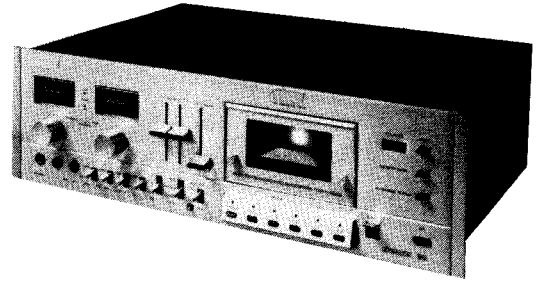


Service
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Service



18129A12

Service Manual

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Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified, be used.

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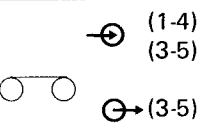

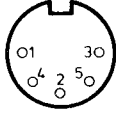


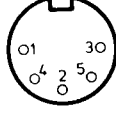


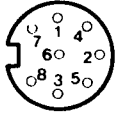
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PHILIPS

INPUTS AND OUTPUTS

HEADPHONES BU1		0,2 mW	8-600 Ω	JACK	1 -  2 - left 3 - right
MICROPHONE L BU2		0,4 mV	47 k Ω	JACK	1 -  2 - left
MICROPHONE R BU3		0,4 mV	47 k Ω	JACK	1 -  2 - right
LINE INPUT L BU4		60 mV	300 k Ω	CINCH 	1 - left 2 - 
LINE INPUT R BU5		60 mV	300 k Ω	CINCH 	1 - right 2 - 
LINE OUTPUT L BU6		0...1 V	3 k Ω	CINCH 	1 - left 2 - 
LINE OUTPUT R BU7		0...1 V	3 k Ω	CINCH 	1 - right 2 - 
LINE INPUT/OUTPUT BU8	 (1-4) (3-5)  (3-5)	0,4 mV 200 mV 0...1 V	2 k Ω 1 M Ω 3 k Ω	5p, 180°, DIN 	1 - left 4 - right 2 -  5 - right 3 - left
MONITOR BU9	 (3-5)	0...1 V	3 k Ω	5p, 180°, DIN 	1 - 4 - 2 -  5 - right 3 - left
REMOTE BU10				8p, DIN 	7 - STOP 1 - PAUZE 4 - WIND 2 - REC 5 - PLAY 3 - REWIND 8 - -12 V 6 - PLAY

401	4822 347 10247	418	4822 214 30435	437	4822 410 22189
402	4822 214 50184	419	4822 459 80118	438	4822 276 10731
403	4822 214 30436	421	4822 443 50315	439	4822 410 22188
404	4822 505 10571	422	4822 256 90274	441	4822 267 20168
406	4822 417 50132	423	4822 130 31128	442	4822 381 10485
407	4822 462 71126	424	4822 255 10151	443	4822 459 80119
408	4822 443 50314	426	4822 134 40326	444	4822 492 60063
408/28	4822 443 50318	427	4822 403 51146	446	4822 146 60088
409	4822 532 10284	428	4822 462 40381	447	4822 272 10079
411	4822 413 40835	429	4822 410 90047	448	4822 462 71121
412	4822 411 50474	431	4822 267 54072	449	4822 462 71127
413	4822 411 20276	432	4822 105 10358	451	4822 276 10641
414	4822 492 31498	433	4822 105 10367	452	4822 492 30256
416	4822 403 51148	434	4822 413 30757	453	4822 411 50475
417	4822 403 51147	436	4822 349 50104	454	4822 410 40154

3

SPECIFICATIONS

Mains voltage : 110-127-220-240 V
 Mains frequency : 50-60 Hz
 Power consumption : 20 W
 Number of tracks : 2x2
 Tape speed : 4.76 cm/sec. \pm 1 % (DIN 45500)
 Wow and flutter : \leq 0.1 % (DIN 45500)
 Winding time C60 cassette : \leq 85 secs.
 Frequency range for
 . Metal cassettes : 20...20,000 Hz (DIN 45500)
 . Chromium cassettes : 20...20,000 Hz (DIN 45500)
 . Ferro cassettes : 20...20,000 Hz (DIN 45511)
 Improvement in dynamic range when metal cassettes are used in comparison with chromium reference tape C401R
 . Max. output level at 315 Hz : + 3 dB
 . Saturation level at 10 kHz : + 7 dB
 . Saturation level at 16 kHz : +10 dB
 Signal/noise ratio (without DNL or Dolby)

. Metal cassettes : \geq 57 dB (DIN 45405)
 . Chromium cassettes : \geq 56 dB (DIN 45405)
 . Ferro cassettes : \geq 55 dB (DIN 45405)

Improvement in signal/noise ratio (with A-filter) obtained with metal cassettes in comparison with the chromium reference tape C401R

. At 315 kHz : + 1 dB
 . At 10 kHz : + 5 dB
 . At 16 kHz : + 8 dB

Improvement signal/noise ratio with

. Dolby : \geq 8.5 dB (CCIR)
 . DNL : \geq 10 dB (with filter 5.6 kHz, 18 dB/octave)

Erase frequency : 100 kHz \pm 10 %

Input and output sensitivities

: See Chapter "Inputs and outputs"

Dimensions

: 482 x 150 x 300 mm

Weight

: 8.2 kg

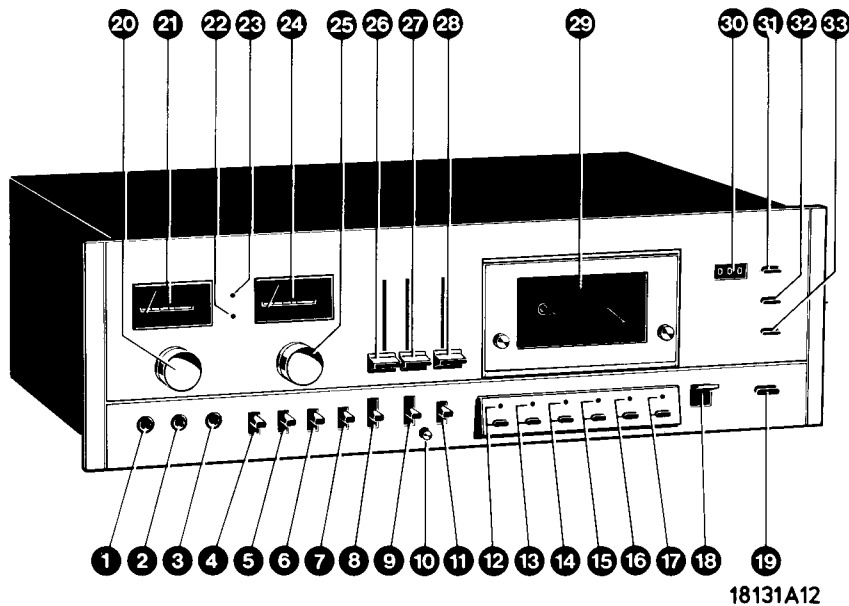


Fig. 1

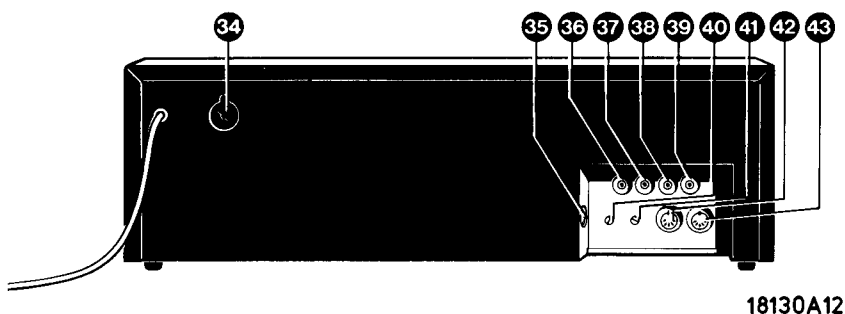


Fig. 2

CONNECTIONS AND CONTROLS

Figs. 1 and 2

	Designation in diagram	Designation on recorder
1 Socket for stereo headphones	BU1	PHONES
2 Socket for microphone, left-hand channel	BU2	L-MIC
3 Socket for microphone, right-hand channel	BU3	MIC-R
4 Monitor switch	SK7	MONI
5 RIF and MPX filter switch	SK1	RIF-MPX
6 Dolby on/off switch	SK2	DOLBY NR
7 DNL on/off switch	SK3	DNL
8 Tape-sort equalisation switch	SK4	EQ
9 Tape sort bias switch	SK5	BIAS
10 Button for releasing the post-fading switch	—	LOCK
11 Post-fading switch	SK6	POST FADING
12 Pause button with indicator	SK11, D426	PAUSE
13 Recording button with "rec" indicator	SK12, D427	REC
14 Fast-rewind and review button with "rew" indicator	SK13, D428	REW
15 Start button with "play" indicator	SK14, D429	PLAY
16 Fast wind and cue button with "ff" indicator	SK15, D430	FF
17 Stop button with indicator	SK16, D431	STOP
18 Button for releasing the cassette holder	—	EJECT
19 Mains switch	SK0	ON
20 Balance control for headphones	R433	BALANCE PHONES
21 Recording level meter, left-hand channel	IND.416	—
22 Peak-value indicator +4 dB, both channels	D420	PEAK +4 dB
23 Overmodulation indicator +7 dB, both channels	D421	PEAK +7 dB
24 Recording level meter, right-hand channel	IND.417	—
25 Headphone-volume control	R432	PHONES LEVEL
26 Recording level control, left-hand channel	R422a	L-RECORDING
27 Recording level control, right-hand channel	R422b	RECORDING-R
28 Speed control for post-fading-erasures	R423	POST FADING
29 Cassette holder	—	—
30 Counter	—	COUNTER
31 Counter reset button	SK8	RESET
32 Zero-stop on/off switch	SK9	MEMORY STOP
33 Automatic repeat on/off switch	SK10	AUTOMATIC REPEAT
34 Mains voltage adapter	SK20	—
35 Remote-control socket	BU10	REMOTE
36 Line output, left-hand channel	BU6	LINE OUT L
37 Line output, right-hand channel	BU7	LINE OUT R
38 Line input, left-hand channel	BU4	LINE IN L
39 Line input, right-hand channel	BU5	LINE IN R
40 Output level control, left-hand channel	R492	LINE OUT L
41 Output level control, right-hand channel	R493	LINE OUT R
42 Monitor output (DIN)	BU9	MONITOR
43 Line input/output (DIN)	BU8	LINE IN/OUT

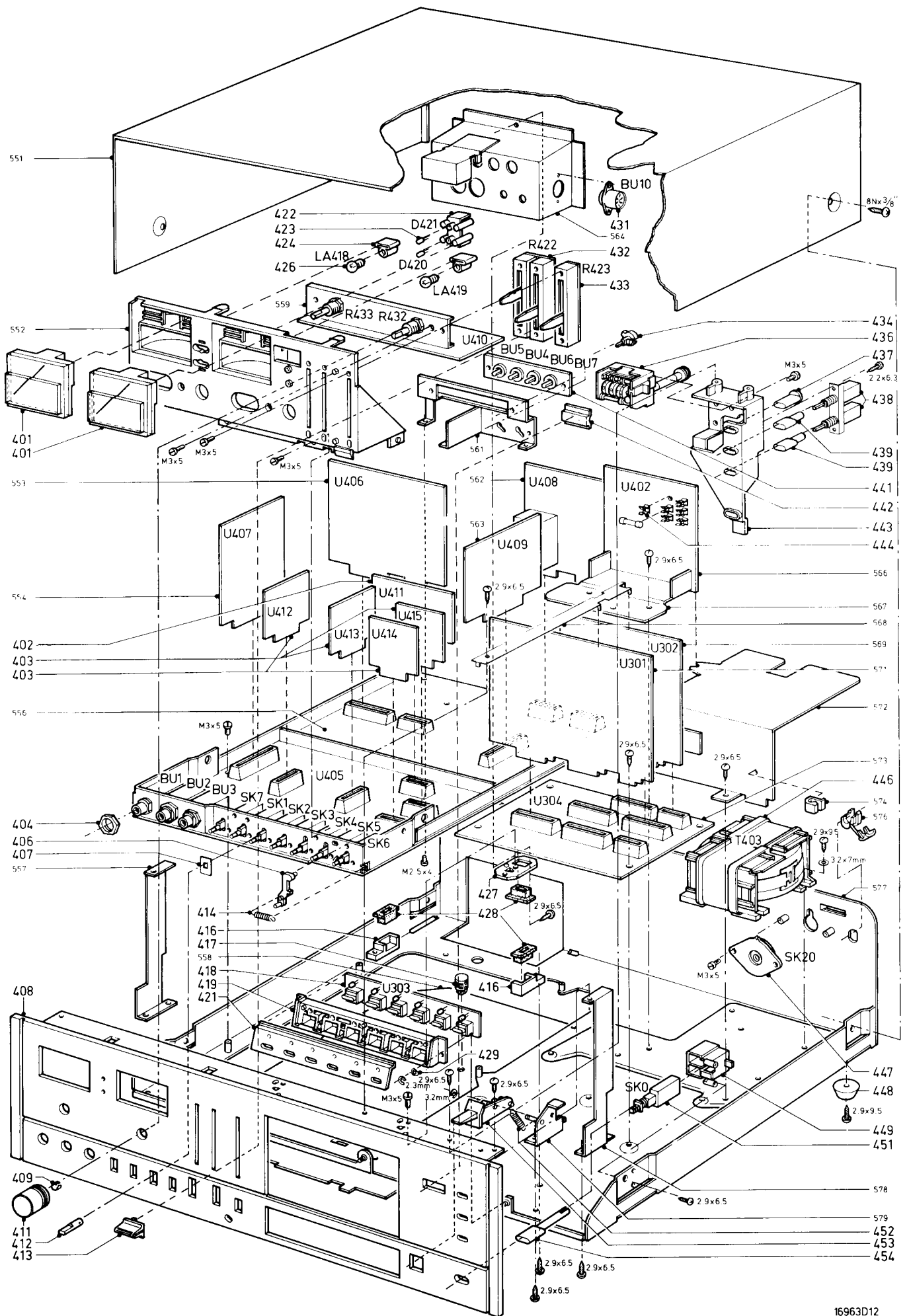


Fig. 3

REPAIR INSTRUCTIONS

1. Top cover

- Remove the four screws in the side of the top cover. In the case of repairs or measurements with the top cover removed, exposure to strong direct lighting may give rise to incorrect operation of the automatic stop system.

2. Tape deck (Fig. 3 and 13)

- Remove the top cover.
- Unplug the following connectors:
 - a. Plugs 9, 10 and 11 (head wiring)
 - b. P.C. board connector 12
- Take the counter belt off the counter pulley.
- Remove motor control unit U302 and logic unit U301.
- Unscrew the two tape-deck holders 427.
- The tape deck can now be removed from the cabinet by sliding it to the rear.

3. Front panel 408 (Fig. 3)

- Remove the top cover.
- Remove the knobs 411 and 413.
- Remove the eight screws at the top and the three screws at the bottom of the front panel.
- Press the two tabs at the top of item 552 downwards and pull the front panel forwards. The front panel is now detached from the cabinet.

Note:

The front panel must be removed for replacement of the following parts:

Indicators 401, switches SK1...SK7, sockets BU1...BU3, potentiometers R422, R423 and the tape-deck control panel.

4. L.H. friction 174 (Fig. 9)

- Open the cassette holder.
- Remove left-hand carrier 107 and pulley 189.
- The L.H. friction may now be pulled out of the tape deck in a backward direction.

Note:

When the friction is mounted, the fork should engage with the centring pin, so that the friction is locked in position.

5. R.H. friction 181 (Fig. 9)

- Remove the tape deck.
- Remove cassette holder 124, cover plate 108, right-hand carrier 107, capstan motor 183 (three screws), pulley 189, pulsing disc 194.
- The R.H. friction may now be pulled backwards out of the tape deck.

6. Bearings 176 or 179 (Fig. 4 and 9)

- The bearings can be removed by driving a self-tapping screw into the bearing to be removed and pulling the bearing out of the bearing seat by means of pliers.
- When mounting the new bearings press them into the bearing seats with the fingers or a blunt object of a soft material (for example wood). Check that the bearing is placed so that the mark is visible.

MAINTENANCE AND LUBRICATING INSTRUCTIONS

It is recommended to clean the recorder and lubricate the principal points after approximately 500 hours of operation.

1. To be cleaned with alcohol or spirit

- The heads
- Belts
- Pulleys
- Brake discs and brake shoes

Attention !

- a. The capstan has been provided with a special protective coating. Therefore, the capstan and pressure roller should *not* be cleaned with alcohol or spirit. Clean the capstan and pressure roller with *dry* filter paper (as used in coffee filters).
- b. After the heads have been cleaned with alcohol or spirit wipe them with water and subsequently dry them.

2. Lubricating instructions (Fig. 9)

- All purpose oil (4822 390 10048) for the bearings of: pressure rollers 112, 138, 153, gear wheel shafts, wind selection friction. Pivots of head brackets 521, 523 and pressure roller bracket 512.
- Shell Alvania 2 (4822 389 10001): gear wheels and ball seats underneath head slide 114.
- Lubricant 10 (4822 390 10003) brackets 509 and 522.

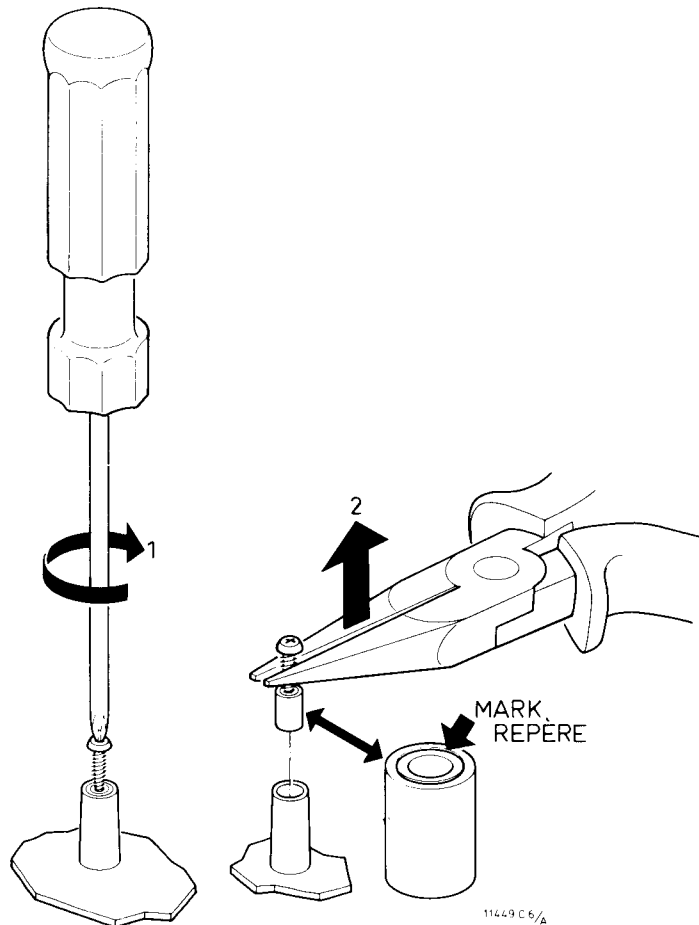


Fig. 4

MECHANICAL ADJUSTMENTS AND CHECKS

Required test equipment

- Head alignment jig 4822 395 80152
- Friction test cassette 4822 395 30054
- Spring pressure gauge 50...500 g 4822 395 80028
- Azimuth test cassette (e.g. Universal test cassette SBC 126 Cr) 4822 397 30038
- Millivoltmeter or oscilloscope

1. Adjusting the heads

Note:

First check the adjustment of the head-slide relay (see Chapter "Solenoid adjustments").

a1. Height recording/playback head (Fig. 5)

- Slide jig 4822 395 80152 over the capstan and hold it horizontally on the supporting points A.
- Press the head slide forwards and turn the two nuts B and C so that the tape guides of the recording/playback head slide over the jig and the underside of the jig just touches the top of the lower tape guide.

a2. Azimuth recording/playback head (Fig. 5)

- Connect the two outputs BU8 in parallel to a millivoltmeter or oscilloscope.
- Play back the 10 kHz signal on an azimuth test cassette.
- Adjust for maximum output voltage with nut C. The output voltage should not fluctuate more than 1.5 dB. If this is more, the lace-path must be checked.
- Again check the height of the recording/playback head (see Chapter a1).

a3. Penetration depth of recording/playback head (Fig. 5)

- Slide jig 4822 395 80152 over the capstan and hold it horizontally on points A.
- Loosen screw E and slide head plate F (item 115) slightly backwards.
- Position the head slide 114 against stop G by pushing the core of solenoid RE176 inwards.
- Slide head plate F forwards, in such a way that the head face of the recording/playback head just contacts the jig.
- Tighten screws E.

b1. Erase head height (Fig. 5)

- Slide jig 4822 395 80152 over the capstan and hold it horizontally on points A.
- Push the head slide forwards and adjust nut D until the tape guides of the erase head just slide over the jig.

b2. Penetration depth of the erase head (Fig. 5)

- Slide jig 4822 395 80152 over the capstan and hold it horizontally on points A.
- Loosen screw H and slide the head plate slightly backwards.
- Position head slide 114 against stop G by pressing the core of solenoid RE176 inwards.
- Slide the head plate forwards until the head face of the erase head just contacts the jig.
- Tighten screw H.

Note:

After the mechanical adjustment of the recording/playback head the following electrical measurements and adjustments should be carried out:

- a. Playback sensitivity and indicators
- b. Bias
- c. Recording sensitivity
- d. Frequency response

2. Solenoid adjustments

a. Head slide solenoid RE476 (Fig. 5)

- Set the recorder to "Play" with an arbitrary cassette.
- Loosen the fixing screws of the solenoid
- With attracted core pull back the relay until the head slide is positioned against stop G (L against G) and subsequently secure the relay.

b. Pressure roller solenoid RE475 (Fig. 6)

- Loosen the fixing screws of the relay.
- Set the recorder to "Play" with an arbitrary cassette.
- With attracted core pull back the solenoid until gear wheel bracket 521 is positioned against stop K. Subsequently secure the solenoid.

3. Brake brackets (Fig. 7)

- In the "off" position (none of the solenoids actuated) the brakes should have a clearance of 0.4 to 0.8 mm relative to the brake discs. This can be adjusted with tab A of brackets 501 and 508.
- In the "Play" mode (head-slide and pressure roller solenoids actuated) the brakes should be 0.8 to 1.5 mm clear of the brake discs. This can be adjusted with tab B of brackets 501 and 508.

4. Pressure roller (Fig. 8)

The force exerted on the capstan by the pressure roller should be 370-450 g. This can be measured as follows:

- Set the recorder to "Play" without cassette (the cassette presence detection should be activated).
- Check the clearance between the pressure roller nut and the pressure roller bracket. This clearance should be 0.3 to 0.6 mm and is adjustable with the pressure roller nut.
- Pull back the pressure roller with the spring pressure gauge, as shown in Fig. 8, with the aid of a string.
- Allow the pressure roller with the spring pressure gauge to return slowly to the capstan.
- Take the gauge reading at the instant that the pressure roller comes into contact with the capstan.
- The pressure roller force is not adjustable. If the pressure roller force is not correct, check the position of the pressure roller solenoid (see Chapter 2b). If no improvement is obtained, replace pressure roller spring 154.

5. RH and LH friction

Set the recorder to "Play" with the friction test cassette inserted.

- The RH friction should be 35 to 46 g.cm.
- The LH friction should be 4 to 8 g.cm.

6. Winding motor M2

The groove of the motor pulley should be at the same level as the groove of pulley 189 within 0.3 mm.

7. Eject bracket 522 (Fig. 9)

- Insert a cassette.
- Bend the adjusting tab of eject bracket 522 so that the top of the eject bracket is just clear of unlocking bracket 509.

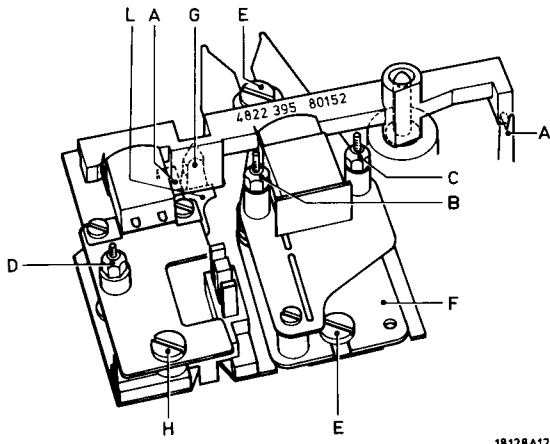


Fig. 5

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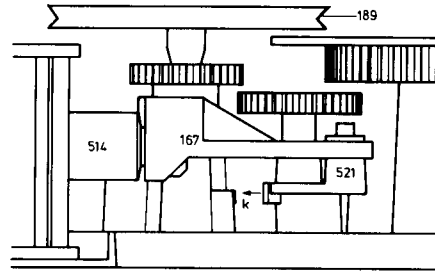


Fig. 6

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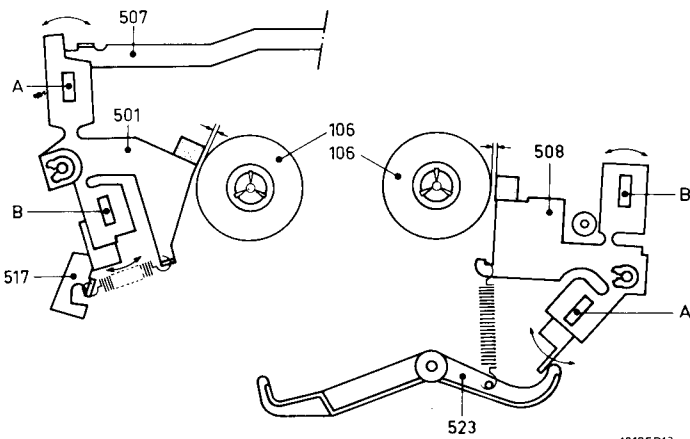


Fig. 7

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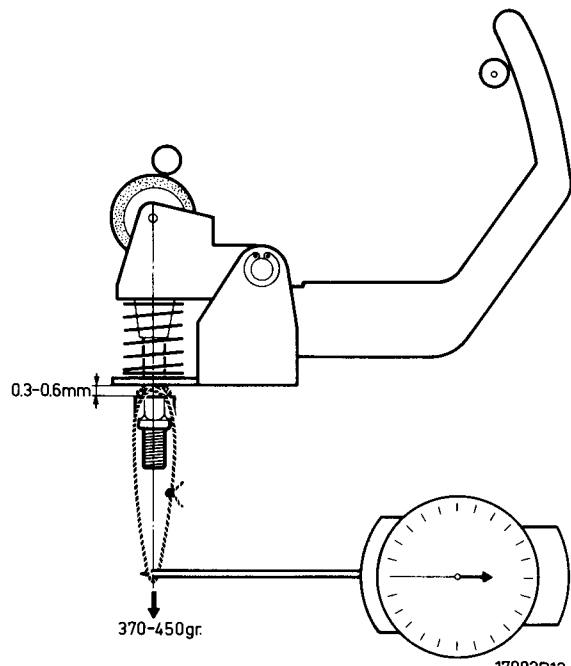


Fig. 8

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101	4822 443 60657	122	4822 506 90024	146	4822 492 31503	171	4822 492 51259
102	4822 443 60656	123	4822 249 40094	147	4822 532 10666	172	4822 532 50692
103	4822 502 11408	124	4822 403 51118	148	4822 492 51261	173	4822 528 90304
104	4822 492 31499	126	4822 403 51119	149	4822 403 51124	174	4822 528 20248
106	4822 528 20249	127	4822 454 20404	151	4822 532 51102	176	4822 520 30353
107	4822 528 40207	128	4822 492 51269	152	4822 528 20251	177	4822 492 31504
108	4822 443 30374	129	4822 492 40809	153	4822 403 51117	178	4822 492 31502
109	4822 130 31194	131	4822 403 51115	154	4822 492 51199	179	4822 532 10766
110	4822 381 20038	132	4822 403 10145	156	4822 505 10612	181	4822 528 20247
111	4822 443 60665	133	4822 492 31498	157	4822 492 31499	182	4822 532 20709
112	4822 532 60699	134	4822 462 71122	158	4822 532 51101	183	4822 361 20157
113	4822 403 10154	136	4822 492 31501	159	4822 403 51125	184	4822 691 20113
114	4822 403 51116	137	4822 520 40044	161	4822 403 51123	186	4822 520 40044
115	4822 403 51166	138	4822 532 51101	162	4822 492 51261	187	4822 492 62138
116	4822 403 51114	139	4822 290 80353	163	4822 403 51122	188	4822 358 30263
117	4822 492 51169	141	4822 403 51165	164	4822 492 31492	189	4822 528 80731
118	4822 492 51275	142	4822 492 31498	166	4822 281 50056	191	4822 522 31276
119	4822 532 10785	143	4822 492 31497	167	4822 403 51121	192	4822 528 90305
120	4822 249 10108	144	4822 403 51164	168	4822 532 70078	193	4822 214 30415
121	4822 532 20708	145	4822 403 51163	169	4822 361 30108	194	4822 528 20246
						196	4822 358 30264

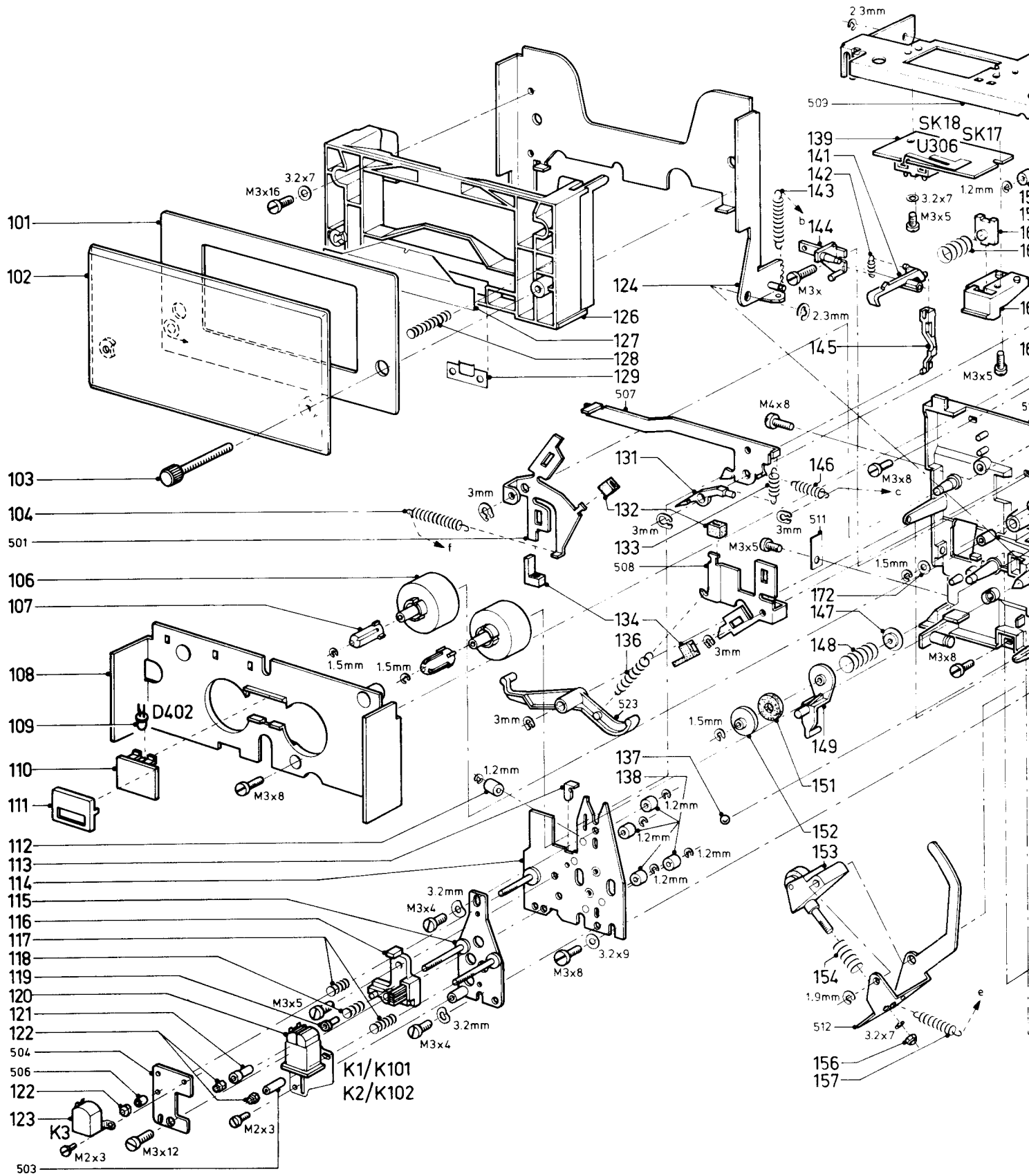


Fig. 9

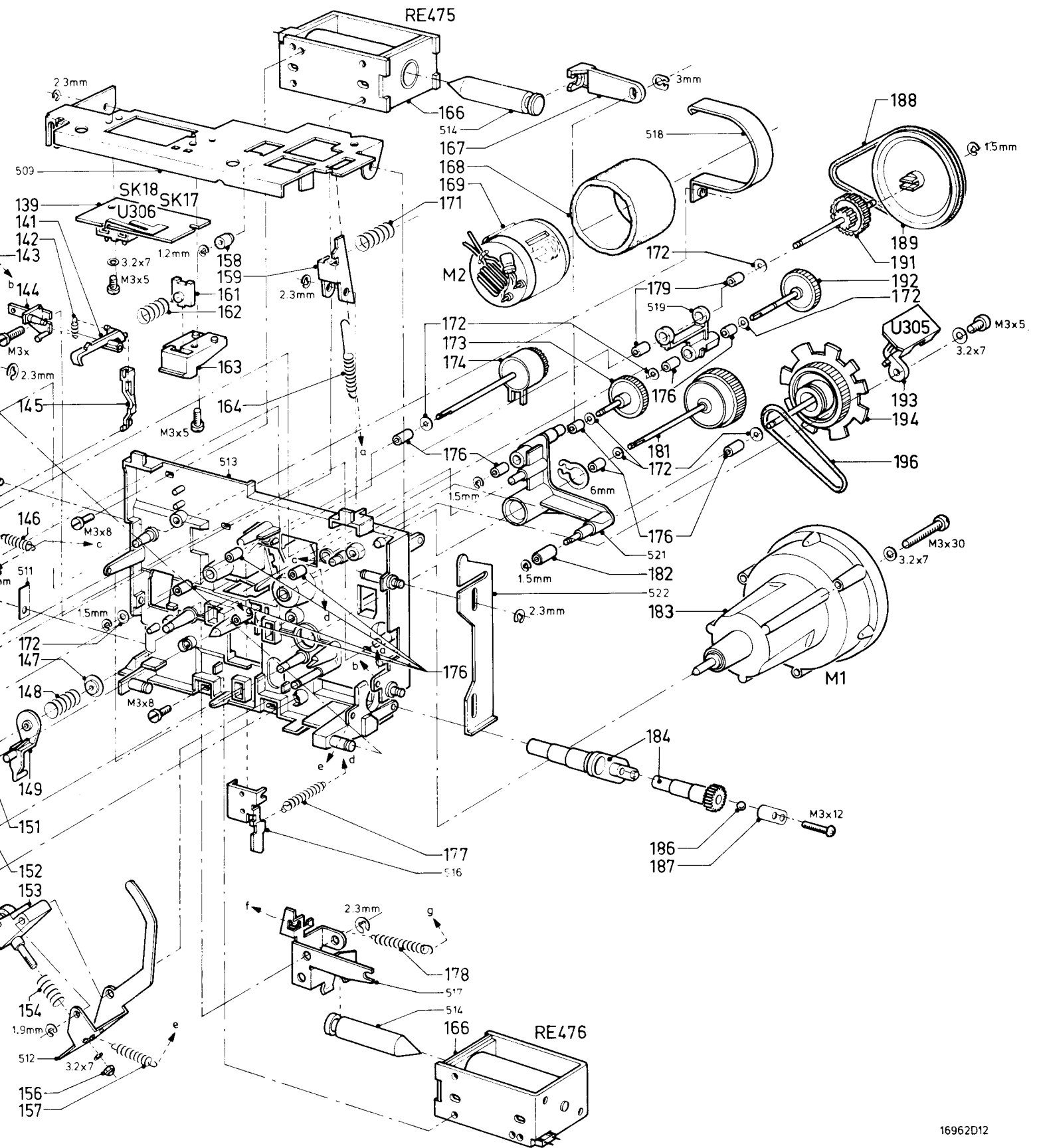


Fig. 9

16962D12

ELECTRICAL MEASUREMENTS AND ADJUSTMENTS

The following measurements and adjustments are described for the left-hand channel. The test points and adjusting elements for the right-hand channel are given in brackets.

Required test equipment and test cassettes

- LF generator
- AC millivoltmeter
- Wow-and-flutter meter
- Multimeter
- Oscilloscope
- Universal test cassette SBC 126 Cr 4822 397 30038
- Universal test cassette SBC 133 Fe 4822 397 30039
- Frequency counter
- Cassette service set 801/CSS 4822 395 30078

General conditions

The following general conditions apply to the electrical measurements and adjustments, unless explicitly stated otherwise.

- Mains voltage $220\text{ V} \pm 5\%$, 50 Hz
- Ambient temperature 20 to $25\text{ }^{\circ}\text{C}$
- Monitor switch set to "Source"
- MPX-RIF, Dolby, DNL and post-fading switched off.
- Tape selectors, BIAS set to Chromium, EQ set to 70 μsecs .
- Volume controls line output, headphones and recording set to maximum.
- Balance control headphones at mid-position.
- The heads must have been adjusted for optimum results (see "Mechanical adjustments and checks")

Note 1:

IC's MC14001BCP, MC14011BCP, MC14071BCP and MC14081BCP are MOS IC's which are generally very susceptible to overloading and excess voltages. Therefore proceed with the greatest care during the measurements.

For further instructions reference is made to the leaflet packed with the IC's.

Note 2:

Before each measurement or adjustment with running tape it is advised to degauss the heads and tape guides. Strong remanent magnetism may adversely affect the signal-noise ratio and the frequency range and may also damage the test cassettes beyond repair.

Moreover, it is recommended to clean the heads before each measurement or adjustment with running tape.

1. Adjusting the tape speed

Method a: With the wow-and-flutter meter

- Connect the recorder to a wow-and-flutter meter.
- Set the recorder to "play" with the 3150 Hz section of test cassette SBC 126 Cr.
- The speed is adjustable with R480 on motor control board U302. The maximum permissible deviation is 1%.
- Moreover, the wow-and-flutter value can be read. This should not exceed 0.065% (with filter).

Note:

When a recording is made and subsequently played back the wow and flutter should be $\leq 0.1\%$.

Method b: With the cassette service set

- Connect the recorder to the cassette service set via an amplifier.

- Set the recorder to "Play" with the 50 Hz cassette of the cassette service set.
- Adjust for minimum beat effect of the test indicator with R480.

2. Winding speed

- Connect a frequency counter to point 4 of U305 or point 6 of connector 12.
- Set the recorder to forward winding ("wind") without cassette.
- Adjust the winding speed with R481 on motor control board U302 until the frequency counter indicates 50 Hz.

3. Adjusting the playback sensitivity and indicators

Method a: With test cassette SBC 126 Cr (250 nWb/m)

- Play back the 315 Hz, 0 dB signal on test cassette SBC 126 Cr.
- Adjust R490 (R491) so that the voltage on test point A/4 (A/2) is 650 mV.
- At this output voltage the indicators should read +1.2 dB. They can be adjusted with R480 (R481) on main p.c. board U405. (Check that the tape selector switch is not set to Me, otherwise the reading will be 3 dB (= 30%) less.

Note:

With a test cassette with a recorded level of 220 nWb/m (for example the Dolby level cassette) the voltage on test point A/4 (A/2) should be 580 mV and the indicators should read 0 dB.

Method b: With LF generator

- Via a 22 k Ω resistor apply a 205 mV, 315 Hz signal to test point B/3 (B/4).
- Insert an arbitrary cassette.
- Adjust R490 (R491) so that the voltage on test point A/4 (A/2) is 580 mV.
- At this output voltage the indicators should give a reading of 0 dB. This is adjustable with R480 (R481) on main p.c. board U405 (Check that the tape selector is *not* set to Me, otherwise the reading will be 3 dB or 30% less).

4. Playback frequency response

When test cassette SBC 126 Cr is played back the frequencies between 40 and 12,500 Hz should be in conformity with the graph of Fig. 11.

Note:

If necessary, check the azimuth.

5. Adjusting the recording sensitivity

a. For Cr tape

- Set the recorder to "Recording" with reference test cassette TC-QR (8945 600 12901) or the reference section of test cassette SBC 126 Cr. If less stringent accuracy requirements are imposed, it is also possible to employ a high-quality chromium cassette.
- Adjust the bias for both channels to 450 μA (target value), which corresponds to a voltage of 9 mV on test point B/1 (B/2). This can be adjusted with R488 (R489). Also see Chapter 6.
- Apply such a 315 Hz signal to BU8, point 3/2 (5/2) that the voltage on test point A/9 (A/7) is 290 mV. (The indicators should read -6 dB).
- Set the monitor switch to "TAPE".
- Adjust the recording sensitivity with R486 (R487)

so that 290 mV is measured on playback Dolby test point A/4 (A/2).

b. For Me tape

- Set the recorder to "Recording" with a metal test cassette or a high-quality metal cassette.
- Set the tape selector to "Me".
- Repeat the adjusting procedure for Cr tape, but now adjust the recording sensitivity with R484 (R485). Do not change the bias.

c. For Fe tape

- Set the recorder to "Recording" with an Fe test cassette (TC-R or SBC 133) or a high-quality Fe cassette.
- Set the tape selector to "Fe".
- Set the equalization switch to 120 μ secs.
- Repeat the adjusting procedure for Cr-tape, but now adjust the recording sensitivity with R482 (R483). Do not change the bias.

6. Adjusting the erase current and bias current

- Set the recorder to "Recording" with a high-quality Me cassette.
Set tape selector SK5 to "Me" and monitor switch SK7 to "TAPE".

a. Erase head current

- Adjust the erase current to 60 mA with R462 (on oscillator unit U408). This corresponds to a voltage of 60 mV across R604 (1 Ω resistor in series with the erase head).

b. Coarse adjustment of bias

- Apply a 315 Hz signal to 3/2 (5/2) of BU8 so that 580 mV is obtained on test point A/4 (A/2).
- Reduce the input voltage in such a way that 29 mV (which is -26 dB relative to 580 mV) is measured on test point A/4 (A/2).
- Set the LF generator to 14 kHz, the input voltage being the same.
- Adjust R488 (R489) until the voltage on test point A/4 (A/2) is 29 mV (output voltage equal to 315 Hz output voltage).

c. Fine adjustment bias Me-tape

The fine adjustment of the bias demands a compromise between frequency response and distortion.

In the case of a correct adjustment the frequency response will be as shown in Fig. 12, curve b.

Curve a points towards an excessive bias current.

Curve c is an indication of too small a bias.

For a correct adjustment of the bias it is necessary to record a number of frequencies between 20 Hz and 20 kHz (level -26 dB).

Play back the recordings made and plot the values thus found in a graph. Figure 11 shows between which limits the curve should be situated.

Correct the bias with R488 (R489) until the correct frequency response is obtained and the distortion is within 3 %.

Attention: Measure the distortion at 100 % modulation, i.e. 580 mV on test point A/4 (A/2).

Note:

In theory it would be possible to read the output levels for the measurement of the frequency response directly by setting SK7 to "TAPE". However, in practice it is found that at higher frequencies the output level in the case of direct reading is adversely affected by the recording head. For this reason it is necessary to first

record various frequencies, to rewind the tape and then to measure the output levels in position "Play".

d. Fine adjustment bias Cr-tape

Note:

This adjustment is necessary only if the (overall) frequency response for Cr-tape is not within the limits of Fig. 11.

- Set the recorder to "Recording" with reference cassette SBC 126 Cr.
- The adjustment procedure is the same as for fine adjustment of the bias for Me-tape, but adjustment is effected with R463 (for both channels).

e. Fine adjustment bias Fe-tape

Note:

This adjustment is necessary only if the (overall) frequency response for Fe-tape is not within the limits of Fig. 11.

- Set the recorder to "Recording" with reference cassette SBC 133 Fe.
Set tape selector SK5 to "Fe"
Set equalization switch SK4 to 120 μ secs.
- Use the same adjusting procedure as in the case of fine adjustment of the bias for Me-tape, but adjust with R464 (for both channels).

7. Adjusting the erase frequency

- Set the recorder to "Recording" with an arbitrary cassette.
- Measure the erase frequency at resistor R604 by means of a frequency meter.
- Adjust the erase frequency to 100 kHz with T460 (on U408).

8. Measuring the frequency response

- Set the recorder to "Recording" with a Metal test cassette or a high-quality metal cassette.
- Set the recording level controls to maximum.
Set tape selector SK5 to "Me".
Set equalization switch SK4 to 70 μ secs.
- Apply a 315 Hz signal to point 3/2 (5/2) of BU8 so that 580 mV is obtained on test point A/4 (A/2).
Reduce the voltage on test point A/4 (A/2) to 29 mV (is -26 dB) with the recording level controls.
- Record some frequencies between 20 Hz and 20 kHz.
- Play back this recording and measure the output voltage on point 3/2 (5/2) of BU8.
- Plot the output levels thus found in a graph.
Figure 11 shows the limits within which the curve should lie.

For Cr and Fe tapes follow the same measuring procedure.

For Cr use reference tape TC-QR or SBC 126 Cr and for Fe use reference tape TC-R or SBC 133 Fe. Set the tape selector switches SK4 and SK5 to Cr, 70 μ secs. and Fe, 120 μ secs. respectively.

9. Adjusting the 19/38 kHz MPX-filter

- Set the recorder to "Recording" with an arbitrary cassette.
- Switch on the MPX switch.
- Apply such a 315 Hz signal to 3/2 (5/2) of BU8 that 775 mV is measured on test point A/9 (A/7).
- Set the LF generator to 19 kHz at the same input voltage.
- Adjust the voltage on test point A/9 (A/7) to minimum

with L464 (L465). The attenuation of the 19 kHz signal should be at least 30 dB (≤ 25 mV).

- Set the LF generator to 38 kHz at the same input voltage. The attenuation of the 38 kHz signal should be at least 25 dB relative to 775 mV (≤ 43.5 mV).

10. Adjusting the recording correction filter

- Set the recorder to "Recording" with an arbitrary cassette.

- Disable the bias oscillator by connecting point 8 of oscillator unit U408 to earth.
- Apply a 315 Hz signal to point 3/2 (5/2) of BU8 so that 0.245 mV is obtained on test point B/1 (B/2).
- Set the LF generator to 20 kHz at the same input voltage.
- With L456 (L457) on recording unit U406 adjust the voltage on test point B/1 (B/2) to 1.55 mV (i.e. +16 dB relative to the 315 Hz signal).
- Disconnect the bias oscillator from earth.

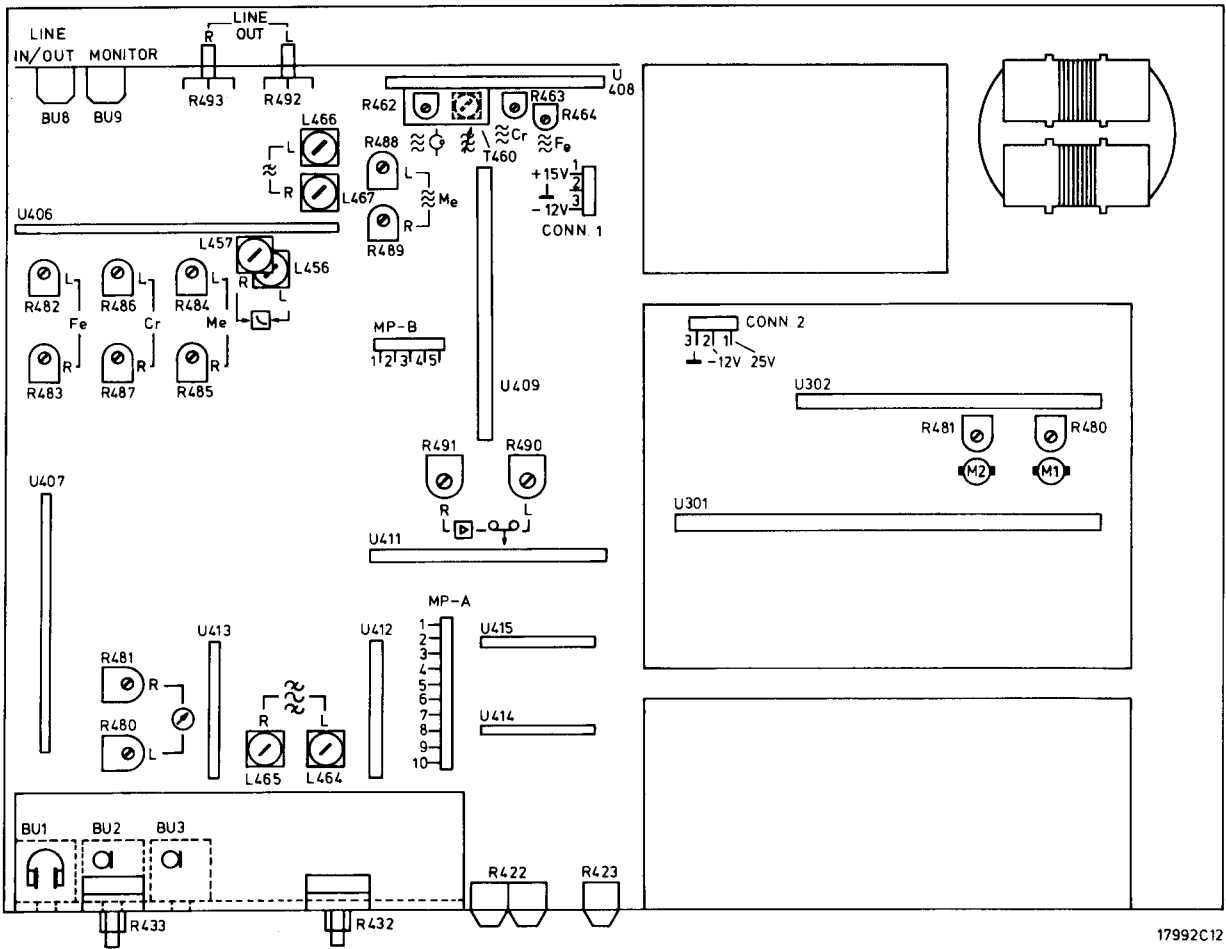


Fig. 10

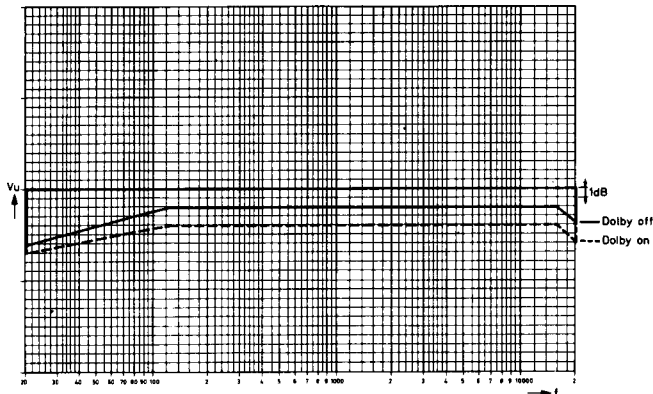


Fig. 11

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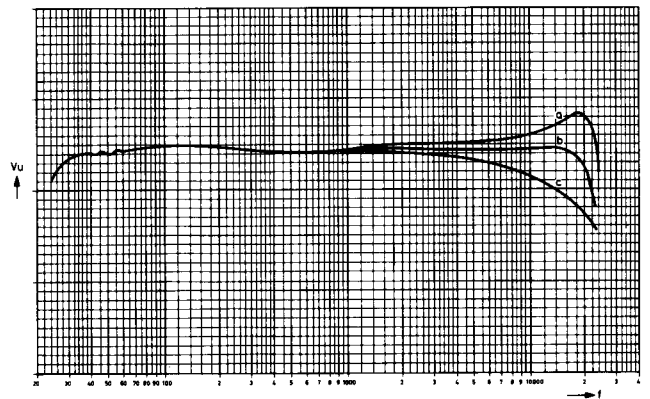


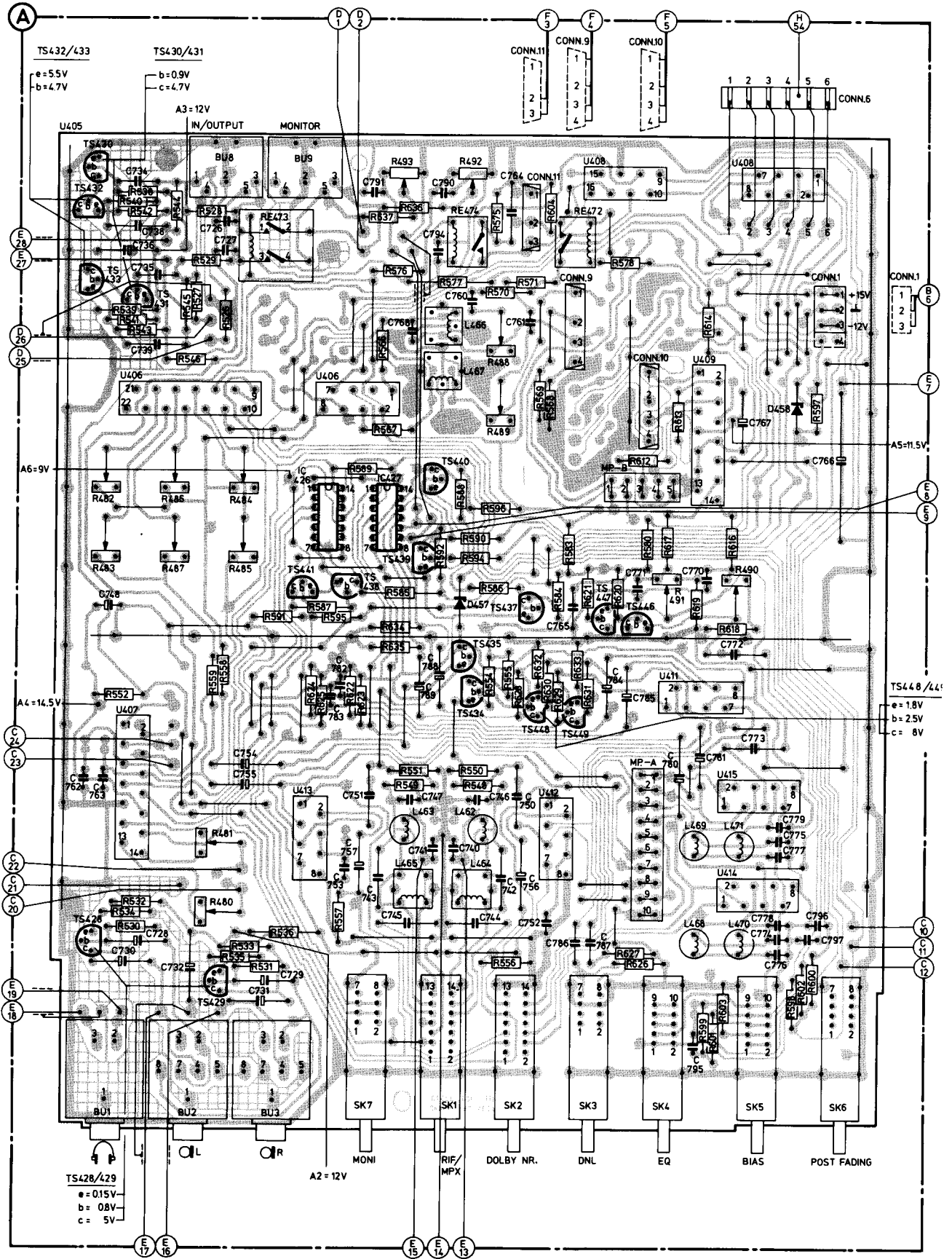
Fig. 12

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SUMMARY OF THE ELECTRICAL ADJUSTMENTS

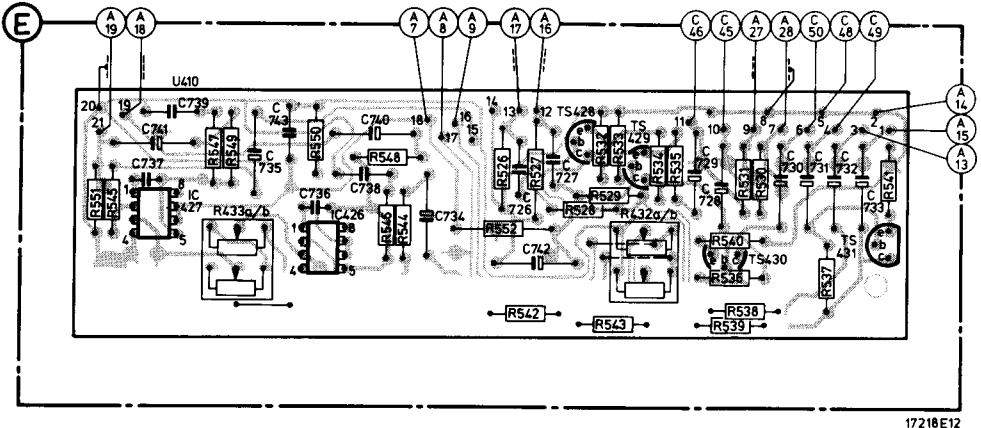
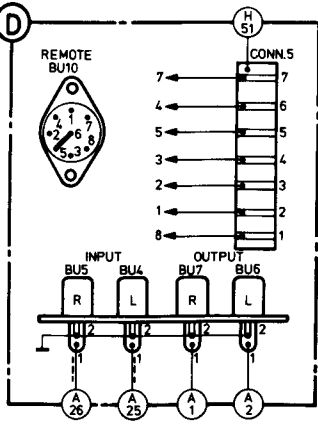
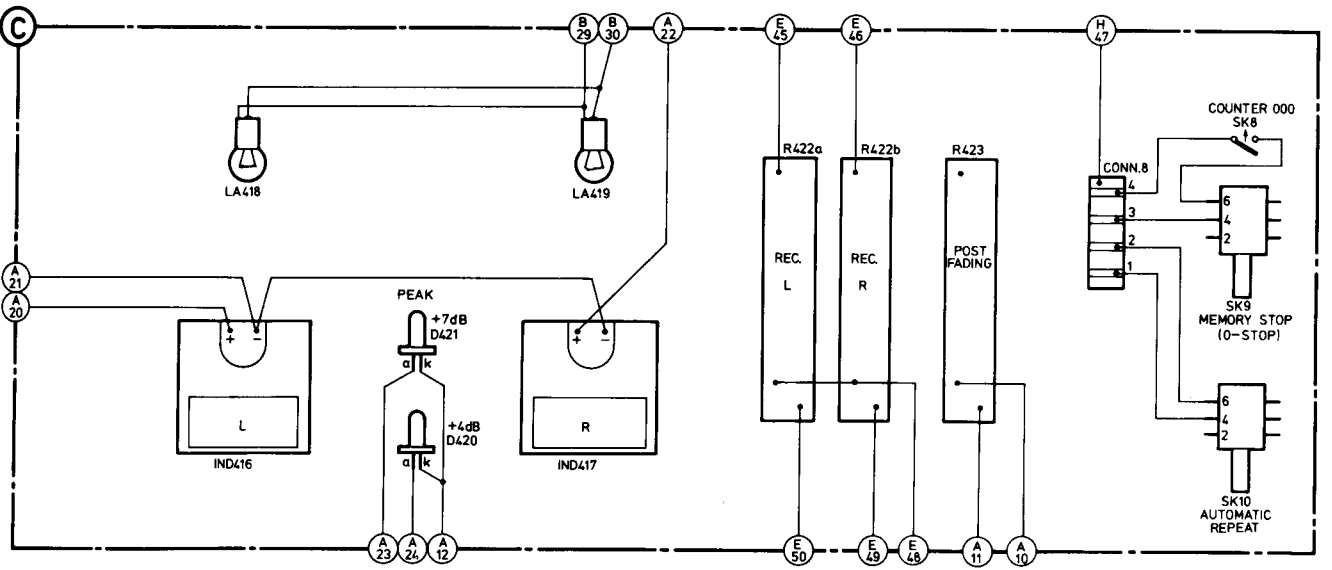
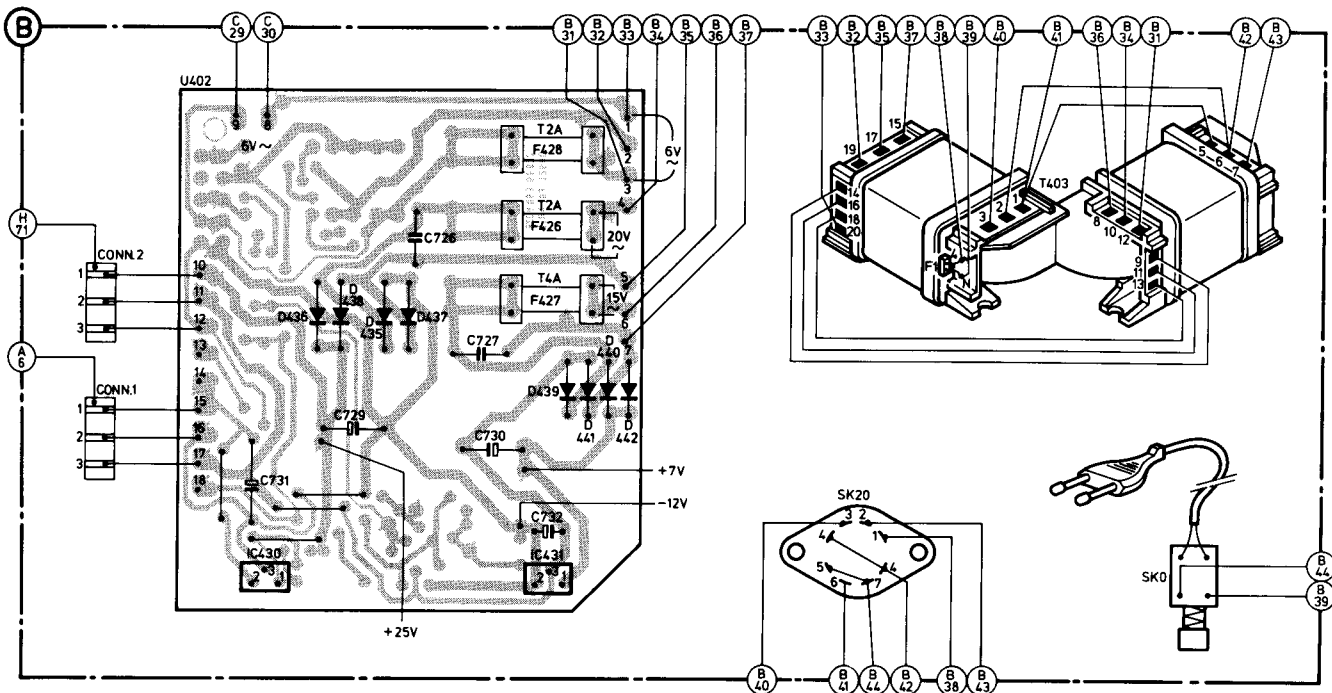
Adjustment	Cassette	Recorder in position	Apply signal to	Measure on	Read on	Adjust with	Adjust to
Playback speed	3150 Hz of SBC 126 Cr	PLAY	—	Line out	Wow and flutter meter	R480 (on U302)	—
Winding speed	No cassette !!	WIND	—	Conn.12/6	Frequency counter	R481 (on U302)	50 Hz
Method 1 Playback sensitivity + Indicators	315 Hz - 0 dB of SBC 126 Cr	PLAY	—	A/4 (A/2)	AC-millivoltmeter	R490 (R491)	650 mV
		PLAY	—	—	Indicators	R480 (R481) on U405	+ 1.2 dB
Method 2 Playback sensitivity + Indicators	Arbitrary cassette	STOP	315 Hz, 205 mV via 22 k to B/3 (B/4)	A/4 (A/2)	AC-millivoltmeter	R490 (R491)	580 mV
				—	Indicators	R480 (R481) on U405	0 dB
Target value BIAS	Arbitrary cassette	REC	—	B/1 (B/2)	AC-millivoltmeter	R488 (R489)	9 mV
Recording sensitivity Cr-tape	Reference tape	REC+PLAY	315 Hz to BU8-3/2 (5/2)	A/9 (A/7)	AC-millivoltmeter	LF generator	290 mV
	SBC 126 Cr	SK7-TAPE	—	A/4 (A/2)	AC-millivoltmeter	R486 (R487)	290 mV
Recording sensitivity Me-tape	Metal-tape	SK5 - Me REC+PLAY	315 Hz to BU8-3/2 (5/2)	A/9 (A/7)	AC-millivoltmeter	LF generator	290 mV
		SK7-TAPE	—	A/4 (A/2)	AC-millivoltmeter	R484 (R485)	290 mV
Recording sensitivity Fe tape	Reference tape	SK5-Fe SK4-120 μ s REC+PLAY	315 Hz to BU8-3/2 (5/2)	A/9 (A/7)	AC-millivoltmeter	LF generator	290 mV
		SK7-TAPE	—	A/4 (A/2)	AC-millivoltmeter	R482 (R483)	290 mV
Erase current	Metal-tape	SK5-Me SK7-TAPE REC+PLAY	—	R604	AC-millivoltmeter	R462 on U408	60 mV
BIAS (coarse adjustment)	Metal-tape	SK5-Me SK7-TAPE	315 Hz to BU8-3/2 (5/2)	A/4 (A/2)	AC-millivoltmeter	LF generator	29 mV
		REC+PLAY	14 kHz to BU8-3/2 (5/2) (same input voltage)	A/4 (A/2)	AC-millivoltmeter	R488 (R489)	29 mV
BIAS (Fine adjustment)	Metal tape	SK5-Me SK7-TAPE REC+PLAY	315 Hz to BU8-3/2 (5/2)	A/4 (A/2)	AC-millivoltmeter	LF generator	29 mV
			40 Hz - 6.3 kHz 16 kHz-18 kHz 20 kHz BU8-3/2 (5/2) (same input voltage)	Record a number of frequencies			
	Rewind recording made	PLAY	—	A/4 (A/2)	AC-millivoltmeter	R488 (R489)	See graph Fig.11 If necessary, repeat adjustment
Erase frequency	Arbitrary cassette	REC	—	R604	Frequency counter	T460 on U408	100 kHz
19/38 kHz Pilot tone suppression	Arbitrary cassette	REC	315 Hz to BU8-3/2 (5/2)	A/9 (A/7)	AC-millivoltmeter	LF generator	775 mV
			19 kHz to BU8-3/2 (5/2)	A/9 (A/7)	AC-millivoltmeter	L464 (L465)	\leq 25 mV
			38 kHz to BU8-3/2 (5/2)	A/9 (A/7)	AC-millivoltmeter	—	\leq 43.5 mV

MISC	TS428+433, BU1	BU2	BU3, BU4, RE473, BU9, IC426, TS438-441, IC427, SK7, D457, TS434, 435, 437, RE474, TS446+448, RE472, SK1-4, MP-B, MP-A	SK5, D458	SK6
L			465, 463, 467, 466, 464, 462	469, 468, 471, 470	
C726+779	762, 763, 748, 738, 734+736, 739, 726+732, 755, 754		753, 757, 751, 768, 740+747, 760, 750, 756, 752, 764, 761, 765	771	770, 767, 772+779, 766
C780+797		783, 782	788+791, 794	784+787	780, 795, 781
R432-571	552, 538-546, 480-487, 526+536, 558, 559	557	567, 566, 493	492, 548+551, 555, 489, 488, 554, 556, 568+571	491, 490
R575-603		591	585, 592, 572+575, 588, 590, 594, 596, 586	584, 583, 578, 580	597+603
R604+637		622-625	634+637	604, 626+633, 621, 620	612-614, 616-619



Fig

BU10	BU4-7	LA418,IC430,IND416,D435-438,421,420,IC427,IC431,F426-428,D439-442,LA419,IND417,IC426	SK20	TS428,F1,TS429	TS430,T403	SK0	TS431,SK8-10
731	729	726	727,730,737,732,741,739,735,743	738,740,734	726,742,727	729,728	730,731,732,733
551,545	547,549,433	550	548,546,544	422,542,552	526+529,543,532+535,540,432,423,536+539,531,530		541



17218E12

MISC	K3	SK11,D426,K1,101,D402,K2,102	D427,SK12	D428,SK13	SK14,D429,TS426,D428,M1,D430,RE476,SK15	SK16,D431	SK17,RE475	M2	SK18
C									
R	826				926				

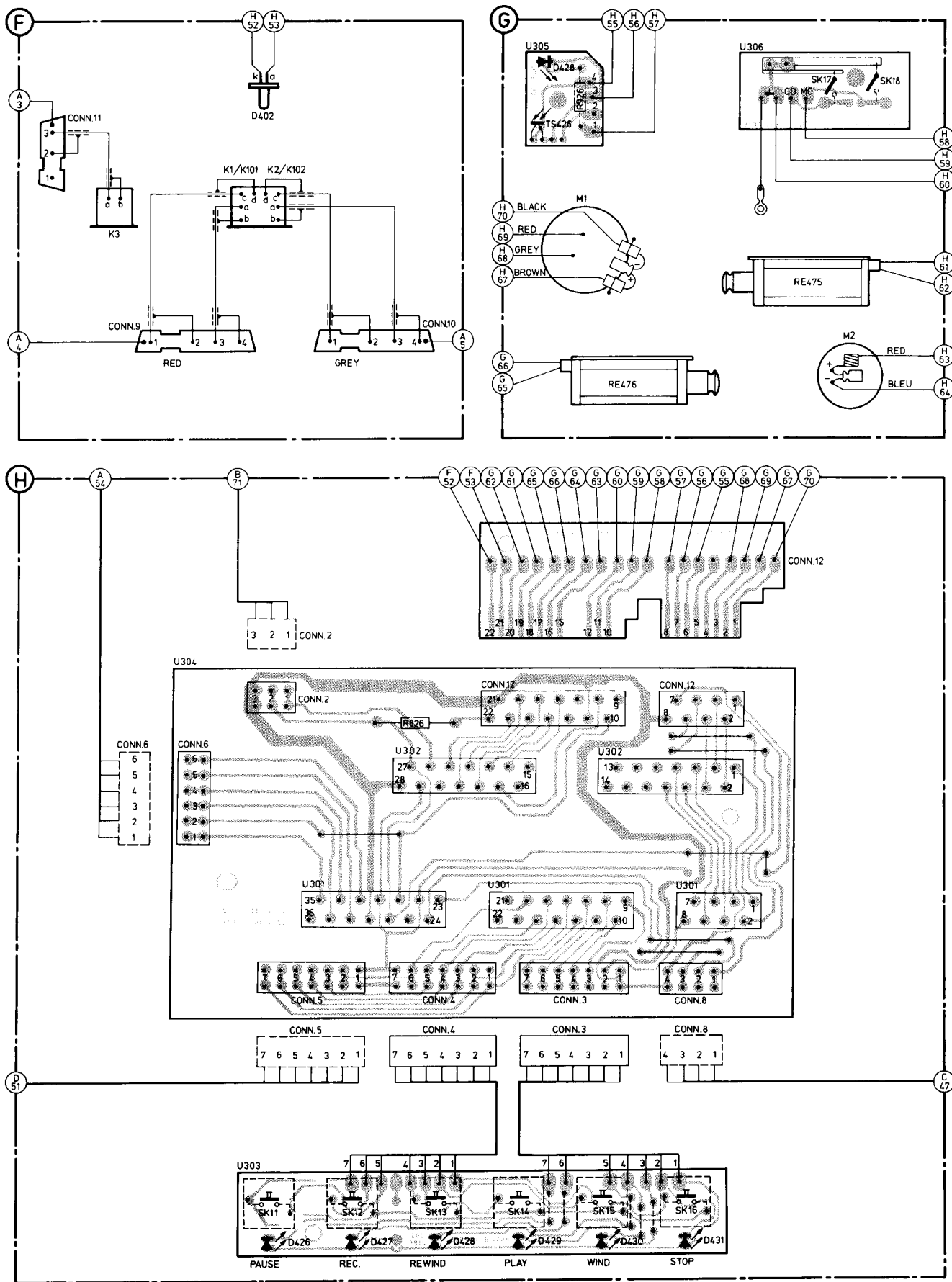


Fig. 14

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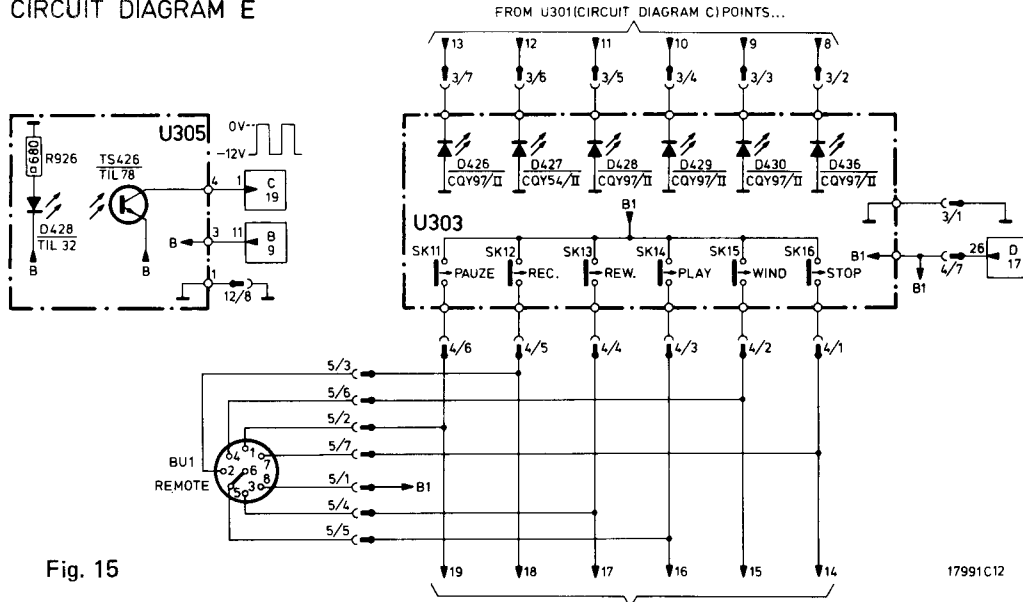


Fig. 15

CIRCUIT DIAGRAM B

MISC	SK0	SK20	F1	T403	F426 + 428	D435-442	IC430, 431	LA418, LA419	SK10, D402	MISC
C					726 727		729 730		731 732	C

U402 POWER SUPPLY

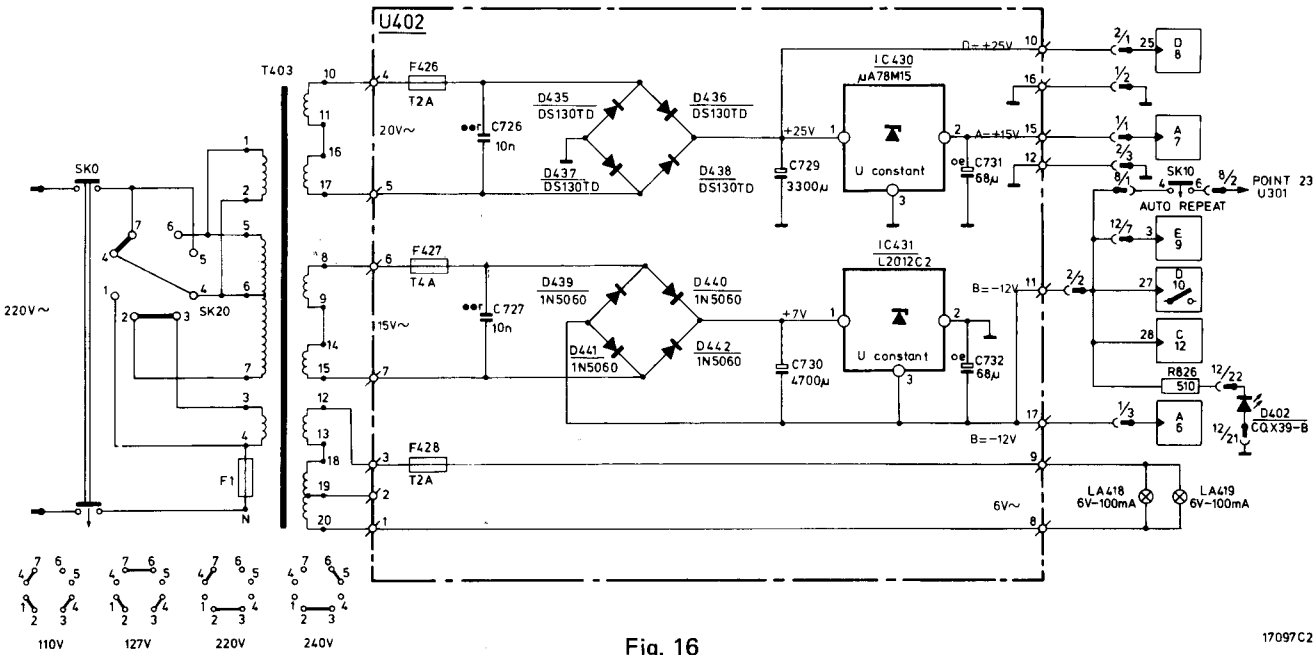


Fig. 16

MISC	D439-442, IC431, F426+428	D435-438	IC430
C	732 730, 727	726 729	731

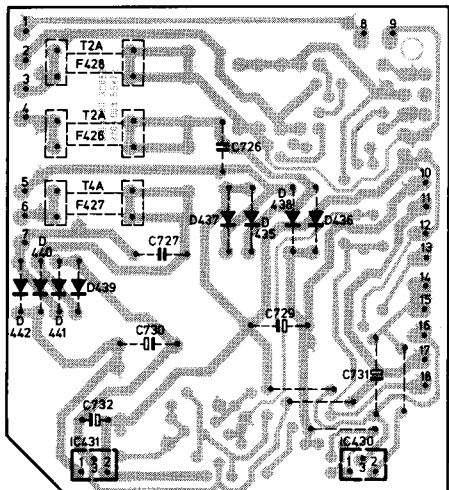










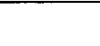


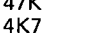


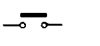









Fig. 17

IC	μA78M15	4822 209 80373
	L2012C2	4822 209 80535
	DS130TD	4822 130 31161
	1N5060	4822 130 31164
	C729	3300 μF - 35 V 4822 124 20798
	C730	4700 μF - 25 V 4822 124 20791
	Spring clip	4822 492 40819
	Jig	4822 403 51043
	Mica	4822 255 40138

U405 MAINBOARD

					
MC14016BCP		5322 209 14119	DS130TD 1N5060		4822 130 31161 4822 130 31164
					
BC337/16 BC548A BC548B BC549C BC550C BC558B		4822 130 41095 4822 130 40948 4822 130 40937 4822 130 44246 4822 130 41096 4822 130 44197	C729 C730	3300 μ F - 35 V 4700 μ F - 25 V	4822 124 20798 4822 124 20791
			Spring clip Jig Mica		4822 492 40819 4822 403 51043 4822 255 40138
BZX79/C9V1 BZX79/C5V1		4822 130 30862 5322 130 34233	U410 MIXING/HEADPHONE AMPL.		
					
L462,463,468 L469,470,471 L464,465	36 mH 36 mH 23 mH	4822 156 20811 4822 156 20811 4822 156 20821	TBA820M		4822 209 80348
					
RE472,474 RE473		4822 280 20076 4822 280 20075	BC548B		4822 130 40937
					
R480,481,484,485 R486,487,490,491 R482,483 R488,489 R492,493	10K 10K 4K7 47K 4K7	4822 100 10035 4822 100 10035 4822 100 10036 4822 101 14048 4822 100 10186	R432 R433	47K log. 22K bal.	4822 102 30314 4822 102 30315
			DIV.		
					
C742,743 C744,745 C764	2n7 - 1 % 4n7 - 1 % 560p	5322 121 54065 4822 121 50539 4822 121 50576	SK0 SK9-10 SK11,12,13, 14,15,16 SK20		4822 276 10641 4822 276 10731 4822 276 10717 4822 272 10079
			-U-		
SK1,2 SK3,7 SK4,5 SK6	2x4 2x2 3x2 1x2	4822 277 10485 4822 277 10483 4822 277 10484 4822 277 10486	U303 U305 U306		4822 214 30435 4822 214 30415 4822 290 80353
					
BU1 BU2,3 BU4-7 BU8,9 BU10 Conn. 8 f for U406,408,411, 412,413,414,415 Conn. 14 f for U406,407,409 Conn. 1, MP.A, MP.B Conn. 9,10 Conn. 11		4822 267 30287 4822 267 30277 4822 267 20168 4822 267 40325 4822 267 54072 4822 290 60213 4822 290 60211 4822 267 40342 4822 265 30119 4822 265 30121	M1 M2		4822 361 20157 4822 361 30108
					
-U-			R422 R423		4822 105 10358 4822 105 10367
					
U411 U412/414 U413/415	DNL DOLBY DOLBY	4822 214 50184 4822 214 30436 4822 214 30436	D402 D420,421,427 D426,428,429 D430,431	CQX39-B CQY54/II CQY97/II CQY97/II	4822 130 31194 4822 130 31128 4822 130 31146 4822 130 31146
U402 POWER SUPPLY			IND416,417 LA418,419 T403 F1 RE475,476 K1/101,K2/102 K3	6 V/100 mA 250 mA/125°	4822 347 10247 4822 134 40326 4822 146 60088 4822 252 20007 4822 281 50056 4822 249 10108 4822 249 40094
					
μ A78M15 L2012C2		4822 209 80373 4822 209 80535			

MISC	SK6	D458.SK5	MP-A.MP-B.TS446-448.RE472.KS1-4.RE474.TS437.435.434.D457SK7.IC427.TS438-441.IC426.BU9.RE473.BU8.3	BU2	TS428-433.BU1
L	470.471.468.469		462.464.466.467.463.465		
C726-779	766	772-779.767	770	771	765.761.764.752.756.750.760.740-747.768.751.757.753
C780-797	797.796	781.795.780	784-787	794.788-791	782.783
R432-571		490	491	568-571.556.554.488.489.555.548-551.492	493.566.567
R575-603	597-603		580.578	583.584	586.596.594.590.588.572-575.592
R604-637		616-619.612-614	620.621.626-633.604		634-637
					622-625

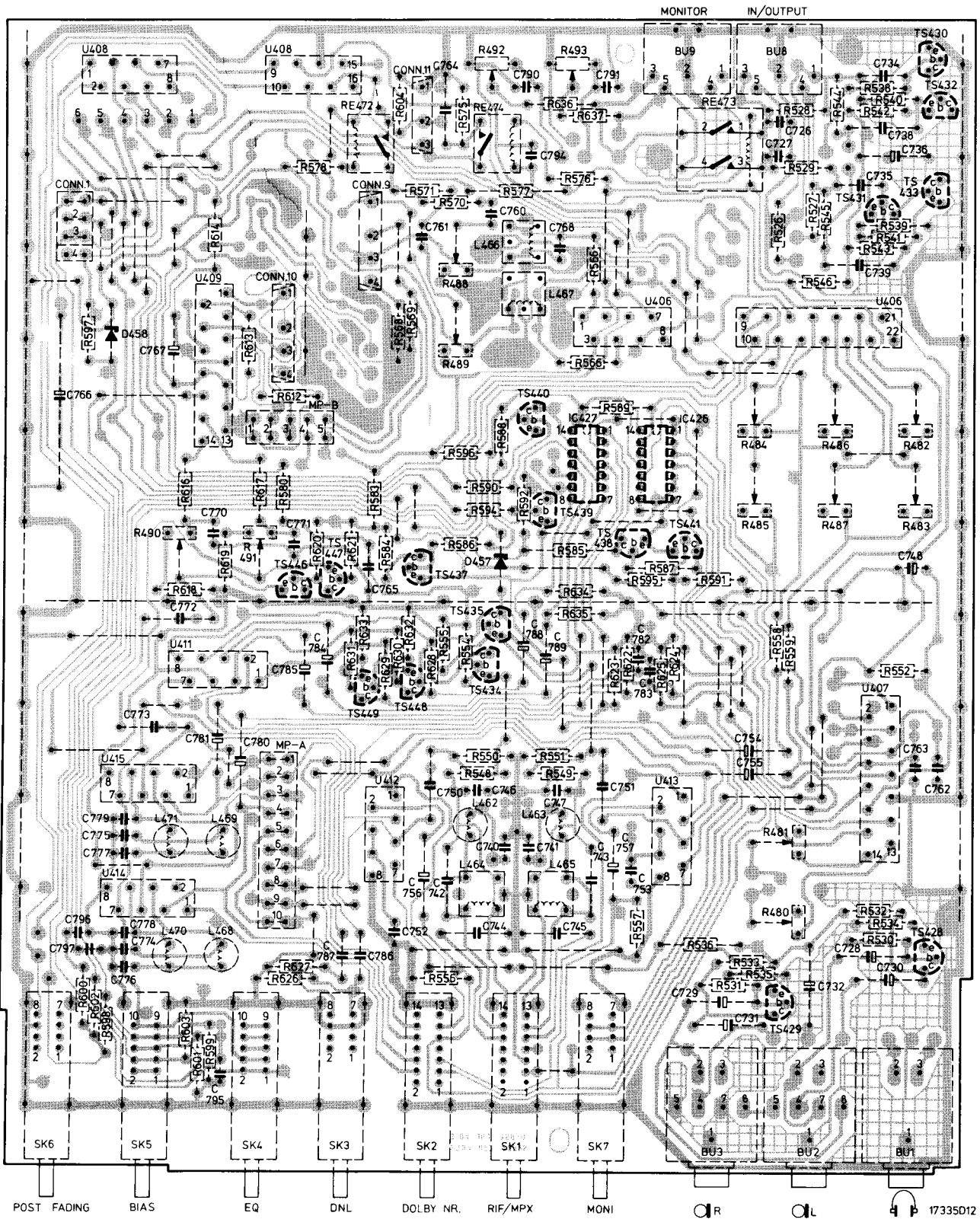
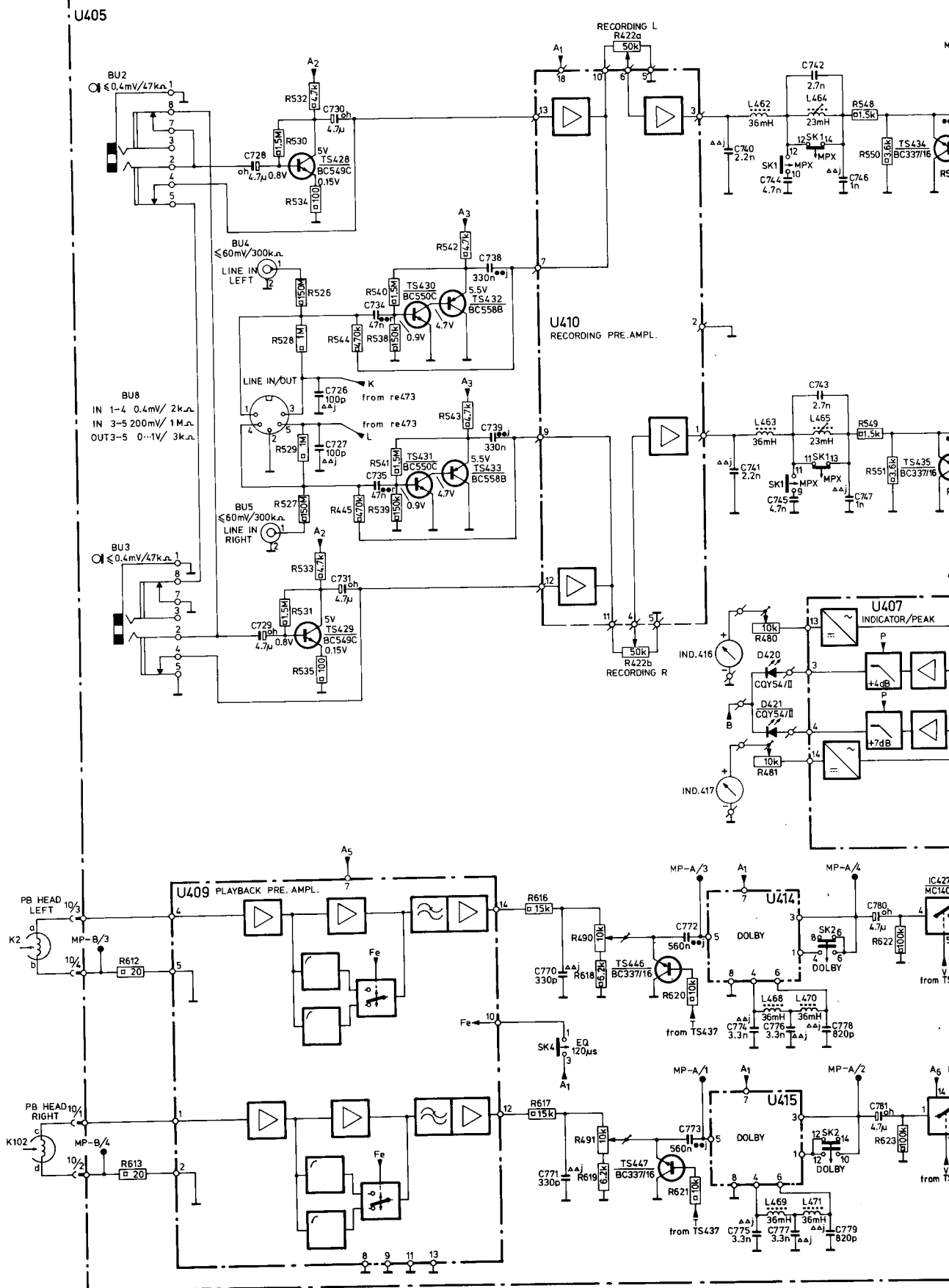


Fig. 18

CIRCUIT DIAGRAM A

MISC.	BU2	BU4, BU8	TS428-TS433	TS446, TS447	D420, D421	TS447
L	BU3	BU5		ME416, ME417		IC427a
C	700-760	726-731	734, 735	738, 739	770, 771	772, 773
R	761-799	526-535	538-545	490, 491	422 a, b	480, 481
	400-551			616-621		548-551
	552-650	612, 613				622, 623



21	TS434, TS435	TS448, TS449	TS437, TS438	TS440, TS441, BU6, BU1
L465	IC427a, b	IC426c, d	IC427c, d	SK6
747	750, 751	752, 753	756, 757	754, 755
+779	780, 781	782, 783	782, 783, 784, 789	790, 791
	548-551		482-487	492, 493
	622, 623	554, 555	556, 557	624, 625
			558, 559	626, 627
			528-635	636, 637
				423
				583-591
				59

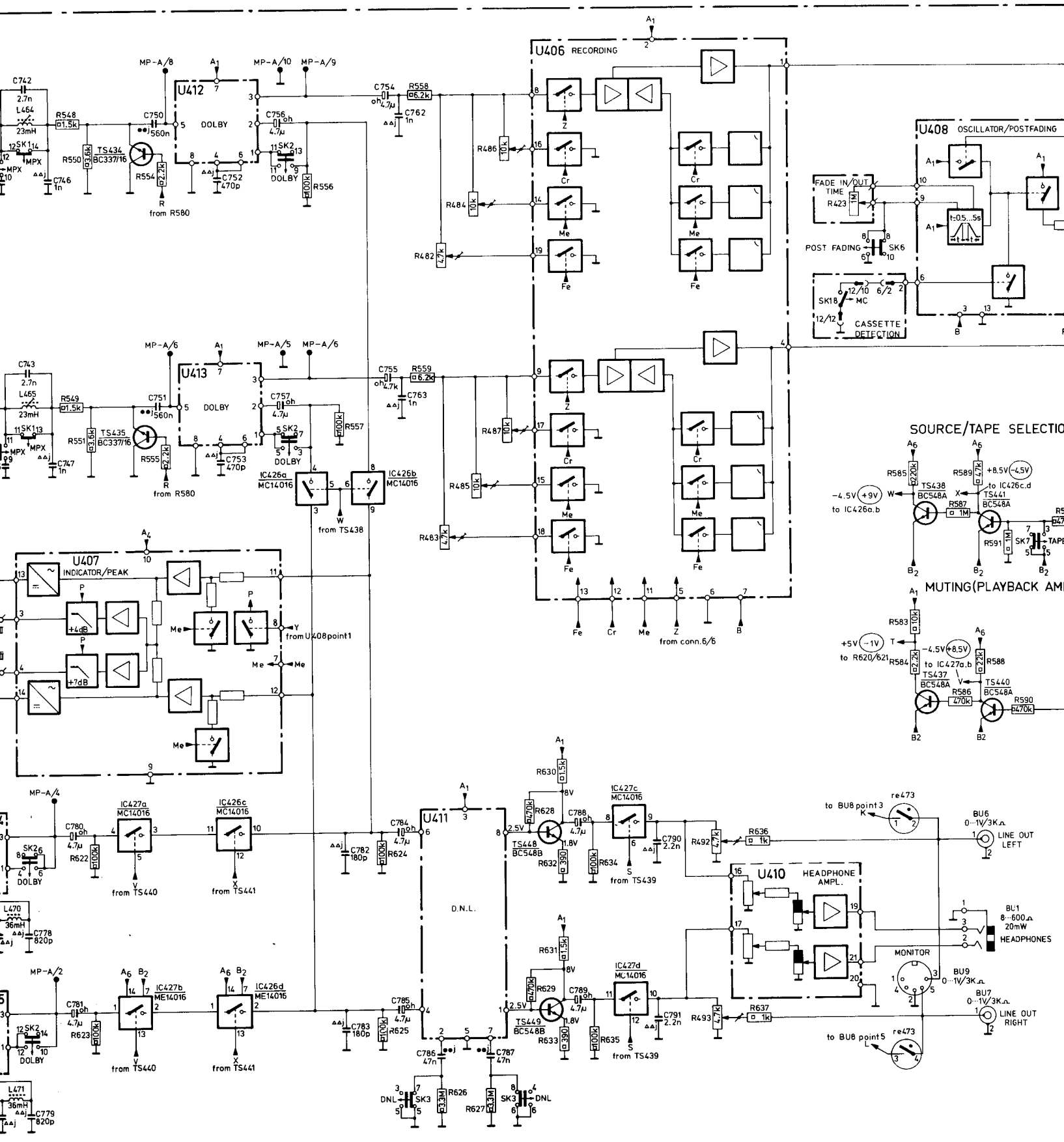
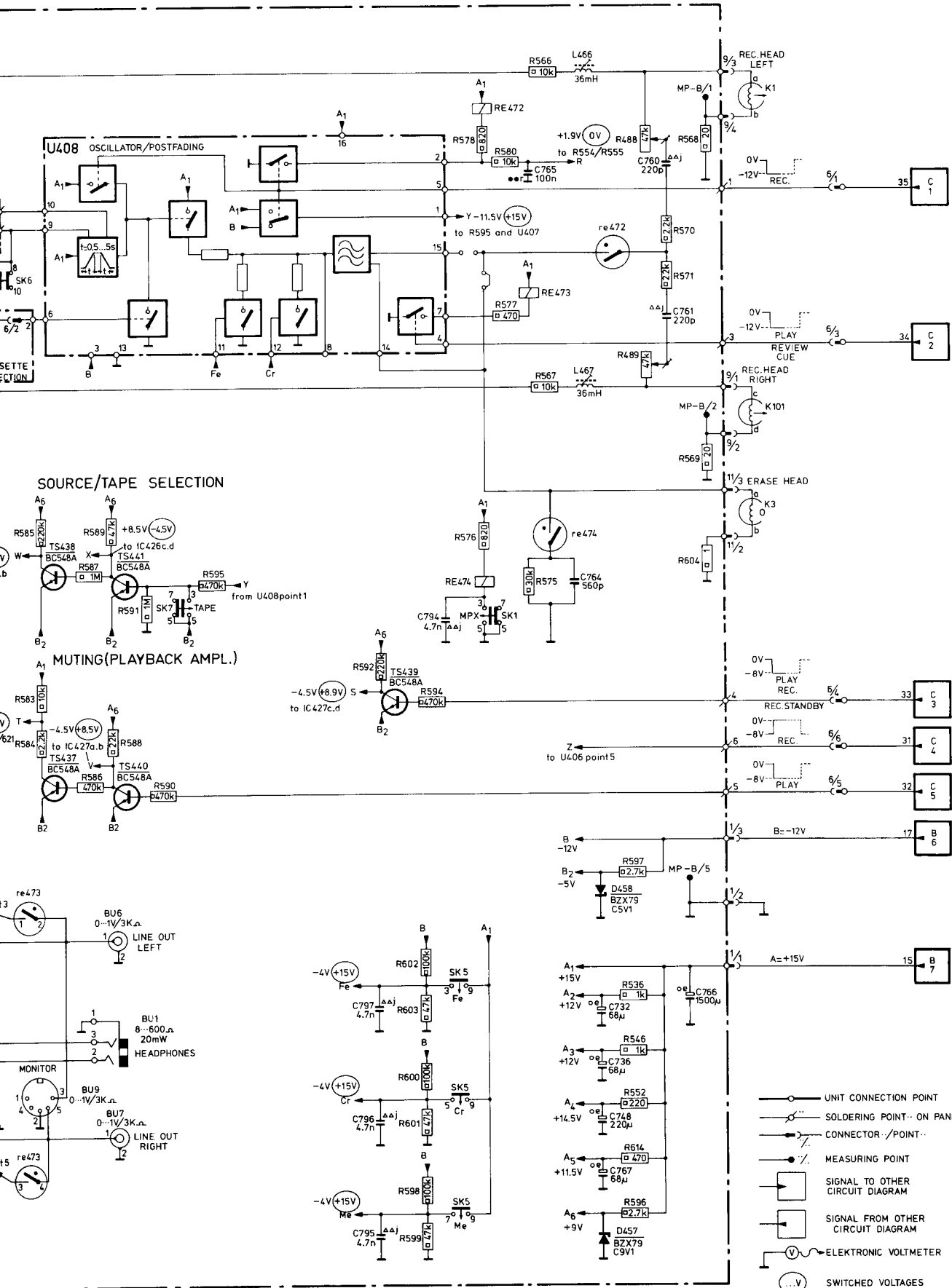


Fig. 19

TS437 TS438	TS440, TS441, BU6, BU1, BU7	TS439	D457 D458	MISC
SK6		RE472 RE473, RE474		L
				L466 L467
			732 736 748 760	700-760
			767 761	766 761-799
			536, 488, 489, 546	400-551
583-591	595	592, 594	598-603	576-578, 580, 566, 567, 575, 552, 596, 597, 614, 568-571, 604
				552-650



- UNIT CONNECTION POINT
- SOLDERING POINT - ON PANEL
- CONNECTOR / POINT
- MEASURING POINT
- SIGNAL TO OTHER CIRCUIT DIAGRAM
- SIGNAL FROM OTHER CIRCUIT DIAGRAM
- ⊕ ELECTRONIC VOLTMETER
- ⊖ SWITCHED VOLTAGES

16822F12

CIRCUIT DIAGRAM C

MISC.	D445				D446				D447				D460				D448																																							
IC	426a				438a,b,c				439c				427a				430d				440c				428b				440b				437b				428d				433a,b				429a				428c				D448			
IC	434a,439d				436c,d				436b				426d				428a				437a				439a,b				434b				437a				431b				431d				435a,d,429b				434c,d				435b,c			
R	526-540				541-581				543-542				544-545				571-576				547				546				574				549				550-548				739				740				738							
C	747-727-729,726,730				735-736				737				737				737				737				737				737				737				737				737				737				737							
C	746-748				732-734				731				731				731				731				731				731				731				731				731				731				731							

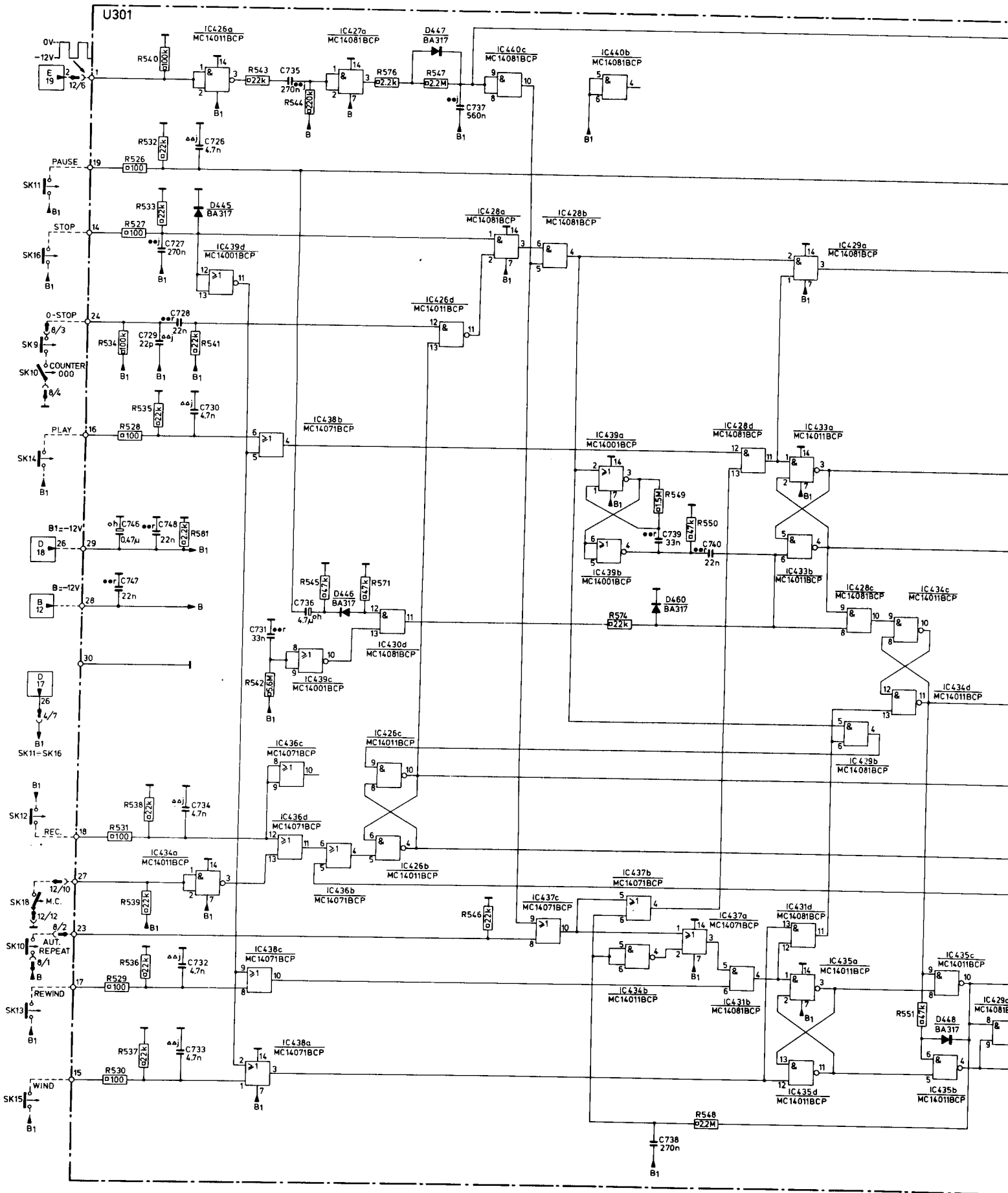


Fig. 20

D448	D449	D450, D452	D451	TS471, D453	D454	D455=457, TS467-470, D458, 459	D426-431	MISC.
28d, 31b	433a,b, 431d, 435a,d, 429b	429c, 429d	432b,c	433c,d	430b	437d, 436a, 430c, 432d	427b,c,d, 438c, 431c, 440a,d, 431a	IC
	551	552, 553	554	741	580	575, 579, 555, 556=558, 577, 578, 572, 573	566=570, 559=565	R
						749	743, 742, 745	C
							744, 751, 750	C

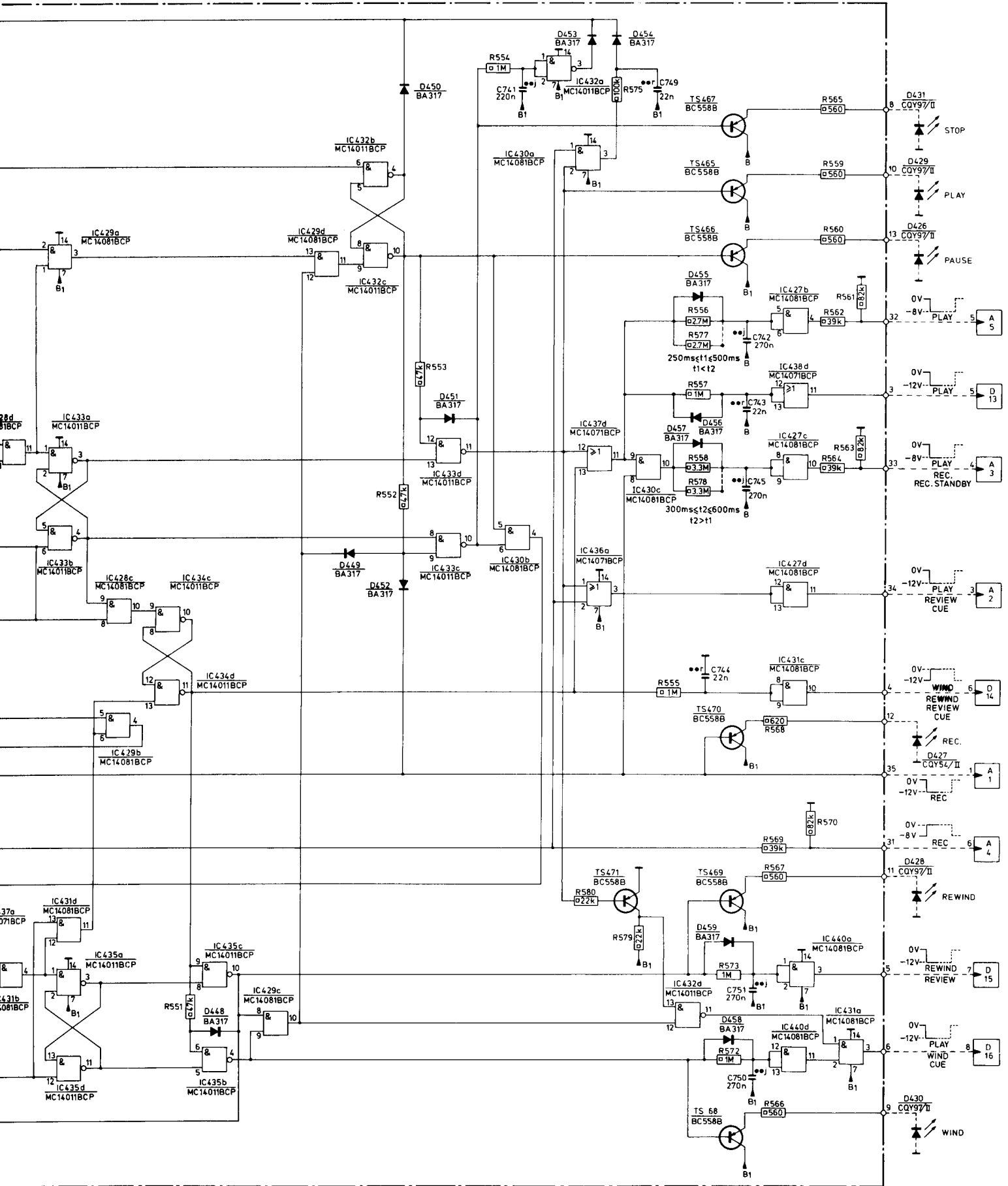


Fig. 20

MISC	D455,IC437	D459,456,448,IC436	D458	IC429	IC432	D450,453,454,TS471,IC428,D460	D457,IC426,430
MISC	IC434,439	IC435	TS465-470,IC440,D445	IC431	IC438	D446,447,IC433,D449,452,451,IC427	
C	739,742,740	738	743	751	727,750	733	730
R526-560	539,556,540,546,548-551,559,557,560					526-533,535-538,555,554,542,541,545	552,553,534,547,544,543,558
R561-581	577	573	565-568	572	581	579	571,575
						570,580,561-564,574,576,569,578	

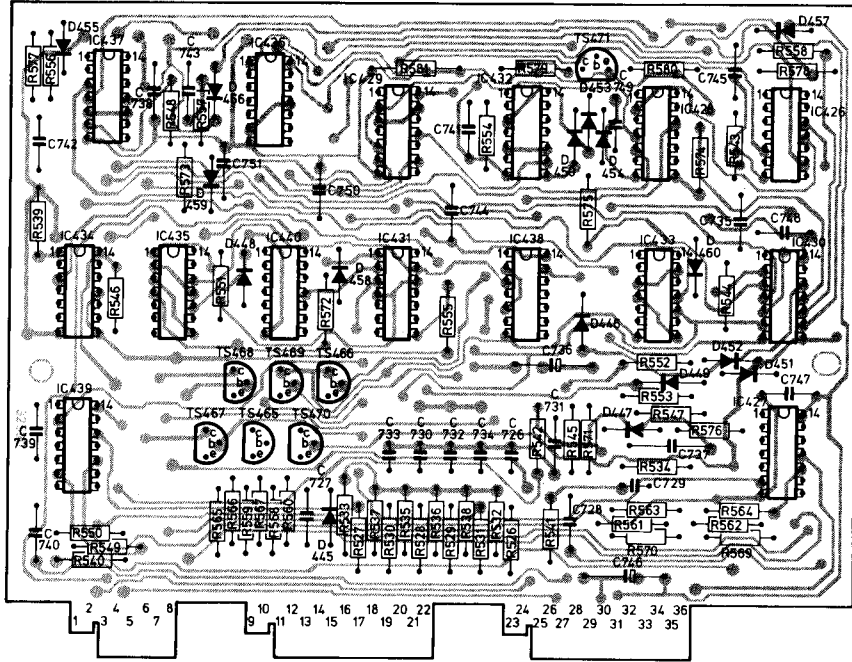


Fig. 21

17326C12

MISC	IC430,426,D457	D460,IC428,TS471,D454,453,450	IC432	IC429	D458	IC436,D448,456,459	IC427,D455
MISC	IC427,D451,452,449,IC433,D447,446		IC438	IC431	D445,IC440,TS465-470	IC435	IC439,434
C	748,747	735,745	737,729,746,749,728,736,731,726,734,741,744,732	730	733	750,727	751
R526-560	558,543,544,547,534,553,552	545,541,542,554,555,535-538,526-533				560,557,559,548-551,546,540,556,539	
R561-581	578,569,576,574,561-564,580,570	575,571	579	581	572	565-568	573
							577

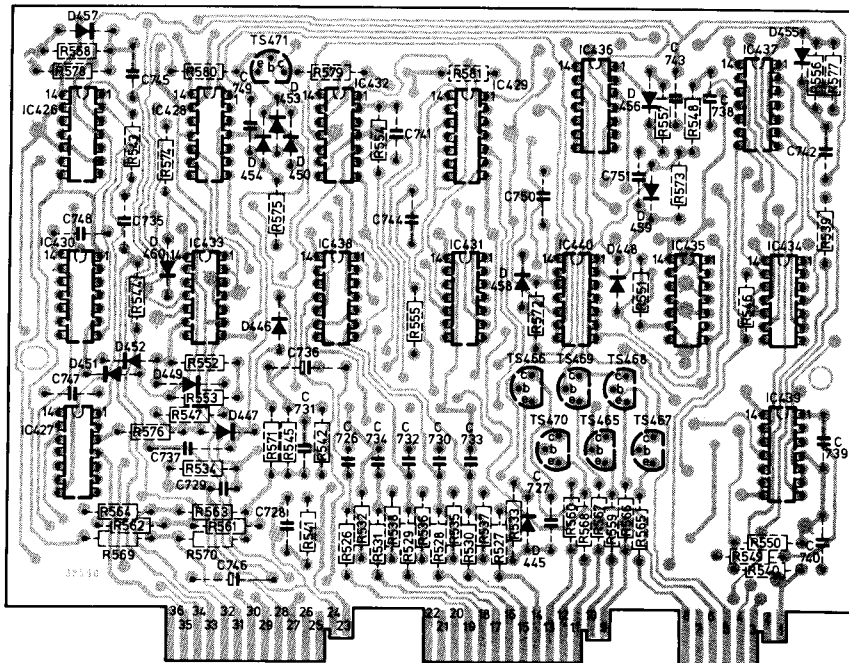


Fig. 22

17332C12



MC14001BCP	5322 209 14045
MC14011BCP	5322 209 14046
MC14071BCP	4822 209 10054
MC14081BCP	4822 209 10053



BC558B	4822 130 44197
--------	----------------



BA317	4822 130 30847
-------	----------------

FLOW CHARTS

L = LOW STATE (-12V)

H = HIGH STATE (0V)

H/ = PRESSED IN SWITCH : LOW STATE RELEASED SWITCH : HIGH STATE

// = WITH DELAY IN LOW STATE

⑤ UNIT CONNECTIONPOINT

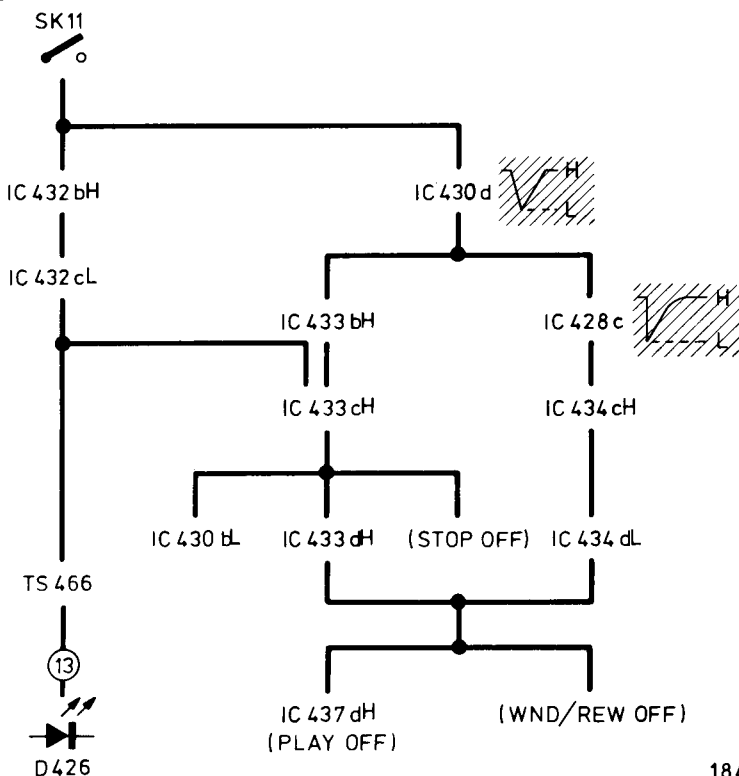
IC4... a = PIN 3 OF IC4...

IC4... b = PIN 4 OF IC4...

IC4... c = PIN 10 OF IC4...

IC4... d = PIN 11 OF IC4...

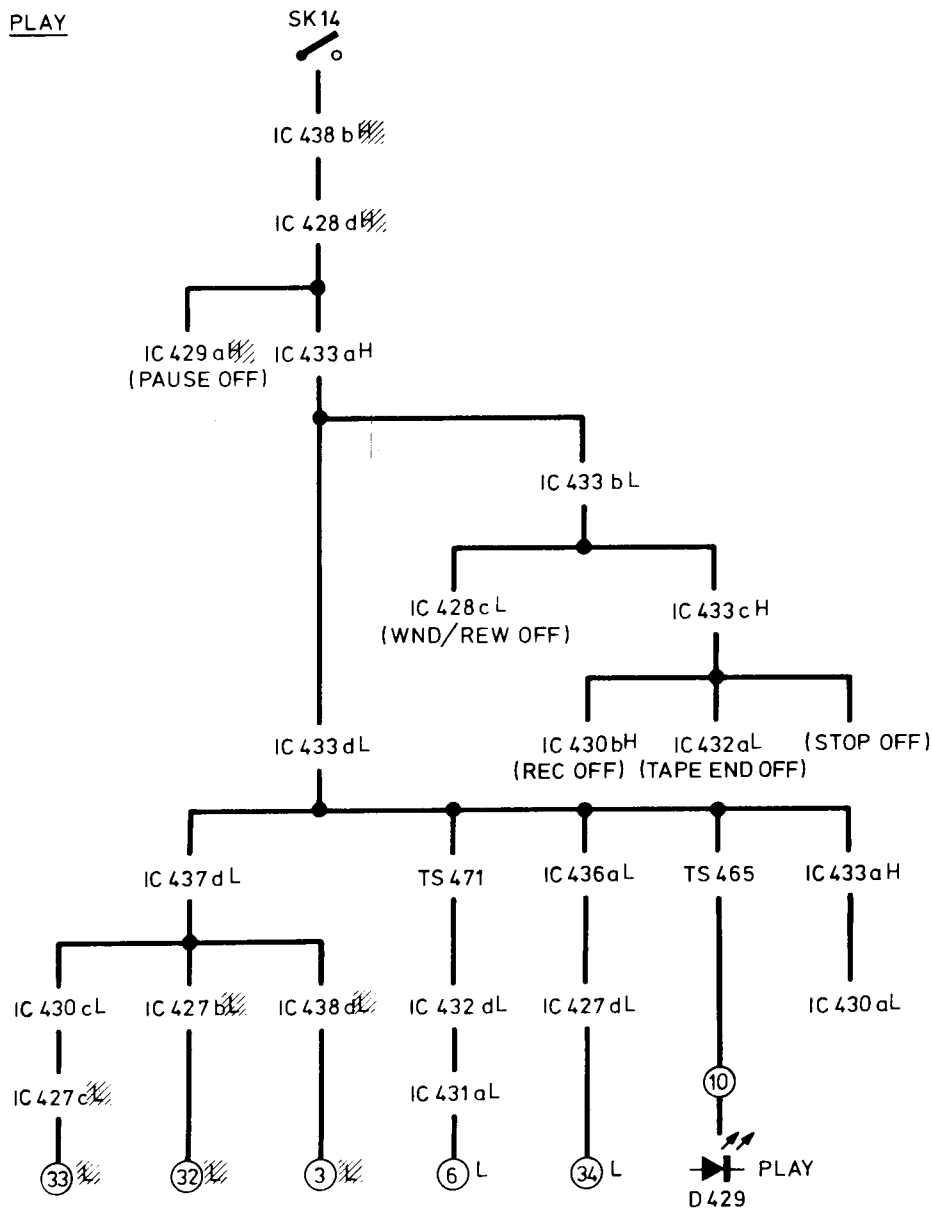
PAUSE



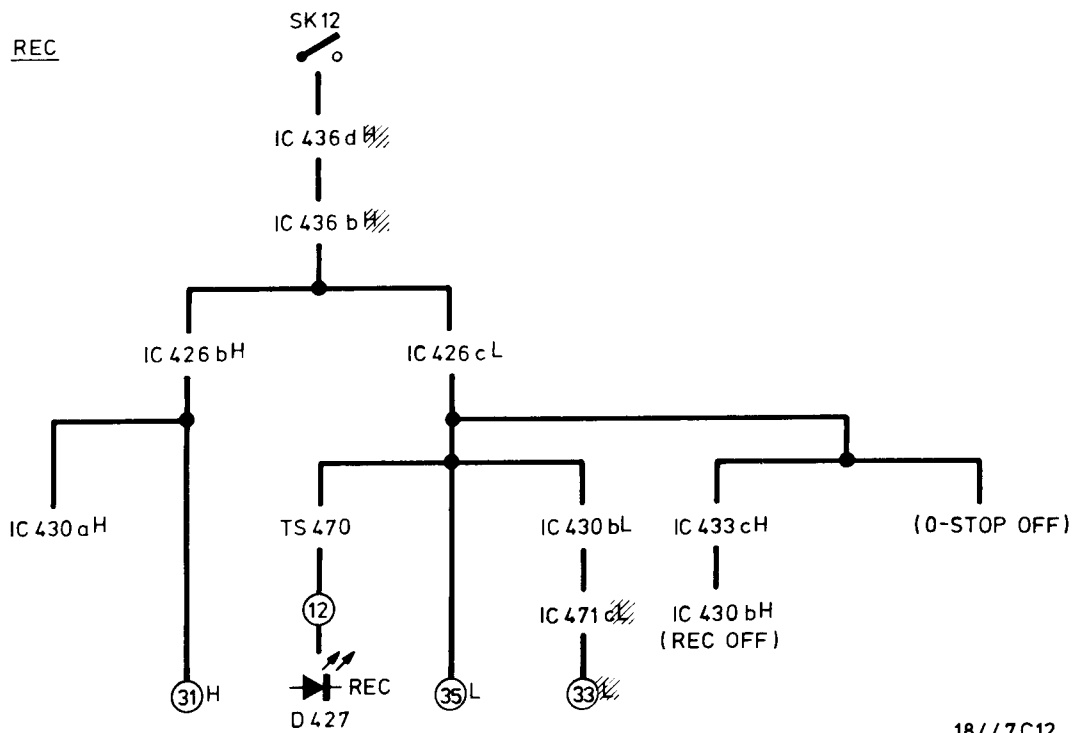
18446B12

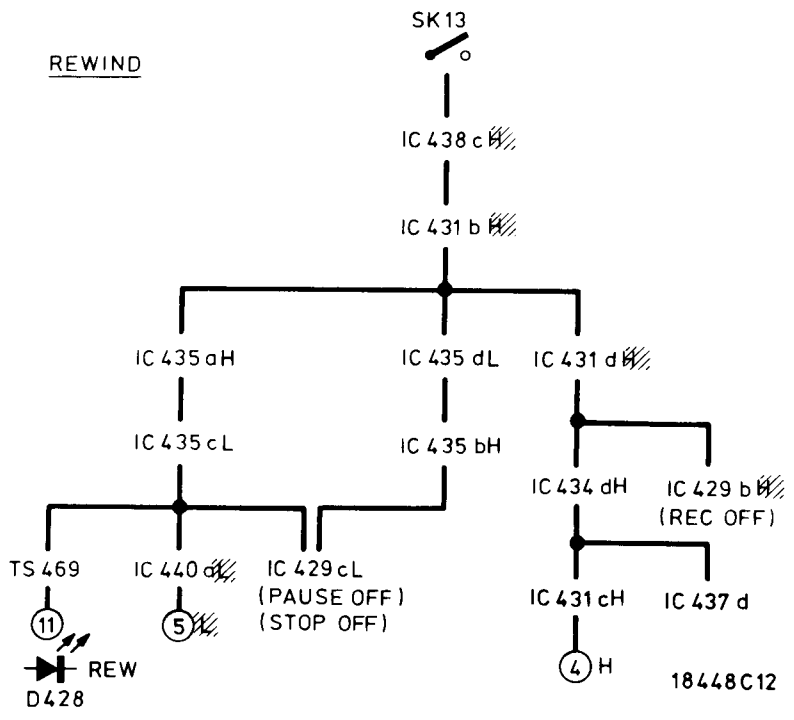
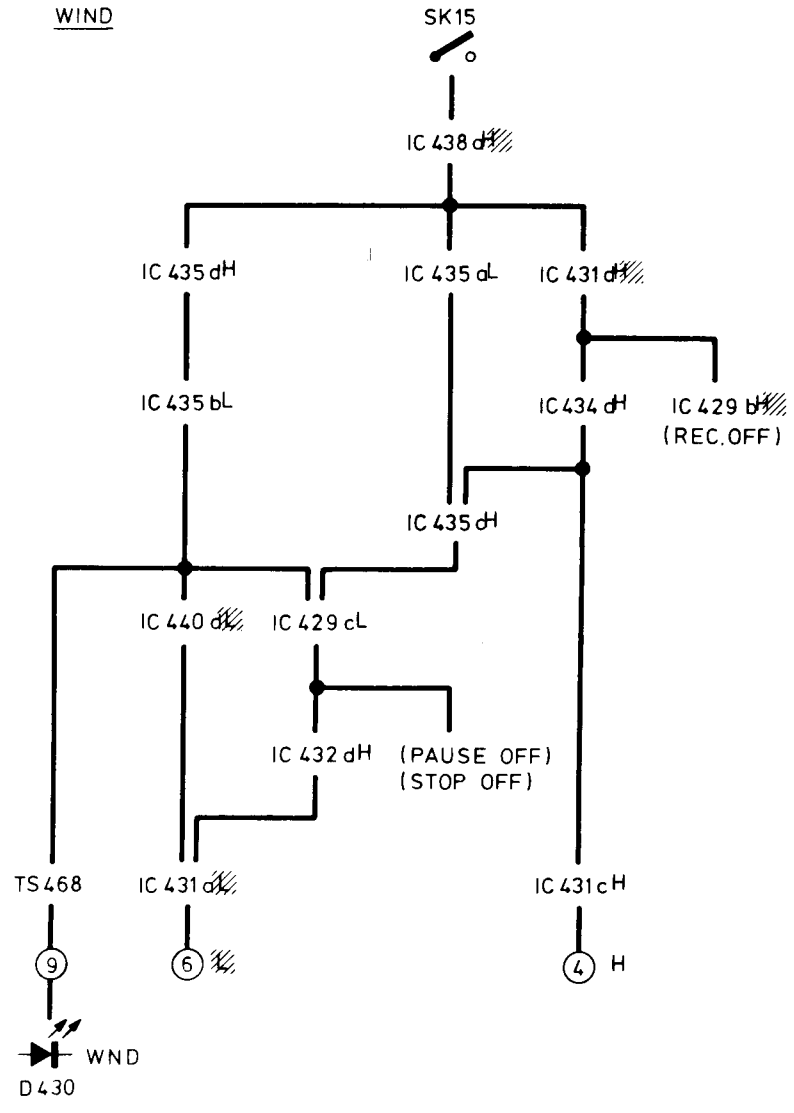
Measuring instrument: $R_i \geq 10 \text{ M}\Omega$

PLAY



REC

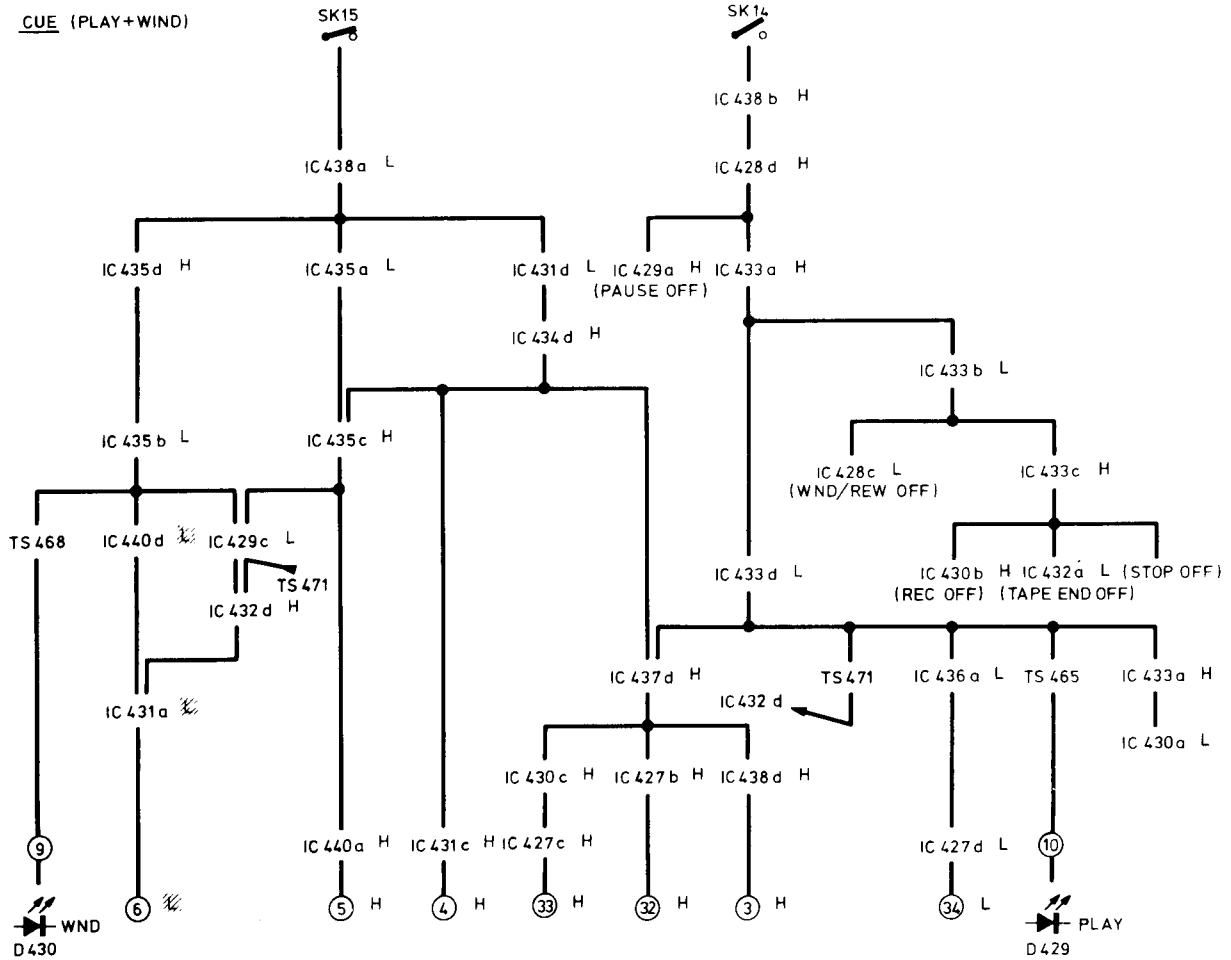




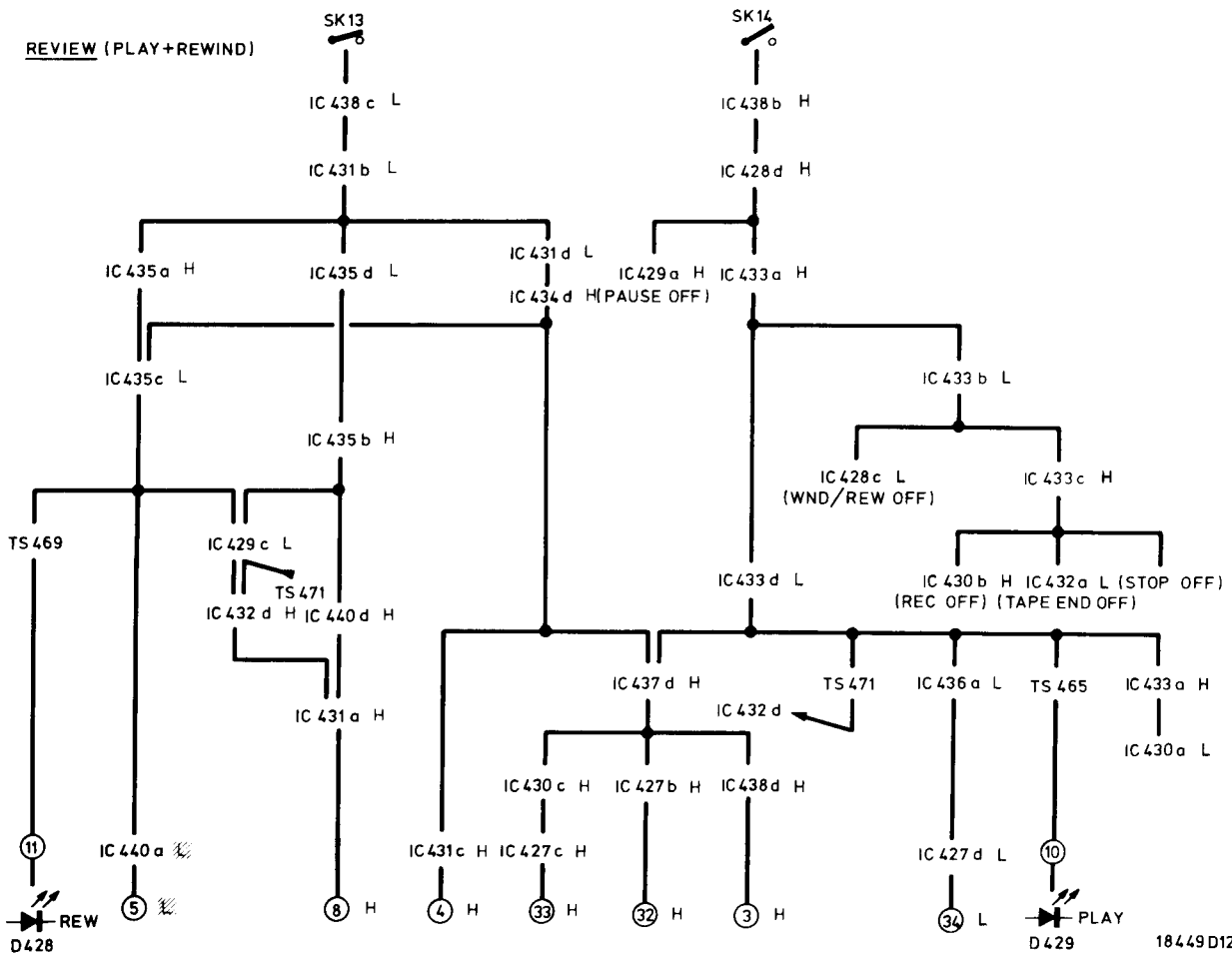
		STOP	PLAY	REC	REC+PLAY	REC+PAUSE	WIND	CUE	REW	REVIEW
IC426	a									
	b	L	L	H	L	H	L	L	L	L
	c	H	H	H	H	H	H	H	H	H
	d	H	H	H	H	H	H	H	H	H
IC427	a	L		L		L				
	b	H	L	H	L	H	L	L	L	L
	c	H	L	H	L	H	L	L	L	L
	d	H	L	H	L	H	L	L	L	L
IC428	a	H	H	H	H	H	H	H	H	H
	b	H	H	H	H	H	H	H	H	H
	c	H	L	H	L	H	L	L	L	L
	d	H	H	H	H	H	H	H	H	H
IC429	a	H	H	H	H	H	H	H	H	H
	b	H	H	H	H	H	L	L	L	L
	c	H	H	H	H	H	L	L	L	L
	d	H	H	H	H	H	L	L	L	L
IC430	a	L	L	H	L	H	L	L	L	L
	b	L	H	H	L	H	L	L	L	L
	c	H	L	L	L	L	H	H	H	H
	d	H	H	H	H	H	H	H	H	H
IC431	a	H	L	H	L	H	L	HL	H	H
	b	H	H	H	L	H	L	H	H	L
	c	L	L	L	L	L	H	H	H	L
	d	H	H	H	H	H	H	H	H	L
IC432	a	H	L	L	L	L	L	L	L	L
	b	L	L	L	L	L	L	L	L	L
	c	H	H	H	H	H	H	H	H	H
	d	H	L	H	L	H	H	H	H	H
IC433	a	L	H	L	H	L	L	H	L	H
	b	L	L	H	L	H	L	L	L	L
	c	H	H	H	H	H	H	H	H	H
	d	H	L	H	L	H	L	L	L	L

		STOP	PLAY	REC	REC+PLAY	REC+PAUSE	WIND	CUE	REW	REVIEW
IC434	a	L	L	L	L	L	L	L	L	L
	b	L	L	L	L	L	L	L	L	L
	c	L	L	L	L	L	L	L	L	L
	d	L	L	L	L	L	L	L	L	L
IC435	a	H	H	H	H	H	H	H	H	H
	b	H	H	H	H	H	H	H	H	H
	c	L	H	L	L	L	L	L	L	L
	d	L	H	L	L	L	L	L	L	L
IC436	a	H	L	H	H	H	H	H	H	H
	b	H	H	H	H	H	H	H	H	H
	c	H	H	H	H	H	H	H	H	H
	d	H	H	H	H	H	H	H	H	H
IC437	a	H	H	H	H	H	H	H	H	H
	b	H	H	H	H	H	H	H	H	H
	c	H	H	H	H	H	H	H	H	H
	d	H	L	H	L	H	H	H	H	H
IC438	a	H	H	H	H	H	H	H	H	H
	b	H	H	H	H	H	H	H	H	H
	c	H	H	H	H	H	H	H	H	H
	d	H	L	H	L	H	H	H	H	H
IC439	a	L	L	L	L	L	L	L	L	L
	b	L	L	L	L	L	L	L	L	L
	c	L	L	L	L	L	L	L	L	L
	d	L	L	L	L	L	L	L	L	L
IC440	a	H	H	H	H	H	H	H	L	L
	b	H	H	H	H	H	H	H	L	L
	c	H	H	H	H	H	H	H	H	H
	d	H	H	H	H	H	H	H	H	H

CUE (PLAY+WIND)

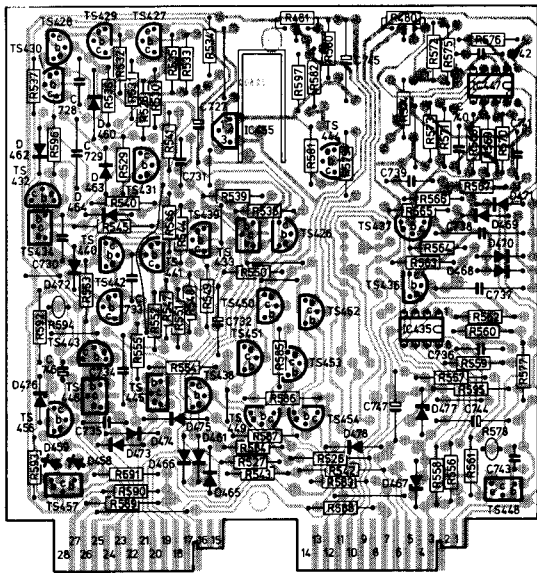


REVIEW (PLAY+REWIND)



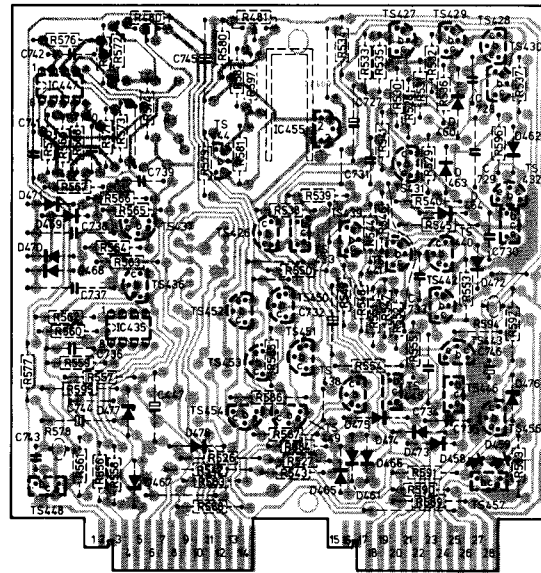
MISC	D462,TS427-432,D460,464,463,TS433,IC455	TS444	IC447,D468-471
MISC	D476,TS434,D472,TS443,446,438-442,445,450-453,426	TS437,436,IC435	
MISC	TS456,D458,458,TS457,D473-475,D466,461,465,TS449,454,D478	D467,477	TS448
C	728-730,735,746,733,731,727,732,734	745,747,736-744	
R480-541	537,536,540,528-535,541,539,527,538,481,526	480	
R542-576	553-555,552,544-549,551,550,543,542	563-576,556-562	
R577-596	592-594,596,589-591	583-588,579-582,597	595,578,577

MISC	D468-471,IC447	TS444	IC455	TS433	D463,464,460	TS427-432	D462
MISC		IC435	TS436,437,426,450-453,445,438-442,446,443,D472	TS434	D476		
MISC		TS448	D467,477,478	TS454,449	D465,461,466,473-475	TS457	D458,459,TS455
C		736-744	747,745		732,727,731,733	746,735,728-730	
R480-541		480	526	481,538,527,539	541,528-535,540	536,537	
R542-576		556-562,563-576	542	543,550,551,544-549	552,553-555		
R577-596		577,578,595	597,579-582,583-588		589-591,596,592-594		



17328C12

Fig. 23



17334C12

Fig. 24

BC547B	4822 130 40959	R480	10K 4822 100 10024
BC548B	4822 130 40937	R481	100E 4822 100 10073
BC548C	4822 130 44196	R563,565	5.1K - 2 % 5322 116 54595
BC557B	4822 130 44568	R569	22K - 2 % 5322 116 54574
BC558B	4822 130 44197	R573	13K - 2 % 5322 116 50522
BC635	5322 130 44349	R578	9.4E - PTC 4822 116 40031
BC636	4822 130 44283	R580	100E - 2 % 5322 116 54469
BD135	4822 130 40645	R594	2.3E - PTC 4822 116 40032
LM358N	4822 209 80484	C737,738	22n - 1 % 4822 121 50609
TDA1059B	4822 209 80361		
		-Div.-	
BA317	4822 130 30847	Spring clip	4822 255 40128
BAX18A	4822 130 31025		
BZX79/C4V7	4822 130 34174		
BZX79/C7V5	4822 130 30861		
BZX79/C9V1	4822 130 30862		

CIRCUIT DIAGRAM D

MISC	G	D467	TS426.IC435a.TS427.D460	TS428-430.IC435b.D462.TS431.D463-466.461.TS436.432-434.437.RE476.D468-471	TS438	D472.TS439	TS440-442.IC447a	D47
C			727 736	728.729	730	737.731	738	735
R		556-558.526.527	559.528-531 532-534.560	561.535	536.537	562.596.538.563.539-541.564	565	542.543 566.544-547.567.568.548-550 569.551 570.552.553 554.480.

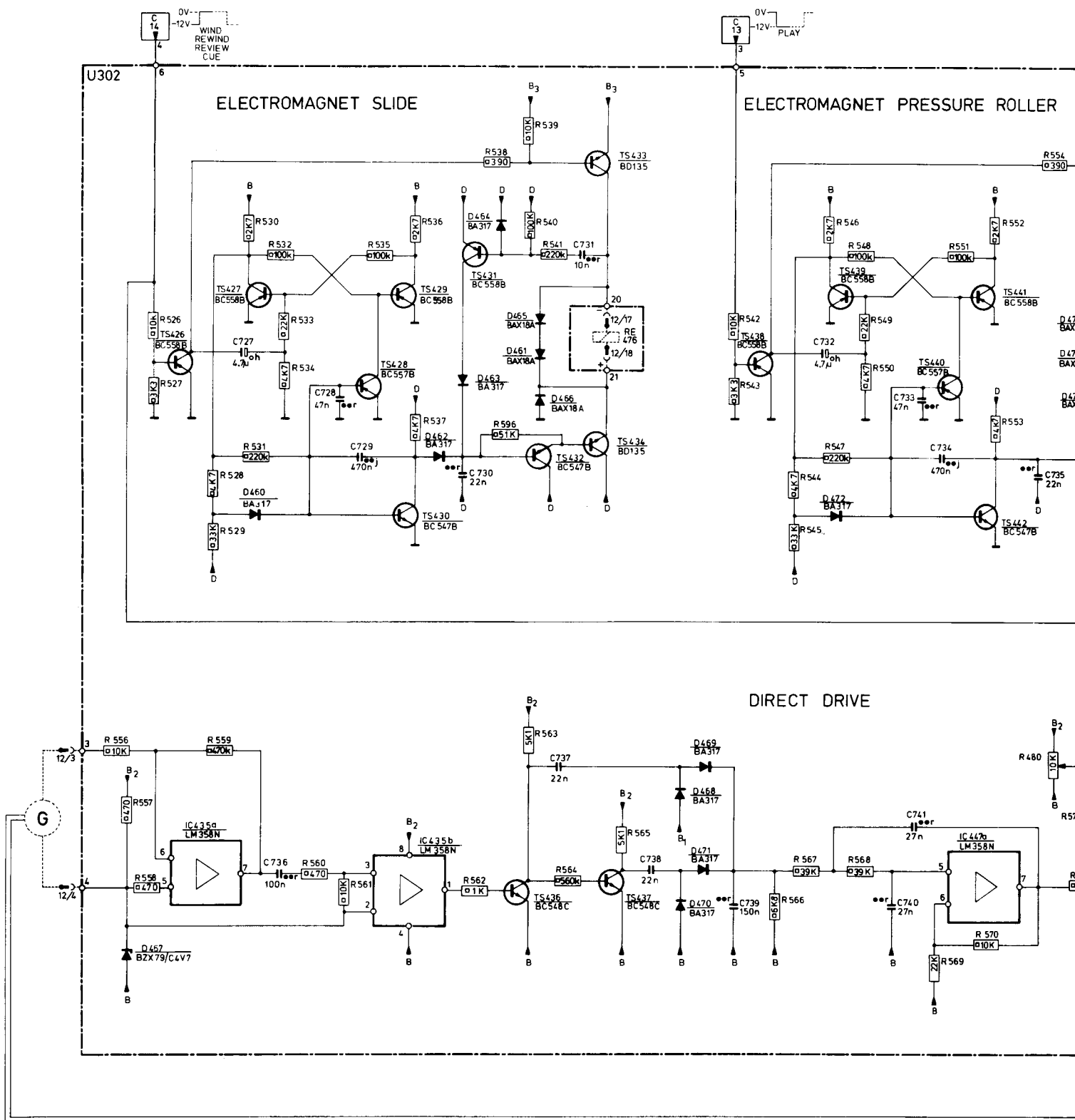
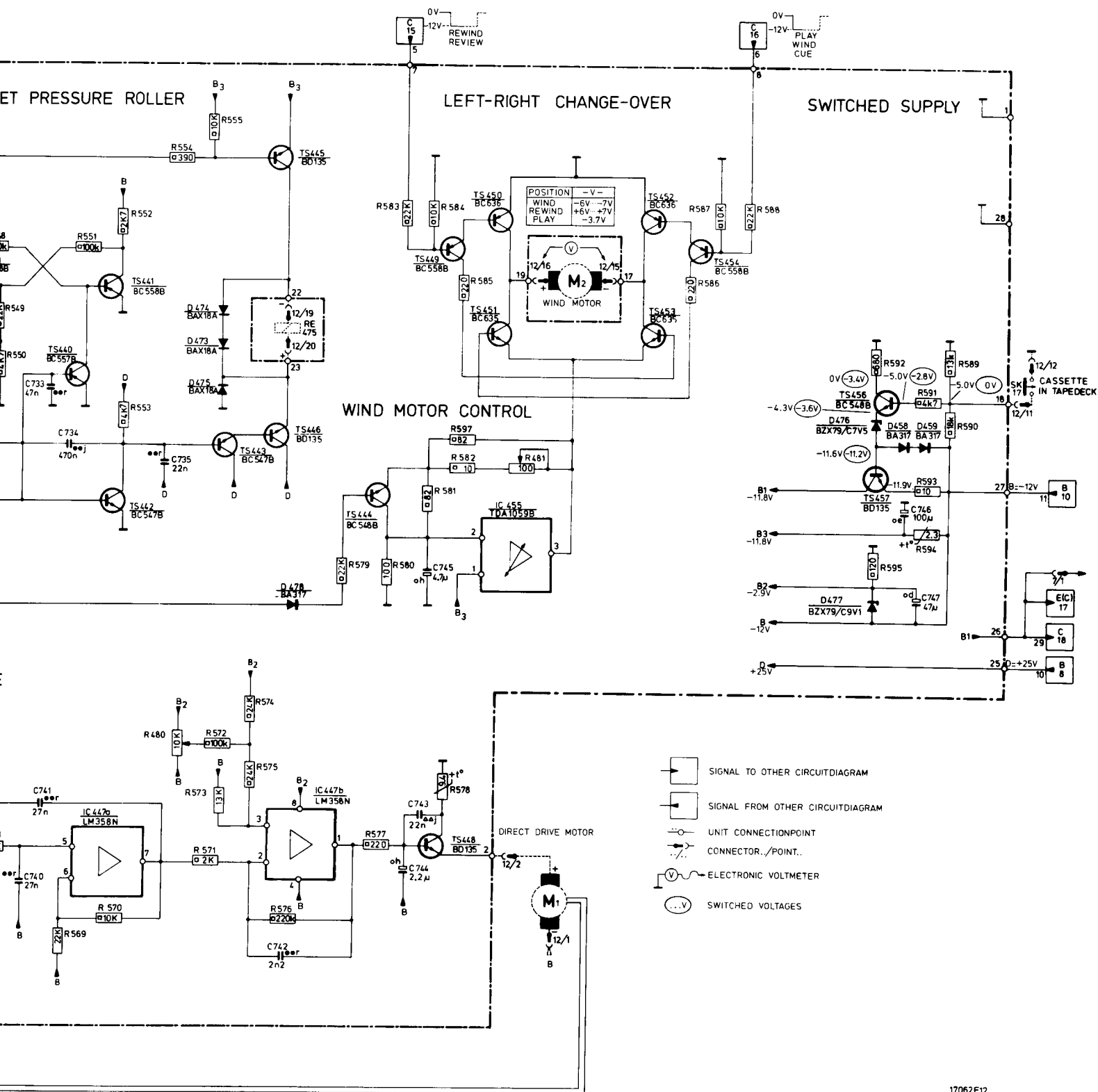


Fig. 25

740,741,733,734	TS440...442.IC447a	D473...475.TS443,445,446,D478.IC447b,RE475.TS444	TS448...451.R578.IC445	M1.2	TS452...454	D477.TS456,457.D476,458,459.R594
548...550	569,551	570,552,553	554,480,555,571...575,	576	579	577,580,583,584,581,582,585,597,481
						586 587 588
						592,595 591,593 589,590



17062E12

Fig. 25

U406

RECORDING AMPLIFIER

U407

MISC	IC426a,b,TS428+433	IC426c,d	TS434-435	TS436+439	TS440-441	TS442-443	L456,457,TS444,445,448,449	TS450,451,446	TS447		
C			746,747	726,727	728,729	730,731	740,741	743,734,735	736,737,742,744,745		
R	526+531	532+539	544,545	540+543	546,547	550+553	554+557	558,559,560,561	562,563,564+567,568,569,586,587	570,571,588,589,572+575,576+579,581+584	580

MISC	TS428	TS429
C	726,727	728
R	532,533,526+531	

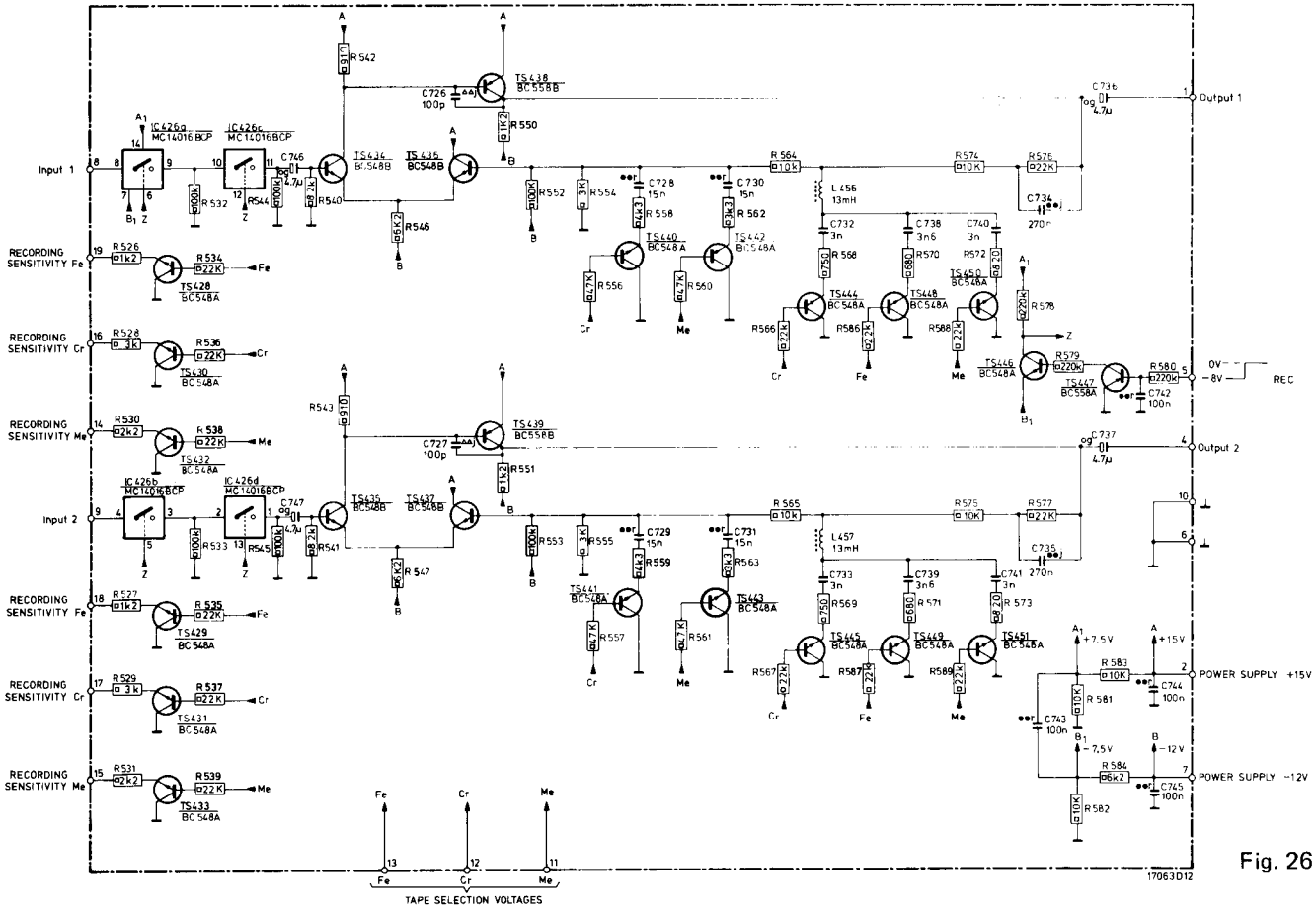


Fig. 26

MISC	TS440-445, 448-451	L456, 457	TS434-439
MISC	TS428-433	IC426	TS446, 447
C	728-733, 738-741, 745	735, 734	747, 746, 726, 727, 742-743, 736, 737
R526-555	526-531, 534-539	532, 533, 550-555, 540-547	
R556-589	556-563, 566-573, 586-589, 564, 565, 574-577	578-584	

MISC	TS434-439	L456, 457	TS440-445, 448-451
MISC	TS446, 447	IC426	TS428-433
C	737, 736, 742-744, 727, 726, 746, 747, 734, 735, 745, 738-741, 728-733		
R526-555	540-547, 550-555, 533, 532		526-531, 534-539
R556-589	578-584	574-577, 565, 564, 586-589, 566-573, 556-563	

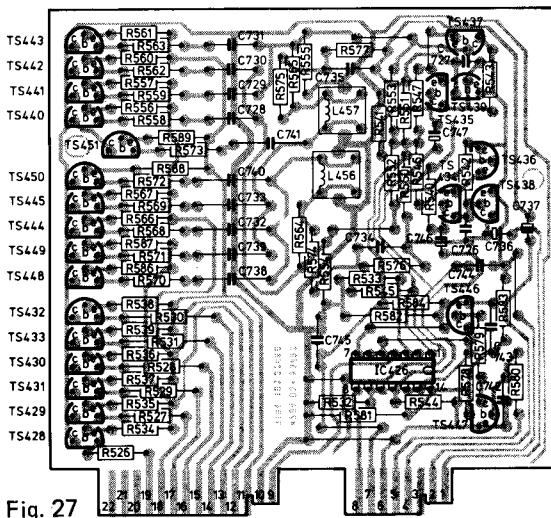


Fig. 27

17327C12

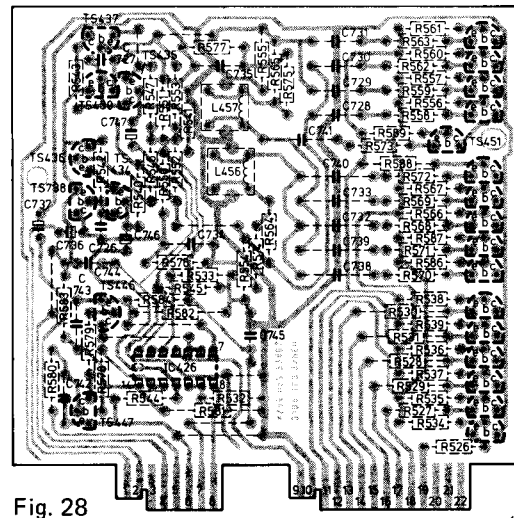


Fig. 28

17333C12

MC14016BCP	5322 209 14119
BC548A	4822 130 40948

BC548B	4822 130 40937
BC548B	4822 130 44197
	L456,457

U406
BA317
C732,733 C738,739 C740,741
L456,457

U407

INDICATOR

MISC	TS426,427	TS428,429	D460+463	TS430,431	D466,467	TS436	TS438	D468,469	TS440,444	TS442
C	726,727 728-731	734,735 736-739 740,741	539,536,537,540,541	744,745	560,561	564	566, 568	570, 574,575, 578,579	752	580, 582,584, 590,586
R	532,533,528-531	534,535,538,539,536,537,540,541	542-545,546,547	548,549	560,561	564	566, 568	570, 574,575, 578,579	580	582,584, 590,586

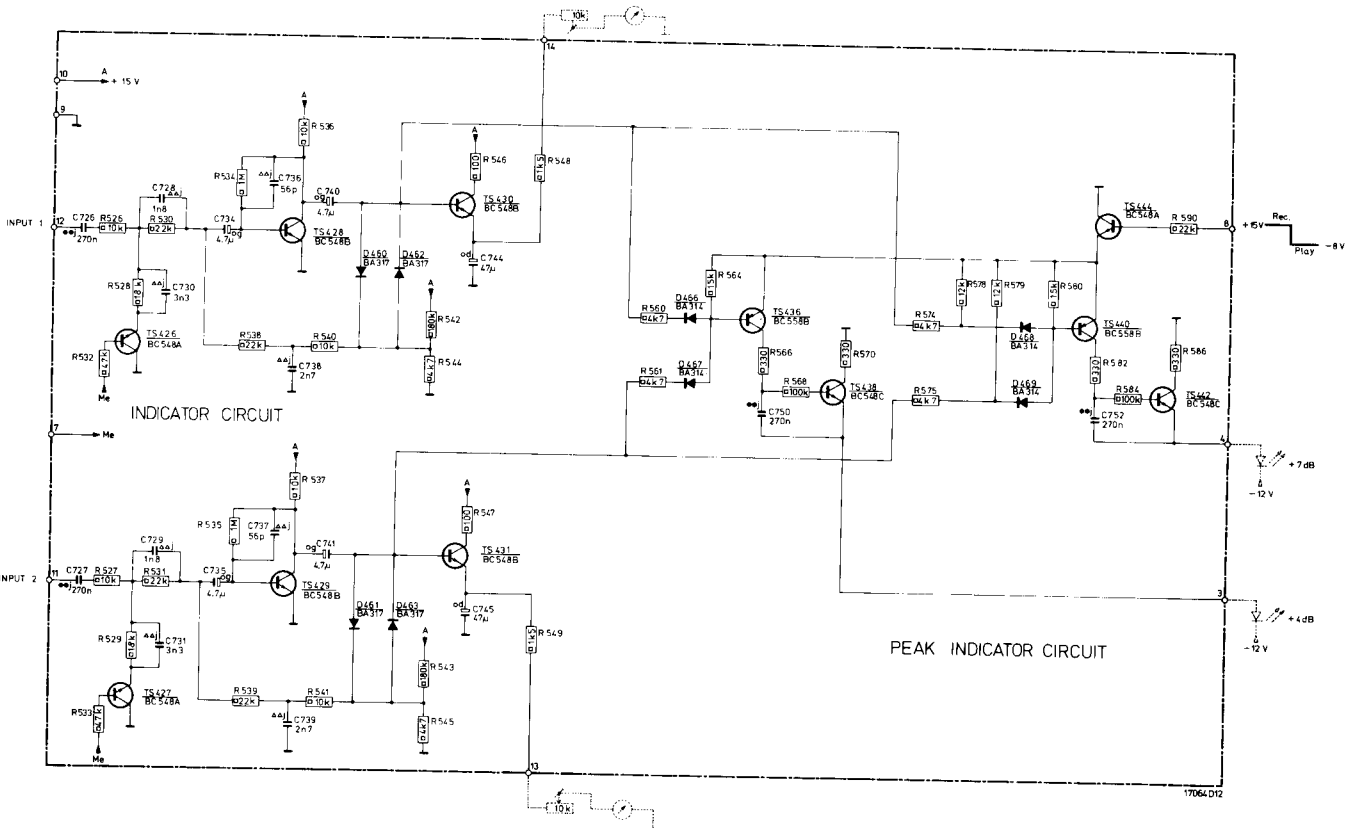


Fig. 29

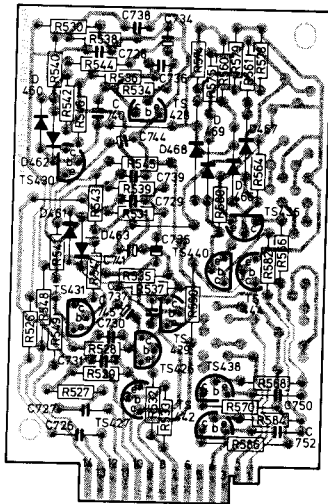
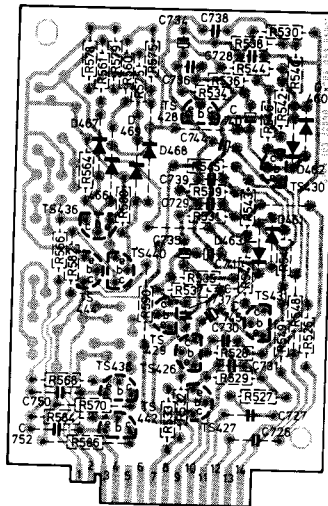


Fig. 30

MISC	C	R526	R533
		-547	-590
TS428	738	530	560
D460	734	538	561
D462	728	544	574
D466	736	540	575
		536	578
		542	579
		546	
D469	739	545	564
TS430	729	539	580
		543	
		531	
TS436	735	541	566
D461	741	547	582
D463		535	
TS440	737	537	590
TS444			
		548	
TS431	745	549	
TS429	730	526	
TS426	731	528	
TS438	750	529	568
TS427	727	532	570
TS442	752	533	584
		726	586



17323C12

U406		
BA317		4822 130 30847
C732,733	3 nF - 63 V	4822 121 50601
C738,739	3.6 nF - 63 V	4822 121 50088
C740,741	3 nF - 63 V	4822 121 50601
L456,457	13 mH	4822 156 20822

U407		
BC548A		4822 130 40948
BC548B		4822 130 40937
BC548C		4822 130 44196
BC558B		4822 130 44197
BA314		4822 130 30879
BA317		4822 130 30847

MISC	TS426	TS427,431	D448,TS434	TS428	TS432,429,430,D449	D450,451,TS433,D452,453	TS439	TS435	TS437,436,R465,TS440	TS438			
C	734		727,726	728					735,731	729			
R	526,544	529,527	560,530	528	532,540,543	533,531,534			539,535,541	542,536+538	545	546,561,463,547,548,550,562,464,549,551+554,465	555

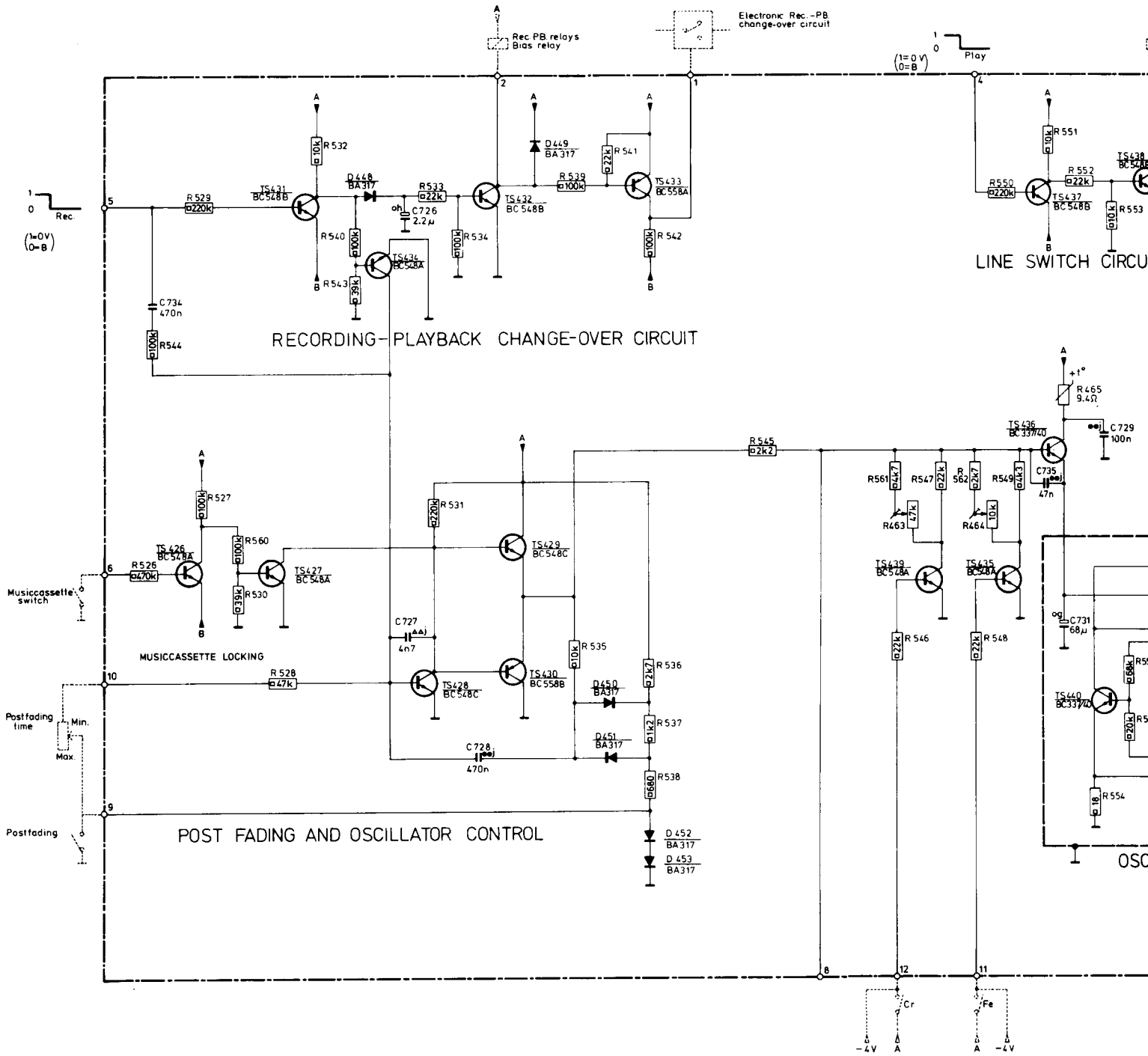
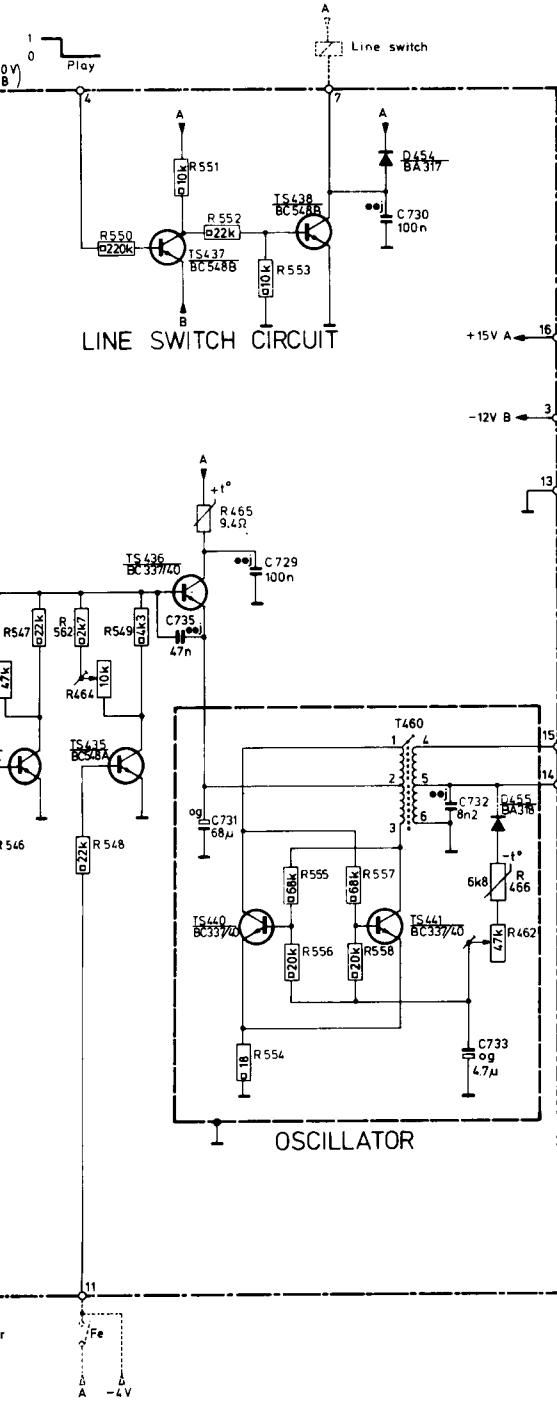


Fig. 31

BC337/40	4822 130 41344	T460	482
BC548A	4822 130 40948		
BC548B	4822 130 40937		
BC548C	4822 130 44196	R462,463	47K 482
BC558A	4822 130 40962	R464	10K 482
BC558B	4822 130 44197	R465	9.4E - PTC 482
		R466	6.8K - NTC 532
BA317	4822 130 30847		
BA318	4822 130 30852		

TS439	TS435	TS437,436,R465,TS440	TS438	TS441,D454	T460	D455
		735 731 729	730	732 733		
461,463,547,548,550,562,464,549,551+554,465			555+558			466,462

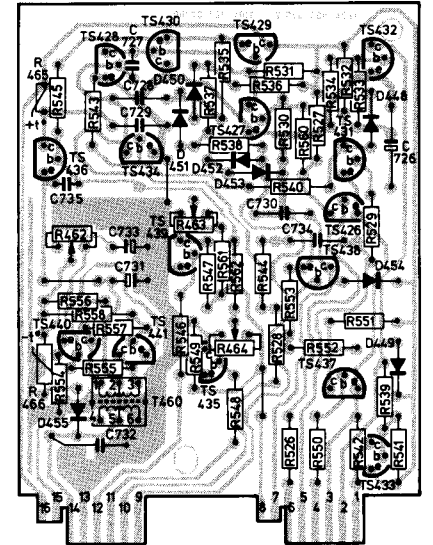


17066D12

U408

OSCILLATOR

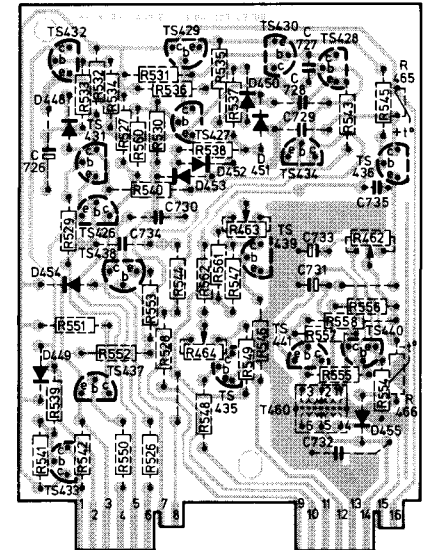
MISC	C	R
TS430		465
TS429	727	543
TS432		530
TS428		538
D450	728	545
D451	729	527
D448		560
TS427		
TS431	726	
D452		
TS436		
TS434	735	540
D453	730	
TS426	734	529
TS439	733	463
TS438	731	462
D454		961
		547
		562
		574
		551
TS440		553
TS441		546
D449		464
TS437		528
TS535		554
T460		558
D455	466	539
		548
		841
		542
		550
		526
TS433		



17324B2

Fig. 32

MISC	C	R
TS430		465
TS429	727	543
TS432		530
TS428		538
D450	728	545
D451	729	527
D448		560
TS427		
TS431	726	
D452		
TS436		
TS434	735	540
D453	730	
TS426	734	529
TS439	733	463
TS438	731	462
D454		961
		547
		562
		574
		551
TS440		553
TS441		546
D449		464
TS437		528
TS535		554
T460		558
D455	466	539
		548
		841
		542
		550
		526
TS433		

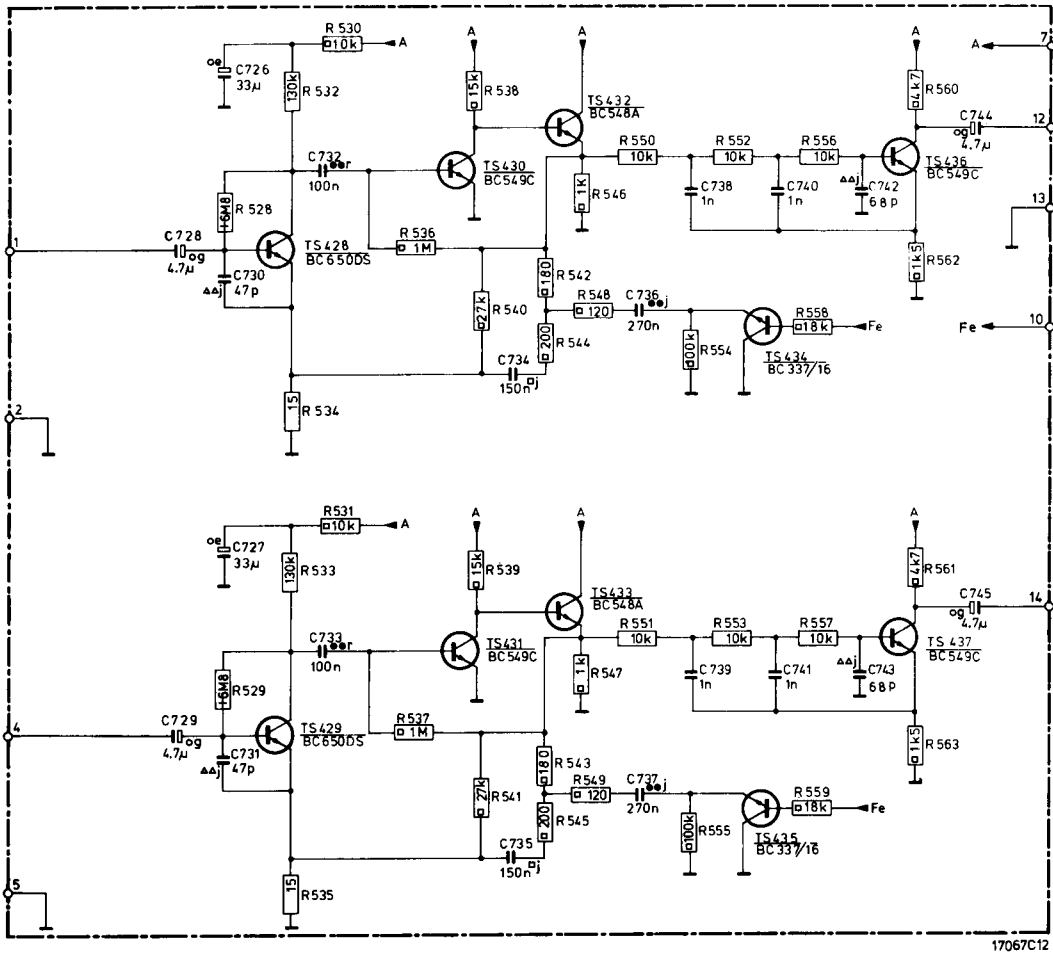


18236B2

Fig. 33

	4822 146 20565
47K	4822 100 10076
10K	4822 100 10024
9.4E - PTC	4822 116 40031
6.8K - NTC	5322 116 34055

MISC	TS428.429	TS430.431	TS432.433	TS434.435	TS436.437
C	726+731	732.733	734.735	736.737 738.739	740.741 742.743 744.745
R	528.529.530+535	536.537.538+541	542+549	550.551 552+555	556+559 560+563

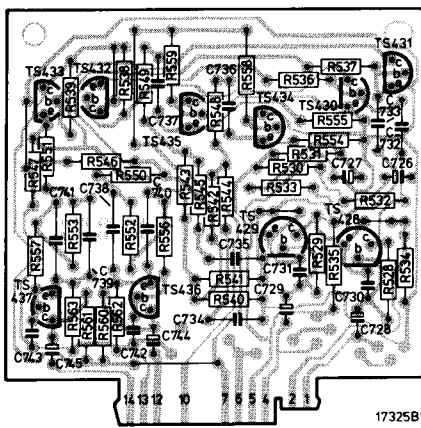


17067C12

Fig. 34

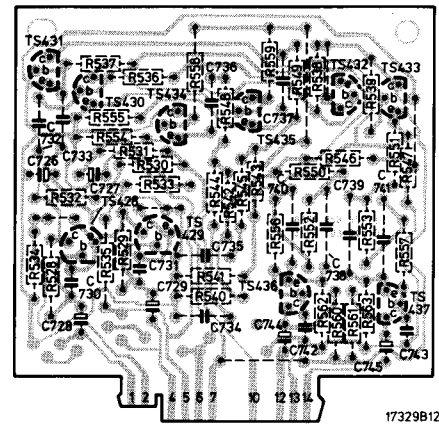
MISC	TS437.433.432.436	TS435	TS434.428+431
C	743.745.738+742.744.734+737	727+733	726
R526+545	539 538 540+545	528+532	533+537
R546+552	547.551 546 550.552.549	548	
R553+564	557.553.560+563.556.559	558	554.555

MISC	TS428+431.434	TS435	TS436.432.433.437
C	726 727+732	734+737.744.738+742.745.743	
R526+545	533+537 528+532	540+545 538	539
R546+552	548	549.552.550 546 551.547	
R553+564	555.554	558 559.556.560+563.553.557	



17325B12

Fig. 35



17329B12

Fig.36

	BC337/16	4822 130 41095		R532,533	130K - 5 %	5322 116 54707
	BC548A	4822 130 40948		R534,535	15E - 5 %	5322 116 50902
	BC549C	4822 130 44246		R550,551		
	BC650DS	4822 130 41364		R552,553	10K - 1 %	5322 116 54619
				R556,557		
	C738,739	1 nF - 1 %	4822 121 50566			
	C740,741	1 nF - 1 %	4822 121 50566			

U410 **MIXER/HEADPHONE AMPL.**

MISC	TS 428,429		TS 430,431				IC 426,427			
C	726,727	728,729	730,731	732,733	734,735	736	739,742	740,741	743	
R	526,527,528,529	530	535	536	541	432a,b	542,543,433a,b	544,545	546	549,552
										550,551

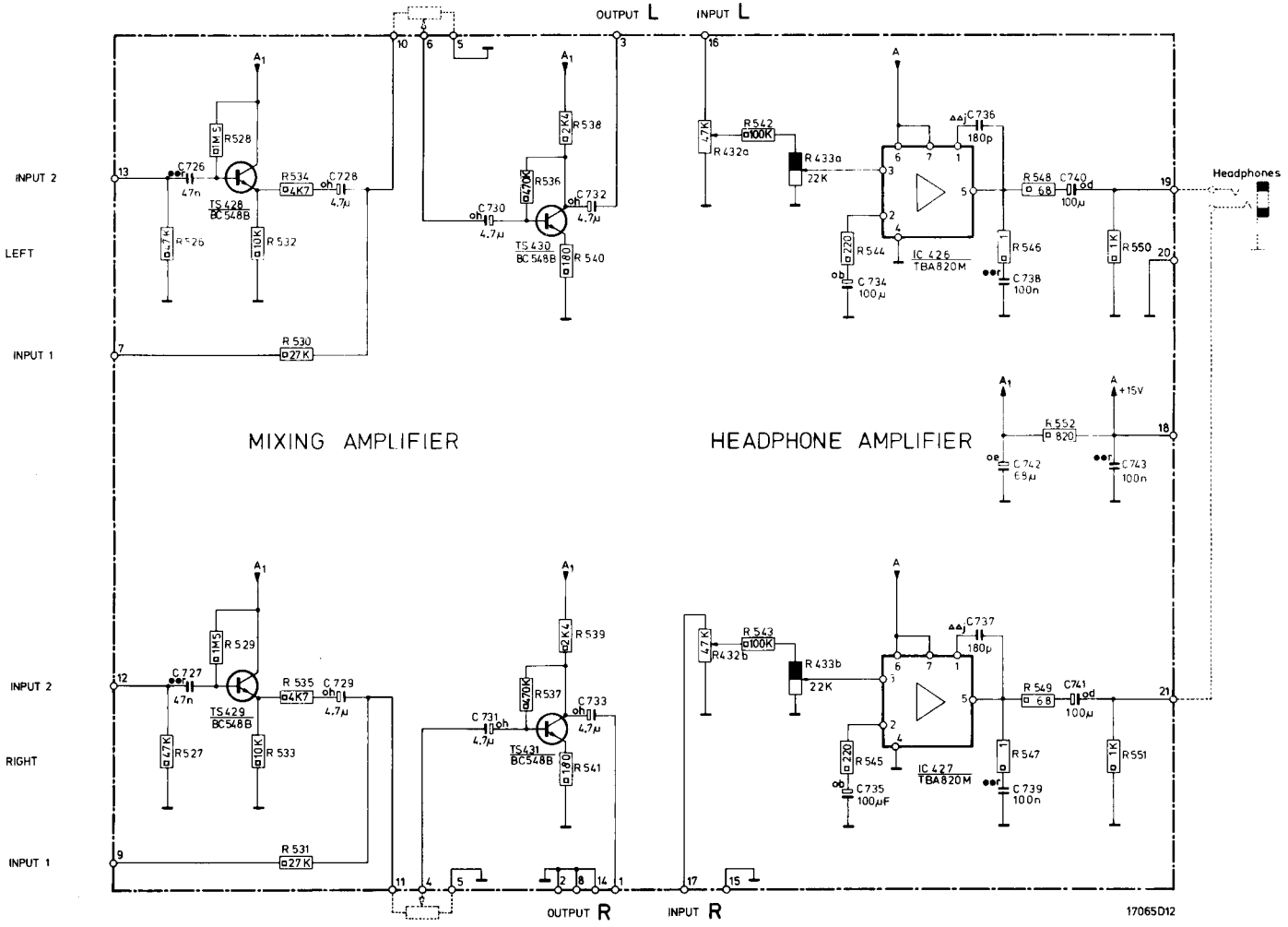


Fig. 37

MISC	IC427	IC426	TS428	TS429	TS430	TS431
C	737,741,739	735,743	736	738,740	734	726,742,727
R	551,545	547,549,433	550	548,546,544	552,542,526	529,543,532-535,432,536-540,531,530
						541

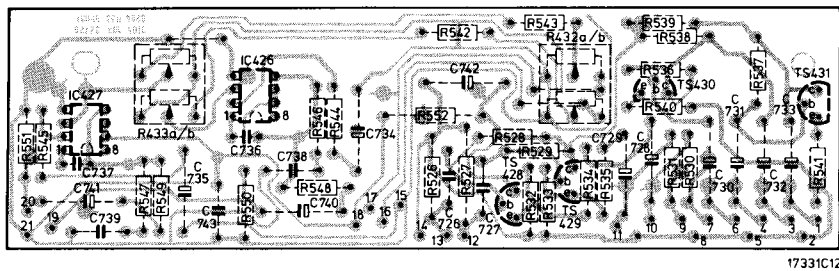


Fig. 38

TBA820M	4822 209 80348	R432	47K log. 4822 102 30314
		R433	22K bal. 4822 102 30315
BC548B	4822 130 40937		

U411

DNL

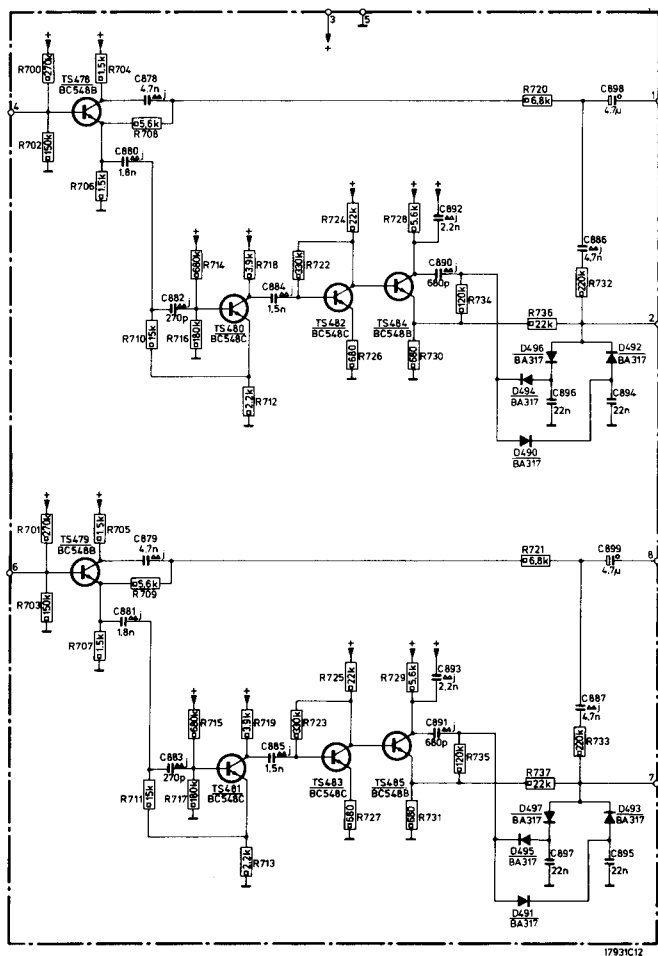


Fig. 39

	BC548B BC548C	4822 130 40937 4822 130 44196
	BA317	4822 130 30847

MISC	D497, D493	D495, D491	D494, D490						D496, D492
C	883, 881	879	897, 895, 887, 886, 896, 894, 878	880, 882					
R	891, 893, 885, 899	898	884, 892, 890						
	737, 731, 727, 717	711, 713, 703, 707, 709, 721, 720, 708, 706, 702, 712, 710	716, 726, 730, 736						
	735, 729, 725, 723, 719, 715, 705, 701, 733	732, 700, 704, 714, 718, 722, 724, 728, 734							

MISC	D496, 492	D494, 490	D495, 491, 493, 497					
C	882, 880, 878, 896, 894, 886, 887, 895, 897	879, 881, 883						
R	890, 892, 884, 898	899	885, 893, 891					
	736, 730, 726, 716, 710, 712, 702, 706, 708, 720	721, 709, 707, 703, 713, 711, 717, 727, 731, 737						
	734, 728, 724, 722, 718, 714, 704, 700, 732	733, 701, 705, 715, 719, 723, 725, 729, 735						

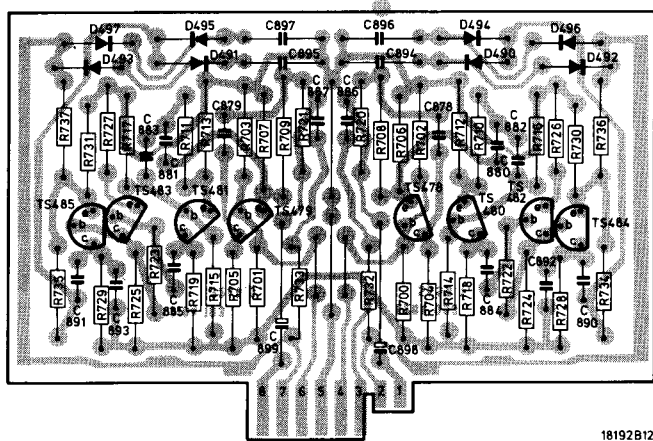


Fig. 40

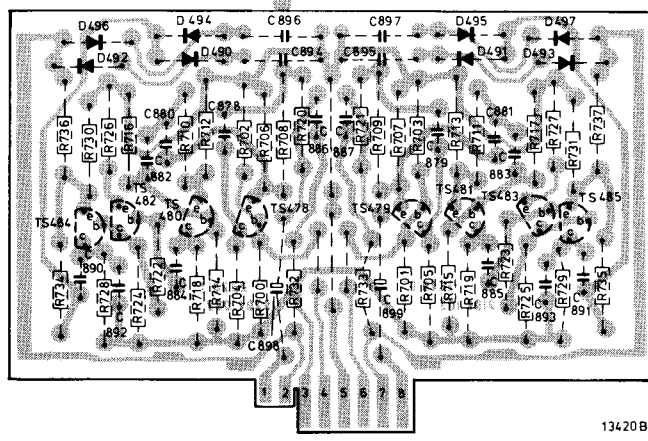
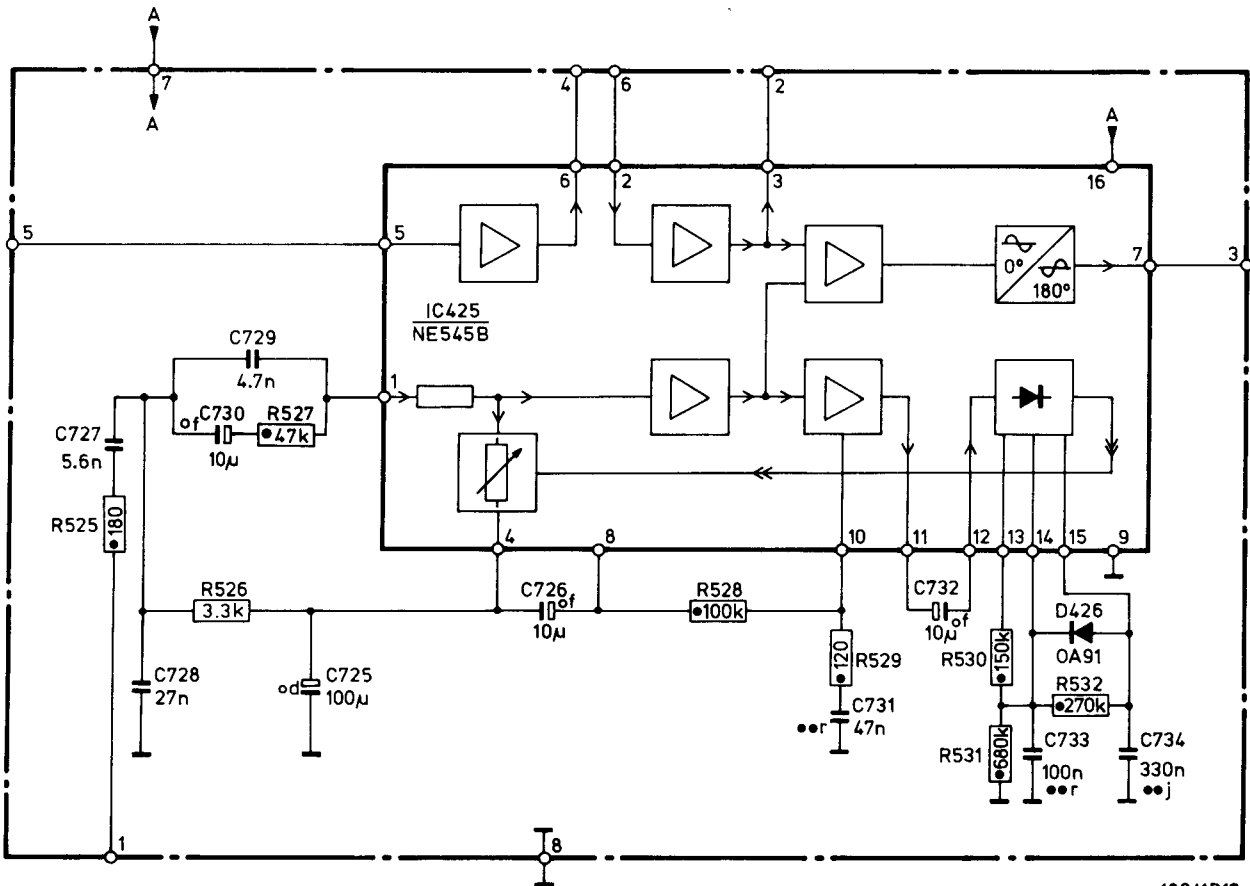
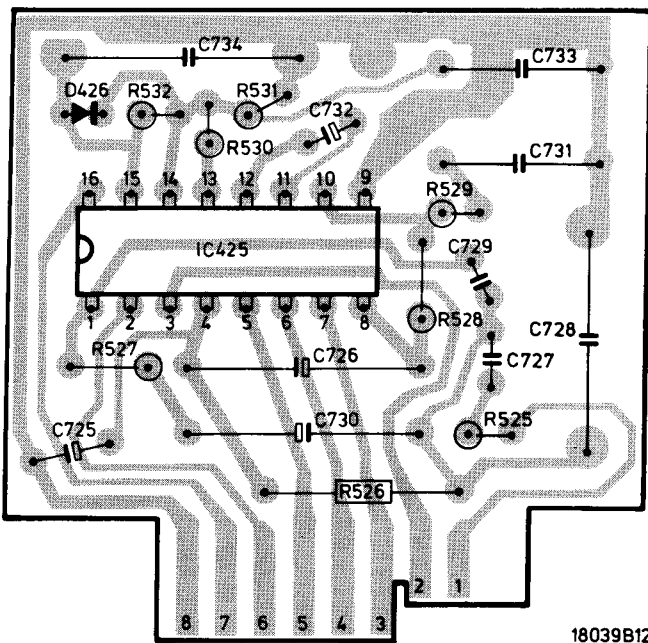


Fig. 41



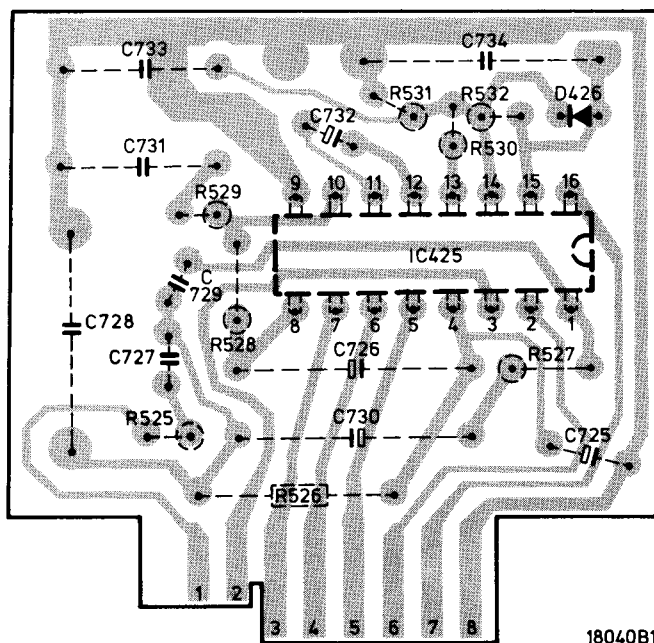
18041B12

Fig. 42



18039B12



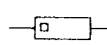


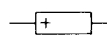


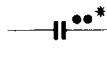


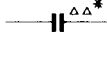


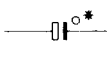


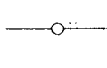


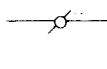

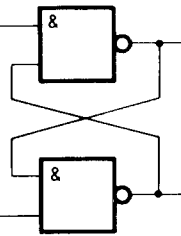
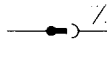



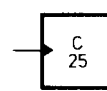

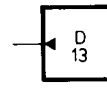


Fig. 43



18040B12

Fig. 44

NE645B	4822 209 80454	C727	5.6 n - 1 % 4822 121 50543
		C728	27 n - 1 % 4822 121 50607
		C729	4.7 n - 1 % 4822 121 50539
R526	3.32k - 1 % 5322 116 54005		

	Reed contact		Voltage-level switch		Resistor 0.33 W ≤ 1 MΩ - 5 % (CR25) > 1 MΩ-10%
	Electronic switch		Voltage-level switch with a specific time t		Resistor 0.5 W > 1 MΩ-5 % (VR37)
	Amplifier		Automatically controlled amplifier		Metallised polyester capacitors
	Operational amplifier		AND-gate Note: output is 1 only if all inputs are 1 1 zijn		Ceramic plate capacitors
	Low-pass filter		NAND-gate Note: output is 0 only if all inputs are 1		Miniature electrolytic capacitors * d = 10 V e = 16 V f = 25 V g = 40 V h = 63 V j = 100 V r = 250 V
	High-pass filter		OR-gate Note: output is 1 only if one or more inputs are 1		Unit connection point . . .
	Rejection filter		NOR-gate Note: output is 0 only if one or more inputs are 1		Solder point . . . on p.c. board
	Oscillator		Bistable multivibrator (flip-flop)		Connector-plug . . . / point . . .
	Detector				Test socket . . . / point . . .
	Voltage stabiliser U-const				Signal goes to point in other circuit diagram. In present example: to circuit diagram C, point 25
	Pre-emphasis				Signal comes from point in other circuit diagram In present example: from point 13, circuit diagram D
	De-emphasis				Switch is open if a cassette with erase protection (knock-out removed) is inserted

CHANGE IN RECORDER

From marking AH01 952 onwards recording/playback head and erase head are raised 0,2 mm in height.

Reason: Improved erase damping obtained by improved tape threading.

Note : Jig 4822 395 80152 (black) referred to in Service Manual is the one to be used for recorders manufactured as from marking AH01 952.
Earlier versions (before marking AH01 952) must be adjusted with jig 4822 395 80154 (transparent).

CHANGES IN DOCUMENTATION

- a) Under "Electrical measurements and adjustments", section 6.c. (page 11), text should read :
Curve c (Fig. 12) points to an excessive bias current and curve a is an indication of too small a bias current.
(Erroneously transposed in Service Manual).
- b) Fig. 3 (exploded view of cabinet) shows item no. 429 as a spring ring. This should however be the loose key of SK11 to SK16 (U303) (codenumber 4822 410 90047).

It may occur that - during playback or recording - the recorder is spontaneously set to the stop position before the end of the tape has been reached.

Remedy :

Install a 100-nF capacitor (code number 4822 121 41161) in parallel to C737 (560nF) of U301 or replace C737 by a 680-nF capacitor (code number 4822 121 40443).