

## COMPRESSOR AMPLIFIER

179-120-X

### CONTENTS

	DRAW. No.
Technical Specifications	179-1211-A-4
Terminals & Interconnections	179-1202-X-3
Characteristics, Input Filter	179-1219-A-4
Input-Output Terminations	179-1220-A-4
Instruction for Alignment, Block	Diagram 179-1222-A-4
Diagram Compressor Card	179-1230-A-3
Component Lay-out	179-1241-A-3
Electrical Partslist	179-1231-A-4
Diagram Amplifier Card	179-1242
Component Lay-out	179-1232-X-3
Electrical Partslist	179-1243-A-3
Diagram Switch Unit	179-A1
Component Lay-out	179-A130-A-4
Electrical Partslist	179-A141-A-4
Diagram Switch Unit	179-A2
Component Lay-out	179-A230-A-4
Electrical Partslist	179-A241-A-4
Diagram Switch Unit	179-A3
Component Lay-out	179-A231-A-4
Electrical Partslist	179-A330-A-4
Diagram Switch Unit	179-A4
Component Lay-out	179-A341-A-4
Electrical Partslist	179-A331-A-4
	179-A430-A-4
	179-A441-A-4
	179-A431-A-4

Supply Voltage	: 24 V dc $\pm$ 10% - common
Maximum Ripple Voltage	: 0.1 V pp
Current Consumption, steady state	: approx. 100mA
Current Consumption, during heat-up	: approx. 275mA in 45 seconds
Temperature Range	: -20 to +60°C (-4 to +140°F)
Frequency Range (0.5dB points)	: 20 c/s to 20.000 c/s
Input Filter	: see fig. 4
Input Impedance within freq. range	: see Input Terminations fig. 1
Output Impedance within freq. range	: see Output Terminations fig. 2
Minimum Load Impedance	: 100 ohms
Basic Amplification	: see fig. 3 Characteristics
Compression Range	: see fig. 3 Characteristics
Compression Ratio	: adjustable 1:1 2:1 3:1 5:1 20:1
Attack Time	: adjustable 100 microseconds/20dB to 200 milliseconds/20dB (11 steps)
Recovery Time	: adjustable 60 milliseconds/20dB to 4 seconds/20dB and one "Auto" position
"Auto" dual time constants	: 200 msec. upon 15 seconds (11 steps)
Recovery Delay	: switchable 0 or 50 milliseconds
Distortion under static conditions	: less than 0.5% up to 20dB gain reduction
Signal to noise ratio at compression threshold	: 80 dB A-curve
Instrument Output	: 0 to 1 mA for 0 to 20dB compression Linear dB scale
<u>Limiter Function</u>	
Attack Time	: 1.5 millisecond combined with a full-wave logarithmic clipping circuit
Recovery Time	: following the recovery time set for the compressor
Limitation Threshold "Normal" Note 1	: +6 dBu output with any of the three output-terminations shown in fig. 2
Limitation Threshold "High" Note 1	: +19 dBu output when using the 0.7 : 1 output transformer +16 dBu output when using the direct output or the 1:1 output transformer
<u>Stereo Operation</u>	
The control voltage of two units may be interconnected to obtain equal gain reduction in the two stereo channels. The control voltage is accessible at the connector pin 3. - To obtain equal reference level, terminal 2 "12V adjust" of the two units must be interconnected.	

Rev.: 17/6/74 B.M.

Connector : Tuchel T2700 Standard Colour : Dull Black

Mechanical Outline : A1-module  
Front 40x190mm (1.58x7.5")  
Depth 105 mm (4.1")Weight : approx. 1 Kg  
(approx. 35 oz.)Note 1: The limitation level stated above applies to steady state conditions.  
Peaks shorter than 1.5ms will be limited at a level max. 3dB above  
steady state conditions.

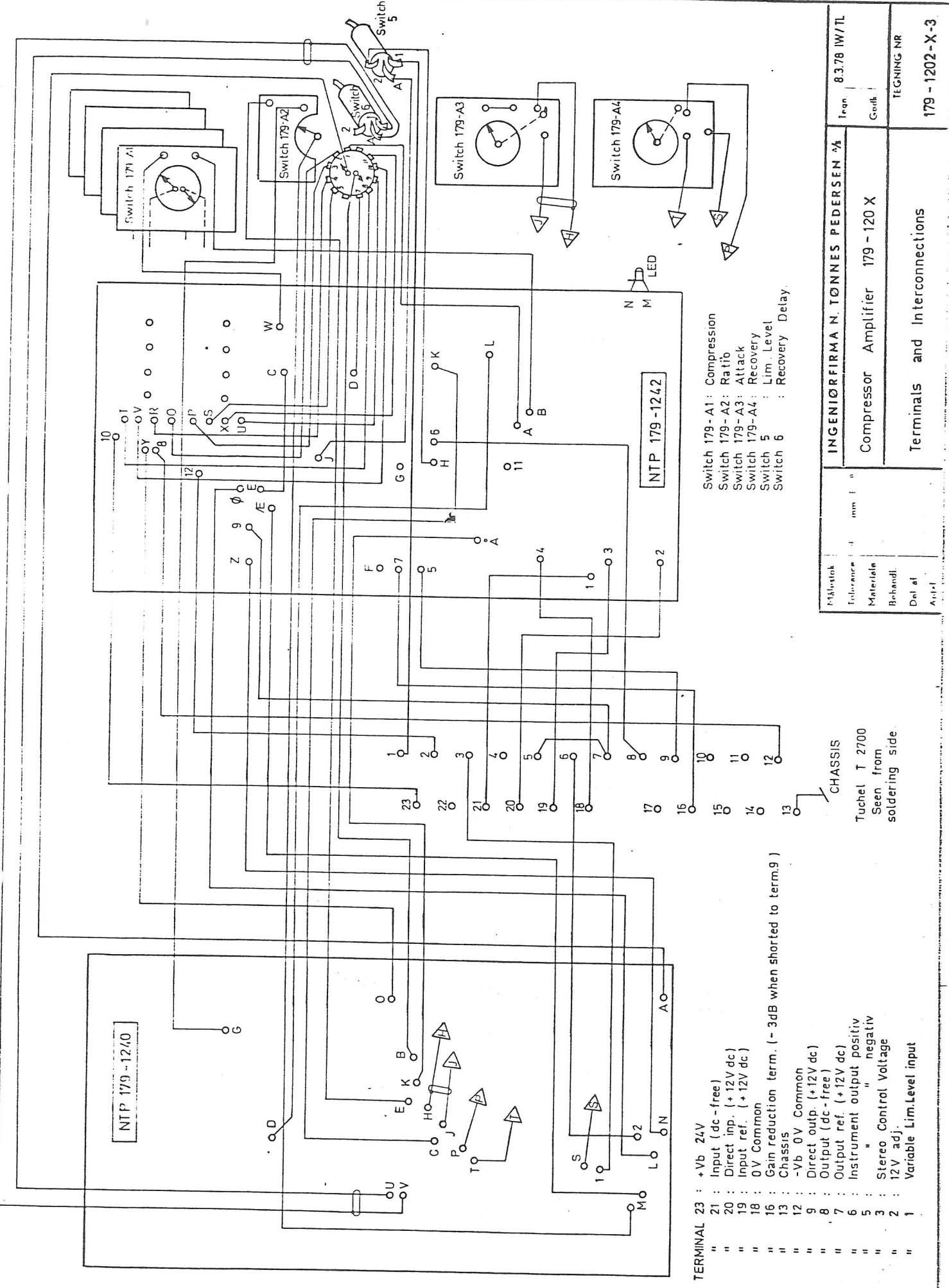


Fig. 3

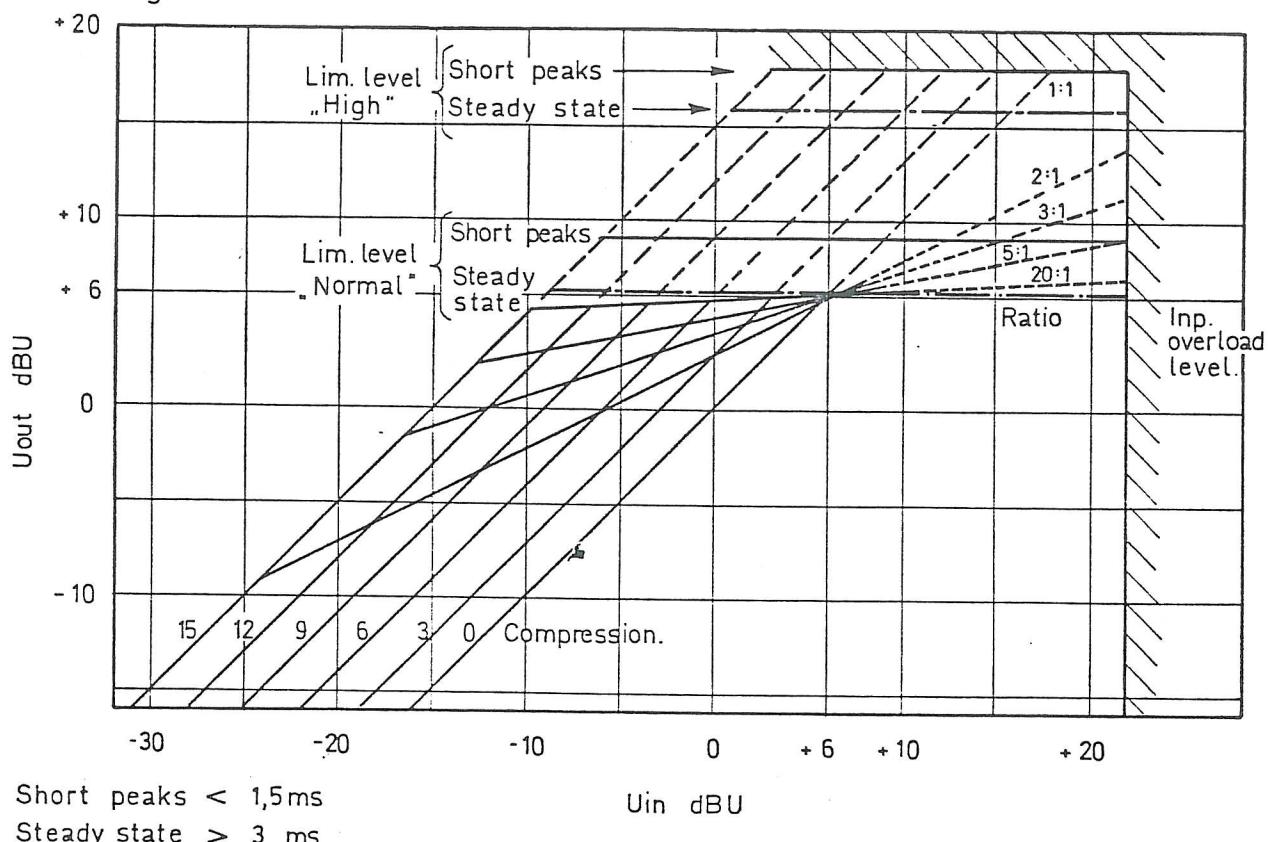
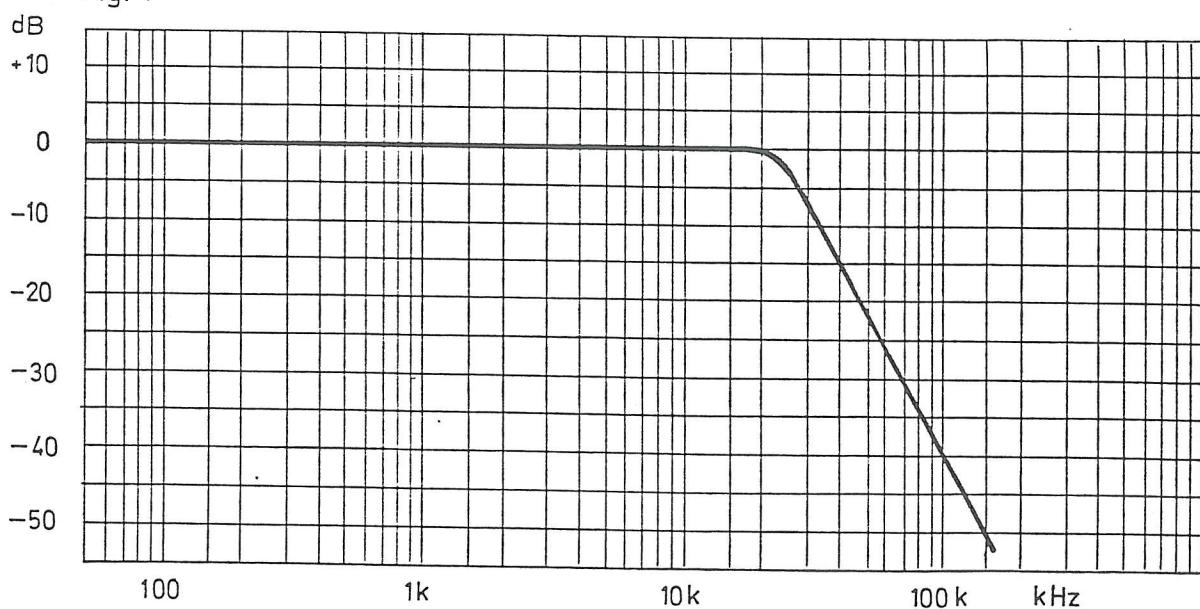


Fig. 4

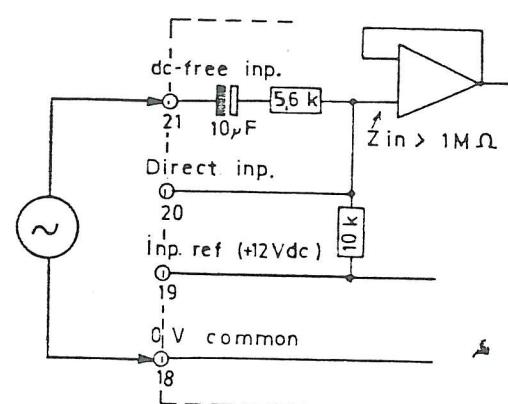


INPUT FILTER CURVE

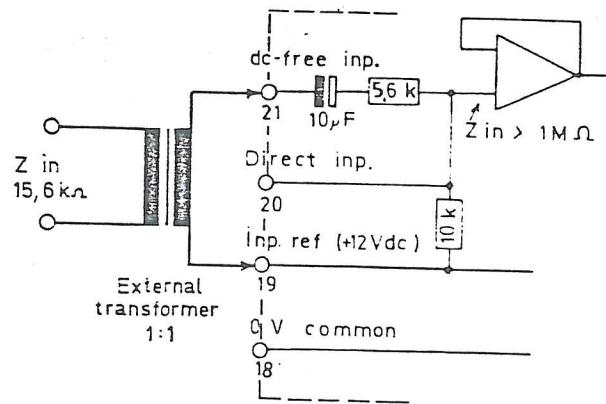
## INPUT TERMINATIONS

fig. 1

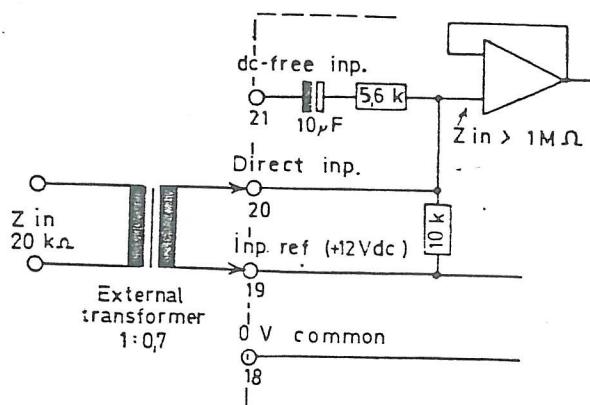
A)

UNSYMMETRICAL

B)

BALANCED FLOATING

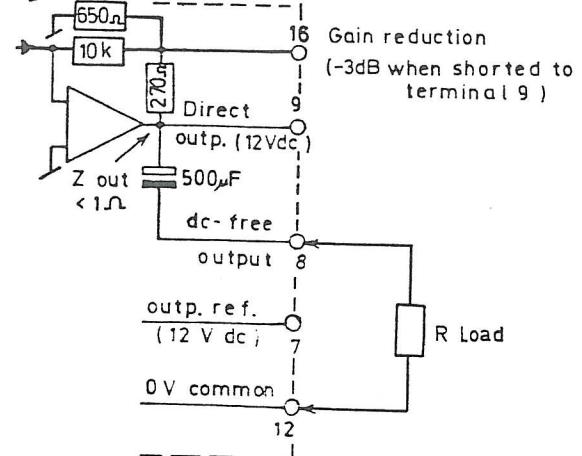
C)

BALANCED FLOATING

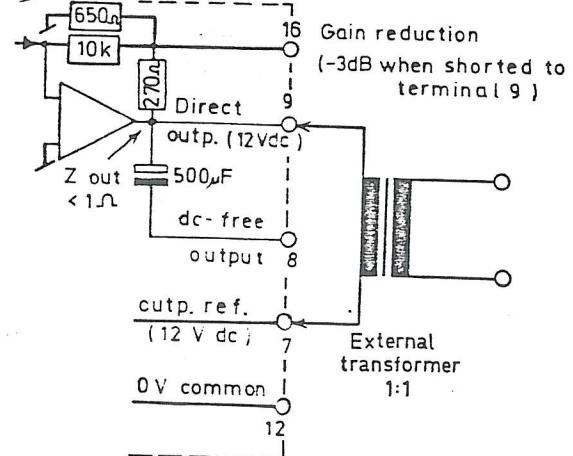
## OUTPUT TERMINATIONS

fig. 2

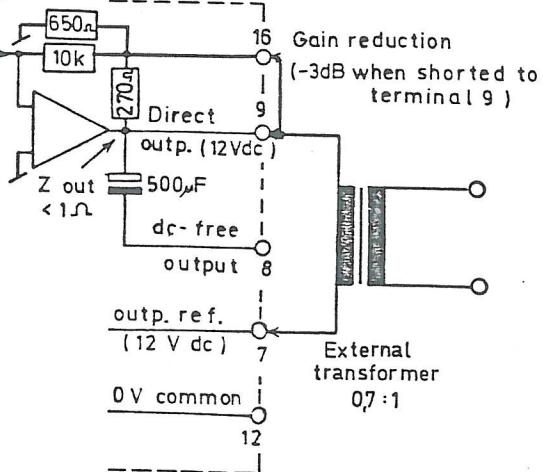
A)

UNSYMMETRICAL

B)

BALANCED FLOATING

C)

BALANCED FLOATING

Normally the Compressor Amplifier will stay correctly adjusted, except when a component has failed and has been replaced; then it may be necessary to make certain adjustments. Before attempting to make any adjustments, note the permissible indication errors stated in Technical Specifications.

The functions of the trimpotentiometers are as follows:

- P1 Bias adjustment of Op. amp A1
- P2 Compensates for individual pinch-off of the F.E.T. (Q1)
- P3 Compensates for individual slope  $\frac{\Delta R_{SD}}{\Delta V_{GD}}$  of the F.E.T.
- P4 Linearity adjustment of the FET Attenuator circuit.
- P5 Adjusts for minimum distortion of the FET attenuator.
- P6 Adjusts the threshold level.

Do not attempt to make any adjustments until the current consumption has fallen to a steady level approx. 100 mA after 60 sec. Correct sequence of adjustments is as follows:

a. Bias adjustment of P1

Conditions: No input signal.

Recovery switch in pos. 0.06 sec.

Connect a DC voltmeter (or DC-oscilloscope sens., approx. 20mV/div.) between TP7 and TP1.  
P1 is adjusted until the voltage measured is the same whether TP2 is connected to TP9 or not.

b. Pinch-off adjustment of P2

Conditions: Input signal +6dBu 1kHz

Ratio switch in pos. 1:1

Lim. level switch in pos. "high"

P2 is adjusted until the output voltage is +6dBu (0dB amplification).

The adjustment range can be altered by connecting or disconnecting R15 and/or R16.

c. Slope dB V and Linearity adjustment of P3 and P4

Conditions: Like referred under pos. b.

A floating external DC-source 0-6 V is connected between term. 3 and 5, term. 3 positive. The DC voltage is set to 3.0 Volt, and P3 is adjusted so that the output level is -9dBu (15 dB attenuation). Now the DC voltage is set to

6.0 Volt, and P4 is adjusted until the output level is -24 dBu (30 dB attenuation). Because of mutual dependence between P3 and P4 the adjustments are repeated until correct output level is obtained.

d. Threshold level adjustment of P6

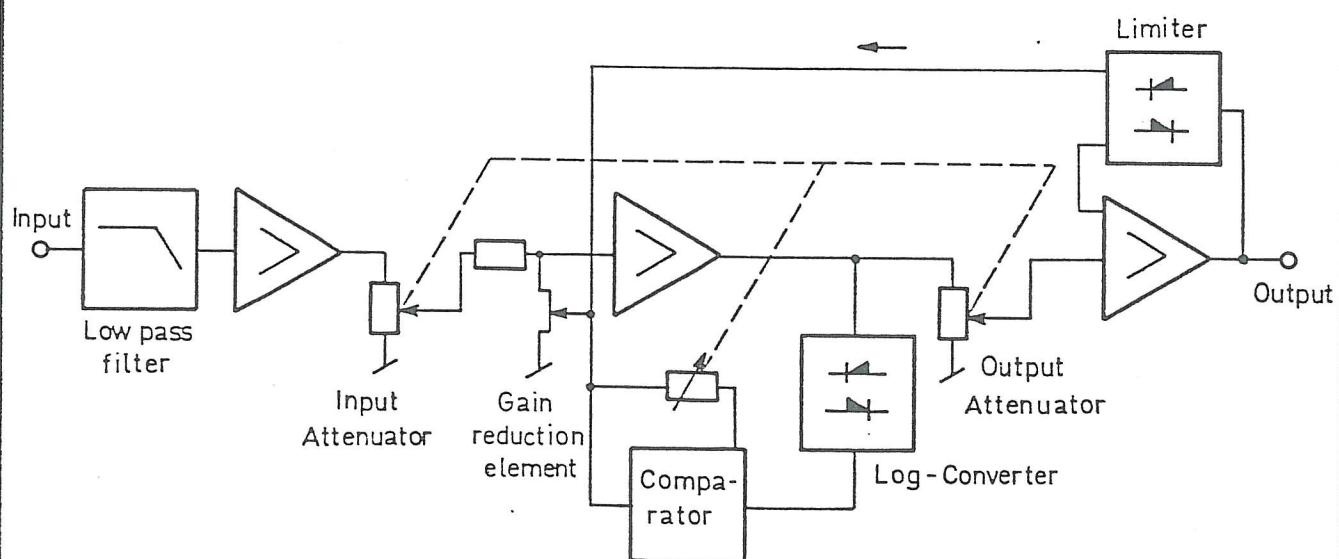
Conditions: Input signal +6 dBu 1kHz  
Ratio switch in pos. 20:1  
Lim. level switch in pos. "high"  
Compression switch in pos. 15 dB

P6 is adjusted to an output level of +6 dBu

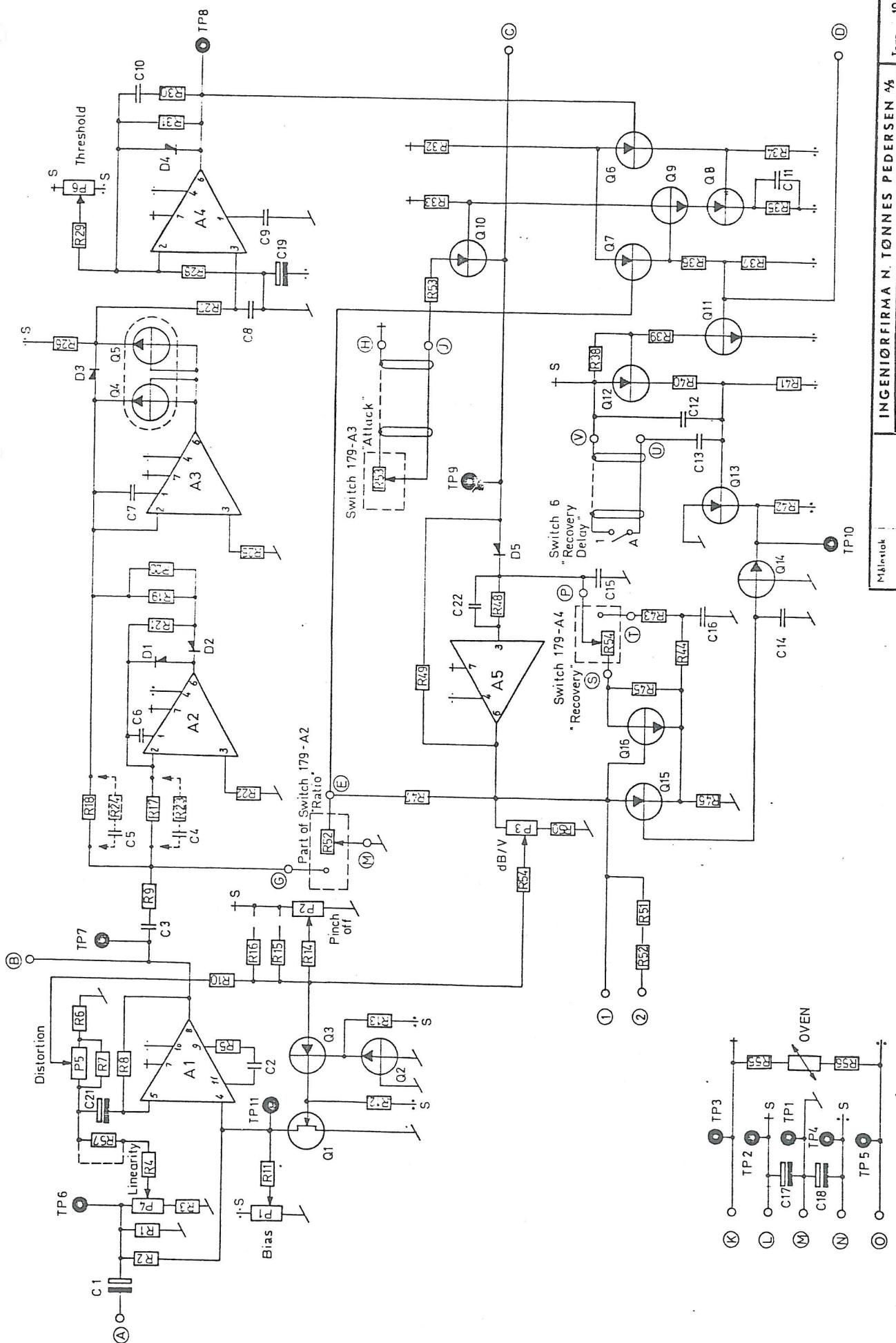
e. Distortion adjustment of P5

Conditions: Ratio switch in pos. 2:1  
Input level and the other controls are set like under pos. d.

P5 is adjusted to minimum distortion.  
Because of interaction between P5 and P2, the adjustment mentioned under pos. b is carried out once more.

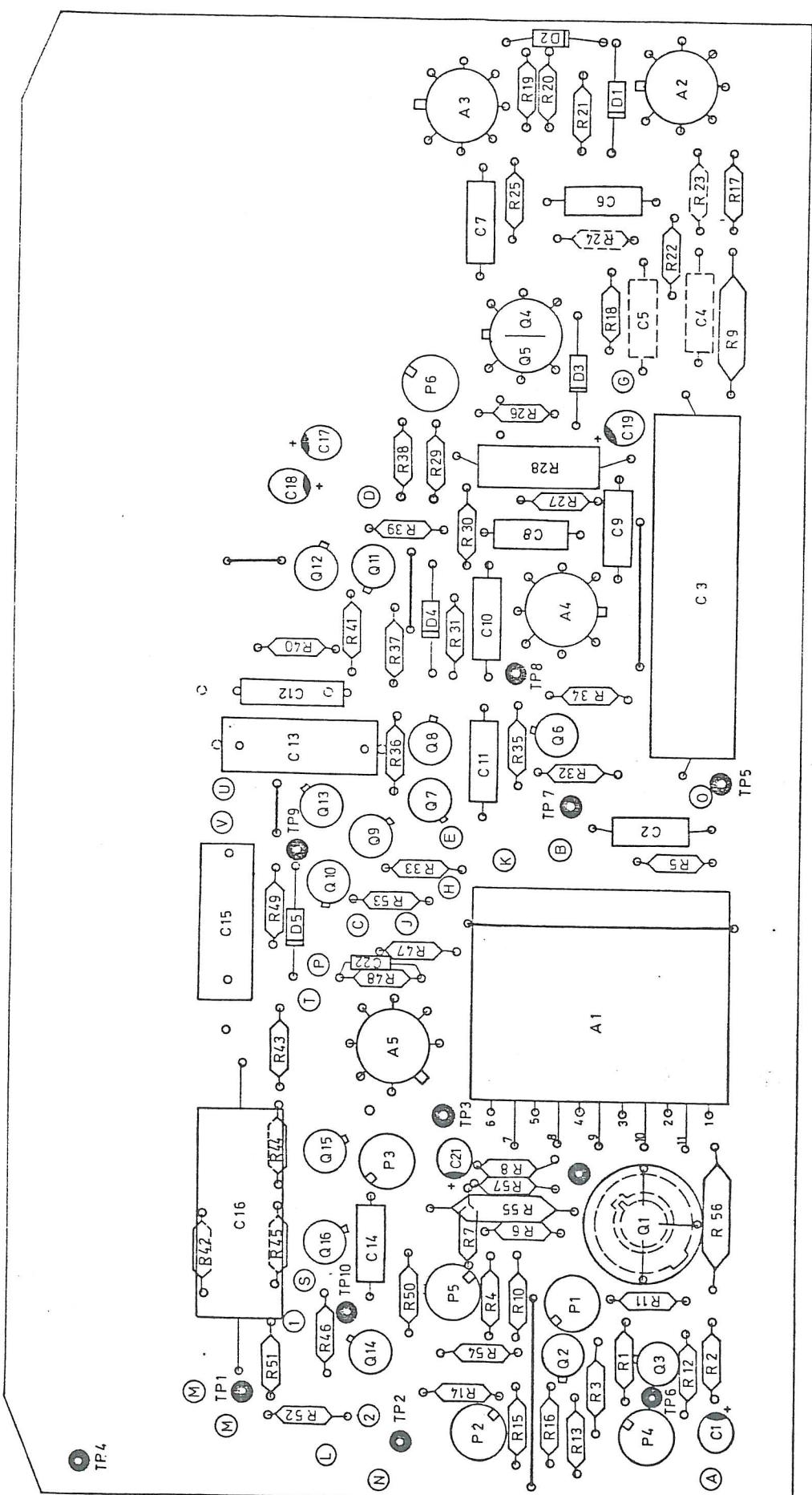


BLOCK DIAGRAM



INGENIØRFIRMAN TØNNES PEDERSEN AS	10-5-71	IW
Compressor Amplifier 179 - 120	Gard.	B
Compressor Card 179 - 1240	Tegning nr.	179 - 1230-A-3
Diagram		

Målestok  
Toleranse  
Materialer  
Behandl.  
Del nr  
Antal



Målestok Tolerance:	2:1 mm + 0	INGENØRFIRMAN TØNNES PEDERSEN A/S Compressor Amplifier 179-120	T <sub>eon</sub> 9-6-71 W Godk. B.M.
Material Behandl. Del af Antal		Compressor Card 179 - 1240 Component Layout.	TEGNING NR. 179 - 1241 - A- 3

POS.	TEGN. NR.	BETEGNELSE					MATERIALE	ANT.
R1		Resistor	6.8kΩ	1/8W	5%		Resista SK2	
R2		"	6.8kΩ	"	"		"	
R3		"	1kΩ	"	"		"	
R4		"	4.7kΩ	"	"		"	
R5		"	220 Ω	"	"		"	
R6		"	680 Ω	"	"		"	
R7		"	390 Ω	"	"		"	
R8		"	10kΩ	"	"		"	
R9		"	330 Ω	1/3W	"		Beyschlag	
R10		"	18kΩ	1/8W	"		Resista SK2	
R11		"	1MΩ	"	"		"	
R12		"	10kΩ	"	"		"	
R13		"	10kΩ	"	"		"	
R14		"	68kΩ	"	"		"	
R15		"	82kΩ	"	"		"	
R16		"	47kΩ	"	"		"	
R17		"	10kΩ	"	"		"	
R18		"	10kΩ	"	"		"	
R19		"	10kΩ	"	"		"	
R20		"	10kΩ	"	"		"	
R21		"	10kΩ	"	"		"	
R22		"	10kΩ	"	"		"	
R23		not used (Appx. 22kΩ when preamphasis)					"	
R24		"	"	( " 1kΩ " )	"		"	
R25		"	4.7kΩ	"	"		"	
R26		"	120kΩ	"	"		"	
R27		"	10kΩ	"	"		"	
R28		"	100Ω	1W	"		Vitrohm 253-9	
R29		"	22kΩ	1/8W	"		Resista SK2	
R30		"	560 Ω	"	"		"	
R31		"	3 kΩ	"	"		"	
R32		"	56kΩ	"	"		"	
R33		"	3.3kΩ	"	"		"	
R34		"	47kΩ	"	"		"	
R35		"	10kΩ	"	"		"	
R36		"	47kΩ	"	"		"	
R37		"	10kΩ	"	"		"	
R38		"	47kΩ	"	"		"	
R39		"	47kΩ	"	"		"	
R40		"	68 Ω	"	"		"	
R41		"	680kΩ	"	"		"	
R42		"	22kΩ	"	"		"	
R43		"	220kΩ	"	"		"	
R44		"	470kΩ	"	"		"	
R45		"	470kΩ	"	"		"	
R46		"	2.2kΩ	"	"		"	
R47		"	3.3kΩ	"	"		"	
R48		"	10kΩ	"	"		"	
SIG./DATO		INGENØRFIRMA N. TØNNES PEDERSEN A/S					STYKLISTE	
BM/DG 5.5.71		COMPRESSOR AMPLIFIER 179-120 Compressor Card 179-1240 Electrical Partslist					3...Blade - Blad...1	
							179-1231-A-4	

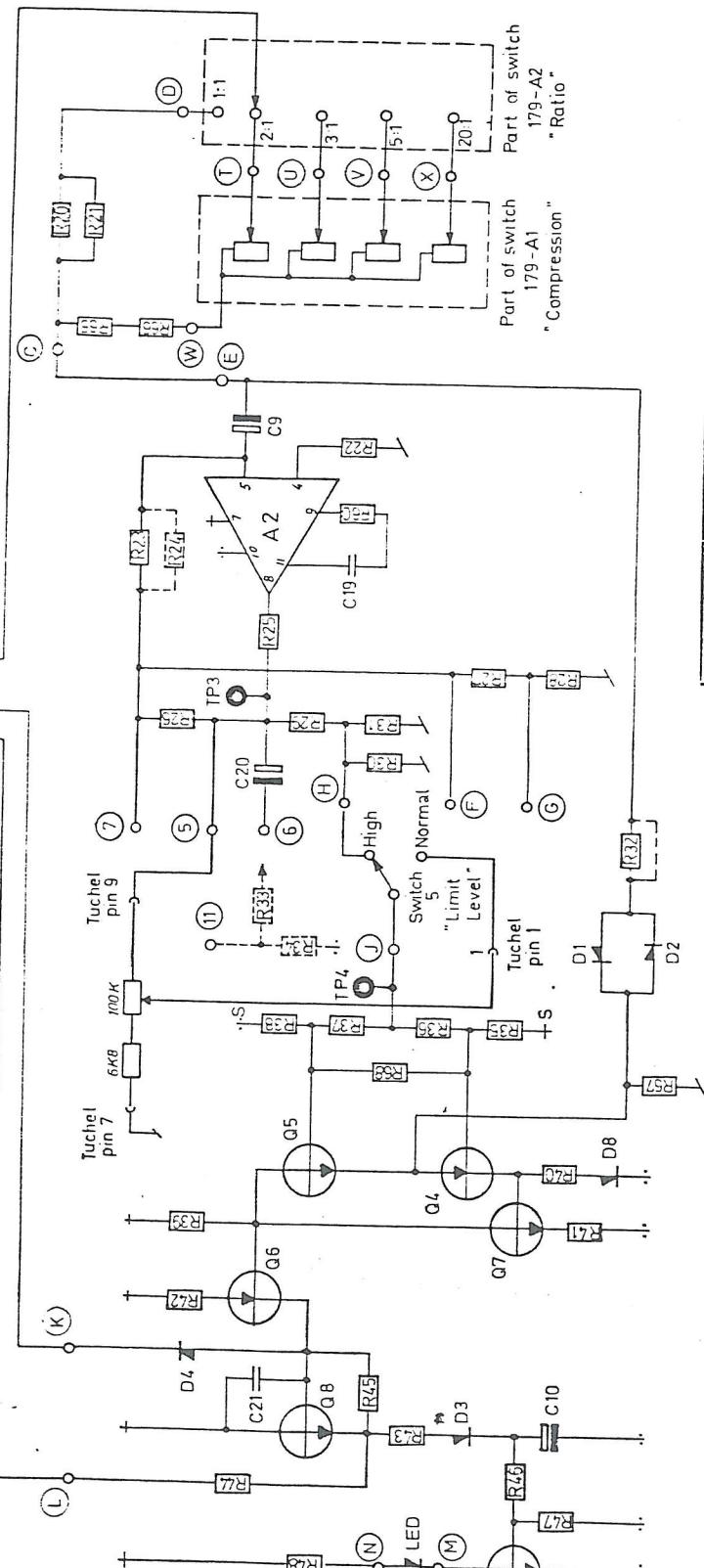
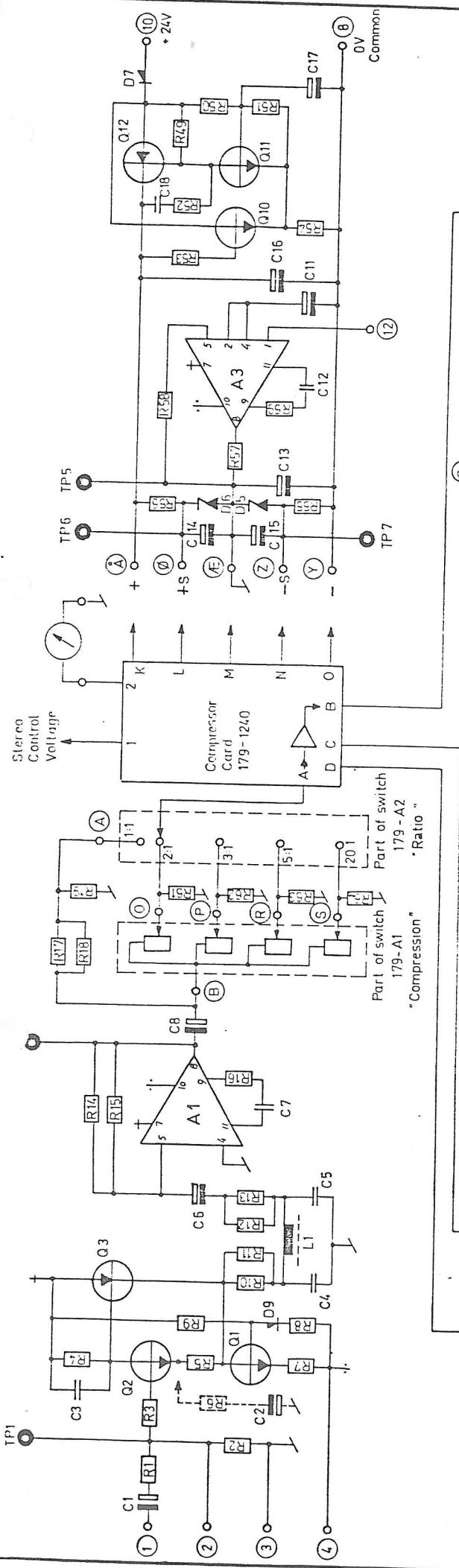
Rør - Især  
 10/12-74 BM  
 2. januar 74 BM/IW (R26)  
 19770125 SH 4.

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
R49		Resistor 470kΩ	Resista SK2	
R50		" 470 Ω	"	
R51		" 39 Ω	"	
R52		" 3.9kΩ	"	
R53		" 220 Ω	"	
R54		" 18kΩ	"	
R55		" 39 Ω 1/3W	Beyschlag	
R56		" 39 Ω 1/3W	"	
R57		" 4.7kΩ 1/8W	Resista SK 2	
C1		Tantal Cap. 100μF/3V ETP3	ERO	
C2		Styroflex Cap. 47 pf B31310 5% J	Siemens	
C3		Polyester Cap. 10μF 63V 10%		
		MKT 1813-547/06	Eromet	
C4		not used (when preamphasis 3,3 nf)		
C5		not used (" 6,7 nf)		
C6		Styroflex Cap. 330 pf B31310 5% J	Siemens	
C7		" " 330 pf " " "	"	
C8		" " 100 pf	"	
C9		" " 470 pf	"	
C10		" " 180 pf	"	
C11		" " 330 pf	"	
C12		" " 3.3 nf B31310 5% J	"	
C13		Mepo Cap. 0.15μF 250V B32234	Philips	
C14		Styroflex Cap. 330 pf B31310 5% J	Siemens	
C15		Mepo Cap. 0.22μF 250V B32234 b	"	
C16		Polyester Cap. 4.7μF/63V 10%		
		MKT 1813-547/06	Eromet	
C17		Tantal Cap. 10μF 16V ETP2	ERO	
C18		" " 10μF 16V ETP2	"	
C19		" " 33μF 25V ETP3	"	
C20		not used		
C21		Tantal Cap. 220μF/3v ETP4	ERO	
C22		Styroflex Cap. 22pf 160V	Siemens	
D1		Diode 1 N 4148	Texas Instr.	
D2		" 1 N 4148	" "	
D3		" 1 N 4148	" "	
D4		" 1 N 4148	" "	
D5		" 1 N 4148	" "	
Q1	179-1218	F.E.T. Si 216 N specially selected	AKERS	
Q2	A4	Transistor BC 107 B (A)	Siemens	
Q3		" BC 177 B (A)	"	
Q4		Dual Transistor MD 8001	Motorola	
Q5		Transistor BC 177 B (A)	Siemens	
Q6		" BC 177 B (A)	"	
Q7		" BC 177 B (A)	"	
Q8		" BC 177 B (A)	"	
Q9		" BC 107 B (A)	"	
Q10		" BC 177 B (A)	"	
SIG./DATO	INGENØRFIRMA N. TØNNES PEDERSEN %			STYKLISTE
BM DG 5.5.71	COMPRESSOR AMPLIFIER 179-120 Compressor Card 179-1240 Electrical Partslist			3 Blade - Blad 2 179-1231-A-4

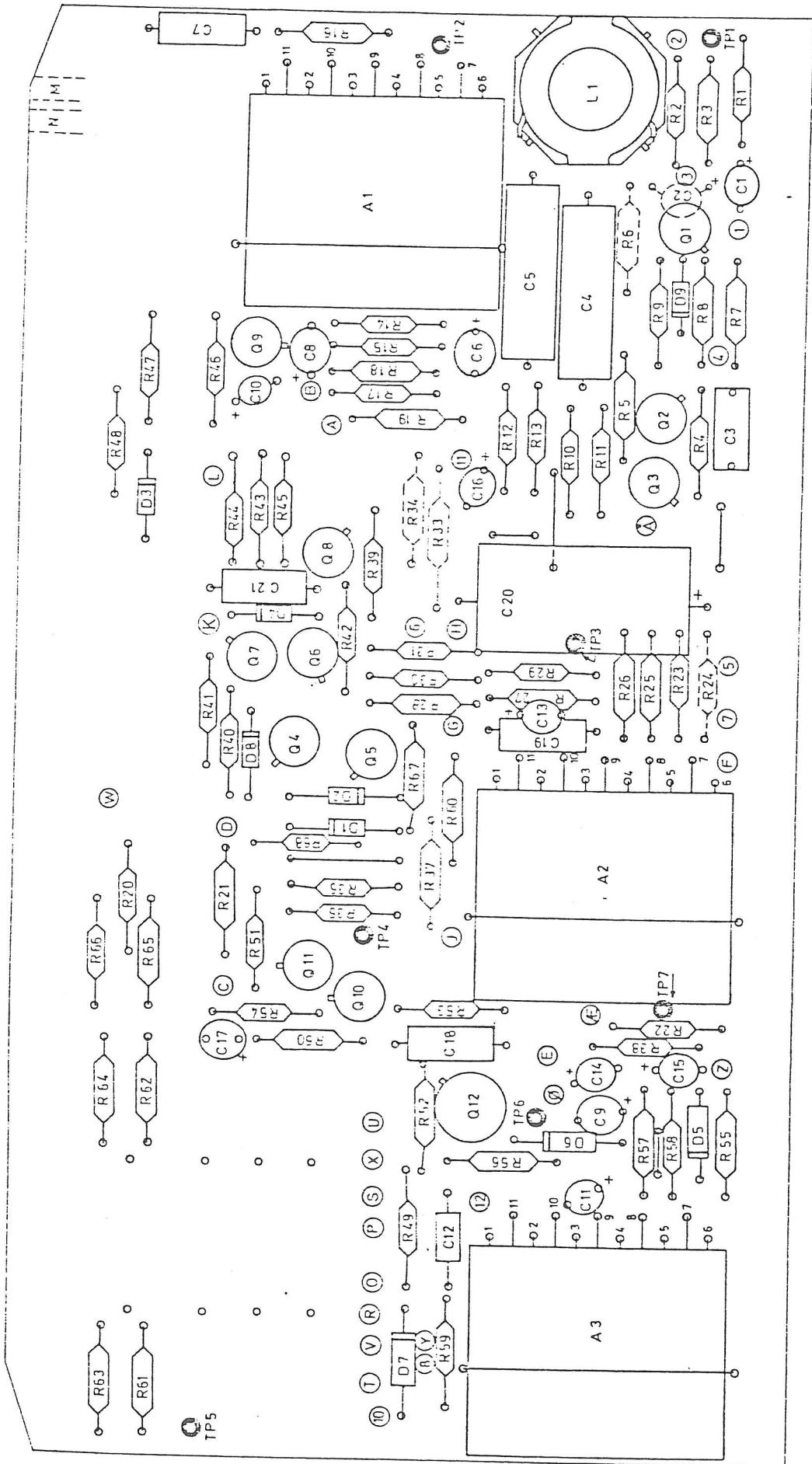
R-ser  
 5/7.71 BM  
 10/12.71 BM  
 14/11-73 BM (lw)

2 Jan 74 BM/lw (C12+13)  
 19770125 SH

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
Q11		Transistor BC 107 B (A)	Siemens	
Q12		" BC 177 B (A)	"	
Q13		" BC 177 B (A)	"	
Q14		" BC 107 B (A)	"	
Q15		" BC 177 B (A)	"	
Q16		" BC 107 B (A)	"	
		Transistor Oven type 5 ST 1-2 (To -18) 80°C	JERMYN	
A1		Linear Amplifier M-100	NTP	
A2		Operational Amplifier LM 301 A	National Semi	
A3		" " LM 301 A	" "	
A4		" " LM 301 A	" "	
A5		" " LM 310	" "	
P1		Trim Potentiometer 10kΩ 3329 H-103	Bourns	
P2		" " 1kΩ 3329 H-102	"	
P3		" " 1kΩ 3329 H-102	"	
P4		" " 1kΩ 3329 H-102	"	
P5		" " 1kΩ 3329 H-102	"	
P6		" " 10kΩ 3329 H-103	"	
		Copper tube rivets S 6086	United Shoe	10
		Transistor spacers To 18-002		12
179-1240 B-3		Printed Circuit Board 179-1240-B	NTP	
SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN A/S	STYKLISTE		
BM/DG 5.5.71	COMPRESSOR AMPLIFIER 179-120 Compressor Card 179-1240 Electrical Partslist	3.....Blade - Blad...3..... 179-1231-A-4		



INGENØRFIRMAN TØNNES PEDERSEN A/S			TEGN. 8.3.78. IW / TL
Material	Del af	Aantal	Godk.
Leverance	Compressor	179 - 120 X	
Bælterelin	Amplifier Card	179 - 1242	
Bænd	Diagram		TEGNING NR. 179 - 1232- X-3



Målverkstid	2:1	INGENØRFIRMA N. JONNES PEDERSEN A/S			Tren.	3-5-71. IW
Toleranse	+ mm - 0	Compressor	Amplifier	179 - 120	Grod.	3 Ar
Materialer						TEGNING NR
Behovsdi						
Del af		Amplifier	Card	179 - 1242		
Aantal		Component	Layout			179 - 1243 - A-3

POS.	TEGN. NR.	BETEGNELSE				MATERIALE	ANT.
R1		Resistor	5.6 kΩ	5%	1/8W	Resista SK2 (Beyschlag)	
R2	"		10 kΩ	"	"	"	
R3	"		220 Ω	"	"	"	
R4	"		2.2 kΩ	"	"	"	
R5	"		1.5 kΩ	"	"	"	
R6	"	not used	(390Ω = -8dBu)			"	
R7	"		68 Ω	"	"	"	
R8	"		270 Ω	"	"	"	
R9	"		10 kΩ	"	"	"	
R10	"		22 kΩ	"	"	"	
R11	"		2.2 kΩ	"	"	"	
R12	"		2.2 kΩ	"	"	"	
R13	"		22 kΩ	"	"	"	
R14	"		4.7 kΩ	"	"	"	
R15	"		27 kΩ	"	"	"	
R16	"		220 Ω	"	"	"	
R17	"		150 kΩ	"	"	"	
R18	"		27 kΩ	"	"	"	
R19	"		470 Ω	"	"	"	
R20	"		8.2 kΩ	"	"	"	
R21	"		1.5 kΩ	"	"	"	
R22	"		10 kΩ	"	"	"	
R23	"		10 kΩ	"	"	"	
R24	"	not used				"	
R25	"		18 Ω	"	"	"	
R26	"		270 Ω	"	"	"	
R27	"		180 Ω	"	"	"	
R28	"		470 Ω	"	"	"	
R29	"		1 kΩ	"	"	"	
R30	"		1.8 kΩ	"	"	"	
R31	"		330 Ω	"	"	"	
R32	"	strapped	"	"	"	"	
R33	"	not used	(330Ω = -8dBu)			"	
R34	"	not used	(82Ω = " )			"	
R35	"		47 kΩ	"	"	"	
R36	"		5.6 kΩ	"	"	"	
R37	"		5.6 kΩ	"	"	"	
R38	"		47 kΩ	"	"	"	
R39	"		2.2 kΩ	"	"	"	
R40	"		2.2 kΩ	"	"	"	
R41	"		2.2 kΩ	"	"	"	
R42	"		2.7 kΩ	"	"	"	

SIG./DATO

INGENIØRFIRMA N. TØNNES PEDERSEN A/S

STYKLISTE

BM/DG  
3.5.71COMPRESSOR AMPLIFIER 179-120  
Amplifier Card 179-1242  
Electrical Partslist

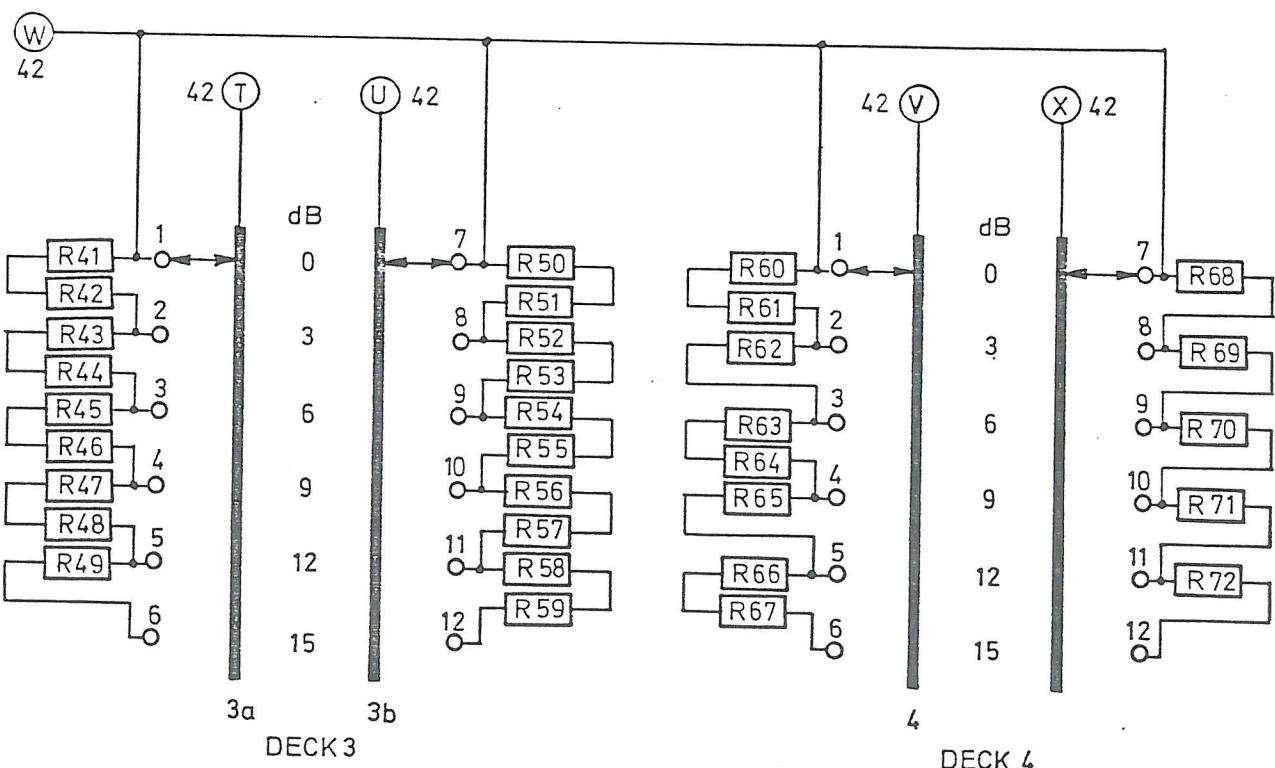
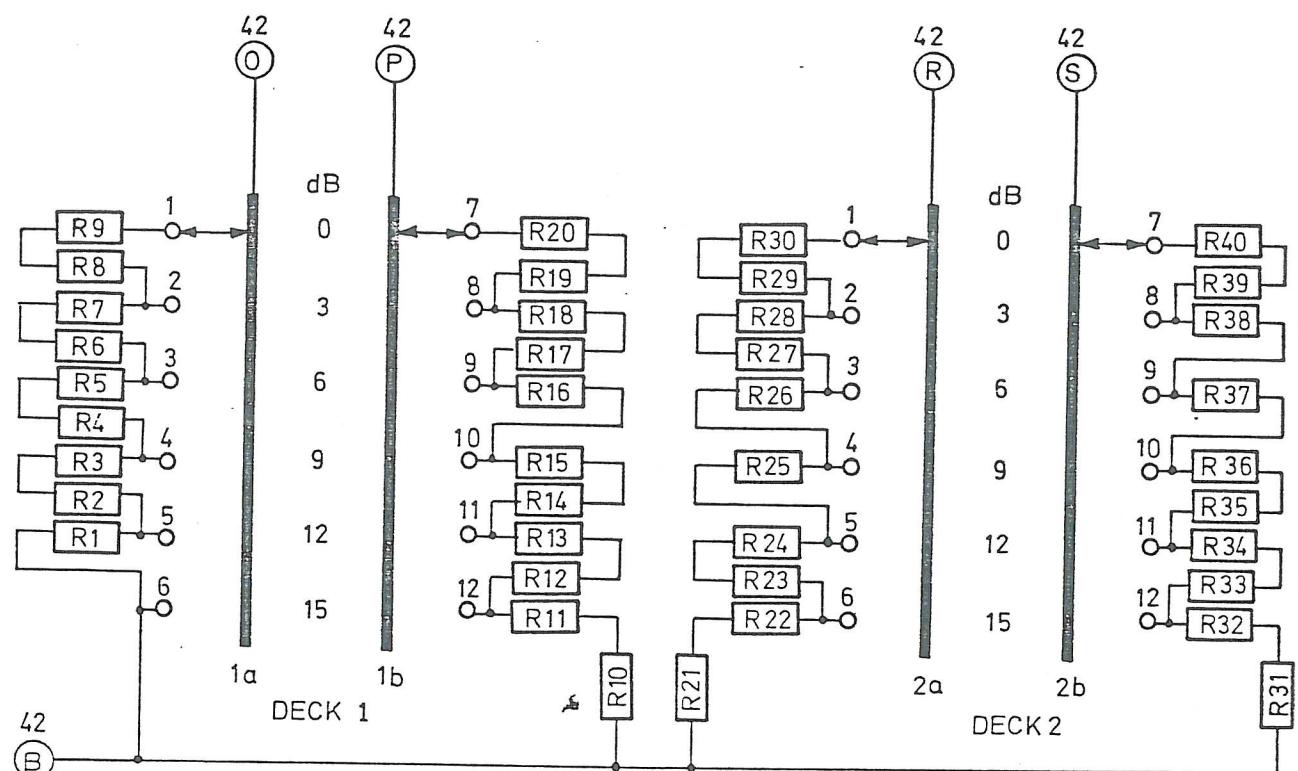
...3.....Blad... - Blad....1....

179-1233-A-4

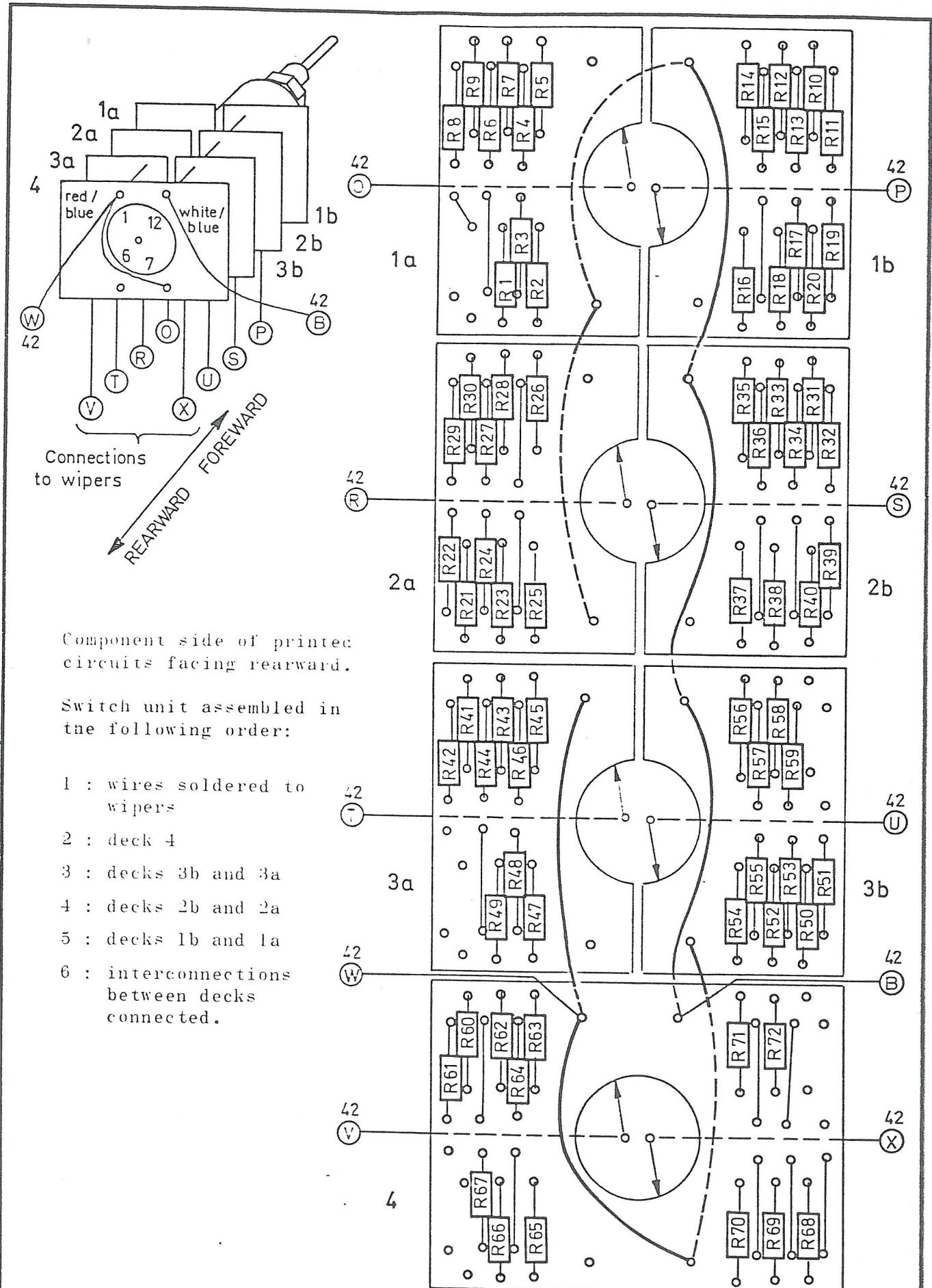
R ser  
A0/12-71 BM/1W  
2 Jan. 74 -II- (R35,36,37 og 38)  
16.10.1975 BM/sh f

POS.	TEGN. NR.	BETEGNELSE					MATERIALE	ANT.
R43		Resistor	470 $\Omega$	5%	1/8W		Resista SK2 (Beyschlag)	
R44		"	47k $\Omega$	"	"		"	
R45		"	470k $\Omega$	"	"		"	
R46		"	100k $\Omega$	"	"		"	
R47		"	100k $\Omega$	"	"		"	
R48		"	2.2k $\Omega$	"	"		"	
R49		"	12k $\Omega$	"	"		"	
R50		"	22k $\Omega$	"	"		"	
R51		"	18k $\Omega$	"	"		"	
R52		"	470 $\Omega$	"	"		"	
R53		"	1k $\Omega$	"	"		"	
R54		"	6.8k $\Omega$	"	"		"	
R55		"	390 $\Omega$	"	"		"	
R56		"	270 $\Omega$	"	"		"	
R57		"	33 $\Omega$	"	"		"	
R58		"	1k $\Omega$	"	"		"	
R59		"	1k $\Omega$	"	"		"	
R60		"	220 $\Omega$	"	"		"	
R61		"	470 $\Omega$	"	"		"	
R62		"	470 $\Omega$	"	"		"	
R63		"	470 $\Omega$	"	"		"	
R64		"	470 $\Omega$	"	"		"	
R65		"	2.7k $\Omega$	"	"		"	
R66		"	120 $\Omega$	"	"		"	
R67		"	470 $\Omega$	"	"		"	
R68		"	220k $\Omega$	"	"		"	
C1		Tantal Cap.	22 $\mu$ F 16V ETP3			ERO		
C2		" "	not used (100 $\mu$ F 3V)					
C3		Styroflex Cap.	470 pF B31310 5% J			Siemens		
C4		" "	4.7 nF " "			"		
C5		" "	4.7 nF " "			"		
C6		Tantal Cap.	33 $\mu$ F/10V ETP3			ERO		
C7		Styroflex Cap.	100 pF B31310 5% J			Siemens		
C8		Tantal Cap.	100 $\mu$ F/3V ETP3			ERO		
C9		" "	100 $\mu$ F/3V ETP3			"		
C10		" "	1 $\mu$ F/35V ETP1			"		
C11		" "	10 $\mu$ F/16V ETP2			"		
C12		Styroflex Cap.	22pF B31110 5% J			Siemens		
C13		Tantal Cap.	10 $\mu$ F/16V ETP2			ERO		
C14		" "	10 $\mu$ F/16V " "			"		
C15		" "	10 $\mu$ F/16V " "			"		
C16		" "	10 $\mu$ F/35V " "			"		
C17		" "	10 $\mu$ F/35V " "			"		
SIG./DATO	INGENØRFIRMA N. TØNNES PEDERSEN A/S						STYKLISTE	
5/7-74 BM 16/12-74 BM 2 Jan. 74 BM/lu (R55,56 og 68)	BM, DG 3.5.71	COMPRESSOR AMPLIFIER 179-120 Amplifier Card 179-1242 Electrical Partslist						3... Blade - Blad...2... 179-1233-A-4

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
C18		Styroflex Cap. 100 pF B31310 5% J-	Siemens	
C19		100 pF B31310 5% J	"	
C20		El.lyt. cap. 500μF/15V EB	ROE	
C21		Styroflex Cap. 220 pF B31310 5% J	Siemens	
D1-2		Diode IN 4152 (BAX 13)	Texas o.a.	2
D3-4		Si-diode IN 4148	Texas LInstr.	2
D5-6		Si-Zenerdiode IN 821	ITT	2
D7		Si-diode 10 D 1	J.R	2
D8-9		Si-diode IN 4148	Texas LInstr.	2
Q1		Transistor BC 107 B (A)	Siemens	
Q2		" BC 107 B (A)	"	
Q3		" BC 177 B (A)	"	
Q4		" BC 177 B (A)	"	
Q5		" BC 107 B (A)	"	
Q6		" BC 177 B (A)	"	
Q7		" BC 107 B (A)	"	
Q8		" BC 107 B (A)	"	
Q9		" BC 107 B (A)	"	
Q10		" BC 107 B (A)	"	
Q11		" BC 107 B (A)	"	
Q12		" BC 161-16 (10)	"	
A1		Amplifier M-100	NTP	
A2		" M-100	"	
A3		" M-100	"	
L1	179-1217 A-4	Coil consists of:  Potcore: B65651-K0250-A022 Bobin : B65652-A0000-M001 Tag plate: B65655-A0007-X000 Spring : 8x11	Siemens	
	179-1242 B-3	Printed Circuit Board 179-1242-B  Copper Tube rivets S6086 Transistor Spacers To 18-002 " " To 518-003	NTP  United Shoe	7 11 1
SIG./DATO	INGENØRFIRMA N. TØNNES PÆDESEN %			STYKLISTE
BM/DG 3.5.71	COMPRESSOR AMPLIFIER 179-120 Amplifier Card 179-1242 Electrical Partslist			3 Blad - Blad. 3..... 179-1233-A-4



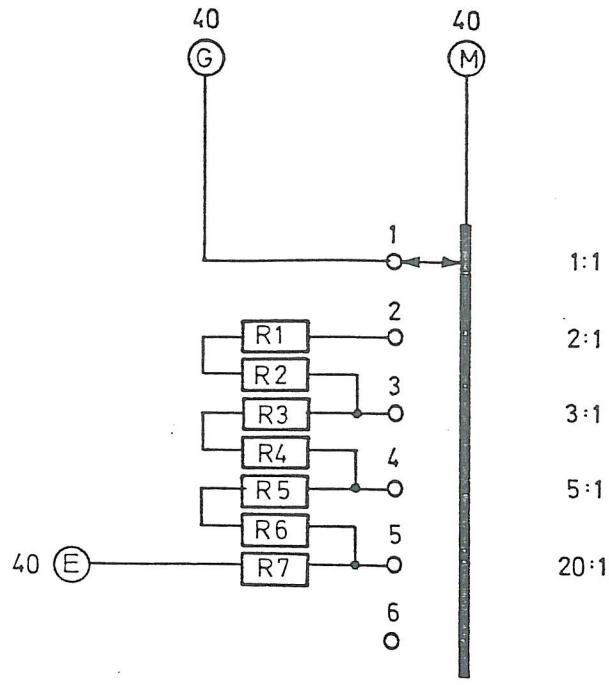
Målestok		INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	13-5-71 I.W.
Tolerance	$\pm$ mm $\pm$ 0			
Materiale		Switch Unit 179-A1 (part of 179-120)	Godk.	
Behandl.				TEGNING NR.
Del af		Function : Compression Diagram		179 - A130 - A - 4
Antal				



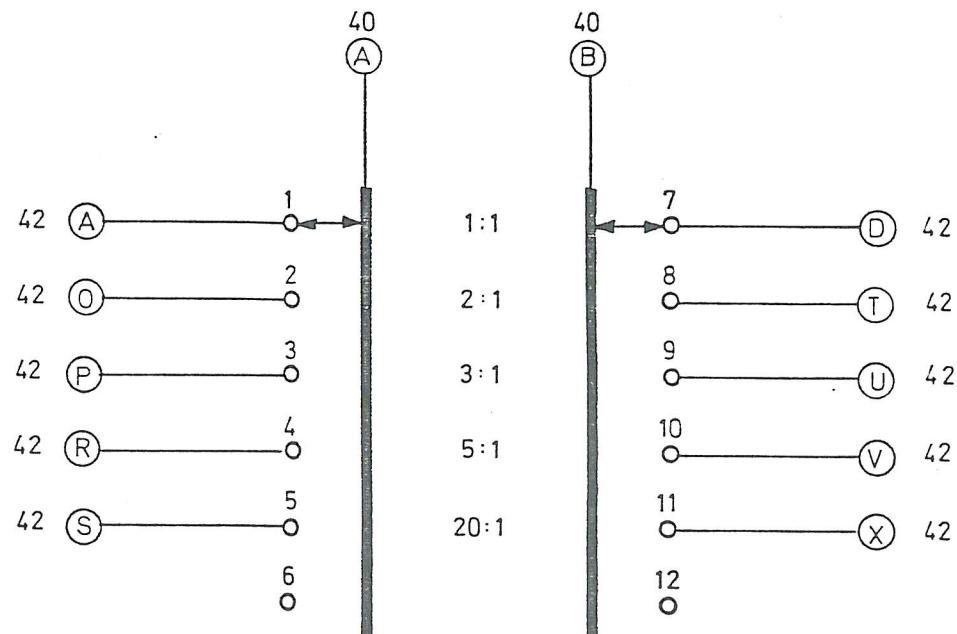
Målestok	2:1	INGENIØRFIRMA N. TØNNES PEDERSEN A/s		Tegn.	12-5-71. IW
Tolerance	$\pm$ mm $\pm$ 0	Switch Unit 179-A1 (part of 179-120)		Godk.	
Materiale					
Behandl.					TEGNING NR.
Del af	Function: Compression		179 - A 141 - A - 4		
Antal	Component Lay - out				

POS.	TEGN. NR.	BETEGNELSE					MATERIALE	ANT.	
R1		Resistor	330 $\Omega$	1/8W	5%		Resista SK 2		
R2		"	330 $\Omega$	"	"		"		
R3		"	330 $\Omega$	"	"		"		
R4		"	100 $\Omega$	"	"		"		
R5		"	1.2k $\Omega$	"	"		"		
R6		"	390 $\Omega$	"	"		"		
R7		"	2.2k $\Omega$	"	"		"		
R8		"	560 $\Omega$	"	"		"		
R9		"	4.7k $\Omega$	"	"		"		
R10		"	390 $\Omega$	"	"		"		
R11		"	68 $\Omega$	"	"		"		
R12		"	470 $\Omega$	"	"		"		
R13		"	68 $\Omega$	"	"		"		
R14		"	820 $\Omega$	"	"		"		
R15		"	56 $\Omega$	"	"		"		
R16		"	1.5k $\Omega$	"	"		"		
R17		"	330 $\Omega$	"	"		"		
R18		"	2.2k $\Omega$	"	"		"		
R19		"	270 $\Omega$	"	"		"		
R20		"	3.9k $\Omega$	"	"		"		
R21		"	820 $\Omega$	"	"		"		
R22		"	56 $\Omega$	"	"		"		
R23		"	560 $\Omega$	"	"		"		
R24		"	100 $\Omega$	"	"		"		
R25		"	1k $\Omega$	"	"		"		
R26		"	1.5k $\Omega$	"	"		"		
R27		"	220 $\Omega$	"	"		"		
R28		"	2.2k $\Omega$	"	"		"		
R29		"	330 $\Omega$	"	"		"		
R30		"	3.9k $\Omega$	"	"		"		
R31		"	1.5k $\Omega$	"	"		"		
R32		"	180 $\Omega$	"	"		"		
R33		"	680 $\Omega$	"	"		"		
R34		"	47 $\Omega$	"	"		"		
R35		"	1k $\Omega$	"	"		"		
R36		"	68 $\Omega$	"	"		"		
R37		"	1.5k $\Omega$	"	"		"		
R38		"	2.2k $\Omega$	"	"		"		
R39		"	470 $\Omega$	"	"		"		
R40		"	2.7k $\Omega$	"	"		"		
R41		"	1k $\Omega$	"	"		"		
R42		"	150 $\Omega$	"	"		"		
R43		"	1.5k $\Omega$	"	"		"		
R44		"	150 $\Omega$	"	"		"		
R45		"	2.2k $\Omega$	"	"		"		
R46		"	120 $\Omega$	"	"		"		
R47		"	2.7k $\Omega$	"	"		"		
E48		"	470 $\Omega$	"	"		"		
SIG./DATO		INGENIØRFIRMA N. TØNNES PEDERSEN A/S					STYKLISTE		
30.4.71		Switch Unit 179-A1 (part of 179-120)					2 Blade - Blad 1		
BM, DG		Electrical Partslist					179-A131-A 4		

POS.	TEGN. NR.	BETEGNELSE				MATERIALE	ANT.				
R49		Resistor	4.7kΩ	1/8W	5%	Resista SK 2					
R50	"		470 Ω	"	"	"					
R51	"		56 Ω	"	"	"					
R52	"		560 Ω	"	"	"					
R53	"		68 Ω	"	"	"					
R54	"		680 Ω	"	"	"					
R55	"		82 Ω	"	"	"					
R56	"		820 Ω	"	"	"					
R57	"		56 Ω	"	"	"					
R58	"		1kΩ	"	"	"					
R59	"		82 Ω	"	"	"					
R60	"		220 Ω	"	"	"					
R61	"		33 Ω	"	"	"					
R62	"		270 Ω	"	"	"					
R63	"		270 Ω	"	"	"					
R64	"		39 Ω	"	"	"					
R65	"		330 Ω	"	"	"					
R66	"		390 Ω	"	"	"					
R67	"		68 Ω	"	"	"					
R68	"		56 Ω	"	"	"					
R69	"		47 Ω	"	"	"					
R70	"		56 Ω	"	"	"					
R71	"		56 Ω	"	"	"					
R72	"		56 Ω								
	182-9040	Printed Circuit Board 182-900 (3 of the circuit boards are divided into halves)				NTP	4				
		Switch type M x 4, 8 x 6 K T = 12				EBE					
<b>SIG./DATO</b>											
<b>INGENIØRFIRMA N. TØNNES PEDERSEN A/S</b>											
30.4.71	BM/DG	Switch Unit	179-A1	(part of 179-120)		2 Blad - Blad 2					
		Electrical Partslist				179-A131-A4					

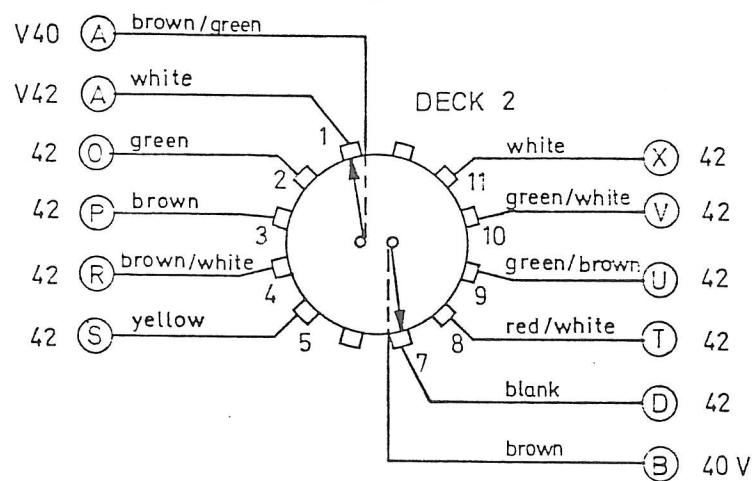
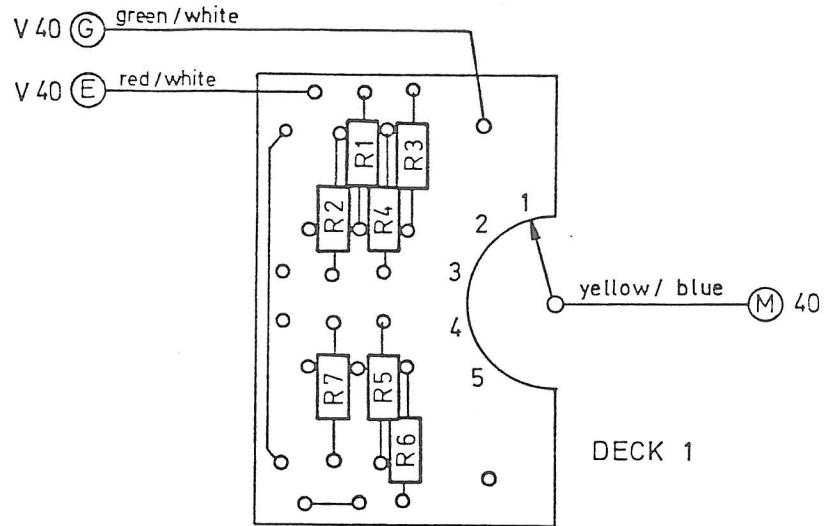


DECK 1



## DECK 2

Målestok		INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	12-5-71. IW
Tolerance	± mm ± 0	Switch Unit 179-A2 (part of 179-120)		
Materiale			Godk.	
Behandl.		Function : Ratio		TEGNING NR.
Del af		Diagram		179 -A230 - A-4
Antal				

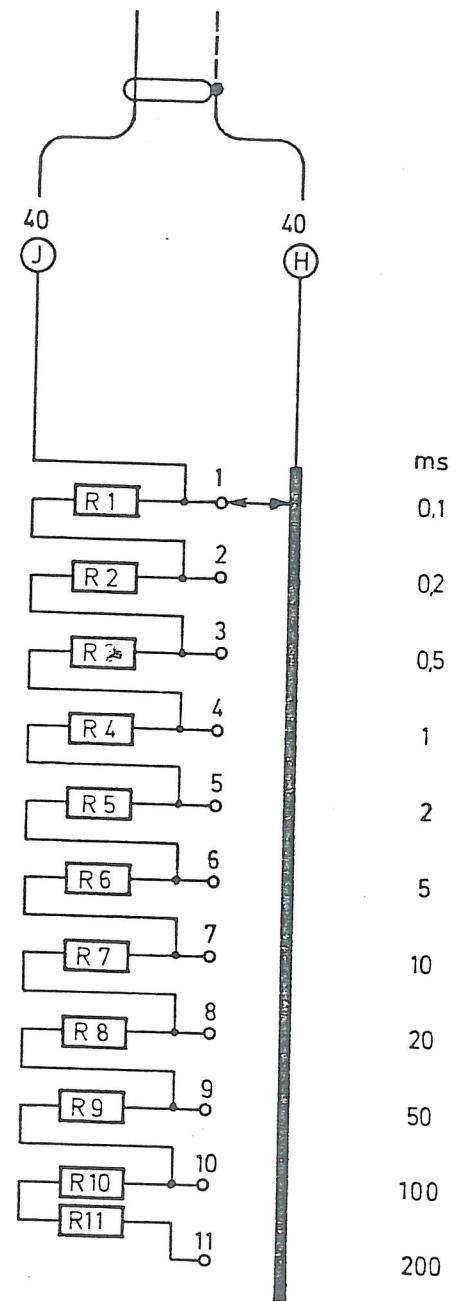


Målestok	2 : 1	INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	11-5-71 IW
Tolerance	$\pm$ mm $\pm$ 0			
Materiale		Switch Unit 179-A2 (part of 179-120)	Godk.	
Behandl.				TEGNING NR.
Del af		Function : Ratio		
Antal		Component Lay - out		179 - A 241 - A - 4

POS.	TEGN. NR.	BETEGNELSE					MATERIALE	ANT.
R1		Resistor	1.8kΩ	1/8W	5%		Resista SK2	
R2		"	150 Ω	"	"		"	
R3		"	470 Ω	"	"		"	
R4		"	82 Ω	"	"		"	
R5		"	330 Ω	"	"		"	
R6		"	33 Ω	"	"		"	
R7		"	82 Ω	"	"		"	
	182-9040	Printed Circuit Board	182-900				NTP	
		Switch type Mx 2 4 x 5 K T = 12					EBE	
SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN A/S						STYKLISTE	
30.4.71 BM DG	Switch Unit 179-A2 (part of 179-120) Electrical Partslist						.....Blade - Blad.....	
							179-A231-A-4	

13/1.72 BM

158

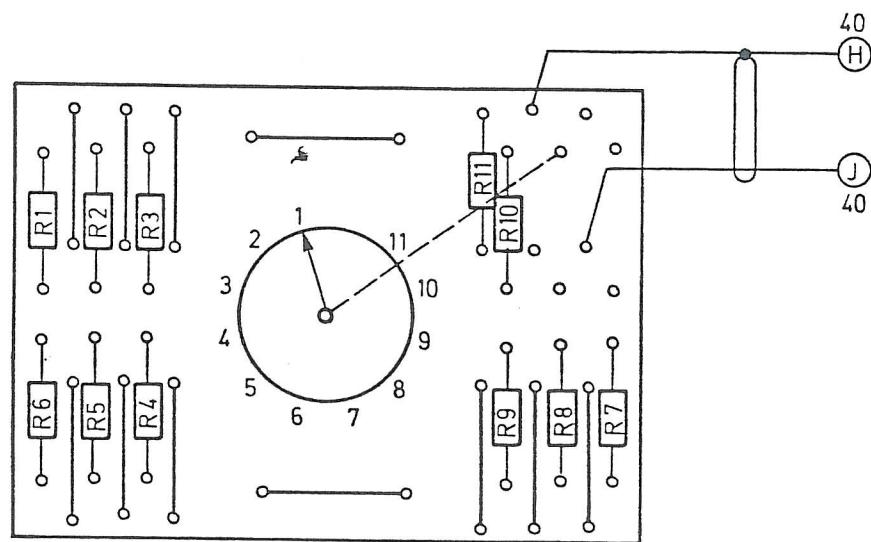


Note !

R11 is only used in 179-140 !

Strap in 179-120

Pos.:	Antal:	Materiale:	Behandl.:	Del af
Målestok :				
Tolerance: $\pm$ mm				
Tegnet : 2-2-77 TL				
Godkendt:				
Revideret :				
Switch Unit 179-A3 (Part of 179-140)				NTP NTP ELEKTRONIK A/S
Funcion: Attack				
Diagram				179-A330-A-4



Pos.:	Antal:	Materiale:	Behandl..	Del af
Mälestok :				
Tolerance: $\pm$	mm			
Tegnet : 2-2-77 TL				
Godkendt:				
Revideret :				
Switch Unit 179-A3 (Part of 179-140)				 NTP ELEKTRONIK A/S
Function: Attack				
Components Lay-out				179-A341-A-4

POS.	TEGN. NR.	BETEGNELSE					MATERIALE	ANT.
R1		Resistor	220 Ω	1 8W	5%		Resista SK 2	
R2		"	680 Ω	"	"		"	
R3		"	1.2kΩ	"	"		"	
R4		"	2.2kΩ	"	"		"	
R5		"	6.8kΩ	"	"		"	
R6		"	12kΩ	"	"		"	
R7		"	27kΩ	"	"		"	
R8		"	82kΩ	"	"		"	
R9		"	180kΩ	"	"		"	
R10		"	330kΩ	"	"		"	
R11	182-9040	Printed Circuit Board	182-900				NTP	
		Switch type Mx 1/1 x 11 K T = 12					EBC	
		Note :						
		R11 is only used in 179-140 !						
		Strap in 179-120.						
SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN %						STYKLISTE	
30.4.71 BM DG	Switch Unit 179-A3 (part of 179-120) Electrical Partslist						1. Blad - Blad 1.....	
							179-A331-A-4	

SIG./DATO

INGENØRFIRMA N. TØNNES PEDERSEN

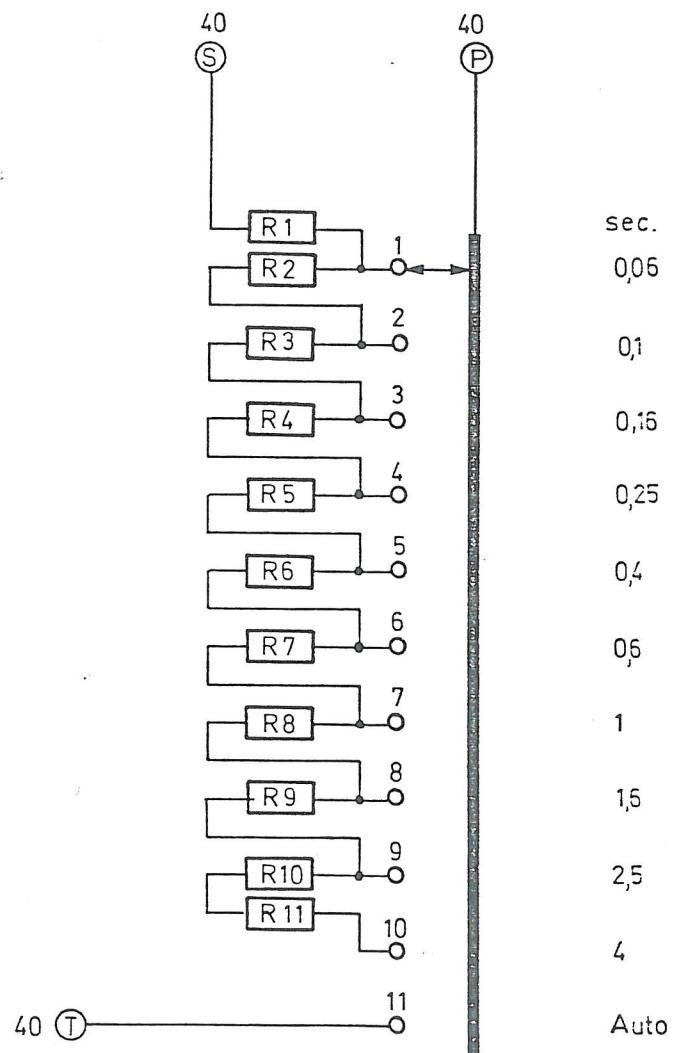
STYKLISTE

30.4.71  
BM - DG

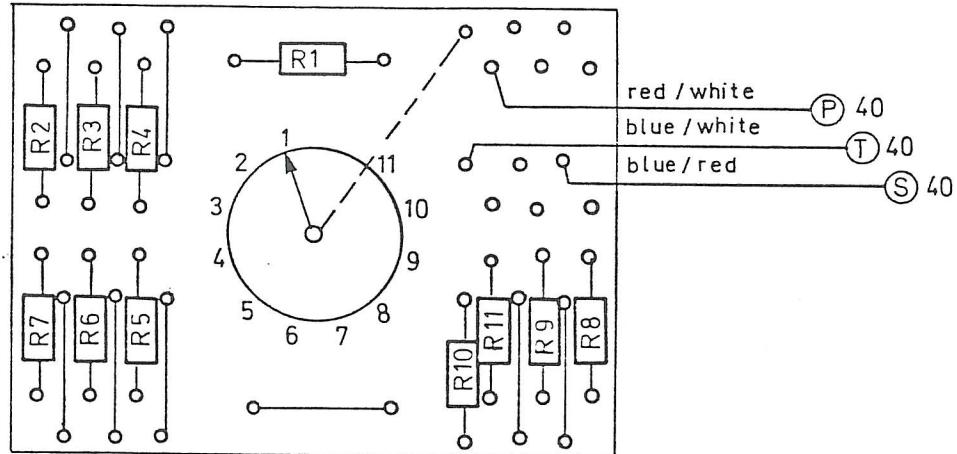
Switch Unit 179-A3 (part of 179-120)  
Electrical Partslist

.....1...Blade - Blad...1.....

179-A331-A-4



Målestok		INGENIØRFIRMA N. TØNNES PEDERSEN A/s	
Tolerance	+ mm + 0	Tegn.	12-5-71 IW
Materiale		Switch Unit 179 - A4 (part of 179 120)	Godk.
Behandl.		Function : Recovery	TEGNING NR.
Del af		Diagram	179-A430-A-4
Antal			



Målestok	2:1	INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	11-5-71-IW
Tolerance	$\pm$ mm $\pm$ 0			
Materiale		Switch Unit 179 - A4 (part of 179-120)	Godk.	
Behandl.				TEGNING NR.
Del af		Function : Recovery		
Antal		Component Lay - out		179 - A441 - A4

POS.	TEGN. NR.	BETEGNELSE					MATERIALE	ANT.
R1		Resistor	47kΩ	1/8W	5%		Resista SK 2	
R2		"	33kΩ	"	"		"	
R3		"	39kΩ	"	"		"	
R4		"	68kΩ	"	"		"	
R5		"	120kΩ	"	"		"	
R6		"	180kΩ	"	"		"	
R7		"	390kΩ	"	"		"	
R8		"	560kΩ	"	"		"	
R9		"	680kΩ	"	"		"	
R10		"	470kΩ	"	"		"	
R11		"	1MΩ	"	"		"	
	182-9040	Printed Circuit Board	182-900				NTP	
		Switch type Mx	1/1 x 11 K	T=12			EBC	
SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN A/S						STYKLISTE	
30.4.71 BM/DG	Switch Unit 179-A4 (part of 179-120) Electrical Partslist						.....1.....	Blade - Blad 1.....
								179-A431-A-4

R \ser 13/1-72 BN /1w