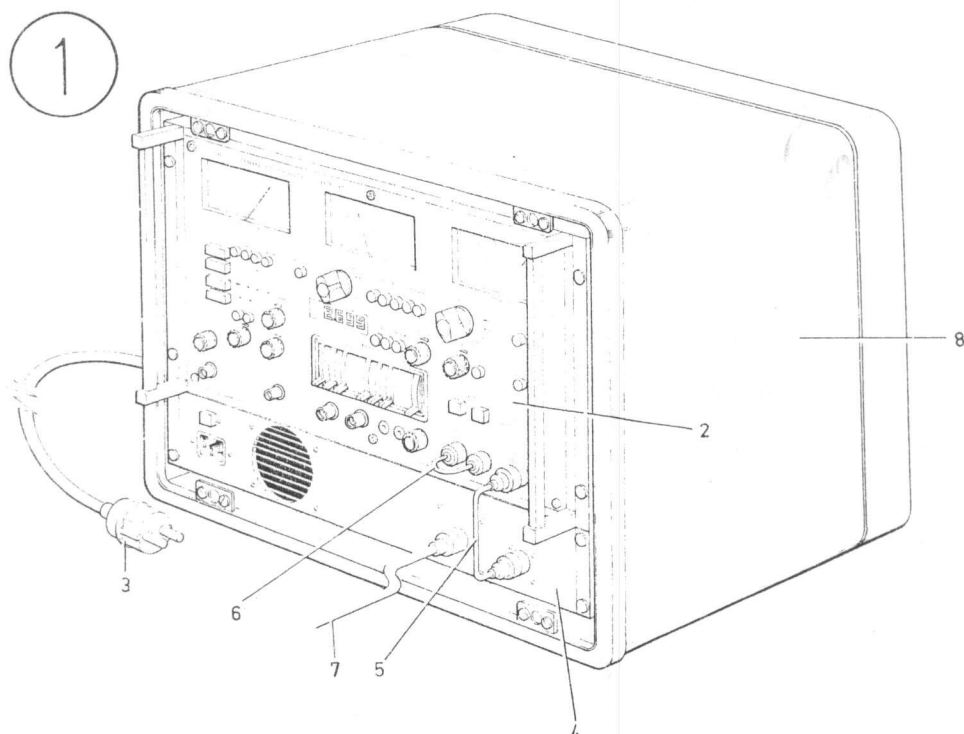




Pos	Ant	Förrådsbeteckning	Förrådsbenämning	Ursprungsbenämning	Ursprungsbezeichnung
1	1	M3743-558011	Radioprovare 558 MT		
2	1	M3743-558010	.Radioprovare 558	Stabilock Funkgeräte Messplatz	SCHIN-STABILOCK 4011S
	1	M3743-558109	..Beskrivning handhav		
	1	M3743-558119	..Beskrivning service		
3	1	M1812-127020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

DATA

Mottagarmätningar	
Frekvensområde:	0,01...479,9999 MHz
Frekvensinställning:	Digital
Frekvensnoggrannhet:	1×10^{-7} efter 10 min vid 20°C
Frekvensdrift:	1×10^{-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.

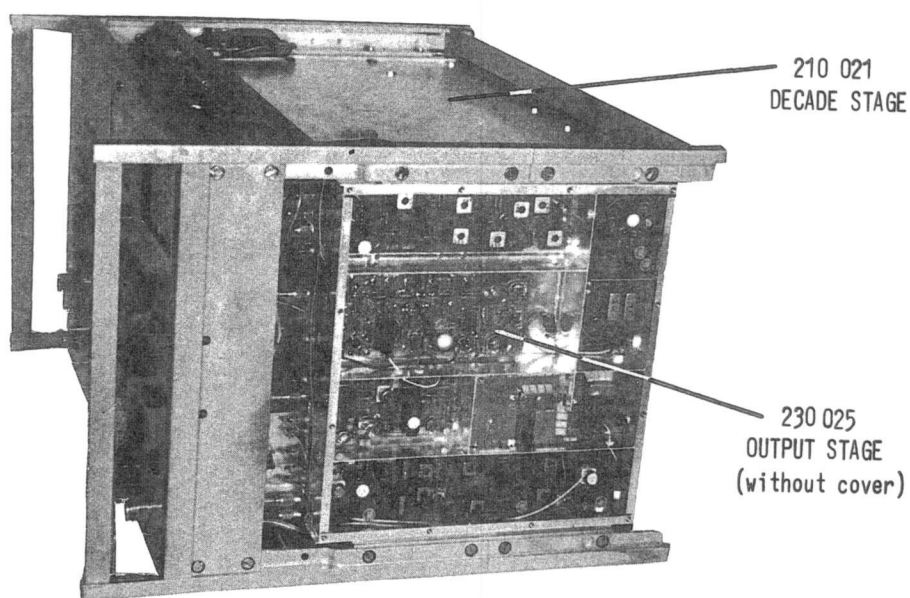
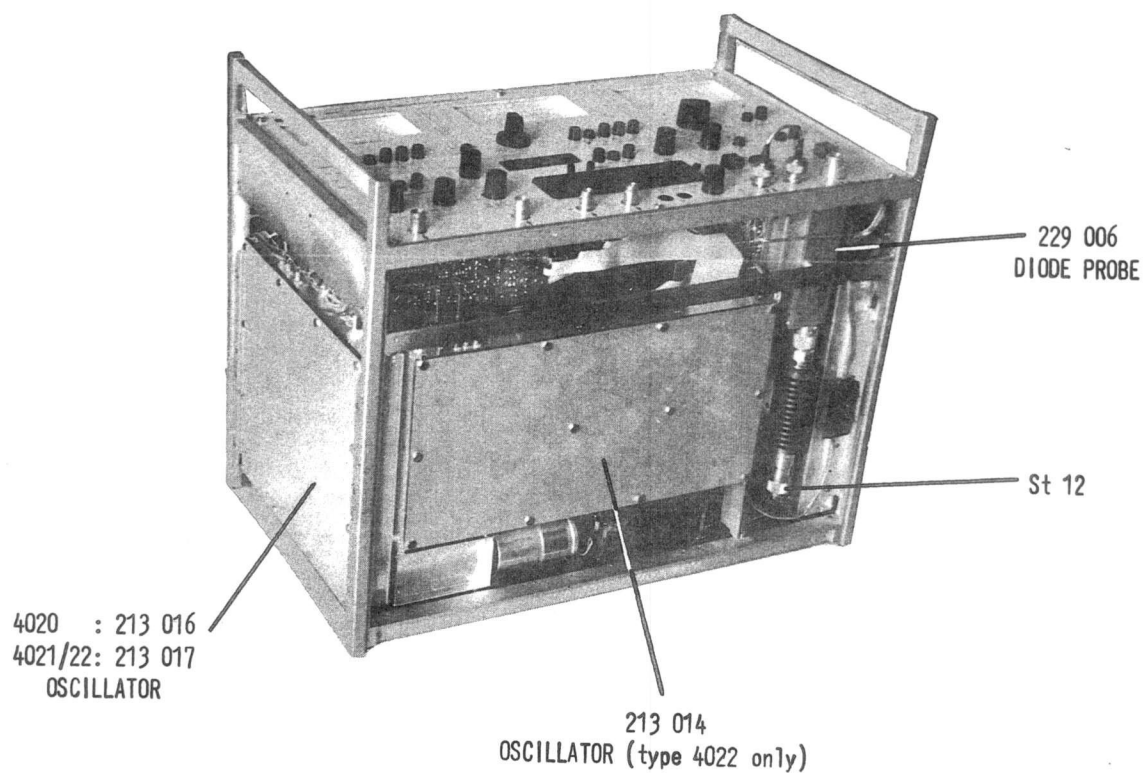
7. Crystal Stage 214 022 (fig. 3)

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.



FUSE FOR CHANNEL SELECTOR TYPE 4932

CHECK POINTS FOR DC SUPPLY VOLTAGES

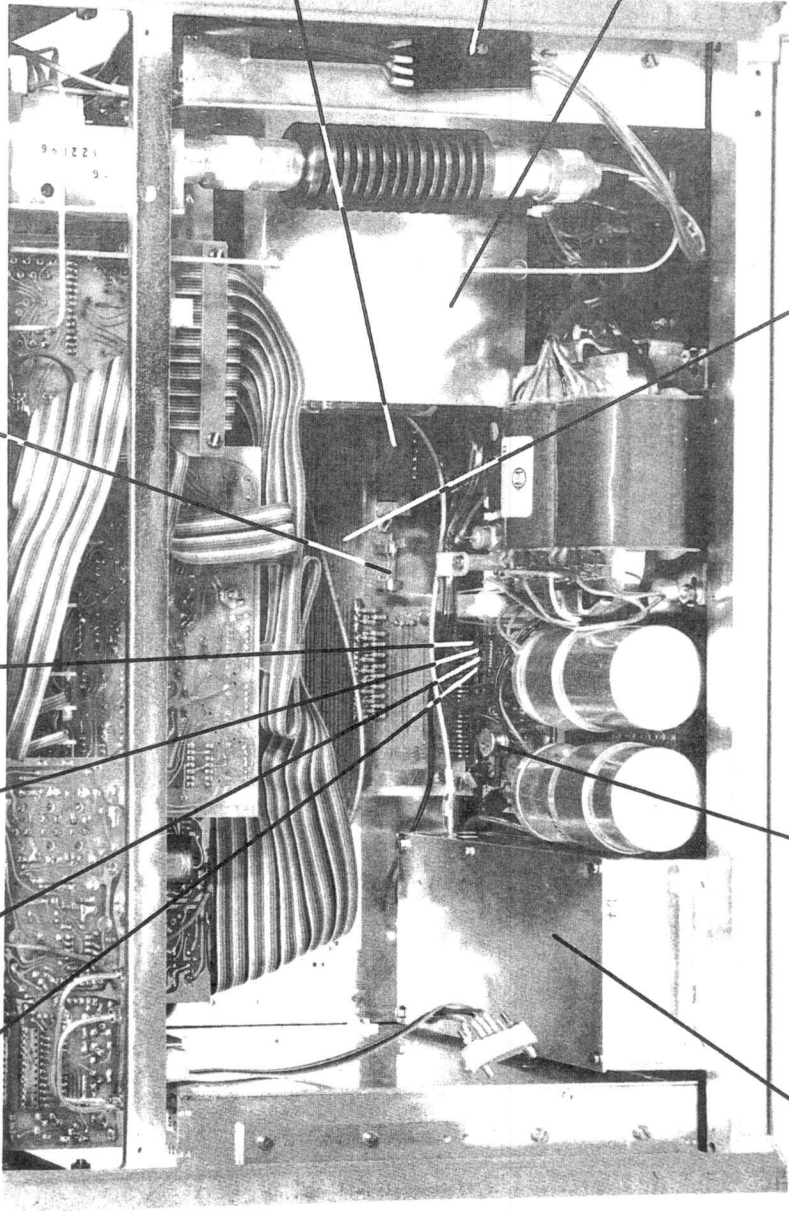
LEAD COLOR:

brown
+5 V
(Sensor)

green
+5 V

red
+14 V

violet
ca. +8 V



Bu 23

Bu 8

370 014
STEP ATTENUATOR
10 x 10 dB

360 759
INTERCONNECTING PC BOARD OF THE DECADE STAGE

204 022
POWER SUPPLY

214 022
CRYSTAL OSCILLATOR

FIG. 3: BOTTOM VIEW

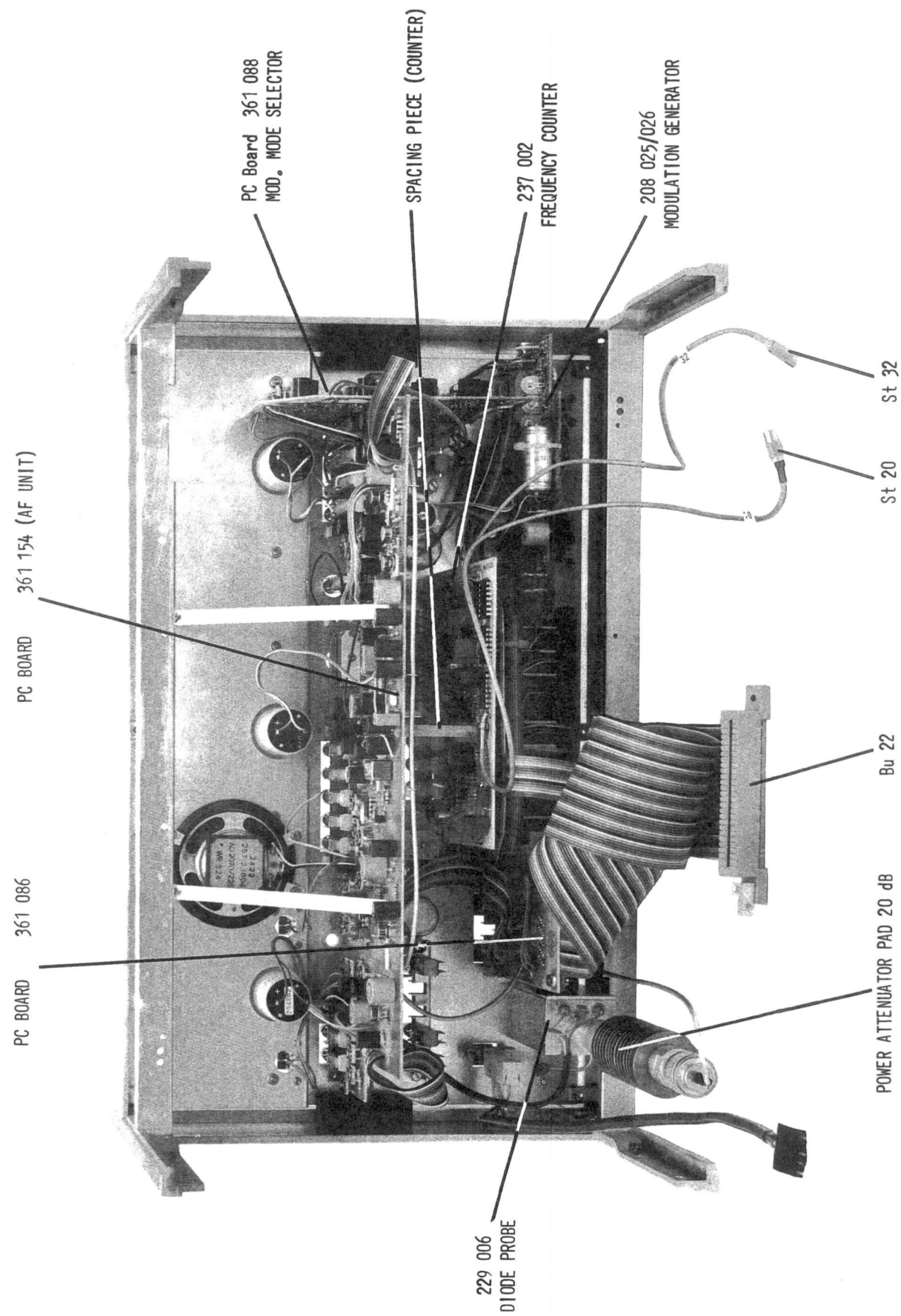


FIG. 4: CONTROL AND DISPLAY UNIT

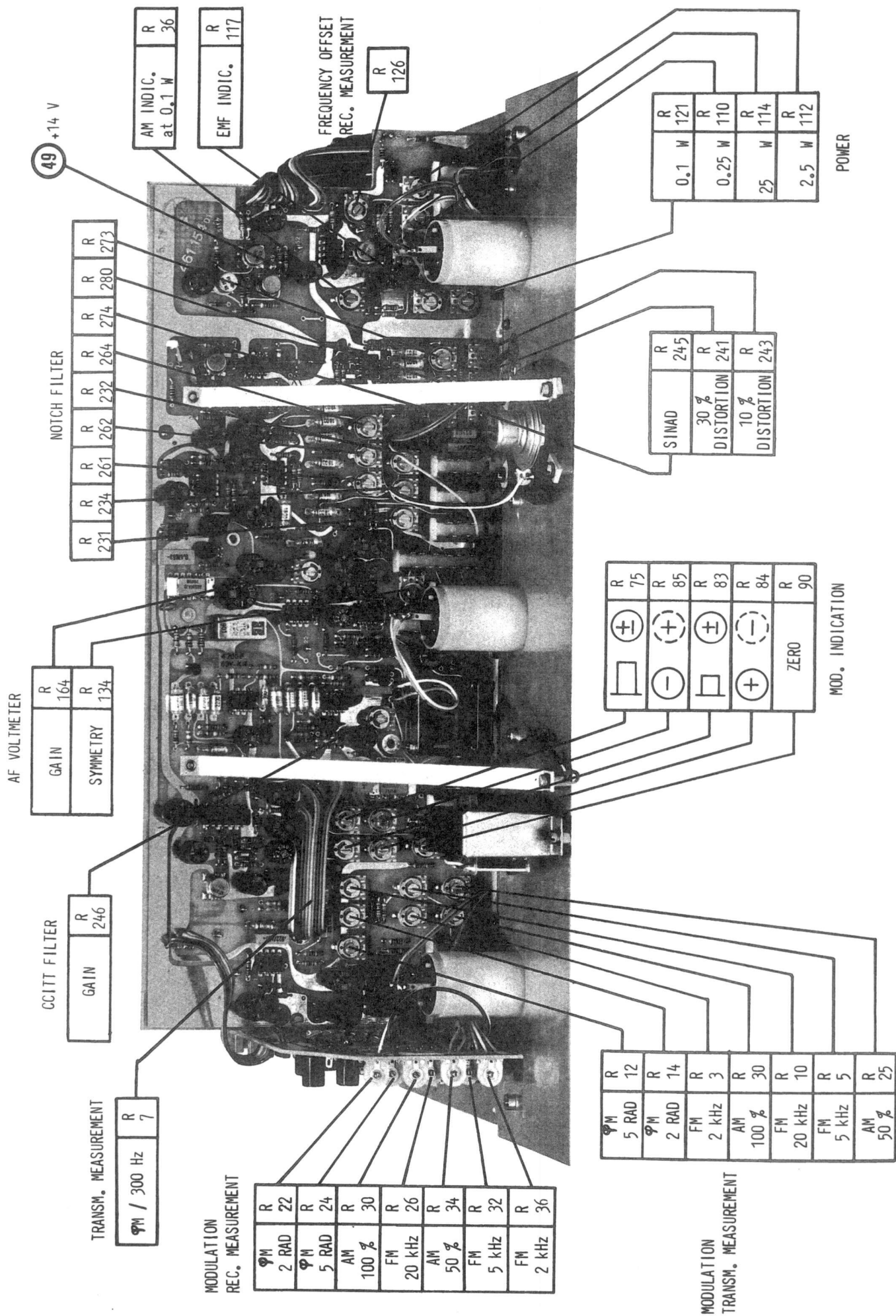


FIG. 5: ADJUSTMENT LOCATIONS OF THE CONTROL AND DISPLAY UNIT

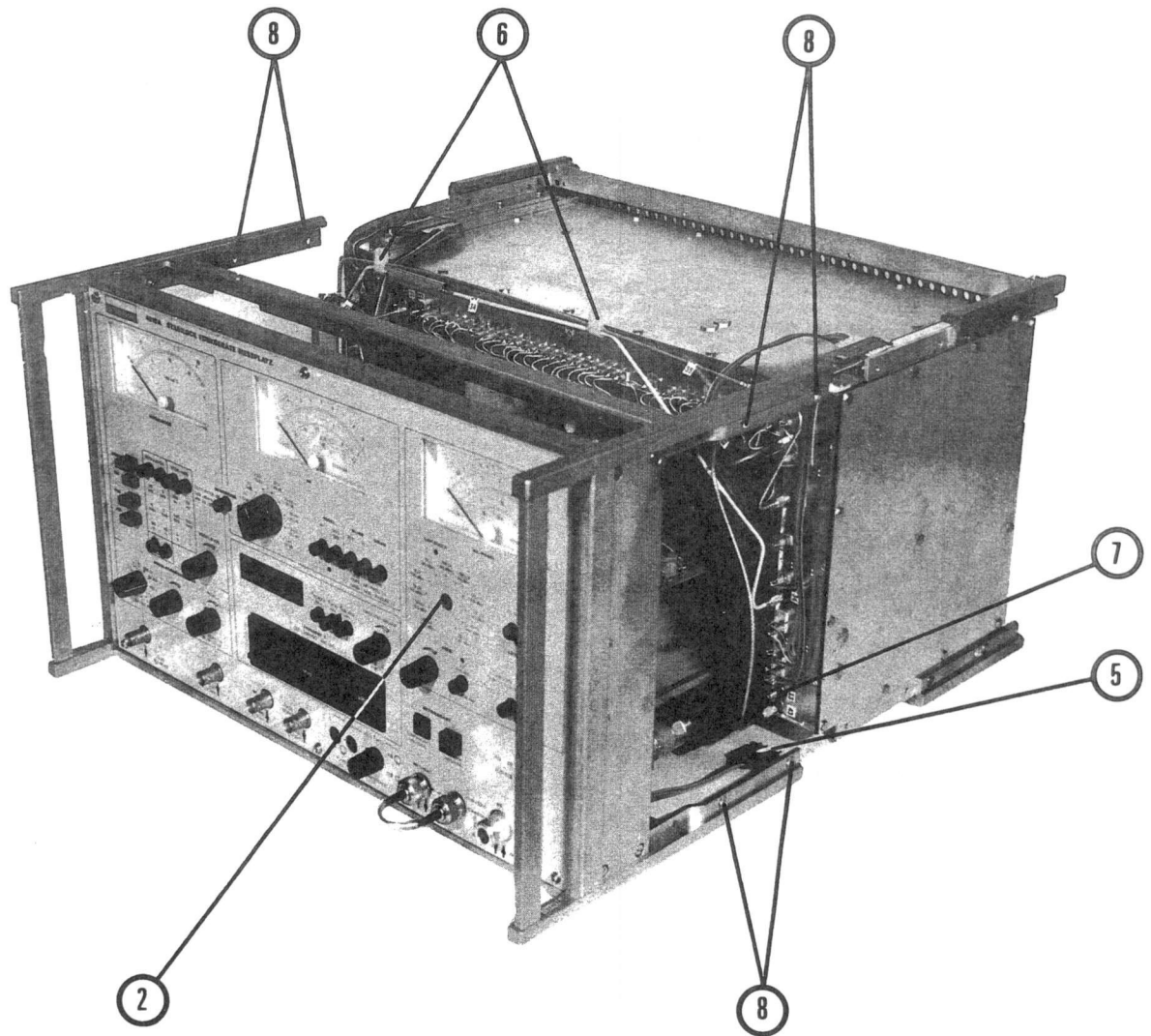


FIG. 6: REMOVING THE CONTROL AND DISPLAY UNIT

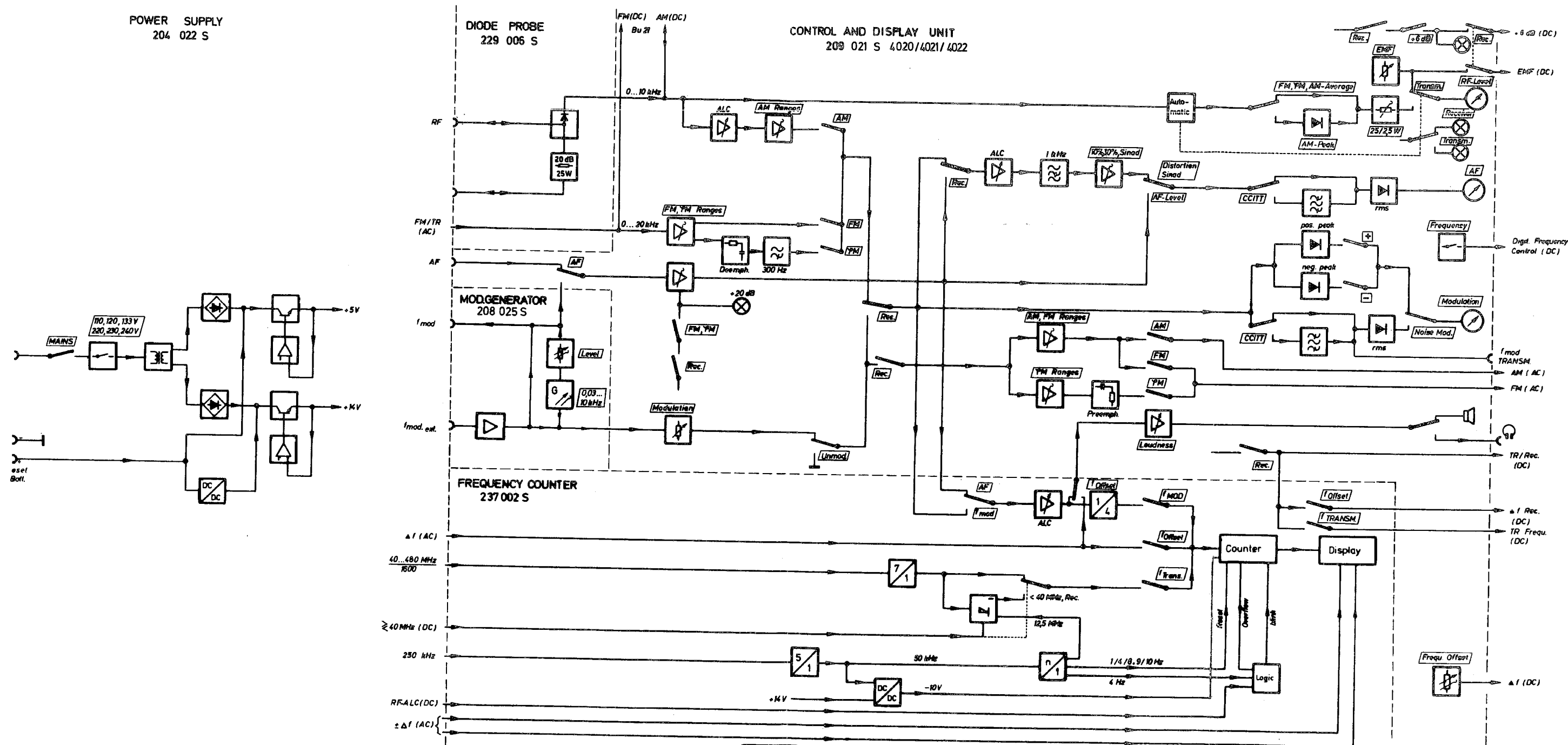
POWER SUPPLY
204 022 S

DIODE PROBE
229 006 S

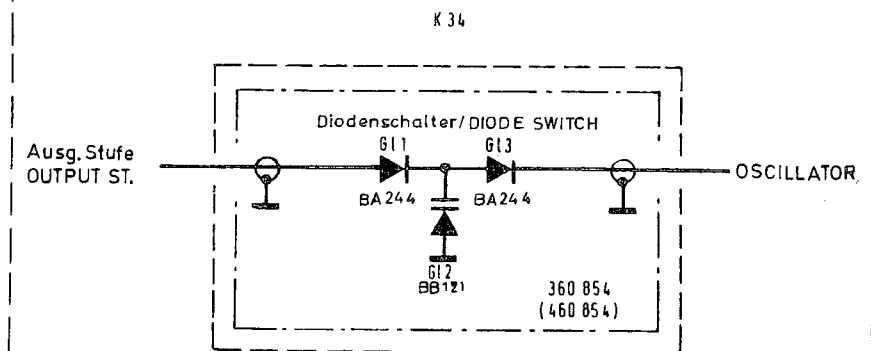
CONTROL AND DISPLAY UNIT
209 021 S 4020/4021/4022

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	gear	9095,67	23,579	K ₁	23,579	K ₂	Modortriebbau 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	norm	9095,67	23,579	K ₁	23,579	K ₂			
YELLOW	TRANSPARENT	norm	9095,67	23,579	K ₁	23,579	K ₂			
GREEN		norm	9095,67	23,579	K ₁	23,579	K ₂			



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.

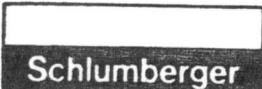
On transmitter measurements the DC provided by the diode probe is provided directly to the meter through the range selector (25 W/ 2, 5 W). Peak rectification is included only when indicating AM peak power. The switch-over to transmitter measurement mode can also be performed automatically, when the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

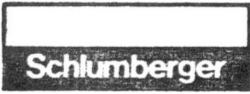
The decade stage is introduced to the positions of the decade switches. On REMOTE CONTROL mode the frequency must be set to 600 MHz (see operating manual 3.7).

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</td></tr><tr><td>+20 dB</td><td>+ 6 dB + RM</td></tr><tr><td></td><td>RM + FM / φM + VOLTMETER</td></tr><tr><td></td><td>Dist. 10%, 30%, SINAD</td></tr></table>	Lamp	Depressed push buttons	RECEIVER	RM (= RECEIVER MEASUREMENT)	TRANSMITTER	TM (= TRANSMITTER MEASUREMENT)	+ 6 dB	RM + TM	+20 dB	+ 6 dB + RM		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																		
+20 dB	+ 6 dB + RM																		
	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

209 021 A

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	— —	DC level between pins 47 and 49 0 V + 5 V	ok
	Bu 22 pin 14 " " pin 16 " " " " pin 21 " " pin 22 " "				+ 5 V 0 V + 14 V 0 V 0 V + 5 V 0 V + 5 V	ok

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

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

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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

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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

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Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	12. IM Modulation Ranges 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 → full scale deflection R 5 → full scale deflection R 3 → full scale deflection		ok
	φM, 5 Rad ⊕ ⊖ " 2 Rad " "	250 mV 100 mV	"	R 12 → full scale deflection R 14 → 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

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 $\pm$ 10 mV	 ok
	ϕM 5 Rad (+) (-)	I 1	0.3 kHz	R 24 	4.8 ... 5.2 Rad	 ok
	" " (+) (-)	"	0.4 kHz	—	4.9 ... 5 Rad	 ok
	" " (+) (-)	"	1 kHz	—	4.9 ... 5 Rad	 ok
	" " (+) (-)	"	3 kHz	—	4.9 ... 5 Rad	 ok
	" " (+) (-)	"	10 kHz	—	4.8 ... 5 Rad	 ok

Adjustment and Test Procedure

4020 series
CONTROLAND DISPLAY UNIT

Schlumberger

Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

229 021 A

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Sheet

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE									
	14. AF Millivoltmeter + CCITT Mod. Gen. Volt meter 4020 or Volt meter 4020 Gen. DVM <table><thead><tr><th></th><th>DVM</th><th>Voltm. Range</th></tr></thead><tbody><tr><td>AF, UNMOD VOLTMETER</td><td>775 mV 775 mV</td><td>0 dB 0 dB</td></tr><tr><td>AF, UNMOD</td><td>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</td><td>+ 30 dB + 20 dB + 10 dB 0 dB - 10 dB - 20 dB - 30 dB - 40 dB - 50 dB - 60 dB</td></tr></tbody></table> 40 dB Attenuation pad on the AF in put		DVM	Voltm. Range	AF, UNMOD VOLTMETER	775 mV 775 mV	0 dB 0 dB	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	+ 30 dB + 20 dB + 10 dB 0 dB - 10 dB - 20 dB - 30 dB - 40 dB - 50 dB - 60 dB	1 2 23	1 kHz	R 164	0 dB 775 mV ± 30 mV	 mV
	DVM	Voltm. Range													
AF, UNMOD VOLTMETER	775 mV 775 mV	0 dB 0 dB													
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	+ 30 dB + 20 dB + 10 dB 0 dB - 10 dB - 20 dB - 30 dB - 40 dB - 50 dB - 60 dB													
		1 2	1 kHz		0 dB ± 0,4 dB "										

Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

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

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 %	

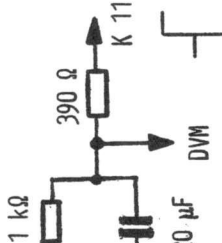
Adjustment and Test Procedure

4020 series
CONTROL AND DISPLAY UNIT

Schlumberger

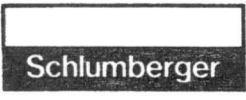
Issue	Alteration No.	Date	Name
01	0028.29	27.3.1980	Morasch

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

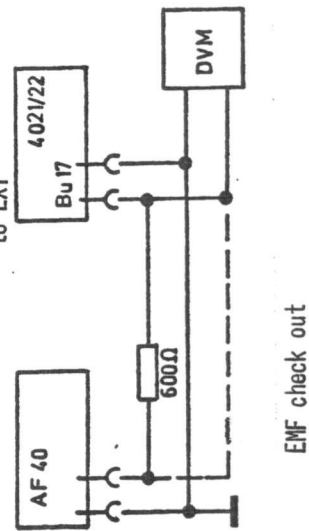
209 021 A

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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					
	Load			Set level to		
		Ro < 6 Ω	1 kHz	0 ... 30 mV "	0 ... > 30 mV	 ok
		"	"	0 ... 2 V "	0 ... > 2 V	 %
		"	"	2 V	5 V Dist. < 1 %	 ok
		600 Ω	"	—	4.976 V "	 ok
		600 Ω	"	—	25 V ±40 mV "	 ok
		200 Ω	"	—	5 V "	 ok
		200 Ω	50 Hz	—	5 V (< 5 %)	 V
	Test for ungrounded output	Bu 17	DC	—	> 1 MΩ across output contacts and ground	 ok
	Return Loss Mod. Generator Level = 0 V S 27 / 600 Ω Frequency control to EXT	Bu 17 S 1	100 Hz 1 kHz 10 kHz 100 kHz	1 V	0,5 V ± 75 mV = 16,5 dB	 mV



Adjustment and Test Procedure

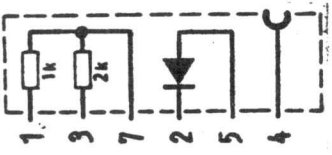
4020 series
CONTROL AND DISPLAY UNIT

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

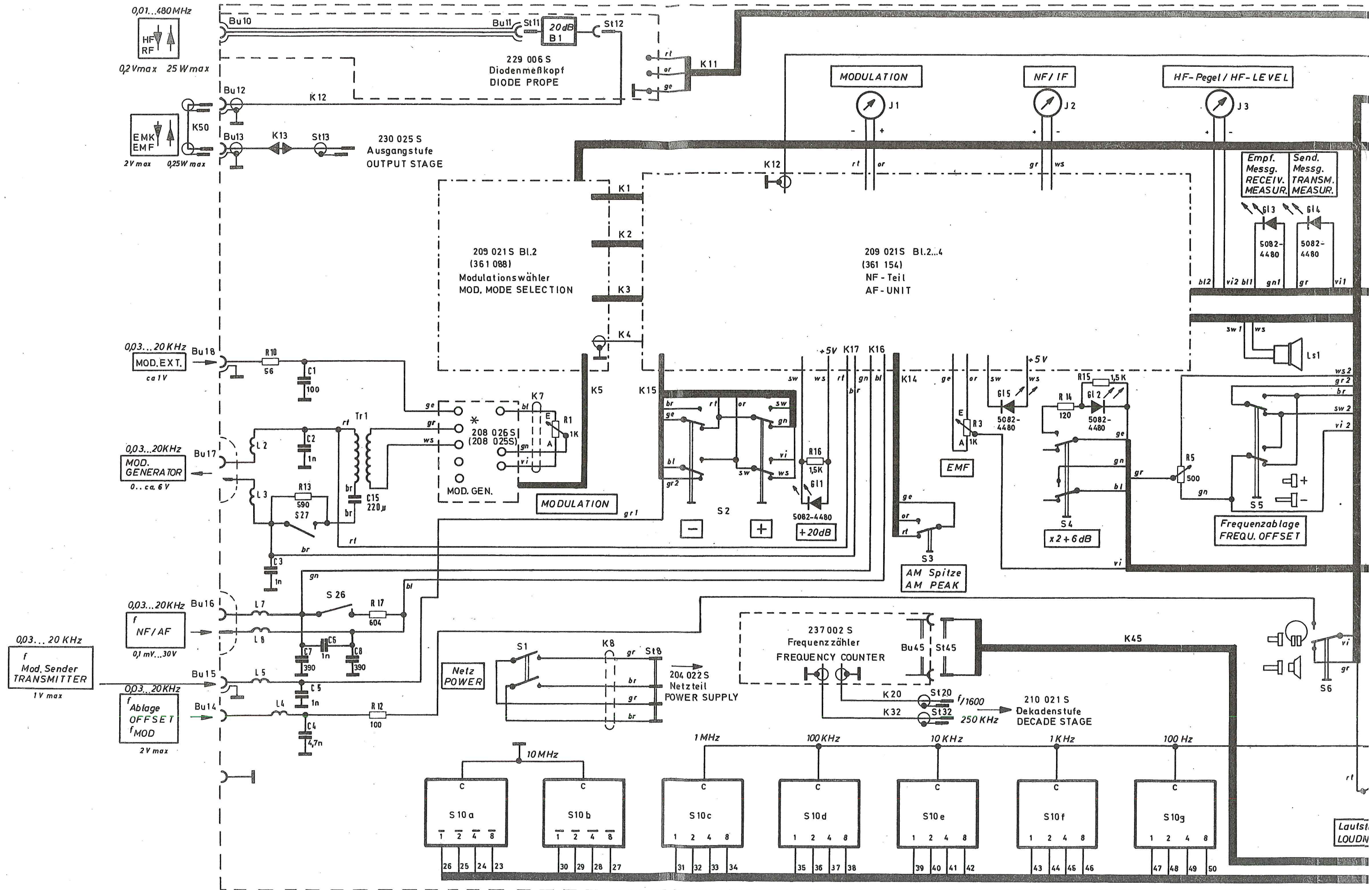
Schlumberger

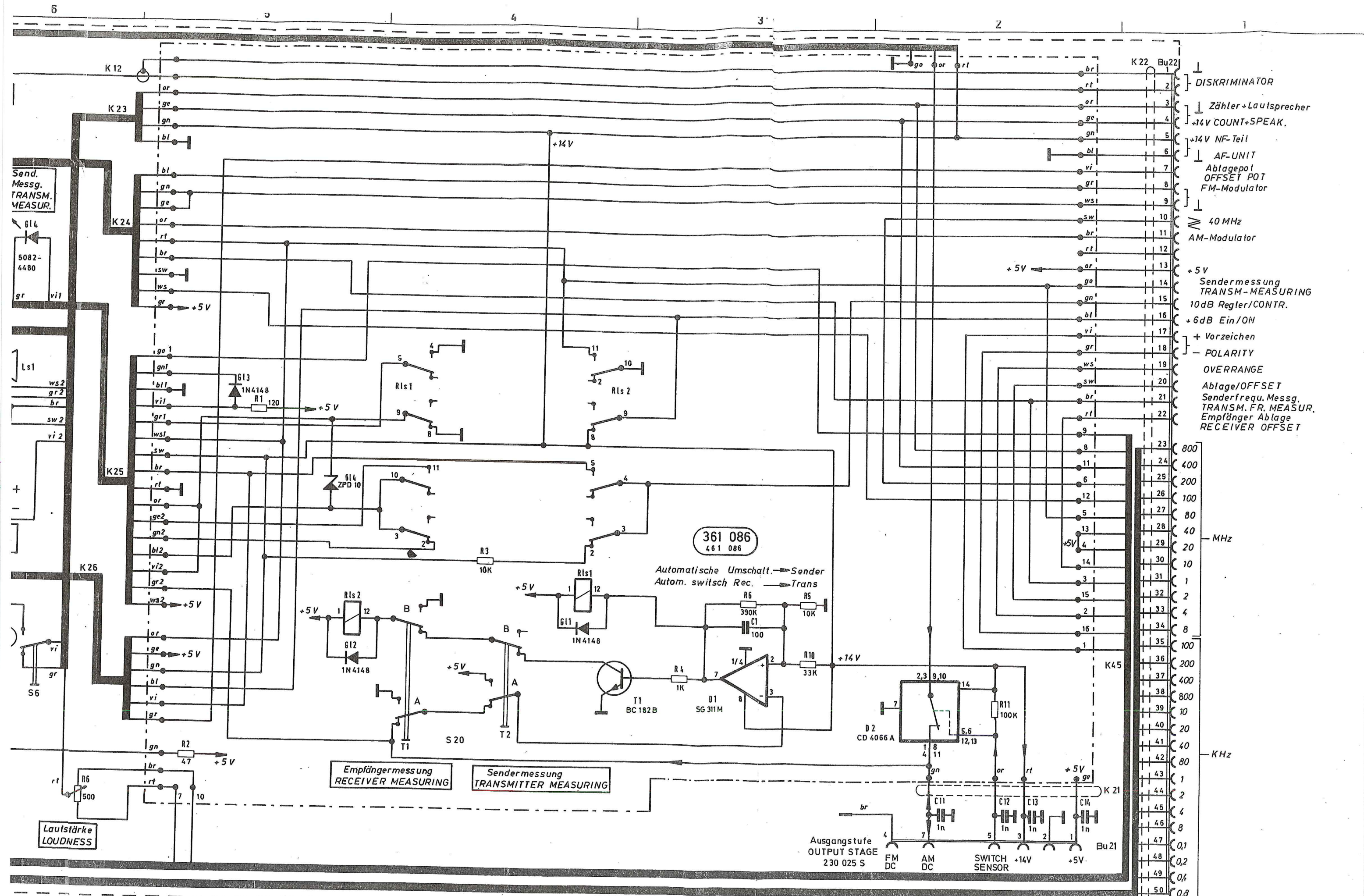
Issue	Alteration No.	Date	Name
	0028-29	27.3.1980	Morasch

209 021 A

12/12
Sheet

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							
ge YELLOW	tr TRANSPARENT							
gn GREEN								
		ISS.	MODIF.	DATE	NAME		DATE	NAME

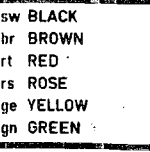
Schlumberger o/s
Meßgerätebau u. Vertrieb GmbH
8 München 46

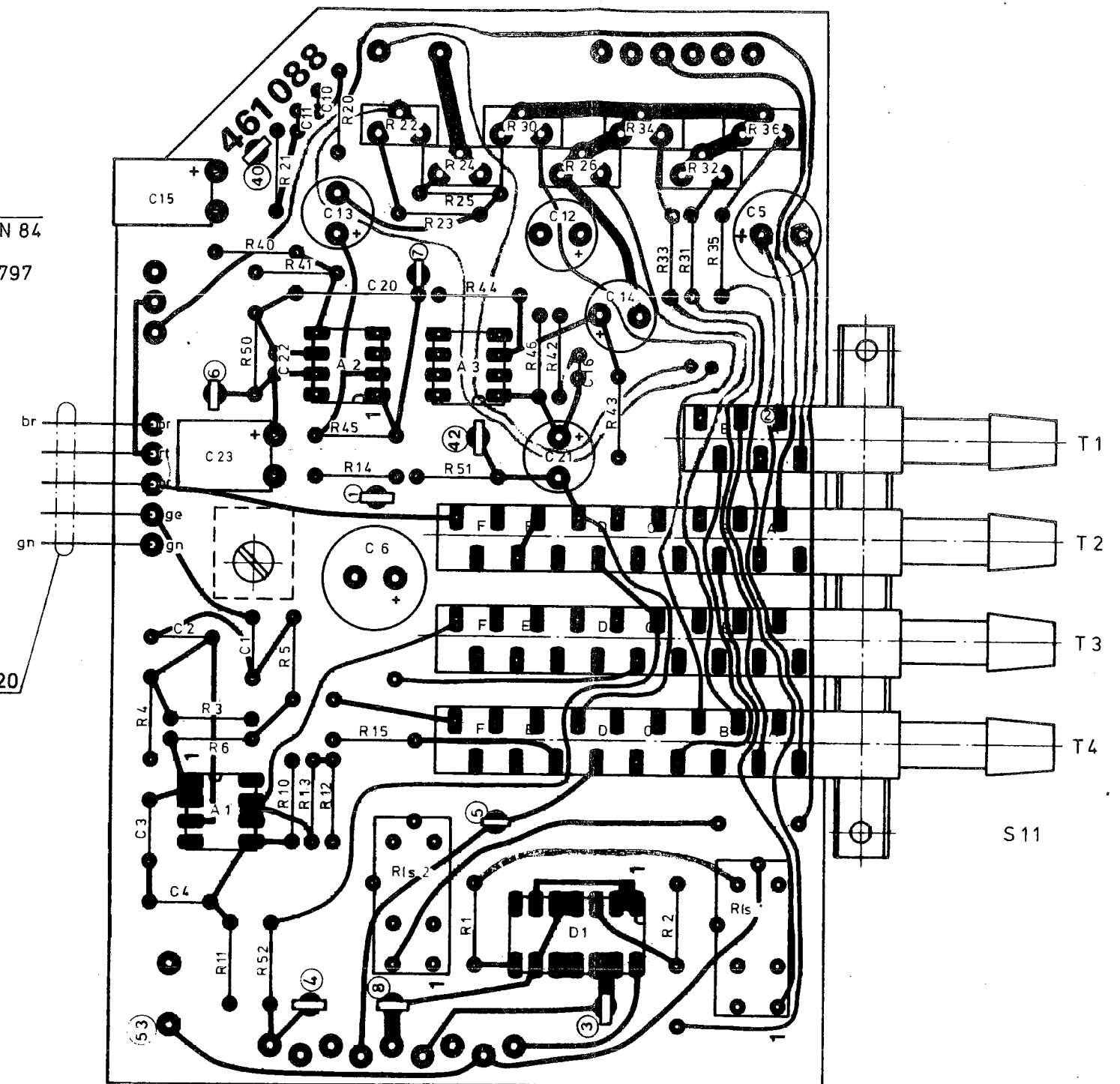
CONTROL AND DISPLAY
UNIT

209 021 S Bl.1
Typ: 4020

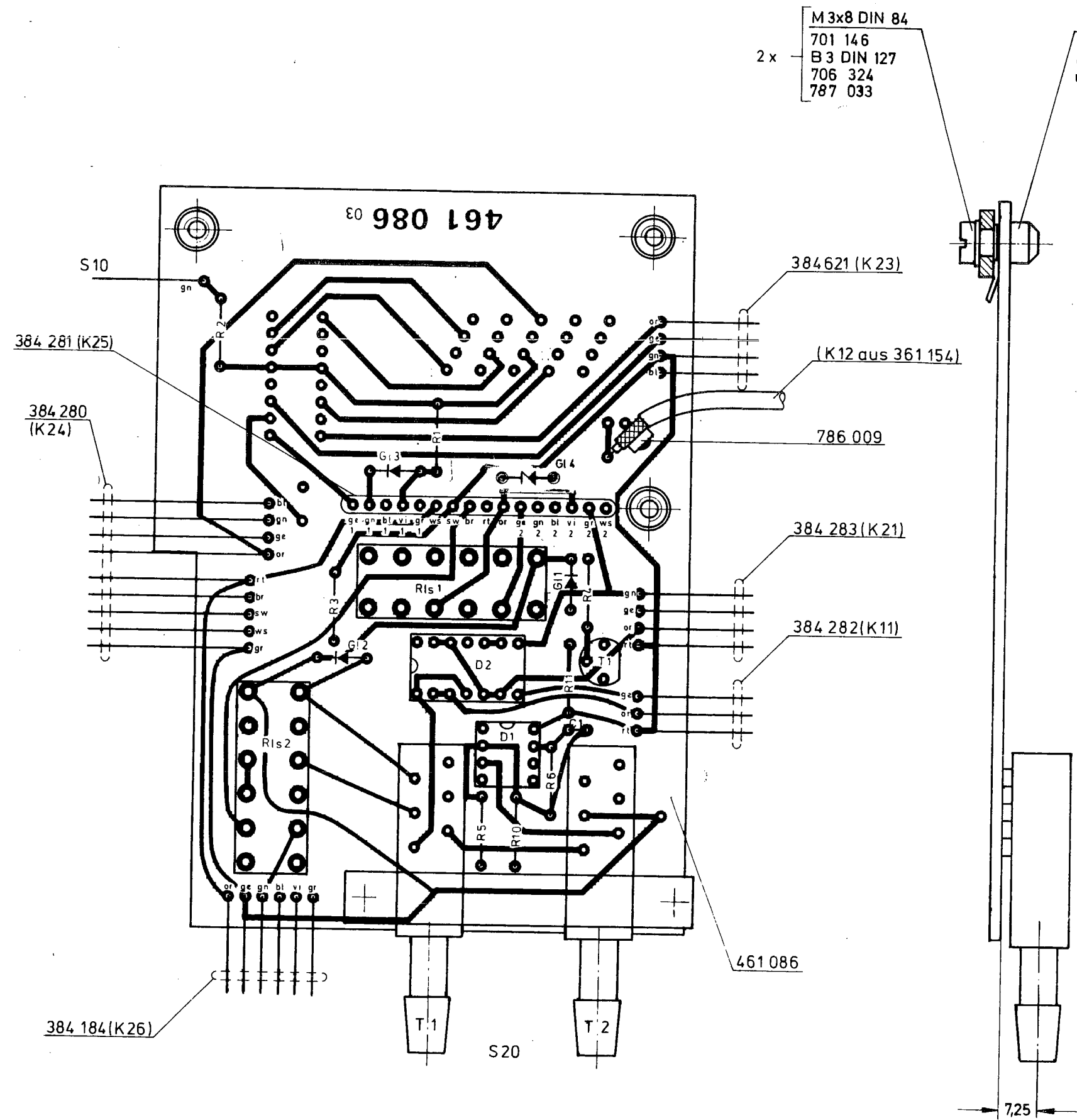






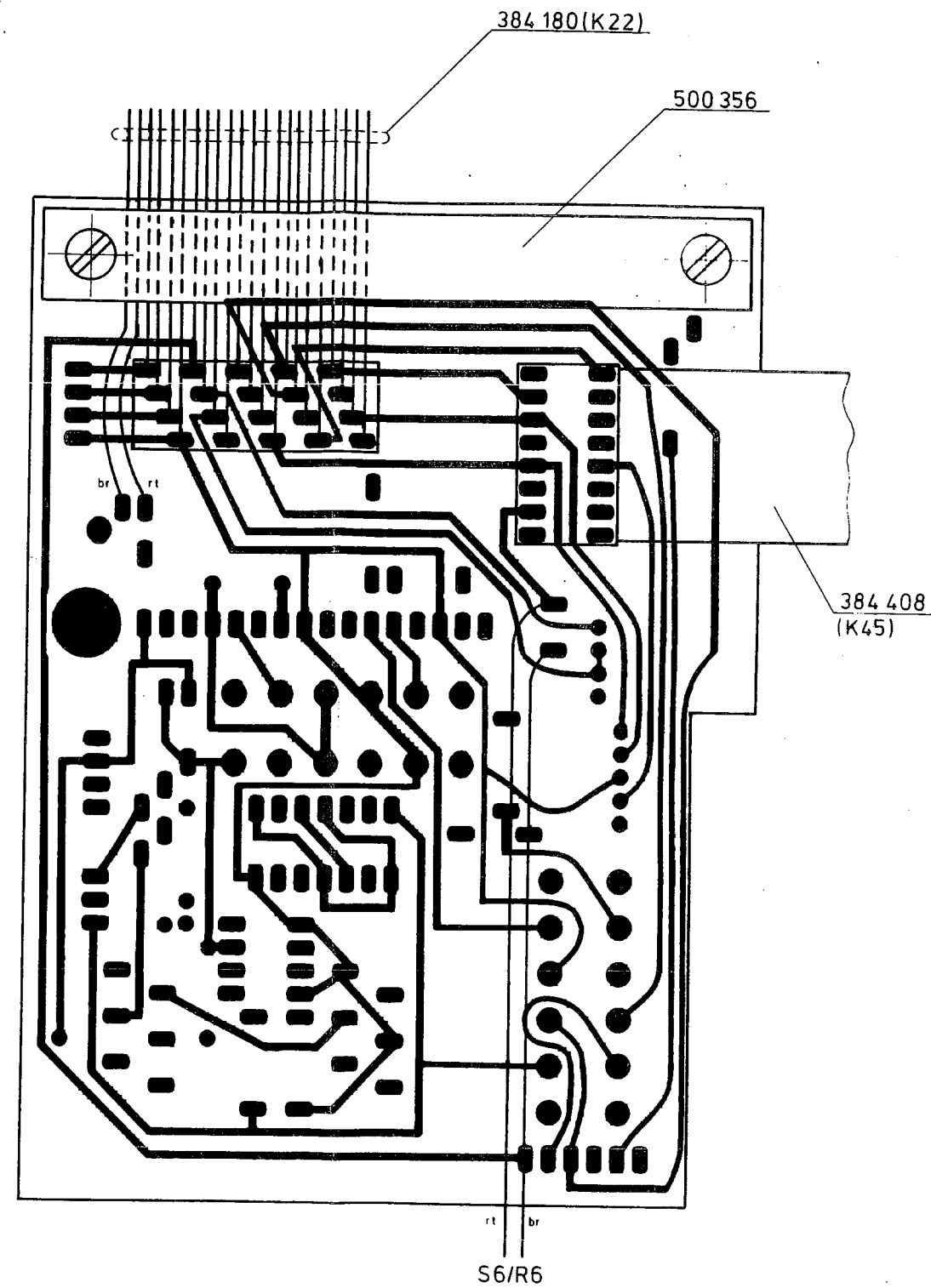


10			Content	Diagram	Material	Schlumberger o/s Mehrzweckbau- / Verteil.-GmbH 70734 Mannheim
09			Werkstoff	±0,2	2:1	
08						
07						
06						
05	9028 41	28.6.79	Eiler			Bestückte Leiterplatte 361 088
04	9028 31	10.4.79	Kunze			
03	9028 15	21.3.79	Mo			
02	9028 9	6.2.79	Pl			
01	9028 94	16.10.78	Pl			
Aus- gabe	Andg. Leseit.	Datum	Name			
				7.8	Datum	Name
				gez	10.10.79	R. Gerstner
				bearb	10.10.79	W. H.



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

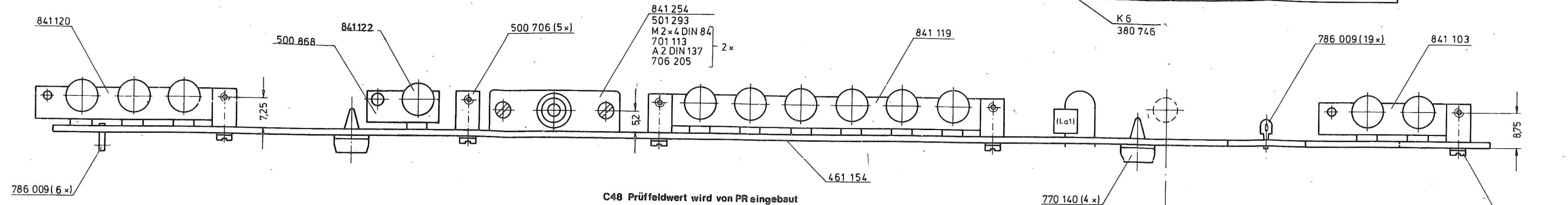
weich gelötet



Kontrollmaß

902827 26.2.79 Mo		0.2	2:1	Schlumberger o/s
80289 2.2.79 Mo				Bestückte Leiterplatte
802896 21.12.78 ga		78	18.12. Gerdner	361 086
802881 18.12.78 ga				

K1(384 620)
aus 361 088



C48 Prüffeldwert wird von PR eingebaut

Farbpunkt
(Cathode)

Ausgangsstufe

832 904 (2x)
(T1/T2)

M2x5 DIN 84
701 114
A2 DIN 137
706 205

K 23
aus 361 086

K 25
aus 361 086

384 279/K3

94 372/K2

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l=90mm
J1

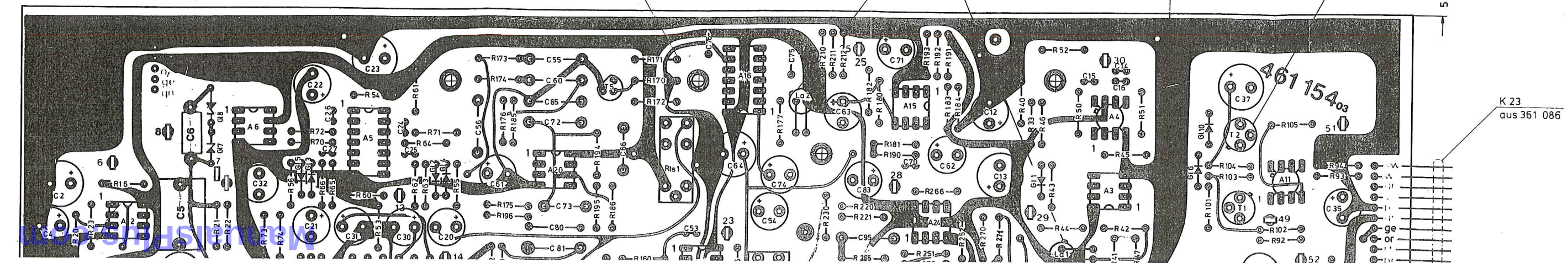
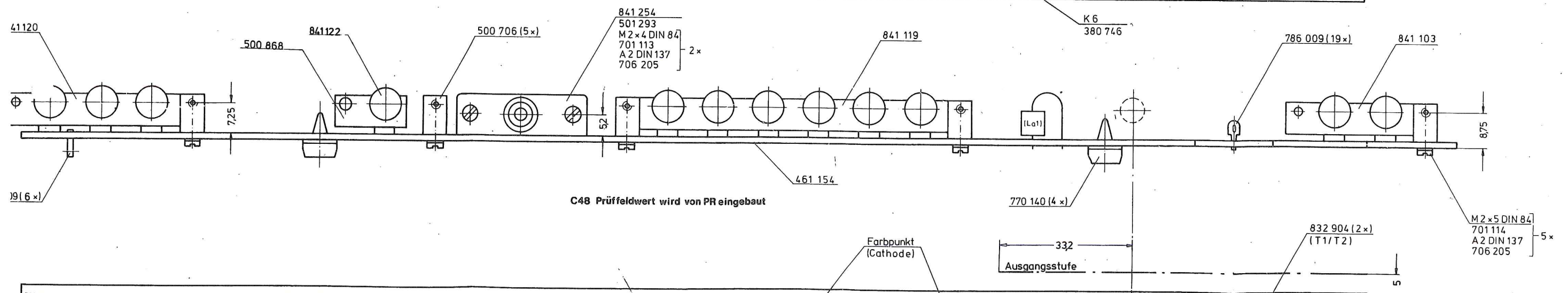
l=75mm
G1 5

J2
ws/gr l=100 mm

für Bauteile gesperrte Zone
(Welle-Dämpfungsglied)

786 004 (2x)
880 168 (2x)
l=110 mm

770 064



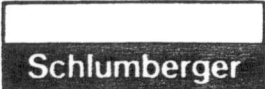
Bestück

(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 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/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

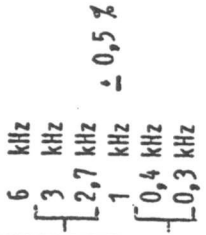
208 026 A

1/2
Sheet

Issue	Alteration No.	Date	Name
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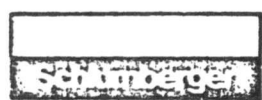
01	9022.78	25.10.79	Harry
	5028.87	11.9.75	Stuh

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



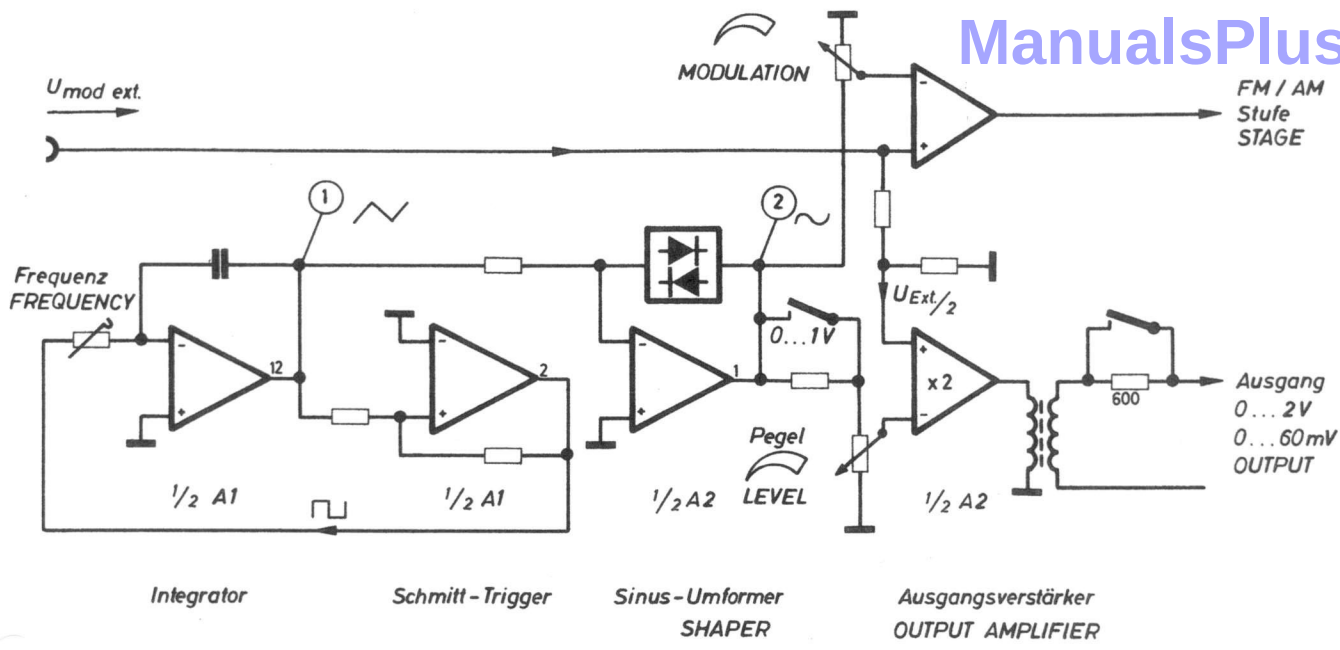
Issue	Alteration No.	Date	Name
		5.10.73	Karmy

208 025 A



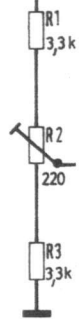
2/2
Sheet

208 025 A	2/2 Sheet
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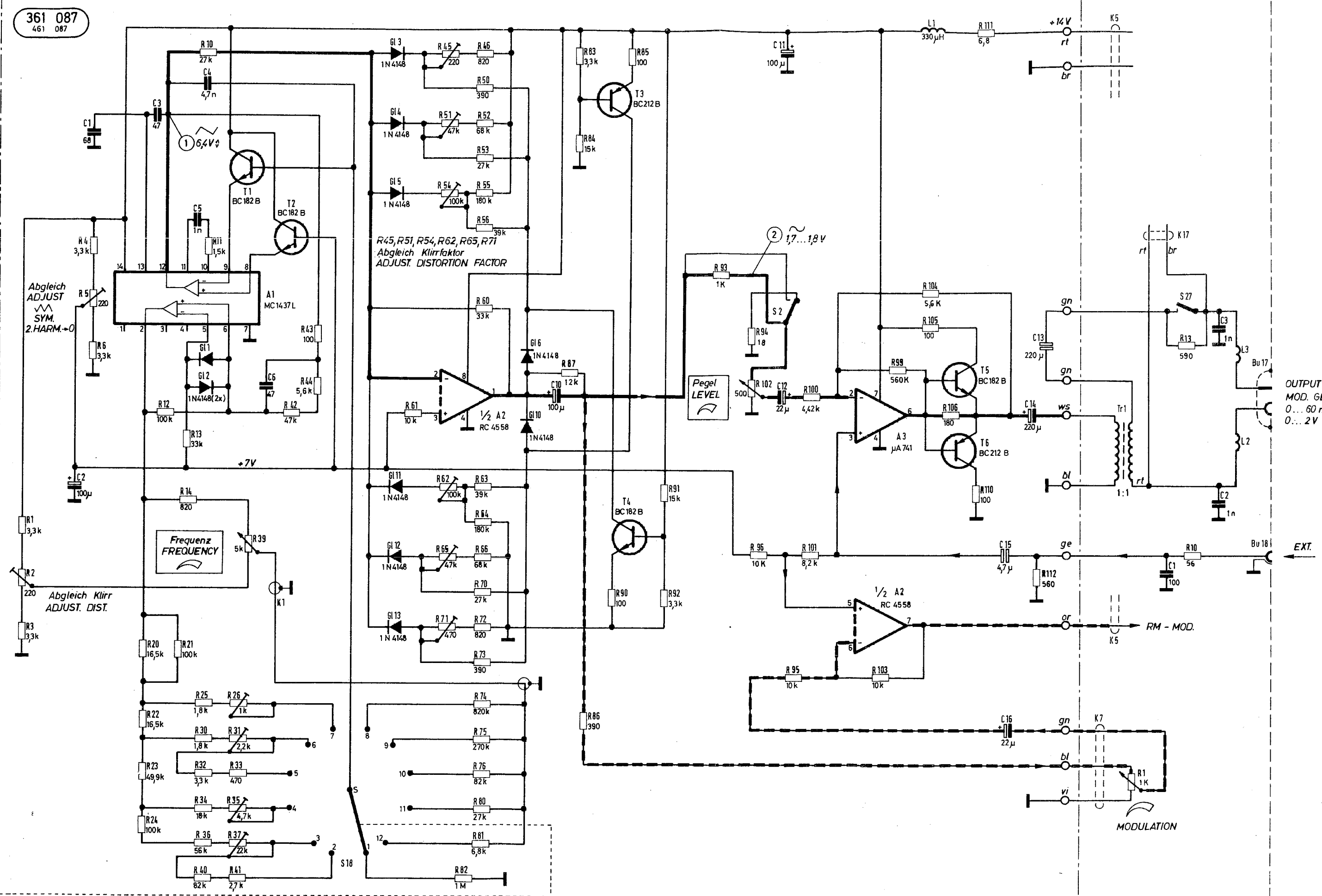
Bereich RANGE	Frequenz FREQUENCY
2	0,3 kHz
3	0,4 kHz
4	1,0 kHz
5	2,7 kHz
6	3,0 kHz
7	6,0 kHz
8	0,03 ... 0,1 kHz
9	0,1 ... 0,3 kHz
10	0,3 ... 1,0 kHz
11	1,0 ... 3,0 kHz
12	3,0 ... 10,0 kHz
1	EXT. MOD.

Abg.
AD.
✓
SI
2.Hz



/ AM
fe
GE

gang
2V
60mV
PUT



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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)

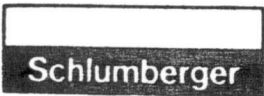
The fully integrated counter provides direct drive of the display in conventional Strobe method, for which it requires merely the counting frequency, the reset pulse, the transfer pulse (transfer of the counter status into the readout store) and the flashing frequency. Its negative feed voltage is generated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

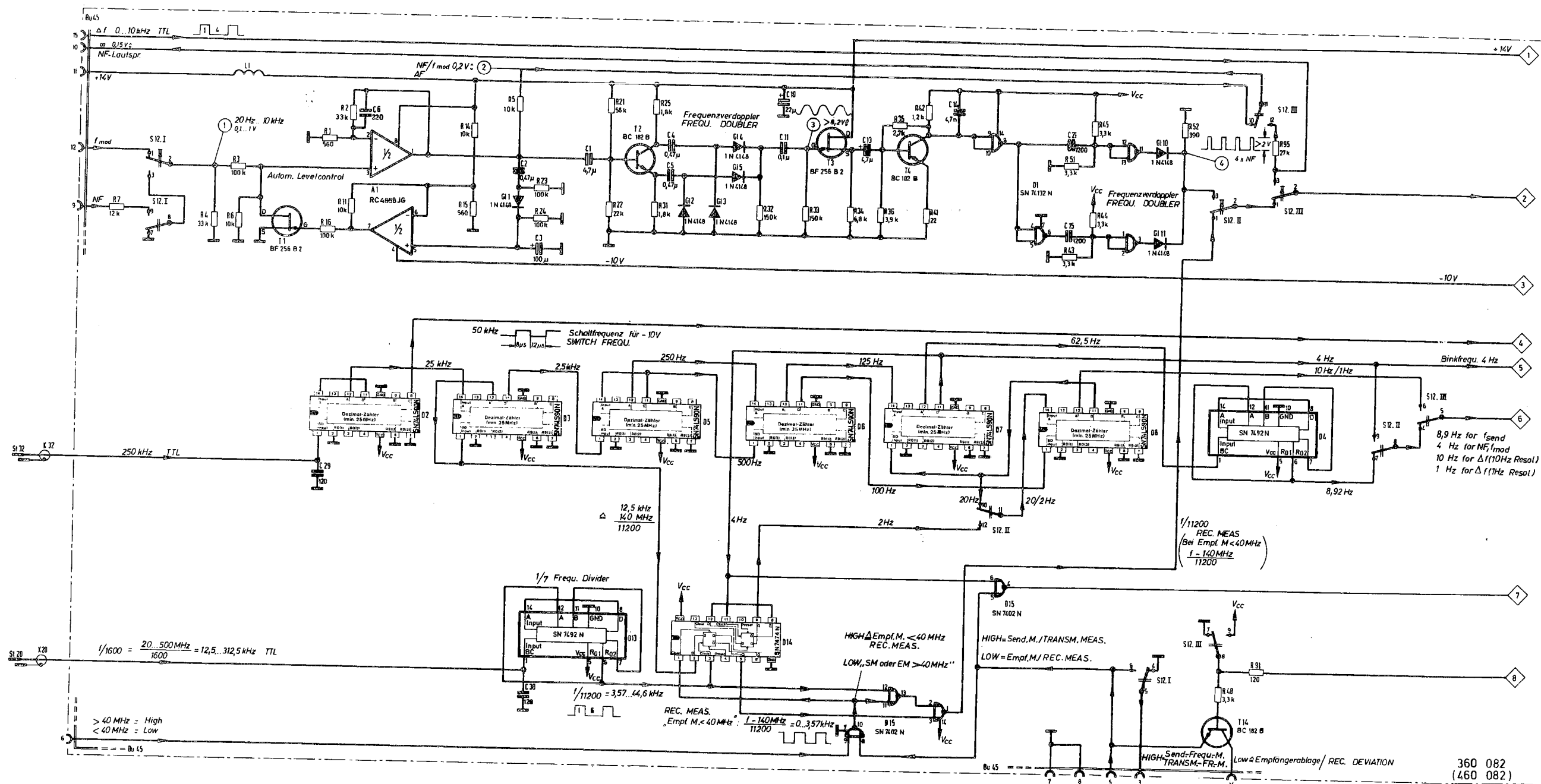
The counting frequency is conditioned by various means depending on the mode of operation:

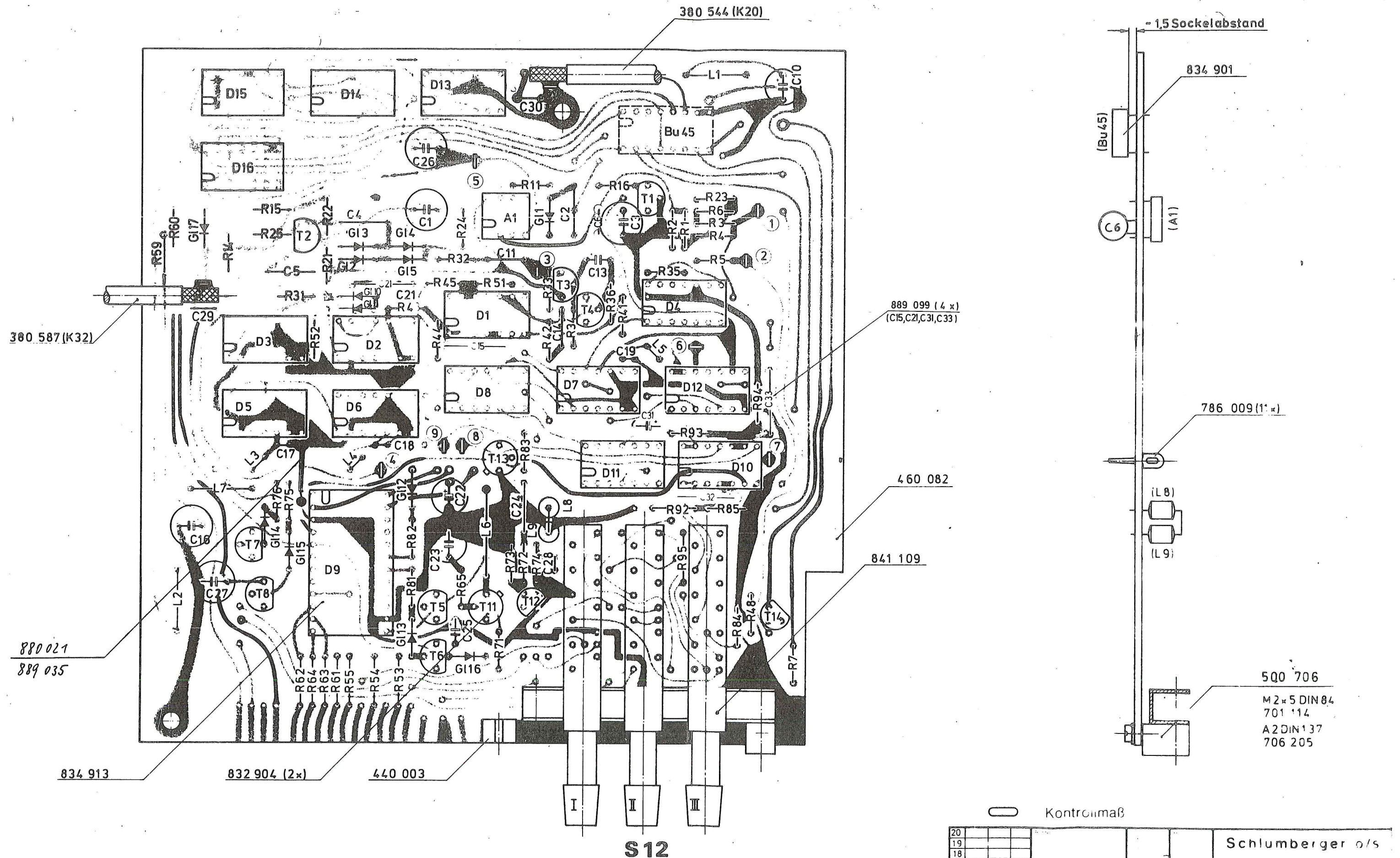
1. The modulation frequency f_{MOD} or the input frequency of the voltmeter is quadrupled by an input amplifier having automatic level control in 2 frequency doublers. Thus attaining a faster counter readout, (4 times/sec) for 1 Hz resolution.
2. The offset frequency " Δf (AC)" is presented directly. (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.

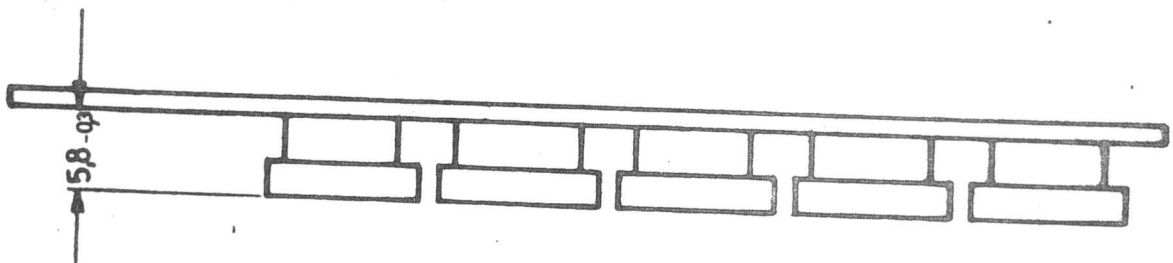
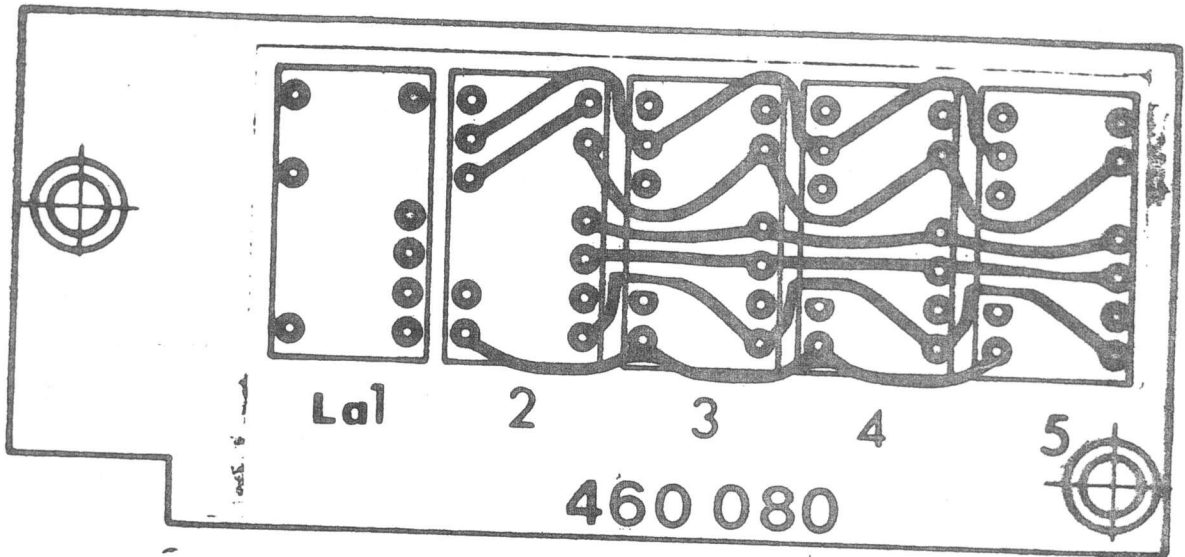
When indicating the synthesizer frequency < 40 MHz the frequency $\frac{140 \dots 180 \text{ MHz}}{1600}$ is de-mixed using a D Flip Flop analogous to de-mixing in the output stage and in the counter stage also.

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

Adjustment and Test Procedure					4020 (4010) series Frequency Counter			
Schlumberger		Issue	Alteration No.	Date	Name	237 002 A		1/1 Sheet
4021 (4010 A) Dig. Voltmeter (Oscilloscope for trouble shooting)		Adjustment and Test Procedure					4020 (4010) series Frequency Counter	
REQUIRED TEST EQUIPMENT		PROCEDURE					MEASURED VALUE	
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		RECEIVER MEASUREMENT					REQUIRED VALUE	
		TRANSM. MEASUREM.					-9.....-11 V on (5) 360 082	
		FREQU. SETTING						
		f _{TRANSM}						
		f _{ABT.}						
Mod. Generator switched to ext. AF Voltmeter range in 1 mV position button UNMOD pressed		X X X X		020,000 MHz 140,000 MHz 479,000 MHz 600,000 MHz	X X X X	020,0 140,0 479,0 600,0 blinks	Noise " " " "	ok
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	010,0 -01,00 blinks -01,00 -1,000 +1,000	Noise 10,1 kHz 1 kHz 1 kHz 1 kHz	ok
fOFFSET Control fully anti-clockwise (+,- sign blinks) pressed pulled pulled		X X X		009,9990 " "	X X X	+00,2... -00,2... - 0,2...	appr. 250Hz " "	ok
FM, Range 5 kHz, Deviation 0,5 kHz Modulation generator 30 Hz 1 kHz 9,9 kHz 10,1 kHz		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	ok
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	ok

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[illegible]



Diese Zeichnung ist unser Eigentum. Vervielfältigung, Verbreitung, Weitergabe, Nachdruck, Fälschung, Entwertung, Verstoßung, Verletzung an andere ist strafbar und schadenverursachend.

Schaltplanpositionierung : 360 080 Sa / 237 002 S

09	Anmerkung	Freigegeben	Menge	Schlumberger o/s
08				
07	Werkstoff	2:1	Menge	Bestückte Leiterplatte
06				
05	Oberfläche	Zahl	Datum	Name
04				
03	Ausgabe	Anzahl	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	

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

3. Oscillators

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

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

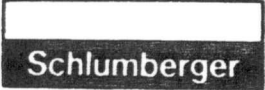
The RF signal is provided to the output amplifier through to the buffer amplifier, harmonic low pass filter and the combination circuitry. To generate 40 ... 60 MHz using a single oscillator circuit a double oscillator frequency of 80...120 MHz is generated and divided at the output by 2.

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

2. Oscillator Selection

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

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

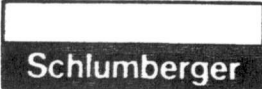
	Function	Description	213 012 F	Sheet 2/3
	Type :	4020/21/22	Oscillator Stage	Date 0979

4. Output Amplifier

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

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

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

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

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
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

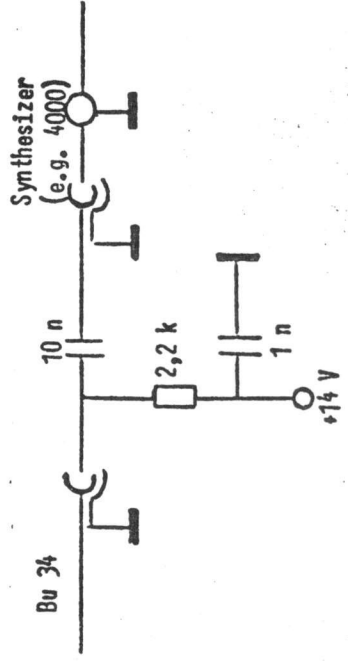
4021 (4010 A)
Oscillator

Schlumberger

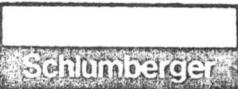
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Synthesizer (60...520 MHz) DVM Power Meter RF Analyser	RF Amplifier (360 885) Connect the Synthesizer to Bu 34 by use of the following coupling circuit. 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	
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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

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Oscillator

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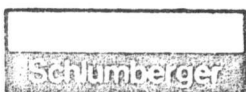
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Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DC-Multimeter	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	

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Oscillator

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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 440 MHz 479,9 440... 479,9 MHz	C12 R10 C32 R34	10 kHz dev. appr. exact value as above 10 kHz $\pm$ 5 % 10 kHz dev. appr. exact value as above 10 kHz $\pm$ 5 %	

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Oscillator

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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

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

Adjustment and Test Procedure

 4021 (4010 A)
 Oscillator

Schumberger

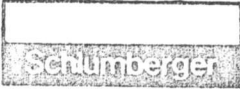
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Counter DVM	Oscillator 40...200 MHz (360 887) - continued					
	2. 2 Mhz Frequency Offset on TRANSM. MEASUREMENT					
	Depress: TRANSM. MEASUREMENT and f 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			
			161,999			
			181,999			
			201,999			
Noise Deviation Meter	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	

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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	

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Oscillator

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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	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
	TRANSMITTER MEASUREMENT	(AFC-line - grey lead)				

Adjustment and Test Procedure

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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Dev. Meter AF Generator DVM	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	$V_{AFC} < 11,5 \text{ V}$	

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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)				

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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)				

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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)				

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

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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 159,9 MHz	R 114 R 123 alternatively	$\Delta f = 20 \text{ kHz}$ $\Delta f = 20 \text{ kHz}$	
		"	140...159,9 MHz	R 114	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	RF DIRECT and AFC-line	140,0 MHz 159,9 MHz	L 33 L 33	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} \leq 11,5 \text{ V}$	
		(AFC-line = grey lead)				

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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. 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.	RF DIRECT or Bu 35	160,0 MHz 179,9 MHz	R 165 R 161 alternatively	$\Delta f \approx 20 \text{ kHz}$ $\Delta f \approx 20 \text{ kHz}$	
		"	160...179,9 MHz	R 165	Accuracy $\pm 3\%$	
	Setting: RECEIVER MEASUREMENT TRANSMITTER MEASUREMENT	RF DIRECT and AFC-line (AFC-line = grey lead)	160,0 MHz 179,9 MHz	L 41 L 41	$V_{AFC} \leq 2,5 \text{ V}$ $V_{AFC} < 11,5 \text{ V}$	

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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)				

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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						

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Oscillator

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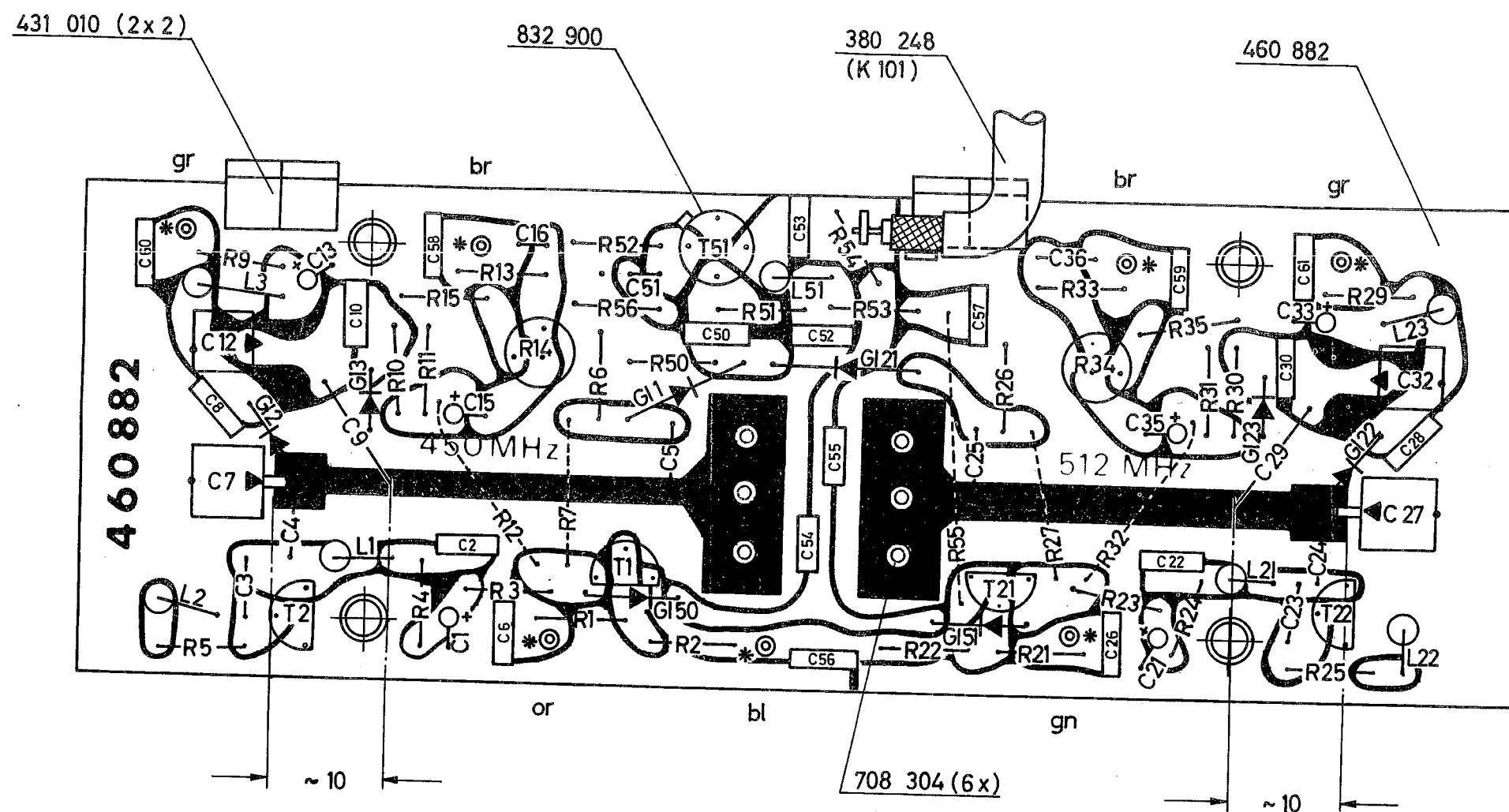
Replacement for

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C7/C12/C27/C32
◄ = Farbpunkt



* = Farbpunkt

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

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					Bestückte Leiterplatte
					360 882

Schaltplanpositionierung $\triangle$ 213 016/017 S/360 882 Sa

verwendet in : 375 200/211

Gerät : 4010/4010A/4011

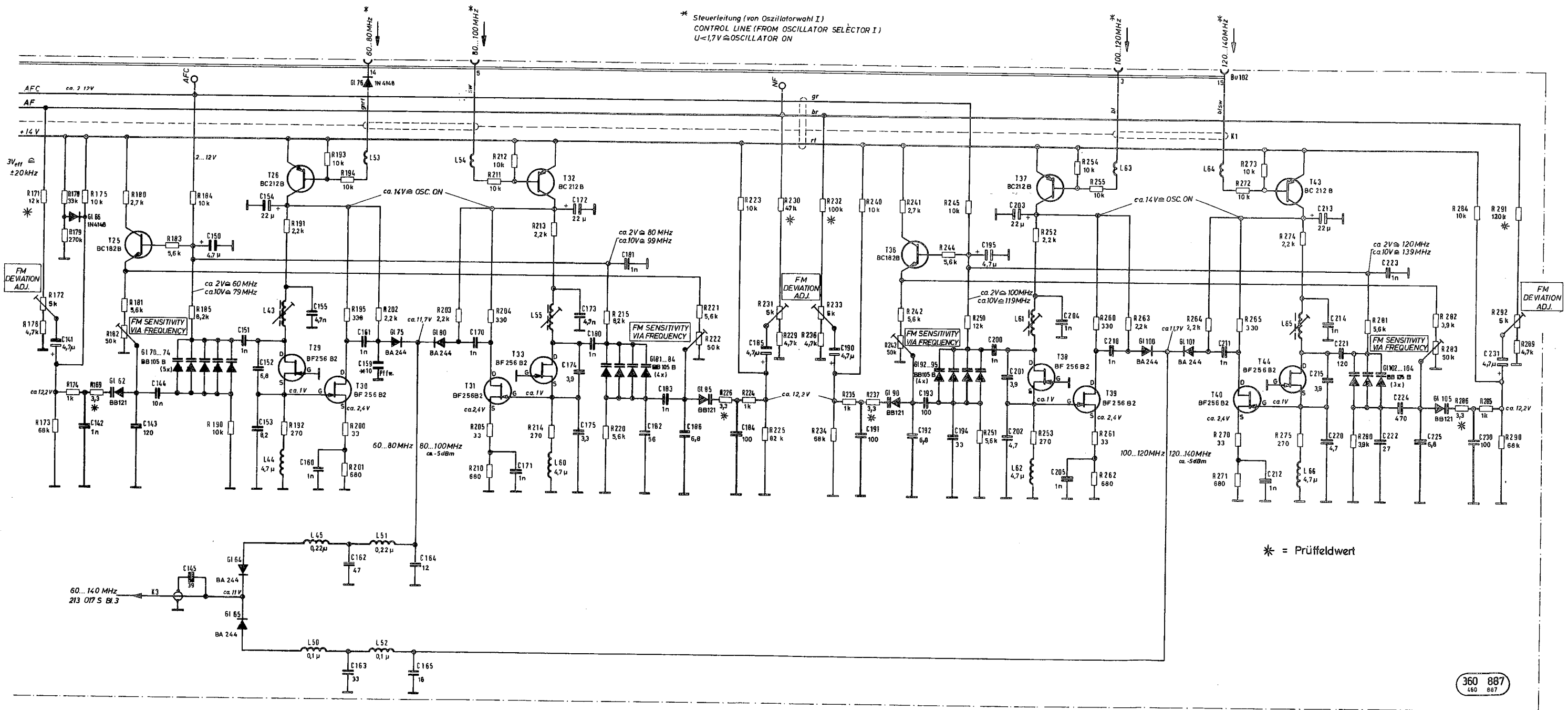
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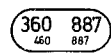
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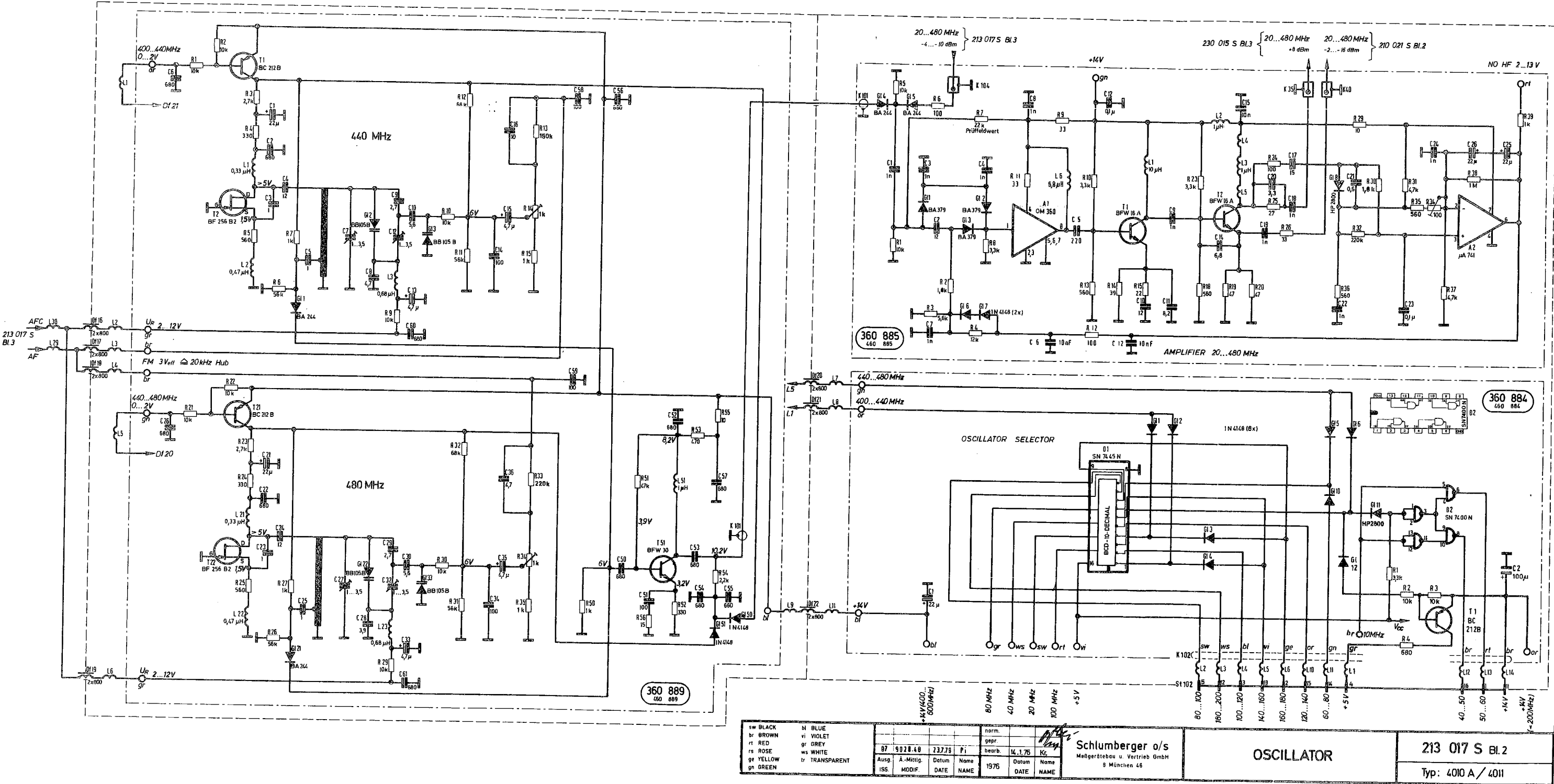


sw BLACK br BROWN rt RED rs ROSE ge YELLOW gn GREEN		bl BLUE vi VIOLET gr GREY ws WHITE tr TRANSPARENT		norm. gepr. beabr. 14.1.76 1976		Schlumberger o/s Meßgerätekau u. Vertrieb GmbH 8 München 48		OSCILLATOR		213 017 S Bl. 5 Typ: 4010 A/4011	
06	8028.56	8.5.78	Wn	1976	1976	1976	1976	1976	1976	1976	1976
Ausg.	Ä-Mittg.	Datum	Name	DATE	DATE	DATE	DATE	DATE	DATE	DATE	DATE
ISS.	MODIF.										

360 887
460 887

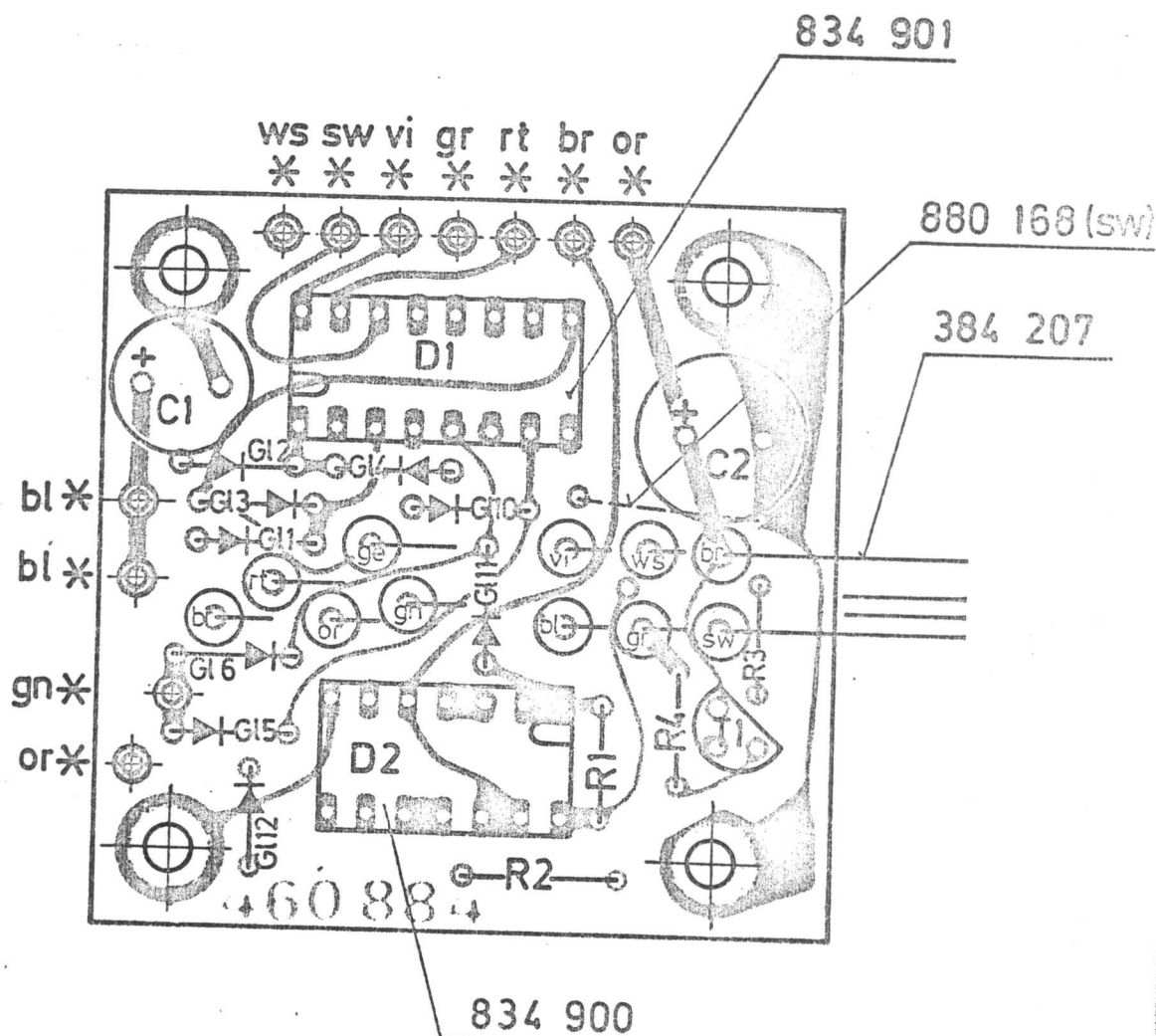


sw BLACK	bl BLUE			norm.		<i>Meyer</i>	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	OSCILLATOR	213 017 S Bl. 4			
br BROWN	vi VIOLET			gopr.								
rt RED	gr GREY	09 9028.76	16.10.76 Eller	bespr.	U _e 1.76					Kr.		
rs ROSE	ws WHITE	Ausg.	A.-Mittg.	Datum	Name					1976	Datum	Name
ge YELLOW	ir TRANSPARENT	ISS.	MODIF.	DATE	NAME							
gn GREEN												
								Typ : 4010 A / 4011				



Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46				OSCILLATOR				213 017 S Bl.2			
Typ: 4010 A / 4011											

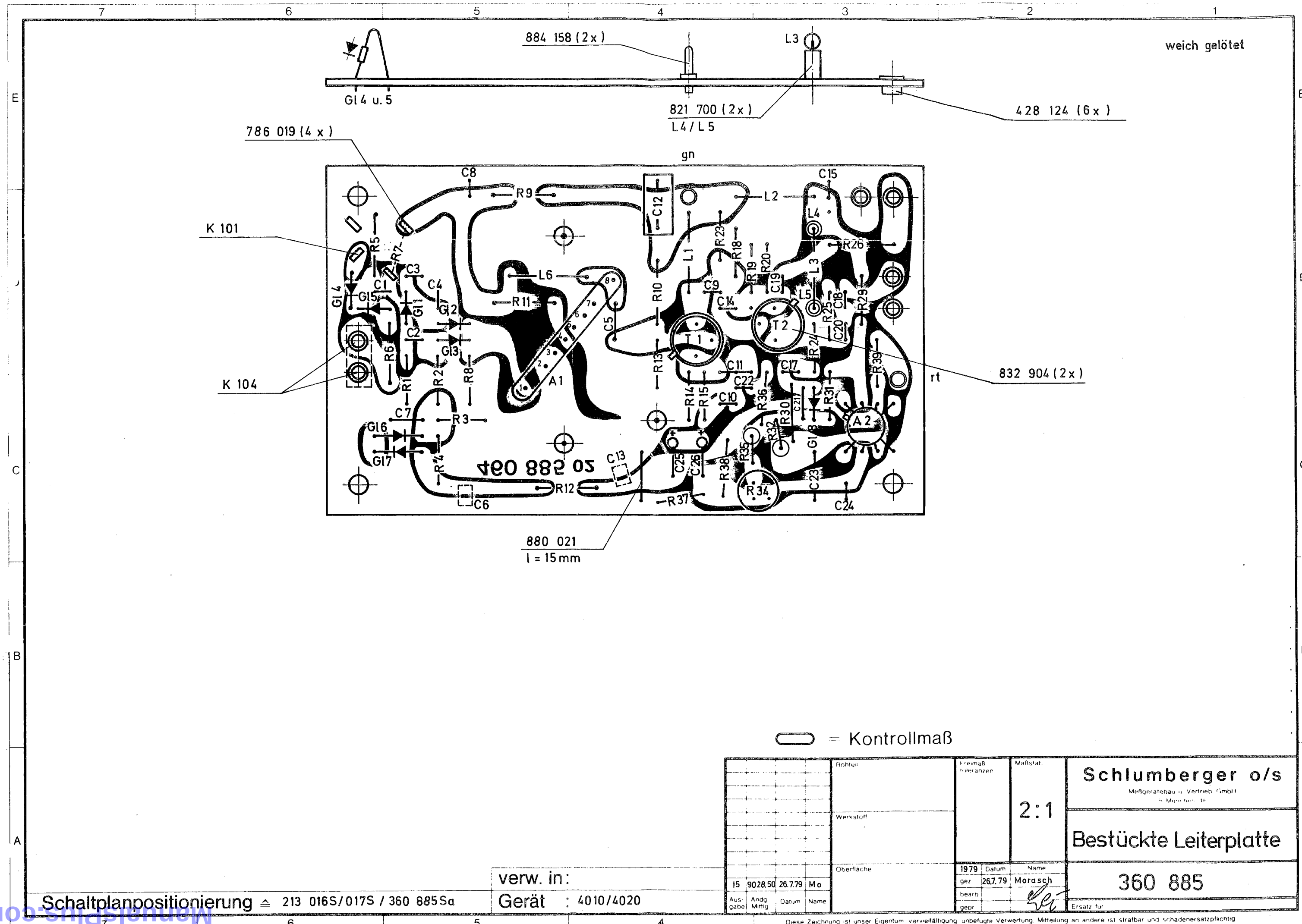
weich gelötet



* = Farbpunkt

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

09				Rohrteil	Freimaßtoleranzen $\pm 0,2$	Maßstab 2:1	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 45
08							
07							
06							
05	8028 93	21.12.78	Mo	Werkstoff			Bestückte Leiterplatte
04	6028 47	22.6.76	Eiler				
03							
02							
01				Oberfläche	1976 Datum gez 22.6. Eiler bearb 24.6. pers	Name 360 884	
Ausgabe	Andg. Mittig	Datum	Name				



= Kontrollmaß

				Rohrer		Freimaßtoleranzen		Maßstab		Schlumberger o/s Meßgerätebau u. Vertrieb GmbH D-4400 Münster 10			
				Werkstoff				2:1		Bestückte Leiterplatte			
				Oberfläche		1979		Datum		Name		360 885	
15		9028.50		26.7.79		Mo		gez		26.7.79		Morasch	
Ausgabe		Andg. Mittig		Datum		Name		bearb					
								gepr				Ersatz für	

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

verw. in:
Gerät : 4010/4020

stehend eingelötet



R178; 179; Gl 66
auf Leiterunterseite gelötet

$$(x^7) \quad 851 \quad 788$$

b1

95

R6:75:1
229:2:
auf Lei

229; 2:
auf Lei

0021

460 887



834 902

95

b1

R8 / R9. u. G16
stumpf aufgetoilet

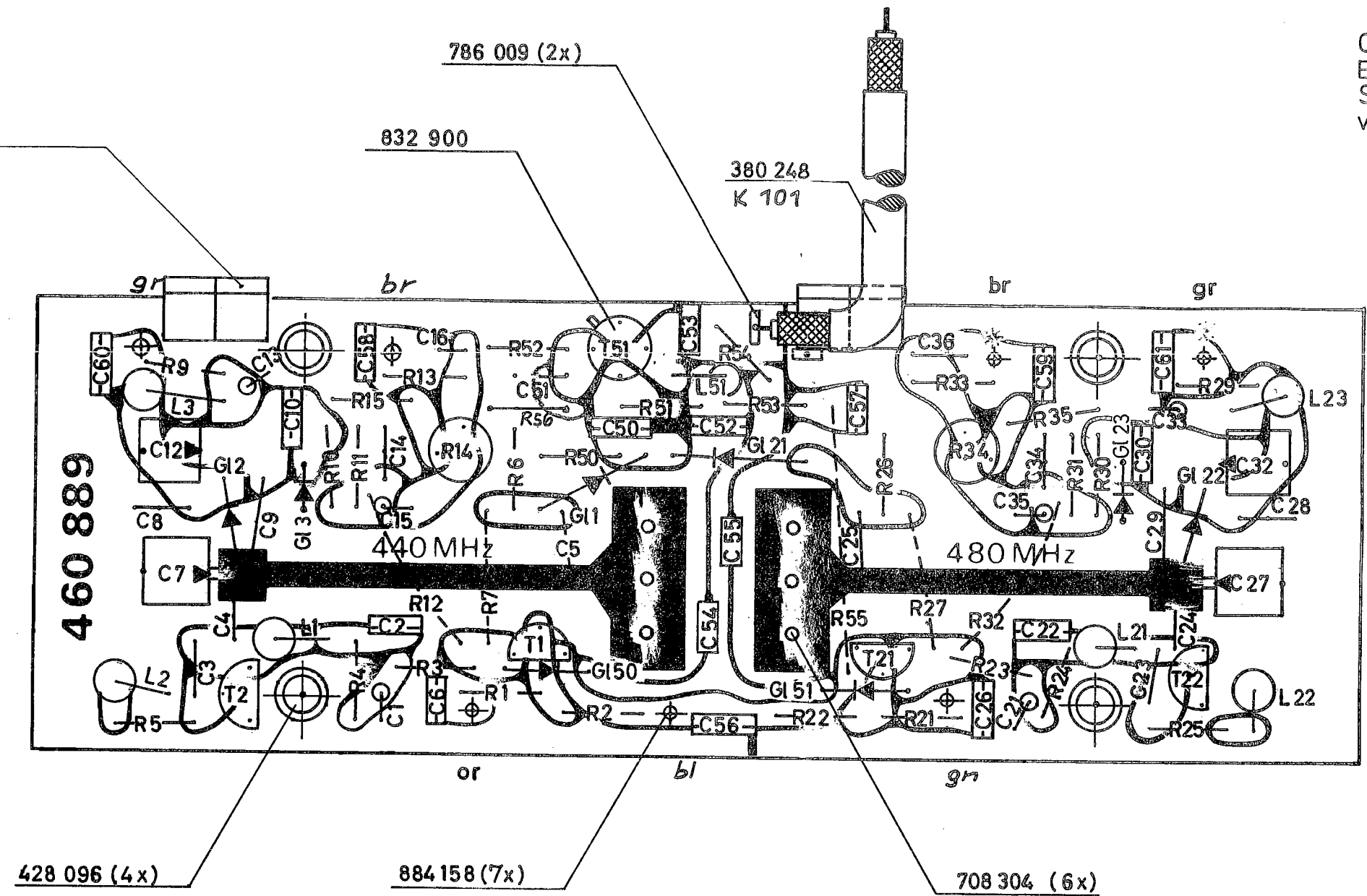
431 010

786 009 (2x)

832 900

380 248
K 101

weich gelötet
C7, C12, C27, C32 : $\triangle$ Farbpunkt
Bauteile auf Unterseite mit
Schrumpfschlauch 787 029
versehen



428 096 (4x)

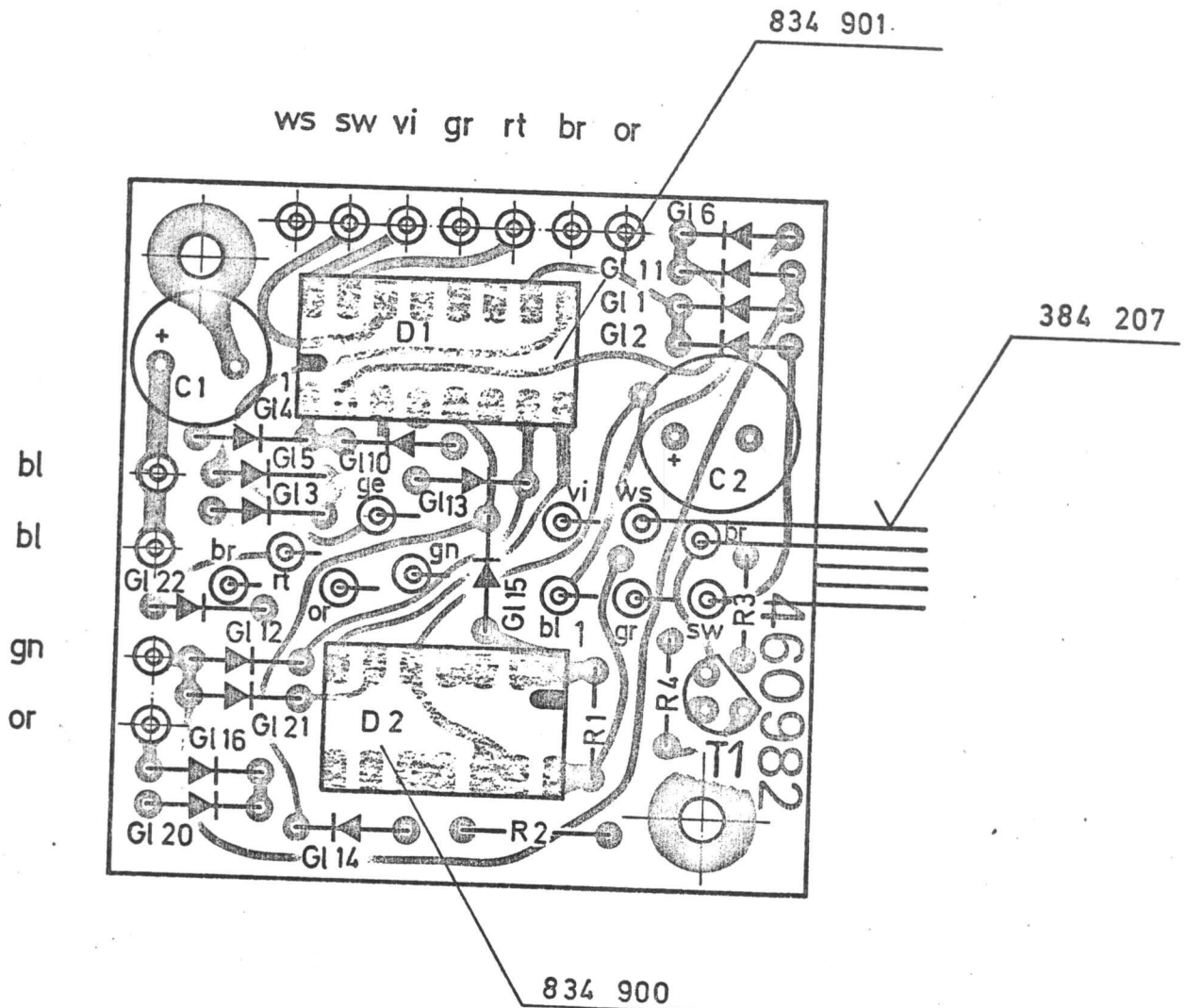
884 158 (7x)

708 304 (6x)

= Kontrollmaß

10	Reiten	Freimaß	Maßstab	Schlumberger o/s
09		toleranz		
08				
07				
06	Werkstoff		2:1	Bestückte Leiterplatte
05				
04	902838 21.5. H			
03	9028.19			
02	6028.28 2.4.76. Eiler			
01	6028.2 12.1.76			
Aus	Arzt	Datum	Name	360 889
Jahr	Mitte			
Ersatz für				

Schaltplanpositionierung $\triangle$ 213 017 S
213016S/ 360889 Sa



Schaltplanpositionierung $\hat{=}$ 213 016 / 213 017S / 360 884 Sa

09					Rohteil	Freimaß- toleranzen	Maßstab	Schlumberger o/s Meltingerstraße u. Vertrieb GmbH 8 München 45
08					Werkstoff	—	2:1	
07								
06								
05								
04					Oberfläche	1979	Datum	Name
03						13.12.79	Morash	
02	90244712.12.79							360 982
01								
Ausg.	Anfert.	Datum	Name					

Bestückte Leiterplatte

360 982

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	

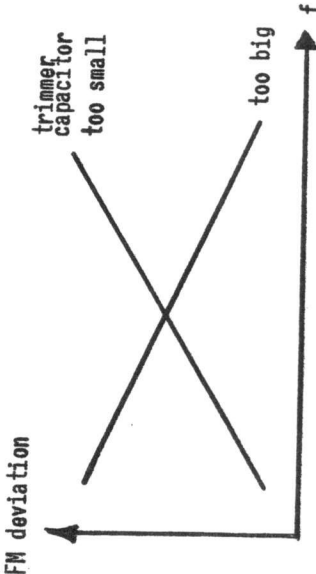
Adjustment and Test Procedure

4022 (4011)
Oscillator

Schlumberger

Issue	Alteration No.	Date	Name
		5.10.79	Ward
		25.2.75	

213 014 A

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
		5.10.73	Harmel
01	602810	26. 2. 76	Schub

213 014 A

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
4000, 4901 or other Modulation Meter and Distortion Analyser	6. <u>Modulation Distortion</u> $f_{\text{mod}} = 1 \text{ kHz}$ 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>	"	$f_{\text{mod}} =$ 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

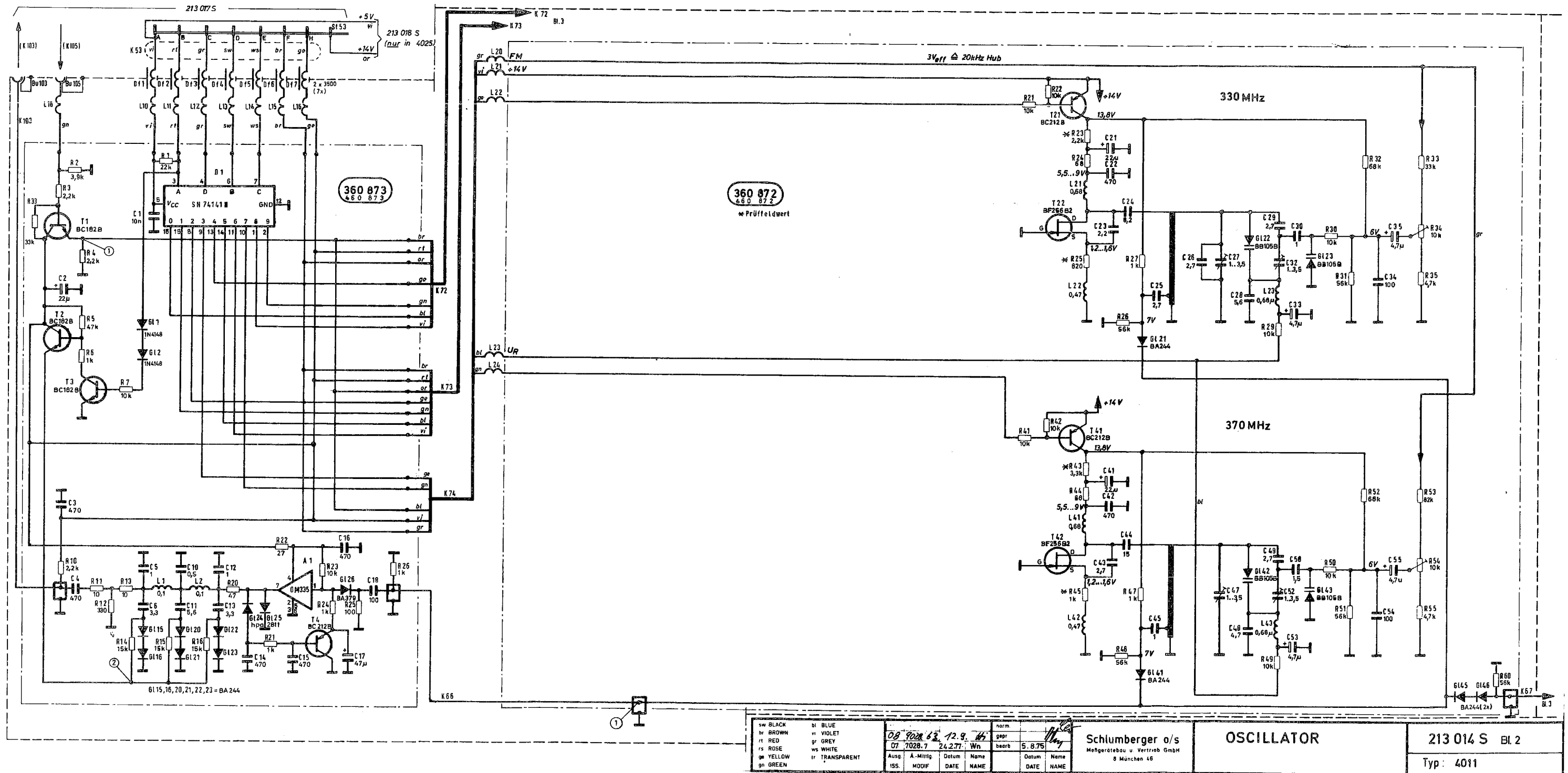
Issue	Alteration No.	Date	Name
		5.10.79	Worm
01	602810	26.2.76	Schub

213 014 A

3/3
Sheet

Replacement for







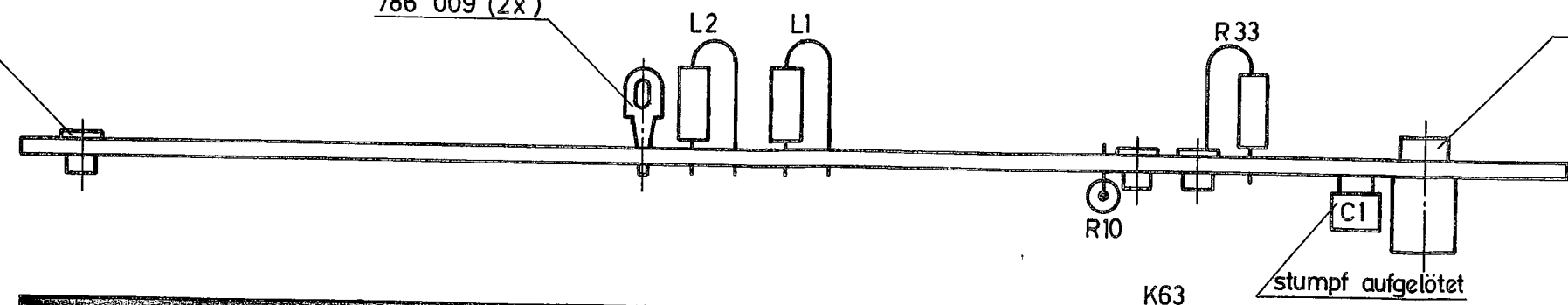
7 6 5 4 3 2 1

428 144 (4x)

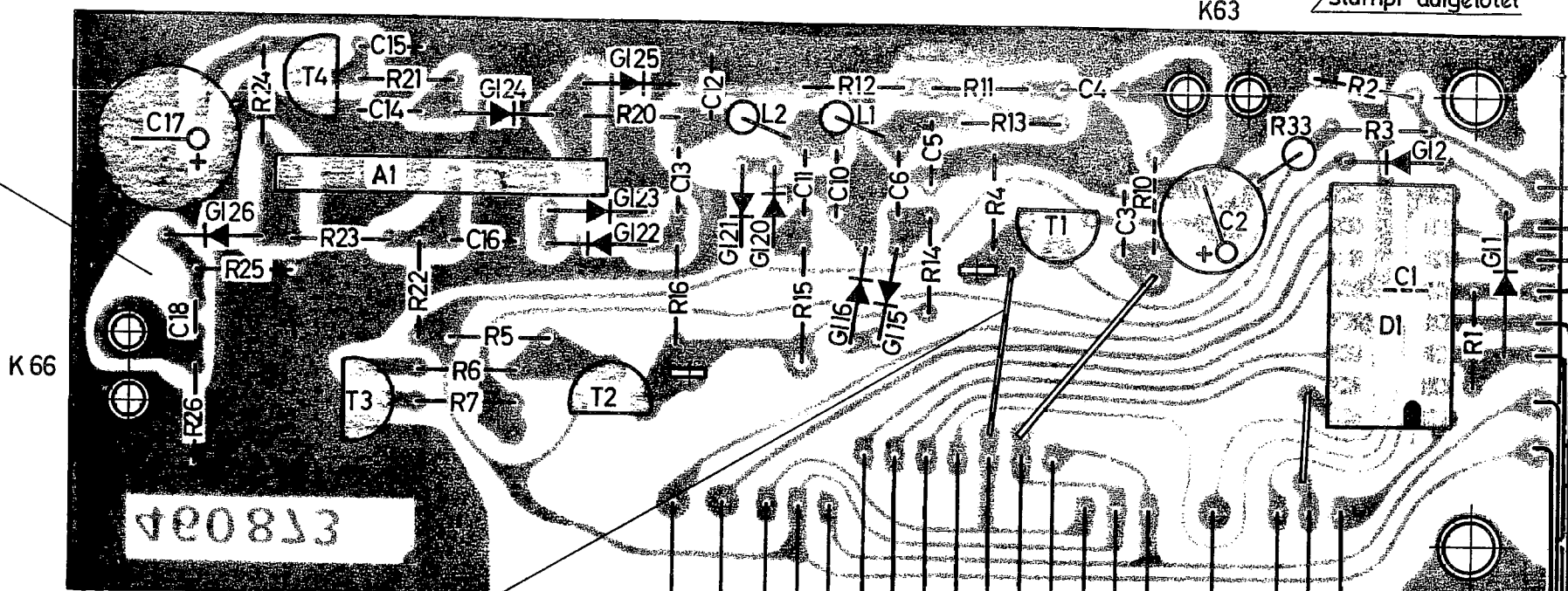
786 009 (2x)

428 096 (2x)

weich gelötet

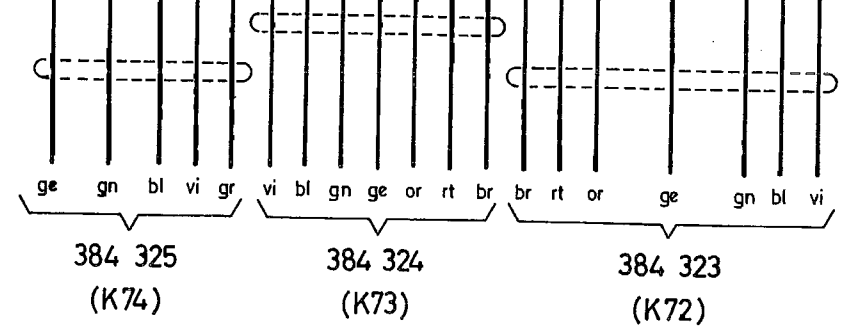


460 873



880 021 (3x)

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



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

Schaltplanpositionierung $\cong$ 213 014 S / 360 873 Sa

verwendet in : 375 217

Gerät : 4011

10		Rechner		Format		Maßstab	
09				Zeichnungs		2:1	
08							
07							
06		Werkstoff					
05							
04	9024.25	15.2.79	Kr.				
03	6028.83	26.10.76	Kr.				
02							
01							
Ausgabe	Andg	Datum	Name	1976	26.10.76	Kringelis	
						Schlumberger o/s	
						Bestückte Leiterplatte	
						360 873	

Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verbreitung, Mitnahme, in andere Art Straftat und Schadenersatzpflichtig

Leiterzug

Brücke

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

auf der Leiterplatte aufliegend

$$\frac{880160}{61 L = 120}$$

 = Kontrollmaß

20				Rohrer	Fremder Lieferanten	Masse	Schlumberger o/s
19							Waldgärden... Vertrieb GmbH
18							A München: "
17							
16				Werkstoff	0,2	2:1	Bestückte Leiterplatte
15							
14							
13							
12				Oberfläche	Datum	Name	360 872
11	909435	19.4.79	Eiler		gar		
					bearb	B. J.S.	
Aus- gabe	Ange- kündig	Datum	Name		gepr		Ersatz für

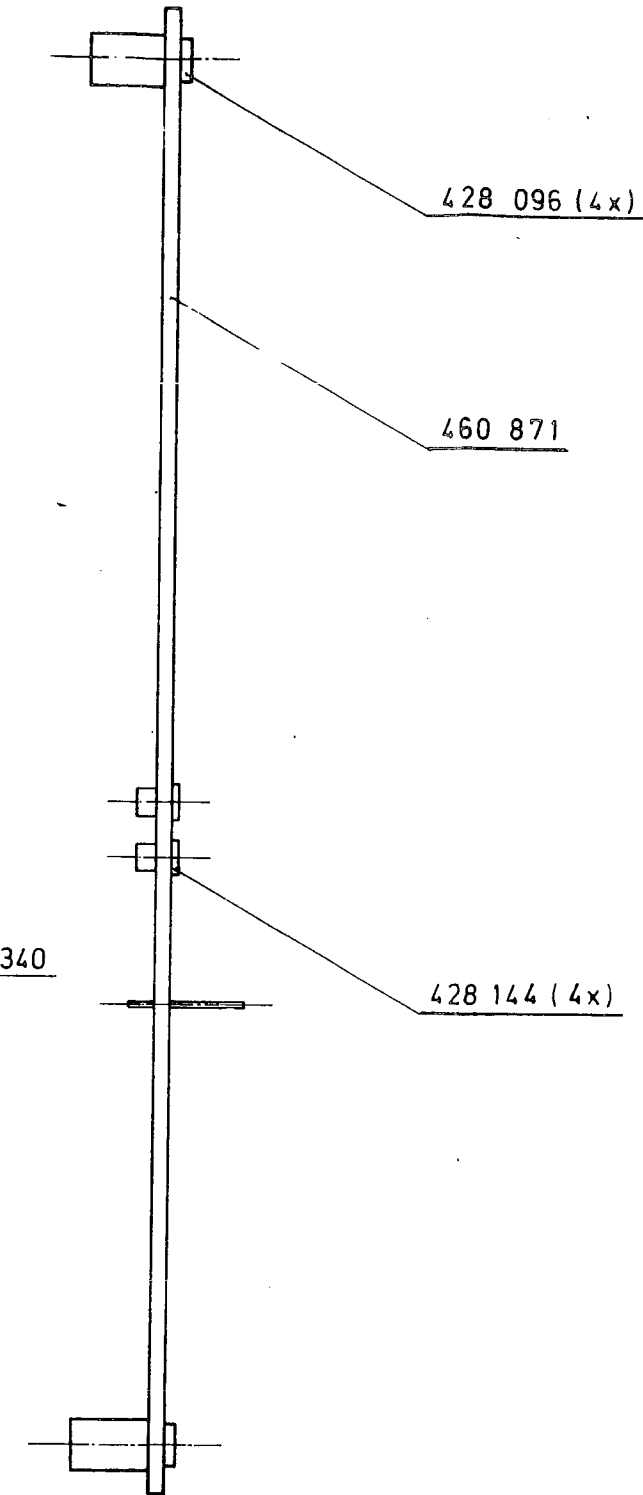
Diese Zeichnung ist unser Eigentum. Vervielfältigung und ohne Genehmigung an andere ist strikt verboten und kann strafbar sein.

Schaltplanpositionierung $\triangle$ 213 014 S / 360 872 Sa

verwendet in: 375 217

Gerät: 4011

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	9028.34	4.5.79	Eiler	±0,2	2:1	Schlumberger o/s	
09	9094.14	19.2.79	Kr.				
08	8028.73	13.10.79	Eiler				
07	8028.63	6.6.79	Eiler				
06	6028.88	29.12.79	BH	Bestückte, Leiterplatte			
05	6028.88	5.3.79	BH				
04	6028.7	30.1.79	Kr.				
03	6028.4	14.1.79	BH				
02	5028.105	24.11.79	Eiler	1979	20.8	Eiler	360 871
01	5028.100	27.10.79	BH	20.8	Eiler		

weich gelötet

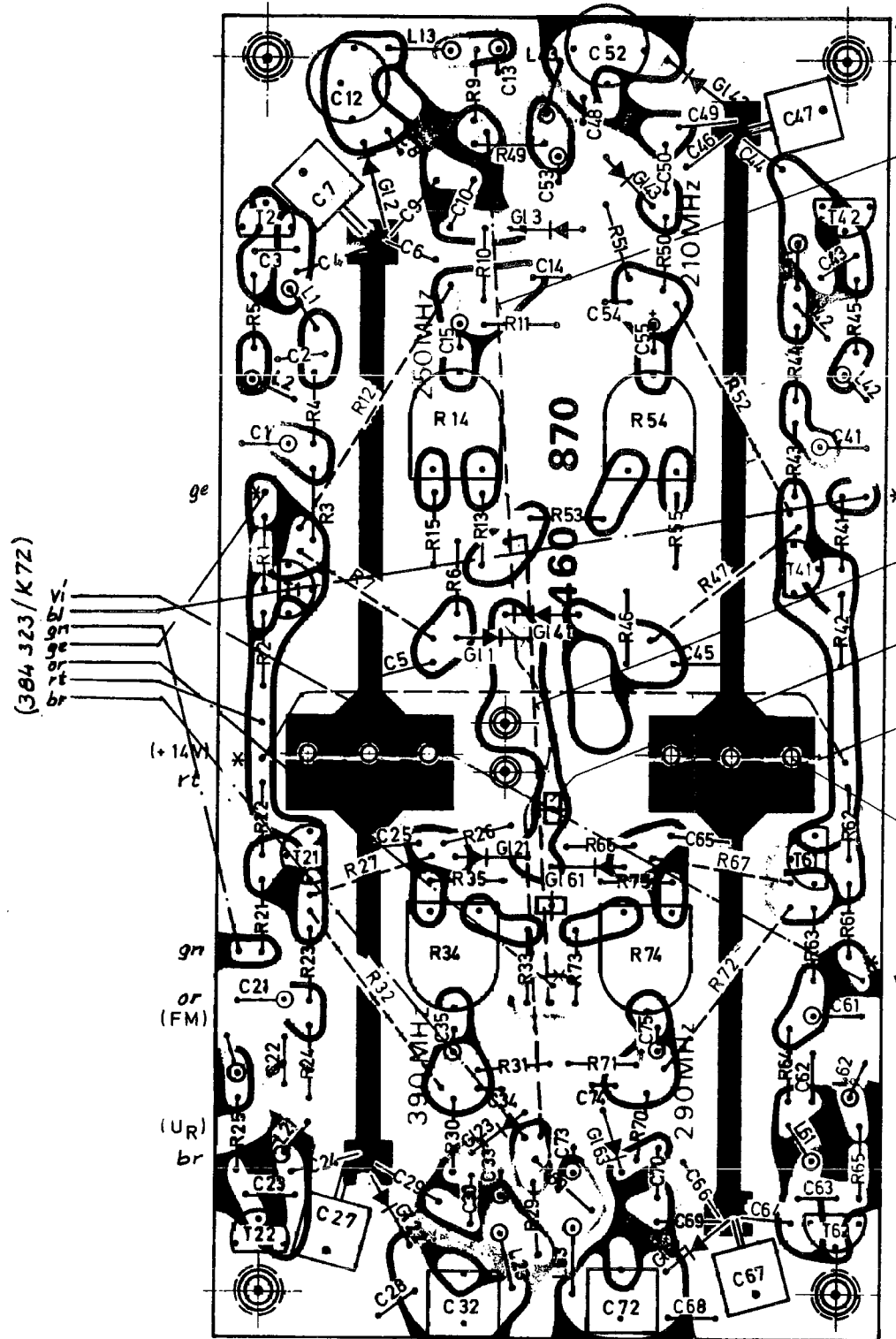
C7/C27/C47/C67

Farbpunkt an
Leiterzug

C32/C72
Farbpunkt an
Brücke

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

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



880161
br L=130 mm

880165
or L=60 mm
786 009 (2x)

880167
rt L=80 mm

A 1.2 x 0.2 x 3.5 DIN 7340
708 304 (6x)

428 096 (4x)

460 870

428.144 (2x)

* = Kabelbaumanschluß

○ Kontrollmaß

		9028 36 8.5.75 Eiler		0.2	2:1	Schlumberger o/s	
		8028 73 13.10.75 Eiler				Bestückte, Leiterplatte	
		8028 63 6.6.78 Eiler					
1F		6028 88 23.11.74 P.H.				360 870	
2F		6028 19 5.8.76 P.H.		19.75	Name	Eiler	
3F		6028 7 30.1.76 P.H.					
4F		6028 4 14.1.76 P.H.		20.8	Name	Eiler	
		5028 106 24.11.74 Eiler					
5F		5028 106 24.11.74 Eiler		8.9	Name	Eiler	
6F		5028 106 24.11.74 Eiler					

(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

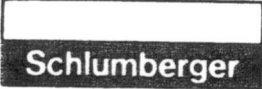
The control line " Δf Rec(DC)" permits the choice of three functions:

- 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.

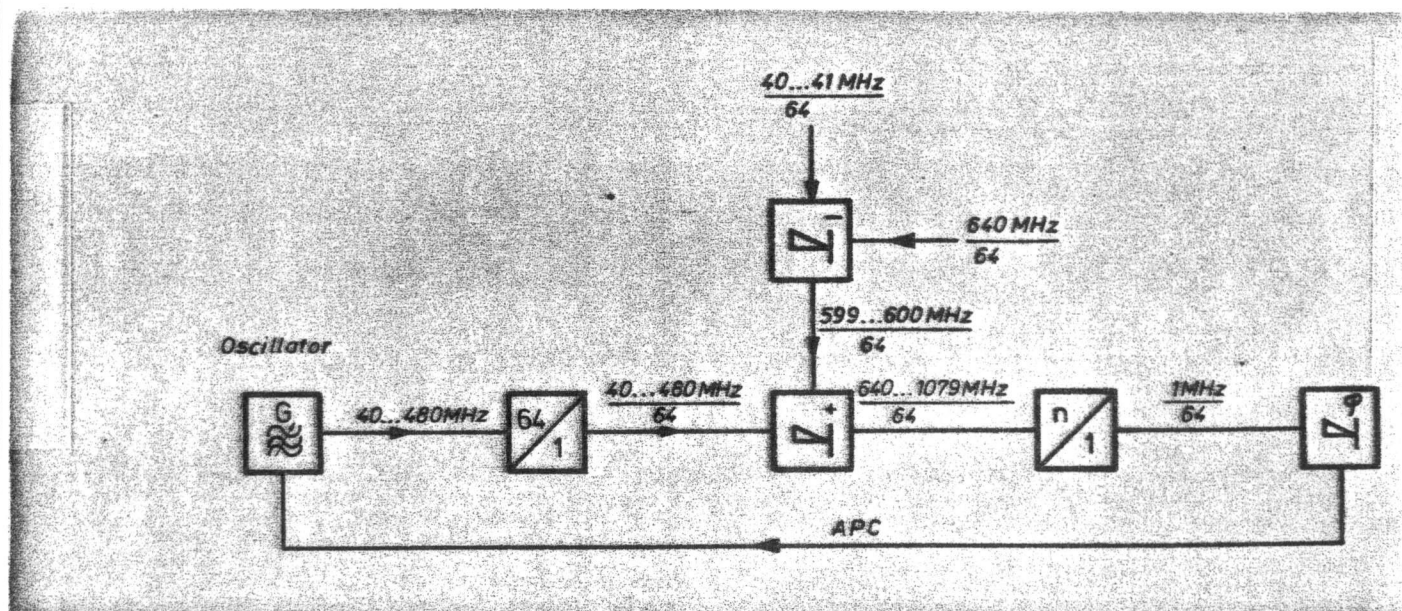
This arrangement permits digital adjustment of the oscillator frequency between 12.5 and 12.8125 MHz in increments of 10 000 (with a vernier offset of $\pm$ approx. 100 increments).

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.

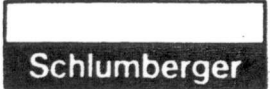
The following simplified block circuit diagram is meant to simplify understanding the mixed frequencies and adjustable frequency divider:



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
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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

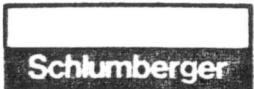
2/11
Sheet

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	12,5 MHz 125 kHz	— —	60 ... 100 mV pp 60 ... 100 mV pp	mVpp
Decade switch Oscilloscope	R 4 fully anti-clockwise and - 0,2 V connected to ⑦ (Resolution 200 kHz) Analys. to Bu 1	⑤3 ⑦ Bu 1	1,2125 MHz 12,2 MHz	DC level on ⑦ L 5 → P max at 12,125 MHz	1,2125 MHz - 34 ... - 38 dBm	dBm
	approx. + 0,60 V on ⑦	⑤3 Bu 1	1,25 MHz 12,5 MHz	DC level on ⑦ R 4 → P min at 12,5 MHz (appr. middle)	1,25 MHz - 70 ... - 90 dBm	dBm
	(Mixture product 12,5 - 0,125 = 12,375 MHz)	Bu 1	12,375 MHz	—	- 46 ... - 50 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product	okdBm
	approx. + 1,6 V on ⑦	Bu 1	12,80 MHz	—	- 52 ... - 56 dBm Lower mixture product > 1,5 dB higher level than upper mixt. product	okdBm
	Oscilloscope with probe to ④ er	④	12,80 MHz	—	1,7 ... 2,8 V (FM) pp	ok
	Analysr with probe to ④ + 0,4 ... + 1,4 V to ⑦	④	12,3 ... 12,8 MHz	—	Spurious products > 3,5 dB below	>dB

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



Issue	Alteration No.	Date	Name
		12.5.75	Shuh

210 021 A	3/11 Sheet
Replacement for	

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Oscilloscope Power Supply	Sample - Hold - Detector 210 021 S Bl. 5: 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)	—	— (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	—	1,25 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)	1,25 MHz 1,26 1,27 1,28 1,28122	—	+ 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
			1,2503125 06250 12500 25000 1253125 56250 62500 75000	—	—	—

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

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Sheet

Replacement for

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Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE

210 021 A

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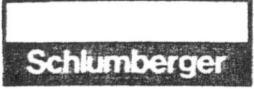
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Replacement for

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

Adjustment and Test Procedure

4020 (4010) series
DECADE STAGE



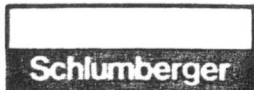
Issue	Alteration No.	Date	Name
01	8028. 3	13.1.78	X
		12.5.75	Stroh

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

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
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		12.5.78	Shub

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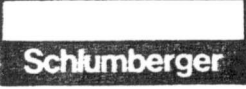
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Replacement for

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

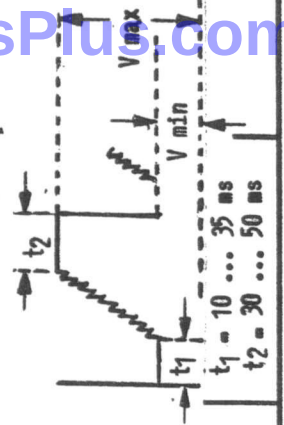
4020 (4010) series
DECADE STAGE



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

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 $\Delta f < 0,2 \text{ kHz}$	R 24 $\rightarrow$ 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

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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	

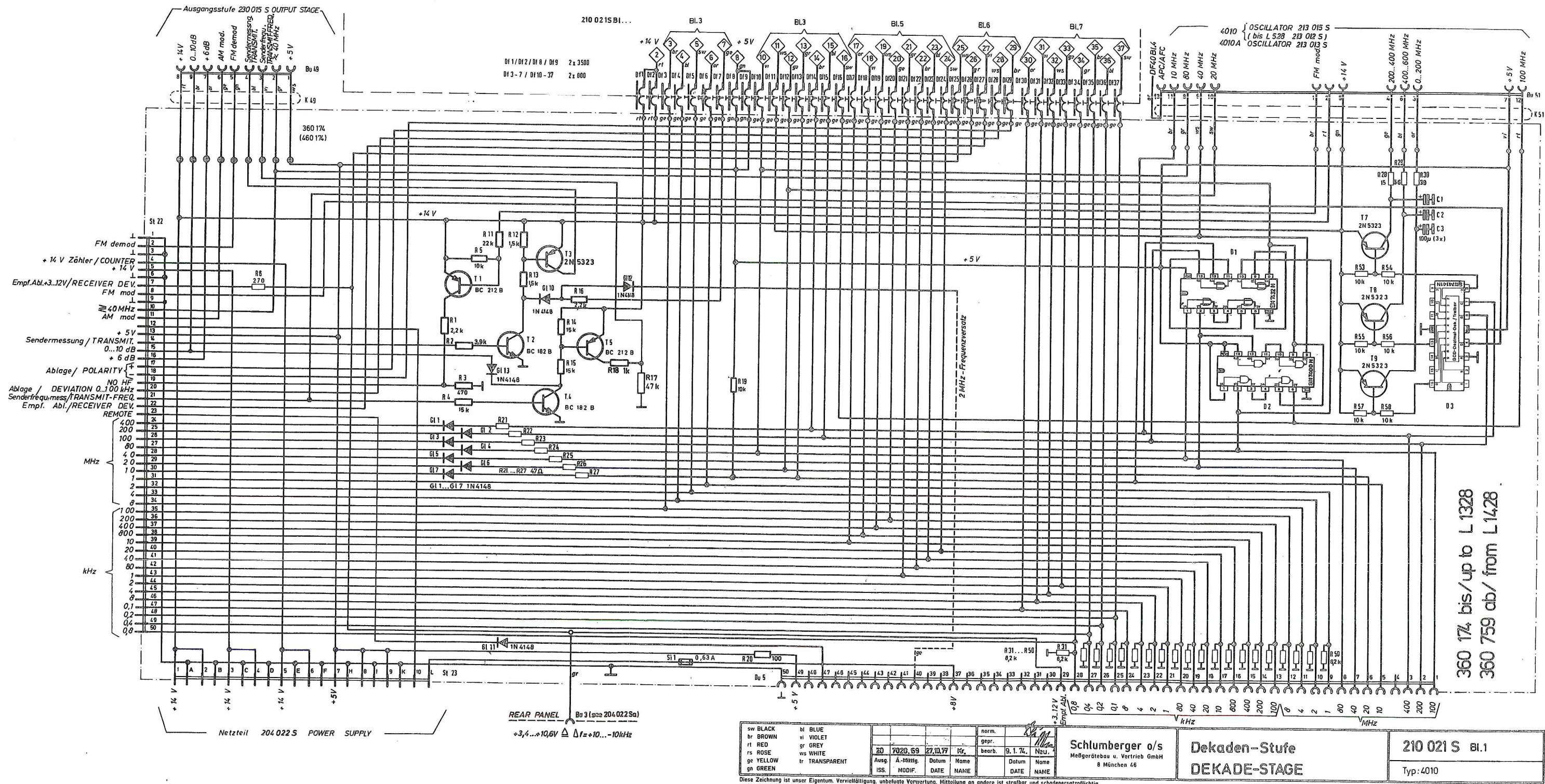
REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
DVM Counter	Sample - Hold - Detector (APC)					
	Decade switch setting					
	100,1 MHz on Bu 40 (-3 dBm)	100,1 MHz	250 kHz	—	Saw tooth V min: 1 ... 2 V _{pp} V max: 8 ... 10 V _{pp} 12 ... 14 V _{pp} Puls width at 7V 0,3 ... 0,4 μs	ok
	100 MHz on Bu 40 (-3 dBm)	100,1 MHz	15,625 kHz	—	Same shape as on ② V min: + 3,5 ... 5 V V max: + 9 ... 13 V	ok
	Control Amplifier Connect 1 kΩ between Df 40 and ground	102 MHz	appr. 36 Hz	—		ok
	Connect Oscillator sub unit	40 ... 480 MHz	102 - 100 64x703x256 = appr. 0,2 Hz corresp. to osc.ranges	—	0,2 Hz saw tooth: + 1 ... 1,4 V = V min + 12 ... 13 V = V max Synchronisation catching time: < 3 S typical: < 1 S	ok
(It can be useful to carry out the synchronisation test, when the total instrument is available).						
Note: 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						

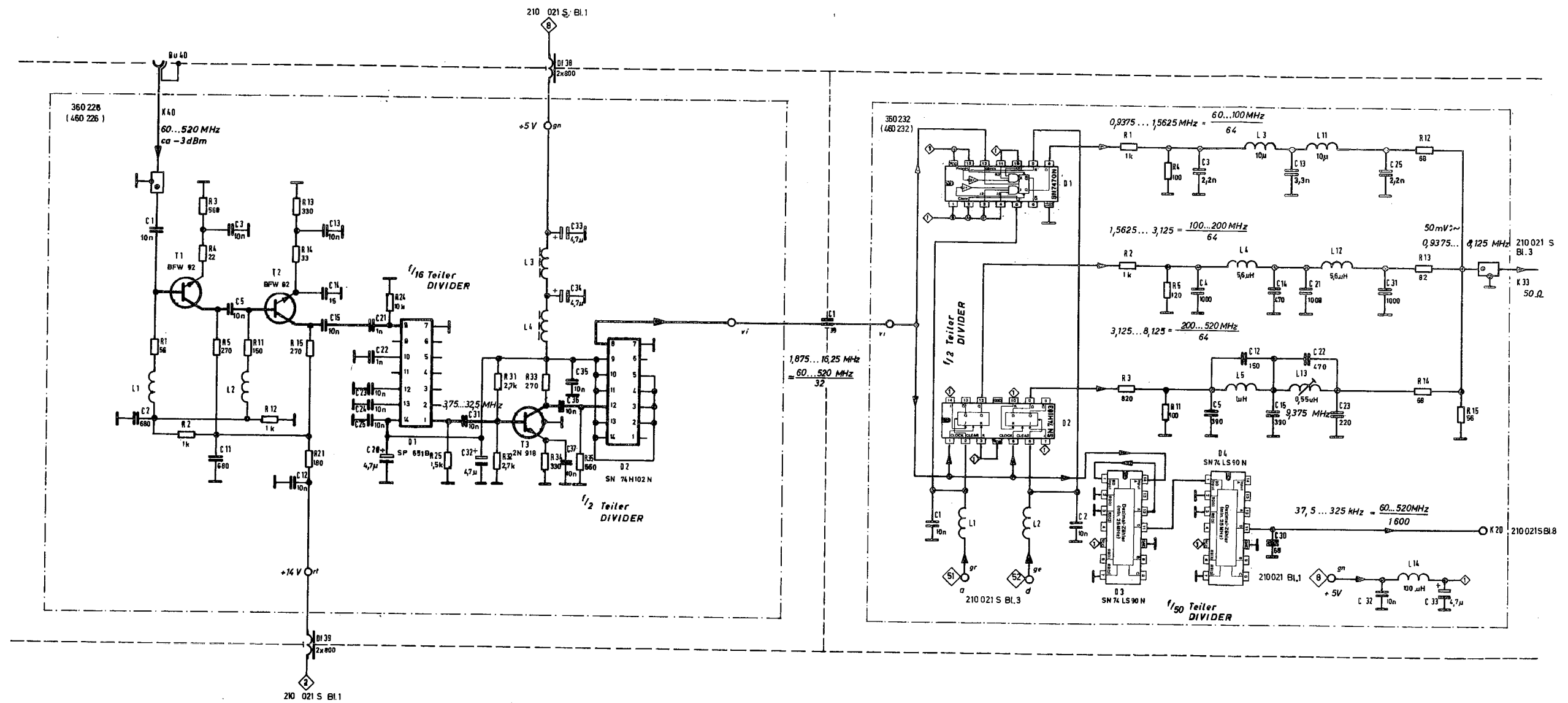
4020 (4010) series
DECADE STAGE

210 021 A

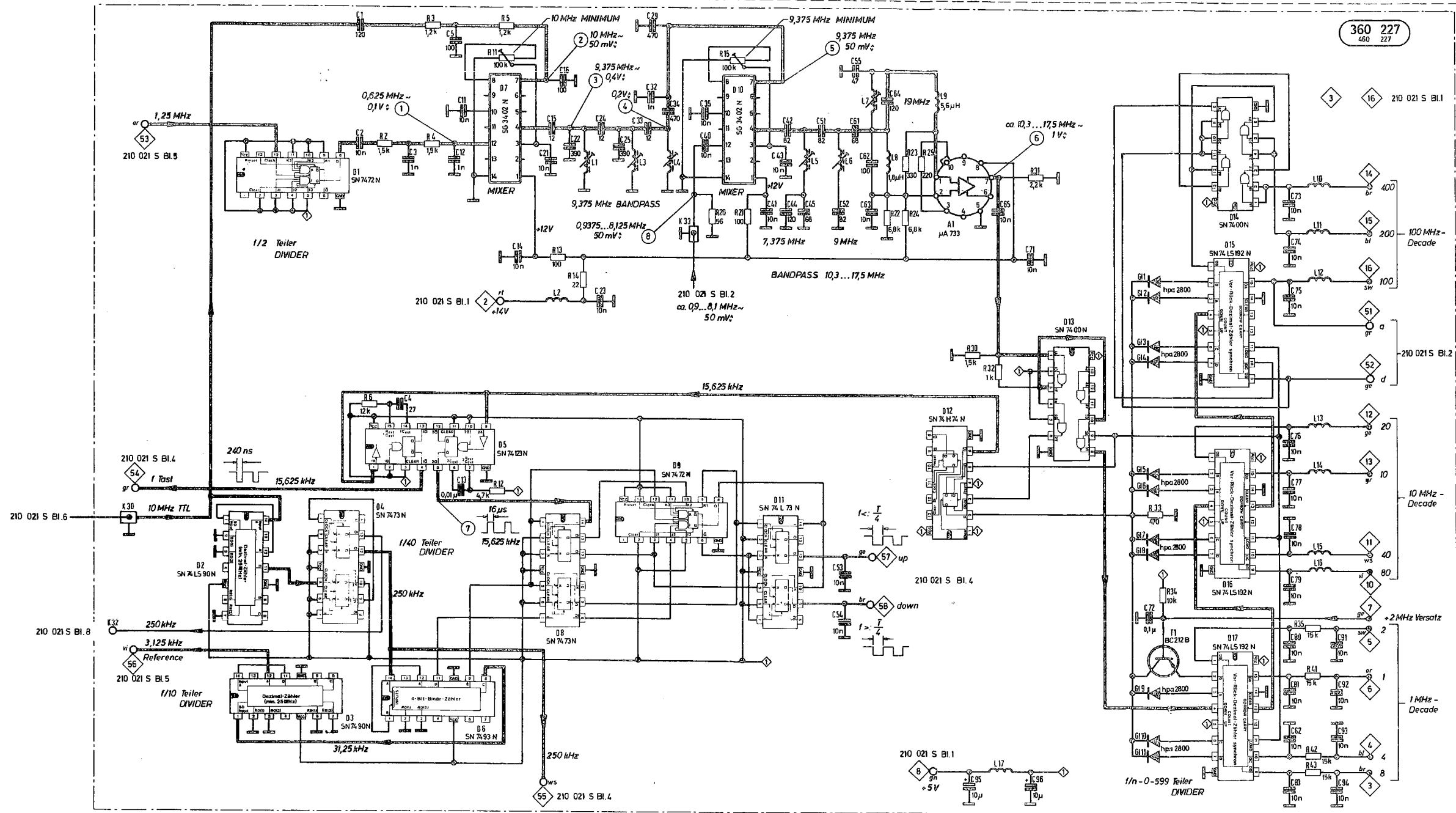
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Replacement for

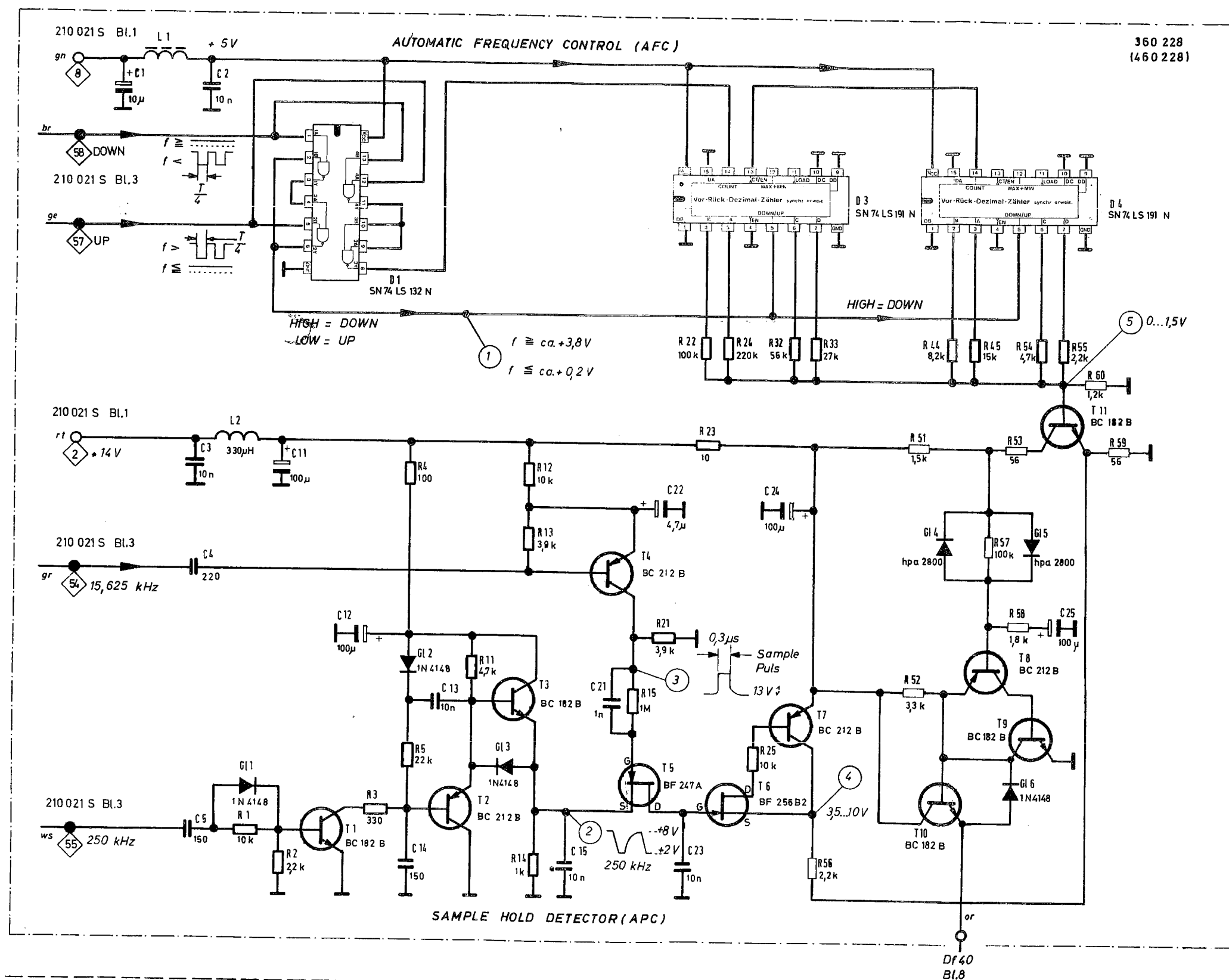




sw BLACK	bl BLUE	07 9028.67	25.9.73	Eiler	norm.		Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	Dekaden-Stufe DEKADE-STAGE	210 021 S Bl.2	03
br BROWN	vi VIOLET	06 5028.100	11.11.76	Wn	gepr.	11.10.73				
rt RED	gr GREY	Ausg.	A-Mittlg.	Datum	Name	Datum	Name			
rs ROSE	ws WHITE	ISS.	MODIF.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



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	Datum	Name			
rs ROSE	ws WHITE	ISS.	MODIF.								
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

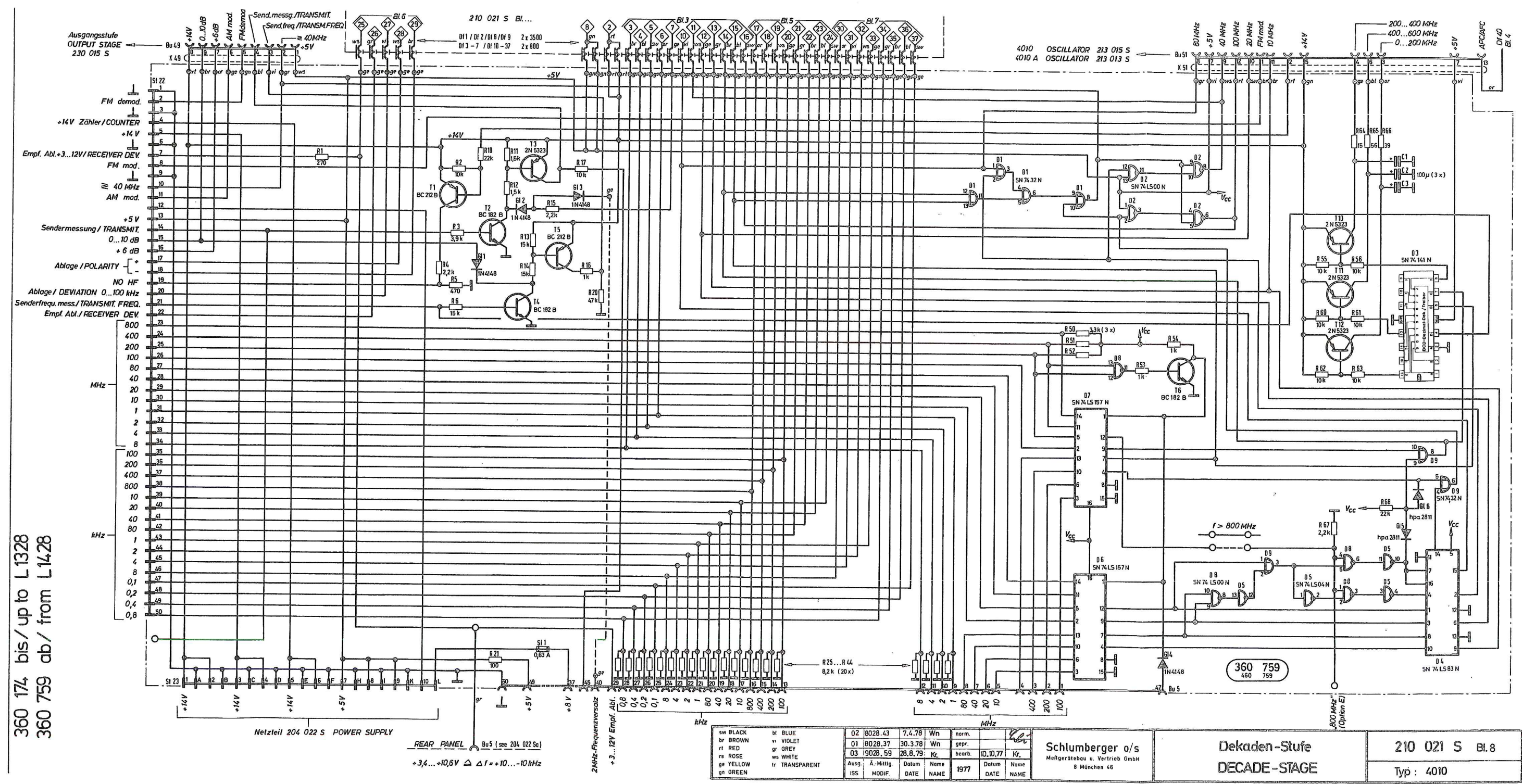
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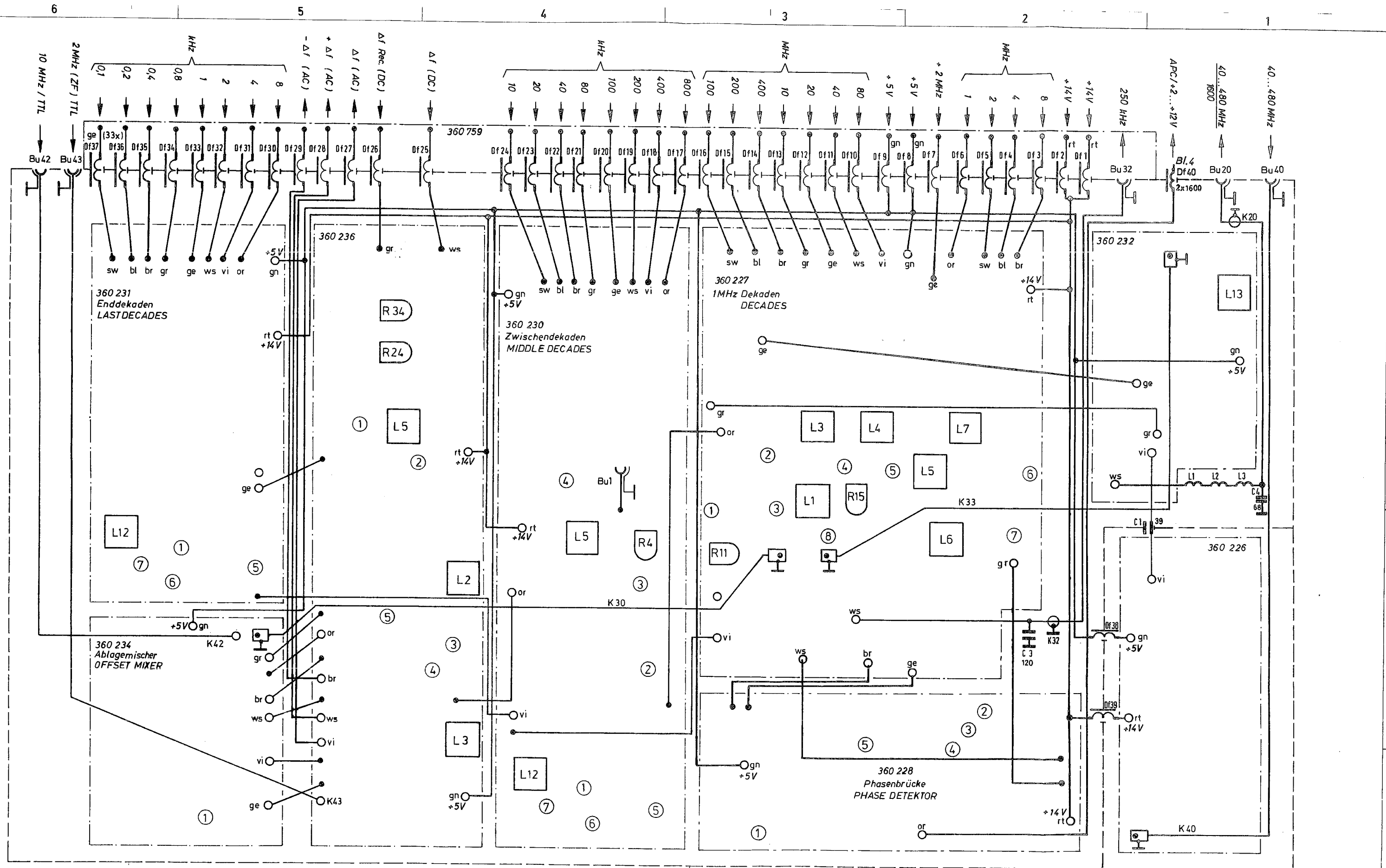


Skizze ei' bra!

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

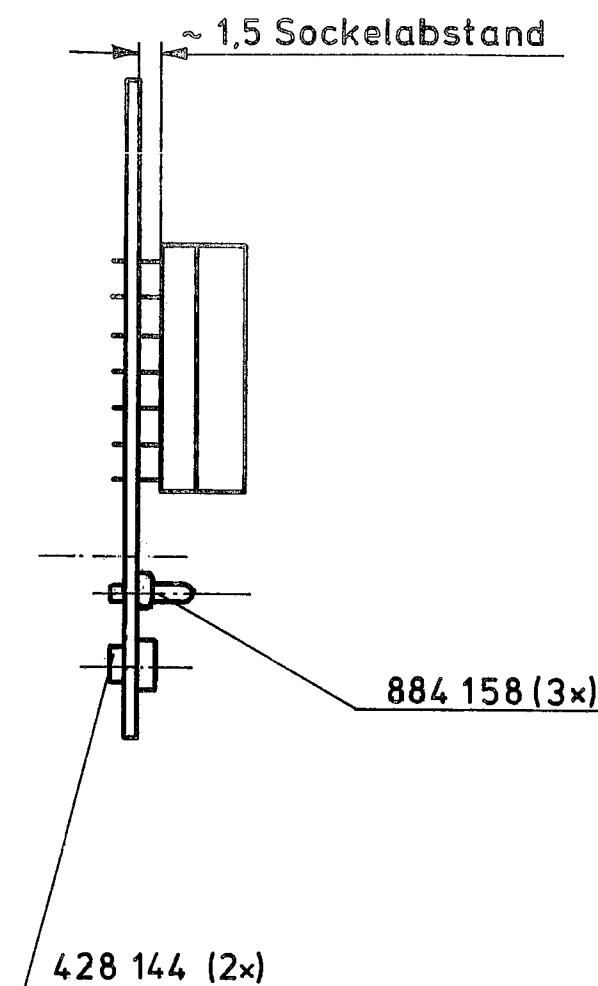


D7/13.
Wu 1
ok. pa skym,
3.2k. D7/12
LD8/4.
D8/1. 7 skym.



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	bearb.	3.4.74	Datum	Name	Typ: 4010
rs ROSE	ws WHITE	ISS.	MODIF.	DATE	NAME					
ge YELLOW	tr TRANSPARENT									
gn GREEN										

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Kontrollmaß

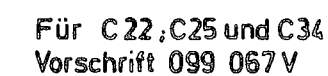
10		Reinhold	ErmaB Isidoranzler	Maßstab:	Schlumberger o/s Meßgeräthbau- u. Vertrieb GmbH 4 München 48
09				2:1	
08					Bestückte Leiterplatte
07		Werkstoff			
06					360 226
05					
04	9028.67 25.9.79 Eiler				
03	8028.92 13.12.78 Mo				
02	5028.21 21.3.75 Le P	Übertragungs		Datum	Name
01	4028.116 26.10.74 Eiler			gez	3.1.74 <i>Fabian Kowatz</i>
Ausgabe:	Änderung	Bezeichnung	Name	bearb	
Mitgl				gepr	<i>Levi</i>
				Einsatz für	

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

Schaltplanpositionierung $\hat{=}$ 210 021 S / 360 226 Sa

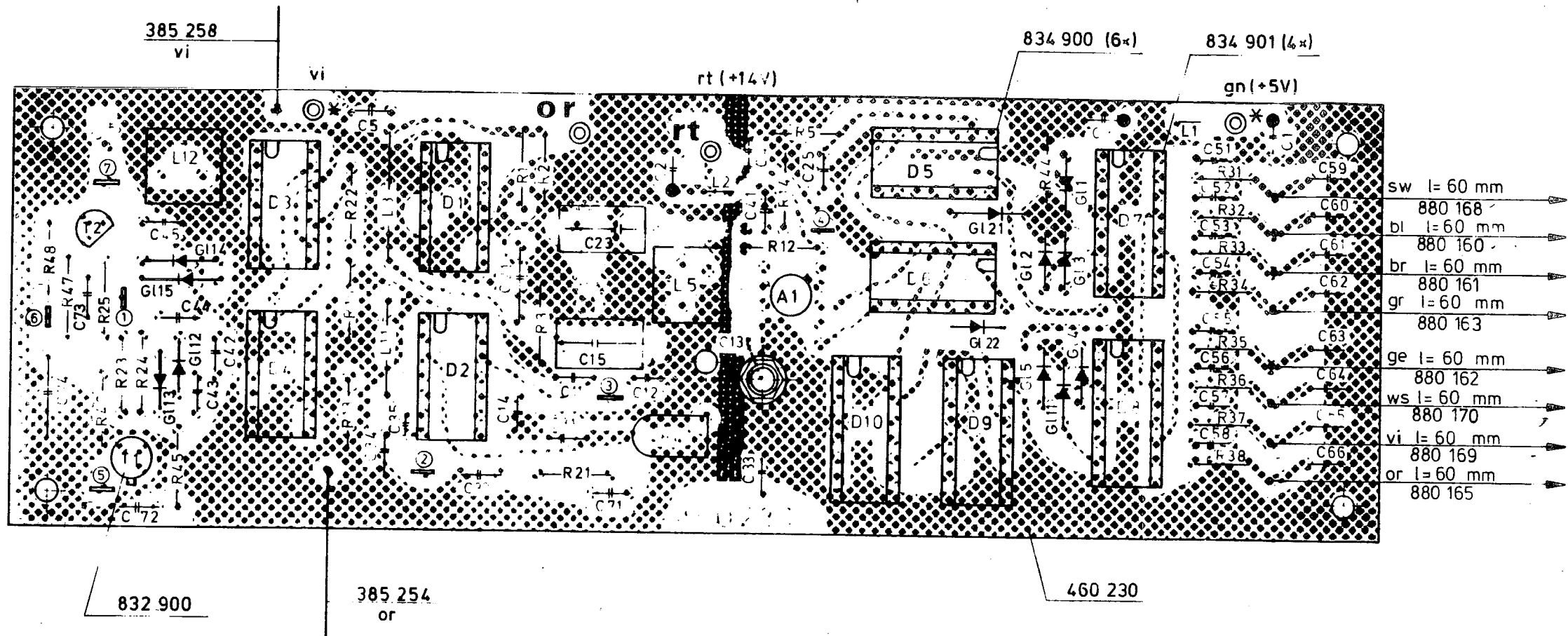
Gerät: 4010 / 4020

AN nur bei 4709 erforderlich



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884 158 (4x)

gn (+5V)

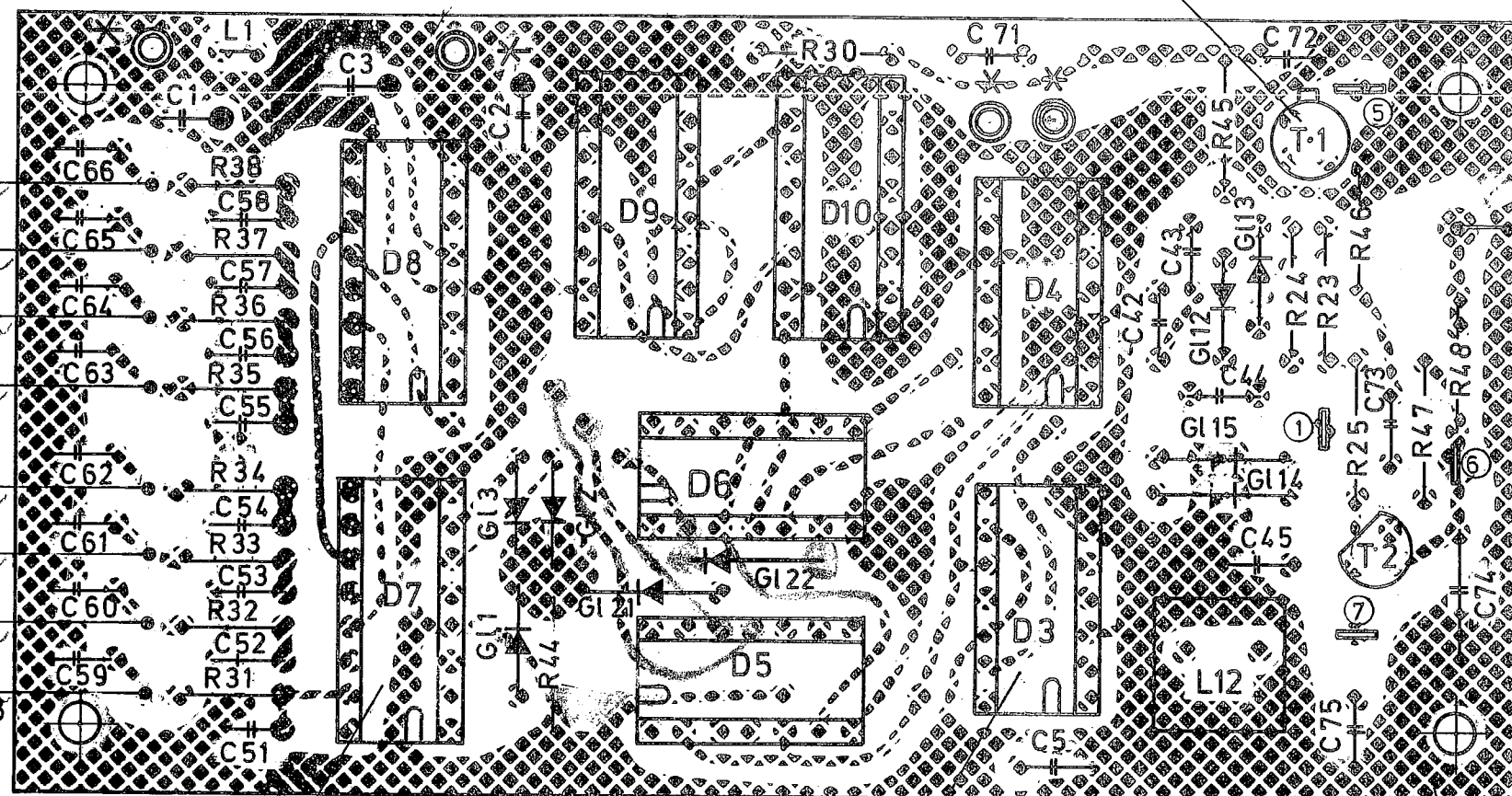
rt (+14V)

832 900

or ge

385 268
vi

or l=60
880 165
vi l=60
880 169
ws l=60
880 170
ge l=60
880 162
gr l=40
880 163
br l=40
880 161
bl l=40
880 160
sw l=60
880 168



786 009 (4x)

834 901 (4x)

834 900 (4x)

460 231

* =Farbpunkt

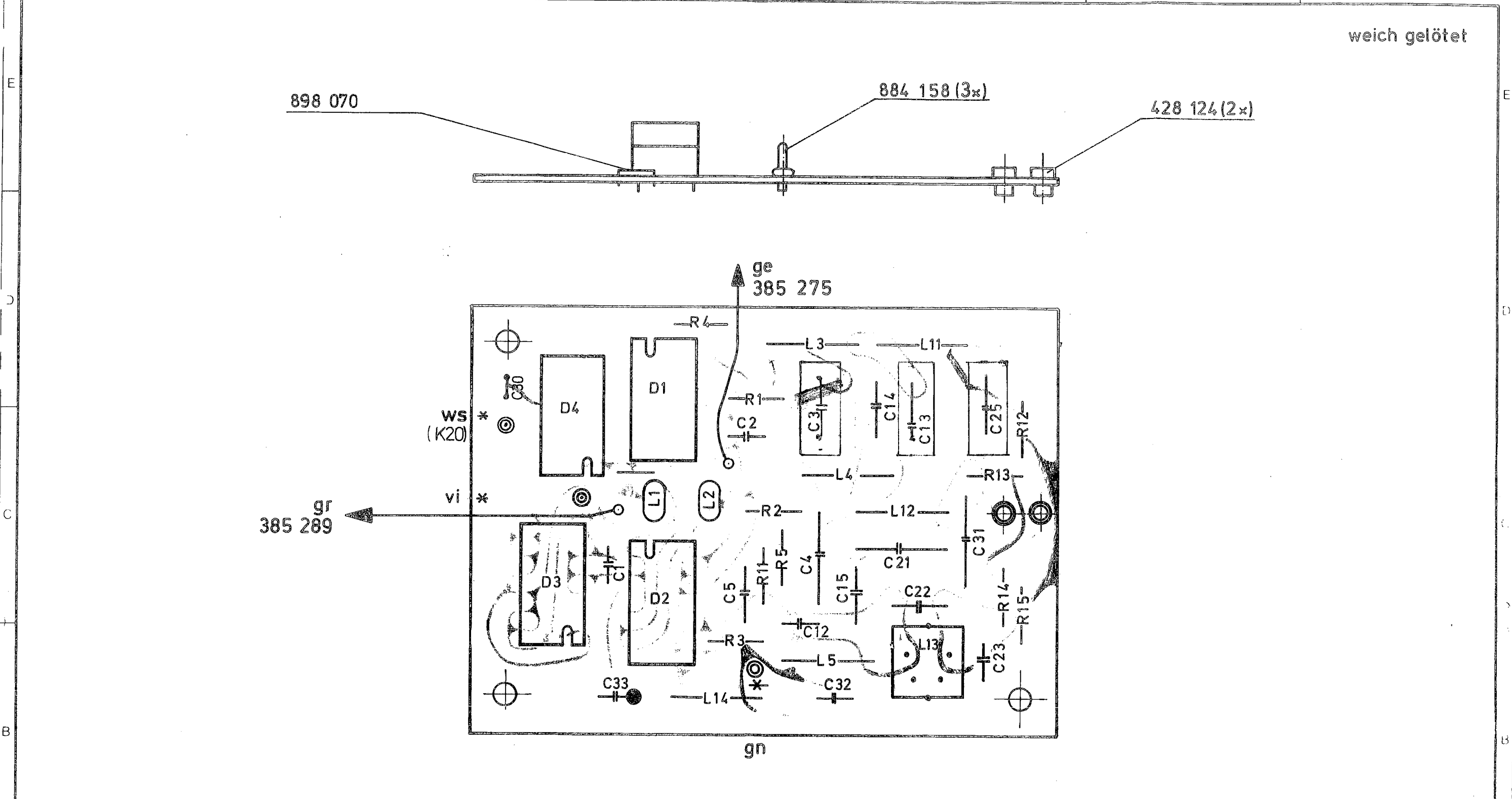
○ Kontrollmaß

10 9028.53 6.8.79 Eiler				Schlumberger o/s
09 8028.92 13.12.78 Mo				
08 6028.8 2.2.76 Koser				
07 5028.46 14.5.75 Eiler				
4028.106 13.10.74 EILER				
4028.92 9.8.74				
4028.48 4.4.74				
4047.11 10.2.74				
4047.1 3.1.74 FAHRND				
3049.11 29.10.74				
			2:1	Bestückte Leiterplatte
			9.10.73	360 231
			26.10.73	

Gerät: 4010/4020

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

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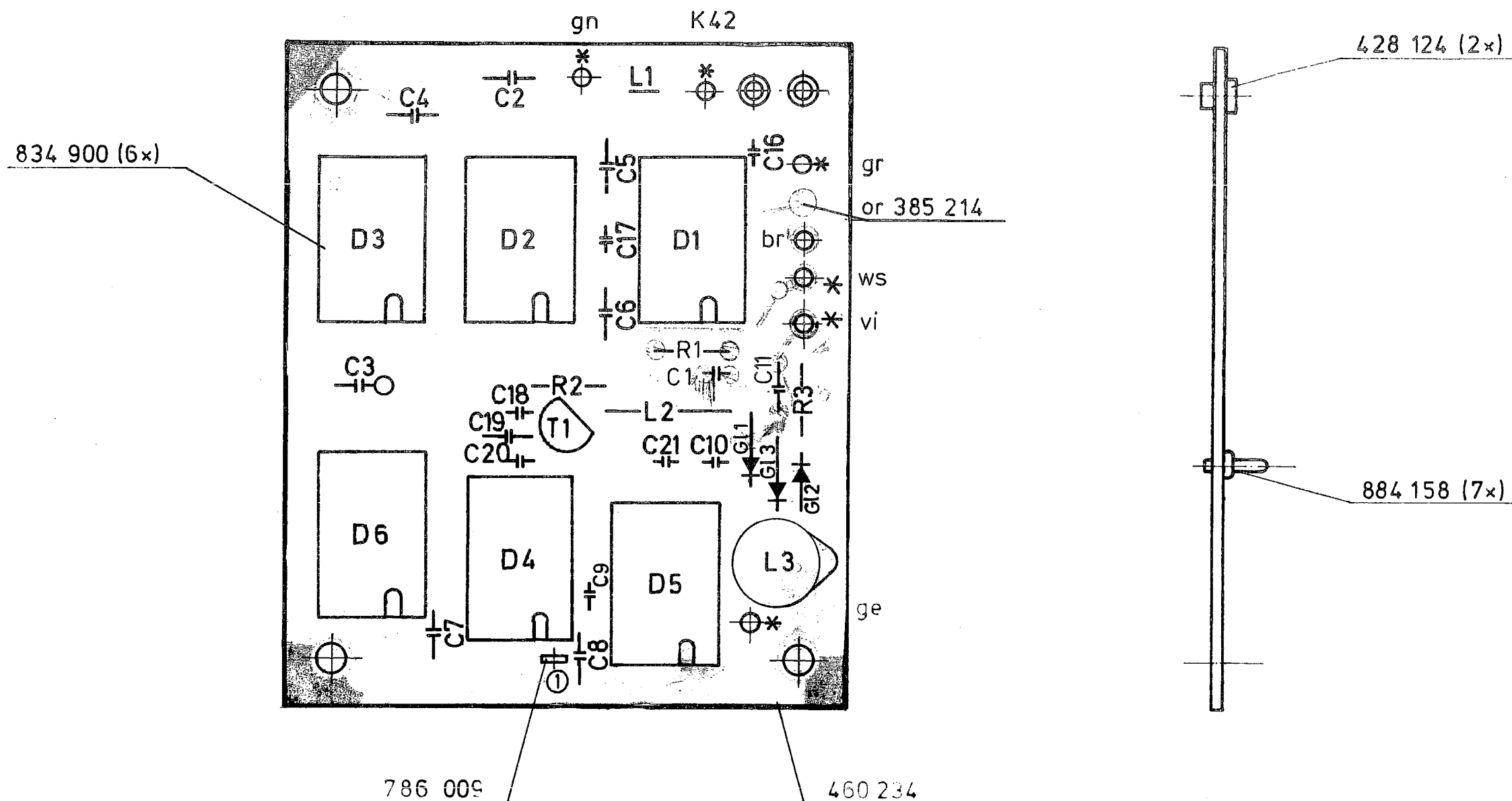
 Kontrollmaß

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Schaltplanpositionierung $\triangleq$ 210 021S/360 232 Sa				20.28.10% 11.10.7% <i>Poland</i> Jahr <i>20.7.4</i> <i>Talman</i> <i>Ernst</i> 360 232 Jahr <i>2.2</i> <i>Lee</i> Ersatz für
Ausgabe	Anzahl Mittel	Datum	Name	

7	6	5	4	Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.
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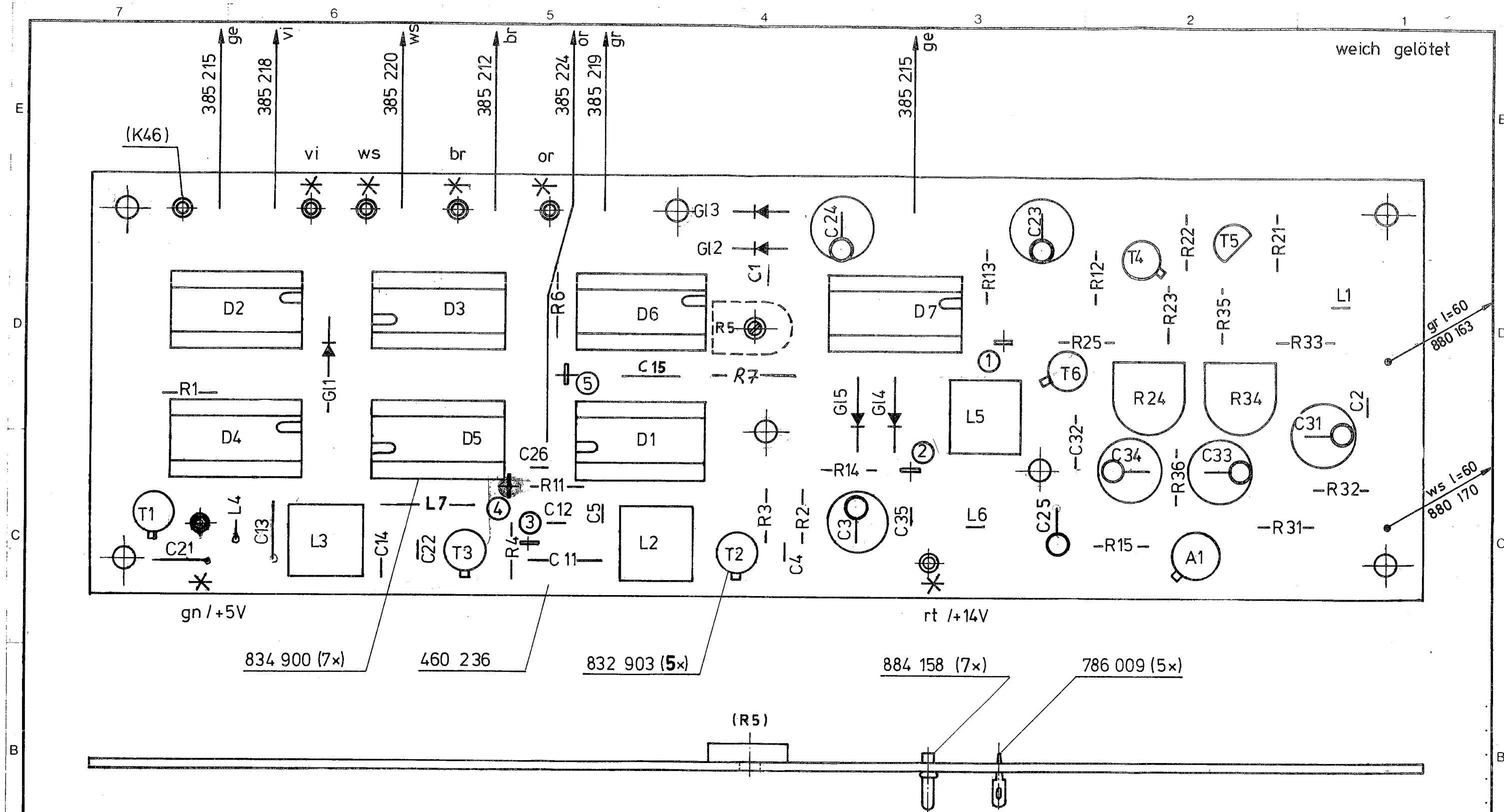
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* = Farbpunkt

Kontrollmaß

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* = Farbpunkt

20				Rohteil	Freimaß- toleranzen	Maßstab	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	
19								
18								
17								
16								
15				Werkstoff		2:1	Bestückte Leiterplatte	
14								
13								
12	9028.53	6.8.79	Eiler					
11	9094.43	9.5.79	Eiler					
Aus- gabe	Ändg- Mitlig	Datum	Name	Oberfläche		Datum	Name	360 236
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Schaltplanpositionierung $\triangle$ 210 021S / 360 236 Sa

Gerät: 4010 / 4020

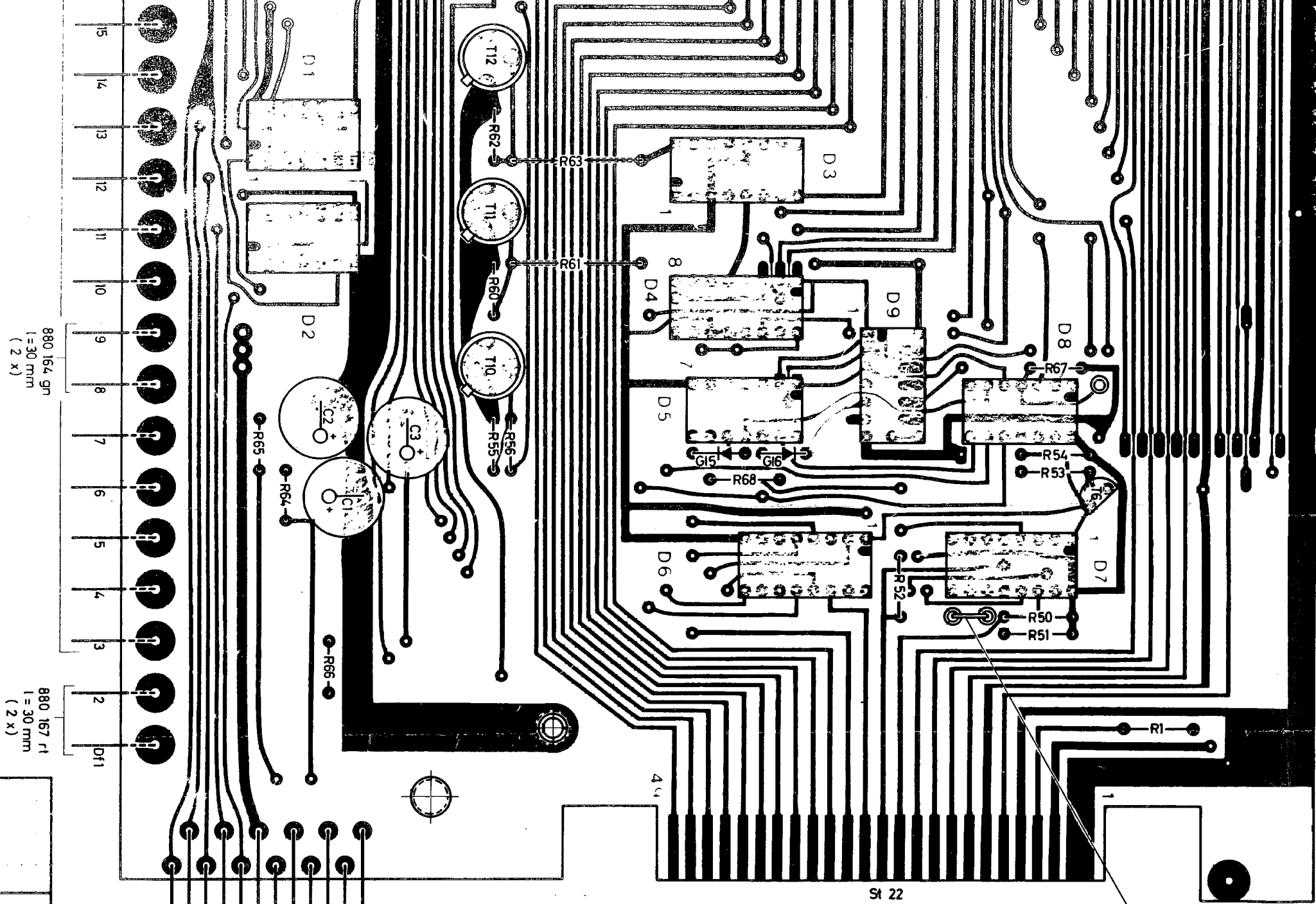
Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

NZ-Vordruck Niedernhausen/Ts

884 207	
M 2 x 5	DIN 84
701 114	
J 22	DIN 6797
706 102	
	- 2 x

R 25 ... R 44 stumpf auf
Massebahn gelötet

428 096 (6 x)



Technical drawing of a lighting fixture assembly, showing various components and their dimensions. The drawing includes a side view of the fixture and a detailed view of the mounting bracket.

Labels and dimensions:

- 385 005** bei $f > 800 \text{ MHz}$
- 428 096 (6 x)**
- 15⁻¹**
- 834 901 (4 x)**
- 460 759**
- 889 035 (4 x)** $l = 10 \text{ mm}$
- (R61/63)**
- 426 093 (3 x)** eingeklebt mit Technic nach 099 041 V
- 17**
- 834 900 (5 x)**
- ~15 Sockelabstand**
- 384 171 (K51)**
- br**
- rl**
- or**
- gn**
- bl**
- vl**
- gr**
- sw**
- br**
- rl**
- or**
- Df 40**
- 375 214**

880 167 r1
l = 30 mm
(2 x)

Gerät : 4010

9028 59 28.8.79 K₄ 7028 85 24.11.77 K₄ 7028 69 27.10.77 K₄			1977 26.10.77	Kingellis Kla-	Bestückte Leiterplatte	360 759
					Schlumberger o/s	
					2:1	

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



R5
R4

R2
R10

R3
R12
G2
G3
R11
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T3
R15

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(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.

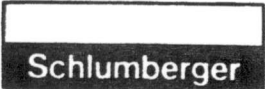
1.2 EMF Adjustment

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	Frequency Multiplier 10140 MHz 230 025 S Bl. 4	Bu 4	10 MHz	-----	10 MHz TTL	
Power Meter	Frequency setting: < 40 MHz	1	DC	L 4	appr. 7,1 V	
Frequency Analyser	(50Ω) Analyser to Bu 1	Bu 1	140 MHz	-----	Suppression of Spurious > 65 dB	
	Power Meter to Bu 1	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

Replacement for

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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 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. <u>Flatness of RF Signal</u> Adjust EMF-indikation by front panel controls to +83 dBµW (+83 dBµW $\hat{=}$ -30 dBm)	Power Meter	MEASURED VALUE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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Adjustment and Test Procedure

Issue	Alteration No.	Date	Name

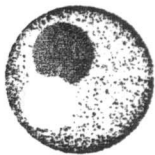
4020 series
OUTPUT STAGE

230 025 A

3/7
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
Modulation Meter Dist. Analyser	<u>AM Distortion Adjustment</u> (Negative AM swing)	RF-socket (front panel) or RF DIRECT	479,99 MHz mod = 1 kHz	R 34 / 360 762 to minimum distortion at 95 % AM depth	< 2 % typical 1 %	%
	Check RF Flatness again	"	39...479,9 MHz	R 72	- 30 dBm ± 0,4 dB	dB
	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

Adjustment and Test Procedure

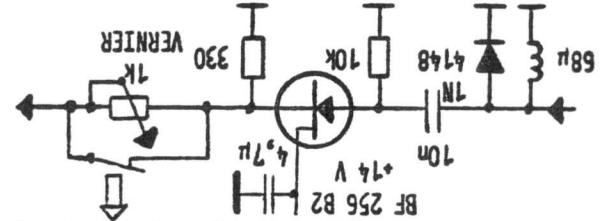
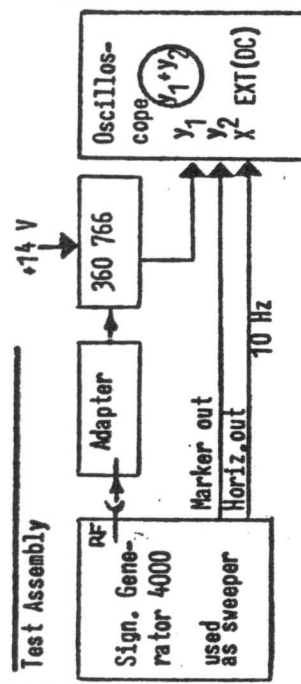
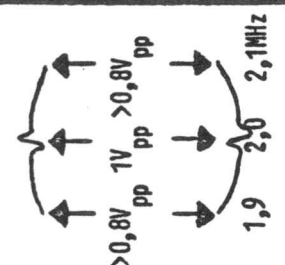
4020 series
OUTPUT STAGE

Schlumberger

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

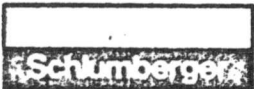
230 025 A

.....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 = $53 \dots 68 \text{ dB}$	⑦	$1,9 \dots 2,1 \text{ MHz}$	$L1/L2 \rightarrow \text{max. level}$ $4000 \rightarrow \text{Min. EMF (Sweeper)}$		

Adjustment and Test Procedure

4020 series
OUTPUT STAGE

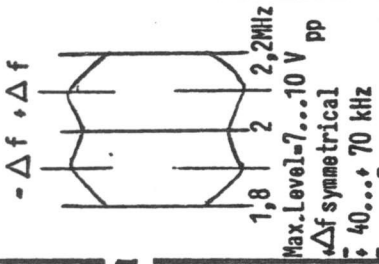
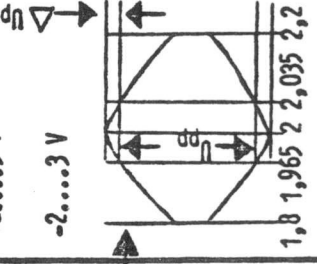


Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A

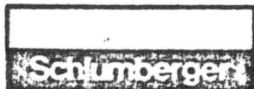
5/7
Sheet

Replacement for

REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
	IF Limiter Amplifier (360 766) 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	②	0,9...1,1 MHz (1,8...2,2 MHz)	L5, L11 → Max. Level (360 766)	 Δf ± Δf 1,8 2 2,2 MHz Max. Level = 7...10 V pp Δf symmetrical ± 40...70 kHz	V pp
						kHz
		③ ⑤ ⑥ ③	2 MHz 1,85 MHz 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	 Δf ± Δf 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
						0,.....V p
						+2,.....V
						-2,.....V
						0,.....V
		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...2,8 V - 2,4...2,8 V VDC₀ = 0 ... ± 0,2 V	V
						V
						V

Adjustment and Test Procedure

4020 series
OUTPUT STAGE



Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A

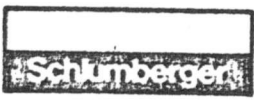
Replacement for

6/7
Sheet

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



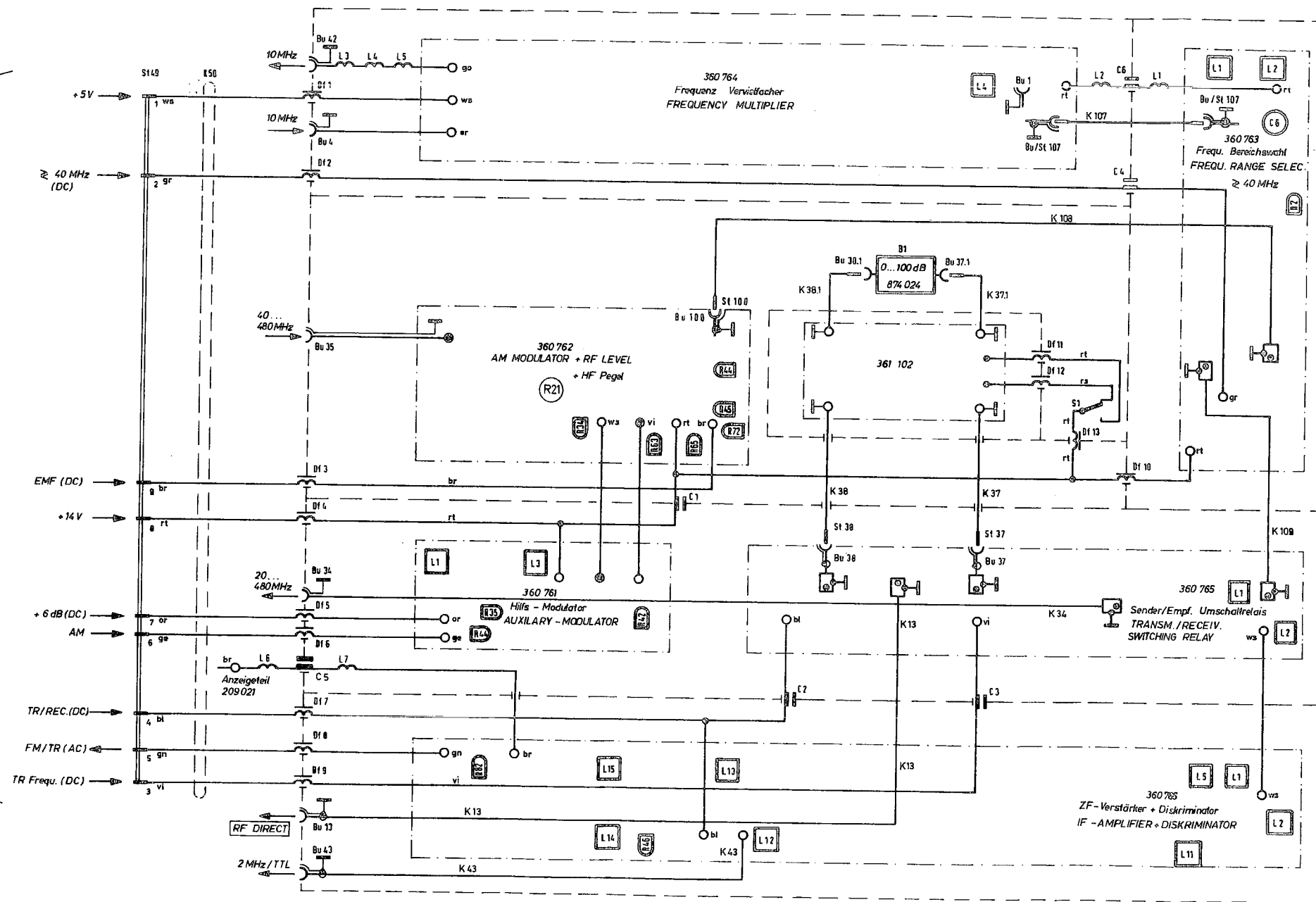
Issue	Alteration No.	Date	Name
-	0028.29	27.3.1980	Morasch

230 025 A

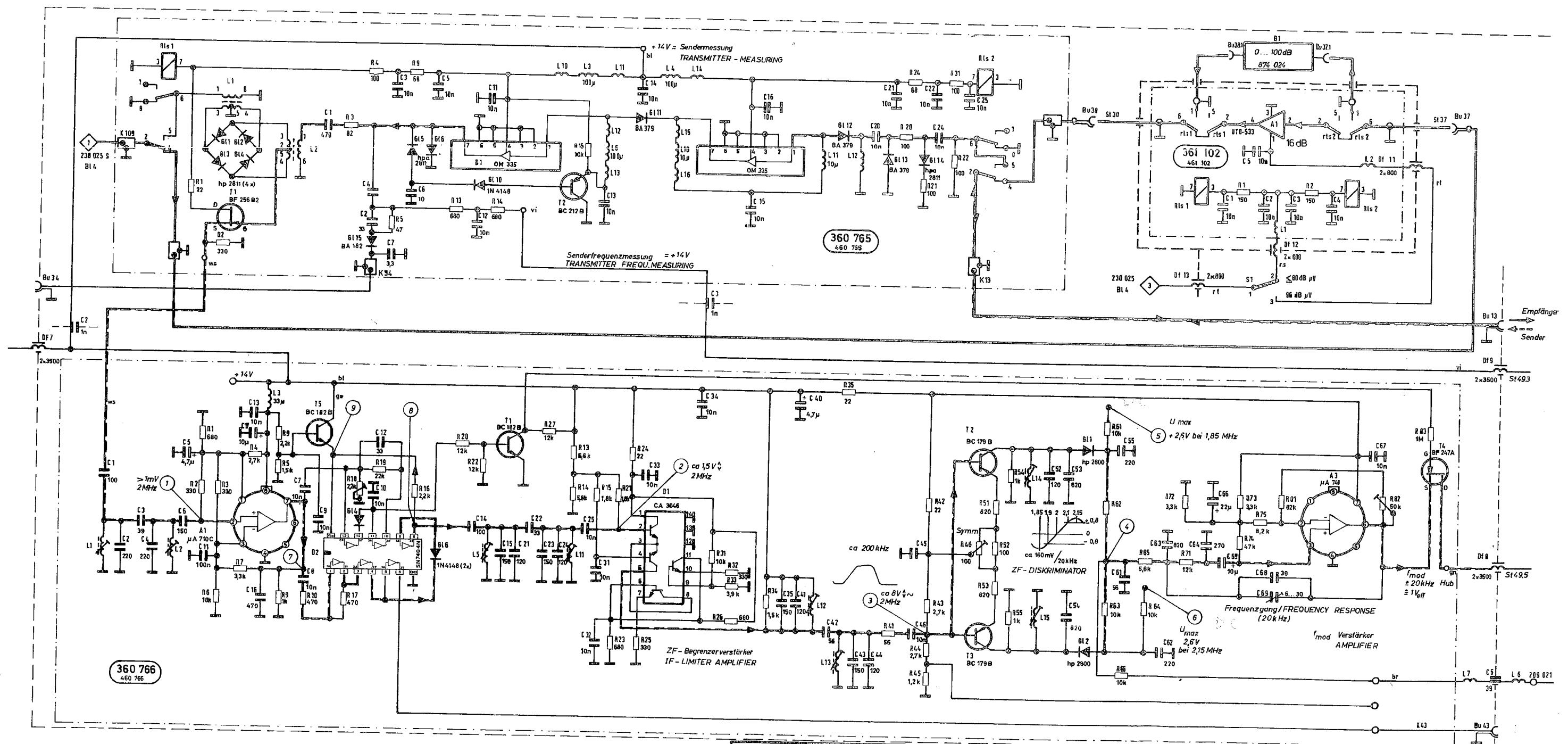
7/7
Sheet

Replacement for

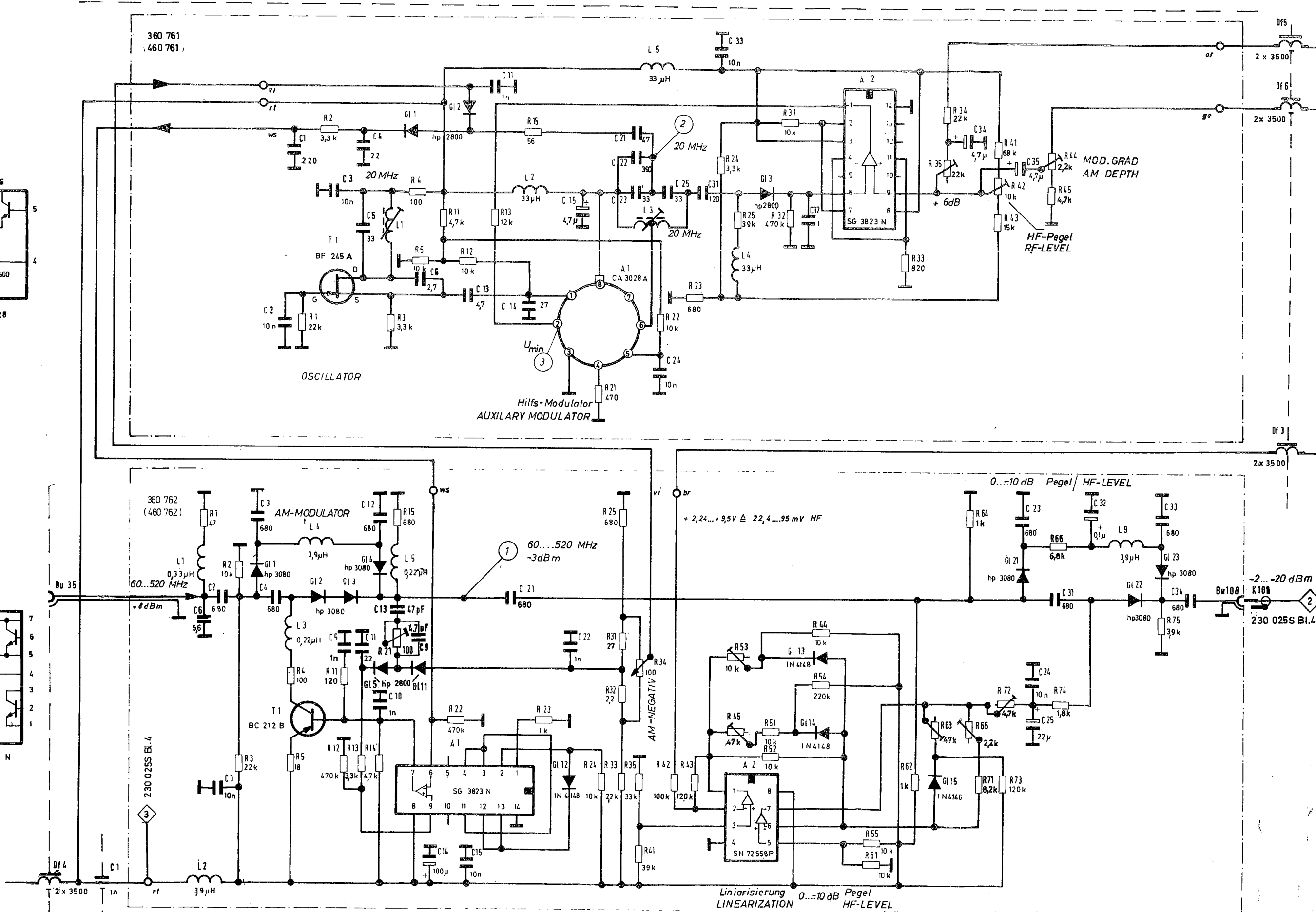
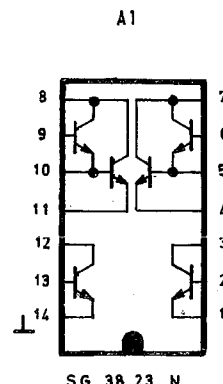
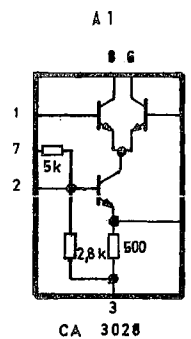
Dezadenstufe
DECADE STAGE
210 021 S



sw BLACK	bl BLUE					norm.		Schlumberger o/s Messgerätebau u. Vertrieb GmbH 8 München 46	Ausgangsstufe OUTPUT-STAGE	230 025 S Bl.1
br BROWN	vi VIOLET	04	9028.58	20.8.78	Eller	gepr.				
rt RED	gr GREY	03	9028.50	27.7.78	Eller	boarb.	28.9.78			
rs ROSE	ws WHITE	Ausg.	Ä-Mittig	Datum	Name		Datum			
ge YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME		DATE			
gn GREEN										Typ: 4020



sw BLACK	bl BLUE	03 9028.42	3.7.79	Eller	norm.		Schlumberger a/s	Ausgangsstufe	230 025 S	Bl.2
br BROWN	vi VIOLET	Ausg.	A. Mittlg.	Datum	beorb.	20.9.78	Meßgerätebau u. Vertrieb GmbH	OUTPUT-STAGE		
rd RED	gr GREY	ISS.	MODIF.	DATE	Name	1978	8 München 48		Typ: 4020	
rs ROSE	ws WHITE									
ge YELLOW	tr TRANSPARENT									
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			

Ausg	A	Mittlg	Datum	Name
ISS	MODIF	DATE	NAME	

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

230 025 S Bl.3
Typ 4020

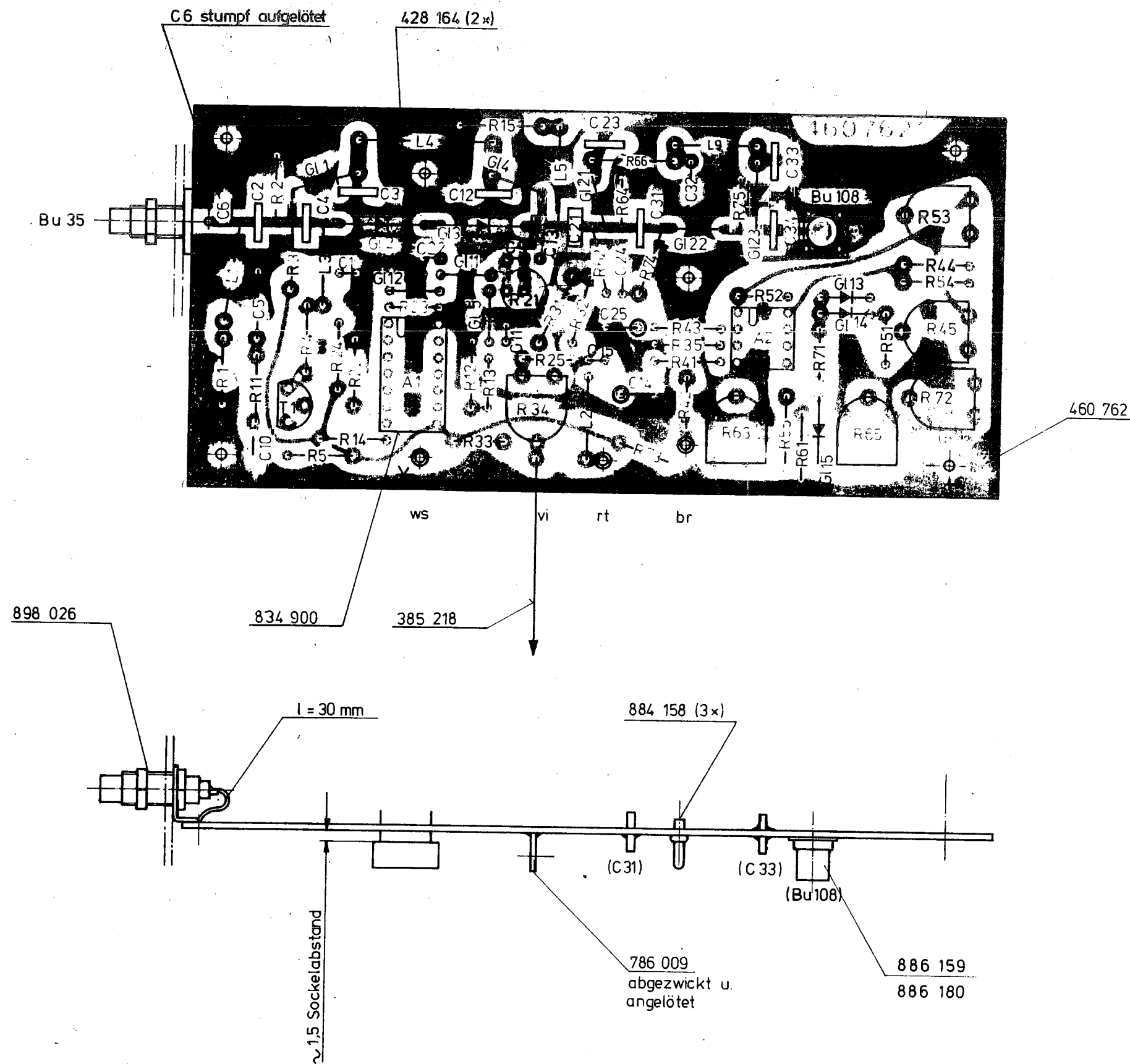
Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.

The diagram illustrates a radio receiver circuit, divided into three main functional blocks:

- 360 764 (460 764):** This block contains the front-end stages. It starts with a 10 MHz input, followed by a 40 MHz input. The circuit includes a phase compensator (PHASE COMP) using a 741 op-amp (A1) and a 741 op-amp (A2). It also features a 140 MHz oscillator (T1) and a 400 kHz oscillator (T2). The output of this section is connected to the mixer section.
- 360 763 (460 763):** This block contains the mixer and audio amplifier stages. The mixer section (MIXER) uses a 400 kHz oscillator (T1) and a 40 MHz oscillator (T2). The audio amplifier section (Versörster 0.01...40 MHz AMPLIFIER) uses a 40 MHz oscillator (T1) and a 40 MHz oscillator (T2). The output of this section is connected to the speaker.
- PHASE COMP:** This section is used for phase compensation and is located between the 10 MHz and 40 MHz input stages.

The circuit includes various components such as transistors (A1, T1, T2, T3, T4, T5), diodes (G1, G2, G3, G4, G5, G6), capacitors (C1-C16), resistors (R1-R25), and integrated circuits (D1, D2, D3, D4). It also shows frequency ranges (10 MHz, 40 MHz, 140 MHz, 400 kHz) and gain specifications (40...480 MHz, 0.01...40 MHz).

10 BLACK	01 BLUE	05	norm	 Schlumberger o/s Hauptstadtbau u. Vertrieb GmbH 8 München 65	Ausgangsstufe OUTPUT - STAGE	230 025 S Bl. 4 Typ : 4020
11 BROWN	02 VIOLET	04	ger			
12 RED	03 GREY	03	board			
13 ROSE	04 WHITE	03 9028.58	20.8.79			
14 YELLOW	17 TRANSPARENT	Aug	A - Montag			
15 GREEN		15.9	15.9			



230 025 S

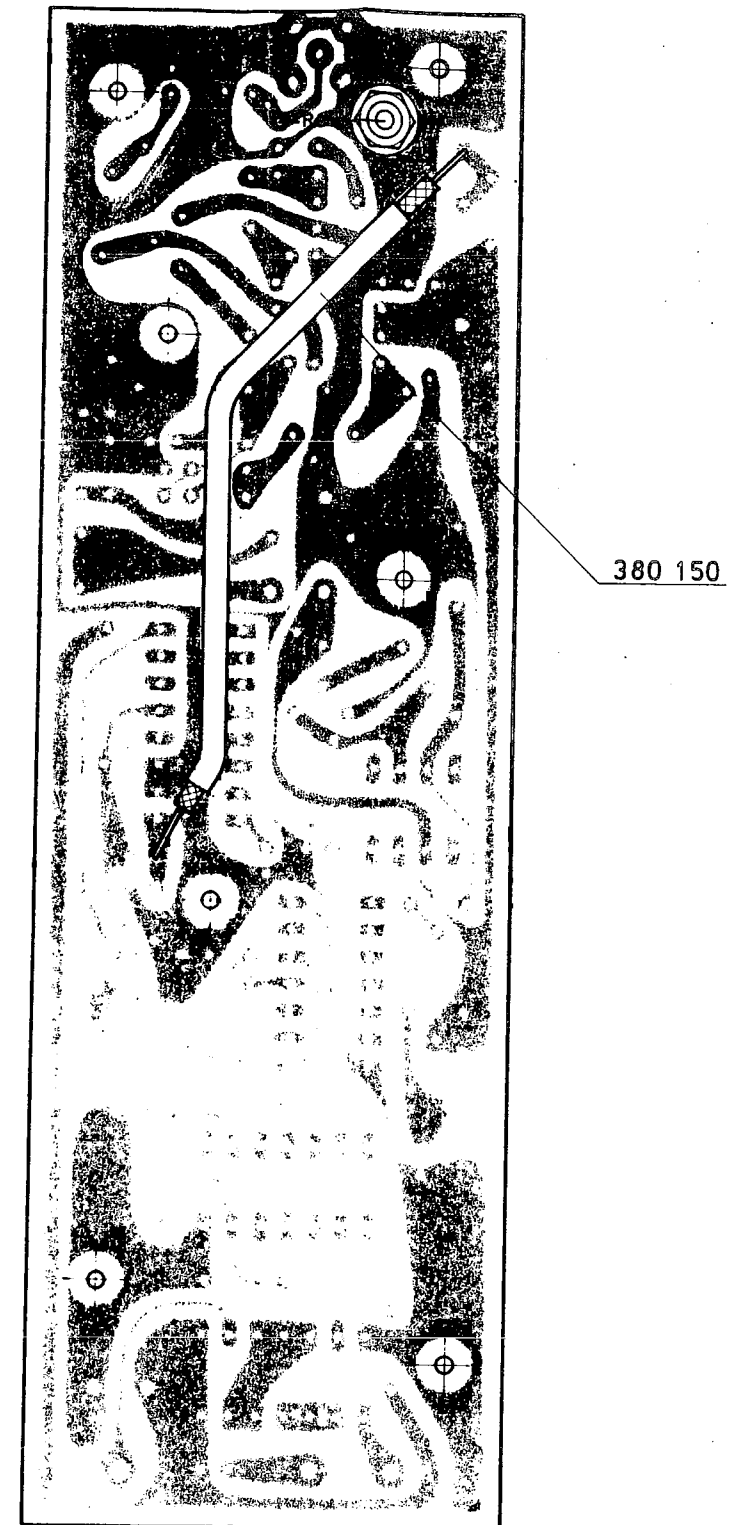
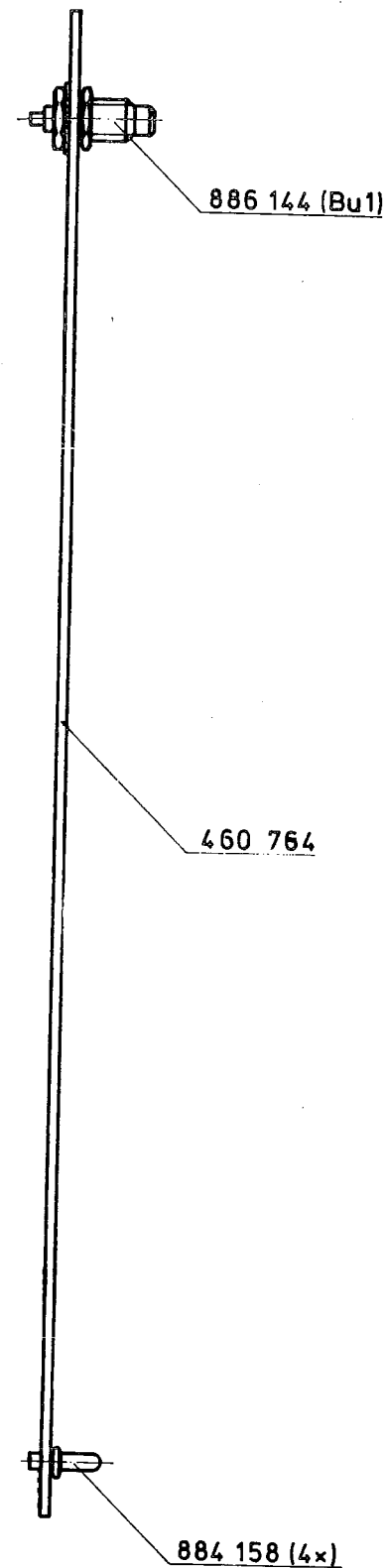
Schaltplanpositionierung: 230 015 S / 360 762 Sa

verwendet in: 375 205/216/226

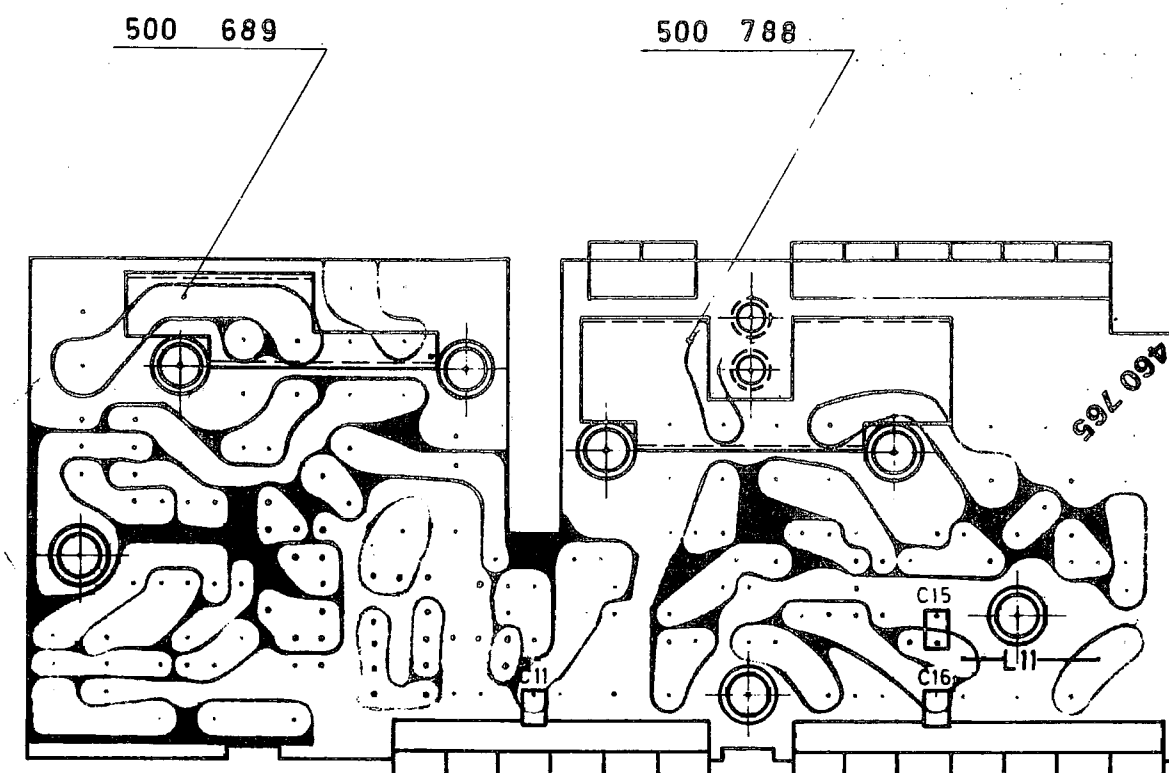
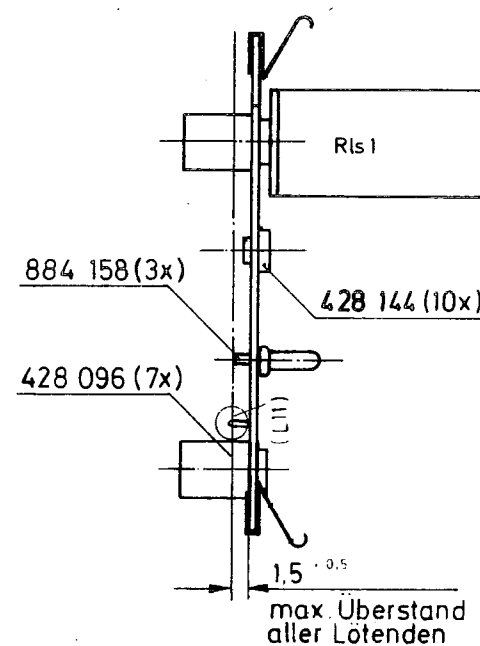
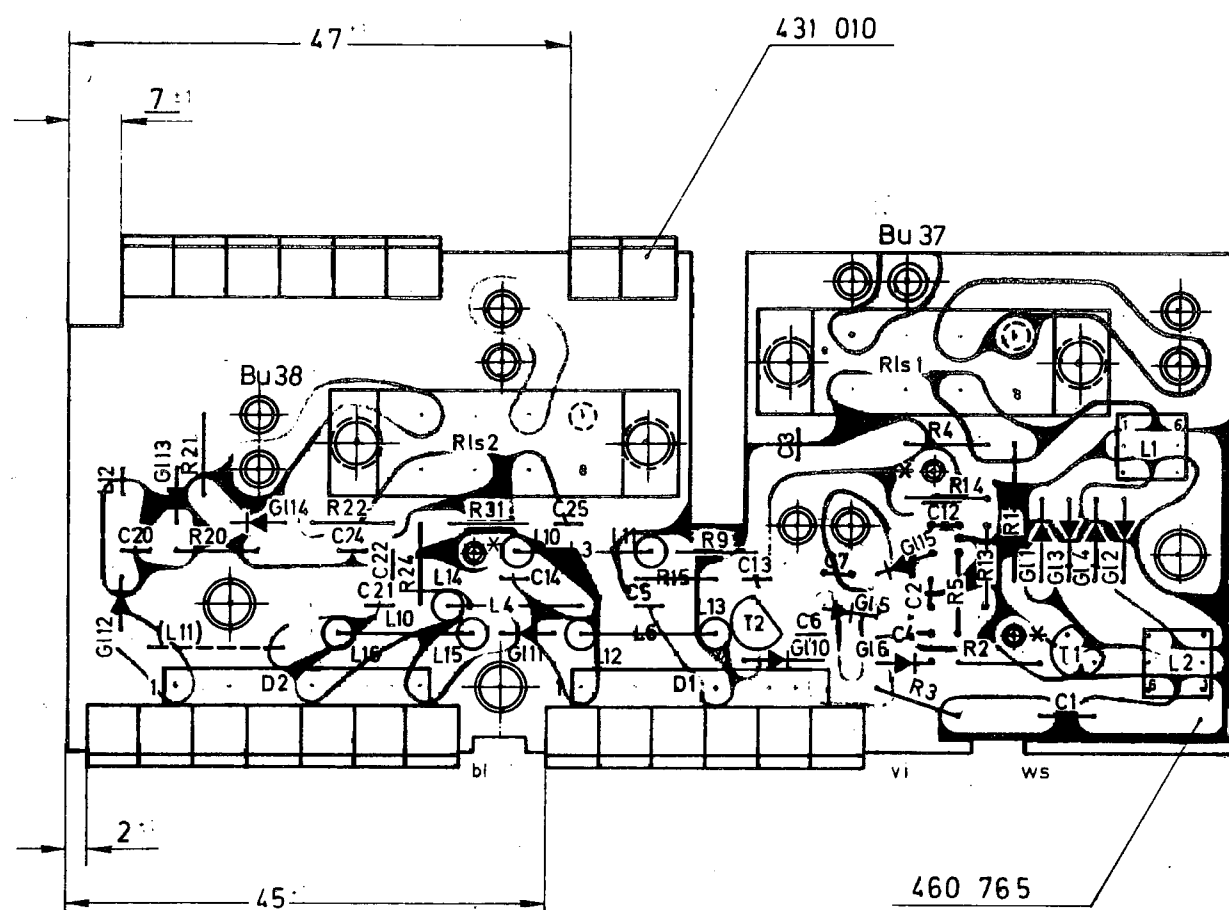
Gerät: 4010/4020

* = Farbpunkt
 □ = Kontrollmaß

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



10				Rohteil	Freimaß: Toleranzen	Maßstab	Schlumberger o/s Meißnersteub u. Vertriebs GmbH Bismarckstr. 48 Bestückte Leiterplatte
09						2:1	
08							
07	902859	20.8	79	Eiler			
06	902837	18.5	79	Eiler			
05	802889	5.12	78	Mo			
04	802870	25.7	78	Mo			
03							
02				Oberfläche			
01							
Ausgabe	Angeb.-Menge	Datum	Name		Jah. bezt. bearb.	Datum Name	360 764
					25.4	26.79	Erstellt von



* = 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

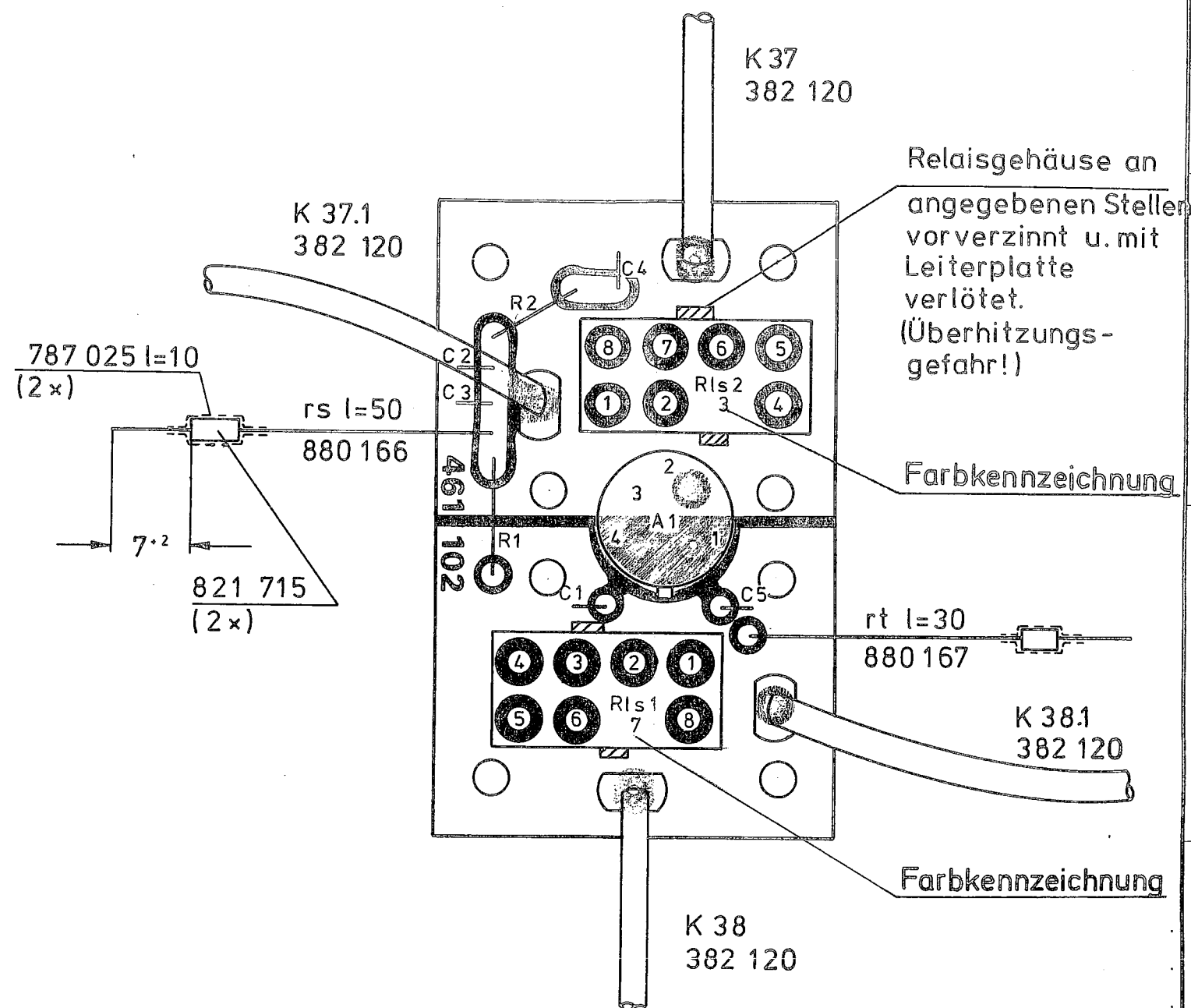
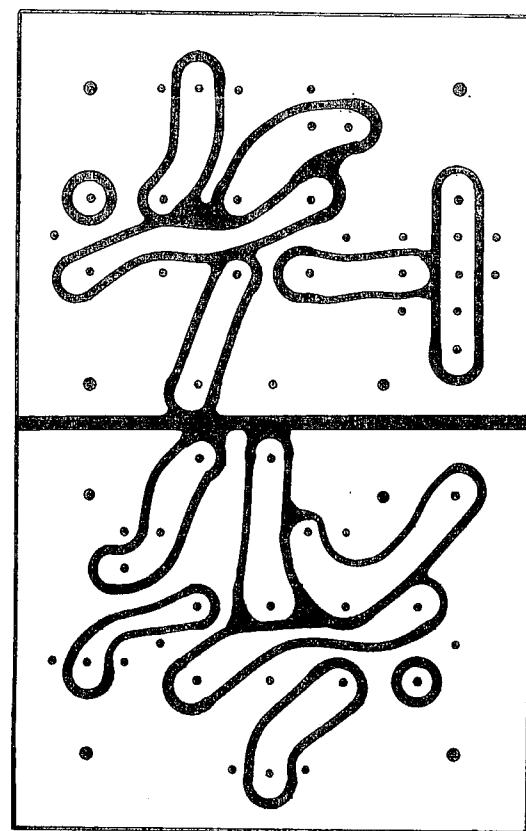
4020 / 21/22

4710 A

berat: 4010



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



= Kontrollmaß

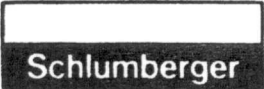
10				Schlumberger o/s Meßgerätekauz. Vertrieb GmbH München
09				
08				Bestückte Leiterplatte
07				
06				361 102
05				
04				Ersatz für
03	9028.41 28.6.79 Eiler			
02	7024.32 R. Gerstner			Diese Zeichnung ist unser Eigentum. Vervielfältigung, unbefugte Verwertung, Mitteilung an andere ist strafbar und schadenersatzpflichtig.
01	8028.83 19.10.78 gl			
Ausgabel	Andg. Mittig	Datum	Name	

Schaltplanpositionierung $\triangle$ 230 025 S

verw. in: 375 223
Gerät : 4020

(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. <u>Visual Inspection</u> 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. <u>Reflection measurement</u> Test set-up and procedure see operating instructions. If the VSWR values can only be maintained to 500 MHz, probe to be stamped: "Unsuitable for > 500 MHz, 4024, 4025"		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. <u>Zero and Linearity at Low Power</u> + 14 V (± 4 mV) into DF 1 If +3 V not adjustable, compare DC values with service-able probe. Caution: If required, only replace G1 1, G12, G1 3 together (Trio or quartet with same diode characteristic)	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. <u>Limiting the LM 308</u> 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 This set-up permits precise comparison of the frequency response of a known probe with an unknown. Absolute calibration is of no use with this small RF level. The absolute deviation independent from frequency is compensated by a potentiometer control in W 395. The FET chopper provides alternate switching of both outputs at approx. 5 kHz, thus rendering the long-term drift of the complete test set-up unimportant. Since both probes have the same configuration, faulty measurements due to RF distortion, temperature fluctuations, VSWR error etc. are compensated by initial approximation. The mechanical balance of both probes to the power splitter (same N-N adapter) is important for measurement accuracy, the requirement being precise calibration of the reference probe in a special test set-up. The test set-up can be switched by the push/pull switch on the potentiometer 25 W (pressed) to 50 W (pulled) probe power rating.	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

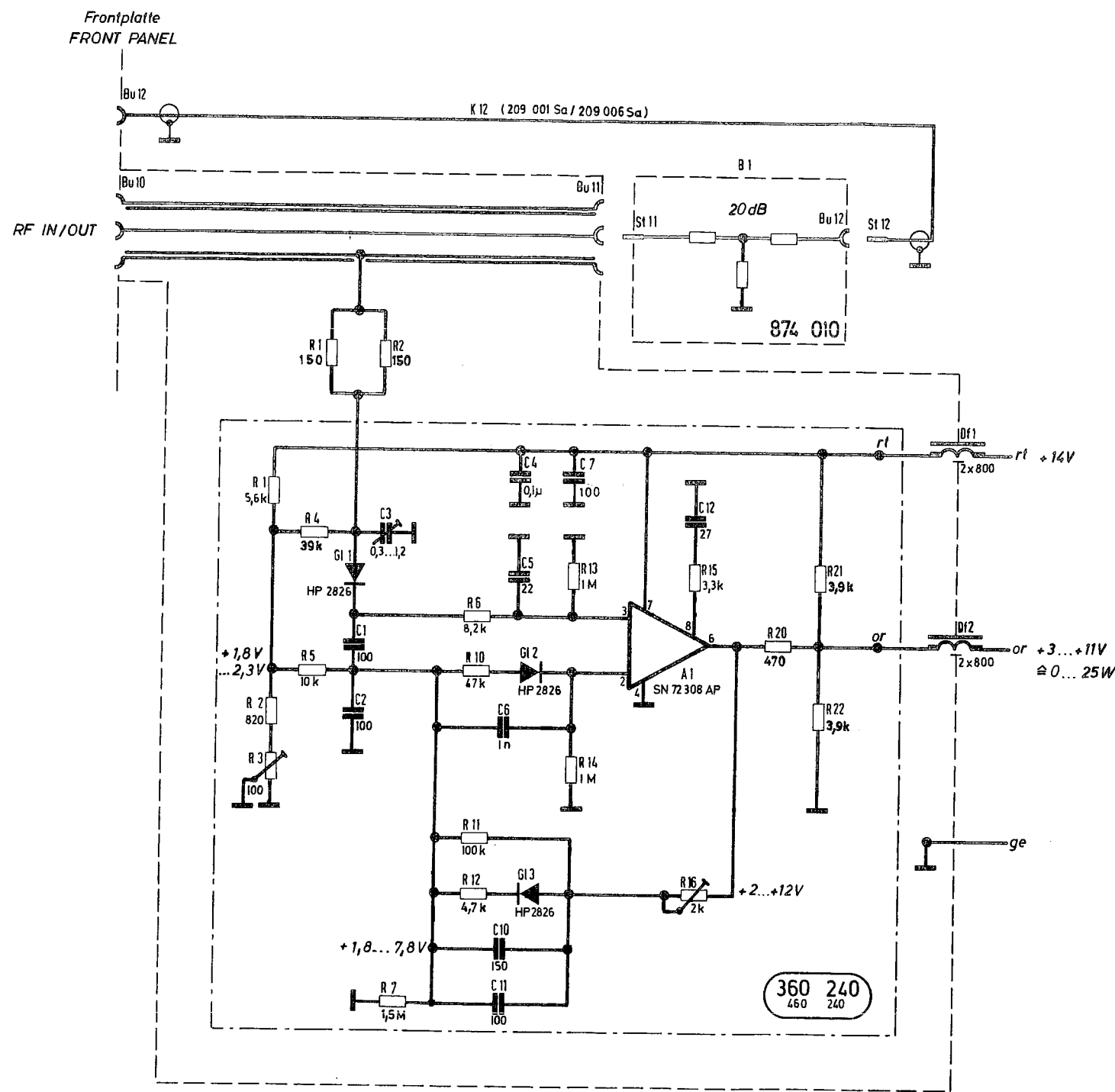
Issue	Alteration No.	Date	Name
03	4028, 83	24.1.80	

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

229 006 A
229 009 A

Replacement for

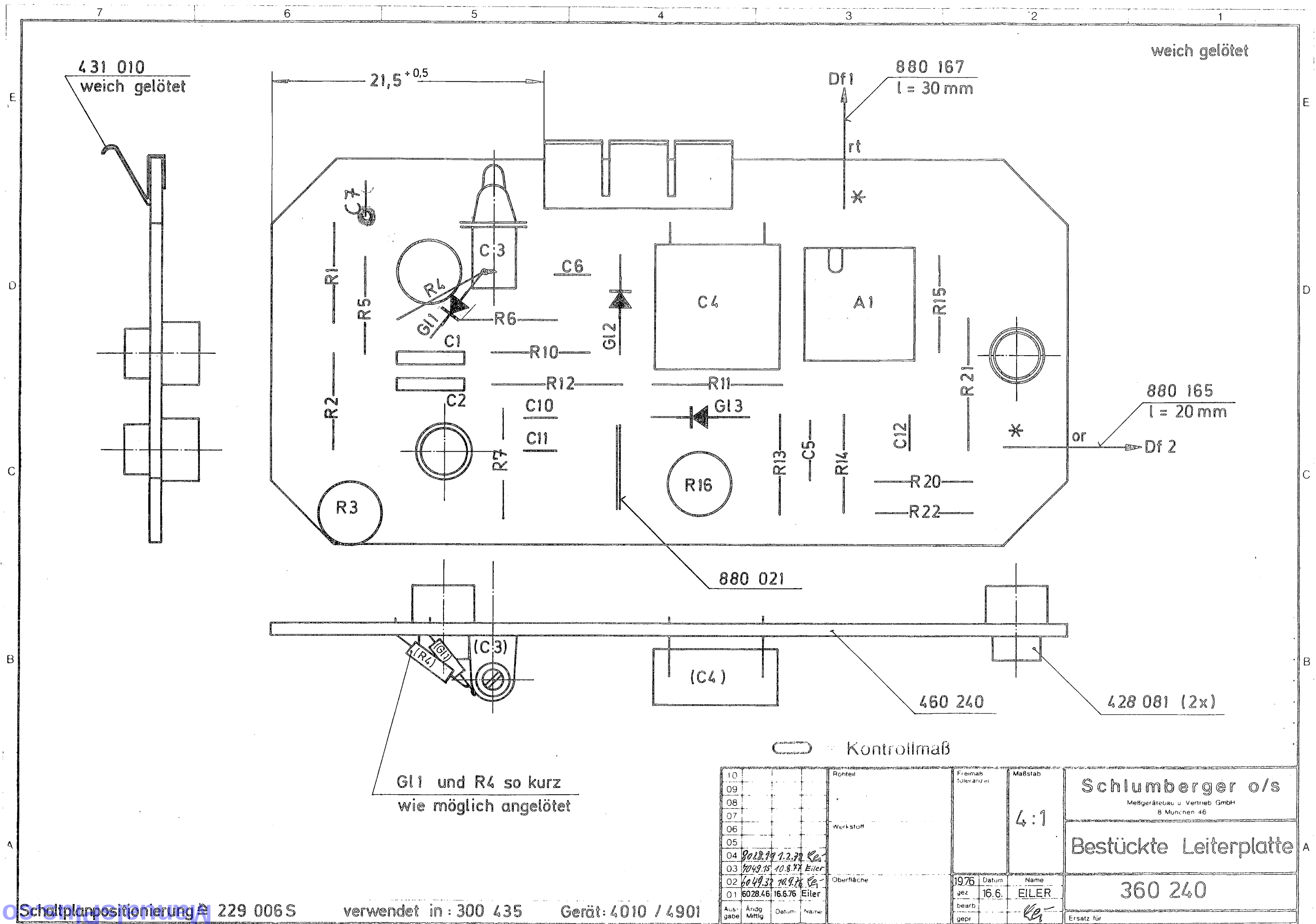
2/2
Sheet



sw BLACK	bl BLUE					norm.		Kt	Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 46	Diodenmeßkopf DIODE PROBE	229 006 S
br BROWN	vi VIOLET	04	8028.19	3.2.78	Kr.	gepr.					
rt RED	gr GREY	03	7 028.68	27.10.77	Wn	bearb.	16.3.76	Kr.			
rs ROSE	ws WHITE	Ausg.	A.-Mittg.	Datum	Name	1976	Datum	Name			
ge YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME		DATE	NAME			Typ: 4010/4010A/4011/4011S/4710A

Diese Zeichnung ist unser Eigentum. Vervielfältigungen, unbefugte Weiterverbreitung ist untersagt.

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



800 154 (2x) R1 / R2

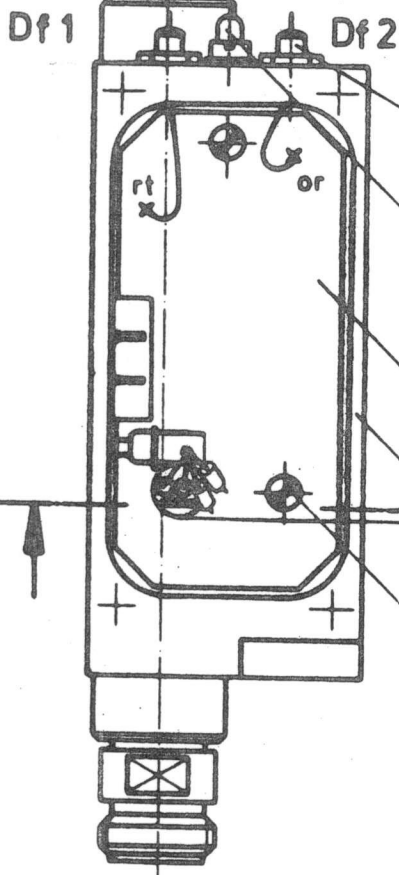
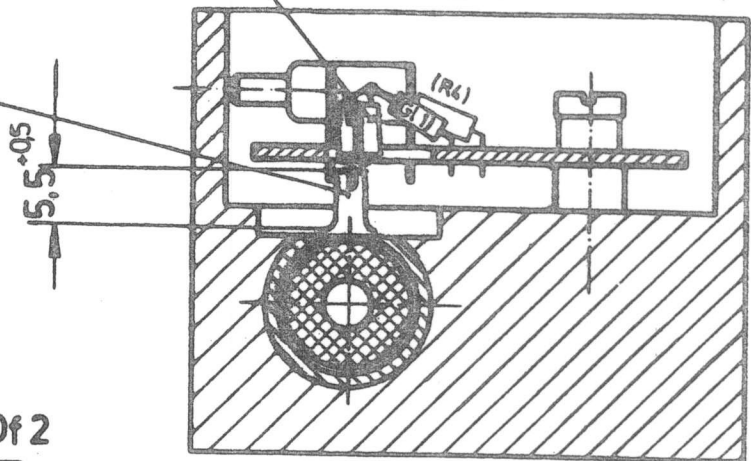
weich gelötet

Widerstand und Diode so kurz wie möglich angelötet

786 009

abgewinkelt und gekürzt

M 2:1

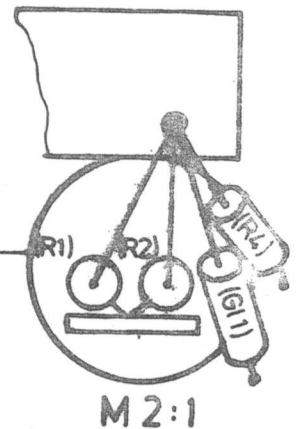


816 044 (2x)

786 004
M3x4 DIN 84
701 143J3.2 DIN 6797
706 105

360 240

300 430

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

M 2:1

Schaltplanpositionierung $\hat{=}$ 229 006 S

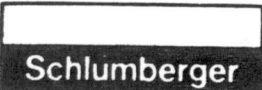
09				Rohrteil	Freimaßtoleranz	Maßstab	Schlumberger o/s Meßgerätekau u. Vertrieb GmbH 8 München 46
08							
07							Diodenmeßkopf Typ: 4010 / 4901
06							
05				Werkstoff	$\pm 0,2$	1:1 (M 2:1)	300 435
04							
03	8047.2	20.4.76	Eiler				
02	8028.2	13.2.76	Mo				
01	4028.4	16.6.76	Eiler	Oberfläche	Datum	Name	
-	8028.2	16.3.76			gez	beerb	
Aus-	Ändg-	Datum	Name				

(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.

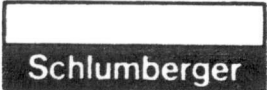
The NTC resistor R 1 is part of a resistance bridge upstream of a differential amplifier A 1 through which the heating current is controlled through T 1. The heating current is instantly corrected for even a slight change of temperature of R 1 in 360 770 to retrieve the balance of the resistance bridge.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

214 022 A

1/4
Sheet

01	9028.5	8.1.79	Stuh
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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 +8.8V	...
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

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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	Geib

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

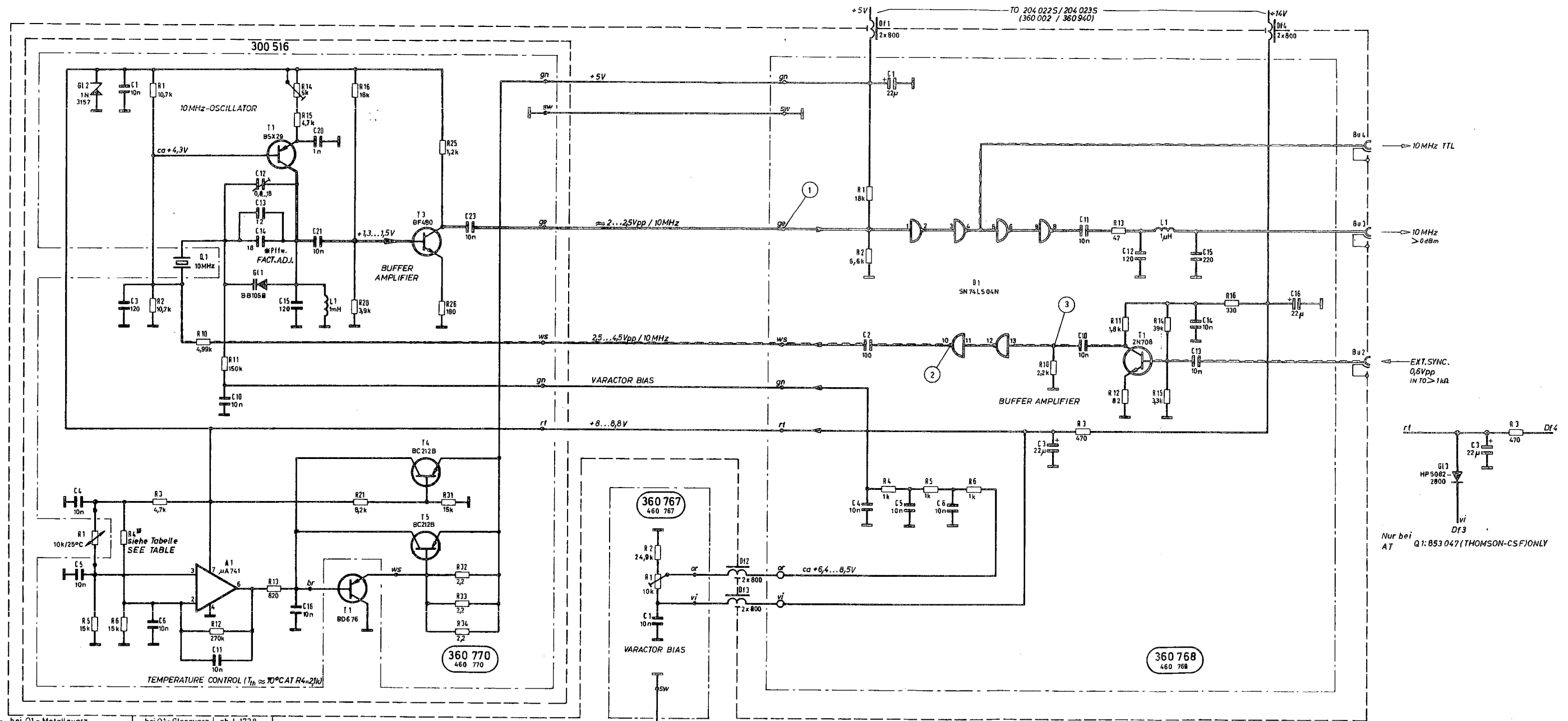
Schlumberger

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

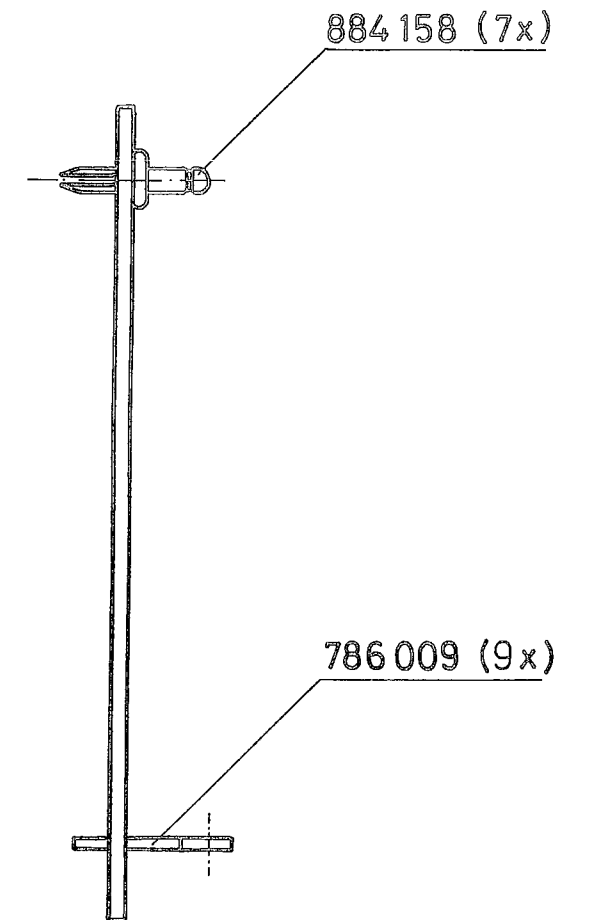
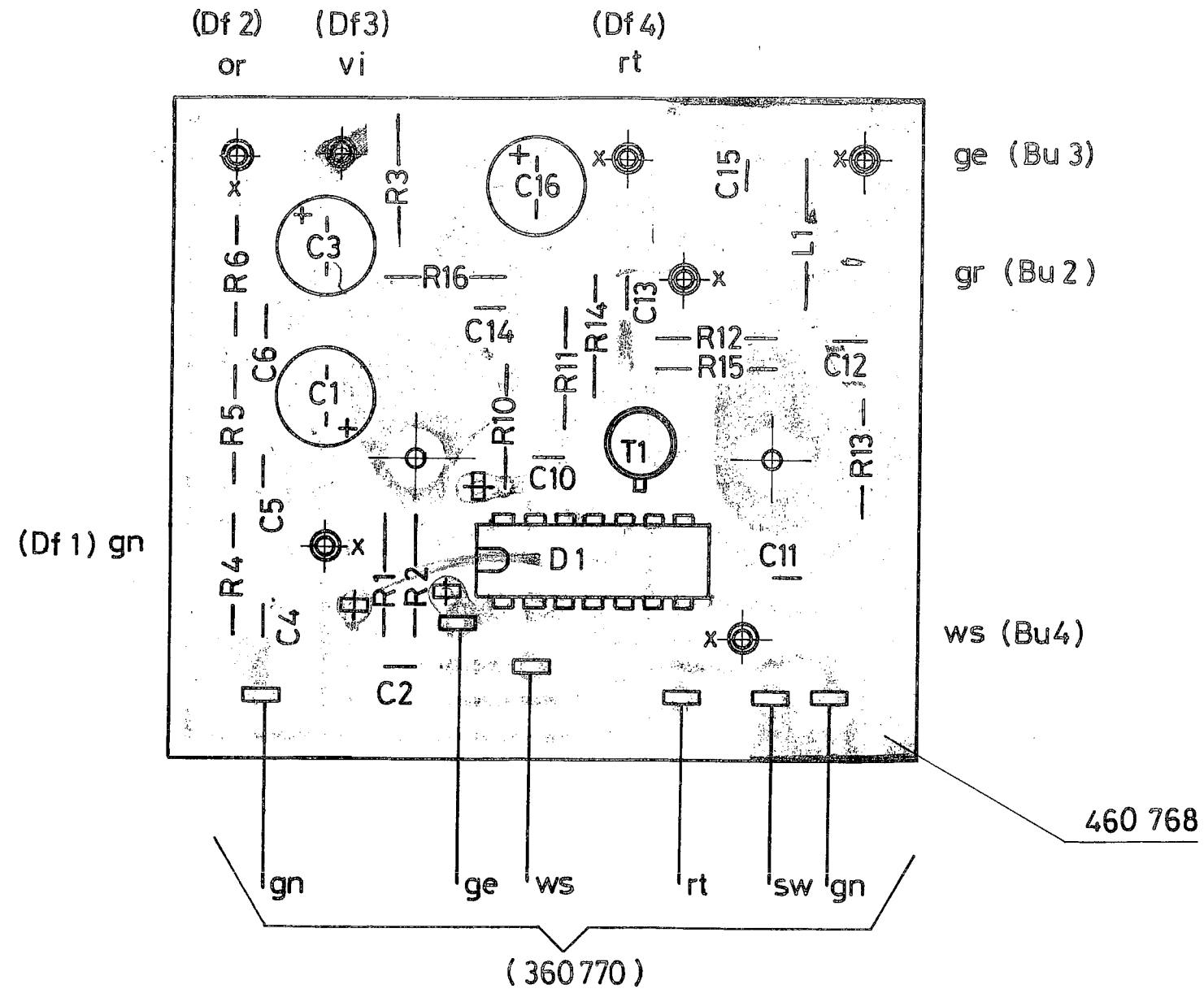
sw BLACK	bl BLUE				norm.			Schlumberger o/s Meßgerätebau u. Vertrieb GmbH 8 München 48	10MHz CRYSTAL OSCILLATOR	214 022 S Typ : 4010/4011/4710	
br BROWN	vl VIOLET	10	3096.80	12.7.79	Mo	gebr.					
rt RED	gr GREY	09	3096.12	17.1.79	Eiler	beabr.					27.7.77
rs ROSE	ws WHITE	Ausg.	A-Mittg.	Datum	Name	Datum					Name
gr YELLOW	tr TRANSPARENT	ISS.	MODIF.	DATE	NAME	DATE	NAME				

428 096 (2x)



360 767

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 27.7.78

1977

26.7

Knobloch

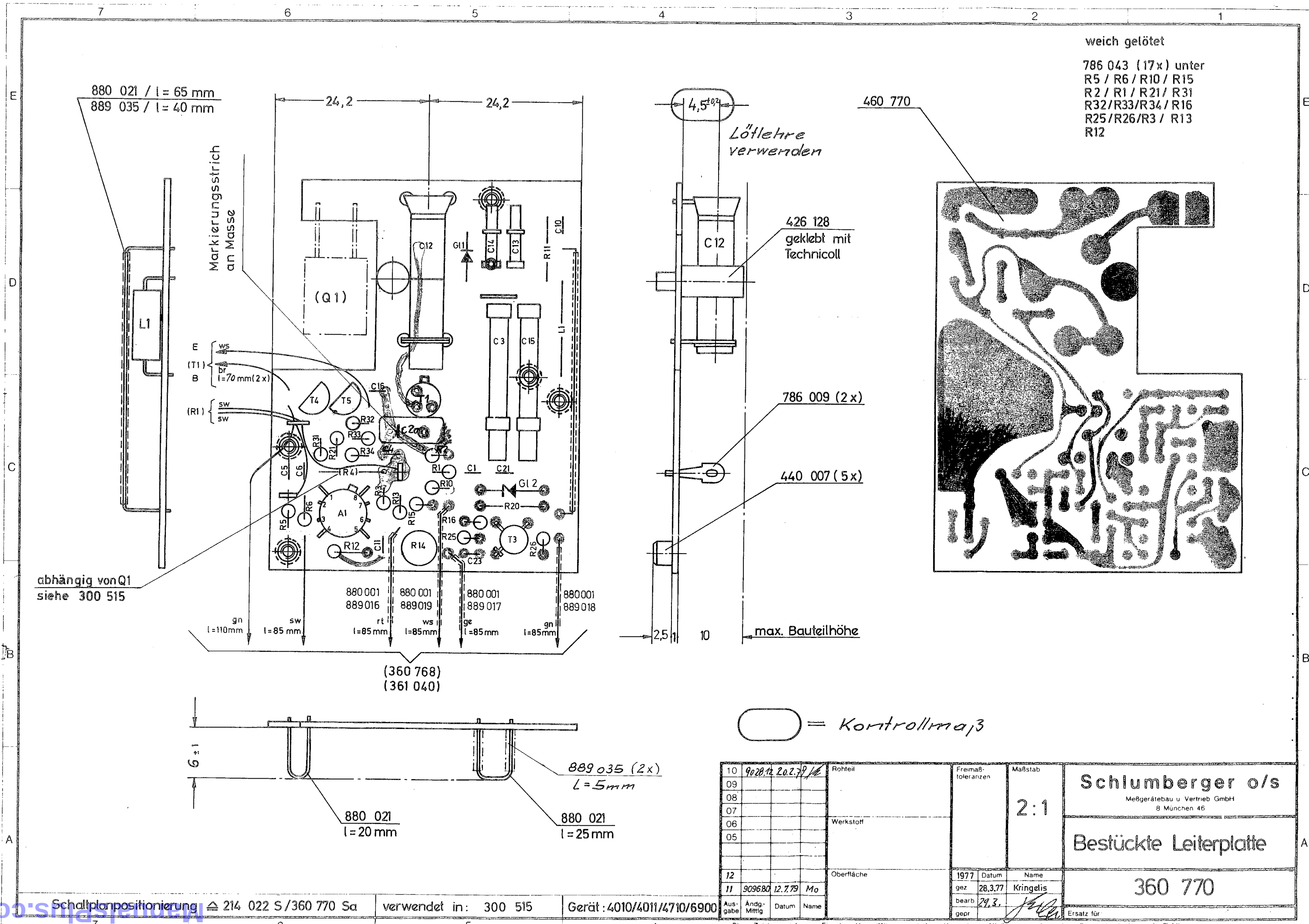
27.7

Schlumberger o/s

2:1

Bestückte Leiterplatte

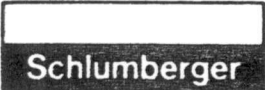
360 768



(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.

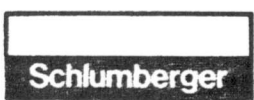
On external 12 V battery operation the battery voltage is made use of through a buffer diode directly as the upper voltage of the +5 V control circuit. For the +14 V control circuit the battery voltage is first of all elevated accordingly by means of a DC/DC converter. A resonant chopper circuit permits 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. <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 8 Bu 23/B1 /B8 /B1 /B8 /A10 /B1 /B8 /B1 /B8	— — — — — — — — — —	— — 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 Δ V < 20 mV DC Δ V < 20 mV DC V _{AF} < 200 μ W rms V _{AF} < 50 μ W rms	mA VmVmV μ W μ W
AF Analyser	<u>Current Limiting</u> adjustable load 0...14 Ω to + 14 V output 0...2,2 Ω to + 5 V output	Bu 23/B1 " Bu 23/B8 "	— — — —	R load R load = 0 Ω R load R load = 0 Ω	Maximum available current: 1,4 ... 1,8 A Short circuit current: 0,1 ... 0,3 A Maximum current available: 2,8 ... 4,0 A Short circuit current: 0,3 ... 0,85 A	AAAA

Adjustment and Test Procedure

4020 (4010) series
POWER SUPPLY



Issue	Alteration No.	Date	Name
04	8028.44	1.4.78	X
		8.10.79	Ham
25	0028.50	25.7.70	Mamoch

204 022 A	1/2 Sheet
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REQUIRED TEST EQUIPMENT	PROCEDURE	MEASURE POINT	FREQUENCY	ADJUST	REQUIRED VALUE	MEASURED VALUE
6 A - Power Supply	<u>Mains Selector</u> Before changing Mains Selector position, mains must be switched off. Variable transformer and Mains Selector to 230 V 110 V 240 V 120 V 130 V 220 V Switch mains selector to the required position. <u>DC - DC - Converter</u> Switch off mains + 10,8...15,6 V to St 2 Current consumption hereby ($V_{batt.} = 12 V$) (without crystal oscillator) Set load current exactly to 2,27 A at 5 V and simultaneously to 1 A at 14 V. Check start condition of the DC-converter: Switch power OFF → ON (Note: DC-Converter does not start oscillating, when the mains voltage is increased slowly)	Bu 23/A10 " " " " " Bu 23/B1 Bu 23/B8 St 2 /Power Supply Bu 23/B1	— — — — — — — — — —	— — — — — — — — — —	+ 8 ... + 9 V " " " " " + 14 V/ΔV < 20 mV + 5 V/ΔV < 30 mV + 4,0 ... 4,7 A + 14 V	ok mVmV A

Adjustment and Test Procedure

4020 (4010) series
POWER SUPPLY

Schlumberger

Issue	Alteration No.	Date	Name
		8.10.73	Karmy
03	8028.44	1.4.78	K
02	6028.51	1.7.76	Kr.
04	5028.92	10.8.75	...

204 022 A

2/2
Sheet

