

LIMITER AMPLIFIER  
— 179-230 —

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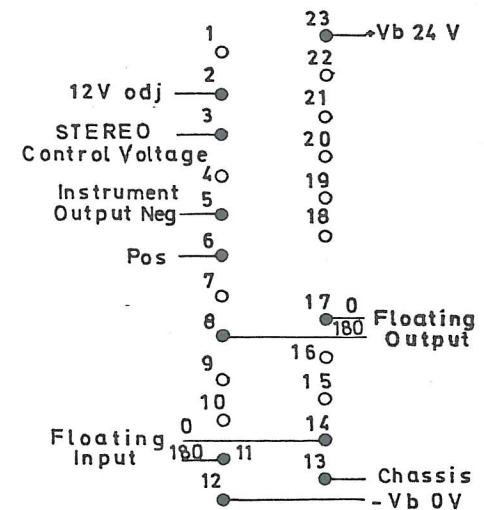
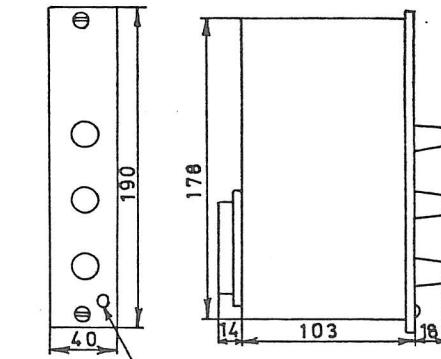
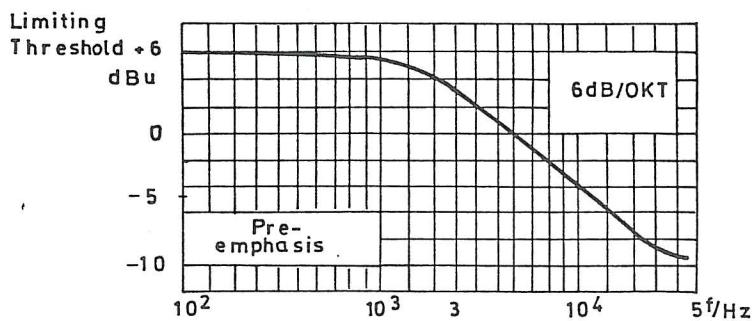
Technical Specifications  
Instructions for Alignment  
Diagram  
Component lay-out  
Electrical Parts list

Draw No.:

179-2311-A4  
179-2322-A4  
179-2330-A3  
179-2341-A3  
179-2331-A4

Supply Voltage	:	24 V dc $\pm 10\%$
Maximum Ripple Voltage	:	0,1 V pp
Current Consumption, steady state	:	appr. 75 mA
Current Consumption, during heat-up	:	200 mA
Temperature Range	:	-20°C to +60°C (-40°F to +140°F)
Frequency Response	:	$\pm 0,5$ dB 20 Hz to 20 kHz
Input Impedance 20 Hz to 20 kHz	:	22 kOhms $\pm 10\%$ floating
Output Impedance 20 Hz to 20 kHz	:	20 Ohms floating
Input Overload level	:	+21 dBu (8,6 V rms)
Minimum load	:	200 Ohms
Basic Amplification	:	0 $\pm 0,5$ dB
Preamplification	:	0 to 24 dB in 3 dB steps
Limiting threshold, ref. to output	:	+6 dBu (1,55 V rms) $\pm 0,5$ dB <sup>1)</sup>
Limiting Range	:	> 30 dB
Distortion 20 Hz to 20 kHz	:	0 to 20 dB lim. 0,3%
Steady conditions	:	20 to 30 dB lim. 0,5%
Attack Time	:	1,5 msec. <sup>1)</sup>
Recovery Time T1	:	0,1-0,2-0,4-1-2-4 sec.
Recovery Time T2	:	1-2-4-10-20 off sec.
Control Voltage in- and output (Instr.etc.)	:	1 V/5 dB ref. to pin 5 <sup>2)</sup>
Signal to Noise Ratio at lim. threshold	:	86 dB A-curve
Standard colour	:	Dull black
Connector	:	Tuchel T 2700
Mechanical Outlines	:	see drawing

Pre-emphasis: 50  $\mu$  sec. (normally not connected)



1.) The attack time is combined with a full-wave logarithmic clipping circuit. The limiting threshold stated above applies to steady state conditions. Peaks shorter than 1,5 msec. will be limited at a level max. 3 dB above steady state conditions.

2.) Stereo Operation:  
 The Control Voltage of two units may be linked so as to obtain equal gain reduction in the two stereo channels. By cutting the connection between the two terminals L and M it is possible to apply an external control voltage to pin 3 giving a gain reduction of 5 dB per Volt up to 30 dB reduction.

Specifications subject to change.

Normally the Limiter 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. A2
- P2 Compensates for individual pinch-off of the F.E.T. (Q1)
- P3 Compensates for individual slope  $\frac{R_{SD}}{V_{GD}}$  of the F.E.T.
- P4 Linearity adjustment of the FET Attenuator circuit.
- P5 Adjustments for minimum distortion of the FET Attenuator.

Do not attempt to make any adjustments until the current consumption has fallen to a steady level approx. 75mA after 60 sec. Correct sequence of adjustments is as follows:

a. Bias adjustment of P1

Conditions: No input signal.

Connect a DC voltmeter (or DC-oscilloscope sens. approx. 20mV/div.) between TP3 and TP2.

P1 is adjusted until the voltage measured is the same whether TP 1 is connected to T2 or not.

b. Pinch-off adjustment of P2

Conditions: Input signal +6dBu 1kHz

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

The adjustment range can be altered by connecting or disconnecting R4 and / or R5.

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

Conditions: Like referred under pos. b.

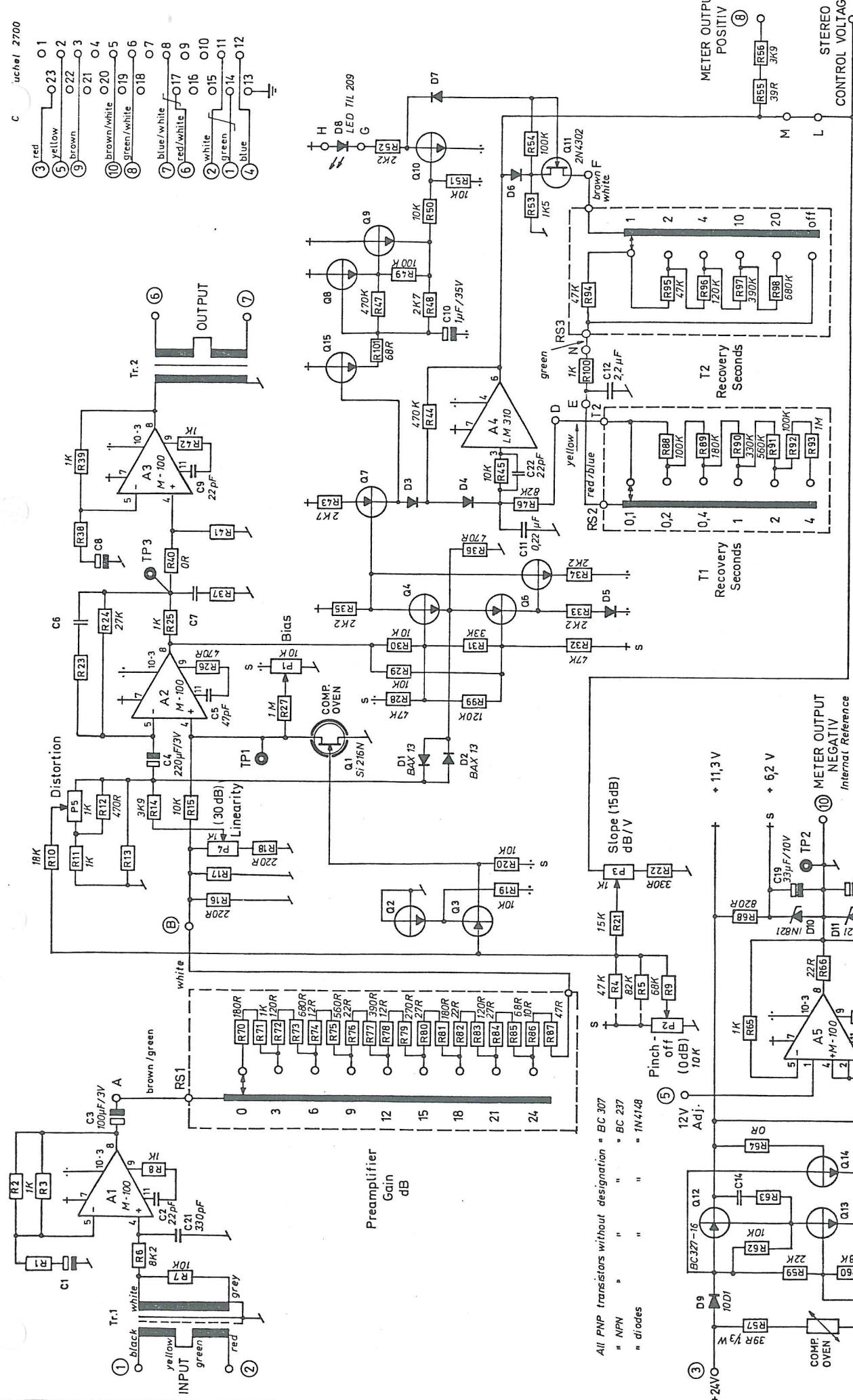
A floating external DC-source 0-6 V is connected between terminal 3 and 5, terminal 3 positive. The DC voltage is set to 3.0 Volt, and P3 is adjusted so that the output level is -9dBu (15 dB attenuation). Now the DC voltage is set to 6.0 Volt, and P4 is adjusted until the output level is -24dBu (30 dB attenuation). Because of mutual dependence between P3 and P4 the adjustments are repeated until correct output level is obtained.

e. Distortion adjustment of P5.

Conditions: Input signal +16dBu 1kHz

P5 is adjusted to minimum distortion.

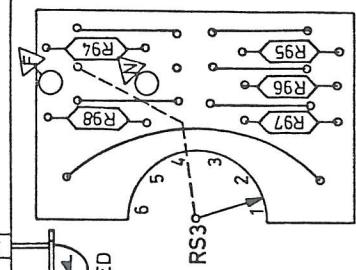
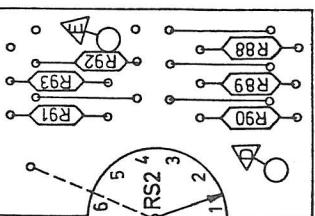
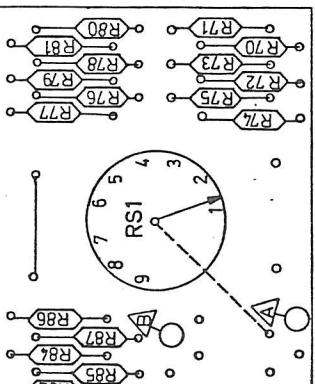
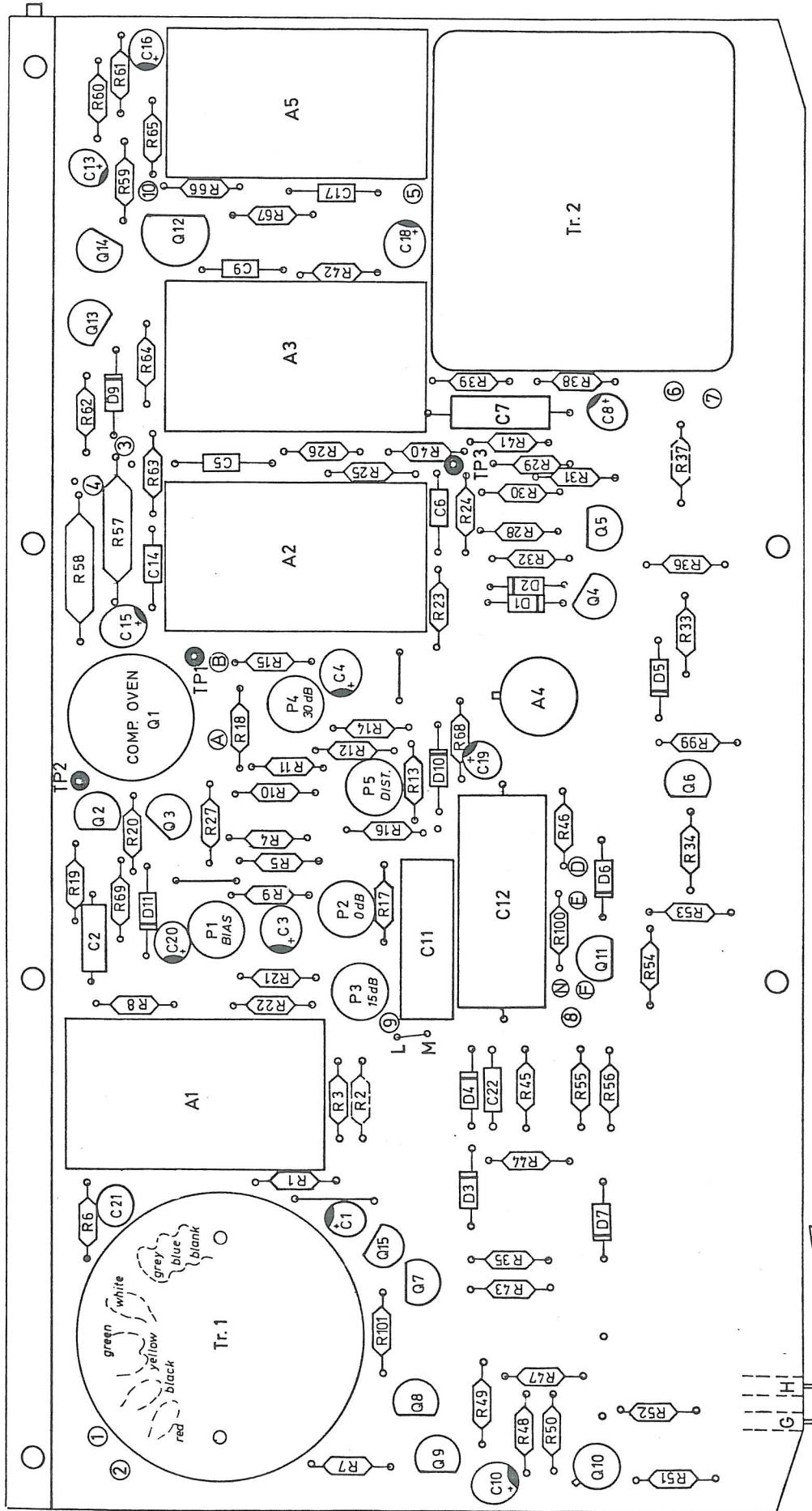
Because of interaction between P5 and P2, the adjustment mentioned under pos. b might be carried out once more.



4) 5.375 BH/11w  
 3) 25.275 BH/11w  
 2) 5.74 BH/11w  
 1) 7.613 BH/11w

	<b>NTP</b> N. TONNES PEDERSEN A/S	179 - 2330 - A - 3
Materstok :	LIMITER	AMPLIFIER
Tolerance : ± mm	179 - 230	
Tegnet : 7-6-72 IW		
Godkendt:		DIAGRAM
Revideret:		5.

## DIAGRAM



Pos.:	Antal:	Materiale:	Behandl.:	Del af:
Målestok:	2 : 1			
Toleranc:	$\pm$ mm			
Tegnet:	1 : 6 - 72 W			
Godkendt:				
Revideret:	3.			

LIMITER AMPLIFIER 179 - 230

Components Layout

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
R1		Resistor not used		
R2		" " "		
R3		" 1KΩ 5% 1/8W	Resista SK 2	
R4		" 47KΩ " "	" "	
R5		" 82KΩ " "	" "	
R6		" 8,2KΩ " "	" "	
R7		" 10KΩ " "	" "	
R8		" 1KΩ " "	" "	
R9		" 68KΩ " "	" "	
R10		" 18KΩ " "	" "	
R11		" 1KΩ " "	" "	
R12		" 470 Ω " "	" "	
R13		" not used		
R14		" 3K9 5% 1/8W	Resista SK 2	
R15		" 10KΩ " "	" "	
R16		" 220Ω " "	" "	
R17		" not used		
R18		" 220Ω 5% 1/8W	Resista SK 2	
R19		" 10KΩ " "	" "	
R20		" 10KΩ " "	" "	
R21		" 15KΩ " "	" "	
R22		" 330Ω " "	" "	
R23	Pre-empha- sis only	" 330Ω " "	" "	
R24		" 27KΩ " "	" "	
R25		" 1KΩ " "	" "	
R26		" 470Ω " "	" "	
R27		" 1MΩ " "	" "	
R28		" 47KΩ " "	" "	
R29		" 10KΩ " "	" "	
R30		" 10KΩ " "	" "	
R31		" 33KΩ " "	" "	
R32		" 47KΩ " "	" "	
R33		" 2,2KΩ " "	" "	
R34		" 2,2KΩ " "	" "	
R35		" 2,2KΩ " "	" "	
R36		" 470Ω " "	" "	
R37	Pre-empha- sis only	" 180Ω " "	" "	
R38		" not used		
R39		" 1KΩ 5% 1/8W	Resista SK 2	
R40		" Ω(strapped)		
R41		" not used		
R42		" 1KΩ 5% 1/8W	Resista Sk 2	
R43		" 2,7KΩ " "	" "	
R44		" 470KΩ " "	" "	
R45		" 10KΩ " "	" "	
R46		" 82KΩ " "	" "	
R47		" 470KΩ " "	" "	
R48		" 2,7KΩ " "	" "	
R49		" 100KΩ " "	" "	
R50		" 10KΩ " "	" "	
R51		" 10KΩ " "	" "	
R52		" 2,2KΩ " "	" "	
R53		" 1,5KΩ " "	" "	

SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN A/S	STYKLISTE
7.6.1972 HB/LK	LIMITER AMPLIFIER 179-230 ELECTRICAL PARTS LIST	4...Blade - Blad 1 179-2331-A4

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
R54		Resistor 100 KΩ 5% 1/8 W	Resista SK2	
R55		" 39Ω " "	" "	
R56		" 3,9KΩ " "	" "	
R57		" 39Ω " 1/3W	Beyschlag	
R58		" 39Ω " "	"	
R59		" 22KΩ " 1/8W	Resista Sk2	
R60		" 18KΩ " "	" "	
R61		" 6,8KΩ " "	" "	
R62		" 10KΩ " "	" "	
R63		" not used		
R64		" 0Ω (strapped)		
R65		" 1KΩ 5% 1/8W	Resista Sk2	
R66		" 22Ω " "	" "	
R67		" 1KΩ " "	" "	
R68		" 820R " "	" "	
R69		" 820R " "	" "	
R70		" 180Ω " "	" "	
R71		" 1KΩ " "	" "	
R72		" 120Ω " "	" "	
R73		" 680Ω " "	" "	
R74		" 12Ω " "	" "	
R75		" 560Ω " "	" "	
R76		" 22Ω " "	" "	
R77		" 390Ω " "	" "	
R78		" 12Ω " "	" "	
R79		" 270Ω " "	" "	
R80		" 27Ω " "	" "	
R81		" 180Ω " "	" "	
R82		" 22Ω " "	" "	
R83		" 120Ω " "	" "	
R84		" 27Ω " "	" "	
R85		" 68Ω " "	" "	
R86		" 10Ω " "	" "	
R87		" 47Ω " "	" "	
R88		" 100KΩ " "	" "	
R89		" 180KΩ " "	" "	
R90		" 330KΩ " "	" "	
R91		" 560KΩ " "	" "	
R92		" 100KΩ " "	" "	
R93		" 1MΩ " "	" "	
R94		" 47KΩ " "	" "	
R95		" 47KΩ " "	" "	
R96		" 120KΩ " "	" "	
R97		" 390KΩ " "	" "	
R98		" 680KΩ " "	" "	
R99		" 120KΩ " "	" "	
see last page				
P1		Trimpotmeter 10KΩ 3329-1-103	Bourns	
P2		" 10KΩ 3329-1-103	"	
P3		" 1KΩ 3329-1-102	"	
P4		" 1KΩ 3329-1-102	"	
P5		" 1KΩ 3329-1-102	"	
C1		Capacitor not used		
C2		" 22pf/100V Ceramic	Miniwatt	
C3		" 100μF/ 3V Tantal	ERO	
C4		" 220μF/3V "	"	
C5		" 47pF/ 100V Ceramic	Miniwatt	
SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN A/S	STYKLISTE		
7.6.1972 HB/LK	LIMITER AMPLIFIER 179-230 ELECTRICAL PARTS LIST	4. Blade - Blad 2 179-2331-A4		

POS.	TEGN. NR.	BETEGNELSE			MATERIALE	ANT.
C6	Pre-emphasis only	Capacitor	100pV/160V	Styroflex	Siemens	
C7	"	"	47nF/250V	Mepo	Miniwatt	
C8	"	"	not used		"	
C9	"	"	22pf/100V	Ceramic	"	
C10	"	"	1μF/35V	Tantal	ERO	
C11	"	"	0,22μF/250V-32234	Polyest.	Siemens	
C12	"	"	2,2μF/100V 10%	Eromet		
C13	"	"	10μF/35V	Tantal	ERO	
C14	"	"	not used			
C15		"	10μF/35	Tantal	ERO	
C16		"	22μF/16	"	"	
C17		"	22pf/100V	Ceramic	Miniwatt	
C18		"	10μF/16V	Tantal	ERO	
C19		"	33μF/110V	"	"	
C20		"	100μF/10V	"	"	
C21		"	330pf/100V	Ceramic	Miniwatt	
D1	Si diode		BAX 13 (IN 4152)		Texas	
D2	" "		BAX 13 (IN 4152)		"	
D3		" "	IN4148		"	
D4		" "	IN4148		"	
D5		" "	IN4148		"	
D6		" "	IN4148		"	
D7		" "	IN4148		"	
D8	LED		TIL 209		"	
D9	Si diode		10D1		J.R.	
D10	" Zenerdiode		IN 821		Motorola	
D11	" "		IN 821		Motorola	
Q1	FET		Si 216N		Akers	
Q2		Transistor	BC 107B(A)		Siemens	
Q3		"	BC 177B(A)		"	
Q4		"	BC 107B(A)		"	
Q5		"	BC 177B(A)		"	
Q6		"	BC 107B(A)		"	
Q7		"	BC 177B(A)		"	
Q8		"	BC 107B(A)		"	
Q9		"	BC 107B(A)		"	
Q10		"	BC 107B(A)		"	
Q11		FET	2N4302		Amelco	
Q12		Transistor	BC 161-16(10)		Siemens	
Q13		"	BC 107B(A)		"	
Q14		"	BC 107B(A)		"	
Q15		"	BC 107B(A)		"	
A1		Operational Amplifier	M-100		NTP	
A2		"	M-100		"	
A3		"	M-100		"	
A4		"	LM-310		NS	
A5		"	" M-100		NTP	
Tr.1		Transformator	Type JS 13592/2		JS	
Tr.2		"	JS 13590		JS	
Comp. oven conn.		(To -18)	Transistor oven type 5st 1-2(80°C)		Jermyn SEMCO	
RS 1		Tuchel T 2700			EBE	
RS 2		Switch type Mx 1/1x9K T=12			"	
		"	Mx 1/1x6K T=12			
SIG./DATO	INGENØRFIRMA N. TØNNES PEDERSEN %				STYKLISTE	
7.6.1972	LIMITER AMPLIFIER 179-230 ELECTRICAL PARTS LIST				4 Blade - Blad 3.....	
HB/LK					179-2331-A4	

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
RS3		Switch type Mx 1/1 x 6K T=12	EBE	
	179-2340	Printed circuit Board	NTP	
	182-900	" " " for RS 1	"	1
	182-900	" " " " " 2	"	1/2
	182-900	" " " " " 3	"	1/2
		Knobs type 023-332	ELMA	3
		Caps for knobs type 040-301	"	3
R 100		Resistor 1K 5% 1/8W	Resista SK 2	
R 101		" 68R " "	"	
C 22		Capacitor 22pf/160V Styroflex	Siemens	
SIG./DATO	INGENIØRFIRMA N. TØNNES PEDERSEN A/S			STYKLISTE
	LIMITER AMPLIFIER 179-230 ELECTRICAL PARTS LIST			.....4.....Blade - Blad 4.....
				179-2331-A4