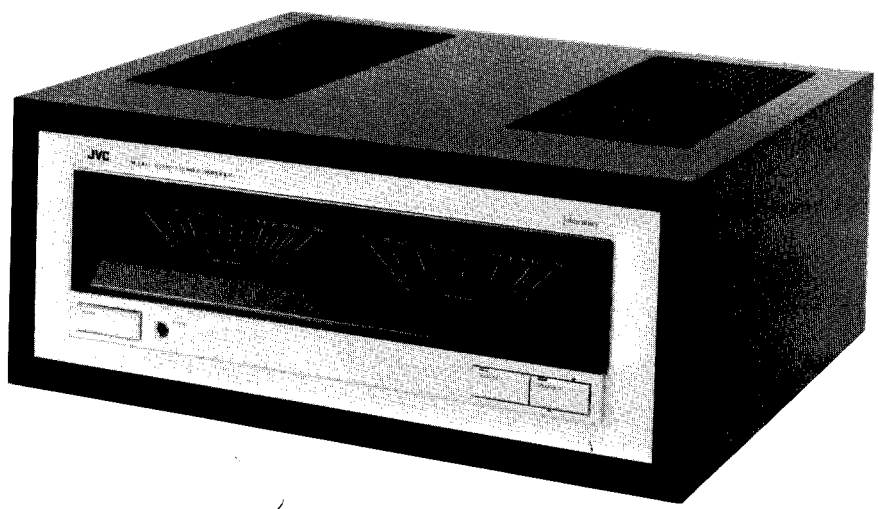
JVC

SERVICE MANUAL

MODEL
M-L10
STEREO POWER AMPLIFIER



No. 2620
May. 1982

This manual combines four single volumes.

1. Instruction Manual.
2. Technical Manual.
3. Service Manual.
4. Parts Manual.

M-L10

INSTRUCTION MANUAL

IMPORTANT (In the United Kingdom)
Mains Supply (AC 240 V~, 50 Hz only)

IMPORTANT

Do not make any connection to the Larger Terminal coded E or Green. The wires in the mains lead are coloured in accordance with following code:

Blue to N (Neutral) or Black
Brown to L (Live) or Red

If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black.
Brown wire to terminal coded L (Live) or coloured Red.
If in doubt – consult a competent electrician.

Note: We recommend that you should disconnect the AC cord from the outlet when not in use.

WARNING
Dangerous voltage inside

CAUTION
To prevent electric shock, do not remove screws, covers or cabinet.
No user-serviceable parts inside. Refer servicing to qualified service personnel.

WARNUNG
Gefährliche Spannung im Innern

ACHTUNG
Zur Vermeidung von Kurzschlüssen sollten Schrauben, Abdeckplatten und Gehäuse nicht entfernt werden.
Das Gerät enthält keine von Laien reparierbaren Einzelteile. Reparaturen nur von einem qualifizierten Kundendienst ausführen lassen.

AVERTISSEMENT
Tension dangereuse à l'intérieur

ATTENTION
Afin de prévenir un choc électrique, ne pas enlever les vis, ni les couvercles. Il ne se trouve à l'intérieur aucune pièce pouvant être réparée par l'usager. S'adresser à un réparateur compétent.

Thank you for purchasing this JVC product.
Before you begin operating this unit, please read the instruction book carefully to be sure you get the best possible performance.
If you have any question, consult your JVC dealer.

CONTENTS

Vielen Dank für den Kauf dieses JVC-Produkts.
Bitte lesen Sie diese Bedienungsanleitung sorgfältig, bevor Sie dieses Gerät in Betrieb nehmen, um die beste Leistung zu erhalten.
Falls Sie Fragen haben, wenden Sie sich bitte an Ihren JVC-Fachhändler.

INHALT

Tous nos compliments pour vous être procuré cet appareil de JVC. Pour que vous puissiez obtenir les meilleures performances possibles, nous vous recommandons de lire attentivement le manuel d'instructions avant de commencer à utiliser votre nouvel appareil.
En cas de question, consultez votre revendeur JVC.

SOMMAIRE

IMPORTANT

■ **Safety precautions**

1. To prevent fire or electric shock, be careful when handling the power cord.
2. It is dangerous to use this unit if smoke, strange smells, or other unusual symptoms occur.
   In such a case, unplug the power cord and consult your JVC dealer.
3. There are no user serviceable parts inside.
4. Do not place objects containing water on this unit.
5. Do not allow any metallic or inflammable object inside this unit through the ventilation holes, etc.

■ **Installation**

1. Do not place the unit too close to a heater, and keep it away from direct sunlight, to avoid deformation and discoloration.
2. Avoid humidity, dust and vibration.
3. Avoid quick movement from a cold place to a warm place.
   If a rapid change in temperature occurs, this unit may not function correctly immediately after being moved.
   This is due to moisture condensation on the operating parts. After a short time, it will function normally.
4. Do not hamper ventilation.
   Because ventilation holes are provided on the base to prevent high internal temperatures, do not place the unit in a narrow or poorly ventilated place, nor fill the ventilation holes with tape or cloth.
5. Avoid unstable placement.
   Do not place the unit on an incline, or on a weak table.

■ **Precautions for handling**

1. Stacking.
   Avoid using the unit in a stack; because if a preamplifier or other equipment is put on this unit, a malfunction may occur due to heat trapped by blocked ventilation, or deformation or surface damage to the cabinet may be caused. In addition, the power transformer inside this unit may cause hum in a preamplifier or noise in the AM section of a tuner.
2. Usage over long periods.
   When using it for a long time at more than 10 watts output (on the average), leave space above the upper panel of this unit to obtain good ventilation.

■ **Maintenance of cabinet**

When the cabinet becomes dirty or dusty, etc., wipe with a soft cloth soaked in a liquid wax (silicon wax, etc.) and then wipe evenly with a dry cloth.
Do not use thinner or benzine because cracks or discoloration may occur.

WICHTIG

■ **Sicherheitsvorkehrungen**

1. Gehen Sie sorgsam mit dem Netzkabel um, um Feuer und elektrische Schläge zu vermeiden.
2. Es ist gefährlich, dieses Gerät zu betreiben, wenn Rauch, seltsame Gerüche und andere ungewöhnliche Symptome auftreten.
   Ziehen Sie in solchen Fällen das Netzkabel aus der Steckdose und wenden sich an Ihren JVC-Fachhändler.
3. Das Gerät enthält keine Teile, die vom Benutzer gewartet werden können.
4. Stellen Sie keine Gefäße mit Wasser auf dieses Gerät.
5. Achten Sie darauf, daß keine metallischen oder entflammbaren Materialien durch die Belüftungsöffnungen usw. in das Gerät eindringen.

■ **Aufstellung**

1. Stellen Sie das Gerät nicht zu nahe an einer Heizung auf und setzen Sie es nicht direktem Sonnenlicht aus, um Verformungen und Farbänderungen zu vermeiden.
2. Setzen Sie das Gerät nicht Feuchtigkeit, Staub oder Vibrationen aus.
3. Das Gerät sollte nicht rasch von einem kalten Ort zu einem warmen Ort transportiert werden. Nach schnellen Temperaturänderungen funktioniert das Gerät eventuell nicht ordnungsgemäß, weil sich auf den inneren Teilen Feuchtigkeit niedergeschlagen hat. Nach einer kurzen Zeit wird das Gerät wieder normal funktionieren.
4. Hemmen Sie die Belüftung nicht.
   Am Boden des Geräts befinden sich Belüftungsöffnungen, um hohe Temperaturen im Innern zu verhindern. Stellen Sie das Gerät nicht an einem engen oder schlecht belüfteten Ort auf und verschließen Sie die Belüftungsöffnungen nicht mit Klebeband oder Textilien.
5. Vermeiden Sie eine unstabile Aufstellung.
   Stellen Sie das Gerät nicht auf eine geneigte oder unstabile Unterlage.

■ **Vorsichtsmaßnahmen beim Betrieb**

1. Stapeln.
   Vermeiden Sie eine stapelweise Aufstellung, denn wenn der Vorverstärker oder andere Gerät auf dieses Gerät gestellt werden, könnten durch gestaute Hitze wegen blockierter Belüftungsöffnungen Fehlfunktionen auftreten oder Verformungen oder Beschädigungen des Gehäuses verursacht werden. Außerdem könnte der Leistungstransformator dieses Geräts Brummstörungen im Vorverstärker oder Störgeräusche im MW-Empfangsteil des Tuners verursachen.
2. Betrieb über lange Zeiträume.
   Wenn dieses Gerät lange Zeit mit mehr als 10 Watt Ausgang (Durchschnitt) betrieben wird, muß oberhalb des Geräts genug Raum gelassen werden, um eine gute Belüftung sicherzustellen.

■ **Pflege des Gehäuses**

Wenn das Gehäuse schmutzig oder staubig ist, sollte es mit einem weichen Tuch, das in flüssiges Wachs (Silizium-Wachs o.ä.) getaucht wurde, gereinigt werden. Wischen Sie mit einem trockenen Tuch nach.
Verwenden Sie keinen Verdünner und kein Benzin, um Beschädigungen und Verfärbungen zu vermeiden.

IMPORTANT

■ Précautions à observer

1. Pour éviter les risques d'incendie ou d'électrocution, manier le fil de branchement avec précaution.
2. L'emploi de cet appareil est dangereux dans le cas d'apparition de fumée, d'odeurs étranges ou d'autres symptômes inhabituels.
   Dans de tels cas, débrancher l'appareil et consulter votre revendeur JVC.
3. Aucune pièce intérieure n'est à régler par l'utilisateur.
4. Ne pas placer d'objet contenant de l'eau sur cet appareil.
5. Ne pas laisser tomber d'objets métalliques ou inflammables à l'intérieur par les trous de ventilation etc.

■ Installation

1. Ne pas placer cet appareil trop près d'un radiateur et le tenir à l'écart de la lumière directe du soleil pour éviter sa déformation et sa décoloration.
2. Eviter les endroits humides ou pussiéreux et les vibrations.
3. Eviter les changements brusques de température d'une pièce froide à une pièce chaude. Lors d'un changement brusque de température, cet appareil risque de ne pas bien fonctionner après son déplacement. Ceci est dû à la condensation d'humidité sur les pièces nécessaires au fonctionnement. Il refonctionnera normalement après un court instant.
4. Ne pas obstruer les bouches d'aération.
   Des trous d'aération sont situés sur la base de l'appareil pour éviter des températures internes élevées. Ne pas le placer à un endroit étroit ou mal aéré. Ne pas boucher les trous d'aération avec du ruban adhésif ou du tissu.
5. Eviter de le placer à un endroit instable.
   Ne pas placer l'appareil sur un plan incliné ou sur une table qui n'est pas solide.

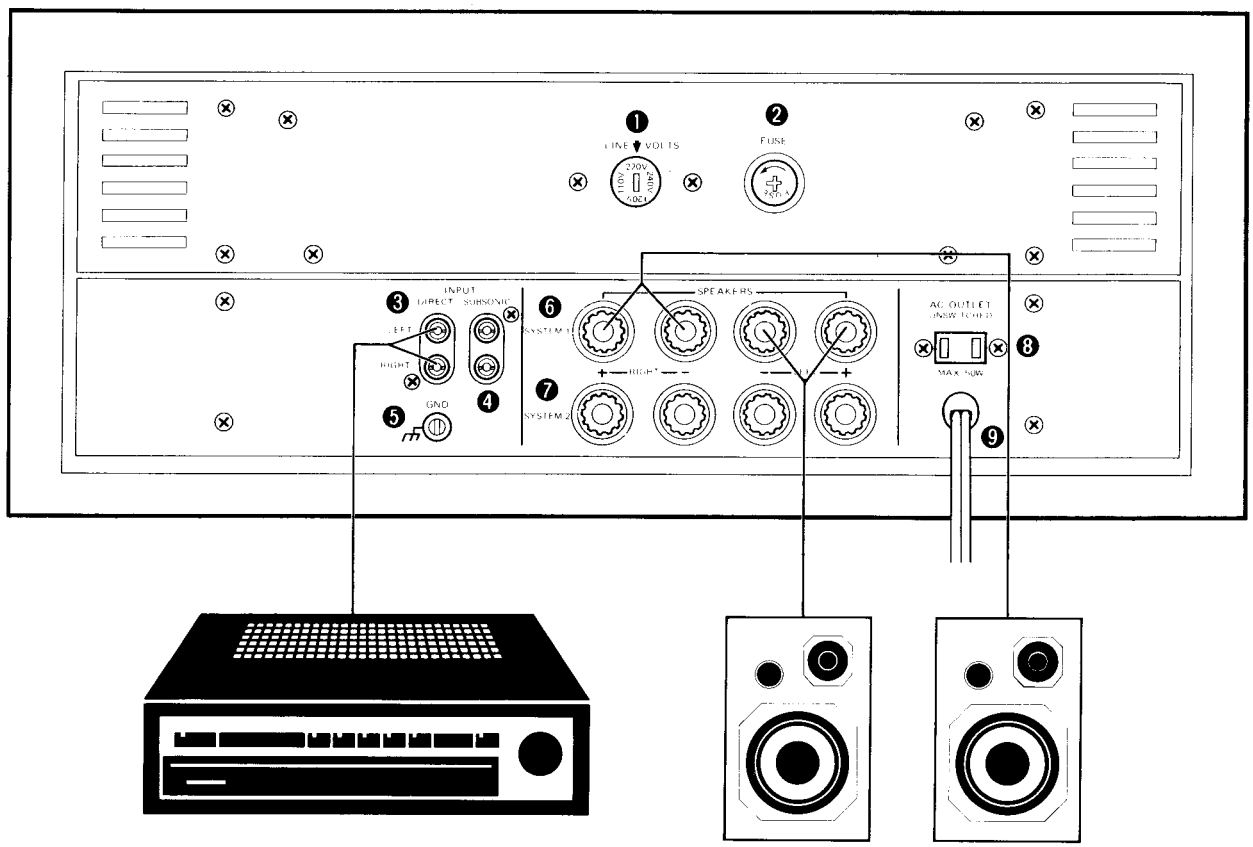
■ Précautions à observer lors de la manipulation

1. Empilage.
   Eviter de superposer cet appareil avec d'autres. Si un préamplificateur ou quelque autre appareil est placé sur celui-ci, il risque de mal fonctionner à cause de l'emmagasinage de chaleur dû au blocage de l'aération, ou bien une déformation ou des dégâts de la surface du coffret risquent de se produire. De plus, le transformateur de puissance incorporé dans cet appareil risque de produire des ronflements dans un préamplificateur ou des bruits dans la section AM d'un tuner.
2. Utilisation pendant une longue période
   Quand vous utilisez cet appareil pendant longtemps avec une sortie supérieure à 10 watts (en moyenne), laissez un espace au-dessus du panneau supérieur pour permettre une bonne aération.

■ Entretien du coffret

Lorsque le coffret est sale ou poussiéreux etc. l'essuyer avec un chiffon doux imbibé de cire liquide (cire aux silicones etc.) puis le frotter uniformément avec un chiffon sec.
Ne pas utiliser de dilvant ni de benzine parce qu'ils risquent de provoquer des craquelures ou une décoloration.

CONNECTION DIAGRAM
ANSCHLUSSDIAGRAMM
SCHEMA DES CONNEXIONS



❶ AC LINE VOLTAGE SELECTOR
(Not provided on units for Continental Europe, the United Kingdom, Australia, U.S.A. and Canada.)
❷ AC fuse socket
❸ INPUT (DIRECT)
Can be connected directly.
❹ INPUT (SUBSONIC)
Prevents intermodulation distortion by infrasonic frequencies because frequencies below 16 Hz pass through a filter to be attenuated by 6 dB/oct.
❺ GND terminal
❻ SPEAKERS SYSTEM-1 terminals
❼ SPEAKERS SYSTEM-2 terminals
❽ UNSWITCHED AC outlet
(Not provided on units for Continental Europe, the United Kingdom and Australia.)
❾ Power cord

NOTES

1. **Connect source components with left and right channels connected correctly. Reversed channels will degrade the stereo effect.**
2. **Connect speakers with correct polarity; (+) to (+) and (-) to (-). Reversed polarity will degrade the stereo effect.**
3. **Switch the power off when connecting any component.**
4. **Connect plugs or wires firmly. Poor contact may result in hum.**
5. **Use speakers with the correct impedance.**
This amplifier is for use with speakers with impedances from 4 to 16 ohms when a single pair of speakers is used and with impedances of 8 to 16 ohms when two pairs of speakers are used. Be sure to provide good ventilation. (The temperature rise of the cabinet may not satisfy BS 415 or IEC 65 standards.)

❶ Netzspannungswähler (AC LINE VOLTAGE SELECTOR)
(Nicht an Geräten, die für Kontinental-Europa, Großbritannien, Australien, die USA und Kanada bestimmt sind.)
❷ Netzspannungs-Sicherungshalter
❸ Direkteingang (INPUT (DIRECT))
Zum direkten Anschluß.
❹ Unterschalleingang (INPUT (SUBSONIC))
Zur Verhinderung von Intermodulationsverzerrungen durch infratonale Frequenzen. Frequenzen unter 16 Hz werden durch einen Filter geleitet und um 6 dB/Okt. gedämpft.
❺ Erdungsbuchsen (GND)
❻ Lautsprechersystem-1-Buchsen (SPEAKERS SYSTEM-1)
❼ Lautsprechersystem-2-Buchsen (SPEAKERS SYSTEM-2)
❽ Unbeschalteter Netzausgang (UNSWITCHED AC)
(Nicht an Geräten, die für Kontinental-Europa, Großbritannien und Australien bestimmt sind.)
❾ Netzkabel

HINWEISE

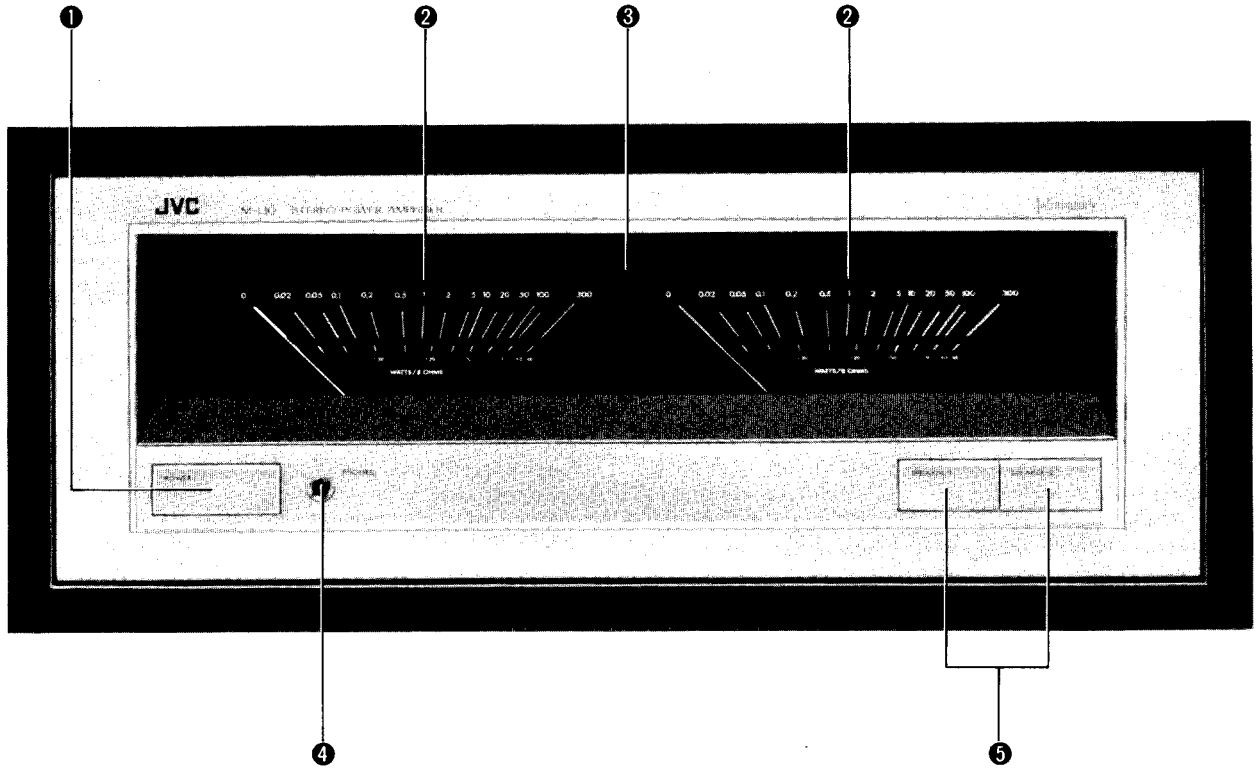
1. **Schließen Sie die Tonquellen-Komponenten mit deren linken und rechten Kanälen richtig verbunden an. Verkehrt angeschlossene Kanäle beeinträchtigen den Stereo-Effekt.**
2. **Schließen Sie die Lautsprecher mit der korrekten Polarität an: (+) an (+) und (-) an (-). Eine umgekehrte Polarität beeinträchtigt den Stereo-Effekt.**
3. **Schalten Sie den Netzschalter aus, wenn Sie irgendeine Komponente anschließen.**
4. **Verbinden Sie die Stecker und Drähte gut. Ein schlechter Kontakt kann zu Brummgeräuschen führen.**
5. **Benutzen Sie Lautsprecher mit richtiger Impedanz.**
Dieser Verstärker ist ausgelegt für Lautsprecher mit 4 bis 16 Ohm Impedanz bei der Benutzung eines Paares Lautsprecher und für Lautsprecher mit 8 bis 16 Ohm Impedanz bei der Benutzung von zwei Paar Lautsprechern. Sorgen Sie für eine gute Belüftung.
(Der Temperaturanstieg könnte den BS415- oder IEC 65-Normen nicht entsprechen.)

❶ Sélecteur de tension CA (AC LINE VOLTAGE SELECTOR)
(N'existe pas sur les appareils destinés à l'Europe Continentale, au Royaume-Uni, à l'Australie, aux Etats-Unis et au Canada.)
❷ Douille de fusible CA
❸ Entrée (INPUT) (DIRECTE)
Peut être raccordé directement.
❹ Entrée (INPUT) (SUBSONIC)
Prévient la distorsion d'intermodulation par des fréquences infra-acoustiques car les fréquences inférieures à 16 Hz traversent un filtre qui les atténue de 6 dB/oct.
❺ Borne de prise de terre (GND)
❻ Bornes H.P.-1 (SPEAKERS SYSTEM-1)
❼ Bornes H.P.-2 (SPEAKERS SYSTEM-2)
❽ Arrivée secteur non commutée (CA)
(N'existe pas sur les appareils destinés à l'Europe Continentale, au Royaume-Uni et à l'Australie.)
❾ Câble d'alimentation

REMARQUES

1. **Ne pas inverser les canaux droit et gauche lors du raccordement des appareils de source sonore, sinon l'effect stéréophonique risque de perdre de sa qualité.**
2. **Respecter les polarités des enceintes lors de leur raccordement (les polartités positives (+) entre elles, et les polarités négatives (-) entre elles), sinon l'effet stéréophonique risque de perdre de sa qualité.**
3. **Débrancher l'alimentation secteur lors du raccordement d'un autre élément de chaîne stéréo.**
4. **S'assurer que les prises et les fils sont raccordés correctement. Un mauvais contact risque de produire des bruits de bourdonnement parasites.**
5. **Utiliser des haut-parleurs à impédance correcte.**
Cet amplificateur est conçu pour être utilisé avec des haut-parleurs à impédance de 4 à 16 ohms avec une paire de baffles et à impédance de 8 à 16 ohms avec deux paires de baffles. Bien s'assurer de procurer une ventilation suffisant. (L'accroissement de la température peut ne pas satisfaire les standards BS 415 ou IEC 65).

FRONT PANEL
FRONTPLATTE
PANNEAU AVANT



❶ **POWER switch**
Press to switch on power. The yellow indicator in the button will light and the power meters will be illuminated. Press again to switch off the power.

Note:

- **Because a power transformer with a large capacity is installed in this unit, a little hum may be heard when the power is turned on. This is inevitable due to the large power capacity transformer, not a malfunction. This hum will decrease to a normal level about 30 seconds after the power is turned on.**

❷ **POWER meter**
This logarithmic scale shows the power when the speakers have an impedance of 8 ohms.

❸ **Meter illumination**
When the power switch is initially set to on or when the protection circuit operates due to a malfunction, the illumination changes to red.
After 5 – 6 seconds, it should change back to its normal white illumination. If it does not, turn off the power switch and investigate.

Note:

- **This unit is designed to protect the amplifier and the speakers from damage in the following cases using a protection circuit.**
  1) **When an input surge occurs or the sepaker terminals are short-circuited.**
  2) **If more than ± 3 V output is applied to the speaker terminals when direct current is input to the DIRECT input terminals.**
  When the protection circuit functions, the power meter light becomes red to indicate a malfunction. In this case, switch off the POWER switch and investigate. After removing the cause of the malfunction, switch the POWER switch on again.

❹ **PHONES (headphones) jack**
Plug stereo headphones into this jack.

Note:

- **When headphones are plugged in, speaker sound will not be switched off. To listen to the headphones on their own, set the SPEAKER switches off.**

❺ **SPEAKER switches**
Press to turn on the speakers. When on, the blue indicators in the switches light. Press again to turn off.

SYSTEM-1: Press to listen to the speakers connected to the SYSTEM-1 terminals.

SYSTEM-2: Press to listen to the speakers connected to the SYSTEM-2 terminals.

When both are switched on, sound will be heard from both sets of speaker systems.

❶ Netzschalter (POWER)
Durch Drücken dieses Schalters wird die Spannungsversorgung eingeschaltet, die gelbe Anzeige in der Taste leuchtet und die Ausgangs-Meßinstrumente sind beleuchtet. Durch nochmaliges Drücken wird die Spannungsversorgung wieder ausgeschaltet.

Hinweis:

- **Weil dieses Gerät einen Leistungstransformator mit großer Kapazität verwendet, kann nach dem Einschalten ein geringfügiges Brummen auftreten. Dies ist keine Fehlfunktion, sondern beruht auf eine unvermeidbare Eigenschaft von Leistungstransformatoren mit großer Kapazität. Dieses Brummen verringert sich etwa 30 Sekunden nach dem Einschalten der Spannungsversorgung auf einen normalen Pegel.**

❷ Ausgangs-Meßinstrument (POWER)
Auf dieser logarithmischen Skala wird die Ausgangsleistung angezeigt, wenn die Lautsprecher eine Impedanz von 8 Ohm haben.

❸ Instrumentenbeleuchtung
Die Beleuchtung wechselt auf Rot, wenn die Spannungsversorgung eingeschaltet oder wenn die Schutzschaltung wegen einer Fehlfunktion aktiviert wird.
Nach 5 bis 6 Sekunden sollte die Beleuchtung auf die normale weiße Farbe zurückwechseln. Wenn nicht, sollte die Spannungsversorgung ausgeschaltet und nach der Störungsursache gesucht werden.

Hinweis:

- **Dieses Gerät ist mit einer Schutzschaltung zum Schutz des Verstärkers und der Lautsprecher ausgestattet, die in den folgenden Fällen aktiviert wird:**
  1) Bei einem plötzlichen Anstieg des Eingangssignals oder bei einem Kurzschluß der Lautsprecherbuchsen.
  2) Wenn den DIRECT-Eingangsbuchsen Gleichspannung zugeführt wird und an den Lautsprecherbuchsen mehr als ± 3 V Ausgangsspannung erscheint.
  Wenn die Schutzschaltung aktiviert wird, wird die Beleuchtung des Meßinstruments rot, um die Fehlfunktion anzuzeigen. Schalten Sie in einem solchen Fall die Spannungsversorgung aus und gehen Sie der Störungsursache nach. Schalten Sie die Spannungsversorgung wieder ein, nachdem Sie die Ursache der Fehlfunktion beseitigt haben.

❹ Kopfhörerbuchse (PHONES)
Zum Anschluß eines Stereokopfhörers.

Hinweis:

- **Die Lautsprecher werden durch Anschließen des Kopfhörers nicht ausgeschaltet. Schalten Sie die SPEAKER-Schalter aus, um nur über Kopfhörer zu hören.**

❺ Lautsprecherschalter (SPEAKER)
Drücken Sie diese Schalter zum Einschalten der Lautsprecher, die blauen Anzeigen in den Schaltern leuchten. Durch nochmaliges Drücken werden die Lautsprecher wieder ausgeschaltet.

SYSTEM-1: Zum Hören der Lautsprecher, die an den SYSTEM-1-Buchsen angeschlossen sind.
SYSTEM-2: Zum Hören der Lautsprecher, die an den SYSTEM-2-Buchsen angeschlossen sind.

Wenn beide Schalter eingeschaltet sind, wird der Ton von beiden Lautsprechersystemen gehört.

❶ Interrupteur d'alimentation (POWER)
Appuyer sur l'interrupteur pour mettre l'appareil en circuit. Le voyant jaune du bouton s'allume et les indicateurs de puissance seront éclairés. Pour mettre l'appareil hors circuit, appuyer de nouveau sur l'interrupteur.

Remarque:

- **Du fait qu'un transformateur de puissance de grande capacité est incorporé dans cet appareil, un léger bourdonnement peut être audible au moment de la mise en circuit. Ceci est inévitable et est dû au transformateur de grande capacité de puissance; ce n'est pas une panne. Ce bourdonnement décroîtra pour atteindre un niveau normal 30 secondes environ après la mise en circuit.**

❷ Indicateur de puissance (POWER meter)
Cette échelle logarithmique indique la puissance quand les haut-parleurs ont une impédance de 8 ohms.

❸ Eclairement de l'indicateur
Cet éclairement vire au rouge lorsque l'interrupteur d'alimentation est branché ou quand le circuit de protection se met en march à cause d'un mauvais fonctionnement.
Il devrait revenir à sa couleur initiale, blanc, après 5 à 6 secondes. S'il n'y revient pas, couper le contact et en chercher la cause.

Remarque:

- **Cet appareil est conçu de manière à protéger l'amplificateur et les haut-parleurs d'endommagements dans les cas suivants grâce à un circuit de protection.**
  1) Lors d'une saute de courant à l'entrée ou d'un court-circuit des bornes des haut-parleurs.
  2) Si une sortie équivalente à ± 3 V est appliquée aux bornes des haut-parleurs alors qu'un courant continu entre aux bornes d'entrée DIRECT.
  Lorsque le circuit de protection fonctionne, l'éclairage de l'indicateur de puissance tourne au rouge pour indiquer un mauvais fonctionnement. Dans ce cas, couper le courant et en chercher la raison. Après avoir éliminé la cause de ce mauvais fonctionnement, remettre l'appareil en circuit.

❹ Prise pour casque d'écoute (PHONES)
Brancher un casque d'écoute sur cette prise.

Remarque:

- **Le raccordement d'un casque d'écoute ne coupe pas le son des haut-parleurs. Pour écouter uniquement le son provenant du casque d'écoute, placer les interrupteurs d'enceintes (SPEAKER) sur la position arrêt (OFF).**

❺ Interrupteurs d'enceintes (SPEAKER)
Appuyer sur ces interrupteurs pour mettre les enceintes en circuit. Quand ils sont en marche, les indicateurs bleus des boutons s'allument. Appuyer à nouveau pour couper le circuit.

SYSTEM-1: Appuyer pour écouter les haut-parleurs branchés aux bornes SYSTEM-1.
SYSTEM-2: Appuyer pour écouter les haut-parleurs branchés aux bornes SYSTEM-2.

Lorsque les deux sont en circuit, le son sera entendu des deux systèmes de haut-parleurs.

SPECIFICATIONS

Output power	:	160 watts per channel min. RMS, both channels driven into 8 ohms from 20 Hz to 20 kHz, with no more than 0.002 % total harmonic distortion
Total harmonic distortion	:	0.002 % at 160 watts output (20 Hz – 20 kHz, 8 ohms)
Intermodulation distortion	:	0.002 % (60 Hz : 7 kHz = 4 : 1) at 160 watts output, 8 ohms.
Power band width	:	5 Hz – 100 kHz (0.02 % harmonic distortion, 8 ohms, IHF)
Switching distortion	:	0
Transient intermodulation distortion	:	0 (LPF fc = 100 kHz)
Frequency response	:	DC to 300 kHz +0, -3 dB (DIRECT input, 8 ohms)
Subsonic filter	:	16 Hz (-6 dB/oct)
Input sensitivity/impedance	:	1 V/100 kohms
Signal-to-noise ratio*	:	120 dB/100 dB/75 dB
Damping factor	:	200 (1 kHz, 8 ohms)
Dimensions	:	460 (W) x 203.5 (H) x 417.5 (D) mm 18-1/8 (W) x 8 (H) x 16-7/16 (D)
Weight	:	28 kg (61.6 lbs)

* IHF-A network, short-circuited/IHF A-202/DIN

Design and specifications subject to change without notice.

TECHNISCHE DATEN

Ausgangsleistung	:	160 Watt pro Kanal min. eff., beide Kanäle mit 8 Ohm von 20 Hz bis 20 kHz betrieben mit nicht mehr als 0,002 % Klirrgrad
Klirrgrad	:	0,002 % bei 160 Watt Ausgangsleistung. (20 Hz bis 20 kHz, 8 Ohm)
Intermodulationsverzerrungen	:	0,002 % (60 Hz : 7 kHz = 4 : 1) bei 160 Watt Ausgangsleistung, 8 Ohm
Leistungsbandbreite	:	5 Hz bis 100 kHz (0,02 % Klirrgrad, 8 Ohm, IHF)
Schaltverzerrungen	:	0
Einschwing-Intermodulationsverzerrungen	:	0 (LPF fc = 100 kHz)
Frequenzgang	:	Gleichstrom bis 300 kHz +0 -3 dB (DIRECT-Eingang, 8 Ohm)
Unterschallfilter	:	16 Hz (-6 dB/Okt.)
Eingangs-Empfindlichkeit/Impedanz	:	1 V/100 kOhm
Störspannungsabstand*	:	120 dB/100 dB/75 dB
Dämpfungsfaktor	:	200 (1 kHz, 8 Ohm)
Abmessungen	:	460 (B) x 203,5 (H) x 417,5 (T) mm
Gewicht	:	28 kg

* IHF A-Netzwerk, kurzgeschlossen/IHF A-202/DIN

Technische Änderungen vorbehalten.

CARACTERISTIQUES TECHNIQUES

Puissance de sortie	:	160 watts par min. RMS, deux canaux en service sous 8 ohms de 20 Hz à 20 kHz avec moins de 0,002 % de distorsion harmonique totale
Distorsion harmonique totale	:	0,002 % à une sortie de 160 watts (20 Hz – 20 kHz, 8 ohms)
Distorsion d'intermodulation	:	0,002 % (60 Hz : 7 kHz = 4 : 1) à une sortie de 160 watts, 8 ohms
Largeur de bande puissance	:	5 Hz – 100 Hz (Distorsion harmonique 0,02%, 8 ohms, IHF)
Distorsion à la commutation	:	0
Distorsion d'intermodulation transitoire	:	0 (LPF 'Filtre passe-bas' fc = 100 kHz)
Réponse en fréquence	:	CC–300 kHz +0, -3 dB (Entrée DIRECTE, 8 ohms)
Filtre subsonic	:	16 Hz (-6 dB/oct)
Entrée de sensibilité/impédance	:	1 V/100 kohms
Rapport signal/bruit*	:	120 dB/100 dB/75 dB
Facteur d'amortissement	:	200 (1 kHz, 8 ohms)
Dimensions	:	460 (L) x 203,5 (H) x 417,5 (P) mm
Poids	:	28 kg

* IHF-A, court-circuit/IHF A-202/DIN

Présentation et caractéristiques modifiables sans préavis.

POWER SPECIFICATIONS

Areas	Line Voltage & Frequency	Power Consumption
U.S.A.	AC 120 V, 60 Hz	380 watts
CONTINENTAL EUROPE	AC 220 V∿, 50 Hz	680 watts
U.K.	AC 240 V∿, 50 Hz	680 watts
OTHER AREAS	AC 110/120/220/240 V∿ Selectable, 50/60 Hz	680 watts

SPANNUNGSVERSORGUNG

Länder	Netzspannung und Frequenz	Leistungsaufnahme
USA	Netz 120 V, 60 Hz	380 Watt
EUROPA (KONTINENT)	Netz 220 V∿, 50 Hz	680 Watt
ENGLAND	Netz 240 V∿, 50 Hz	680 Watt
ANDERE LÄNDER	Netz 110/120/220/240 V∿ umschaltbar, 50/60 Hz	680 Watt

SPECIFICATIONS D'ALIMENTATION

Pays	Tension du secteur et fréquence	Consommation
ETATS-UNIS	CA 120 V, 60 Hz	380 watts
EUROPE CONTINENTALE	CA 220 V∿, 50 Hz	680 watts
ROYAUME-UNI	CA 240 V∿, 50 Hz	680 watts
AUTRES PAYS	CA 110/120/220/240 V∿ Commutable, 50/60 Hz	680 watts

Vol. 7

M-L10

TECHNICAL MANUAL

Contents

Chapter 1. Basic Circuits

1. Introduction

The attention in the present audio field is centered on "digital audio". The audio equipment developed recently always lays importance on "digital compatible" in preparation for the coming digital audio age.

Certainly, when audio equipment is digitized, the S/N ratio is improved, the dynamic range is widened and the distortion is reduced. Thus, high power and improved linearity are naturally required for amplifiers and speakers. Namely the dynamic range is extended more at upper level, and what is meant by "digital compatible" mostly seems to indicate the tendency of dynamic range extension at upper level.

However, the unforgettable matter here is the extension of the dynamic range at lower level rather than at upper level. Especially, it is easy to extend the dynamic range at upper level when depending on the quantity of audio material, while it is difficult at lower level because of various problems which cannot be solved by the improved S/N ratio alone.

The sound quality of the amplifier generally depends on the reproduction of this dynamic range determinatively.

In the digital audio, as the 16-bit system is superior to the 14-bit system, the effort to increase the number of bits is made to extend the dynamic range at lower level.

Our new laboratory series separate amplifiers, P-L10 (preamp) and M-L10 (power amp) are developed taking this point into account. The features of the resultant circuit are: application of the newly developed Gm processor to the P-L10; application of the power cascode super A circuit to the M-L10 in which the power amplifier is composed of all-stage cascode bootstrap circuit.

In this volume, we would like to introduce the M-L10 with an emphasis on the power cascode circuit.

2. Basic Circuit Configuration of Power Amplifier and Its Problems

2-1 Basic Circuit Configuration

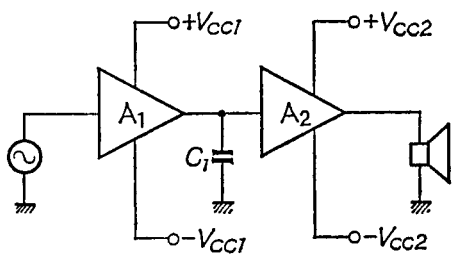


Fig. 1 Basic circuit configuration of power amplifier

Fig. 1 shows the basic circuit configuration of the power amplifier. This configuration also applies to the pre-amp and op amp. Section A_1 mainly amplifies the voltage.

Section A_2, so-called the power stage, amplifies the current or converts the impedance.

2-2 Problem of Power Supply

The power supply ($\pm V_{CC1}$) to section A_1 normally uses a regulated power supply. The power supply to power stage A_2 ($\pm V_{CC2}$) is of large voltage so that it normally uses a non-regulated power supply. Therefore, as the supply voltage to power stage A_2 normally changes by more than 10 V with speakers connected, a circuit which the least possible change of voltage (taken to be noise or distortion) appears in the speakers is desirable. At a glance, it seems to solve this problem by making $\pm V_{CC2}$ constant. However, no matter how the supply voltage is stabilized, the voltage applied to the transistors at the power stage changes once a music signal enters the power stage. For power transistors, this change is equivalent to the change of the supply voltage.

2-3 Voltage Amplifier Section

When we developed the "super A" technology, we recommended the introduction of that cascode bootstrap circuit into the predriver stage which provides the greatest voltage amplitude for the voltage amplifier stage. We took notice of the low distortion property of the cascode circuit which is remarked by its high-frequency response before. Thus, the distortion rate is successfully improved by 20 dB or more. However, at present, the cascode circuit is commonly used in the predriver stage in high class amplifier. In view of the dynamic characteristic, the operating current is determined on obvious design guideline. As far as the amplifier design is concerned, the amplifier section is relatively less problematic.

2-4 Relationship between Volltage Amplifier and Power Amplifier Stage

The output of voltage amplifier stage A_1 is generally of constant current. The degree of constant current greatly differs for different outputs in the predriver stage; resistload, constant current or cascode output. Anyway, at higher frequencies, this output becomes a constant voltage because of phase compensation capacitor C_1. The problem lies in matching between this stage and power stage A_2, and the input impedance and dynamic characteristic of the power stage should be fully taken into account.

This is because as the emitter-follower is used in the power stage, the distortion generally seems to be low. However, the current and voltage vary so mush as to drive the speakers. Further, when the operation of the power amplifier is near class B operation, the situation is considerable different.

2-5 Problem of Power Stage

In the power stage, the voltage, current and junction temperature (heat generation) vary acutely so that the current amplification factor (β) of power transistors or the voltage between base and emitter (V_{BE}) changes with distortion. Normally, in the emitter-follower, only the distortion (ΔV_{BE}) due to the exponential characteristic is noted (which occurs between Ⓑ and Ⓒ in **Fig. 2**). As the power stage is not driven by a constant voltage, the distortion between Ⓐ and Ⓑ due to the non-linear portion of change of the base current (i_B) caused by β change cannot be ignored.
These distortions are prevented as follows:
ΔV_{BE} can be eliminated by:

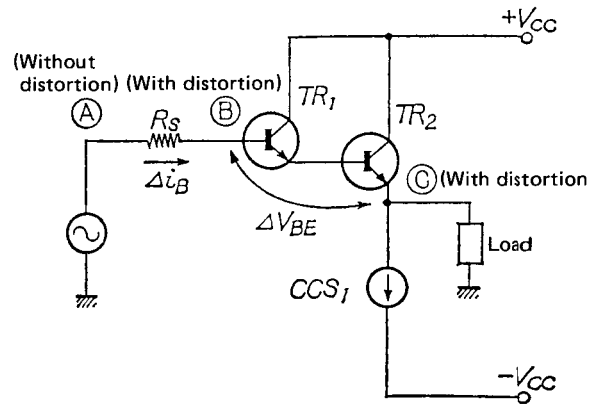


Fig. 2 Distortion in emitter-follower

(1) Using the sufficiently small non-linear portion of the dynamic resistance between base and emitter by adopting a classic class A operation.
(2) Using the bias circuit (e.g. super A bias circuit) to correct the exponential characteristic between base and emitter.

The distortion due to β change can be eliminated by:

(3) Operating the power transistors by cascode bootstraping, concurrently assuring the sufficient current linearity.
(4) Driving the power transistors in a constant voltage (when Rs=0, no voltage appears between (A) and (B)).

2-6 Problem when Speakers are connected

The amplifier performance is usually estimated by using a pure load resistance of 8 ohms or 4 ohms to ensure its signal reproductivity. This is also true of the specifications. Namely, despite that speakers must be connected instead of the pure resistance to reproduce sound in practice there has never been an amplifier which shows the specifications when speakers are connected.
Thus, the characteristics when speakers are connected are guessed from the characteristics when an 8-ohm or a 4-ohm resistor is connected.
In a word, at present, to reproduce the sound in accordance with the measurement data, some attempts have been made.

However, the standard method has not yet been established. The impedance characteristic of speaker is necessarily divided into capacitive and inductive portions, wherein the operation of the amplifier is considerably different from that when a pure resistance is connected. This should be fully considered.

For example, when the voltage change between collector and emitter (V_{CE}) of the power transistor at the output stage of an ordinary pure capacitive SEPP is compared with the change of the collector current (I_C) as shown in **photos 1** and **2.**

Photo 1 shows the case of using an 8-ohm pure resistance and **photo 2** shows the case of using a bass-reflex type speaker with a nominal impedance of 8 ohms. These two photos represent the same portion of the music signal for about 1 second.

Their respective operating traces are obviously different. This difference indicates not only the difference of distortion due to the difference of β change depending on the voltage and current but also the difference of thermal distortion due to the difference of the moment-by-moment heat generation change of each transistor.

Fig. 3 shows the momentary heat generation change of power transistors at an input of sinewave.

Curve A represents the change against a pure resistance load and curves B and C shows the changes against load impedance with phase shift though they have the same absolute value.

The power cascode super A circuit has been developed with these points taken into account.

Methods (2) and (3) mentioned previously are used against the distortion. At the same time, the operating characteristic change due to the load impedance is eliminated by a merit of method (3).

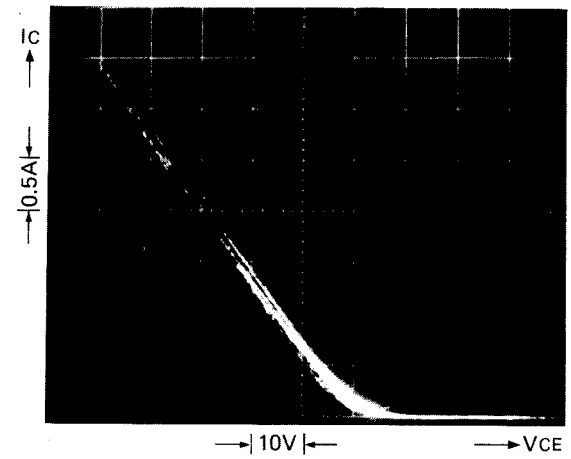


Photo 1 Power transistor V_{CE}-I_C characteristic when pure resistance load of 8-ohms is connected.

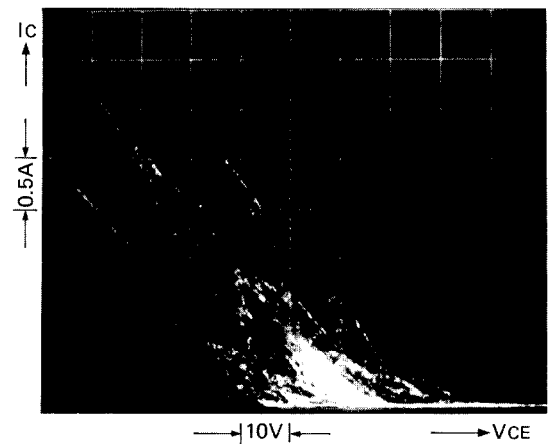


Photo 2 Power transistor V_{CE}-I_C characteristic when bass-reflex speakers are connected.

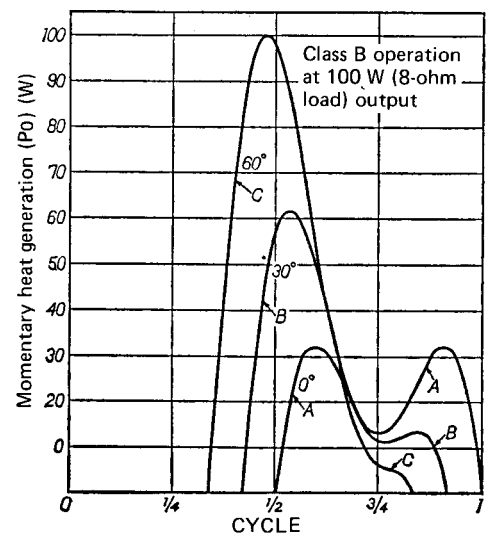


Fig. 3 Comparison between momentary collector losses

3. Power Cascode Super-A Circuit

3-1 Types of Power Cascode Circuits

(1) Cascode circuit using two separate resistors
This system is used when high dielectric strength power transistors are not available.
Its basic circuit is shown in **Fig. 4**. The advantage of this circuit lies only in doubled dielectric strength; no other characteristics can not be improved. This circuit is used in some overseas power amplifiers.

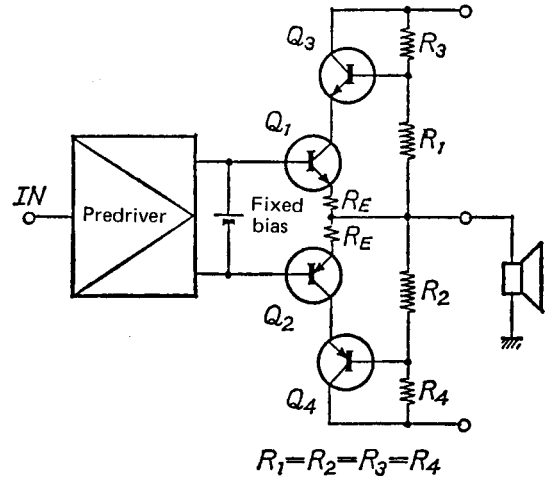


Fig. 4 Cascode circuit using two separate resistors

(2) Feedback bootstrap cascode circuit
Fig. 5 shows a feedback bootstrap cascode circuit which is not confined to a power stage but is generally used in small signal circuits. In a small signal circuit, a sufficient performance can be obtained. However, in a power stage, some problems are present.
Namely, the voltage drop due to R_E results in change of V_{CE} in Q_1 and Q_2.
Further, as the control voltages of Q_3 and Q_4 are extracted from the emitters of Q_1 and Q_2, the phase delay between base and emitter in Q_1 and Q_2 is noticeable in cases of power transistors (this is negligible in small signal transistors), resulting in degraded high-frequency response.
When the control voltages of Q_3 and Q_4 are extracted from the bases of Q_1 and Q_2, V_{CE} in the fixed bias class B (AB) operation lowers during half cycle of cut-off frequency so that oscillation occurs.

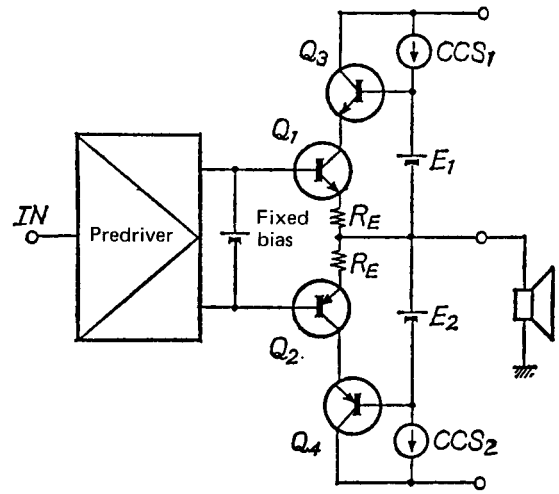


Fig. 5 Cascode circuit using feedback bootstrap

(3) Power cascode super A circuit (super A + feed forward system cascode circuit)

Fig. 6 shows a basic configuration of the power cascode super A circuit.

In combination with the super A bias circuit, the drawbacks in item (2) are all solved so that a good characteristic is obtained. Namely, as the control voltages of Q3 and Q4 are extracted from the bases of Q1 and Q2 (feed forward), high-frequency response is desirable.

In addition, owing to the super A bias circuit, no cut-off action occurs, thus permitting stable operation.

Amplifier A is a buffer to prevent interference between Q3/Q4 and the signal system. In practical circuits, it consists of a bootstrap type emitter-follower circuit.

Since E1 and E2 are 4.7 V Zener diodes, Q1 and Q2 operate on a constant voltage of about 5 V in which current alone varies.

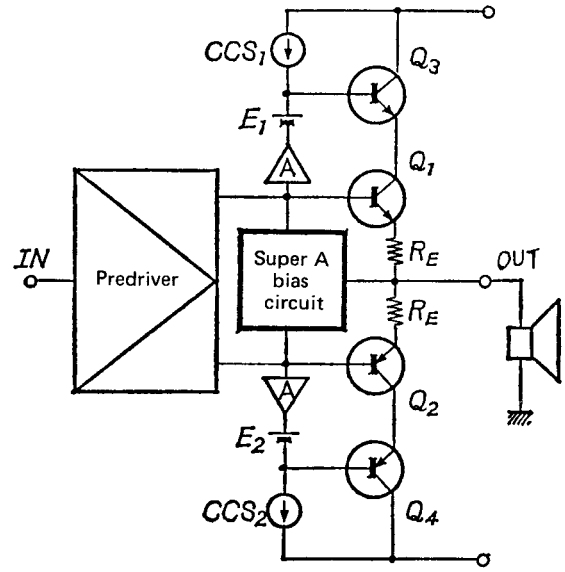


Fig. 6 Power cascode super A circuit

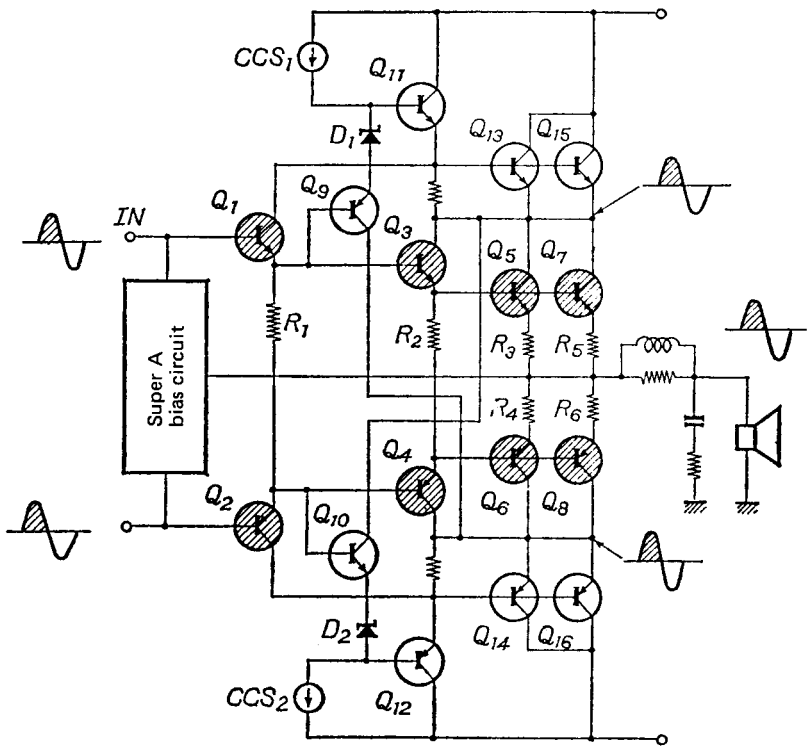


Fig. 7 Power cascode super A circuit in M-L10

Fig. 7 shows the power cascode circuit used in M-L10.

As known from this diagram, this is basically a parallel-push-pull output triple Darlington power stage(consisting of transistors shaded with slanted lines). The operating voltage waveform at each section at an input of sinewave is also shown in **Fig. 7.**

3-2 Features of Power Cascode Super-A Circuit

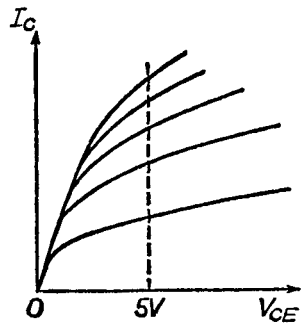


Fig. 8 I/O characteristic of ordinary high-dielectric-strength power transistor

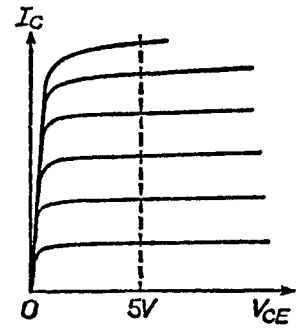


Fig. 9 I/O characteristic of low-saturation-voltage power transistor

(1) Free from the effect of supply voltage change
The supply voltage change is absorbed by Q3 and Q4 (see **Fig. 6**) so that Q1 and Q2 which determine the output characteristic are free from the effect of the supply voltage change.

In combination with the super A bias circuit, Q1 and Q2 operate on a constant VCE of about 5 V in which current alone varies. This can be obtained with speaker or pure resistance load.

(2) Characteristic with pure resistance load is also assured when speaker load is connected.
From another viewpoint of feature (1), the

As Q1 and Q2 operate on a constant voltage at all times, as long as the current linearity is assured within the required output current range, a desirable performance can be obtained whatever the load impedance.
However, as VCE is a low voltage of about 5 V, using ordinary power transistors results in selecting an operating area with poor linearity (see **Fig. 8**).
In M-L10, a low-voltage saturation type power transistor which is also developed for this circuit (which does not provide a high dielectric strength but whose current linearity is superb even when operated on a low voltage. For example, even when VCE is 2 V, linearity is assured up to 10 A or more. This transistor is entirely devoted to current amplification whose characteristic is inherent to a transistor) is used in a parallel-push-pull configuration.
For this reason, a linear relationship between current and β is assured up to 20 A or more.
As a result of this, even with a low impedance load, the distortion does not increase. With a 4-ohm load, the distortion rate is specified at

phase shift of voltage and current (see **photo 2**) because of the frequency characteristic against the load impedance is absorbed by Q3 and Q4.

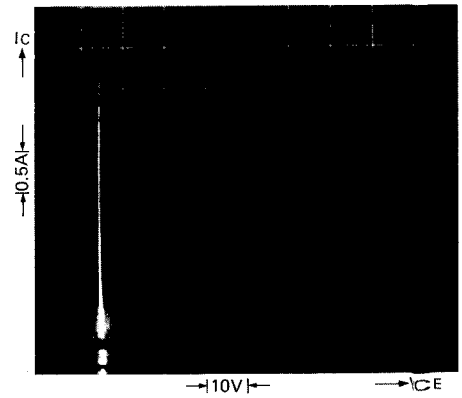


Photo 3 Operating state of Q1

0.002 % or less, the same percentage as with an 8-ohm load.
Let us compare an ordinary high dielectric strength power transistor with a low voltage saturation power transistor in respect to I/O characteristic as shown in **Figs 8** and 9.
When the operation of Q1 is photographed in the same conditions as in **photos 1** and **2**, it is as shown in **photo 3** whatever the load impedance, though the current value is different. Thereby, the afore-said fact is proved.

(3) Desirable stability of idling current
This relates to feature (1). A large change of the supply voltage does not lead to change of the idling current. This is a great feature of stable operating point. When this circuit is compared with an ordinary circuit, it is as shown in **Fig. 10**. Practically, even when the voltage at the AC primary side drops from 100 % to 50 %, M-L10 operates normally with no change of the distortion rate except that the maximum rated output drops from 160 W to 40 W, thus providing high stability.

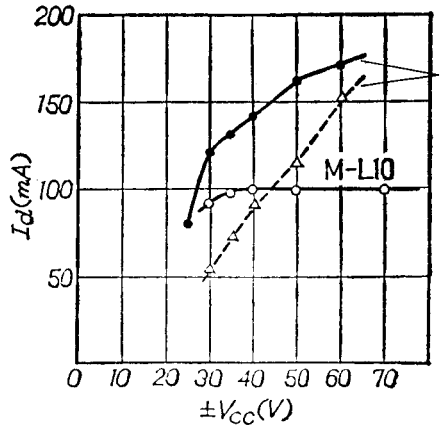


Fig. 10 Comparison between idling current changes due to supply voltage change

The main cause of the idling current change lies in the supply voltage change, P_D change, junction temperature change and V_{BE} change. SVRR in the predriver stage also relates to this. In M-L10, as V_{CE} in Q_1 and Q_2 is constant even when the supply voltage varies, P_D does not change at all.
As SVRR in the predriver stage is sufficiently good, the idling current is extremely stable. This also leads to smaller change of momentary heat generation of Q_1 and Q_2 due to varying magnitude of the output. This is illustrated in **Fig. 11**. This does not mean that the heat generation of the amplifier is decreased but means that the heat generation in Q_3 and Q_4 changes as shown in **Fig. 3** independent of the output characteristic.
In the long run, the supply voltage change or the heat generation change is all absorbed by Q_3 and Q_4 just as in shock absorbers so that Q_1 and Q_2 can operate very stably.

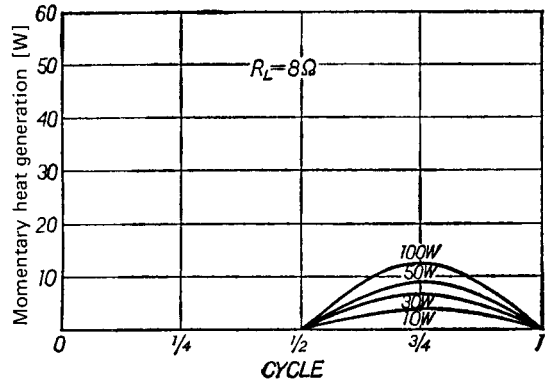


Fig. 11 Output vs momentary collector loss

4. Other Features of M-L10

4-1 Voltage Amplifier Stage

In addition to the 2-stage differential circuit which is a base of the amplifying circuit and is taken to be an ultimate configuration, the cascode bootstrap circuit and the first stage automatic balance type active load are added to increase SVRR, thereby amplifying the input signal alone. **Fig. 12** shows the basic circuit configuration.
A pure NFB circuit with a base of 2-pole 1-lead compensation is adopted for the phase compensation.

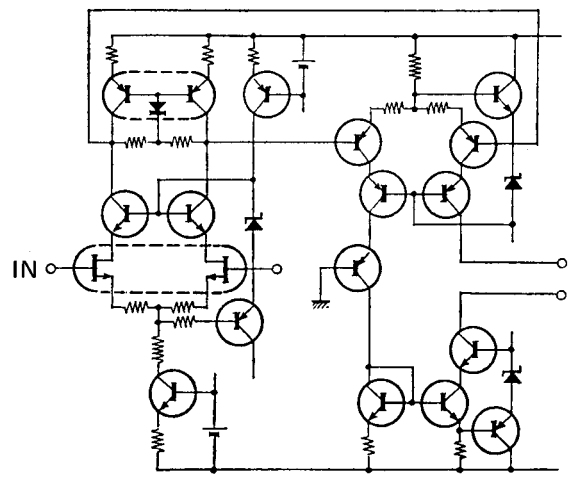


Fig. 12 Voltage amplifying stage in M-L10

4-2 Protector Circuits

(1) Protection by detecting the center voltage
When the DC voltage accidentally exceeds ±3 V for some reason or other in such cases as DC voltage is applied to the input, the speaker relay is released to prevent damage to the speakers.

(2) Protection against load shorting
When the speaker output terminals are shorted for some reason or other, the speaker relay is released to prevent damage to the amplifier. The release time of the relay is given in two steps: 6 seconds and about 30 seconds according to the output state.

(3) Power limiter circuit
The power limiter circuit is provided so that the maximum rated output is 200 W at 4 ohms. This is not a current limiter but a pure voltage limiter in which stress is put on sound quality.

4-3 Large-Scale Power Meter

This is a logarithmic scale type power level meter capable of indicating from minute output to maximum power without selecting the scale range.

In its electric circuit, the attack/recovery time is set so that the meter deflection exactly follows the musical intonation.

5. Closer to the Musical Truth

So far, the hardware is described with stress upon the power cascode super A circuit. After all, an amplifier is nothing more than a device for listening to music. The explanation of the hardware is powerless in front of music no matter how well it is made. Therefore, sense of vision, sense of touch and harmony with surroudings should be considered, not to mention sound (sense of hearing), so that "mind of audio" or "heart of music" are satisfied at high grade. The separate amplifier is expected to fulfill this so-called "high musical sensibility".
From such points, P-L10 and M-L10 are fruited as a result of stressing the features of the separate amplifier from viewpoint of "musical sensibility".

Concerning the latest technology, its employment is not shown off on the mechanical appearance intentionally but is secretly indicated on the orthodox panel design of the real rosewood-trimmed cabinet to which our traditional wood working technology is applied.
As described here, the design lays importance on the heart of music.
"Closer to the Musical Truth" is our design concept towards all over the world.

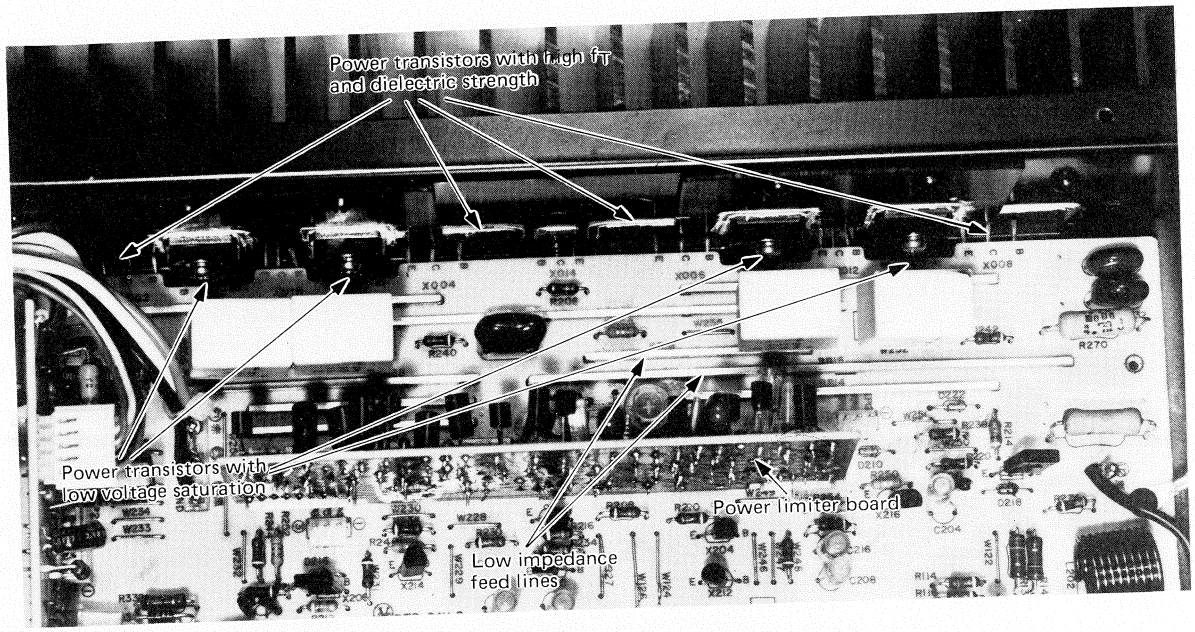


Photo 4 Power cascode super A output stage in M-L10.

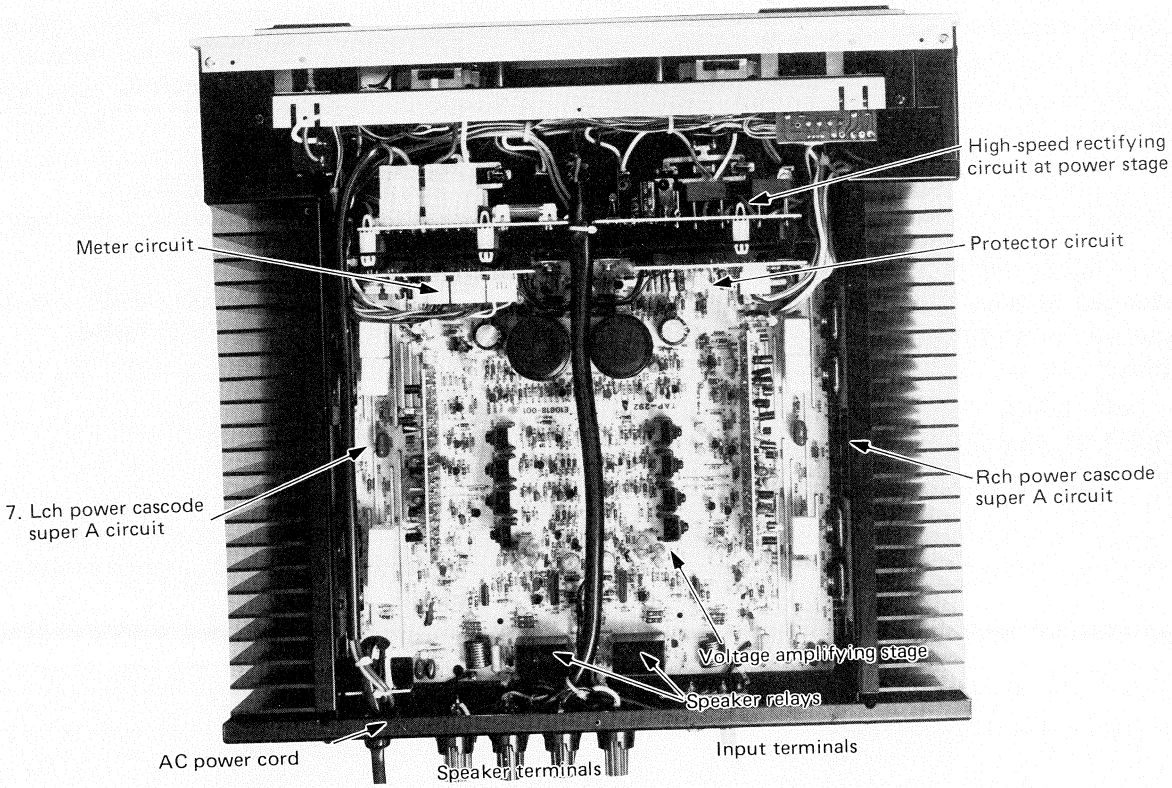


Photo 5 Rear view of parts locations in M-L10

Chapter 2. Operation of each Circuit

1. Voltage Amplifier Circuit

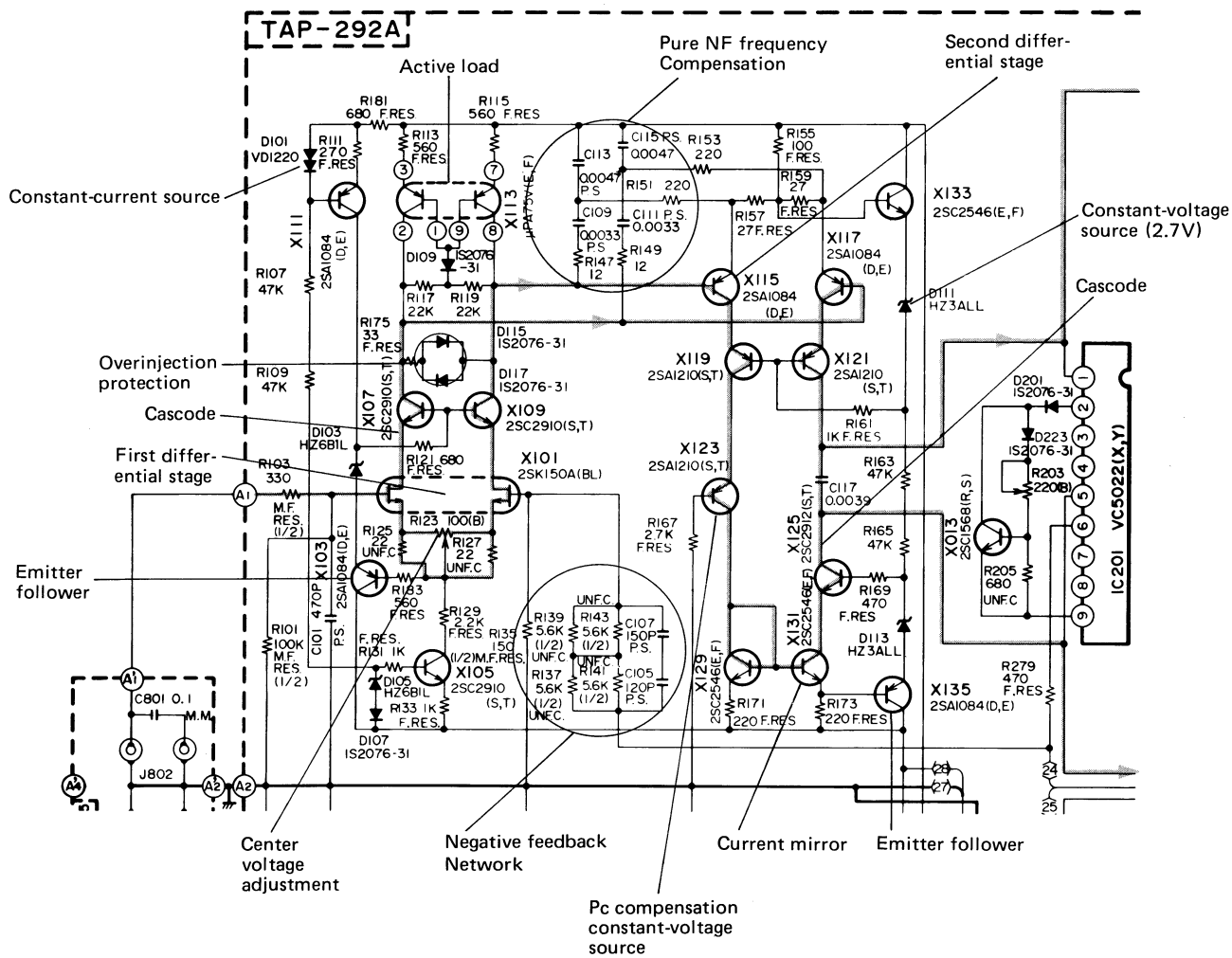


Fig. 13 Voltage amplifier circuit

(1) This circuit voltage-amplifies the input signal to supply it to the power amplifying stage.
This circuit is basically configured of two differential stages, each with a cascode bootstrap circuit.

(2) The first differential stage is formed of a combination of a differential circuit consisting of dual low-noise FET 2SK150A (X101) and constant-current source X105 with a cascode bootstrap circuit consisting of X107, X109, X103, D103 and X111. As a result, X101 operates on a constant source-drain voltage of about 5.6 V, thus permitting improved characteristics.
Dual transistor X113 is the active load which takes advantage of the large internal impedance of the constant-current source circuit to work as an AC load in the first differential stage.

(3) The second differential stage is formed of a combination of a differential circuit of X115 and X117 with a cascode bootstrap circuit of X119, X121, X133 and D111.
One of push-pull outputs is extracted from the collector of X121. The other, extracted from the collector of X119, is phase-inverted by the current mirror circuit consisting of X129 and X131, and is extracted from the output of the cascode bootstrap circuit (X125, X135, D113) for this current mirror circuit.
X123, a constant-voltage source, compensates the collector loss of X119 for thermal balance.
Thus, the collector losses of X119, X121, X123 and X125 are each about 700 mW or less.

(4) The CR network of C109-116 and R147-154, the pure NF frequency compensation, determines the 2-pole 1-lead open-loop characteristic in combination with C201-208 in the power stage, thus permitting wider negative feddback bandwith.

(A 1-lead circuit is formed by applying a positive feedback across R151-154 to the mid-points of series-connected capacitors. At the same time, C109-112 undergo bootstrapping to improve the slew rate.

2. Super-A Bias Circuit

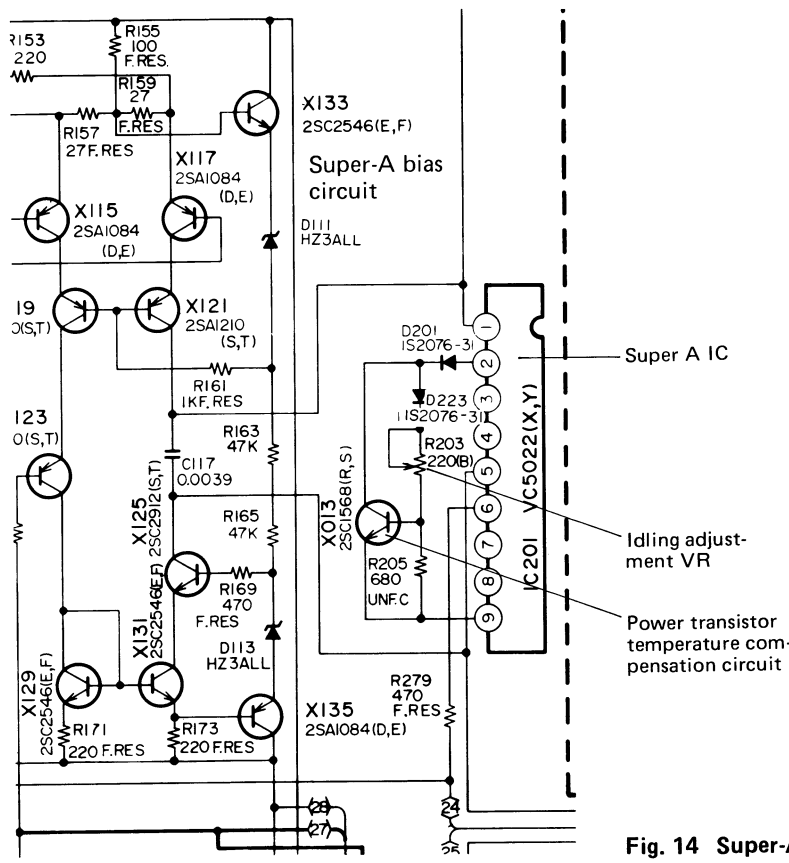


Fig. 14 Super-A bias circuit

(1) This circuit permits high-efficiency class-A operation by joint use of super-A IC and the power stage.

(2) X013 in combination with R203, R205 and D223 forms a constant voltage circuit which compensates the power transistors for temperature change concurrently with the adjustment of the idling. (X013 is mounted on the main heat sink.)

3. Power Amplifier Circuit

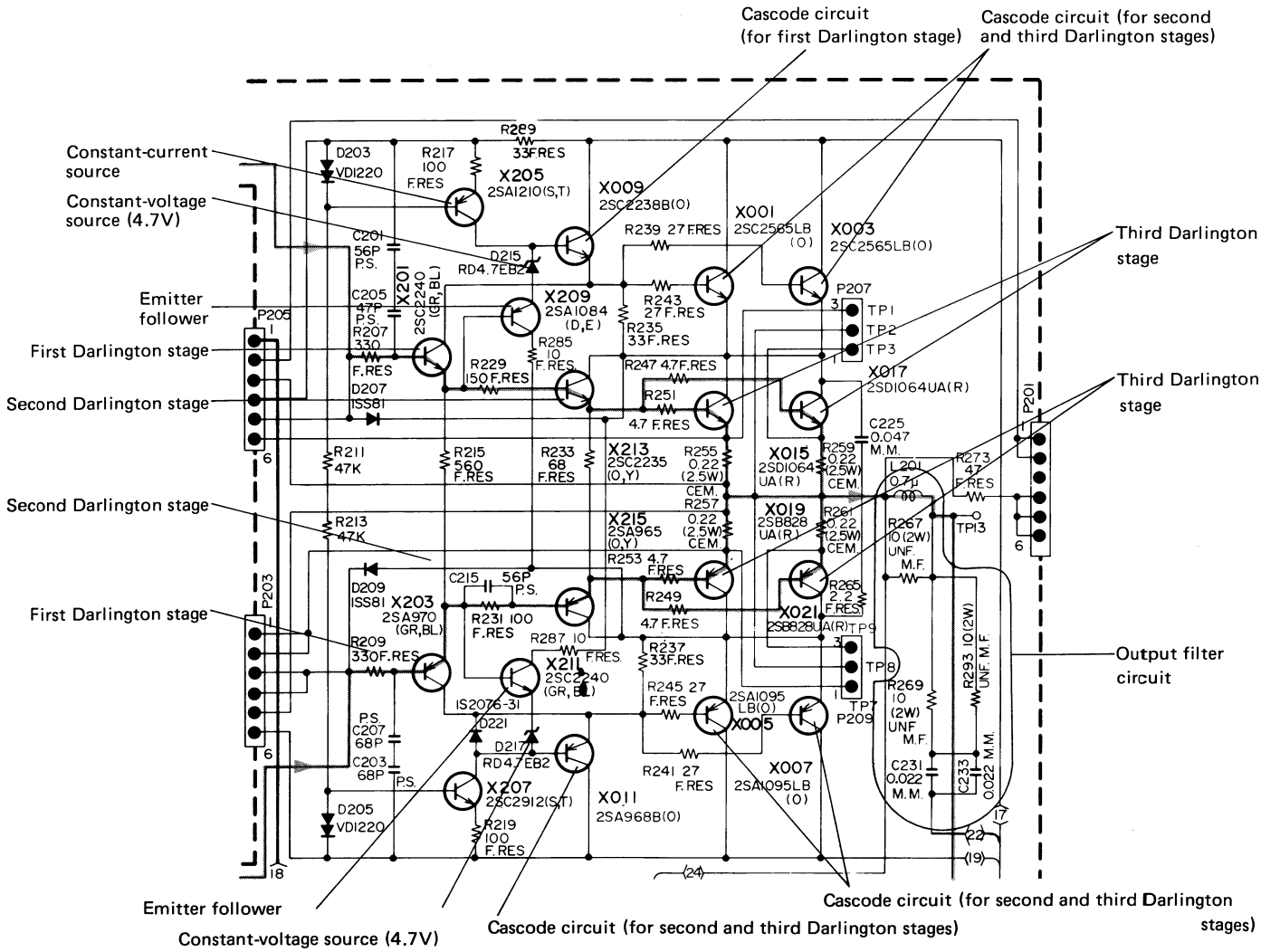


Fig. 15 Power amplifier circuit

(1) The basic circuit consists of a parallel push-pull triple Darlington circuit in all-stage cascode bootstrap system.

(2) The signal path is formed of X201 → X213 → X015//X017 (negative side, X203 → X215 → X019//X021).
This portion corresponds to that of the conventional power stage to determine the output characteristic of the power stage.
In the M-L10, a newly added power cascode circuit of X209, X205, X009, X001 and X003 (negative side, X211, X207, X011, X005 and X007) forms the cascode bootstrap circuit to improve characteristics.

(3) The power cascode circuit extracts the cascode signal from the emitter of X201 by emitter follower X209 to drive its other circuit elements of X009, X001 and X003 via the constant voltage circuit (4.7 V Zener diode).
X205 is a constant current source to D215.
X009, the cascode transistor for X201 in the first Darlington stage, drives X001 and X003 in the final cascode stage. X001 and X003 which are the cascode transistors common to the second and third Darlington stages, forms a parallel push-pull circuit; these are large capacity power transistors with Pc=150 W.
As a result, the collector-emitter voltages of X201, X213, X015 and X017, which determine the output characteristic of the amplifier, become constant at 5 V. On the other hand, voltage change is absorbed by the cascode transistors.

(4) D207 and D209 are clipper diodes to prevent overdrive.

4. Limiter and Protector Circuits

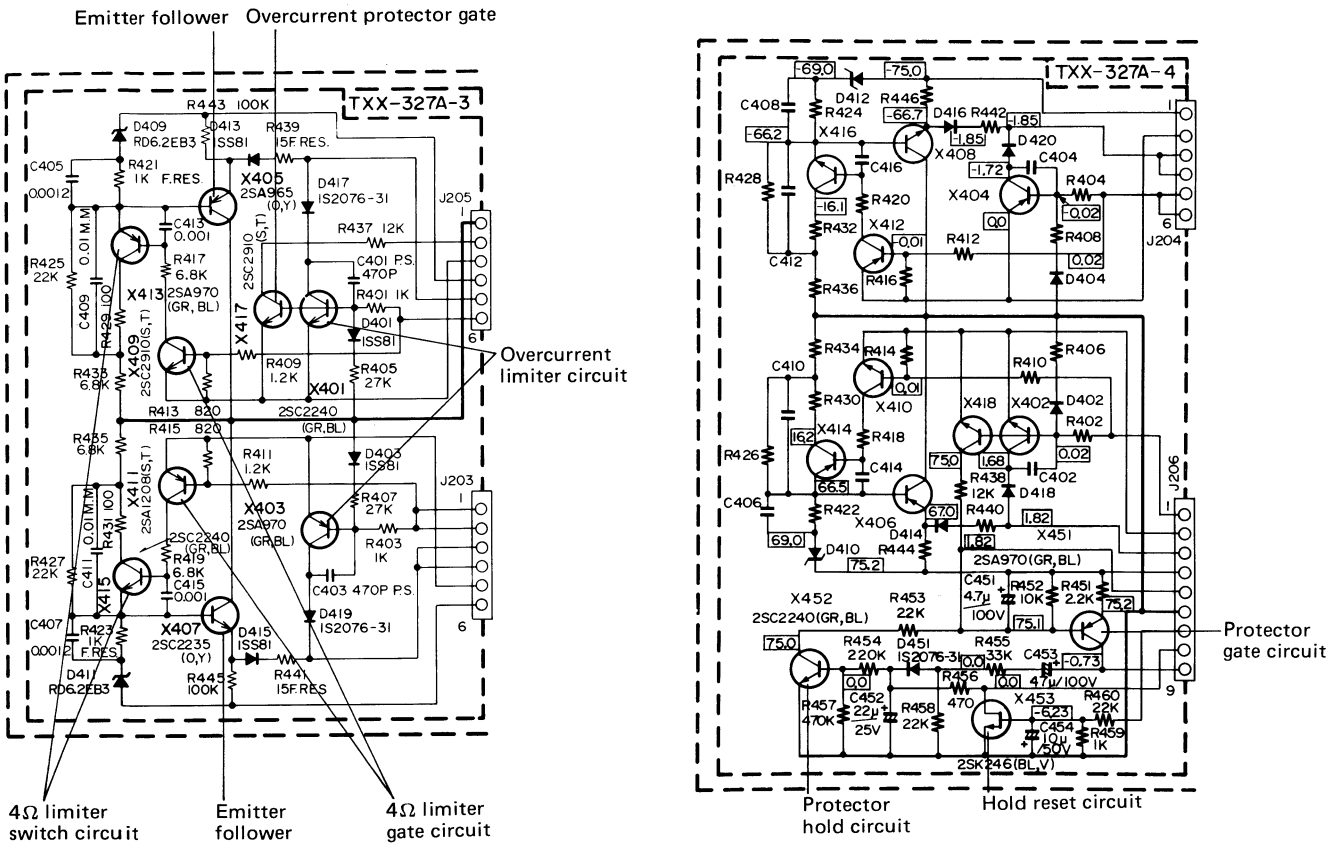


Fig. 16 Limiter and protector

(1) TXX-327-3 as well as -4 consists of an overcurrent limiter circuit, a 4 Ω limiter circuit and a part of protector detection circuit.

(2) Overcurrent limiter circuit:
Abnormal current due to load shorting, oscillation, etc. is detected and controlled by the impedance detection type gate circuit consisting of R401, R405 and X401 to limit the output current in the power stage. X417 actuates the protector circuit in synchronism with the overcurrent limiter circuit to turn off the speaker relay.

(3) 4 Ω limiter circuit:
An output of more than 200 W/4 Ω turns on the current detection type gate circuit consisting of R409, R413 and X409 to turn on switching circuit of X413.
The source voltage divider circuit consisting of D409, R421, R425 and R433 is designed in which the voltage at point A (VA) works to control the output voltage more than 200 W/4 Ω when X413 is on.
Therefore, the output voltage of the power stage which exceeds 200 W/4 Ω is clamped to less than VA via D413 and X405 so that the output power is controlled.
Emitter follower X405 is provided for impedance conversion at point A.

(4) The protector gate circuit (X451), incorporated only in TXX-327A-4, turns on when either overcurrent detection gate X417 or X418 operates, thereby raising the gate voltage at pin 1 of protector IC TA7317P to turn off the speaker relay.
The protector hold circuit is designed to automatically set the reset time of the protector to about 6 to 20 sec depending on the degree of the abnormality for more complete protection of the power stage. This operation is controlled by the time constant circuit of C453, R455, R458, D451, C452, R454 and R457 which detects the number of operations of protector gate X451 to hold the protector by applying the positive feedback to the base of X451.
FET X453 is used to reset the hold circuit when power is applied again even when the hold circuit is in operation.

5. Regulated Power Supply Circuit (for Predriver)

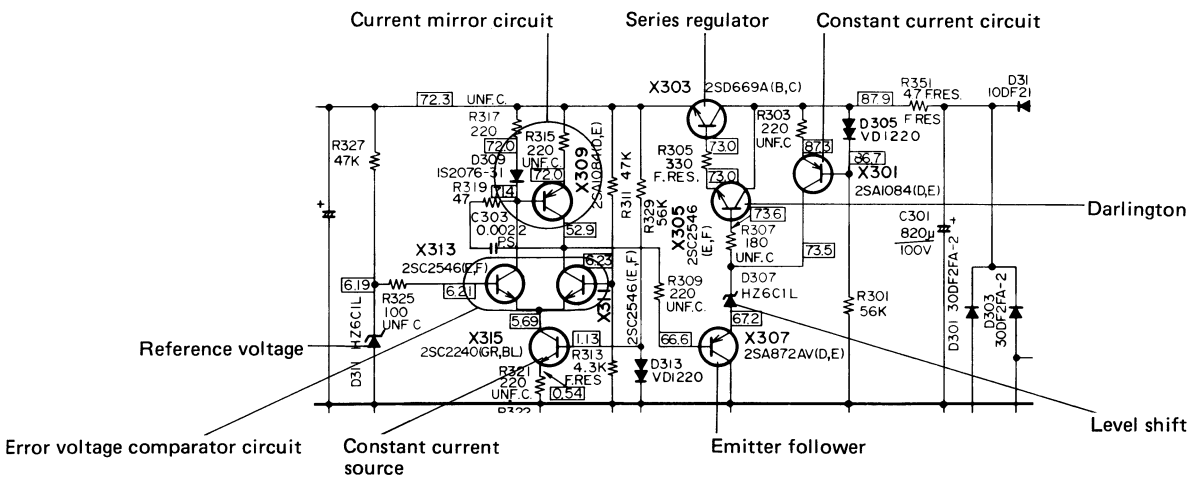


Fig. 17 Regulated Power Supply circuit (for predriver)

The error voltage comparator section is composed of the differential circuit with carrent mirror circuit consisting of X311, X313, X315 and X309. This section compares the output feedback voltage determined by R311 and R313 with the reference voltage at D311, amplifies it and controls the Darlington connected series requlator section of X305 and X303 via emitter follower X307.

6. Primary Power Source Circuit

The inrush resistors (R701 and R702) in the inrush protection circuit use two parallel-connected large-capacity cement resistors (6.8 Ω, 10 W) with a total of 20 W to prevent damage.
The inrush relay drive circuit is constructed in constant-current drive configuration (X701) so that the relay is actuated at 30 % of AC and is kept on against a reduced voltage down to 10 % of AC. This superb operating characteristic against AC voltage change helps to prevent damage to the inrush resistors.

Bootstrap Cascode Circuit

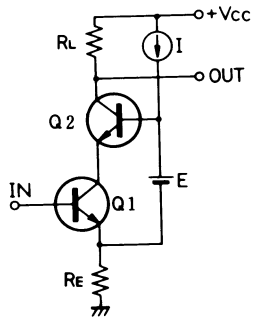


Fig. 18 Bootstrap cascode circuit

This diagram shows an example using a bootstrap technique, which allows a variation in emitter voltage of Q_1 to change the collector voltage in the same amplitude in synchronism with the emitter voltage variation. Thus, V_{CE} is fixed at a constant voltage (=E), eliminating the occurrence of ΔV_{CE} distortion (due to nonlinear change of β which depends on V_{CE}) and Δ Cob distortion (due to nonlinear change of Cob). Further, Cob can be regarded to be far smaller than the practical value.
Therefore, when the variation in V_{CB} is zero, Cob is equivalent to zero.

Chapter 3. Hints on Servicing

1. Caution when Powering the Unit after Repair

Instantaneous application of 100 % of AC may cause damage to power transistors again uless the unit is repaired completely.
For powering the unit, gradually increase the AC voltage with variac referring to the following procedure.

(1) Make sure that no lead of power capacitors (C1-C4, C301, C302, C307 and C308) is not shorted.
(2) First, keep the indling adjustment VRs (R203 and R204) turned fully counterclockwise. (bias: zero)
(3) Observing the idling current at the power stage, gradually increase the AC voltage with variac.
    * For checking the idling current, refer to "2. How to check characteristics after repair".
(4) With a defect which may lead to damage to the power stage, the idling current starts to flow at less than 30 % of AC voltage.
    In this case, do not increase this AC voltage, and follow the checking procedure below.
(5) With no defect, the inrush relay turns on at about 30 % of AC and the speaker relay at about 80 % of AC voltage. Even when the voltage is applied up to 100 % of AC voltage, the idling current observed on the oscilla-scope remains zero.
(6) Next, turn the adjustment VR to make sure the idling current can be varied. (0 mA to 400 mA)

Note: The voltage range of the oscilloscope while observing the idling current should be set to 50 mV/div. (≒200 mA/div.).

2. How to Check Characteristics after Repair

When no abnormal current is at the power stage and the power application is completed, be sure to check the following items:

2-1 Re-check and Re-adjustment of Center Voltage

P.C. Board name	Connection point (test point No.)	Adjustment point (VR No.)	Setting voltage	Remarks
Driver amp P.C. board (TAP-292)	TP13-GND	R123	0 ± 5 mV	Lch
	TP14-GND	R124	0 ± 5 mV	Rch

• GND: Negative SPEAKER terminal

2-2 Re-adjustment of Idling Current

Before powering, keep VR R203 and R204 turned fully counterclockwise, then adjust them after 1 minute from power-on.

Board name	Connection point (test point No.)	Adjustment point (VR No.)	Setting voltage	Remarks
Driver amp P.C. board (TAP-292)	TP13-TP1 TP13-TP3 TP13-TP7 TP13-TP9	R203	8-12 mV (10mV center) For idling current, 45 mA center	Lch
	TP14-TP4 TP14-TP6 TP14-TP10 TP-14-TP12	R204	8-12 mV (10 mV center) For idling current, 45 mA center	Rch

Note: When the unit is cool right after power-on, the setting idling voltage is small (5-10 mV), while as the unit gets warm, it increases and about 20 minutes later becomes stable (18-26 mV). Therefore, after 1 minute from power-on, adjust to 8-12 mV (10 mV center), then make sure the setting idling voltage is 18-26 mV when the idling become stable (about 20 minutes later).

2-3 Level Adjustment of Power Meter

Adjustment procedure

1. Make sure that the pointer of the meter reads 0 when power is off. When the pointer is away from 0, adjust it to the proper position.
2. Apply a signal of 1 kHz from the input terminal (SUBSONIC), then adjust the input signal level so that an output of 20 V appears at the SPEAKER terminals.
3. At this time, adjust R505 (Lch) and R506 (Rch) so that the pointer reads -5 dB (about 50 W).
4. Next, turn down the input signal by 20 dB and make sure that the pointer reads -25 ± 2 dB.

2-4 Signal Applying Test

a. With no dummy load, apply a 20 kHz sinewave. A normal sinewave should be obtained and a clear clipped waveform of about 70 Vo-p output should be obtained with no oscillation at clipped portion as shown in **Fig. 19.**

b. Next, connect an 8 Ω dummy load, then apply the same sinewave. The same waveform as with no load should be obtained.
However, the clipping level will be about 60 Vo-p. (Using 100 % of AC voltage)

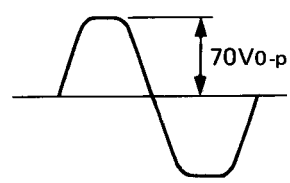


Fig. 19

2-5 Frequency Response

Connect an 8 Ω dummy load, and measure at an output level of about 1 V. A frequency response of 180 kHz -3 dB should be obtained when the output impedance of an oscillator (or attenuator) is 600 Ω.

2-6 Check of Residual Noise and Hum Level

This should be less than 0.2 Vrms at the output 8 Ω dummy load termination with the input shorted.

2-7 Capacitive Load Test

This checks the oscillation allowance. Be sure to perform this test. Do not connect an 8 Ω dummy load (because the test is more severe with no load).

a. Connect test capacitors to the SPEAKER terminals. (Both channels tested at the same time.)
   Connect three types of capacitors, about 0.001 μF, 0.01 μF and 0.1 μF.
   (Withstand voltage : more than 100 V)
b. Apply a 20 kHz sinewave. No oscillation should occur at the clipping point as in item (3).
   Since this load is capacitive, slight ringing at the clipping point does not matter. (**Fig. 20-A** shows a desirable example and **Fig. 20-B** an undesirable example.)
c. With a square wave generator, more accurate checking is possible.
   Apply a 10 kHz square wave. Even when rining occurs, it is permissible when it converges within 50 % of the half cycle.

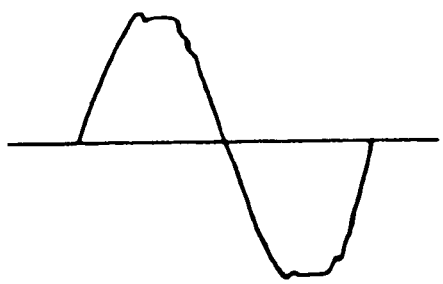


Fig. 20-A

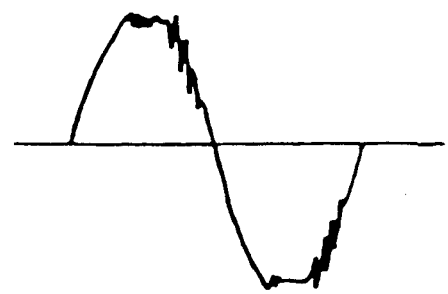


Fig. 20-B

2-8 Running Test

It is desirable to run the unit for half a day before shipment.

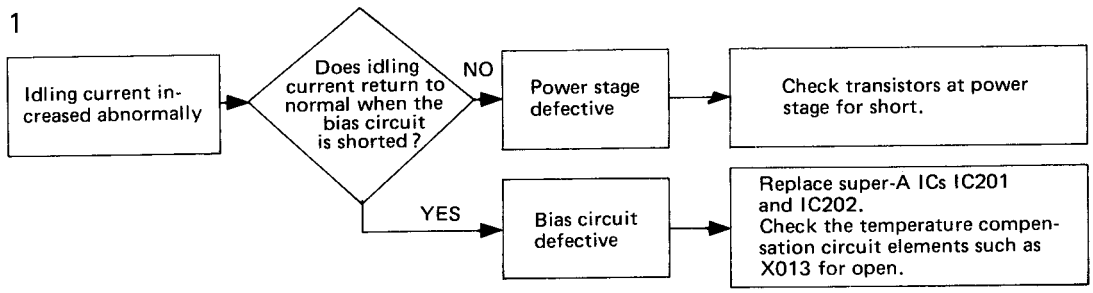
- Load: 4 Ω dummy
- Signal: Apply an FM music signal, then observe the output level on an oscilloscope, and set it to a level just before clipping at the peak level.

* When the foregoing items are met, the unit is judged normal.

3. How to Locate the Defective Stage

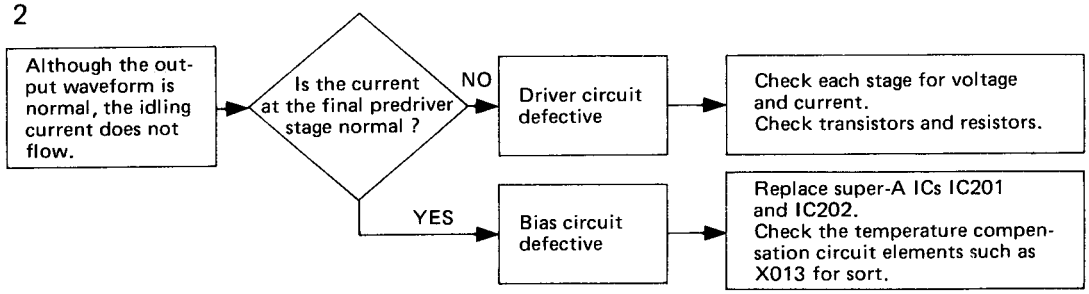
For symptoms whose causes are difficult to find out,refer to the following flowcharts:

Symptom 1



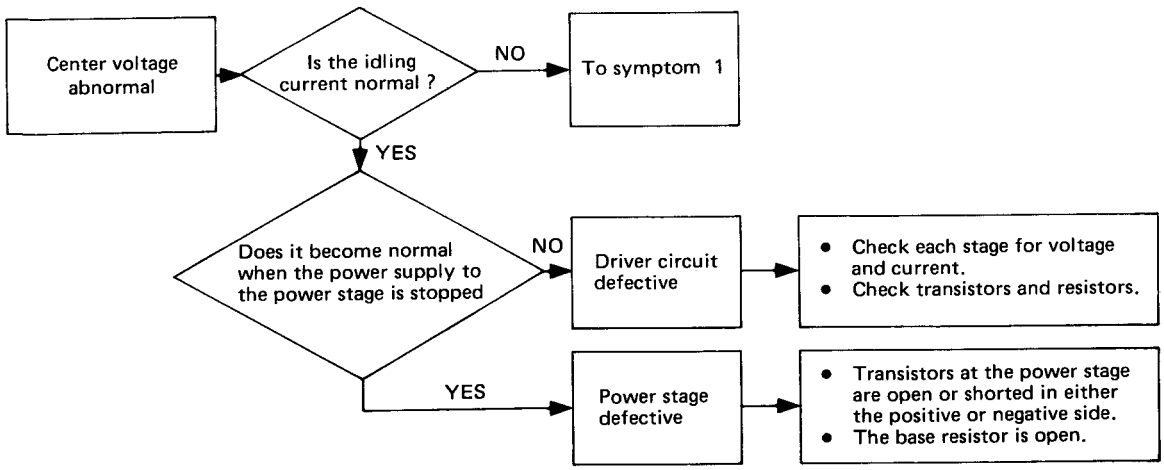
* To short the bias circuit, bridge the both terminals of C117 (C118).

Symptom 2



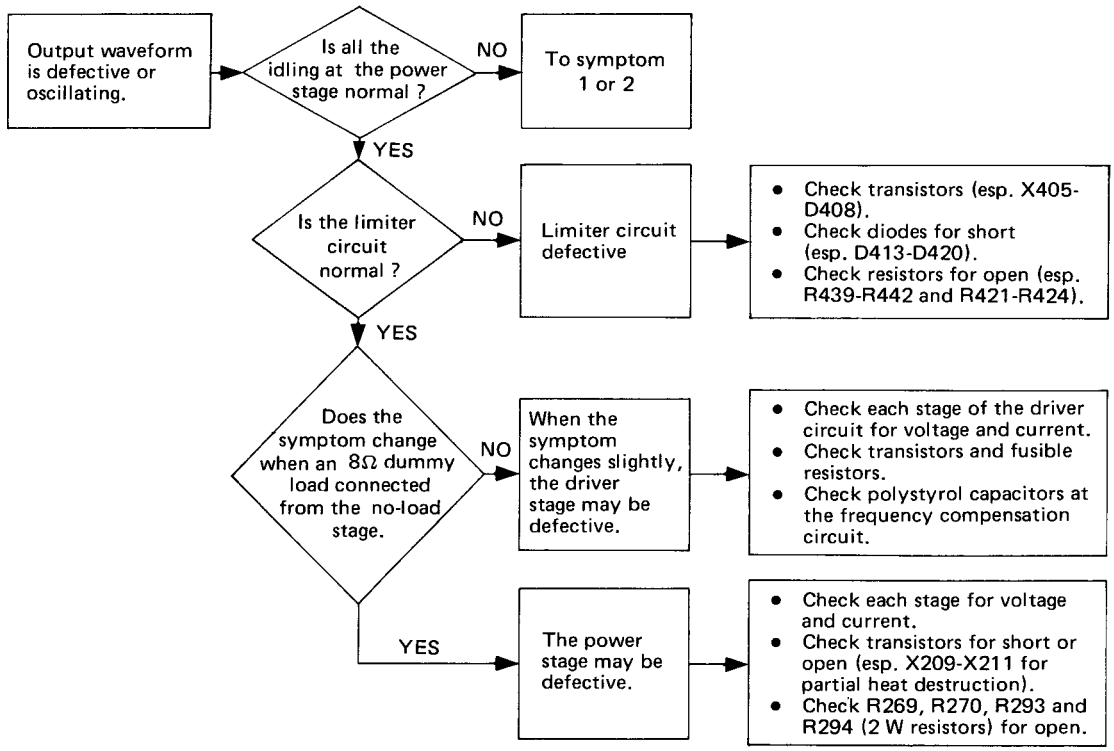
* Measure the current of the final predriver stage (X119-X126) at both ends of R157-R160. When the reading is about 10 mA, it is normal.

Symptom 3



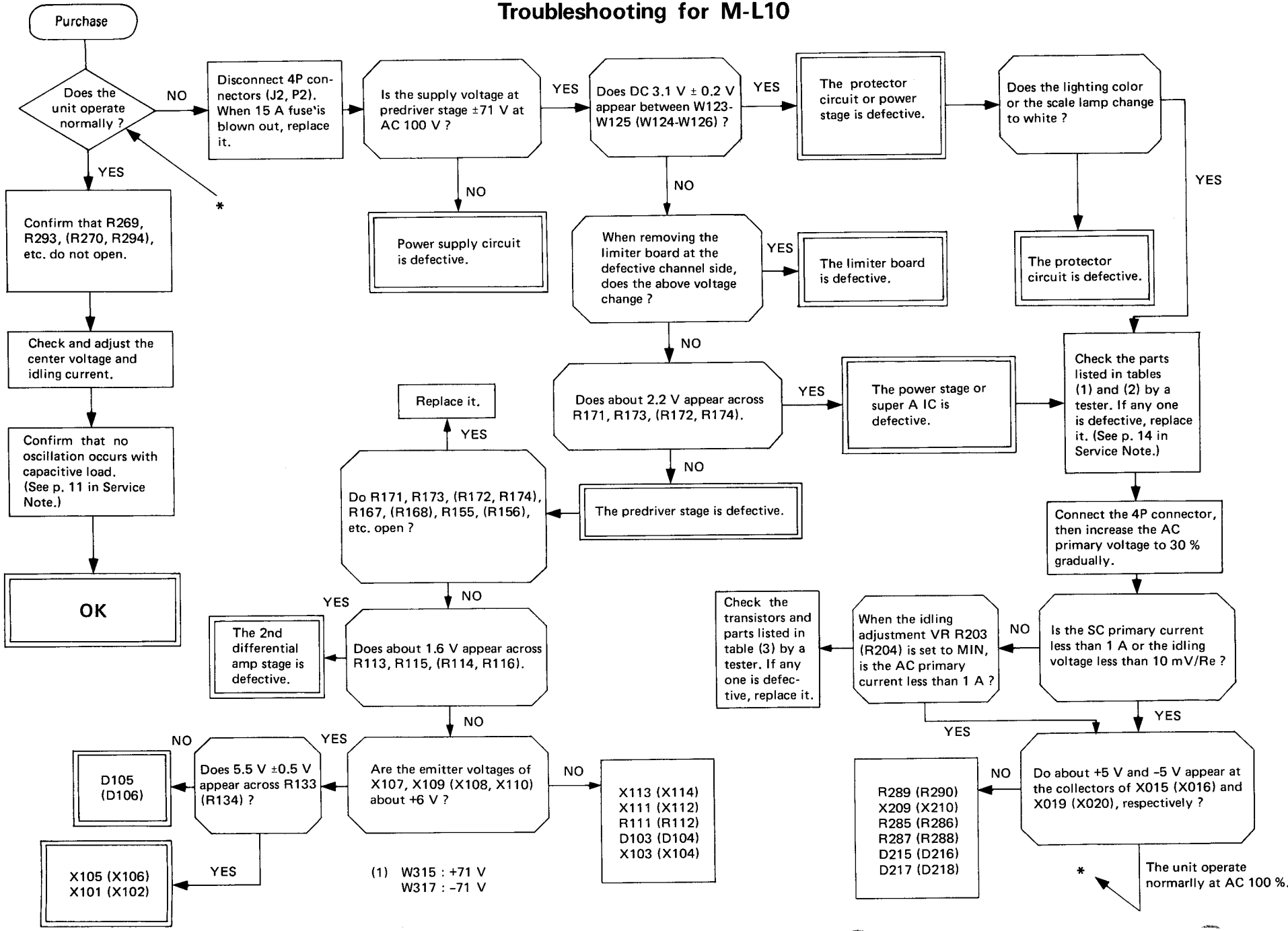
* The power supply to the power stage is cut off by disconnecting the connectors (P2, J2: 4-pin connectors, red-black-black-orange) of the leads of the toroidal transformer. However, the inrush protection circuit goes inoperative at the same time. This does not matter practically.

Symptom 4



* The limiter circuit can be checked with TXX-327-3 and TXX-327-4 removed.

Troubleshooting for M-L10



4. Hints on Other Checks

(1) Almost all defects tends to occur even under 30 % of AC voltage.
When the symptom appears even under 30 % of AC voltage, check at a voltage as low as possible. (This is because even when abnormality occurs, the AC voltage, when low, seldom damages the final stage.)
* In this case, since the speaker relay doe not turn on, observe the waveform before this relay. (TP13, TP14)

(2) When servicing the driver circuit, checking is also possible by shorting the bias circuit (the both leads of C117 and C118) or by removing the power supply connectors (P2, J2) to the power stage. (This prevents overcurrent from flowing into the final stage.)
In this case, although the operating condition of the driver stage changes, checking is possible to a certain extent.
* When reconnecting the connectors, be sure to wrap a specified tape to protect them against disengaging.

(3) Intermittent occurrence of symptom results largely from extra solder attached to parts leads or transistors half-destroyed by heat when the temperature changes.
In this case, a partial heating with a dryer or cooling agent will locate the defect.
* When heating, pay attention to the parts susceptible to heat. (esp., polystyrol capacitors)

5. Detailed Service Hints when Power Stage is Damaged

Based upon the shorting test data at the stage of designing the M-L10 in accordance with the safety standards, the parts likely to fail when the power stage is damaged are listed in the order of failure rate.
Check according to the following procedures and replace the defective parts.

(1) The transistors listed below are most likely to be defective when stress is applied to the power stage. Even when the checking with a tester shows no failure, replace all the listed transistors associated with the defective channel because the stress may reduce the reliability.

Part No.	Lch ref. No.	Rch ref. No.	Remarks
2SC2565LB(0) 2SA1095LB(0)	X001, X003 X005, X007	X002, X004 X006, X008	Power transistors at final power cascpde stage (heatsink div.)
2SD1064UA(R) 2SB828UA(R)	X015, X017 X019, X021	X016, X018 X020, X022	Power transistors at final Darlington stage (sub-heatsink div.)
2SC2240(GR,BL) 2SA1084(D,E)	X211 X209	X212 X210	Power cascode buffer amp div. (TAP-292)

(2) The parts listed below are most likely to fail when the power stage is damaged. Since the fusible resistors are opended symptomatically, be sure to check resistance in the x 1 ohm range of a tester and replace them with the specified ones if defective.

Part No.	Lch ref. No.	Rch ref. No.	Remarks	
QRZ0052-270	R239, R241, R243, R245	R240, R242, R244, R246	Fusible resistors 27 Ω	TAP-292
QRZ0052-330	R235, R237	R236, R238	Fusible resistors 33 Ω	
QRZ0052-100	R285, R287	R286, R288	Fusible resistors 10 Ω	
2SA965(O,Y)	X405	X406	Emitter follower	TXX-327-3(L) TXX-327-4(R) Limiter circuit
2SC2235(O,Y)	X407	X408	"	
QRZ0052-150	R439, R441	R440, R442	Fusible resistors 15 Ω	
QRZ0052-102	R421, R423	R442, R424	Fusible resistors 1 kΩ	

Note:
In most cases, replacing parts in items **(1)** and **(2)** will permit the unit to operate normal. If the defect cannot be cleared, check the parts listed on next page in item **(3)**.

(3) The parts listed below fail occasionally when power transistors are damaged.

Part No.	Lch ref. No.	Rch ref. No.	Remarks	
2SC2238B(0) 2SA968B(0)	X009 X011	X010 X012	Transistors at 1st power cascode stage	Heatsink division
2SC2235(O,Y) 2SA965(O,Y)	X213 X215	X214 X216	Transistors at 2nd Darlington stage	TAP-292
2SC2240(GR,BL) 2SA970(GR,BL)	X201 X203	X202 X204	Transistors at 1st Darlington stage	
QRZ0052-151	R229	R230	Fusible resistors 150 Ω, base resistors at 2nd Darlington stage	
QRZ0052-101	R231	R232	Fusible resistors 100 Ω, base resistors at 2nd Darlington stage	
QRZ0052-331	R207, R209	R208, R210	Fusible resistors 330 Ω, base resistors at 1st Darlington stage	
QRZ0052-680	R233	R234	Fusible resistors 68 Ω, emitter resistors at 2nd Darlington stage	
QRZ0052-561	R215	R216	Fusible resistors 560 Ω, emitter resistors at 1st Darlington stage	
QRZ0052-471	R279	R280	Fusible resistors 470 Ω, super-A feedback resistors	
VC5022(X,Y)	IC201	IC202	Super-A ICs	

Current mirror Circuit

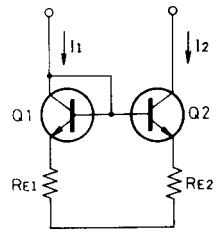


Fig. 21

The diagram shows a current mirror circuit. Assuming that Q_1 and Q_2 are transistors well balanced in characteristrics, their relationship is represehted by the following expression:

$$I_2 = \frac{I_1}{1 + 2/\beta} \qquad \text{(Provided that } R_{E1} = R_{E2}\text{)}$$

If β is sufficiently large, $I_1 \fallingdotseq I_2$. Here, the same amount of current flows through the two transistors.

6. How to Clean and Repair the Cabinet

6-1 How to Clean

To clean the cabinet, soak a piece of dry, soft cloth with a liquid wax (silicone wax) available in markets, wipe the cabinet thoroughly, and finish with dry cloth evenly.

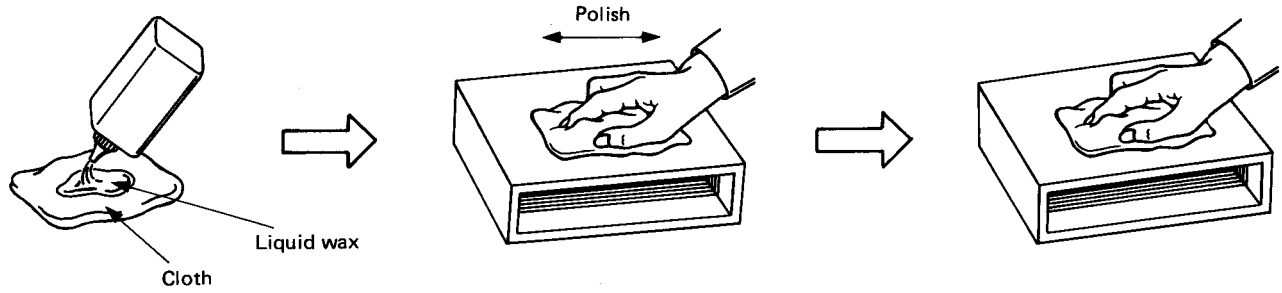


Fig. 22

6-2 How to Repair

Slight scratches

Grind the scratched part with water-resisting sand-paper of #800-1000 with the aid of water until scratches are removed. Apply rubbing compound to cloth and polish the surface with considerable force until the traces of sandpaper disappear and the surface becomes lustrous. Apply silicone wax to cloth and wipe the surface with it finally.

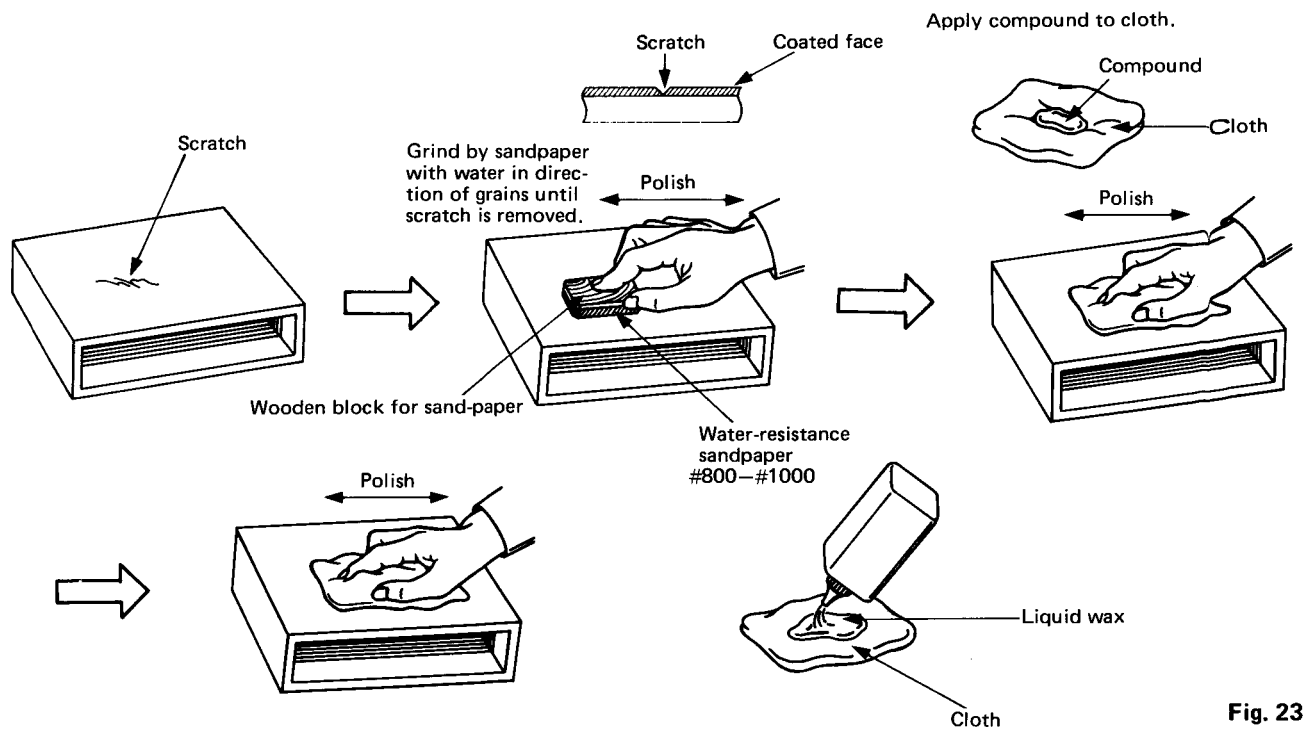


Fig. 23

Serious scratches

Coat a scratched part with lacquer enamel two to three times in such a manner that the color is first lighter than at the surrounding part and then color becomes deeper. Apply thick transparent lacquer thickly to the part with the tip of a thin brush. When it has dried up (it takes about 8 hours), grind with water-resisting sandpaper of #800-1000 using water. When the surface has become level, polish it with rubbing compound until traces of sandpaper disappear and the surface becomes lustrous. Apply silicone wax to cloth and wipe the surface with it finally.

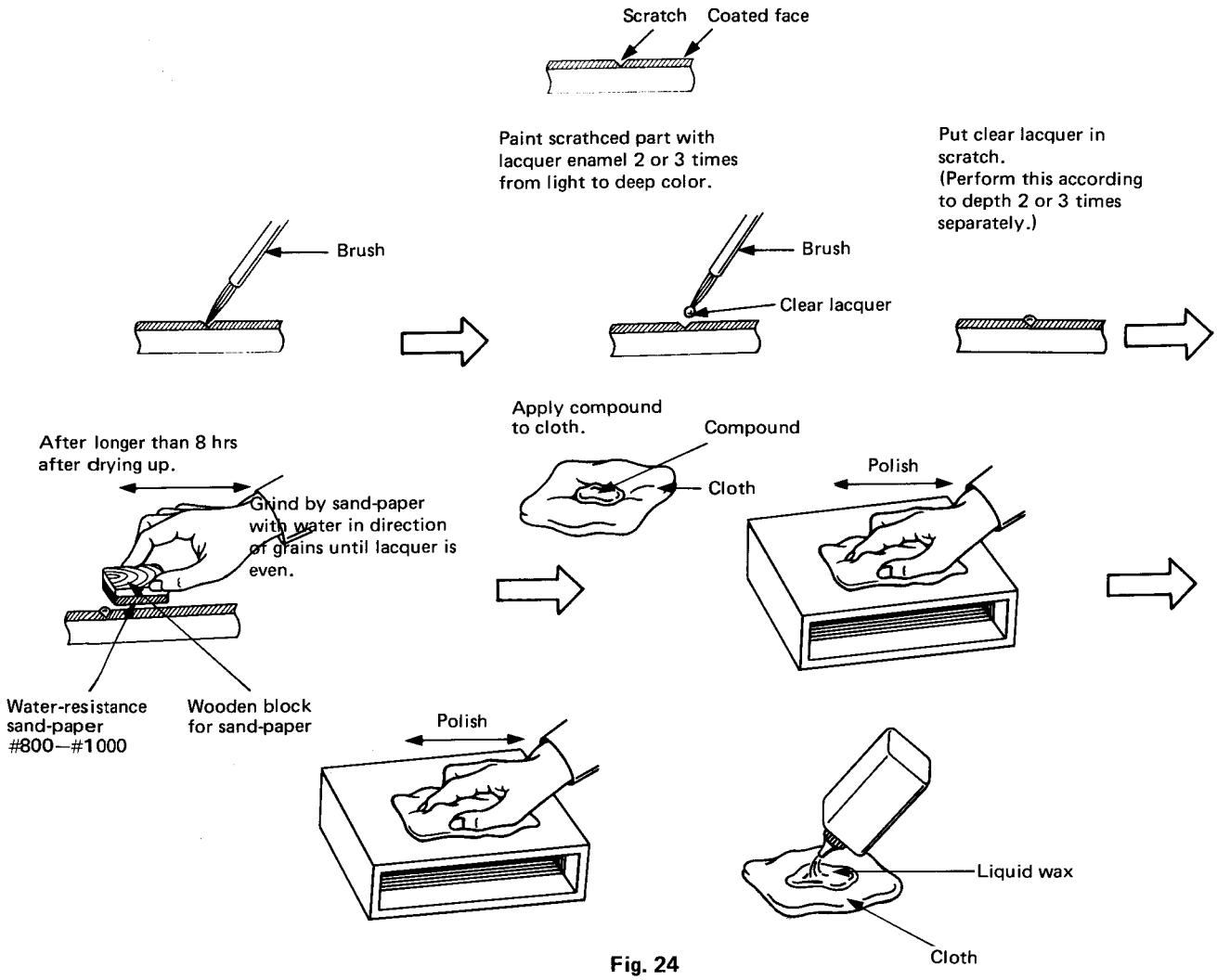


Fig. 24

Contusion

Put an annealed lac in the contusion, then write grains with lacquer enamel of the same color as the surrounding grains in such a manner that the color is first lighter and then deeper. Spray it with transparent lacquer two or three times. When it has dried up, grind with water-resisting sandpaper of #800-1000 using water. When the surface has become level, polish it with rubbing compound until the traces of sandpaper disappear and the surface becomes lustrous. Apply silicone wax to cloth and wipe the surface with it finally.

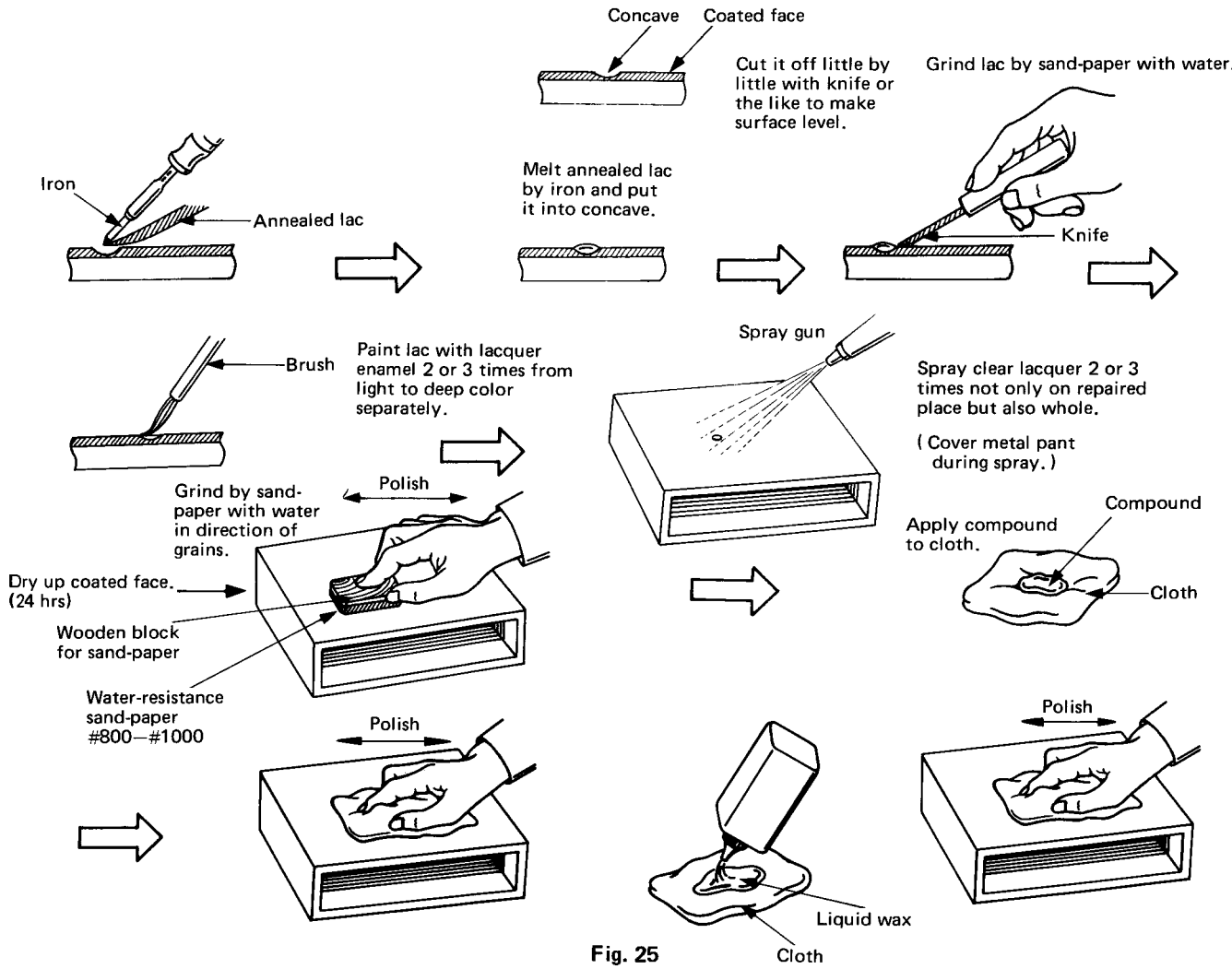


Fig. 25

Discolored edge

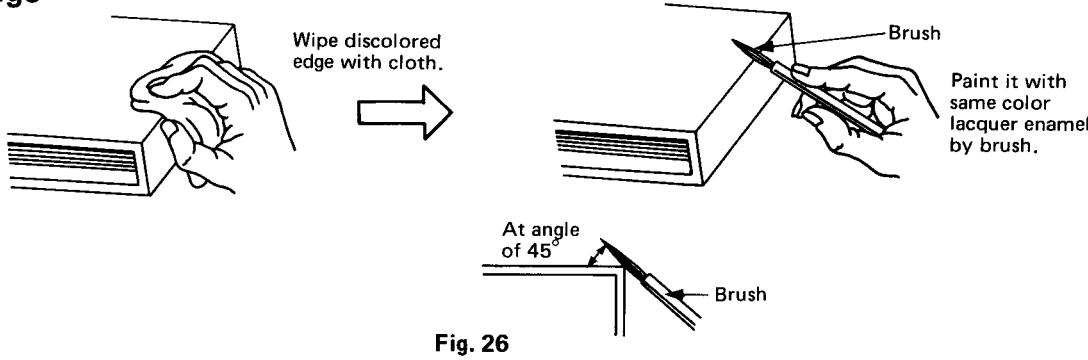


Fig. 26

JVC

VICTOR COMPANY OF JAPAN, LIMITED, TOKYO, JAPAN

Printed in Japan

M-L10

SERVICE MANUAL

Contents

1. Service Precautions

1-(1) For safety

1. When replacing the parts marked with ⚠ , be sure to use the designated parts to ensure safety.
2. If the power cord has been replaced, pull the cord in all directions to see that it does not come off.
3. Parts and wires which are related with supply power should be bound and soldered.

1-(2) Caution when powering the unit after repair

Instantaneous application of 100 % of AC voltage may cause damage to power transistors again unless the unit is repaired completely.
For powering the unit, gradually increase the AC voltage with Variac referring to the following procedure.

1. Make sure that no lead of power capacitors (C1-C4, C301, C302, C307 and C308) is shorted.
2. First, keep the idling adjustment VRs (R203 and R204) turned fully counterclockwise. (bias: zero)
3. Observing the idling current at the power stage, gradually increase the AC voltage with Variac.
4. With no defect, the inrush relay turns on at about 30 % of AC voltage and the speaker relay at about 80 % of AC voltage. Even when the voltage is applied up to 100 % of AC voltage, the idling current observed on the oscilloscope remains zero.
5. Next, turn the adjustment VR to make sure the idling current can be varied. (0 mA to 400 mA)

Note : The voltage range of the oscilloscope while observing the idling current should be set to 50 mV/div. (≒200 mA/div.).

2. Adjustment Procedures

2-(1) Level adjustment of power meter

1. Make sure that the pointer of the meter reads 0 when power is off. When the pointer is away from 0, adjust it to the proper position.
2. Apply a signal of 1 kHz from the input terminal (SUBSONIC) then adjust the input signal level so that an output of 20 V appears at the SPEAKER terminals.
3. At this time, adjust R505 (Lch) and R506 (Rch) so that the pointer reads -5 dB (about 50 W).
4. Next, turn down the input signal by 20 dB and make sure that the pointer reads -25 ± 2 dB.

2-(2) Adjustment of center voltage

P.C. Board name	Connection point (test point No.)	Adjustment point (VR No.)	Setting voltage	Remarks
Drive amp. P.C. Board (TAP-292A)	TP13-GND	R123	0 ± 5 mV	Lch
	TP14-GND	R124	0 ± 5 mV	Rch

GND : Negative SPEAKER terminal

2-(3) Adjustment of idling current

Before powering, keep adjustment VR R203 and R204 turned fully counterclockwise, then adjust them after 1 minute from power-on.

P.C. Board name	Connection point (test point No.)	Adjustment point (VR No.)	Setting voltage	Remarks
Drive amp. P.C. Board (TAP-292A)	TP13-TP1 TP13-TP3 TP13-TP7 TP13-TP9	R203	8-12 mV (10 mV center) For idling current, 45 mA center	Lch
	TP14-TP4 TP14-TP6 TP14-TP10 TP14-TP12	R204	8-12mV (10 mV center) For idling current, 45 mA center	Rch

Note : When the unit is cool right after power-on, the setting idling voltage is small (5-10 mV), while as the unit get warm, it increases and about 20 minutes later becomes stable (18-26 mV). Therefore, after 1 minute from power-on, adjust to 8-12 mV (10 mV center), then make sure the setting idling voltage is 18-26 mV when the idling becomes stable (about 20 minutes later).

3. Disassembly

3-(1) Removal Procedures of Cabinet

Note: In this work, it is recommeded that a soft cloth be put on the working table to avoid damage to the cabinet.

1. Remove four screws ① – ④ near the foot shown in **Fig 1**.
2. As shown in **Fig. 2**, put a mat or the like on the table, place the unit with its front downward and take out the cabinet.

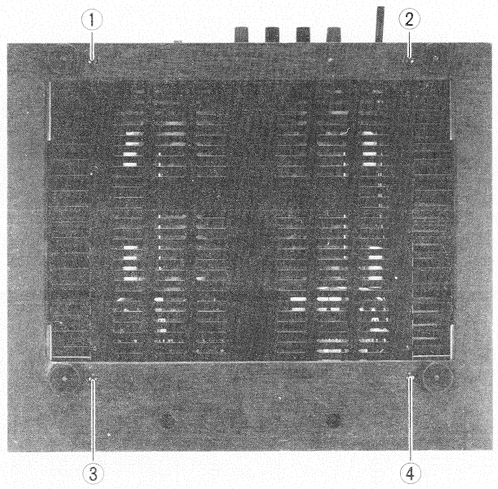


Fig. 1

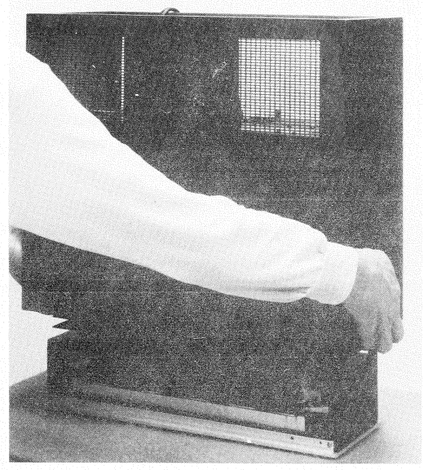


Fig. 2

3-(2) Removal Procedures of Power Transformer

1. Remove four mounting screws ① – ④ of the upper side of the heat sink.
2. Remove four screws ⑤ – ⑧ on the rear panel.
3. Disconnect the six wires from the connection sockets in the transformer.
4. Pull out the transformer together with its cover.

Note: When remounting, securely tighten the screws, and reinforce each socket connection with an adhesive tape so that no socket goes off at any time.

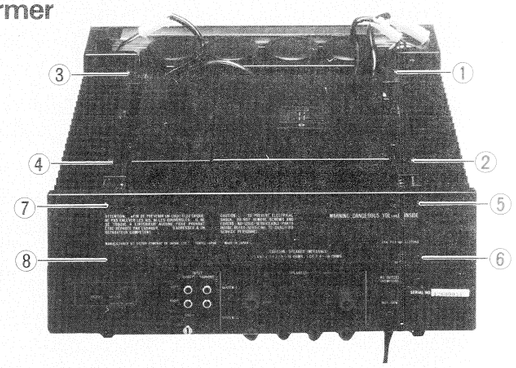


Fig. 3

3-(3) Removal Procedures of Power Meter

1. Remove of the front panel.
2. Remove soven screws ① – ⑦ of the dial back panel.
3. Hold both side of the dial back panel pull it out forward.
4. Remove two screws ⑧ – ⑨ on the mask plate, and remove of the lamp house of right side.
5. Remove of the meter scale in this manner shown in **Fig. 5**.
6. Remove mounting screws ① – ④ of the power meter.

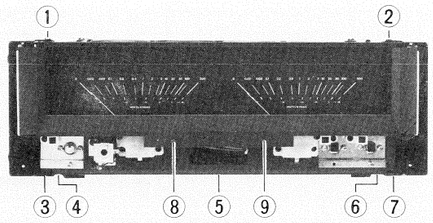


Fig. 4

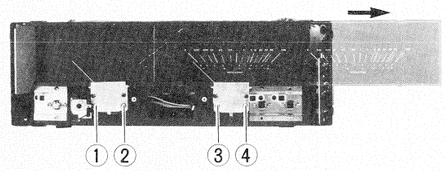


Fig. 5

M-L10
No. 2620

Instruction on Extension Cord for M-L10

In M-L10, it is difficult to repair the PC board, unless the power transformer is removed.
In order to perform servicing more conveniently, use the extension cord.

1. How to use

1) After confirming that the power plug is unplugged, unlock each connector retaining the power transformer, then disconnect the cord. (See **Fig. A.**)
2) Remove the power transformer from the main body, then connect the accessory extension cord. (See **Photo 1**)
3) Employ an extension cord with the same color, number of pins and connector size as those of the transformer and main body cords, and connect each connector until it locks. (See **Photo 2**)
4) After putting the power transformer back to the same position, connect the all connections properly and wrap the locked portion of each connector two or three times with tape to secure it. (See **Photo 3**)

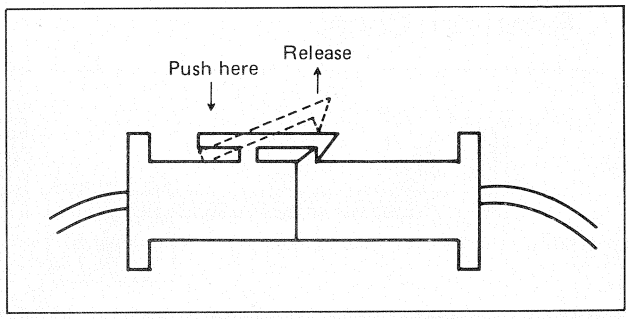


Fig. A Side View of Connection

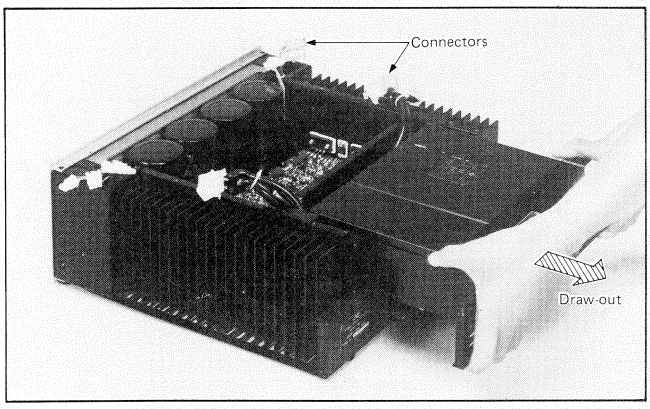


Photo 1

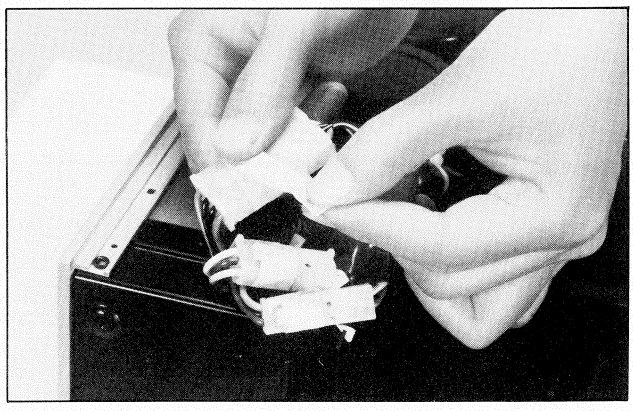


Photo 3

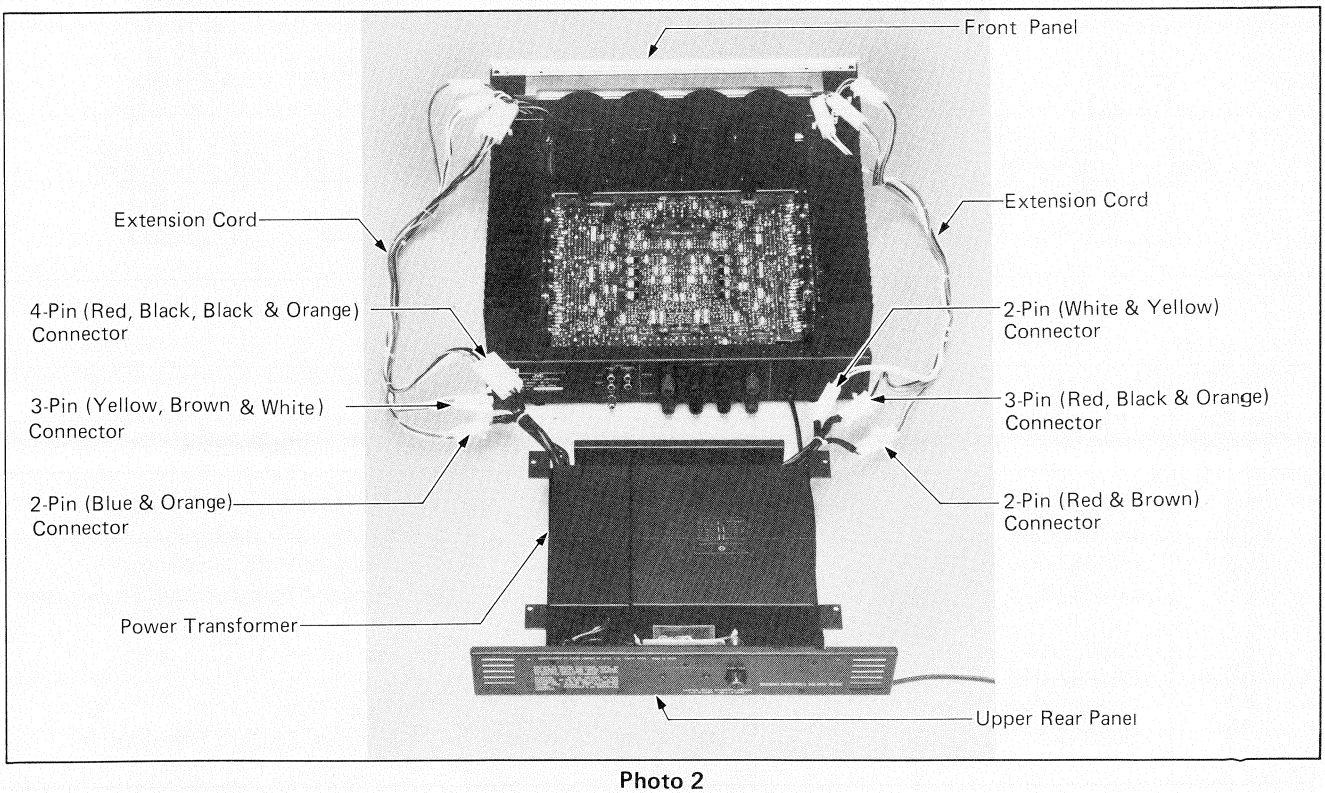


Photo 2

2. Hints on correct use

1) Before turning the power ON, be sure to confirm that the color and pin number of each cord is identical with those of the other cord and that each connector is properly connected.

2) There are two connectors (2-pin and 3-pin types) for the extension cord. When a cord with a different color is connected mistakenly and the power is turned ON, the circuit will be damaged.

3. Extension Cords

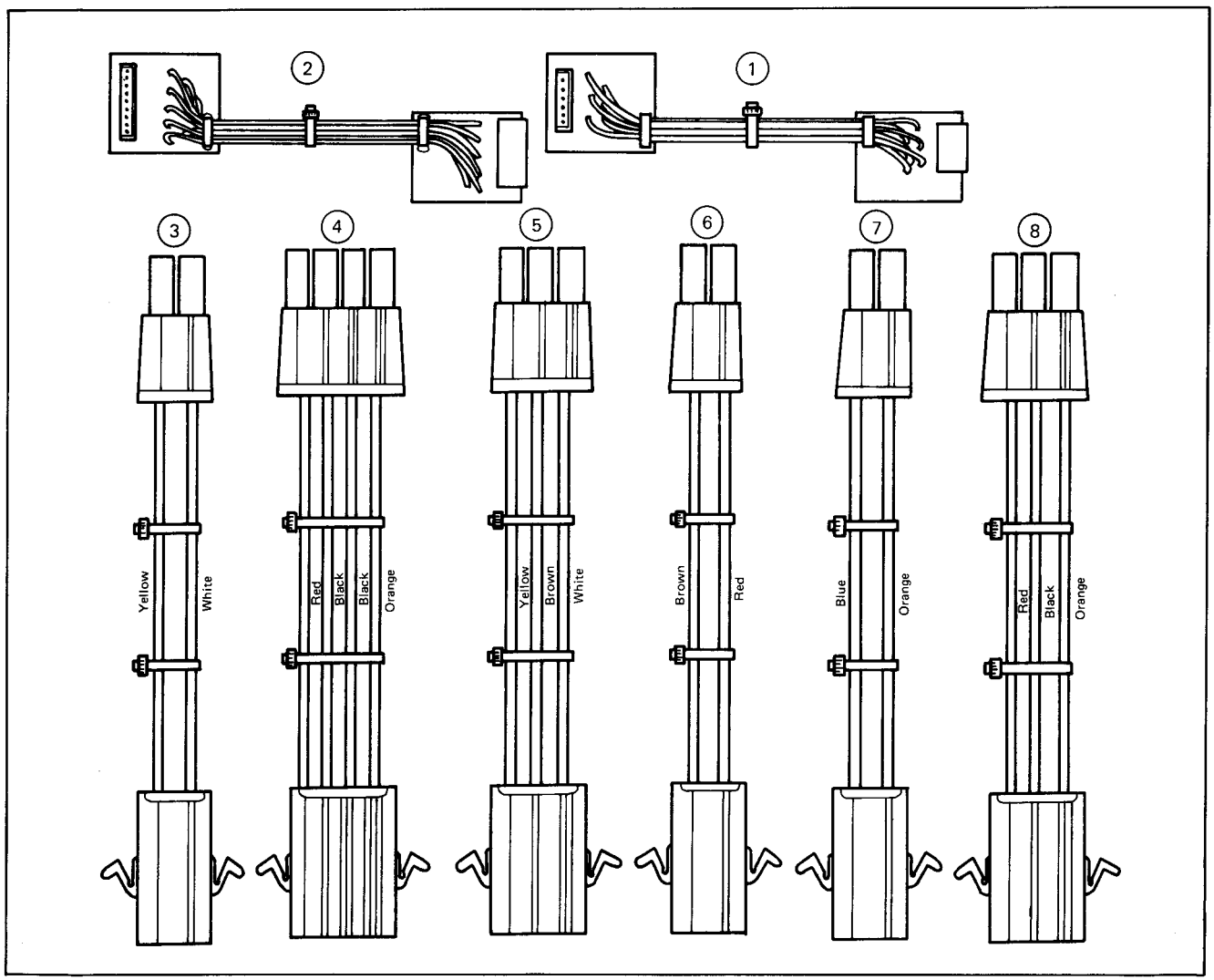
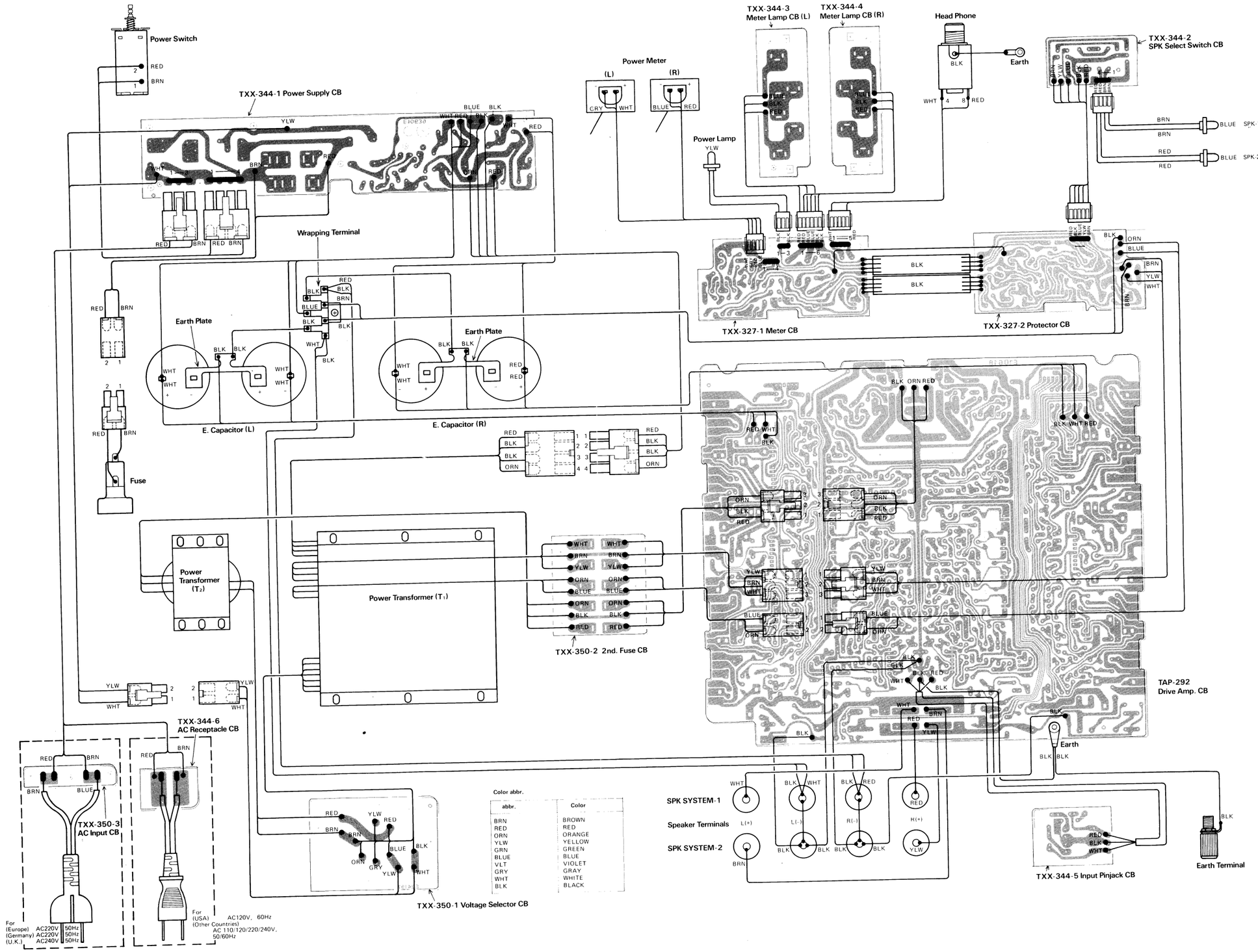


Fig. B

Item No.	Part Number	Extension Cord		
		No. of Pin	Cord Color	Connection
①	E03887-007	6		TXX-327-1 Meter P.C. Board
②	E03887-008	9		TXX-327-2 Protector P.C. Board
③	E03887-009	2	White / Yellow	Primary to Voltage Selector
④	E03887-010	4	Red / Black / Black / Orange	Secondary Toroidal Core Transformer
⑤	E03887-011	3	Yellow / Brown / White	"
⑥	E03887-012	2	Blue / Orange	"
⑦	E03887-013	2	Brown / Red	Primary Fuse
⑧	E03887-014	3	Red / Black / Orange	Secondary EI Core Transformer

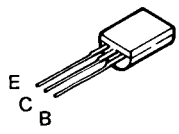
4. Connection Diagram



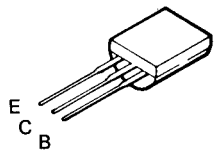
M-L10 Schematic Diagram & Block Diagram

Appearance of Transistors, ICs and Diodes

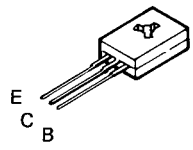
Transistors



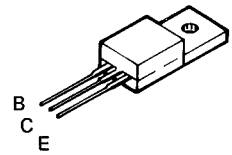
2SA872AV(D,E)
2SA970(GR,BL)
2SA1084(D,E)
2SC1775AV(E,F)
2SC2240(GR,BL)
2SC2546(E,F)



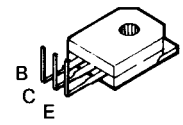
2SA965(O,Y)
2SA1208(S,T)
2SC2235(O,Y)
2SC2910(S,T)



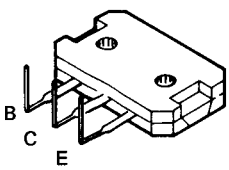
2SA1210(S,T)
2SB649A(B,C)
2SC1568(R,S)
2SC2912(S,T)
2SD669A(B,C)



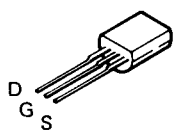
2SA968B(O)
2SB536(L,M)
2SC2238B(O)



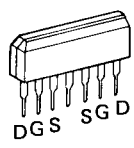
2SB828UA(R)
2SD1064UA(R)



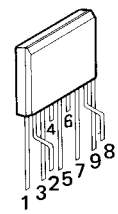
2SA1095LB(O)
2SC2565LB(O)



2SK246(BL,V)



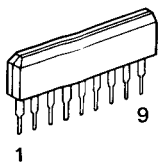
2SK150A(BL)



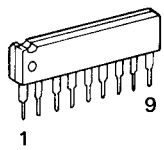
μPA75V(P,F)

1 . . . B1
2 . . . C1
3 . . . E1
4 . . . NC
5 . . . SUB
6 . . . NC
7 . . . E2
8 . . . C2
9 . . . B2

Integrated Circuits

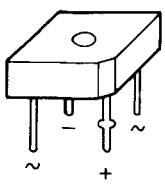


TA7317P
TA7318P(I)

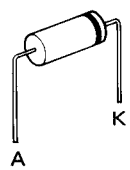


VC5022(X,Y)

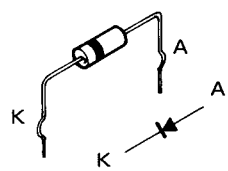
Diodes



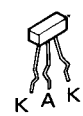
PB102F-6



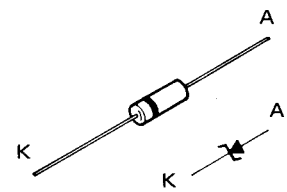
30DF2FA-2



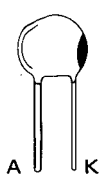
10DF2FD



S2VC20
S2VC20R

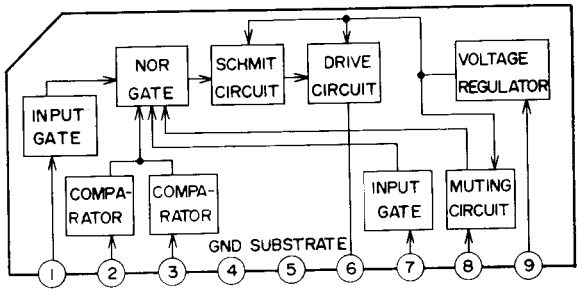


RD4.7EB2
RD6.2EB3
1S2076-31
1SS81
1S1925
HZ3ALL
HZ6B1L
HZ6C1L

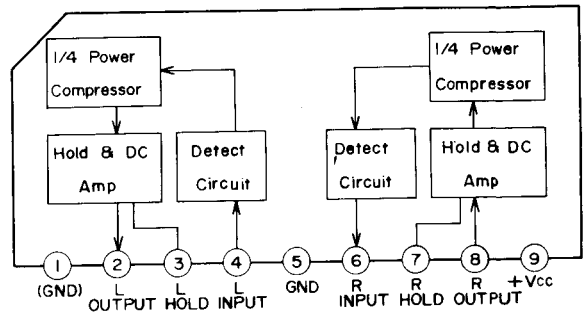


VD1220

TA7317P



TA7318P



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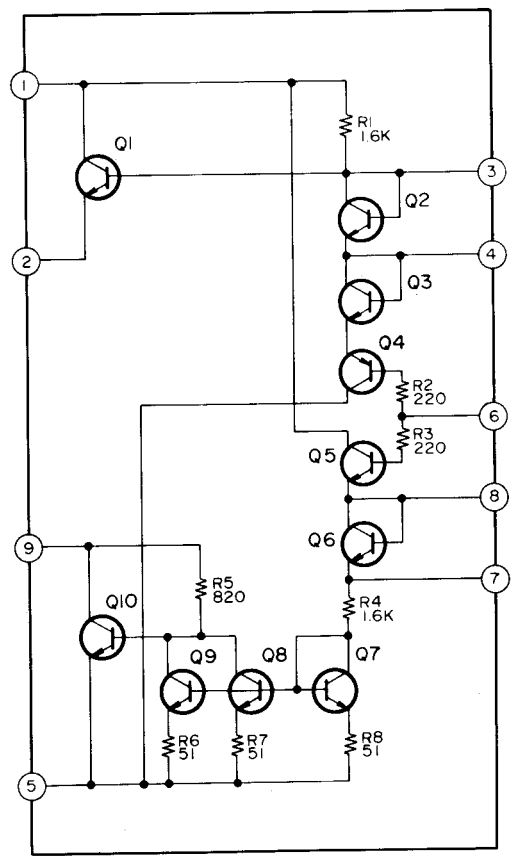
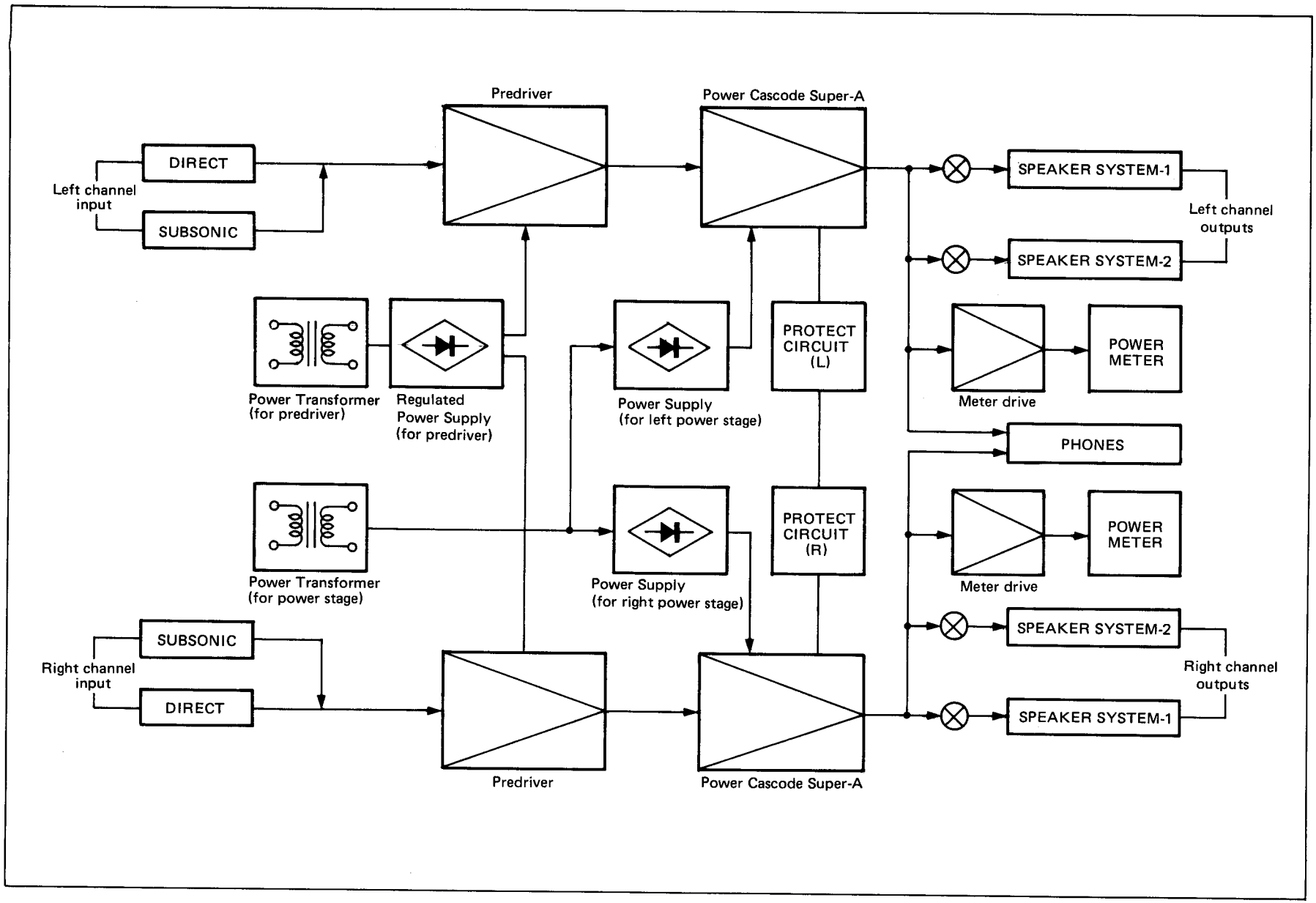


Block Diagram



JVC

VICTOR COMPANY OF JAPAN, LIMITED, TOKYO, JAPAN

Printed in Japa

M-L10

PARTS MANUAL

Contents

1. Main Parts Locations

1-(1) Front View

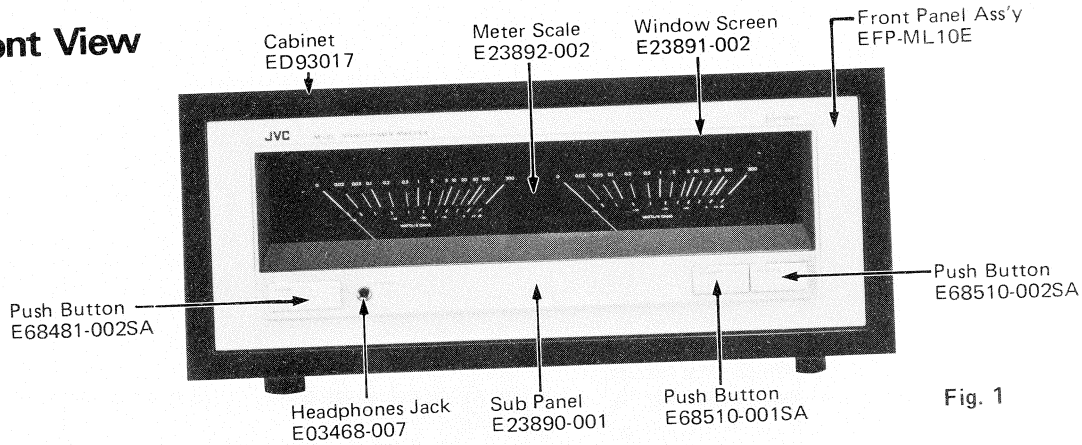


Fig. 1

1-(2) Rear View

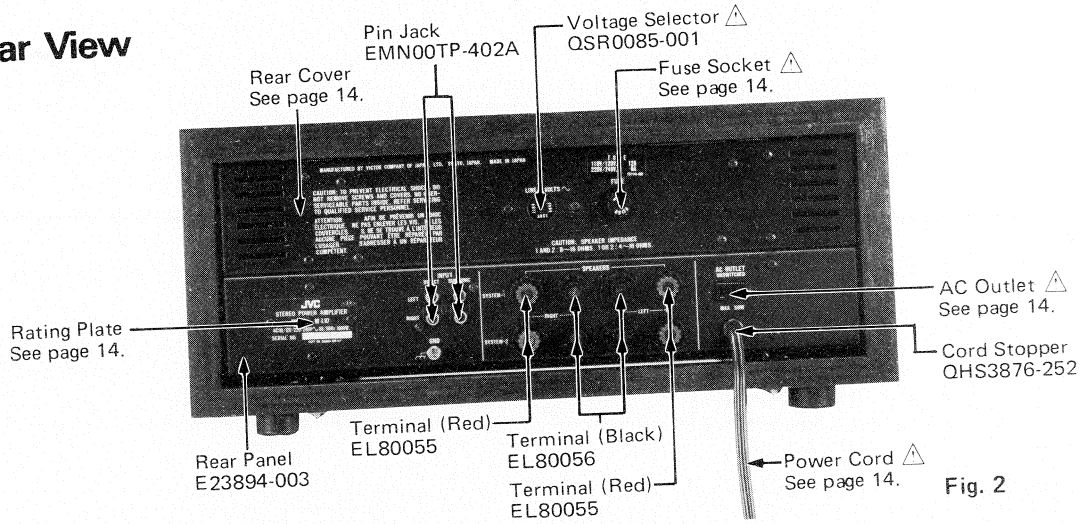


Fig. 2

1-(3) Top View

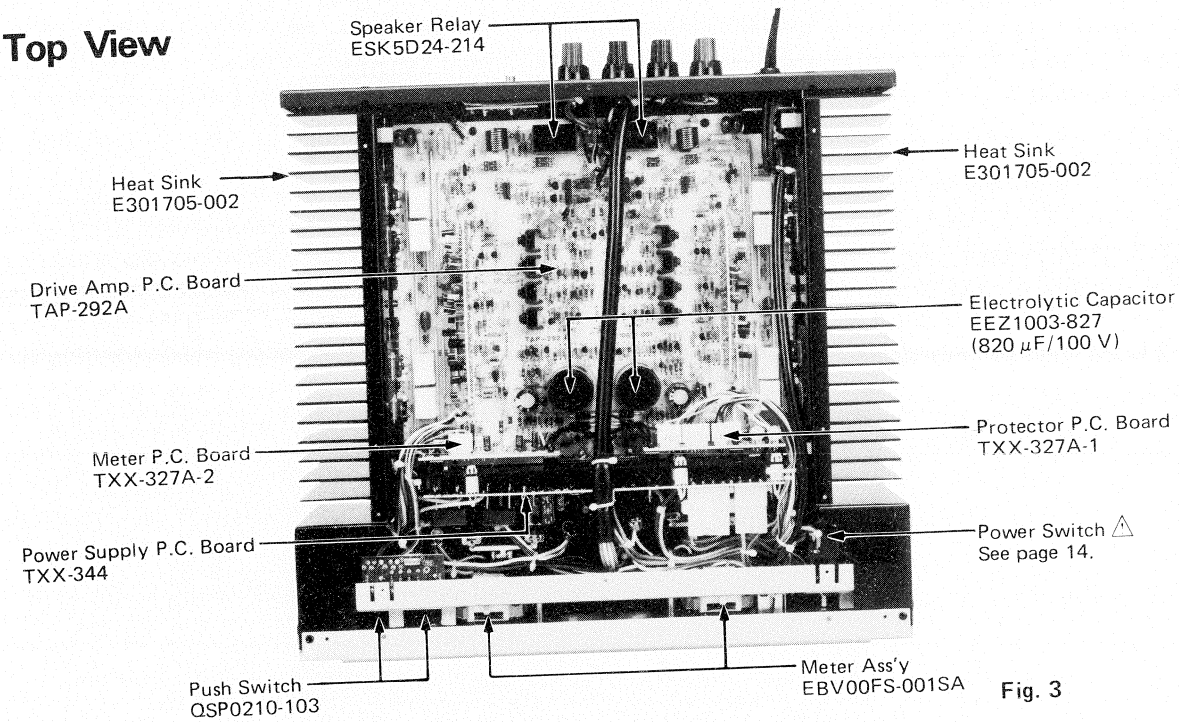


Fig. 3

2. Exploded View and Part Numbers

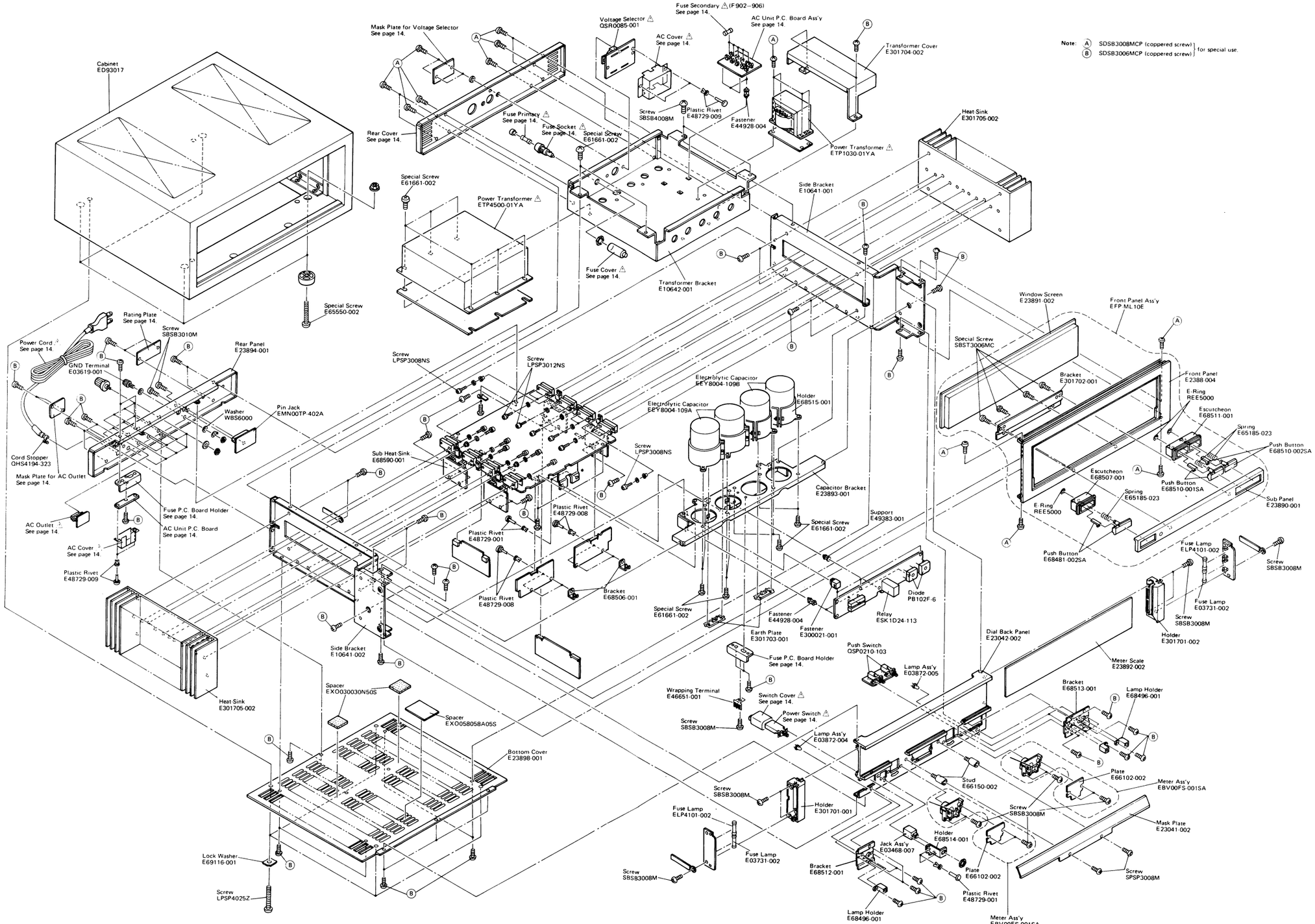


Fig. 4

3. Printed Circuit Board Ass'y and Parts List

3-(1) TXX-327A Protector & Meter P.C. Board Ass'y

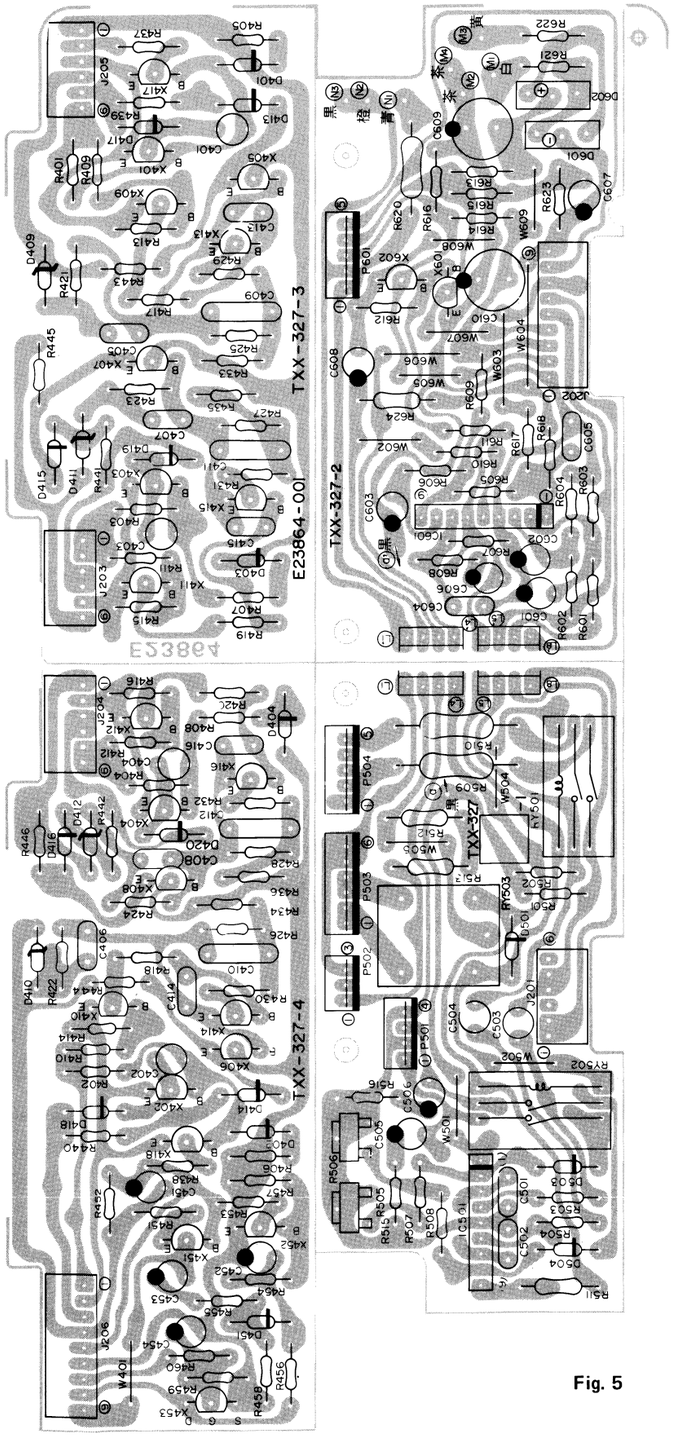


Fig. 5

Note:
The symbols (赤、黒、白 ...etc.) on P.C. Board surface are factory process only.

Transistors

Item No.	Part Number	Rating		Description	
		Pc	fT		Maker
X401	2SC2240(GR,BL)			Silicon	Toshiba
X402	2SC2240(GR,BL)			"	Sanyo
X403	2SA970(GR,BL)			"	Toshiba
X404	2SA970(GR,BL)			"	"
X405	2SA965(O,Y)			"	"
X406	2SA965(O,Y)			"	"
X407	2SC2235(O,Y)			"	"
X408	2SC2235(O,Y)			"	"
X409	2SC2910(S,T)			"	Sanyo
X410	2SC2910(S,T)			"	"
X411	2SA1208(S,T)			"	"
X412	2SA1208(S,T)			"	Toshiba
X413	2SA970(GR,BL)			"	"
X414	2SA970(GR,BL)			"	"
X415	2SC2240(GR,GL)			"	"
X416	2SC2240(GR,BL)			Silicon	Toshiba
X417	2SC2910(S,T)			"	Sanyo
X418	2SA970(GR,BL)			"	Toshiba
X451	2SA970(GR,BL)			"	"
X452	2SC2240(GR,BL)			"	"
X453	2SK246(BL,V)			F.E.T.	"
X601	2SC2240(GR,BL)			Silicon	"
X602	2SC2240(GR,BL)			"	"

Integrated Circuits

Item No.	Part Number	Description	Maker
IC501	TA7318P(1)		Toshiba
IC601	TA7317P		"

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D401	1SS81		Silicon	Hitachi
D402	1SS81		"	"
D403	1SS81		"	"
D404	1SS81		"	"
D409	RD6.2EB3		Zener	NEC
D410	RD6.2EB3		"	"
D411	RD6.2EB3		"	"
D412	RD6.2EB3		"	"
D413	1SS81		Silicon	Hitachi
D414	1SS81		"	"
D415	1SS81		"	"
D416	1SS81		"	"
D417	1S2076-31		"	"
D418	1S2076-31		"	"
D419	1S2076-31		"	"
D420	1S2076-31		"	"
D451	1S2076-31		"	"
D501	1S2076-31		"	"
D503	1S1925		"	Dainichi
D504	1S1925		"	"
D601	S2VC20R		"	Shindengen
D602	S2VC20		"	"

Capacitors

Item No.	Part Number	Rating		Description
C401	QFS81HJ-471	470 pF	50 V	Polystyrene
C402	QFS81HJ-471	"	"	"
C403	QFS81HJ-471	"	"	"
C404	QFS81HJ-471	"	"	"
C405	QFM81HJ-122	1200 pF	"	Mylar
C406	QFM81HJ-122	"	"	"
C407	QFM81HJ-122	"	"	"
C408	QFM81HJ-122	"	"	"
C409	EFZ0091-103	0.01 μF	"	M. Mylar
C410	EFZ0091-103	"	"	"
C411	EFZ0091-103	"	"	"
C412	EFZ0091-103	"	"	"
C413	QFM81HJ-102	1000 pF	"	Mylar
C414	QFM81HJ-102	"	"	"
C415	QFM81HJ-102	"	"	"
C416	QFM81HJ-102	"	"	"
C451	QET52AR-475	4.7 μF	100 V	Electrolytic
C452	QET51ER-226	22 μF	25 V	"
C453	QET52AR-475	4.7 μF	100 V	"
C454	QET51HR-106	10 μF	50 V	"
C501	QFM81HJ-332	3300 pF	"	Mylar
C502	QFM81HJ-332	"	"	"
C503	QEZ0046-105	1 μF	"	Non-Pole
C504	QEZ0046-105	"	"	"
C505	QET51AR-476	47 μF	10 V	Electrolytic
C506	QET51AR-476	"	"	"
C601	QET51AR-476	"	"	"
C602	QET51AR-476	"	"	"
C603	QET51CR-226	22 μF	16 V	"
C604	QFM81HJ-153	0.015 μF	50 V	Mylar
C605	QFM81HJ-222	2200 pF	"	"
C606	QET51HR-474	0.47 μF	"	Electrolytic
C607	QET51HR-106	10 μF	"	"
C608	QET51HR-475	4.7 μF	"	"
C609	QET51VR-227	220 μF	35 V	"
C610	QET51VR-227	"	"	"

Resistors

Item No.	Part Number	Rating		Description
R401	QRD141J-102S	1 kΩ	1/4 W	Carbon
R402	QRD141J-102S	"	"	"
R403	QRD141J-102S	"	"	"
R404	QRD141J-102S	"	"	"
R405	QRD141J-273S	27 kΩ	"	"
R406	QRD141J-273S	"	"	"
R407	QRD141J-273S	"	"	"
R408	QRD141J-273S	"	"	"
R409	QRD141J-122S	1.2 kΩ	"	"
R410	QRD141J-122S	"	"	"
R411	QRD141J-122S	"	"	"
R412	QRD141J-122S	"	"	"
R413	QRD141J-821S	820 Ω	"	"
R414	QRD141J-821S	"	"	"
R415	QRD141J-821S	"	"	"
R416	QRD141J-821S	"	"	"
R417	QRD141J-682S	6.8 kΩ	"	"
R418	QRD141J-682S	"	"	"
R419	QRD141J-682S	"	"	"
R420	QRD141J-682S	"	"	"
R421	QRZ0052-102	1 kΩ	"	Fusible ⚠
R422	QRZ0052-102	"	"	"
R423	QRZ0052-102	"	"	"
R424	QRZ0052-102	"	"	"
R425	QRD141J-223S	22 kΩ	"	Carbon
R426	QRD141J-223S	"	"	"
R427	QRD141J-223S	"	"	"
R428	QRD141J-223S	"	"	"
R429	QRD141J-101S	100 Ω	"	"
R430	QRD141J-101S	"	"	"
R431	QRD141J-101S	"	"	"
R432	QRD141J-101S	"	"	"
R433	QRD141J-682S	6.8 kΩ	"	"
R434	QRD141J-682S	"	"	"
R435	QRD141J-682S	"	"	"
R436	QRD141J-682S	"	"	"
R437	QRD141J-123S	12 kΩ	"	"
R438	QRD141J-123S	"	"	"
R439	QRZ0052-150	15 Ω	"	Fusible ⚠
R440	QRZ0052-150	"	"	"
R441	QRZ0052-150	"	"	"
R442	QRZ0052-150	"	"	"
R443	QRD141J-104S	100 kΩ	"	Carbon
R444	QRD141J-104S	"	"	"
R445	QRD141J-104S	"	"	"
R446	QRD141J-104S	"	"	"
R451	QRZ0052-222	2.2 kΩ	"	Fusible ⚠
R452	QRD141J-103S	10 kΩ	"	Carbon
R453	QRD141J-223S	22 kΩ	"	"
R454	QRD148J-224S	220 kΩ	"	"
R455	QRD141J-333S	33 kΩ	"	"
R456	QRD141J-471S	470 Ω	"	"
R457	QRD141J-474S	470 kΩ	"	"
R458	QRD141J-223S	22 kΩ	"	"
R459	QRD141J-102S	1 kΩ	"	"
R460	QRD141J-222S	2.2 kΩ	"	"
R501	QRD141J-224S	220 kΩ	"	"
R502	QRD141J-224S	"	"	"
R503	QRD141J-683S	68 kΩ	"	"
R504	QRD141J-683S	"	"	"
R505	QVP9A0B-471	470 Ω		Variable
R506	QVP9A0B-471	"		"
R507	QRD141J-821S	820 Ω	1/4 W	Carbon
R508	QRD141J-821S	"	"	"
R509	QRG027J-471	470 Ω	2 W	O.M. Film ⚠
R510	QRG027J-471	"	"	"
R511	QRD129J-122	1.2 kΩ	1/2 W	UFN. Carbon ⚠
R512	QRD129J-560	56 Ω	"	"
R513	QRD129J-560	"	"	"
R515	QRD141J-102S	1 kΩ	1/4 W	Carbon

⚠ : Safety parts

M-L10
No. 2620

Resistors

Item No.	Part Number	Rating		Description
R516	QRD141J-102S	1 kΩ	1/4 W	Carbon
R601	QRD141J-683S	68 kΩ	"	"
R602	QRD141J-683S	"	"	"
R603	QRD141J-273S	27 kΩ	"	"
R604	QRD141J-273S	"	"	"
R605	QRD141J-683S	68 kΩ	"	"
R606	QRD141J-224S	220 kΩ	"	"
R607	QRD141J-223S	22 kΩ	"	"
R608	QRD141J-563S	56 kΩ	"	"
R609	QRD141J-103S	10 kΩ	"	"
R610	QRD141J-272S	27 kΩ	"	"
R611	QRD141J-333S	33 kΩ	"	"
R612	QRD141J-103S	10 kΩ	"	"
R613	QRD141J-223S	22 kΩ	"	"
R614	QRD141J-223S	"	"	"
R615	QRD141J-152S	1.5 kΩ	"	"
R616	QRD141J-152S	"	"	"
R617	QRD141J-473S	47 kΩ	"	"
R618	QRD141J-124S	120 kΩ	"	"
R620	QRX017J-1R0	1 Ω	1 W	Metal Film ⚠
R623	QRD141J-183S	18 kΩ	1/4 W	Carbon
R624	QRD129J-102	1 kΩ	1/2 W	UNF. Carbon ⚠

⚠ : Safety parts

Others

Item No.	Part Number	Rating	Description
	E23864-001		Circuit Board
J201	E04364-006A		6P Socket
J202	E04364-009A		9P Socket
J203	E04364-006A		6P Socket
J204	E04364-006A		"
J205	E04364-006A		"
J206	E04364-009A		9P Socket
J3	EWS052-007		2P Socket
J4	EWS053-013		3P Socket
P501	QMV5005-004		4P Plug
P502	QMV5005-003		3P Plug
P503	QMV5005-006		6P Plug
P504	QMV5005-005		5P Plug
P601	QMV5005-005		"
RY501	ESK2D24-213		Relay
RY502	ESK2D24-213		"
RY503	ESK1D24-115		"

3-(2) TXX-350□ AC Unit P.C. Board Ass'y

Note: TXX-350□-1 varies according to areas employed. See note (1) when placing an order.

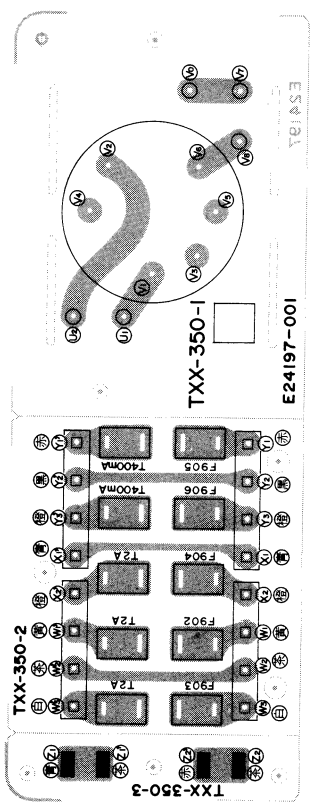


Fig. 6

Note (1):

Designated Areas	P.C. Board Ass'y
Europe & U.K.	TXX-350Ⓑ-1
U.S.A. & Other Areas	TXX-350Ⓐ-1

Note (2): The symbols (赤、黒、白 ····· etc.) on P.C. Board surface are factory process only.

Others

Item No.	Part Number	Rating	Description
	E24197-001		Circuit Board
	QSR0085-001		Rotary Switch (Voltage Selector)⚠
	E67764-104		Terminal
	E43727-002		Tab
	E65508-002		Tab (for B only)
	EMG7331-001		Fuse Clip
	E61380-011		Fuse Label (2 A/125 V) for Ⓐ only
	E61380-029		Fuse Label (1.25 A/125 V) for Ⓐ only
J901	EWS053-014		3P Socket
P009	EWS112-003		2P Plug
P901	EWS062-008		"
P902	EWS063-014		3P Plug

3-(3) TXX-344□ Power Supply P.C. Board Ass'y

Note: TXX-344□-1 varies according to areas employed. See note (1) when placing an order.

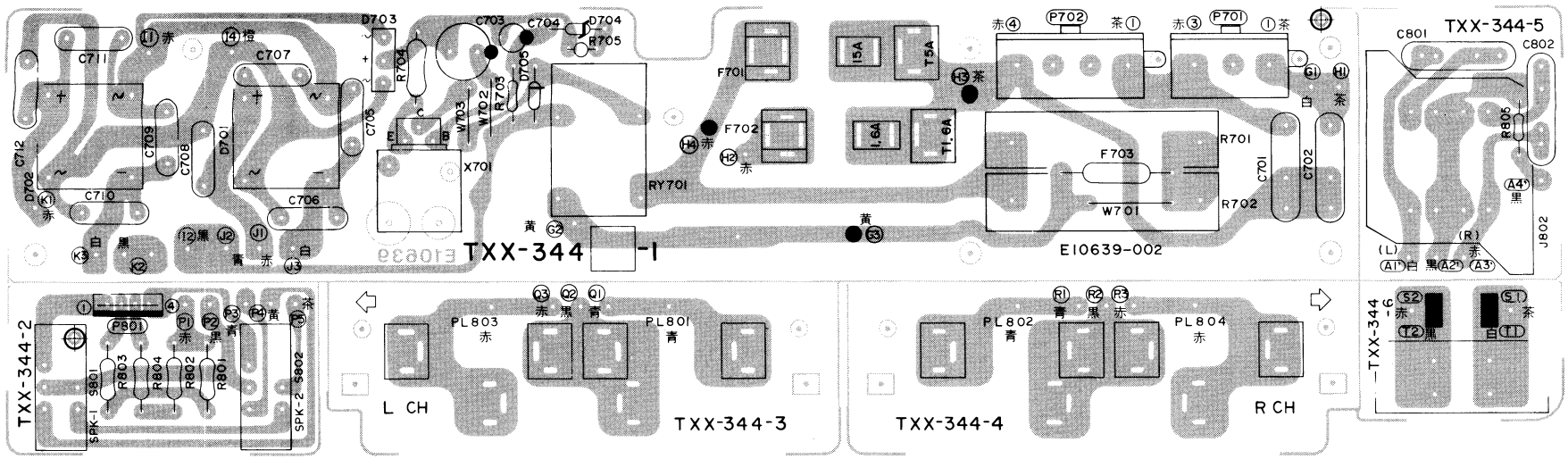


Fig. 7

Transistor

Item No.	Part Number	Rating	Description	
				Maker
X701	2SB536(L,M)		Silicon	NEC

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D701	PB102F-6		Silicon	Nippon Inter
D702	PB102F-6		"	"
D703	S2VC20		"	Shindengen
D704	RD4.7EB2		Zener	NEC
D705	1S2076-31		Silicon	Hitachi

Thermistor

Item No.	Part Number	Rating	Description	
				Maker
R705	SDT35			Sanyo

Capacitors

Item No.	Part Number	Rating		Description
C701	QFZ9010-103	0.01 μF	250 V	M. Mylar
C702	QFZ9010-103	"	"	"
C703	QET52AR-476	47 μF	100 V	Electrolytic
C704	QET51CR-226	22 μF	16 V	"
C801	QFZ0074-104	0.1 μF	250 V	M. Mylar
C802	QFZ0074-104	"	"	"

Resistors

Item No.	Part Number	Rating		Description
R701	QRF106K-6R8M	6.8 Ω	10 W	Cement ⚠
R702	QRF106K-6R8M	"	"	"
R703	QRD148J-393S	39 kΩ	1/4 W	Carbon
R704	QRD129J-121	120 Ω	1/2 W	UNF. Carbon ⚠
R801	QRD129J-560	56 Ω	"	"
R802	QRD129J-560	"	"	"
R803	QRD129J-560	"	"	"
R804	QRD129J-560	"	"	"

⚠ : Safety parts

Others

Item No.	Part Number	Rating	Description
	E10639-002		Circuit Board
	EWS112-003		2P Plug
	EWS102-002		2P Socket
	QMC0231-004		AC Outlet (for B only) ⚠
	E45524-002		Fuse Clip
	SBSB3008M		Screw
	SBSB3012M		"
	E61537-001		Heat Sink
J802	EMN00TP-402A		Pin Jack (Input)
P701	E04362-003		3P Plug (AC)
P702	E04362-004		4P Plug (Push Switch)
P801	QMV5005-004		4P Plug
S801	QSP0210-103		Push Switch (Speakers)
S802	QSP0210-103		" (")
RY701	ESK1D24-113		Relay

⚠ : Safety parts

Note (1):

Designated Areas	P.C. Board Ass'y
Europe & U.K.	TXX-344D-1
U.S.A. & Other Areas	TXX-344B-1

Note (2):

The symbols (赤、黒、白 ····· etc.) on P.C. Board surface are factory process only.

3-(4) TAP-292A Drive Amp. P.C. Board Ass'y

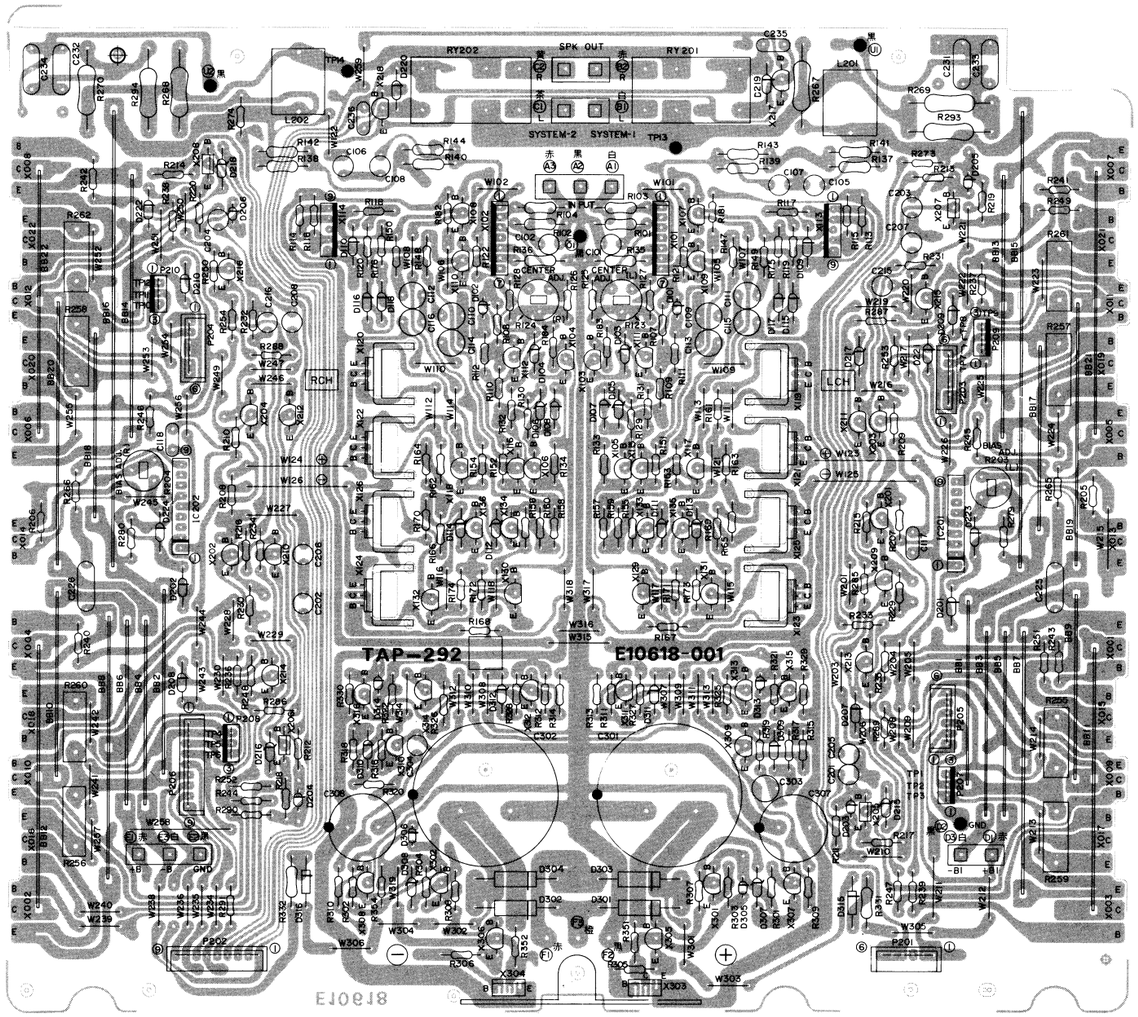


Fig. 8

Note: The symbols (赤、黒、白 ····· etc.) on P.C. Board surface are factory process only.

Transistors

Item No.	Part Number	Rating	Description	
				Maker
X101	2SK150A(BL)		F.E.T.	Toshiba
X102	2SK150A(BL)		"	"
X103	2SA1084(D,E)		Silicon	Hitachi
X104	2SA1084(D,E)		"	"
X105	2SC2910(S,T)		"	Sanyo
X106	2SC2910(S,T)		"	"
X107	2SC2910(S,T)		"	"
X108	2SC2910(S,T)		"	"
X109	2SC2910(S,T)		"	"
X110	2SC2910(S,T)		"	"
X111	2SA1084(D,E)		"	Hitachi
X112	2SA1084(D,E)		"	"
X113	UPA75V(P,F)		"	NEC
X114	UPA75V(P,F)		"	"
X115	2SA1084(D,E)		"	Hitachi

Transistors

Item No.	Part Number	Rating	Description	
				Maker
X116	2SA1084(D,E)		Silicon	Hitachi
X117	2SA1084(D,E)		"	"
X118	2SA1084(D,E)		"	"
X119	2SA1210(S,T)		"	Sanyo
X120	2SA1210(S,T)		"	"
X121	2SA1210(S,T)		"	"
X122	2SA1210(S,T)		"	"
X123	2SA1210(S,T)		"	"
X124	2SA1210(S,T)		"	"
X125	2SC2912(S,T)		"	"
X126	2SC2912(S,T)		"	"
X129	2SC2546(E,F)		"	Hitachi
X130	2SC2546(E,F)		"	"
X131	2SC2546(E,F)		"	"
X132	2SC2546(E,F)		"	"
X133	2SC2546(E,F)		"	"
X134	2SC2546(E,F)		"	"
X135	2SA1084(D,E)		"	"
X136	2SA1084(D,E)		"	"
X201	2SC2240(GR,BL)		"	Toshiba
X202	2SC2240(GR,BL)		"	"
X203	2SA970(GR,BL)		"	"
X204	2SA970(GR,BL)		"	"
X205	2SA1210(S,T)		"	Sanyo
X206	2SA1210(S,T)		"	"
X207	2SC2912(S,T)		"	"
X208	2SC2912(S,T)		"	"
X209	2SA1084(D,E)		"	Hitachi
X210	2SA1084(D,E)		"	"
X211	2SC2240(GR,BL)		"	Toshiba
X212	2SC2240(GR,BL)		"	"
X213	2SC2235(O,Y)		"	"
X214	2SC2235(O,Y)		"	"
X215	2SA965(O,Y)		"	"
X216	2SA965(O,Y)		"	"
X217	2SC2240(GR,BL)		"	"
X218	2SC2240(GR,BL)		"	"
X301	2SA1084(D,E)		"	Hitachi
X302	2SC2546(E,F)		"	"
X303	2SD669A(B,C)		"	"
X304	2SB649(B,C)		"	"
X305	2SC2546(E,F)		"	"
X306	2SA1084(D,E)		"	"
X307	2SA872AV(D,E)		"	"
X308	2SC1775AV(E,F)		"	"
X309	2SA1084(D,E)		"	"
X310	2SC2546(E,F)		"	"
X311	2SC2546(E,F)		"	"
X312	2SC2546(E,F)		"	"
X313	2SA1084(D,E)		"	"
X314	2SA1084(D,E)		"	"
X315	2SC2240(GR,BL)		"	Toshiba
X316	2SA970(GR,BL)		"	"

Integrated Circuits

Item No.	Part Number	Rating	Description	
				Maker
IC201	VC5022(X,Y)			Rōhm
IC202	VC5022(X,Y)			"

Diodes

Item No.	Part Number	Rating	Description	
				Maker
D101	VD1220		Silicon	NEC
D102	VD1220		"	"
D103	HZ6B1L		Zener	Hitachi
D104	HZ6B1L		"	"
D105	HZ6B1L		"	"
D106	HZ6B1L		"	"
D107	1S2076-31		Silicon	"
D108	1S2076-31		"	"
D109	1S2076-31		"	"
D110	1S2076-31		"	"
D111	HZ3ALL		Zener	"
D112	HZ3ALL		"	"
D113	HZ3ALL		"	"
D114	HZ3ALL		"	"
D115	1S2076-31		Silicon	"
D116	1S2076-31		"	"
D117	1S2076-31		"	"
D118	1S2076-31		"	"
D201	1S2076-31		"	"
D202	1S2076-31		"	"
D203	VD1220		"	NEC
D204	VD1220		"	"
D205	VD1220		"	"
D206	VD1220		"	"
D207	1SS81		"	Hitachi
D208	1SS81		"	"
D209	1SS81		"	"
D210	1SS81		"	"
D215	RD4.7EB2		Zener	NEC
D216	RD4.7EB2		"	"
D217	RD4.7EB2		"	"
D218	RD4.7EB2		"	"
D219	1S2076-31		Silicon	Hitachi
D220	1S2076-31		"	"
D221	1S2076-31		"	"
D222	1S2076-31		"	"
D223	1S2076-31		"	"
D224	1S2076-31		"	"
D301	30DF2FA-2		"	Nippon Inter
D302	30DF2FA-2		"	"
D303	30DF2FA-2		"	"
D304	30DF2FA-2		"	"
D305	VD1220		"	NEC
D306	VD1220		"	"
D307	HZ6C1L		Zener	Hitachi
D308	HZ6C1L		"	"
D309	1S2076-31		Silicon	"
D310	1S2076-31		"	"
D311	HZ6C1L		Zener	"
D312	HZ6C1L		"	"
D313	VD1220		Silicon	NEC
D314	VD1220		"	"
D315	10DF2FD		"	Nippon Inter
D316	10DF2FD		"	"

Coils

Item No.	Part Number	Rating	Description
L201	E04059-R68	0.68 μH	Choke Coil
L202	E04059-R68	"	"

Capacitors

Item No.	Part Number	Rating		Description
C101	QFS81HJ-471	470 pF	50 V	Polystyrene
C102	QFS81HJ-471	"	"	"
C105	QFS82BJ-121	120 pF	125 V	"
C106	QFS82BJ-121	"	"	"
C107	QFS82BJ-151	150 pF	"	"
C108	QFS82BJ-151	"	"	"
C109	QFS81HJ-332	3300 pF	50 V	"
C110	QFS81HJ-332	"	"	"
C111	QFS81HJ-332	"	"	"
C112	QFS81HJ-332	"	"	"
C113	QFS81HJ-472	4700 pF	"	"
C114	QFS81HJ-472	"	"	"
C115	QFS81HJ-472	"	"	"
C116	QFS81HJ-472	"	"	"
C117	QFM41HJ-392N	3900 pF	"	Mylar
C118	QFM41HJ-392N	"	"	"
C201	QFS82BJ-560	56 pF	125 V	Polystyrene
C202	QFS82BJ-560	"	"	"
C203	QFS82BJ-680	68 pF	"	"
C204	QFS82BJ-680	"	"	"
C205	QFS82BJ-470	47 pF	"	"
C206	QFS82BJ-470	"	"	"
C207	QFS82BJ-680	68 pF	"	"
C208	QFS82BJ-680	"	"	"
C215	QFS82BJ-560	56 pF	"	"
C216	QFS82BJ-560	"	"	"
C225	EFZ0091-473	0.047 μF	50 V	M. Mylar
C226	EFZ0091-473	"	"	"
C231	EFZ0091-223	0.022 μF	"	"
C232	EFZ0091-223	"	"	"
C233	EFZ0091-223	"	"	"
C234	EFZ0091-223	"	"	"
C235	QFM81HJ-273	0.027 μF	"	Mylar
C236	QFM81HJ-273	"	"	"
C301	EEZ1003-827	820 μF	100 V	Electrolytic
C302	EEZ1003-827	"	"	"
C303	QFS81HJ-222	2200 pF	50 V	Polystyrene
C304	QFS81HJ-222	"	"	"
C307	EEZ1002-475	4.7 μF	100 V	Electrolytic
C308	EEZ1002-475	"	"	"

Resistors

Item No.	Part Number	Rating		Description
R101	QRV121F-1003	100 kΩ	1/2W	Metal Film ⚠
R102	QRV121F-1003	"	"	"
R103	QRV121F-3300	330 Ω	"	"
R104	QRV121F-3300	"	"	"
R107	QRD141J-473S	47 kΩ	1/4W	Carbon
R108	QRD141J-473S	"	"	"
R109	QRD141J-473S	"	"	"
R110	QRD141J-473S	"	"	"
R111	QRZ0052-271	270 Ω	"	Fusible ⚠
R112	QRZ0052-271	"	"	"
R113	QRZ0052-561	560 Ω	"	"
R114	QRZ0052-561	"	"	"
R115	QRZ0052-561	"	"	"
R116	QRZ0052-561	"	"	"
R117	QRD141J-223S	22 kΩ	"	Carbon
R118	QRD141J-223S	"	"	"
R119	QRD141J-223S	"	"	"
R120	QRD141J-223S	"	"	"
R121	QRZ0052-681	680 Ω	"	Fusible ⚠
R122	QRZ0052-681	"	"	"
R123	QVZ3501-101	100 Ω		Variable
R124	QVZ3501-101	"		"
R125	QRD149J-220S	22 Ω	1/4W	UNF. Carbon ⚠
R126	QRD149J-220S	"	"	"
R127	QRD149J-220S	"	"	"

⚠ : Safety parts

Resistors

Item No.	Part Number	Rating		Description
R128	QRD149J-220S	22 Ω	1/4W	UNF. Carbon ⚠
R129	QRZ0052-102	1 kΩ	"	Fusible ⚠
R130	QRZ0052-102	"	"	"
R131	QRZ0052-222	2.2 kΩ	"	"
R132	QRZ0052-222	"	"	"
R133	QRZ0052-102	1 kΩ	"	"
R134	QRZ0052-102	"	"	"
R135	QRV121F-1500	150 Ω	1/2W	Metal Film ⚠
R136	QRV121F-1500	"	"	"
R137	QRD129J-562	5.6 kΩ	"	UNF. Carbon ⚠
R138	QRD129J-562	"	"	"
R139	QRD129J-562	"	"	"
R140	QRD129J-562	"	"	"
R141	QRD129J-562	"	"	"
R142	QRD129J-562	"	"	"
R143	QRD129J-562	"	"	"
R144	QRD129J-562	"	"	"
R147	QRD141J-120S	12 Ω	1/4W	Carbon
R148	QRD141J-120S	"	"	"
R149	QRD141J-120S	"	"	"
R150	QRD141J-120S	"	"	"
R151	QRD141J-221S	220 Ω	"	"
R152	QRD141J-221S	"	"	"
R153	QRD141J-221S	"	"	"
R154	QRD141J-221S	"	"	"
R155	QRZ0052-101	100 Ω	"	Fusible ⚠
R156	QRZ0052-101	"	"	"
R157	QRZ0052-270	27 Ω	"	"
R158	QRZ0052-270	"	"	"
R159	QRZ0052-270	"	"	"
R160	QRZ0052-270	"	"	"
R161	QRZ0052-102	1 kΩ	"	"
R162	QRZ0052-102	"	"	"
R163	QRD141J-473S	47 kΩ	"	Carbon
R164	QRD141J-473S	"	"	"
R165	QRD141J-473S	"	"	"
R166	QRD141J-473S	"	"	"
R167	QRZ0052-272	2.7 kΩ	"	Fusible ⚠
R168	QRZ0052-272	"	"	"
R169	QRZ0052-471	470 Ω	"	"
R170	QRZ0052-471	"	"	"
R171	QRZ0052-221	220 Ω	"	"
R172	QRZ0052-221	"	"	"
R173	QRZ0052-221	"	"	"
R174	QRZ0052-221	"	"	"
R175	QRZ0052-330	33 Ω	"	"
R176	QRZ0052-330	"	"	"
R181	QRZ0052-681	680 Ω	"	"
R182	QRZ0052-681	"	"	"
R203	QVZ3501-221	220 Ω		Variable
R204	QVZ3501-221	"		"
R205	QRD149J-681S	680 Ω	1/4W	U. Carbon ⚠
R206	QRD149J-681S	"	"	"
R207	QRZ0052-331	330 Ω	"	Fusible ⚠
R208	QRZ0052-331	"	"	"
R209	QRZ0052-331	"	"	"
R210	QRZ0052-331	"	"	"
R211	QRD141J-473S	47 kΩ	"	Carbon
R212	QRD141J-473S	"	"	"
R213	QRD141J-473S	"	"	"
R214	QRD141J-473S	"	"	"
R215	QRZ0052-561	560 Ω	"	Fusible ⚠
R216	QRZ0052-561	"	"	"
R217	QRZ0052-101	100 Ω	"	"
R218	QRZ0052-101	"	"	"
R219	QRZ0052-101	"	"	"
R220	QRZ0052-101	"	"	"
R229	QRZ0052-151	150 Ω	"	"
R230	QRZ0052-151	"	"	"
R231	QRZ0052-101	100 Ω	"	"

⚠ : Safety parts

Resistors

Item No.	Part Number	Rating		Description
R232	QRZ0052-101	100 Ω	1/4W	Fusible ⚠
R233	QRZ0052-680	68 Ω	"	"
R234	QRZ0052-680	"	"	"
R235	QRZ0052-330	33 Ω	"	"
R236	QRZ0052-330	"	"	"
R237	QRZ0052-330	"	"	"
R238	QRZ0052-330	"	"	"
R239	QRZ0052-270	27 Ω	"	"
R240	QRZ0052-270	"	"	"
R241	QRZ0052-270	"	"	"
R242	QRZ0052-270	"	"	"
R243	QRZ0052-270	"	"	"
R244	QRZ0052-270	"	"	"
R245	QRZ0052-270	"	"	"
R246	QRZ0052-270	"	"	"
R247	QRZ0051-4R7	4.7 Ω	"	"
R248	QRZ0051-4R7	"	"	"
R249	QRZ0051-4R7	"	"	"
R250	QRZ0051-4R7	"	"	"
R251	QRZ0051-4R7	"	"	"
R252	QRZ0051-4R7	"	"	"
R253	QRZ0051-4R7	"	"	"
R254	QRZ0051-4R7	"	"	"
R255	ERF027J-R22	0.22 Ω	2W	Cement ⚠
R256	ERF027J-R22	"	"	"
R257	ERF027J-R22	"	"	"
R258	ERF027J-R22	"	"	"
R259	ERF027J-R22	"	"	"
R260	ERF027J-R22	"	"	"
R261	ERF027J-R22	"	"	"
R262	ERF027J-R22	"	"	"
R265	QRZ0051-2R2	2.2 Ω	1/4W	Fusible ⚠
R266	QRZ0051-2R2	"	"	"
R267	QRX027J-100	10 Ω	2W	O.M. Film ⚠
R268	QRX027J-100	"	"	"
R269	QRX027J-100	"	"	"
R270	QRX027J-100	"	"	"
R273	QRZ0052-470	47 Ω	1/4W	Fusible ⚠
R274	QRZ0052-470	"	"	"
R279	QRZ0052-471	470 Ω	"	"
R280	QRZ0052-471	"	"	"
R285	QRZ0052-100	10 Ω	"	"
R286	QRZ0052-100	"	"	"
R287	QRZ0052-100	"	"	"
R288	QRZ0052-100	"	"	"
R289	QRZ0052-330	33 Ω	"	"
R290	QRZ0052-330	"	"	"
R291	QRD141J-471S	470 Ω	"	Carbon
R293	QRX027J-100	10 Ω	2W	O.M. Film ⚠
R294	QRX027J-100	"	"	"
R301	QRD141J-563S	56 kΩ	1/4W	Carbon
R302	QRD141J-563S	"	"	"
R303	QRD149J-221S	220 Ω	"	UNF. Carbon ⚠
R304	QRD149J-221S	"	"	"
R305	QRZ0052-331	330 Ω	"	Fusible ⚠
R306	QRZ0052-331	"	"	"
R307	QRD149J-181S	180 Ω	"	UNF. Carbon ⚠
R308	QRD149J-181S	"	"	"
R309	QRD149J-221S	220 Ω	"	"
R310	QRD149J-221S	"	"	"
R311	QRD141J-473S	47 kΩ	"	Carbon
R312	QRD141J-473S	"	"	"
R313	QRZ0052-432	4.3 kΩ	"	Fusible ⚠
R314	QRZ0052-432	"	"	"
R315	QRD149J-221S	220 Ω	"	UNF. Carbon ⚠
R316	QRD149J-221S	"	"	"
R317	QRD149J-22S	"	"	"
R318	QRD149J-221S	"	"	"
R319	QRD141J-470S	47 Ω	"	Carbon
R320	QRD141J-470S	"	"	"

⚠ : Safety parts

Resistors

Item No.	Part Number	Rating		Description
R321	QRD149J-221S	220 Ω	1/4W	UNF. Carbon ⚠
R322	QRD149J-221S	"	"	"
R325	QRD149J-101S	100 Ω	"	"
R326	QRD149J-101S	"	"	"
R327	QRD141J-473S	47 kΩ	"	Carbon
R328	QRD141J-473S	"	"	"
R329	QRD141J-563S	56 kΩ	"	"
R330	QRD141J-563S	"	"	"
R331	QRD129J-150	15 Ω	1/2W	UNF. Carbon ⚠
R332	QRD129J-150	"	"	"
R351	QRZ0052-4R7	4.7 Ω	1/4W	Fusible ⚠
R352	QRZ0052-4R7	"	"	"
R354	QRD149J-332S	3.3 kΩ	"	UNF. Carbon ⚠

⚠ : Safety parts

Others

Item No.	Part Number	Rating	Description
	E10618-001		Circuit Board
	E67764-102		Terminal
	E67764-103		"
	E301690-001		Bus Bar
	E68474-001		"
	E68475-001		"
	WNS3000		Washer
	LPSP3008M		Screw
	SPSP3008M		"
	E60171-005		Heat Sink
	E68561-001		"
P201	E04363-006		6P Plug
P202	E04363-009		9P Plug
P203	E04363-006		6P Plug
P204	E04363-006		"
P205	E04363-006		"
P206	E04363-009		9P Plug
P207	QMV5005-003		3P Plug
P208	QMV5005-003		"
P209	QMV5005-003		"
P210	QMV5005-003		"
P6	EWS063-012		"
RY201	ESK5D24-214		Relay
RY202	ESK5D24-214		"

4. Packing Materials and Part Numbers

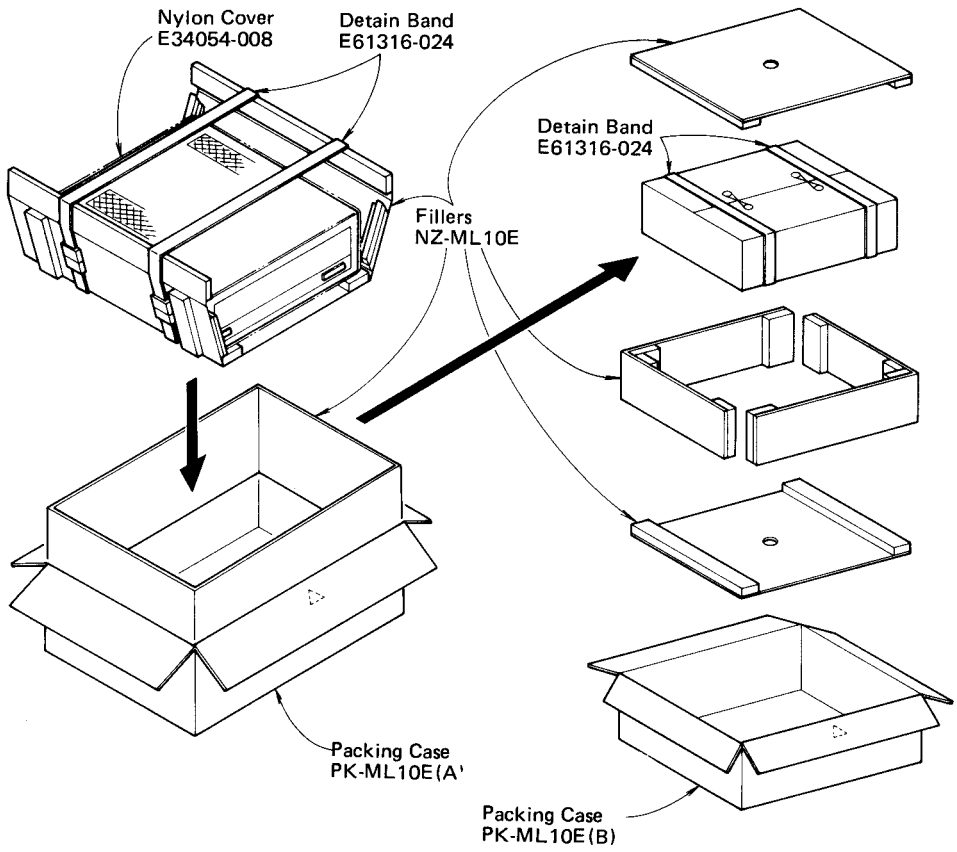


Fig. 9

5. Accessories List

Description	U.S.A.	Europe	U.K.	Other Countries
Instruction Book	E30580-934A	E30580-934A	E30580-934A	E30580-934A
" (Dutch & Spanish)	–	E30580-1049A	–	E30580-1049A
Warranty Card	BT20048	–	BT20013C	–
Polishing Cloth	E65660-001	E65660-001	E65660-001	E65660-001
Service Information Card	BT20046	–	–	–
Safety Instruction Sheet	BT20044D	–	–	–
Fuse Primary ⚠	–	–	–	QMF61M1-120 (110/120 V, 12 A) or QMF61U1-6R0 (220/240 V, 6 A)
Fuse Label	–	–	–	E66188-030 (12 A) or E66188-017 (6 A)
Free-Up Belt	E03709-001	E03709-001	E03709-001	E03709-001
Envelope (for Instruction Book)	E41202-2	E41202-2	E41202-2	E41202-2
" (for Warranty Card)	E66416-003	–	–	–
" (for Fuse)	–	–	–	E41202-1
" (for Power Cord)	QPGA012-03505	QPGA012-03505	QPGA012-03505	QPGA012-03505

⚠ : Safety parts

6. Parts List with Specified Numbers for Designated Areas

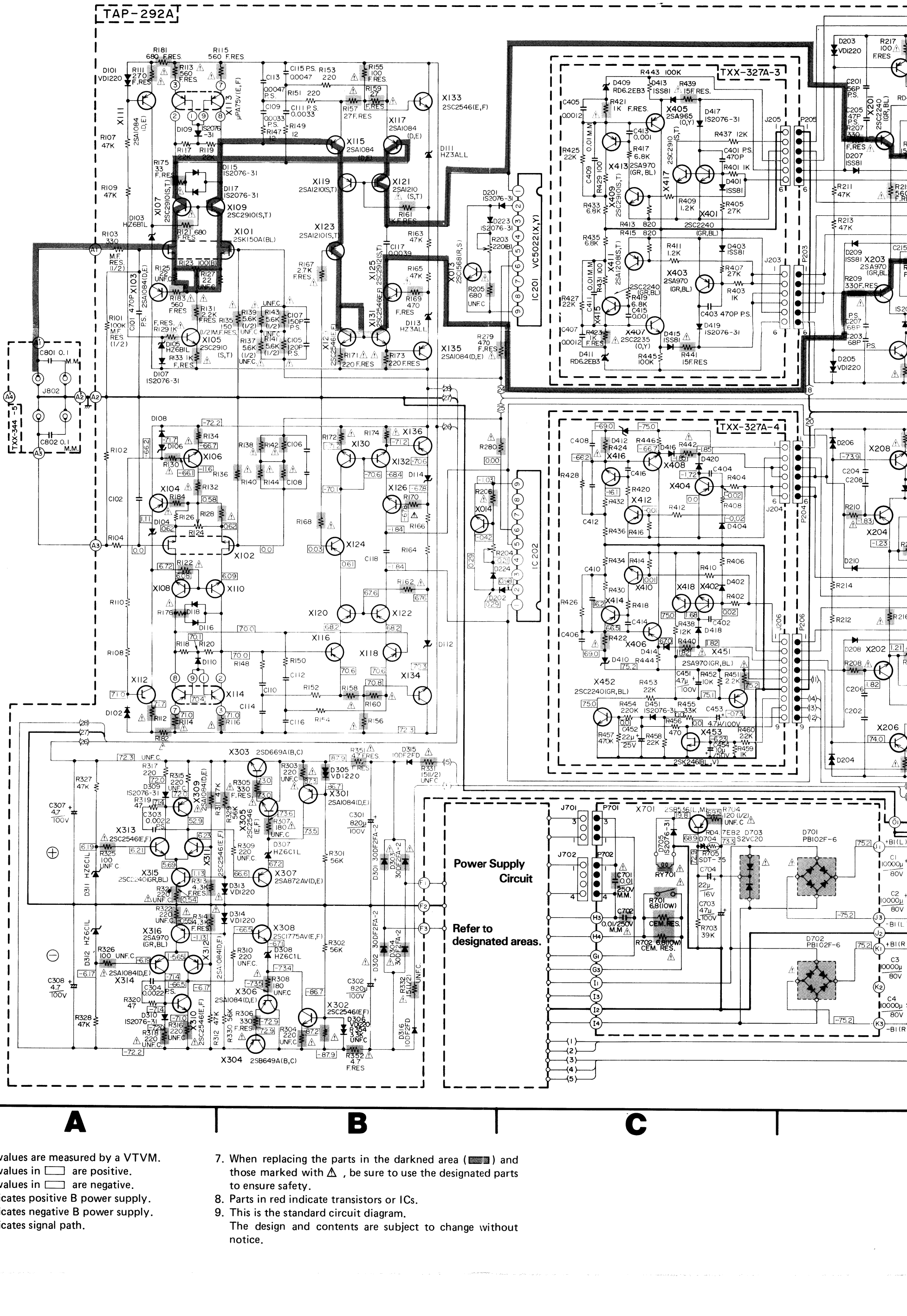
Description	U.S.A.	Europe	U.K.	Other Countries
Power Switch ⚠	QSP1110-310	QSP1106-002	QSP1106-002	QSP1106-002
Switch Cover ⚠	–	E67520-002	E67520-002	–
Power Cord ⚠	QMP1700-244	QMP4400-200 (for Swiss) QMP4100-200 (for Others)	QMP9017-008	QMP1700-244
Siemens Plug ⚠	–	–	–	E04056
AC Outlet ⚠	QMC0231-004	–	–	QMC0231-004
Mask Plate for AC Outlet	–	E66863-002	E66863-002	–
AC Cover for TXX-350-3	–	E69529-001	E69529-001	–
Fuse P.C. Board Holder	–	E47275-003	E47275-003	–
Fuse Socket ⚠	QMG0201-003	QMG0301-003	QMG0301-003	QMG0201-003
Fuse Cover ⚠	–	E69291-001	E69291-001	–
Fuse Primary (F001) ⚠	QMF61M1-120 (120 V, 12 A)	QMF51A2-5R0S (220 V, T5 A)	QMF51A2-5R0S (240 V, T5 A)	QMF61M1-120 (110/120 V, 12 A) or QMF61U1-6R0 (220/240 V, 6 A)
Fuse Secondary (F902, 903) ⚠	QMF51U1-2R0S (2A)	QMF51A2-2R0L (T2A)	QMF51A2-2R0L (T2A)	QMF51U1-2R0S (2A)
Fuse Secondary (F904) ⚠	QMF51U1-2R0S (2A)	QMF51A2-2R0L (T2A)	QMF51A2-2R0L (T2A)	QMF51U1-2R0S (2A)
Fuse Secondary (F905, 906) ⚠	QMF51U1-1R25S (1.25 A)	QMF51A2-R40L (T400 mA)	QMF51A2-R40L (T400 mA)	QMF51U1-1R25S (1.25 A)
Mask Plate for Voltage Selector	E66196-001	E66196-001	E66196-001	–
Cover for TXX-350-1	–	E69528-001	E69528-001	–
Rating Plate	–	E66860-027	E66860-028	E66860-037
AC Unit P.C. Board Ass'y	TXX-350A	TXX-350B	TXX-350B	TXX-350A
Power Supply P.C. Board Ass'y	TXX-344B	TXX-344D	TXX-344D	TXX-344B
Rear Cover	E23896-002	E23896-003	E23896-003	E23896-002

⚠ : Safety Parts

JVC

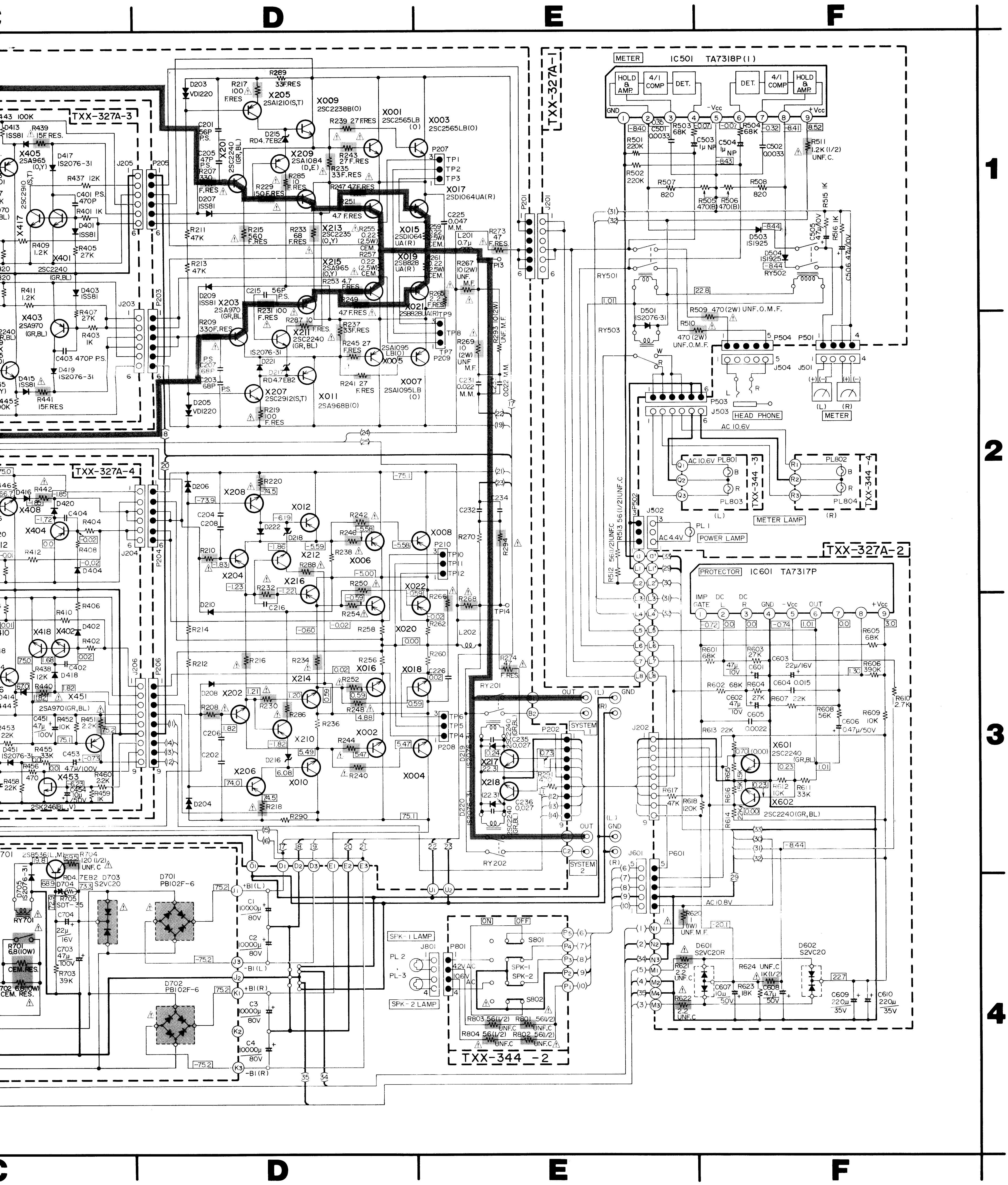
VICTOR COMPANY OF JAPAN, LIMITED, TOKYO, JAPAN

M-L10 Schematic Diagram



Notes:

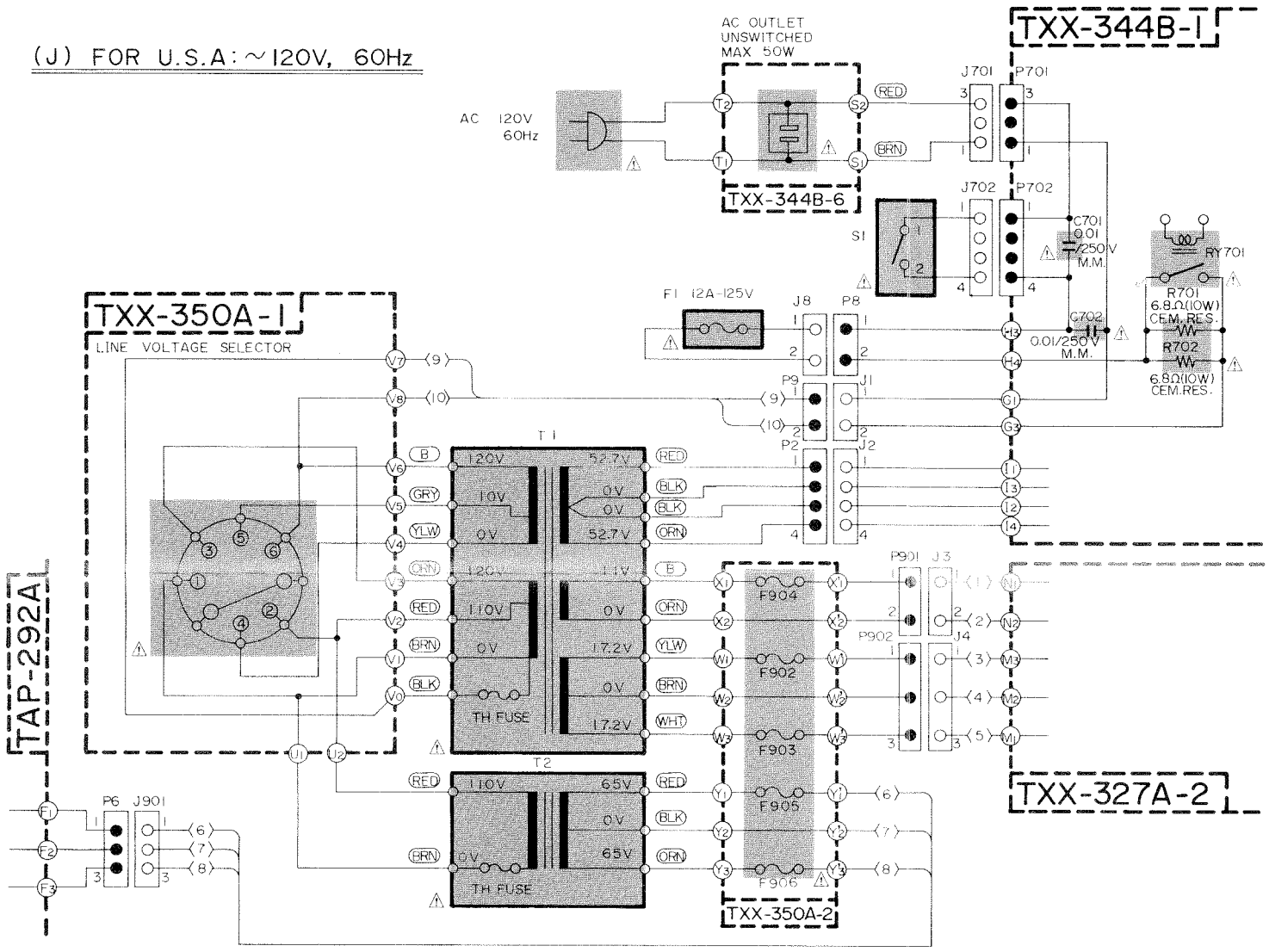
1. Voltage values are measured by a VTVM.
2. Voltage values in ▭ are positive.
3. Voltage values in ▭ are negative.
4. —— indicates positive B power supply.
5. —— indicates negative B power supply.
6. ▬ indicates signal path.
7. When replacing the parts in the darkned area (▬) and those marked with ⚠ , be sure to use the designated parts to ensure safety.
8. Parts in red indicate transistors or ICs.
9. This is the standard circuit diagram.
   The design and contents are subject to change without notice.



C
D
E
F
1
2
3
4
TXX-327A-1
TXX-327A-2
TXX-327A-3
TXX-327A-4
TXX-344-2
TXX-344-3
TXX-344-4
METER
IC501 TA7318P(1)
HOLD & AMP.
4/1 COMP
DET.
GND
-Vcc
+Vcc
R501 220K
R502 220K
R503 68K
R504 68K
C501 0.0033
C502 0.0033
C503 1μ NP
C504 1μ NP
R505 470(B)
R506 470(B)
R507 820
R508 820
R511 1.2K (1/2) UNF.C.
R515 1K
R516 1K
C505 47μ/10V
C506 47μ/10V
D503 1S1925
D504 1S1925
RY501
RY502
RY503
D501 1S2076-31
R509 470(2W) UNF.O.M.F.
R510 470 (2W) UNF.O.M.F.
P504
P501
J504
J501
P503
J503
HEAD PHONE
METER
(L)
(R)
AC 10.6V
PL801
PL802
PL803
PL804
METER LAMP
P502
J502
PL 1
AC 4.4V
POWER LAMP
R512 56(1/2)UNF.C
R513 56(1/2)UNF.C
PROTECTOR
IC601 TA7317P
IMP GATE
DC L
DC R
OUT
R601 68K
R602 68K
R603 27K
R604 27K
R605 68K
R606 390K
R607 22K
R608 56K
R609 10K
R610 2.7K
R611 33K
R612 10K
R613 22K
R614 22K
R615 15K
R616 15K
R617 47K
R618 120K
C601 47μ 10V
C602 47μ 10V
C603 22μ/16V
C604 0.015
C605 0.0022
C606 0.47μ/50V
X601 2SC2240 (GR,BL)
X602 2SC2240(GR,BL)
J202
J601
P601
AC 10.8V
R620 1 (1W) UNF.M.F.
D601 S2VC20R
D602 S2VC20
R621 2.2 UNF.C
R622 2.2 UNF.C
R623 18K
R624 UNF.C 1K(1/2)
C607 10μ 50V
C608 4.7μ 50V
C609 220μ 35V
C610 220μ 35V
X001 2SC2565LB (O)
X003 2SC2565LB(O)
X005 2SA1095 LB(O)
X007 2SA1095LB (O)
X009 2SC2238B(O)
X011 2SA968B(O)
X015 2SD1064 UA(R)
X017 2SD1064UA(R)
X019 2SB828 UA(R)
X021 2SB828UA(R)
X201 2SC2240 (GR,BL)
X203 2SA970 (GR,BL)
X205 2SA1210(S,T)
X207 2SC2912(S,T)
X209 2SA1084 (D,E)
X211 2SC2240 (GR, BL)
X213 2SC2235 (O,Y)
X215 2SA965 (O,Y)
D203 VD1220
D205 VD1220
D207 1SS81
D209 1SS81
D215 RD4.7EB2
D217 RD4.7EB2
D221 1S2076-31
R289 33F.RES
R217 100 F.RES
R219 100 F.RES
R207 330 F.RES
R209 330F.RES
R211 47K
R213 47K
R215 560 F.RES
R229 150F.RES
R231 100 F.RES
R233 68 F.RES
R235 33F.RES
R237 33F.RES
R239 27 F.RES
R241 27 F.RES
R243 27 F.RES
R245 27 F.RES
R247 4.7F.RES
R249 4.7 F.RES
R251 4.7 F.RES
R253 4.7 F.RES
R255 0.22 (2.5W) CEM.
R257 0.22 (2.5W) CEM.
R259 0.22 2.5W CEM.
R261 0.22 2.5W CEM.
R265 2.2 F.RES
R267 10 (2W) UNF. M.F.
R269 10 (2W) UNF M.F.
R273 47 F.RES.
R285 10 F.RES.
R287 10 F.RES.
R293 10(2W) UNF. M.F.
C201 56P P.S.
C203 68P P.S.
C205 47P P.S.
C207 68P P.S.
C215 56P P.S.
C225 0.047 M.M.
C231 0.022 M.M.
C233 0.022 M.M.
L201 0.7μ
P201
J201
P207
TP1
TP2
TP3
P209
TP7
TP8
TP9
TP13
TP14
J203
P203
J205
P205
X405 2SA965 (O,Y)
X417 2SC2910 (S,T)
X401 2SC2240 (GR,BL)
X403 2SA970 (GR,BL)
D413 1SS81
D415 1SS81
D417 1S2076-31
D419 1S2076-31
D401 1SS81
D403 1SS81
R437 12K
R439 15F.RES.
R441 15F.RES
R401 1K
R403 1K
R405 27K
R407 27K
R409 1.2K
R411 1.2K
C401 P.S. 470P
C403 470P P.S.
X002
X004
X006
X008
X010
X012
X016
X018
X020
X022
X202
X204
X206
X208
X210
X212
X214
X216
X217 2SC2240 (GR,BL)
X218 2SC2240 (GR,BL)
D204
D206
D208
D210
D216
D218
D219 1S2076-31
D220 1S2076-31
D222
R208
R210
R212
R214
R216
R218
R220
R230
R232
R234
R236
R238
R240
R242
R244
R246
R248
R250
R252
R254
R256
R258
R260
R262
R266
R268
R270
R274 47 F.RES.
R286
R288
R290
R291 470
R294
C202
C204
C206
C208
C216
C226
C232
C234
C235 0.027
C236 0.027
L202
P208
TP4
TP5
TP6
P210
TP10
TP11
TP12
P202
RY201
RY202
OUT
GND
SYSTEM 1
SYSTEM 2
J204
P204
J206
P206
X402
X404
X408
X418
X451 2SA970(GR,BL)
X453 2SK246(BL,V)
D402
D404
D414
D416
D418
D420
D451 1S2076-31
R402
R404
R406
R408
R410
R412
R438 12K
R440
R442
R451 2.2K
R452 10K
R453 22K
R455 33K
R456 470
R458 22K
R459 1K
R460 22K
C402
C404
C451 4.7μ 100V
C453 4.7μ/100V
C454 10μ 50V
2SB536(L,M)
R704 120 (1/2) UNF. C
RD4.7EB2 D703 S2VC20
D704
D705 1S2076-31
R705 SDT-35
C704 22μ 16V
C703 47μ 100V
R703 39K
RY701
R701 6.8(10W) CEM. RES.
R702 6.8(10W) CEM. RES.
D701 PB102F-6
D702 PB102F-6
+B1(L)
-B1(L)
+B1(R)
-B1(R)
C1 10000μ 80V
C2 10000μ 80V
C3 10000μ 80V
C4 10000μ 80V
SPK-1 LAMP
SPK-2 LAMP
PL 2
PL-3
J801
P801
4.2V AC
10.6V AC
ON
OFF
S801
S802
SPK-1
SPK-2
R801 56(1/2) UNF.C
R802 56(1/2) UNF.C
R803 56(1/2) UNF.C
R804 56(1/2) UNF.C

Power Supply Circuit

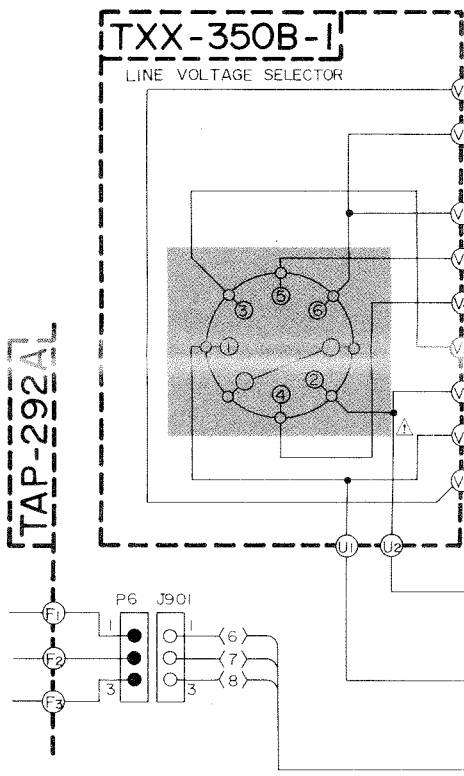
(J) FOR U.S.A: ~120V, 60Hz



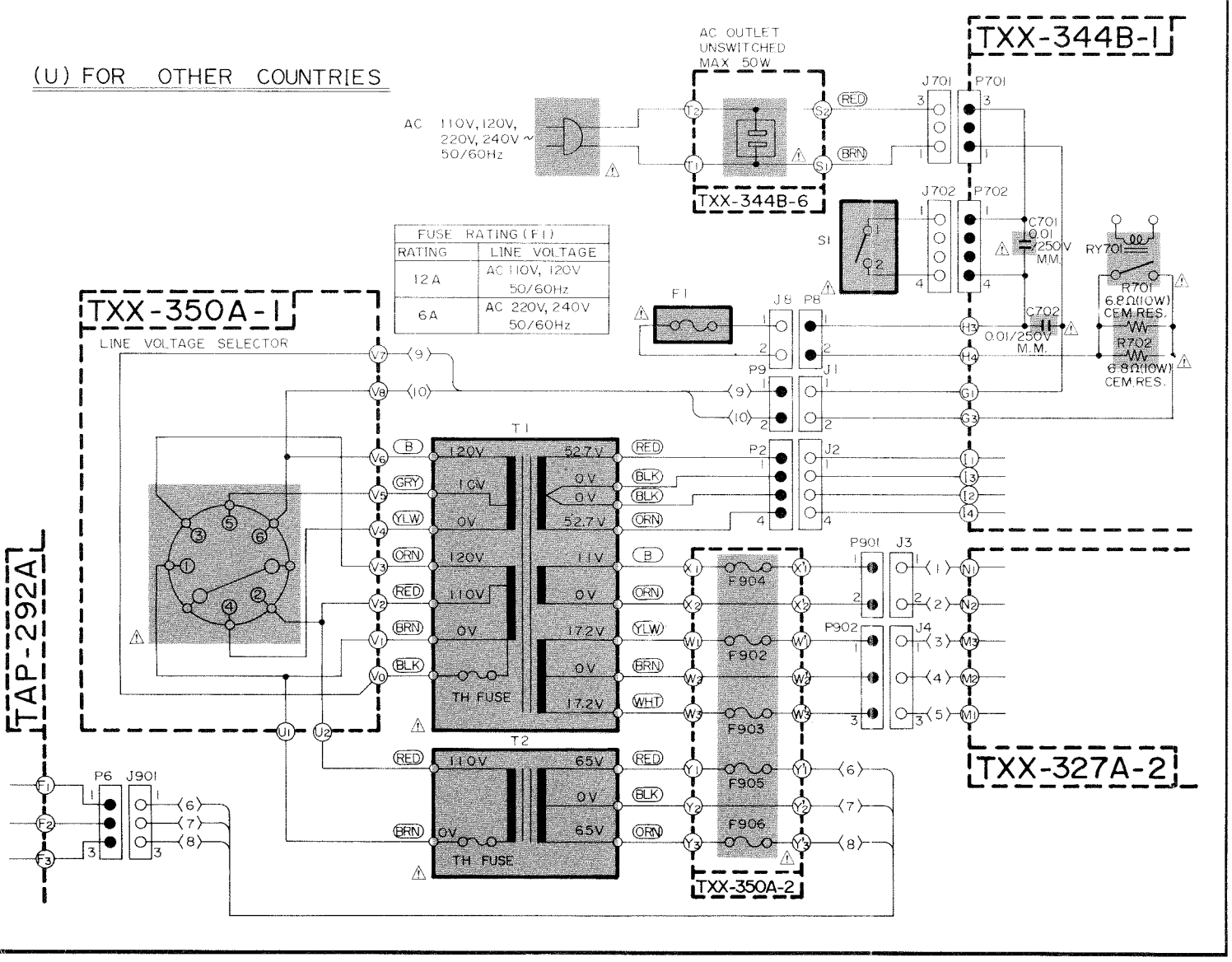
(E), (B)

(E) FOR EUROPE: ~ 220V,

(B) FOR U.K. : ~ 240V,



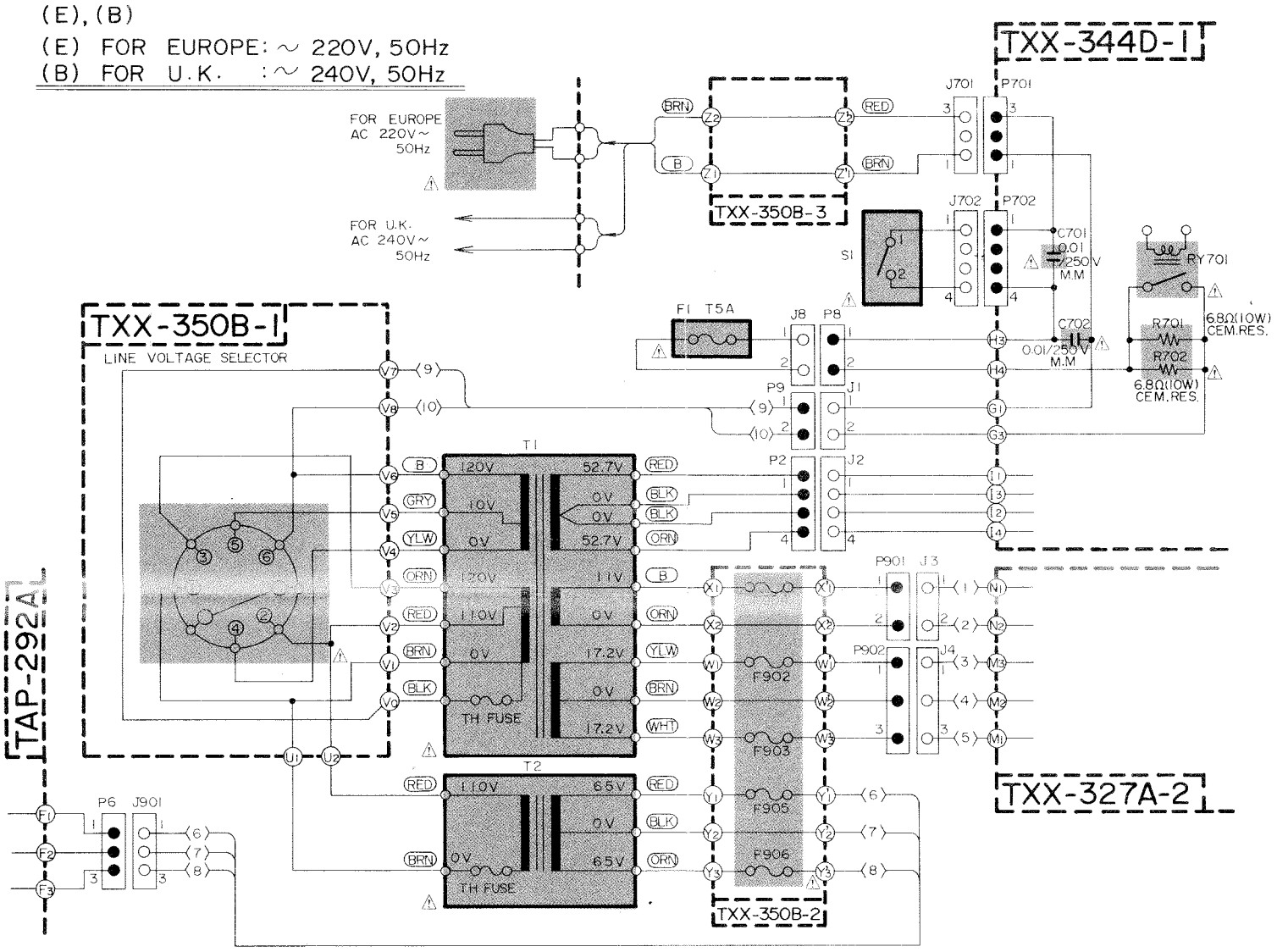
(U) FOR OTHER COUNTRIES



(E),(B)

(E) FOR EUROPE: ~ 220V, 50Hz

(B) FOR U.K. : ~ 240V, 50Hz



VOLTAGE SELECTOR CONNECTION(TOP VIEW)