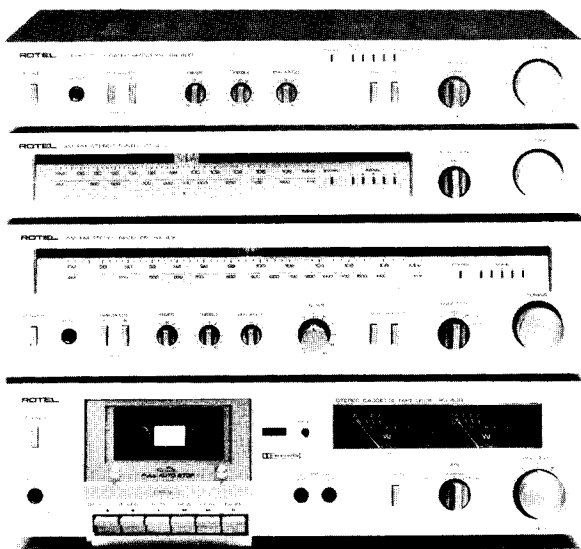


Quality Uncompromised.

ROTEL®

Technical Manual



AM/FM STEREO RECEIVER

RX-400

MW/LW/FM STEREO RECEIVER

RX-400L

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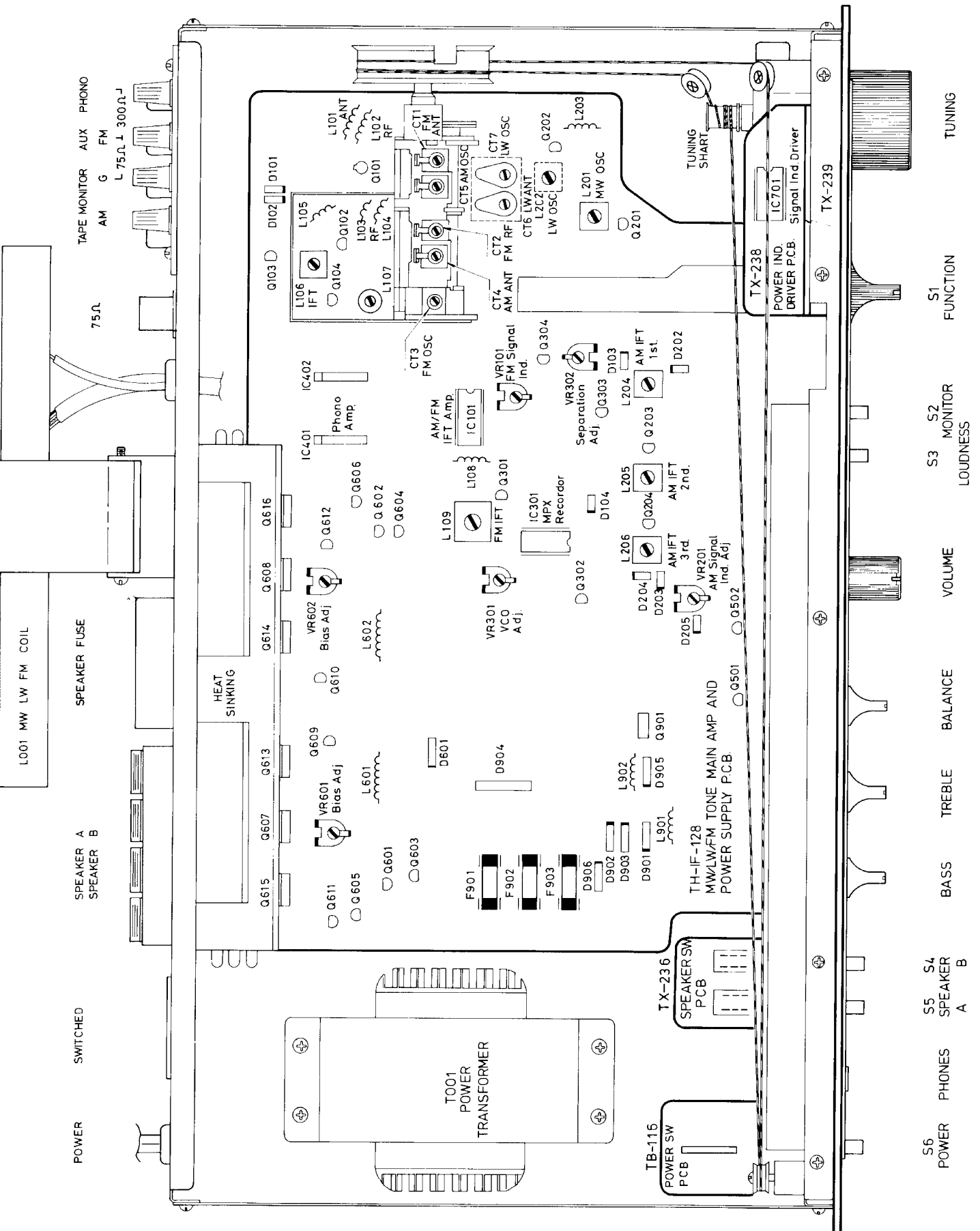
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 BUCKINGHAMSHIRE, ENGLAND

Chassis Layout/Chassis Anordnung/ Installation de Châssis



AM IF and RF Alignment/ Signal Indicator Calibration

Instruments: AM Signal Generator (400Hz 30% Modulated), AC VTVM and Oscilloscope.

AM IF Alignment (AM/FM, MW/LW/FM)

Step	Generator		Tuning Dial setting	Adjust	Adjust for
	Coupling	Frequency			
1	Pin No.12 (on IF board through a 0.01 mfd Capacitor)	455KHz	No interfering at low end of scale	L204, L205 and L206 (on IF board)	Maximum reading on AC VTVM.

MW RF Alignment (AM/FM, MW/LW/FM)

Step	Generator		Tuning Dial setting	Adjust	Adjust for
	Coupling	Frequency			
1	Test Loop Radiate signal into ferrite loop-stick antenna.	600KHz	600KHz	L201 (OSC) and L001 (ANT) lead line side	Maximum reading on AC VTVM.
2		1400KHz	1400KHz	CT5 (OSC) and CT4 (ANT)	
3	(Input 100mV)	1000KHz	1000KHz	VR201	5 LEDs just light up. (Signal strength indicator.)

LW RF Alignment (MW/LW/FM only)

Step	Generator		Tuning Dial setting	Adjust	Adjust for
	Coupling	Frequency			
1	Test Loop Radiate signal into ferrite loop-stick antenna.	160KHz	160KHz	L202 (OSC) and L001 (ANT) against the lead line side	Maximum reading on AC VTVM.
2		330KHz	330KHz	CT7 (OSC) and CT6 (ANT)	

Power Amplifier Bias Adjustment

Instruments: DC milli-voltmeter

Notes: Prior to Bias Adjustment, run about 5 minutes with rated output (8 ohm) and warm up Power Transistor and Heat Sink.
Set Volume Control to Minimum.

Step	Coupling		Adjust	Adjust for
	Plus Lead	Minus Lead		
1	TP2	TP1	VR601	DC milli-voltmeter reads 4.4mV.
2	TP3	TP4	VR602	

FM IF and RF Alignment/ Tuning and Signal Indicator Calibration

Instruments: FM Signal Generator (400Hz, 100% Modulated), H.D. Analyzer, Oscilloscope, AC VTUM and Tuning Meter.

Step	Generator		Tuning Dial setting	Adjust	Adjust for
	Coupling	Frequency			
1	Antenna terminal	90MHz	90MHz	L107 (OSC)	Maximum reading on AC VTUM.
2		106MHz	106MHz	CT3 (OSC)	
3	Repeat steps 1 and 2 unit no further improvement is noticed.				
4	Antenna terminal	90MHz	90MHz	L101, L102, L103 and L104(RF)	Maximum reading on AC VTUM.
5		106MHz	106MHz	CT1 (ANT) and CT2 (RF)	
6		98MHz	98MHz	L106 (OSC)	
7	Repeat steps 4 and 5 unit no further improvement is noticed.				
8	Antenna terminal (1mV Input)	98MHz	98MHz	L109 (upper core)	Minimum reading on H.D. Analyzer.
9			No interfering	L109 (low core)	Tuning Meter to "Center" position.
10			98MHz	VR101	5 LEDs just light up. (Signal strength indicator)

FM MPX Alignment

Instruments: FM Stereo Generator, AC VTVM and Oscilloscope.

Step	Generator		Tuning Dial setting	Adjust	Adjust for
	Coupling	Frequency			
1	Antenna terminal	98MHz Pilot.....10% 1KHz..... 90% Mod.	98MHz	VR301	Stereo indicator light up.
2				VR302	best separation
3	Check the stereo indicator can be operated normally when pilot signal is reduce from 10% to 6%.				

MW-ZF und HF-Einstellung/ _ MW-Signalstärkeanzeige-Eichung

Instrumente: MW-Messender (400Hz 30% moduliert), Wechselstrom-Roehrevoltmeter und Oszillograph.

MW-ZF Einstellung (MW/UKW, MW/LW/UKW)

Schritt	Messender		Abstimmskalen Einstellung	Abgleich	Abgleich auf
	Anschluss	Frequenz			
1	Steckerstift 12 (auf ZF-Leiterplatte ueber 0.01 MF Kondensator)	455KHz	Kine Interferenz am unteren ska- lenende	L204, L205 und L206 (auf ZF- Leiterplatte)	Maximalanzeige am Roehrevoltmeter

MW-HF Einstellung (MW/UKW, MW/LW/UKW)

Schritt	Messender		Abstimmskalen Einstellung	Abgleich	Abgleich auf
	Anschluss	Frequenz			
1	Mess-Signal mit Schleife in Fe- rrit antenna einspeisen.	600KHz	600KHz	L201 (OSZ) und L001 (ANT) Lotleine-Seite	Maximalanzeige am Roehrevoltmeter
2		1400KHz	1400KHz	CT5 (OSZ) und CT4 (ANT)	
3	(Antennenkl- ennenspannung 1mV)	1000KHz	1000KHz	VR201	fünf LEDS leuchtet recht auf. (Signalstärkeanzeige)

LW-HF Einstellung (MW/LW/UKW nur)

Schritt	Messender		Abstimmskalen Einstellung	Abgleich	Abgleich auf
	Anschluss	Frequenz			
1	Mess-Signal mit Schleife in Fe- rrit antenna einspeisen	160KHz	160KHz	L202 (OSZ) und L001 (ANT) gegen Lotleine- Seite	Maximalanzeige am Roehrevoltmeter
2		330KHz	330KHz	CT7 (OSZ) und CT6 (ANT)	

Endverstärker-Vorspannung-Einstellung

Instrumente: DC-Gleichstrom-millivoltmeter

Anmerkung: Vor Einstellung der Vorspannung ist das Graet stwa 5 minuten mit nennleistung unter 8 ohm belastung zu betreiben, um die Leistung-stransistoren und Kuehlbleche warm werden zu lassen.
Lautstärke-regler Volumenkontrolle auf Minimum stellen.

Schritt	Anschluss		Abgleich	Abgleich auf
	Pruefstift	Minuspol		
1	TP2	TP1	VR601	DC-Gleichstrom-millivoltmeter auf 4.4mV einstellen.
2	TP3	TP4	VR602	

UKW-ZF und HF-Einstellung/ Signalstärkeanzeige-Eichung

Instrumente: UKW-Messenger (400Hz 100% Moduliert), Klirrfaktormesser, Oszillograph, Wechselstrom-Roehrenvoltmeter

Schritt	Messender		Abstimmungsskalen Einstellung	Abgleich	Abgleich auf
	Anschluss	Frequenz			
1	Antennenkl- emmen	90MHz	90MHz	L 107 (OSZ)	Maximalanzeige am Roehrenvoltmeter
2	anschiessen	106MHz	106MHz	CT3 (OSZ)	
3	Schritt 1 und 2 wiederholen, bis keine weitere Verbesserung eintritt.				
4	Antennekl- emmen ansch- liessen	90MHz	90MHz	L 101, L 102, L 103 und L 104 (HF)	Maximalanzeige am Roehrenvoltmeter
5		106MHz	106MHz	CT1 (ANT) and CT2 (HF)	
6		98MHz	98MHz	L 106 (OSZ)	
7	Schritt 4 und 5 wiederholen, bis keine weitere Verbesserung eintritt.				
8	Antennenkl- emmen ansch- liessen (Antennenkl- emmen ensp- annung 1mV	98MHz	98MHz	L 109 (upper core)	Minimalanzeige am Klirrfaktormesser
9			KEINE Inter- ferenz	L 109 (low core)	Abstimmungsanzeiger auf "center" stellen.
10			98MHz	VR101	fünf LEDs leuchtet richtig auf. (Signalstärkeanzeige)

UKW MPX-Einstellung

Instrumente: UKW-stereo Messenger, Roehrenvoltmeter und Oszillograph.

Schritt	Messender		Abstimmungsskalen Einstellung	Abgleich	Abgleich auf
	Anschluss	Frequenz			
1	Antennenkl- emmen anschiessen	98MHz Pilotton.....10% 1KHz..... 90% Moduliert.	98MHz	VR301	Stereoanzeige leuchtet auf.
2				VR302	beste Trennung
3	Einwandfreier Stereoanzeigebetrieb muss auch noch gewährleistet sein, wenn der Stereopilotton von 10% auf 6% reduziert wird.				

Alignement AM IF et HF/ Indicateur de niveau de signal

Instruments: Générateur de signal AM (400Hz 30% modulé) AC VTVM et Oscilloscope.

ALIGNEMENT AM IF (AM/FM, MW/LW/FM)

Point	Générateur		Ecran d'accord	Réglage	Réglage pour
	Couplage	Fréquence			
1	Brouche No. 12 (Sur IF plaque- tte par l'inter- médiaire d'un condensateur de 0.01 mfd.	455KHz	Non interférence a l'extrémité de l'échelle	L204, L205 et L206 (sur la pla- quette IF)	Lecture maximum sur le voltmètre électronique AC VTVM.

Alignement MW RF (AM/FM, MW/LW/FM)

Point	Générateur		Ecran d'accord	Réglage	Réglage pour
	Couplage	Fréquence			
1	Boucle de mesure Envoyée le signal sur ferrite à boucle	600KHz	600KHz	L201 (OSC) et L001 (ANT) Côté de ligne de connexion	Lecture maximum sur AC VTVM.
2		1400KHz	1400KHz	CT5 (OSC) et CT4 (ANT)	
3	(absorbé 100mV)	1000KHz	1000KHz	VR201	5 LEDS allument seule- ment. (Indicateur de force du signal)

Alignement LW RF (MW/LW/FM senlement)

Point	Générateur		Ecran d'accord	Réglage	Réglage pour
	Couplage	Fréquence			
1	Boucle de mesure Envoyée le signal sur ferribe à boucle	160KHz	160KHz	L202 (OSC) et L001 (ANT) contre le côté de ligne de connex- ion	Lecture maximum sur AC VTVM.
2		330KHz	330KHz	CT7 (OSC) et CT6 (ANT)	

Régtage de la potarisation de l'amplificateur de puissance

Instrument: DCmilli-voltmètre

Note: Avant le réglage de la polarisation, passer à peu près 5 minutes avec une proportion de la sortie du courant (8 ohm) et réchauffer le transistor de puissance et le snk.
Mettre le contrôle de l'étendue au minimum.

Point	Couplage		Réglage	Réglage pour
	Positif	Moins		
1	TP2	TP1	VR601	DC-millivoltmeter lit 4.4mV.
2	TP3	TP4	VR602	

Alignement FM IF et HF/ Indicateur de force du signal

Instruments: (400Hz, 100% modulé) Analyseur H.D., Oscilloscope, AC VTVM et Compteur de syntonisation.

Point	Générateur		Ecran d'accord	Réglage	Réglage pour
	Couplage	Fréquence			
1	Borne d'antenne	90MHz	90MHz	L 107 (OSC)	Lecture maximum sur AC VTVA
2		106MHz	106MHz	CT3 (OSC)	
3	Répéter les points 1 et 2 jusqu'aucun perfectionnement est marqué.				
4	Borne d'antenne	90MHz	90MHz	L 101, L 102, L 103 et L 104 (RF)	Lecture maximum sur AC VTVM.
5		106MHz	106MHz	CT1 (ANT) et CT2 (RF)	
6		98MHz	98MHz	L 106 (OSC)	
7	Répéter les points 4 et 5 jusqu'aucun perfectionnement est marqué				
8	Borne d'antenne (1mV absorbée)	98MHz	98MHz	L 109 (Nogan bas)	Lecture maximum sur AC VTVM.
9			non interférence	L 109 (Nogan bas)	Lecture de syntonisation à la position "centrole"
10			98MHz	VR101	5 LEDS allument seulement (Indicateur de force du signal)

Alignement FM MPX

Instruments: FM stéréo Générateur, AC VTVM et Oscilloscope.

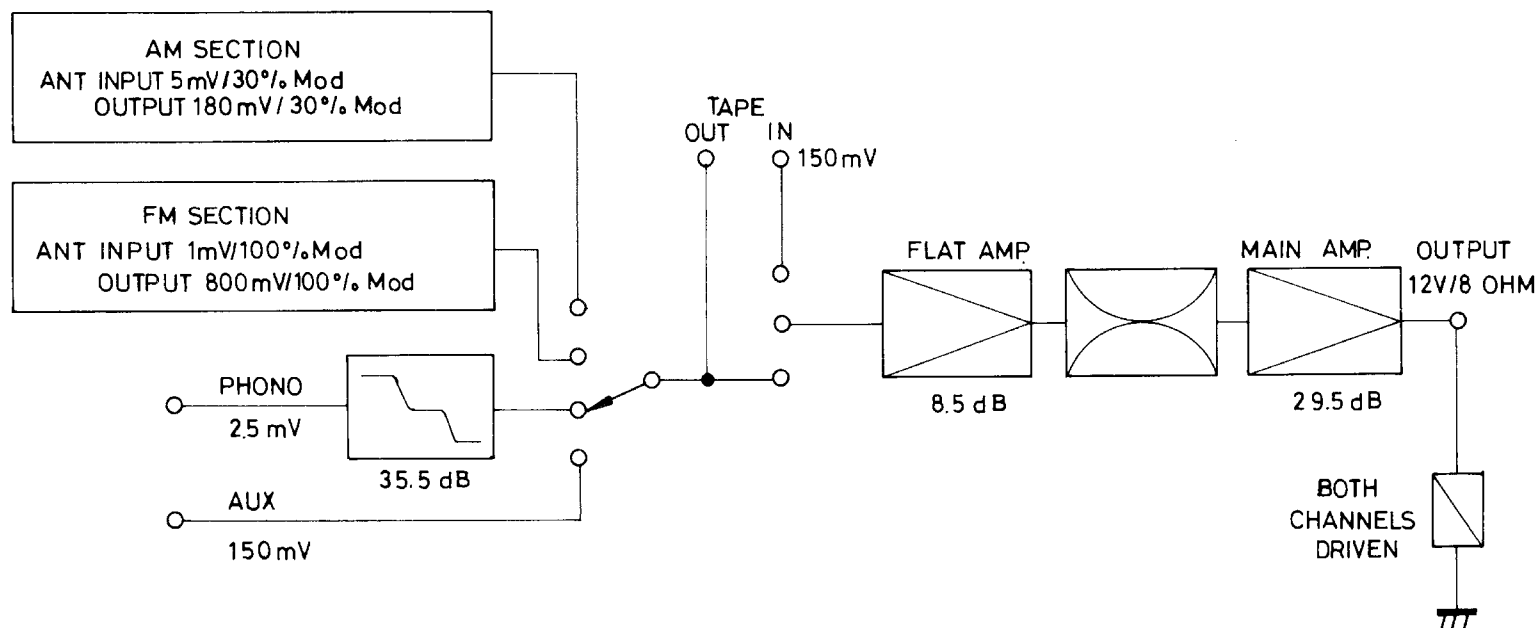
Point	Générateur		Ecran d'accord	Réglage	Réglage pour
	Couplage	Fréquence			
1	Borne d'antenne	98MHz lampe témoin 10% 1 KHz 90! Mod.	98MHz	VR301	Indicateur stéréo allume
2				VR302	Séparation la plus meilleure
3	Eraminer l'indicateur stéréo peut être opéré normalement lorsque le signal de lampe témoin est véduite de 10% à 6%				

Repair Parts List/Reparaturteilliste/ Liste des pièces de rechange

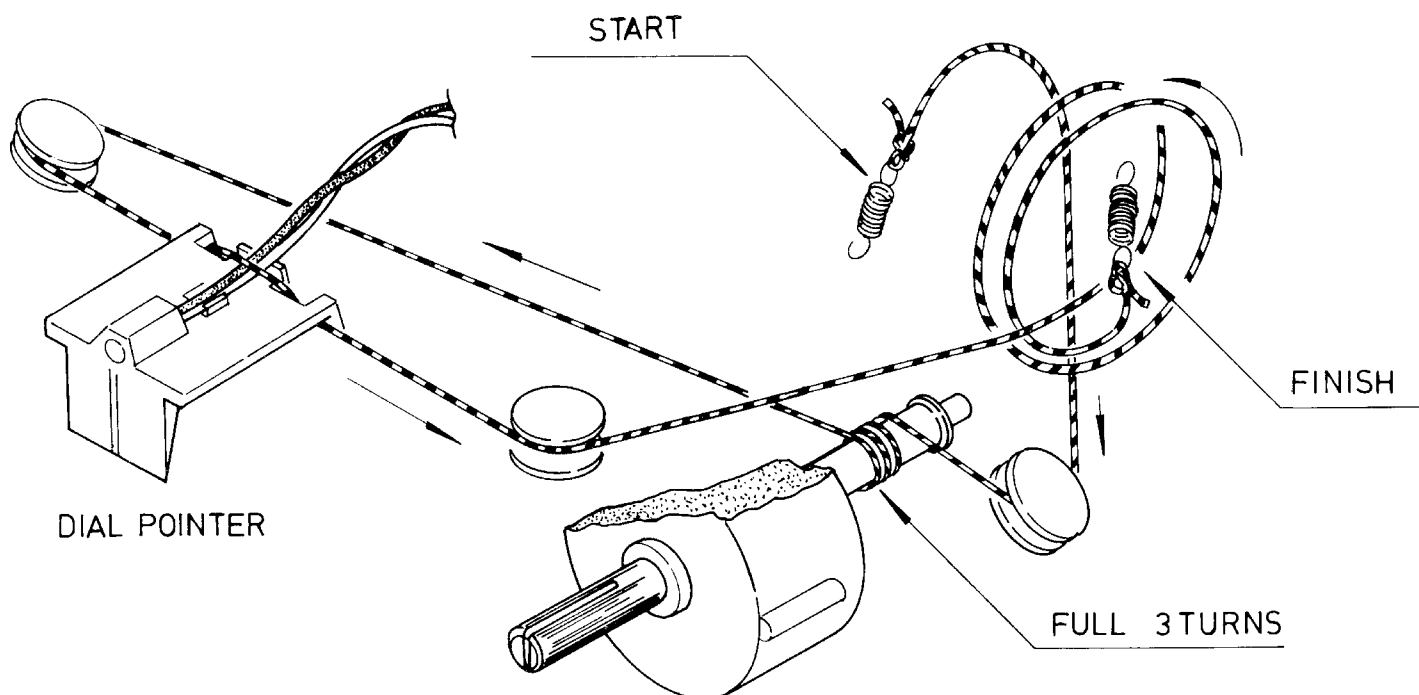
Schematic Location	Parts No.	Description
TRANSISTORS, DIODES AND IC'S		
Q101	302001112	2SK49 (F,H), FM RF Amp.
Q102,104	301201163	2SC1674 (K,L), FM MIX OSC
Q103	301201117	2SC829 (C), FM IF Amp.
Q201	301201117	2SC829 (C), MW OSC
Q202	301201117	2SC829 (C), LW OSC (MW/LW/FM only)
Q203,204	301201117	2SC829 (C), Audio Amp.
Q301,302	301201115	2SC828 (R), for Switching, VOC stop Control
Q303,304	301201134	2SC1327 (S,T), Audio Amp.
Q501,502	301201134	2SC1327 (S,T), Flat Amp.
Q601-604	301001145	2SA921 (S), Differential Amp.
Q605,606	301201155	2SC1318 (R,S), Pre-Driver
Q607,608	301301134	2SD571 (K,L), Idling
Q609,610	301201132	2SC1384 (R,S), Driver
Q611,612	301001140	2SA684 (R), Driver
Q613-616	301201169	2SC1826 (O,Y), Power Amp.
Q901	301201150	2SC1567 (R,S), Stabilizer
D101,102	300111008	1K188, FM AGC Detector
D103,104	300111018	1S2472, for Switching Rectifier
D201-205	300111008	1K188, AM AGC, POP Pro. Rectifier
D601	300111018	1S2472, DC Balance Regulator
D801-806	300414042	LN224RP, Signal Ind.
D901	300313019	WZ-350, Zener Regulator, 35V ½W
D902,903 906	300919026	IN4003, Rectifier
D904	300919027	KBP-02, Rectifier
D905	300313017	WZ-162, Zener Regulator, 16V ½W
IC101	303452251	HA11225, IF Amp.
IC301	303452250	HA12003, MPX Decoder
IC401,402	303452164	uPC1024H, Phono Amp.
IC601	303452188	LB1405, Signal Ind. Driver

Schematic Location	Parts No.	Description
COILS AND VARIABLE RESISTORS		
L001	222391156	AM ANT Coil (AM/FM)
	222391158	MW/LW ANT Coil (MW/LW/FM)
L101	226501131	FM ANT Coil
L102-104	226501132	FM RF Coil
L105	226501143	2.2uH, FM IF Trap Coil
L106	225501142	FM IFT
L107	226501161	FM OSC Coil
L108	226501125	18uH, Moving Phase
L109	225501139	FM IFT Quadrature Detector
L201	223301127	MW OSC
L202	223301129	LW OSC (MW/LW/FM only)
L203	226501142	2mH, LW Filter (MW/LW/FM only)
L204	225301131	AM IFT 1st.
L205	225301132	AM IFT 2nd.
L206	225301133	AM IFT 3rd.
L901,902	226501127	470uH, Chock Coil
VR101	510502196	100KB, FM Signal Ind. Adj.
VR201	510502200	50KB, AM Signal Ind. Adj.
VR301	510502195	10KB, VCO Adj.
VR302	510502199	20KB, Separation Adj.
VR501	515121131	250KW, Balance Control
VR502	525121146	100KBx2, Volume Control
VR503,504	525101173	100KCx2, Treble Bass Control
VR601,602	510502198	1KB, Bias Adj.
SWITCHES AND OTHERS		
S1	601011308	Switch, Function Selector (AM/FM)
	601011303	Switch, Function Selector (MW/LW FM)
S2,3 (1 Set)	614020450	Switch, Push 2-Key, Tape Monitor/Loudness
S4,5 (1 Set)	614020449	Switch, Push 2-Key, Speaker A/B
S6	614010139	Switch, Power Supply (for UL, CSA)
	614010138	Switch, Power Supply (for BEAB . . .)
T001	207001523	Transformer, Power Supply (Multi-type) ⚠
C901,902	422470425	Smoothing Capacitor
F001,002	341221250	Fuse, 2.5A, Speaker Protector (Long Size)
	345222250	Fuse, 2.5A, Speaker Protector (Mini Size)
	345252250	Fuse, 2.5A, Speaker Protector (Mini Size SD mark)
F003,004	341221300	Fuse, 3A, Inside Speaker Protector (CSA only)
F901,902	341221400	Fuse, 4A, AC Circuit Protector (Long Size)
	345222400	Fuse, 4A, AC Circuit Protector (Mini Size)
	345252400	Fuse, 4A, AC Circuit Protector (Mini Size "S" "D" mark)

Gain Diagram/Verstärkungsdiagramm/ Diagramme de gain



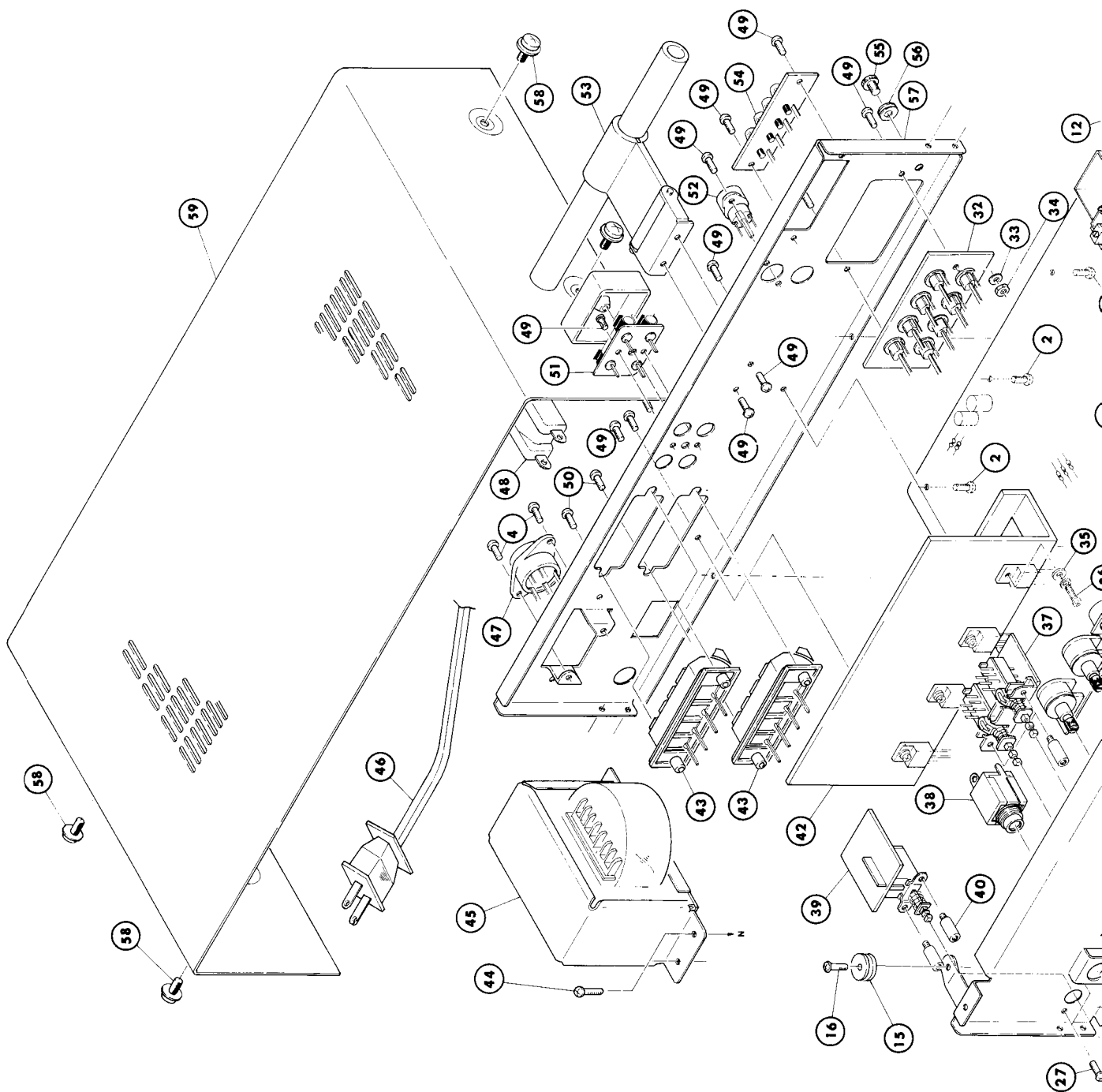
Dial Stringing Diagram Skalenantriebsschema Diagramme des câble d'entraînement

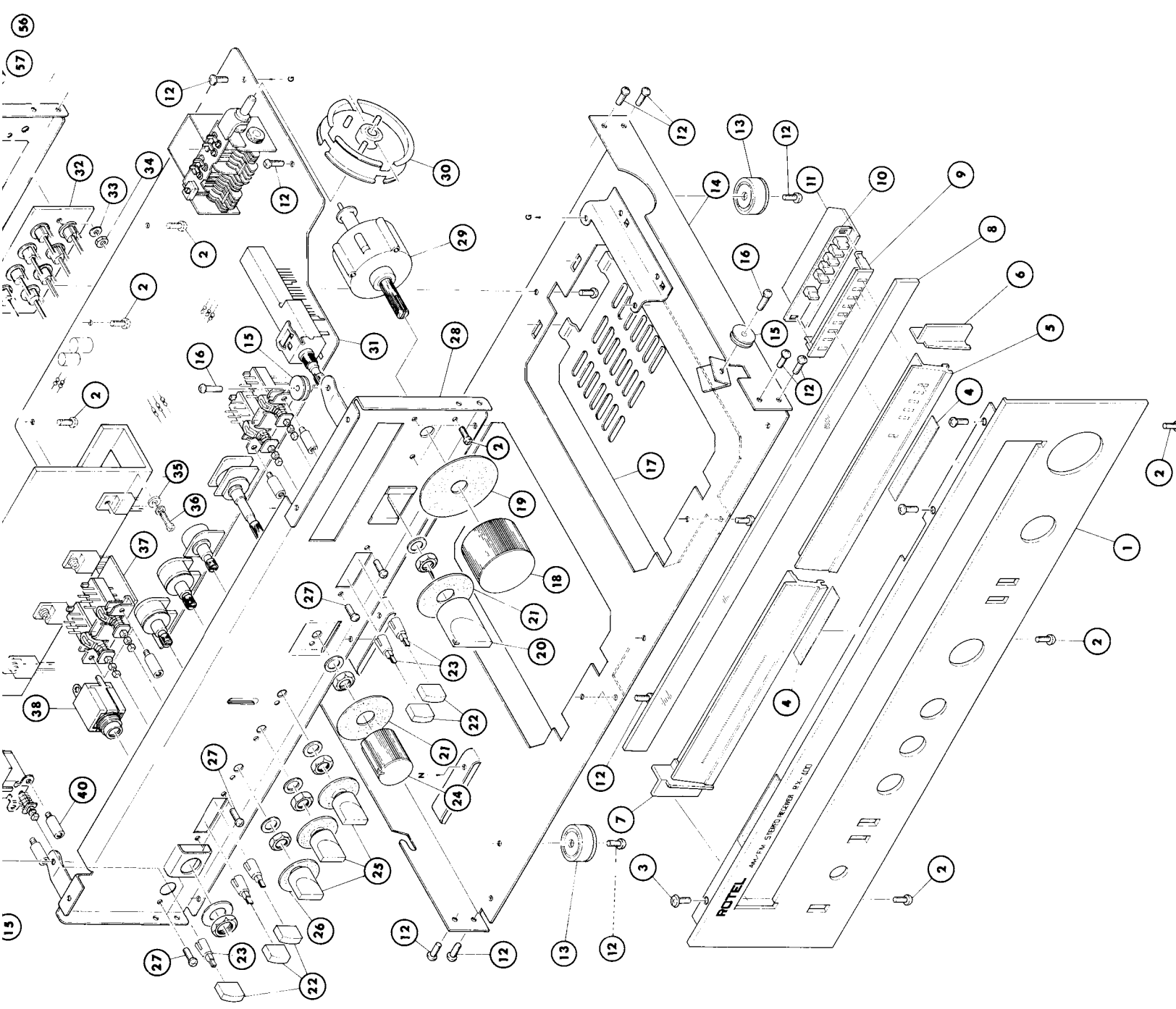


Note: Carry out stringing with the front end set at VC maximum.

Zur Beachtung: Antriebsseil mit dem Drehko der Eingangs-Stufe in Maximumstellung verlegen.

Note: Effectuer le câblage avec le condensateur réglable de l'entrée réglé au maximum.

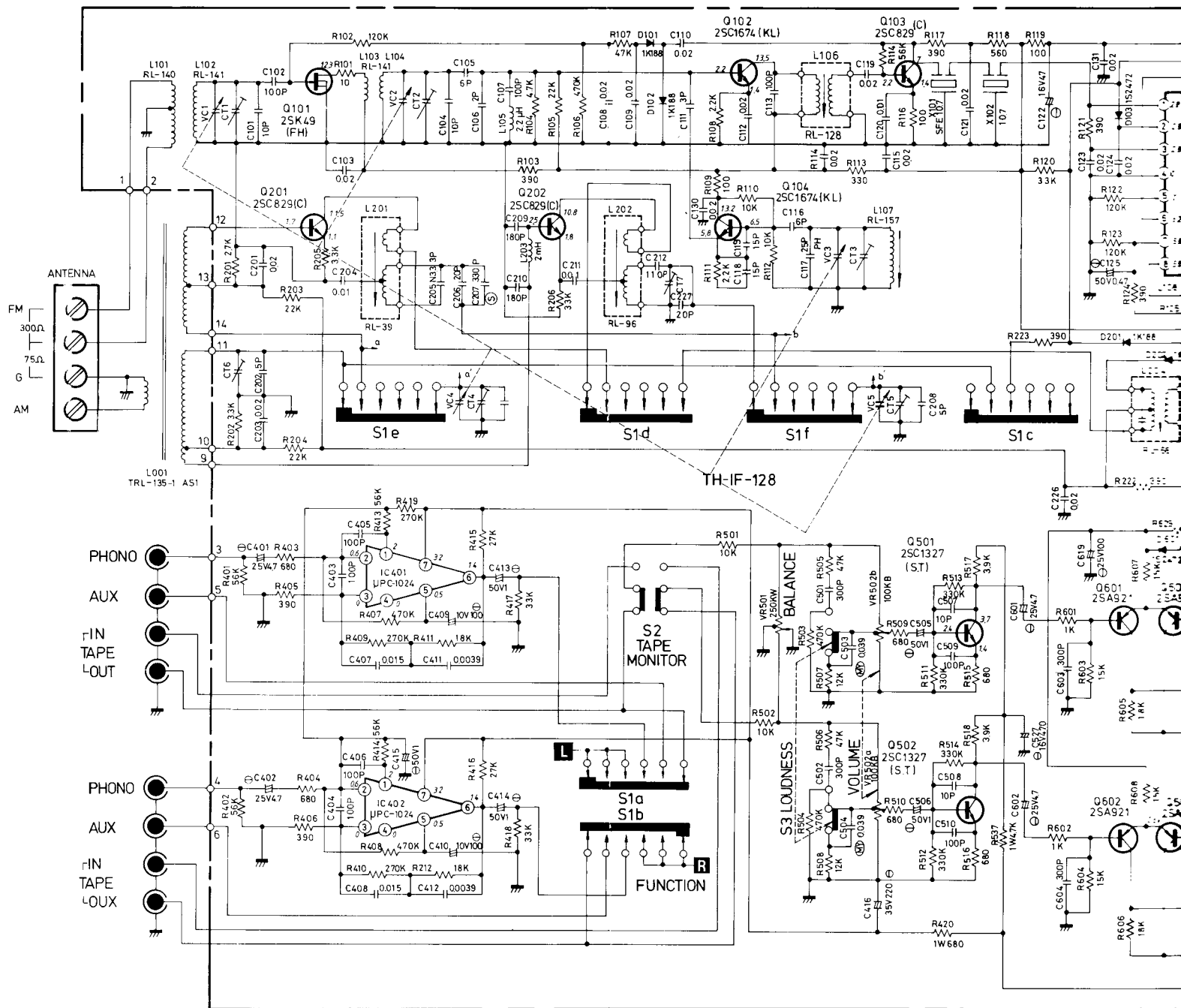




Key No.	Parts No.	Description	Key No.	Parts No.	Description	Key No.	Parts No.	Description
1	111911556	Front Panel Ass'y (AM/FM)	27	703213006	Screw, +M3x6 Pan	42	127012261	Heat Sinking
2	111911557	Front Panel Ass'y (MW/LW/FM)	28	122011430	Front Chassis Ass'y	43	642400114	Terminal, Push 4P, Speaker A/B
2	701203006	Screw, +M3x6 SMF	29	654911300	Tuning Shaft	44	713214008	Screw, +M4x8 W/Sp Ni
3	726203006	Screw, +M3x6 MC	30	651300015	Pulley, Dial	45	207001523	Transformer, Power Supply (Multi-Type)
4	990201134	Felt, Front Panel				46	796301115	Line Cord
5	112011394	Dial Board (AM/FM)					796301149	Line Cord (for Europe)
6	112011395	Dial Board (MW/LW/FM)	31	141010198	AM/FM, 75uS, Long Fuse		796301125	Line Cord (for Austria)
6	114902359	Holder, Dial Board (R)		141010199	AM/FM, 75uS, Long Fuse (for UL, CSA)	47	796301138	Line Cord (for BEAB)
7	114902358	Holder, Dial Board (L)					648211247	Voltage Selector
8	114902360	Dial Window		141010200	AM/FM, 50uS, Mini Fuse (for Europe)	48	648211268	AC Outlet
9	114902322	Holder, Signal Ind.				49	7062223006	Screw, +M3x6 BK
10	141811180	Signal Ind. PCB Ass'y		141010201	AM/FM, 50uS, "S" "D" mark (for BEAB)	50	7862223008	Screw, +M3x8 STV BK
11	141811179	Signal Ind. Driver PCB Ass'y				51	648211157	Holder, 2P, Fuse (for UL, CSA)
12	726203006	Screw, +M3x6 BTV MC		141010202	MW/LW/FM, 50uS, Mini Fuse		648211162	Holder, 2P, Fuse (for BEAB)
13	673402055	Plastic Foot		141010203	"D" mark (for BEAB)	52	628111166	Coaxle Connector
14	121011362	Chassis Body				53	222391156	AM/FM ANT Coil
15	651110019	Pulley	32	624200208	Terminal, 6P, RCA Type	54	222391158	MW/LW ANT Coil
16	770911264	Screw, Pulley	33	770500014	Washer, 3.2¢, Inner	55	649201115	Terminal, Screw, 4P
17	120013021	Bottom Mask	34	770402201	Nut, M3	56	770911126	Screw, GND, -4x8
18	116310307	Knob, 33¢, Tuning	35	992001112	Spacer, Insulation	57	770500004	Washer, 4.5¢x10¢x1t
19	990201330	Felt, Knob (33¢)	36	770911287	Screw, +M2.6x12 W/SP		123011500	Rear Chassis Ass'y (for Generator)
20	116310335	Knob, 22¢, Function	37	141811178	Speaker Switch PCB Ass'y		123011562	Rear Chassis Ass'y (for CSA)
21	990201329	Felt, Knob (20¢)	38	626110035	Jack, Headphones	58	756224008	Screw, +M4x8 W/SP BK
22	116210073	Push Button, Bass . . . etc.	39	141811067	Power Switch PCB Ass'y (for BEAB . . .)	59	138011319	Upper Cover
23	114902356	Connector, Push Button						
24	116310339	Knob, 20¢, Volume		141811068	Power Switch PCB Ass'y (for UL, CSA)			
25	116310304	Knob, 13¢, Bass . . . etc.	40	770911263	Cylinder Bush, Inner Screw			
26	990201328	Felt, Knob (13¢)	41		No used			

Schematic Diagram/Schaltungsschema/Diagramme schém

NOTE: PARTS AND CIRCUIT SUBJECT TO CHANGES FOR IMPROVEMENT WITHOUT PRIOR NOTICE



THIS SCHEMATIC DIAGRAM IS AVAILABLE COMBINATION OF MW/LW/FM UNITS ONLY WHEN UNITS COMBINE JUST AM/FM ONLY THERE WERE MADE SOME MODIFICATIONS AS FOLLOWING

- 1 CHANGED ANTENNA COIL L001 FROM TRL-135-1 TO RL-72B
- 2 CANCELLED SWITCHES S1e S11
- 3 SHORTED a AND a' b AND b'
- 4 CANCELLED RESISTORS R203 204 AND 206 CAPACITORS C202 203 210 209 211 212 AND 227 COILS L203 AND 202 TRANSISTOR Q202 TRIMMER CT6 AND C17

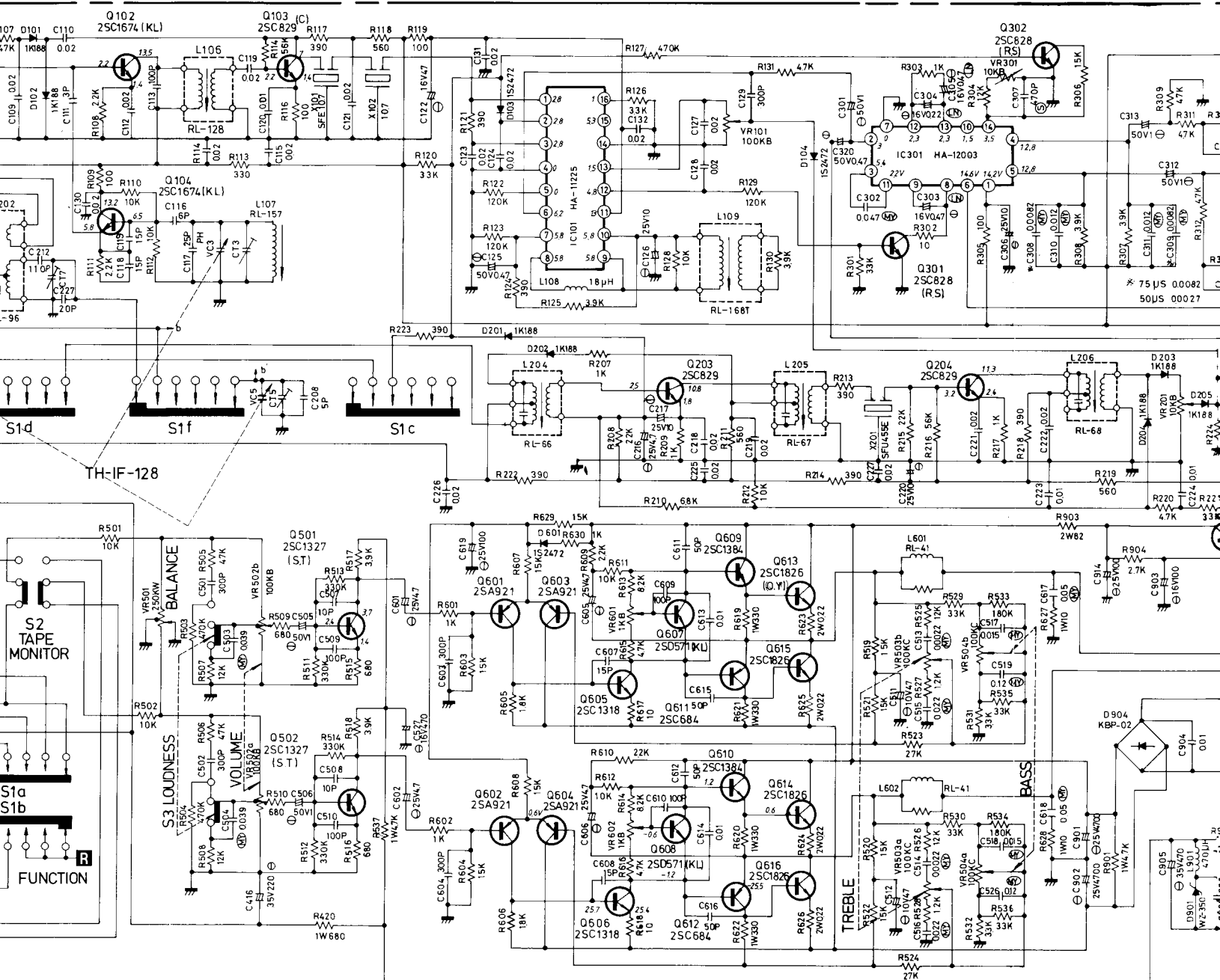
RESISTORS

- 5% TOLERANCE UNLESS OTHERWISE NOTED
- K---K LO OHM
- M---MEGA OHM
- COMPOSITION RESISTORS 1/2 WATT
- RSU METAL OXIDE FILM RESISTORS
- NON MARK LOW NOISE TYPE CARBON RESISTORS

CAPACITORS

- ①---LOW NOISE ELECTROLYTIC CAPACITORS
- ②---MYLAR FILM CAPACITORS
- ③---POLYSTYRENE FILM CAPACITORS
- ④---TANTALUM CAPACITORS
- ⑤---ELECTROLYTIC CAPACITORS
- #---CERAMIC CAPACITORS
- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED

WITHOUT PRIOR NOTICE



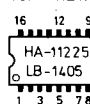
RESISTORS

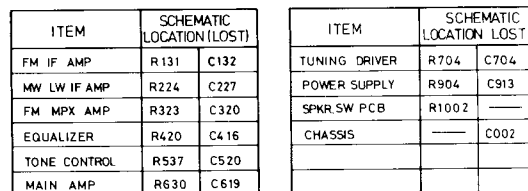
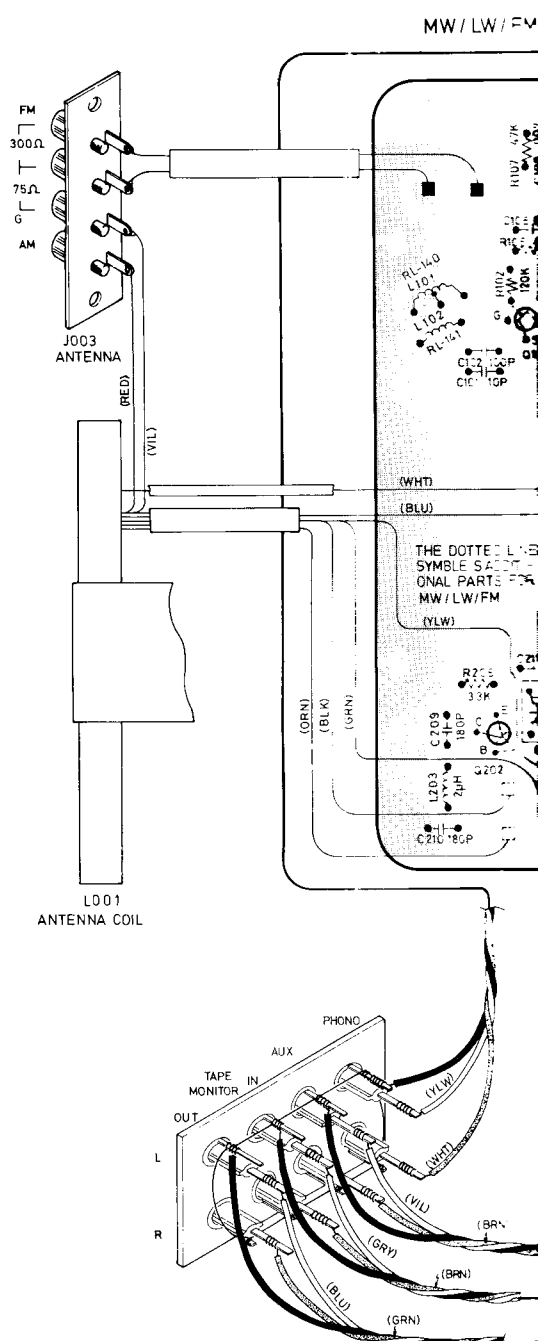
RESISTANCE UNLESS OTHERWISE NOTED
 0 OHM
 100 OHM
 1000 OHM
 COMPOSITION RESISTORS 1/2 WATT
 METAL OXIDE FILM RESISTORS
 LOW NOISE TYPE CARBON RESISTORS

CAPACITORS

LOW NOISE ELECTROLYTIC CAPACITORS
 MYLAR FILM CAPACITORS
 POLYSTYRENE FILM CAPACITORS
 TANTALUM CAPACITORS
 ELECTROLYTIC CAPACITORS
 NON MARK CERAMIC CAPACITORS
 UNLESS OTHERWISE NOTED IN SCHEMATIC ALL
 CAPACITANCE VALUES ARE EXPRESSED

TOP VIEW





MW/LW/FM TONE CONTROL MAIN AMP AND POWER SUPPLY C B D

