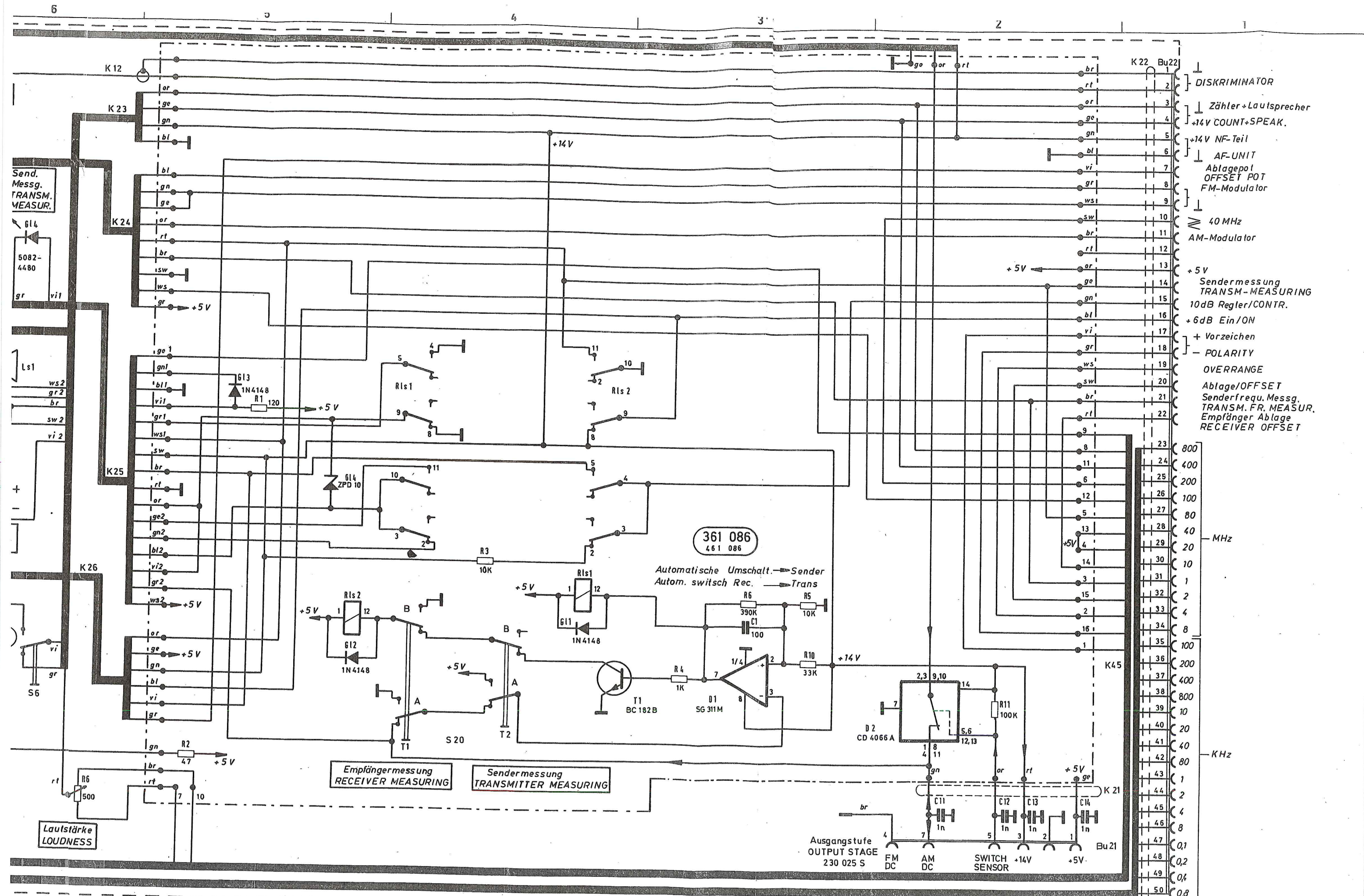
0028-29

27.3.1980

Morasch

Replacement for





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				bearb.	12.1.79	Ge.
rs ROSE	ws WHITE	Ausg.	Ä.-Mittlg.	Datum	Name	Datum	Name
ge YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME	DATE	NAME

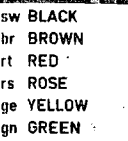
Schlumberger o/s
Meßgerätebau u. Vertrieb GmbH
8 München 46

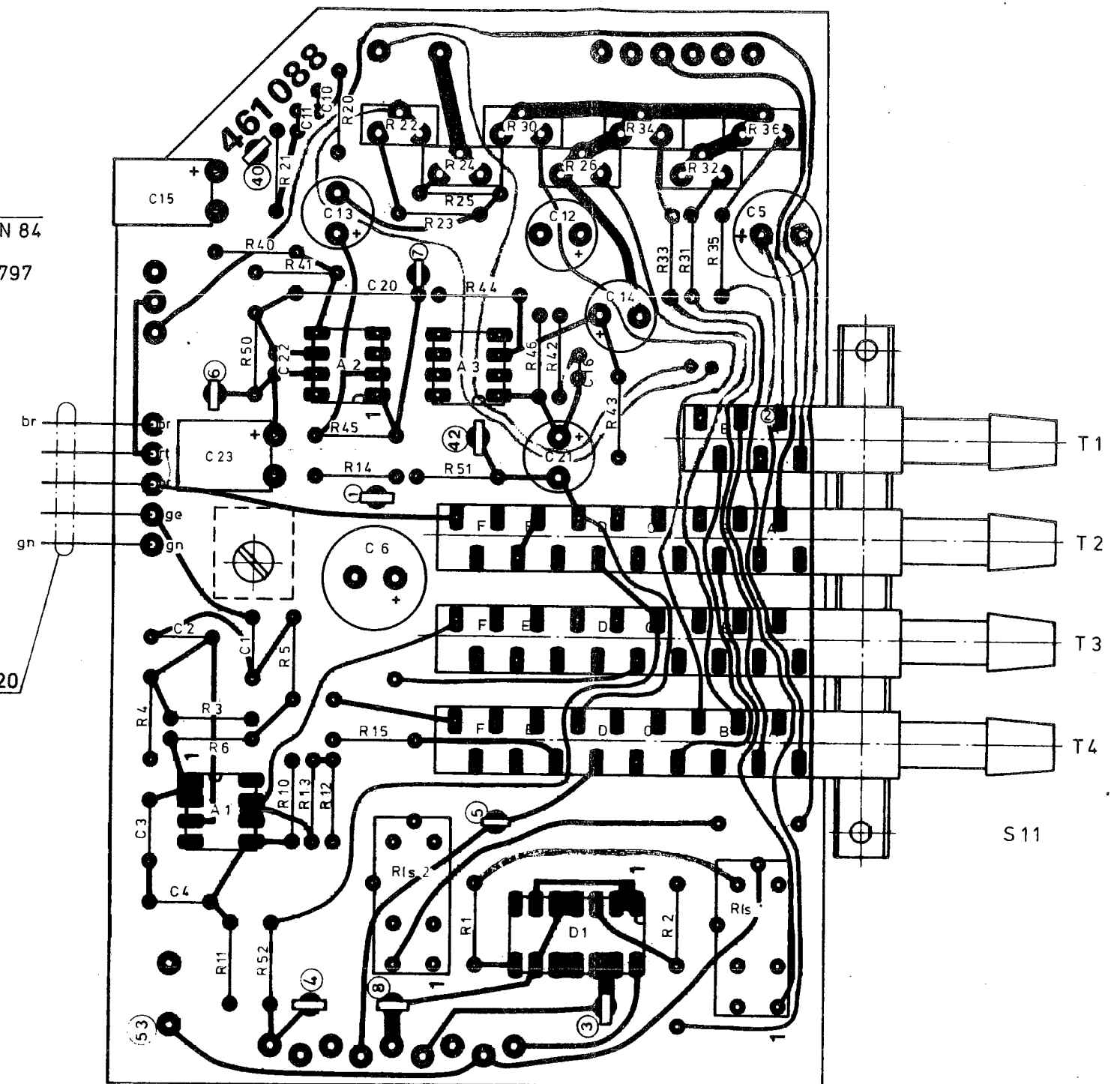
CONTROL AND DISPLAY
UNIT

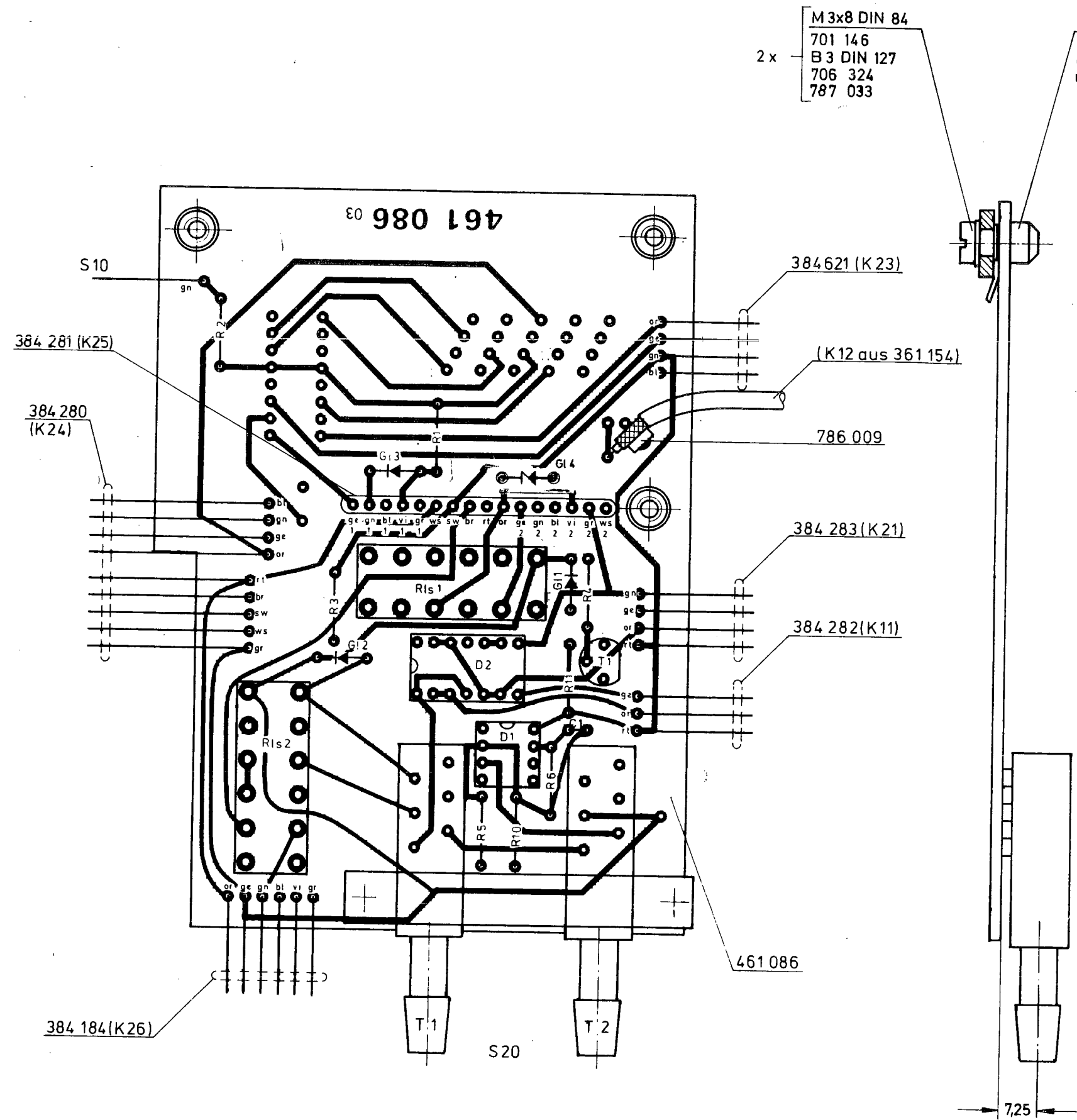
209 021 S Bl.1
Typ: 4020







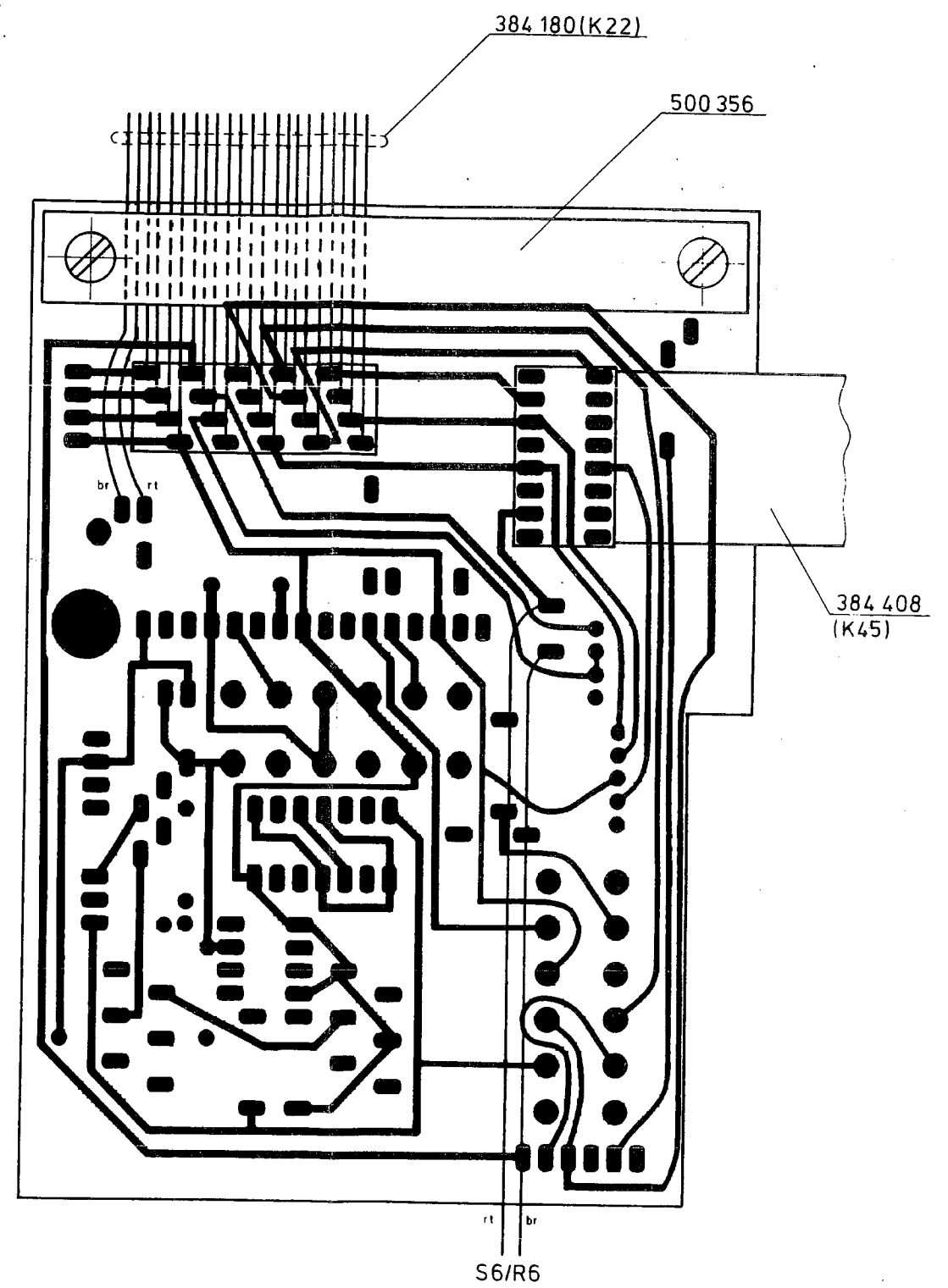
[illegible]



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

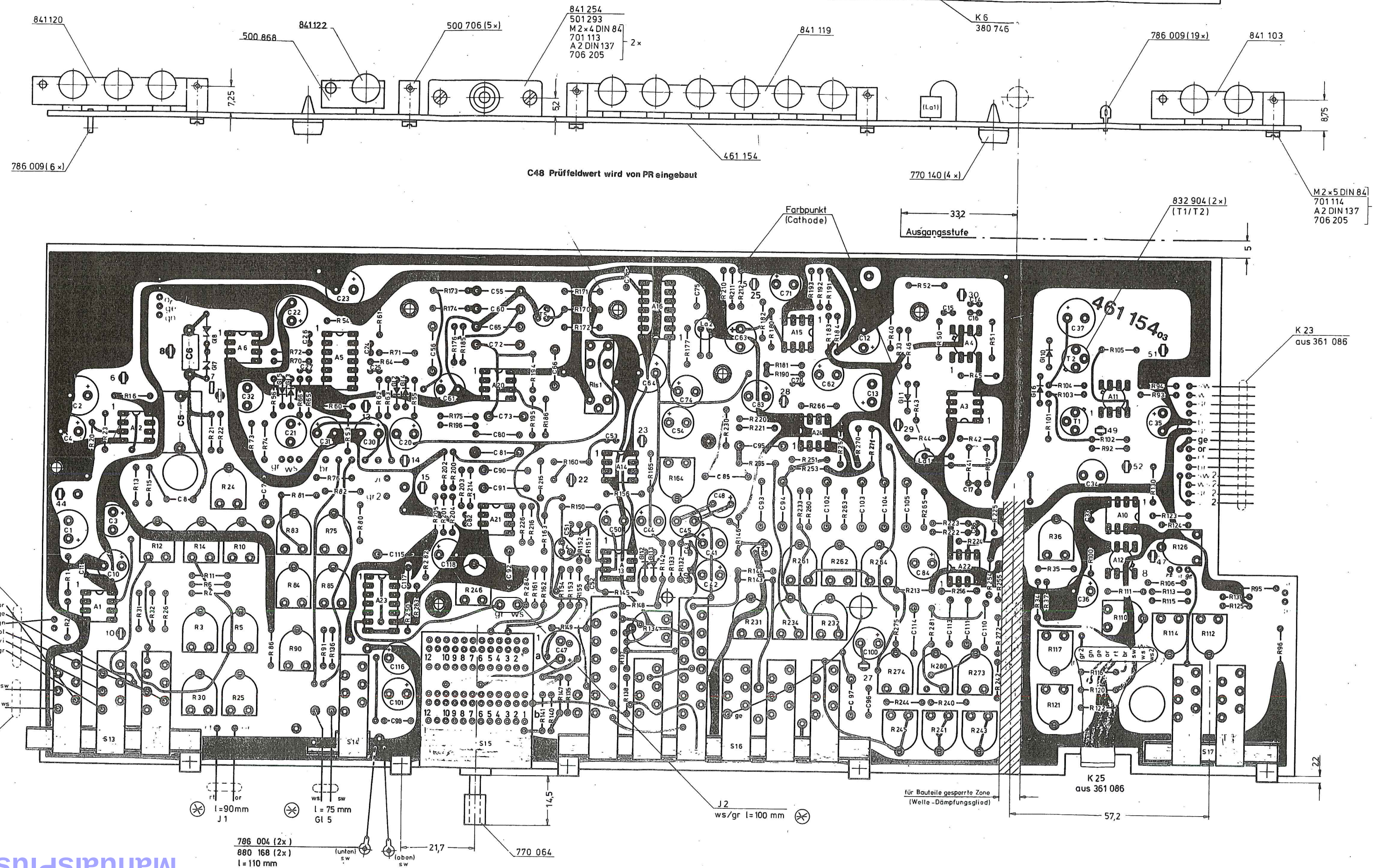
2 x
M3x8 DIN 84
701 146
B3 DIN 127
706 324
787 033

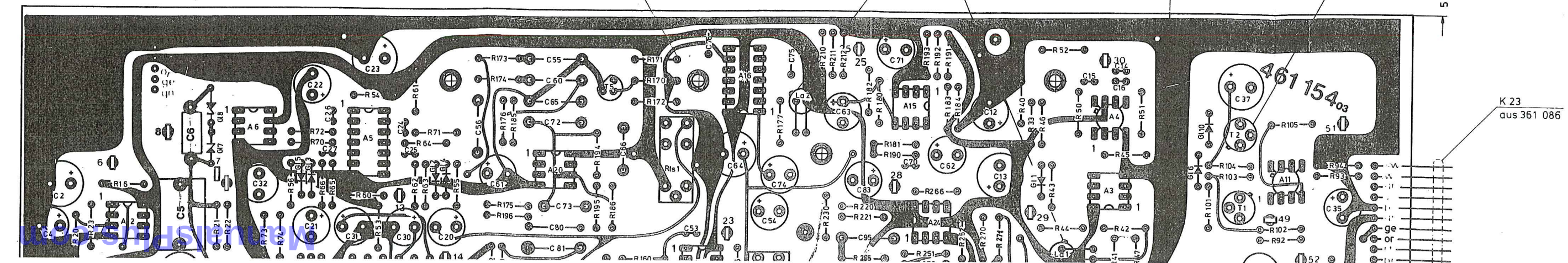
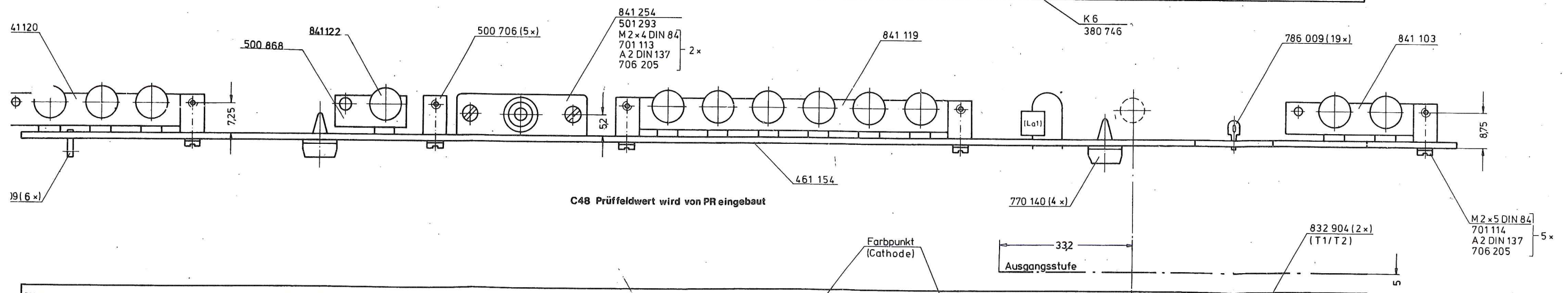
weich gelötet

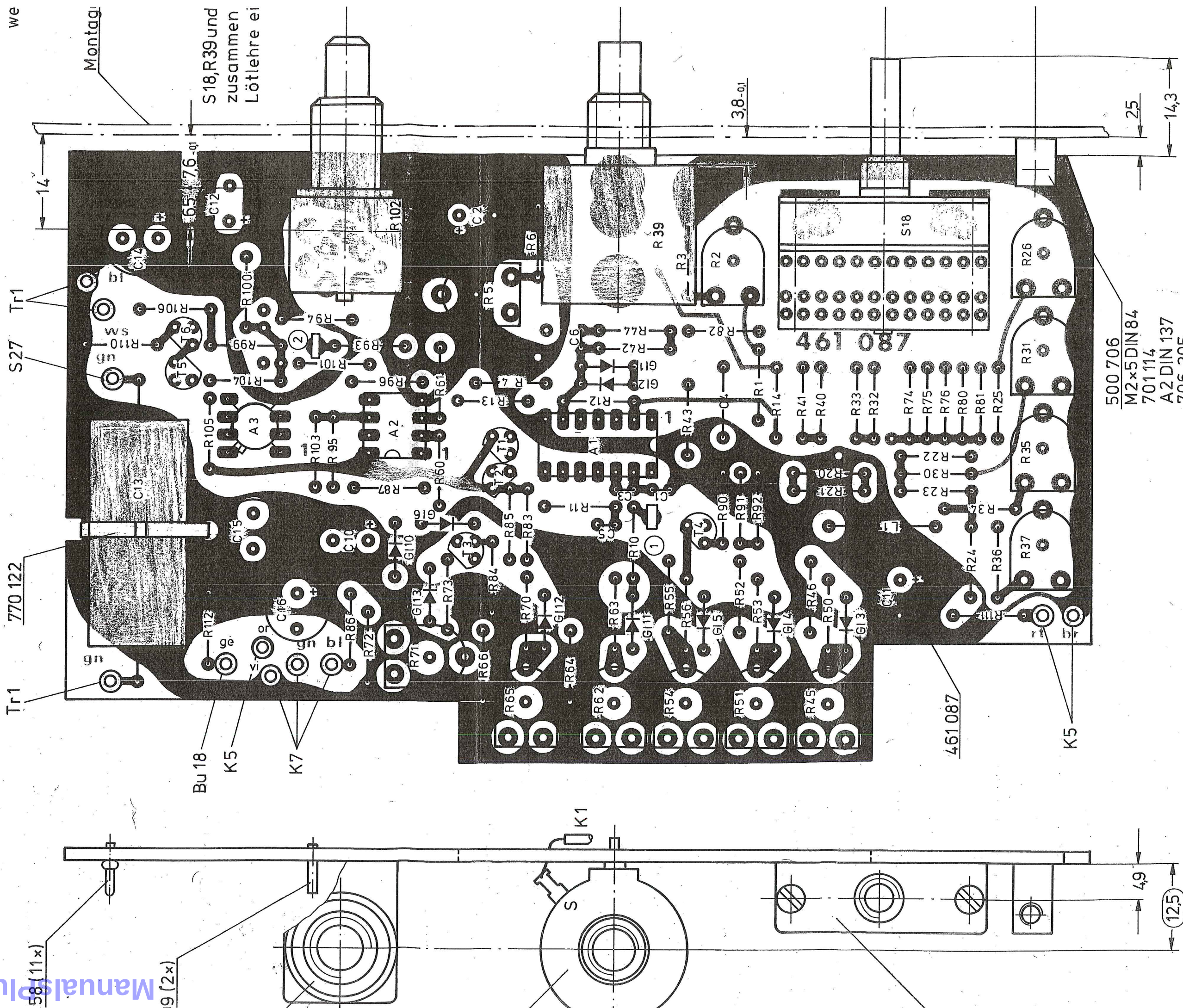


Kontrollmaß

902827 262.79 Mo		0.2		2:1		Schlumberger o/s	
80289 2.279 Mo						Bestückte Leiterplatte	
802896 21.12.78						361 086	
802881 18.12.78							







500 706
M2x5 DIN 84
701 114
A2 DIN 137
706 205

2025-01-01

1	2	3	4	5	6	7	8	9	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
1	2	3	4	5	6	7	8	9	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

5
6
7
8
9

02
21

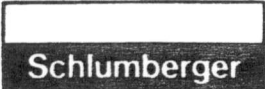
Bestück

(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 $600\ \Omega$ 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
DVM Oscilloscope	Preset all adjustment potentiometer to middle position apply +14 V ± 10 mV to the rail pin. Select R _o < 6 Ω, terminate with 600 Ω.					
	1. <u>Integrator + Schmitt - Trigger</u> S 18 : 1 kHz (S 18 = Freq. range switch) For troubleshooting only: S 18 : Ext. connect + 14 V to S 18 slider (T1/C4) " " " " " " " " " 0 V " " " " " " " " " "	① A 1/Pin 2 ① A 1/Pin 2	approx. 1 kHz 	 	 	 V pp ok
	2. <u>Sinus Shaping Network</u> S 18 : 1 kHz " " , R 102 fully clockwise, S 2 pressed	FM, AM- output Mod. Gen.- output	approx. 1 kHz "	 	approx. 4 V distorted "	ok
Counter	3. <u>Frequency Adjustment</u> (+ 14 V ± 10 mV) S 18 : 6 kHz " 3 kHz " 2,7 kHz " 1 kHz " 0,4 kHz " 0,3 kHz	FM, AM output " " " " "	6 kHz 3 kHz 2,7 kHz 1 kHz 0,4 kHz 0,3 kHz	R 26 → R 31 → R 35 → R 37 →	6 kHz [3 kHz 2,7 kHz 1 kHz 0,4 kHz 0,3 kHz] ± 0,5 %	kHzkHzkHzkHzkHzkHz

Adjustment and Test Procedure

4020 series
MODULATION GENERATOR

Schlumberger

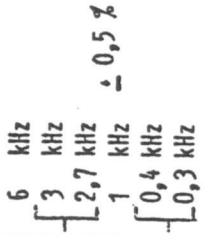
208 026 A

1/2
Sheet

Issue	Alteration No.	Date	Name
-------	----------------	------	------

01	9022.78	25.10.79	Harry
	5028.87	11.9.75	Shuh

Replacement for

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

Adjustment and Test Procedure

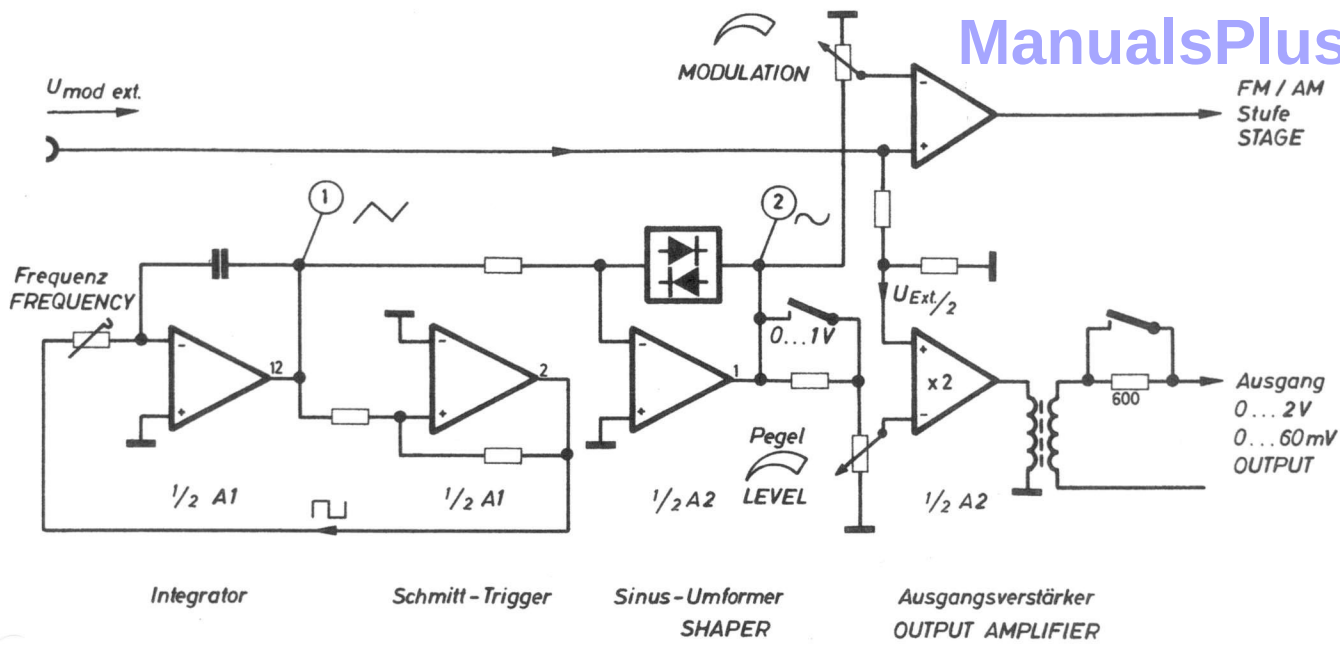
4020 series
MODULATION GENERATOR

Issue	Alteration No.	Date	Name
		5.10.73	Karim

208 025 A



208 025 A



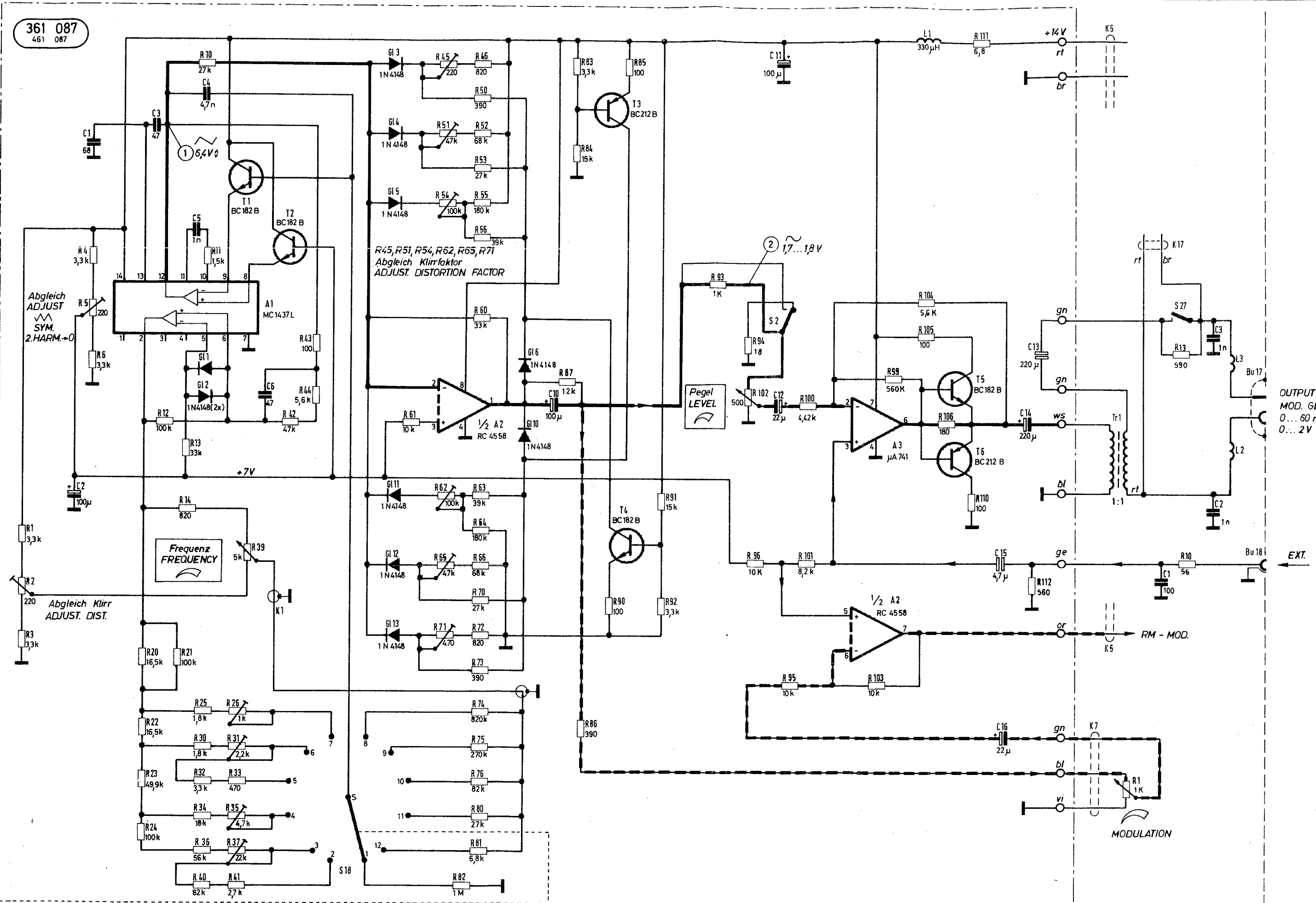
Bereich RANGE	Frequenz FREQUENCY
2	0,3 kHz
3	0,4 kHz
4	1,0 kHz
5	2,7 kHz
6	3,0 kHz
7	6,0 kHz
8	0,03 ... 0,1 kHz
9	0,1 ... 0,3 kHz
10	0,3 ... 1,0 kHz
11	1,0 ... 3,0 kHz
12	3,0 ... 10,0 kHz
1	EXT. MOD.



/ AM
fe
GE

gang
2V
60mV
PUT

361 087
461 087



ManualsPlus.com

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

bl BLUE
vi VIOLET
gr GREY
ws WHITE
tr TRANSPARENT

				norm.		
				gepr.		
				bearb.		
Ausg.	Ä-Mittg.	Datum	Name	1978	Datum	Name
ISS.	MODIF.	DATE	NAME		DATE	NAME

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)

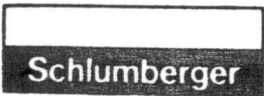
The fully integrated counter provides direct drive of the display in conventional Strobe method, for which it requires merely the counting frequency, the reset pulse, the transfer pulse (transfer of the counter status into the readout store) and the flashing frequency. Its negative feed voltage is generated 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 $\frac{40 \dots 480 \text{ MHz}}{1600}$ is presented divided by 7 as the counter frequency.

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

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

REQUIRED TEST EQUIPMENT		PROCEDURE		REQUIRED VALUE						MEASURED VALUE
4021 (4010 A)	Dig. Voltmeter (Oscilloscope for trouble shooting)	For carrying out the test procedure, the counter can be placed outside of the instrument. Connect Bu 35, St 32 and St 20 to the instrument. Caution! MOS-Counter D 9 is highly sensitive against electrostatic potentials. Exercise normal MOS handling procedures. Check negative Supply Potential Counter Functions		-9.....-11 V on (5) 360 082						-.....V
		RECEIVER MEASUREMENT	TRANSM. MEASUREM.	Frequ. Setting	f _{TRANSM}	f _{MOD}	f _{Abt.}	Counter indication	Loud Speaker	
Mod. Generator switched to ext. AF Voltmeter range in 1 mV position button UNMOD pressed		X X X X		020,0000 MHz 140,0000 MHz 479,0000 MHz 600,0000 MHz	X X X X			020,0 140,0 479,0 600,0	Noise " " "	
10 MHz Output on rear panel connected to HF DIRECT socket AF Voltmeter range in 1 mV position			X X X X X	010,1010 010,0010 " 009,9990	X X X X		X X X X	010,0 -01,00 blinks -01,00 -1,000 +1,000	Noise 10,1 kHz 1 kHz 1 kHz 1 kHz	
f _{OFFSET} Control fully anti-clockwise (+,- sign blinks)		X X X		009,9990 " "			X X X	+00,2... -00,2... - 0,2...	appr. 250Hz " "	
FM, Range 5 kHz, Deviation 0,5 kHz Modulation generator		X X X X		009,9990 " "		X X X X		0,030 1,000 9,900 0,100 blinks	30 Hz 1 kHz 9,9kHz 10,1kHz	
Mod. mode switch to UNMOD, Modul. Generator output connected to AF Millivoltmeter input f _{AF} , Range = 1 mV Signal: 1 kHz, appr. 0,2 mV		X		009,9990	X			1,000	1 kHz	

Adjustment and Test Procedure

4020 (4010) series
Frequency Counter

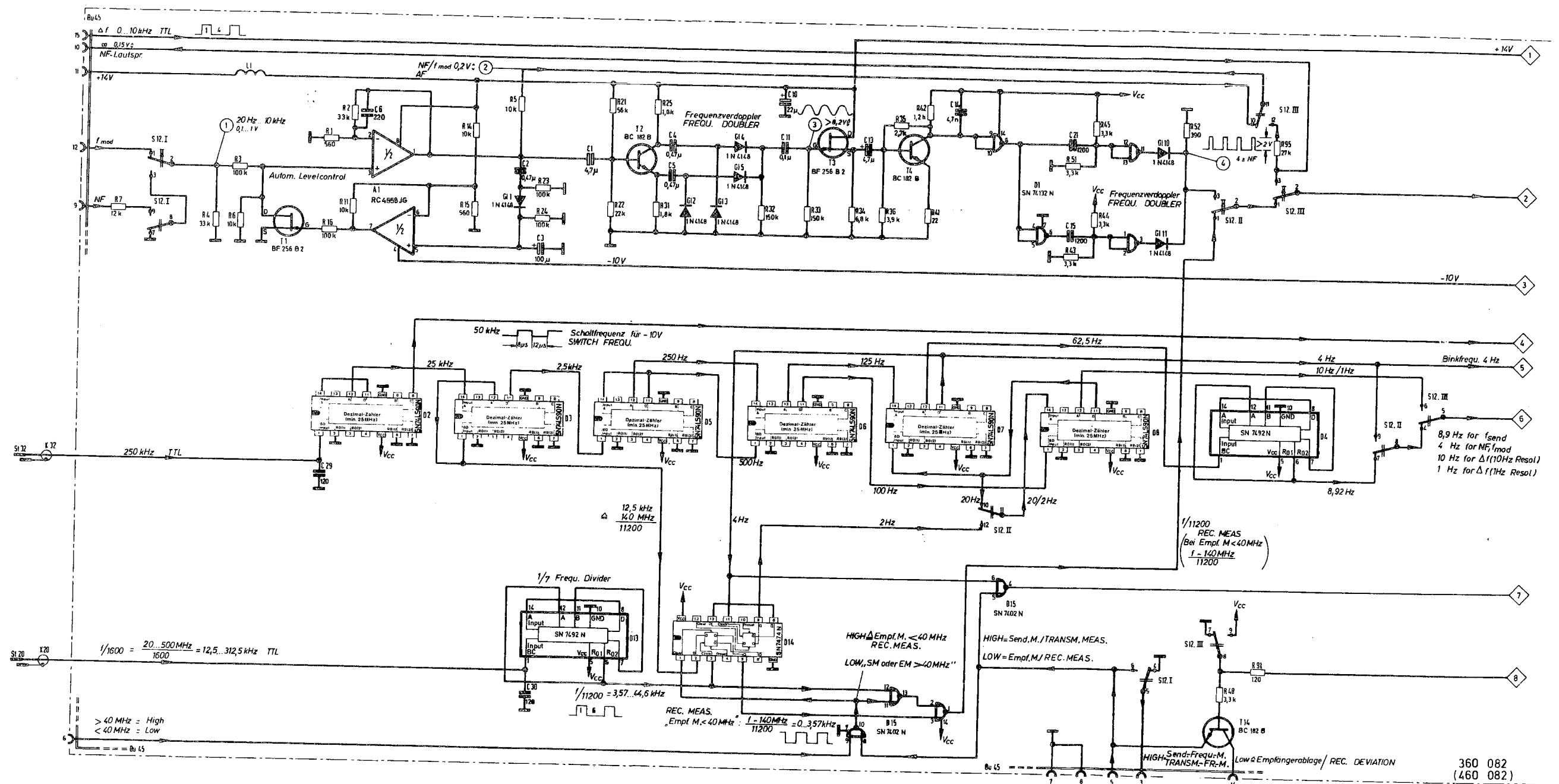
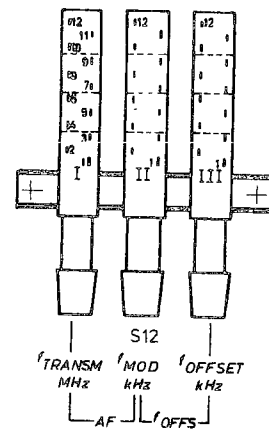
Schlumberger

Issue	Alteration No.	Date	Name
		12.5.78	Schulz
		8.10.79	Harwig

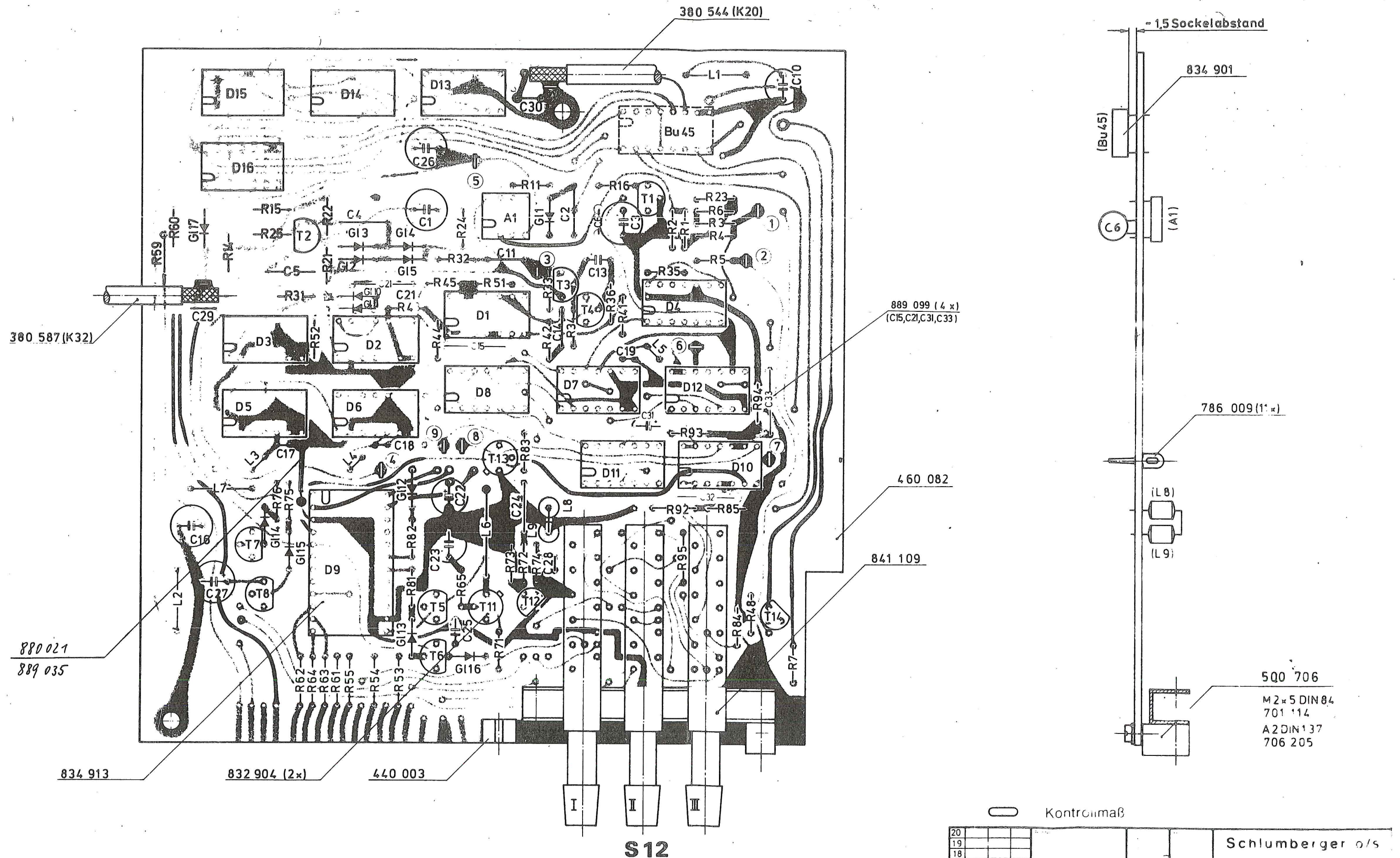
237 002 A

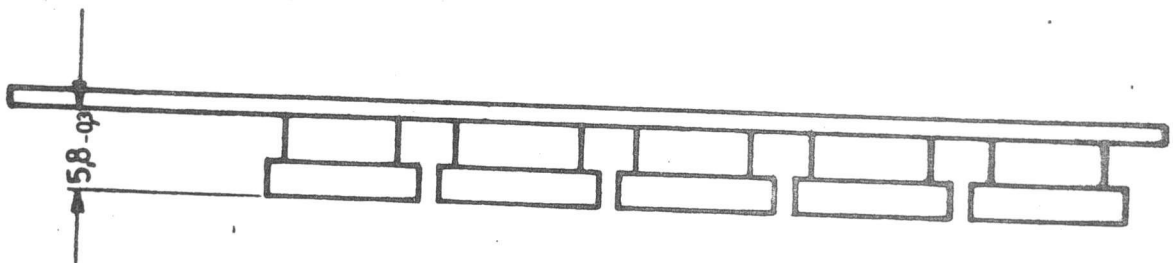
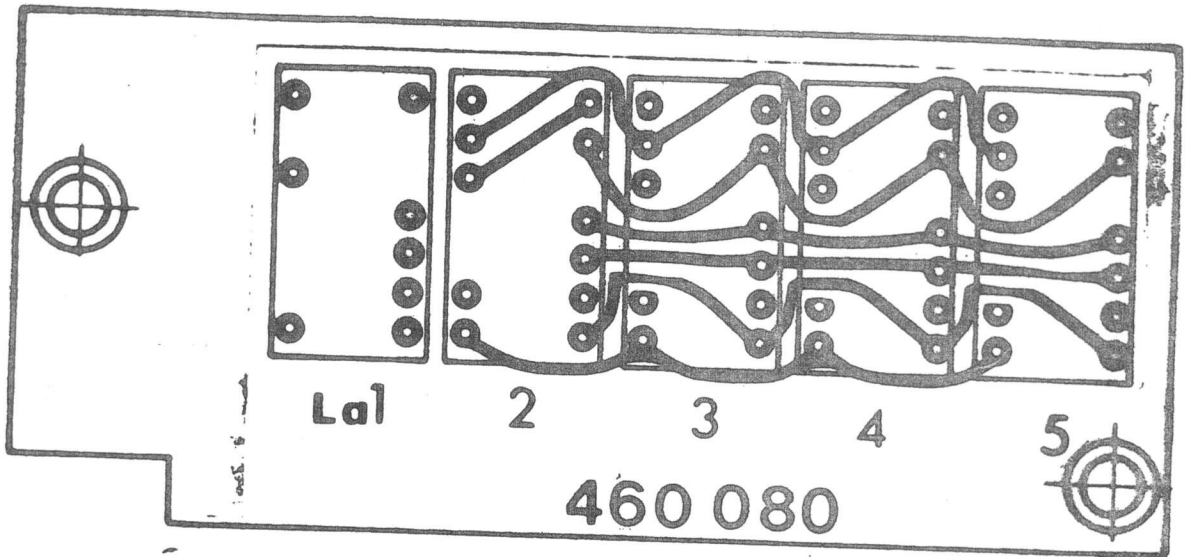
1/1
Sheet

Replacement for



sw BLACK	bl BLUE	11	7028,96	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	vi VIOLET	12	8028,5	9.1.78	Kc	gepr.					
r RED	gr GREY	Ausg.	A. Mittg.	Datum	Name	1975				Datum	Name
rs ROSE	ws WHITE	ISS	MODIF	DATE	NAME	DATE				NAME	
ge YELLOW	tr TRANSPARENT								Typ: 4010		

[illegible]



Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weitergabe, Nachdruck, Fälschung, Entwertung, Verstoß gegen das Patentrecht sind strafbar und schadenersatzpflichtig.

Schaltplanpositionierung : 360 080 Sa / 237 002 S

09		Rechner	Freigegeben	Menge	Schlumberger o/s Werkzeugbau, Vertrieb GmbH H. München 45
08					
07		Werkstoff	2:1		Bestückte Leiterplatte
06					
05		Oberfläche	Z	Datum	Name
04					
03		Ausgabe	Ange	Datum	Name
02					
01		360 080			

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

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.

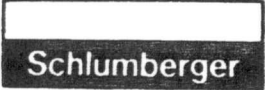
The RF signal is provided to the output amplifier through to the buffer amplifier, harmonic low pass filter and the combination circuitry. To generate 40 ... 60 MHz using a single oscillator circuit a double oscillator frequency of 80...120 MHz is generated and divided at the output by 2.

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.

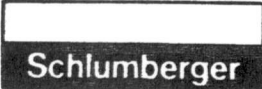
	Function	Description	213 012 F	Sheet 2/3
	Type :	4020/21/22	Oscillator Stage	Date 0979

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

Adjustment and Test Procedure

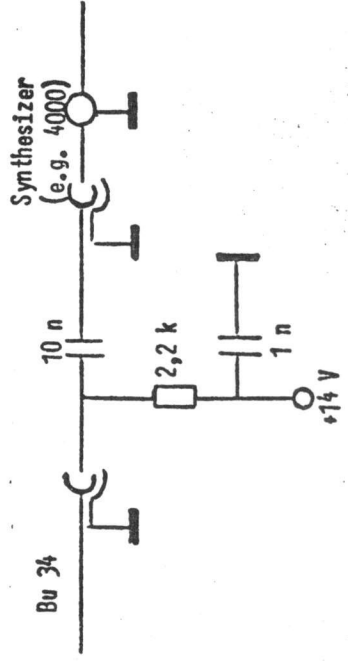
Issue	Alteration No.	Date	Name

4021 (4010 A)
Oscillator

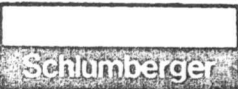
Schlumberger

213 017 A

1/19
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Synthesizer (60...520 MHz) DVM Power Meter RF Analyser	RF Amplifier (360 885) 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.  To avoid excessive frequency response keep leads short.					

Adjustment and Test Procedure

	Issue	Alteration No.	Date	Name	4021 (4010 A) Oscillator	
					213 017 A	
					Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Synthesizer (60...520 MHz)	RF Amplifier (360 885) - continued Output Level on Bu 35 $P_{IN} = -7$ dBm on Bu 34	Bu 35	60...400 MHz		$P_{out} = +7,8...+9$ dBm	
DVM	$P_{IN} = -5$ dBm on Bu 34	Bu 35	400...480 MHz		$P_{out} = +8,8...+10$ dBm	
Power Meter	DVM connected to DF 10 Automatic Level Control $P_{IN} = +2$ -12 dBm	DF 10	60...480 MHz		$P_{out} = +8$...+10 dBm $P_{out} = +10...+12$ dBm VDC < 11 V	
	$P_{IN} = +2$ -6 dBm	Bu 35	60 MHz		$P_{out} = +7,8...+9$ dBm	
	Command Line : "RF present" "RF lacking"	Bu 35	500 MHz		$P_{out} = +8,8...+10$ dBm $P_{out} = +8$...+10 dBm $P_{out} = +10$...+12 dBm	
	Output Level on Bu 40 $P_{IN} = -5$ dBm on Bu 34 For this measurement a 50 Ω load must be connected to Bu 35	DF 10	60...500 MHz		VDC < 11,5 V VDC > 11,5 V	
RF Analyser	Harmonic Output	Bu 40	20... 60 MHz 60...100 MHz 100...480 MHz		- 2 ... - 16 dBm - 2 ... - 12 dBm - 2 ... - 10 dBm	
		Bu 35	20...500 MHz		> 30 dBc	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Schlumberger

Issue	Alteration No.	Date	Name

213 017 A

3/19
Sheet

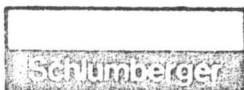
21.6.24

S. H. H.

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DC-Multimeter	1. Oscillator Selector (PCB 360 889)					
	Set frequency 400 MHz and check supply voltage at L1	L1	400 MHz		> 4 VDC	
	Set 440 MHz and check at L1	L1	440 MHz		0 V	
	Set 440 MHz and check at L21	L21	440 MHz		> 4 VDC	
	Set 480 MHz and check at L21	L21	480 MHz		0 V	
	2. Frequency Alignment					
	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)	Up-Line	439,9 MHz	C7	11,4 VDC	
	Set 400 MHz and check AFC again		400 MHz		> 2 VDC	
	Set 479,9 MHz and adjust C27	Up-Line	479,9 MHz	C27	11,4 VDC	
	Set 440 MHz and check again		440 MHz		> 2 VDC	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Issue	Alteration No.	Date	Name

213 017 A

4/19
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Modulation meter Multimeter	<u>FM-Sensitivity Adjustment (PCB 350 089)</u> Set approx. 10 kHz frequency deviation. Set 400 MHz and note deviation on the modulation meter. Set 439,9 MHz and adjust C12 to get equal deviation as at 400 MHz Adjust R10 to exact 10 kHz deviation Check deviation at 2 MHz frequency spacing Set 440 MHz and note deviation on the modulation meter. Set 479,9 MHz and adjust C32 to get equal deviation as at 440 MHz. Adjust R34 to exact 10 kHz deviation Check deviation at 2 MHz frequency spacing	Mod. meter ■ ■ ■ ■ ■	400 MHz 439,9 MHz 400...439,9 MHz	C12 R10	10 kHz dev. appr. exact value as above 10 kHz $\pm$ 5 %	
			440 MHz 479,9 440... 479,9 MHz	C32 R34	10 kHz dev. appr. exact value as above 10 kHz $\pm$ 5 %	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Schlumberger

Issue	Alteration No.	Date	Name
		21.6.76	Schuh

213 017 A

5/19
Sheet

Replacement for

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

Adjustment and Test Procedure

 4021 (4010 A)
 Oscillator

Schünberger

Issue	Alteration No.	Date	Name

213 017 A

6/19
Sheet

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

4021 (4010 A)
Oscillator

Schumberger

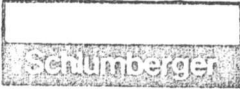
Issue	Alteration No.	Date	Name

213 017 A

7/19
Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Counter DVM	Oscillator 40...200 MHz (360 887) - continued					
	2. 2 Mhz Frequency Offset on TRANSM. MEASUREMENT					
	Depress: TRANSM. MEASUREMENT and f _{MOD}					
	(When checking without the Control and Display Unit, connect pin 21 of St 22 and DF 7 of the Decade Stage to ground).					
	Set decade switch to	RF DIRECT or Bu 35	51,999		$V_{AFC} \leq 11,5 \text{ V}$	
			61,999			
			81,999			
			101,999			
			121,999 MHz			
			141,999			
Noise Deviation Meter			161,999			
			181,999			
			201,999			
	Check the RF present line at the same frequencies.	DF 10	as above		$< 10,5 \text{ V}$	
	3. Noise Deviation	RF DIRECT or Bu 35	40...199,99 MHz		Noise Dev. $< 8 \text{ Hz}$ CCITT weighted	
	FM				Phase Dev. $< 0,01 \text{ RAD}$ CCITT weighted	
	PM:					

Adjustment and Test Procedure



Issue	Alteration No.	Date	Name
-------	----------------	------	------

21.6.76 Schuh

4021 (4010 A)
Oscillator

213 017 A

Replacement for

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

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

213 017 A

9/19
Sheet

Replacement for

Schlumberger

Issue	Alteration No.	Date	Name
-------	----------------	------	------

М. б. 76

Schuh

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.	RF DIRECT or Bu 35	40,0 MHz 49,999 MHz	R 2 R 12 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	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.		40...49,999 MHz	R 12	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT	RF DIRECT and AFC-line	40 MHz 49,9 MHz	L 1 L 1	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
	Setting: TRANSMITTER MEASUREMENT	(AFC-line - grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

213 017 A

10/19
Sheet

Issue Alteration No. Date Name

11 2022.15 21.1.20 G. J. J.

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter AF Generator DVH	Oscillator 40...200 MHz (360 887) - continued					
	50...60 MHz Band					
	Adjust deviation at both ends of the band	RF DIRECT or Bu 35	50,0 MHz 59,9 MHz	R 72 R 63 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	Check deviation across whole band in 1 MHz steps. If necessary, adjust R 72 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 11) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.	"	50...59,9 MHz	R 72	Accuracy $\pm 3\%$	
	Settings: RECEIVER MEASUREMENT	RF DIRECT and AFC-line	50,0 MHz	L 11	$V_{AFC} < 2,5 \text{ V}$	
	TRANSMITTER MEASUREMENT	(AFC-line = grey lead)	59,9 MHz	L 11	$V_{AFC} < 11,5 \text{ V}$	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

213 017 A

11/19

Sheet

Replacement for

Issue	Alteration No.	Date	Name
-------	----------------	------	------

21.6.76

Shuh

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360 887) - continued					
	60...80 MHz Band					
	Adjust deviation at both ends of the band	RF DIRECT or Bu 35	60,0 MHz 79,9 MHz	R 172 R 182 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	Check deviation across whole band in 2 steps. If necessary, adjust R 172 for equal positive and negative deviation accuracy. 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.		60...79,9 MHz	R 172	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	RF DIRECT and AFC-line	60,0 MHz 79,9 MHz	L 43 L 43	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
		(AFC-line = grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

213 017 A

12/19
Sheet

Schumberger

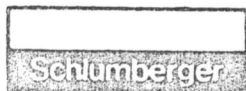
Issue	Alteration No.	Date	Name

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360 887) - continued					
	80...100 MHz Band					
	Adjust deviation at both ends of the band	RF DIRECT or Bu 35	80,0 MHz 99,9 MHz	R 231 R 222 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	Check deviation across whole band in 2 steps. If necessary, adjust R 231 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 55) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.	"	80...99,9 MHz	R 231	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	RF DIRECT and AFC-line	80,0 MHz 99,9 MHz	L 55 L 55	$V_{AFC} < 2,5 \text{ V}$ $V_{AFC} < 11,5 \text{ V}$	
		(AFC-line = grey lead)				

Adjustment and Test Procedure

4021 (4010 A)

Oscillator



Issue	Alteration No.	Date	Name

213 017 A

13/19
Sheet

27.6.76

Schub

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURE VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360887) - continued	RF DIRECT or Bu 35	100,0 MHz 119,9 MHz	R 233 R 243 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	100...120 MHz Band					
	Adjust deviation at both ends of the band	■	100...119,9 MHz	R 233	Accuracy $\pm 3\%$	
	Check deviation across whole band in 2 MHz steps. If necessary, adjust R 233 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 61) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.					
	Setting: RECEIVER MEASUREMENT	RF DIRECT and AFC-line	100,0 MHz 119,9 MHz	L 61	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
	TRANSMITTER MEASUREMENT					
		(AFC-line = gray lead)				

Adjustment and Test Procedure

Schumberger	Issue	Alteration No.	Date	Name	4021 (4010 A) Oscillator	213 017 A	14/19 Sheet
21.6.76				Schub	Replacement for		

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360 887) - continued					
	<u>120...140 MHz Band</u>					
	Adjust deviation at both ends of the band	RF DIRECT or Bu 35	120,0 MHz 139,9 MHz	R 292 R 283 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
	Check deviation across whole band in 2 MHz steps. If necessary, adjust R 292 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 65) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.	"	120...139,9 MHz	R 292	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	RF DIRECT and AFC-line	120,0 MHz 139,9 MHz	L 65 L 65	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
		(AFC-line= grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Schlumberger

Issue	Alteration No.	Date	Name

213 017 A

15/19
Sheet

21. 6. 76

Schuh

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360 887) - continued 140...160 MHz Band ----- Adjust deviation at both ends of the band Check deviation across whole band in 2 MHz steps. If necessary, adjust R 114 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 33) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.	RF DIRECT or Bu 35	140,0 MHz	R 114 $\rightarrow$	$\Delta f = 20 \text{ kHz}$	
			159,9 MHz	R 123 $\rightarrow$ alternatively	$\Delta f = 20 \text{ kHz}$	
		"	140...159,9 MHz	R 114 $\rightarrow$	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	RF DIRECT and AFC-line (AFC-line = grey lead)	140,0 MHz 159,9 MHz	L 33 $\rightarrow$ L 33 $\rightarrow$	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Schumberger

Issue	Alteration No.	Date	Name
		24.6.76	Schub

213 017 A

16/19
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360 887) - continued 160...180 MHz Band					
	Adjust deviation at both ends of the band Check deviation across whole band in 2 MHz steps. If necessary, adjust R 165 for equal positive and negative deviation accuracy.	RF DIRECT or Bu 35	160,0 MHz 179,9 MHz	R 165 R 161 alternatively	$\Delta f \approx 20 \text{ kHz}$ $\Delta f \approx 20 \text{ kHz}$	
	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.	"	160...179,9 MHz	R 165	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	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)				

Adjustment and Test Procedure

4021 (4010 A)

Oscillator

213 017 A

17/19

Sheet

Replacement for

Schumberger

Issue	Alteration No.	Date	Name

21.6.76 Schuh

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter Counter DVM	Oscillator 40...200 MHz (360 887) - continued					
	180...200 MHz Band					
	Adjust deviation at both ends of the band	RF DIRECT or Bu 35	180,0 MHz 199,9 MHz	R 81 R 91 alternatively	$\Delta f \approx 20 \text{ kHz}$ $\Delta f \approx 20 \text{ kHz}$	
	Check deviation across whole band in 2 MHz steps. If necessary, adjust R 81 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 25) must be changed. Simultaneously the AFC-potential must be observed and kept within limits.	"	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	$V_{AFC} < 2,5 \text{ V}$ $V_{AFC} < 11,5 \text{ V}$	
	Setting: TRANSMITTER MEASUREMENT	(AFC-line = grey lead)				

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

Schlumberger

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

Adjustment and Test Procedure

4021 (4010 A)
Oscillator

213 017 A

19/19
Sheet

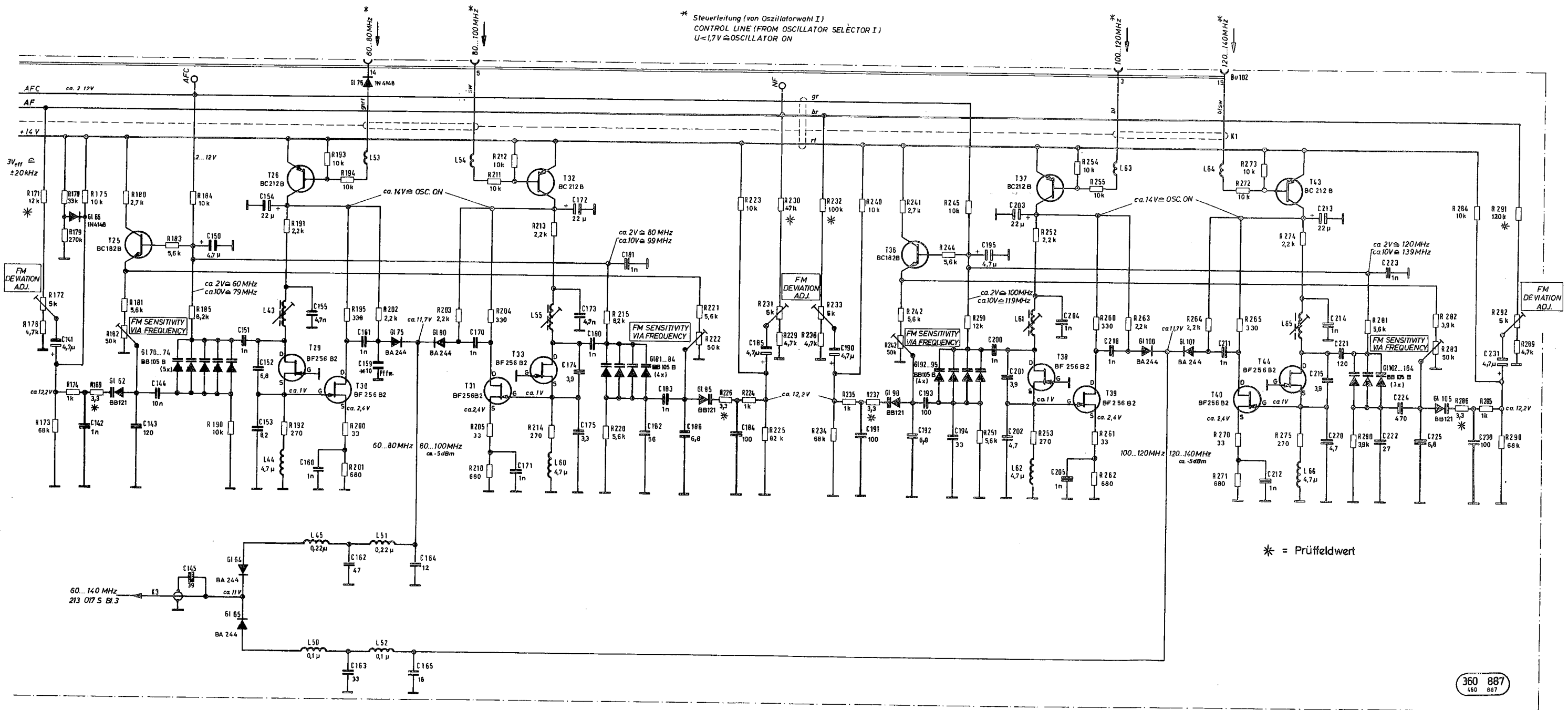
Replacement for

Schumacher

Issue	Alteration No.	Date	Name

21.6.76 Schuch





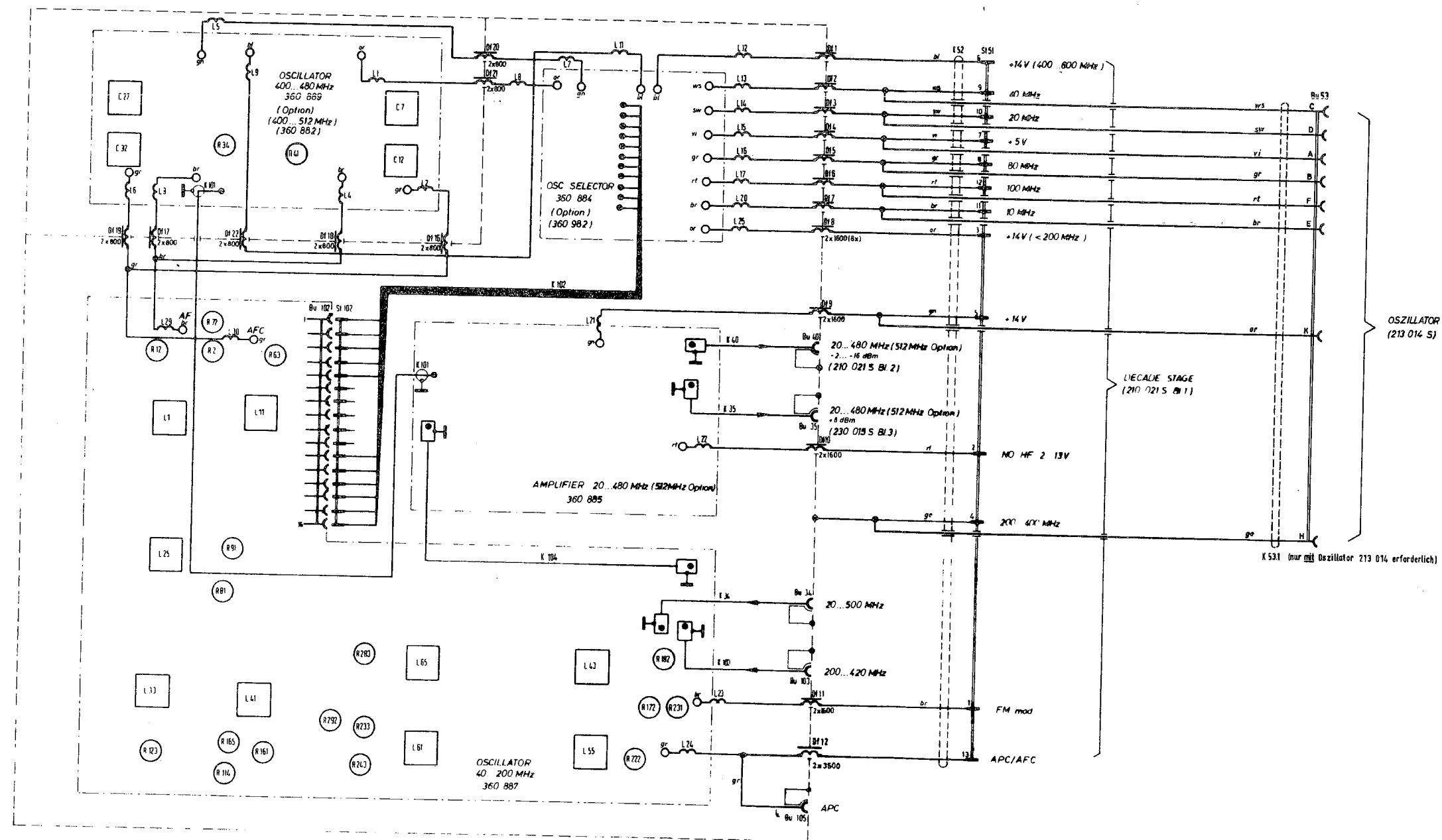
sw BLACK	bl BLUE				norm.		Schlumberger o/s Messgerätekau u. Vertrieb GmbH 8 München 48	OSCILLATOR	213 017 S Bl. 5			
br BROWN	vi VIOLET				gnr.							
rt RED	gr GREY	06	8028.56	8.5.78	Wn					beorb.	14.1.78	Kr.
rs ROSE	ws WHITE	Ausg.	Ä-Mittig.	Datum	Name					1976	DATE	NAME
ge YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME							
gn GREEN									Typ: 4010 A / 4011			

360 887
460 887

213 017 S Bl. 5

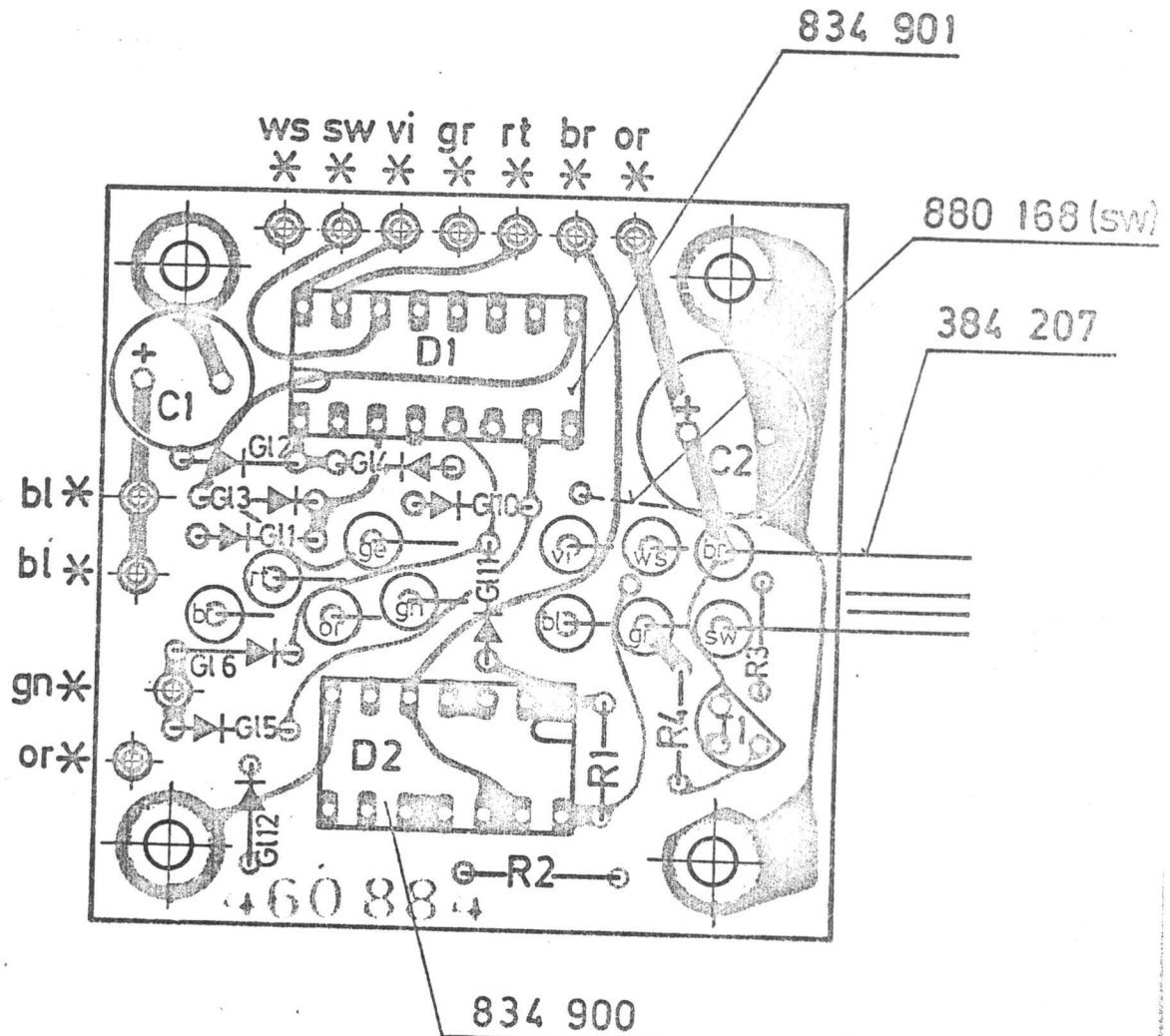
Typ: 4010 A/4011





* BLACK B1 BLUE B2 BROWN B3 RED B4 ROSE B5 YELLOW B6 GREEN	B7 BLUE B8 VIOLET B9 GREY B10 WHITE B11 TRANSPARENT	03 902863 12.9. Hi Ausg. A M. g. Datum Name 155 MODH DATE NAME	14.1. Kr Datum Name 76 DATE NAME	Schlumberger o. s. Maßstab: 1:1 Maßstab: 1:1	OSCILLATOR	213 017 S Bl. 1. Typ 4010A, 4011
--	---	--	--	--	------------	-------------------------------------

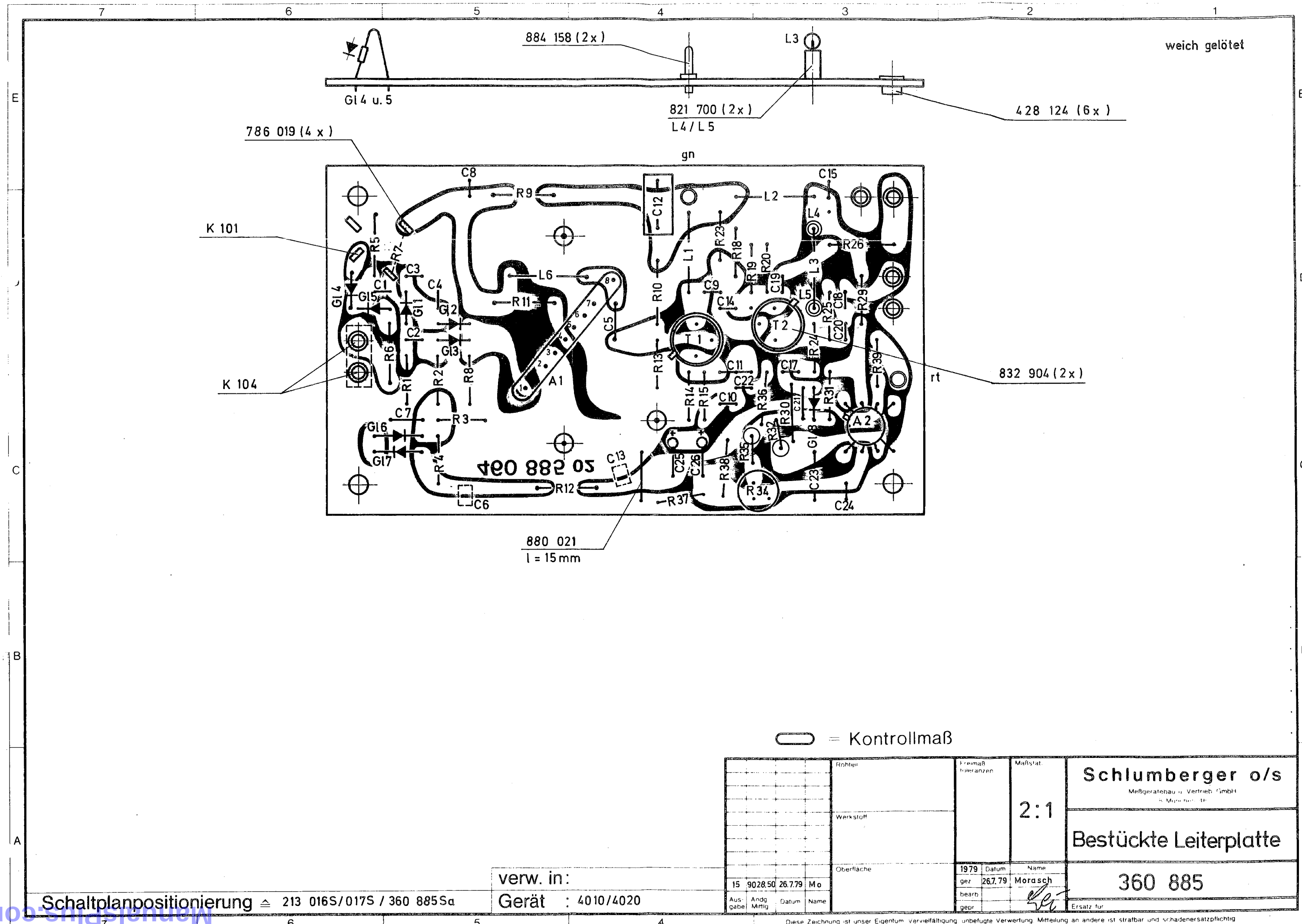
weich gelötet



* = Farbpunkt

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

09				Rohrteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 45
08							
07							
06							
05	8028 93	21.12.78	Mo	Werkstoff	$\pm 0,2$	2:1	Bestückte Leiterplatte
04	6028 47	22.6.76	Eiler				
03							
02							
01				Oberfläche	1976	Datum	Name
Ausgabe	Andg. Mittig	Datum	Name				360 884



weich gelötet

K 101

K 104

gn

rt

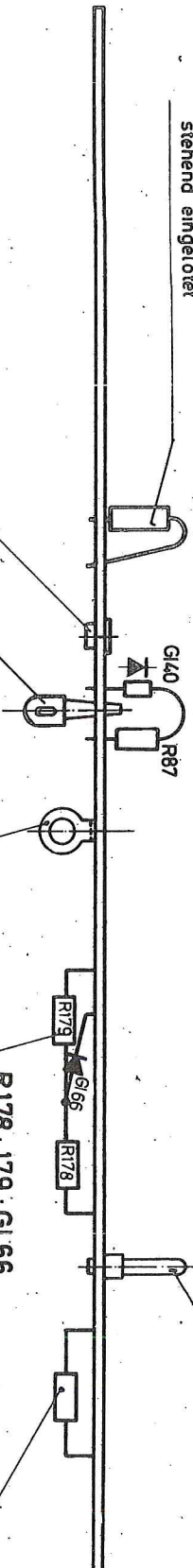
○ = Kontrollmaß

Rohlen				Freimaß toleranzen		Maßstab 2:1		Schlumberger o/s	
								Meßgerätebau u. Vertrieb GmbH in München, BRG	
Werkstoff								Bestückte Leiterplatte	
Oberfläche								360 885	
15	9028.50	26.7.79	Mo	1979	Datum	Name		Ersatz für	
Ausgabe	Andg. Mittig	Datum	Name	gez	26.7.79	Morasch			
				bearb.					
				gepr.					

Schaltplanpositionierung $\triangle$ 213 016S/017S / 360 885Sa

verw. in:
Gerät : 4010/4020

R1/23/24/34/L2/L5/74/103/115/132/133/143
151/160/171/193/194/211/212/232/254/255
272/273
stehend eingelötet



786 002

R178, 179, G1 66
auf Leiterunterseite gelötet

884 158 (4x)

428 124 (6x)

br gr

786 009 (8x)

R6, 75, 1
229, 2
auf Lei

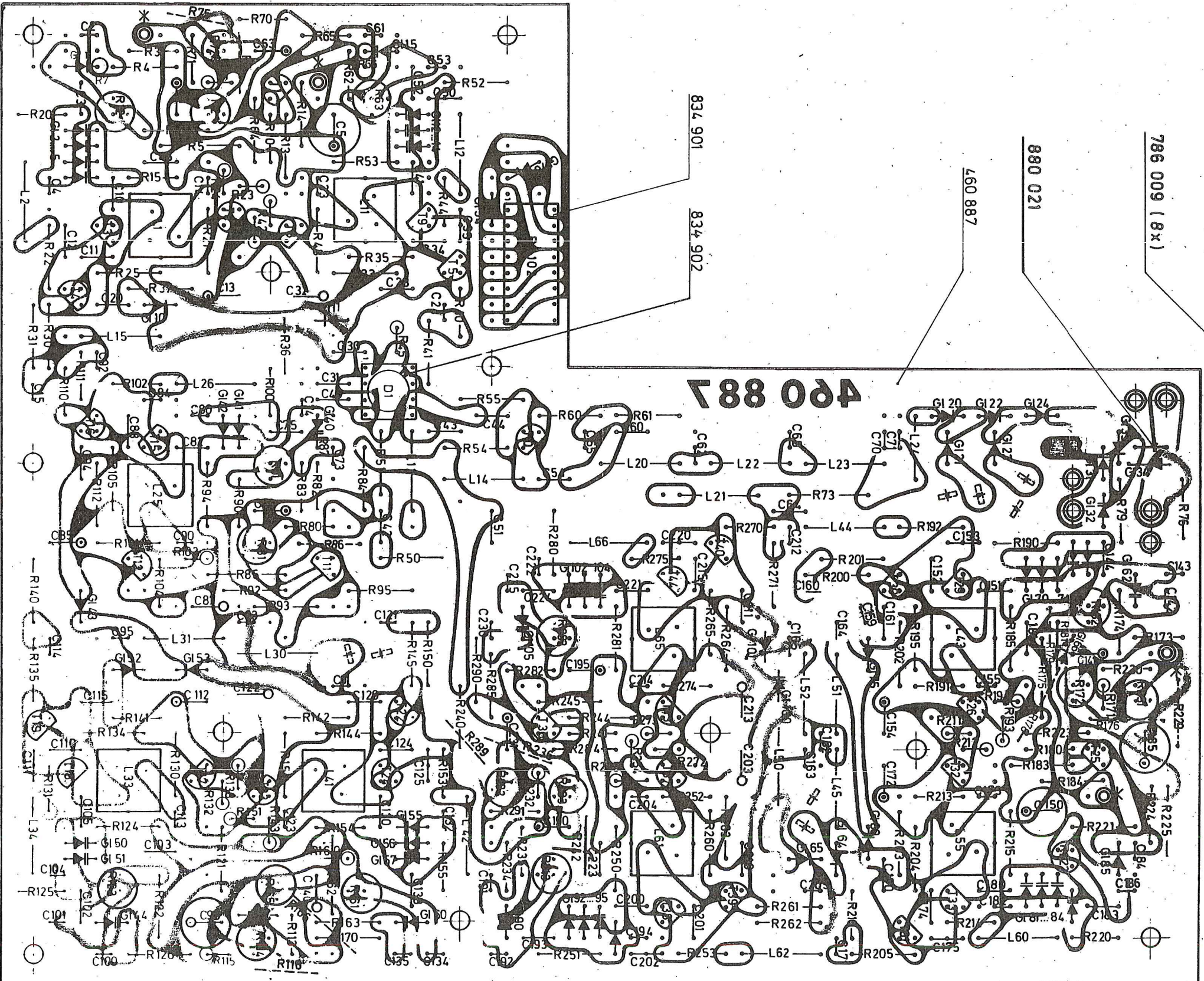
880 021

460 887

834 901

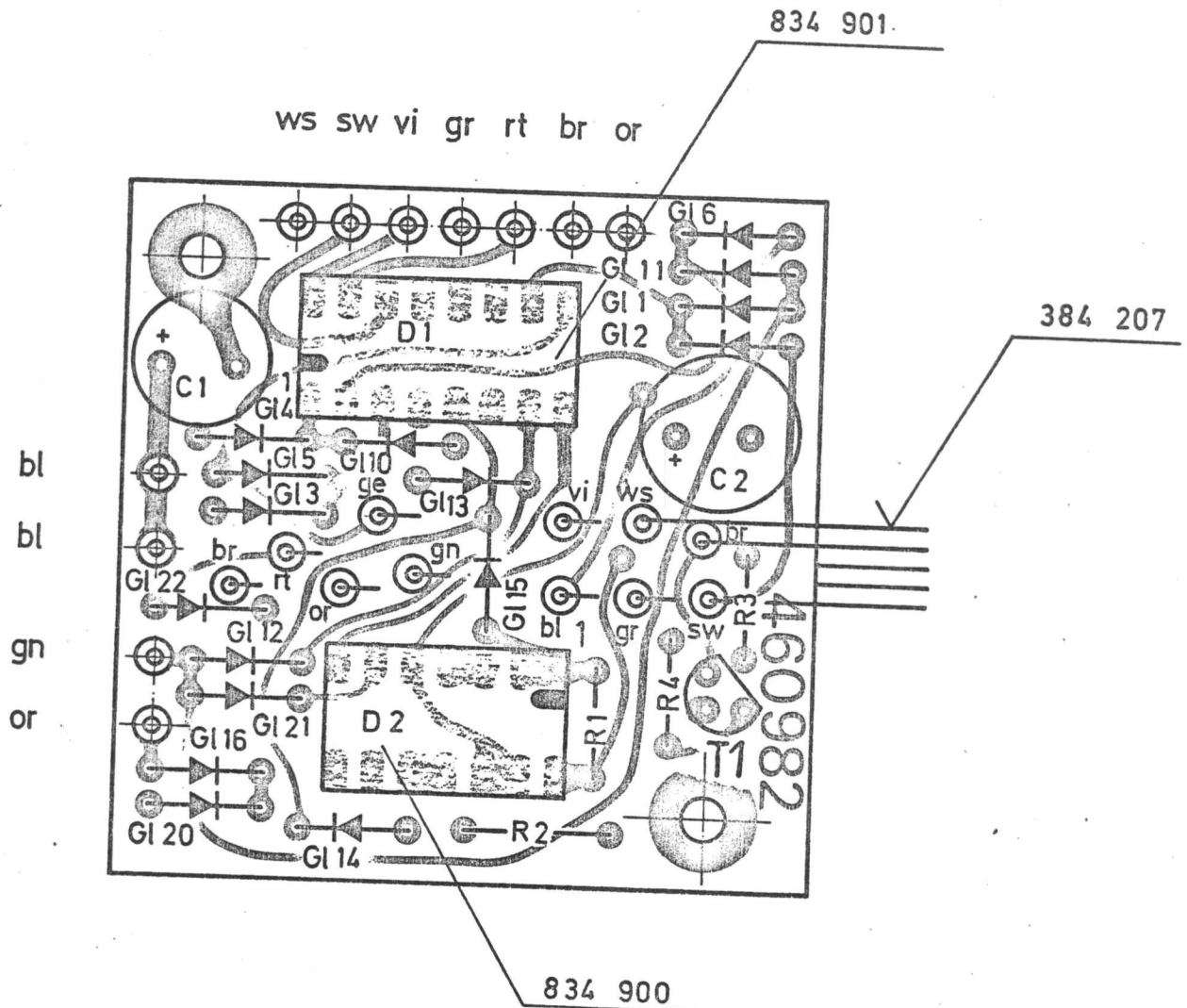
834 902

788 004



R8/R9-u. G16
stumpf aufgelötet

weich gelötet



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

09				Rohteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Messgerätekau u. Vertriebs GmbH 8 München 45
08							
07				Werkstoff	—	2:1	Bestückte Leiterplatte
06							
05				Oberfläche	1979	1312 79	Morasch
04							
03							360 982
02	90244712.1279						
01							
	Ausg. Zeichn.	Arzt. Zeichn.	Datum	Name			

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM Multimeter	1. <u>Oscillator Selector (PC Boards 360 870, 871, 872)</u> Set Frequency 210 MHz and check supply Voltage at L 41 (360 870) Change frequency in 20 MHz steps and check voltage at corresponding points of the other sub oscillators.	L 41	210 MHz 230 MHz 250 MHz		> 5 VDC > 5 VDC "	
	2. <u>Switch-over to 213 017 oscillator (360 873)</u> Check DC-voltage at the middle conductor of the RF-cable K 103 (R 10 on 360 873)		410 MHz 200- 419,9 MHz		" > 10 VDC	
	3. <u>Low pass filter change over (360 873)</u> Set 200 MHz, and check potential of Emitter of T 2. Change frequency		< 200 MHz > 420 MHz		< 1 VDC < 1 VDC	
	4. <u>Frequency Alignment (360 870, 71, 72)</u> Adjust trimmer capacitors C 12, C32 ... C 62 to mid-position. Select the RECEIVER MEASUREMENT mode. Set 219, 999 MHz and adjust C 47 to get 10 V on the U_R-Line (AFC).	T2/Emitter " "	200 MHz 300 MHz 400 MHz		> 10 VDC < 1 VDC < 1 VDC	
		① on 360 872	219,999 MHz	C 47 / 360 870	10 VDC	
		"	239,999 MHz 419,999 MHz	C 47 / 360 871 c 7 / 360 872	10 VDC 10 VDC	

Adjustment and Test Procedure

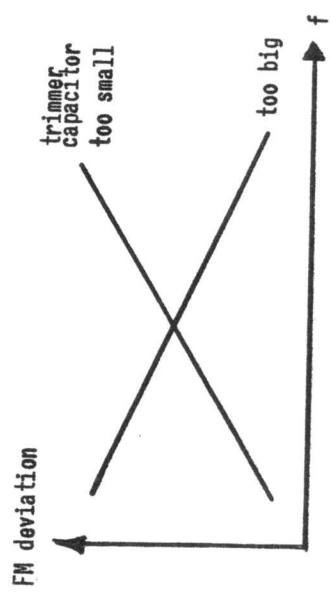
4022 (4011)
Oscillator

Schlumberger

Issue	Alteration No.	Date	Name
		5.10.79	Ward

213 014 A

1/3
Sheet

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

Adjustment and Test Procedure

4022 (4011)
Oscillator

Schlumberger

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

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> $f_{mod} = 1 \text{ kHz}$ FM-Deviation 20 kHz	RF	200 to 419,9 MHz	-	Dist. < 1 %	
	7. <u>Unwanted Noise Deviation</u> Phase deviation Frequency deviation	" "	" "	- -	< 8m Rad < 7 Hz	
	8. <u>Modulation Frequency Response</u>	"	$f_{mod} =$ 300 Hz to 10 kHz	-	< $\pm 3 \%$	
	9. <u>RF-Harmonics</u>	"	200 to 419,9 MHz	-	< 34 dB c	

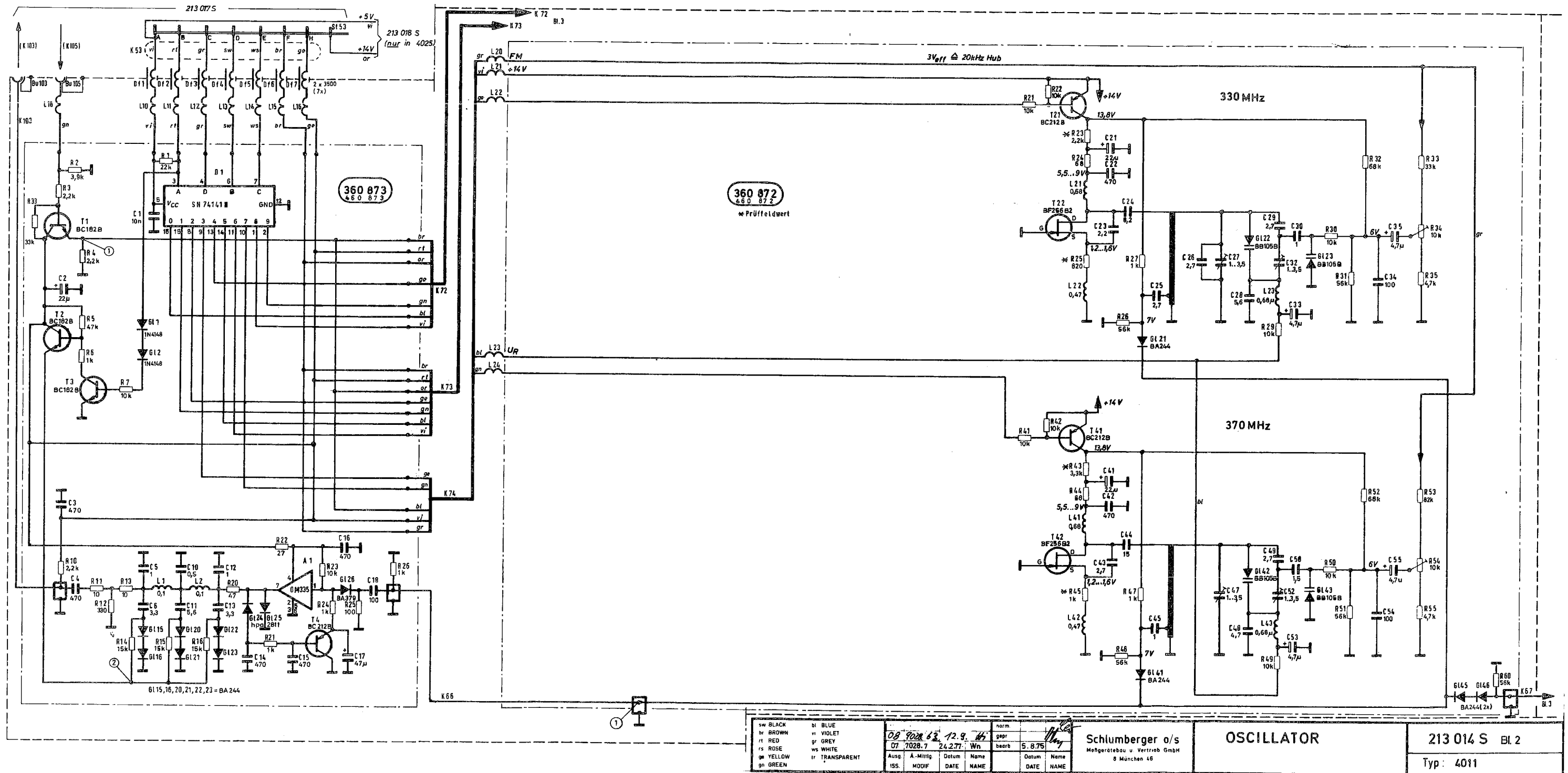
Adjustment and Test Procedure

4022 (4011)
Oscillator

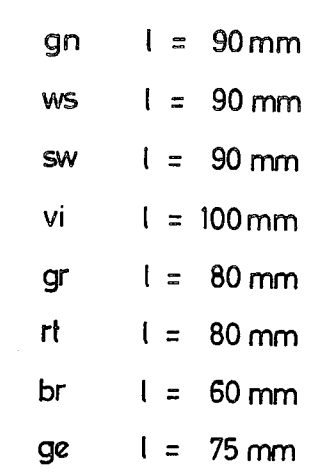
Schlumberger

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









10			Hinter	Fremd	Märkte
09				Leiterplatte	
08					
07					
06			Workshop		
05					
04	9024,25	15,2,79	Kr.		
03	6028,83	26,10,76	Kr.		
02			Oberfläche		
01					
Ausg.	Ansg.	Datum	Name	1976	Namen
jagd. Mittl.				26,10,76	Kringelis
					<i>[Signature]</i>

Schlumberger o/s

Mittel- und Niederdruck-Leitungen
Kabel- und Drahtwerke

Bestückte Leiterplatte

360 873

Diese Zeichnung ist unser Eigentum. Nachdruck ohne Erlaubnis ist strafbar.

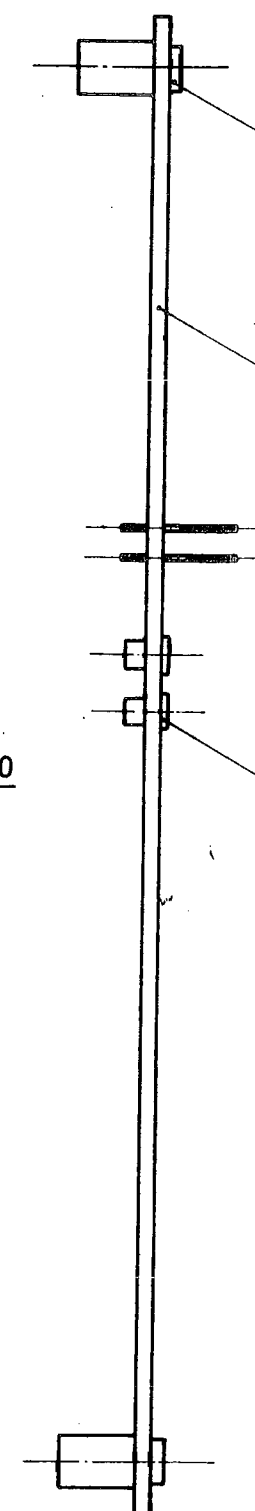
Farbpunkt an Leiterzug

Farbpunkt an Brücke

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

L21, L22, L23, L41, L42, L43
C17, C27, C32, C52
auf der Leiterplatte aufliegend

428 144 (4x)

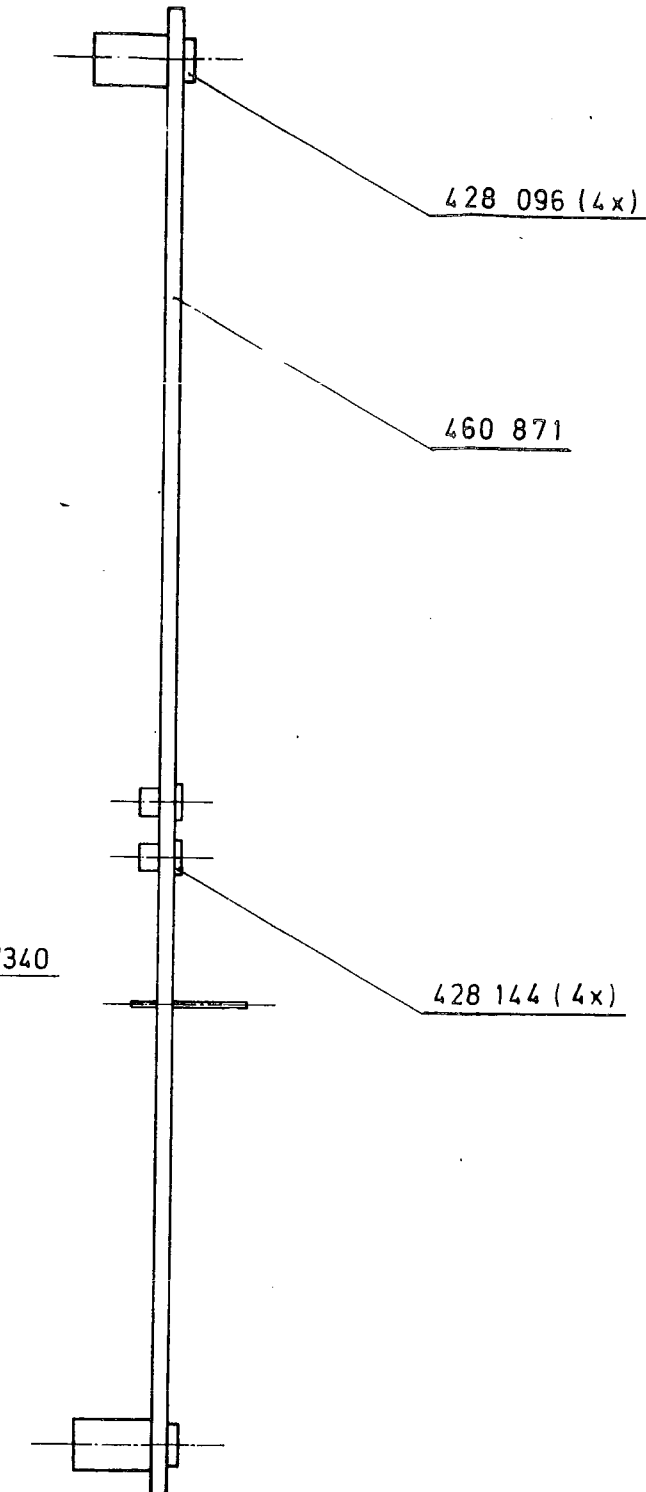


 = Kontrollmaß

20				Rohrer	Fremder Telefonat	Märkte	Schlumberger o/s Vollgüterbes. - Vertrieb GmbH A München 81
19							
18							
17							
16				Werkstoff	0,2	2:1	
15							
14							Bestückte Leiterplatte
13							
12				Oberfläche	Datum	Name	360 872
11	909435	19.4.79	Eiler		gel.		
Ausgabe	Anlag.- Vorg.	Datum	Name		bearb. 8.9.79		
					gepr.		Ersatz für

Diese Zeichnung ist unser Eigentum. Vervielfältigung und ohne Genehmigung an andere ist strikt verboten und kann strafbar sein.

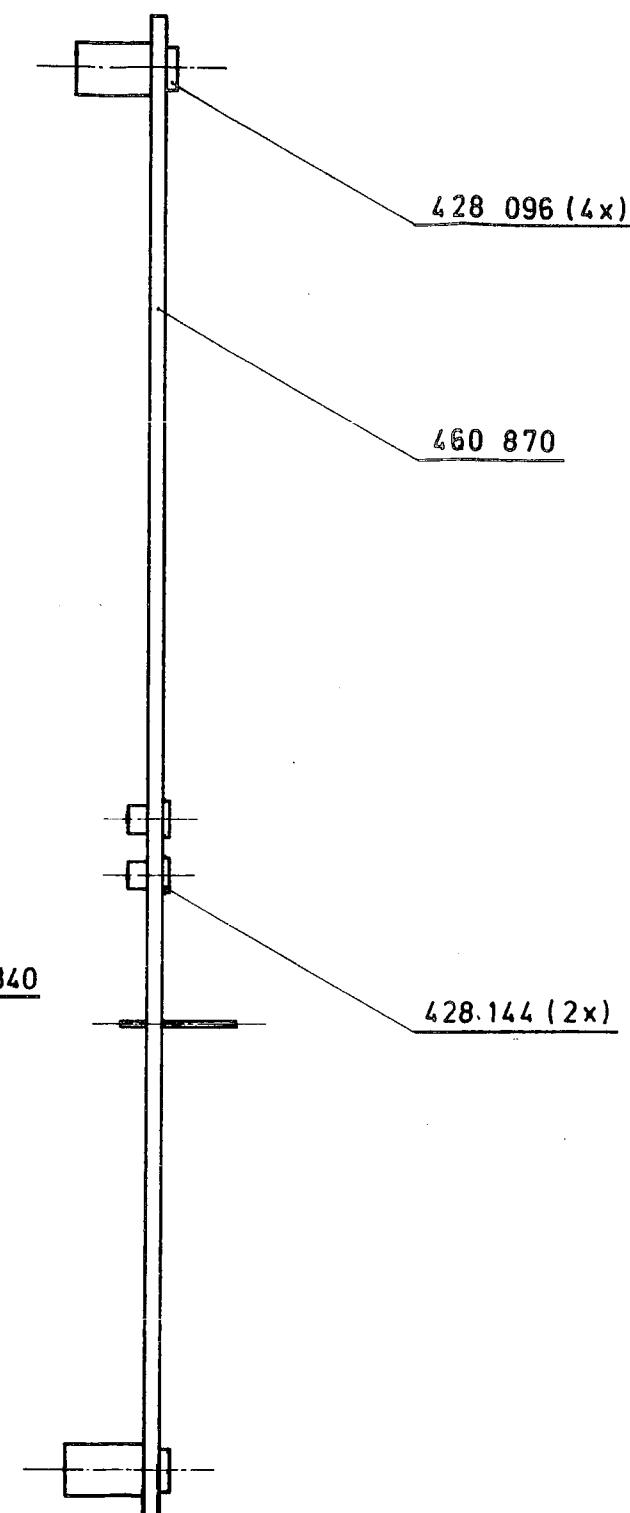
L1, L2, L13, L21, L22, L23
L41, L42, L43, L61, L62, L63
C7, C27, C32, C47, C67, C72
auf der Leiterplatte aufliegend.



O K₂Nr m₄₁₃

10	3028.34	4.5.79	Eiler	±0,2	2:1	Schlumberger o/s
09	909K.14	19.2.79	Kr.			Bestückte, Leiterplatte
08	8028.73	13.10.78	Eiler			
07	8028.63	6.6.78	Eiler			
06	60288B	29.11.78	BH	1975	20.8 8.9	
05	6028.48	5.3.76	PK			
04	6028.7	30.1.76	Kr.			
03	6028.4	14.1.76	PK			
02	5028.105	20.11.78	Eiler	1975	20.8 8.9	360 871
01	5028.180	27.10.75	PK			

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



		Schlumberger o/s	
		Bestückte, Leiterplatte	
		360 870	

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

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

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

2. Vernier offset

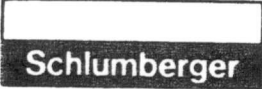
The control line " Δf Rec(DC)" permits the choice of three functions:

- 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 " Δf (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 " Δf (DC)" from the potentiometer control.

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

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

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

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

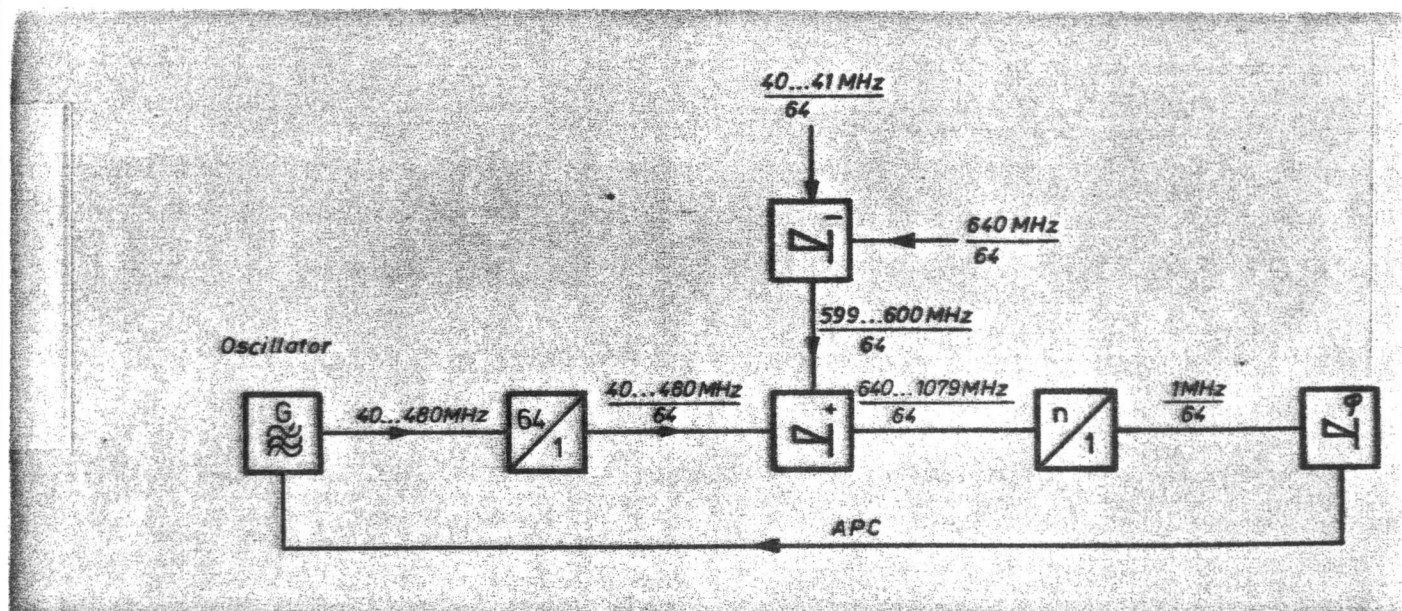
This arrangement permits digital adjustment of the oscillator frequency between 12.5 and 12.8125 MHz in increments of 10 000 (with a vernier offset of $\pm$ approx. 100 increments).

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

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

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

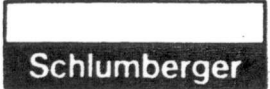
The following simplified block circuit diagram is meant to simplify understanding the mixed frequencies and adjustable frequency divider:



Schlumberger	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 %.					
	<u>Supply Voltages 210 021 S BL. 1:</u> connect + 5 V to St 23 " + 14 V to St 23	8	—	—	4,95 ... 5,05 V 0,8 ... 1 A	A
Dig. Voltmeter		2	—	—	13,95 ... 14,05 V 90 ... 110 mA	mA
10 MHz-Crystal oscillator with TTL - output	<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	250 kHz 3,125 kHz	—	250 kHz 3,125 kHz	ok
Counter		56 vi				
Power Supply 0 ... 3 V	<u>Final Decade Stage 210 021 S BL. 7:</u> apply + 0,60 V to 7	1	—	—	Digitalvoltmeter + 5,7 ... + 6,6 V	V
		62 ge	2,5 MHz	L 12	2,5 MHz	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	3,125 MHz	—	12 ... 14 V Puls width at + 6 V 0,2 ... 0,3 µs	ok
		6	"	—	+3 ... +4 V	µs
		62 ge	2,5 MHz	—	0 ... +0,2 V	ok
		7	—	(L 12)	2,5 MHz + 0,60 V	

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

Schlumberger

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

210 021 A	1/11 Sheet
-----------	---------------

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.	<u>Final Decade Stage - Frequency Control 210 021 S Bl.7 and Bl. 1:</u> 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

Schlumberger

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

210 021 A

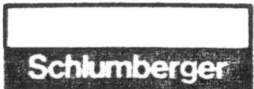
2/11
Sheet

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 to St 22 Frequency setting: 000 0000	(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	mVmVppppdBm
Decade switch Oscilloscope	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)	53 Bu 1 Bu 1	1,25 MHz 12,5 MHz 12,375 MHz	DC level on (7) R 4 → P min at 12,5 MHz (appr. middle)	1,25 MHz - 70 ... - 90 dBm - 46 ... - 50 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product - 52 ... - 56 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product 1,7 ... 2,8 V (FM) pp Spurious products > 3,5 dB below	dBmdBmokdBmokokdB
	approx. + 1,6 V on (7) Oscilloscope with probe to (4) er Analyser with probe to (4) + 0,4 ... + 1,4 V to (7)	Bu 1 (4) (4)	12,80 MHz 12,80 MHz 12,3 ... 12,8 MHz			

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

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

[illegible]

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

210 021 A

5/11

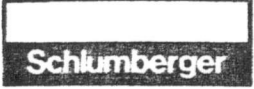
Sheet 1

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: . Frequ. Setting 000 0000	②	10 MHz	—	40 ... 60 mVpp	ok
	Analysér via probe	①	625 kHz	—	80 ... 120 mVpp	ok
	Analysér via probe	④	9,375 MHz	R 11→middle pos. L 1, L 3, L 4 → max. level	150 ... 250 mVpp	mVpp
	Analysér via probe	⑤	"	at 9,375 MHz		mVpp
	Oscilloscope via probe	"	9,375/10 MHz	L 4→ max. level	50 ... 100 mVpp	mVpp
Synthesizer	Mixer D 10	④	9,375 MHz	R 11→ min. level at 10 MHz		
	Analysér via probe on → ⑥	⑤	"	—		
	approx. 0 dBm on Bu 40	⑥	9,375 MHz	R 15→ min. level	ca. - 70 dBc	
	Decade switch setting	"	8,75 MHz	L 6→ min. level	"	
	0 MHz 40 MHz 144 MHz 480 MHz approx. 58...480 MHz	"	7,125 MHz	L 5→ min. level	"	
	40... 60 MHz (perhaps correction by L 4) Oscilloscope on ⑥	"	16,85 MHz	L 7→ max. level	ca. - 30 dBc	
	40...480 MHz	"	10,3...16,85 MHz	—	spurious products	
	0 MHz	"	10 ...10,3 MHz	—	> 20 dBc	
		"		—	> 14 dBc	
		"	10 ...16,85 MHz	—	1,5 ... 2,5 Vpp	
		"	9,375	R 15	< 0,1 Vpp	
		"				
		"				
		"				
		"				

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
01	8028. 3	13.1.78	X
		12.5.75	Stroh

210 021 A

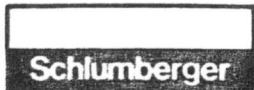
6/11
Sheet

Replacement for

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

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
0.1	8028.9	13.1.78	X
		12.5.75	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	
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	" "	—	Puls 120....160 ns	ok
	2,01 MHz TTL on Bu 43	29 br 28 ws	10 kHz	(L 3 with tuning slug)	TTL 10 kHz +3,5 ... 5 V	
	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 5,0625 MHz 10,125 MHz	—	0 V 2,53125 MHz 4 ... 8 V _{pp} 5,5 ... 7 V _{pp}	ok
	Decade switch: 000 0050	D 2/6 = ge	2,025 MHz	—	TTL 2,025 MHz	ok

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

Schlumberger

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

210 021 A

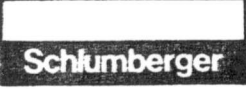
8/11
Sheet

Replacement for

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

Adjustment and Test Procedure

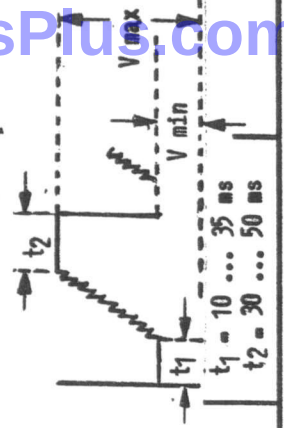
4020 (4010) series
DECADE STAGE



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

210 021 A	9/11 Sheet
Replacement for	

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



Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

Schlumberger

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

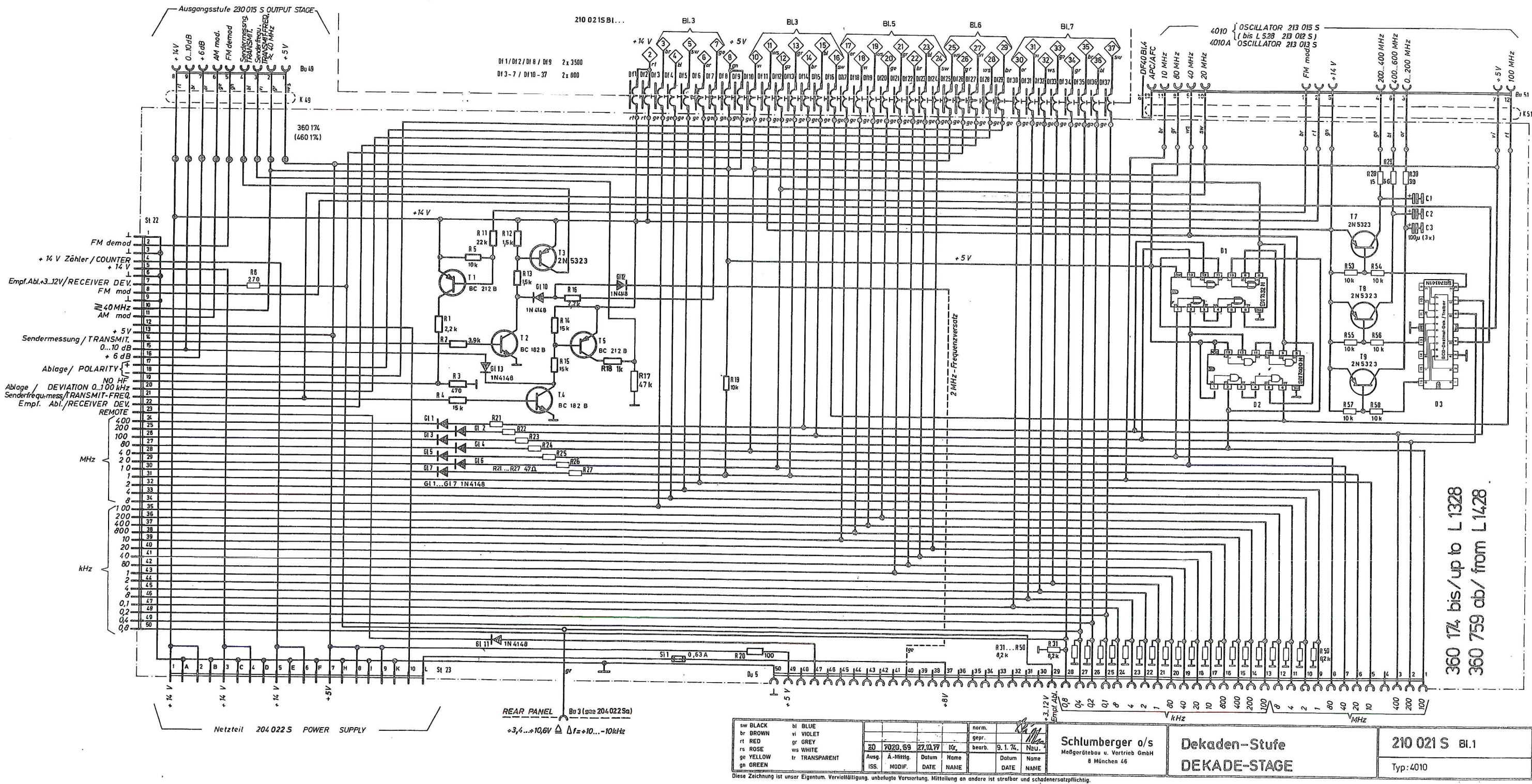
210 021 A

10/11
Sheet

Replacement for

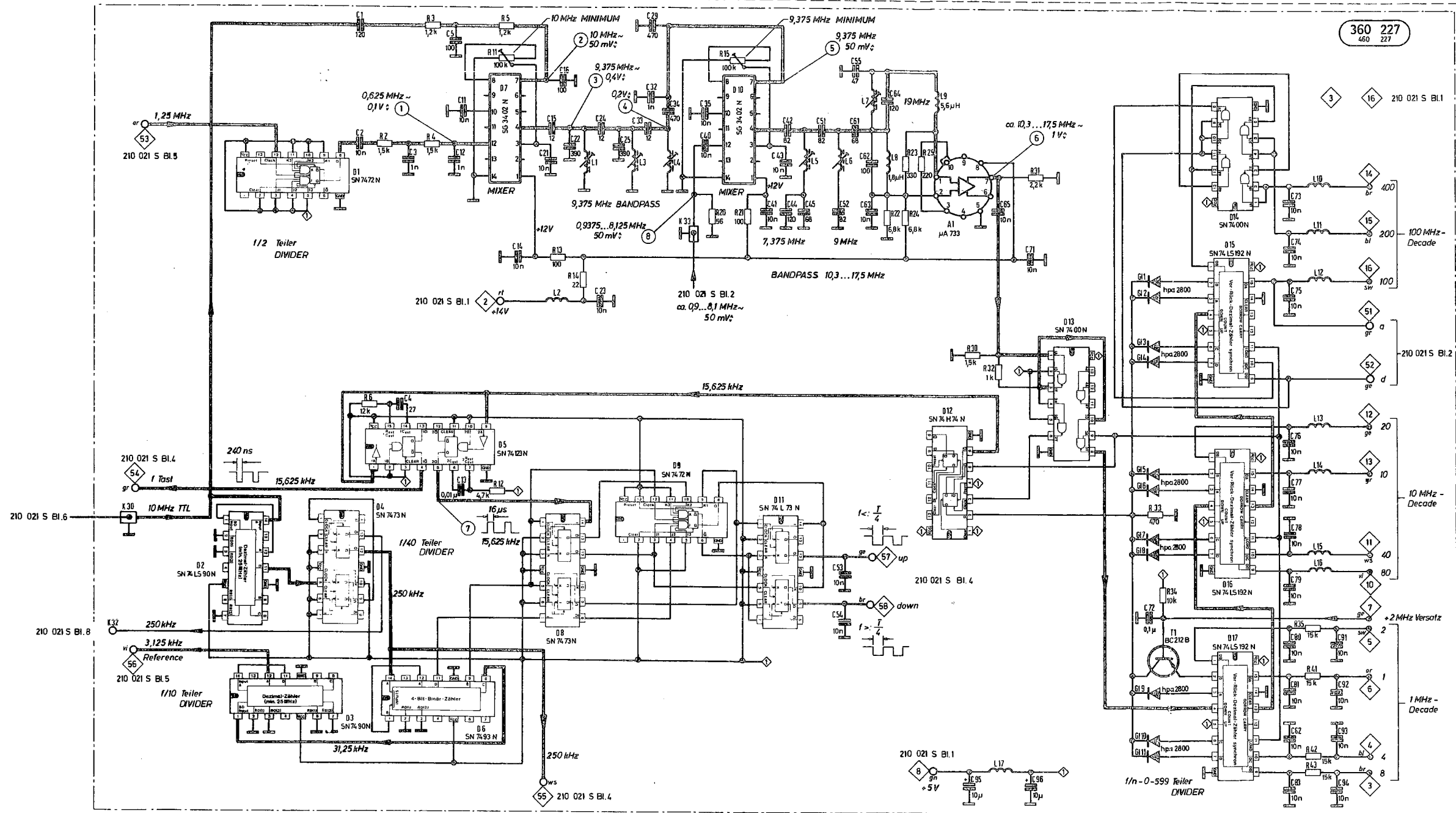
Adjustment and Test Procedure					4020 (4010) series DECADE STAGE	
Schlumberger	Issue	Alteration No.	Date	Name	210 021 A	
	01	8082.9	13.7.78	X		
			12.5.75	Shuh	Replacement for	
					11/11 Sheet	

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

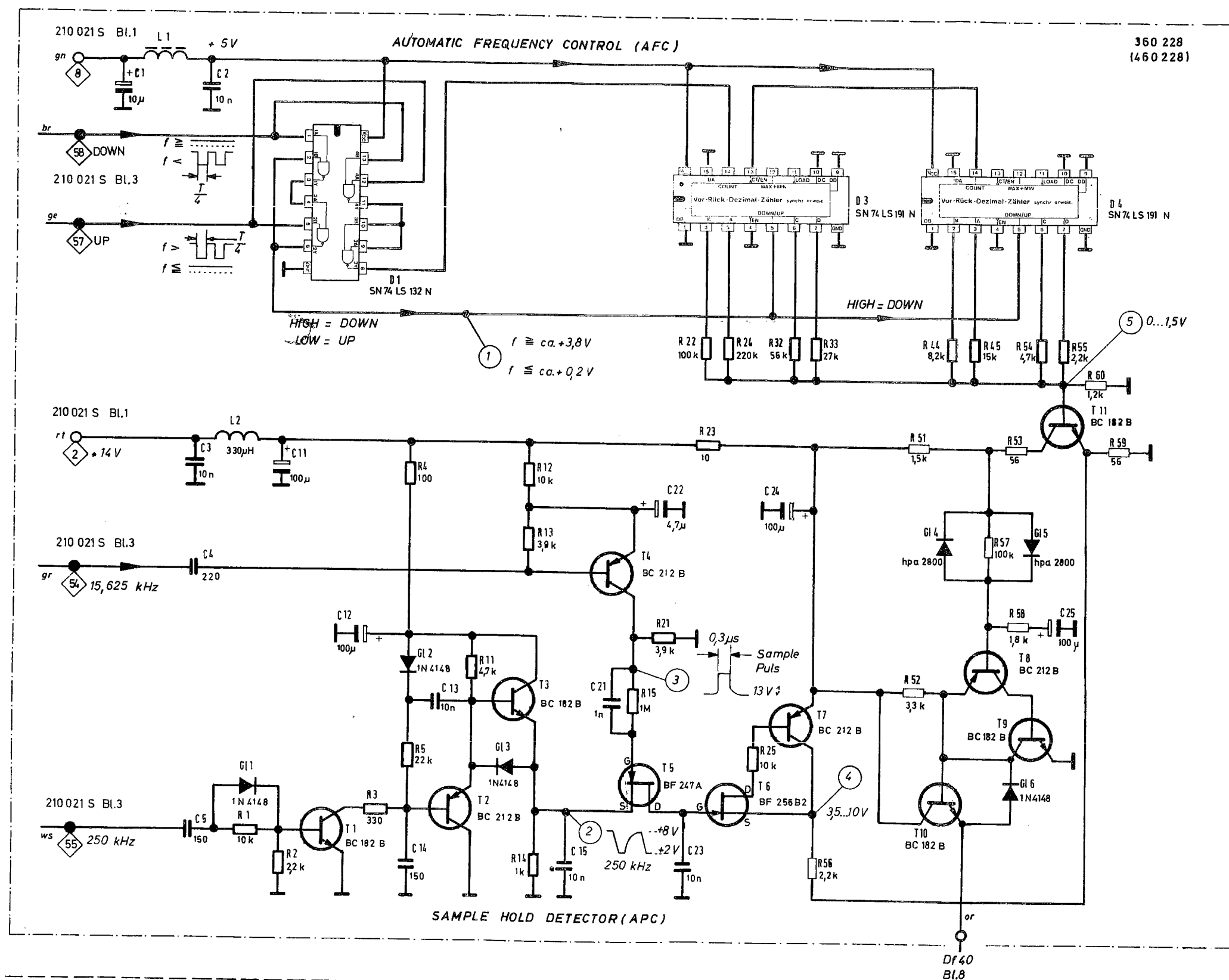


sw BLACK	bl BLUE	20 7020.69	27.10.77	Norm.	gepr.	beerb.	9.1.74.	Neu.	Schlumberger o/s	Dekaden-Stufe	210 021 S Bl.1
br BROWN	vi VIOLET	Ausg.	A-Mittig.	Datum	Name	Datum	Name	Datum	Meßgerätebau u. Vertrieb GmbH	DEKADE-STAGE	Typ: 4010
rt RED	gr GREY	ISS.	MODIF.	DATE	NAME	DATE	NAME	DATE	8 München 46		
rs ROSE	ws WHITE										
ge YELLOW	tr TRANSPARENT										
gn GREEN											

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



sw BLACK	bl BLUE	13 8028.88	17.11.78	ge	norm	Schlumberger o/s	Dekaden-Stufe	1 MHz Dekaden	210 021 S Bl.3
br BROWN	vi VIOLET	12 7028.62	13.10.77	Kf.	gepr.	Meßgerätebau u. Vertrieb GmbH	DECADE STAGE	1 MHz DECADES	Typ : 4010
rt RED	gr GREY	Ausg.	A-Mittg.	Datum	Name	1977			
rs ROSE	ws WHITE	ISS.	MODIF.	DATE	NAME				
ge YELLOW	tr TRANSPARENT								
gn GREEN									



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

15	8028.67	14.7.78	Kr.	norm.	
14	7028.32	12.10.77	Wn	gepr.	
13	7028.52	5.9.77	Kr.	bearb.	21.12.73
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

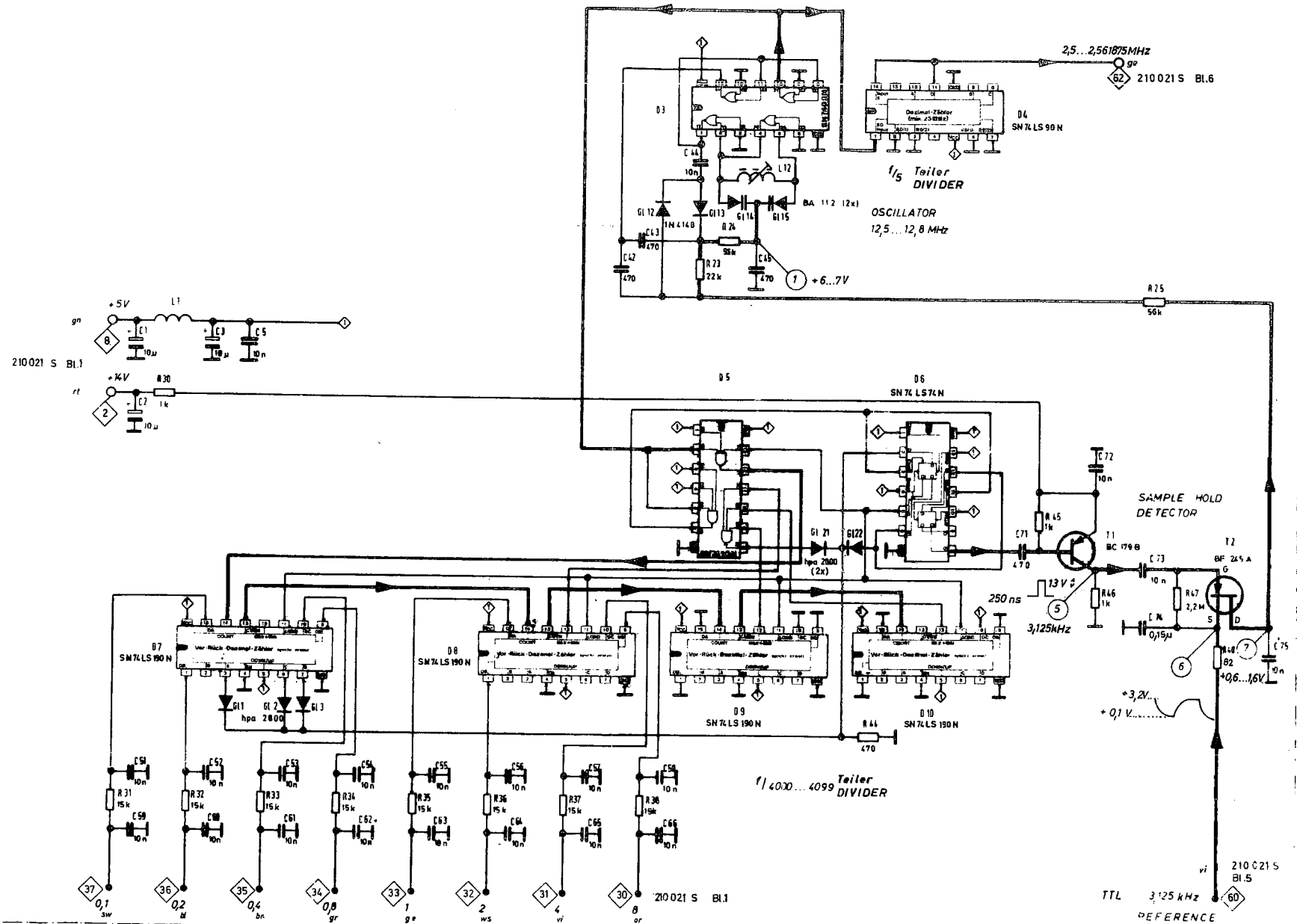
Typ: 4010

Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Nachdruck ist ohne schriftliche Genehmigung der Schlumberger o/s Meßgerätebau u. Vertrieb GmbH.





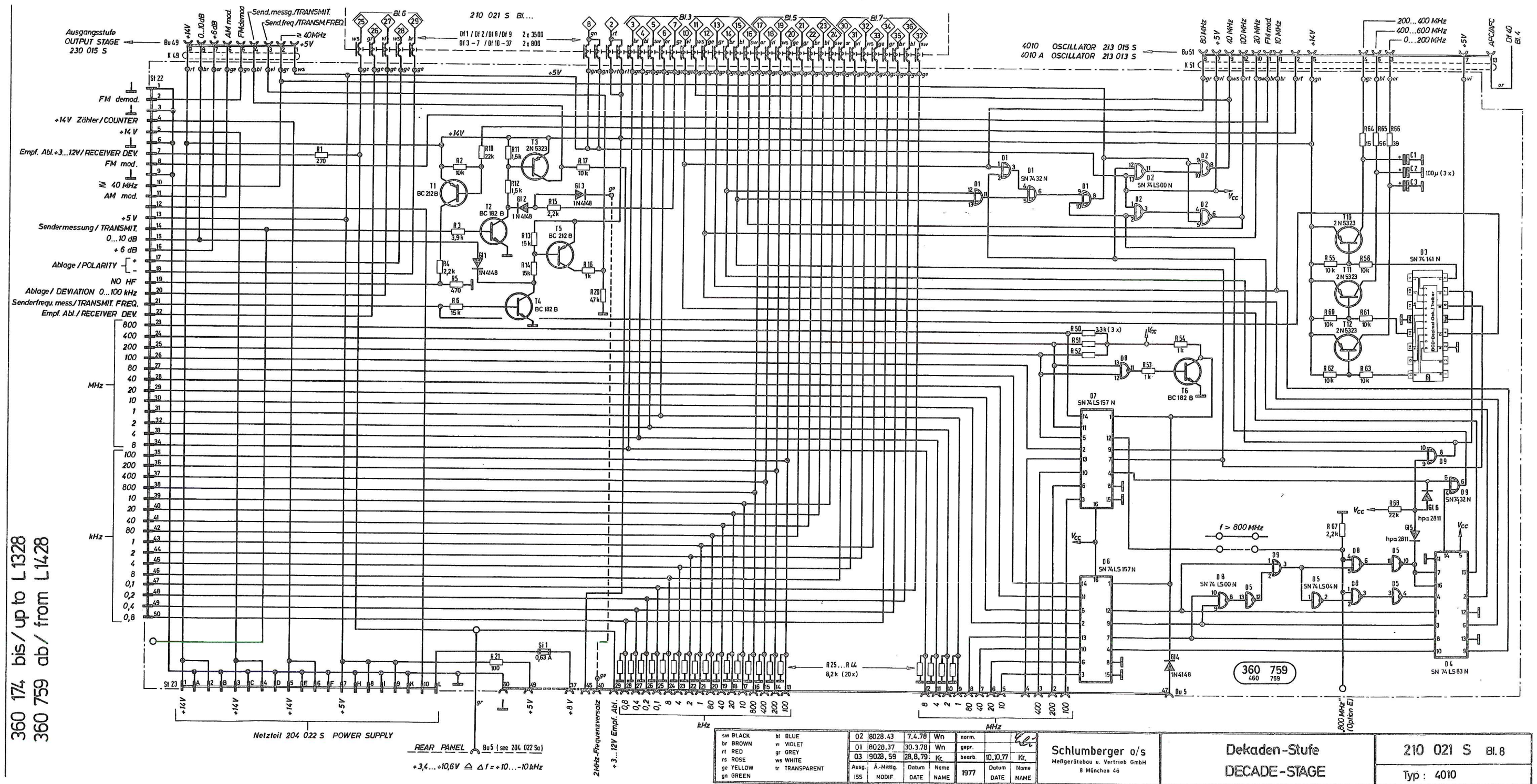
360 231
(460 231)



10 BLACK	11 BLUE	08 8028.27	23.278	Wn	norm	20.9.73	Neu	Schlumberger o/s Messgerätebau u. Vertrieb GmbH 8 München 48	Dekaden-Stufe Enddekaden DEKADE STAGE LASTDECADES	210 021 S Bl. 7	03
12 BROWN	12 VIOLET	06 6028.78	18.875	Wn	gep						
13 RED	13 GREY	07 6028.8	3.276	Kr	beob						
14 ROSE	14 WHITE										
15 YELLOW	15 TRANSPARENT										
16 GREEN											

Typ: 4010

Skjerna er bra.

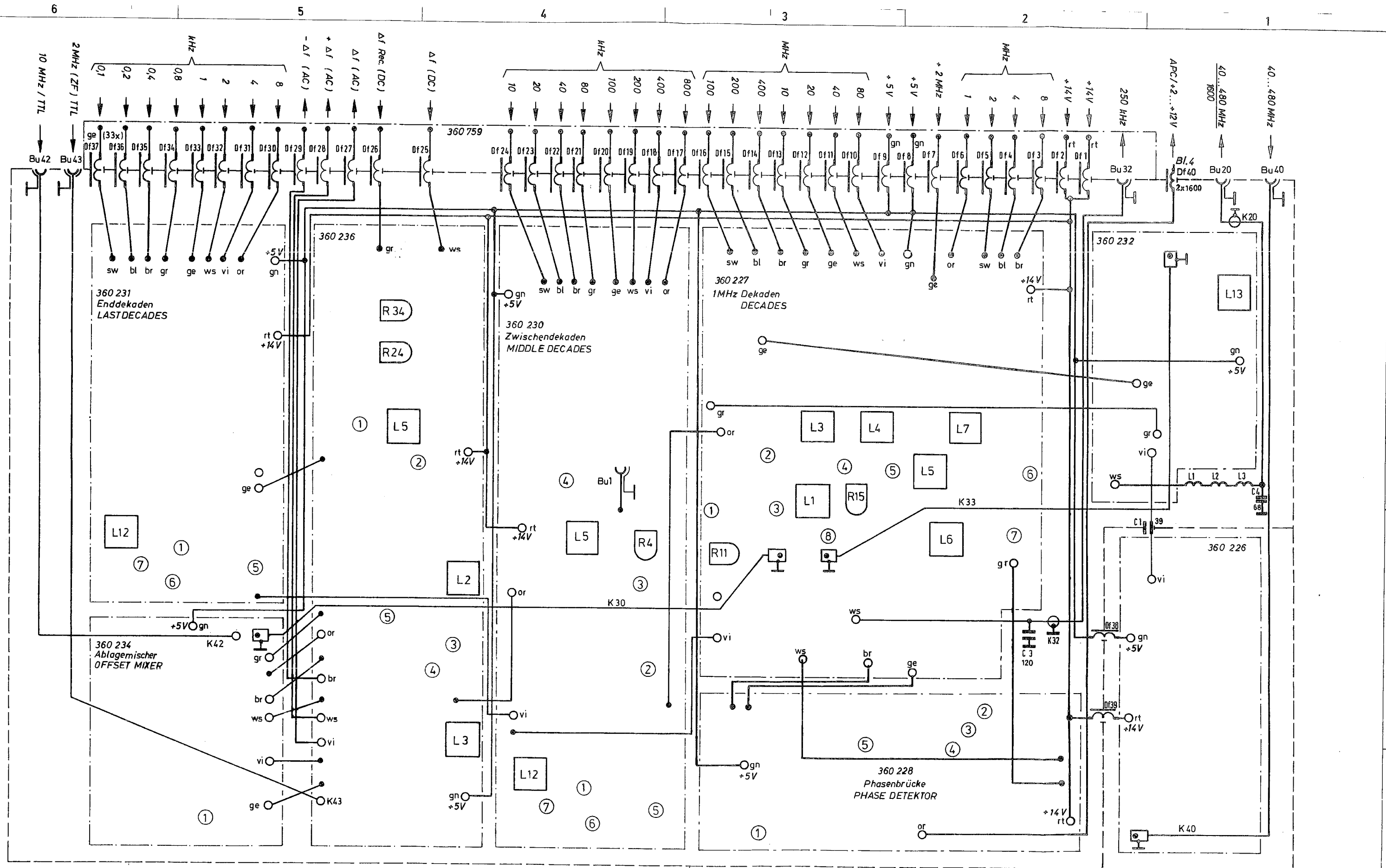


D7/13.
 till $\frac{1}{2}$
 ok. på skymning

3.2k. 1D7/12
1D8/4.

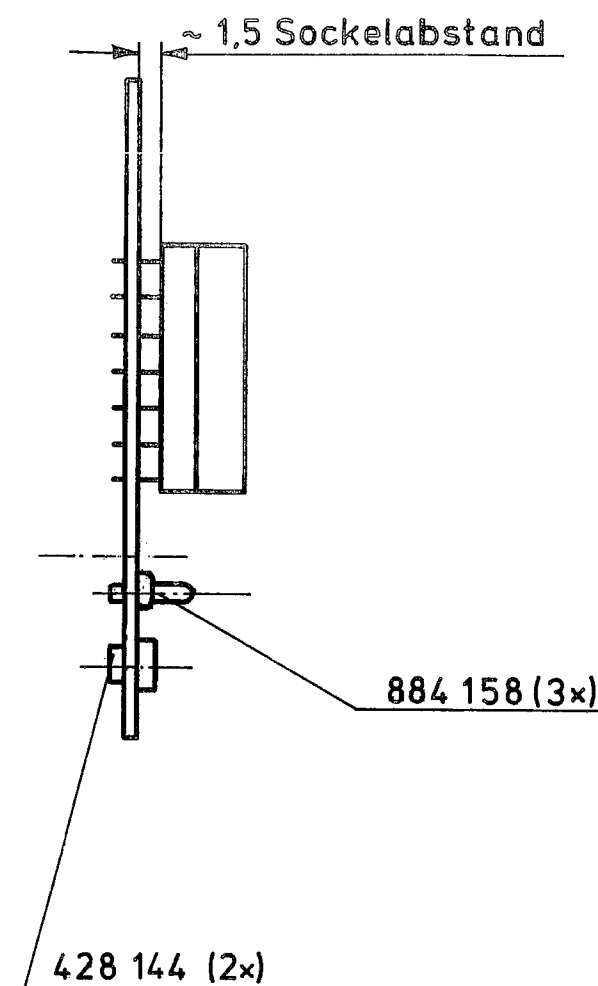
Skullerås förs.

D8/1 7 Skinner.



sw BLACK	bl BLUE	12 7028.69	27.10.77	Kr.	norm.	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	Dekaden-Stufe DECADE-STAGE	210 021 S Bl.9
br BROWN	vi VIOLET	11 7028.62	11.10.77	Wn	gepr.			
rt RED	gr GREY	Ausg.	A.-Mittlg.	Datum	Name	Datum	Name	Typ: 4010
rs ROSE	ws WHITE	ISS.	MODIF.	DATE	NAME	DATE	NAME	
ge YELLOW	tr TRANSPARENT							
gn GREEN								

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

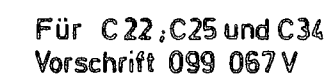


Kontrollmaß

10		Reinhold	ErmaB Isarbrunn	Maßstab:	Schlumberger o/s Meßgeräthbau- u. Vertrieb GmbH München 46
09				2:1	
08					Bestückte Leiterplatte
07					
06		Werkstoff			360 226
05					
04	9028.67 25.9.79 Eiler				Ersatz für
03	8028.92 13.12.78 Mo				
02	5028.21 21.3.75 Le P	Übertragungs	Datum	Name	
01	4028.116 26.10.74 Eiler		gez. 8.1.74	Fabianbauer	
Ausgabe:	Änderung	Name	gezeichnet		
Mitig			gezeichnet		

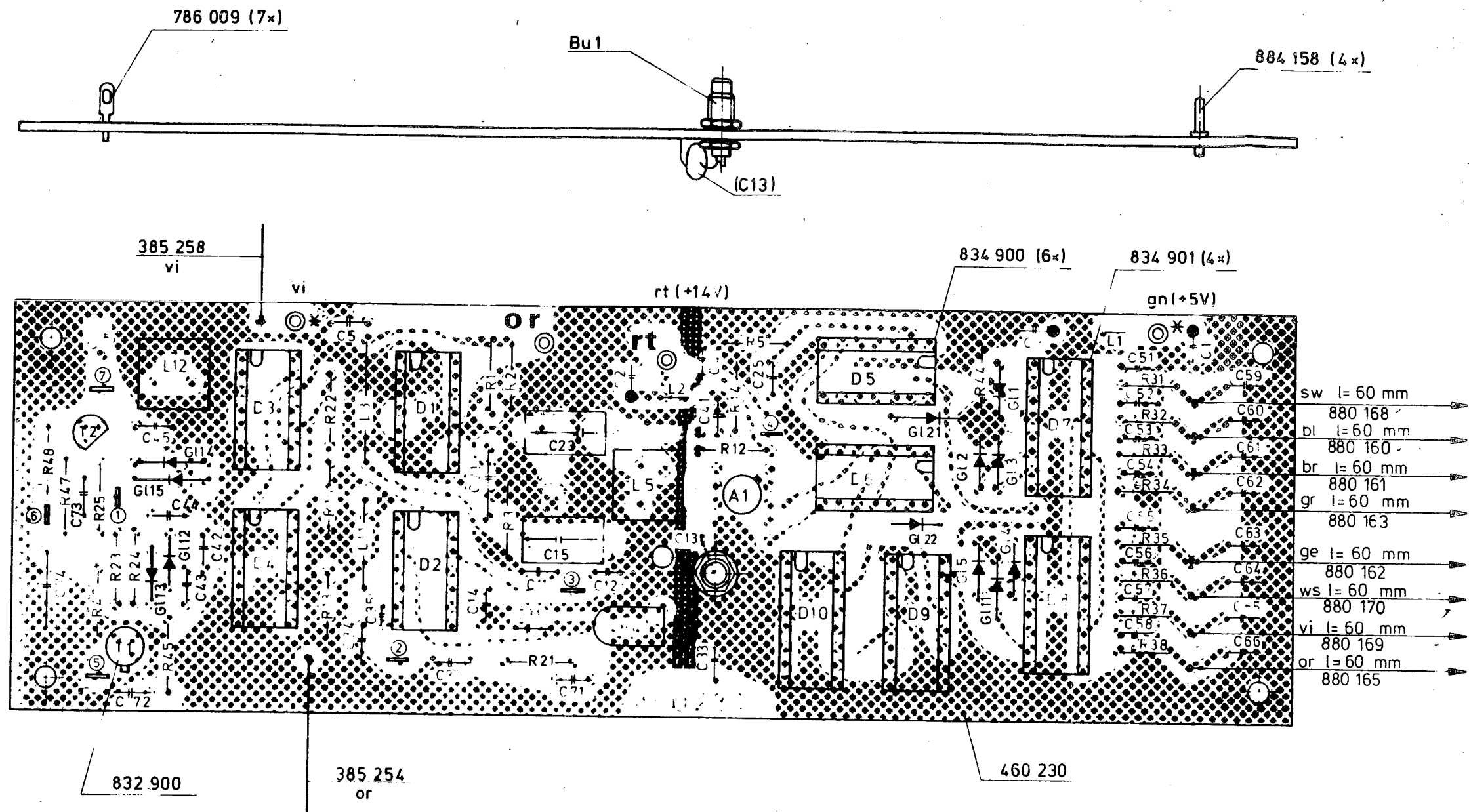
Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

AN nur bei 4709 erforderlich



 = Kontrollmaß

10		Posten	Material in 100%	Material	Schlumberger o/s Ausgabe: 100% Eintrag: 100%
1			0,2	2:1	
1		Ausgang			Bestückte Leiterplatte
1	8028 9 12.76 Mo				
1	8028 15 11.78 Ge				
1	8028 12 10.77 K4				
1	8028 13 11.77 K4	Umfäche			
1	8028 102 12.76 Eiler				
a. a. And- gabe, Metg	Datum		9.57% Lz F		360 227
			beab		
			neu		



* = Farbpunkt

 Kontrollmaß

10	9028.53	6.87	Eiler	Werkstoff	2:1	Schlumberger o/s Meßgerät-Gehäuse-Verbleib H.M. 1. 1. 1.
09	8028.92	13.12.78	Mo			
08	6440.53	23.10.78	Ca	Oberfläche	360 230	360 230
07	6028.8	1.2.76	Haus			
06	4028.106	13.10.74	EILER	Ausgabe	29.10.73	360 230
05	4028.70	19.6.74	Fachb.			
04	4049.21	4.4.71	12-1	Ausgabe	29.10.73	360 230
03	4028.14	12.2.74	Werkb.			
02	6047.1	3.1.74	FACHB.	Ausgabe	29.10.73	360 230
01	3043.21	30.10.	Ca			

E

()

$$rt (+14V)$$

or ge

1

8

A

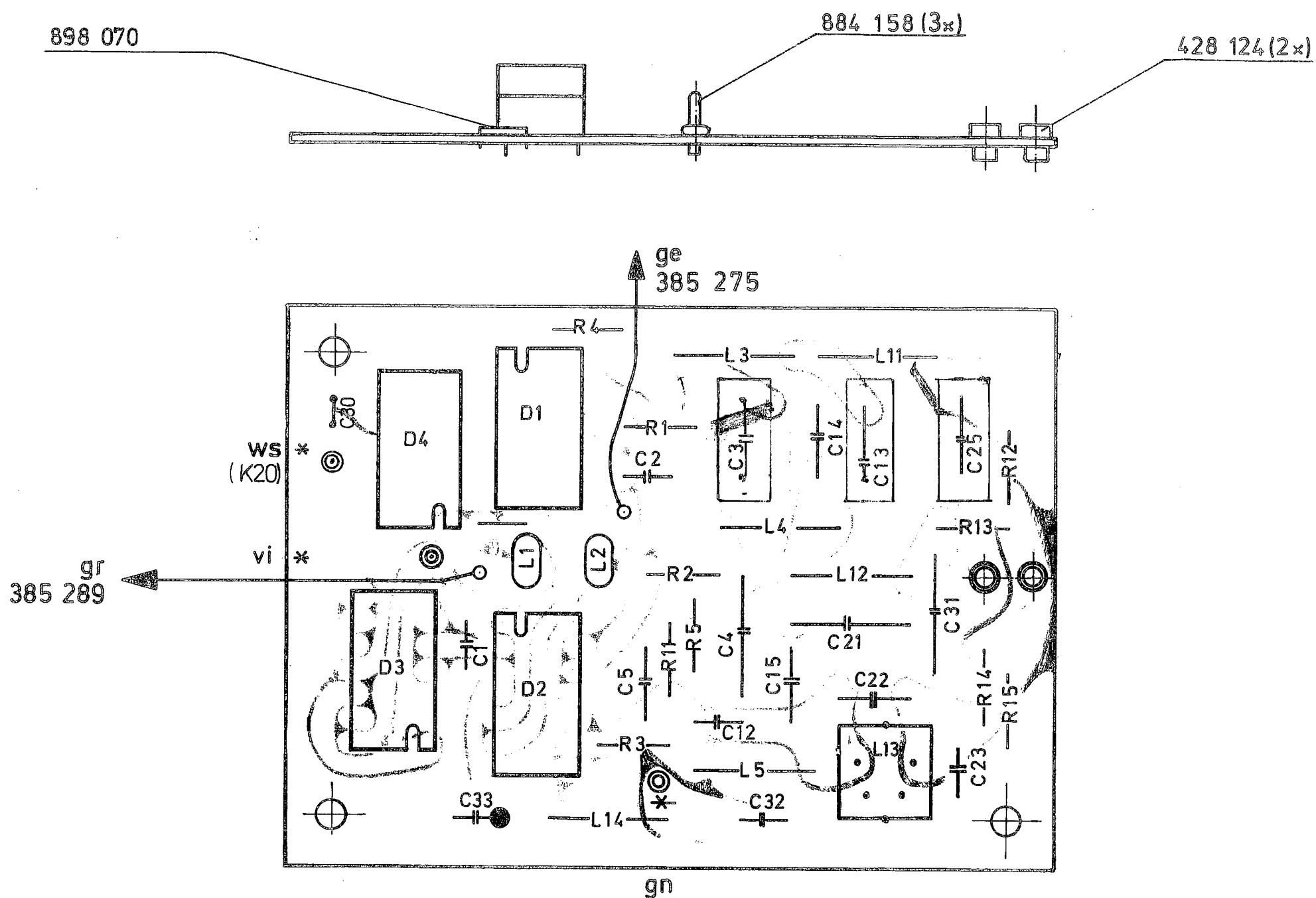
10	9028.53	6.8.79	Eiler
09	8026.92	13.12.78	Mo
08	6028.8	2.2.76	Koser
07	5028.46	14.5.75	Eiler
06	4028.106	131074	EILER
05	3028.97	9.9.75	42-
04	2028.48	4.4.74	13-J
03	4047.11	18.2.74	Fahnd
02	4047.1	3.1.74	FAHND.
01	3047.11	29.10.73	42-

360 231

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

9.10.73. Fahrplan
26.10.73

weich gelötet



* = Farbpunkt

— Kontrollmaß

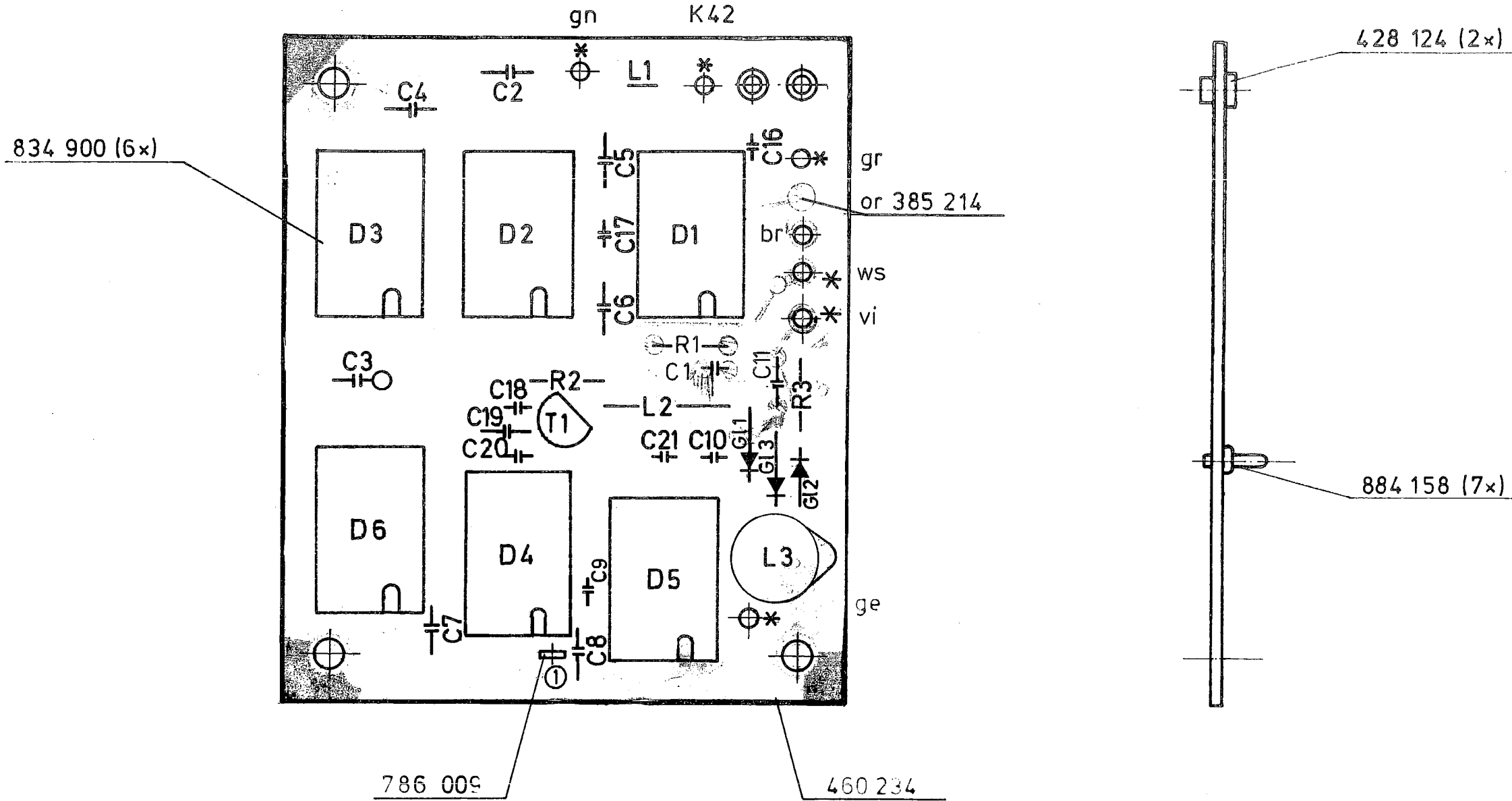
verwendet in: 210 021

Gerät: 4010 / 4020

Schaltplanpositionierung $\triangle$ 210 021 S / 360 232 Sa

IC				Rohrteil	Lagerort	Maßstab	Schlumberger o/s Meßgerätekabine - Vertrieb GmbH K. Meißner Str.
IC	8028.92	13.12.78	Mo				
09	8028.92	13.12.78	Mo	Werkstoff		2:1	Bestückte Leiterplatte
08	7028.88	30.11.77	Eiler				
07	6028.90	11.11.76	Le				
06	6028.28	2.4.76	Eiler				
05	6028.7	2.2.76	Eiler				
04	5028.104	25.11.75	Eiler	Oberfläche		Datum	Name
03	5028.97	23.10.75	Eiler				
02	5028.2	22.1.75	Eiler				
01	4028.104	11.10.74	Falch	Ausgabe		Datei	360 232
Ausgabe	Andg	Mittig	Datum				
Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.				Ersatz für			

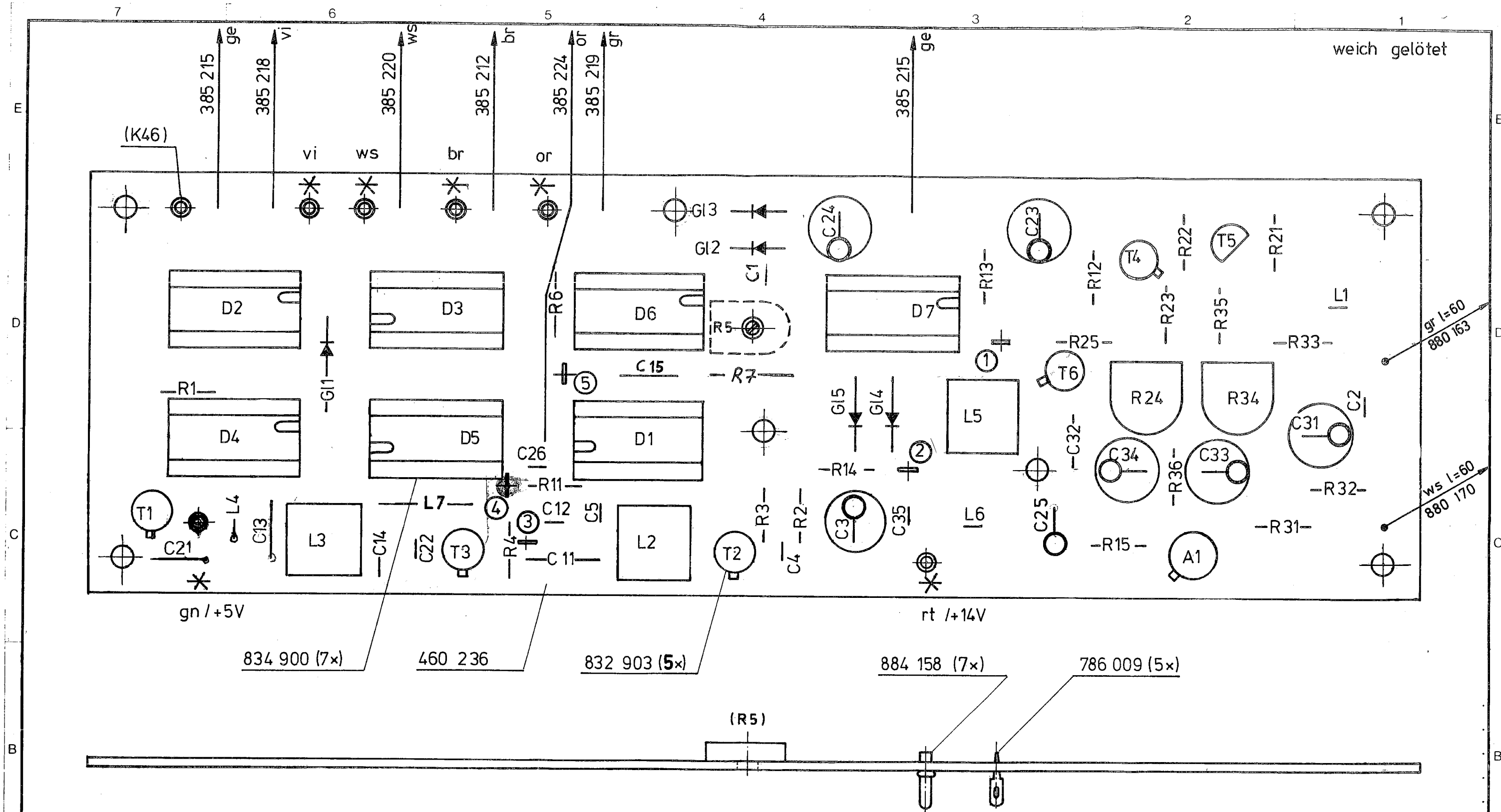
weich gelötet



* = Farbpunkt

Kontrollmaß

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----



20				Rohteil	Freimaßtoleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46
19						2:1	
18				Werkstoff			Bestückte Leiterplatte
17							
16							360 236
15							
14							Ersatz für
13							
12	9028.53	6.8.79	Eiler	Oberfläche	Datum	Name	360 236
11	9094.43	9.5.79	Eiler		gezt	LE P	
Ausgabe	Ändg. Mittlg	Datum	Name		bearb		Ersatz für
					gepr		

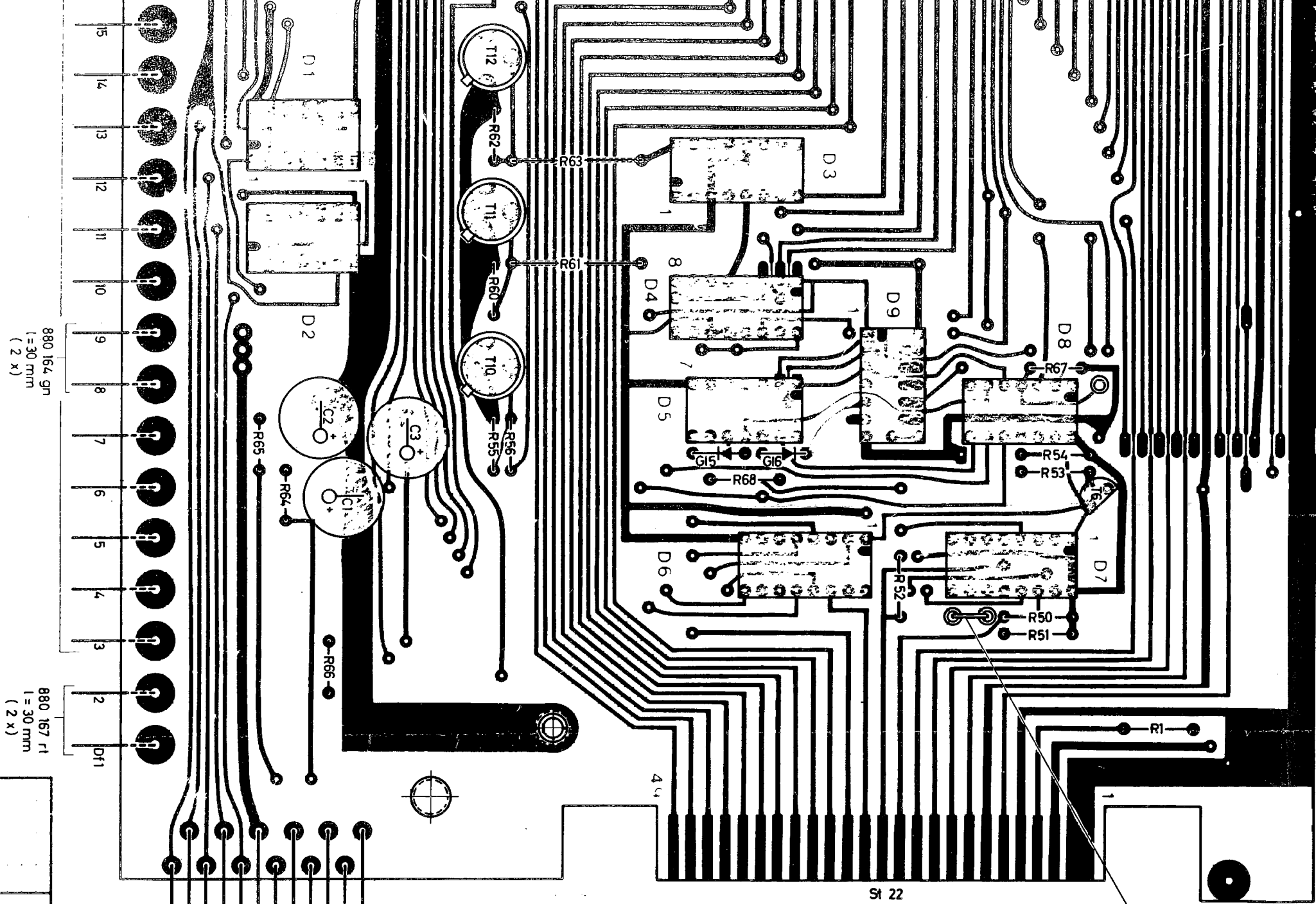
Schaltplanpositionierung $\triangle$ 210 021S / 360 236 Sa

Gerät: 4010 / 4020

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

NZ-Vordruck Niedernhausen/Ts

R25 ... R44 stumpf auf
Massebahn geölt



Technical drawing of a street lighting pole assembly. The drawing shows a vertical pole with various components and dimensions. Key components and dimensions include:

- 385 005**: Component at the top of the pole.
- bei $f > 800 \text{ MHz}$** : Note indicating frequency.
- 428 096 (6 x)**: Component with a dimension of 15 ± 1 .
- 834 901 (4 x)**: Component with a dimension of 17 .
- 460 759**: Component with a dimension of $l = 10 \text{ mm}$.
- 889 035 (4 x)**: Component with a dimension of $l = 10 \text{ mm}$.
- (R61/63)**: Component with a dimension of 17 .
- 426 093 (3 x)**: Component with a dimension of 17 .
- eingeklebt mit Technicoil nach 099 041 V**: Note indicating adhesive.
- 834 900 (5 x)**: Component with a dimension of $\sim 15 \text{ Sockelabstand}$.
- 384 171 (K51)**: Component with a dimension of $\sim 15 \text{ Sockelabstand}$.
- DF 40**: Component with a dimension of 375 214 .

Gerät : 4010

9028 59 28.8. 79 M4 7028 85 24.11.77 M4 7028 69 27.10.77 M4			
1977 26.10.77 Kringelis	2:1	Schlumberger o/s	Bestückte Leiterplatte
			360 759

500 565
M3x6 DIN84
701 145
A3 DIN 137
706 208
2x

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

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

SI 23

SI 1
T 0 63 / 250 B

R25

R27

50



(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.

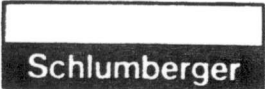
1.2 EMF Adjustment

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 2 V 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 Frequ. (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.

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

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

Adjustment and Test Procedure					4020 series OUTPUT STAGE	
Schlumberger	Issue	Alteration No.	Date	Name	230 025 A	1/7 Sheet
	-	0028, 29	27.3.80	Morasch	Replacement for	

Adjustment and Test Procedure					4020 series OUTPUT STAGE						
Schlumberger	Issue	Alteration No.	Date	Name	DWM	<u>ENF and Power Indication Meter.</u> Check out of mechanical zero setting Adjust Pointer to full-scale deflection by aid of the ENF control knob on the front panel and check potential at	Df 3	DC	meter I 3	zero deflection	ok
					Power Meter	Pre-set all trimmer potentiometers on 360 761 and 360 762 to mid-position, except R 34. R 34 adjust to 2/3 fully anti-clockwise. Pre-set C 9 to minimum capacity.		40 to 200 MHz	R 42 / 360 761 R 72 / 360 762 Don't change R 42 if level is below -30 dBm	- 30 dBm $\pm$ 0,4 dB	dB
						<u>Flatness of RF Signal</u> Adjust ENF-indikation by front panel controls to +83 dBµW (+83 dBµW $\hat{=}$ -30 dBm)	RF output (N-socket)	400 to 479 MHz	R 21	- 30 dBm $\pm$ 0,4 dB	dB
					230 025 A		2/7 Sheet				

4020 series
OUTPUT STAGE

230 025 A

Adjustment and Test Procedure

Issue	Alteration No.	Date	Name

0028.29

27.3.80

Morasch

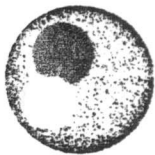
Replacement for

4020 series
OUTPUT STAGE

230 025 A

3/7
Sheet

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
	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 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.	Bu 13 "	C 6 mid-pos. 0,1 MHz 10 kHz...39,9 MHz	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
AC-DVM Modulation Meter	<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
	<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 %



REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
RF Power meter	<u>Linearization of EMF Setting</u> Set attenuator on front panel to + 80 dB μ V and EMF Control to indication	RF-socket " " " "	180 MHz " " " "	R 72 R 65 Test	- 30 dBm - 35 dBm - 30 dBm	
	<u>Power Flatness at meter deflections - 7 and + 5 dB</u> Attenuator setting to + 80 dB μ V EMF meter deflection - 7 dB + 5 dB	" " " "	40 ... 479,9 MHz " " " "	check " "	- 40 dBm $\pm$ 0,8 dB - 28 dBm $\pm$ 0,8 dB	dBdB
	<u>Auxiliary Modulator (360 761)</u> Disconnect the counter " + 6 dB " not pressed	230 025 S B1. 3 ② ③	20 MHz - "	R 35, 42, 44 — Middle position L 1 L 3	— 20 MHz $\pm$ 100kHz Minimum of the AGC voltage + 11,5 V	+V
					9,5 mV into 50 Ω - 28 dBm 7,5 mV into 50 Ω Error < 0,1 dB	ok

Adjustment and Test Procedure

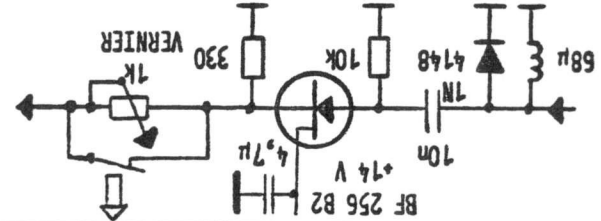
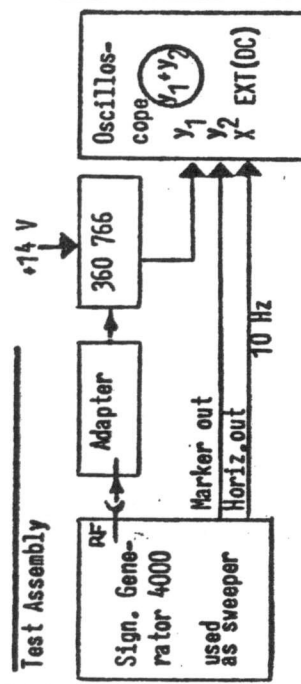
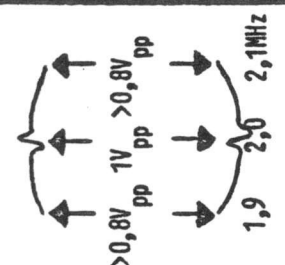
Schlumberger

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

4020 series
OUTPUT STAGE

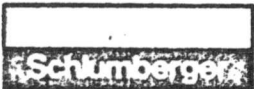
230 025 A

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

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

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
	IF Limiter Amplifier (360 766)	(2)			$\Delta f \pm \Delta f$ Max.Level = 7...10 V pp Δf symmetrical $\pm 40 \dots \pm 70$ kHz	V ppkHz
	4000: 1 MHz, 2 V EMF, Attenuator = 0 dB Sweep Deviation = 100 kHz, Sweep Rate = 10 Hz (Due to its high input level, the adapter is operating as a frequency doubler now. Available sweep deviation is increased to ± 200 kHz.) IF Discriminator (360 766) Set R 46 to mid position 4000: 1,85...2,15 MHz, 2 V EMF, 0 dB, UNMOD without SWEEP Vernier adjustment: 4000: 1 MHz, 2 V EMF, 0 dB, UNMOD, SWEEP ± 100 kHz	(3) (5) (6) (3)	2 MHz 1,85MHz 2,15 MHz 1,8...2,2 MHz	L12/L13 → Max.RF Level 7...9 V pp L14 → Max. DC L15 → Max. DC L12/L13	$\pm 2 \dots 3$ V $-2 \dots -3$ V 1,8 1,965 2 2,035 2,2 Max.Level = 7,5...8,5 V pp ΔU_p from 1,965 MHz up to 2,035 MHz < 0,1 V p	V pp
	4000: 1,85...2,15 MHz, 2 V EMF, 0 dB, UNMOD, without SWEEP	(5) (6) (4)	1,85 MHz 2,15 MHz 2 MHz	L14 → Max.DC L15 → L14 → VDC ₀ /2 L15 → VDC ₀ = 0 V	$+ 2,4 \dots + 2,8$ V $- 2,4 \dots - 2,8$ V VDC ₀ = 0 ... $\pm 0,2$ V	0,V p +2,V -2,V 0,Vok

Adjustment and Test Procedure

4020 series
OUTPUT STAGE

230 025 A

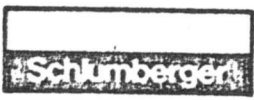
6/7
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	f_{mod} Amplifier (360 766) Calibrate precisely the frequency deviation 20 kHz at $f_{mod} = 1/10/20$ KHz of the signal generator (4000) before the following procedure. 4000: 2 MHz, 2 V EMF, 0 dB, FM: $\Delta f = 20$ kHz	DF 8 ■ ■	$f_{mod} = 1$ kHz ■ = 20 kHz ■ 1 to 10 kHz ■ 10 to 20 kHz $f_{mod} = 1$ kHz	R 82 C 69 --- --- ---	1,00 V AC 0,93 V AC 0,97.....1,03 V AC 0,91,1 V AC Distortion < 0,7% (CCITT weighted)	V V 0.....%
	<u>Squelch</u> Test assembly as on sheet 5/7 Signal Generator 4000: 2 MHz, 2 V EMF Output attenuator 53 ... 68 dB Select and adjust SWEET MODE	DF 8		R 18	10 to 13 V pp (Squelch ON)	

Adjustment and Test Procedure

4020 series
OUTPUT STAGE



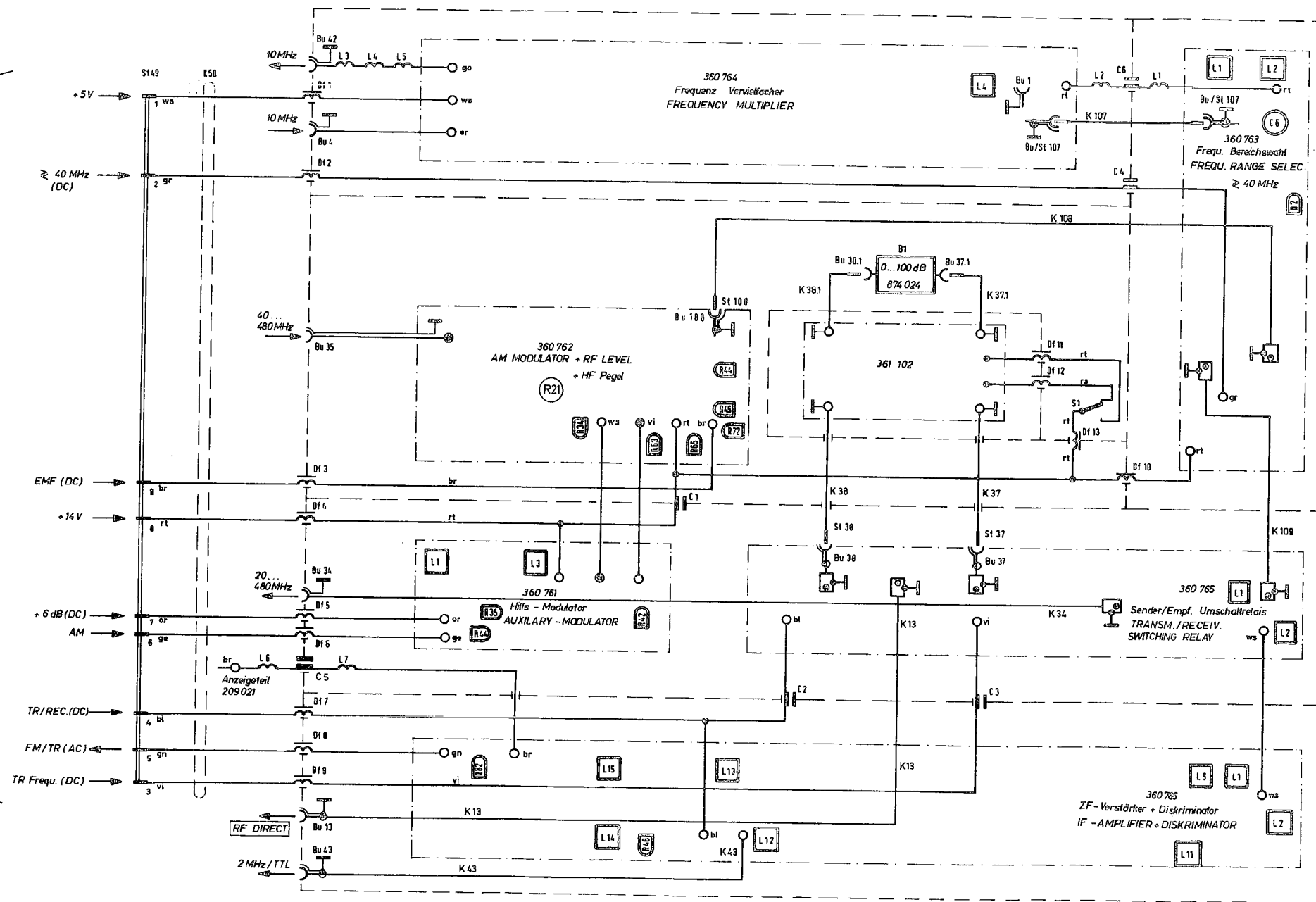
Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A

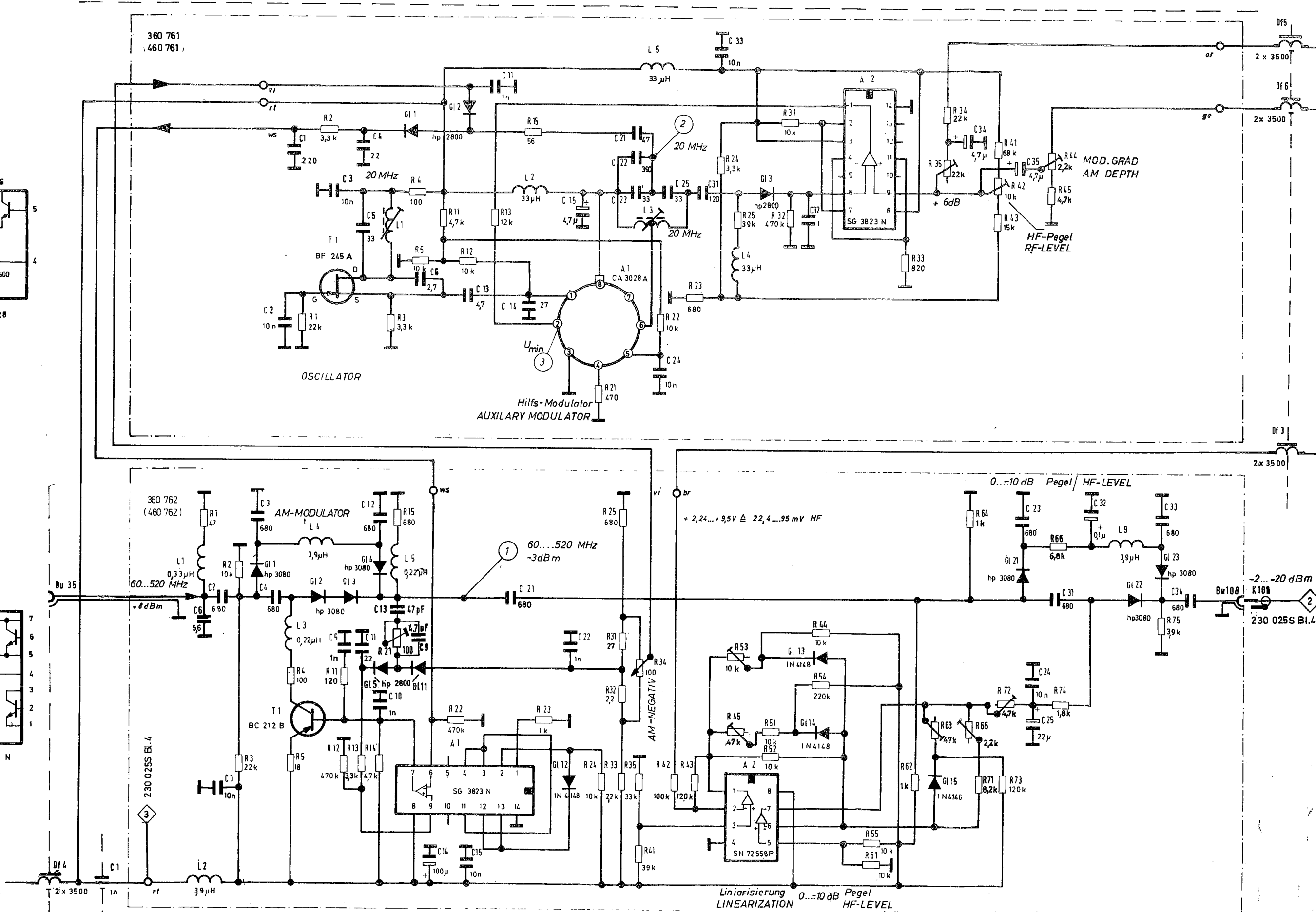
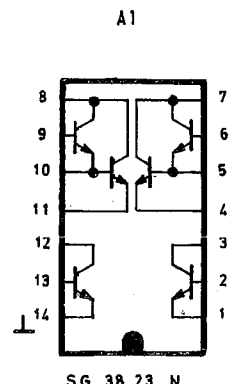
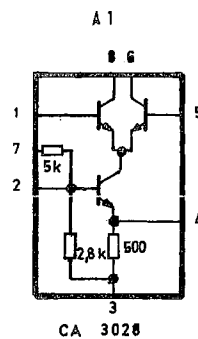
7/7
Sheet

Replacement for

Dezadenstufe
DECADE STAGE
210 021 S



sw BLACK	bl BLUE	04	9028.58	20.8.75	Eller	norm.		Schlumberger o/s Messgerätebau 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	Eller	gepr.				
rt RED	gr GREY					boarb.	28.9.78			
rs ROSE	ws WHITE	Ausg.	A-Mittig	Datum	Name					
ge YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME					
gn GREEN										



sw BLACK	bl BLUE	norm	
br BROWN	vi VIOLET	gepr	
rt RED	gr GREY	bearb	11.10.78
rs ROSE	ws WHITE		
ge YELLOW	tr TRANSPARENT		
gn GREEN			

3028-50 27.7.79 Eiler	
3028-78 27.7.79 Eiler	
Ausg A Mittlg Datum Name	
ISS MODIF DATE NAME	

Schlumberger o.s	
Meßgerätekau u. Vertrieb GmbH	
8 München 46	

Ausgangsstufe	
OUTPUTSTAGE	

230 025 S Bl.3	
Typ 4020	

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

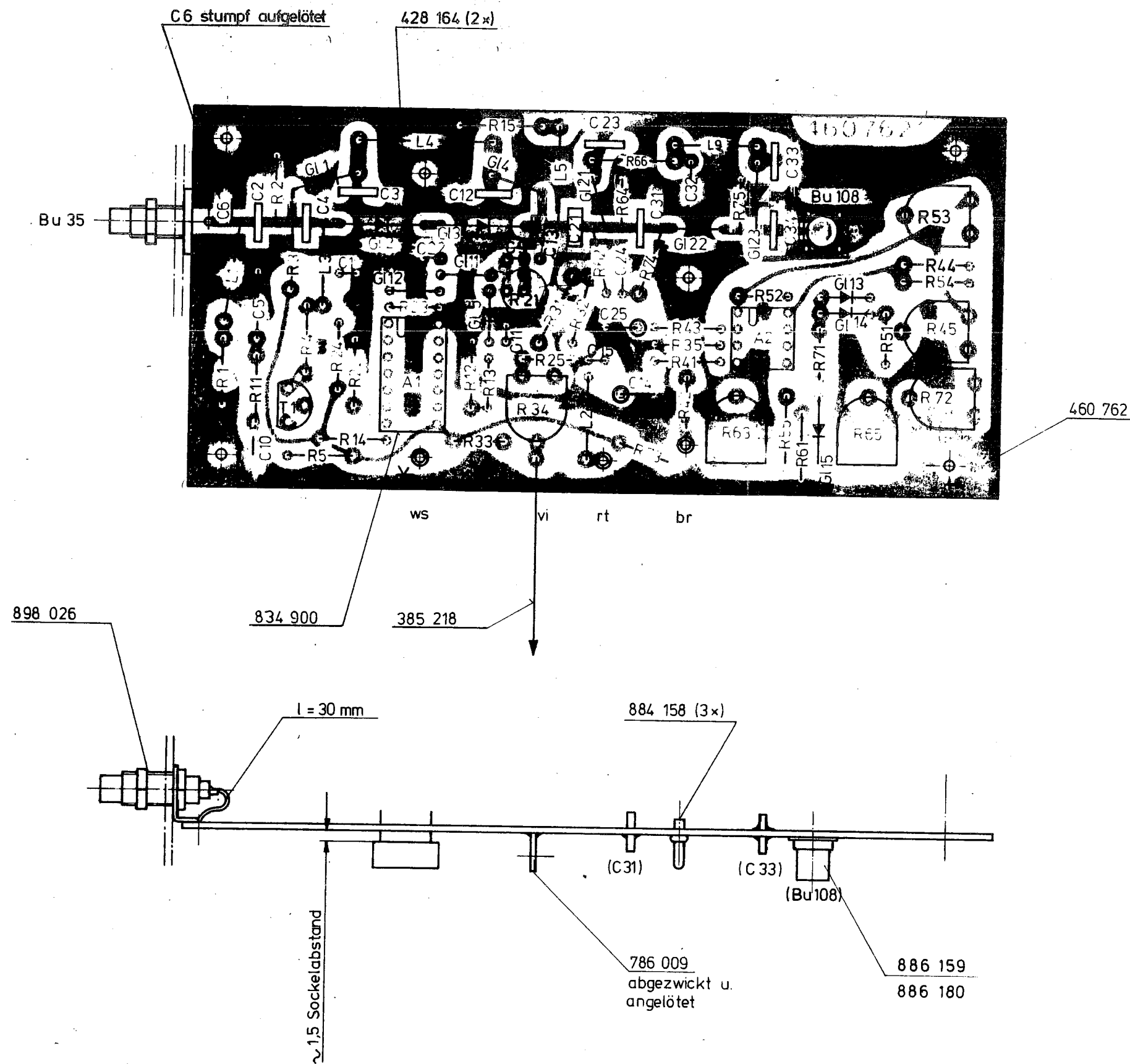
The diagram illustrates a radio receiver circuit, divided into three main sections, each with its own component list and frequency specifications.

Section 360 764 (460 764): This section includes a phase-locked loop (PLL) circuit with a phase-locked loop (PLL) IC (D1, MC 4044), a phase-locked loop (PLL) IC (D2, MC 4044), and a phase-locked loop (PLL) IC (D3, SN 74LS74N). It also features a phase-locked loop (PLL) IC (D4, SP 8741) and a phase-locked loop (PLL) IC (D5, SN 74LS74N). The circuit is powered by a 5V supply and includes a 10 MHz input signal.

Section 360 763 (460 763): This section is a mixer and amplifier stage. It includes a mixer (T1, BC 212 B) and an amplifier (T2, BC 212 B). The circuit is powered by a 5V supply and includes a 10 MHz input signal. It also features a phase-locked loop (PLL) IC (D1, MC 4044) and a phase-locked loop (PLL) IC (D2, MC 4044).

Section 360 762 (460 762): This section is a mixer and amplifier stage. It includes a mixer (T1, BC 212 B) and an amplifier (T2, BC 212 B). The circuit is powered by a 5V supply and includes a 10 MHz input signal. It also features a phase-locked loop (PLL) IC (D1, MC 4044) and a phase-locked loop (PLL) IC (D2, MC 4044).

100 BLACK	01 BLUE	05	norm	 Schlumberger o/s Hauptgeschäftsbau u. Vertrieb GmbH 8 München 66	Ausgangsstufe OUTPUT - STAGE	230 025 S Bl. 4 Typ : 4020
110 BROWN	02 VIOLET	04	gepr			
120 RED	03 GREY	03	bezo			
130 ROSE	04 WHITE	9028.58	20.8.78			
140 YELLOW	17 TRANS-PARENT	03	28.8.78			
00 GREEN						



* = Farbpunkt
 O = Kontrollmaß

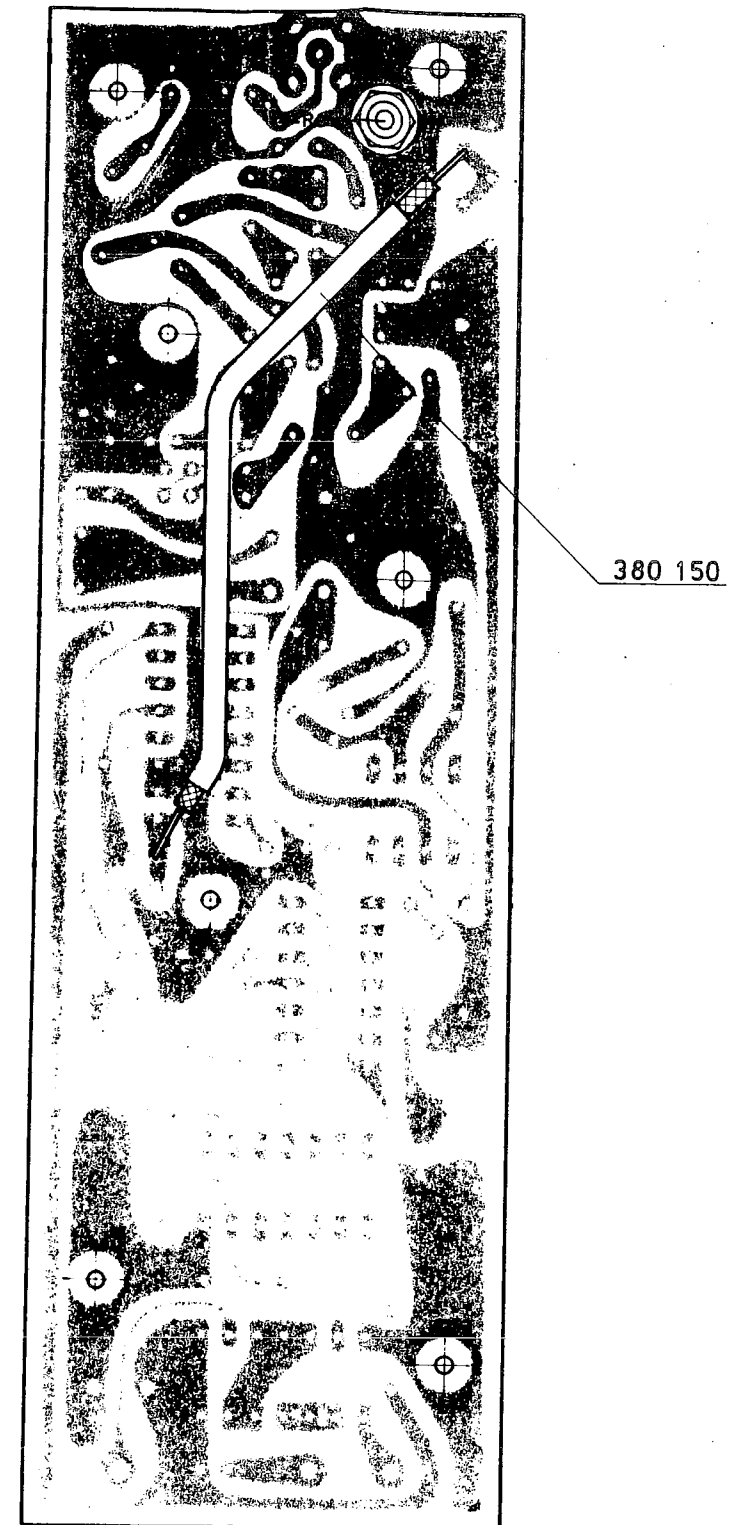
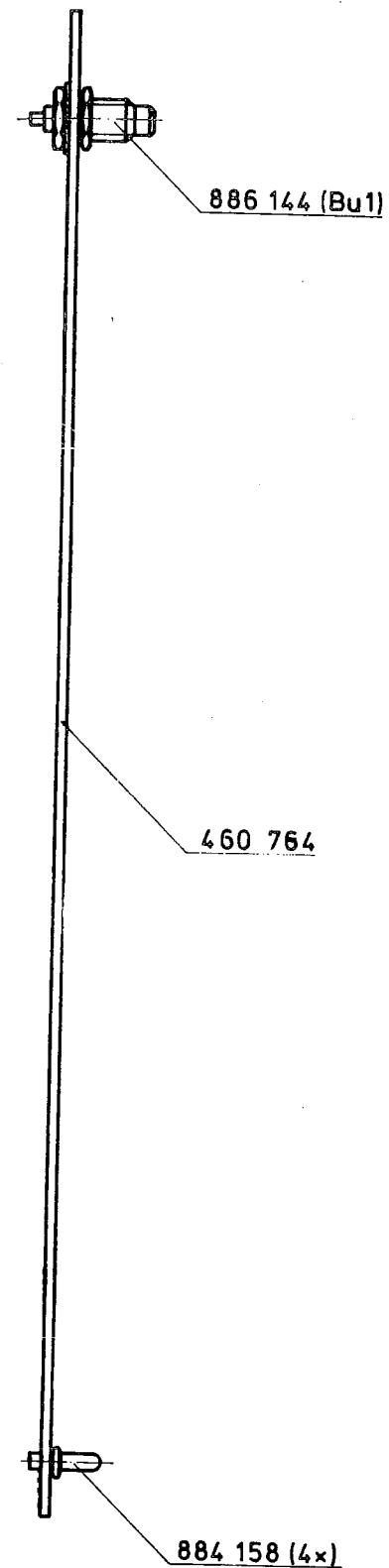
		Schlumberger o/s	
		2:1	
		Bestückte Leiterplatte	
12 9028 50 277.78 Eiler		311.76 LE P	
11 802889 512 78 Mo		360 762	
Ansg. Mittig			

230 025 S

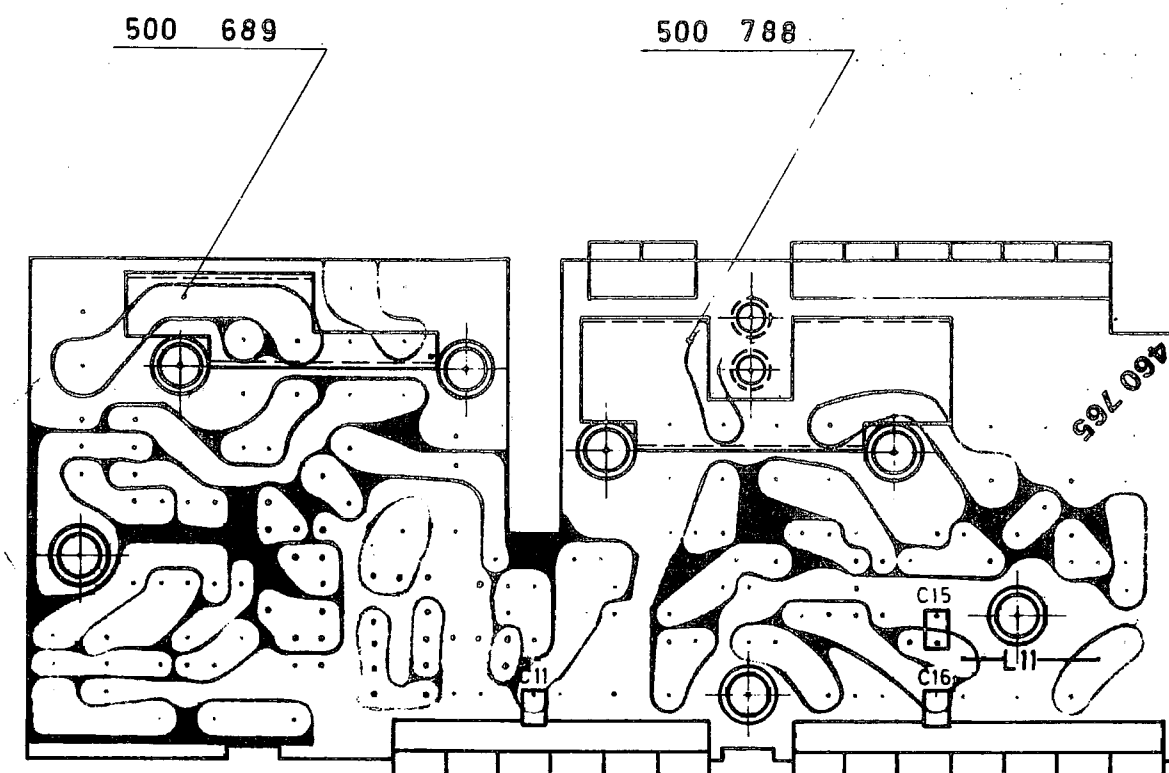
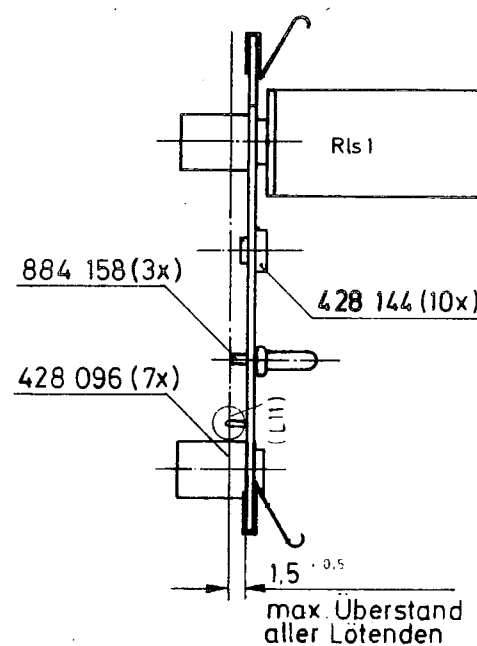
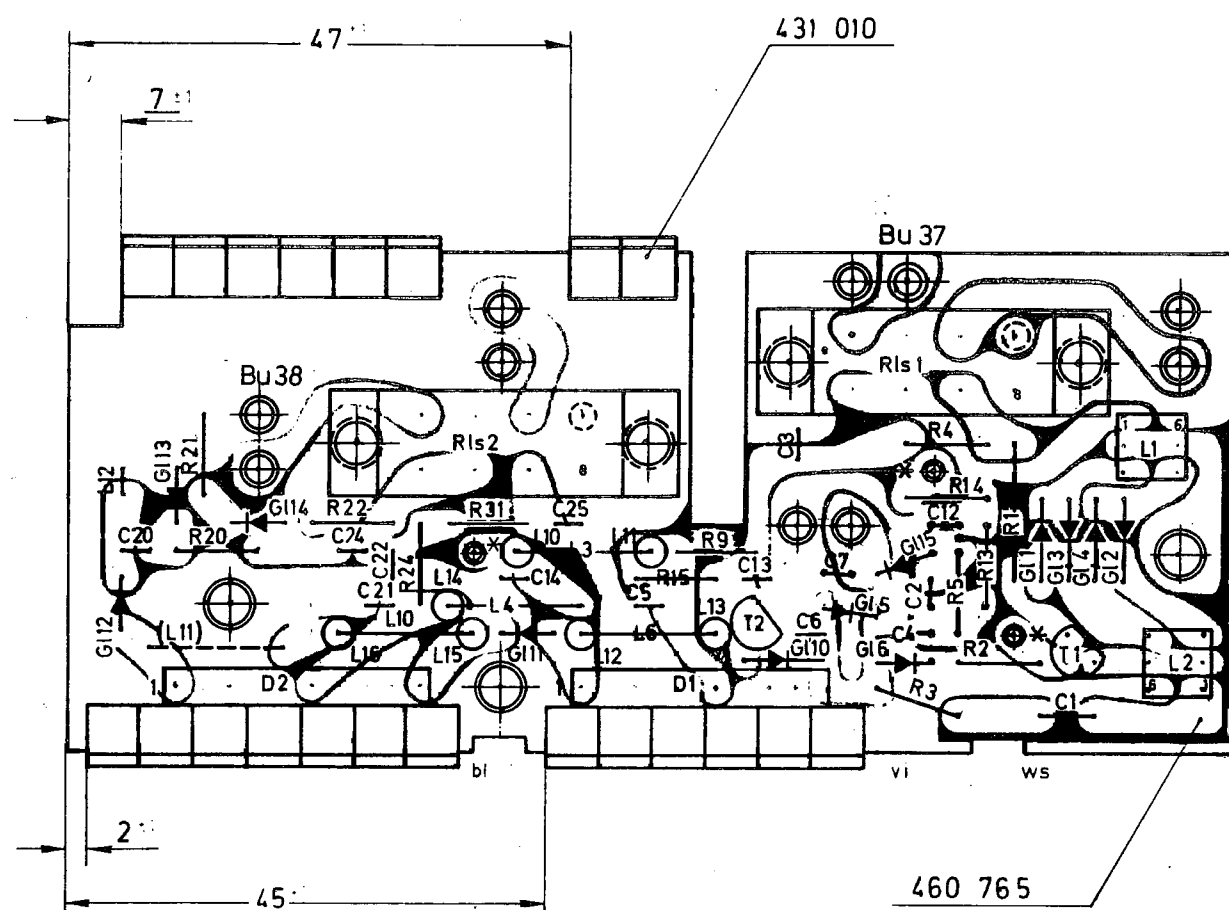
Schaltplanpositionierung 230 015 S / 360 762 Sa

verwendet in: 375 205/216/226

Gerät: 4010/4020



10						Rohteil	Freimaß: Toleranzen	Maßstab	Schlumberger o/s Meßgerätestaub u. Vertriebs GmbH 5. Musterstr. 45
09									
08									
07	90285	20.8	79	Eiler		Werkstoff		2:1	
06	9028	37.18	5.79	Eiler					
05	802889	5.12.78	Mo						
04	802870	25.7.78	Mo						
03									Bestückte Leiterplatte 360 764
02						Oberteile	18 Datum	Name	
01							gez		
	Ausgabe	Ändg-Menge	Datum	Name			bearb	25.7.78	



* = Farbpunkt

10	902842	3.7.79	Eiler	±	2.1	Schlumberger & S.
09	902875	26.9.78	Eiler			
08	902847	23.6.76	Eiler			Bestückte Leiterplatte
07	902837	18.4.75	Eiler			
06	902822	25.3.75	Eiler			
				25.3.75	EILER	360 765
				2.4.75	<i>Ja K. K.</i>	

230 025 S
230 018 S

230 015 S / 360 765 Sa

375 226

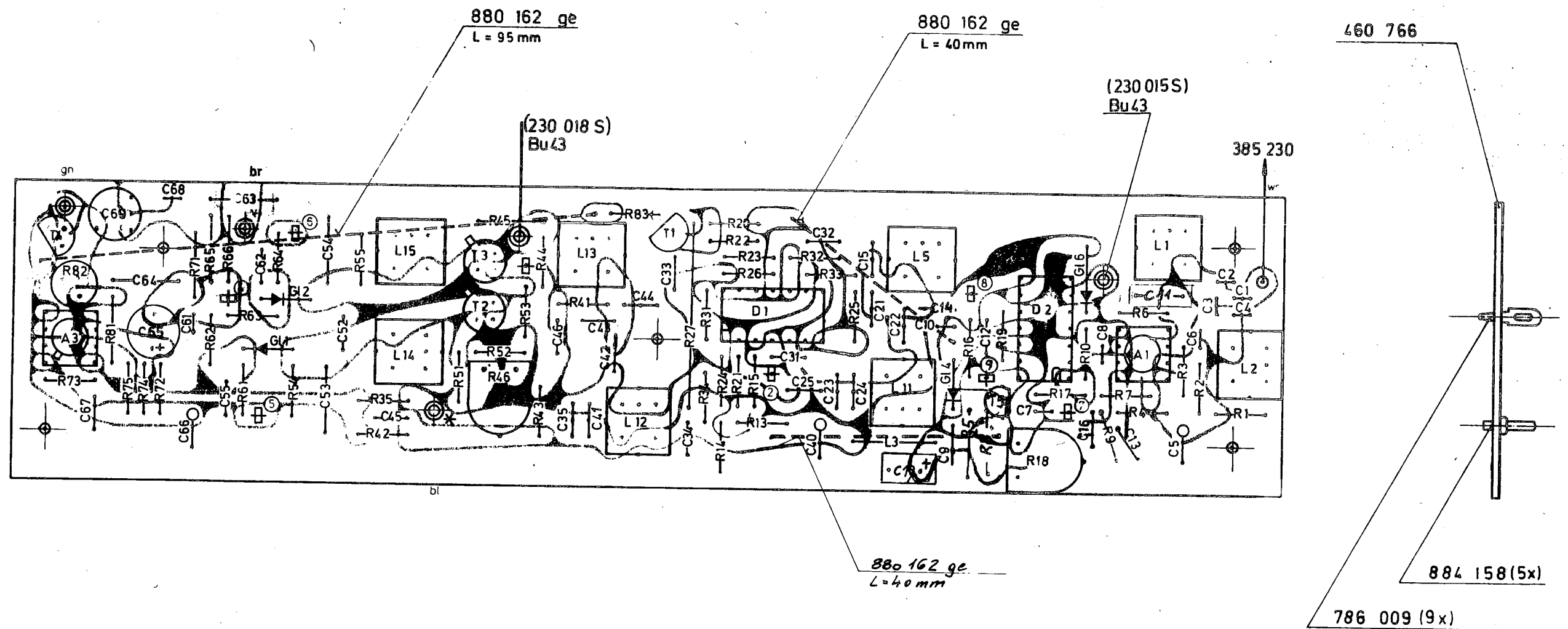
375 205

375 216

4020 / 21/22

4710 A

berat: 4010

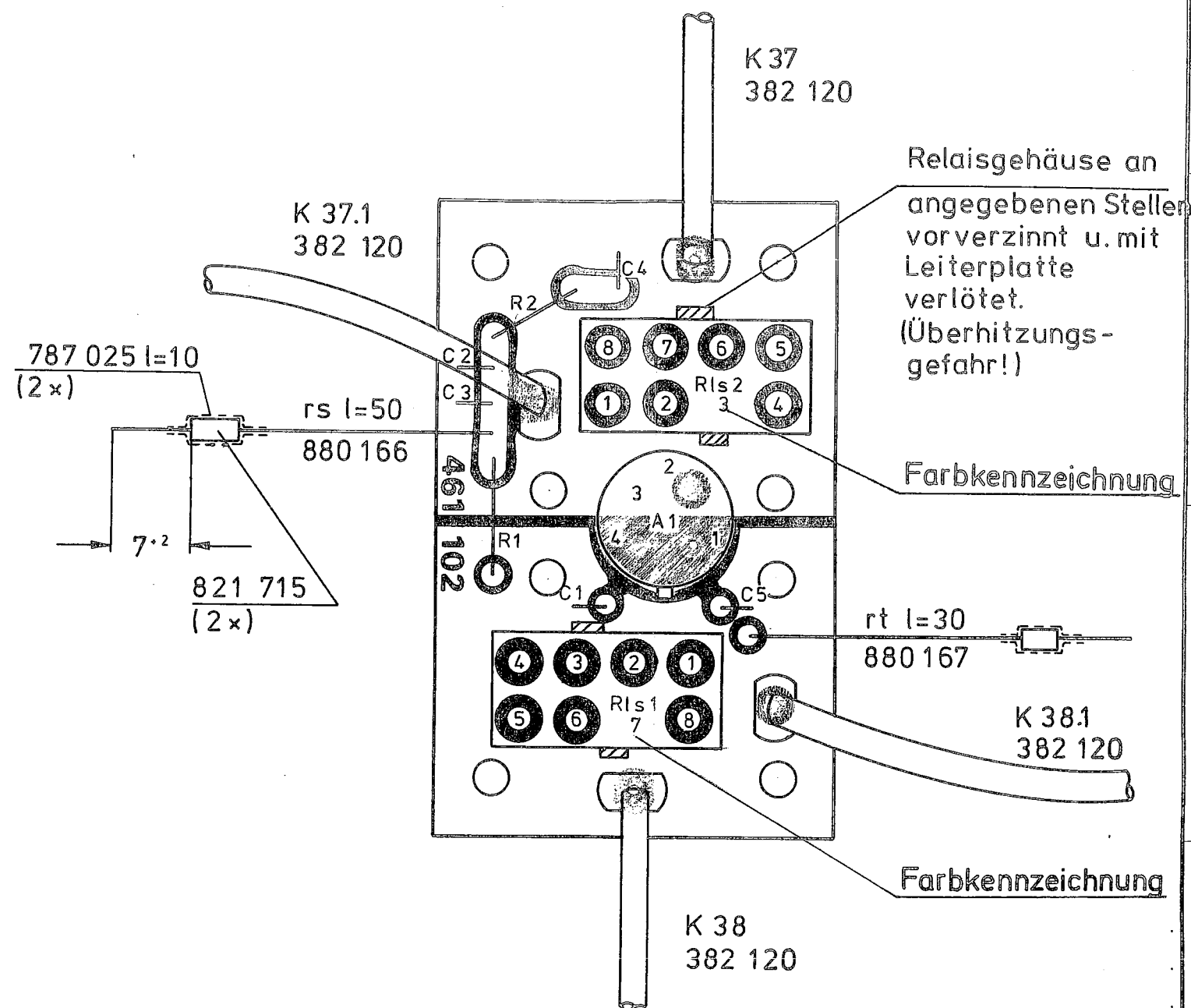
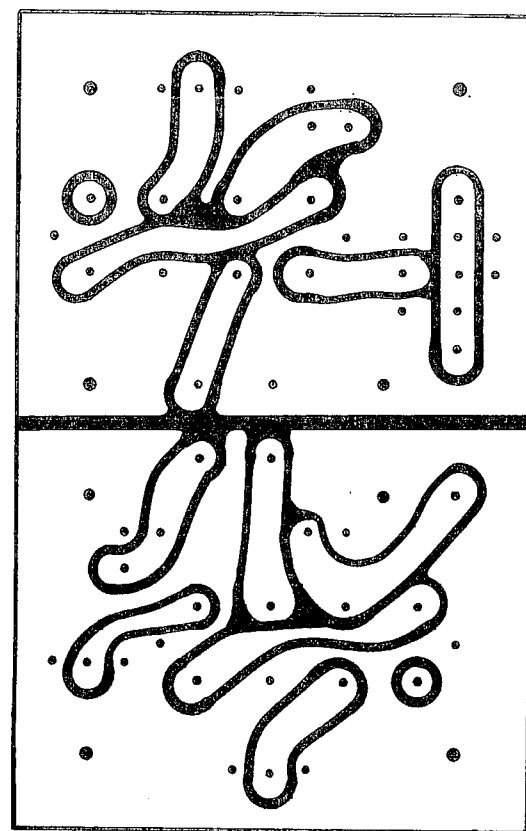


230 018 S / 230 024 S
230 015 S / 230 025 S
230 015 S / 360 766 Sa

verwendet in: 375 216/375 205/225/162 Gerät. 4010 / 4710A/4020

 Kontrollmaß

15 9028.207.3.78 Mo 14 8028096 12.78 Mo 13 8028.71.3.78 Mo 12 8028.44.4.78 Mo 11 8028.25 4.5.78 Mo			0.2	1:1	Schlumberger a/s Main, Paris, Bonn, Berlin, Frankfurt, Köln, München, Stuttgart, Wien, Zürich
					Bestückte, Leiterplatte
A. S. - Name	1975	ger	14.5	Name	360 766
Arzt					



= Kontrollmaß

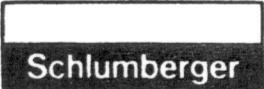
1.0	Zeichner	Freigegeben	Maßstab	Schlumberger o/s	
09					
08					
07					
06	Werkstoff	2:1	Bestückte Leiterplatte		
05					
04					
03					
02	9028.41 28.6.79 Eiler	19.10. R. Gerstner	361 102		
01	7024.32 R.				
00	8028.83 19.10.78 G.				
Ausgabel	Andg. Mittig	Datum	Name	gepr.	Ersatz für

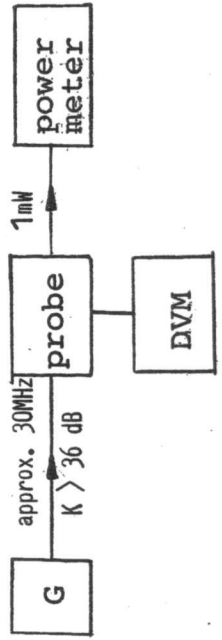
verw. in: 375 223
Gerät : 4020

Schaltplanpositionierung $\triangle$ 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
	1. Visual Inspection Solder joints, screws, coaxial internal conductors etc. (screw on cover not earlier than 5.)			R 3 → centre C 3 → Cmin		
Reflection test set e.g. ZWA 50 Ω precision termination	2. Reflection measurement 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 ^{II}		100 ... 1000 MHz	without test obj. (merely 50Ω termin.)	VSWR < 1,02 > 40 dB Δ a _R	1,0.... dB
		Bu 10/11 Bu 10/11	100 ... 500 MHz 800 ... 960 MHz	with probe +50 Ω termination with probe + 50 Ω termination	VSWR < 1,04 > 34 dB Δ a _R VSWR < 1,06 > 31 dB Δ a _R	1,0.... dB 1,0.... dB
+ 14 V power supply precision DVM	3. Zero and Linearity at Low Power + 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 (Irio or quartet with same diode characteristic)	DF 2	DC	for R 3 [→ 0 mW R 3 [→	U max. > +3,02 V U min. < +2,98 V	+ 3 ... V + 2,9 ... V
RF generator e.g. FS 30 or equivalent (1 mW calibration socket of hp power meter 335 A also possible)	 Accuracy requirement of 1 mW level is ± 0.2 dB		for > 3,02 V remove R 7 = 1,5 MΩ	for 1 mW R 3 → for 0 mW	+ 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
	4. Limiting the LM 308 Apply +14 V via 10 kΩ across A 1/pin 3 or 30 W RF	DF 2	DC	-----	U ₋ = 11,3...11,8 V	11,... V

Adjustment and Test Procedure

Schlumberger

Issue	Alteration No.	Date	Name
03	9028.83	24.1.80	

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

REQUIRED TEST EQUIPMENT	PROCEDURE	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
RF sweeper e.g. Wiltron 610 B (freq. limit < 1 dB) Oscilloscope 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 DVM 14 V power supply	5. RF Response 20 to 960 MHz RF = approx. 13 dBm (= +7 dBm on probe) W 395 pot C 3 20 to 960 MHz swept, unmodulated, sweep-time approx. 0.01 sec. With poor frequency response from 800 to 960 MHz stamp probe: "Unsuitable for > 500 MHz, 4024, 4025" The cause can be in the probe or in the power attenuation pad. Ensure that a sufficient number of combinations result which are also suitable for 960 MHz.	20 to 960 MHz swept, unmodulated, sweep-time approx. 0.01 sec.	RF = approx. 13 dBm (= +7 dBm on probe) W 395 pot C 3	$\Delta U \rightarrow \text{Min.}$ (wideband) 20 to 200 MHz $\Delta U < 2.5 \text{ mV}$ ($\Delta \Delta P = 1\%$) 200 to 500 MHz $\Delta U < 5 \text{ mV}$ ($\Delta \Delta P = 2\%$) 800 to 960 MHz $\Delta U < 15 \text{ mV}$ ($\Delta \Delta P = 6\%$)	

Adjustment and Test Procedure

Schlumberger

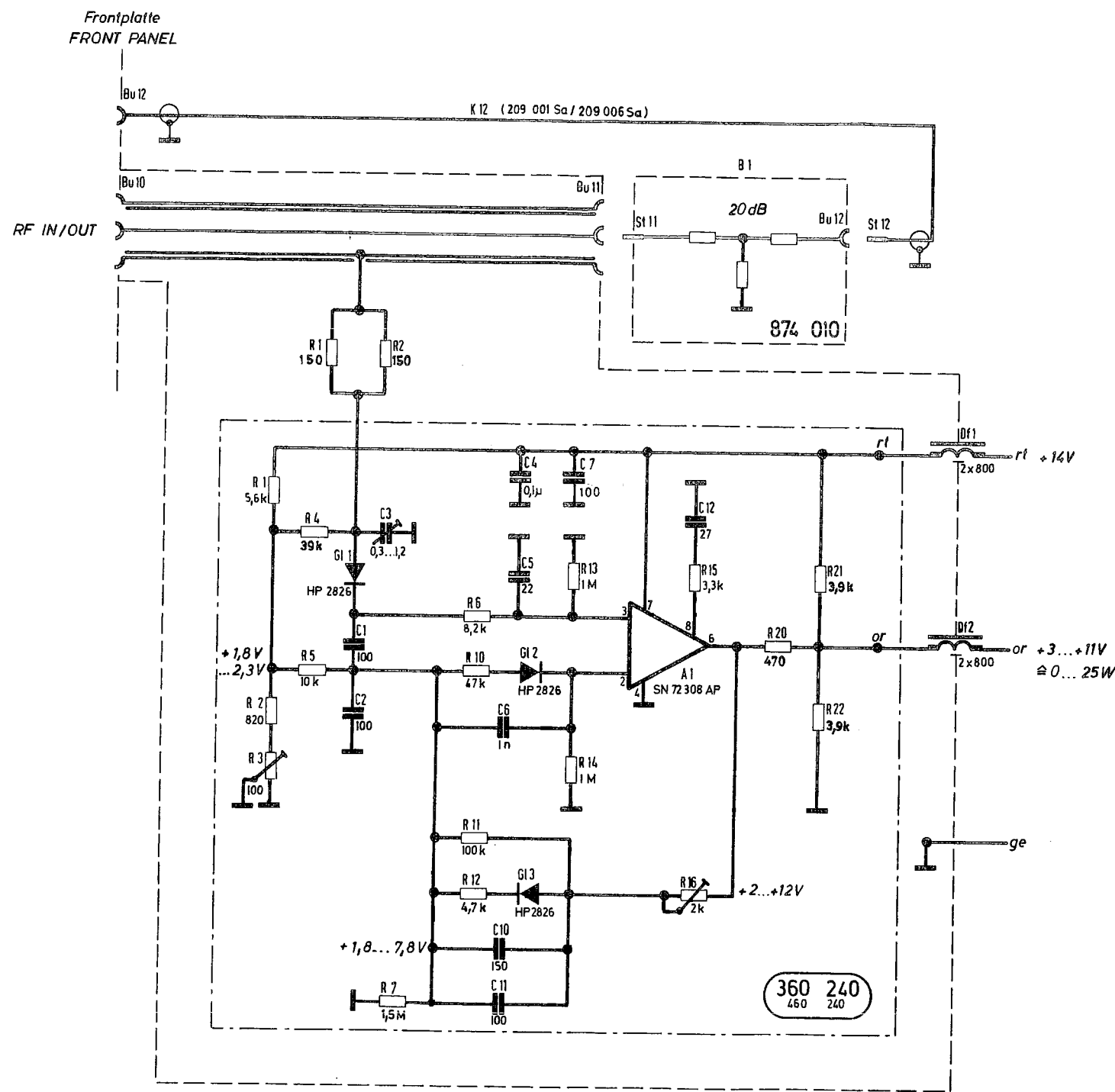
Issue	Alteration No.	Date	Name
03	4028, 83	24.1.80	

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

229 006 A
229 009 A

Replacement for

2/2
Sheet



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

04	8028.19	3.2.78	Kr.	norm.		
03	7 028.68	27.10.77	Wn	gepr.		
Ausg.	Ä.-Mittg.	Datum	Name	bearb.	16.3.76	Kr.
ISS.	MODIF.	DATE	NAME	1976	DATE	NAME

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

Diodenmeßkopf
DIODE PROBE

229 006 S

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



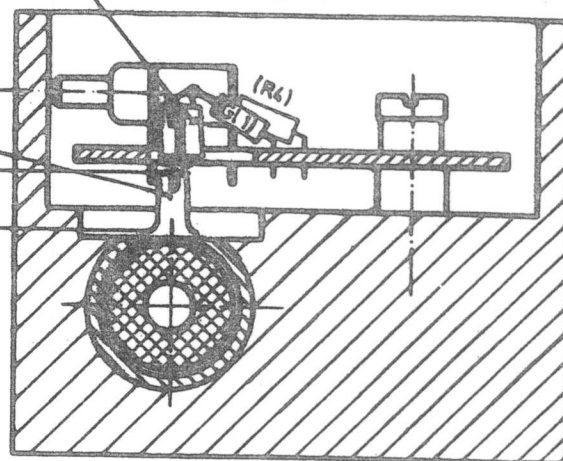
weich gelötet

Widerstand und Diode so kurz wie möglich angelötet

786 009

abgewinkelt und gekürzt

M 2:1



5.5105

Df 1

Df 2

816 044 (2x)

786 004
M3x4 DIN 84
701 143

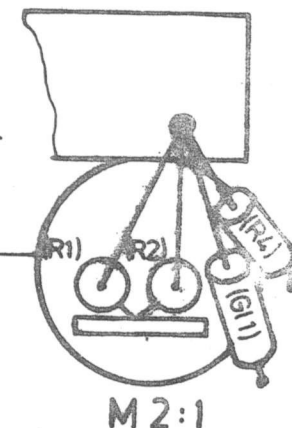
J3.2 DIN 6797
706 105

360 240

300 430

M25 x 8 DIN 84
701 334

J2.7 DIN 67 97
706 106



- 2*

Schaltplanpositionierung $\hat{=}$ 229 006 S

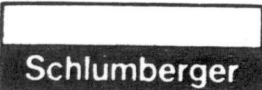
09					Rohteil	Freimaß- toleranzen	Maßstab	Schlumberger o/s Meßgerätekau u. Vertrieb GmbH 8 München 48	
08									
07									
06									
05									
04					Werkstoff	±0,2	1:1 (M 2:1)	Diodenmeßkopf Typ: 4010 / 4901	
03	804.7.2	20.4.78	ENER						
02	8028.2	13.2.78	Mo						
01	4028.4	1.6.78	Eiler						
-	8028.2	16.3.78	HA						
Aus-	Ändg-	Datum	Name		Oberfläche	7/6	Datum	Name	300 435
						gez	30.1.78	HA	
						beorb			

(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.

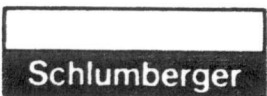
The NTC resistor R 1 is part of a resistance bridge upstream of a differential amplifier A 1 through which the heating current is controlled through T 1. The heating current is instantly corrected for even a slight change of temperature of R 1 in 360 770 to retrieve the balance of the resistance bridge. 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.

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

Adjustment and Test Procedure

4020 (4010) series
10 MHz Crystal Oscillator

Schlumberger

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	5. <u>Varactor voltage</u> Turn R1 from stop to stop Set R1 to $U_{m\text{in}} + 1 \text{ V}$ 6. <u>Checking heating current</u> Heating current must be $< 750 \text{ mA}$ after 6 minutes running. 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 far as it will go. Offset the synthesizer until the scope display freezes. $f_{\text{synth.}} - 10 \text{ MHz} \rightarrow 40 = \Delta f$	Df 2	DC	—	$\Delta V > 2 \text{ V}$ between $+5.6$ and $+8.8 \text{ V}$	...
Ammeter		Ammeter	DC	—	750 mA	
Standard, oscilloscope, synthesizer		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. $10 \text{ MHz} - f_{\text{synth.}} > 40 \text{ Hz} = \Delta f$ 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	$\Delta f > 40 \text{ Hz}$	
	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	$\Delta f \rightarrow 0$	
		"	10MHz - Δf	R 1	$\Delta f > 8 \text{ Hz}$	
		"	10MHz + Δf	R 1	$\Delta f > 8 \text{ Hz}$	
		"	10MHz + Δf	R 1	$\Delta f \rightarrow 0$	
		MP 2	DC	---	$< + 0.4 \text{ V}$	
		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	Kurban
3	90185	01.12.80	Geub

214 022 A

B/4

Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Temperature gauge Frequency Difference Meter (Tracor) and XY Recorder	9. <u>Oven temperature</u> Apply temperature sensor directly alongside T 1 on mounting plate At R 4 = 2 kΩ At R 4 = 2.49 kΩ 10. Reassemble the oscillator chassis, solder the supply leads an note date on the chassis Apply 8 weeks minimum aging time. 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). 12. <u>Final Test</u> Plot temperature coefficient against $\Delta T = 400^\circ\text{C}$ in oven or cabinet. 13. After 3 hours turn-on time at room temperature turn R 1 to mid position	(T 1) (T 1)	----- -----	----- -----	73 $^\circ\text{C} \pm 4^\circ\text{C}$ 67 $^\circ\text{C} \pm 4^\circ\text{C}$	
		Bu 3	-----	-----	Transient frequency peaks $< \pm 4 \cdot 10^{-9}$	
		Bu 3	-----	-----	TK $< 15 \cdot 10^{-8}/40^\circ\text{K}$ Aging $< -5 \cdot 10^{-9}/16 \text{ h}$ 10 MHz accuracy $\pm 3 \cdot 10^{-8}$	

Adjustment and Test Procedure

4020 (4010) series
10 MHz Crystal Oscillator

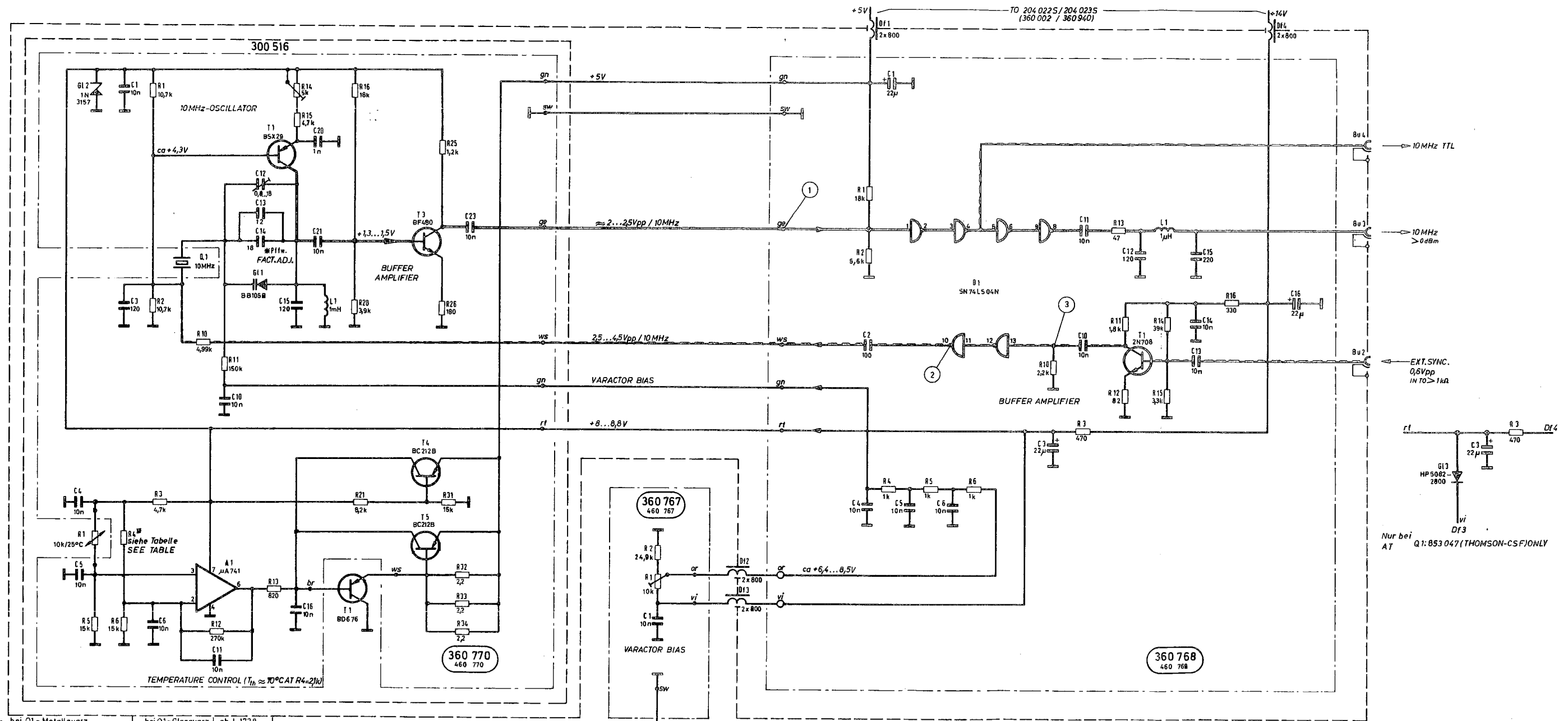
Schlumberger

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.	R4
60 ... 61,5°C	2,67 k
61,6 ... 63,0°C	2,49 k
63,1 ... 65,0°C	2,37 k
65,1 ... 68,5°C	2,21 k
68,6 ... 70,5°C	2,10 k

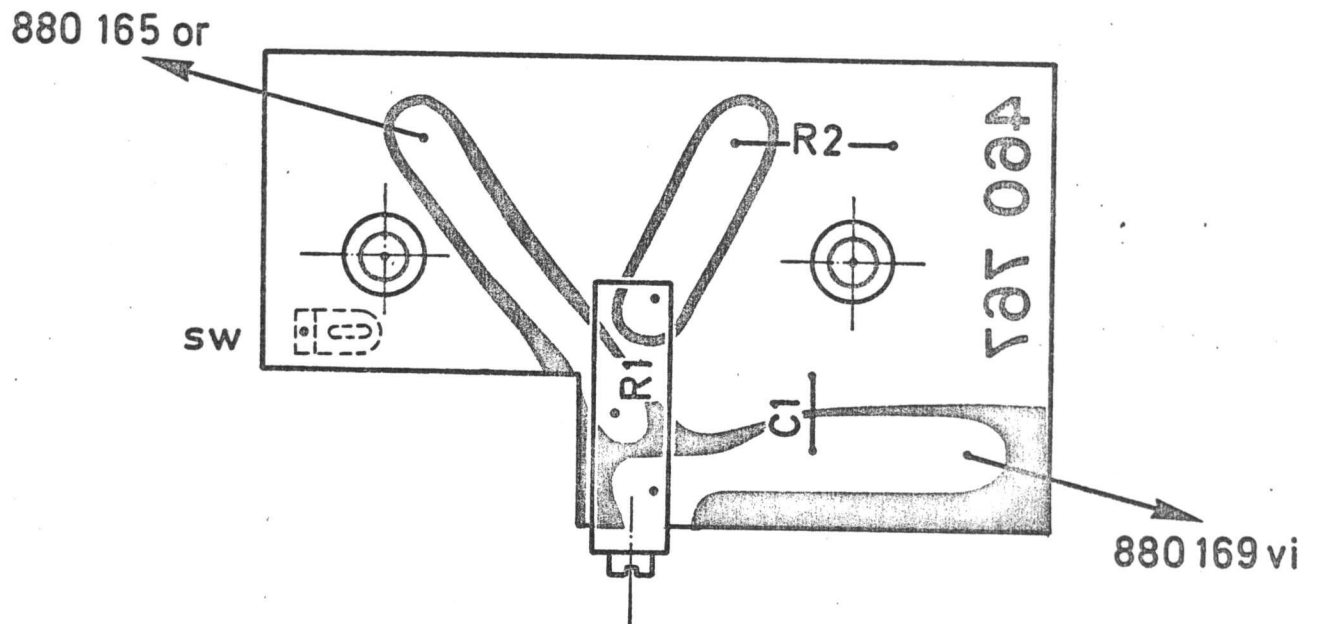
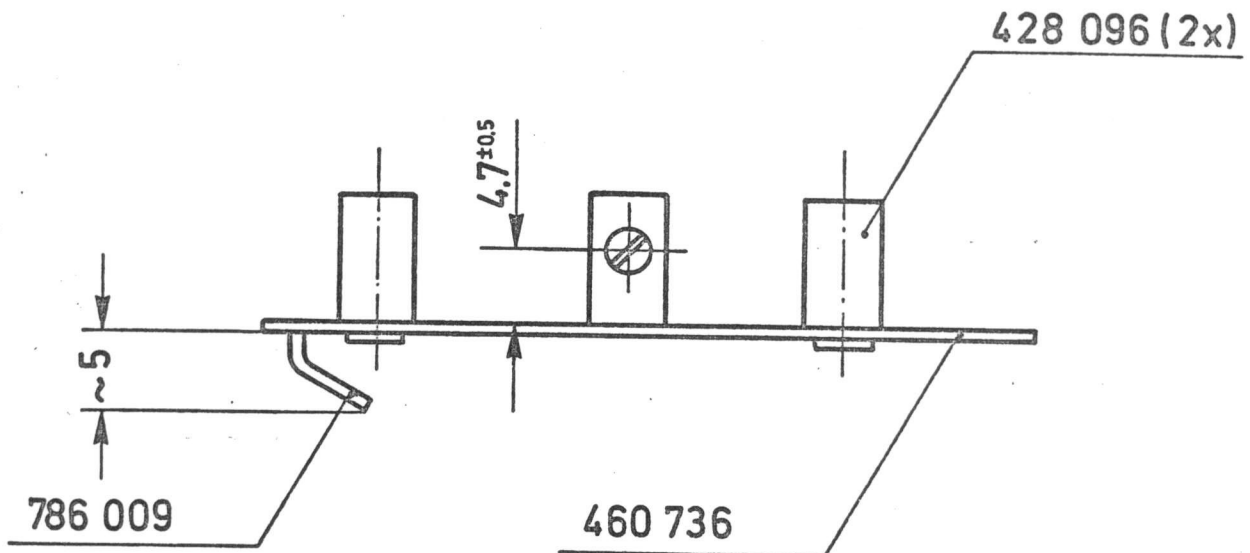
bei Q1 = Glasquarz
* R4 = 2,1 k

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

204 022S/204 023S
Bu23

SW BLACK	bl BLUE	10 3096.80	12.7.79	Mo	norm.	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 48	10MHz CRYSTAL OSCILLATOR	214 022 S
br BROWN	vi VIOLET	09 3096.12	17.1.79	Eiler	gebr.			
rt RED	gr GREY	Ausg.	A-Mittg.	Datum	Name	Datum	Name	Typ : 4010/4011/4710
rs ROSE	ws WHITE	ISS.	MODIF.	DATE	NAME	DATE	NAME	
ge YELLOW	tr TRANSPARENT							
gn GREEN								

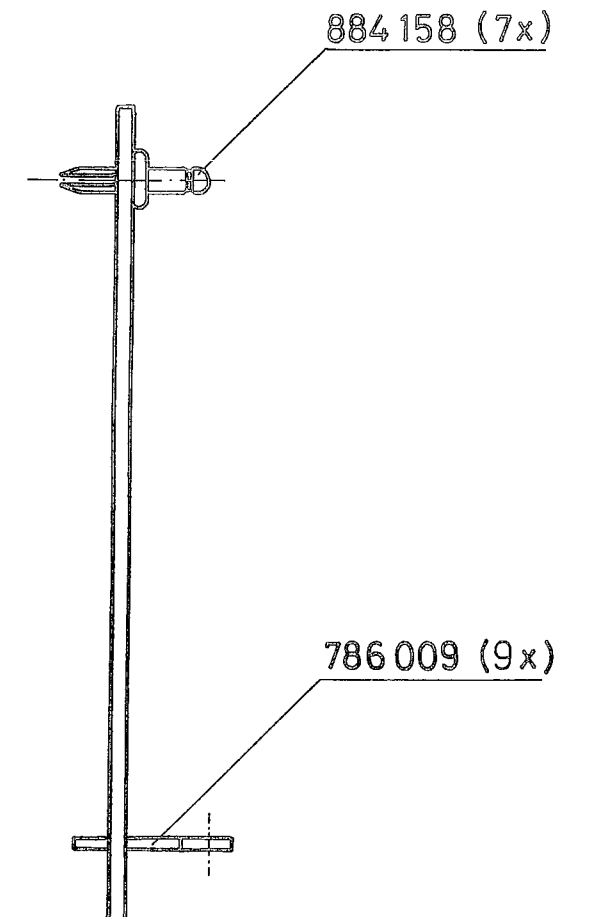
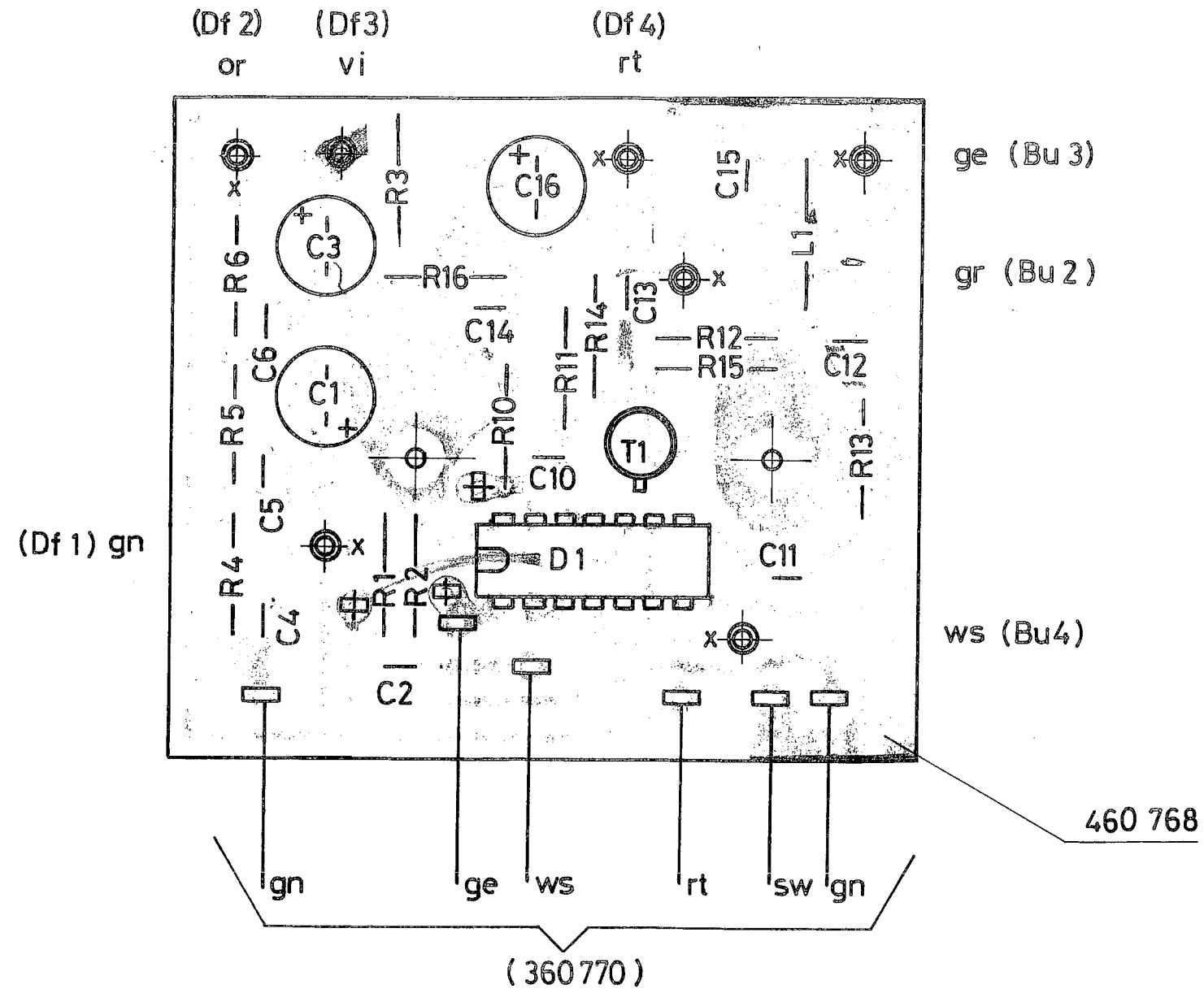
weich gelötet



Schaltplanpositionierung 214 022 Sa/360 767 Sa

09				Reihen	Freimast toleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH München, GFR
08					—	2:1	
07							
06							
05				Werkstoff			
04							
03							
02							
01	9026.89	12.12.79	Eiler	Oberfläche	1979	Datum	Bestückte Leiterplatte 360 767
					12.12.	Name	
						EILER	

weich gelötet



x = Farbpunkt

verwendet in: 375 222

Schaltplanpositionierung 214 022 S / 360 768 Sa

4020
Gerät: 4010 / 4011 / 4710

802890 8.12.78 Mo
802811 18.1.78 Eiler
7028.47 27.7.77

1977

26.7

Knobloch

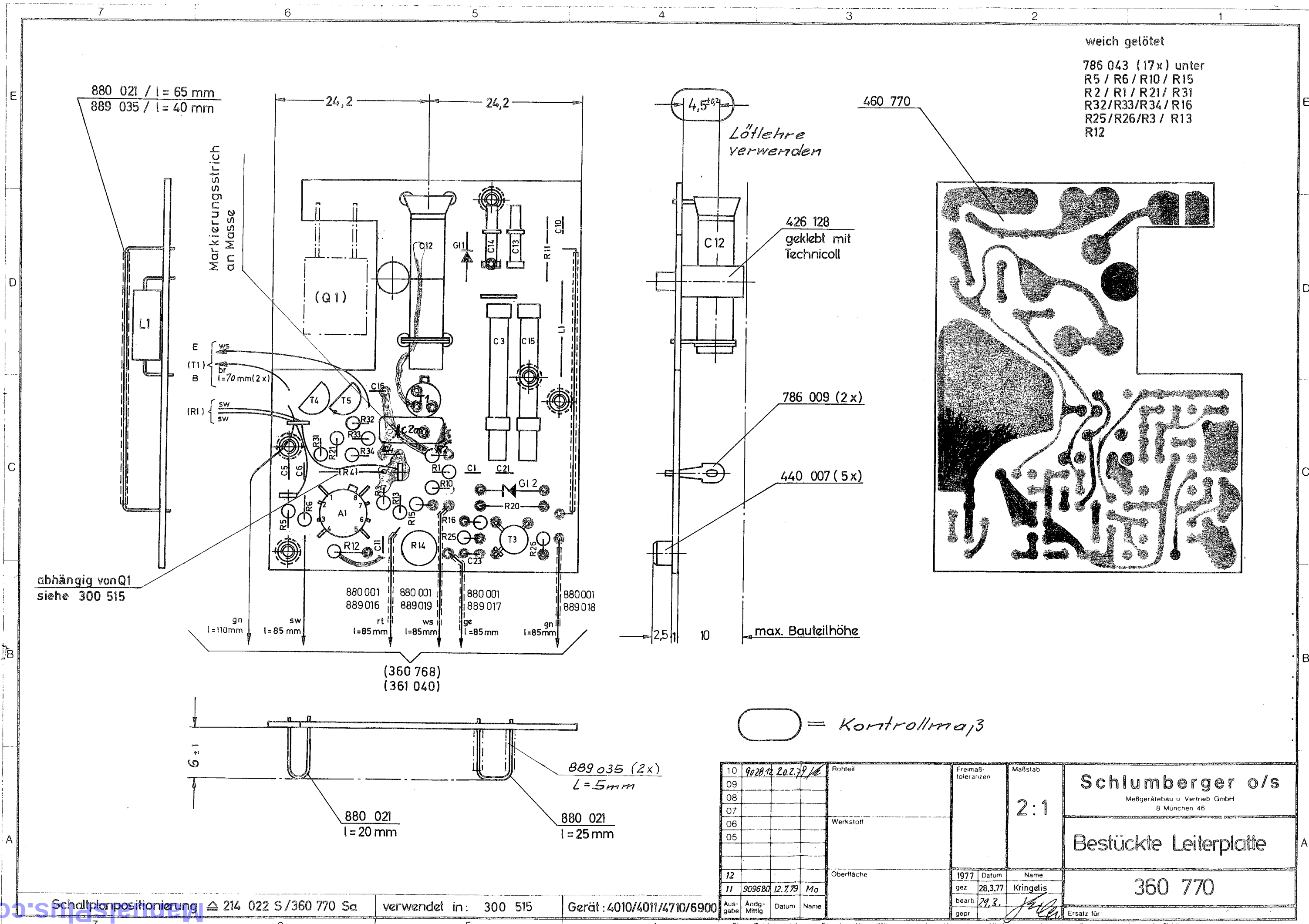
27.7.

Schlumberger o/s

2:1

Bestückte Leiterplatte

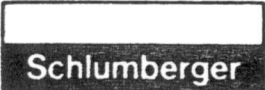
360 768



(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
Adapter with mains switch, or short circuit termination HNK 898 033 Dummy Loads Voltmeter Ammeter Variable mains transformer	Crystal Stage (214 022) disconnected. Mains switch adapter or short circuit termination HNK 898 033 connected to Bu 8 (see 209 021 (209 001) S B1. 1) Dummy Loads (+ 5 V : 2,2 Ω /11 W = 2,27 A and simultaneously + 14 V : 14 Ω /14 W = 1 A) connected to Bu 23 (see 204 022 S) and Sensor (Bu 23, Pin 7) connected to rail (Pins 8/9). St 1 connected to variable mains transformer.	Bu 8 Bu 23/B1 " /B8 " /B1 " /B8 " /A10 " /B1 " /B8 " /B1 " /B8	— — — — — — — — — — Ripple (100 Hz) " "	— — — R 23 R 22 — — — — — — —	Current consumption 220 ... 290 mA from 0 to + 14 V from 0 to + 5 V + 14,02 V + 5,05 V + 8... + 9 V $\Delta V < 20$ mV DC $\Delta V < 20$ mV DC $V_{AF} < 200$ μ V rms $V_{AF} < 50$ μ V rms	mA +VmVmV μ V μ V
AF Analyser	<u>Regulation Characteristics</u> variable transformer slowly from 0 to 242 V variable transformer slowly from 0 to 220 V to 220 187...242 V	Bu 23/B1 " /B8 " /B1 " /B8 " /B1 " /B8	— — — — — — " "	R load R load = 0 Ω R load R load = 0 Ω	Maximum available current: 1,4 ... 1,8A Short circuit current: 0,1 ... 0,3 A Maximum current available: 2,8 ... 4,0A Short circuit current: 0,3 ... 0,85 A	AAAA
	<u>Current Limiting</u> adjustable load 0...14 Ω to + 14 V output " " " " " " " 0...2,2 Ω to + 5 V output " " " " " "	Bu 23/B1 " /B8 " /B1 " /B8	— — — — — — " "			

Adjustment and Test Procedure

4020 (4010) series
POWER SUPPLY

204 022 A

1/2
Sheet

A

4020 (4010) series
POWER SUPPLY

204 022 A

2/2
Sheet

Issue	Alteration No.	Date	Name
		8.10.78	Kamraj
03	8028.44	1.4.78	K
02	6028.51	1.7.76	Kr.
04	5028.38	18.8.75	S. S. S.

