



ELEKTRONIK-
MESS- UND
TONSTUDIOTECHNIK

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Instruction Manual

**EMT 938
Broadcast
Disk Reproducer**



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Connections and Preparation for Use

A 1 Unpacking Instructions

- Place the carton in an upright position (as indicated on the carton) and open.
- Remove the dust cover and the accessories. The dust cover is included only when ordered with the unit.
- Remove the upper foam packing insert.
- Remove the Broadcast Disk Reproducer from the lower foam insert. Do not use the tone arm as a handle.

The turntable platter and the rubber mat are located in the lower foam insert. Some units are delivered with a premounted turntable platter. In these units, the turntable platter must be removed in order to release the transport locks.

The unit may 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, follow the reverse procedure with appropriate care. Do not forget to engage the two transport locks – chassis and motor bearing – and remove the counterweight with the tube end from the tone arm. Tighten the screws firmly.

A 2 Releasing the Transport Locks

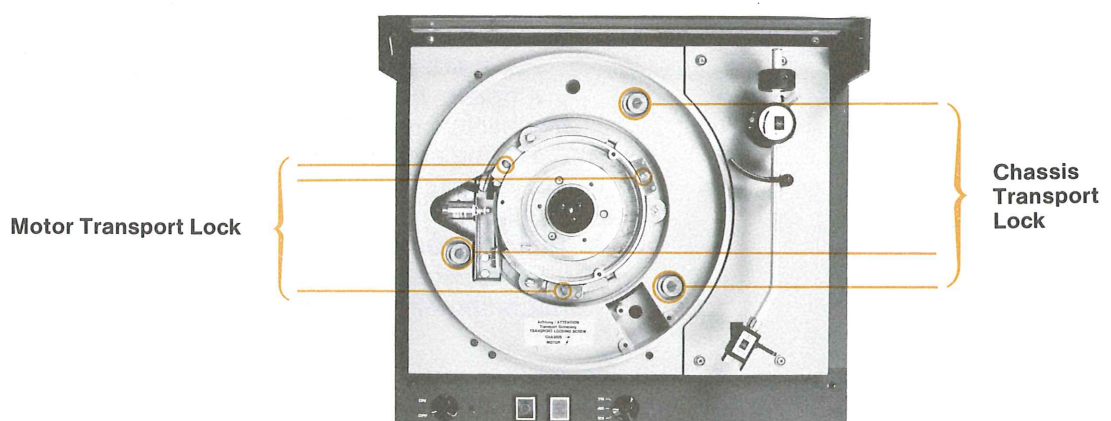
The turntable platter must be removed in order to release the transport locks.

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.

The transport lock for the suspended chassis is released by loosening the three large screws (identified in red) in the opening for the turntable platter. These screws must be loosened completely, i.e., turned to the end of travel. 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.

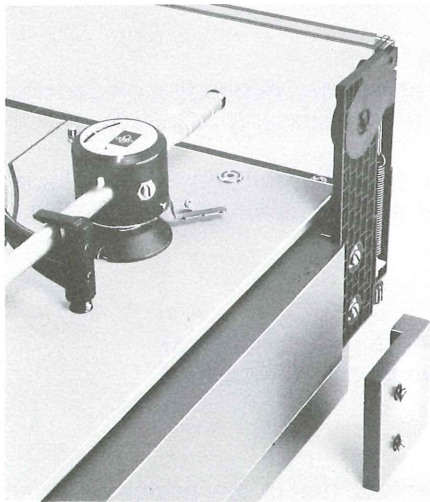


Connections and Preparation for Use

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 Dust Cover (Option)



As an option for the EMT 938 Broadcast Disk Reproducer, a clear plastic dust cover is available under order number 9938900 that may be swiveled open to an angle of 60° . The hinges required for the cover are secured to the rear of the turntable with metal plates, and each hinge assembly is fastened with two screws and accompanying washers. Before the dust cover is mounted, the lining angles and the sheet metal strip along the rear of the turntable must be removed. The letters R (right) and L (left) are engraved into the hinges and hinge covers for the purpose of identification.

The rear plastic cover is subsequently mounted and fixed with the two delivered screws.

The dust cover is subsequently inserted into the guide and snapped into place. When the cover is to be removed, the side supports should be pressed slightly inwards. The spring force for holding the dust cover is adjustable with a screw in the hinge shaft.

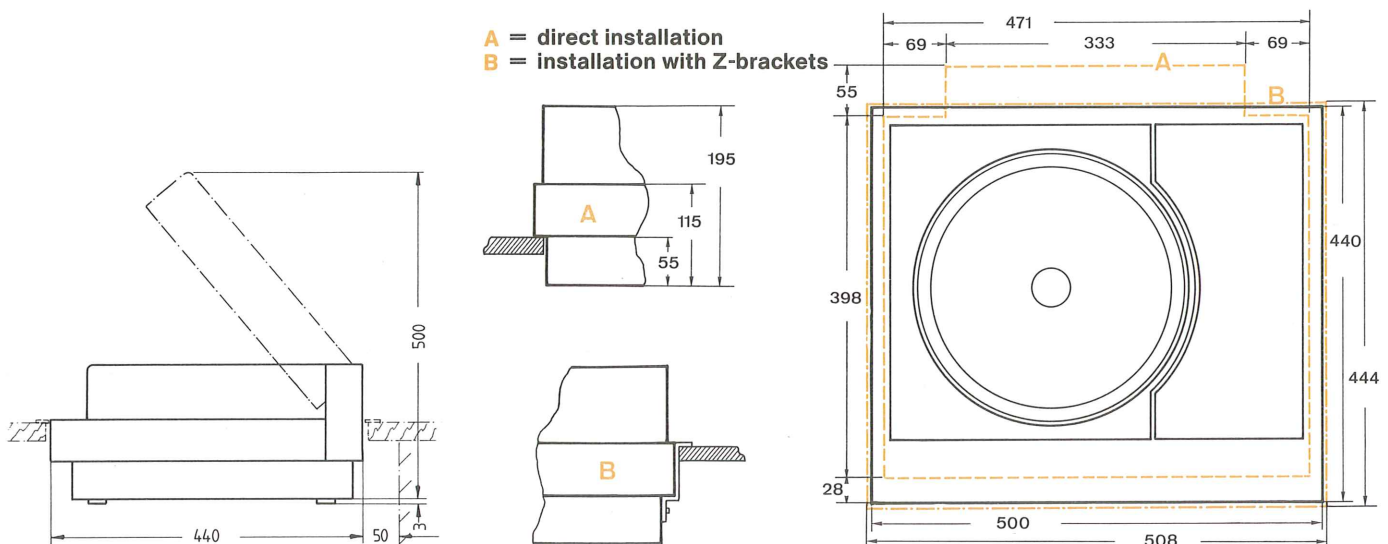
The hinge covers are then pressed onto the hinge. They may be removed by pressing open lightly the side supports.

The EMT 938 Broadcast Disk Reproducer may also be delivered with a lift-off cover, order number 938 PC.

A 5 Installation in Cabinets or Tables

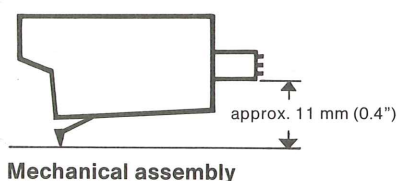
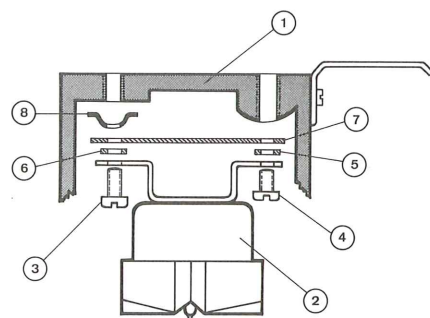
The EMT 938 Broadcast Disk Reproducer is delivered in a base that may serve as a tabletop cabinet. The external contours of the base allow the turntable to be used as a free-standing unit or to be recess-mounted in an appropriate counter cutout (line A in the diagram) without additional installation elements. If the unit is to be mounted deeper so that the upper surface is flush with the countertop, a set of Z-brackets is required, order number 9938901. The two flat iron strips included are employed for covering the cutout slit at the front and the rear of the unit.

The dimensions for counter installation are provided in the diagram. With the dust cover fully opened, the EMT 938 Broadcast Disk Reproducer is 503 mm high.



Connections and Preparation for Use

A 6 Mounting a Pickup Cartridge into an EMT Cartridge Shell



Under the catalog number 9938 120, the EMT 938 Broadcast Disk Reproducer is delivered with an empty EMT cartridge shell, including the hardware necessary for mounting the pickup cartridge selected.

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

The distance of 11 mm is achieved with an appropriate number of spacing washers. The height of the tone arm should be checked and adjusted, if necessary; see page 7.

Electrical connections:

red : right channel (a)
green : right channel (b)

white : left channel (a)
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 to prevent hum loops.

Under some conditions, it may be necessary to provide an electrical connection between the shielding body of the cartridge and the cartridge shell using one or two of the mounting screws.

A 7 Dynamic and Magnetic Pickup Cartridges

Nearly every commercial pickup cartridge with standard 1/2" mounting centers may be mounted into the empty pickup shell delivered with the EMT 938 Broadcast Disk Reproducer under order number 9938 120. The input impedance of the amplifier installed in this version complies with the international standard of 47 kOhms. As is the case for all other EMT turntables, the EMT 938 Broadcast Disk Reproducer is also available in a version (order number 9938 110) for use with the EMT TSD 15 Studio Pickup Cartridge. A plug-in active impedance transformer (preamplifier) provides proper matching for the moving coil cartridge. This impedance transformer is inserted onto the Amplifier Board between the tone arm cable connector and the amplifier. (See also the EMT 938 Block Diagram.) The bottom cover of the turntable must be removed for this purpose; the Amplifier Board may be swung out after the two screws have been removed.

An angular piece with white field is mounted on the preamplifier board. This field appears in a small hole on the lower front right-hand side of the unit, thereby serving as an optical check for installation of the preamplifier (left picture).



White point visible: active impedance transformer (preamplifier) is plugged in.



No white point visible: unit switched to 47 kOhm input impedance.

Connections and Preparation for Use

A 8 Tone Arm Adjustments Mounting the Counterweight

The counterweight with tube piece is mounted with a central screw on the rear of the tone arm. The constricted portion of the plastic sleeve must lie at the rear.

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.

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 ("EMT 938") lies exactly at the middle of the bearing adjustment screw.

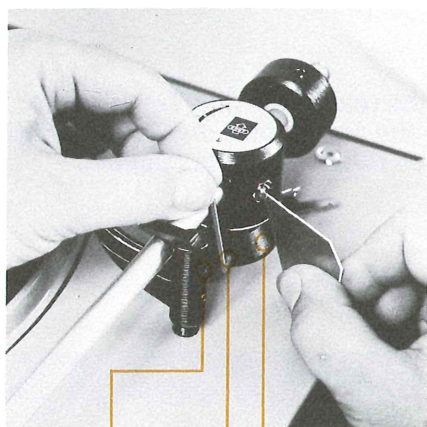
Tone Arm Lift Platform

The height of the tone arm lift platform may be corrected, if necessary, by changing its position on the lifting shaft. The Allen screw on the platform is to be loosened for this purpose (see photo).

The opening angle of the tone arm clasp is adjusted with the upper screw on the platform.

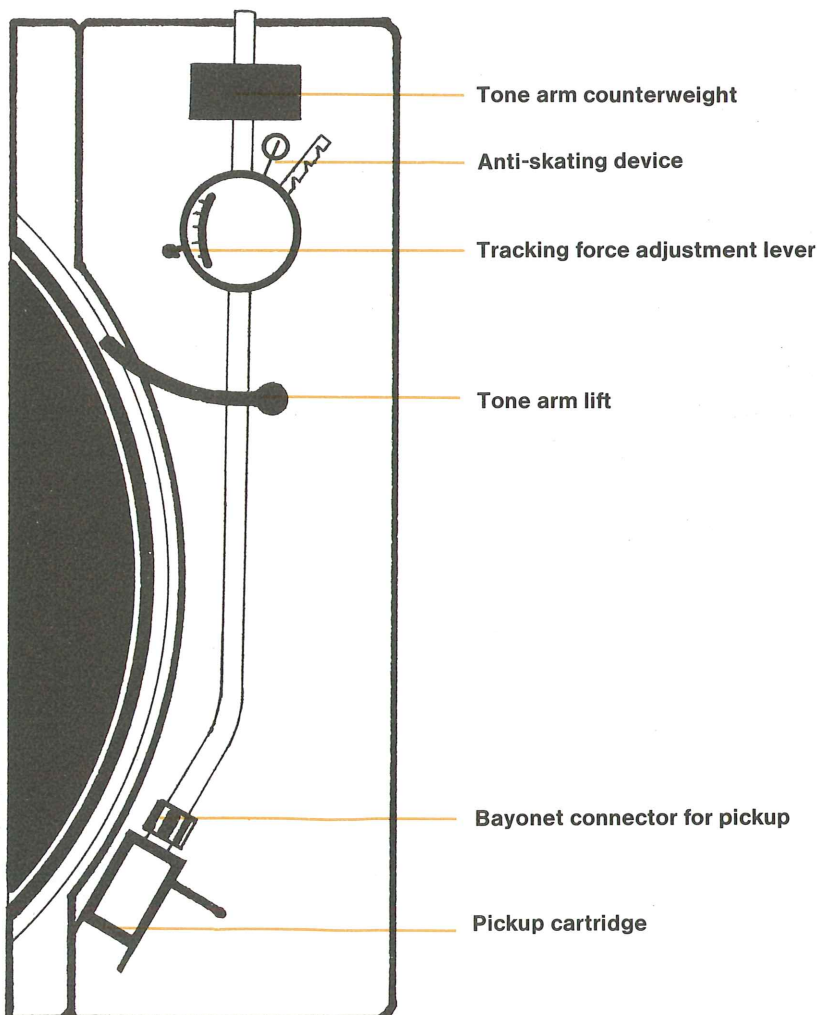
EMT 929 Tone Arm

(Dust cover and bracket not shown)



Allen screw in pedestal flange (underneath the cover)

Allen Screw for changing the height of the tone arm lift platform



Connections and Preparation for Use

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).

A 9 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 chassis. The unit may be switched to a mains voltage range of either 100 - 120 V or 200 - 240 V.

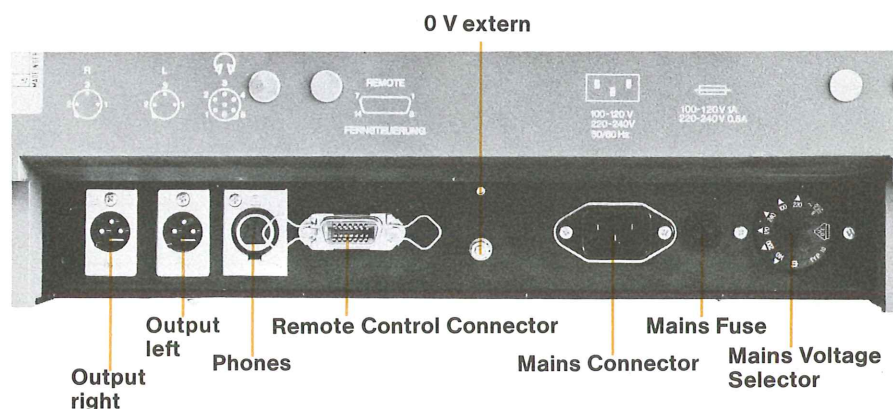
For 100 - 120 V, a 1 A slow-blow mains fuse is required; for 200 - 240 V, a 0.5 A slow-blow fuse. The specified mains frequency is 50 - 60 Hz.

A 10 Grounding Connections

The grounding wire of the mains power cable is permanently connected to the chassis of the turntable. The voltage potential "0 V extern" ($\perp$ ext., the shield potential of the audio cables) is also connected at the factory to the chassis. This connection may be removed if required to prevent disturbances ("hum loops") due to electromagnetic fields. To separate the connection, remove the connecting collar at pin 1 of the 3-pin audio connector and push onto the insulated pin. (See also the block diagram on page 16). The pin and the connecting collar are easily accessible after the bottom plate has been removed.

A 11 Audio Connectors

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.

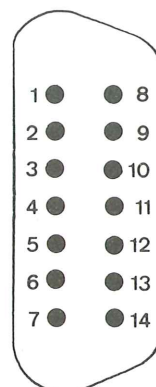


Connections and Preparation for Use

A 12 Remote Control Connector

Pin connections:

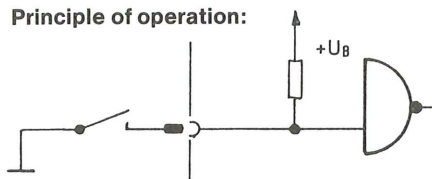
1. Lift - remote
2. Mono (0 V)/Stereo
3. + 20 V (Lamps)
4. 0 Volt
5. Vario (0 V)/Quartz
6. Start Lamp
7. Lift Lamp
8. Start/Stop - remote
9. Fader Start/Stop
10. Vario Potentiometer (cw)
11. Vario Potentiometer (Wiper)
12. Vario Potentiometer (ccw)
13. -
14. -



See also the Interface/Oscillator schematic diagram on page 24.

Remote Control and Indicator Lamps

Principle of operation:

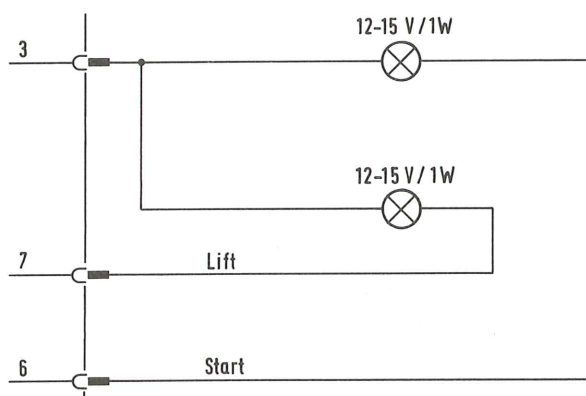


The remote control connections are designed for activation of a function with 0 V.

Example:

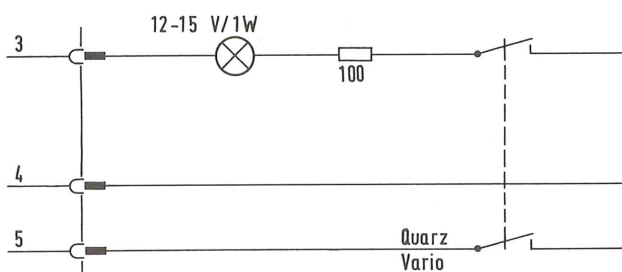
Pin 2 at 0 V: the unit operates monophonically.
Unused or open inputs are pulled up to + 12 V through a resistor.

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.

For the indication of Vario/Quartz switching, the following connection scheme may be employed.



Connections and Preparation for Use

Start/Stop, Faderstart

Pin 8 of the remote control connector is provided for the Start/Stop function. The pin connection lies parallel to the button on the operating panel. The unit may also be remotely controlled by the end contact of a channel fader (Fader Start/Stop). If the fader end contact is normally closed, the programming plug on the Interface/Oscillator Board must be inserted into the NC position; if the contact is normally open, the NO position must be used.

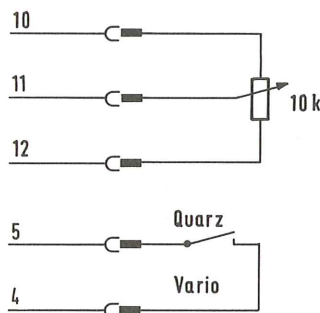
The Interface/Oscillator Board is accessible after the operating panel has been removed. For this purpose, remove the two screws (see the photo on page 15) and loosen the two outer screws accessible from underneath the unit. Observe that the power switch is rigidly mounted.

Lift

The Lift function can be activated with a switch between pins 1 and 4 of the remote control connector.

Variable Speed

Circuit diagram for Vario Operation:



If variable speed operation is desired, pin 5 of the remote control connector must be connected to ground. The selected speed may then be varied by approx. $\pm 25\%$ with a potentiometer at pins 10, 11, and 12. Pin 10 should be connected to the full-clockwise terminal and pin 12 to the full-counterclockwise terminal.

A 13 Level

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.

The level adjustments may easily be made from below at the front of the unit with the screws labeled L and R.

A 14 Muting

The line outputs are muted during the Start and Stop phases. This muting function may be defeated by opening a Dip-Fix switch on the Amplifier Board; see page 31.

Transport locks released? (See A 2, page 4.)
Mains voltage selector in correct position? (See A 9, page 8.)
Tone arm adjusted? (See A 8, page 7.)



B 1 Switch Functions

Power Switch



Located at the front of the unit on the left.

Start/Stop



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

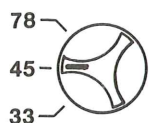
The LED (SYNC) at the edge of the platter is lit when the platter has reached nominal speed.

Tone Arm Lift



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

Speed Selector



Front right.

The adapter at the middle of the turntable platter can be turned to lock into the upper or lower position. It is to be locked into the lower position for records with a small center hole.

B 2 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 rotating the turntable back and forth by hand. The cueing signal (mono or stereo) can be monitored continuously at the Phones jack. The level may be adjusted with three potentiometers on the amplifier board; see page 30.

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 page 10 and page 30.

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.

D General

The EMT 938 block diagram supplies information concerning the designations of signals and the connecting leads between the individual circuit boards of the motor drive system. In the descriptions included in the circuit diagrams, the following abbreviations are employed for the pins of the integrated circuits:

10/Z 801 $\hat{=}$ pin 10 of IC no. 801

The following designations apply for logic signals:

LOW $\hat{=}$ approx. 0 V

HIGH $\hat{=}$ approx. 12 - 15 V

Instruments required for servicing:

1 audio millivoltmeter

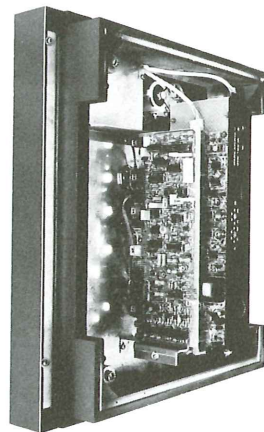
1 dual-channel oscilloscope

In the event of improper operation of the control circuitry, it is suggested that the adjustments of the control circuitry be checked in the order given on page 19.

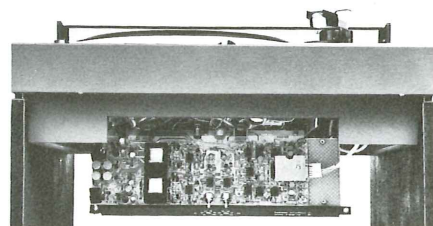
The Speed Control Board and the Amplifier Board are accessible after the bottom plate has been removed. The boards may be swiveled out after two screws have been removed.

The Broadcast Disk Reproducer may be placed on its side for servicing. However, it is advantageous to support the turntable horizontally on two rails or two wooden blocks. In particular, the turntable should rest horizontally for tests with the motor running.

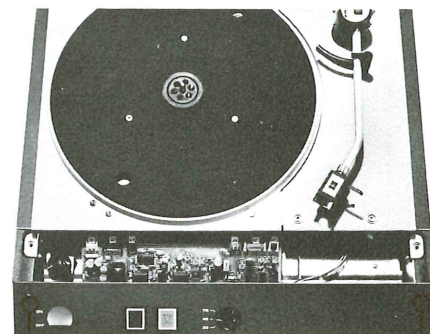
The Interface/Oscillator Board is accessible after the operating panel has been removed. For this purpose, remove the two screws (see photo) and loosen the two outer screws accessible from underneath the unit. Observe that the power switch is rigidly mounted.



Placing the Broadcast Disk Reproducer on the side



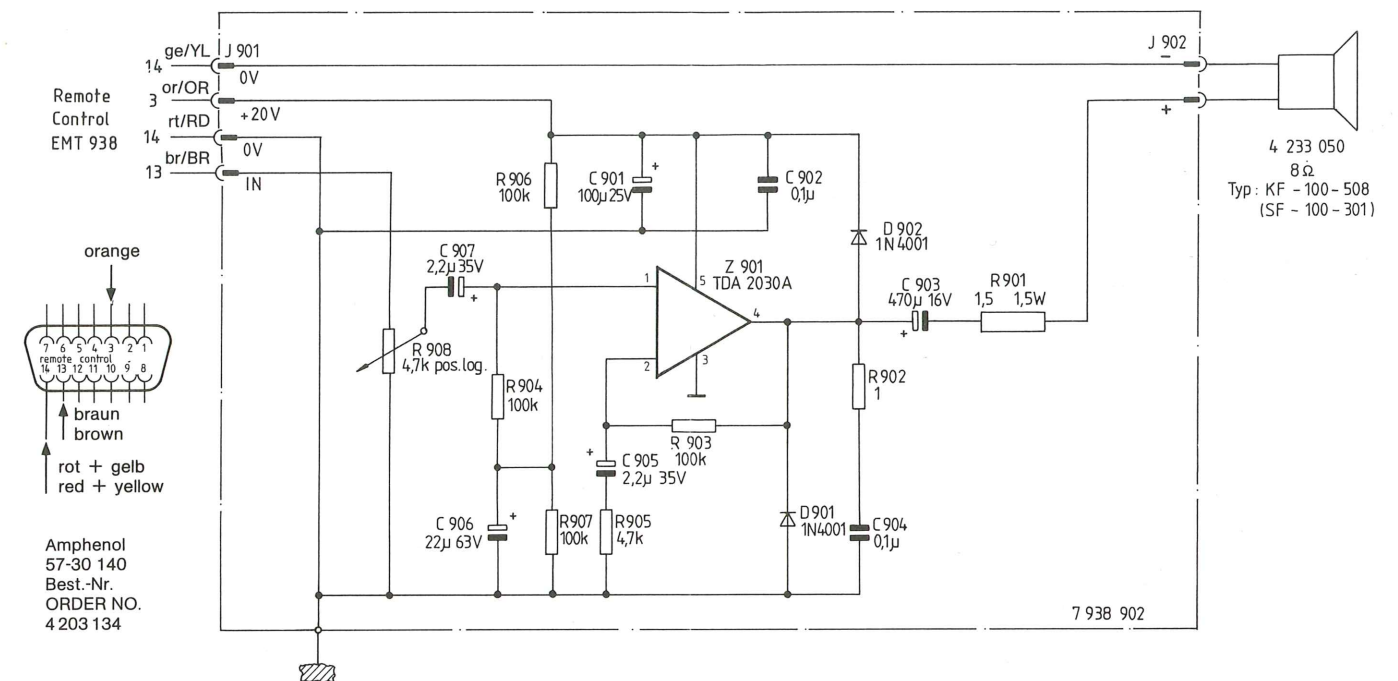
Supporting on two wooden boards



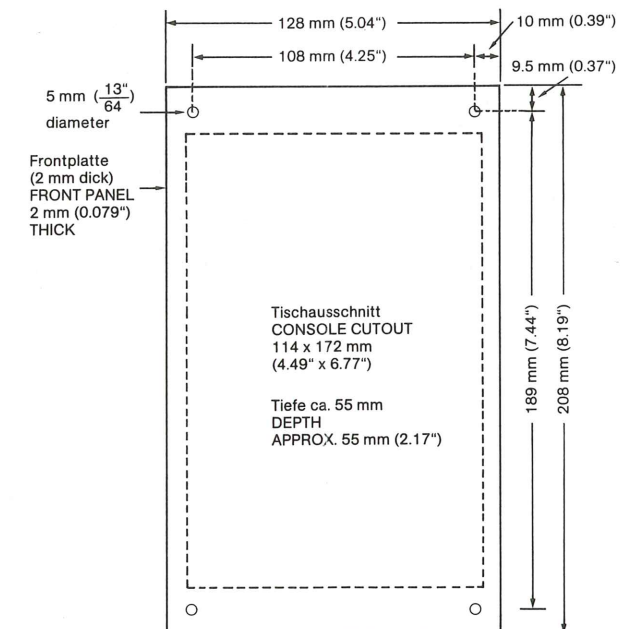
Removing the Interface/Oscillator Board

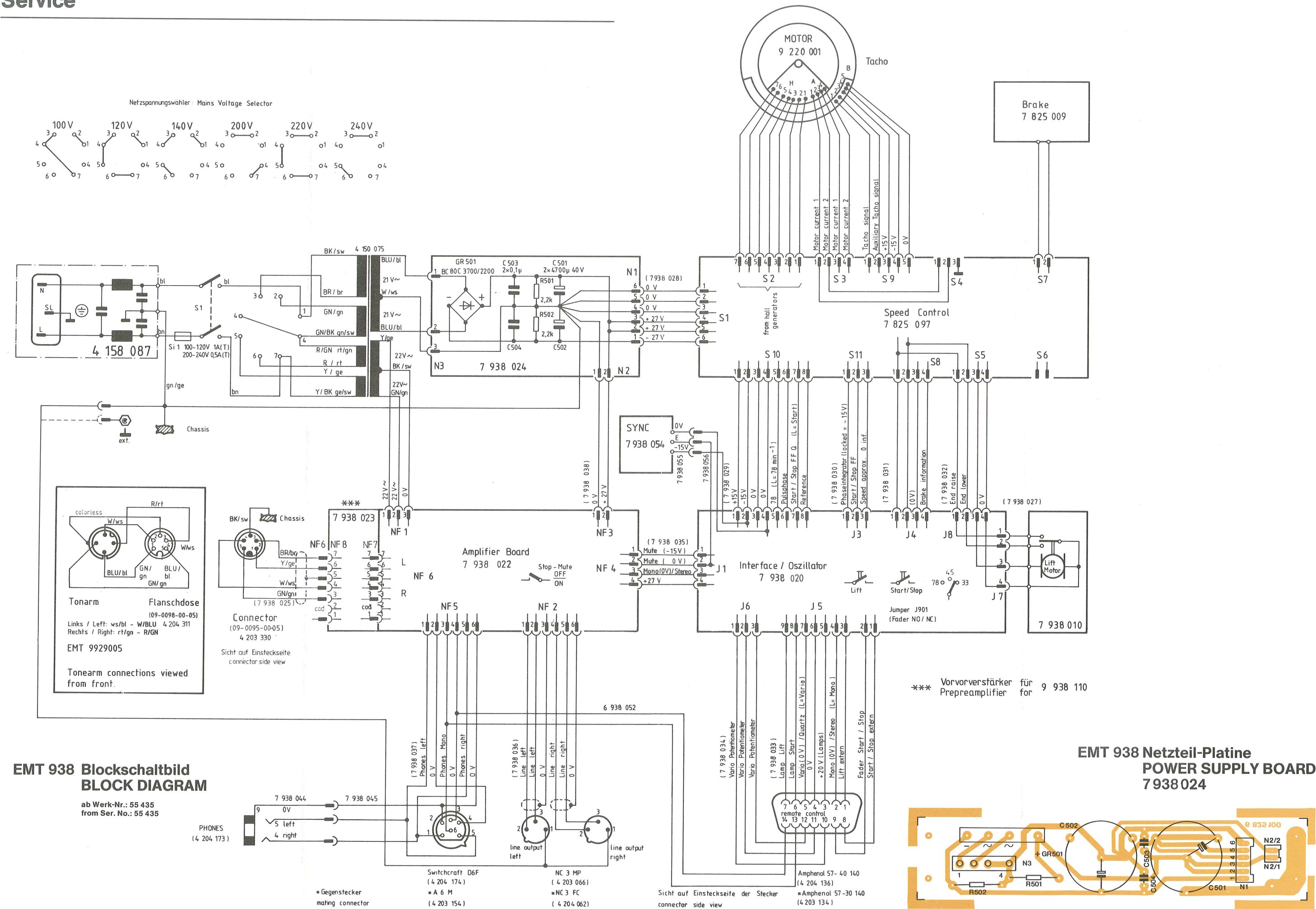
Screw

Screw

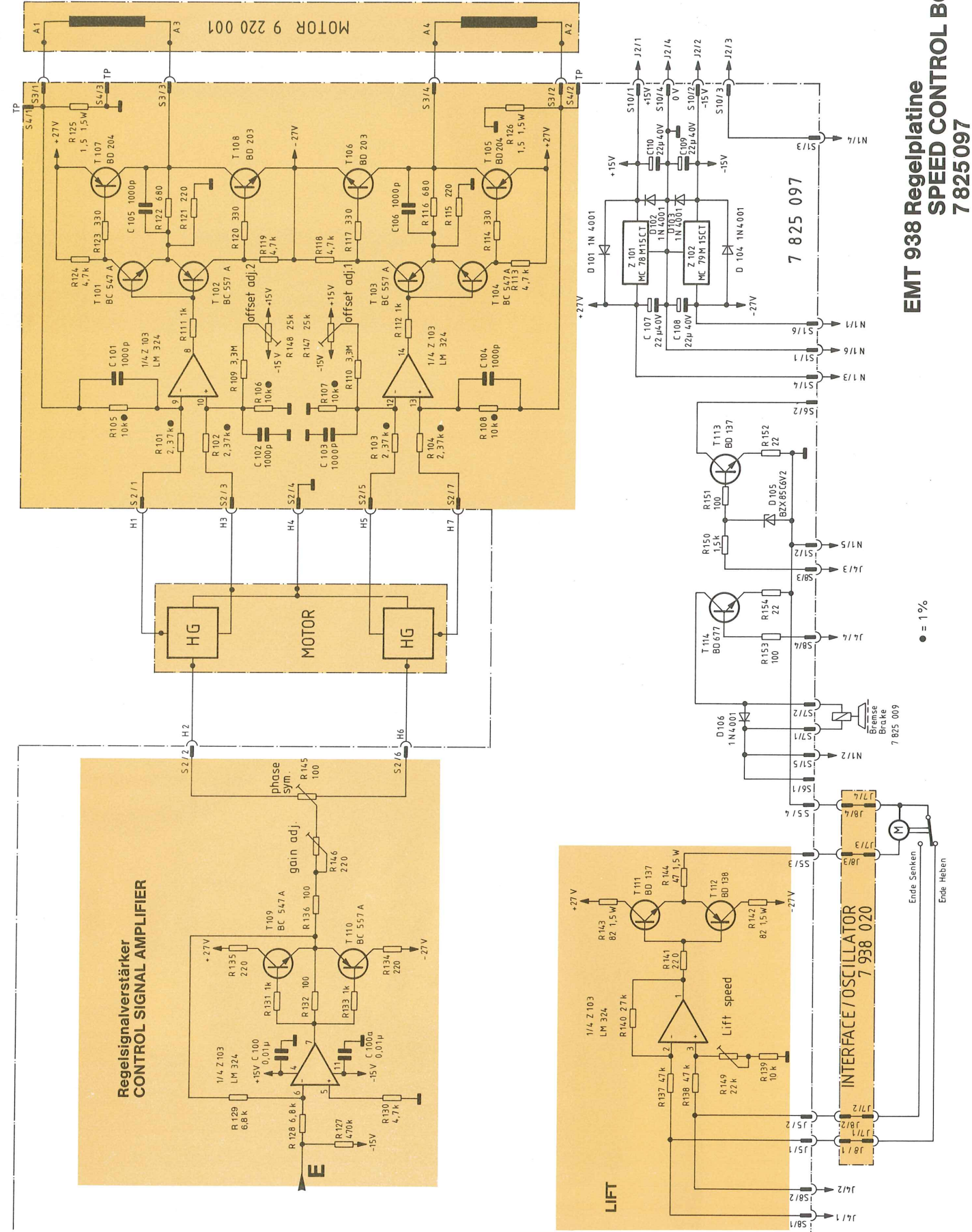
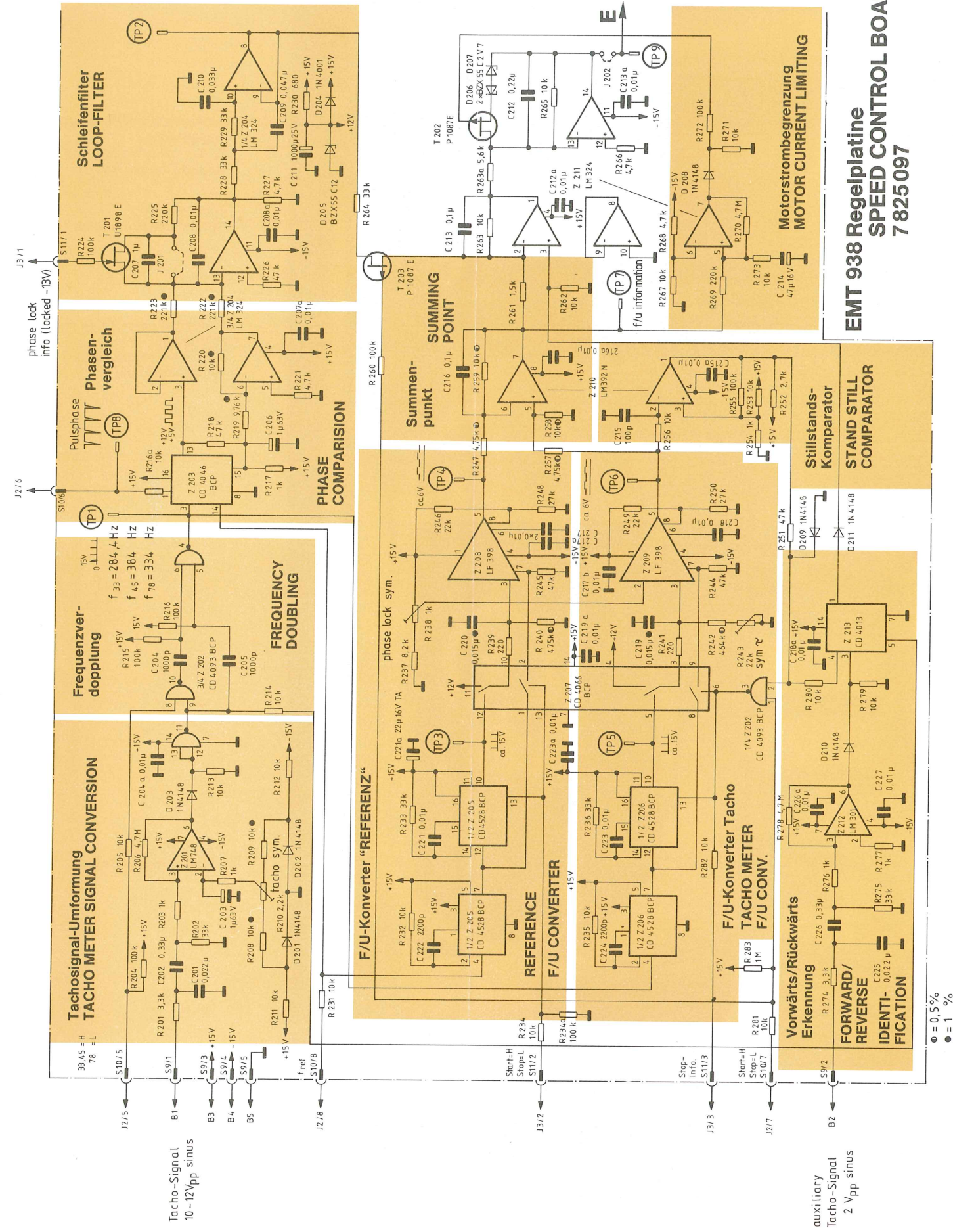


Cue-Verstärker für EMT 938
CUE AMPLIFIER FOR EMT 938
9938903









PRÜFUNG UND EINSTELLUNG DER REGELELEKTRONIK

1. R 210 "TACHO SYM."

- Maschine einschalten. Geschwindigkeit 33 1/3 wählen.
- Oszilloskop an TP 7 (f/u-information) anschließen, ($y = 10 \text{ mV/div}$; $x = 2 \text{ ms/div}$). Dabei hochohmigen, kapazitätsarmen Tastkopf verwenden, da sonst unter Umständen HF-Einstreuungen auftreten.
- Start drücken.
- Mit R 210 "tacho sym." auf minimale Sägezahn-Amplitude einstellen, $< 20 \text{ mV}_{pp}$.

2. R 238 "PHASE LOCK SYM."

- Maschine einschalten. Stop drücken.
- An TP 9 der Platine mit R 238 offset auf 0 V einstellen.

3. R 243 "SYM. τ "

- Stifte an J 201 "phase adj." kurzschließen.
- Oszilloskop an TP 8 der Platine (Signal Pulsphase) anschließen.
- Start drücken.
- Mit R 243 "sym. τ " minimale Pulspause einstellen.
- Kurzschluß an J 201 wieder aufheben.

EINSTELLUNG DER MOTOR-ENDSTUFE

4. R 148 "OFFSET ADJ. 2"

5. R 147 "OFFSET ADJ. 1"

6. R 145 "PHASE SYM."

7. R 146 "GAIN ADJ."

- Jumper J 202 ziehen, damit ist der Regelkreis unterbrochen. Es liegt eine konstante Gleichspannung am Eingang der Endstufe (TP 9).
- Maschine einschalten. Plattenteller dreht vorwärts.
- Oszilloskop an Anschluß S4/1 bzw. an Anschluß S4/2 der Platine (0 V: Anschluß S4/3) anschließen.
- Mit R 147 "offset adj. 1" und R 148 "offset adj. 2" beide Signale symmetrisch zu ihrer Nulllinie einstellen.
- Mit R 145 "phase sym." gleiche Amplitude beider Signale einstellen.
- Mit R 146 "gain adj." Signale auf 100 mV_{pp} einstellen.
- Jumper J 202 wieder einstecken!

R 149 LIFT SPEED

Mit R 149 wird die Lift-Senkgeschwindigkeit eingestellt. Die Einstellung ist unkritisch.

TEST AND ADJUSTMENTS OF ELECTRONICS

1. R 210 "TACHO SYM."

- Turn on the unit. Select 33 1/3 speed.
- Connect an oscilloscope to TP 7 (f/u information; $y = 10 \text{ mV/div}$; $x = 2 \text{ ms/div}$). Use a high impedance, low capacitance probe, since otherwise rf interference may be encountered under some conditions.
- Press Start.
- Adjust R 210 "tacho sym." for minimum voltage-step amplitude, $< 20 \text{ mV}_{pp}$.

2. R 238 "PHASE LOCK SYM."

- Turn on the unit. Press Stop.
- Adjust R 238 for 0 V at TP 9 of the board.

3. R 243 "SYM. τ "

- Connect Jumper 201.
- Connect an oscilloscope ($y = 5 \text{ V/div}$, $x = 5 \text{ ms/div}$) to TP 8 on the board.
- Press Start.
- Adjust R 243 "sym. τ " for minimum pulse pause.
- Disconnect Jumper J 201.

ADJUSTMENT OF THE MOTOR AMPLIFIER

4. R 148 "OFFSET ADJ. 2"

5. R 147 "OFFSET ADJ. 1"

6. R 145 "PHASE SYM."

7. R 146 "GAIN ADJ."

- Remove jumper J 202 to open the control loop. A constant dc voltage lies at the input of the amplifier (TP 9).
- Turn on the unit. The turntable platter will turn forwards.
- Connect an oscilloscope ($y = 50 \text{ mV/div}$; $x = \text{minimum sweep}$) to S4/1 and to S4/2 to the board (0 V: pin S4/3).
- Set both signals symmetrically about their zero-signal levels with R 147 "offset adj 1" and R 148 "offset adj. 2".
- Set both signals to an identical amplitude with R 145 "phase sym."
- Set the signals to 100 mV_{pp} with R 146 "gain adj."
- Connect Jumper J 202!

R 149 LIFT SPEED

The lowering speed of the lift is adjusted with R 149. The setting is uncritical.

TACHOSIGNAL (ANSCHLUSS S9/1)

Das Tachosignal, vom Tachoverstärker im Motor kommend, liegt als Sinussignal am Eingang der Regelplatine an Anschluß S9/1. Der Pegel beträgt bei $33 \frac{1}{3} \text{ min}^{-1}$ 12 - 13 V_{pp}.

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

SCHALTUNGSBESCHREIBUNG (DETAILS)

TACHOSIGNAL UMFORMUNG

Z 201 ist als Schmitt-Trigger geschaltet. Das sinusförmige Tachosignal wird in ein Rechtecksignal mit dem Tastverhältnis 1 : 1 umgewandelt, negative Signalanteile werden mit D 203 kurzgeschlossen. Das Tastverhältnis wird mit R 210 eingestellt ("tacho sym.")

FREQUENZVERDOPPLUNG

An Ausgang 4/Z 202 liegen Nadelimpulse (TP 1) der doppelten Tachofrequenz bei den Geschwindigkeiten 33 und 45 min⁻¹. Bei 78 min⁻¹ ist die Frequenz der Impulse gleich der Tachofrequenz (Eingang 8/Z 202 = "0"). Die Pulsdauer wird durch die RC-Glieder C 204, R 215 und C 205, R 216 bestimmt.

PHASENVERGLEICH

Z 203 ist als Phasenvergleicherschaltete. Referenzsignal (heruntergeteilte Oszillatorfrequenz) und Signal von 4/Z 202 erzeugen eine von ihrem Phasenunterschied abhängige Spannung an 13/Z 203. Diese Spannung beträgt ca. +7,5 V; ihr werden Pulse von $\pm 7,5 \text{ V}$ je nach positivem bzw. negativem Phasenunterschied überlagert. Die Dauer dieser Impulse wird vom Betrag des Phasenwinkels bestimmt.

In der nachfolgenden Schaltung wird eine Gleichspannung von ca. 7,5 V vom Signal des Phasenvergleichers subtrahiert.

A 1/Z 203 steht das Signal Pulsphase zur Verfügung. Es entspricht dem Betrag des Signals an 13/Z 203.

SCHLEIFENFILTER (LOOP FILTER)

Z 204 mit dem Ausgang 14 ist als Integrator geschaltet. Zur Verbesserung des Hochlaufverhaltens ist C 207 während der Hochlaufphase kurzgeschlossen.

Tiefpaß 2. Ordnung: zum Abbau der Restwelligkeit des Signals an 14/Z 204.

An Ausgang 8/Z 204 (TP 2) liegt das Regelsignal der PLL-Schaltung.

TACHOMETER SIGNAL (PIN S9/1)

The tachometer signal, fed from the tachometer amplifier in the motor, appears as a sinewave signal at the input of the Speed Control board at pin S9/1. The level at $33 \frac{1}{3} \text{ min}^{-1}$ lies between 12 - 13 V_{pp}.

$$\begin{aligned} f_{33} &= 142.2 \text{ Hz} \\ f_{45} &= 192 \text{ Hz} \\ f_{78} &= 334 \text{ Hz} \end{aligned}$$

CIRCUIT DESCRIPTION (DETAIL)

TACHOMETER SIGNAL CONVERSION

Z 201 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 203. The symmetry is adjusted with R 210 "tacho sym."

FREQUENCY DOUBLING

Voltage pulses appear at output 4/Z 202 (TP 1) at twice the tachometer frequency for speeds of 33 and 45 min⁻¹. At 78 min⁻¹, pulse frequency is identical to the tachometer frequency (input 8/Z 202 = "0"). The duration of the pulses is determined by the RC networks C 204, R 215 and C 205, R 216.

PHASE COMPARISON

Z 203 is connected as a phase comparator. The reference signal (the divided oscillator frequency) and signal from 4/Z 202 produce a voltage at 13/Z 203 proportional to the phase difference between the two. This voltage is approximately +7.5 V, upon which pulses of $\pm 7.5 \text{ V}$ are superimposed, corresponding to either a positive or 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 203. It corresponds to the value of the signal at 13/Z 203.

LOOP FILTER

Z 204 is connected with output 14 as an integrator. In order to improve run-up performance, C 207 is shorted during this interval.

Second order low-pass: for attenuating residual ripple of the signal at 14/Z 204.

The control signal of the PLL circuit appears at output 8/Z 204.

F/U KONVERTER "REFERENZ"

Die Nadelimpulse des "Referenzsignals" stoßen nacheinander 2 Monoflops an, die Impulse konstanter Dauer abgeben: 7/Z 205, 10/Z 205.

– 7/Z 205 HIGH. Über Analogschalter 1-2/Z 207 ist 7/Z 208 ebenfalls HIGH (Sample Phase der Spannung am RC-Glied R 240/C 220).

LOW. Über Analogschalter 1-2/Z 207 ist 7/Z 208 ebenfalls LOW (Hold Phase der Spannung am RC-Glied R 240/C 220).

Der Analogschalter 1-2/Z 207 wird von Anschluß 13/Z 207 gesteuert. Er öffnet bei Stop und schließt bei Start.

– 10/Z 205 HIGH. Der Analogschalter 10-11/Z 207 wird durchgeschaltet. Am RC-Glied R 240/C 220 liegen ca. 12 V.

LOW. Schalter 10-11/Z 207 wird geöffnet, das RC-Glied R 240/C 220 entlädt sich.

– Z 207/Z 208/ arbeiten als Sample- und Holdstufe, Z 209 die Spannung am RC-Glied wird während der Sample Phase an C 217 übernommen und während der Hold Phase am Ausgang 5/Z 208 übergeben und konstant gehalten.

Am Ausgang 5/Z 208 ist eine von der Frequenz des Referenzsignals abhängige Spannung.

F/U-KONVERTER TACHO

Die f/u-Wandlung des Tachosignals wird wie beim f/u-Konverter "Referenz" durchgeführt.

Unterschiede:

- Der Analogschalter 8-9/Z 207 öffnet bei Stop verzögert, und zwar bei der Drehzahl ca. 0. Dadurch wird der Motor solange entgegen der Drehrichtung beschleunigt, bis er steht.
- R 243 "sym. τ ". Mit R 243 werden identische Zeitkonstanten der beiden f/u-Wandler eingestellt.

REFERENCE F/U CONVERTER

The pulses of the reference signal activate two monostable multivibrators in succession, which produce pulses of constant width: 7/Z 205, 10/Z 205.

– 7/Z 205 HIGH. Through analog switch 1-2/Z 207, 7/Z 208 is also HIGH (sample phase of the voltage on RC network R 240/C 220).

LOW. Through analog switch 1-2/Z 207, 7/Z 208 is also LOW (hold phase of the voltage on RC network R 240/C 220).

The analog switch 1-2/Z 207 is controlled from pin 13/Z 207. It opens during Stop and closes during Start.

– 10/Z 205 HIGH. Analog switch 10-11/Z 207 is closed. Approx. 12 V lie on RC network R 240/C 220.

LOW. Analog switch 10-11/Z 207 is open, the RC network R 240/C 220 discharges.

– Z 207/Z 208 function as a sample and hold stage. The voltage on the RC network is transferred to C 217 during the sample phase and conducted to output 5/Z 208, where it is held constant, during the hold phase.

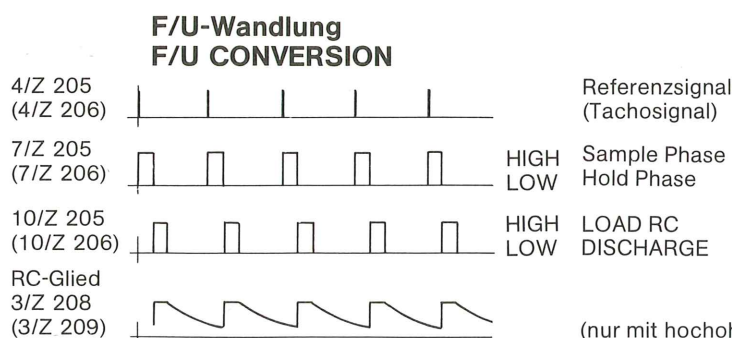
A voltage which is dependent on the frequency of the reference signal appears at output 5/Z 208.

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 207 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 243 "sym. τ ". Identical time constants for f/u Converters are adjusted with R 243.



(nur mit hochohmigem, kapazitätsarmem Tastkopf meßbar).

(measurable only with a high impedance, low-capacitance probe).

SUMMENPUNKT

Die Differenz der Signale aus den f/u-Konvertern liegt am Ausgang 7/Z 210. An 2/Z 211 wird dann die Summe mit dem Regelsignal aus der PLL-Schaltung gebildet. T 203 sperrt bei Stop und leitet bei Start.

STILLSTANDSKOMPARATOR 1/Z 210

Bei Start liegt an 1/Z 210 eine Spannung von ca. -15 V. Wird Stop gedrückt, bleibt die Spannung erhalten, solange bis an 5/Z 209 ein bestimmter Spannungswert (ca. 1,5 V) unterschritten wird. Der Komparator springt auf ca. +15 V. Mit diesem Signal wird der f/u-Wandler für das Tachosignal abgeschaltet.

REGELSIGNAL

An 14/Z 211 steht das Regelsignal zur Verfügung.

MOTORSTROMBEGRENZUNG

Mit 7/Z 211 wird eine Motorstrombegrenzung geschaltet. Wird beispielsweise der Plattenteller von Hand festgehalten, lädt sich C 214 auf bis zum Überschreiten der Schwellwertspannung ca. 10 V. Ausgang 7/Z 211 springt auf ca. -15 V. Das GATE Potential von T 202 sinkt auf ca. 0 V, T 202 leitet. Damit wird das Regelsignal auf ca. 3 V begrenzt.

VORWÄRTS-/RÜCKWÄRTS-ERKENNUNG

Die Vorwärts-/Rückwärts-Erkennung verhindert ein unkontrolliertes Beschleunigen des Plattentellers entgegen der eingestellten Drehrichtung. Das geschieht mit den zwei gleich aufgebauten Tachogeneratoren, die durch mechanische Anordnung um 90° phasenverschoben sind.

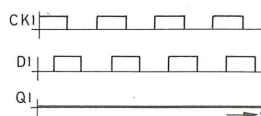
Funktion:

Tachosignal (nach Rechteckwandlung) an D 1 5/Z 213.

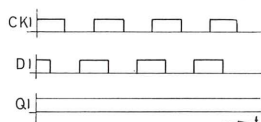
Tachohilfssignal (nach Rechteckwandlung) an Ck 1 3/Z 213.

a) Normalfall: Start gedrückt, Plattenteller dreht vorwärts.

Q 1 1/Z 213 bleibt LOW.



b) Start gedrückt, Plattenteller dreht rückwärts, durch Cue von Hand.



Q 1 1/Z 213 wird HIGH. An 3/Z 211 liegt ca. +15 V, der Plattenteller wird gebremst mit Hilfe des Regelsignals, bis er steht und in die gewünschte Richtung läuft.

SUMMING POINT

The difference of the signal from the f/u converters appears at output 7/Z 210 and is summed at 2/Z 210 with the control signal from the PLL circuit. T 203 is cutoff during Stop and conducts during Start.

STANDSTILL COMPARATOR 1/Z 210

A voltage of approx. -15 V lies at 1/Z 210. When Stop is pressed, the voltage remains at this level until the voltage at 5/Z 209 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.

CONTROL SIGNAL

The control signal is produced at 14/Z 211.

MOTOR CURRENT LIMITING

Motor current limiting is accomplished with 7/Z 211. If for instance, the turntable platter is held by hand, C 214 is charged to a level above the threshold voltage of approx. 10 V. Output 7/Z 211 jumps to approx. -15 V, the gate potential of T 202 sinks to approx. 0 V, T 202 conducts. The control signal is thereby limited to approx. 3 V.

FORWARD/REVERSE IDENTIFICATION

The forward/reverse identification prevents uncontrolled acceleration of the turntable platter opposite to the selected direction. This function is implemented with two identically constructed tachometer generators, the phases of which differ by 90° by reason of their physical location.

Funktion:

Tachometer signal (after conversion into square wave) at D 1 5/Z 213.

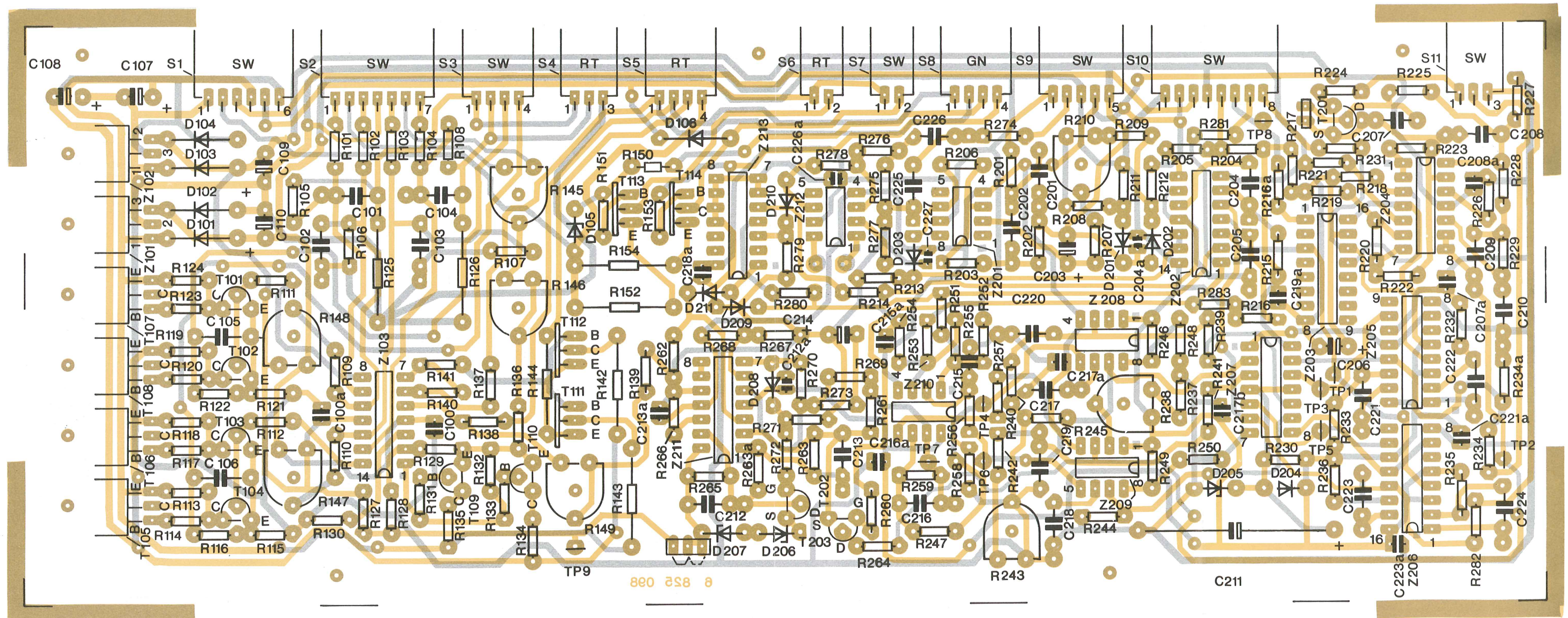
Auxiliary tachometer signal (after conversion into square wave) at Ck 1 3/Z 213.

a) Normal case: Start pressed, platter rotates forward.

Q 1 1/Z 213 remains LOW.

b) Start pressed. Platter is rotated backwards by hand during cueing.

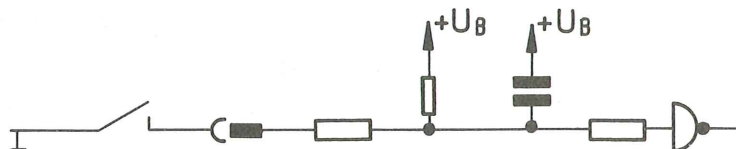
Q 1 1/Z 213 becomes HIGH. Approx. +15 V lie at 1/Z 211, braking of the platter is caused by means of the speed control signal until the platter stops and then rotates in a forward direction.



EMT 938 Regelplatine
SPEED CONTROL BOARD
7 825 097

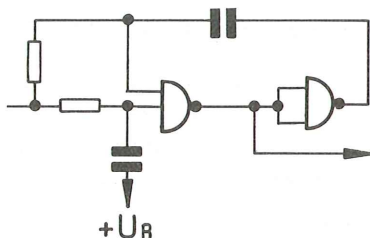
Die von den Drucktasten, Schaltern und der Fernbedienung ankommenden Befehle werden in die erforderlichen Signale für die Steuerelektronik umgewandelt. Alle Anschlüsse werden aktiv bei LOW, d.h. Verbindung mit Masse. Offene Anschlüsse werden durch Pull-up-Widerstände auf HIGH gezogen.

The commands arriving from the 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.



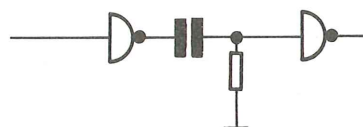
Durch Differenzierglieder (RC-Kombinationen) und durch Rückkopplung zweier NAND-Gatter wird erreicht, daß die Befehle Start, Stop, Lift nur im Schalt Augenblick kurze Impulse auslösen, die in Flip Flops die nötigen Steuersignale für die Steuerelektronik erzeugen. Jeweils der zuletzt betätigte Befehl, nicht etwa eine dauernd gedrückte Taste, wird berücksichtigt.

By means of differentiation networks (RC combinations) and of feedback of two NAND gates, the Start, Stop, 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.



START/STOP FLIP FLOP

Ausgang Q 8/Z 908 HIGH: Maschine startet
LOW: Maschine stoppt



START/STOP FLIP FLOP

Output Q 8/Z 908 HIGH: the unit starts
LOW: the unit stops

START/STOP ÜBER CLOCK-EINGANG 3/Z 908

Signal an Clock-Eingang wird ausgelöst durch Start-/Stop-Taste bei Lokalbedienung und Fernbedienung. Durch Betätigen ändert Ausgang Q 1/Z 908 seinen logischen Zustand.

START/STOP THROUGH CLOCK INPUT 3/Z 908

The signal at the clock input is initiated by the Start/Stop button in the local and in the remote mode. The logic state of output Q 1/Z 908 is changed upon actuation.

START ÜBER SET-EINGANG 6/Z 908

Ausgelöst wird das Signal über den Fader-Start-/Stop-Schalter (Fernbedienung). 6/Z 908 wird kurzzeitig HIGH und damit 1/Z 908. 4/Z 908 bleibt LOW.

START THROUGH SET INPUT 6/Z 908

The signal is initiated by the Fader Start/Stop switch (Remote Control). 6/Z 908 momentarily becomes HIGH and thus 1/Z 908. 4/Z 908 remains LOW.

STOP ÜBER RESET 4/Z 908

Ausgelöst wird das Signal über den Fader-Start-/Stop-Schalter (Fernbedienung). 4/Z 908 wird kurzzeitig HIGH und 1/Z 908 wird LOW. 6/Z 908 bleibt LOW.

STOP THROUGH RESET 4/Z 908

The signal is initiated by the Fader Start/Stop switch (Remote Control). 4/Z 908 momentarily becomes HIGH and 1/Z 908 becomes LOW. 6/Z 908 remains LOW.

LIFT FLIP FLOP

Betätigen der Taste Lift löst einen Steuersprung am Clock-Eingang 11/Z 908 aus. Q und $\bar{Q}$ wechseln ihren logischen Zustand.

LIFT FLIPFLOP

Actuating the Lift button causes a jump in the control signal at clock input 11/Z 908. The logic states of Q and $\bar{Q}$ change with each actuation.

BREMSE

Die Bremsspule ist zwischen den Anschlüssen S7/1 und S7/2 der Regelplatine (Speed Control) angeschlossen.

Leitet T 114 (auf Regelplatine), fließt durch die Bremsspule ein Strom. Die Bremse zieht an. Sperrt T 114, öffnet die Bremse.

Die Bremse zieht in zwei Stufen an.

Beispiel:

Der Plattenteller dreht, Stop wird gedrückt.

- Ausgang 3 und 4/Z 910 springt von LOW auf HIGH. Ausgänge 10 und 11/Z 910 bleiben LOW. Der Kondensator C 926 lädt auf, die Basis des Transistors T 114 wird leicht positiv. T 114 beginnt zu leiten, die Bremse zieht leicht an.
- Bei der Drehzahl 0 springen 10 und 11/Z 910 ebenfalls auf HIGH, der Transistor T 114 steuert weiter durch, und volle Bremskraft wird wirksam.

STUMMSCHALTUNG WÄHREND DER START- UND STOP-PHASE

Während der Start- und Stop-Phase sind die Line-Ausgänge stummgeschaltet. Um ein besseres Hochlaufverhalten zu erhalten, ist in dieser Zeit C 207 auf der Reglerplatine kurzgeschlossen.

Signale:

J1/1 Mute: –15 V sonst 0 V

J1/2 Mute: 0 V, sonst –15 V

Die Stummschaltung wird ausgelöst bei

- Drücken der Taste Stop, d.h. 2/Z 908 HIGH

oder

- zu großem Unterschied im Phasenwinkel zwischen Tachosignal und Referenzsignal. Dieses Signal wird aus dem Signal Pulsphase gewonnen.

LED-SYNC-ANZEIGE

Das Mute-Signal an J 1/2 wird zur Steuerung der LED Sync-Anzeige verwendet. Dazu ist es an die Basis von T 301 (auf der Platine 7 938 054 SYNC) geführt. Die LED am Plattentellerrand leuchtet also bei Übereinstimmung der Phase von Tacho und Referenzsignal.

VCO (VARIO)

Z 905 arbeitet als VCO (Voltage Controlled Oscillator). Je höher die Spannung an J6/2, desto höher die Frequenz am Ausgang 3/Z 905. Z 906 mit Ausgang 1 arbeitet als Impedanzwandler. Am Ausgang 3/Z 905 liegen Rechteckimpulse. Z 905 wird aktiviert durch LOW an J5/7; gleichzeitig wird der Quarz durch LOW an 5/Z 901 abgeschaltet.

BRAKE

The brake coil is connected between pins S7/1 and S7/2 of the Speed Control board.

When T 114 (on Speed Control board) conducts, a current flows through the brake coil. The brake engages. When T 114 is cut off, the brake is released.

The Brake is engaged in two stages.

Example:

The Platter turns, Stop is pressed.

- Output 3 and 4/Z 910 jumps from LOW to HIGH. Outputs 10 and 11/Z 910 remain LOW. Capacitor C 926 charges, the base of transistor T 114 becomes slightly positive. T 114 begins to conduct, the brake is slightly engaged.
- At zero rotational speed, 10 and 11/Z 910 also jumps to HIGH, T 114 is conducting, the full braking force is applied.

MUTING DURING START AND STOP PHASES

During the Start and Stop phases, the line outputs are muted. In order to improve run-up performances, C 207 (on the Speed Control board) is shorted during this interval.

Signals:

J1/1 mute: –15 V otherwise 0 V

J1/2 mute: 0 V otherwise –15 V

The muting function is initiated when

- the Stop button is pressed, i.e. 2/Z 908 HIGH

or

- an excessive phase-angle difference exists between the tachometer signal and reference signal. This signal is derived from the Pulsphase signal.

LED SYNC INDICATOR

Muting Signal J 1/2 is used for driving the SYNC Indicator LED. It is fed to the base of T 301 (on the SYNC board 7 938 054). The LED at the rim of the turntable therefore illuminates when the tachometer signal is in phase with the reference signal.

VCO (VARIO)

Z 905 functions as a VCO (Voltage Controlled Oscillator). The higher the voltage at J6/2 the higher the frequency at output 3/Z 905. Z 906 (output 1) performs impedance transformation. Squarewave pulses appear at output 3/Z 905. Z 905 is activated by LOW at J5/7; the quartz is switched off simultaneously by LOW at 5/Z 901.

QUARZ-OSZILLATOR

An 10/Z 904 liegt das Signal vom Quarz-Oszillator. $f = 3,93216$ MHz. (Achtung: Messungen an diesem Punkt können den Oszillator geringfügig verstimmen.) An TP 1 ist diese Frequenz auf 1,966 MHz heruntergeteilt.

FREQUENZTEILER

Z 902 und Z 903 sind als programmierbare Frequenzteiler geschaltet. Mit ihnen wird das Signal vom Quarz-Oszillator, bzw. bei Variobetrieb das Signal vom VCO, auf feste Werte heruntergeteilt, die die Drehgeschwindigkeit des Plattentellers bestimmen. An 12/Z 902 steht das Referenzsignal für die Regelplatte zur Verfügung. Das Teilverhältnis wird durch logische Pegel an Anschluß 10 und 11/Z 901 bestimmt.

Drehzahl: 33 45 78 min^{-1}

10/Z 901: HIGH LOW HIGH

11/Z 901: LOW LOW HIGH

Referenzsignal an J2/8 (Nadelimpulse):

$f_{33} = 284,2$ Hz

$f_{45} = 384$ Hz

$f_{78} = 334$ Hz

EINSTELLUNGEN

R 913 "VARIO ADJUST"

- Auf Variobetrieb schalten (J5/7 LOW).
- Vario-Potentiometer in Mittelstellung.
- Mit R 913 "Vario adj." $f = 7,68$ kHz an 3/Z 905 einstellen.

QUARTZ OSCILLATOR

The signal from the quartz oscillator appears at 10/Z 904. $f = 3.93216$ MHz. (Note: measurements at this point can slightly detune the oscillator.) This frequency is divided down to 1.966 MHz at TP 1.

FREQUENCY DIVIDER

Z 902 and Z 903 are connected as programmable frequency dividers. The signal from the quartz oscillator, or during Vario operation, the signal from the VCO is divided down to fixed values which determine the rotational speed of the turntable platter. The reference signal for the Speed Control Board appears at 12/Z 902. The divisor is determined by logic levels at pins 10 and 11/Z 901.

Speed: 33 45 78 min^{-1}

10/Z 901: HIGH LOW HIGH

11/Z 901: LOW LOW HIGH

Reference signal (needle pulses):

$f_{33} = 284,2$ Hz

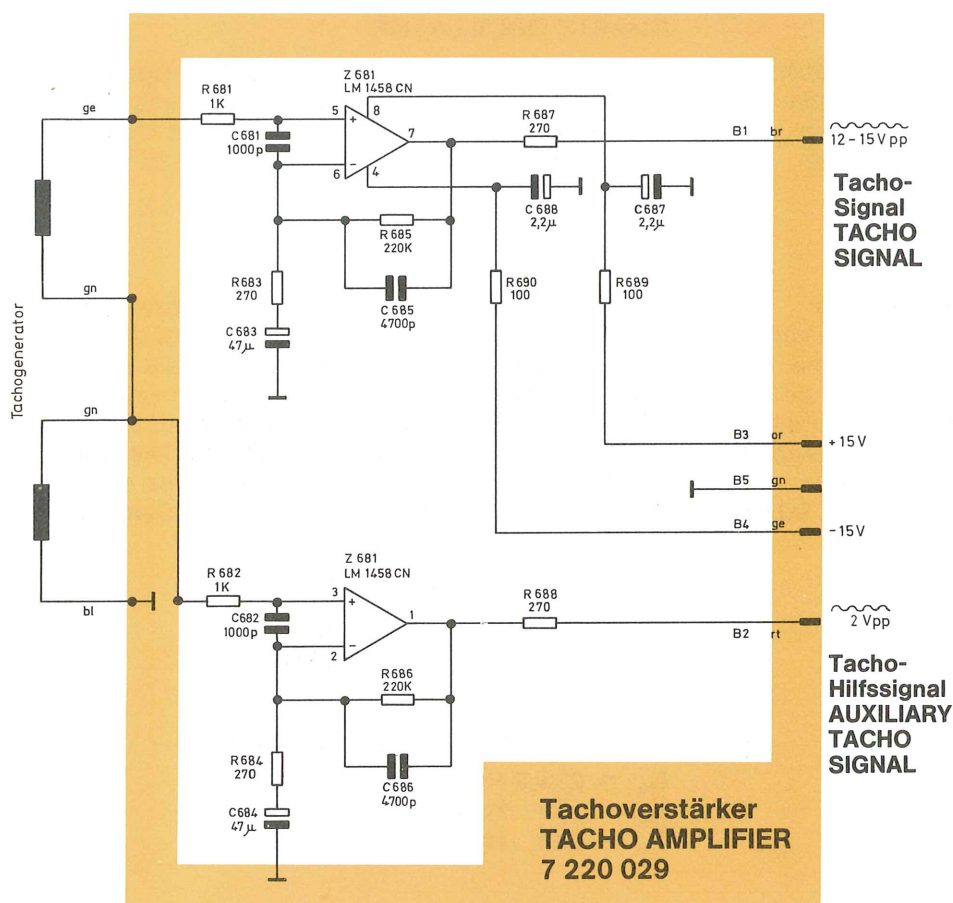
$f_{45} = 384$ Hz

$f_{78} = 334$ Hz

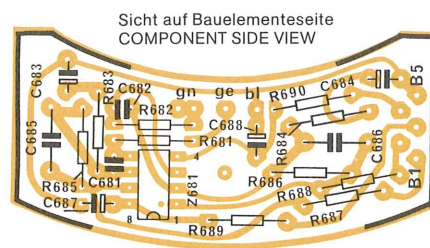
ADJUSTMENTS

R 913 "VARIO ADJUST"

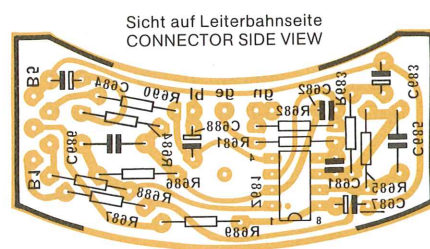
- Activate Vario (J5/7 LOW).
- Set Vario potentiometer into center position.
- Adjust R 913 "Vario adj." to $f = 7.68$ kHz at 3/Z 905.



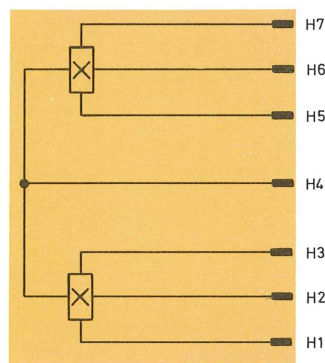
MOTOR 9220001



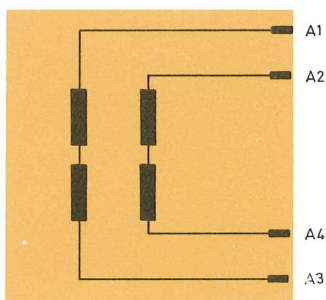
EMT 938 Tachoverstärker TACHO AMPLIFIER



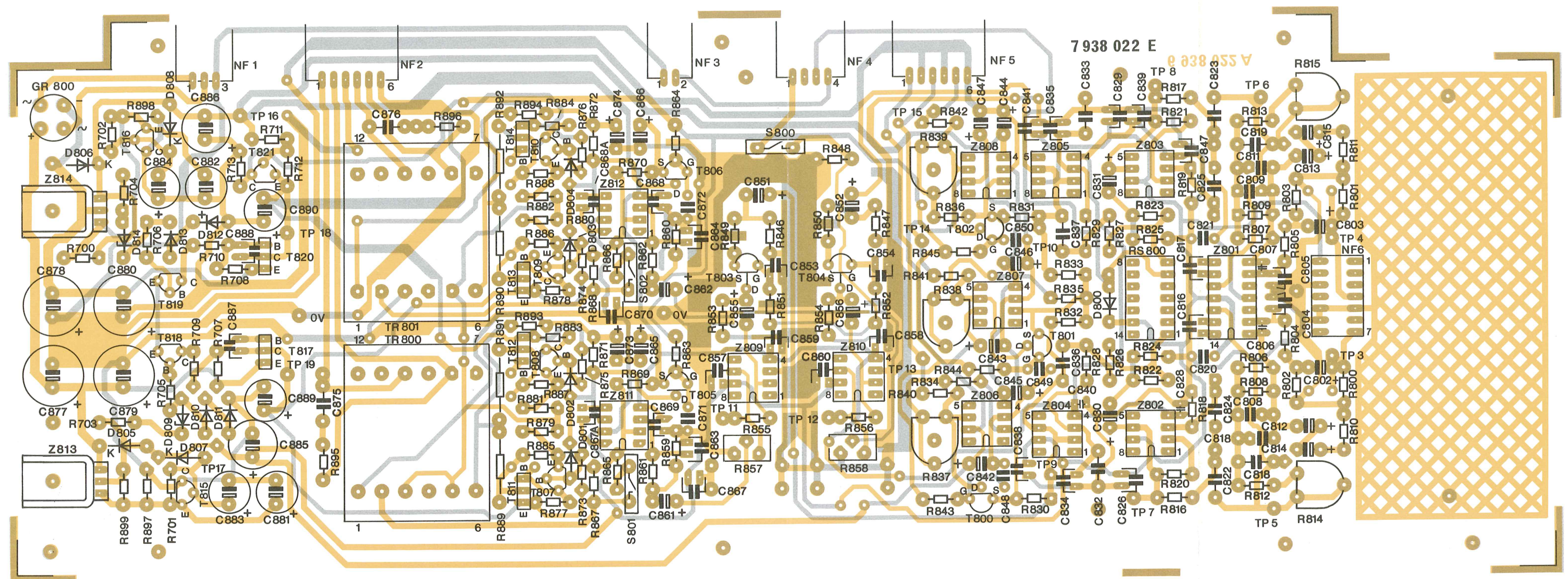
EMT 938 MOTOR



**Anschlüsse
Hallgeneratoren
HALL ELEMENTS
CONNECTIONS**



**Anschlüsse
Motorwicklungen
MOTOR COILS
CONNECTIONS**



EMT 938 NF-Platine
AMPLIFIER BOARD
7938022

ZEITKONSTANTEN

Im Rückkopplungsweig des Eingangsverstärkers werden die Zeitkonstanten für die Entzerrung gebildet (75/318/3180 μ s).

Mit R 814 (R 815) wird die Entzerrung in den Tiefen kalibriert. Die Einstellung sollte nicht verändert werden (–3 dB bei ca. 30 Hz).

HOCHPASS

Zusammen mit dem Hochpaß C 812, C 814 und R 810 (C 815, C 813, R 811) ergibt sich ein Abfall von ca. 20 dB/Oktave für Frequenzen unterhalb 30 Hz.

TIME CONSTANTS

The time constants for equalization are determined in the feedback loop of the input amplifier (75/318/3180 μ s).

The low-frequency equalization is calibrated with R 814 (R 815). This adjustment should not be changed (–3 dB at approx. 30 Hz).

HIGH PASS

Together with the High pass network C 812, C 814 and R 810 (C 815, C 813, R 811) a rolloff of approx. 20 dB/octave is produced for frequencies below 30 Hz.

TIEFPASS

Der 2polige Tiefpaß ergibt einen Abfall von ca. 12 dB/Oktave für Frequenzen oberhalb 25 kHz.

VORVERSTÄRKER

Der Vorverstärker wird benötigt bei Einsatz des dynamischen Tonabnehmers EMT TSD 15. Die Verstärkung beträgt + 17 dB (z.B. 1,4 mV $\rightarrow$ 10 mV).

AUSGANGSVERSTÄRKER

In der Endstufe des Verstärkers sind Dip-Fix-Schalter eingebaut, die eine Verstärkungsumschaltung erlauben. In der Stellung OFF (Schalter geöffnet) ist die Verstärkung um 10 dB höher.

LOW PASS

The two-pole Low-pass produces a rolloff of approx. 12 dB/octave for frequencies above 25 kHz.

PREAMPLIFIER

The preamplifier is employed if a EMT TSD 15 moving coil pickup cartridge is used. The amplification is + 17 dB (for example 1.4 mV $\rightarrow$ 10 mV).

OUTPUT AMPLIFIER

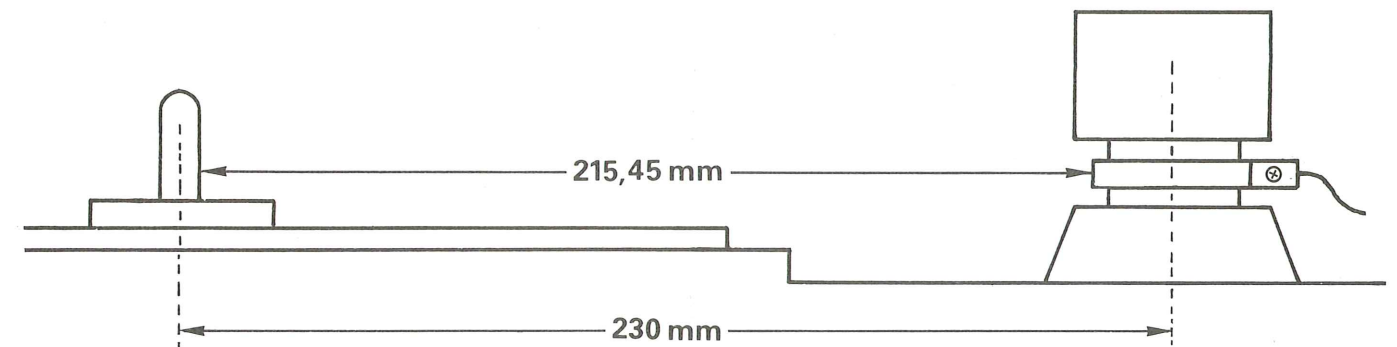
Dip-Fix switches are provided in the power amplifier in order to make a change of amplification possible. In the OFF position (switch open) the amplification is 10 dB higher.

Die mechanischen Einstellungen des Rundfunk-Plattenspieler sind einfach:

1. Bei Austausch des Motors oder des Tonarmbretts ist darauf zu achten, daß der Abstand zwischen Motorachse und Tonarmachse 230 mm beträgt. Diese Einstellung wird am schnellsten mit Hilfe des gezeichneten Maßes 215,45 mm gefunden.

The Broadcast Disk Reproducer is simple to adjust mechanically.

1. If a replacement motor or tone arm mounting board is installed, a distance of 230 mm must be set between the motor spindle and the tone arm shaft. This adjustment may be made most readily with reference to the distance of 215.45 mm shown in the diagram.



2. BREMSE

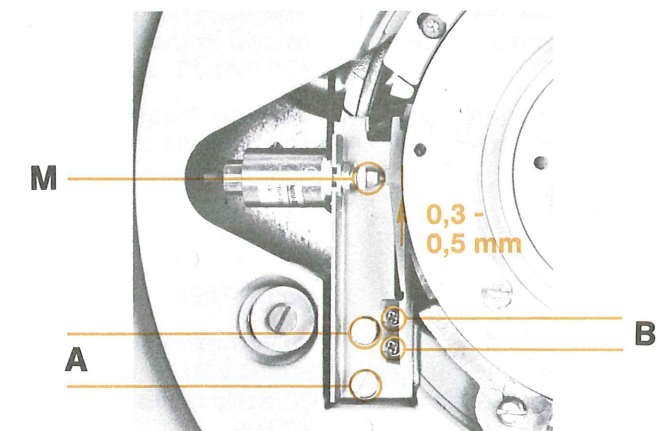
Die Bremse ist unter dem Plattenteller montiert. Sie ist so justiert, daß beim Lauf des Plattenspieler ein "paralleler" Abstand von ca. 0,3 - 0,5 mm zwischen Bremsbacke und Rotor des Motors vorhanden ist. Muß die Bremse neu eingestellt werden, ist wie folgt vorzugehen:

- Schrauben A lösen, Bremse herausnehmen.
- Mit der Mutter M einen möglichen Bremschub von ca. 2 mm einstellen, d.h. die Achse des Bremsmagneten hat ein mögliches Spiel von ca. 2 mm.
- Die Bremsbacke bei den Kreuzschlitzschrauben B auf die darunterliegende Blechkante ausrichten.
- Die gesamte Bremse jetzt so ausrichten, daß sich bei abgeschaltetem Plattenspieler ein "paralleler" Abstand von ca. 0,3 - 0,5 mm zwischen Bremsbacke und Rotor des Motors ergibt und die Schrauben A festziehen.

2. BRAKE

The brake is mounted underneath the turntable platter. It is adjusted so that a "parallel" separation of approx. 0.3 - 0.5 mm is present between the brake shoe and the rotor of the motor when the turntable is running. If necessary, the brake is to be readjusted as follows:

- Unscrew screws "A" and remove the brake.
- Adjust nut "M" to achieve a brake travel of approx. 2 mm, that is, the shaft of the brake should exhibit a free play of approx. 2 mm.
- Align the brake shoe at Philips screws "B" along the metal edge lying underneath.
- Align the entire brake assembly to achieve a "parallel" separation of approx. 0.3 - 0.5 mm between the brake shoe and the rotor of the motor when the mains power is turned off. Tighten screws "A".



3. MOTOR

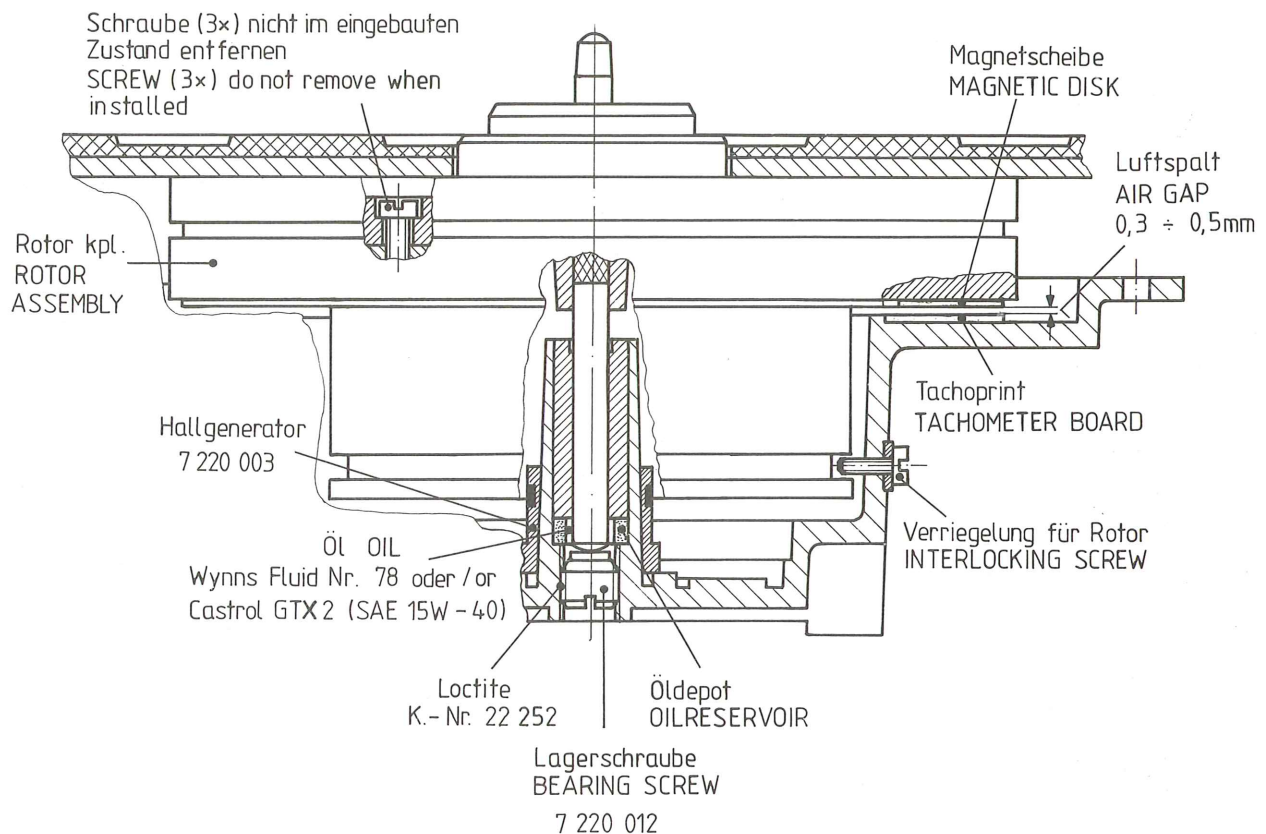
Der geregelte Gleichstrom-Motor hat eine Kommutierung durch Hallgeneratoren.

Die Prinzip-Skizze zeigt den Aufbau: Die durchgehende Rotorachse wird in einem Sinterlager geführt. Das kugelförmig ausgebildete Ende der Rotorachse läuft auf einer Lagerscheibe aus Nylatron.

3. MOTOR

The controlled DC motor employs Hall generator commutation.

The diagram illustrates the principle of construction. The rotor shaft extending through the unit is guided by a sintered bearing. The rounded end of the rotor shaft turns on a bearing disk made of Nylatron.



Die Laufhöhe des Rotors ist im Werk mit der unteren Lagerschraube (7 220 012) so eingestellt, daß sich zwischen der am Rotor befestigten Magnetscheibe und dem feststehenden Tachospulen-Print ein Luftspalt von 0.3 bis 0.5 mm ergibt.

Dadurch erhält man auch einen entsprechenden Pegel am Ausgang des Tachoverstärkers: 12 bis 13 V_{pp} bei 33 1/3 U/min.

Die Position dieser Lagerschraube (mit Loctite gedichtet) sollte im Normalfall nicht verändert werden!

Der Rotor des Motors ist durch eine Schraube, welche außen am Statorgehäuse neben der Motornummer sitzt, gegen Herausfallen gesichert.

Bei einer Inspektion des Rotors, bzw. der Achse ist nur diese eine Schraube (grüne Lacksicherung) einige Umdrehungen zu lösen. Dann kann die komplette Rotoreinheit nach oben abgezogen werden.

The running height of the rotor is adjusted at the factory with the lower bearing screw (7 220 012), resulting in an air gap of 0.3 to 0.5 mm between the magnetic disk secured to the rotor and the stationary board containing the tachometer coil.

In this manner, a corresponding voltage level is obtained at the amplifier output of 12 to 13 V_{pp} at 33-1/3 rpm.

The position of this bearing screw (secured with Loctite) should normally NOT be changed.

The rotor of the motor is protected from falling out by a screw on the stator housing, situated externally next to the motor number.

When the motor or shaft is to be inspected, only this one screw (sealed with green paint) should be loosened several turns. The complete rotor assembly may then be removed by pulling upwards.

VERSTÄRKER
Entzerrung

DIN, NAB, IEC

 75/318/3180 μ s

Frequenzgang

 40 Hz...15 kHz $\pm 0,5$ dB
 30 Hz ca. -3 dB
 unter 30 Hz ca. 20 dB/
 Oktave Abfall
 über 25 kHz ca. 12 dB/
 Oktave Abfall

Eingangsspannung

für EMT-T-Tondosen

 0,3...1,4 mV für dynami-
 sche Tonabnehmer (mit
 aktivem Impedanz-
 wandler $V = 17$ dB)

 für magn. Tonabneh-
 mersysteme
 ($R_i = 47$ kOhm)

2...10 mV

**Eingangs-Übersteue-
rungsgrenze**

20 dB über Nennpegel

**Ausgangs-Übersteue-
rungsgrenze**

10 V (+ 22 dB)

Ausgangsspannung

 einstellbar zwischen
 0 V und 10 V an 200 Ohm

Klirrfaktor

 30 Hz...12 kHz $\leq 0,2$ % bei
 4,4 V (+ 15 dB) an
 200 Ohm

Übersprechdämpfung

min. 50 dB, 30 Hz...15 kHz

**Fremdspannungsab-
stand effektiv**

min. 70 dB

**Geräuschspannungsab-
stand, CCIR 468-2**

min. 64 dB

**Kopfhörerausgang,
mono und stereo**

 unsymmetrisch,
 einstellbar

**Pegel bei einem Last-
widerstand 200 Ohm**

ca. 500...2000 mV

Monoschaltung

fernsteuerbar

AMPLIFIER
Equalization

DIN, NAB, IEC

 75/318/3180 μ s

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
 active impedance
 transformer; gain
 = 17 dB)

 for magnetic car-
 tridges

 ($R_i = 47$ kohms)

2 to 10 mV

**Overload margin of
the input**

 20 dB above
 nominal level

**Maximum output level
before clipping**

10 V (+ 22 dB)

Output voltage

 adjustable between
 0 V and 10 V on 200 ohms

Harmonic distortion

 max. 0.2 % between 30
 Hz and 12 kHz at 4.4 V
 (+ 15 dB) on 200 ohms

Crosstalk supression

min. 50 dB, 30 Hz to 15 kHz

**RMS S/N ratio,
unweighted**

min. 70 dB

**Peak S/N ratio,
weighted CCIR 468-2**

min. 64 dB

**Headphone output,
mono, stereo**

unbalanced, adjustable

**Level on a load of
200 ohms**

approx. 500 to 2000 mV

Mono switching

 operable by remote
 control

Technische Änderungen vorbehalten!

Subject to change without notice.

MENGE	BEST.-NR.	TYPEN BEZEICHNUNG	TYPES DESCRIPTION
QUANTITY	ORDER NO.		
1	9938 120/...	Rundfunk-Plattenspieler EMT 938 Tischmodell, Stereoverstärker 47 kOhm und T-Leergehäuse.	EMT 938 Broadcast Disk Reproducer, tabletop model, 47 kOhm stereo amplifier and empty pickup shell.
1	9938 110/...	Rundfunk-Plattenspieler EMT 938 Tischmodell, Stereoverstärker mit aktivem Impedanzwandler (Vorver- stärker), ohne Tonabnehmer.	EMT 938 Broadcast Disk Reproducer, tabletop model, stereo amplifier with active pre-preamplifiers without pickup cartridge.
	/...	gewünschte Netzspannung einsetzen.	indicate requested mains voltage.

TEILE-LISTE (in Lieferung enthalten)

PARTS LIST (supplied with machine)

MENGE	BEST.-NR.	BEZEICHNUNG	DESCRIPTION
QUANTITY	ORDER NO.		
1	9935 007	Tonabnehmerleergehäuse TSD-G (für 9938 120)	Pick-up cartridge shell TSD-G (for 9938 120)
1	7948 036	Plattenteller komplett	Turntable Platter, complete
1	6948 065	Gummiplatte	Rubber mat

ZUBEHÖR

ACCESSORIES

1	4203 154	Stecker, 6polig	Male plug, 6 pin
1	4203 134	Stecker, 14polig	Male plug, 14 pin
2	4204 062	Kupplungsbuchse, 3polig A3F	Female plug, 3 pin A3F
1	4240 579	Netzkabel mit Schuko-Stecker	Mains cable with Schuko-plug
1	4240 580	Netzkabel US-Ausführung	Mains cable with USA plug
1	4295 001	Inbus-Schlüssel, 2 mm	Allen key, 2 mm
1	4295 002	Inbus-Schlüssel, 3 mm	Allen key, 3 mm
1	6929 100	Tonarm-Höhenlehre	Tone arm height adjustment gauge
1	7948 100	Satz Sicherungen und Lampen	Set of fuses and lamps
3	4107 117	Glühlampe 12 V/0,08 A	Pilot lamp 12 V/0.08 A
2	4190 050	Sicherung, 1 AT/250 V USA	Fuse 1 A slow blow/250 V USA
2	4190 051	Sicherung, 0,5 AT/250 V USA	Fuse 0.5 slow blow/250 V USA
2	4190 005	Sicherung, 0,5 AT/250 V EUR	Fuse 0.5 A slow blow/250 V EUR
2	4190 103	Sicherung, 1,0 AT/250 V EUR	Fuse 1.0 A slow blow/250 V EUR
1	4191 069	Sicherungskappe EUR	Fuse cap EUR
1	4191 070	Sicherungskappe USA (davon eine Sicherung und eine Sicherungskappe als Netzsiche- rung eingebaut)	Fuse cap USA (one fuse and one fuse cap installed as mains fuse)
1	7929 055	Antiskating-Gewicht, verpackt	Antiskating weight, in bag
1	6929 016	Gegengewicht	Counterweight
1	6950 060	Stroboskopscheibe	Stroboscope disk

SONDERZUBEHÖR (getrennt zu bestellen)

SPECIAL ACCESSORIES (to be ordered separately)

1	7938 023	Vorverstärker zum Einbau dy- namischer Systeme TSD 15, TMD 15 oder TND 65	Preamplifier for pick-up cartridges TSD 15, TMD 15 or TND 65
1	9935 000	Tonabnehmer für Stereorillen TSD 15 (für 9938 110)	Pick-up cartridge, stereo TSD 15 (for 9938 110)
1	9935 001	Tonabnehmer für Mikrorillen TMD 25 (für 9938 110)	Pick-up cartridge, mono TMD 25 (for 9938 110)

1	9938 002	Tonabnehmer für Normalrillen TND 65 (für 9 938 110)	Pick-up cartridge, mono TND 65 (for 9 938 110)
1	9938 900	Schwenkhaube mit Lagerwinkel	Swing-open dust cover with support bracket
1	9938 903	Cue-Verstärker mit Lautsprecher in Gehäuse	Cue amplifier with loudspeaker in cabinet
1	9938 901	Satz Z-Winkel für versenkten Tischeinbau	Set Z-brackets for flush installation

Achtung!

Bei Ersatzteilbestellungen und Angebotsanfragen bitte neben der genauen Bezeichnung der Teile auch Gerätetyp und Werk-Nr. angeben.

Durch Produktverbesserungen an Geräten der laufenden Serien und Änderungen bestimmter Industrieteile ist es unvermeidbar, daß manche Teile nicht voll kompatibel sind.

Notice!

When ordering replacement parts or requesting price quotations, please specify the unit model and serial number as well as the exact part designation.

Due to product improvements made during the course of a manufacturing series and to changes in particular industrial components, the incompatibility of some parts cannot be avoided.

EMT 938 Empfohlene Ersatzteile/ Recommended Spare Parts

Die angegebenen Stückzahlen beziehen sich auf eine Laufzeit von 5 Jahren. Bruchzahlwerte geben an, daß wir nur ein Ersatzteil für mehrere gemeinsam betriebene Plattenspieler anzuschaffen empfehlen. Beispiel: 1/3 = 1 Ersatzteil für 3 Geräte.

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.

MENGE	BEST.-NR.	BEZEICHNUNG	DESCRIPTION
QUANTITY	ORDER NO.		
3	4 107 117	Glühlampe 12...15 V/0,08 A	Pilot lamp, 12 V/0.08 A
2	4 190 050	Sicherung 1 A/T 250 V USA	Fuse, 1 A slow-blow, 250 V USA
2	4 190 051	Sicherung 0,5 A/T 250 V USA	Fuse, 0.5 A slow-blow, 250 V USA
2	4 190 005	Sicherung 0,5 A/T 250 V EUR	Fuse, 0.5 A slow-blow, 250 V EUR
2	4 190 103	Sicherung 1 A/T 250 V EUR	Fuse, 1 A slow-blow, 250 V EUR
1/5	9 220 001	Motoraggregat kompl.	Motor assembly, complete
1/3	9938 010	Lift, komplett	Lift motor, complete
2	6832 070	Antriebsriemen für Tonarmlift	Drive belt for tone arm lift
1/5	9929 007	Tonarm stereo/mono komplett	Tone arm stereo/mono complete
1/5	7 938 020	Interface/Oscillator	Interface/Oscillator
1/5	7 825 097	Regelplatine	Speed Control
1/5	7 938 022	NF-Platine	Amplifier Board
1/5	7 938 024	Netzteil-Platine	Power Supply
1/5	7 938 023	Vorverstärker	Preamplifier
1	9938 900	Schwenkhaube (mit Lagerwinkel)	Swing-open dust cover with support

BEST.-NR. ORDER NO.	BEZEICHNUNG	DESCRIPTION
4 101 345	Transistor BD 139	Transistor BD 139
4 101 346	Transistor BD 140	Transistor BD 140
4 101 165	Diode 1N 4001	Diode 1N 4001
4 101 230	Diode 1N 4148	Diode 1N 4148
4 101 513	Z-Diode BZX 97 / C2V7	Z-Diode BZX 97 / C2V7
4 101 303	Z-Diode BZX 55 / C12	Z-Diode BZX 55 / C12
4 101 190	Z-Diode BZY 85 / C6V2	Z-Diode BZY 85 / C6V2
4 104 005	LED 5082-4650, rot	LED 5082-4650, red
4 104 006	LED 5082-4950, grün	LED 5082-4950, green
4 101 331	IC LM 301 AN 8pol.	IC LM 301 AN 8pol.
4 101 430	IC NE 555 V	IC NE 555 V
4 101 446	IC LM 324	IC LM 324
4 101 453	IC MC 78 M 20 CT/TO 220	IC MC 78 M 20 CT/TO 220
4 101 549	IC NE 5534 AN	IC NE 5534 AN
4 101 455	IC MC 79M15 CT/TO 220	IC MC 79M15 CT/TO 220
4 101 454	IC MC 78M15 CT/TO 220	IC MC 78M15 CT/TO 220
4 101 474	IC CD 4093	IC CD 4093
4 101 417	IC 14011	IC 14011
4 101 462	IC CD 4013/14 Anschlüsse	IC CD 4013/14 Pins
4 101 465	IC CD 4046	IC CD 4046
4 101 466	IC CD 4066	IC CD 4066
4 101 470	IC CD 4522	IC CD 4522
4 101 235	IC LM 748 C	IC LM 748 C
4 101 548	IC LM 317 T	IC LM 317 T
4 101 547	IC LM 337 T	IC LM 337 T
4 101 293	Transistor J111 (U 1898 E)	Transistor J111 (U 1898 E)
4 101 324	Transistor BC 547 A	Transistor BC 547 A
4 101 326	Transistor BC 557 A	Transistor BC 557 A
4 163 019	Gleichrichter B80C 3700/2200 SI	Rectifier B80C 3700/2200 SI
4 163 012	Gleichrichter B250 C800 SI	Rectifier B250 C800 SI
4 101 408	Z-Diode BZX 55/C 10	Z-Diode BZX 55/C 10
4 101 449	IC LM 394 H	IC LM 394 H
4 101 236	IC μ A 741 C	IC μ A 741 C
4 101 259	IC LM 1458 CN	IC LM 1458 CN
4 101 313	FET P 1087 E	FET P 1087 E
4 101 326	Transistor BC 557 A	Transistor BC 557 A
4 101 415	Diode 1N 4150	Diode 1N 4150
4 101 456	IC LM 392 N	IC LM 392 N
4 101 457	IC LF 398 N	IC LF 398 N
4 101 458	Transistor BD 203	Transistor BD 203
4 101 459	Transistor BD 204	Transistor BD 204
4 101 460	Transistor BD 677	Transistor BD 677
4 101 461	Transistor BC 517	Transistor BC 517
4 101 463	IC CD 4040	IC CD 4040
4 101 471	IC CD 4528	IC CD 4528
4 101 532	IC NE 5533 AN	IC NE 5533 AN
4 102 045	Quarz 3.93216 MHz	Quartz 3.93216 MHz
7 220 003	Hallgenerator, komplett	Hall Element, complete
7 929 003	Kontaktbuchse, komplett	Contact Assembly, complete
6 938 038	Pot. 10 kOhm POS LOG (Pegel)	Pot 10 kOhm POS LOG (LEVEL)
6 938 014	Drehzahl-Wahlschalter	Speed Selector
6 938 027	Netzschalter	Mains Switch
4 133 386	ELKO 470 μ F 40 V ST	ELKO 470 μ F 40 V ST
4 133 389	ELKO 220 μ F 40 V ST	ELKO 220 μ F 40 V ST
4 133 510	ELKO 4700 μ F 50 V	ELKO 4700 μ F 50 V

BEST.-NR.	BEZEICHNUNG	DESCRIPTION
ORDER NO.		
4 150 069	Ausgangsübertrager	Output Transformer
4 150 075	Ringkern-Netztrafo	Ring Power Transformer
4 225 024	G-Strom-Motor 6,8 V (Lift)	DC-Motor 6.8 V (LIFT)
7 948 028	Bremsbackenhalter, komplett	Brake Shoe Holder, complete
6 832 070	Antriebsriemen für Tonarmlift	Drive Belt f. Tone Arm Lift
4 220 073	G-Stromrelais 15 V (mono)	DC-Relay 15 V (mono)
7 938 060	Hubmagnet Bremse, komplett	Solenoid f. Brake, complete
4 321 075	Druckfeder (Taste)	Pressure Spring (Push button)
6 832 007	H-Feder (Taste)	Contact Leaf, H, (Push button)
4 107 026	Lampenfassung, komplett	Lamp Holder, complete
4 107 117	Glühlampe 12 V/0,08 A	Pilot Lamp 12 V/0.08 A
4 190 051	Sicherung 0,5 AT/220 V USA	Fuse 0.5 AT/220 V USA
7 220 012	Lagerschraube, komplett (Motor)	Bearing Screw, complete (Motor)
BAUGRUPPEN		ASSEMBLIES
9 220 001	Motor Aggregat, komplett	Motor Assembly, complete
9 929 005	Tonarm stereo/mono (929/950)	Tone arm stereo/mono (929/950)
7 938 010	Lift, komplett	Lift, complete
7 825 009	Bremse	Brake
7 938 020	Interface-Oszillator-Platine	Interface Oscillator Board
7 825 097	Regel-Platine	Speed Control Board
7 938 022	Verstärker-Print, stereo	Stereo Amplifier Board
7 938 024	Netzteil-Platine	Power Supply Board
7 220 029	Tacho-Verstärker	Tacho Amplifier
7 938 023	Vorverstärker stereo für TSD	Stereo Pre-Amplifier for TSD

