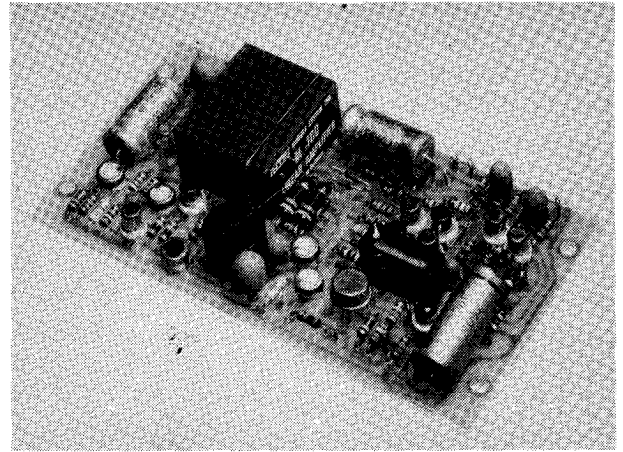


The limiter was designed according to an entirely new principle, involving a combination of a relatively long attack time with a symmetric logarithmic clipping circuit. This design eliminates the well known transient noise during striking. The recovery circuit is program dependent based on the dual time constant principle, eliminating pumping and similar effect. An mA instrument may be connected to indicate the actual gain reduction. An external control voltage may be supplied.



TECHNICAL SPECIFICATIONS

Supply Voltage Symmetrical	$\pm 15 \text{ V dc} \pm 10\% \text{ OV common}$
Maximum Ripple Voltage	20 mV pp 20 Hz to 1 kHz Derate with 6 dB per octave above 1 kHz
Current Consumption Steady State	60 mA
Current Consumption during Heat-Up	approx. 225 mA in 45 sec.
Current Consumption without Oven	35 mA
Temperature Range	-20°C to $+60^{\circ}\text{C}$ (-4 to $+140^{\circ}\text{F}$)
Frequency Range within 0,5 dB	20 Hz to 20 kHz
Input Impedance, high Level Input +6 dBu	22 kohms in series with $100\mu\text{F}$
Input Impedance, low Level Input -28 dBu	460 ohms in series with $100\mu\text{F}$
Output Impedance	less than 1 ohm in series with $100\mu\text{F}$
Minimum Load Impedance	100 ohms
Basic Amplification high Level Input	$0 \text{ dB} \pm 0.5 \text{ dB}$
Basic Amplification low Level Input	$+34 \text{ dB} \pm 0.75 \text{ dB}$

Limiter Amplifier Card

type 179-300

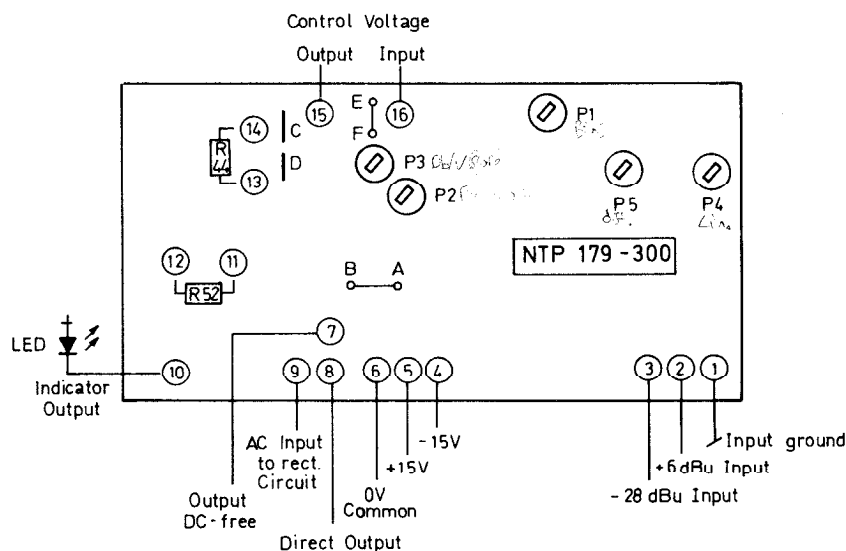
Limiting Level ref. to Output	Note 1	+6 dBu
Limiting Range		more than 30 dB
Distortion under Static Conditions up to 20 dB Limiting 40 Hz to 20 kHz		less than 0.2%
Signal to Noise Ratio at Limiting Threshold		82 dB A-Curve
Control Voltage Output (Instrument etc.)	Note 2	1 Volt per 5 dB ref. to OV
Indicator Output (LED Indicator)		14 mA
Attack Time	Note 1	1.5 millisecond combined with a full-wave logarithmic clipping circuit.
Recovery Time	Note 3	Dual time constants 200 msec. upon 15 seconds.
Weight		0,07 kg.

Note 1: The limiting level 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.

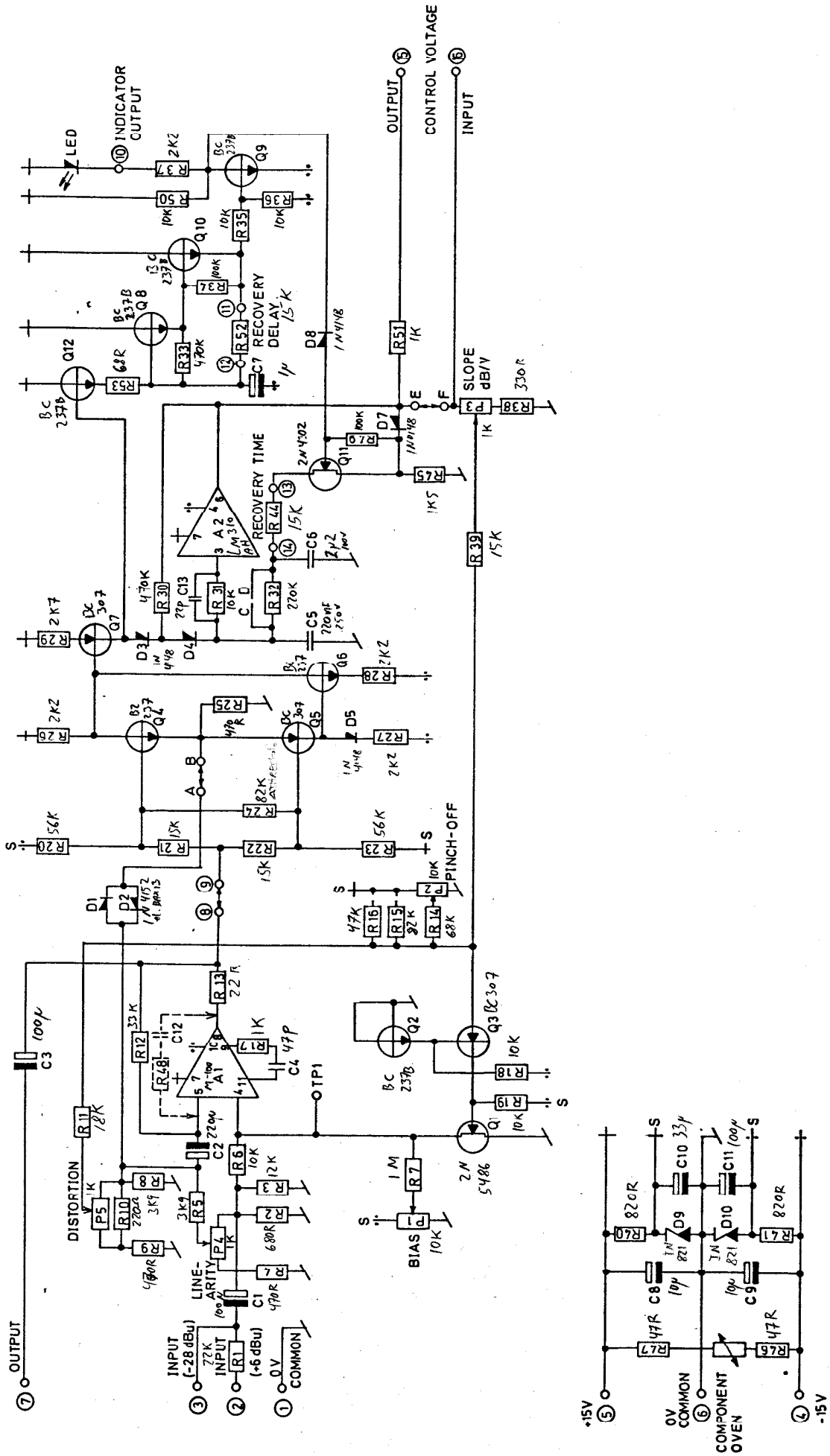
Note 2: Stereo Operation:

The Control Voltages of two units may be linked together to obtain equal gain reduction in the two stereo channels. By cutting the connection between the two terminals E and F it is possible to apply an external control voltage giving a gain reduction of 5 dB per Volt up to 30 dB reduction.

Note 3: It is not recommended to change recovery and delay times when the card is used as a limiter. For override and other special functions, various time constants may be obtained by changing R 32 and R 44, and by changing R 52. For further information please contact the factory.

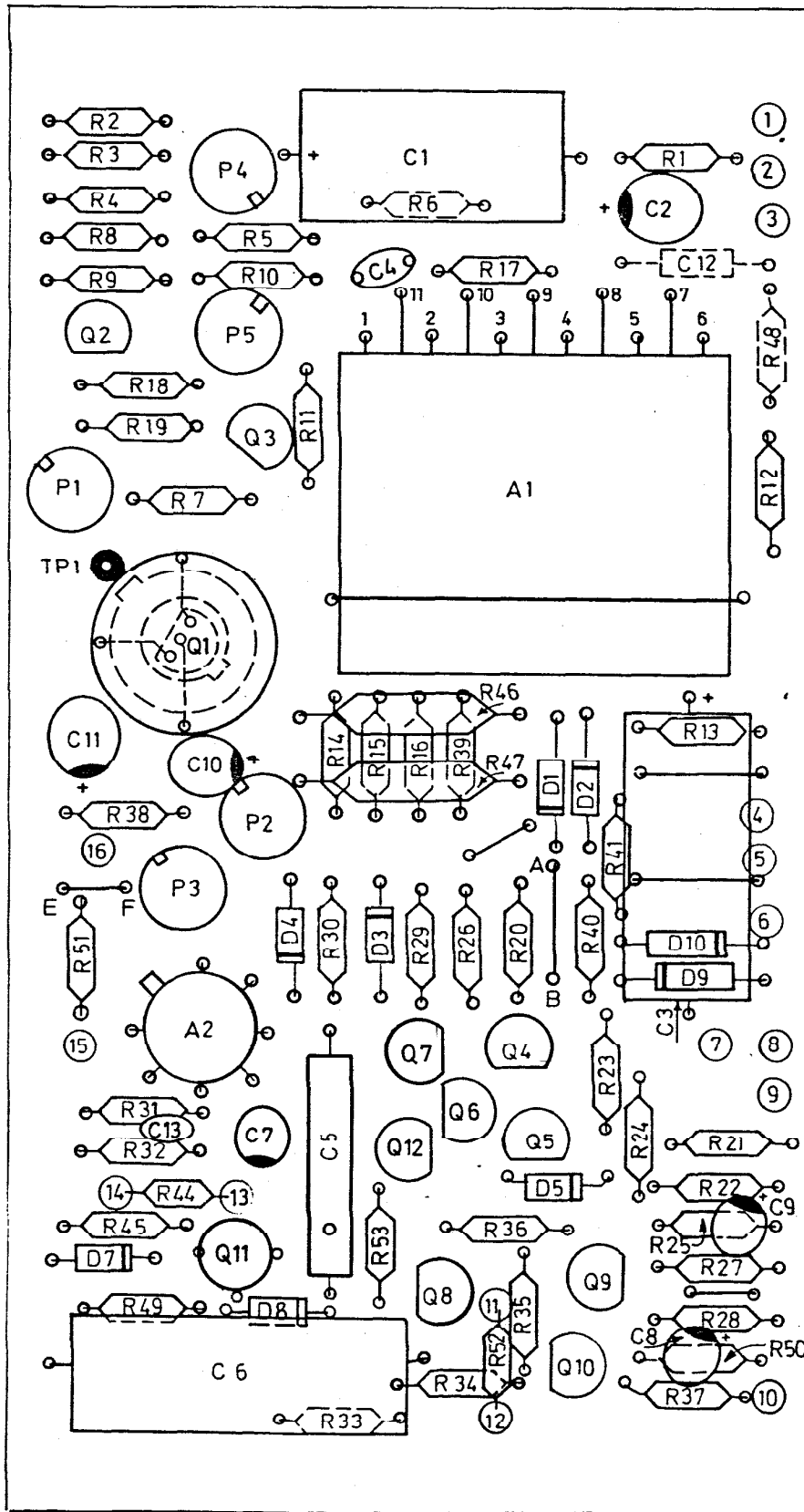


Card size: 115 x 60 mm
Height: 20 mm

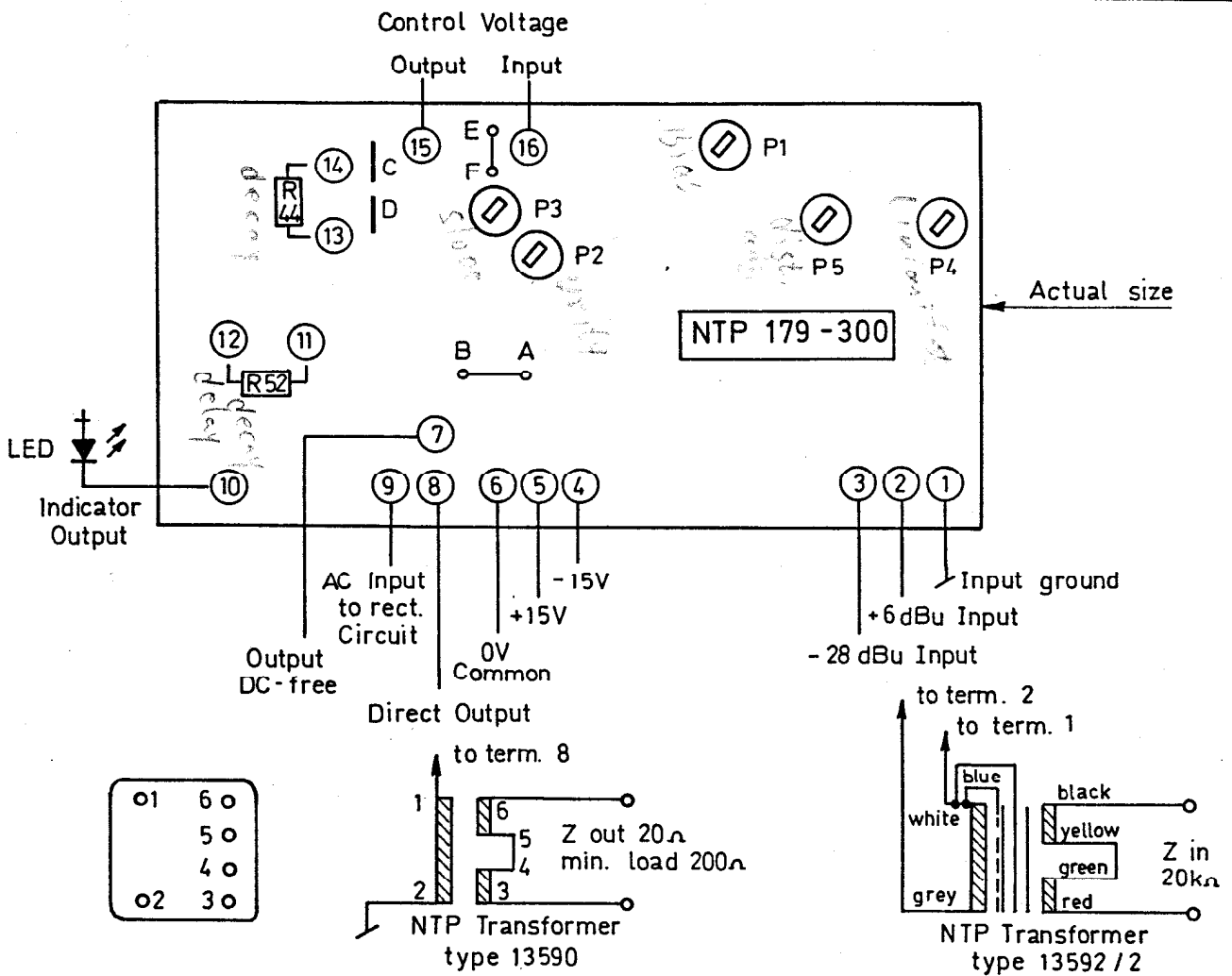


INGENIÖRFIRMA N. TØNNES PEDERSEN 4%		Teqn.	27.2.75 IW
LIMITER AMPLIFIER 179-300-C		Godk.	2/2-75 B.M.
DIAGRAM		TEGNING NR.	179-3030-C-3
Målestok	mm + 0		
Tolerance			
Materialie			
Behandl.			
Drl af			
Antal			

Retfælsler
 1/12-71 BM/1W (R42 & R43 erst. m. strap) 10/12-80 Q1 ændret
 26/4-72 1W
 25/5-72 1W / R53 og C13 monteret, 2.7/2-75 BM/1W



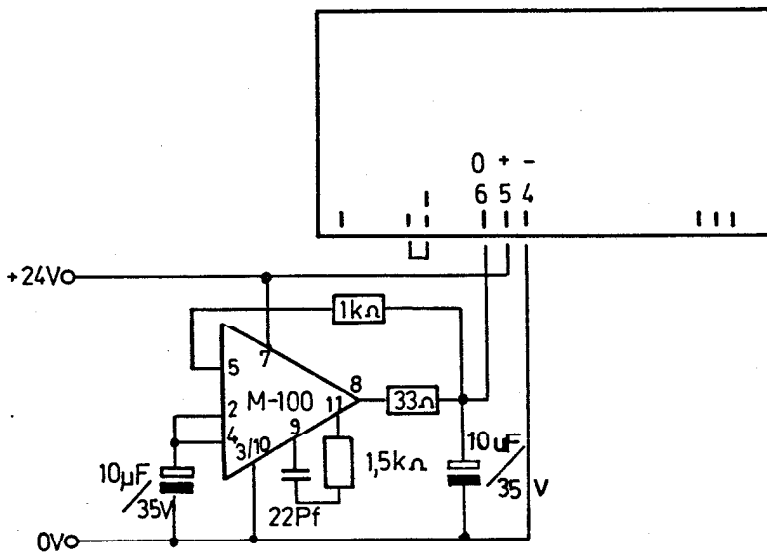
Målestok	2:1	INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	31-8-71 1W.
Tolerance	+ mm + 0		Godk.	
Materiale		Limiter Amplifier 179-300-C	TECNING NR.	
Behandl.			179-3041-C-4	
Del. af				
Antal				



- Terminal 1 : Input ground
 " 2 : +6dBu input, $Z_{in} 10k\Omega$
 " 3 : -28dBu input, $z_{in} 400\Omega$
 " 4 : -15V supply voltage
 " 5 : +15V supply voltage
 " 6 : 0V common
 " 7 : Output through $100\mu F$ cap. (DC-free)
 " 8 : Direct output normally connected to rect.circuit.
 " 9 : Input to rect. circuit, $Z_{in} 27k\Omega$
 " 10 : Indicator output
 " 11 : } Recovery delay (R52) see curve I
 " 12 : }
 " 13 : } Recovery time (R44) see curve II
 " 14 : }
 " 15 : DC control voltage output.
 " 16 : DC control voltage input.

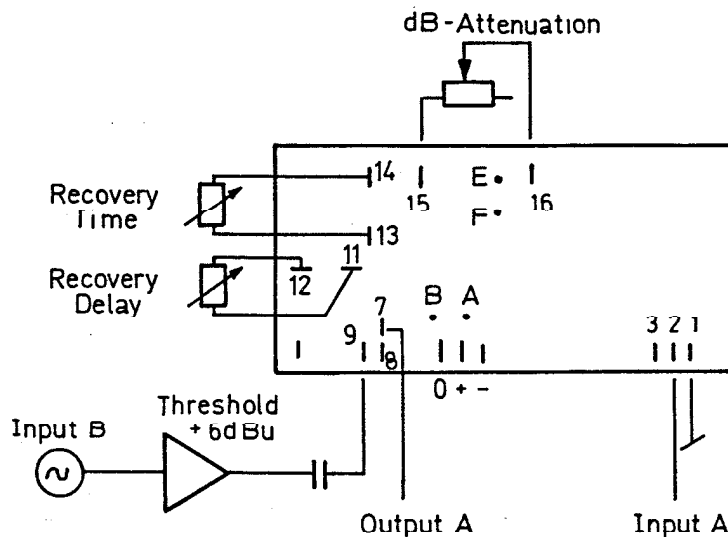
NOTE. If the Limiter card is used with NTP input and output transformers for balanced floating operation, the limitation level will be raised by 3dB, unless R24 is decreased until the Limitation level is +6dB. For transformers with 1:1 ratio, no modifications are needed.

Målestok		INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	1-9-71. IW
Tolerance	± mm ± 0		Limiter Amplifier 179-300	Godk.
Materiale		Terminals, Input - output terminations		TEGNING NR.
Behandl.			179-3002-A-4	
Del af				
Antal				



Unsymmetrical supply voltage

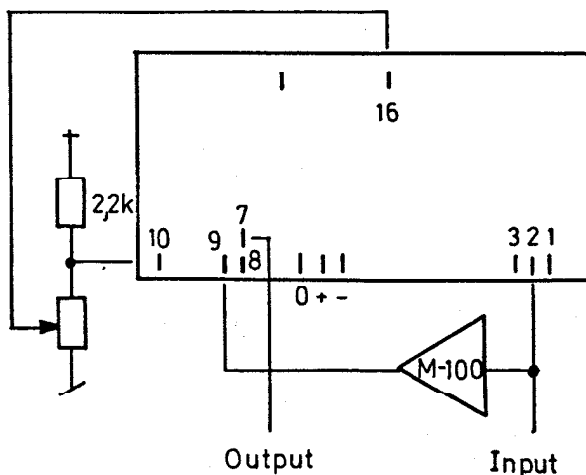
If the Limiter Amplifier is supplied from an unsymmetrical power supply, an external voltage splitter must be provided. For instance an M-100 Op. amp. connected as shown to the left.



Override function

Break the connections E - F and A - B and 8 - 9

An override function is accomplished by letting one sound channel control another sound channel. In the example to the left the sound channel B will override the channel A as soon as the level to term. 9 exceeds +6dBu. The attenuation of channel A is determined by the potentiometer P. For desired recovery time and recovery delay, see the curve on draw No. 179-3019-A-4.



Squelch function

Break the connections E - F and A - B and 8 - 9

The squelch threshold is determined by the gain of the external M-100 Amplifier. The potentiometer P determines the range that is squelched (max. appr. 30dB)

NOTE. For further information of Limiter Amplifier 179-300 please contact the factory,



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 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 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. 50 mA 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 terminal 8 and terminal 6. P1 is adjusted until the voltage measured is the same whether TP is connected to terminal 6 or not.

b. Pinch-off adjustment of P2

Conditions: Input signal +6dBu 1kHz on terminal 2.

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 terminal 6 and 16, terminal 16 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.

e. Distortion adjustment of P5. Conditions: +16dBu 1KHz on term. 2.

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.

Supply Voltage symmetrical	:	± 15 V dc $\pm 10\%$ 0V common
Maximum Ripple Voltage	:	0.1 V pp
Current Consumption steady state	:	60 mA
Current Consumption during heat-up	:	approx. 225 mA in 45 sec.
Current Consumption without oven	:	35 mA
Temperature Range	:	-20°C to $+60^{\circ}\text{C}$ (-4 to $+140^{\circ}\text{F}$)
Frequency Range within 0,5 dB	:	20 Hz to 20kHz
Input Impedance high level input	:	22 kohms in series with 100 μ F
Input Impedance low level input	:	460 ohms in series with 100 μ F
Output Impedance	:	less than 1 ohm in series with 100 μ F
Minimum Load Impedance	:	100 ohms
Basic Amplification high level input	:	0dB ± 0.5
Basic Amplification low level input	:	+34 dB ± 0.75
Limitation Level ref. to output Note 1	:	+6 dB
Limitation Range	:	more than 35 dB
Distortion under steady conditions		
1 kHz 0 to 20 dB limitation	:	less than 0.2 %
40 Hz 0 to 20 dB limitation	:	less than 0.2 %
Signal to Noise Ratio at Limitation Threshold flat respons	:	73 dBu
Control Voltage output (Instrument etc.) RMS (Δf 23kHz) Note 2	:	1 Volt per 5 dB ref. to 0V
Indicator Output (LED indicator)	:	14 mA
Attack Time Note 1	:	1.5 millisecond combined with a full-wave logarithmic clipping circuit
Recovery Time Note 3	:	Dual time constants 200 msec. upon 15 seconds

Note 1: The limitation level 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.

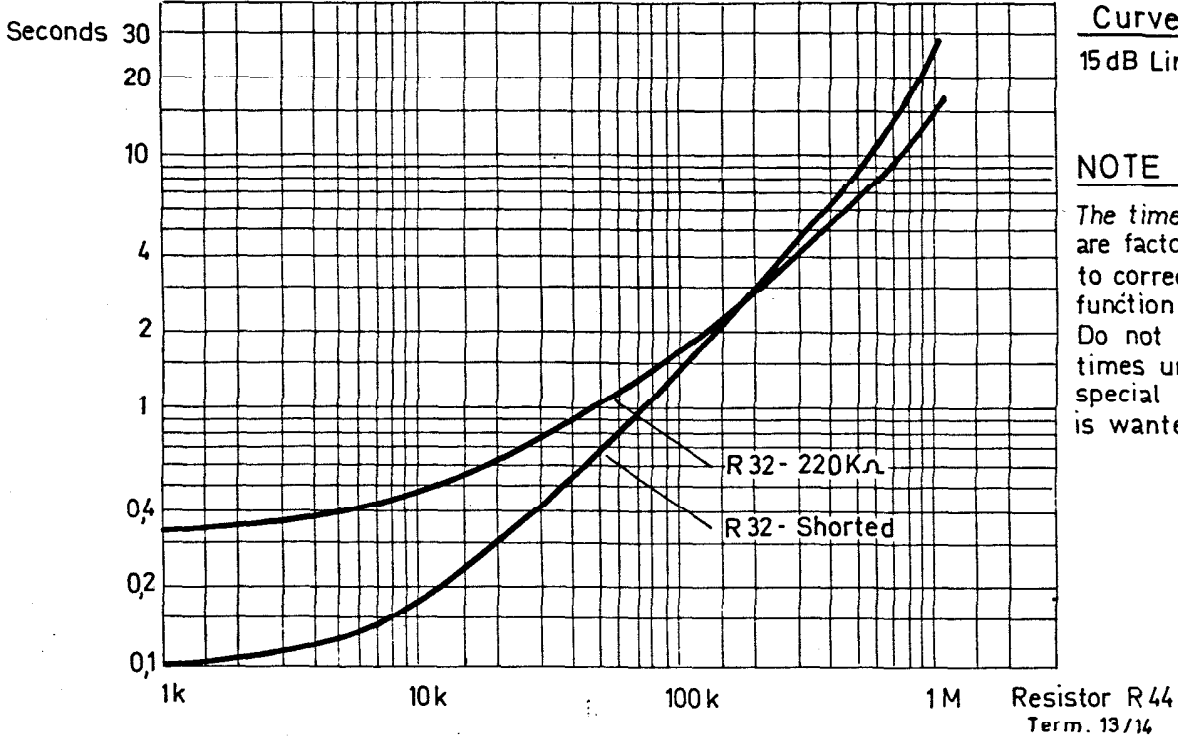
Note 2: Stereo Operation:

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 it is possible to apply an external control voltage giving a gain reduction of 5 dB per Volt up to 30 dB reduction.

Note 3: It is not recommended to charge recovery-and delay times when the card is used as a limiter. For override and other special functions, various time constants can be obtained by changing R 32 and R 44, and by changing R 52, See curves on 179-3019-A-4.

Recovery Time

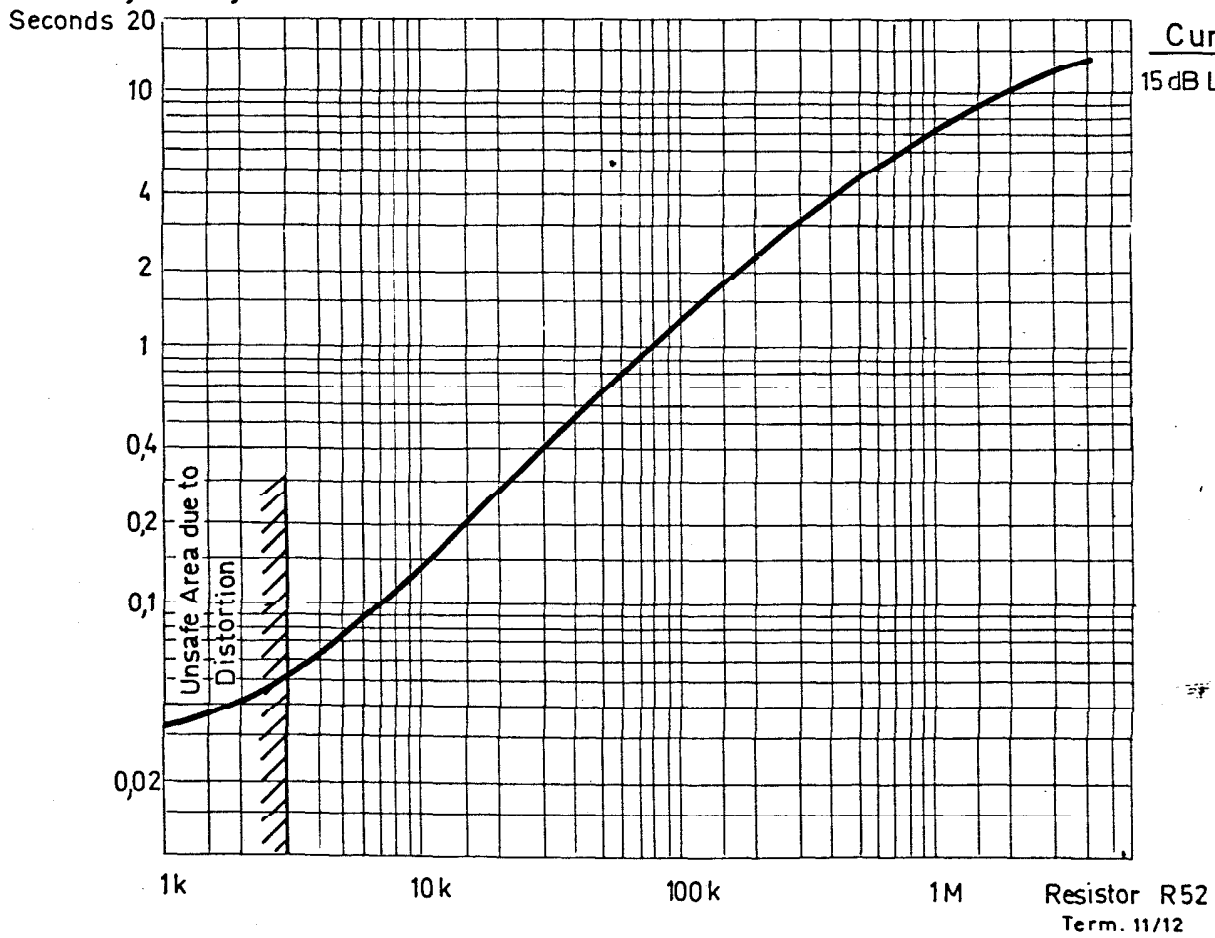


Curve II
15dB Limiting

NOTE !

The time constants are factory adjusted to correct Limiter function. Do not change the times unless a special function is wanted.

Recovery Delay



Curve I
15dB Limiting

Målestok		INGENIØRFIRMA N. TØNNES PEDERSEN A/s	Tegn.	27.2.75 IW
Tolerance	± mm ± °		Limiter Amplifier 179-300-C	Godk.
Materiale		Recovery time & -delay curves	TEGNING NR.	
Behandl.			179-3019-C-4	
Del af				
Antal				

Rettiliser A/12-71 BM
25/5-72 BM/1W
5/4-72 O.K.
9.4.1974/BM/ua

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
R1		Resistor 22 k Ω 5% 1/8	Resista SK 2	
R2		" 680 Ω " "	" "	
R3		" 12 k Ω " "	" "	
R4		" 470 Ω " "	" "	
R5		" 3k9 k Ω " "	" "	
R6		" 10 k Ω " "	" "	
R7		" 1 M Ω " "	" "	
R8		" 3,9 k Ω " "	" "	
R9		" 470 Ω " "	" "	
R10		" 220 Ω " "	" "	
R11		" 18 k Ω " "	" "	
R12		" 33 k Ω " "	" "	
R13		" 22 Ω " "	" "	
R14		" 68 k Ω " "	" "	
R15		" 82 k Ω " "	" "	
R16		" 47 k Ω " "	" "	
R17		" 1 k Ω " "	" "	
R18		" 10 k Ω " "	" "	
R19		" 10 k Ω " "	" "	
R20		" 56 k Ω " "	" "	
R21		" 15 k Ω " "	" "	
R22		" 15 k Ω " "	" "	
R23		" 56 k Ω " "	" "	
R24		" 82 k Ω " "	" "	
R25		" 470 Ω " "	" "	
R26		" 2,2 k Ω " "	" "	
R27		" 2,2 k Ω " "	" "	
R28		" 2,2 k Ω " "	" "	
R29		" 2,7 k Ω " "	" "	
R30		" 470 k Ω " "	" "	
R31		" 10 k Ω " "	" "	
R32		" 220 k Ω " "	" "	
R33		" 470 k Ω " "	" "	
R34		" 100 k Ω " "	" "	
R35		" 10 k Ω " "	" "	
R36		" 10 k Ω " "	" "	
R37		" 2,2 k Ω " "	" "	
R38		" 330 Ω " "	" "	
R39		" 15 k Ω " "	" "	
R40		" 820 Ω " "	" "	
R41		" 820 Ω " "	" "	
R42		" not used " "	" "	
R43		" not used " "	" "	
R44		" 820 k Ω " "	" "	
R45		" 1,5 k Ω " "	" "	
R46		" 47 Ω 5% 1/3W	Beyschlag	
R47		" 47 Ω " "	"	
R48		" Not used " "	"	
R49		" 100 k Ω 5% 1/8	Resista SK 2	
R50		" 10 k Ω " "	" "	
R51		" 1 k Ω " "	" "	
R52		" 2k7 " "	" "	
R53		" 68 Ω " "	" "	
SIG./DATO		INGENIØRFIRMA N. TØNNES PEDERSEN 4%		STYKLISTE
29.7.71		Limiter Amplifier 179-300 - C		2 Blade - Blad 1
B.M./ g.h.		Electrical Partslist		179-3031-C-4

POS.	TEGN. NR.	BETEGNELSE	MATERIALE	ANT.
P1		Trimpotmeter 10 K Ω 3329-1-103	Bourns	
P2		" 10 K Ω 3329-1-103	"	
P3		" 1 K Ω 3329-1-102	"	
P4		" 1 K Ω 3329-1-102	"	
P5		" 1 K Ω 3329-1-102	"	
C1		El.cap. 100 μ F/40V EB	ROE	
C2		Tantal cap. 220 μ F/3V ETQ5	ERO	
C3		El.cap. 100 μ F/40V EB	ROE	
C4		Ceramic cap. 47pf 100V	Miniwatt	
C5		Polyester 0,22 μ F/250V 32234	Siemens	
C6		" 2,2 μ F/100V 10%	MKT 1813	
C7		Tantal cap. 1 μ F/35V ETP1	ERO	
C8		" " 10 μ F/35V ETP3	"	
C9		" " 10 μ F/35V ETP3	"	
C10		" " 33 μ F/10V ETP3	"	
C11		" " 100 μ F/10V ETQ5	"	
C12		Not used		
C13		Ceramic cap. 22pf/100V	Miniwatt	
D1		Diode BAX 13 IN 4152	TEXAS	
D2		" BAX 13 IN 4152	"	
D3		" IN4148	"	
D4		" IN4148	"	
D5		" IN4148	"	
D6		" not used.	"	
D7		" IN4148	"	
D8		" IN4148	"	
D9		Zenerdiode IN 821	Motorola	
D10		" IN 821	"	
Q1		Transistor 2N5486 FET	Texas	
Q2		" BC 237 B(A)	Siemens	
Q3		" BC 307 B(A)	"	
Q4		" BC 237 B(A)	"	
Q5		" BC 307 B(A)	"	
Q6		" BC 237 B(A)	"	
Q7		" BC 307 B(A)	"	
Q8		" BC 237 B(A)	"	
Q9		" BC 237 B(A)	"	
Q10		" BC 237 B(A)	"	
Q11		" 2N4302 FET	AMELCO	
Q12		" BC 237 B	TEXAS	
A1		Operationamplifier M-100	NTP	
A2		" LM-310 AH	National Semi	
		Soldering tags	Nor nit	
		Component oven 5 ST 1-2	JERMYN	
		Printed Circuit Board 179-3040-C	NTP	
SIG./DATO		INGENIØRFIRMA N. TØNNES PEDERSEN %		STYKLISTE
29.7.71		Limiter Amplifier 179-300-C		2 Blade - Blad 2
B.M./ g.h.		Electrical Partslist		179-3031-C-4

Rettelser 25/5-72 (3)
 9.4.74 BM/ua