



ELEKTRONIK-
MESS- UND
TONSTUDIOTECHNIK

EMT-FRANZ^{GMBH}

Postfach 1520, D-7630 Lahr
Tel. 07825/1011, Telex 754319

Instruction Manual

EMT 948 Broadcast Turntable

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EMT 948 Broadcast Turntable

December 1982

**Applies to units starting with
serial no. 52997.**

**Constructions and circuits are
subject to change without notice.**



EMT-FRANZ

**G
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B
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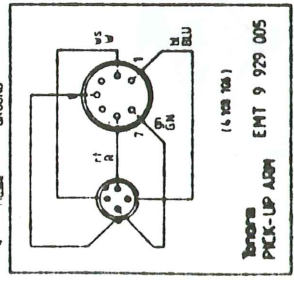
Postfach 1520, D-7630 Lahr, Tel. 07825-1011, Telex: 754319

* Gegenüber
MATING CONNECTOR

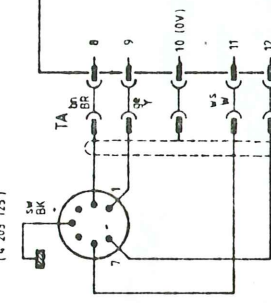
** Sicht auf Einstellseite
VIEW ON FRONT SIDE

Draufsicht auf Einstellseite des Tonreizes
PICK-UP ARM CONNECTIONS VIEWED FROM FRONT

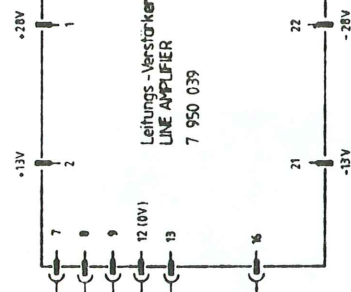
1-2 Interkanal LEFT CHANNEL
6-7 rechter Kanal RIGHT CHANNEL
4 Masse



Sicht auf Lattseite
VIEW ON WIND SIDE
Amplifier Nr. 86-895
(4 203 123)

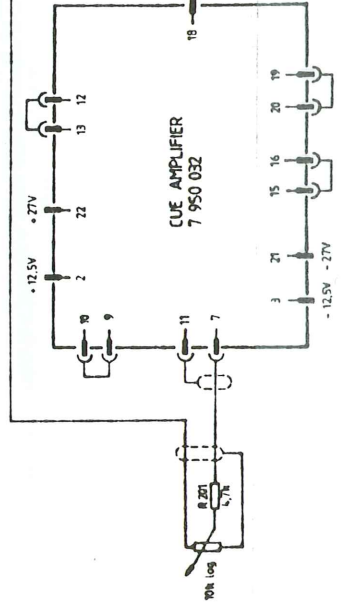
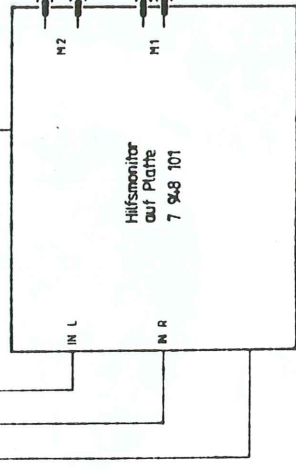
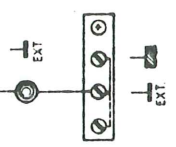


MUTING	
OFF	ON
0V	-15V
-15V	0V



MONO	STEREO
+13V	0V

REMOTE	LOCAL
0V	+13V



EMT 9948 XX1 NF-Blockschaltbild
AUDIO BLOCK DIAGRAM

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* Référence HP de Repérage → 20 020 203 00

Connections and Preparation for Use

A 1 Unpacking Instructions

- Place the carton in an upright position (as indicated on carton) and open.
- Remove the upper foam packing insert.
- Remove the accessories from the next foam insert and lift out the insert.
- Remove the turntable dust cover.
- Lift out the rigid foam cover.
- Grasp the turntable by the two handles and lift out from the lower rigid foam insert.
- The turntable platter and the rubber mat are located in the base of the foam insert.

The unit can now be prepared for operation with the appropriate accessories (tone arm counterweight, etc.).

Important!

Retain all packing materials for possible reshipment of the unit.

When repacking the unit, follow the reverse procedure with appropriate care.

Whenever the unit is repacked, do not forget to engage the two transport locks - chassis and motor bearing - and to remove the counterweight with the tube end of the tone arm. Tighten the screws firmly.

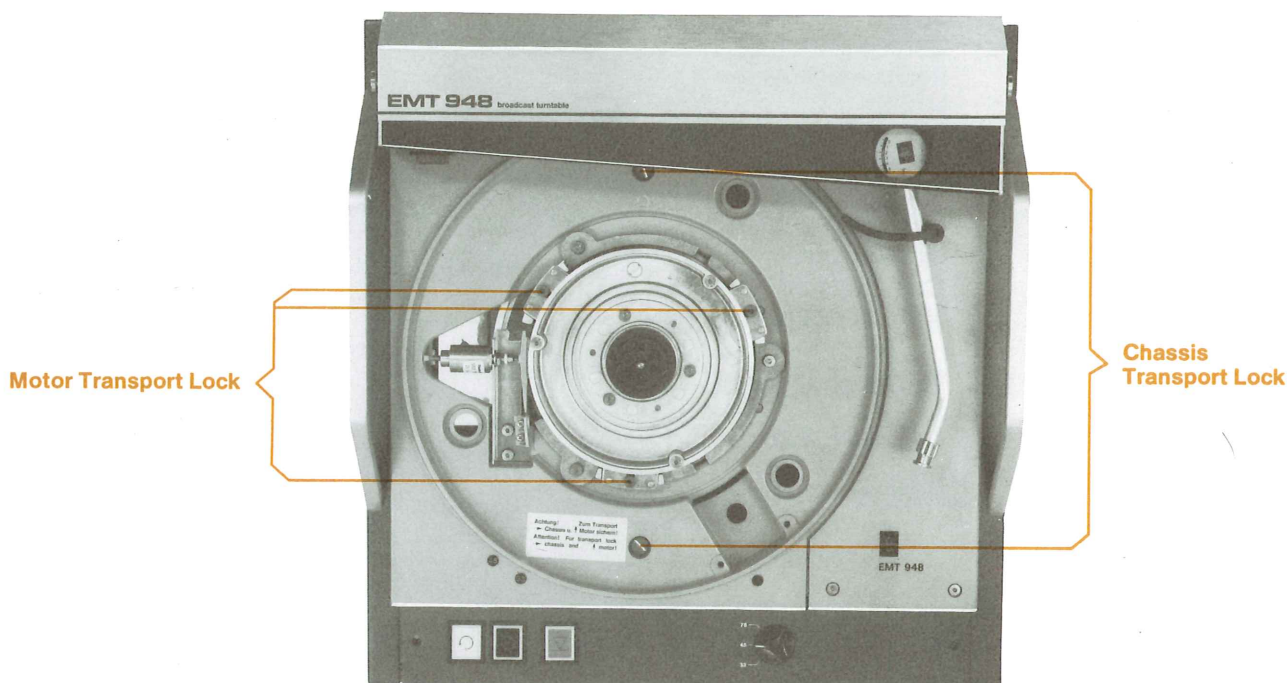
The tone arm should be firmly secured to the lift rest.

A 2 Releasing the Transport Locks

The unit is fitted with two transport locks, which are accessible from above through the opening in the chassis for the turntable platter. The locks stabilize the chassis and protect the lower motor bearing against excessive stress due to axial and radial vibrations.

The motor is secured with three brass-tone strips, which extend into a ring-shaped groove in the rotor.

- Slightly loosen the three associated Allen screws (identified in red).
- Hold the rotor so that it cannot fall onto the lower bearing.
- Pull the three strips out of the groove and lower the rotor onto the bearing (approx. 1 mm).
- Retighten the Allen screws. Make sure that the strips do not touch the rotor, lest they impede the motion of the motor.



Connections and Preparation for Use

The transport lock for the suspended chassis is released by loosening the two large screws (identified in red) in the opening for the turntable platter. These two screws must be loosened completely, i. e., until they are pushed against the chassis from below by the built-in springs. The screws remain in the unit.

If the unit is to be secured for reshipment, proceed in reverse order. The three strips of the motor lock must be pressed somewhat against the inner wall of the groove to inhibit radial vibrations of the rotor.

A 3 Turntable Platter

Attach the turntable platter to the rotor of the motor with three screws and place the rubber mat on the platter.

A 4 Installation in Cabinets, Tables, or the EMT Console 9 948 970

A cutout of 442 x 457 x 157 mm (17.6" x 18.2" x 6.3") (width x length x depth) is required for installation in cabinets or tables.

The EMT Console 9 948 970 has been designed for the EMT 948 Broadcast Turntable. Space is provided to the left of the turntable for the installation of additional control elements such as a cue amplifier, cue loudspeaker, vario potentiometer, etc. This area is covered with a blank panel.

The space can be alternatively provided to the right of the turntable platter if specified with the order.

The console requires an installation space of 697 x 495 x 800 ±25 mm (27.8" x 19.7" x 31.9" ±1") (width x depth x height). The height of the legs can be changed, enabling the operating height to be adjusted between 775 (30.9") and 825 mm (32.9").

The console consists of the console chassis with blank panel, two side elements, a front panel, a rear panel, and four legs. Eight Allen screws, plastic cover caps, and an Allen key for attaching the legs are also supplied.

Assembly proceeds as follows. The two side elements are first screwed onto the chassis. The eight Allen screws are inserted for this purpose through the large openings in the side elements and screwed in tightly. The openings are then covered with the black cover caps.

The legs are screwed into the side elements until the desired operating height has been attained and then locked into place with the wrench supplied.

The rear panel, which can be identified by the somewhat larger side areas, is attached to the rear of the console where the feedthrough holes at the bottom of the chassis are located. The spring pins on the rear panel must snap into the two holes provided for this purpose in the side elements, at the level of the bottom of the chassis. Depress these spring pins slightly to insert. The rear panel is then swiveled upward and fastened to the chassis with the Phillips screws.

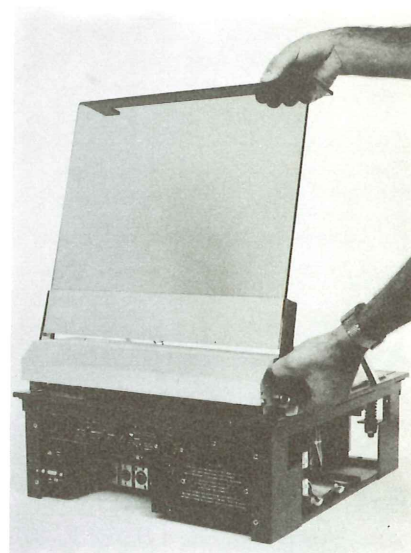
The front panel is mounted in the same manner as the rear panel.

The EMT 948 Broadcast Turntable is inserted from above into the cutout provided in the console. The grounding cable attached to the console must be connected to the turntable.

Connections and Preparation for Use

A 5 Turntable Dust Cover

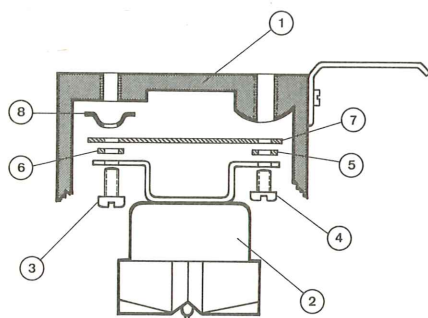
The plastic dust cover can be attached most easily to the unit in a perpendicular position. To facilitate installation, slightly press one of the side supports outwards.



A 6 Mounting a Pickup Cartridge into an EMT Cartridge Shell

Under the catalog number 9 948 120, the EMT 948 Broadcast Turntable is delivered with an empty EMT cartridge shell, including the hardware necessary for mounting the pickup cartridge selected.

- | | | |
|--------|---|---|
| Pos. 1 | cartridge shell | |
| 2 | pickup cartridge (with 1/2" mounting bracket) | |
| 3 | screw, M 2.6 x 5.5 | } EMT accessories |
| 4 | screw, M 2.6 x 5 | |
| 5,6 | spacing washers, 2.6 Ø | } cartridge accessory
(not necessarily required) |
| 8 | bronze spring | |
| 7 | plastic strip | |



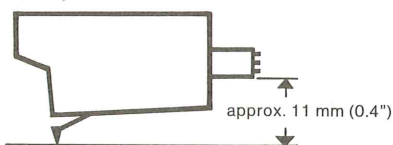
The distance of 11 mm is achieved with an appropriate number of spacing washers. The height of the tone arm should be checked (Section A 7 of this instruction manual) and adjusted, if necessary.

Electrical connections:

- | | | | |
|-------|---------------------|-------|--------------------|
| red | - right channel (a) | white | - left channel (a) |
| green | - right channel (b) | blue | - left channel (b) |

Important!

The cartridge circuit must remain balanced, that is, any bridge between one of the connecting pins and the cartridge body must be removed.

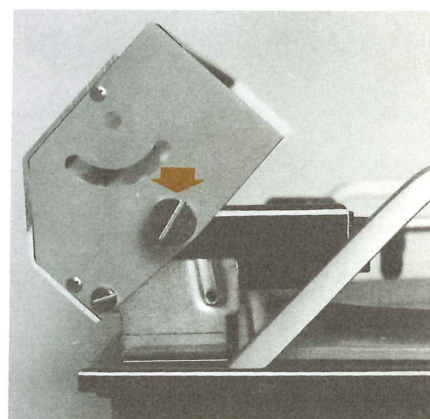


Mechanical assembly

A 7 Tone Arm Adjustments

Mounting the Counterweight

After loosening the two knurled screws at the right and left, tilt the bracket of the dust cover to the rear. Secure the counterweight with the tube piece on the rear end of the tone arm using the center screw; the countersunk side of the plastic sleeve must face the rear.

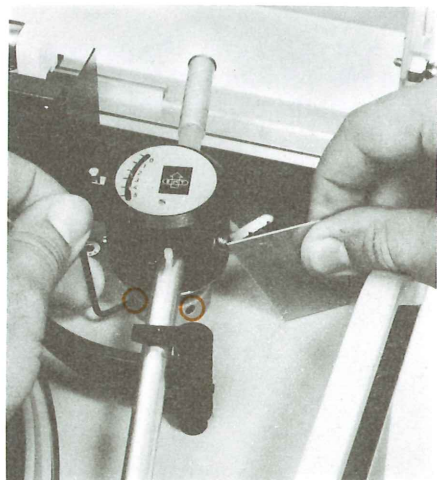


Connections and Preparation for Use

Adjustment of Balance and Tracking Force

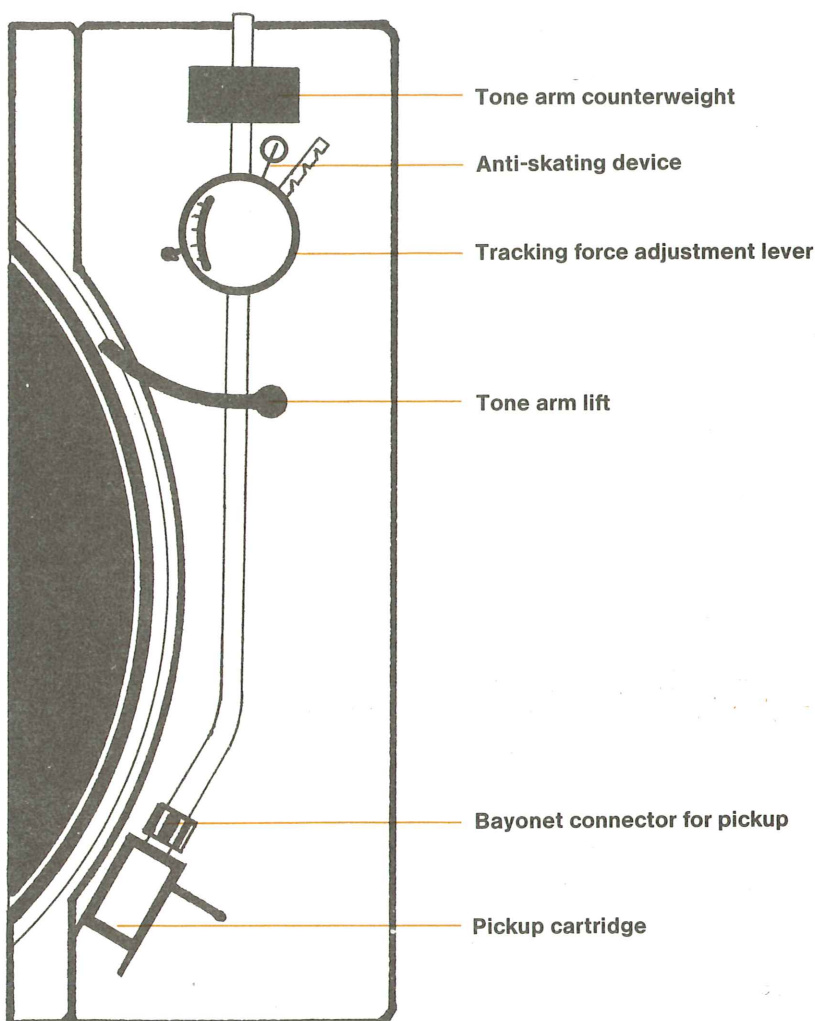
Insert the cartridge into the tone arm and tighten the bayonet connector. Set the tracking force adjustment lever to "0". Lower the tone arm lift and turn the counterweight on the threaded tube end until the stylus tip balances exactly in the plane of the record. Fix the counterweight in this position by gently tightening the Allen screw.

Set the tracking force adjustment lever to "2,5" (a tracking force of 25 mN, or 2.5 grams) for T-Series cartridges, or to the force specified by the cartridge manufacturer.



EMT 929 Tone Arm

(Dust cover and bracket not shown)



Tone Arm Height

The height of the tone arm is adjusted with the two Allen screws in the pedestal flange at the base of the tone arm.

The horizontal bearing should lie 35 mm above the chassis. To determine the correct height, place the trapezoidal gauge on the chassis. The tone arm height is adjusted correctly when the point of the gauge lies exactly at the middle of the bearing adjustment screw.

Anti-Skating Device

An undesirable force, known as skating force, is produced with any pickup arm due to the tracking angle and the friction between the stylus and the record. The magnitude of this force is about 1/10 of the tracking force employed, and it causes the pickup stylus to be pressed rather unidirectionally against the inner, left-hand groove wall. The tracking force on the right-hand wall is therefore somewhat lower than on the left.

The EMT 929 Tone Arm employs an anti-skating device which consists of a small weight attached to a nylon thread, acting upon the tone arm over a lever arm to produce the required counterforce.

Mounting the Anti-Skating Weight

Lower the anti-skating weight with nylon thread through the hole in the turntable chassis. The small clear plastic disk will prevent the weight from falling through. Feed the nylon thread into the wire eyelet, and hang the loop at the end onto the middle notch of the lever.

This setting is correct for the nominal tracking force of the TSD 15 pickup cartridge of 25 mN (2.5 grams). The inner notch corresponds to a tracking force of 20 mN (2 grams), the outer notch to a force of 30 mN (3 grams).

Connections and Preparation for Use

A 8 Mains Power Connection

Each unit is set at the factory to the mains voltage specified with the order. The set voltage is visibly indicated on the selector on the rear of the unit.

The following mains voltages may be selected: 100, 110, 120, 220, 230, and 240 V.

For 100 - 120 V, a 1 A slow-blow fuse is required; for 220 - 240 V, a 0.5 A slow-blow fuse. The specified mains frequency is 50 - 60 Hz.

A 9 Grounding Connections

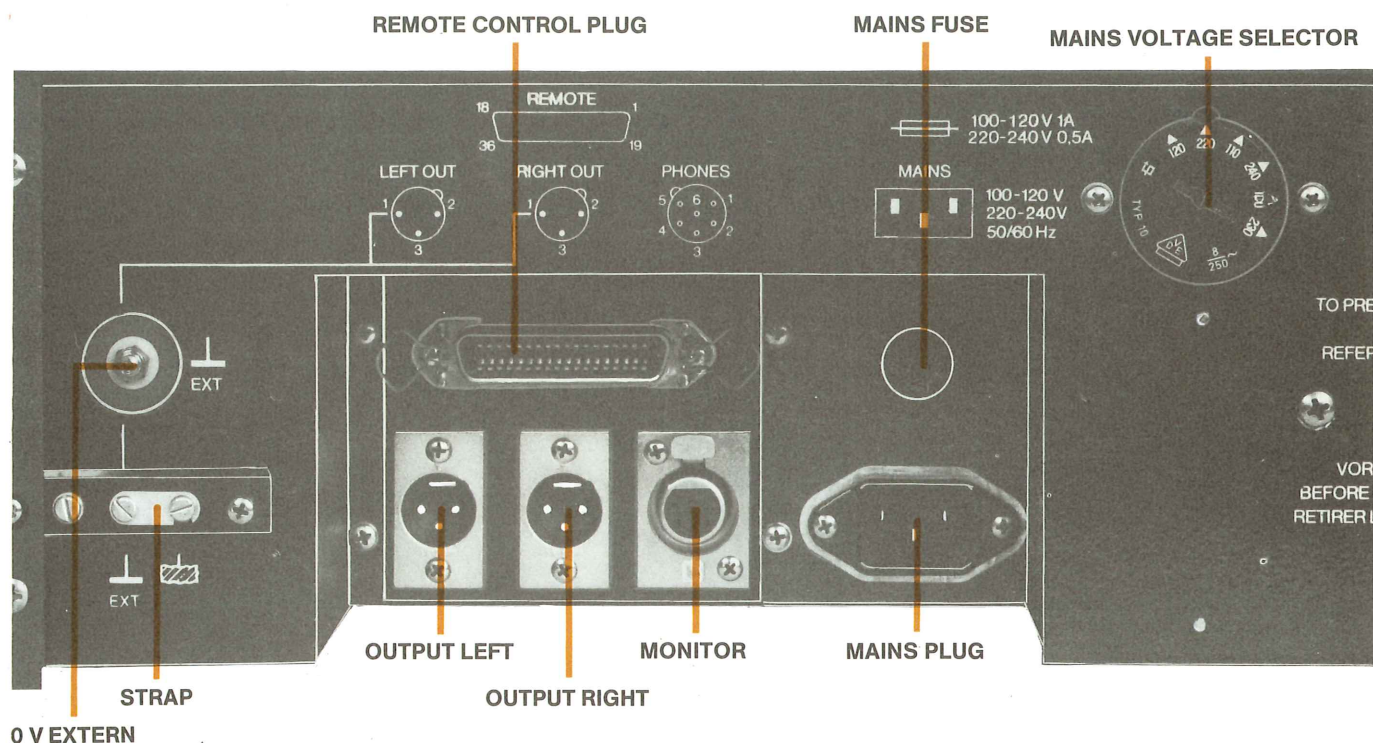
The grounding wire of the mains power cable is permanently connected to the chassis of the turntable. The voltage potential labeled "0 V extern" (⊥ ext., the shield potential of the audio cables) is connected at the factory to the chassis . This connection can be removed by unscrewing the strap on the rear of the unit if required for preventing disturbances ("hum loops") due to electromagnetic fields.

An additional grounding screw is provided for the "0 V extern" potential, e.g., for centrally grounding all cable shields.

A 10 Audio Connections

The audio connectors are located on the rear of the unit. The pin connections of the mating connectors for the line outputs and for the head-phone/monitor outputs are indicated on the audio block diagram.

Connections and Preparation for Use



A 11 Remote Control Connector

The pin connections of the remote control connector are divided into three groups: 1. Ext. Cue Amplifier

2. Remote Control

3. Test Signals

Pin Connections:

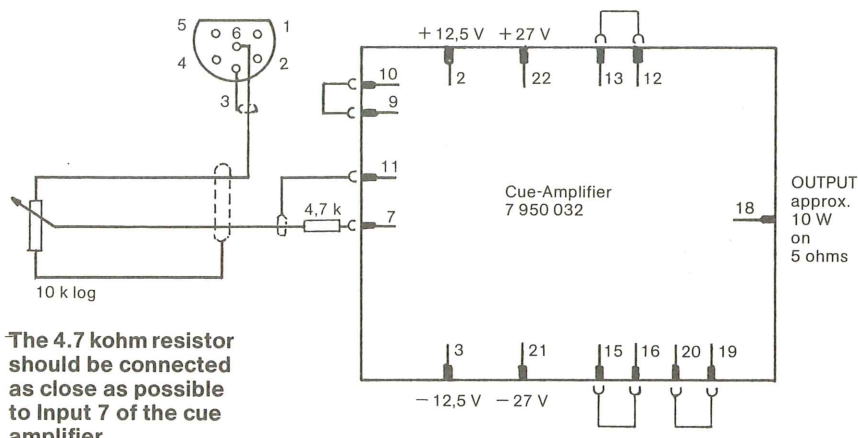
- 1 + 27 V Cue-Ampl.
- 2 0 V Cue-Speaker
- 3 + 12,5 V Cue-Ampl.
- 4 0 V Cue-Ampl.
- 5 0 V Lamps
- 6 Mono (0 V)/Stereo
- 7 Remote Start (+ Faderstart)
- 8 Remote Stop
- 9 Local Only
- 10 Remote Only
- 11 Vario Pot. (more pos. volt.)
- 12 Vario Pot. (less pos. volt.)
- 13 Vario Pot. (Schleifer)
- 14 Vario (0 V)/Quartz
- 15 —
- 16 —
- 17 —
- 18 —

- 1 ● ● 19
- 2 ● ● 20
- 3 ● ● 21
- 4 ● ● 22
- 5 ● ● 23
- 6 ● ● 24
- 7 ● ● 25
- 8 ● ● 26
- 9 ● ● 27
- 10 ● ● 28
- 11 ● ● 29
- 12 ● ● 30
- 13 ● ● 31
- 14 ● ● 32
- 15 ● ● 33
- 16 ● ● 34
- 17 ● ● 35
- 18 ● ● 36

- 19 — 27 V Cue-Ampl.
- 20 0 V Cue-Speaker
- 21 — 12,5 V Cue-Ampl.
- 22 0 V Cue-Ampl.
- 23 0 V Lamps
- 24 0 V Pushbuttons
- 25 + 20 V Lamps
- 26 + 20 V Lamps
- 27 Lamp Lift
- 28 Lamp Stop
- 29 Lamp Start
- 30 Phones Mono (Cue-Ampl.)
- 31 Frequ.-Volt.-Inf.
- 32 Pulsphase
- 33 Tacho
- 34 0 V Motor
- 35 Motor-current I
- 36 Motor-current II

Connections and Preparation for Use

EMT 7 950 032 Cue Amplifier (Option)



The EMT 7 950 032 Cue Amplifier Board (mono) can be delivered as an option with the appropriate mating connector. The supply voltage is fed from the turntable through the remote control connector (see pin connections). The audio signal is taken from pins 2 and 30 of the 36-pin remote control connector or from pins 3 and 6 of the audio connector.

Important! Turn off the mains power before connecting the cue amplifier to the turntable.

Remote Control and Indicator Lamps

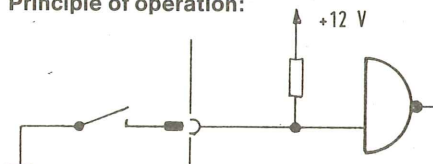
The remote control connections are designed for activation of a function with 0 V.

Example:

Pin 9 Local Only 0 V: Operation possible only at the unit

Pin 7 Remote Start 0 V: The turntable starts. In this case, pin 9 (Local Only) may not lie at 0 V.

Principle of operation:



Unused or open inputs are pulled up to 15 V through a resistor (see diagram).

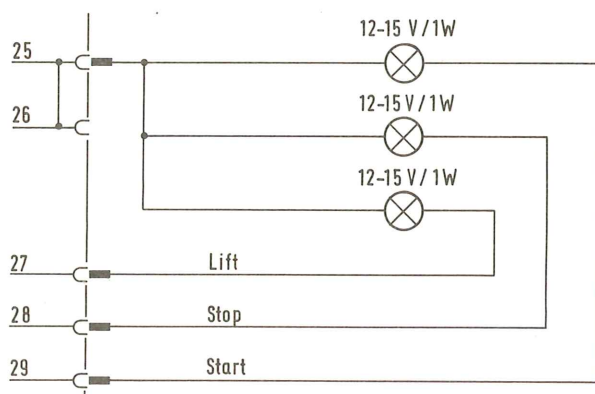
The following operating modes can be established using the Local Only (pin 9) and Remote Only (pin 10) connections:

Local Only Remote Only

Input open	Input open
0 V	Input open
Input open	0 V
0 V	0 V

Local and remote operation possible
Only local operation possible
Only remote operation possible
Operation not possible (can be used for inhibiting operation)

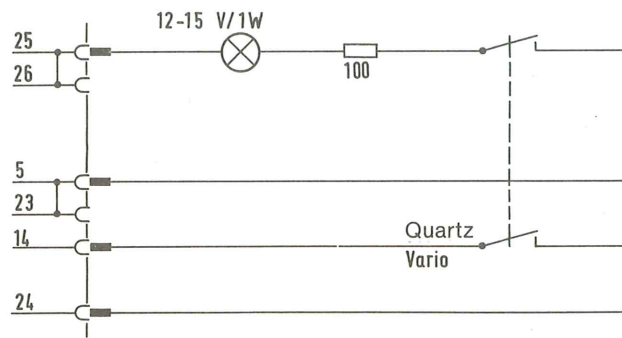
If the momentary operating state of the turntable is to be indicated at a remote location such as the mixing console, indicator lamps for the Start, Stop, and Lift functions can be connected to the corresponding remote control pins.



The voltage drop on the lamps is approx. 12 V in this circuit.

Connections and Preparation for Use

For the indication of additional functions, e.g., Vario/Quartz Switching, Remote Only, etc., the following connection scheme can be employed:

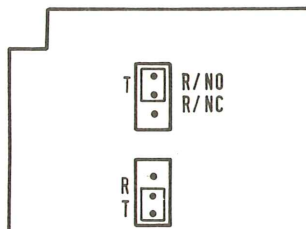


Current drain on pins 25 and 26 max. 400 mA, corresponding to five miniature lamps

Example:
Vario/Quartz Switching

Start/Stop, Fader Start

Position and function of the two programming plugs on the Interface Board (7 948 108):

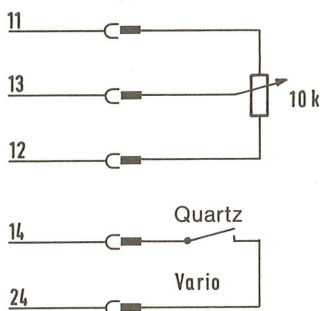


Two connections are provided on the remote control connector for the Start and Stop functions: pin 7 for Remote Start and pin 8 for Remote Stop. Remote control is not possible when pin 9 (Local Only) is connected to ground. To enable fader starts, two programming plugs must be alternately inserted on the Interface Board:

- T $\hat{=}$ Pushbutton Start; the Start and Stop functions are initiated through pins 7 and 8 of the remote control connector.
- R $\hat{=}$ Start/Stop through a fader contact or switch; the Start and Stop functions are initiated through pin 7 of the remote control connector.
- R/NO $\hat{=}$ The fader contact is normally open.
- R/NC $\hat{=}$ The fader contact is normally closed.

Variable Speed

Circuit diagram for Vario Operation:



If variable speed operation be desired, pin 14 of the remote control connector must be connected to ground. The nominal speed can be varied approximately $\pm 25\%$ with a potentiometer connected to pins 11, 12, and 13. The internal circuitry of the unit is designed such that the turntable rotates more slowly when the voltage on the wiper is increased.

Test Signals

Pins 31 - 36 simplify adjustments of the unit and enable fault detection to be accomplished rapidly in the event of improper drive system performance. Refer to the block diagram and the servicing section.

Connections and Preparation for Use

A 12 Levels

The unit is adjusted to the program levels given in the control report, in general to $+6 \text{ dB} \hat{=} 1.55 \text{ V}$. The corresponding test record exhibits a full modulation level of $\hat{v} = 10 \text{ cm/s}$ at 1 kHz (e. g., DIN 45 544 Test Record). The levels at 315 Hz and $\hat{v} = 5.42 \text{ cm/s}$ correspond to the full modulation level cited above.

Level adjustments may be accomplished easily with the potentiometers projecting toward the front of the printed circuit boards. The locations of these potentiometers are indicated on the label strips. Possible level differences between the channels of a pickup cartridge are balanced out with the "right adj." potentiometer; the adjustment range is approximately 4 dB .

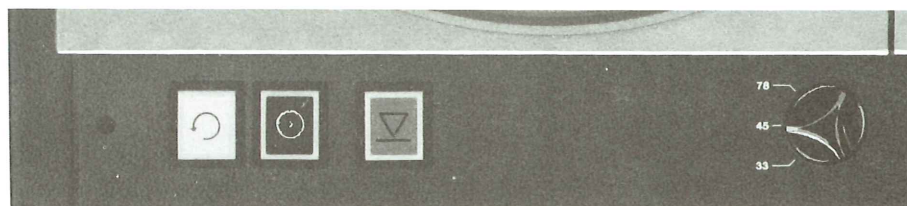
A 13 Muting

The standard unit is equipped with the following muting functions:

1. The line outputs are muted during the Start and Stop phases. This muting function can be defeated by changing the positions of two programming plugs on the Line Amplifier Board (EMT 7 950 039).
2. The headphone outputs on the six-pin audio connector are muted in the Remote Only mode. This muting function can be defeated for the mono signal (pins 6 and 3 of the six-pin audio connector) by changing the position of a programming plug on the Equalizer Board (EMT 7 950 038 or EMT 7 950 088). The muting function for the stereo signal (pins 1, 2, 4, and 5) can be defeated by changing the position of a programming plug on the Interconnection Board.

Transport locks released? (See A 2, page 4)
Mains voltage selector set to correct position? (See A 8, page 8)
Tone arm adjusted? (See A 7, page 6)

Switch Functions



Power Switch

Located under the dust cover to the rear left. When power is applied, a cold-cathode lamp illuminates the record.



Reverse

Front left. Pressing the button rotates the turntable platter in the reverse direction at 33-1/3 RPM; releasing the button stops the motion.

If the button be pressed when the turntable platter is rotating forward, reverse rotation is effected.



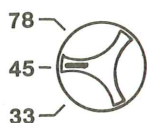
Start/Stop

Front left. Pressing the button starts platter rotation (the indicator lamp illuminates); pressing again stops the platter (the lamp is extinguished).



Tone Arm Lift

Front left. Pressing the button lowers the tone arm (the indicator lamp illuminates); pressing again lifts the arm.



Speed Selector

Front right

The adaptor in the middle of the turntable platter can be turned to lock into the upper or lower position.

Cueing to a desired position (e.g., the beginning of modulation)

Position the raised tone arm over the desired point on the record and lower the arm. The cueing position can be found easily by alternately actuating the Start and Reverse buttons while monitoring with headphones.

A desired point on the record can also be found manually by rotating the turntable platter back and forth.

When the point has been found, hold a finger on the edge of the platter at the black point corresponding to the selected speed and rotate the platter in a counterclockwise direction to the black point near the pickup cartridge.

The rotational distance corresponds to the acceleration time needed for the platter to attain the selected speed. During this time, the line outputs are muted (see A 13, page 12).

The record itself should not be touched when rotating back and forth. For the purpose of manual cueing, the edge of the turntable platter extends approximately 24 mm beyond the record.

Technical Description

C 1 Drive System

The EMT 948 Broadcast Turntable is equipped with a direct drive system, that is, the platter is rigidly connected to the rotor of the drive motor by a shaft. This rigid connection enables rapid acceleration of the platter for "quick starts".

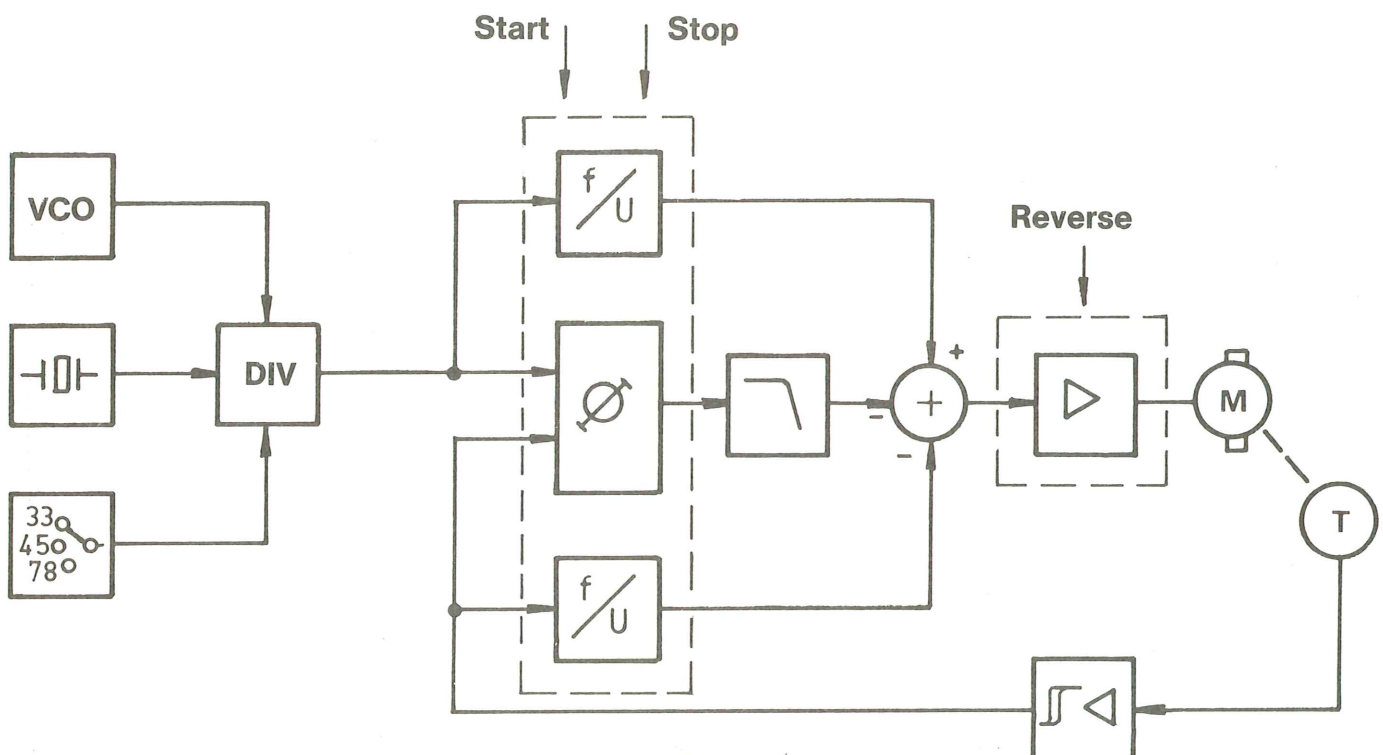
Rotational drive is provided by a controlled dc motor. Commutation is performed using Hall generators, thereby totally eliminating wear due to mechanical contact.

A high-resolution tachometer generator magnetically senses the momentary speed of the turntable platter and delivers a sinewave signal to the control board. There, two comparison processes are performed with a reference signal obtained from a highly stabile quartz oscillator.

In one process, the tachometer signal and reference signal are converted into frequency-dependent signals (f/u converter) and compared. The large acceleration signals required for Start and Stop are obtained from this comparison. In the second process, the relative phases of the tachometer signal and the reference signal are compared in a phase locked loop (PLL) circuit. The resultant control signal is employed in the range of the nominal rotational speed to eliminate small phase variations between the tachometer signal and the reference signal.

The various speeds (33-1/3, 45, 78 min⁻¹) are attained by changing the frequency of the reference signal. This process is performed with a programmable divider, which divides the signal from the quartz oscillator down to particular frequencies.

If variable speed is to be employed instead of the nominal speed, a VCO (voltage controlled oscillator) is used as the reference source. The frequency produced by the VCO is controlled by a dc voltage from an external potentiometer. Vario/quartz switching is accomplished by a logic signal fed externally through the remote control connector.

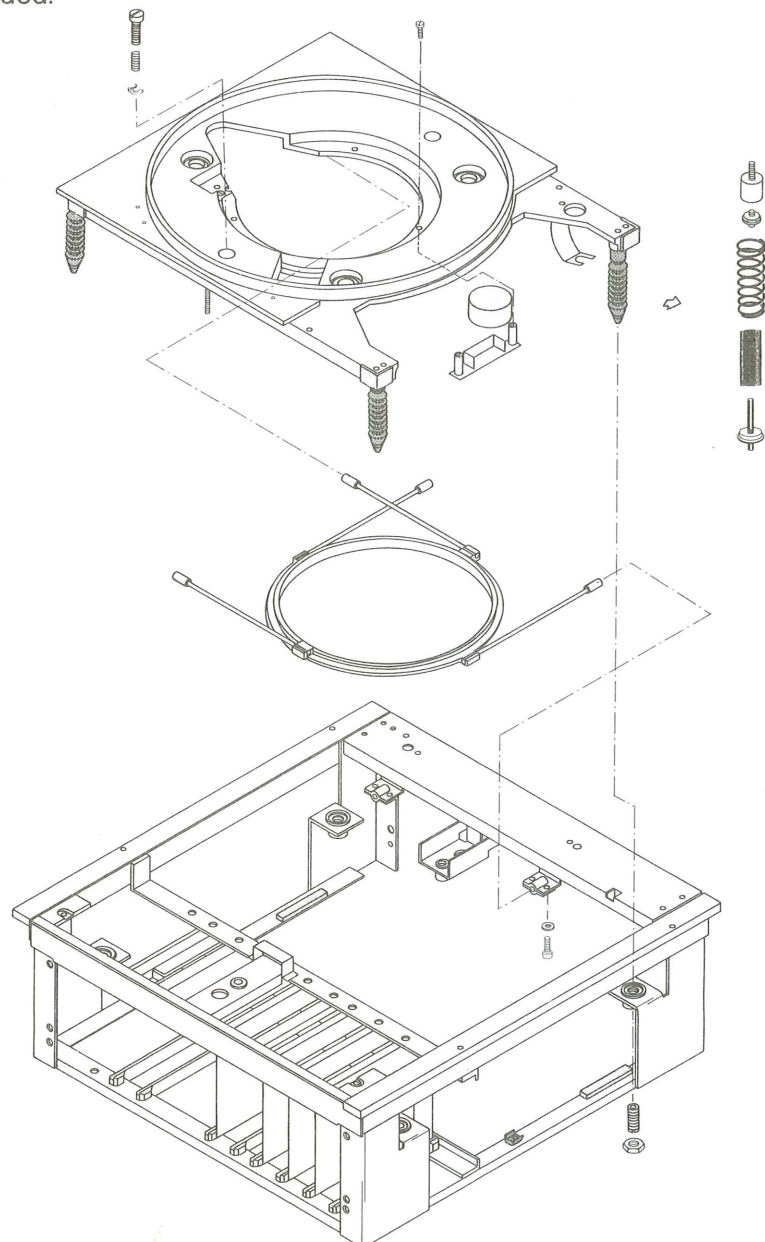


C 2 Chassis and Suspension

Broadcast schedules are relentless in their demands for exact timing. Precise fade-ins with quick turntable starts must be possible during live programs. Therefore, a short run-up time of the platter to the nominal speed represents an important requirement for a broadcast turntable. The use of the most modern drive system principles, a light platter, a motor with low-inertia rotor, and direct drive allows rapid starts and stops to be achieved optimally.

With such operation, however, considerable reaction moments occur which lead to such effects as rotational vibration around the axis perpendicular to the turntable platter. While compensation for purely lateral or vertical moments can be made by dynamically balancing the tone arm, this does not hold true for rotational moments because of the finite mass of the arm. The rotational moments cause tracking disturbances and produce unpleasant wow and flutter effects, especially during the starting phase.

By means of a new mechanical design, which employs a stiff ring with two rods connected to the lower frame and two further rods to the chassis, the excitation of rotational vibrations is highly damped. The chassis can therefore be dimensioned for lower mass, considerably reducing the total weight of the unit. The required isolation from mechanical and solid-borne vibrations is achieved by four coil springs, upon which the chassis is suspended.



Technical Description

C 3 Tone Arm

The proven EMT 929 precision tone arm is employed. This arm is statically and dynamically balanced in all three dimensions, reducing its sensitivity to external disturbances (such as mechanical shocks and vibrations) to an absolute minimum. Through use of precision ball bearings for all degrees of freedom and exceptionally supple internal tone arm leads (terminated in an audio connector for the pickup signal), extremely low bearing friction is achieved. The maximum force, including torsional forces, measured at the stylus tip is 0.5 mN (or 50 milligrams). The stylus force is produced by spring tension and can be adjusted by means of a lever to any value between 0 and 50 mN (0 to 5 grams). An anti-skating device supplements the basic tone arm, which fulfills all state-of-the-art requirements and makes further developments unnecessary in the foreseeable future. Of particular importance is the careful tuning of the resonant frequency of the tone arm integrated with the EMT TSD-15 pickup cartridge with regard to the vibrational characteristics of the entire turntable system. Experience has shown that damage to the diamond stylus is not caused by record play but rather by improper lowering of the stylus onto the record surface. This procedure has been automated, therefore, in order to increased operational reliability. A small, internal, low-noise motor raises and lowers the tone arm. The adjustable lowering time is approximately 200 ms, which is more rapid than achievable with manual lowering, yet insures that the maximum allowable forces on the stylus cantilever will never be exceeded.

C 4 Amplifiers

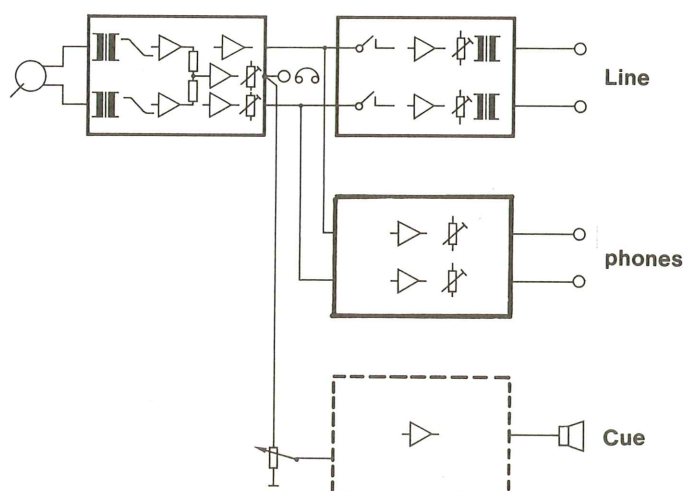
In broadcast studio use, a phonograph turntable constitutes a program source fulfilling standard matching requirements. For this reason, integrated equalizing amplifiers are employed. In addition to the standard equalization time constants of 3180/318/75 μ s, the equalization can be switched to 3180/318/0 μ s (FLAT) for the reproduction of test records. Two filters are also included which attenuate signals lying outside of the corner frequencies of 30 Hz and 25 kHz as a preventative against disturbance frequencies. The maximum output level of +22 dB on a load of 200 Ohms reflects the trend toward higher recording levels and the resultant requirements for greater signal headroom.

In the standard version, the amplifier consists of two plug-in printed circuit boards, the stereo preamplifier with standard equalization and the stereo line amplifier.

The line outputs are automatically muted when the platter is stopped and during Start run-up, as controlled by the motor speed. The muting function can be defeated with programming plugs.

A monitor output, mono and stereo, is provided for purposes such as cueing. Headphones or an external amplifier may be connected to the output.

A 10 W cue amplifier is available as an option.



Instructions for Use

The EMT 948 block diagram provides information concerning the designation of signals and the connecting leads between the individual circuit boards of the motor drive system.

In the descriptions accompanying the circuit diagrams, the following abbreviations are employed for the pins of integrated circuits:

6/Z 601 ≡ pin 6 of integrated circuit no. 601

The following designations apply for logic signals:

LOW ≡ approx. 0 V
HIGH ≡ approx. 12 — 15 V

Instruments required for servicing:

- 1 audio millivoltmeter
- 1 dual-channel oscilloscope
- 1 dc millivoltmeter

The following abbreviations are employed in the circuit diagrams:

AMPS	Amplifier Supply
PAN	Control Panel
EQU	Equalizer
INT	Interface
LINE	Line Amplifier
OSZ	Oscillator
PWS	Power Supply
REM	Remote Control (connector)
SERV	Servo Amplifier
SPC	Speed Control
MOT	Motor
BRAK	Brake
MON	Aux. Monitor

Auxiliary Monitor on
Interconnection Board

Note: No boards should be removed or put into the unit with the power switched on.

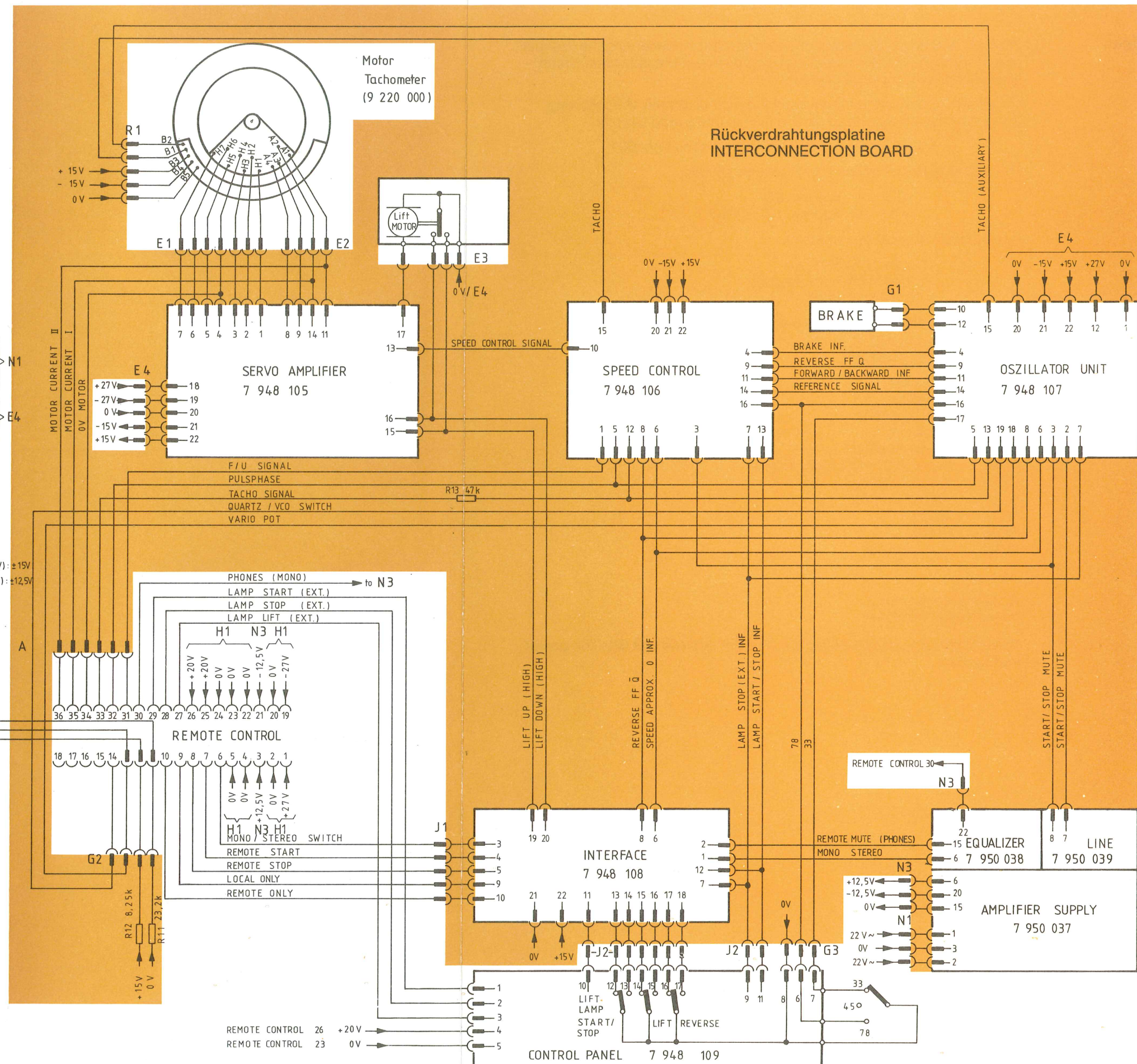
POWER SUPPLY
7 948 110

1 2 3 4 5 6 7 8

0V 0V -27V 0V 0V +20V +27V +27V

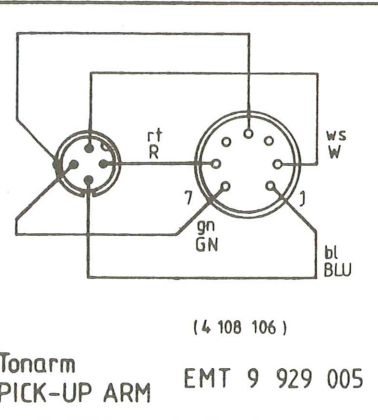
POWER VOLTAGES
Spannungsquellen:

POWER SUPPLY : $\pm 27\text{ V}$; $2 \times 22\text{ V} \sim$; $+20\text{ V}$
 SERVO AMPLIFIER (aus $\pm 27\text{ V}$ abgeleitet) (from $\pm 27\text{ V}$) : $\pm 15\text{ V}$
 AMPLIFIER SUPPLY (aus $2 \times 22\text{ V} \sim$ abgeleitet) (from $2 \times 22\text{ V} \sim$) : $\pm 12,5\text{ V}$



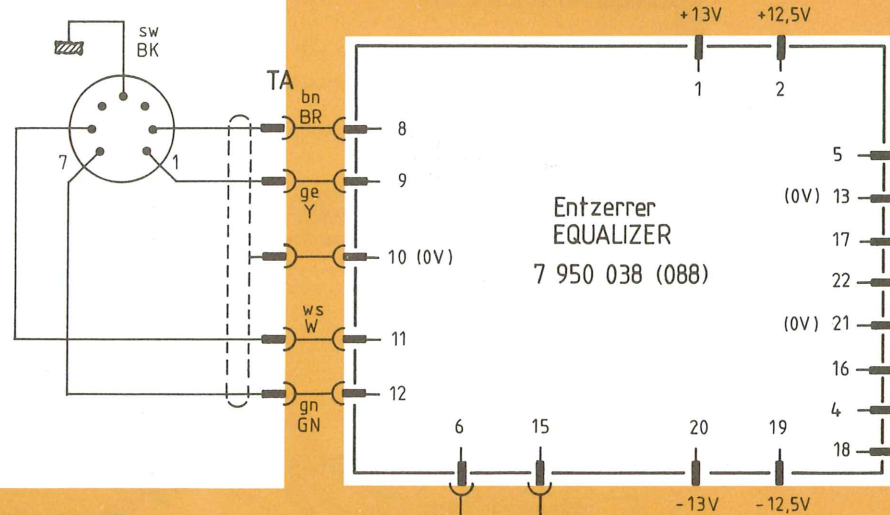
Draufsicht auf Einsteckteile des Tonarmes
PICK-UP ARM CONNECTIONS VIEWED FROM FRONT

1+2 linker Kanal LEFT CHANNEL
6+7 rechter Kanal RIGHT CHANNEL
4 Masse GROUND



Sicht auf Lötseite
VIEW ON WIRED SIDE

Amphenol Nr. 86-895
(4 203 125)



MUTING	
OFF	ON
0V	-15V
-15V	0V

(0SZ. 2)
(0SZ. 3)

Leitungs - Verst.
LINE AMPLIFIER
7 950 039

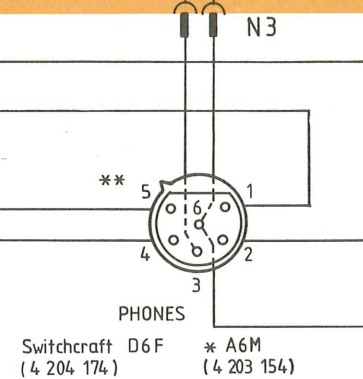
MONO	STEREO
+13V	0V

(INTER F / 1)

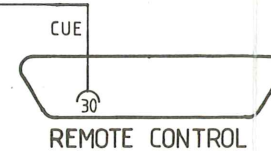
REMOTE	LOCAL
0V	+13V

(INTER F / 2)

Rückverdrahtungsplatine
INTERCONNECTION BOARD

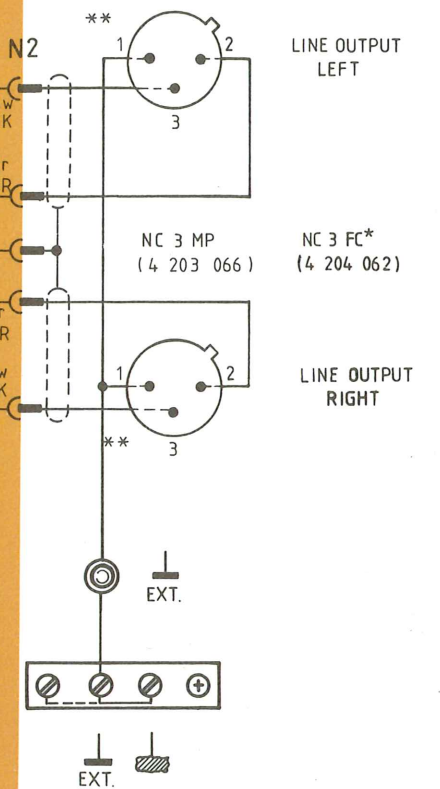


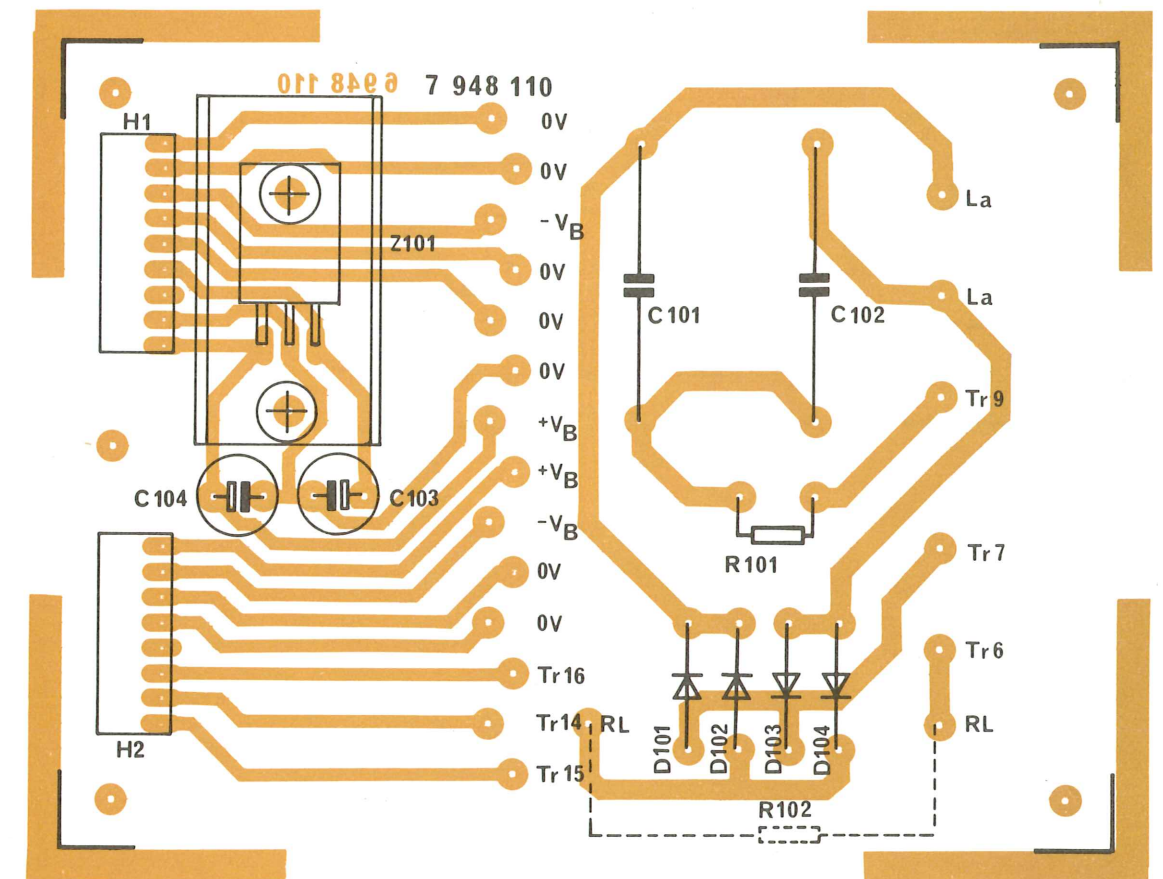
NF Blockschaltbild EMT 948
AUDIO BLOCK DIAGRAM



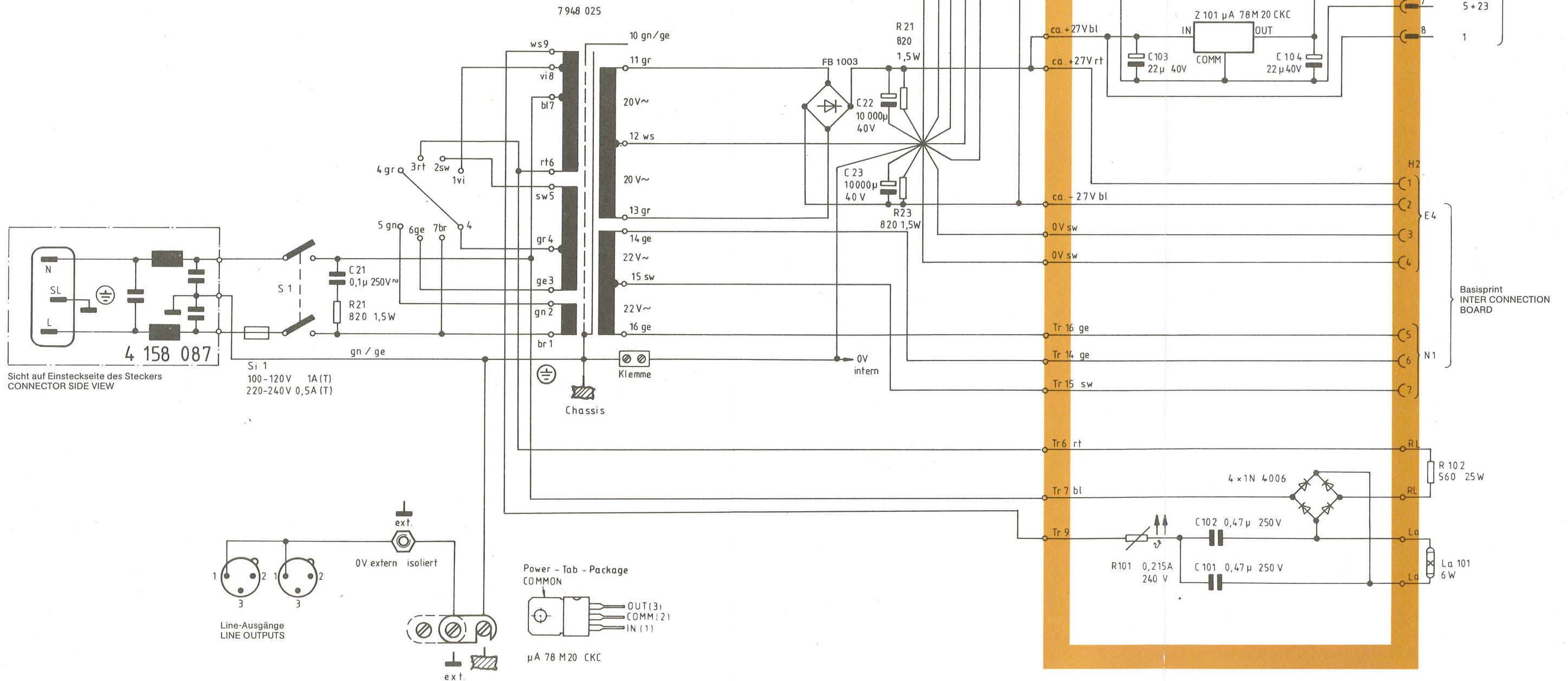
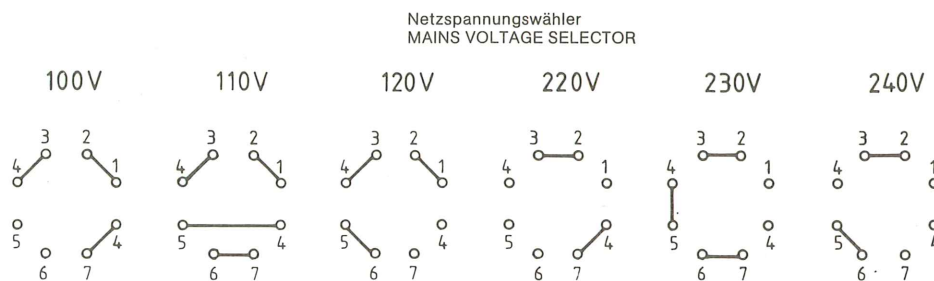
* Gegenstecker
MATING CONNECTOR

** Sicht auf Einsteckseite
VIEW ON FRONT SIDE



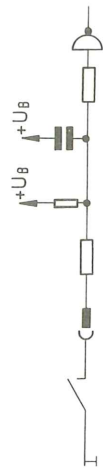


EMT 948
Netzteil
POWER SUPPLY

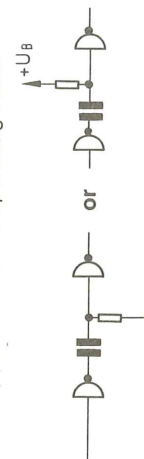


The commands arriving from pushbuttons, switches, and remote control unit are converted into signals required by the control electronics.

All connections are activated in the LOW state, i. e., when connected to ground. Open connections are drawn to HIGH by pull-up resistors.



By means of differentiation networks (RC combinations), the Start, Stop, Reverse, and Lift commands produce short impulses only at the moment of switching, causing flipflops to generate the control signals required for the control electronics. The most recently issued command and not (for instance) a continuously depressed button, determines the operating state.



Remote Control Start/Stop, Fader Start

The Start and Stop functions are switched through two pushbuttons in the Remote Control mode. If these functions are to be initiated by a switch or fader contact, the positions of two programming plugs must be changed:

R NO = fader-down contact, normally open

R NC = fader-down contact, normally closed

T NO = pushbutton start (Start/Stop with two pushbuttons)

Switches are to be employed for the Remote Control Only, Local Only, and Mono/Stereo commands. The following modes can be established through the Remote Only and Local Only connections:

Remote Only	Local Only
Input open	Input open
0 V	Input open
Input open	0 V
0 V	0 V

Reverse Flipflop

The Reverse flipflop is set when the Reverse button has been pressed and the speed is approx. zero. (The zero-speed signal is produced by the standstill comparator on the Speed Control Board.)

The Reverse flipflop is reset when the speed is approx. zero and a new Start command is issued. The Start command is a dynamic signal. Therefore the Start signal is temporarily stored at 2/Z 804 to insure proper operation of the unit when a rapid change from the Reverse to the Start function is made.

The signal produced by the Reverse flipflop (2/Z 806) determines the rotational direction of the platter. Switching from forward to reverse rotation is accomplished by inverting the control signal. The signal is required, moreover, for forward/reverse identification and for the muting function on the Oscillator board.

Start/Stop Flipflop

Output Q 13/Z 806 HIGH: the unit starts

LOW: the unit stops
This convention also applies for Reverse, in which case the control signal is inverted.

Start/Stop through Clock Input 11/Z 806 (Local Operation)

The signal at the clock input is initiated by the Start/Stop button (Local). The logic state of output Q 13/Z 806 is changed upon actuation.
Condition: Reverse button not pressed.

That is, 3/Z 807 HIGH and Local operation possible, that is, 4/Z 806 HIGH

Start through Set Input 8/Z 806 (Remote Start and Reverse)

- 1) Initiated through Remote Start (dynamically). 8/Z 807 momentarily becomes HIGH.
Condition: Reverse button not pressed.
1/Z 807 HIGH and Local Only button not depressed
2/Z 807 HIGH

- 2) Initiated through Reverse
Condition: Local operation possible
12/Z 803 HIGH and speed zero (produced from standstill comparator on Speed Control Board).
Then, 1/Z 803, 2/Z 803, and 3/Z 803 HIGH and thereby also 3/Z 805.

If the platter is rotating clockwise, Reverse first initiates Stop through the reset input of Z 806 until the platter comes to a stop.

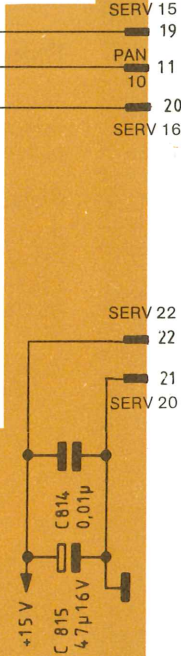
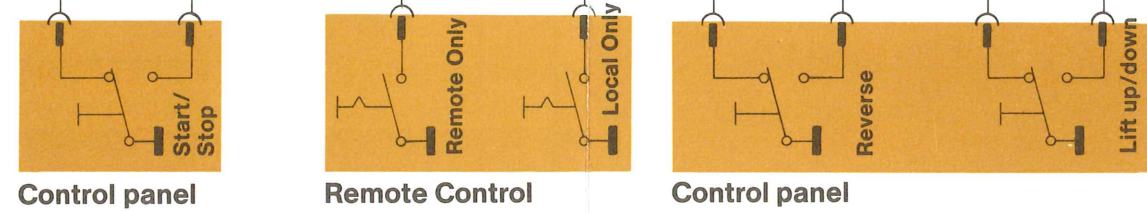
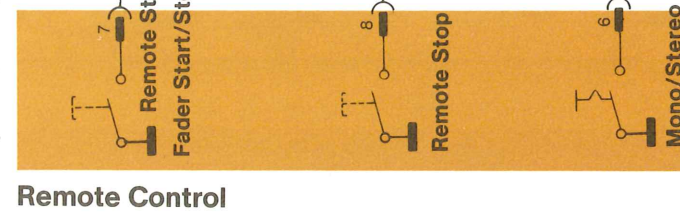
Stop through Reset 10/Z 806

- 1) Initiated through Remote Stop (dynamically).
Condition: Reverse button not pressed.
12/Z 807 HIGH and Local Only not pressed
13/Z 807 HIGH

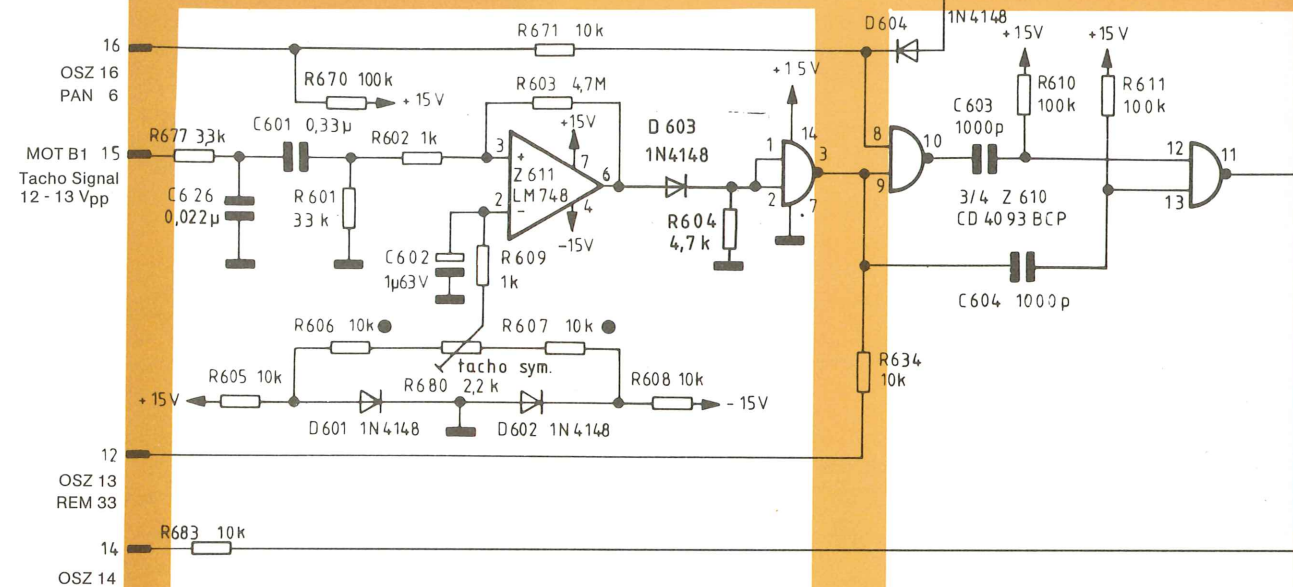
- 2) Initiated through Reverse button (dynamically).
Pressing or releasing the Reverse button.
Output 4/Z 801 momentarily becomes HIGH and resets the Start flipflop through 10/Z 805. The unit comes to a stop.
Condition: Remote Only switch not pressed, 1/Z 801, 2/Z 801, 12/Z 803 HIGH.

Lift Flipflop

Actuating the Lift up/down button causes a jump in the control signal at clock input 11/Z 804. The logic states of Q and Q change with each actuation. In the Remote Only mode, 2/Z 802 becomes LOW; the Lift function is inoperative.



Regelplatine 7948 106 SPEED CONTROL



Tachometer Signal Conversion

Z 611 is connected as a Schmitt trigger. The sinusoidal tachometer signal is converted to a symmetrical squarewave signal. The negative portion of the signal is shorted to 0 V by D 603. The symmetry is adjusted with R 680.

The adjustment is performed to achieve minimum voltage steps following the f/u conversion (pin 1 of the board, see below).

Tachometer Signal (pin 15)

$f_{33} = 142,2 \text{ Hz}$
 $f_{45} = 192 \text{ Hz}$
 $f_{78} = 334 \text{ Hz}$

Frequency Doubling

Voltage pulses appear at output 11/Z 610 (TP 1) at twice the tachometer frequency for speeds of 33 and 45 min⁻¹. At 78 min⁻¹, the pulse frequency is identical to the tachometer frequency (input 8/Z 610 = "0"). The duration of the pulses is determined by the RC networks C 603/R 610 and C 604/R 611.

Phase Comparison and Loop Filter

Z 609 is connected as a phase comparator. The reference signal (the divided oscillator frequency) and the signal from 11/Z 610 produce a voltage at 13/Z 609 proportional to the phase difference between the two. This voltage is approximately +7.5 V, upon which pulses of 7.5 V are superimposed, corresponding to either a positive or a negative phase difference. The duration of the pulses is determined by the magnitude of the phase angle.

In the subsequent circuit, a dc voltage approx. 7.5 V is subtracted from the signal of the phase comparator.

The Pulsphase signal is produced at 1/Z 609. It corresponds to the value of the signal at 13/Z 609.

Loop Filter

Z 608 is connected with output 14 as an integrator. In order to improve run-up performance, C 606 is shorted during this interval.

Second order low-pass: for attenuating residual ripple of the signal at 14/Z 608.

The control signal of the PLL circuit appears at output 8/Z 608 (Test Point 2).

R 680 (tacho sym.)

- Turn off the unit.
- Insert the Speed Control Board on the Extension Board.
- Turn on the unit. Select 33-1/3 speed.
- Connect an oscilloscope ($y = 10 \text{ mV/div}$, $x = 2 \text{ ms/div}$) to pin 1 of the board or to pin 31 (F/U-Information) of the Remote Control connector. Use a high-impedance, low-capacitance probe, since otherwise rf interference may be encountered under some conditions.
- Press Start

Adjust R 680 (tacho sym.) for minimum voltage-step amplitude, $< 20 \text{ mV}_{pp}$

Important!

In units no 44 151 to 44 180, potentiometer R 681 (sym.) is not installed. As a consequence, a small rotational moment may operate on the platter during Stop. These units are adjusted for operation with R 679 (phase lock sym.):

R 679 (phase lock sym.)

Applies to units with ser. no. below 44 180

- Turn off the unit.
- Insert the Speed Control Board on an extension board. Connect jumper J 601.
- Connect an oscilloscope ($y = 5 \text{ V/div}$, $x = 5 \text{ ms/div}$) to pin 5 of the board (Pulsphase signal) or to pin 32 of the Remote Control connector.
- Turn on the unit and press Start.
- Adjust the phase lock sym. trimmer R 679 for minimum Pulsphase (refer to the Pulsphase signal on the circuit diagram).
- Turn off the unit. Remove jumper J 601 and reinsert the Speed Control Board.

No adjustment is performed for the standstill state.

Reference f/V Converter

The pulses of the reference signal activate two monostable multivibrators in succession, which produce pulses of constant width: 7/Z 601, 10/Z 601.

— 7/Z 601 HIGH. Through analog switch 1 — 2/Z 603, 7/Z 604 is also HIGH (sample phase of the voltage on RC network R 633/C 618).

LOW. Through analog switch 1 — 2/Z 603, 7/Z 604 is also LOW (hold phase of the voltage on RC network R 663/C 618).

The analog switch 1 — 2/Z 603 is controlled from pin 13/Z 603. It opens during Stop and closes during Start.

— 10/Z 601 HIGH. Analog switch 10 — 11/Z 603 is closed. Approx. 12 V lie on RC network R 633/C 618.

LOW. Analog switch 10 — 11/Z 603 is open, the RC network R 663/C 618 discharges.

— Z 603/Z 604/ Z 605 function as a sample-and-hold stage. The voltage on the RC network is transferred to C 615 during the sample phase and conducted to output 5/Z 604, where it is held constant, during the hold phase.

A voltage which is dependent on the frequency of the reference signal appears at output 5/Z 604.

R 679 (phase lock sym.)

— Turn off the unit.
— Insert the Speed Control Board on the extension board.

— Turn on the unit. Press Stop.
— Adjust R 679 for 0 V at pin 10 of the board.

See also page 27.

R 681 (sym.τ)

— Turn off the unit.
— Insert the Speed Control Board on the extension board. Connect jumper J 601.

— Connect an oscilloscope (y = 5 V/div, x = 5 ms/div) to pin 5 of the board (Pulsphase signal) or to pin 32 of the Remote Control connector

— Turn on the unit. Press Start.
— Adjust R 681 (sym.τ) for minimum pulse pause. Refer to the Pulsphase signal on the circuit diagram of page 27.

— Turn off the unit. Remove jumper J 601 and reinsert the Speed Control Board.

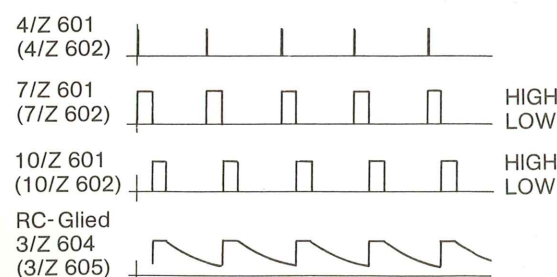
See also page 27.

Tachometer f/u Converter

The f/u conversion of the tachometer signal is performed in the same manner as for the reference signal. Differences:

- Opening of the analog switch 8 — 9/Z 603 is delayed for Stop until the speed is approximately zero. The motor is thereby accelerated against the direction of the rotation until it comes to a stop.
- R 681 (sym.τ). Identical time constants for both f/u converters are adjusted with R 681.

Tacho f/u Conversion Reference Signal (Tachometer Signal)



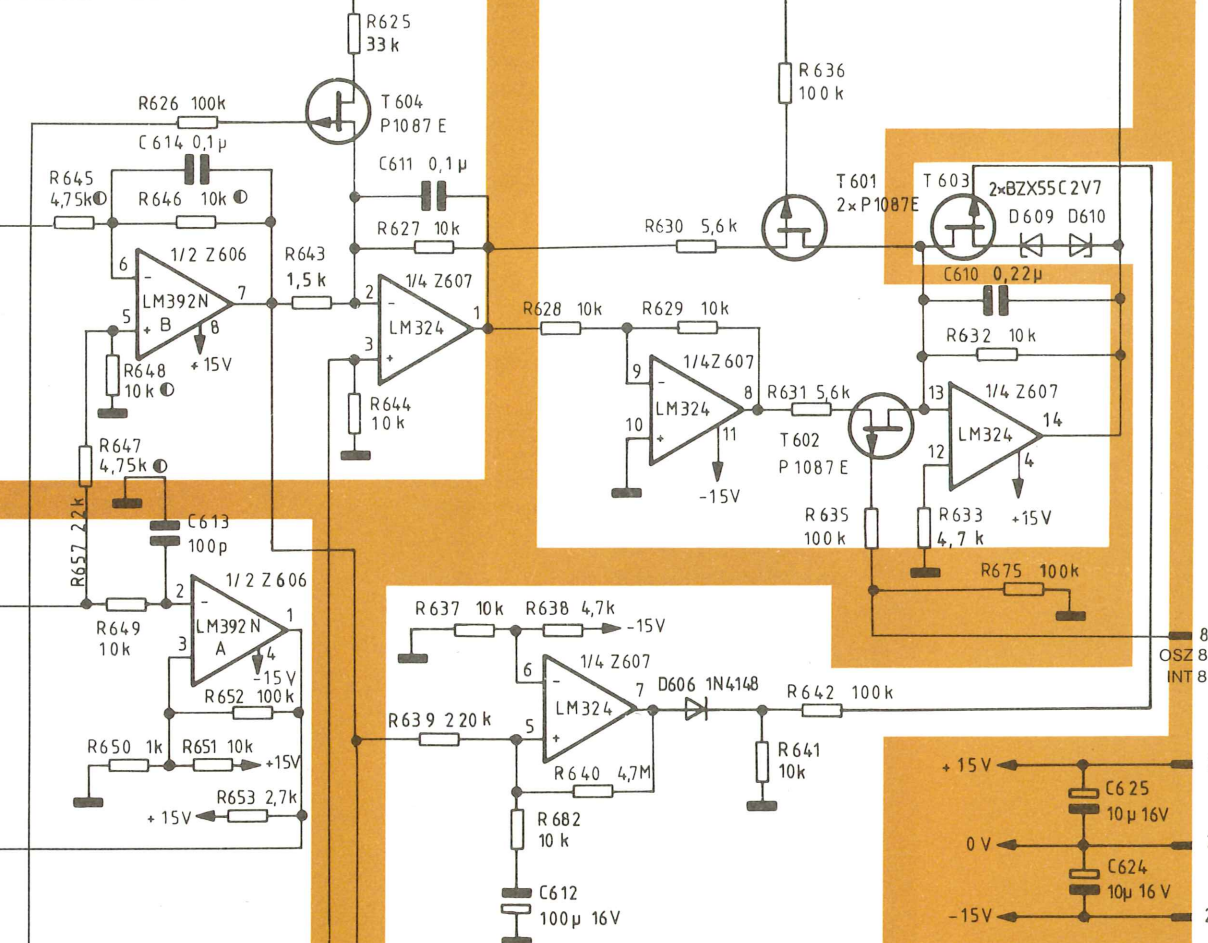
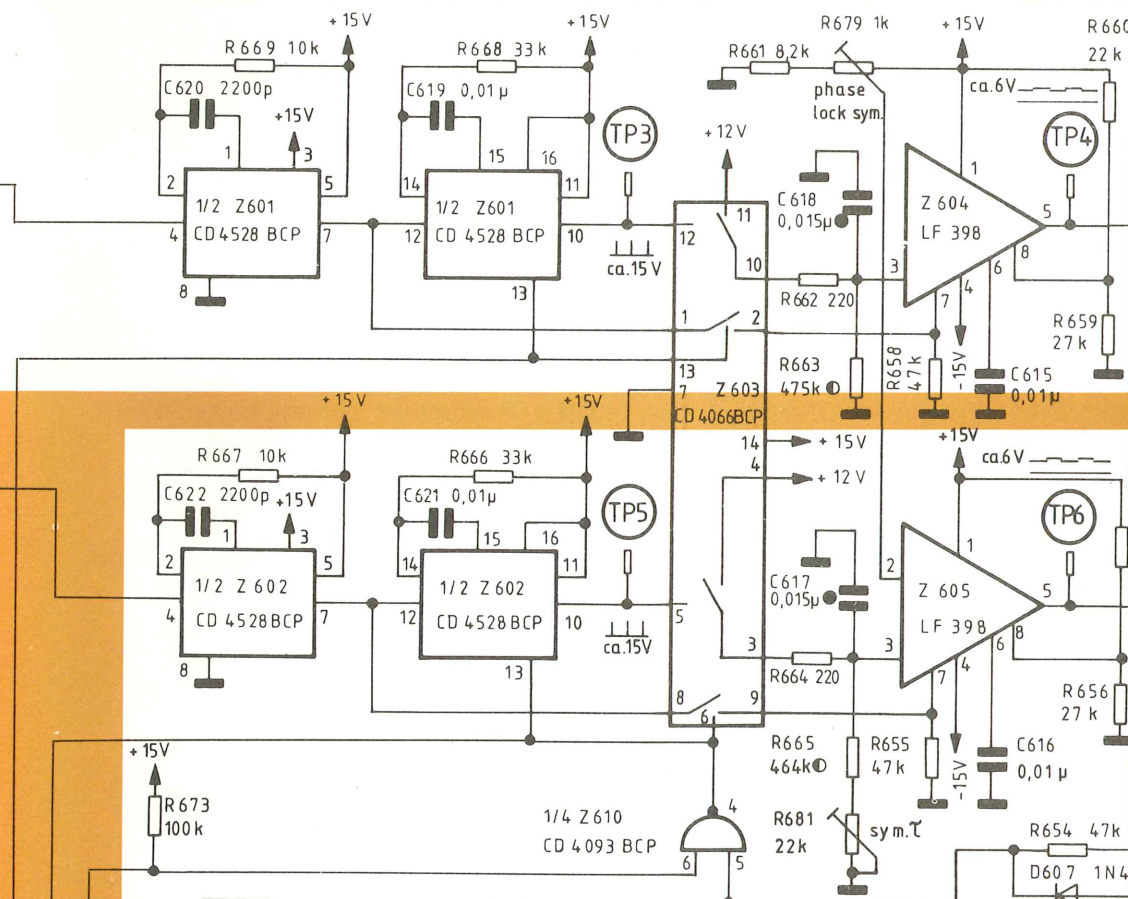
load RC R 663/C 618 (R 665 + R 681/C 617)
Discharge RC
(measurable only with a high-impedance, low-capacitance probe)

Summing Point

The difference of the signal from the f/u converters appears at output 7/Z 606 and is summed at 2/Z 607 with the control signal from the PLL circuit. T 604 is cut off during Stop and conducts during Start.

Control Signal

The control signal is produced at 14/Z 607. At input 13/Z 607, T 601 conducts and T 602 is cut off during Start. T 602 conducts and T 601 is cut off during Reverse.



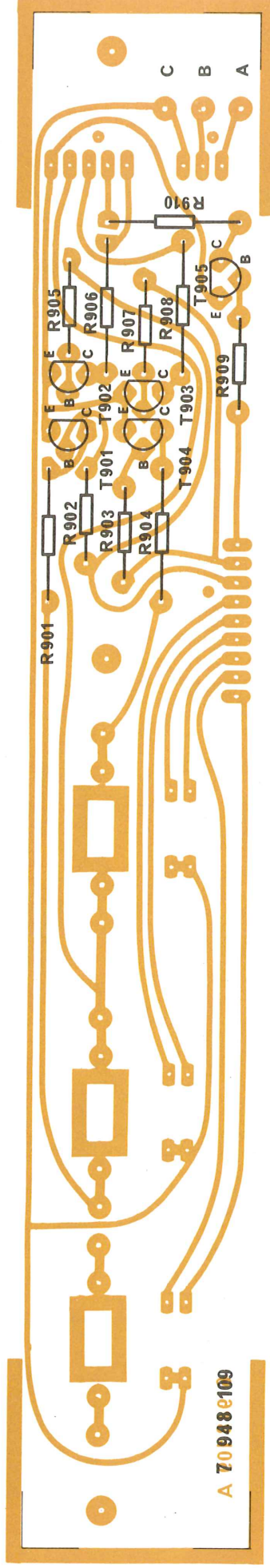
Motor Current Limiting

Motor current limiting is accomplished with 7/Z 607. If, for instance, the turntable platter is held by hand, C 612 is charged to a level above the threshold voltage of approx. 10 V. Output 7/Z 607 jumps to approx. -15 V, the gate potential of T 603 sinks to approx. 0 V, T 603 conducts. The control signal is thereby limited to approx. 3 V.

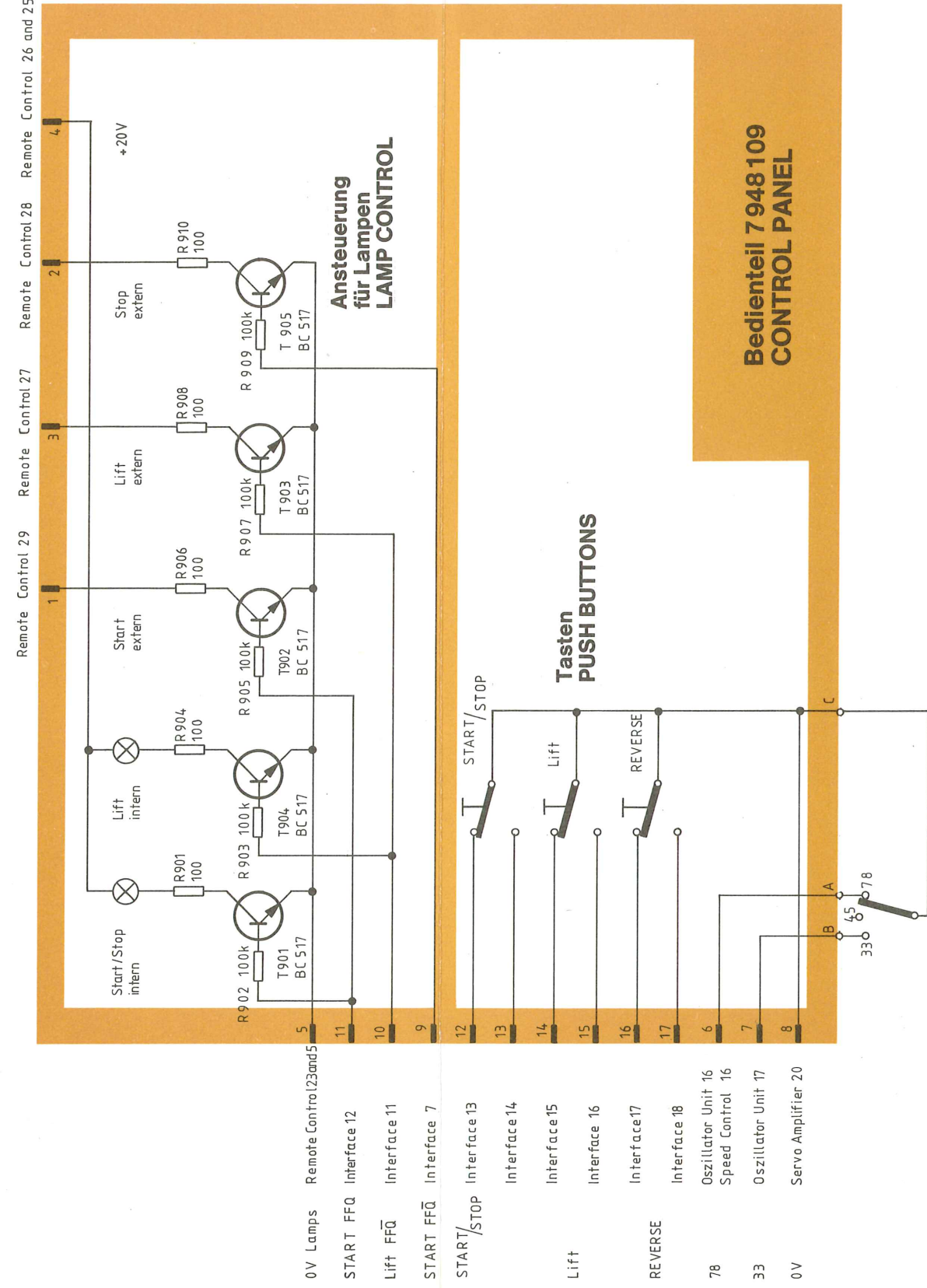
Standstill Comparator 1/Z 606

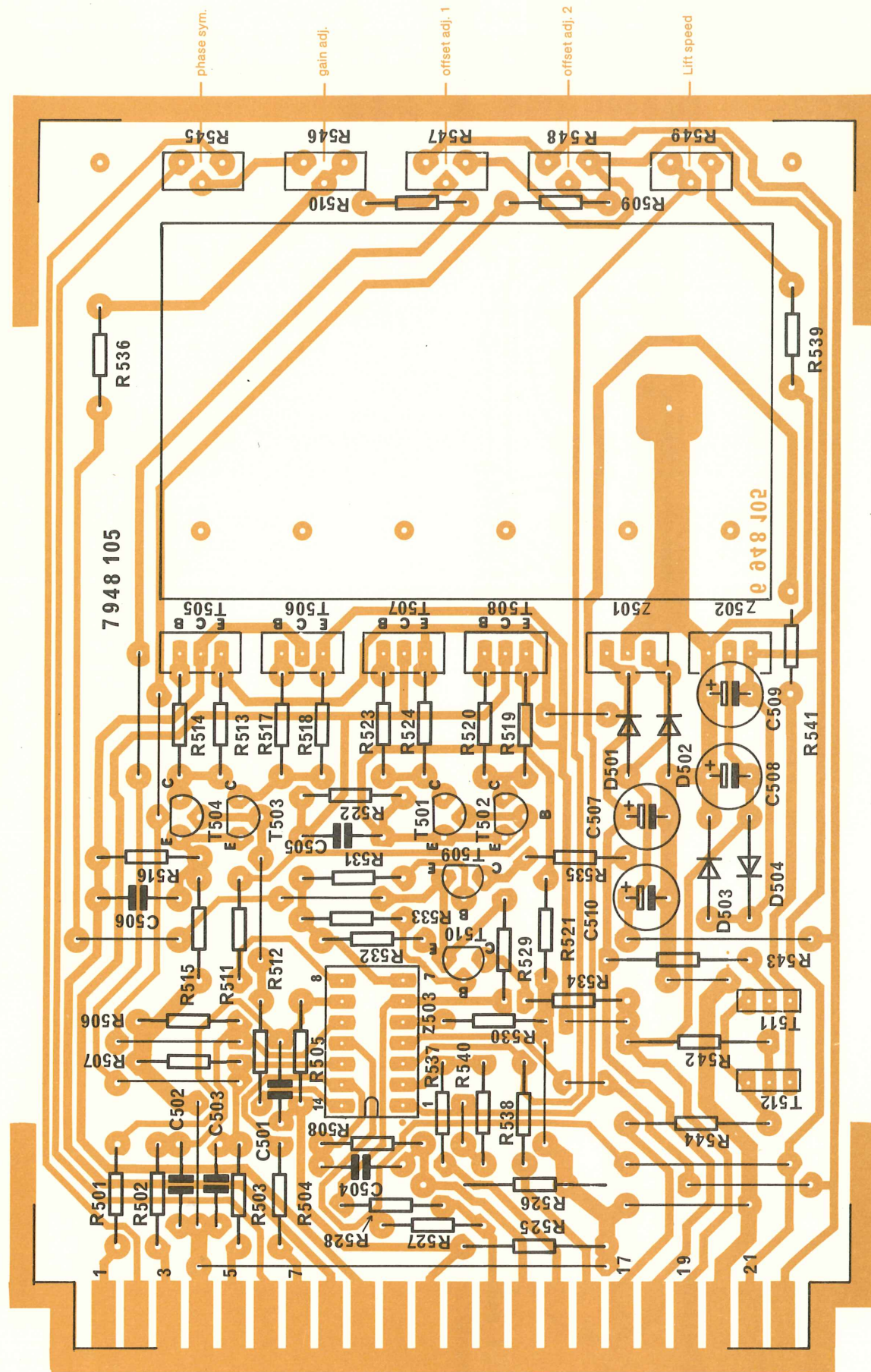
A voltage of approx. -15 V lies at 1/Z 606. When Stop is pressed, the voltage remains at this level until the voltage at 5/Z 605 falls below a specified value (approx. 1.5 V). The comparator jumps to approx. +15 V. The f/u converter for the tachometer signal is switched off with this signal.

Regelplatine 7948 106 SPEED CONTROL



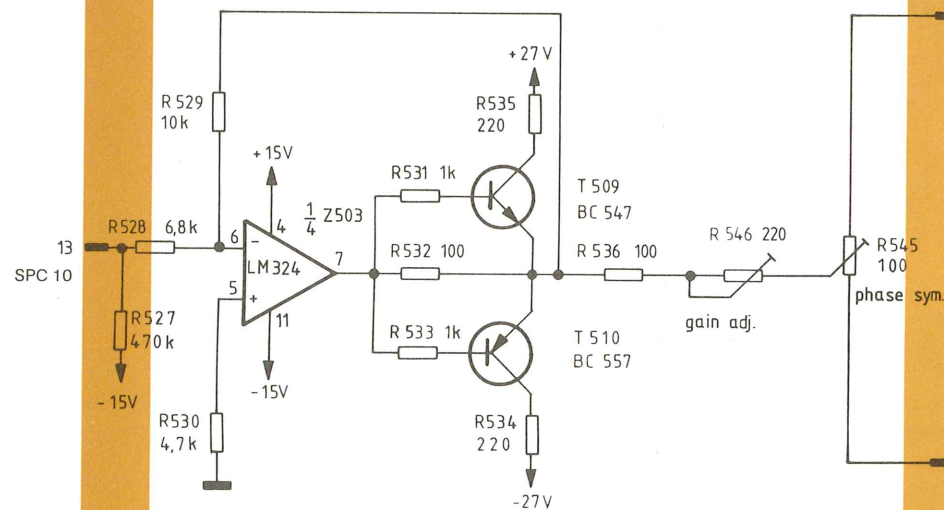
EMT 948
Bedienteil
CONTROL PANEL





EMT 948
Endstufen-Platine
SERVO AMPLIFIER

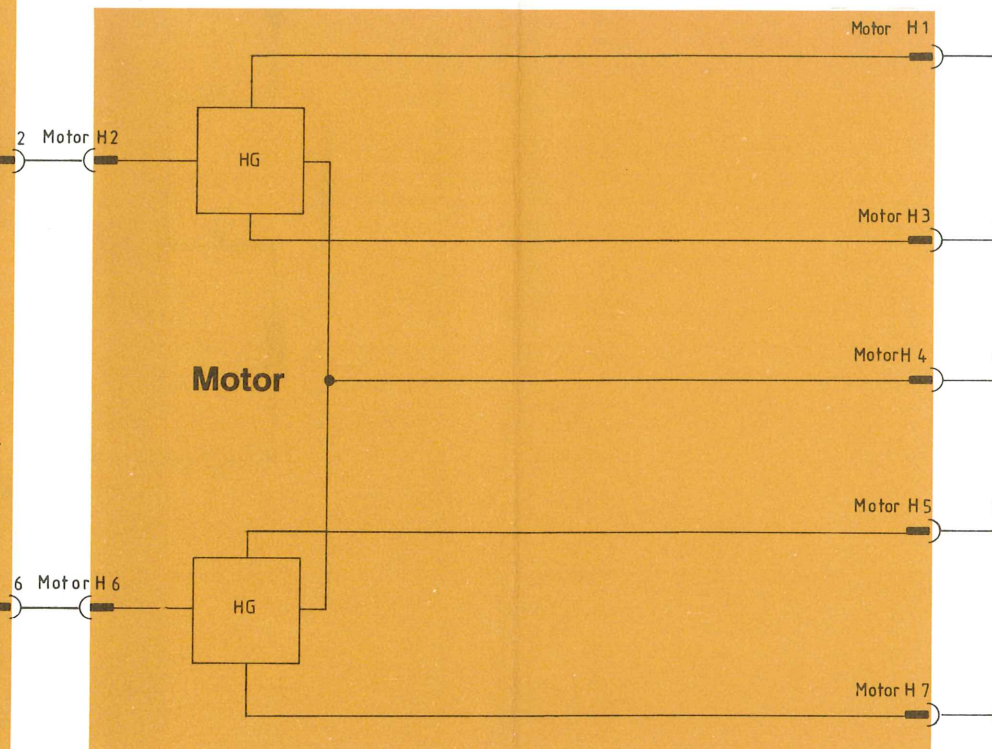
Endstufen-Platine 7948 105 SERVO AMPLIFIER



Control Signal Amplifier

The control signal at pin 13 from the Speed Control Board is amplified.

Motor



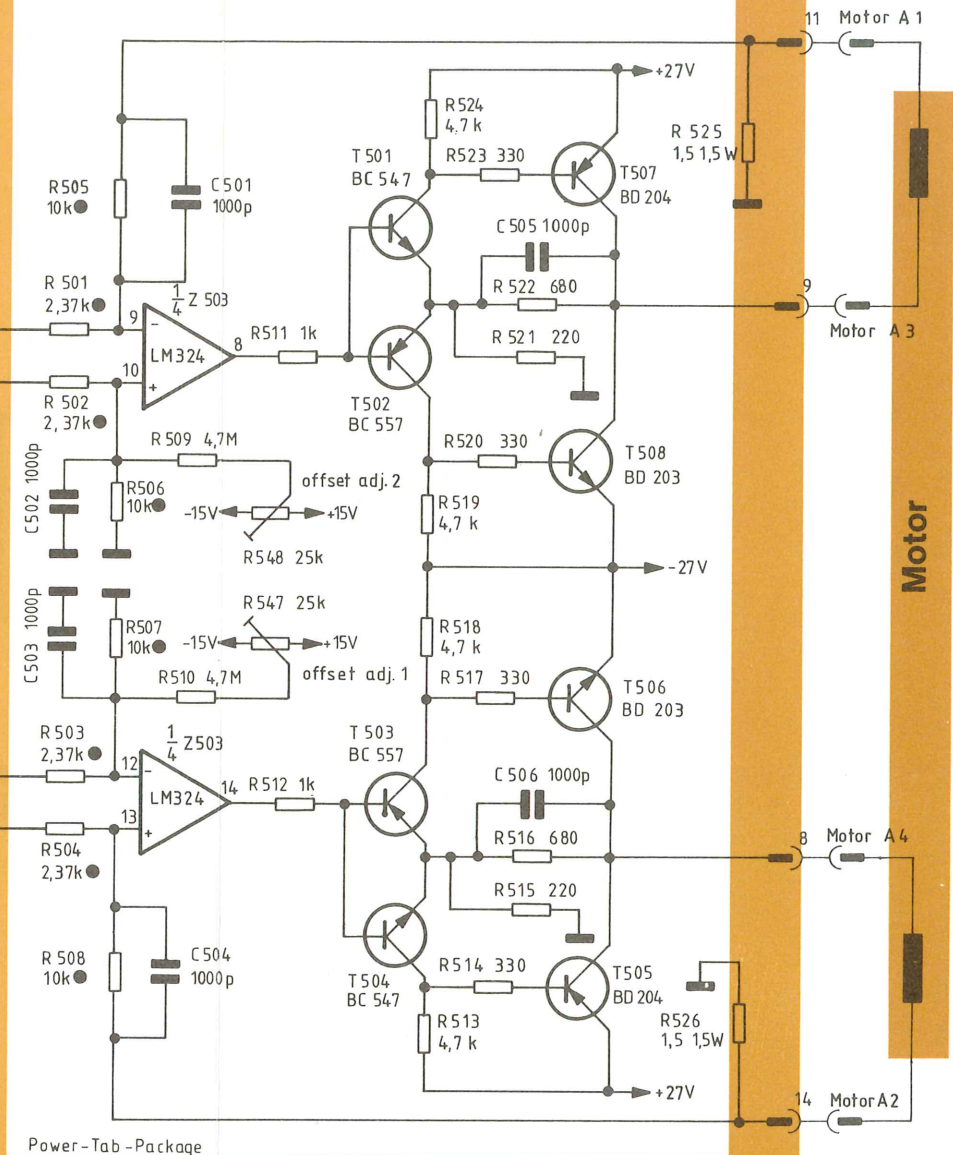
R 549 Lift Speed

The raising and lowering of the lift is adjusted with R 549. The setting is uncritical.

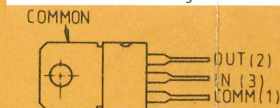
Adjustment of the Motor Currents

R 545 phase sym.
R 546 gain adj.
R 548 offs. adj. 2
R 547 offs. adj. 1

- Turn off the unit.
- Pull out all circuit boards. Reinsert the Servo Amplifier Board on the extension board.
- Turn on the unit. The turntable platter will turn slightly forwards.
- Connect an oscilloscope (y = 50 mV/div, x = minimum sweep speed) to pins 11 and 14 of the board (0 V: pin 20) or to pins 35 and 36 of the Remote Control connector (0 V: pin 34).
- Set both signals symmetrically about their zero-signal levels with R 547 offset adj. 1 and R 548 offset adj. 2.
- Set both signals to an identical amplitude with R 545 phase sym.
- Set the signals to 100 mV_{pp} with R 546 gain adj.
- Turn off the unit. Reinsert all boards.

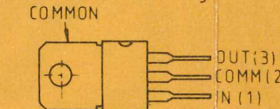


Power - Tab - Package

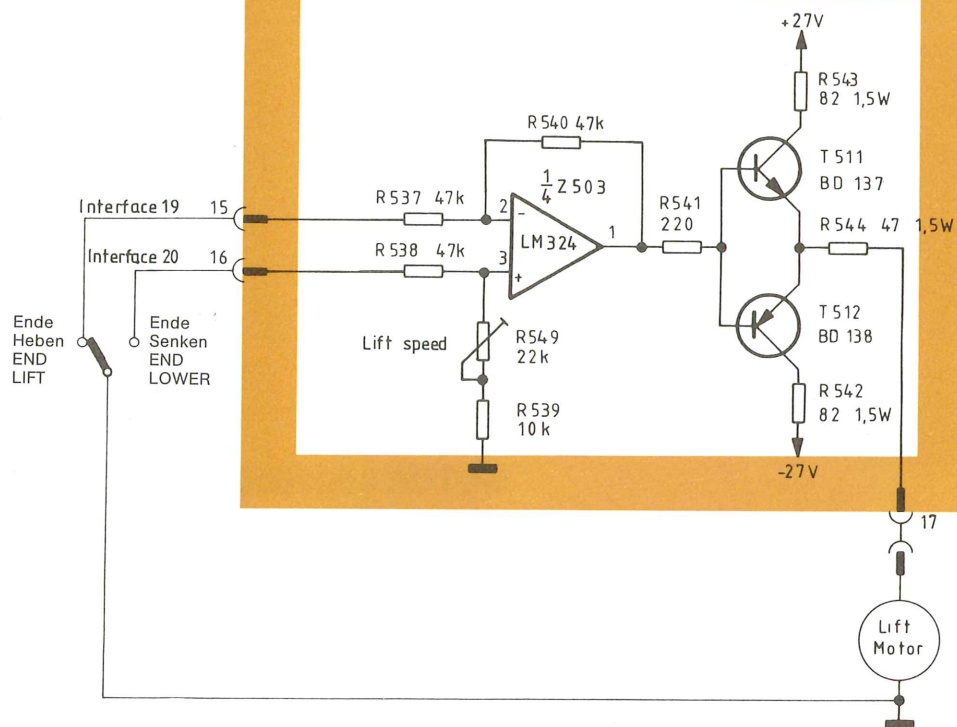
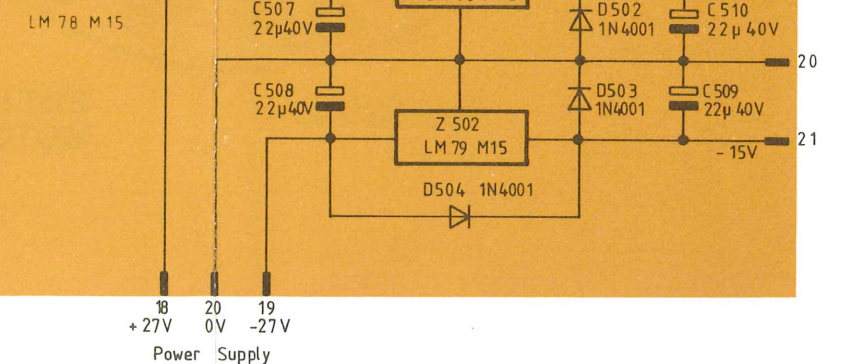


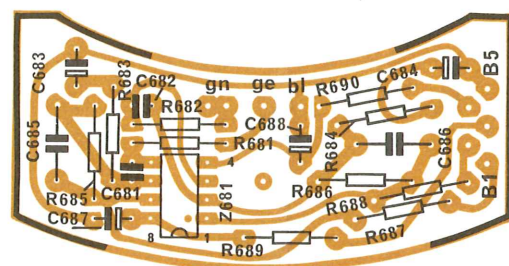
LM 79 M 15

Power - Tab - Package



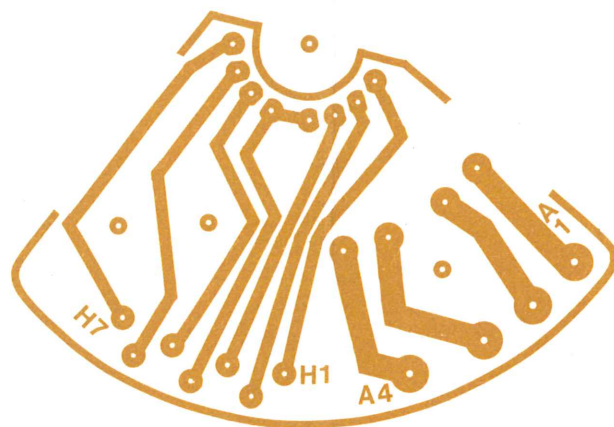
LM 78 M 15





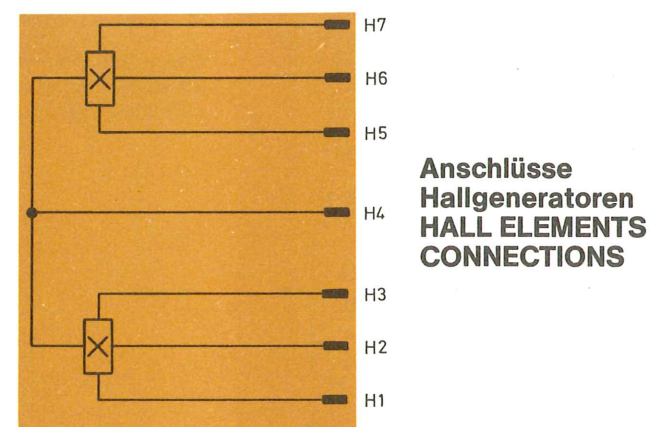
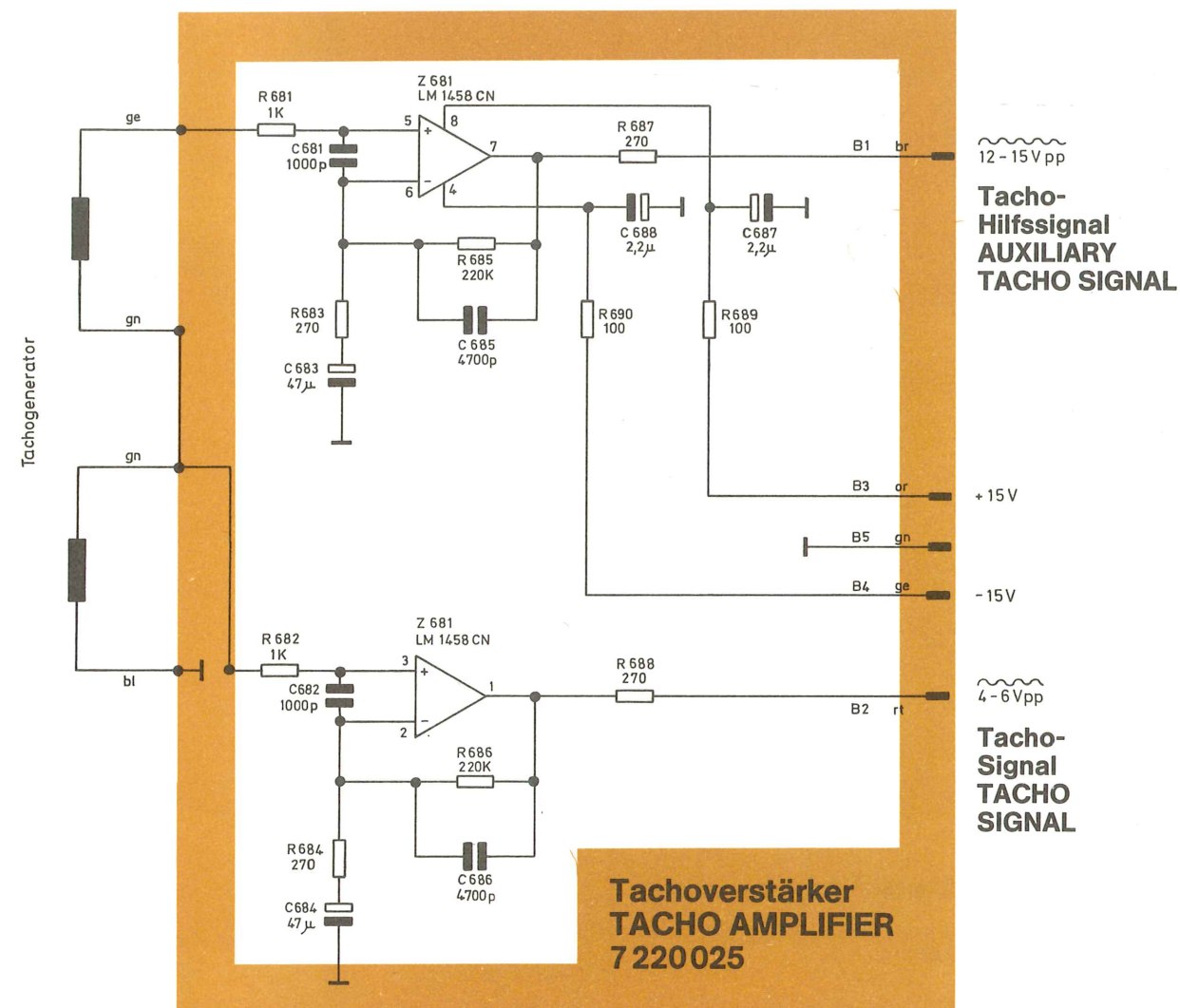
Sicht auf Bauelementeseite
COMPONENT SIDE VIEW

EMT 948
Tachoverstärker
TACHO AMPLIFIER

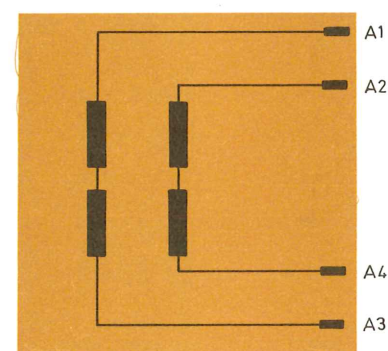


Sicht auf Leiterbahnseite
CONNECTOR SIDE VIEW

EMT 948
MOTOR



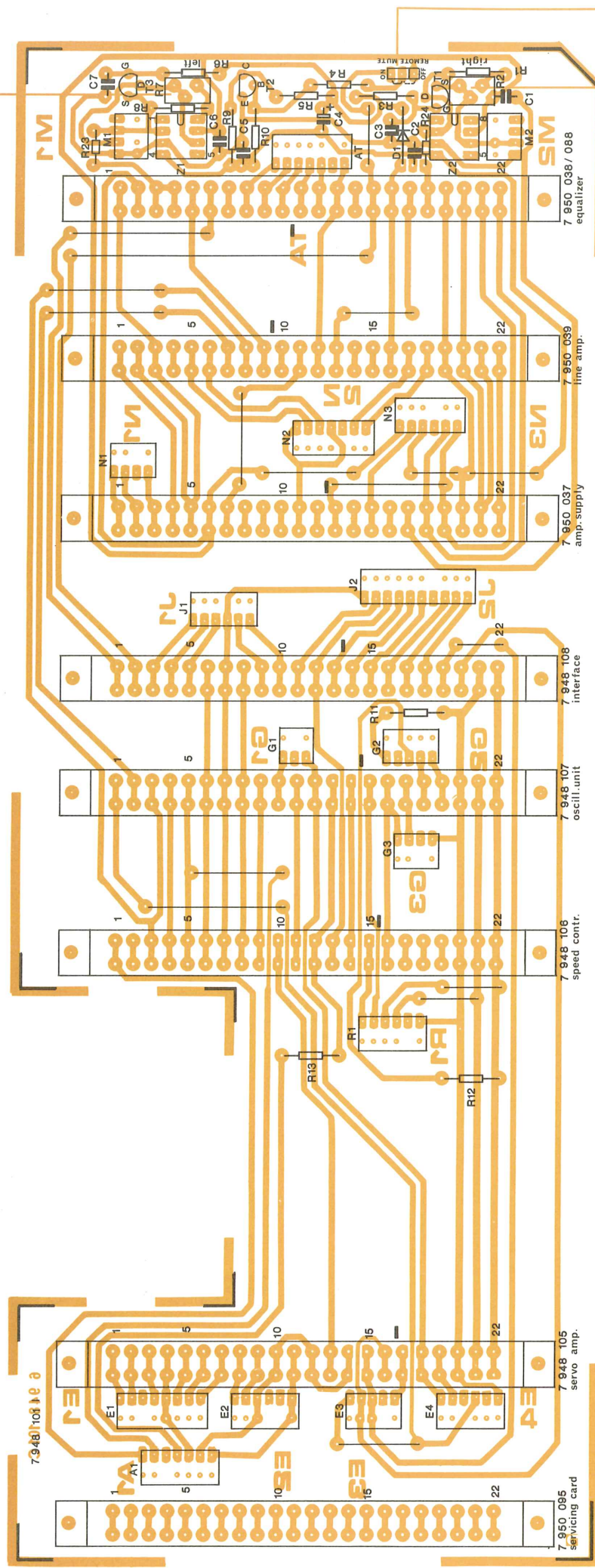
Anschlüsse
Hallgeneratoren
HALL ELEMENTS
CONNECTIONS



Anschlüsse
Motorwicklungen
MOTOR COILS
CONNECTIONS

MOTOR 9 220 000

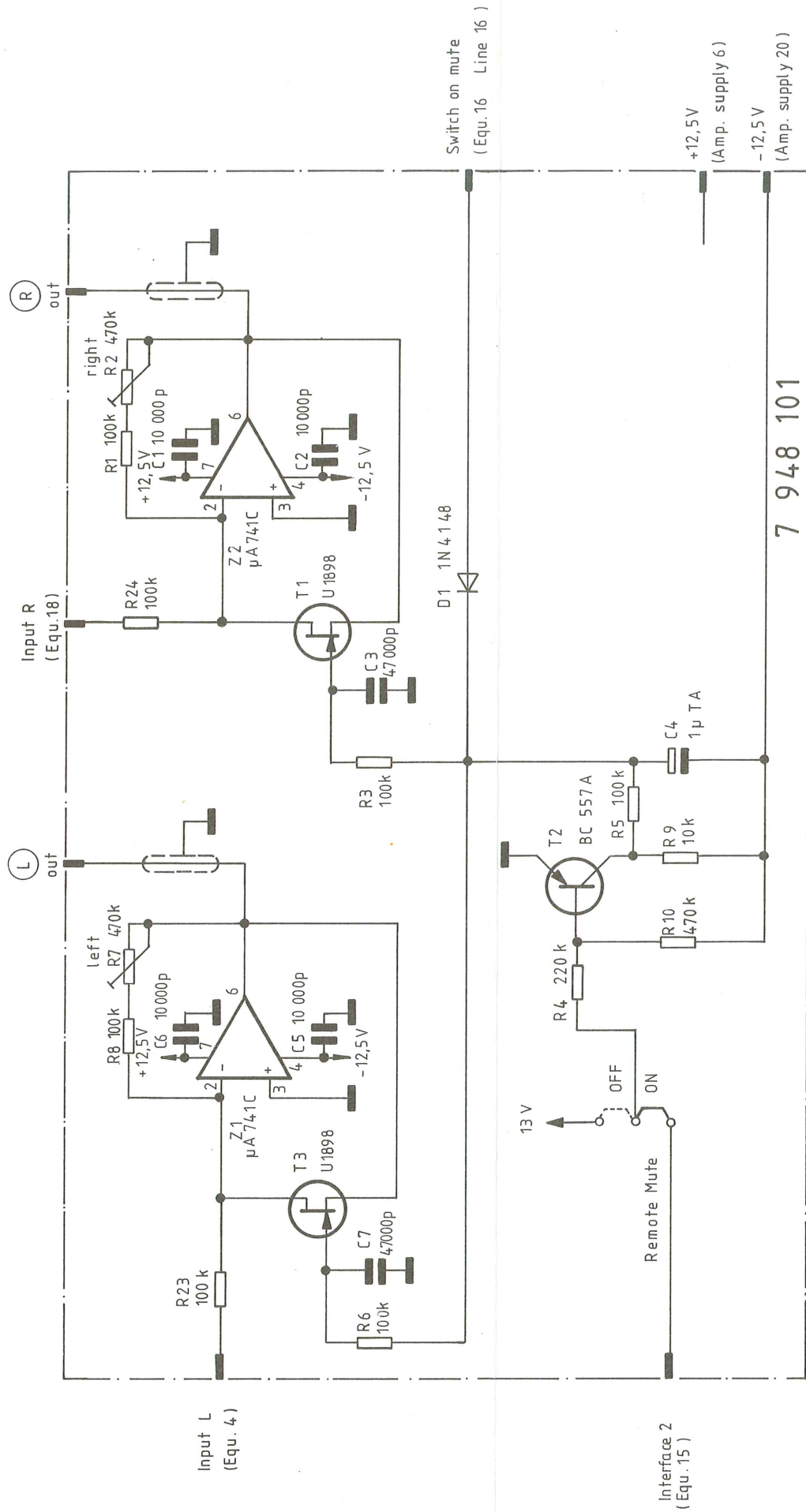
Kopfhörer Pegel links
PHONES LEVEL ADJ. LEFT



EMT 948 **Rückverdrahtungsplatine** **INTERCONNECTION BOARD**

Kopfhörer Pegel rechts
PHONES LEVEL ADJ. RIGHT

Stummschaltung
bei Fernbed.
REMOTE MUTE



Hilfsmonitorstufe auf Rückverdrahtungsplatine **AUXILIARY MONITOR ON CONNECTOR PRINT BOARD**

Pick-up cartridges

"T" series (stereo and mono)

Type	TSD 15	TMD 25	TND 65
Application	Stereo Stereo grooves	Mono Microgrooves	Mono Standard grooves
Stylus	Diamond	Diamond	Diamond
Tip radius (conical)	15 μ m	25 μ m	65 μ m
Tracking force	20 - 30 mN	20 - 30 mN	20 - 30 mN
Output level at 1 kHz (for 1 cm/s rms recorded velocity)	0.21 mV $\pm$ 2 dB	0.21 mV $\pm$ 2 dB	0.21 mV $\pm$ 2 dB
Frequency range	20 Hz - 20 kHz	20 Hz - 20 kHz	20 Hz - 20 kHz
Frequency response 40 Hz - 12.5 kHz	$\pm$ 2 dB	$\pm$ 2 dB	$\pm$ 2 dB
Difference in output level between channels 40 Hz - 12.5 kHz	max. 2 dB	-	-
Crosstalk at 1 kHz	min. 25 dB	-	-
Frequency intermodulation (FIM)	max. 1 %	max. 1 %	max. 1 %
Vertical tracking angle	18° ($\pm$ 3°)	18° ($\pm$ 3°)	18° ($\pm$ 3°)
DC resistance	2 x 24 ohms	24 ohms	24 ohms
Compliance	15 μ m/mN	15 μ m/mN	15 μ m/mN
Equivalent mass at stylus tip	approx. 1 mg	approx. 1 mg	approx. 1 mg

The above data were obtained using the following test records:

Frequency response and crosstalk test record DIN 45 543

Distortion test record DIN 45 542

Distortion measurements performed with test record DIN 45 542 referred to "reference level - 6 dB" $\triangleq$ full modulation (peak velocity 8 cm/s at 1 kHz)

Note: The stylus assemblies are not user replaceable.

Subject to change without notice.

Technical Data

Amplifiers

Plug-in boards

Equalization

DIN, NAB, IEC
FLAT

75/318/3180 μ s
0/318/3180 μ s,
selected with programming plug

Frequency response

40 Hz to 15 kHz ± 0.5 dB
30 Hz approx. -3 dB
below 30 Hz approx. 20 dB/octave
rolloff
above 25 kHz approx. 12 dB/octave
rolloff

Input voltage

for EMT "T" cartridges

0.3 to 1.4 mV (with 1:7 input trans-
former)

for magnetic cartridges
($R_i = 47$ kohms)

2 to 10 mV

Overload margin of the input

20 dB

Maximum output level before
clipping

10 V (+ 22 dB)

Output voltage

adjustable between 700 mV and
10 V (0 to + 22 dB) on 200 ohms

Harmonic distortion

max. 0.1 % between 30 Hz and
12 kHz at 4:4 V (+ 15 dB) on 200
ohms

Crosstalk supression

min. 55 dB, 30 Hz to 15 kHz

RMS S/N ratio, unweighted

min. 75 dB

Peak S/N ratio, weighted

min. 70 dB

Headphone output, mono

unbalanced, adjustable

Headphone output, stereo

unbalanced, adjustable

on a load of 200 ohms
on a load of 2 kohms

approx. 200 to 600 mV
approx. 500 to 1500 mV

Mono switching

operable by remote control

Subject to change without notice.

Information for Ordering

Types	Quantity	Order No.	Name
	1	9948 110/...	Broadcast Turntable, deck, stereo with EMT 929 Tone Arm and Equalizer Amplifier for TSD 15 Stereo Pickup Cartridge
	1	9948 120/...	Broadcast Turntable, deck, stereo with EMT 929 Tone Arm and 47 kOhm Equalizer Amplifier for magnetic pickup cartridges
		/...	Please indicate desired mains voltage.
Parts List	1	9935 000	TSD 15 Pickup Cartridge, stereo, for 9948 110
	1	9935 006	Empty EMT Pickup Shell T-series with accessories for 9948 120
	1	7 948 030	Dust cover assembly
	1	6 948 036	Turntable platter assembly
Accessories	1	4 203 154	Male plug, 6 pin
	1	4 203 234	Male plug, 36 pin
	1	4 204 062	Female plug, 3 pin
	1	4 240 579	Mains cable, german standard
	1	4 240 580	Mains cable, USA
	1	4 295 001	Allen key, 2 mm
	1	4 295 002	Allen key, 3 mm
	1	6 929 100	Tone arm height adjustment gauge
	1	7 948 100	Set of fuses and lamps:
	3	4 107 117	Incandescent lamp 12 V/0,08 A
	2	4 190 050	Fuse 1,0 AT/250 V USA
	2	4 190 051	Fuse 0,5 AT/250 V USA
	2	4 190 100	Fuse 0,5 AT/250 V EUR
	2	4 190 103	Fuse 1,0 AT/250 V EUR
	1	4 191 069	Fuse cap EUR
	1	4 191 070	Fuse cap USA
			(One fuse and one fuse cap installed as mains fuse).
	1	7 929 055	Antiscating weight, in bag
	1	6 929 016	Counterweight
	1	6 950 060	Stroboscope disk
	1	7 948 034	Holding bracket, in bag

Special Accessories (to be ordered separately)

1	9948 970	Console, operating height 800 mm, vertically adjustable feet ± 25 mm, with cover plate for mounting additional control elements or loudspeakers.
1	9948 971	Console, operating height 800 mm, vertically adjustable feet ± 25 mm, with cue amplifier and cue loudspeaker, cover plate for mounting additional control elements.
1	948 910	Transport Trunk
1	9948 905	PC Board Holder with connector for Cue Amplifier
1	7 950 032	Cue Amplifier

Recommended Spare Parts

The numbers quoted are intended for 5 years' operation. Fractions indicate that we recommend only one spare part where several turntables are operated together. Example: 1/3 = 1 spare part for 3 machines.

Recommended Quantity	Order No.	Name
2	4 107 005	Cold cathode lamp
3	4 107 117	Incandescent lamp, 12 V/0.08 A
2	4 190 050	Fuse, 1 A slow-blow, 250 V USA
2	4 190 051	Fuse, 0.5 A slow-blow, 250 V USA
2	4 190 100	Fuse, 0.5 A slow-blow, 250 V EUR
2	4 190 103	Fuse, 1 A slow-blow, 250 V EUR
1/3	9 220 000	Motor assembly, complete
1	7 950 010	Lift motor, complete
2	6 832 070	Drive belt for tone arm lift
1/5	9 929 007	Tone arm
1/5	7 950 038	Stereo equalizer amplifier for TSD cartridges
1/5	7 950 088	Stereo equalizer amplifier, 47 kohms
1/5	7 950 039	Line amplifier
1/5	7 948 105	Servo amplifier board
1/5	7 948 106	Speed control board
1/5	7 948 107	Oscillator board
1/5	7 948 108	Interface board
1/5	7 950 037	Amplifier power supply
1/5	7 948 110	Power supply board
1/5	7 948 030	Dust cover, complete
1/5	7 948 017	Lamp cover, complete