

# TANDBERG EDUCATIONAL

## TCR 922 CLASSROOM RECORDER

### Service Manual with Circuit Diagrams



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### General

This service manual contains all essential information for service and maintenance of TCR 922. For easy service the TCR 922 is built up by modules. This means that when a major repair is necessary the module with fault must be replaced.

### Adjustments

TCR 922 has only bias (frequency response) and speed adjustments. After replacing a module, check that the adjustments are correct, see page 6. The TCR 922 has no other adjustments, only regular maintenance like cleaning the tape path when necessary.

### Phones outputs

The Phones outputs is protected with fuse resistors. If one output has been shorted the fuse resistor might burn out and must then be replaced. For more information, see page 5.

### High voltage warning!

The recorder is driven from the mains supply. Voltages and currents are present inside the recorder which might give electrical shock. All servicing shall be preformed by a qualified service technician.

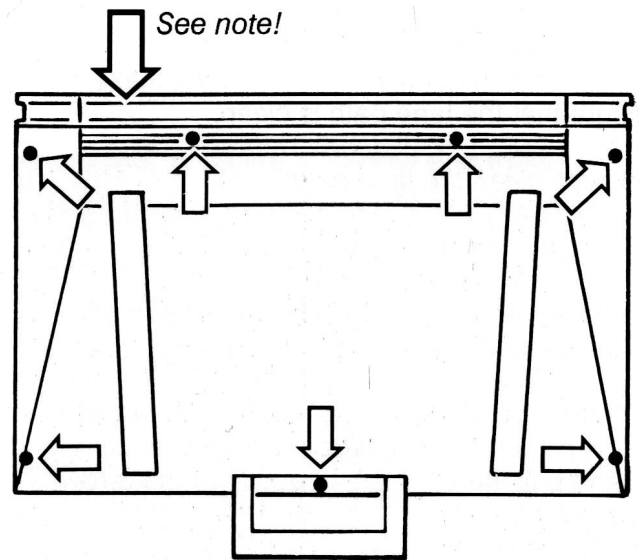
## Dismantling the cabinet

**Note!** When the bottom cover is removed, the blue rear panel is only fastened to the chassis with two screws. Take care not to bend the rear panel in any way. This may cause the mounting brackets for the screws to break.

Remove the 7 screws as shown in the figure and lift the bottom cover up.

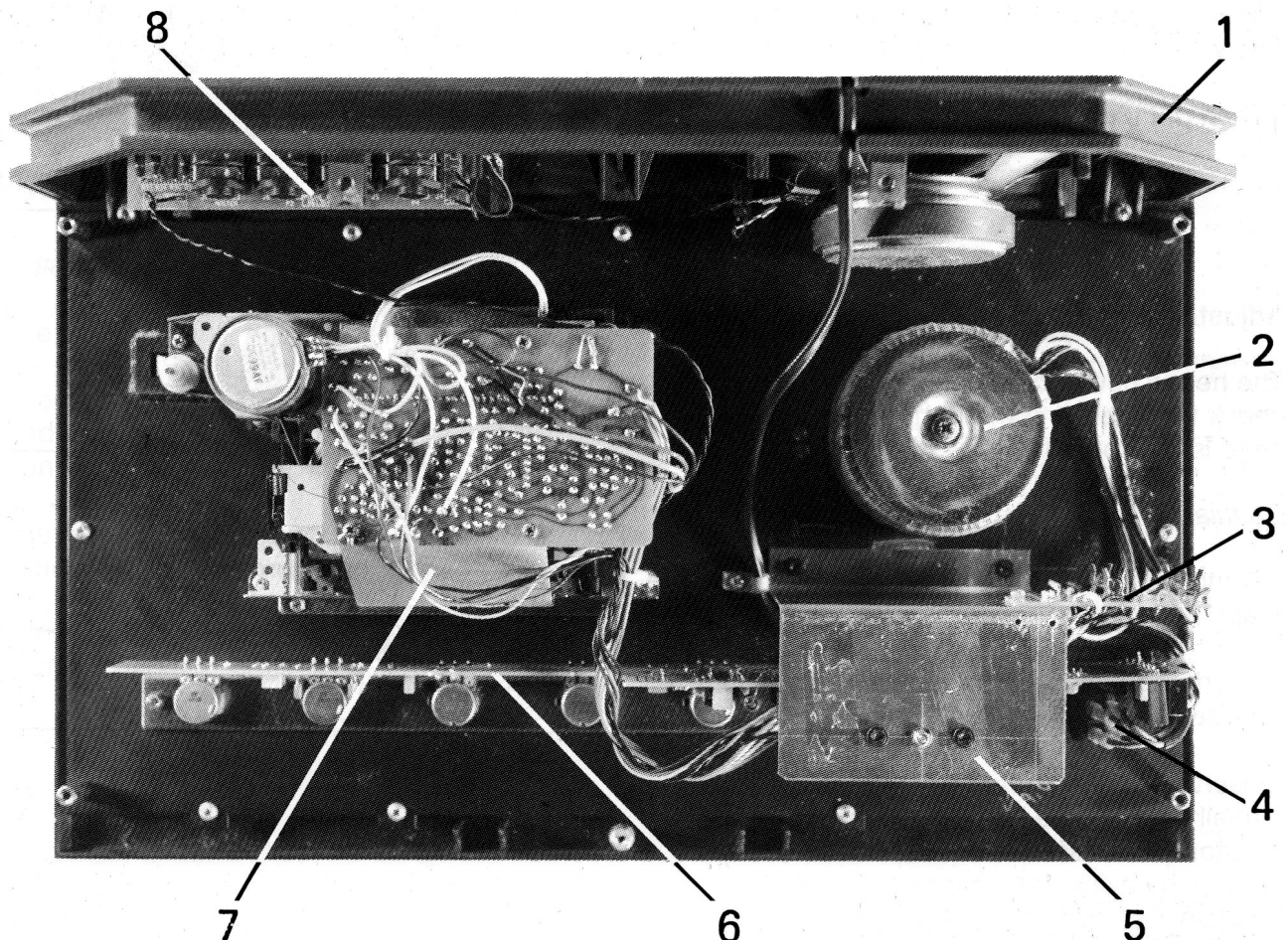
When mounting the bottom cover note that the screws in each corner are metric (M4).

If the front panel must be removed, it is fastened to the front plastic cover with 13 screws (different types).



*Removing the bottom cover.*

## Location of the modules



- 1 Rear panel
- 2 Power transformer
- 3 Fuse board
- 4 Main switch

- 5 Heat sink (power amplifier)
- 6 Main board
- 7 Tape drive unit
- 8 Phones output board

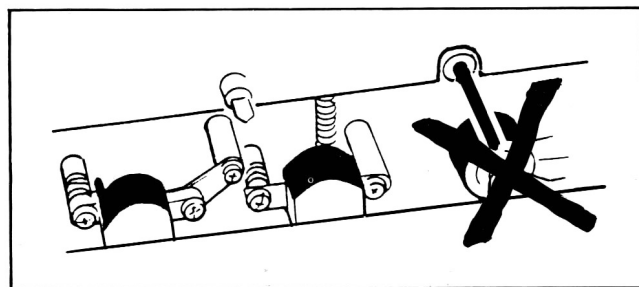
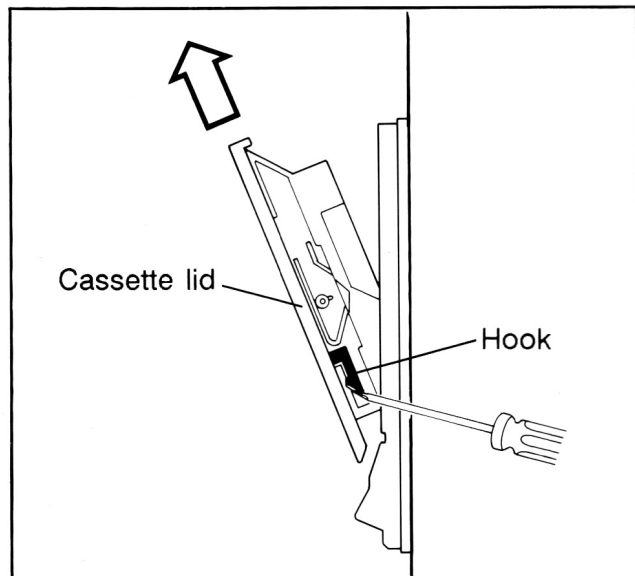
## Cleaning the tape path

### Important!

Before proceeding with any service, make sure that the tape path is clean.

### *How to clean the tape path*

- Turn off the unit.
- Press the STOP/EJECT button and remove the cassette.
- Very carefully use a screwdriver etc. to unlock the hooks on both sides of the cassette lid and pull the lid in the direction of the arrow, see figure.
- Note! Do not clean the pressure roller in any way. The rubber will become sticky and the tape will not run past the roller. Clean the parts in contact with the tape, see figure. The capstan must always be cleaned very carefully.
- Then put the cassette lid back on its place.



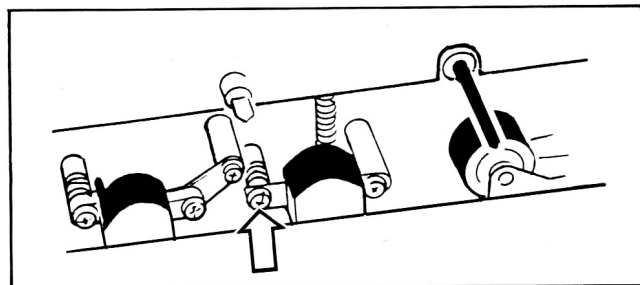
*Clean the spots marked with black*

## Adjusting the heads

The heads need no adjustments, except to check that the azimuth on the record/playback head is set correctly.

### *Do this:*

- Remove the cassette lid (see cleaning the tape path).
- Insert and play back an azimuth adjustment cassette. (Press the PLAY button.)
- Insert a small screw/pozi driver through the small square hole right above the rewind button (the cassette lid must be removed) to reach the azimuth screw on the record/playback head.
- Adjust to maximum output.
- When the azimuth is correctly adjusted, put the lid back on its place.



*Azimuth adjustment, rec./playback head*

## Replacing parts in the tape drive mechanism

Worn heads or other parts are not to be replaced. Replace the worn/defective tape drive with a new one. The tape drive is fastened to the chassis with only four screws. You also have to disconnect the two connectors on the main board, J10 and J11.

When replaced the tape drive, check the adjustments on page 6.

## Power supply

The power supply is part of the Main board. In addition, a fuse board is also a part of the Power supply, see figure.

### 230/115 V AC operation

The power transformer must be replaced when converting the TCR 922 to a different line voltage.

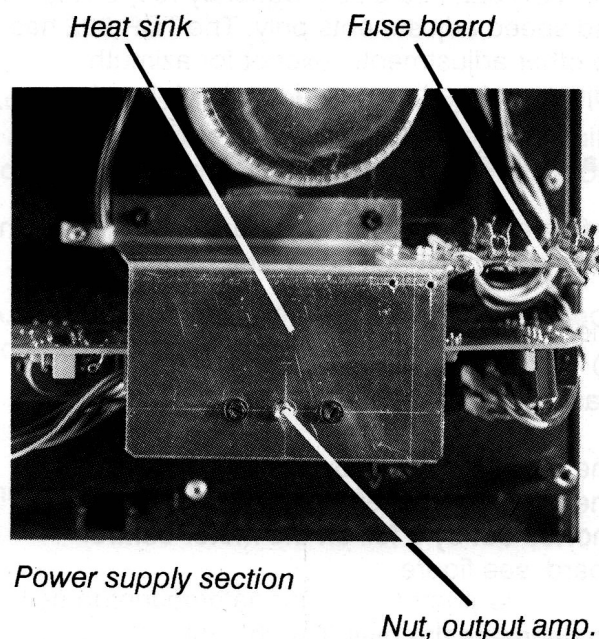
### Fuses

The fuse board has two fuses.

- Line fuse:  
Depending on the line voltage,  
230 V AC: 250 mA, slow  
115 V AC: 500 mA, slow
- Power supply fuse:  
250 mA, slow

### Removing the heat sink (Power amplifier)

The heat sink is fastened with 4 screws. When removing the heat sink, do not unscrew the nut for the power output amplifier, see figure.



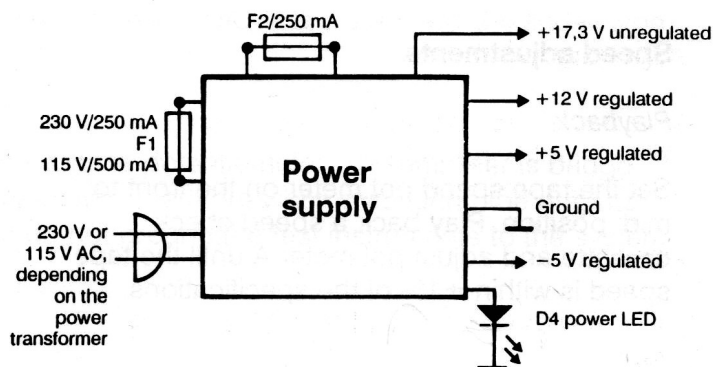
### Voltage from the power supply

The power supply has 3 regulated outputs:

- + and -5 V CD for the pre.amps. (amplifier section), +12 V DC for the tape drive and in addition, the supply delivers +17.3 V DC unregulated to the power (output) amplifier.

The fuses and the Power LEDs are also connected to the power supply, see figure.

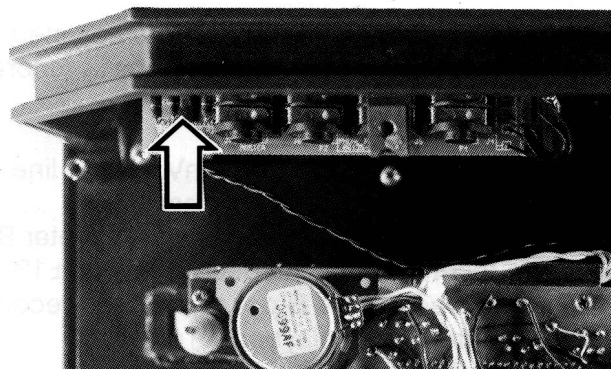
For more information, see page 9, Power Supply circuit.



Block diagram, power supply

## Phone outputs

Note: The Phones outputs are protected with fuse resistors. If one output is shorted for some time, the resistor might burn and must be replaced. The fuse resistors are located on the Phone board, see figure. When replacing, use the same type of resistor, 120 ohm 1/2 Watt.



Fuse resistors

## Adjustments

The TCR 922 has bias (frequency response) and speed adjustments only. The TCR 922 has no other adjustments, except for azimuth adjustment on the record/playback head.

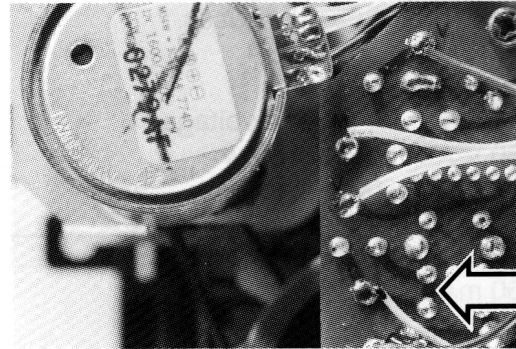
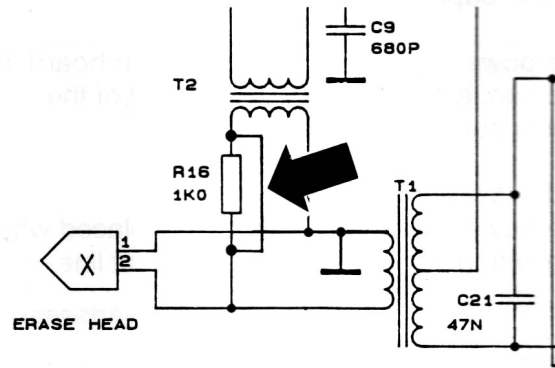
### Bias adjustment

Before adjusting the bias, check the azimuth on the record/playback head, see page 4.

Then check the frequency response, 60 - 10 000 Hz, +3 to -5 dB. If necessary, the bias can be adjusted.

The bias is adjusted by a 1000 ohm resistor. The resistor is either present in the circuit or shorted out by a foil on the motor control board, see figure.

To decrease the bias: Cut the foil.  
To increase the bias: Short out the resistor.

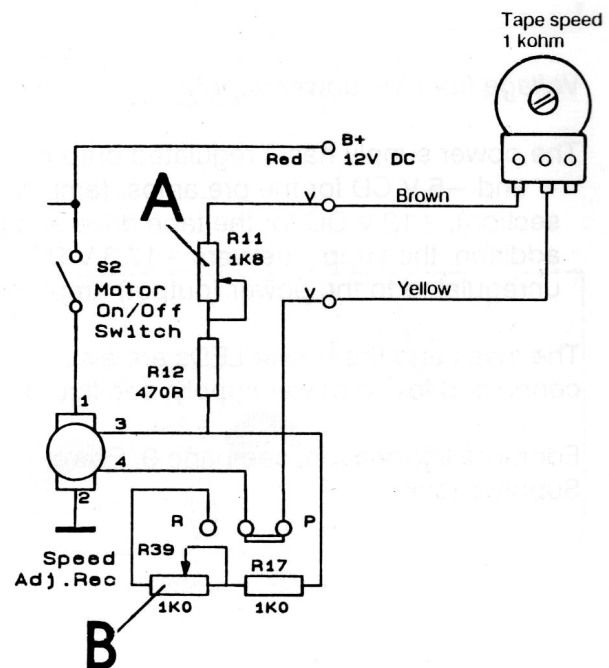


Where to cut the foil

## Speed adjustments

### Playback

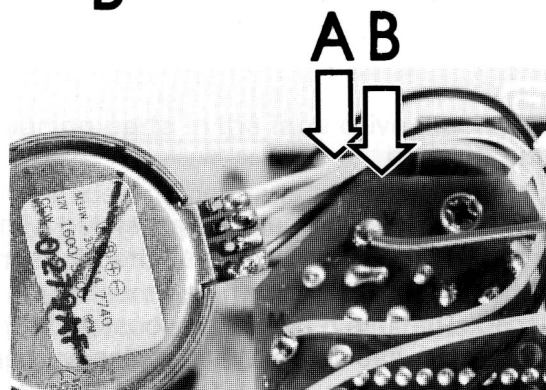
Set the tape speed pot. meter on the front to mid. position. Play back a speed check cassette and adjust pot. meter A until the tape speed is within  $\pm 1\%$  of the specifications.



### Speed adjustment, record mode

**NOTE:** The playback speed must be adjusted before any speed adjustment is made in record mode.

Record a signal, ie. 1 kHz/200 mV, on the line input. Play the recorded signal back and measure on the line output. Adjust pot. meter B until the record/playback speed is within  $\pm 1\%$ . You have to adjust the B pot. meter, then record and measure during playback. To get the correct result you may have to repeat the procedure several times.



Speed adj. pot. meters, A and B are located on the component side

## Simplified circuit description

Except for the tape deck and transformer, the electronic circuits are mounted on 3 separate boards; fuse board, main board and phone board. All the amplifiers and the power supply circuits are located on the main board. The record LED (red) and Tape Speed potentiometer mounted on the main board is a part of the tape deck circuits.

Microphone and Line amplifier are built around UIA. Different gain for the two inputs are provided by R1 and R2. The output of UIA is fed to the record/equalizer amplifier on the tape deck and to a buffer stage.

Q1, a buffer stage, is fed from UIA and drives the mic./line input level potentiometer.

The mixer amplifier, UIC, is fed by two sources, mic./line potentiometer and the line output amplifier UIB.

The line output amplifier, UIB, amplifies the signal from the playback/equalizer amplifier on the tape deck and drives the mixer amplifier UIC and the Line Out. Only tape playback signal is available on this output.

The tone control circuits, UID, are driven by the mixer amplifier UIC. It is a standard Baxandall type active circuit. UID drives the volume potentiometer.

The power amplifier, U5A and B, are driven by the volume potentiometer. The amplifier is bridge connected i.e. both + and – output terminals are active. Therefore when measuring the outputs, (loudspeaker and headphone), do it balanced or do not ground the test instruments to the system ground.

Power supply. See page 5.

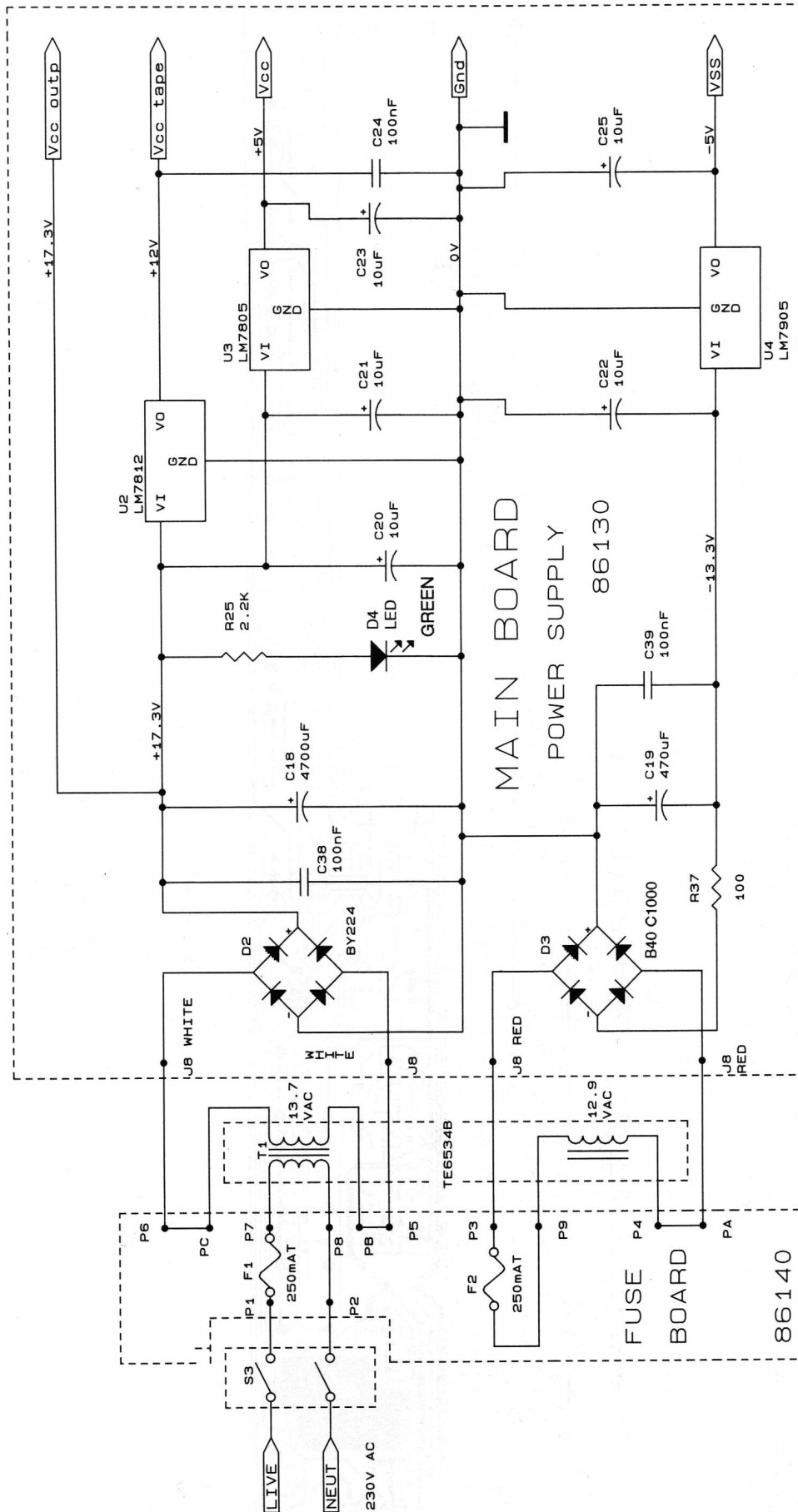
TINBERG EDUCATION  
TMS 922  
MAIN PCB - 86130-1

The figure consists of two parts, (a) and (b), each showing a top-down view of a circuit board with various components and a 1 cm scale bar.

Part (a) shows the TCR 922. It features a central rectangular component labeled "FUSE PCB 86140-1". To its left are two vertical strips of components, each labeled "TCR 922". To the right of the central component is a large rectangular component labeled "TANDBERG EDUCATIONAL". Below the central component is a small square component labeled "FUSE PCB - 86140-1".

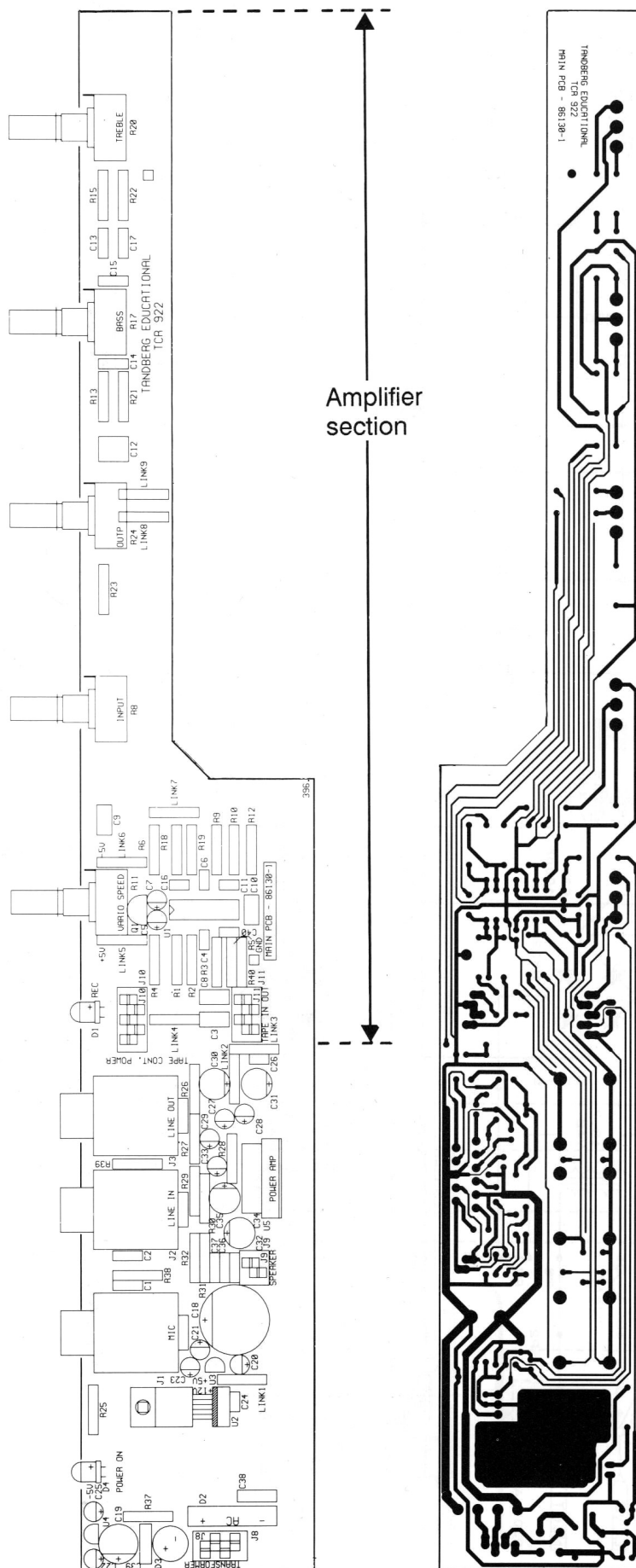
Part (b) shows the TCR 927. It features a central rectangular component labeled "FUSE PCB - 86140-1". To its left are two vertical strips of components, each labeled "TCR 927". To the right of the central component is a large rectangular component labeled "TANDBERG EDUCATIONAL". Below the central component is a small square component labeled "FUSE PCB - 86140-1".

*Fuse board*

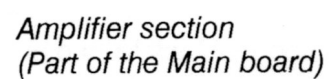


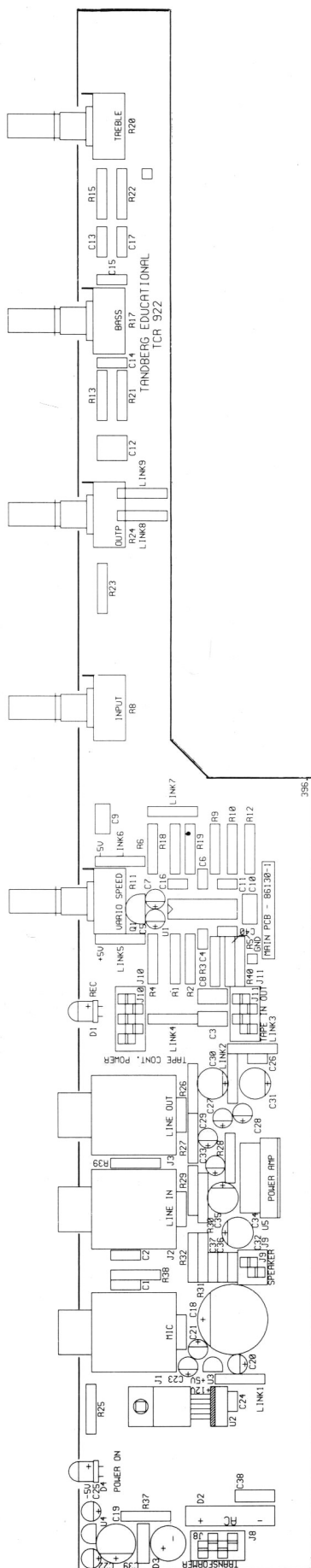
NOTE!  
115V version has its own transformer. 6657.

Power supply  
(Part of the Main board)

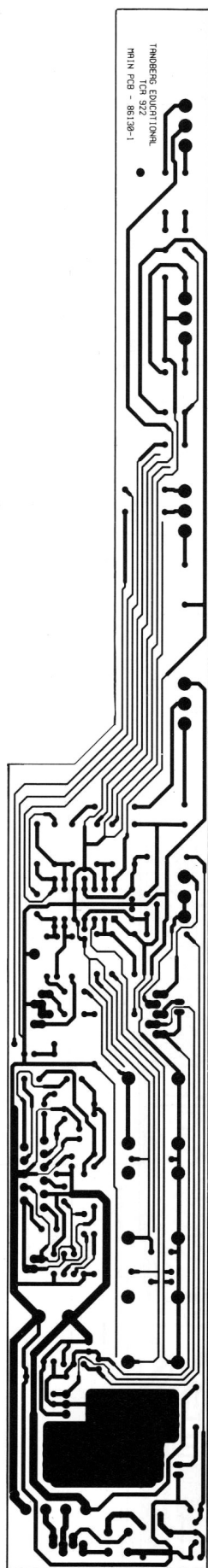


Main board

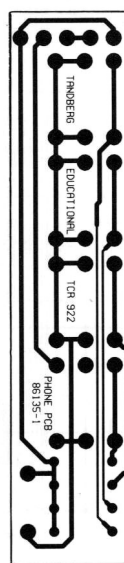




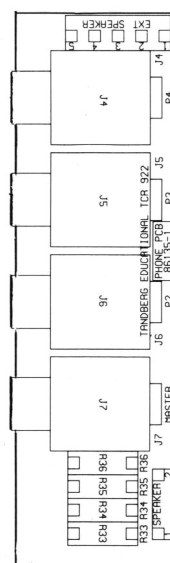
Main board

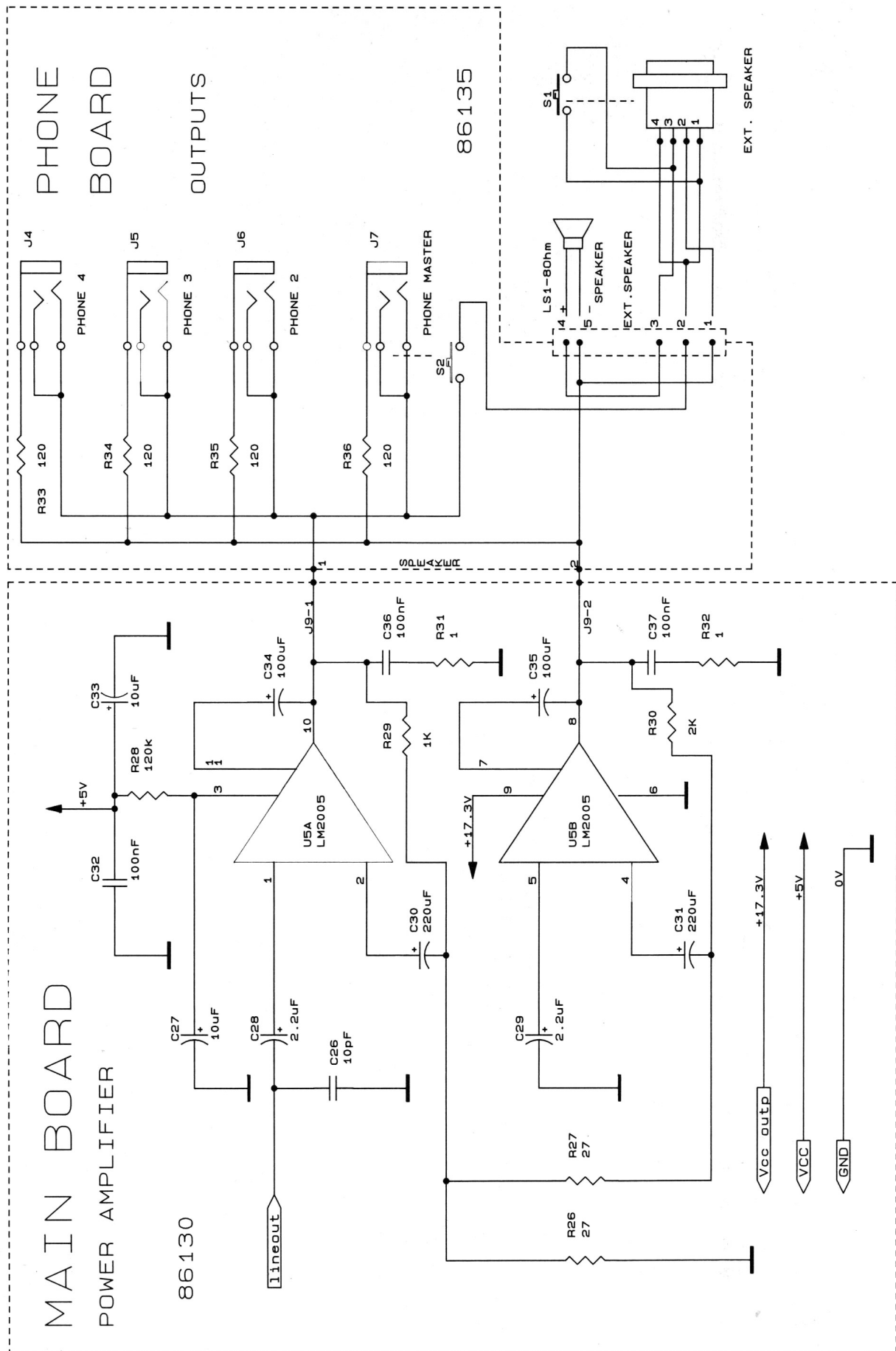


Power amplifier

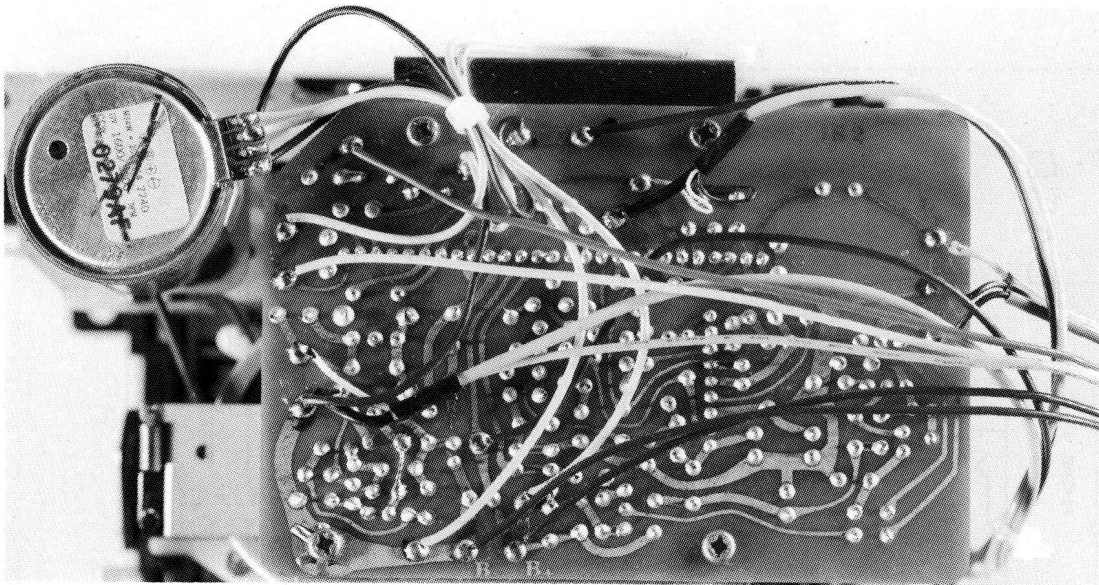


Phone board

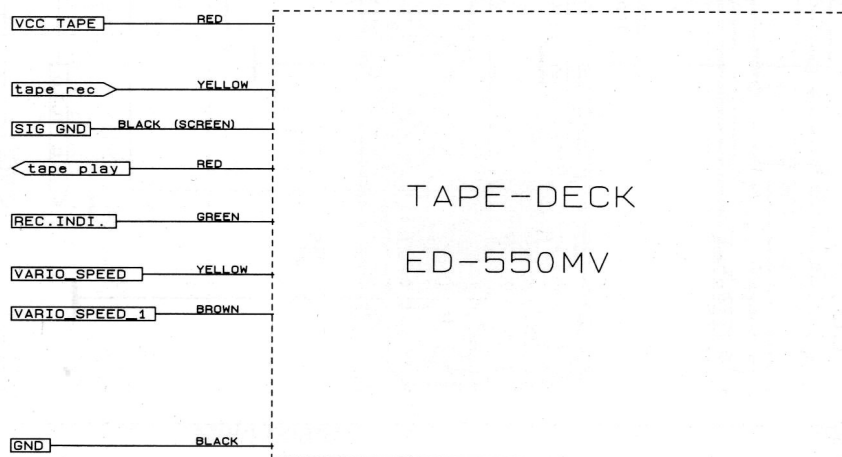
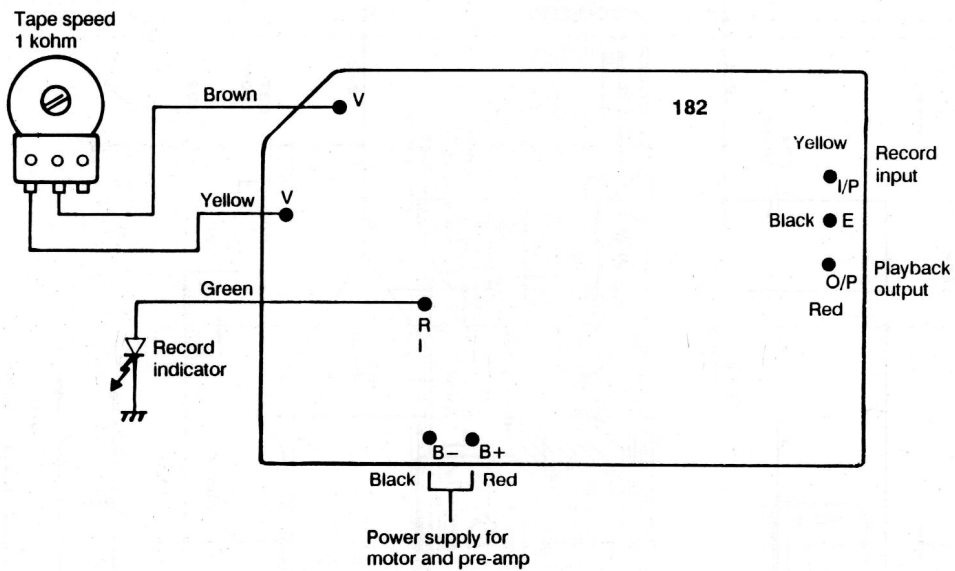




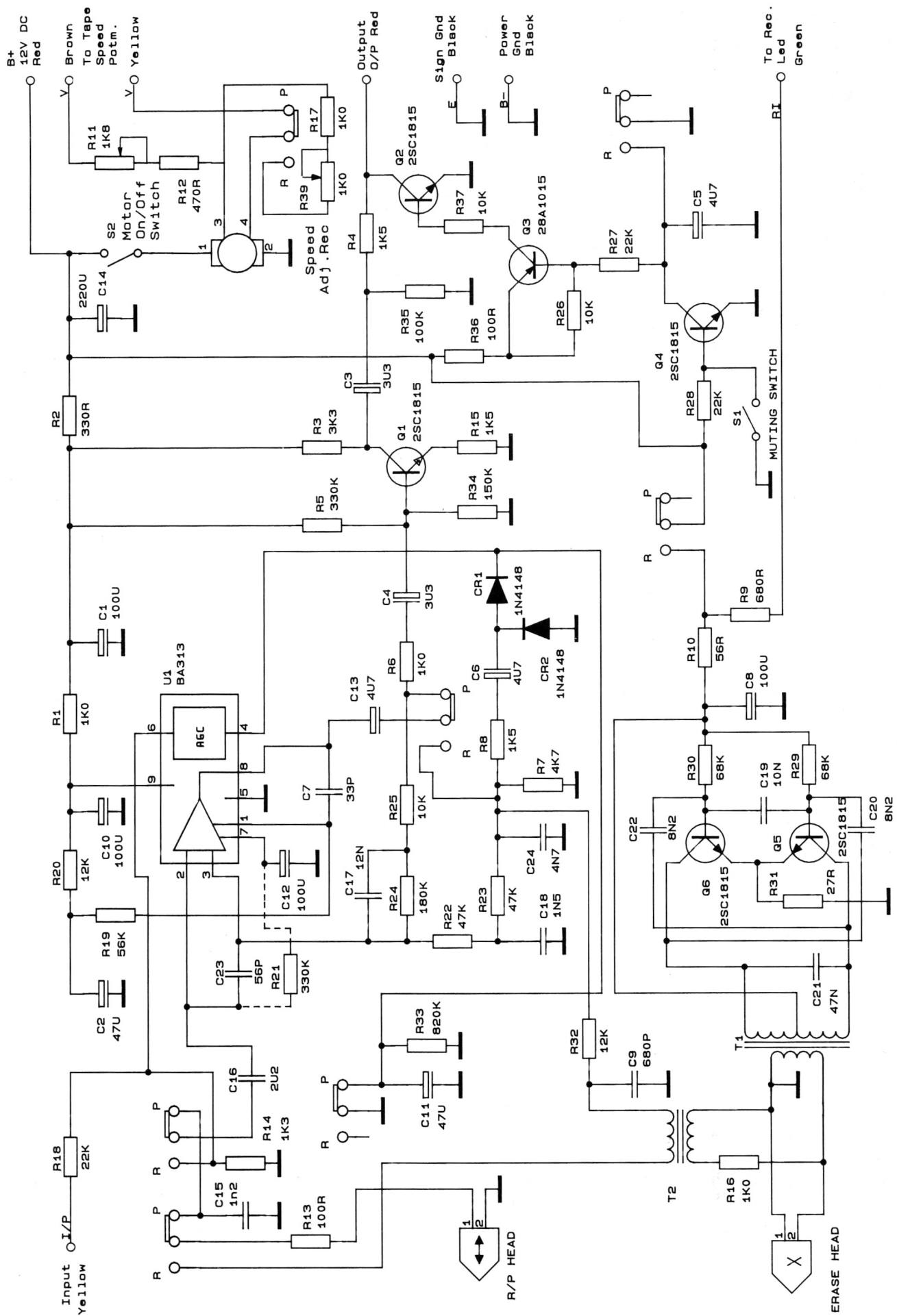
Power amplifier and Phone output  
(Power amp. is part of the Main board)



*Tape drive board*



*Tape drive connecting diagrams*



Play/Rec. amplifiers with motor speed control  
(Tape drive board)

## Technical data for TCR 922

|                                    |                                                          |
|------------------------------------|----------------------------------------------------------|
| Supply voltage:                    | 230 V AC 50/60 Hz $\pm 10\%$ , 115 V AC 60 Hz $\pm 10\%$ |
| Power consumption:                 | Max. 45 W                                                |
| Ambient temperature:               | 10 - 40°C                                                |
| Track configuration:               | Half track system                                        |
| Tape:                              | Compact cassette C-60, C-90                              |
| Tape speed:                        | 4,75 cm/s (vario speed $\pm$ app. 10%)                   |
| Speed tolerance:                   | +3% to -2%                                               |
| End stop:                          | Automatic, mechanical                                    |
| Wind/rewind time:                  | 105 $\pm$ 15 sec. C-60 cassette                          |
| Frequency response:                | 60 - 10000 Hz +3 to -5 dB                                |
| Wow and flutter:                   | <0,25% WRMS JIS, 0,35% WTD peak DIN 45507                |
| Signal to noise ratio at 4,75 cm/s |                                                          |
| Unweighted:                        | 50 dB                                                    |
| Weighted A-curve:                  | 55 dB                                                    |
| Erase attenuation:                 | 60 dB                                                    |
| Motors:                            | 1                                                        |
| Tape counter:                      | 3 digits mechanical                                      |
| Tape transport:                    | Single capstan                                           |
| Safety classification:             | IEC 65                                                   |
| Heads:                             | 2                                                        |
| Record/play:                       | Permalloy                                                |
| Erase:                             | Ferrite                                                  |
| Inputs:                            | Two 1/4" jacks                                           |
| Line sensitivity:                  | 100 mV                                                   |
| Line impedance:                    | 47 kohm                                                  |
| Mic. sensitivity:                  | 2 mV                                                     |
| Mic. impedance:                    | 200 - 600 ohm                                            |
| Outputs:                           | Two 1/4" jacks                                           |
| Line:                              | 300 mV/1 kohm                                            |
| Headphones:                        | 4 V/200 ohm                                              |
| External speaker:                  | DIN (switchable) 10 W RMS in 4 ohm (15 W music power)    |
| Dimensions in mm                   |                                                          |
| Width:                             | 445                                                      |
| Height:                            | 142                                                      |
| Depth:                             | 280                                                      |
| Weight:                            | 5,6 kg                                                   |

Specifications are subject to change without notice.

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Professional people sell Tandberg Educational products all over the world.

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