

C 901

# Dual

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# C 901

No. 37 000 and subsequent Nos.

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## Service Manual

Dual Gebrüder Steidinger · 7742 St. Georgen/Schwarzwald

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| <b>Technical data</b>                                                                                                       |                                |
| The Dual C 901 meets or surpasses the requirements of DIN (German Industry Standard) 45 500 for HiFi home studio equipment. |                                |
| <b>Tape speed</b>                                                                                                           | 1.875 ips                      |
| <b>Deviation from correct speed</b>                                                                                         | < 1 %                          |
| <b>Wow and Flutter</b>                                                                                                      |                                |
| Measured according to DIN 45 507                                                                                            | < 0.12 %                       |
| Weighted R.M.S.                                                                                                             | < 0.09 %                       |
| <b>Frequency response</b> (according to DIN 45 500)                                                                         |                                |
| With Standard (STD) tape                                                                                                    | 30 - 14,000 Hz                 |
| With Chromium dioxide (CrO <sub>2</sub> ) tape                                                                              | 30 - 16,000 Hz                 |
| <b>Dynamic range</b>                                                                                                        |                                |
| Measured according to IEC, curve A                                                                                          | > 51 dB                        |
| With *Dolby system                                                                                                          | > 60 dB                        |
| <b>Harmonic Distortion</b>                                                                                                  | < 2 % at 333 Hz 0 dB VU        |
| <b>Oscillator frequency</b>                                                                                                 | 85 kHz, push-pull oscillator   |
| <b>Erasure</b>                                                                                                              |                                |
| STD                                                                                                                         | > 70 dB                        |
| CrO <sub>2</sub>                                                                                                            | > 65 dB                        |
| <b>Channel separation</b>                                                                                                   |                                |
| in opposite direction                                                                                                       | > 60 dB                        |
| between stereo channels                                                                                                     | > 30 dB                        |
| <b>Inputs</b>                                                                                                               |                                |
| Radio (DIN jack)                                                                                                            | 1.8 mV into 20 kohm            |
| (RCA jack)                                                                                                                  | 60 mV                          |
| Microphone                                                                                                                  | 0.22 mV                        |
| <b>Outputs</b>                                                                                                              |                                |
| Radio (DIN jack)                                                                                                            | 0.75 V                         |
| (RCA jack)                                                                                                                  | 0.75 V                         |
| Headphones (designed for approx-400 ohms impedance)                                                                         |                                |
| <b>Fast-wind time</b>                                                                                                       | 58 seconds for C 60 Cassette   |
| <b>Semiconductor Complement</b>                                                                                             |                                |
|                                                                                                                             | 4 IC's, 3 FET's                |
|                                                                                                                             | 32 transistors                 |
|                                                                                                                             | 1 photodarlington              |
|                                                                                                                             | 38 diodes                      |
| <b>Line voltage</b>                                                                                                         | 110 - 117, 220 - 240 V         |
| <b>Line frequency</b>                                                                                                       | Adaptable to 50 or 60 Hz       |
| <b>Dimensions</b>                                                                                                           | 420 x 122 x 281 mm (W x H x D) |
| <b>Weight</b>                                                                                                               | Approx. 6.5 kg                 |
| * Dolby is a registered trade mark of DOLBY Laboratories Inc.                                                               |                                |



# Mechanical Part

Fig. 1

## 1. Dismounting and mounting

Pull out power plug. Remove mounting plate from the bottom of the cabinet. Release pull-relief of power cable by removing the securing wedge. (Fig. 1)

After detaching the two covers (7) from the cover plate (2) the wood screws underneath should be removed. (Fig. 2) Then raise left-hand side of chassis slightly (looking at the unit from the front) and pull to the left, lift chassis out upwards. When mounting proceed in reverse order.

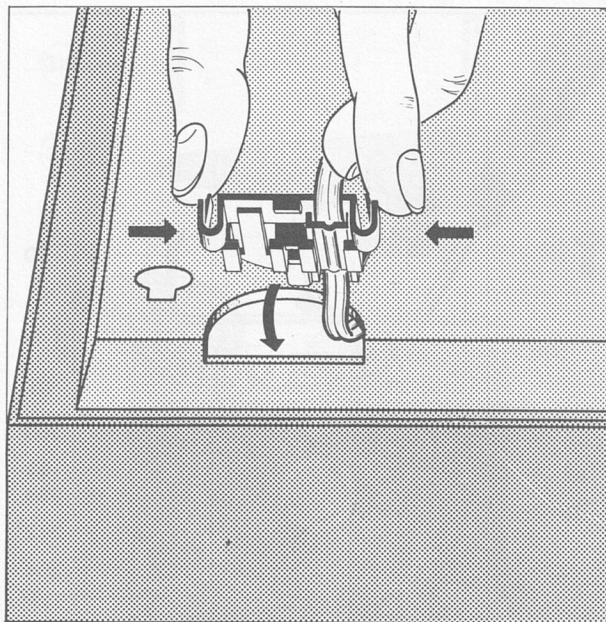
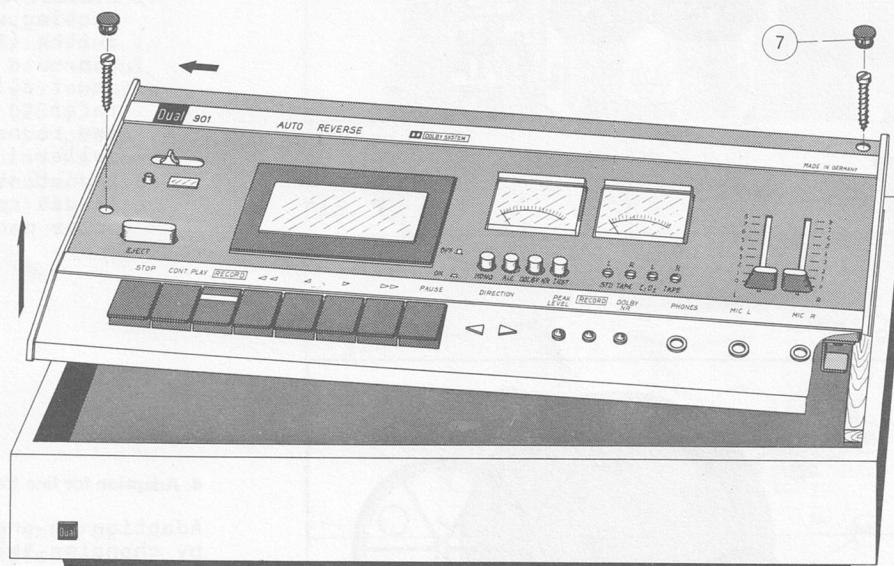


Fig. 2



## 2. Removal of front panel and cover plate

To remove the cover plate (Fig. 3) detach the two slide knobs (191/204) and remove the following parts:

- The two hexagon head self-tapping screws (37) on the back
- The two oval-head screws (5) on the front
- The two fillister head cap screws (35) and the two retainer straps (34).

In addition the two fillister head cap screws (25) should be loosened and the two clamps (24) pushed back.

Flip up the VU meter (188) and open the cassette holder (16). Detach front panel (11) and cover plate (2). Carry out mounting in reverse order, ensure that the slider (S) for STD/CrO<sub>2</sub> bias switching engages with switch lever (61).

Fig. 3

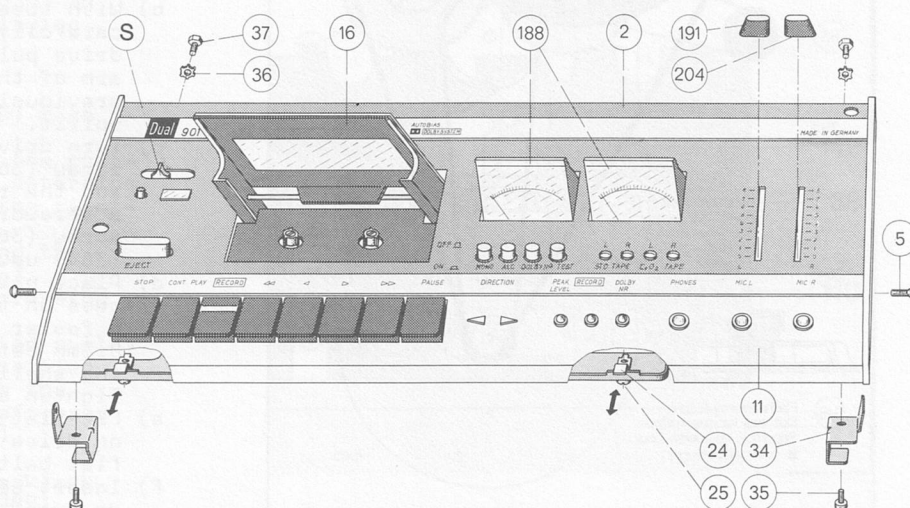
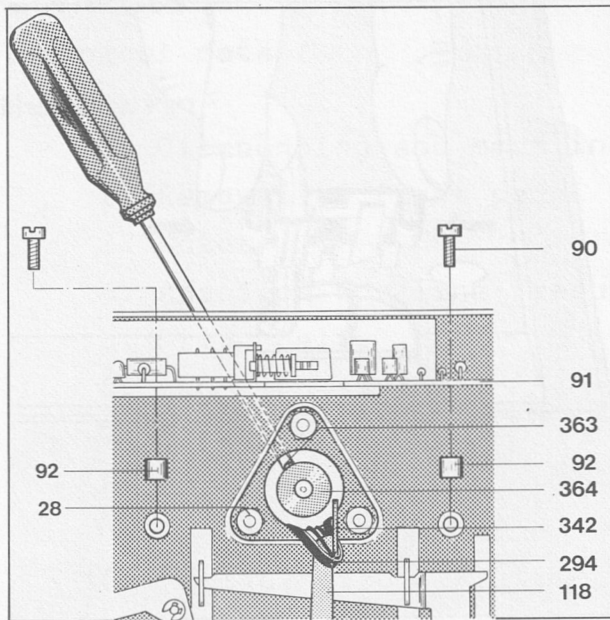


Fig. 4



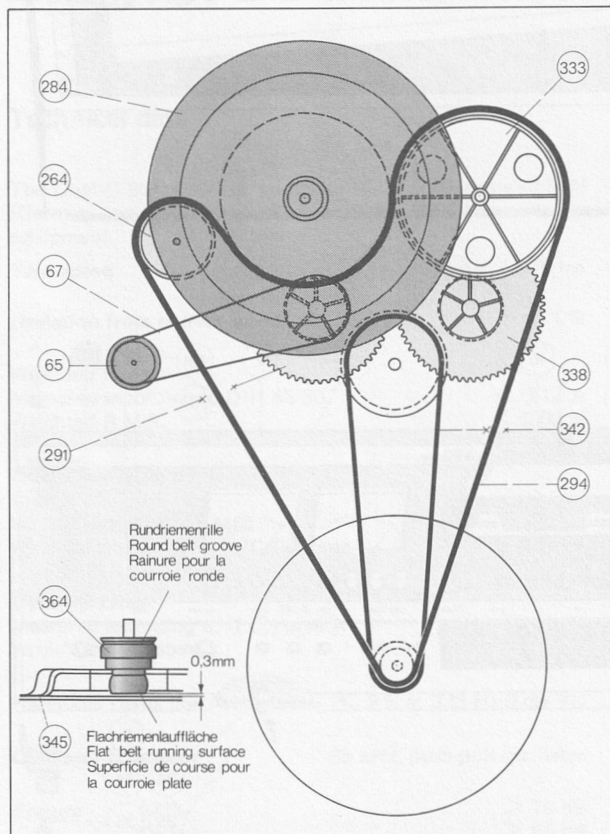
### 3. Motor

When the motor (345) is changed first of all remove the stranded connecting wires from the power switch (274). Then remove the two fillister head cap screws (90) and tilt the power supply board (91) to the rear. Note the two spacing rollers (92). With tweezers and a small wire hook carefully detach the two belts from the drive pulley (364) and engage over the arm of feeler bar (118) which has previously been cleaned with methylated spirit. Remove the hexagon nuts (28) and withdraw motor (345). When installing the motor (345) proceed as follows:

- Place drive pulley (364) on the motor spindle. (Round belt recess on top). With the aid of a feeler gauge set clearance of approx. 0.3 mm between drive pulley (364) and top bearing shell. Tighten set screw (363).
- Solder leak resistor (362) onto these soldering lug (357) on the motor. Then push the other end of the leak resistor provided with an eyelet onto the motor mounting opposite the soldering lug. Push washers (365) on to the 2 free motor mountings.
- Install motor so that the stranded connecting wires are opposite the power switch (274), then secure with hexagon nuts (28). Connect motor to the power switch. For connection diagramm refer to Fig. 19. Fit flat belt (294) and round belt (342) on to the drive pulley.

Important - do not twist flat belt! Insert spacer bushes (92) and screw power pack (91) in position.

Fig. 5



### 4. Adaption for line frequency

Adaption to another line frequency is done by changing the drive pulley (364). Drive pulley for 50 Hz = Part.No. 226 812. Drive pulley for 60 Hz = Part.No. 226 813.

- Remove fillister head cap screws (90) and tilt powerpack board (91) to the rear. Note the two spacing rollers (92).
- With tweezers and a small wire hook carefully remove the two belts from the drive pulley and engage them over the arm of the feeler bar (118) which has previously been cleaned with methylated spirit.
- Turn drive pulley (364) so that the set screw (363) is between line transformer and the rear motor mounting. Then with a screwdriver (2mm x 0.4 mm) slacken set screw (363) and detach the drive pulley (364) upwards.
- Place new drive pulley (round belt recess on top) on the motor spindle. With a feeler gauge set a clearance of approx. 0.3mm between drive pulley and top bearing shell (366) (unit in normal position). Tighten set screw (363) of drive pulley.
- Fit flat belt (294) and round belt (342) on drive pulley. Note - do not twist flat belt.
- Insert spacer bushes (92) and screw power supply unit (91) in position.



## 5. Drive belts

To change defective belts proceed as follows:

Stand unit up.

Remove fillister head cap screw (314) and two studs (315). Detach bottom board (313). Raise coupling unit (341) slightly, then withdraw towards motor. Now the round belt (342) for take-up can be changed.

To change the main belt (294) or the counter belt (67) the large flywheel (284) should be withdrawn from the bearing bush.

**Important** - the polythene washer (39) on the top of the unit will drop out. Detach main belt (294) and counter belt (67).

The new belts are best mounted in the following sequence:

Insert counter belt (67) between the two winding gears, then fit on the drive pulley of the counter (65).

Afterwards fit main belt (294) first of all and then the round belt (342) for take-up on drive pulley (364). Fit main belt on the guide pulley (264) and on the small flywheel (333). When doing so pass the main belt (294) between the guide pulley (264) and the small flywheel (333) towards the motor so that it is possible to insert the large flywheel (284). Ensure that the main belt is not twisted and that the belts are fitted on the correct drive steps.

Further mounting should be carried out in reverse order to dismounting. Be careful to refit the polythene washer (39) on the spindle of the large flywheel (284).

After mounting it is advisable to press the rapid forward or reverse wind key and clean the capstan and the drive belt with a cloth soaked in methylated spirit.

Fig. 6

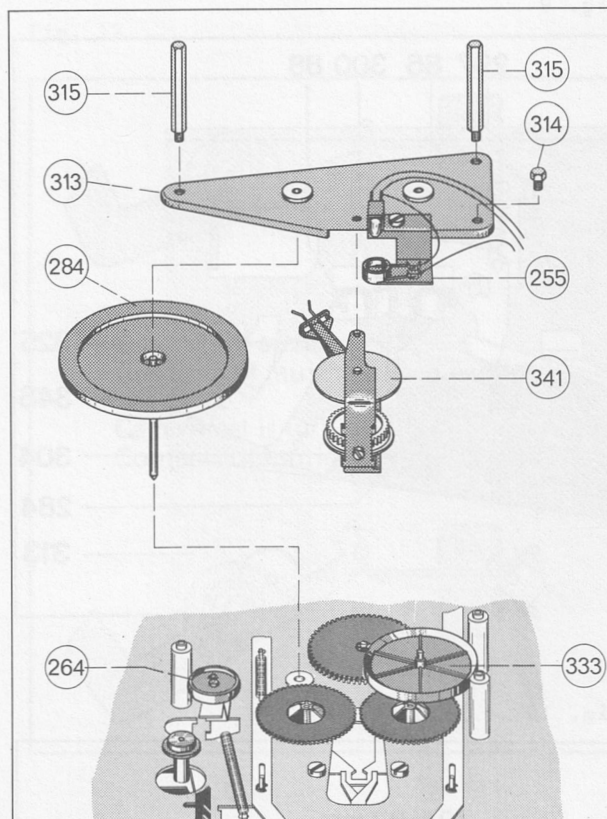


Fig. 7

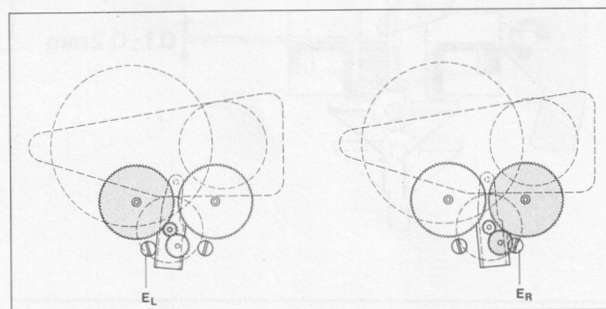
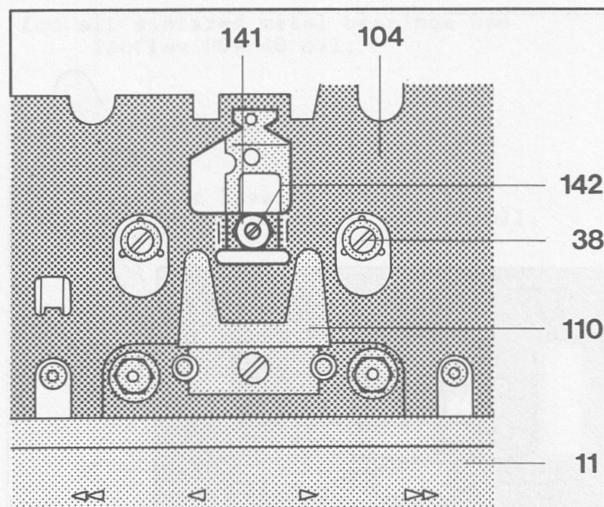


Fig. 8



## 6. Coupling assembly

To ensure satisfactory winding the following adjustments should be noted:

### a) Tooth backlash:

Slight tooth backlash should be perceptible between coupling assembly (341) and winding gears (291/338) in clockwise or anti-clockwise playing position.

Adjust as follows:

1. Depress playback key marked (▷) then pull out power plug.
2. Hold the intermediate gear of the coupling assembly in position and determine backlash in conjunction with the right-hand winding gear (338).
4. Carry out adjustment by turning the right-hand eccentric screw (E<sub>R</sub>).
5. Repeat the operation after depressing the playback key marked (◁).

In this case hold the perforated pulley of the coupling assembly in position and adjust in conjunction with the winding gear by turning the left-hand eccentric screw (E<sub>L</sub>). (Fig. 7)

It is advisable to check tooth backlash in four positions (intervals of 90°).



Fig. 9

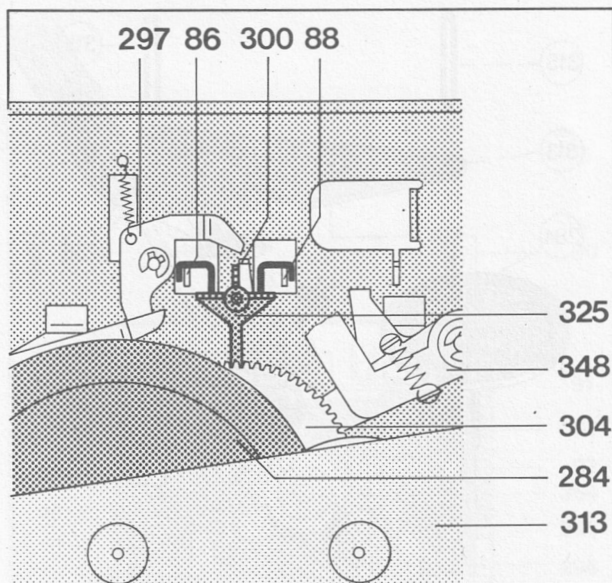


Fig. 10

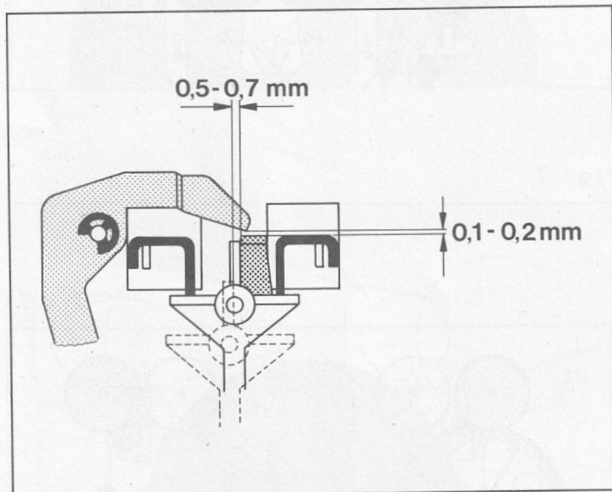
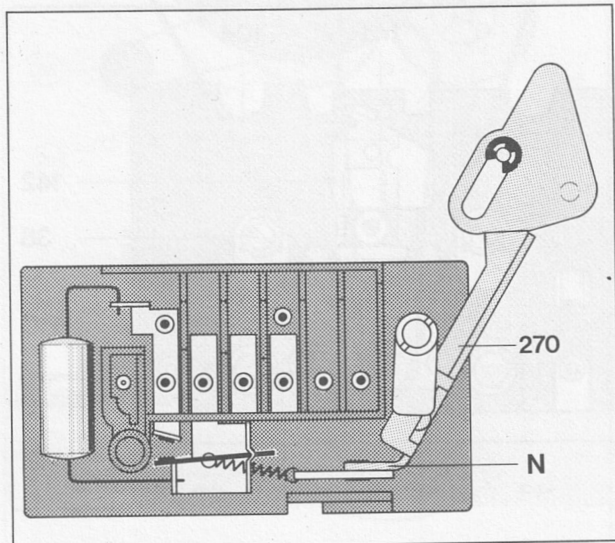


Fig. 11



b) Coupling travel:

With the unit in neutral position the coupling should have vertical play of 0.3 - 0.5 mm between set screw (142) and the stop.

Adjustment:

1. Open cassette holder. Loosen the hexagon nut (141) with a ring spanner (5mm A/F). (Fig. 8)
2. Adjust backlash by turning set screw (142), then tighten hexagon nut (141).

c) Coupling force (tape tension)

The tape tension during winding should be  $65 \pm 5$  p (in the cold state of the instrument). Any alteration should be carried out only by an authorized Dual Service Stadion.

7. Tape motion keys

When the right or left-hand playback key (<or>) is operated the pawl (325) of the swivel unit (348) must swivel the coupling assembly to the left or right. In right-hand playing position the unit must automatically changeover to anti-clockwise tape travel when the right-hand driver (38) is held in position. If then, the left-hand driver is held in position the unit must change over again to clockwise tape travel and shortly after must switch off mechanically and electrically. For any adjustment necessary the cover plate (2) and the front panel (11) need not be dismantled. Otherwise the key panel (154) must be located in correct position by securing the front panel (11).

In the event of readjustment proceed as follows:

1. Operate right-hand (>) playback key. Then rotate the large flywheel (284) by hand until pawl (325) is in front position and contacts simultaneously both selector levers on the left and right playback levers (86/88). (Fig. 9) If necessary bend the two selector levers.
2. Then continue turning the large flywheel (284) until pawl (325) and cam wheel (304) are in 0 position. Now there should be a gap of 0.5 - 0.7 mm between the slide (300) and pawl (325). (Fig. 10)

8. Locking pawl

After operating the left-hand playback key (<) slide (300) should not contact locking pawl (297). (Fig. 10)

There should be a gap of 0.1 - 0.2 mm between them. If necessary the locking pawl (297) should be adjusted by bending.

9. Power switch

The switch bar (270) should only switch on the power switch shortly before engagement of the key (rapid or reverse wind). If necessary the lug (N) of the actuating member (270) in the power switch should be adjusted (Fig. 11).

## 10. Muting switch

To prevent interference noise when reversing direction of tape travel the unit is fitted with a muting switch. The switch springs for both channels are controlled by the cam wheel. With the unit in neutral position - cam wheel in neutral position - there should be a contact gap of 0.3 - 0.5 mm. (Fig. 12)  
Adjust by bending the muting switch arm.

## 11. Cleaning

Always clean unit when servicing or repairing it.

For proper function of the unit the record/playback head (111), the erase heads (112), the pressure rollers (107/146) and the capstans must always be perfectly clean.

These parts are best cleaned with a linen cloth or cotton wool tip soaked in methylated spirit. The cleaning cassettes available from dealers as special accessory are also recommended.

Never use metal objects. The surface of the head should never be touched with the bare hands.

## 12. Lubrication

All bearings and sliding points of the unit are adequately lubricated at the works. Relubrication is normally not necessary for several years since the most important bearing points are provided with sintered bearings and oil retainers.

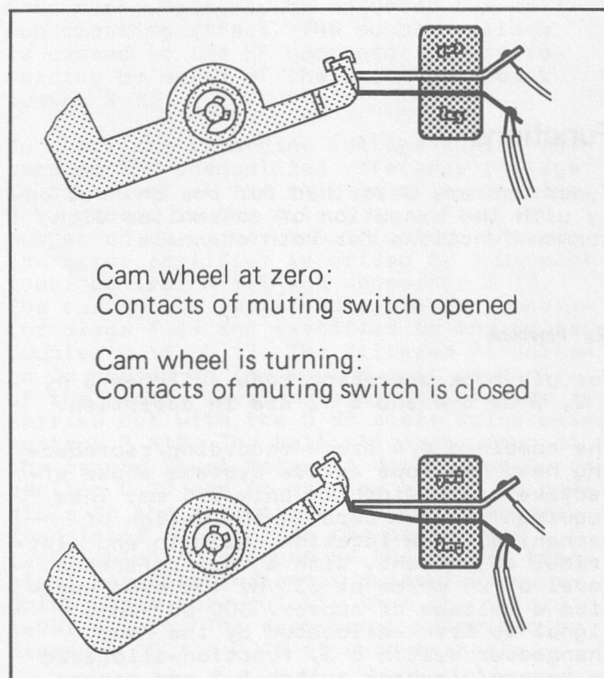
Bearings and sliding points should be lubricated sparingly rather than generously. It is important that no form of oil or grease reaches the rubber surfaces and rubber belts as otherwise they will be destroyed. For the same reason these parts should not be touched unnecessarily.

Chemical decomposition frequently takes place when lubricants of different types are used.

To prevent lubrication failure we recommend the following original lubricants for lubrication purposes:

Lubricate contact surfaces of spur gear with wacker silicon oil AK 100 000.

Fig. 12



For all sintered metal bearings use  
Isoflex PDP 40 oil,

For all other bearing points use  
BP Super Viscostatic 10W/30 oil,

For friction points use  
Shell Alvania No. 2 grease,

For sliding faces use  
Molykote compound.



# Electrical Part

## Functions

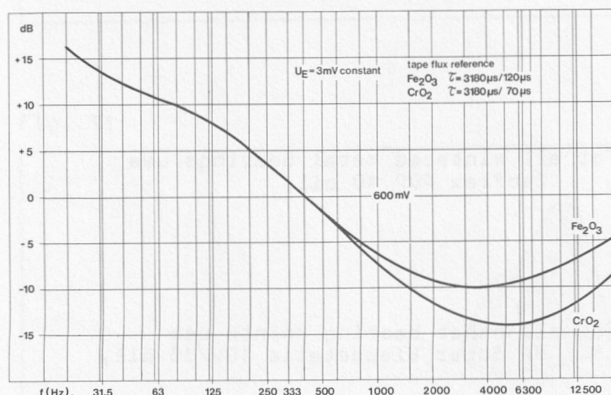
Functions are described for one channel only with the exception of assemblies with common functions for both channels.

### A. Playback

For playback operating mode switches S 1, S 2, S 3, S 4 and S 12 are in operation.

The combined 4/4 track recording/reproducing head has four active systems whose effective track width is only 0.6 mm. This requires maximum care in the design of mechanical tape location, azimuth and electrical adjustment. With a tape reference level of 25 mm/mm at 333 Hz the head supplies a voltage of approx. 300  $\mu$ V. This signal is track-allocated by the head changeover switch S 3, function-allocated by record/playback switch S 2 and passed to the input amplifier through double capacitor C 5. At the two stage discrete design amplifier high standards are set with respect to the signal-to-noise ratio. Particularly, transistor T 1 and resistor R 11 should have minimum noise values. The transistors operate in emitter circuit. The frequency response for the function in question is determined by a differentiated network between collector T 2 and emitter T 1. During playback the frequency response is as shown in Fig. 13.

Fig. 13



Tape changeover switch S 5 carries out correction for CrO<sub>2</sub> tapes in the treble range, this corresponding to the increased high frequency response of these tapes. Amplification of the input amplifier is approximately 48 dB at 333 Hz during playback. The amplified signal is passed to the playback level controls R 31 and R 32

where the exact level is set, this being particularly important for satisfactory Dolby function. The signal is passed to the input of the Dolby unit via a further section of the record/playback switch S 1. The signal is again amplified by approx. 18 dB by the transistor stages T 6, T 7 and T 9, coupled out at the emitter of transistor T 9 and passed via capacitor C 45 to the output amplifier. Integrated circuit IC 1 acting as operation amplifier amplifies the signal by approximately 26 dB with linear frequency response. The signal is passed via double capacitor C 48 to voltage divider R 110, R 111 with which a defined output impedance is created at the output jacks. As during recording the output amplifier is also in operation, the output signal is passed to the output jacks via switch S 1 only during playback. This is intended to prevent cross coupling through cable capacitances, jacks etc. To suppress switch noises the output signal is again passed through start switch S 4. At pins 3/5 of the DIN jack and at the output jacks the output voltage is present (approx. 1 V) at 9 k $\Omega$  at tape reference level (0.7 V at 0 VU). No control facility is provided. If in individual cases it should be necessary to alter the output voltage, this can be carried out by changing resistor R 110.

During playback and recording the meter amplifier and the record level meters are in operation. Function is described under recording.

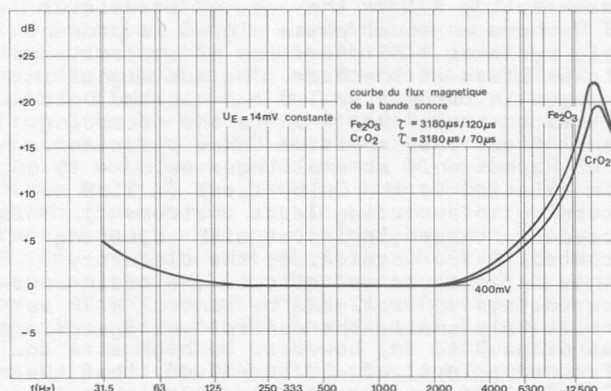
### B. Recording

The signal source intended for recording can be applied at contact springs 1/4 of the DIN jack, at the input jacks or at one of the microphone jacks. The signal supplied passes through the record/playback switch S 1 and capacitor C 5 to the input amplifier which during recording has linear response and produces approximately 22 dB amplification. The signal is passed via capacitor C 9 and decoupling resistor R 30 to the recording controls P 1 which take the form of wafer potentiometers. Here with manual recording control the optimum recording level is set, with automatic recording control the ALC circuit assumes this function which can alternatively be made operative by means of self-locking ALC key S 8. Function is described below.

The level adjusted recording signal is applied to the input of the Dolby circuit through switches S 10 and S 1. From there the signal passes with Dolbyised recording in corresponding sequence through transistor stages T 6, T 7, T 9, T 11 and T 12 and via the record/playback switch S 1 through stage T 8. At its emitter the signal is coupled out and passed via the Dolby

level controls, the tape selector switch S 5 and capacitor C 55 to the recording amplifier. The signal which (for producing of the reference level of 333 Hz at the head) has a value of approx. 100 mV at point 32 is amplified in the recording amplifier by approximately 29 dB and frequency regulated with respect to diagram (Fig. 14).

Fig. 14



The tape selector switch S 5 switches over the recording characteristics in the treble range according to the tape used. The signal is transmitted via capacitor C 63, the HF wave trap L 3, C 64, decoupling resistor R 128, record/playback switch S 2 and changeover switch S 3 to the audio-frequency current adjusting controls R 4, R 5. Here the audio frequency recording current can be adjusted separately for each track. This current induces a certain magnetic field strength in the head gap which modulates the magnetic tape accordingly. To determine the optimum high frequency operating point the RF generator supplies an exactly sinusoidal frequency with low distortion via capacitor C 2. The high frequency voltage is adjusted separately for each track for linear overall frequency response with controls R 2, R 3.

The RF generator supplies on the one hand the voltage for the recording head which can be switched over with the tape selector switch S 6 and at the head reaches a resultant value of 8 - 12 V for standard tape and 15 - 18 V for CrO<sub>2</sub> tape. On the other hand the half track double gap erase heads are supplied with an erase voltage of 18 - 22 V. The erase head voltage is passed via head changeover switch S 3 only to the erase head resting on the tape at the time. The RF generator operates on the push-pull principle whereby the feedback energy is passed back in each case from the collector to the adjacent base. The capacitor C 96 forms a parallel resonance circuit with the tunable inductance of the capcore transformer. The inductance detuning permits a frequency change of 60 - 90 kHz. A change in the HF by a maximum of 10 kHz might be possible in individual cases if recordings are being made from AM stations whose transmission frequency with the HF voltage causes beat-

note whistling in the audible range. When the HF is changed the HF wave trap L 3, C 64 must, however, be adjusted for maximum blocking effect. The supply voltage is passed to the HF generator during recording by means of the record/playback switch S 1.

To check the recording voltage during recording the unequalized reference voltage is taken off at the emitter of transistor T 9, passed to the output amplifier and subjected to linear amplification there. The meter amplifier is driven by indicator level control R 112 and capacitor C 70. The current is amplified again in transistor stage T 14 and rectified in the voltage doubler D 16, D 17. The filtered DC voltage is passed to the moving coil mechanism of the record level meters. Calibration is carried out with the 0 dB scale value using control R 112. The ballistic behaviour of the record level meter is determined by capacitor C 77 and is matched as far as possible to the properties of the VU meters. Transistor T 15 drives the peak level light which on account of the faster transient response indicates pulse-like overdrive peaks more quickly than the record level meters. The transistor is driven by diodes D 18 and D 19 of both channels.

The recording functions described above represent the simplest recording mode, input DIN jack, manual recording level control, without Dolby circuit.

A number of special functions are described below.

#### Microphone recording

The two microphone jacks are suitable for low impedance to medium impedance microphones having an impedance of 200 to 700 Ω. A DC voltage supply of approx. 18V is designed for low voltage capacitor microphones, especially the Dual MC 312. Current limitation prevents dynamic microphones being unfavourably influenced by this voltage. Switch S 11 coupled to the microphone jack switches over the high control time of the automatic level control (ALC). During recording of mono signals, particularly with a microphone the stereo/mono key S 7 can be used. Recording then takes place uniformly on both tracks of one direction of tape movement.

In the meantime the mono microphone input jacks have been replaced by stereo jacks. They are connected in such a way that low-voltage capacitor microphones with stereo connectors are fed by a separate power switch other than by the audio lead. In the case of dynamic microphones with mono connectors the supply voltage at the jack is ineffective. Dual microphones are equipped with the corresponding connectors.

#### Automatic level control (ALC)

This circuit permits fully automatic recording level control independently of the manual control. As control signal the DC voltage of the recording amplifiers of both channels is passed via capacitors C 20, C 21 to diodes D 10, D 10' and is there rectified if it exceeds a threshold value adjustable by means of R 48. The capacitor C 19 is charged thereby and makes the gate negative as a result of which the source current is reduced. The voltage drop at



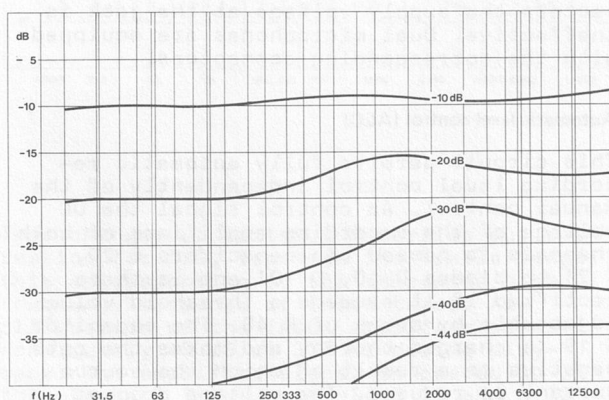
resistor R 40 becomes less, the anode of diode D 9 and of diodes D 1 to D 4 become more positive and thus the diode current increases. The differential resistance at D 1 to D 4 is reduced. Together with resistor R 33 these form a voltage divider for the low frequency recording signal. The level coupled out via capacitor C 15 becomes correspondingly lower, thus preventing overloading. The high control time constant of the circuit is determined by the RC network C 19, R 43. In the case of microphone recordings the time constant is reduced by parallel connection of R 49 to reduce the effect of extraneous noise on control. Transistor T 3 prevents indifferent control behaviour occurring during switch-on. Switch S 4 discharges capacitor C 19 in the case of stop function to guarantee immediate control of the circuit on switch on.

### Dolby noise suppression

The Dolby circuit produces treble emphasis during recording differentiated as to amplitude and frequency and exactly reciprocal suppression during playback. As a result the natural tape noise can be improved by approx. 9 dB, but not natural source noise components. The method of operation of the discrete circuit is described for recording. Function during playback meets the necessary requirements. The signal amplified in the input amplifier is present at transistor T 6 via switches S 8, S 10, S 1 and capacitor C 25. A 19 kHz-suppression filter for pilot frequency suppression combined with an HF filter connected to the collector of T 6. From the collector of transistor T 7 the signal is passed on to the base of transistor T 8.

From the emitter of transistor T 7 a signal phase shifted by  $180^\circ$  in relation to the base of T 8 is applied via the emitter follower T 9 to a complex network. The latter consists in part of the RC network C 33, R 22 and clips the frequency response below 500 Hz. Parallel thereto FET T 10 acts as variable resistor independent from frequency. Above 500 Hz the network is frequency dependent according to recording level control. See curve Fig. 15.

Fig. 15



The resultant voltage at the base of transistor T 11 can be influenced accordingly by the gate voltage of FET T 10. At transistor T 11 the low frequency signal is amplified again and passed via transistor T 12 connected to the base of transistor T 13. The amplification of this section can be adjusted with the variable emitter resistor R 80. The control voltage for FET T 10 is obtained at Diode D 14, behaving exactly in proportion to the low frequency signal. At resistor R 93 there is a low frequency signal which is phase displaced by  $180^\circ$  in relation to the base of transistor T 11. This signal is applied via the record/playback switch S 1 to the base of transistor T 8 where an equal phase signal is present via resistor R 65. Addition of the voltages takes place at the base. The sum signal is passed in transistor T 8 and via the Dolby level control P 94, P 95 to the recording amplifier. This addition takes place above 500 Hz but only at amplitudes below -15 dB in relation to the Dolby level (+3 dB according to recording level instrument). This response threshold is set with adjusting control R 78. Considering the circuitry this is achieved as follows: The drain source voltage controllable by control R 78 is relatively small, the control voltage gained at diode D 14 is, however, so high at a low frequency level of -25 to -30 dB, that the FET T 10 is driven slightly. At higher low frequency levels the FET T 10 drives completely and passes the low frequency signal of the subsidiary branch via capacitor C 35 to chassis, voltage increase at the base of transistor T 8 cannot therefore take place. Diodes D 12 and D 13 have purely limiting functions and are intended to prevent sudden voltage surges blocking transistor T 13. The playback functions are, to a large extent, identical to the recording functions. The signal of the subsidiary branch present at resistor R 93 is now, however, transmitted via the record/playback switch S 1 and capacitor C 30 to the base of transistor T 9 where it meets an anti-phase signal which leads to subtraction and thus to treble attenuation. The Dolby function can be switched off for recording and playback by means of the Dolby key S 9.

### Test generator

For proper operation of the Dolby circuit it is necessary for the resultant playback level to correspond exactly to the recording level. As, however, the response of the various tape types of the cassettes differs widely individual level matching must be possible. In the C 901 the recording current is matched to the tape in question with Dolby level controls P 94, P 95 behind the Dolby circuit so that the playback level is always the same. For this purpose the single stage feedback oscillator supplies a 400 Hz sinusoidal signal whose voltage is calibrated to a fixed value with adjusting control R 149. With this signal a test recording is made which during playback should produce 0 dB reading on the level control instruments.

In the case of deviation controls P 94 or P 95 are adjusted accordingly and the test repeated. The level recorded on the tape will, when correctly adjusted be - 3 dB below the official Dolby level at 20 mM/mm. (VU meter 0 dB).

## Other electronic components

### Limit switch

The limit switch has the function of reversing direction of tape travel and protecting the cassette from damage e.g. if winding is incorrect as a result of excessive friction in the cassette. An aperture disc permanently coupled to the winding spindle supplies the photo-resistor LDR 07 with a flash period in the frequency range from 3 to 30 Hz. The photoresistor supplies via capacitor C 109 an AC voltage whose negative half wave generates a DC voltage via diode D 29 at the base of transistor T 24 which opposes the static base emitter voltage through voltage divider section R 81, R 186. If this voltage fails the resultant base emitter voltage becomes more positive by a slight amount which is sufficient for driving. As a result the base of transistor T 25 is connected to plus. The latter drives as well and operates the traction magnet which reverses direction of tape travel or shuts off the drive. If for any reason the first instruction has not led to attraction of the traction magnet transistor T 23 made active as multi-vibrator will repeat the instruction until the traction magnet responds. Diode D 30 protects transistor T 25 during shut-off by representing a load for the counter e.m.f. of the traction magnet.

## Adjustment and test data

### General notes

Before re-adjustment all controls should be set to mechanical centre position.

During measurement at the OUTPUT or REC/PB output no headphone shall be connected to the headphone jack otherwise the level will be affected.

Before adjustment the magnetic head and all ferrous components contacting the tape shall be demagnetized.

When adjusting the coils two core positions are possible. However, the outer core position should always be selected.

Re-adjustment must be carried out in the sequence stated.

## Power supply unit

The C 901 can be connected to AC voltage sources from 110 to 117 V and 220 to 240 V. The primary winding of the C-core transformer and the motor are switched over by series-parallel circuit. The secondary voltage is rectified at the bridge circuit of diodes D 22 to D 25 and effectively filtered. Transistor T 19 acting as a variable resistor automatically corrects voltage and load fluctuations. Transistor T 19 is controlled by transistor T 20 which receives its reference voltage from Z-diode D 26. The exact operating voltage of 18.4V is set with adjusting control R 168. The secondary circuit is protected by the 0.63 Amp. slow-blow fuse.

### Pilot lamps

The lamps for the limit switch, record and peak-level indication are connected to the stabilized DC voltage. The others are connected to the secondary AC voltage.

### Optional components

Instead of the matching resistor R 113 for medium to high impedance headphones it is possible according to design, to fit a transformer for low impedance headphones. The headphone voltage is not variable.

### Test instruments and test cassettes necessary

- 2 Millivoltmeters
- 1 AF oscillator
- 1 Oscilloscope
- 1 Frequency counter
- 1 1000-Hz filter
- 1 Capacitive voltage divider 1 : 1 000  
Coupling capacitance 1 pF
- 1 Test cassette 3 150 Hz (deviation from correct speed)
- 1 Test cassette 400 Hz 0 dB VU (reference level)
- 400 Hz-20 dB (playback)
- 10kHz-20 dB frequency response)
- 1 Test cassette Fe<sub>2</sub>O<sub>3</sub> (reference medium section)
- CrO<sub>2</sub> (reference medium section)



### Operating voltage

With R 168 set + 18.4V at point 55.

### Channel symmetrization and VU meters

RECORD, <or>, STD, TEST

With R 149 set 70.7 mV at Point 67.

With R 60 set 70.7 mV at Point 64.

With R 112' adjust VU meters for 0 dB.

### Playback

Insert test cassette (400 Hz reference level 0 dB VU).

<or>, STD

Set 70.7 mV in each case.

For track 1 with R 31 at Point 64

For track 4 with R 32 at Point 64

For track 2 with R 31' at Point 67

For track 3 with R 32' at Point 67

The grounded side of the adjusting control is marked with a circle.

0.707 V  $\pm$  1 dB must be applied to OUTPUT L and OUTPUT R and the VU meters must indicate 0 dB.

### Magnetic head adjustment

Insert test cassette (Section determined for gap adjustment, noise or 10 kHz).

Connect the millivoltmeters to OUTPUT L and R. If only 1 millivoltmeter is available OUTPUT L and R should be connected in parallel <or>, STD.

With the set screw on the left-hand side of the magnetic head align for maximum voltage. Determine setting for both directions of tape travel. Maximum permissible distance between tracks 4 dB.

### Playback frequency response

Insert test cassette (400 Hz/10 kHz - 20 dB), <or>, STD.

The reproducing output voltages at Output L and Output R should be

$$\text{referring to } U_{400 \text{ Hz}} = 0 \text{ dB}$$

$$U_{10 \text{ kHz}} = +3 \text{ dB}$$

When switching over to CrO<sub>2</sub>-tape the 10 kHz level should indicate a voltage step of -4.5  $\pm$  1 dB.

### Background noise

Screen amplifier. Make sure that the magnetic head and the adjustment plate are free of hum <or>, STD, PAUSE

Background noise at OUTPUT L and R max.

6 mV measured with 20 Hz filter (e.g. Sennheiser F 055 curve 2, 20 Hz - 3 dB) and R.M.S rectification of meter. Observe polarity of power plug.

### HF generator

R 2, R 3, R 2', R 3' in mechanical centre position.

RECORD, <or>, STD

With L 4 set 80 kHz.

Measure the generator frequency with absorption frequency meter in the vicinity of the erase head, or with oscilloscope or frequency counter through 1 MOhm series resistor at erase head. Frequency deviation on changeover to CrO<sub>2</sub>  $\pm$  1 kHz.

### Erase head voltage

Measured at the erase heads  $\geq$  18 V

### HF wave traps

The HF should be measured at measuring points 1 to 4 and aligned to maximum voltage with L 3, L 3'.

Measuring Track Appropriate Permissible ad-  
point coil justment dif-  
ference

|   |   |      |               |
|---|---|------|---------------|
| 1 | 1 | L 3  |               |
| 4 | 4 | L 3  |               |
| 3 | 3 | L 3' |               |
| 2 | 2 | L 3' | 1/2 turn max. |

### Bias switching

On switching over from STD to CrO<sub>2</sub> a voltage rise of 2.5 to 3.5 dB must occur at measuring points 1 to 4.

### Recording

First turn Dolby calibrators P 94, P 95, P 94' and P 95', by ten turns counter-clockwise and then approximately 3.5 turns clockwise.

R 4, R 5, R 4', R 5' (AF recording current) and R 2, R 3, R 2', R 3' RF-biasing in mechanical centre position. Connect generator to INPUT, millivoltmeters and distortion meter to OUTPUT, turn on output control.

Insert test cassette (unrecorded Fe<sub>2</sub>O<sub>3</sub> tape). RECORD, <or>, STD

Record 400 Hz and 6 300 Hz at -20 dB (VU meter).

Compare level during subsequent playback.

If there is no uniformity of level, the should RF-biasing be corrected. 1 dB HF variation will produce approx.

1 dB frequency change at 6300 Hz.

Less RF = treble emphasis

More RF = treble attenuation.

Alteration of the RF level can be checked by means of a capacity voltage divider with 1 pF coupling capacitance at measuring points 1 to 4.

Measuring point Track HF adjusting control

|   |   |      |
|---|---|------|
| 1 | 1 | R 2  |
| 2 | 2 | R 2' |
| 3 | 3 | R 3' |
| 4 | 4 | R 3  |

### Level

Insert test cassette (unrecorded Fe<sub>2</sub>O<sub>3</sub> tape).

RECORD, <or>, STD

Record 400 Hz, 0 dB (VU meter).

With R 4, R 5, R 4', R 5' alter the AF recording current so that the playback level is 0 dB (VU meter).

To check the level change of the AF recording current the voltage can be measured at measuring points 1 to 4. When doing so ensure that the RF is switched off by shorting the centre contacts of S 6 (powerpack board).

Measuring point Track LF adjusting control

|   |   |      |
|---|---|------|
| 1 | 1 | R 4  |
| 2 | 2 | R 4' |
| 3 | 3 | R 5' |
| 4 | 4 | R 5  |

Remove short circuit at S 6.

RECORD, <or>, STD

Record 400 Hz, 0 dB (VU meter) and then check playback level (0 dB).

Insert test cassette (CrO<sub>2</sub> tape with reference medium section)  
 RECORD, <or>, CrO<sub>2</sub>  
 Record 400 Hz, 0 dB and then check the playback level.

With the Dolby Calibrator set the playback level to 0 dB (VU meter).

One turn produces approximately 1 dB level change. Turning clockwise = increasing level.

| Dolby Calibrator                        | Track   | VU meter |
|-----------------------------------------|---------|----------|
| P 94 (CrO <sub>2</sub> )                | 1 and 4 | LH       |
| P 94' (CrO <sub>2</sub> )               | 2 and 3 | RH       |
| P 95 (Fe <sub>2</sub> O <sub>3</sub> )  | 1 and 4 | LH       |
| P 95' (Fe <sub>2</sub> O <sub>3</sub> ) | 2 and 3 | RH       |

#### Harmonic Distortion

For recordings at 333 Hz, 0 dB (VU meter) the harmonic distortion during playback shall not exceed the following values:

|                                          |                |
|------------------------------------------|----------------|
| with Fe <sub>2</sub> O <sub>3</sub> tape | K 3 $\geq$ 3 % |
| with CrO <sub>2</sub> tape               | K 3 $\geq$ 5 % |

#### Dolby NR (noise reduction) alignment

Coils L 1 and L 1' are set at the works to 40 mH and should not be altered.

RECORD, <or>, turn up level control. Feed in 19 kHz approx. 300 mV at INPUT.

Align L 2 and L 2' for minimum, measured at point 64 or 67.

Set adjusting control for FET working point to maximum positive voltage:

R 78 to left-hand stop and R 78' to right-hand stop, seen from the wiring side.

For printed circuits from Index No. 4 on as seen from the complement side.

Ground FET gate to chassis:  
 Connect measuring point 62 to 63 and measuring point 65 to 66. Dolby NR not depressed. Feed in 5 kHz approx. 30 mV at INPUT, set 3 mV with slide control P 1 or P 1', measured at point 63 or 67.

The measurement should not be falsified by superimposed (RF). To check, short circuit the generator output (connect center contacts of S 6 to one another) and observe reading.

Measure level at point 32 or 36.

Permissible values 2.8 to 3.2 mV.

Switch on DOLBY NR.

With controls R 80 or R 80' increase the level measured at point 32 or 36 by 10 dB.

Remove chassis short of FET gate at point 62 and 65.

With controls R 78 or R 78' reduce the level at point 32 or point 36 by 2 dB.

#### ALC

Turn R 48 fully left (as seen from wiring side).

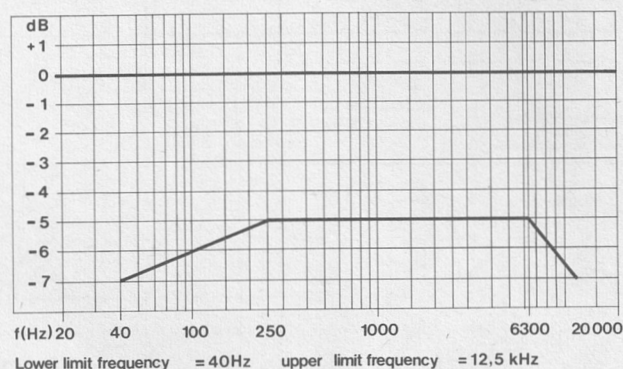
RECORD, <or>, STD, ALC, MONO  
 Feed in 400 Hz, 400 mV at INPUT, turn up level control.

Turn control R 48 slowly clockwise until the VU meters averaged indicate + 2 dB  $\pm$  1.5 dB.

#### Overall frequency responses

The overall frequency responses for Fe<sub>2</sub>O<sub>3</sub> and CrO<sub>2</sub> tapes must be within the specified tolerances, in accordance with DIN 45 500, recorded at -20 dB (VU meter).

Fig. 16



#### Microphone connection

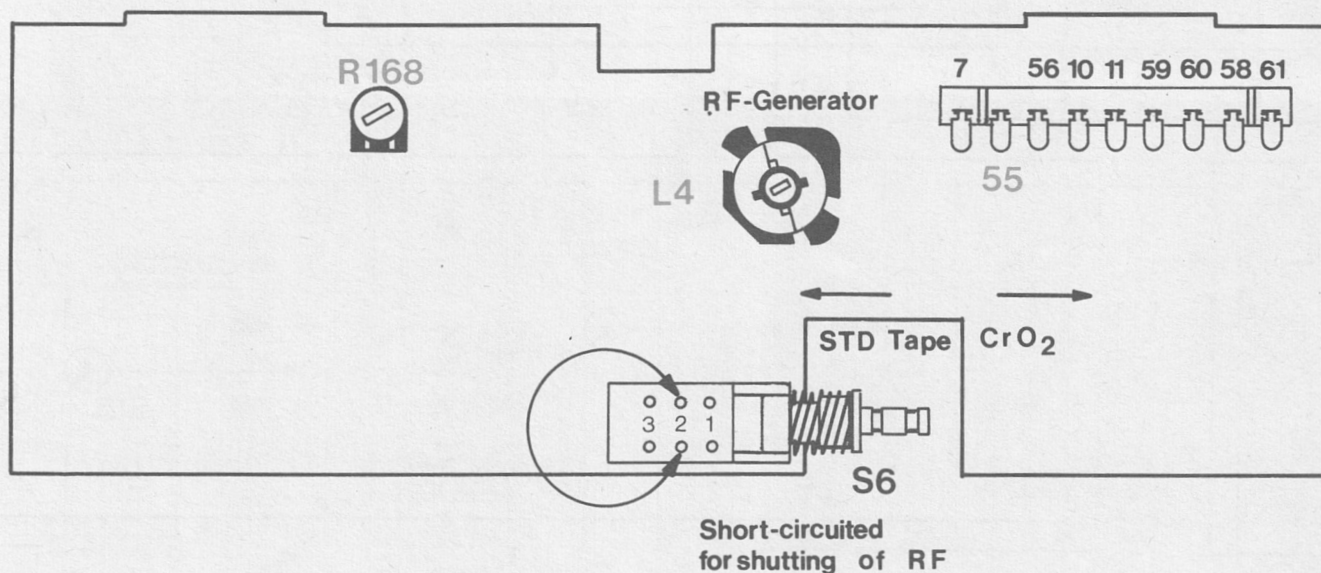
Check the power supply for capacitor microphones at the microphone jacks. Supply voltage on no-load operation should be 18.4 V  $\pm$  0.5 V.

#### Important note

The field effect transistor (T 10) 2 N 5458 PF-349 Motorola VP 1, 5-4V used in the C 901 must be selected with a field effect tester in accordance with FH 226 425, i.e. only the original DUAL replacement type shall be used.



### Power Pack Board



### Push buttons and Dolby calibrating control

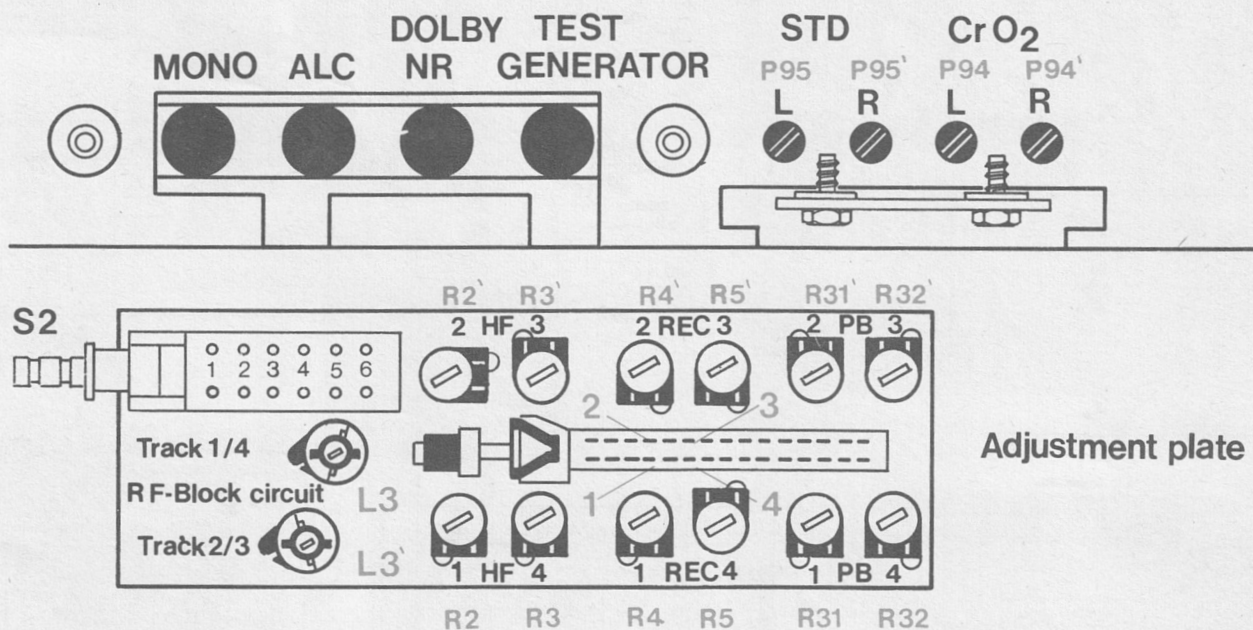
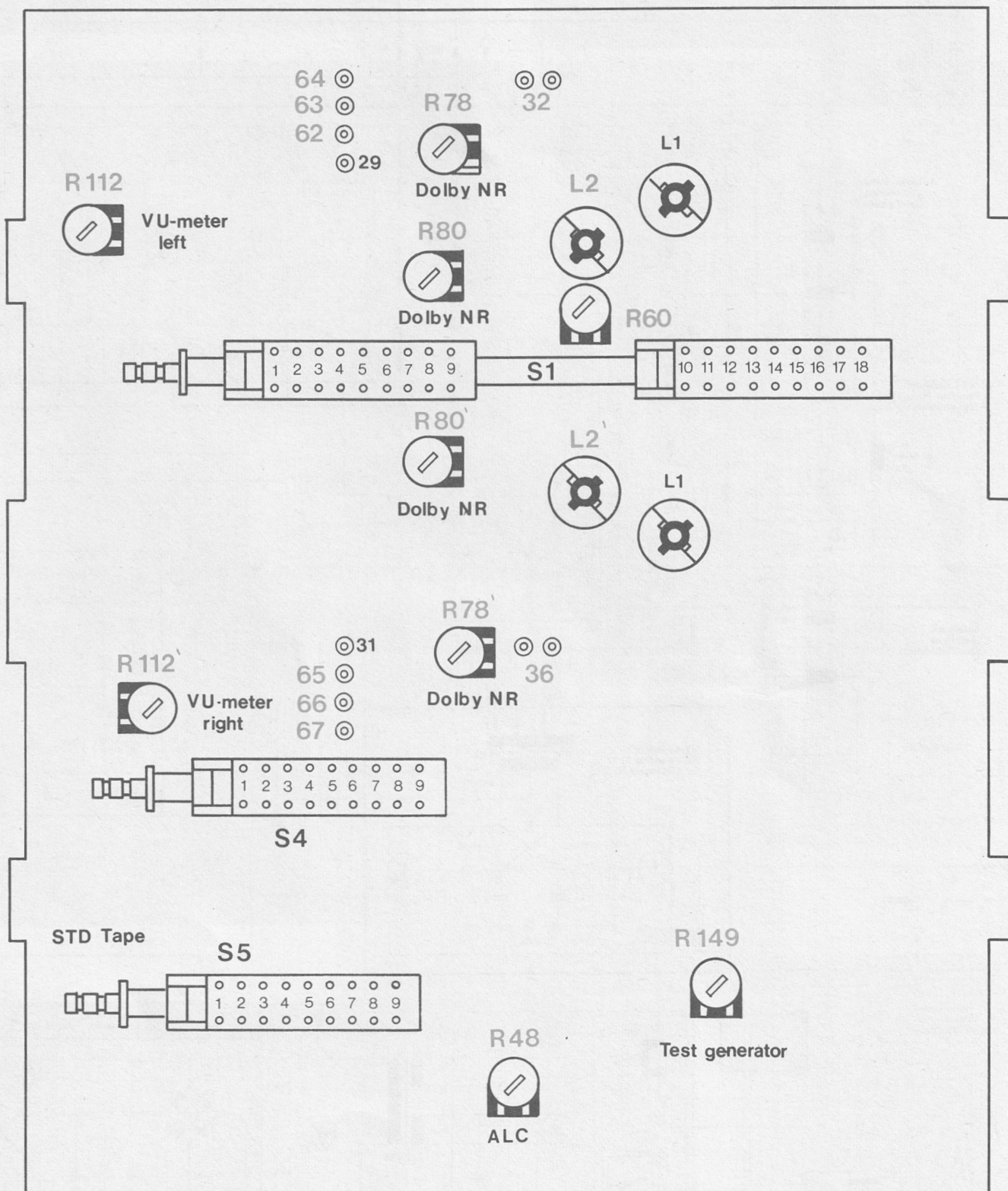


Fig. 18 Adjustment

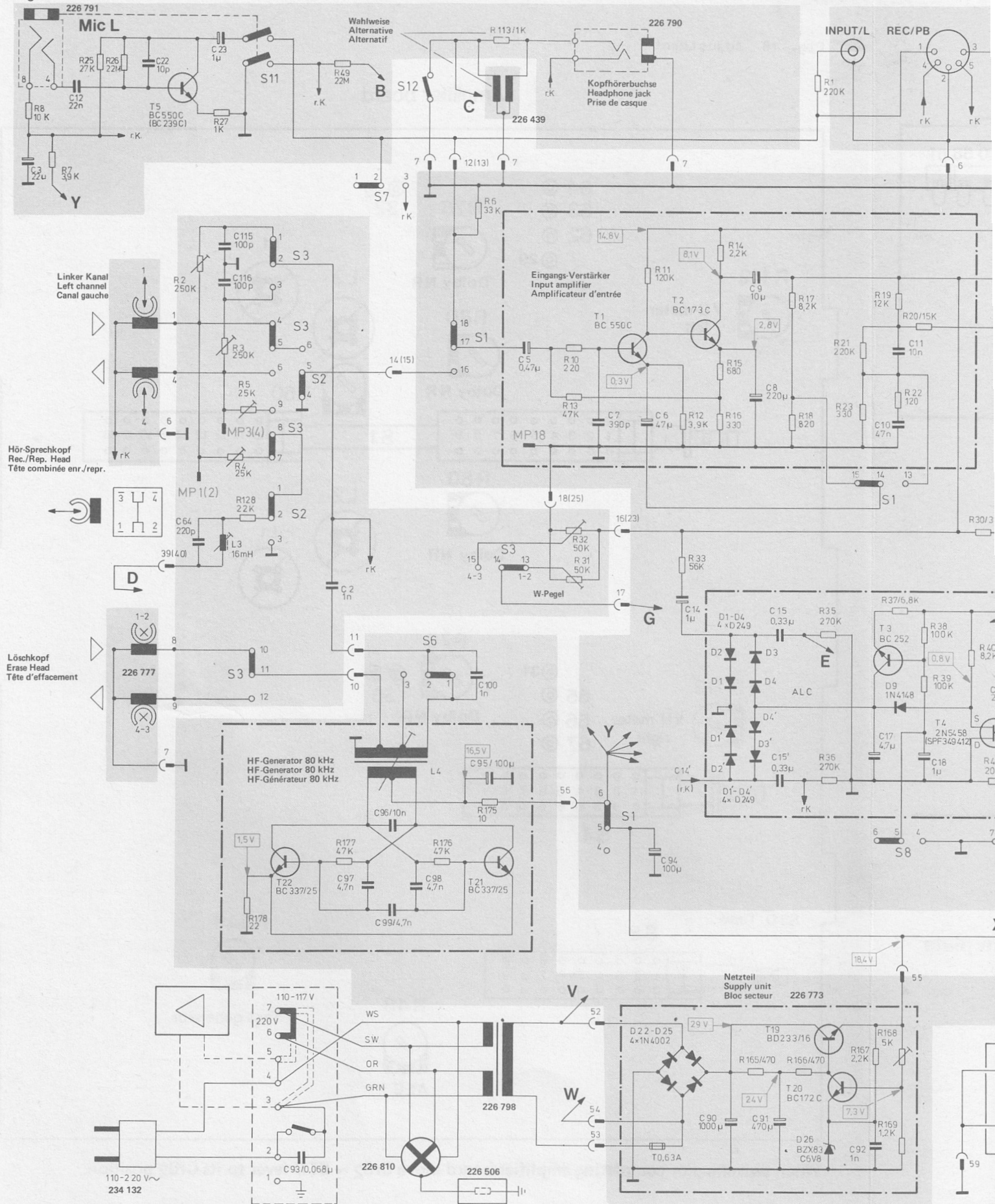
# Amplifier board



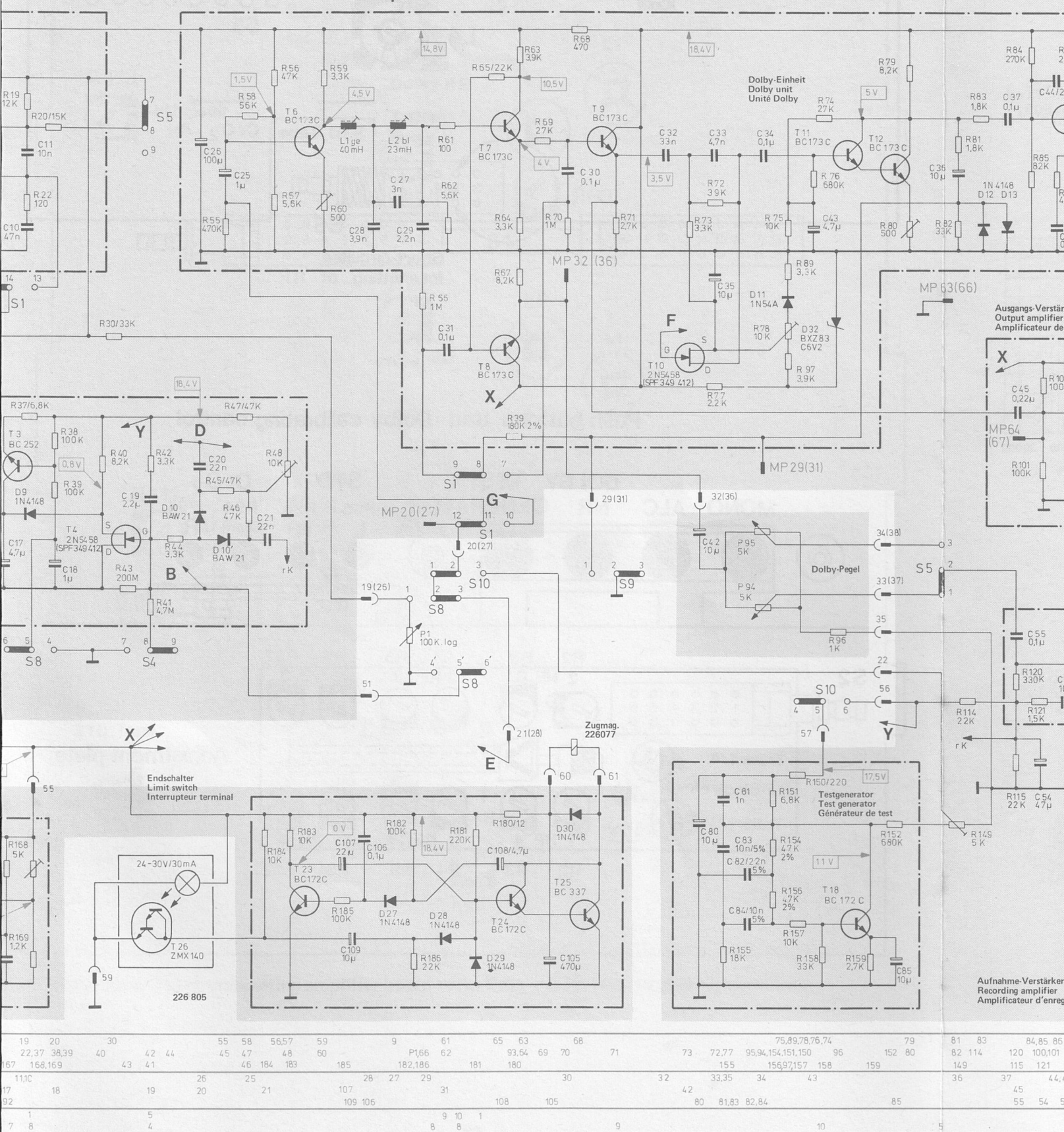
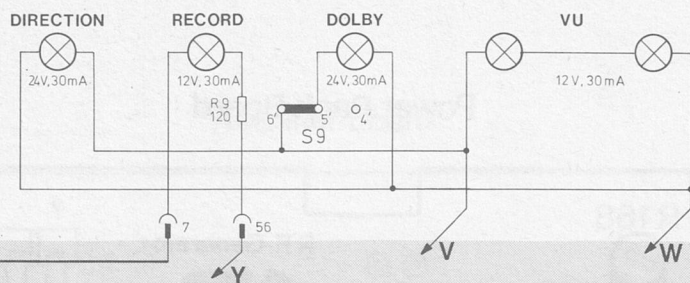
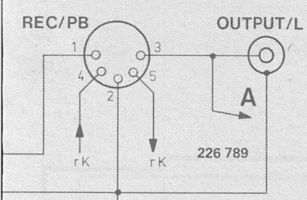
When swivelling or completing amplifier board move Cr02 – STD lever to its Cr02 position.



Fig. 19

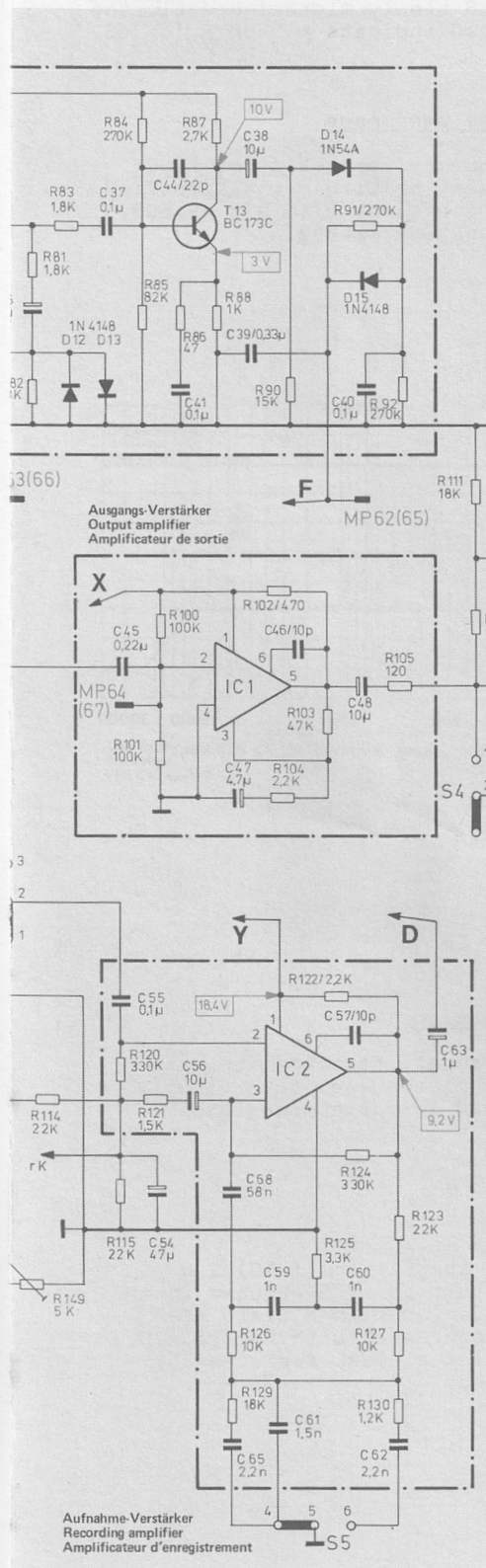


|   |   |    |    |    |     |     |    |   |    |         |     |     |     |    |    |    |    |    |    |        |    |        |    |
|---|---|----|----|----|-----|-----|----|---|----|---------|-----|-----|-----|----|----|----|----|----|----|--------|----|--------|----|
| R | 8 | 7  | 25 | 26 | 2   | 27  | 3  | 5 | 4  | 128,178 | 177 | 6   | 113 | 10 | 11 | 12 | 14 | 17 | 1  | 21     | 19 | 20     | 30 |
| C | 3 | 12 | 22 | 23 | 1   | 115 | 4  | 2 | 97 | 96      | 98  | 176 | 175 | 5  | 7  | 6  | 94 | 14 | 9  | 15,15' | 17 | 11,13C | 18 |
| S |   |    |    | 64 | 116 | 93  | 11 | 3 | 2  | 2       | 7   | 12  | 1   | 3  | 1  |    |    |    | 90 | 8      | 91 | 92     | 1  |





# Dual



Transistoren von der Anschlußseite gesehen  
Transistors as seen from the connecting side  
Transistors vus du côté des connexions



BC 550 C  
BC 207 B  
BC 337  
BC 172 C  
BC 252  
BC 173 C



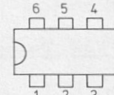
2 N 5458  
SPE 349 411



ZMX 140

ws = weiß, white, blanc  
sw = schwarz, black, noir  
or = orange, orange, orang  
grn = grün, green, vert  
ge = gelb, yellow, jaune  
bl = blau, blue, bleu

**TAA 761 A**  
von der Bestückungsseite gesehen  
as seen from the top side  
vu du côté éléments



r.k. = Rechter Kanaal  
Right channel  
Canal droit

gezeichnete Schalterstellung  
RECORD, SPUR 1-2  
START, Cr 02-TAPE, STEREO  
ALC, DOLBY

Show switch position  
RECORD, TRACK 1-2  
START, Cr 02-TAPE, STEREO  
ALC, DOLBY

Dessin de la position  
du commutateur  
RECORD, TRACE 1-2  
START, Cr O<sub>2</sub>-TAPE, STEREO  
A.I.C. DOLBY

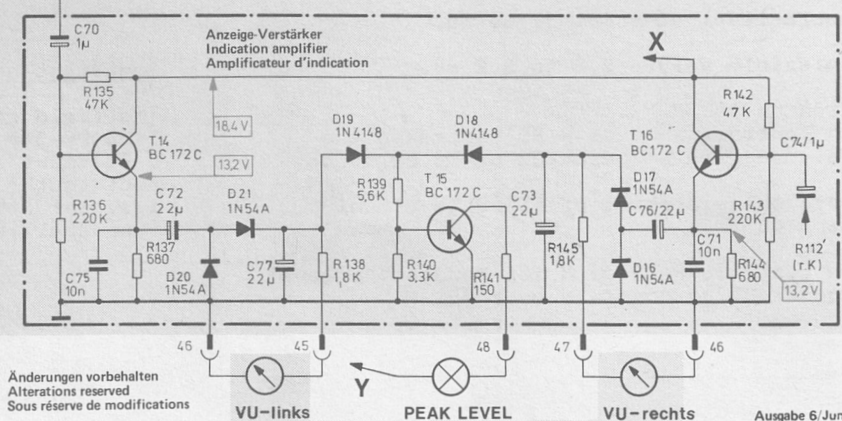
Spannungen gemessen ohne Signal in Stellung RECORD, START, DOLBY ALC, CrO<sub>2</sub> mit Digitalvoltmeter ( $R_E \geq 1 \text{ M}\Omega$ ) gegen Masse bei 220 V Spannungen in Volt.

Voltages measured without signal in position RECORD, START, DOLBY ALC, CrO<sub>2</sub> with digital voltmeter ( $R_E \geq 1\text{ M}\Omega$ ) to ground at 220 V. Voltages in volts.

Tensions sans signal mesurées en position RECORD, DOLBY, ALC, CrO<sub>2</sub> avec voltmètre numérique ( $R_E \geq 1 \text{ M}\Omega$ ) contre masse à 220 V.  
Tensions en volts.



- |                                  |                                     |                                               |
|----------------------------------|-------------------------------------|-----------------------------------------------|
| S 1 AW-Schalter, Verstärker      | S 1 REC.-REP.-switch, amplifier     | S 1 ENR.-REP.-interrupteur, amplificateur     |
| S 2 AW-Schalter, Einstellplatte  | S 2 REC.-REP.-switch, control plate | S 2 ENR.-REP.-interrupteur, plaque de réglage |
| S 3 Kopfschalter, Spure 1-2, 4-3 | S 3 Head change, track 1-2, 4-3     | S 3 Changement de tête, trace 1-2, 4-3        |
| S 4 AW-Schalter                  | S 4 ST-REP.-switch                  | S 4 START-interrupteur                        |
| S 5 STD/Cr/2-Umschalter          | S 5 STD/Cr/2-change                 | S 5 STD/Cr/2-changement                       |
| S 6 STD/Cr/2-HF-Umschalter       | S 6 STD/Cr/2-HF-change              | S 6 STD/Cr/2-HF-changement                    |
| S 7 STEREO-MONO-Drucktaste       | S 7 STEREO/MONO-press button        | S 7 STEREO/MONO-bouton poussoir               |
| S 8 ALC-Drucktaste               | S 8 ALC-press button                | S 8 ALC-bouton poussoir                       |
| S 9 DOLBY-Drucktaste             | S 9 DOLBY-press button              | S 9 DOLBY-bouton poussoir                     |
| S 10 TEST Drucktaste             | S 10 TEST press button              | S 10 TEST bouton poussoir                     |
| S 11 MIKROFON-Schaltbuchse       | S 11 MIKROFON-socket with switch    | S 11 MIKROFON-douille avec interrupteur       |
| S 12 Kurzschließer Kurvenrad     | S 12 Short-circuiter, cam wheel     | S 12 Court-circuiteur, roue a came            |



Änderungen vorbehalten  
Alterations reserved  
Sous réserve de modifications

VU-links

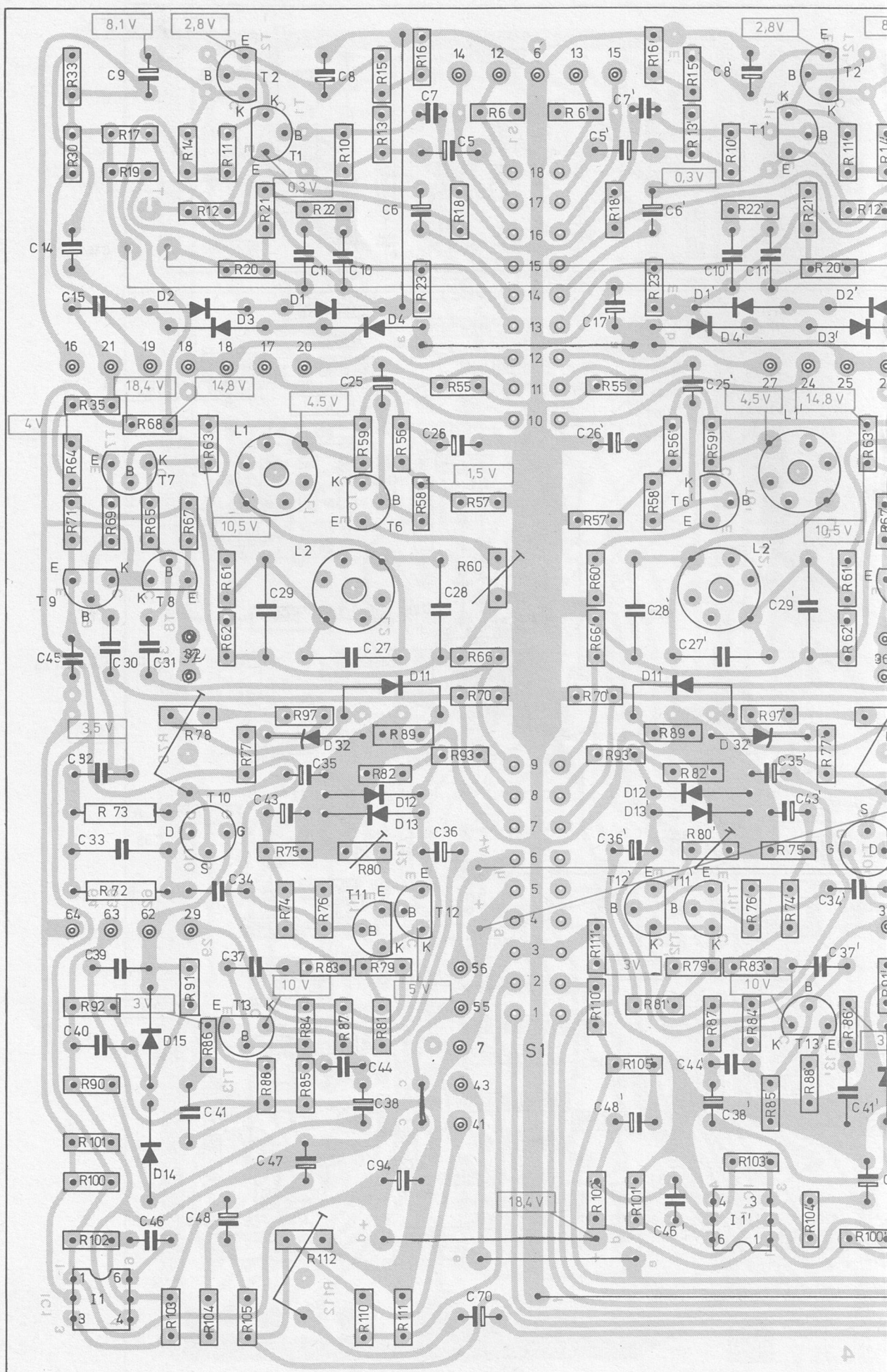
PEAK LEVEL

VU-rechts

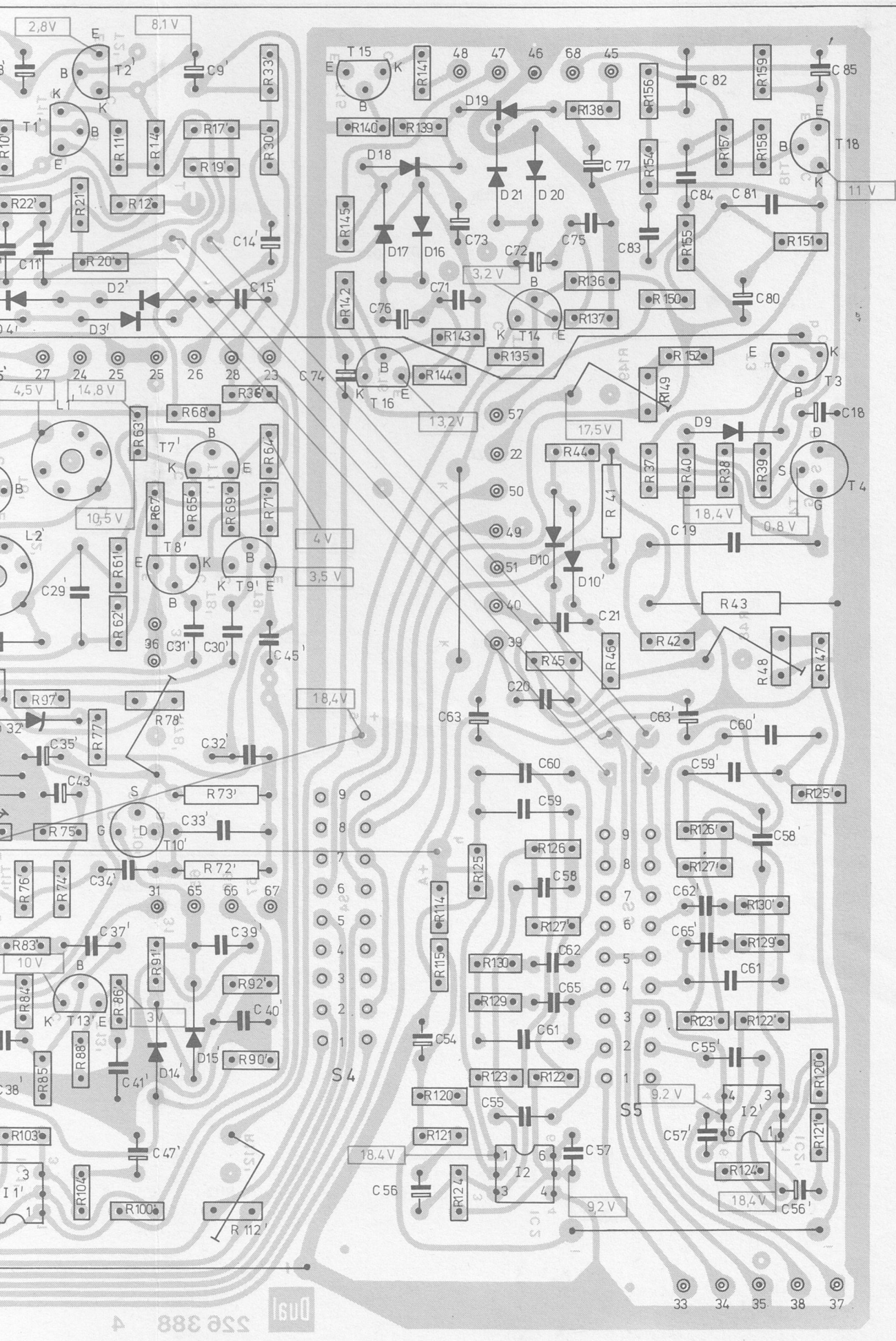
Ausgabe 6/Juni 1975

[illegible]

Fig. 20 Amplifier board 226 784 (Component side)







21





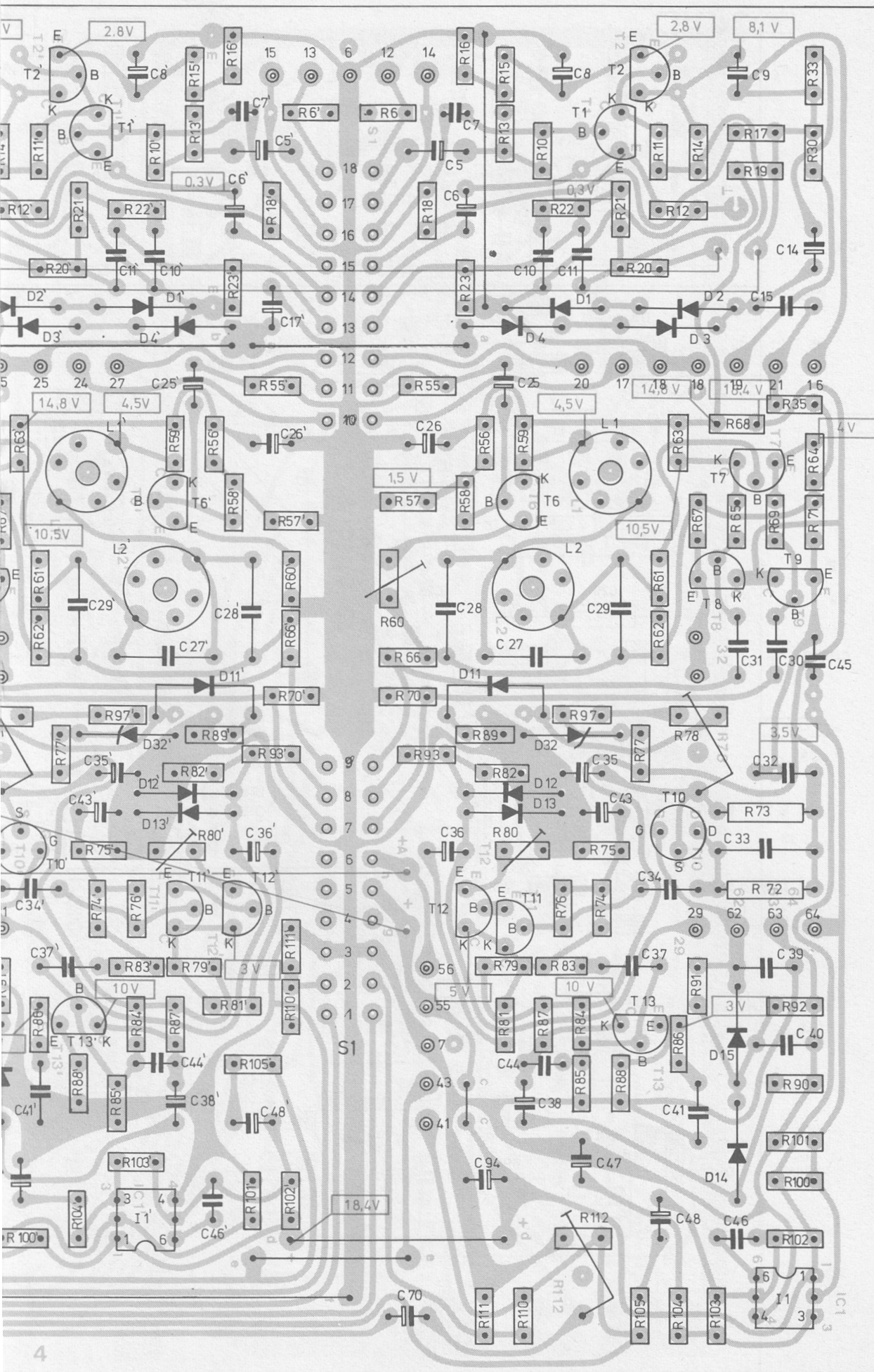


Fig. 22 Adjusting control board 226 781 (Wiring side)

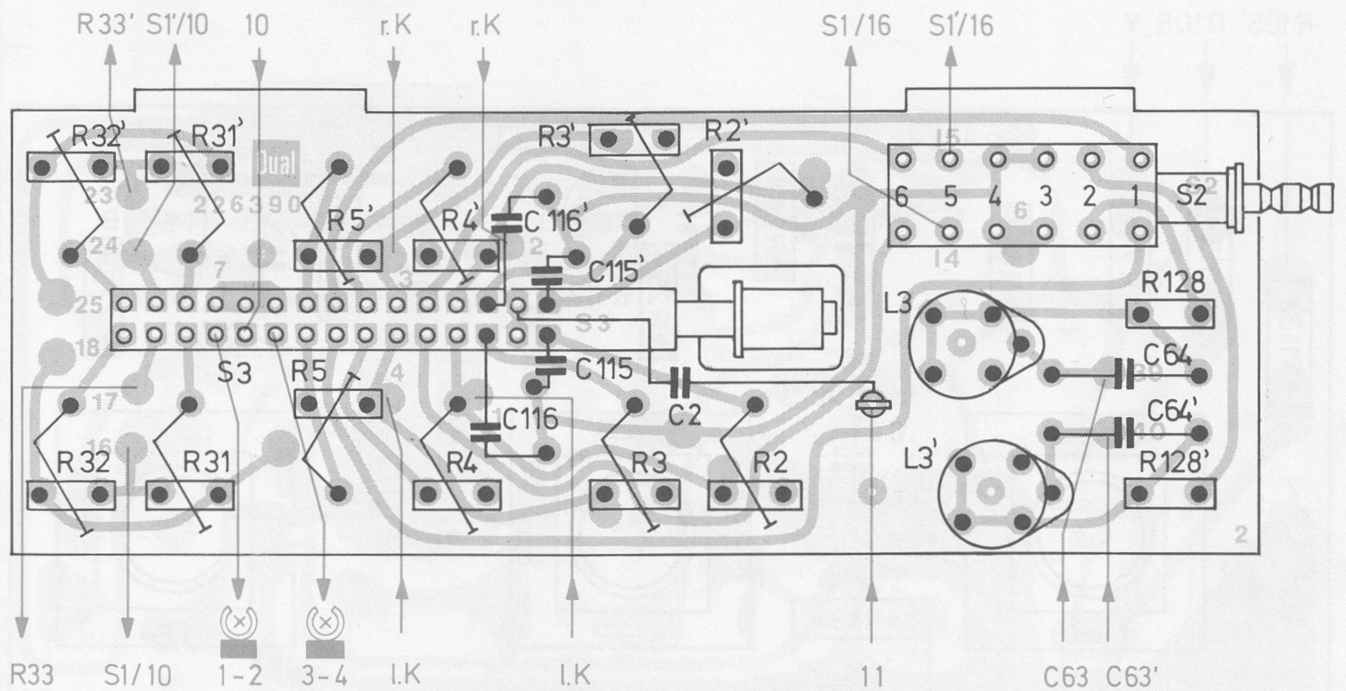


Fig. 23 Power board 226 773 (Wiring side)

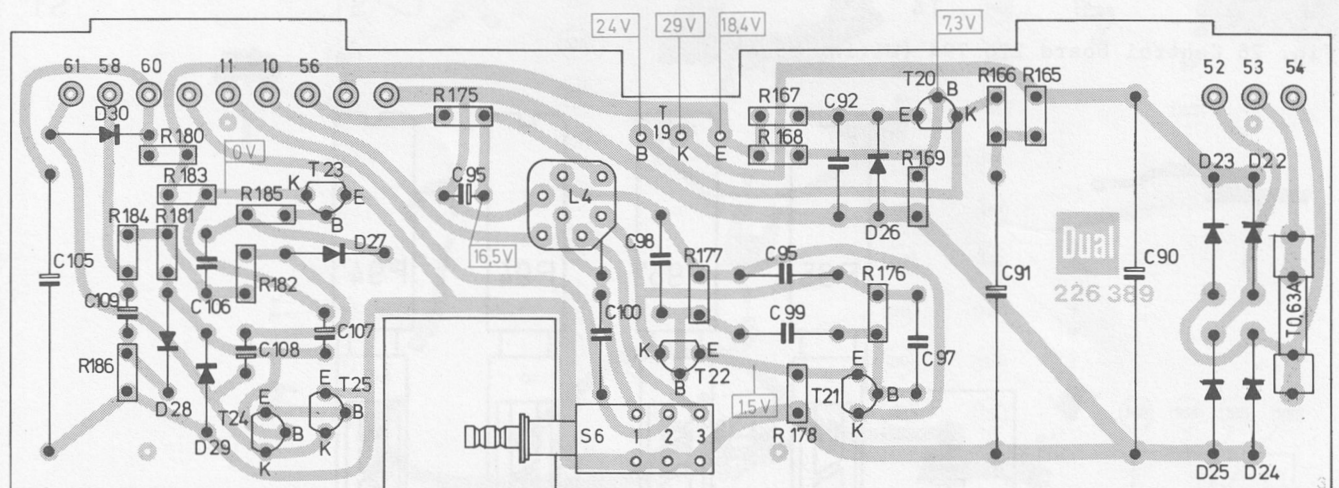


Fig. 24 Transformer board 226 439 (Wiring side)

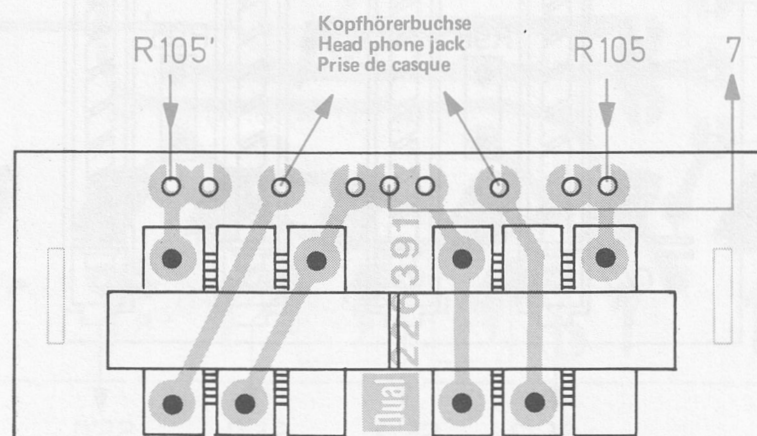




Fig. 25 Connection board 226 913 (wiring side)

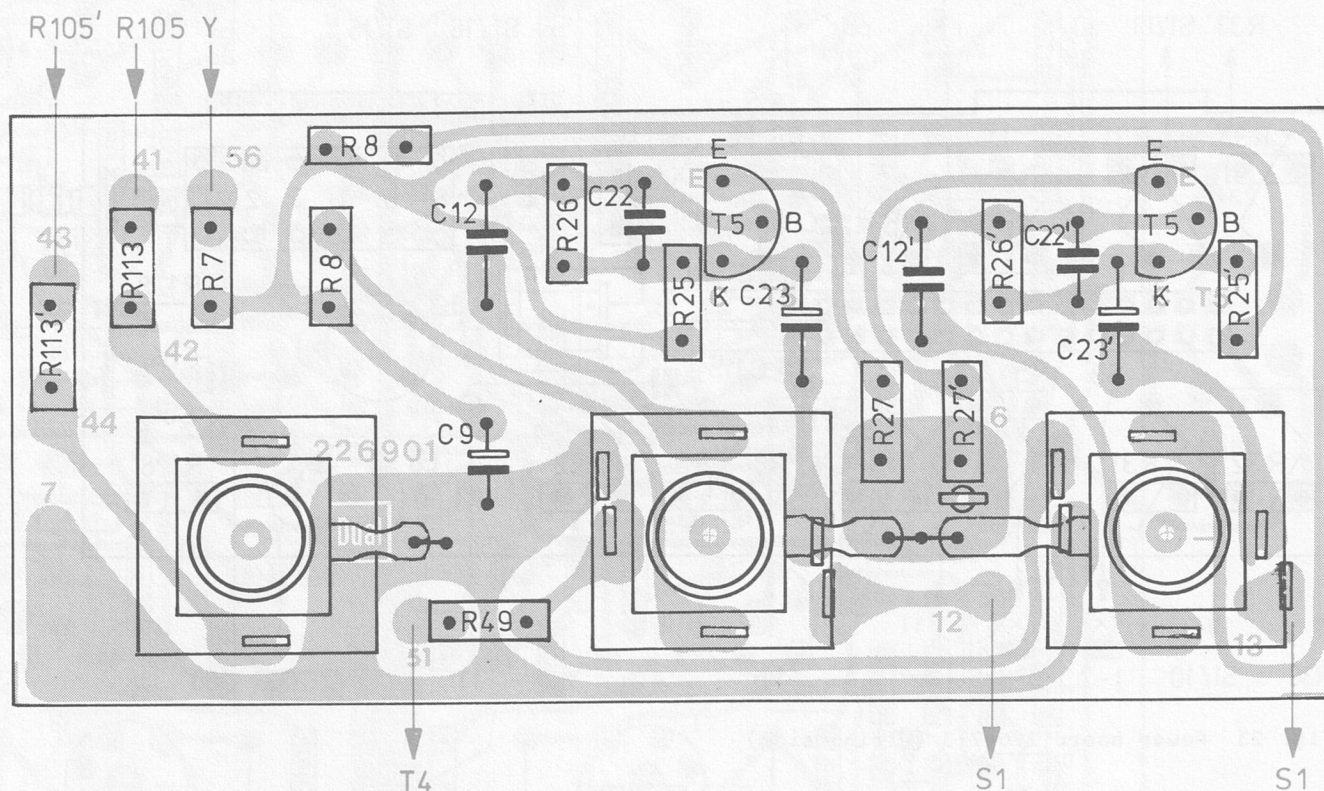
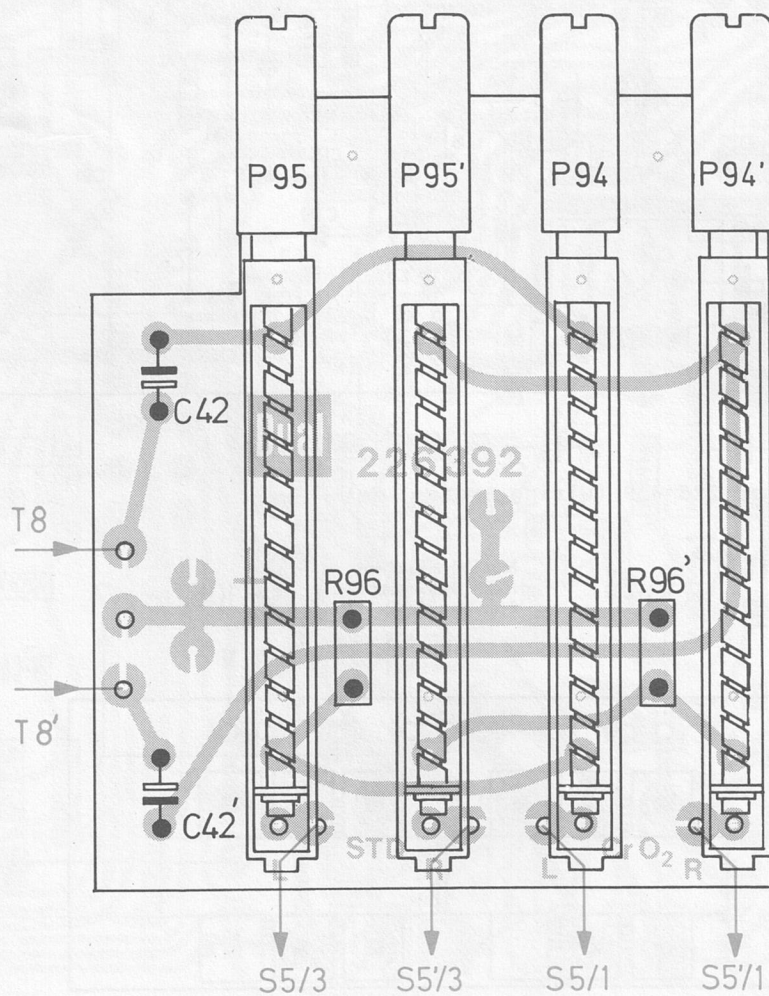


Fig. 26 Control board 226 794 (Wiring side)



# Replacement parts

| Pos. | Part. No. | Description                                             | Qty. |
|------|-----------|---------------------------------------------------------|------|
| 1    | 226 761   | Panel assembly .....                                    | 1    |
| 2    | 226 760   | Cover plate assembly without sides .....                | 1    |
| 3    | 226 012   | Side panel LH .....                                     | 1    |
| 4    | 210 586   | Washer 3.2/7/0.5 ST .....                               | 2    |
| 5    | 226 301   | Fillister head screw C/S M 3 x 10 .....                 | 4    |
| 6    | 210 362   | Hexagon nut BM 3 .....                                  | 2    |
| 7    | 226 074   | Cover .....                                             | 2    |
| 8    | 226 300   | Mirror .....                                            | 1    |
| 9    | 210 387   | C/S screw M 3 x 6 .....                                 | 2    |
| 10   | 226 249   | Spacer bolt 7mm A/F x 22.5 .....                        | 2    |
| 11   | 226 762   | Front panel assembly .....                              | 1    |
| 12   | 226 364   | V-spring .....                                          | 1    |
| 13   | 210 144   | Lock washer 1.9 .....                                   | 11   |
| 14   | 226 260   | Rubber sleeve .....                                     | 3    |
| 15   | 226 769   | Fixing rubber assembly .....                            | 2    |
| 16   | 226 763   | Cassette holder assembly .....                          | 1    |
| 17   | 226 221   | Taper bush assembly .....                               | 2    |
| 18   | 211 306   | Ball 3.5mm dia. ....                                    | 4    |
| 19   | 210 145   | Lock washer 2.3 .....                                   | 28   |
| 20   | 226 255   | Roller .....                                            | 1    |
| 21   | 210 145   | Lock washer 2.3 .....                                   | 28   |
| 22   | 226 260   | Rubber sleeve .....                                     | 3    |
| 23   | 226 764   | Leaf springs complete .....                             | 1    |
| 24   | 226 245   | Clamp .....                                             | 2    |
| 25   | 210 478   | Machine screw M 3 x 5.5 .....                           | 7    |
| 26   | 210 144   | Lock washer 1.9 .....                                   | 11   |
| 27   | 226 250   | Spindle .....                                           | 1    |
| 28   | 210 366   | Hexagon nut BM 4 .....                                  | 7    |
| 29   | 226 068   | Light aperture for direction of travel .....            | 1    |
| 30   | 223 625   | Locking plate .....                                     | 3    |
| 31   | 226 765   | Illumination sleeve, orange plastic .....               | 1    |
| 32   | 226 766   | Illumination sleeve, red plastic .....                  | 1    |
| 33   | 226 767   | Illumination sleeve, green plastic .....                | 1    |
| 34   | 226 503   | Retainer strap .....                                    | 2    |
| 35   | 210 478   | Machine screw M 3 x 5.5 .....                           | 7    |
| 36   | 210 155   | Serrated lock washer A 3.2 .....                        | 2    |
| 37   | 226 448   | Hexagon self-tapping screw with slot BZ 2.9 x 6.5 ..... | 10   |
| 38   | 226 768   | Driver assembly .....                                   | 2    |
| 39   | 210 556   | Washer 2.4/0.5, polyethylene .....                      | 2    |
| 40   | 226 330   | Cover for bulbs .....                                   | 1    |
| 41   | 226 261   | Seal .....                                              | 2    |
| 42   | 226 011   | Side panel RH .....                                     | 1    |
| 43   | 226 769   | Fixing rubber assembly .....                            | 2    |
| 44   | 226 260   | Rubber sleeve .....                                     | 3    |
| 59   | 226 895   | Washer 5.1 x 10 x 0.75 .....                            | 1    |
| 60   | 210 145   | Lock washer 2.3 .....                                   | 28   |
| 61   | 226 191   | Switch lever assembly .....                             | 1    |
| 62   | 226 366   | V-spring .....                                          | 1    |
| 63   | 210 145   | Lock washer 2.3 .....                                   | 28   |
| 64   | 226 193   | Reset lever assembly .....                              | 1    |
| 65   | 226 770   | Counter assembly .....                                  | 1    |
| 66   | 210 478   | Machine screw AM 3 x 5.5 .....                          | 7    |
| 67   | 226 259   | Counter belt .....                                      | 1    |
| 68   | 226 199   | EJECT key .....                                         | 1    |
| 69   | 226 361   | Compression spring .....                                | 1    |
| 70   | 210 145   | Lock washer 2.3 .....                                   | 28   |
| 71   | 210 144   | Lock washer 1.9 .....                                   | 11   |
| 72   | 226 324   | Washer 2.6/5/0.75 ST .....                              | 2    |
| 73   | 226 363   | V-spring .....                                          | 1    |
| 74   | 226 240   | Switch catch .....                                      | 1    |
| 75   | 226 188   | Intermediate lever assembly .....                       | 1    |
| 76   | 210 144   | Lock washer 1.9 .....                                   | 11   |
| 77   | 226 060   | Reset paul .....                                        | 1    |
| 78   | 226 640   | Tension spring .....                                    | 1    |
| 79   | 226 608   | Leaf spring .....                                       | 1    |
| 80   | 210 145   | Lock washer 2.3 .....                                   | 28   |
| 81   | 226 235   | Release .....                                           | 1    |
| 82   | 226 843   | "RECORD" key .....                                      | 8    |
| 83   | 226 173   | Spindle .....                                           | 1    |
| 84   | 210 147   | Lock washer 4 .....                                     | 4    |
| 85   | 210 472   | Machine screw AM 3 x 4 .....                            | 12   |
| 86   | 226 771   | Playback lever LH assembly .....                        | 1    |
| 87   | 226 305   | Rubber stop .....                                       | 1    |
| 88   | 226 772   | Playback lever RH assembly .....                        | 1    |
| 89   | 226 169   | Tension spring .....                                    | 2    |
| 90   | 210 486   | Machine screw AM 3 x 8 .....                            | 2    |
| 91   | 226 773   | Power supply board .....                                | 1    |



Fig. 27

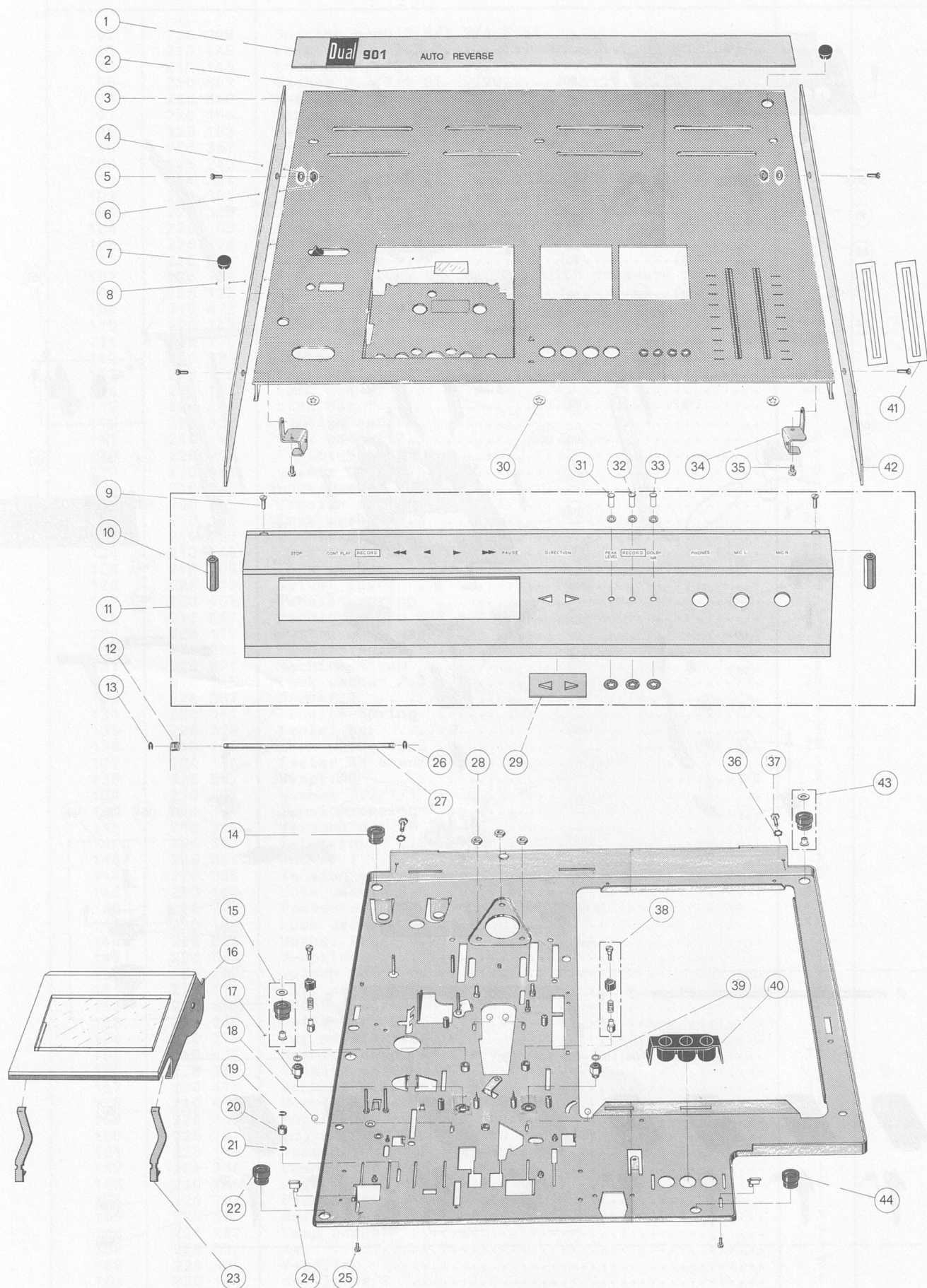
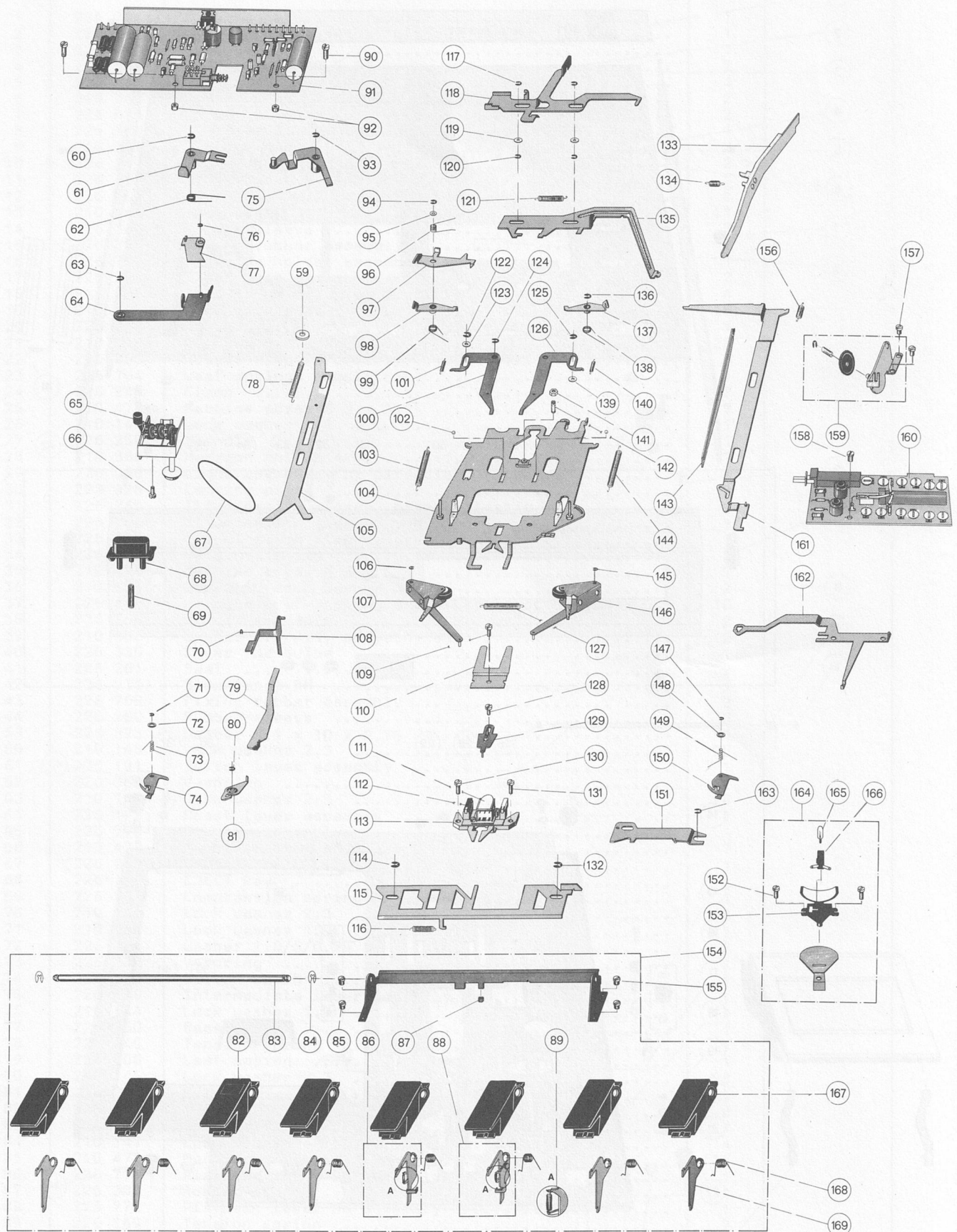


Fig. 28



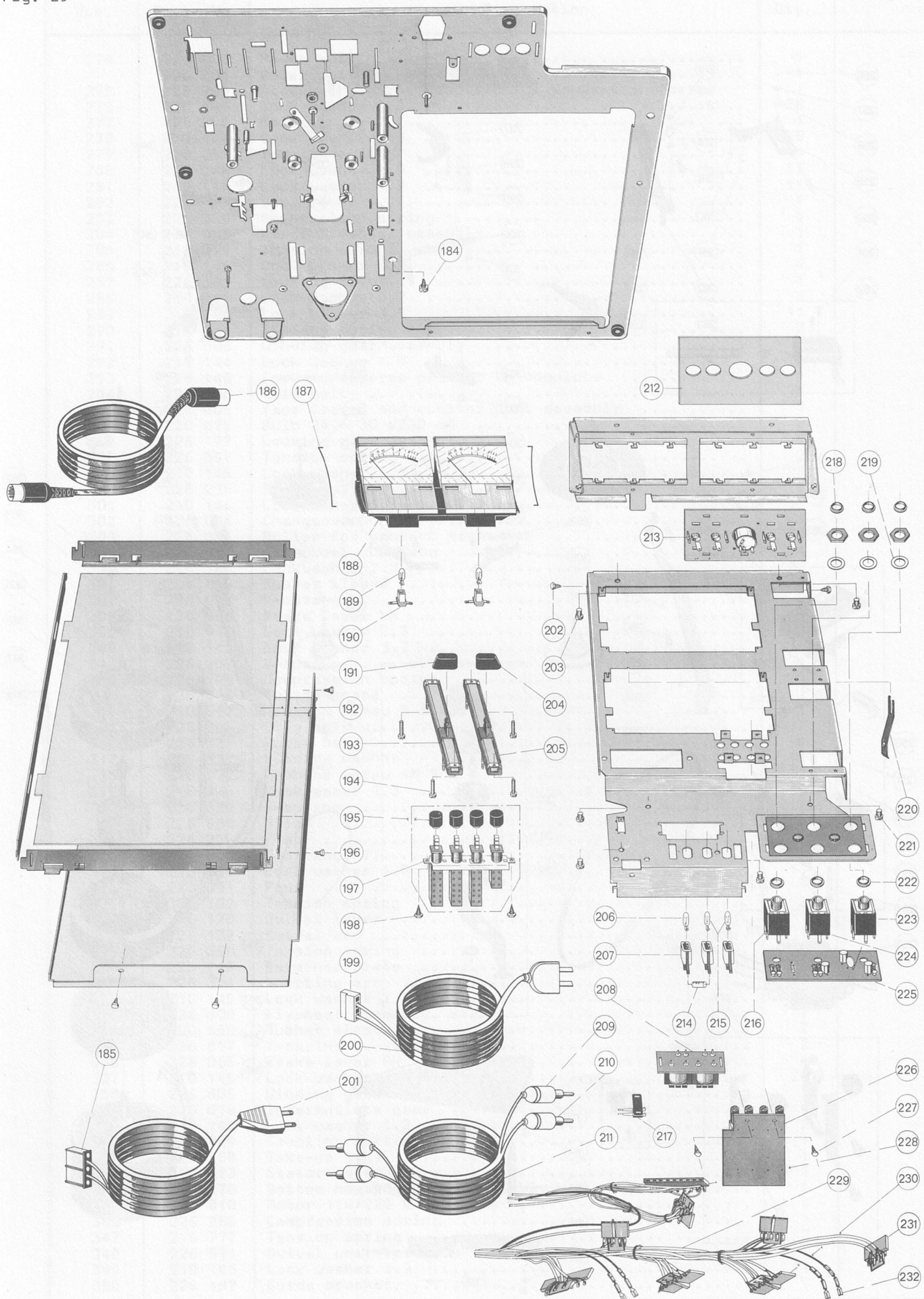


| Pos. | Part. No. | Description                                     | Qty. |
|------|-----------|-------------------------------------------------|------|
| 92   | 226 299   | Spacing bush 5.5/3.2/4.5 ST .....               | 2    |
| 93   | 210 145   | Lock washer 2.3 .....                           | 28   |
| 94   | 210 145   | Lock washer 2.3 .....                           | 28   |
| 95   | 210 587   | Washer 3.2/7/1 ST .....                         | 6    |
| 96   | 226 368   | V-spring .....                                  | 1    |
| 97   | 226 196   | Probe .....                                     | 1    |
| 98   | 226 183   | Feeler LH assembly .....                        | 1    |
| 99   | 226 367   | V-spring .....                                  | 1    |
| 100  | 226 243   | Swivel lever .....                              | 2    |
| 101  | 214 344   | Tension spring .....                            | 2    |
| 102  | 209 353   | Ball 2mm dia. ....                              | 2    |
| 103  | 226 355   | Tension spring .....                            | 2    |
| 104  | 226 108   | Head block plate assembly .....                 | 1    |
| 105  | 226 126   | Record bar assembly .....                       | 1    |
| 106  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 107  | 226 774   | Pressure lever LH complete with pressure roller | 1    |
| 108  | 226 122   | Ejector lever assembly .....                    | 1    |
| 109  | 210 472   | Machine screw AM 3 x 4 .....                    | 11   |
| 110  | 226 247   | Retaining spring .....                          | 1    |
| 111  | 226 776   | Record/playback .....                           | 1    |
| 112  | 226 777   | Erase head support assembly .....               | 1    |
| 113  | 226 775   | Head unit assembly .....                        | 1    |
| 114  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 115  | 226 241   | Stop bar .....                                  | 1    |
| 116  | 226 353   | Tension spring .....                            | 1    |
| 117  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 118  | 226 294   | Feeler bar .....                                | 1    |
| 119  | 210 587   | Washer 3.2/7/1 ST .....                         | 6    |
| 120  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 121  | 200 453   | Tension spring .....                            | 2    |
| 122  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 123  | 210 587   | Washer 3.2/7/1 ST .....                         | 6    |
| 124  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 125  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 126  | 226 243   | Swivel lever .....                              | 2    |
| 127  | 200 453   | Tension spring .....                            | 1    |
| 128  | 211 667   | Machine screw M 2 x 4 .....                     | 1    |
| 129  | 226 179   | Switch unit assembly .....                      | 1    |
| 130  | 226 821   | Machine screw .....                             | 2    |
| 131  | 226 821   | Machine screw .....                             | 2    |
| 132  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 133  | 226 307   | Rocker 2 .....                                  | 1    |
| 134  | 226 351   | Tension spring .....                            | 1    |
| 135  | 226 293   | Feeler bar .....                                | 1    |
| 136  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 137  | 226 186   | Feeler RH assembly .....                        | 1    |
| 138  | 226 367   | V-spring .....                                  | 2    |
| 139  | 210 587   | Washer 3.2/7/1 ST .....                         | 6    |
| 140  | 214 344   | Tension spring .....                            | 2    |
| 141  | 210 357   | Hexagon nut BM 2.6 .....                        | 1    |
| 142  | 226 303   | Set screw M 2.6 x 7.5 .....                     | 1    |
| 143  | 226 234   | Rocker 1 .....                                  | 1    |
| 144  | 226 355   | Tension spring .....                            | 2    |
| 145  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 146  | 226 778   | Pressure lever RH complete with pressure roller | 1    |
| 147  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 148  | 226 324   | Washer 2.6/5/0.75 ST .....                      | 2    |
| 149  | 226 363   | V-spring .....                                  | 2    |
| 150  | 226 240   | Switch catch .....                              | 2    |
| 151  | 226 119   | Lift assembly .....                             | 1    |
| 152  | 210 472   | Machine screw AM 3 x 4 .....                    | 12   |
| 153  | 226 289   | Reflector .....                                 | 1    |
| 154  | 226 779   | Key panel assembly .....                        | 1    |
| 155  | 210 472   | Machine screw AM 3 x 4 .....                    | 12   |
| 156  | 226 352   | Tension spring .....                            | 4    |
| 157  | 210 472   | Machine screw AM 3 x 4 .....                    | 12   |
| 158  | 210 478   | Machine screw M 3 x 5.5 .....                   | 7    |
| 159  | 226 780   | Angle complete with spur gear .....             | 1    |
| 160  | 226 781   | Adjusting control board assembly .....          | 1    |
| 161  | 226 148   | Disengagement arm assembly .....                | 1    |
| 162  | 226 236   | Changeover arm .....                            | 1    |
| 163  | 210 146   | Lock washer 3.2 .....                           | 5    |
| 164  | 226 782   | Direction indicator assembly .....              | 1    |
| 165  | 220 625   | Bulb 24 - 30 V/30 mA (direction indicator)      | 1    |
| 166  | 226 287   | Lamp socket .....                               | 1    |
| 167  | 226 031   | Key .....                                       | 7    |
| 168  | 226 891   | V-spring .....                                  | 8    |
| 169  | 226 164   | Key lever 1 .....                               | 1    |

| Pos. | Part. No. | Description                                                                | Qty. |
|------|-----------|----------------------------------------------------------------------------|------|
| 184  | 227 467   | Hexagon self-tapping screw BZ 2.9 x 6.5 .....                              | 10   |
| 185  | 213 980   | Bush housing .....                                                         | 1    |
| 186  | 226 816   | Audio cable 5-pole .....                                                   | 1    |
| 187  | 226 369   | Hock spring .....                                                          | 2    |
| 188  | 226 783   | Recording level meter assembly, twin-type .....                            | 1    |
| 189  | 226 393   | Bulb 12-15V/30 mA .....                                                    | 3    |
| 190  | 230 955   | Bulb socket .....                                                          | 2    |
| 191  | 226 029   | Slide knob .....                                                           | 2    |
| 192  | 226 784   | Amplifier board assembly .....                                             | 1    |
| 193  | 226 785   | Slide control assembly .....                                               | 2    |
| 194  | 210 487   | Machine screw M 3 x 10 .....                                               | 4    |
| 195  | 226 030   | Key button .....                                                           | 4    |
| 196  | 227 467   | Hexagon self-tapping screw BZ 2.9 x 6.5 .....                              | 10   |
| 197  | 226 786   | Push button assembly, quadruple .....                                      | 1    |
| 198  | 227 467   | Hexagon self-tapping screw BZ 2.9 x 6.5 .....                              | 10   |
| 199  | 209 457   | Inner housing for AMP plug .....                                           | 1    |
| 200  | 207 311   | Power cord complete with AMP plug .....                                    | 1    |
| 201  | 234 132   | Power cord complete .....                                                  | 1    |
| 202  | 227 467   | Hexagon self-tapping screw with slot B 2.9 x 6.5 .....                     | 10   |
| 203  | 210 472   | Machine screw M 3 x 4 .....                                                | 12   |
| 204  | 226 029   | Slide knob .....                                                           | 2    |
| 205  | 226 785   | Slide control assembly .....                                               | 2    |
| 206  | 226 393   | Bulb 12 - 15 V/30 mA (PEAK LEVEL indicator) ....                           | 3    |
| 207  | 209 441   | Lamp socket (PEAK LEVEL, RECORD, DOLBY indicator)                          | 3    |
| 208  | 226 439   | Transformer board (America/Canada) .....                                   | 1    |
| 209  | 209 425   | Cynch plug white .....                                                     | 2    |
| 210  | 209 426   | Cynch plug black .....                                                     | 2    |
| 211  | 226 817   | Pick-up cord complete with Cynch plug .....                                | 1    |
| 212  | 226 327   | Jack panel .....                                                           | 1    |
| 213  | 226 789   | Jack plate assembly .....                                                  | 1    |
| 214  | 216 695   | R 9 film resistor 120 Ohm/0.25 W/10 % .....                                | 1    |
| 215  | 220 625   | Bulb 24 - 30 V/30 mA (RECORD, DOLBY indicator)                             | 2    |
| 216  | 226 790   | PHONES jack assembly .....                                                 | 1    |
| 217  | 226 788   | Muting switch assembly .....                                               | 1    |
| 218  | 226 072   | Insulating bush 1 .....                                                    | 3    |
| 219  | 210 714   | Washer 9.2/15/0.15 TFE .....                                               | 3    |
| 220  | 226 308   | Fork .....                                                                 | 1    |
| 221  | 210 472   | Machine screw M 3 x 4 .....                                                | 12   |
| 222  | 226 073   | Insulating bush 2 .....                                                    | 3    |
| 223  | 226 938   | MIC jack assembly .....                                                    | 2    |
| 224  | 226 938   | MIC jack assembly .....                                                    | 2    |
| 225  | 226 913   | Connection board assembly .....                                            | 1    |
|      | 226 914   | Connection board assembly (America/Canada) ....                            | 1    |
| 226  | 226 794   | Control board assembly .....                                               | 1    |
| 227  | 227 467   | Hexagon self-tapping screw with slot B 2.9 x 6.5 .....                     | 10   |
| 228  | 226 516   | Female multi-point connector 9-pole .....                                  | 1    |
| 229  | 226 795   | Cable harness assembly .....                                               | 1    |
| 230  | 223 834   | Female multi-point connector 7-pole .....                                  | 3    |
| 231  | 226 514   | Female multi-point connector 5-pole .....                                  | 4    |
| 232  | 222 038   | Flat connector sleeve .....                                                | 4    |
| 250  | 230 356   | Suppression capacitor 68 nF (C 93) .....                                   | 1    |
| 251  | 223 621   | Roller .....                                                               | 1    |
| 252  | 224 183   | Screw bolt .....                                                           | 1    |
| 253  | 226 796   | Power switch cover .....                                                   | 1    |
|      | 226 797   | Power switch cover, AMP .....                                              | 1    |
| 254  | 226 642   | Machine screw M 3 x 33 .....                                               | 1    |
| 255  | 226 798   | Power transformer assembly .....                                           | 1    |
| 256  | 210 145   | Lock washer 2.3 .....                                                      | 28   |
| 257  | 210 586   | Washer 3.2/7/0.5 ST .....                                                  | 4    |
| 258  | 210 586   | Washer 3.2/7/0.5 ST .....                                                  | 4    |
| 259  | 226 115   | Non-stop lever assembly .....                                              | 1    |
| 260  | 226 353   | Tension spring .....                                                       | 1    |
| 261  | 210 472   | Machine screw AM 3 x 4 .....                                               | 14   |
| 262  | 226 800   | Traction magnet complete with armature .....                               | 1    |
| 263  | 226 618   | Felt washer .....                                                          | 1    |
| 264  | 226 595   | Guide pulley .....                                                         | 1    |
| 265  | 210 142   | Lock washer 1.2 .....                                                      | 2    |
| 266  | 227 216   | Switch board complete with voltage selector and<br>special capacitor ..... | 1    |
| 267  | 223 617   | Hold-down assembly .....                                                   | 1    |
| 268  | 219 200   | Snap spring .....                                                          | 1    |
| 269  | 227 209   | Tension spring .....                                                       | 1    |
| 270  | 226 136   | Switch bar assembly .....                                                  | 1    |
| 271  | 220 152   | Plastic clip .....                                                         | 1    |
| 272  | 210 586   | Washer 3.2/7/0.5 ST .....                                                  | 4    |
| 273  | 210 487   | Machine screw M 3 x 10 .....                                               | 1    |



Fig. 29



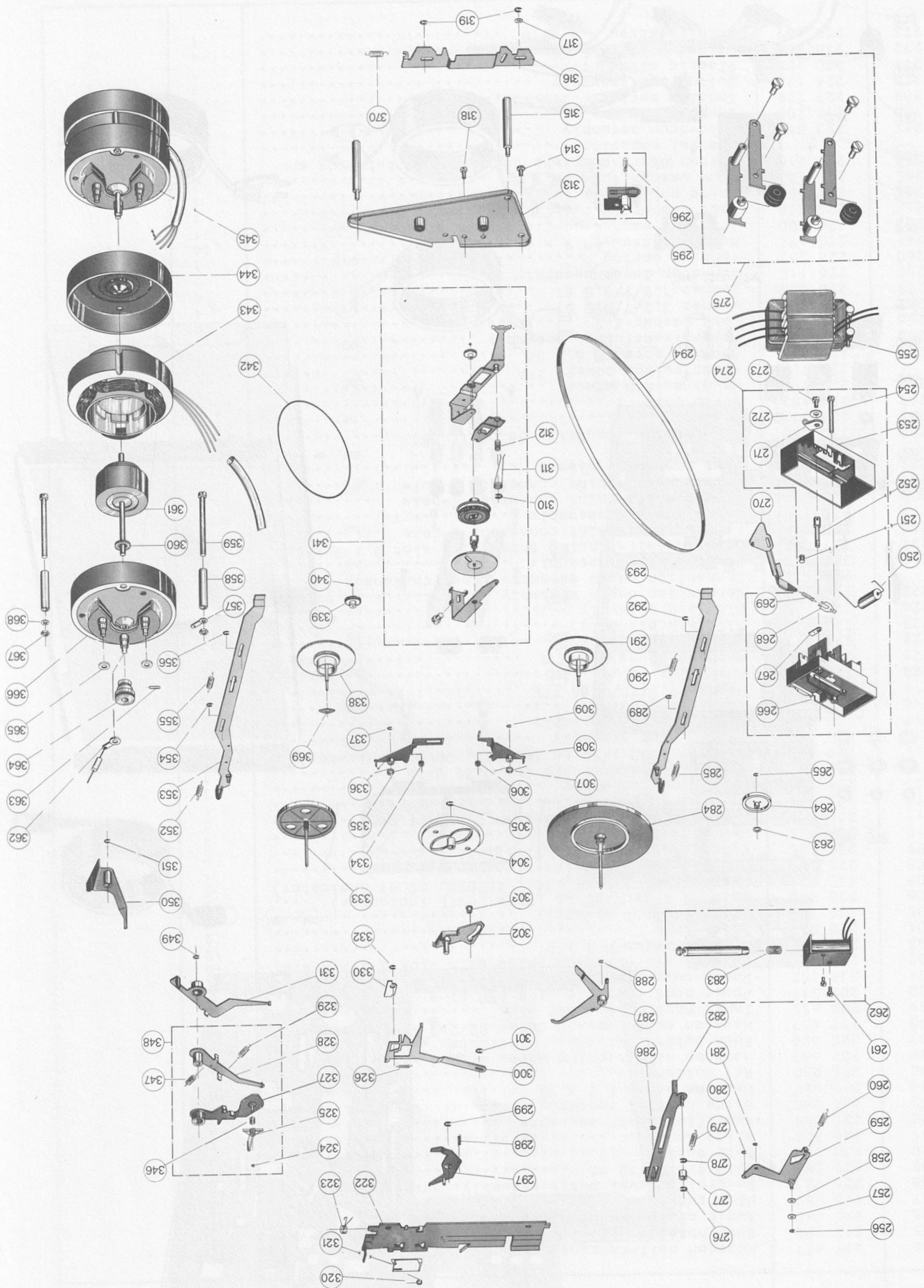


Fig. 30

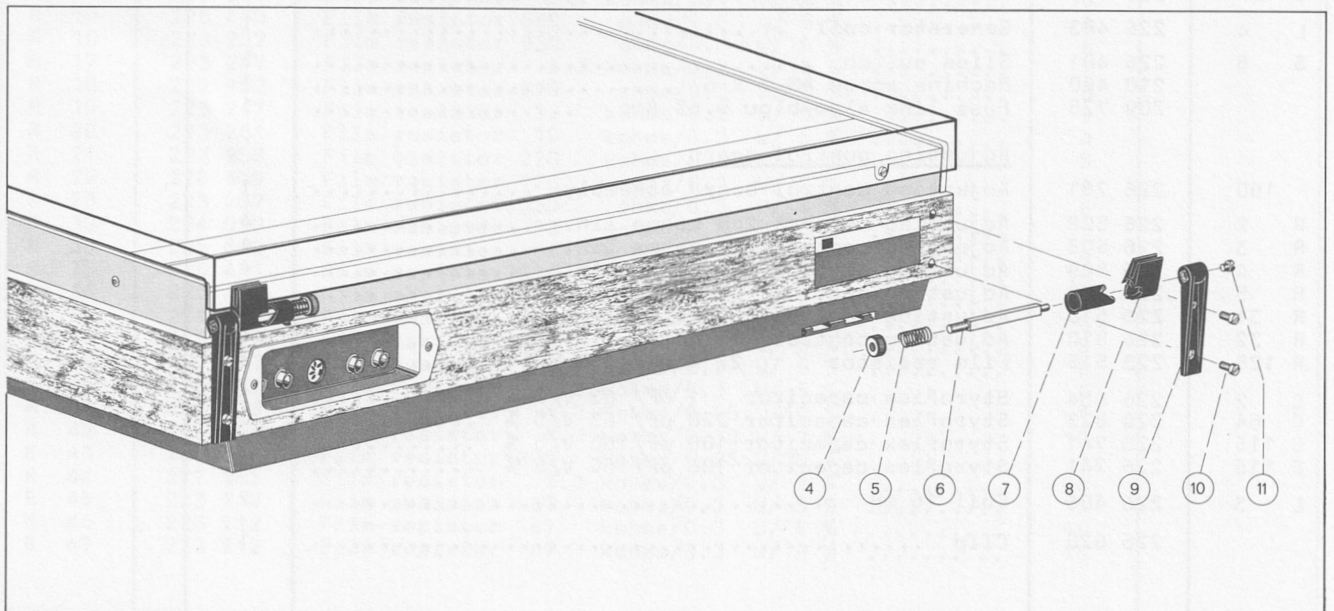


| Pos. | Part. No. | Description                                     | Qty. |
|------|-----------|-------------------------------------------------|------|
| 274  | 226 803   | Power switch assembly .....                     | 1    |
|      | 226 804   | Power switch (AMP) assembly .....               | 1    |
| 275  | 226 799   | Attachment parts complete for power transformer | 1    |
| 276  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 277  | 226 255   | Roller .....                                    | 1    |
| 278  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 279  | 226 357   | Tension spring .....                            | 1    |
| 280  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 281  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 282  | 226 174   | Stop lever .....                                | 1    |
| 283  | 226 359   | Compression spring .....                        | 1    |
| 284  | 226 802   | Large flywheel assembly .....                   | 1    |
| 285  | 216 777   | Tension spring .....                            | 1    |
| 286  | 210 146   | Lock washer 3.2 .....                           | 4    |
| 287  | 226 151   | Locking lever .....                             | 1    |
| 288  | 210 146   | Lock washer 3.2 .....                           | 4    |
| 289  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 290  | 214 344   | Tension spring .....                            | 2    |
| 291  | 226 806   | Winding gear assembly .....                     | 2    |
| 292  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 293  | 226 146   | Forward/reverse plunger LH complete .....       | 1    |
| 294  | 226 606   | Main belt .....                                 | 1    |
| 295  | 226 805   | Tape travel and monitor unit assembly .....     | 1    |
| 296  | 220 625   | Bulb 24 - 30 V/30 mA .....                      | 2    |
| 297  | 226 177   | Locking pawl assembly .....                     | 1    |
| 298  | 226 357   | Tension spring .....                            | 2    |
| 299  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 300  | 226 238   | Slide .....                                     | 1    |
| 301  | 210 144   | Lockwasher 1.9 .....                            | 11   |
| 302  | 226 064   | Changeover unit .....                           | 1    |
| 303  | 226 321   | Roller for contact mechanism .....              | 1    |
| 304  | 226 807   | Cam wheel complete .....                        | 1    |
| 305  | 210 145   | Lockwasher 2.3 .....                            | 28   |
| 306  | 200 650   | Rubber sleeve .....                             | 2    |
| 307  | 226 617   | V-spring .....                                  | 2    |
| 308  | 226 066   | Brake lever LH .....                            | 1    |
| 309  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 310  | 210 146   | Lock washer 3.2 .....                           | 4    |
| 311  | 226 207   | V-spring .....                                  | 1    |
| 312  | 226 206   | Compression spring .....                        | 1    |
| 313  | 226 138   | Bottom board .....                              | 1    |
| 314  | 210 811   | Hexagon screw M 3 x 5 .....                     | 1    |
| 315  | 226 248   | Stay bolt .....                                 | 2    |
| 316  | 226 237   | Power bar .....                                 | 1    |
| 317  | 201 187   | Sliding washer .....                            | 1    |
| 318  | 210 472   | Machine screw AM 3 x 4 .....                    | 11   |
| 319  | 210 145   | Lockwasher 2.3 .....                            | 28   |
| 320  | 226 639   | V-spring .....                                  | 1    |
| 321  | 226 638   | Slide .....                                     | 1    |
| 322  | 226 239   | Flap .....                                      | 1    |
| 323  | 226 845   | V-spring .....                                  | 1    |
| 324  | 210 144   | Lock washer 1.9 .....                           | 11   |
| 325  | 226 061   | Pawl .....                                      | 1    |
| 326  | 226 352   | Tension spring .....                            | 2    |
| 327  | 226 128   | Swivel lever .....                              | 1    |
| 328  | 226 132   | Swivel arm .....                                | 1    |
| 329  | 226 350   | Tension spring .....                            | 2    |
| 330  | 226 246   | Retainer plate .....                            | 1    |
| 331  | 226 374   | Shorting arm .....                              | 1    |
| 332  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 333  | 226 808   | Flywheel assembly, small .....                  | 1    |
| 334  | 200 650   | Rubber sleeve .....                             | 2    |
| 335  | 226 617   | V-spring .....                                  | 2    |
| 336  | 226 065   | Brake lever RH .....                            | 1    |
| 337  | 210 145   | Lock washer 2.3 .....                           | 28   |
| 338  | 226 806   | Winding gear assembly .....                     | 2    |
| 339  | 226 018   | Intermediate gear .....                         | 1    |
| 340  | 210 142   | Lock washer 1.2 .....                           | 2    |
| 341  | 226 809   | Coupling unit assembly .....                    | 1    |
| 342  | 226 258   | Take-up belt .....                              | 1    |
| 343  | 218 323   | Stator assembly .....                           | 1    |
| 344  | 216 276   | Bottom housing panel assembly .....             | 1    |
| 345  | 226 810   | Motor 110/220 V assembly .....                  | 1    |
| 346  | 226 358   | Compression spring .....                        | 1    |
| 347  | 216 777   | Tension spring .....                            | 3    |
| 348  | 226 511   | Swivel unit assembly .....                      | 1    |
| 349  | 210 146   | Lock washer 3.2 .....                           | 11   |
| 350  | 226 197   | Guide bracket .....                             | 1    |

| Pos. | Part. No. | Description                                                             | Qty. |
|------|-----------|-------------------------------------------------------------------------|------|
| 351  | 210 145   | Lock washer 2.3 .....                                                   | 28   |
| 352  | 216 777   | Tension spring .....                                                    | 3    |
| 353  | 226 142   | Forward/reverse plunger RH complete .....                               | 1    |
| 353  | 210 144   | Lock washer 1.9 .....                                                   | 11   |
| 355  | 214 344   | Tension spring .....                                                    | 2    |
| 356  | 210 144   | Lock washer 1.9 .....                                                   | 11   |
| 357  | 210 161   | Serrated lock washer 4.3 .....                                          | 2    |
| 358  | 213 510   | Insulating sheath .....                                                 | 2    |
| 359  | 211 553   | Machine screw AM 4 x 48 .....                                           | 2    |
| 360  | 220 806   | Washer 4.1/12/0.7 F .....                                               | 1    |
| 361  | 226 811   | Armature assembly .....                                                 | 1    |
| 362  | 226 506   | Leak resistor 2.2 Mohms/0.3 W/10 % .....                                | 1    |
| 363  | 210 220   | Set screw M 2.6 x 3.5 .....                                             | 1    |
| 364  | 226 812   | Drive pulley 50 Hz complete .....                                       | 1    |
|      | 226 813   | Drive pulley 60 Hz complete .....                                       | 1    |
| 365  | 210 626   | Washer 4.2/7/0.5 ST .....                                               | 2    |
| 366  | 226 271   | Top housing panel assembly .....                                        | 1    |
| 367  | 210 366   | Hexagon nut BM 4 .....                                                  | 2    |
| 368  | 209 977   | Solder lug .....                                                        | 1    |
| 369  | 226 517   | Friction spring .....                                                   | 1    |
| 370  | 231 017   | Tension spring .....                                                    | 1    |
| **   | 226 411   | Accessories for wall mounting .....                                     | 1    |
| **   | 226 814   | Vertical base complete with accessories .....                           | 2    |
| **   | 226 414   | Packing carton C 901 complete .....                                     | 1    |
| **   | 226 412   | Operating Instructions .....                                            | 1    |
|      |           | <u>CK 90 base</u>                                                       |      |
| 1    | 231 045   | CK 90 base walnut, complete .....                                       | 1    |
|      | 231 046   | CK 90 base white, complete .....                                        | 1    |
| 2    | 228 387   | Dual name plate .....                                                   | 1    |
| 3    | 226 281   | Coyer frame .....                                                       | 1    |
| 4    | 217 323   | Chipboard C/S screw 2.7 x 10 .....                                      | 2    |
| 5    | 226 279   | Base .....                                                              | 2    |
| 6    | 226 815   | Mounting plate complete with mounting wedge .....                       | 1    |
| 7    | 202 257   | Cheese head self-tapping screw 3.9 x 25 .....                           | 2    |
|      |           | <u>CH 90 Cover</u>                                                      |      |
| 1    | 226 844   | Ch 90 cover, complete with hinges<br>(kit for subsequent fitment) ..... | 1    |
| 2    | 226 890   | CH 90 cover .....                                                       | 1    |
| 3    | 226 899   | Hinge assembly .....                                                    | 2    |
| 4    | 226 836   | Knurled nut .....                                                       | 2    |
| 5    | 226 835   | Compression spring .....                                                | 2    |
| 6    | 226 832   | Hinge pin .....                                                         | 2    |
| 7    | 226 834   | Hinge cam .....                                                         | 2    |
| 8    | 226 833   | Hinge plate .....                                                       | 2    |
| 9    | 226 831   | Hinge pivot .....                                                       | 2    |
| 10   | 226 856   | Machine screw AM 4 x 8 .....                                            | 4    |
| 11   | 226 855   | Machine screw AM 3 x 5 .....                                            | 2    |

\*\* not illustrated

Fig. 31





| Pos.  | Part. No. | Description                                     | Qty. |
|-------|-----------|-------------------------------------------------|------|
|       |           | <u>Power supply board</u>                       |      |
| 91    | 226 773   | Power supply board assembly .....               | 1    |
| T 19  | 226 472   | Transistor BD 233/16 .....                      | 2    |
| T 20  | 209 862   | Transistor BC 172 C .....                       | 2    |
| T 21  | 226 870   | Transistor BC 337/25 .....                      | 2    |
| T 22  | 226 870   | Transistor BC 337/25 .....                      | 2    |
| T 23  | 209 862   | Transistor BC 172 C .....                       | 3    |
| T 24  | 209 862   | Transistor BC 172 C .....                       | 3    |
| T 25  | 224 726   | Transistor BC 337 .....                         | 3    |
| D 22  | 226 501   | Diode 1 N 4002 .....                            | 4    |
| D 23  | 226 501   | Diode 1 N 4002 .....                            | 4    |
| D 24  | 226 501   | Diode 1 N 4002 .....                            | 4    |
| D 25  | 226 501   | Diode 1 N 4002 .....                            | 4    |
| D 26  | 226 444   | Diode BZX 83 C .6 V 8 .....                     | 1    |
| D 27  | 223 906   | Diode 1 N 4148 .....                            | 4    |
| D 28  | 223 906   | Diode 1 N 4148 .....                            | 4    |
| D 29  | 223 906   | Diode 1 N 4148 .....                            | 4    |
| D 30  | 223 906   | Diode 1 N 4148 .....                            | 4    |
| R 165 | 223 259   | Film resistor 470 ohms/0.3 W/5 % .....          | 2    |
| R 166 | 223 259   | Film resistor 470 ohms/0.3 W/5 % .....          | 2    |
| R 167 | 223 216   | Film resistor 2.2 kohms/0.3 W/5 % .....         | 1    |
| R 168 | 229 391   | Adjusting control 5 kohms/lin. ....             | 1    |
| R 169 | 223 265   | Film resistor 1.2 kohms/0.3 W/5 % .....         | 1    |
| R 175 | 224 147   | Film resistor 10 kohms/0.3 W/5 % .....          | 1    |
| R 176 | 223 212   | Film resistor 47 kohms/0.3 W/5 % .....          | 2    |
| R 177 | 223 212   | Film resistor 47 kohms/0.3 W/5 % .....          | 2    |
| R 178 | 223 219   | Film resistor 22 kohms/0.3 W/5 % .....          | 1    |
| R 180 | 226 490   | Film resistor 12 kohms/0.3 W/5 % .....          | 1    |
| R 181 | 223 258   | Film resistor 220 kohms/0.3 W/5 % .....         | 1    |
| R 182 | 223 897   | Film resistor 100 kohms/0.3 W/5 % .....         | 2    |
| R 183 | 223 898   | Film resistor 10 kohms/0.3 W/5 % .....          | 2    |
| R 184 | 223 898   | Film resistor 10 kohms/0.3 W/5 % .....          | 2    |
| R 185 | 223 897   | Film resistor 100 kohms/0.3 W/5 % .....         | 2    |
| R 186 | 223 215   | Film resistor 22 kohms/0.3 W/5 % .....          | 1    |
| C 90  | 226 586   | Electrolytic capacitor 1000 $\mu$ F/ 40 V ..... | 1    |
| C 91  | 226 457   | Electrolytic capacitor 470 $\mu$ F/ 40 V .....  | 1    |
| C 92  | 226 465   | Styroflex capacitor 1 nF/ 63 V/ 5 % ....        | 1    |
| C 95  | 226 455   | Electrolytic capacitor 100 $\mu$ F/ 25 V .....  | 1    |
| C 96  | 226 824   | Styroflex capacitor 10 nF/ 63 V/ 5 % ....       | 1    |
| C 97  | 217 981   | Styroflex capacitor 4.7 nF/ 63 V/ 5 % ....      | 3    |
| C 98  | 217 981   | Styroflex capacitor 4.7 nF/ 63 V/ 5 % ....      | 3    |
| C 99  | 217 981   | Styroflex capacitor 4.7 nF/ 63 V/ 5 % ....      | 3    |
| C 100 | 226 634   | Styroflex capacitor 1 nF/ 63 V/ 5 % ....        | 3    |
| C 101 | 226 632   | Foil capacitor 470 pF/ 63 V/10 % ....           | 1    |
| C 105 | 226 587   | Electrolytic capacitor 470 $\mu$ F/ 25 V .....  | 1    |
| C 106 | 226 459   | Foil capacitor 0.1 $\mu$ F/100 V/ 5 % ....      | 1    |
| C 107 | 226 451   | Electrolytic capacitor 22 $\mu$ F/ 25 V .....   | 1    |
| C 108 | 222 219   | Electrolytic capacitor 4.7 $\mu$ F/ 25 V .....  | 1    |
| C 109 | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25 V .....   | 1    |
| L 4   | 226 403   | Generator coil .....                            | 1    |
| S 6   | 226 401   | Slide switch .....                              | 1    |
|       | 210 480   | Machine screw AM 3 x 6 .....                    | 1    |
|       | 209 725   | Fuse link slow-blow 0.63 Amp. ....              | 1    |
|       |           | <u>Adjusting control board</u>                  |      |
| 160   | 226 781   | Adjusting control board assembly .....          | 1    |
| R 2   | 226 508   | Adjusting control 250 kohms lin. ....           | 4    |
| R 3   | 226 508   | Adjusting control 250 kohms lin. ....           | 4    |
| R 4   | 226 509   | Adjusting control 25 kohms lin. ....            | 4    |
| R 5   | 226 509   | Adjusting control 25 kohms lin. ....            | 4    |
| R 31  | 226 510   | Adjusting control 50 kohms lin. ....            | 4    |
| R 32  | 226 510   | Adjusting control 50 kohms lin. ....            | 4    |
| R 128 | 223 515   | Film resistor 22 kohms/0.3 W/5 % .....          | 2    |
| C 2   | 226 634   | Styroflex capacitor 1 nF/ 63 V/5 % .....        | 1    |
| C 64  | 226 823   | Styroflex capacitor 220 pF/ 63 V/5 % .....      | 2    |
| C 115 | 226 741   | Styroflex capacitor 100 pF/160 V/5 % .....      | 4    |
| C 116 | 226 741   | Styroflex capacitor 100 pF/160 V/5 % .....      | 4    |
| L 3   | 226 406   | Coil 16 mH .....                                | 2    |
|       | 226 820   | Clip .....                                      | 1    |

| Pos. | Part. No. | Description                               | Qty. |
|------|-----------|-------------------------------------------|------|
| S 2  | 226 397   | Slide switch .....                        | 1    |
| S 3  | 226 398   | Slide switch .....                        | 1    |
|      | 226 323   | Break-and-make jack .....                 | 1    |
|      | 210 145   | Lock washer 2.3 .....                     | 1    |
|      |           | <u>Amplifier board</u>                    |      |
| 192  | 226 784   | Amplifier board assembly .....            | 1    |
| I 1  | 226 442   | Integrated circuit TAA 761 A .....        | 4    |
| I 2  | 226 442   | Integrated circuit TAA 761 A .....        | 4    |
| T 1  | 226 898   | Transistor BC 550 C .....                 | 2    |
| T 2  | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 3  | 220 535   | Transistor BC 252 B .....                 | 1    |
| T 4  | 226 383   | Transistor 2 N 5458 (SPF 349 412).....    | 3    |
| T 6  | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 7  | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 8  | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 9  | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 10 | 226 383   | Transistor 2 N 5458 (SPF 349 412).....    | 3    |
| T 11 | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 12 | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 13 | 209 863   | Transistor BC 173 C .....                 | 16   |
| T 14 | 209 862   | Transistor BC 172 C .....                 | 4    |
| T 15 | 209 862   | Transistor BC 172 C .....                 | 4    |
| T 16 | 209 862   | Transistor BC 172 C .....                 | 4    |
| T 18 | 209 862   | Transistor BC 172 C .....                 | 4    |
| D 1  | 226 896   | Diode D 249 .....                         | 8    |
| D 2  | 226 896   | Diode D 249 .....                         | 8    |
| D 3  | 226 896   | Diode D 249 .....                         | 8    |
| D 4  | 226 896   | Diode D 249 .....                         | 8    |
| D 9  | 223 906   | Diode 1 N 4148 .....                      | 9    |
| D 10 | 226 629   | Diode BAW 21 .....                        | 2    |
| D 11 | 226 443   | Diode 1 N 54 A .....                      | 6    |
| D 12 | 223 906   | Diode 1 N 4148 .....                      | 9    |
| D 13 | 223 906   | Diode 1 N 4148 .....                      | 9    |
| D 14 | 226 443   | Diode 1 N 54 A .....                      | 6    |
| D 15 | 223 906   | Diode 1 N 4148 .....                      | 9    |
| D 16 | 226 443   | Diode 1 N 54 A .....                      | 6    |
| D 17 | 226 443   | Diode 1 N 54 A .....                      | 6    |
| D 18 | 223 906   | Diode 1 N 4148 .....                      | 9    |
| D 19 | 223 906   | Diode 1 N 4148 .....                      | 9    |
| D 20 | 226 443   | Diode 1 N 54 A .....                      | 6    |
| D 21 | 226 443   | Diode 1 N 54 A .....                      | 6    |
| D 32 | 226 725   | Diode BZX 83 C 6 V 2 .....                | 2    |
| R 6  | 224 059   | Film resistor 33 kohms/0.3 W/ 5 % .....   | 4    |
| R 10 | 226 477   | Film resistor 220 ohms/0.3 W/ 5 % .....   | 3    |
| R 11 | 226 904   | Film resistor 120 kohms/0.3 W/ 5 % .....  | 2    |
| R 12 | 227 252   | Film resistor 3.9 kohms/0.3 W/ 2 % .....  | 4    |
| R 13 | 223 212   | Film resistor 47 kohms/0.3 W/ 5 % .....   | 15   |
| R 14 | 223 216   | Film resistor 2.2 kohms/0.3 W/ 5 % .....  | 10   |
| R 15 | 226 480   | Film resistor 680 ohms/0.3 W/ 5 % .....   | 4    |
| R 16 | 223 207   | Film resistor 330 ohms/0.3 W/ 5 % .....   | 6    |
| R 17 | 223 257   | Film resistor 8.2 kohms/0.3 W/ 5 % .....  | 7    |
| R 18 | 229 952   | Film resistor 820 ohms/0.3 W/ 5 % .....   | 6    |
| R 19 | 223 267   | Film resistor 12 kohms/0.3 W/ 5 % .....   | 9    |
| R 20 | 223 261   | Film resistor 15 kohms/0.3 W/ 5 % .....   | 4    |
| R 21 | 223 258   | Film resistor 220 kohms/0.3 W/ 5 % .....  | 5    |
| R 22 | 226 479   | Film resistor 120 ohms/0.3 W/ 5 % .....   | 4    |
| R 23 | 223 207   | Film resistor 330 ohms/0.3 W/ 5 % .....   | 6    |
| R 30 | 224 059   | Film resistor 33 kohms/0.3 W/ 5 % .....   | 7    |
| R 33 | 225 592   | Film resistor 56 kohms/0.3 W/ 5 % .....   | 4    |
| R 35 | 226 481   | Film resistor 270 kohms/0.3 W/ 5 % .....  | 10   |
| R 36 | 226 481   | Film resistor 270 kohms/0.3 W/ 5 % .....  | 10   |
| R 37 | 224 058   | Film resistor 6.8 kohms/0.3 W/ 5 % .....  | 3    |
| R 38 | 223 897   | Film resistor 100 kohms/0.3 W/ 5 % .....  | 8    |
| R 39 | 223 897   | Film resistor 100 kohms/0.3 W/ 5 % .....  | 8    |
| R 40 | 223 257   | Film resistor 8.2 kohms/0.3 W/ 5 % .....  | 6    |
| R 41 | 226 536   | Film resistor 4.7 Mohms/0.25 W/10 % ..... | 1    |
| R 42 | 227 251   | Film resistor 3.3 kohms/0.30 W/ 2 % ..... | 10   |
| R 43 | 226 348   | Film resistor 200 Mohms/0.25 W/20 % ..... | 1    |
| R 44 | 227 251   | Film resistor 3.3 kohms/0.3 W/ 2 % .....  | 10   |
| R 45 | 223 212   | Film resistor 47 kohms/0.3 W/ 5 % .....   | 15   |
| R 46 | 223 212   | Film resistor 47 kohms/0.3 W/ 5 % .....   | 15   |
| R 47 | 223 212   | Film resistor 47 kohms/0.3 W/ 5 % .....   | 15   |



| Pos.  | Part. No. | Description                            | Qty. |
|-------|-----------|----------------------------------------|------|
| R 48  | 226 498   | Adjusting control 10 kΩ lin. ....      | 3    |
| R 55  | 227 262   | Film resistor 470 kΩ/0.30 W/ 5 % ..... | 2    |
| R 56  | 223 212   | Film resistor 47 kΩ/0.30 W/ 5 % .....  | 15   |
| R 57  | 223 266   | Film resistor 5.6 kΩ/0.30 W/ 5 % ..... | 5    |
| R 58  | 225 592   | Film resistor 56 kΩ/0.30 W/ 5 % .....  | 4    |
| R 59  | 227 251   | Film resistor 3.3 kΩ/0.30 W/ 2 % ..... | 10   |
| R 60  | 226 729   | Adjusting control 500 Ω lin. ....      | 1    |
| R 60  | 228 741   | Film resistor 270 Ω/0.30 W/ 5 % .....  | 1    |
| R 61  | 225 483   | Film resistor 100 Ω/0.30 W/ 5 % .....  | 2    |
| R 62  | 223 266   | Film resistor 5.6 kΩ/0.30 W/ 5 % ..... | 5    |
| R 63  | 227 252   | Film resistor 3.9 kΩ/0.30 W/ 2 % ..... | 4    |
| R 64  | 227 251   | Film resistor 3.3 kΩ/0.30 W/ 2 % ..... | 10   |
| R 65  | 226 491   | Film resistor 22 kΩ/0.30 W/ 2 % .....  | 2    |
| R 66  | 223 263   | Film resistor 1 MΩ/0.30 W/ 5 % .....   | 4    |
| R 67  | 223 257   | Film resistor 8.2 kΩ/0.30 W/ 5 % ..... | 6    |
| R 68  | 223 259   | Film resistor 470 Ω/0.30 W/ 5 % .....  | 4    |
| R 69  | 226 492   | Film resistor 27 kΩ/0.30 W/ 2 % .....  | 4    |
| R 70  | 223 263   | Film resistor 1 MΩ/0.30 W/ 5 % .....   | 4    |
| R 71  | 223 214   | Film resistor 2.7 kΩ/0.30 W/ 5 % ..... | 5    |
| R 72  | 226 485   | Film resistor 39 kΩ/0.25 W/ 2 % .....  | 2    |
| R 73  | 226 727   | Film resistor 3.3 kΩ/0.25 W/ 1 % ..... | 2    |
| R 74  | 226 492   | Film resistor 27 kΩ/0.30 W/ 2 % .....  | 4    |
| R 75  | 223 898   | Film resistor 10 kΩ/0.30 W/ 5 % .....  | 9    |
| R 76  | 223 895   | Film resistor 680 kΩ/0.30 W/ 5 % ..... | 2    |
| R 77  | 223 216   | Film resistor 2.2 kΩ/0.30 W/ 5 % ..... | 10   |
| R 78  | 226 498   | Adjusting control 10 kΩ lin. ....      | 3    |
| R 79  | 223 257   | Film resistor 8.2 kΩ/0.30 W/ 5 % ..... | 6    |
| R 80  | 226 499   | Adjusting control 500 Ω lin. ....      | 2    |
| R 81  | 226 631   | Film resistor 1.8 kΩ/0.30 W/ 5 % ..... | 4    |
| R 82  | 224 059   | Film resistor 33 kΩ/0.30 W/ 5 % .....  | 7    |
| R 83  | 226 631   | Film resistor 1.8 kΩ/0.30 W/ 5 % ..... | 4    |
| R 84  | 226 481   | Film resistor 270 kΩ/0.30 W/ 5 % ..... | 10   |
| R 85  | 223 218   | Film resistor 82 kΩ/0.30 W/ 5 % .....  | 2    |
| R 86  | 226 487   | Film resistor 47 Ω/0.30 W/ 5 % .....   | 2    |
| R 87  | 223 214   | Film resistor 2.7 kΩ/0.30 W/ 5 % ..... | 5    |
| R 88  | 223 264   | Film resistor 1 kΩ/0.30 W/ 5 % .....   | 2    |
| R 89  | 229 940   | Film resistor 3.3 kΩ/0.30 W/ 5 % ..... | 2    |
| R 90  | 223 261   | Film resistor 15 kΩ/0.30 W/ 5 % .....  | 4    |
| R 91  | 226 481   | Film resistor 270 kΩ/0.30 W/ 5 % ..... | 10   |
| R 92  | 226 481   | Film resistor 270 kΩ/0.30 W/ 5 % ..... | 10   |
| R 93  | 226 475   | Film resistor 180 kΩ/0.30 W/ 2 % ..... | 10   |
| R 97  | 227 252   | Film resistor 3.9 kΩ/0.30 W/ 2 % ..... | 2    |
| R 100 | 223 897   | Film resistor 100 kΩ/0.30 W/ 5 % ..... | 8    |
| R 101 | 223 897   | Film resistor 100 kΩ/0.30 W/ 5 % ..... | 8    |
| R 102 | 223 259   | Film resistor 470 Ω/0.30 W/ 5 % .....  | 4    |
| R 103 | 223 212   | Film resistor 47 kΩ/0.30 W/ 5 % .....  | 15   |
| R 104 | 223 216   | Film resistor 2.2 kΩ/0.30 W/ 5 % ..... | 10   |
| R 105 | 226 479   | Film resistor 120 Ω/0.30 W/ 5 % .....  | 4    |
| R 110 | 229 909   | Film resistor 18 kΩ/0.30 W/ 5 % .....  | 4    |
| R 111 | 229 909   | Film resistor 18 kΩ/0.30 W/ 5 % .....  | 4    |
| R 112 | 226 500   | Adjusting control 5 kΩ lin. ....       | 3    |
| R 114 | 223 215   | Film resistor 22 kΩ/0.30 W/ 5 % .....  | 4    |
| R 115 | 223 215   | Film resistor 22 kΩ/0.30 W/ 5 % .....  | 4    |
| R 120 | 226 486   | Film resistor 330 kΩ/0.30 W/ 5 % ..... | 4    |
| R 121 | 223 211   | Film resistor 1.5 kΩ/0.30 W/ 5 % ..... | 2    |
| R 122 | 223 216   | Film resistor 2.2 kΩ/0.30 W/ 5 % ..... | 10   |
| R 123 | 223 215   | Film resistor 22 kΩ/0.30 W/ 5 % .....  | 4    |
| R 124 | 226 486   | Film resistor 330 kΩ/0.30 W/ 5 % ..... | 4    |
| R 125 | 227 251   | Film resistor 3.3 kΩ/0.30 W/ 2 % ..... | 4    |
| R 126 | 223 898   | Film resistor 10 kΩ/0.30 W/ 5 % .....  | 9    |
| R 127 | 223 898   | Film resistor 10 kΩ/0.30 W/ 5 % .....  | 9    |
| R 129 | 229 909   | Film resistor 18 kΩ/0.30 W/ 5 % .....  | 2    |
| R 130 | 223 265   | Film resistor 1.2 kΩ/0.30 W/ 5 % ..... | 2    |
| R 135 | 223 212   | Film resistor 47 kΩ/0.30 W/ 5 % .....  | 15   |
| R 136 | 223 258   | Film resistor 220 kΩ/0.30 W/ 5 % ..... | 5    |
| R 137 | 226 480   | Film resistor 680 Ω/0.30 W/ 5 % .....  | 4    |
| R 138 | 226 631   | Film resistor 1.8 kΩ/0.30 W/ 5 % ..... | 10   |
| R 139 | 223 266   | Film resistor 5.6 kΩ/0.30 W/ 5 % ..... | 5    |
| R 140 | 227 251   | Film resistor 3.3 kΩ/0.30 W/ 2 % ..... | 10   |
| R 141 | 223 268   | Film resistor 150 Ω/0.30 W/ 5 % .....  | 1    |
| R 142 | 223 212   | Film resistor 47 kΩ/0.30 W/ 5 % .....  | 15   |
| R 143 | 223 258   | Film resistor 220 kΩ/0.30 W/ 5 % ..... | 5    |
| R 144 | 226 480   | Film resistor 680 Ω/0.30 W/ 5 % .....  | 4    |
| R 145 | 226 631   | Film resistor 1.8 kΩ/0.30 W/ 5 % ..... | 10   |
| R 149 | 226 500   | Adjusting control 5 kΩ lin. ....       | 3    |
| R 150 | 226 477   | Film resistor 220 Ω/0.30 W/ 5 % .....  | 3    |
| R 151 | 224 058   | Film resistor 6.8 kΩ/0.30 W/ 5 % ..... | 3    |

| Pos.  | Part. No. | Description                                            | Qty. |
|-------|-----------|--------------------------------------------------------|------|
| R 152 | 223 895   | Film resistor 680 k $\Omega$ /0.30 W/5 %               | 5    |
| R 154 | 226 489   | Film resistor 47 k $\Omega$ /0.30 W/2 %                | 2    |
| R 155 | 229 909   | Film resistor 18 k $\Omega$ /0.30 W/5 %                | 5    |
| R 156 | 226 489   | Film resistor 47 k $\Omega$ /0.30 W/2 %                | 2    |
| R 157 | 223 898   | Film resistor 10 k $\Omega$ /0.30 W/5 %                | 9    |
| R 158 | 224 059   | Film resistor 33 k $\Omega$ /0.30 W/5 %                | 7    |
| R 159 | 223 214   | Film resistor 2.7 k $\Omega$ /0.30 W/5 %               | 5    |
| C 5   | 226 863   | Tantalum electrolytic capacitor 0.47 $\mu$ F/ 35V/20 % | 2    |
| C 6   | 226 452   | Electrolytic capacitor 47 $\mu$ F/ 6V ...              | 2    |
| C 7   | 226 854   | Styroflex foil capacitor 390 pF/ 63V/10 %              | 2    |
| C 8   | 226 456   | Electrolytic capacitor 220 $\mu$ F/ 6V ...             | 2    |
| C 9   | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 2    |
| C 10  | 222 500   | Foil capacitor 47 nF/250V/ 5 %                         | 2    |
| C 11  | 226 458   | Foil capacitor 10 nF/250V/ 5 %                         | 4    |
| C 14  | 222 213   | Electrolytic capacitor 1 $\mu$ F/ 50V ...              | 9    |
| C 15  | 226 460   | Foil capacitor 0.33 $\mu$ F/100V/ 5 %                  | 4    |
| C 17  | 222 219   | Electrolytic capacitor 4.7 $\mu$ F/ 25V ...            | 5    |
| C 18  | 222 213   | Electrolytic capacitor 1 $\mu$ F/ 50V ...              | 9    |
| C 19  | 226 461   | Electrolytic capacitor 2.2 $\mu$ F/100V/ 5 %           | 1    |
| C 20  | 223 039   | Foil capacitor 22 nF/250V/ 5 %                         | 3    |
| C 21  | 223 039   | Foil capacitor 22 nF/250V/ 5 %                         | 3    |
| C 25  | 222 213   | Electrolytic capacitor 1 $\mu$ F/ 50V ...              | 9    |
| C 26  | 226 455   | Electrolytic capacitor 100 $\mu$ F/ 26V ...            | 3    |
| C 27  | 226 468   | Styroflex foil capacitor 3 nF/ 63V/ 5 %                | 2    |
| C 28  | 226 469   | Styroflex foil capacitor 3.9 nF/ 63V/ 5 %              | 2    |
| C 29  | 226 467   | Styroflex foil capacitor 2.2 nF/ 63V/ 5 %              | 4    |
| C 30  | 226 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 31  | 226 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 32  | 226 502   | Foil capacitor 33 nF/ 63V/2.5 %                        | 2    |
| C 33  | 226 726   | Styroflex capacitor 4.7 nF/ 63V/2.5 %                  | 2    |
| C 34  | 226 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 35  | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 14   |
| C 36  | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 14   |
| C 37  | 226 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 38  | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 14   |
| C 39  | 226 460   | Foil capacitor 0.33 $\mu$ F/100V/ 5 %                  | 4    |
| C 40  | 226 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 41  | 226 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 43  | 222 219   | Electrolytic capacitor 4.7 $\mu$ F/ 25V ...            | 5    |
| C 44  | 217 862   | Ceramic disc capacitor 22 pF/500V/10 %                 | 2    |
| C 45  | 226 827   | Foil capacitor 0.22 $\mu$ F/ 63V/10 %                  | 2    |
| C 46  | 226 462   | Ceramic disc capacitor 10 pF/250V/10 %                 | 4    |
| C 47  | 222 219   | Electrolytic capacitor 4.7 $\mu$ F/ 25V ...            | 8    |
| C 48  | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 14   |
| C 54  | 226 453   | Electrolytic capacitor 47 $\mu$ F/ 16V ...             | 1    |
| C 55  | 225 459   | Foil capacitor 0.1 $\mu$ F/100V/ 5 %                   | 14   |
| C 56  | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 14   |
| C 57  | 226 462   | Ceramic disc capacitor 10 pF/250V/10 %                 | 4    |
| C 58  | 229 529   | Foil capacitor 68 nF/100V/ 5 %                         | 2    |
| C 59  | 226 465   | Styroflex foil capacitor 1 nF/ 63V/ 5 %                | 5    |
| C 60  | 226 465   | Styroflex foil capacitor 1 nF/ 63V/ 5 %                | 5    |
| C 61  | 226 829   | Styroflex foil capacitor 1.5 nF/ 63V/ 5 %              | 2    |
| C 62  | 226 467   | Styroflex foil capacitor 2.2 nF/ 63V/ 5 %              | 4    |
| C 63  | 222 213   | Electrolytic capacitor 1 $\mu$ F/ 50V ...              | 9    |
| C 65  | 226 467   | Styroflex foil capacitor 2.2 nF/ 63V/ 5 %              | 2    |
| C 70  | 222 213   | Electrolytic capacitor 1 $\mu$ F/ 50V ...              | 9    |
| C 71  | 220 533   | Ceramic capacitor 10 nF/250V ...                       | 2    |
| C 72  | 226 450   | Electrolytic capacitor 22 $\mu$ F/ 16V ...             | 4    |
| C 73  | 226 450   | Electrolytic capacitor 22 $\mu$ F/ 16V ...             | 4    |
| C 74  | 222 213   | Electrolytic capacitor 1 $\mu$ F/ 50V ...              | 9    |
| C 75  | 220 533   | Ceramic capacitor 10 nF/250V ...                       | 2    |
| C 76  | 226 450   | Electrolytic capacitor 22 $\mu$ F/ 16V ...             | 4    |
| C 77  | 226 450   | Electrolytic capacitor 22 $\mu$ F/ 16V ...             | 4    |
| C 81  | 226 465   | Styroflex foil capacitor 1 nF/ 63V/ 5 %                | 5    |
| C 82  | 223 039   | Foil capacitor 22 nF/250V/ 5 %                         | 3    |
| C 83  | 226 458   | Foil capacitor 10 nF/250V/ 5 %                         | 4    |
| C 84  | 226 458   | Foil capacitor 10 nF/250V/ 5 %                         | 4    |
| C 85  | 226 449   | Electrolytic capacitor 10 $\mu$ F/ 25V ...             | 14   |
| C 94  | 226 455   | Electrolytic capacitor 100 $\mu$ F/ 25V ...            | 3    |
| L 1   | 226 404   | Coil, yellow                                           | 2    |
| L 2   | 226 405   | Coil, blue                                             | 2    |
| S 1   | 226 396   | Slide switch                                           | 1    |
| S 4   | 226 400   | Slide switch                                           | 2    |
| S 5   | 226 400   | Slide switch                                           | 2    |



| Pos.  | Part. No. | Description                                                     | Qty. |
|-------|-----------|-----------------------------------------------------------------|------|
|       |           | <u>Transformer board</u>                                        |      |
| 208   | 226 439   | Transformer board (America/Canada) compl. ....                  | 1    |
|       | 226 607   | Transformer .....                                               | 2    |
|       |           | <u>Jack mounting plate</u>                                      |      |
| 213   | 226 789   | Jack mounting plate compl. ....                                 | 1    |
|       | 209 461   | Flange receptical .....                                         | 1    |
| R 1   | 216 336   | Film resistor 470 kohms/0.25 W/10 % .....                       | 2    |
|       |           | <u>Connection board</u>                                         |      |
| 223   | 226 913   | Connection board with pre-resistor compl. ....                  | 1    |
|       | 226 914   | Connection board with pre-resistor (America/Canada) compl. .... | 1    |
| 224   | 226 902   | MIC jack compl. ....                                            | 2    |
| C 3   | 226 451   | Electrolytic capacitor 22 $\mu$ F/ 25 V                         | 1    |
| C 12  | 223 039   | Foil capacitor 22 nF/250 V/ 5 % .....                           | 2    |
| C 22  | 223 079   | Ceramic capacitor 10 pF/500 V/10 % .....                        | 2    |
| C 23  | 211 101   | Electrolytic capacitor 1 $\mu$ F/ 25 V .....                    | 2    |
| R 7   | 229 927   | Film resistor 3.9 kohms/0.3 W/ 5 % .....                        | 1    |
| R 8   | 223 898   | Film resistor 10 kohms/0.3 W/ 5 % .....                         | 2    |
| R 25  | 223 262   | Film resistor 27 kohms/0.3 W/ 5 % .....                         | 2    |
| R 26  | 223 896   | Film resistor 2,2 Mohms/0.3 W/ 5 % .....                        | 2    |
| R 27  | 223 264   | Film resistor 1 kohms/0.3 W/ 5 % .....                          | 4    |
| R 49  | 226 493   | Film resistor 22 Mohms/0.5 W/10 % .....                         | 1    |
| R 113 | 223 264   | Film resistor 1 kohms/0.3 W/ 5 % .....                          | 4    |
| T 5   | 221 942   | Transistor BC 239 C/02 .....                                    | 2    |
|       |           | <u>Control board</u>                                            |      |
| 226   | 226 794   | Control board compl. ....                                       | 1    |
| R 96  | 223 264   | Film resistor 1 k $\Omega$ /0.30 W/5 % .....                    | 2    |
| P 94  | 226 075   | Spindle potentiometer 5 kohms.....                              | 4    |
| P 96  | 226 075   | Spindle potentiometer 5 kohms.....                              | 4    |
| C 42  | 226 449   | Electrolytic capacitor 10 $\mu$ F/25 V .....                    | 2    |

Modification reserved!