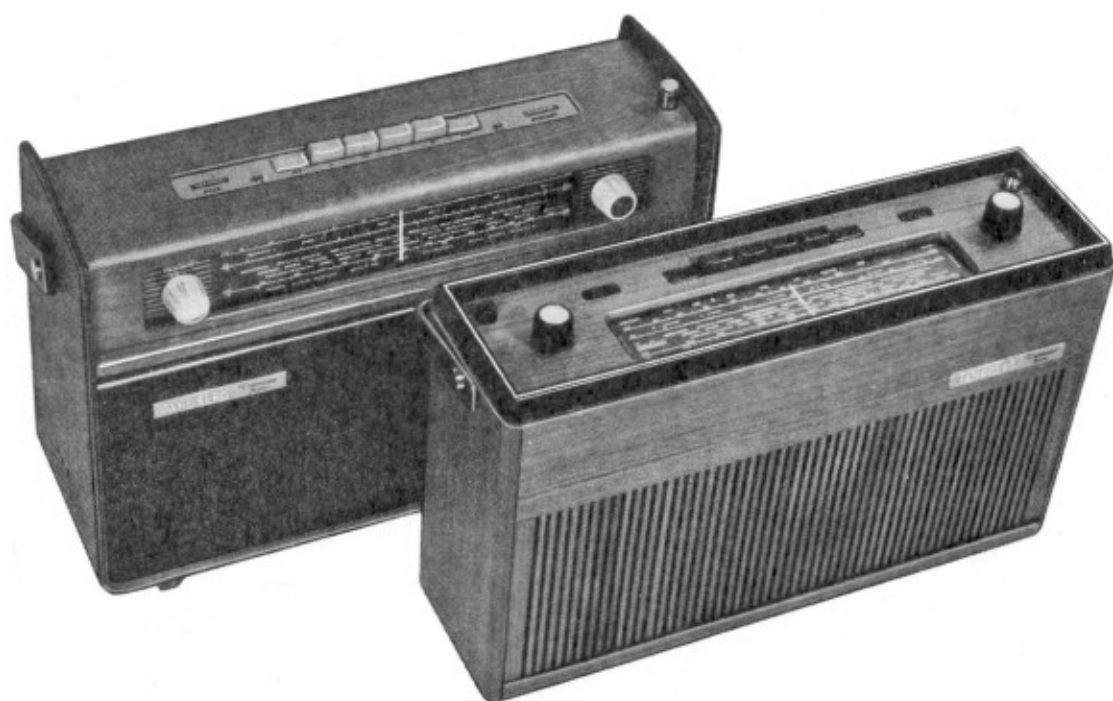


Januar 1966.

TANDBERG TRANSISTOR RADIO

Models TTR 1 and TTR Auto

Service Manual



Tandberg
RADIO

TANDBERGS RADIOFABRIKK A/S - OSLO - NORWAY

Service

MODEL TTR 1

Disassembling the set: Remove the knobs, the guide frame for the printed circuit, the batteries and the two Parker screws on top of the tuner. Pull the chassis down towards the loudspeaker magnet and tip it out. The chassis will stand up vertically with easy access to nearly all parts. If the chassis, however, has to be moved out of the cabinet, the wires for the antennas (point 1-9, ref. figs. 6 and 7) have to be unsoldered. It will not be necessary to remove other wires, and the tuner is still operative, without the AM input circuits.

Assembling the set: Make sure that the upper part of the printed circuit board fits into the guide slots of the wooden cabinet. Insert the guide frame, the Parker screws and the knobs.

MODEL TTR-Auto

Disassembling the set: Unscrew the bottom plate and take out the batteries. Remove the two nuts on the lower edge of

the chassis and the two screws at the back of the cabinet. The wires to the loudspeaker are fitted with «Fast on» connectors, and can easily be disconnected at the loudspeaker side. The chassis together with the top framing can now be pushed up and out.

Connect the loudspeaker with a pair of lengthening wires to the set and replace the batteries. The radio is then complete with easy access to all parts for measuring.

To remove the top framing, take off the knobs and unscrew the nuts placed beneath.

MODELS TTR 1 AND TTR-AUTO

Push Button Assembly. Note: The Push-Button-Switch is made of polystyrene elements and care must be taken when soldering. See fig. 11 for disassembling and cleaning instructions. The knobs are easily replaced and it is possible to replace a single section of the switch if necessary. (When ordering name the wave band.)

Trouble shooting: It might be difficult to find the cause of some of the troubles which might occur—often the cause is of an intermittent nature. We will mention a few symptoms, provided that the batteries are fresh i.e. the battery voltage is 6.5 volts or better.

Symptom:

Unstability, particularly at strong signals on LW.

Low amplification in the low-frequency stage with poor bass regulation.

Microphonic on FM.

Microphonic on FM, especially with the tuning capacitor turned all the way in.

Dead AM, but o.k. FM.

Noise when the volume control is turned down.

Valid for TTR 1 only:

Distortion, mainly second harmonics.

Unstability on FM, especially on the left side of the dial at high volume.

Cause:

Defective C81, 320 μ F or intermittent connection in same.

Defective C66, 100 μ F. The amplification in T7 is reduced with a following reduction of the feed back. The bass regulation in the feed back circuit should give a variation of approx. 7 dB at 120 c/s, measured across the loudspeaker.

The following three possibilities:

- 1) loose turns on coil L13;
- 2) intermittent failure in the trimming capacitor C30;
- 3) vibrations of the rotor blades in the tuning capacitor of the oscillator section. Use a pin of wood or plastic to check for the stage which is oscillating. L13 can be repaired by gluing the loose turns on the coil. The adjustment screw of C30 can be sealed by a sealing lacquer, but if the play in the screw is too great, the trimming capacitor should be replaced.

The rotor blades can be dampened by gluing an insulating plate of for instance .5 mm thick bakelite sheet of a half-circle shape with a diameter 28 mm on to the outside of the rotor blades of the FM-oscillator.

Open circuit in L25 or L31.

Check the soldering connection of L24 and L30. L25 and L31 are chokes mounted on the plate between the coils in the filter box.

Defective T6—AC151.

Defective C86, 500 μ F, or intermittent connection in same.

Note: When this capacitor is replaced make sure that the new capacitor is of exactly the same shape and that it is being placed in exactly the same position as the old one. The location of the capacitor is critical for the stability on LW.

The FM oscillator is weak. The oscillator voltage measured with a high frequency voltmeter between the emitter and the ground shall be 150 millivolts through out the entire FM band. If the voltage decreases when the tuner is turned towards lower frequencies a ceramic capacitor of approx. 10 pF connected between the emitter and the ground might be helpful. Minor re-adjustment of the trimming capacitor C30 is necessary to correct the dial adjustments.

Alignments

Adjustment of AM-IF (455 kc/s)

Apply a 455 kc/s signal (30 % AM-modulated) to the base of the transistor Q3, pt. A fig. 5 or 8. The level should be approx. $20\mu\text{v}$. Align L20-23-26-29-32 for maximum output. Adjust the blocking circuit L10 with a relatively strong IF signal (455 kc/s) applied to the base of transistor Q1, pt. B fig. 5 or 8. If a wobbler is used during the alignment, the oscilloscope should be connected to pt. C fig. 5 or 8 in the AM detector, and the treble control should be set to max.

Adjustment of FM-IF (10,7 Mc/s)

Apply a 10,7 Mc/s signal, modulated ± 200 kc/s to the base of the transistor Q1 (pt. B, fig. 5 or 8). The level should be approx. 2 mV. Connect the oscilloscope to the diode output, and set the sensitivity of the scope to 10 mV/cm. Detune L34, and align L14-15-21-28-30-33 for symmetry and maximum curve height.

Reduce the modulation to ± 75 kc/s and align the raitodetectorcurve by adjusting L34. The signal level should be as low as possible. The coils L33 and L34 are located behind the battery tube, and the battery must therefore be connected to the receiver via wires during adjustment of these coils.

R53 is adjusted for max. AM-supression when a FM signal (400 c/s, 75 kc/s deviation) and an AM signal (50 c/s, 30 % modulation) are applied simultaneously. Re-adjust L34, if necessary, for max. linearity.

Adjustment of the oscillator- and HF-circuits

Connect the signal generator to the input terminal for the car antenna via the circuit shown in fig. 1. For the Auto-model, depress the push-button marked AUTO. Adjust the oscillatortrimmers on the frequencies given in the columns below.

A wobbler and an oscilloscope can be used for aligning the HF-circuits. The wobbler can produce certain unwanted frequencies with high signal level which must be filtered to avoid blocking of the receiver.

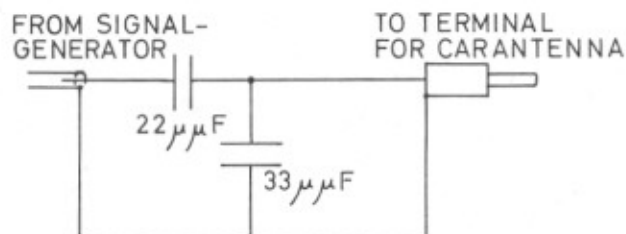


Fig. 1.

(TTR-Auto)

Band	Frequency	Oscillator	HF-stage	
			Car-ant.	Ferr.ant.
FM	89 MHz 102 MHz	L13 C30	L11 C8	
SW KB	6.5 MHz 14 MHz	L19 C45	L9 C18	
BC MB	600 kHz 1300 kHz	L17 C43	L7 C17	L2 C5
LW LB	170kHz 280kHz	L16 C42	L6 C14	L1 C20

The signal level during the HF alignments should be kept as low as possible. See adjustment frequencies in the columns below.

When aligning the ferriteantenna circuits, the signal must be applied via a loop loose connected to the receiver.

For the TTR 1

The frame aerials are connected to circuits for matching to the respective wavelengths. These circuits should be adjusted when aligning.

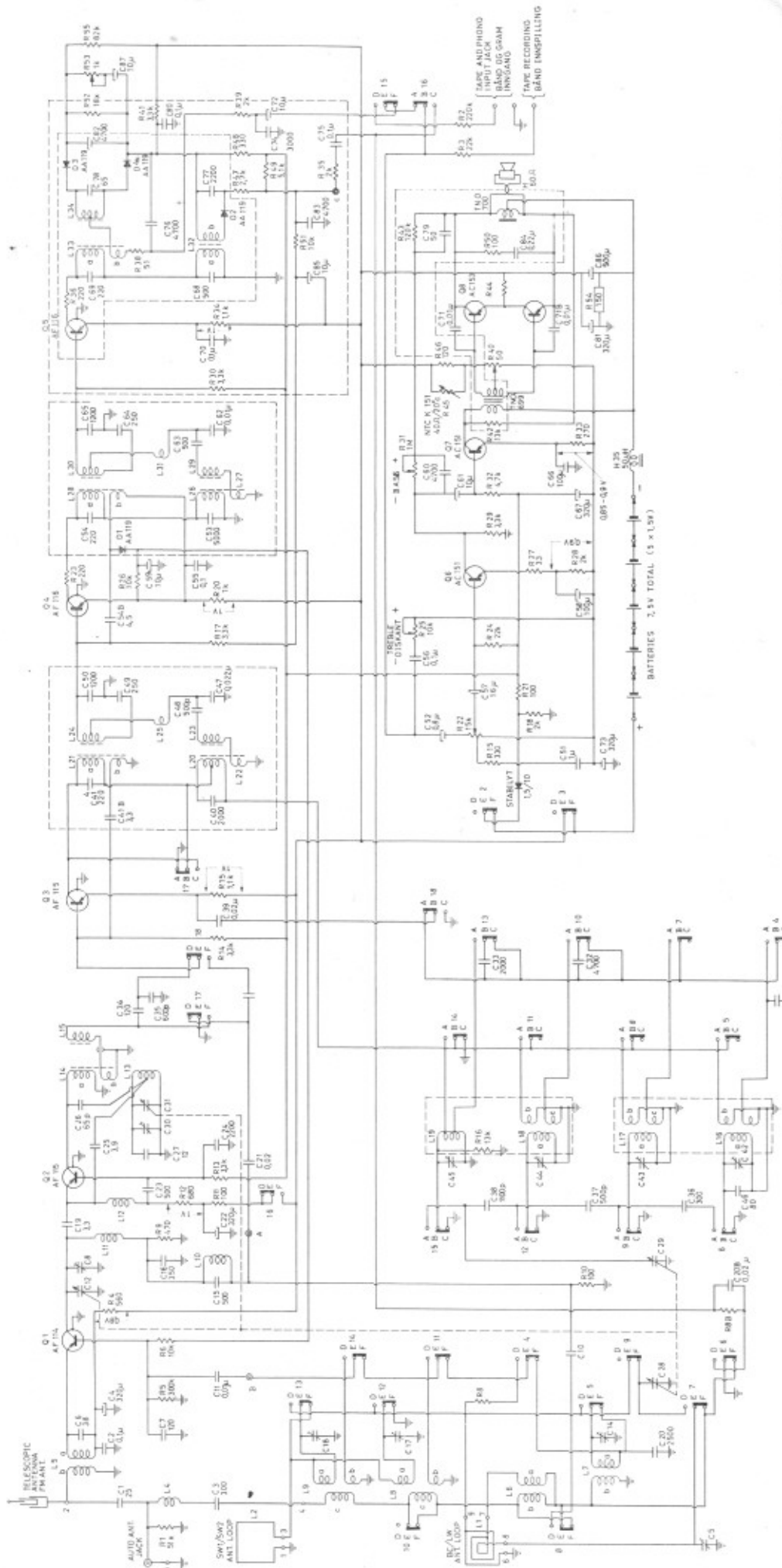
The battery voltage. The voltage is measured between the red and the blue wire from the battery when the receiver is operating at normal volume.

Note: The minus terminal of the battery is connected through a series resistor R54 (150 ohms) to the chassis. This resistor is carrying the current to the RF stages and 1st LF stage and serves as a filter between these stages and the output stage. R54 is located close to the board terminal of the blue wire, and the easiest way of controlling battery voltage is to connect the voltmeter between the upper end of R54 and the red wire terminal on the Push-Button-Switch. The receiver will operate at a battery voltage of 4 volts, but the output power will be rather low. We do recommend to have the batteries changed when the voltage has dropped to 5.5–6 volts. A good check on the battery performance is obtained by measuring the voltage drop of the batteries from Off to On position with quiescent current load. (Volume control at zero). The voltage drop should not exceed .1 volt with a good battery. If the drop is .5 volt the internal resistance is approx. 25 ohms and the output power will then be limited to approx. .3 watt. With a drop of 1 volt the output power will hardly exceed 75–100 milliwatts.

The working conditions of the transistors: Check the working conditions of the transistors by measuring the emitter voltage. The values are given in the schematic. The quiescent current through the transistors T8 and T9 is measured by a millivoltmeter connected across R44 (10 millivolts) or by measuring the total current. The total current should be 20–21 milliamps without any signal when the tuner is in AM position (LW). The specification appertain to a battery voltage of 7 volts and a temperature of 20° C. The «stabilitt» voltage measured between + and R21 should be 1.5 volts.

(TTR 1)

Band	Frequency	Oscillator	HF-stage
FM	89 MHz 99 MHz	L13 C30	L11 C8
SW2 KB	6.5 MHz 14 MHz	L19 C45	L9 C18
SW1 FB	1.8 MHz 4.2 MHz	L18 C44	L8 C17
BC MB	600 kHz 1300 kHz	L17 C43	L6 C5
LW LB	170kHz 300kHz	L16 C42	L7 C14



TANDBERG TRANSISTOR RADIO
 MODEL 1
 PARTS LIST ACCORDING TO ORIGINAL
 JAN. 1955

DRAWING NO. 6059-3
 TERNING INT.

RESISTORS: NOT INDICATED
 M = MEG OHM
 K = KILO OHM
 NOT INDICATED = OHM
 U = UNDEFINITE

CAPACITORS: CONDENSATORS
 M = MICRO FARAD
 NOT INDICATED = MICRO MICRO FARAD
 U = UNDEFINITE

Δ = LOG UP
 LOG UP LOG DOWN
 LOG DOWN
 ♯ = LOG UP AND DOWN
 } = LOG UP AND DOWN

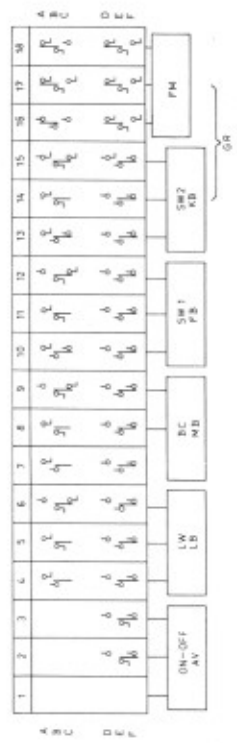
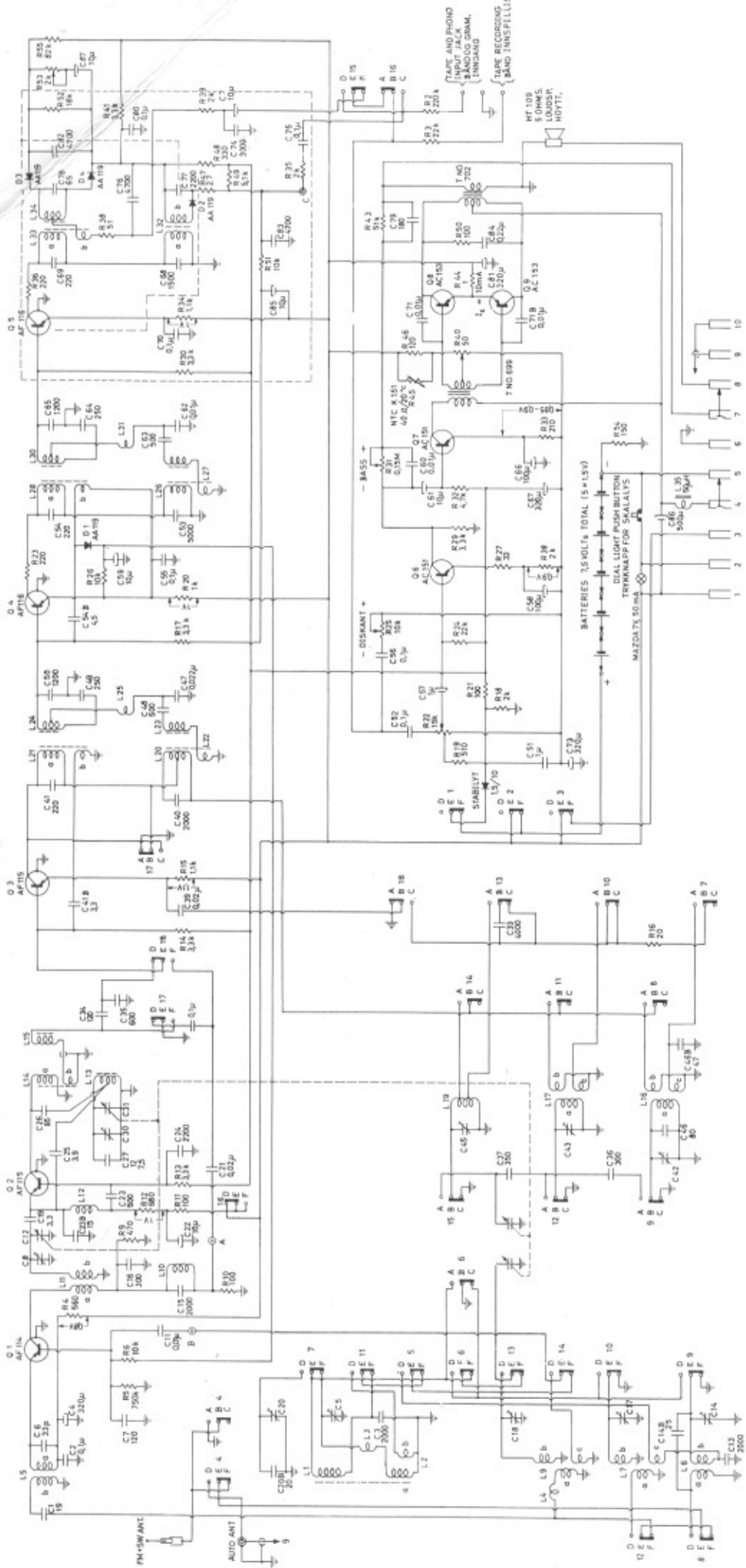


Fig. 2. Schematic TTR 1.



TANBERG TRANSISTOR RADIO
 MODEL AUTO
 TANBERG INSTRUMENTS A.S. OSLO
 JAN. 1965

DRAWING NO. 6161-1
 FEKUNING N.E.

RESISTORS: MΩ STANDER
 M = MEG OHM
 Ω = OHM
 NOT INDICATED } = OHM
 UBENEVNT } = OHM

CAPACITORS: KONDENSATORER
 NOT INDICATED } = MICRO FARAD
 UBENEVNT } = MICRO MICRO FARAD

4 = LUG UP
 LOBBETAGG OPP
 5 = LUG DOWN
 LOBBETAGG NED
 6 = LUG BOTH UP AND DOWN
 LOBBETAGG BADE OPP OG NED

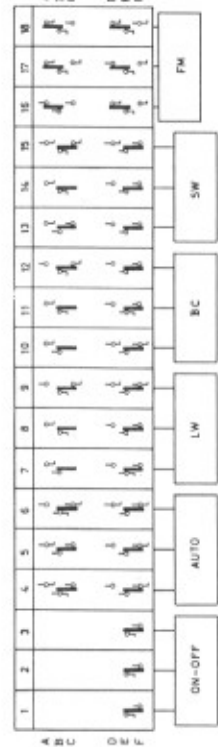


Fig. 3. Schematic TTR Auto.

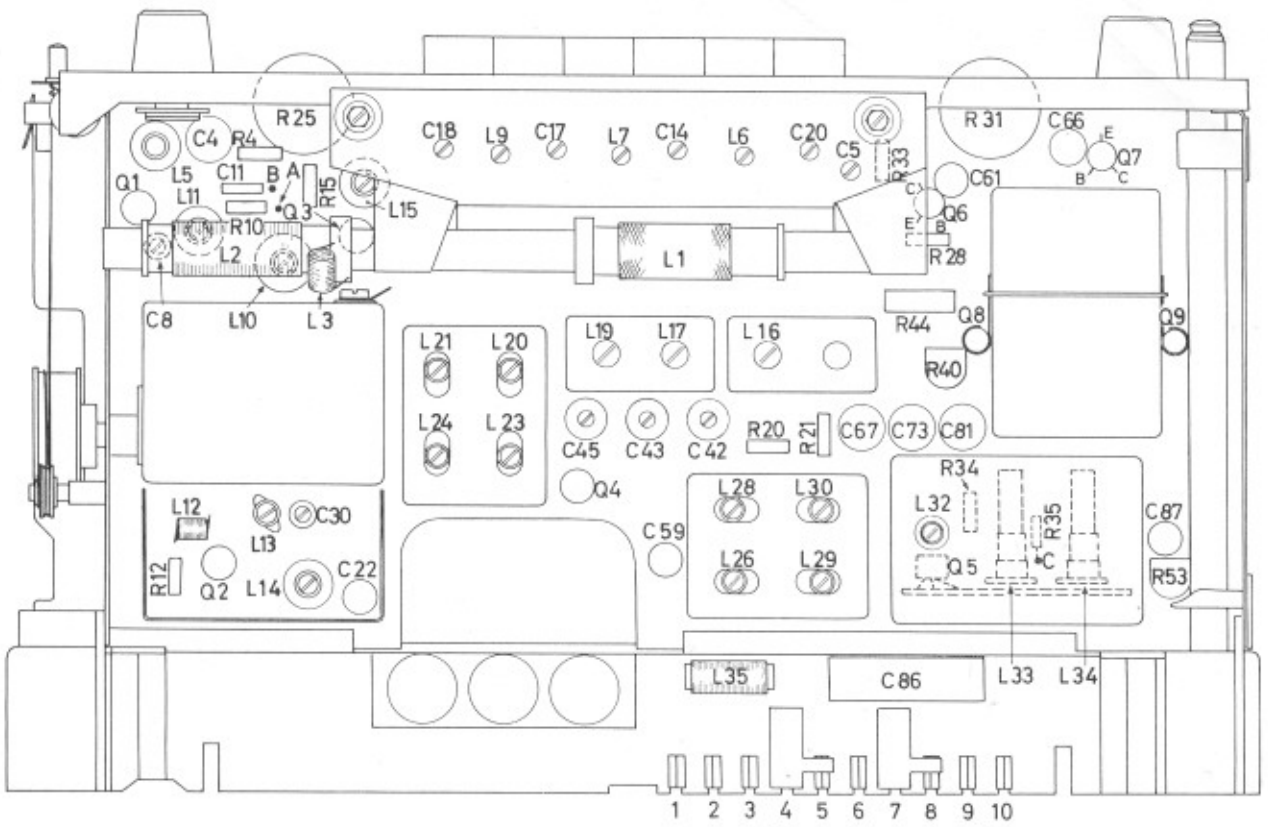


Fig. 4. TTR Auto layout.

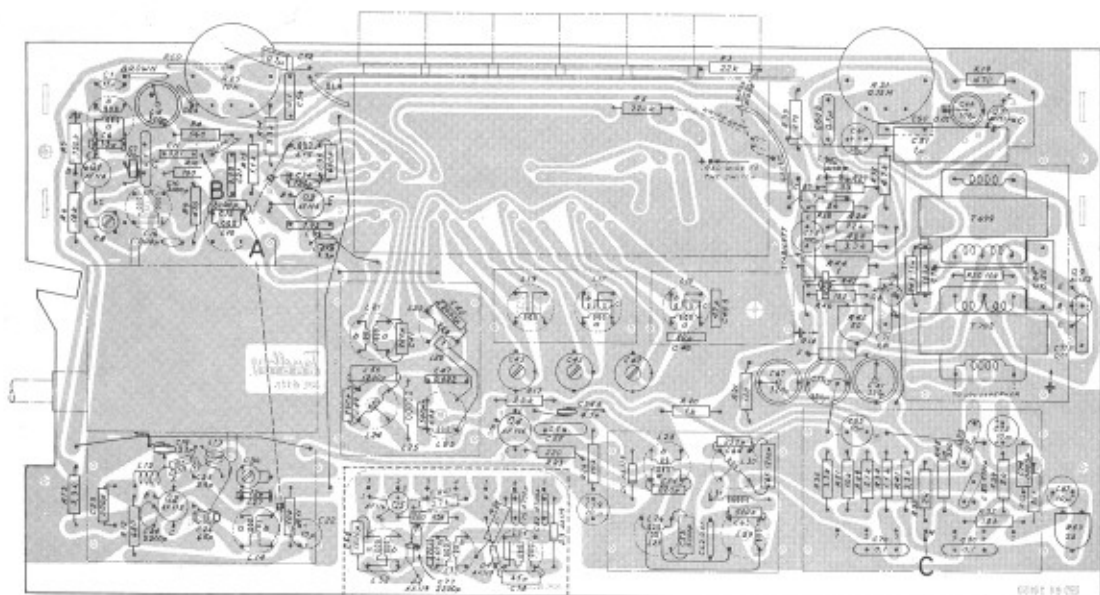


Fig. 5. Printed circuit board TTR Auto, component side.

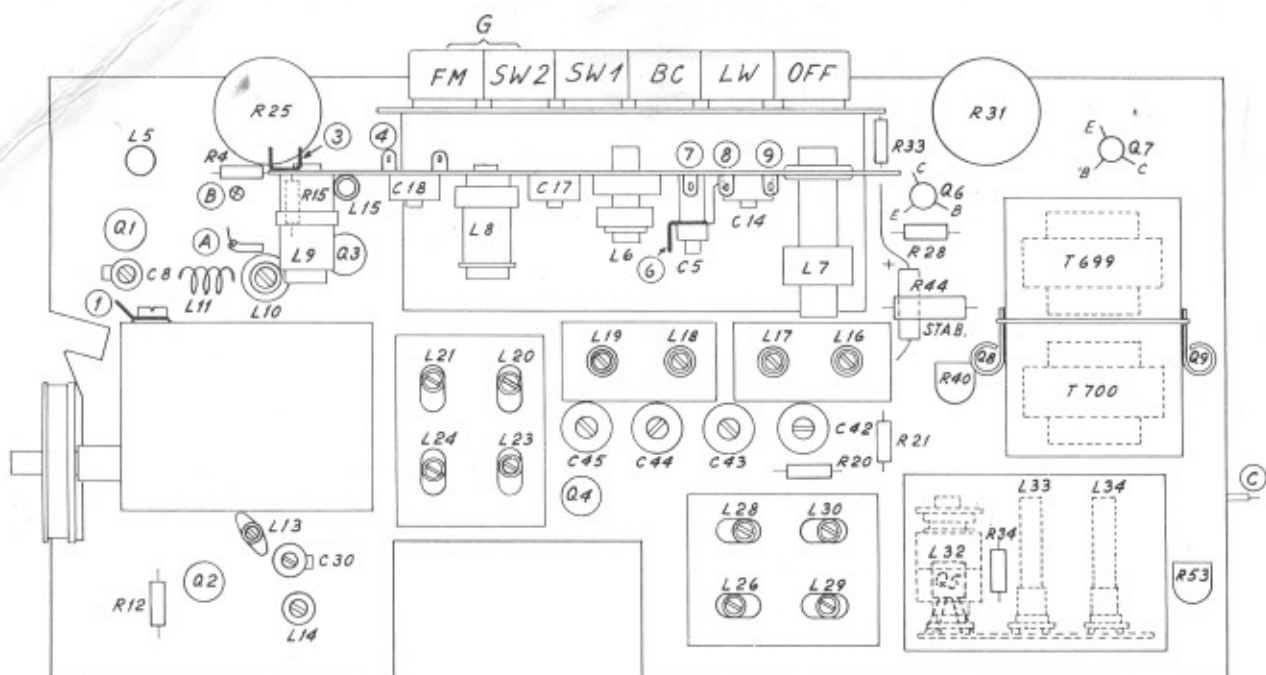


Fig. 6. TTR 1 layout.

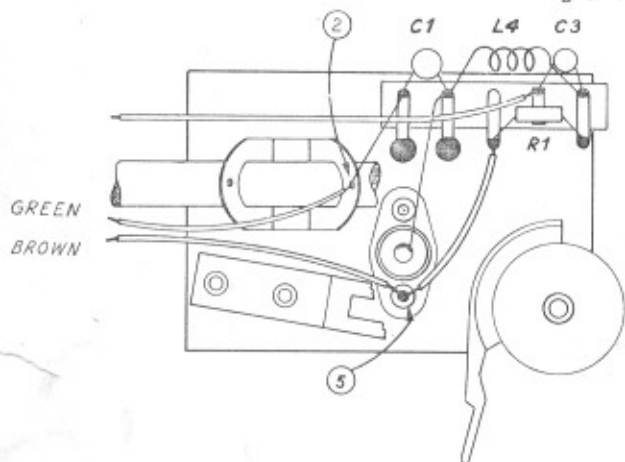


Fig. 7. Antenna terminal board.

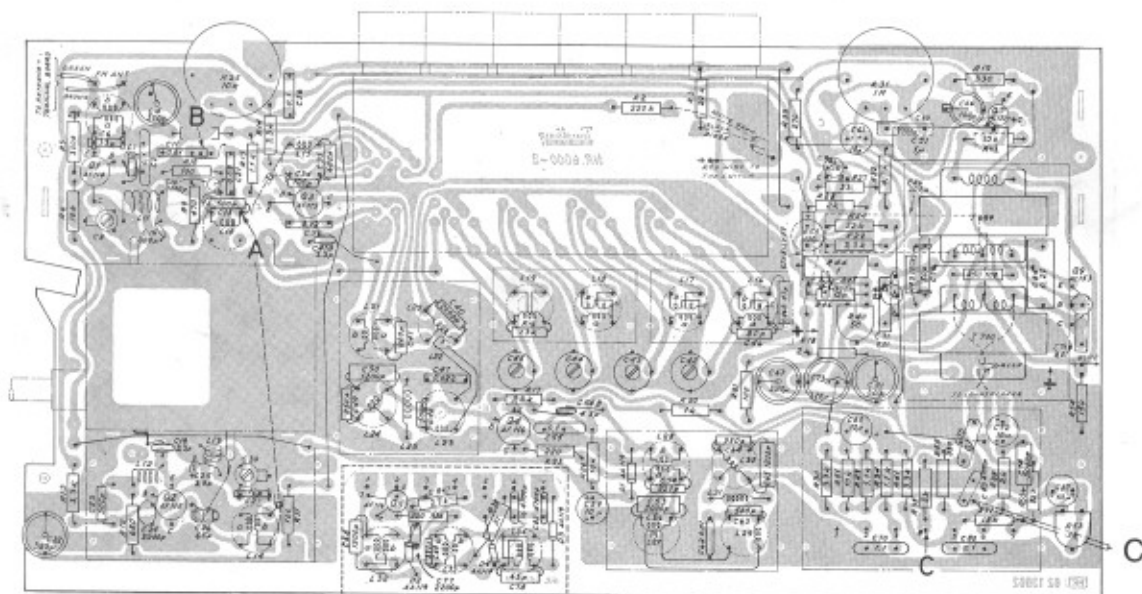


Fig. 8. Printed circuit board TTR 1, component side.

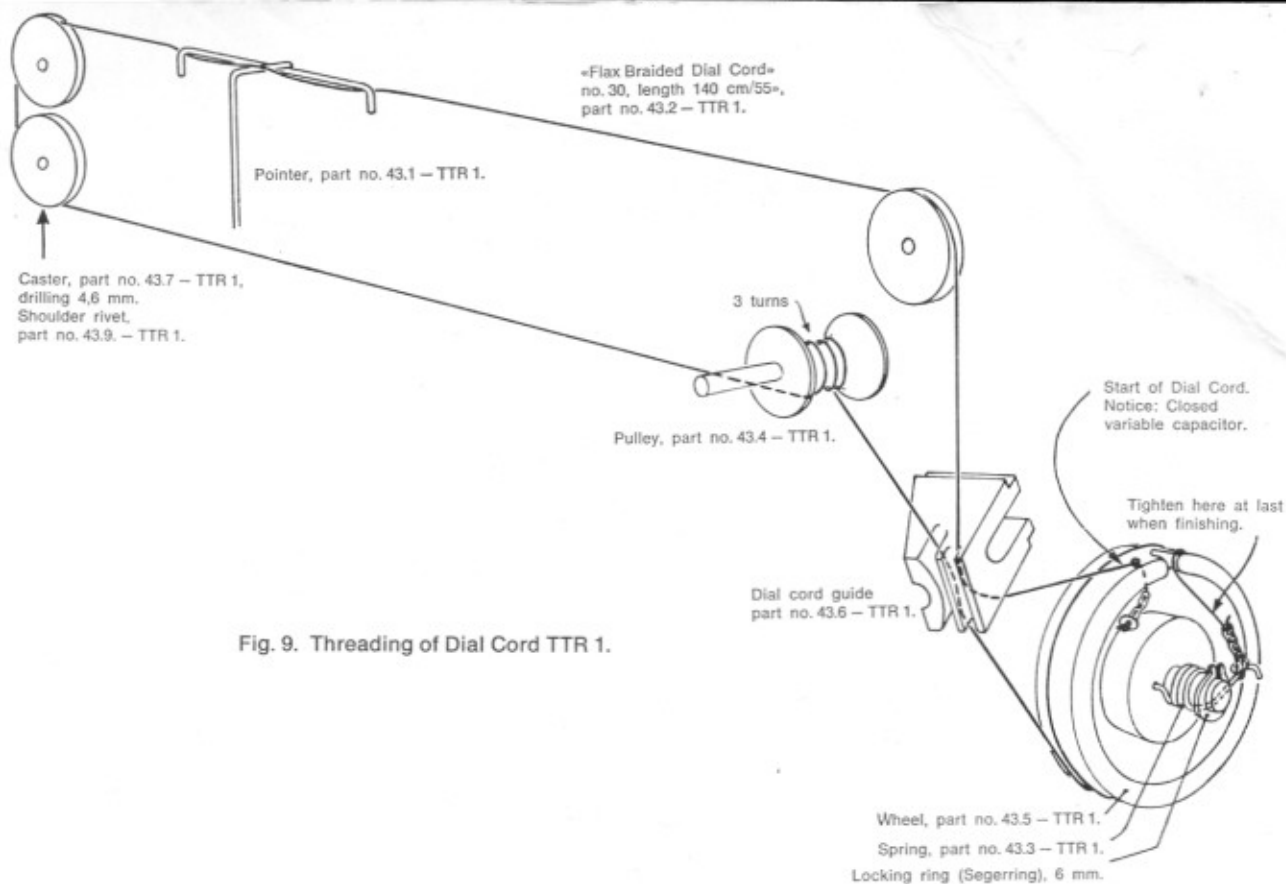


Fig. 9. Threading of Dial Cord TTR 1.

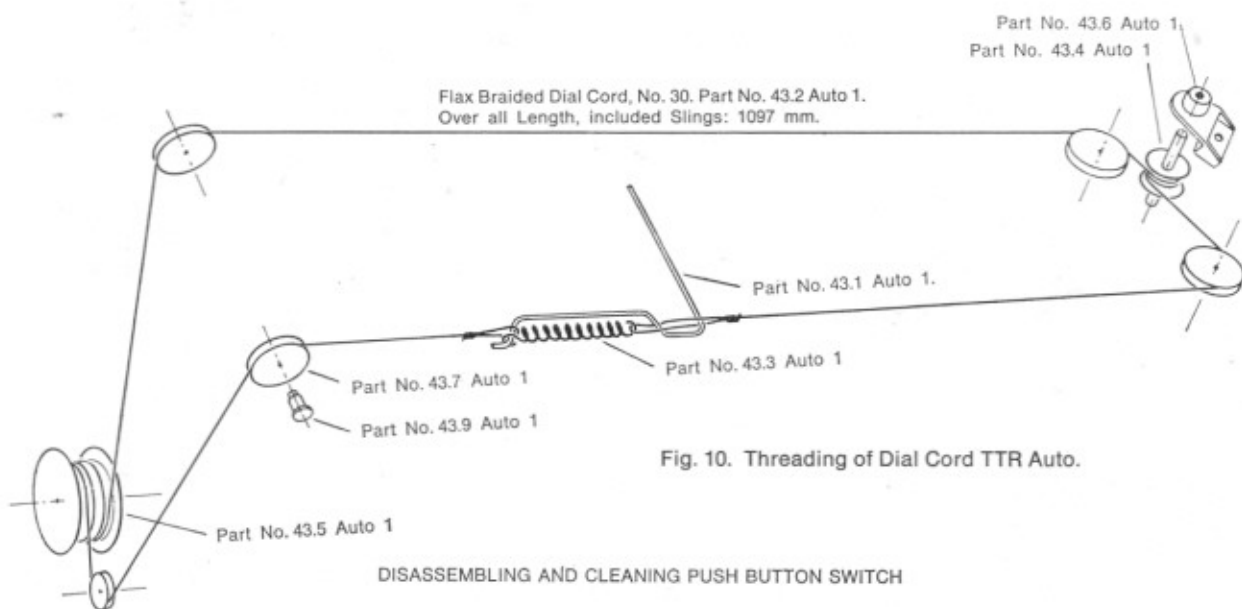


Fig. 10. Threading of Dial Cord TTR Auto.

DISASSEMBLING AND CLEANING PUSH BUTTON SWITCH

Disassembling Push Button Switch:
Twist ① (both sides) and remove cover ② Pull cam ③ halfway out of knob arm ④ and pull knob arm out of the switch.

To clean contacts use a small round brush. Lubricate with pure light vaseline or a lubricant that is not harmful to polystyrene.^{*)} Note that if a harmful detergent is used, the damage will be developed after one or two months.

^{*)} We recommend Wählerfett from Siemens & Halske A.G, Germany.

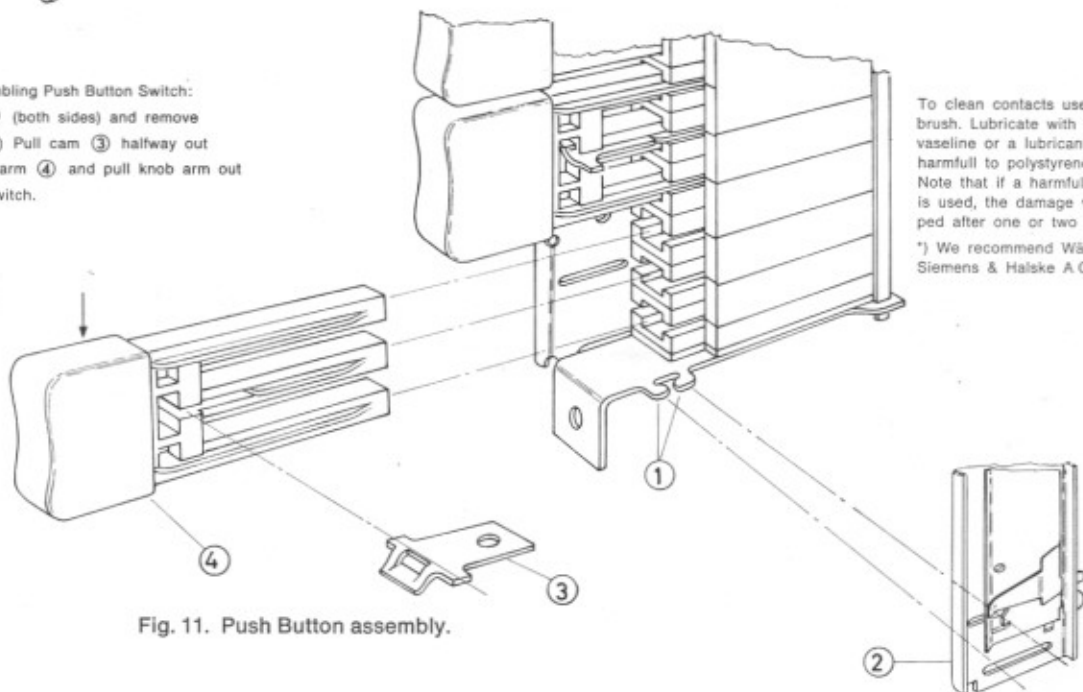
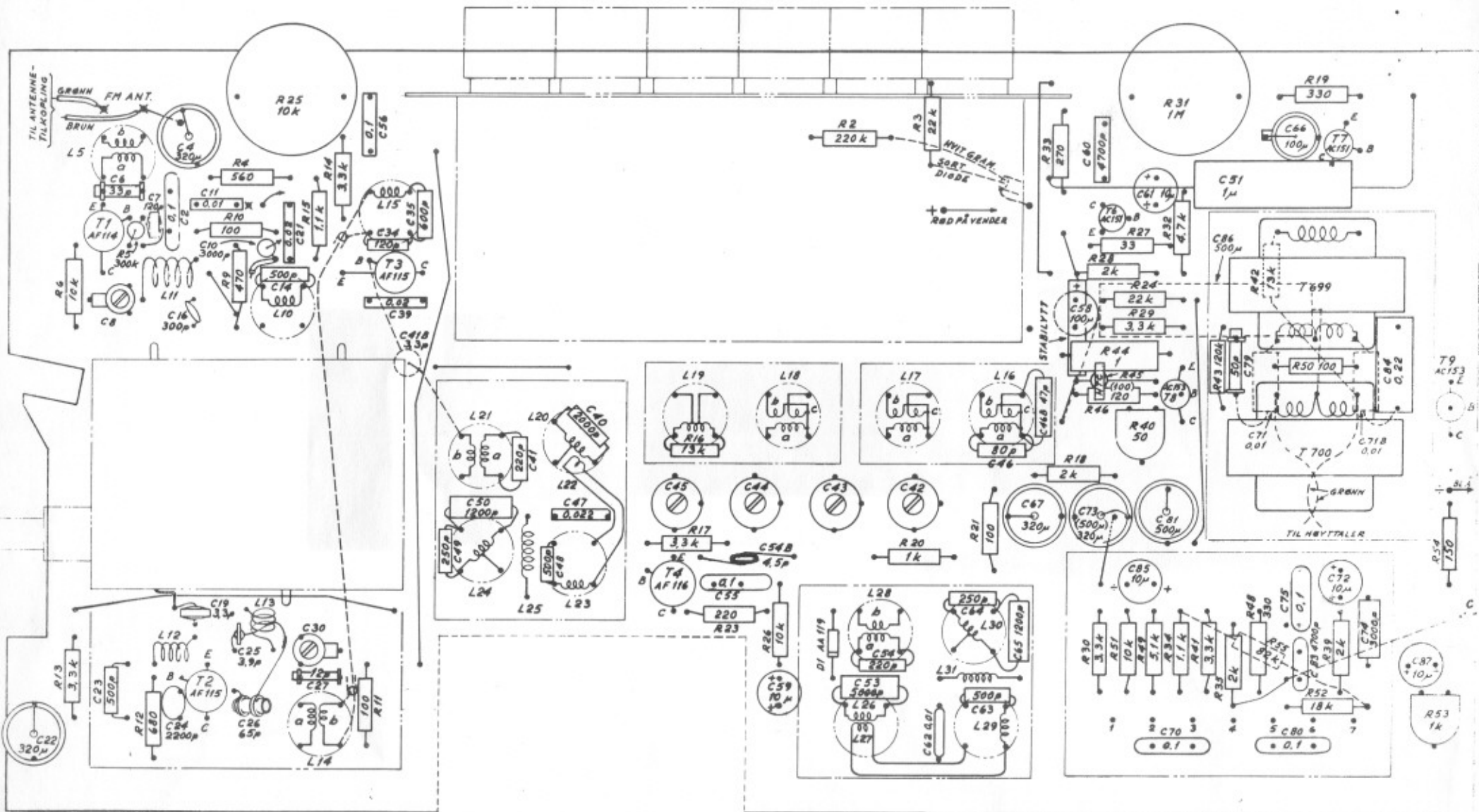
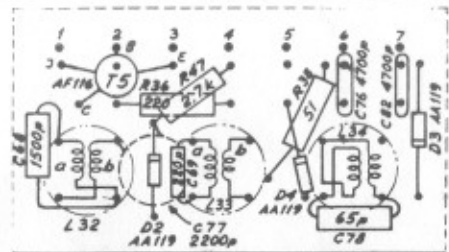


Fig. 11. Push Button assembly.



KOMPONENTPLASERING TANDBERG TRANSISTOR-RADIO
 SERIENR. 600001 - 606000



TANDBERG TRANSISTOR-RADIO

Tandbergs Radiofabrik A/S
Oslo
Mars 1963
Typ. nr. 6059
Fra opp. nr. 900 001

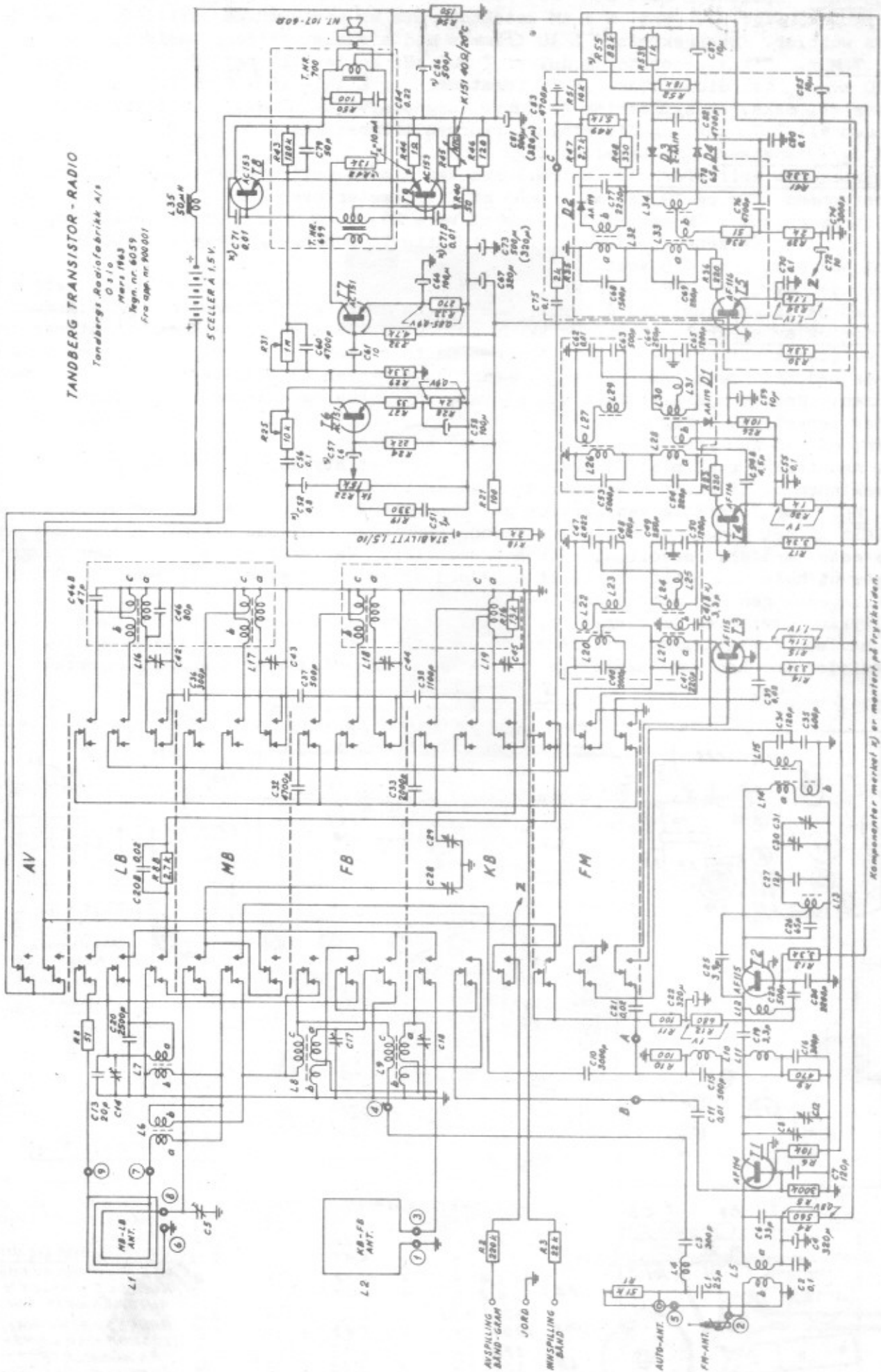


Fig. 1

Trimming. Alle kretser kan trimmes uten demontering av apparatet.

MF 455 kHz. Spolene L 20 - 23 - 26 - 29 - 32 trimmes med signalet tilført basis T3 (ledning pkt. A, fig. 2). Pkt. C i AM detektorkrets er beregnet på oscilloskop hvis det benyttes wobblers. Sperrekretsen L 10 trimmes med signalet tilført basis T1 (pkt. B).

MF 10.7 MHz. Signalgenerator modulert ± 200 kHz koples til pkt. B. Oscilloskop (følsomhet 10 mV/cm) til diodeuttak. L 34 forstemmes og L 14 - 15 - 21 - 24 - 28 - 30 - 33 trimmes til maks. og symmetrisk MF kurve (signalnivå ca. 2 mV). Deretter reduseres modulasjonen til ± 75 kHz, og diskriminatorekurven trimmes med L 34.

Skala og forkretser. Se tabellen fig. 4.

Transistorenes driftsforhold kontrolleres ved å måle emitterspenningene som angitt i skjema. Hvilestrømmen i T8 og T9 kan måles med millivoltmeter over R 44 (10 mV) eller ved å måle totalstrømmen, som i AM stilling (LB) skal være 20-21 mA uten signal. Justering foretas med R 40. Angivelsene gjelder for 7 volt batterispennning og temperatur 20°C. Stabilyttspenningen skal være 1.5 volt. (Målt mellom + og R 21).

Plaseringen av C 86 og R 44 er kritisk med hensyn til kopling mellom utgangsdelen og rammeantennen på langbølge. Ved å forskyve R 44 kan koplingen justeres til et minimum.

Demontering av apparat. Knappene skrues av. Deretter fjernes skinnen som styrer trykkplaten, (ta ut batteriene), og så fjernes de to skruene på oversiden. Nå kan sjassiet trekkes ned mot høyttalermagneten og nedre kant utover så sjassiet blir stående på høykant i kassen. Ønskes sjassiet helt ut, må rammeantennene og antennetilkoplingene loddes løs. Punkter merket 1-9 i fig. 2 og 3. De øvrige ledninger er så lange at de ikke behøver løsnes, og man kan fremdeles sette strøm på apparatet.

Ved innmontering skal platens øverste kant inn i et styrespor i kassen. Deretter plasseres styreskinnen og tilslutt knappeskiltet med skruer.

NB! Vær forsiktig ved service så transistorene ikke utsettes for overspenninger. Spesielt må det unngås at basiselektrodene forbindes med gods. Bruk heller ikke ohmmeter på laveste områder, rørvoltmeter er å foretrekke. Ved bruk av loddebolt bør pluggen trekkes ut hvis apparatet er koplet til jord eller nettdrevne instrumenter. Slå av batterispenningen når det loddes i apparatet.

NB: Trykkknappvenderen er bygget opp av støpte polystyrenelementer. Det må derfor ved lodding utvises forsiktighet; likeledes må det ikke brukes tri eller andre løsnings- eller smøremidler som kan være skadelige. Originalt smøremiddel er Siemens Wählerfett.

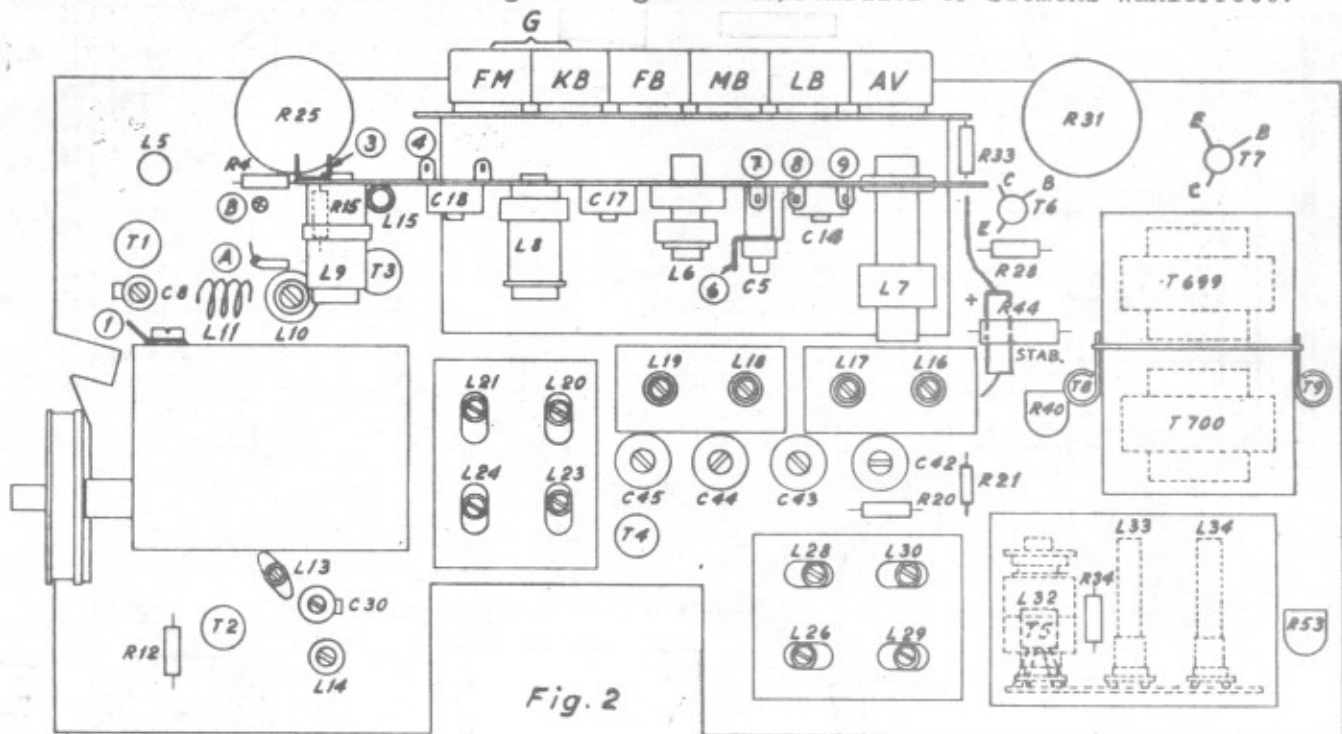


Fig. 2

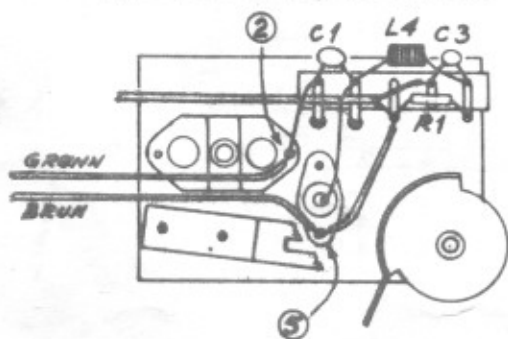
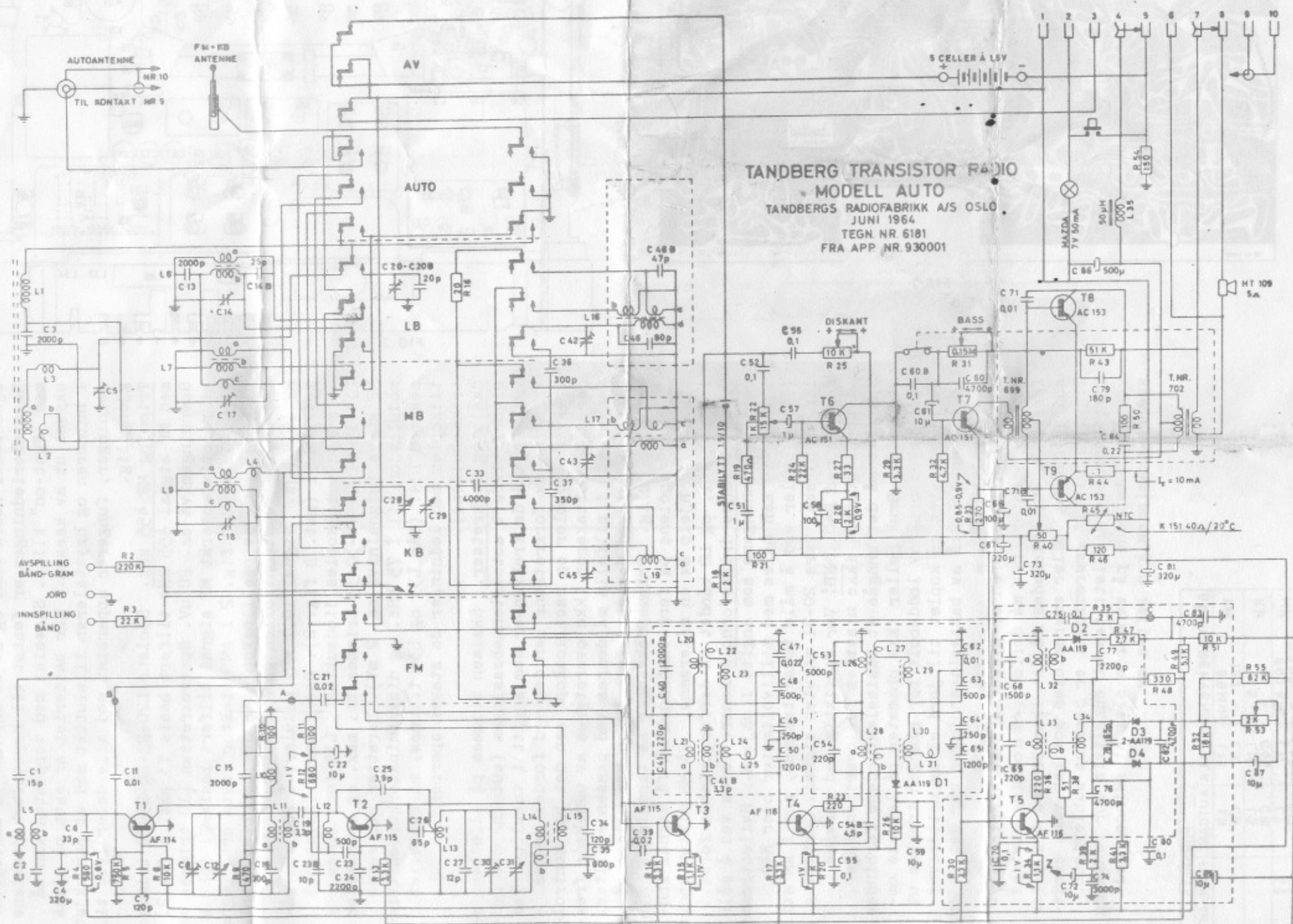


Fig. 3

	FM:	89	MHz	SKALA	L13	FORKRETS	L11	SIGNALGEN. MOD. ± 75 kHz
		99	"	"	C30	"	C8	NIVÅ CA. 20 μ V TIL AUTOANT. -
		6,5	"	"	L19	"	L9	BØSSING.
		14	"	"	C45	"	C18	OSCILLOSKOP TIL DIODEUTTAK.
		1,8	"	"	L18	"	L8	VED TRIMMING AV FORKRETSER
		4,2	"	"	C44	"	C17	KOPLES SIGNALGEN. TIL AUTO-
		600	kHz	"	L17	"	L6	ANTENNE BØSSINGEN VIA 10pF.
		1300	"	"	C43	"	C5	BRUKES FREKV. WOBBLER OG OSCIL-
		170	"	"	L16	"	L7	LOSKOP KAN UBØSKEDE FREKV.
		300	"	"	C42	"	C14	FRA WOBBLER OVERSTYRE MOT-
								TAKEREN. DET MÅ DA SETTES
								INN ET FILTER SOM BEHVER DISSE.

Fig. 4



TANDBERG TRANSISTOR RADIO
 MODELL AUTO
 TANDBERGS RADIOFABRIKK A/S OSLO
 JUNI 1964
 TEGN. NR. 6181
 FRA APP. NR. 930001

MAZDA
 7V 50mA

HT 100
 5A

$I_p = 10 \text{ mA}$

K 151 $4.0 \mu\text{A} / 20^\circ\text{C}$

AVSPILLING
 BÅND-GRAM

JORD

INNSPILLING
 BÅND

FM-KB
 ANTENNE

AUTOANTENNE
 NR 10
 TIL KONTAKT NR 9

5 CELLES À 1.5V

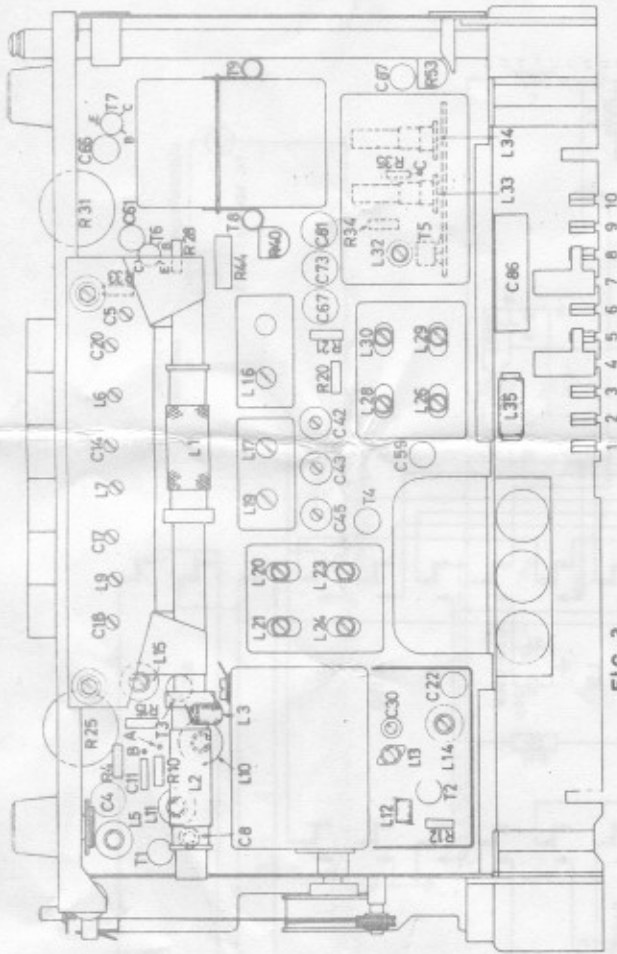


FIG. 3



FIG. 2

Utmontering av sjassi. Bunnplaten tas av, og batteriene fjernes. Deretter løsnes de to muttrene som holder sjassiet i nedre kant og de to skruene på bakveggen. Høyttalerledningen er festet til høyttalerkontaktene med "Fast-on" klips. Sjassiet med topplaten kan nå skyves ut av kassen. Når batteriet er satt på plass i holderen og høyttaleren tilsluttet med et par skjõt ledninger, fungerer apparatet med alle deler lett tilgjengelig.

Trimming MF 455 kHz. Spolene L20-23-26-29-32 trimme med MF signal 455 kHz tilført basis T3 pkt. A fig.2. Spenningsnivå ca. 20 uV. Sperrekretsen L10 trimmes med et relativt sterkt MF signal tilført basis T1 (pkt. B fig. 2). Pkt. C fig. 2 i AM detektor krets er beregnet på tilkopling av oscilloskop hvis det benyttes wobblers. NB! Sett diskantkontrollen på max.

MF 10.7 MHz. Signal 10.7 MHz modulert \pm 200 kHz påtrykkes T1 (pkt. B fig. 2). Oscilloskop (følsomhet 10 mV/cm), tilkoples diodeuttak. L34 forstemmes, og L14-15-21-24-28-30-33 trimmes til max. og symmetrisk MF kurve (signalnivå ca. 2 mV). Deretter reduseres modulasjon til \pm 75 kHz, og diskriminatorekurven trimmes med L34. (Når L33 og L34 trimmes, må batteriet tilkoples med ledninger da staven sperrer trimmehullene).

Skala og forkrets. Skalaen trimmes på alle bånd med signal tilført autoantennebøssingen (autoknappen nedtrykket) på de frekvenser som angitt i tabellen. Ved trimming av forkretsene kan det med fordel brukes frekvens-wobblers og oscilloskop, men det bør kontrolleres at mottakeren ikke overstyres av uønskede frekvenser som i tilfelle må dempes med passende filter. Signalnivået ved forkrets-trimmingen bør holdes så lavt som mulig. Trimmefrekvenser se tabellen.

LB og MB spolene på ferritantennen må få signal innstrålt ved hjelp av en måleramme. På MB sitter spolene i parallell, og LB båndet må derfor trimmes først. Transistorenes driftsforhold kontrolleres ved å måle emitterspenningene som angitt i skjema. Hvilestrømmen i T8 og T9 kan måles med millivoltmeter over R44 (10 mV) eller ved å måle totalstrømmen, som i AM stilling (LB) skal være 20-21 mA uten signal. Justering foretas med R40. NB! Vær forsiktig ved service så transistorene ikke utsettes for overspenninger. Spesielt må det unngås at basiselektrodene forbindes med gods. Bruk heller ikke ohmmeter på laveste områder. Ved bruk av loddebolt bør pluggen trekkes ut hvis apparatet er koplet til jord eller nettdrevne instrumenter. Slå av batterispenningen når det loddes i apparatet.

NB! Trykknappvenderen er bygget opp av støpte polystyrenelementer. Det må derfor ved loding utvises forsiktighet; likeledes må det ikke brukes tri eller andre løsning- eller smøremidler som kan være skadelige. Originalt smøremiddel er Siemens Wählerfett. Tangentarmene kan lett tas ut enkeltvis for rensning ved å vri tappene på venderen slik at skinnen med sperremekanismen kan løftes av.

BÅND	FREKVENNS	SKALA	FÖRKRETS	
			AUTOANT.	FERR.-ANT.
FM	89 MHz	L13	L11	
	102 "	C30	C8	
KB	6,5 "	L19	L9	
	14 "	C45	C18	
MR	600 kHz	L17	L7	L2
	1300 "	C43	C17	C5
LB	170 "	L16	L6	L1
	280 "	C42	C14	C20