TD 9

SWITZERLAND ®

STELLAVOX

OPERATING MANUAL

OPERATING MANUAL

DIGITAL AUDIO TECHNOLOGIES SA
MEMBER OF AIHC GROUP

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IMPORTANT : For any future communication, please note hereafter the following information concerning your recorder :

TD 9 Type : [N] [P] [S]

Serial Nr. : ..... (indicated top left of the platine)

Serial Nr. of the headblock (below cover) : .....

Serial Nr. of 2nd headblock (option) : .....

Date of acquisition : ..... by ..... in .....

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A. O P E R A T I O N

1. UNPACKING THE RECORDER TD 9

On first unpacking your STELLAVOX TD 9 recorder and accessories, check the contents carefully against the packing list to make sure everything has been received. In case of shipping damage, follow the instructions attached to the packing list, since such damage is covered by insurance and is NOT guaranteed by the shipper. SAVE PERMANENTLY THE SPECIAL PACKING SINCE IT IS THE BEST TO SHIP THE TD 9 RECORDER WITHOUT DAMAGE.

Your distributor is at your disposal to furnish any additional information you may wish.

Do not dismantle or tear up the box! Remove first the top of the packing which may contain accessories (please unpack them carefully) and then lift up the internal box containing the recorder. You can display this internal box only when out of the main packing.

IMPORTANT : FOR THE TRANSPORT THE HEAVY SMOOTHING ROLLER (40) IS LOCKED WITH ITS LEVER WITH A SCREW ACCESSIBLE THROUGH A SMALL HOLE. TO UNLOCK, USE THE IMBUS NO. 3 SCREWDRIVER TO TURN IT COUNTER-CLOCKWISE FULLY UP. THE SCREWDRIVER IS IN THE BLACK LEATHER KIT, TOGETHER WITH OTHER TOOLS, FUSES, ETC. IF NECESSARY TO SHIP THE TD 9, DON'T FORGET TO SCREW FULLY (CLOCKWISE) THIS SCREW!

SECURE ALSO, FOR ANY TRANSPORT OF THE TD 9, BOTH TENSIOMETER ROLLERS AND THE SMOOTHING ROLLER BY A FOAM CUSHION.

CHECK THAT THE VOLTAGE SELECTOR AT THE REAR OF THE TD 9 RECORDER IS PLACED EXACTLY TO THE VOLTAGE OF YOUR LINE (ONLY AC!)

2. GENERAL DESCRIPTION OF THE TD 9

The universal, professional Tape Recorder TD 9, although designed according to the most sophisticated technologies, is in its appearance similar to a conventional studio recorder, so that its use will not surprise a new operator : on the contrary, the agreeable and ergonomic styling ensures an easy handling.

IMPORTANT : PLEASE UNFOLD THE LAST PAGES (LAYOUT) OF THIS BROCHURE IN ORDER TO FOLLOW THE DESCRIPTION.

- The BASE (48) is similar for all recorder variants, established by plugging various Headblocks, Tensiometers, L-Modules, S-Modules. It is very slim and permits easy installation : horizontal, vertical or oblique for operation in a sitting position, as it is done with mixers. A four-wheeled trolley (accessory) is available (see § 9). Two carrying cavities on both sides of the TD 9 recorder allow easy handling and fastening on the truck or any other stable surface.

Removing both side panels and replacing them by special corners prepare the recorder to be installed inside a RACK of 24" width; consult us.

- On the front of the BASE, left, are located the stereo jacks (25), allowing the connection of headphones and external monitors.

- The internal audio connector (36) is accessible after removal of the front panel, to install an optional audio control unit.

- The rear of the BASE provides the modular space for max. four plug-in L-Modules (1 to 4) and one plug-in S-Module (5).

- The incorporated Power Supply Module (6) accepts : all AC-supplies 110 to 260 V for 50/60 Hz and DC supply 24 V/4 A. A 50-poles D-connector is used for all remote functions, and a Binder 8-poles round connector for a varispeed. Electrical and mechanical grounds are separated.

- The L(ine)-Modules (1) to (4) are simply plugged into prewired connectors of the BASE and secured by two bolts.

- The S(ync)-Module (5) (optional) plugs also, beside the built-in Power Supply Module (6).

- THE TOP PANEL (50) on the BASE shows the INCORPORATED ELEMENTS :

° AC-DC POWER SWITCH (9) switching on/off both poles of an external supply.

° TAPE PLATES (10) left and right, accepting :
Cine reels with Reel Holders
Tape pancakes with plates and DIN-Holder
NAB reels with NAB Holder
Perfo tape 16 mm, 17,5 or 35 mm, with plate and Hub

° WINDING MODE SELECTOR (14) for switching off the right winding Motor (for editing purpose) or both Winding Motors (for closed tape loop operation).

CAUTION : during these special operations keyboard functions (27) (29) (27 + 29) and (39) are intentionally locked in order to avoid any misfunction and a warning blinking light of these buttons appears.

Similarly, switching the Selector (14) to left or right during record or playback has effect only after having pressed the STOP (3).

° The built-in LOUDSPEAKER (12) monitors the recording according to the TRACK SELECTOR (22), as "tape-direct" by the CHANGE-OVER Switch (24) with the PHASE-CHECK (23), and volume by the Monitor Button (26).

° The COUNTER DISPLAY (30) is put to zero by the RESET (32), and pressing the
SPEED DISPLAY Button (28) TAPE SPEED is indicated.

° The Key-Board (27) to (41) controls all the tape transport functions, with signal light (any blinking means uncorrect or not executed function).

All functions of this board, (apart the "EDIT"), the COUNTER DISPLAY and the signal lights may be remote controlled.

The Magnetic Tape may be wound oxide "in" or "out" by switching the
° TAPE PATH SELECTOR (11) (left, right or both).

° The SMOOTHING ROLLER (40) guides the tape against the Magnetic Heads, also in function STOP, to give smooth starts. The tape is driven by the

° CAPSTAN (46) against which it is pressed by the

° PINCH WHEEL (45) and the STOP is given by the

° TAPE END SENSOR (38)

The Tape is protected against unwilled erase not only by the necessity of pressing both buttons PLAY (31) and RECORD (35) but also by the Lock (Ready-Safe) (34). The tape may be marked and shielded by the

° MARKER + SHIELD HOLDER (44) and the choice of two speeds (among 4 + 2) is made by both

° SPEEDS PRESELECTORS (20), the alternative being taken by the

° SPEED Switch (19) according to the Indication of the

° EQUALIZATIONS MEMO (18) located on the headblock plate.

° The SPEED ADJUSTMENT (49) allows a tape speed deviation of +/- 25 % for all speed settings (less for the 76,2 cm/s speed).

PLUG-IN ELEMENTS

° HEADBLOCK (42) which includes all the complete Audio and Sync Cards (up to 8)

° LEFT TENSIOMETER (21)

° RIGHT TENSIOMETER (47)

Thanks to this unique Modularity which STELLAVOX has pioneered for over 15 years, your TD 9 can always be adapted to most standards of the present and of the future.

IMPORTANT : EXPLANATION OF THE BASE UNITS

"N" "P" "S"

The original TD 9 - BASE UNIT was designed in order to accept the 3 tape formats : 1/4", 1/2" and perfofilm PE 16 mm.

This is feasible with the BASE called "N".

The success of this modular system was such that other "heavy" formats like perfofilm PE 17,5 and up to 35 mm were required, along with all the unique advantages of the TD 9 concept.

For many technical reasons we had (alas !) to renounce to the common BASE UNIT TYPE "N" and to redesign a very similar BASE UNIT called "P".

DIFFERENCES BETWEEN "N" AND "P" BASE UNITS

Compared with the "N" BASE UNIT, the "P" BASE UNIT, which has to drive "heavy" tape rolls like 35 mm ones should show the following differences :

1. MECHANICAL

1.1	Stronger winding motors	
1.2	Stronger mechanical reel brakes	
1.3	Larger capstan shaft	(46)
1.4	Higher (2-parts) smoothing roller	(40)
1.5	Height-adjustable pinch wheel	(45)
1.6	Both different speed pre-selectors	(20)

2. ELECTRONICAL

2.1	Other "EPROM"
2.2	Other Capstan Motor Card

The "P" BASE UNIT accepts the Tensiometers (21) (47) and the Headblock (42) for the formats perfo 16 mm (identical to "N" BASE UNIT) 17,5 and 35 mm, the film 17,5 being also able to pass through the 35 mm system.

Consequence : it follows, that a "P" BASE UNIT could accept for example 1/4" tape tensiometers and headblock simply by exchanging 1.6 / 2.1 and 2.2.

N.B. The "S" version is a special BASE UNIT accepting video tape 1" for sound lay-back. Consult us for availability.

3. MULTIPLE USES

Please refer also to the TD 9 leaflet, which gives a lot of application facilities, in correlation with the exchangeable plug-in modules.

The BASE (48) is common to the many various configurations obtainable by different plug-in units like HEADBLOCKS (42), TENSIOMETERS (21 + 47), L-MODULES (1 to 4), S-MODULE(S), etc. Rewiring is not necessary, and a change is a matter of minutes, using a screwdriver.

- The TENSIOMETERS, guiding the tape and giving all necessary information for the tape transport, are obtainable for :

  VAR.N: 1/4" magnetic tape / 1/2" magnetic tape / perfofilm 16 mm PE
  VAR.P: 35 mm perfotape / 17,5 mm perfotape / perfofilm 16 mm PE

  Other formats could be considered in the future.

- The L(ine)-MODULES, interfacing all in/outputs for balanced symmetrical standardised levels, are plugged and fixed at the rear of the BASE, up to four units, equivalent to four audio inputs, four audio outputs, and four selsync outputs.

- The S(ync)-Module interfaces both "CUE" and "REFERENCE" inputs and outputs; it is necessary as long as external devices are used for the synchronisation proceedings.

- One plug-in HEADBLOCK (42) includes up to 6 magnetic heads, specialized for various functions erase, synchro, record, playback; all this may be single or multitrack.

  The "audio" cards, each having the necessary circuits for record, playback and sync, and the "synchronization" cards as well, are also plugged into the HEADBLOCK, which itself plugs into the BASE.

  This shows the impressive number of possible combinations (see 12 standard examples, last page of the TD 9 leaflet) for today and tomorrow.

Positive consequences :

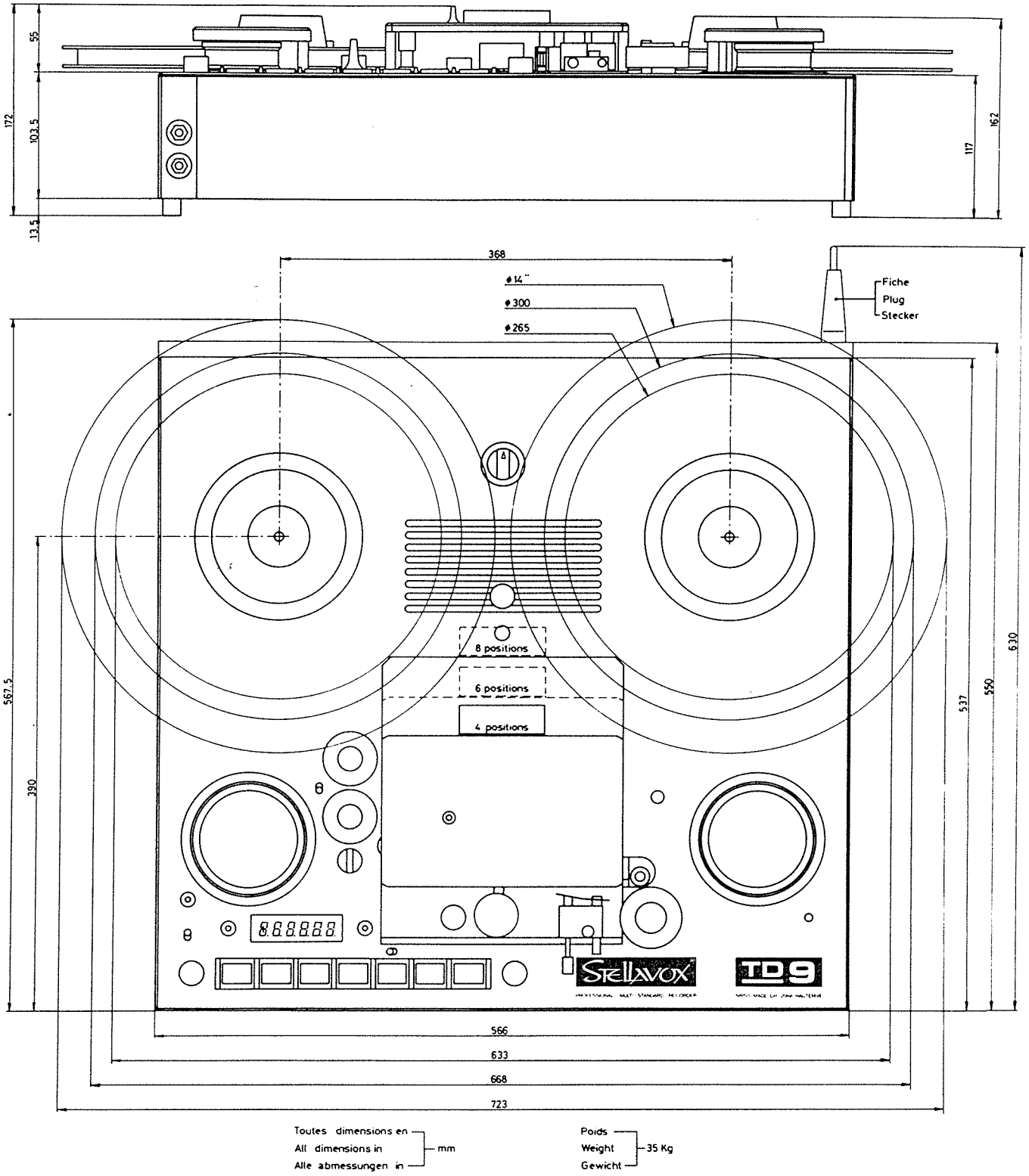
a) few various BASE units may accept various standards, according to new requirements or future standards. The TD 9 is FUTURE-PROOF.

b) many different combinations may be obtained for transcription purposes using two (N and P) BASES and some plug-in units.

c) the matter of fact that each BASE is already prepared for Time Code and/or Computer Operation affords this modernst aids to practically any tape format and tracks configuration.

d) the exceptional TD 9 MODULARITY as well as its very slim construction offer easy maintenance.

e) other features like : low weight, ergonomic design, universal supply, unsurpassable musicality make the TD 9 unbeatable.



TD9 DIMENSIONS

4. INSTALLATION OF THE TD 9

The drawing of the opposite page indicates all necessary dimensions for the installation of the recorder TD 9, as follows

4.1 The simplest way is to lay the TD 9 on a table, a bench or any stable surface, installed for comfortable operation.

4.2 A special four-wheeled trolley has been designed to accept the TD 9 recorder. See § 9.

4.3 The extra large reels (diameter 14") accepted by the TD 9 don't permit a 19"-rack installation of the TD 9. We nevertheless provided the possibility to install (vertically) the TD 9 recorder into a 24" rack; both sides are removed and replaced by two corners (delivered upon request).

4.4 The TD 9 recorder may also be installed in mobile vans, etc. and firmly fastened by two clamps which hold firmly the recorder against a stable surface.

> TAKE CARE TO SAVE SOME SPACE ALL AROUND THE RECORDER FOR COOLING PURPOSE.

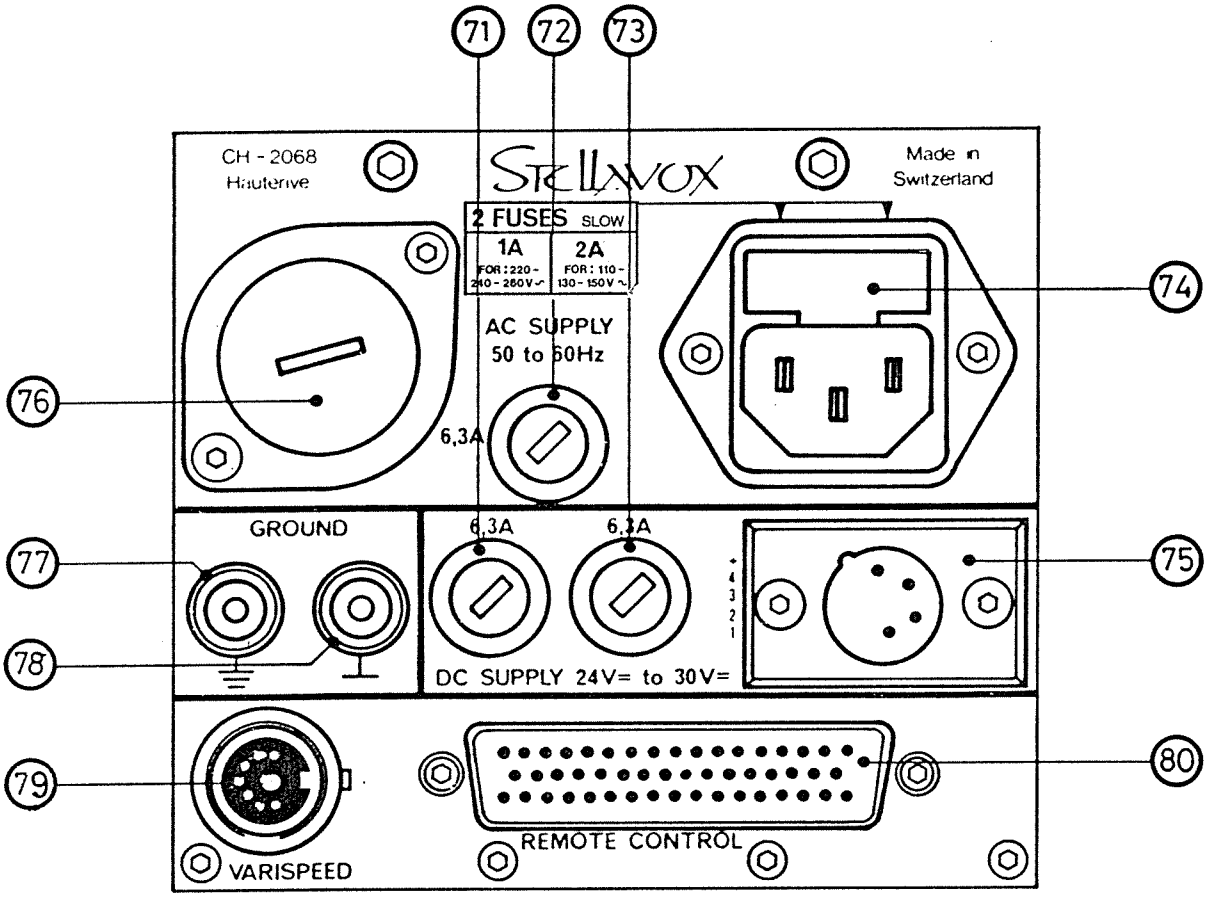
4.5 Timetable for different speeds and reel sizes

Tape type Tape speed	76 cm/s	38 cm/s	19 cm/s	9,5 cm/s
Reel Ø 13 cm = 5"				
Standard	3.75 min.	7,5 min.	15 min.	30 min.
Long Playing LP	5,6 min.	11,25 min.	11,5 min.	45 min.
Double " DP	7,5 min.	15 min.	30 min.	60 min.
Triple " TP	11,25 min.	22,5 min.	45 min.	90 min.
Reel Ø 26,5 cm = 10,5				
Standard	15 min.	30 min.	60 min.	120 min.
Long Playing LP	22,5 min.	45 min.	90 min.	180 min.
Double " DP	80 min.	60 min.	120 min.	240 min.
Triple " TP	45 min.	90 min.	180 min.	360 min.
Reel Ø 35,5 cm = 14"				
Standard	1/2 hour	1 hour	2 hours	4 hours
Long Playing LP	3/4 hour	1 1/2 hour	3 hours	6 hours
Double " DP	1 hour	2 hours	4 hours	8 hours
Triple " TP	1 1/2 hour	3 hours	6 hours	12 hours

TD 9

Recording times at the different formats and for different configurations with pyral perfo tape at 25 frames/sec.

Configuration	N	P	
Format	1 p–1 p + Cue–2 p–2 p + Cue–4 p–4 p + Cue	1 p–1 p + Cue–2 p–2 p + Cue–3 p	3 p + Cue–4 p–4 p + Cue
16 mm	640 m 56 min	960 m 84 min	640 m 56 min
17,5 mm		960 m 33 min	640 m 22 min
35 mm		960 m 33 min	640 m 22 min



STELLAVOX SWITZERLAND	POWER SUPPLY MODULE	17.00.31004.0

71. Fuse A
72. Fuse C 6,3 A slow FST
73. Fuse B
74. Mains connector + mains fuse
75. DC-supply connector (24-30 V)
76. Voltage selector : 110 to 260 V AC, 50/60 Hz
77. Mechanical ground
78. Electrical ground
79. Varispeed + preview (perfo 16 mm) connector J23
80. Remote control connector J22

super-slow	
1 A for 220 V and up 2 A for below 220 V	FTT

IMPORTANT : you find the detailed diagram of this connector on page 14.

71. Sicherung A
72. Sicherung C 6,3 A träge FST
73. Sicherung B
74. Netzanschluss mit Netzsicherung :
75. Batterieanschluss (24-30 V)
76. Netzspannungswähler : 110 - 260 V Wechselstrom, 50/60 Hz
77. Mechanische Erdung
78. Elektrische Erdung
79. Anschluss für externe Bandgeschwindigkeitssteuerung und Vorhören perfo 16 mm J23
80. Fernsteuerungsanschluss J22

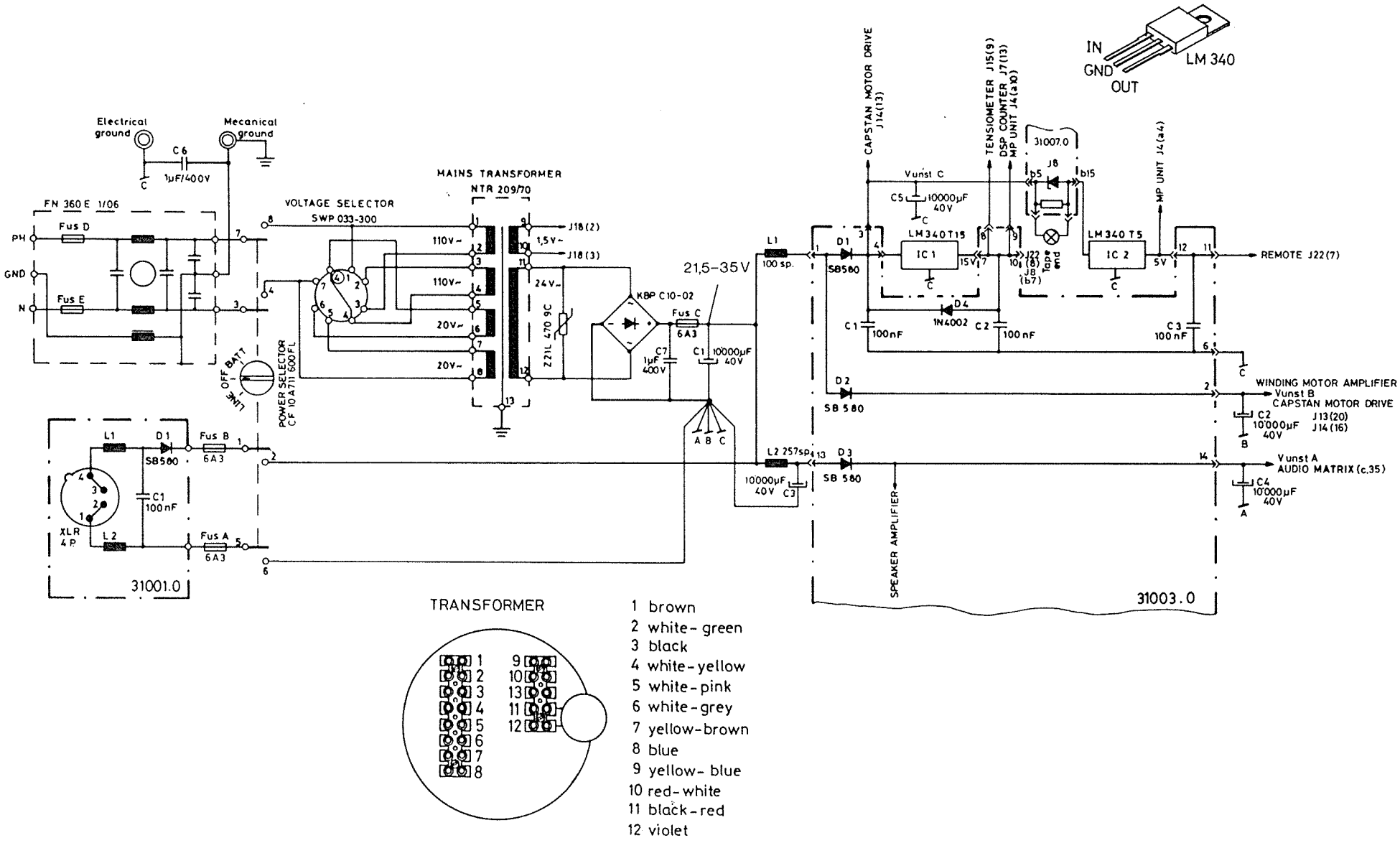
superträge	
1 A für 220 V und mehr 2 A für weniger als 220 V	FTT

WICHTIG : die Schaltung dieses Anschlusses ist auf Seite 14 zu finden.

71. Fusible A
72. Fusible C 6,3 A retardé FST
73. Fusible B
74. Prise secteur + fusibles secteur :
75. Connecteur alimentation DC (24-30 V)
76. Sélecteur de tension : 110 à 260 V alternatif, 50/60 Hz
77. Masse mécanique
78. Masse électrique
79. Connecteur variateur de vitesse + prélecture perfo 16 mm J23
80. Connecteur télécommande J22

super lent	
1 A pour 220 V et plus 2 A au-dessous de 220 V	FTT

IMPORTANT : le schéma détaillé de ce connecteur se trouve en page 14.



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POWER SUPPLY INTERCONNECTIONS

63.04.31001.0

5. CONNECTIONS OF THE RECORDER

5.1 Line (50 or 60 Hz) supply

Before connecting the TD 9 recorder (74) to the electrical mains by the 2 poles + ground cable (be sure of a correct ground), set the voltage selector (76) of the rear POWER SUPPLY MODULE (6) to the right voltage! Switch on by turning to the left the AC-DC POWER SWITCH (9).

5.2 DC- (24 V) supply

Connect by (75) to a proper battery (accumulator) with the 4-poles XLR-connector delivered with the machine. The cable resistance should be LOWER than 0,2 ohm!

IMPORTANT : both supplies connections AC and DC may coexist and are fuse-protected (71) (72) (73) (74), separately. Values of voltage limits and fuse types are indicated on the panel of the POWER SUPPLY MODULE (6). See drawing on the opposite page.

5.3 Remote Control

The 50-pole D-connector (80) installed on this same module (6) may be connected to various remote controls, according to various requirements. The TD-9 leaflet and the service section (§ 41) of this manual give all technical information and facilities.

5.4 Sound-Modulation

As already described, each "audio" card of any type inside the Headblock is fitted with a +6 dBm asymmetrical input and a +6 dBm asymmetrical output.

The rear L(ine)-Module (see next page) interfaces those cards in order to "balance" them as follows :

- Input : 10 Kohms, adjustable from the TOP of the recorder (from 0 dBm to 22 dBm) (LEVEL ADJUSTMENT (8) from 0,7 to 10 V.
- Output switchable and lockable : 1,55 V / 200 ohms or 4,4 V / 600 ohms. Adjustable from 0 to 1,55 V or from 0 to 4,4 V.

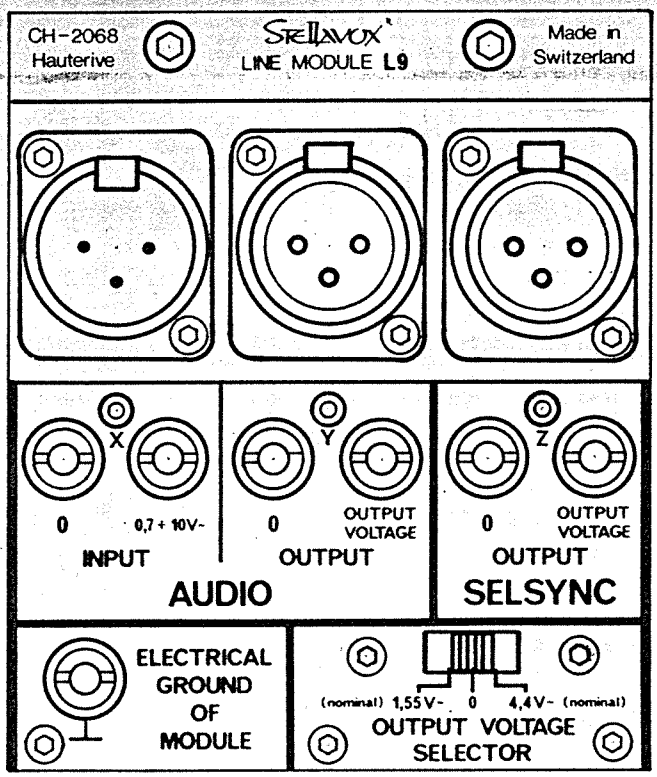
5.5 Cue-Reference Modulation

As above (5.4) for Synchronisation purposes. See following page. Output only 1,5 V (= +6 dBm).

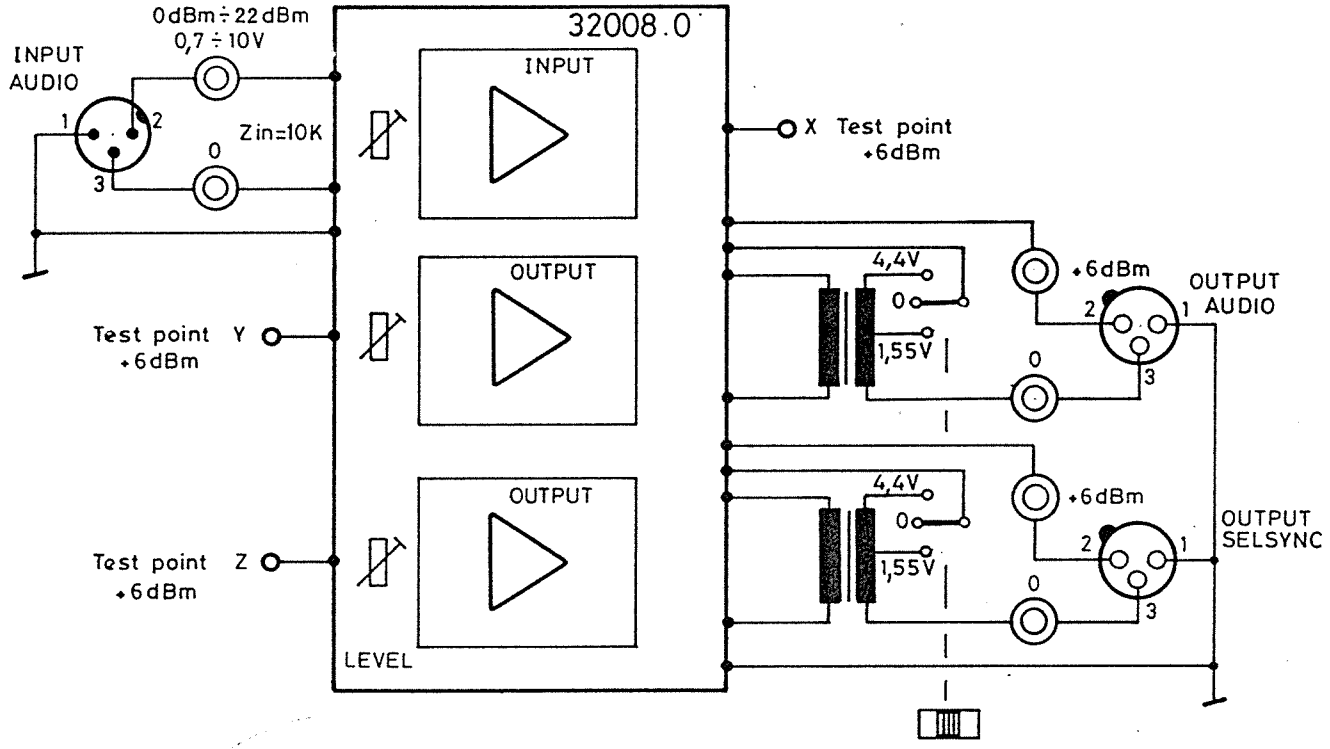
5.6 Speed Variator

Although a tape speed deviation of +/- 25 % is simply obtained by the SPEED ADJUSTMENT (49), it may be more practical to use an external frequency generator (varispeed) connected to the Binder 8-poles round connector (79) located on the Power Supply Module (6).

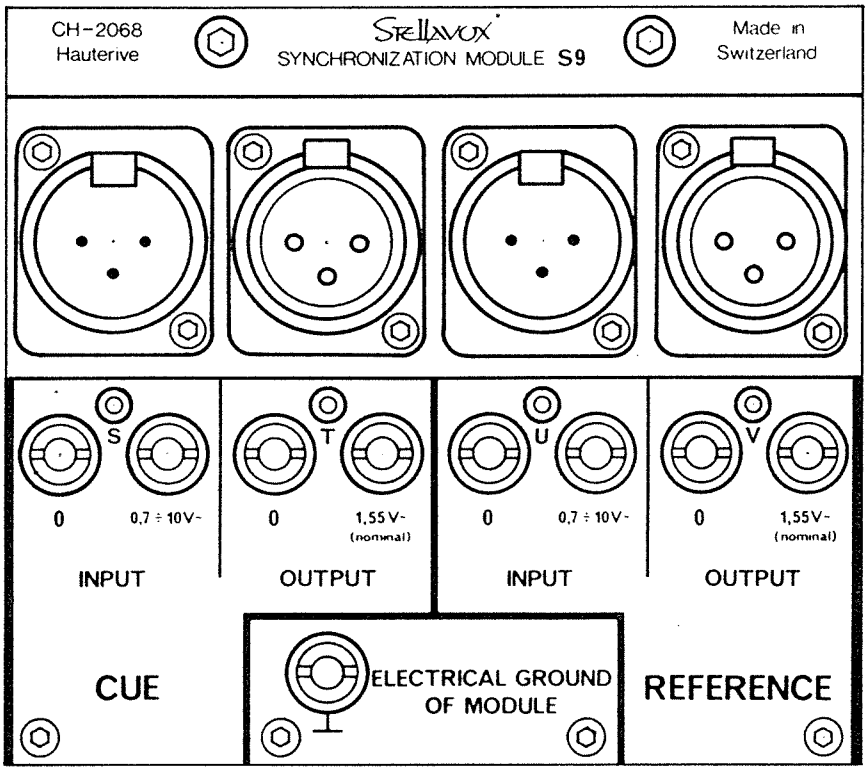
The nominal presetted speed is reached by a generator frequency of 1,6 kHz, square, 12 V peak to peak (open collector). The deviation range is larger than that obtained by the SPEED ADJUSTMENT.



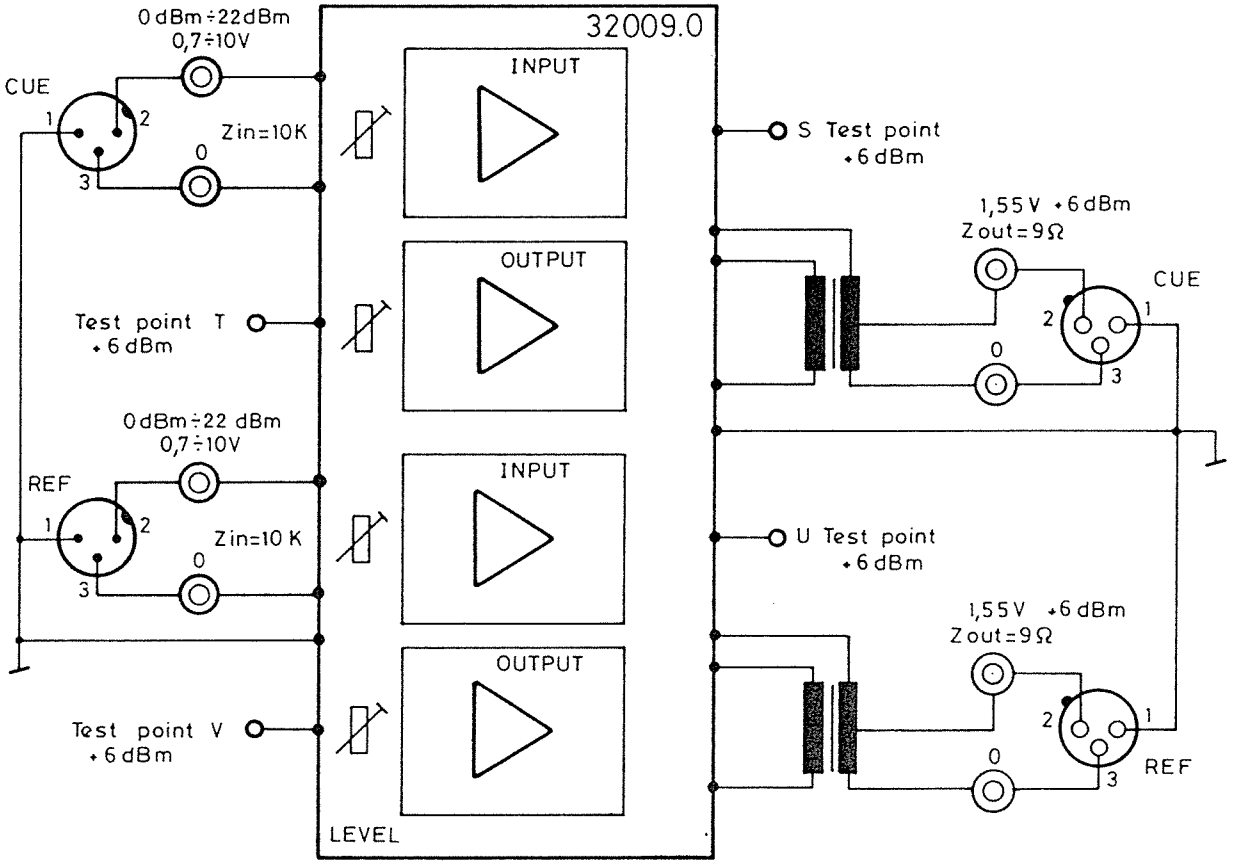
OPTIONAL:
XLR male or female



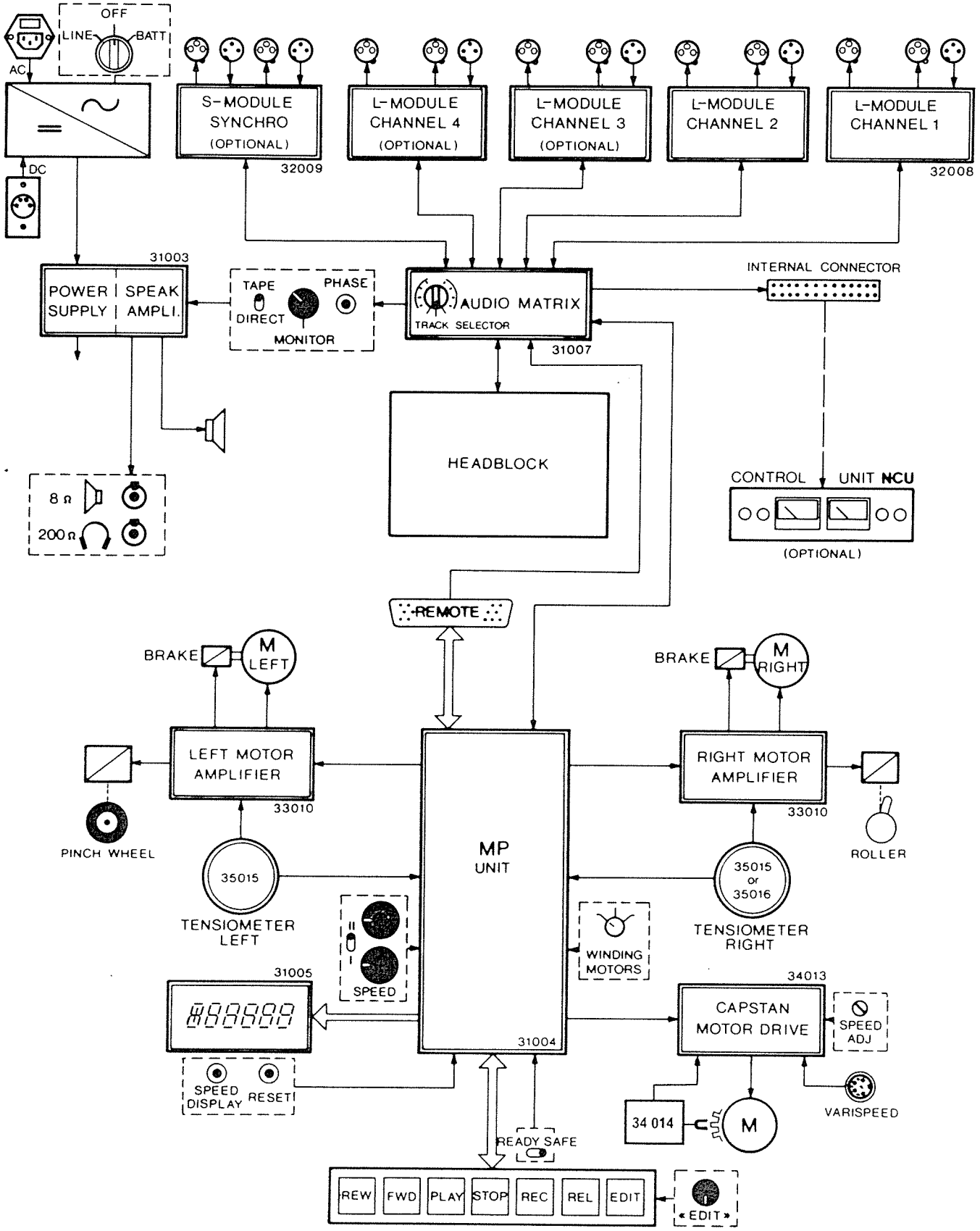
STELLAVOX SWITZERLAND	L-MODULE	17.00.32002.1



OPTIONAL :
XLR male or female



SWITZERLAND STELLAVOX	S-MODULE	17.00.32003.1



BLOCK DIAGRAM TD 9

6. FUNCTIONS AND OPERATING PROCEDURE

The professional Universal Tape Recorder TD 9 consists mainly of a tape deck including 3 DC servo motors for the tape drive, its microprocessorized electronics, the electromagnetic transducers ("sound heads") and the PB/RC audio amplifiers.

- The POWER SWITCH (9) turns the recorder on : Left for line supply, Right for accumulator supply. Before switching on, after first installation, check the correct position of the line voltage selector at the rear of the machine ! BE SURE OF YOUR LINE VOLTAGE !

  Check also the correctly chosen setting of :

- the WINDING MODE SELECTOR (14) is normally in center position. Turned to the right, it switches off the right take-up motor, for tape editing purpose. Turned to the left, it switches off both winding motors, for closed loop operation.

- the TAPE PATH SELECTORS (11) left and right : "no color" is for "oxide inside" operation with "C" tape path; "red" is for "oxide outside" operation, with "omega" tape path. This means four possible usable combinations : follow the engraved indications on the top plate of the recorder.

- the SPEED PRESELECTORS (20) the position of which must be in accordance with the EQUALIZATIONS MEMO (18) on the HEADBLOCK (42).

- the SPEED SWITCH (19) selecting the required speed between two preselections. No lighting of the SPEED SELECTOR II means no sub-card (for a 2nd equalization : this should be indicated by the "MEMO" (18).

- the TRACK SELECTOR (22) for the monitoring, either of the built-in LOUDSPEAKER (12) which is switched on with knob (26) pulled. Both HEADPHONE/SPEAKER OUTPUTS JACKS (25) are always connected. The SPEAKER jack delivers some watts stereo for direct ext. speaker monitoring without the need of a supplementary amplifier.

- the TAPE DIRECT Switch (24).

- The Tape Drive is controlled by the Keybord (27) to (39). To record : press simultaneously both keys "RECORD" (35) and "PLAY" (31). "STOP" (33) does not release the SMOOTHING ROLLER (40) in order to allow a fast and quiet starting, but only the PINCH WHEEL (45). The "Zero-Locate" is operated by the simultaneous pushing of both buttons (27) (29). The "EDIT" (39) function allows the smooth bi-directional tape drive either by the knob (41), either manually, but activating by hand only one reel (the largest).

  To release the brakes of both winding motor plates, depress "RELEASE" and "STOP"; this makes tape threading easier.

  The marking of the tape occurs exactly in front of the replay head by the MARKER (44) which operates automatically the "RELEASE" function for easy editing.

  IMPORTANT : you may easily remove the marker by unscrewing the black knurled button. To reinstall PUSH fully back the smoothing roller (40).

- The transducers are located in the plug-in HEADBLOCK (42) which accepts up to 6 magnetic heads, 1 to 5 tracks, even with special features : synchro, PCM, etc. for many tape sizes : 3,81 mm, 1/4", 1/2", perfo 16, 17,5 and 35 mm PE-film. This shows the unique possibilities of our modular system.

- The audio-amplifiers are plugged directly in the HEADBLOCK (42) as complete RP/RC cards, one per channel : each card contains all necessary circuits up to selsync = multitrack facility and bias oscillator 153,6 KHz for the type "B" audio card.

  The inputs + outputs of all those audio-cards (there are various types) are calibrated to +6 dBm unbalanced, which are fed to the symmetrisation Line-Modules or Sync.-Module at the rear of the TD 9. These plug-in Modules contain high quality, wide band balanced buffer amplifiers for all inputs and outputs. They have a typical voltage ratio 1 : 1, which may be calibrated from the top of the recorder by the multiturn LEVEL ADJUSTMENTS (8).

  Each audio card contains all the necessary multiturn trimmers for equalizations adjustments accessible directly from the top of the HEADBLOCK (42) after removal of its cover.

  Audio Sub-cards may be plugged onto the main audio cards to get a second equalization, switchable by the SPEED SWITCH (19) at the same time the tape speed is changed.

IMPORTANT :	3 headblock sizes are available :
- SHORT [4] ,	allowing room for 36 cm Ø reels and place for 4 cards, i.e. 2 channels + 2 equalizations.
- AVERAGE [6] ,	allowing 30 cm Ø reels and 6 cards, i.e. 2 channels + 2 equalizations + pilot card + 1 sync card.
- LONG [8]	allowing 26,5 Ø reels and 8 cards, usually for 1/2" tape, i.e. quadro (or four tracks) with 2 equalizations.

6.1 The Synchronization Facilities

As mentioned the TD 9 BASE is already prewired to match any sync. system, via its Remote Plug. The plug-in SYNCHRONIZATION Module (6) must be installed in the BASE in order to interface all balanced input and output sync. signals.

Some various more or less complex systems exist :

6.2 The Pilot-Neo-System

is the oldest standard for mono 1/4" tape, using a single 50 or 60 Hz frequency. Position (5) of an average [6] headblock takes the amplifier card for this head and pos. (6) accepts a particular "NQS" Sync card which resolves or writes the sync. signal, referred to line, crystal or external control.

6.3 The Synchrotone System

invented by Stellavox and internationally used as the standard, is a third thin central track between both sound tracks and may be used as above, but with the advantage of two sound tracks.

But the ability of the Synchrotone to accept a wide frequency range with low cross-talk, on the contrary of the neo-pilot, makes it suitable for TIME CODE SIGNAL RECORDINGS of any type and FM-Nagrasync as well.

The TD 9 may therefore act as MASTER for any track configuration as the cue track fits 1/4", 1/2", 16, 17,5 and 35 mm PE-perfo tapes, and as a SLAVE, provided the interfacing of a SYNCHRONIZER, like Adams Smith, Applied Microsystems, Audio Kinetics, Giese, GTC, Studer TLS 4000 (on option) (other in preparation 1987). Consult us.

6.4 The STELLALOCK

is the system (accessory available from STELLAVOX) which interfaces a recorder or projector or editing table, etc. giving a biphasic signal (48, 50 or 60 Hz) (for 24, 25 or 30 f/s) and a TD 9 (SLAVE) equipped for 16, 17,5 and 35 mm PE mm perfotape, the perforations of which will follow up.

6.5 Putting into operation

Thread the magnetic tape in the conventional manner, using the proper reels, DIN-hubs or NAB-hubs, etc.

Switch on (9) and operate with the push-buttons (27) to (39).

Operation with oxide outside is possible, for all kinds of tapes, left and/or right reel by switching left and/or right TAPE PATH SELECTORS Nr. 11.

7. HINTS FOR BEST RESULTS

It is easy to realize wonderful recordings, after some practical experience, by observing the following simple rules :

- Clean and demagnetize regularly the magnetic heads.
- Use high quality tape, preferably the type for which your tape recorder was calibrated (that calibration may be easily modified anytime in case of use of another tape type, see chapter B 8).
- Please care for a regular and adequate maintenance : see section B.

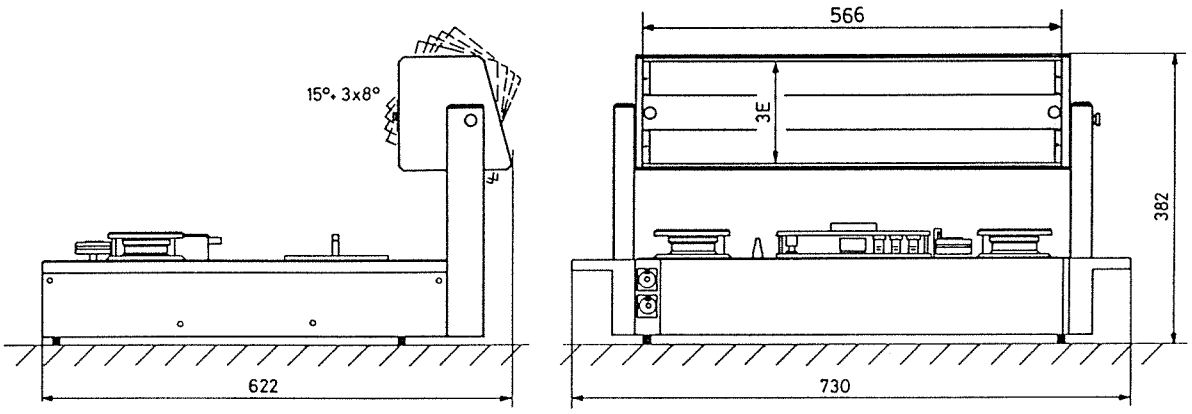
8. ACCESSORIES

The TD 9 recorder line enjoys a line of accessories which is continuously growing. Detailed informations are regularly sent to your local distributor, or directly to you if you write us with your address and wishes. Our address :

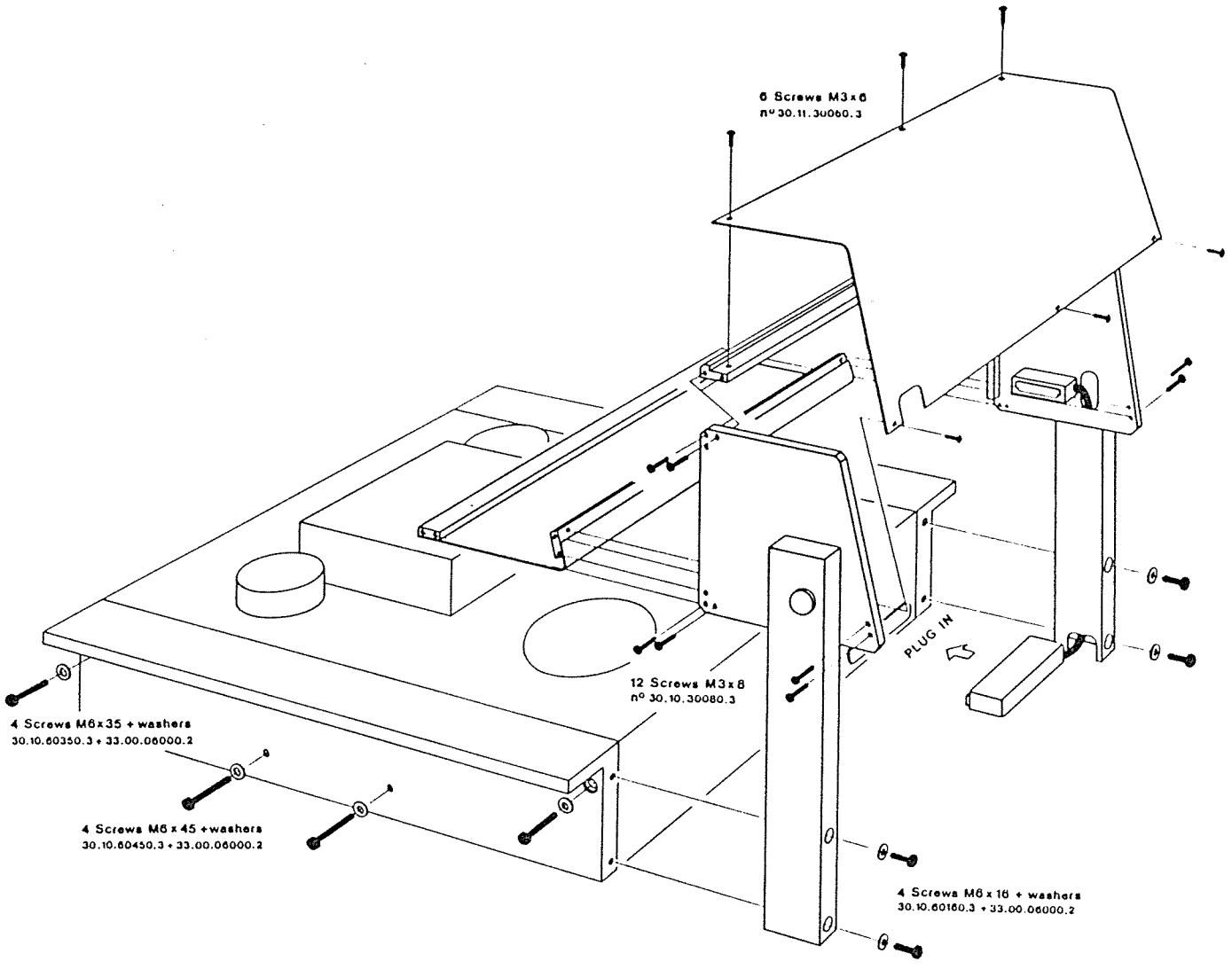
STELLAVOX CH-2068 Hauterive Phone : 038 33 42 33 - Tx : 952 783

9. PENTHOUSE, CABINET AND RACK INSTALLATION

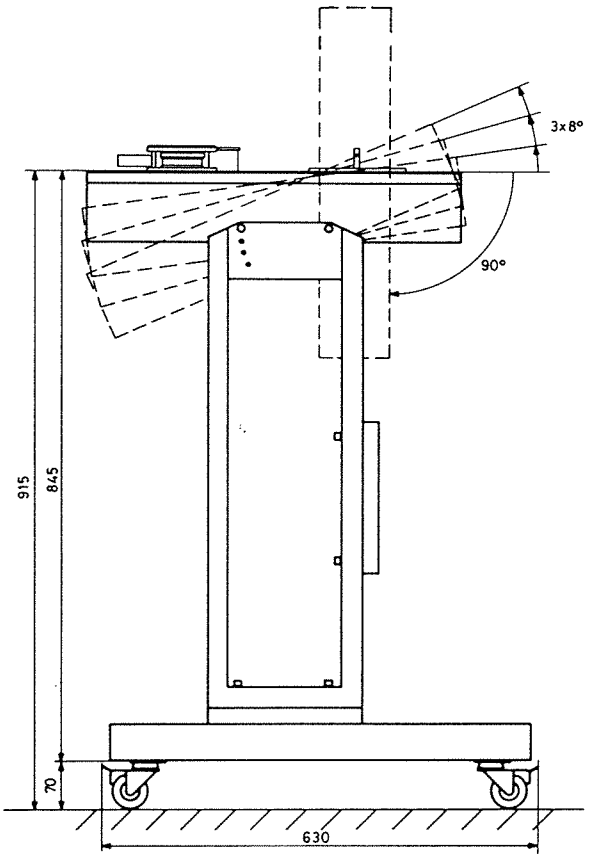
The following drawings show all important details about them.

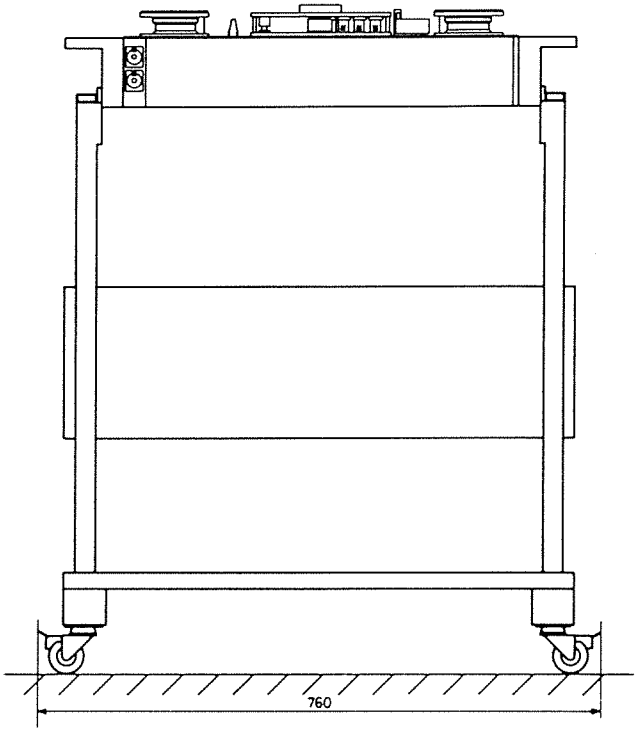


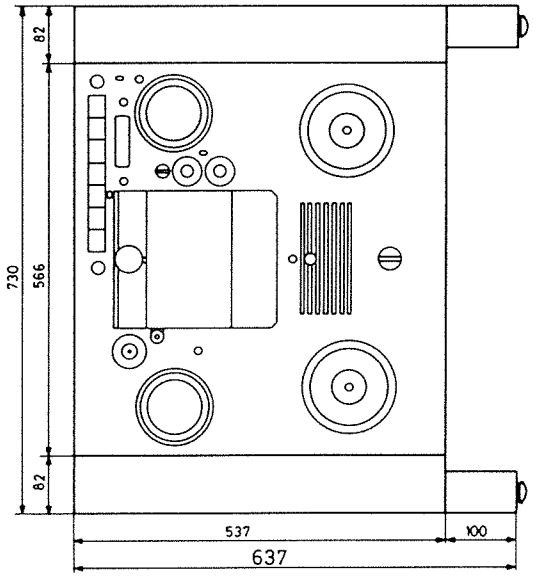
All dimensions in
Alle Abmessungen in — mm
Toutes dimensions en



SWITZERLAND STELLAVOX	PENTHOUSE dimensions and mounting	17.00.37001.0



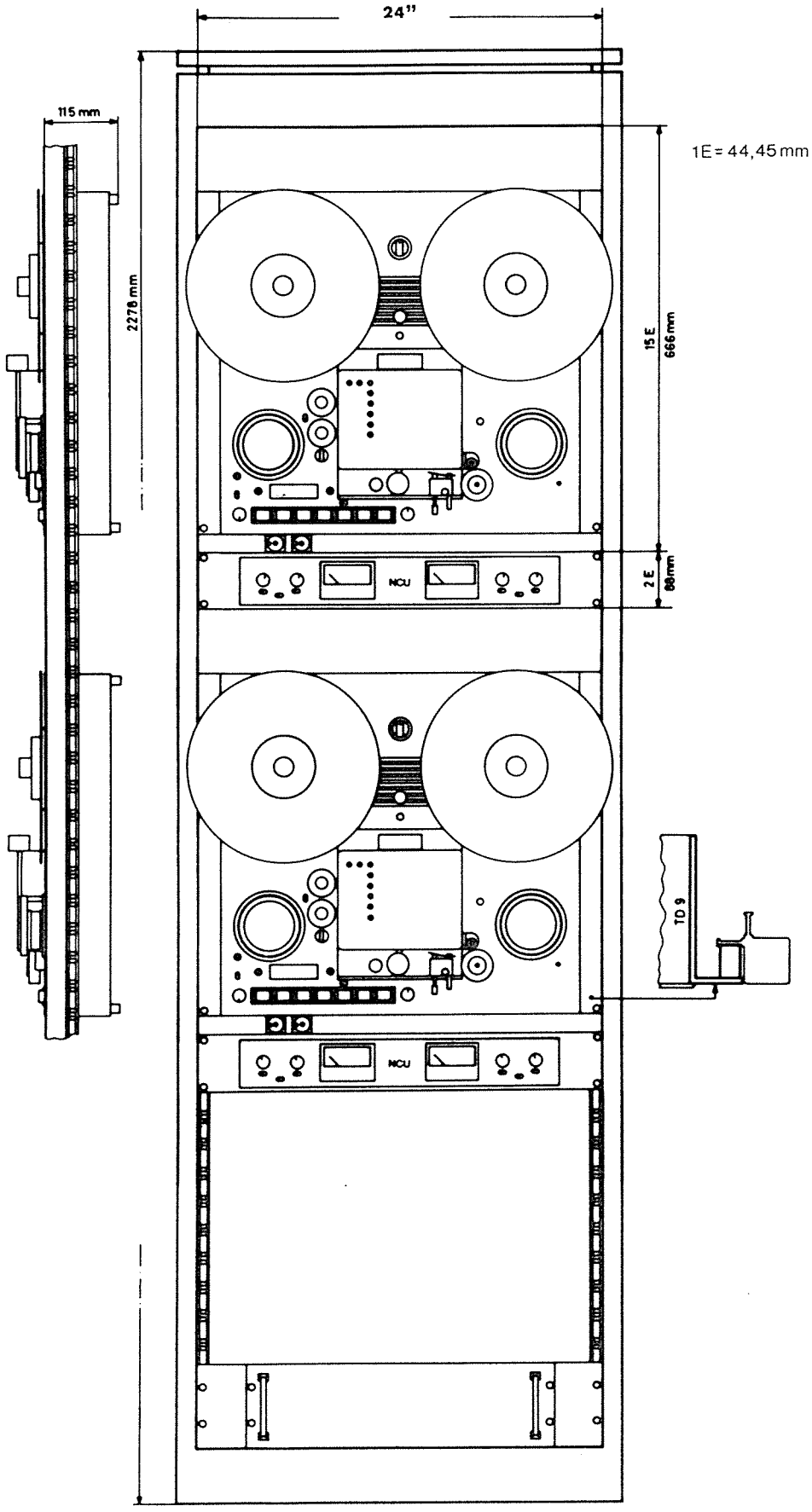




All dimensions in
Alle Abmessungen in
Toutes dimensions en
mm

WEIGHT 15,5 Kg

SWITZERLAND STELLAVOX	ANF CONSOLE DIMENSIONS	17.00.37005.0


24"
115 mm
2278 mm
1E = 44,45 mm
15 E
666 mm
2 E
88 mm
MCU
MCU
TD 9

B. MAINTENANCE

11. INTRODUCTION

By regular maintenance it is possible to prevent many difficulties which could occur with any professional machine suffering of lack of maintenance, and also to increase the life of the machine.

12. WARRANTY

Our products are guaranteed against manufacturing defects for the period indicated at delivery. This guarantee is valid only for replacing or repairing the obviously recognized faulty parts in our factory or for the free of charge delivery of same (in exchange of the returned faulty parts) if circumstances should not allow us to carry out the repairs in our own workshops. We cannot reimburse any cost incurred for repairs done outside our workshops. Our guarantee becomes void if alterations or repairs have been carried out without our previous written consent. No cost for transport, damages, loss of income etc. can be claimed. STELLAVOX reserves the right of further modifications and improvements. That does not bind STELLAVOX to execute further improvements and modifications under warranty on earlier delivered recorders and accessories.

Our warranty does not include any cost, i.e. research, interconnections, special adjustments, electronical or mechanical interfaces, travelling expenses of our technicians, etc. which could be required by the integration of our equipment into a system.

13. MEASURING CONDITIONS

The following TEST SHEET § 14 reports the individual measurements of your TD 9 recorder, according to following standards and/or conditions.

1. The Power Drain is measured with an accurate Wattmeter, indicating the true RMS power (and not the product V.A.). One must give full attention to the exact RMS line voltage at the moment of the mesurement, as the power drain is approximately proportional to the square of the voltage. Example : if the line voltage is 230 V (nominal 220 V) during the measuring, the power drain will be about 10 % higher than the rated value.

2. By measuring the Power Drain in the Record and in the Fast Winding function we get two interesting values, by which various functions are engaged, allowing a first check.

3/4. Similar considerations as above may easily be achieved with DC supply. Please use a good stabilized, possibly variable DC power supply, with at least 10 A possibility.

5. A reel of 730 m magnetic tape 1/4" or 1/2", or a roll of 320 m perfofilm PE 16, 17,5 or 35 mm is wound fast to the empty reel from left to right or reverse. This operation is accurately timed in seconds.

6. Among many methods used to measure accurately a tape speed, the use of a calibrated tape having a single frequency magnetisation, is the best (the choice of 3810 Hz recorded at 38,1 cm/s simplifies the determination of the actual tape speed; or the choice of 1000 Hz at a given speed gives immediately the error percentage). An accurate frequency counter is necessary.

   But, for measuring a speed deviation, the necessary Wow + Flutter Meter indicates it directly :

   Record, at the beginning of the tape, the 3150 Hz and set the W+F-M exactly to zero. Reverse then both reels so that the beginning will be at end; replay : the W+F-M will show (2 x) the speed change from beginning to end.

7/8. This measurement is made not only overall, but also Record, Rewind and Play.

9. An accurate comparator (micron precision) should be used to measure a possible capstan excentricity, which should be within +/- one micron (clean the capstan before the measurement).

10. Mark the tape beginning, reset the counter to zero, wind forward 90 % approximately of the total length and rewind back to the mark : the counter should reach zero +/- the tolerated error (tape slip).

11. Proceed as above, but rewind back by depressing both buttons (27) (29) for ZERO-LOCATE.

12. A special instrument (TENTELOMETER, etc.) is necessary to measure the mechanical tape tension during its transport.

13. This measurement requires a scope connected to the output of the W+F-M.

14. Simply estimated with a stop-watch.

15. See 12.

16/17. As inputs and outputs of the L-Modules are adjustable (8) (typ. + 6 dBm) it is necessary to know for which level(s) this recorder was set.

18. Playing back a STANDARD REFERENCE TAPE, section operating level, the magnetisation of which is indicated, should give a zero dB Playback for each channel, zero dB being the voltage mentioned under 16/17.

19. A 1000 Hz pure sine wave signal is recorded entering the level as mentioned under 16. The output should be that mentioned under 17. Please use the same type of tape that machine was calibrated for !

20. The recorded tape section, as 19, is rewound and replayed to measure its content of total harmonic distortion (or 2nd and 3rd).

21. The second half of a similar (+4 dB) recording may be erased (record without any input signal!) and the amplitude ratio of both sections (please use a good 1 kHz bandpass filter!) indicates the erase efficiency.

22/23. Similar as under 21 but using an adequate filter. Notice that our figures refer to 0dB level for the standard DIN 468 peak and to +4dB for ASA A standard. The extensive chart mentioned in the TD 9 leaflet (last page) gives all possible indications.

24-26. Here the S/N ratio is measured without tape running (machine noise only) and per 3 standards. The equivalent figures should be some dB better than with tape.

27-33. All the measurements of the CUE TRACK are identical to those concerning an AUDIO TRACK as described from 18 to 26.

34/35. A recorded signal at f = ... (50 or 1000 or 10.000 Hz) at a given level, on the Cue Track generates some crosstalk into the adjacent audio track, the ratio of which expresses the quality of the separation. Not indicated values : f, l are chosen (and indicated in the Test Report) according to the destination of the Cue Track : pilotone, time code etc.

37-40. Frequency responses are measured as under 18/19 but 10dB lower, in order to avoid high frequency saturation of the tape.

General Note : Some figures depend upon the quality of the Reference Tape (azimut, etc.), the used tape and the measurement proceeding, making some deviations unavoidable compared to our Test Report.

TEST REPORT FOR RECORDER TD 9

Nr:

All mesurements are made with 730 m tape for 1/4", 1/2" or 320 m for perfotape

Tape Format: L.tensiom.Nr: R.tensiom.Nr: Date:

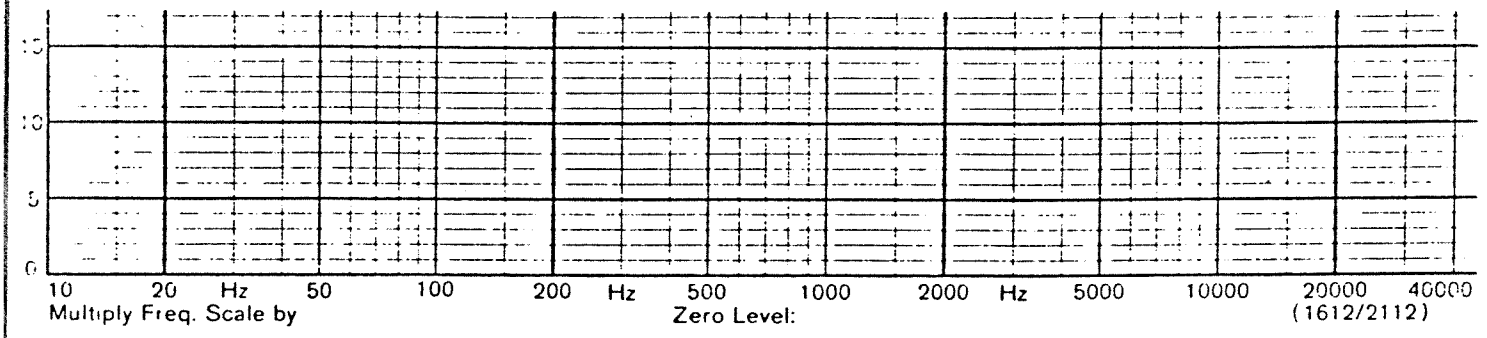
Capst.motor Nr: L.W.motor Nr: R.W.motor Nr: Tested by

1	Power drain with AC supply (220V)	Record		W
2		Fast Winding		W
3	Current drain with DC supply (26V)	Record		A
4		Fast winding		A
5	Tape transfer time			s
6	Speed change from beg. to end of tape			%
7	Wow + flutter DIN 45507 peak weighted at	v1 =		%
8	(with hubs Ø 100 mm)	v2 =		%
9	Capstan excentricity			µm
10	Tape timer accuracy			s
11	Zero locator accuracy			s
12	Tape tension at v =	beg./end		N
13	Starting time at v =	for 0,1% flutter weighted		s
14	Stopping time from fastwind mode			s
15	Max. tape tension			N
16	Input reference level			dBm
17	Output reference level			dBm

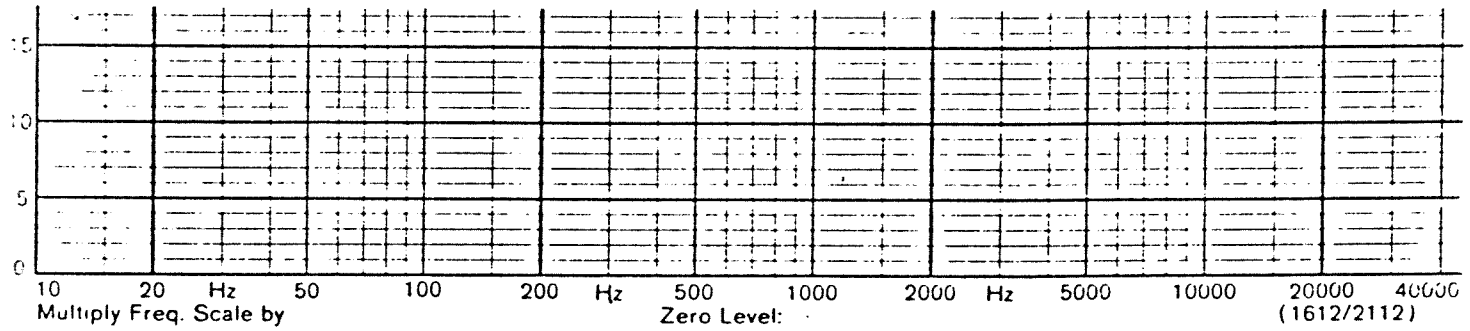
NHB Nr.:	Tape type:	Speed II =		Speed I =		
NHB Type:	Standard :	CH-1	CH-2	CH-1	CH-2	
18	PLAYBACK: tape reference level (nWb/m)					dB
19	RECORD + Output for 0dB recording level					dB
20	PLAYBACK: Tot. harm. distorsion at 0dB					%
21	AUDIO TRACKS Erase efficiency 1 kHz re +4dB					dB
22	Signal to noise DIN 468 peak re 0dB					dB
23	ratio via tape ASA A re +4dB					dB
24	Signal to noise DIN 468 peak re 0dB					dB
25	ratio without tape ASA A re +4dB					dB
26	LINEAR rms re 0dB					dB
27	PLAYBACK: tape reference level (nWb/m)					dB
28	RECORD + Output for 0dB recording level					dB
29	PLAYBACK: Tot. harm. distorsion at 0dB					%
30	CUE TRACK Erase efficiency 1 kHz at +4dB					dB
31	S/N ratio via tape DIN 468 peak re 0dB					dB
32	S/N ratio without tape DIN 468 peak re 0dB					dB
33	LINEAR rms re 0dB					dB
34	Cross talk on sound track at					dB
35	Cross talk on sound track at					dB
36						

FREQUENCY RESPONSES

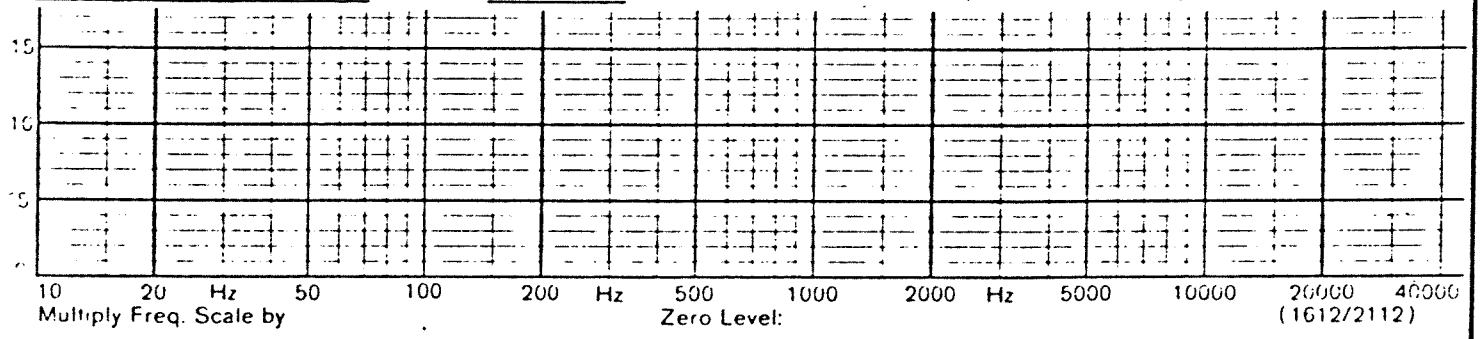
PLAYBACK SPEED I = cm/s f/s



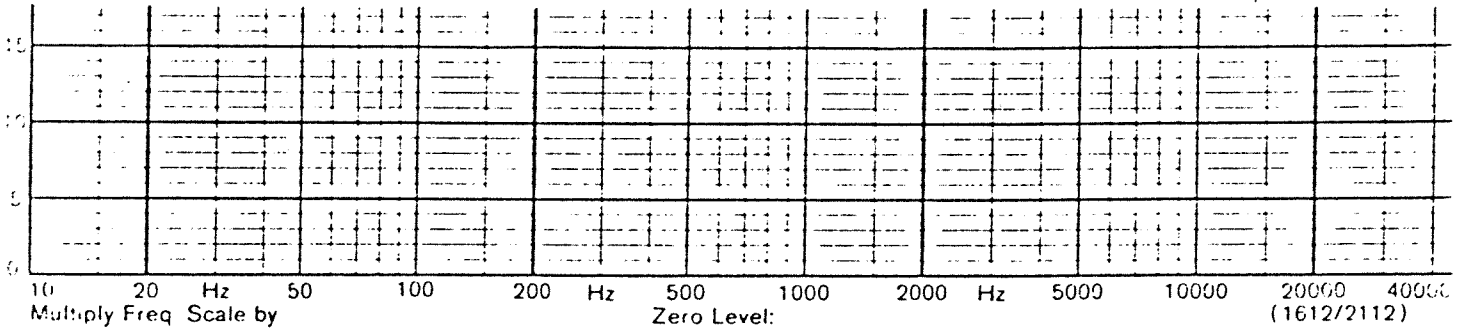
PLAYBACK SPEED II = cm/s f/s



RECORD + PLAYBACK SPEED I = cm/s f/s



RECORD + PLAYBACK SPEED II = cm/s f/s



NOTE: - RP levels at 10 dB below operating level
- CH-1 = green CH-2 = red
- One division = 1 dB

15. GENERAL MAINTENANCE

The maintenance should be secured by an authorized technician according to a schedule which may be :

- weekly (or daily by intensive use or before any important recording): careful cleaning and demagnetisation of the heads, guides, capstan. pinch wheel, etc.
  Check accuracy of tape speed (28) (49). Don't forget the "winding motor selector (14).

- monthly : control of the important specs, cleaning of the pinch wheel (45).

- yearly : Control of all specs and of the electromechanical figures. Possible replacement (if necessary) of the pinch wheel (45), of the brakes pads: remove left and right plates (10), Replacement of the 3 belts of the capstan motor assembly (see § 25). General (light) oiling of pivots and bearings, never oil the ball-bearing and NEVER all four magnetic armatures! Cleaning of the whole recorder (dust, tape deposit, grease). Replacement of any dubious part. Check out also the winding motor brushes.

  All this depends on the intensity of the use : the operating hours indicated on the display by each switching on of the TD 9 will help; as also the TEST REPORT § 14.

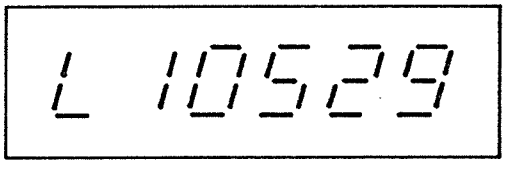
IMPORTANT : use only pure alcohol for cleaning any part : heads, capstan, pinch wheel, etc.

DISPLAY INFORMATION : By switching on the recorder TD 9, either from line or battery supply, the green display indicates first, during some seconds, the total operating hours of the machine; this shows the running hours of the capstan motor and bearings, etc.

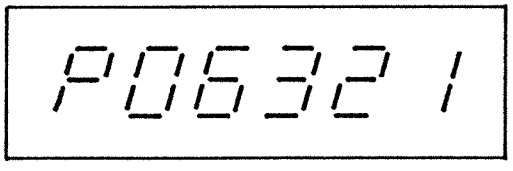
The display indicates then, also for some seconds, the operating hours of the recorder running PLAY or RECORD. This shows particularly the heads wear, as also winding motors (brushes) running time.

Then the display indicates the tape counting (last information).

1. total op. hours

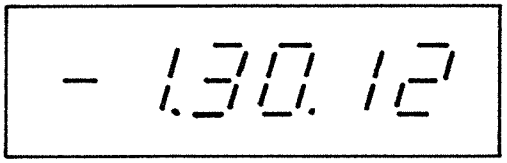


2. running hours

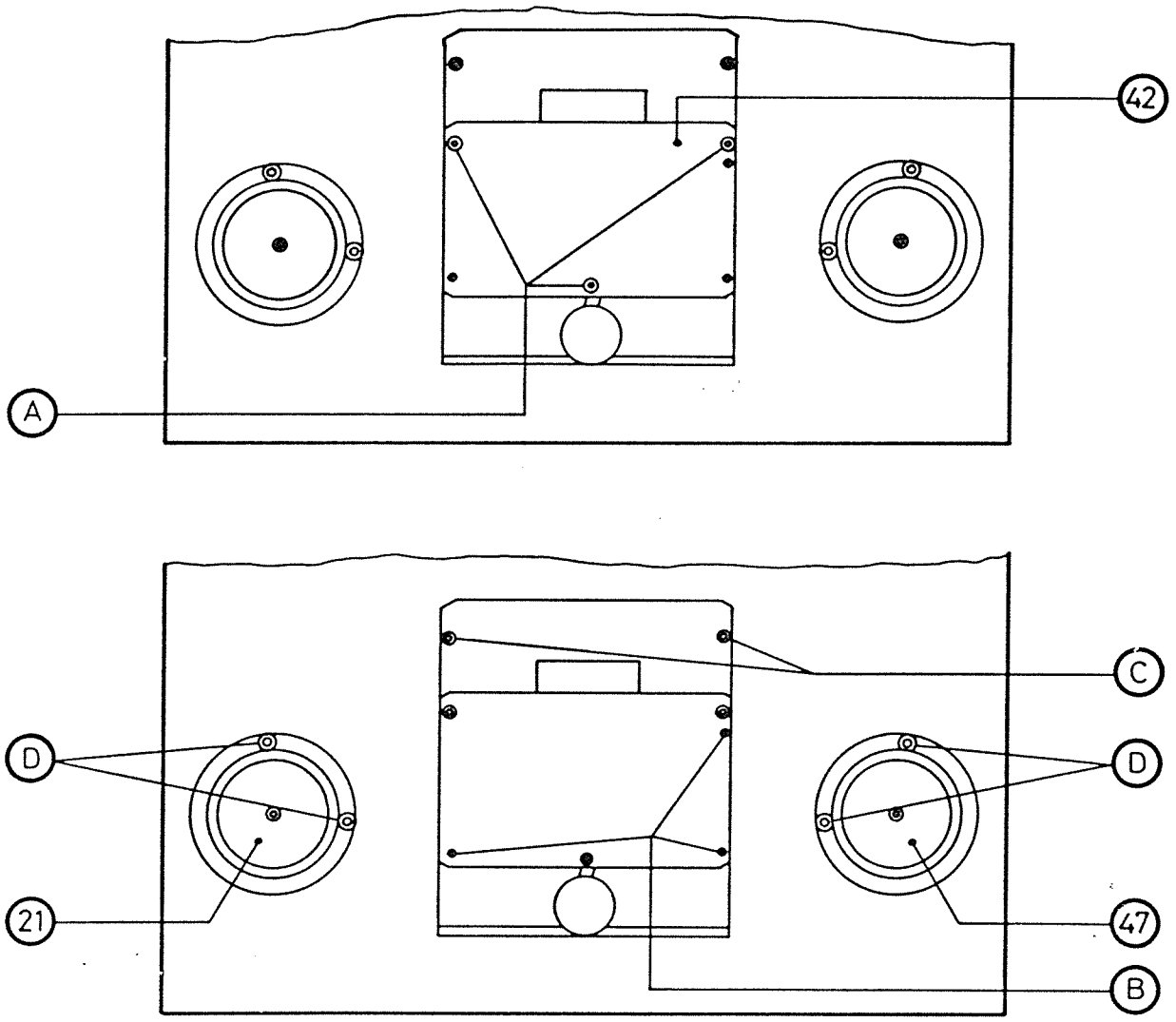


See also § 35, page 69

3. counter memory



4. zero reset



47. Right tensiometer
21. Left tensiometer
42. Plug-in headblock
A. 3 screws M3x6 No. 30.69.30003.7
B. 3 black screws M4x30 No. 30.10.40030.3
C. 2 screws M3x6 No. 30.69.30003.7
D. 2 screws No. 30.19.40003.7

47. Rechtes Tensiometer
21. Linkes Tensiometer
42. Steckbarer Tonkopfträger
A. 3 Schrauben M3x6 Nr. 30.69.30003.7
B. 3 schwarze Schrauben M4x30 Nr. 30.10.40030.3
C. 2 Schrauben M3x6 Nr. 30.69.30003.7
D. 2 Schrauben Nr. 30.19.40003.7

47. Tensiomètre droit
21. Tensiomètre gauche
42. Bloc porte-têtes enfichable
A. 3 vis M3x6 no 30.69.30003.7
B. 3 vis noircies M4x30 no 30.10.40030.3
C. 2 vis M3x6 no 30.69.30003.7
D. 2 vis no 30.19.40003.7

16. EXCHANGE OF TENSIOMETERS

IMPORTANT : Before exchanging any module, please switch off the recorder.

The reason for exchanging a module may be :

a) to service the recorder which failed precisely in this module. Replacing it instantly by another spare, precalibrated, allows the immediate pursuit of the recording session, without immobilizing the complete recorder for a long time.

b) to change over the application of the recorder : size of tape, for example 1/4" tape to perfo 16 mm,
   - track configuration, for example stereo to two-tracks + synchro-tone, etc.

Unscrew both imbus screws (D) and pull firmly, but delicately the tensiometer (21) at the left and (47) at the right. Both are identical for 1/4" and 1/2" but different (automatically locked) for perfo 16 mm, 17,5 mm and 35 mm. Replace by another, taking care of the connector and proper location.

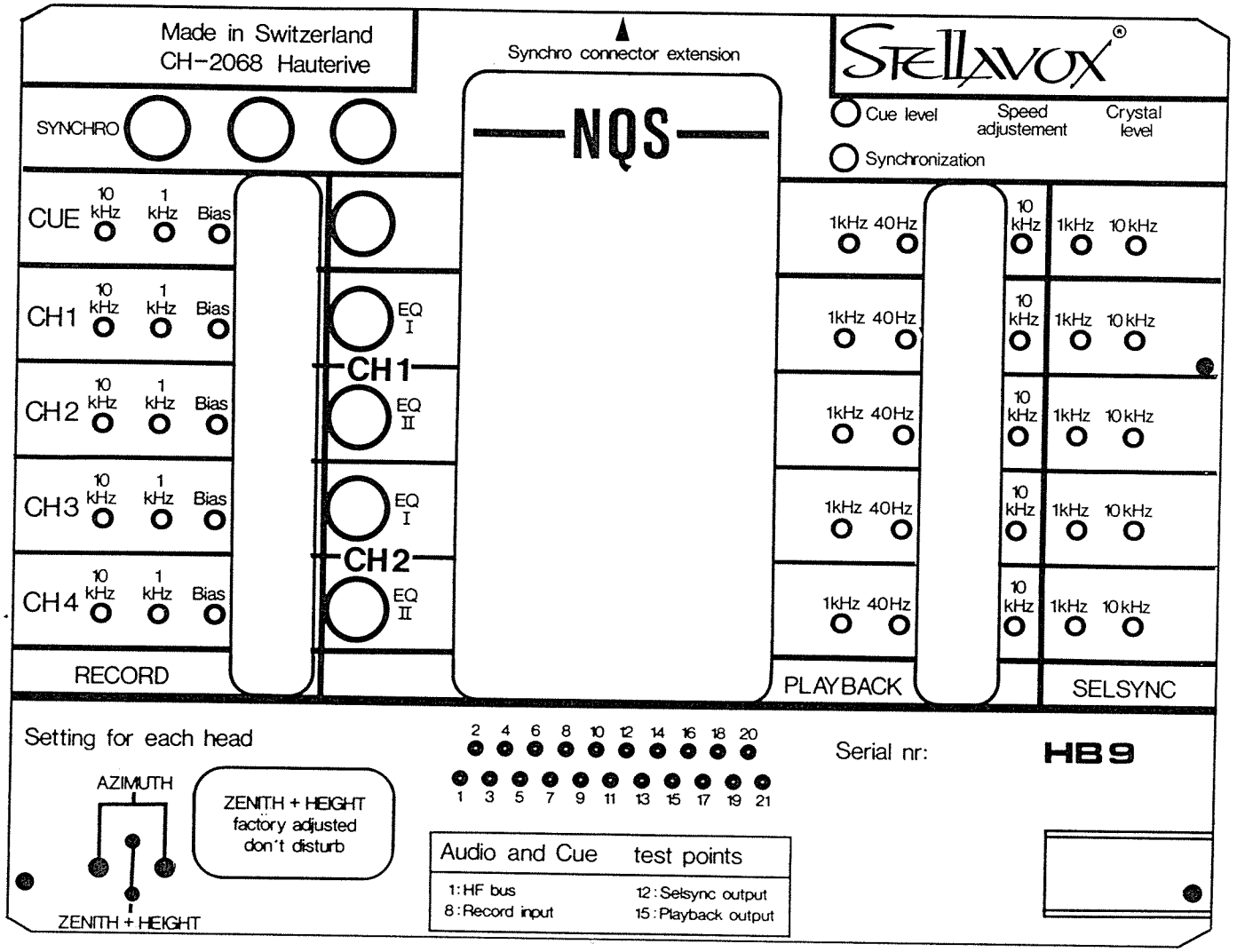
17. EXCHANGE OF HEADBLOCKS

Similar to 16. Unscrew the three imbus screws (b) and pull firmly but delicately (all audio-cards come with the block) the complete block. If the other block has another length (there are 3 types : 4 / 6 / 8 pos.) you should compensate with an adequate (ore more) plate fixed by the screws (C).

18. CALIBRATION PROCEEDINGS

All adjustments are accessible by removing the headblock cover fixed by the 3 screws (A).

The following simple proceeding requires no intervention inside the recorder TD 9 and allows the setting of the specs within the standards and also the recalibration for a new tape type or the equalizations for other speeds.

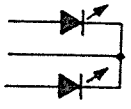


AUDIO + CUE

1. HF bus 153,6 kHz
2. GND record head
3. Erase head
4. Record head
5. GND erase head
6. Ground A
7. EQ II bulb
8. Record IN
9. V. unst. A
10. Record info
11. Mono info
12. Selsync OUT
13. Mode (Ready, Safe, Sync)
14.
15. Playback OUT
16. EQ II info
17.
18. Ground A
19. GND playback head
20. Mono bridge
21. Playback head

NQS

HF bus 153,6 kHz
Line ref. 1,55 V
GND line ref. 1,55 V
Info 30 frames
Info 24 frames
Cue IN
External ref. IN
Reference OUT
V. unst. C
Record info
Record/Play info
Speed correction
Mode (Ready, Safe, Sync)
Tach signal 50 Hz
Signal from Cue OUT
Test point (ref.)
Test point (Cue OUT)
Ground C



SYNCHRO

CUE

18.1 Checking and adjustment of the tape speed

MUST BE READJUSTED FOR ANY CHANGE OF TAPE THICKNESS !

Pressing the "SPEED DISPLAY" button (28) displays (30) the present tape speed in cm/s with one decimal.

Adjusting the multiturn (10 turns) trimmer "SPEED ADJUSTMENT" (49) calibrates accurately the tape speed. Using a higher speed (say 76,2 cm/s) claims for a better accuracy.

Check against 25 resp. 30 frames/sec for perfotapes.

18.2 Checking the gain of the L-Module

The nominal input and output levels of the "audio"-cards of the headblock (42) are always +6 dBm = 1,55 V, for a magnetic flux of typically 514 nWb/m. The possible overload is approx. 11 dB.

As the buffer input/output amplifiers of the L-module are connected between the "audio"-cards of the headblock and the in/out plugs at the rear of the recorder it is necessary to know, i.e. to adjust the gain of those amplifiers with the built-in trimmers (8) accessible from the bottom of the recorder. The proceeding is similar for the S-Module (if any).

> Note : A change-over switch included in each L-Module allows to switch the output of both "audio" and selsync signals either to 1,55 V nominal or 4,4 V nominal. Please check for adequate switching !
>
> The S-Module, which is calibrated typically for +6 dBm, does not offer this facility.

- Adjusting the INPUT-Gain

  Connect a signal generator or your mixing console, etc. (1 kHz low impedance) to the "audio" input and measure the output at point X of the concerned L-Module.

  Adjust the input trimmer (8) on the bottom plate at the top of the recorder in order to get also 1,55 V at point X. Proceed similarly channel by channel. The equivalent test points of the S-Module are "S" for "cue" and "U" for "reference".

- Adjusting the OUTPUT-Gain

  Thread and playback a test tape 1 kHz having your operating level and measure the output level. Calibrate the output trimmer (8) in order to get your usual operating signal level at the L-Module output.

  Attention : see above Note. Proceed similarly channel by channel.

  ALL THE ABOVE PROCEEDING IMPLIES CORRECT EQUALIZATIONS OF THE HEADBLOCK - CARDS : SEE § 18.3 and § 18.4.

18.3 Playback Equalization

Connect the TD 9 to the proper measuring instruments and play a TEST TAPE (REFERENCE TAPE).

The section 1 kHz is generally magnetized 320 nWb/m giving a typical output at point Y of +6 dBm (mono) and +2 dBm (stereo = 514 nWb/m) when properly adjusted by the trimmer "1 kHz" of the playback section of the headblock (see figure opposite page).

The coarse azimuth (coarse because 1 kHz; this avoids possible error of secondary max. if azimuth is checked only by 10 kHz) is also checked and if necessary readjusted by the proper screws (see figure). Tighten them firmly but not too much. The Zenith and the height of the heads are supposed to be correct. The next section of the tape : 10 kHz at -10 dB allows the adjustment of accurate azimuth, for maximum signal output. In stereo, the phase of both channels may be used (instead of the maximum method). THIS IMPLIES THAT THE MICROMETER SCREW IS POSITIONED IN THE MIDDLE OF ITS EXCURSION RANGE.

The 10 kHz output trimmer (see figure) is then adjusted for -10 dB below the 1 kHz full level.

The following sections of the reference tape are used for the frequency response check-up. The trimmer 40 Hz (see figure) allows the best even level (attention to the "bumps") of the lowest frequencies.

To check the correct centering (stereo 0,75 mm only) of both tracks, use a special test tape having a thin centertrack 1 kHz : its reproducing should induce the same level (approx. -30 dB) on both channels; if not, readjust carefully the height of the playback head and recheck the azimuth after this operation. To control the height of the record head, use the same principle, but switching the record head to selsync (or connecting it temporarily to the PB channel : the levels are then approx. -40 dB).

18.4 Recording Equalization

The following adjustments imply necessarily the proper playback calibration described before.

Use the chosen tape type, as indicated in the TEST REPORT § 14, wind it forward and backwards, in order to ensure a proper and stable tape transport.

Three main adjustments are possible : bias amplitude, 1 kHz and 10 kHz levels. As the results are interdependent, the following proceeding should be repeated a few times ("check and try" proceeding) in order to reach the best compromise :

a) feed a 1 kHz signal nominal level at the input and measure (a scope control is a must) the output (overall) signal. Remember that the L-Module Line Output is always connected to the playback, and therefore not affected by the switching "TAPE DIRECT" (24) or the "TRACK SELECTOR" (22), which are effective for the jacks (25) only.

b) check the coarse azimuth of the record head (don't touch the playback head) as under § 18.3.

c) adjust the trimmer "bias" (see figure) for maximum output signal.

d) feed 10 kHz at -10 dB and check carefully the accurate azimuth, as under § 18.3.

e) readjust the bias in order to get the maximum output signal (10 kHz), and then increase the bias (trimmer clockwise) in order to decrease that signal some 2 or 3 dB, according to the tape type and tape speed.

f) it is also possible to use carefully the criterium of the distortion (first minimum) of 1 kHz full level signal, (800 nWb/m) or the criterium of the "basic noise level".

IMPORTANT : All trimmers and variable capacitors accessible from the top of the headblock allow adjustments excursion, starting from a correct, factory-calibrated recorder. If it is necessary, for any reason, to obtain larger excursions, some R/C values on the board itself may be altered : see section C.

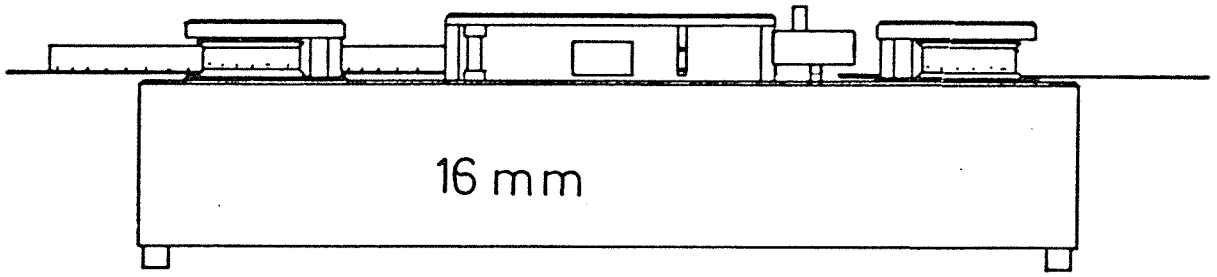
19. IN CASE OF TROUBLE

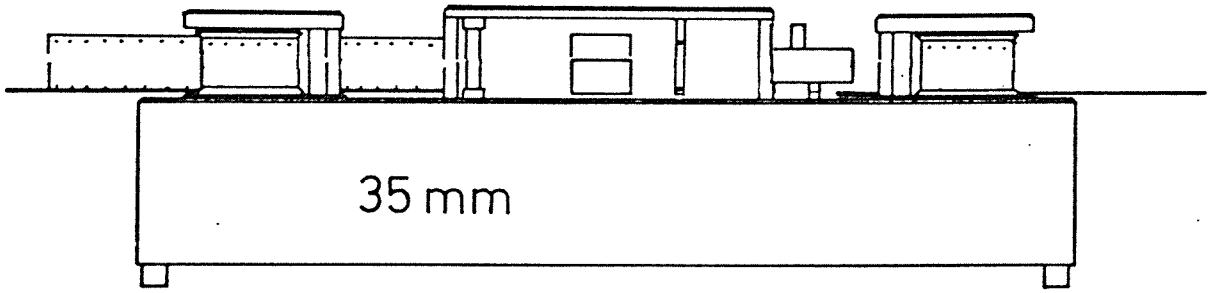
In most cases a machine showing some operational trouble does not need service. Control carefully the various § of the first section : A. OPERATION, particularly § 5 and § 6 : possibly some switch was inadvertendly changed over, for example :

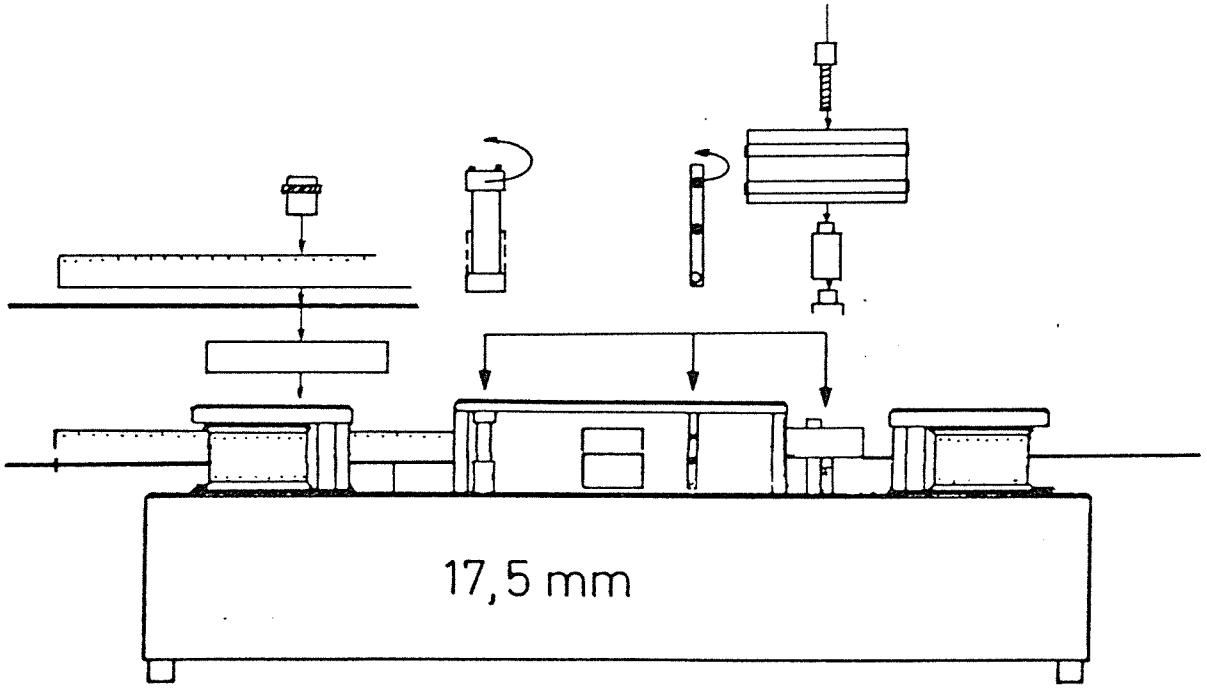
- if the "TAPE DIRECT" switch (24) is switched to "direct", no sound will be heard from the Monitoring (headphones or speakers) connected to (25), as long as a tape is played back.

ANYWAY, BEFORE RETURNING YOUR RECORDER TD 9 (to your distributor or to us) TAKE UP CONTACT WITH YOUR LOCAL AGENT OR WITH US :

STELLAVOX CH-2068 Hauterive Phone : 038 33 42 33 - Tx : 952 783


16 mm


35 mm


17,5 mm

SERVICE INSTRUCTIONS

C. S E R V I C E

21. PREPARATION AND REFERENCE

If the maintenance part of this manual (see past section B, § 11 to § 19) helps to keep the Stellavox TD 9 recorder in perfect operating condition for years, and to adapt his functions to new ones, by exchanging modules, the service section to a good general and detailed comprehension of that recorder, and helps to repair possible failures of the machine, whatever their origin.

IMPORTANT : The modularity of the TD 9 allows often the simple and quick exchange of a defective module, for later repair, during which time the recorder may operate without interruption. Please make use of this unique facility but this requires the stock of the pre-adjusted modules.

If the TD 9 recorder requires a general service or a complete overhaul, its installation on the console ANF (see end of section A : Operation) is preferable.

A very stable suspension is secured by that ANF console which may support the recorder TD 9 vertically, for best access.

In emergency, you are allowed to put the recorder up, standing either on the left, right or front side.

REFERENCE : by measuring specs of the TD 9 recorder, please consider the international standards : the explanatory § 13 may help. For ordering parts, please refer to the No which is indicated throughout all diagrams of this manual.

22. NECESSARY EQUIPMENT AND TOOLS

A. Mechanics

1 Flat Screwdriver No. 00 *
1 " " " 1
1 " " " 3
1 " " " 4
1 Allen Screwdriver " 2 *
1 " " " 3 *
1 " " " 4
1 " " " 5
1 " Key " 089 *
1 " " " 2 *
1 Box Spanner " 5,5
1 " " " 8
1 " " " 10
1 " " " 13
1 " " " 14
1 Monkey Wrench " 5
1 Flat nose Plier
1 Cutting Plier
1 Pair of Tweezers
1 Soldering Iron (small)
1 Set of Gauges for Heads adjustment °
1 Set of Reference Tapes
1 Tentelometer (to measure tape tension) □
1 Watch-Clock □

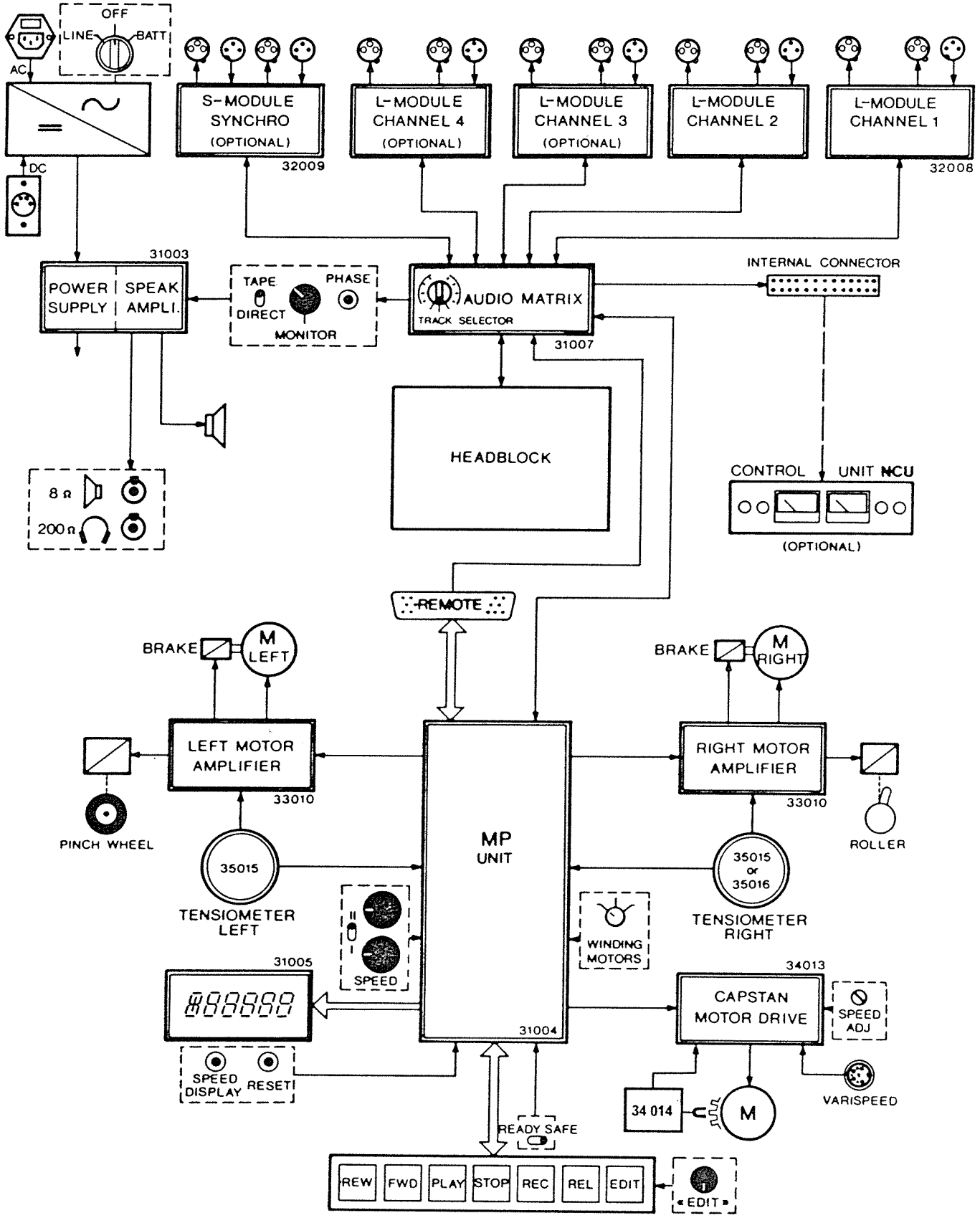
* all these tools (and some other parts) are contained in the bag delivered with each recorder.

° on special order □ facultative

B. Electronics

1 Double Trace Scope
1 Audio Generator 10 Hz - 100 kHz, low distortion, low input impedance, adjustable 0 to 10 V
1 Distortion Analyser
1 Accurate Multimeter
1 Frequency Counter (w. good trigger)
1 Audio Voltmeter 20 Hz - 200 kHz) with very high AC impedance probe, for bias voltage measurement
1 Wow + Flutter Meter
1 Resistors Decade
1 Stabilized adjustable DC Supply (20 - 30 V 10 A) □
1 Wattmeter □
Connecting Cables

IMPORTANT : please switch off the power AC or DC before any internal intervention.



BLOCK DIAGRAM TD 9

23. The TD 9 BLOCK DIAGRAM

The drawing on the opposite page shows the main electronic and electro-mechanical elements pertaining all the "audio" and "drive" functions of the magnetic tale.

The TD 9 operates basically from a single positive 24 V +/- 10 % (4 A) DC-supply.

N.B. The electronic supply of the TD 9 (like all other STELLAVOX products is NEGATIVE GROUNDED.

Both electrical and mechanical grounds are separated, and accessible to both terminals (77) (78) on the SUPPLY MODULE (6). See page 12.

According to the local conditions (ground loops, etc.), these terminals must be or must not be interconnected.

A built-in supply, including the various stabilized voltages from the card 31003, allows the TD 9 also to be fed by any AC line voltage from 110 to 260 V, 50 or 60 Hz, approx. 120 VA.

The 50 poles REMOTE connector includes the MICROPROCESSOR CONTROL (in both directions in/out) and the varispeed control. External accessories, like Time Code synchronizers, (Q-Lock, Giese, GTC, etc.) or biphasic synchronizers (STELLALOCK), or remote controls/display, or Varispeed etc. are simply connected to this REMOTE connector.

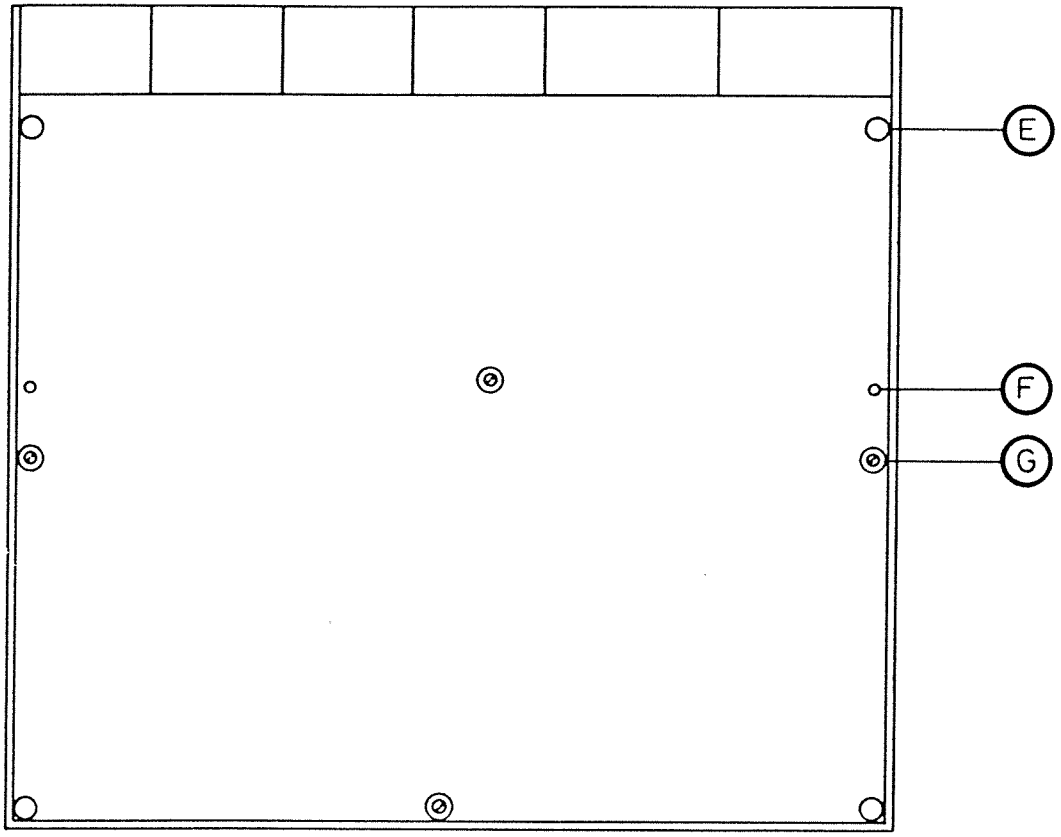
The various commands are processed by the uP unit 31004 receiving also the digital informations from both tensiometers and acting upon :

- both WINDING MOTORS and all 4 magnetic actuators (2 brakes, 1 pinch wheel lever, 1 main lever) through both identical cards 33010 which contain the necessary drivers and receive also the "tape tension" and analog information from both tensiometers.
- the card 34013 controls the various capstan speeds which are also coupled through the uP to the DISPLAY 31005, not forgetting the preselection for both equalizations I/II.

  The ANALOG "audio" signals (modulation) are buffered by the L-Modules; "Synchro" signals by the S-Module as well.

Last but not least, the HEADBLOCK is the heart of the TD 9 and contains all "audio" cards; a front CONSOLE NCU (optional accessory) including METERS, can also be plugged in, being connected to the internal connector of the TD 9 BASE.

It is also possible to install a penthouse at the rear of the recorder, accepting the "STELLALOCK ASB" synchronizing (biphase) unit.



E. 4 rubber feet No. 35.00.0074.0.0
F. 2 screws M6x8 No. 30.40.60080.3
G. 4 screws M4x10 No. 30.50.40100.1

E. 4 Gummi-Füsse Nr. 35.00.0074.0.0
F. 2 Schrauben M6x8 Nr. 30.40.60080.3
G. 4 Schrauben M4x10 Nr. 30.50.40100.1

E. 4 pieds de machine no 35.00.0074.0.0
F. 2 vis sans tête à six pans creux M6x8 30.40.60080.3
G. 4 vis tête cônique à fente M4x10 no 30.50.40100.1

24. THEORY OF THE TD 9 RECORDER

Enjoying 30 years of designing and producing small professional portable selfcontained recorders, STELLAVOX entered the field of studio recorders some years ago.

Right from the start, our idea was different from all conventional realizations : we created a future-oriented technology made possible only using throughout the MODULARITY PRINCIPLE by which you enjoy with STELLAVOX products always (with 90 %) matched to your needs, now and later.

This unique conceipt means no limit to your creativity, even by future changes of the technical standards or simply of your application field.

Practically, you may receive a recorder exactly matched to your requirements, selected from many various possible combinations, all realized simply from a line of few modules as shown in the price list.

Later on, if you need another configuration of your recorder, you have the facility, within the numerous possibilities of that system, to adapt easily and at reasonable cost, your recorder to the new standard, maybe stereo to quadro, 1/4" tape to perfo tape 16 mm, etc.

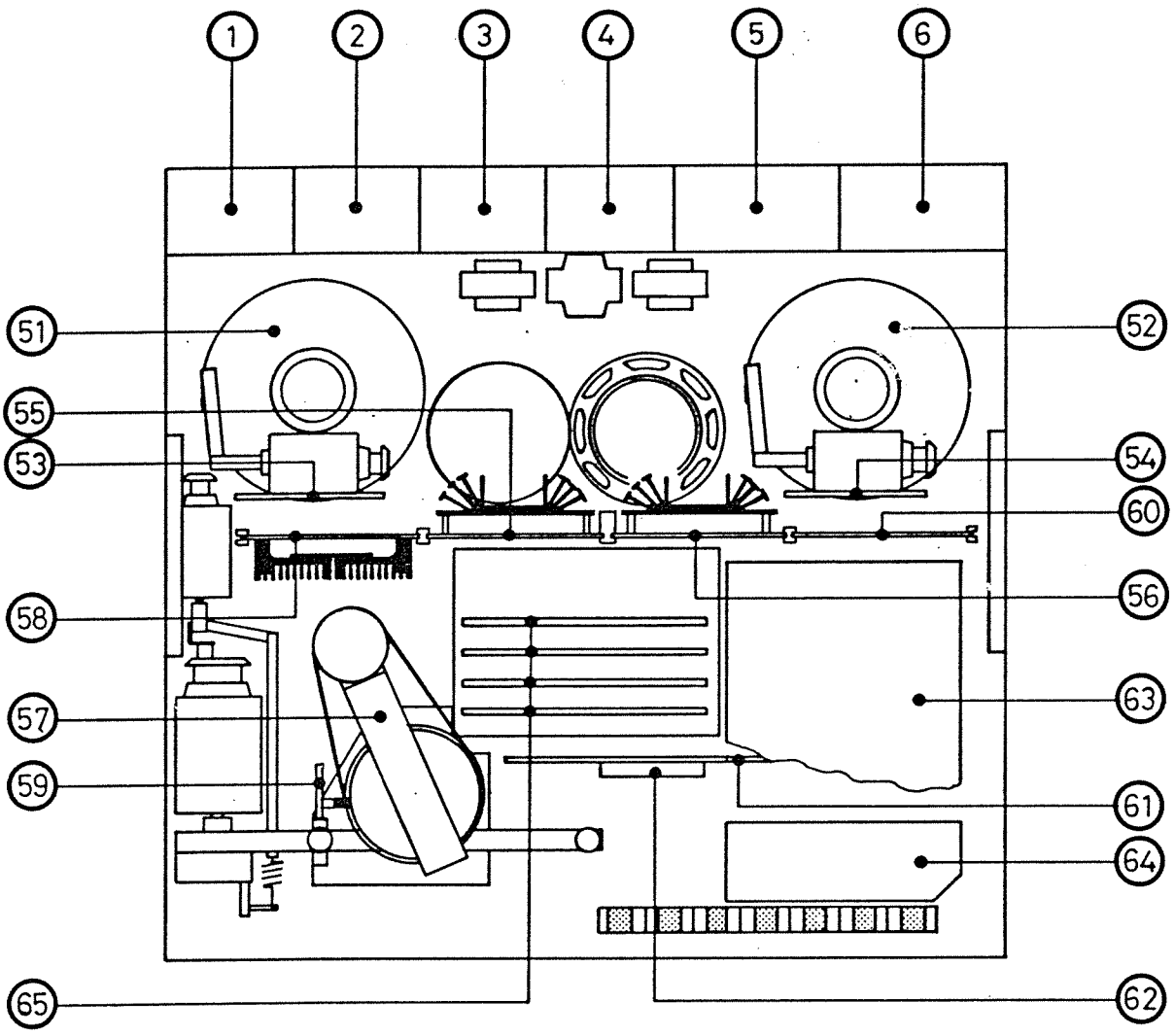
25. OPENING THE RECORDER

Place the recorder, either on the console ANF or lay it flat, bottom up, on a bench, with a soft and thick foam in order to protect the top face of the machine. With care it is also possible to place the TD 9 on its front face.

Unscrew all 4 rubber feet (E) and all 4 screws (G). Remove the cover.

Both screws (F) fasten the intermediate blocks matched to the trolley ANT.

CAUTION : please take care of all screws and small parts, not to lose them, as many are special.



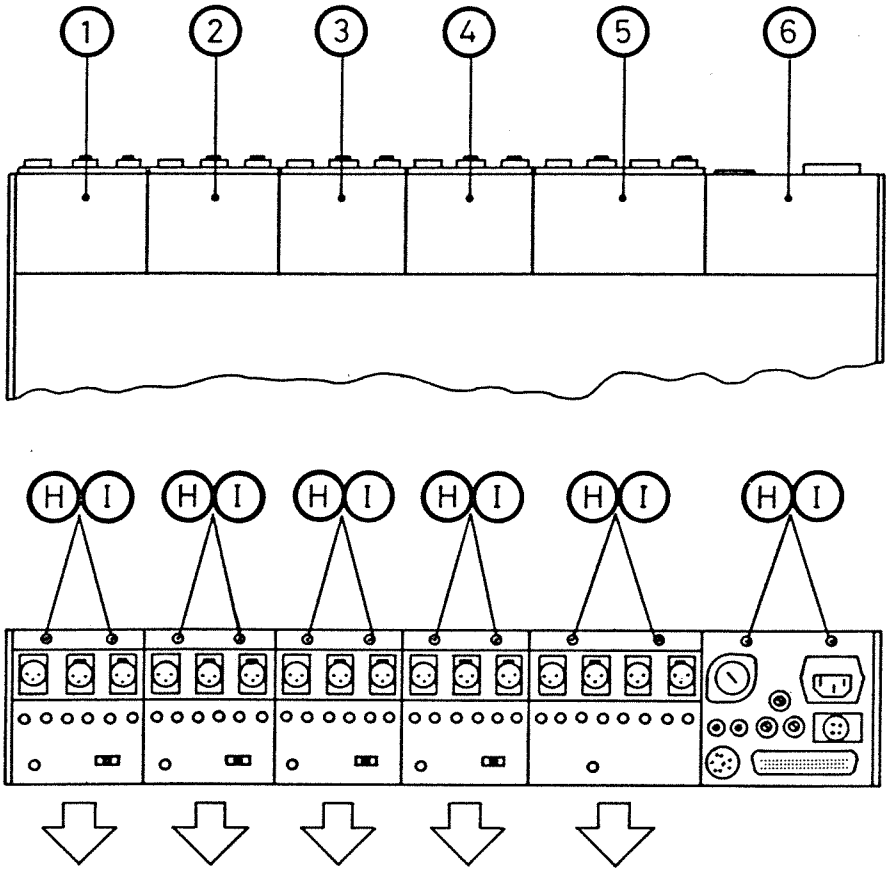
SWITZERLAND STELLAVOX	INTERNAL LAYOUT	

26. LAY-OUT OF THE UNITS AND CARDS

51. Right winding motor
52. Left winding motor
53. Right winding motor connection board
54. Left winding motor connection board
55. Right winding motor amplifier board
56. Left winding motor amplifier board
57. Capstan-motor assembly
58. Capstan-motor drive board
59. Opto-sensor tachometer board
60. Power supply and speaker amplifier board
61. Audio matrix board
62. NCU connector for ext. console
63. µP unit board
64. Display counter board
65. Audio cards of the headblock

51. Rechter Aufwickelmotor
52. Linker Aufwickelmotor
53. Verbindungkarte rechter Aufwickelmotor
54. Verbindungskarte linker Aufwickelmotor
55. Schaltung rechter Aufwickelmotor
56. Schaltung linker Aufwickelmotor
57. Kapstan-Motor-Gruppe
58. Schaltung Kapstanmotorsteuerung
59. Schaltung Opto-Tachymetrie
60. Schaltung der Speisungen + NF-Verstärker
61. Schaltung Audio-Verteiler
62. NCU-Konnektor für ext. Geräte
63. Schaltung des Mikroprozessors
64. Schaltung "Anzeige"
65. "Audio"-Steckkarten des Tonkopfträgers

51. Moteur bobine droit
52. Moteur bobine gauche
53. Carte connexion moteur droit
54. Carte connexion moteur gauche
55. Carte ampli moteur bobine droit
56. Carte ampli moteur bobine gauche
57. Bloc moteur cabestan
58. Carte asservissement moteur cabestan
59. Carte opto-tachymétrique
60. Carte alimentation + ampli HP
61. Carte carrefour audio
62. Connecteur rampe NCU
63. Carte microprocesseur
64. Carte affichage
65. Cartes "audio" du bloc porte-têtes



1. Plug-in LINE Module Channel 1
2. Plug-in LINE Module Channel 2
3. Plug-in LINE Module Channel 3
4. Plug-in LINE Module Channel 4
5. Plug-in SYNCHRONIZATION Module
6. POWER SUPPLY Module
H. 2 black screws M4x8 No. 30.10.40080.3
I. 2 washers No. 33.90.00201.5

1. Steckbares L-Modul, Kanal 1
2. Steckbares L-Modul, Kanal 2
3. Steckbares L-Modul, Kanal 3
4. Steckbares L-Modul, Kanal 4
5. Steckbares S-Modul, Synchro
6. Speisungs-/Fernbedienungsmodul
H. 2 schwarze Imbusbolzen M4x8 Nr. 30.10.40080.3
I. 2 Unterlegscheiben Nr. 33.90.00201.5

1. Module-L enfichable, canal 1
2. Module-L enfichable, canal 2
3. Module-L enfichable, canal 3
4. Module-L enfichable, canal 4
5. Module-S enfichable, synchro
6. Module d'alimentation et télécommande
H. 2 vis cyl. six pans creux M4x8 no 30.10.40080.3
I. 2 Rondelles no 33.90.00201.5

27. THE PRINCIPLE OF THE L(INE)-MODULES

The rear of the TD 9 BASE (see figure opposite page) accepts up to four plug-in LINE-MODULES and one plug-in SYNCHRO-MODULE.

If less modules are necessary (for instance only two audio modules and no synchro module, in the case of a simple stereo recorder), the empty spaces are simply filled by a blank corner plate.

REMOVING A L- or S-MODULE :
Unscrew both screws (H) (I) and PULL firmly but with care the module in direction of the bottom, parallel to its front face. It is not necessary to remove the bottom plate. SWITCH OFF THE RECORDER BEFORE. To install a module, proceed reciprocally.

CAUTION : HOLD FIRMLY THE MODULE BY UNSCREWING (H) (I) to prevent its fall.

28. DIAGRAM OF THE L-MODULE

Next pages show the detailed

- Print LINE MODULE L9 - Circuit LINE MODULE L9

which are self-explanatory. Consider that each module has its own voltage stabilizer, for best separation. The three level calibration trimmers (10-turns) are accessible from the top plate of the recorder.

Note the switchable outputs ("audio" and "selsync") 1.55 - 0 - 4,4 V.

29. THE PRINCIPLE OF THE S(YNCHRO)-MODULE

This single Module is somewhat longer than the L-Module, having 4 connectors (instead of 3), in order to buffer 2 inputs and 2 outputs. The S-Module is requested only if any synchronization proceeding or cue track is requested; the TD 9 recorder will be delivered, for instance, as a simple stereo recorder, without an S-Module, by simply removing the blank corner plate (5) and plugging the S-Module (see § 27).

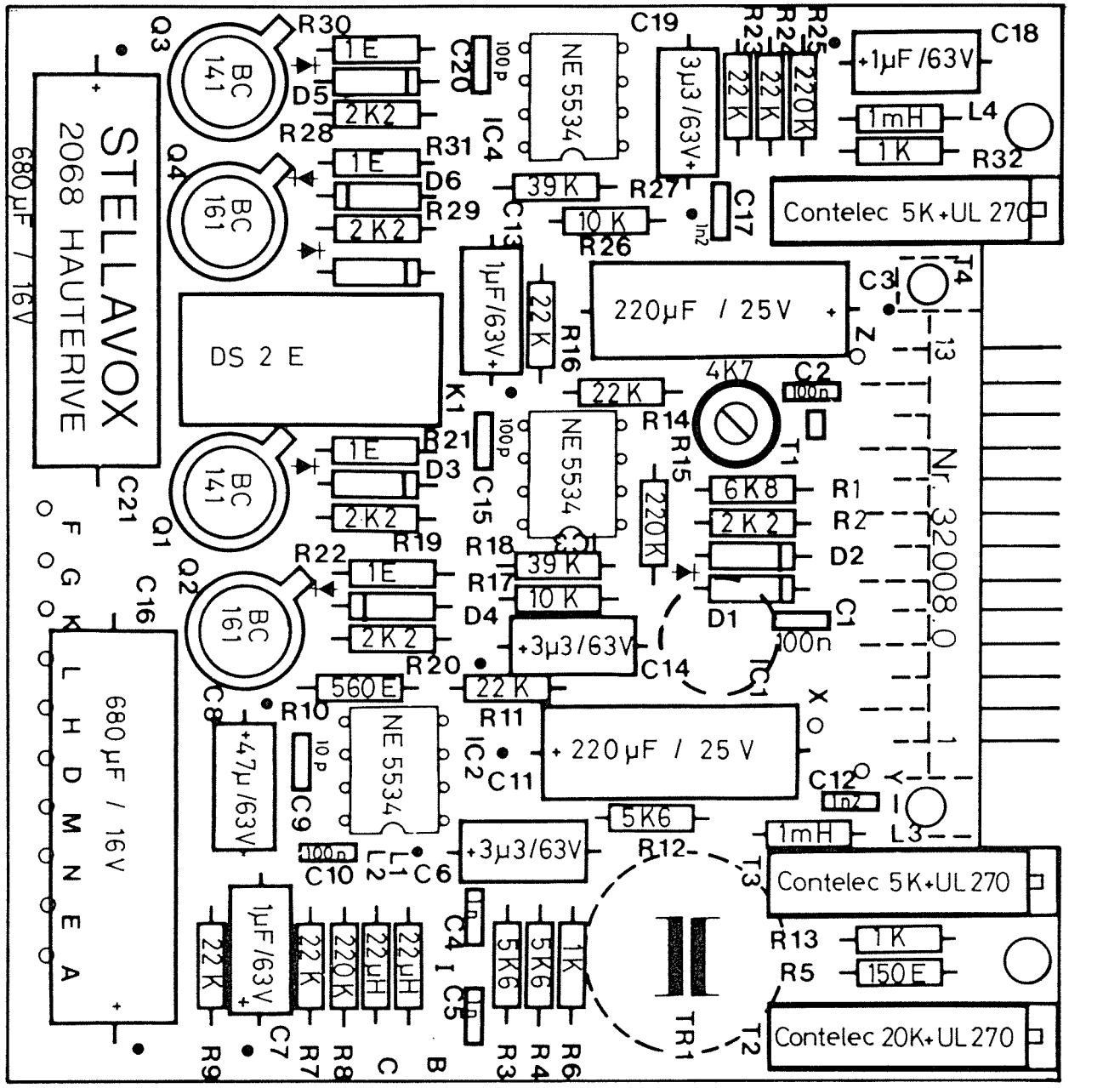
It will be of course necessary, in that case, to fit a new headblock having the requested heads (including a cue track neo-pilottone or synchrotone, etc.), the matched cue amplifier card and eventually synchronizer card.

30. DIAGRAM OF THE S-MODULE

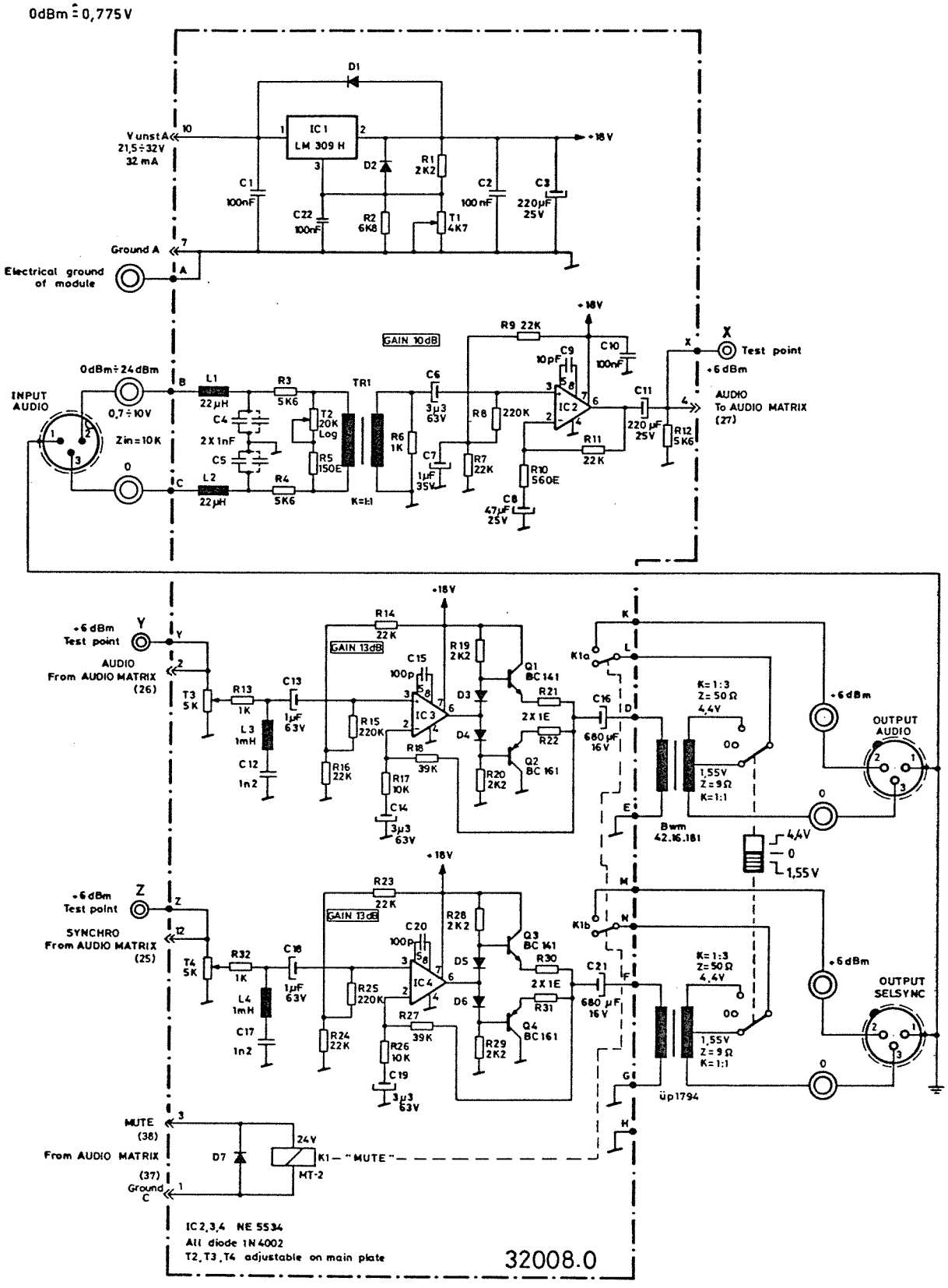
Next pages show the detailed

- Print SYNCHRONIZATION S9 - SYNCHRONIZATION MODULE S9 which are self-explanatory.

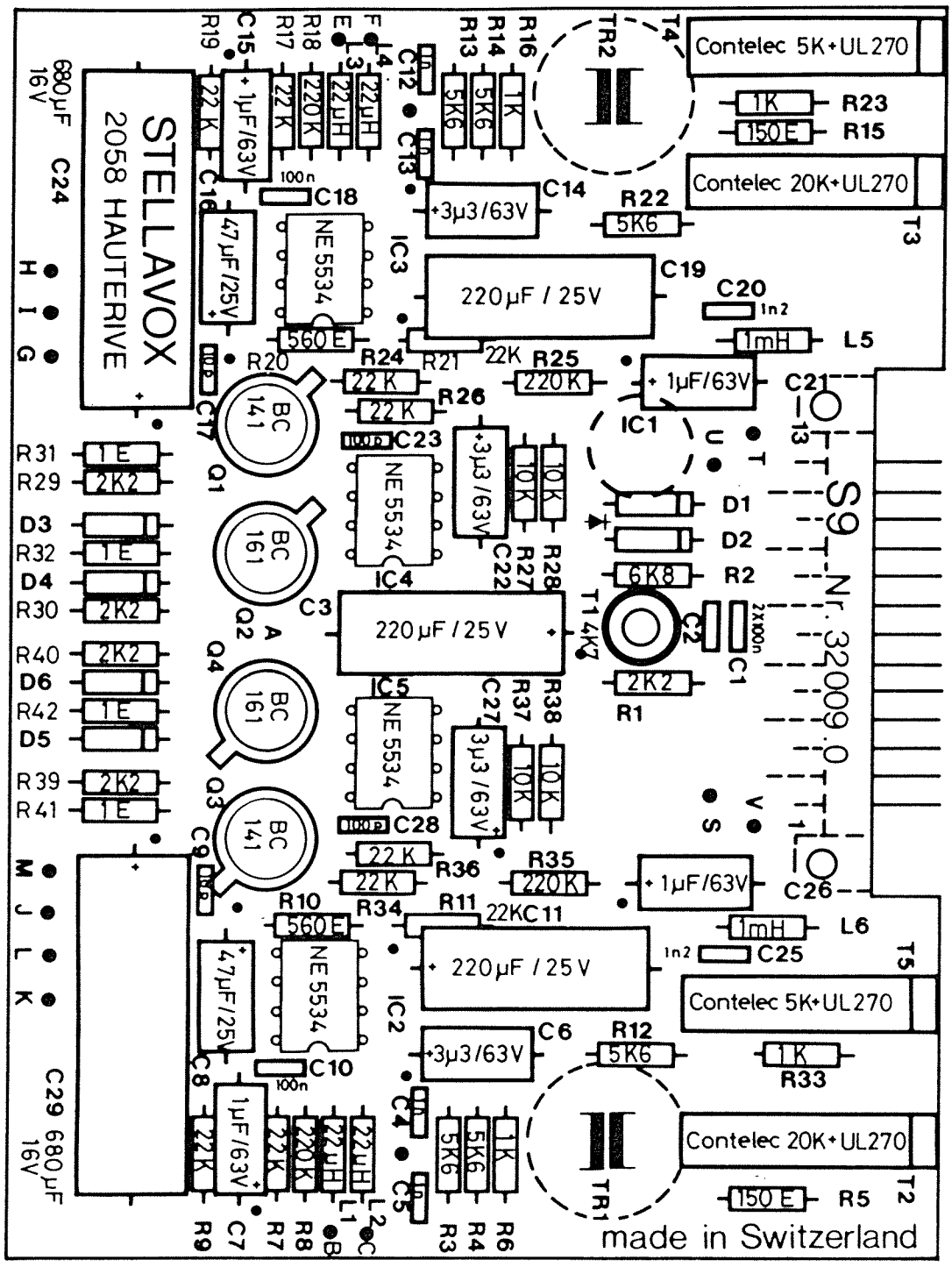
Note that both outputs are wired for 1,55 V nominal (with the possibility of 4,4 by the internal tapping.



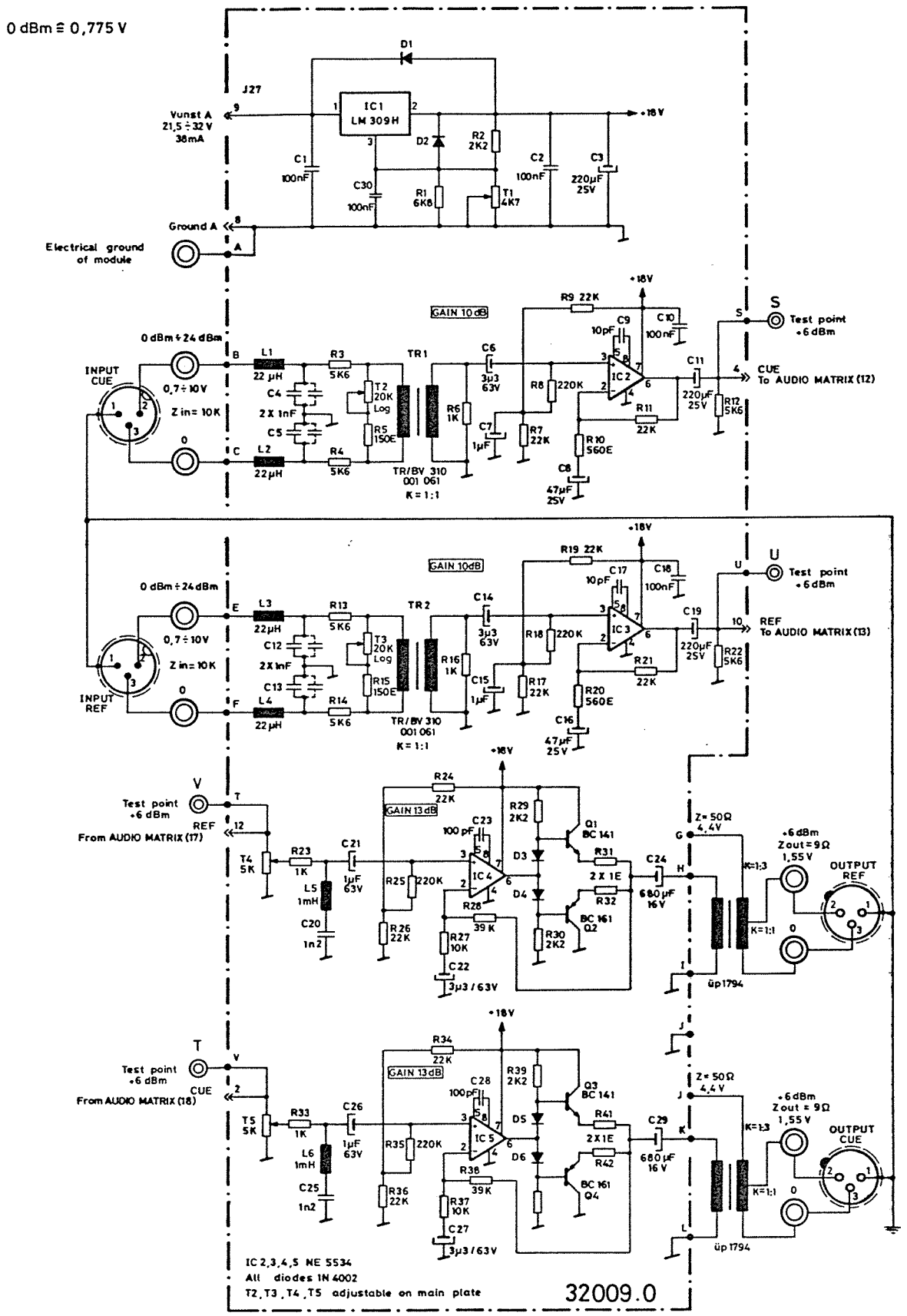
SWITZERLAND STELLAVOX	Print LINE MODULE L9	66.06.32008.0



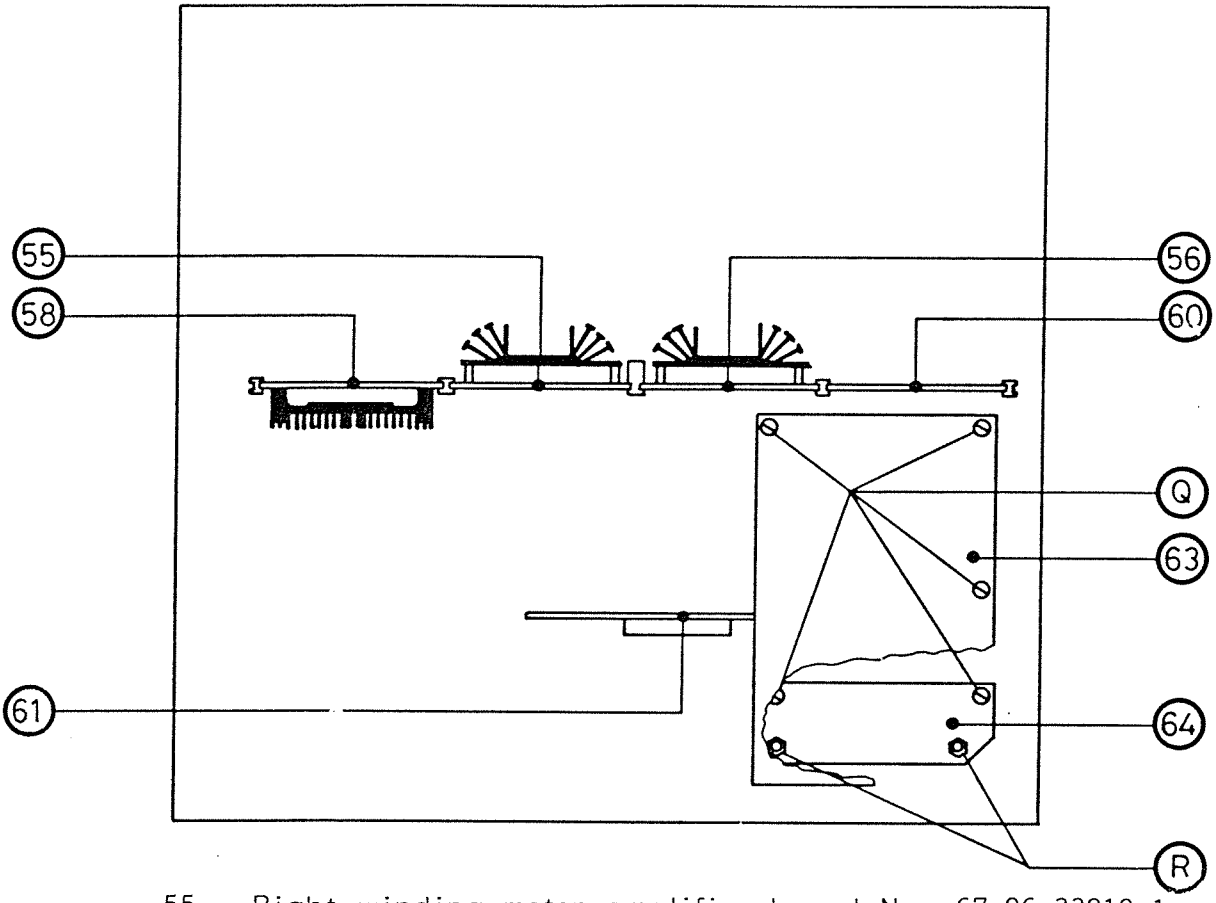
SWITZERLAND STELLAVOX	Circuit LINE MODULE L9	64.06.32008.0



STELLAVOX SWITZERLAND	Print SYNCHRONIZATION MODULE S9	66.06.32009.0



STELLAVOX SWITZERLAND	Circuit SYNCHRONIZATION MODULE S9	64.06.32009.0



55. Right winding motor amplifier board No. 67.06.33010.1
56. Left winding motor amplifier board No. 67.06.33010.1
*58. Capstan motor drive board No. 67.06.34013.2
60. Supplies + power amplifier board No. 67.06.31003.1
61. Audio matrix board 67.06.31007.0
63. µP unit board 67.06.31004.1
64. Display counter board 67.06.31005.0
Q. 7 screws M3x6 No. 30.00.30060.1
R. 2 spacers No. 38.01.30500.1

55. Schaltung rechter Aufwickelmotor Nr. 67.06.33010.1
56. Schaltung linker Aufwickelmotor Nr. 67.06.33010.1
58. Schaltung Kapstansteuerung Nr. 67.06.34013.2
60. Schaltung Speisungen + NF-Verstärker Nr. 67.06.31003.1
61. Schaltung Audio-Verteiler 67.06.31007.0
63. Schaltung des Mikroprozessors Nr. 67.06.31004.1
64. Schaltung "Anzeige" 67.06.31005.0
Q. 7 Schrauben M3x6 Nr. 30.00.30060.1
R. 2 Distanzhülsen Nr. 38.01.30500.1

55. Carte ampli moteur bobine droite no 67.06.33010.1
56. Carte ampli moteur bobine gauche no 67.06.33010.1
58. Carte asservissement moteur cabestan no 67.06.34013.2
60. Carte alimentation + ampli HP no 67.06.31003.1
61. Carte carrefour "audio" no 67.06.31007.0
63. Carte microprocesseur no 67.06.31004.1
64. Carte affichage no 67.06.31005.0
Q. 7 vis M3x6 no 30.00.30060.1
R. 2 entretoises no 38.01.30500.1

* This board is different for "P" : 67.06.34013.3

31. THE ELECTRONIC CARDS OF THE TD 9

VERY IMPORTANT : Before attempting to plug out or plug in any card (or plug-in headblock module or Line-Module or Synchro-Module) switch off the POWER ! No warranty for modules damaged by irrespect of this caution.

Having opened the recorder TD 9 (see § 25) you find all electronic modules and mechanical assemblies clearly laid our for good accessibility.

The opposite page shows the lay-out of all electronic board, which are of the plug-in type, apart the prints (61) and (64).

Please notice that both boards (55) and (56) are identical, and get therefore the same number. As the functions at "left" and at "right" are somewhat different, a particular connection programs the correct functions, according to the position (left or right of that board).

All four boards (55) (56) (58) (60) may be removed by simple pulling; as they are of different length, no error is possible by replacing them.

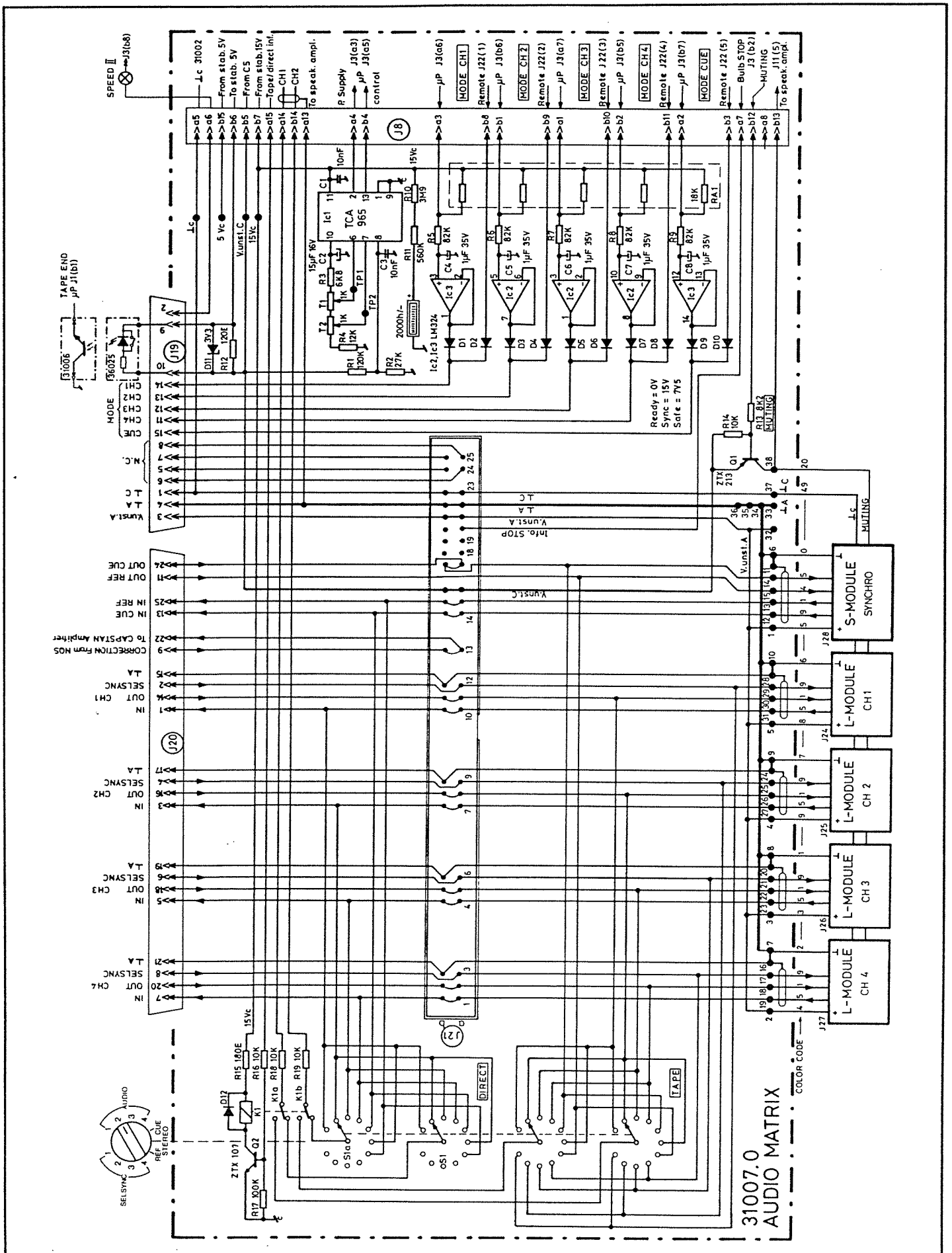
The large µP-BOARD (63) is firmly maintained by 5 screws (Q) and receives five connectors (see § 38).

The DISPLAY-BOARD (64) is accessible by removing first the µP-board (but not its 5 connectors). Take care about the glass bulb !

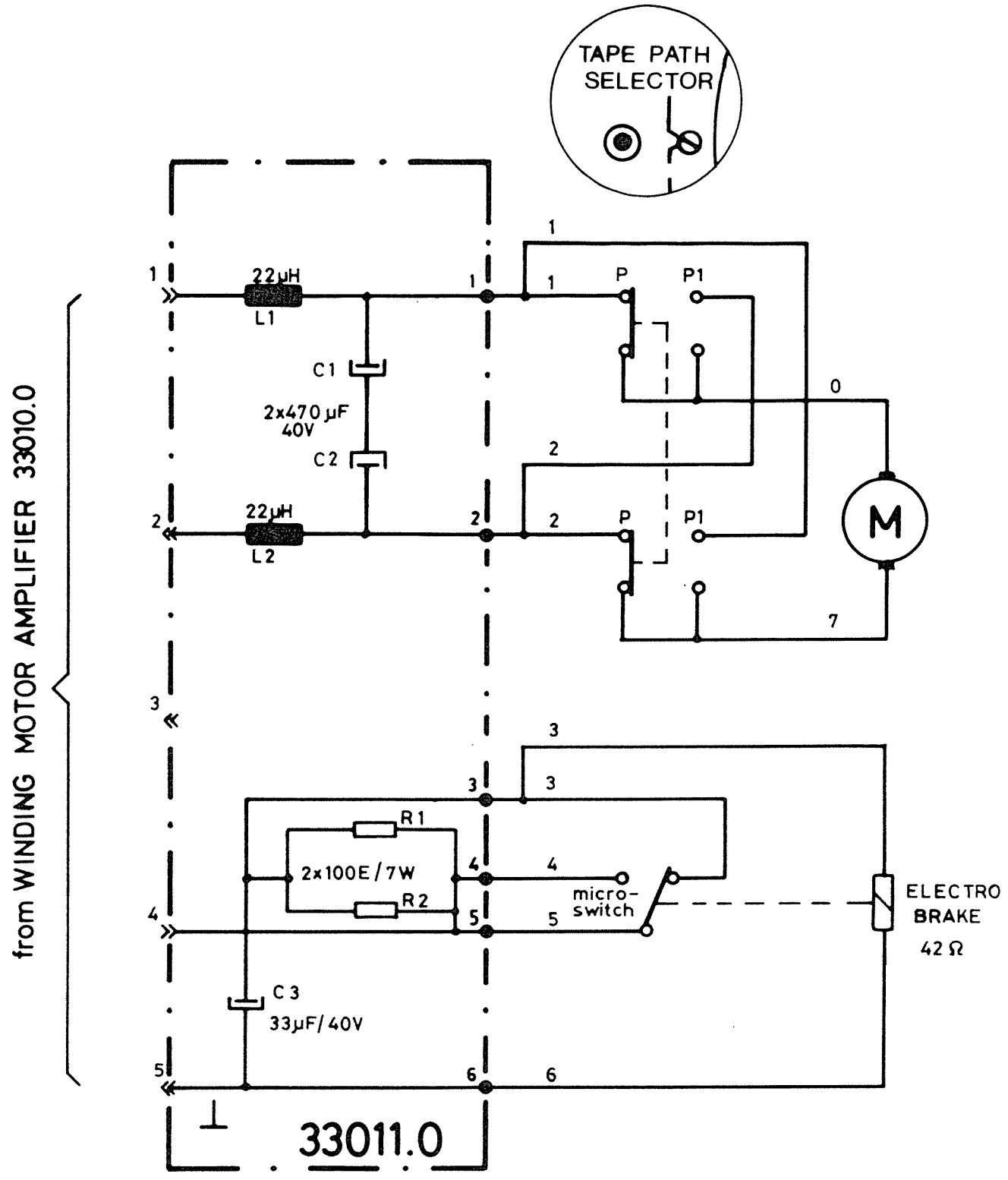
The MATRIX BOARD (61) centralizes all audio connections and supports the INTERNAL AUDIO CONNECTOR (36) which is to be connected to an external accessory, like the FRONT METERING CONSOLE, if provided.

Attention : as this INTERNAL AUDIO CONNECTOR gets inputs and outputs which must be interconnected, a dummy plug must be inserted if no console is connected.

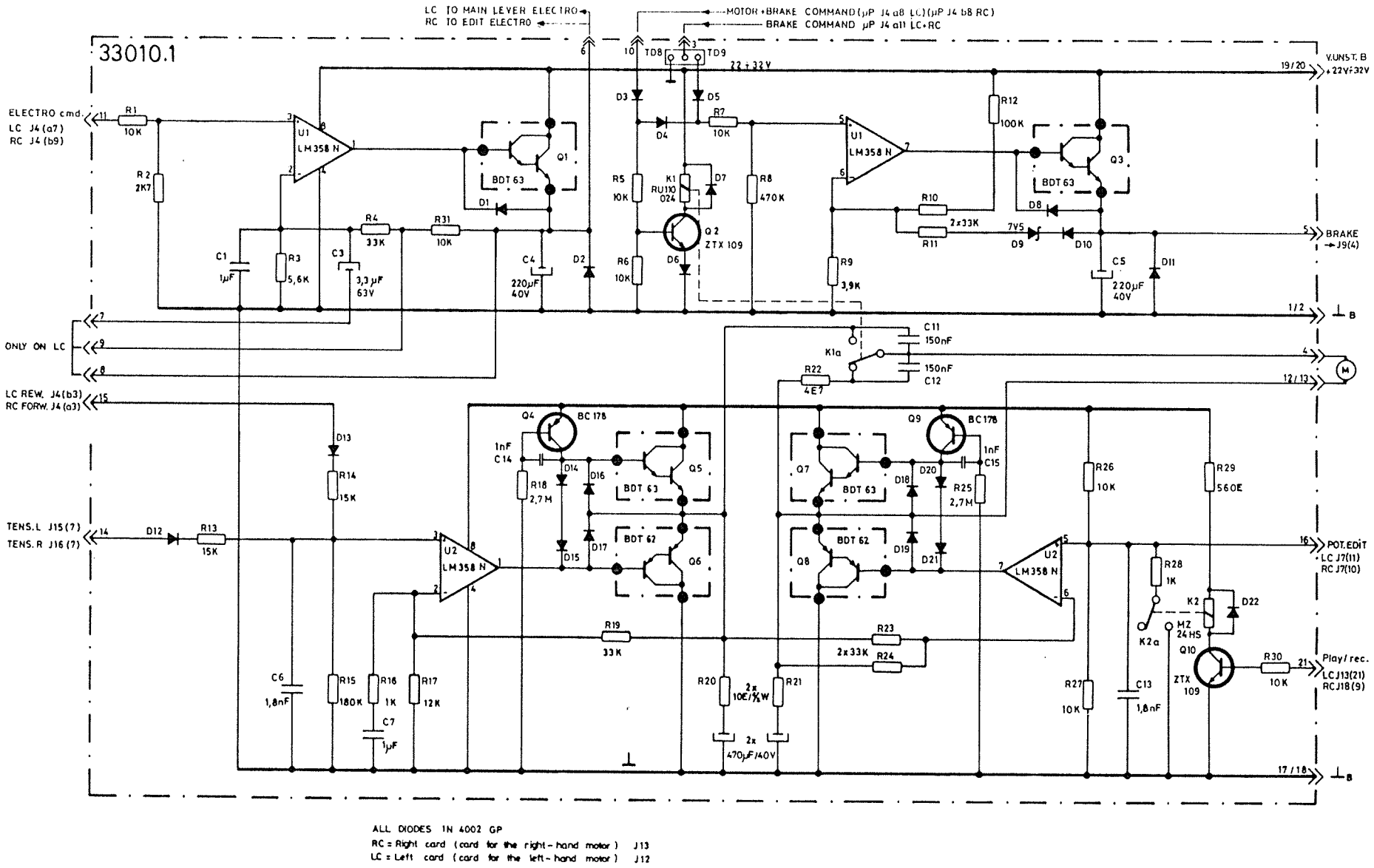
If you dispose of spare cards you can use them as replacement for a defective card. The above mentioned cards require no adjustment. You can then repare quietly that card, or leave it to your distributor, or return it to us for repair. The recorder may inbetween operate !



STELLAVOX SWITZERLAND	Circuit AUDIO MATRIX	64.06.31007.0



STELLAVOX SWITZERLAND	Circuit WINDING MOTOR CONNECTION	64.06.33011 .0



ALL DIODES IN 4002 GP
RC = Right card (card for the right-hand motor) J13
LC = Left card (card for the left-hand motor) J12

STELLAVOX SWITZERLAND	Circuit WINDING MOTOR AMPLIFIER	64.06.33010.1

32. DIAGRAM + DESCRIPTION OF THE MOTOR CARDS

The TD 9 recorder is equipped with two (identical) DC flat block motors structured with their brake magnet, etc. as a complete winding unit, which is energized by the circuit "WINDING MOTOR AMPLIFIER" of the opposite page. This card contains 3 different circuits : one driving the motor, the 2nd driving the brake magnet and the 3rd driving the main lever magnet (if card placed left) or the capstan lever magnet (if placed right).

PRINCIPLE OF THE MOTOR AMPLIFIER

A particular bridge (bi-directional) power amplifier energizes the motor, and a switch on the motor, operated by the TAPE PATH SELECTOR (11) reverses the motor direction.

This amplifier, equipped with adequate filters RC preventing oscillations, receives 4 types of commands :

- pin 14 receives the analog signal from the tensiometer, proportional (S-curve) to the tape tension, which is therefore (negative feedback) controlled.
- pin 15 receives the order (from the uP, with priority) for fast rewinding, etc.
- pin 16 introduces the "EDIT" information.
- pin 21 gets its command from the uP in order to inhibit the acceleration possibility during "PLAY" or "RECORD", the acceleration of the supply reel motor being necessary for fast windings.

The switch-relay S1 shortens (electrical brake) the motor.

PRINCIPLE OF THE MAGNET AMPLIFIERS

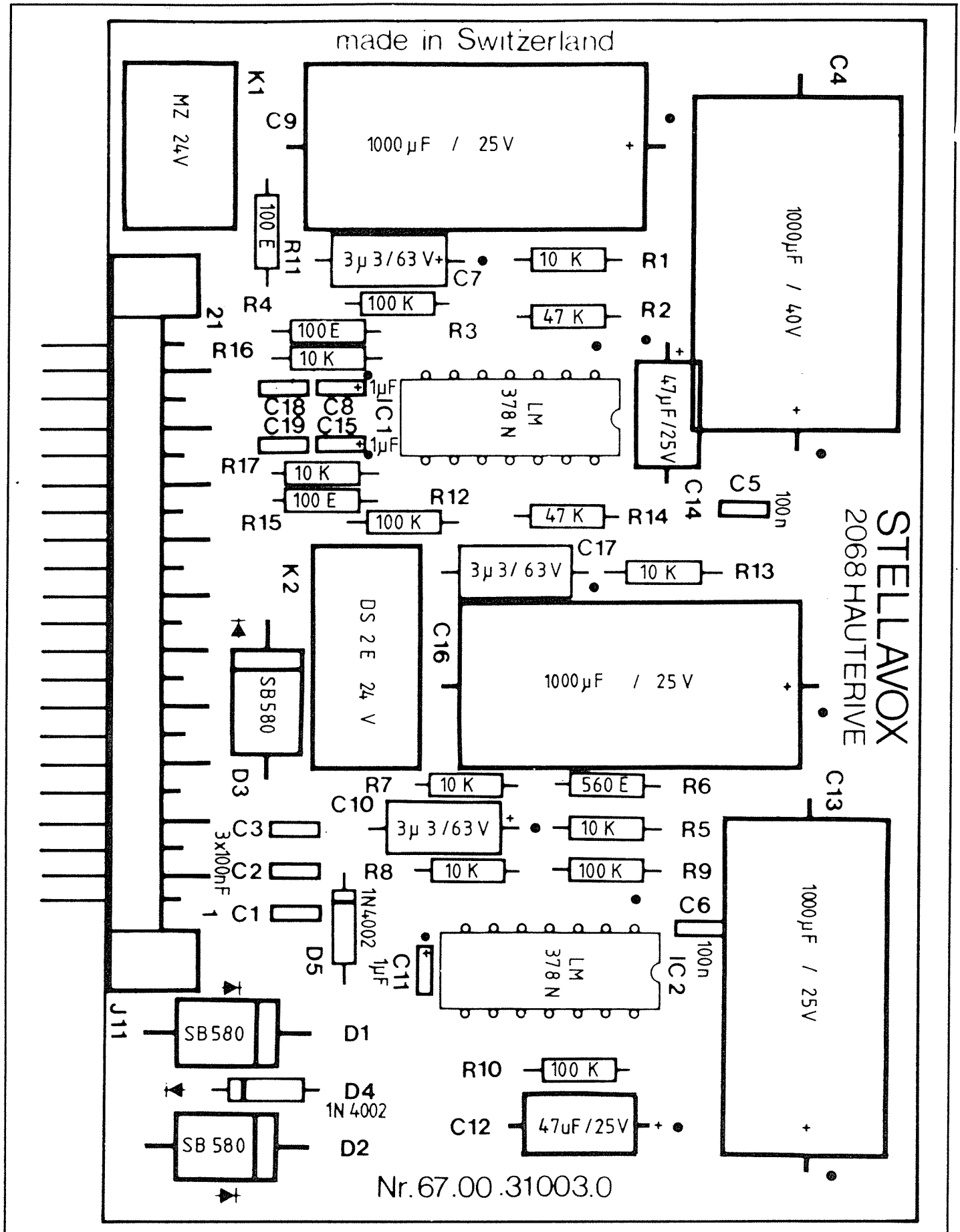
One of these amplifiers operates the electro-magnetic brake, receiving its order from pin 10, for the simultaneous motor + brake and from pin 3 for the brake only.

The 2nd amplifier operates either the large main lever magnet if the card is placed left or the edit lever magnet, if placed right.

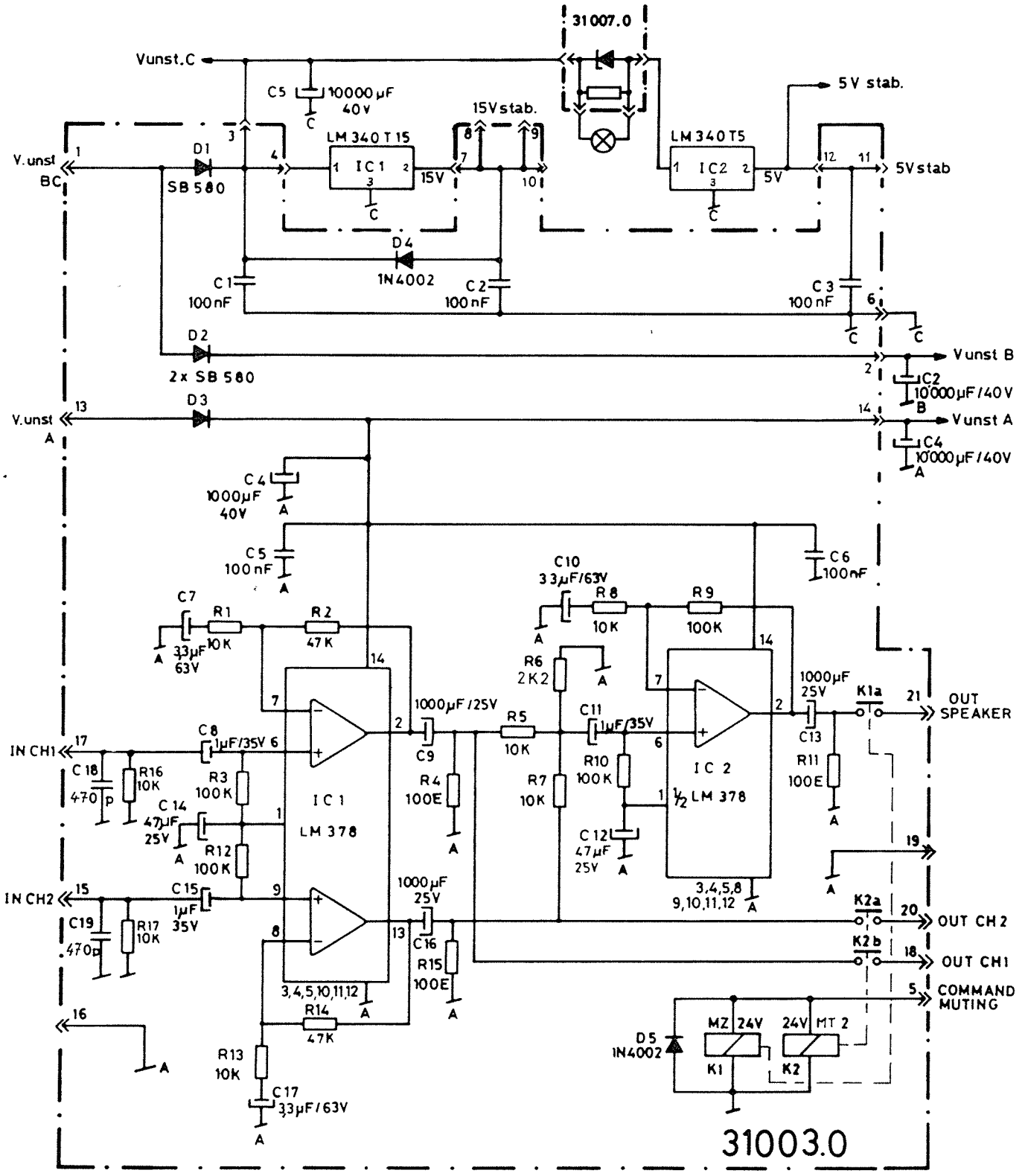
33. DIAGRAM + DESCRIPTION OF THE SUPPLY CARD

(see next pages)

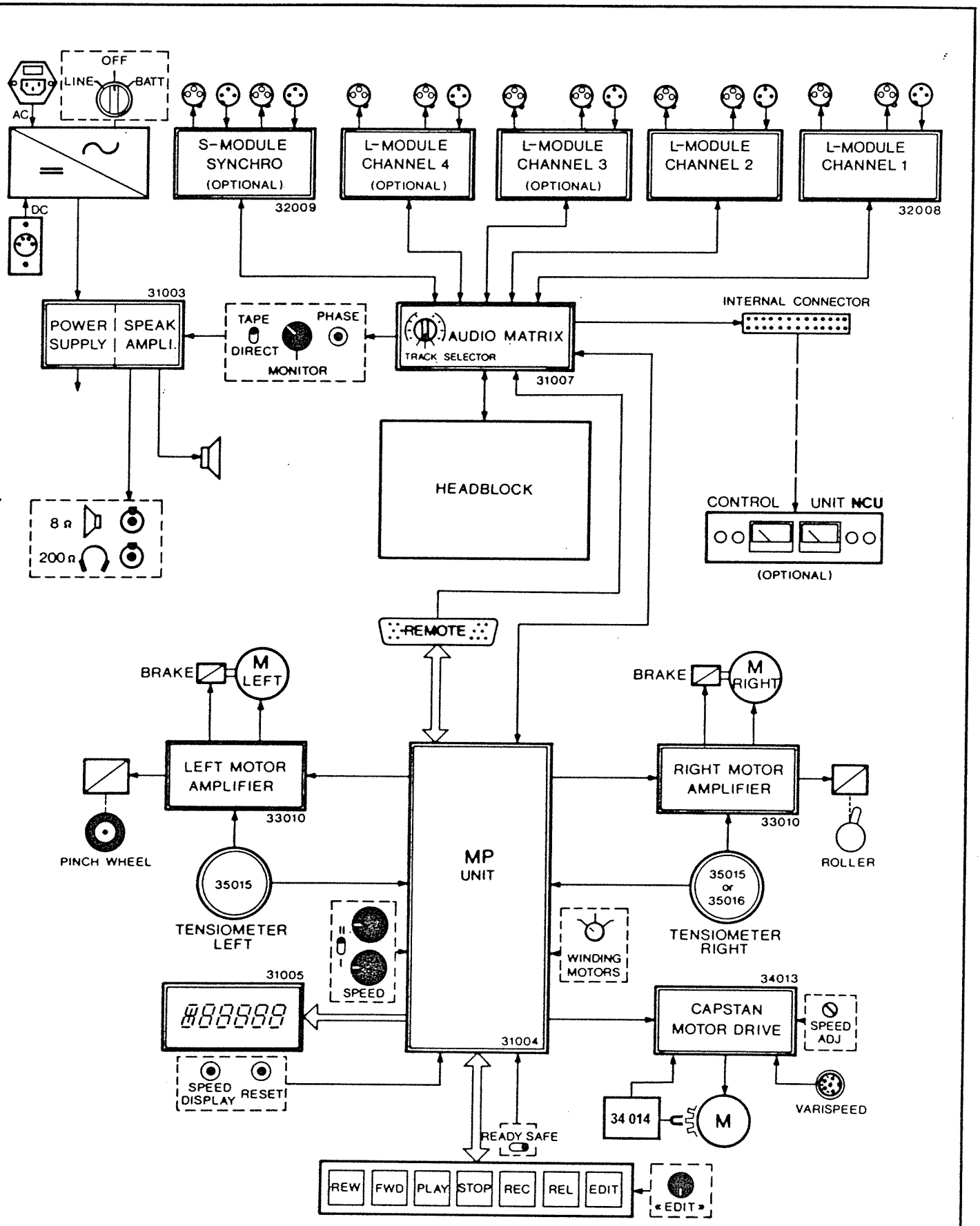
This board contains some stabilizer circuits (notice that the power stabilizers are not on the board, but located on the platine for best heat radiation), and one stereo power amplifier supplying both "audio jack outputs" front left of the recorder, for monitoring purposes (external speakers or headphones) and of course the built-in monitoring speaker, for which both amplifiers are mixed, in case of stereo selection.



STELLAVOX SWITZERLAND	Print POWER SUPPLY & SPEAKER AMPLIFIER	66.06.31003.0



STELLAVOX SWITZERLAND	Circuit POWER SUPPLY & SPEAKER AMPLIFIER	64.06.31003.0



BLOCK DIAGRAM TD 9

34. DIAGRAM + DESCRIPTION OF THE CAPSTAN CARD

The general diagram on the opposite page resumes how the "CAPSTAN MOTOR DRIVE CARD" is interconnected between :

- the digital opto speed sensor (see diagram 3rd page)
- the fine speed control = built-in SPEED ADJ (49).
- the coarse speed control = ext. Varispeed
- the speed choice order from the uP
- the servo controlled current to the capstan motor.

34.1 DESCRIPTION

(see next pages)

The small high precision DC motor drives the flywheel loaded capstan shaft via 3 smooth belts. This construction offers the best solution regarding the tape transport regularity and the possible adaptation to extreme speeds (low or fast).

A very accurately divided disc (400 lines) placed on the capstan is read optically. The tacho signal is fed to the pin 3 of the "CAPSTAN MOTOR DRIVE" board, shaped and divided (according to the selected speed) in order to deliver always the nominal frequency of about 1,5 kHz, which is "D/A" converted. The amplified (filters!) voltage difference is used to drive the motor.

34.2 SPEED DETECTOR

The circuit using 2 LM 393 delivers a signal flashing the lamp of the SPEED SELECTOR (20), as long as the capstan speed is not reached.

34.3 CIRCUIT FOR SYNCHRONIZERS INPUT

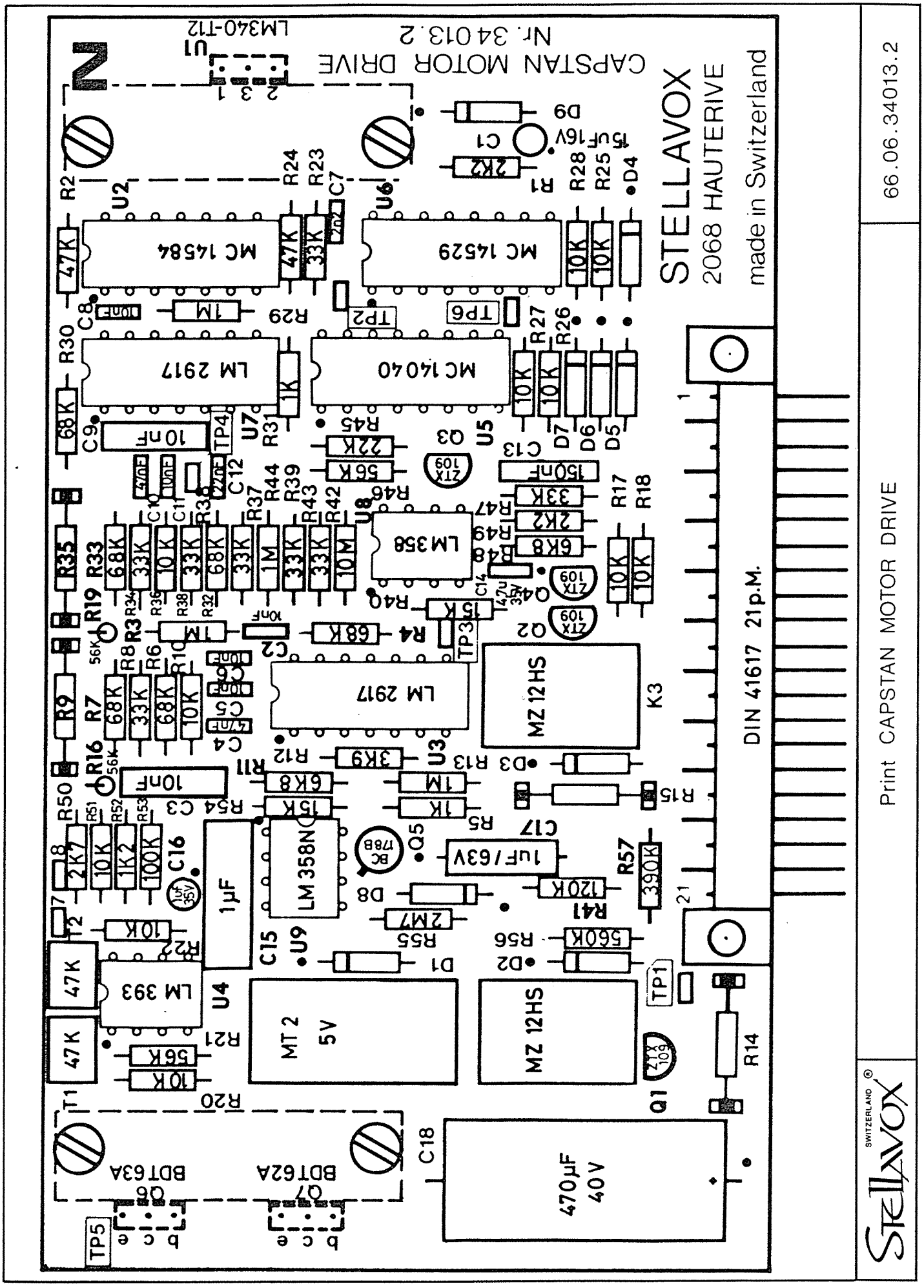
External synchro signal references (1,6 kHz from Q-Lock for instance) are fed similarly to a D/A converter and follow then the way described above.

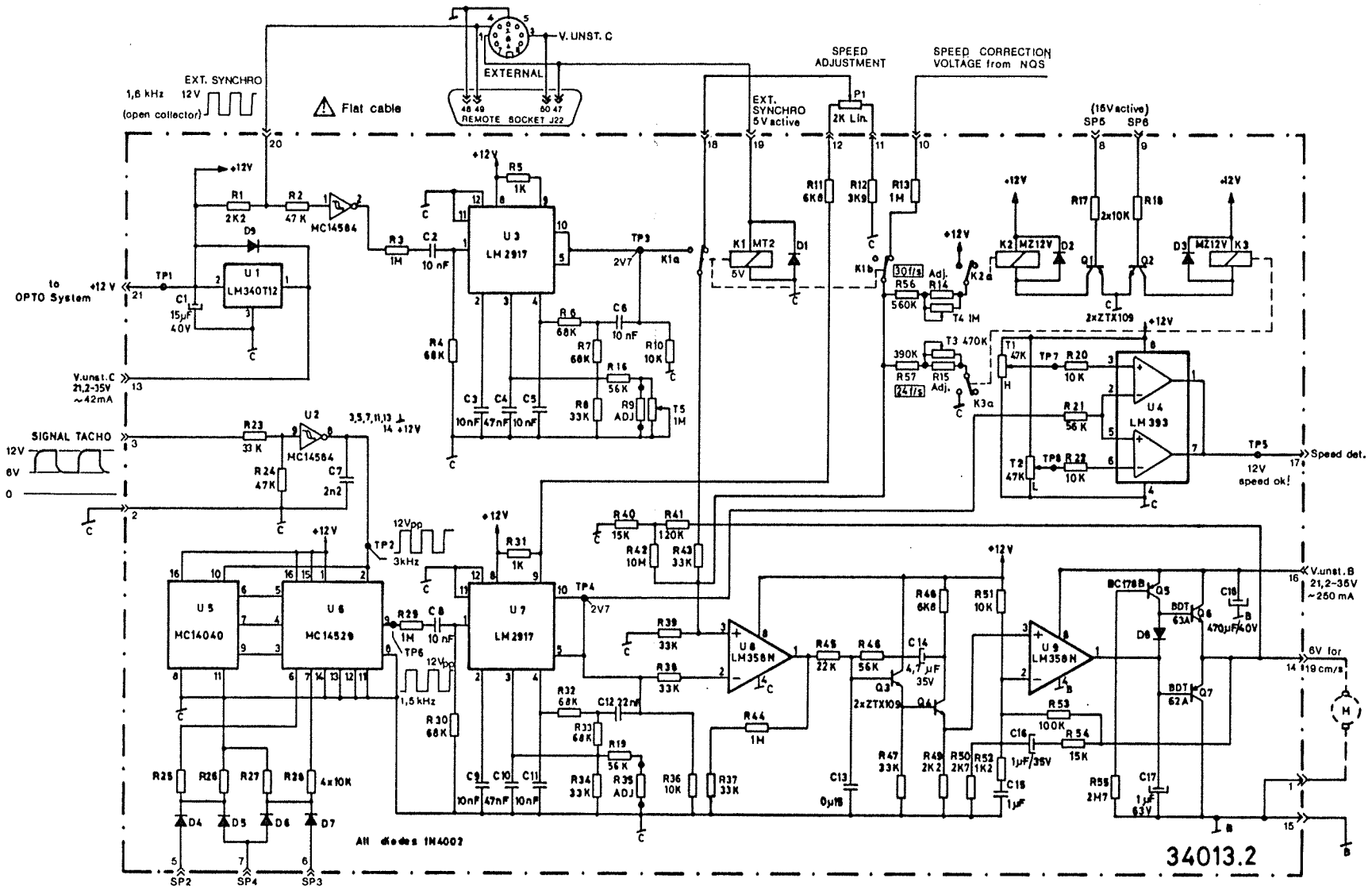
34.4 EXTERNAL VARISPEED

Operates also from a variable frequency (typ. 1,6 kHz); it is switched on energizing the relay K1, by-passing pins 3 + 1 of the "varispeed" connector.

34.5 SPEEDS CORRECTION CIRCUIT

Activated relays K2 and K3 switch resistors networks for obtaining special speeds, like 24 / 25 / 30 frames/second for perfotape.


CAPSTAN MOTOR DRIVE
Nr. 34013.2
LM340-T12
STELLAVOX
2068 HAUTERIVE
made in Switzerland
DIN 41617 21p.M.
MC 14584
MC 14529
LM 2917
MC 14040
LM 358
LM 2917
MZ 12HS
LM 358N
LM 393
MT 2
5V
MZ 12HS
470µF
40V
BDT62A
BDT63A
Print CAPSTAN MOTOR DRIVE
66.06.34013.2
SWITZERLAND
STELLAVOX



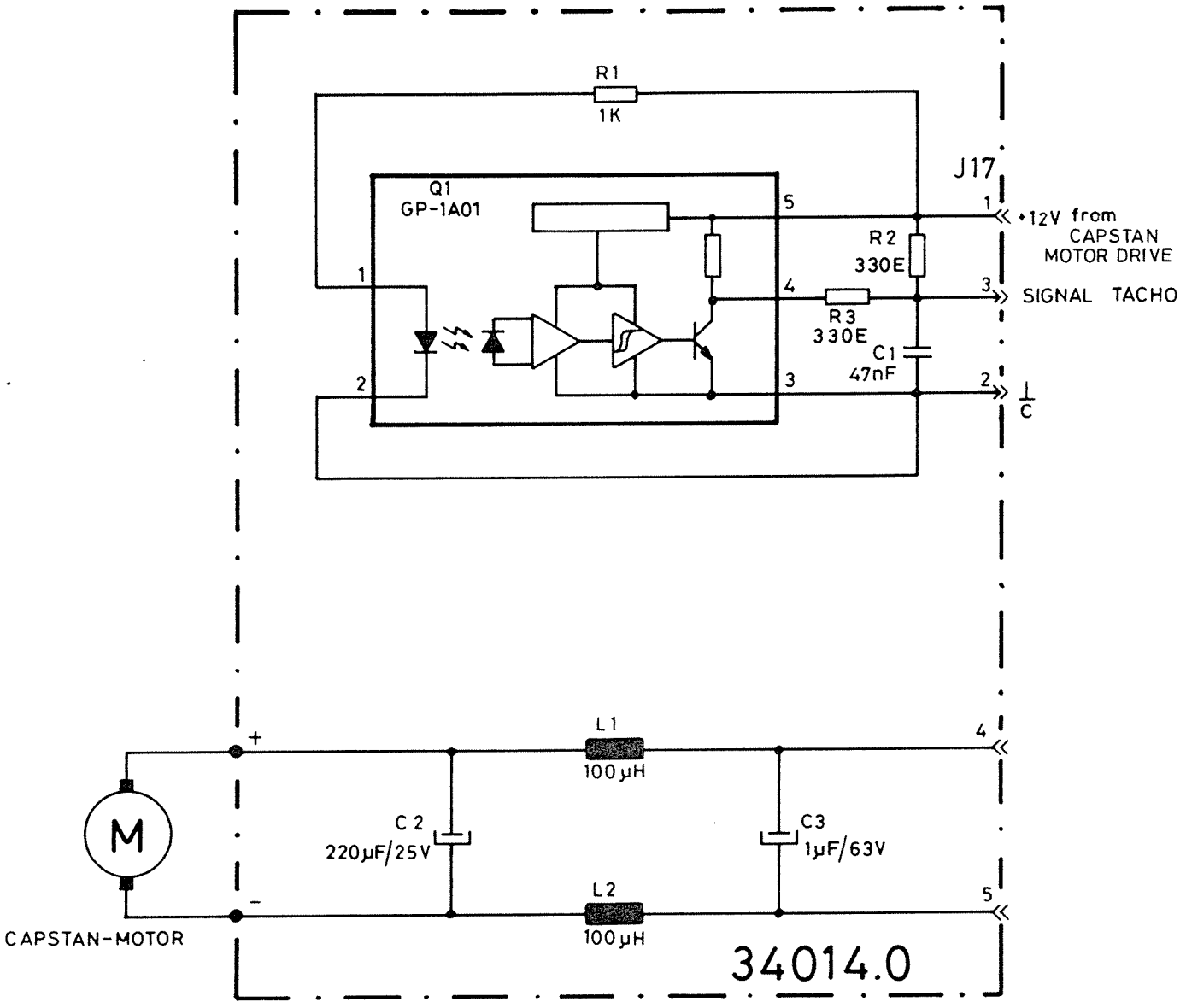
SPEED	F, TACHO		Sp2	Sp3	Sp4	Sp5	Sp6
30 f/s	3,6 kHz					1	
25 f/s	3 kHz		1				
24 f/s	2,88kHz		1				1
76 cm/s	12 kHz	1 = 15V active			1		
38 cm/s	6 kHz			1			
19 cm/s	3 kHz		1				
9,5 cm/s	1,5 kHz						

SWITZERLAND

STELLAVOX

Circuit CAPSTAN MOTOR DRIVE

64.06.34013.2



STELLAVOX SWITZERLAND	Circuit OPTO-SENSOR TACHOMETER	64.06.34014.0

35. DIAGRAM + DESCRIPTION OF THE DISPLAY CARD

Print and Circuit of the DISPLAY, shown on both next pages, are typical of the supply and drive of the vacuum green fluorescent tube which was chosen for the quality of its luminous image and of its long life expectancy.

In order to have the best and stable luminosity, in spite of voltage changes, a DC-DC converter is installed on the board.

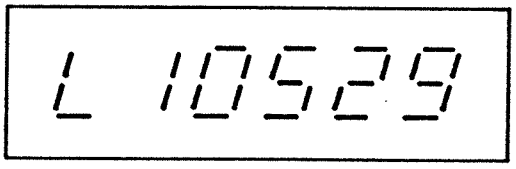
Remember that the display indicates not only the "counter" information but other useful datas :

DISPLAY INFORMATION : By switching on the recorder TD 9, either from line or battery supply, the green display indicates first, during some seconds, the total operating hours of the machine; this shows the running hours of the capstan motor and bearings, etc.

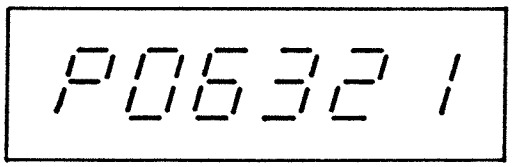
The display indicates then, also for some seconds, the operating hours of the recorder running PLAY or RECORD. This shows particularly the heads wear, as also winding motors (brushes) running time.

Then the display indicates the tape counting (last information).

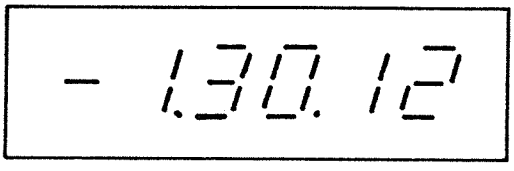
1. total op. hours



2. running hours

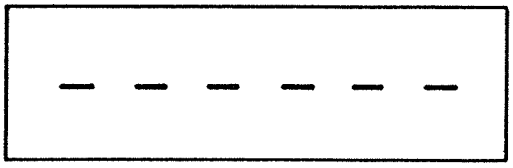


3. counter memory

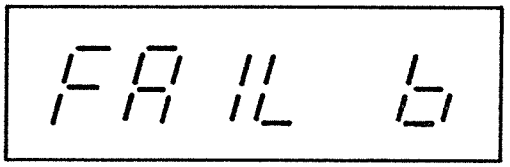


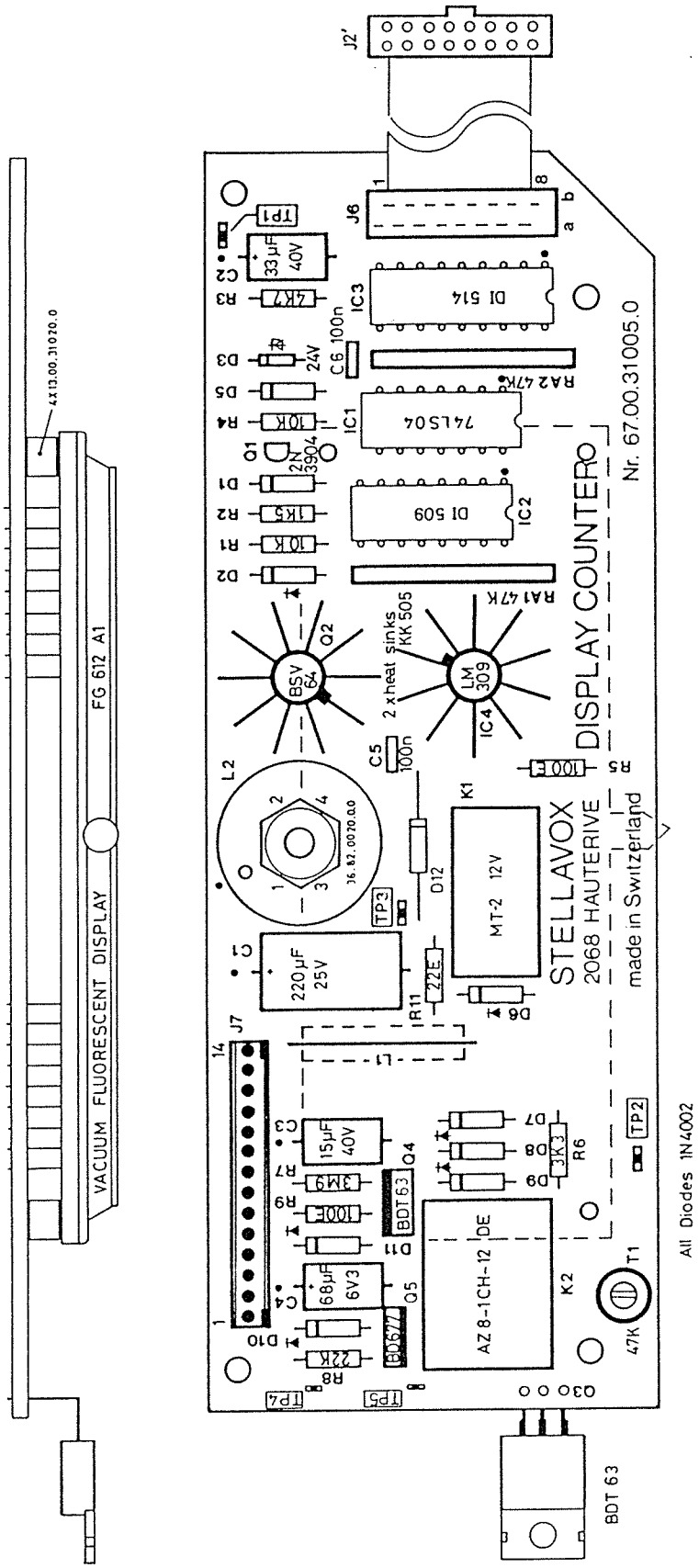
4. zero reset

5. supply voltage low

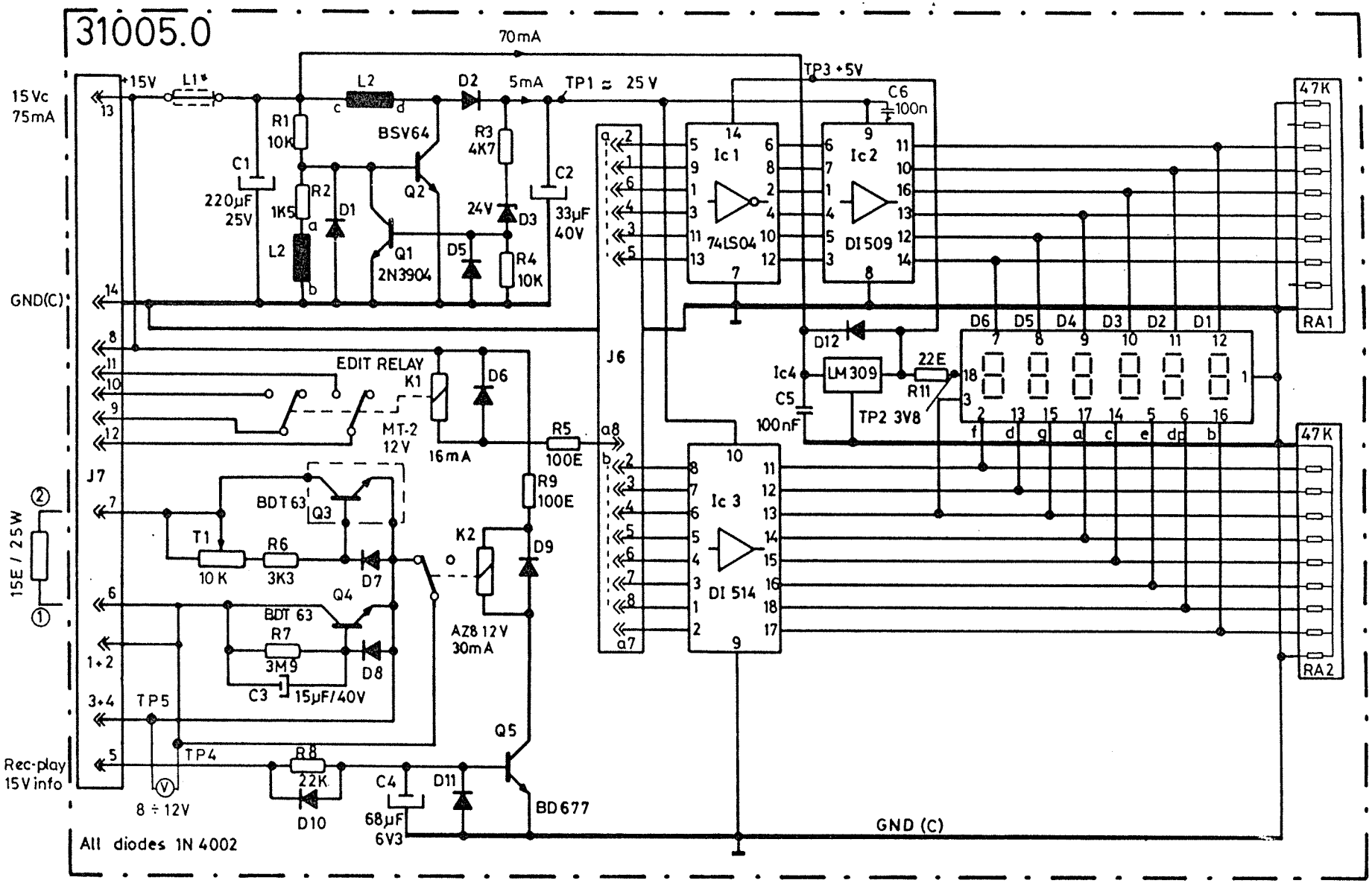


6. insufficient supply voltage





STELLAVOX SWITZERLAND	Print DISPLAY COUNTER	66.06.31005.0

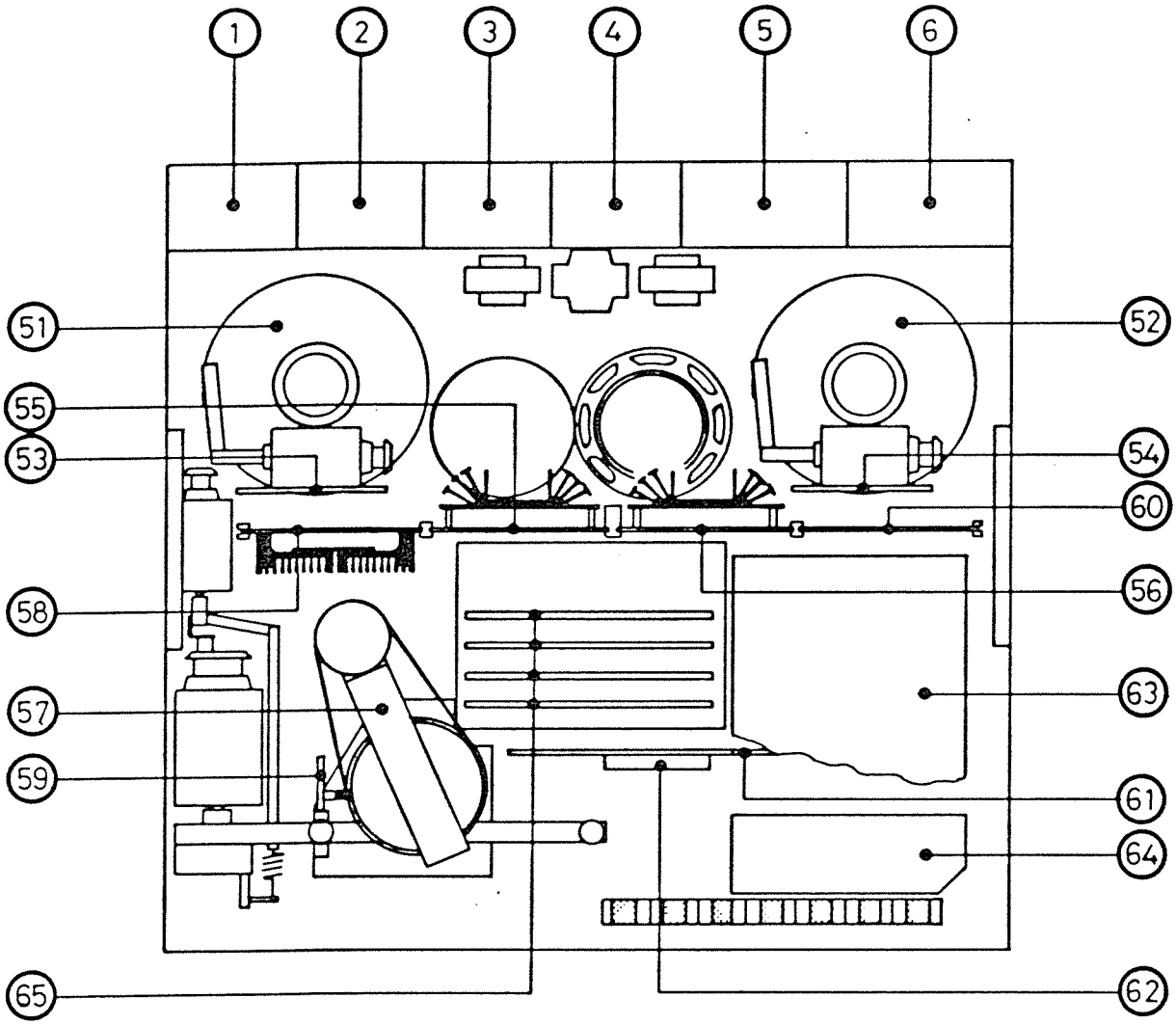


SWITZERLAND

STELLAVOX

Circuit DISPLAY COUNTER

64.06.31005.0



STELLAVOX SWITZERLAND	INTERNAL LAYOUT	

36. DIAGRAM + DESCRIPTION OF ONE AUDIO CARD

One of the many interesting and unique characteristics of the TD 9 recorder is the integration of all audio circuits inside the headblock, as discrete unity cards containing each all the necessary circuits : playback, erase, record and selsync, all with own equalizations.

Headblocks § 6 and § 17 accept other card types (Synchronizers, etc.).

Each card is plugged into the removed headblock : once the headblock inserted into the BASE, all cards (65) are locked in position, as shown on the opposite drawing.

IMPORTANT : please notice that all calibration trimmers are accessible from the top of the headblock, without the need of removing it.

PRINCIPLE OF THE CIRCUITS

NOTE : all the "audio" electronics of these cards are designed with discrete components only, for best "sound quality". The schematic of the sub-amplifier mentioned "TOA", schematized inside a triangle, is shown on the top of the diagram on next pages.

PLAYBACK

The signal (asymetrical) coming (shortest possible lead!) from the P.B. head through pin 21 is preamplified with pre-emphasis and fed through a double variable filter, acting as adjustable equalizer, into a main output amplifier TOA (having an extra optional switchable NAB equalization) for a flat output nom. +6 dBm (= 1,55 V).

SELSYNC PLAYBACK

As above, but with the record head used for P.B., and switched to the input of a 2nd P.B. amplifier for nom. +6 dBm output.

BOTH PLAYBACK OUTPUTS ARE FED TO THE CORRESPONDING L(ine)-MODULES, AT THE REAR OF THE RECORDER, FOR BALANCED OUTPUTS.

RECORDING

The modulation signal coming from the L(ine)-Module Balanced Input (through pin 8 of the "audio" card) passes a first filter for fine high frequency adjustment, and a muting opto-circuit (purely resistive for no distortion like that introduced by FET's, etc.).

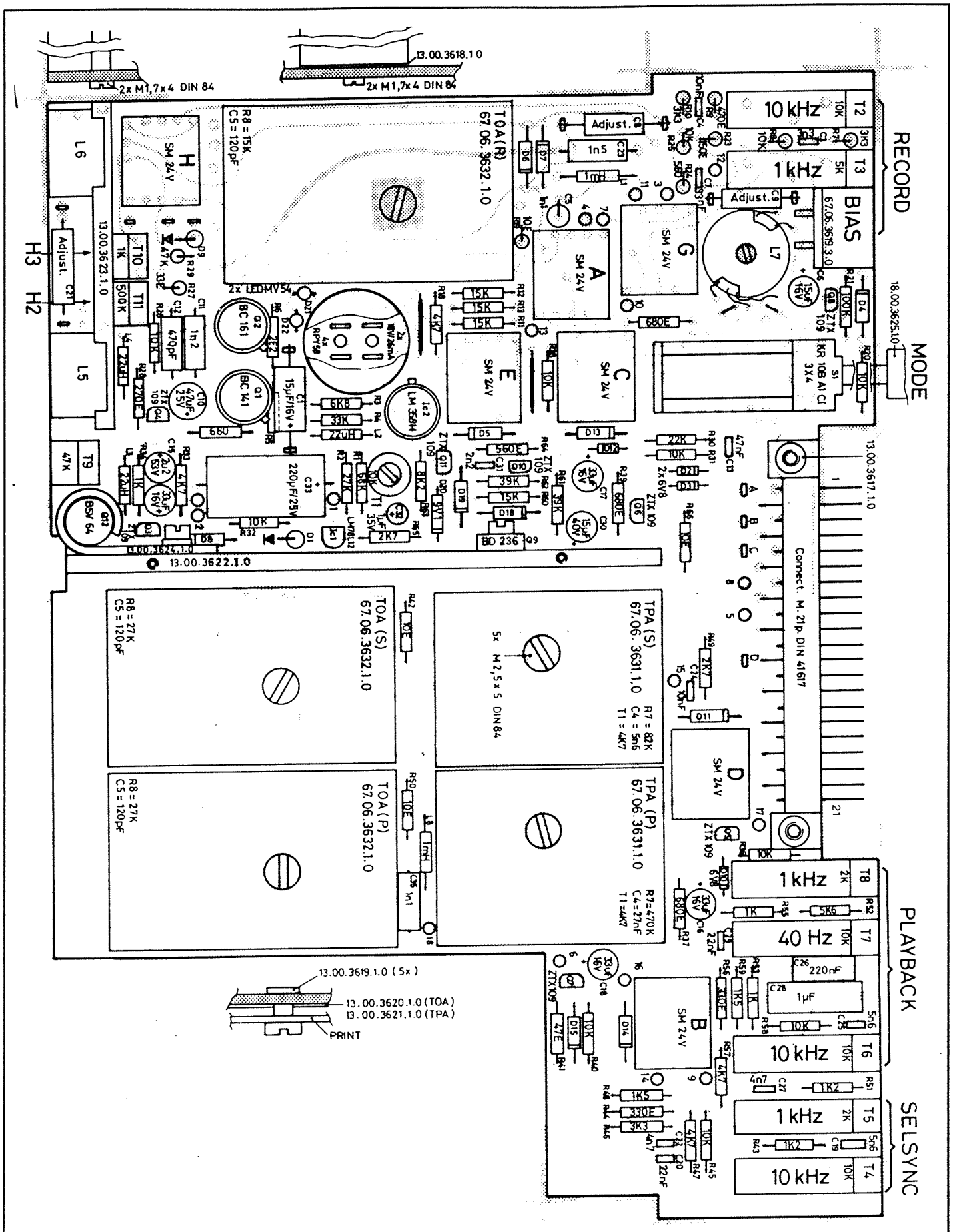
The following TOA drives the record head through a special network allowing the recording level adjustment without reducing the headroom, and the coarse high frequency correction; this network may vary according to the kind of record head.

The bias is fed as a serial circuit (transformer) avoiding the necessity of HF-traps which have a negative influence on the signal quality. A grounded adjustable capacitor operating in the leg of a capatitive divider supplying the primary of this transformer, allows the bias adjustment.

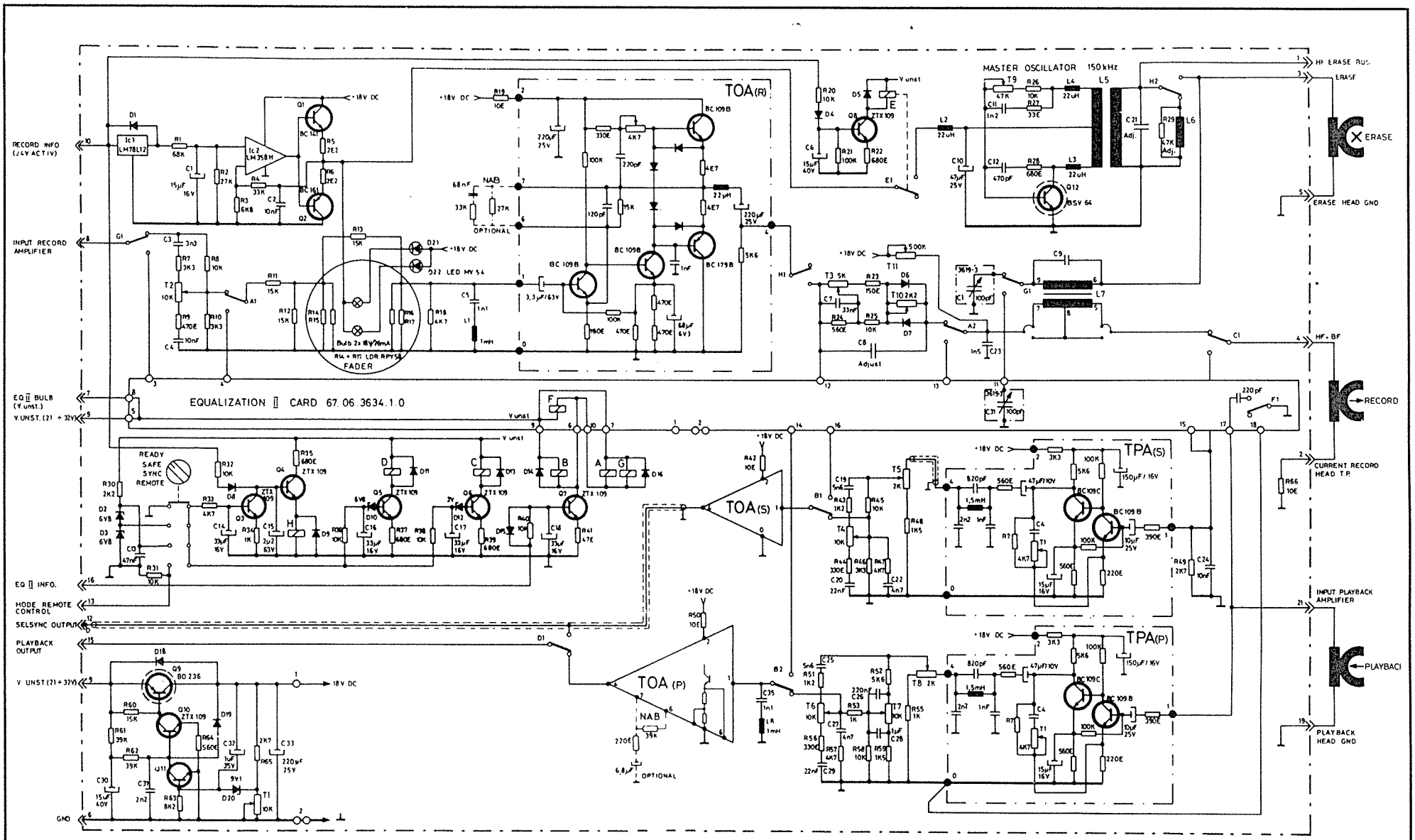
The erase (double gap ferrite) head is directly driven from the oscillator transformer and is part of the combined reactance of the system, eliminating the tedious adjustment of resonant circuits.

The various modes "ready", "safe", "sync" and "remote" may be switched "mechanically" directly on the headblock, or electrically over the REMOTE plug through a special electronics with 3 thresholds.

CALIBRATION PROCEDURE : see § 18



STELLAVOX SWITZERLAND	Print AUDIO CARD type BO	66.06.3639.1.0



SWITZERLAND ® STELLAVOX	Circuit AUDIO CARD type BO	64.06.3639.1.0

37. THE INTERNAL SYNCHRONIZATION CARD

a) Theory

For the many applications where sound is simply recorded (or reproduced), no particular accessory is requested.

But there are numerous fields where at least two machines must be interlocked (i.e. synchronized) in order to move both film/tape exactly synchronously, sometimes even with phase accuracy (= real time).

One machine is the SLAVE, conducted by the MASTER. The SLAVE is typically a tape recorder, the TD 9 for example whereas the MASTER may be another TD 9, a telecine, an editing table, a videocorder like U-Matic or BVU, a biphasic generator, etc.

The "language" used to interlock two machines may be :

1. a simple frequency 50 or 60 Hz magnetized onto one magnetic track of the tape, or issued from the sprockets of a perforated film. This system assures a simple synchronization, without real time lock, nor direction sensing.
2. A supplementary (BI-PHASIC) signal to the previous signal allows the direction information : forward or reverse.
3. A complex electronic coding system for instance the SMPTE time code allows the true REAL TIME SYNCHRONIZATION between two or more machines.

   The TD 9 recorder is suited for all possible synchronization systems.

b) The Synchronizers

To interface two (or more) machines for SMPTE synchronization purposes, it is necessary to interconnect their REMOTE connectors via an external synchronizer, manufactured by various companies : the Q-Lock from Audio-Kinetics, the German G.T.C. or Giese, etc. Such systems operate according to § 3 above, with a lot of facilities (counters, offsets, cycles, etc.).

Such synchronizers may accept :

- one plug-in card typically suited to the MASTER machine, for instance a U-Matic.
- one plug-in card typically matched to the SLAVE machine, for instance a TD 9.

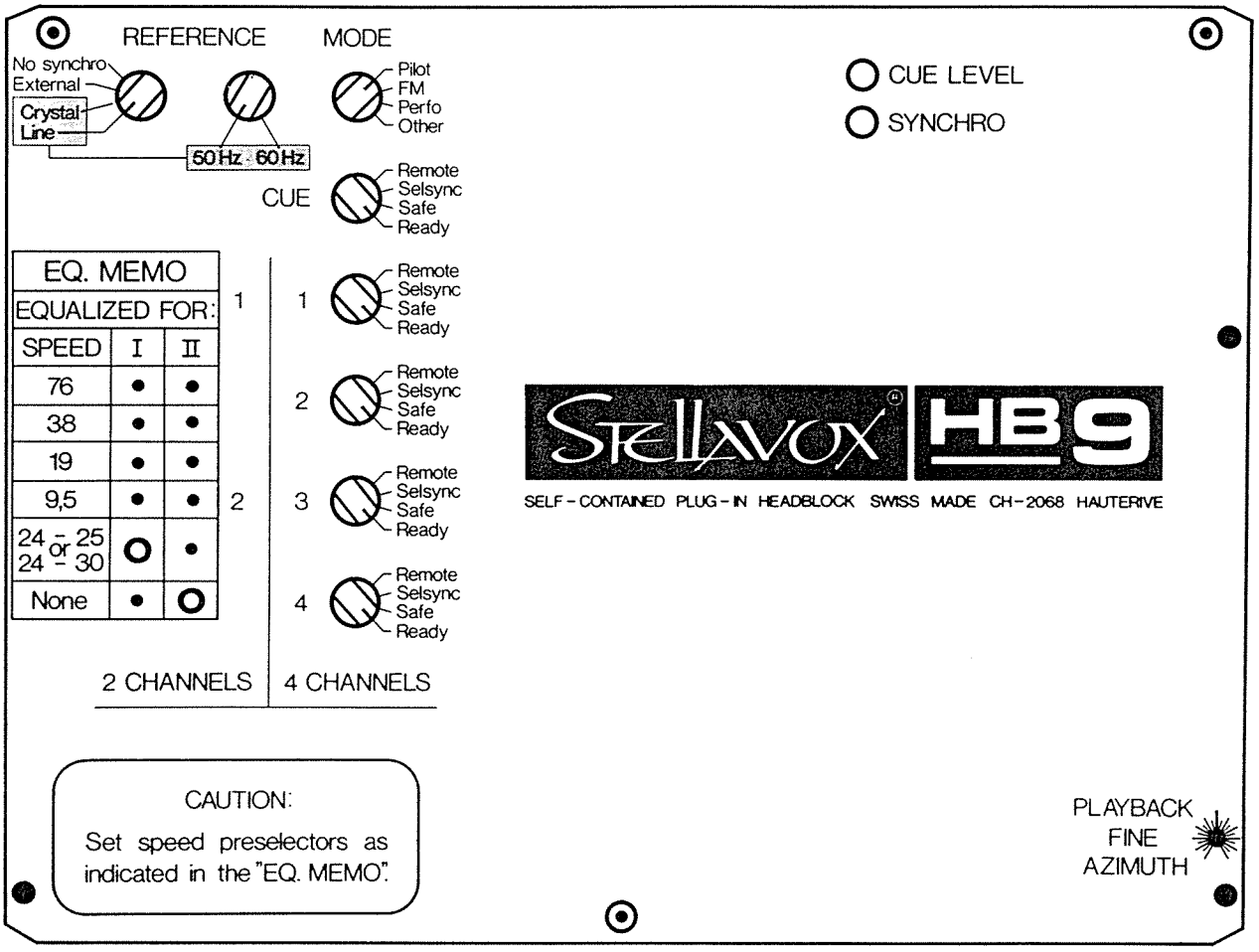
c) The Resolver Card NQS

is conceived as a single unit, which is to be plugged in the last position of one head-block (6), with 3 large holes permitting the passing through of the 3 knobs operating the 3 rotary switches of this card.

The NQS receives the cue information from the neighbour "CUE CARD" which amplifies the cue track signal.

d) Description of the card NQS

The 3 selectors, accessible directly from the top of the headblock, pre-select the reference, frequency and mode; two leds indicate the correct operation :

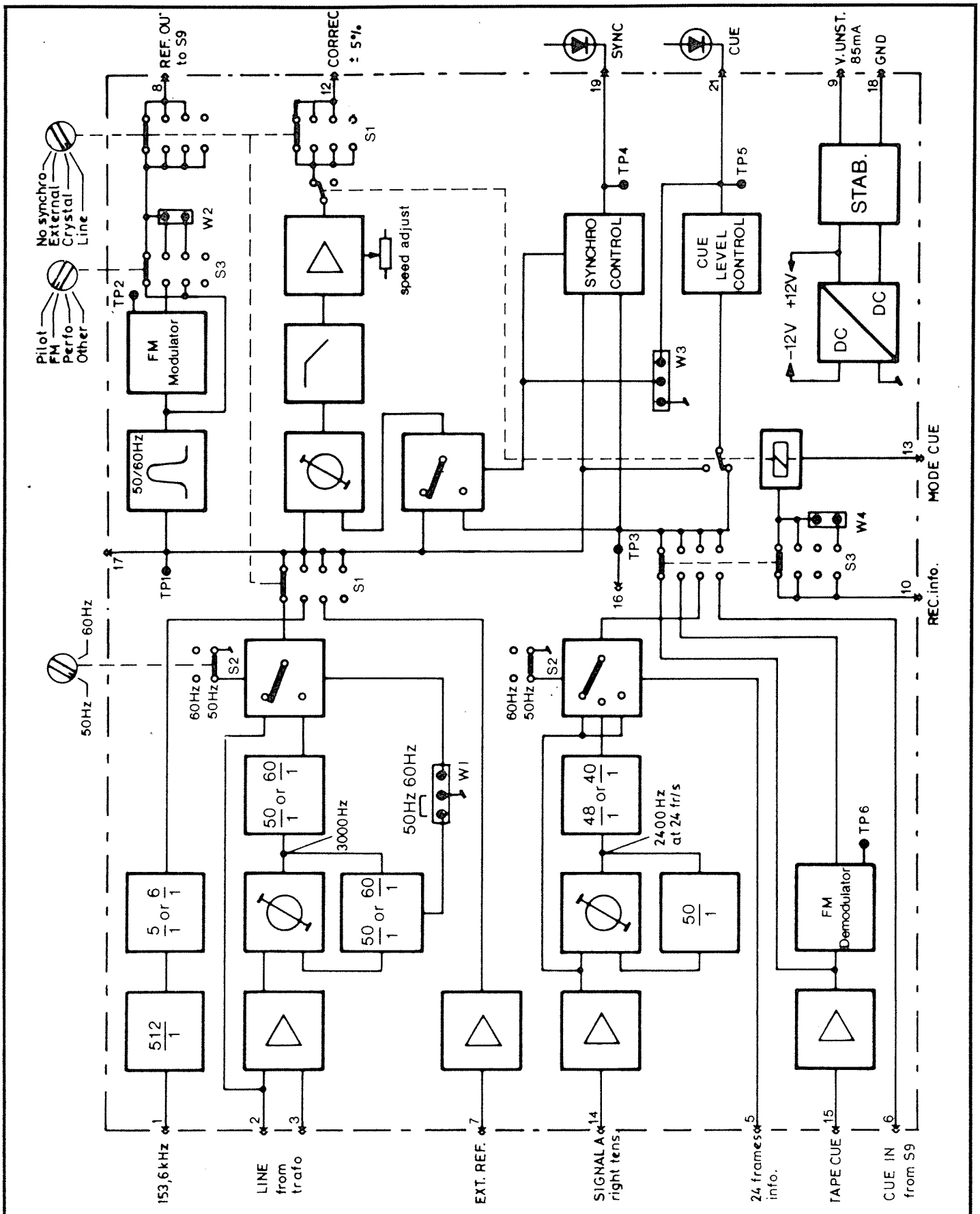


Please notice that the selections operate for the resolving during playback, and cover all standards, up to the special FM(= 50/60 Hz, 13,5 kHz frequency modulated NAGRA SYNC) apart any SMPTE TIME CODE which requires an external synchronizer, as seen just above.

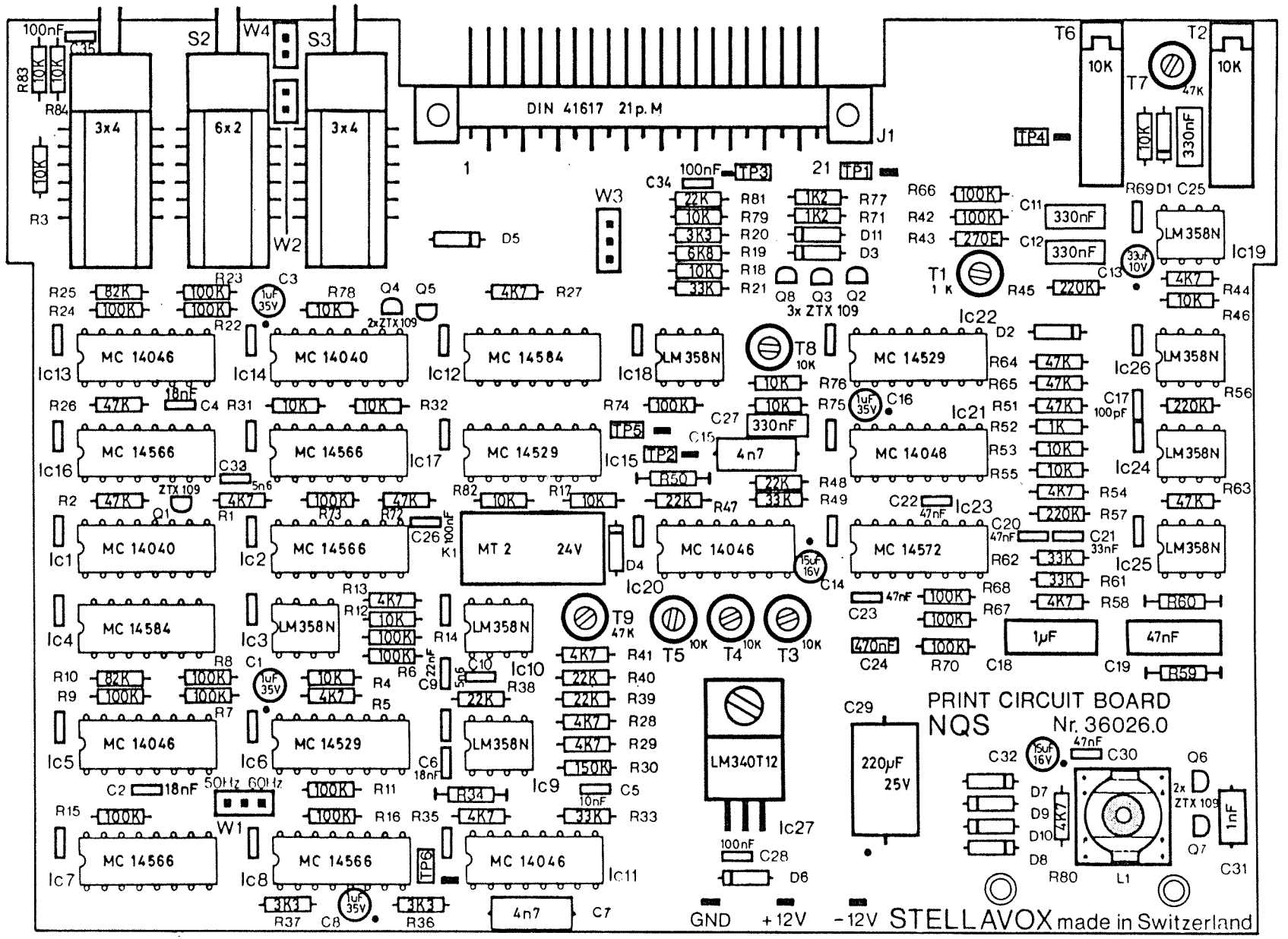
During recording with perfo tape, the synchronization may also operate, as long as the MODE selector is switched to "Perfo". For the other selections "Pilot" or "FM", the proper signal is available at the "REFERENCE" output of the SYNCHRONIZER R-Module at the rear of the recorder, and fed to the CUE input of this same module , to be recorded on the cue track.

The block diagram on the opposite page shows more details, as both print and circuit drawing of next pages.

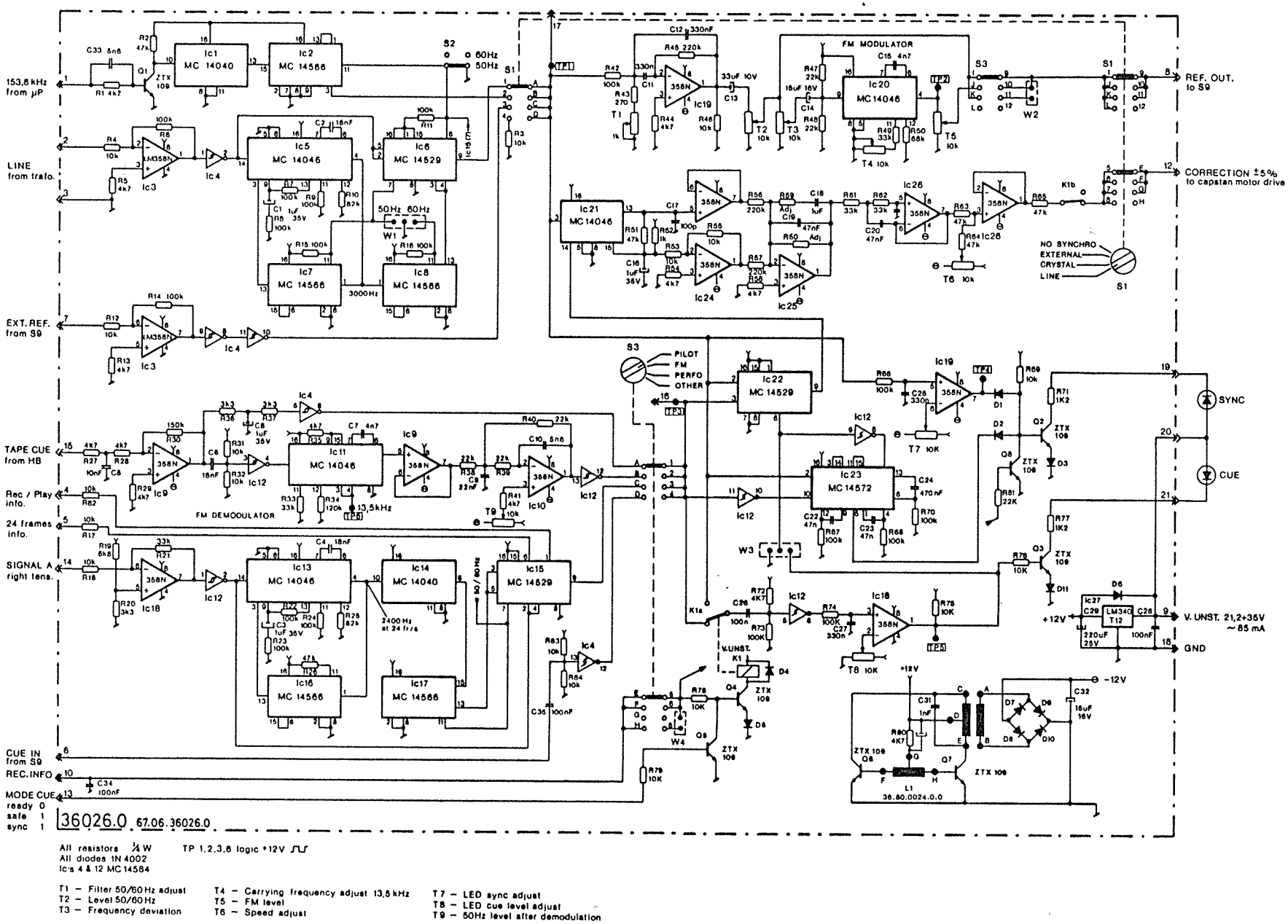
IMPORTANT : a special module type "NDS" may be plugged at the place reserved for "NAM" CH-4 line module for resolving SMPTE Time Code, from its 50/60 Hz. SWITCH MODE : "OTHER".



STELLAVOX SWITZERLAND	BLOCK DIAGRAM NQS	63.04.36026.0



All diodes 1N 4002. Ic-decoupling capacitor 10nF

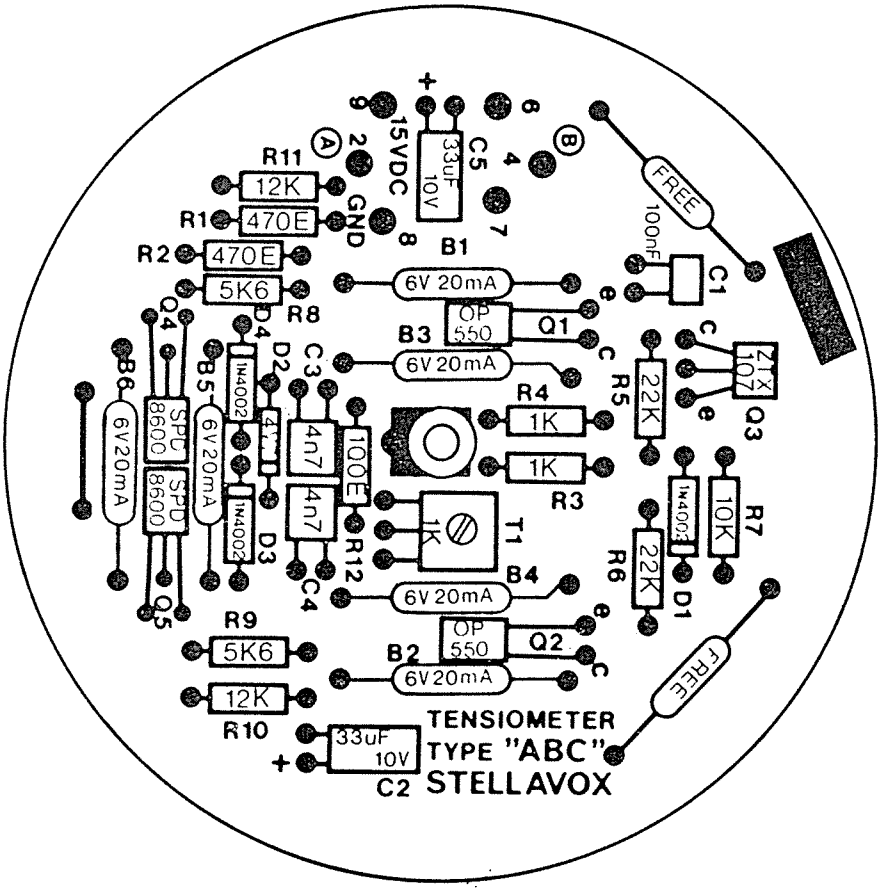


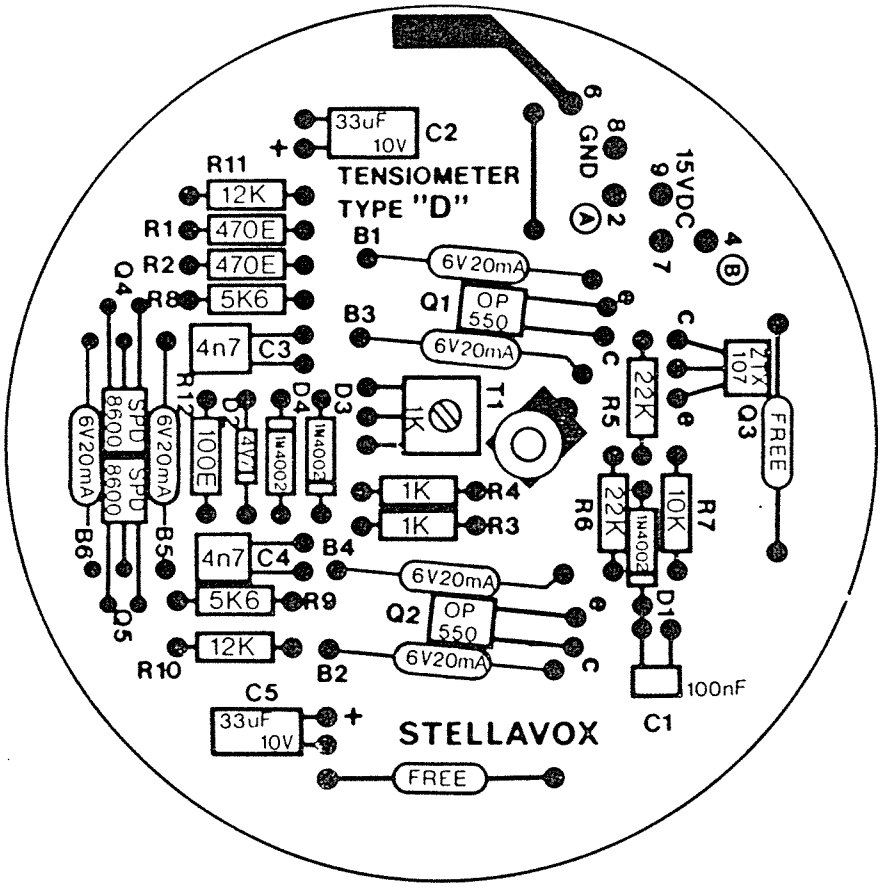
All resistors ¼ W
All diodes 1N 4002
Ic's 4 & 12 MC 14584

TP 1,2,3,6 logic +12V

T1 – Filter 50/60 Hz adjust
T2 – Level 50/60 Hz
T3 – Frequency deviation
T4 – Carrying frequency adjust 13,5 kHz
T5 – FM level
T6 – Speed adjust
T7 – LED sync adjust
T8 – LED cue level adjust
T9 – 50Hz level after demodulation

STELLAVOX SWITZERLAND	Circuit NQS	64.06.36026.0





SWITZERLAND STELLAVOX	Print TENSIOMETER ABCD	66.06.35015.0 66.06.35016.0

38. DIAGRAM AND DESCRIPTION OF ONE TENSIOMETER

Each TD 9 recorder BASE operates with one pair of TENSIOMETERS, one placed Left, and the other Right. These components were designed according to a deliberately new conceipt, in order to ensure without any problem or complication, a fast exchange to obtain, at the delivery or anytime later, another, or more, tape format possibilities.

At the present time, 6 formats are currently offered :

Standard	L-Tensiometer	R-Tensiometer
1/4" (6,25 mm) tape	A	A
1/2" (2,7 mm) tape	B	B
16 mm Perfo PE film	C	D
17,5 mm Perfo PE film	E	F
35 mm Perfo PE film	G	H
1" Video	I	J

REMARK : There is need of two slightly different left and and right tensiometers only in case of perforated tape, the counting informations being taken right. A mechanical lock avoids confusion.

For exchanging tensiometers, please refer to § 16. Don't forget to switch off before removing a tensiometer.

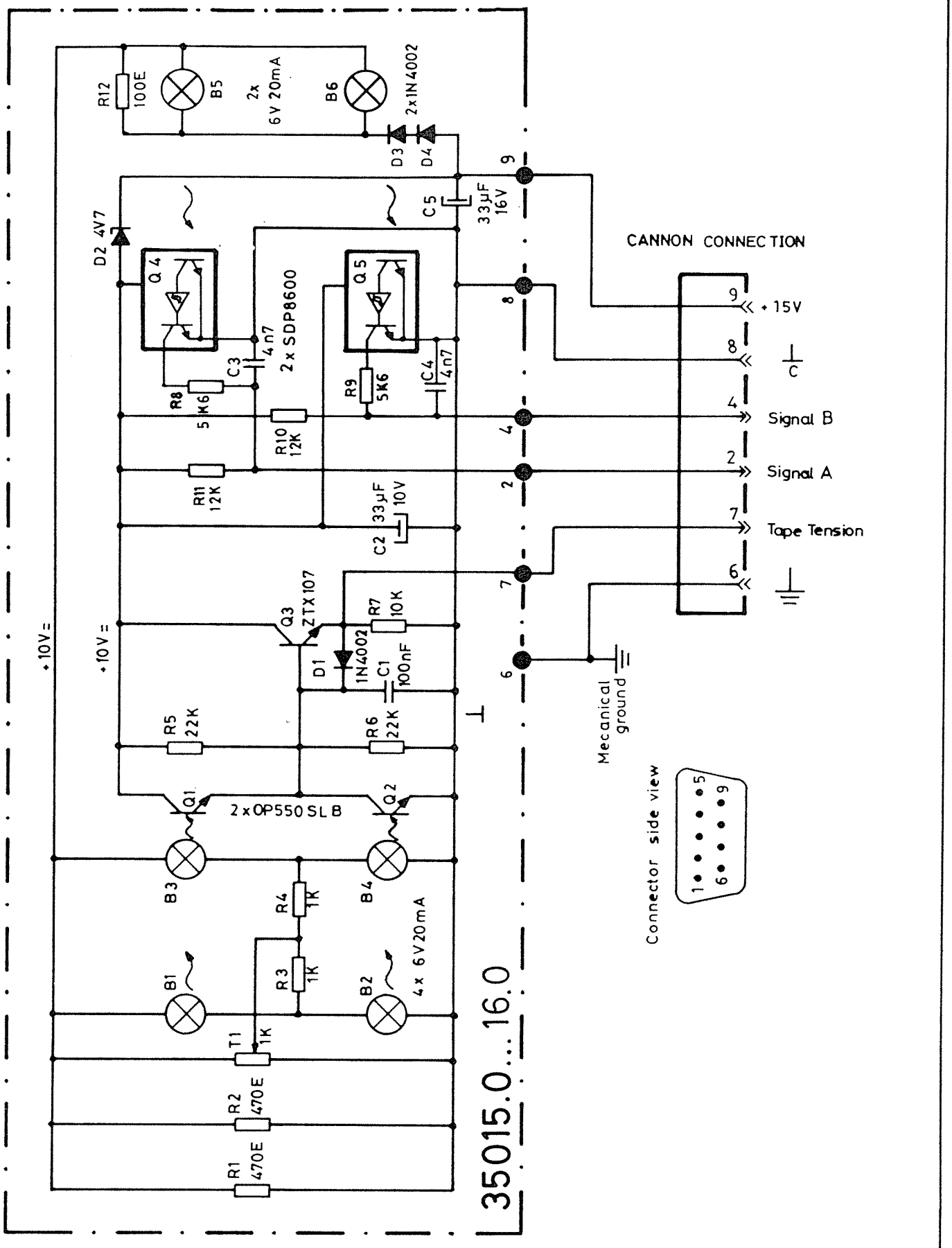
THE FUNCTIONS OF A TD 9 TENSIOMETER

1. Reverts the direction of the magnetic tape from the supply reel to the headspath, or from the heads path to the take-up reel.
2. Gives the height of that tape
3. Checks the tape velocity
4. Checks the tape motion direction
5. Gives informations about the tape tension

Exchanging a tensiometer against another type matches automatically all those features according to the new format !

MAINTENANCE OF TENSIOMETERS

Clean regularly the groove of the pulley. After 5000 hours, or in case of abnormal noise or friction : remove the tensiometer, unscrew the 3 main bolts, separate carefully the parts (take care of the wires) remove both circlips (with a special tool!) retaining the roller. Oil carefully both bearings.



STELLAVOX SWITZERLAND	Circuit TENSIOMETER ABCD	64.06.35015.0 64.06.35016.0

MECHANICAL DESCRIPTION

A very rugged housing of plain metal supports a short spring-articulated lever, which holds the very large (O 60,6 mm) roller around which the tape is thread. The bottom of this roller has a particular black + white design, which is optically sensored by reflexion from the various cells located on the black print covering the roller. The rotation of this roller induces square waves : 90° shifted bi-phasic signals on Q4 and Q5 opto-triggers, at a rate of 50 cycles rotation.

The translation of the roller moves variable black-white density array, inducing a proportional output signal through Q1 and Q2 opto-diodes, which signal the tape tension information for its servo-control.

ELECTRICAL DESCRIPTION

The simple tensiometer board (see PRINT and CIRCUIT next pages) has typically an opto-function, where the location of components, especially opto-triggers and - diodes is critical.

Eventual adjustments (normally never necessary) should be made with the help of a 2 traces-scope and a multimeter.

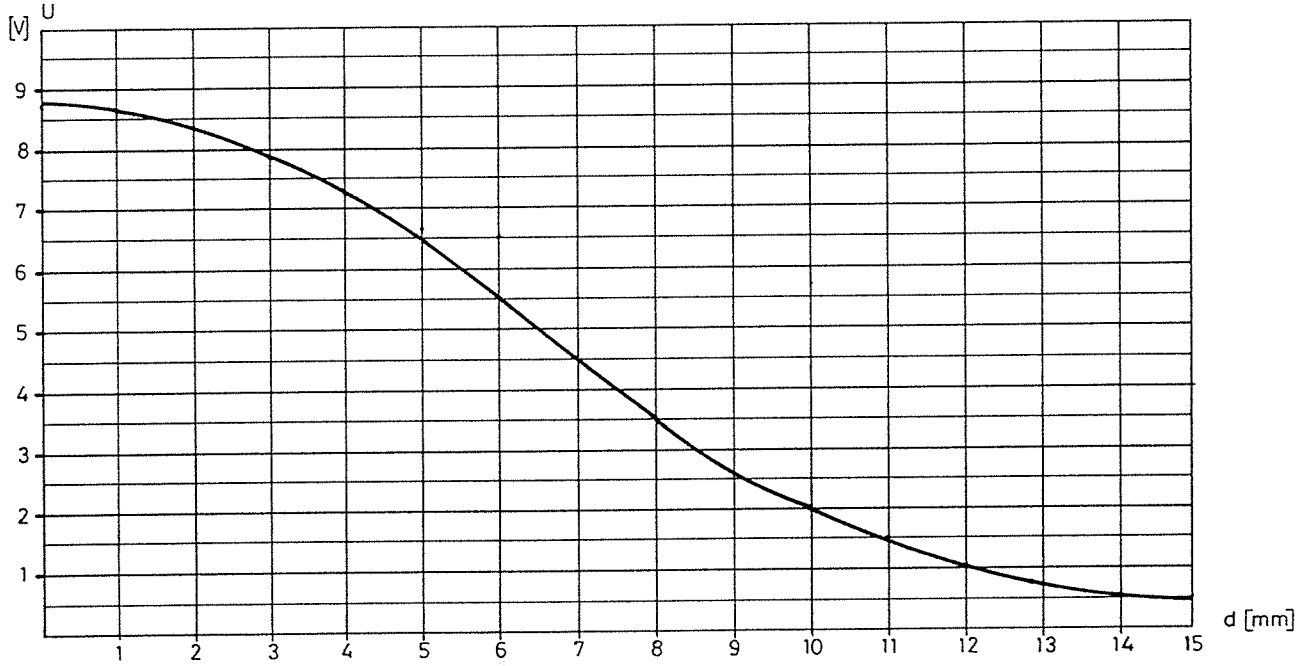
Tape tension :

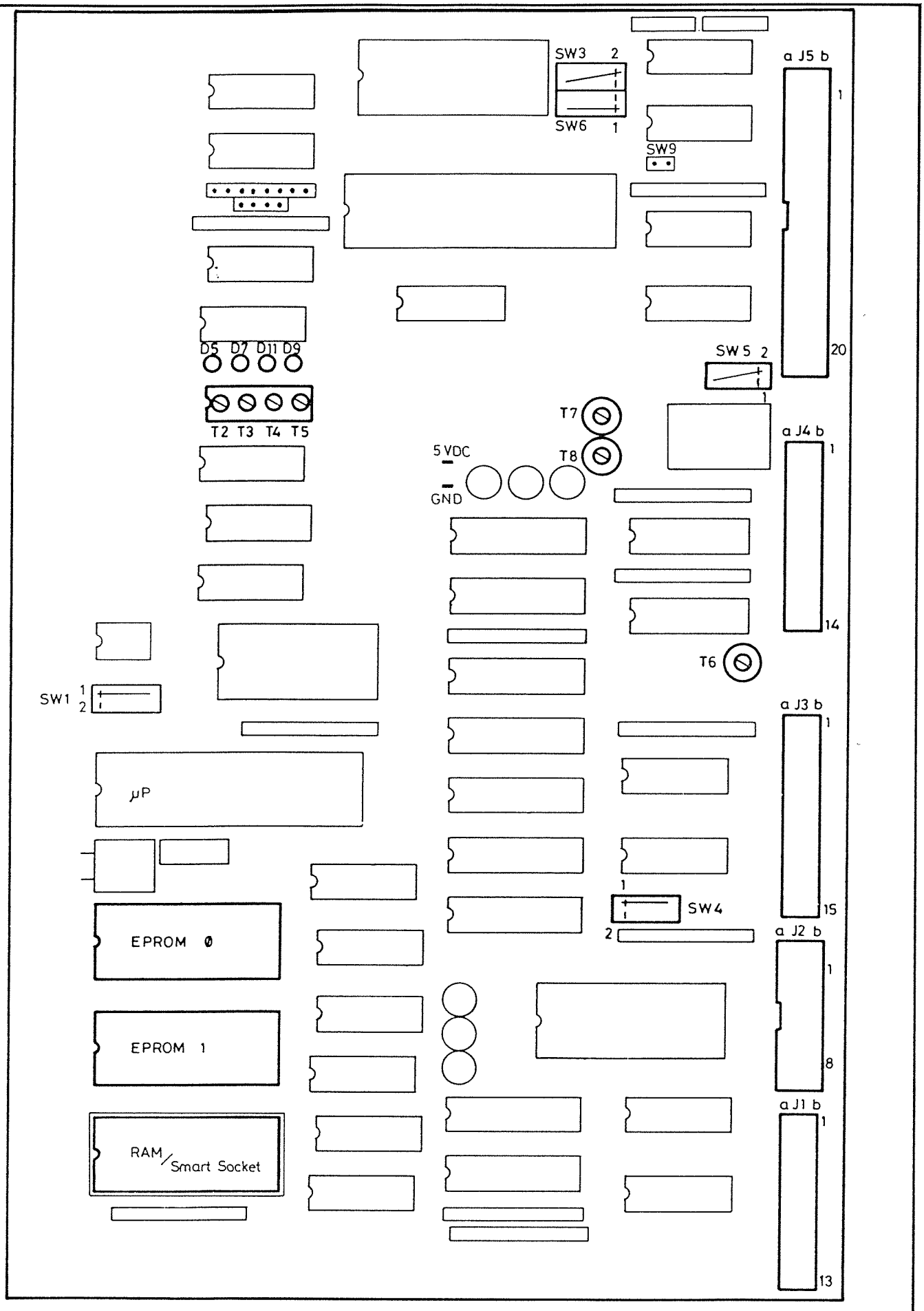
Measure the DC voltage pin 7 : it should vary (according to the roller position : moved by hand to the extremes, the recorder being simply ON, without tape) as a S symmetrical shaped curve (see diagram below). If not symmetrical, calibrate with the trimmer T1, eventually modify R5 or R6.

Counter :

Both opto-triggers Q4 and Q5 must deliver a clean symmetrical 90° delayed square wave, measured at pins 2 and 4. Symmetrisation may be improved by (B5 + B6) lamp currents through resistors R1/R2, ev. by gentle repositioning of the opto-triggers.

Spare lamps are located on the board of each tensiometer





SWITZERLAND STELLAVOX	Print µP UNIT	66.06.31004.1

39. THE µP CARD

is based on the uP (Microprocessor) 80 C 85, having a managing capacity of 64 Kbytes, association to an Eprom 2764 (8 Kbytes) which can be extended to 16 Kbytes. They are located, with all peripherical circuits and connectors, on one only card 16 x 25 cm, for highest reliability, easy maintenance and possible future programme extensions.

This logical circuits system ensures :

- a very gentle and safe tape transport, servo-controlled by plug-in tensiometers of a very new technology, using frictionless opto-electronic sensors for speed and motion control of the tape as well as its tension;
- safety of handling by following warnings through indicator lamps : no tape / incorrect capstan speed / incorrect function settings / locked recording function / low battery voltage, etc.;
- some datas like : real time counter display / total operating hours / actual tape speed, etc. Permanent datas are held by a 16 Kbytes Cmos-memory supplied by a lithium battery;
- The connection ready to external biphasic or Time Code synchronizers, using the recorder as a Master or Slave;
- the possible computer dialogue with RS 422 or others.

Due to the complexity of this board, and the electrical fragility of many circuits contained in this board, we decline any warranty for a damage due to an intervention.

In case of difficulty arising from this board, the simplest way is to replace it against a new one. Your local distributor or ourselves :

STELLAVOX CH-2068 Hauterive Phone : 038 33 42 33 - Tx : 952 783

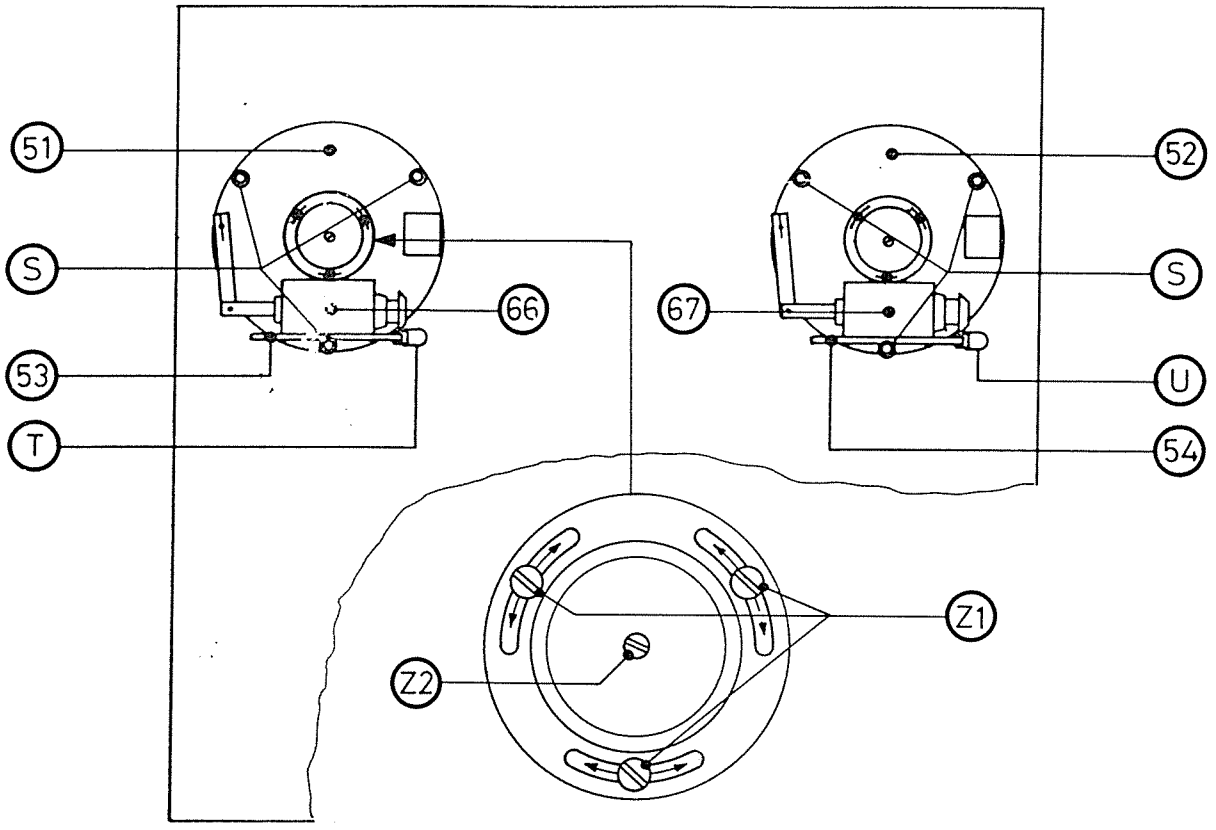
may repair the board, or afford a low cost standard exchange.

The few presettings T2 to T8 are factory-calibrated and don't require subsequent correction.

Only the setting T6 ("tape end") could change with the illumination of the infrared emitter inside the headblock, and/or the photocell "End of Tape Sensor" (38). T6 calibration proceeding :

1. Switch on the recorder, without tape.
2. Turn T6 fully clockwise
3. Turn T6 slowly anticlockwise, up to the point X where the bulb of the "RELEASE" button (37) flashes
4. Insert a tape : the flashing stops, turn T6 further up to the point where the flashing starts.
5. Set definitely T6 at the mid-position between X and Y.

The switch SW4 on the uP board allows the use of the perfotape speed 30 frames/sec. Pos. 1 operates 24/25 f/s and pos. 2: 24/30 f/s.



51. Right take-up motor No.15.00.33003 (for "N") .33004 for "P"
52. Left take-up motor No. 15.00.33003 (for "N")
53. Right winding motor connection board No. 67.06.33011.0
54. Left winding motor connection board No. 67.06.33011.0
66. Right brake magnet
67. Left brake magnet
S. 3 bolts M6x55 No. 30.19.00004.3
T. Plug of the motor block 51
U. Plug of the motor block 52

51. Rechter Aufwickelmotor Nr. 15.00.33001.0
52. Linker Aufwickelmotor Nr. 15.00.33002.0
53. Verbindungskarte rechter Aufwickelmotor Nr. 67.06.33011.0
54. Verbindungskarte linker Aufwickelmotor Nr. 67.06.33011.0
66. Rechter Bremsmagnet
67. Linker Bremsmagnet
S. 3 Bolzen M6x55 Nr. 30.19.00004.3
T. Motorstecker 51
U. Motorstecker 52

51. Moteur bobine droite no 15.00.33001.0
52. Moteur bobine gauche no 15.00.33002.0
53. Carte connexion moteur droite no 67.06.33011.0
54. Carte connexion moteur gauche no 67.06.33011.0
66. Electro-frain droit
67. Electro-frein gauche
S. 3 boulons M6x55 no 30.19.00004.3
T. Connecteur moteur droite 51
U. Connecteur moteur gauche 52

40. HANDLING OF THE WINDING MOTOR UNITS

The drawing on the opposite page shows the position of both winding motors, which incorporate all the parts operating together for the powerful and controlled reel drive, so that the complete assembly may be removed simply by unscrewing all 3 bolts (S) and disconnecting the plug (T).

There is practically no possible trouble of those systems, and no maintenance as well.

However, if any component should be replaced, please refer to the parts list on the opposite page. No special skill is required for such interventions, but don't attempt to open a motor, to replace a ball bearing, etc. We rather suggest a standard exchange in such an (improbable) motor difficulty.

On the contrary, it may be necessary to replace the motor brushes, very rarely in fact, as their life expectancy is very high : thousands of hours !.

If a brush becomes noisy (a graphic inclusion inside the brush could come in contact, during the brush wear, with the rotating collector and induce vibrations) it is easy to find out which, pulling slightly with a pair of tweezers each brush one after the other by its thin connecting cable after having removed the screw (Z 2) and cover.

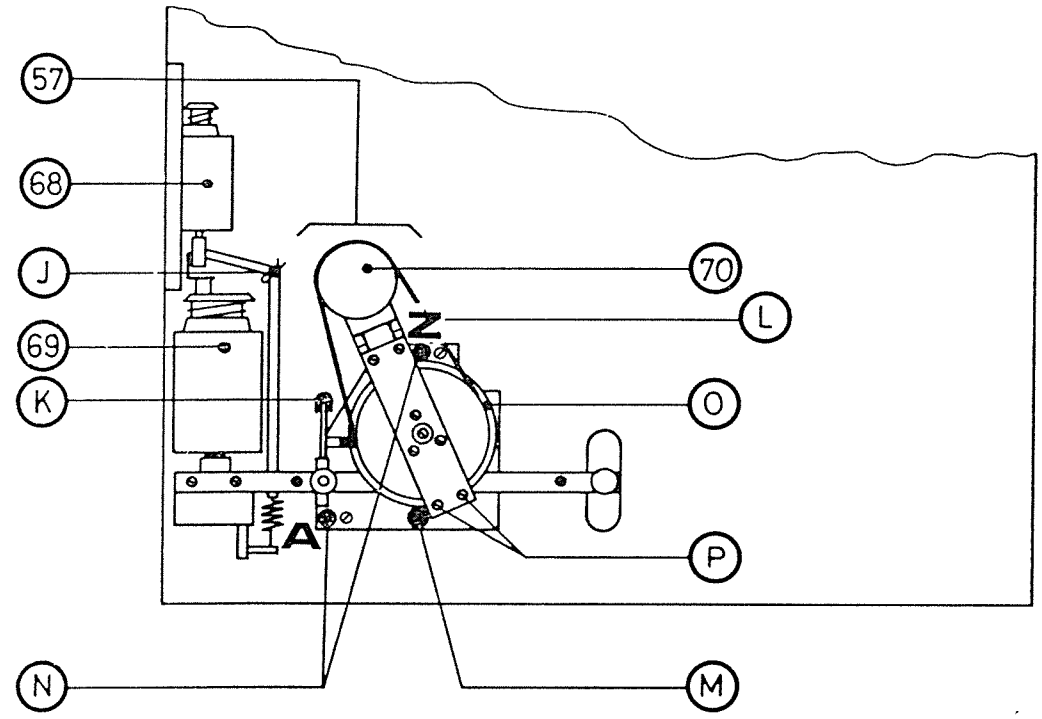
REPLACEMENT OF BRUSHES :

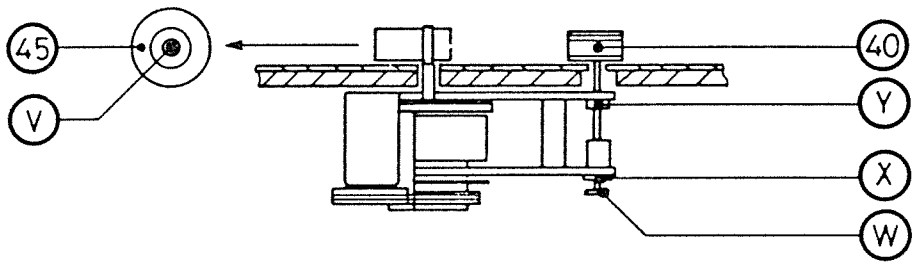
1. Remove screw (Z 2) and the cover.
2. Check the position of the brush holder against the motor chassis : a black line (factory adjustment) should face a red point on the chassis.
3. Unscrew the 3 screws (Z1) and remove carefully the brush-holder. Unsolder the brushes cables, pull them out (don't lose the small guides and spring which have to be reinstalled on the new brushes); reinsert the fresh brushes and solder their cables at the right points. Remember that alternate polarities must follow.
4. Check for perfect mobility of each brush inside its channel.
5. Replace the brush-holder and tighten the 3 screws (Z1); consider the position : see § 2 above. Replace cover and screw (Z2).
6. In case of doubt of the correct position of this "neutral zone" adjust it for motor minimum current.

40. Wheel No. 14.00.34005.0
45. Pinch wheel 13.00.34033.0
57. Capstan motor assembly No. 15.00.34001.0
68. Magnet "Edit" No. 14.00.31016.0
69. Main magnet No. 14.00.31015.0
70. Servo motor No. 35.00.0093.0.0
J. Spring plug No. 37.00.0001.1
K. Connector
L. 3 belts No. 39.00.00008.0
M. 1 allen screw No. 30.19.60002.3
N. 2 allen screws
O. Tachymetric disc No. 18.00.34015.0
P. Screw No. 30.00.40160.1
V. Allen screw No. 30.40.40050.3
W. Adjusting screw No. 30.90.4001.2
X. Counter nut No. 32.03.0040.5
Y. Small allen screw No. 30.40.40050.3

40. Rolle Nr. 14.00.34005.0
45. Gegenkapstanrolle Nr. 13.00.34033.0
57. Kapstan-Motor-Gruppe Nr. 15.00.34001.0
68. Magnet "Edit" Nr. 14.00.31016.0
69. Hauptmagnet Nr. 14.00.31015.0
70. Servo-Motor Nr. 35.00.0093.0.0
J. Federstift Nr. 37.09.0001.1
K. Stecker
L. 3 Riemen Nr. 39.00.00008.0
M. 1 Imbusschraube Nr. 30.19.600002.3
N. 2 Imbusschrauben Nr. 30.19.6001.3
O. Tacho-Scheibe Nr. 18.00.34015.0
P. Schrauben Nr. 30.00.40160.1
V. Imbusschraube Nr. 30.40.40100.3
W. Einstellschraube Nr. 30.90.40001.2
X. Gegenmutter Nr. 32.03.0040.5
Y. Kleine Imbusschraube Nr. 30.k40.40050.3

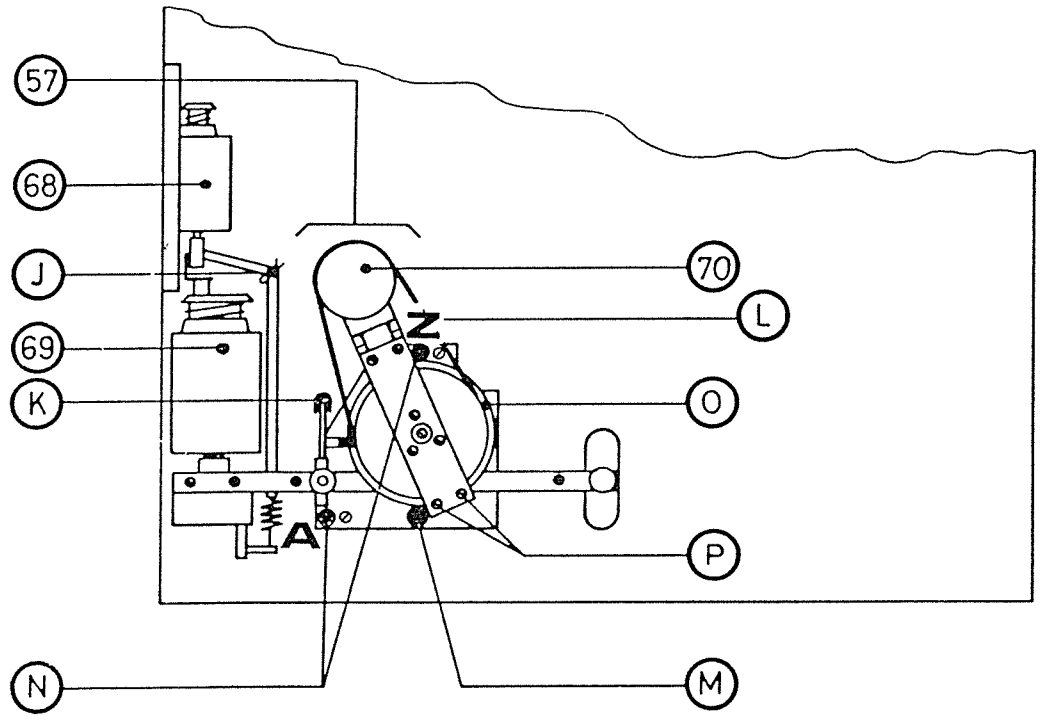
40. Roulette no 14.00.34005.0
45. Galet d'appui no 13.00.34033.0
57. Bloc-moteur cabestan no 15.00.34001.0
68. Electro-aimant "Edit" no 14.00.31016.0
69. Electro-aimant principal no 14.00.31015.0
70. Servo-moteur no 35.00.0093.0.0
J. Goupille ressort 37.09.0001.1
K. Fiche moteur avec détrompeur
L. 3 courroies no 39.00.00008.0
M. Vis noire no 30.19.60002.3
N. 2 vis noires no 30.19.60001.3
O. Disque tachymétrique no 18.00.34015.0
P. 2 vis tête cylindrique no 30.00.40160.1
V. 1 vis noircie tête cyl. six pans creux M4x no 30.10.40100.3
W. Vis à tête moletée basse M4x25 no 30.90.40001.2
X. Ecrou moleté bas M4 no 32.03.0040.5
Y. 1 vis sans tête six pans creux M4x4 no 30.40.40050.3

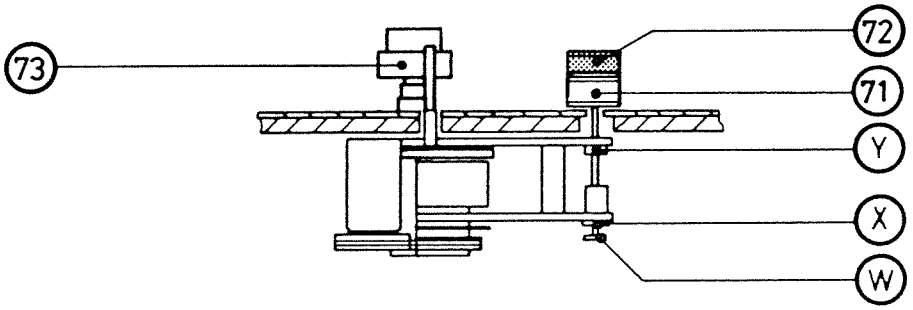




SWITZERLAND STELLAVOX

CAPSTAN-MOTOR ASSEMBLY **N**


57
68
J
69
K
70
L
O
P
N
M
A


73
72
71
Y
X
W

41. CARE OF THE CAPSTAN MOTOR UNIT

In order to maintain a stable alignment of the main elements deciding the tape transport stability : capstan (46), pinch wheel (45) and smoothing roller (40), are articulated onto a very solid base, which is tightened to the recorder chassis (a 8 mm thick plate of special high stability alloy) by 3 points N / N / M, M being firm and both points N being adjustable for the accurate perpendicularity (azimut and zenit being independent) of the capstan shaft.

41.1 BELTS REPLACEMENT

Unscrew both screws (P) and remove carefully the parts where the screws were screwed in. Belts can be easily replaced. Reinstall parts and screws (P).
NEVER ATTEMPT TO TOUCH THE OTHER SCREWS, WHICH TIGHTEN THE ASSEMBLY FOR PERFECT CAPSTAN ALIGNMENT.

41.2 PINCH WHEEL REPLACEMENT

Unscrew (45) and replace the pinch wheel which contains the ball bearing already installed. Some play of the wheel is not only normal, but necessary.

41.3 CAPSTAN MOTOR REPLACEMENT

Unsolder both wires (notice the polarity!) on both motor lugs.
Remove the pulley fixed by 3 screws on shaft of the motor (70).
Unscrew the 4 screws which maintain the motor and remove it.

> NOTE : by replacing the pulley, take care to leave a gap of approx. 0,5 mm between the pulley and the bracket.

41.4 CAPSTAN ALIGNMENT

The capstan shaft must be strictly perpendicular to the surface of the chassis (all levels are referred to the lower surface of this 8 mm thick plane chassis), unless the tape transport is not parallel to that plane, especially by incorrect capstan azimut.

This alignment is factory-adjusted, with special tools and method, so that we do not recommend to modify it.

If a re-alignment is anyway necessary, do it with care (+/- 0,5 mm max.), using screw (Z) for the zenit modification and, more important, the screw (A) for the azimut, which controls typically the tape transport which must be parallel to the platine.

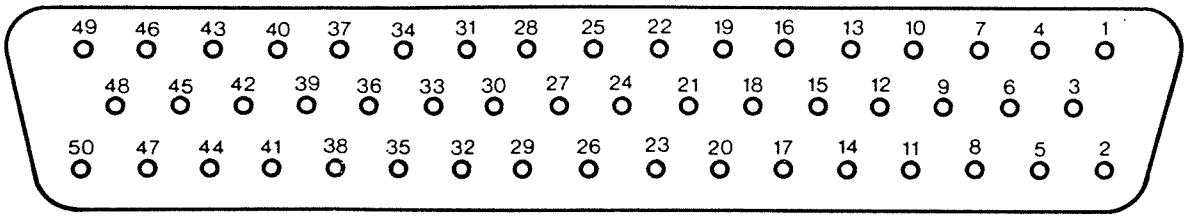
Please notice the special adjustment system, by which the "pushing" screw adjust the height, and the larger screw, spring-loaded, locks the definitive position, once calibrated.

41.5 SMOOTHING ROLLER ALIGNMENT

Please refer to the bottom drawing of the opposite page. Here also, the perpendicularity of the axle of this roller is very important for a correct tape path in front of the heads. Don't attempt to adjust, only if truly necessary :

Height : loosen the counter nut (X); adjust the height by screw (W) so that the grooves of the roller face exactly the tape.

Angle : some horizontal play of the lower bearing allow inclination adjustment of the shaft, for best tape motion in front of the heads. Tighten then firmly (X).

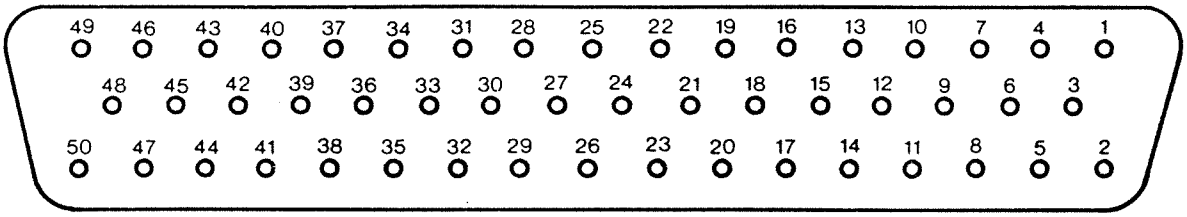


D SUB 50p. (front view) J22 ⚠ Flat cable

PIN	FUNCTION	from TD 9	pin	to TD 9
				0V ready, +6 V safe +12 V sync
1	REMOTE MODE CH 1		1	
2	REMOTE MODE CH 2		2	" "
3	REMOTE MODE CH 3		3	" "
4	REMOTE MODE CH 4		4	" "
5	REMOTE MODE CUE		5	" "
6	GROUND C (Logic)		6	
7	+5 V C	Max. 100 mA	7	
8	+15 V C	Max. 100 mA	8	Auto Baud Rate
9	RS 422		9	⊥ +5V
10	RS 422		10	+5V ⊥
11	RS 422		–	38400 Bauds
12	RS 422		–	
13	RS 422	DS26LS32 Rx	13	
14	RS 422		14	
15	RS 422		–	
16	RS 422		–	
17	RS 422	DS26LS31 Tx	17	
18	RS 422		18	
19	RS 422		–	
20	RS 422		–	
21	RS 422		–	
22	RS 422		–	
23	INPUT A (free)		–	
24	INPUT SW-RST		24	+5V pin7
25	INPUT SW-REW		25	+5V pin7

SWITZERLAND STELLAVOX

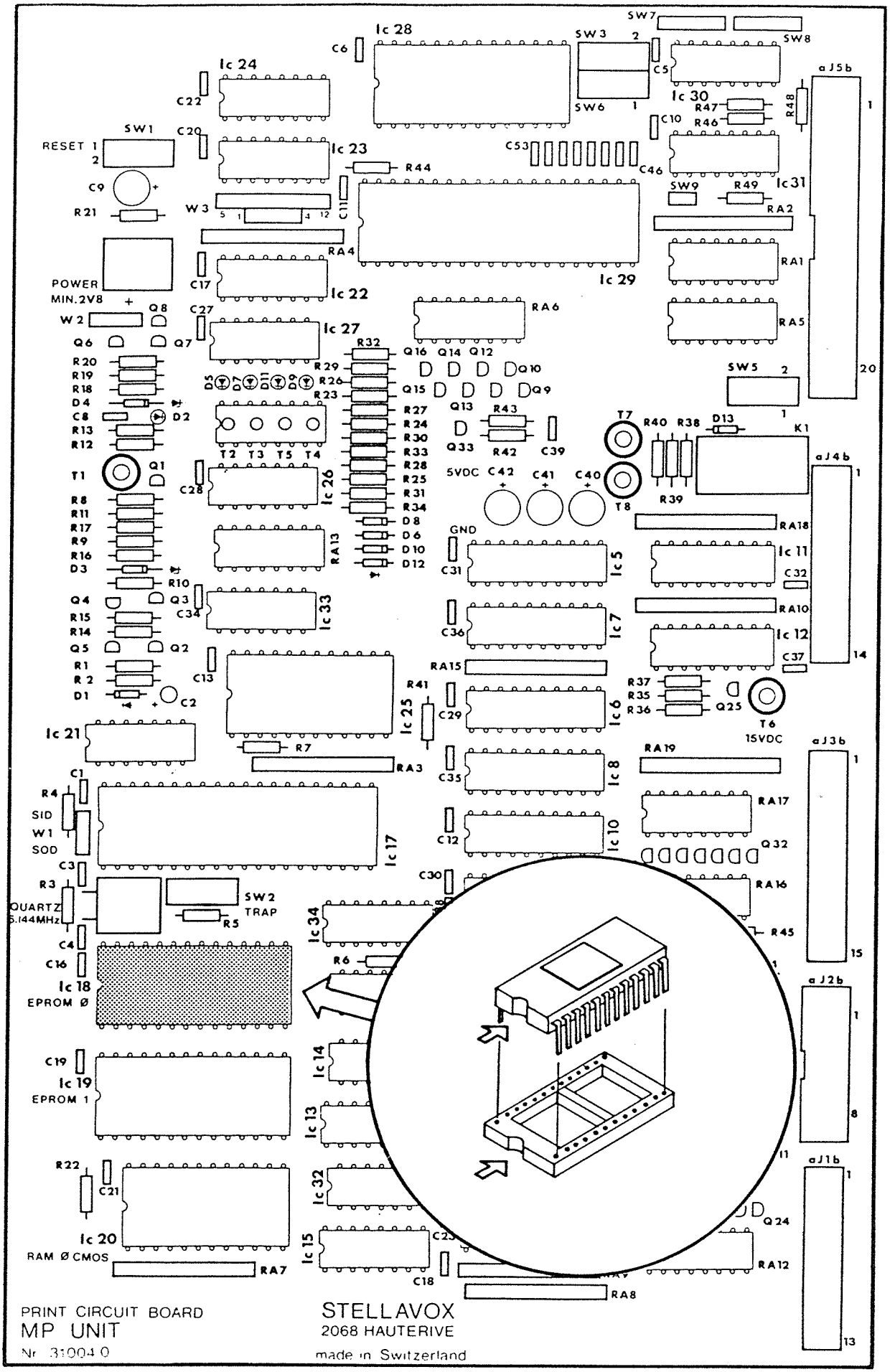
REMOTE SOCKET CONNECTIONS "TD 9" | 76 00.31022.0

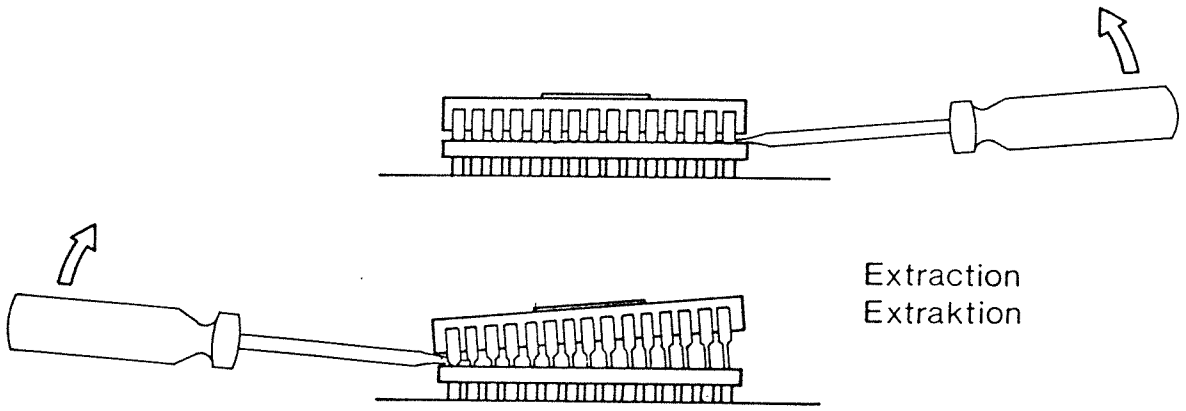


D SUB 50p. (front view) J22 ⚠ Flat cable

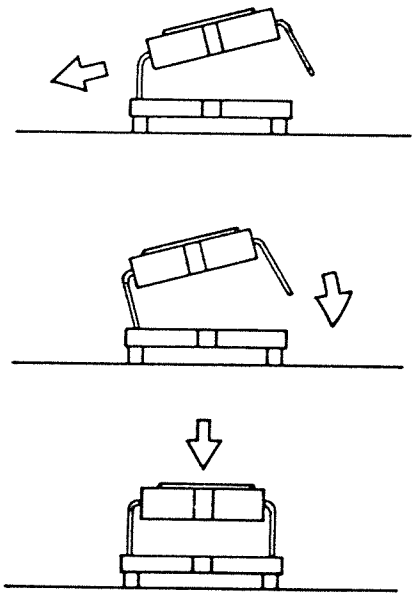
PIN	FUNCTION	from TD 9	pin	to TD 9
26	INPUT SW-FORW		26	+5V pin7
27	INPUT B (free)		–	
28	INPUT SW-REC		28	+5V pin7
29.	INPUT SW-PLAY		29	+5V pin7
30	INPUT SW-STOP		30	+5V pin7
31	OUTPUT B-REC	1K2	31	
32	OUTPUT B-STOP	1K2	32	
33	OUTPUT B-FOW	1K2	33	
34	CAP. MOTOR DIRECTION		–	
35	OUTPUT A (free)		–	
36	OUTPUT B (free)		–	
37	OUTPUT B-REW	1K2	37	
38	OUTPUT B-PLAY	1K2	38	
39	RIGHT TENS. SIGNAL B	74HC14	39	
40	RIGHT TENS. SIGNAL A	74HC14	40	
41	LEFT TENS. SIGNAL A	74HC14	41	
42	LEFT TENS. SIGNAL B	74HC14	42	
43	INPUT FADER		43	pin 6
44	INPUT MODE 0		44	
45	INPUT MODE 1		–	
46	OUTPUT END OF TAPE	1K	46	
47	INPUT EXT.SYNCHRO (order)		47	+5V pin7
48	GROUND C (Ext. synchro)		48	
49	INPUT EXT.SYNCHRO (1,6 kHz)	+12 V 2K2	49	pin 48
50	V. unst. C (21,5-32 V)	Max. 200 mA	50	

STELLAVOX SWITZERLAND	REMOTE SOCKET CONNECTIONS "TD 9"	76 00.31022.0


Ic 28
Ic 24
Ic 30
Ic 23
Ic 31
Ic 29
Ic 22
Ic 27
Ic 26
Ic 33
Ic 21
Ic 25
Ic 5
Ic 7
Ic 6
Ic 8
Ic 10
Ic 11
Ic 12
Ic 17
Ic 18
EPROM Ø
Ic 19
EPROM 1
Ic 20
RAM Ø CMOS
Ic 34
Ic 14
Ic 13
Ic 32
Ic 15
SW1
RESET
SW2
TRAP
SW3
SW6
SW7
SW8
SW9
W1
SID
SOD
W2
W3
POWER
MIN.2V8
QUARTZ
5.144MHz
5VDC
15VDC
GND
K1
aJ1b
aJ2b
aJ3b
aJ4b
aJ5b
PRINT CIRCUIT BOARD
MP UNIT
Nr. 31004.0
STELLAVOX
2068 HAUTERIVE
made in Switzerland



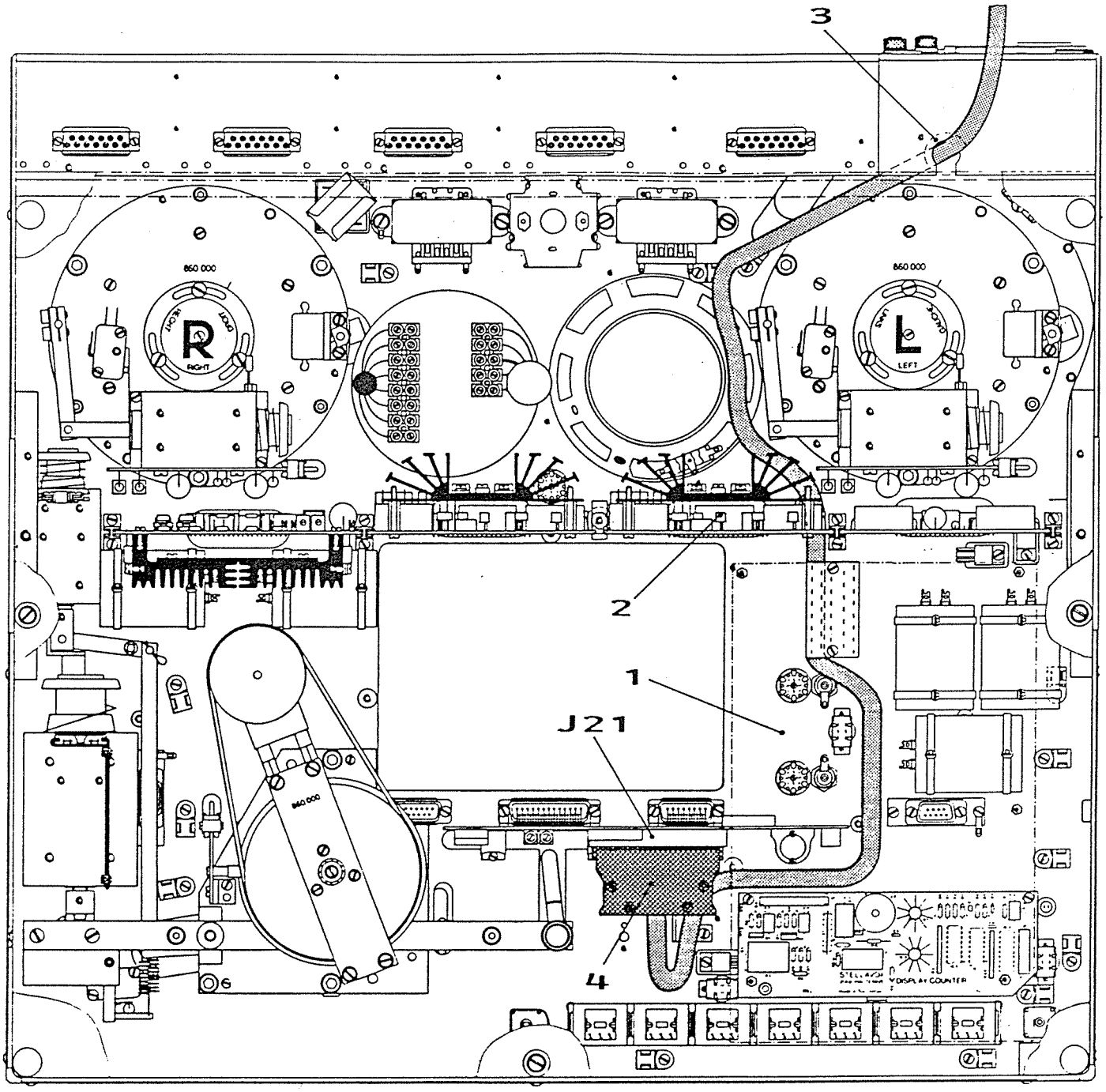
Extraction
Extraktion



Insertion
Einsetzen

CAUTION : Switch off the power AC or DC before this intervention

STELLAVOX SWITZERLAND	Changing of EPROM	

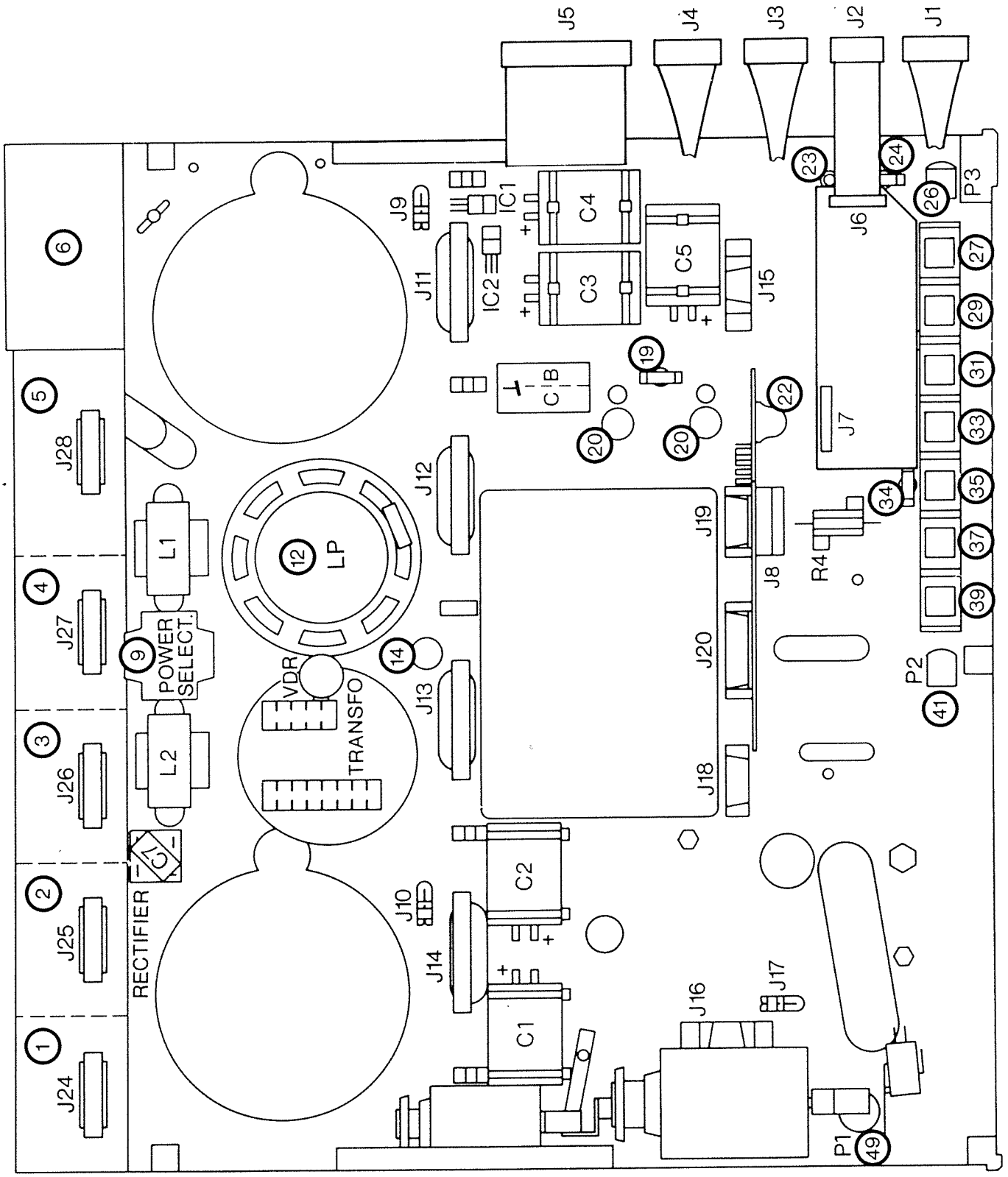


Enlever le fond. Extraire le connecteur-pont de J21. Dévisser les 5 vis de la carte microprocesseur **1** et la basculer. Extraire la carte ampli-moteur gauche **2** et retirer le bouchon en plastique **3** . Enficher le connecteur **4** dans J21 et brider le câble suivant le schéma ci-dessus. Enficher la carte ampli-moteur **2** et fixer la carte microprocesseur **1** . Fixer le fond.

Remove the bottom. Remove the bridge connector from J21. Unscrew the 5 screws from the microprocessor card **1** and overturn it. Remove the left winding motor amplifier **2** and remove the plastic cap **3** . Plug in the connector **4** into J21 and tie the cable according to the scheme above. Plug in the winding motor amplifier card **2** and reinsert the microprocessor card **1** . Fasten the bottom.

Bodenplatte entfernen. Brückenschaltung aus J21 herausziehen. Die 5 Schrauben der Mikroprozessorkarte **1** losschrauben und diese kippen. Linke Ampli-Motor-Karte **2** entfernen und den Plastikzapfen **3** herausziehen. Den Steckkontakt **4** in J21 stöpseln und das Kabel gemäss obigen Schema anflanschen. Die Ampli-Motor-Karte **2** einstecken und die Mikroprozessorkarte **1** befestigen. Bodenplatte befestigen.

STELLAVOX SWITZERLAND	INSTALLATION OF THE AMU EXTENTION CABLE	17.00.37006.0



SWITZERLAND STELLAVOX	GENERAL LAYOUT	60.03.31000.0

1 Module-L enfichable, canal 1
2 Module-L enfichable, canal 2
3 Module-L enfichable, canal 3
4 Module-L enfichable, canal 4
5 Module-S enfichable, synchro

6 Module d'alimentation et télécommande
7 Numéro de série
8 Calibrage des niveaux entrées-sorties
9 Commutateur général réseau/batterie
10 Plateau porte-bobine

11 Commutateur de rotation
12 Haut-parleur incorporé (monitoring)
13 Poulie-guide
14 Commutateur des moteurs
15 Connecteur de service

16 Sélecteurs des modes synchro et selsync
17 Indicateur de synchronisation (facultatif)
18 Indicateur des égalisations établies
19 Inverseur de vitesse
20 Présélecteurs des vitesses

21 Tensiomètre enfichable (gauche)
22 Sélecteur de pistes (monitoring)
23 Contrôle de phase
24 Inverseur «Tape-Direct»
25 Jacks sorties écouteur et HP externes

26 Bouton «VOLUME»
27 Touche «REWIND» + indicateur
28 Bouton pour affichage vitesse bande
29 Touche «FAST FORWARD» + indicateur
30 Compteur en temps réel/Affichage des heures d'utilisation et de la vitesse de bande/alarme

31 Touche «PLAY» + indicateur
32 Remise à zéro du compteur
33 Touche «STOP» + indicateur
34 Verrouillage de l'enregistrement
35 Touche «RECORD» + indicateur

36 Connecteur «AUDIO» (interne)
37 Touche «RELEASE» + indicateur
38 Détecteur fin de bande
39 Touche «EDIT» + indicateur
40 Poulie de stabilisation

41 Bouton «EDIT»
42 Bloc porte-têtes enfichable
43 Têtes magnétiques
44 Bloc amovible marqueur + blindage
45 Galet contre-cabestan

46 Cabestan
47 Tensiomètre enfichable (droit)
48 Base
49 Ajustage vitesse de bande
50 Platine

1 Steckbares L-Modul, Kanal 1
2 Steckbares L-Modul, Kanal 2
3 Steckbares L-Modul, Kanal 3
4 Steckbares L-Modul, Kanal 4
5 Steckbares S-Modul, Synchro

6 Speisungs-/Fernbedienungs-Modul
7 Gerätenummer
8 Pegel-Eichung der Ein/Aus-Pegel
9 Hauptschalter Netz/Batterie
10 Spulenhalter

11 Drehrichtungsumschalter
12 Eingebauter Lautsprecher (Monitoring)
13 Führungsrolle
14 Motorenumschalter
15 Kontrollstecker

16 Synchro- und Selsync-Betriebsartenumschalter
17 Synchronisierungsanzeige (fakultativ)
18 Tabelle der eingestellten Entzerrungen
19 Geschwindigkeitsumschalter
20 Geschwindigkeiten-Vorwahl

21 Steckbarer Tensiometer (links)
22 Spurenwähler (Monitoring)
23 Phasenkontrolle
24 Umschalter «Tape-Direct»
25 Kopfhörer/Lautsprecher-Klinkenstecker

26 Knopf «LAUTSTAERKE»
27 Taste «REWIND» + Anzeige
28 Knopf für Bandgeschwindigkeits-Anzeige
29 Taste «FAST FORWARD» + Anzeige
30 Zähler reelle Zeitanzeige / Betriebsstunden- und Bandgeschwindigkeitsanzeige / Alarm

31 Taste «PLAY» + Anzeige
32 Zählerrückstellung
33 Taste «STOP» + Anzeige
34 Aufnahme-Verriegelung
35 Taste «RECORD» + Anzeige

36 «AUDIO»-Konnektor (intern)
37 Taste «RELEASE» + Anzeige
38 Bandende-Fühler
39 Taste «EDIT» + Anzeige
40 Beruhigungsrolle

41 Knopf «EDIT»
42 Steckbarer Tonkopfträger
43 Magnetische Tonköpfe
44 Herausnehmbarer Abschirmungs- und Markierblock
45 Gegenkapstanrolle

46 Kapstan
47 Steckbarer Tensiometer (rechts)
48 Grundgerät
49 Bandgeschwindigkeitseinstellung
50 Platine

1 Plug-in LINE Module Channel 1
2 Plug-in LINE Module Channel 2
3 Plug-in LINE Module Channel 3
4 Plug-in LINE Module Channel 4
5 Plug-in SYNCHRONIZATION Module

6 POWER SUPPLY Module
7 Serial Number
8 LEVEL ADJUSTMENTS
9 Power Switch AC/DC
10 Tape Plate

11 TAPE PATH SELECTOR
12 Monitor Speaker
13 Guide Pulley
14 Winding Mode Selector
15 Service Connector

16 Synchro Mode Selector/Recording Track Selectors (optional)
17 SYNCHRO Indicator (optional)
18 Equalizations Memo
19 SPEED Switch
20 SPEED PRESELECTOR

21 Plug-in Tensiometer left
22 TRACK SELECTOR Monitor
23 PHASE Check Button
24 "TAPE-DIRECT" Switch
25 Stereo Headphone Jack/Monitor Speaker Jack

26 MONITOR Volume Control
27 REWIND Button and Indicator
28 SPEED DISPLAY Button
29 FAST FORWARD Button and Indicator
30 Real Time Tape Counter/Elapsed operating hours information/Speed Display/Warning Indicator

31 PLAY Button and Indicator
32 Counter RESET Button
33 STOP Button and Indicator
34 Record Inhibit Switch
35 RECORD Button and Indicator

36 Internal Audio Connector
37 RELEASE Button and Indicator
38 End of Tape Sensor
39 EDIT Button and Indicator
40 Smoothing Roller

41 EDIT Speed Control
42 Selfcontained plug-in Headblock HB
43 Magnetic Heads
44 Removable Headshield and Tape Marker
45 Pinch Wheel

46 Capstan
47 Plug-in Tensiometer right
48 Base (Main Body)
49 SPEED ADJUSTMENT
50 Top Panel