



# Technical Manual

# STEREO DC INTEGRATED AMPLIFIER RA-2040

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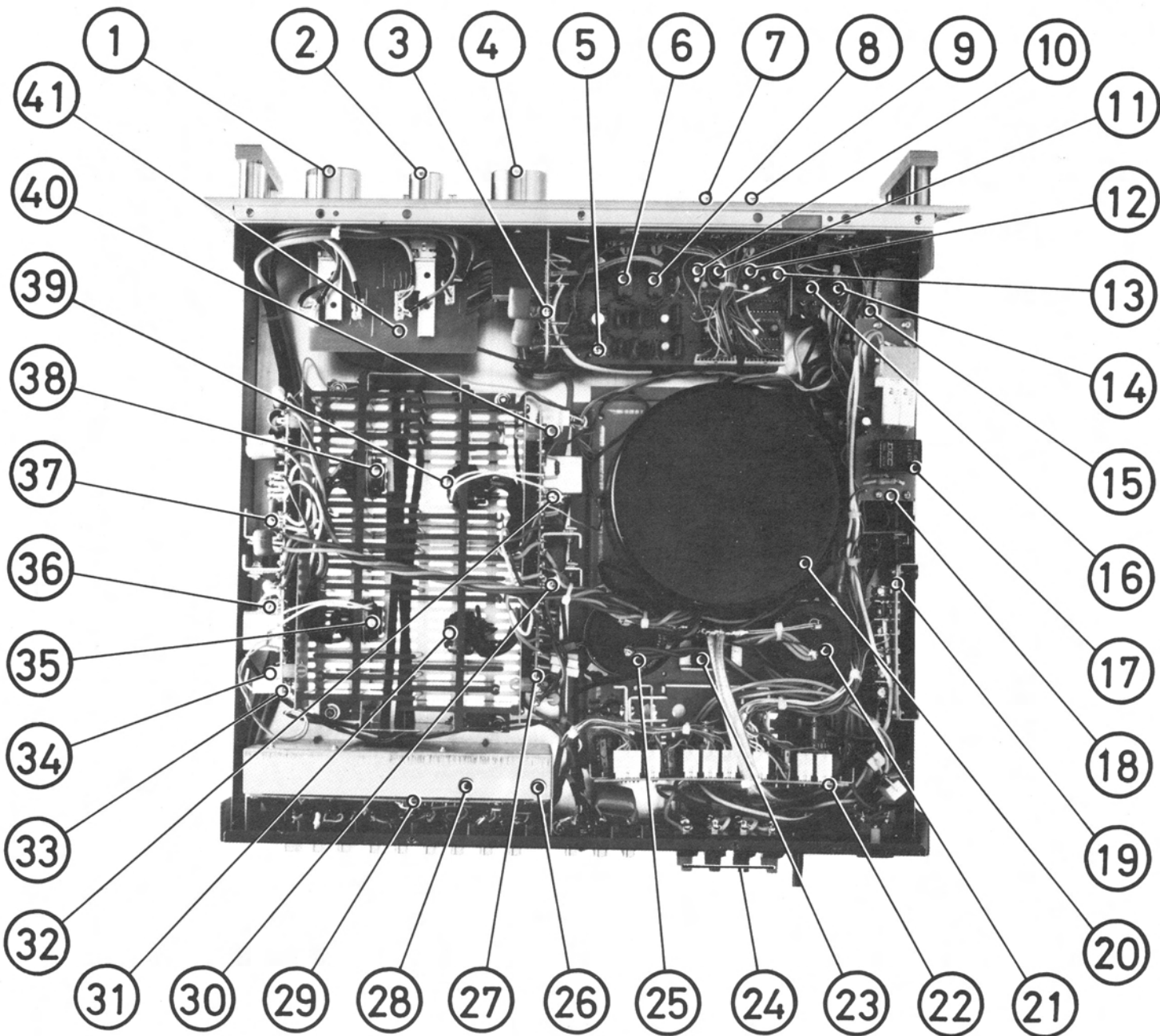
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Serial No. Beginning  
NB80195

**THE ROTEL CO., LTD.**  
**ROTEL ELECTRONICS CO., LTD.**  
**ROTEL OF AMERICA, INC.**

1-36-8 OHOKAYAMA, MEGURO-KU, TOKYO 152, JAPAN  
2ND FLOOR, EVERGLORY BLDG., NO. 305, SECTION 3,  
NANKING E. ROAD, TAIPEI, TAIWAN, REPUBLIC OF CHINA  
1055 SAW MILL RIVER ROAD, ARDSLEY, N.Y. 10502, U.S.A.

# Chassis Layout (Top View)



- |  |   |
|--|---|
| 1. FUNCTION SELECTOR                       | 22. POWER SUPPLY PCB (B-134)                    |
| 2. RECORDING SELECTOR                      | 23. D001, RECTIFIER FOR POWER AMP               |
| 3. VOLUME CONTROL AMP PCB (TC-142)         | 24. SPEAKER TERMINALS                           |
| 4. VOLUME CONTROL                          | 25. C003, -B SMOOTHING CAPACITOR                |
| 5. FILTER AND LEVEL IND DRIVER PCB (X-279) | 26. VR102, PHONO DC BALANCE ADJ, R-CH           |
| 6. S12, SUPERSONIC FILTER SW               | 27. L-CH DRIVER PCB (AF-112)                    |
| 7. TREBLE CONTROL                          | 28. VR101, PHONO DC BALANCE ADJ, L-CH           |
| 8. S13 SUBSONIC FILTER SW                  | 29. MC HEAD AND PHONO EQ AMP PCB (PR-114)       |
| 9. BASS CONTROL                            | 30. VR703, OVERLOAD PROTECTION LEVEL ADJ, L-CH  |
| 10. VR502, LEVEL INDICATOR CAL, R-CH       | 31. Q003, 004, POWER AMP, L-CH                  |
| 11. S18, INDICATOR OFF SW                  | 32. VR702, IDLING CURRENT ADJ, L-CH             |
| 12. S17, INDICATOR SENSITIVITY SW          | 33. R-CH DRIVER PCB (AF-112)                    |
| 13. VR501, LEVEL INDICATOR CAL, L-CH       | 34. VR701', DC BALANCE ADJ, R-CH                |
| 14. S15, SPEAKER A SW                      | 35. Q005, 006, POWER AMP, R-CH                  |
| 15. SPEAKER SW PCB (X-266)                 | 36. VR702', IDLING CURRENT ADJ, R-CH            |
| 16. S16, SPEAKER B SW                      | 37. VR703', OVERLOAD PROTECTION LEVEL ADJ, R-CH |
| 17. RY351, POWER SUPPLY RELAY              | 38. Q007, 008, POWER AMP, R-CH                  |
| 18. INRUSH ABSORBER PCB (X-264)            | 39. Q001, 002, POWER AMP, L-CH                  |
| 19. FUSE PCB (X-296)                       | 40. VR701, DC BALANCE ADJ, L-CH                 |
| 20. POWER TRANSFORMER                      | 41. SWITCH PCB (X-276)                          |
| 21. C002, +B SMOOTHING CAPACITOR           |   |

# Adjustment

**Instruments:** Audio Generator, Oscilloscope, AC voltmeter, DC millivoltmeter, HD Analyzer.

First set the potentiometers and switches as follows:

- Power, Muting, Loudness, Filters, and Recording Selector switches → OFF;
- Turnover switch → DEFEAT;
- Tape Monitor Switch → SOURCE;
- Function Selector → PHONO;
- Phono Selector → 1;
- Mode Switch → STEREO;
- Capacitance and Impedance Switches → mid-position;
- Balance, Bass and Treble controls → mid-position;
- Volume control → minimum

## A. Phono Amplifier DC Balance Adjustment

1. Connect AC Voltmeter and Oscilloscope to Tape Monitor Out jack. Connect Audio Generator to Phono-1 jack. Set Power switch to ON (allow 3 to 10 seconds before relay is activated).
2. Feed in 1,000Hz (sine wave) signal from Audio Generator, and gradually raise the input level until output waveform appears clipped on Oscilloscope connected to Tape Out. In this state, adjust potentiometer VR101 (VR102 for R-ch) on Equalizer PC board so that the upper and lower portions of wave are uniformly clipped.

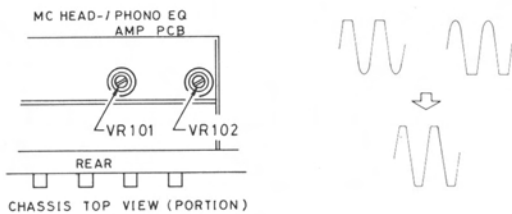


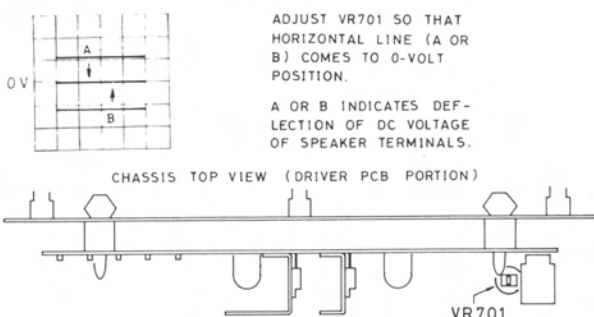
Fig. 1. Phono Amp DC Balance Adjustment

## B. Main Amp DC Balance Adjustment

Before starting this adjustment, calibrate the oscilloscope as follows: set the vertical gain control at 0.1 volt/cm. Set AC-GND-DC switch to GND to determine zero point on the screen. Then set the switch to DC position.

1. Short-circuit Main-In terminals. Set UNITE-SEPARATE switch to SEPARATE. Connect the oscilloscope to the speaker terminals, and adjust potentiometer VR701 so that the horizontal line on the oscilloscope screen, which indicates voltage, comes to 0-volt position.
2. Next, check that when Main-In terminals are opened, or when UNITE-SEPARATE switch is set to UNITE position with Main-In terminals open, fluctuation of voltage is within  $\pm 0.04$  volts.
3. Make the same adjustment for the other channel following steps 1 and 2 above.

Fig. 2. Main Amp DC Balance Adjustment

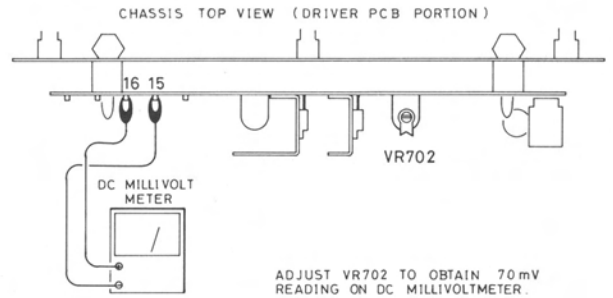


## C. Idling Current (Bias) Adjustment

Before starting this adjustment, warm up the unit for 3 minutes or so to stabilize the power transistors and the heat sink, with Volume Control set at minimum.

1. Connect the plus lead of DC millivoltmeter to pin 16 and the minus lead to pin 15 on the Driver PC board.
2. Adjust potentiometer VR702 on the Driver PC board so that DC millivoltmeter reads 70 mV.
3. Make the same adjustment for the other channel following steps 1 and 2 above.

Fig. 3. Idling Current (Bias) Adjustment



## D. Overload Protection Level Adjustment

Make this adjustment for left and right channels separately (feed signal only to the channel to be adjusted).

- Before making adjustment, warm up the unit adequately to prevent fluctuation of the preset level caused by temperature rise.
- Do not short-circuit the output pins for more than one minute. This requires the adjustment to be made bit by bit by repeating the action of turning the potentiometer a bit and short-circuiting the pins momentarily.

Note that short-circuiting output pins for a prolonged period of time when the protection circuit is not activated will damage power transistors, etc.

1. Connect an 8-ohm load resistor to speaker terminals. Connect AC voltmeter in parallel with the load resistor. Set Volume Control to maximum. Connect Audio Generator to AUX input jack and feed in 1,000Hz (sine wave) signal. Adjust the input level with the attenuator of Audio Generator to obtain 0.6-volt reading on AC voltmeter.
2. Adjust potentiometer VR703 on Driver PC board so that the protection circuit is activated (i.e. Speaker relay is set to OFF) the instant pins 17 and E 2 are short-circuited.
3. Set Power Switch to OFF to release the protection circuit, then back to ON. Reduce the input level until AC voltmeter reads 0.5 volts. Then, make certain that the protection circuit is not activated (i.e. Speaker Relay keeps ON) when pins 17 and E2 are shorted.

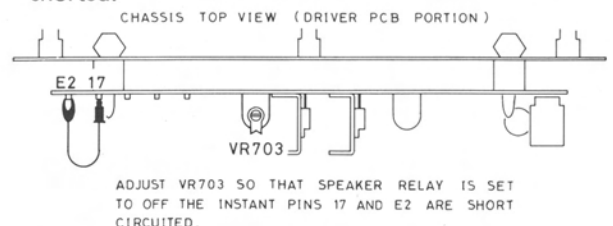


Fig. 4. Overload Protection Level Adjustment

## E. Peak Level Indicator Calibration

1. Connect an 8-ohm load resistor to speaker terminals. Connect AC voltmeter in parallel with the resistor. Connect Audio Generator to AUX input and feed in 1,000Hz (sine wave) signal. Adjust the input level to obtain 31-volt reading on AC voltmeter. Set the sensitivity changeover switch for Peak Level Indicator to NORMAL.
2. Maintaining this state, adjust by turning potentiometer VR501 (VR502 for R-channel) on the Indicator Driver PC board so that the Level Indicator lights up to 0dB position.
3. Adjust the input level so that AC voltmeter indicates the point 20dB lower than that at 31-volt reading. Push on the sensitivity changeover switch to -20dB position. Check that the Peak Level Indicator lights up to 0dB position.

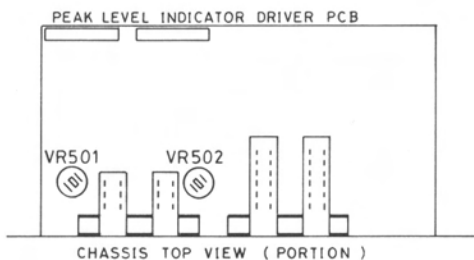


Fig. 5. Peak Level Indicator Adjustment

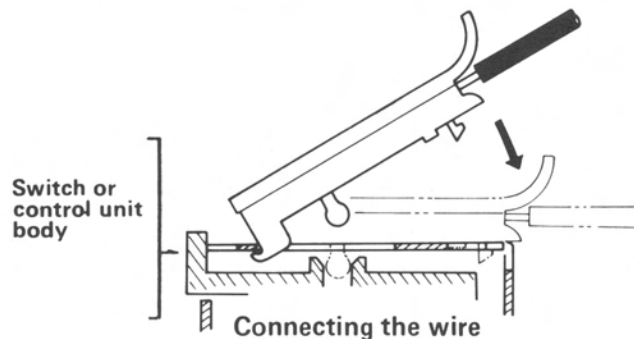
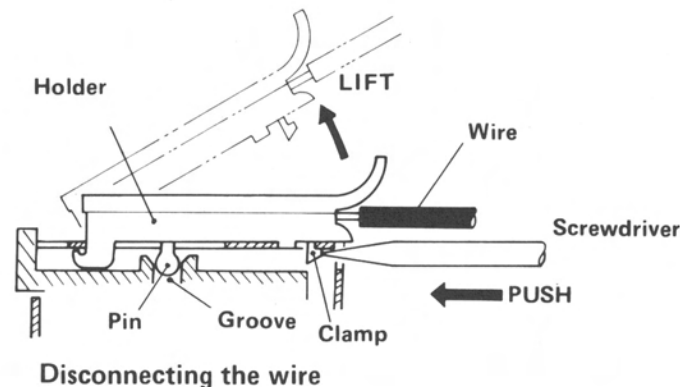
## To Disconnect or Connect the Wire Between Remote Switch and Control Unit

### 1. Disconnecting the wire

To detach the wire from the remote switch or from the control unit, lift the curved tip of the wire holder while pushing in on the claw-like holder clamp in direction of arrow, using a small screwdriver or the like.

### 2. Connecting the wire

- a. Note that there are two types of wire and control unit, for 3P and 6P switches. Make sure the wire being used is appropriate to the remote switch type in your unit.
- b. Match the position of slider pin and pin groove, then snap-fit the wire holder in place.



# Specifications

## A. POWER AMPLIFIER SECTION

- Continuous Power Output . . . 120W\* per channel min. RMS, both channels driven at B-M load, from 20Hz to 20,000Hz with no more than 0.01% total harmonic distortion.
- Total Harmonic Distortion . . . No more than 0.01% at rated output.  
No more than 0.006% at 60-watt output.  
No more than 0.008% at 1-watt output.
- Intermodulation Distortion . . . No more than 0.015% at 60-watt output.  
(60Hz : 7,000Hz = 4 : 1)  
No more than 0.008% at 1-watt output.
- Frequency Response (at 1-watt output)  
DC IN, +0dB ~ -1dB . . . . 4Hz ~ 100,000Hz  
DC IN, +0dB ~ -3dB . . . . 2Hz ~ 200,000Hz  
AC IN, +0dB ~ -1dB . . . . 5Hz ~ 100,000Hz
- Input Sensitivity/Impedance . . 1.5V/50k $\Omega$
- Output ; Speaker . . A or B . . . 4 ~ 16 $\Omega$   
A + B . . . . 8 ~ 16 $\Omega$
- Damping Factor  
at 20Hz ~ 20,000Hz . . . . . 65  
at 1000Hz . . . . . 100
- Hum and Noise (IHF A-network)  
. . . . . 110dB
- Crosstalk, at 10,000Hz . . . . . 65dB

## B. EQUALIZER AMPLIFIER SECTION (measured at tape out)

- Output Voltage/Impedance at 1,000Hz  
Rated Output  
PIN Jack . . . . . 150mV/2k $\Omega$   
DIN Jack . . . . . 50mV/80k $\Omega$   
Max. Output at 0.5% THD  
PIN Jack . . . . . 25V
- Harmonic Distortion (5V-output, 20Hz to 20,000Hz)  
Phono-1, -2 . . . . . 0.005%  
Phono-3 (MC) . . . . . 0.006%
- Phono Equalization 20Hz to 20,000Hz  
Phono-1, -2, -3 . . . . . RIAA STD  $\pm$  0.3dB
- Hum and Noise (IHF A-Network, 1-V output)  
Phono-1, -2 (MAG) . . . . . 75dB  
Phono-3 (MC) . . . . . 64dB
- Input Sensitivity/Impedance at rated output  
Phono-1 . . . . . 2mV/35k $\Omega$ , 50k $\Omega$ , 0k $\Omega$ , 0,  
100, 200pF  
Phono-2 . . . . . 2mV/50k $\Omega$   
Phono-3 (MC) . . . . . 100 $\mu$ V/33 $\Omega$
- Crosstalk at 20,000Hz . . . . . 55dB
- Overload at 1,000Hz 0.5% THD  
Phono-1, -2 . . . . . 400mV  
Phono-3 (MC) . . . . . 15mV

## C. PREAMPLIFIER SECTION (measured at tape out)

- Output Voltage/Impedance  
Rated Output . . . . . 1.5V/600 $\Omega$   
Max. Output . . . . . 7V (0.5% THD)
- Harmonic Distortion at rated output  
(20Hz to 20,000Hz) . . . . . 0.008%
- Frequency Response  
(+0dB, -1dB) . . . . . 4Hz to 160,000Hz
- Hum and Noise (IHF A-Network)  
Tuner, AUX . . . . . 95dB  
Tape Monitor-1, -2 . . . . . 95dB  
Residual Noise (volume control at min.)  
. . . . . 6 $\mu$ V/110dB
- Input Sensitivity/Impedance at rated output  
Tuner, AUX } . . . . . 150mV/50k $\Omega$   
Tape monitor-1, 2 }
- Overload (1,000Hz, 0.5% THD)  
Tuner, AUX } . . . . . 15V  
Tape Monitor -1, -2 }
- Crosstalk (1,000Hz) . . . . . 70dB AVE
- Intermodulation Distortion  
60Hz : 7,000Hz = 4:1 . . . . . 0.01%

## D. CONTROL CHARACTERISTIC

- Tone Controls  
Bass (at 100Hz)  
Turnover, 150Hz . . . . . +5dB, -5dB  
Turnover, 400Hz . . . . . +10dB, -10dB  
Treble Control (at 10,000Hz)  
Turnover, 7,000Hz . . . . . +5dB, -5dB  
Turnover, 2,500Hz . . . . . +10dB, -10dB
- Loudness, at 100Hz . . . . . +8dB  $\pm$ 1dB  
at 10,000Hz . . . . . +4dB  $\pm$ 1dB
- Supersonic Filter at 24,000Hz . . -12dB/oct
- Subsonic Filter at 16Hz . . . . . -12dB/oct
- Audio Muting . . . . . -15dB  $\pm$ 1dB

## E. MISCELLANEOUS

- Power Requirement . . . . . 120V/60Hz, 220V/50Hz,  
240V/50Hz, or 100, 120,  
220, 240V/50 ~ 60Hz  
(Switchable)
- Power Consumption . . . . . 900 watts max.
- Dimensions (Overall) . . . . . 482(W) x 143(H) x 408(D)  
mm
- Weight (Net) . . . . . 22kg

**Note:** Specification and design subject to possible modification without notice.

\* Measured pursuant to the Federal Trade Commission's Trade Regulation Rule on Power Claim for Amplifiers. (Applicable to the U.S.A. only)

# Addendum

1. The overload detection circuit has been modified. This change is applicable to all units with serial numbers NB83986 or over.

a) The new overload protection circuit saves adjustment of overload protection. Accordingly resistors R746, 747, 748 and VR703, and transistor Q716 are eliminated from the Driver PC Board of the new unit.

b) Because of the modification explained in 1. a), the new Driver PC Board assembly used for repair is given a new number, to distinguish it from conventional Driver PC Board.

- Driver PC Board assembly (Part No. 141810328) is applicable to units with serial nos. NB83986 or over.

- The newly designed Overload Detection PC Board assembly: Part No. 141810850.

c) See Figs. A and B for the new overload detection circuit and connection.

d) To check operation of overload protection circuit when new Overload Detection PC Board is employed:

- 1) Connect an 8Ω load resistor to speaker terminals and produce 0.6-volt output (1,000Hz, sine wave signal) at speaker terminals.

- 2) Maintaining this state, short-circuit pins 17 and E2 on Driver PC board and check that the speaker relay is set to OFF.

- 3) Reduce output voltage to 0.5 volts. Then, make certain that the speaker relay keeps ON when pins 17 and E2 are shorted.

e) To attach the new Overload Detection PC Board to conventional units (with serial nos. up to NB83985) it is necessary to drill a hole in the Driver PC Board fitting plate. The following parts are necessary to attach the new PC board. See Fig. C-2 for mounting position.

### PARTS REQUIRED:

- 1) PC board fitting plate: Part No. 120012231 . .2
- 2) Screw + 3 x 6mm: Part No. 766213006 . .4
- 3) Nut, M3 Hexagonal: Part No. 770402201 . .2

### HOW TO ATTACH

- 1) Drill a φ3.5 hole in the Driver PC Board fitting plate. See Fig. C-1.
- 2) Attach the Overload Detection PC Board to the Driver PC Board fitting plate as shown in Fig. C-2.
- 3) The fitting position of the Overload Detection PC Board as seen from chassis top is illustrated in Fig. C-3.

2. The following modification has been made for the units with Serial No. NB92399 or over.

Phono-3(MC) input jack design has been modified:

**Conventional design:** the input circuit is shorted at the input terminal when the input jack is left unplugged.

**New design:** the input circuit is open when the jack is left unplugged. The pin plug for shorting is used to short the circuit.

Since new type jack is available as a repair part, be sure to use the pin plug for shorting when replacing the conventional jack with a new one. (Fig. D)

Fig. A. Schematic Diagram (Overload Detection Circuit Portion): Applicable to units with serial numbers NB83986 or over.

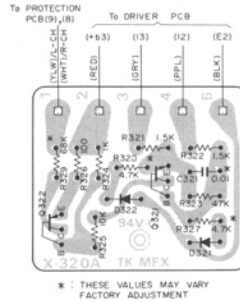
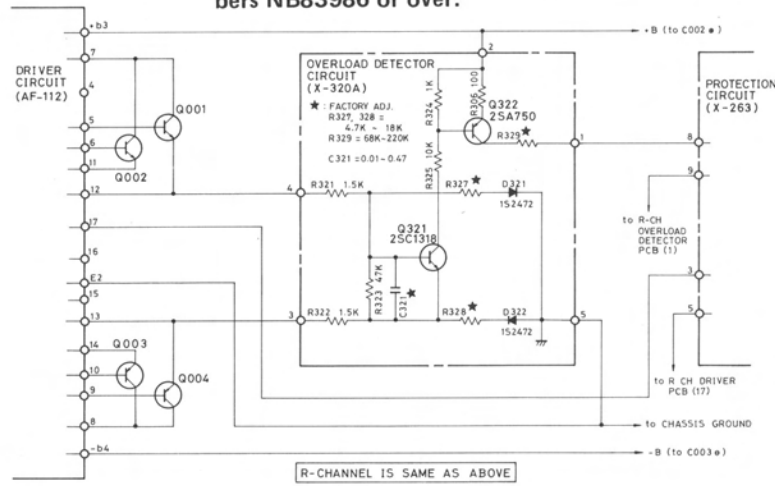


Fig. B

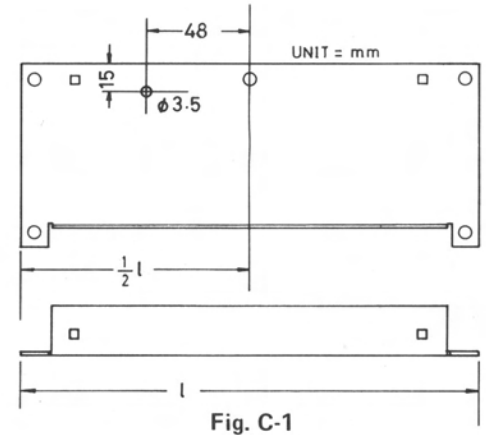


Fig. C-1

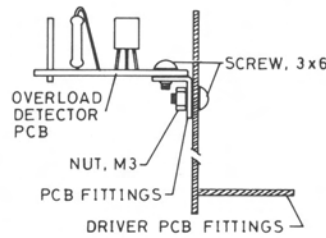


Fig. C-2



Fig. D.

# Repair Parts List

Schematic Location	Part No.	Description
<b>TRANSISTORS, DIODES AND IC'S</b>		
Q101, 102, 105, 106, 111, 112, 113, 114	301201180	2SC1844 (E) or (F)
Q103, 104, 107, 108, 109, 110, 115, 116		
Q117, 118, 121, 122, 123, 124, 131, 132, 351, 441, 702, 703, 704, 705, 710, 802	301201171	2SC1980 (S) or (T)
Q119, 120, 125, 126, 401, 402, 403, 404, 501, 502, 505, 506		
Q127, 128, 129, 130, 138, 409, 410, 411, 412, 716* <sup>1</sup> , 801	301001145	2SA921 (S) or (T)
Q133, 134, 137, 407, 408, 413, 414, 706, 707, 805, 807		
Q135, 136, 139, 405, 406, 503, 504, 507, 508, 806, 808	301001142	2SA912 (R) or (S)
Q321* <sup>2</sup>		
Q322* <sup>2</sup>	301001133	2SA750 (E)
Q601, 602, 603, 604	301201134	2SC1327 (S) or (T)
Q651		
Q701	302001121	μPA63H (M2), Dual FET
Q708, 709	301001151	2SA914 (R) or (S)
Q711, 712, 809, 810		
Q713, 811	301001143	2SA913 (R) or (Q)
Q714	301301134	2SD571 (K) or (L)
Q715	301101124	2SB605 (K) or (L)
Q803	301201181	2SC2167 (O) or (Y)
Q804	301001148	2SA957 (O) or (Y)
Q001, 002, 005, 006	301201188	2SC2492 (O)
Q003, 004, 007, 008		
D101, 102, 105, 106, 808, 809	300212002	KB-265, Varistor
D103, 104, 107, 108, 401, 402		
D501, 502, 503, 504	300313028	WZ-050, Zener Regulator, 5V, 0.5W
D321* <sup>2</sup> , 322* <sup>2</sup> , 441, 651, 653, 702		
D351, 652, 801, 802, 803, 804, 805, 806, 807	300919024	SR1K-4, Rectifier
D701, 813		
D810, 811	300313030	CZ-117, Zener Regulator 11.7V, 1W
D812, 814, 815	300313025	WZ-240, Zener Regulator, 24V, 0.5W

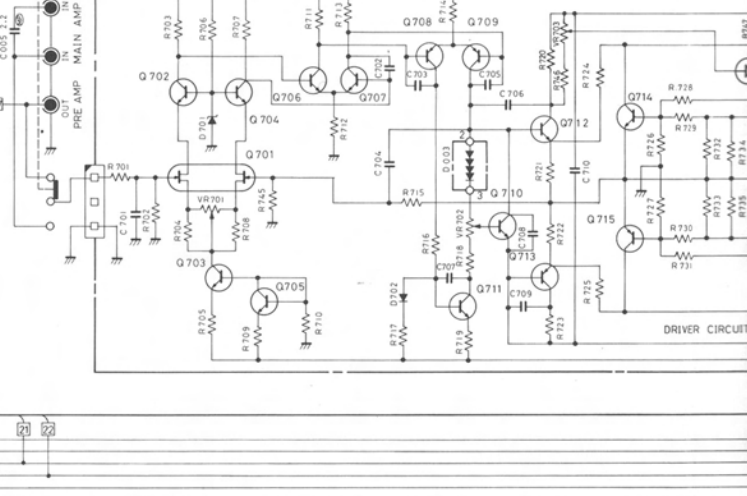
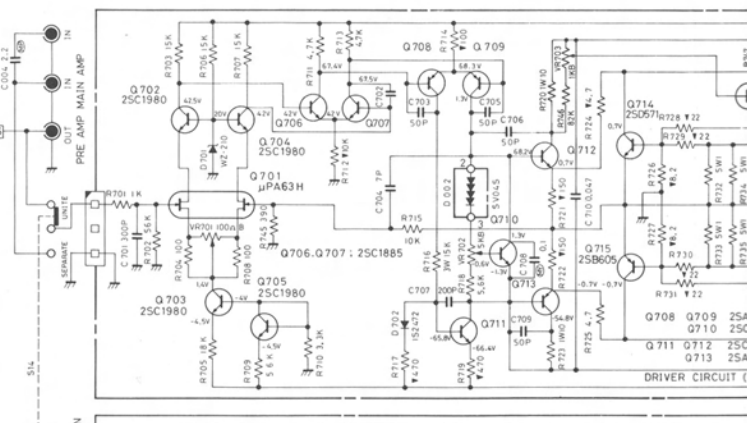
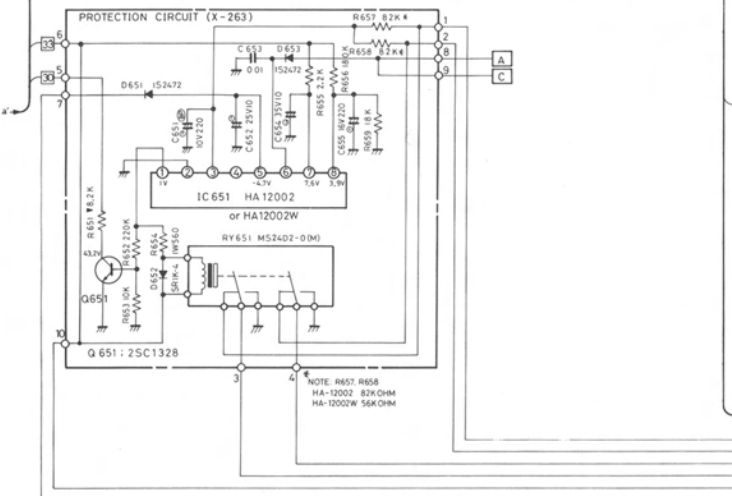
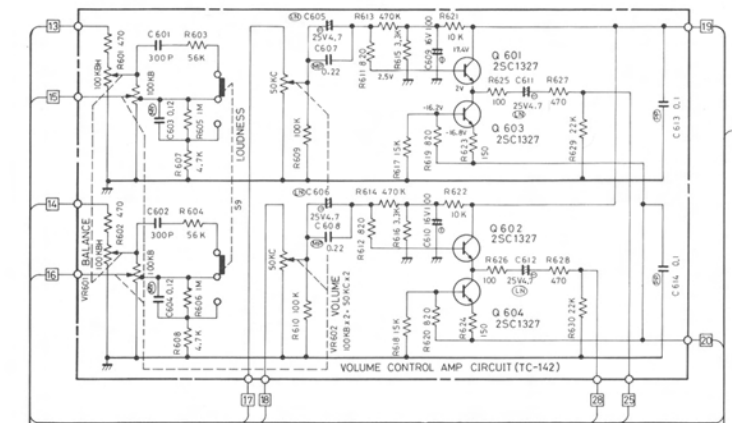
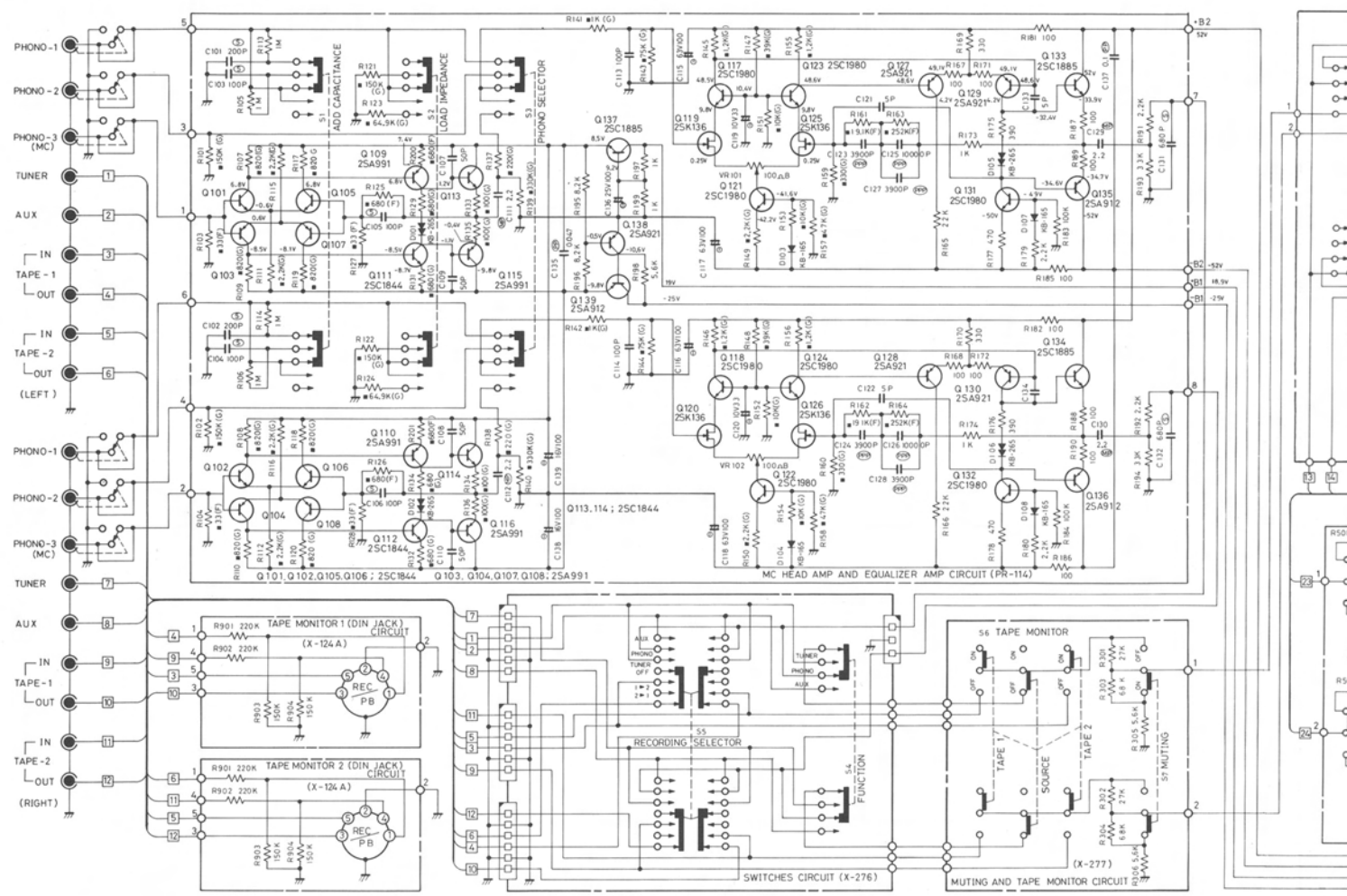
Schematic Location	Part No.	Description
D816, 817	300313006	BZ-270, Zener Regulator, 27V, 0.5W
D901	300414021	SLP-237, LED (GRN)
D902 ~ 928	300414020	SLP-137B, LED (RED)
D001	300919030	S-15 VB-20, Rectifier
D002, 003	300212010	SV-04S, Varistor
IC501, 502, 503, 504	303452188	LB-1405S
IC651		
<b>VARIABLE RESISTORS</b>		
VR101, 102	510502177	100B, Phono Amp DC Balance Adj
VR401, 402	525101157	50KB, Treble, Bass Control
VR501, 502	510502138	10KB, Level Indicator Cal.
VR601	525101143	100KBHx2, Balance Control
VR602	525121140	100KBTx2+50KCx2, Volume Control
VR701	510502176	100B, Main Amp DC Balance Adj
VR702	510502146	5KB, Bias Adj
VR703* <sup>1</sup>	510502145	1KB, Overload Protection Level Adj
<b>SWITCHES</b>		
S1, 2, 3	615212263	Phono Selector, etc.
S4	601011339	Function Selector
S5	601011337	Recording Selector
S6	614030819	Tape Monitor
S7	614010133	Muting
S8	611001269	Mode
S9	614010132	Loudness
S10	611001261	Treble Turnover
S11	611001270	Bass Turnover
S12, 13 (1Set)	614020424	Filters
S14	613000022	Pre/Main
S15, 16 (1Set)	614020408	Speakers
S17, 18 (1Set)	614020425	Indicator
S19	615212270	Thermostat, 95°C
S20	611001271	Power
<b>OTHERS</b>		
RY351	240111240	Relay, Power Supply
RY651	240111241	Relay, Speakers
L701	228641124	Coil, Anti-parasitic
T001	205001441	Power Transformer (Multi-voltage)
	206001441	Power Transformer (220/240V)
F901, 902	341221800	Fuse, 8A-3AG, for STD Type
	345952630	Fuse, 6.3AT Midget, for European Type
F903, 904	341221150	Fuse, 1.5A-3AG, for STD Type
	345252160	Fuse, 1.6A Midget for European Type
F905	341221100	Fuse, 1A-3AG, for STD Type
	345252100	Fuse, 1A Midget, for European Type

Schematic Location	Part No.	Description
F906	341221800	Fuse, 8A-3AG, for STD Type (100 ~ 120V)
	341221350	Fuse, 3.5A-3AG, for STD Type (220 ~ 240V)
	345952315	Fuse, 3.15AT Midget, for European Type
	654101144	Remote Control Unit, 3P Switch
	626110028	Headphone Jack
	624206202	2P Pin Jack (Gold), Phono-3
	624205204	4P Pin Jack (Gold), Phono-1,2
	624200202	2P Pin Jack, Main AC IN
	624200204	4P Pin Jack, AUX/Tuners etc.
	649201118	Speaker Terminal
	648211141	AC Outlet (not used on units for UK)
	648211121	Voltage, Selector, (for STD type only)
	625001114	DIN Socket
	648211163	Transistor Socket, Power Amp.
	647110005	Wire Ass'y, Remote Control Switch
	141510165	MC Head Amp and Equalizer Amp PCB Ass'y
	141710301	Volume Control Amp PCB Ass'y
	141710302	Tone Control Amp PCB Ass'y
	141610316	Main Amp PCB Ass'y
	141810730	DIN Socket PCB Ass'y
	141810825	Inrush Detector PCB Ass'y
	141810826	Protection PCB Ass'y
	141810818	Inrush Current Absorber PCB Ass'y
	141810827	Speaker Switch PCB Ass'y
	141810828	Level Indicator (LED) PCB Ass'y
	141810829	Function Switch PCB Ass'y
	141810830	Tape Monitor & Muting PCB Ass'y
	141810831	Filter and Level Indicator Driver PCB Ass'y
	141810832	Fuse PCB Ass'y for STD Type (100 ~ 120V area)
	141810833	Fuse PCB Ass'y, for STD Type (220 ~ 240V area)
	141810834	Fuse PCB Ass'y, for European Type
	141810835	Power Supply PCB Ass'y
	111911408	Front Panel Ass'y
	138011296	Top Cover
	116210046	Button, Push Switch
	116310242	Knob, Lever Switch
	116310235	Knob, Volume, Function
	116310236	Knob, Balance, Phone Selector

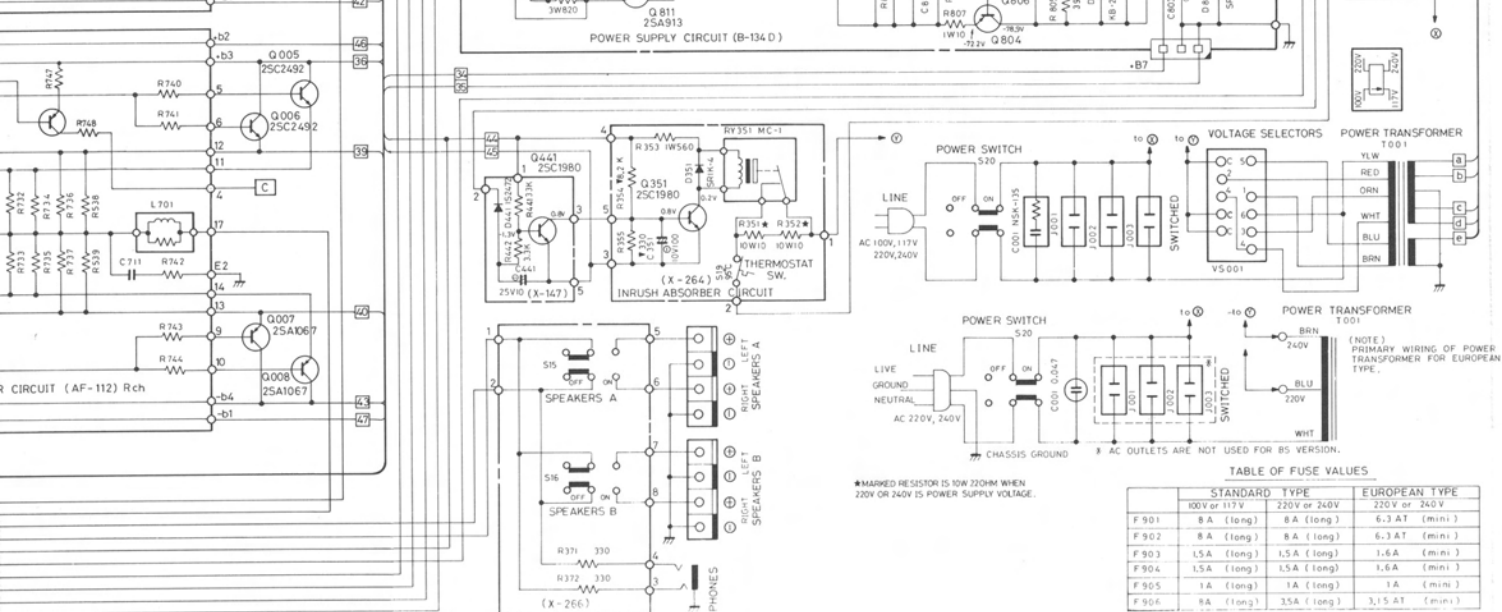
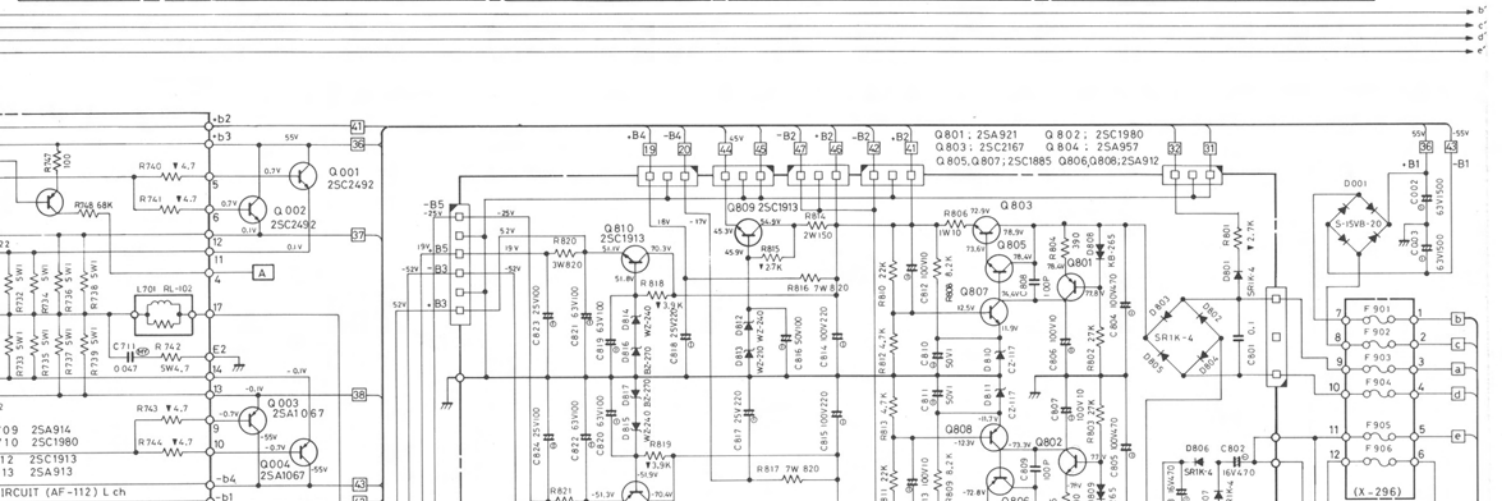
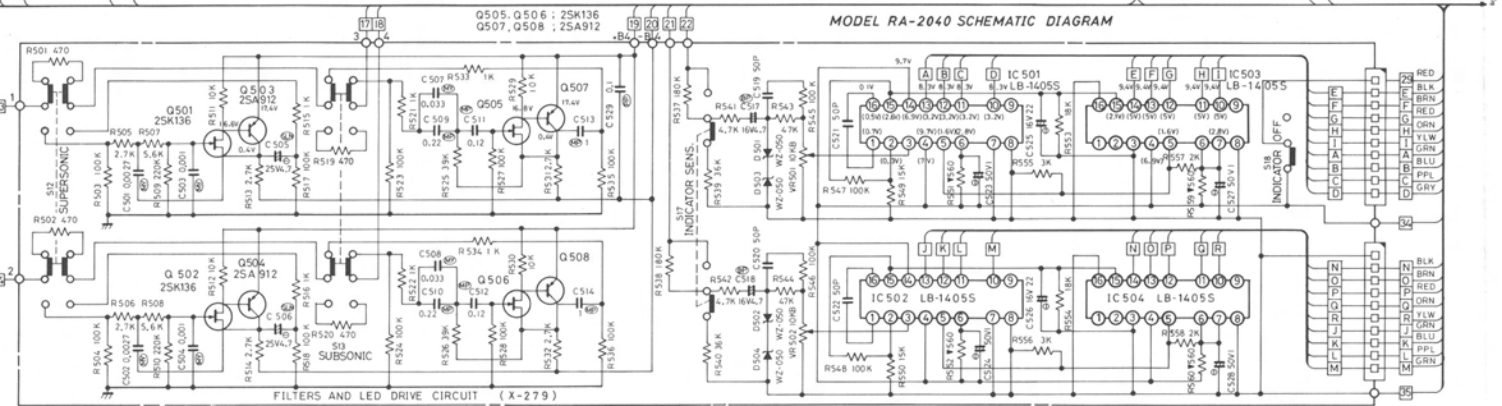
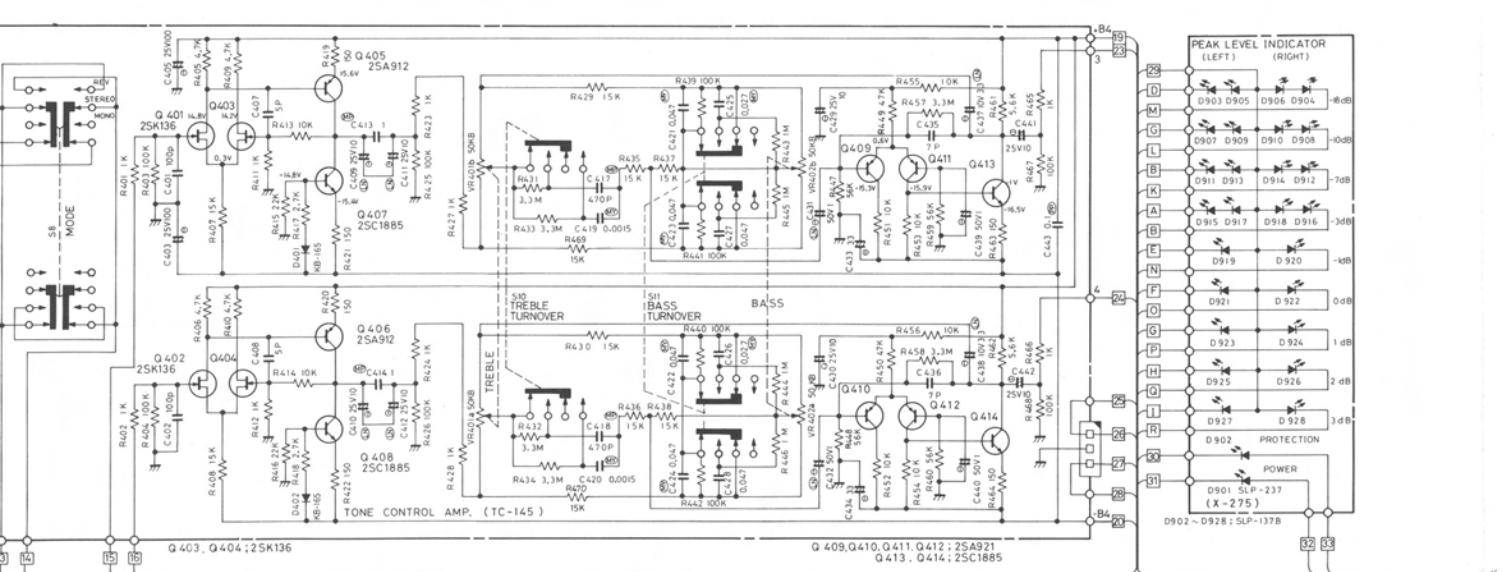
Schematic Location	Part No.	Description
	116310237	Knob, Recording Selector
	116310238	Knob, Bass, Treble, etc.
	120012715	Ornamental Board, Level Indicator
	670101118	Handle
	673402018	Foot
	770911119	GND Terminal
	766213006	Screw, + 3x6mm (Ni), Tap-tight
	705213004	Screw, + 3x4mm (Ni), Binding
	762213006	Screw, + 3x6mm (Ni), Oval Countersunk
	766223008	Screw, + 3x8mm (BLZ), Tap-tight
	766213010	Screw, + 3x10mm (Ni), Tap-tight
	725223008	Screw, + 3x8mm (BLZ), Tapping
	770911166	Screw, 3x8mm (BLZ), Plain Head
	725213008	Screw, + 3x8mm (Ni), Tapping
	766223012	Screw, + 3x12mm (BLZ), Tap-tight
	766213020	Screw, + 3x20mm (Ni), Tap-tight
	765224008	Screw, + 4x8mm (BLZ), Tap-tight
	765224020	Screw, + 4x20mm (BLZ), Tap-tight
	765224012	Screw, + 4 x 12mm (BLZ), Tap-tight
	725224010	Screw, + 4x10mm (BLZ), Tapping
	770911209	Cap Screw, 6x40mm,
	770402209	Nut, M12, Hex, Phono Jack Mtg.
	770402206	Nut, M8, Hex, Vol Mtg
	770402205	Nut, M7, Hex, Switch Mtg, etc.
	770402201	Nut, M3, Hex, GND Terminal Mtg, etc.
	770911144	Nut, M3, Square, Tr. Mtg.
	770402204	Nut, M6, Hex, Handle Mtg, etc.
	770402210	Nut, M5, Hex.
	770500009	Washer, $\phi$ 12
	770500007	Washer, $\phi$ 8
	770500006	Washer, $\phi$ 7
	770500014	Teethed Washer $\phi$ 3
	770500010	Spring Washer, $\phi$ 3
	770500003	Washer, $\phi$ 3
	770500012	Spring Washer, $\phi$ 6
	770500032	Washer, $\phi$ 6
	770500029	Spring Washer, $\phi$ 5
	770500033	Washer, $\phi$ 5
	770911216	Collar, Handle Mtg.
	992001111	Spacer, Tr Mtg.
	648211146	Clip, Long Fuse
	648211147	Clip, Midget Fuse



# Schematic Diagram



5V  
15V  
19V  
-25V



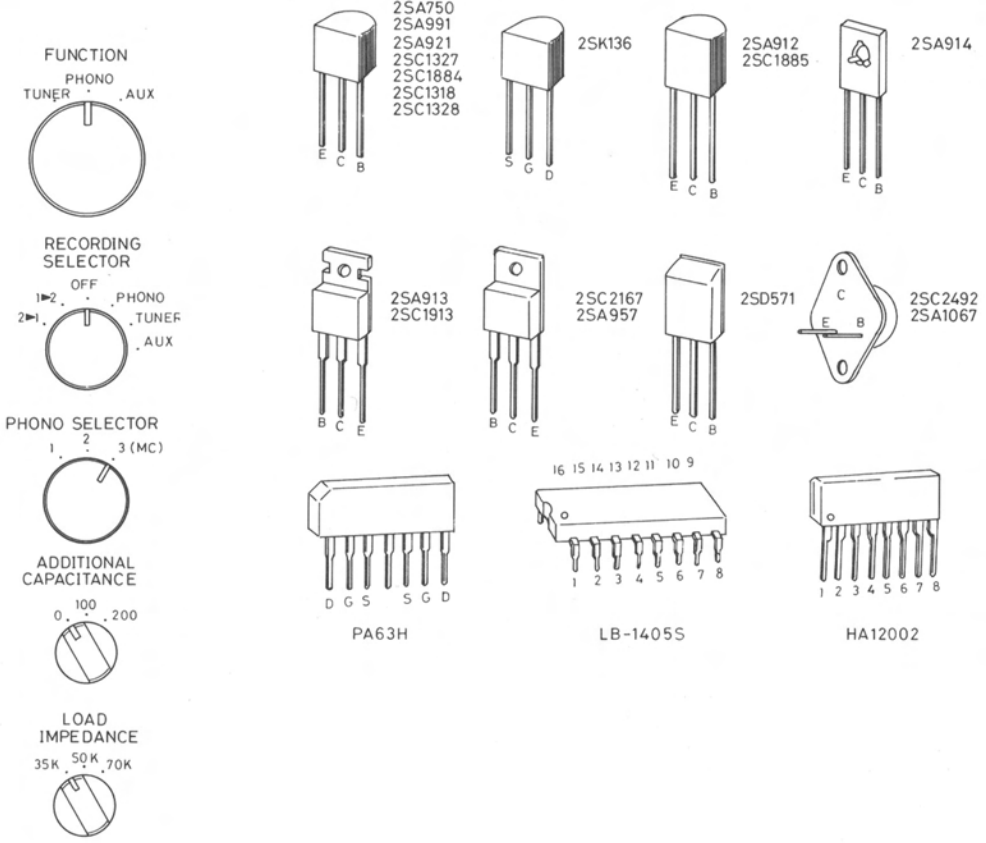
\* MARKED RESISTOR IS 10W 220HM WHEN 220V OR 240V IS POWER SUPPLY VOLTAGE.

TABLE OF FUSE VALUES

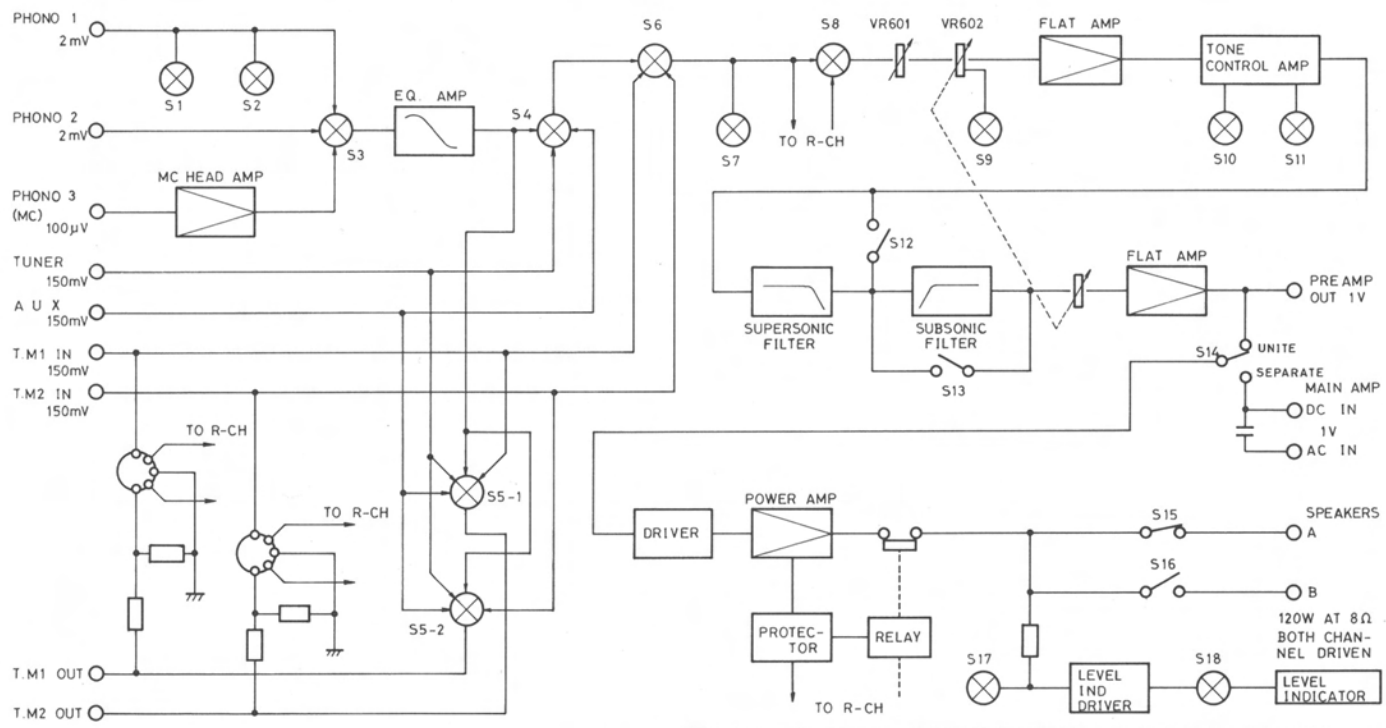
STANDARD TYPE	EUROPEAN TYPE
F 901	100V or 113V 220V or 240V
F 902	8 A (long) 8 A (long)
F 903	6.3 AT (mini)
F 904	1.5 A (long) 1.5 A (long)
F 905	1.6 A (mini)
F 906	1.6 A (long) 1.6 A (long)
F 907	1 A (long) 1 A (long)
F 908	1 A (mini)
F 909	3.5 A (long) 3.5 A (long)
F 910	3.15 AT (mini)

ITEM	SCHEMATIC LOCATION (LAST)	
MC HEAD AMP AND EQUALIZER AMP CIRCUIT.	R 2 0 1	C 1 3 9
TAPE MONITOR (DIN JACK) CIRCUIT.	R 9 0 4	—
MUTING AND TAPE MONITOR CIRCUIT.	R 3 0 6	—
tone control amp.	R 4 7 0	C 4 4 3
FILTERS AND LED DRIVE CIRCUIT.	R 5 6 0	C 5 2 8
VOLUME CONTROL AMP.	R 6 3 0	C 6 1 4
OVERLOAD DETECTOR CIRCUIT.	R 3 2 9	C 3 2 1
PROTECTION CIRCUIT	R 6 5 9	C 6 5 5
DRIVER CIRCUIT	R 7 4 8	C 7 1 1
BOOSTER CIRCUIT	R 4 4 2	C 4 4 1
INRUSH ABSORBER CIRCUIT	R 3 5 5	C 3 5 1
SPEAKERS SW AND PHONES CIRCUIT	R 3 7 2	—
POWER SUPPLY CIRCUIT	R 8 2 1	C 8 2 4
CHASSIS	—	C 0 0 5

- (RESISTORS)  
 5% TOLERANCE UNLESS OTHERWISE NOTED.  
 K--- KILO OHM.  
 M--- MEGA OHM.  
 ▽--- NONFLAMMABLE CARBON FILM RESISTORS.  
 ■--- FIXED PRECISION METAL FILM RESISTORS (F); 1% (G); 2%  
 NON MARK-- LOW NOISE TYPE CARBON RESISTORS 1/4 WATT
- (CAPACITORS)  
 ⊖--- POLYSTYRENE FILM CAPACITORS.  
 ⊖--- MYLAR FILM CAPACITORS.  
 ⊖--- POLYPROPYLENE FILM CAPACITORS.  
 ⊖--- BI POLAR ELECTROLYTIC CAPACITORS.  
 ⊖--- LOW NOISE TYPE CAPACITORS.  
 ⊖--- SUPER LOW NOISE TYPE CAPACITORS.  
 ⊖--- POLYPROPYLENE AND POLYESTER FILM CAPACITORS.  
 ⊖--- METALIZED POLYESTER FILM CAPACITORS.  
 ⊖--- ELECTROLYTIC CAPACITORS.  
 NON MARK-- CERAMIC CAPACITORS.
- UNLESS OTHERWISE NOTED IN SCHEMATIC ALL CAPACITANCE VALUES ARE EXPRESSED IN MFD.
  - VOLTAGE READING WITH VTVM FROM THE POINT SHOWN TO THE CHASSIS GROUND (LINE VOLTAGE 117 VOLTS)
  - VOLTAGE READING MAY VARY ± 20%

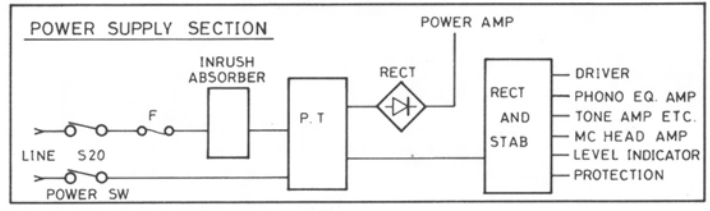


# Block Diagram



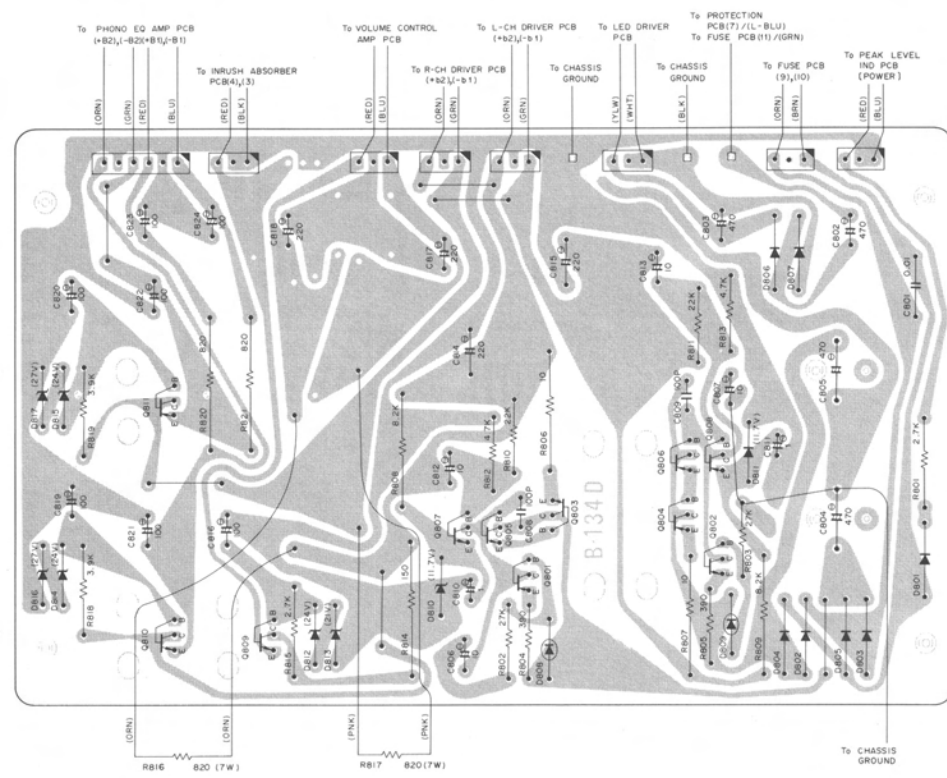
RIGHT CHANNEL IS SAME AS ABOVE LEFT CHANNEL.

- |                       |                    |                   |
|-----------------------|--------------------|-------------------|
| S1 ADD CAP SELECTOR   | S7 MUTING SW       | S13 SUBSONIC SW   |
| S2 LOAD IMPEDANCE SW  | S8 MODE SW         | S14 PRE/MAIN SW   |
| S3 PHONO SELECTOR     | S9 LOUDNESS SW     | S15 SPEAKER A SW  |
| S4 FUNCTION SELECTOR  | S10 TREB.T.OVER SW | S16 SPEAKER B SW  |
| S5 RECORDING SELECTOR | S11 BASS T.OVER SW | S17 IND. SENS. SW |
| S6 TAPE MONITOR SW    | S12 SUPERSONIC SW  | S18 IND. OFF SW   |

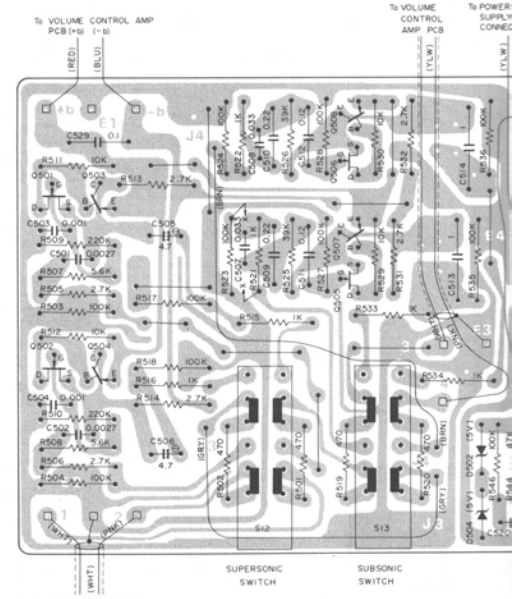


# PC BOARD DIAGRAMS

## Power Supply Circuit

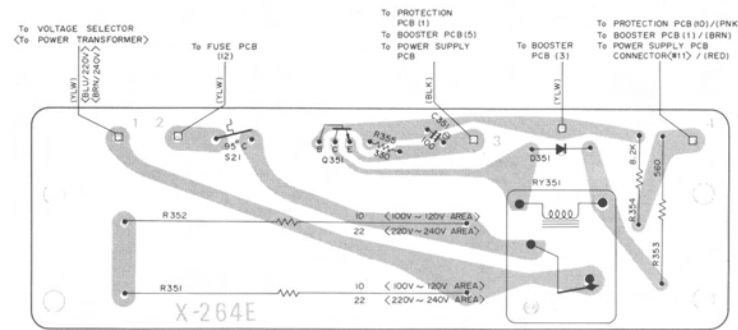


## Filter and Level Indicator (LED) Driver

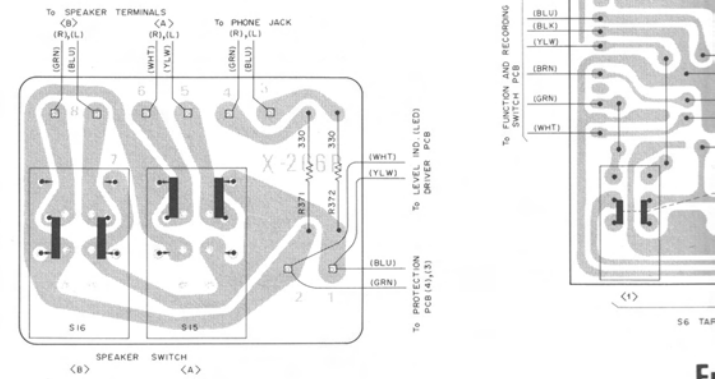


## Muting and Tape

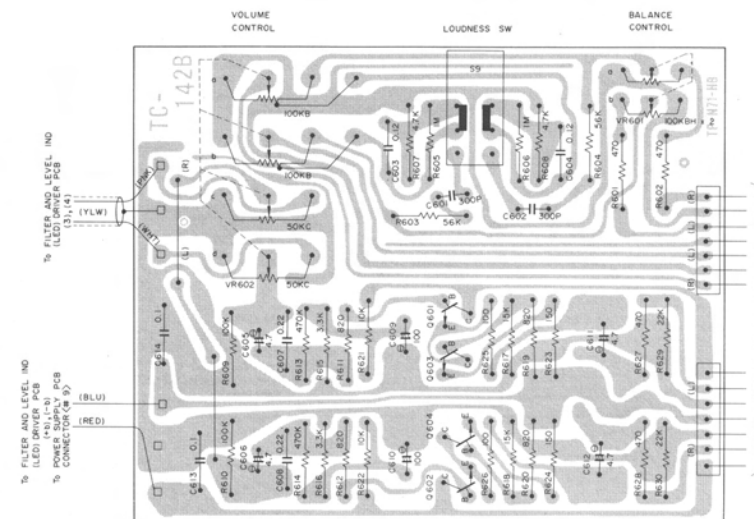
## Inrush Current Absorber Circuit



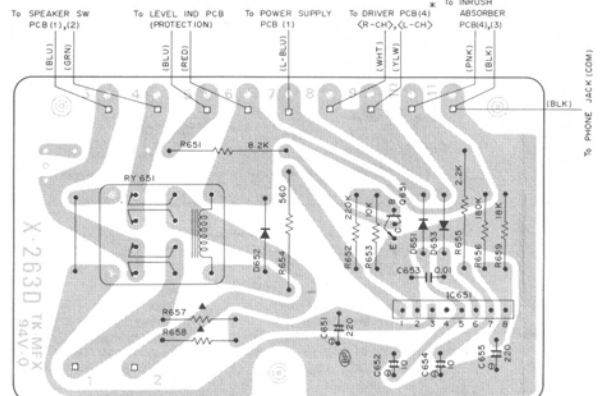
## Speaker Switches Circuit



## Volume Control Amp



## Protection Circuit

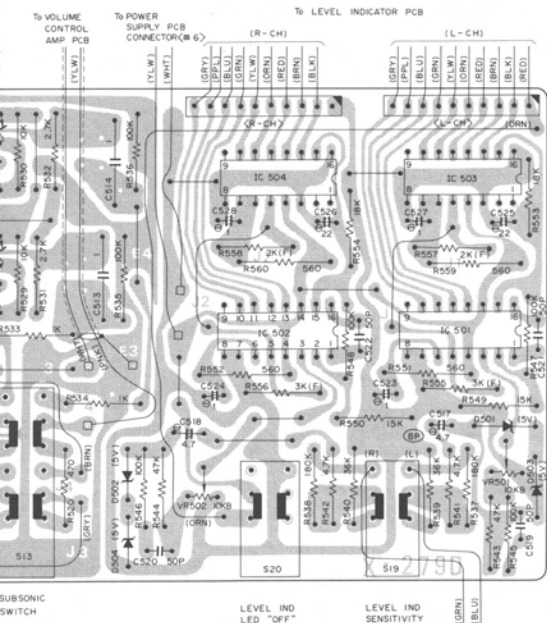


Values of R657 and 658 vary according to the type of IC651:  
 When HA12002 is used: 82kΩ

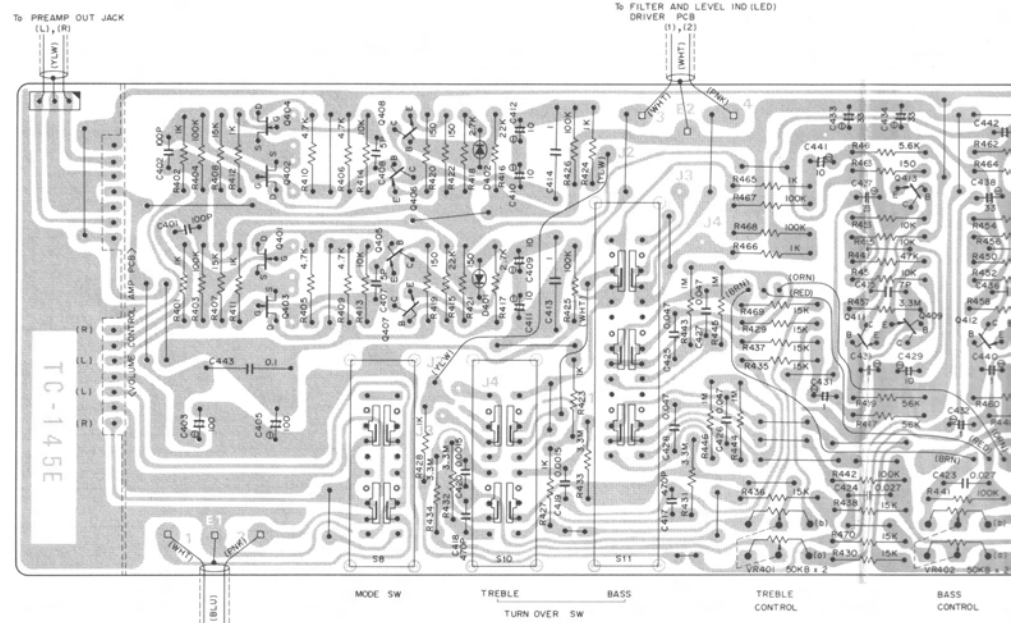
When HA12002W is used: 56kΩ

\*To OVERLOAD DETECTION PCB (1) for the units with serial no. 83986 or over. (See Addendum).

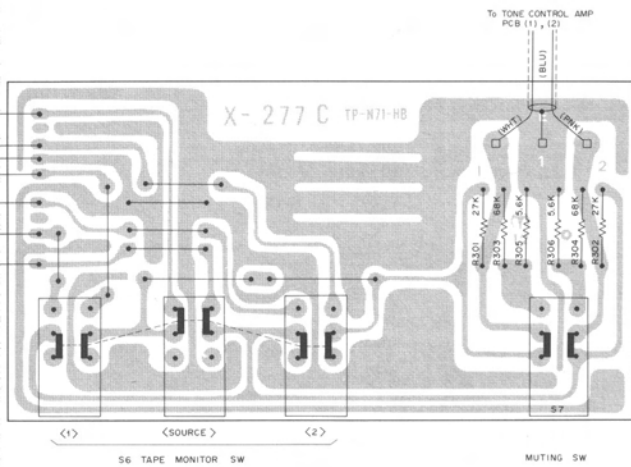
# LED) Driver Circuit



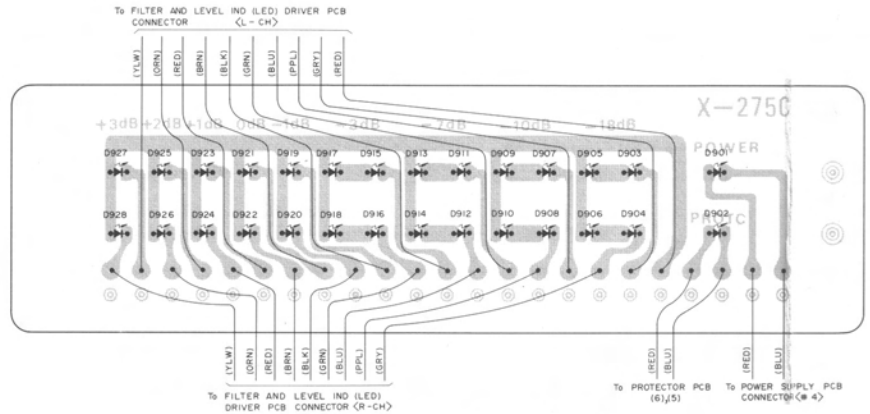
# Tone Control Amp Circuit



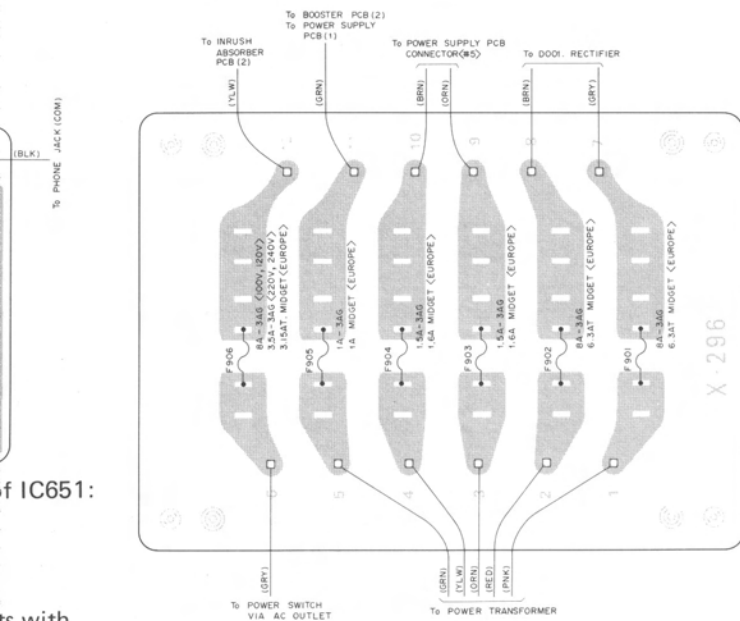
# ing and Tape Monitor Switch Circuit



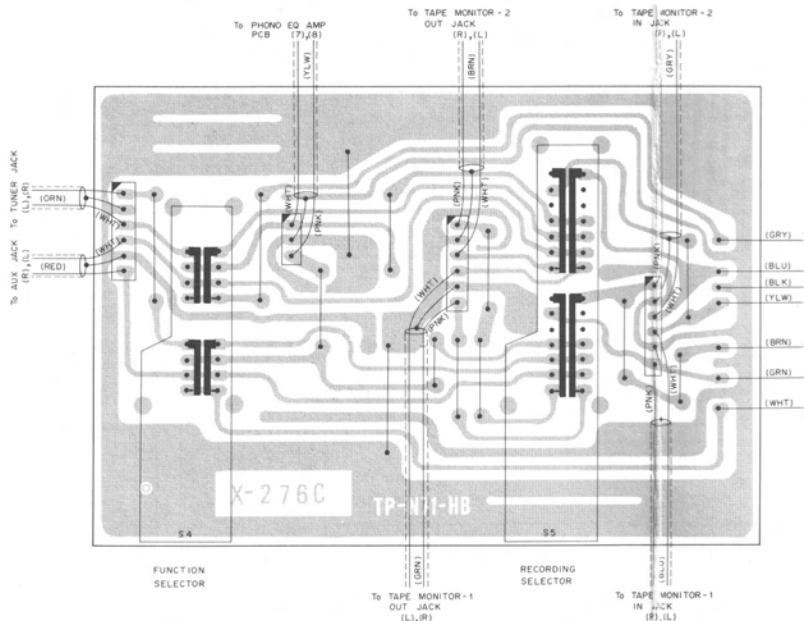
# Peak Level Indicator Circuit



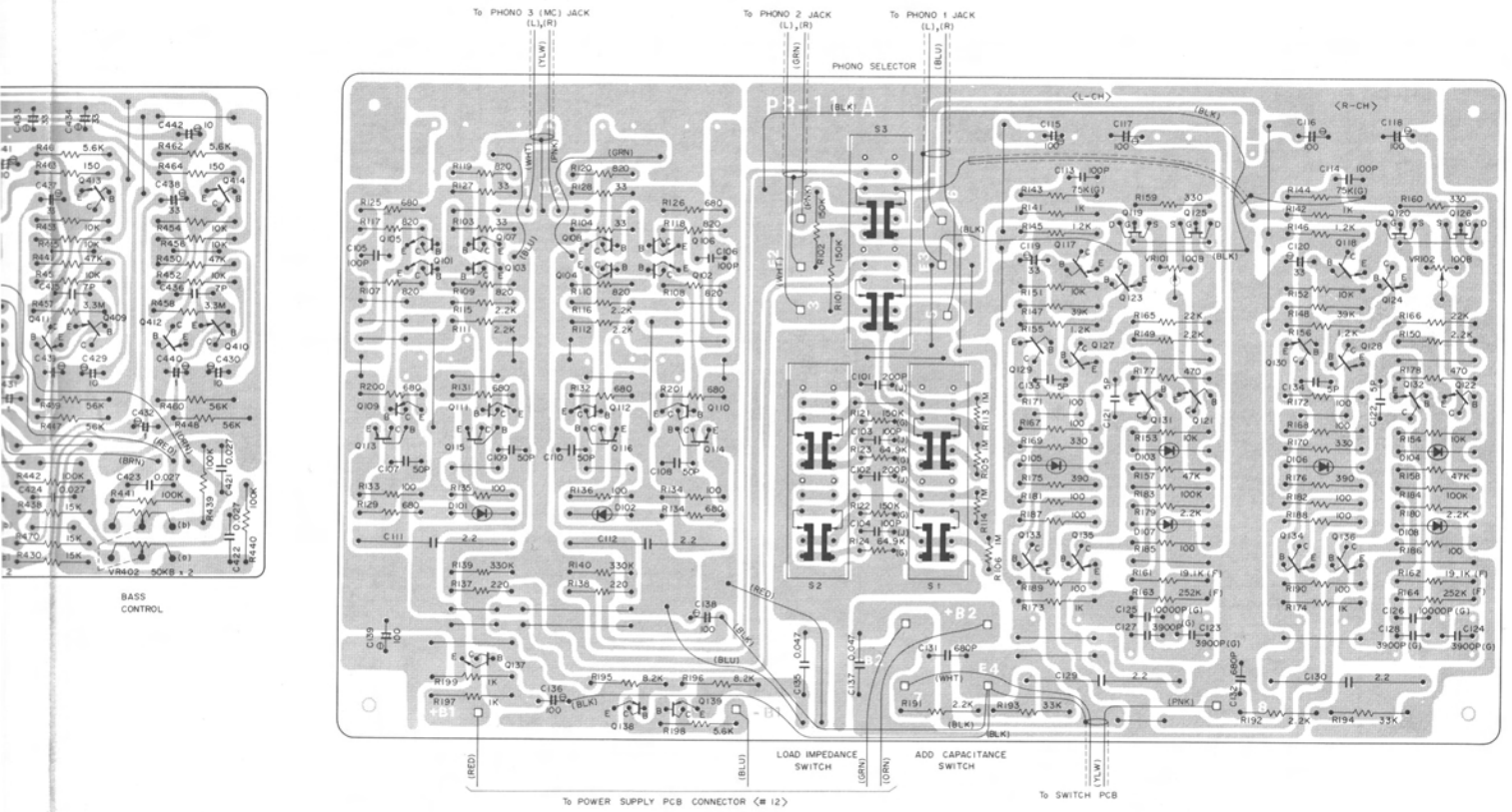
# Fuses Circuit



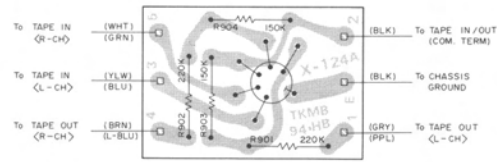
# Function and Recording Switch Circuit



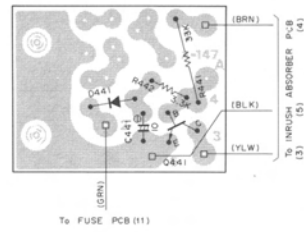
# Phono-3 (MC) Head Amp Circuit



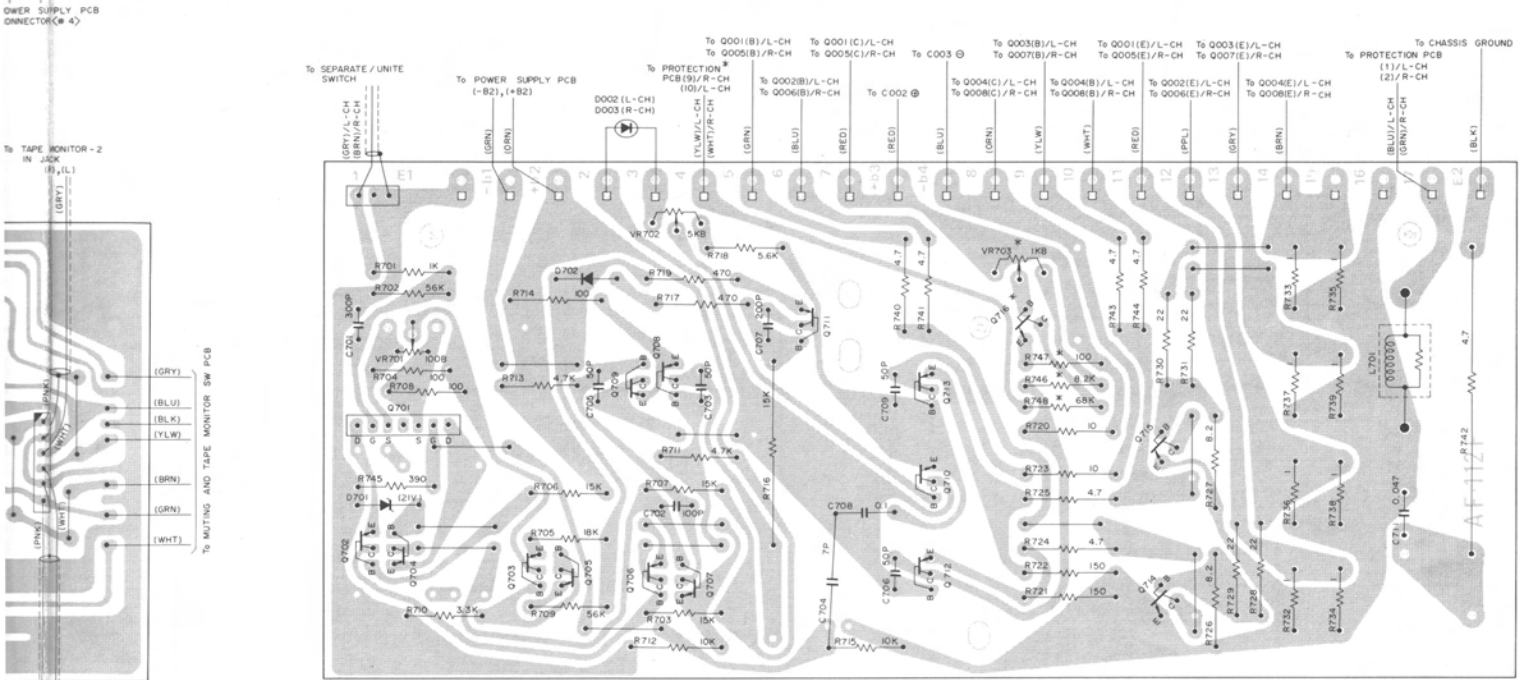
## Tape Monitor-1, -2 (DIN) Circuit



## Booster Circuit



## Driver Circuit



\* THESE PARTS AND THE CONNECTION ARE NOT USED FOR ALL UNITS WITH SERIAL NOS. NB83986 AND ONWARD