

TANDBERG®

TCD 3004

Service Manual



TANDBERG® — The European Alternative

Contents

	Page
Removing the front panel	2
Cassette drive mechanism	3
Service position	4
Cleaning the tape path	4
De-magnetizing	4
Replacing the drive belts	5
Replacing the azimuth wire	5
Dismantling the drive mechanism	6
Tape path adjustments	7
Electrical adjustments	7
Block diagram	9
Circuit diagrams and P.C. boards	10

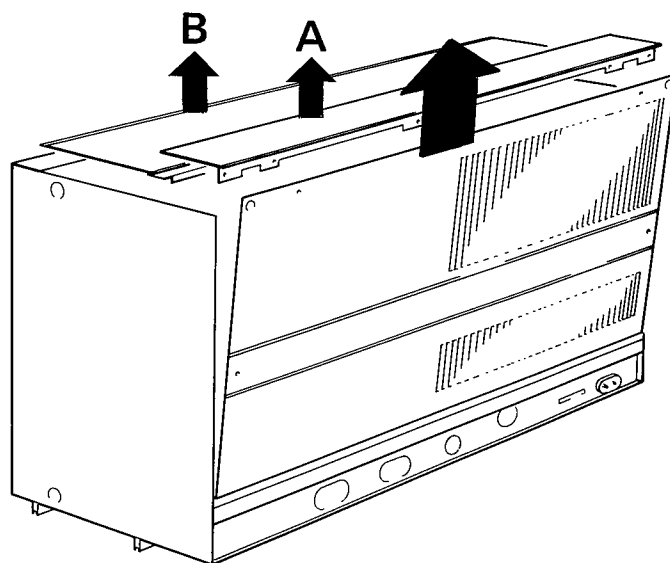
"Dolby" and the double-D-symbol are trademarks of Dolby Laboratories Licensing Corporation.

Noise Reduction System manufactured under license from Dolby Laboratories Licensing Corporation.

Removing the front panel

Remove the five screws on the rear panel and lift the panel in the direction of the arrow, see figure.

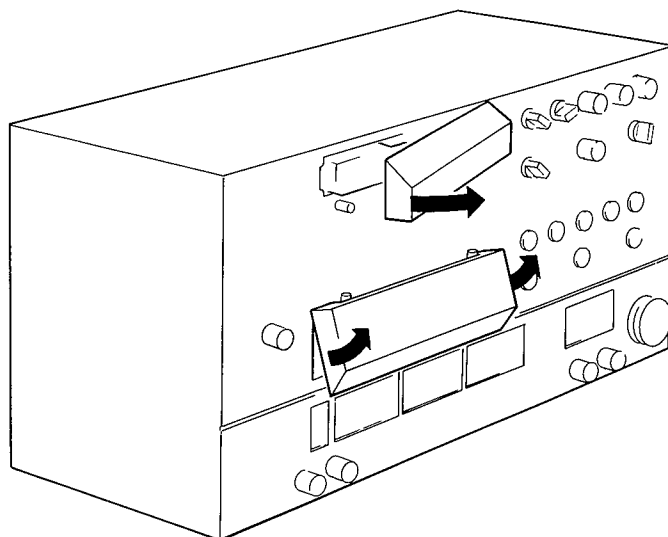
Then remove the screws on the panels A and B, see figure.



Pull off the head covers, see figure.

When you pull off the rotary knobs*, the Playback Eq. knob must not be mixed with the other knobs, because it is different on its inside.

* **NOTE!** Do not pull off the function knobs as Record, Rec. Preset, Rewind, Stop, etc. or the other push buttons.

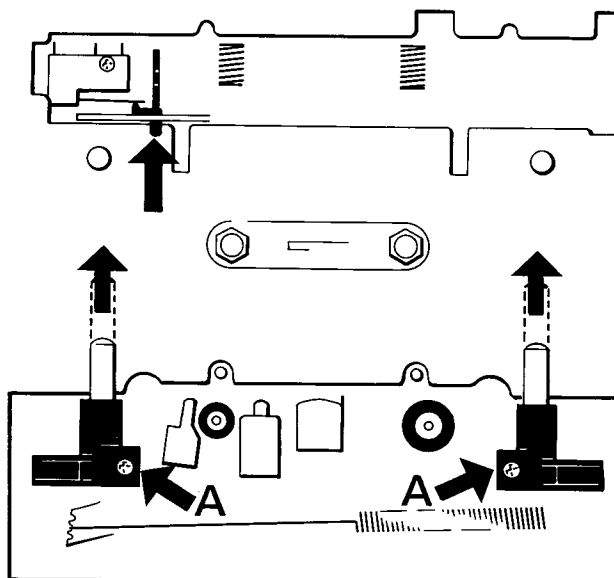


Loosen* the screws A in the figure with maximum two turns.

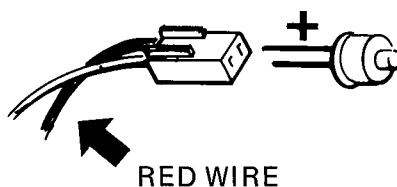
* **NOTE!** If you unscrew the two screws A, the nuts behind the screws will fall down.

Push or pull the cassette guides out from the black plastic moldings, see figure.

Press in the record-protection switch, see figure and remove the front panel by pulling the upper edge away from the deck.

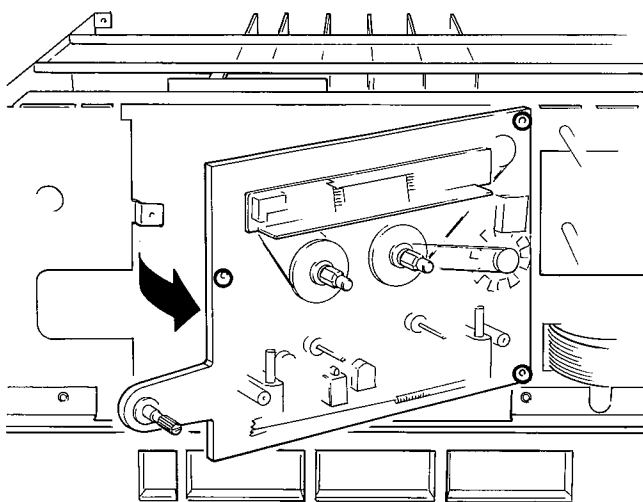


When replacing the panel, the long leg on the LED must be connected to the red wire on the socket, see figure.



Cassette drive mechanism

Remove the three mounting screws and lift the mechanism out, see figure.

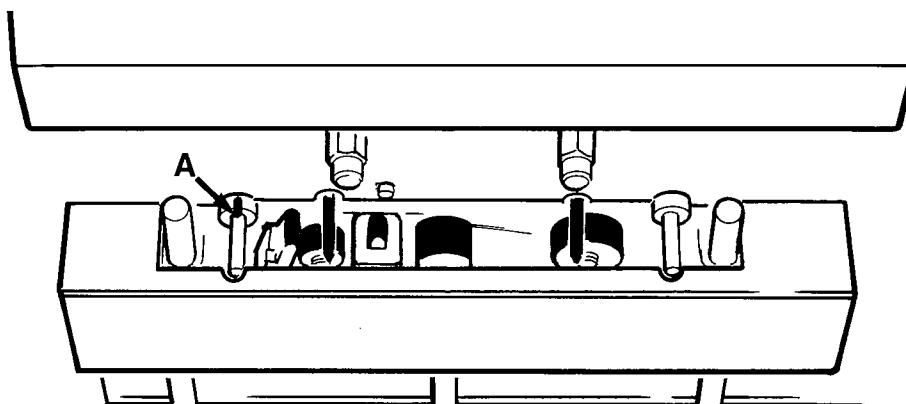
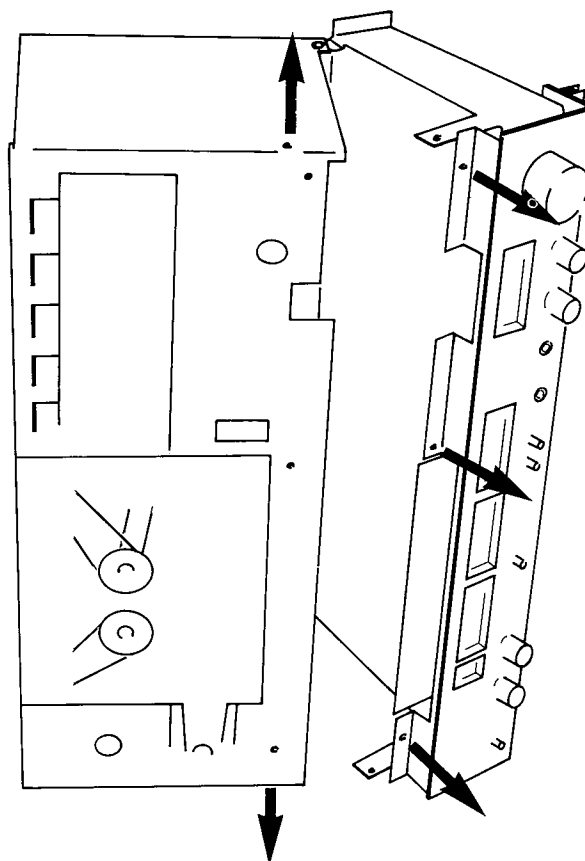


Service position

Remove the front panel.

Remove the side panels

Remove the five screws as shown in the figure.



Clean the places marked with colour.

Cleaning the tape path

- Press the Release button and remove the cassette.
- Press in the cassette sensor (A) and the Stop button. This raises the tape path and makes it more accessible for cleaning.
- Clean those places marked in colour in the figure. The pinch rollers must be well dried after cleaning.
- Take care that the cleaning fluid does not run along the capstans into the bearings.

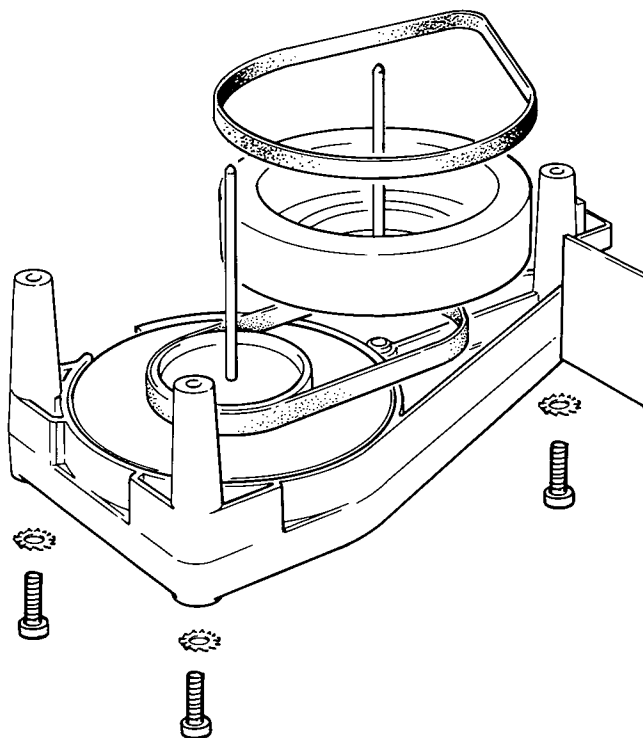
De-magnetizing

An audible increase in background noise from the tape can be a sign that the heads and other parts of the tape path need to be de-magnetized. This can be done with a de-magnetizing rod and the procedure is as follows:

Switch off the cassette deck. Remove the lower head cover. Switch on the de-magnetizer and move it slowly past the metal parts which are normally in contact with the tape. Make sure that the rod does not touch the metal parts. Do not switch off the rod before it is at least 1 meter from the deck.

Replacing the drive belts

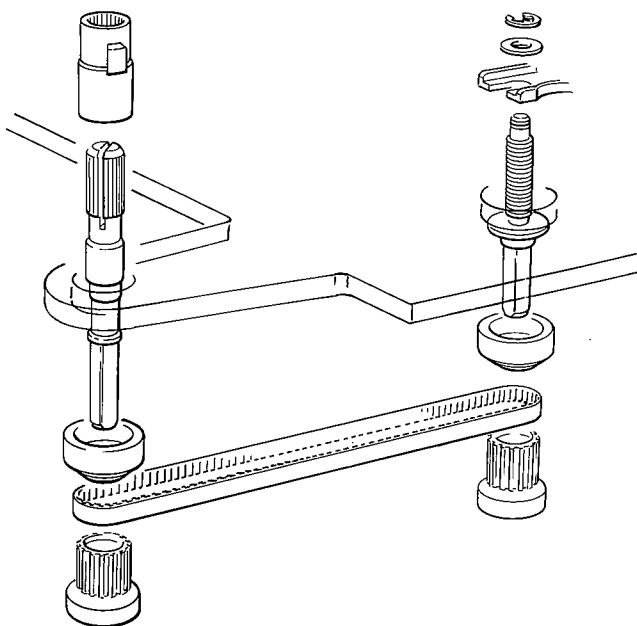
Remove the three screws (see figure) to loosen the mounting plate. Replace the drive belts and fasten the mounting plate. Check that the capstans have a small play. If not, adjust the bottom bearings and seal the bearings with some laquer.



Replacing the drive belts

Replacing the azimuth wire

From approximately serial No. 00700, the wire is replaced with a belt. When ordering the wire from our Spares Department, you will receive the new belt with necessary parts. When installing the new belt, see figure.



The new azimuth belt

Dismantling the drive mechanism

When dismantling the mechanism start with parts marked in colour in figure 1, continue to figure 2, and so on.

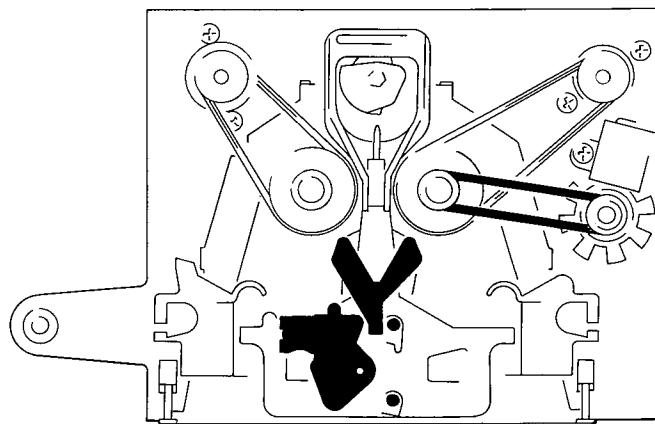


Figure 3

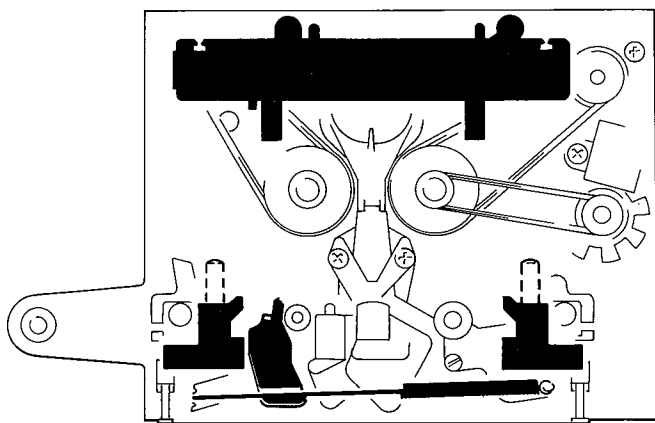


Figure 1

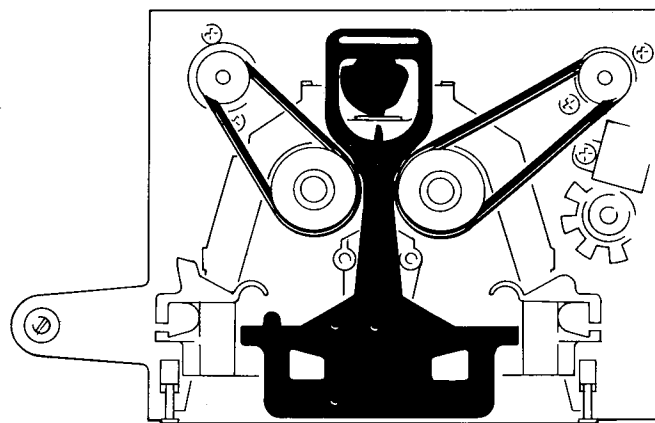


Figure 4

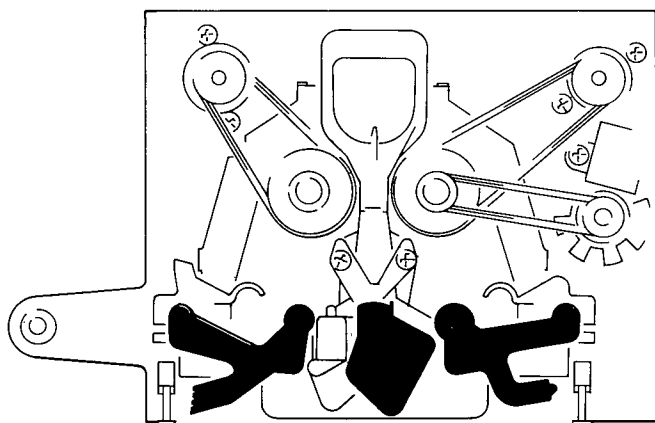


Figure 2

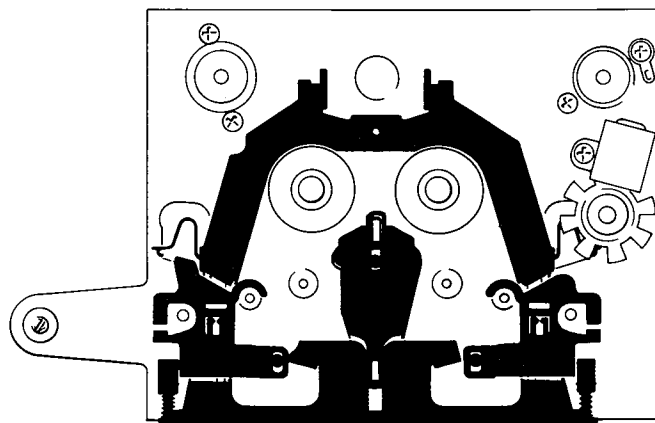


Figure 5

Tape path adjustments

NOTE! If you use a tape path gauge, move part B on the gauge slowly and carefully when it is near the heads.

The tape path adjustments must be carried out in the order described since they affect each other.

Before adjusting, fold out page 9.

Erase head

The erase head has only a height adjustment. Adjust the height so that the tape guides do not rub against the tape when the head bridge is in Play position.

If you use a Tandberg tape gauge, part B of the gauge must fit into the tape guides on the erase head, see figure.

Playback head

Use an open cassette*. Adjust the height of the playback head so that the tape guides do not rub on the tape when the head bridge is in the Play position. Adjust the height by means of the screws shown in the figure. Adjust the height adjustment screws by equal amounts so that the parallelism does not change.

Insert a Tandberg test tape No. 23 or a standard azimuth cassette. Adjust the azimuth screw on the playback head to obtain max. output measured on the Play sockets.

* If you use a Tandberg tape path gauge, part B of the gauge will fit into the tape guides on the playback head when the head is at the correct height. The pointed end of B must be parallel with the head face.

Record head

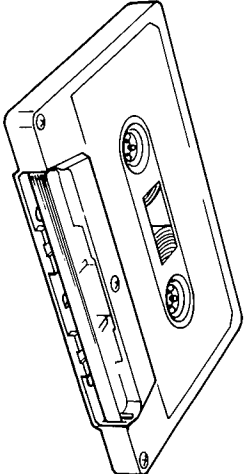
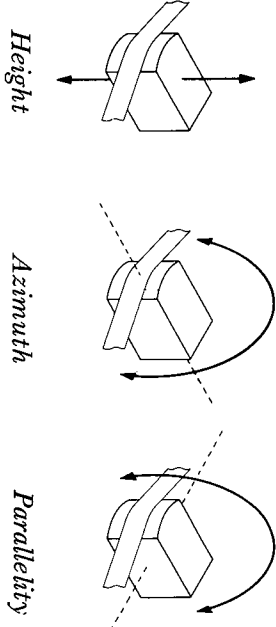
Adjusting the parallelism

Insert an open cassette and make sure that the tape lies parallel with the head face. Adjust the height by means of the screws shown in the figure.

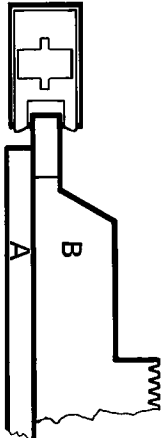
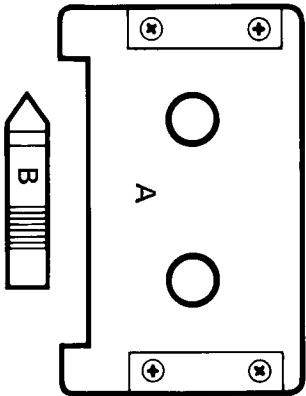
Adjusting the height

Insert a new cassette. Set the deck to Record. Record 1000 Hz from an audio generator at normal recording level. Set the Monitor switch to Tape and adjust the height of the record head by means of the screws shown in the figure to obtain max. output on the Play sockets. When you obtain max. output on the sockets, the tracks across the heads will be at the same height.

Adjust the height adjustment screws by equal amounts so that the parallelism does not change.



Open cassette



Tape path gauge

Adjusting the eccentricity screw

NOTE! Seal the eccentricity screw after the adjustment.

After one or both pinch rollers have been changed you must check that the eccentricity screw is correctly adjusted.

Press down the cassette sensor and set the deck to Play.

Press the head bridge assembly away from the capstans. Then check that both pinch rollers meet the capstans at the same time. If necessary, adjust the eccentricity screw shown in the figure.

Electrical adjustment

Equipment required:

- 2 millivolmeters
- Audio signal generator
- Frequency counter
- Distortion meter
- Wow and flutter meter
- Tandberg test cassettes:
 - No. 21 (speed check 1000 Hz)
 - No. 22 (wow and flutter check 3150 Hz)
 - No. 23 (azimuth adj. playback head 6300 Hz)
 - No. 24 (playback level adj. 1000 Hz)
 - No. 29 (tape path check)
- Tandberg tape path gauge
- Measuring cassettes:
 - Maxell UD XL I (Group I)
 - Maxell UD XL II (Group II)
 - Maxell Metal MX or TDK Metal MA (MA-R)

General

Before adjusting the tape path must be cleaned and demagnetized, see page 4. The adjustments require that the tape path is correctly adjusted.

Remove the back panel and the base panel.

Before adjusting, set the knobs to:

- Bias/Rec. Eq. to position I.
- Playback Eq. to position 120 uS.
- Cal. Selector to Off.
- Dolby NR. to Off.
- Input and Output Level controls to maximum.

Before adjusting, fold out page 9.

Oscillator

The bias oscillator frequency is between 80 and 90 kHz.

The test and azimuth oscillator frequency is approx. 400 Hz and 12 kHz.

The voltage measured on the erase head should be with the Bias/Rec. Eq. switch in:

- position I: approx. 5.2 V
- position II/III: approx. 8.4 V
- position Metal: approx. 8.4 V

Bias traps

Set the deck to record mode.

Encoder

Measure with a millivoltmeter on C107 (Left) and C207 (Right) on the A1, Dolby encoder board. Adjust with L101 (Left) and L201 (Right) to minimum reading on the millivoltmeter.

Decoder

Measure with a millivoltmeter on C502 (Left) and C602 (Right) on the A3, Dolby decoder board. Adjust L501 (left) and L601 (Right) to minimum reading on the millivoltmeter.

Sensitivity adjustment

- Set the Monitor switch to Source.
- Apply 80 mV, 1000 Hz to the Record sockets.
- Adjust the SENS ADJ. (A15) R2124/R2224 to 725 mV measured on the Dolby Encoder (A1) test points, see figure.
- Move the measure probe to Dolby Decoder (A3) test points and adjust with SOURCE ADJ. (A3) R502/R602 to obtain 725 mV.
- Insert a cassette (to operate the cassette sensor).
- Set the deck to Stop mode.
- Adjust the REC. METER (A15) R2301/R2401 to obtain 0 dB on the program meters (scale I — II).

DYNEQ adjustment

The DYNEQ adjustment must be adjusted with the Bias/Rec. Eq. in position I.

When the program meters are correct, reduce the level on the audio generator (1000 Hz) with 10 dB. Set the generator to 15 kHz. Adjust with the DYNEQ ADJ. (A2) R346/R446 to — 1 dB (scale I — II) deflection on the program meters.

Playback adjustment

- Insert Tandberg test cassette No. 23 (azimuth adj. playback head 6300 Hz) or a standard azimuth cassette.
- Adjust the playback azimuth screw to maximum output or best compromise on the Play sockets.
- Insert Tandberg test cassette* No. 24 (Playback level adj. 1000 Hz) and adjust with PLAYBACK LEVEL (A3) R503/R603 to 725 mV measured on the Dolby Decoder test points TP3 and TP4.
- Adjust the program meters to 0 dB with PLAYB. METER (A15) R2303/R2403.

The PLAYB. EQ. (A4), R713 and R813 are adjusted from the factory and should not be adjusted.

* If you use a Dolby level cassette, adjust to 580 mV measured on the Dolby Decoder test points TP3 and TP4. Then adjust the program meters to the double-D-symbol.

Adjustments for metal tape

- Set the knobs Bias Fine, Rec. Level Left, and Rec. Level Right to mid-position.
- Set the Bias/Rec. Eq. to Metal and the Playback Eq. to 70 uS.
- Use Maxell Metal MX or an equivalent metal tape.
- Use a — 20 dB recording level.

NOTE! Remember the azimuth adjustment of the record head.

- Check the frequency response and, if necessary, adjust the BIAS METAL (A5) R909/R1009 to obtain the correct response, ± 3 dB from 19 to 21000 Hz.

Record Eq.

- This adjustment affect the record eq. for all groups of tapes. Adjust the RECORD EQ (A2) R312/R412 to + 1 dB at 18 kHz when using metal tape.
- Use the same level, — 20 dB.

- If necessary, adjust the RECORD EQ (carefully) so that the frequency response is correct for all groupes of tapes.

Adjusting the record current (Source/Tape) for metal tape

- Use — 10 dB level, 1000 Hz.
- Adjust the record current with REC. LEVEL METAL (A2) R326/R426 to obtain the same output level for both positions on the Monitor switch.
- Check the frequency response with and without the Dolby system. Use 1000 Hz, without the Dolby system as a reference.

Adjustment for group II tape

- Set the Bias/Rec. Eq. to II/III and the Playback Eq. to 70 uS.
- Use Maxell UD XL II or an equivalent group II tape.
- Use — 20 dB recording level.

NOTE! Remember the azimuth adjustment on the record head. Check the frequency response (see RECORD EQ. adjustment, and if necessary, adjust the BIAS II/III (A5) R907/R1007 to obtain the correct response, ± 3 dB from 19 to 20000 Hz.

Adjusting the record current (Source/Tape) for group II tape

- Use — 10 dB level, 1000 Hz.
- Adjust the record current with REC. LEVEL II/III (A2) R323/R423 to obtain the same output level for both positions on the Monitor switch.

Adjustment for group III tape

Use the calibration system (Cal. Selector) to adjust for group III tape.

Adjustment for group I tape

- Set the knobs Bias Fine, Rec. Level Left and Rec. Level Right to mid-position.
- Set the Bias/Rec. Eq to I and Playback Eq. to 120 uS.
- Use Maxell UD XL I or an equivalent group I tape.
- Use a — 20 dB recording level.

NOTE! Remember the azimuth adjustment on the record head. Check the frequency response (see RECORD EQ. adjustment) and if necessary, adjust the BIAS I (A5) R905/R1005 to obtain the correct response, ± 3 dB from 19 to 19,000 Hz.

Adjusting the record current (Source/Tape) for group I tape

- Use — 10 dB level, 1000 Hz.
- Adjust the record current with REC. LEVEL I (A2) R320/R420 to obtain the same output level for both positions on the Monitor switch.

Adjusting the calibration system

- Set the TCD 3004 to Stop.
- Set the Monitor switch to Source.
- Set the Cal. Selector to Rec. Level R.
- Adjust the 400 Hz OSC. ADJ. (A5) R958 to 580 mV measured on the right Decoder (A3) test point TP4.
- Then adjust with REC. LEVEL CAL. (A5) R993 to R (ref.) deflection on the Calibration meter.
- Set the Cal. Selector to Rec. Level L.
- Check that the left Decoder (A3) test point TP3 has 580 mV and that the deflection on the Calibration meter is on R (ref.).
- Set the Cal. Selector to Bias Fine.
- Measure on the right Decoder (A3) test point TP3. This level is approximately 25 dB below 580 mV. Adjust with the 12 kHz OSC. ADJ. (A5) R967 to the Calibration meter shows the same level for both 400 Hz and 12 kHz.
- Then adjust the BIAS FINE CAL. (A5) R991 to middle deflection on the calibration meter.
- Set the Cal. Selector to Azimuth.
- Adjust with the AZIMUTH CAL. (A5) R989 to R deflection on the Calibration meter.
- Check the Calibration system in all functions and with all groups of tapes.

Distortion

Record 1000 Hz at 0 dB deflection on the meters. The max. distortion for record/playback are 3% with metal tape and 1% with conventional tapes.

Erase test

Record 1000 Hz at 0 dB deflection on the meters. Record again to erase the 1000 Hz signal and play back to ensure that the signal cannot be heard.

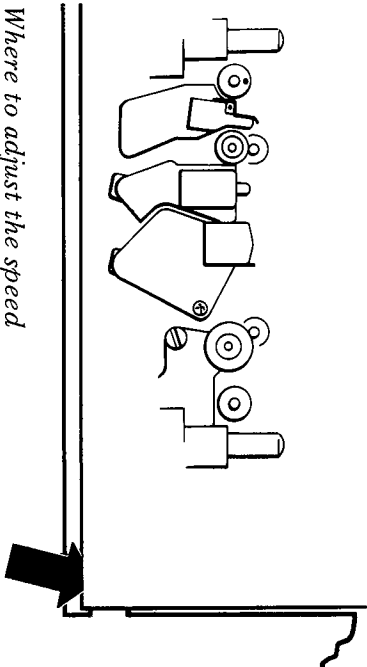
Measure with a narrow band filter, frequency < 10 Hz: Metal tape > 80 dB.

NOTE! If filter bandwidth is too wide, it is not possible to measure better than approximately 75 dB.

Speed check

Play back Tandberg test cassette No. 21 (speed check 1000 Hz), and measure with a frequency counter on the Play sockets: ± 0.5% (995 to 1005 Hz).

If necessary, adjust SPEED ADJ. to correct speed. Remove the front panel, see page 2. Then adjust the SPEED ADJ. on the motor control board with an insulated screwdriver, see figure.



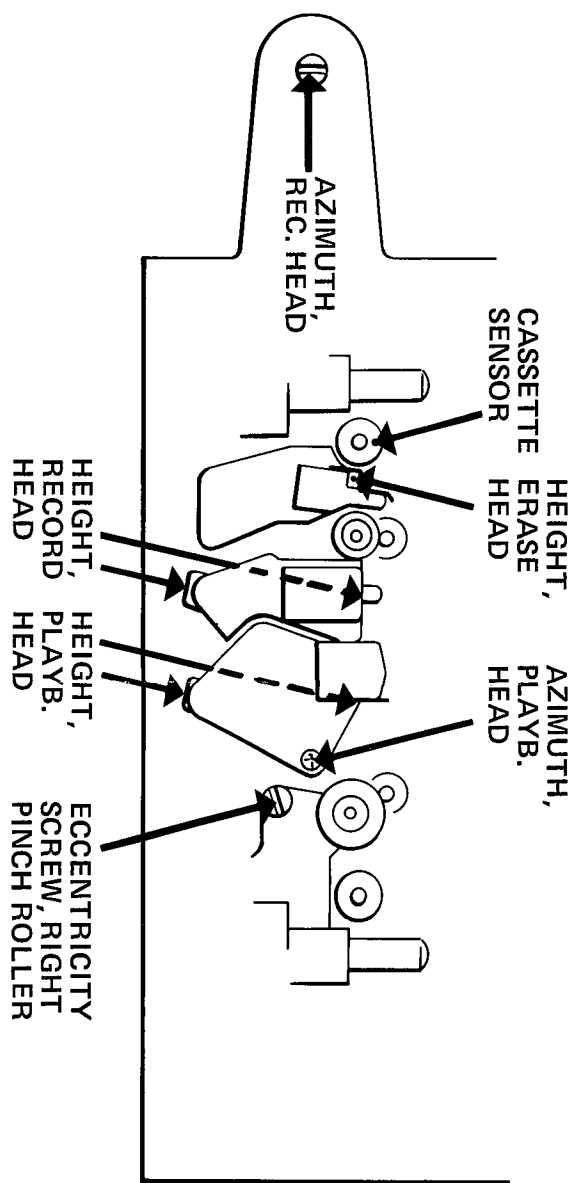
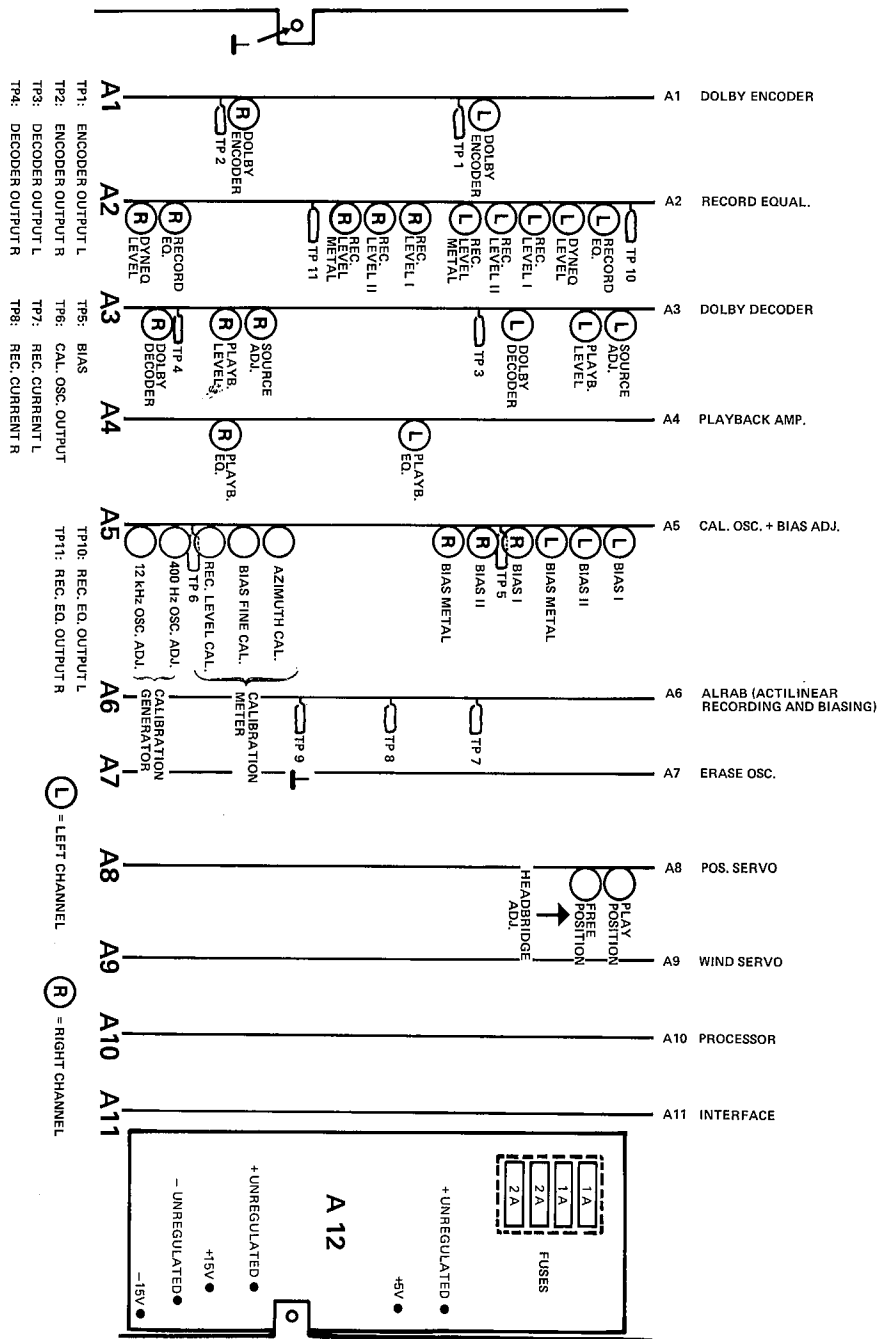
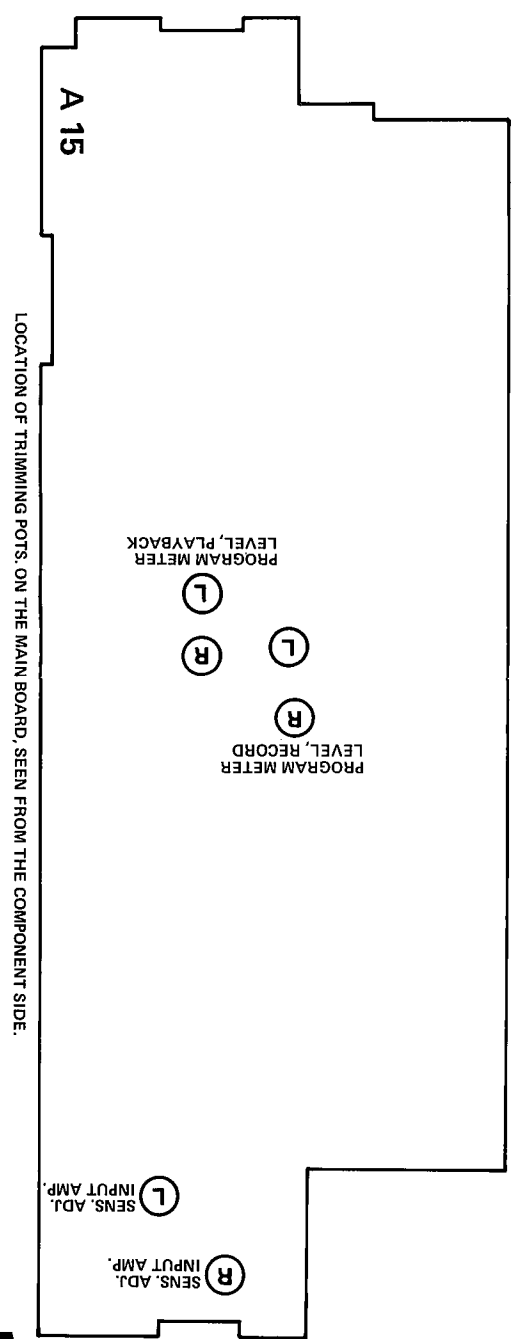
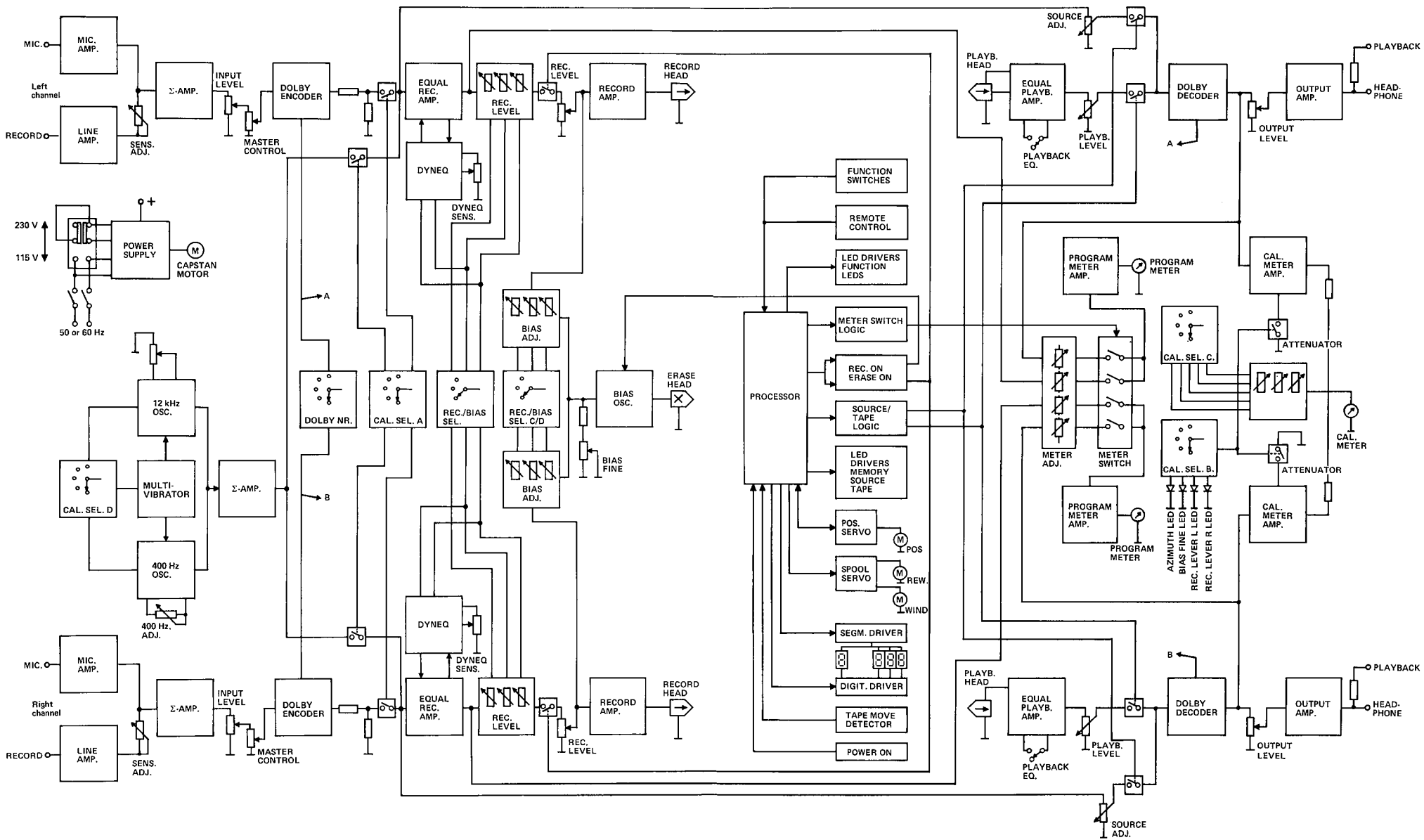
Wow and flutter check

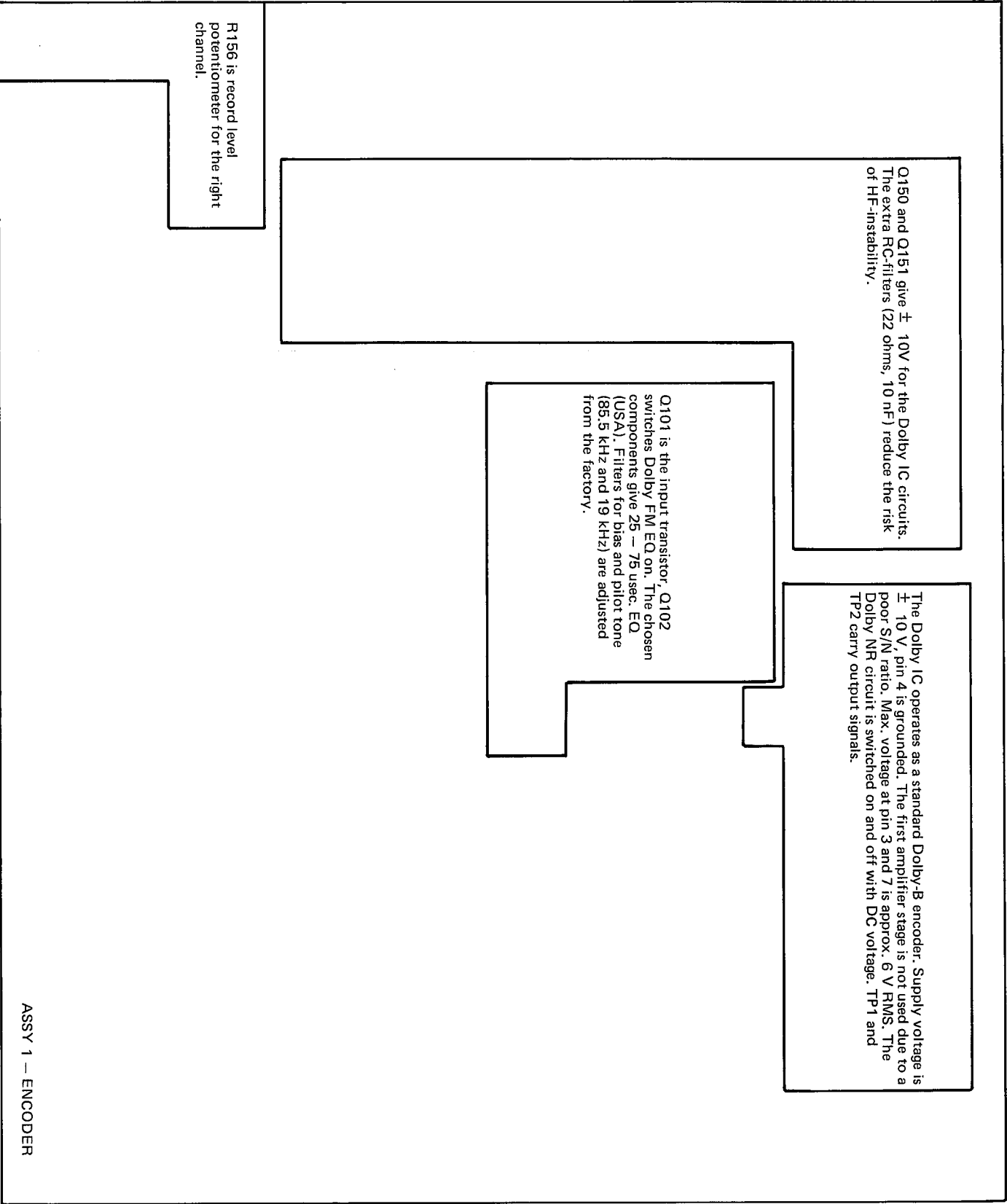
Playback
Play back Tandberg test cassette No. 22 (3150 Hz) and measure with a wow and flutter meter on the Play sockets:
Playback (RMS): < 0.06%

Record/playback
Use a Maxell C-60 UD cassette. Connect the wow and flutter meter to the TCD 3004.

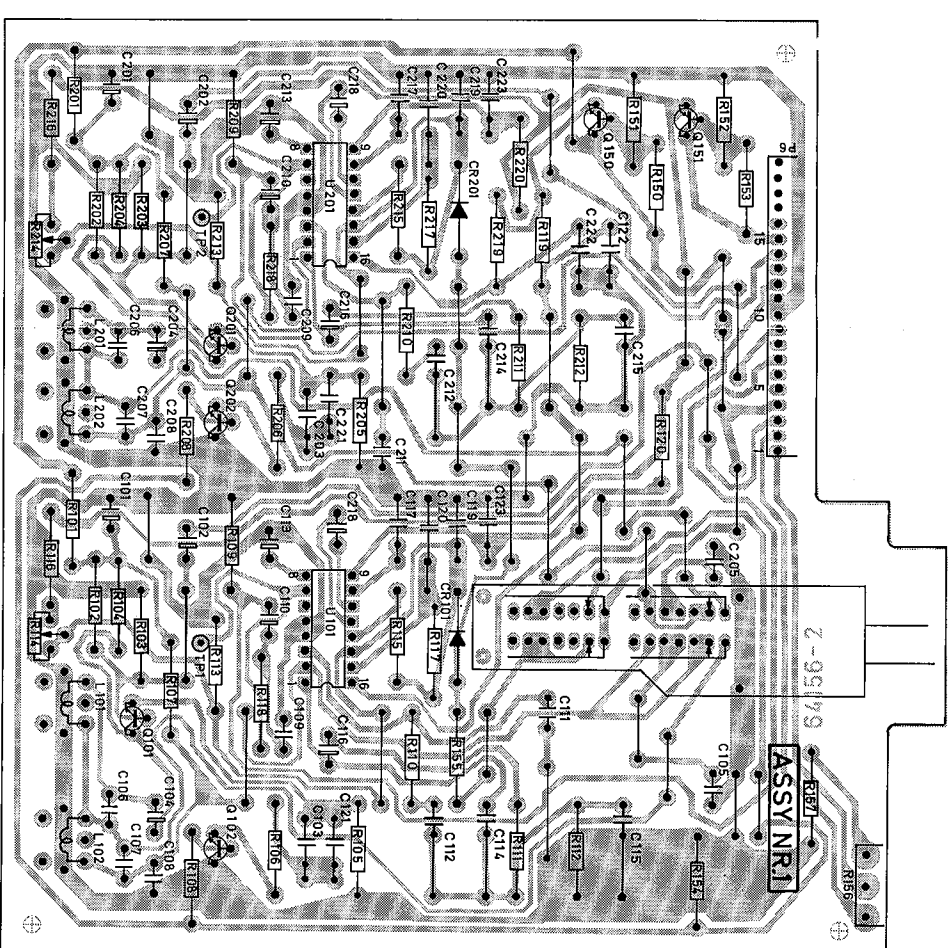
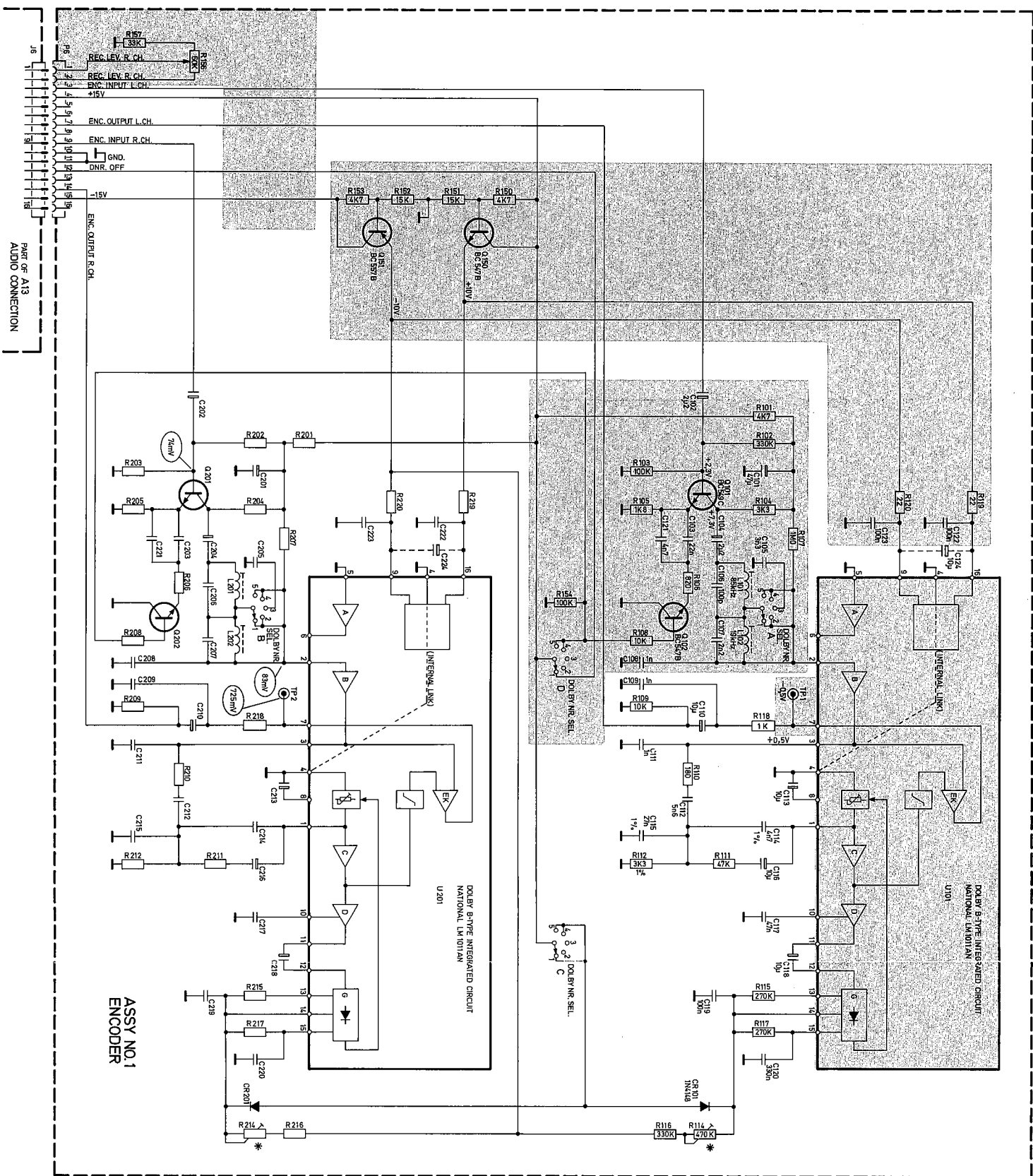
Set the deck to Record and record for about half a minute. Wind back the cassette and set the TCD 3004 to Play.

Measure on the Play sockets:
Record/playback (DIN): < 0.12%
Record/playback (RMS): < 0.09%.





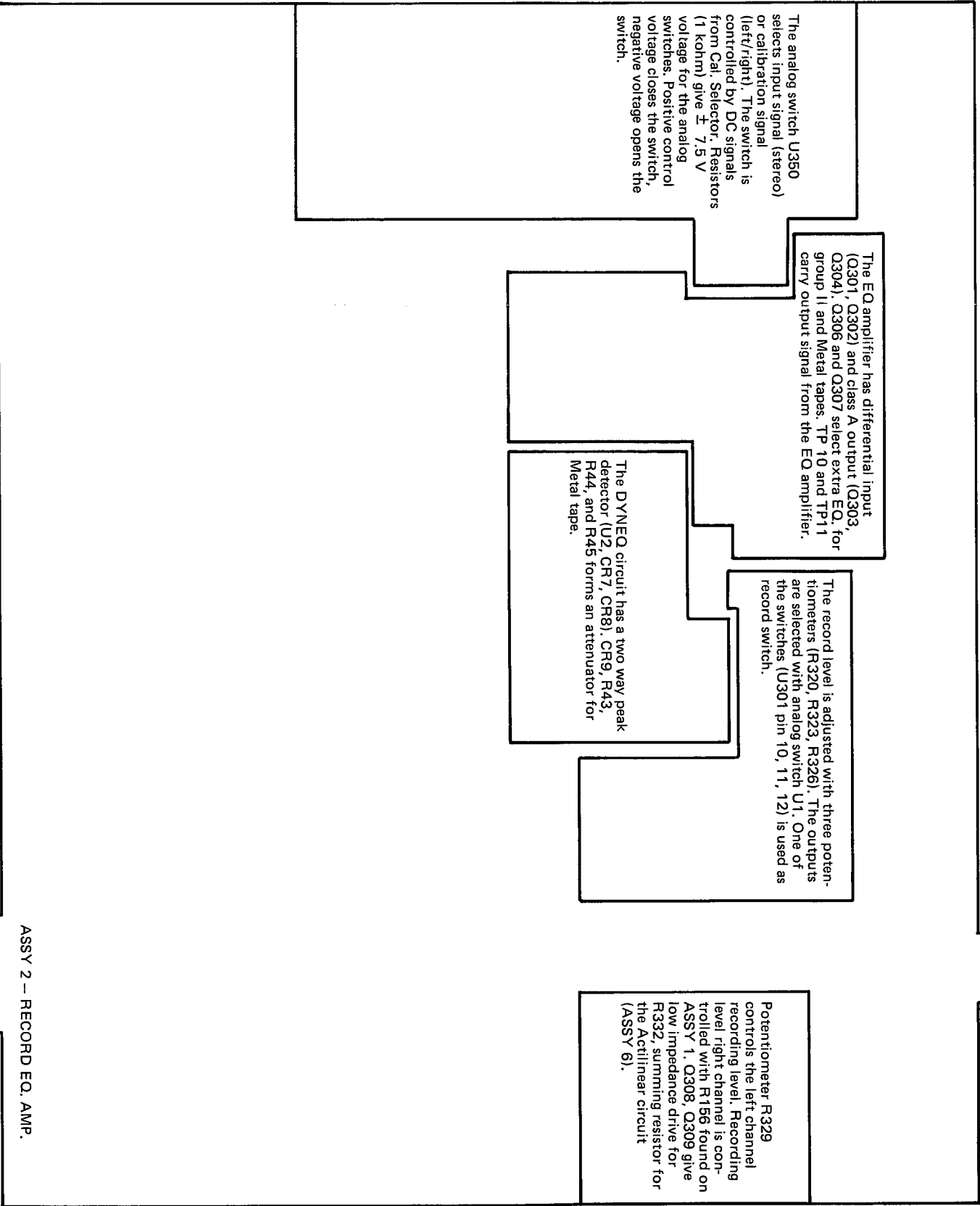
10V DENOTES DC VOLTAGES
1mV DENOTES SIGNAL VOLTAGES (000Hz)



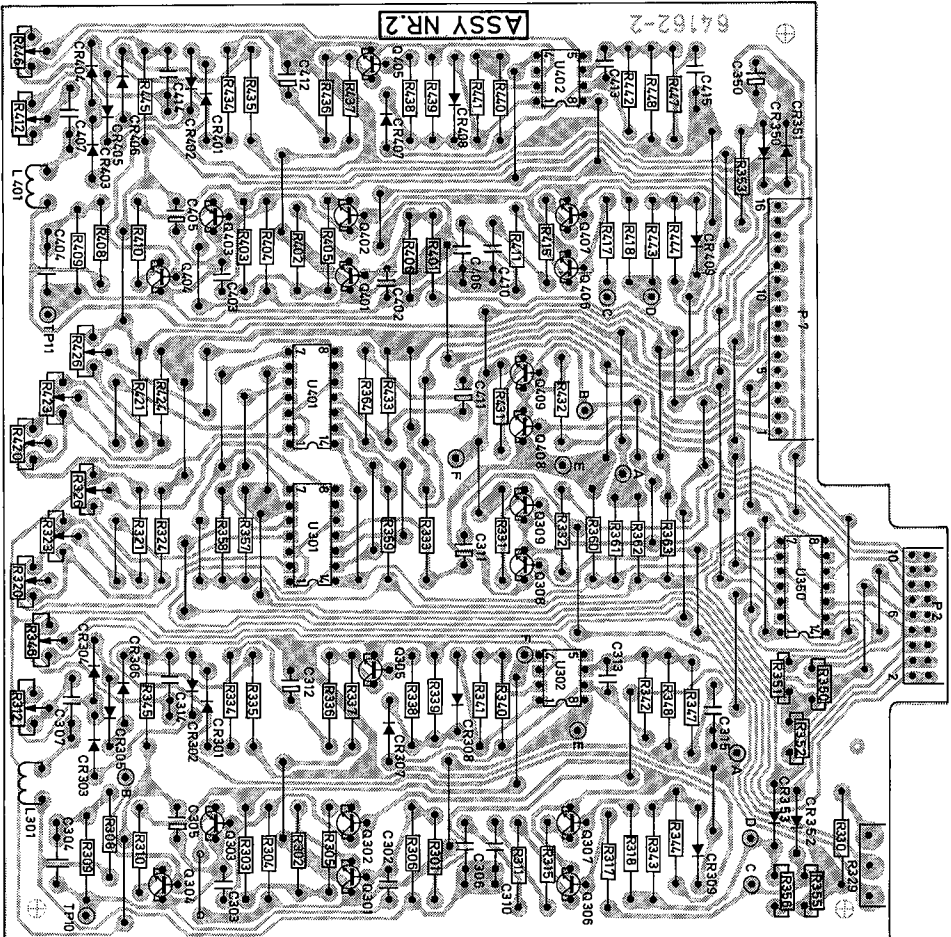
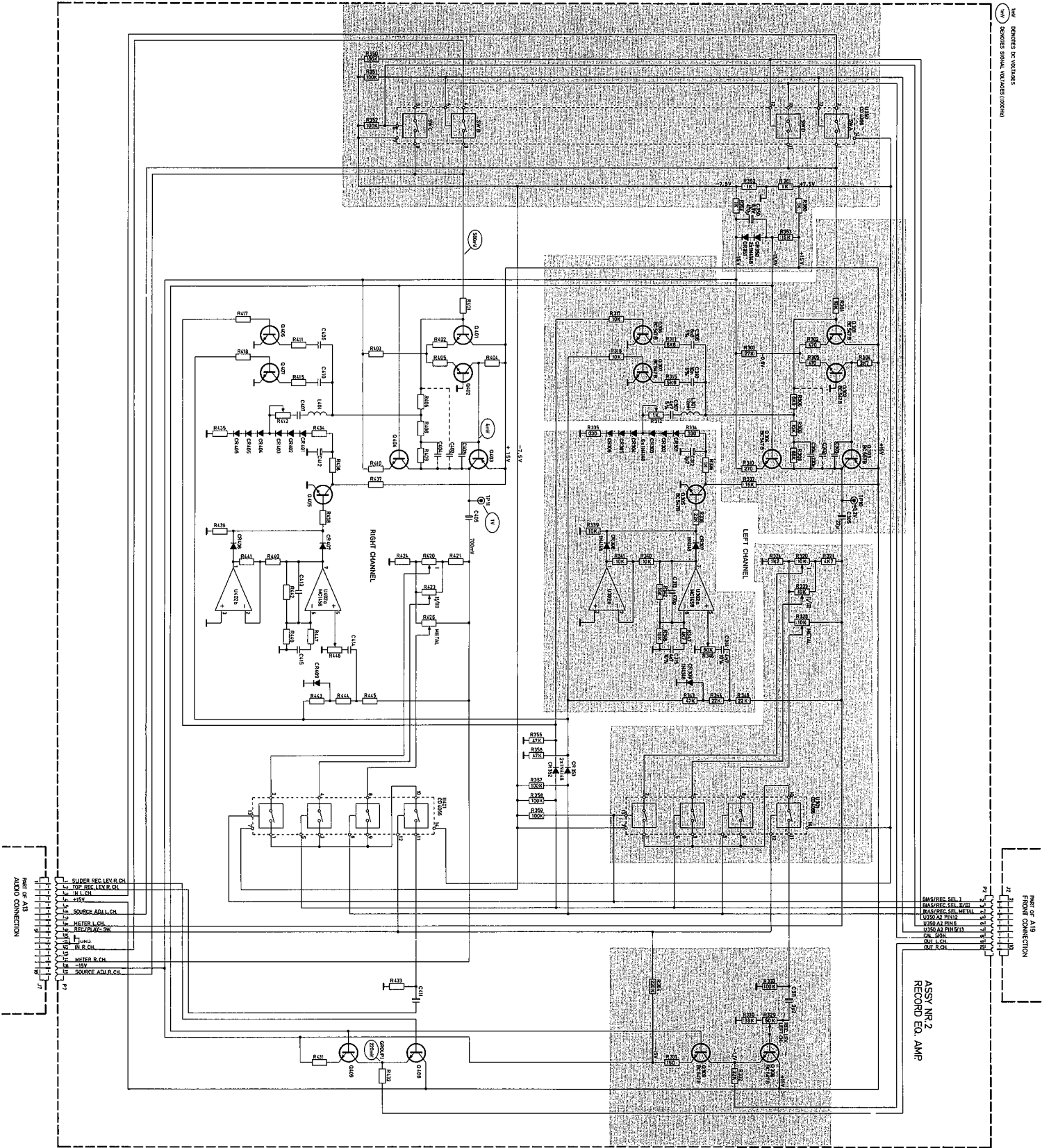
ALL THE BOARDS ARE SEEN FROM THE SOLDER SIDE.

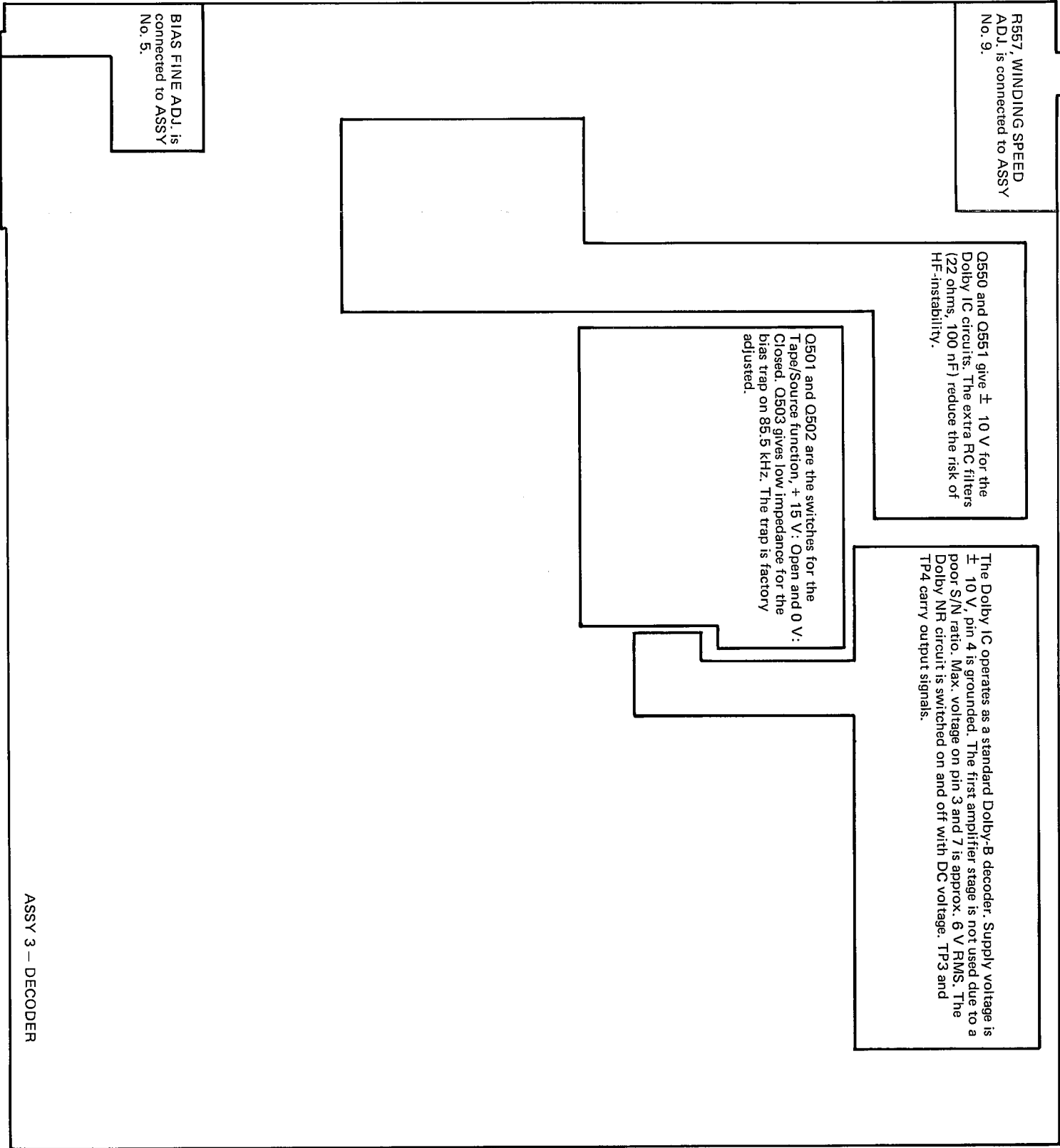
* R114/R214:
ADJUSTMENT OF DETECTOR
SENSITIVITY, FACTORY
ADJUSTED.

DOLEBY NR. SEL.
OFF
NORMAL/FILTER ON
DOLEBY NR. FILTER ON



DEFINITIONS OF SYMBOLS
DEFINITIONS OF SYMBOLS





ASSY 3 – DECODER

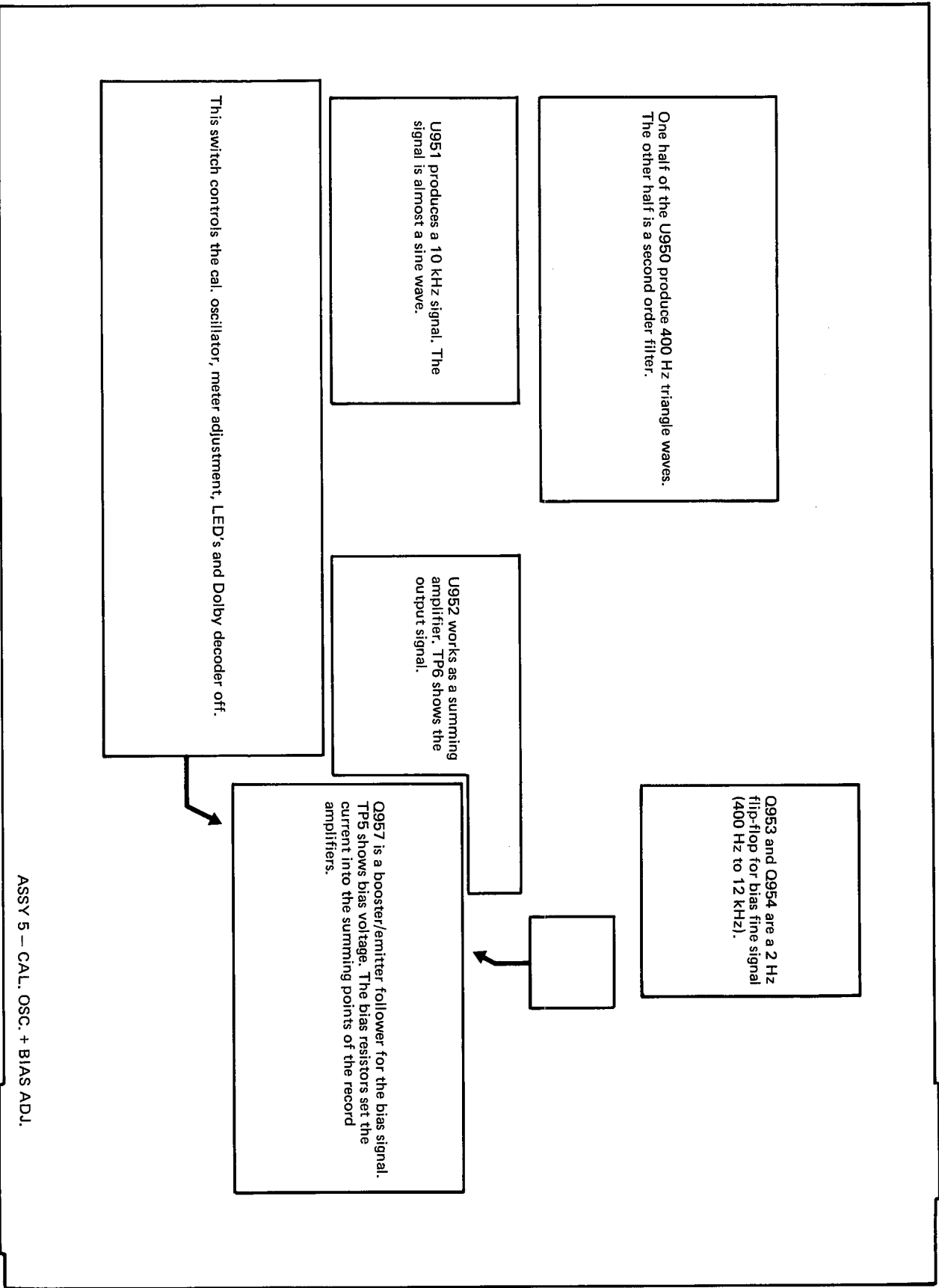
The playback amplifier is a 3 stage amplifier. Stage 1 (Q701, Q702, Q703) is a standard 120 – 70 μ sec. playback amplifier. Stage 2 (Q704) is a second order low pass filter with approx. 10 dB gain at the crossover frequency. R713 adjusts the frequency from approx. 21 to 29 kHz. Q709 switches C706 in during wind and rewind to reduce the high frequency on the output sockets. Stage 3 has constant gain of 11x (R723, R724). C709, R716, R721, R722 is a phase shifting network.

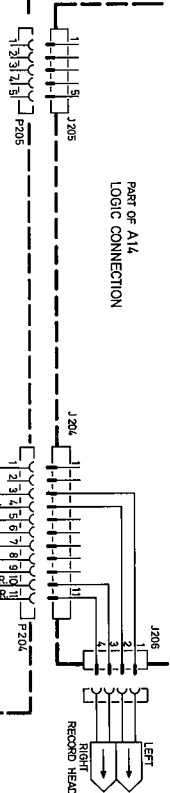
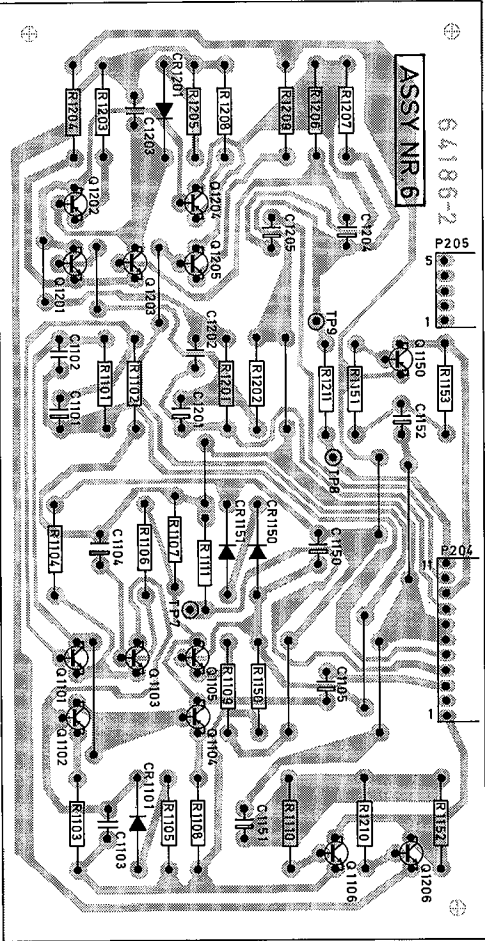
NOTE! A 1 kohm resistor (R733) is inserted in series with C6 to prevent instability.

Q708 works as a ripple filter.

Q750, Q751, Q752 operate as a program detector. The program detector is not used, and the input (R751) is grounded.

ASSY 4 – PLAYBACK



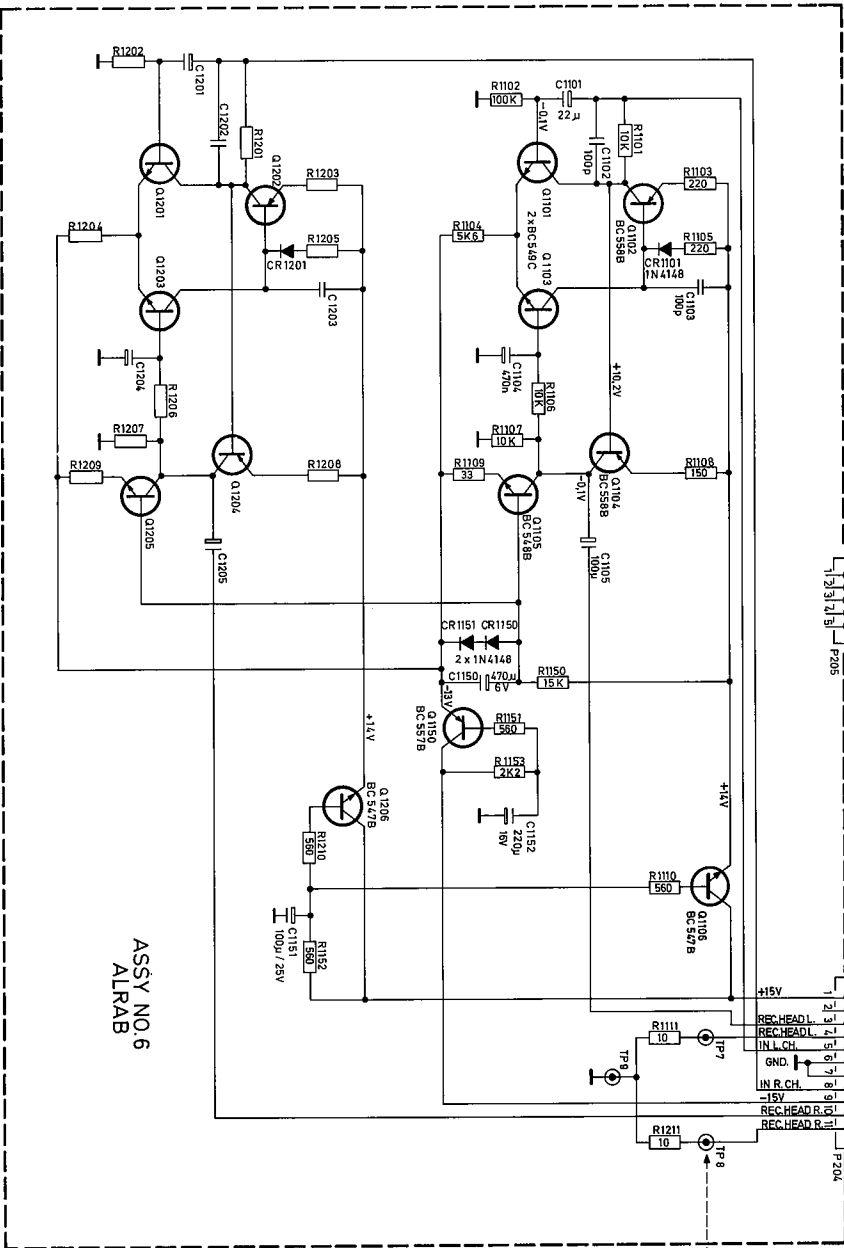


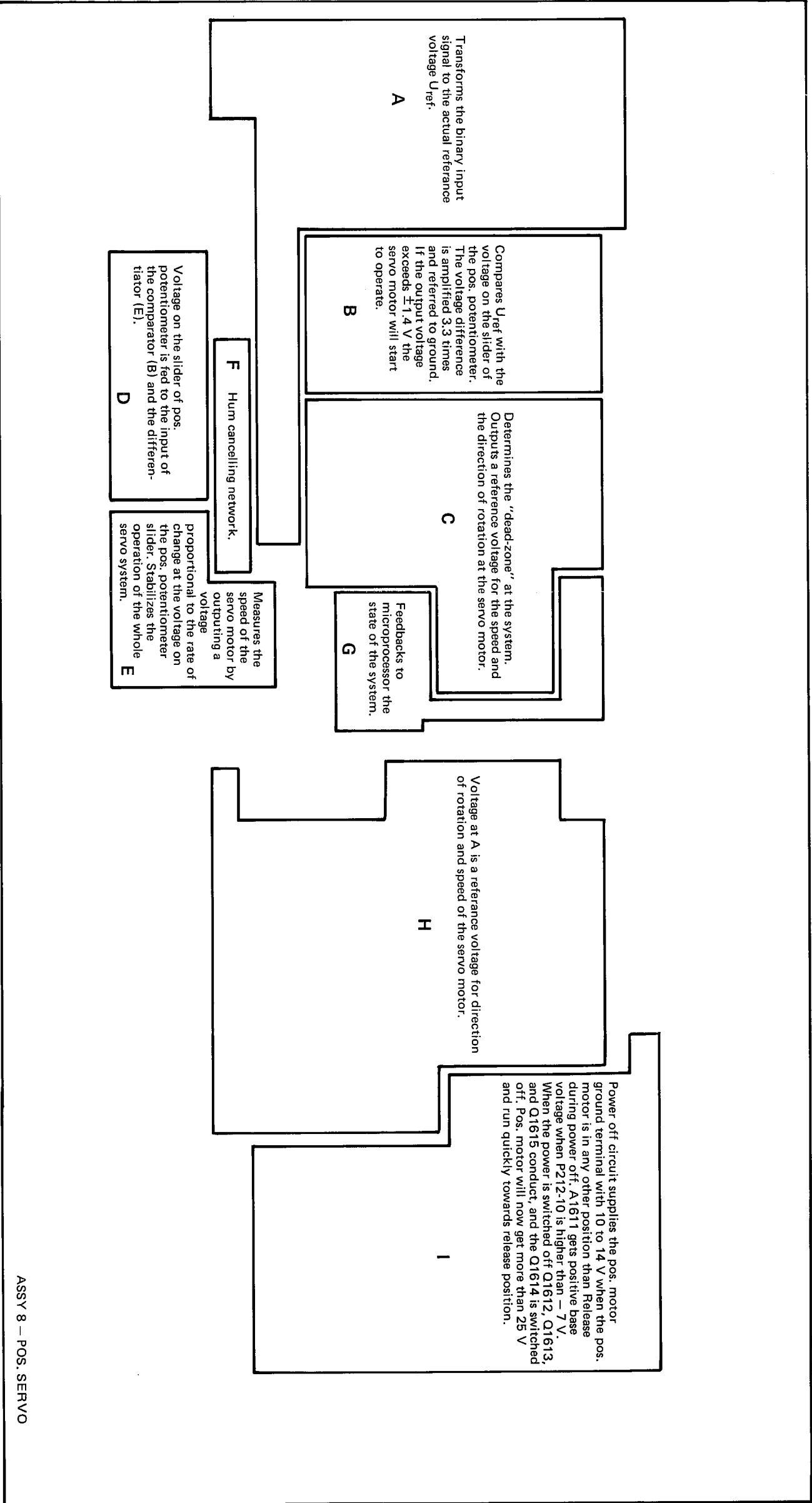
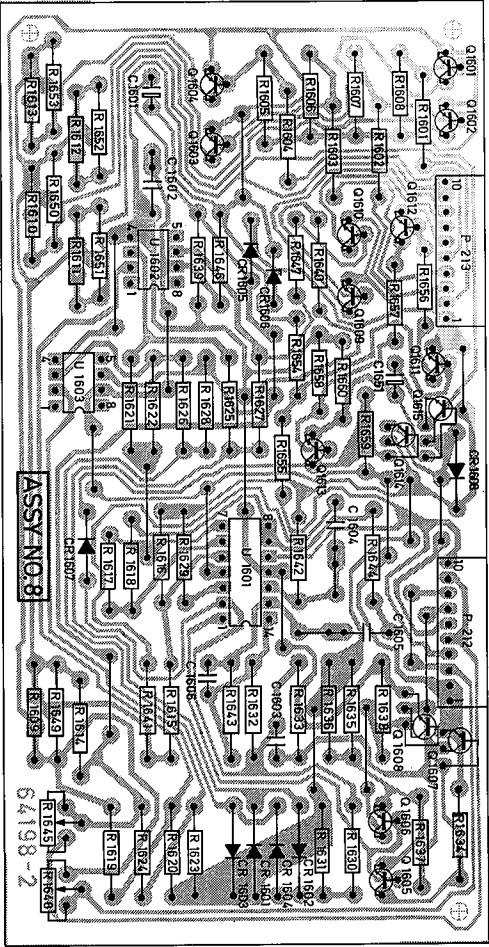
TYPICAL BIAS VOLTAGE:
I: 30mV
IITH: 40mV
METAL: 75mV
BIAS VOLTAGE MAY VARY DUE TO SPREAD IN SENSITIVITY.

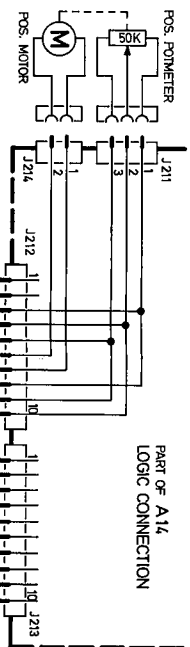
Q1101, Q1102, and Q1103 are a summing amplifier. Q1104 and Q1105 are the actilinear amplifier that deliver both record and bias current. The base on Q1101 is the summing point. Q1101 is the first and Q1103 is the other half of the differential stage. Together with R1106, R1107, C1104, and C1105 it forms a high pass filter with second order roll-off below 15 kHz.

Q1106, Q1206, and Q1150 isolate the supply voltage from ripple and noise. TP7, TP8, and TP9 show typical record and bias current. The voltage is approx.:
Type I tape: 30 mV
Type II/III tapes: 40 mV
Metal tape: 75 mV

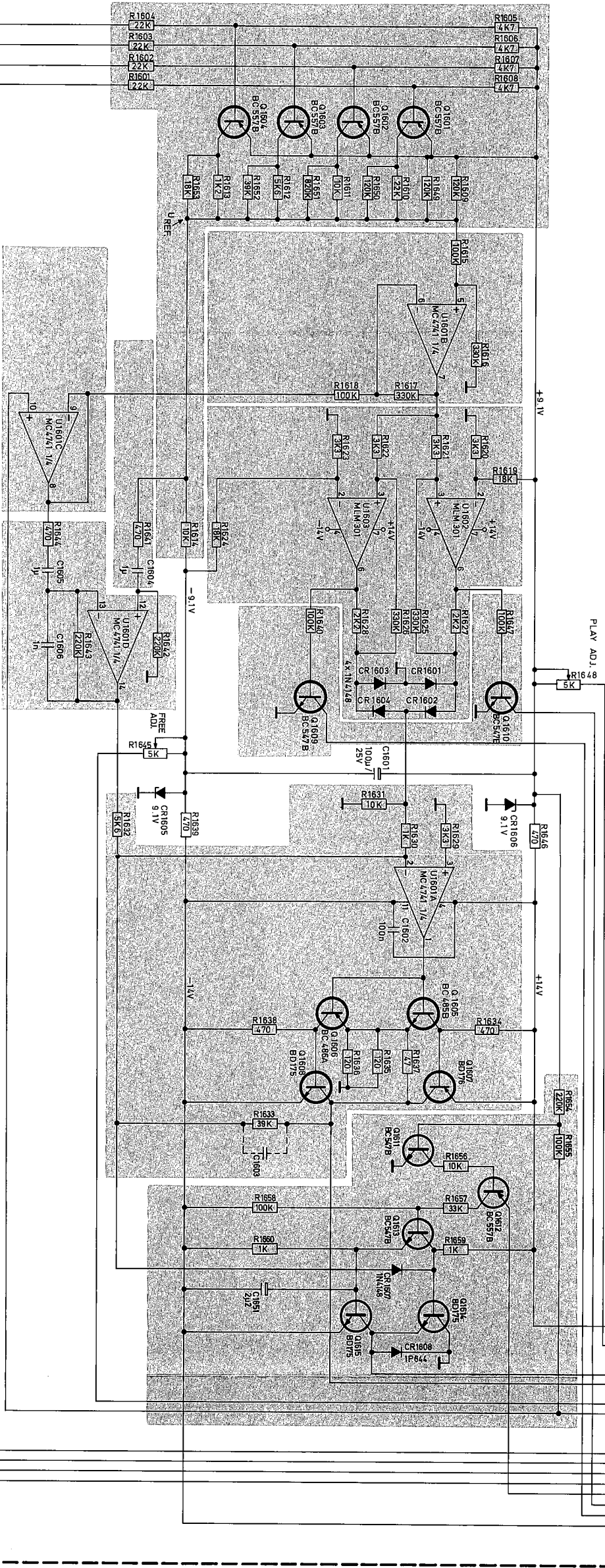
ASSY 6 — ALRAB (actilinear recording and biasing)





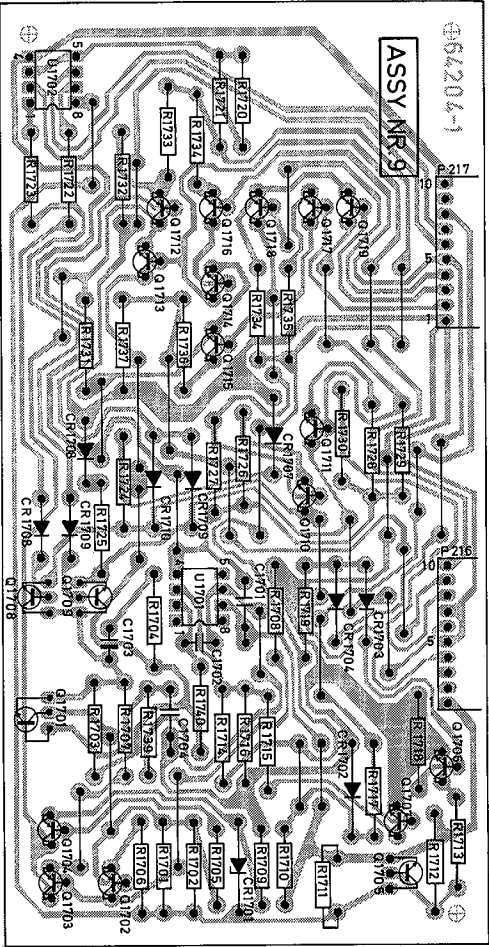


ASSY NO.8 POS. SERVO

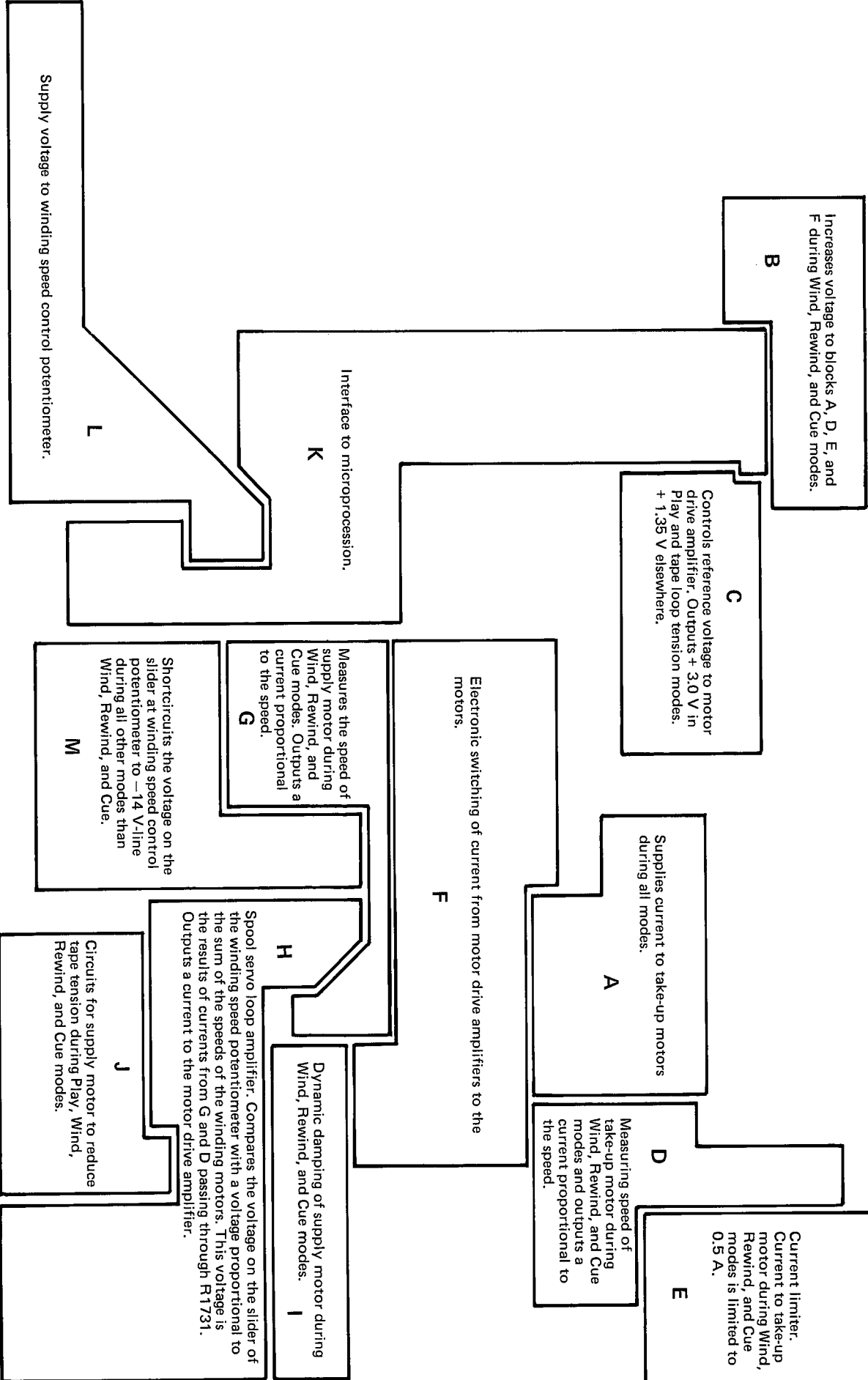


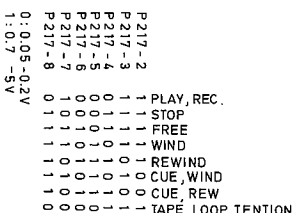
	PLAY	STOP	CUE	W/REW	FREE	H1	H2
P 213-2	1	1	1	0	1	5V	0V
P 213-3	1	1	0	1	1	0V	0V
P 213-4	1	0	1	1	1	0V	0V
P 213-5	0	1	1	1	1	5V	5V
U REF	+6.9V	+3.3V	+0.7V	-1.6V	-7.1V		

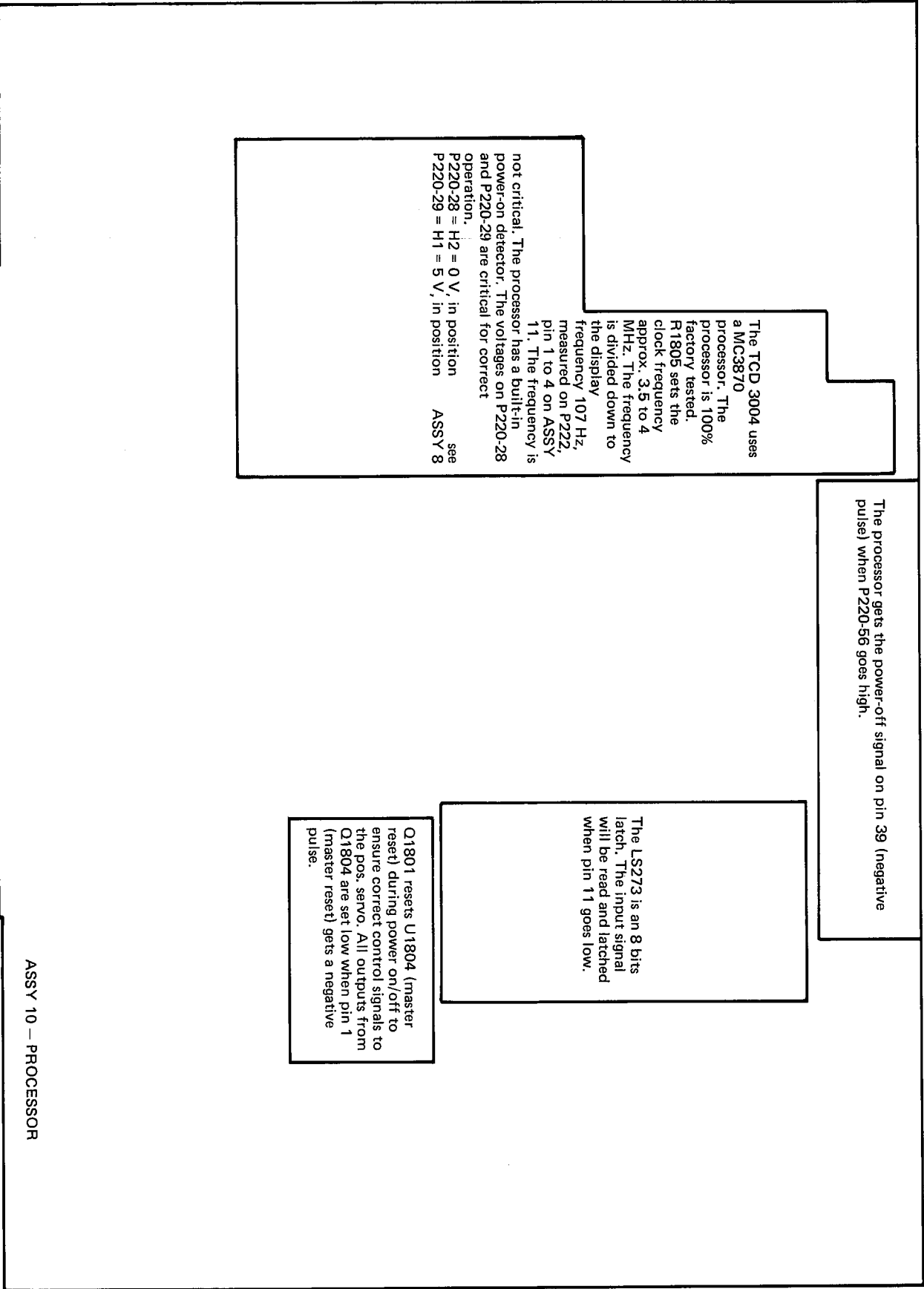
0=-+0.1V APPROX
1=-+0.1V APPROX.



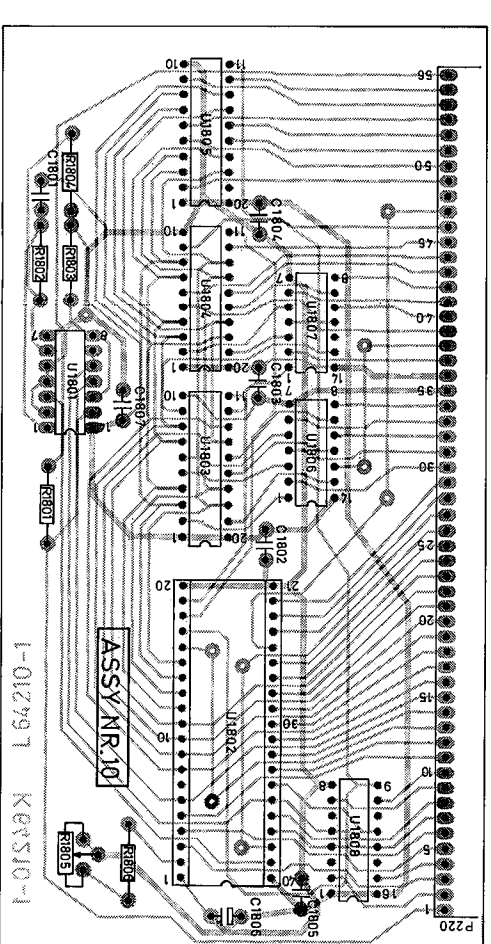
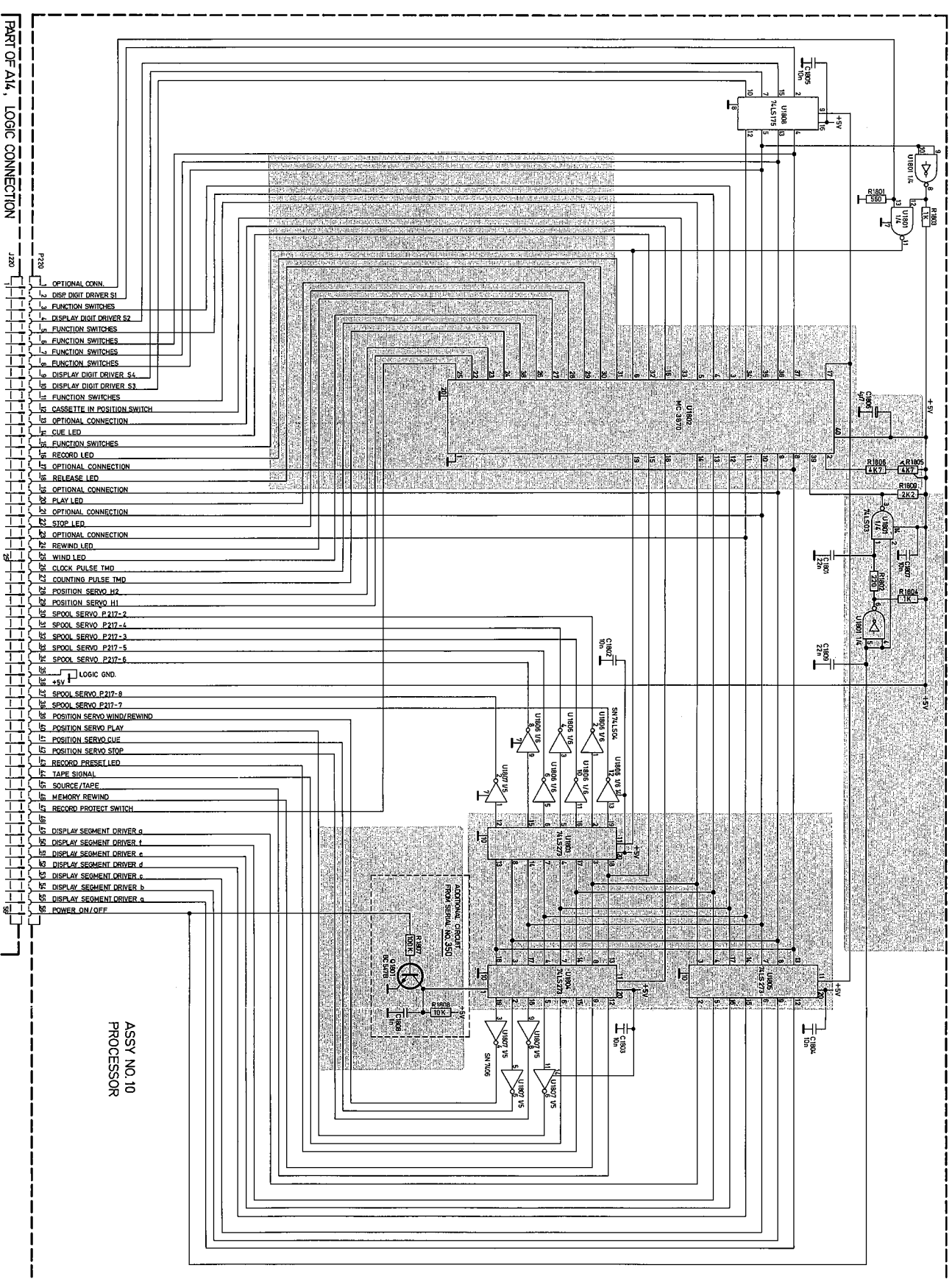
ASSY 9 — SPOOL SERVO

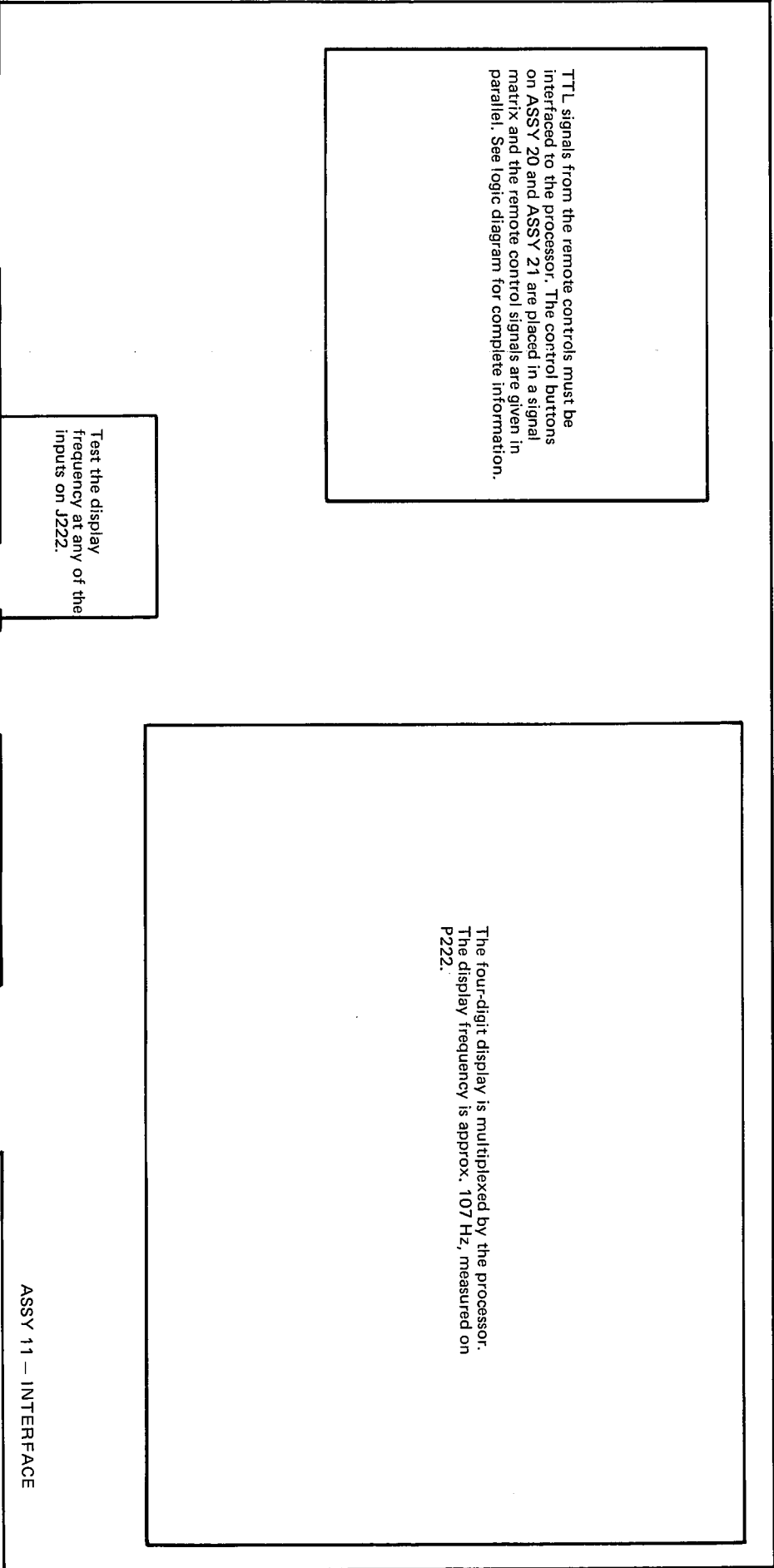


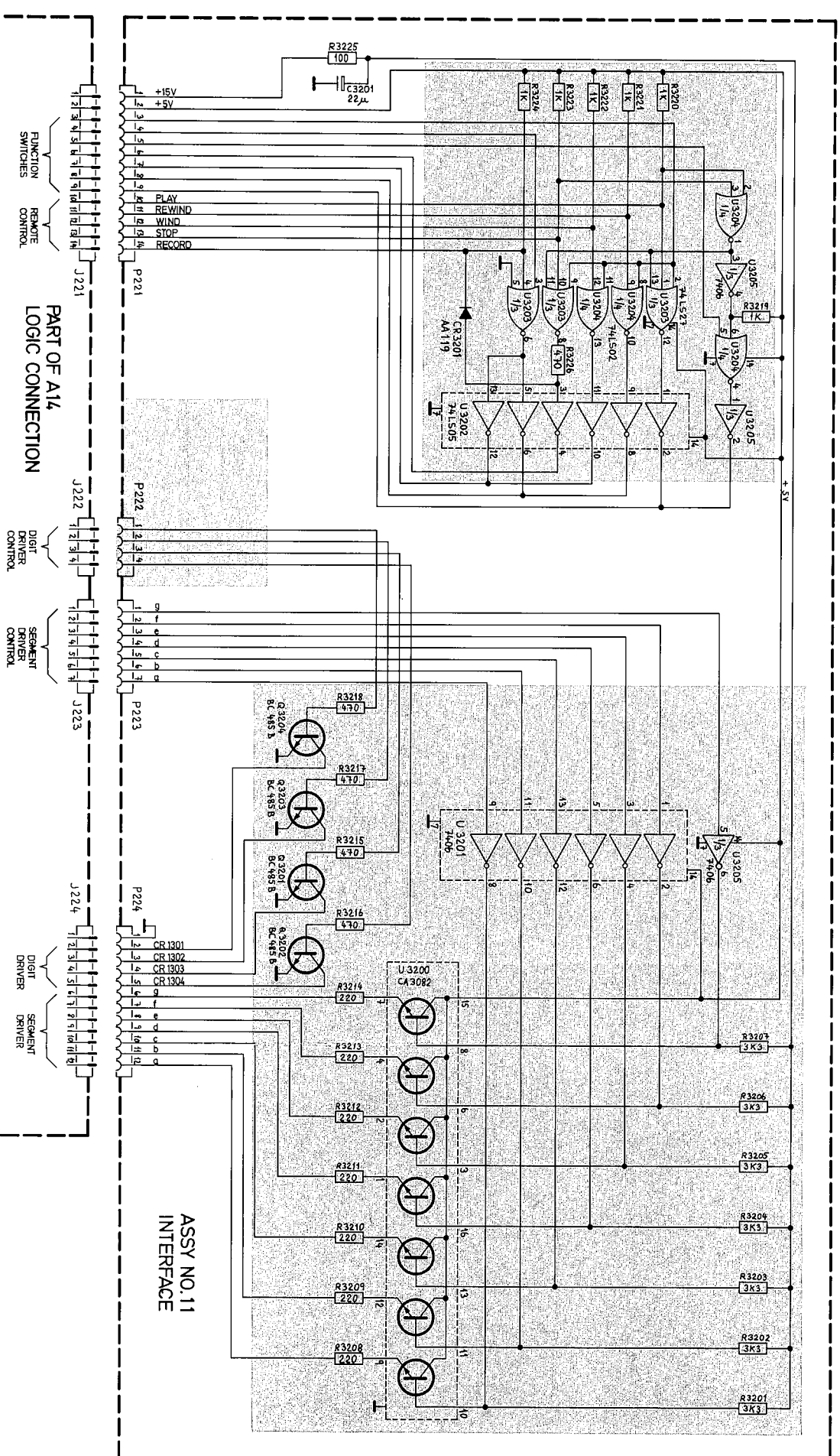


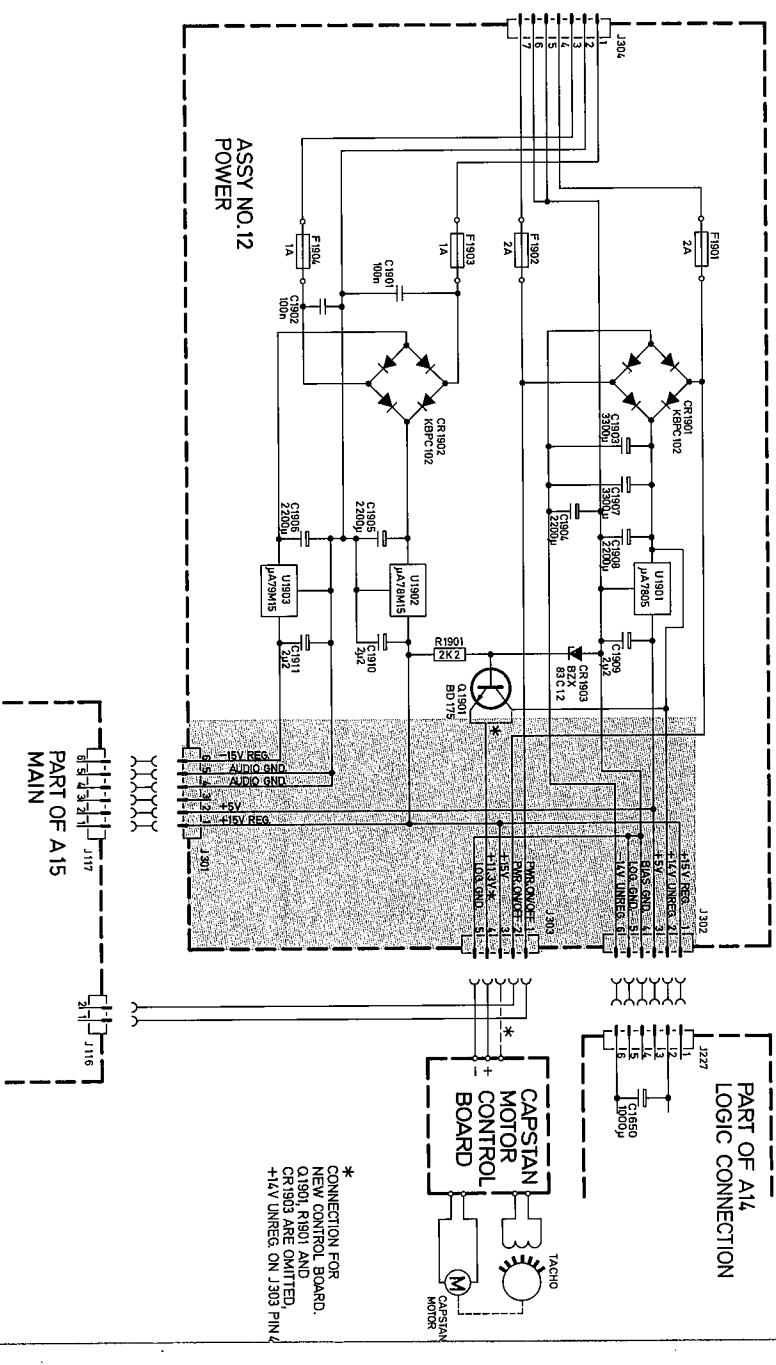
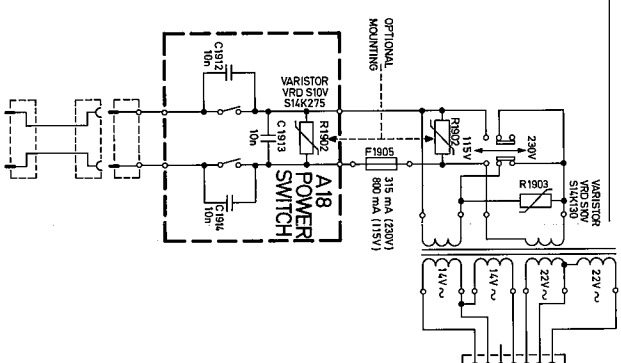
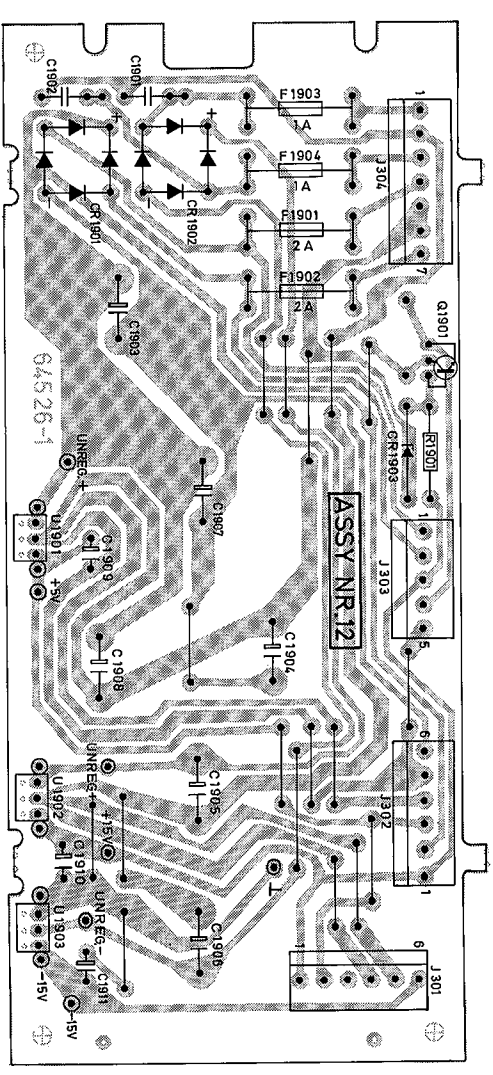


ASSEMBLY No. 10, PROCESSOR



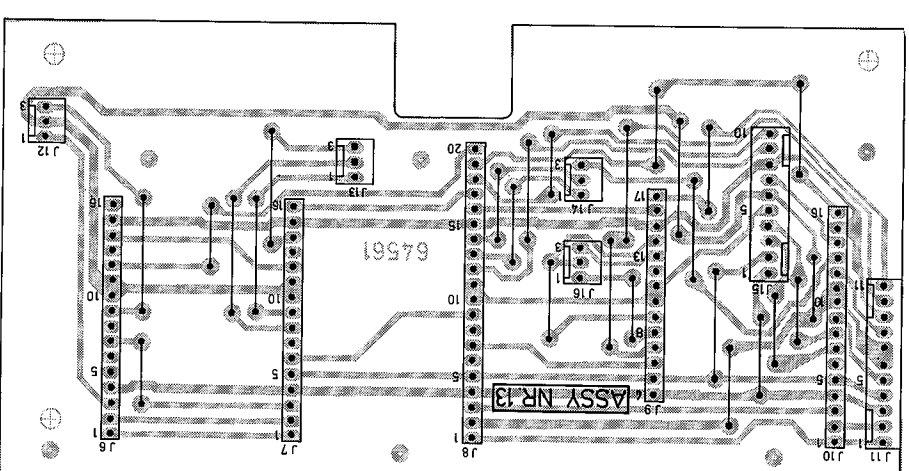
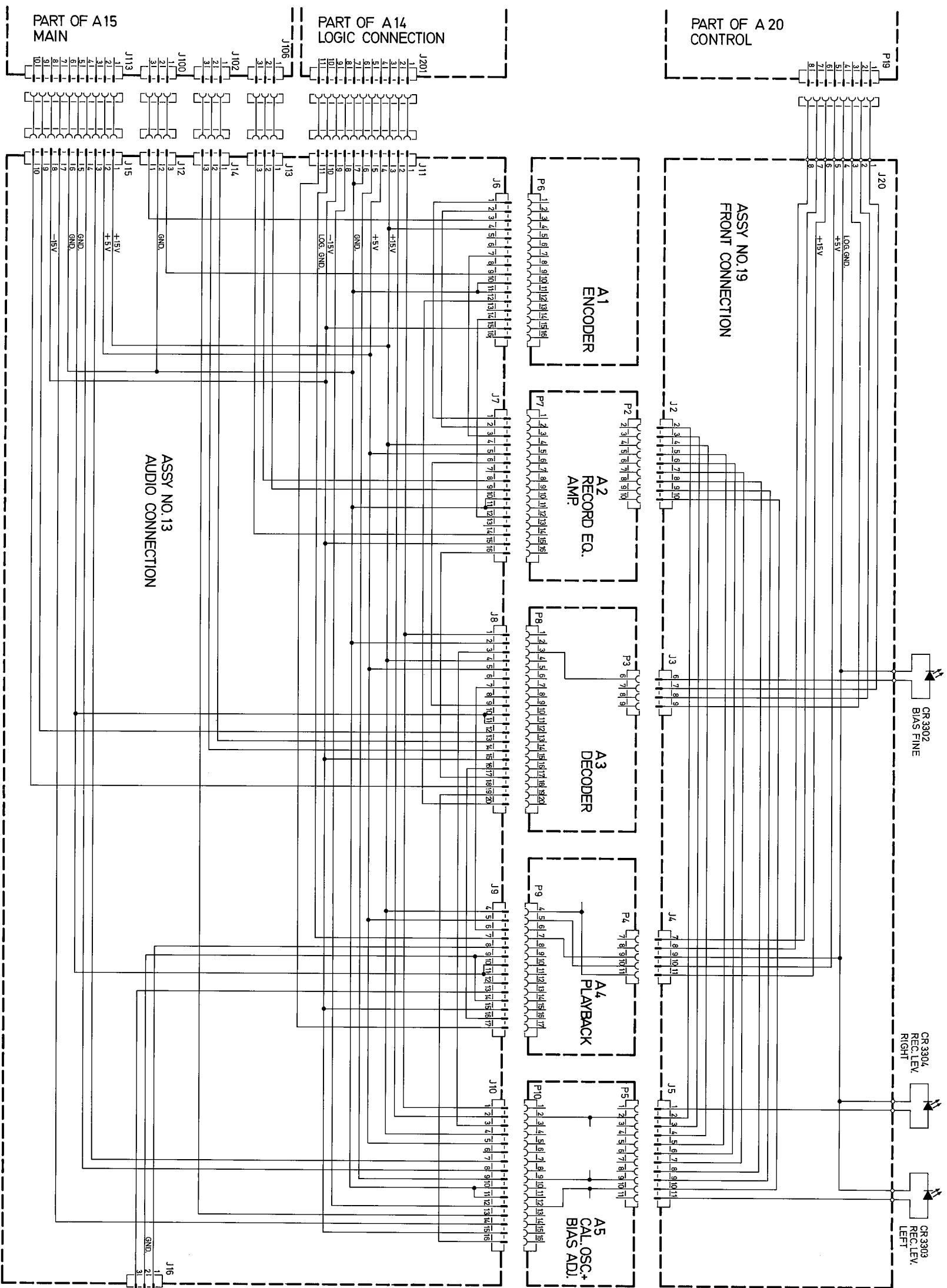






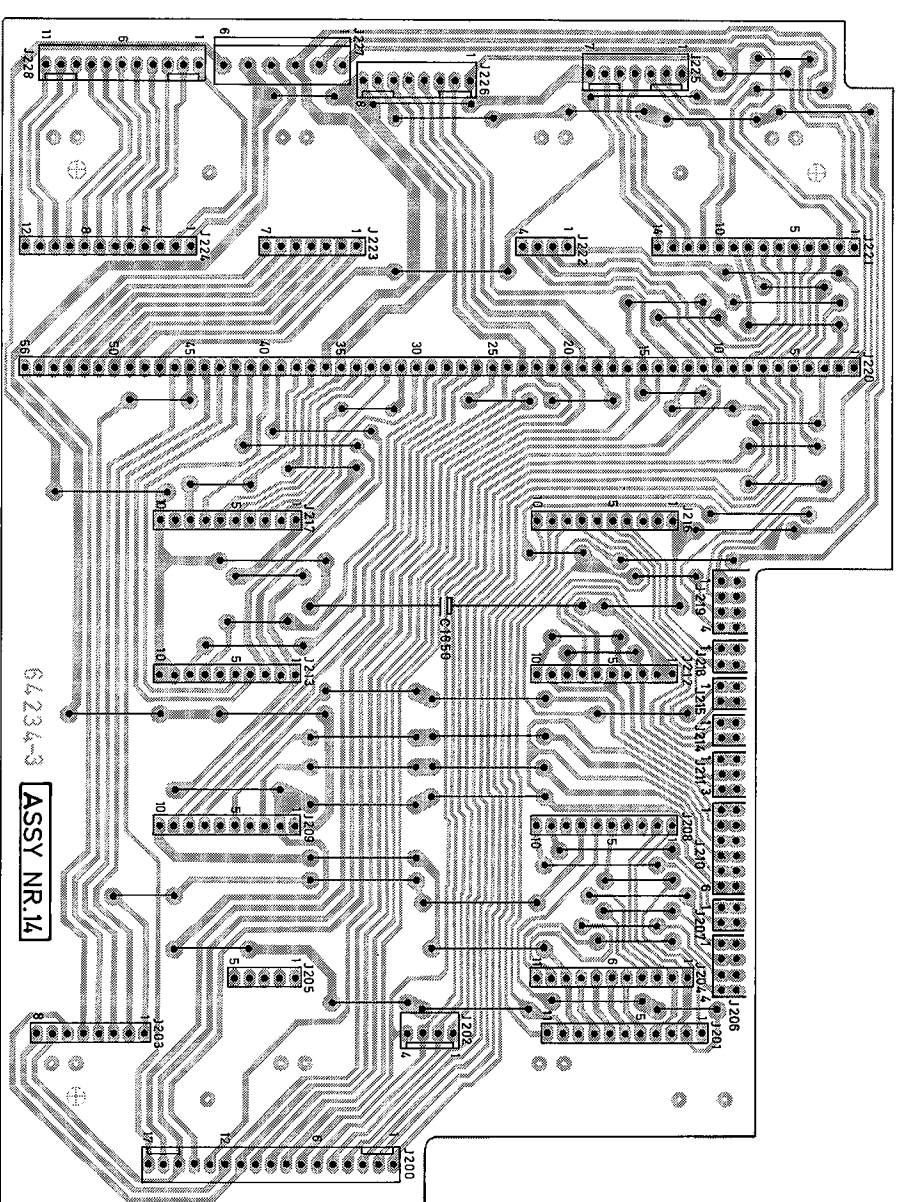
The power circuit supplies ± 15 V for the audio circuits, +5 V for the logic circuits, and ± 14 V unregulated for the motor control circuits.

ASSY 12 – POWER



ASSEMBLY No. 13, AUDIO CONNECTION





Q2101 is a line buffer and Q 2102 is the current generator. Q1203 to Q1207 form the microphone amplifier with self adjusting sensitivity (R110 is the feedback resistor). With the microphone disconnected, the R2125 gives low impedance feedback for minimum output noise. Q1208 to Q1211 form a summing amplifier and a second order 60 KHz low pass filter. The line input sensitivity is adjusted with R2024.

AC voltage is rectified and filtered giving the base drive for Q3104. Collector is low when the power is on. Q3101, Q3102, and Q3103 form a conventional circuit for delayed relay switching. Collector of Q3103 is connected to the meter circuit for meter damping during power on/off.

The logic circuits control the meter switch, LED's, source/tape switch and erase oscillator.

Record or playback signals are connected to the meter circuits via analog switches. The switches are controlled by the processor. The meter sensitivity is adjusted with the input volume controls.

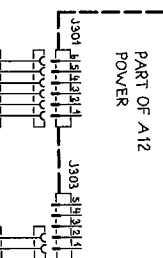
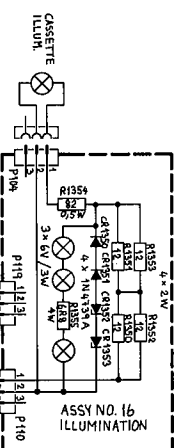
Q2902, Q2903 and Q2904 are the cal. meter amplifier. Q2901 is a 30 dB attenuator.

U2550 is a meter amplifier. The signal is amplified and phase switched for symmetrical peak detection. R2514 and C2501 set the rise time on the program meter to 15 msec. and R2501, R2508, and C2501 set the fall time to 660 msec.

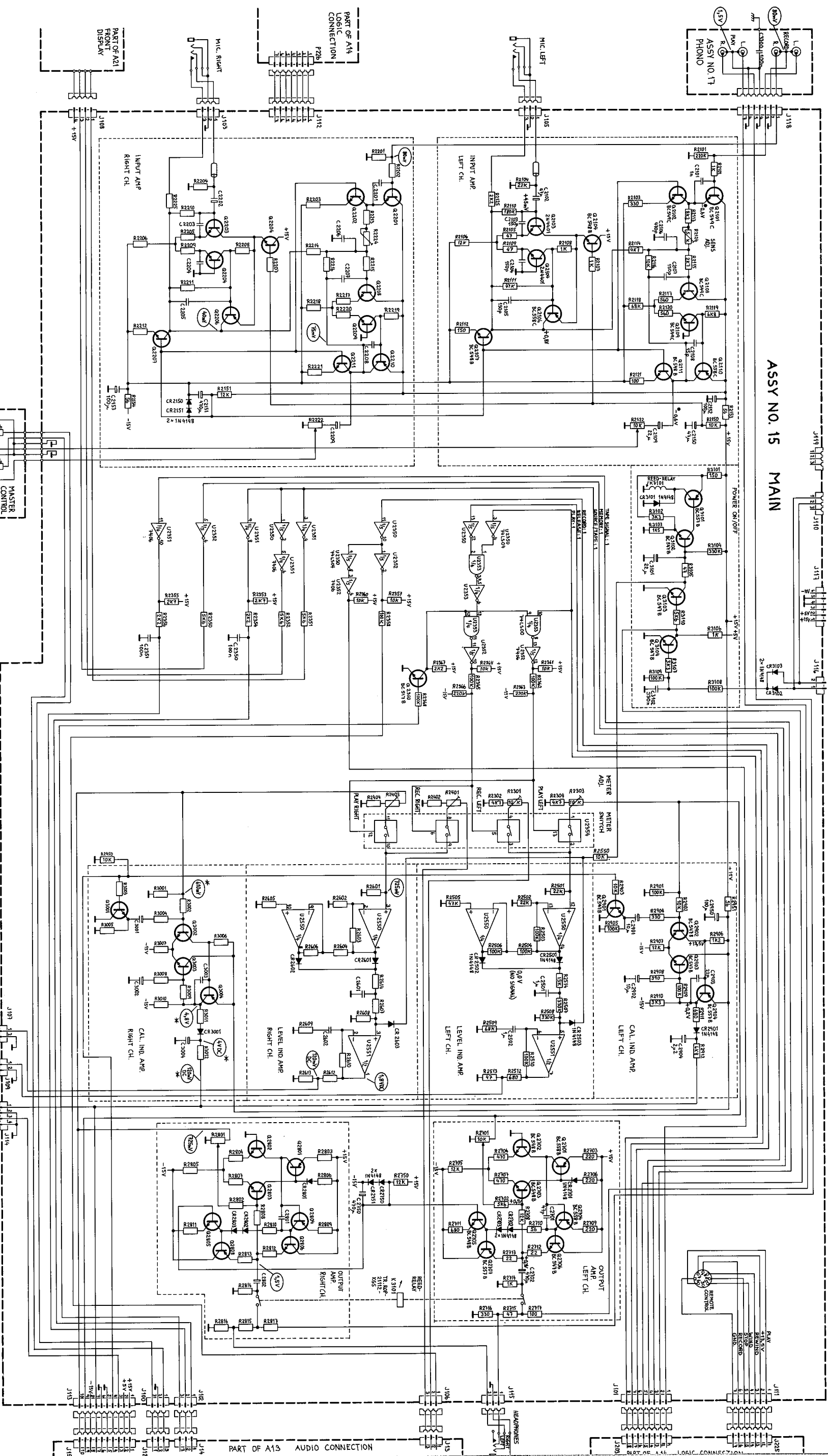
Q2701 to Q2707 are the output amplifier. R2701 and R2708 set the gain to approx. 2.15x.

1-1V DENOTES DC VOLTAGES.
(1-1V) DENOTES SIGNAL VOLTAGES(1000 Hz).

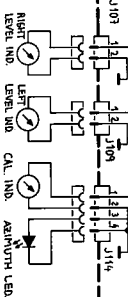
* X VOLTAGES ON INPUT AMP WITH GENERATOR CONNECTED.

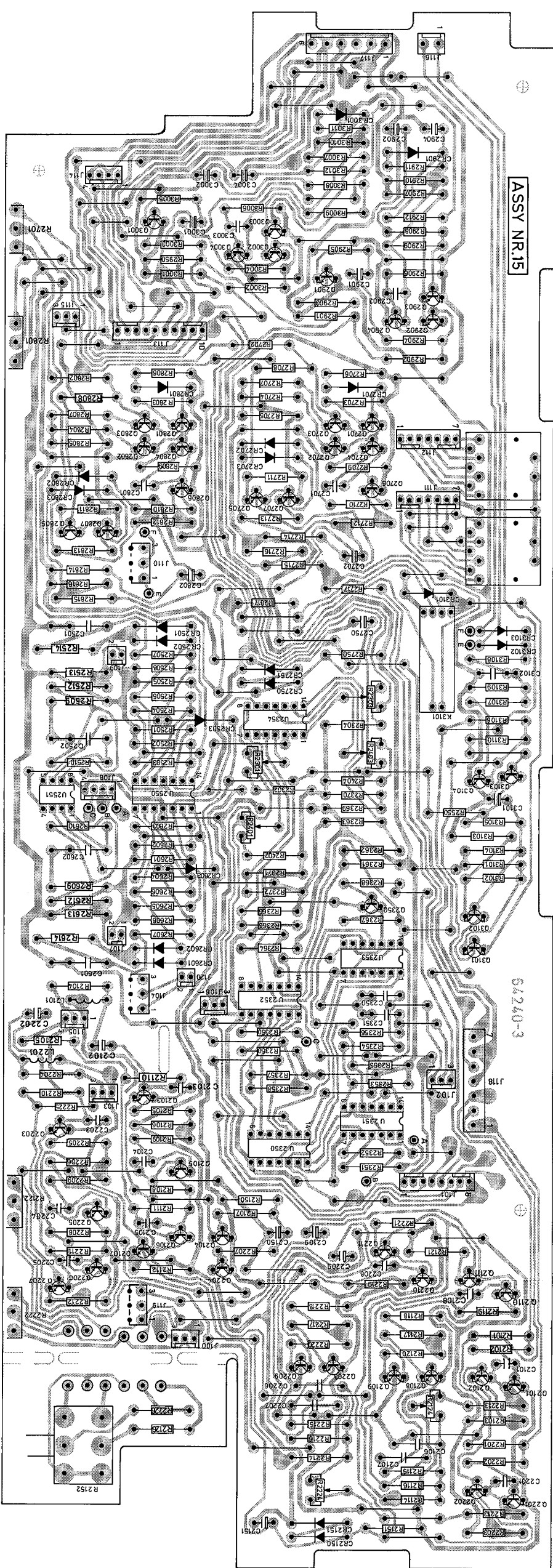


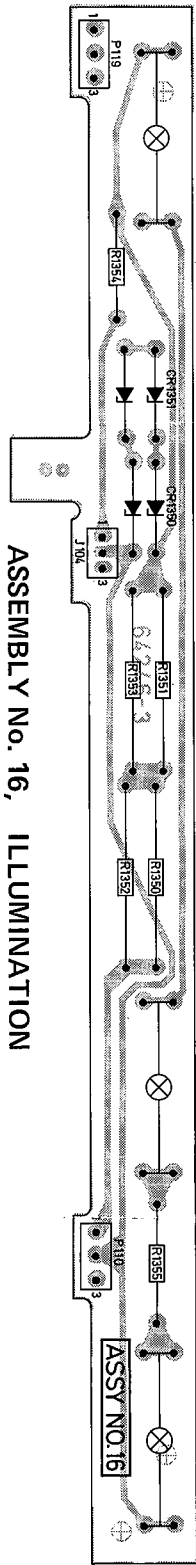
ASSY NO. 15 MAIN



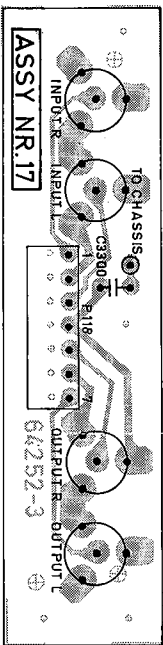
* CAL. SET. J. REC. LEVEL RIGHT



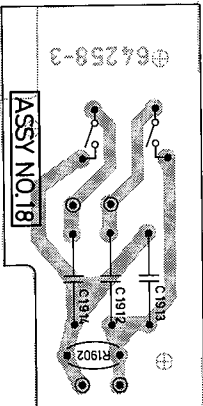




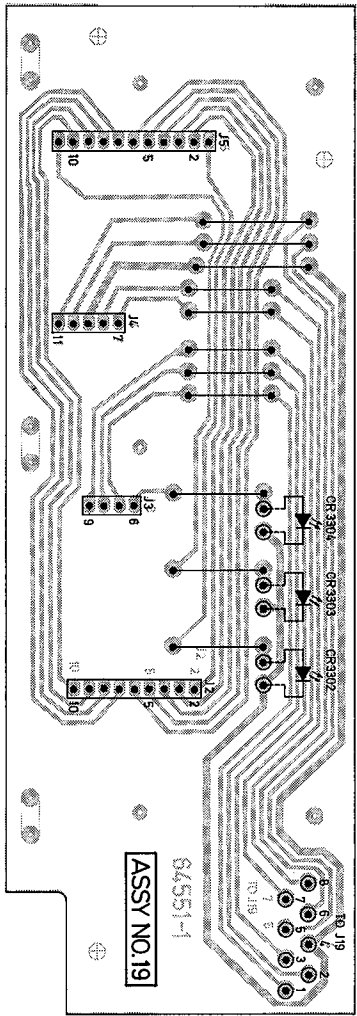
ASSEMBLY No. 16, ILLUMINATION



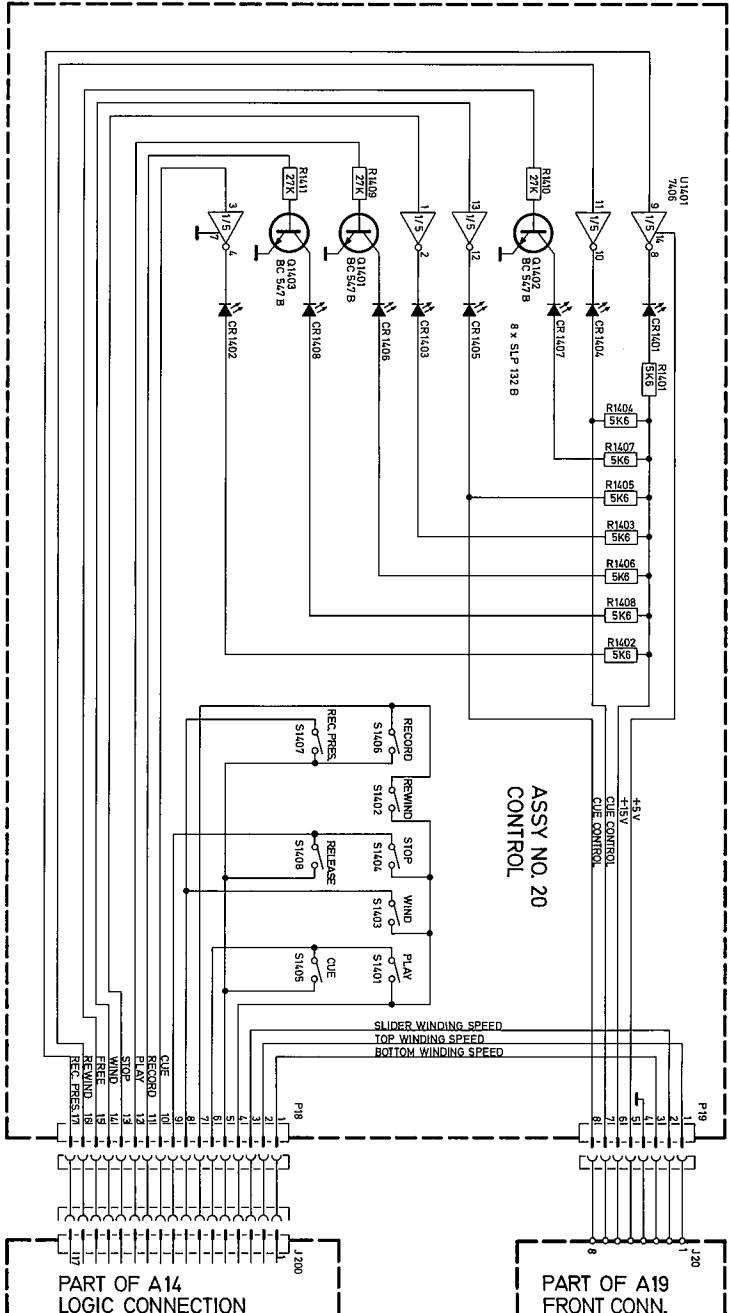
ASSEMBLY No. 17, PHONO



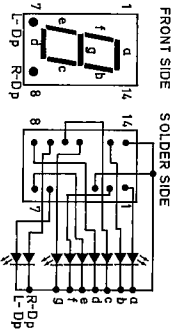
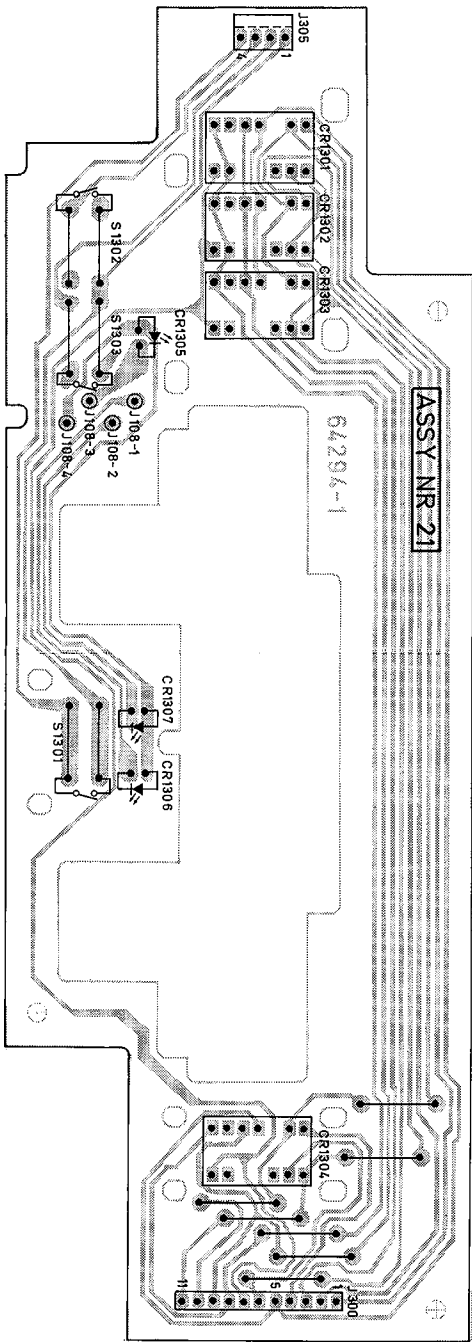
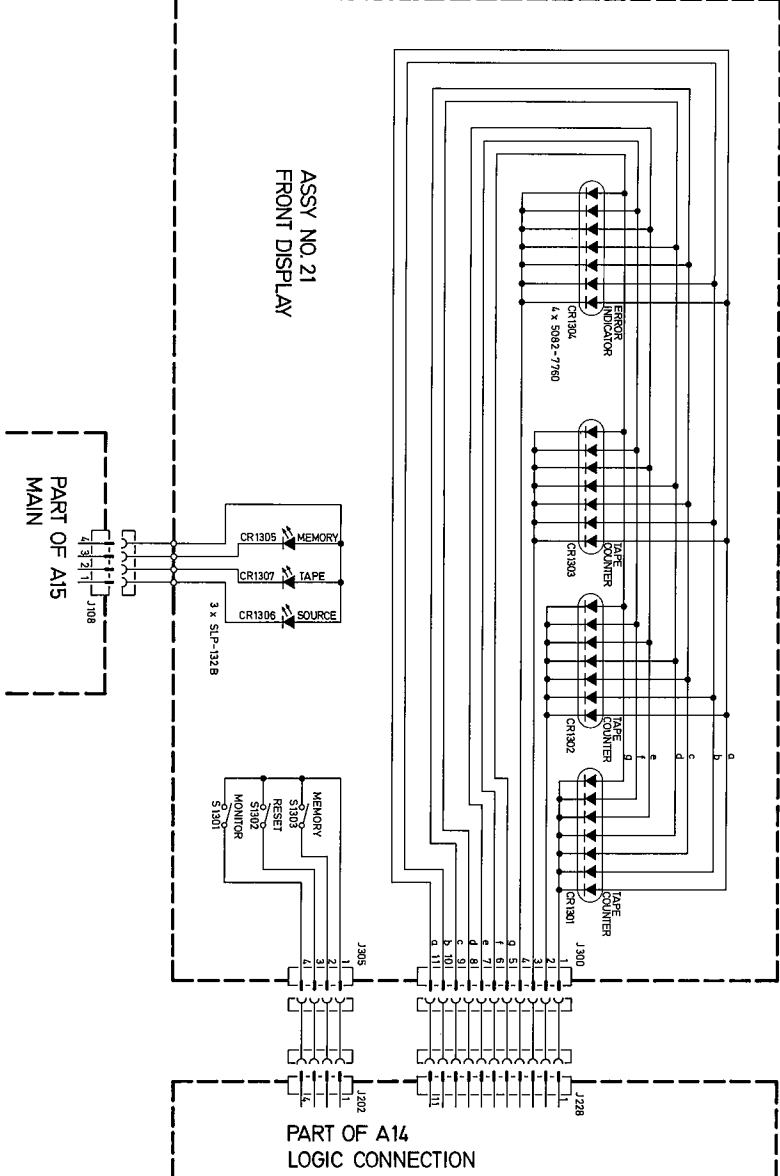
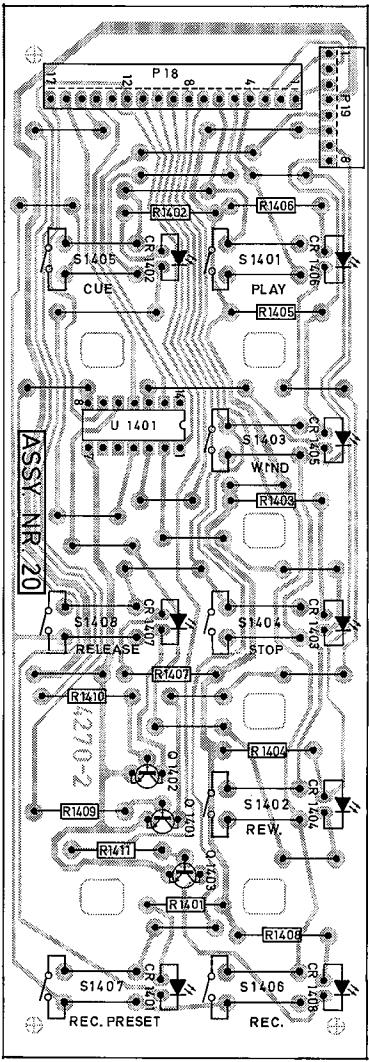
ASSEMBLY No. 18. POWER SWITCH

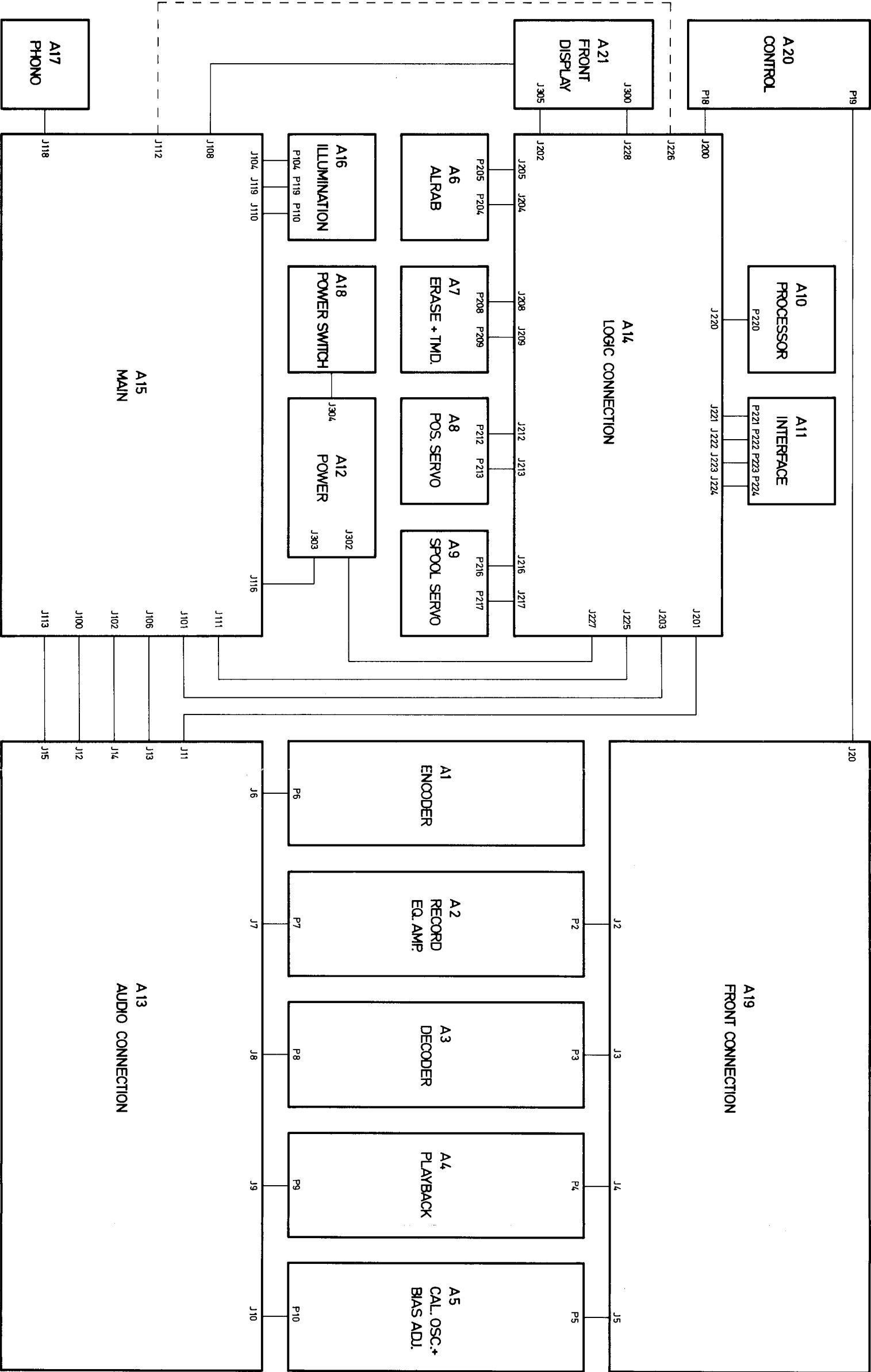


ASSEMBLY No. 19. FRONT CONNECTION



ASSEMBLY No. 20, CONTROL





WIRING DIAGRAM

