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TONSTUDIOTECHNIK

EMT-FRANZ VG mbH.

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Instruction Manual

PDM-Compressor
EMT 156
EMT 156 TV

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EMT 156
EMT 156 TV

March 1978

Applies to units starting with serial No. 25 738.

Constructions and circuits are subject to change without notice!

EMT-FRANZ GMBH
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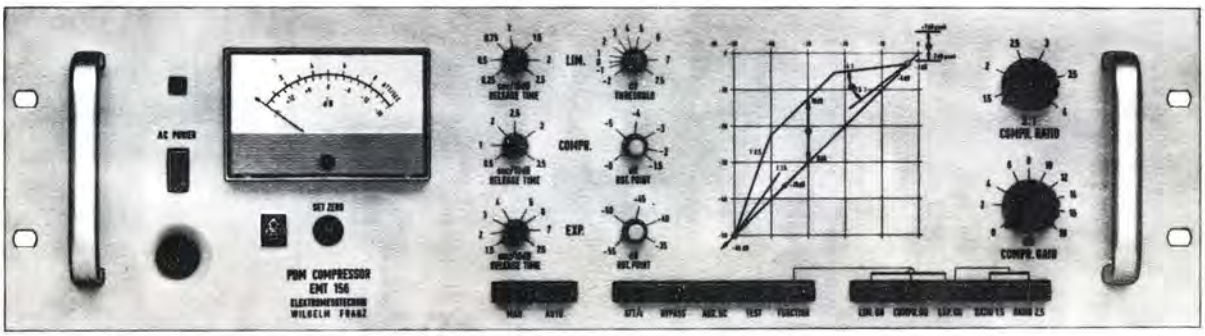
A Preparatory

A 1 MOUNTING

This unit is designed to be mounted in any standard 19" rack corresponding to the standards USAS C 83.9, DIN 41 494.

The front panel dimensions:

19" x 5 1/4" (size C)
vertical distance between mounting holes 2 1/4"
required clearance depth 14 1/4".



The unit is to be mounted using four screws.

The EMT 156 is delivered with the following accessories:

2 male connectors, Cannon	XLR 3-12c
2 female connectors, Cannon	XLR 3-11c
1 Connector, Lumberg	SV 3
1 Connector, Lumberg	SV 5

1 AC mains cable

1 fuse 0.8 A slo-blo (European standard)

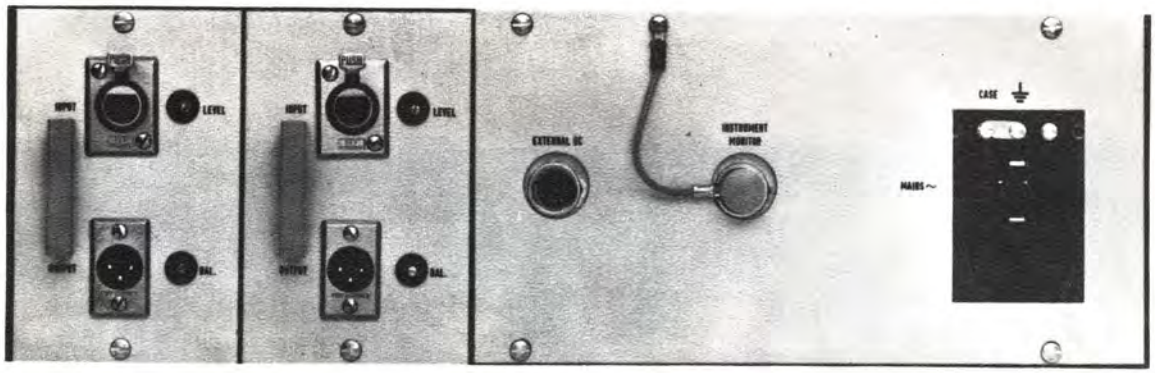
1 fuse 0.8 A slo-blo (USA standard)

1 fuse holder for USA standard fuse

A 2 A.C. MAINS CONNECTION

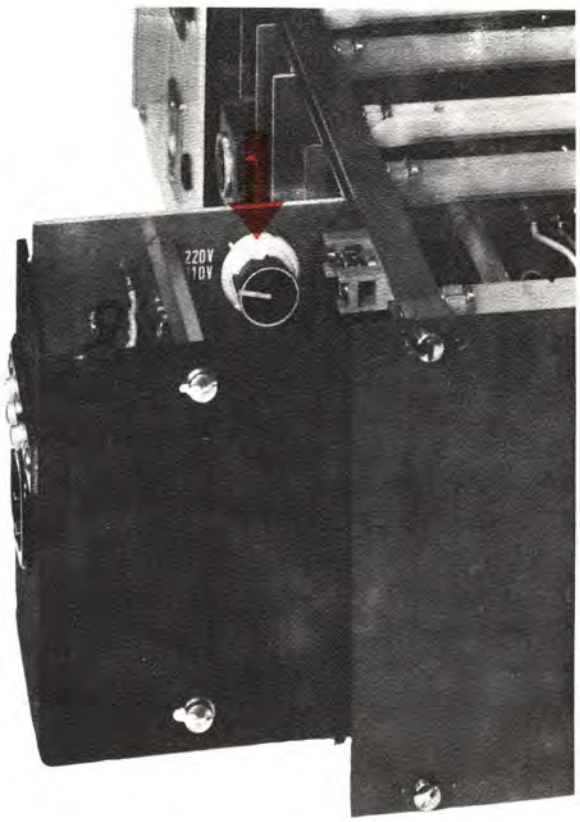
The unit's A.C. mains socket on the back panel is connected to the A.C. mains by means of the threeconductor A.C. mains cable which is supplied.

If there is no plug on this cable, then the user should attach his own mains plug using the yellow/green wire for the mains ground. The unit is set at the factory for a mains voltage of 200 to 250 volts and has a 0.4 A slo-blo fuse.



A 3 CHANGING THE A.C. MAINS VOLTAGE SETTING

1. Open the four quick-release screws on the back right half panel.
2. While holding down the locking spring, pull out the power supply plug-in until the A.C. mains selecting switch becomes accessible. To change the mains voltage, pull on the mains switch knob and then rotate it to the desired voltage, either 110 or 220 V.



The 110 V position is used with a voltage

between 100 and 125 V, 50/60 Hz.

The 220 V position is used with a mains voltage

between 200 and 250 V, 50/60 Hz.

When the unit has been changed to 110 V, the 0.4 A fuse must be replace with a 0.8 A slo-blo fuse.

A 4 GROUNDING

The case and the internal electronic ground are connected together internally. The mains cable ground wire is only connected to the power transformer shield, although it can be connected to the case by means of the jumper link on the back panel.

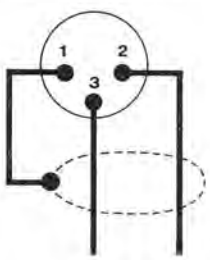
Note:

The unit is grounded through the mains cable only when it is connected to an A.C. mains socket which has a valid ground.

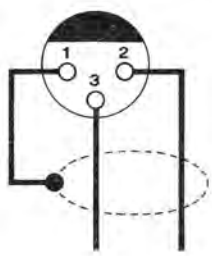
A 5 CONNECTION OF THE INPUT AND OUTPUT LINES

The input and output Cannon connectors delivered with the unit should be connected as shown below.

INPUT - Stecker
INPUT · PLUG



OUTPUT - Stecker
OUTPUT - PLUG



A 6 SELECTING THE REFERENCE LEVEL

The EMT 156 compressor can be connected for any of the following peak line levels:

+ 4 dBm ≙ 1.23 V
+ 6 dBm ≙ 1.55 V
+ 8 dBm ≙ 1.95 V
+12 dBm ≙ 3.08 V
+15 dBm ≙ 4.36 V

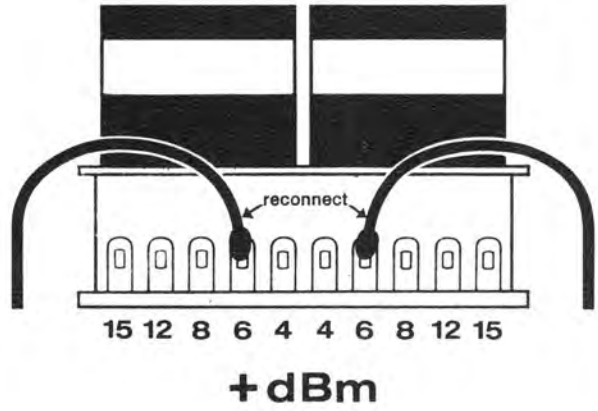
The unit is normally shipped with the output transformer connected for +6 dBm, and therefore, the output transformer taps must be changed if it is to be used with any of the other reference levels listed above. If the user's reference level does not correspond to the unit's, then the picture on the front panel and the adjustment-control scales will no longer be accurate.

Note:

All reference levels correspond to the normal 100% modulation point. This level is generally much higher than the usual 0 dB VU reference. (See section C for details.)

To change the normal output line level, remove both amplifier plug-ins at the back panel (left) by turning the quick-release screws.

The picture below shows how to reconnect the transformer output wires. Both wires must be connected to the same level.



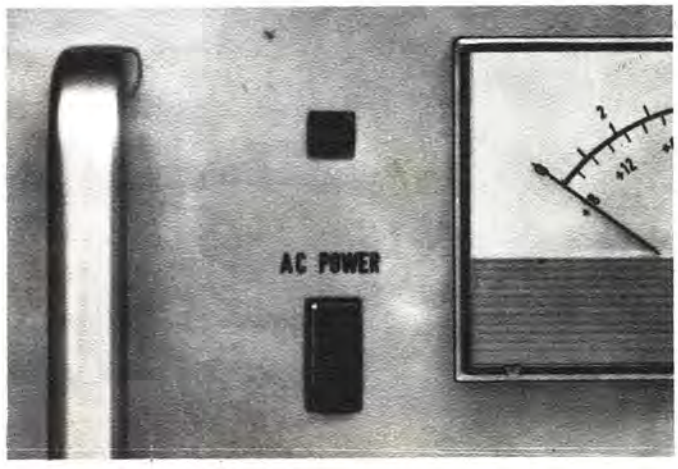
Now, replace the two plug-ins and connect a 1 kHz sine wave, corresponding to the 100% level, to the input. Connect an A.C. Volt meter to the output and push the buttons FUNCTION and either MAN or AUTO.

Using a screw driver, adjust the input-LEVEL control of both plug-ins until the output line level is correct.

B Operation

B 1 POWER ON

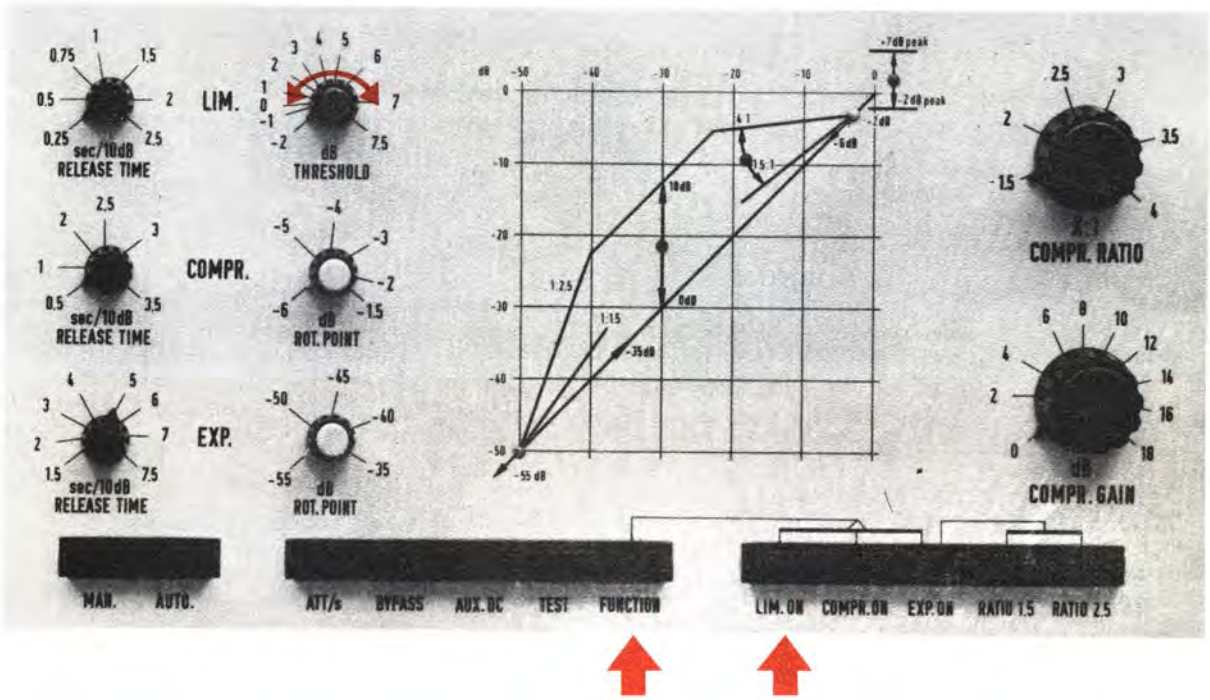
Push the AC POWER button to turn the unit on or off. The lamp indicates when the unit is on.



B 2 CHOOSING OPERATING MODE:
LIMITER, COMPRESSOR, AND EXPANDER

First, push the button FUNCTION, located at the right end of the middle group of buttons.

B 2a LIMITER: push button LIM.ON



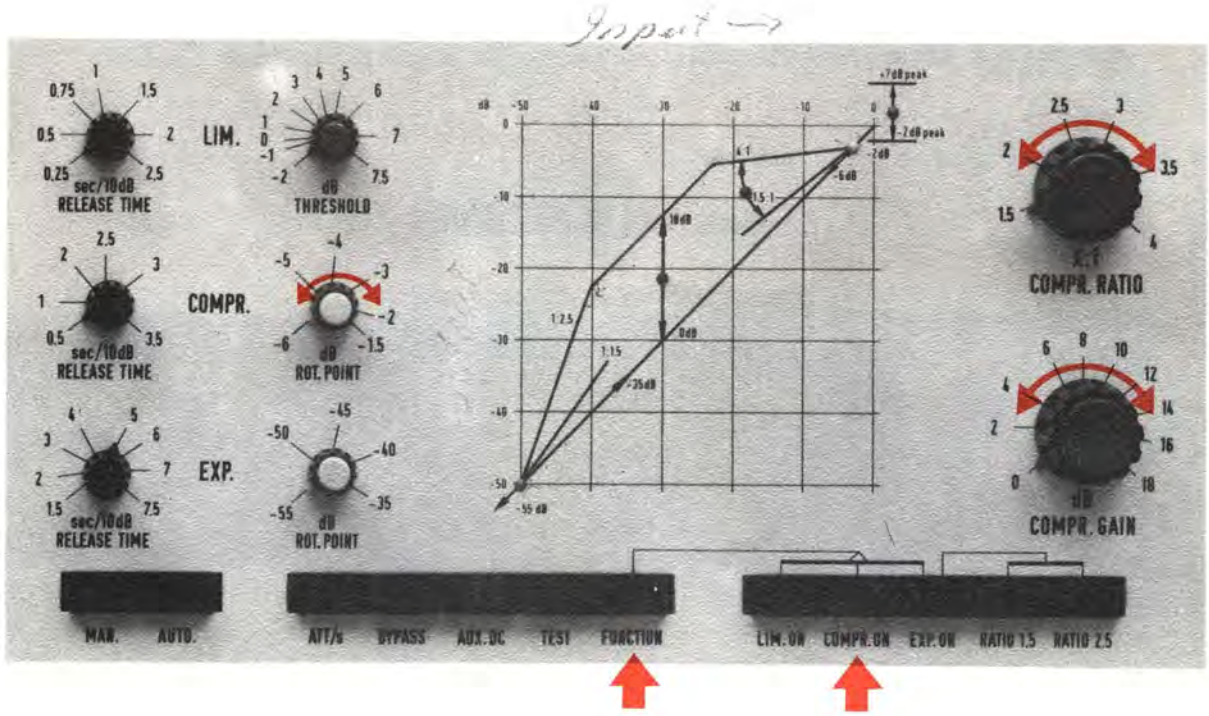
The unit is now operating as a limiter. Limiting begins when the output level tries to exceed the preset limiter threshold. Once this point is reached, any increase in input level results in a corresponding decrease in gain so that the peak value of the output does not exceed the threshold.

This can be seen from the diagram. With just the limiter function in operation, the gain remains at unity, corresponding to the 45° line, until the level exceeds the adjustable threshold, corresponding to the horizontal line (red dot). The point of intersection at which the 45° line and the horizontal line meet is the level at which limiting begins.

The limiter threshold level can be adjusted with the red control LIM./THRESHOLD between a relative level of -2 dB and +7 dB. The relative level corresponds to the normal 100% (see A6 Selecting the reference Level).

In order to avoid introducing distortion, the maximum input level should never exceed +24 dBm, regardless of reference level or adjustments.

B 2b COMPRESSOR: push button COMP. ON



The unit is now operating as a compressor. The compressor operates on the average program level which approximates the loudness. There are 3 static parameters, which are located on the front panel, for controlling the compressor characteristics.

1. COMPRESSOR GAIN

   This determines the maximum additional gain by which medium and low level signals are amplified. At higher levels compression begins and the gain is reduced below the maximum which was set with this control.

   In the above diagram, this corresponds to an upward paralled shift of the 45° 0 dB amplification curve (blue dot).

   The blue COMPRESSION GAIN control allows this maximum gain to be varied from 0 dB to +18 dB.

2. COMPRESSION RATIO

   This determines the density or dynamic range of high-level program. In the above diagram, this corresponds to the slope (green dot) of the compression curve, which intersects the unity gain line. As the program level increases, the gain decreases in a dB linear (logarithmic) fashion starting from the maximum set by the COMPRESSION GAIN control. At the point where the program level equals the intersection of the compression and 0 dB curve, the gain is (0 dB) unity; for further increases in program level, the gain decreases below unity.

The compression ratio determines how much gain change is produced by a given change in input level. This can be written as:

$$K = dV_{in} / dV_{out} \quad dB$$

A compression ratio of 3:1, for example, means that with a 3 dB increase in the input level, the output level increases by only 1 dB.

The compression ratio is adjusted with the green control for values between 1.5:1 and 4:1.

3. ROTATION POINT / COMPRESSOR

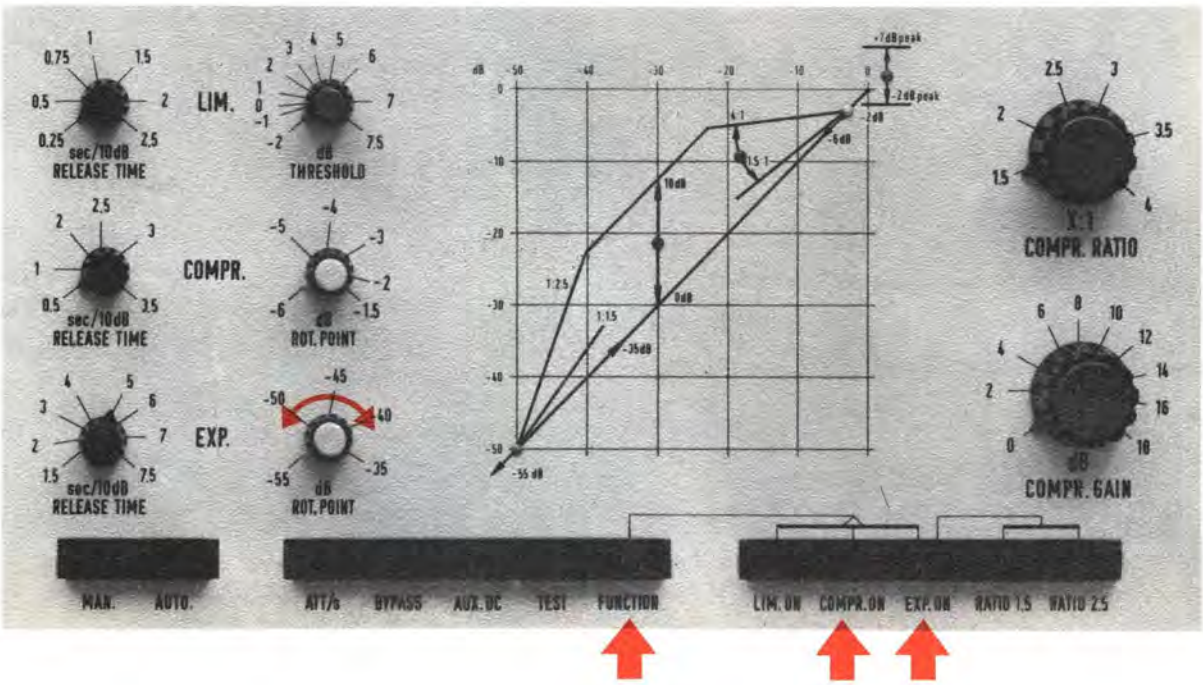
The compression rotation point (yellow dot) is the point around which the compression curve is rotated. In order that this point be unaffected by changes in the COMPRESSION GAIN or COMPRESSION RATIO, it is fixed on the 0 dB (unity gain) curve.

The point can be raised or lowered along the 0 dB amplification curve by adjusting the small yellow COMPR./ROT.POINT control between -1.5 dB and -6 dB.

Adjusting this control results in a parallel shift of the compression line and it therefore changes the distance between the compression and limiting regions, assuming that the limiter is also in operation.

B 2c EXPANDER: push button EXP ON

Operating with the expander section is only meaningful if the compressor section is also in operating.



The meaning of "expander' in this application is not related to the type of equipment used to compensate for compression in a companding system. Rather, the expan er function for low level program and has a compression ratio less than 1 (an expansion ratio greater than 1). The xpander function prevents very low level program and noise from being amplified by the COMPRESSION GAIN In this way, program level which is below an adjustable threshold is unaffected by the system (amplification = 0 dB) and the effective signal-to-noise ratio at the output is the same as at the input.

In the diagram, the line connecting the linear (45°) compression gain curve to the low-level 0 dB gain region is called the expansion line. When operating in this region, an increase in input level results in a increase in gain (in contrast to the compression region), until the maximum ga n is reached. A decrease in input level results in a decrease in gain until the minimum of 0 dB (unity) gain is reached. The gain never decreases below 0 dB in this region of operation. The intersection of the expander curve and the 0 dB (unity) gain curve is called the ROTATION POINT/EXPANDER. This point can be moved up and down along the 0 dB line by adjusting the green EXP./ROT. POINT control between -35 dB and -55 dB. Thus, this control affects the range of program level over which the expansion occurs, and also affects the range of program over which the gain is kept at 0 dB (unity).

Push button RATIO 1.5
RATIO 2.5

With these two buttons, the expansion ratio, or slope f the expansion curve, is selected This determines the range of input level over which the gain increase is distributed.

B 2d INTERACTION OF THE LIMITER, COMPRESSOR, AND EXPANDER PARAMETERS

There are 5 meaningful combinations of function which may be used.

Individual functions:	LIMITER
	COMPRESSOR
	LIMITER + COMPRESSOR
Combination functions:	COMPRESSOR + EXPANDER
	LIMITER + COMPRESSOR + EXPANDER

The geometric level diagram clearly shows the effect of the individual compressor and expander functions. We recommend that the user sketch on the accompanying pre-printed from the particular static characteristics for each application. In this way, a systematic method of choosing the best parameters for each kind of application can be determined and incorrect parameter settings will be avoided. In addition, by learning to correlate the optical diagram with the acoustic impression, the user will gain more insight into the best approach for choosing the optimum parameters for his application. After a little experience with this approach, the system is easly adjusted for any kind of problem.

B 2e DYNAMIC CHARACTERISTICS

1. Attack time

The compressor attack time is adjusted for approximately 2 msec at the factory. It can be changed internally within the region of 2 to 5 msec. (see SERVICE-appendix)

The attack-time for the limiter and expander sections is not adjustable. They have the following values:

Limiter	80 µsec
Expander	Program dependent

2. Release time, manually adjusted

The release time for the Limiter, Compressor, and Expander can be manually adjusted using the three knobs, labeled RELEASE TIME, if the push button MAN has been pressed. The release time is meaningful only when the program level is decreasing faster than the setting on the release time knob. This means, for example, with a setting of 2 sec/10 dB, the gain will increase 10 dB in 2 sec following a sudden decrease in level. The 10 dB increase in gain will only occur, however, if the new program level allows for a 10 dB increase. If the new level is such that a 5 dB gain increase occurs, then the new gain will occur 1 sec after the program gain change.

The same is true for the expander, except that the gain increases when the program level decreases. With the release time set at 3 sec/10 dB, for example, then the gain decreases 5 dB in 1.5 sec, with a setting of 6 sec/10 dB the gain decreases 5 dB in 3 sec, etc. . .

In the case of the Limiter, the value of the gain change corresponds to the change in the input level. If the level suddenly decreases 10 dB while operating in the limiter region, then the gain must increase 10 dB so that the peak output level is the same. Thus, the amount of time needed for this gain change is easily determined from the setting on the release time.

The scales for the release time should be interpreted as meaning the rate at which the g in changes from the old value to the new value with a de rease in program. The time for this change to occur is obviously dependent on the program changes as well as on the static parameters, since these two factors determine the necessary change in gain.

3. Release Time, automatically controlled

The automatic release time funtion is activated by pushing the button AUTO located under the release-time controls. In this mode, the effective release time is automatically determined as a function of the program. In the limiter function, this time is determined by the number of times the limiter is activated in a giv n time, nd also by the density of peaks which occur in a region between the limiter threshold and 2 dB below. If the peaks seldom exceed a value -2 dB relative to the threshold, then the release time is made very short Whereas, if the peaks approach the threshold relatively often, then the release time approaches infinity.

In the compression function the release time is determined by the "Density" of the program, i.e. by the relationship between the average to peak le el. When the program is dense having a small dynamic range, the release time is made long. Alternatively, when t e peaks are much greater than the average level, the release time is made short.

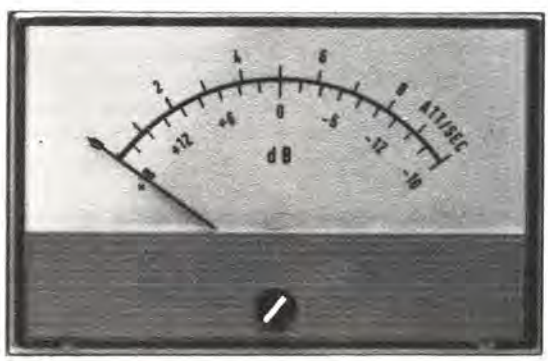
For high level program, the el ase time of the expander function is made a function of the compressor release time. In this way, when the evel suddenly decreases from a normal value to zero, the rate of gain decrease for the expander exactly matches the ra e of gain increase for the compressor. Thus, the total gai approaches 0 dB (uni y) without a sudden increase or de rease in the program noise level, an gain-modulated no se is avoided.

The expander release time for low level programs is proportional to the program level. This avoids noise-modulated program and program-modulated noise since the release time is relatively long. With higher level programs this is no longer a problem and the release time becomes increas ngly shorter.

For a l three functions compressor, limiter and expander, the release time is actually composed of a short and a long part The long part determines the extention of the short term release.

B 3 METERING MODE

The mete has two scales.

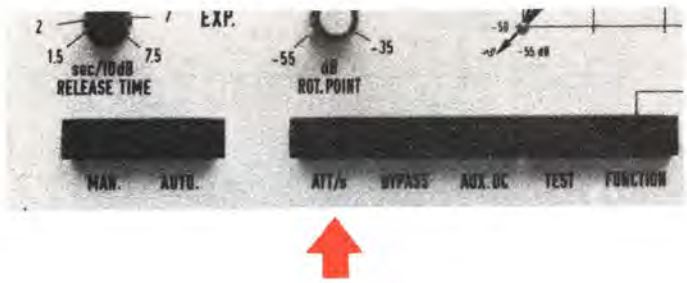


B 3a THE LOWER SCALE

The instantaneous gain of the entire unit is shown on this scale. If the program level is between the rotation points of the compressor and expander, the gain is greater than O dB and the meter points in the left of center part of the scale. For program level below the expander rotation point, the pointer indicates the center of the scale, O dB. High level program which causes the compressor to operate above the rotation point, and also peaks above the limiter threshold, result in the meter showing a gain of less than O dB, the right of center part of the scale.

It is important to realize that the contribution from the limiter and compressor functions cannot be distinguished. Therefore, gains less than O dB (unity) can be caused in part by both the limiter and the compressor.

B 3b THE UPPER SCALE



When the button ATT/s is pushed, located at the left side of the middle series of buttons, the instrument is operating on the upper scale. In this mode, the meter shows the number of times per second the limiter section has reduced the gain. This shows the limiting, in dB, caused by the peak exceeding the threshold. It is, in general, unreasonable to have the limiter function operate too frequently, for excessive limiting the input level should be reduced. More than 10 limiting operations per second, full scale reading on the meter, means that the average level is too high. Under certain special conditions, however, this may be desireable (see Section C Application Example).

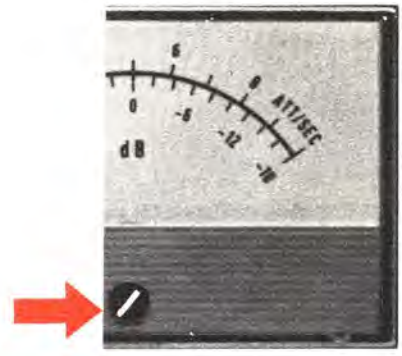
B 3c ZERO ADJUSTMENT FOR THE METER

Mechanical Zero

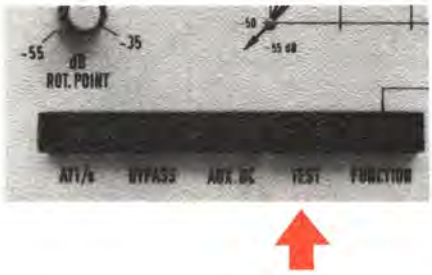
With the unit turned off, carefully turn the screw located directly under the meter until the pointer is exactly at the left end of the scale.

Electrical Zero

Remove all input program to the unit, push button FUNCTION, and now adjust the control SET ZERO until the pointer is exactly at zero the middle of the scale.



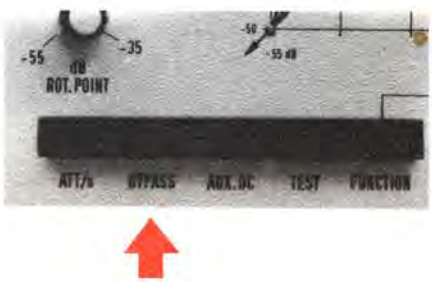
B 4 PUSH BUTTON TEST



This mode allows the two multipliers to be balanced. Remove any input program, push button TEST, attach an A.C. volt meter to the output of each channel. The symetry control BAL., located at the back near the output connected, should now be adjusted so that the 50/60 Hz output signal is a minimum (approximately -36 dB).

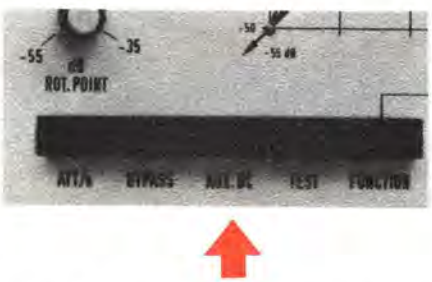
It is recommended that this adjustment be made after the unit has been operating for a few minutes. After the unit has reached temperature equilibrium with the environment, this adjustment should again be corrected to achieve optimum balance. During normal service, the TEST mode should be checked every so often, especially if there has been a large temperature transient.

B 5 PUSH BUTTON BYPASS

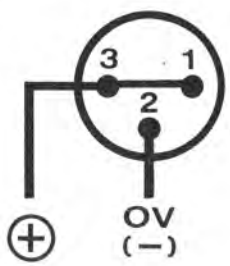


When the button BYPASS is pushed, the entire unit is bypassed so that the input or each channel is connected directly to the output without any electronic processing of the signal. Turning the unit off automatically activates the bypass mode. A power failure, therefore, does not cause an interuption of the program.

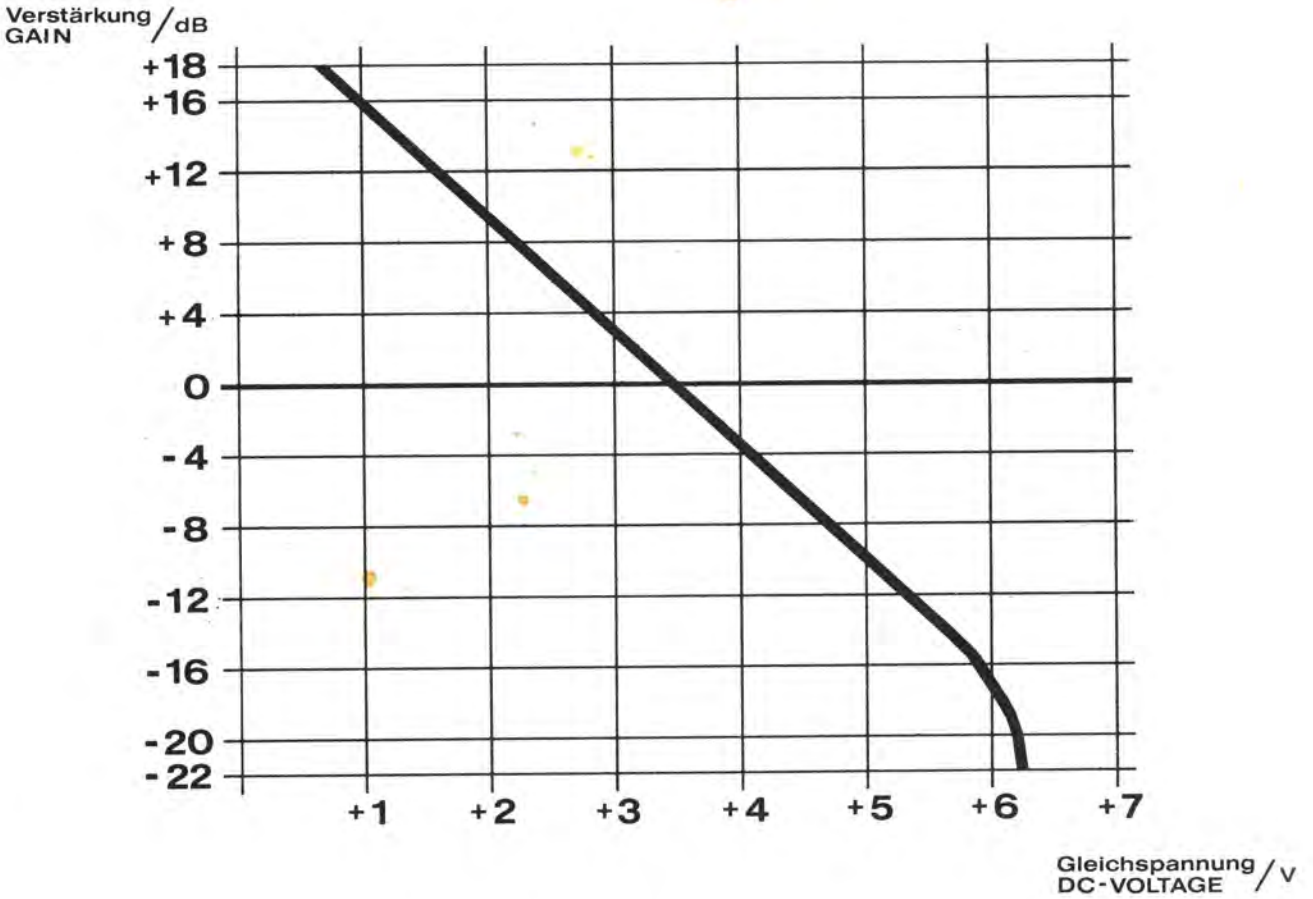
B 6 PUSH BUTTON AUX.DC



This DC voltage is connected to the connector marked EXTERNAL DC using the 3 pin connected supplied with the unit. The wiring of the connector is shown below. The voltage source used to drive this input should be between 0 and +7 volts without any AC component. This input loads the voltage source with a 2.2 kOhm resistance.



The following curve shows the relationship between the amplification of the unit and the applied DC voltage.



B 7 THE CONNECTOR
INSTRUMENT MONITOR

The signals on this connector allow for external metering and monitoring of the internal control voltages.

1. Connection of a second metering instrument

For external metering, for example in mixing console, the second meter is connected in series with the internal instrument. In this application, the jumper between pins 1 and 4 is removed and the meter is inserted with the -pole connected to pin 1 and the +pole connected to pin 4.

When the external instrument is removed, the jumper between pins 1 and 4 must be replace to allow the internal instrument to function.

This external meter must have the following characteristics:

Moving coil movement
Full scale reading 100 /uA
Internal resistance 2 kOhms or less

The scale should be similar to the instrument supplied in the unit.

It should now be necessary to re-adjust the electrical zero with the control SET ZERO as described in section B 3c.

2. Connecting a Monitor Oscilloscope

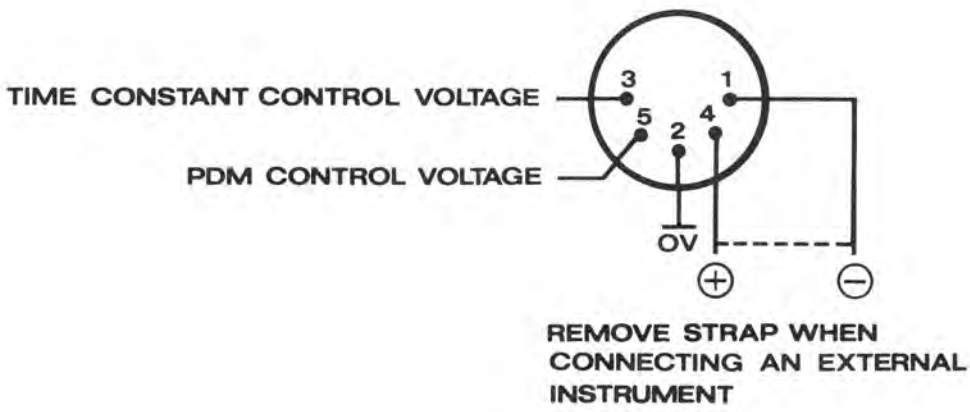
By monitoring the internal control voltages on pins 3 and 5 of the 5 pin connector, the user can continuously observe the way in which the unit is operating and can therefore determine if the parameters are adjusted for optimum.

On pin 5 is the control voltage which determines the pulse duration modulation. Since it is proportional to amplification determined by the compressor section, it is a measure of the average value of the program level in the compressor and limiter region.

The voltage on pin 3 is the control voltage for the automatic release time constant and is dependent on the characteristics of the program material.

Both signals (on pin 3 or 5) can be monitored together with the input audio program, or the two control voltages can be compared to each other.

The diagram below shows the wiring for the INSTRUMENT MONITOR connector:



C Application

C 1 RECOMMENDED ADJUSTMENT OF THE SYSTEM

In order to gain an understanding of the system the user should begin experimentation with the following initial adjustments.

Press the following buttons:

FUNCTION,
AUTOMATIC RELEASE TIME,
LIMITER.

Set limiter THRESHOLD (red knob) to desired value. Feed the normal program to the system.

Press the meter function ATT/sec. If the meter pointer deflects, the input program has peaks greater than the nominal 0 dB. This may or may not be desirable. Release ATT/s button.

Now, push the COMPR.ON button with the limiter also operating. Adjust the compression ratio (green knob) to about 2:1 for classical music and 3.5:1 for popular music.

The COMPR.GAIN control (blue) should be set to about 10 dB for normal program. If the program has a good signal-to-noise ratio, than the COMPR.GAIN control can be set higher. With 18 dB additional gain, and a noisy background, the effect of compression is perceived by changing noise background (pumping). Decreasing the compression (blue) and increasing the compression ratio (green), reduces this noise "pumping".

Additionally push the EXP.ON button and choose a RATIO of 2.5:1 for the expander. Adjust the expander rotation point (grey) with an input signal of noise alone without program. The EXP.ROT. point is adjusted so that with the noise alone the meter gain shown on the meter is zero dB. In this way, when the program is no longer present, the gain will return to 0 dB (unity), the effective signal-to-noise ratio at the output of the compressor will be the same as the original signal-to-noise ratio, and the rushing noise during pauses will be eliminated.

The system is now ready for operation. Press the ATT/sec meter function with normal program. Although the input level may have been adjusted so that limiting does not take place, the compressor can function to increase the gain so that the limiter is now forced to operate on the peaks of the signal. The amount of limiting that takes place can be adjusted with the compression rotation point (yellow). The higher the point the more the compressor will increase the gain and thus the more often the limiter will be forced to operate. Unlike normal compressor and limiter systems, it is in this case desirable for some limiting to take place, especially with program signals which have a high peak to average ratio. The limiter effectively removes the peaks so that the average signal level can be increased without overmodulating the channel following the system.

If the user finds the particular program is too sensitive to gain changes, the compression ratio should be reduced. On the other hand if the user wants a compression system which produces a very dense sound, the compression ratio should be increased.

In some application the user may find that he does not wish to use the automatic release function. It should be remembered that the release function has as much if not more effect on the nature of the compression than does the static characteristics A long release time results in an almost constant gain, that is the short time dynamic range is unaffected and the system operates as an automatic volume control.

On the other hand with a short release time, the gain is continuously changing and the compression effect is very pronounced. With too short a release time, there is a sensation of muddiness and distortion.

D Servicing

D 1 FAULT FINDING

Faulty functioning or failure of the unit are most probably due to component failure, provided that the ambient and operating conditions have been normal. Even when working well within their rated limits, a certain proportion of electronic components will still fail after a certain period of operation. In such cases the unit can often be fully repaired in a short space of time simply by replacing the defective component.

The following hints outline certain basic methods for locating the defective component quickly. Before looking for a fault in the PDM Compressor EMT 156, however, it is advisable quickly to carry out the following checks:

1. Are the AC mains voltage and the incoming signal levels correct?
2. Have the correct operating functions and parameters been selected?
3. Is the 5-pin shorting plug on the back of the unit firmly in position?
4. Is the noise voltage at the output when pressing the "TEST" button (no input voltage) below 100 mV (output transformer in +6 dB position)? (If the noise voltage is much higher the four diodes Gr1 - Gr4 or T5, T6 in the multiplier may be defective.)

D 1.1 MECHANICAL PREPARATIONS FOR FAULT FINDING

For quick check measurements and adjustments it is generally sufficient to remove the upper cover plate (6 screws). All pre-sets are then accessible from above.

IMPORTANT

Removal and replacement of the cover panels as well as handling the open unit should not be undertaken while the AC mains are connected.

For extensive checks and measurements the lower cover panel as well as the back panel should also be removed by unscrewing the four retaining screws; the individual printed circuit cards can now be withdrawn, if required, by depressing the locking springs.

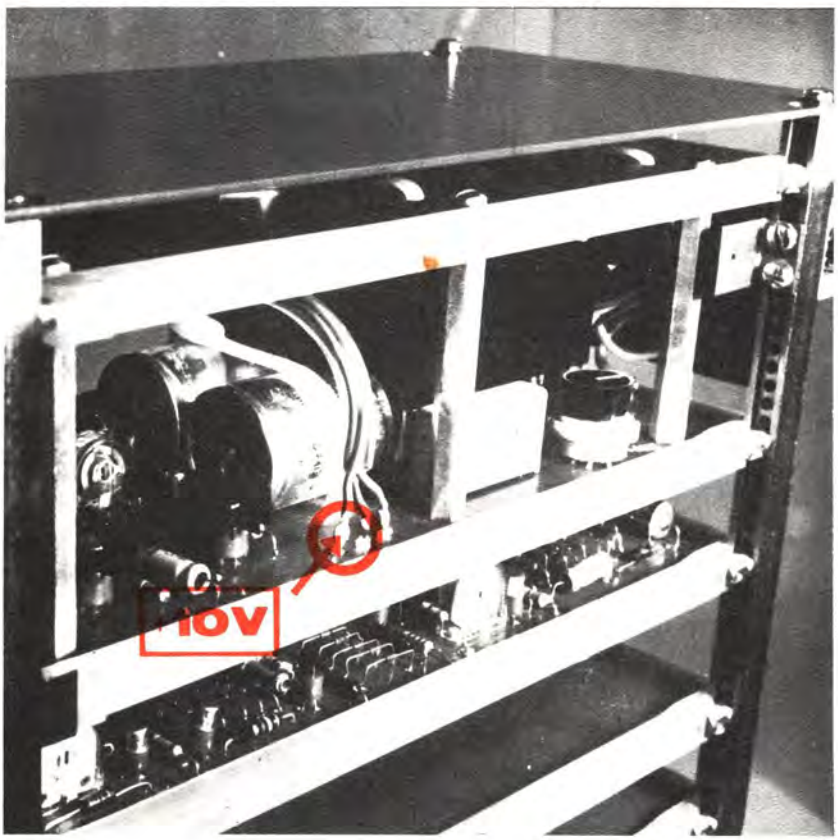
D 1.2 MEASURING THE SUPPLY VOLTAGES

The supply voltages should always be checked first. The two voltages should be +10 V and -10 V measured against O-V (circuit ground).

IMPORTANT

During all measurements great care should be taken to avoid short circuiting the supply voltages even for a short period of time. Short circuits will generally destroy the series transistor 2N3053 (T71) in the stabilizer circuit in the supply section.

Since all the chassis parts of the unit are connected to the O-V potential, the O-V clip of the test instrument can be attached to any part of the metal frame.



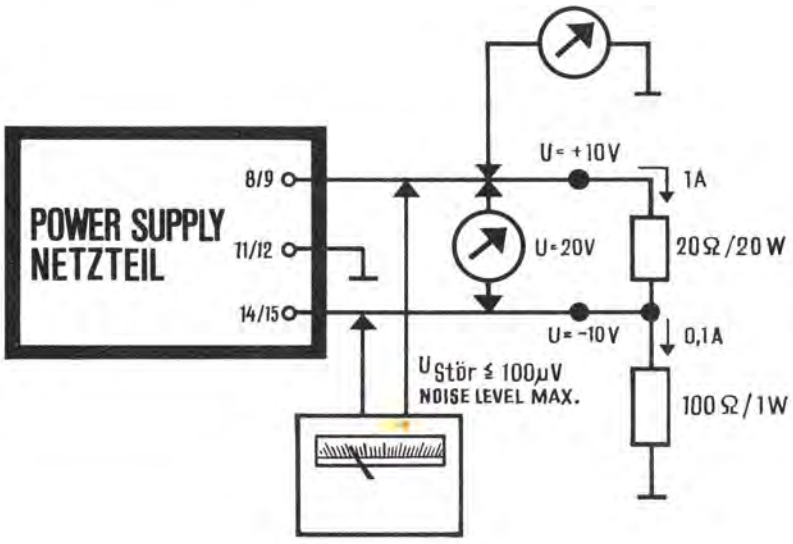
The +10 V potential can be picked up at the top of the powering printed circuit card at the nearest of the three large soldering lugs which lie side by side (see photograph) or better still it can be picked up at pin 2 (red wire) on the connector of the expander card.

The -10 V potential is readily available at point 1 (blue wire) of the connector of the expander cassette. Fig 3 shows the position of the expander card. The pin numbers on the printed circuit card connectors are always counted starting at the top (1) and counting downwards.

D 1.3 LOCALIZING A DEFECTIVE SUB ASSEMBLY (PRINTED CIRCUIT CARD) SUPPLY VOLTAGE CHECK

Incorrect supply voltages or total failure thereof indicate component failure (short circuits due to defective transistors, diodes or electrolytics). If this is the case one should proceed as follows:

withdraw the AC mains section and measure the open circuit voltage and if this is correct the voltage under load with dummy load resistors as shown in the diagram. If the voltages are incorrect the fault in the AC mains unit should be found (the series transistors may need replacing).



If the fault has been repaired, the AC mains section must not be put back into the compressor where it would be loaded by the printed circuit cards because the faulty printed circuit card would again damage the AC mains section. On the contrary all printed circuit cards including the amplifier-multiplier prints should be removed and tested for short circuits.

IMPORTANT

If an ohmmeter is used great care must be taken to ensure that the internal test voltage of the ohmmeter is applied to the printed circuit cards in the correct polarity.

A short circuit can be located by systematically opening connections to transistors, resistors etc. on the printed circuit card with reference to the circuit diagram. If there is no definite short circuit the following method will help to find the defective circuit card relatively quickly, as defective components generally cause changes in the current consumption. Remove all printed circuit cards - including the AC mains section - from the unit.

Connect an external DC source - e. g. two 10 V batteries with clips on to the soldering tags on the contact strip of the mains unit as follows:

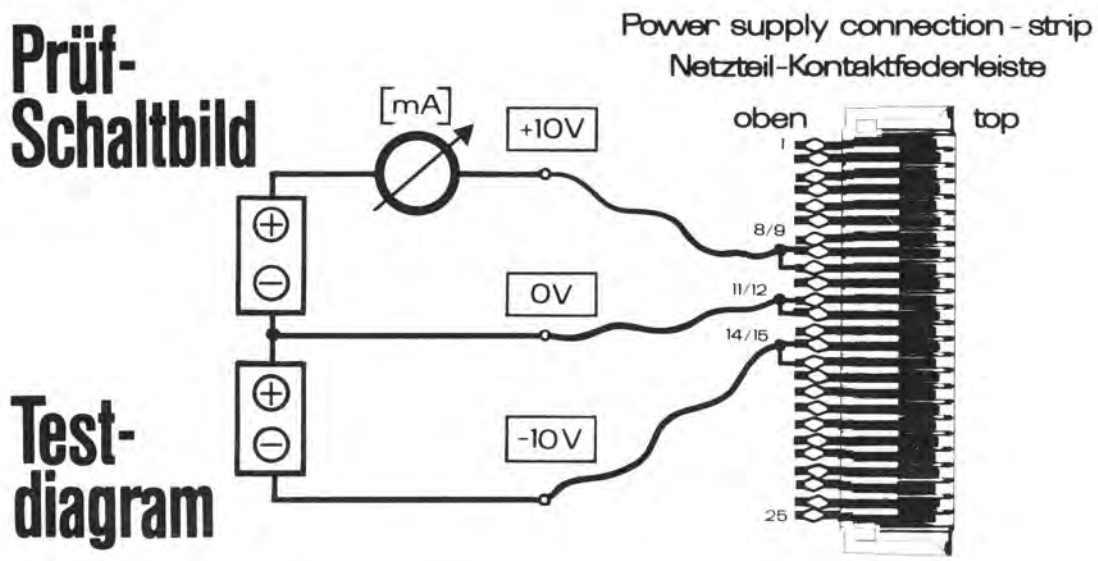
+10 V on to contact 8/9
0 V on to contact 11/12
-10 V on to contact 14/15

The contacts are numbered from top (1) to bottom (25).

An ammeter (range 1 A or 300 mA) is connected into the +10 V line. The DC supply must be capable of supplying 200 - 300 mA at 2 x 10 V.

Prüf-Schaltbild

Test-diagram



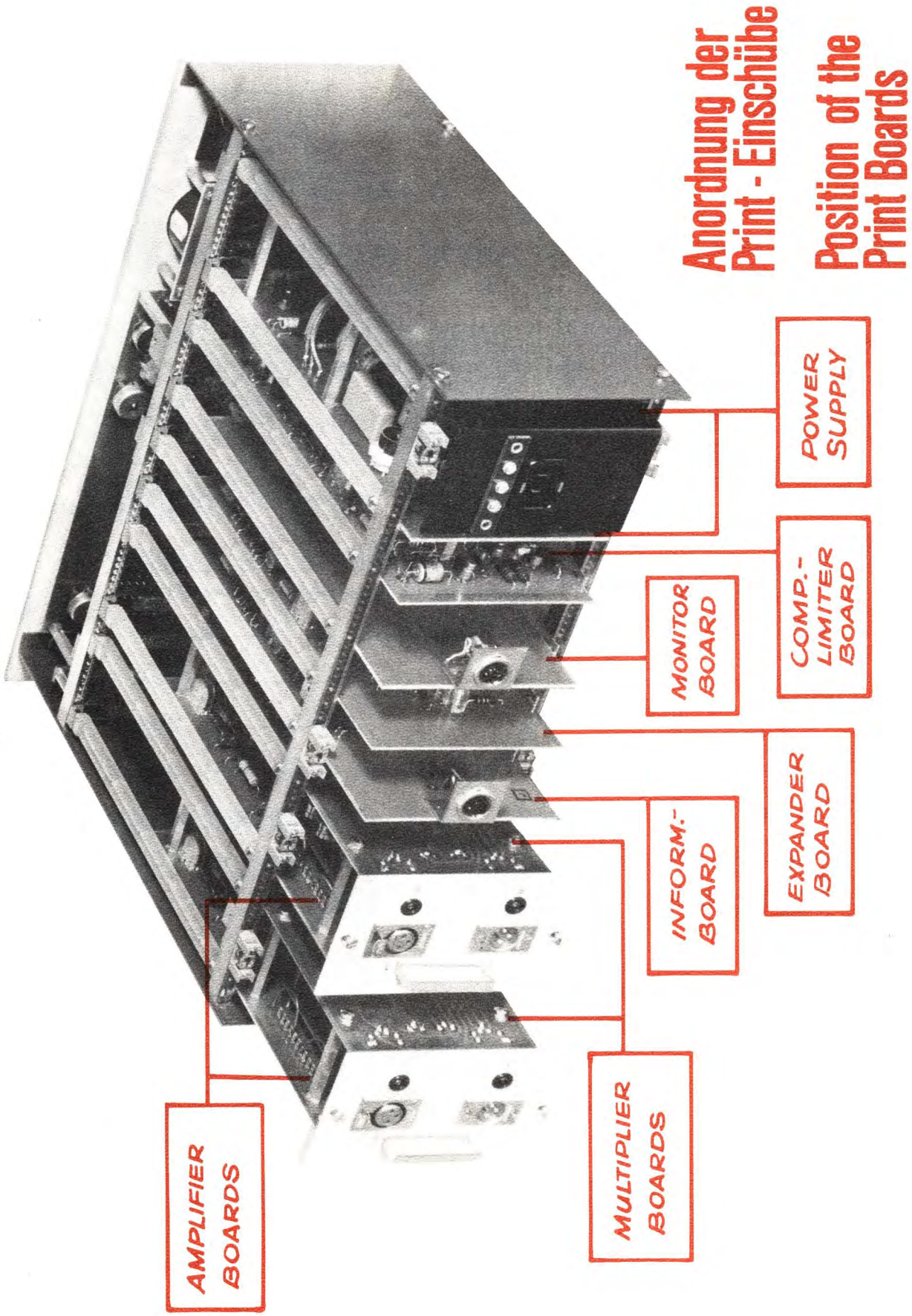
Now one printed circuit card after the other (only one at a time) is plugged into its appropriate place and the current consumption is measured.

Properly adjusted printed circuit cards should have the following current consumptions:

	+ Voltage	- Voltage
COMPR. LIM.	27 mA	32 mA
EXPANDER	18 mA	12 mA
INFORMATION BOARD	30 mA	80 mA
MULTIPLIER	125 mA	120 mA
AMPLIFIER	180 mA	160 mA
The Power Supply will produce with full load:	approx. 710 mA	approx. 740 mA.

If the measured values differ substantially, the DC voltages which are shown in the cicuit diagram (in tiny rectangles) should be measured on the printed circuit card (the collector-emitter voltages of the transistors should also be checked).

The recommended check points on the printed circuit cards for voltage measurements or C.R.O. are shown on the printed circuit diagrams.



PERFORMANCE TEST

If the DC conditions in the various printed circuit cards are correct the cause of malfunctioning can be localized and found by means of the following systematic tests:

1. Remove all printed circuit cards except the INFORMATION card and the AC mains section.

   Press the button AUX. DC.

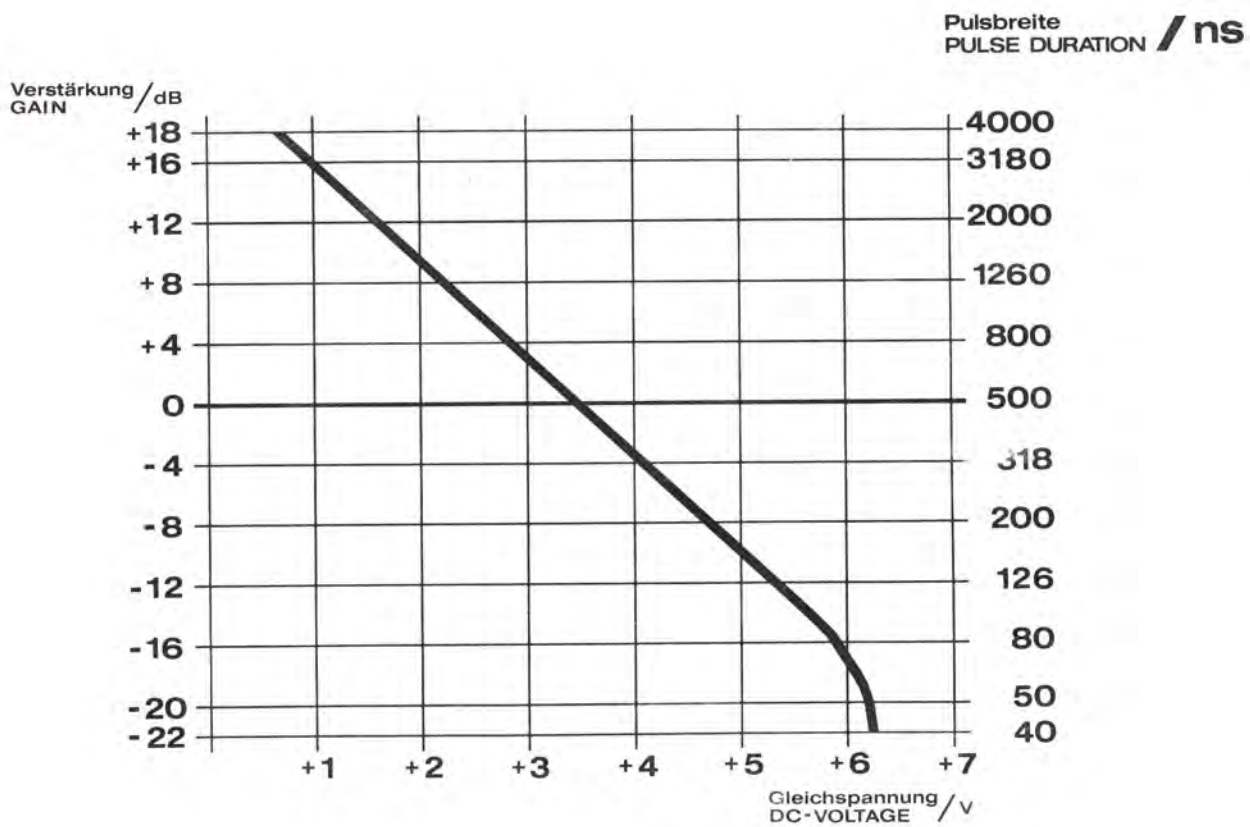
   Feed a DC voltage to the EXTERNAL DC socket on the back panel.

   Observe correct polarity.

   The DC supply should be continuously variable from 0 - 7 V.

   The EXTERNAL DC input presents a load of 2,2 kOhm.

The variation of the pulse width as a function of the DC voltage may be observed by connecting an oscilloscope (rise time 20 nanosec) to the points (15) and (16). The illustration 4 shows the pulse width as a function of DC input voltage. The amplitude of the pulses should lie between -6 and -8 V.



If there are no pulses, the pulse generator (circuit section comprising T 35, T 38 and T 40) should be checked. Furthermore the differentiating networks should be checked at points (10) to (14). If the width of the pulses cannot be modulated, the DC voltage amplifier T 36 to T 39 and the comparitor uA 710 should be checked. If the test of the supply voltage showed a shift from -10 V to -20 V (or +10 to +20 V) it is highly probable that the comparator uA 710 is defective.

2. If the INFORMATION BOARD functions correctly the MULTIPLIER-AMPLIFIER unit may also be plugged in. With the same test arrangement as described under 1, the gain measured between input and output should be variable by means of the auxiliary DC voltage. The appropriate values are also shown in the table.

Tests: the pulse - length modulated audio signal may be observed on an oscilloscope across the points (1) and (2).

If the BALANCE control (R5) at the rear of the multiplier unit is not correctly adjusted, the gain control may introduce noise. For optimum adjustment the TEST button should be pressed which feeds a 50 Hz half wave signal (half way rectifier) to the comparator. This signal alters the gain 50 (60) times per second from maximum to minimum. The 50 Hz (60 Hz) appears as noise signal at the output and is a measure of the unbalance of the push-pull switching stage (T5, T6, T7). The BALANCE control should be adjusted for minimum noise voltage. Values of 100 mV (referred to a +6 dB setting of the output transformer) are sufficient for the functioning of the unit and values below 30 mV may be considered optimum.

INTERNAL TRIMMER ADJUSTMENTS AND THEIR EFFECT

The internal trimmers are set at the factory for optimum performance and should not be altered. Readjustments are only recommended if a setting has been accidentally altered or after repairs have been carried out in that particular part of the circuit, especially in the mains section if transistors have had to be replaced.

R 28 OV on base of T 12 or minimum distortion at 40 Hz and +20 dB input.

R 52 Expander ROT POINT adjustment.

R 86 Adjust for minimum gain increase, with 8 dB indicated gain and sudden removal of input signal.

R 74 Expander threshold.

R 93 Adjust instrument to +18 dB gain indication with -40 dB input, COMPR. GAIN at 18 dB and COMPR. RATIO at 4:1.

R 97 O dB adjustment of the meter indication.

R 98 O dB position of the meter (O dB gain position by turning the COMPR. RATIO quickly to 4:1 and back: output should remain constant).

R 105 Adjust pulse width ratio on (10).

R 112 Increase DC input voltage at Information Board (contact point 15) to +3,6 V and adjust pulse width to 500 ns.

R 118 Adjust with DC input voltage at Information Board of O,6 V (contact point 15) so that the pulse width of the output signal is barely affected.

R 130 Compressor attack time (standard value: 2 ms).

R 139 Adjust compression ratio to 4:1.

R 141 Adjust so that OUTPUT remains constant when COMPR. RATIO is varied rapidly.

R 152 Limiter threshold.

R 155 DC voltage adjustment for the points (25) and (26).

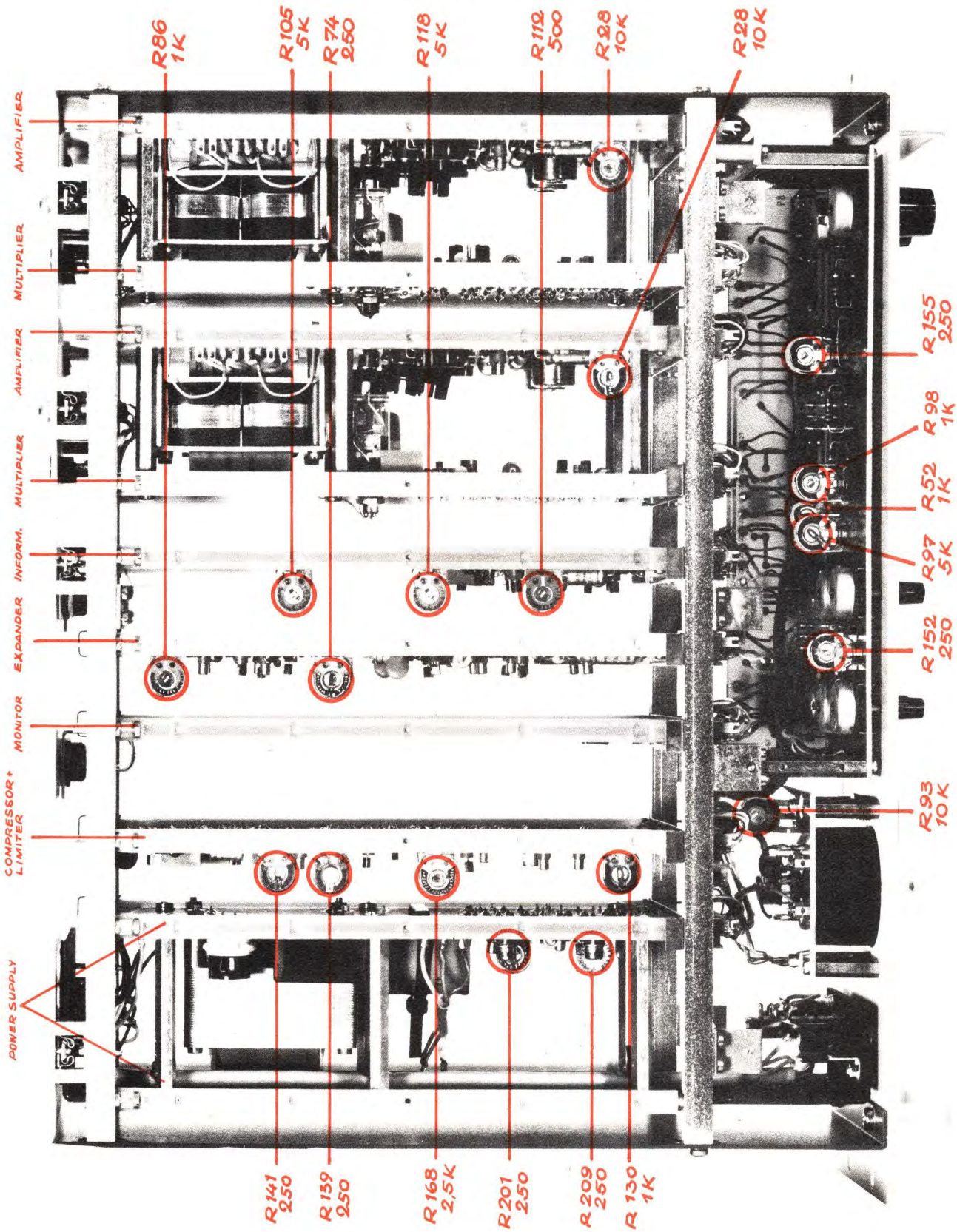
R 168 Affects the DC voltages on the points (21) to (26) in conjunction with the limiter threshold.

R 201 Adjust voltage between 8/9 (+10 V) and 14/15 (-10 V) to 20 V.

R 209 Adjust voltage between O V (11/12) and +10 V (8/9) to +10 V.

Positionen der Einstellregler

POSITIONS OF THE ADJUSTMENT POTENTIOMETERS



Technical Specifications

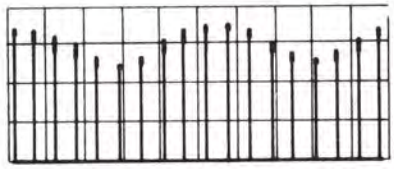
Inputs	2 for stereo, balanced, floating
Input impedance	min. 5 kΩ
Input level range (continuously adjustable)	+4 dB (1.2 V) ... +15 dB (4.4 V)
Max. input voltage, independent of line level setting	+24 dB (12.3 V)
Outputs	2 for stereo, balanced, floating
Nominal output line levels (by selecting suitable tap at output transformer)	+4 dB, +6 dB, +8 dB, +12 dB, +15 dB (1.2, 1.55, 2, 3, 4.4 Volts)
Max. output level for 1 % THD	+24 dB
Output source impedance	15 Ω, 20 Ω, 30 Ω, 40 Ω, 50 Ω (+4, +6, +8, +12, +15 dB) designed to work into a load of 200 Ω or more
Frequency Response	
referred to 1 kHz in the 30 Hz . . . 10 kHz range	± 1 dB
at 15 kHz	—1.5 dB
Total Harmonic Distortion	
at 1 kHz	
gain 0 dB (unity), intern. level 0 dB	less than .6 %
within operating range of compressor, Release time autom. controlled	less than .6 %
within operating range of limiter, Release time autom. controlled	less than 1 %
S/N-Ratio	
Input terminated with 200 Ω Output terminated with 600 Ω	
unweighted	
gain 0 dB (unity)	70 dB rms
gain 18 dB	68 dB rms
weighted (CCIR)	
gain 0 dB (unity)	70 dB rms 65 dB peak
gain 18 dB	68 dB rms 63 dB peak
Channel Separation	
at 1 kHz and line level	better than 35 dB
with input +20 dB (Limiter operating)	better than 35 dB

Overall range of gain variation (Compr. + Lim.)	40 dB
Limiter	
Threshold	—2 dB . . . + 7.5 dB*
Max. input voltage	+24 dB (12.3 V)
Attack time	max. 100 μsec
Release time with 10 dB level decrease	
manually adjustable	.25 . . . 2.5 sec
automatically controlled	program dependent
Compressor	
Compressor gain adjustable	0 . . . 18 dB
Compression Ratio adjustable	1.5:1 . . . 4:1
Rotation Point adjustable	—6 dB . . . 1.5 dB*
Attack time internally adjustable	1 . . . 4 msec
adjusted at the factory to	2 msec
Release time with a level decrease creating a 10 dB gain variation	
manually adjustable	.5 . . . 3.5 sec
automatically controlled	program dependent
Expander	
Expansion Ratio selectable by push buttons	1:1.5, 1:2.5
Expander Rot. Point adjustable	—35 dB . . . —55 dB*
Attack time	controlled by Compr. Release time and program dependent
Release time with a level decrease creating a 10 dB gain variation	
manually adjustable	1.5 . . . 7.5 sec
automatically controlled	appr. 4.5 sec
AC Mains	
Voltage ranges	100 to 130 Volts 200 to 250 Volts
Frequency range	50 to 60 Hz
Power consumption	40 VA
Weight	29 lbs. (13.3 kg)

* referred to an internal level of 0 dB.

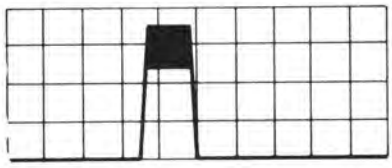
MULTIPLIER

① Hor. Abl. 10µsec/cm
Vert. Abl. 2V/cm
HOR. DEFL. 10µsec/cm
VERT. DEFL. 2V/cm



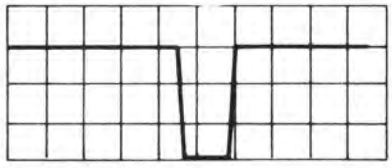
20kHz-Signal zerhackt durch 200kHz-Impulse
20kHz-SIGNAL SAMPLED BY 200kHz-PULSE

Hor. Abl. 50nsec/cm
Vert. Abl. 2V/cm
HOR. DEFL. 50nsec/cm
VERT. DEFL. 2V/cm



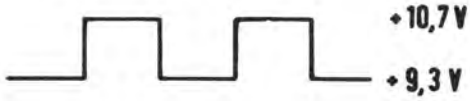
zugehöriger 200kHz-Impuls zum oberen Bild
SINGLE PULSE FROM ABOVE PICTURE

② Hor. Abl. 50nsec/cm
Vert. Abl. 2V/cm
HOR. DEFL. 50nsec/cm
VERT. DEFL. 2V/cm



Gegentakt-Impuls zum Bild ①
CORRESPONDING PULSE TO PICTURE ①

EXPANDER

③ 

④ -10V ÷ -9,5V

⑤ -8,5V ÷ -9V

⑥ -8,5V ÷ -8V

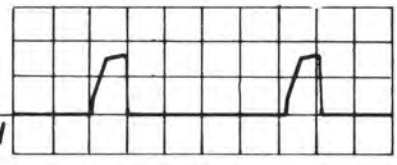
⑦ +2,8V ÷ -0,7V

⑧ +3,7V ÷ 0V

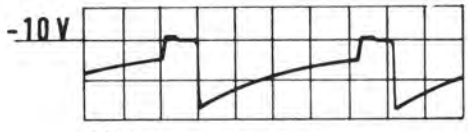
⑨ +5V ÷ +8V

INFORMATION BOARD

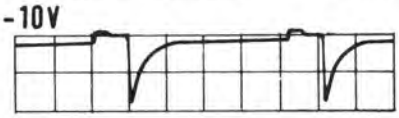
⑩ Hor. Abl. 1 µsec/cm
HOR. DEFL. 1 µsec/cm

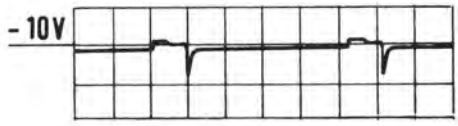


200kHz Rechteckimpuls
200kHz SQUARE WAVE

⑪ 

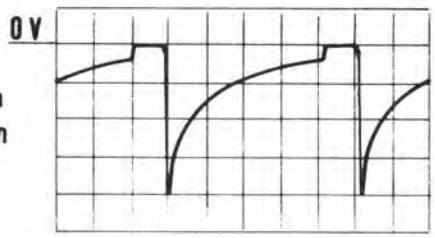
⑫ Hor. Abl. 1µsec/cm
HOR. DEFL. 1µsec/cm



⑬ 

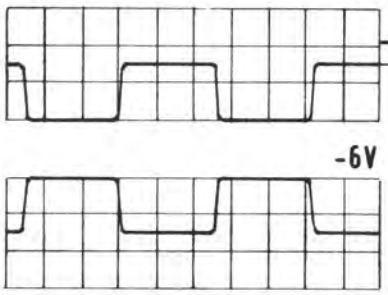
differenzierte Rechteckimpulse mit verschiedenen Zeitkonstanten
DIFFERENTIATED SQUARE WAVE WITH DIFFERENT TIME CONSTANTS

⑭ Hor. Abl. 1µsec/cm
HOR. DEFL. 1µsec/cm



Addition der drei differenzierten Signale
ADDITION OF THE THREE DIFFERENTIATED SIGNAL
⑪ ⑫ ⑬

⑮ ⑯ Hor. Abl. 1µsec/cm
HOR. DEFL. 1µsec/cm



Gegentakt-Ausgangssignal der Information-Einheit
COMPLEMENTARY OUTPUT FROM INFORMATION BOARD

COMPRESSOR-LIMITER

⑰ -0,9V ÷ +2,8V

⑱ -1,1V ÷ -1,2V [ohne Signal / WITHOUT SIGNAL]
bei „COMPRESSOR ROTATION POINT" ca. 0V
AT „COMPRESSOR ROTATION POINT" APPROX. 0V

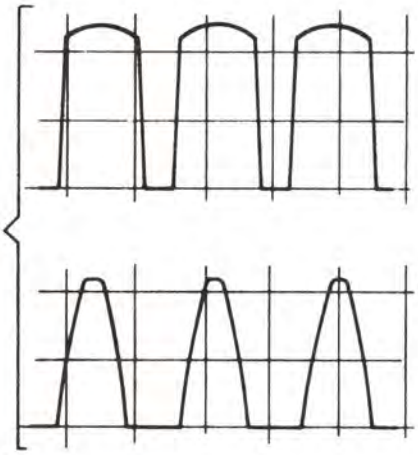
⑲ -0,4V ÷ -1,2V

⑳ +0,6V ÷ +6V [je nach Signal / DEPENDENT ON SIGNAL]

㉑ +8V ÷ +9,7V

㉓ -9V ÷ 0V

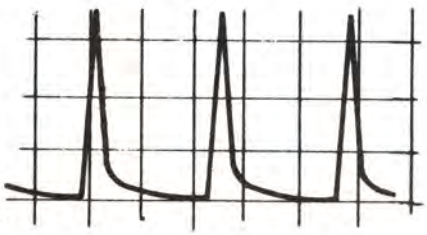
㉒



3dB oberhalb Limiter-Einsatz
3dB OVER LIMITER THRESHOLD

3dB unterhalb Limiter-Einsatz
3dB UNDER LIMITER THRESHOLD

㉔



㉕ COMPRESSOR GAIN +18dB ca. +0,6V, 0dB ca. +3,7V
COMPRESSOR GAIN +18dB APPROX. +0,6V, 0dB APPROX. +3,7V

㉖ = ㉕

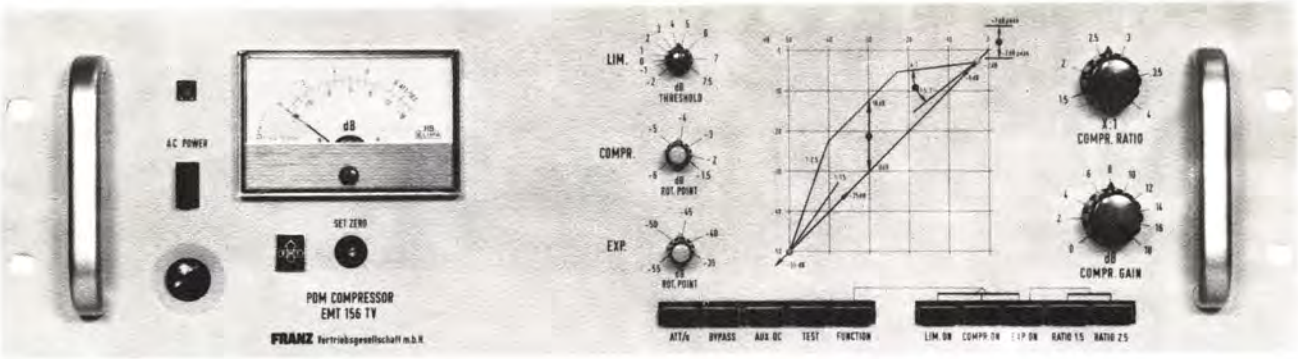
EMT 156 TV

Die Spezialausführung EMT 156 TV unterscheidet sich von der Normalausführung EMT 156 durch die nur einkanalige Bestückung und den Wegfall der Einstellregler für die Rücklaufzeit.

Die Schaltkreise

LIM.RELEASE TIME,
COMPR.RELEASE TIME,
EXP.REL.TIME

im Gesamtschaltbild entfallen, ebenso Punkt B 2e - 2 der Bedienungsanleitung.



Compared with the standard model EMT 156 the special model EMT 156 TV is a one-channel unit with no decay time setting controls.

The circuits concerned:

LIM.RELEASE TIME,
COMPR.RELEASE TIME,
EXP.REL.TIME

in the diagram as well as Paragraph B 2e - 2 of the instruction manual have to be deleted.

Stereo ausbaufähig mit Einschub Nr. 7 156 776
Multiplier – Amplifier

MULTIPLIER

AMPLIFIER

Monitor
7 156 008

MONITOR

BYPASS

EINGANG INPUT

MULTIPLIER

AUSG. OUTPUT

AMPLIFIER

EXPANDER

INFORMATION BOARD

FUNCTION

EXTERN

TEST

FUNCTION

EXP. ON

EXP. RATIO

COMP. ROT. PT.

COMPR. RATIO

COMP. ON

POWER SUPPLY

ATT/S SET ZERO

LIM. THRESHOLD

LIM. ON

COMPR. GAIN

COMPRESSOR LIMITER

EX. ROT. POT.

117 V~ 0,8A SLOBLO
230V~ 0,4A M

Tr.3 M74

Lo 110 V

Gültig ab Fabrik-Nr. 25 738

Applies to units starting with serial No. 25 738

0,25 - 0,3 W
0,5 W

Spannungsangaben sind ca. Werte
VOLTAGE VALUES APPROX.

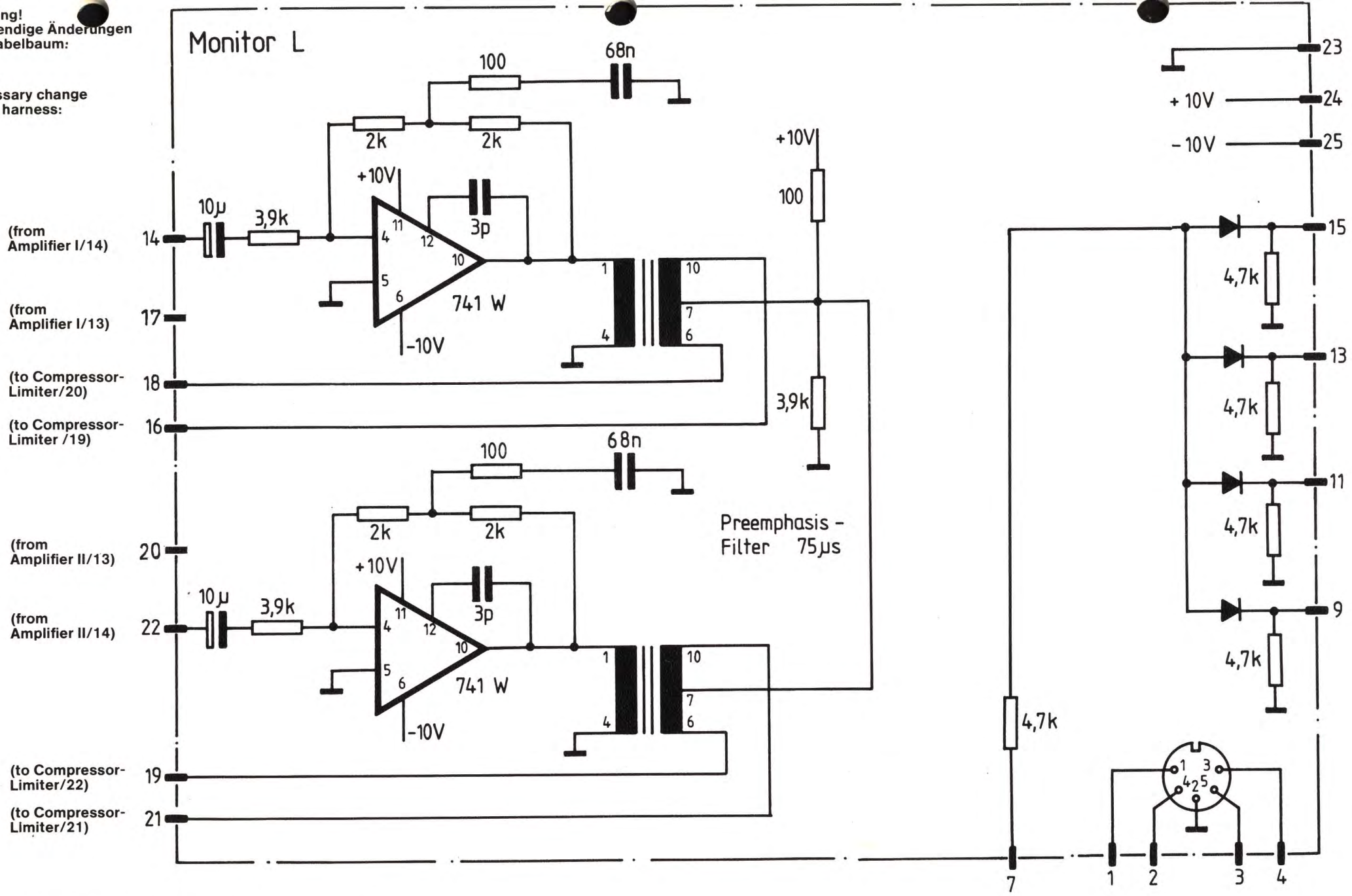
Technische Änderungen vorbehalten
SPECIFICATIONS CHANGE RESERVED

PDM-Compressor
EMT 156 TV

PDM COMPRESSOR TV X156 021 I TV

Achtung!
Notwendige Änderungen
am Kabelbaum:

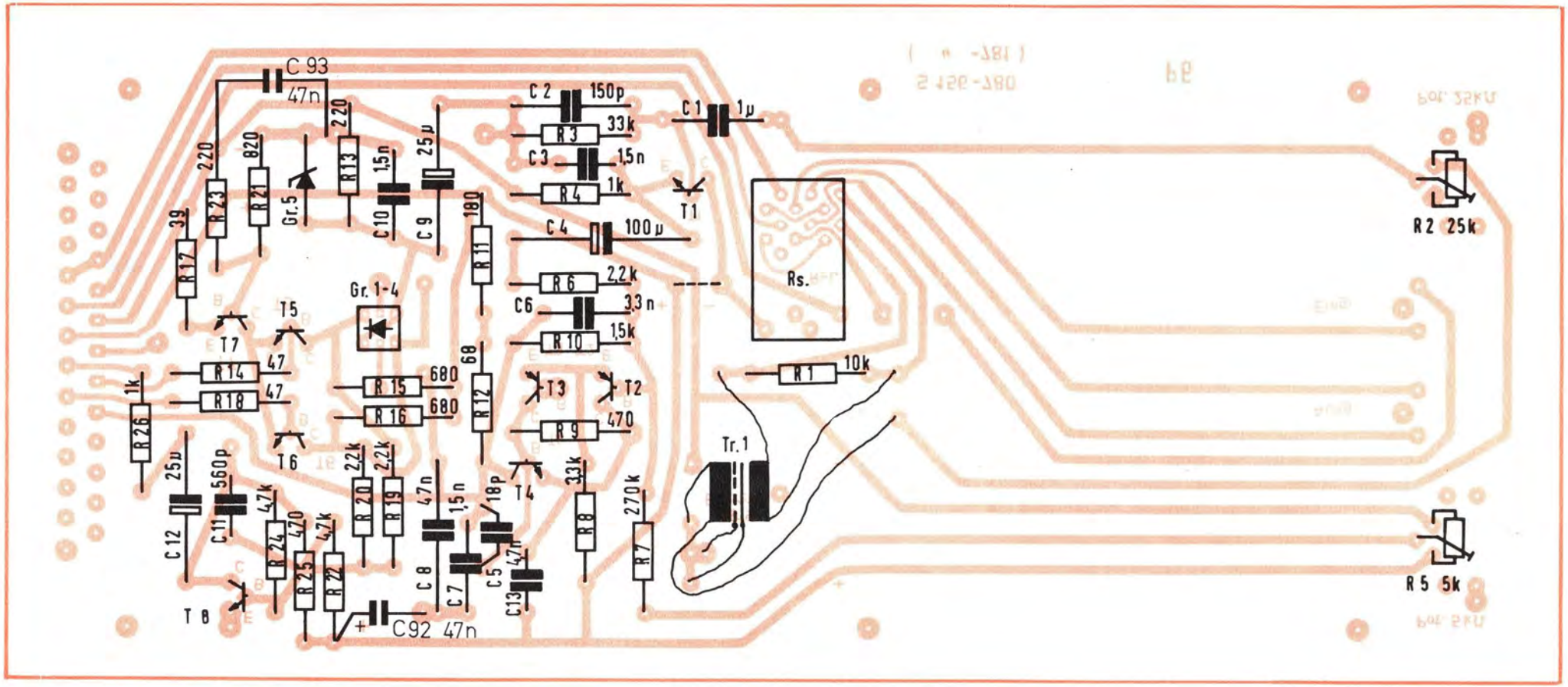
Note!
Necessary change
in the harness:



MONITOR L

für 75 µs Preemphasis
for 75 µs Preemphasis

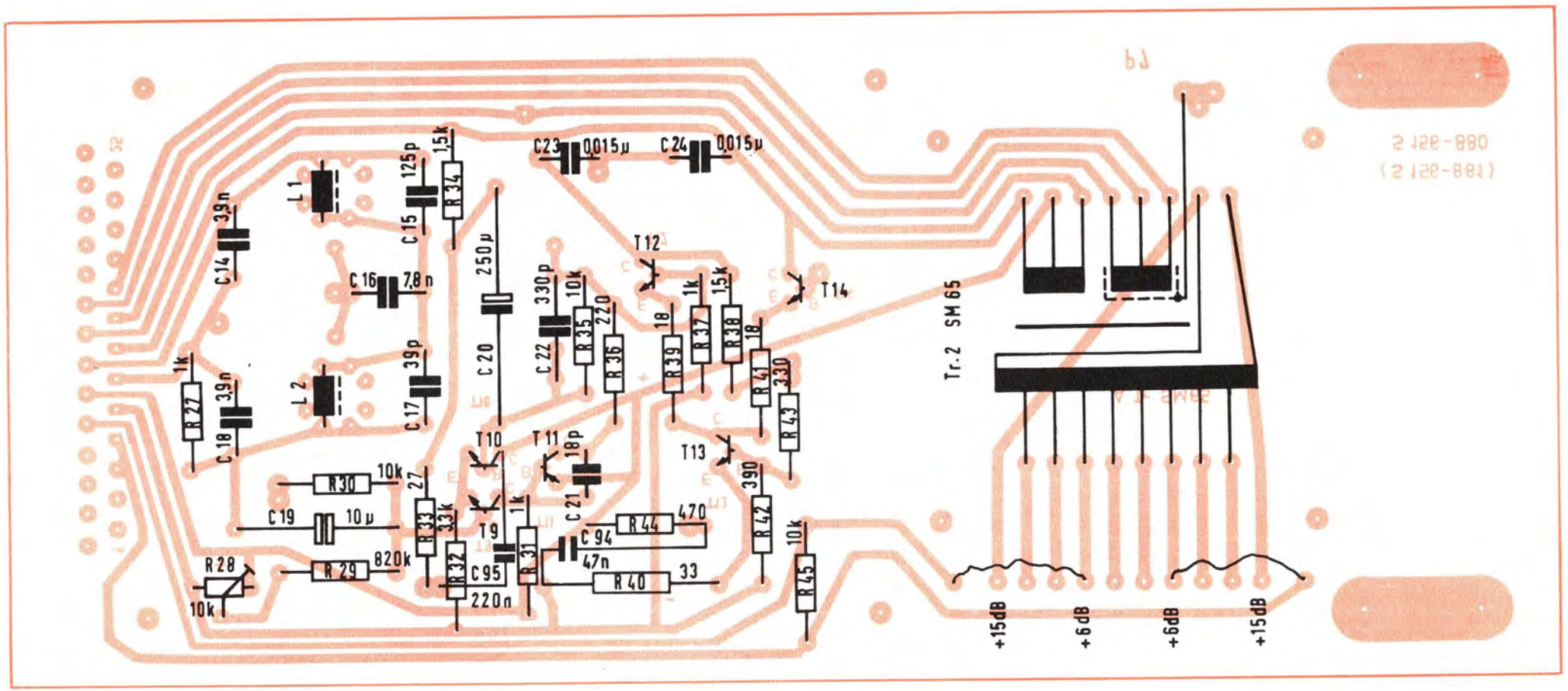
Für 50 µs oder 90 µs sind die 68 nF-Kondensatoren in 47 nF oder 82 nF zu ändern.
For 50 µs or 90 µs change the 68 nF capacitors to 47 nF or 82 nF.



EMT 156

APRIL 75

Multiplier Board

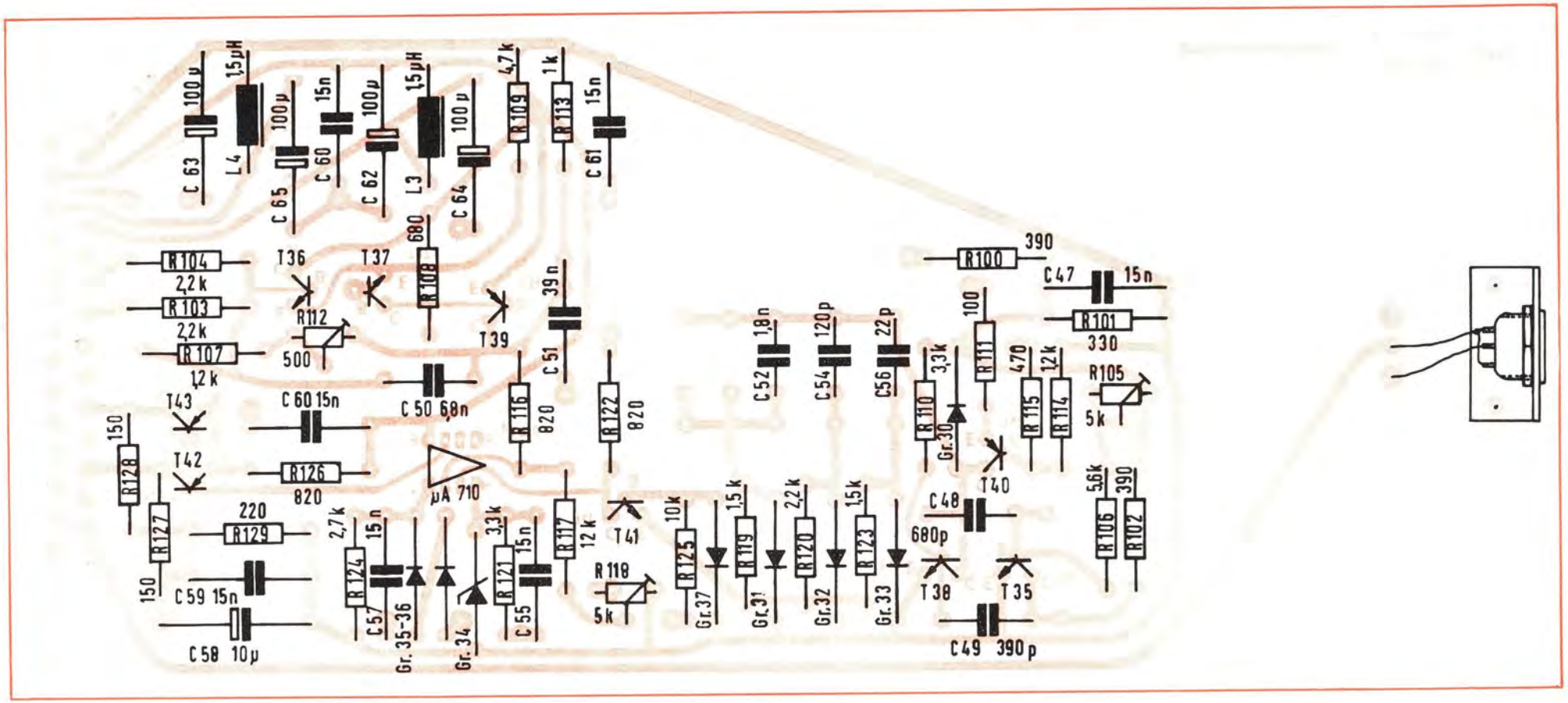


EMT 156

März 76

Amplifier Board

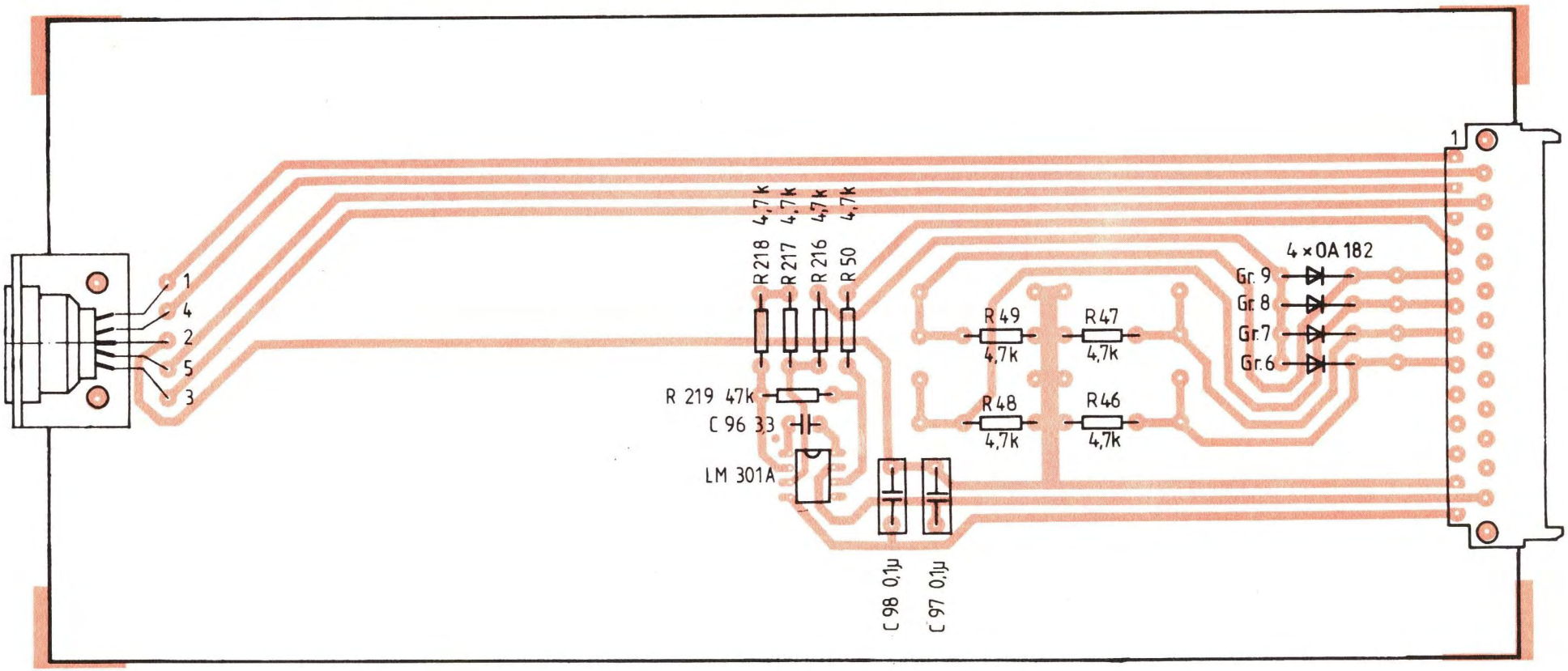
INFORMATION S156-689
BOARD P5
(S156-690)



EMT 156

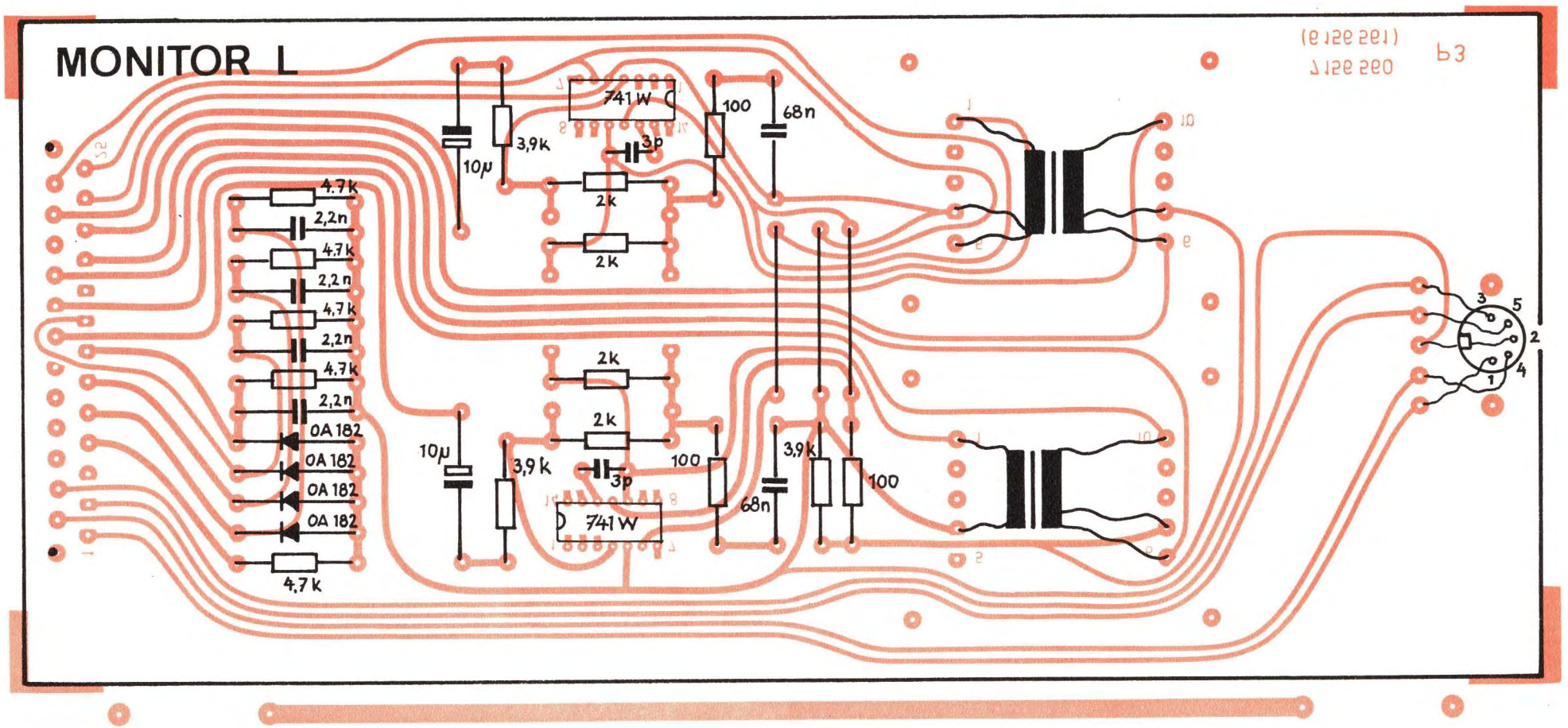
Information Board

MAI 70



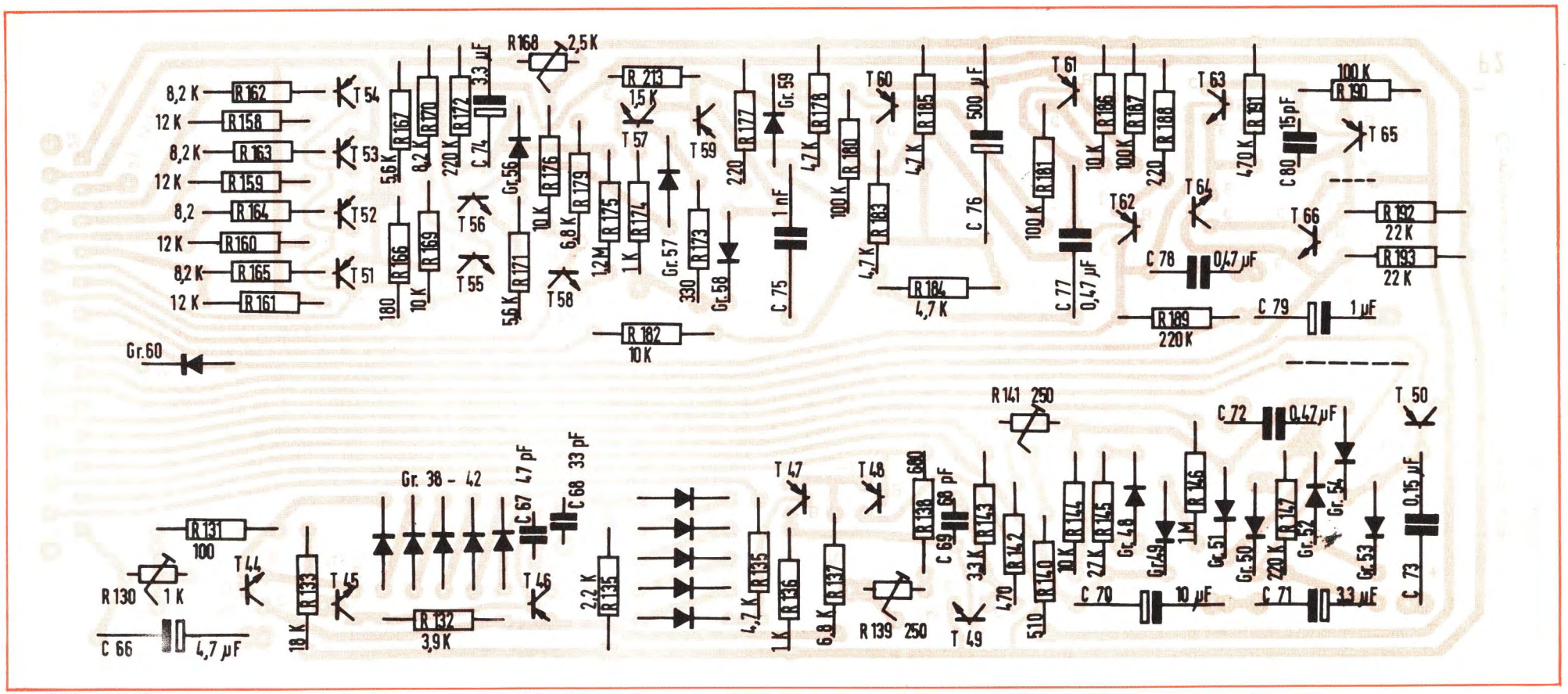
EMT 156

Monitor Board



EMT 156

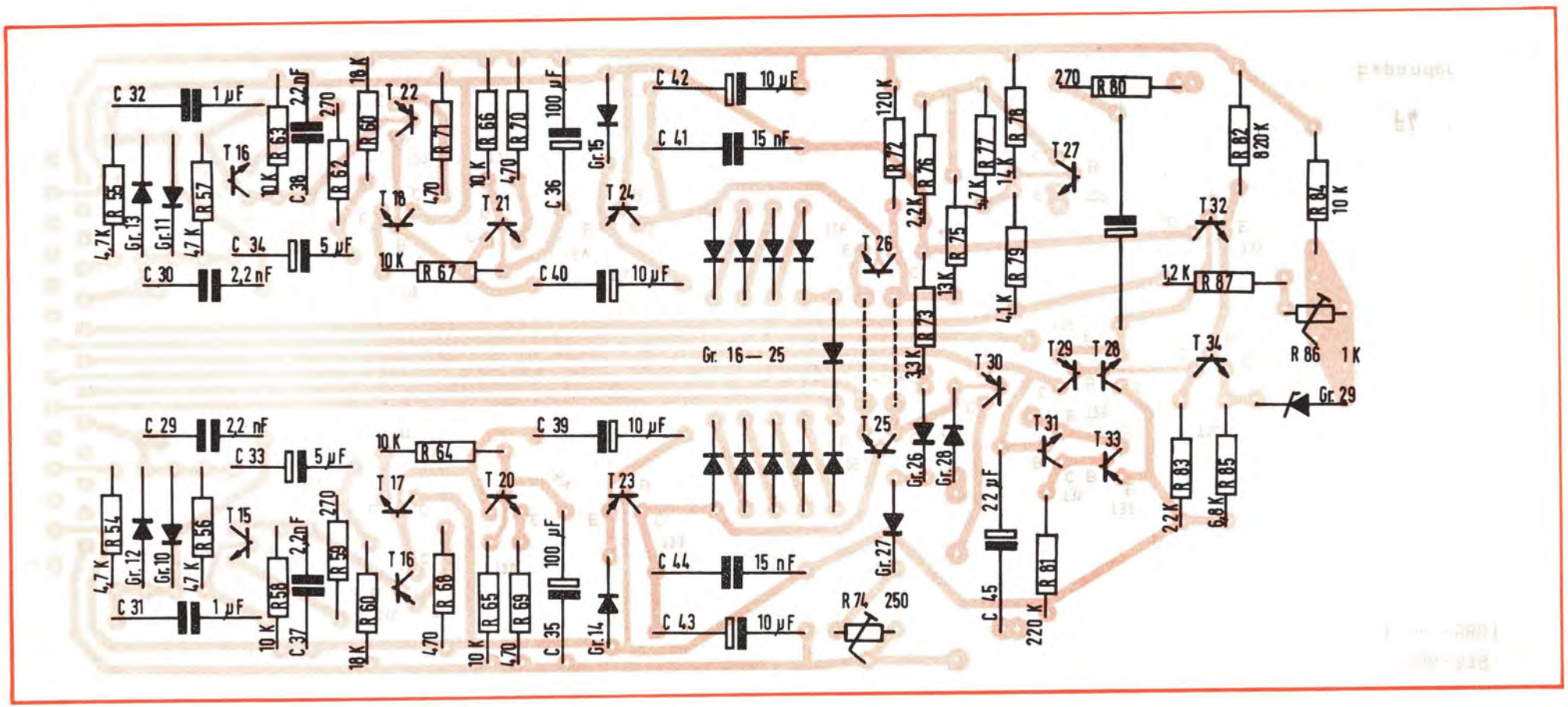
Monitor L Board



EMT 156

März 76

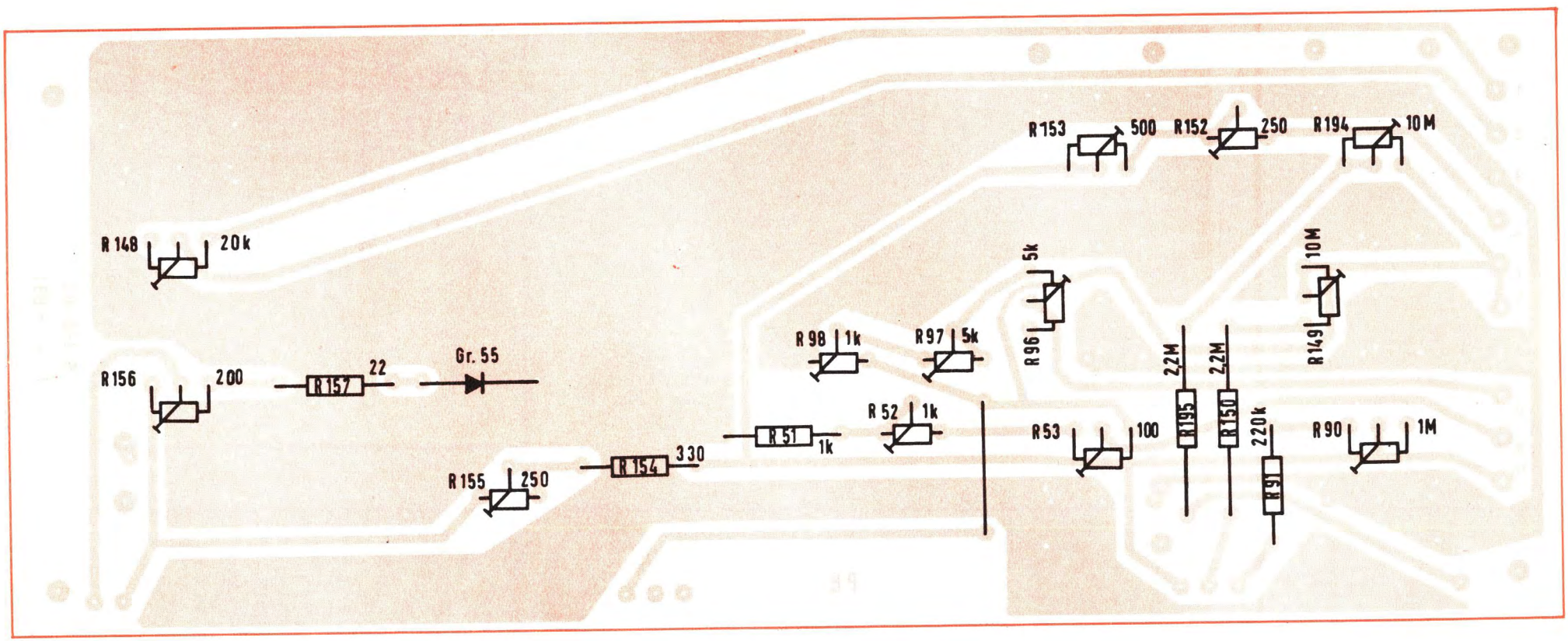
Compressor-Limiter Board



EMT 156

Expander Board

MAI 70

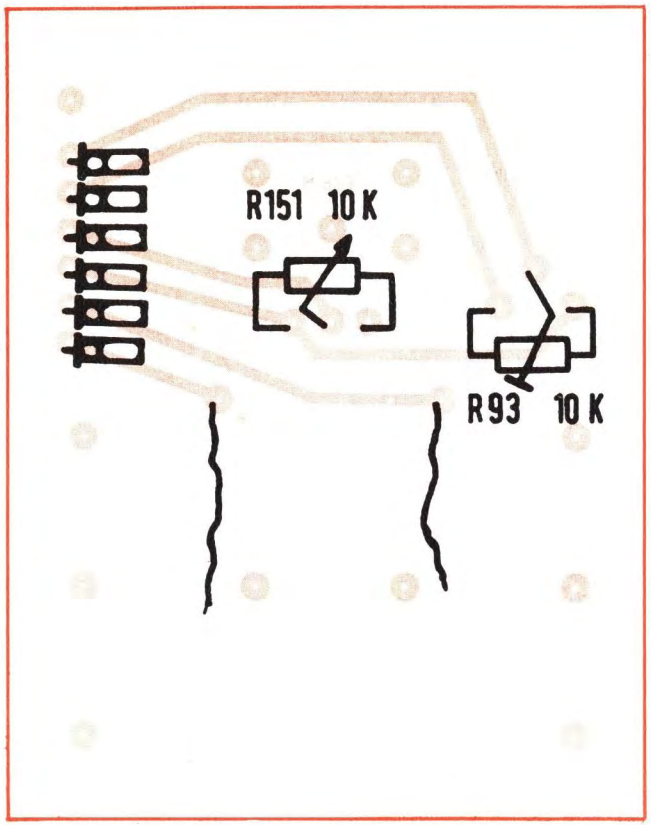


EMT 156

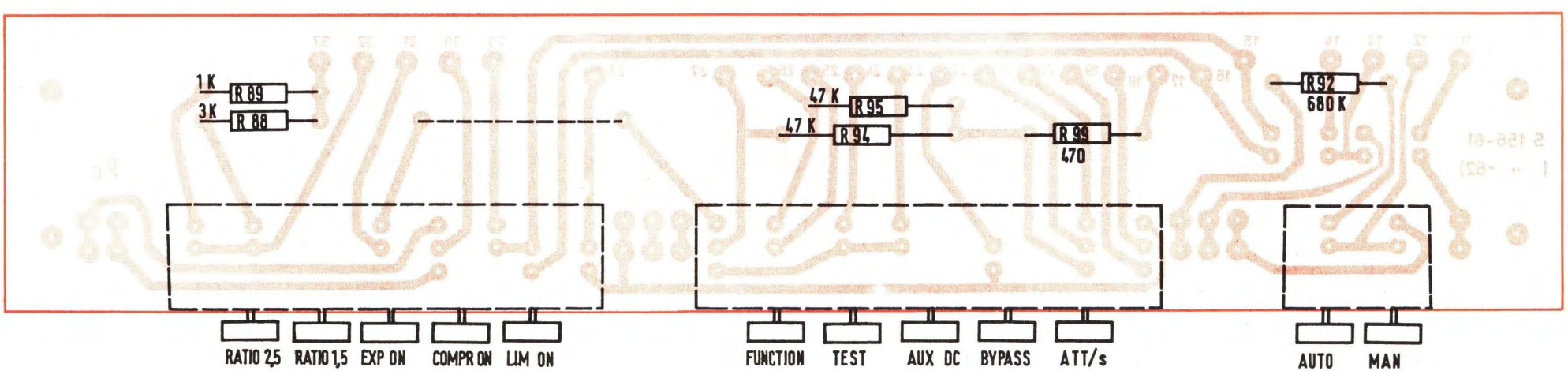
Potentiometer Board

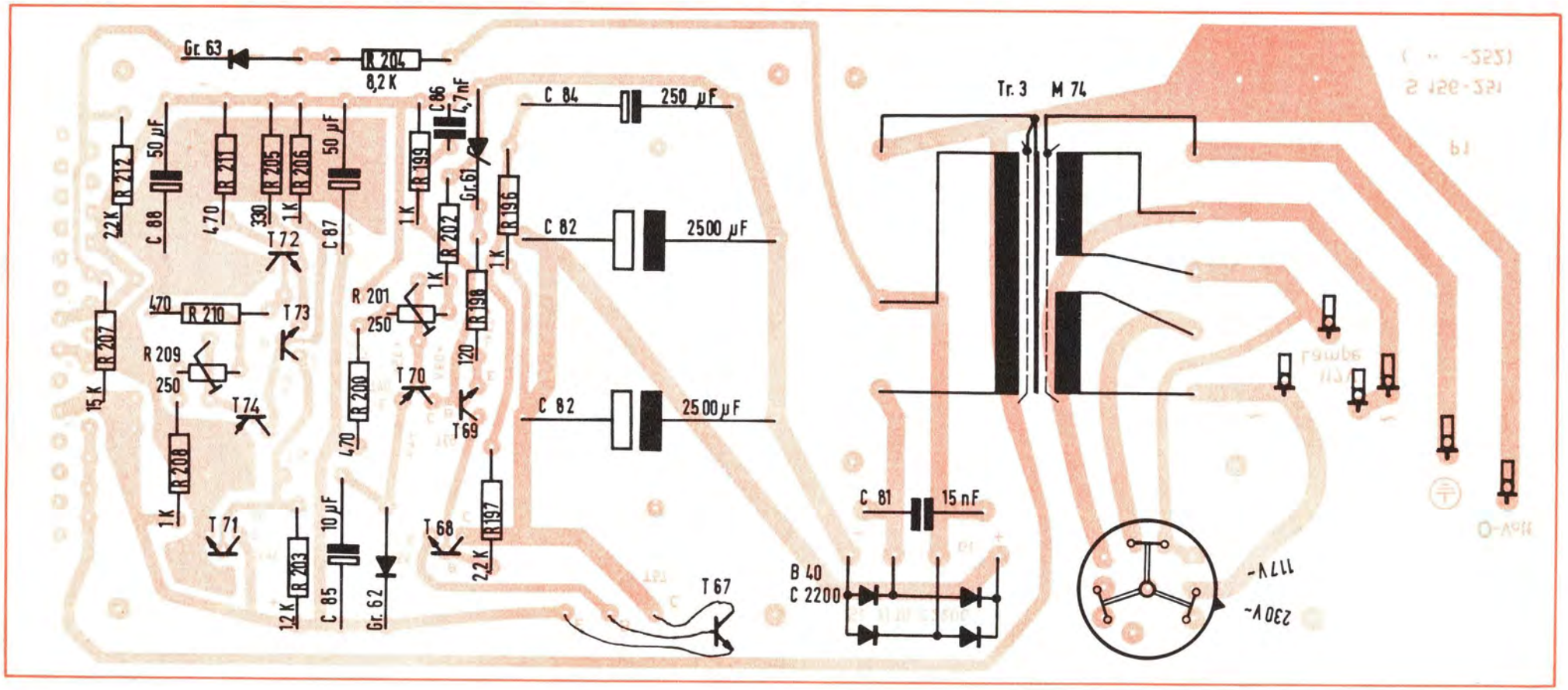
MAI 70

Meter Board



Function Selector Board





EMT 156

Power Supply Board

MAI 70

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