WAVETEK

Service Manual 4015 (2)

CONTENTS

	SOL SYNT	DEMOD + 15V
POWER	OK	OK
COMP	REL. TEST FAIL	FAIL
DATA	OK	FAIL
MOD GEN	OK	FAIL
DEMOD	FAIL	FAIL
DUPLEX	OK	FAIL
SYNT	RELA. TEST FAIL	FAIL
RF UNIT	REL TEST FAIL	FAIL

CONTENTS

Chapter	Designation		Drawing No.
3	FIXED UNITS		
3.1	CONTROL PANEL		
	Functional description + Troubleshooting		227 036 F
	Circuit diagram		227 036 S
	Assembly Drawing		227 036
	Electrical parts list		227 036 Sa
	Circuit diagram	Control Panel	361 521 S
	Components layout	Control Panel	361 521 Page 2
	Electrical parts list	Control Panel	361 521 Sa
3.2	GRAPHIC DISPLAY (from Finlux)		
	Functional description		856 106 F
3.3	RF POWER PROTECTION		
	Functional description		248 237 F
	Alignment procedure		248 237 A
	Assembly Drawing		375 335
	Circuit diagram		248 237 S
			361 560 S
	Components layout		361 560
	Electrical parts list		248 237 Sa
			361 560 Sa

Chapter	Designation		Drawing No.
4.2	SYNTHESIS		
	Functional description		213 038 F
	Alignment procedure		213 038 A
	Circuit diagram		213 038 S
	Assembly Drawing		213 038
	Assembly Drawing		375 331
	Electrical parts list		213 038 Sa
	Circuit diagram	Synthesis	361 531 S
	Components layout	Synthesis	361 531 Page 2
	Electrical parts list	Synthesis	361 531 Sa
	Functional description		361 565 F
	Circuit diagram	Oszillator	361 565 S
	Components layout	Oszillator	361 565
	Electrical parts list	Oszillator	361 565 Sa

Chapter	Designation		Drawing No.
5	AF PLIUG-IN UNITS		
5.1	COMPUTER		
	Functional description + Troubleshooting		250 036 F
	Circuit diagram		250 036 S
	Electrical parts list		250 036 Sa
	Circuit diagram	Computer	361 546 S
	Components layout	Computer	361 546 Page 2
	Electrical parts list	Computer	361 546 Sa
5.2	DEMOD METER		
	Functional description		229 036 F
	Alignment procedure		229 036 A
	Circuit diagram		229 036 S
	Electrical parts list		229 036 Sa
	Circuit diagram	Demod Meter	361 548 S
	Components layout	Demod Meter	361 548 Page 2
	Electrical parts list	Demod Meter	361 548 Sa
5.3	MOD GEN		
	Functional description		208 036 F
	Alignment procedure		208 036 A
	Circuit diagram		208 036 S
	Electrical parts list		208 036 Sa
	Circuit diagram	Mod Gen	361 545 S
	Components layout	Mod Gen	361 545 Page 2
	Electrical parts list	Mod Gen	361 545 Sa
5.4	POWER SUPPLY (from MGV)		
	Functional description + Test instructions		204 038 F
	Circuit diagram		204 038 S
	Assembly Drawing		204 038
	Electrical parts list		204 038 Sa

Chapter	Designation		Drawing No.
6	OPTIONS		
6.1	DUPLEX SYNTHESIS		
	Functional description		229 038 F
	Alignment procedure		229 038 A
	Circuit diagram		229 038 S
	Assembly Drawing		229 038
	Assembly Drawing		375 333
	Electrical parts list		229 038 Sa
	Circuit diagram	Duplex	361 533 S
	Components layout	Duplex	361 533 Page 2
	Electrical parts list	Duplex	361 533 Sa
	Documentation for the oscillator: see Chapter 4.2, SYNTHESIS		
6.2	DATA MODULE		
	Functional description + Troubleshooting		236 016 F
	Circuit diagram		236 016 S
	Electrical parts list		236 016 Sa
	Circuit diagram	Data Modul	361 543 S
	Components layout	Data Modul	361 543 Page 2
	Electrical parts list	Data Modul	361 543 Sa
6.3	DTMF MODULE		
	Functional description		248 171 F
	Alignment procedure		248 171 A
	Circuit diagram		248 171 S
	Components layout		248 171
	Electrical parts list		248 171 Sa

Chapter	Designation		Drawing No.
6.4	IEEE BUS INTERFACE		
	Functional description + Troubleshooting		236 013 F
	Circuit diagram		236 013 S
	Assembly Drawing		236 013
	Electrical parts list		236 013 Sa
	Circuit diagram	IEEE Bus Interface	361 551 S
	Components layout	IEEE Bus Interface	361 551
	Electrical parts list	IEEE Bus Interface	361 551 Sa
6.5	CENTRONICS INTERFACE		
	Functional description + Troubleshooting		236 012 F
	Circuit diagram		236 012 S
	Assembly Drawing		236 012
	Electrical parts list		236 012 Sa
	Circuit diagram	Centronics Interface	361 554 S
	Components layout	Centronics Interface	361 554
	Electrical parts list	Centronics Interface	361 554 Sa
6.6	ASCII KEYBOARD		
	Circuit diagram		248 192 S
	Overall view		248 192
6.7	EXT 10 MHz SYNC		
	Functional description		214 026 F
	Alignment procedure		214 026 A
	Circuit diagram		214 026 S
	Assembly Drawing		214 026
	Electrical parts list		214 026 Sa
	Circuit diagram	Ext. 10 MHz Sync	361 553 S
	Components layout	Ext. 10 MHz Sync	361 553
	Electrical parts list	Ext. 10 MHz Sync	361 553 Sa

Chapter	Designation	Drawing No.
6.8	INT BATTERY	
	Functional description	205 006 F
	Test instructions	205 006 A
	Circuit diagram	205 006 S
	Assembly Drawing	205 006
	Electrical parts list	205 006 Sa
6.9	SYMM AF TRANSFORMER	
	Functional description	248 194 F
	Test instructions	248 194 A
	Circuit diagram	248 194 S
		361 559 S
	Assembly Drawing	375 334
	Components layout	248 194
		361 559
	Electrical parts list	248 194 Sa
		361 559 Sa

IF Section

Attenuator

The IF signal is first adapted in level to the following IF amplifier by a switchable attenuator. The attenuation values are 0/-10/-20 dB. The attenuator is matched to the very low-impedance IF output of the RF stage. The maximum input level is +10 dBm or 2 V_{pp}. A 450-kHz test signal can be fed in for the self-check.

IF Bandpass Filter

The IF filter has a bandwidth of ±30 kHz and passband ripple of < 1 dB at a center frequency of 450 kHz. The far-off selectivity is > 35 dB at ±150 kHz frequency offset. For impedance matching and amplification there is a transistor amplifier both before and after the bandpass filter for noise reasons. A ±10-kHz or a ±4.5-kHz ceramic filter can be cut in as a channel filter before the FM demodulator. These are solely for aural monitoring, not for testing.

FM Demodulator

Before the FM demodulator the IF signal is amplified by a comparator and limited in amplitude for AM rejection.

The rectangular IF signal is applied on the one hand to a 10:1 frequency divider that generates a 45-kHz signal for the IF counter on the computer board, and on the other it is applied via a lowpass filter to the FM demodulator device. This includes a coincidence demodulator, ie it uses the slope of a parallel resonant circuit for demodulation. The resulting AF signal is freed of residual IF by a 14-kHz lowpass filter and shifted in level by a compensating DC voltage, also generated by the device, so that at 450 kHz IF frequency there is 0 V on the output. The signal is compensated thermally for any manufacturing and temperature dependence of the demodulator device and adjusted for a rate of rise of 0.2 V/kHz.

ΦM Deemphasis

In ΦM mode the AF signal is equalized after FM demodulation by an integrator. A highpass filter suppresses any low-frequency noise components.

IJ

AM Demodulation

The AM detector is an active rectifier circuit with a fast operational amplifier. The on and off transients in rectangular modulation are approx. 25 µs, dynamic response is > 40 dB. A lowpass filter follows up to reject the IF frequency.

Analyzer Lowpass Filter

Analyzer mode uses the principle of zero down-conversion. The wideband analyzer front-end filter is a lowpass with a 3-dB bandwidth of 14 kHz, optimized for minimal passband ripple. A follow-up AC-coupled amplifier suppresses the zero and boosts the signal by a factor of 45.

A signal switch selects the demodulated signals according to mode. A buffer amplifier feeds them to the DEMOD socket on the front panel. Parallel to this they are fed via a programmable amplifier (x1/x5/x15) to the AF section, where they are filtered and digitized and processed on the processor board (see also AF Section).

AF Section

Voltmeter/Scope

The input impedance of the voltmeter/scope socket on the front panel is 1 MΩ/20 pF to permit the use of oscilloscope probes. An impedance transformer immediately on the socket produces the necessary noise margin of approx. 100 dB.

A switch is used to select between the signals voltmeter, scope and MOD generator. For further digital processing there is first band limiting to approx. 14 kHz and then the signal is fed to an amplifier that can be programmed in eight steps (1,2,4,8...128). Two further switches select between the DEMOD signals and the AF signals (voltmeter/scope/MOD generator). The selected signal goes to the programmable lowpass filter, the Data Module (option), the loudspeaker amplifier and a comparator, which generates the TTL signal for the AF counter on the processor.

Programmable Lowpass Filter

For digital signal processing it is necessary to filter the signal first to avoid measuring errors caused by the transformation of high-frequency signal components in the useful frequency range.

Filtering in the 4015 is performed by a 6th-order lowpass filter with a programmable cutoff frequency. This is a switched-capacitor filter whose cutoff frequency is determined by an external clock. The clock frequency in the original range can cause interference in the IF section, so a low frequency generated in the timer of the computer is multiplied by a PLL circuit and fed to the device.
Apart from the filtering for digital signal processing, the filter is also used for selecting the analyzer bandwidth and for optional lowpass filtering of the AF signal. Lowpass filters with fixed settings before and after the filter are used to avoid aliasing by the filter itself.

CCITT Filter

If required, a CCITT filter (P 53 A) can also be cut into the signal path.

RF Power Measurement

For RF power measurement the demodulated AM signal is applied via a 30-Hz lowpass filter to the signal selector before the analog/digital converter on the processor board.

Auxiliary Voltages

The maximum voltage on the CMOS analog switches is limited, but the signals must be balanced to ground, so the switches are supplied with an auxiliary voltage of ±7 V. The signal voltages are divided accordingly.

Temperature Sensor

The parameters of some components are temperature-dependent. So an NTC thermistor senses the temperature on the board and the processor derives from this the criteria for automatic recalibration.

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
DVM Oscilloscope Counter	The Demod stage is controlled by the computer automatically (signal path, measurement ranges, filter bandwidths) as a function of instrument settings and the measured results. In testing and troubleshooting, defined signal paths and measurement ranges have to be switched on the stage for constant values. With the aid of the "Selfcheck" memory card, the test can be halted at certain points by a "breakpoint". The 4015 can then be stimulated with signals internally or externally that must lead to defined signals at the individual testpoints. <u>Operation:</u> Key "MEMORY" Cursor "Selfcheck" Softkey "RECALL" Key "RX" Key "MENU" Softkey "MENU >>" (twice) Softkey "CALBRT" Cursor "Start Self-Check" Key "UNIT/SELECT" Set appropriate figure for breakpoint. Key "ENTER" Softkey "RUN" , "SINGLE STEP" or "CONTIN"				

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure		Measuring Point	Frequency	Adjust-ment	Set Value
	1. Supply voltages					
	1.1. Reference voltage (+15 V)		R 255	DC	--	+15 V ± 10 mV
	-15V		ST63-27C	DC	--	-15 V ±100 mV
	Vcc		ST63-18C	DC	--	+5.2 V ±100 mV
	1.2. Auxiliary supply (±7 V)		R 260	DC	--	+6.8 V ±0.4 V
			R 260	AC	--	< 5 mV
			R 261	DC	--	-6.8 V ±0.4 V
			R 261	AC	--	< 5 mV
	1.3. Test voltages					
	Breakpoint 6	Ground	I19/ST63-21C	DC	--	0 V ± 2 mV
	Breakpoint 7	V_{ref}	I19/ST63-21C	DC	--	4.69 V ±50 mV
	Breakpoint 8	Supply -15 V/+5 V	I19/ST63-21C	DC	--	-2.9 V ±50 mV
	Breakpoint 9	V_{batt} (only with built-in battery)	I19/ST63-21C	DC	--	$0.2 \cdot V_{batt}$

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	22.3.94 Bach	Regel	STABILOCK 4015	Demod Meter	229 036 A			2/9

4089.5

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	2. Test AF signal path				
	The test can be made with the internal MOD GEN as a source or the socket "VOLTM" with an external AF generator. The requirement for the internal test is that MOD GEN A is working properly. The stated tolerances are only valid after calibration. Without calibration (set defective) the measured values are only for reference.				
	2.1. Internal MOD GEN as signal source (1 V/1 kHz)				
	Breakpoint 26	A20/pin 6	1 kHz	--	1 V ±20 mV
		I12	1 kHz	--	0.5 V ±20 mV
		I14	1 kHz	--	2 V ±50 mV
		I19/ST63-21C	1 kHz	--	2 V ±50 mV
	2.2. Test of AF counter	I15	1 kHz	--	TTL level
	2.3. External modulation generator as signal source				
	Breakpoint 27				
	The internal MOD GEN generates a signal of 3 V/1 kHz. If it is used as an external signal source (cable connection socket "MODGEN" and "VOLTM"), the measured values are identical to those of the internal measurement (see items 2.1 and 2.2). At the same time the test of the signal path on the front panel is made.				

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	2.4. Offset adjustment lowpass filter 1-10 kHz				
	Breakpoint 46	I17	DC	R167	0 V ±20 mV
	2.5. Test AF meter amplifier Signal source is MOD GEN A				
	Breakpoint 47 (*128)	I14	1 kHz	--	3.2 V ±0.4 V
	Breakpoint 48 (* 64)	I14	1 kHz	--	1.6 V ±0.2 V
	Breakpoint 49 (* 32)	I14	1 kHz	--	0.8 V ±0.1 V
	Breakpoint 50 (* 16)	I14	1 kHz	--	0.4 V ±50 mV
	Breakpoint 51 (* 8)	I14	1 kHz	--	3.2 V ±0.4 V
	Breakpoint 52 (* 4)	I14	1 kHz	--	1.6 V ±0.2 V
	Breakpoint 53 (* 2)	I14	1 kHz	--	0.8 V ±0.1 V
	Breakpoint 54 (* 1)	I14	1 kHz	--	0.4 V ±50 mV

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	2.6. Frequency-response test lowpass filter 1-10 kHz				
	Signal source is MOD GEN A				
	Cutoff frequency: 10 kHz				
	Breakpoint 76	I19/St63-21C	1 kHz	--	2 V ±0.1 V
		I22	DC	--	approx. +0.5 V
		D170/pin 4	575 kHz	--	TTL
	Breakpoint 77	I19/St63-21C	9 kHz	--	1.7 V ±0.2 V
	Breakpoint 78	I19/St63-21C	10 kHz	--	1.5 V ±0.2 V
	Breakpoint 79	I19/St63-21C	15 kHz	--	180 mV ±20 mV
	Cutoff frequency: 3 kHz				
	Breakpoint 80	I19/St63-21C	1 kHz	--	2 V ±0.1 V
		I22	DC	--	approx. -4 V
		D170/pin 4	150 kHz	--	TTL
	Breakpoint 81	I19/St63-21C	3 kHz	--	1.5 V ±0.2 V
	Breakpoint 82	I19/St63-21C	4.5 kHz	--	170 mV ±20 mV
	Cutoff frequency: 1 kHz				
	Breakpoint 83	I19/St63-21C	0.4 kHz	--	2 V ±0.1 V
		I22	DC	--	approx. -4.75 V
		D170/pin 4	50 kHz	--	TTL
	Breakpoint 84	I19/St63-21C	1 kHz	--	1.5 V ±0.2 V
	Breakpoint 85	I19/St63-21C	1.5 kHz	--	170 mV ±20 mV
	2.7. Test of CCITT filter				
	Signal source is MOD GEN A				
	Breakpoint 86	I19/St63-21C	0.4 kHz	--	0.5 V ±50 mV
	Breakpoint 87	I19/St63-21C	0.8 kHz	--	1 V ±50 mV
	Breakpoint 88	I19/St63-21C	3.3 kHz	--	0.5 V ±50 mV

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	3. IF test				
	3.1. Adjustment of test oscillator (450 kHz)				
Oscilloscope	Breakpoint: 99	I20	450 kHz	R10	450 kHz ±1 kHz TTL
		I1	450 kHz	--	approx. 2 V_{PP}
		I2	450 kHz	--	approx. 1.3 V_{PP}
		I3	DC	--	approx. 6 V
	3.2. Test preattenuator Signal source is output stage				
	Breakpoint 105 (-20 dB)	St63-24A	450 kHz	--	approx. 360 mV_{PP}
		I 1	450 kHz	--	approx. 300 mV_{PP}
	Breakpoint 106 (-10 dB)	St63-24A	450 kHz	--	approx. 40 mV_{PP}
		I 1	450 kHz	--	approx. 85 mV_{PP}
	Breakpoint 107 (0 dB)	St63-24A	450 kHz	--	approx. 30 mV_{PP}
		I1	450 kHz	--	approx. 270 mV_{PP}
	3.3. Adjustment of IF filter Note: The IF filter can only be adjusted for optimal balance with a sweeper. The static adjustment that is described here should only be made after a defect on one of the filter components. It is advisable to check the stage afterwards with a sweeper or to have it done at the works.				
	Breakpoint 108	I2	590 kHz	L1	Minimum
	Breakpoint 109	I2	450 kHz	L2	Maximum
		I2	450 kHz	L3	Maximum
	Repeat adjustment.				

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	22.3.94 Bach	Regel	STABILOCK 4015	Demod Meter	229 036 A			6/9

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	3.4. Test IF filter 80 kHz				
	Signal source is output stage (450 kHz)				
	Breakpoint 110	I3	DC	--	approx. 880 mV
	Breakpoint 111 (410 kHz)	I3	DC	--	approx. 700 mV
	Breakpoint 112 (490 kHz)	I3	DC	--	approx. 700 mV
	3.5. Test IF filter 20 kHz				
	Breakpoint 113	I21	450 kHz	--	approx. 450 mV
Oscilloscope	Breakpoint 114	I21	463 kHz	--	« approx. 140 mV
	Breakpoint 115	I21	437 kHz	--	« approx. 140 mV
	3.6. Test IF filter 9 kHz				
	Breakpoint 116	I21	450 kHz	--	approx. 500 mV
	Breakpoint 117	I21	456 kHz	--	approx. 160 mV
	Breakpoint 118	I21	444 kHz	--	approx. 160 mV
	3.7. Adjustment of AM demodulator				
DVM	Cable connection between RX HIGH and TX SENS				
	Breakpoint 119	I3	DC	--	approx. -3 V *
	Breakpoint 120	I3	DC	R46	40 dB under * (approx. 30 mV)
	Breakpoint 121 (50% AM)	Demod socket	DC	--	approx. 3 V
		I3	DC	--	approx. -3 V #
			1 kHz	--	approx. 3 V_{pp}/1 V_{rms} (value like #)

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	22.3.94 Bach	Regel	STABILOCK 4015	Demod Meter	229 036 A			7/9

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	3.8. Test 30-Hz lowpass filter (TX power)				
	Cable connection between RX HIGH and TX SENS				
	Breakpoint 122	I19/St63-21C	DC	--	approx. -3 V
		I19/St63-21C	AC		< 5 mV
	Breakpoint 123 (50% AM 30 Hz)	I19/St63-21C	30 Hz	--	approx. 0.7 V
	Breakpoint 124 (50% AM 1 kHz)	I19/St63-21C	DC	--	approx. -3 V
			1 kHz	--	< 5 mV
	3.9. Adjustment of FM demodulator				
	Breakpoint 135 (450 kHz) C60 in center setting!	I3	DC	L4	0 V
				Note:	Core is fixed
		I3	DC	C 60	0 V ±50 mV
	Breakpoint 136 (460 kHz)	I3	DC	R 80	1.0 V ±50 mV
		I13	DC	--	1.0 V ±50 mV
	Breakpoint 146 (5 kHz FM)	I13	1 kHz	--	1.77 V ±50 mV
		I19/St63-21C	1 kHz	--	1.77 V ±50 mV
	Breakpoint 147 (2 kHz FM)	I13	1 kHz	--	2.12 V ±50 mV
		I19/St63-21C	1 kHz	--	2.12 V ±50 mV
		St63-30C	1 kHz	Loudspeaker test	2.12 V ±50 mV
	3.10. Test ΦM deemphasis				
	Breakpoint 151	I3	1 kHz	--	353 mV ±10 mV
		I19/St63-21C	1 kHz	--	1.77 V ±50 mV
	Breakpoint 152	I3	2 kHz	--	177 mV ± 5 mV
		I19/St63-21C	2 kHz	--	2.65 V ±75 mV
	Breakpoint 153	I3	0.5 kHz	--	707 mV ±20 mV
		I19/St63-21C	0.5 kHz	--	707 mV ±20 mV

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	22.3.94 Bach	Regel	STABILOCK 4015	Demod Meter	229 036 A			8/9

Adjustment and Test Procedure

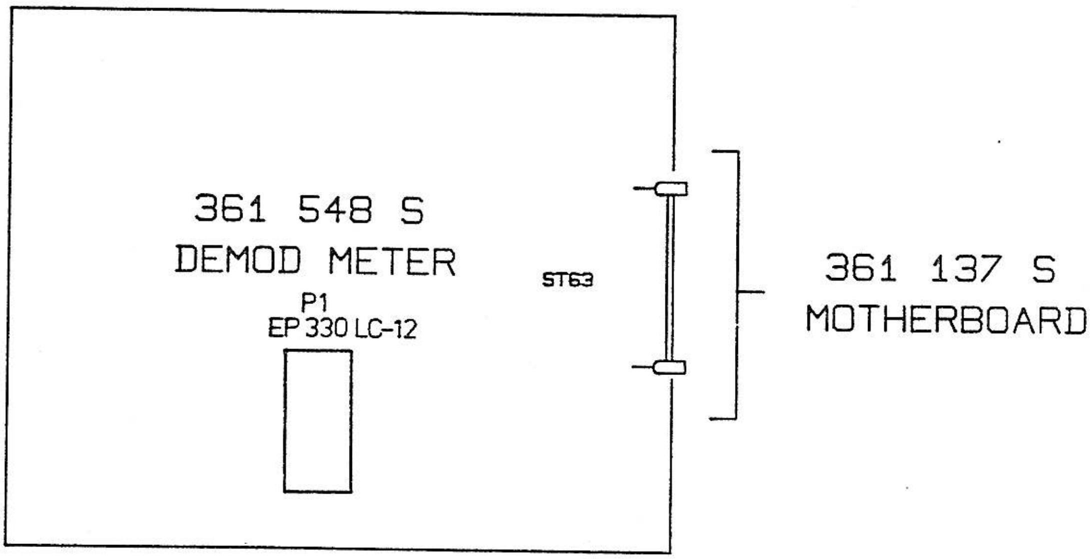
Necessary Equipment	Measuring Procedure		Measuring Point	Frequency	Adjust-ment	Set Value
	3.11. Test IF counter					
	Breakpoint 154		St63-5C	45 kHz	--	TTL level
	3.12. Test analyzer lowpass filter					
	Breakpoint 158		I19/St63-21C	1 kHz	--	2.1 V ±0.2 V
	Breakpoint 159		I19/St63-21C	10 kHz	--	1.5 V ±0.2 V
	Breakpoint 160		I19/St63-21C	15 kHz	--	170 mV ±30 mV
	4. Test temperature sensor					
	Breakpoint 166	At 20°C	I19/St63-21C	DC	--	approx. -1 V
		25°C	I19/St63-21C	DC	--	approx. -0.5 V
		30°C	I19/St63-21C	DC	--	approx. 0 V
222						

Lifeline: 4015 – Demod Meter – 229 036 A

The chronological lifeline tells you what modifications have been made in the Service Manual concerning the alignment procedure of the above-mentioned sub-unit. This lifeline helps you to find out quickly about all major changes (see code) stating the relevant pages on which alterations took place.

Code: C = Correction, TC = Text changed, SC = Specifications changed

Issue No.	Change-Note No.	pages	Code	Changes
01	4089.5	7	SC	Point 3.5. Breakpoint 114/115, Set Value << ca./approx. 140 mV



				NORM.		
01	3089.11	24.6.93	Dem.	GEPR.		
00	0089.68	23.11.90	HUBER	BEARB.		
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR.67 A 8000 MÜNCHEN 46	DEMOD METER	229 036 S GERÄT:4015/201 238

1	2	3	4	5	6	7	8
Pos REF NO	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT	Pos REF NO	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT
1	Bestückte Leiterplatte	361 548					
	hierzu	361 548 Sa					
P1	EPLD	893 470	Schl				

Ausgabe ISSUE	Änd.-Mittlg Nr MODIFIC NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02			
01	3089.11	24.6.93	Dem.
00	0089.68	27.11.90	Kr.

	Tag DATE	Name NAME
1990		
geschr	27.11.90	Kr.
bearb		
gepr		

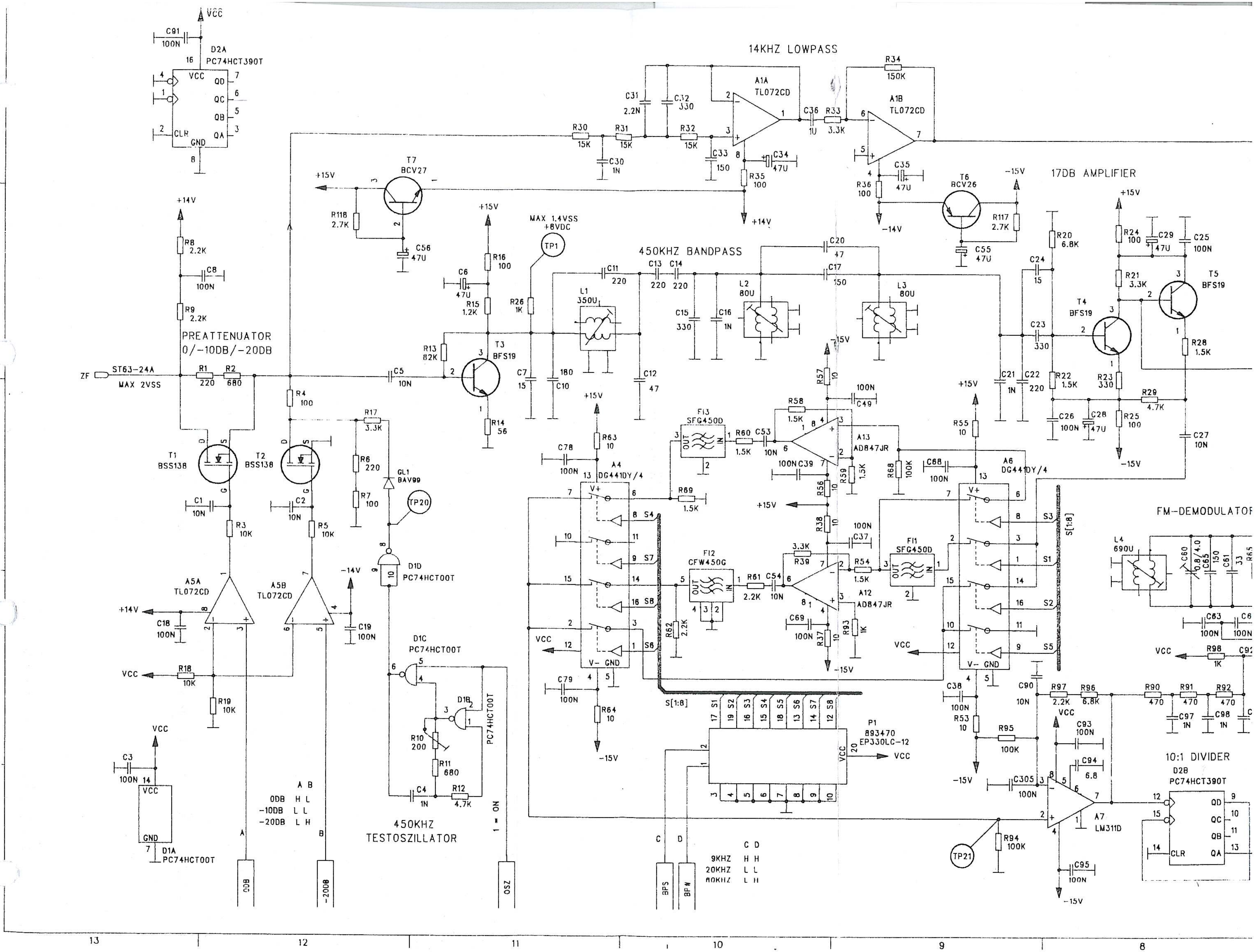
Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

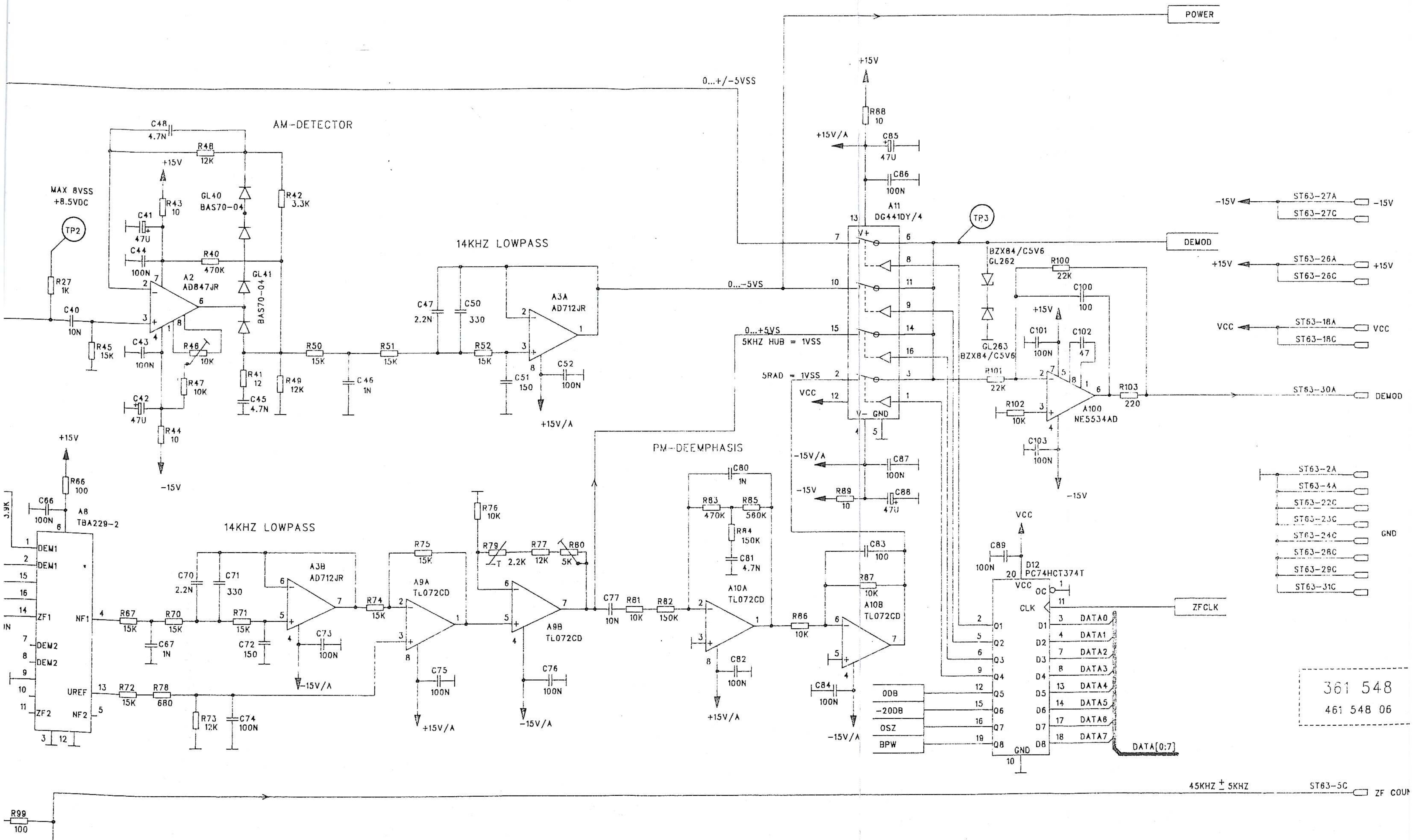
Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION	DEMOD METER
Bezeichnung Schlumberger PART NO	229 036 Sa
Hierzu Schaltplan SEE CIRCUIT DIAGRAM	229 036 S
Gerät	4015

Liste besteht / LIST CONSISTS aus / OF 1 Blatt / SHEETS

Blatt Nr. / SHEET NO 1


14KHZ LOWPASS
17DB AMPLIFIER
450KHZ BANDPASS
PREATTENUATOR
0/-10DB/-20DB
ZF
ST63-24A
MAX 2VSS
MAX 1.4VSS
+8VDC
FM-DEMODULATOR
10:1 DIVIDER
450KHZ
TESTOSZILLATOR
D2A
PC74HCT390T
D2B
PC74HCT390T
A1A
TL072CD
A1B
TL072CD
A5A
TL072CD
A5B
TL072CD
A4
DG441DY/4
A6
DG441DY/4
A12
AD847JR
A13
AD847JR
A7
LM311D
P1
893470
EP330LC-12
FI1
SFG450D
FI2
CFW450G
FI3
SFG450D
D1A
PC74HCT00T
D1B
PC74HCT00T
D1C
PC74HCT00T
D1D
PC74HCT00T
T1
BSS138
T2
BSS138
T3
BFS19
T4
BFS19
T5
BFS19
T6
BCV26
T7
BCV27
GL1
BAV99
TP1
TP20
TP21
A B
0DB H L
-10DB L L
-20DB L H
C D
9KHZ H H
20KHZ L L
60KHZ L H
1 = ON
0DB
-20DB
OSZ
BFS
BF#
S[1:8]
13
12
11
10
9
8



INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME
08	4089.5	03.11.93	VARGA	DESIGNED		
07	3089.11	22.06.93	VARGA	CHECKED		
06	2089.6	26.02.92	VARGA	DRAWN	25.4.89	FLE

SCHLUMBERGER TECHNOLOGIES GMBH
Gutenbergstr. 2-4
85737 ISMANING

BEZEICHNUNG/DESCRIPTION:

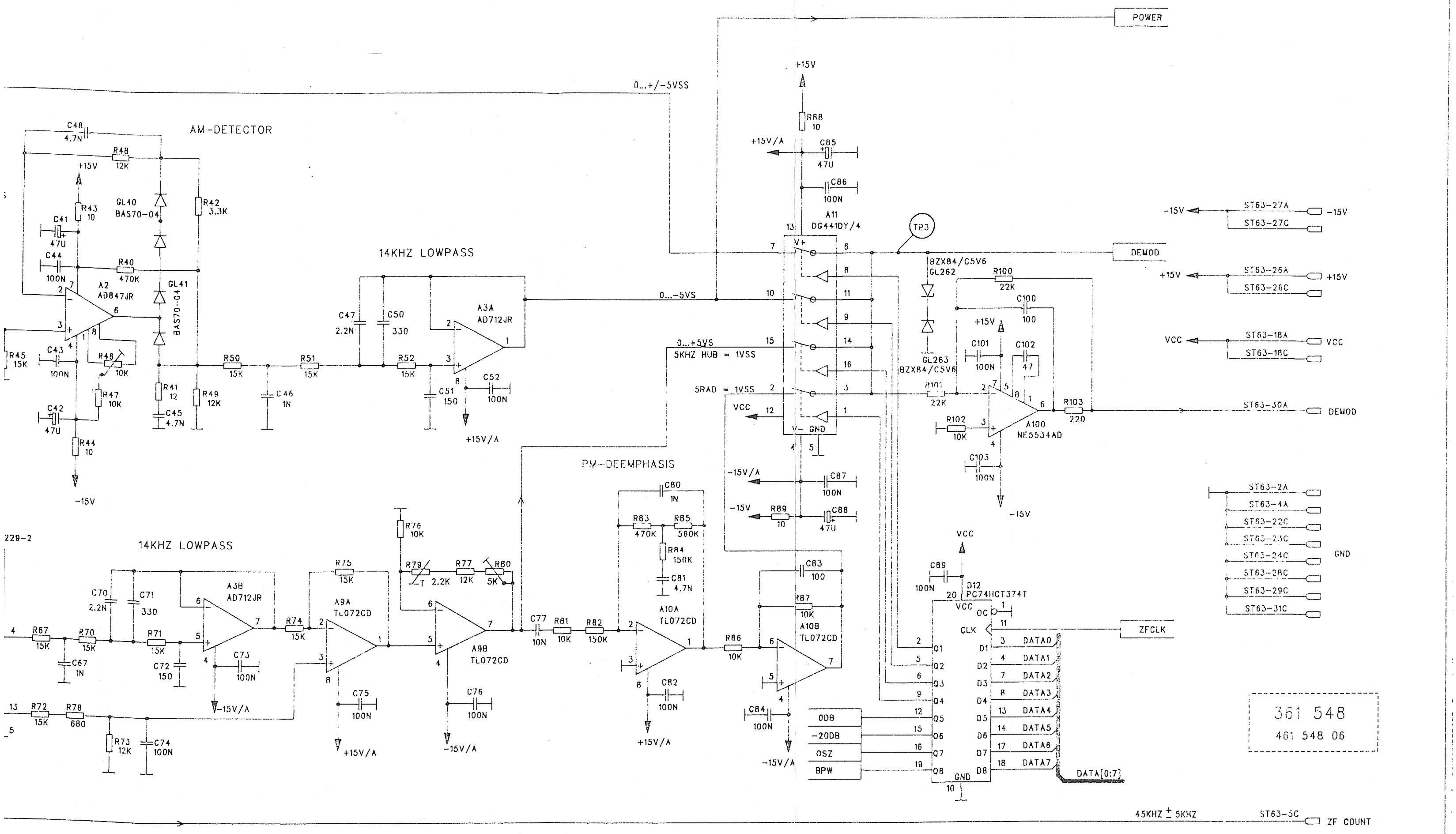
DEMOD-METER
(IF-UNIT)

ZEICHNUNGSNR./DRAWING N

361 548

PROJECT/GROUP:
4015 / 229 036 S

7 6 5 4



08	4089.5	03.11.93	VARGA	DESIGNED			
07	3089.11	22.06.93	VARGA	CHECKED			
06	2089.6	26.02.92	VARGA	DRAWN	25.4.89	FLE	
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME	

SCHLUMBERGER TECHNOLOGIES GMBH
Gutenbergstr. 2-4
85737 ISMANING

BEZEICHNUNG/DESCRIPTION:

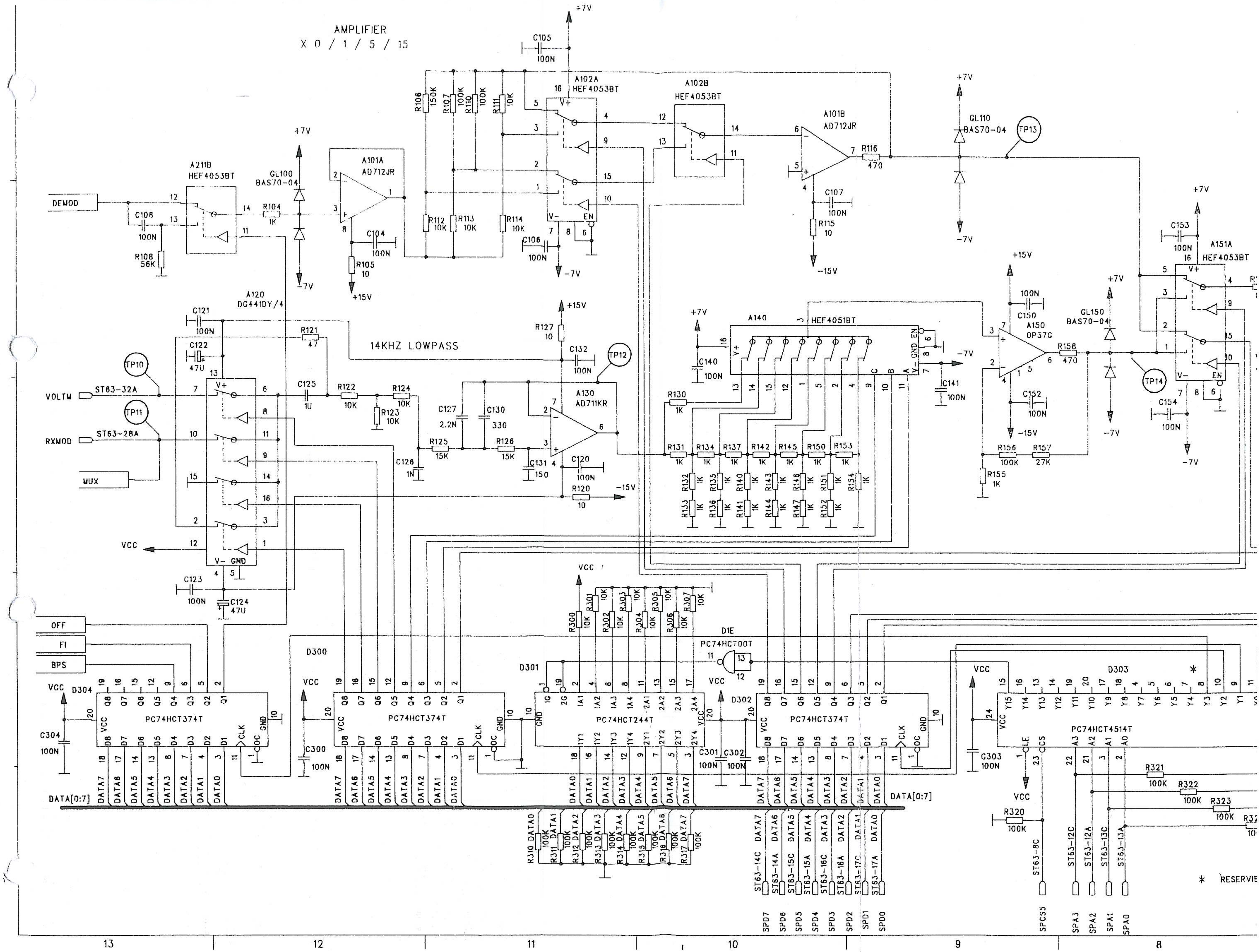
DEMOD-METER (IF-UNIT)

ZEICHNUNGSNR./DRAWING NO.: 361 548 S

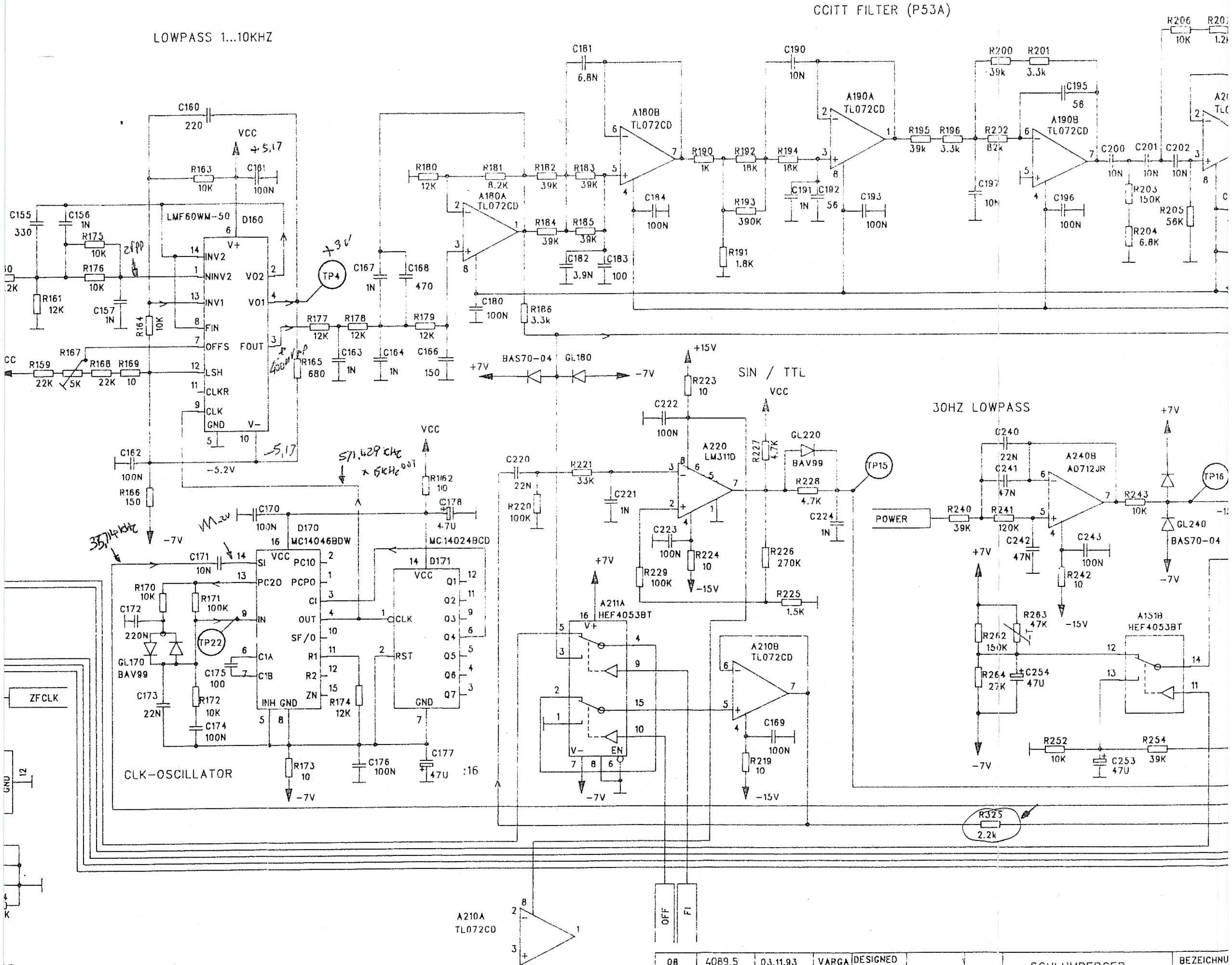
1 VON/OF 2

PROJECT/GROUP: 4015 / 229 036 S

BLATT SHEET



AMPLIFIER
X 0 / 1 / 5 / 15
14KHZ LOWPASS
DEMOD
VOLTM
RXMOD
MUX
OFF
FI
BPS
VCC
TP10
TP11
TP12
TP13
TP14
ST63-32A
ST63-28A
A211B HEF4053BT
GL100 BAS70-04
A101A AD712JR
A102A HEF4053BT
A102B HEF4053BT
A101B AD712JR
GL110 BAS70-04
A151A HEF4053BT
A120 DG441DY/4
A130 AD711KR
A140 HEF4051BT
A150 OP37G
GL150 BAS70-04
D300
D301
D302
D303
D304
D1E PC74HCT00T
PC74HCT374T
PC74HCT244T
PC74HCT4514T
DATA[0:7]
ST63-14C
ST63-14A
ST63-15C
ST63-15A
ST63-16C
ST63-16A
ST63-17C
ST63-17A
ST63-8C
ST63-12C
ST63-12A
ST63-13C
ST63-13A
SPD7
SPD6
SPD5
SPD4
SPD3
SPD2
SPD1
SPD0
SPCS5
SPA3
SPA2
SPA1
SPA0
* RESERVE
+7V
-7V
+15V
-15V
13
12
11
10
9
8

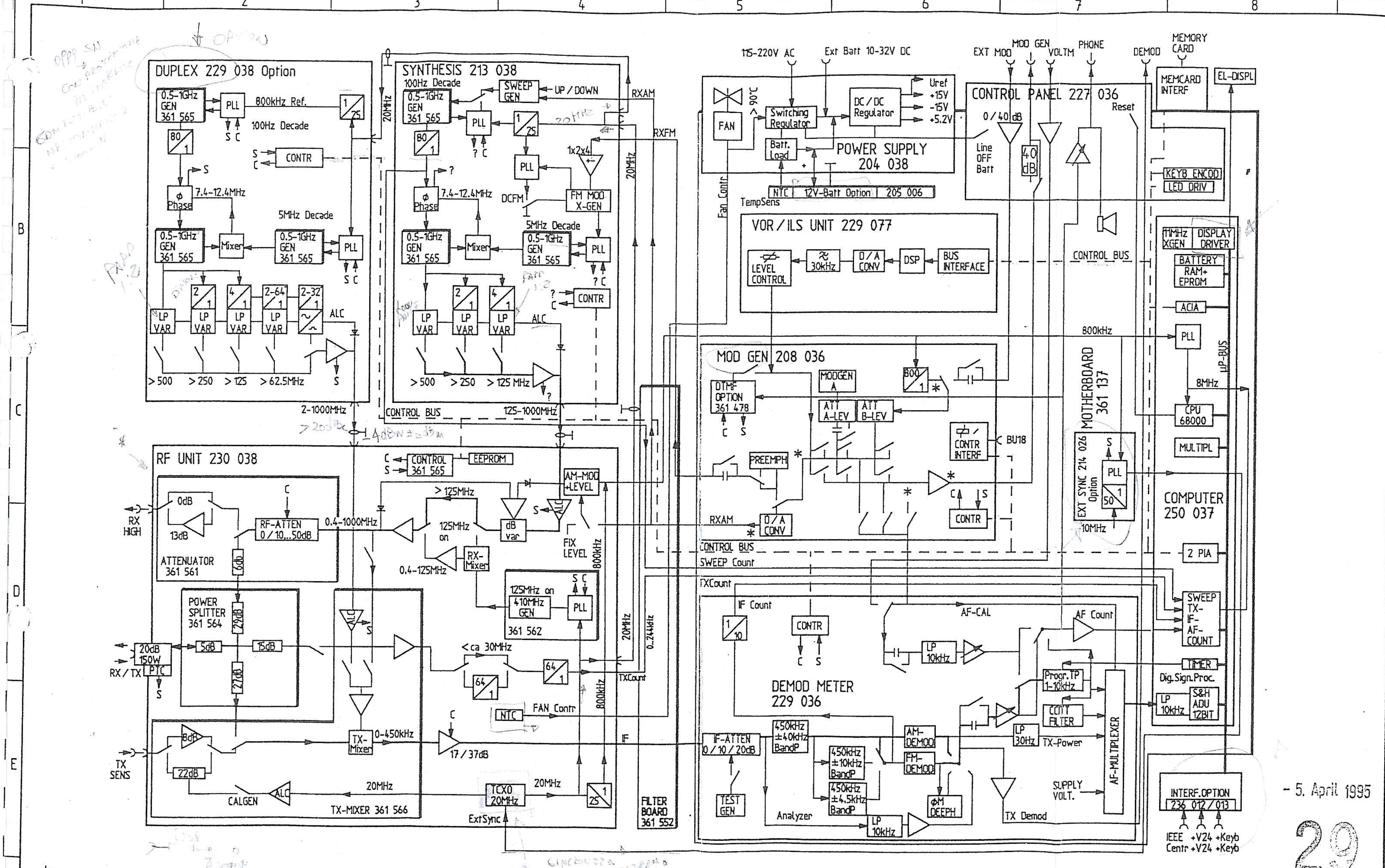


08	4089,5	03.11.93	VARGA	DESIGNED			SCHLUMBERGER TECHNOLOGIES GMBH
07	3089.11	22.06.93	VARGA	CHECKED			Gutenbergstr. 2-4
06	2089.6	26.02.92	VARGA	DRAWN	25.4.89	FLE	85737 ISMANING
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME	

BEZEICHNU

7 6 5 4

DIESE ZEICHNUNG IST UNSER EIGENTUM. VERVIELFÄLTIGUNG, UNBE



LEGEND
C = Controllines
S = Selfchecklines
* = Calibrale measurements

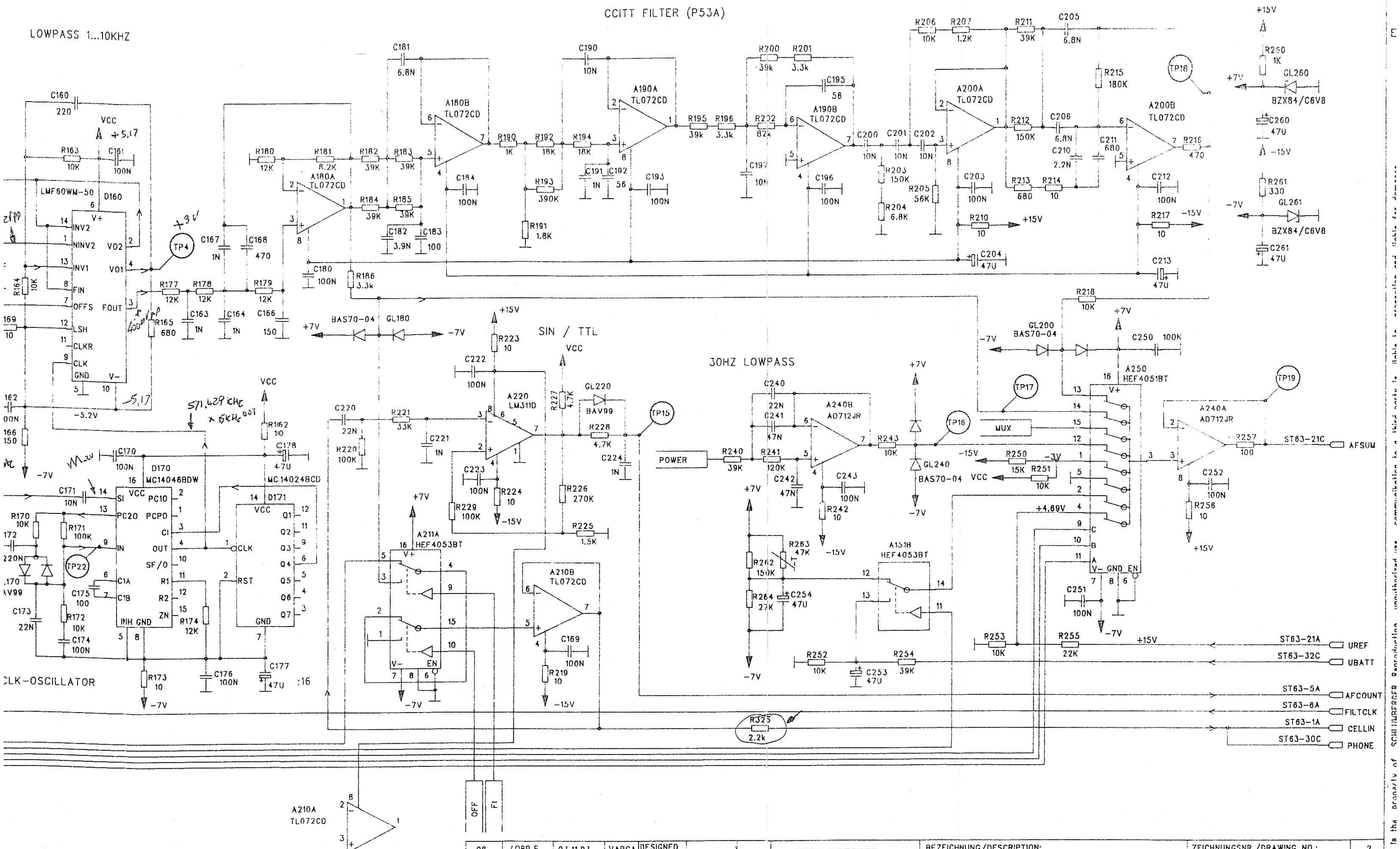
sw	BLACK	bl	BLUE
br	BROWN	vi	VIOLET
rt	RED	gr	GREY
rs	ROSE	ws	WHITE
ge	YELLOW	tr	TRANSPARENT
gn	GREEN		

				NORM.		
				GEPR.		
00	5089.3	14.03.95	Kr.	BEARB.	14.03.95	Kr.
INDEX ISS	Ä.-NR. MODIF.	DATUM DATE	NAME NAME	1995	DATUM DATE	NAME NAME

WAVETEK
Wireless Communications Division
Gutenbergstr. 2-4
85737 Ismaning

BEZEICHNUNG / DESCRIPTION:
COMMUNICATION / NAVIGATION TEST SET
BLOCKDIAGRAM

ZEICHNUNGSNR. / DRAWING NO.: 108 902 B
1/1 VON / OF
PROJEKT / GROUP: 4015 N
BLATT SHEET



08	4089,5	03.11.93	VARGA	DESIGNED			
07	3089.11	22.06.93	VARGA	CHECKED			
06	2089.6	26.02.92	VARGA	DRAWN		25.4.89	FLE
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME			DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH
Gutenbergstr. 2-4
85737 ISMANING

BEZEICHNUNG/DESCRIPTION:

DEMOD METER (AF-UNIT)

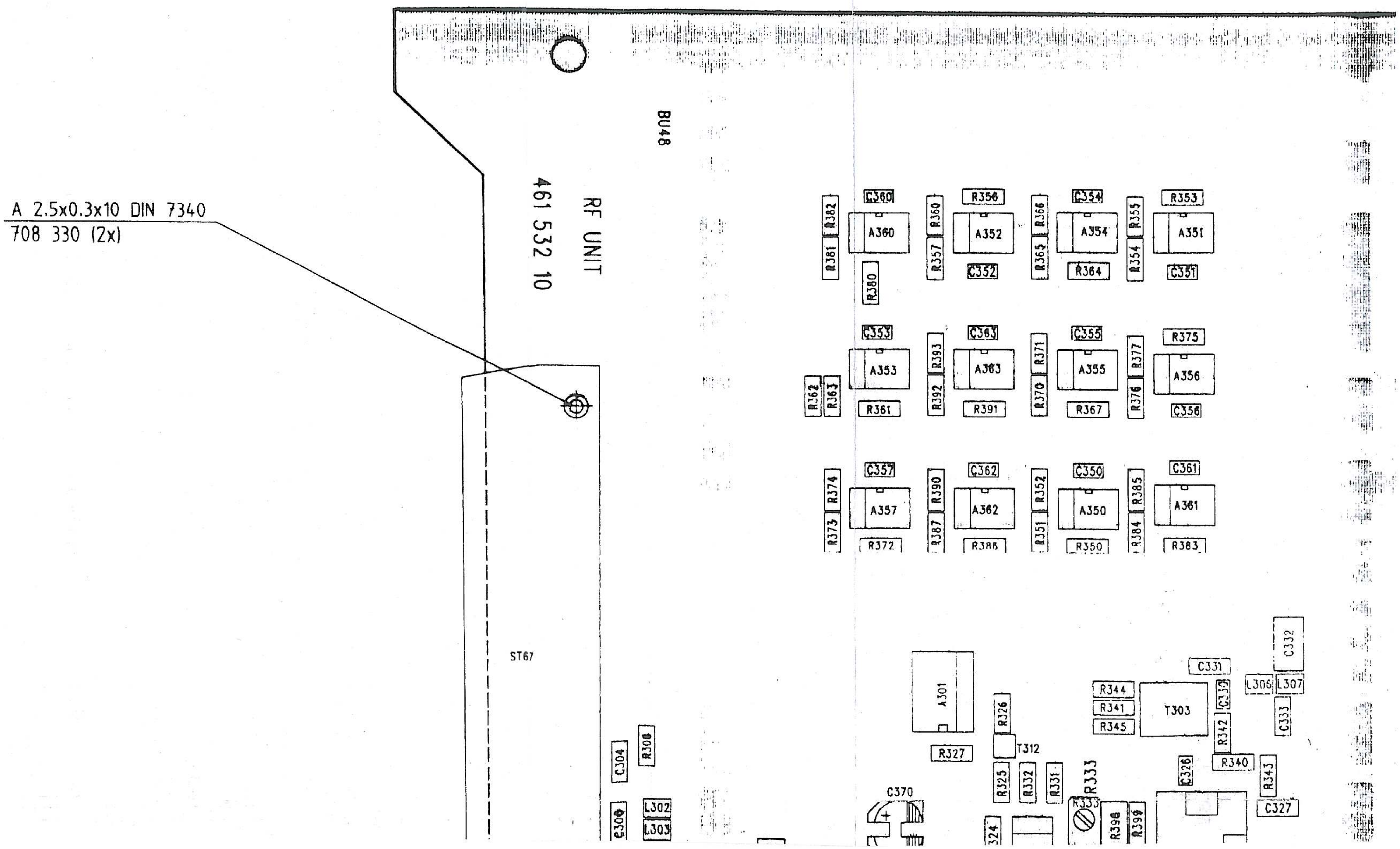
ZEICHNUNGSNR./DRAWING NO.: 361 548S

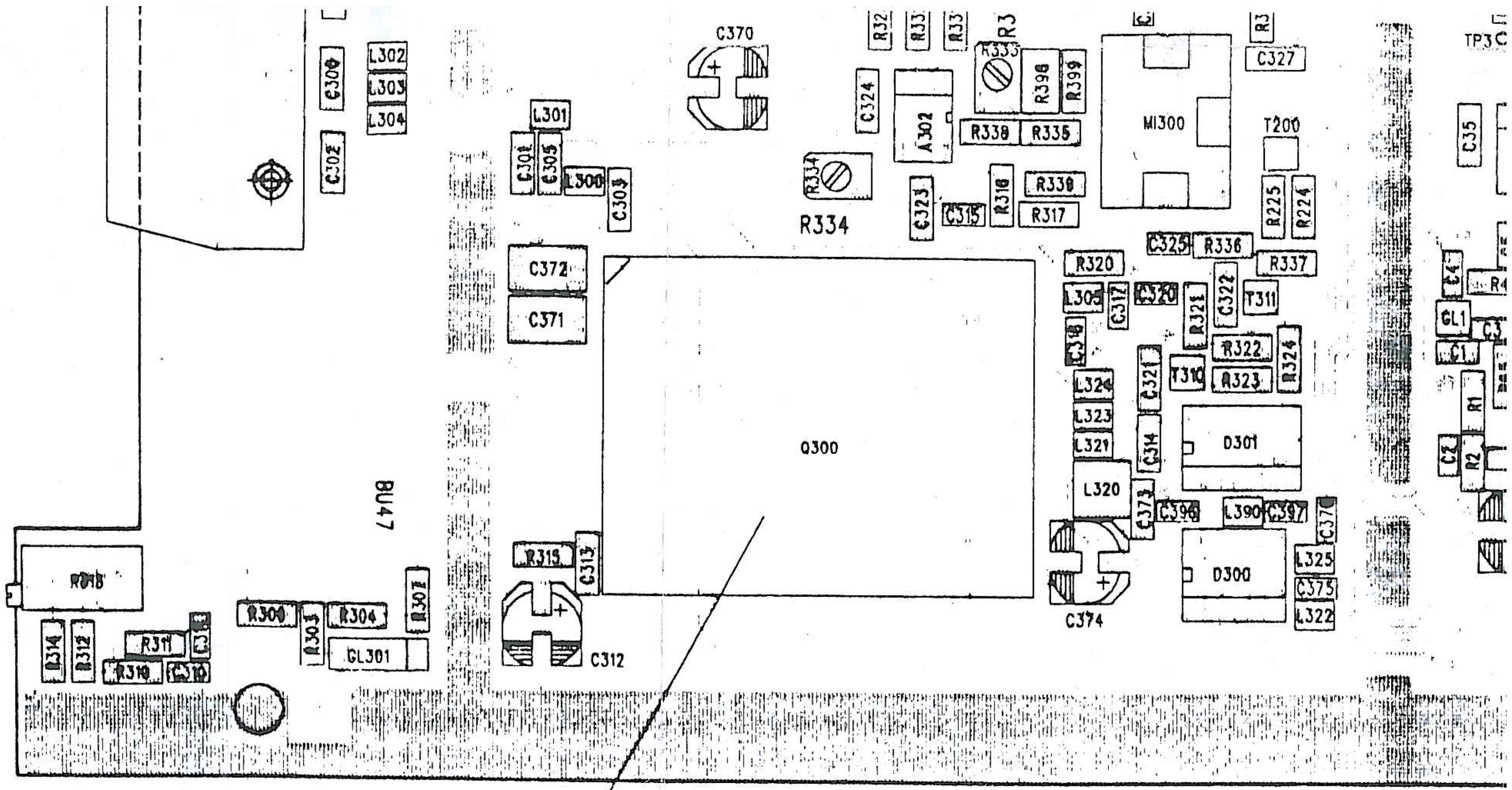
2 VON/OF 2

PROJECT/GROUP: 4015 / 229 036 S

BLATT SHEET

7 6 5 4

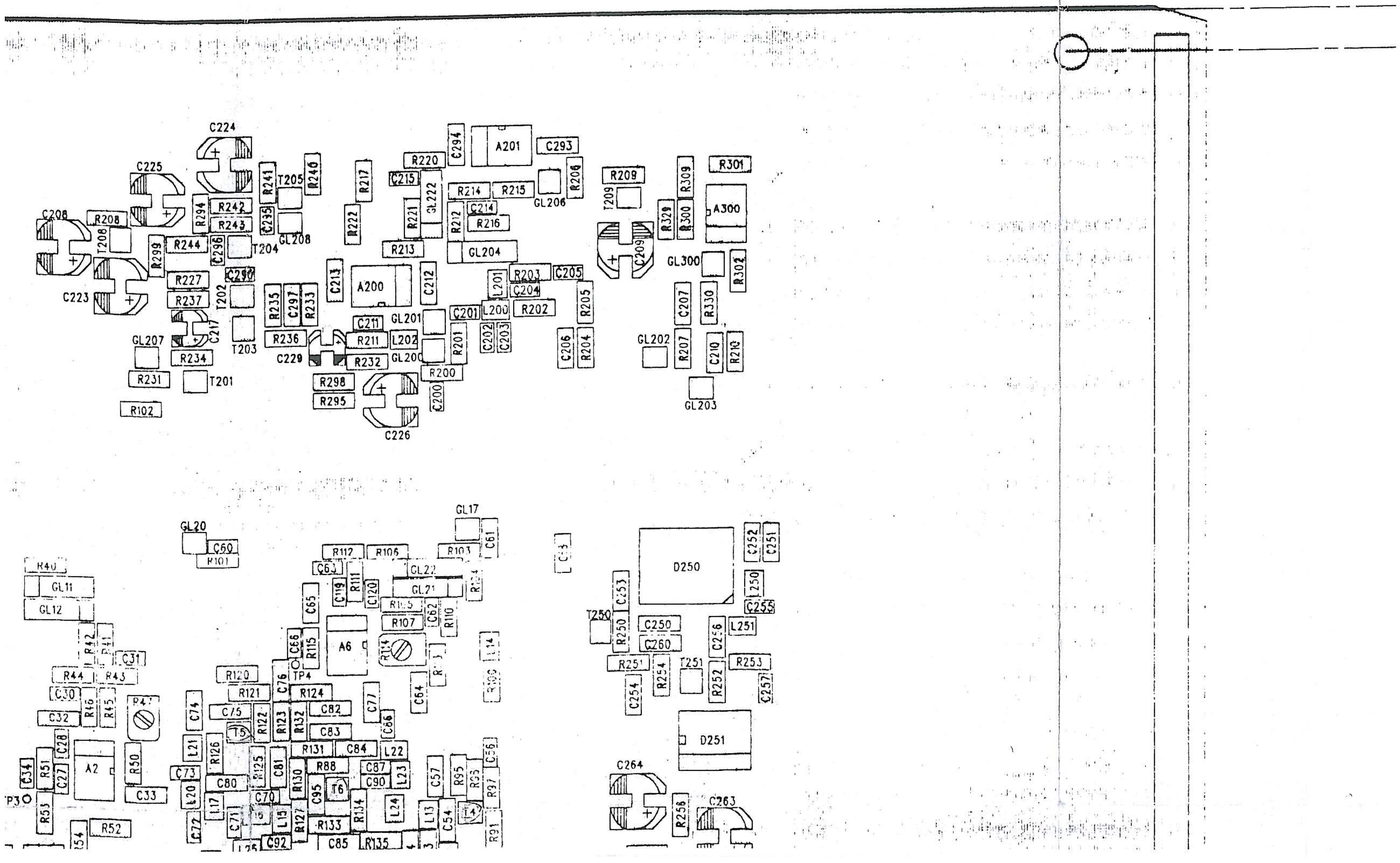

A 2.5x0.3x10 DIN 7340
708 330 (2x)
RF UNIT
461 532 10
BU48
ST67
A360
A352
A354
A351
A353
A363
A355
A356
A357
A362
A350
A361
A301
T303
T312
C370

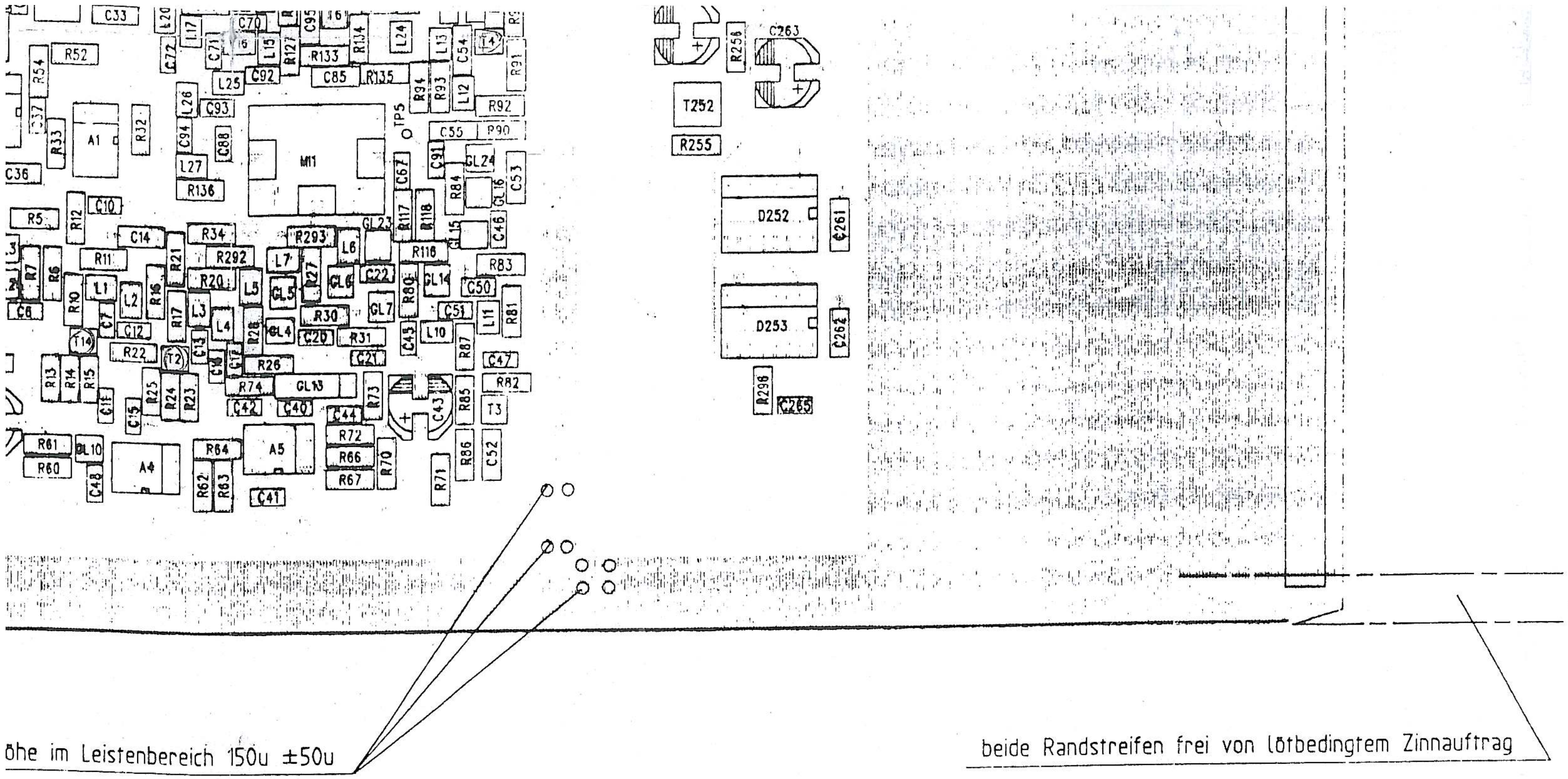


Isolierfolie 761 039 aufgeklebt (30x38)
und Anschlußbohrungen durchgestoßen

Zinnwarze

Reflow gelötet und Sonderlötung
hierzu Bauteilklebemaske 461 532 10





= Kontrollmaß
Critical measurements

Schaltplanpositionierung = 361 532 S / Sa

Rev. No.	Rev. Sht.	Date	Name
09			
08	4089.3	17.3.94	Kr.
07			
06			
05			
04			
03			
02			
01			
00			

Rohteil / Initial part:

Werkstoff / Material:

Oberfläche / Surface:

Freimaßtoleranzen / default tolerance

Scale: 2:1

DIN A1

1993	Date	Name
Drawn	7.10.93	Kr.
Designed		
Checked		

Schlumberger Technologies GmbH
Gutenbergstr. 2-4
85737 Ismaning

Bezeichnung: / Description:
Bestückte Leiterplatte
Type: RF-UNIT

Zeichnungsnr.: / Drawing No.:
361 532 cD

Gerät: / Unit: 4015 / 375 332

... Mitteilung an andere ist strafbar und schadenersatzpflichtig.

Pos.	Benennung	Wert	HNK-Nr.	Herst.
A1	OPV	TL072CD	834222	TI
A2	OPV	AD847JR	835209	ANAL
A3	OPV	AD712JR	835211	ANAL
A4	Analog Schalter	DG441DY	835336	SILI
A5	OPV	TL072CD	834222	TI
A6	Analog Schalter	DG441DY	835336	SILI
A7	Komparator	LM311D	834213	VAL
A8	FM-Demodulator	TBA229-2	835230	SIE
A9	OPV	TL072CD	834222	TI
A10	OPV	TL072CD	834222	TI
A11	Analog Schalter	DG441DY	835336	SILI
A12	OPV	AD847JR	835209	ANAL
A13	OPV	AD847JR	835209	ANAL
A100	OPV	NE5534AD	834209	VAL
A101	OPV	AD712JR	835211	ANAL
A102	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A120	Analog Schalter	DG441DY	835336	SILI
A130	OPV	AD711KR	835210	ANAL
A140	Analog De-/Multiplexer	HEF4051BT	835321	VAL
A150	Operationsverst.	OP37G	835214	PMI
A151	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A180	OPV	TL072CD	834222	TI
A190	OPV	TL072CD	834222	TI
A200	OPV	TL072CD	834222	TI
A210	OPV	TL072CD	834222	TI
A211	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A220	Komparator	LM311D	834213	VAL
A240	OPV	AD712JR	835211	ANAL
A250	Analog De-/Multiplexer	HEF4051BT	835321	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.5 Ä.Nr.	15.03.94 Datum	VARGA Name	Bestückte Leiterplatte Typ: DEMOD-METER	18
Erst.: VARGA Gepr.:				361 548 Sa	Seite Nr
Gerät: 4015 / 229 036					1

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C1	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C2	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C3	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C4	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C5	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C6	Elko	47µF ±20% 16V-	814386	RÖD
C7	Kondensator NP0	15pF ±5% 50V-	813225	VIT
C8	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C10	Kondensator NP0	180pF ±5% 50V-	813238	VIT
C11	Kondensator NP0	220pF ±5% 50V-	813239	VIT
C12	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C13	Kondensator NP0	220pF ±5% 50V-	813239	VIT
C14	Kondensator NP0	220pF ±5% 50V-	813239	VIT
C15	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C16	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C17	Kondensator NP0	150pF ±1% 50V-	813437	VIT
C18	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C19	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C20	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C21	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C22	Kondensator NP0	220pF ±5% 50V-	813239	VIT
C23	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C24	Kondensator NP0	15pF ±5% 50V-	813225	VIT
C25	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C26	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C27	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C28	Elko	47µF ±20% 16V-	814386	RÖD
C29	Elko	47µF ±20% 16V-	814386	RÖD

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C30	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C31	Kondensator NP0	2.2nF ±1% 50V-	813451	VIT
C32	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C33	Kondensator NP0	150pF ±1% 50V-	813437	VIT
C34	Elko	47μF ±20% 16V-	814386	RÖD
C35	Elko	47μF ±20% 16V-	814386	RÖD
C36	Kondensator Z5U	1μF ±20% 50V-	813390	VIT
C37	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C38	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C39	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C40	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C41	Elko	47μF ±20% 16V-	814386	RÖD
C42	Elko	47μF ±20% 16V-	814386	RÖD
C43	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C44	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C45	Kondensator X7R	4.7nF ±10% 50V-	813328	VIT
C46	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C47	Kondensator NP0	2.2nF ±1% 50V-	813451	VIT
C48	Kondensator X7R	4.7nF ±10% 50V-	813328	VIT
C49	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C50	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C51	Kondensator NP0	150pF ±1% 50V-	813437	VIT
C52	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C53	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C54	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C55	Elko	47μF ±20% 16V-	814386	RÖD
C56	Elko	47μF ±20% 16V-	814386	RÖD
C60	Trimm-Kondensator	0.8/4.0pF 100V-	817150	STET
C61	Kondensator NP0	33pF ±5% 50V-	813229	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C63	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C64	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C65	Kondensator NP0	150pF ±5% 50V-	813237	VIT
C66	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C67	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C68	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C69	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C70	Kondensator NP0	2.2nF ±1% 50V-	813451	VIT
C71	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C72	Kondensator NP0	150pF ±1% 50V-	813437	VIT
C73	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C74	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C75	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C76	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C77	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C78	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C79	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C80	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C81	Kondensator NP0	4.7nF ±1% 50V-	813455	VIT
C82	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C83	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C84	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C85	Elko	47µF ±20% 16V-	814386	RÖD
C86	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C87	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C88	Elko	47µF ±20% 16V-	814386	RÖD
C89	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C90	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C91	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C92	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C93	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C94	Kondensator NP0	6.8pF ±0.5pF	813221	VIT
C95	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C96	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C97	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C98	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C99	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C100	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C101	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C102	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C103	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C104	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C105	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C106	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C107	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C108	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C120	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C121	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C122	Elko	47µF ±20% 16V-	814386	RÖD
C123	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C124	Elko	47µF ±20% 16V-	814386	RÖD
C125	Kondensator Z5U	1µF ±20% 50V-	813390	VIT
C126	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C127	Kondensator NP0	2.2nF ±1% 50V-	813451	VIT
C130	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C131	Kondensator NP0	150pF ±1% 50V-	813437	VIT
C132	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C140	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C141	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C150	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C152	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C153	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C154	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C155	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C156	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C157	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C160	Kondensator NP0	220pF ±5% 50V-	813239	VIT
C161	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C162	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C163	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C164	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C166	Kondensator NP0	150pF ±5% 50V-	813237	VIT
C167	Kondensator NP0	1nF ±1% 50V-	813447	VIT
C168	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C169	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C170	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C171	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C172	Kondensator X7R	220nF ±10% 50V-	813379	VIT
C173	Kondensator X7R	22nF ±10% 50V-	813336	VIT
C174	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C175	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C176	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C177	Elko	47µF ±20% 16V-	814386	RÖD
C178	Elko	47µF ±20% 16V-	814386	RÖD
C180	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C181	Kondensator NP0	6.8nF ±1% 50V-	813457	VIT
C182	Kondensator NP0	3.9nF ±1% 50V-	813454	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C183	Kondensator NPO	100pF ±5% 50V-	813235	VIT
C184	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C190	Kondensator NPO	10nF ±1% 50V-	813459	VIT
C191	Kondensator NPO	1nF ±1% 50V-	813447	VIT
C192	Kondensator NPO	56pF ±5% 50V-	813232	VIT
C193	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C195	Kondensator NPO	56pF ±5% 50V-	813232	VIT
C196	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C197	Kondensator NPO	10nF ±1% 50V-	813459	VIT
C200	Kondensator NPO	10nF ±1% 50V-	813459	VIT
C201	Kondensator NPO	10nF ±1% 50V-	813459	VIT
C202	Kondensator NPO	10nF ±1% 50V-	813459	VIT
C203	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C204	Elko	47µF ±20% 16V-	814386	RÖD
C205	Kondensator NPO	6.8nF ±1% 50V-	813457	VIT
C206	Kondensator NPO	6.8nF ±1% 50V-	813457	VIT
C210	Kondensator NPO	2.2nF ±1% 50V-	813451	VIT
C211	Kondensator NPO	680pF ±1% 50V-	813445	VIT
C212	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C213	Elko	47µF ±20% 16V-	814386	RÖD
C220	Kondensator X7R	22nF ±10% 50V-	813336	VIT
C221	Kondensator NPO	1nF ±1% 50V-	813447	VIT
C222	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C223	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C224	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C240	Kondensator X7R	22nF ±10% 50V-	813336	VIT
C241	MKT-Chip-Kondensator	47nF ±10% 50V-	812601	WIMA
C242	MKT-Chip-Kondensator	47nF ±10% 50V-	812601	WIMA
C243	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C250	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C251	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C252	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C253	Elko	47µF ±20% 16V-	814386	RÖD
C254	Elko	47µF ±20% 16V-	814386	RÖD
C260	Elko	47µF ±20% 16V-	814386	RÖD
C261	Elko	47µF ±20% 16V-	814386	RÖD
C300	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C301	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C302	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C303	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C304	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C305	Kondensator X7R	100nF ±10% 50V-	813375	VIT
D1	NAND-Gatter	PC74HCT00T	834430	VAL
D2	Decade Counter	PC74HCT390T	834438	VAL
D12	8 Bit Latch	PC74HCT374T	834437	VAL
D160	Switched Capacitor Filter	LMF60CIWM-50	835250	NS
D170	PLL / VCO	MC14046BDW	835318	MOT
D171	Binary Counter	MC14024BCD	835358	MOT
D300	8 Bit Latch	PC74HCT374T	834437	VAL
D301	Buffer	PC74HCT244T	834436	VAL
D302	8 Bit Latch	PC74HCT374T	834437	VAL
D303	4:16 Decoder	PC74HCT4514T	834443	VAL
D304	8 Bit Latch	PC74HCT374T	834437	VAL
FI1	Keramik-Filter 450kHz	SFG450D	853201	MURATA
FI2	Keramik-Filter 450kHZ	CFW450G	853202	MURATA
FI3	Keramik-Filter 450kHz	SFG450D	853201	MURATA

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.5 Ä.Nr.	15.03.94 Datum	VARGA Name	Bestückte Leiterplatte Typ: DEMOD-METER	18
Erst.: VARGA Gepr.:				361 548 Sa	Seite Nr
Gerät: 4015 / 229 036					8

Pos.	Benennung	Wert	HNK-Nr.	Herst.
GL1	Diode	BAV99	830491	VAL
GL40	Schottky-Diode	BAS70-04	830031	SIE
GL41	Schottky-Diode	BAS70-04	830031	SIE
GL100	Schottky-Diode	BAS70-04	830031	SIE
GL110	Schottky-Diode	BAS70-04	830031	SIE
GL150	Schottky-Diode	BAS70-04	830031	SIE
GL170	Diode	BAV99	830491	VAL
GL180	Schottky-Diode	BAS70-04	830031	SIE
GL200	Schottky-Diode	BAS70-04	830031	SIE
GL220	Diode	BAV99	830491	VAL
GL240	Schottky-Diode	BAS70-04	830031	SIE
GL260	Zener-Diode	BZX84/C6V8	830494	VAL
GL261	Zener-Diode	BZX84/C6V8	830494	VAL
GL262	Zener-Diode	BZX84/C5V6	830495	VAL
GL263	Zener-Diode	BZX84/C5V6	830495	VAL
L1	abgleichb. Chip-Spule 5CD	350µH (1018)	821621	COMP
L2	abgleichb. Chip-Spule 5CD	80µH (1019)	821622	COMP
L3	abgleichb. Chip-Spule 5CD	80µH (1019)	821622	COMP
L4	abgleichb. Chip-Spule 5CD	690µH (1076)	821620	COMP
P1	IC-Sockel	20polig	834960	AMP
R1	Chip-Widerstand	220Ω ±1%	804729	VAL
R2	Chip-Widerstand	680Ω ±1%	804735	VAL
R3	Chip-Widerstand	10kΩ ±1%	804749	VAL
R4	Chip-Widerstand	100Ω ±1%	804725	VAL
R5	Chip-Widerstand	10kΩ ±1%	804749	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R6	Chip-Widerstand	220Ω ±1%	804729	VAL
R7	Chip-Widerstand	100Ω ±1%	804725	VAL
R8	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R9	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R10	Potentiometer	200Ω ±25%	807735	BOURNS
R11	Chip-Widerstand	680Ω ±1%	804735	VAL
R12	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R13	Chip-Widerstand	82kΩ ±1%	804760	VAL
R14	Chip-Widerstand	56Ω ±5%	804722	VAL
R15	Chip-Widerstand	1.2kΩ ±1%	804738	VAL
R16	Chip-Widerstand	100Ω ±1%	804725	VAL
R17	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R18	Chip-Widerstand	10kΩ ±1%	804749	VAL
R19	Chip-Widerstand	10kΩ ±1%	804749	VAL
R20	Chip-Widerstand	6.8kΩ ±1%	804747	VAL
R21	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R22	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R23	Chip-Widerstand	330Ω ±1%	804731	VAL
R24	Chip-Widerstand	100Ω ±1%	804725	VAL
R25	Chip-Widerstand	100Ω ±1%	804725	VAL
R26	Chip-Widerstand	1kΩ ±1%	804737	VAL
R27	Chip-Widerstand	1kΩ ±1%	804737	VAL
R28	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R29	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R30	Chip-Widerstand	15kΩ ±1%	804751	VAL
R31	Chip-Widerstand	15kΩ ±1%	804751	VAL
R32	Chip-Widerstand	15kΩ ±1%	804751	VAL
R33	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R34	Chip-Widerstand	150kΩ ±1%	804763	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R35	Chip-Widerstand	100Ω ±1%	804725	VAL
R36	Chip-Widerstand	100Ω ±1%	804725	VAL
R37	Chip-Widerstand	10Ω ±5%	804713	VAL
R38	Chip-Widerstand	10Ω ±5%	804713	VAL
R39	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R40	Chip-Widerstand	470kΩ ±1%	804769	VAL
R41	Chip-Widerstand	12Ω ±5%	804714	VAL
R42	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R43	Chip-Widerstand	10Ω ±5%	804713	VAL
R44	Chip-Widerstand	10Ω ±5%	804713	VAL
R45	Chip-Widerstand	15kΩ ±1%	804751	VAL
R46	Potentiometer	10kΩ ±25%	807740	BOURNS
R47	Chip-Widerstand	10kΩ ±1%	804749	VAL
R48	Chip-Widerstand	12kΩ ±1%	804750	VAL
R49	Chip-Widerstand	12kΩ ±1%	804750	VAL
R50	Chip-Widerstand	15kΩ ±1%	804751	VAL
R51	Chip-Widerstand	15kΩ ±1%	804751	VAL
R52	Chip-Widerstand	15kΩ ±1%	804751	VAL
R53	Chip-Widerstand	10Ω ±5%	804713	VAL
R54	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R55	Chip-Widerstand	10Ω ±5%	804713	VAL
R56	Chip-Widerstand	10Ω ±5%	804713	VAL
R57	Chip-Widerstand	10Ω ±5%	804713	VAL
R58	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R59	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R60	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R61	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R62	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R63	Chip-Widerstand	10Ω ±5%	804713	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R64	Chip-Widerstand	10Ω ±5%	804713	VAL
R65	Chip-Widerstand	3.9kΩ ±1%	804744	VAL
R66	Chip-Widerstand	100Ω ±1%	804725	VAL
R67	Chip-Widerstand	15kΩ ±1%	804751	VAL
R68	Chip-Widerstand	100kΩ ±1%	804761	VAL
R69	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R70	Chip-Widerstand	15kΩ ±1%	804751	VAL
R71	Chip-Widerstand	15kΩ ±1%	804751	VAL
R72	Chip-Widerstand	15kΩ ±1%	804751	VAL
R73	Chip-Widerstand	12kΩ ±1%	804750	VAL
R74	Chip-Widerstand	15kΩ ±1%	804751	VAL
R75	Chip-Widerstand	15kΩ ±1%	804751	VAL
R76	Chip-Widerstand	10kΩ ±1%	804749	VAL
R77	Chip-Widerstand	12kΩ ±1%	804750	VAL
R78	Chip-Widerstand	680Ω ±1%	804735	VAL
R79	Heißleiter	2.2kΩ ±20%	805040	SIE
R80	Potentiometer	5kΩ ±25%	807739	BOURNS
R81	Chip-Widerstand	10kΩ ±1%	804749	VAL
R82	Chip-Widerstand	150kΩ ±1%	804763	VAL
R83	Chip-Widerstand	470kΩ ±1%	804769	VAL
R84	Chip-Widerstand	150kΩ ±1%	804763	VAL
R85	Chip-Widerstand	560kΩ ±1%	804770	VAL
R86	Chip-Widerstand	10kΩ ±1%	804749	VAL
R87	Chip-Widerstand	10kΩ ±1%	804749	VAL
R88	Chip-Widerstand	10Ω ±5%	804713	VAL
R89	Chip-Widerstand	10Ω ±5%	804713	VAL
R90	Chip-Widerstand	470Ω ±1%	804733	VAL
R91	Chip-Widerstand	470Ω ±1%	804733	VAL
R92	Chip-Widerstand	470Ω ±1%	804733	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.5 Ä.Nr.	15.03.94 Datum	VARGA Name	Bestückte Leiterplatte Typ: DEMOD-METER	18
Erst.: VARGA	Gepr.:			361 548 Sa	Seite Nr
Gerät: 4015 / 229 036					12

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R93	Chip-Widerstand	1kΩ ±1%	804737	VAL
R94	Chip-Widerstand	100kΩ ±1%	804761	VAL
R95	Chip-Widerstand	100kΩ ±1%	804761	VAL
R96	Chip-Widerstand	6.8kΩ ±1%	804747	VAL
R97	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R98	Chip-Widerstand	1kΩ ±1%	804737	VAL
R99	Chip-Widerstand	100Ω ±1%	804725	VAL
R100	Chip-Widerstand	22kΩ ±1%	804753	VAL
R101	Chip-Widerstand	22kΩ ±1%	804753	VAL
R102	Chip-Widerstand	10kΩ ±1%	804749	VAL
R103	Chip-Widerstand	220Ω ±1%	804729	VAL
R104	Chip-Widerstand	1kΩ ±1%	804737	VAL
R105	Chip-Widerstand	10Ω ±5%	804713	VAL
R106	Chip-Widerstand	150kΩ ±1%	804763	VAL
R107	Chip-Widerstand	100kΩ ±1%	804761	VAL
R108	Chip-Widerstand	56kΩ ±1%	804758	VAL
R110	Chip-Widerstand	100kΩ ±1%	804761	VAL
R111	Chip-Widerstand	10kΩ ±1%	804749	VAL
R112	Chip-Widerstand	10kΩ ±1%	804749	VAL
R113	Chip-Widerstand	10kΩ ±1%	804749	VAL
R114	Chip-Widerstand	10kΩ ±1%	804749	VAL
R115	Chip-Widerstand	10Ω ±5%	804713	VAL
R116	Chip-Widerstand	470Ω ±1%	804733	VAL
R117	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R118	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R120	Chip-Widerstand	10Ω ±5%	804713	VAL
R121	Chip-Widerstand	47Ω ±5%	804721	VAL
R122	Chip-Widerstand	10kΩ ±1%	804749	VAL
R123	Chip-Widerstand	10kΩ ±1%	804749	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R124	Chip-Widerstand	10kΩ ±1%	804749	VAL
R125	Chip-Widerstand	15kΩ ±1%	804751	VAL
R126	Chip-Widerstand	15kΩ ±1%	804751	VAL
R127	Chip-Widerstand	10Ω ±5%	804713	VAL
R130	Chip-Widerstand	1kΩ ±1%	804737	VAL
R131	Chip-Widerstand	1kΩ ±1%	804737	VAL
R132	Chip-Widerstand	1kΩ ±1%	804737	VAL
R133	Chip-Widerstand	1kΩ ±1%	804737	VAL
R134	Chip-Widerstand	1kΩ ±1%	804737	VAL
R135	Chip-Widerstand	1kΩ ±1%	804737	VAL
R136	Chip-Widerstand	1kΩ ±1%	804737	VAL
R137	Chip-Widerstand	1kΩ ±1%	804737	VAL
R140	Chip-Widerstand	1kΩ ±1%	804737	VAL
R141	Chip-Widerstand	1kΩ ±1%	804737	VAL
R142	Chip-Widerstand	1kΩ ±1%	804737	VAL
R143	Chip-Widerstand	1kΩ ±1%	804737	VAL
R144	Chip-Widerstand	1kΩ ±1%	804737	VAL
R145	Chip-Widerstand	1kΩ ±1%	804737	VAL
R146	Chip-Widerstand	1kΩ ±1%	804737	VAL
R147	Chip-Widerstand	1kΩ ±1%	804737	VAL
R150	Chip-Widerstand	1kΩ ±1%	804737	VAL
R151	Chip-Widerstand	1kΩ ±1%	804737	VAL
R152	Chip-Widerstand	1kΩ ±1%	804737	VAL
R153	Chip-Widerstand	1kΩ ±1%	804737	VAL
R154	Chip-Widerstand	1kΩ ±1%	804737	VAL
R155	Chip-Widerstand	1kΩ ±1%	804737	VAL
R156	Chip-Widerstand	100kΩ ±1%	804761	VAL
R157	Chip-Widerstand	27kΩ ±1%	804754	VAL
R158	Chip-Widerstand	470Ω ±1%	804733	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R159	Chip-Widerstand	22kΩ ±1%	804753	VAL
R160	Chip-Widerstand	8.2kΩ ±1%	804748	VAL
R161	Chip-Widerstand	12kΩ ±1%	804750	VAL
R162	Chip-Widerstand	10Ω ±5%	804713	VAL
R163	Chip-Widerstand	10kΩ ±1%	804749	VAL
R164	Chip-Widerstand	10kΩ ±1%	804749	VAL
R165	Chip-Widerstand	680Ω ±1%	804735	VAL
R166	Chip-Widerstand	150Ω ±1%	804727	VAL
R167	Potentiometer	5kΩ ±25%	807739	BOURNS
R168	Chip-Widerstand	22kΩ ±1%	804753	VAL
R169	Chip-Widerstand	10Ω ±5%	804713	VAL
R170	Chip-Widerstand	10kΩ ±1%	804749	VAL
R171	Chip-Widerstand	100kΩ ±1%	804761	VAL
R172	Chip-Widerstand	10kΩ ±1%	804749	VAL
R173	Chip-Widerstand	10Ω ±5%	804713	VAL
R174	Chip-Widerstand	12kΩ ±1%	804750	VAL
R175	Chip-Widerstand	10kΩ ±1%	804749	VAL
R176	Chip-Widerstand	10kΩ ±1%	804749	VAL
R177	Chip-Widerstand	12kΩ ±1%	804750	VAL
R178	Chip-Widerstand	12kΩ ±1%	804750	VAL
R179	Chip-Widerstand	12kΩ ±1%	804750	VAL
R180	Chip-Widerstand	12kΩ ±1%	804750	VAL
R181	Chip-Widerstand	8.2kΩ ±1%	804748	VAL
R182	Chip-Widerstand	39kΩ ±1%	804756	VAL
R183	Chip-Widerstand	39kΩ ±1%	804756	VAL
R184	Chip-Widerstand	39kΩ ±1%	804756	VAL
R185	Chip-Widerstand	39kΩ ±1%	804756	VAL
R186	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R190	Chip-Widerstand	1kΩ ±1%	804737	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R226	Chip-Widerstand	270kΩ ±1%	804766	VAL
R227	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R228	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R229	Chip-Widerstand	100kΩ ±1%	804761	VAL
R240	Chip-Widerstand	39kΩ ±1%	804756	VAL
R241	Chip-Widerstand	120kΩ ±1%	804762	VAL
R242	Chip-Widerstand	10Ω ±5%	804713	VAL
R243	Chip-Widerstand	10kΩ ±1%	804749	VAL
R250	Chip-Widerstand	15kΩ ±1%	804751	VAL
R251	Chip-Widerstand	10kΩ ±1%	804749	VAL
R252	Chip-Widerstand	10kΩ ±1%	804749	VAL
R253	Chip-Widerstand	10kΩ ±1%	804749	VAL
R254	Chip-Widerstand	39kΩ ±1%	804756	VAL
R255	Chip-Widerstand	22kΩ ±1%	804753	VAL
R256	Chip-Widerstand	10Ω ±5%	804713	VAL
R257	Chip-Widerstand	100Ω ±1%	804725	VAL
R260	Chip-Widerstand	1kΩ ±1%	804737	VAL
R261	Chip-Widerstand	330Ω ±1%	804731	VAL
R262	Chip-Widerstand	150kΩ ±1%	804763	VAL
R263	Heißleiter	47kΩ ±20%	805022	SIE
R264	Chip-Widerstand	27kΩ ±1%	804754	VAL
R300	Chip-Widerstand	10kΩ ±1%	804749	VAL
R301	Chip-Widerstand	10kΩ ±1%	804749	VAL
R302	Chip-Widerstand	10kΩ ±1%	804749	VAL
R303	Chip-Widerstand	10kΩ ±1%	804749	VAL
R304	Chip-Widerstand	10kΩ ±1%	804749	VAL
R305	Chip-Widerstand	10kΩ ±1%	804749	VAL
R306	Chip-Widerstand	10kΩ ±1%	804749	VAL
R307	Chip-Widerstand	10kΩ ±1%	804749	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R191	Chip-Widerstand	1.8kΩ ±1%	804740	VAL
R192	Chip-Widerstand	18kΩ ±1%	804752	VAL
R193	Chip-Widerstand	390kΩ ±1%	804768	VAL
R194	Chip-Widerstand	18kΩ ±1%	804752	VAL
R195	Chip-Widerstand	39kΩ ±1%	804756	VAL
R196	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R200	Chip-Widerstand	39kΩ ±1%	804756	VAL
R201	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R202	Chip-Widerstand	82kΩ ±1%	804760	VAL
R203	Chip-Widerstand	150kΩ ±1%	804763	VAL
R204	Chip-Widerstand	6.8kΩ ±1%	804747	VAL
R205	Chip-Widerstand	56kΩ ±1%	804758	VAL
R206	Chip-Widerstand	10kΩ ±1%	804749	VAL
R207	Chip-Widerstand	1.2kΩ ±1%	804738	VAL
R210	Chip-Widerstand	10Ω ±5%	804713	VAL
R211	Chip-Widerstand	39kΩ ±1%	804756	VAL
R212	Chip-Widerstand	150kΩ ±1%	804763	VAL
R213	Chip-Widerstand	680Ω ±1%	804735	VAL
R214	Chip-Widerstand	10Ω ±5%	804713	VAL
R215	Chip-Widerstand	180kΩ ±1%	804764	VAL
R216	Chip-Widerstand	470Ω ±1%	804733	VAL
R217	Chip-Widerstand	10Ω ±5%	804713	VAL
R218	Chip-Widerstand	10kΩ ±1%	804749	VAL
R219	Chip-Widerstand	10Ω ±5%	804713	VAL
R220	Chip-Widerstand	100kΩ ±1%	804761	VAL
R221	Chip-Widerstand	33kΩ ±1%	804755	VAL
R223	Chip-Widerstand	10Ω ±5%	804713	VAL
R224	Chip-Widerstand	10Ω ±5%	804713	VAL
R225	Chip-Widerstand	1.5kΩ ±1%	804739	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R310	Chip-Widerstand	100kΩ ±1%	804761	VAL
R311	Chip-Widerstand	100kΩ ±1%	804761	VAL
R312	Chip-Widerstand	100kΩ ±1%	804761	VAL
R313	Chip-Widerstand	100kΩ ±1%	804761	VAL
R314	Chip-Widerstand	100kΩ ±1%	804761	VAL
R315	Chip-Widerstand	100kΩ ±1%	804761	VAL
R316	Chip-Widerstand	100kΩ ±1%	804761	VAL
R317	Chip-Widerstand	100kΩ ±1%	804761	VAL
R320	Chip-Widerstand	100kΩ ±1%	804761	VAL
R321	Chip-Widerstand	100kΩ ±1%	804761	VAL
R322	Chip-Widerstand	100kΩ ±1%	804761	VAL
R323	Chip-Widerstand	100kΩ ±1%	804761	VAL
R324	Chip-Widerstand	100kΩ ±1%	804761	VAL
R325	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
ST63	Messerleiste DIN 41612	64polig a/c	884517	ERNI
T1	N-Kanal SIPMOS	BSS138	832439	SIE
T2	N-Kanal SIPMOS	BSS138	832439	SIE
T3	NPN Transistor	BFS19	832286	VAL
T4	NPN Transistor	BFS19	832286	VAL
T5	NPN Transistor	BFS19	832286	VAL
T6	PNP Transistor	BCV26	832294	SIE
T7	NPN Transistor	BCV27	832295	SIE

K

On the circuit board of the modulation generator there are AF generator A, 1-kHz generator B with an input for external modulation, the input for connecting the Data Module, the summing and output amplifier for TX mode, the summing amplifier for RX mode, the AM RF level control and the preemphasis network. The signals of generator A, of the Data Module, of generator B or an external signal can be superimposed on the summing amplifiers.

Modulation Generator A (sinewave generator)

Modulation generator A consists of a digital synthesizer (gate array), in which the signal is first conditioned with crystal accuracy in digital form. A processor determines the binary "hit values" for the sinewave/time function that is to be generated.

A sinusoidal oscillation is then produced from the binary hit values by a digital/analog converter.

Gate array GA1 on the circuit board includes a phase accumulator, latches (µP-compatible 8-bit bus) and a switchable frequency divider for the system clock.

Phase Accumulator

The phase accumulator is fed the numeric value of the frequency setting as increment I. With each clock pulse from the divided oscillator frequency the output is incremented by the value I.

Once the range of values of the accumulator is exhausted, the output jumps back to 0...I and the process starts afresh. In this way a numeric sequence is produced with a sawtooth-shaped characteristic. The slope of the sawtooth and thus its frequency are determined on the one hand by the increment I from the µP and on the other by the switchable frequency divider.

D\A Conversion (sine table)

The digital sawtooth generated in the phase accumulator is converted by EPROM P1 into a digital sinewave equivalent. The IC contains a sine table for the range 0-360° with 8 bits amplitude resolution. The data are taken to a digital/analog converter on whose output a finely graduated, staircase-shaped sinusoidal voltage appears with the required frequency and constant amplitude.

Electronic Attenuator (level control)

The voltage on the interface between the generator and attenuator is approx. 10 V_{pp}. The attenuator consists of a fine divider 0-4096. This fine divider is designed as a multiplying binary 12-bit digital/analog converter. This produces high resolution even at small voltages.

Frequency Bands

The generator has two frequency bands for selection:
0 Hz to 3 kHz with resolution of 0.1 Hz,
0 Hz to 30 kHz with resolution of 1 Hz.
They are produced by switchable division of the crystal clock frequency.

1-kHz Generator B

By division of the 1-MHz system clock by 1000, a 1-kHz squarewave signal is produced. To obtain a signal of precise amplitude, a multiplexer (FET switch) is driven with the 1-kHz that switches between 5 V reference voltage and ground. A follow-up 1-kHz lowpass filters the 1-kHz sinusoidal signal out of the squarewave signal. Before the following level control, either the 1-kHz signal or an external AF signal (eg microphone) can be fed in by a FET switch. The level control is again a 12-bit D/A converter.

Output Amplifier

For RX and TX mode there is in each case a separate output amplifier.

TX Mode

The voltages of the two modulation generators A and B as well as an external modulation voltage can be added with the aid of signal switches by an operational amplifier. This makes dual modulation possible. Following this there are two transistors as boosters for high output currents.

RX Mode

Here too, the voltages of the two modulation generators and an external modulation voltage can be added with the aid of signal switches by an operational amplifier.

AM modulation: the RX voltage, added to a DC voltage (10-V reference), produces the signal for AM modulation. In the AM RF level control there is an electronic attenuator that will set the RF level even without modulation.

ΦM modulation: the preemphasis network permits the generation of phase modulation by an FM modulator.

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	The stated tolerances are only valid after calibration. Without calibration (instrument defective) the measured values are only for reference.				
	Supply voltages				
DVM	Auxiliary supply (±7 V)	C100	DC		+6.8 V ±0.4 V
Oscilloscope			AC		≤ 10 mV
Counter		C101	DC		-6.8 V ±0.4 V
			AC		≤ 10 mV
	Reference voltage	I13	DC		+10 V ±50 mV
	Test: GEN "A"				
	4015 settings: TX mode				
	MODGEN 1 kHz/20 mV	I12	2.097150 MHz ±200 Hz		TTL
		I14	1 kHz		3.53 V ±60 mV
			DC		-5 V ±50 mV
		I15	1 kHz		7.07 V ±100 mV
			DC		0 V ±50 mV
		I17	1 kHz		3.53 V ±100 mV
			DC		0 V ±50 mV
	4015 settings: MODGEN 1 kHz/2 V	I17	1 kHz		3.53 V ±100 mV
	1 kHz/1 V	I17	1 kHz		1.76 V ±100 mV
	1 kHz/100 mV	I17	1 kHz		176 mV ±10 mV
	1 kHz/10 mV	I17	1 kHz		1.76 V ±100 mV
	Repeat the test as necessary in the range 30 Hz to 30 kHz.				

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	27.05.91	Regel	STABILOCK 4015	Mod. Generator	208 036 A			1/4

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	4015 settings: MODGEN 1 kHz/20 mV	I20	1 kHz		2.0 V ±20 mV
	38 mV	I20	1 kHz		3.8 V ±20 mV
	100 mV	I20	1 kHz		0.1 V ± 1 mV
	1.0 V	I20	1 kHz		1.0 V ±10 mV
	3.8 V	I20	1 kHz		3.8 V ±20 mV
					Watch for 40-dB jump at 39 mV.
	<u>Test: 1-kHz GEN "B"</u>				
	4015 settings: GEN OFF				
	EXT MOD 1 kHz/20 mV	I3	1 kHz		TTL
	RMS voltmeter on RX MOD	I8	1 kHz		2.5 V ±50 mV
			DC		2.5 V ±50 mV
		I10	1 kHz		2.75 V ±50 mV
		I11	1 kHz		2.45 V ±50 mV
		I16	1 kHz		860 mV ±20 mV
	4015 settings: 20 mV	I19	1 kHz		424 mV ±10 mV
	2.0 V	I19	1 kHz		424 mV ±10 mV
	1.0 V	I19	1 kHz		212 mV ±5 mV
	100 mV	I19	1 kHz		21 mV ±1 mV
	10 mV	I19	1 kHz		212 mV ±5 mV
	20 mV	I20	1 kHz		2.0 V ±20 mV
	38 mV	I20	1 kHz		3.8 V ±20 mV
	100 mV	I20	1 kHz		100 mV ±2 mV
	1.0 V	I20	1 kHz		1.0 V ±10 mV
	3.8 V	I20	1 kHz		3.8 V ±20 mV
		I26	1 kHz		1.9 V ±20 mV
	<u>Test: Ext. AC/DC</u> Apply 1 Vdc to EXT MOD socket.				
	4015 settings: Ext DC-FM	I16	DC		4.0 V ±50 mV
	Ext FM	I16	DC		0 V ±5 mV

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	27.05.91	Regel	STABILOCK 4015	Mod. Generator	208 036 A			2/4

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure		Measuring Point	Frequency	Adjust-ment	Set Value
	Test: RX FM					
	4015 settings:	RX frequency 150 MHz				
		GEN A fmod 1 kHz	I21	1 kHz		204 mV ±10 mV
		MOD 2.4 kHz	I24	1 kHz		407 mV ±20 mV
		RMS voltmeter on RX MOD	I26	1 kHz		204 mV ±10 mV
	Test: RX ΦM					
	4015 settings:	RX frequency 150 MHz				
		MOD 2.4 rad				
		GEN A fmod 1 kHz	I24	1 kHz		407 mV ±20 mV
		0.25 kHz	I24	0.25 kHz		102 mV ±5 mV
		0.5 kHz	I24	0.5 kHz		204 mV ±10 mV
		2.0 kHz	I24	2.0 kHz		815 mV ±40 mV
		4.0 kHz	I24	4.0 kHz		1.63 V ±80 mV
		6.0 kHz	I24	6.0 kHz		2.45 V ±0.1 V
	Test: RX AM					
	4015 settings:	RX level -66 dBm	I21	1 kHz		1.61 V ±50 mV
		GEN A 1 kHz/50% AM	I21	DC		≤ 10 mV
			I22	1 kHz		1.94 V ±50 mV
			I22	DC		-5.54 V ±80 mV
			I23	1 kHz		1.04 V ±30 mV
			I23	DC		2.95 V ±50 mV
		RX level -72 dBm	I23	1 kHz		520 mV ±20 mV
			I23	DC		1.48 V ±20 mV

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	27.05.91	Regel	STABILOCK 4015	Mod. Generator	208 036 A			3/4

Schlumberger

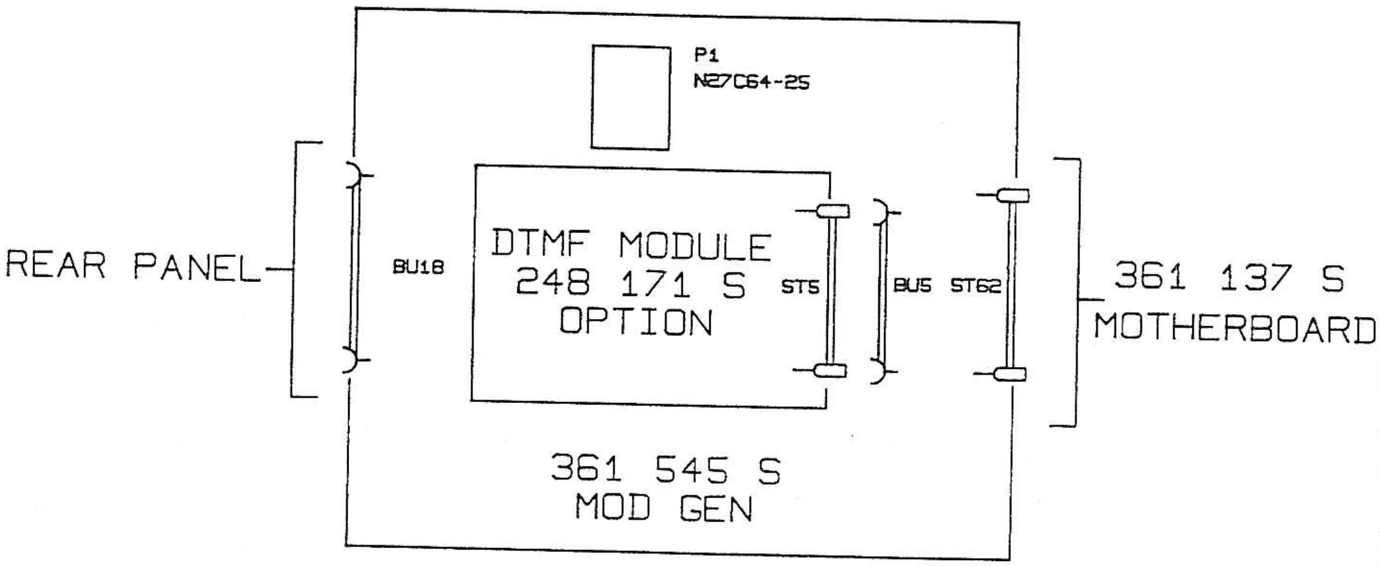
Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjustment	Set Value
	Test: control interface				
	Check relay contacts: RLY 1	Bu18-13/-25			Test contact
	RLY 2	Bu18-12/-24			Test contact
	RLY 3	Bu18-11/-23			Test contact
	RLY 4	Bu18-10/-22			Test contact
	TTL control lines: TTL12 to 1 000000000000	Bu18			TTL output = L
	111111111111	Bu18			TTL output = H

Bu18 assignment:

TTL12 to 1	0	0	0	0	0	0	0	0	0	0	0	0
Bu18	4	5	6	7	14	15	16	17	18	19	2	3

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	27.05.91	Regel	STABILOCK 4015	Mod. Generator	208 036 A			4/4



				DESEGNED		
01	0089.75	13.12.90	UNGER	CHECKED		
00	0089.68	23.11.90	HUBER	DRAWN		
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH
INGOLSTÄDTER STR.67 A
8000 MÜNCHEN 46

BEZEICHNUNG/DESCRIPTION:

MOD GEN

ZEICHNUNGSNR./DRAWING NO.:

208 036 S

PROJECT/GROUP:
4015 / 201 238 S

Pos. REF. NO.	Wert VALUE	Bezeichnung Schlumberger PART. NO.	Hersteller MANUFACT	Pos. REF. NO.	Wert VALUE	Bezeichnung Schlumberger PART. NO	Hersteller MANUFACT
1	Bestückte Leiterplatte	361 545					
	hierzu	361 545 Sa					
P1	N 27 C 64-25	893 394	STG				
1	DTMF-MODULE	248 171 OPTION					

Ausgabe ISSUE	Änd.-Mittlg. Nr. MODIFIC. NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02			
01	0089.75	13.12.90	Kr.

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

1990	Tag DATE	Name NAME
geschr.	13.12.90	Kr.
bearb.		
gepr.		

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: MOD GEN

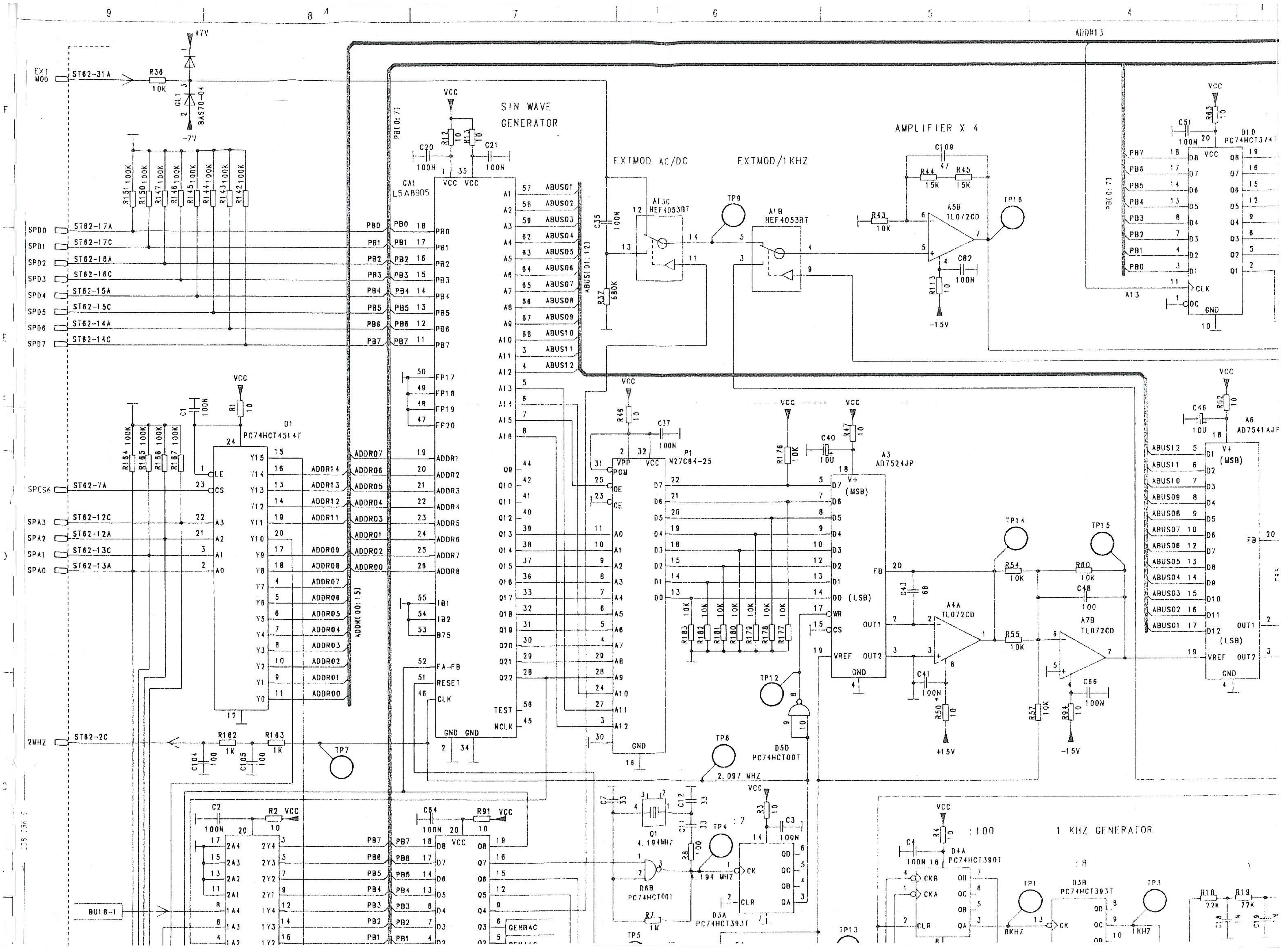
Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

Bezeichnung Schlumberger PART. NO: 208 036 Sa

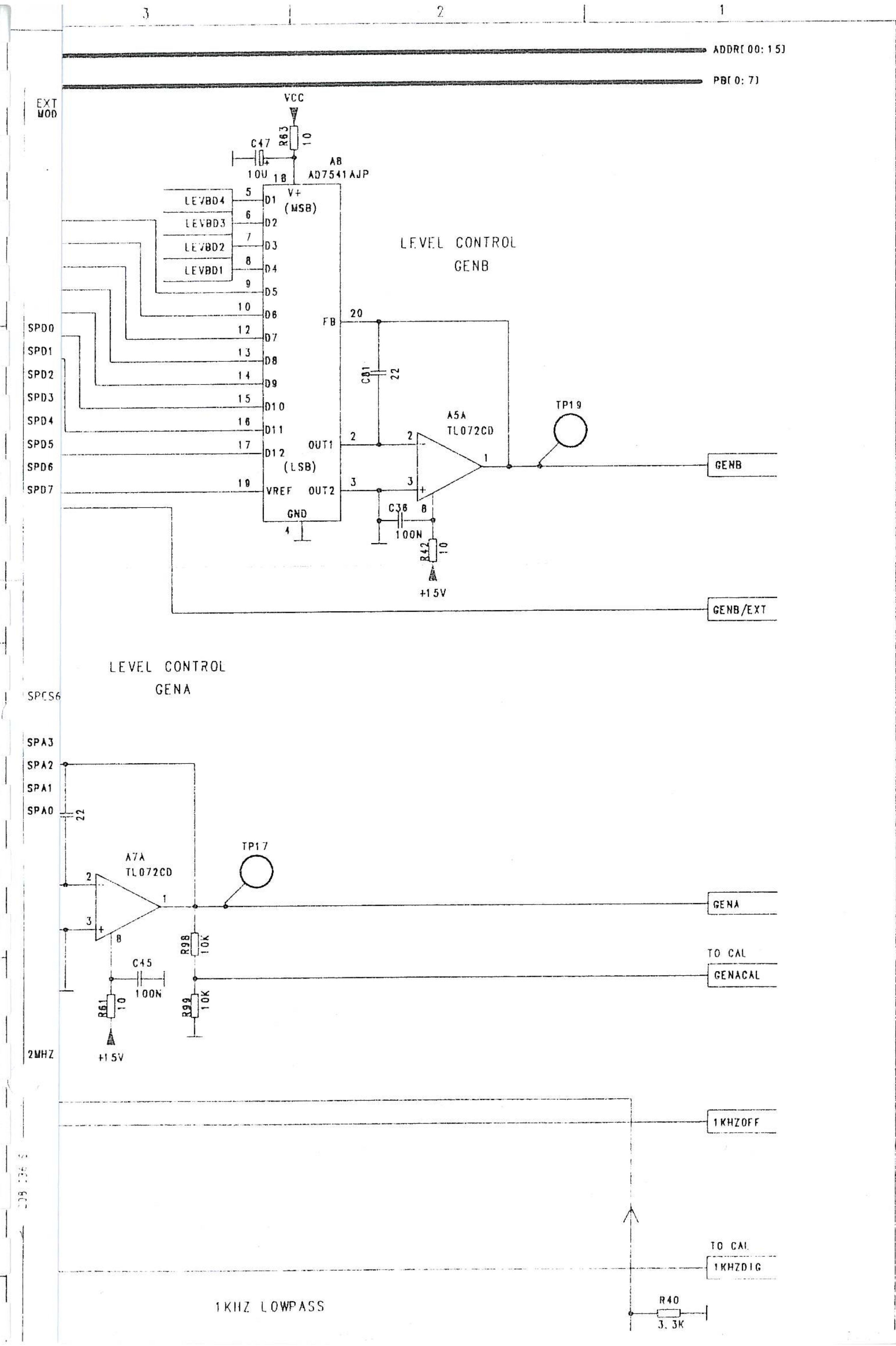
Blatt Nr SHEET NO: 1

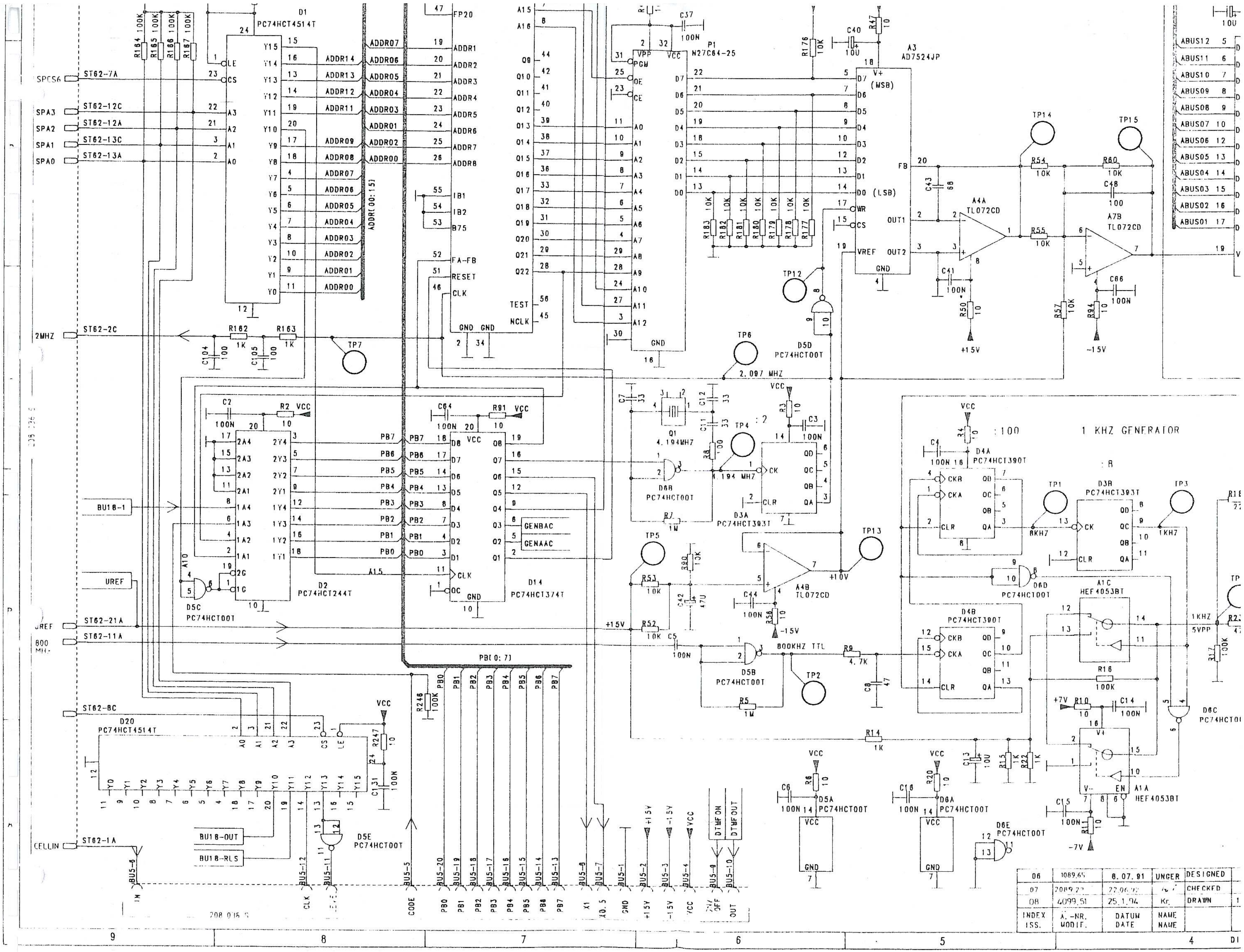
Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 208 036 S

Gerät: 4015

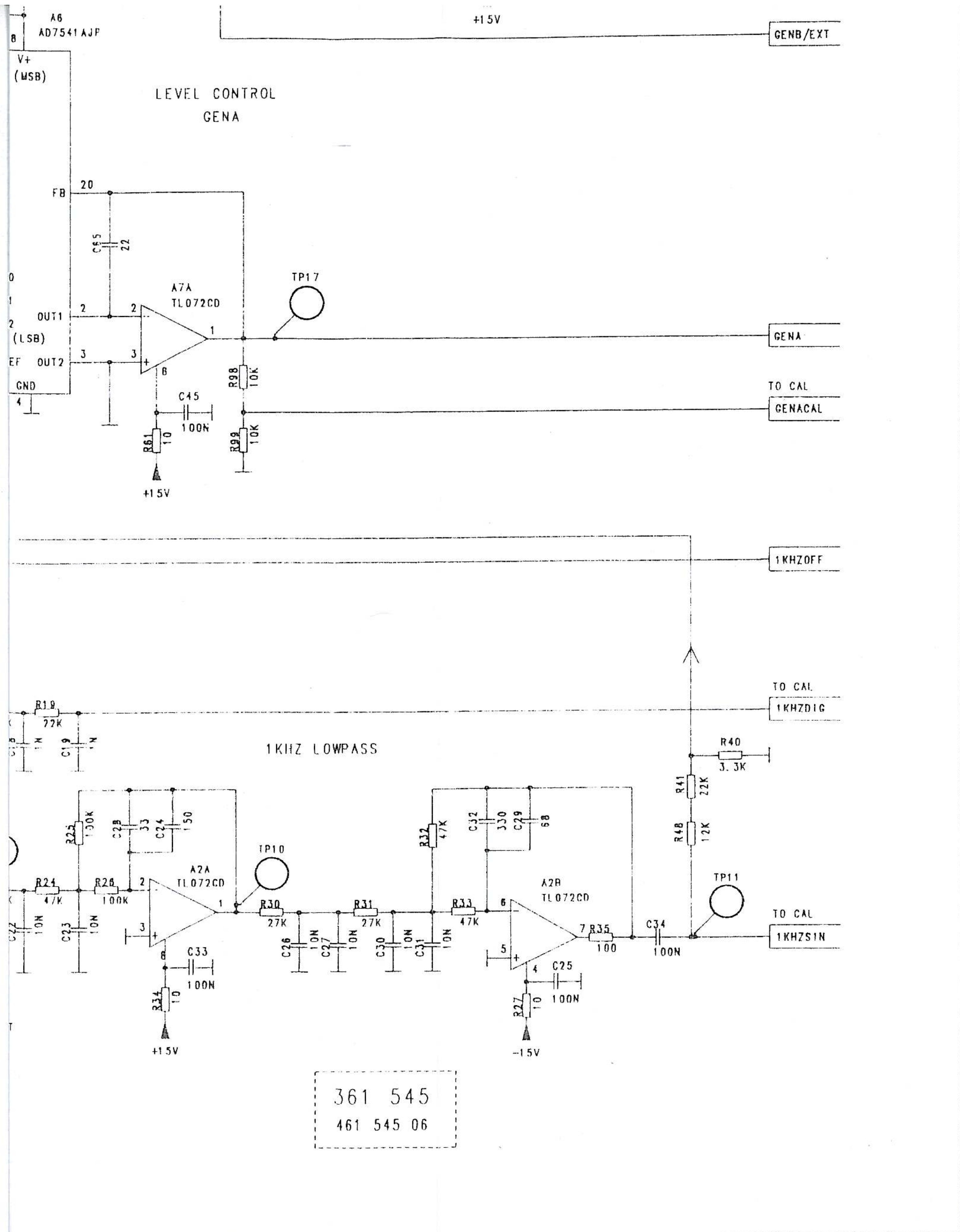


SIN WAVE GENERATOR
EXTMOD AC/DC
EXTMOD/1KHZ
AMPLIFIER X 4
1 KHZ GENERATOR
EXT MOD
ST62-31A
R36 10K
GL1 BAS70-04
+7V
-7V
SPD0 ST62-17A
SPD1 ST62-17C
SPD2 ST62-16A
SPD3 ST62-16C
SPD4 ST62-15A
SPD5 ST62-15C
SPD6 ST62-14A
SPD7 ST62-14C
SPCS6 ST62-7A
SPA3 ST62-12C
SPA2 ST62-12A
SPA1 ST62-13C
SPA0 ST62-13A
2MHZ ST62-2C
BU18-1
GA1 L5A8905
D1 PC74HCT4514T
P1 N27C64-25
A13C HEF4053BT
A1B HEF4053BT
A5B TL072CD
A3 AD7524JP
A4A TL072CD
A7B TL072CD
A6 AD7541AJP
D10 PC74HCT374T
D5D PC74HCT00T
D6B PC74HCT00T
D3A PC74HCT393T
D3B PC74HCT393T
D4A PC74HCT390T
Q1 4.194MHZ
2.097 MHZ
4.194 MHZ
8KHZ
1KHZ
ABUS[01:12]
ADDR[00:15]
PB[0:7]
ADDR13
GENBAC
VCC
+15V
-15V

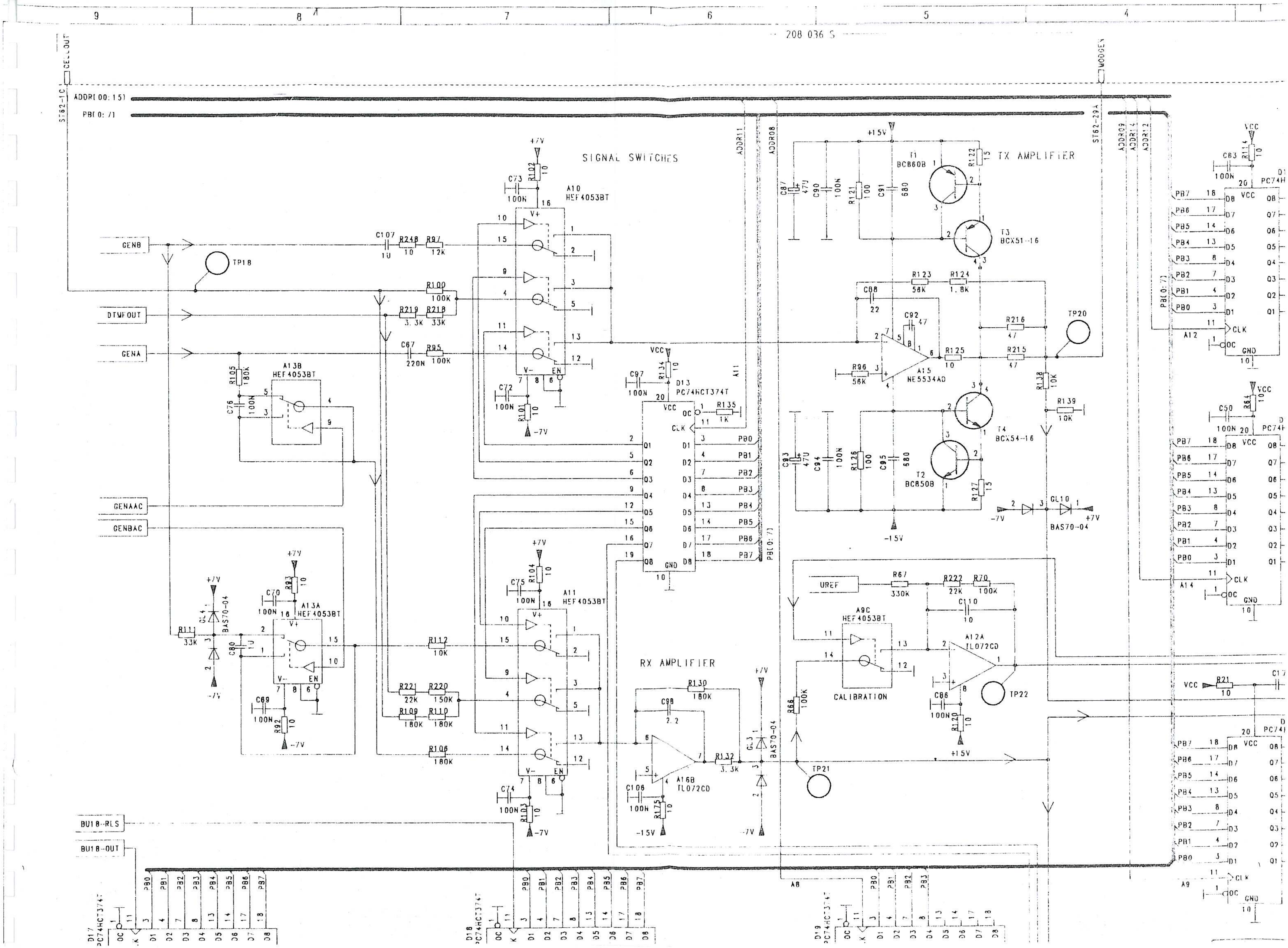

3
2
1
ADDR[00:15]
PB[0:7]
EXT MOD
VCC
R63 10
C47
10U
A8
AD7541AJP
V+
(MSB)
LEVBD4
LEVBD3
LEVBD2
LEVBD1
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
(LSB)
VREF
GND
FB
OUT1
OUT2
LEVEL CONTROL
GENB
SPD0
SPD1
SPD2
SPD3
SPD4
SPD5
SPD6
SPD7
C81 22
A5A
TL072CD
TP19
GENB
C36
100N
R42 10
+15V
GENB/EXT
LEVEL CONTROL
GENA
SPCS6
SPA3
SPA2
SPA1
SPA0
22
A7A
TL072CD
TP17
GENA
R98 10K
C45
100N
TO CAL
GENACAL
R99 10K
R61 10
+15V
2MHZ
1KHZOFF
TO CAL
1KHZDIG
1KHZ LOWPASS
R40
3.3K
F
E
D

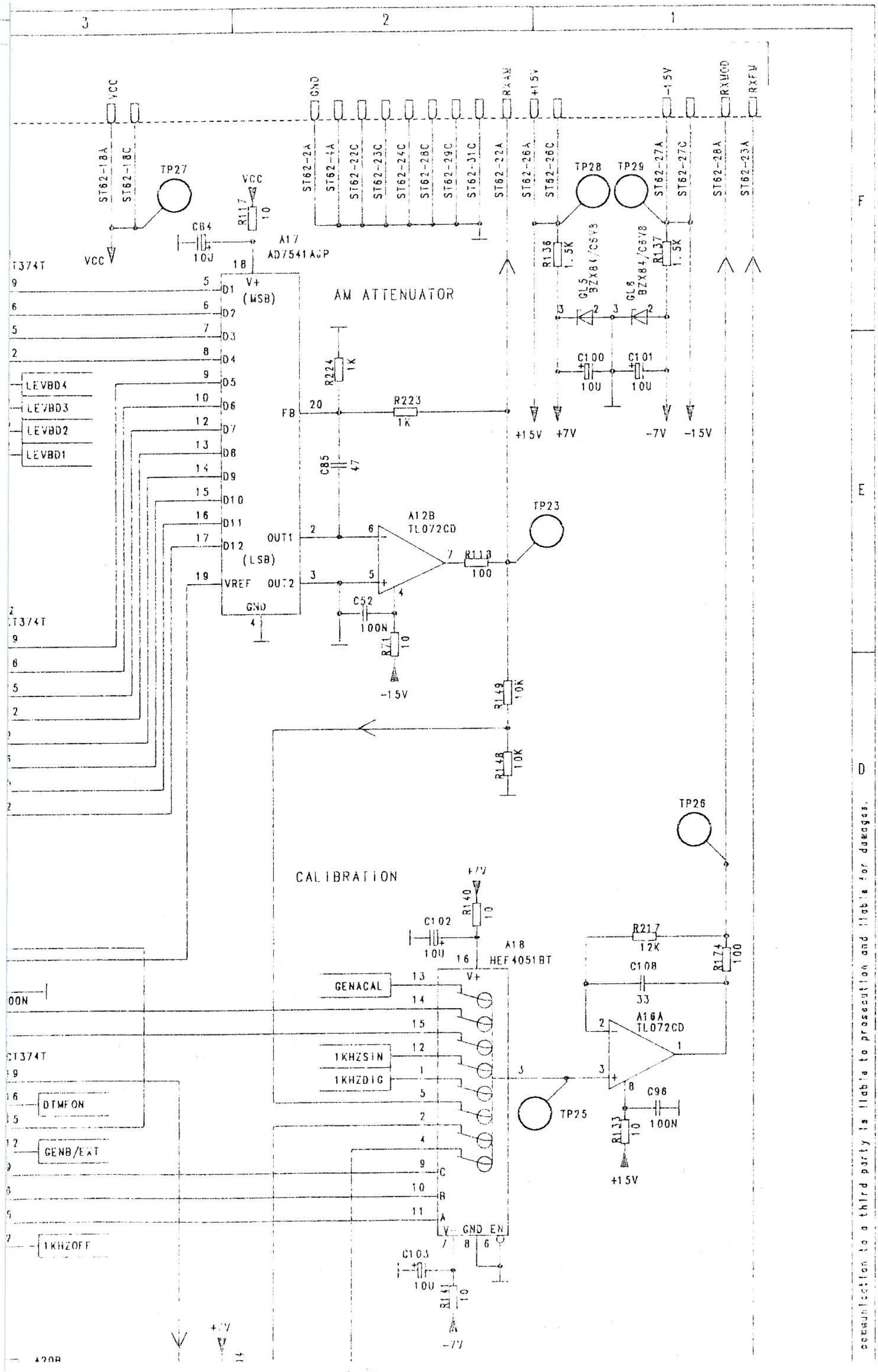


INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME	
06	1089.65	6.07.91	UNGER	DESIGNED
07	2009.2?	22.06.92		CHECKED
08	4099.51	25.1.94	Kr.	DRAWN

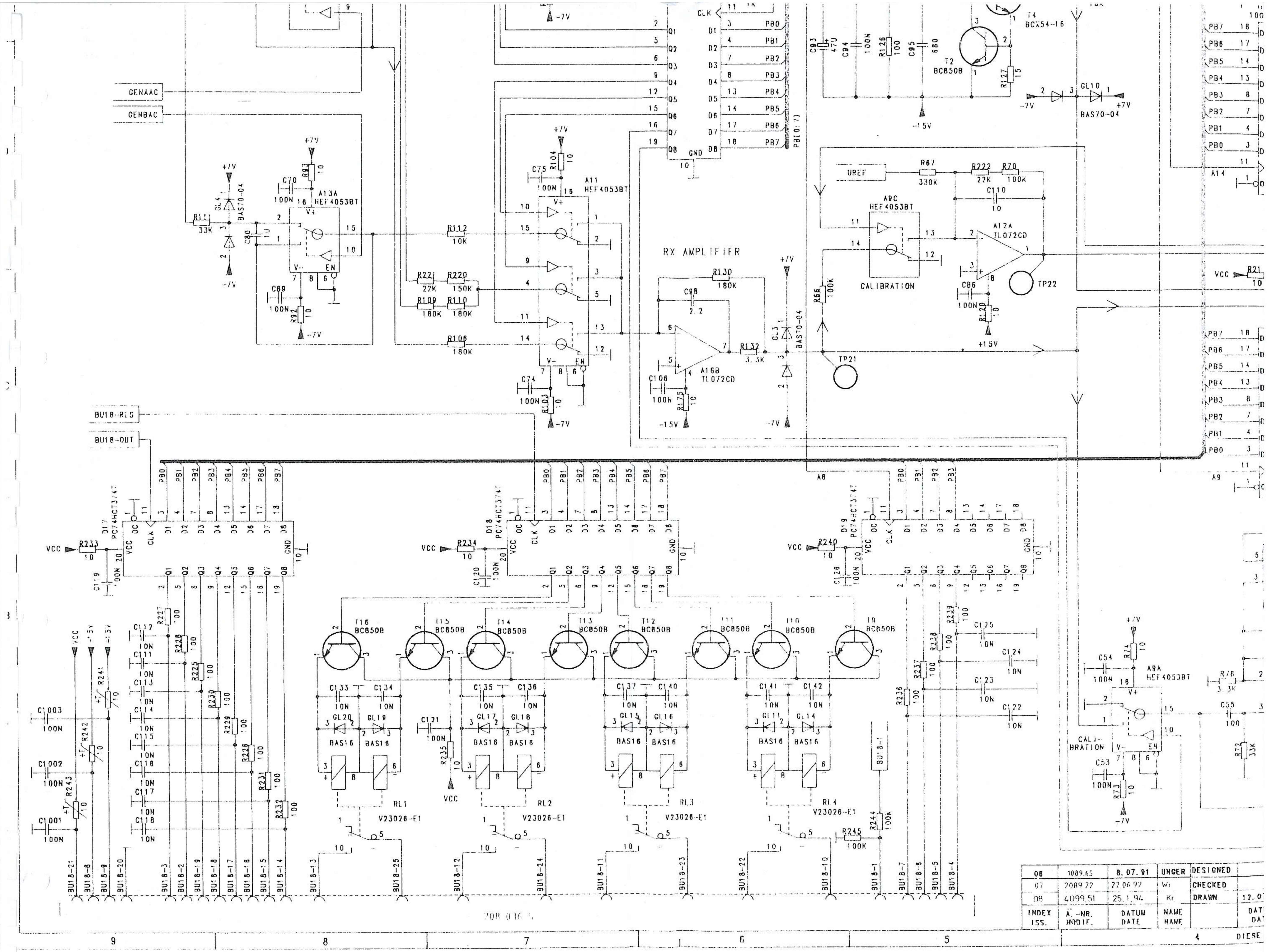


.07.89	HOFF	SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR. 67A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: MOD GENERATOR	ZEICHNUNGSNR./DRAWING NO.: 361 545 S
DATUM DATE	NAME NAME			PROJECT/GROUP: 4015 / 208 036 S
				1 VON/OF 2 BLATT SHEET

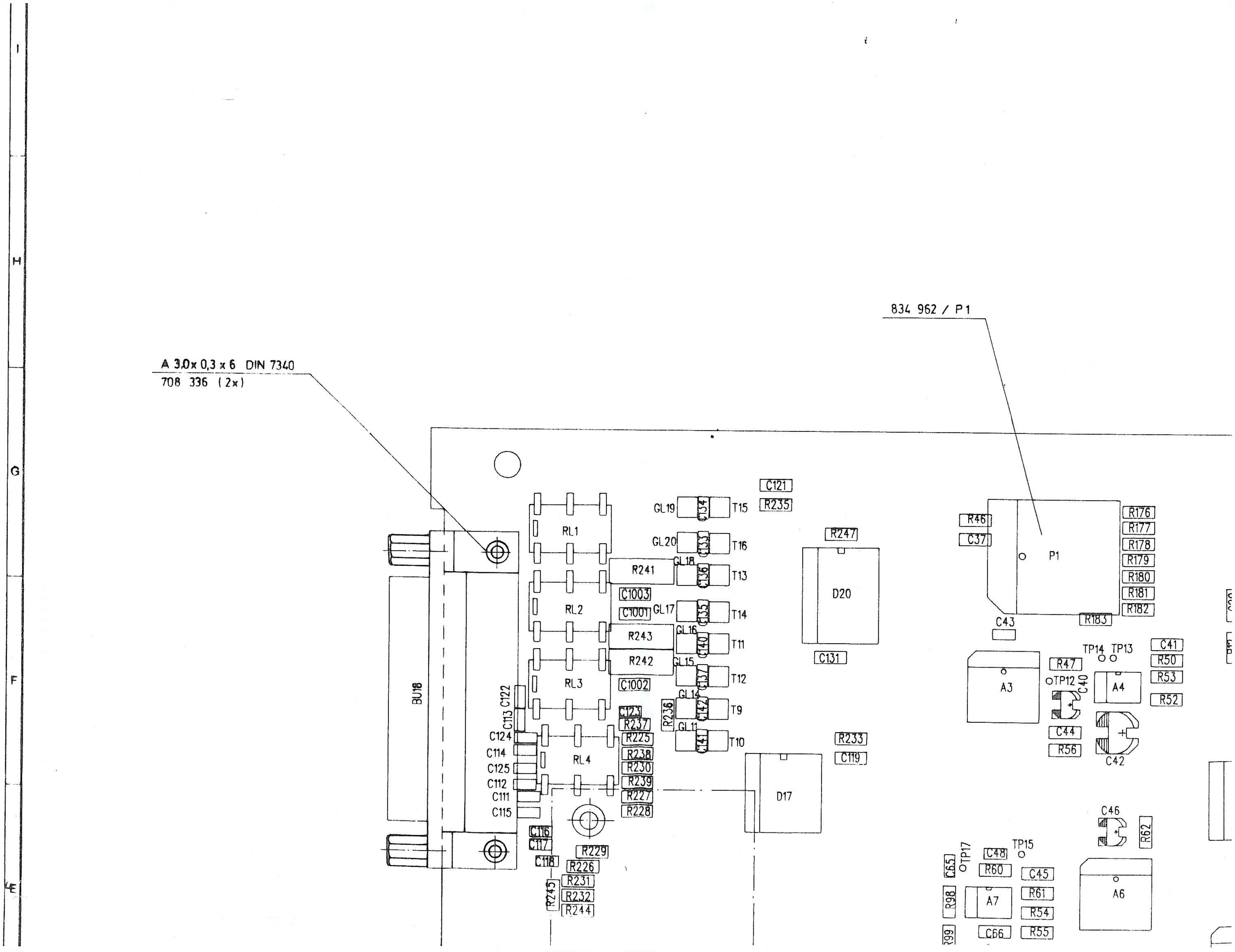

9
8
7
6
5
4
208 036 S
CELLOUT
MODGEN
ST62-1C
ST62-29A
ADDR[00:15]
PB[0:7]
SIGNAL SWITCHES
TX AMPLIFIER
RX AMPLIFIER
CALIBRATION
GENB
DTMFOUT
GENA
GENAAC
GENBAC
BU18-RLS
BU18-OUT
UREF
TP18
TP20
TP21
TP22
A10
HEF4053BT
A11
HEF4053BT
A13B
HEF4053BT
A13A
HEF4053BT
A9C
HEF4053BT
D13
PC74HCT374T
A15
NE5534AD
A12A
TL072CD
A16B
TL072CD
T1
BC860B
T2
BC850B
T3
BCX51-16
T4
BCX54-16
GL10
BAS70-04
GL4
BAS70-04
GL3
BAS70-04
D17
PC74HCT374T
D18
PC74HCT374T
D19
PC74HCT374T
+15V
-15V
+7V
-7V
VCC

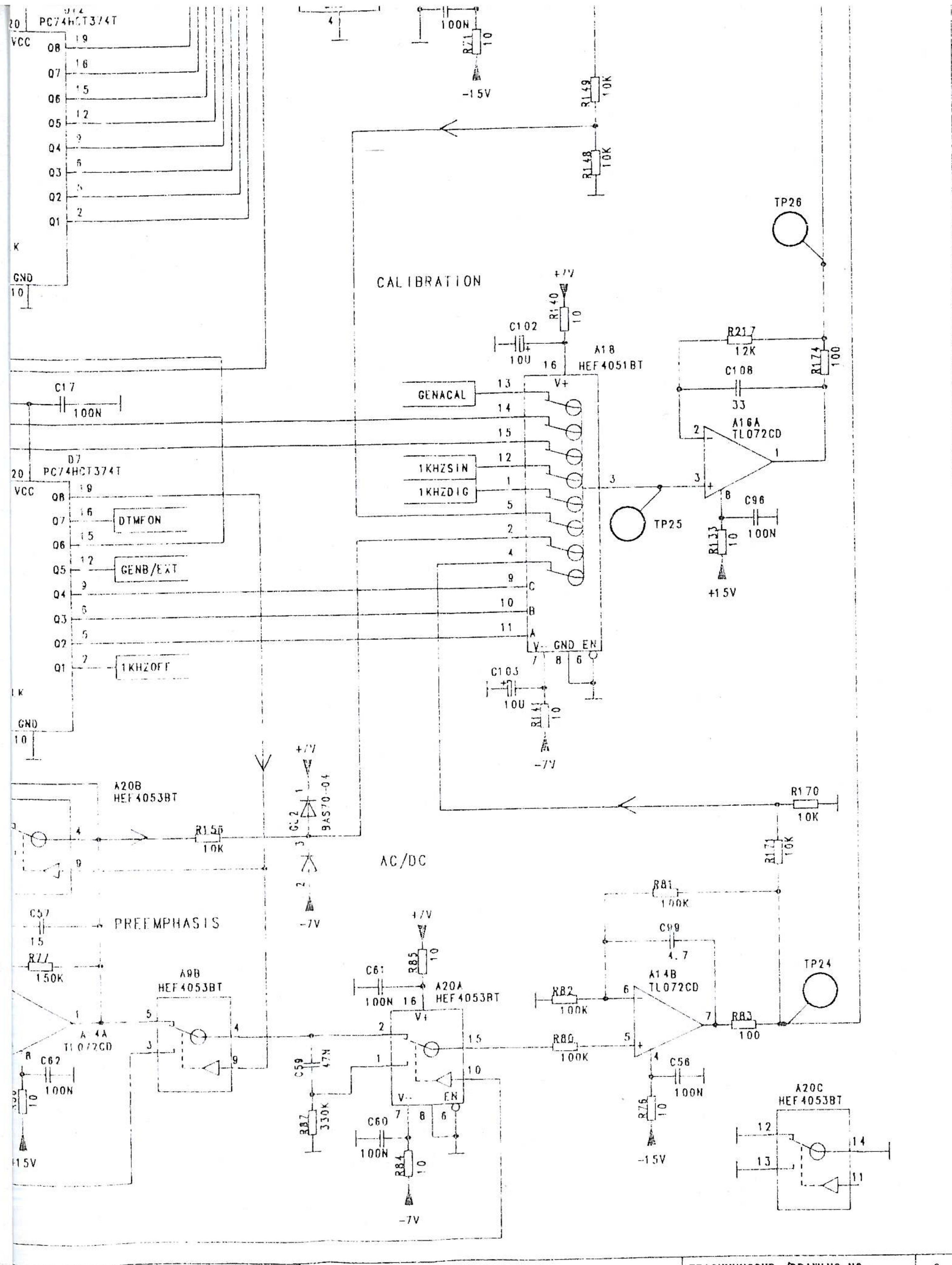


communication to a third party is liable to prosecution and liable for damages.



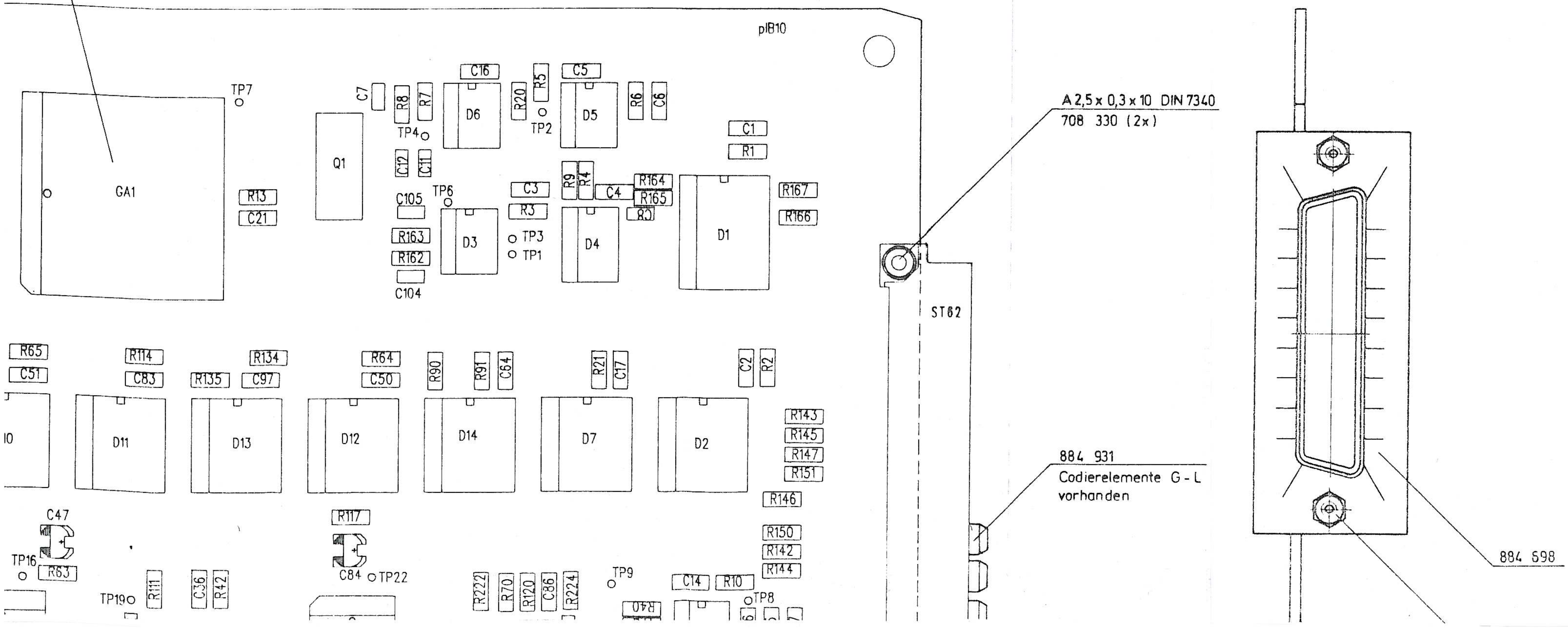
GENAAC
GENBAC
A13A HEF4053BT
A11 HEF4053BT
A9C HEF4053BT
CALIBRATION
A12A TL072CD
RX AMPLIFIER
A16B TL072CD
UREF
TP21
TP22
T2 BC850B
T4 BCX54-16
GL10 BAS70-04
PB[0:7]
BU18-RLS
BU18-OUT
D17 PC74HCT374T
D18 PC74HCT374T
D19 PC74HCT374T
A8
A9
A14
T16 BC850B
T15 BC850B
T14 BC850B
T13 BC850B
T12 BC850B
T11 BC850B
T10 BC850B
T9 BC850B
RL1 V23026-E1
RL2 V23026-E1
RL3 V23026-E1
RL4 V23026-E1
A9A HEF4053BT
CALI-BRATION
208 036 5
06 | 1089.65 | 8.07.91 | UNGER | DESIGNED
07 | 2089.22 | 22.06.92 | Wi | CHECKED
08 | 4099.51 | 25.1.94 | Kr | DRAWN | 12.0
INDEX ISS. | Ä.-NR. MODIF. | DATUM DATE | NAME NAME | DAT DAT
9
8
7
6
5
4
DIESE

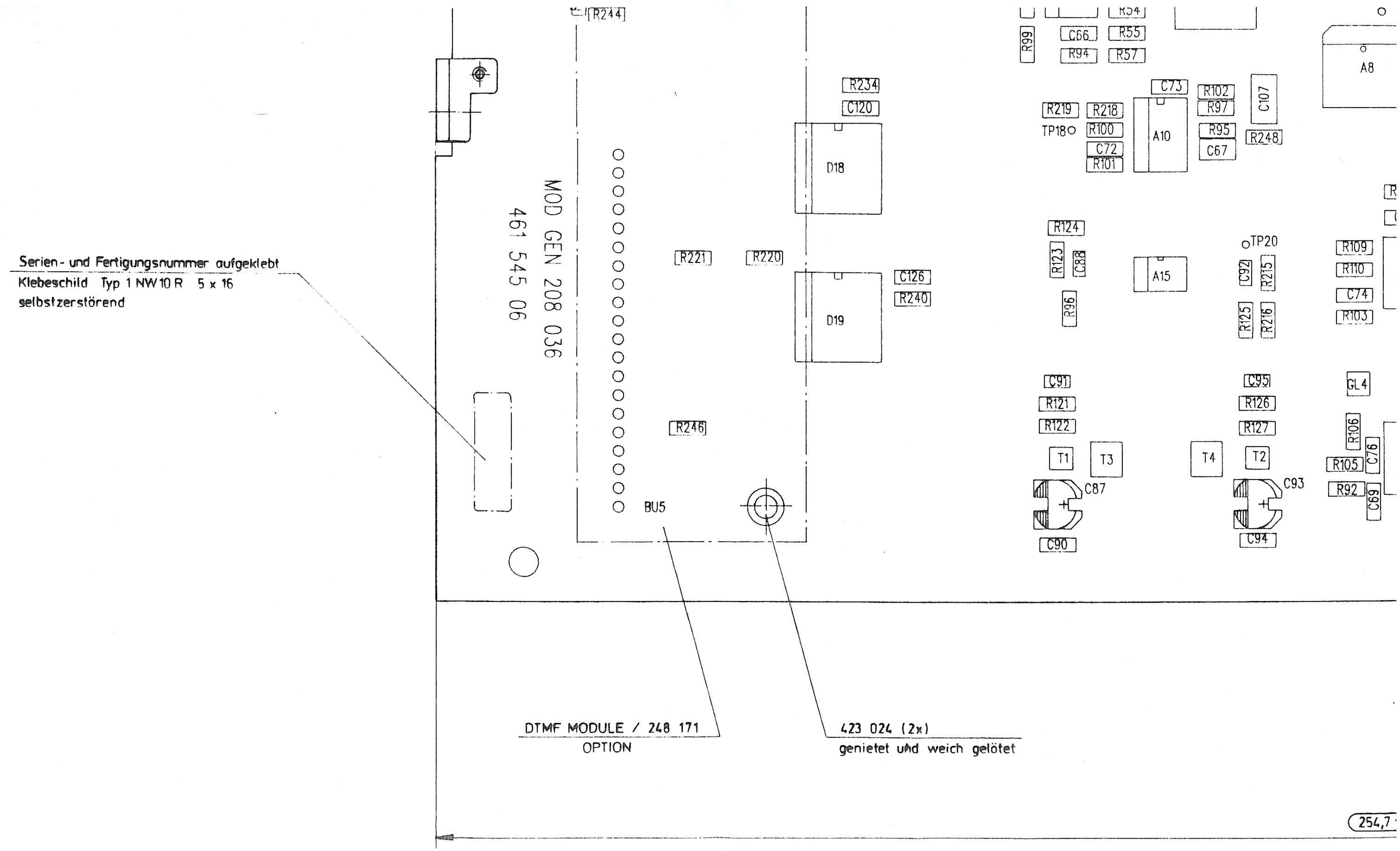

I
H
G
F
E
A 3,0x 0,3 x 6 DIN 7340
708 336 (2x)
834 962 / P1
BU18
RL1
RL2
RL3
RL4
R241
R243
R242
C1003
C1001
C1002
C123
R237
R225
R238
R230
R239
R227
R228
R229
R226
R231
R232
R244
R245
R236
C116
C117
C118
C122
C113
C124
C114
C125
C112
C111
C115
GL19
GL20
GL18
GL17
GL16
GL15
GL14
GL11
C134
C133
C136
C135
C140
C137
C142
C141
T15
T16
T13
T14
T11
T12
T9
T10
C121
R235
R247
D20
C131
R233
C119
D17
R46
C37
P1
R176
R177
R178
R179
R180
R181
R182
R183
C43
A3
R47
TP14
TP13
TP12
C40
A4
C41
R50
R53
R52
C44
R56
C42
C46
R62
TP17
C48
TP15
C65
R60
C45
R98
A7
R61
R54
A6
R99
C66
R55



89	HOFF	SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR. 67A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: MOD GENERATOR	ZEICHNUNGSNR. /DRAWING NO.: 361 545 S	2 VON/OF 2
	NAME			PROJECT/GROUP: 4015 / 208 038 S	BLATT SHEET
	NAME				

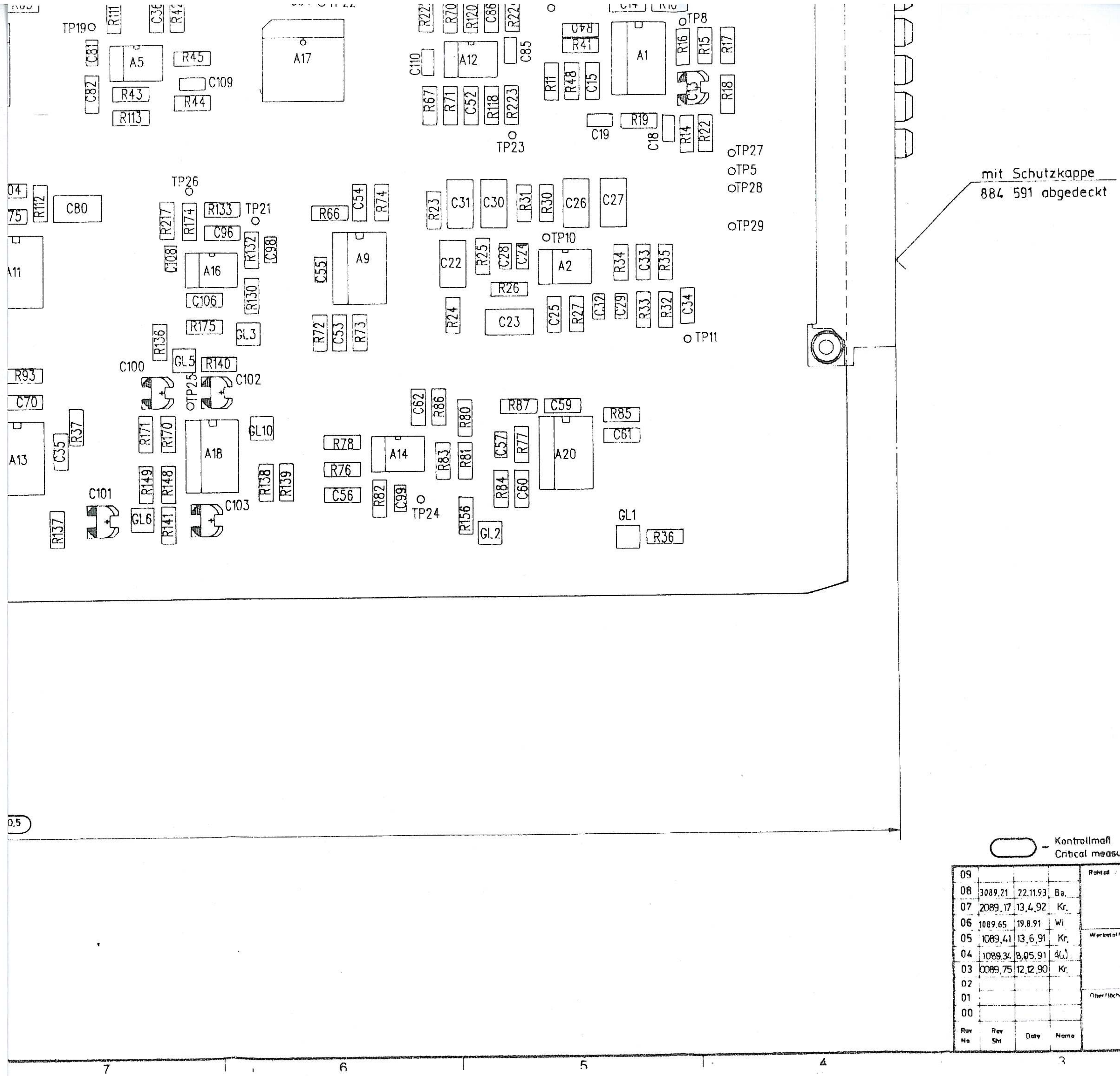
Bauteil 835 100 16 Std. bei 150°C tempern
Innerhalb 8 Std. nach Entnahme aus dem Ofen verarbeiten





Schaltplanpositionierung = 361 545 S/Sa

13	12	11	10	9	8



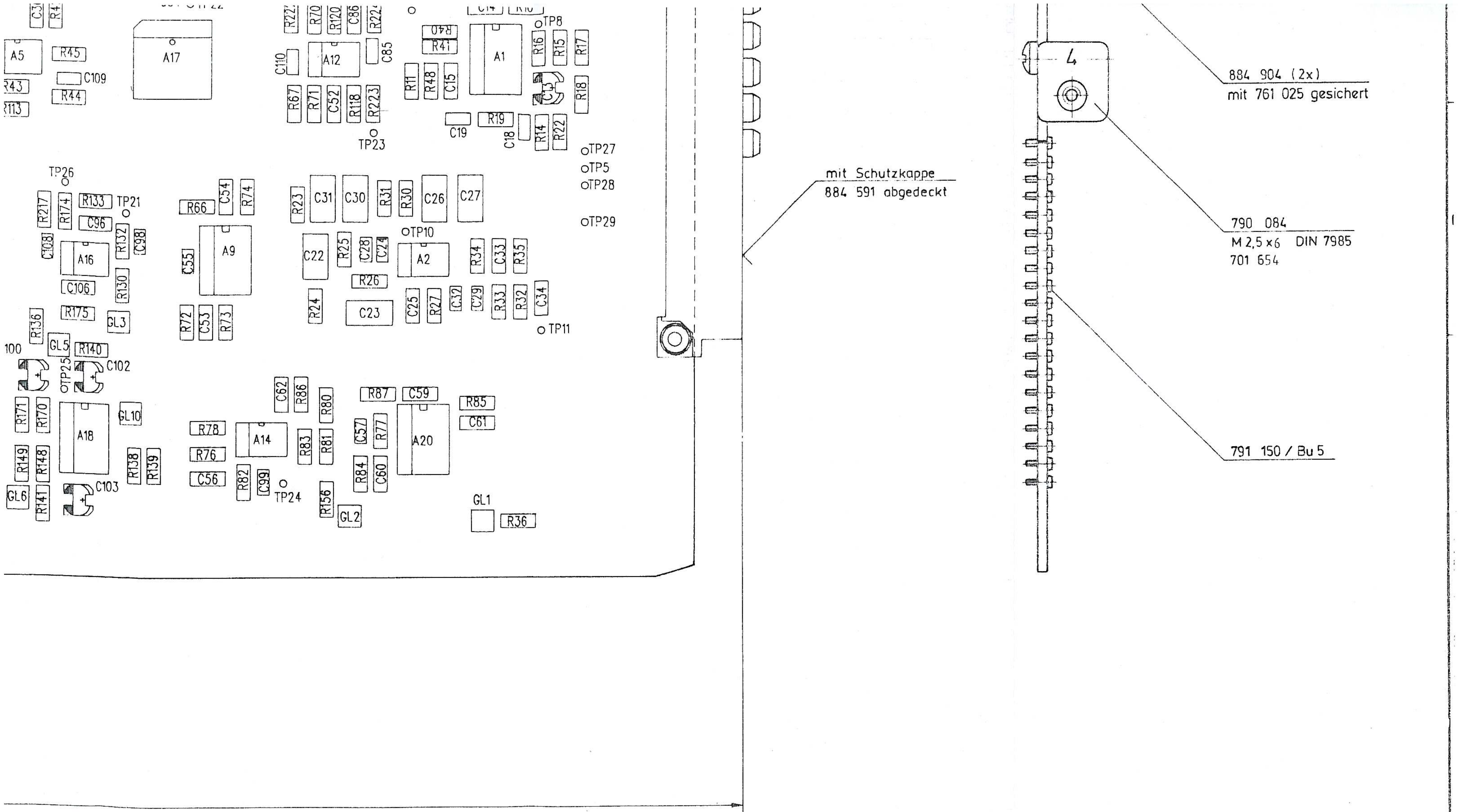
Kontrollmaß – Critical measurements

Rev No	Rev Sht	Date	Name
09			
08	3089.21	22.11.93	Ba.
07	2089.17	13.4.92	Kr.
06	1089.65	19.8.91	Wi
05	1089.41	13.6.91	Kr.
04	1089.34	8.05.91	[illegible]
03	0089.75	12.12.90	Kr.
02			
01			
00			

Rohteil / Initial part

Werkstoff / Material

Oberfläche / Surface



Kontrollmaß
Critical measurements

Rev No	Rev Sht	Date	Name
09			
08	3089.21	22.11.93	Ba.
07	2089.17	13.4.92	Kr.
06	1089.65	19.8.91	Wi
05	1089.41	13.6.91	Kr.
04	1089.34	8.05.91	[illegible]
03	0089.75	12.12.90	Kr.
02			
01			
00			

Rohteil / Initial part

Werkstoff / Material

Oberfläche / Surface

Freimaß toleranzen / default tolerance

Scale 2:1

DIN A1

1990	Date	Name
Drawn	12.12.90	Kr.
Designed	21.8.91	[illegible]
Checked		

Schlumberger Technologies GmbH
Ingolstädter Straße 67 a
8000 München 46

Bezeichnung / Description
Bestückte Leiterplatte
Typ · MOD GEN

Zeichnungsnr / Drawing No 361 545 2/2 H

Gerät / Unit 4015 / 208 036

6 5 4 3

Pos.	Benennung	Wert	HNK-Nr.	Herst.
A1	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A2	OPV	TL072CD	834222	TI
A3	8-Bit DAC	AD7524JP	834137	ANAL
A4	OPV	TL072CD	834222	TI
A5	OPV	TL072CD	834222	TI
A6	12-Bit DAC	AD7541AJP	834141	ANAL
A7	OPV	TL072CD	834222	TI
A8	12-Bit DAC	AD7541AJP	834141	ANAL
A9	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A10	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A11	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A12	OPV	TL072CD	834222	TI
A13	Analog De-/Multiplexer	HEF4053BT	834442	VAL
A14	OPV	TL072CD	834222	TI
A15	OPV	NE5534AD	834209	VAL
A16	OPV	TL072CD	834222	TI
A17	12-Bit DAC	AD7541AJP	834141	ANAL
A18	Analog De-/Multiplexer	HEF4051BT	835321	VAL
A20	Analog De-/Multiplexer	HEF4053BT	834442	VAL
BU5	Buchse	20polig	791150	COM
BU18	D-Buchse 90°	25polig	884688	AMP
C1	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C2	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C3	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C4	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C5	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C6	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C7	Kondensator NP0	33pF ±5% 50V-	813229	VIT
C8	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C11	Kondensator NP0	33pF ±5% 50V-	813229	VIT
C12	Kondensator NP0	33pF ±5% 50V-	813229	VIT
C13	Elko	10µF ±20% 16V-	814382	RÖD
C14	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C15	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C16	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C17	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C18	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C19	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C20	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C21	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C22	Kondensator NP0	10nF ±1% 50V-	813459	VIT
C23	Kondensator NP0	10nF ±1% 50V-	813459	VIT
C24	Kondensator NP0	150pF ±5% 50V-	813237	VIT
C25	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C26	Kondensator NP0	10nF ±1% 50V-	813459	VIT
C27	Kondensator NP0	10nF ±1% 50V-	813459	VIT
C28	Kondensator NP0	33pF ±5% 50V-	813229	VIT
C29	Kondensator NP0	68pF ±5% 50V-	813233	VIT
C30	Kondensator NP0	10nF ±1% 50V-	813459	VIT
C31	Kondensator NP0	10nF ±1% 50V-	813459	VIT
C32	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C33	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C34	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C35	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C36	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C37	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C40	Elko	10µF ±20% 16V-	814382	RÖD
C41	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C42	Elko	47µF ±20% 16V-	814386	RÖD
C43	Kondensator NP0	68pF ±5% 50V-	813233	VIT
C44	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C45	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C46	Elko	10µF ±20% 16V-	814382	RÖD
C47	Elko	10µF ±20% 16V-	814382	RÖD
C48	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C50	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C51	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C52	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C53	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C54	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C55	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C56	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C57	Kondensator NP0	15pF ±5% 50V-	813225	VIT
C59	Kondensator X7R	47nF ±10% 50V-	813371	VIT
C60	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C61	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C62	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C64	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C65	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C66	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C67	Kondensator X7R	220nF ±10% 50V-	813379	VIT
C69	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C70	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C72	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C73	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C74	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C75	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C76	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C80	Kondensator Z5U	1µF ±20% 50V-	813390	VIT
C81	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C82	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C83	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C84	Elko	10µF ±20% 16V-	814382	RÖD
C85	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C86	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C87	Elko	47µF ±20% 16V-	814386	RÖD
C88	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C90	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C91	Kondensator NP0	680pF ±5% 50V-	813245	VIT
C92	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C93	Elko	47µF ±20% 16V-	814386	RÖD
C94	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C95	Kondensator NP0	680pF ±5% 50V-	813245	VIT
C96	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C97	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C98	Kondensator NP0	2.2pF ±0.25pF	813215	VIT
C99	Kondensator NP0	4.7pF ±0.25pF	813219	VIT
C100	Elko	10µF ±20% 16V-	814382	RÖD
C101	Elko	10µF ±20% 16V-	814382	RÖD
C102	Elko	10µF ±20% 16V-	814382	RÖD
C103	Elko	10µF ±20% 16V-	814382	RÖD
C104	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C105	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C106	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C107	Kondensator Z5U	1µF ±20% 50V-	813390	VIT
C108	Kondensator NP0	33pF ±5% 50V-	813229	VIT
C109	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C110	Kondensator NP0	10pF ±5% 50V-	813223	VIT
C111	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C112	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C113	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C114	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C115	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C116	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C117	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C118	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C119	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C120	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C121	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C122	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C123	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C124	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C125	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C126	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C131	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C133	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C134	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C135	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C136	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C137	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C140	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C141	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C142	Kondensator X7R	10nF ±10% 50V-	813332	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C1001	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C1002	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C1003	Kondensator X7R	100nF ±10% 50V-	813375	VIT
D1	4:16 Decoder	PC74HCT4514T	834443	VAL
D2	Buffer	PC74HCT244T	834436	VAL
D3	Binary Counter	PC74HCT393T	834446	VAL
D4	Decade Counter	PC74HCT390T	834438	VAL
D5	NAND-Gatter	PC74HCT00T	834430	VAL
D6	NAND-Gatter	PC74HCT00T	834430	VAL
D7	8 Bit Latch	PC74HCT374T	834437	VAL
D10	8 Bit Latch	PC74HCT374T	834437	VAL
D11	8 Bit Latch	PC74HCT374T	834437	VAL
D12	8 Bit Latch	PC74HCT374T	834437	VAL
D13	8 Bit Latch	PC74HCT374T	834437	VAL
D14	8 Bit Latch	PC74HCT374T	834437	VAL
D17	8 Bit Latch	PC74HCT374T	834437	VAL
D18	8 Bit Latch	PC74HCT374T	834437	VAL
D19	8 Bit Latch	PC74HCT374T	834437	VAL
D20	4:16 Decoder	PC74HCT4514T	834443	VAL
GA1	Signalgenerator	L5A8905	835100	LSI
GL1	Schottky-Diode	BAS70-04	830031	SIE
GL2	Schottky-Diode	BAS70-04	830031	SIE
GL3	Schottky-Diode	BAS70-04	830031	SIE
GL4	Schottky-Diode	BAS70-04	830031	SIE
GL5	Zener-Diode	BZX84/C6V8	830494	VAL
GL6	Zener-Diode	BZX84/C6V8	830494	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
GL10	Schottky-Diode	BAS70-04	830031	SIE
GL11	Diode	BAS16	830552	VAL
GL14	Diode	BAS16	830552	VAL
GL15	Diode	BAS16	830552	VAL
GL16	Diode	BAS16	830552	VAL
GL17	Diode	BAS16	830552	VAL
GL18	Diode	BAS16	830552	VAL
GL19	Diode	BAS16	830552	VAL
GL20	Diode	BAS16	830552	VAL
P1	IC-Sockel	32polig	834962	AMP
Q1	Quarz	4.194304MHz	853102	JAUCH
R1	Chip-Widerstand	10Ω ±5%	804713	VAL
R2	Chip-Widerstand	10Ω ±5%	804713	VAL
R3	Chip-Widerstand	10Ω ±5%	804713	VAL
R4	Chip-Widerstand	10Ω ±5%	804713	VAL
R5	Chip-Widerstand	1MΩ ±1%	804773	VAL
R6	Chip-Widerstand	10Ω ±5%	804713	VAL
R7	Chip-Widerstand	1MΩ ±1%	804773	VAL
R8	Chip-Widerstand	100Ω ±1%	804725	VAL
R9	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R10	Chip-Widerstand	10Ω ±5%	804713	VAL
R11	Chip-Widerstand	10Ω ±5%	804713	VAL
R12	Chip-Widerstand	10Ω ±5%	804713	VAL
R13	Chip-Widerstand	10Ω ±5%	804713	VAL
R14	Chip-Widerstand	1kΩ ±1%	804737	VAL
R15	Chip-Widerstand	1kΩ ±1%	804737	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R16	Chip-Widerstand	100kΩ ±1%	804761	VAL
R17	Chip-Widerstand	100kΩ ±1%	804761	VAL
R18	Chip-Widerstand	22kΩ ±1%	804753	VAL
R19	Chip-Widerstand	22kΩ ±1%	804753	VAL
R20	Chip-Widerstand	10Ω ±5%	804713	VAL
R21	Chip-Widerstand	10Ω ±5%	804713	VAL
R22	Chip-Widerstand	1kΩ ±1%	804737	VAL
R23	Chip-Widerstand	47kΩ ±1%	804757	VAL
R24	Chip-Widerstand	47kΩ ±1%	804757	VAL
R25	Chip-Widerstand	100kΩ ±1%	804761	VAL
R26	Chip-Widerstand	100kΩ ±1%	804761	VAL
R27	Chip-Widerstand	10Ω ±5%	804713	VAL
R30	Chip-Widerstand	27kΩ ±1%	804754	VAL
R31	Chip-Widerstand	27kΩ ±1%	804754	VAL
R32	Chip-Widerstand	47kΩ ±1%	804757	VAL
R33	Chip-Widerstand	47kΩ ±1%	804757	VAL
R34	Chip-Widerstand	10Ω ±5%	804713	VAL
R35	Chip-Widerstand	100Ω ±1%	804725	VAL
R36	Chip-Widerstand	10kΩ ±1%	804749	VAL
R37	Chip-Widerstand	680kΩ ±1%	804771	VAL
R40	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R41	Chip-Widerstand	22kΩ ±1%	804753	VAL
R42	Chip-Widerstand	10Ω ±5%	804713	VAL
R43	Chip-Widerstand	10kΩ ±1%	804749	VAL
R44	Chip-Widerstand	15kΩ ±1%	804751	VAL
R45	Chip-Widerstand	15kΩ ±1%	804751	VAL
R46	Chip-Widerstand	10Ω ±5%	804713	VAL
R47	Chip-Widerstand	10Ω ±5%	804713	VAL
R48	Chip-Widerstand	12kΩ ±1%	804750	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R50	Chip-Widerstand	10Ω ±5%	804713	VAL
R52	Chip-Widerstand	10kΩ ±1%	804749	VAL
R53	Chip-Widerstand	10kΩ ±1%	804749	VAL
R54	Chip-Widerstand	10kΩ ±1%	804749	VAL
R55	Chip-Widerstand	10kΩ ±1%	804749	VAL
R56	Chip-Widerstand	10Ω ±5%	804713	VAL
R57	Chip-Widerstand	10kΩ ±1%	804749	VAL
R60	Chip-Widerstand	10kΩ ±1%	804749	VAL
R61	Chip-Widerstand	10Ω ±5%	804713	VAL
R62	Chip-Widerstand	10Ω ±5%	804713	VAL
R63	Chip-Widerstand	10Ω ±5%	804713	VAL
R64	Chip-Widerstand	10Ω ±5%	804713	VAL
R65	Chip-Widerstand	10Ω ±5%	804713	VAL
R66	Chip-Widerstand	100kΩ ±1%	804761	VAL
R67	Chip-Widerstand	330kΩ ±1%	804767	VAL
R70	Chip-Widerstand	100kΩ ±1%	804761	VAL
R71	Chip-Widerstand	10Ω ±5%	804713	VAL
R72	Chip-Widerstand	33kΩ ±1%	804755	VAL
R73	Chip-Widerstand	10Ω ±5%	804713	VAL
R74	Chip-Widerstand	10Ω ±5%	804713	VAL
R76	Chip-Widerstand	10Ω ±5%	804713	VAL
R77	Chip-Widerstand	150kΩ ±1%	804763	VAL
R78	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R80	Chip-Widerstand	100kΩ ±1%	804761	VAL
R81	Chip-Widerstand	100kΩ ±1%	804761	VAL
R82	Chip-Widerstand	100kΩ ±1%	804761	VAL
R83	Chip-Widerstand	100Ω ±1%	804725	VAL
R84	Chip-Widerstand	10Ω ±5%	804713	VAL
R85	Chip-Widerstand	10Ω ±5%	804713	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R86	Chip-Widerstand	10Ω ±5%	804713	VAL
R87	Chip-Widerstand	330kΩ ±1%	804767	VAL
R90	Chip-Widerstand	10kΩ ±1%	804749	VAL
R91	Chip-Widerstand	10Ω ±5%	804713	VAL
R92	Chip-Widerstand	10Ω ±5%	804713	VAL
R93	Chip-Widerstand	10Ω ±5%	804713	VAL
R94	Chip-Widerstand	10Ω ±5%	804713	VAL
R95	Chip-Widerstand	100kΩ ±1%	804761	VAL
R96	Chip-Widerstand	56kΩ ±1%	804758	VAL
R97	Chip-Widerstand	12kΩ ±1%	804750	VAL
R98	Chip-Widerstand	10kΩ ±1%	804749	VAL
R99	Chip-Widerstand	10kΩ ±1%	804749	VAL
R100	Chip-Widerstand	100kΩ ±1%	804761	VAL
R101	Chip-Widerstand	10Ω ±5%	804713	VAL
R102	Chip-Widerstand	10Ω ±5%	804713	VAL
R103	Chip-Widerstand	10Ω ±5%	804713	VAL
R104	Chip-Widerstand	10Ω ±5%	804713	VAL
R105	Chip-Widerstand	180kΩ ±1%	804764	VAL
R106	Chip-Widerstand	180kΩ ±1%	804764	VAL
R109	Chip-Widerstand	180kΩ ±1%	804764	VAL
R110	Chip-Widerstand	180kΩ ±1%	804764	VAL
R111	Chip-Widerstand	33kΩ ±1%	804755	VAL
R112	Chip-Widerstand	10kΩ ±1%	804749	VAL
R113	Chip-Widerstand	10Ω ±5%	804713	VAL
R114	Chip-Widerstand	10Ω ±5%	804713	VAL
R117	Chip-Widerstand	10Ω ±5%	804713	VAL
R118	Chip-Widerstand	100Ω ±1%	804725	VAL
R120	Chip-Widerstand	10Ω ±5%	804713	VAL
R121	Chip-Widerstand	100Ω ±1%	804725	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R122	Chip-Widerstand	15Ω ±5%	804715	VAL
R123	Chip-Widerstand	56kΩ ±1%	804758	VAL
R124	Chip-Widerstand	1.8kΩ ±1%	804740	VAL
R125	Chip-Widerstand	10Ω ±5%	804713	VAL
R126	Chip-Widerstand	100Ω ±1%	804725	VAL
R127	Chip-Widerstand	15Ω ±5%	804715	VAL
R130	Chip-Widerstand	180kΩ ±1%	804764	VAL
R132	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R133	Chip-Widerstand	10Ω ±5%	804713	VAL
R134	Chip-Widerstand	10Ω ±5%	804713	VAL
R135	Chip-Widerstand	1kΩ ±1%	804737	VAL
R136	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R137	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R138	Chip-Widerstand	10kΩ ±1%	804749	VAL
R139	Chip-Widerstand	10kΩ ±1%	804749	VAL
R140	Chip-Widerstand	10Ω ±5%	804713	VAL
R141	Chip-Widerstand	10Ω ±5%	804713	VAL
R142	Chip-Widerstand	100kΩ ±1%	804761	VAL
R143	Chip-Widerstand	100kΩ ±1%	804761	VAL
R144	Chip-Widerstand	100kΩ ±1%	804761	VAL
R145	Chip-Widerstand	100kΩ ±1%	804761	VAL
R146	Chip-Widerstand	100kΩ ±1%	804761	VAL
R147	Chip-Widerstand	100kΩ ±1%	804761	VAL
R148	Chip-Widerstand	10kΩ ±1%	804749	VAL
R149	Chip-Widerstand	10kΩ ±1%	804749	VAL
R150	Chip-Widerstand	100kΩ ±1%	804761	VAL
R151	Chip-Widerstand	100kΩ ±1%	804761	VAL
R156	Chip-Widerstand	10kΩ ±1%	804749	VAL
R162	Chip-Widerstand	1kΩ ±1%	804737	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R163	Chip-Widerstand	1kΩ ±1%	804737	VAL
R164	Chip-Widerstand	100kΩ ±1%	804761	VAL
R165	Chip-Widerstand	100kΩ ±1%	804761	VAL
R166	Chip-Widerstand	100kΩ ±1%	804761	VAL
R167	Chip-Widerstand	100kΩ ±1%	804761	VAL
R170	Chip-Widerstand	10kΩ ±1%	804749	VAL
R171	Chip-Widerstand	10kΩ ±1%	804749	VAL
R174	Chip-Widerstand	100Ω ±1%	804725	VAL
R175	Chip-Widerstand	10Ω ±5%	804713	VAL
R176	Chip-Widerstand	10kΩ ±1%	804749	VAL
R177	Chip-Widerstand	10kΩ ±1%	804749	VAL
R178	Chip-Widerstand	10kΩ ±1%	804749	VAL
R179	Chip-Widerstand	10kΩ ±1%	804749	VAL
R180	Chip-Widerstand	10kΩ ±1%	804749	VAL
R181	Chip-Widerstand	10kΩ ±1%	804749	VAL
R182	Chip-Widerstand	10kΩ ±1%	804749	VAL
R183	Chip-Widerstand	10kΩ ±1%	804749	VAL
R215	Chip-Widerstand	47Ω ±5%	804721	VAL
R216	Chip-Widerstand	47Ω ±5%	804721	VAL
R217	Chip-Widerstand	12kΩ ±1%	804750	VAL
R218	Chip-Widerstand	33kΩ ±1%	804755	VAL
R219	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R220	Chip-Widerstand	150kΩ ±1%	804763	VAL
R221	Chip-Widerstand	22kΩ ±1%	804753	VAL
R222	Chip-Widerstand	22kΩ ±1%	804753	VAL
R223	Chip-Widerstand	1kΩ ±1%	804737	VAL
R224	Chip-Widerstand	1kΩ ±1%	804737	VAL
R225	Chip-Widerstand	100Ω ±1%	804725	VAL
R226	Chip-Widerstand	100Ω ±1%	804725	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R227	Chip-Widerstand	100Ω ±1%	804725	VAL
R228	Chip-Widerstand	100Ω ±1%	804725	VAL
R229	Chip-Widerstand	100Ω ±1%	804725	VAL
R230	Chip-Widerstand	100Ω ±1%	804725	VAL
R231	Chip-Widerstand	100Ω ±1%	804725	VAL
R232	Chip-Widerstand	100Ω ±1%	804725	VAL
R233	Chip-Widerstand	10Ω ±5%	804713	VAL
R234	Chip-Widerstand	10Ω ±5%	804713	VAL
R235	Chip-Widerstand	10Ω ±5%	804713	VAL
R236	Chip-Widerstand	100Ω ±1%	804725	VAL
R237	Chip-Widerstand	100Ω ±1%	804725	VAL
R238	Chip-Widerstand	100Ω ±1%	804725	VAL
R239	Chip-Widerstand	100Ω ±1%	804725	VAL
R240	Chip-Widerstand	10Ω ±5%	804713	VAL
R241	Kaltleiter	10Ω ±25%	805028	SIE
R242	Kaltleiter	10Ω ±25%	805028	SIE
R243	Kaltleiter	10Ω ±25%	805028	SIE
R244	Chip-Widerstand	100kΩ ±1%	804761	VAL
R245	Chip-Widerstand	100kΩ ±1%	804761	VAL
R246	Chip-Widerstand	100kΩ ±1%	804761	VAL
R247	Chip-Widerstand	10Ω ±5%	804713	VAL
R248	Chip-Widerstand	10Ω ±5%	804713	VAL
RL1	SMD-Relais MRP1	V23026-E1	843300	SIE
RL2	SMD-Relais MRP1	V23026-E1	843300	SIE
RL3	SMD-Relais MRP1	V23026-E1	843300	SIE
RL4	SMD-Relais MRP1	V23026-E1	843300	SIE
ST62	Messerleiste DIN 41612	64polig a/c	884517	ERNI

Pos.	Benennung	Wert	HNK-Nr.	Herst.
T1	PNP Transistor	BC860B	832285	VAL
T2	NPN Transistor	BC850B	832284	SIE
T3	PNP Transistor	BCX51-16	832283	SIE
T4	NPN Transistor	BCX54-16	832289	SIE
T9	NPN Transistor	BC850B	832284	SIE
T10	NPN Transistor	BC850B	832284	SIE
T11	NPN Transistor	BC850B	832284	SIE
T12	NPN Transistor	BC850B	832284	SIE
T13	NPN Transistor	BC850B	832284	SIE
T14	NPN Transistor	BC850B	832284	SIE
T15	NPN Transistor	BC850B	832284	SIE
T16	NPN Transistor	BC850B	832284	SIE

Schlumberger Technologies GmbH			Schaltteilliste	Anz. d. Seiten
06 Index	4099.51 Ä.Nr.	25.01.94 Datum	Kr. Name	Bestückte Leiterplatte Typ: MOD GEN	14
Erst.: UNG	Gepr.:		361 545 Sa	Seite Nr
Gerät: 4015 / 208 036				14

L

Functional Description of 4015 Power Supply

The power supply can work on different input voltages. Firstly it is possible to operate it on AC voltage, which may be between 92 and 138 V or 176 and 264 V. The power supply detects the AC input voltage automatically and switches to the appropriate range. The input stage is switched by relay K1. At the 230-V setting this works as a bridge-connected rectifier (D500). At the 120-V setting it functions as a doubler stage (C5 and C6). The input voltage is detected by IC11 with its peripheral components R121, D44, T29, R141, R157, D42, D43, R151, R154, C87, C86 and IC12. For RFI suppression on the line side there is a filter L700 and the components L500, C3, C4, C1 and L400.

Circuit diagram 561200 D1 shows the complete primary side. This is made up for the most part of a single-ended forward converter. T3 acts as a switching transistor. For secure driving of this high-voltage switching transistor, even in extreme conditions of operation, there are R13, R11, L401, R12, D5, R10, D6, T2, D14, T1, R4, R5, R9, D3, R32, D12, D15, C9, D13, C11, T4, T5, R14 and R15. There is an auxiliary oscillator for buildup of the power supply when the line voltage is applied. This consists of the following components: C10, R601, R7, R8, D1 and D2. The single-ended forward converter is controlled and monitored by IC1, which monitors for undervoltage, overcurrent and overvoltage. The primary side generates a link voltage of 17 V on C2 and C24. This link voltage is stabilized by a separate control circuit made up of the components B400, R21, R22, C14, R23, IC10, R132, R133, C67, R134, R135, R137, R138, C68 and R136.

In addition to its AC input, the power supply also has two DC inputs for an internal and an external battery. D38 is provided for isolation and to prevent reverse current to the batteries. The link voltage of 17 V on C2 is connected in parallel with the internal and external battery. To prevent them from being discharged, the batteries are only switched through to the power supply via relay K2 in the "Batt" setting of the front-panel switch.

The 17-V link voltage from the primary side also serves as a charging voltage for the internal battery. The charger section consists of T25, R160, R161, R158, R159, C88, D34, T24, IC7.3, C80, R156, R610, R155, R153, R174, D35 and D45 (IC7.3 functions as a servocontrol).

The switchover of the 70 mA/700 mA charging current, caused by the battery temperature sensor, is performed by R178, D37, R177, C81, IC3.4, D47, R175, R140 and R139.

The power supply has integrated overtemperature protection consisting of R801 (fitted close to the power components), IC6.2, R144, R143 and C69 (IC6.2 functions as a comparator). The temperature-governed fan control by way of a temperature sensor consists of the components D30, D32, D33, C70, R164, R148, IC7.4, R149, C78, R163, T28, R145, T26 and C77, with IC7.4 working as a servocontrol. Once the sensor detects a certain temperature, the power supply is cut out by IC.2, which works as a comparator.

IC6.4 monitors the three DC/DC converters for undervoltage. IC6.1 monitors for battery undervoltage. IC6.4 and IC6.1 are designed as comparators with hysteresis.

T21 and IC9, R112, R113 and R114 serve for generating an auxiliary voltage of 9.1 V as a supply to all ICs and other components that require it.

There are three DC/DC converters for generating the output voltages of +5.2 V, +15 V and -15 V, their input voltage being the voltage on C2. The +5.2-V converter works as a stepdown converter. The +15-V converter acts as a stepdown or a stepup converter, depending on the input voltage. The input of the -15-V converter is fed from the output of the +15-V converter.

The three DC/DC converters have separate control circuits for voltage stabilization (IC3.2, IC3.1, IC3.3). Each converter also features separate current limiting in the form of a comparator (IC2.4, IC4.1, IC4.2). The driving pulse necessary for the switching transistor is produced in each case by a pulse-width modulator (IC2.3, IC2.2, IC2.1).

IC4.3 is a multivibrator synchronized by B401 with the master oscillator of IC1. The sawtooth signal from the multivibrator is used as a central switching signal for the three pulse-width modulators of the DC/DC converters, which work at twice the frequency (approx. 63 kHz) of the primary side.

Adjustment and Test Procedure

1. Visual inspection

2. Connect fan K600 (M612 M).

3.* Check OVP, +5 V and +15 V (V_{out} = 120 to 140%, feed in from rear).

4. Apply probe to:
1) X13, T9 (+5.2 V)
2) X14, T12 (+15 V)
3) X9, T15 (+15 V)
4) X11, T18 (-15 V)

5. Apply +10 V on DC input (external battery) (reduce current limiting on lab power supply, in "Batt" switch setting). Relay K2.S must energize before this voltage (approx. 8 V).

6. Set output voltages:
R602 +5.2 V
R604 +15 V
R606 -15 V

7. Adjust DC frequency to 17 µs (R609).

8. Set output currents:
R603 5.0 A
R605 2.5 A
R607 1.2 A

9. Shortcircuit test of output voltages:
+5.2 V I_{SC} = 1.6 to 3.2 A
+15 V I_{SC} = 1 to 1.7 A
-15 V I_{SC} = 0.4 to 0.8 A

10. Set jumper S503.2 and .3, drive +15 V into current limiting. Set R608 so that current at V_{in} = 32 V does not exceed 4 A. At V_{in} = 18 V, current limiting is 5 ±1 A.

11.* Load X7 and check output voltage.
Check DC buildup and cutout:
On: V_{in} = 9.8 to 10.3 V (comparator)
Off: V_{in} = 9.3 to 9.5 V

12.* Fan control:
At 4 V (< 40°C) on connector pin 1b referred to 0 V, collector T26 = 5.8 to 6.2 V.
At 6 to 9 V (40 to 50°C) speed increases.
At > 9 V (50°C) maximum speed, ie 12 to 15 V on collector.
At 11 to 12 V cutout.
At 10 to 11 V cuts in again.

13. Check following: residual ripple, hum, interference voltage.

Primary Side

14. Apply 12 to 15 V to S505.1.
Apply negative auxiliary voltage -5 V to S505.2.
Check base signal of T3 (S504.4).
Place probe on collector T3 (S504.1).
Slowly increase line voltage in "Line" setting.
After approx. 50 V relay K1.S must energize (110 V switchover).
After approx. 150 V relay K1.S must drop out again (220 V switchover).
Continue to 220 V.

15. Measure voltage on X7. 16 to 18 V link voltage.
Load voltage outputs:

-5.2 V	I = 4 A
+15 V	I = 2 A
-15 V	I = 1 A

16. Set jumper S502.1 and .2. Remove voltage from S505.

17. Set duty cycle with potentiometer R600 = jumper S502.
Set V_{link} = 18.3 to 20.2 V.

18. Check buildup (maximum 87 V in 110-V range).
Observe time for buildup (max. 1 s).

19. Synchronization, switching frequency 62 to 66 kHz.
Apply +15 V via battery.
Probe on S503.1.
Turn on IC1 with external voltage.
Δt = 1 µs, scope on 2 µs/div.
Disconnect external voltage.

20. Check primary current limiting.
Load X7 referred to 0 V.
Link voltage must have dropped to 6 V under load.
I_{SC} = 7 to 14 A.
Load max. 5 s.

21. Check turn-on/turn-off threshold of link voltage:
On: V_{link} = 15 to 15.5 V (comparator)
Off: V_{link} = 13 to 12.5 V

22. Check DC/AC switchover:
Check at 93 Vac.
"Batt" on.
"Line" on.
DC > 18 V: switchover to DC.
DC < 17 V: switchover to AC.

23. Connect power cable. Maximum line voltage and switch setting "Line".
Unit must start up without complications.
Feed in $V_{batt.\ sensor}$ = 2 V; set approx. 70 mA with R610.
Feed in $V_{batt.\ sensor}$ = 4 V; line off, line on; check for large charging current.
Switch to "Batt"; check for "Charging current off".

24. Check dynamic response of all output voltages (range up to 220 V).
Dynamic response of V_{link} (+15 V).

*These test steps can be omitted because of test unit.

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
15.6140.000.900	66.56140000	TBG-komplett	1 Stück	B	B	.FTZ.
33.5561.003.011	M5.C561.003.000	Chassis 561.003 G	1 Stück	B	B	.EAU.2825
36.7561.002.011	M7.I561.002.000 M7I	Isolierung 561002B HP2063	1 Stück	B	B	
33.5561.004.011	M5.C561.004.000	Chassis 561.004 C	1 Stück	B	B	
36.7561.007.011	M7.I561.007.000	Isolierung 561007A TC-020AG-AV	1 Stück	B	B	
38.2125.008.110	MS.S250.801.1S0	Senkschraube M2.5x 8 D 965StZn	1 Stück	C		
35.8420.003.011	M7.H420.003.000	Halter 420003 ALU 2.5mm	1 Stück	B	B	
38.2130.010.110	MS.S301.001.1S0	Senkschraube M3 x10 D 965StZn	2 Stück	C		
48.2314.060.157	MI.NG04.031.000	Isoliernippel IB8-4.5	2 Stück	C		
38.2130.000.030	MS.M300.000.3S0	Sechskantmutter+S M3 H520702StZn	2 Stück	C		
38.2125.005.110	MS.S250.401.1S0	Senkschraube M2.5x 4 D 965StZn	16 Stück	C		
38.2125.005.100	MS.S250.501.0S0	Linsenschr. M2.5x 5 D7985StZn	1 Stück	C		
33.1561.005.011	GF.56150000	TBG-Frontplatte 6HE20TE 561.005	1 Stück	B	B	
87.6300.655.011	ET.M300.655.00G	Typenschild Ge 300.655	1 Stück	C		.P.
	15.6140.000					
38.8006.007.001	X4.6308.RT0.000 X401.X402.X403	Fl.Steckhülse Volliso. 6.3x0.8rt	3 Stück	C		
87.5000.000.025	GV.00184M00	TBG Verpackung 0HE01-84TE	1 Stück	B	A	
1016	AGKOMM	Arbeitsgang Kommissionieren	1 min			
1013	AGZ3	Arbeitsgang Z3 elektrischer Gesammtfunktiontest	1 min			
1002	AGM	Arbeitsgang Montage	1 min			
1015	AGZ5	Arbeitsgang Z5 Burn-In	1 min			
1017	AGWAK	Arbeitsgang WAK Warenausgangskontrolle	1 min			
1001	AGV	Arbeitsgang Verpackung	1 min			

Ba.

29.09.93

3089.18

ıuptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

ıterposition: Teil 15.6140.000.900 66.56140000 TBG-komplett SM6204038

ıch-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
;.6140.000.600	G4.56140100	TBG-LP	1	Stück	B	B	,FTZ,.
;.6140.000.500	G4.561400R0	TBG-Stecker-LP	1	Stück	B	B	,FTZ,EAU,3084
1016	AGKOMM	Arbeitsgang Kommissionieren	1	min			
;.6666.666.666	BLANK015 Pseudobeistellteil	Blankoartikel mit 15% Steuer	1	Stück	B	B	

nterposition: Teil 33.1561.005.011 GF.56150000 TBG-Frontplatte 6HE20TE 561.005 SM6204038

ach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
3.2561.005.014	M4.F561.005.010 ME5-3	FP.561.005 J1 Wa+Dr+Mu 20TE	1	Stück	B	B	
3.3001.033.000	M6.2080.000.500	Griff mit Blende 20808-003 05TE	1	Stück	B	B	
.8.2125.006.100	MS.S250.601.0S0	Linsenschr. M2,5x 6 D7985StZn	3	Stück	C		
.8.2125.000.050	M8.S250.000.000	Einpressmutter M2,5	6	Stück	C		
'9.0060.000.023	MS.S250.119.9S0	Halsschraube Kreuz M2,5x11Ni	6	Stück	B	B	
;8.2329.006.194	MS.B290.651.9N0	Sk-Blechschr.B2,9x6,5DIN7983Ni	4	Stück	C		
;5.B561.009.012	M7.F561.009.000	Filtereinsatz 561.009 A f.Lüfter	1	Stück	B	B	
;8.7005.003.000	L7.F3EE.A10.000 L500 (ME11-2) 3EEA1-Corcom	Kaltger.Filter /03A	1	Stück	B	B	
38.2130.008.124	MS.S300.801.2N0	Senkschraube M3 x 8 D 966 Ni	4	Stück	C		
38.7003.007.000	K6.612Y.000.000 K600 (ME6-2)	Lüfter Typ 612 /6-15VDC	1	Stück	B	B	
38.2130.000.050	MS.M300.000.5S0 ME6-3	SelbstsicherμutterM3 D 985	4	Stück	C		
38.2130.016.124	MS.S301.601.2S0 ME6-1	Senkschraube HM3 x16 D 966StNi	4	Stück	C		
38.2232.000.250	MS.A032.002.5S0	Unterlegscheibe A3,2DIN 125StZn	4	Stück	C		

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 33.1561.005.011 GF.56150000 TBG-Frontplatte 6HE20TE 561.005 SMG204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
38.6000.019.000	Y3.1401.300.000	Kabeldurchführung 14.01.300	4	Stück	B	B	
38.8006.007.001	X4.6308.RT0.000 X400	Fl.Steckhülse Volliso. 6,3x0,8rt	2	Stück	C		
38.8003.049.000	X6.03S1.100.NC2 X603(ME8-2)	Stecker 3Pol NC-MP	1	Stück	B	B	
38.8001.001.000	X7.03S1.100.AE0 X700	Gehäuse Buchse 3Pol 2,5MBC/AE	1	Stück	B	B	
38.8001.002.000	X8.FC01.L00.000 X800	Buchsenkontakt FC016/500	2	Stück	C		
35.8561.010.011	M7.D561.010.000	D-Lagerung 561010A Silicon-K.	1	Stück	B	B	
38.6202.150.060	Y0.0115.000.0RT Y1	Iso.Litze 1,5x 00 rt Radox155	4	Stück	C		,NILA,
38.6200.150.055	Y0.0115.000.0SW Y2	Iso.Litze 1,5x 00 sw Radox155	2	Stück	C		,NILA,
38.6311.048.003	Y8.0104.800.000 Y800,801	Schrumpfschlauch LWS 4,8	2	Stück	C		,NILA,
38.6200.075.050	Y0.0110.000.0SW Y5	Iso.Litze 1,00x 00sw Radox155	1	Stück	C		,NILA,
38.6254.075.050	Y0.0107.500.066 Y6	Iso.Litze 0,82x 00gg AWG18	1	Stück	C		,NILA,
38.2130.000.080	MS.M300.000.6S0	Rändelmutter M3 561.011	3	Stück	B	B	
1002	AGM	Arbeitsgang Montage	1	min			

Ba. 29.09.93

Unterposition: Teil 87.5000.000.025 GV.00184M00 TBG Verpackung 0HE01-84TE AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
87.3000.000.008	VL.M050.060.000	Luftpolsterfolie rosa 050x060	1	Stück	C		,NILA,

3089.18

ıotposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

:erposition: Teil 15.6140.000.600 64.56140100 TBG-LP SMG204038

:h-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
.2130.000.060	MB.S300.000.000 MBS1	Einpressmutter M3.0	1	Stück	C		
5613.010.321	P0.5613.01E.000 P0	LP 561301E 105um 2seitigDk 1,5mm	1	Stück	B	B	
8003.023.000	X0.02S6.308.000 X7	Steckzunge-LP 2Pin 6,3x0.8	1	Stück	C		
2532.104.010	L5.5321.04S.K22 L500	Drossel 532.104 A 4 mH/ 2A	1	Stück	B	B	,TUEV,UL,CSA,
2L0001	ZL0001 Z1	Montage Schalenkern 18x11/14 vBs	1	Stück	B	A	
2524.025.050	L0.5240.25R.K36 L1	Drossel 524.025E/58548/ 92uH 10A	1	Stück	B	B	,TUEV,VDE,
2L0002	ZL0002 Z4	Montage Ringkern D36 - LP vBs	1	Stück	B	A	
0000.210.130	B4.CNY2.1Y0.014 B400	Optokoppler CNY21N (4)/14-PIN	1	Stück	B	B	
0001.360.030	B4.6N13.6GY.008 B401	Optokoppler CNW136. /8-PIN	1	Stück	B	B	
1100.612.200	C0.1U00.250.011 C1	Kond 1uF 250V F1772 27,94	1	Stück	B	B	,P,
1100.306.600	CE.1000.040.016 C2,C24	Elko 1000uF 40V EKR 16,5*30	2	Stück	B	B	,P,
1250.912.400	C0.2N50.250.001 C3,C4,C12,C23	Kond 2,5nF 250V WY 5,08	4	Stück	B	B	,P,UL,
1330.411.600	CE.330U.200.025 C5,C6	Elko 330uF 200V KMH 22,5*31	2	Stück	B	B	,P,UL,
1150.413.600	CE.150U.350.025 C7	Elko 150uF 350V KMG 25,4*31	1	Stück	B	B	,P,UL,
1100.708.200	C0.0U10.100.002 C8,C17,C22,C26,C27,C76	Kond 0,1uF 100V MKS2i 5% 5,08	6	Stück	C		,P,
1470.404.611	CE.470U.025.010 C9	Elko 470uF 25V SXE 10*20	1	Stück	B	B	,P,
1470.909.200	C0.4N70.100.002 C10	Kond 4,7nF 100V FKS2 5% 5,08	1	Stück	C		,P,

==================

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.600 64.56140100 TBG-LP SMG204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
52.1470.708.211	C0.0U47.063.002 C11	Kond 0,47uF 63V MKS2i 5% 5,08	1 Stück	C		,P,
53.1100.504.600	CE.10U0.025.004 C13,C25	Elko 10uF 25V SXE 4*7	2 Stück	C		,P,
52.1100.909.200	C0.1N00.100.002 C14,C87	Kond 1nF 100V FKC2 5% 5,08	2 Stück	C		,P,
52.1220.909.200	C0.2N20.100.002 C15,C16	Kond 2,2nF 100V FKC2 5% 5,08	2 Stück	C		,P,
52.1101.008.400	C0.100P.100.002 C18,C19,C20	Kond 100pF 100V FKC2 5% 5,08	3 Stück	C		,P,
52.1220.708.200	C0.0U22.063.002 C21	Kond 0,22uF 63V MKS2i 5% 5,08	1 Stück	C		,P,
53.1330.513.600	CE.2U20.400.010 C84	Elko 2,2uF 400V KME 10*16	1 Stück	B	B	
52.1470.808.200	C0.47N0.100.002 C85,C86	Kond 47nF 100V MKS2i 5% 5,08	2 Stück	C		,P,
44.0009.100.820	D0.ZY91.Y00.041 D1,D2	Z-Diode ZY91 /BZY97C91 /DO-41	2 Stück	B	B	,P,
44.0000.200.590	D0.EGP2.0DY.041 D3,D12	Diode EGP20D /DO-41	2 Stück	B	B	,P,
44.0000.270.810	D0.ZPD2.V7Y.035 D4	Z-Diode ZPD2,7 5% /DO-35	1 Stück	B	B	,P,
44.0001.000.790	D0.1N49.34Y.041 D5,D8,D40	Diode 1N4934 /DO-41	3 Stück	C		,P,
44.0040.070.740	D0.UF40.07Y.041 D6,D7	Diode UF4007 /DO-41	2 Stück	B	B	,P,UL,
44.0001.590.510	D0.BA15.9Y0.041 D9	Diode BA159 /DO-41	1 Stück	C		,P,
44.0041.480.010	D0.1N41.48Y.035 D10,D14,D42,D44	Diode 1N4148 /DO-35	4 Stück	C		,P,
44.0000.820.810	D0.ZPD8.V2Y.035 D11	Z-Diode ZPD8,2 5% /DO-35	1 Stück	B	B	,P,
44.0002.700.820	D0.ZY27.Y00.041 D13	Z-Diode ZY27 /BZY97C27 /DO-41	1 Stück	B	B	,P,

3089.18 29.09.93 Ba.

ıptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

:erposition: Teil 15.6140.000.600 64.56140100 TBG-LP SMG204038

:h-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
.0000.460.570	D0.BZV4.61V.535 D15	Z-Diode ZTE 1,5	/DO-35	1	Stück	B	B	,P,
.0000.160.640	D0.FEP1.6DT.Y22 D16	Diode FEP16DT stehend	/TO-220	1	Stück	B	B	,P,
.0000.560.820	D0.ZY5V.6Y0.041 D17	Z-Diode ZY5,6 /BZY97C5V6/DO-41		1	Stück	B	B	,P,
.0000.620.810	D0.ZPD6.V2Y.035 D19	Z-Diode ZPD6,2 5%	/DO-35	1	Stück	B	B	,P,
.0002.700.810	D0.ZPD2.7Y0.035 D41	Z-Diode ZPD27 5%	/DO-35	1	Stück	B	B	,P,
.0000.910.810	D0.ZPD9.V1Y.035 D43	Z-Diode ZPD9,1 5%	/DO-35	1	Stück	C		,P,
..0099.030.480	D4.A990.3Y0.035 D400	Diac A9903	/DO-35	1	Stück	B	B	,P,
..0100.001.072	D5.B250.C80.0Y1 D501	BR.Gl.B250C800DM	/Bauf. 1	1	Stück	B	B	
3.7004.003.000	F4.3135.510.000 F402	Si-Halter Typ	FAB031-3551	1	Stück	B	B	,P,
1.0047.180.110	IC.TDA4.718.A18 IC1	IC TDA4718A	/18-PIN	1	Stück	B	B	,P,
1.0003.580.100	IC.LM35.8Y0.008 IC11	IC LM358	/08-PIN	1	Stück	B	B	,P,
1.0004.310.150	IC.TL43.1Y0.092 IC12	IC TL431CLPR	/TO-92	1	Stück	B	B	,P,
8.7002.008.000	K0.0011.10D.100 K1	Rel 1W 110VDC Bauf1		1	Stück	B	B	
6.1120.710.000	L4.120U.1A0.014 L400	Drossel 100uH,120uH/1A		1	Stück	B	B	
6.1680.508.000	L4.6U80.A67.005 L401	Drossel 6,8uH/0,67A B78108S1682K		1	Stück	B	B	,P,
5.2700.522.021	R0.270K.220.004 R1,R2	Widerst. SK2 270K 2% 0,3W		2	Stück	C		,P,INDUS,
5.1100.422.021	R0.11K0.220.004 R3	Widerst. SK2 11K 2% 0,3W		1	Stück	C		,P,INDUS,

==================

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.600 64.56140100 TBG-LP SMG204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
55.1000.122.021	R0.10R0.220.004 R4,R182	Widerst. SK2 10R 5% 0,3W	2 Stück	C		,P,INDUS,
55.2200.222.021	R0.220R.220.004 R5	Widerst. SK2 220R 2% 0,3W	1 Stück	C		,P,INDUS,
55.1000.322.021	R0.1K00.220.004 R6,R18,R27,R28	Widerst. SK2 1K0 2% 0,3W	4 Stück	C		,P,INDUS,
55.8200.422.021	R0.82K0.220.004 R7	Widerst. SK2 82K 2% 0,3W	1 Stück	C		,P,INDUS,
55.4700.423.300	R0.47K0.320.005 R8	Widerst. SC4 47K 5% 0,5W	1 Stück	B	B	
55.2200.822.021	R0.2R20.220.004 R9,R10,R17	Widerst. SK2 2R2 5% 0,3W	3 Stück	C		,P,INDUS,
55.1000.222.021	R0.100R.220.004 R11,R23	Widerst. SK2 100R 2% 0,3W	2 Stück	C		,P,INDUS,
55.4700.122.021	R0.47R0.220.004 R12	Widerst. SK2 47R 5% 0,3W	1 Stück	C		,P,INDUS,
59.0000.005.001	R0.0000.K00.504 R13	Konstantanbrücke 0,5x10,16x5mm	1 Stück	C		,P,
55.4700.222.021	R0.470R.220.004 R14,R15	Widerst. SK2 470R 2% 0,3W	2 Stück	C		,P,INDUS,
55.2700.425.700	R0.27K0.520.011 R16	Widerst. SK8 27K 5% 2,0W	1 Stück	B	B	,P,
55.8200.322.021	R0.8K20.220.004 R19,R22	Widerst. SK2 8K2 2% 0,3W	2 Stück	C		,P,INDUS,
55.6800.222.021	R0.680R.220.004 R20	Widerst. SK2 680R 2% 0,3W	1 Stück	C		,P,INDUS,
55.2200.322.021	R0.2K20.220.004 R21	Widerst. SK2 2K2 2% 0,3W	1 Stück	C		,P,INDUS,
55.7150.313.021	R0.7K15.210.004 R24	Widerst. MK2 7K15 1% 0,3W	1 Stück	C		,P,
55.1500.622.021	R0.1M50.220.004 R25	Widerst. SK2 1M5 2% 0,3W	1 Stück	C		,P,INDUS,
55.3000.422.021	R0.30K0.220.004 R26,R154	Widerst. SK2 30K 2% 0,3W	2 Stück	C		,P,INDUS,

3089.18 29.09.93 Ba.

uptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

terposition: Teil 15.6140.000.600 64.56140100 TBG-LP SMG204038

ch-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
.1000.622.021	R0.1M00.220.004 R29,R31	Widerst. SK2 1M 2% 0,3W	2	Stück	C		,P,INDUS,
.6190.313.021	R0.6K19.210.004 R30	Widerst. MK2 6K19 1% 0,3W	1	Stück	C		
.4700.022.021	R0.4R70.220.004 R32	Widerst. SK2 4R7 5% 0,3W	1	Stück	C		,P,INDUS,
.2200.622.021	R0.2M20.220.004 R33,R151	Widerst. SK2 2M2 2% 0,3W	2	Stück	C		,P,INDUS,
.7500.522.021	R0.750K.220.004 R34	Widerst. SK2 750K 2% 0,3W	1	Stück	C		,P,INDUS,
.6800.122.021	R0.68R0.220.004 R35	Widerst. SK2 68R 5% 0,3W	1	Stück	C		,P,INDUS,
5.4700.622.021	R0.4M70.220.004 R121	Widerst. SK2 4M7 5% 0,3W	1	Stück	C		,P,INDUS,
5.6800.522.021	R0.680K.220.004 R141	Widerst. SK2 680K 2% 0,3W	1	Stück	C		,P,INDUS,
5.1800.524.401	R0.180K.420.006 R146	Widerst. WK4 180K 5% 1,0W	1	Stück	B	B	
5.1200.422.021	R0.12K0.220.004 R147	Widerst. SK2 12K 2% 0,3W	1	Stück	C		,P,INDUS,
5.6800.422.021	R0.68K0.220.004 R157,R166	Widerst. SK2 68K 2% 0,3W	2	Stück	C		,P,INDUS,
5.1000.522.021	R0.100K.220.004 R165	Widerst. SK2 100K 2% 0,3W	1	Stück	C		,P,INDUS,
55.1000.422.021	R0.10K0.220.004 R167	Widerst. SK2 10K 2% 0,3W	1	Stück	C		,P,INDUS,
55.3300.422.021	R0.33K0.220.004 R168	Widerst. SK2 33K 2% 0,3W	1	Stück	C		,P,INDUS,
56.5000.533.540	R6.500K.330.400 R600	Wid-Trimm 3386 500K 10% 0,5 W	1	Stück	B	B	
56.1000.433.540	R6.10K0.330.400 R601	Wid-Trimm 3386 10K 10% 0,5 W	1	Stück	B	B	,P,
57.1240.000.611	R8.S624.000.000 R800,R802	NTC S6 240	2	Stück	B	B	,P,UL,

----

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.600 64.56140100 TBG-LP SMG204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
57.1142.750.610	R9.S14K.275.000 R900	VDR V275LA20A	1 Stück	B	B	,P,
38.8003.026.003	S5.WW36.050.400 S504,S505	Stiftstreifen stehend 5,5x4pol	2 Stück	B	B	
42.0001.610.180	T0.BC16.116.Y39 T1	Transistor BC161-16 PNP/TO-39	1 Stück	B	B	,P,
42.0007.850.220	T0.BD78.5Y0.012 T2,T5	Transistor BD785 NPN/TO-126	2 Stück	B	B	,P,
42.0005.570.190	T0.BC30.7BY.092 T4	Transistor BC307B PNP/TO-92	1 Stück	C		,P,
42.9001.000.250	T0.BSS1.00Y.092 T6,T7,T8,T31	Transistor BSS100 N-FET/TO-92	4 Stück	B	B	
42.0000.600.300	T0.BUZ6.0Y0.022 T29,T30	Transistor BUZ60 N-FET/TO-220	2 Stück	B	B	
42.9001.100.250	T0.BSS1.10Y.092 T32	Transistor BSS110 P-FET/TO-92	1 Stück	B	B	,P,
61.2561.100.010	UE.5611.000.000 UE1	Übertrager 561.100 E	1 Stück	B	B	
44.0100.001.260	D5.KBL0.6Y0.008 D500	Br.Gl.KBL06 600V4A /Bauf. 8	1 Stück	B	B	
38.7040.160.040	F0.0160.0AT.005 F1	G-Schmelzeinsatz 1.6AT /5x20	1 Stück	B	B	,P,
38.3040.100.551	MB.N250.550.000 MBN1,MBN2,MBN3,MBN4,MBN5	Abstandsnietbolzen M2,5x5,5	5 Stück	C		
48.3000.000.104	MK.KSK1.040.220 MKK1	KK-SK104-38,1-ST-C-220 /TO220	1 Stück	B	B	
38.6000.002.000	MZ.SST1.5M0.000 MZS1	Kabelbinder-SST1,5M (130x1,5)	1 Stück	C		
38.6200.050.050	Y0.0105.000.0SW Y5,Y6	Iso.Litze 0,5x 00 sw Radox155	2 Stück	C		,NILA,
38.6254.075.050	Y0.0107.500.0GG Y7	Iso.Litze 0,82x 00gg AWG18	1 Stück	C		,NILA,
38.6311.048.003	Y8.0104.800.000 Y804	Schrumpfschlauch LWS 4,8	1 Stück	C		,NILA,

3089.18 29.09.93 Ba

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.600 64.56140100 TBG-LP SM6204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
38.6312.095.003	Y8.0109.500.000 Y805	Schrumpfschlauch LWS 9,5	1	Stück	C		,NILA,
38.6312.257.040	Y8.0125.400.000 Y806	Schrumpfschlauch LWS25,4 RNF100	1	Stück	C		,P,UL,NILA,
18.3000.000.100	MK.KKK3.200.120 MKK2,MKK3	KK-Aufsteck KK32 gekürzt /TO126	2	Stück	B	B	,P,
38.8006.007.001	X4.6308.RT0.000 X401,X402,X403	Fl.Steckhülse Volliso. 6,3x0,8rt	3	Stück	C		
2WP005	ZWP005 Z2	Montage KW-LP vLs	1	Stück	B	A	
2TW003	ZTW003 Z3	Montage TO-KW vVo	1	Stück	B	A	
42.0043.140.380	T0.2SC4.314.Y33 T3	Transistor 2SC4314 NPN/TOP-3	1	Stück	B	B	,UM,
2TK007	ZTK007 Z5	Montage TO-KK vVo	1	Stück	B	A	
1010	AGA	Arbeitsgang Ausrüsten	1	min			
1004	AGB	Arbeitsgang Bestückung	1	min			
1011	AGZ1	Arbeitsgang Zi elektrischer Teilfunktionstest	1	min			
1002	AGM	Arbeitsgang Montage	1	min			

Unterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SM6204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
71.5613.000.221	P0.5613.00E.000 P0	LP 561300E 105um 2seitigDk 1,5mm	1	Stück	B	B	
38.8003.023.000	X0.0256.308.000 X17,X18	Steckzunge-LP 2Pin 6,3x0,8	2	Stück	C		
38.8003.065.000	X6.48L3.111.CK5 X601	Messerleiste 48Pol CK	1	Stück	B	B	

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SMG204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
2XP001	ZXP001 Z6	Montage Stecker an LP vLs	1	Stück	B	A	
62.2519.023.030	L0.5190.23R.K36 L2	Drossel 519.023D/58548/155uH 6A	1	Stück	B	B	
62.2524.026.020	L0.5240.26R.K36 L3	Drossel 524.026C/55548/155uH 6A	1	Stück	B	B	,TUEV,UL,CSA,
2L0007	ZL0007 Z8	Montage Ringkern 2x D36 - LP vLs	1	Stück	B	A	
62.2532.101.040	L0.5321.01R.K31 L4	Drossel 532.101D/58930/275uH 4A	1	Stück	B	B	,TUEV,UL,CSA,
2L0017	ZL0017 Z9	Montage Ringkern 1xD31 vBs	1	Stück	B	A	
53.1100.306.600	CE.1000.040.016 C25,C26,C41,C42,C55	Elko 1000uF 40V EKR 16,5*30	5	Stück	B	B	,P,
52.1470.708.211	C0.0U47.063.002 C27,C28,C38,C39,C44,C57,C70,C71, C73,C74,C101	Kond 0,47uF 63V MKS2i 5% 5,08	11	Stück	C		,P,
53.1220.302.600	CE.2200.016.016 C29,C30	Elko 2200uF 16V EKR 16,5*30	2	Stück	B	B	,P,
52.1100.607.200	C0.1U00.063.002 C31,C78,C90	Kond 1uF 63V MKS2i 5% 5,08	3	Stück	C		
53.1120.404.600	CE.120U.025.006 C32,C45,C54	Elko 120uF 25V SXE 6,3*15	3	Stück	B	B	,P,
52.1471.009.200	C0.470P.100.002 C33,C59,C69,C81,C82	Kond 470pF 100V FKC2 5% 5,08	5	Stück	C		,P,
52.1100.809.200	C0.10N0.100.002 C34,C49,C50,C61,C65,C67,C68,C80	Kond 10nF 100V MKS2i 5% 5,08	8	Stück	C		,P,
52.1470.909.200	C0.4N70.100.002 C35,C40,C53,C58,C92	Kond 4,7nF 100V FKS2 5% 5,08	5	Stück	C		,P,
53.1100.504.600	CE.10U0.025.004 C36,C51,C64	Elko 10uF 25V SXE 4*7	3	Stück	C		,P,
52.1680.812.211	C0.68N0.250.004 C37,C62	Kond 68nF 250V MKT1822 10,16	2	Stück	B	B	,P,

3089.18 29.09.93 Ba.

auptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

nterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SMG204038

ach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
3.1100.304.600	CE.1000.025.012	Elko 1000uF 25V SXE 12,5*25 C43,C52,C56,C83	4	Stück	B	B	,P,
2.1101.008.400	C0.100P.100.002	Kond 100pF 100V FKC2 5% 5,08 C46	1	Stück	C		,P,
2.1561.107.400	C0.56P0.200.002	Kond 56pF 200V CK05 7.62 C47,C93	2	Stück	C		,P,
2.1220.909.200	C0.2N20.100.002	Kond 2,2nF 100V FKC2 5% 5,08 C48	1	Stück	C		,P,
2.1220.808.200	C0.22N0.100.002	Kond 22nF 100V MKS2i 5% 5,08 C60	1	Stück	C		,P,
3.1120.508.600	CE.12U0.063.006	Elko 12uF 63V SXE 6,3*7 C63	1	Stück	B	B	,P,
2.1220.009.200	C0.220F.100.002	Kond 220pF 100V FKC2 5% 5,08 C66	1	Stück	C		,P,
2.1100.708.200	C0.0U10.100.002	Kond 0,1uF 100V MKS2i 5% 5,08 C72,C102,C105	3	Stück	C		,P,
2.1100.712.212	C0.0U10.250.004	Kond 0,1uF 250V MKTB32561 10,16 C75	1	Stück	C		
3.1470.404.611	CE.470U.025.010	Elko 470uF 25V SXE 10*20 C77	1	Stück	B	B	,P,
3.1100.505.600	CE.10U0.035.005	Elko 10uF 35V EPMS1 5,5x12 C88,C89,C103,C104	4	Stück	B	B	
2.1100.909.200	C0.1N00.100.002	Kond 1nF 100V FKC2 5% 5,08 C91	1	Stück	C		,P,
2.1220.608.200	C0.2U20.063.006	Kond 2,2uF 63V MKT1822 15,24 C100	1	Stück	B	B	,P,
4.0000.510.810	D0.ZPD5.V1Y.035	Z-Diode ZPD5,1 5% /DO-35 D18,D37	2	Stück	B	B	,P,
4.0001.600.810	D0.ZPD1.6Y0.035	Z-Diode ZPD16 5% /DO-35 D21	1	Stück	B	B	,P,
4.0041.480.010	D0.1N41.48Y.035	Diode 1N4148 /DO-35 D22,D23,D24,D27,D29,D44,D46,D47, D48	9	Stück	C		,P,

==================

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SM6204038

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
44.0001.000.810	D0.ZPD1.0Y0.035 D25	Z-Diode ZPD10 5%	/DO-35	1	Stück	B	B	,P,
44.0000.680.810	D0.ZPD6.V8Y.035 D28	Z-Diode ZPD6,8 5%	/DO-35	1	Stück	B	B	,P,
44.0000.460.570	D0.BZV4.61V.535 D30,D32,D33,D101	Z-Diode ZTE 1,5	/DO-35	4	Stück	B	B	,P,
44.0086.140.110	D0.BZV8.61V.435 D31,D35,D39,D45	Diode BZV861V4	/DO-35	4	Stück	B	B	
44.0001.600.731	D0.SB16.0Y0.041 D34	Diode SB160	/DO-41	1	Stück	B	B	,P,
44.0001.000.790	D0.1N49.34Y.041 D36	Diode 1N4934	/DO-41	1	Stück	C		,P,
44.0002.410.780	D0.SD24.1PY.033 D38	Diode SD241P stehend	/TOP3	1	Stück	B	B	,P,
44.0003.900.820	D0.ZY39.Y00.041 D40	Z-Diode ZY39 /BZY97C39	/DO-41	1	Stück	B	B	,P,
44.0001.500.820	D0.ZY15.Y00.041 D41	Z-Diode ZY15 /BZY97C15	/DO-41	1	Stück	B	B	,P,
44.0001.800.810	D0.ZPD1.8Y0.035 D49	Z-Diode ZPD18 5%	/DO-35	1	Stück	B	B	,P,
44.0002.700.810	D0.ZPD2.7Y0.035 D100	Z-Diode ZPD27 5%	/DO-35	1	Stück	B	B	,P,
38.7004.012.000	F4.1978.200.000 F400	Si-Halter ohne Kappe 19782(12,5)		1	Stück	B	B	
48.4001.000.020	I0.AWS0.400.000 I1	T0-Abstandshalter M0455 (AWS)		1	Stück	C		,P,UL,
41.0003.390.060	IC.LM33.9Y0.014 IC2,IC4,IC6	IC LM339	/14-PIN	3	Stück	B	B	,P,
41.0003.240.070	IC.LM32.4Y0.014 IC3,IC7	IC LM324	/14-PIN	2	Stück	B	B	,P,
41.0003.920.060	IC.LM39.2Y0.008 IC5	IC LM392	/08-PIN	1	Stück	B	B	,P,
41.0004.310.150	IC.TL43.1Y0.092 IC8,IC9	IC TL431CLPR	/TO-92	2	Stück	B	B	,P,

3089.18 29.09.93 Ba

auptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

nterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SMG204038

ach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
4.0008.230.040	IC.1N82.3Y0.035 IC10	Diode 1N823A liegend /DO-35	1	Stück	B	B	,P,
8.7002.001.000	K0.0010.12D.100 K2	Rel 1W 12VDC Baufl	1	Stück	B	B	
6.1680.508.000	L4.6U80.A67.005 L402,L403,L406	Drossel 6,8uH/0,67A B78108S1682K	3	Stück	B	B	,P,
6.1020.630.000	L4.2U00.3A0.007 L404,L405	Drossel 2uH/3A B82131-5302-M	2	Stück	B	B	
6.1030.620.000	L4.3U00.2A0.007 L407	Drossel 3uH/2A B82131A5202M	1	Stück	B	B	,P,
6.1500.699.020	L4.5U00.10A.014 L408	Drossel 5uH/10A B82111-B-C21	1	Stück	B	B	
5.1800.222.021	R0.180R.220.004 R36,R93	Widerst. SK2 180R 2% 0,3W	2	Stück	C		,P,INDUS,
5.9100.122.021	R0.91R0.220.004 R37,R42,R43,R63,R64,R94	Widerst. SK2 91R 5% 0,3W	6	Stück	C		,P,INDUS,
5.2200.022.021	R0.2R20.220.004 R38,R95,R160,R161	Widerst. SK2 2R2 5% 0,3W	4	Stück	C		,P,INDUS,
5.1500.222.021	R0.150R.220.004 R39,R59,R98	Widerst. SK2 150R 2% 0,3W	3	Stück	C		,P,INDUS,
9.0000.010.002	R0.0000.K01.004 R40,R41	Konstantanbrücke 1,0x10,16x5mm	2	Stück	C		,P,
5.1000.322.021	R0.1K00.220.004 R44,R45,R80,R88,R101,R102,R108, R139,R166,R178	Widerst. SK2 1K0 2% 0,3W	10	Stück	C		,P,INDUS,
5.8200.522.021	R0.820K.220.004 R46	Widerst. SK2 820K 2% 0,3W	1	Stück	C		,P,INDUS,
5.8200.422.021	R0.82K0.220.004 R47,R107	Widerst. SK2 82K 2% 0,3W	2	Stück	C		,P,INDUS,
5.6800.522.021	R0.680K.220.004 R48	Widerst. SK2 680K 2% 0,3W	1	Stück	C		,P,INDUS,
5.2700.322.021	R0.2K70.220.004 R49,R50,R73,R99,R115,R145,R158	Widerst. SK2 2K7 2% 0,3W	7	Stück	C		,P,INDUS,

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SM6204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
55.1500.522.021	R0.150K.220.004 R51,R105	Widerst. SK2 150K 2% 0,3W	2	Stück	C		,P,INDUS,
55.4700.322.021	R0.4K70.220.004 R52,R53,R54,R116	Widerst. SK2 4K7 2% 0,3W	4	Stück	C		,P,INDUS,
55.4700.022.021	R0.4R70.220.004 R55,R60,R83,R111,R181	Widerst. SK2 4R7 5% 0,3W	5	Stück	C		,P,INDUS,
55.1000.222.021	R0.100R.220.004 R56,R84,R117	Widerst. SK2 100R 2% 0,3W	3	Stück	C		,P,INDUS,
55.4700.122.021	R0.47R0.220.004 R57	Widerst. SK2 47R 5% 0,3W	1	Stück	C		,P,INDUS,
55.2700.022.021	R0.2R70.220.004 R58	Widerst. SK2 2R7 5% 0,3W	1	Stück	C		,INDUS,
59.0000.005.001	R0.0000.K00.504 R61,R62,R97	Konstantanbrücke 0,5x10,16x5mm	3	Stück	C		,P,
55.4640.313.021	R0.4K64.210.004 R65,R66,R106	Widerst. MK2 4K64 1% 0,3W	3	Stück	C		
55.1500.622.021	R0.1M50.220.004 R67	Widerst. SK2 1M5 2% 0,3W	1	Stück	C		,P,INDUS,
55.3010.313.021	R0.3K01.210.004 R68	Widerst. MK2 3K01 1% 0,3W	1	Stück	C		
55.2940.313.021	R0.2K94.210.004 R69,R130	Widerst. MK2 2K94 1% 0,3W	2	Stück	C		
55.4700.622.021	R0.4M70.220.004 R70	Widerst. SK2 4M7 5% 0,3W	1	Stück	C		,P,INDUS,
55.1800.422.021	R0.18K0.220.004 R71,R164,R173	Widerst. SK2 18K 2% 0,3W	3	Stück	C		,P,INDUS,
55.3300.522.021	R0.330K.220.004 R72	Widerst. SK2 330K 2% 0,3W	1	Stück	C		,P,INDUS,
55.6200.322.021	R0.6K20.220.004 R74	Widerst. SK2 6K2 2% 0,3W	1	Stück	C		,P,INDUS,
55.4640.413.021	R0.46K4.210.004 R75	Widerst. MK2 46K4 1% 0,3W	1	Stück	C		
55.3600.222.021	R0.360R.220.004 R76	Widerst. SK2 360R 2% 0,3W	1	Stück	C		,P,INDUS,

3089.18 29.09.93 Ba.

==================

ıuptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

ıterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SMG204038

ıch-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
;.2200.322.021	R0.2K20.220.004 R77	Widerst. SK2 2K2 2% 0,3W	1 Stück	C		,P,INDUS,
;.2870.413.021	R0.28K7.210.004 R78	Widerst. MK2 28K7 1% 0,3W	1 Stück	C		,P,
;.9100.422.021	R0.91K0.220.004 R79	Widerst. SK2 91K 2% 0,3W	1 Stück	C		,P,INDUS,
5.5100.322.021	R0.5K10.220.004 R81	Widerst. SK2 5K1 2% 0,3W	1 Stück	C		,P,INDUS,
5.2700.422.021	R0.27K0.220.004 R82,R120,R150,R174,R175	Widerst. SK2 27K 2% 0,3W	5 Stück	C		,P,INDUS,
5.1000.413.021	R0.10K0.210.004 R85,R86,R113	Widerst. MK2 10K0 1% 0,3W	3 Stück	C		,P,
5.2700.622.021	R0.2M70.220.004 R87	Widerst. SK2 2M7 2% 0,3W	1 Stück	C		,INDUS,
5.8250.313.021	R0.8K25.210.004 R89,R90,R104	Widerst. MK2 8K25 1% 0,3W	3 Stück	C		,P,
5.4700.522.021	R0.470K.220.004 R91	Widerst. SK2 470K 2% 0,3W	1 Stück	C		,P,INDUS,
ı5.2400.522.021	R0.240K.220.004 R92	Widerst. SK2 240K 2% 0,3W	1 Stück	C		,P,INDUS,
ı5.1800.122.021	R0.18R0.220.004 R96,R162	Widerst. SK2 18R 5% 0,3W	2 Stück	C		,P,INDUS,
;5.9100.522.021	R0.910K.220.004 R100	Widerst. SK2 910K 2% 0,3W	1 Stück	C		,P,INDUS,
;5.1800.522.021	R0.180K.220.004 R103	Widerst. SK2 180K 2% 0,3W	1 Stück	C		,P,INDUS,
;5.1960.413.021	R0.19K6.210.004 R109	Widerst. MK2 19K6 1% 0.3W	1 Stück	C		
55.2740.413.021	R0.27K4.210.004 R110	Widerst. MK2 27K4 1% 0,3W	1 Stück	C		,P,
55.1000.324.400	R0.1K00.420.006 R112	Widerst. WK4 1K0 5% 1,0W	1 Stück	B	B	,P,
55.3830.313.021	R0.3K83.210.004 R114	Widerst. MK2 3K83 1% 0,3W	1 Stück	C		,P,

===================

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.500 64.561400RB TBG-Stecker-LP SM6204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart Kennzeichen
55.2700.522.021	R0.270K.220.004 R118	Widerst. SK2 270K 2% 0,3W	1	Stück	C	,P,INDUS,
55.1300.522.021	R0.130K.220.004 R119,R144	Widerst. SK2 130K 2% 0,3W	2	Stück	C	,P,INDUS,
55.4750.413.021	R0.47K5.210.004 R122,R125	Widerst. MK2 47K5 1% 0,3W	2	Stück	C	,P,
55.5620.413.021	R0.56K2.210.004 R123	Widerst. MK2 56K2 1% 0,3W	1	Stück	C	
55.8200.322.021	R0.8K20.220.004 R124,R140,R180,R183	Widerst. SK2 8K2 2% 0,3W	4	Stück	C	,P,INDUS,
55.4300.422.021	R0.43K0.220.004 R126	Widerst. SK2 43K 2% 0,3W	1	Stück	C	,P,INDUS,
55.1000.422.021	R0.10K0.220.004 R127,R133,R169	Widerst. SK2 10K 2% 0,3W	3	Stück	C	,P,INDUS,
55.4700.422.021	R0.47K0.220.004 R128,R142,R152,R156,R179	Widerst. SK2 47K 2% 0,3W	5	Stück	C	,P,INDUS,
55.7500.313.021	R0.7K50.210.004 R129	Widerst. MK2 7K5 1% 0,3W	1	Stück	C	,P,
55.1200.422.021	R0.12K0.220.004 R131	Widerst. SK2 12K 2% 0,3W	1	Stück	C	,P,INDUS,
55.5100.222.021	R0.510R.220.004 R132,R153	Widerst. SK2 510R 2% 0,3W	2	Stück	C	,P,INDUS,
55.1200.522.021	R0.120K.220.004 R134	Widerst. SK2 120K 2% 0,3W	1	Stück	C	,P,INDUS,
55.4700.222.021	R0.470R.220.004 R135	Widerst. SK2 470R 2% 0,3W	1	Stück	C	,P,INDUS,
55.3300.222.021	R0.330R.220.004 R136	Widerst. SK2 330R 2% 0,3W	1	Stück	C	,P,INDUS,
55.1240.413.021	R0.12K4.210.004 R137,R171	Widerst. MK2 12K4 1% 0,3W	2	Stück	C	
55.6810.313.021	R0.6K81.210.004 R138	Widerst. MK2 6K81 1% 0,3W	1	Stück	C	
55.2000.422.021	R0.20K0.220.004 R143	Widerst. SK2 20K 2% 0,3W	1	Stück	C	,P,INDUS,

3089.18 29.09.93 Ba.

jotposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

terposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SM6204038

ch-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
.6800.422.021	R0.68K0.220.004	Widerst. SK2 68K 2% 0.3W	2 Stück	C		,P,INDUS,
	R148,R177					
.5600.422.021	R0.56K0.220.004	Widerst. SK2 56K 2% 0,3W	1 Stück	C		,P,INDUS,
	R149					
.2400.422.021	R0.24K0.220.004	Widerst. SK2 24K 2% 0,3W	1 Stück	C		,P,INDUS,
	R155					
.1000.323.300	R0.1K00.320.005	Widerst. SC4 1K0 5% 0,5W	1 Stück	B	B	,P,
	R159					
.6800.222.021	R0.680R.220.004	Widerst. SK2 680R 2% 0,3W	1 Stück	C		,P,INDUS,
	R163					
.4020.413.021	R0.40K2.210.004	Widerst. MK2 40K2 1% 0,3W	1 Stück	C		,P,
	R170					
.6200.522.021	R0.620K.210.004	Widerst. SK2 620K 2% 0,3W	1 Stück	C		,P,INDUS,
	R172					
.1000.622.021	R0.1M00.220.004	Widerst. SK2 1M 2% 0,3W	1 Stück	C		,P,INDUS,
	R176					
.1000.331.520	R6.1K00.430.200	Wid-Trimm 141 1K 10% 1,0 W	3 Stück	B	B	
	R602,R604,R606					
.1000.333.540	R6.1K00.330.400	Wid-Trimm 3386 1K 10% 0,5 W	3 Stück	B	B	,P,
	R603,R605,R607					
6.1000.333.530	R6.1K00.330.300	Wid-Trimm 3323 1K 10% 0,5 W	2 Stück	B	B	,P,
	R608,R611					
6.1000.432.510	R6.10K0.330.100	Wid-Trimm 3321 10K 10% 0,5 W	1 Stück	B	B	,P,
	R609					
6.5000.333.540	R6.5K00.330.400	Wid-Trimm 3386 5K 10% 0,5 W	1 Stück	B	B	
	R610					
6.1000.533.530	R6.100K.330.300	Wid-Trimm 3323 100K 10% 0,5 W	1 Stück	B	B	,P,
	R612					
8.8003.026.002	S5.WW36.050.200	Stiftstreifen stehend 5,5x2pol	2 Stück	B	B	
	S500,S501					
8.8003.064.300	S5.WW36.050.300	Stiftstreifen stehend 5,5x3pol	1 Stück	B	B	
	S503					
2.0005.520.470	T0.ZTX5.52Y.092	Transistor ZTX552 PNP/TO-92	2 Stück	B	B	,P,
	T10,T19					

Hauptposition: Teil 15.6140.000 ASMG204038SA A6.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SMG204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
42.0005.470.190	T0.BC23.7BY.092	Transistor BC237B NPN/TO-92	5	Stück	C		,P,UL,
	T11,T14,T20,T22,T35						
42.0007.530.470	T0.ZTX7.53Y.092	Transistor ZTX753 PNP/TO-92	1	Stück	B	B	,P,
	T13						
42.9001.100.250	T0.BSS1.10Y.092	Transistor BSS110 P-FET/TO-92	3	Stück	B	B	,P,
	T16,T33,T34						
42.9001.000.250	T0.BSS1.00Y.092	Transistor BSS100 N-FET/TO-92	3	Stück	B	B	
	T17,T24,T28						
42.0000.460.260	T0.BSX4.616.Y39	Transistor BSX46-16 NPN/TO-39	1	Stück	B	B	,P,
	T21						
42.0503.000.750	T0.VN50.300.L92	Transistor VN50300L N-FE/TO92	1	Stück	B	B	,P,
	T23						
42.0005.440.210	T0.BD54.4CY.022	Transistor BD544C PNP/TO-220	1	Stück	B	B	,P,
	T25						
42.0001.610.180	T0.BC16.116.Y39	Transistor BC161-16 PNP/TO-39	1	Stück	B	B	,P,
	T26						
42.0007.850.220	T0.BD78.5Y0.012	Transistor BD785 NPN/TO-126	1	Stück	B	B	,P,
	T27						
38.8003.025.000	X6.03S1.100.SF4	Stiftleiste 3Pol 2,5MSF	1	Stück	B	B	
	X602						
38.7141.000.040	F0.1000.0AT.006	G-Schmelzeinsatz 10AT /6,3x32	1	Stück	B	B	
	F2						
38.7004.016.000	F4.1978.600.000	Si-Halter-Kappe 19786(6,3x32)	1	Stück	B	B	
	F401						
38.3040.100.551	MB.N250.550.000	Abstandsnietbolzen M2,5x5,5	3	Stück	C		
	MBN1,MBN2,MBN3						
48.3000.000.120	MK.KFE3.750.390	KK-Feder FE375-10 /TO39	1	Stück	B	B	
	MKK1						
48.3000.000.060	MK.KKK5.110.390	KK-Feder KK511 /TO39	1	Stück	B	B	
	MKK2						
38.6500.690.040	X9.0425.406.900	LP-Verbinder 4Pol 69mm 2,54	2	Stück	B	B	
	X900,X901						
38.6202.150.060	Y0.0115.000.0RT	Iso.Litze 1,5x 00 rt Radox155	1	Stück	C		,NILA,
	Y3						

3089.18 29.09.93 Ba.

ıptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

:erposition: Teil 15.6140.000.500 G4.561400R0 TBG-Stecker-LP SMG204038

:h-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
6206.150.085	Y0.0115.000.0BL Y4	Iso.Litze 1,5x 00 bl Radox155		1	Stück	C		,NILA,
.6311.064.003	Y8.0106.400.000 Y802	Schrumpfschlauch LWS 6,4		1	Stück	C		,NILA,
.1150.050.601	R8.150K.K15.400 R801	NTC K45-150K 2Anschl in Y8 LW1,6		1	Stück	B	B	,UL,
.4561.000.011	M9.W561.000.000 M9W1	Kühlwinkel 561.000 D		1	Stück	B	B	
2WP006	ZWP006 Z7	Montage KW-LP	vLs	1	Stück	B	A	
.0010.450.750	D0.SB10.45Y.022 D20,D26	Diode SB1045 stehend /TO-220		2	Stück	B	B	,P,
.0000.110.300	T0.BUZ1.1Y0.022 T15	Transistor BUZ11 N-FET/TO-220		1	Stück	B	B	,P,
.0000.440.490	T0.D44V.H10.Y22 T18	Transistor D44VH10 NPN/TO-220		1	Stück	B	B	,P,
2TW019	ZTW019 Z10	Montage T0-KW	vOb	1	Stück	B	A	
.0000.080.590	D0.FES8.BTY.022 D17	Diode FES8BT stehend /TO-220		1	Stück	B	B	,P,
.0010.450.750	D0.SB10.45Y.022 D19	Diode SB1045 stehend /TO-220		1	Stück	B	B	,P,
.0000.440.490	T0.D44V.H10.Y22 T9	Transistor D44VH10 NPN/TO-220		1	Stück	B	B	,P,
.0000.260.270	T0.BUV2.6Y0.022 T12	Transistor BUV26 NPN/TO-220		1	Stück	B	B	,P,
.0065.020.020	TY.2N65.02Y.022 TY1,TY2	Thyristor 2N6502 /TO-220		2	Stück	B	B	
2TW020	ZTW020 Z11	Montage T0-KW	vVo	1	Stück	B	A	
2BP004	ZBP004 Z12	Montage Bolzen-LP	vLs	1	Stück	B	A	
1010	AGA	Arbeitsgang Ausrüsten		1	min			
1004	AGB	Arbeitsgang Bestückung		1	min			
1011	AGZ1	Arbeitsgang Z1 elektrischer Teilfunktionstest		1	min			
1002	AGM	Arbeitsgang Montage		1	min			

Hauptposition: Teil 15.6140.000 ASM6204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 15.6140.000.500 64.561400R0 TBG-Stecker-LP SM6204038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart Kennzeichen

Unterposition: Teil 35.8561.009.012 M7.F561.009.000 Filtereinsatz 561.009 A f.Lüfter SM64038

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart Kennzeichen
35.8561.009.011	M7.F561.009.001	Filtereinsatz 561.009 A f.Lüfter	1	Stück	B	B

Unterposition: Teil 62.2532.104.010 L5.5321.04S.K22 Drossel 532.104 A 4 mH/ 2A AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart Kennzeichen
63.0000.027.000	LZ.K221.300.038	Kern 22/13 oL T38	2	Stück	B	B
64.0000.026.000	LZ.S221.30S.200	S.Körp 22/13 S/2/0	1	Stück	B	B

Unterposition: Teil 2L0001 ZL0001 Montage Schalenkern 18x11/14 vBs

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart Kennzeichen
38.2130.016.175	MS.S301.601.7P0	Zylinderschr. M3 x16 D 85 Pl Drossel	1	Stück	C	
38.2130.000.060	MB.S300.000.000	Einpressmutter M3,0 von Bauteilseite (außer DG36 alt) Leiterplatte 1	1	Stück	C	

Unterposition: Teil 2L0002 ZL0002 Montage Ringkern D36 - LP vBs

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart Kennzeichen
38.2130.010.100	MS.S301.001.0S0	Linsenschr. M3 x10 D7985StZn	1	Stück	C	
38.2232.000.290	MS.A032.002.9S0	Unterlegscheibe A3,2DIN9021StZn	1	Stück	C	

3089.18 29.09.93 Ba.

auptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

nterposition: Teil 2L0002 ZL0002 Montage Ringkern D36 - LP vBs

ach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
5.1000.004.000	MR.H112.515.000	Ringkernhalterung Vogel 3070 L0 1	1 Stück	B	B	
6.7524.005.011	M7.I524.005.000	Isolierung 524005 HP2063 Leiterplatte 1	1 Stück	B	B	,UL,

nterposition: Teil 57.1240.000.611 R8.SG24.000.000 NTC SG 240 AVNS

ach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
8.4829.100.610	MB.C100.600.0K0	Keramikrolle D2,9xd1,0xL6,0	2 Stück	C		,P,

Interposition: Teil 42.9001.000.250 T0.BSS1.00Y.092 Transistor BSS100 N-FET/TO-92 AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
.2.9001.000.251	T0.BSS1.00Y.692	Transistor BSS100 N-FET/TO-92	1 Stück	B	B	,P,

Interposition: Teil 42.9001.100.250 T0.BSS1.10Y.092 Transistor BSS110 P-FET/TO-92 AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
42.9001.100.251	T0.BSS1.10Y.692	Transistor BSS110 P-FET/TO-92	1 Stück	B	B	,P,

Unterposition: Teil 61.2561.100.010 UE.5611.000.000 Übertrager 561.100 E SMG4038

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
63.0000.005.000	LZ.KEC4.100.0C3	Kern EC41 oL PC30	2 Stück	B	B	
64.0000.006.000	LZ.SEC4.10L.109	S.Körp EC41 L/1/9	1 Stück	B	B	

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 48.3000.000.100 MK.KKK3.200.120 KK-Aufsteck KK32 gekürzt /T0126 AVNS

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
48.3000.000.103	MK.KKK3.200.126	KK-Aufsteck KK32	/T0126	1	Stück	B	B	

Unterposition: Teil 2WP005 ZWP005 Montage KW-LP vLs

Sach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
38.2322.007.180	MS.B220.651.8S0	Li-Blechschr.B2,2x6,5DIN7981StZn	2	Stück	C		
	Leiterplatte						
	Kühlwinkel						

Unterposition: Teil 2TW003 ZTW003 Montage T0-KW vVo

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
48.7003.000.010	MH.C220.000.220	T0-Halteclip C2200	/T0220	1	Stück	B	B	
	T0220	1						
48.3220.100.000	MI.S220.23L.S00	Isolierung Silpad	T0220	1	Stück	C		
	KW	1						

Unterposition: Teil 42.0043.140.380 T0.2SC4.314.Y33 Transistor 2SC4314 NPN/TOP-3 AVNS,

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
42.0043.140.381	T0.2SC4.314.Y00	Transistor 2SC4314	NPN/TOP-3	1	Stück	B	B	,UM,

Unterposition: Teil 2TK007 ZTK007 Montage T0-KK vVo

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
48.7001.000.009	MH.KTHF.104.330	Bef-Klammer THF104	/TOP3	1	Stück	B	B	
	T0	1						

3089.18 29.09.93 B1.

ıuptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

ıterposition: Teil 2TK007 ZTK007 Montage T0-KK vVo

ıch-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
3.5218.100.000	MI.S330.23L.S00	Isolierung Silpad	TOP3	1	Stück	C		
3.3000.000.104	MK.KSK1.040.220	KK-SK104-38,1-ST-C-220	/TO220	1	Stück	B	B	

ıterposition: Teil 2XP001 ZXP001 Montage Stecker an LP vLs

ach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
3.4009.001.000	MN.A240.790.0A0	Niete für H15	d2,4x7,9D7337	2	Stück	C		
	LP	1						
	Stecker	1						

nterposition: Teil 2L0007 ZL0007 Montage Ringkern 2x D36 - LP vLs

ach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
8.2130.030.131	MS.S303.001.3M0	Zylinderschr. M3 x30 D 84 Ms		1	Stück	C		
	LP	1						
6.7524.005.011	M7.I524.005.000	Isolierung 524005 HP2063		1	Stück	B	B	,UL,
	L0	1						
5.2540.021.011	M7.Z540.021.000	Zentrierung 540021A Delrin		1	Stück	B	B	,UL,
6.7524.005.011	M7.I524.005.000	Isolierung 524005 HP2063		1	Stück	B	B	,UL,
	L0	1						
5.1000.004.000	MR.H112.515.000	Ringkernhalterung Vogel	3070	1	Stück	B	B	
8.2232.000.290	MS.A032.002.9S0	Unterlegscheibe A3,2DIN9021StZn		1	Stück	C		
8.2130.000.050	MS.M300.000.5S0	SelbstsichermutterM3 D 985		1	Stück	C		

Jnterposition: Teil 2L0017 ZL0017 Montage Ringkern 1xD31 vBs

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 2L0017 ZL0017 Montage Ringkern 1xD31 vBs

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
38.2130.010.100	MS.S301.001.0S0	Linsenschr. M3 x10 D7985StZn	1 Stück	C		
65.1000.001.000	MR.H102.009.000 L	Ringkernhalterung Vogel 3050 1	1 Stück	B	B	
36.7524.007.011	M7.I524.007.000 LP	Isolierung 524007 HP2063 1	1 Stück	B	B	,UL,

Unterposition: Teil 44.0002.410.780 D0.SD24.1PY.033 Diode SD241P stehend /TOP3 AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
44.0002.410.769	D0.SD24.1PY.0UB	Diode SD241P /TOP3	1 Stück	B	B	

Unterposition: Teil 44.0008.230.040 IC.1N82.3Y0.035 Diode 1N823A liegend /DO-35 AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
44.0008.230.049	IC.1N82.3Y0.0UB	Referenz 1N823A /DO-35G	1 Stück	B	B	

Unterposition: Teil 42.9001.100.250 T0.BSS1.10Y.092 Transistor BSS110 P-FET/TO-92 AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
42.9001.100.251	T0.BSS1.10Y.692	Transistor BSS110 P-FET/TO-92	1 Stück	B	B	,P,

Unterposition: Teil 42.9001.000.250 T0.BSS1.00Y.092 Transistor BSS100 N-FET/TO-92 AVNS

Sach-Nr	EDV-Nr	Bezeichnung	Menge	Dis	Eart	Kennzeichen
42.9001.000.251	T0.BSS1.00Y.692	Transistor BSS100 N-FET/TO-92	1 Stück	B	B	,P,

3089.18 29.09.93 ba.

ıptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

:terposition: Teil 57.1150.050.601 R8.150K.K15.400 NTC K45-150K 2Anschl in Y8 LW1,6 AVNS

:h-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
.6311.016.007	Y8.0101.600.000	Schrumpfschlauch LWS 1,6 RNF100 Länge 25mm	2	Stück	C		,UL,NILA,

ıterposition: Teil 2WP006 ZWP006 Montage KW-LP vLs

ch-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
.2322.007.180	MS.B220.651.8S0	Li-Blechschr.B2,2x6,5DIN7981StZn Leiterplatte Kühlwinkel	3	Stück	C		

ıterposition: Teil 2TW019 ZTW019 Montage T0-KW vOb

ıch-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
ı.2125.012.110	MS.S251.201.1S0	Senkschraube M2,5x12 D 965StZn KW 1	2	Stück	C		
3.4001.000.011	MI.H220.450.000	Isolierhaube /T0220 T0 4	4	Stück	C		
5.8540.000.012	M7.H540.000.000	Halter 540000A ws-verzinkt	1	Stück	B	B	

nterposition: Teil 2TW020 ZTW020 Montage T0-KW vVo

ach-Nr	EDV-Nr	Bezeichnung	Menge		Dis	Eart	Kennzeichen
8.2125.020.100	MS.S252.001.0S0	Linsenschr. M2,5x20 D7985StZn	2	Stück	C		
8.2225.000.260	MS.A025.002.6S0	Federring A2,5DIN 127StZn	2	Stück	C		
5.8561.001.011	M7.H561.001.000	Halter 561001 ALU 2mm T0 3	1	Stück	B	B	
6.7561.012.011	M7.I561.012.000	Isolierung 561012A TC-020AG-AV KW 1	1	Stück	B	B	

Hauptposition: Teil 15.6140.000 ASMG204038SA A4.56140000 Schlumberger Netzteil

Unterposition: Teil 2TW020 ZTW020 Montage T0-KW vVo

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
36.7561.012.011	M7.I561.012.000 T0	Isolierung	561012A TC-020AG-AV 3	1	Stück	B	B	
35.8554.010.021	M7.H554.010.000	Halter	554010A ALU 2mm	1	Stück	B	B	

Unterposition: Teil 2BP004 ZBP004 Montage Bolzen-LP vLs

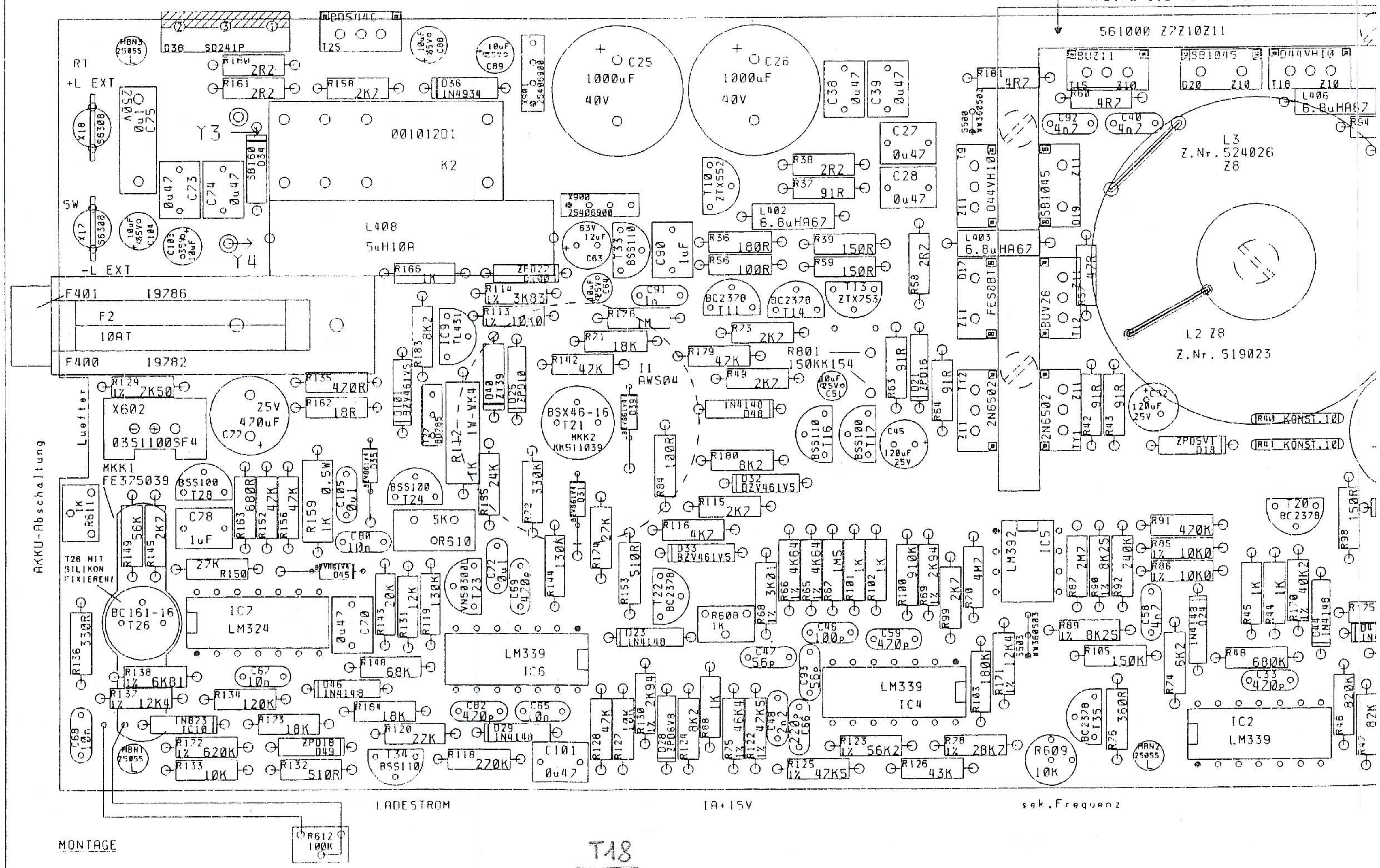
Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
38.3020.100.500	M8.A250.500.0S0 LP	Abstandsb.	AM2505 -M2,5x05 StZn 1	2	Stück	B	B	
38.2222.000.280	MS.A022.002.8S0	Zahnscheibe	A2,2DIN6797StZn	2	Stück	C		
38.2125.000.010	MS.M250.000.1S0	Sechskantmutter	M2,5D 934StZn	2	Stück	C		

Unterposition: Teil 35.8540.000.012 M7.H540.000.000 Halter 540000A ws-verzinkt P3300

Sach-Nr	EDV-Nr	Bezeichnung		Menge		Dis	Eart	Kennzeichen
35.8540.000.011	M7.H540.000.001	Halter	540000A Stahl 1,5mm	1	Stück	B	B	

3089.18 29.09.93

HINWEIS:
T12,D19,TY1 MIT SILPAD-ZUSCHNITT M
(KEINE SILPAD-HAUBE)



MONTAGE

Z6 ZXP001 — Z7 ZWP006 — M9W1 561000 Z7Z10Z11

Z8 ZL0007 — Z9 ZL0017

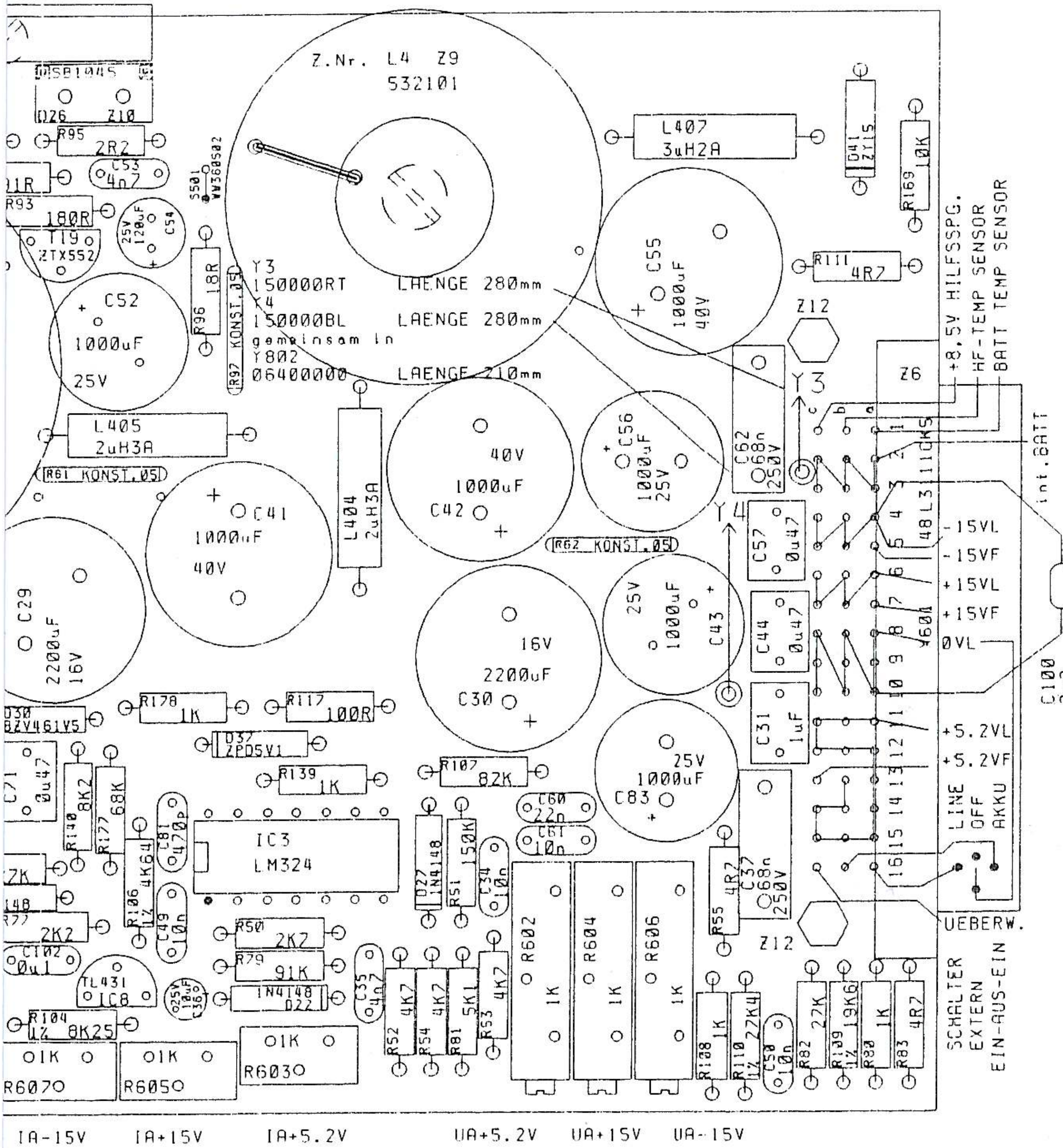
Z10 ZIW019 — Z11 ZTW020

Z12

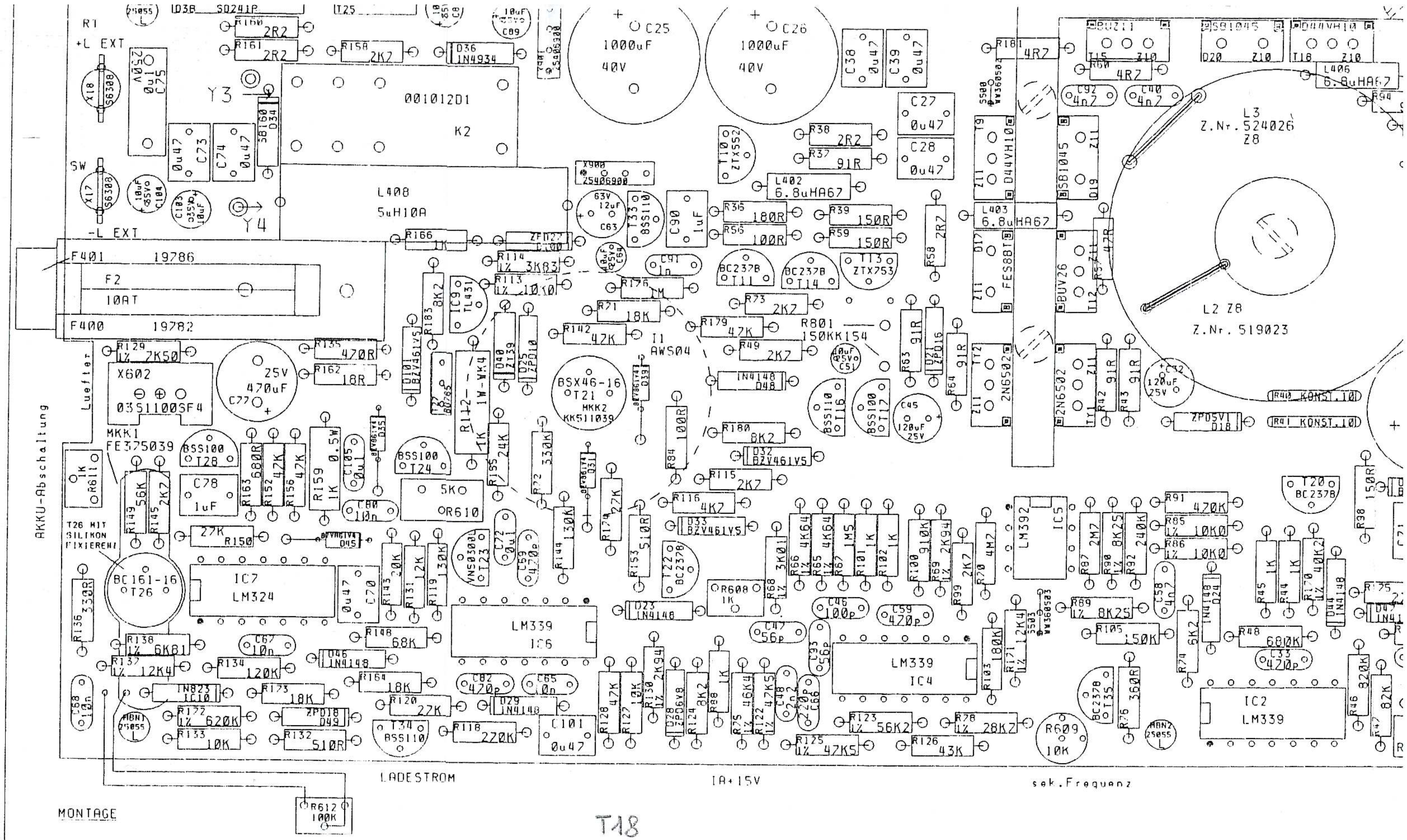
PROVA DELLE TENSIONI D'USCITA

METTENDO UN CAVALLOTTO TRA IL 9.(0V) E

NTIERT



1146a



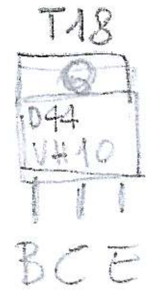
MONTAGE

Z6 ZXP001   Z7 ZWP006   M9W1 561000 Z7Z10Z11

Z8 ZL0007   Z9 ZL0017

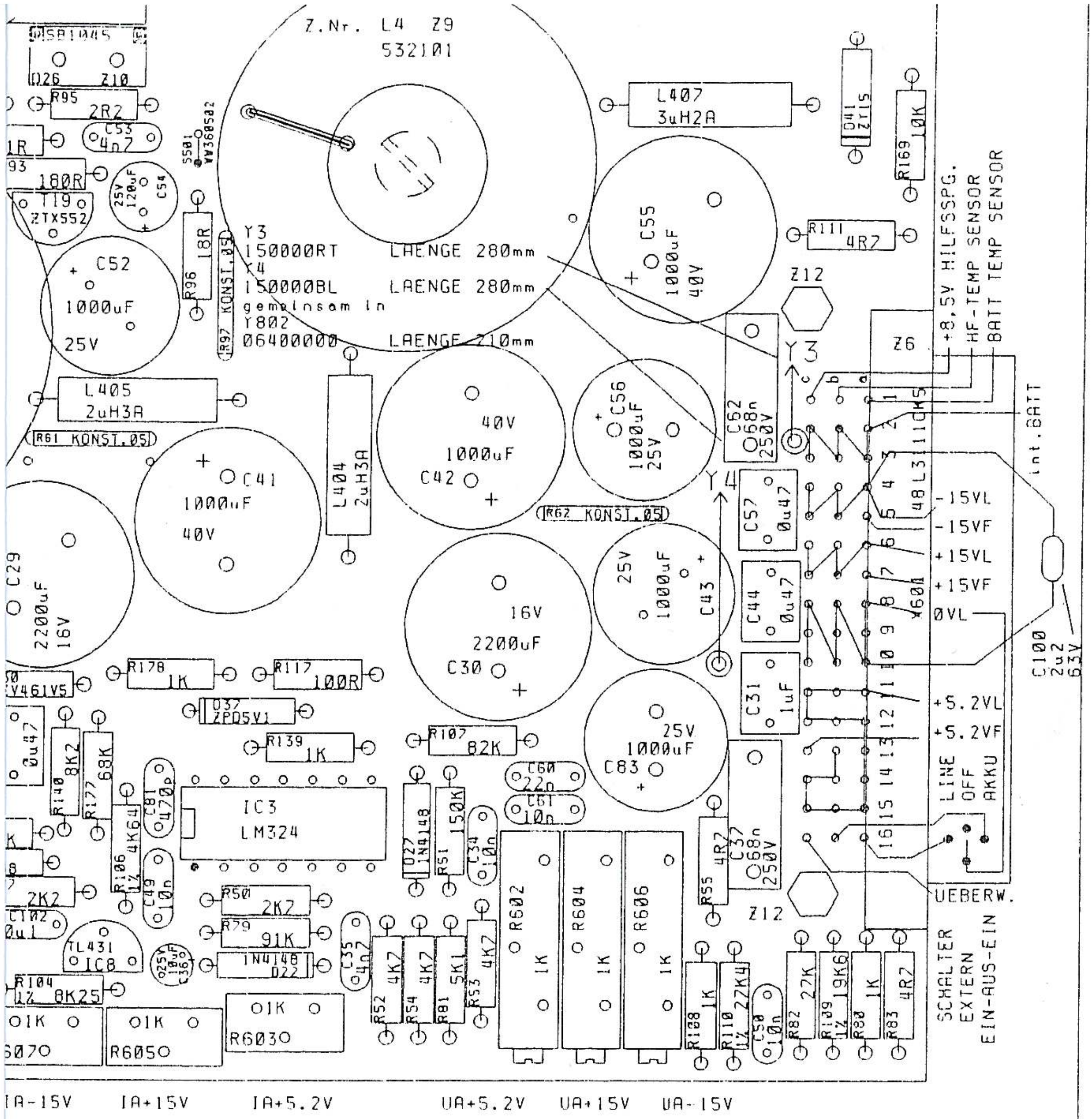
Z10 ZTW019   Z11 ZTW020

Z12 ZBP004



PROVA DELLE TENSIONI D'USCITA
METTENDO UN CAVALLOTTO TRA IL 9a (0V) E

0V	+5V	+15V	-15V
1a 9a 10a	11a 12a	6a	4a



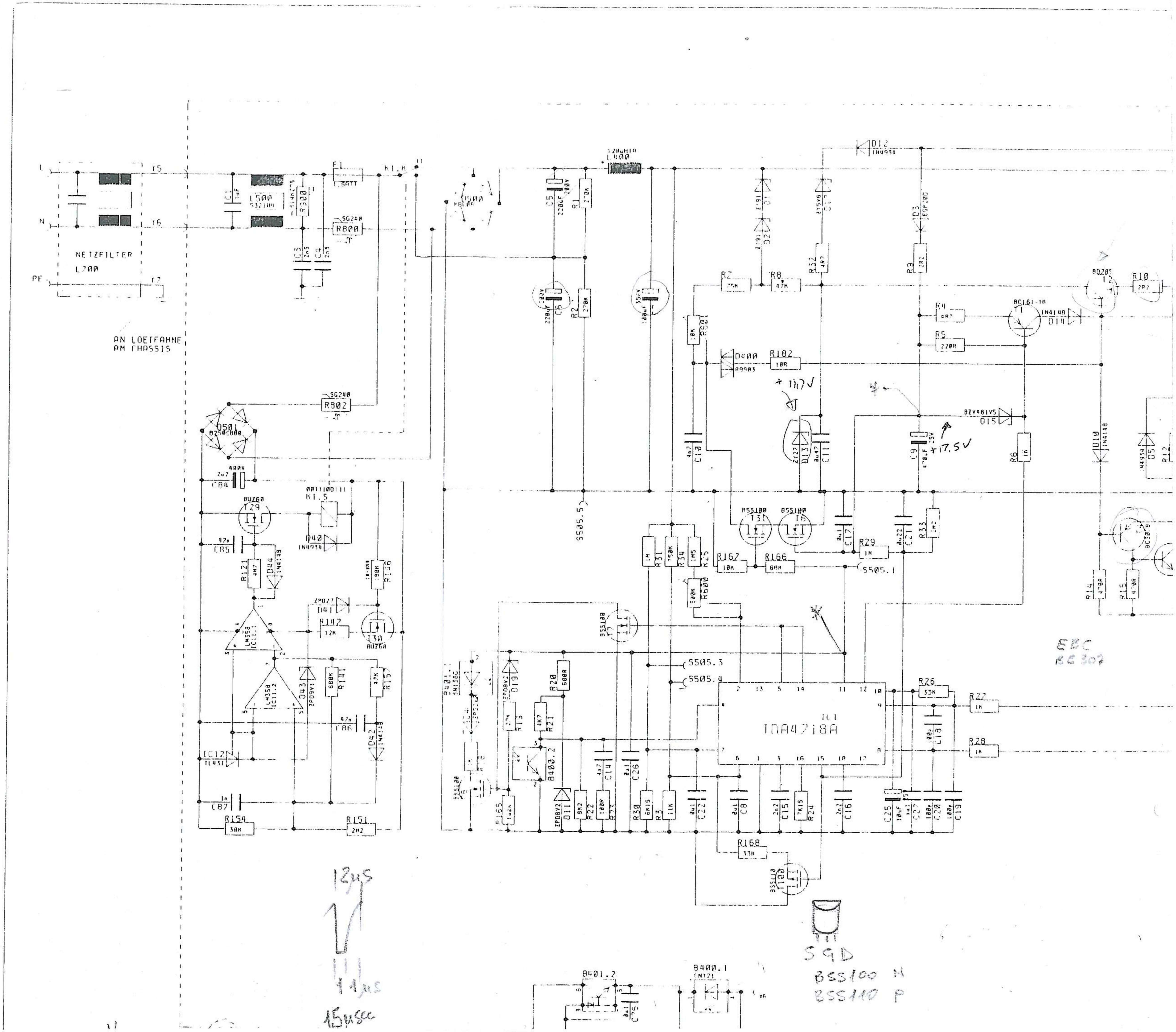
IL 16a

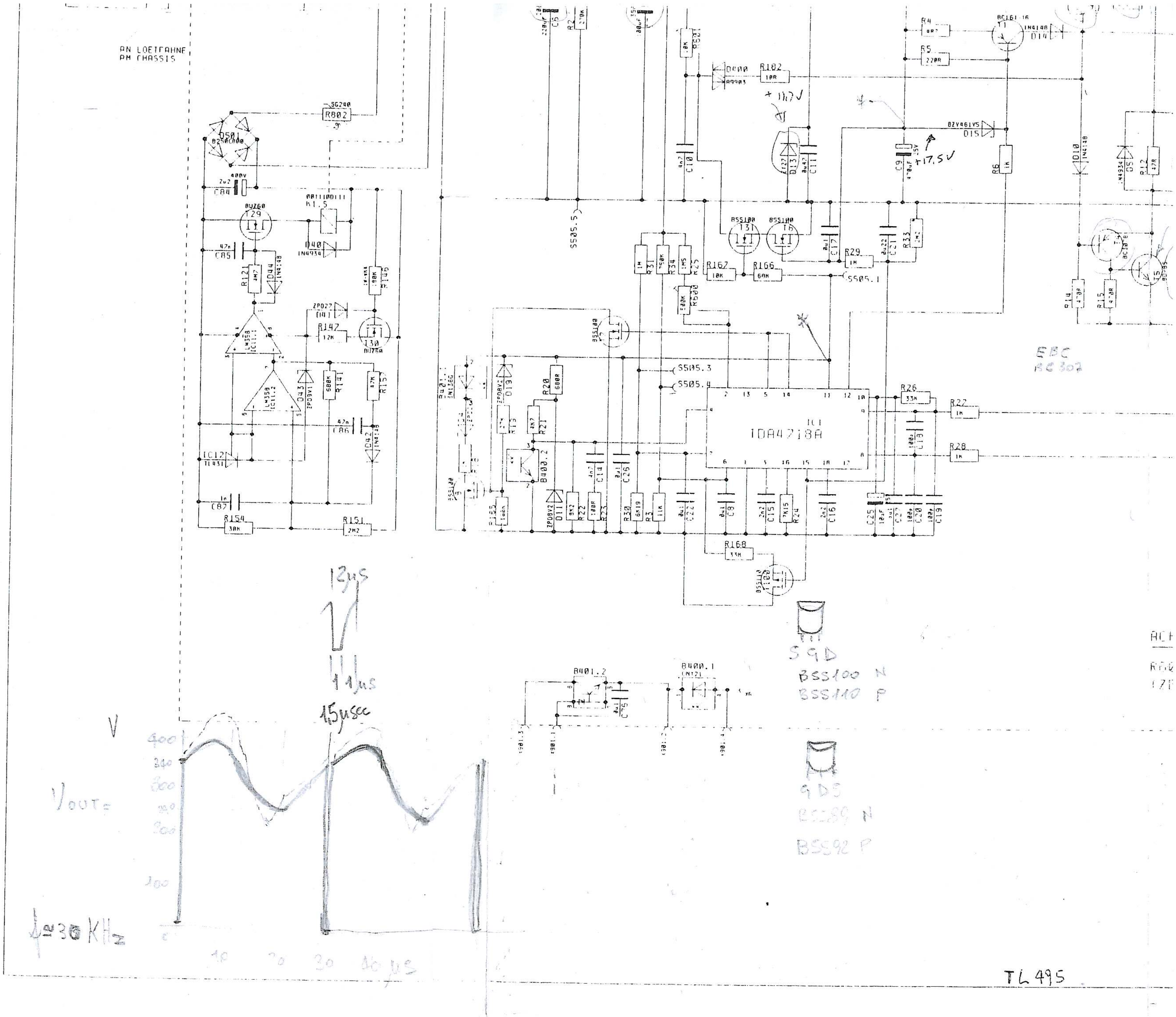
POWER SUPPLY 204 038

SMG204038 Bl. 2/3 (SMG4015)				UE1= 92-264V AC UE2= 10.8-32V DC		MASSTAB 3:1 / P2.8	4015		
						Z.Nr. 561400R			
					DATUM	NAME	+5.2V 4A		
				BEARB.	15.08.00	HEMMLER	+15V 2A	STECKER-LP	
				GEPR.	21.10.01	KOENIG	-15V 1A		
				NORM					
F	C106 DATU	12.08.01		MGV STROMVERSORGUNGEN			LP-Z.Nr. 561300E	BLATT 1/2	
D	LAYOUT NEU	12.02.03							
H	D51, D38, D39, D48								
	C87, R104, R812	20.06.01							
IND	ÄNDERUNG	DATUM	B	G					

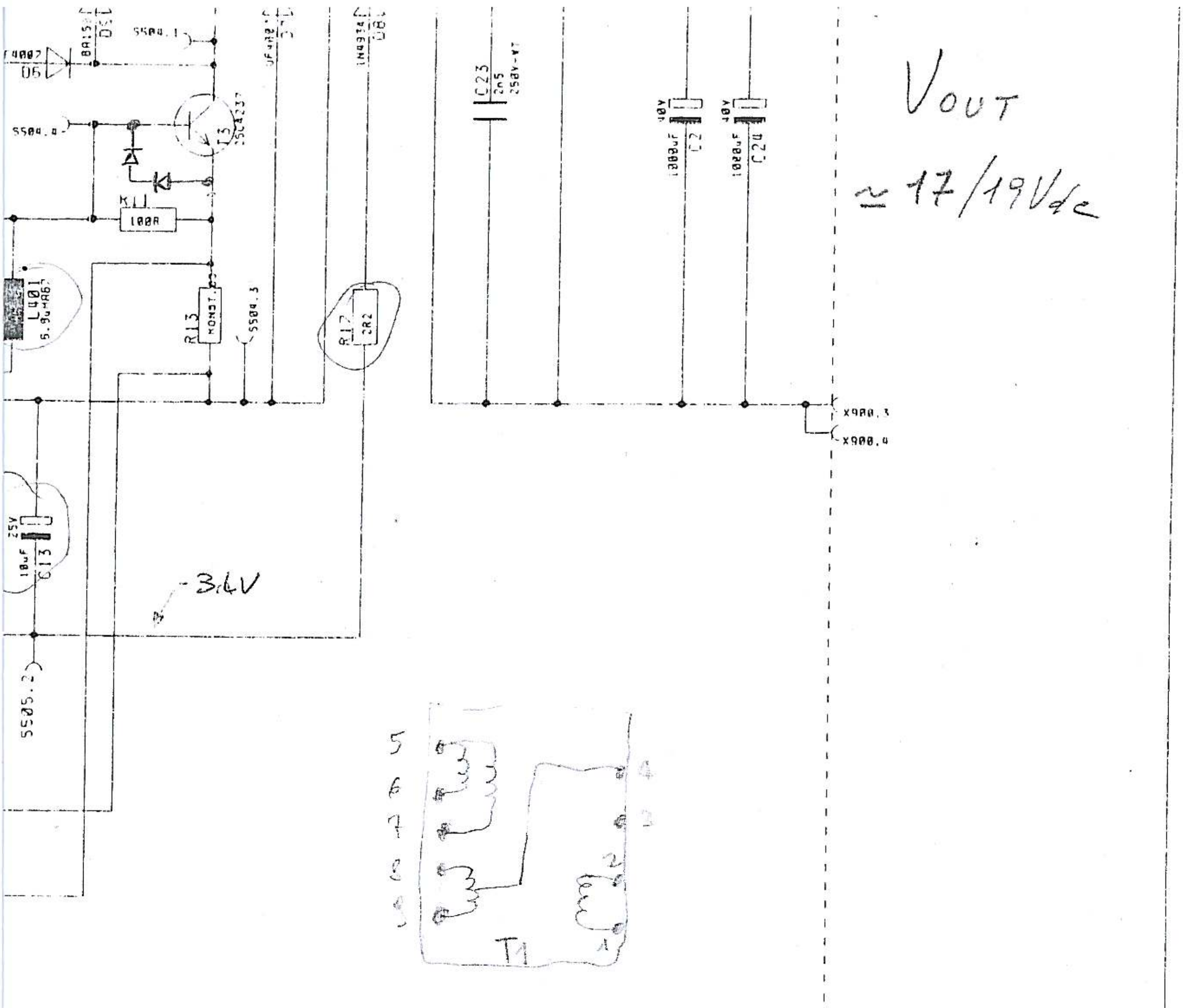
01/3089.18/29.9.93/Kr.

K


NETZFILTER
L200
AN LOETFAHNE
AM CHASSIS
L500
R300
F1
R800
R802
D501
B250C800
C84
T29
BUZ60
K1.5
D40
1N4934
C85
R121
D44
R145
D41
R142
T30
BUZ60
IC11.1
LM358
IC11.2
D43
R141
R15
C86
D42
IC12
TL431
C87
R154
R151
L400
C5
R1
C6
R2
D12
1N4934
D1
D2
R32
D3
EGP100
R3
R7
R8
R4
R5
T1
BC161-16
D14
1N4148
BD205
T2
R10
R181
D400
R182
+11,7V
D13
C10
C11
D15
BZV461V5
C9
+17,5V
R6
D10
1N4148
S505.5
T31
BSS100
T6
BSS100
C17
C21
R33
R29
R31
R34
R25
R167
R166
S505.1
R600
T7
BSS100
S505.3
S505.4
D19
R20
R13
R21
B400.2
D11
R22
R23
C14
C26
R30
R3
C22
C8
C15
R24
C16
C25
C27
C20
C19
IC1
TDA4718A
R26
C18
R27
R28
R168
T10
BSS110
R165
B401.2
B400.1
C75
EBC
BC307
12µs
11µs
15µsec
SGD
BSS100 N
BSS110 P



AN LOETFAHNE
AM CHASSIS
R802
DS01
C84
T29
K1.5
D40
1N4934
C85
R121
D44
1N4148
IC11.1
LM358
IC11.2
R142
T30
D41
D43
R141
R145
R151
C86
D42
IC12
TL431
C87
R154
R151
SS05.5
SS05.1
SS05.3
SS05.4
R162
R166
R182
R29
R26
R22
R28
R20
R21
R13
D11
D12
D13
D15
R6
R5
R4
T1
D14
C9
C10
C11
C12
C13
C14
C15
C16
C17
C19
C20
C21
C22
C25
C26
C27
R33
R34
R31
R25
R500
T31
T6
T5
T11
T14
T100
R168
IC1
TDA4718A
B400.2
B401.2
B400.1
+17,5V
EBC
BC 307
S9D
BSS100 N
BSS110 P
9DS
BSS89 N
BSS92 P
12µs
11µs
15µsec
V
Vout=
f≈30 KHz
10
20
30
40 µs
400
340
300
200
100
TL495



TUNG:

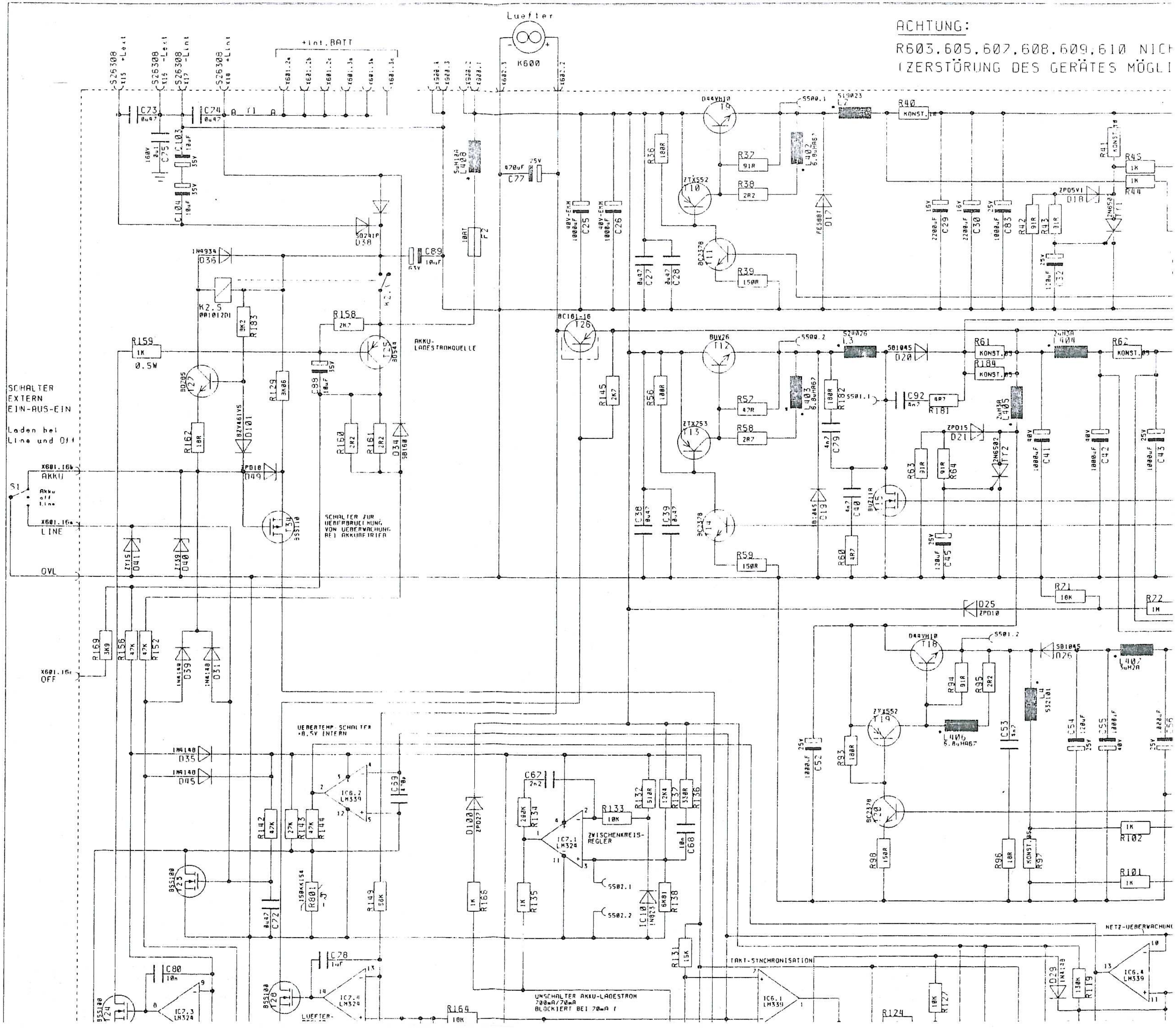
0 UND R601 NICHT VERSTELLEN !
RSTÖRUNG DES GERÄTES MÖGLICH!

HV-LP
561301

01 / 3089.18 / 29.9.93 / Kr.

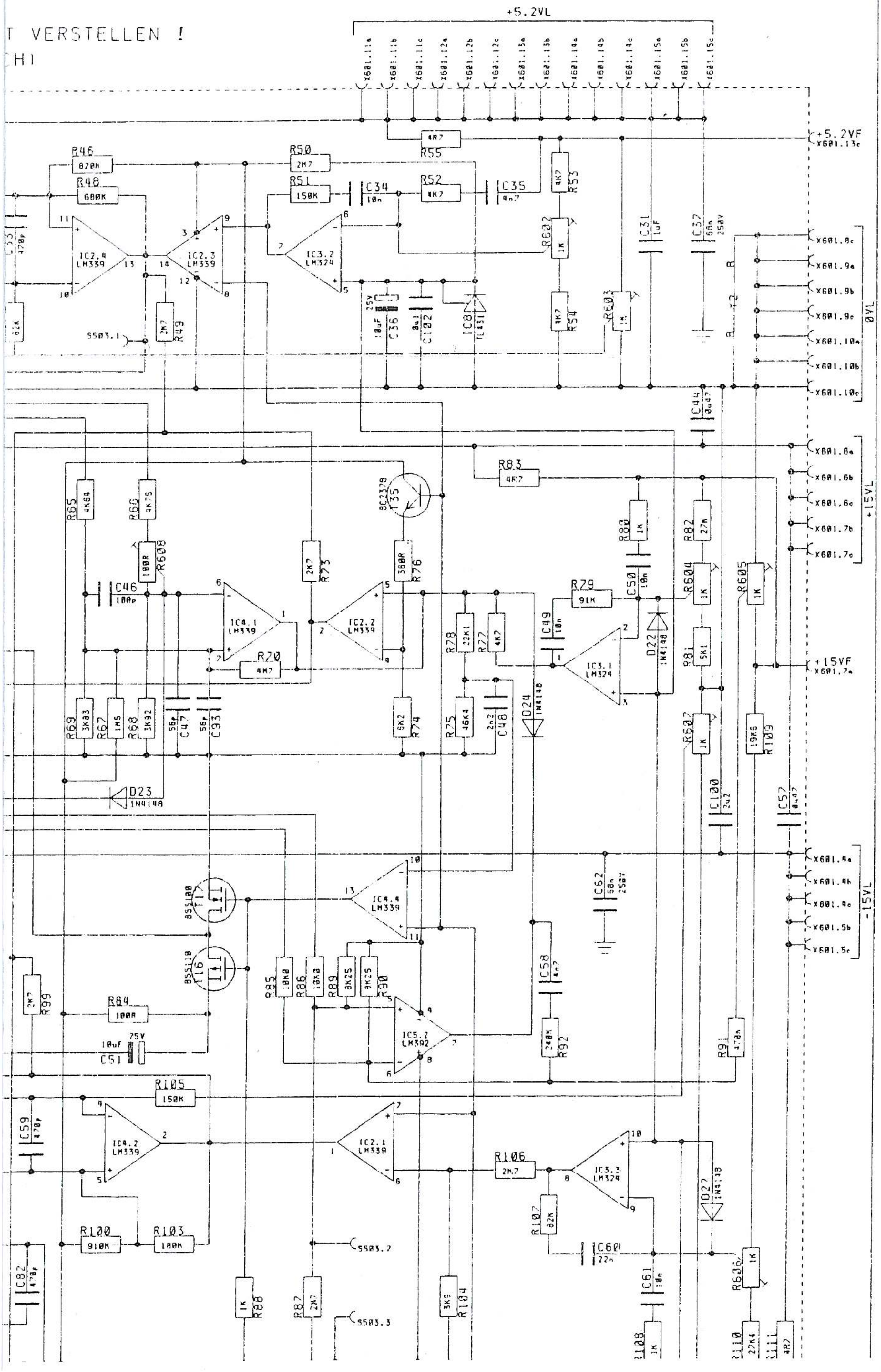
POWER SUPPLY 204 038 S

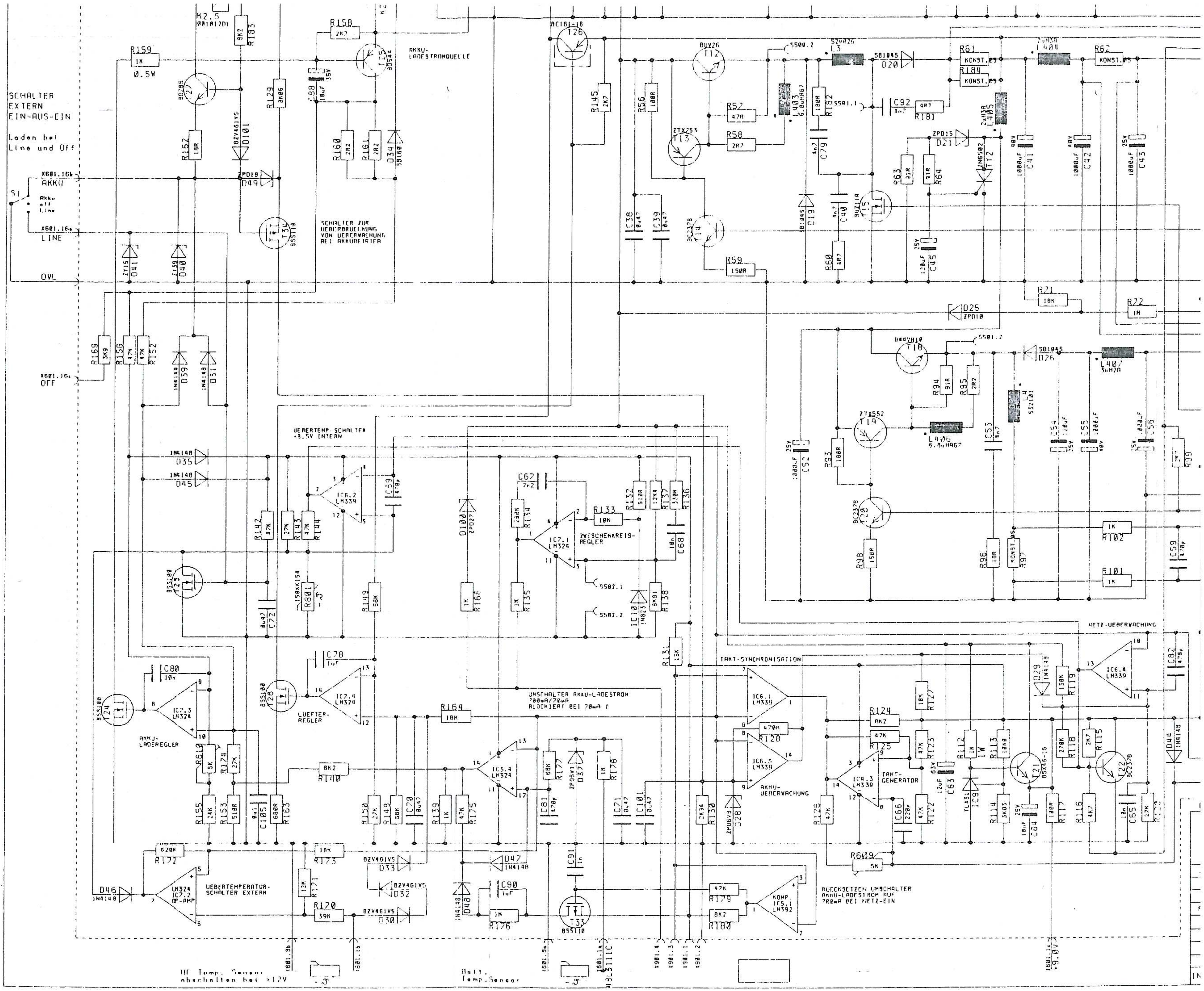
SMG204038 ALT (SMG4015)				UE = 10 32V	176-264V~ 92-138V~	MASSTAB 1 : 1		4015
						Z.Nr. 561200F1		
-	S504.505.R182	12.07.90	Li.		DATUM	NAME		
D	ZELLE 103-1.OPTOS	15.01.91	Li.	BEARB.	22.08.89	LINKE	+5.2V 4A	
E	F1.17.83.165.168	28.08.91	Li. Kae	GEPR.			+15V 2A	HV-LP
-	NEUZEICHNUNG WEGEN			NORM			-15V 1A	
	DATENVERLUST	12.06.92	Li.					
F	R5.6.26.C12.18.19.							BLATT 2/2 Bl.
	C20.23.84.D500	12.06.92	Li.				LP.Z.Nr. 561301	K
-	FEHLERKORREKTUREN	17.06.92	Li.					
IND	ÄNDERUNG	DATUM	B S	(Urspr.)			(Ers.f.) 561200A	(Ers.d.)



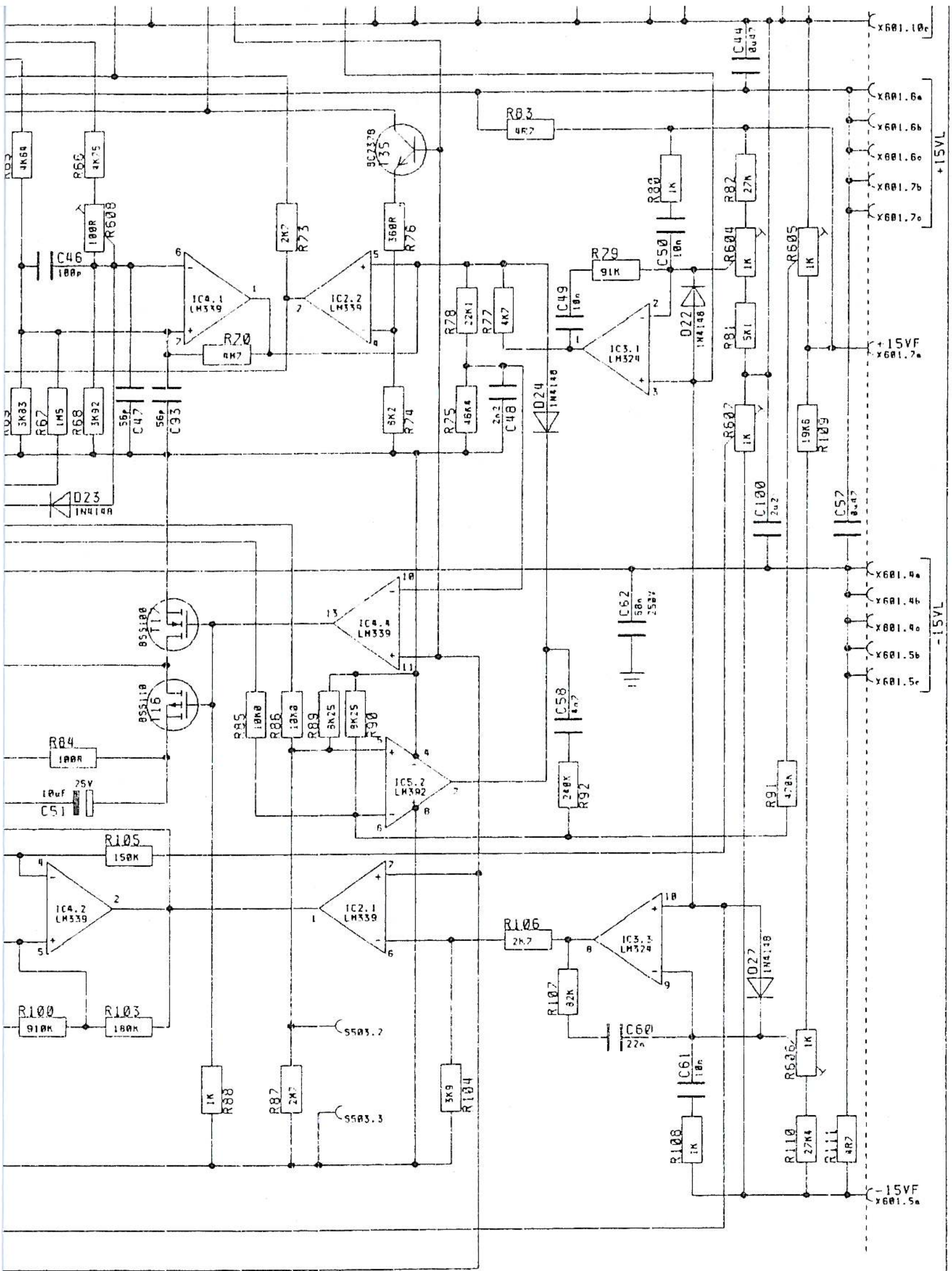
ACHTUNG:
R603,605,607,608,609,610 NICH
(ZERSTÖRUNG DES GERÄTES MÖGLI
Luefter
K600
+int.BATT
SCHALTER
EXTERN
EIN-AUS-EIN
Laden bei
Line und Off
AKKU
LINE
OVL
OFF
AKKU-
LADESTROMQUELLE
SCHALTER ZUR
UEBERBRUECKUNG
VON UEBERWACHUNG
BEI AKKUBETRIEB
UEBERTEMP.-SCHALTER
+8,5V INTERN
ZWISCHENKREIS-
REGLER
TAKT-SYNCHRONISATION
UMSCHALTER AKKU-LADESTROM
200mA/20mA
NETZ-UEBERWACHUNG

T VERSTELLEN !
CH)





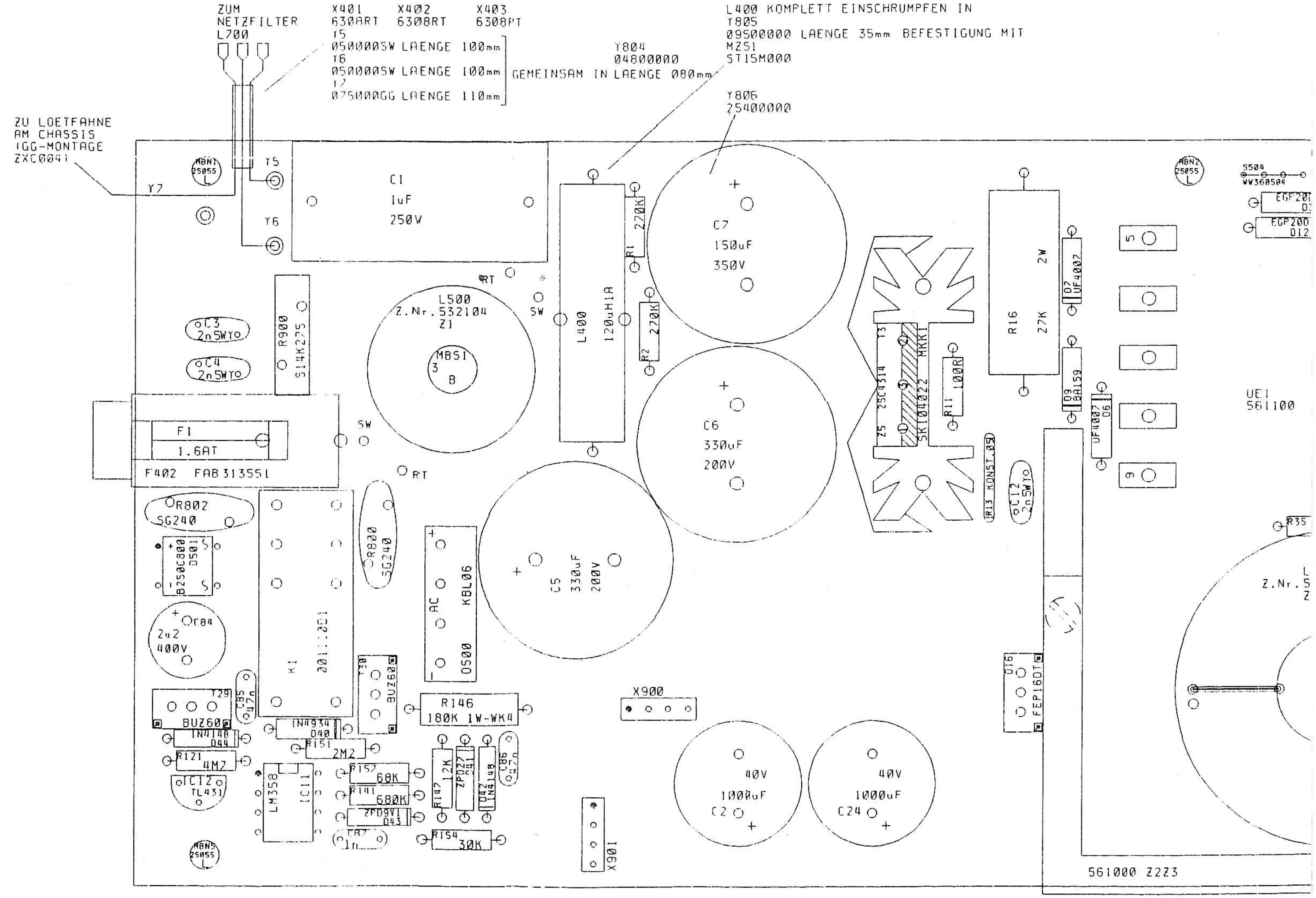
SCHALTER
EXTERN
EIN-AUS-EIN
Laden bei
Line und Off
X601.16b
AKKU
S1
X601.16a
LINE
OVL
X601.16c
OFF
R159
1K
0.5W
R158
2K2
AKKU-
LADESTROMQUELLE
SCHALTER ZUR
UEBERBRUECKUNG
VON UEBERWACHUNG
BEI AKKUBETRIEB
UEBERTEMP.SCHALTER
+8.5V INTERN
IC6.2
LM339
IC7.1
LM324
ZWISCHENKREIS-
REGLER
R133
10K
IC7.3
LM324
AKKU-
LADEREGLER
IC7.4
LM324
LUEFTER-
REGLER
R164
10K
UMSCHALTER AKKU-LADESTROM
700mA/70mA
BLOCKIERT BEI 70mA !
IC3.4
LM324
R140
TAKT-SYNCHRONISATION
IC6.1
LM339
IC6.3
LM339
AKKU-
UEBERWACHUNG
IC4.3
LM339
TAKT-
GENERATOR
NETZ-UEBERWACHUNG
IC6.4
LM339
LM324
IC7.2
OP-AMP
UEBERTEMPERATUR-
SCHALTER EXTERN
R172
R173
R120
39K
KOMP
IC5.1
LM392
R179
R180
RUECKSETZEN UMSCHALTER
AKKU-LADESTROM AUF
700mA BEI NETZ-EIN
HF Temp. Sensor
abschalten bei >12V
Batt.
Temp.Sensor
R609
5K



POWER SUPPLY 204 038 S

1 / 3089,18 / 29.9.93 / Kr.

SMG204038 AL1 (SMG4015)				UE = 10-32V	176-264V~ 92-130V ~	MASSTAB 1 : 1 — 4015 — Z.Nr. 561200F2
FEHLERKORREKTUREN	12.06.92	Li.			DATUM / NAME	+5.2V 4A
				BEARB.	22.08.89 LINKE	+15V 2A STECKER-LP
				GEPR.		-15V 1A
C40,103,104,105,				NORM		
HKK2,R56,57,58,61						
R72,113,114,162,						LP.Z.Nr. 561300 — BLATT 1/2 Bl.
R166,176,183,T12,						
T13,27,D100,101	12.06.92	Li.				
ÄNDERUNG	DATUM	B	G	(Urspr.)		(Ers.f.) 561200A (Ers.d.)



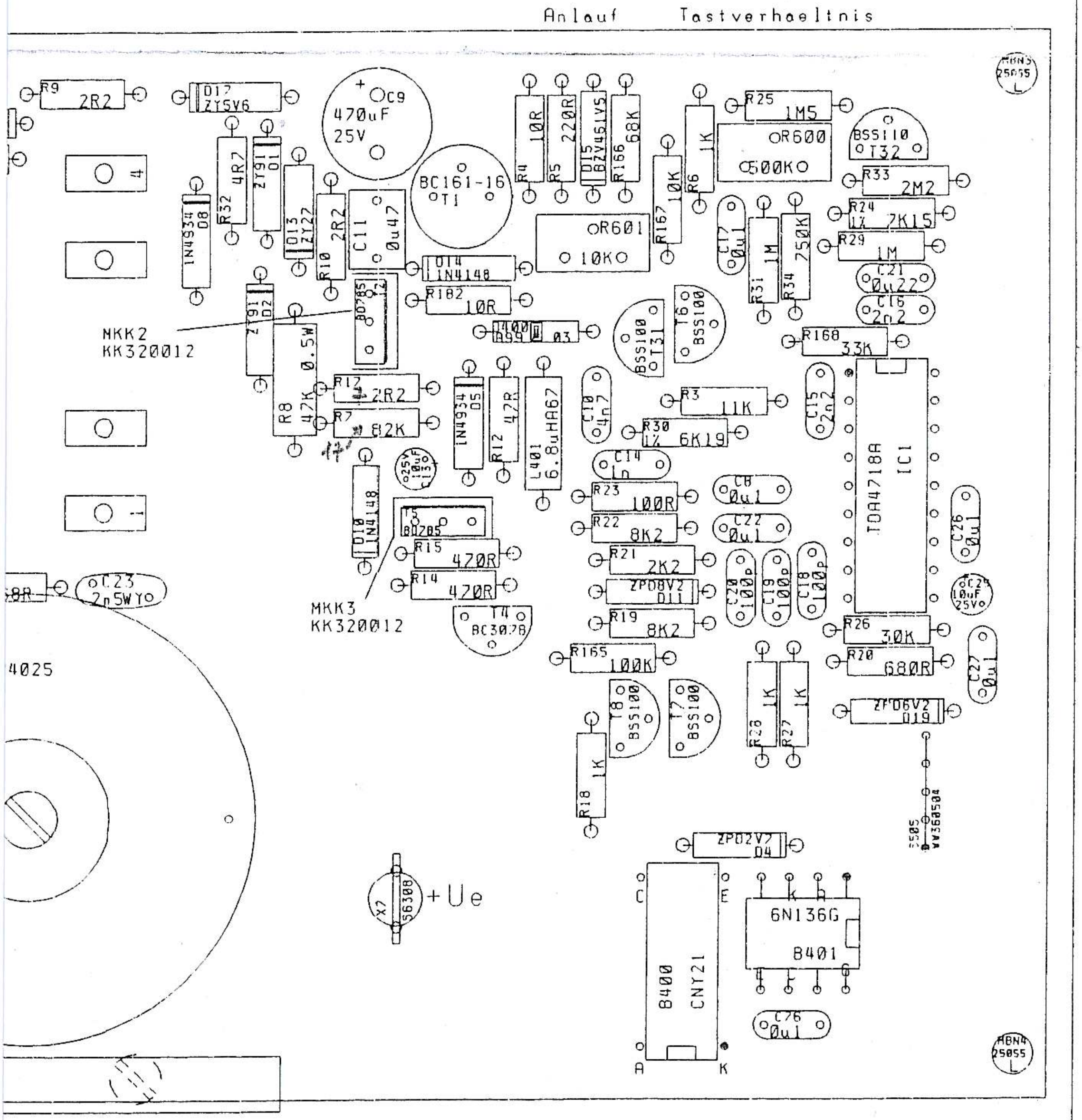
MONTAGE

Z1 ZL0001
Z2 ZWP005

Z3 ZTW003
Z4 ZL0002

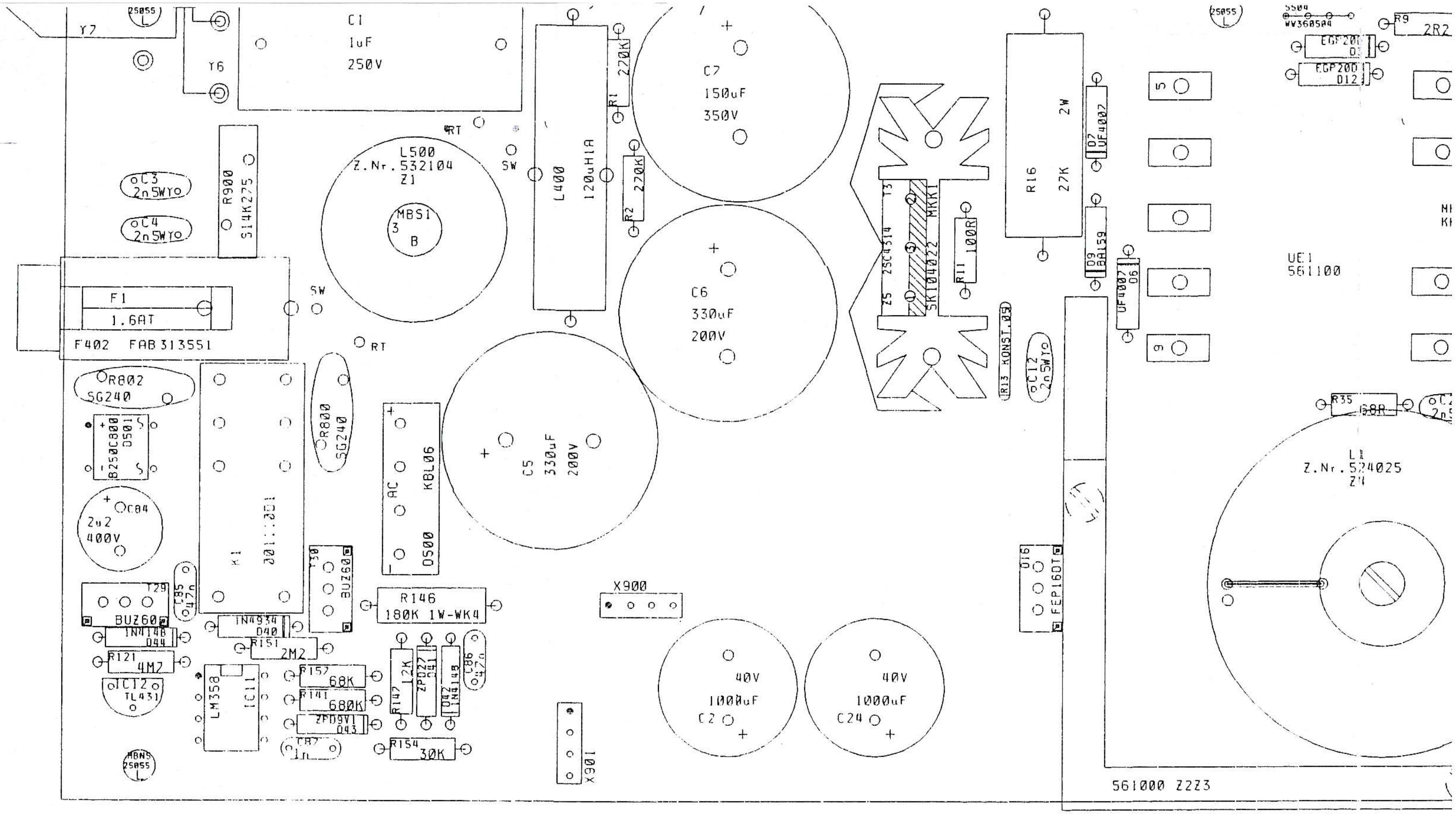
Z5 ZTK007

BD 441



2SC 4314 = BUV48 = BUW13

Cauals 1)



MONTAGE

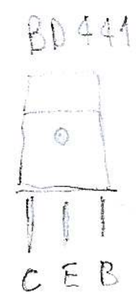
Z1
ZL0001

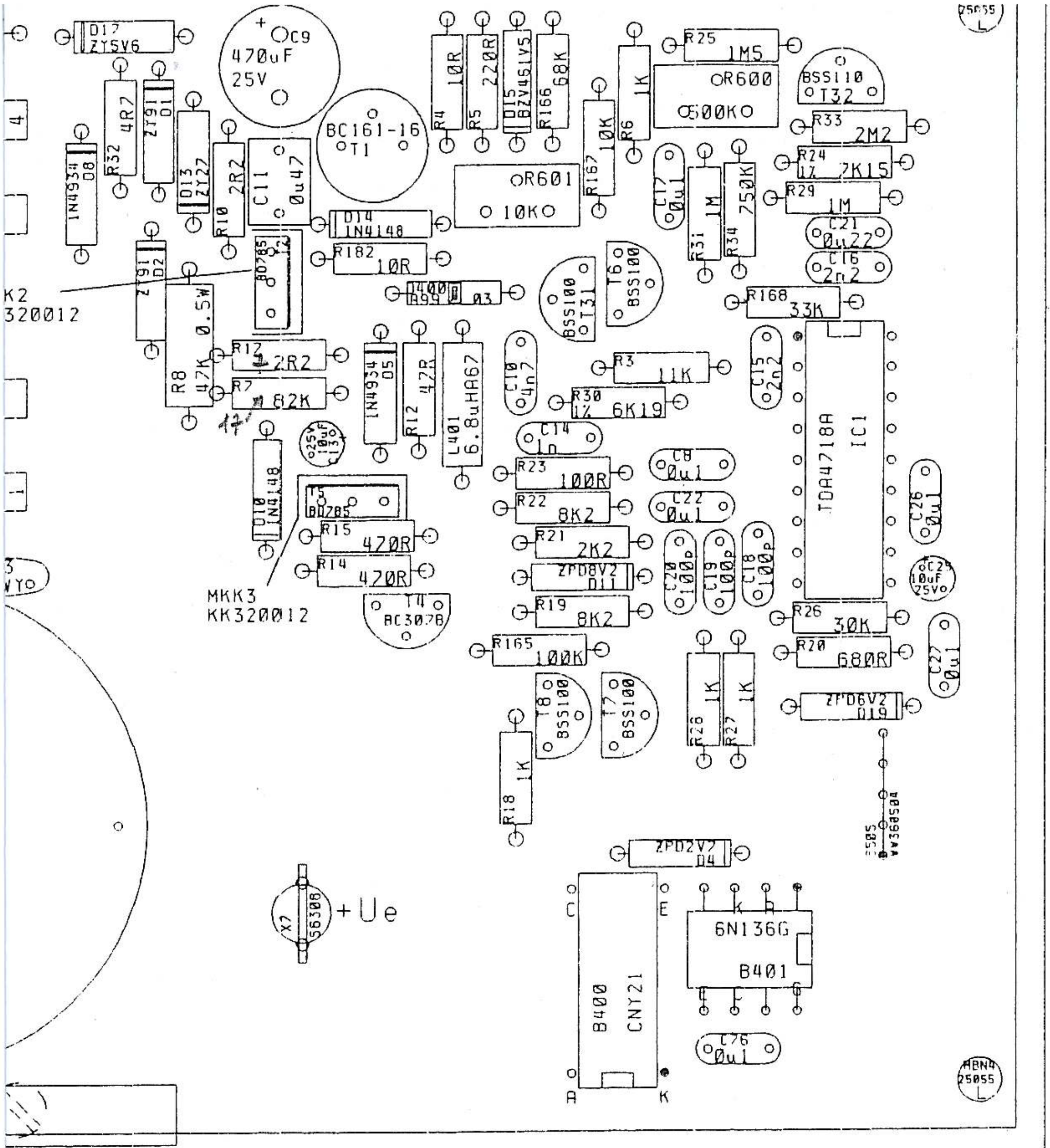
Z2
ZWP005

Z3
ZTW003

Z4
ZL0002

Z5
ZTK007





ZSC 4314 = BUV48 = BUW13

Canale N

900/800V 15A 150W

POWER SUPPLY 204 038

01/3089.18 / 29.9.93 / Kr.

SMG204038 Bl. 3/3 (SMG4015)					UE1= 92-264V AC UE2= 10.8-32V DC		MASSTAB 3:1 /P2.8 — 4015
							Z.Nr. 5614010
L	D19/18,R19	07.04.01				DATUM — NAME	+5.2V 4A
M	D1/2,C18,R7	02.04.01			BEARB.	15.08.89 — SEHNLER	+15V 2A HV-LP
N	P1,T7,R3,105,100	27.06.01	Li.		GEPR.	21.10.91 — KOENIG	-15V 1A
O	R1,8,28,D500,C12				NORM		
	C18,18,20,23,84	04.08.02	Li.				
P	LAYOUT NEU	05.02.03			MGV STROMVERSORGUNGEN		LP-Z.Nr. 561301E — Blatt Bl. 2/2
Q	C14,R21	10.09.03	Le.				
IND	ÄNDERUNG	DATUM	B	G			Weitergabe sowie Vervielfältigung dieser Zeichnung, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden

K

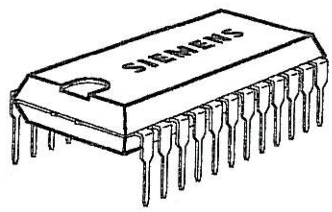
SIEMENS

Control IC for Single-Ended and Push-Pull Switched-Mode Power Supplies (SMPS)

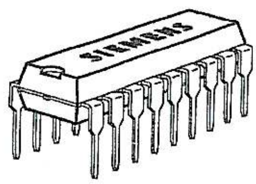
TDA 4700
TDA 4718

Features

- Feed-forward control (line hum suppression)
- Symmetry inputs for push-pull converter (TDA 4700)
- Push-pull outputs
- Dynamic output current limitation
- Overvoltage protection
- Undervoltage protection
- Soft start
- Double pulse suppression



P-DIP-24-1



P-DIP-18-1

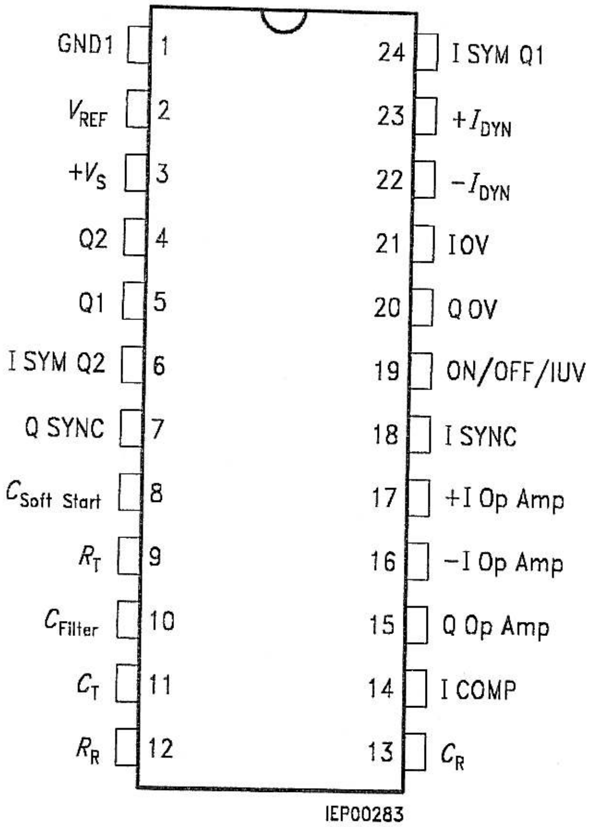
Type	Ordering Code	Package	Temp.-Range
TDA 4700 A	Q67000-Y594	P-DIP-24-1	– 0 to 70 °C
■ TDA 4718 A	Q67000-Y639	P-DIP-18-1	– 0 to 70 °C

■ Not for new design

These versatile SMPS control ICs comprise digital and analog functions which are required to design high-quality flyback, single-ended and push-pull converters in normal, half-bridge and full-bridge configurations. The component can also be used in single-ended voltage multipliers and speed-controlled motors. Malfunctions in electrical operation are recognized by the integrated operational amplifiers, which activate protective functions.

[1] Is now available for temperature range – 25 to 85 °C.

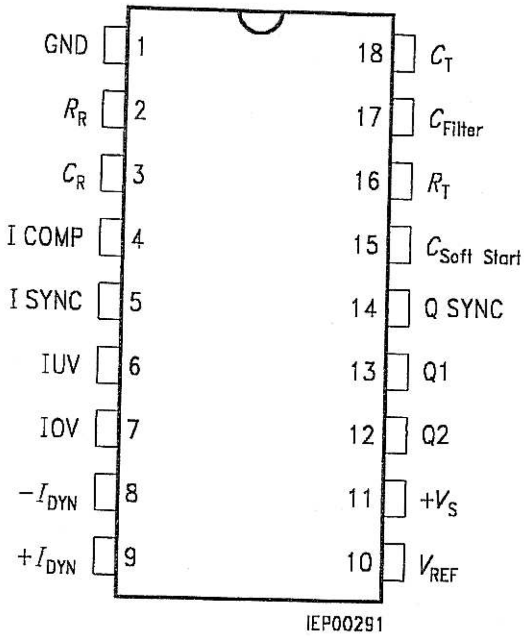
Pin Configuration (TDA 4700)
(top view)



Pin Definitions and Functions (TDA 4700)

Pin	Symbol	Function
1	GND	Ground 0 V
2 3	+ V_{REF} + V_S	Reference voltage Supply voltage
4 5	Q2 Q1	Output Q2 Output Q1
6 7 8	I SYM Q2 Q SYNC $C_{soft\ start}$	Symmetry Q2 Sync. output Soft start
9 10 11	R_T C_{filter} C_T	VCO R_T Capacitance VCO C_T
12 13	R_R C_R	Ramp generator R_R Ramp generator C_R
14 15	I COMP Q Op Amp	Comparator input Operational amplifier output
16 17 18	– I Op Amp + I Op Amp I SYNC	Operational amplifier input (–) Operational amplifier input (+) Sync. input
19	ON/OFF/IUV	ON/OFF, undervoltage
20 21	QOV IOV	Overvoltage output Overvoltage input
22 23	– I_{DYN} + I_{DYN}	Dynamic current limitation (–) Dynamic current limitation (+)
24	I SYM Q1	Symmetry

Pin Configuration (TDA 4718)
(top view)



Pin Definitions and Functions (TDA 4718)

Pin	Symbol	Function
1	GND	Ground 0 V
2 3	R_R C_R	Ramp generator R_R Ramp generator C_R
4 5	I COMP I SYNC	+ Input comparator K2 Sync. input
6 7	IUV IOV	Input undervoltage, ON/OFF Input overvoltage
8 9	$-I_{DYN}$ $+I_{DYN}$	Input dynamic current limitation (–) Input dynamic current limitation (+)
10 11	$+V_{REF}$ $+V_S$	Reference voltage Supply voltage
12 13	Q 2 Q 1	Output Q2 Output Q1
14 15	Q SYNC $C_{soft\ start}$	Sync. output Soft start
16 17 18	R_T C_{filter} C_T	VCO R_T Capacitance VCO C_T

Circuit Description

Voltage Controlled Oscillator (VCO)

The VCO generates a sawtooth voltage. The duration of the falling edge is determined by the value of C_T. The duration of the rising edge of the waveform and, therefore, approximately the frequency, is determined by the value of R_T. By varying the voltage at C_{filter}, the oscillator frequency can be changed by its rated value. During the fall time, the VCO provides a trigger signal for the ramp generator, as well as an L signal for a number of IC parts to be controlled.

Ramp Generator

The ramp generator is triggered by the VCO and oscillates at the same frequency. The duration of the falling edge of the ramp generator waveform is to be shorter than the fall time of the VCO. To control the pulse width at the output, the voltage of the rising edge of the ramp generator signal is compared with a DC voltage at comparator K2. The slope of the rising edge of the ramp generator signal is controlled by the current through R_R. This offers the possibility of an additional, superimposed control of the output duty cycle. This additional control capability, called "feed-forward control", is utilized to compensate for known interference such as ripple on the input voltage.

Phase Comparator

If the component is operated without external synchronization, the sync input must be connected to the sync output for the phase comparator to set the rated voltage at C_{filter}. The VCO then oscillates with rated frequency. In the case of external synchronization, other components can be synchronized with the sync output. The component can be frequency-synchronized, but not phase-synchronized, with the sync input. The duty cycle of the squarewave voltage at the sync input is arbitrary. The best stability as to small phase and frequency interference deviation is achieved with a duty cycle as offered by the sync output.

Push-Pull Flipflop

The push-pull flipflop is switched by the falling edge of the VCO. This ensures that only one output of the two push-pull outputs is enabled at a time.

Comparator K2

The two plus inputs of the comparator are switched such that the lower plus level is always compared with the level of the minus input. As soon as the voltage of the rising sawtooth edge exceeds the lower of the two plus levels, both outputs are disabled via the pulse turn-off flipflop. The period during which the respective, active outputs is low can be infinitely varied. As the frequency remains constant, this process corresponds to a change in duty cycle.

Operational Amplifier K1 (TDA 4700; A)

The K1 op amp is a high-quality amplifier. Fluctuations in the output voltage of the power supply are amplified by K1 and applied to the free + input of comparator K2. Variations in output voltage are, in this way, converted to a corresponding change in output duty cycle. K1 has a common-mode input voltage range between 0 V and + 5 V.

Pulse-Turn-OFF Flipflop

The pulse turn-OFF flipflop enables the outputs at the start of each half cycle. If an error signal from comparator K7 or a turn-off signal from K2 is present, the outputs will immediately be switched off.

Comparator K3

Comparator K3 limits the voltage at capacitance $C_{\text{soft start}}$ (and also at K2) to a maximum of + 5 V. The voltage at the ramp generator output may, however rise to 5.5 V. With a corresponding slope of the rising ramp generator edge, the duty cycle can be limited to a desired maximum value.

Comparator K4

The comparator has its switching threshold at 1.5 V and sets the error flipflop with its output if the voltage at capacitance $C_{\text{soft start}}$ is below 1.5 V. However, the error flipflop accepts the set signal only if no reset pulse (error) is applied. In this way the outputs cannot be turned on again as long as an error signal is present.

Soft Start

The lower one of the two voltages at the plus inputs of K2 is a measure for the duty cycle at the output. At the instant of turning on the component, the voltage at capacitor $C_{\text{soft start}}$ equals 0 V. As long as no error is present, this capacitor is charged with a current of 6 µA to the maximum value of 5 V. In case of an error, $C_{\text{soft start}}$ is discharged with a current of 2 µA. A set signal is pending at the error flipflop below a charge of 1.5 V and the outputs are enabled if no reset signal is pending simultaneously. As the minimum ramp generator voltage, however, is 1.8 V, the duty cycle at the outputs is actually increased slowly and continuously not before the voltage at $C_{\text{soft start}}$ exceeds 1.8 V.

Error Flipflop

Error signals, which are led to input $\overline{\text{R}}$ of the error flipflop cause an immediate disabling of the outputs, and after the error has been eliminated, cause the component to switch on again by the soft start.

Comparator K5, K6, K8, V_{REF} Overcurrent Load

These are error detectors which cause immediate disabling of the outputs via the error flipflop when an error occurs. After elimination of the error, the component switches on again using the soft start. The output of K5 can be fed back to the input. This causes the IC output stage to remain disabled even after elimination of the overvoltage. However, it requires high-ohmic overvoltage coupling.

Comparator K7

K7 serves to recognize overcurrents. This is the reason why both inputs of the op amp have been brought out. Turning on is resumed after error recovery at the beginning of the next half period but without using the soft start.

K7 has a common-mode range covers 0 V and + 4 V. The delay time between occurrence of an error and disabling of the outputs is only 250 ns.

Symmetry (TDA 4700; A)

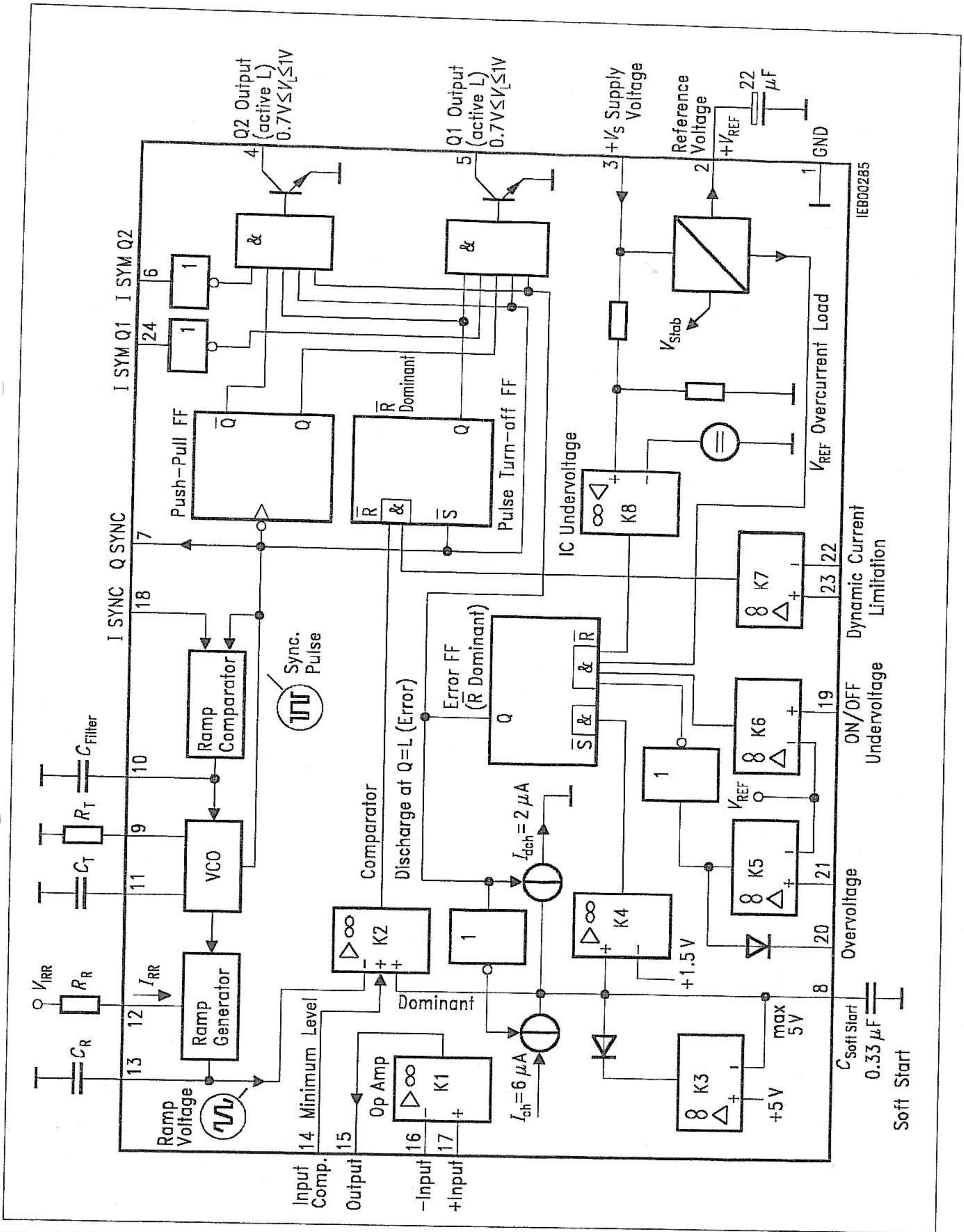
In push-pull converters, a saturation of the transformer core must be prevented. The degree of saturation of the transformer can be determined with an external circuit, thus the active periods of the outputs can be decreased unsymmetrically at the symmetry inputs.

Outputs

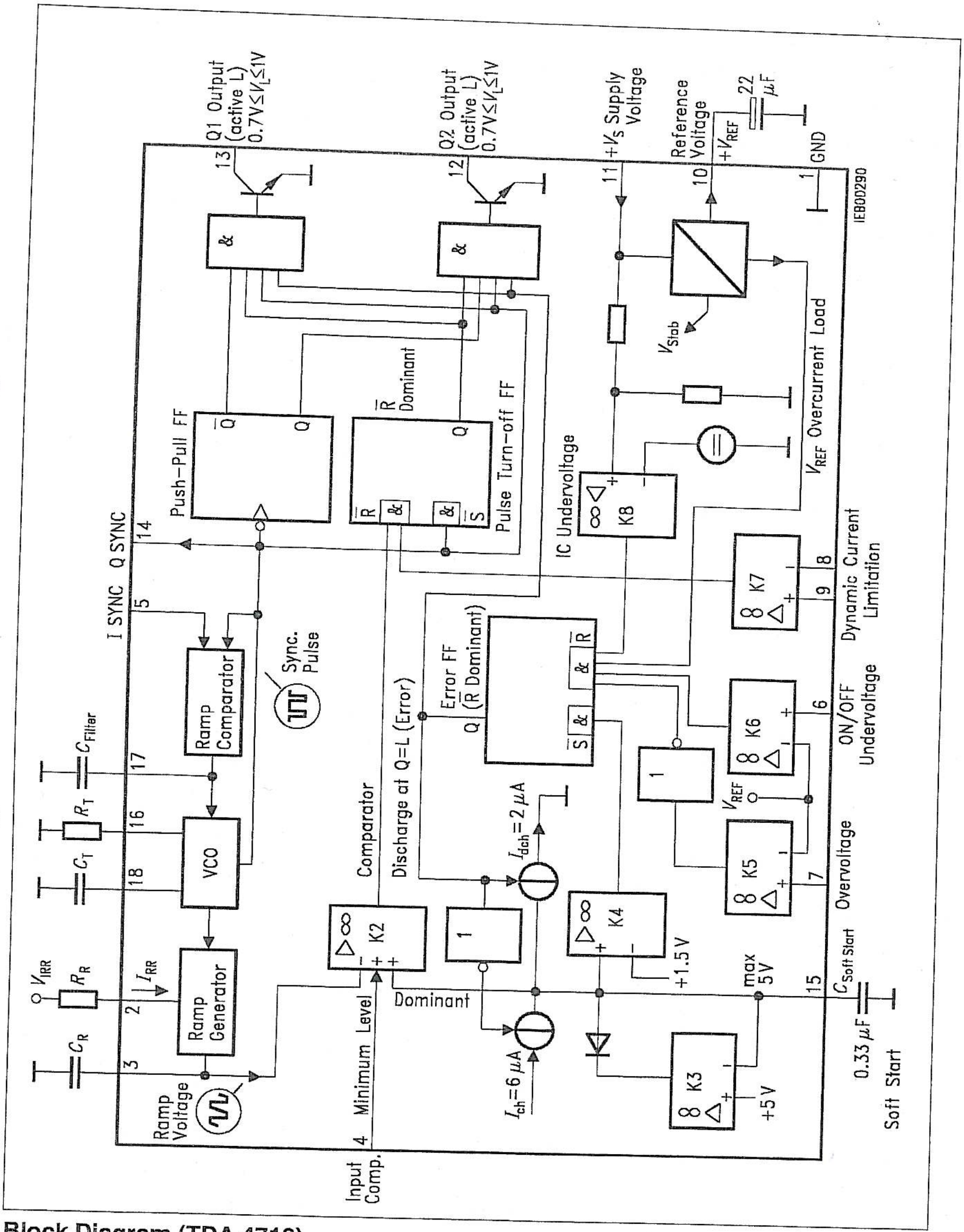
Both outputs are transistors with open collectors and operate in a push-pull arrangement. They are active low. The time in which only one of the two outputs is conductive can be varied infinitely. The length of the falling edge at VCO is equal to the minimum time during which both outputs are disabled simultaneously. The minimum L voltage is 0.7 V.

Reference Voltage

The reference voltage source is a highly constant source with regard to its temperature behavior. It can be utilized in the external wiring of the op amp, the error comparators, the ramp generator, or other external components.



Block Diagram (TDA 4700)



Block Diagram (TDA 4718)

Absolute Maximum Ratings

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Supply voltage	V_S	– 0.3	33	V	
Voltage at Q1, Q2	V_Q	– 0.3	33	V	Q1, Q2 high
Current at Q1, Q2	I_Q		70	mA	Q1, Q2 low
Symmetry 1, 2 TDA 4700; A	V_{SYM}	– 0.3	33	V	
Sync output	$V_{SYNC\,Q}$	– 0.3	7	V	SYNC Q high
	$I_{SYNC\,Q}$	0	10	mA	SYNC Q low
Sync input	$V_{SYNC\,I}$	– 0.3	33	V	
Input C_{filter}	$V_{I\,Cf}$	– 0.3	7	V	
Input R_T	$V_{I\,RT}$	– 0.3	7	V	
Input C_T	$V_{I\,CT}$	– 0.3	7	V	
Input R_R	$V_{I\,RR}$	– 0.3	7	V	
Input C_R	$I_{I\,CR}$	– 10	10	mA	
Input comparator K2, K5, K6, K7	$V_{I\,K}$	– 0.3	33	V	
Output K5	$V_{Q\,K5}$	– 0.3	33	V	
Input op amp TDA 4700; A	$V_{I\,Op\,Amp}$	– 0.3	33	V	
Output op amp TDA 4700; A	$V_{Q\,Op\,Amp}$	– 0.3	$V_S - 1$	V	
			max. 7	V	
Reference voltage	V_{REF}	– 0.3	V_{REF}	V	
Input $C_{soft\,start}$	$V_{I\,soft\,start}$	– 0.3	7	V	
Junction temperature	T_j		150	°C	
Storage temperature	T_{stg}	– 55	125	°C	
Thermal resistance system - air TDA 4700; A	$R_{th\,SA}$		65	K/W	
TDA 4718	$R_{th\,SA}$		70	K/W	
TDA 4718 A	$R_{th\,SA}$		60	K/W	

Operating Range

Parameter	Symbol	Limit Values		Unit	Test Condition
		min.	max.		
Supply voltage	V_S	10.5	30	V	
Ambient temperature TDA 4700 TDA 4718	T_A	– 25	85	°C	
TDA 4700 A TDA 4718 A	T_A	0	70	°C	
VCO frequency	f	40	250 000	Hz	
Ramp generator frequency	f_{RG}	40	250 000	Hz	

Characteristics
V_S = 11 to 30 V; T_A = – 25 to 85 °C

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Supply current	I_S	8		20	mA	C_T = 1 nF f_{VCO} = 100 kHz
Reference						
Reference voltage	V_{REF}	2.35	2.5	2.65	V	0 mA < I_{REF} < 5 mA
Reference voltage change	ΔV_{REF}		8		mV	14 V ± 20 %
Reference voltage change	ΔV_{REF}		15		mV	25 V ± 20 %
Reference voltage change	ΔV_{REF}			15[1]	mV	0 mA < I_{REF} < 5 mA
Temperature coefficient	TC		0.25	0.4	mV/K	
Response threshold of I_{REF} overcurrent	I_{REF}		10		mA	

[1] At T_A = 0 to 70 °C, this value falls to max. 5 mV

Characteristics (cont'd)
V_S = 11 to 30 V; T_A = – 25 to 85 °C

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Oscillator (VCO)						
Frequency range	f_{VCO}	40		100 000	Hz	
Frequency change	$\Delta f/f_{VCO}$		0.5		%	14 V ± 20 %
Frequency change	$\Delta f/f_{VCO}$	– 1		1	%	25 V ± 20 %
Tolerance	$\Delta f/f_{VCO}$	– 7		7	%	$\Delta R_T = 0$; $\Delta C_T = 0$
Fall time sawtooth	t		1		µs	C_T = 1 nF
	t		10		µs	C_T = 10 nF
RC combination	C_T	0.82		47	nF	
VCO	R_T	5		700	kΩ	
Ramp Generator						
Frequency range	f	40		100 000	Hz	
Maximum voltage at C_R	V_H		5.5		V	
Minimum voltage at C_R	V_L		1.8		V	
Input current through R_R	I_{RR}	0		400	µA	
Current transformation ratio	I_{RR}/I_{CR}		1/4			
Synchronization						
Sync output	V_{QH}	4			V	I_{QH} = – 200 µA
	V_{QL}			0.4	V	I_{QL} = 1.6 mA
Sync input	V_{IH}	2			V	
	V_{IL}			0.8	V	
Input current	$-I_I$			5	µA	

Characteristics (cont'd)
V_S = 11 to 30 V; T_A = – 25 to 85 °C

Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Comparator K2						
Input current	$-I_{I\,K2}$			2	µA	
Turn-OFF delay[1]	$t_{D\,OFF}$			500	ns	
Input voltage	$V_{I\,K2}$					for duty cycle
			1.8		V	$D = 0$
			5		V	D = max.
Common-mode input voltage range	$V_{I\,C}$	0		5.5	V	
Soft Start K3, K4						
Charge current for $C_{soft\ start}$	I_{ch}		6		µA	
Discharge current for $C_{soft\ start}$	I_{dch}		2		µA	
Upper limiting voltage	V_{lim}		5		V	
Switching voltage K4	V_{K4}		1.5		V	
Operational Amplifier K1 (TDA 4700; TDA 4700 A)						
Open-loop voltage gain	G_{V0}	60	80		dB	
Input offset voltage	V_{IO}	– 10		10	mV	
Temperature coefficient of V_{IO}	TC	– 30		30	µV/K	
Input current	$-I_I$			2	µA	
Common-mode input voltage range	V_{IC}	0		5	V	
Output current	I_Q	– 3		1.5	mA	
Rise time of output voltage	$\Delta V/\Delta t$		1		V/µs	
Transition frequency	f_T		3		MHz	
Phase at f_T	φ_T		120		deg.	
Output voltage	$V_{Q\,H/L}$	1.5		5.5	V	$-3\ mA < I < 1.5\ mA$

1) At the input: step function $\Delta V = -100$ mV → $\Delta V = +100$ mV

Characteristics (cont'd)
V_S = 11 to 30 V; T_A = – 25 to 85 °C

Parameter	Symbol	Limit Values min.	Limit Values typ.	Limit Values max.	Unit	Test Condition
Symmetry (TDA 4700; TDA 4700 A)						
Input voltage	V_{IH}	2.0			V	
	V_{IL}			0.8	V	
Input current	$-I_I$			2	µA	
Output Stages Q1, Q2						
Output voltage	V_{QH}			30	V	
	V_{QL}			1.1	V	I_Q = 20 mA
Output leakage current	I_Q			2	µA	V_{QH} = 30 V
ON, OFF, Undervoltage K6						
Switching voltage	V	$V_{REF} - 0.03$		$V_{REF} + 0.03$	V	
Input current	$-I_I$			2	µA	
Turn-OFF delay time[1]	$t_{D\,OFF}$		250		ns	
Error detection time[1]	t		50		ns	
Dynamic Current Limitation K7						
Common-mode input voltage range	V_{IC}	0		4	V	
Input offset voltage	V_{IO}	– 10		10	mV	
Input current	$-I_I$			2	µA	
Turn-OFF delay time[2]	$t_{D\,OFF}$		250		ns	
Error detection time[2]	t		50		ns	
Overvoltage K5						
Switching voltage	V	$V_{REF} - 0.03$		$V_{REF} + 0.03$	V	
Input current	$-I_I$			2	µA	
Output current	$-I_Q$	0		200	µA	$V_{QH\,min}$ = 5 V
Turn-OFF delay time[1]	$t_{D\,OFF}$		250		ns	
Error detection time[1]	t		50		ns	

1) At the input: step function $\Delta V = V_{REF} - 100\text{ mV} \rightarrow V_{REF} + 100\text{ mV}$
2) At the input: step function $\Delta V = -100\text{ mV} \rightarrow \Delta V = +100\text{ mV}$

Characteristics (cont'd)
V_S = 11 to 30 V; T_A = – 25 to 85 °C

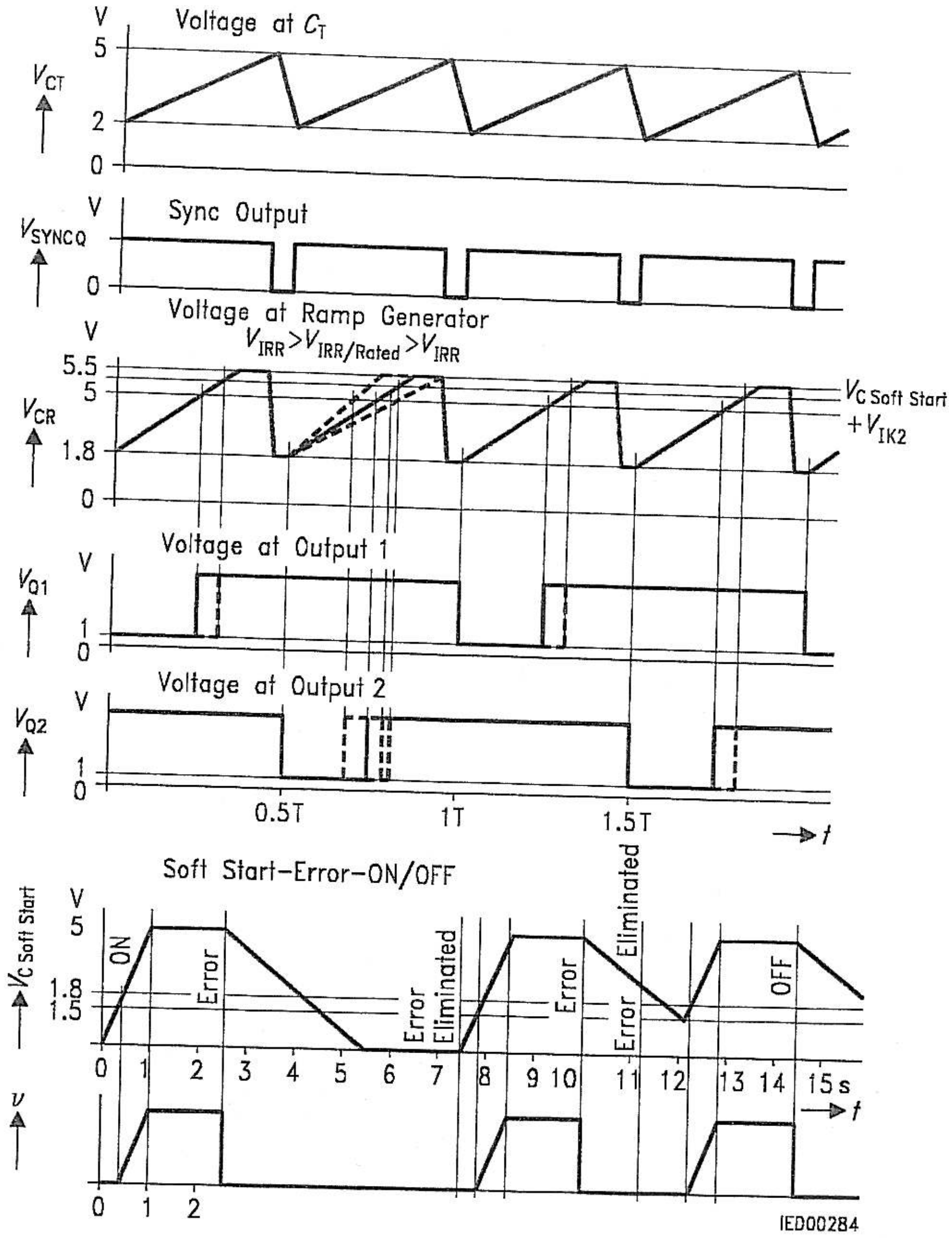
Parameter	Symbol	Limit Values			Unit	Test Condition
		min.	typ.	max.		
Supply Undervoltage						
Turn-ON threshold for V_S rising	V_S	8.8		11 10.5	V V	0 °C < T_A < 70 °C
Turn-OFF threshold for V_S falling	V_S	8.5		10.5 10	V V	0 °C < T_A < 70 °C
Input C_{filter}						
Rated voltage for rated frequency	V_R		4		V	
Frequency approx. proportional to voltage within the range	V_R	3		5	V	
Voltage at open sync input	$V_{C\ filter}$		1.6		V	

Dimensioning Notes for RC Network

1. Determination of the minimum time during which both outputs must be disabled
   → selection of C_T; selection of $C_R \leq C_T$.
2. Determination of the VCO frequency = 2 x output frequency
   → selection of R_T.
3. Determination of the rated slope of the rising ramp generator voltage, which the maximum possible turn-on period per half wave depends on
   → selection of R_R.
4. Duration of the soft start process
   → selection of $C_{soft\ start}$.
5. In the case of a free-running VCO: connect sync output with sync input.
6. Wiring of the op amp according to the dynamic requirements and connection of its output with the free input of K2. (TDA 4700; TDA 4700 A)
7. Capacitance C_{filter} is not required in the free-running operation (sync input connected with sync output).

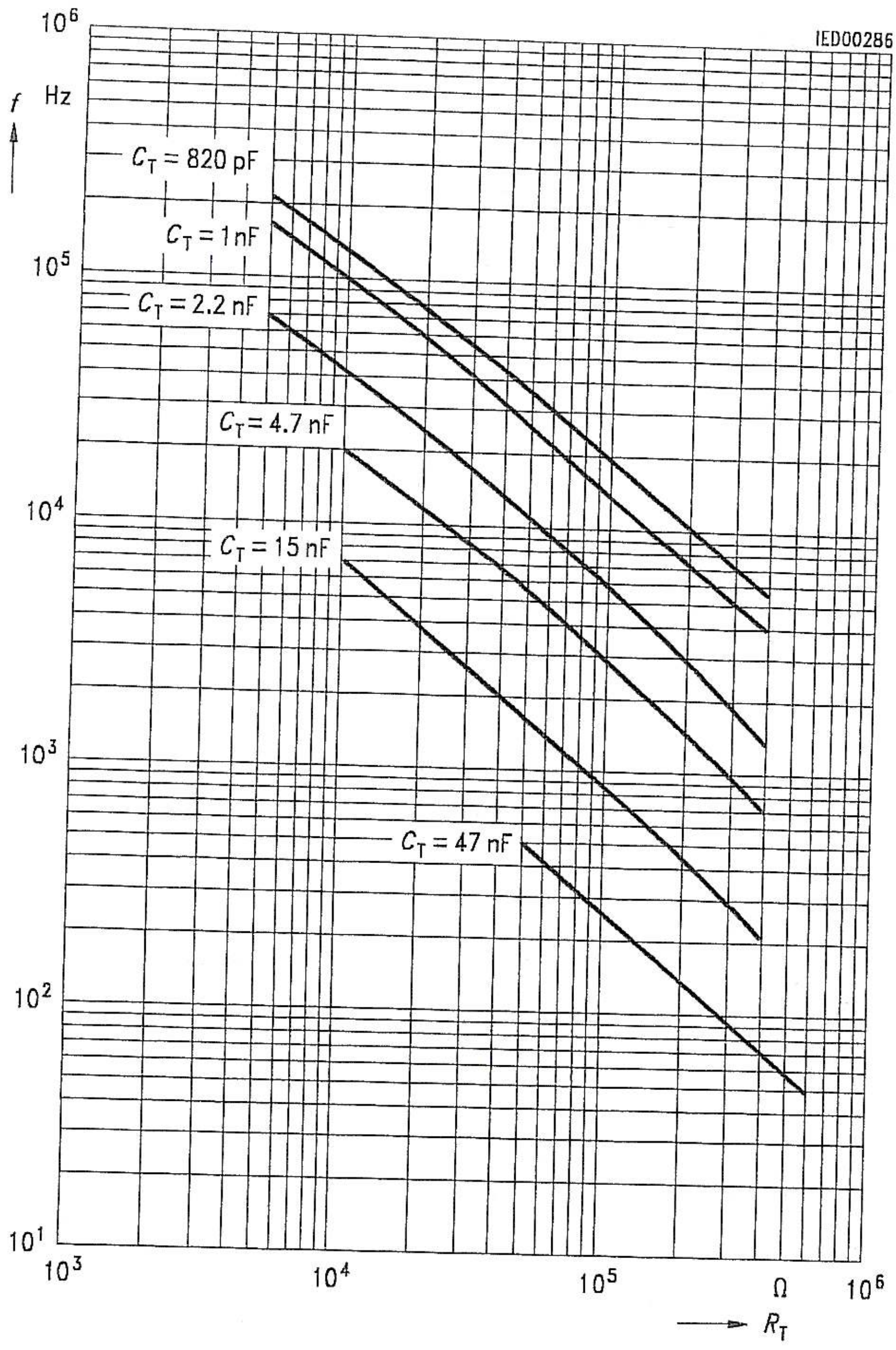
   In the case of external synchronization, that value depends on the selected operating frequency and the required maximum phase interference deviation.

Rated VCO frequency:	100 kHz	50 Hz
C_{filter} favourable:	10 nF	1µF



Pulse Diagram

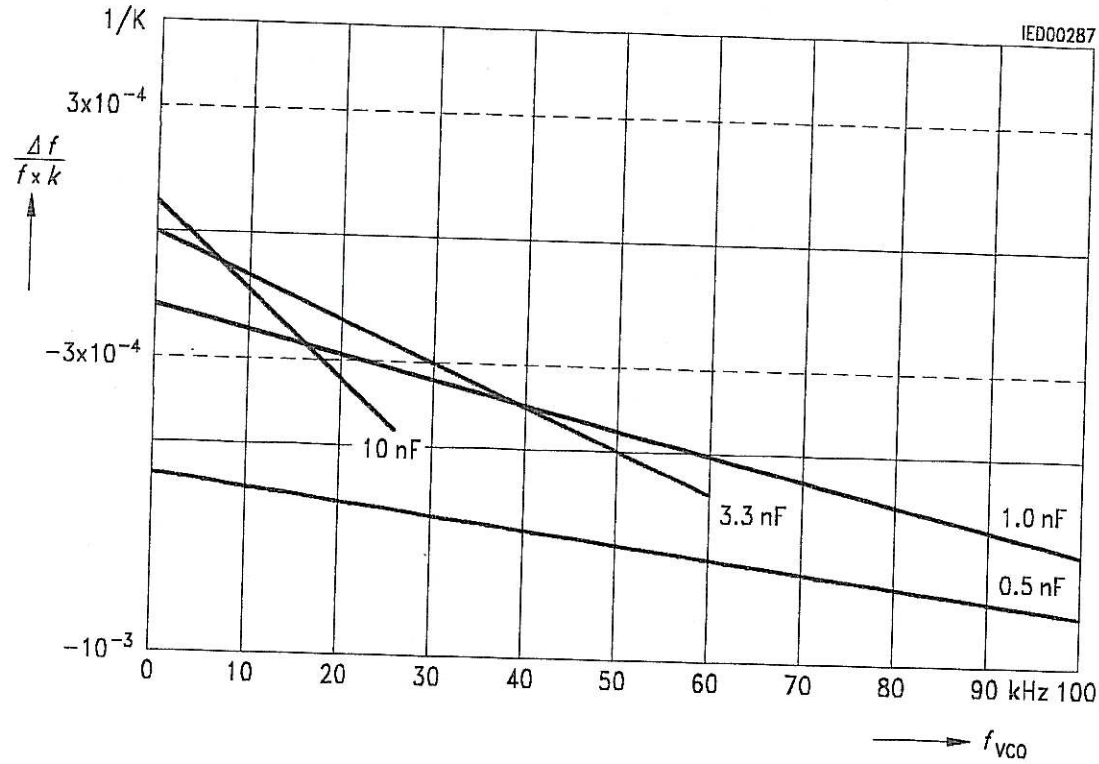
VCO Frequency versus R_T and C_T



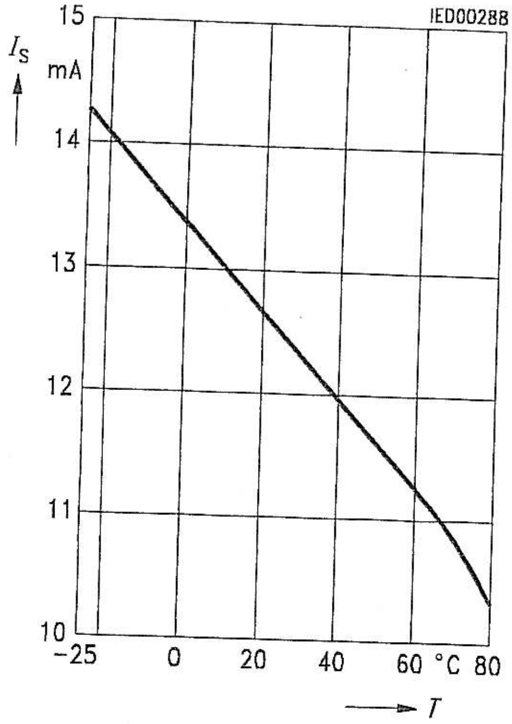
VCO Temperature Response

$V_S = 12$ V; D = max.

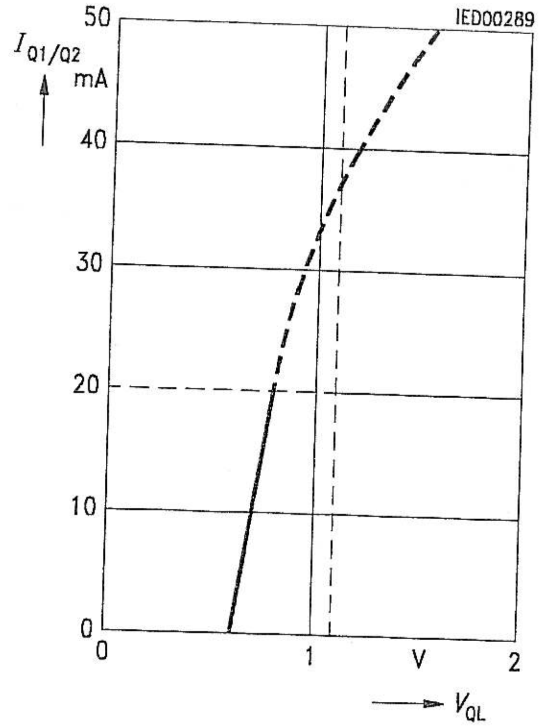
$\frac{\Delta f_{VCO}}{f_K \times K}$ [1/K] with C_T as parameter



Current Consumption versus Temperature



Output Current versus Output Voltage



M

Fine Decade

The fine decade generates a signal of 7.4 to 12.4 MHz in frequency increments of 100 Hz. The oscillator signal is divided by 80 by dividers D102, D103, so oscillator U100 works at a frequency that is higher by a factor of 80. The phase of the oscillator frequency is bound to the signal of the master crystal in the RF Unit (230038) by a phase-locked loop (PLL) and dividers D100-A, D100-B and the signal line 20 MHz or Bu49.

The phase comparator and dividers are integrated into synthesizer device D106, the internal division ratio being increased by modulo-2 prescaler D101. The division ratios are programmed serially on the DATA control line after selection of the device on the ENABLE-5 control line.

The amplifier with transistor T100 and inverters D104-B, D104-G produce level matching between the prescaler and the synthesizer device. Phase comparison is made at a frequency of 8 kHz. The active loop filter with operational amplifier A101 sums the correction pulses of the phase comparator to form a control voltage that corrects the frequency of the oscillator by means of variable-capacitance diodes if the phase deviates. If this control operation is disturbed, the output level of operational amplifier A100 goes High and signals asynchronism.

5-MHz Decade

This part of the circuit generates frequencies from 490 to 990 MHz in 5-MHz increments. For this purpose the 20 MHz from socket Bu49 is divided down to 10 MHz and to 5 MHz in divider D200. The amplified 5 MHz is applied across transistor T200 to step-recovery diode GL200. Here a 5-MHz frequency spectrum is produced that is used in the range 490 to 990 MHz. This spectrum is down-converted in the sampling detector in mixer diode GL201 with the RF signal from VCO U200 that is amplified by A201. When the VCO frequency hits a spectrum point, a control voltage is generated that is fed via loop filter A200 to the VCO. The synchronization detection ensures that the VCO can only synchronize with the set spectrum point. The signal for this is generated in the two PLL devices D201 and D202. The internal dividers are set by the Computer. The 10 MHz from D200 and the RF signal from VCO U200 are divided according to the setting and compared. D201 delivers a signal to the loop filter via T204 if the VCO frequency is more than 100 kHz above the set frequency. D202 delivers a signal to the loop filter via T206 if the VCO frequency is more than 100 kHz below the set frequency.

Adder PLL

The adder PLL produces an RF signal in the frequency range 500 to 1000 MHz with resolution of 100 Hz. The input signals come from VCO U200 of the 5-MHz decade and from the fine decade. The 490 to 990 MHz of the 5-MHz decade is applied via a buffer amplifier, circuit T310 to T311, to the LO input of mixer MI3. Here it is down-converted with the RF signal that comes from VCO U300. In this signal path there is also a buffer amplifier, formed of transistors T300 and T301.

The mixture product on the IF output of mixer MI300 is in the frequency range 7.4 to 12.4 MHz. It is converted to TTL level by T303 and applied to phase detector D303. The phase detector compares this 7.4 to 12.4 MHz with the 7.4 to 12.4 MHz of the fine decade. The loop filter with A301 converts the phase-detector signal into the required control voltage. This control voltage is fed to VCO U300 on pin 7.

The synchronization detection ensures that the VCO falls into the capture range of the phase detector if there are largish frequency errors. This synchronization detection consists of the two PLL devices D301 and D302. The internal dividers of D301 and D302 are set by the Computer. The 5-MHz decade signal via prescaler D300 and the VCO signal amplified by T300 are divided according to the settings and compared. D301 delivers a signal to the loop filter via A300 and T304 or T305 if the frequency of the VCO is below the capture range. D302 delivers a signal to the loop filter via A300 and T306 if the frequency of the VCO is above the capture range.

Output Divider and Filter

The output signal of the adder PLL from VCO U300, in the frequency range 500 to 1000 MHz, is further processed in this part of the circuit. A division ratio of 2, 4, 8 through 256 can be selected. So the signal on output Bu48 is between 1.95 and 1000 MHz. Lowpass filters are cut into the signal path for frequencies greater than 62.5 MHz. This improves the distortion margin on Bu48 to > 20 dBc. Depending on the driving, the RF signal is switched through to the selected signal path by PIN diodes. There are four different tunable lowpass filters for the bands 500 to 1000 MHz (L400 through L402), 250 to 500 MHz (L403 through L405), 125 to 250 MHz (L406 through L411) and 62.5 to 125 MHz (L500 through L502). The lowpass filters are tuned by the variable-capacitance diodes GL405/GL406, GL412/GL413, GL415/GL416 and GL501 through GL506. The slope of the set lowpass filters is controlled by A402 so that a level of -6 dBm ±2 dB is produced on the output of amplifier T405/T410.

The peak-responding rectifier GL421 converts the RF output signal into a DC voltage. Controller A402 compares this DC to a setpoint and thus derives the control voltage for the variable-capacitance diodes. In the frequency band 1.95 to 62.5 MHz a squarewave signal of -6 dBm ±2 dB is applied to the output. Control in this frequency band is by A402 and the diode limiter GL512.

2089.02

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	Equipment required: Digital voltmeter, eg Schlumberger 7150 DC power supply unit 0 to ±15 V, eg HP6236 Oscilloscope 100 MHz Spectrum analyzer to 2 GHz, eg MS611 RF probe (500 Ω), eg HP10020 Frequency counter to 1.3 GHz, eg HP5386 Powermeter, eg Boonton 4200				
	1. Fine decade				
4015	1.1 Oscillator (361565)				
DVM	Measure voltage.	I1	DC		-12.7 to -11.3 V
Power supply	Connect DC source to oscillator input.	E1-7	DC		
Spectrum analyzer with	Measure frequency for input voltage of -10 V and measure power.	I4			< 480 MHz -20 ±1 dBm
RF probe (500 Ω)	Measure frequency for input voltage of +12 V and measure power.	I4			> 1010 MHz -20 ±1 dBm
DVM	Continuously vary input voltage from -10 V to +12 V and check output signal for nonharmonics, check continuous tuning and control voltage.	I4 I2	450-2000 MHz DC		< +3 V

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	1.2 PLL				
	Set duplex mode, 501.9499 MHz on 4015.				
	Synchronize frequency counter or spectrum analyzer with 4015.				
Oscilloscope	Check signal.	I13	approx. 7.7 MHz		Low < 1, High > 3 V
Frequency counter	Measure frequency.	I11	approx. 13 MHz		12.3999 MHz
Spectrum analyzer	Check selfcheck message.	I12	DC		< 0.7 V, LED GL101 on
	Disconnect 20-MHz signal from RF Unit from socket Bu49.				
Oscilloscope	Check selfcheck message.	I12	DC		> 3 V, LED GL101 off
	Reapply 20-MHz signal to socket Bu49.				
	Set 501.95 MHz on 4015.				
	Measure frequency.				7.4 MHz

2089.02

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	2. 5-MHz decade				
	2.1 Oscillator adjustment Adjust oscillator U200 as under item 1.1. But connect DC source to R262 and separate control line to R261. 2.2 Step-recovery multiplier				
Frequency counter	Measure reference frequency.	I30	5 MHz		5 MHz
Spectrum analyzer with RF probe (500 Ω)	Measure n*5-MHz spectrum with RF probe (10:1). Set level-reference point on spectrum analyzer with Cal output.	I35	490-990 MHz		-20 to -30 dBm
	2.3 Synchronization detection Set duplex mode, f = 509.55 MHz (corr. to 500 MHz spectrum frequency) on 4015.				
Frequency counter	Measure reference frequency.	I32 and I34	100 kHz		100 kHz / TTL pulse
Power supply Spectrum analyzer with RF probe (500 Ω) DVM	Measure detection of capture range. Separate control line to R261, apply approx. -7 Vdc to R262 and measure oscillator frequency on I36. Tune frequency in range 450-550 MHz with DC and measure control voltage.	I36	450-550 MHz		approx. 0 dBm
	For f > 500.10 MHz LED GL206 lights.	I39	DC		V < -10 V
	For f < 499.90 MHz LED GL206 lights.	I39	DC		V > +10 V
	Between 499.90 and 500.10 MHz LED GL206 does not light.				

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	19.02.92	Pichon	STABILOCK 4015	Duplex	229 038 A			3/7

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	2.4 Loop filter Set duplex mode, f = 509.55 MHz (corr. to 500 MHz spectrum frequency) on 4015.				
Power supply	As under item 2.3, also desolder R214. Set frequency with DC to f > 500 MHz.				
Oscilloscope	Adjust DC offset.	I38	DC with superimposed AC	R209	V = 0 ±0.01 Vdc
Oscilloscope	Measure phase-detector slope. Tune frequency in range 490-990 MHz with DC, there must be one beat every 5 MHz.	I38	AF beat		V > 0.2 Vpp
	Remove DC, resolder R214 and R261.				
Frequency counter	2.5 Functional test Set duplex mode, f = 499.55-994.55 MHz in 5-MHz steps (corr. to f = 490-985 MHz) on 4015. LED GL206 does not light.	R249	490-985 MHz		490-985 MHz
	3. Adder PLL				
	3.1 Oscillator adjustment Adjust oscillator U300 as under item 1.1. But connect DC source to R378 and separate control line to R377.				

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	3.2 Synchronization detection Set duplex mode, f = 499.55 MHz (corr. to 490 MHz spectrum frequency) on 4015.				
Frequency counter Oscilloscope	Measure reference frequency. On testpoint I40 f = 490 MHz/256 = 1.914xx MHz On testpoint I42 and I44 f = 490 MHz/(256*8) = 239.xx kHz	I40 I42 and I44	1.91xx MHz 239.xx kHz		1.91xx MHz V > 0.5 Vpp 239.xx kHz TTL pulse
Power supply	Measure detection of capture range. Separate control line to R377, apply DC to R378. Set duplex mode, f = 499.55 MHz (corr. to 490 MHz spectrum frequency) on 4015.				
Oscilloscope	Tune frequency in range 450-550 MHz with DC and measure control voltage for f < 490 MHz, f > 505.3125 MHz.	A300/1 A300/7	DC DC		V > +10 V V < -10 V
	Set duplex mode, f = 994.55 MHz (corr. to 985 MHz spectrum frequency) on 4015. Tune frequency in range 950-1050 MHz with DC and measure control voltage for f < 985 MHz, f > 1016 MHz.	A300/1 A300/7	DC DC		V > +10 V V < -10 V
Power supply Frequency counter Oscilloscope	3.3 Mixer check Set duplex mode, f = 994.55 MHz on 4015. Tune frequency in range 986-1020 MHz with DC.	I45	approx. 1-34 MHz		TTL level

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	19.04.91	Pichon	STABILOCK 4015	Duplex	229 038 A			5/7

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	3.4 Loop filter				
Power supply Oscilloscope	Set duplex mode, f = 499.55 MHz on 4015.		500 MHz		
	Tune frequency in range 450-550 MHz with DC and measure control voltage for				
	f > 500 MHz LED GL301 lights.	I46	DC		V < -10 V
	f < 500 MHz LED GL301 lights.	I46	DC		V > +10 V
	Remove DC, resolder R377.				
	3.5 Functional test				
Spectrum analyzer with RF probe (500 Ω)	Set duplex mode, f = 499.55 MHz on 4015.	R379	500.0 MHz		500.0 MHz
	Set duplex mode, f = 739.55 MHz on 4015.	R379	740.0 MHz		740.0 MHz
	Set duplex mode, f = 998.55 MHz on 4015.	R379	999.0 MHz		999.0 MHz
	LED does not light.				
	4. Output divider and filter				
Oscilloscope	4.1 Driving				

Duplex mode	A400 Pin1	A400 Pin7	A401 Pin1	A401 Pin7	A500 Pin7	A500 Pin1	A501 Pin1	D506 Pin10	D506 Pin4	D506 Pin1	D506 Pin13	Frequency
f = 499.55 MHz	+10V	-10V	-10V	-10V	-10V	-10V	-10V	L	L	L	L	500 MHz
f = 249.55 MHz	-10V	+10V	-10V	-10V	-10V	-10V	-10V	L	L	L	L	250 MHz
f = 124.55 MHz	-10V	-10V	+10V	+10V	-10V	-10V	-10V	L	L	L	L	125 MHz
f = 62.05 MHz	-10V	-10V	-10V	+10V	+10V	+10V	-10V	L	L	L	L	62.5 MHz
f = 30.80 MHz	-10V	-10V	-10V	+10V	+10V	-10V	+10V	L	L	L	L	31.25 MHz
f = 15.175 MHz	-10V	-10V	-10V	+10V	+10V	-10V	+10V	H	L	L	L	15.625 MHz
f = 7.3625 MHz	-10V	-10V	-10V	+10V	+10V	-10V	+10V	L	H	L	L	7.8125 MHz
f = 3.4562 MHz	-10V	-10V	-10V	+10V	+10V	-10V	+10V	L	L	H	L	3.9062 MHz
f = 1.5032 MHz	-10V	-10V	-10V	+10V	+10V	-10V	+10V	L	L	L	H	1.9532 MHz

set on 4015

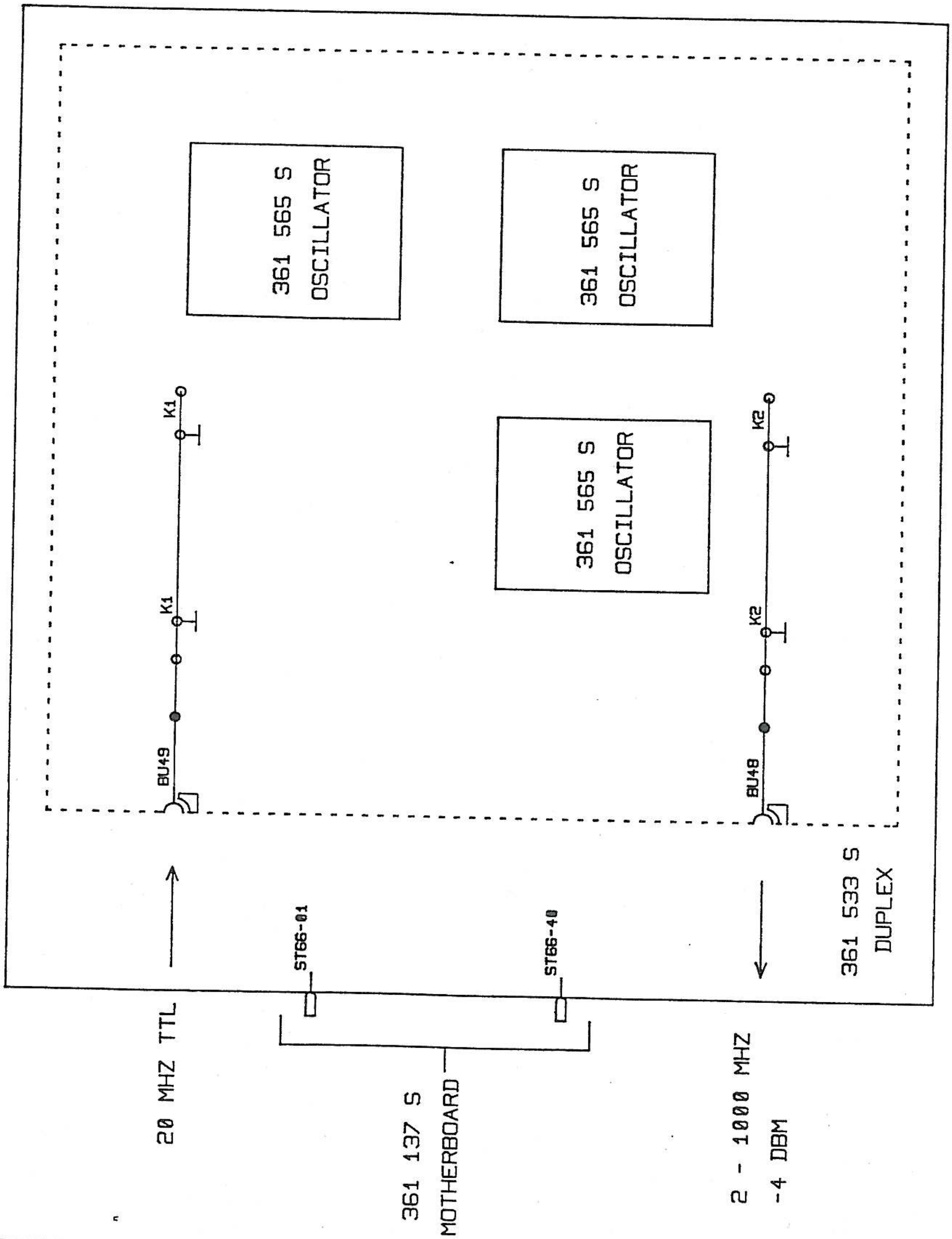
2089.02

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	4.2 Measure ALC and filter.				
DVM	Measure DC reference voltage.	I54	DC		V = 0.148 ±0.01 V
Powermeter Spectrum analyzer DVM	Measure level and control voltage. Set duplex mode on 4015				
	f = 499.55-998.55 MHz		500-999 MHz		
	f = 249.55-498.55 MHz	Bu48	250-499 MHz		-6 dBm ±2 dB
	f = 124.55-248.55 MHz		125-249 MHz		
	f = 62.05-123.55 MHz		62.5-124 MHz		
	f = 30.80-61.95 MHz	I53	31.25-62.4 MHz		V = -13 to +11 V
	f = 15.175-30.79 MHz		15.625-31.24 MHz		
	f = 7.3625-15.165 MHz		7.8125-15.615 MHz		
	f = 3.4562-7.3525 MHz		3.9062-7.8025 MHz		
	f = 1.5032-3.4462 MHz		1.9532-3.8962 MHz		
	LED GL422 does not light.				
Spectrum analyzer	Measure distortion margin. Set duplex mode, f = 62.05-998.55 MHz on 4015.	Bu48	62.5-999 MHz		< -20 dBc

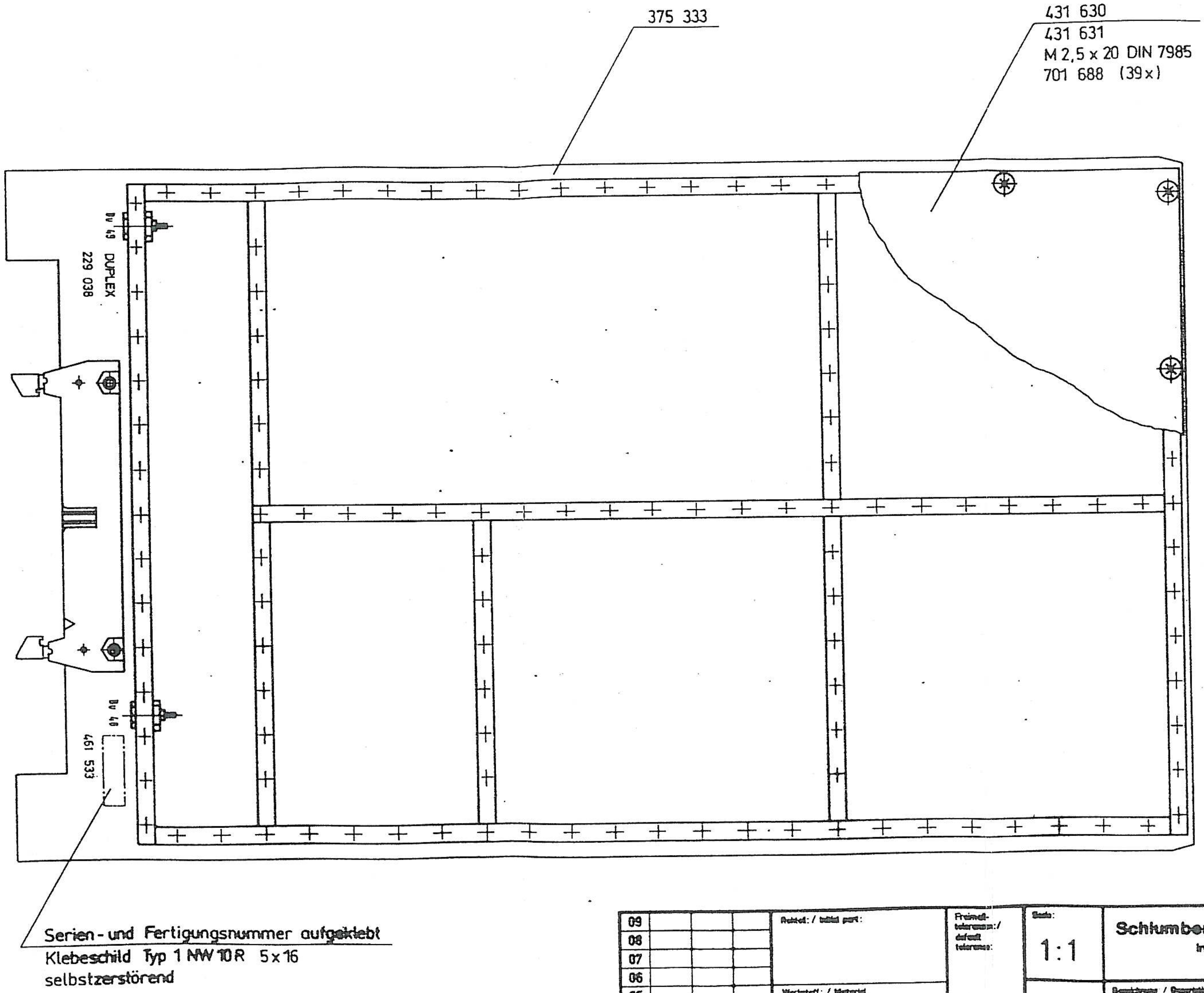
Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	19.02.92	Pichon	STABILOCK 4015	Duplex	229 038 A			7/7



02	1089.6	31.01.91	UNGER	NORM.		
01	0889.41	30.08.90	ROE	GEPR.		
00	0889.24	3.7.90	UNGER	BEARB.	3.7.90	UNGER
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR.67A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: DUPLEX	ZEICHNUNGSNR./DRAWING NO.: 229 038 S PROJECT/GROUP: 4015 / 100 S01

...ND SCHADENERSATZPFLICHTIG.



Rev. No.	Rev. Bl.	Date	Name
09			
08			
07			
06			
05			
04			
03			
02	1089.6	30.1.91	Kr.
01			
00			

Rohteil: / initial part:

Werkstoff: / Material

Oberfläche: / Surface

Freimaßtoleranzen: / default tolerances:

Scale: 1:1

DIN A3

1991	Date	Name
Drawn	30.1.91	Kr.
Designed	31.1.91	
Checked		

Schlumberger Technologies GmbH
Ingolstädter Straße 67 a
8000 München 46

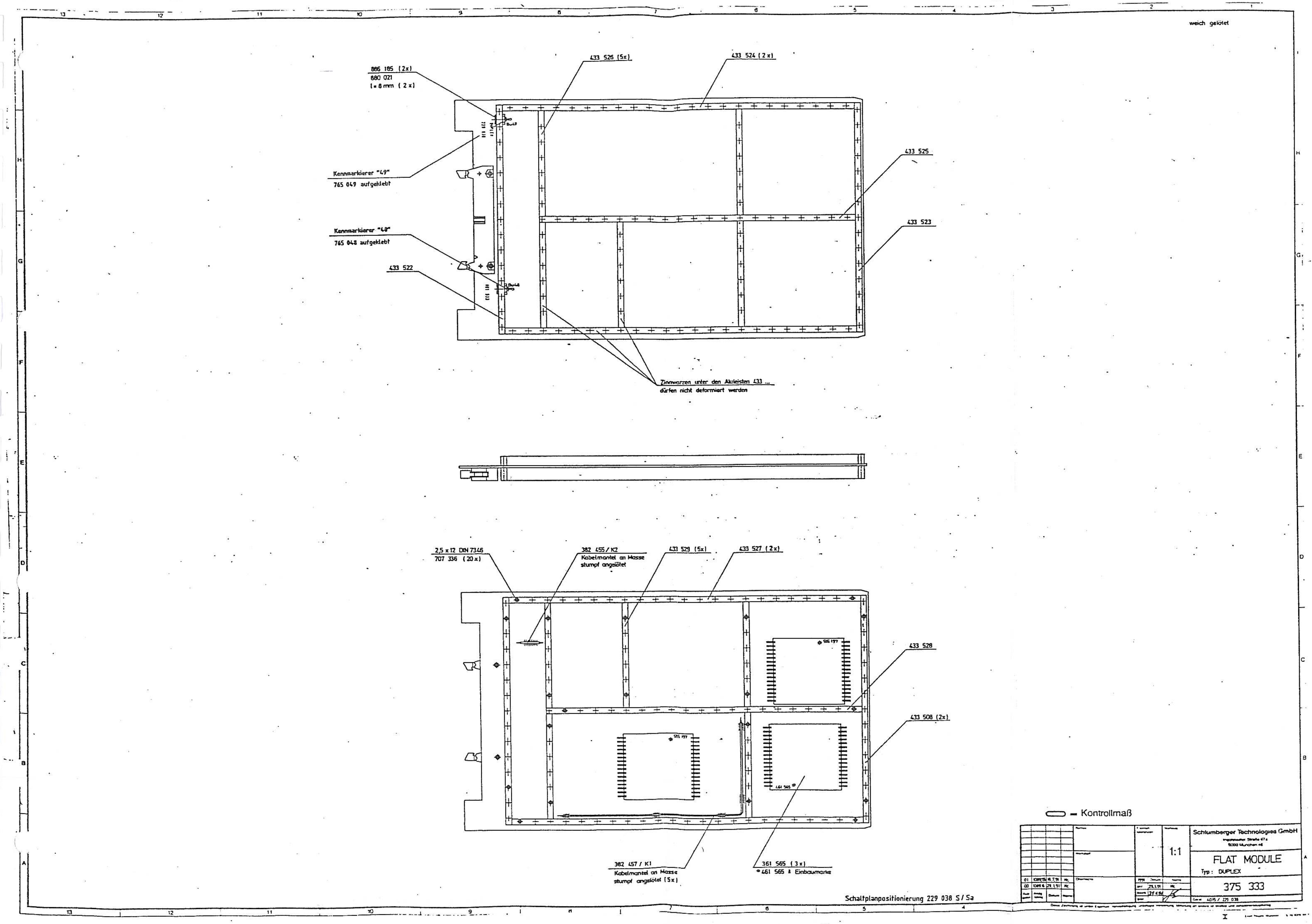
Benennung / Description:

DUPLEX

Zeichnungsnr. / Drawing No.:

229 038

Gerät / Unit: 4018 / 108 901



weich gelötet
886 185 (2x)
880 021
l = 8 mm (2x)
433 526 (5x)
433 524 (2x)
Kennmarkierer "49"
765 049 aufgeklebt
433 525
Kennmarkierer "48"
765 048 aufgeklebt
433 523
433 522
Zinnwarzen unter den Alu-leisten 433 ...
dürfen nicht deformiert werden
2,5 x 12 DIN 7346
707 336 (20x)
382 455 / K2
Kabelmantel an Masse
stumpf angelötet
433 529 (5x)
433 527 (2x)
433 528
433 508 (2x)
382 457 / K1
Kabelmantel an Masse
stumpf angelötet (5x)
361 565 (3x)
* 461 565 ä Einbaumarke
Kontrollmaß
1:1
Schlumberger Technologies GmbH
FLAT MODULE
Typ: DUPLEX
375 333
Schaltplanpositionierung 229 038 S / Sa

1 Pos. REF. NO.	2 Wert VALUE	3 Bezeichnung Schlumberger PART. NO.	4 Hersteller MANUFACT	5 Pos REF. NO.	6 Wert VALUE	7 Bezeichnung Schlumberger PART. NO.	8 Hersteller MANUFACT
1	Bestückte Leiterplatte	361 533	SCHL				
	hierzu	361 533 Sa					
3	Bestückte Leiterplatte	361 565	SCHL				
	hierzu	361 565 Sa					
Bu 48	82 MCX-50-0-1-133	886 185	SUHN				
Bu 49	82 MCX-50-0-1-133	886 185	SUHN				
K 1	Vollmantelkabel	382 457	SCHL				
K 2	Vollmantelkabel	382 455	SCHL				

Ausgabe ISSUE	Änd.-Mittlg Nr. MODIFIC NO	Tag DATE	Name NAME			
07						
06						
05						
04						
03						
02	1089.6	31.1.91	Kr.		Tag DATE	Name NAME
01	0089.41	29.8.90	Staff.			
–	0089.7	27.3.90	Kr.	geschr	27.3.90	Kr.
				bearb	29.8.90	
				gepr		

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: DUPLEX

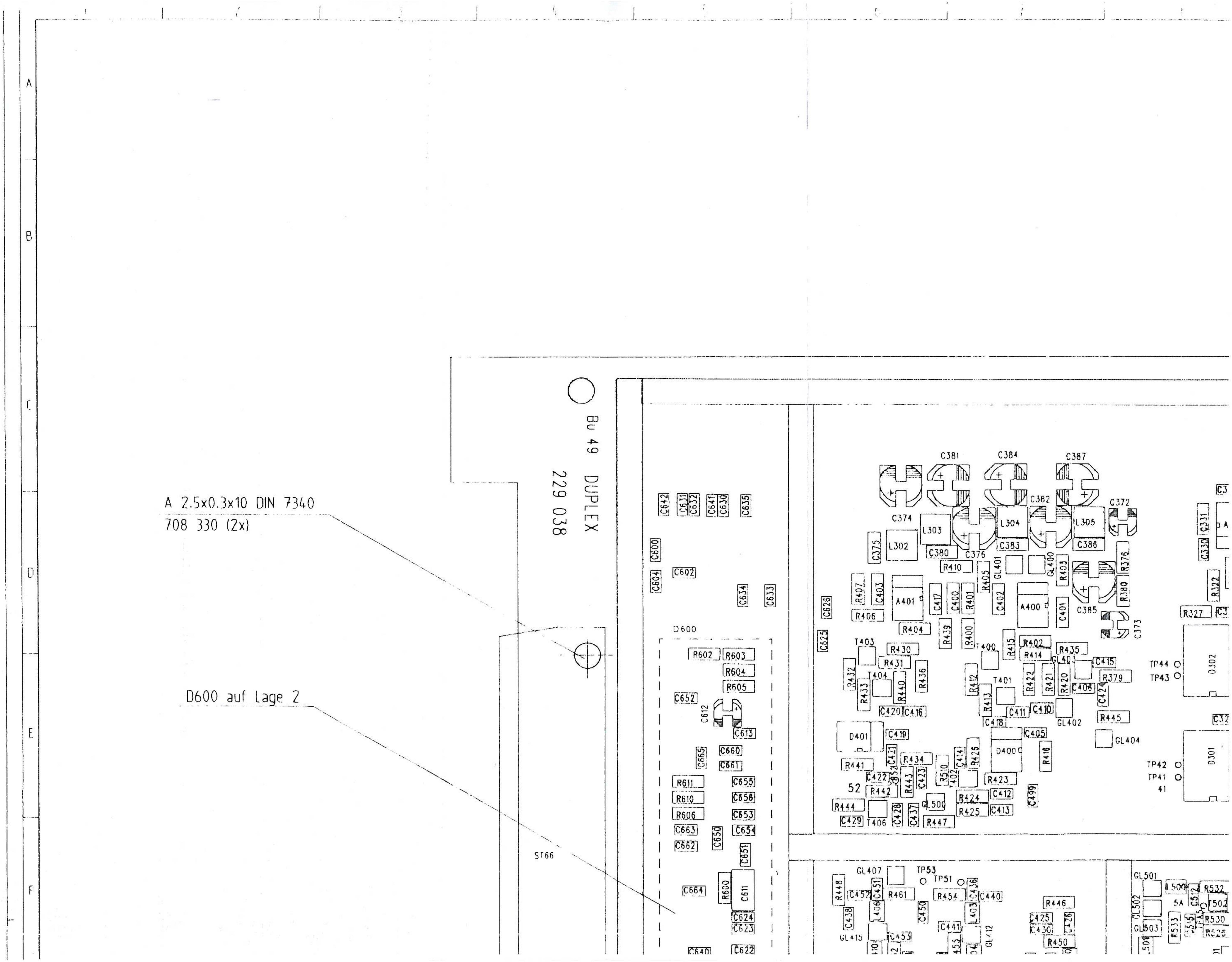
Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

Bezeichnung Schlumberger PART NO: 229 038 Sa

Blatt Nr SHEET NO: 1

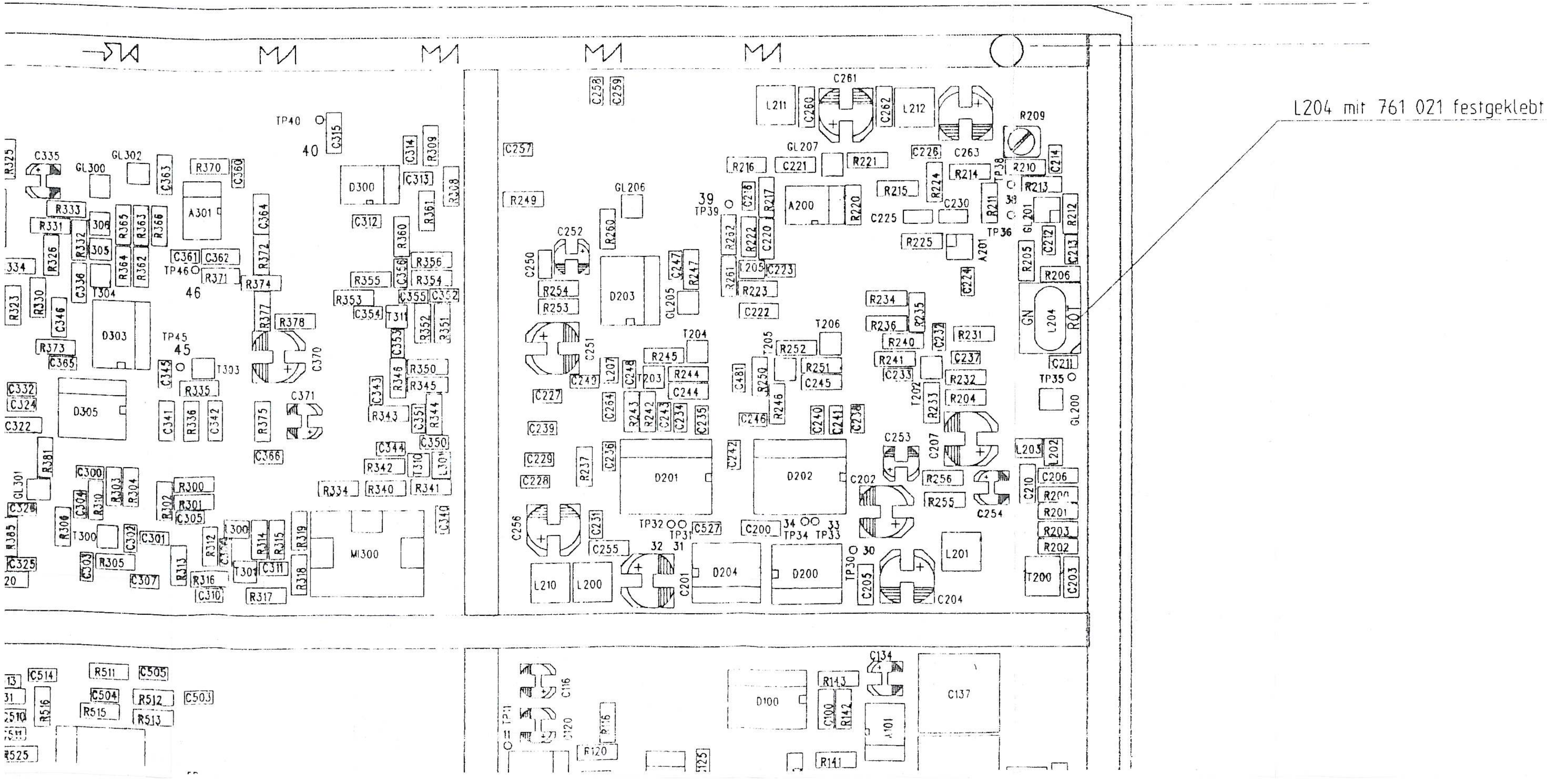
Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 229 038 S

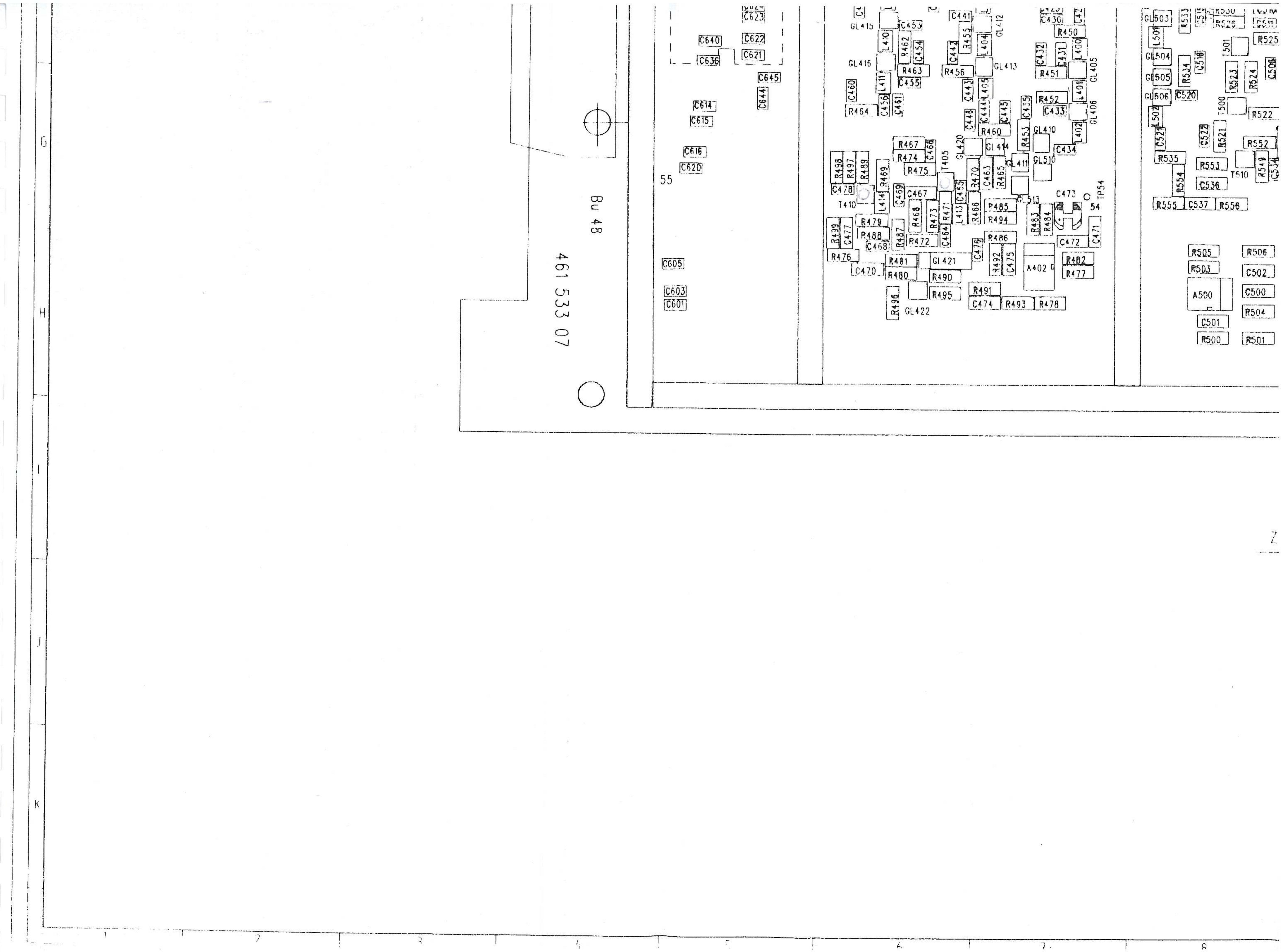
Gerät: 4015


A 2.5x0.3x10 DIN 7340
708 330 (2x)
D600 auf Lage 2
Bu 49
229 038
DUPLEX
D600
ST66
TP44
TP43
TP42
TP41
TP53
TP51

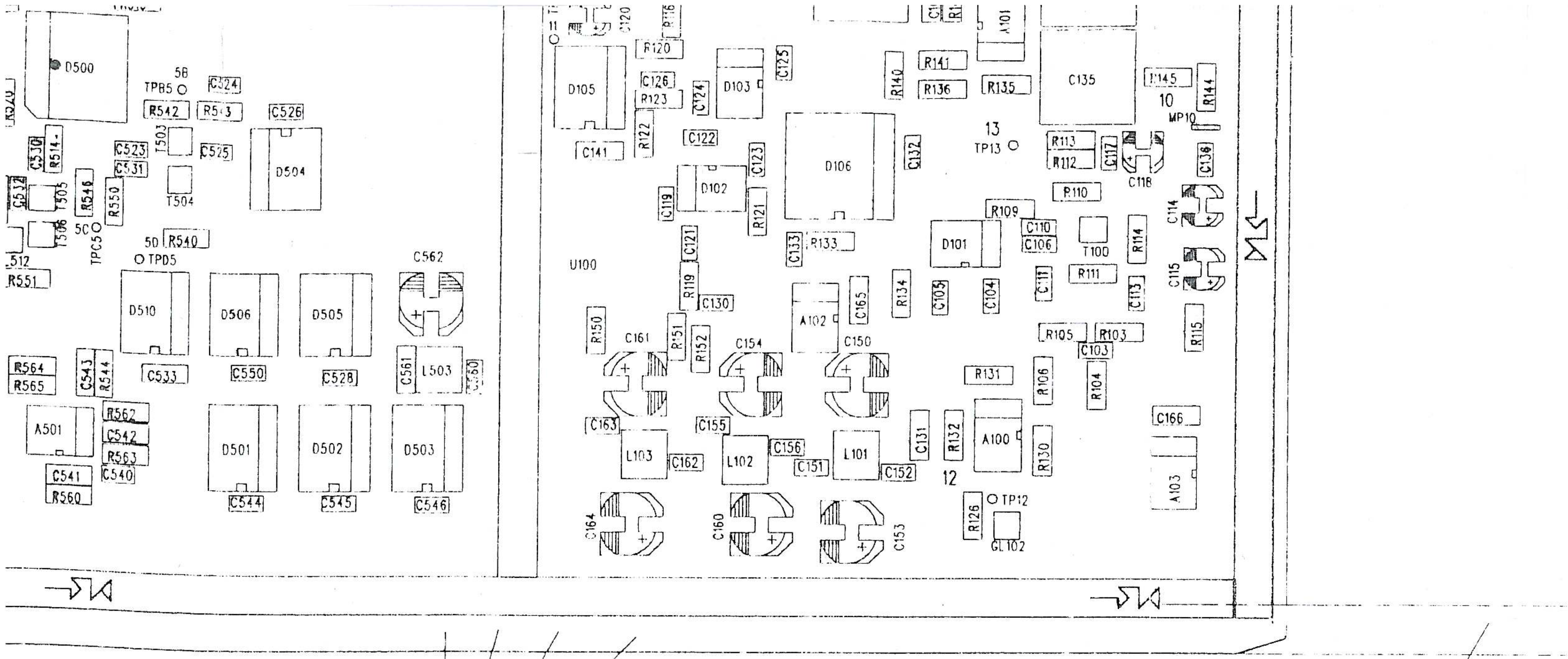
Reflow gelötet und Sonderlötung

Hierzu Bauteilklebemaske 461 533 07





G
H
I
J
K
Bu 48
461 533 07
55
C623
C622
C621
C640
C636
C645
C644
C614
C615
C616
C620
C605
C603
C601
GL415
GL416
C453
C454
R462
R463
C455
L410
L411
C460
R464
C456
C461
C441
C442
R455
L404
GL413
R456
C443
L405
C444
C446
C445
R460
C430
R450
C432
C431
L400
GL405
R451
L401
R452
C433
C435
GL406
L402
GL410
R453
C434
GL420
GL414
GL411
GL510
R467
C466
R474
T405
R475
R498
R497
R489
R469
C478
T410
L414
C469
C467
C465
R470
C463
R465
GL513
C473
TP54
54
R485
R494
R483
R484
R479
R488
C468
R487
R468
R473
R471
L413
R466
C471
R499
C477
R472
C464
C476
R486
C472
R476
R481
GL421
R492
C475
A402
R482
R477
C470
R480
R490
R496
GL422
R495
R491
C474
R493
R478
GL503
R533
R526
C511
R525
L501
GL504
T501
C506
GL505
R534
C518
R523
R524
GL506
C520
L502
T500
R522
C521
C522
R521
R552
R535
R553
T510
R549
C534
R554
C536
R555
C537
R556
R505
R506
R503
C502
A500
C500
R504
C501
R500
R501



...warzenhöhe im Leistenbereich 150μ ±50μ

Beide Randstreifen frei von lötbedingtem Zinnauftrag.

Kontrollmaß / Critical measurements

Schaltplanpositionierung = 361 533 S / Sa

Rev. No.	Rev. Sht	Date	Name
09			
08	4082.8	18.8.94	Ug
07			
06			
05			
04			
03			
02			
01			
00			

Rohteil / Initial part

Werkstoff / Material

Oberfläche / Surface

Freimaßtoleranzen / default tolerance

Scale 2:1

DIN A1

1993	Date	Name
Drawn	27.7.93	Kr.
Designed		
Checked		

Schlumberger Technologies GmbH
Gutenbergstr. 2-4
85737 Ismaning

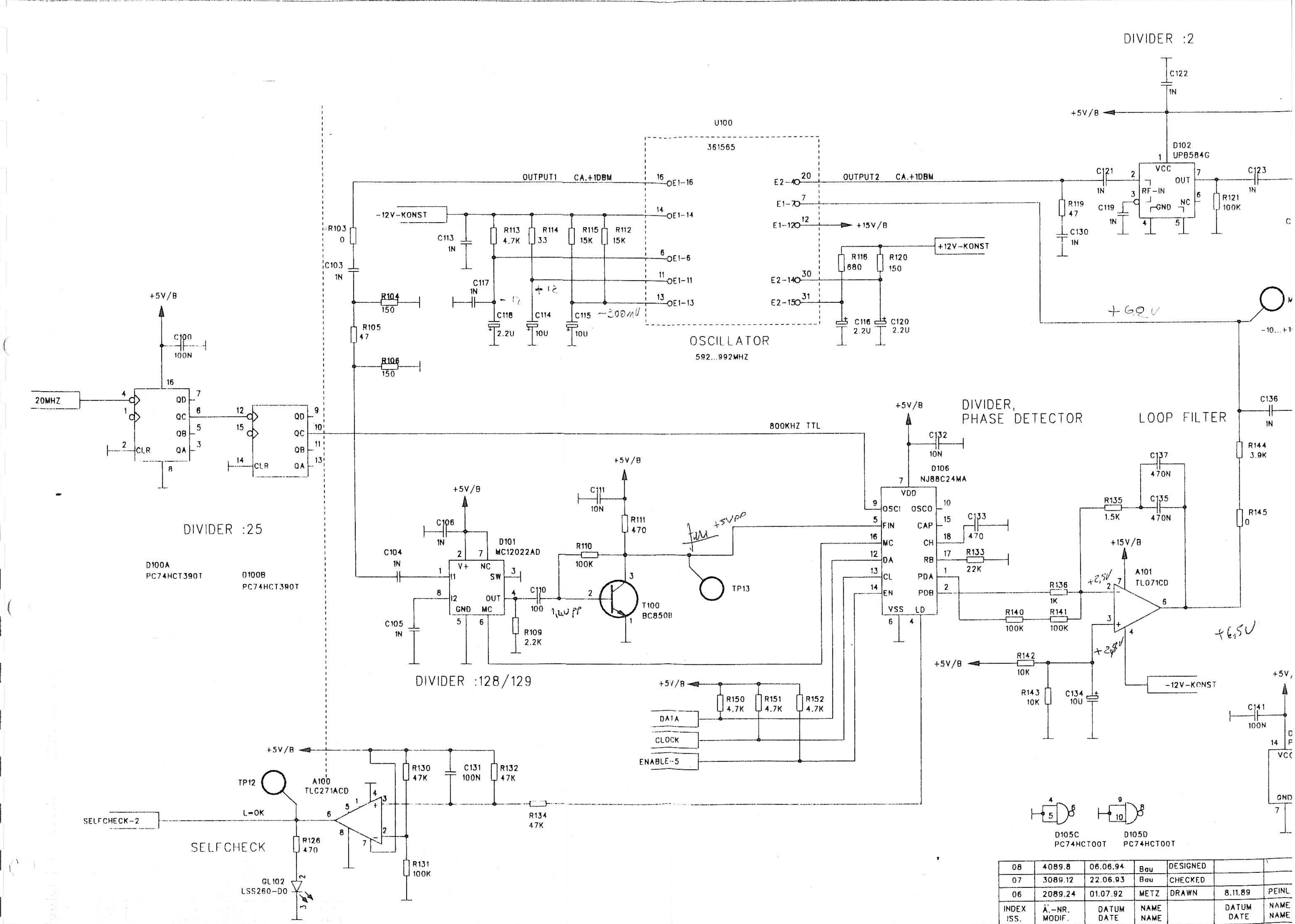
Bezeichnung / Description
Bestückte Leiterplatte
Type DUPLEX

Zeichnungsnr. / Drawing No.
361 533

Gerät / Unit 4015 / 375 333

9 10 11 12 13

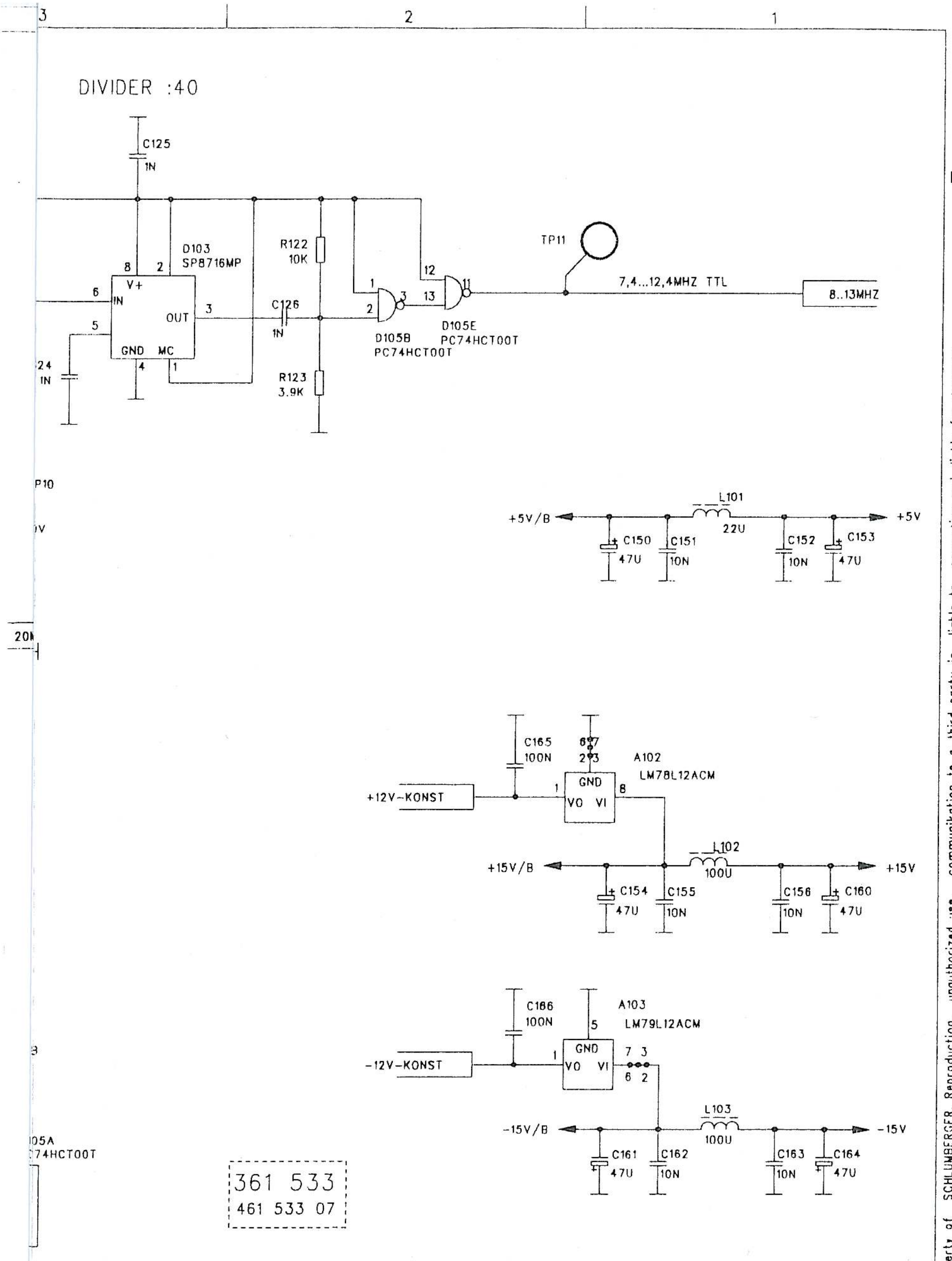
8 | 7 | 6 | 5 | 4



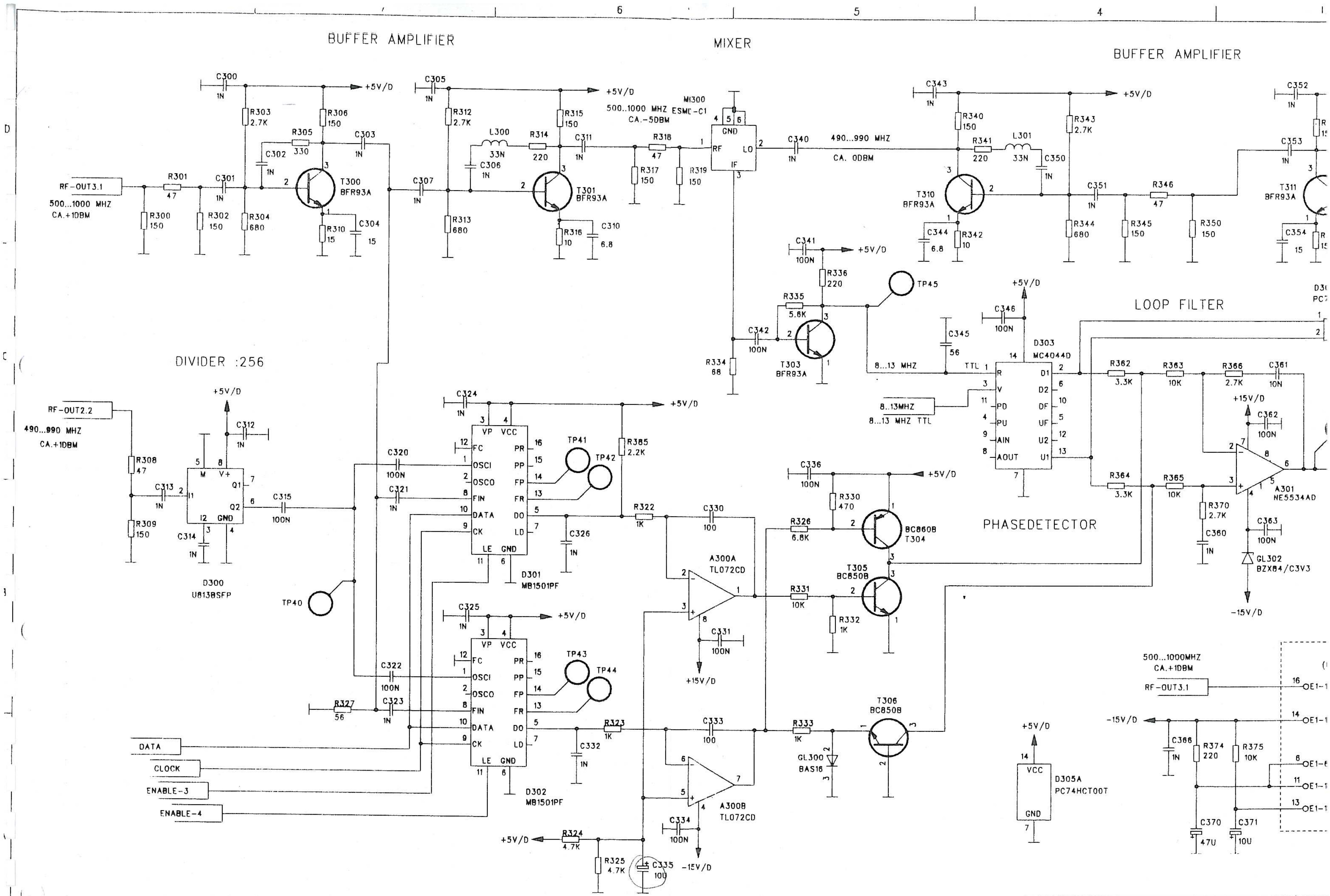
08	4089.8	06.06.94	Bau	DESIGNED		
07	3089.12	22.06.93	Bau	CHECKED		
06	2089.24	01.07.92	METZ	DRAWN	8.11.89	PEINL
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

DIESE ZEICHNUNG

8 | 7 | 6 | 5 | 4

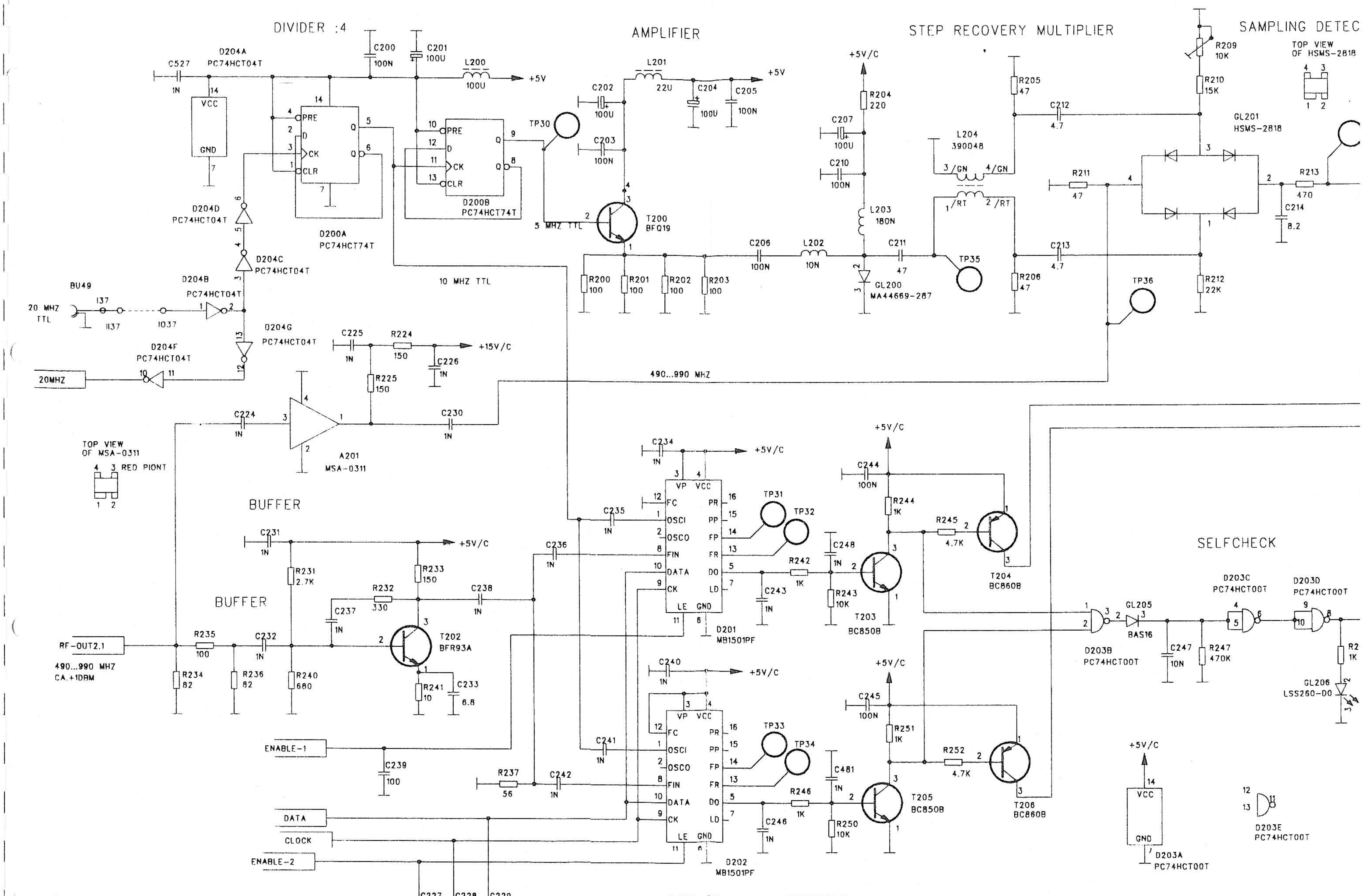


SCHLUMBERGER TECHNOLOGIES GMBH Gutenbergstr. 2-4 85737 ISMANING	BEZEICHNUNG/DESCRIPTION: DUPLEX	ZEICHNUNGSNR./DRAWING NO.: 361 533 S	1 VON/OF 6
		PROJECT/GROUP: 4015 / 229 038	BLATT SHEET



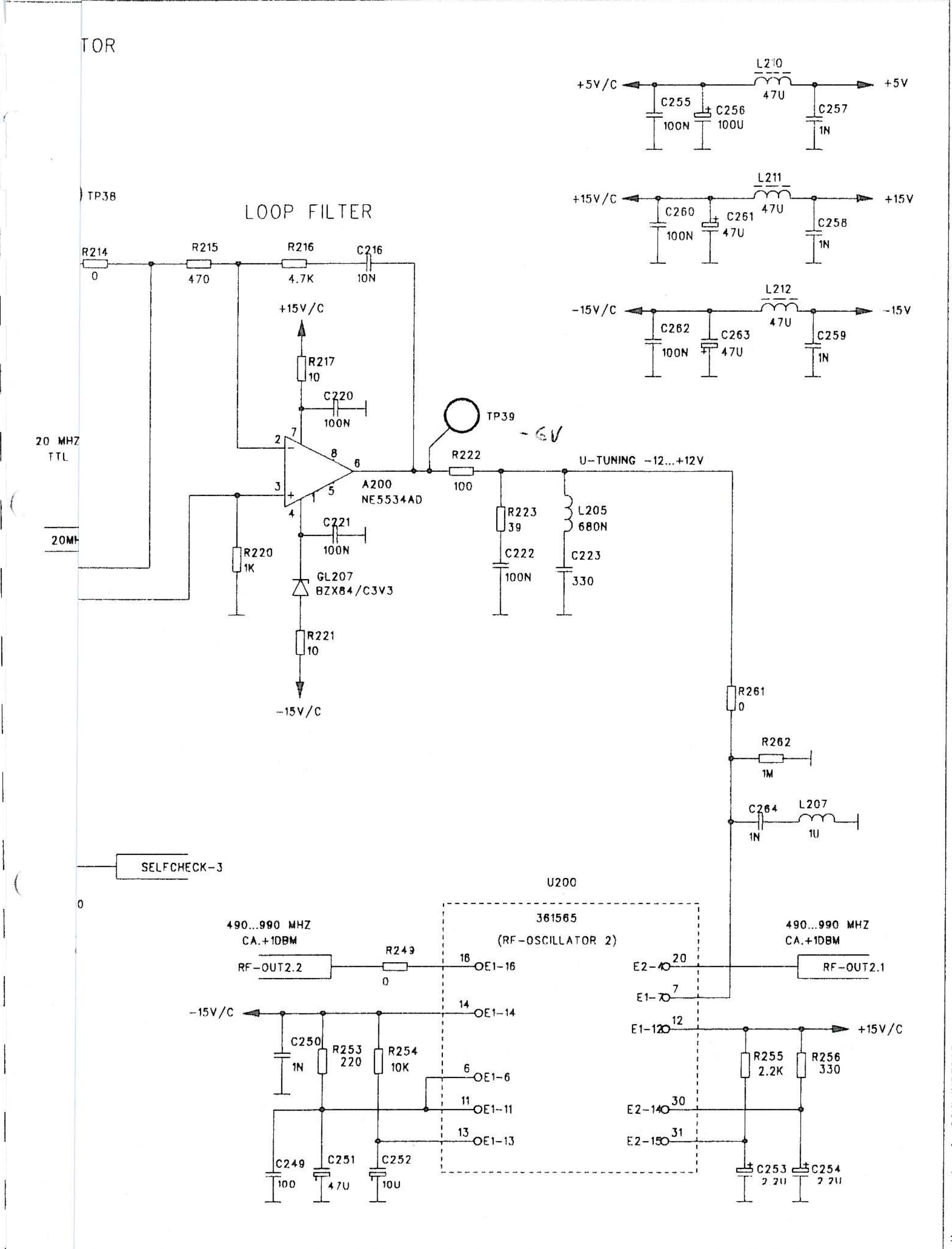
08	4089.8	06.06.94	Bau	DESIGNED			
07	3089.12	22.06.93	Bau	CHECKED			
06	2089.24	01.07.92	METZ	DRAWN	8.11.89	PEINL	
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME	

DIESE ZEICHNUNG IS

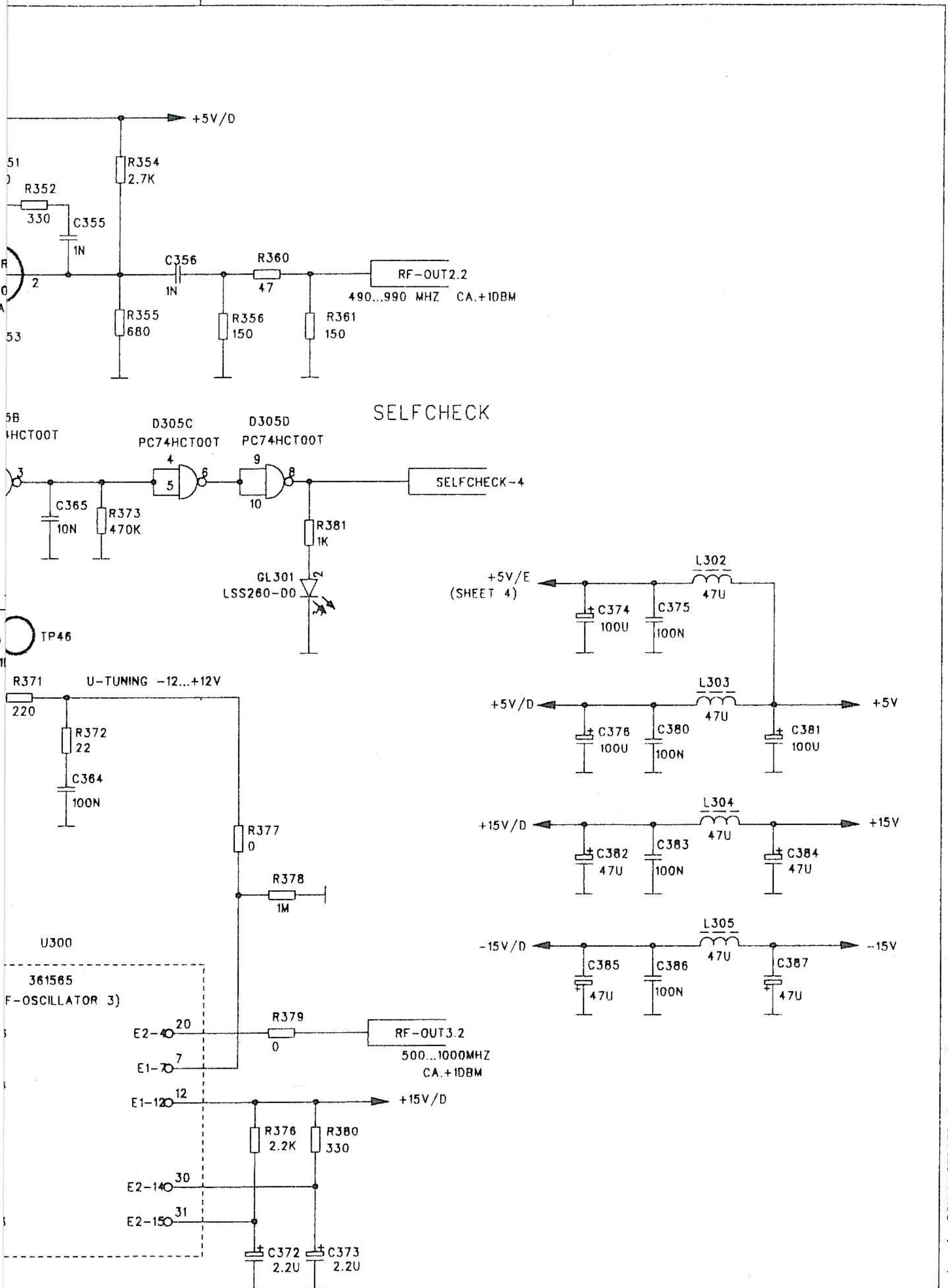


08	4089.8	06.06.94	Bau	DESIGNED		
07	3089.12	22.06.93	Bau	CHECKED		
06	2089.24	01.07.92	METZ	DRAWN	8.11.89	PEINL
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

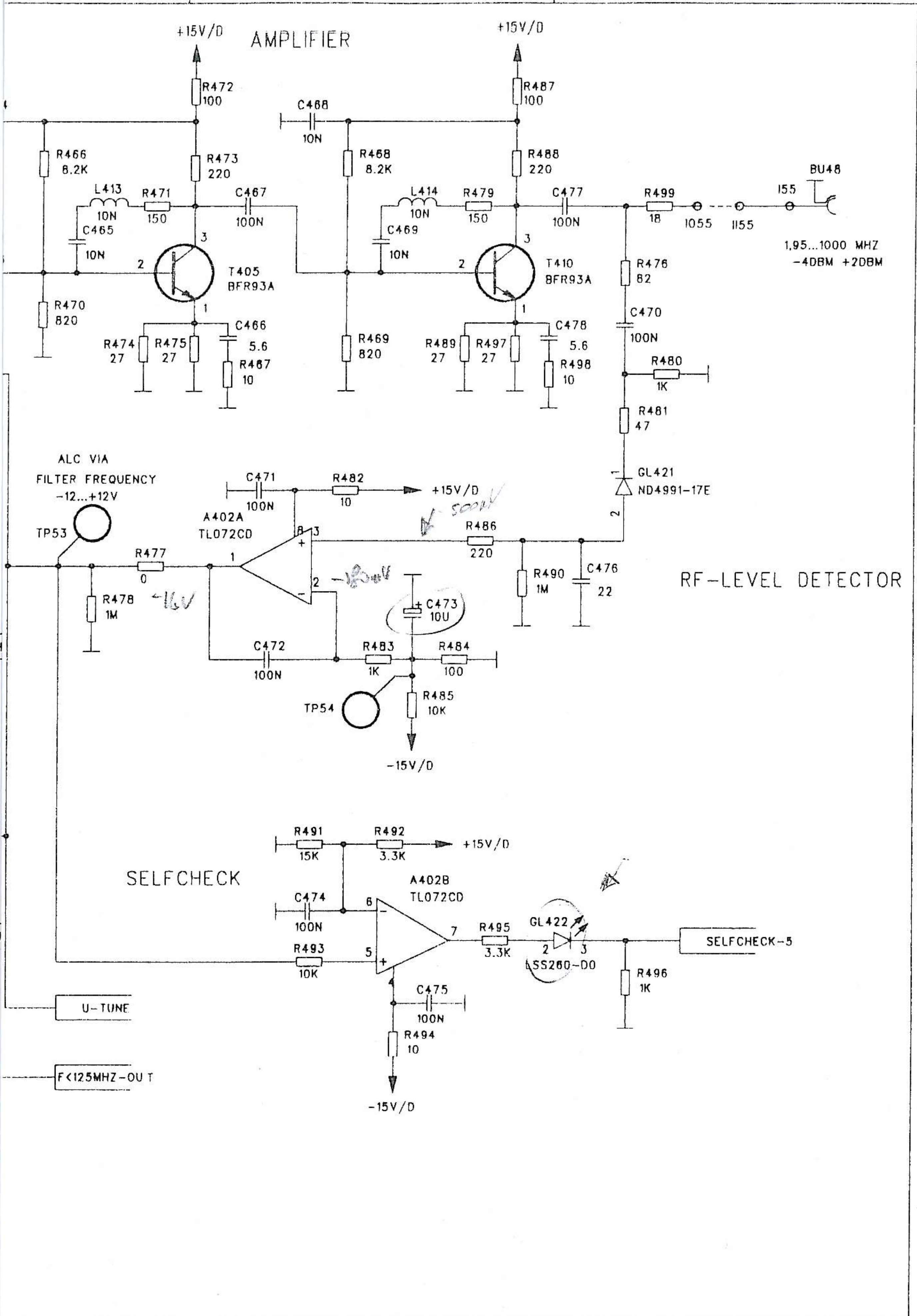
DIESE ZEICHNUNG



SCHLUMBERGER TECHNOLOGIES GMBH Gutenbergstr. 2-4 85737 ISMANING	BEZEICHNUNG/DESCRIPTION: DUPLEX	ZEICHNUNGSNR./DRAWING NO.: 361 533 S	2 VON/OF 6
		PROJECT/GROUP: 4015 / 229 038	BLATT SHEET



SCHLUMBERGER TECHNOLOGIES GMBH Gutenbergstr. 2-4 85737 ISMANING	BEZEICHNUNG/DESCRIPTION: DUPLEX	ZEICHNUNGSNR./DRAWING NO.: 361 533 S	3 VON/OF 6
		PROJECT/GROUP: 4015 / 229 038	BLATT SHEET



SCHLUMBERGER TECHNOLOGIES GMBH
Gutenbergstr. 2-4
85737 ISMANING

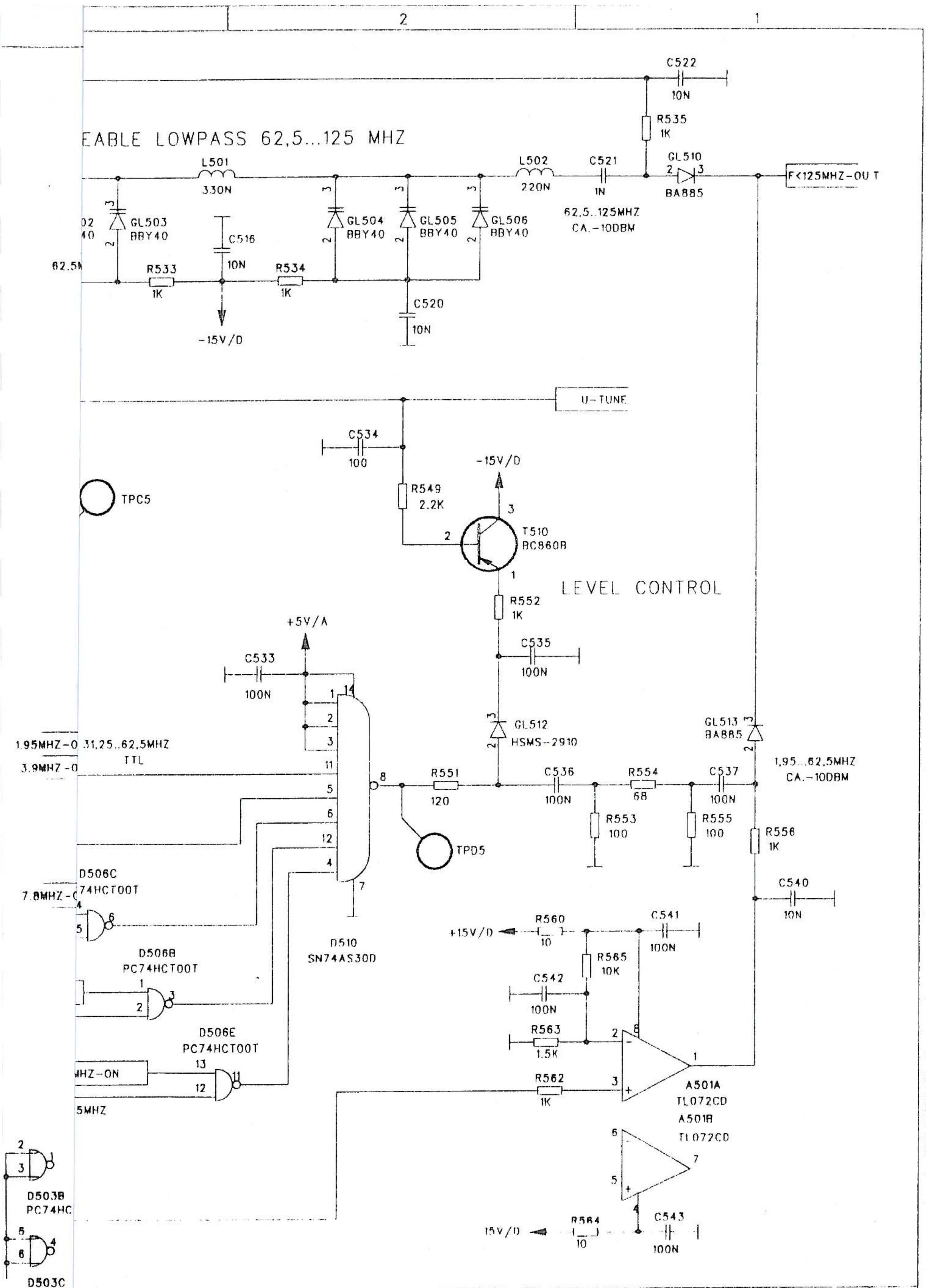
BEZEICHNUNG/DESCRIPTION:

DUPLEX

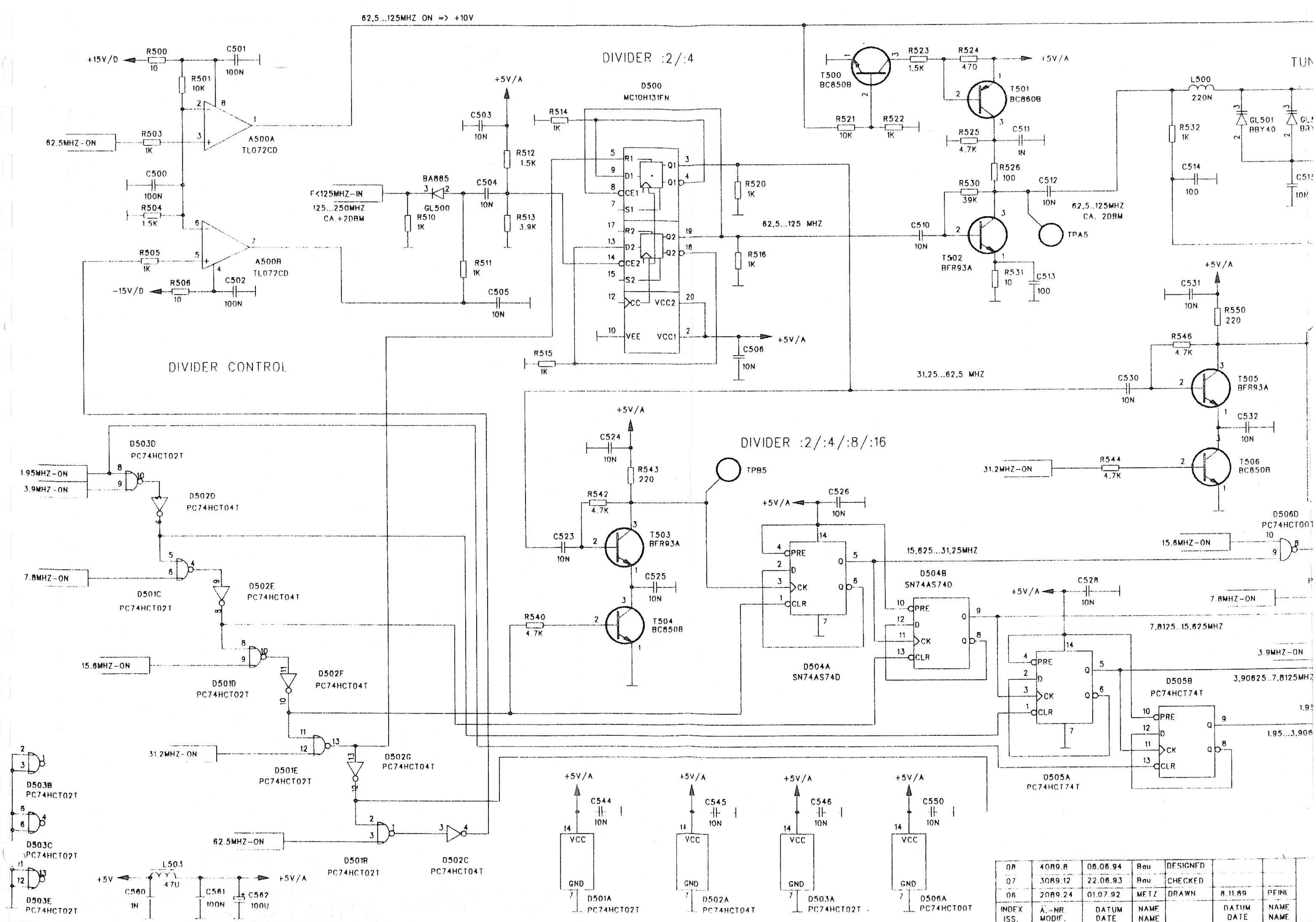
ZEICHNUNGSNR./DRAWING NO.: 361 533 S

4 VON/OF 6 BLATT SHEET

PROJECT/GROUP: 4015 / 229 038



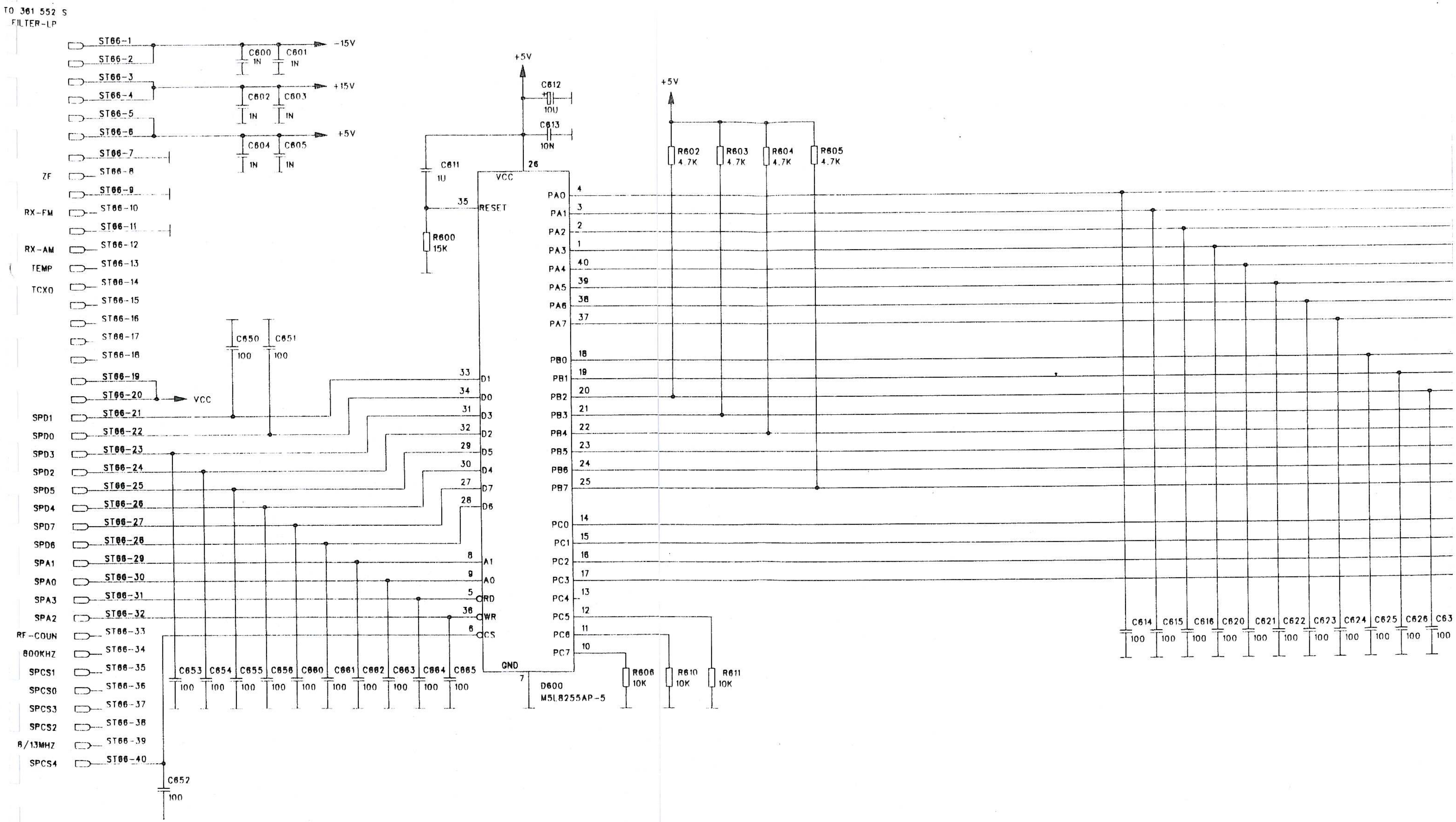
SCHLUMBERGER TECHNOLOGIES GMBH Gutenbergstr. 2-4 85737 ISMANING	BEZEICHNUNG/DESCRIPTION: DUPLEX	ZEICHNUNGSNR./DRAWING NO.: 361 533 S PROJECT/GROUP: 4015 / 229 038	5 VON/OF 6 BLATT SHEET



08	4089.8	08.08.94	Rau	DESIGNED		
07	3089.12	22.08.93	Rau	CHECKED		
06	2089.24	01.07.92	METZ	DRAWN	8.11.89	PFINL
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

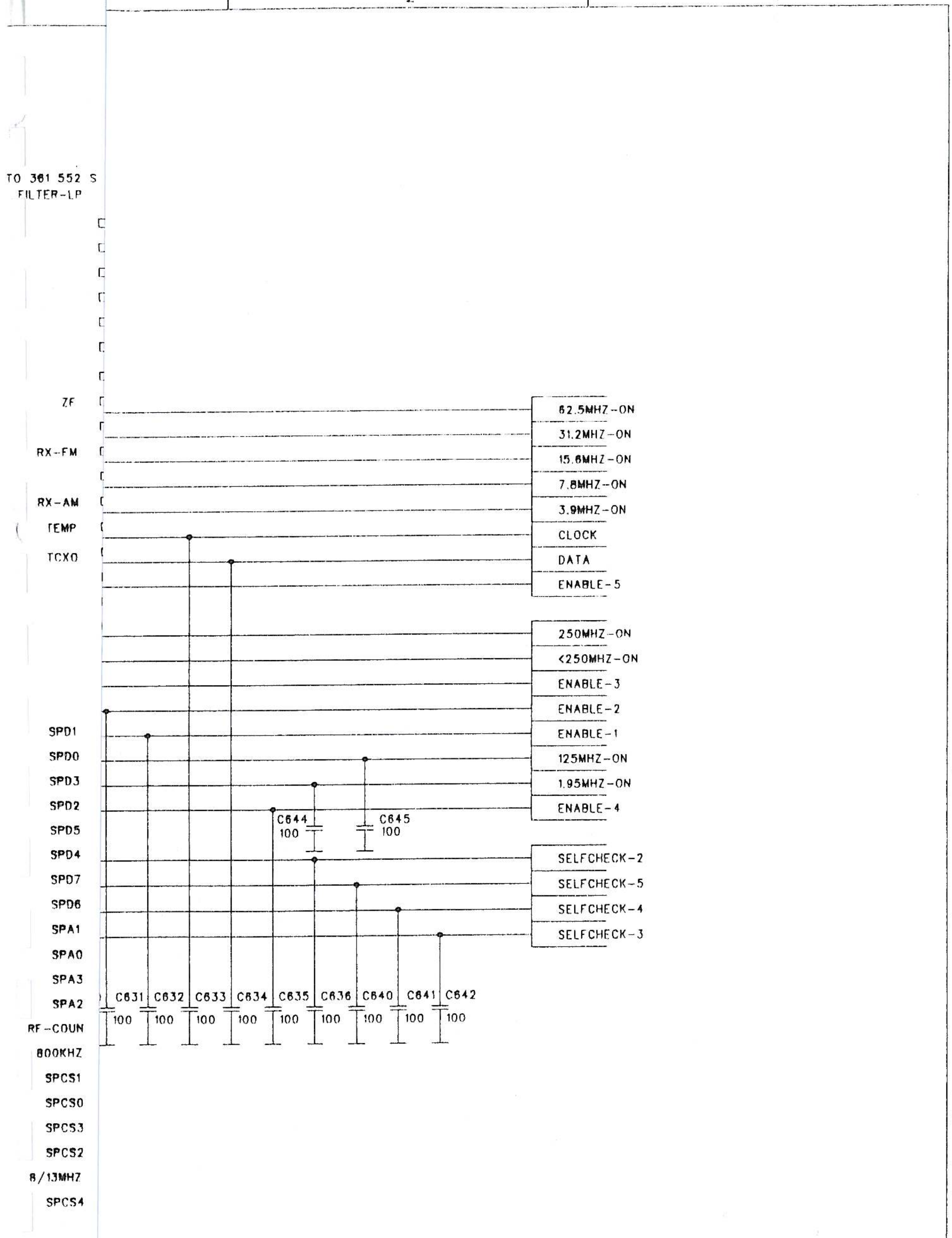
DIESE ZEICHNUNG IST U

CONTROL UNIT



08	4089.8	06.06.94	Bau	DESIGNED			
07	3089.12	22.06.93	Bau	CHECKED			TE(
06	2089.24	01.07.92	METZ	DRAWN	8.11.89	PEINL	
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME	8

DIESE ZEICHNUNG IST UNSER



CHLUMBERGER HNOLOGIES GMBH utenbergstr. 2-4 5737 ISMANING	BEZEICHNUNG/DESCRIPTION: DUPLEX	ZEICHNUNGSNR./DRAWING NO.: 361 533 S PROJECT/GROUP: 4015 / 229 038	6 VON/OF 6 BLATT SHEET

Pos.	Benennung	Wert	HNK-Nr.	Herst.
A100	OPV	TLC271ACD	834221	TI
A101	OPV	TL071CD	834227	TI
A102	Spannungsregler	LM78L12ACM	834250	NS
A103	Spannungsregler	LM79L12ACM	834251	NS
A200	OPV	NE5534AD	834209	VAL
A201	Verstärker	MSA-0311	834229	AVAN
A300	OPV	TL072CD	834222	TI
A301	OPV	NE5534AD	834209	VAL
A400	OPV	TL072CD	834222	TI
A401	OPV	TL072CD	834222	TI
A402	OPV	TL072CD	834222	TI
A500	OPV	TL072CD	834222	TI
A501	OPV	TL072CD	834222	TI
C100	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C103	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C104	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C105	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C106	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C110	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C111	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C113	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C114	Elko	10µF ±20% 16V-	814382	RÖD
C115	Elko	10µF ±20% 16V-	814382	RÖD
C116	Elko	2.2µF ±20% 50V-	814362	RÖD
C117	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C118	Elko	2.2µF ±20% 50V-	814362	RÖD
C119	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C120	Elko	2.2µF ±20% 50V-	814362	RÖD

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA	Gepr.:			361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					1

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C121	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C122	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C123	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C124	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C125	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C126	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C130	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C131	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C132	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C133	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C134	Elko	10μF ±20% 16V-	814382	RÖD
C135	MKT-Chip-Kondensator	470nF ±10% 50V-	812628	WIMA
C136	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C137	MKT-Chip-Kondensator	470nF ±10% 50V-	812628	WIMA
C141	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C150	Elko	47μF ±20% 16V-	814386	RÖD
C151	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C152	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C153	Elko	47μF ±20% 16V-	814386	RÖD
C154	Elko	47μF ±20% 16V-	814386	RÖD
C155	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C156	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C160	Elko	47μF ±20% 16V-	814386	RÖD
C161	Elko	47μF ±20% 16V-	814386	RÖD
C162	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C163	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C164	Elko	47μF ±20% 16V-	814386	RÖD
C165	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C166	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C200	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C201	Elko	100µF ±20% 6.3V	814394	RÖD
C202	Elko	100µF ±20% 6.3V	814394	RÖD
C203	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C204	Elko	100µF ±20% 6.3V	814394	RÖD
C205	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C206	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C207	Elko	100µF ±20% 6.3V	814394	RÖD
C210	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C211	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C212	Kondensator NP0	4.7pF ±0.25pF	813219	VIT
C213	Kondensator NP0	4.7pF ±0.25pF	813219	VIT
C214	Kondensator NP0	8.2pF ±0.5pF	813222	VIT
C216	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C220	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C221	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C222	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C223	Kondensator NP0	330pF ±5% 50V-	813241	VIT
C224	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C225	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C226	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C227	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C228	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C229	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C230	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C231	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C232	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C233	Kondensator NP0	6.8pF ±0.5pF	813221	VIT
C234	Kondensator NP0	1nF ±5% 50V-	813247	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C235	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C236	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C237	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C238	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C239	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C240	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C241	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C242	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C243	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C244	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C245	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C246	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C247	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C248	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C249	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C250	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C251	Elko	47µF ±20% 16V-	814386	RÖD
C252	Elko	10µF ±20% 16V-	814382	RÖD
C253	Elko	2.2µF ±20% 50V-	814362	RÖD
C254	Elko	2.2µF ±20% 50V-	814362	RÖD
C255	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C256	Elko	100µF ±20% 6.3V	814394	RÖD
C257	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C258	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C259	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C260	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C261	Elko	47µF ±20% 16V-	814386	RÖD
C262	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C263	Elko	47µF ±20% 16V-	814386	RÖD

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C264	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C300	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C301	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C302	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C303	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C304	Kondensator NP0	15pF ±5% 50V-	813225	VIT
C305	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C306	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C307	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C310	Kondensator NP0	6.8pF ±0.5pF	813221	VIT
C311	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C312	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C313	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C314	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C315	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C320	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C321	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C322	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C323	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C324	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C325	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C326	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C330	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C331	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C332	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C333	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C334	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C335	Elko	10µF ±20% 16V-	814382	RÖD
C336	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C340	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C341	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C342	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C343	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C344	Kondensator NPO	6.8pF ±0.5pF	813221	VIT
C345	Kondensator NPO	56pF ±5% 50V-	813232	VIT
C346	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C350	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C351	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C352	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C353	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C354	Kondensator NPO	15pF ±5% 50V-	813225	VIT
C355	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C356	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C360	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C361	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C362	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C363	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C364	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C365	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C366	Kondensator NPO	1nF ±5% 50V-	813247	VIT
C370	Elko	47μF ±20% 16V-	814386	RÖD
C371	Elko	10μF ±20% 16V-	814382	RÖD
C372	Elko	2.2μF ±20% 50V-	814362	RÖD
C373	Elko	2.2μF ±20% 50V-	814362	RÖD
C374	Elko	100μF ±20% 6.3V	814394	RÖD
C375	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C376	Elko	100μF ±20% 6.3V	814394	RÖD
C380	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA Gepr.:				361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					6

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C381	Elko	100μF ±20% 6.3V	814394	RÖD
C382	Elko	47μF ±20% 16V-	814386	RÖD
C383	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C384	Elko	47μF ±20% 16V-	814386	RÖD
C385	Elko	47μF ±20% 16V-	814386	RÖD
C386	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C387	Elko	47μF ±20% 16V-	814386	RÖD
C400	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C401	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C402	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C403	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C405	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C406	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C410	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C411	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C412	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C413	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C414	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C415	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C416	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C417	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C418	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C419	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C420	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C421	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C422	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C423	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C424	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C425	Kondensator NP0	1nF ±5% 50V-	813247	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C426	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C428	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C429	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C430	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C431	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C432	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C433	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C434	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C435	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C436	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C437	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C438	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C440	Kondensator NP0	3.3pF ±0.25pF	813217	VIT
C441	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C442	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C443	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C444	Kondensator X7R	1nF ±10% 50V-	813320	VIT
C445	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C446	Kondensator NP0	3.3pF ±0.25pF	813217	VIT
C450	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C451	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C452	Kondensator NP0	3.3pF ±0.25pF	813217	VIT
C453	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C454	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C455	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C456	Kondensator X7R	1nF ±10% 50V-	813320	VIT
C460	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C461	Kondensator NP0	3.3pF ±0.25pF	813217	VIT
C463	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA Gepr.:				361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					8

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C464	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C465	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C466	Kondensator NP0	5.6pF ±0.5pF	813220	VIT
C467	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C468	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C469	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C470	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C471	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C472	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C473	Elko	10µF ±20% 16V-	814382	RÖD
C474	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C475	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C476	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C477	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C478	Kondensator NP0	5.6pF ±0.5pF	813220	VIT
C481	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C499	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C500	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C501	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C502	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C503	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C504	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C505	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C506	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C510	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C511	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C512	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C513	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C514	Kondensator NP0	100pF ±5% 50V-	813235	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C515	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C516	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C520	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C521	Kondensator X7R	1nF ±10% 50V-	813320	VIT
C522	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C523	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C524	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C525	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C526	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C527	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C528	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C530	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C531	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C532	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C533	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C534	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C535	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C536	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C537	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C540	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C541	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C542	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C543	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C544	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C545	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C546	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C550	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C560	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C561	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C562	Elko	100µF ±20% 6.3V	814394	RÖD
C600	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C601	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C602	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C603	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C604	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C605	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C611	Kondensator Z5U	1µF ±20% 50V-	813390	VIT
C612	Elko	10µF ±20% 16V-	814382	RÖD
C613	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C614	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C615	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C616	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C620	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C621	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C622	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C623	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C624	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C625	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C626	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C630	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C631	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C632	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C633	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C634	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C635	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C636	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C640	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C641	Kondensator NP0	100pF ±5% 50V-	813235	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C642	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C644	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C645	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C650	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C651	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C652	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C653	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C654	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C655	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C656	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C660	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C661	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C662	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C663	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C664	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C665	Kondensator NP0	100pF ±5% 50V-	813235	VIT
D100	Decade Counter	PC74HCT390T	834438	VAL
D101	Frequenzteiler	MC12022AD	835359	MOT
D102	2.5GHz Teiler :2	UPB584G	835396	NEC
D103	Frequenzteiler	SP8716MP	834447	PLES
D105	NAND-Gatter	PC74HCT00T	834430	VAL
D106	PLL-Synthesizer	NJ88C24MAMP	835399	PLES
D200	Flip-Flop	PC74HCT74T	834433	VAL
D201	PLL-Synthesizer	MB1501PF	835346	FUJI
D202	PLL-Synthesizer	MB1501PF	835346	FUJI
D203	NAND-Gatter	PC74HCT00T	834430	VAL
D204	Inverter	PC74HCT04T	834432	VAL
D300	1.1GHz Frequenzteiler	U813BSFP	835348	TF

Pos.	Benennung	Wert	HNK-Nr.	Herst.
D301	PLL-Synthesizer	MB1501PF	835346	FUJI
D302	PLL-Synthesizer	MB1501PF	835346	FUJI
D303	Phase-Frequency Detector	MC4044D	835345	MOT
D305	NAND-Gatter	PC74HCT00T	834430	VAL
D400	2.5GHz Teiler :2	UPB584G	835396	NEC
D401	2.5GHz Teiler :4	UPB585G	835395	NEC
D500	Flip-Flop	MC10H131FN	835347	MOT
D501	NOR-Gatter	PC74HCT02T	834431	VAL
D502	Inverter	PC74HCT04T	834432	VAL
D503	NOR-Gatter	PC74HCT02T	834431	VAL
D504	Flip-Flop	SN74AS74D	834449	TI
D505	Flip-Flop	PC74HCT74T	834433	VAL
D506	NAND-Gatter	PC74HCT00T	834430	VAL
D510	NAND-Gatter	SN74AS30D	834495	TI
D600	PIA (NMOS)	M5L8255AP-5	835027	MITSU
GL102	Leuchtdiode rot	LSS260-D0	856200	SIE
GL200	Step Recovery Diode	MA44669-287	830518	M/ACOM
GL201	Diodenquartett	HSMS-2818	830555	HP
GL205	Diode	BAS16	830552	VAL
GL206	Leuchtdiode rot	LSS260-D0	856200	SIE
GL207	Zener-Diode	BZX84/C3V3	830496	VAL
GL300	Diode	BAS16	830552	VAL
GL301	Leuchtdiode rot	LSS260-D0	856200	SIE
GL302	Zener-Diode	BZX84/C3V3	830496	VAL
GL400	Diode	BAS16	830552	VAL
GL401	Diode	BAS16	830552	VAL
GL402	PIN-Diode	BA885	830533	SIE
GL403	PIN-Diode	BA885	830533	SIE

Pos.	Benennung	Wert	HNK-Nr.	Herst.
GL404	PIN-Diode	BA885	830533	SIE
GL405	Abstimm-Diode	BBY31	830618	VAL
GL406	Abstimm-Diode	BBY31	830618	VAL
GL407	PIN-Diode	BA885	830533	SIE
GL410	PIN-Diode	BA885	830533	SIE
GL411	PIN-Diode	BA885	830533	SIE
GL412	Abstimm-Diode	BBY40	830619	VAL
GL413	Abstimm-Diode	BBY40	830619	VAL
GL414	PIN-Diode	BA885	830533	SIE
GL415	Abstimm-Diode	BBY40	830619	VAL
GL416	Abstimm-Diode	BBY40	830619	VAL
GL420	PIN-Diode	BA885	830533	SIE
GL421	Schottky-Diode	ND4991-17E	830508	NEC
GL422	Leuchtdiode rot	LSS260-D0	856200	SIE
GL500	PIN-Diode	BA885	830533	SIE
GL501	Abstimm-Diode	BBY40	830619	VAL
GL502	Abstimm-Diode	BBY40	830619	VAL
GL503	Abstimm-Diode	BBY40	830619	VAL
GL504	Abstimm-Diode	BBY40	830619	VAL
GL505	Abstimm-Diode	BBY40	830619	VAL
GL506	Abstimm-Diode	BBY40	830619	VAL
GL510	PIN-Diode	BA885	830533	SIE
GL512	Schottky-Diode	HSMS-2910	830551	HP
GL513	PIN-Diode	BA885	830533	SIE
L101	Ferrit-Spule	22μH ±15%	821318	SIE
L102	Ferrit-Spule	100μH ±15%	821322	SIE
L103	Ferrit-Spule	100μH ±15%	821322	SIE
L200	Ferrit-Spule	100μH ±15%	821322	SIE

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA Gepr.:				361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					14

Pos.	Benennung	Wert	HNK-Nr.	Herst.
L201	Ferrit-Spule	22µH ±15%	821318	SIE
L202	Keramik-Spule	10nH ±20%	821207	STET
L203	Keramik-Spule	180nH ±5%	821218	STET
L204	HF-Übertrager		390048	STG
L205	Keramik-Spule	680nH ±5%	821225	STET
L207	Keramik-Spule	1µH ±5%	821227	STET
L210	Ferrit-Spule	47µH ±15%	821320	SIE
L211	Ferrit-Spule	47µH ±15%	821320	SIE
L212	Ferrit-Spule	47µH ±15%	821320	SIE
L300	Keramik-Spule	33nH ±10%	821209	STET
L301	Keramik-Spule	33nH ±10%	821209	STET
L302	Ferrit-Spule	47µH ±15%	821320	SIE
L303	Ferrit-Spule	47µH ±15%	821320	SIE
L304	Ferrit-Spule	47µH ±15%	821320	SIE
L305	Ferrit-Spule	47µH ±15%	821320	SIE
L400	Keramik-Spule	10nH ±20%	821207	STET
L401	Keramik-Spule	10nH ±20%	821207	STET
L402	Keramik-Spule	10nH ±20%	821207	STET
L403	Keramik-Spule	22nH ±20%	821208	STET
L404	Keramik-Spule	39nH ±10%	821210	STET
L405	Keramik-Spule	22nH ±20%	821208	STET
L406	Keramik-Spule	150nH ±5%	821217	STET
L410	Keramik-Spule	220nH ±5%	821219	STET
L411	Keramik-Spule	150nH ±5%	821217	STET
L413	Keramik-Spule	10nH ±20%	821207	STET
L414	Keramik-Spule	10nH ±20%	821207	STET
L500	Keramik-Spule	220nH ±5%	821219	STET
L501	Keramik-Spule	330nH ±5%	821221	STET
L502	Keramik-Spule	220nH ±5%	821219	STET

Pos.	Benennung	Wert	HNK-Nr.	Herst.
L503	Ferrit-Spule	47µH ±15%	821320	SIE
MI300	Mischer	ESMD-C1	872082	EURO
MP10	Stecklötöse		786009	ETT
R103	Chip-Widerstand	0Ω	804700	VAL
R104	Chip-Widerstand	150Ω ±1%	804727	VAL
R105	Chip-Widerstand	47Ω ±5%	804721	VAL
R106	Chip-Widerstand	150Ω ±1%	804727	VAL
R109	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R110	Chip-Widerstand	100kΩ ±1%	804761	VAL
R111	Chip-Widerstand	470Ω ±1%	804733	VAL
R112	Chip-Widerstand	15kΩ ±1%	804751	VAL
R113	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R114	Chip-Widerstand	33Ω ±5%	804719	VAL
R115	Chip-Widerstand	15kΩ ±1%	804751	VAL
R116	Chip-Widerstand	680Ω ±1%	804735	VAL
R119	Chip-Widerstand	47Ω ±5%	804721	VAL
R120	Chip-Widerstand	150Ω ±1%	804727	VAL
R121	Chip-Widerstand	100kΩ ±1%	804761	VAL
R122	Chip-Widerstand	10kΩ ±1%	804749	VAL
R123	Chip-Widerstand	3.9kΩ ±1%	804744	VAL
R126	Chip-Widerstand	470Ω ±1%	804733	VAL
R130	Chip-Widerstand	47kΩ ±1%	804757	VAL
R131	Chip-Widerstand	100kΩ ±1%	804761	VAL
R132	Chip-Widerstand	47kΩ ±1%	804757	VAL
R133	Chip-Widerstand	22kΩ ±1%	804753	VAL
R134	Chip-Widerstand	47kΩ ±1%	804757	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA	Gepr.:			361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					16

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R135	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R136	Chip-Widerstand	1kΩ ±1%	804737	VAL
R140	Chip-Widerstand	100kΩ ±1%	804761	VAL
R141	Chip-Widerstand	100kΩ ±1%	804761	VAL
R142	Chip-Widerstand	10kΩ ±1%	804749	VAL
R143	Chip-Widerstand	10kΩ ±1%	804749	VAL
R144	Chip-Widerstand	3.9kΩ ±1%	804744	VAL
R145	Chip-Widerstand	0Ω	804700	VAL
R150	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R151	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R152	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R200	Chip-Widerstand	100Ω ±1%	804725	VAL
R201	Chip-Widerstand	100Ω ±1%	804725	VAL
R202	Chip-Widerstand	100Ω ±1%	804725	VAL
R203	Chip-Widerstand	100Ω ±1%	804725	VAL
R204	Chip-Widerstand	220Ω ±1%	804729	VAL
R205	Chip-Widerstand	47Ω ±5%	804721	VAL
R206	Chip-Widerstand	47Ω ±5%	804721	VAL
R209	Potentiometer	10kΩ ±25%	807740	BOURNS
R210	Chip-Widerstand	15kΩ ±1%	804751	VAL
R211	Chip-Widerstand	47Ω ±5%	804721	VAL
R212	Chip-Widerstand	22kΩ ±1%	804753	VAL
R213	Chip-Widerstand	470Ω ±1%	804733	VAL
R214	Chip-Widerstand	0Ω	804700	VAL
R215	Chip-Widerstand	470Ω ±1%	804733	VAL
R216	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R217	Chip-Widerstand	10Ω ±5%	804713	VAL
R220	Chip-Widerstand	1kΩ ±1%	804737	VAL
R221	Chip-Widerstand	10Ω ±5%	804713	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R222	Chip-Widerstand	100Ω ±1%	804725	VAL
R223	Chip-Widerstand	39Ω ±5%	804720	VAL
R224	Chip-Widerstand	150Ω ±1%	804727	VAL
R225	Chip-Widerstand	150Ω ±1%	804727	VAL
R231	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R232	Chip-Widerstand	330Ω ±1%	804731	VAL
R233	Chip-Widerstand	150Ω ±1%	804727	VAL
R234	Chip-Widerstand	82Ω ±5%	804724	VAL
R235	Chip-Widerstand	100Ω ±1%	804725	VAL
R236	Chip-Widerstand	82Ω ±5%	804724	VAL
R237	Chip-Widerstand	56Ω ±5%	804722	VAL
R240	Chip-Widerstand	680Ω ±1%	804735	VAL
R241	Chip-Widerstand	10Ω ±5%	804713	VAL
R242	Chip-Widerstand	1kΩ ±1%	804737	VAL
R243	Chip-Widerstand	10kΩ ±1%	804749	VAL
R244	Chip-Widerstand	1kΩ ±1%	804737	VAL
R245	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R246	Chip-Widerstand	1kΩ ±1%	804737	VAL
R247	Chip-Widerstand	470kΩ ±1%	804769	VAL
R249	Chip-Widerstand	0Ω	804700	VAL
R250	Chip-Widerstand	10kΩ ±1%	804749	VAL
R251	Chip-Widerstand	1kΩ ±1%	804737	VAL
R252	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R253	Chip-Widerstand	220Ω ±1%	804729	VAL
R254	Chip-Widerstand	10kΩ ±1%	804749	VAL
R255	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R256	Chip-Widerstand	330Ω ±1%	804731	VAL
R260	Chip-Widerstand	1kΩ ±1%	804737	VAL
R261	Chip-Widerstand	0Ω	804700	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R262	Chip-Widerstand	1MΩ ±1%	804773	VAL
R300	Chip-Widerstand	150Ω ±1%	804727	VAL
R301	Chip-Widerstand	47Ω ±5%	804721	VAL
R302	Chip-Widerstand	150Ω ±1%	804727	VAL
R303	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R304	Chip-Widerstand	680Ω ±1%	804735	VAL
R305	Chip-Widerstand	330Ω ±1%	804731	VAL
R306	Chip-Widerstand	150Ω ±1%	804727	VAL
R308	Chip-Widerstand	47Ω ±5%	804721	VAL
R309	Chip-Widerstand	150Ω ±1%	804727	VAL
R310	Chip-Widerstand	15Ω ±5%	804715	VAL
R312	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R313	Chip-Widerstand	680Ω ±1%	804735	VAL
R314	Chip-Widerstand	220Ω ±1%	804729	VAL
R315	Chip-Widerstand	150Ω ±1%	804727	VAL
R316	Chip-Widerstand	10Ω ±5%	804713	VAL
R317	Chip-Widerstand	150Ω ±1%	804727	VAL
R318	Chip-Widerstand	47Ω ±5%	804721	VAL
R319	Chip-Widerstand	150Ω ±1%	804727	VAL
R322	Chip-Widerstand	1kΩ ±1%	804737	VAL
R323	Chip-Widerstand	1kΩ ±1%	804737	VAL
R324	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R325	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R326	Chip-Widerstand	6.8kΩ ±1%	804747	VAL
R327	Chip-Widerstand	56Ω ±5%	804722	VAL
R330	Chip-Widerstand	470Ω ±1%	804733	VAL
R331	Chip-Widerstand	10kΩ ±1%	804749	VAL
R332	Chip-Widerstand	1kΩ ±1%	804737	VAL
R333	Chip-Widerstand	1kΩ ±1%	804737	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA Gepr.:				361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					19

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R334	Chip-Widerstand	68Ω ±5%	804723	VAL
R335	Chip-Widerstand	5.6kΩ ±1%	804746	VAL
R336	Chip-Widerstand	220Ω ±1%	804729	VAL
R340	Chip-Widerstand	150Ω ±1%	804727	VAL
R341	Chip-Widerstand	220Ω ±1%	804729	VAL
R342	Chip-Widerstand	10Ω ±5%	804713	VAL
R343	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R344	Chip-Widerstand	680Ω ±1%	804735	VAL
R345	Chip-Widerstand	150Ω ±1%	804727	VAL
R346	Chip-Widerstand	47Ω ±5%	804721	VAL
R350	Chip-Widerstand	150Ω ±1%	804727	VAL
R351	Chip-Widerstand	150Ω ±1%	804727	VAL
R352	Chip-Widerstand	330Ω ±1%	804731	VAL
R353	Chip-Widerstand	15Ω ±5%	804715	VAL
R354	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R355	Chip-Widerstand	680Ω ±1%	804735	VAL
R356	Chip-Widerstand	150Ω ±1%	804727	VAL
R360	Chip-Widerstand	47Ω ±5%	804721	VAL
R361	Chip-Widerstand	150Ω ±1%	804727	VAL
R362	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R363	Chip-Widerstand	10kΩ ±1%	804749	VAL
R364	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R365	Chip-Widerstand	10kΩ ±1%	804749	VAL
R366	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R370	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R371	Chip-Widerstand	220Ω ±1%	804729	VAL
R372	Chip-Widerstand	22Ω ±5%	804717	VAL
R373	Chip-Widerstand	470kΩ ±1%	804769	VAL
R374	Chip-Widerstand	220Ω ±1%	804729	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R375	Chip-Widerstand	10kΩ ±1%	804749	VAL
R376	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R377	Chip-Widerstand	0Ω	804700	VAL
R378	Chip-Widerstand	1MΩ ±1%	804773	VAL
R379	Chip-Widerstand	0Ω	804700	VAL
R380	Chip-Widerstand	330Ω ±1%	804731	VAL
R381	Chip-Widerstand	1kΩ ±1%	804737	VAL
R385	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R400	Chip-Widerstand	10kΩ ±1%	804749	VAL
R401	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R402	Chip-Widerstand	10Ω ±5%	804713	VAL
R403	Chip-Widerstand	10kΩ ±1%	804749	VAL
R404	Chip-Widerstand	1kΩ ±1%	804737	VAL
R405	Chip-Widerstand	10Ω ±5%	804713	VAL
R406	Chip-Widerstand	1kΩ ±1%	804737	VAL
R407	Chip-Widerstand	1kΩ ±1%	804737	VAL
R410	Chip-Widerstand	10Ω ±5%	804713	VAL
R412	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R413	Chip-Widerstand	470Ω ±1%	804733	VAL
R414	Chip-Widerstand	10kΩ ±1%	804749	VAL
R415	Chip-Widerstand	1kΩ ±1%	804737	VAL
R416	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R420	Chip-Widerstand	1kΩ ±1%	804737	VAL
R421	Chip-Widerstand	1kΩ ±1%	804737	VAL
R422	Chip-Widerstand	47Ω ±5%	804721	VAL
R423	Chip-Widerstand	100kΩ ±1%	804761	VAL
R424	Chip-Widerstand	68kΩ ±1%	804759	VAL
R425	Chip-Widerstand	100Ω ±1%	804725	VAL
R426	Chip-Widerstand	10Ω ±5%	804713	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA Gepr.:				361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					21

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R430	Chip-Widerstand	10kΩ ±1%	804749	VAL
R431	Chip-Widerstand	1kΩ ±1%	804737	VAL
R432	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R433	Chip-Widerstand	470Ω ±1%	804733	VAL
R434	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R435	Chip-Widerstand	1kΩ ±1%	804737	VAL
R436	Chip-Widerstand	1kΩ ±1%	804737	VAL
R439	Chip-Widerstand	10Ω ±5%	804713	VAL
R440	Chip-Widerstand	47Ω ±5%	804721	VAL
R441	Chip-Widerstand	100kΩ ±1%	804761	VAL
R442	Chip-Widerstand	39kΩ ±1%	804756	VAL
R443	Chip-Widerstand	100Ω ±1%	804725	VAL
R444	Chip-Widerstand	10Ω ±5%	804713	VAL
R445	Chip-Widerstand	1kΩ ±1%	804737	VAL
R446	Chip-Widerstand	1kΩ ±1%	804737	VAL
R447	Chip-Widerstand	1kΩ ±1%	804737	VAL
R448	Chip-Widerstand	1kΩ ±1%	804737	VAL
R450	Chip-Widerstand	1kΩ ±1%	804737	VAL
R451	Chip-Widerstand	1kΩ ±1%	804737	VAL
R452	Chip-Widerstand	1kΩ ±1%	804737	VAL
R453	Chip-Widerstand	1kΩ ±1%	804737	VAL
R454	Chip-Widerstand	1kΩ ±1%	804737	VAL
R455	Chip-Widerstand	1kΩ ±1%	804737	VAL
R456	Chip-Widerstand	1kΩ ±1%	804737	VAL
R460	Chip-Widerstand	1kΩ ±1%	804737	VAL
R461	Chip-Widerstand	1kΩ ±1%	804737	VAL
R462	Chip-Widerstand	1kΩ ±1%	804737	VAL
R463	Chip-Widerstand	1kΩ ±1%	804737	VAL
R464	Chip-Widerstand	1kΩ ±1%	804737	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R465	Chip-Widerstand	1kΩ ±1%	804737	VAL
R466	Chip-Widerstand	8.2kΩ ±1%	804748	VAL
R467	Chip-Widerstand	10Ω ±5%	804713	VAL
R468	Chip-Widerstand	8.2kΩ ±1%	804748	VAL
R469	Chip-Widerstand	820Ω ±1%	804736	VAL
R470	Chip-Widerstand	820Ω ±1%	804736	VAL
R471	Chip-Widerstand	150Ω ±1%	804727	VAL
R472	Chip-Widerstand	100Ω ±1%	804725	VAL
R473	Chip-Widerstand	220Ω ±1%	804729	VAL
R474	Chip-Widerstand	27Ω ±5%	804718	VAL
R475	Chip-Widerstand	27Ω ±5%	804718	VAL
R476	Chip-Widerstand	82Ω ±5%	804724	VAL
R477	Chip-Widerstand	0Ω	804700	VAL
R478	Chip-Widerstand	1MΩ ±1%	804773	VAL
R479	Chip-Widerstand	150Ω ±1%	804727	VAL
R480	Chip-Widerstand	1kΩ ±1%	804737	VAL
R481	Chip-Widerstand	47Ω ±5%	804721	VAL
R482	Chip-Widerstand	10Ω ±5%	804713	VAL
R483	Chip-Widerstand	1kΩ ±1%	804737	VAL
R484	Chip-Widerstand	100Ω ±1%	804725	VAL
R485	Chip-Widerstand	10kΩ ±1%	804749	VAL
R486	Chip-Widerstand	220Ω ±1%	804729	VAL
R487	Chip-Widerstand	100Ω ±1%	804725	VAL
R488	Chip-Widerstand	220Ω ±1%	804729	VAL
R489	Chip-Widerstand	27Ω ±5%	804718	VAL
R490	Chip-Widerstand	1MΩ ±1%	804773	VAL
R491	Chip-Widerstand	15kΩ ±1%	804751	VAL
R492	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R493	Chip-Widerstand	10kΩ ±1%	804749	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R494	Chip-Widerstand	10Ω ±5%	804713	VAL
R495	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R496	Chip-Widerstand	1kΩ ±1%	804737	VAL
R497	Chip-Widerstand	27Ω ±5%	804718	VAL
R498	Chip-Widerstand	10Ω ±5%	804713	VAL
R499	Chip-Widerstand	18Ω ±5%	804716	VAL
R500	Chip-Widerstand	10Ω ±5%	804713	VAL
R501	Chip-Widerstand	10kΩ ±1%	804749	VAL
R503	Chip-Widerstand	1kΩ ±1%	804737	VAL
R504	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R505	Chip-Widerstand	1kΩ ±1%	804737	VAL
R506	Chip-Widerstand	10Ω ±5%	804713	VAL
R510	Chip-Widerstand	1kΩ ±1%	804737	VAL
R511	Chip-Widerstand	1kΩ ±1%	804737	VAL
R512	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R513	Chip-Widerstand	3.9kΩ ±1%	804744	VAL
R514	Chip-Widerstand	1kΩ ±1%	804737	VAL
R515	Chip-Widerstand	1kΩ ±1%	804737	VAL
R516	Chip-Widerstand	1kΩ ±1%	804737	VAL
R520	Chip-Widerstand	1kΩ ±1%	804737	VAL
R521	Chip-Widerstand	10kΩ ±1%	804749	VAL
R522	Chip-Widerstand	1kΩ ±1%	804737	VAL
R523	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R524	Chip-Widerstand	470Ω ±1%	804733	VAL
R525	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R526	Chip-Widerstand	100Ω ±1%	804725	VAL
R530	Chip-Widerstand	39kΩ ±1%	804756	VAL
R531	Chip-Widerstand	10Ω ±5%	804713	VAL
R532	Chip-Widerstand	1kΩ ±1%	804737	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA	Gepr.:			361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					24

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R533	Chip-Widerstand	1kΩ ±1%	804737	VAL
R534	Chip-Widerstand	1kΩ ±1%	804737	VAL
R535	Chip-Widerstand	1kΩ ±1%	804737	VAL
R540	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R542	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R543	Chip-Widerstand	220Ω ±1%	804729	VAL
R544	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R546	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R549	Chip-Widerstand	2.2kΩ ±1%	804741	VAL
R550	Chip-Widerstand	220Ω ±1%	804729	VAL
R551	Chip-Widerstand	120Ω ±1%	804726	VAL
R552	Chip-Widerstand	1kΩ ±1%	804737	VAL
R553	Chip-Widerstand	100Ω ±1%	804725	VAL
R554	Chip-Widerstand	68Ω ±5%	804723	VAL
R555	Chip-Widerstand	100Ω ±1%	804725	VAL
R556	Chip-Widerstand	1kΩ ±1%	804737	VAL
R560	Chip-Widerstand	10Ω ±5%	804713	VAL
R562	Chip-Widerstand	1kΩ ±1%	804737	VAL
R563	Chip-Widerstand	1.5kΩ ±1%	804739	VAL
R564	Chip-Widerstand	10Ω ±5%	804713	VAL
R565	Chip-Widerstand	10kΩ ±1%	804749	VAL
R600	Chip-Widerstand	15kΩ ±1%	804751	VAL
R602	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R603	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R604	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R605	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R606	Chip-Widerstand	10kΩ ±1%	804749	VAL
R610	Chip-Widerstand	10kΩ ±1%	804749	VAL
R611	Chip-Widerstand	10kΩ ±1%	804749	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
ST66	Stiftleiste 90°	40polig	884486	AMP
T100	NPN Transistor	BC850B	832284	SIE
T200	NPN Transistor	BFQ19	832290	SIE
T202	NPN Transistor	BFR93A	832287	VAL
T203	NPN Transistor	BC850B	832284	SIE
T204	PNP Transistor	BC860B	832285	VAL
T205	NPN Transistor	BC850B	832284	SIE
T206	PNP Transistor	BC860B	832285	VAL
T300	NPN Transistor	BFR93A	832287	VAL
T301	NPN Transistor	BFR93A	832287	VAL
T303	NPN Transistor	BFR93A	832287	VAL
T304	PNP Transistor	BC860B	832285	VAL
T305	NPN Transistor	BC850B	832284	SIE
T306	NPN Transistor	BC850B	832284	SIE
T310	NPN Transistor	BFR93A	832287	VAL
T311	NPN Transistor	BFR93A	832287	VAL
T400	NPN Transistor	BC850B	832284	SIE
T401	PNP Transistor	BC860B	832285	VAL
T402	NPN Transistor	BFR93A	832287	VAL
T403	NPN Transistor	BC850B	832284	SIE
T404	PNP Transistor	BC860B	832285	VAL
T405	NPN Transistor	BFR93A	832287	VAL
T406	NPN Transistor	BFR93A	832287	VAL
T410	NPN Transistor	BFR93A	832287	VAL
T500	NPN Transistor	BC850B	832284	SIE
T501	PNP Transistor	BC860B	832285	VAL
T502	NPN Transistor	BFR93A	832287	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
T503	NPN Transistor	BFR93A	832287	VAL
T504	NPN Transistor	BC850B	832284	SIE
T505	NPN Transistor	BFR93A	832287	VAL
T506	NPN Transistor	BC850B	832284	SIE
T510	PNP Transistor	BC860B	832285	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
08 Index	4089.8 Ä.Nr.	8.6.1994 Datum	Bau Name	Bestückte Leiterplatte Typ: DUPLEX	27
Erst.: VARGA Gepr.:				361 533 Sa	Seite Nr
Gerät: 4015 / 229 038 / 375 333					27

The Data Module consists of a microcomputer and an analog section.

Microcomputer

In the microcomputer section there are two microprocessor systems for the encoder and decoder functions. Communication between the host and encoder or host and decoder is by way of a serial master/slave bus. Communication between the encoder and the decoder is by way of the dualport RAM D10 (common communication memory). The encoder and decoder have the following components:

Decoder: CPU D3, address latch D11, D12, ROM P11, RAM D13, timer/counter D15, gate-array decoder and I/O control P9.

Encoder: CPU D2, address latch D4, D5, ROM P10, RAM D6, timer/counter D8, gate-array decoder and I/O control P8.

The address decoding for memory and I/O devices is handled for both the encoder and the decoder by P8. Common matching to the serial master/slave bus is produced by P7.

For conditioning the external clock signal for the analog section there is a PLL device D21. D22 and P15 synthesize the processor timing. The RAMs D13 and D6 are supplied from the battery of the host computer via D23 and D24; they also protect the RAM contents against interference from switching transients.

Address plan

0100h	Gate array
0900h	Latch RESET GATE ARRAY, OUTCONTROL
0B00h	READ IDENT
0D00h	Timer

A15	A14	A13		A11	A10	A9	A8		A7..A4	A3..A0	T a r g e t
0	0	0		0	0	0	0		xxxx	xxxx	CPU internal
0	0	0		0	0	0	1		0000	0000	Gate array....
0	0	0		0	0	0	1		0000	0111	....Gate array
0	0	0		1	0	0	1		xxxx	xxxx	Control (1)
0	0	0		1	0	1	1		xxxx	xxxx	READ IDENT
0	0	0		1	1	0	1		0000	0000	Timer 6340....
0	0	0		1	1	0	1		0000	0111	....Timer 6340
0	0	1		0	0	0	0		0000	0000	RAM..........
1	0	0		1	1	1	1		1111	1111	..........RAM
1	0	1		x	x	x	x		xxxx	xxxx	Dualport RAM
1	1	0		0	0	0	0		0000	0000	EPROM........
1	1	1		1	1	1	1		1111	1111	........EPROM

Table 1

(1) The I/O addresses of the Data Module are no different from those of STABILOCK 4031. There are also two latches with the address 900h and, for the encoder, the address D00h for querying the hardware code.

Data format: WRITE TO LATCHES

```
D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
---+----+----+----+----+----+----+----+
                             |    |
                             |    |_______ OUTCONTROL
                             |             0= CELLULAR OUT ON
                             |             1= CELLULAR OUT OFF
                             |
                             |____________ RESET GA
                                           0 = RESET
```

Data format: READ IDENT

```
 D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
----+----+----+----+----+----+----+----+
 I7   I6   I5   I4   I3   I2   I1   I0
 |    |    |    |    |    |    |    |
 ---------------------------------------- Version code
```

Bus description

Bus name:	**GEBCNTR**[00 thru 19]	**AUSCNTR**[00 thru 18]
Bit no.:	Encoder (-2)	Decoder (-3)
00	IO-2	IO-3
01	RM-2	RM-3
02	DR-2	DR-3
03	EP-2	EP-3
04	IRQ-2	IRQ-3
05	OE-2	OE-3
06	R/W-2	R/W-3
07	EI-2	EI-3
08	ASI-2	ASI-3
09	ASO-2	ASO-3
10	T0-2	T0-3
11	T1-2	T1-3
12	T2-2	T2-3
13	T3-2	T3-3
14	T4-2	T4-3
15	T5-2	T5-3
16	T6-2	T6-3
17	T7-2	T7-3
18	RDID	
19	CS-RAM-2	CS-RAM-3

Bus name:	**COMMNIO**[00 thru 13]	
Bit no.:	Source/name	Target/name
00	D3 13 / P10-3	GA2 52 / FA-FB
01	D3 17 / P14-3	P12 16 / DATA
02	D3 18 / P15-3	P12 15 / FUERCK
03	D3 19 / P16-3	P11 17 / D20 1 / SUN
04	D3 20 /P17-3	
05	D2 13 / P10-2	P9 20 /P10-2
06	D2 17 / P14-2	P9 15 / PEGEL
07	D2 18 /P15-2	P9 19 /P15-2
08	D2 19 / P16-2	P9 5 / P16-2
09	D2 20 / P17-2	P9 18 / EDGE
10	D8 6 (Counter 03)	P9 3, A104 9
11	P11 13 (OX)	D15 6, A104 16
12	D18 25 (GX)	D15 5, 7, P9 27, A104 8
13	P9 16 / FA/FB	GA1 52 / FA-FB

Diagnostics Schedule

Functional check

Make sure that the set is switched off. Insert the Data Module in the correct slot and switch the set on. Perform a total reset with [RESET] + [OFF] and check in the STATUS menu whether a software version number is entered in addition to the encoder and decoder.

If YES, Data Module OK.
If NO, continue with 1.

1. Check RESET

1.1 Press RESET key several times

D2 6 = 0/1/0
D3 6 = 0/1/0
If YES, RESET OK.
If NO, continue with 1.2.

1.2. Press RESET key several times

P7 14 = 0/1/0
If YES, connection D2 6 P7 14 missing;
so D3 6 P7 14 missing.
If NO, continue with 1.3.

1.3. Press RESET key several times

P7 21 = 0/1/0.
If YES, P7 defective.
If NO, connector defective?

2. Check clock signal

D2 2, D2 3 squarewave signal of frequency 4 MHz.
D3 2, D3 3 squarewave signal of frequency 4 MHz.
If YES, clock signal OK.
If NO, continue with 2.1.

2.1 Check clock signal

P7 6, P7 9 squarewave signal of frequency 4 MHz.
If YES, connection P7 6 D2 3, P7 6 D3 3 missing;
so P7 9 D2 2, P7 9 D3 2 missing.
If NO, continue with 2.2.

2.2 Check clock signal

P7 5 squarewave signal of frequency 8 MHz.
P7 33 squarewave signal of frequency 8 MHz.
If YES, P7 defective.
If NO, continue with 2.3.

2.3 Check clock signal

P15 4 squarewave signal of frequency 8 MHz.
If YES, connection P15 4 P7 33 missing.
If NO, check PLL D22 with circuitry and input signal 800 kHz.

2.4 Check clock signal

GA1 46 squarewave signal of frequency 2.097 MHz.
P12 21 squarewave signal of frequency 2.097 MHz.
P13 24 squarewave signal of frequency 2.097 MHz.
P13 25 squarewave signal of frequency 2.097 MHz.
If YES, continue with 3.
If NO, continue with 2.5.

2.5 Check clock signal

D21 3 D21 4 squarewave signal of frequency 2.097 MHz.
If YES, clock signal OK.
If NO, check PLL D21 with circuitry and input signal 2.097 MHz.

3. Test mode setting

3.1. Check serial clock

P7 15 squarewave signal of frequency 400 kHz.
If YES, continue with 4.3.
If NO, continue with 4.2.

3.2. Check serial clock

P7 3 squarewave signal of frequency 400 kHz.
If YES, P7 defective?
If NO, connector interface defective?

3.3 Hold down RESET key

P7 15 = 1
If YES, shift clock OK.
If NO, P7 defective?

Analog Section

The analog section consists of the call-tone generator and the call-tone decoder.

Call-tone generator

The generated call-tone signals are fed to the modulator of 4015. The call-tone generator can also be used as an AF signal generator DATA; this mode is best suited for a performance test. The circuit of this generator is identical to that of the standard generator MOD GEN.

Brief test instructions

Setting on 4015: TX mode, DATA: 1 kHz/1 V

The D/A converter A2 receives the sine samples as a digital word on D0 through D7 (check whether bits change there). Its DC reference voltage is A2-VREF (10 V ±2%). On I22 there must be a sinusoidal voltage of 10 Vp ±7%. The D/A converter A1 works as a digital attenuator. Its setting is corrected by the automatic self-calibration of the 4015 so that impermissible tolerances are compensated. If the self-calibration finds greater tolerance than 15 %, this is signalled onscreen and no calibration data are stored. In an uncalibrated state the voltage on I23 should be 2.44 Vp ±8% (1.72 Vrms). The same signal should also appear after the switch A104-A on St60-1C.

The testing of different call-tone signals is handled by the SELFCHECK.

Call-tone decoding

The signal to be decoded is fed from ST60-1A via an AC/DC coupling, a lowpass filter and a highpass filter to the comparator. Once they have been converted into 1/0 levels, the call-tone signals are decoded by D20, P13 and P12. The hardware weighs FFSK, Manchester and NRZ signals and sends the decoded bits to the computer for analysis.

Task of individual devices

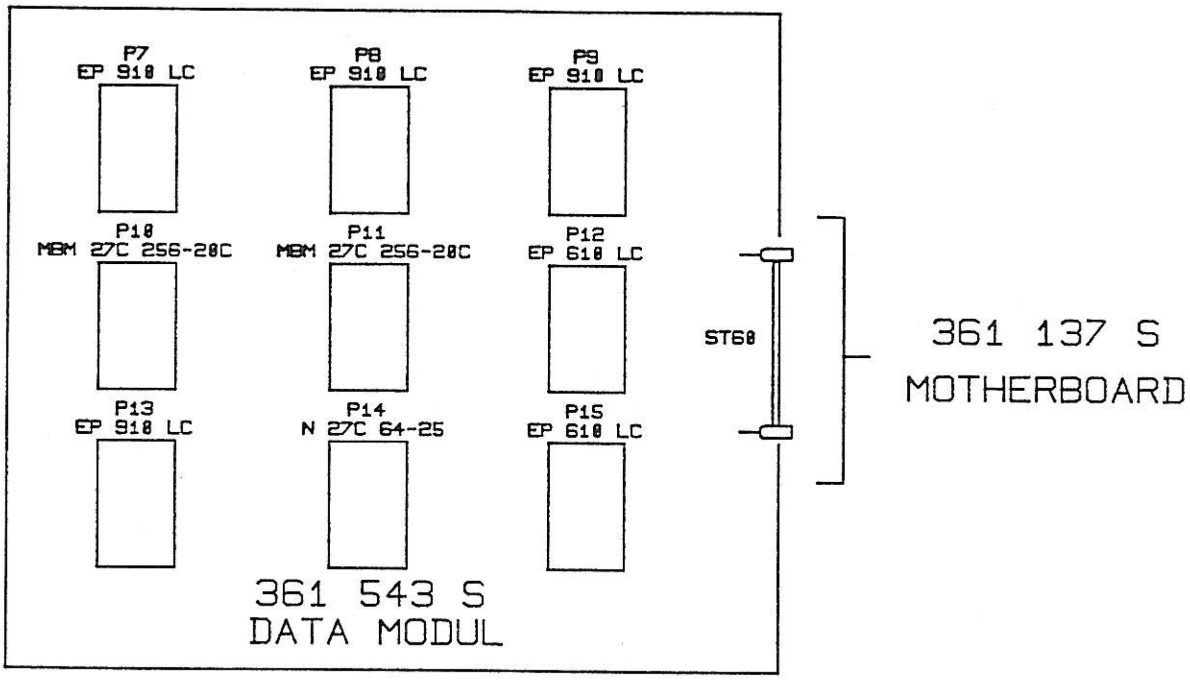
GA2: Functioning of gate array: see register MOD GEN. GA2 produces the clock frequencies for P12 and D20. GA2 receives its clock frequency on pin 46. For clock regeneration from the call-tone signals (synchronization with baud rate) this clock is controlled and modified by P13. Without call-tone data it is precisely 1.048676 MHz.

D20: D20 is a shift register. On the outputs Q0 and Q7 there is, depending on the clock frequency (pin 8), a time shift to the signals on pin 1 and pin 12.

P13: Contains a circuit for decoding the call-tone data and the clock regeneration from the call-tone data. The decoded call-tone data (logic 1 or 0) appear on pin 16 (data). The related timing comes from pin 15 (FUERCK). Processor D13 can load a valid bit with the negative edge of the FUERCK signal.

P12: P12 contains a number of auxiliary circuits. There is frequency division by a factor of 4 between pins 21 and 7 for generating the 524-kHz clock for GA1.

Various call-tone signals are tested by SELFCHECK.

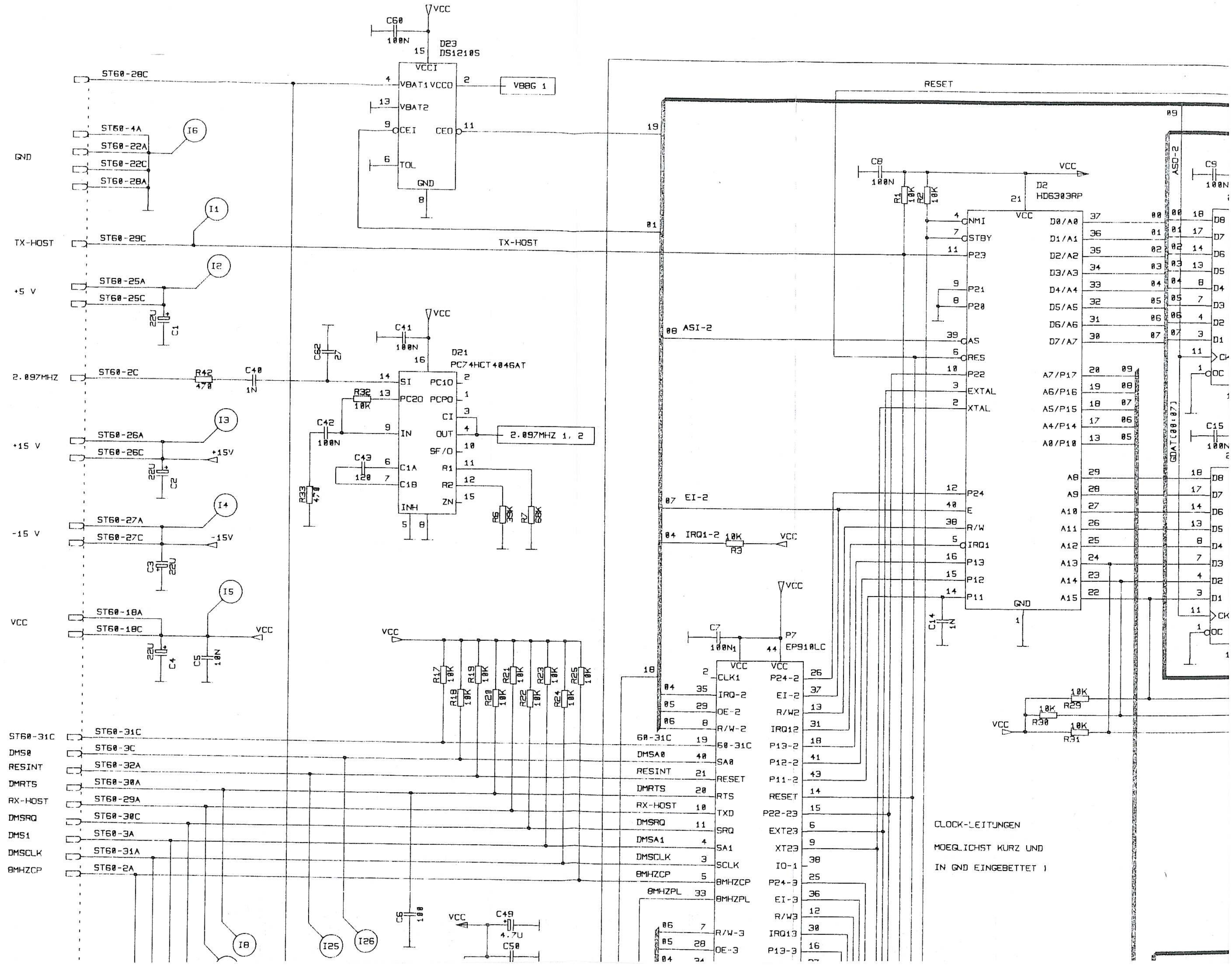


				NORM.	21.2.91	
				GEPR.		
00	1089.15	23.11.90	HUBER	BEARB.		
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

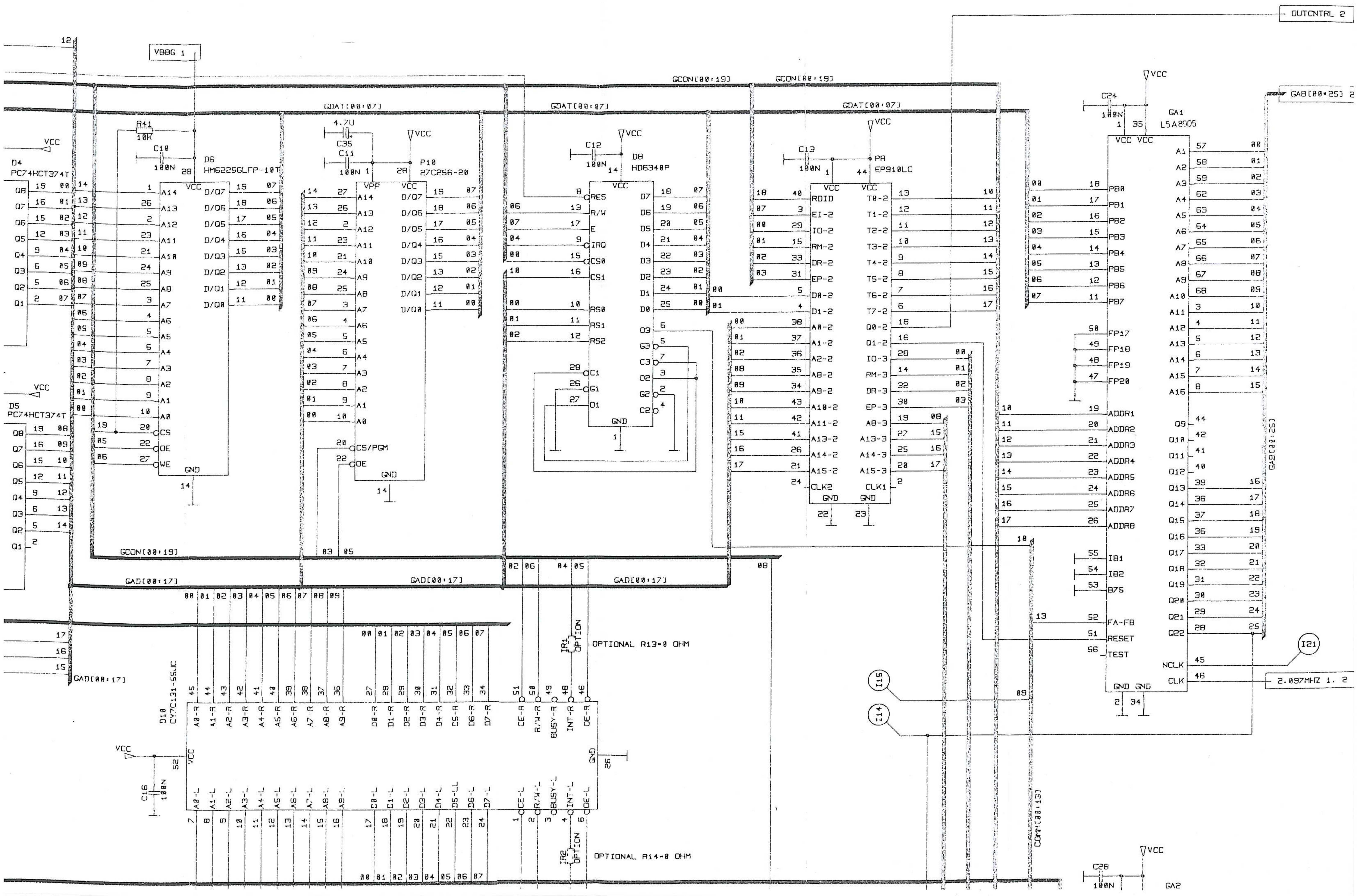
SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR.67 A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: DATA MODUL	ZEICHNUNGSNR./DRAWING NO.: 236 016 S PROJECT/GROUP: 4015 / 201 230 S

Pos.	Benennung	Wert	HNK-Nr.	Herst.
1	Bestückte Leiterplatte		361 543	
P7	EP 910 LC		893 352	SCHL
P8	EP 910 LC		893 351	SCHL
P9	EP 910 LC		893 353	SCHL
P10	MBM 27 C 256-20 C		893 356	SCHL
P11	MBM 27 C 256-20 C		893 355	SCHL
P12	EP 610 LC		893 392	SCHL
P13	EP 910 LC		893 354	SCHL
P14	N 27 C 64-25		893 393	SCHL
P15	EP 610 LC		893 384	SCHL

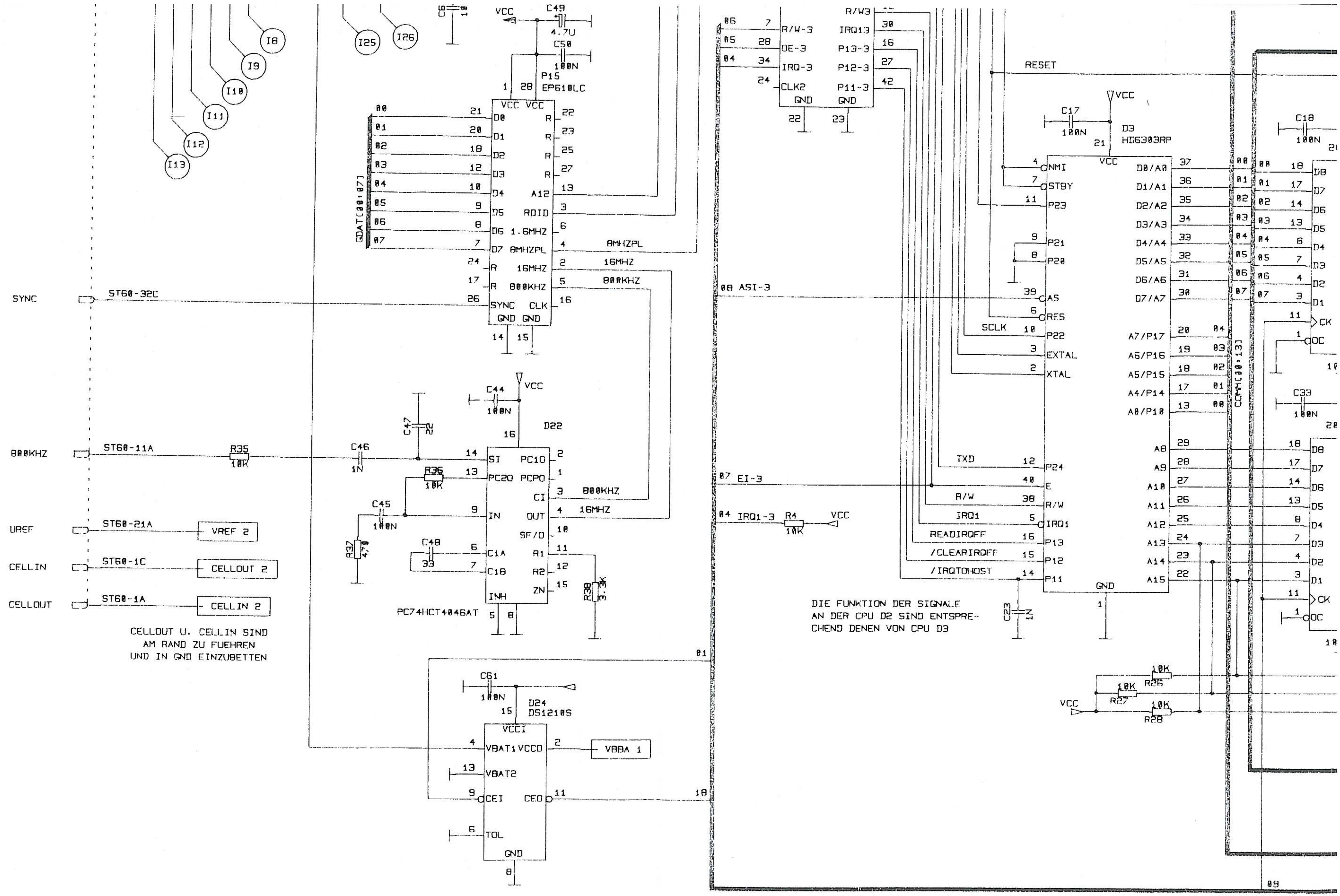
Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
01 Index	4089.6 Ä.Nr.	21.03.94 Datum	Kr. Name	DATA MODUL	1
Erst.: Kr.	Gepr.:			236 016 Sa	Seite Nr
Gerät: 4015 / 201 238					1



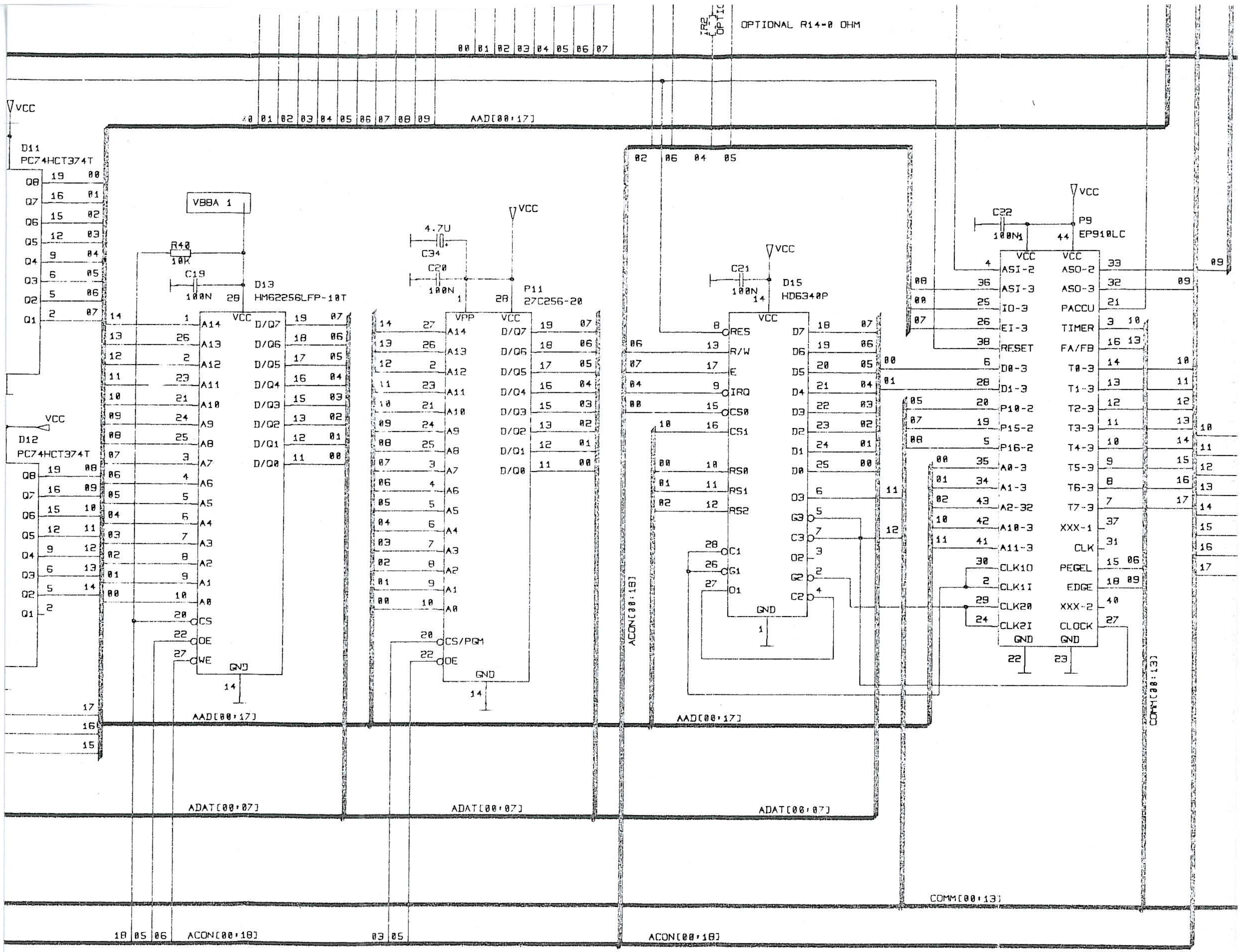
VCC
C60
100N
D23
DS1210S
VCCI
VBAT1
VCCO
VBAT2
CEI
CEO
TOL
GND
VBBG 1
RESET
ST60-28C
ST60-4A
ST60-22A
ST60-22C
ST60-28A
GND
I6
I1
TX-HOST
ST60-29C
I2
+5 V
ST60-25A
ST60-25C
22U
C1
C62
C41
D21
PC74HCT4046AT
2.097MHZ
ST60-2C
R42
470
C40
1N
SI
PC1O
R32
10K
PC2O
PCPO
CI
C42
100N
IN
OUT
2.097MHZ 1, 2
SF/O
C43
120
C1A
C1B
R1
R2
ZN
INH
R33
470
R6
39K
R7
68K
I3
+15 V
ST60-26A
ST60-26C
+15V
C2
I4
-15 V
ST60-27A
ST60-27C
-15V
C3
I5
VCC
ST60-18A
ST60-18C
C4
C5
10N
R17
R18
R19
R20
R21
R22
R23
R24
R25
ST60-31C
DMS0
RESINT
DMRTS
RX-HOST
DMSRQ
DMS1
DMSCLK
8MHZCP
ST60-3C
ST60-32A
ST60-30A
ST60-29A
ST60-30C
ST60-3A
ST60-31A
ST60-2A
C6
I8
I25
I26
C49
4.7U
C50
ASI-2
EI-2
IRQ1-2
R3
C7
100N
P7
EP910LC
CLK1
IRQ-2
OE-2
R/W-2
60-31C
SA0
RTS
TXD
SRQ
SA1
SCLK
8MHZCP
8MHZPL
R/W-3
OE-3
DMSA0
DMSA1
P24-2
EI-2
R/W2
IRQ12
P13-2
P12-2
P11-2
P22-23
EXT23
XT23
IO-1
P24-3
EI-3
R/W3
IRQ13
P13-3
C8
100N
R1
R2
D2
HD6303RP
NMI
STBY
P23
P21
P20
AS
RES
P22
EXTAL
XTAL
P24
E
R/W
IRQ1
P13
P12
P11
C14
1N
D0/A0
D1/A1
D2/A2
D3/A3
D4/A4
D5/A5
D6/A6
D7/A7
A7/P17
A6/P16
A5/P15
A4/P14
A0/P10
A8
A9
A10
A11
A12
A13
A14
A15
ASO-2
GDAT[00:07]
C9
C15
R29
R30
R31
CLOCK-LEITUNGEN
MOEGLICHST KURZ UND
IN GND EINGEBETTET)



OUTCNTRL 2
VBBG 1
GCON[00:19]
GDAT[00:07]
GAB[00:25]
R41 10K
C10 100N
D4 PC74HCT374T
D5 PC74HCT374T
D6 HM62256LFP-10T
C35 4.7U
C11 100N
P10 27C256-20
C12 100N
D8 HD6340P
C13 100N
P8 EP910LC
C24 100N
GA1 L5A8905
GAD[00:17]
D10 CY7C131-55JC
C16 100N
OPTIONAL R13=0 OHM
OPTIONAL R14=0 OHM
IR1 OPTION
IR2 OPTION
I15
I14
I21
2.097MHZ 1, 2
COMM[00:13]
C26 100N
GA2



P15
EP610LC
VCC
C49
4.7U
C50
100N
GDAT[00:07]
SYNC
ST60-32C
800KHZ
ST60-11A
R35
10K
C46
1N
C47
22
C44
100N
D22
PC74HCT4046AT
R36
10K
C45
100N
R37
4.7
C48
33
R38
3.3K
8MHZPL
16MHZ
UREF
ST60-21A
VREF 2
CELLIN
ST60-1C
CELLOUT 2
CELLOUT
ST60-1A
CELLIN 2
CELLOUT U. CELLIN SIND
AM RAND ZU FUEHREN
UND IN GND EINZUBETTEN
C61
100N
D24
DS1210S
VBAT1
VBAT2
VCCO
VBBA 1
CEI
CEO
TOL
R/W-3
OE-3
IRQ-3
CLK2
IRQ13
P13-3
P12-3
P11-3
RESET
C17
100N
D3
HD6303RP
NMI
STBY
00 ASI-3
SCLK
EXTAL
XTAL
TXD
07 EI-3
R/W
IRQ1
04 IRQ1-3
R4
10K
READIRQFF
/CLEARIRQFF
/IRQTOHOST
C23
1N
DIE FUNKTION DER SIGNALE
AN DER CPU D2 SIND ENTSPRE-
CHEND DENEN VON CPU D3
COMM[00:13]
C18
100N
C33
100N
R26
R27
R28
10K

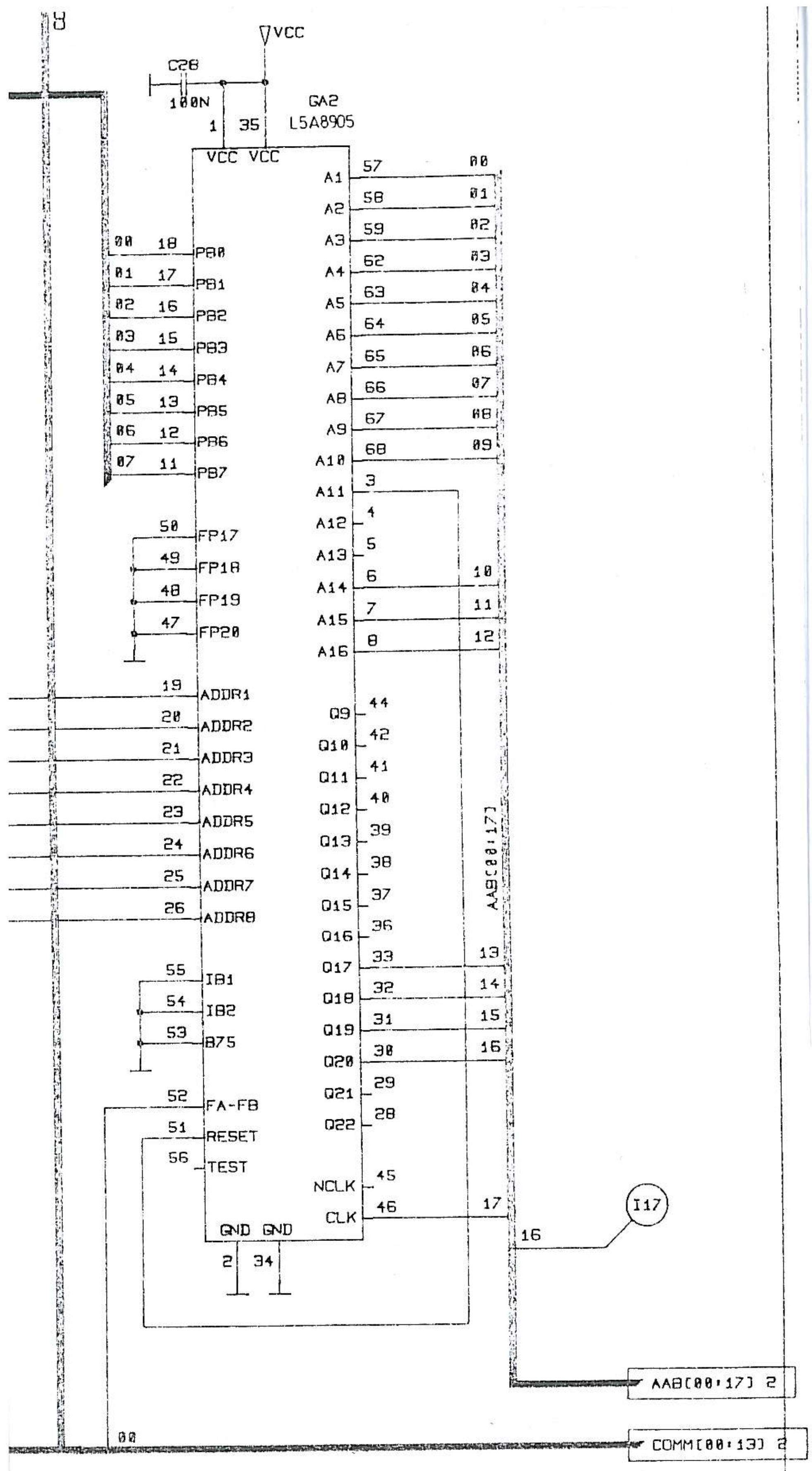


361 543
461 543 03

02	4099.51	25.1.94	Kl.	NORM.			
01	1089.24	11.04.91	GRIE.	GEPR.			
00	-----	13.11.90	GRIE.	BEARB.	28.06.89	GRIE.	
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME	

SCHLUMBERGER TECHNOLOGIES GMBH
INGOLSTÄDTER STR. 67A
8000 MÜNCHEN 46

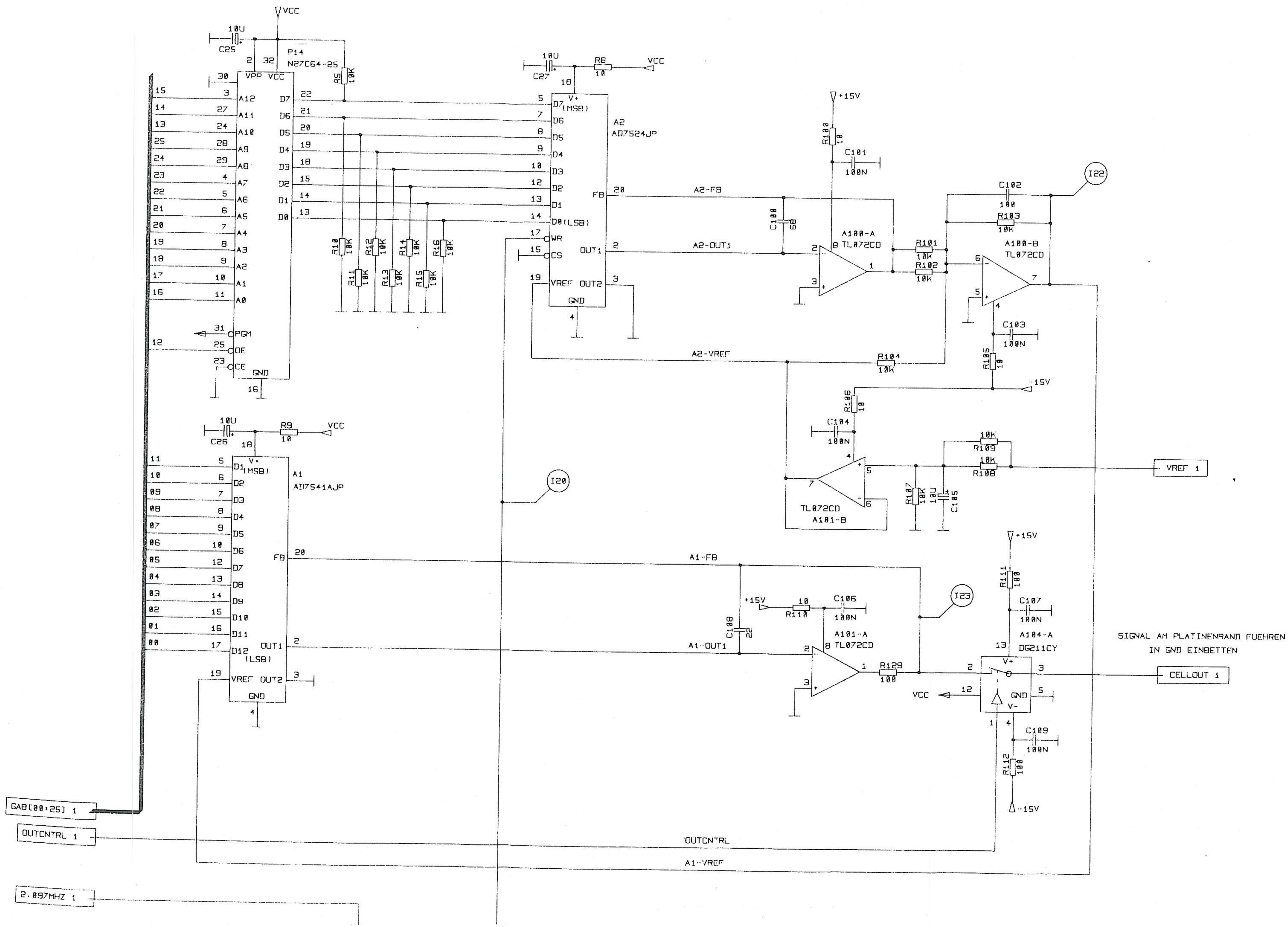
BEZEICHN

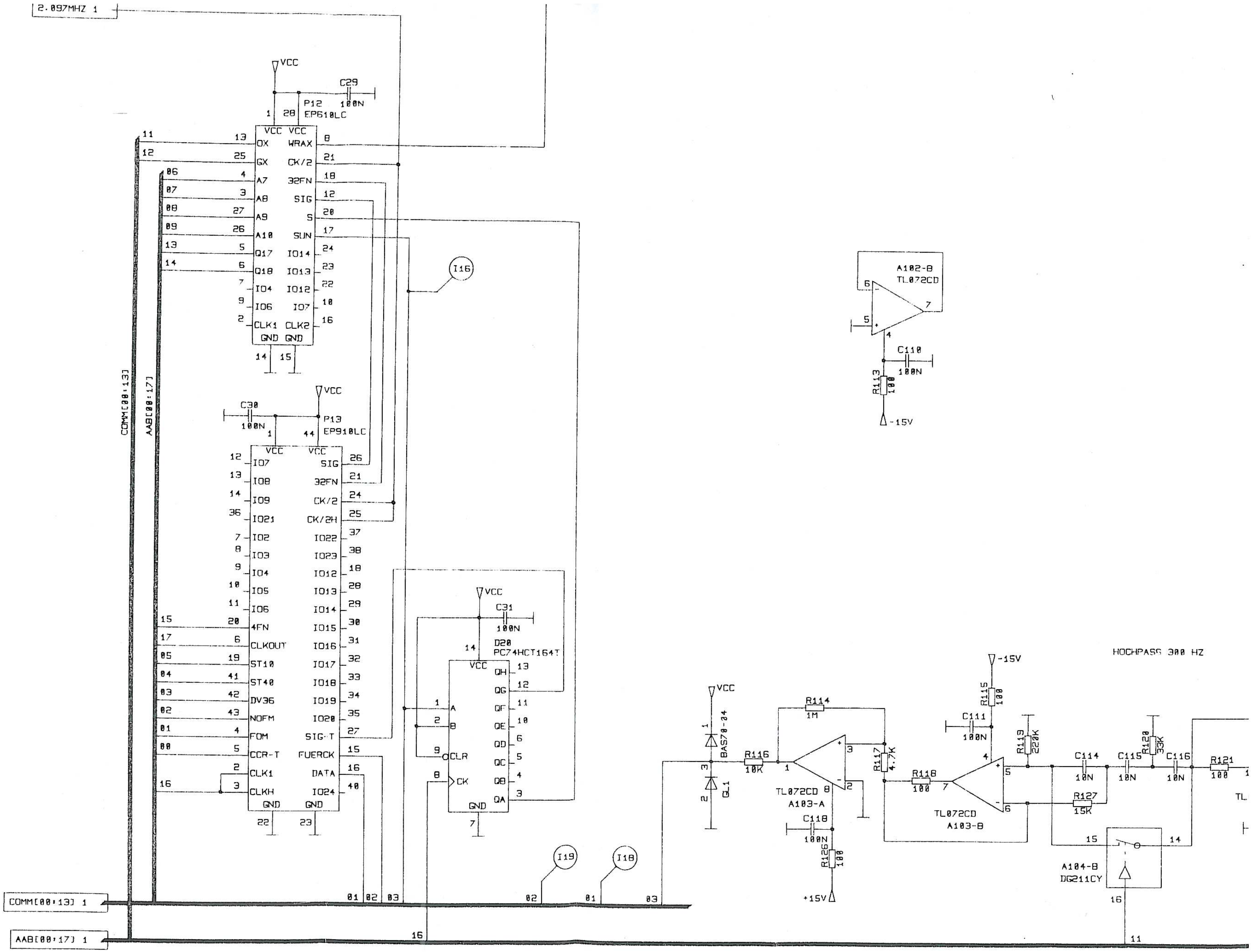


UNG\DESCRIPTION:

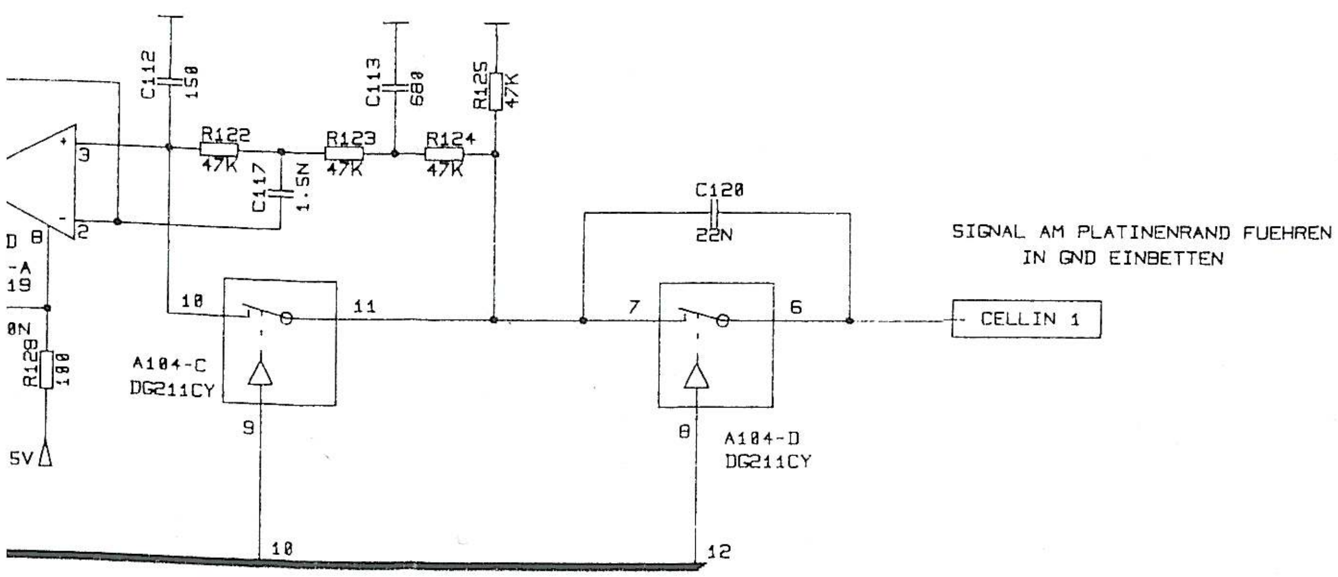
DATAMODUL

ZEICHNUNGSNR.\DRAWING NO.: 361 543 S	1 VON/OF 2
PROJECT\GROUP: 4015 \ 236 016 S	BLATT SHEET

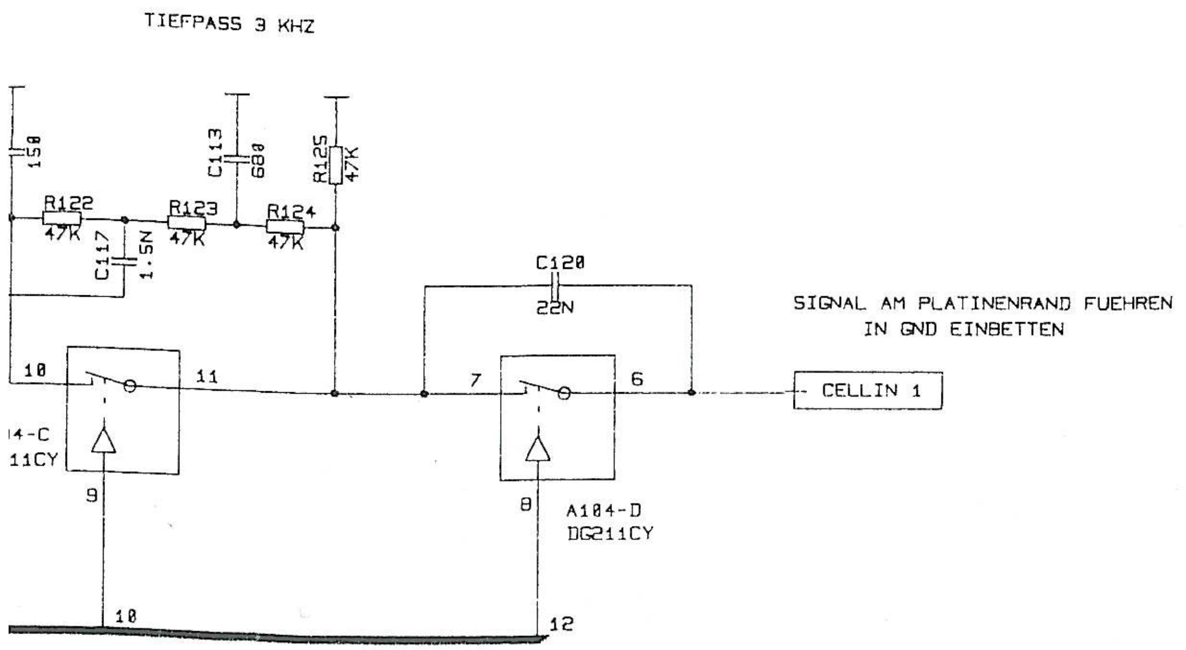

VCC
P14
N27C64-25
A2
AD7524JP
A1
AD7541AJP
A100-A
TL072CD
A100-B
A101-A
A101-B
A104-A
DG211CY
A2-FB
A2-OUT1
A2-VREF
A1-FB
A1-OUT1
A1-VREF
OUTCNTRL
VREF 1
CELLOUT 1
GAB[00:25] 1
OUTCNTRL 1
2.097MHZ 1
SIGNAL AM PLATINENRAND FUEHREN
IN GND EINBETTEN
+15V
-15V
I20
I22
I23



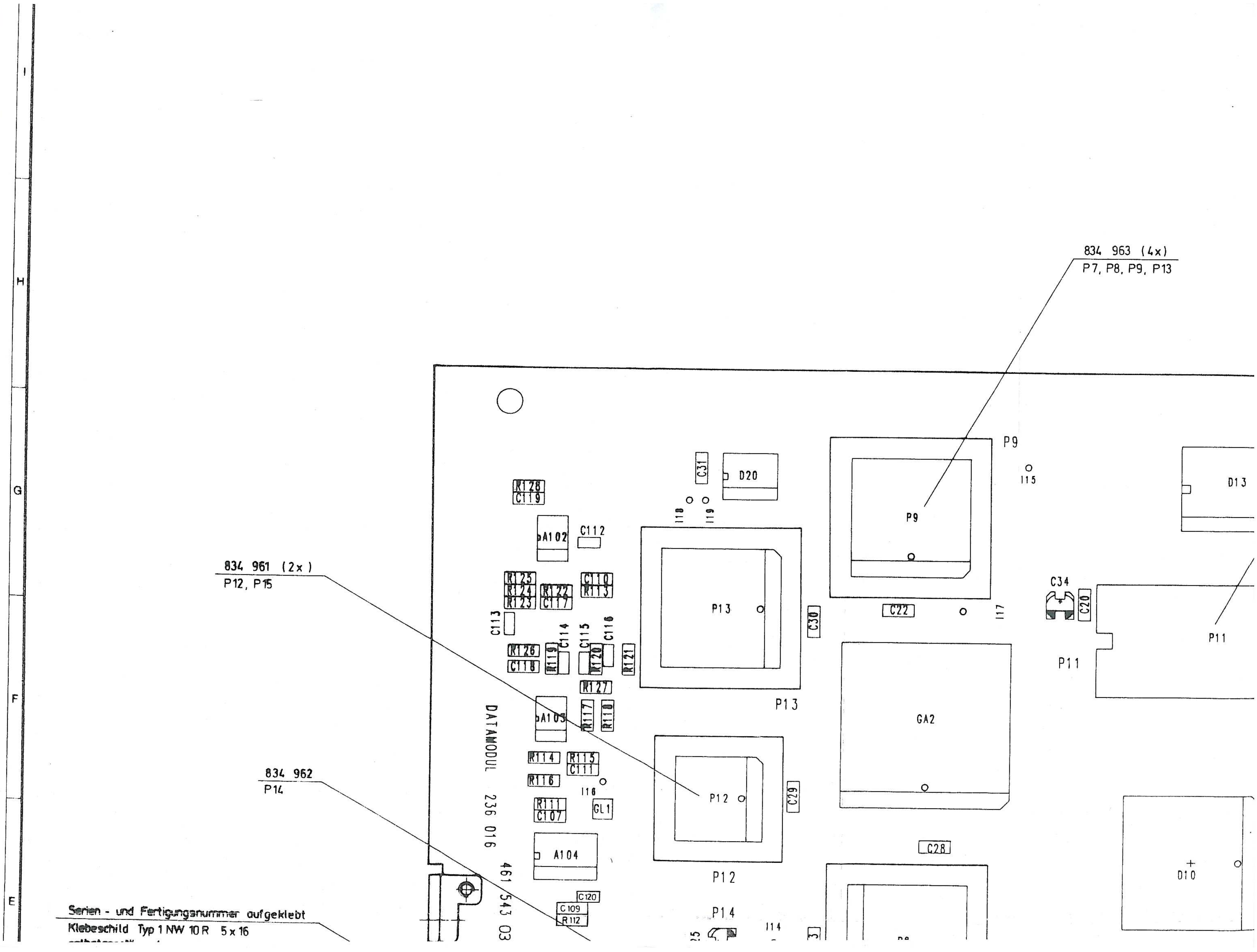
2.097MHZ 1
P12
EP610LC
C29
100N
VCC
WRAX
CK/2
32FN
SIG
S
SUN
IO14
IO13
IO12
IO7
CLK1
CLK2
GND
OX
GX
A7
A8
A9
A10
Q17
Q18
IO4
IO6
I16
COMM[00:13]
AAB[00:17]
P13
EP910LC
C30
100N
IO7
IO8
IO9
IO21
IO2
IO3
IO5
4FN
CLKOUT
ST10
ST40
DV36
NOFM
FOM
CCR-T
CLKH
32FN
CK/2H
IO22
IO23
IO15
IO16
IO17
IO18
IO19
IO20
SIG-T
FUERCK
DATA
IO24
D20
PC74HCT164T
C31
100N
CLR
CK
QH
QG
QF
QE
QD
QC
QB
QA
I19
I18
COMM[00:13] 1
AAB[00:17] 1
A102-B
TL072CD
C110
100N
R113
100
-15V
HOCHPASS 300 HZ
BAS70-04
QL1
R114
1M
R116
10K
TL072CD
A103-A
C118
100N
R126
100
+15V
R117
4.7K
R118
100
R115
100
C111
100N
TL072CD
A103-B
R119
220K
C114
10N
C115
10N
R120
33K
C116
10N
R121
100
R127
15K
A104-B
DG211CY



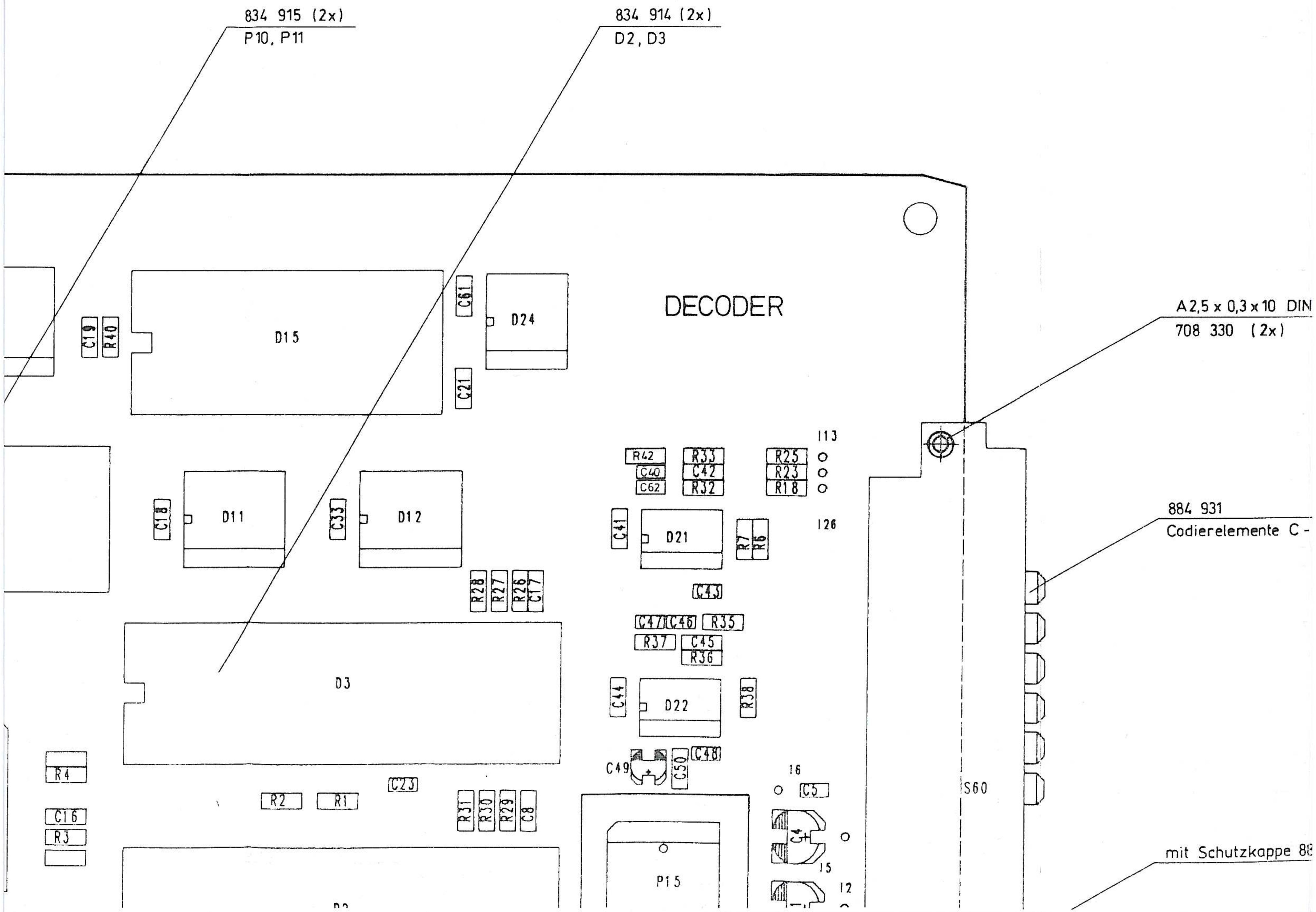
02	4099.51	25.1.94	Kr.	NORM.			SCHLUMBERGER TECHNOLOGIES GMBH	BEZEICHNUNG\DESCRIPTION:	ZEICHNUNGSNR.\DRWAING NO.:
01	1089.24	11.04.91	GRIF.	GEPR.			INGOLSTÄDTER STR. 67A	DATAMODUL	361 543 S
00	-----	13.11.90	GRIF.	BEARB.	28.06.89	GRIF.	8000 MÜNCHEN 46		PROJECT\GROUP:
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME			4015 \ 20G 016



02	4099.51	25.1.94	Kr.	NORM.			SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR. 67A 8000 MÜNCHEN 46	BEZEICHNUNG\DESCRIPTION: DATAMODUL	ZEICHNUNGSNR.\DRWAING NO.: 361 543 S	2 VON/OF 2
01	1089.24	11.04.91	GRIE.	GEPR.						
00	-----	13.11.90	GRIE.	BEARB.	28.06.89	GRIE.			PROJECT\GROUP: 4015 \ 206 016	BLATT SHEET
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME				



834 963 (4x)
P7, P8, P9, P13
834 961 (2x)
P12, P15
834 962
P14
Serien - und Fertigungsnummer aufgeklebt
Klebeschild Typ 1 NW 10 R 5 x 16
DATAMODUL 236 016
461 543 03
P9
P13
P12
P11
P14
GA2
D20
D13
D10
A102
A103
A104
GL1
C34
C20
C22
C28
C29
C30
C31
C112
C113
C114
C115
C116
C120
C109
R112
I
H
G
F
E

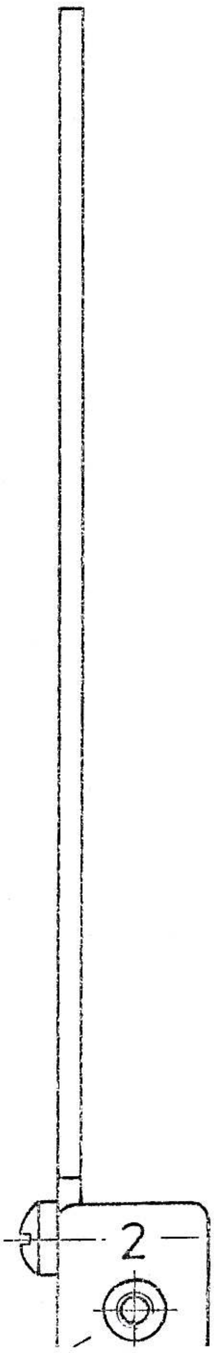


834 915 (2x)
P10, P11
834 914 (2x)
D2, D3
DECODER
A 2,5 x 0,3 x 10 DIN
708 330 (2x)
884 931
Codierelemente C -
mit Schutzkappe 88
D15
D24
D11
D12
D21
D22
D3
P15
S60
C19
R40
C61
C21
C18
C33
R42
C40
C62
R33
C42
R32
R25
R23
R18
I13
I26
C41
R7
R6
R28
R27
R26
C17
C43
C47
C46
R35
R37
C45
R36
C44
R38
C49
C50
C48
I6
C5
C4
I5
I2
R4
C16
R3
R2
R1
C23
R31
R30
R29
C8

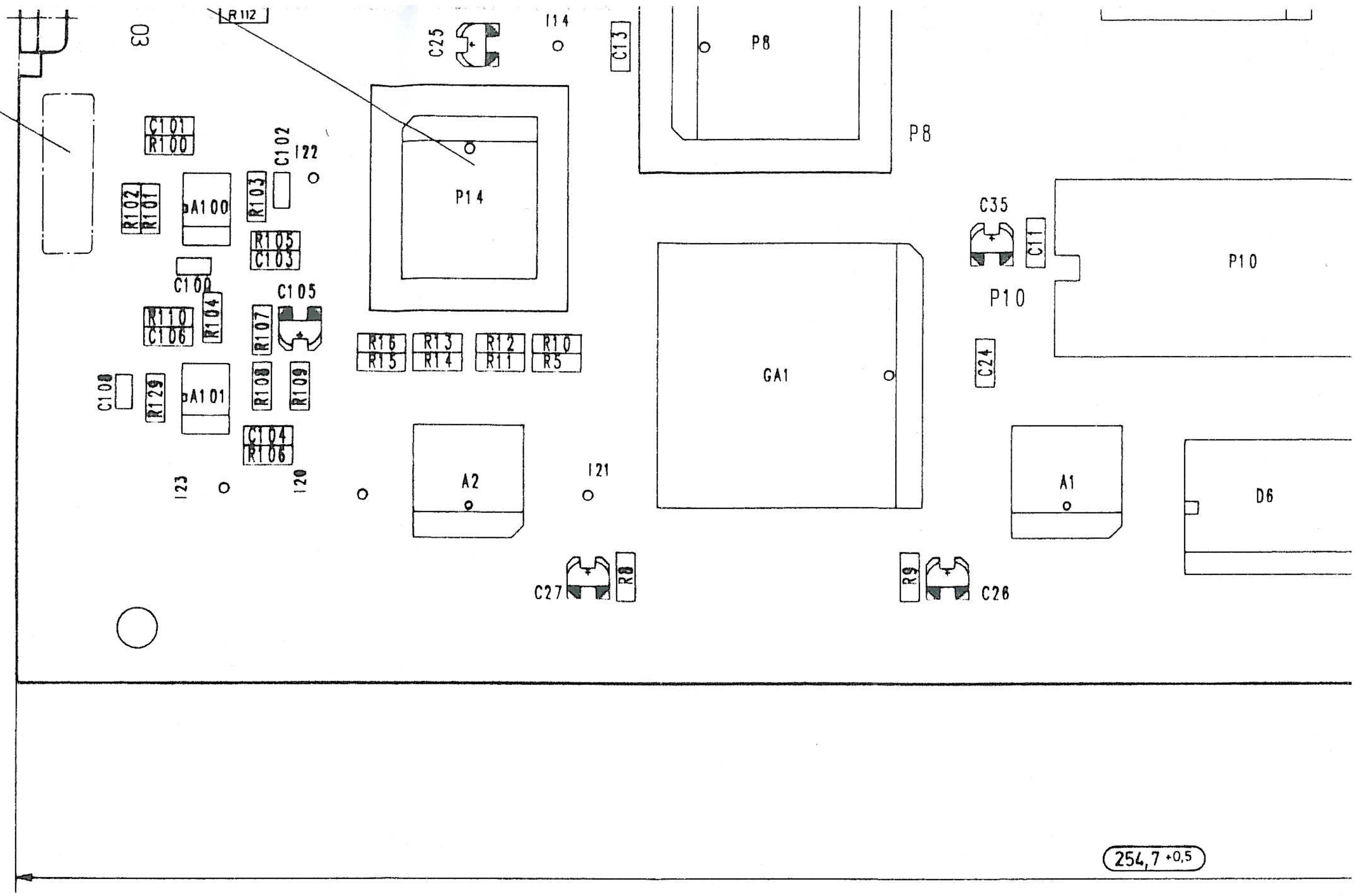
7340

H vorhanden

34 591 abgedeckt

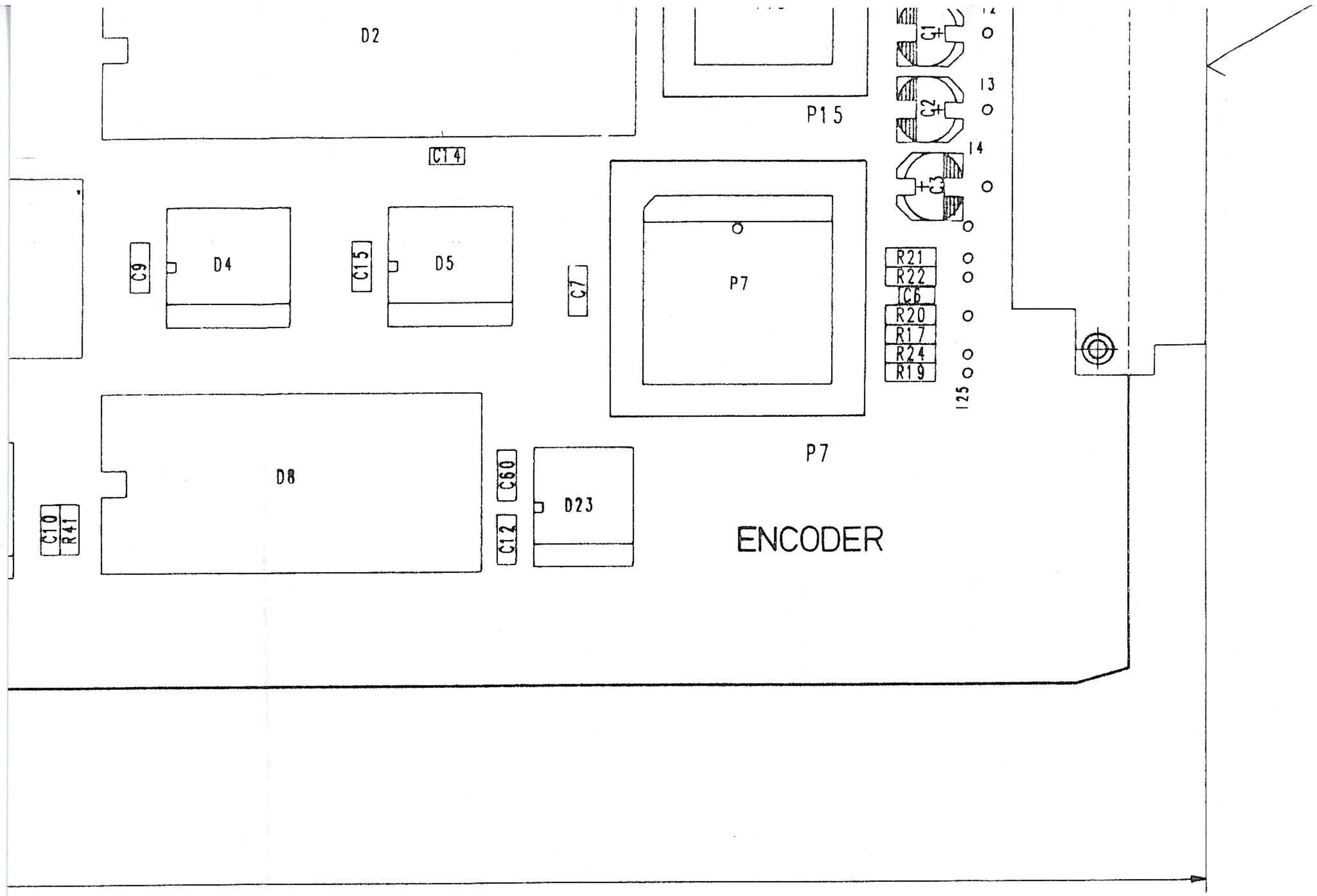


Klebeschild Typ 1 NW 10 R 5 x 16
selbstzerstörend



Schaltplanpositionierung ≙ 361 543 S / Sa

13	12	11	10	9	8



= Kontrollma

Ausgabe	Ändg Mittlg	Datum	Name
09			
08			
07			
06			
05			
04			
03			
02	3089.22	23.11.93	Ba.
01	1089.24	22.4.91	Kr.
00	1089.15	19.2.91	Kr.

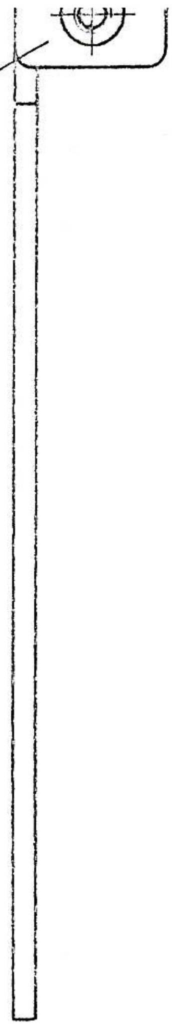
Rohteil

Werkstoff

Oberfläche

7 6 5 4

'90 082
12,5 x6 DIN 7985
01 654



ß

Freimaß toleranzen	Maßstab	Schlumberger Technologies GmbH Ingolstädter Straße 67a 8000 München 46
	2 : 1	Bestückte Leiterplatte Typ: DATA MODUL

1991	Datum	Name	
gez	19.2.91	Kr.	361 543 2/2 M
bearb	21.2.91	[signature]	
gepr			Gerät 4015 / 236 016

Pos.	Benennung	Wert	HNK-Nr.	Herst.
A1	12-Bit DAC	AD7541AJP	834141	ANAL
A2	8-Bit DAC	AD7524JP	834137	ANAL
A100	OPV	TL072CD	834222	TI
A101	OPV	TL072CD	834222	TI
A102	OPV	TL072CD	834222	TI
A103	OPV	TL072CD	834222	TI
A104	Analog Schalter	DG211CY	834471	SILI
C1	Elko	22µF ±20% 25V-	814376	RÖD
C2	Elko	22µF ±20% 25V-	814376	RÖD
C3	Elko	22µF ±20% 25V-	814376	RÖD
C4	Elko	22µF ±20% 25V-	814376	RÖD
C5	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C6	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C7	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C8	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C9	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C10	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C11	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C12	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C13	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C14	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C15	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C16	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C17	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C18	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C19	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C20	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C21	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C22	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C23	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C24	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C25	Elko	10µF ±20% 16V-	814382	RÖD
C26	Elko	10µF ±20% 16V-	814382	RÖD
C27	Elko	10µF ±20% 16V-	814382	RÖD
C28	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C29	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C30	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C31	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C33	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C34	Elko	4.7µF ±20% 25V-	814372	RÖD
C35	Elko	4.7µF ±20% 25V-	814372	RÖD
C40	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C41	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C42	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C43	Kondensator NP0	120pF ±5% 50V-	813236	VIT
C44	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C45	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C46	Kondensator X7R	1nF ±10% 50V-	813320	VIT
C47	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C48	Kondensator NP0	33pF ±5% 50V-	813229	VIT
C49	Elko	4.7µF ±20% 25V-	814372	RÖD
C50	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C60	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C61	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C62	Kondensator NP0	27pF ±5% 50V-	813228	VIT
C100	Kondensator NP0	68pF ±5% 50V-	813233	VIT
C101	Kondensator X7R	100nF ±10% 50V-	813375	VIT

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C102	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C103	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C104	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C105	Elko	10µF ±20% 16V-	814382	RÖD
C106	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C107	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C108	Kondensator NP0	22pF ±5% 50V-	813227	VIT
C109	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C110	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C111	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C112	Kondensator NP0	150pF ±5% 50V-	813237	VIT
C113	Kondensator NP0	680pF ±5% 50V-	813245	VIT
C114	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C115	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C116	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C117	Kondensator NP0	1.5nF ±5% 50V-	813249	VIT
C118	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C119	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C120	Kondensator X7R	22nF ±10% 50V-	813336	VIT
D2	8bit Microprozessor	HD6303RP	835020	HIT
D3	8bit Microprozessor	HD6303RP	835020	HIT
D4	8 Bit Latch	PC74HCT374T	834437	VAL
D5	8 Bit Latch	PC74HCT374T	834437	VAL
D6	32k x 8 CMOS Static RAM	HM62256-10T	834770	HIT
D8	Timer	HD6340P	835022	HIT
D10	1024x8 Static RAM	CY7C131-55JC	834851	AMD
D11	8 Bit Latch	PC74HCT374T	834437	VAL
D12	8 Bit Latch	PC74HCT374T	834437	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
D13	32k x 8 CMOS Static RAM	HM62256-10T	834770	HIT
D15	Timer	HD6340P	835022	HIT
D20	8-bit Schieberegister	PC74HCT164T	835365	VAL
D21	PLL / VCO	PC74HCT4046AT	834440	VAL
D22	PLL / VCO	PC74HCT4046AT	834440	VAL
D23	Nonvolatile Controller	DS1210S	835366	DSC
D24	Nonvolatile Controller	DS1210S	835366	DSC
GA1	Signalgenerator	L5A8905	835100	LSI
GA2	Signalgenerator	L5A8905	835100	LSI
GL1	Schottky-Diode	BAS70-04	830031	SIE
P7	IC-Sockel	44polig	834963	AMP
P8	IC-Sockel	44polig	834963	AMP
P9	IC-Sockel	44polig	834963	AMP
P10	IC-Sockel	28polig	834915	AUG
P11	IC-Sockel	28polig	834915	AUG
P12	IC-Sockel	28polig	834961	AMP
P13	IC-Sockel	44polig	834963	AMP
P14	IC-Sockel	32polig	834962	AMP
P15	IC-Sockel	28polig	834961	AMP
R1	Chip-Widerstand	10kΩ ±1%	804749	VAL
R2	Chip-Widerstand	10kΩ ±1%	804749	VAL
R3	Chip-Widerstand	10kΩ ±1%	804749	VAL
R4	Chip-Widerstand	10kΩ ±1%	804749	VAL
R5	Chip-Widerstand	10kΩ ±1%	804749	VAL
R6	Chip-Widerstand	39kΩ ±1%	804756	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R7	Chip-Widerstand	68kΩ ±1%	804759	VAL
R8	Chip-Widerstand	10Ω ±5%	804713	VAL
R9	Chip-Widerstand	10Ω ±5%	804713	VAL
R10	Chip-Widerstand	10kΩ ±1%	804749	VAL
R11	Chip-Widerstand	10kΩ ±1%	804749	VAL
R12	Chip-Widerstand	10kΩ ±1%	804749	VAL
R13	Chip-Widerstand	10kΩ ±1%	804749	VAL
R14	Chip-Widerstand	10kΩ ±1%	804749	VAL
R15	Chip-Widerstand	10kΩ ±1%	804749	VAL
R16	Chip-Widerstand	10kΩ ±1%	804749	VAL
R17	Chip-Widerstand	10kΩ ±1%	804749	VAL
R18	Chip-Widerstand	10kΩ ±1%	804749	VAL
R19	Chip-Widerstand	10kΩ ±1%	804749	VAL
R20	Chip-Widerstand	10kΩ ±1%	804749	VAL
R21	Chip-Widerstand	10kΩ ±1%	804749	VAL
R22	Chip-Widerstand	10kΩ ±1%	804749	VAL
R23	Chip-Widerstand	10kΩ ±1%	804749	VAL
R24	Chip-Widerstand	10kΩ ±1%	804749	VAL
R25	Chip-Widerstand	10kΩ ±1%	804749	VAL
R26	Chip-Widerstand	10kΩ ±1%	804749	VAL
R27	Chip-Widerstand	10kΩ ±1%	804749	VAL
R28	Chip-Widerstand	10kΩ ±1%	804749	VAL
R29	Chip-Widerstand	10kΩ ±1%	804749	VAL
R30	Chip-Widerstand	10kΩ ±1%	804749	VAL
R31	Chip-Widerstand	10kΩ ±1%	804749	VAL
R32	Chip-Widerstand	10kΩ ±1%	804749	VAL
R33	Chip-Widerstand	470Ω ±1%	804733	VAL
R35	Chip-Widerstand	10kΩ ±1%	804749	VAL
R36	Chip-Widerstand	10kΩ ±1%	804749	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
02 Index	4099.51 Ä.Nr.	25.01.94 Datum	Kr. Name	Bestückte Leiterplatte Typ: DATAMODUL	7
Erst.: UNGER	Gepr.:			361 543 Sa	Seite Nr
Gerät: 4015 / 236 016					5

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R37	Chip-Widerstand	470Ω ±1%	804733	VAL
R38	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R40	Chip-Widerstand	10kΩ ±1%	804749	VAL
R41	Chip-Widerstand	10kΩ ±1%	804749	VAL
R42	Chip-Widerstand	470Ω ±1%	804733	VAL
R100	Chip-Widerstand	10Ω ±5%	804713	VAL
R101	Chip-Widerstand	10kΩ ±1%	804749	VAL
R102	Chip-Widerstand	10kΩ ±1%	804749	VAL
R103	Chip-Widerstand	10kΩ ±1%	804749	VAL
R104	Chip-Widerstand	10kΩ ±1%	804749	VAL
R105	Chip-Widerstand	10Ω ±5%	804713	VAL
R106	Chip-Widerstand	10Ω ±5%	804713	VAL
R107	Chip-Widerstand	10kΩ ±1%	804749	VAL
R108	Chip-Widerstand	10kΩ ±1%	804749	VAL
R109	Chip-Widerstand	10kΩ ±1%	804749	VAL
R110	Chip-Widerstand	10Ω ±5%	804713	VAL
R111	Chip-Widerstand	100Ω ±1%	804725	VAL
R112	Chip-Widerstand	100Ω ±1%	804725	VAL
R113	Chip-Widerstand	100Ω ±1%	804725	VAL
R114	Chip-Widerstand	1MΩ ±1%	804773	VAL
R115	Chip-Widerstand	100Ω ±1%	804725	VAL
R116	Chip-Widerstand	10kΩ ±1%	804749	VAL
R117	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R118	Chip-Widerstand	100Ω ±1%	804725	VAL
R119	Chip-Widerstand	220kΩ ±1%	804765	VAL
R120	Chip-Widerstand	33kΩ ±1%	804755	VAL
R121	Chip-Widerstand	100Ω ±1%	804725	VAL
R122	Chip-Widerstand	47kΩ ±1%	804757	VAL
R123	Chip-Widerstand	47kΩ ±1%	804757	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R124	Chip-Widerstand	47kΩ ±1%	804757	VAL
R125	Chip-Widerstand	47kΩ ±1%	804757	VAL
R126	Chip-Widerstand	100Ω ±1%	804725	VAL
R127	Chip-Widerstand	15kΩ ±1%	804751	VAL
R128	Chip-Widerstand	100Ω ±1%	804725	VAL
R129	Chip-Widerstand	100Ω ±1%	804725	VAL
ST60	Messerleiste DIN 41612	64polig a/c	884517	ERNI

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
02 Index	4099.51 Ä.Nr.	25.01.94 Datum	Kr. Name	Bestückte Leiterplatte Typ: DATAMODUL	7
Erst.: UNGER		Gepr.:		361 543 Sa	Seite Nr
Gerät: 4015 / 236 016					7

The DTMF module consists of a DTMF decoder and a DTMF encoder, both integrated in the device D3. This has a µP interface and is controlled by the slave computer (RF/AF-MCU). Q1 generates the necessary clock of 3.58 MHz.

1. Decoder

The double tones are split into the upper and lower frequency bands by two 6-pole bandpass filters. A comparator produces squarewaves that are counted by the following frequency counter. It compares the values with the standard DTMF frequencies. If a tone is detected correctly, it is written into the receive-data register and can be read by the µP. R7 and C6 are used to specify when a tone is valid. The dynamic range of the decoder can be expanded with switch D1.

2. Encoder

The µP delivers the data corresponding to the required DTMF tone to the transmit-data register of the device. All 16 standard frequencies are produced from the clock frequency by programmable dividers. The tone is generated by means of a sine table and the following D/A converter. There are two identical circuits for producing the upper and lower tone.

The two tones are added in the summing amplifier and transmitted when instructed by the µP.

The level of the double tone is approx. 600 mV_{rms}. The signal is boosted in operational amplifier A1 and then set to the required level by D/A converter A2.

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value	Actual Value
4031						
	1. <u>DTMF encoder</u>					
Peak-	Level setting:					
responding	Set 4031 to RX AUX					
meter	4 kHz deviation					
	999 ms time					
	0 ms pause					
	Call: 0 1 2 3 4 5 6 7 8 9 A B C D E F					
	Send	Mp3	941/1336 Hz	R13	1 V ±10 mV	
		on Opt. card				
4922	<u>Encoder test:</u>					
Decoder:	Connect RX MOD socket to 4922 input					
both filters	Set 4031 for 2 kHz deviation,					
on, range	100 ms time, 100 ms pause					
20-500 mV						
	Measured value on 4922 ---->	Tone	Freq.dev.	Time	Pause	
	Call: 0 1 2 3 4 5 6 7 Send	0-7	<1.5%	100 ±5 ms	100 ±5 ms	
	Call: 8 9 A B C D E F Send	8-F	<1.5%	100 ±5 ms	100 ±5 ms	
	2. <u>DTMF decoder</u>					
4922	Connect AF EXT socket to 4922 output					
Encoder	Set 4922 for					
	Call: 0 1 2 3 4 5 6 7 8 9 A B C D E F					
	Frequency standard					
	Amplitude per tone 70 mV					
	Time/pause 30 ms					
	Set 4031 for					
	100 ms timeout					
	number of tones 16				Received no.	
	AF EXT receiver switch					
	Receive	screen			0123456789ABCDEF	

Issue	Alteration No.	Date	Name	Issue	Alteration No.	Date	Name
02	8088.87	23.6.88	Di.				

Ref. No. 248 171 A

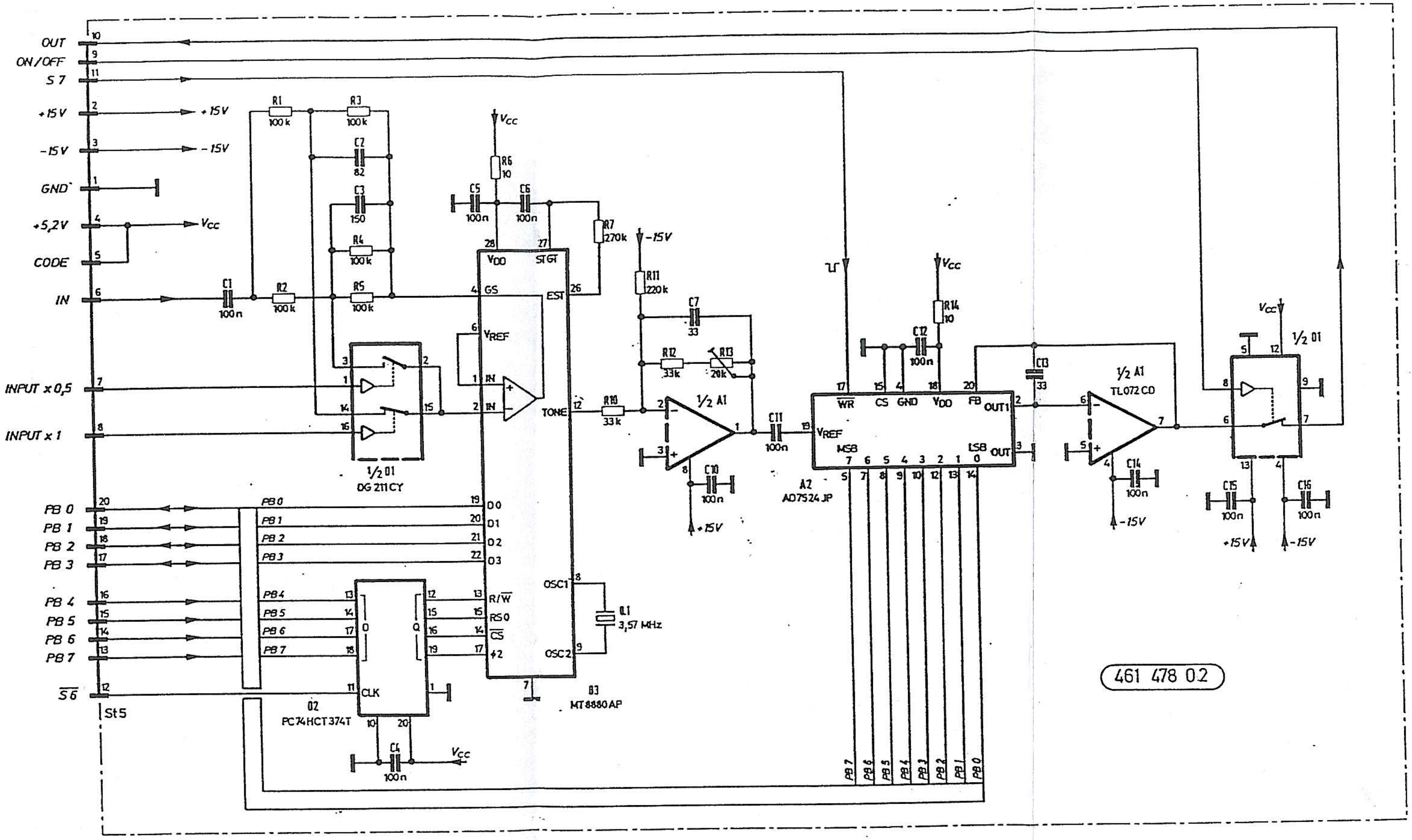
Type STABILOCK 4031/4015

Sub Unit DTMF Module

Sheet 1/1

Zeichnungsindex

ISSUE ≙	Serie
01	LX 089
02	LX 128



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

Ausg. ISS.	Ä.-Mittlg. MODIF.	Datum DATE	Name NAME
02	8088.112	11.10.88	Mo.
01	8088.42	15.3.88	Mo.
—	8088.4	18.1.88	Kr.

	Datum DATE	Name NAME
norm.		
gepr.		
bearb.	18.1.88	Kr.
1988		

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

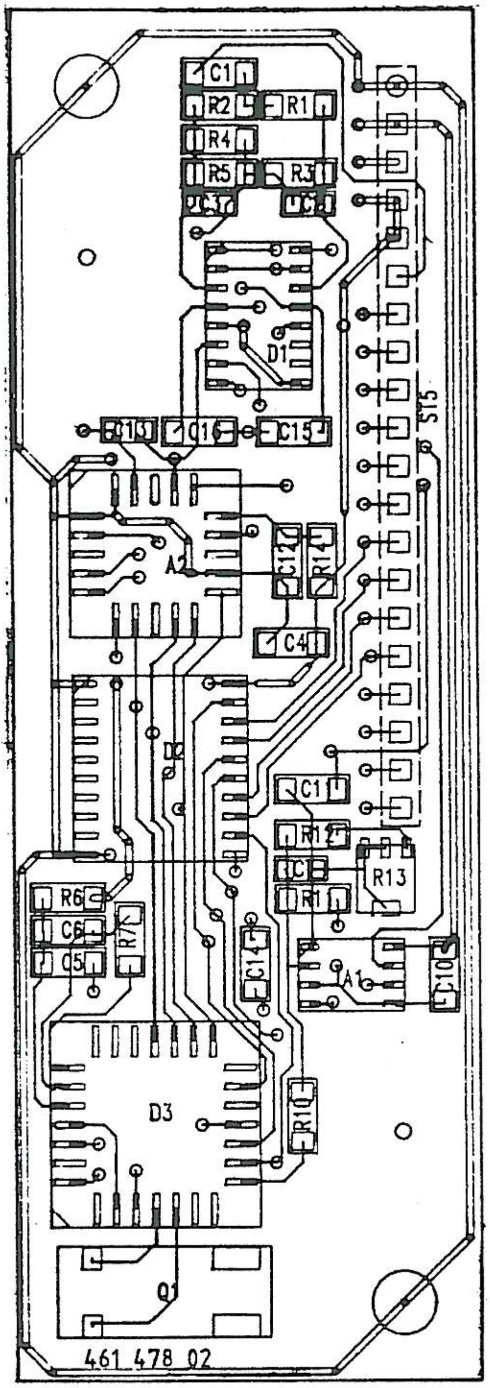
DTMF-Module

248 171 S

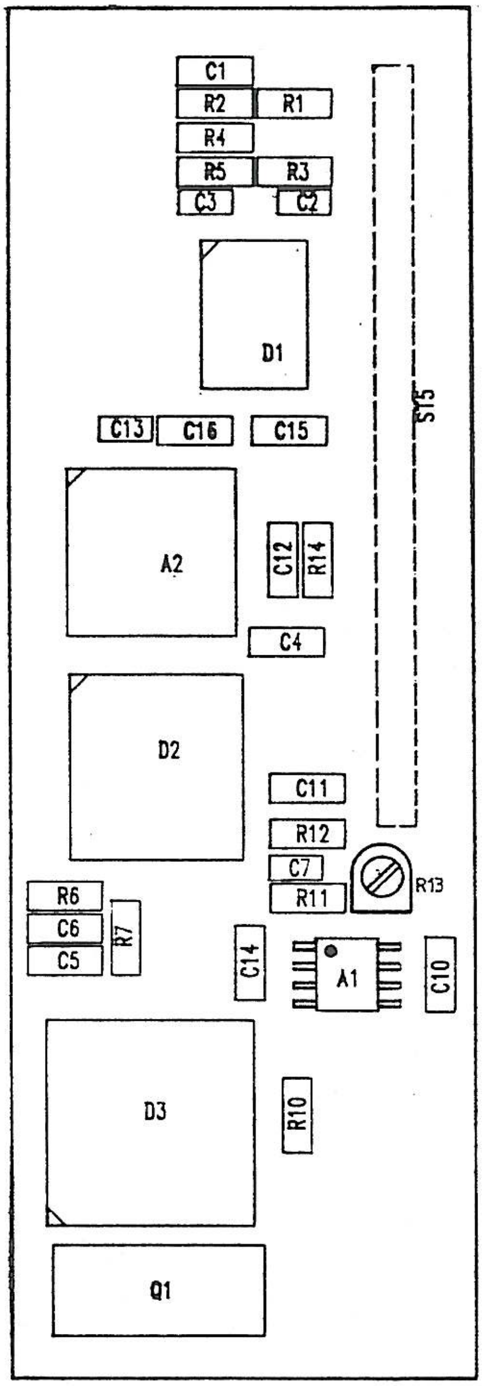
Gerät: 4031

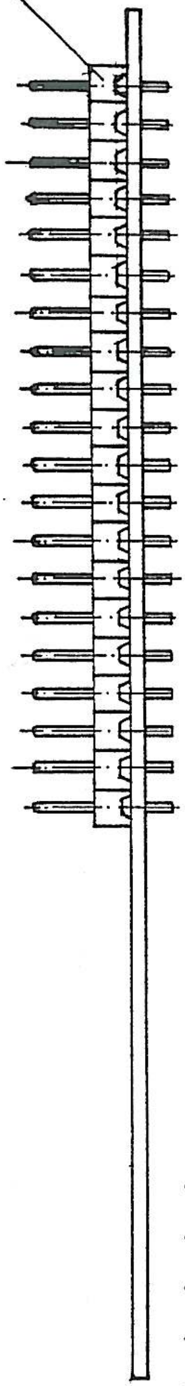
Reflow gelötet
Hierzu Bauteilklebemaske 461 478 02

884 801



Ansicht mit Leiterbahnen nur zur Orientierung





Ansicht ≙ Sollbestückung lt. Stromlauf 248 171 S

Ausgabe	Ändg-Mittlg	Datum	Name			
10				Rohteil	Freimaßtoleranzen	Maßstab
09						2 : 1
08						
07						
06				Werkstoff		
05						
04						
03	8088.112	10.10.88	Mo.			
02				Oberfläche		
01						

1988	Datum	Name
gez	10.10.88	Morasch
bearb	13.10.88	Stoll
gepr		

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

DTMF Module

248 171

Gerät: 40 31 / 108 801

1 Pos. REF NO	2 Wert VALUE	3 Bezeichnung Schlumberger PART. NO.	4 Hersteller MANUFACT	5 Pos REF. NO	6 Wert VALUE	7 Bezeichnung Schlumberger PART. NO	8 Hersteller MANUFACT
A1	TL 072 CD	834 222	MOTO				
A2	AD 7524 JP	834 137	ANA				
				R1	100 kΩ ± 1%	804 761	RÖD
C1	100 nF ± 10% 50V-	813 375	VAL	R2	100 kΩ ± 1%	804 761	RÖD
C2	82 pF ± 5% 50V-	813 234	VAL	R3	100 kΩ ± 1%	804 761	RÖD
C3	150 pF ± 5% 50V-	813 237	VAL	R4	100 kΩ ± 1%	804 761	RÖD
C4	100 nF ± 10% 50V-	813 375	VAL	R5	100 kΩ ± 1%	804 761	RÖD
C5	100 nF ± 10% 50V-	813 375	VAL	R6	10 Ω ± 1%	804 713	RÖD
C6	100 nF ± 10% 50V-	813 375	VAL	R7	270 kΩ ± 1%	804 766	RÖD
C7	33 pF ± 5% 50V-	813 229	VAL				
				R10	33 kΩ ± 1%	804 755	RÖD
C10	100 nF ± 10% 50V-	813 375	VAL	R11	220 kΩ ± 1%	804 765	RÖD
C11	100 nF ± 10% 50V-	813 375	VAL	R12	33 kΩ ± 1%	804 755	RÖD
C12	100 nF ± 10% 50V-	813 375	VAL	R13	20 kΩ ± 25%	807 741	BOURN
C13	33 pF ± 5% 50V-	813 229	VAL	R14	10 Ω ± 1%	804 713	RÖD
C14	100 nF ± 10% 50V-	813 375	VAL				
C15	100 nF ± 10% 50V-	813 375	VAL				
C16	100 nF ± 10% 50V-	813 375	VAL	St5	331-0300-1-20500	884 801	COM
D1	DG 211 CY	834 471	SILIC				
D2	PC 74 HCT 374 T	834 437	VAL				
D3	MT 8880 AP	835 311	MITEL				
Q1	3,57 MHz	853 101					

Ausgabe ISSUE	Änd.-Mittlg Nr MODIFIC NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02	8088.102	11.7.88	Di
01	8088.42	14.3.88	Mo.
-	8088.4	18.1.88	Kr.

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67a
8000 München 46

1988	Tag DATE	Name NAME
geschr	18.1.88	Kr.
bearb		
gepr.		

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: DTMF MODULE

Bezeichnung Schlumberger PART NO: 248 171 Sa

Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 248 171 S

Gerät: 4031

Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

Blatt Nr SHEET NO 1

NO

Switch the Communication Test Set off before attachment/removal of the interface!

Settings on interface: see operating instructions, Chapter 4, section "PRINT".

The interface is actually three interfaces: an IEEE-488 bus interface, an RS-232-C interface and an interface for the ASCII keyboard. The interface can be both a controller and a slave. Table 1 shows the address plan for driving important functions.

Buffers D1 and D2 of the interface are only active for data communication between the microprocessor and the interface. Independently of the other hardware components, it is possible to perform a software reset of the interface alone.

ROV	A2	A1	A0	CPU ADDRESS	FUNCTION
0	0	0	1	300 001 H	DISABLE EXTERNAL KEYBOARD
0	0	1	0	300 002 H	READ OPTION VERSION
0	0	1	1	300 003 H	RESET software
0	1	0	0	300 004 H	READ OPTION VERSION EXTENSION
0	1	0	1	300 005 H	Slave (1)
0	1	1	0	300 006 H	Controller (1)

Table 1

(1): Signal state controller: CONTROLLER = 0, SLAVE = 1
Signal state slave : CONTROLLER = 1, SLAVE = 0
"Slave" must be set when initializing the option!

The keyboard and the RS-232-C interface are interrupt-controlled.

4 bits of a hardware code are read in with the instruction READ OPTION VERSION; the format is as follows:

```
¦  D3  ¦  D2  ¦  D1  ¦  D0  ¦

+------+------+------+------+
¦ INP3 ¦ INP2 ¦ INP1 ¦ INP0 ¦
+------+------+------+------+
   ¦      ¦      ¦      ¦
   ¦      +------+------+--------- Hardware code (version)
   +------------------------------ 0 = Interface Centronics/RS-232/keyboard
                                   1 = Interface IEEE/RS-232/keyboard
```

Another 4 bits of a code given by the PLD are read in with the instruction READ OPTION VERSION EXTENSION. This makes it possible to distinguish between further options that are added later; the format is as follows:

```
¦ D3  ¦ D2  ¦ D1  ¦ D0  ¦

+-----+-----+-----+-----+
¦ INP7 ¦ INP6 ¦ INP5 ¦ INP4 ¦
+-----+-----+-----+-----+
   ¦     ¦     ¦     ¦
   +-----+-----+-----+--------- Additional hardware code
```

An MC68488 controller is used for the IEEE bus interface, a PIA N82C55 for the keyboard interface and the RS-232-C controller N82050 for the serial interface. The different addresses are given in Table 2.

OPT2	OPT1	OPT0	CPU ADDRESS	FUNCTION
0	1	1	900 000 H	KEYBOARD
1	0	1	E00 000 H	RS-232-C
1	1	0	D00 000 H	IEEE BUS

Table 2

Testing Instructions

1. General performance check

1. Test whether the interface is recognized.

   Make sure that STABILOCK 4015 is switched off.

   Attach interface,
   switch set on,
   perform a total reset according to operating instructions (Chapter 1).

   Set should log on with STATUS menu and following display:

   Interface Serial,KBD,IEC

   If YES, continue with 4.
   If NO, continue with 2.

2. Interface blocks system

2.1 Press RESET key several times.
P16 10 pulse sequence : 0/1/0.
If YES, continue with 3.
If NO, continue with 2.2.

2.2 Press RESET key several times.
P16 24 pulse sequence : 0/1/0.
If YES, P16 defective?
If NO, continue with 2.3.

2.3 Press RESET key several times.
P16 24 = 0.
If YES, check computer version and exchange:
P16 version 1.0 (see test item 5.)
and back to 1.
If NO, connector defective?

2.4 Back to 1.

3. Check signal path

3.1 D1 1 = 0
If YES, continue with 3.2.
If NO, continue with 3.4.

3.2 P16 14 = 0
If YES, continue with 3.3.

3.3 P16 41 = 0 OR
P16 42 = 0 OR
P16 43 = 0
If YES, connector defective?
If NO, P16 defective?

3.4 Back to 1.

4. Special performance check

4.1 Check signal path

D2 9 squarewave signal of frequency 18.432 MHz

4.2 Test of keyboard interface (KBD)

Connect keyboard and enter data.

4.3 Test of RS-232-C interface

Connect RS-232-C printer.
Make test printout (see Chapter 4, "PRINT").

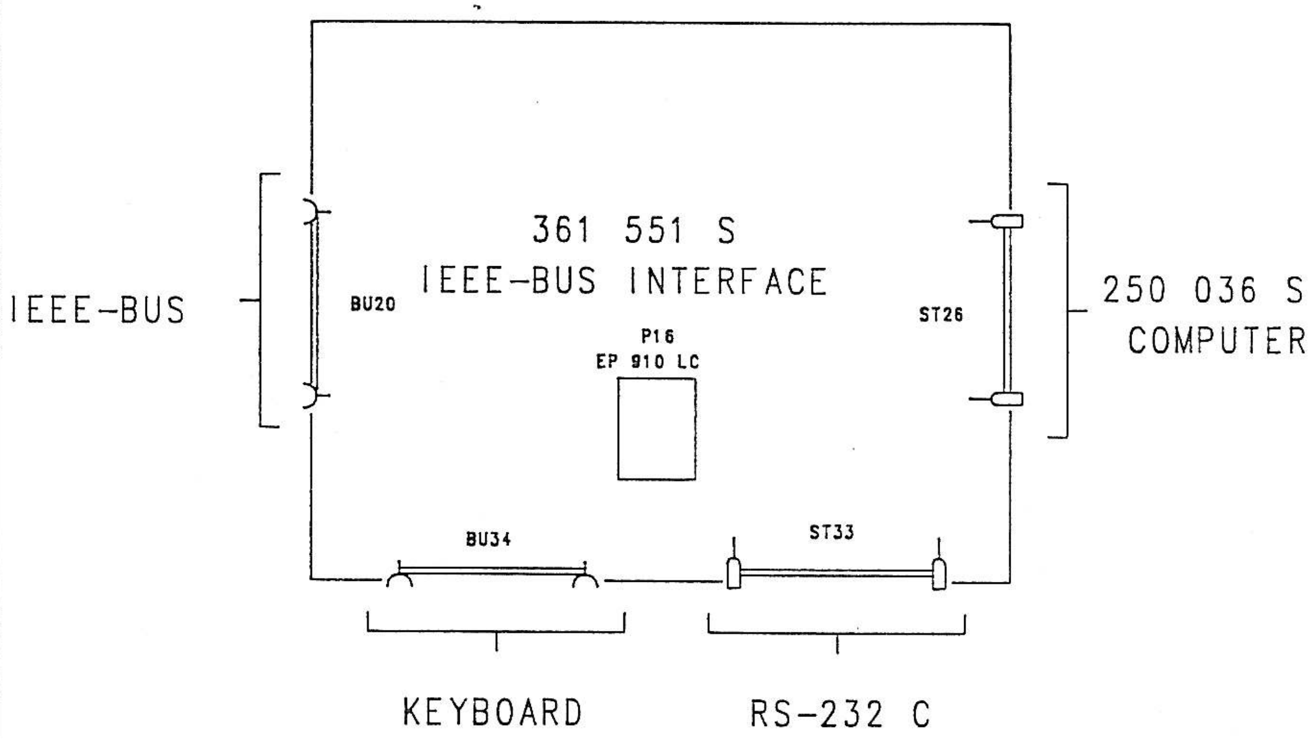
4.4 Test of IEEE bus interface

Connect IEEE bus printer.
Make test printout (see Chapter 4, "PRINT").

5. Version number of P16

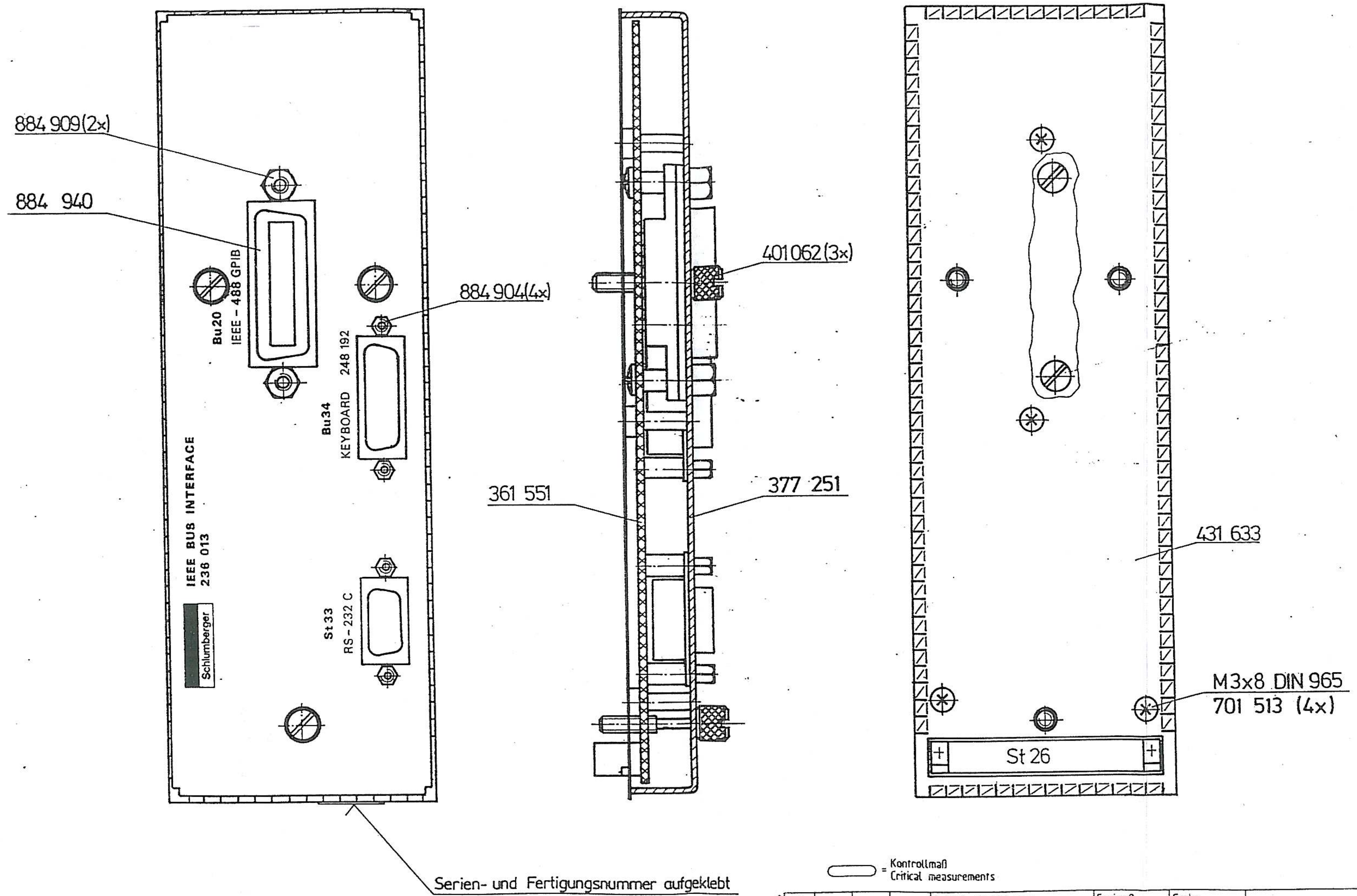
Because of circuit variants between computer boards of the versions 461 546 01, 461 556 02 on the one hand and 461 546 03 on the other, the options require EPLDs (P16) of different versions:

Computer version	Version number of P16
461 546 01	1.0
461 546 02	1.0
461 546 03 & higher	2.0



				DESIGNED		
01	1089.21	09.04.91	UNGER	CHECKED		
00	0089.65	23.11.90	HUBER	DRAWN		
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR. 67 A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: IEEE - BUS INTERFACE	ZEICHNUNGSNR./DRAWING NO.: 236 013 S PROJECT/GROUP: 4015 / 108 901



= Kontrollmaß
Critical measurements

Rev. No.	Rev. Sht.	Date	Name
09			
08			
07			
06			
05			
04			
03	1089.80	15.10.91	Wi.
02	1089.60	24.7.91	Kc
01	1089.21	8.4.91	Kr.
00	0089.65	26.11.90	Kr.

Rohteil / Initial part:

Werkstoff / Material:

Oberfläche / Surface:

Freimaßtoleranzen / default tolerance:

Scale: 1:1

DIN A3

'90	Date	Name
Drawn	28.9.	West.
Designed		
Checked		

Schlumberger Technologies GmbH
Ingolstädterstraße 67a
8000 München 46

Bezeichnung: / Description:

IEEE BUS INTERFACE

Zeichnungsnr.: / Drawing No.: 236 013

Gerät: / Unit: 4015 / 108 901

Pos REF NO	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT	Pos REF. NO	Wert VALUE	Bezeichnung Schlumberger PART NO	Hersteller MANUFACT
1	Bestückte Leiterplatte	361 551					
	hierzu	361 551 Sa					
P16	EP 910 LC	893 391	STG				

Ausgabe ISSUE	Änd.-Mittlg Nr MODIFIC NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02			
01	1089.21	4.4.91	Kr.
00	0089.65	26.11.	Kr.

1990	Tag DATE	Name NAME
geschr	26.11.	Kr.
bearb		
gepr		

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: IEEE - BUS INTERFACE

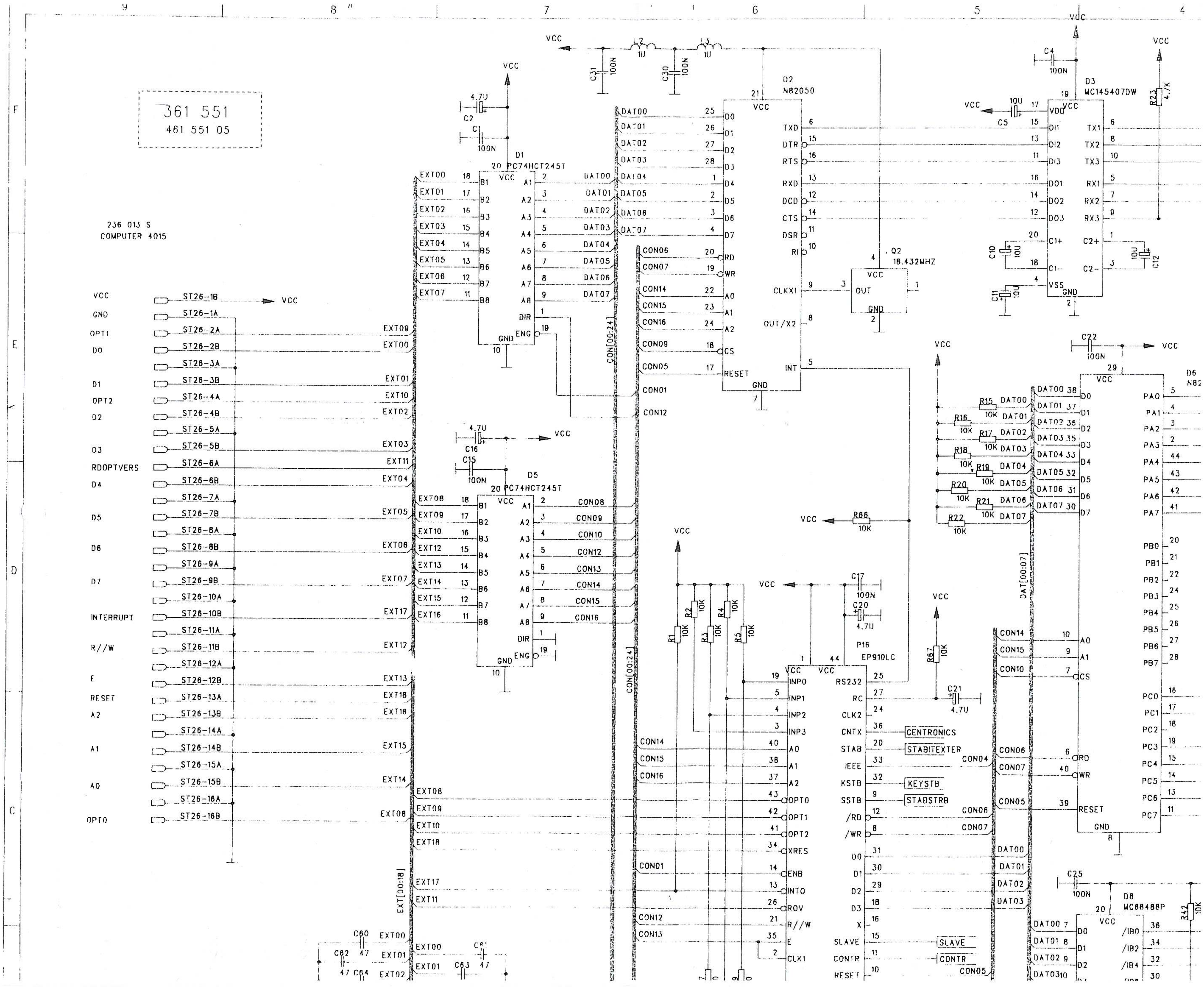
Bezeichnung Schlumberger PART NO: 236 013 Sa

Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 236 013 S

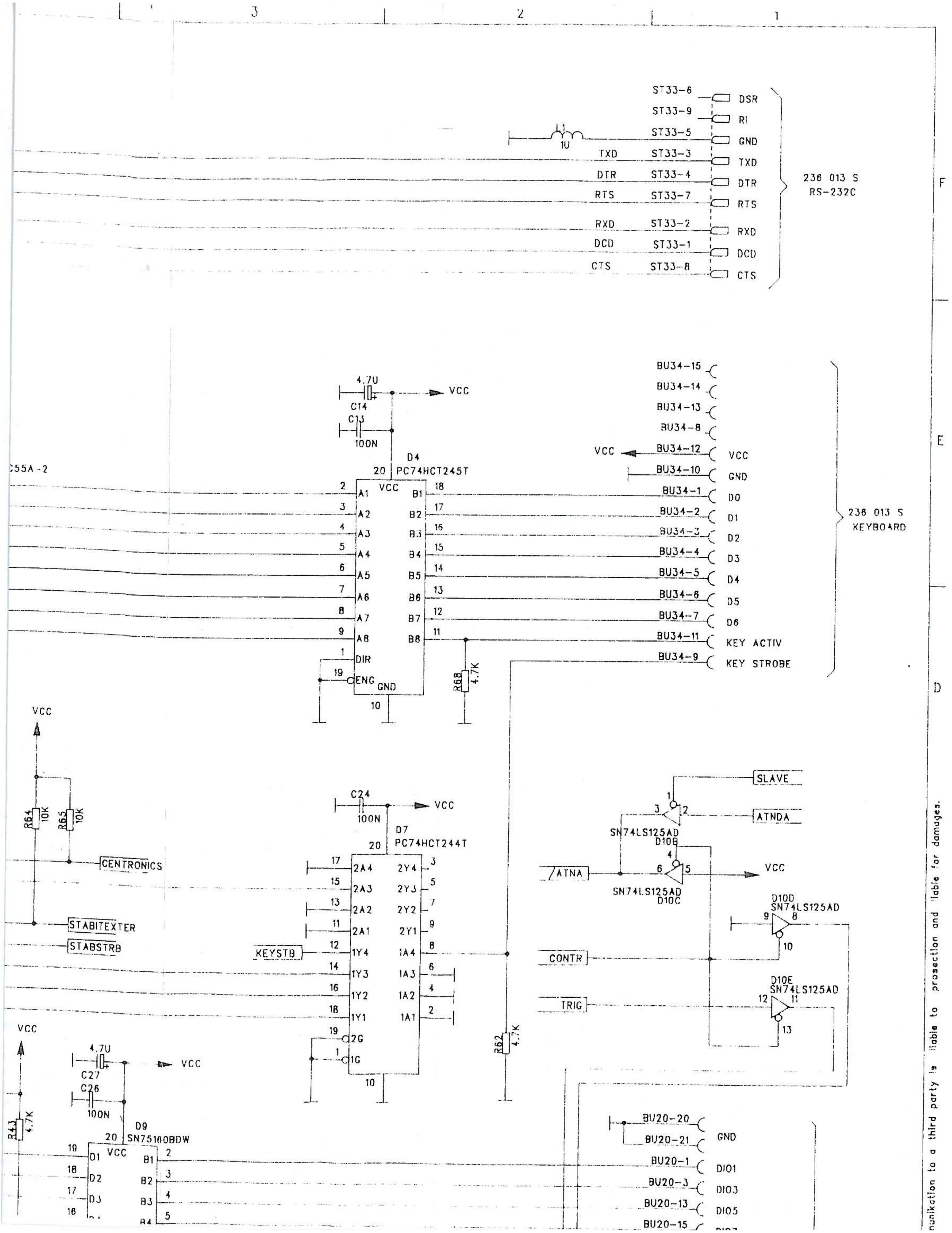
Gerät: 4015

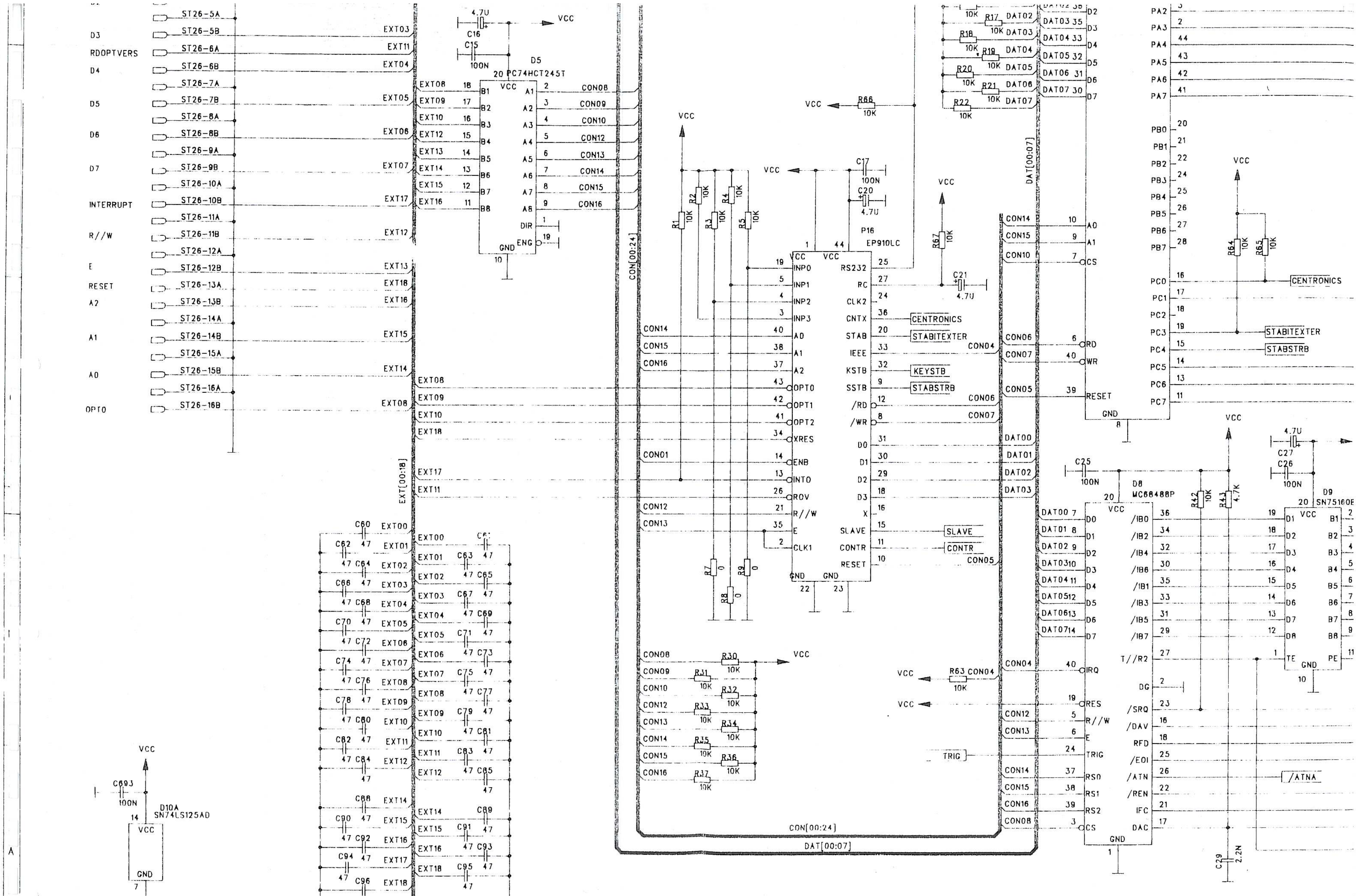
Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

Blatt Nr SHEET NO 1



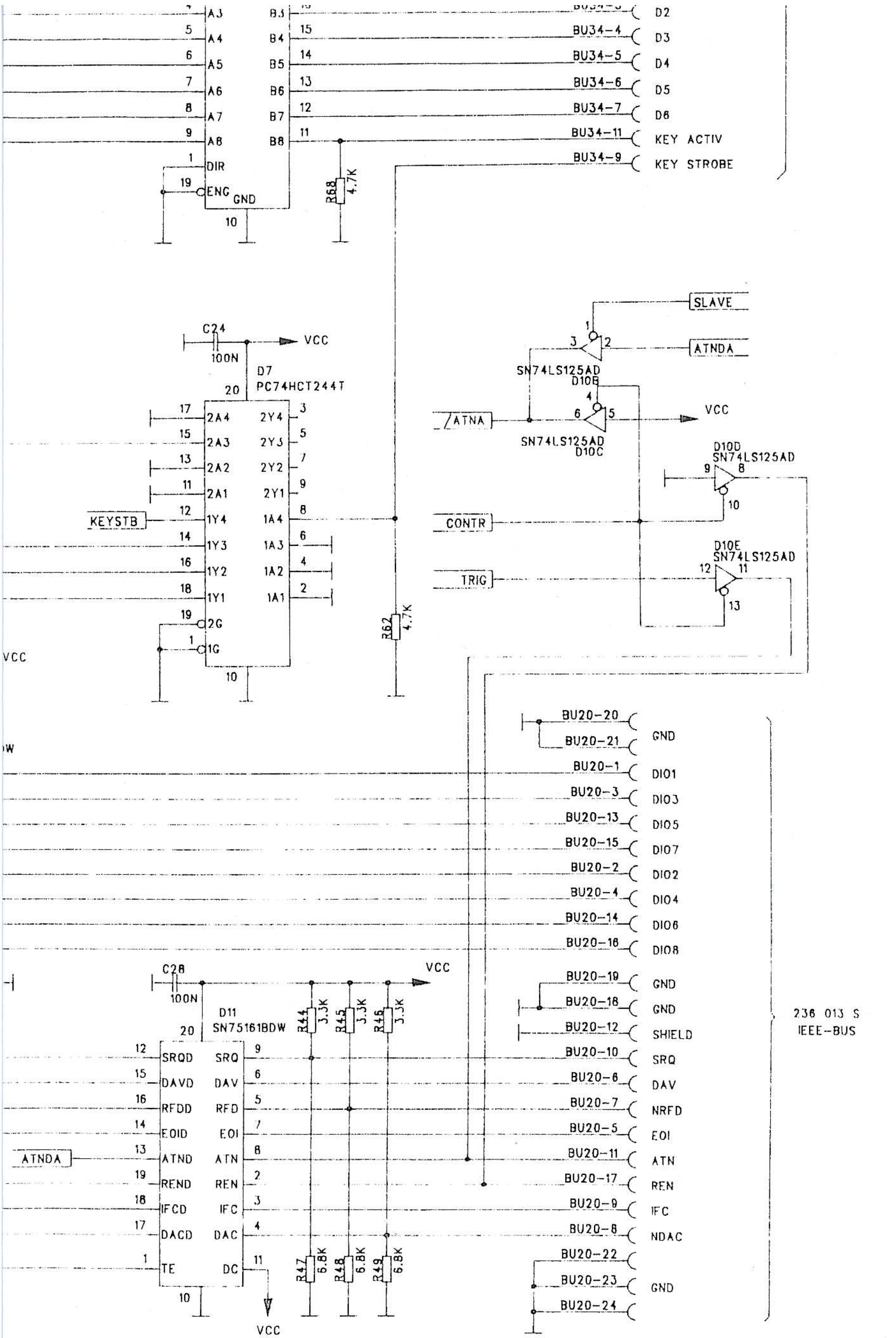
361 551
461 551 05
236 013 S
COMPUTER 4015
D1 PC74HCT245T
D5 PC74HCT245T
D2 N82050
Q2 18.432MHZ
D3 MC145407DW
D6 N82
P16 EP910LC
D8 MC68488P
CENTRONICS
STABITEXTER
KEYSTB
STABSTRB
SLAVE
CONTR
VCC
GND
OPT1
D0
D1
OPT2
D2
D3
RDOPTVERS
D4
D5
D6
D7
INTERRUPT
R//W
E
RESET
A2
A1
A0
OPT0
EXT[00:18]
CON[00:24]
DAT[00:07]


3
2
1
F
E
D
ST33-6 DSR
ST33-9 RI
L1 1U ST33-5 GND
TXD ST33-3 TXD
DTR ST33-4 DTR
RTS ST33-7 RTS
RXD ST33-2 RXD
DCD ST33-1 DCD
CTS ST33-8 CTS
236 013 S
RS-232C
4.7U C14 VCC
C13 100N
D4
PC74HCT245T
20 VCC
A1 A2 A3 A4 A5 A6 A7 A8
B1 B2 B3 B4 B5 B6 B7 B8
DIR
ENG
GND 10
R68 4.7K
BU34-15
BU34-14
BU34-13
BU34-8
VCC BU34-12 VCC
BU34-10 GND
BU34-1 D0
BU34-2 D1
BU34-3 D2
BU34-4 D3
BU34-5 D4
BU34-6 D5
BU34-7 D6
BU34-11 KEY ACTIV
BU34-9 KEY STROBE
236 013 S
KEYBOARD
C55A-2
VCC
R64 10K
R65 10K
CENTRONICS
STABITEXTER
STABSTRB
KEYSTB
C24 100N VCC
D7
PC74HCT244T
20
2A4 2A3 2A2 2A1 1Y4 1Y3 1Y2 1Y1
2Y4 2Y3 2Y2 2Y1 1A4 1A3 1A2 1A1
2G 1G
10
R62 4.7K
SLAVE
ATNDA
SN74LS125AD
D10B
/ATNA
VCC
SN74LS125AD
D10C
D10D
SN74LS125AD
CONTR
D10E
SN74LS125AD
TRIG
VCC
4.7U C27 VCC
C26 100N
R43 4.7K
D9
SN75160BDW
20 VCC
D1 D2 D3
B1 B2 B3 B4
BU20-20 GND
BU20-21
BU20-1 DIO1
BU20-3 DIO3
BU20-13 DIO5
BU20-15



04	3089.16	29.07.93	VARGA	DESIGNED		
03	1089.80	29.10.91	VARGA	CHECKED		
02	1089.60	19.07.91	GRIE	DRAWN	29.10.90	GRIE
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

9 8 7 6 5 4 DIESE ZEICHNUNG IST



SCHLUMBERGER TECHNOLOGIES GMBH Gutenbergstr. 2-4 8045 ISMANING	BEZEICHNUNG/DESCRIPTION: IEEE BUS INTERFACE	ZEICHNUNGSNR./DRAWING NO.: 361 551 S PROJECT/GROUP: 4015 / 236 013 S	1 VON/OF 1 BLATT SHEET

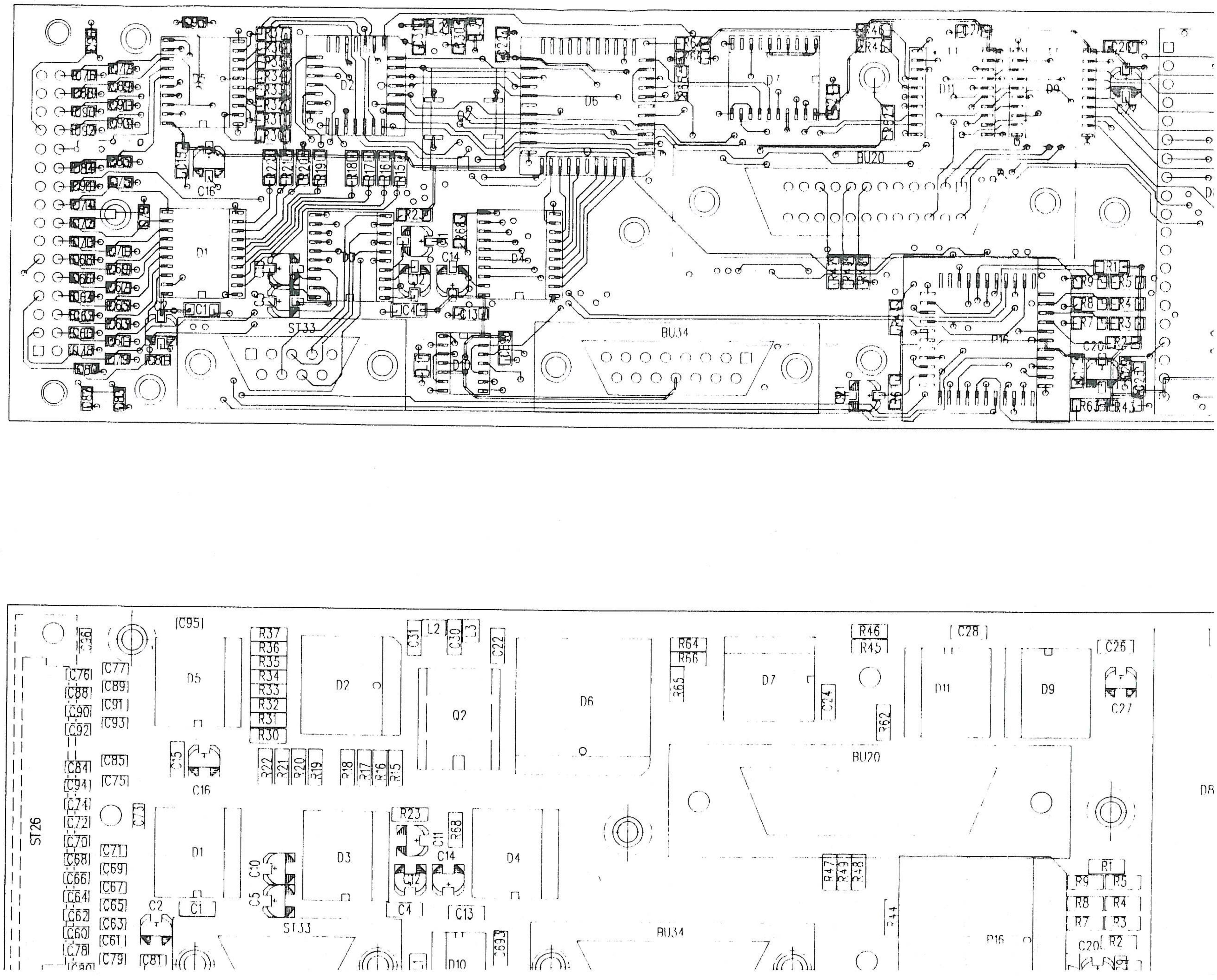
9 8 7 6 5 4

F

E

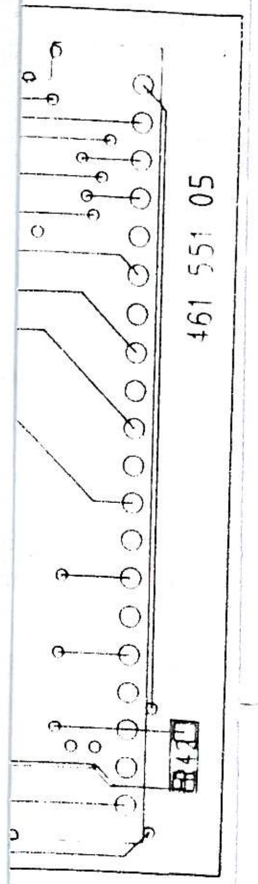
D

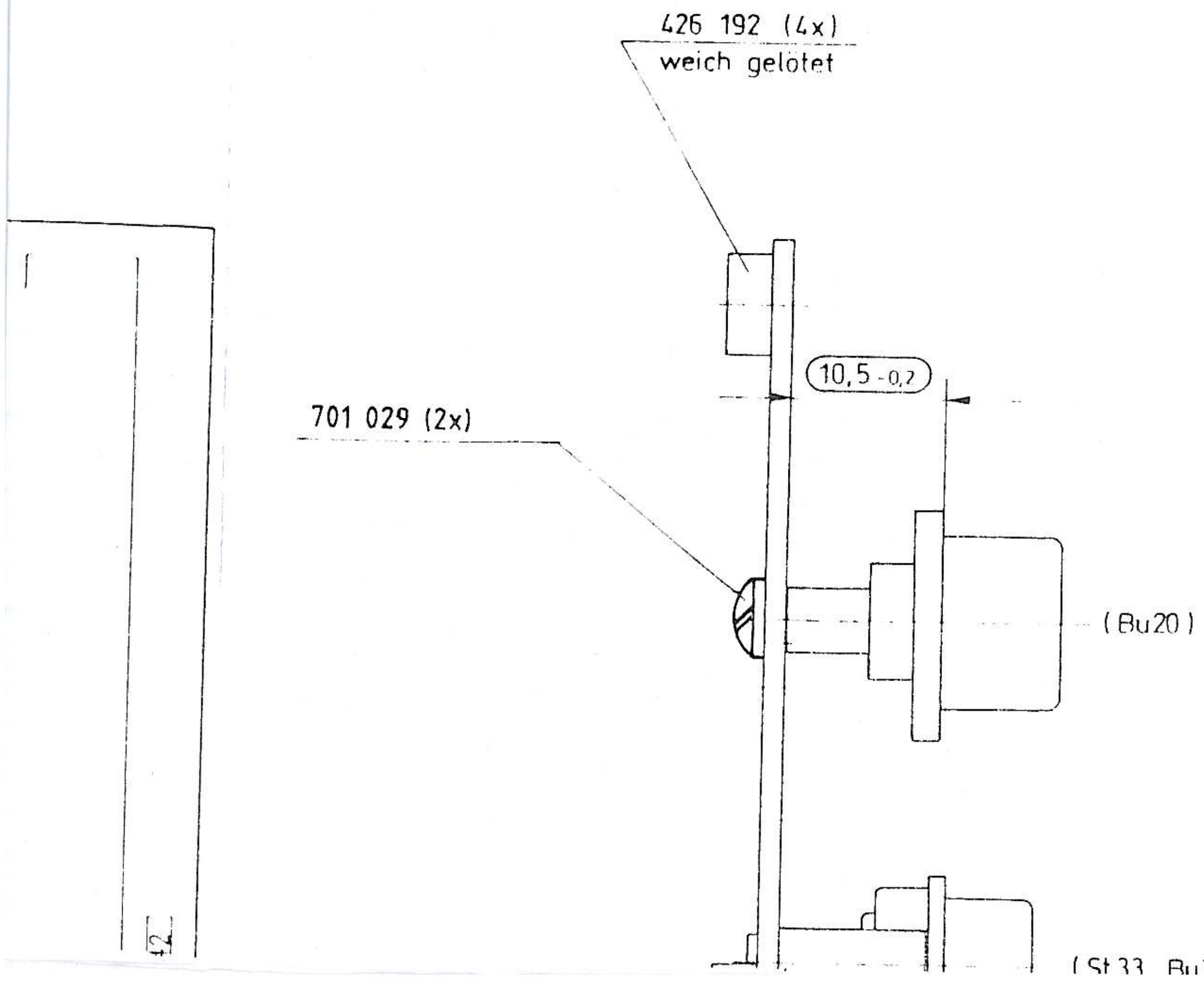
C

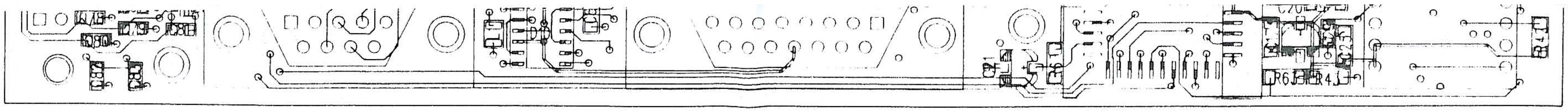


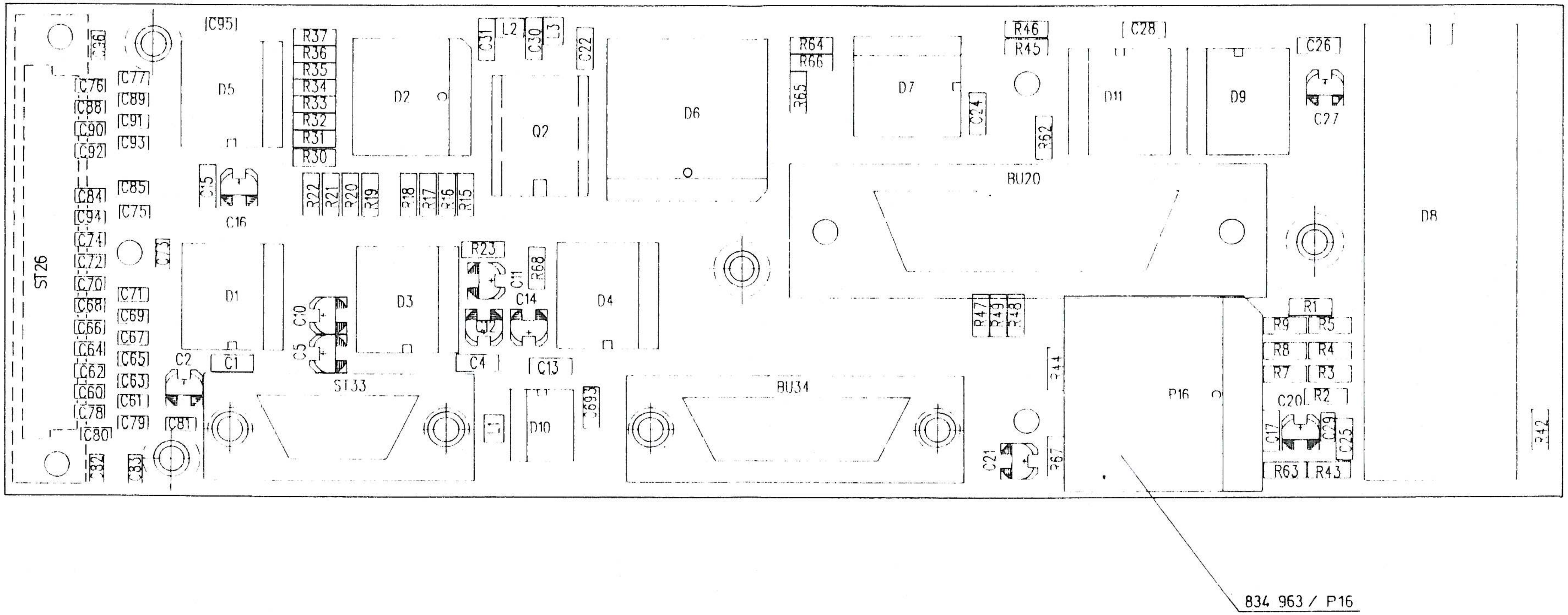
Reflow und Sonderlötung

Hierzu Bauteilklebemaske 461 551 05





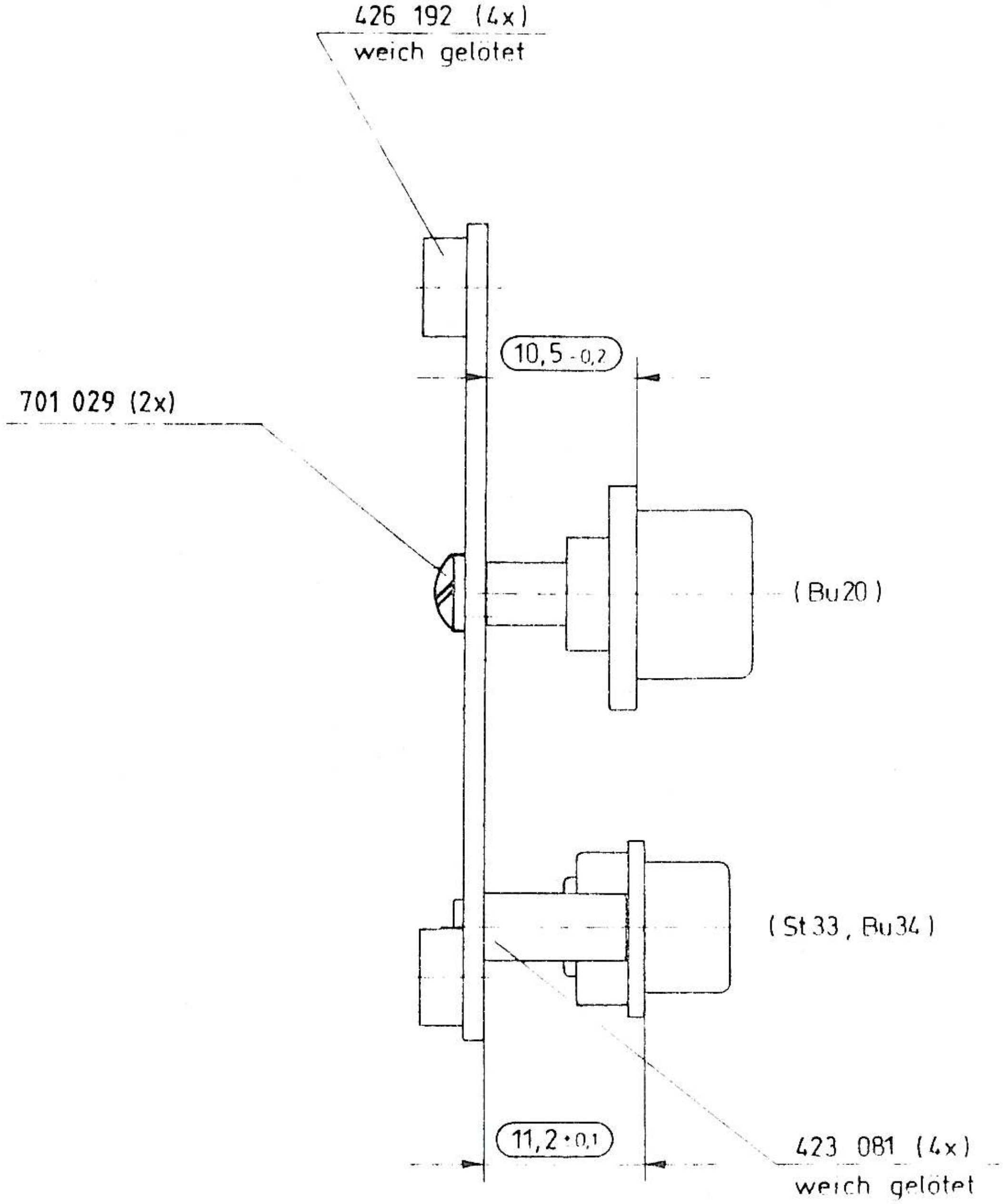




Schaltplanpositionierung = 361 551 S/Sa

9 8 7 6 5 4

09 08 07 06 05 04 03 02 01 00



Kontrollmaß
Critical measurements

Rev Shi	Date	Name
3089.16	27.7.93	Wi.
1089.80	15.10.91	Wi.
1089.60	24.7.91	Kr.
1089.21	4.4.91	Kr.

Rohteil Initial part

Werkstoff Material

Oberfläche Surface

Freimaß toleranzen default tolerance

Scale 2:1

DIN A2

1991 Date Name
Drawn 4.4.91 Kr.
Designed
Checked

Schlumberger Technologies GmbH
Ingolstädter Straße 67a
8000 München 46

Benennung Description
Bestückte Leiterplatte
Typ: IEEE BUS INTERFACE

Zeichnungsnr. Drawing No.
361 551 NO

Gerät Unt 4015 / 236 013

Pos.	Benennung	Wert	HNK-Nr.	Herst.
BU20	D-Buchse gerade	24polig	884216	AMP
BU34	D-Stecker mit Filter	15polig	884661	SC
C1	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C2	Elko	4.7µF ±20% 25V-	814372	RÖD
C4	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C5	Elko	10µF ±20% 16V-	814382	RÖD
C10	Elko	10µF ±20% 16V-	814382	RÖD
C11	Elko	10µF ±20% 16V-	814382	RÖD
C12	Elko	10µF ±20% 16V-	814382	RÖD
C13	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C14	Elko	4.7µF ±20% 25V-	814372	RÖD
C15	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C16	Elko	4.7µF ±20% 25V-	814372	RÖD
C17	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C20	Elko	4.7µF ±20% 25V-	814372	RÖD
C21	Elko	4.7µF ±20% 25V-	814372	RÖD
C22	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C24	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C25	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C26	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C27	Elko	4.7µF ±20% 25V-	814372	RÖD
C28	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C29	Kondensator X7R	2.2nF ±10% 50V-	813324	VIT
C30	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C31	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C60	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C61	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C62	Kondensator NP0	47pF ±5% 50V-	813231	VIT

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
03 Index	3089.16 Ä.Nr.	27.07.93 Datum	Witt Name	Bestückte Leiterplatte Typ: IEEE BUS INTERFACE	5
Erst.: UNG	Gepr.:			361 551 Sa	Seite Nr
Gerät: 4015 / 236 013					1

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C63	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C64	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C65	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C66	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C67	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C68	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C69	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C70	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C71	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C72	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C73	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C74	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C75	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C76	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C77	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C78	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C79	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C80	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C81	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C82	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C83	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C84	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C85	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C88	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C89	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C90	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C91	Kondensator NP0	47pF ±5% 50V-	813231	VIT

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
03 Index	3089.16 Ä.Nr.	27.07.93 Datum	Witt Name	Bestückte Leiterplatte Typ: IEEE BUS INTERFACE	5
Erst.: UNG		Gepr.:		361 551 Sa	Seite Nr
Gerät: 4015 / 236 013					2

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C92	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C93	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C94	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C95	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C96	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C693	Kondensator X7R	100nF ±10% 50V-	813375	VIT
D1	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D2	RS-232C-Controller	N82050	835018	INTEL
D3	V24-Treiber	MC145407DW	835367	MOT
D4	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D5	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D6	PPI	N82C55A-2	834870	INTEL
D7	Buffer	PC74HCT244T	834436	VAL
D8	GPIB-Controller	MC68488P	835007	MOT
D9	GPIB-Treiber	SN75160BDW	835374	TI
D10	Buffer / Treiber	PC74HCT125T	835384	TEX
D11	GPIB-Treiber	SN75161B	835375	TI
L1	Keramik-Spule	1µH ±5%	821227	STET
L2	Keramik-Spule	1µH ±5%	821227	STET
L3	Keramik-Spule	1µH ±5%	821227	STET
P16	IC-Sockel	44polig	834963	AMP
Q2	Quarz	18.432MHZ	853308	SE
R1	Chip-Widerstand	10kΩ ±1%	804749	VAL
R2	Chip-Widerstand	10kΩ ±1%	804749	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R3	Chip-Widerstand	10kΩ ±1%	804749	VAL
R4	Chip-Widerstand	10kΩ ±1%	804749	VAL
R5	Chip-Widerstand	10kΩ ±1%	804749	VAL
R7	Chip-Widerstand	0Ω	804700	VAL
R8	Chip-Widerstand	0Ω	804700	VAL
R9	Chip-Widerstand	0Ω	804700	VAL
R15	Chip-Widerstand	10kΩ ±1%	804749	VAL
R16	Chip-Widerstand	10kΩ ±1%	804749	VAL
R17	Chip-Widerstand	10kΩ ±1%	804749	VAL
R18	Chip-Widerstand	10kΩ ±1%	804749	VAL
R19	Chip-Widerstand	10kΩ ±1%	804749	VAL
R20	Chip-Widerstand	10kΩ ±1%	804749	VAL
R21	Chip-Widerstand	10kΩ ±1%	804749	VAL
R22	Chip-Widerstand	10kΩ ±1%	804749	VAL
R23	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R30	Chip-Widerstand	10kΩ ±1%	804749	VAL
R31	Chip-Widerstand	10kΩ ±1%	804749	VAL
R32	Chip-Widerstand	10kΩ ±1%	804749	VAL
R33	Chip-Widerstand	10kΩ ±1%	804749	VAL
R34	Chip-Widerstand	10kΩ ±1%	804749	VAL
R35	Chip-Widerstand	10kΩ ±1%	804749	VAL
R36	Chip-Widerstand	10kΩ ±1%	804749	VAL
R37	Chip-Widerstand	10kΩ ±1%	804749	VAL
R42	Chip-Widerstand	10kΩ ±1%	804749	VAL
R43	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R44	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R45	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R46	Chip-Widerstand	3.3kΩ ±1%	804743	VAL
R47	Chip-Widerstand	6.8kΩ ±1%	804747	VAL

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R48	Chip-Widerstand	6.8kΩ ±1%	804747	VAL
R49	Chip-Widerstand	6.8kΩ ±1%	804747	VAL
R62	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R63	Chip-Widerstand	10kΩ ±1%	804749	VAL
R64	Chip-Widerstand	10kΩ ±1%	804749	VAL
R65	Chip-Widerstand	10kΩ ±1%	804749	VAL
R66	Chip-Widerstand	10kΩ ±1%	804749	VAL
R67	Chip-Widerstand	10kΩ ±1%	804749	VAL
R68	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
ST26	Messerleiste DIN 41612	32polig a/b	884506	ERNI
ST33	D-Stecker mit Filter	9polig	884660	SC

Schlumberger Technologies GmbH			Schaltteilliste	Anz. d. Seiten
03 Index	3089.16 Ä.Nr.	27.07.93 Datum	Witt Name	Bestückte Leiterplatte Typ: IEEE BUS INTERFACE	5
Erst.: UNG	Gepr.:			361 551 Sa	Seite Nr
Gerät: 4015 / 236 013					5

Switch the Communication Test Set off before attachment/removal of the interface!

Settings on interface: see operating instructions, Chapter 4, section "PRINT".

The interface is actually three interfaces: an RS-232-C interface, a Centronics interface and an interface for the keyboard. Table 1 shows the address plan for driving important functions.

Buffers D1 and D2 of the interface are only active for data communication between the microprocessor and the interface. Independently of the other hardware components, it is possible to perform a software reset of the interface alone.

ROV	A2	A1	A0	CPU ADDRESS	FUNCTION
0	0	0	1	300 001 H	DISABLE EXTERNAL KEYBOARD
0	0	1	0	300 002 H	READ OPTION VERSION
0	0	1	1	300 003 H	RESET software
0	1	0	0	300 004 H	READ OPTION VERSION EXTENSION
0	1	0	1	300 005 H	ENABLE EXTERNAL KEYBOARD

Table 1

The keyboard and the RS-232-C interface are interrupt-controlled.

4 bits of a hardware code are read in with the instruction READ OPTION VERSION; the format is as follows:

```
¦  D3  ¦  D2  ¦  D1  ¦  D0  ¦

+------+------+------+------+
¦ INP3 ¦ INP2 ¦ INP1 ¦ INP0 ¦
+------+------+------+------+
   ¦      ¦      ¦      ¦
   ¦      +------+------+--------- Hardware code (version)
   +------------------------------ 0 = Interface Centronics/R2-232/keyboard
                                   1 = Interface IEEE/RS-232/keyboard
```

Another 4 bits of a code given by the PLD are read in with the instruction READ OPTION VERSION EXTENSION. This makes it possible to distinguish between further options that are added later; the format is as follows:

```
¦  D3  ¦  D2  ¦  D1  ¦  D0  ¦

+------+------+------+------+
¦ INP7 ¦ INP6 ¦ INP5 ¦ INP4 ¦
+------+------+------+------+
   ¦      ¦      ¦      ¦
   +------+------+------+--------- Additional hardware code
```

A PIA N82C55 controller is used for the Centronics and keyboard interfaces and the RS-232-C controller N82050 for the serial interface. The different addresses are given in Table 2.

OPT2	OPT1	OPT0	CPU-ADRESSE	FUNCTION
0	1	1	900 000 H	CENTRONICS / KEYBOARD
1	0	1	E00 000 H	RS-232C

Table 2

Testing Instructions

1. General performance check

1. Test whether the interface is recognized.

   Make sure that STABILOCK 4015 is switched off.

   Attach interface,
   switch set on,
   perform a total reset according to operating instructions (Chapter 1).

   Set should log on with STATUS menu and following display:

   Interface   Serial,KBD,Centr.

   If YES, continue with 4.
   If NO, continue with 2.

2. Interface blocks system

2.1 Press RESET key several times.
P16 10 pulse sequence : 0/1/0.
If YES, continue with 3.
If NO, continue with 2.2.

2.2 Press RESET key several times.
P16 24 pulse sequence : 0/1/0.
If YES, P16 defective?
If NO, continue with 2.3.

2.3 Press RESET key several times.
P16 24 = 0.
If YES, check computer version and exchange:
P16 version 1.0 (see test item 5.)
and back to 1.
If NO, connector defective?

2.4 Back to 1.

3. Check signal path

3.1 D1 1 = 0
  If YES, continue with 3.2.
  If NO, continue with 3.4.

3.2 P16 14 = 0
  If YES, continue with 3.3.

3.3 P16 41 = 0 OR
P16 42 = 0 OR
P16 43 = 0
  If YES, connector defective?
  If NO, P16 defective?

3.4 Back to 1.

4. Special performance check

4.1. Check signal path

D2 9 squarewave signal of frequency 18.432 MHz.

4.2. Test of keyboard interface (KBD)

Connect keyboard and enter data.

4.3. Test of RS-232-C interface

Connect RS-232-C printer.
Make test printout (see Chapter 4, "PRINT").

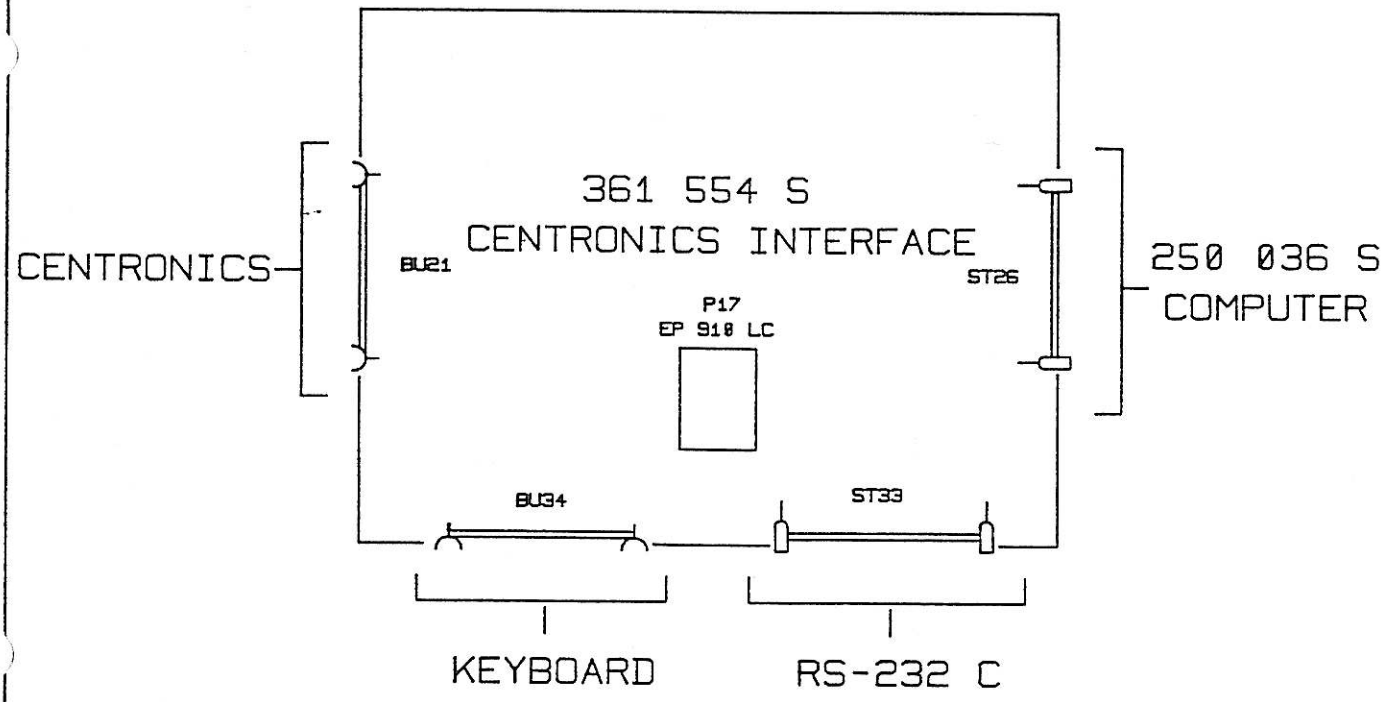
4.4. Test of Centronics interface

Connect Centronics printer.
Make test printout (see Chapter 4, "PRINT").

5. Version number of P16

Because of circuit variants between computer boards of the versions 461 546 01, 461 556 02 on the one hand and 461 546 03 on the other, the options require EPLDs (P16) of different versions.

Computer version	Version number of P16
461 546 01	1.0
461 546 02	1.0
461 546 03 & higher	2.0



				NORM.		
01	1089.22	12.04.91	UNGER	GEPR.		
00	0089.66	23.11.90	HUBER	BEARB.		
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR.67 A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: CENTRONICS INTERFACE	ZEICHNUNGSNR./DRAWING NO.: 236 012 S PROJECT/GROUP: 4015 / 201 238 S

1	2	3	4	5	6	7	8
Pos REF. NO	Wert VALUE	Bezeichnung Schlumberger PART. NO.	Hersteller MANUFACT	Pos. REF. NO.	Wert VALUE	Bezeichnung Schlumberger PART. NO.	Hersteller MANUFACT
1	Bestückte Leiterplatte	361 554					
	hierzu	361 554 Sa					
P17	EP 910 LC	893 389	STG				

Ausgabe ISSUE	Änd.-Mittlg. Nr. MODIFIC. NO.	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02	1089.61	24.7.91	Kr.
01	1089.22	15.4.91	Kr.
00	0089.66	28.11.90	Kr.

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

1990	Tag DATE	Name NAME
gezchr.	28.11.90	Kr.
bearb.	17.4.91	
gepr.		

Schaltteilliste
EL. PARTS LIST

Liste besteht
LIST CONSISTS aus OF 1 Blatt SHEETS

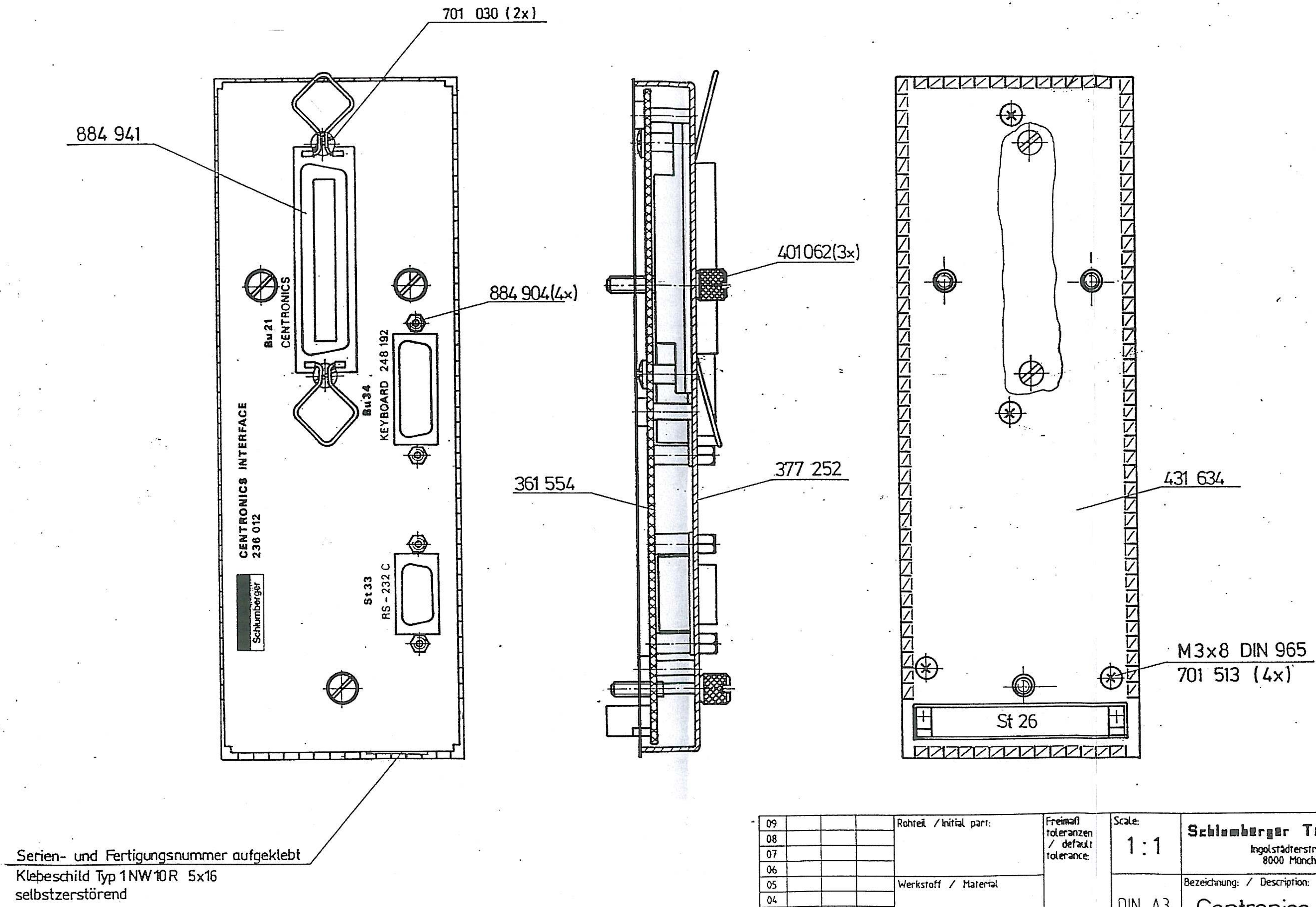
Benennung DESCRIPTION: CENTRONICS INTERFACE

Bezeichnung Schlumberger PART. NO.: 236 012 Sa

Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 236 012 S

Gerät: 4015

Blatt Nr. SHEET NO.: 1



Rev. No.	Rev. Sht.	Date	Name
09			
08			
07			
06			
05			
04			
03	1089.80	15.10.91	Wi.
02	1089.61	24.7.91	Kr.
01	1089.22	12.4.91	Kr.
00	0089.66	28.11.90	Kr.

Rohteil / Initial part:

Werkstoff / Material

Oberfläche / Surface

Freimaß toleranzen / default tolerance

Scale: 1 : 1

DIN A3

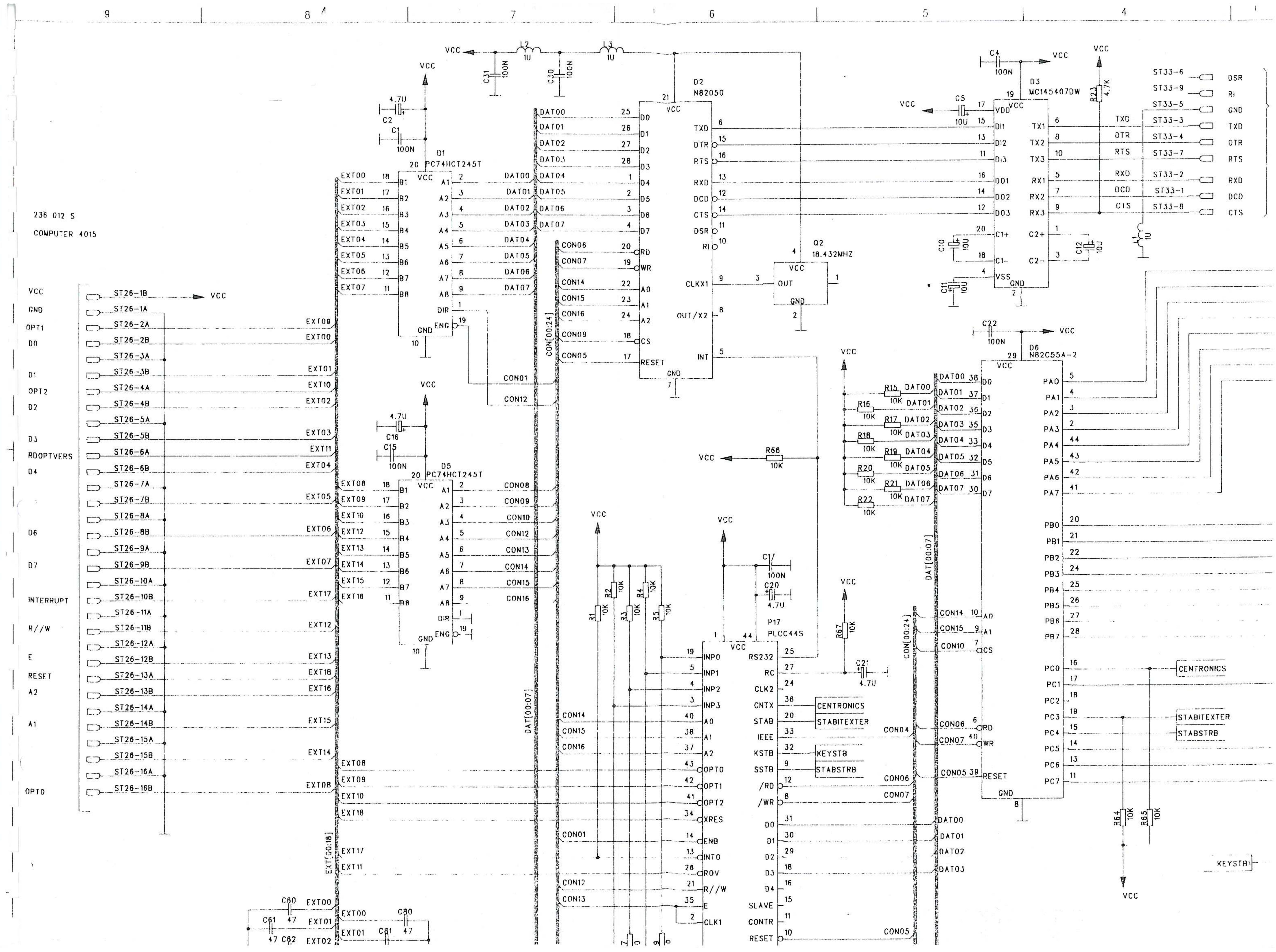
'90	Date	Name
Drawn	5.10.	West.
Designed	17.4.91	
Checked		

Schlumberger Technologies GmbH
Ingolstädterstraße 67a
8000 München 46

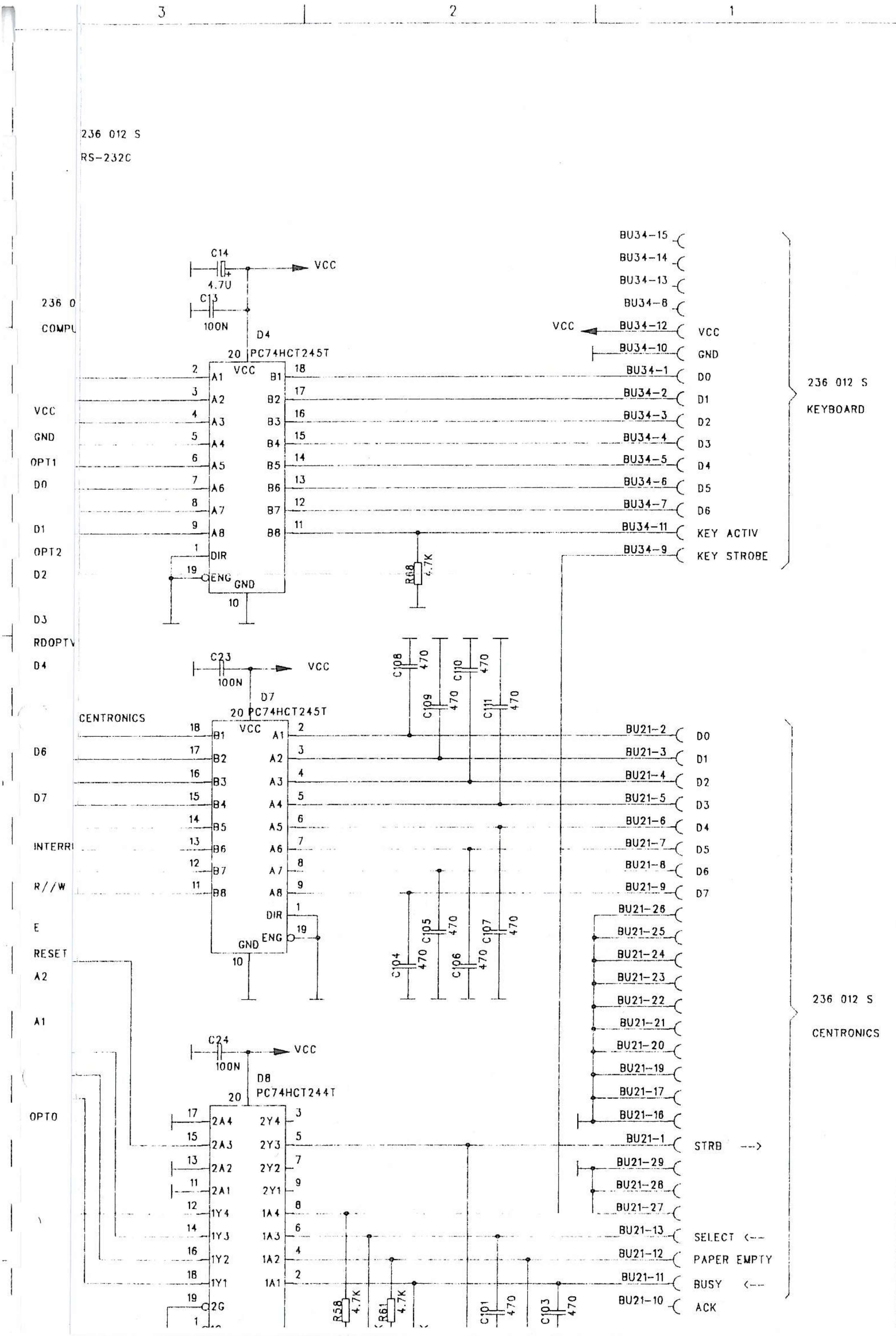
Bezeichnung: / Description:
Centronics Interface

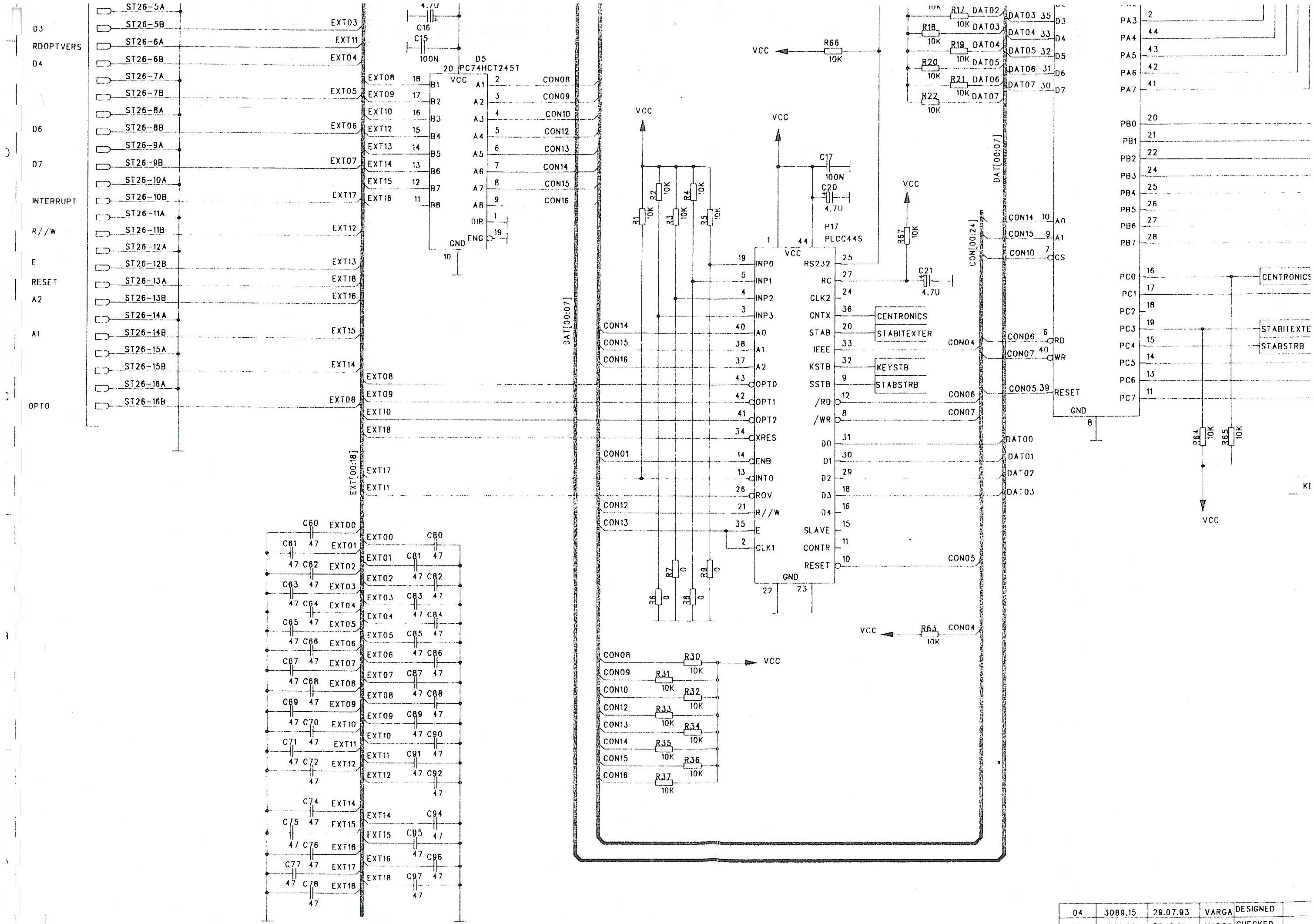
Zeichnungsnr.: / Drawing No.:
236 012

Gerät: / Unit: 4015/108 901



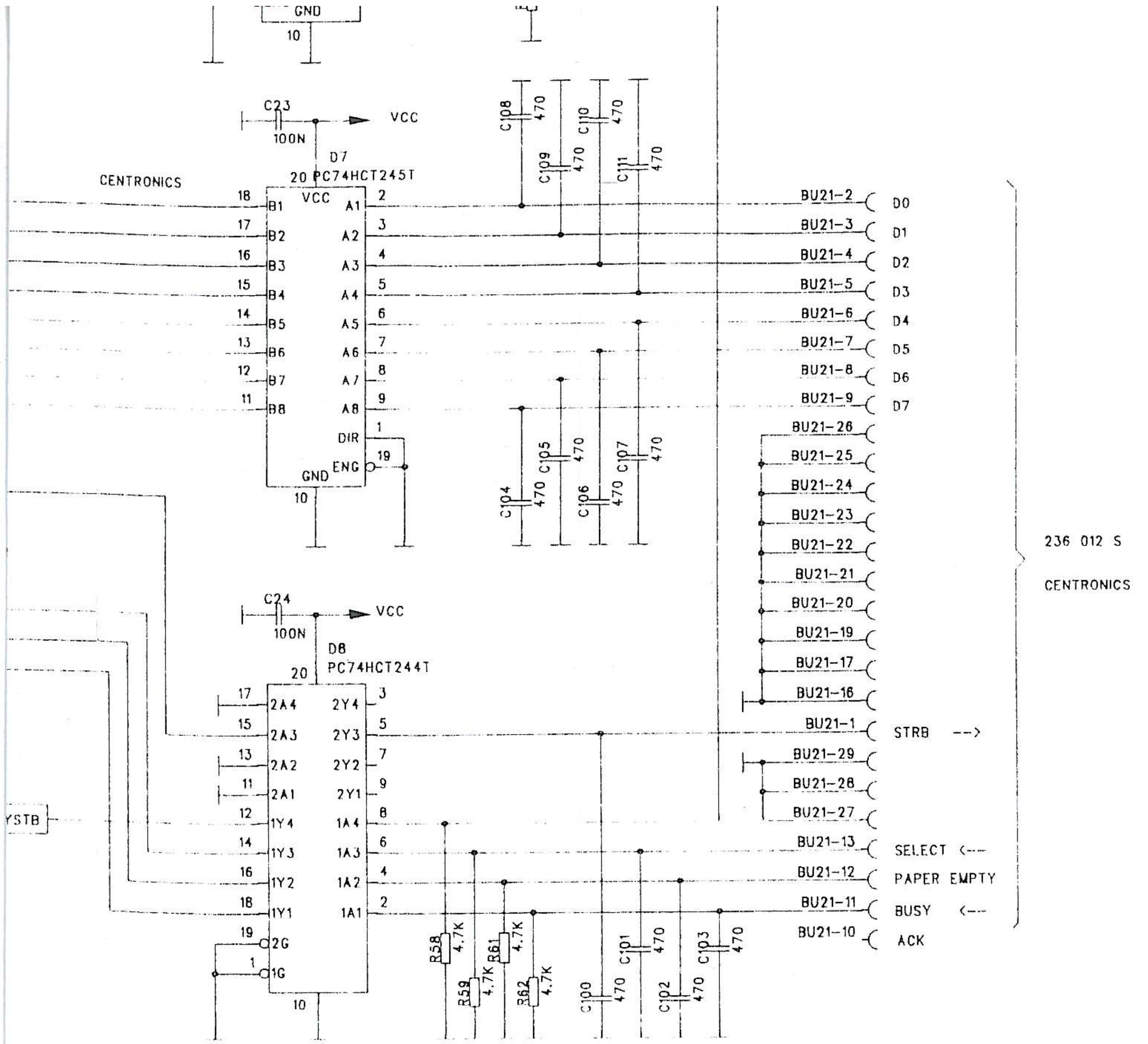
9
8
7
6
5
4
236 012 S
COMPUTER 4015
D1
PC74HCT245T
D5
PC74HCT245T
D2
N82050
D3
MC145407DW
D6
N82C55A-2
P17
PLCC44S
Q2
18.432MHZ
VCC
GND
OPT1
D0
D1
OPT2
D2
D3
RDOPTVERS
D4
D6
D7
INTERRUPT
R//W
E
RESET
A2
A1
OPT0
DAT[00:07]
CON[00:24]
EXT[00:18]
ST33-6 DSR
ST33-9 RI
ST33-5 GND
ST33-3 TXD
ST33-4 DTR
ST33-7 RTS
ST33-2 RXD
ST33-1 DCD
ST33-8 CTS
CENTRONICS
STABITEXTER
STABSTRB
KEYSTB
L2 1U
L3 1U
C31 100N
C30 100N
C4 100N
C5 10U
R23 4.7K
R66 10K
R67 10K
R64 10K
R65 10K


3
2
1
F
E
D
236 012 S
RS-232C
236 0
COMPU
VCC
GND
OPT1
D0
D1
OPT2
D2
D3
RDOPTV
D4
CENTRONICS
D6
D7
INTERRU
R//W
E
RESET
A2
A1
OPTO
C14
4.7U
C13
100N
VCC
D4
PC74HCT245T
C23
100N
D7
PC74HCT245T
C24
100N
D8
PC74HCT244T
R68
4.7K
R58
4.7K
R61
4.7K
C101
C103
C104
C105
C106
C107
C108
C109
C110
C111
470
BU34-15
BU34-14
BU34-13
BU34-8
BU34-12
BU34-10
BU34-1
BU34-2
BU34-3
BU34-4
BU34-5
BU34-6
BU34-7
BU34-11
BU34-9
GND
KEY ACTIV
KEY STROBE
236 012 S
KEYBOARD
BU21-2
BU21-3
BU21-4
BU21-5
BU21-6
BU21-7
BU21-8
BU21-9
BU21-26
BU21-25
BU21-24
BU21-23
BU21-22
BU21-21
BU21-20
BU21-19
BU21-17
BU21-16
BU21-1
BU21-29
BU21-28
BU21-27
BU21-13
BU21-12
BU21-11
BU21-10
STRB -->
SELECT <--
PAPER EMPTY
BUSY <--
ACK
236 012 S
CENTRONICS



04	3089.15	29.07.93	VARGA	DESIGNED	
03	1089.80	30.10.91	VARGA	CHECKED	
02	1089.61	19.07.91	METZ	DRAWN	07.11
INDEX ISS	Ä.-NR. MODIF	DATUM DATE	NAME NAME		DAT DA

9 8 7 6 5 4 DIESE

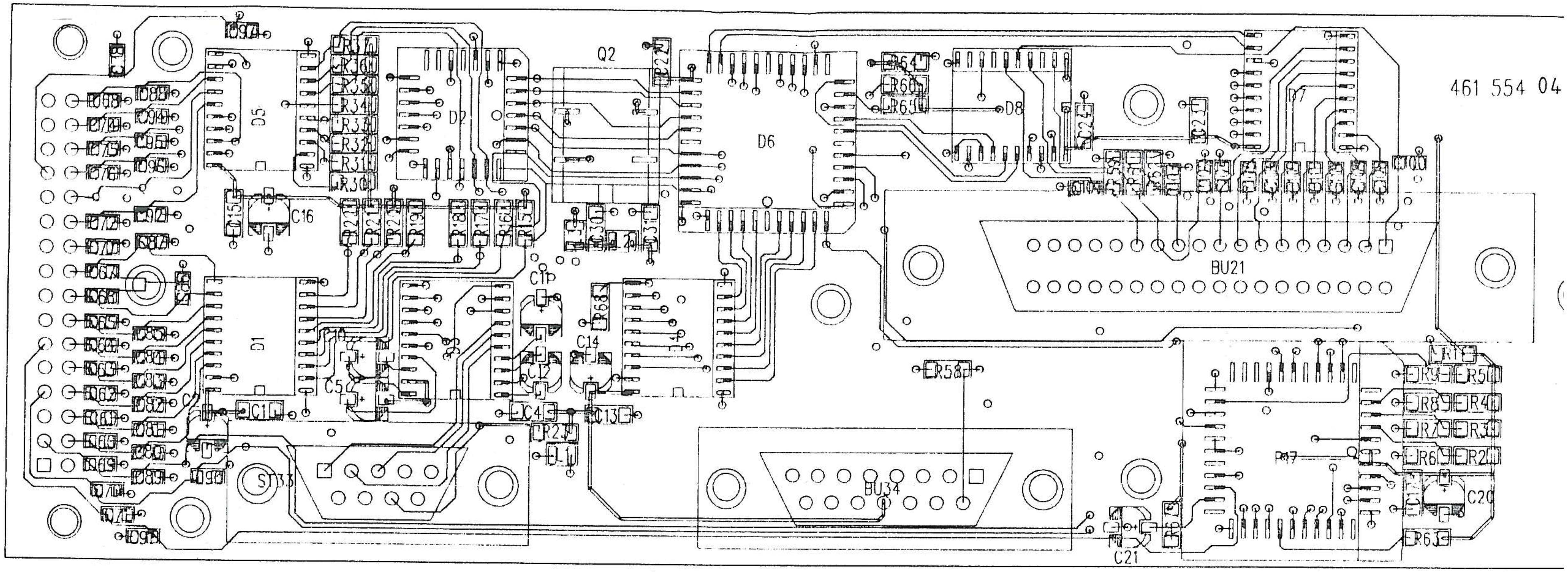


361 554
461 554 04

90	GRIE	SCHLUMBERGER TECHNOLOGIES GMBH Gutenbergstr. 2–4 8045 ISMANING	BEZEICHNUNG/DESCRIPTION: CENTRONICS–INTERFACE	ZEICHNUNGSNR./DRAWING NO.: 361 554 S PROJECT/GROUP: 4015 / 236 012 S NC	1 VON/OF 1 BLATT SHEET
M	NAME				
T	NAME				

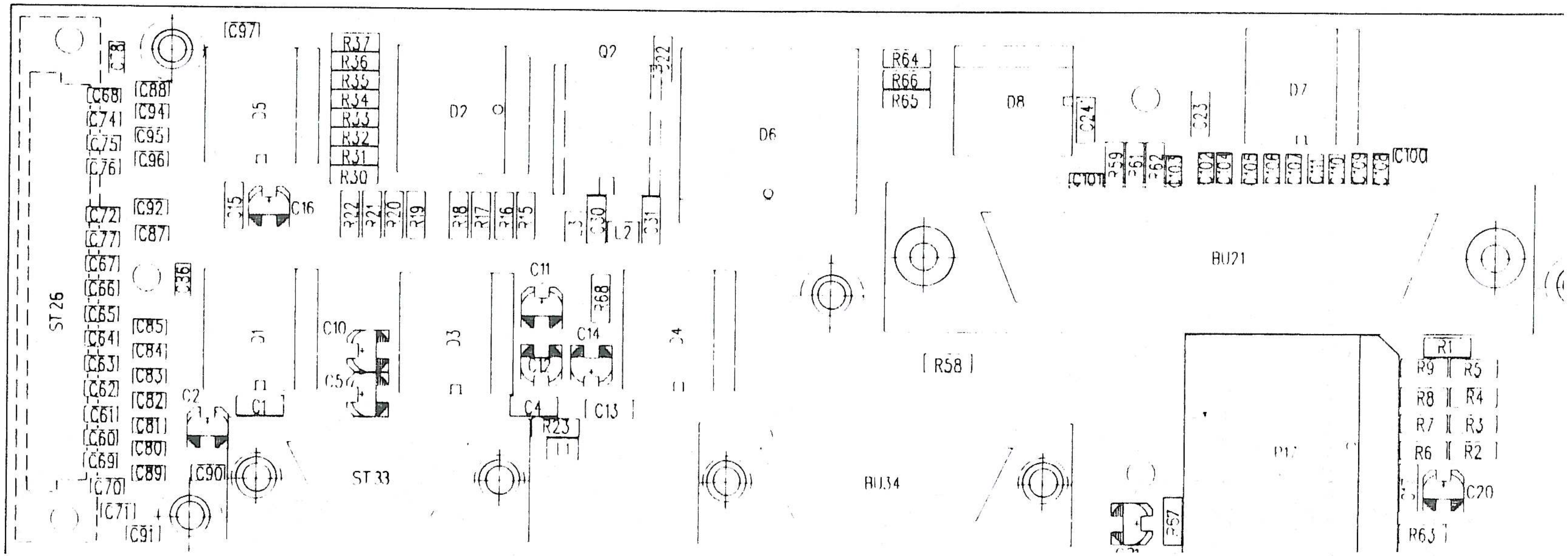
9 8 7 6 5 4

F


461 554 04
D5
D2
Q2
D6
D8
D7
D1
BU21
BU34
ST33
C16
C14
C21
C20
R58

E

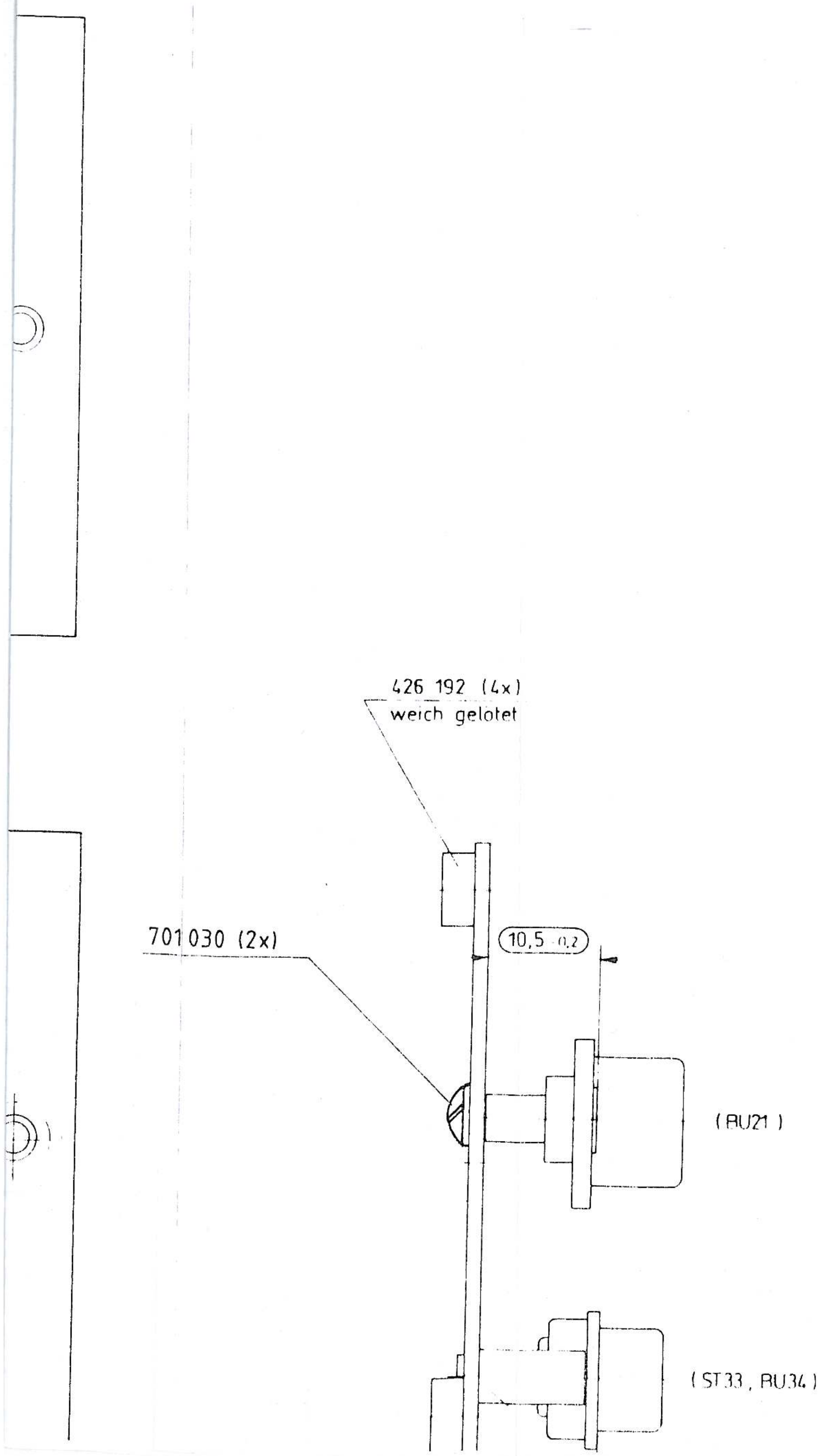
D

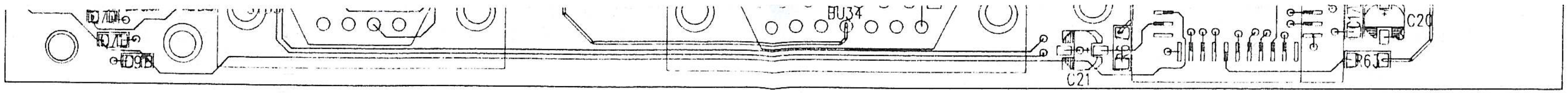

C97
R37
R36
R35
R34
R33
R32
R31
R30
D2
Q2
D6
R64
R66
R65
D8
D7
C100
C101
C16
BU21
ST26
C11
R68
C14
C10
R58
R1
R9
R5
R8
R4
R7
R3
R6
R2
C20
ST33
BU34
R63

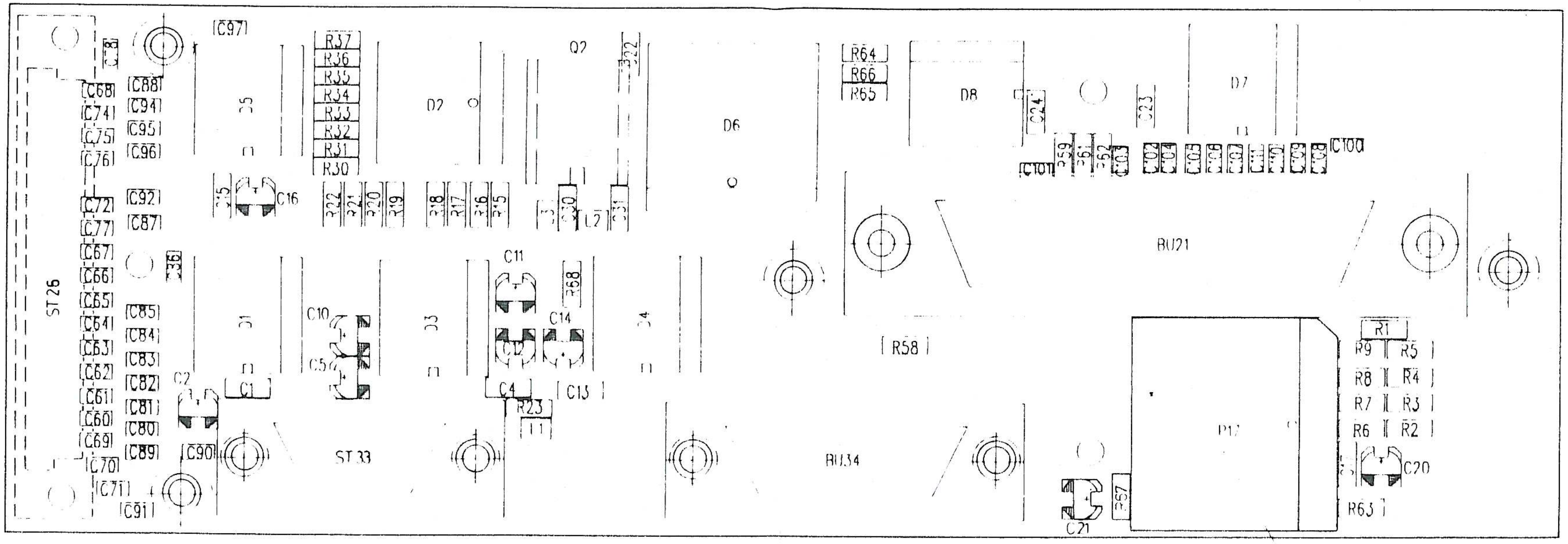
C

Reflow und Sonderlotung

Hierzu Bauteilklebemaske 461 554 04







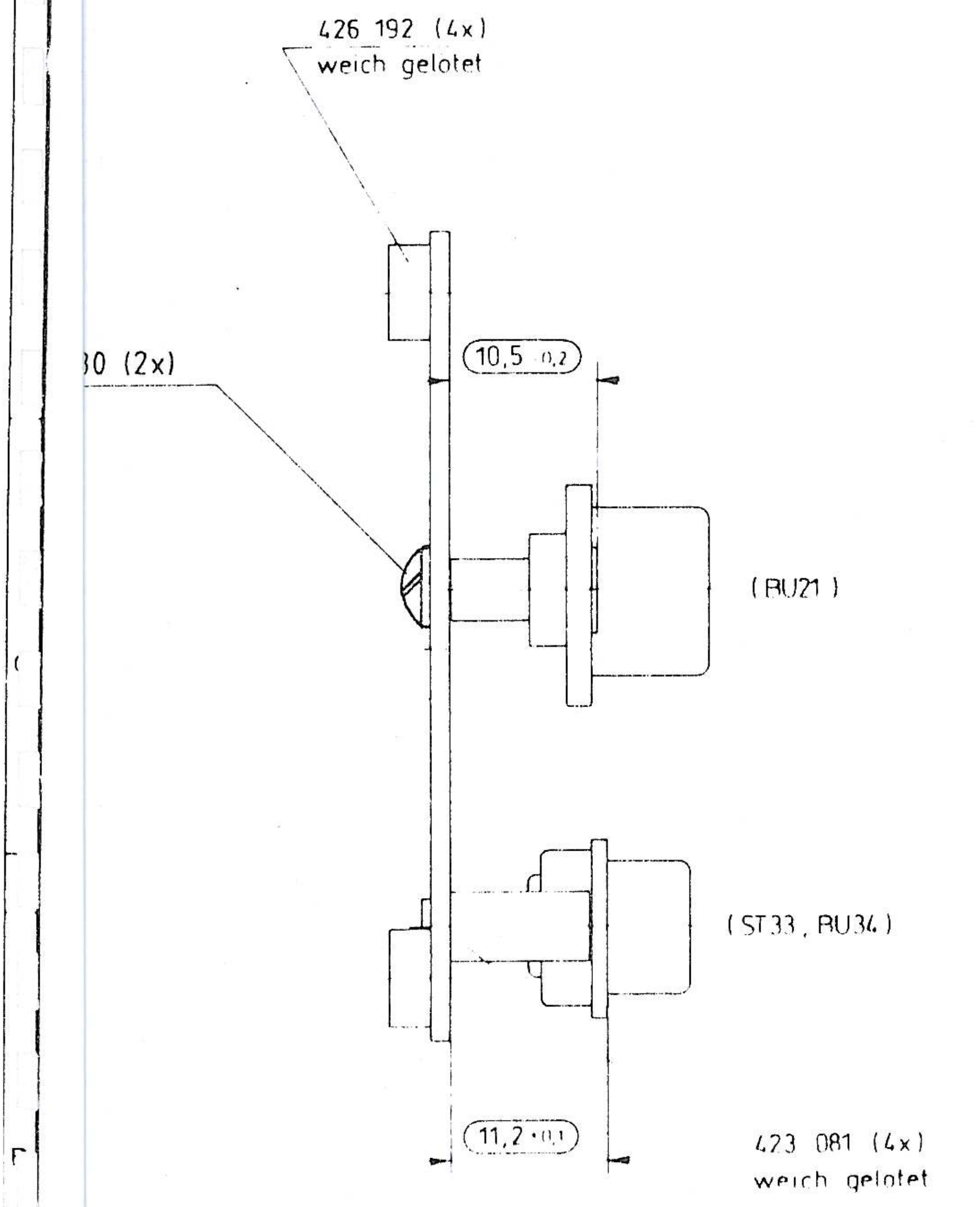
701 C

'834 963 / P17

A

Schaltplanpositionierung = 361 554 S/Sa

9 8 7 6 5 4



Kontrollmaß
Critical measurements

Rev	Sht	Date	Name
9			
8			
7			
6			
5			
4	3089.15	27.7.93	Wi.
3	1089.80	15.10.91	Wi.
2	1089.61	25.7.91	Kr.
1	1089.22	15.4.91	Kr.
0			

Rohteil / Initial part
Werkstoff / Material
Oberfläche / Surface

Freimaßtoleranzen / default tolerance

Scale: 2:1

DIN A2

1991	Date	Name
Drawn	15.4.91	Kr.
Designed	12.4.91	
Checked		

Schlumberger Technologies GmbH
Ingolstädter Straße 67a
8000 München 46

Bezeichnung / Description
Bestückte Leiterplatte
Typ CENTRONICS INTERFACE

Zeichnungsnr. / Drawing No. 361 554

Gerät / Unit 4015 / 236 012

3

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

Pos.	Benennung	Wert	HNK-Nr.	Herst.
BU21	D-Steckverbinder,bearb.	36polig	898081	STG
BU34	D-Buchse mit Filter	15polig	884661	SC
C1	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C2	Elko	4.7µF ±20% 25V-	814372	RÖD
C4	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C5	Elko	10µF ±20% 16V-	814382	RÖD
C10	Elko	10µF ±20% 16V-	814382	RÖD
C11	Elko	10µF ±20% 16V-	814382	RÖD
C12	Elko	10µF ±20% 16V-	814382	RÖD
C13	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C14	Elko	4.7µF ±20% 25V-	814372	RÖD
C15	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C16	Elko	4.7µF ±20% 25V-	814372	RÖD
C17	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C20	Elko	4.7µF ±20% 25V-	814372	RÖD
C21	Elko	4.7µF ±20% 25V-	814372	RÖD
C22	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C23	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C24	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C30	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C31	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C60	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C61	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C62	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C63	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C64	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C65	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C66	Kondensator NP0	47pF ±5% 50V-	813231	VIT

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
02 Index	3089.15 Ä.Nr.	27.07.93 Datum	Wi. Name	Bestückte Leiterplatte Typ:CENTRONICS-INTERFACE	5
Erst.: UNG		Gepr.:		361 554 Sa	Seite Nr
Gerät: 4015 / 236 012					1

Pos.	Benennung	Wert	HNK-Nr.	Herst.
Q2	SMD-Quarz	18.432MHZ	853308	
R1	Chip-Widerstand	10kΩ ±1%	804749	VAL
R2	Chip-Widerstand	10kΩ ±1%	804749	VAL
R3	Chip-Widerstand	10kΩ ±1%	804749	VAL
R4	Chip-Widerstand	10kΩ ±1%	804749	VAL
R5	Chip-Widerstand	10kΩ ±1%	804749	VAL
R6	Chip-Widerstand	0Ω	804700	VAL
R7	Chip-Widerstand	0Ω	804700	VAL
R8	Chip-Widerstand	0Ω	804700	VAL
R9	Chip-Widerstand	0Ω	804700	VAL
R15	Chip-Widerstand	10kΩ ±1%	804749	VAL
R16	Chip-Widerstand	10kΩ ±1%	804749	VAL
R17	Chip-Widerstand	10kΩ ±1%	804749	VAL
R18	Chip-Widerstand	10kΩ ±1%	804749	VAL
R19	Chip-Widerstand	10kΩ ±1%	804749	VAL
R20	Chip-Widerstand	10kΩ ±1%	804749	VAL
R21	Chip-Widerstand	10kΩ ±1%	804749	VAL
R22	Chip-Widerstand	10kΩ ±1%	804749	VAL
R23	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R30	Chip-Widerstand	10kΩ ±1%	804749	VAL
R31	Chip-Widerstand	10kΩ ±1%	804749	VAL
R32	Chip-Widerstand	10kΩ ±1%	804749	VAL
R33	Chip-Widerstand	10kΩ ±1%	804749	VAL
R34	Chip-Widerstand	10kΩ ±1%	804749	VAL
R35	Chip-Widerstand	10kΩ ±1%	804749	VAL
R36	Chip-Widerstand	10kΩ ±1%	804749	VAL
R37	Chip-Widerstand	10kΩ ±1%	804749	VAL
R58	Chip-Widerstand	4.7kΩ ±1%	804745	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten 5
02 Index	3089.15 Ä.Nr.	27.07.93 Datum	Wi. Name	Bestückte Leiterplatte Typ:CENTRONICS-INTERFACE	
Erst.: UNG	Gepr.:			361 554 Sa	Seite Nr
Gerät: 4015 / 236 012					4

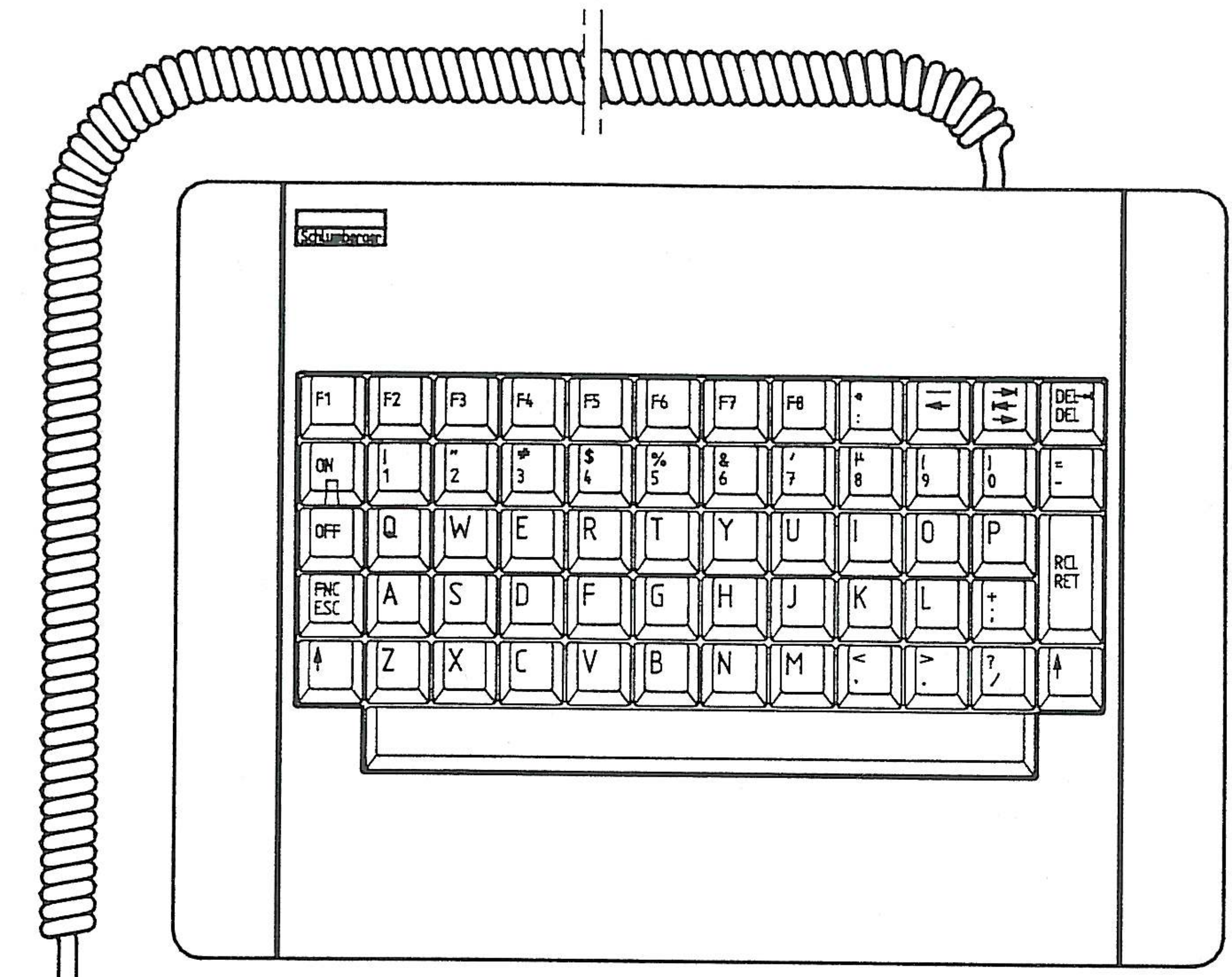
Pos.	Benennung	Wert	HNK-Nr.	Herst.
C67	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C68	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C69	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C70	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C71	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C72	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C74	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C75	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C76	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C77	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C78	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C80	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C81	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C82	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C83	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C84	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C85	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C86	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C87	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C88	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C89	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C90	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C91	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C92	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C94	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C95	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C96	Kondensator NP0	47pF ±5% 50V-	813231	VIT

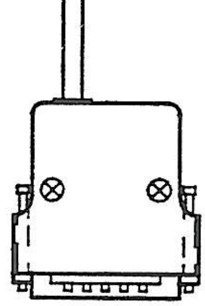
Pos.	Benennung	Wert	HNK-Nr.	Herst.
C97	Kondensator NP0	47pF ±5% 50V-	813231	VIT
C100	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C101	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C102	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C103	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C104	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C105	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C106	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C107	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C108	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C109	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C110	Kondensator NP0	470pF ±5% 50V-	813243	VIT
C111	Kondensator NP0	470pF ±5% 50V-	813243	VIT
D1	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D2	RS-232C-Controller	N82050	835018	INTEL
D3	V24-Treiber	MC145407DW	835367	MOT
D4	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D5	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D6	PPI	N82C55A-2	834870	INTEL
D7	Bidir. Bustreiber	PC74HCT245T	835327	VAL
D8	Buffer	PC74HCT244T	834436	VAL
L1	Keramik-Spule	1μH ±5%	821227	STET
L2	Keramik-Spule	1μH ±5%	821227	STET
L3	Keramik-Spule	1μH ±5%	821227	STET
P17	IC-Sockel	44polig	834963	AMP

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
02 Index	3089.15 Ä.Nr.	27.07.93 Datum	Wi. Name	Bestückte Leiterplatte Typ:CENTRONICS-INTERFACE	5
Erst.: UNG		Gepr.:		361 554 Sa	Seite Nr
Gerät: 4015 / 236 012					3

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R59	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R61	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R62	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R63	Chip-Widerstand	10kΩ ±1%	804749	VAL
R64	Chip-Widerstand	10kΩ ±1%	804749	VAL
R65	Chip-Widerstand	10kΩ ±1%	804749	VAL
R66	Chip-Widerstand	10kΩ ±1%	804749	VAL
R67	Chip-Widerstand	10kΩ ±1%	804749	VAL
R68	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
ST26	Messerleiste DIN 41612	32polig a/b	884506	ERNI
ST33	D-Stecker mit Filter	9polig	884660	SC

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten 5
02 Index	3089.15 Ä.Nr.	27.07.93 Datum	Wi. Name	Bestückte Leiterplatte Typ:CENTRONICS-INTERFACE	
Erst.: UNG		Gepr.:		361 554 Sa	Seite Nr 5
Gerät: 4015 / 236 012					





Hersteller: Firma Cherry
Bestellbez.: 248 192

Service Unterlagen von Fa. Cherry
Zeichnungsnr. 601-1640 248 192S in DOK-Archiv Zulieferfirmen

= Kontrollmaß
Critical measurements

Rev. No.	Rev. Sht.	Date	Name
09			
08			
07			
06			
05			
04			
03			
02			
01			
00	1088.21	14.05.91	H.W.

Rohteil / Initial part:

Werkstoff / Material:

Oberfläche / Surface:

Freimaß toleranzen / default tolerance:

Scale: 1 : 2

DIN A4

1991	Date	Name
Drawn	14.05.	Weidinger
Designed		
Checked		

Schlumberger Technologies GmbH
Ingolstädterstraße 67a
8000 München 46

Bezeichnung: / Description:

KEYBOARD

Type: G20-1246 H

Zeichnungsnr.: / Drawing No.: 248 192

Gerät: / Unit: 4015 / 4031

Makro ☐

PQ

External Synchronization (10 MHz)

With this option the Communication Test Set can be synchronized with other instruments. What is necessary for this is a 10-MHz signal on socket Bu22. The 20-MHz reference oscillator (TCXO) of the 4015 is synchronized with the applied 10-MHz signal by the external synchronization.

The 10-MHz signal is divided down to 400 kHz and fed to phase comparator D2. On the other input of the phase comparator there is the signal of the reference oscillator, likewise divided down to 400 kHz. The loop filter, with A3 on the phase-comparator output, generates the control voltage for the reference oscillator. The control voltage is connected through by A1-A and A2 when a signal appears on socket Bu22. When the 4015 is synchronized, the output of A1-B is High and LED GL15 lights up.

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
4015, signal generator 4002 or 4015, oscilloscope, DVM, frequency counter					
	Ext. Sync. on 4015. Signal generator f = 10.00 MHz and connect V > 0.5 Vpp to Bu22. Synchronize frequency counter with signal generator.				
DVM	Test level detection.	A1-A/1	DC		0 to +0.8 V
Frequency counter		D2/14	400 kHz		TTL
Oscilloscope		D2/3	400 kHz		TTL
	Divider test				
DVM	PLL test				
	Increase f = 10.00 MHz on Bu22 to f = 10.10 MHz. LED GL15 does not light.	St27/9A	DC		-1 to -0.4 V
	Reduce f = 10.10 MHz on Bu22 to f = 9.90 MHz. LED GL15 does not light.	St27/9A	DC		+1.8 to +2.5 V
Frequency counter DVM	**Sync check**				
	Apply f = 10.0000 MHz to Bu22. RX mode, set f = 10.00 MHz on 4015. Measure output frequency on socket RX High.	Socket RX High St27/9A	10.0000 MHz DC		LED GL15 lights 0 to +1.4 V
	Apply f = 10.00003 MHz to Bu22.	Socket RX High St27/9A	10.00003 MHz DC		LED GL15 lights 0 to +1.4 V
	Apply f = 9.99997 MHz to Bu22.	Socket RX High St27/9A	9.99997 MHz DC		LED GL15 lights 0 to +1.4 V

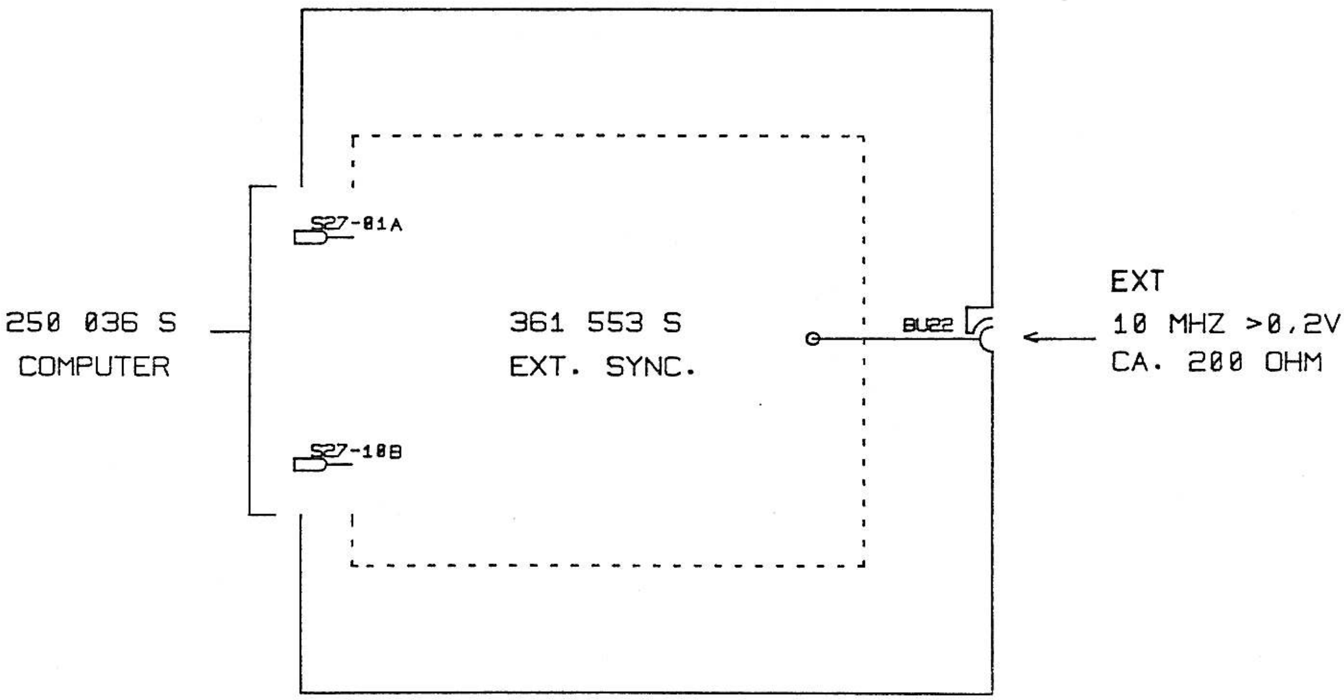
Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	13.06.91	Peinl	STABILOCK 4015	Ext. Synchronization	214 026 A			1/2

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjust-ment	Set Value
	Check of capture time Alternately apply and disconnect 10.0000-MHz signal on Bu22. LED GL15 lights up and extinguishes again.				approx. 1-3 s

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	13.06.91	Peinl	STABILOCK 4015	Ext. Synchronization	214 026 A			2/2



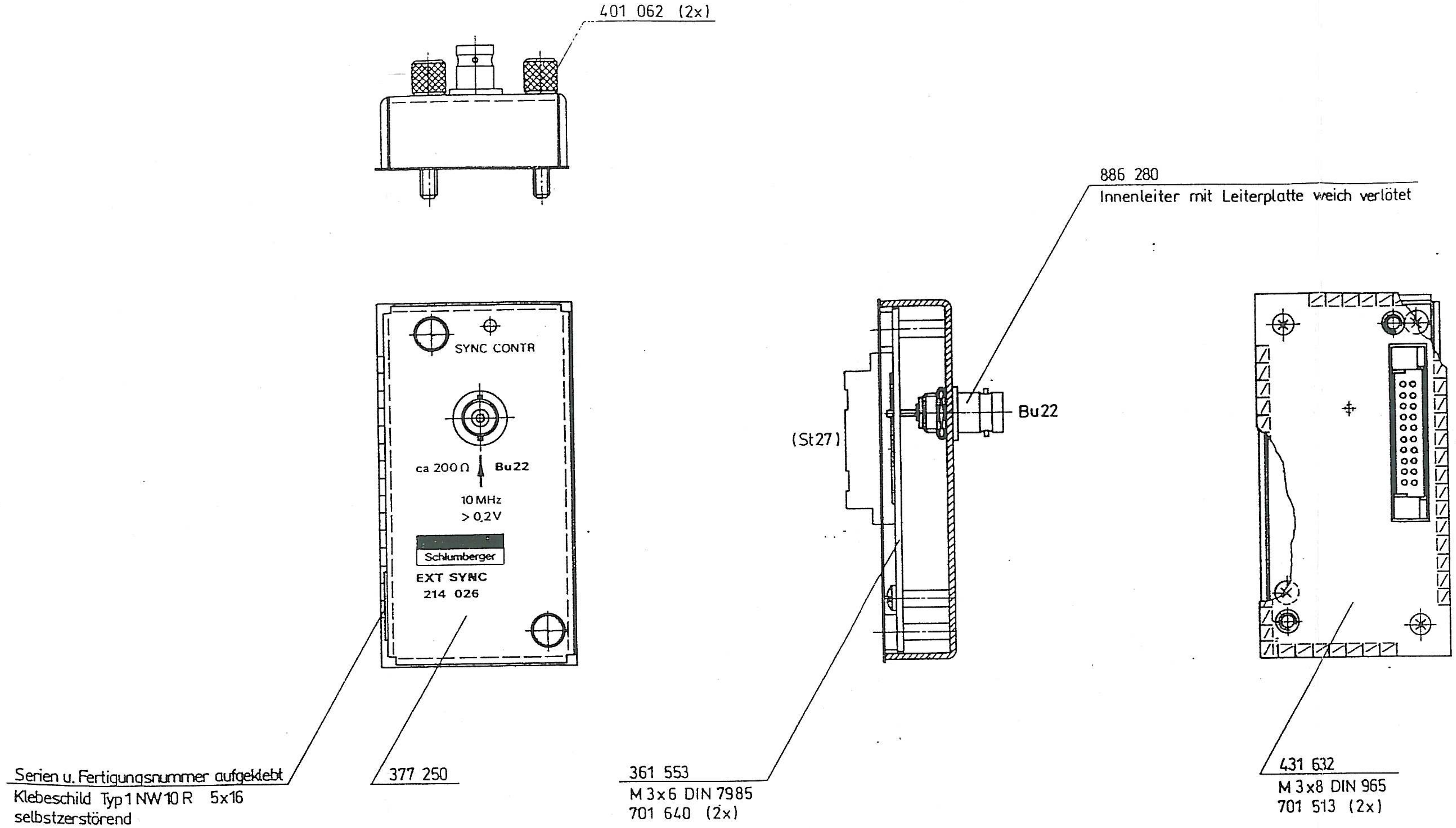
				NORM.		
				GEPR.		
00	0089.64	15.11.90	UNGER	BEARB.	26.07.90	UNGER
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER
TECHNOLOGIES GMBH
INGOLSTÄDTER STR.67 A
8000 MÜNCHEN 46

EXT SYNCHRON

214 026 S

GERÄT: 4015 / 108 901



Ausgabe	Ändg.-Mittlg	Datum	Name				
01	1089.31	29.4.91	Kr.	Rohteil	Freimaßtoleranzen	Maßstab 1:1	Schlumberger Meßgeräte GmbH Ingolstädter Straße 67 a 8000 München 46
00	0089.64	15.11.90	Kr.	Werkstoff			EXT SYNC
				Oberfläche	1990 / Datum / Name		214 026
					gez 19.7.90 Kr.		
					bearb 16.11.90		
					gepr		Gerät 4015 / 108 901

Schaltplanpositionierung ≙ 214 026 S/Sa

Pos. REF. NO	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT	Pos. REF. NO	Wert VALUE	Bezeichnung Schlumberger PART NO	Hersteller MANUFACT
1	Bestückte Leiterplatte	361 553 S					
	hierzu	361 553 Sa					
Bu 22	22 BNC-50-0-5	886 280	SUHN				

Ausgabe ISSUE	Änd.-Mittlg Nr MODIFIC NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02			
01			
00	0089.64	15.11.90	Kr.

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

	Tag DATE	Name NAME
gesch.	26.7.90	Jakob
bearb.	16.11.90	
gepr.		

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: Externe Synchronisation

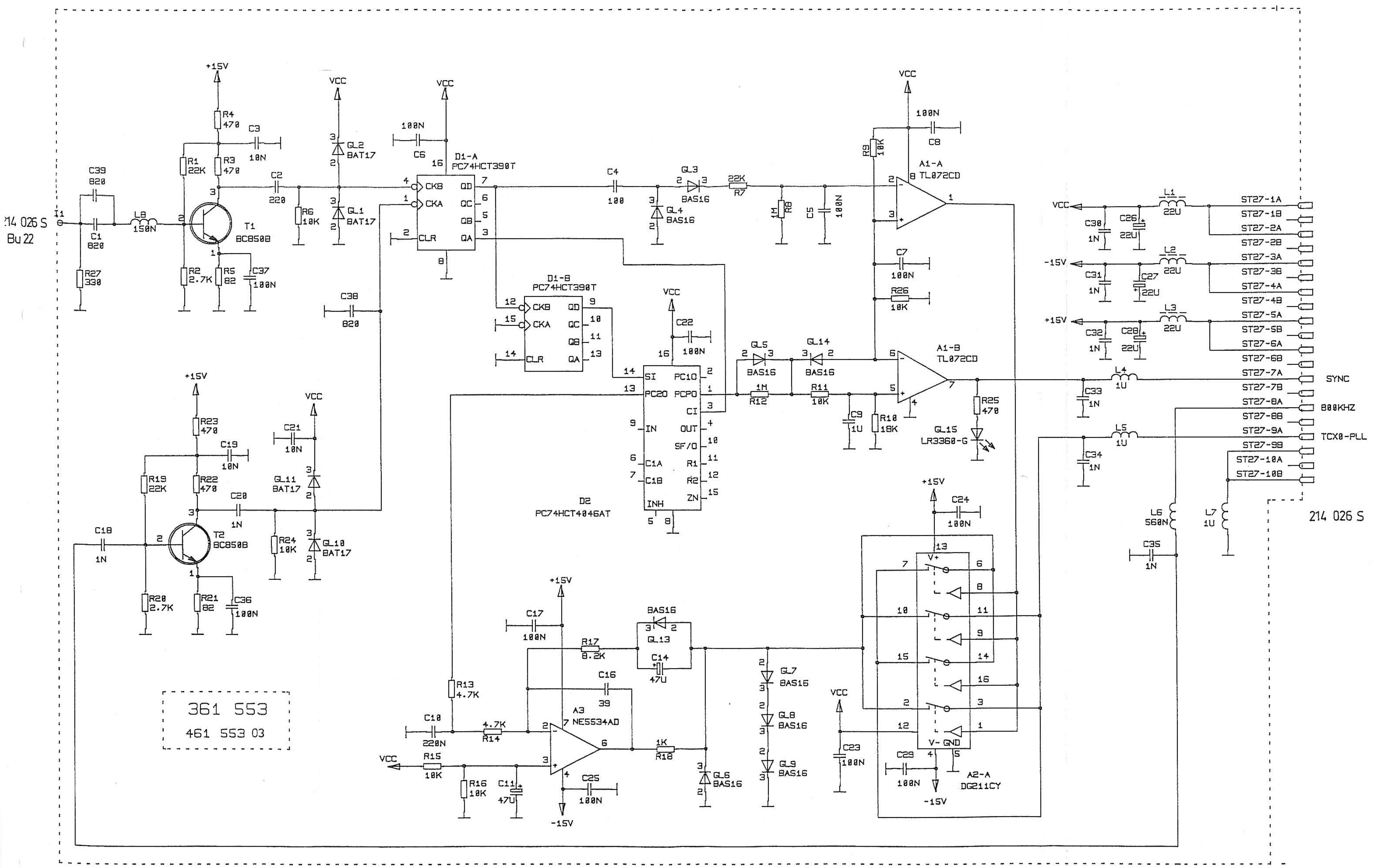
Bezeichnung Schlumberger PART NO: 214 026 Sa

Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 214 026 S

Gerät: 4015 / 108 901

Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

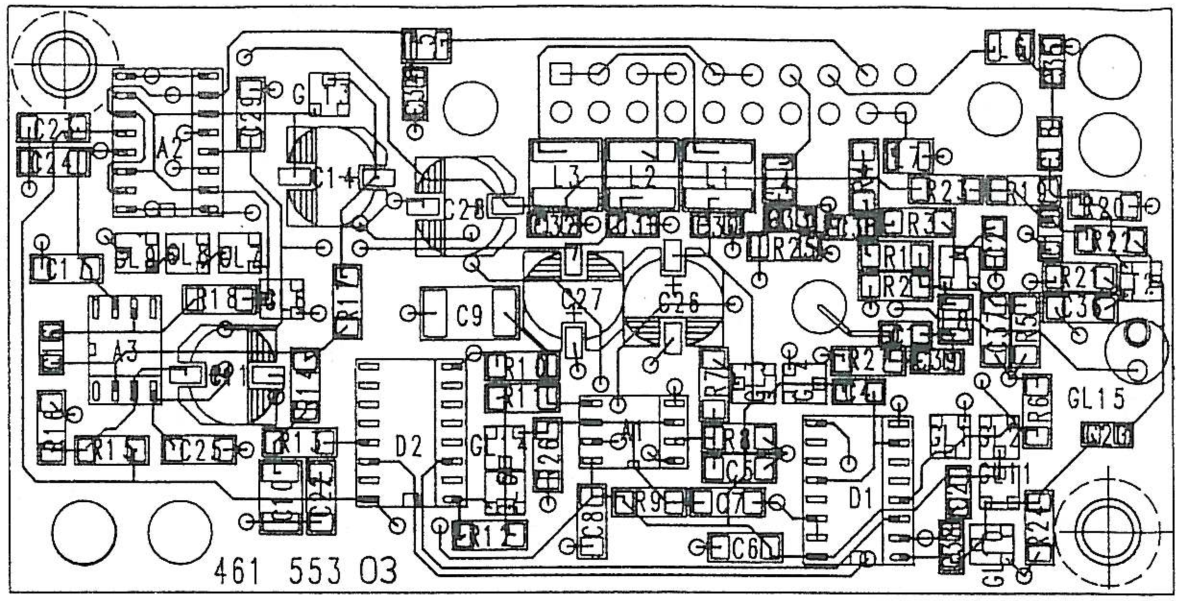
Blatt Nr SHEET NO: 1

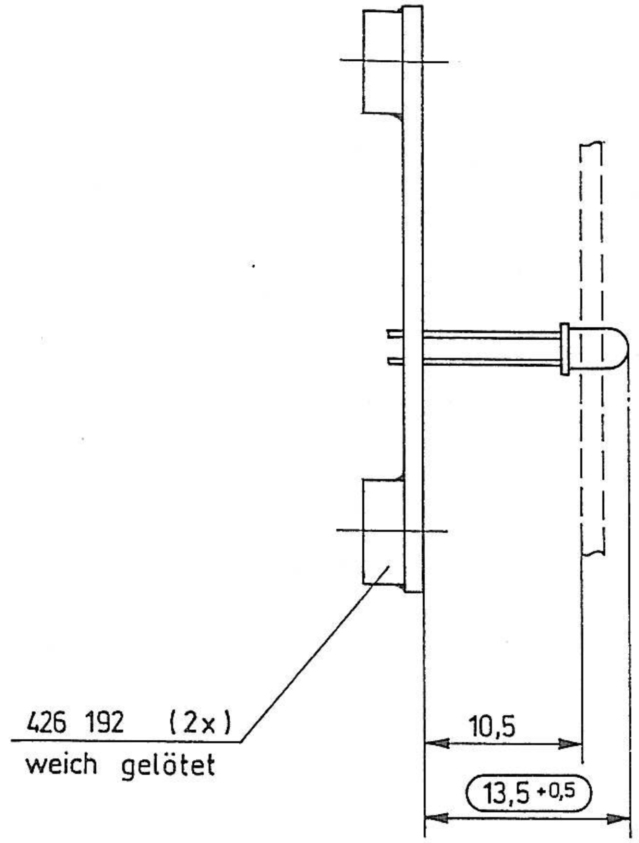


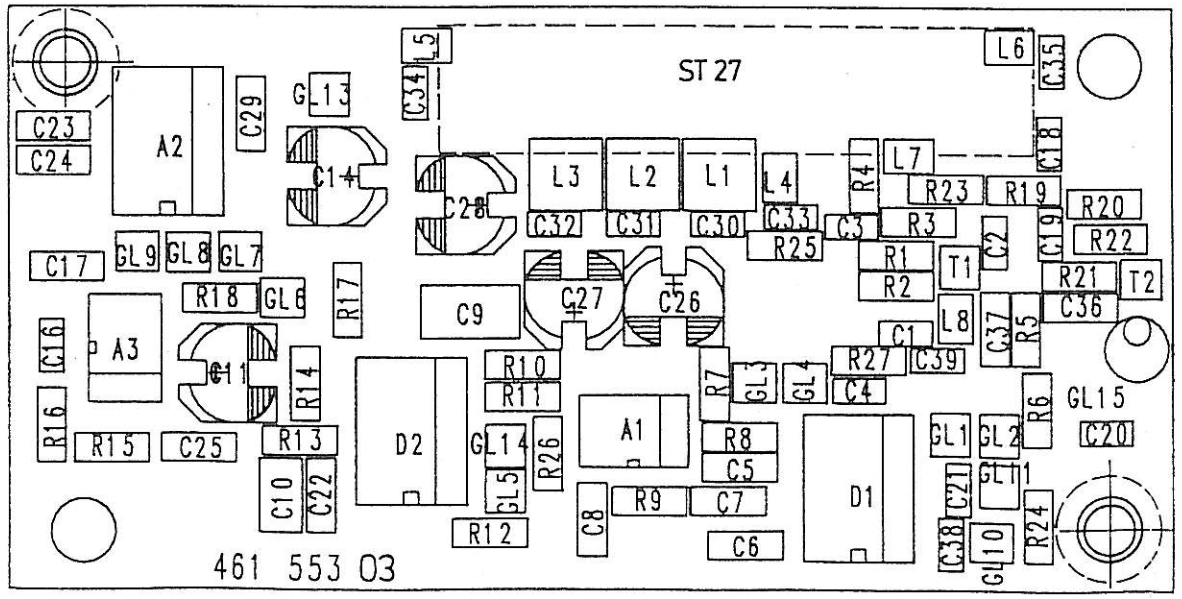
				NORM.			SCHLUMBERGER TECHNOLOGIES GMBH	EXT SYNCHRON	361 553 S	1 VON/OF 1
01	1089.31	29.4.91	Kr.	GEPR.			INGOLSTÄDTER STR. 67A			
00	0089.64	7.11.90	PEINL	BEARB.	25.04.89	BAU	8000 MÜNCHEN 46			
INDEX ISS.	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME			GERÄT: 4015	BLATT SHEET

Reflow gelötet

hierzu Bauteilklebemaske 461 553 03







Schaltplanpositionierung ≙ 361 553 S / Sa

Rev. No.	Rev. Sht.	Date	Name
09			
08			
07			
06			
05			
04			
03			
02			
01	1089.31	29.4.91	Kr.
00	0089.64	15.11.90	Kr.

Rohteil / Initial part:	
Werkstoff / Material:	
Oberfläche / Surface:	
Freimaßtoleranzen / default tolerance:	± 0,2
Scale:	2:1
	DIN A3

1990	Date	Name
Drawn	14.11.90	Kr.
Designed		
Checked		

Schlumberger Technologies GmbH
Ingolstädter Straße 67 a
8000 München 46

Bezeichnung / Description:

Bestückte Leiterplatte

Typ: EXT. SYNCHRON

Zeichnungsnr. / Drawing No.: 361 553

Gerät / Unit: 4015 / 214 026

E D

7 6 5 4

Pos.	Benennung	Wert	HNK-Nr.	Herst.
A1	OPV	TL072CD	834222	TI
A2	Analog Schalter	DG211CY	834471	SILI
A3	OPV	NE5534AD	834209	VAL
C1	Kondensator NP0	820pF ±5% 50V-	813246	VIT
C2	Kondensator NP0	220pF ±5% 50V-	813239	VIT
C3	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C4	Kondensator NP0	100pF ±5% 50V-	813235	VIT
C5	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C6	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C7	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C8	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C9	Kondensator Z5U	1µF ±20% 50V-	813390	VIT
C10	Kondensator X7R	220nF ±10% 50V-	813379	VIT
C11	Elko	47µF ±20% 16V-	814386	RÖD
C14	Elko	47µF ±20% 16V-	814386	RÖD
C16	Kondensator NP0	39pF ±5% 50V-	813230	VIT
C17	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C18	Kondensator X7R	1nF ±10% 50V-	813320	VIT
C19	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C20	Kondensator X7R	1nF ±10% 50V-	813320	VIT
C21	Kondensator X7R	10nF ±10% 50V-	813332	VIT
C22	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C23	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C24	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C25	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C26	Elko	22µF ±20% 25V-	814376	RÖD
C27	Elko	22µF ±20% 25V-	814376	RÖD
C28	Elko	22µF ±20% 25V-	814376	RÖD

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten 4
00 Index	0089.64 Ä.Nr.	15.11.90 Datum	Kr. Name	Bestückte Leiterplatte Typ: EXT.SYNCHRON	
Erst.: VARGA Gepr.:				361 553 Sa	Seite Nr 1
Gerät: 4015 / 214 026					

Pos.	Benennung	Wert	HNK-Nr.	Herst.
C29	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C30	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C31	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C32	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C33	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C34	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C35	Kondensator NP0	1nF ±5% 50V-	813247	VIT
C36	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C37	Kondensator X7R	100nF ±10% 50V-	813375	VIT
C38	Kondensator NP0	820pF ±5% 50V-	813246	VIT
C39	Kondensator NP0	820pF ±5% 50V-	813246	VIT
D1	Decade Counter	PC74HCT390T	834438	VAL
D2	PLL / VCO	PC74HCT4046AT	834440	VAL
GL1	Schottky-Diode	BAT17	830516	VAL
GL2	Schottky-Diode	BAT17	830516	VAL
GL3	Diode	BAS16	830552	VAL
GL4	Diode	BAS16	830552	VAL
GL5	Diode	BAS16	830552	VAL
GL6	Diode	BAS16	830552	VAL
GL7	Diode	BAS16	830552	VAL
GL8	Diode	BAS16	830552	VAL
GL9	Diode	BAS16	830552	VAL
GL10	Schottky-Diode	BAT17	830516	VAL
GL11	Schottky-Diode	BAT17	830516	VAL
GL13	Diode	BAS16	830552	VAL
GL14	Diode	BAS16	830552	VAL
GL15	Leuchtdiode rot	LR3360-G	856041	SIE

Pos.	Benennung	Wert	HNK-Nr.	Herst.
R20	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R21	Chip-Widerstand	82Ω ±5%	804724	VAL
R22	Chip-Widerstand	470Ω ±1%	804733	VAL
R23	Chip-Widerstand	470Ω ±1%	804733	VAL
R24	Chip-Widerstand	10kΩ ±1%	804749	VAL
R25	Chip-Widerstand	470Ω ±1%	804733	VAL
R26	Chip-Widerstand	10kΩ ±1%	804749	VAL
R27	Chip-Widerstand	330Ω ±1%	804731	VAL
ST27	Stecker 20-polig		884507	
T1	NPN Transistor	BC850B	832284	SIE
T2	NPN Transistor	BC850B	832284	SIE

Schlumberger Technologies GmbH			Schaltteilliste	Anz. d. Seiten
00 Index	0089.64 Ä.Nr.	15.11.90 Datum	Kr. Name	Bestückte Leiterplatte Typ: EXT.SYNCHRON	4
Erst.: VARGA	Gepr.:		361 553 Sa	Seite Nr
Gerät: 4015 / 214 026				4

Pos.	Benennung	Wert	HNK-Nr.	Herst.
L1	Ferrit-Spule	22µH ±15%	821318	SIE
L2	Ferrit-Spule	22µH ±15%	821318	SIE
L3	Ferrit-Spule	22µH ±15%	821318	SIE
L4	Keramik-Spule	1µH ±5%	821227	STET
L5	Keramik-Spule	1µH ±5%	821227	STET
L6	Keramik-Spule	560nH ±5%	821224	STET
L7	Keramik-Spule	1µH ±5%	821227	STET
L8	Keramik-Spule	150nH ±5%	821217	STET
R1	Chip-Widerstand	22kΩ ±1%	804753	VAL
R2	Chip-Widerstand	2.7kΩ ±1%	804742	VAL
R3	Chip-Widerstand	470Ω ±1%	804733	VAL
R4	Chip-Widerstand	470Ω ±1%	804733	VAL
R5	Chip-Widerstand	82Ω ±5%	804724	VAL
R6	Chip-Widerstand	10kΩ ±1%	804749	VAL
R7	Chip-Widerstand	22kΩ ±1%	804753	VAL
R8	Chip-Widerstand	1MΩ ±1%	804773	VAL
R9	Chip-Widerstand	10kΩ ±1%	804749	VAL
R10	Chip-Widerstand	18kΩ ±1%	804752	VAL
R11	Chip-Widerstand	10kΩ ±1%	804749	VAL
R12	Chip-Widerstand	1MΩ ±1%	804773	VAL
R13	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R14	Chip-Widerstand	4.7kΩ ±1%	804745	VAL
R15	Chip-Widerstand	10kΩ ±1%	804749	VAL
R16	Chip-Widerstand	10kΩ ±1%	804749	VAL
R17	Chip-Widerstand	8.2kΩ ±1%	804748	VAL
R18	Chip-Widerstand	1kΩ ±1%	804737	VAL
R19	Chip-Widerstand	22kΩ ±1%	804753	VAL

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten 4
00 Index	0089.64 Ä.Nr.	15.11.90 Datum	Kr. Name	Bestückte Leiterplatte Typ: EXT.SYNCHRON	
Erst.: VARGA	Gepr.:			361 553 Sa	Seite Nr
Gerät: 4015 / 214 026					3

R

Design

The battery block consists of a series circuit of ten "high-temperature-proof" round nickel-cadmium cells (V = 1.2 V, capacity = 7 Ah). This is sufficient to operate STABILOCK for about one hour.

Incorporation

Undo the baseplate (six screws). Undo the two socket-head screws in the side panel and remove the spacers. Insert the battery and secure it with the socket-head screws. Plug St71 onto Bu71. The cable is laid under the battery. See drawing for position of cable, connector and NTC.

To form the battery, it is advisable to first charge it for at least 14 hours, then discharge it by operating STABILOCK for at least one hour by battery and then recharge again for at least 14 hours.

Charging

When STABILOCK is connected to the line and the power switch is set to "LINE" or "OFF", the internal (flat) battery - after a short line interruption - is recharged for approx. 14 hours with about 0.7 A. At full charge the battery warms up and the attached temperature-dependent resistor R1 becomes lower in resistance than the temperature-dependent resistor R5 on the motherboard. If the voltage "BTEMP" on K71-1 then goes below a voltage threshold of approx. +2.5 V, the charging current is reduced in the power supply to the trickle charge of about 70 mA. This state is maintained even if the relative battery temperature decreases again. As soon as STABILOCK is briefly disconnected from the line and then connected again, full charging recommences with about 0.7 A.

The critical temperature difference between battery and motherboard changes with ambient temperature. This charge control will only work properly when STABILOCK 4015 is switched off, ie power switch on OFF. If it is set to LINE, the battery is cooled by the fan and the slight warming up of the battery is not enough to switch to a trickle charge. This does not harm the battery, however, because of the good cooling and the low charge current. There is never charging in BATT mode.

Display

The STATUS menu shows the momentary battery voltage and the charging state. During trickle charging, only "Battery installed" is displayed.

Disposal

The battery contains poisonous cadmium. So do not just throw it in a waste-paper backet or dustbin when it is finished. It should be taken to a recycling yard, a disposal station for used batteries or a SCHLUMBERGER service station.

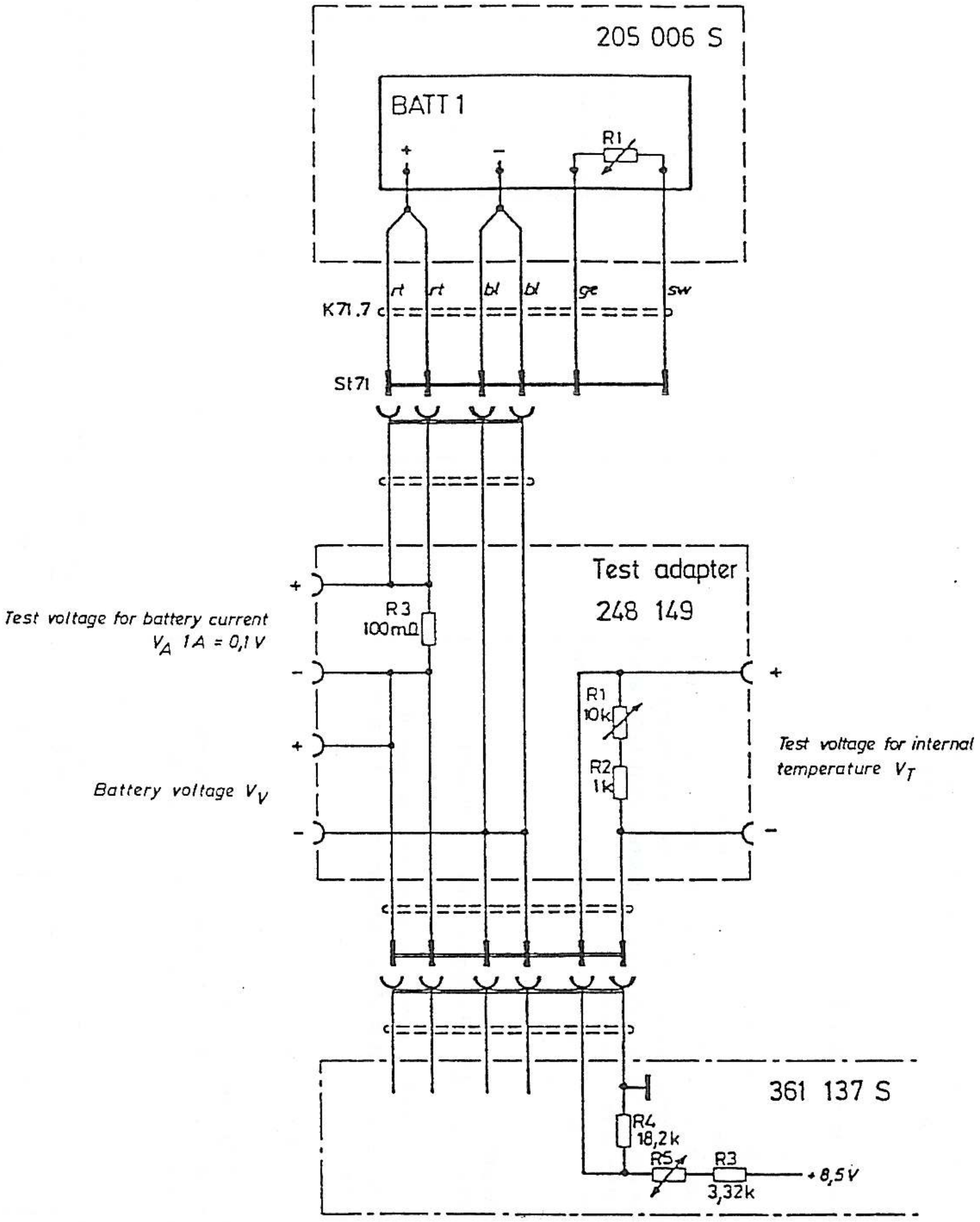
01/1089.88

Schlumberger

Adjustment and Test Procedure

Necessary Equipment	Measuring Procedure	Measuring Point	Frequency	Adjustment	Set Value
4015	**Requirement** The 4015 must be fully equipped and tested. **Note** The condition of the battery can be queried in the status mask. By again pressing the STATUS softkey, the present condition of the battery is again measured and indicated.				
4015 without internal battery	**1. Status message without battery**			Power switch on "Line"	Status message: "Battery - - -"
	2. Battery operation and discharge Make a rough measurement of the resistance of the NTC temperature sensor on connector 71 (ye/bl). Install a charged battery (at least partly charged) according to the operating instructions and connect it. Attach the top and bottom panelling to create normal temperature conditions. Withdraw the power cable.				At 20°C: 10 kΩ At 30°C: 7.2 kΩ ±10%
	Operate the 4015 on the battery until it is discharged (display goes dark).			Power switch on "Batt"	Status message: "Battery installed...V" No battery operation on "Line" or "Off"
	3. Battery charging Connect the 4015 back to the line (power switch on "Line").				Status message: "Battery charging...V"
	Set the power switch "Off". After 12 h at the earliest and 18 h at the latest there is an automatic switchover from full charge to trickle charge.				
	Set the power switch back to "Line".				Status message: "Battery installed...V"
	4. Battery operating time Disconnect the 4015 from the line and operate it battery-powered as a monitoring receiver. Fully charge for 18 h before despatch.				Length of operation: >60 to 100 min

Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
01	31.10.91	Hoefer	STABILOCK 4015	Internal Battery	205 006 A			1/2



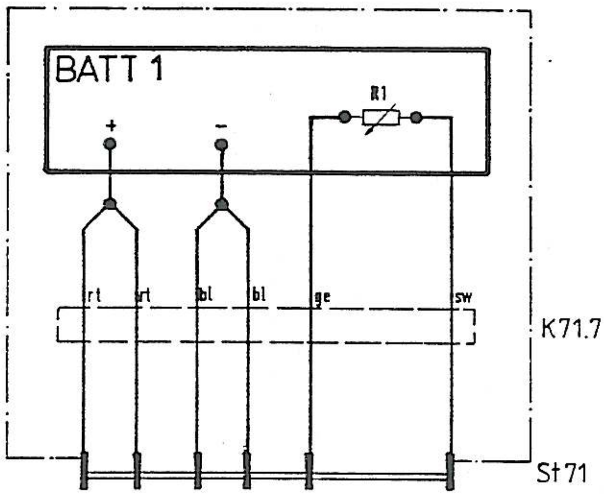
R1 = HNK 807 030 (10 kΩ)

R2 = HNK 800 037 (1 kΩ)

R3 = Fa. Isabellenhütte, Best.-Nr. A-NR100F1K21 (100 mΩ)

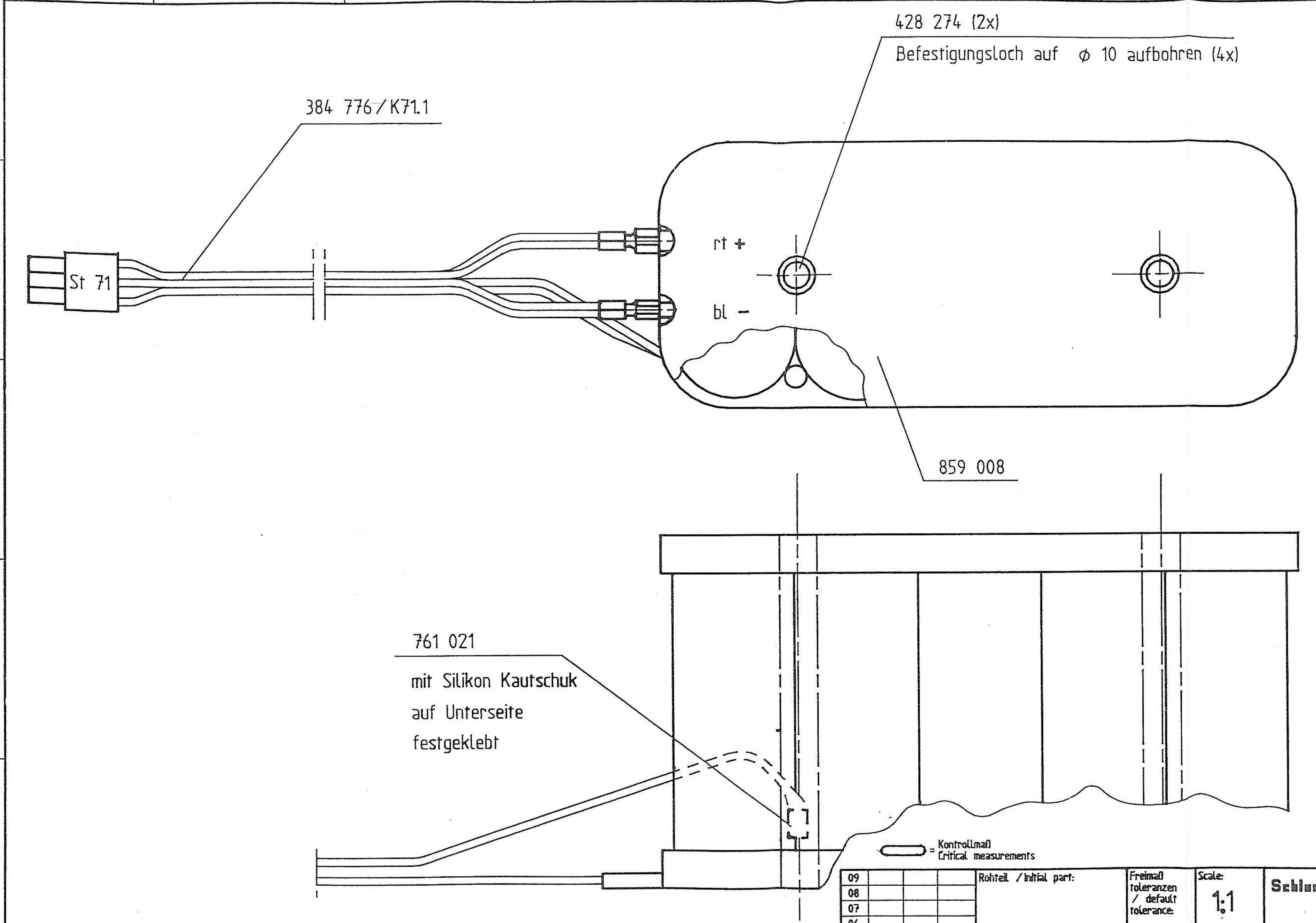
HNK = ISC (Inhouse Standards Catalog)

Sheet	Comment	Series	Ref. No.	Sub Unit	Unit	Name	Date	Issue
2/2			205 006 A	Internal Battery	STABILOCK 4015	Hoefer	31.10.91	01



				norm			
01	0089.40	24.8.90		gepr.	28.6.90		
—	0089.23	28.6.90	Kr.	bearb.	28.6.90	Kr.	
Ausg	Ä.-Mittlg.	Datum	Name	1990	Datum	Name	
ISS	MODIF	DATE	NAME		DATE	NAME	

Schlumberger Meßgeräte GmbH Ingolstädter Straße 67 a 8000 München 46	INT BATTERY	205 006 S Gerät: 4015



Rev. No.	Rev. Sht.	Date	Name				
09				Rohteil / Initial part:	Freimaßtoleranzen / default tolerance:	Scale: 1:1	Schlumberger Technologies GmbH Gutenbergstr. 2-4 D - 8045 Ismaning
08							
07							
06							
05				Werkstoff / Material:	±0,2	DIN A3	Bezeichnung: / Description: INT BATTERY
04	3089.13	28.06.93	Unger				
03	1089.81	23.10.91	Loipl				
02							
01				Oberfläche / Surface:	1991	Date / Name	Zeichnungsnr.: / Drawing No.: 205 006
00					Drawn	23.10 Loipl	
					Designed		
					Checked		Gerät: / Unit: 4015 / 108 901

Designed with Mac BRAVO!

Makro ☐

Pos. REF. NO.	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT	Pos REF. NO	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT
Batt1	12 V 7 Ah	859 008	VARTA				
R 1		in 384 776					
K71.1	Kabelbaum	384 776	SCHL				

Ausgabe ISSUE	Änd.-Mittlg Nr. MODIFIC NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02			
01	0089.40	24.8.90	[signature]
--	0089.23	28.6.90	Kr.

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

	Tag DATE	Name NAME
gezchn.	28.6.90	Kr.
bearb.	28.6.90	[signature]
gepr.		

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: INT. BATTERY

Bezeichnung Schlumberger PART NO.: 205 006 Sa

Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 205 006 S

Gerät: 4015

Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

Blatt Nr. SHEET NO: 1

S

All AF sockets of STABILOCK 4015 are unbalanced. This means that ripple and noise levels can occur in more elaborate test setups. Test results are corrupted as a result, especially at low useful levels.

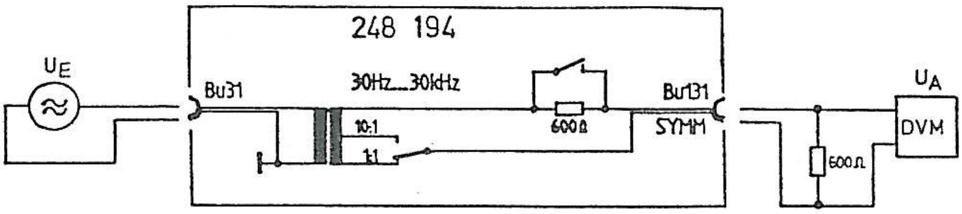
The external Symmetrical AF Transformer (accessory) is offered for the purpose of suppressing asymmetrical noise, which is connected to the MODGEN output or VOLTM input of STABILOCK 4015. For low-impedance loads and when only low modulation levels are necessary, it is possible to switch the transformation ratio from 1:1 to 10:1. Upward transformation at 1:10 in the inverse signal direction is only possible at the cost of extra errors, depending on frequency and level.

Technical Data

Frequency range:	30 Hz to 30 kHz
Transformation ratio:	1:1 or 10:1 (switch-selectable) ±3%
Input:	BNC socket, unbalanced (outer conductor connected to ground)
Max. input level:	5 V_{rms}
Output:	BNC socket, balanced (outer conductor insulated)
Impedance (source: $Z_i = 0\ \Omega$):	600 ±15 Ω or 8 ±5 Ω (switch-selectable)
Permissible load at 1:1	min. 200 Ω
at 10:1	min. 10 Ω
Extra distortion:	< 0.5%
Dimensions:	approx. 100 mm x 45 mm x 65 mm
Weight:	approx. 270 g

TEST SPECIFICATION

Test circuit 1



Switch setting: 1 : 1, 10 Ω

f_{in} = 1 kHz V_{in} = 5 V V_{out} = 5 V +0/-2 % dist < 0,1 %

f_{in} = 30 Hz V_{in} = 1 V V_{out} = 1 V +0/-3 %

f_{in} = 30 kHz V_{in} = 1 V V_{out} = 1 V +0/-3 %

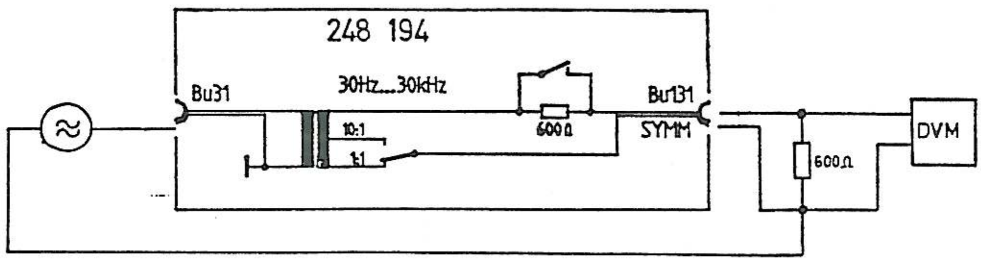
Switch setting: 1 : 1, 600 Ω

f_{in} = 1 kHz V_{in} = 2 V V_{out} = 1 V ± 2 % dist < 0,1 %

Switch setting: 10 : 1, 10 Ω

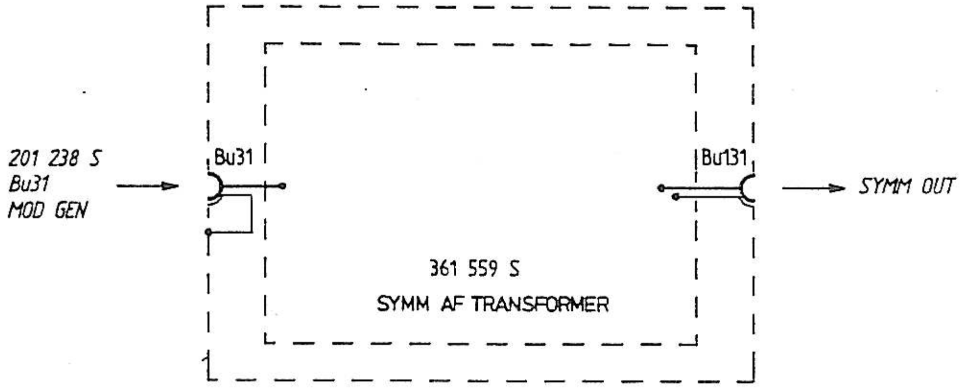
f_{in} = 1 kHz V_{in} = 2 V V_{out} = 0,2 V ± 2 % dist < 0,1 %

Test circuit 2



f_{in} = 1 kHz, V_{in} = 1 V, V_{out} < 3 mV

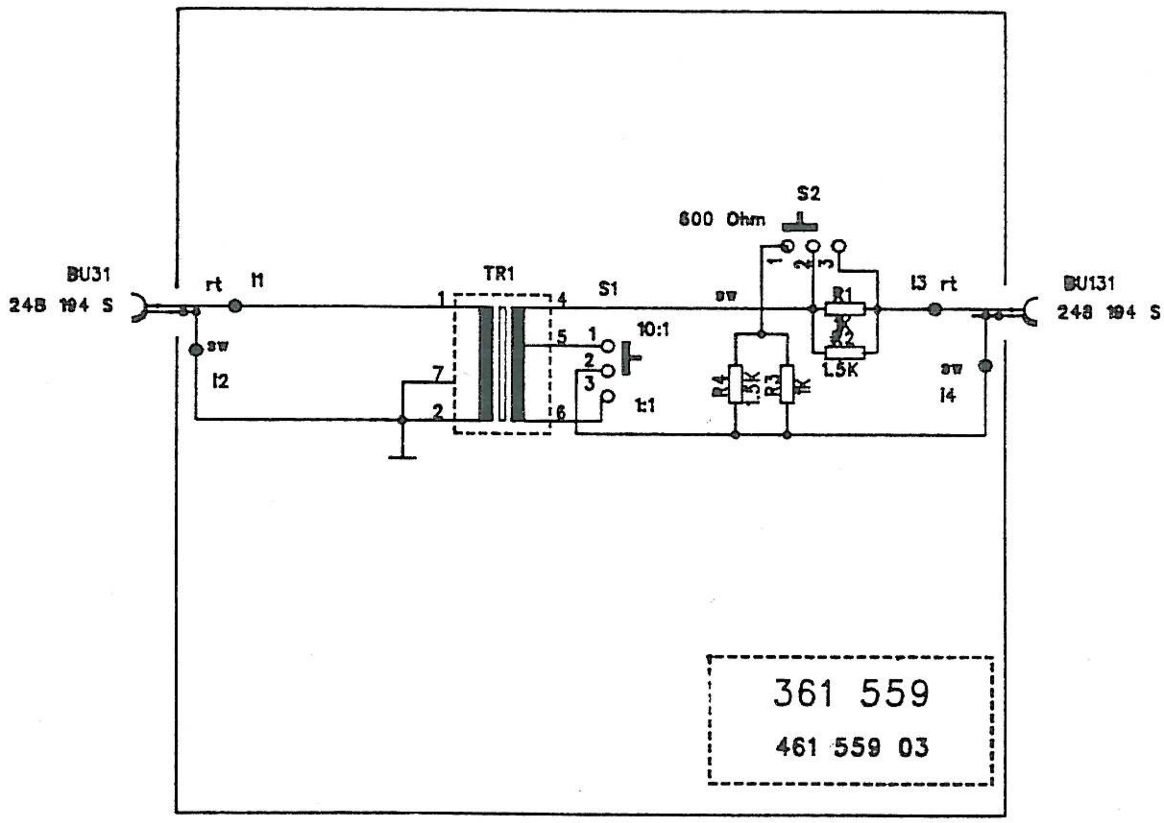
Issue	Date	Name	Unit	Sub Unit	Ref. No.	Series	Comment	Sheet
00	19.12.91	HI	STABILOCK 4015	SYMM AF TRANSFORMER	248 194 A			1/1



				NORM.			SCHLUMBERGER TECHNOLOGIES GMBH
				GEPR.			INGOLSTÄDTER STR. 67 A
00	1089.43	12.6.91	Kr.	BEARB.	12.6.91	Kr.	8000 MÜNCHEN 46
INDEX ISS	Ä.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME	

sw BLACK br BROWN rt RED rs ROSE ge YELLOW gn GREEN	bl BLUE vi VIOLET gr GREY ws WHITE tr TRANSPARENT	BEZEICHNUNG / DESCRIPTION: SYMM AF TRANSFORMER	ZEICHNUNGSNR. / DRAWING NO.: 248 194 S PROJEKT / GROUP: 4015 / 201 238 S VON / OF 1/1 BLATT SHEET

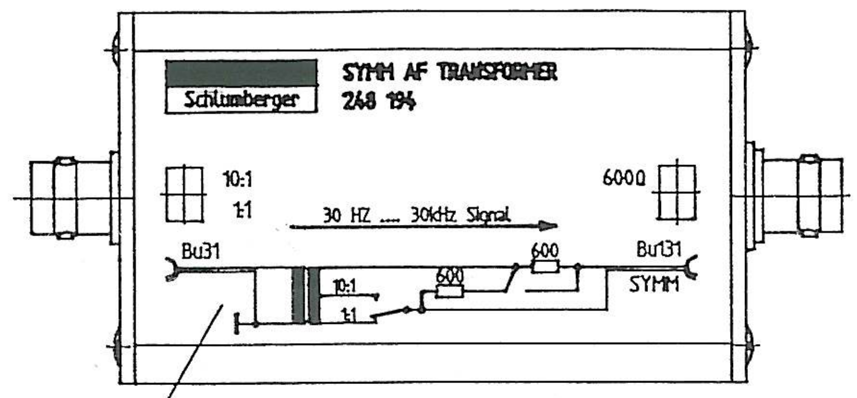
Designed with Mac BRAVO! Makro ☐



03	2089.30	03.11.92	METZ	DESIGNED		
02	2089.27	22.08.92	Varga	CHECKED		
01	2089.15	09.04.92	Kr.	DRAWN	22.05.91	Varga
INDEX ISS.	A.-NR. MODIF.	DATUM DATE	NAME NAME		DATUM DATE	NAME NAME

SCHLUMBERGER TECHNOLOGIES GMBH INGOLSTÄDTER STR.67 A 8000 MÜNCHEN 46	BEZEICHNUNG/DESCRIPTION: SYMM AF TRANSF	ZEICHNUNGSNR./DRAWING NO.: 361 559 S PROJECT/GROUP: 4015 / 248 194

weich gelötet

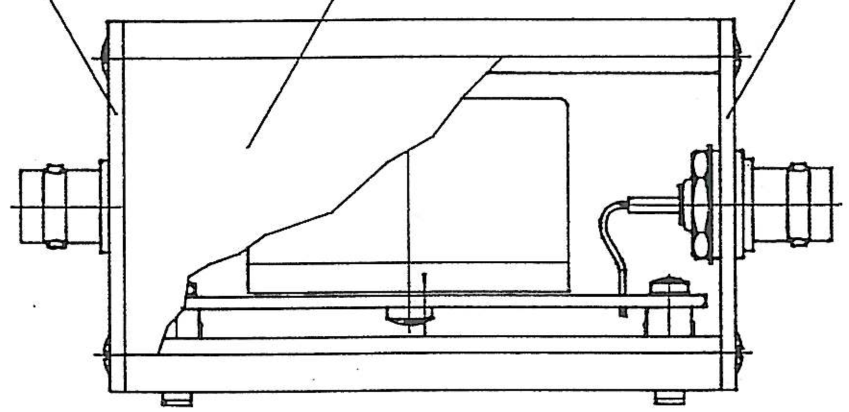


444 349

431 635

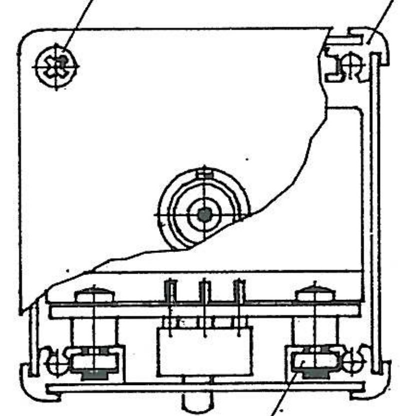
433 488 (3x)

431 636



2.9x9.5 DIN 7983
701 547 (8x)

790 088 (4x)

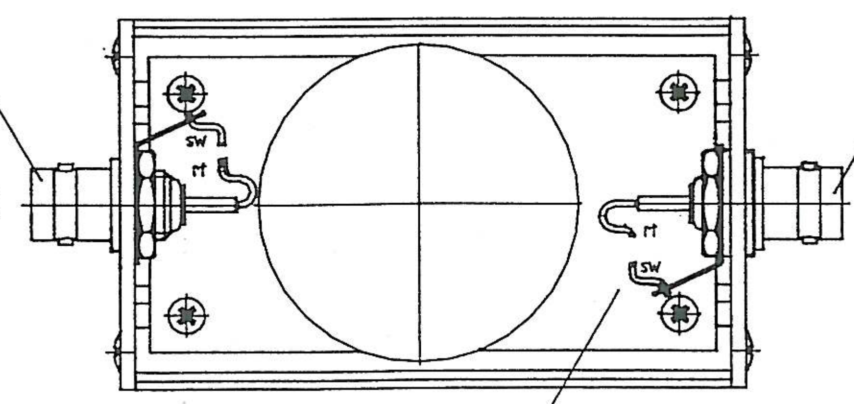


704 050 (4x)

886 280
886 284

886 280
886 282 (2x)
886 284

Bu31



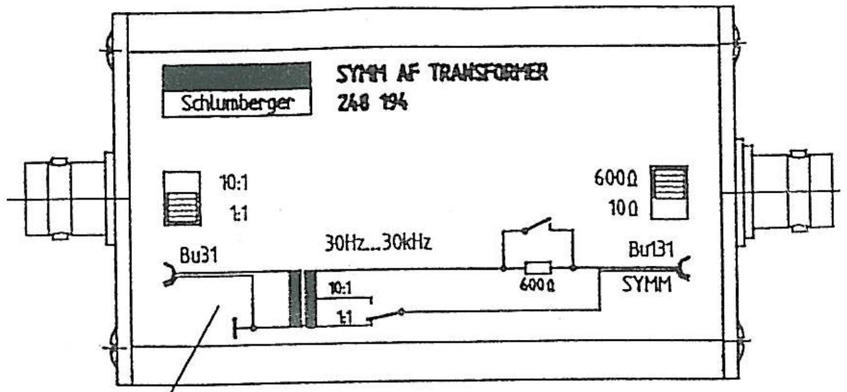
Bu131

361 559
M3x10 DIN 7985
701 642 (4x)

⬭ = Kontrollmaß
Critical measurements

09				Rohteil / Initial part:	Freimaßtoleranzen / default tolerance: ±0,2	Scale: 1:1	Schlumberger Technologies GmbH Ingolstädterstraße 67a 8000 München 46
08							
07							
06							
05				Werkstoff / Material:		DIN A3	Bezeichnung: / Description: ASSEMBLY UNIT
04							
03							
02							
01	2089.27	31.08.92	Ka.	Oberfläche / Surface:	1992 / Date	Name	Zeichnungsnr.: / Drawing No.: 375 334
00	2089.15	9.4.92	Kr.		Drawn / 9.4.92	Kr.	
Rev. No.	Rev. Sht.	Date	Name		Designed		
					Checked		Gerät: / Unit: 4015 / 248 194

weich gelötet

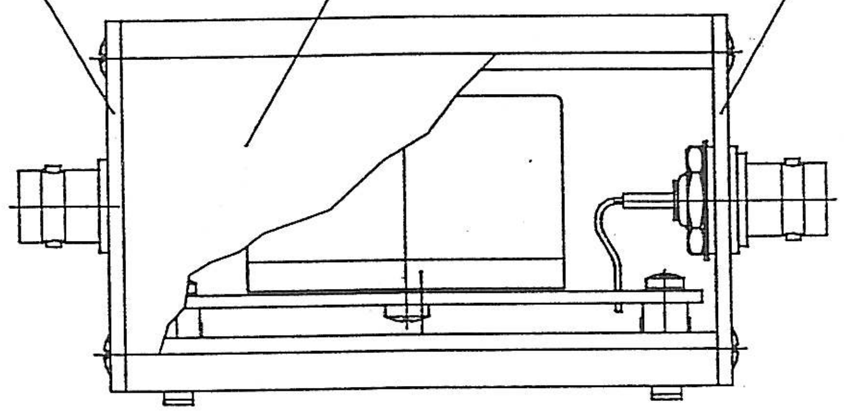


444 349

431 635

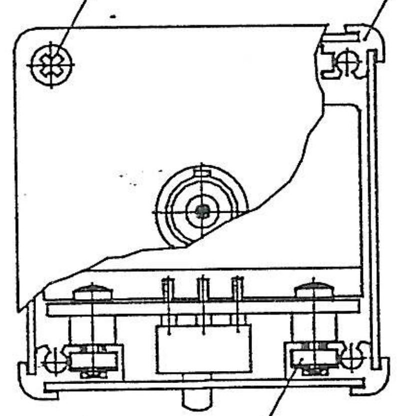
433 488 (3x)

431 636



2.9x9.5 DIN 7983
701 547 (8x)

790 088 (4x)

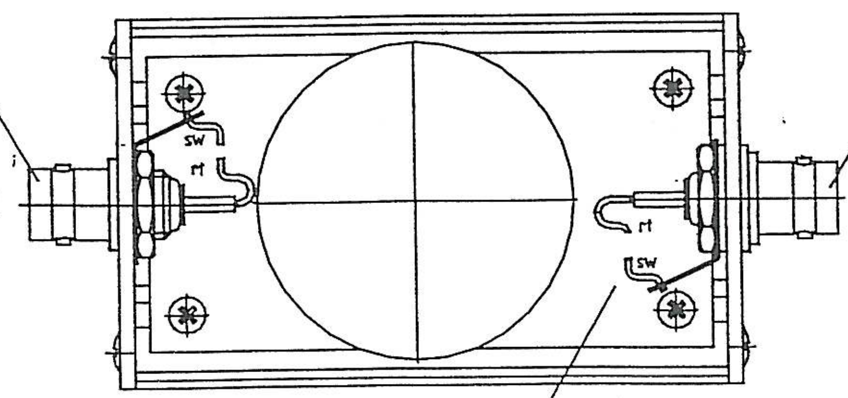


704 050 (4x)

886 280
886 284
Masseaufbau

886 280
886 282 (2x)
886 284
isolierter Aufbau

Bu31



Bu131

361 559
M3x10 DIN 7985
701 642 (4x)

= Kontrollmaß
Critical measurements

Rev. No.	Rev. Sht.	Date	Name
09			
08			
07			
06			
05			
04			
03			
02			
01			
00	1089.43	12.6.91	Kr.

Rohteil / Initial part:

Werkstoff / Material:

Oberfläche / Surface:

Freimaß toleranzen / default tolerance:

Scale: 1:1

DIN A3

1991	Date	Name
Drawn	12.6.91	Kr.
Designed	29.7.91	
Checked		

Schlumberger Technologies GmbH
Ingolstädterstraße 67a
8000 München 46

Bezeichnung: / Description:
SYMM AF TRANSFORMER

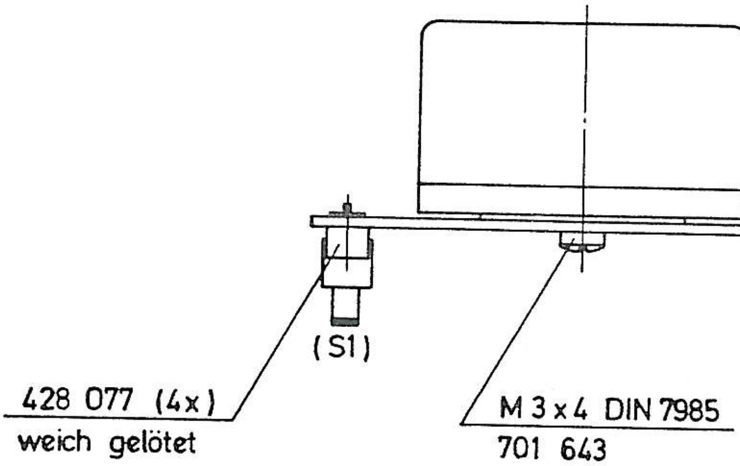
Zeichnungsnr.: / Drawing No.:
248 194

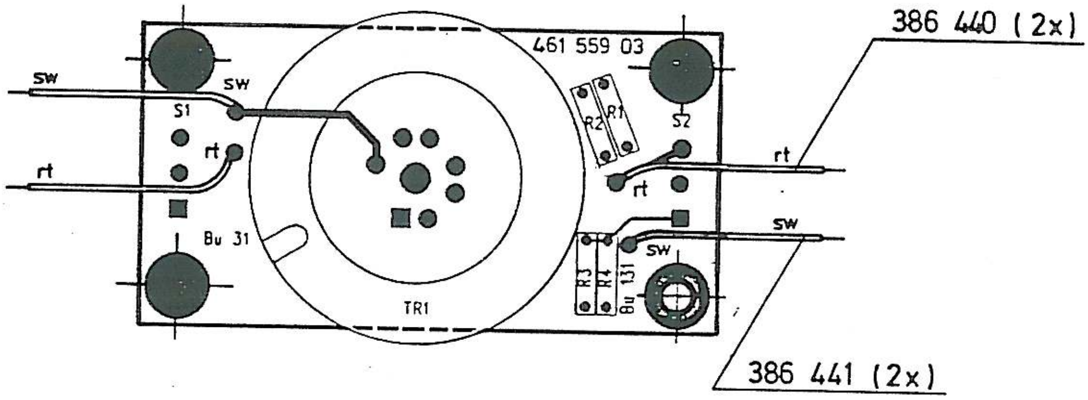
Gerät: / Unit: 4015 / 108 901

Designed with Mac BRAVO!

Makro ☐

weich gelötet





Schaltplanpositionierung ≙ 361 559 S / Sa

Ausgabe	Ändg Mittlg	Datum	Name
09			
08			
07			
06			
05			
04			
03	2089.30	5.11.92	Kr.
02	2089.27	1.9.92	Ka.
01	2089.15	9.4.92	Kr.
00	1089.66	28.8.91	Kr.

Rohteil

Werkstoff

Oberfläche

Freimaßtoleranzen

Maßstab 1:1

1991	Datum	Name
gez	28.8.91	Kr.
bearb		
gepr		

Schlumberger Technologies GmbH
Ingolstädter Straße 67 a
8000 München 46

Bestückte Leiterplatte

Typ : SYMM AF TRANSFORMER

361 559

Gerät: 4015 / 375 334 / 248 194

Pos REF NO	Wert VALUE	Bezeichnung Schlumberger PART NO.	Hersteller MANUFACT	Pos REF NO	Wert VALUE	Bezeichnung Schlumberger PART NO	Hersteller MANUFACT
1	Bestückte Leiterplatte	361 559					
	hierzu	361 559 Sa					
Bu31	22 BNC-50-0-5	886 280	SUHN				
Bu131	22 BNC-50-0-5	886 280	SUHN				

Ausgabe ISSUE	Änd.-Mittlg Nr. MODIFIC NO	Tag DATE	Name NAME
07			
06			
05			
04			
03			
02			
01			
00	1089.43	12.6.91	Kr.

Schlumberger Meßgeräte GmbH
Ingolstädter Straße 67 a
8000 München 46

1991	Tag DATE	Name NAME
geschr.	12.6.91	Kr.
bearb.		
gepr		

Schaltteilliste
EL. PARTS LIST

Benennung DESCRIPTION: SYMM AF TRANSFORMER

Liste besteht LIST CONSISTS aus OF 1 Blatt SHEETS

Bezeichnung Schlumberger PART NO: 248 194 Sa

Blatt Nr. SHEET NO. 1

Hierzu Schaltplan SEE CIRCUIT DIAGRAM: 248 194 S

Gerät: 4015

Pos.	Benennung	Wert	HNK-Nr.	Herst.
BU31	BNC Chassisbuchse	22 BNC-50-0-5	886280	SUHN
BU131	BNC Chassisbuchse	22 BNC-50-0-5	886280	SUHN
R1	Widerstand 0.3W	1kΩ ±1%	802037	RÖD
R2	Widerstand 0.3W	1.5kΩ ±1%	802039	RÖD
R3	Widerstand 0.3W	1kΩ ±1%	802037	RÖD
R4	Widerstand 0.3W	1.5kΩ ±1%	802039	RÖD
S1	Schiebeschalter	1polig	841063	C&K
S2	Schiebeschalter	1polig	841063	C&K
TR1	NF-Übertrager	RÜP845M	825015	PIK

Schlumberger Technologies GmbH				Schaltteilliste	Anz. d. Seiten
02 Index	2089.27 Ä.Nr.	31.8.1992 Datum	VARGA Name	Bestückte Leiterplatte Typ: SYMM AF TRANSFORMER	1
Erst.: VARGA	Gepr.:			361 559 Sa	Seite Nr
Gerät: 4015 / 375 334 / 248 194					1

Scl

St

TV

W

XZ