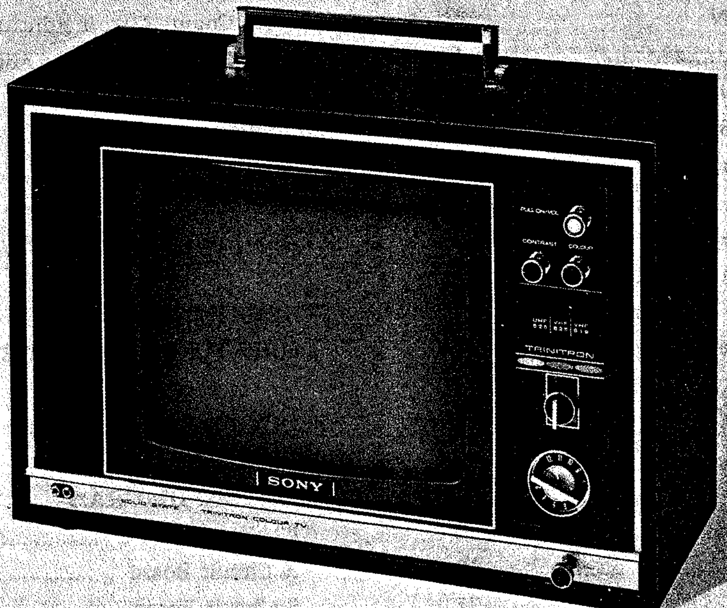
KV-1220DF



TRINITRON® COLOUR TV

SPECIFICATIONS

TV-signal Standards:	French TV standards System E (819 lines) System L (625 lines; SECAM COLOUR system)
Picture Tube:	33 cm (13") 90° deflection TRINITRON system
Semiconductors:	62 transistors, 56 diodes, 1 tube and 1 IC
Channel Coverage:	VHF; ch. F2～F12 UHF; ch. 21～69
Antenna Input Impedance:	75 ohms unbalanced (VHF); dipole antenna and external antenna 75 ohms unbalanced (UHF); parabolic antenna and external antenna
IF Circuit:	4 stages with 2 double tuned and 2 single tuned elements
SIF Circuit:	3 stages with 1 double tuned and 3 single tuned elements
Intermediate Frequency:	Picture i-f carrier; VHF 28.05MHz UHF 32.70MHz Sound i-f carrier; 39.2MHz AM detection
Sound System:	Power output; 1W (at 10% harmonic distortion) Speaker; 8 x 16 cm, 16 ohm voice coil
Video System:	Red, Green and Blue cathode drive system
Colour Signal System:	FM colour signal amplifier 4 stages
Colour Selecting System:	SECAM-IIIb system
Colour Demodulation System:	Direct coupling matrix system
Convergence Correction System:	Horizontal; electrostatic deflection system Vertical; magnetism correction system of magnet
Automatic Controls:	ACC (automatic colour control) ACK (automatic colour killer) ADG (automatic degaussing) ABL (automatic brightness limiter) ARC (automatic resolution control) Mean-value agc Saw-tooth afc
Power Requirements:	AC 110V, 127V, 220V 50Hz
Power Consumption:	AC 95 watts
Jack:	Earphone jack 2 pcs
Dimensions:	508 mm (W) x 358 mm (H) x 395 mm (D)
Weight:	19.7 kg
Accessories:	Earphone ME-20B Polishing cloth VHF dipole antenna (AN-14F) Instruction manual etc.

SONY®

SERVICE MANUAL

TABLE OF CONTENTS

 KV-1220DF

SECTION 1
CIRCUIT DESCRIPTION

1-1. CIRCUIT DE FIXAGE

Ce circuit de fixage définit un niveau noir pour le signal video au début de chaque ligne de balayage. Le niveau moyen du signal vidéo à la sortie du détecteur est maintenu constant grâce au contrôle automatique de gain (AGC) moyennant la valeur moyenne utilisé dans le KV-1220DF. Par conséquent, une image correcte ne peut être obtenue sur l'écran, si le circuit de fixage n'était pas muni.

Le niveau noir du signal vidéo peut être fixé à un certain niveau au moyen du circuit de fixage, on peut alors obtenir une image nette et de haute qualité (voir le schéma du circuit figure 1-1).

Le signal de synchronisation est séparé par Q408 du signal délivré par l'émetteur de Q411 (Amplificateur Y). Le signal de synchronisation qui apparaît sur le collecteur de Q408 est différencié par un filtre passe-haut constitué de C410 (150 pF) et de 2 résistances montées en parallèle (R420: 10 kΩ et R418: 10 k). On obtient alors un signal différencié (voir forme du signal N° ③ figure 1-1) qui est fourni à la base de Q407 (porte de fixage). Le potentiel de l'émetteur de Q407 est plus élévé que celui de la base dans des conditions normales de fonctionnement, Q407 est alors coupé.

Lorsqu'on applique une impulsion négative H à partir de FBT, à l'émetteur, D401 devient conductrice et le potentiel de l'émetteur de Q407 devient potentiel de la masse pendant la durée de l'impulsion. En même temps, l'impulsion différenciée est transmise à la base de Q407. Q407 est allumé uniquement lorsqu'une impulsion différenciée positive est appliquée à sa base. On obtient une impulsion négative sur le collecteur de Q407. Cette impulsion négative est transmise à la base de Q417 (fixatif) à travers une capacité C424 de 1 μF, et le transistor non polarisé Q417 devient conducteur. Alors le signal vidéo est fourni à Q417, à travers C415 (2.2 μF). Le niveau noir du signal vidéo est fixé à la tension de l'émetteur de Q417 car la pulsation de fixage est synchronisée avec le palier arrière du signal vidéo. Voir les relations entre phases en figure 1-1.

Le signal vidéo est fixé à chaque 1 H. On obtient ainsi le juste degré de saturation des couleurs.

1-1. CLAMP CIRCUIT

This clamp circuit fixes a black level of the video signal at the beginning of each scanning line. The average value of the video signal at the detector output is kept constantly due to the mean-value agc circuit employed in KV-1220DF. As the result, if the clamp circuit is not used, the correct picture cannot be obtained on the screen.

Black level of the video signal can be clamped at a certain level by the clamp circuit, and a clear and high quality picture can be obtained. See the schematic diagram in Fig. 1-1.

The sync signal is separated by Q408 from the signal supplied from the emitter of Q411 (Y AMP). Sync signal from the collector of Q408 is differentiated by the high-pass filter consisting of C410 (150pF) and a parallel resistance of R420 (10k) and R418 (10k). Thus the signal shown at ③ is obtained, and is supplied to the base of Q407 (CLAMP GATE). The emitter potential of Q407 is higher than its base potential in a normal condition, and Q407 is cut off.

When the negative H pulse is supplied to the emitter from the FBT, D401 becomes ON and the emitter potential of Q407 becomes ground potential within pulse duration. At the same time the differentiated pulse is supplied to the base of Q407. Q407 conducts only when the positive differentiated pulse is supplied to the base. At the collector of Q407, negative pulse is obtained. This negative pulse is supplied to the base of Q417 (CLAMPER) through C424 (1 μF), and non biased Q417 becomes ON. At that time the video signal is supplied to Q417 through C415 (2.2 μF). The black level of the video signal is clamped to the emitter voltage of Q417, as the clamp pulse is synchronized with the back porch of the video signal. See the phase relation in Fig. 1-1.

The video signal is clamped at each 1 H. Thus the correct degree of color saturation can be obtained.

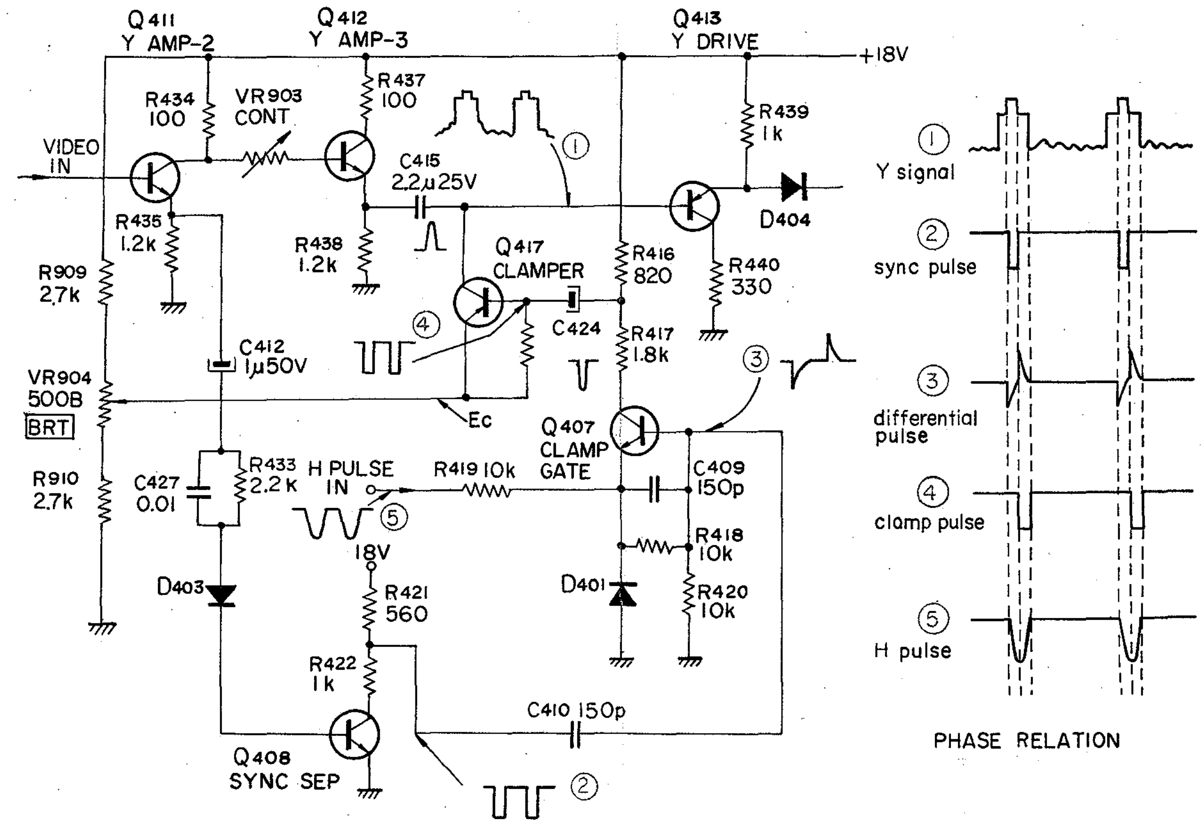


Fig. 1-1.

1-2. CIRCUIT DE LIMITEUR AUTOMATIQUE DE BRILLANCE (ABL)

Ce circuit est utilisé pour maintenir le courant du faisceau d'électrons du tube image dans certaines limites, protégeant ainsi le tube image et le transformateur HT d'éventuelles degâts. Le diagramme schématique se trouve en figure 1-2.

Le transistor Q415 du circuit ABL est normalement conducteur (courant de faisceau inférieur à 800 μA). Le courant d'électrons s'écoule, de la masse au transformateur de focalisation FBT à travers R807.

Un accroissement du courant du faisceau d'électrons du tube image fait baisser la tension de la base du transistor Q415 du circuit ABL. Lorsque la tension de la base est inférieur à celle de l'émetteur, Q415 est coupé. Par conséquent, la tension du collecteur du transistor Q415 augmente.

Le collecteur de Q415 est relié à l'émetteur du transistor de fixage Q417 à travers R451 et R453. Ainsi la tension du collecteur de Q417 et la tension de l'émetteur de Q413 augmentent. L'émetteur de Q413 est relié à la base de 3 transistors amplificateurs (Q402, Q404 et Q406) à travers la diode de suppression D404 et trois résistances d'ajustement.

1-2. AUTOMATIC BRIGHTNESS LIMITER (ABL) CIRCUIT

This circuit is employed to maintain the beam current of the picture tube within limits, thereby protecting both the picture tube and the high-voltage transformer from possible damage. The schematic diagram is shown in Fig. 1-2.

The ABL transistor Q415 is ON at the normal condition (beam current is less than 800 μA). The beam current flows from ground to FBT through R807.

An increase in the beam current of picture tube lowers the base voltage of ABL transistor Q415. When the base voltage drops below the emitter voltage, Q415 becomes OFF. As the result, the collector voltage of Q415 will increase.

The collector of Q415 is connected to the emitter of clamper transistor Q417 through R451 and R453. Thus the collector voltage of Q417 and the emitter voltage of Q413 will increase. The emitter of Q413 is connected to the base of three drive transistors (Q402, Q404 and Q406) through the blanking diode D404 and three drive controls. Therefore, the emitter voltage of three drive tran-

1-3. CIRCUIT D'IDENTIFICATION DE COULEUR

Dans le système de balayage de chrominance par séquences de ligne employé dans le procédé SECAM, le signal différentiel couleur R-Y est envoyé sur une ligne et le signal B-Y sur la ligne suivante. Le signal de luminance est transmis à chaque ligne de façon normale. Pour modifier proprement les signaux de différence de couleur en signaux simultanés, un signal d'identification de ligne est transmis sur neuf lignes insérées dans les intervalles de suppression de balayage vertical.

Dans le récepteur, le circuit d'identification de couleur, commandé par le signal d'identification de ligne, est utilisé pour les fonctions suivantes; il commande les diodes de blocage (killer) et l'amplificateur de couleur pour éliminer l'élément couleur de l'écran durant la transmission en noir et blanc.

Le signal d'identification de ligne est également utilisé pour commander les diodes commutation de façon à modifier le signal d'entrée en signal simultané par sychronisation de la bascule flip-flop.

Le circuit intégré utilisé pour le circuit d'identification de ligne est composé de trois circuits distincts:

- une bascule flip-flop qui commande les diodes de commutation
- un multivibrateur à retard pour la mise en forme des impulsions du balayage vertical
- une bascule commandant les diodes de blocage (killer) des circuits coulerur (voir figure 1-4).

Circuit de la Bascule Flip-Flop commandant les Diodes de Commutation

L'impulsion de balayage horizontal, issue de HOT, est mise en forme par la capacité C002, la résistance R002 et la diode D002, et est transmise aux bases des transistors Qa et Qb; aux collecteurs (8) et (9) des transistors Qa et Qb, on obtient alors les impulsions de commutation telles qu'elles figurent figure 1-3 (J), et qui sont destinées aux diodes de commutation D305, D306, D313 et D314. Les impulsions de commutation fournient donc le signal couleur directe et le signal couleur retardé de 1-H aux discriminateurs R-Y et B-Y par ordre correct.

Circuit de la Bascule Flip-Flop commandant les Diodes de Blocage (Killer) des Circuits Couleur

La bascule Flip-Flop est constituée des transistors Qe et Qf et fonctionne lorsque les impulsions sont appliquées soit au point (5), (10) ou (4). Le point (11) est relié à la base de l'amplificateur de chrominance Q302 et aux diodes D307 et D315, diodes de blocage des signaux couleur R-Y et B-Y.

1-3. COLOUR-IDENTIFICATION CIRCUIT

In line sequential chrominance scanning employed in SECAM system, R-Y colour-difference signal is sent on one line and B-Y signal on the next line. The luminance signal is transmitted on every line in the normal way. To change the both of the colour-difference signals to the simultaneous signal correctly, line-identification signal is transmitted on nine lines being inserted into the vertical blanking interval.

In the receiver, the colour-identification circuit, driven by line-identification signal, is adopted for the following functions; it turns on or off the killer diodes and the colour amplifier to eliminate colour component from the screen during black-and-white broadcasting time.

The line-identificaiton signal is also used to turn ON or OFF the switching diode to change the input signal to the simultaneous signal by synchronizing the flip-flop circuit.

IC component employed for the colour-identification circuit is consisting of three circuits; flip-flop circuit for operating switching diodes, delay multivibrator circuit for vertical pulse shaper and flip-flop circuit for operating colour killer diodes. (Refer to Fig. 1-4.)

Flip-Flop Circuit for Operating Switching Diodes

The horizontal pulse from HOT is waveshaped by C002, R002 and D002, and is supplied to the bases of Qa and Qb. At the collectors (8) and (9) of Qa and Qb, the switching pulses shown in Fig. 1-3 (J) appear, and are supplied to the switching diodes D305, D306, D313 and D314 respectively. Thus the switching pulses supply the direct colour signal and the 1-H delayed colour signal to each R-Y and B-Y discriminator in right order.

Flip-Flop Circuit for Operating Colour Killer Diodes

This flip-flop circuit, consisting of Qe and Qf, is operated when the pulse is supplied to either terminal (5), (10) or (4). Terminal (11) is connected to the base of Q302 chroma amplifier, and D307 and D315 R-Y and B-Y colour killer diodes.

Near 0V is obtained at terminal (11) during the black-and-white broadcasting time, so colour killer circuit operates and only luminance picture appears on the screen. When the chrominance input signal is supplied, the level at terminal (11) becomes high and the colour killer circuit is cut off. Thus the chroma circuit operates correctly and the colour picture can be obtained on the screen.

On obtient environ 0 volt au point (11) lors d'une transmission en noir et blanc, le circuit des diodes de blocage fonctionne et l'on obtient sur l'écran qu'une image en luminosité. Loraqu'on applique le signal de chrominance, la tension au point (11) augmente et le circuit des diodes de blocage devient inopérant. Le circuit de chrominance est alors en fonctionnement correct et l'on peut ainsi obtenir une image couleur sur l'écran.

Circuit du Multivibrateur de Retard

Le circuit du multivibrateur de retard est déclenché par le front de l'impulsion verticale, provenant du VOT, qui est mis en forme par la capacite C001 et la diode D001. On obtient aux points (12) et (13) l'impulsion retardée par la constante de temps engendrée par la capacité C009 et la résistance R006, dont la forme est représentée en figures 1-3(B) et 1-3(A). Ces impulsions sont transmises aux bases des transistors Qe et Qf comme impulsion de porte après différentiation; l'impulsion positive (voir figure 1-3(A)) est fournie au collecteur du transistor Q307 (ACC-2) par l'intermédiaire de la diode D308. Celle-ci commande l'ampli chrominance de manière qu'il ne coupe pas les signaux d'identification de couleur, lorsque le potentiomètre de réglage de couleur est actionné contre le sens des aiguilles d'une montre. La largeur de l'impulsion est déterminée de telle façon que le circuit de chrominance n'agit que durant les intervalles de suppression de balayage vertical, et la durée de la descente de l'impulsion doit être finie lorsque le signal d'identification de couleur est délivrée à la base.

La diode D006 sert à déclencher le circuit de retard et la diode D007 sert à la protection du circuit intégré.

Fonctionnement lors d'une Emission en Noir et Blanc

Les circuits servant à la mise en marche des diodes de commutation ne servent que pour des réceptions d'émissions en couleur, la description de ces circuits ne sera donc pas faite dans ce paragraphe.

Dans le circuit de retard, les impulsions verticales servent à la commutation. Les impulsions verticales, différenciées par la capacite C001 et la résistance R001 sont mis en forme par la diode D001. Seules les impulsions négatives sont transmises à la cathode de la diode D006.

Lorsqu'aucune impulsion négative n'est transmise à la cathode de la diode D006, on obtient pratiquement le même potentiel aux bornes de la capacité C009 car la diode D006 est hors de conduction. Le transistor Qd est en travail, et

Delay Multivibrator Circuit

Delay multivibrator circuit is triggered by the leading edge of the vertical pulse from VOT which is waveshaped by C001 and D001. At terminals (12) and (13), the pulse delayed by the time constant that is the product of C009 and R006 is obtained as shown in Figs. 1-3 (A) and 1-3 (B) These pulses are supplied to the bases of Qe and Qf as a gate pulse after differentiation, and positive pulse in Fig. 1-3 (A) is also supplied to the collector of Q307 (ACC-2) through D308. It operates the chroma amplifier not to cut off colour-identification signal, when the colour control is turned counterclockwise. The pulse width is determined so that the chroma circuit is operated during only the vertical blanking interval, and the decay time of the pulse should be finished while the colour-identification signal is supplied to the base.

D006 is used to trigger the delay circuit, and D007 is for the protection of IC.

Operation in Black-and-White Broadcasting

The operation of the circuit for operating switching diodes is only necessary in colourcast, so its circuit description is omitted in this section.

In the delay circuit, vertical pulse is used as a switching pulse. Vertical pulse differentiated by C001 and R001 is waveshaped by D001. And only negative pulse is supplied to the cathode of D006.

When the negative pulse is not supplied to the cathode of D006, almost same potential is obtained across C009 because D006 is not conducted. And Qd is ON, accordingly the collector voltage of Qd is 0V. Qc is cut off, and the collector voltage of Qc is about 8V.

When the negative pulse is supplied to the cathode of D006, D006 conducts and the base voltage of Qd is lowered. Qd is cut off and high collector voltage is obtained. Qc is turned ON, and C009 is charged through R006. Thus the base voltage of Qd rises slowly by the time constant of R006 and C009, and then Qd is turned ON. Thus the pulse, whose width is determined by the time constant of R009 and C009, is obtained at terminals (12) and (13) as illustrated in Fig. 1-4. These pulses are differentiated and supplied to the bases of Qe and Qf respectively to turn ON or OFF the killer diodes. Transistor Qe turns ON, only when the negative pulse is supplied to the base of Qf. Pulses at terminals (12) and (13) are the same in their rise times and have opposite polarities. Therefore, the negative differentiated pulses at terminals (4) and (5) have some time

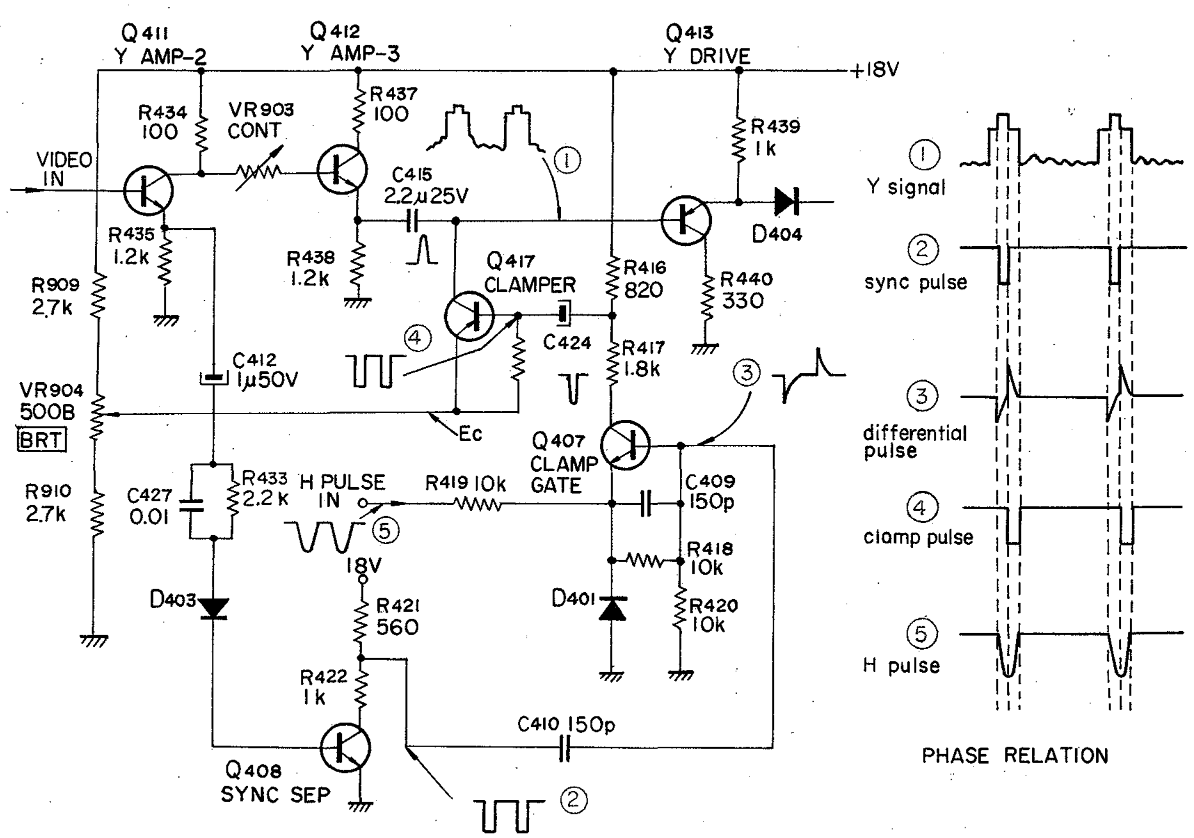


Fig. 1-1.

1-2. CIRCUIT DE LIMITEUR AUTOMATIQUE DE BRILLANCE (ABL)

Ce circuit est utilisé pour maintenir le courant du faisceau d'électrons du tube image dans certaines limites, protégeant ainsi le tube image et le transformateur HT d'éventuelles degâts. Le diagramme schématique se trouve en figure 1-2.

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Un accroissement du courant du faisceau d'électrons du tube image fait baisser la tension de la base du transistor Q415 du circuit ABL. Lorsque la tension de la base est inférieur à celle de l'émetteur, Q415 est coupé. Par conséquent, la tension du collecteur du transistor Q415 augmente.

Le collecteur de Q415 est relié à l'émetteur du transistor de fixage Q417 à travers R451 et R453. Ainsi la tension du collecteur de Q417 et la tension de l'émetteur de Q413 augmentent. L'émetteur de Q413 est relié à la base de 3 transistors amplificateurs (Q402, Q404 et Q406) à travers la diode de suppression D404 et trois résistances d'ajustement.

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This circuit is employed to maintain the beam current of the picture tube within limits, thereby protecting both the picture tube and the high-voltage transformer from possible damage. The schematic diagram is shown in Fig. 1-2.

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An increase in the beam current of picture tube lowers the base voltage of ABL transistor Q415. When the base voltage drops below the emitter voltage, Q415 becomes OFF. As the result, the collector voltage of Q415 will increase.

The collector of Q415 is connected to the emitter of clamper transistor Q417 through R451 and R453. Thus the collector voltage of Q417 and the emitter voltage of Q413 will increase. The emitter of Q413 is connected to the base of three drive transistors (Q402, Q404 and Q406) through the blanking diode D404 and three drive controls. Therefore, the emitter voltage of three drive tran-

Donc, la tension de l'émetteur des 3 transistors amplificateurs s'élève et le courant du collecteur des transistors de sortie (Q401 pour le rouge, Q403 pour le vert, Q405 pour le bleu) diminue.

Le courant d'électrons du faisceau a tendance à diminuer vers sa valeur d'origine en accroissant la tension de la cathode du tube image. L'émetteur de Q413 est relié à la base de Q416 à travers une diode D406 (diode de porte ACC – Réglage Automatique de Chrominance –). Le niveau du signal couleur ne change pas, à cause de l'augmentation de la tension de l'émetteur de Q416 à travers R455 ainsi que de l'augmentation de la tension de la base de Q416 (voir les explications concernant le circuit de réglage automatique de chrominance ACC).

Par conséquent l'image qui a la meilleure saturation des couleurs n'est pas obtenue sur l'écran comme il faut. Pour éliminer ce phénomène, le collecteur de Q415 est relié à l'émetteur de Q416 à travers la résistance R454. C'est à dire, lorsque la tension du collecteur du transistor Q415 s'accroît par suite de fonctionnement du circuit ABL, la tension de l'émetteur augmente en raison de R454 plus que la tension de la base de Q416. Or, l'accroissement de la tension de l'émetteur arrête tout accroissement de la tension de la base. Donc, le signal couleur suit le signal Y, et la meilleure saturation de l'image couleur sur l'écran est obtenue automatiquement.

sistors will increase, and the collector current of red, green and blue output transistor (Q401, Q403 and Q405) will decrease.

Beam current tends to decrease toward the original value by increasing the cathode voltage of the picture tube. The emitter of Q413 is connected to the base of Q416 through a ACC gate diode D406. The level of colour signal, however, will not change because of an increase of the emitter voltage of Q416 through R455 as same as the increase of base voltage of Q416. (See the explanation of ACC circuit).

As the result, the picture which has the best colour saturation is not obtained on the screen as it is. To eliminate this phenomenon, the collector of Q415 is connected to the emitter of Q416 through R454. Namely, when the collector voltage of Q415 is increased by the operation of ABL circuit, the emitter voltage increases by R454 more than the increase of base voltage of Q416. And the increasing of emitter voltage stops the increasing of base voltage. Thus the colour signal follows the Y signal, the best colour saturation picture is obtained on the screen automatically.

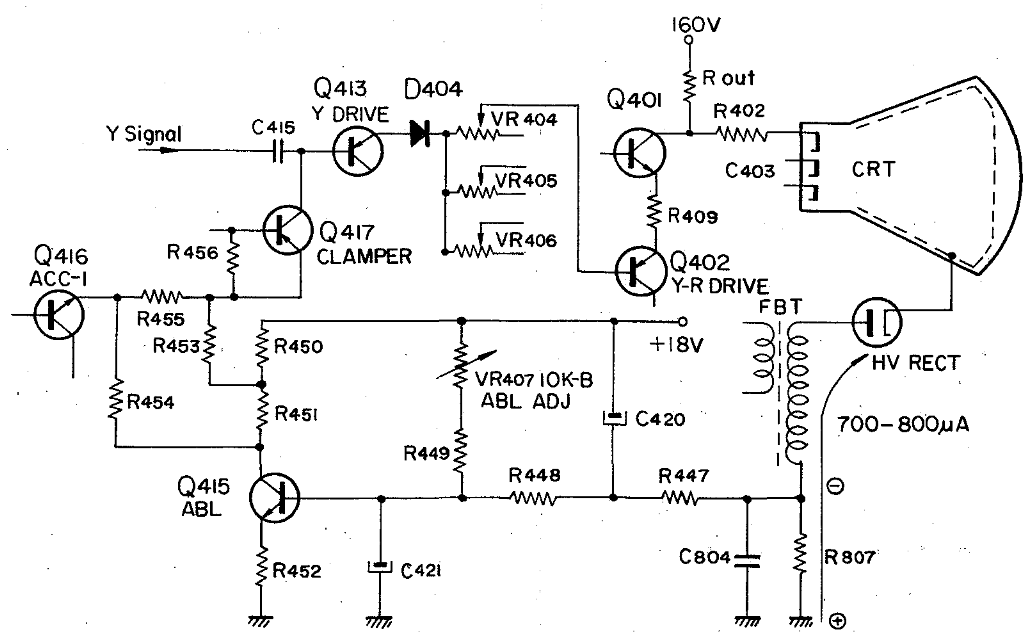

Fig. 1-2.

 KV-1220DF

On obtient environ 0 volt au point (11) lors d'une transmission en noir et blanc, le circuit des diodes de blocage fonctionne et l'on obtient sur l'écran qu'une image en luminosité. Loraqu'on applique le signal de chrominance, la tension au point (11) augmente et le circuit des diodes de blocage devient inopérant. Le circuit de chrominance est alors en fonctionnement correct et l'on peut ainsi obtenir une image couleur sur l'écran.

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Le circuit du multivibrateur de retard est déclenché par le front de l'impulsion verticale, provenant du VOT, qui est mis en forme par la capacite C001 et la diode D001. On obtient aux points (12) et (13) l'impulsion retardée par la constante de temps engendrée par la capacité C009 et la résistance R006, dont la forme est représentée en figures 1-3(B) et 1-3(A). Ces impulsions sont transmises aux bases des transistors Qe et Qf comme impulsion de porte après différentiation; l'impulsion positive (voir figure 1-3(A)) est fournie au collecteur du transistor Q307 (ACC-2) par l'intermédiaire de la diode D308. Celle-ci commande l'ampli chrominance de manière qu'il ne coupe pas les signaux d'identification de couleur, lorsque le potentiomètre de réglage de couleur est actionné contre le sens des aiguilles d'une montre. La largeur de l'impulsion est déterminée de telle façon que le circuit de chrominance n'agit que durant les intervalles de suppression de balayage vertical, et la durée de la descente de l'impulsion doit être finie lorsque le signal d'identification de couleur est délivrée à la base.

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When the negative pulse is supplied to the cathode of D006, D006 conducts and the base voltage of Qd is lowered. Qd is cut off and high collector voltage is obtained. Qc is turned ON, and C009 is charged through R006. Thus the base voltage of Qd rises slowly by the time constant of R006 and C009, and then Qd is turned ON. Thus the pulse, whose width is determined by the time constant of R009 and C009, is obtained at terminals (12) and (13) as illustrated in Fig. 1-4. These pulses are differentiated and supplied to the bases of Qe and Qf respectively to turn ON or OFF the killer diodes. Transistor Qe turns ON, only when the negative pulse is supplied to the base of Qf. Pulses at terminals (12) and (13) are the same in their rise times and have opposite polarities. Therefore, the negative differentiated pulses at terminals (4) and (5) have some time

la tension de son collecteur est donc 0V. Qc est coupé et la tension de son collecteur est d'environ 8V.

Lorsqu'une impulsion négative apparaît aux bornes de la diode D006, elle est en fonction, et la tension de la base du transistor Qd diminue. Qd est coupé et l'on obtient une tension du collecteur élevée. Qc est mis en conduction et la capacité C009 se charge à travers la résistance R006. La tension de la base du transistor Qd augmente lentement en fonction de la constante de temps déterminée par la résistance R006 et la capacité C009 et Qd devient conducteur. L'impulsion (dont la largeur est déterminée par la constante de temps fournie par la résistance R009 et la capacité C009) est obtenue aux points (12) et (13) ainsi que le montre la figure 1-4. Ces impulsions sont différenciées et transmises aux bases des transistors Qe et Qf pour allumer ou couper les diodes de blocage. Le transistor Qe ne devient conductif uniquement que lorsqu'on applique une impulsion négative à la base du transistor Qf. Les impulsions délivrées aux points (13) et (12) ont les mêmes temps de montée et sont de phase inversée (polarité inversée). Donc, les impulsions négatives différenciées fournies aux points (4) et (5) peuvent présenter parfois quelques différences en temps. Les impulsions différentielles négatives produites au point X (figure 1-3) sont d'abord délivrées au point (5) et le transistor Qf est coupé. La tension au point (11) augmente. Etant donné que le point (11) est relié aux circuits de blocage de couleurs et à la base du transistor Q302, les diodes de blocage de couleurs (diodes killer) sont coupées et le signal de chrominance est délivré à l'amplificateur de chrominance. Ceci est réalisé durant l'intervalle de suppression du faisceau de balayage vertical, l'image de chrominance n'apparaît pas sur l'écran. En suite l'impulsion négative produite an point Y est délivrée au point (4), le transistor Qe est coupé et le transistor Qf est allumé. La tension en (11) decroît jusqu'a près de 0 volt et les diodes de blocage de couleurs sont en fonction. Ainsi seule une image en luminosité apparaît sur l'écran durant une émission en noir et blanc.

Fonctionnement lors d'une Emission en Couleur

Durant l'intervalle de suppression du faisceau de balayage vertical, les diodes de blocage de couleurs sont coupées et l'amplificateur de chrominance fonctionne de la même façon que durant une émission en noir et blanc. Toutefois, le fonctionnement est différent lorsque l'impulsion négative produite en Y est délivrée à la base du transistor Qe par l'intermédiaire du point (4), le signal d'identification est fourni à la base du transistor Qf par l'intermédiaire

differences. The negative differentiated pulse produced at point X in Fig. 1-3 is first supplied to terminal (5), and Qf is cut off. The voltage at terminal (11) is increased. As the terminal (11) is connected to the colour killer circuit and also the base of Q302, the colour killer diodes are cut off and chrominance signal is supplied to the chroma amp. But this is done in the vertical blanking interval, colour picture does not appear on the screen. Next the negative pulse produced at point Y is supplied to terminal (4), and Qe is cut off and Qf is turned ON. Accordingly the voltage at terminal (11) is decreased to almost 0V, and colour killer diodes conduct. Thus only luminance image appears on the screen in black-and-white broadcasting.

Operation in Colourcasting

In the vertical blanking interval, colour killer diodes are cut off and chroma amplifier operates in the same way as in black-and-white broadcasting. But the operation is different, when the negative pulse produced at point Y is supplied to the base of Qe through terminal (4), the identification signal is supplied to the base of Qf through terminal (10).

Identification signals shown in Fig. 1-3 (E) are matrixed by R364 and R393, and is integrated by C005, R005 and C014. See Fig. 1-3 (F). It is supplied to terminal (10).

When R-Y and B-Y signals are supplied to each correct discriminator by Qa and Qb, each colour-identification signal is fed into a matrix with correct phase. At the same time the colour-identification signal with solid line as shown in Fig. 1-4 (correct polarity) is fed to terminal (10), the negative pulse produced at point Y is supplied to the base of Qe. Usually Qf turns ON as the collector voltage is decreased, but in this case the base voltage of Qf is forced to be decreased by the G-Y colour-identification signal and Qf is still remained in the cut-off condition. The collector voltage at Qf is not decreased and the colour killer diode does not conduct. Thus normal colour picture can be obtained on the screen.

When the switching diodes are operated by the colour-identification signal with incorrect polarity (positive) as shown by a dotted line in Fig. 1-3 (F), the diode connected to terminal (10) is cut off. When the pulse produced at point Y is supplied to terminal (4), Qf turns ON and the collector voltage of Qf is decreased to almost 0V. The colour killer diodes conduct and luminance image appears on only one field after pulse produced at point Y.

du point ⑩

Les signaux d'identification, tels qu'ils se trouvent en figure 1-3(E), sont matricés par les résistances R364 et R393 et intégrés par le système constitué des capacités C005, C014 et de la résistance R005 (voir figure 1-3(F). Ces signaux sont délivrés au point ⑩ . Lorsque les signaux R-Y et B-Y sont fournis à chaque discriminateur correspondant par les transistors Qa et Qb, chaque signal d'identification de couleur est alimenté à une matrice en phase adéquate. En même temps, le signal d'identification de couleur (voir figure 1-4 en trait plein) (polarité correcte) est délivré au point ⑩ et l'impulsion négative dévivrée au point Y est fournie à la base du transistor Qe. En général Qf devient conducteur lorsque la tension du collecteur décroît, mais dans notre cas, la tension de la base du transistor Qf doit décroître à cause du signal d'identification de couleur G-Y et le transistor Qf est toujours maintenu dans l'état de blocage. La tension du collecteur du transistor Qf n'est pas diminuée et les diodes de blocage de couleurs (killer) ne fonctionnent pas. On obtient ainsi une image couleur normale sur l'écran.

Lorsque les diodes de commutation sont mises en fonctionnement par les signaux d'identification de couleur en raison d'une polarité non conforme (positive) (voir figure 1-3(F) en ligne pointillée), la diode reliée au point ⑩ est coupée.

Lorsque les impulsions produites au point Y sont délivrées au point ④, le transistor Qf devient conducteur et la tension de son collecteur décroît jusqu'à près de 0 volt. Les diodes de blocage (killer) de couleurs sont reudues conductrices et un seul champs de luminosité apparaît après l'impulsion produite au point Y. En ce cas, l'impulsion du point ⑪ (voir figure 1-3(G)) est différenciée par la capacité C004 et la résistance R004 (voir figure 1-3(H)) et est ajoutée à l'impulsion de déclenchement horizontal par l'intermédiaire de la diode D003. L'impulsion de commutation est soumise à l'inversion de sa phase dûe à cette impulsion ajoutée de déclenchement (figure 1-3(I)). Les diodes de blocage de couleurs (killer) sont coupées lorsque le signal d'identification de couleur suivant est délivré au point ⑩ et une image couleur peut être obtenue sur l'écran.

In this case the pulse at terminal ⑪ as shown in Fig. 1-3 (G) is differentiated by C004 and R004 as shown in Fig. 1-3 (H), and is added to the horizontal triggering pulse through D003. Thus, the switching pulse is reversed its polarity by this added triggering pulse in Fig. 1-3 (I). Thus the colour killer diodes are turned OFF when next identification signal is supplied to terminal ⑩ and colour picture can be obtained on the screen.

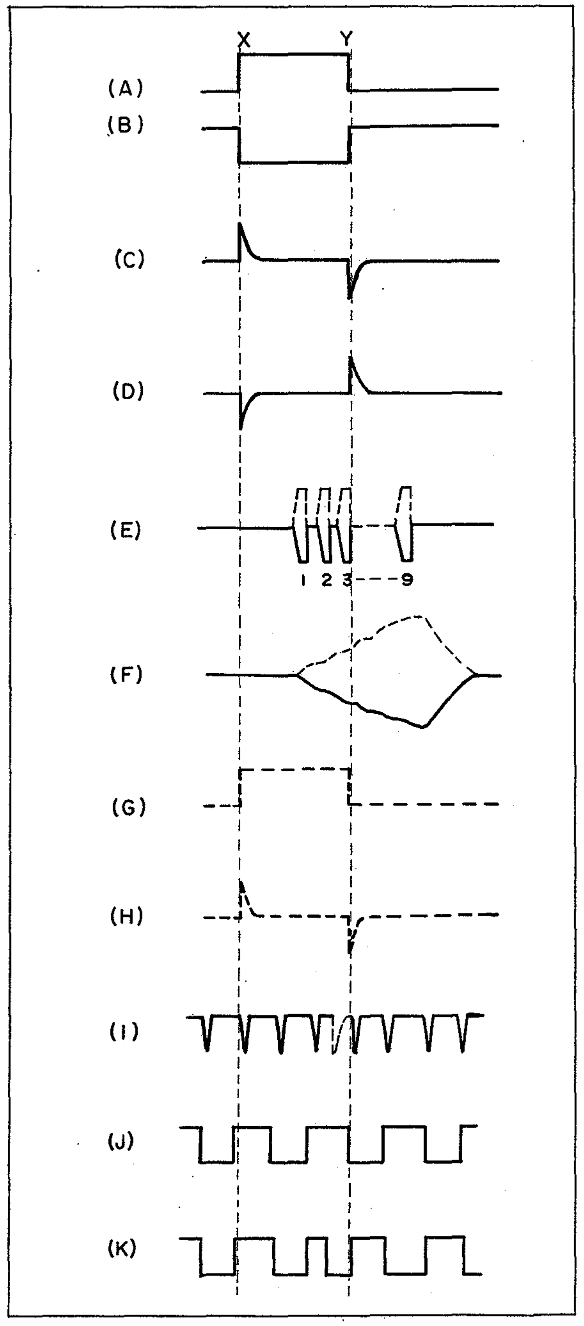


Fig. 1-3.

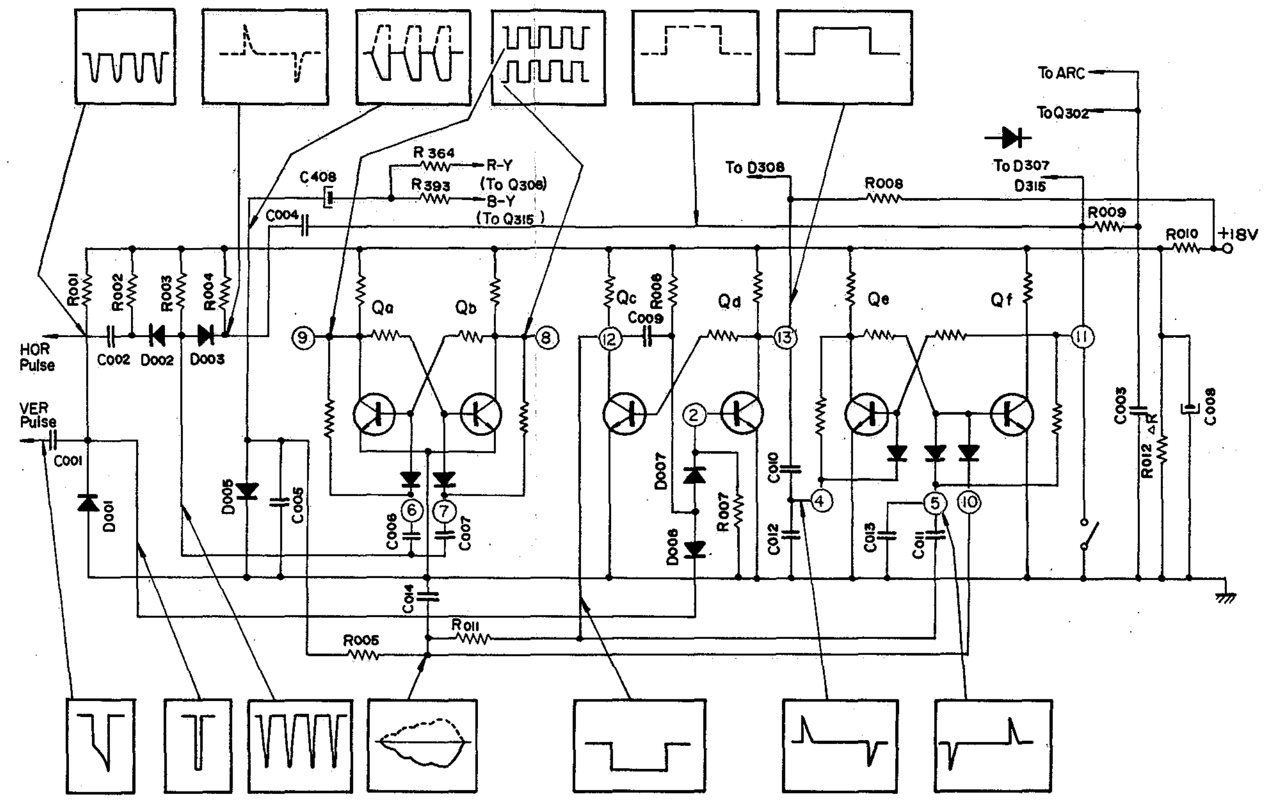


Fig. 1-4.

 KV-1220DF

1-4. AIMANTS D'ALIGNEMENT DU FAISCEAU (BAM)

L'aimant d'alignement du faisceau est constitué d'une paire d'aimants permanents disposés en anneaux montés sur le col arrière du tube image couleur (CRT) (voir figure 1-5). Leur rôle consiste à régler la convergence du faisceau d'électrons au centre de l'écran.

La constitution interne d'un aimant d'alignement est dessiné en figure 1-6. Lorsqu'on tourne l'anneau d'un angle de θ degrés dans la direction de la flèche en figure 1-7, les deux faisceaux périphériques subissent l'influence du champ magnétique dont les sens sont figurées par les flèches en figure 1-6. Le faisceau central d'électrons n'est pas influencé par la variation de champ magnétique. Les deux anneaux sont montés de telle façon que les aimants permanents de chaque anneau se touchent.

Lorsque les deux projections sont alignées, avec les deux pattes séparées de l'une à l'autre de 90 degré, les deux aimants en contact ont des polarités opposées, annulant le champ magnétique. Le taux de correction de convergence est alors nul. Lorsque l'aimant d'alignement est monté sur le col du tube couleur, les deux projections et les pattes doivent être montées de cette façon.

Lorsque les deux pattes se sont eloignées de même distances aux sens opposés (voir figure 1-8), les champs magnétiques induits par chaque anneau sont représentés par des lignes pointillées et en trait fin, et les champs magnétiques composés sont dessinés en trait gras (figure 1-9).

Les deux faisceaux périphériques sont donc déviés dans la direction des flèches (figure 1-10) pour corriger fausse-convergence.

Lorsque les deux pattes se sont rapprochées de même distances, les forces magnétiques s'appliquent en directions opposées vis à vis le cas précédent.

La bissectrice de l'angle entre les deux pattes n'est pas toujours verticale (à 12 heures) comme on n'utilise pas de roue différentielle pour les aimants d'alignement. La correction de convergence, en ce cas, peut être effectuée en opérant une rotation de l'ensemble des aimants d'alignement sans faire varier la position relative des pattes jusqu'à ce que la position correcte de la bissectrice soit obtenue.

1-4. BEAM ALIGNMENT MAGNET (BAM)

The beam alignment magnet (BAM), a pair of two rings with permanent magnets, are mounted on the back of the picture tube neck as shown in Fig. 1-5. They are used to correct convergence at the center of the screen.

An inner make of an alignment magnet is shown in Fig. 1-6. When the ring is turned by θ degree in the direction shown by the arrow in Fig. 1-7, the outside two beams are under the influence of magnetic field in the direction shown by the arrows in Fig. 1-7. The center beam is not influenced. The two rings are mated so that the permanent magnets on both rings contact each other.

When the two projections are mated with the two tabs set 90 degree apart, the two contacted magnets with opposite polarities cancel the magnetic fluxes each other. Convergence correcting amount turns to zero. When the alignment magnet is mounted on the picture tube neck, each two projections and tabs should be set in this way.

When the two tabs are spread in equal amounts opposite directions as shown in Fig. 1-8, the magnetic fields generated by each ring are shown by fine solid lines and dotted lines, and the composite magnetic fields are shown by thick solid lines in Fig. 1-9.

Thus the two outside beams are forced to move in the direction shown by the arrows in Fig. 1-10, to correct misconvergence.

When the two tabs are closed in equal amounts, the forces are added in the opposite directions against those when the tabs are spread.

The center of the angle between the two tabs is not often set to the 12 o'clock position, as the differential gear is not employed in the alignment magnet. The convergence correction in this case can be made by turning the whole alignment magnet without the angle between the tabs varied, until the correct center position of the angle can be obtained.

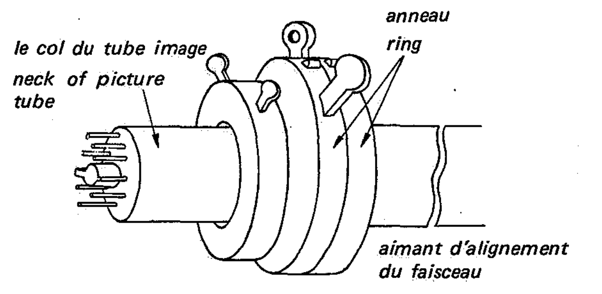


Fig. 1-5.

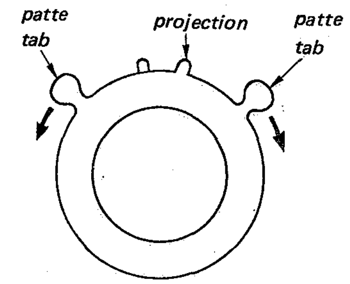


Fig. 1-8.

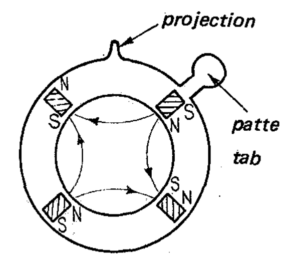


Fig. 1-6.

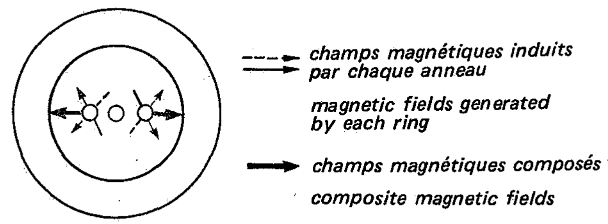


Fig. 1-9.

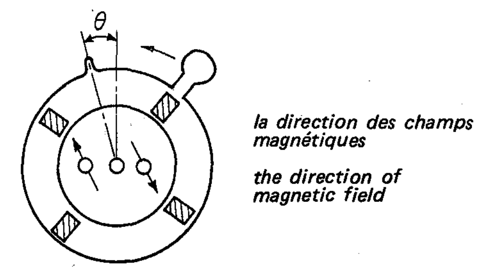


Fig. 1-7.

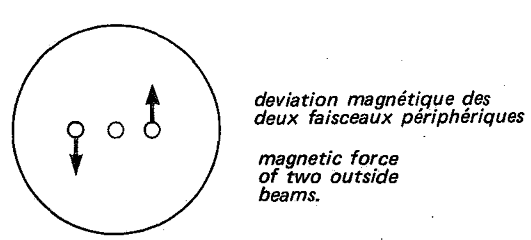


Fig. 1-10.

 KV-1220DF

1-5. CIRCUIT DE REGLACE AUTOMATIQUE DE CHROMINANCE (ACC)

Dans les récepteurs de télévision conventionnels, le AGC (contrôle automatique de gain) a pour but de maintenir le signal vidéo à un niveau constant quelles que soient les variations de niveau du signal d'entrée.

Dans le KV-1220DF, on a adopté le AGC à la valeur moyenne. Le niveau de sortie de la détection varie en fonction du niveau moyen de l'image (APL). De l'autre côté, le signal de chrominance transmis en forme de modulation de fréquence est limité dans une valeur constante par le circuit limiteur, ce qui a pour effet que le signal démodulé n'est pas influencé par le niveau moyen d'image du signal d'entrée.

Il en résulte que, si le signal Y et le signal de chrominance sont matricés dans le démodulateur couleur, le degré de saturation de couleur variera et on ne pourra pas obtenir une image en couleur convenable.

Dans le KV-1220DF, la différence de niveaux de signal de synchronisation est utilisées pour commander le circuit de réglage automatique de chrominance destiné à fournir l'image en couleur de haute qualité.

Le fonctionnement du circuit de réglage automatique de chrominance est décrit ci-dessous (voir figure 1-11).

Le signal Y est transmis de l'émetteur du transistor Q412 à la base du transistor Q413 par l'intermédiaire de la capacité C415 et la base de Q413 est reliée au collecteur du transistor Q417. Le transistor de fixage Q417 est obligé de se rendre conducteur, lorsqu'une impulsion de fixage est appliquée à sa base à travers Q407. La tension de la base de Q413 est donc fixée par la tension continue (Ec) déterminée. (Se référer à la description du circuit de fixage).

Le transistor Q416 fonctionne de la façon suivante:

La tension de la base est déterminée par la somme de la tension de fixage (Ec) et la tension crête-crête du signal de synchronisation (ec); la tension de l'émetteur étant à peu près identique à la tension de fixage Ec. Donc, une tension proportionnelle à ec est obtenue à la jonction base/émetteur de Q416. Un accroissement de ec diminue la tension du collecteur de Q416 et le courant du collecteur de Q307 s'accroît en conséquence. Un accroissement du collecteur a pour effet d'accroître les tensions les tensions d'anode des diodes D309, D310, D316 et D317, car le collecteur de Q307 est relié au circuit limiteur R-Y à travers la résistance R304, et au circuit limiteur B-Y à travers la résistance R371.

1-5. AUTOMATIC COLOUR CONTROL (ACC) CIRCUIT

In conventional TV sets, automatic-gain-control (agc) circuit is provided for keeping the video signal level constant despite the level fluctuation of input signal.

In KV-1220DF, however, mean-value agc is adopted. Therefore, the detector output level changes according to the average-picture-level (APL). On the other hand, chrominance (colour) signal transmitted by the form of frequency modulation, is limited to the constant value by limiter circuit, so the demodulated signal is not influenced by the APL of input signal.

As the result, if Y signal and colour signal are matrixed in the colour demodulator section, the degree of colour saturation will change and correct colour picture will not be obtained.

In KV-1220DF, the difference of sync signal level is utilized to operate the ACC circuit for reproducing high quality colour picture.

The operation of ACC circuit is described as follows (refer to Fig. 1-11).

Y signal is derived from the emitter of Q412 to the base of Q413 through C415 and the base of Q413 is connected to the collector of Q417. The clamper transistor Q417 is forced into conduction when the clamp pulse is applied to the base of Q417 through Q407. Thus, the base voltage of Q413 is clamped by the dc voltage (Ec) determined. (Refer to the description of clamp circuit.)

Transistor Q416 operates as follows:

The base voltage is determined by the sum of clamp voltage (Ec) and peak-to-peak voltage of sync signal (ec), the emitter voltage is about same as clamp voltage (Ec). Thus, the voltage in proportion to the ec voltage is obtained in the base-emitter junction of Q416. An increase of ec lowers the collector voltage of Q416 and the collector current of Q307 increases consequently. An increase in collector current results in increase of anode voltage of D309, D310, D316 and D317, because the collector of Q307 is connected to the R-Y limiter through R340 and to the B-Y limiter through R371.

The colour signal is limited by D301 and D302, and also D303 and D304. The limited colour signal by R-Y limiter and B-Y limiter is fed to the base of Q308 and Q312. The output of Q308 and Q312 are determined not only by the frequency variation, but also by the amplitude variation of

Le signal couleur est limité par les diodes D301 et D302, et aussi par D303 et D304. Le signal couleur écrêté ainsi par limiteurs R-Y et B-Y est fourni à la base des transistor Q308 et Q312. Les niveaux de sorties de Q308 et Q312 ne sont pas uniquement déterminés par les variations de fréquences, mais aussi par la variation d'amplitude des signaux d'entrée.

Donc, si l'amplitude du signal couleur délivré aux bases des transistors Q308 et Q312 varie proportionnellement au niveau du signal de synchronisation (ec), le signal de chrominance varie proportionnellement à la variation du signal Y. On obtient donc automatiquement une image ayant le degré de saturation de couleurs correct.

input signal.

Therefore, if the amplitude of the colour signal which is supplied to the base of Q308 and Q312 is changed in proportion to the level of sync signal (ec), colour signal changes according to the change of Y signal. It results in obtaining the picture which has the correct degree of colour saturation automatically.

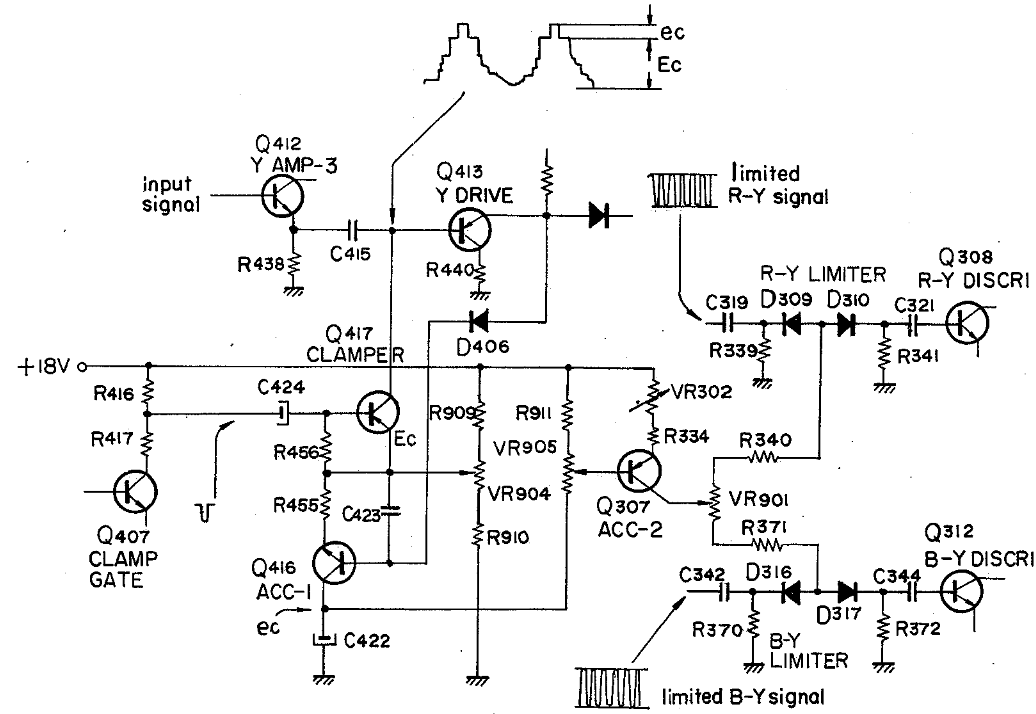


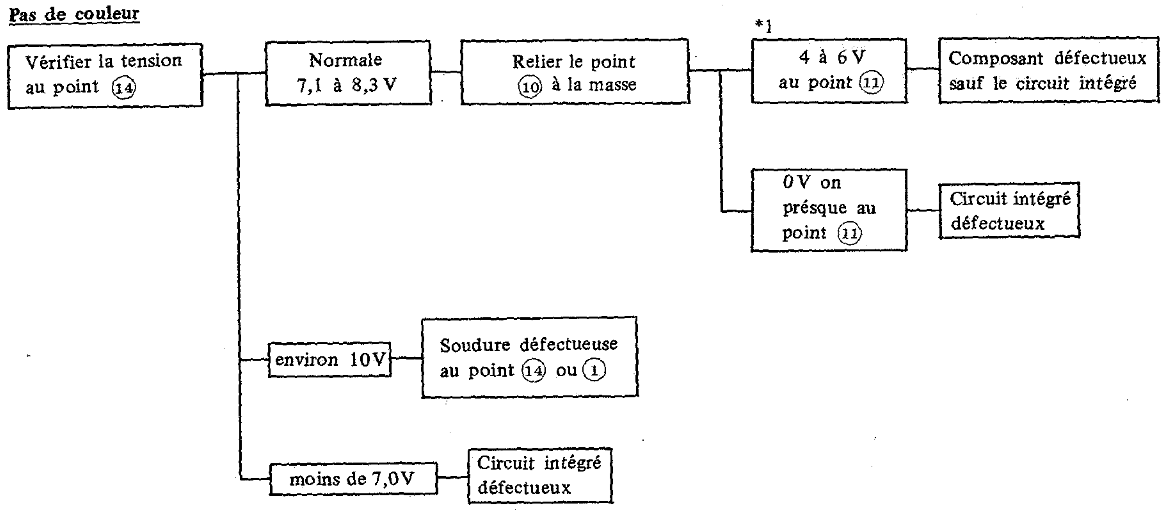
Fig. 1-11.

 KV-1220DF

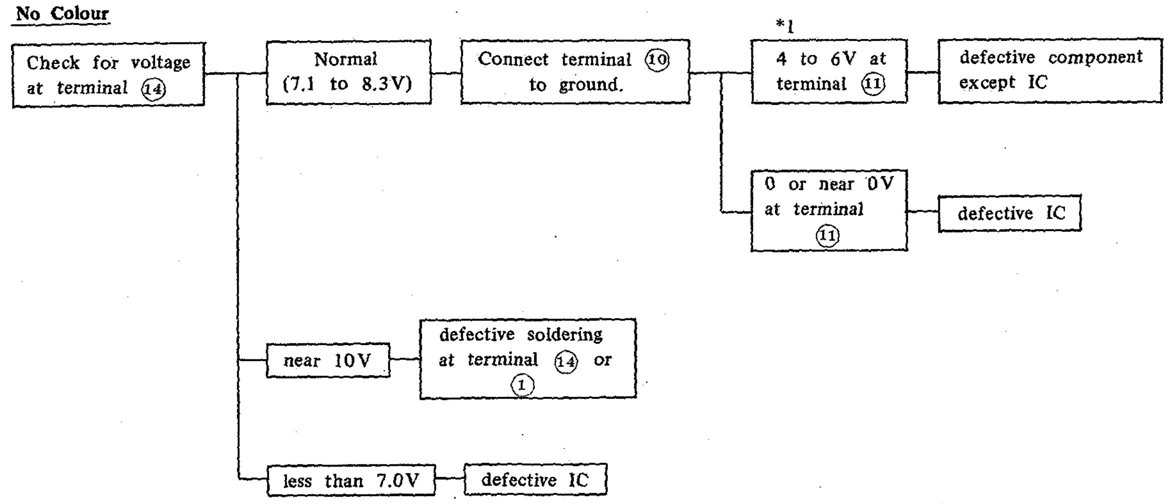
On trouvera ci-après la description des pannes causés par le circuit intégré défaillant (CX-513), pour les distinguer de celles causées par les autres composants du circuit. Le circuit intégré CX-513 est utilisé pour polariser les diodes de blocage de couleurs (diodes de killer) et les diodes de commutation de couleurs, et le circuit du multivibrateur de retard commandent le circuit de mise en forme des impulsions verticales.

The troubles caused by the defective IC (CX-513) are described as follows, to distinguish those caused by other defective components. IC, CX-513, is used for biasing the Colour Killer Diode and the Colour Switching Diode, and the Delay Multivibrator for Vertical Waveshaper.

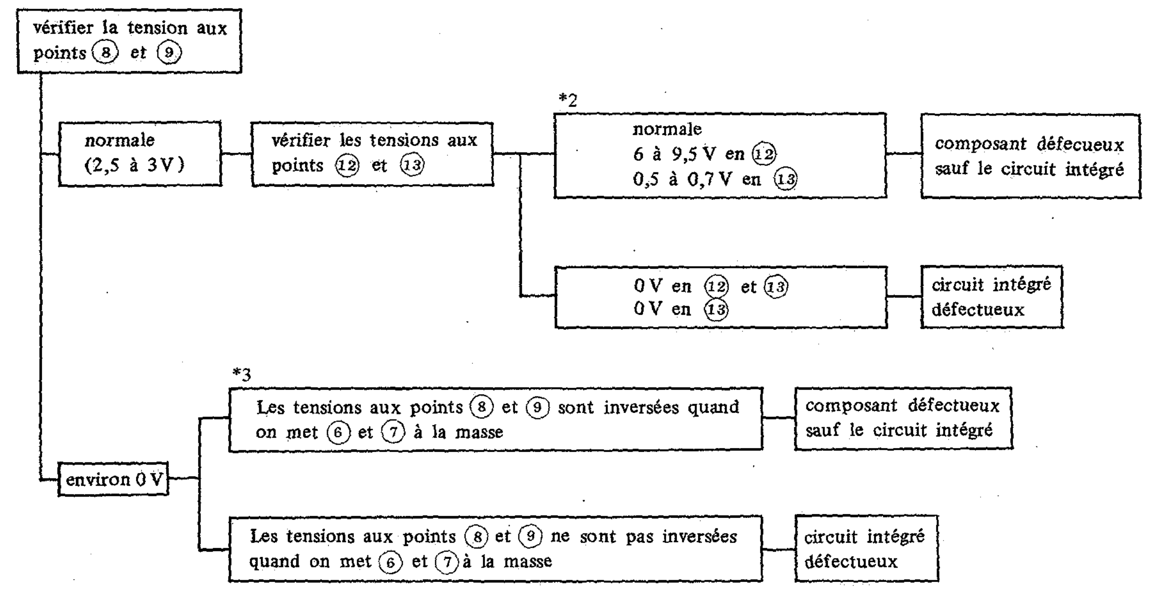
Pas de couleur



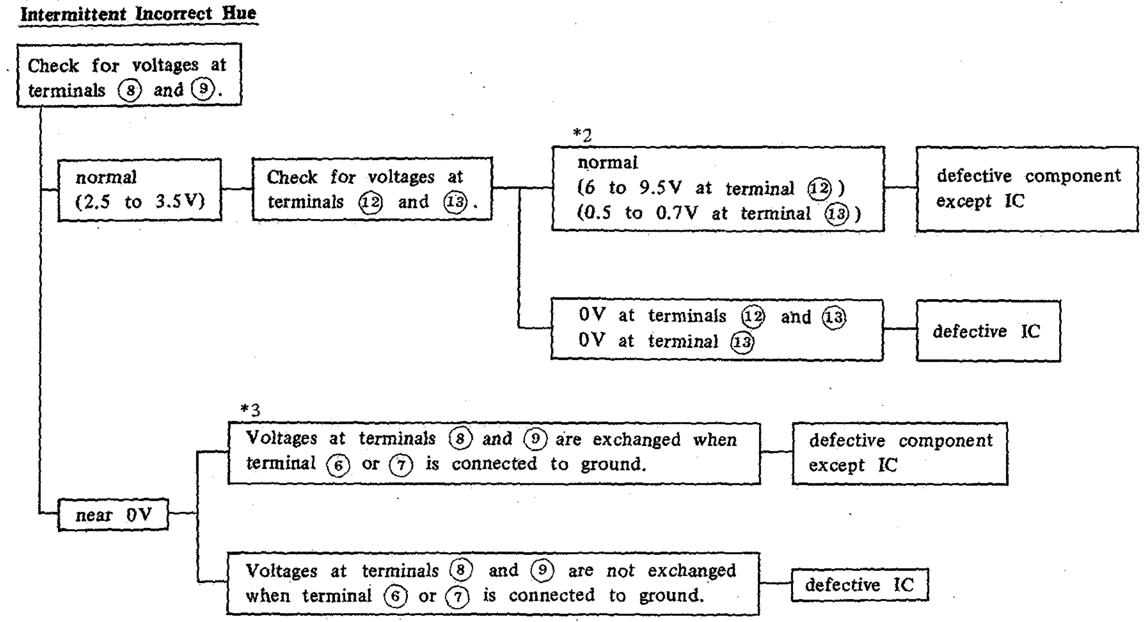
No Colour



Couleur par intermittence
Teinte incorrecte
Teinte incorrecte par intermittence



Intermittent Colour
Incorrect Hue
Intermittent Incorrect Hue



*1: Quand on relie le point (10) à la masse, le transistor Qf de la bascule flip-flop est coupé. La tension obtenue au point (11) (4 à 6 V) est ajoutée à la tension base du transistor Q302 (Amplificateur N° 1 de chrominance) pour une polarisation correcte, et aux diodes de blocage D307 (Ampli R-Y) et D315 (Ampli B-Y) pour polarisation inverse. Le blocage de couleurs ne s'effectue pas et une image en couleur apparaît sur l'écran, cette image n'étant pas nécessairement de bonne qualité.
Si l'on obtient une tension de 4 à 6 V au point (11) , le circuit intégré fonctionne correctement (voir figure 1-12).

*2: En fonctionnement normal du multivibrateur de retard, le transistor Qc est coupé et Qd est allumé (voir figure 1-13).

*3: Quand la tension au point (8) ou (9) est de l'ordre de 0 V et le point (7) ou (6) est relié à la masse, les tensions aux points (8) et sont inversées. En ce cas, la bascule flip-flop pour commutation dans le circuit intégré fonctionne normalement (voir figure 1-14).

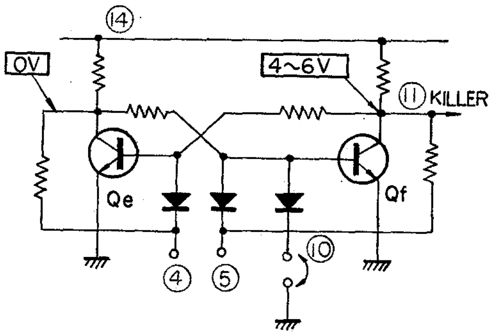


Fig. 1-12

*1: When terminal (10) is connected to ground, transistor Qf of the flip-flop circuit is cut off. 4 to 6V, obtained at terminal (11), is added to the base of Q302 (Chroma Amp-1) for correct bias and to the killer diodes D307 (R-Y) and D315 (B-Y) for reverse bias. Thus the colour killer does not operate, and coloured picture (not always best colour) can be seen on the screen.
If 4 to 6V can be obtained at terminal (11), IC operates correctly. (Refer to Fig. 1-12.)

*2: Qc is OFF and Qd is ON in a normal condition of delay multivibrator. (Refer to Fig. 1-13.)

*3: When the voltage at the terminal (8) (or (9)) is nearly 0V and the terminal (7) (or (6)) is connected to ground, the voltages at terminals (8) and (9) are exchanged each other. In this case the flip-flop circuit for switcher in the IC operates correctly. (Refer to Fig. 1-14.)

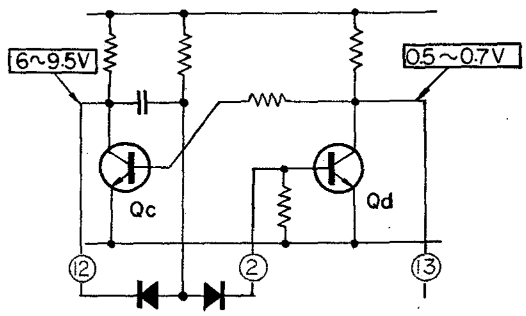


Fig. 1-13.

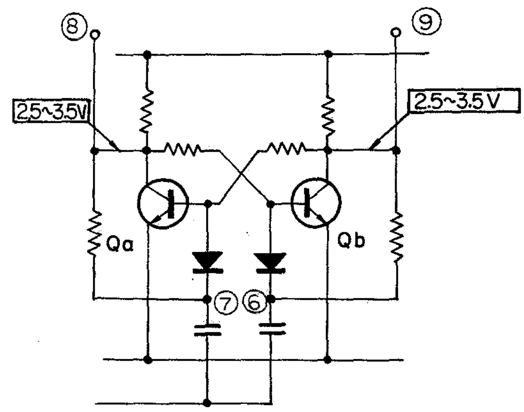
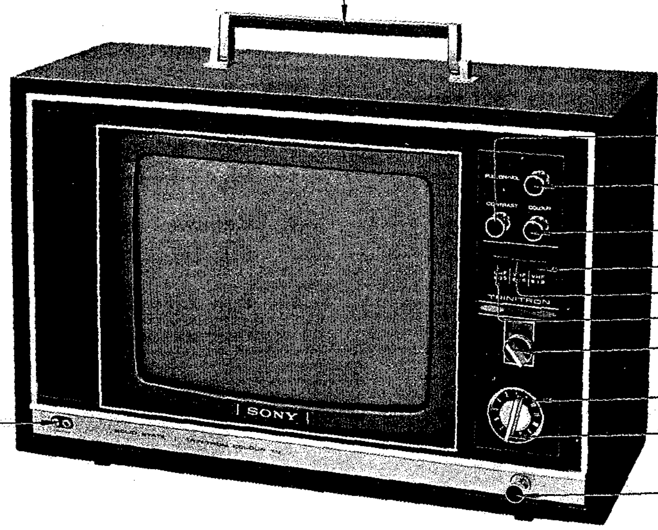


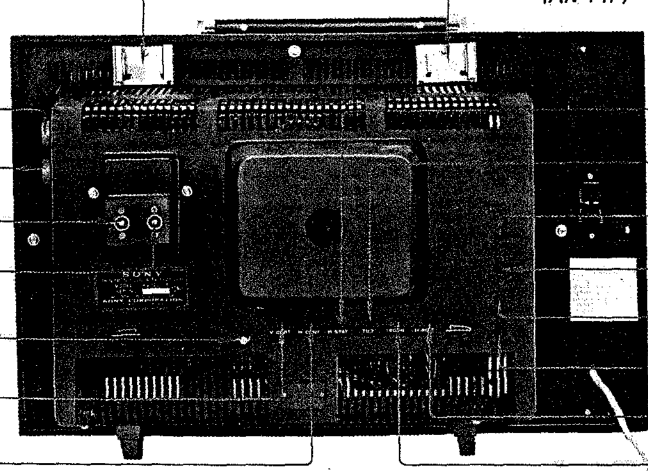
Fig. 1-14.

MEMO

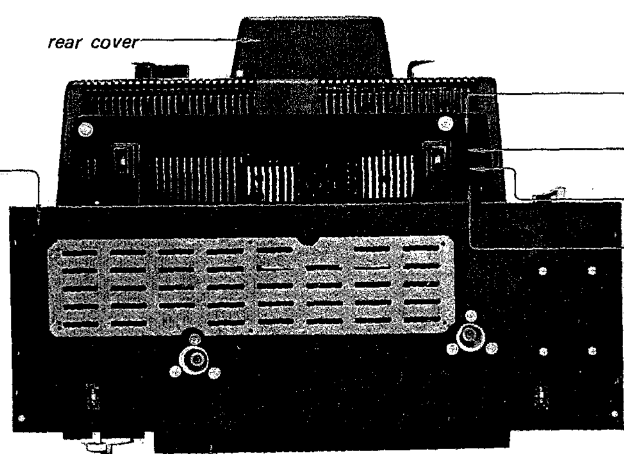
EXTERNAL VIEW



Front view



Rear view



Bottom view

SECTION 2
DISASSEMBLY

2-1. REAR COVER REMOVAL

1. Pull off the knobs for the horizontal hold and brightness controls.
2. Remove the nine screws labeled A1 ~ 9 in Fig. 2-1.
3. Place the set rear-side-up on a padded work surface.
4. Remove the two screws at the bottom labeled B1 ~ 2 in Fig. 2-2.
5. Lift the Rear Cover off as shown in Fig. 2-3.

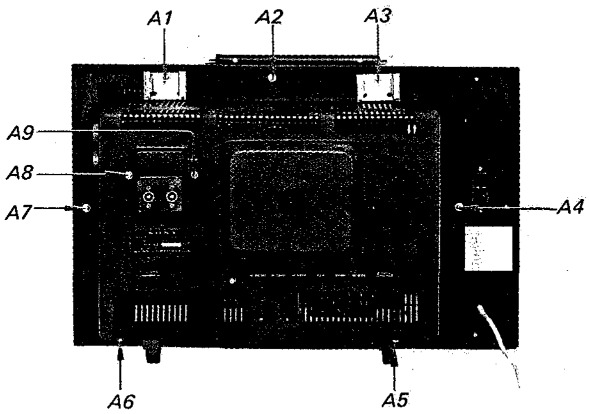


Fig. 2-1

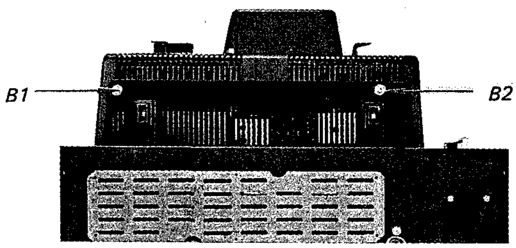


Fig. 2-2.

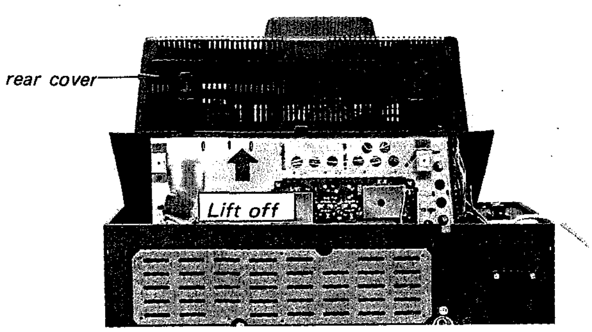


Fig. 2-3.

2-2. CABINET REMOVAL

1. Remove the Rear Cover.
2. Remove the two screws labeled C1 ~ 2 in Fig. 2-4.
3. Remove the two screws labeled D1 ~ 2 in Fig. 2-5.
4. Pull off the Power Plug, and then pull the Cabinet out as shown in Fig. 2-6.

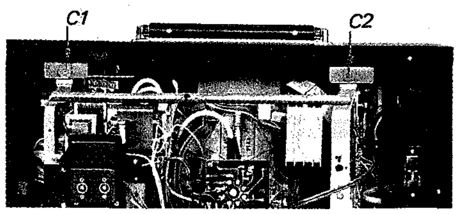


Fig. 2-4.

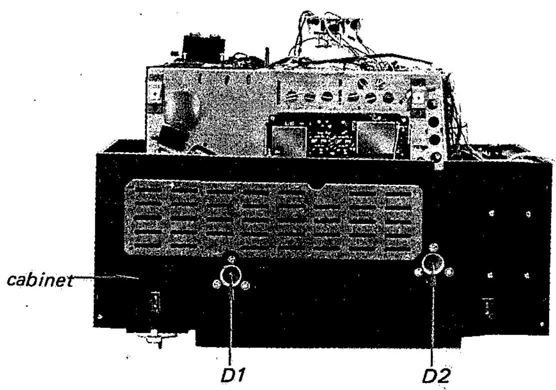


Fig. 2-5.

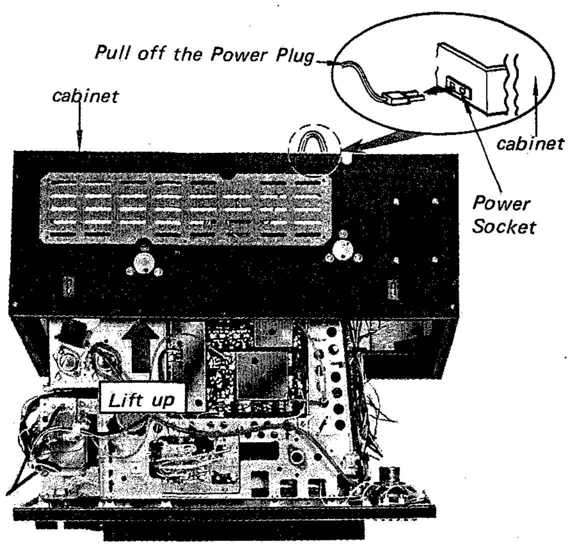


Fig. 2-6.

2-3. SPEAKER REMOVAL

1. Remove the Rear Cover and Cabinet.
2. Remove the four screws labeled E1 ~ 4 in Fig. 2-7.
3. Unsolder the two lead wires and then change the speaker.

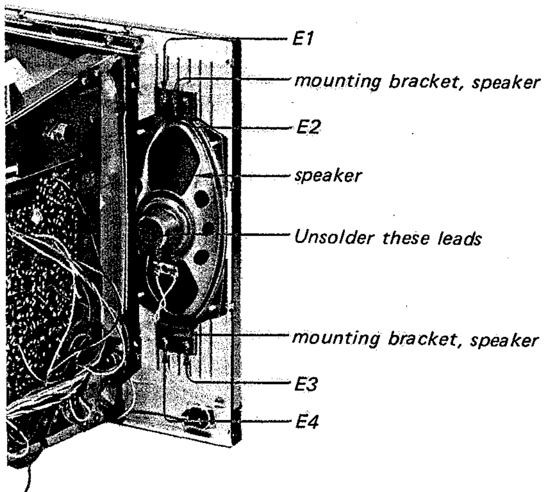


Fig. 2-7.

2-4. VHF TUNER REMOVAL

1. Remove the Rear Cover and Cabinet.
2. Pull off the VHF Channel selector and the Fine-tuning knob.
3. Remove the three screws labeled F1 ~ 3 in Fig. 2-8.
4. Pull the phono plug from the VHF tuner.

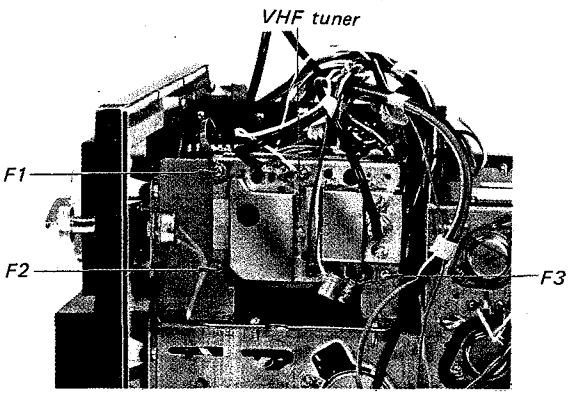


Fig. 2-8.

5. Unsolder the following leads at the VHF tuner. (See Fig. 2-9.)
   a. white/blue lead at agc terminal (to SW board)
   b. blue lead at $+B_1$ terminal (to SW board)
   c. white/red lead at $+B_2$ terminal (to SW board)
   d. VHF IF cable at center of tuner (to SW board)
6. Remove the VHF tuner.

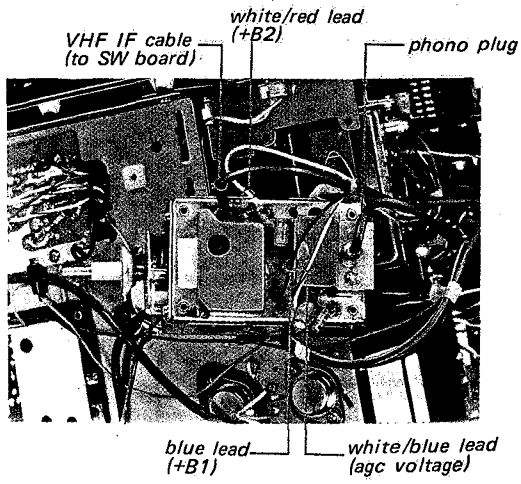


Fig. 2-9.

2-5. UHF TUNER REMOVAL

1. Remove the Rear Cover and Cabinet.
2. Pull off the UHF Channel selector, VHF Channel selector, VHF Fine-tuning Knob and TINT Control Knob.
3. Remove the six screws labeled G1 ~ 6 in Fig. 2-10.
4. Take out the tuner bracket with VHF and UHF tuners carefully.

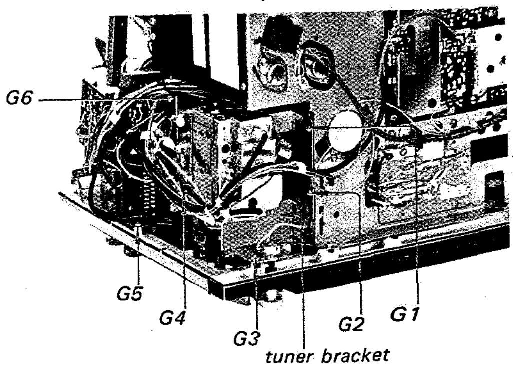


Fig. 2-10.

5. Remove the three screws labeled H1 ~ 3 in Fig. 2-11.
6. Pull off the phono plug as shown in Fig. 2-12.
7. Unsolder the following leads at the UHF tuner.
   a. green lead at $+B_1$ terminal (to SW board)
   b. red lead at $+B_2$ terminal (to SW board)
   c. white/green lead at agc terminal (to SW board)

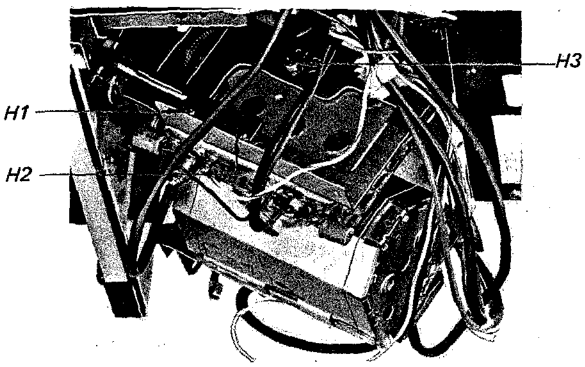


Fig. 2-11.

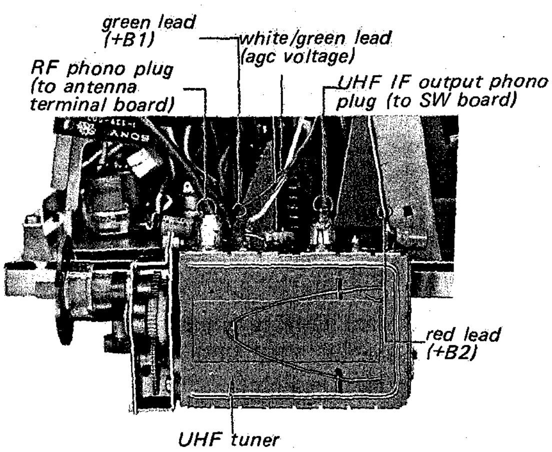


Fig. 2-12.

2-6. PRINTED CIRCUIT BOARD REMOVAL

Remove the Rear Cover and Cabinet to perform the following items:

SW Circuit Board

1. Remove the two screws labeled J1 ~ 2 in Fig. 2-13.
2. Lift out sound output transformer mounting plate carefully.
3. Remove the two screws labeled K1 ~ 2 in Fig. 2-13.
4. Unsolder a grounding lead as shown in Fig. 2-14.
5. Unfasten a wire binder and unfix a wire clamp as shown in Fig. 2-14.
6. Move the SW circuit board toward the High Voltage Insulating Case as shown in Fig. 2-15.
7. Pull out the SW circuit board as shown in Fig. 2-16.

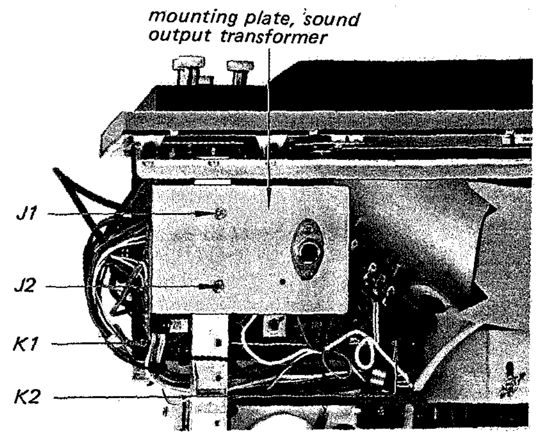


Fig. 2-13.

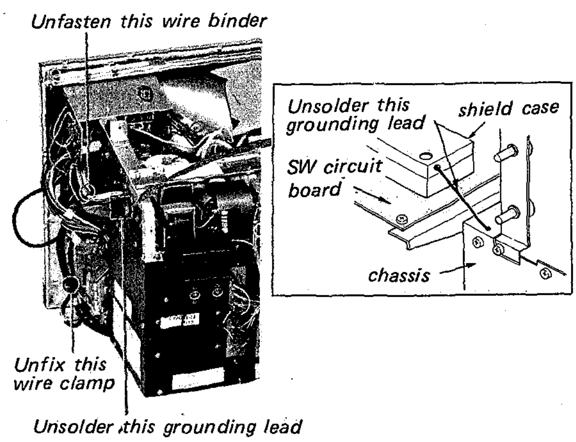


Fig. 2-14.

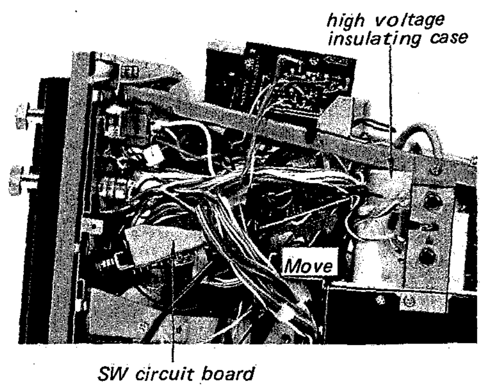


Fig. 2-15.

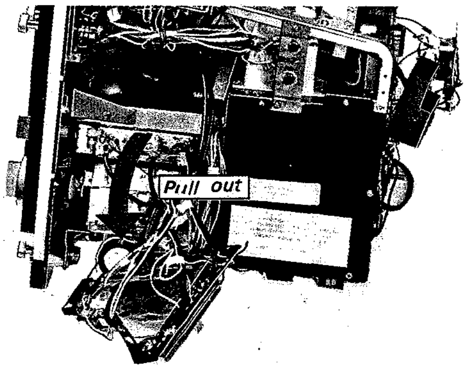


Fig. 2-16.

S Circuit Board

1. Place the set rear-side-up on a padded work surface.
2. Remove the two screws labeled L1 ~ 2 in Fig. 2-17.
3. Swing the S circuit board to the front.
4. If it is necessary to remove the board altogether, remove the two screws that secure the plastic hinges to the chassis.

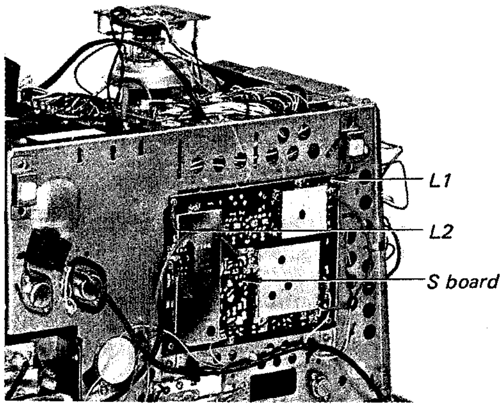


Fig. 2-17.

CD Circuit Board

1. Remove the two screws labeled M1 ~ 2 in Fig. 2-18.
2. Unfix the board retaining pawl.
3. Pull off the three pin-plugs on the T circuit board that connect between the red, green and blue outputs of CD circuit board and the T circuit board as shown in Fig. 2-18.
4. Swing the CD circuit board to the front as shown in Fig. 2-19.
5. If it is necessary to remove the board altogether, remove the two screws that secure the plastic hinges to the chassis.

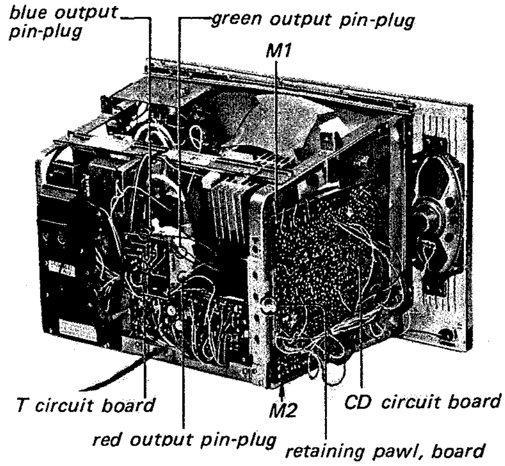


Fig. 2-18.

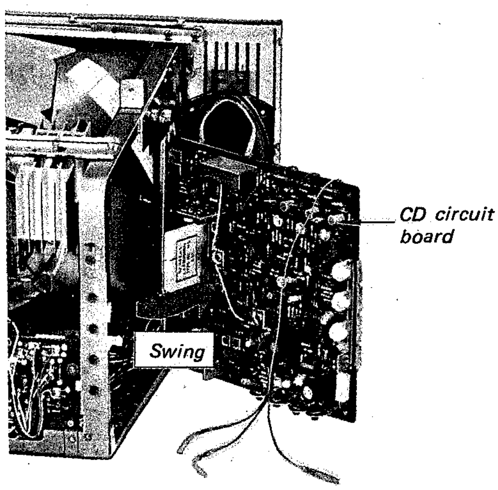


Fig. 2-19.

P1 Circuit Board

1. Remove the two screws labeled P1 ~ 2 in Fig. 2-20.

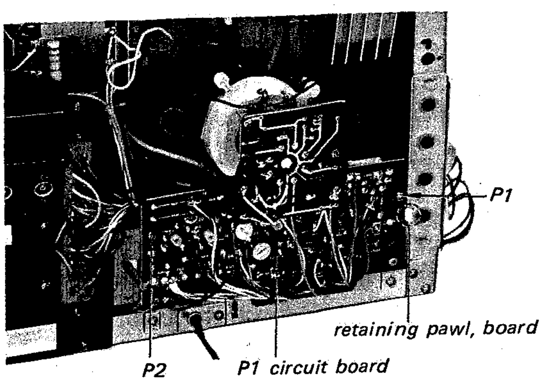


Fig. 2-20.

2. Unfix the board retaining pawl.
3. Swing the top edge of the P1 circuit board down until the board rests in a horizontal position as shown in Fig. 2-21.
4. If it is necessary to remove the board altogether, remove the two screws that secure the plastic hinges to the chassis.

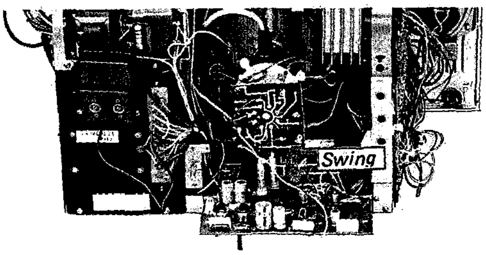


Fig. 2-21.

P2 Circuit Board

1. Remove the two screws labeled Q1 ~ 2 in Fig. 2-22.
2. Take off the P2 circuit board.

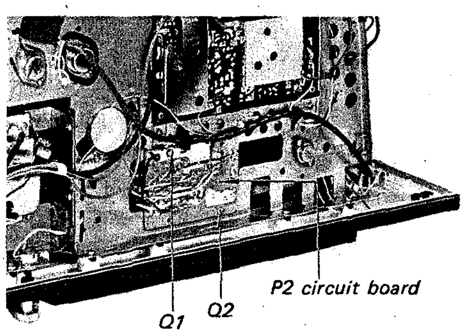


Fig. 2-22.

2-7. CONTROLS REMOVAL

1. Remove the Rear Cover and Cabinet.
2. Pull off the three front-panel control knobs (PULL ON/VOL control, COLOUR control and CONTRAST control).
3. Remove the two screws labeled R1 ~ 2 in Fig. 2-23.
4. Remove the two screws labeled J1 ~ 2 in Fig. 2-13.
5. Lift out the sound output transformer mounting plate carefully.
6. Remove a screw labeled S1 in Fig. 2-24.

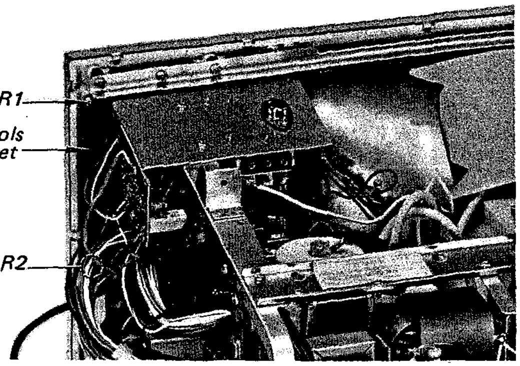


Fig. 2-23.

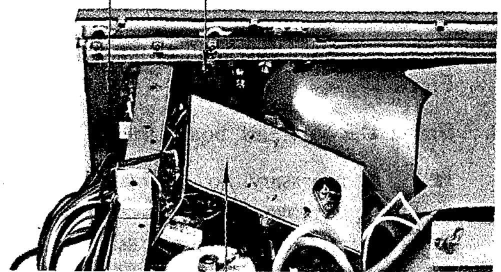


Fig. 2-24.

7. Perform steps 3 ~ 7 in Procedure 2-6 (SW circuit board removal).
8. Pull out the front controls mounting bracket as shown in Fig. 2-25.
9. Replace the controls (pull on/vol, colour and contrast).

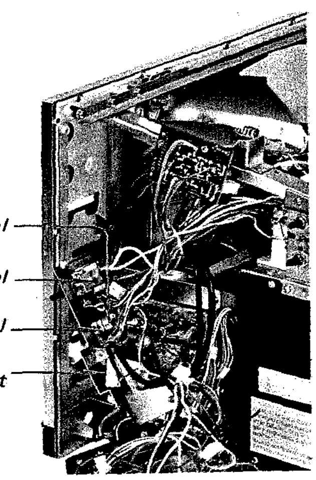


Fig. 2-25.

2-8. PICTURE TUBE REMOVAL

1. Remove the Rear Cover and Cabinet.
2. Pull off the four control knobs on the front panel.
3. Pull off the VHF Channel selector, the Fine-tuning knob and UHF Channel selector.
4. Unsolder the two red leads that are connected to the lug terminal (1L3L1) as shown in Fig. 2-26.
5. Pull off the T (socket) board from the picture tube.

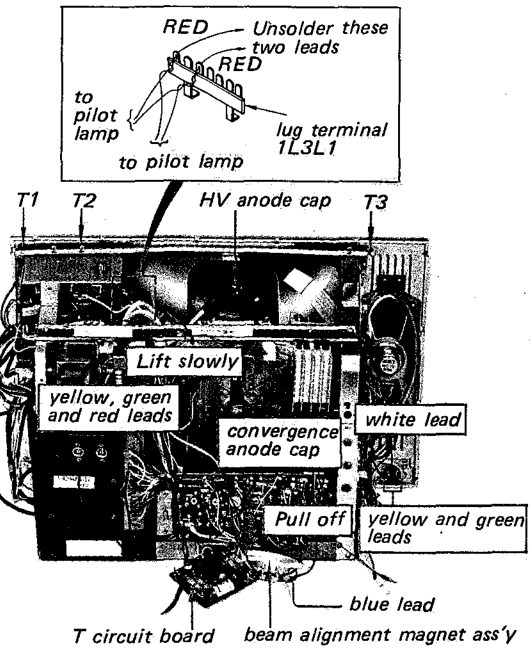


Fig. 2-26.

6. Pull off the beam alignment magnet assembly.
7. Pull off the two anode caps, convergence anode cap and HV anode cap, from the picture tube. Remove the convergence anode cap by removing the two screws and lifting the flaps slowly.
8. Unsolder the blue lead on the beam alignment magnet assembly. (See Fig. 2-26.)
9. Unsolder the three leads (yellow, green and red) on the deflection yoke.
10. Unsolder the two leads (yellow and green) on the earphone jack.
11. Unsolder the white lead that is connected to the left of the speaker terminal.
12. Remove the three screws labeled T1 ~ 3 in Fig. 2-26.
13. Remove the six screws labeled U1 ~ 6 in Fig. 2-27.
14. Remove the two screws labeled J1 ~ 2 in Fig. 2-13 and lift out the sound output transformer mounting plate carefully.
15. Remove a screw labeled S1 in Fig. 2-24.
16. Unsolder the black lead that is connected to the bottom of the chassis as shown in Fig. 2-27.
17. Lift off the chassis from the picture tube.

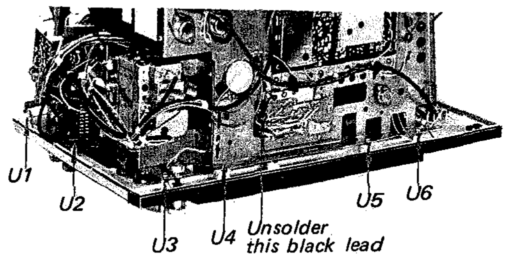


Fig. 2-27.

18. Remove the four nuts labeled V1 ~ 4 in Fig. 2-28.
19. Remove the two wing screws and loosen the clamp band of the deflection yoke as shown in Fig. 2-29.
20. Pull out the picture tube from the front panel and then remove the shield cover from the picture tube.

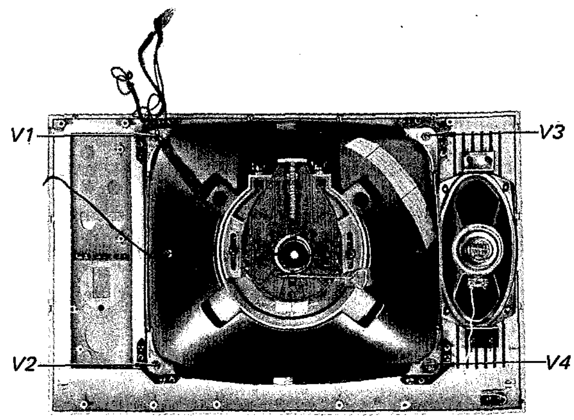


Fig. 2-28.

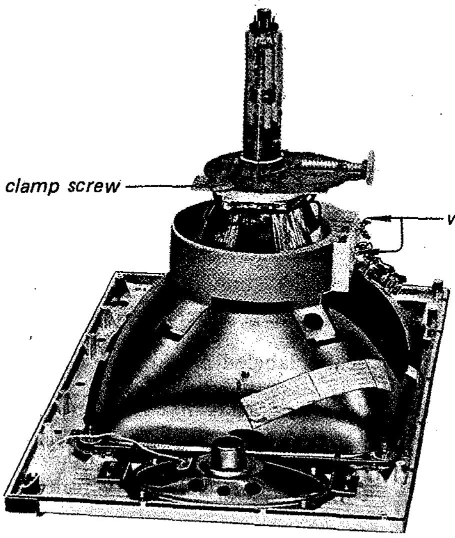


Fig. 2-29.

Note: The plastic assembly that supports the deflection yoke is permanently affixed to the bell of the picture tube. Do not try to pry the plastic assembly off the picture tube. Replacement picture tubes come with the yoke mount attached.

2-9. NEW PICTURE TUBE INSTALLATION

1. Place the shield cover on the new picture tube.
2. Place the picture tube on the front panel.
3. Tighten the four nuts as shown in Fig. 2-28.
4. Install the deflection yoke to the neck of picture tube, and tighten the two wing screws and the clamp band of the deflection yoke as shown in Fig. 2-29.
5. Insert the picture tube into the set. Install and tighten the nine screws shown in Figs. 2-26 and 2-27.
6. Solder the following leads:
   a. blue lead at beam alignment assembly
   b. white lead at speaker
   c. yellow and green leads at earphone jack
   d. yellow, green and red leads at deflection yoke
   e. two red leads at lug terminal (1L3L1)
7. Install the convergence and HV anode caps.
8. Set the rear edge of the beam alignment magnet assembly to contact with the convergence anode cap. Make sure that the two terminals on the beam alignment magnet assembly are uppermost (twelve-o'clock position).
9. Install the picture tube socket (T) board on the base of the tube.

2-10. HORIZONTAL OUTPUT TRANSFORMER REPLACEMENT

1. Remove the Rear Cover and Cabinet.
2. Remove the Antenna Terminal Board.
3. Move the two caps (on the lid of insulating case) along the leads to the anode caps. (See Fig. 2-30.)
4. Remove the four screws labeled W1 ~ 4 in Fig. 2-30.

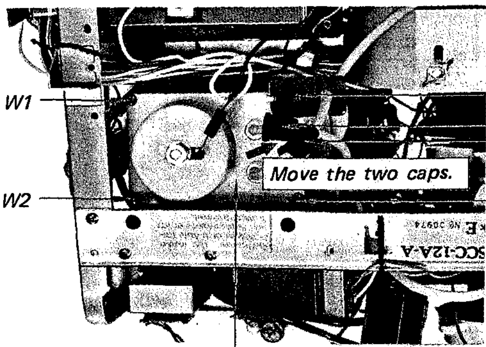


Fig. 2-30.

5. Swing the cover of insulator case as shown in Fig. 2-31. This permits access to the components of the convergence circuit and the socket of the rectifier tube.
6. Remove the four screws labeled X1 ~ 4 in Fig. 2-32.

Fig. 2-31.

7. Swing the cover of high voltage cage down as shown in Fig. 2-33.
8. Pull off the cap of the rectifier tube.
9. Remove the four screws labeled Y1～4 in Fig. 2-32.

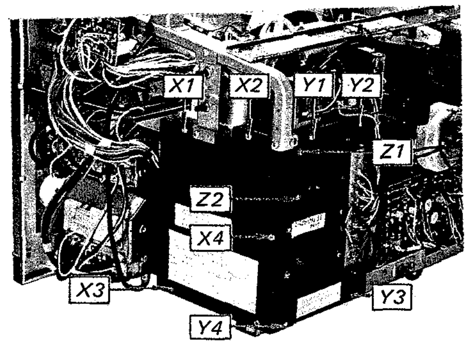


Fig. 2-32.

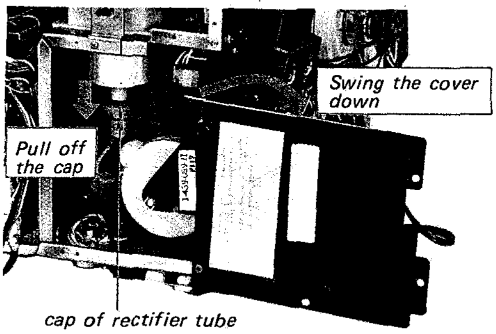


Fig. 2-33.

10. Pull out the rear of high voltage cage as shown in Fig. 2-34.
11. Replace the horizontal output transformer by removing the two screws labeled Z1～2 in Fig. 2-32.

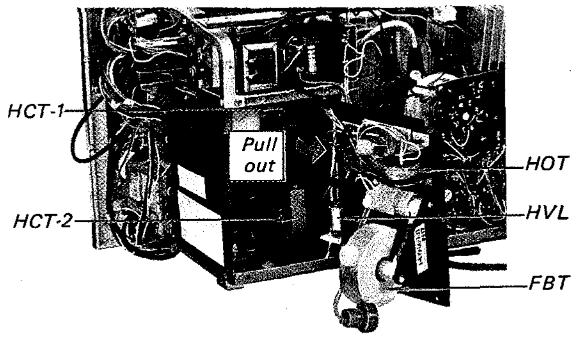


Fig. 2-34.

Note: 1. When handling the rectifier tube, put on gloves.

2. Prohibit the adjustment of high voltage inductance coil (HVL) positively.

SECTION 3
SERVICE ADJUSTMENTS

3-1. BEAM LANDING ADJUSTMENTS

Beam landing adjustments are made to ensure correct landing of the three beams on their designated phosphor stripes. Incorrect beam landing at any point on the screen results in colour contamination (a predominant hue) in those particular areas of the screen. Also, this adjustment is used when a complete realignment is needed following picture tube replacement.

Preparation:

1. Receive the dot pattern from the colour-bar generator.
2. Set the horizontal frequency control and vertical hold control for correct sync.
3. Set the brightness control at fully clockwise position and the contrast control at fully counterclockwise position.

Adjustment Procedure:

1. Face the screen due east or west, and degauss the entire screen area using a degaussing coil.
2. If misconvergence is found on the screen, adjust the horizontal static control (H-STAT) for best convergence at the centre of the screen.
3. Set the purity magnet control to the mechanical centre to obtain minimum magnetic field as shown in Fig. 3-1.
4. Loosen the clamp screw that secures the deflection yoke. Slide the deflection yoke forward against the funnel of the picture tube.
5. Pull off the pin-plugs of the red and blue leads on the T board or turn the red and blue back-ground controls fully counterclockwise to display a green raster. The screen should appear as shown in Fig. 3-2.
6. Adjust the purity magnet control to centre the vertical green band on the screen as shown in Fig. 3-3.
7. Slide the deflection yoke back towards the tube base to obtain a uniform green over the entire screen.

   Note: In this case, don't set the deflection yoke too far from the funnel of the picture tube.

8. If slight mislanding are found, make touch-up adjustments with the purity magnet.
9. Push the pin-plugs of the red and blue leads onto the T board or turn the red and blue back-ground controls clockwise to produce a white raster.
10. If mislanding is still found, touch up the purity magnet control and the position of the deflection yoke.
11. Face the screen due south or north, and degauss the entire screen area using a degaussing coil.
12. Confirm that no mislanding is found on the screen.

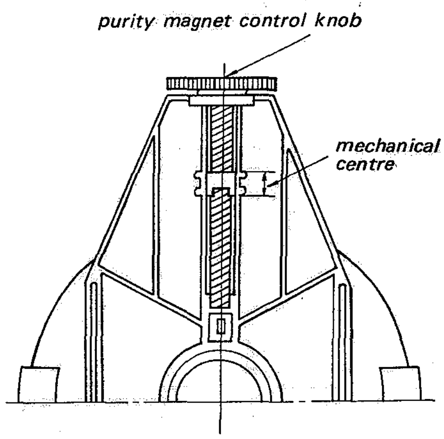


Fig. 3-1.

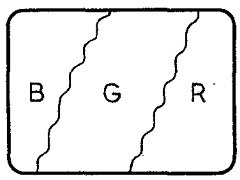


Fig. 3-2.

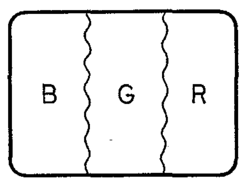


Fig. 3-3.

3-2. STATIC CONVERGENCE ADJUSTMENTS

Preparation:

1. The landing and white balance adjustments should be completed before starting the convergence adjustments.

2. The following adjustments should be completed:
   a. Horizontal size and vertical width and linearity adjustments. (See page 45 and page 46.)
   b. Focus adjustments. (See page 48.)
   c. Pincushion correction. (See page 45.)
3. Set the beam alignment magnet to the mechanical centre as shown in Fig. 3-4.
4. Set the contrast control to the mechanical centre position and the brightness control at fully counterclockwise position.
5. Receive the dot pattern from the colour-bar generator.
6. Set the system selector switch to UHF 625 position.

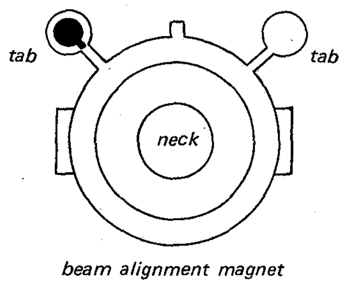


Fig. 3-4.

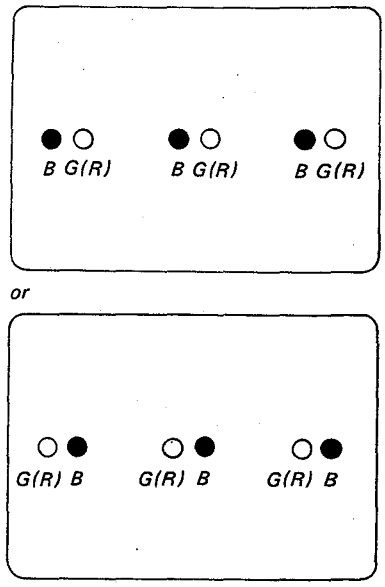


Fig. 3-6.

Adjustment Procedure:

Horizontal static convergence (UHF 625)

1. Adjust the horizontal static convergence control (H-STAT 625L) to converge the red dots and the blue dots with the green dots at the centre of the screen. Fig. 3-5.

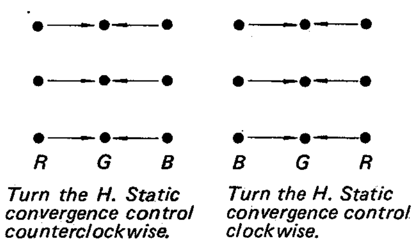
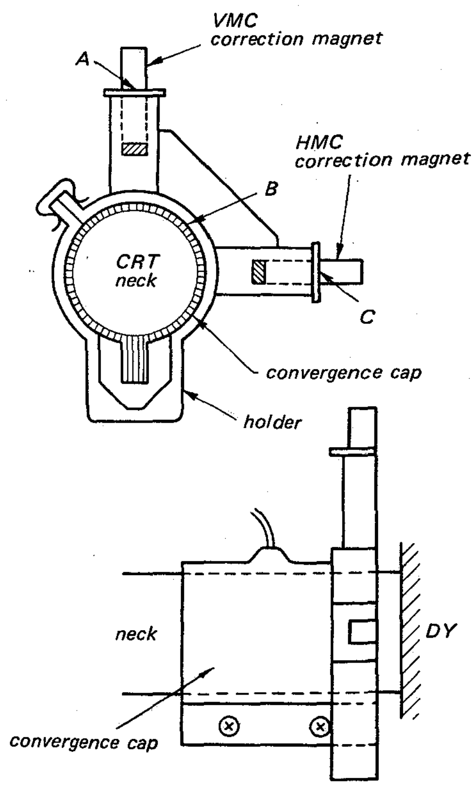


Fig. 3-5.

2. If the blue dots do not converge with the green and red dots at the centre of the screen, adjust the horizontal magnetic convergence control (HMC) as necessary. See Fig. 3-6 and Fig. 3-7.



Seal points A, B and C after adjustment with wax or paint.

Fig. 3-7.

Vertical static convergence (UHF 625)

1. Spread the two tabs of beam alignment magnet in equal amounts opposite directions to converge red dots and blue dots with green dots. See Fig. 3-8.

2. If the blue dot does not converge with the green and red dots at the centre of the screen, adjust the vertical magnetic convergence (VMC) control as necessary. See Fig. 3-9.

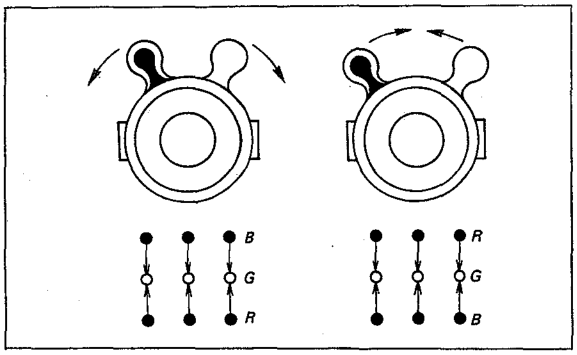
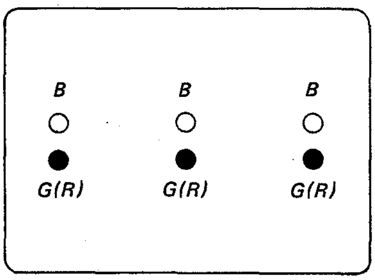


Fig. 3-8.



or

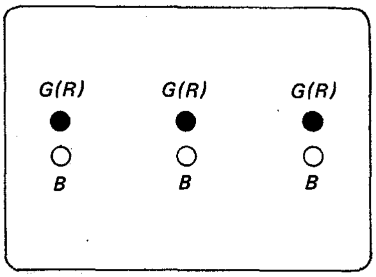


Fig. 3-9.

Note: 1. If it is necessary to correct convergence by using the HMC and VMC controls, mislanding may be found on the screen. Therefore, repeat the landing adjustment.

2. In most cases adjustment of the HMC and VMC controls will not be needed. Therefore, most of the unit have no HMC and VMC holder.

Set the system selector switch to VHF 819 position.

Horizontal static convergence (VHF 819)

1. Adjust the horizontal static convergence control (H-STAT 819L) to converge the red dots and the blue dots with the green dots at the centre of the screen.

2. Confirm that misconvergence does not appear on the screen. If misconvergence appear on the screen, repeat the horizontal and vertical static convergence adjustments when the system selector switch is set to UHF 625 position.

Note: Do not readjust the beam alignment magnet.

3-3. DYNAMIC CONVERGENCE ADJUSTMENTS

Adjustment Procedure:

1. Set the system selector switch to UHF 625 position.

2. Adjust the TILT control (VR604) to obtain the best horizontal convergence at both sides of screen. If correct convergence cannot be obtained, turn the TILT control to display the dot pattern as shown in Fig. 3-10 or Fig. 3-11.

3. If misconvergence is as shown in Fig. 3-10, reduce the capacitance value of C605. (Try the next smaller commercial value.) It will probably be necessary to reset the horizontal static convergence control (H-STAT 625L) after C605 has been changed. Readjust the TILT control, if necessary.

4. If misconvergence is as shown in Fig. 3-11, increase the capacitance value of C605. (Try the next larger commercial value.) It will probably be necessary to reset the horizontal static convergence control (H-STAT 625L) after C605 has been changed. Readjust the TILT control, if necessary.

5. Change the system selector switch to VHF 819 position.

6. Adjust the horizontal static convergence control (H-STAT 819L) to obtain the best convergence at the centre of the screen.

7. Confirm that the convergence at both sides of screen indicate the same conditions as obtained in UHF 625L.

8. If it is not, adjust the TILT control to obtain the best convergence at both VHF 819L and UHF 625L.

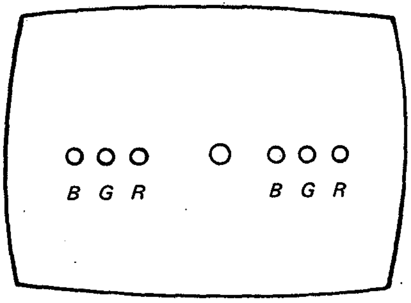


Fig. 3-10.

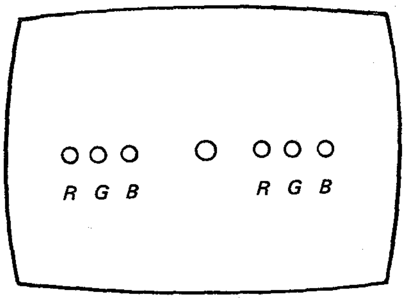


Fig. 3-11.

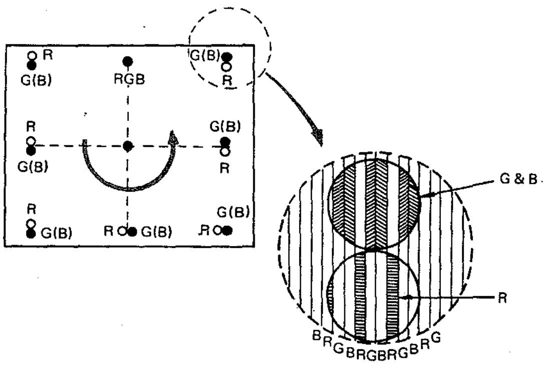
3-4. SCREEN-EDGE CONVERGENCE ADJUSTMENTS

If the conditions shown in Figs. 3-12 and 3-13 are observed, raise or lower the front edge of the deflection yoke to obtain the best vertical convergence at the screen edges.

Note: Confirm that no mislanding is appeared on the screen. If mislanding is found on the screen, repeat the landing adjustment procedure.

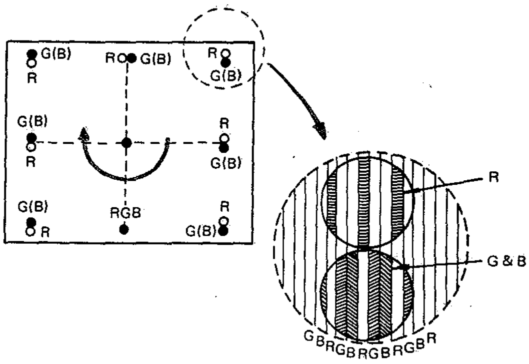
Movement of deflection yoke

1. Loosen the two screws labeled A and B in Fig. 3-14.



To correct this condition (to move the red dot as indicated by the arrow), raise the front edge of the yoke.

Fig. 3-12.



To correct this condition (to move the red dot as indicated by the arrow), lower the front edge of the yoke.

Fig. 3-13.

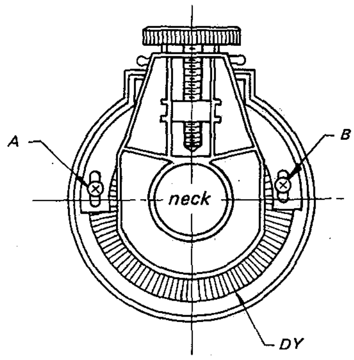


Fig. 3-14.

2. Loosen the clamp band labeled C in Fig. 3-15.
3. Raise or lower the front edge of the deflection yoke while taking care not to move the yoke forward or backward.
4. Secure the yoke in position by tightening the screws labeled A and B in Fig. 3-14. Tighten the clamp band.

Note: Confirm that the same satisfactory results can be obtained with the system selector switch set to both positions (UHF 625L and VHF 819L).

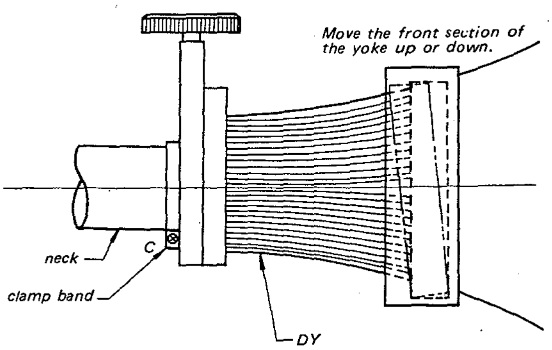


Fig. 3-15.

3-5. WHITE BALANCE ADJUSTMENTS

It is important to balance primary-colour beam current to produce a black-and-white monochrome picture that is free of any predominant hue. Correct white balance is a prerequisite for correct colour reproduction.

Landing adjustments should be completed before starting white-balance adjustments.

Preparation:

1. Receive the dots pattern from the colour-bar generator.
2. Set the horizontal frequency control and vertical hold control for correct sync.
3. Confirm that the raster size on the screen is normal.

Adjustment Procedure:

Low-level white balance adjustments

1. Turn the brightness control and contrast control counterclockwise to the full.
2. Turn the screen (SCRN) control VR603 on the P board to obtain a dark screen.
3. Set all three (red, green and blue) background controls (VR401, VR402 and VR403) to the mechanical centre.
4. Turn all three (red, green and blue) drive controls (VR404, VR405 and VR406) clockwise to the full (maximum brightness position).
5. Turn the screen control clockwise slowly and note the hue (red, green or blue) of the dots that become faintly visible first.
6. Adjust the two background controls for other two colours to obtain optimum white balance (neutral gray).
7. Turn the brightness and contrast controls clockwise about 60 degrees.
8. Confirm that optimum white balance is obtained, and if necessary, readjust the two background controls that was adjusted in step 6 to obtain optimum white balance.

High level white balance adjustments

1. Turn the brightness and contrast controls clockwise to the full.
2. Adjust the all three (red, green and blue) drive controls to obtain optimum white balance.
3. Turn the brightness and contrast controls counterclockwise to the full.
4. Confirm that optimum white balance is obtained at low level.
5. Repeat the adjustments for low and high level white balance two or three times.

SECTION 4
CIRCUIT ADJUSTMENTS

4-1. VIDEO IF ALIGNMENTS

Adjustment of the Last-stage of VIF Circuit

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Set the system selector switch to UHF 625 or VHF 819 position. 2. Set the channel selector to the inactive channel in the area. 3. Connect a 100k-ohm rheostat between collector of Q205 and +12V line as shown in Fig. 4-1. 4. Short the transformer T205 (VIFT-T5) with a short jumper lead as shown in Fig. 4-1. 5. Unsolder the conductor bridge A as shown in Fig. 4-1. 6. Connect a sweep generator to the base of Q203 through a network as shown in Fig. 4-2. 7. Connect a scope to the emitter of Q204 (No. 9 terminal). 8. Loosely couple the output of the marker generator to the output of sweep generator. (marker frequency: 28.05 MHz and 38.00 MHz)	T206 (VIFT-4) T207 (VIFT-5) T208 (VIFT-6)	1. Adjust the rheostat to eliminate the snow noise on the screen. 2. Set the output level of sweep generator to obtain 1.4Vp-p on the scope. 3. Adjust the three transformers T206, T207, and T208 to obtain a standard response curve as shown in Fig. 4-3. T206: position of 28.05MHz marker point T207: position of 38.00MHz marker point T208: tilt of the top of curve 4. Repeat the above steps two or three times.

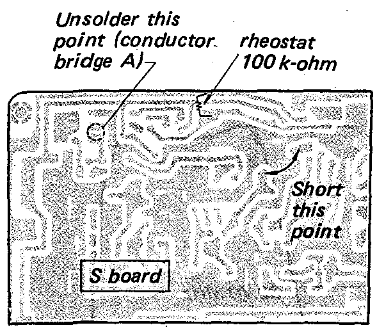


Fig. 4-1.

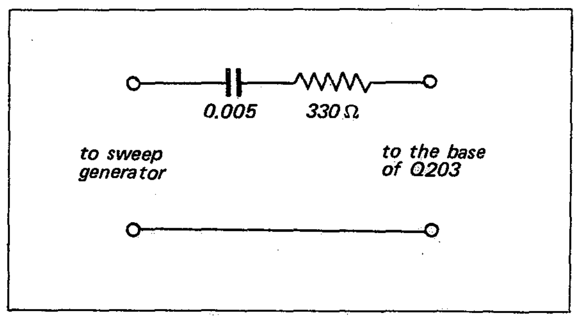


Fig. 4-2.

Adjustment of the Video IF Response Curve

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Set the channel selector to the inactive channel in the area. 2. Unsolder the conductor bridge A as shown in Fig. 4-1. 3. Unsolder the conductor bridge B as shown in Fig. 4-4. 4. Turn the agc adjustment controls VR151 and VR152 fully clockwise as viewed from component side. 5. Connect a sweep generator to the base of Q203 through a network as shown in Fig. 4-2. 6. Connect a scope to the emitter of Q204 (No. 9 terminal). 7. Loosely couple the output of the marker generator to the output of sweep generator.	T155 T156 T201 T202 T203 T204 T205	1. Adjust the output level of sweep generator to obtain 1.4Vp-p on the scope. Then, increase the output level of sweep generator by 30dB. 2. Connect the 100k-ohm rheostat between collector of Q205 and +12V line as shown in Fig. 4-1. 3. Adjust the 100k-ohm rheostat to obtain 1.4Vp-p on the scope. 4. Adjust the transformer T155 until the 28.05MHz marker point indicates maximum indication on the scope. 5. Adjust the five traps (T156; 24.30MHz, T201; 39.20MHz, T202; 39.10MHz, T203; 41.00MHz and T205; 39.30MHz) roughly. 6. Adjust the two transformers T155 and T204 to obtain a VIF response curve as shown in Fig. 4-5.

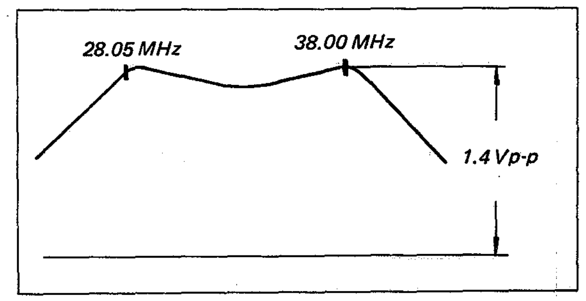


Fig. 4-3.

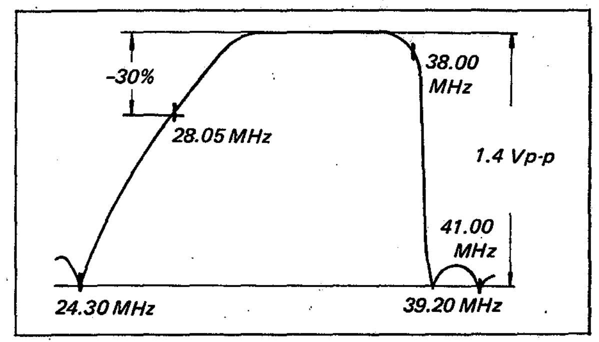


Fig. 4-5.

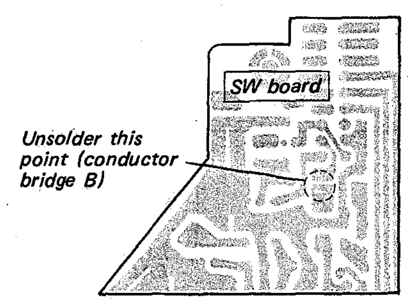


Fig. 4-4.

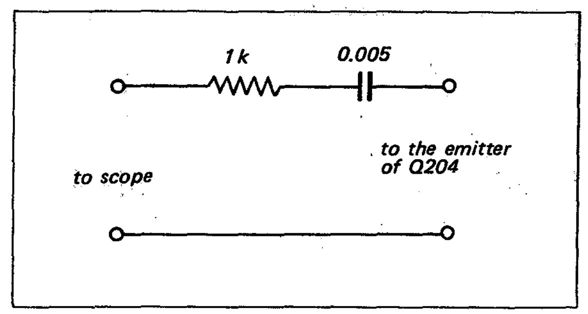


Fig. 4-6.

 KV-1220DF

Trap Adjustment

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Perform preparation steps from 1 to 7 in the video IF response curve adjustment procedure.	T156 (24.30 MHz) T201 (39.20 MHz) T202 (39.10 MHz) T203 (41.00 MHz) T205 (39.30 MHz)	1. Adjust five traps for minimum indication on the scope. 2. Adjust T155 and T204 to obtain a VIF response curve as shown in Fig. 4-5.

Adjustment of VIF Response Curve at VHF 819L

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to VHF 819 position. 2. Set the channel selector to the inactive channel in the area. 3. Turn the agc adjustment controls VR151 and VR152 fully clockwise as viewed from component side. 4. Connect a sweep generator to the VHF tuner's test point (TP). 5. Connect a scope to the emitter of Q204 through a network as shown in Fig. 4-6. 6. Loosely couple the output of the marker generator to the output of sweep generator.	IFT in tuner CV152	1. Adjust the output level of sweep generator to obtain 1.4 Vp-p on the scope. 2. Adjust the IFT in the tuner and CV152 on the SW printed board to obtain a response curve as shown in Fig. 4-7.

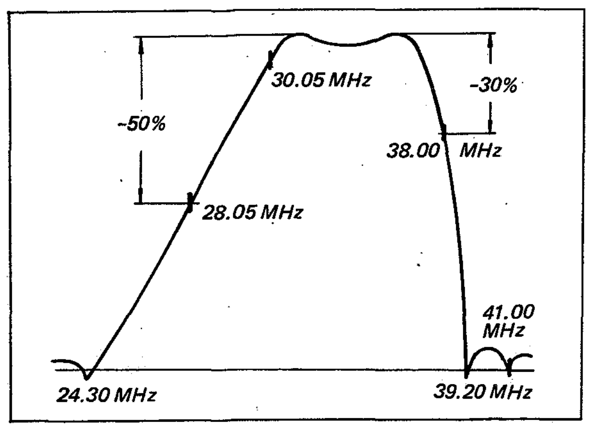


Fig. 4-7.

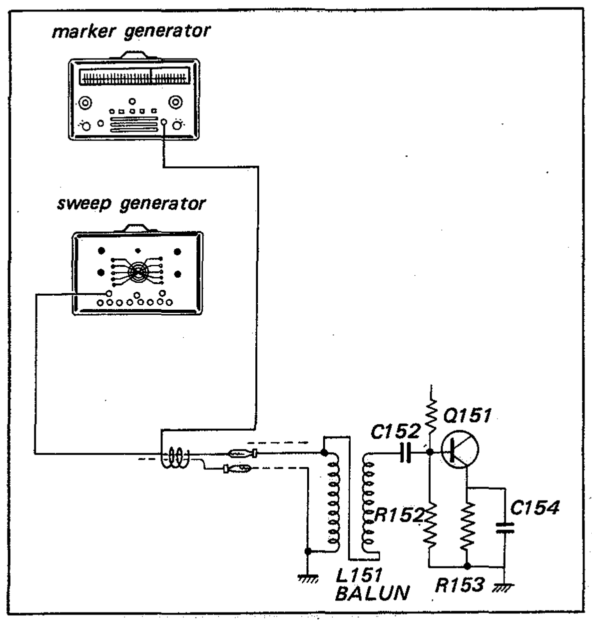


Fig. 4-8.

Adjustment of VIF Response Curve at UHF 625L

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to UHF 625 position. 2. Pull off the IF OUT phono plug from UHF tuner. See Fig. 4-9. 3. Turn the agc adjustment controls VR151 and VR152 fully clockwise as viewed from component side. 4. Connect a sweep generator to primary side of BALUN (L151) as shown in Fig. 4-8. 5. Loosely couple the output of the marker generator to the output of sweep generator. 6. Connect a scope to the emitter of Q204 through a network as shown in Fig. 4-6.	T151 T152 T153 CV151	1. Adjust the output level of sweep generator to obtain 1.4 Vp-p on the scope. 2. Connect a 100 k-ohm rheostat between collector of Q205 and +12 V line as shown in Fig. 4-1. 3. Increase the output level of sweep generator by 30 dB. 4. Adjust the 100 k-ohm rheostat to obtain 1.4 Vp-p on the scope. 5. Adjust the trap T153 until 31.20 MHz marker point indicates minimum indication on the scope. 6. Adjust T151, T152 and CV151 to obtain a standard response curve as shown in Fig. 4-10. 7. Repeat steps 5 and 6 until the standard response curve is obtained on the scope as shown in Fig. 4-10. 8. Decrease the output level of sweep generator by 40 dB. 9. Adjust the 100 k-ohm rheostat to obtain 1.4 Vp-p on the scope. 10. Confirm that the gain difference between the marker point of 33.95 MHz and 38.00 MHz should not exceed the limit of 30%, and the set does not occur the abnormal oscillation.

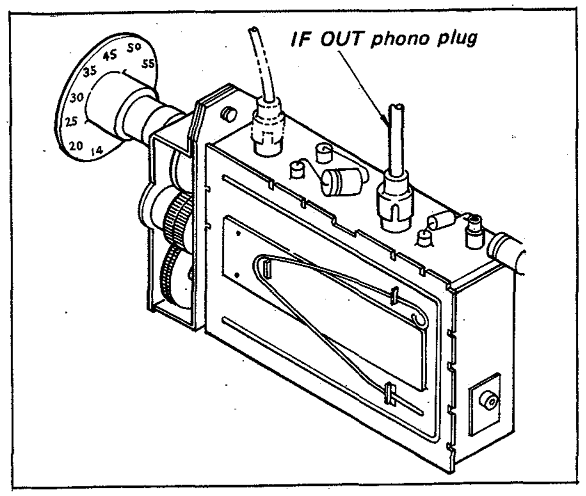


Fig. 4-9.

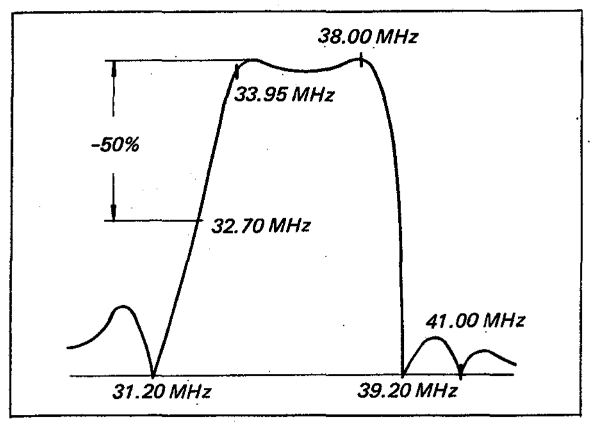


Fig. 4-10.

There are two service methods in the following three items. One is Factory Service Method and the other is Field Service Method.

Factory Service Method

Detector Output Adjustment

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to VHF 819 position. 2. Receive an off-the-air signal. (Input voltage is required from 1 mV to 10 mV). 3. Connect a scope to the emitter of Q204.	VR201	1. Adjust VR201 to obtain 1.4 Vp-p on the scope as shown in Fig. 4-11.

Adjustment of Tuner AGC at VHF 819L

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to VHF 819 position. 2. Receive an off-the-air signal. (Input voltage is required from 450μV to 700μV). 3. Connect a VOM to the emitter of Q153.	VR151	1. Adjust VR151 to obtain 2.0 Vp-p ± 0.2 Vp-p on the VOM.

Adjustment of Tuner AGC at UHF 625L

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to UHF 625 position. 2. Receive an off-the-air signal. (Input voltage is required from 1 mV to 10 mV). 3. Connect a VOM to the emitter of Q153.	VR152	1. Adjust VR152 to obtain 2.0 Vp-p ± 0.2 Vp-p on the VOM.

Field Service Method

Detector Output Adjustment

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to VHF 819 position. 2. Receive a strong off-the-air signal in your locality. 3. Connect a scope to the emitter of Q204.	VR201	1. Adjust VR201 to obtain 1.4 Vp-p on the scope as shown in Fig. 4-11.

Adjustment of Tuner AGC at VHF 819L

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to VHF 819 position. 2. Receive a strong off-the-air signal in your locality.	VR151	1. Adjust VR151 for minimum noise (snow) and cross modulation. Check each channel.

Adjustment of Tuner AGC at UHF 625L

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to UHF 625 position. 2. Receive a strong off-the-air signal in your locality.	VR152	1. Adjust VR152 for minimum noise (snow) and cross modulation. Check each channel.

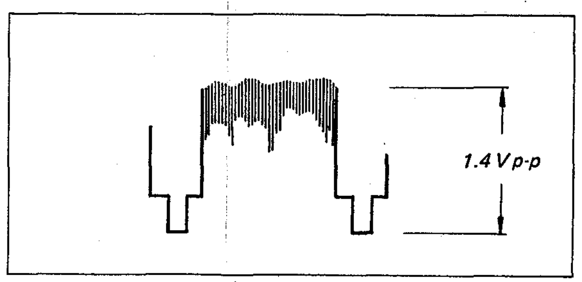


Fig. 4-11.

4-2. SOUND IF ALIGNMENTS

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Set the system selector switch to UHF 625 or VHF 819 position. 2. Set the channel selector to the inactive channel in your area. 3. Set the horizontal frequency control and vertical hold control for correct sync. 4. Set the brightness and contrast controls to obtain the optimum picture on the screen. 5. Connect a sweep generator to the No. 3 terminal of S board through a capacitor 4,700pF as shown in Fig. 4-12. 6. Connect a scope to the sound detector output as shown in Fig. 4-13. 7. Loosely couple the output of the marker generator to the output of sweep generator.	SIFT-1 SIFT-2 SIFT-3 SIFT-4 SIFT-5	1. Adjust the five transformers (SIFT-1 to SIFT-5) until the 39.2 MHz marker point indicates maximum indication on the scope as shown in Fig. 4-14. **Note:** Keep the output level of sweep generator to obtain always 200 mVp-p on the scope in the above steps.

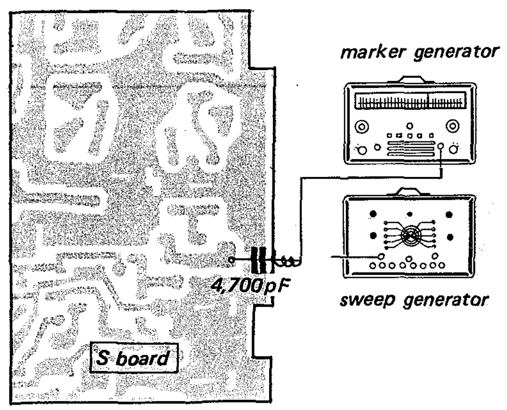


Fig. 4-12.

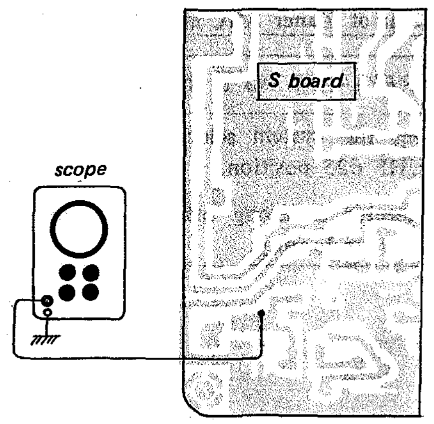


Fig. 4-13.

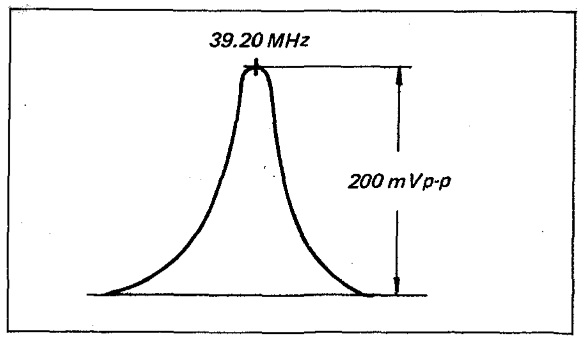


Fig. 4-14.

4-3. COLOUR CIRCUIT ADJUSTMENTS

BELL Characteristic Adjustments

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the colour-bar signal. 2. Set the brightness and contrast controls to obtain optimum picture on the screen. 3. Set the system selector switch to UHF 625 position. 4. Turn the colour control clockwise to the full. 5. Connect a scope to the collector of Q302.	T301	1. If the colour picture does not appear on the screen, ground the No. 10 terminal of IC418 (CX-513) with a jumper. 2. Adjust T301 to equalize the amplitude of waveform A with waveform B as shown in Fig. 4-15.

Level Adjustment between Direct Channel and Delayed Channel

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the colour-bar signal. 2. Set the brightness and contrast controls to obtain optimum picture on the screen. 3. Set the system selector switch to UHF 625 position. 4. Turn the colour control clockwise to the full. 5. Connect a scope to the cathode of D309 as shown in Fig 4-17.	VR301	1. Adjust VR301 to equalize the amplitude of Direct Channel with the amplitude of Delayed Channel as shown in Fig. 4-16.

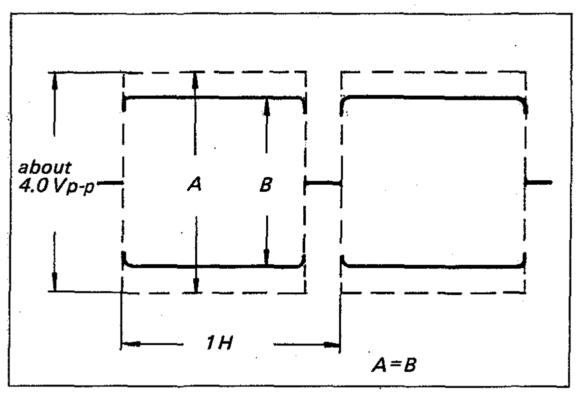


Fig. 4-15.

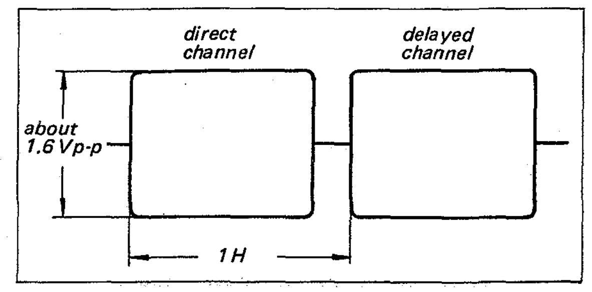


Fig. 4-16.

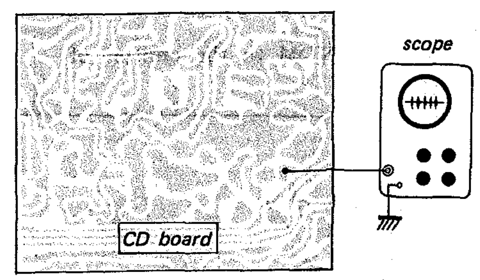


Fig. 4-17.

R-Y Discriminator Adjustment

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the colour-bar signal. 2. Set the contrast control at fully clockwise position (maximum contrast) and the tint control at the mechanical centre position. 3. Connect a scope to the collector of Q309. 4. Turn off the colour control and note the zero level line. 5. Turn the colour control fully clockwise.	T302 T303	1. Adjust T303 until the position of zero level (Z) of R-Y waveform becomes same as the zero level line which was indicated at step 4 as shown in Fig. 4-18. 2. Adjust T302 to make the R-Y waveform symmetrical on the scope as shown in Fig. 4-18.

B-Y Discriminator Adjustment

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the colour-bar signal. 2. Set the contrast control at fully clockwise position (maximum contrast) and the tint control at the mechanical centre position. 3. Connect a scope to the collector of Q313. 4. Turn off the colour control and note the zero level line. 5. Turn the colour control fully clockwise.	T304 T305	1. Adjust T305 until the position of zero level (Z) of B-Y waveform becomes same as the zero level line which was indicated at step 4 as shown in Fig. 4-19. 2. Adjust T304 to make the B-Y waveform symmetrical on the scope as shown in Fig. 4-19.

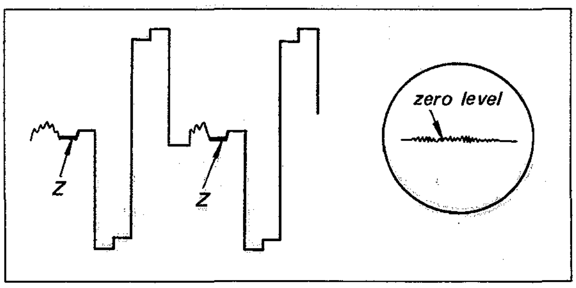


Fig. 4-18.

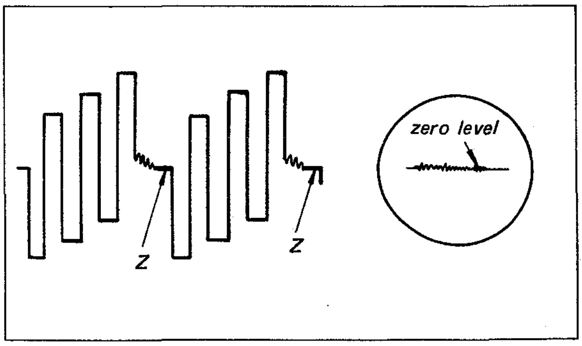


Fig. 4-19.

Y Trap Adjustment

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the colour-bar signal. 2. Set the contrast control at fully clockwise (maximum contrast) position. 3. Set the colour control at fully counterclockwise position. 4. Connect a scope to the red cathode output terminal.	T401	1. Adjust the core of T401 to minimize the sub-carrier component on the waveform as shown in Fig. 4-20.

Matrix Check

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the colour-bar signal. 2. Turn the contrast control clockwise to the full, and then turn it counterclockwise about 15 degrees. 3. Set the tint control at the mechanical centre position. 4. Connect a scope to red cathode output terminal.	VR905 VR303 VR302	1. Adjust the colour control (VR905) to obtain the red waveform as shown in Fig. 4-21. 2. Reconnect the scope to blue cathode output terminal. 3. Adjust VR303 to obtain the blue waveform as shown in Fig. 4-22. 4. Reconnect the scope to green cathode output terminal. 5. Confirm that the green waveform is as shown in Fig. 4-23. 6. Turn the colour control and the contrast control clockwise to the full (maximum position). 7. Reconnect the scope to the collector of Q313. 8. Adjust VR302 to obtain 6 Vp-p B-Y waveform on the scope as shown in Fig. 4-24.

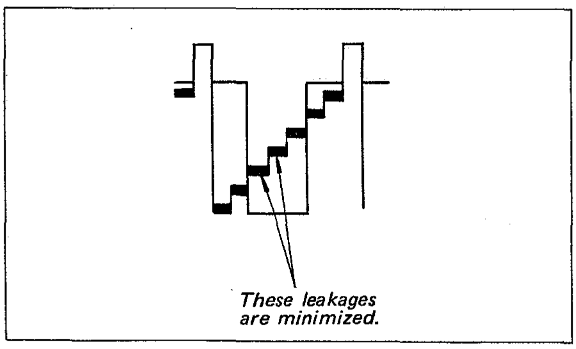


Fig. 4-20.

Fig. 4-21.

Fig. 4-23.

Fig. 4-22.

Fig. 4-24.

R-Y Discriminator Adjustment

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the colour-bar signal. 2. Set the contrast control at fully clockwise position (maximum contrast) and the tint control at the mechanical centre position. 3. Connect a scope to the collector of Q309. 4. Turn off the colour control and note the zero level line. 5. Turn the colour control fully clockwise.	T302 T303	1. Adjust T303 until the position of zero level (Z) of R-Y waveform becomes same as the zero level line which was indicated at step 4 as shown in Fig. 4-18. 2. Adjust T302 to make the R-Y waveform symmetrical on the scope as shown in Fig. 4-18.

B-Y Discriminator Adjustment

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the colour-bar signal. 2. Set the contrast control at fully clockwise position (maximum contrast) and the tint control at the mechanical centre position. 3. Connect a scope to the collector of Q313. 4. Turn off the colour control and note the zero level line. 5. Turn the colour control fully clockwise.	T304 T305	1. Adjust T305 until the position of zero level (Z) of B-Y waveform becomes same as the zero level line which was indicated at step 4 as shown in Fig. 4-19. 2. Adjust T304 to make the B-Y waveform symmetrical on the scope as shown in Fig. 4-19.

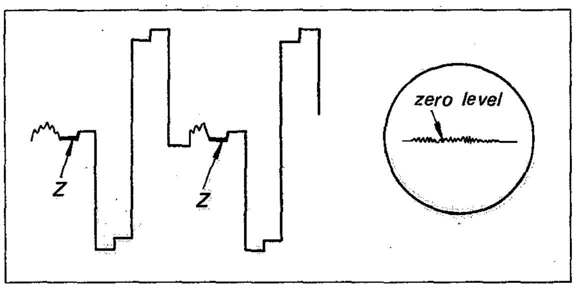


Fig. 4-18.

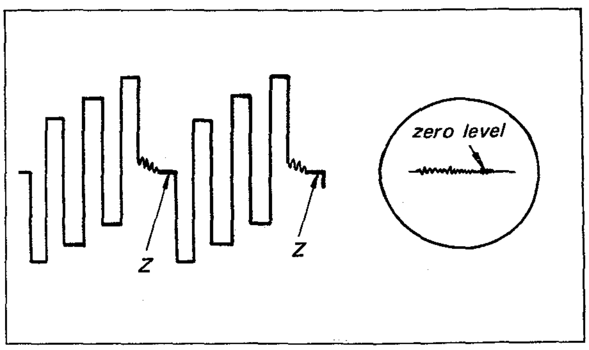


Fig. 4-19.

Y Trap Adjustment

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the colour-bar signal. 2. Set the contrast control at fully clockwise (maximum contrast) position. 3. Set the colour control at fully counterclockwise position. 4. Connect a scope to the red cathode output terminal.	T401	1. Adjust the core of T401 to minimize the sub-carrier component on the waveform as shown in Fig. 4-20.

Matrix Check

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the colour-bar signal. 2. Turn the contrast control clockwise to the full, and then turn it counterclockwise about 15 degrees. 3. Set the tint control at the mechanical centre position. 4. Connect a scope to red cathode output terminal.	VR905 VR303 VR302	1. Adjust the colour control (VR905) to obtain the red waveform as shown in Fig. 4-21. 2. Reconnect the scope to blue cathode output terminal. 3. Adjust VR303 to obtain the blue waveform as shown in Fig. 4-22. 4. Reconnect the scope to green cathode output terminal. 5. Confirm that the green waveform is as shown in Fig. 4-23. 6. Turn the colour control and the contrast control clockwise to the full (maximum position). 7. Reconnect the scope to the collector of Q313. 8. Adjust VR302 to obtain 6 Vp-p B-Y waveform on the scope as shown in Fig. 4-24.

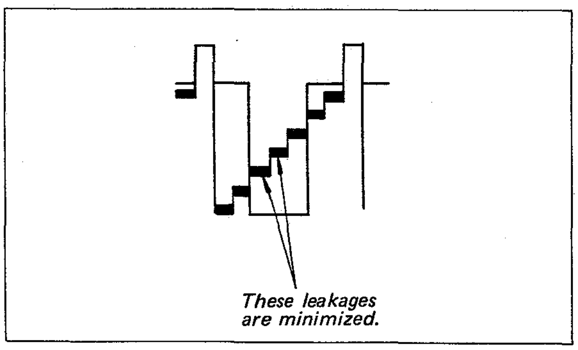


Fig. 4-20.

Fig. 4-21.

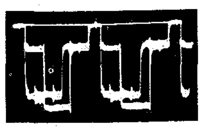


Fig. 4-23.

Fig. 4-22.

Fig. 4-24.

4-4. DEFLECTION CIRCUIT ADJUSTMENTS

Horizontal Frequency and Horizontal Stabilizing Coil Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the off-the-air signal. 2. Set the brightness and contrast controls to the optimum position. 3. Adjust the vertical hold control for correct sync. 4. Set the system selector switch to UHF 625 position. 5. Short the both ends of horizontal stabilizing coil (HSC1) with short jumper. 6. Connect a 4.7μF electrolytic capacitor between the collector of Q408 and ground.	VR504 HSC1	1. Set the horizontal frequency control (VR504) to synchronize the picture horizontally for an instant. 2. Remove the jumper from HSC1. 3. Set the horizontal stabilizing coil (HSC1) to synchronize the picture horizontally for an instant. 4. Confirm that the picture is synchronized after removing the 4.7μF electrolytic capacitor.

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to VHF 819 position. 2. Short the both ends of horizontal stabilizing coil (HSC2) with short jumper. 3. Connect a 4.7μF electrolytic capacitor between the collector of Q408 and ground.	VR505 HSC2	1. Set the horizontal frequency control (VR505) to synchronize the picture horizontally for an instant. 2. Remove the jumper from HSC2. 3. Set the horizontal stabilizing coil (HSC2) to synchronize the picture horizontally for an instant. 4. Confirm that the picture is synchronized after removing the 4.7μF electrolytic capacitor.

Adjustments of Pulse Width of Horizontal Oscillator

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the system selector switch to UHF 625 position. 2. Receive the off-the-air signal. 3. Set the brightness and contrast controls to the optimum position. 4. Adjust the horizontal frequency control and vertical hold control for correct sync. 5. Connect a scope to the emitter of Q506.	C520	1. Select the capacitance value of C520 to obtain 12.0 ± 0.5μs pulse width on the scope as shown in Fig. 4-25. 2. Readjust the horizontal frequency controls (H. FREQ1 and H. FREQ2) and horizontal stabilizing coils (HSC1 and HSC2).

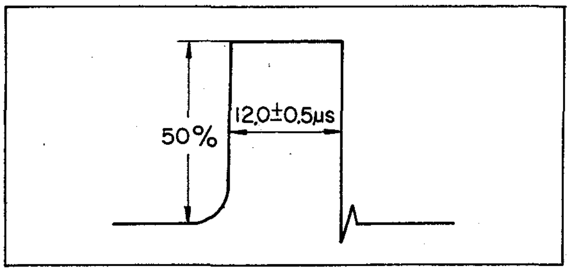
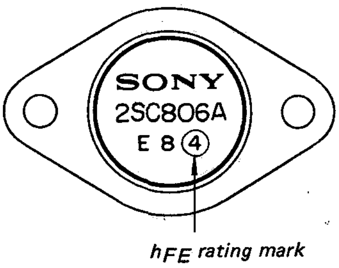
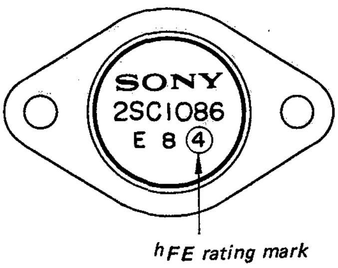


Fig. 4-25.

Horizontal and Converter Output Adjustments

<table>
<tr><th>PREPARATIONS & REMARKS</th><th>ADJUST</th><th>PROCEDURES</th></tr>
<tr><td></td><td>R526
R527</td><td>If a horizontal output transistor has been replaced, change R526 according to the hFE rating of transistor as shown in the table below.
<table>
<tr><th>Q802 hFE rating</th><th>R526</th></tr>
<tr><td>-2
2SC1086-3
-4</td><td>18Ω
24Ω
33Ω</td></tr>
</table>
If a converter output transistor has been replaced, change R527 according to the hFE rating of transistor as shown in the table below.
<table>
<tr><th>Q801 hFE rating</th><th>R527</th></tr>
<tr><td>-4
2SC806A-5
-6</td><td>27Ω
33Ω
43Ω</td></tr>
</table></td></tr>
</table>





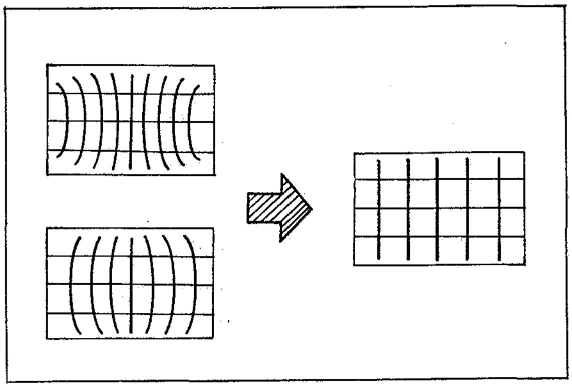


Fig. 4-26.

Horizontal Size and Horizontal Centreing Adjustments

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the test pattern signal. 2. Adjust the horizontal frequency control and vertical hold control for correct sync. 3. Adjust the brightness control until the test pattern becomes faintly visible on the screen. 4. Set the contrast control at fully counterclockwise position (minimum position). 5. Set the system selector switch to VHF 819 position. 6. Confirm that the pincushion distortion is not found on the screen.	VR609 VR605 R634 VR602	1. Adjust VR609 and VR605 until outside lines of the checkers of test pattern are in contact with the edge of picture tube. 2. If the horizontal pattern is larger than the screen despite the adjustments of VR609 and VR605, add resistor R634 (100 kΩ) on the conductor side. 3. Set the system selector switch to UHF 625 position. 4. Adjust VR602 until outside lines of the checkers of test pattern are in contact with the edge of picture tube. 5. Reset the system select switch to VHF 819 position. 6. Confirm that the centre of pattern is at the centre of the screen. If it is not, readjust VR605 for correct position. 7. Readjust VR609 and VR602. 8. Confirm that the optimum white balance is obtained on the screen.

Right and Left Pincushion Correction Adjustments

PREPARATIONS & REMARKS	ADJUST	PROCEDURES
1. Receive the crosshatch signal. 2. Set the system selector switch to UHF 625 position. 3. Adjust the brightness and contrast controls until the crosshatch pattern becomes faintly visible on the screen.	VR601	1. Adjust VR601 to obtain the correct pattern as shown in Fig. 4-26. 2. Change the system selector switch to VHF 819 position. 3. If there is a noticeable pincushion distortion at either of the switch position, adjust VR601 to produce best pattern at both switch position.

Vertical Bias Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the horizontal frequency control and vertical hold control for correct sync. 2. Adjust brightness and contrast controls to obtain the best picture. 3. Set the system selector switch to UHF 625 position. 4. Confirm that the voltage at terminal 8 of P2 board is between 91V and 99V. 5. Connect a VOM to the emitter of Q902 (V. out).	VR501	1. Adjust VR501 to obtain the emitter voltage of Q902 is between 6.8V and 7.2V.

Vertical Height and Linearity Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the test pattern. 2. Set the horizontal frequency control and vertical hold control for correct sync. 3. Adjust the brightness and contrast controls until the test pattern becomes faintly visible on the screen. 4. Set the system selector switch to UHF 625 position.	VR503 VR502 R503	1. Adjust VR503 and VR502 for best picture height and linearity while observing the picture. 2. Change the system selector switch to VHF 819 position. Confirm that the picture height is same as obtained in step 1. i) If the picture height is not enough, readjust VR503 and VR502 for best picture. ii) If the picture height is overscanned, unsolder a lead wire that is connected to resistor R503, and then solder the lead wire to R506 as shown in Fig. 4-27.

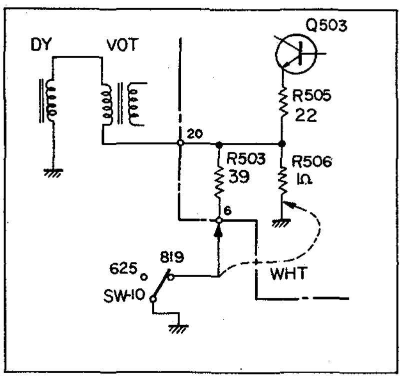


Fig. 4-27.

Vertical Centreing Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the test pattern. 2. Set the horizontal frequency control and vertical hold control for correct sync. 3. Adjust the brightness and contrast controls until the test pattern becomes faintly visible on the screen. 4. Set the system selector switch to UHF 625 position. 5. Face the set due south or north. 6. Degauss the entire screen area using a degaussing coil.	VR606	Adjust VR606 to locate the picture at the centre of the screen while observing the picture.

Vertical Hold Range Check

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Recieve an off-the-air signal. 2. Set the brightness and contrast controls to obtain the optimum picture. 3. Set the system selector switch to UHF 625 position.	C514	1. Turn the vertical hold control clockwise. And note the position of vertical hold control knob when the picture start rolling upward. 2. Set the system selector switch to VHF 819 position. 3. Turn the vertical hold control until the picture start rolling upward. And note the position. 4. The angle difference of vertical hold control between step 1 and step 3 should be within the range of 15°. If it is not, add or omit the capacitor C514 (0.0022μF). **Note:** When omitting the capacitor, the range of vertical hold at VHF 819 position becomes wider.

115V Line Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the brightness and contrast controls to obtain the optimum picture on the screen. 2. Set the horizontal frequency control and vertical hold control for correct sync. 3. Confirm that the output of power rectifier is 126V. 4. Connect a VOM to the emitter of Q901 as shown in Fig. 4-28.	VR607	1. Adjust VR607 to obtain the dc voltage of between 114V and 116V.

Focus Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Set the brightness and contrast controls to obtain the optimum picture on the screen. 2. Set the horizontal frequency control and vertical hold control for correct sync. 3. Receive an off-the-air signal.	Focus lead	1. Try to connect the focus lead at each of the connecting points on the P1 board. See Fig. 4-29. Connect permanently at the point where gives best focus.

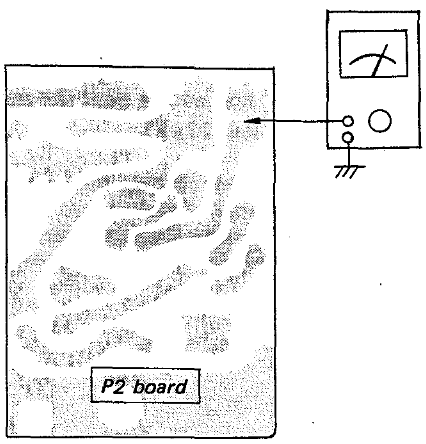


Fig. 4-28.

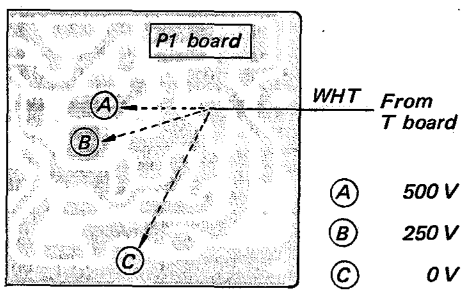


Fig. 4-29.

Automatic Brightness Limiter (ABL) Adjustments

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive the monochrome test pattern. 2. Unsolder R807, C804 and one lead wire from No. 8 pin on 20P terminal board at high voltage block. 3. Connect an ammeter between No. 8 pin and one lead wire together with R807 and C804 as shown in Fig. 4-30.	VR407	1. Adjust VR407 to obtain the current of between 700μA and 800μA on the VOM.

6.5 MHz Trap Adjustments (Serial No. 10501 and later)

PREPARATIONS & REMARKS	*ADJUST*	*PROCEDURES*
1. Receive a UHF off-the-air signal. 2. Set the UHF channel selector for just tuning position, then turn it clockwise little by little to obtain 6.5 MHz beat clearly. 3. Connect a scope to the emitter of Q204.	T905	1. Adjust T905 to minimize the 6.5 MHz beat on the screen. Namely, adjust T905 to minimize the 6.5 MHz component on the back-porch of horizontal synchronizing signal as shown in Fig. 4-31.

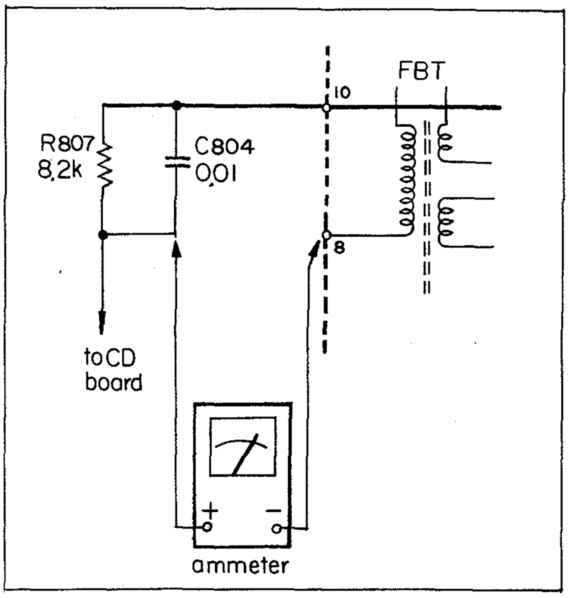


Fig. 4-30.

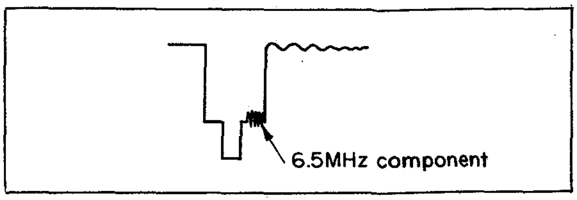
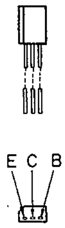
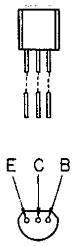


Fig. 4-31.

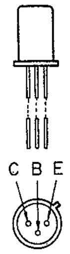
EXTERNAL VIEW OF TRANSISTORS AND DIODES



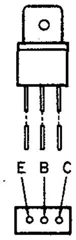
2SC633A
2SC403A



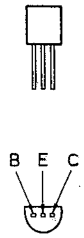
2SA564A



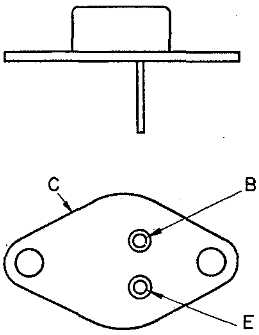
2SC318A



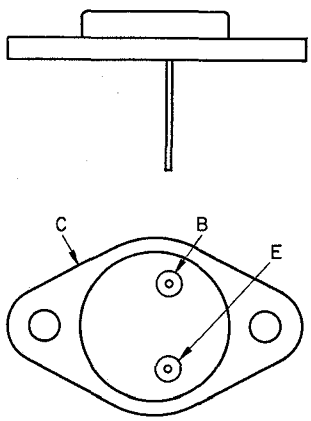
2SC1124
2SC1127



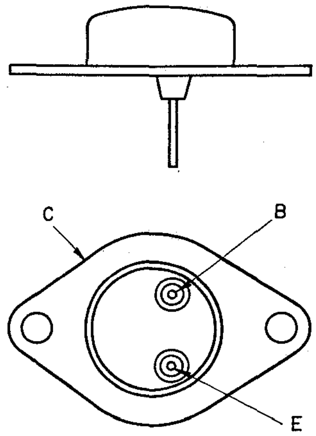
2SC1128
2SC1129



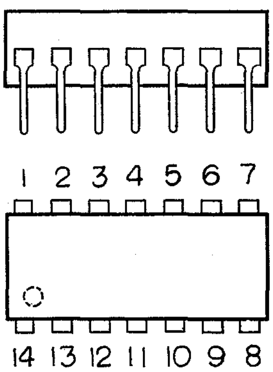
2SC867
2SD24



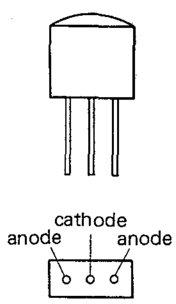
2SC806A
2SD201



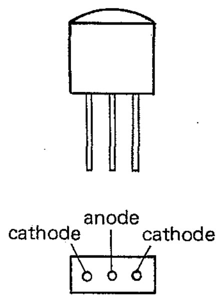
2SC1086



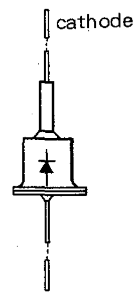
IC CX-513
(bottom view)



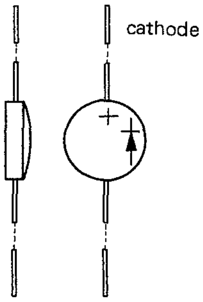
CD-4



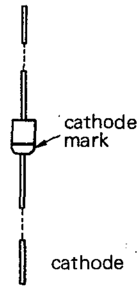
CDR-4



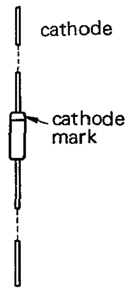
S-4C *TD-13*
SB-2B *AD-2*



ZB1-11
HF SD-1A



10D-2
SK-1W50



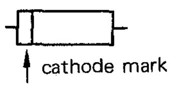
1T22 *1T261*
1T22A *1T40*
1T23S

CLASSIFIED TABLE OF DIODES

1T26-1	*silver*, SONY 1T261, *black*	*black*, *blue*, *clear*	*red*, *blue*, *clear*	*blue*, *blue*, *clear*	*blue*, *clear*	*white*, *blue*, *clear*	*black*, *blue*, *clear*

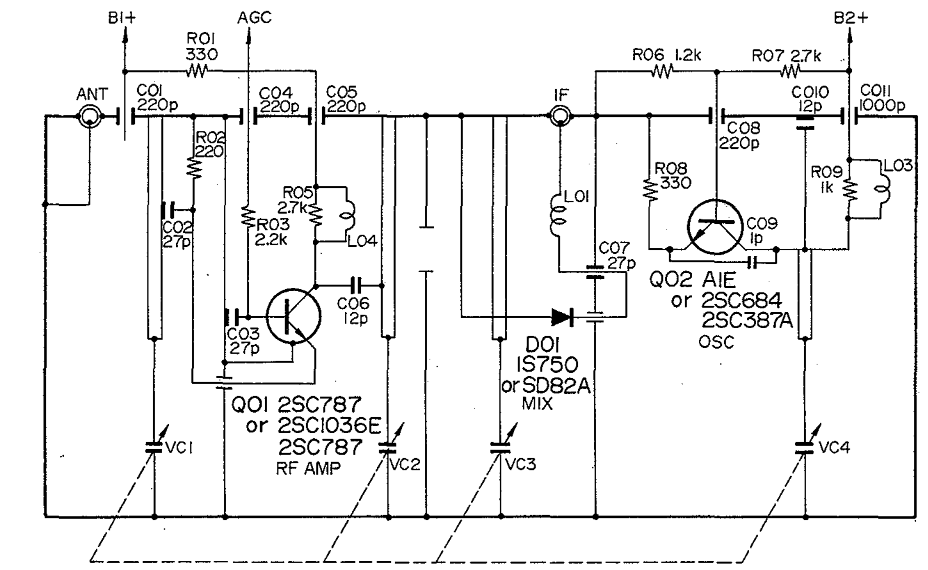
1T23S	*white*, *red*, *clear*	*white*, *red*, *clear*	*black*, *red*, *clear*	*black*, *red*, *clear*			

Note:

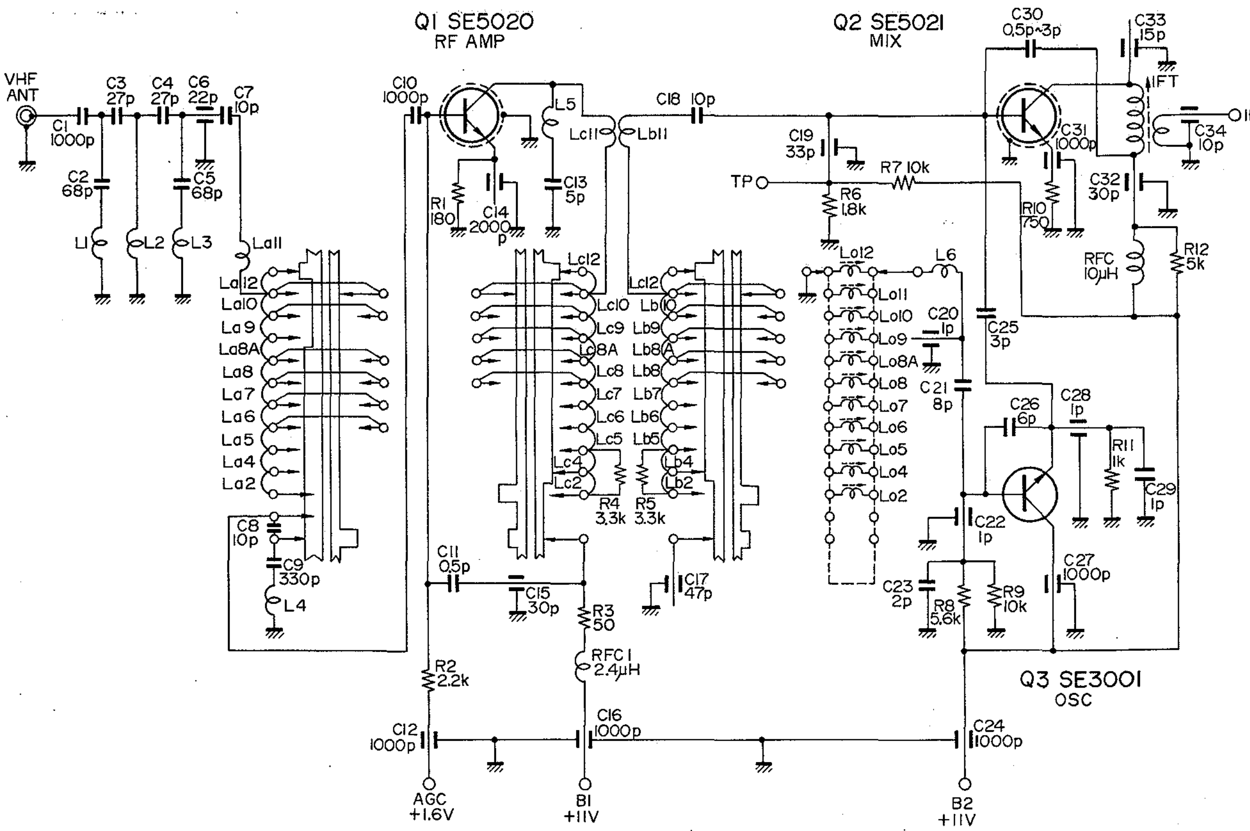


SCHEMATIC DIAGRAM

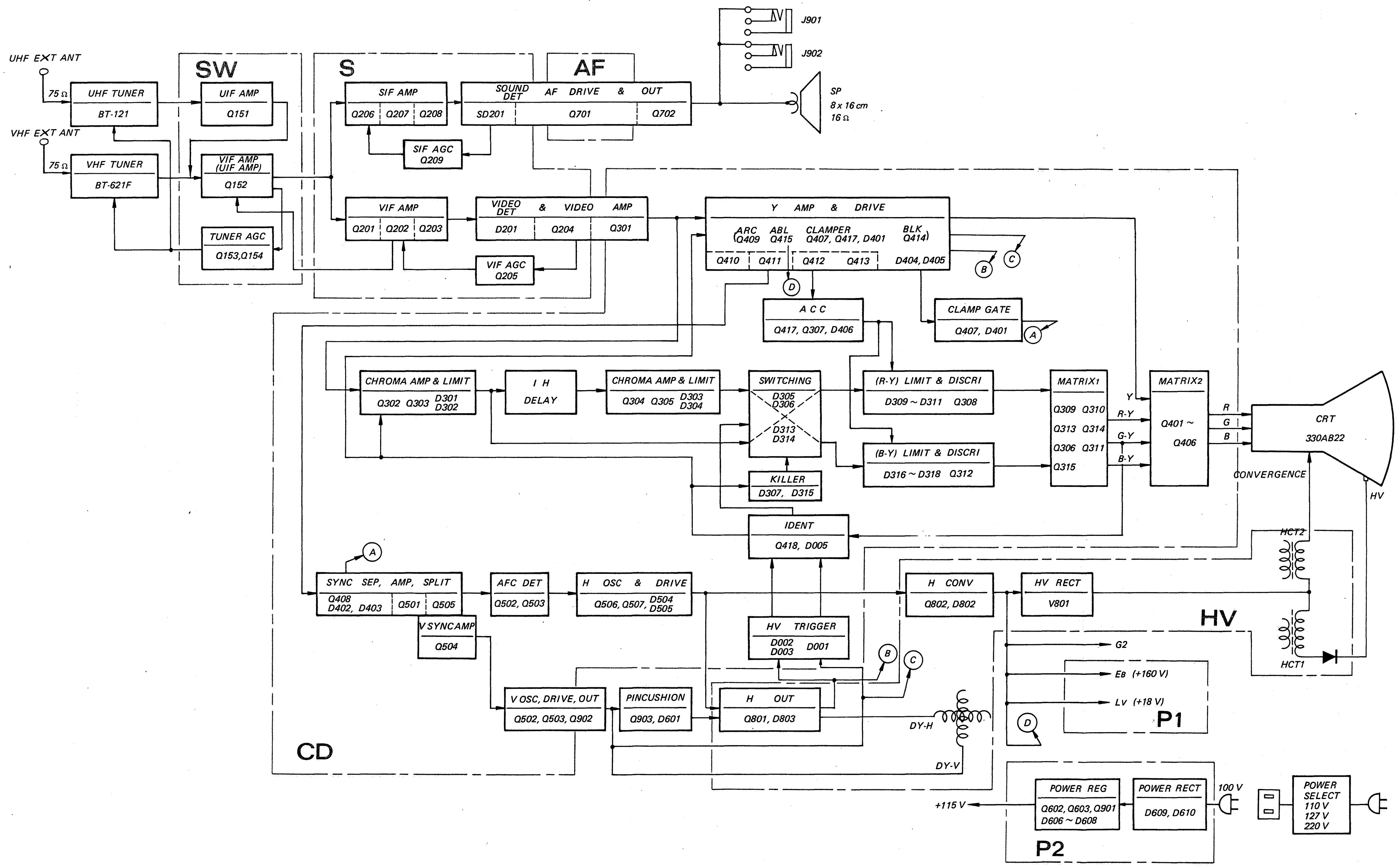
UHF TUNER (BT-121)



VHF TUNER (BT-621F)



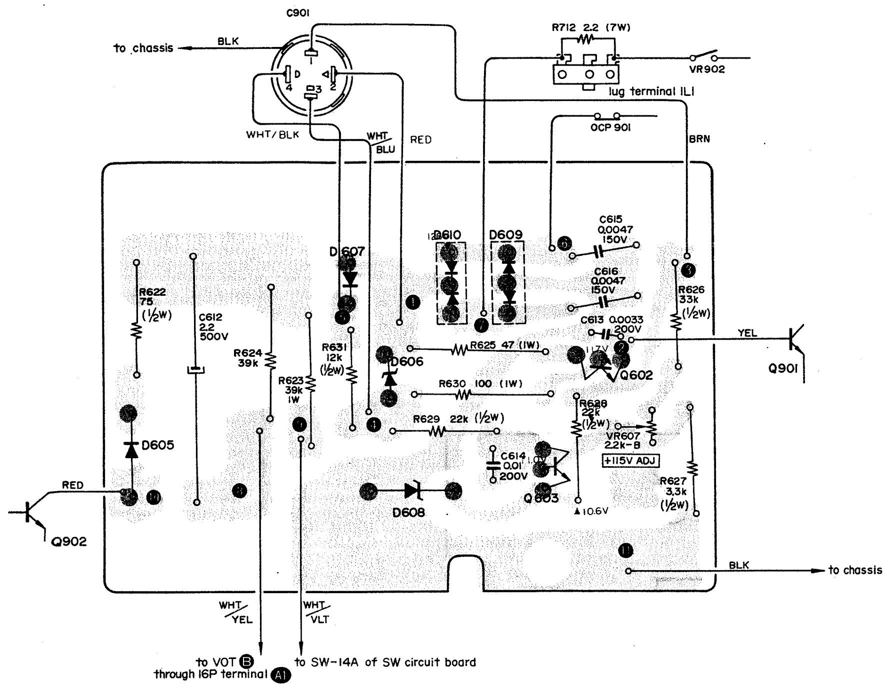
BLOCK DIAGRAM



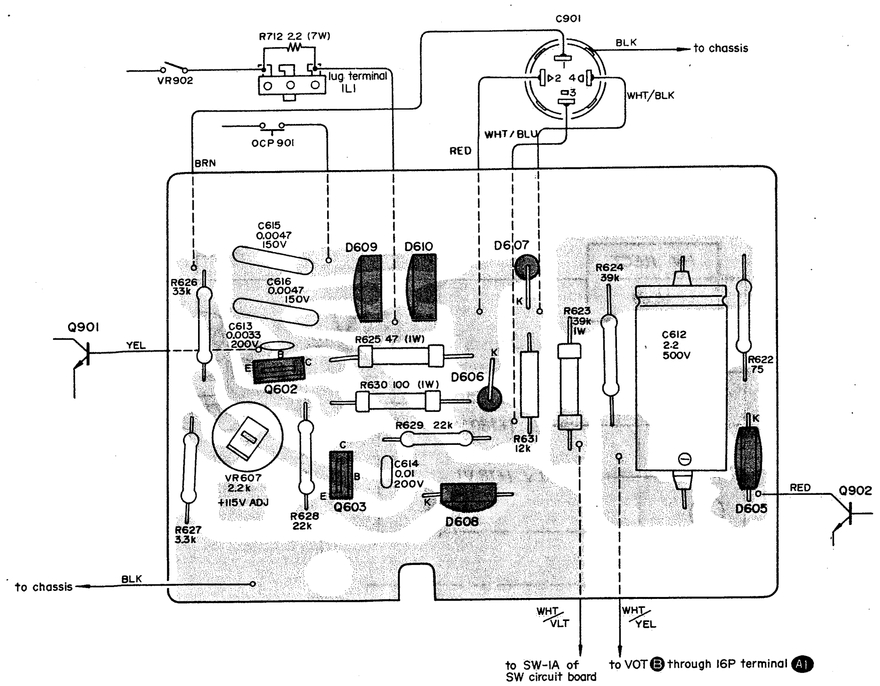
MOUNTING DIAGRAM

P2 Circuit Board

– Conductor Side –



– Component Side –



Note:

1. Line voltage maintained at 110V AC.
2. Voltage measured from point indicated to chassis with a VOM.

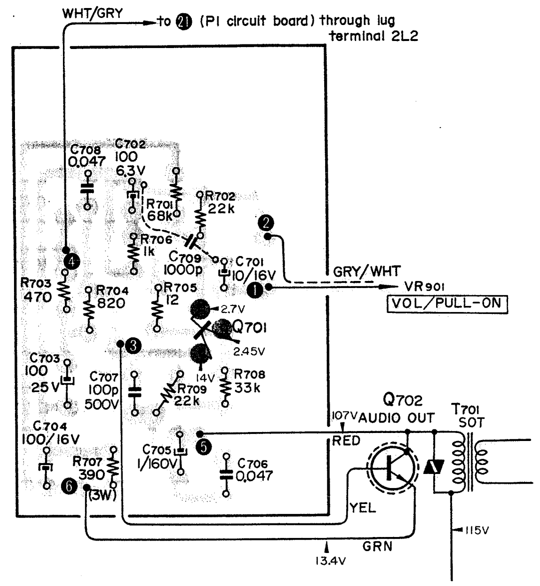
TRANSISTORS		DIODES					
Q602	2SC1124	D605	HFSD-1A	D607	10D-2	D609	CDR-4
Q603	2SC1124	D606	SK1W-50	D608	ZB1-11	D610	CD-4

KV-1220DF

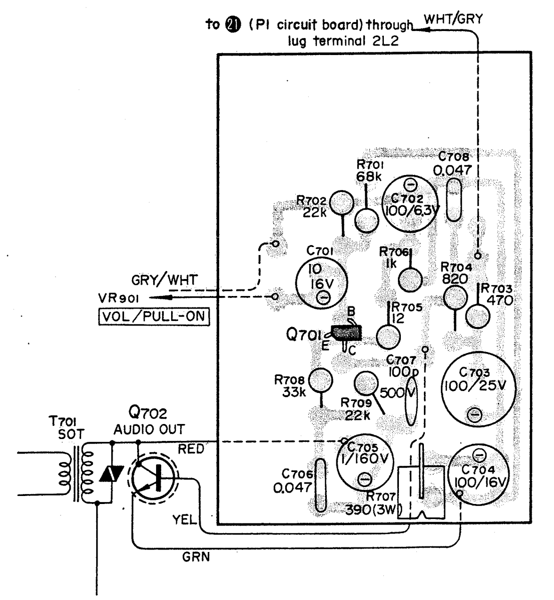
MOUNTING DIAGRAM

A Circuit Board

– Conductor Side –



– Component Side –



TRANSISTOR	
Q701	2SC633A
Q702	2SD24

Note:

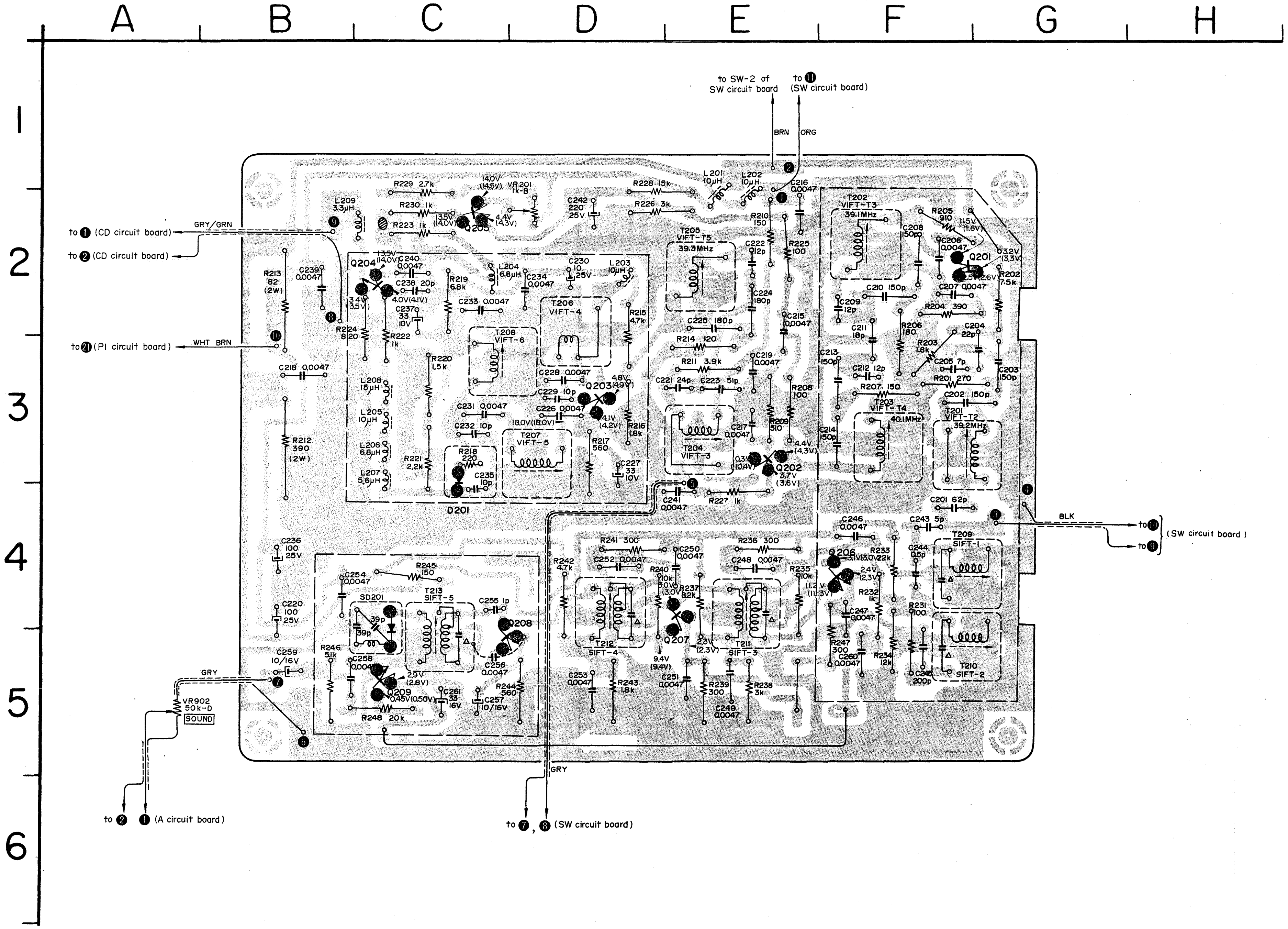
1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.

 KV-1220DF

MOUNTING DIAGRAM

S Circuit Board

– Conductor Side –



TRANSISTORS

Q201	F-2	2SC1128
Q202	E-3	2SC1129
Q203	D-3	2SC1128
Q204	C-2	2SC633A
Q205	C-2	2SA564
Q206	F-4	2SC1128
Q207	E-5	2SC1129
Q208	D-5	2SC1128
Q209	C-5	2SC633A

DIODES

D201	C-4	1T261

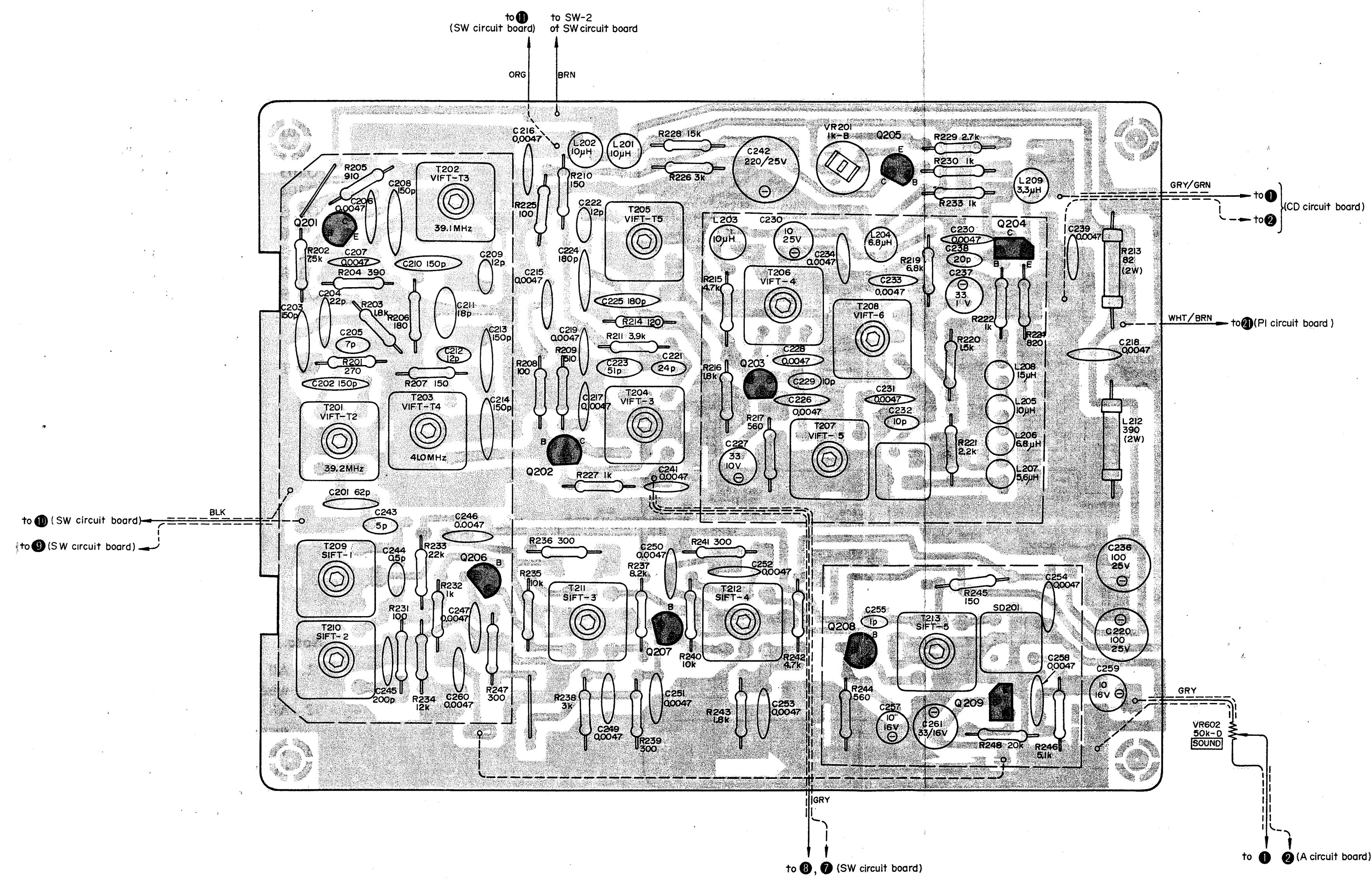
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.
4. △ marks show the internal components of transformers.

MOUNTING DIAGRAM

S Circuit Board

— Component Side —



TRANSISTORS

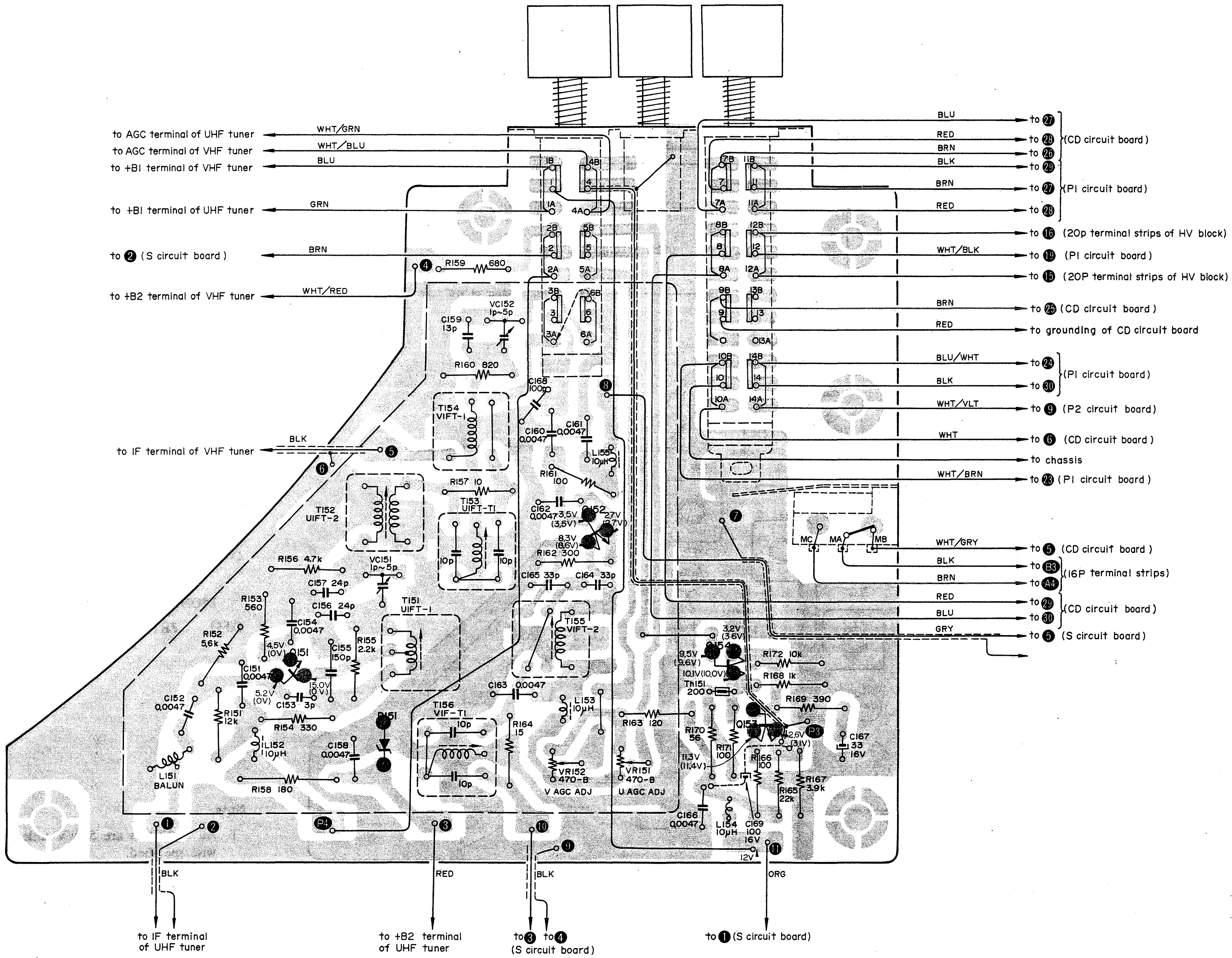
Q201	2SC1128
Q202	2SC1129
Q203	2SC1128
Q204	2SC633A
Q205	2SA564
Q206	2SC1128
Q207	2SC1129
Q208	2SC1128
Q209	2SC633A

Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.

MOUNTING DIAGRAM

SW Circuit Board
– Conductor Side –



TRANSISTORS

Q151	2SC1128
Q152	2SC1129
Q153	2SC633A
Q154	2SA564

DIODES

D151	ZB1-11

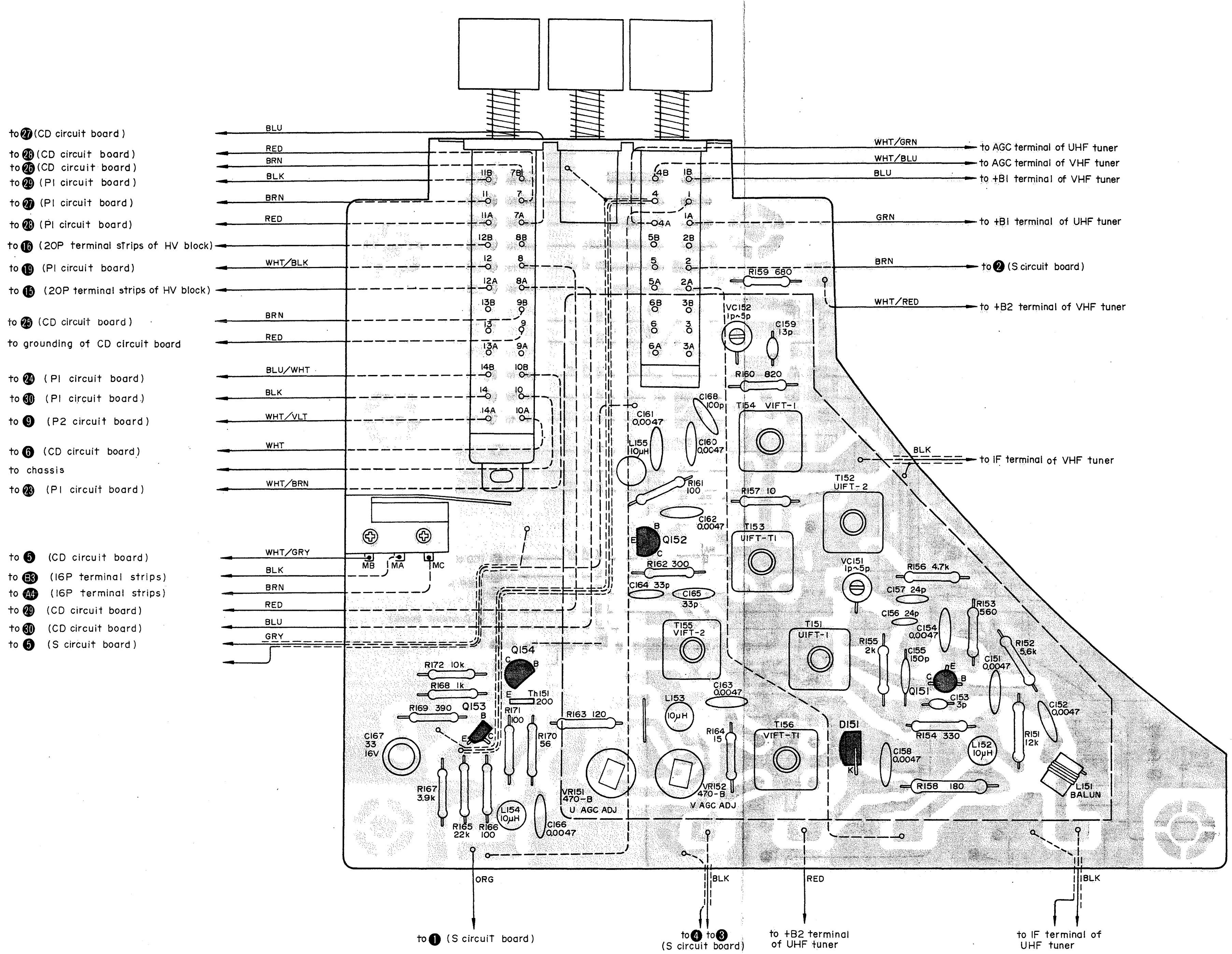
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.

MOUNTING DIAGRAM

SW Circuit Board

– Component Side –



TRANSISTORS

Q151	2SC1128
Q152	2SC1129
Q153	2SC633A
Q154	2SA564

DIODES

D151	ZB1-11

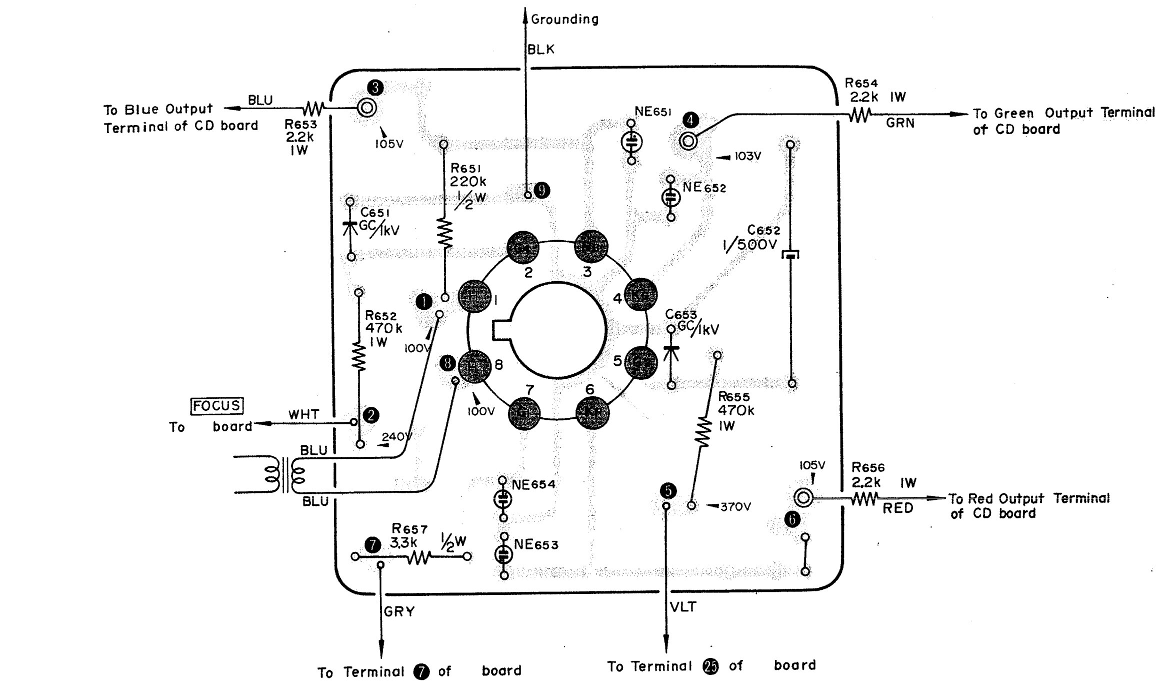
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.

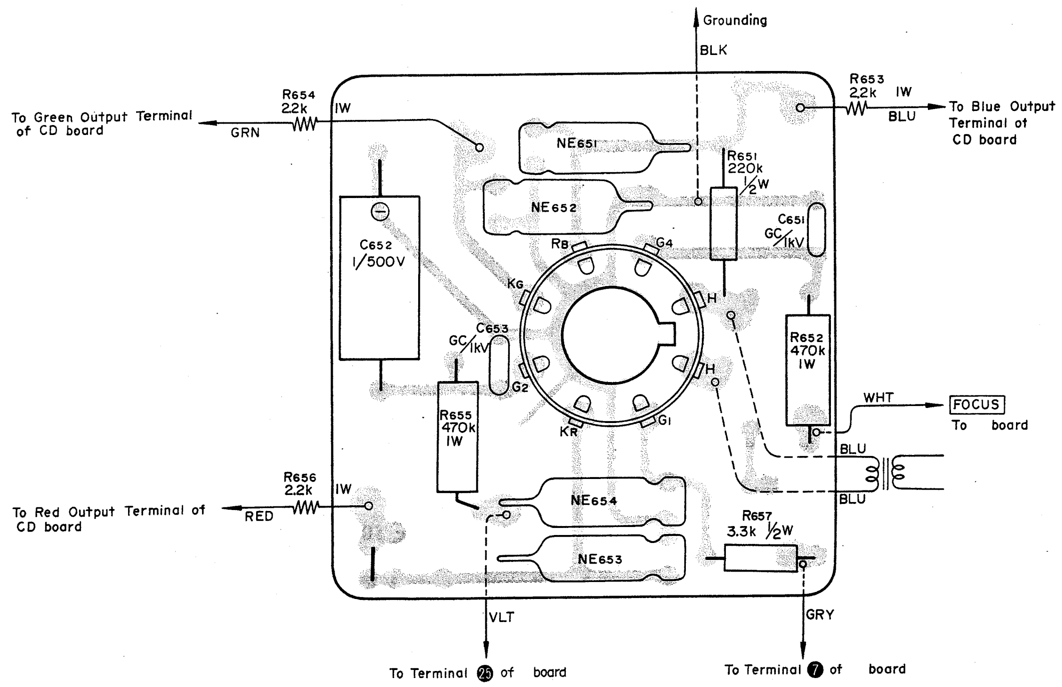
MOUNTING DIAGRAM

T Circuit Board

– Conductor Side –



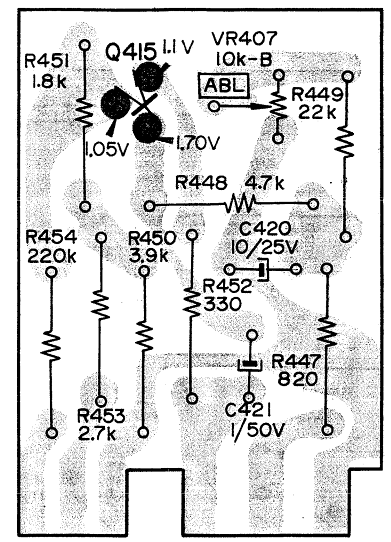
– Component Side –



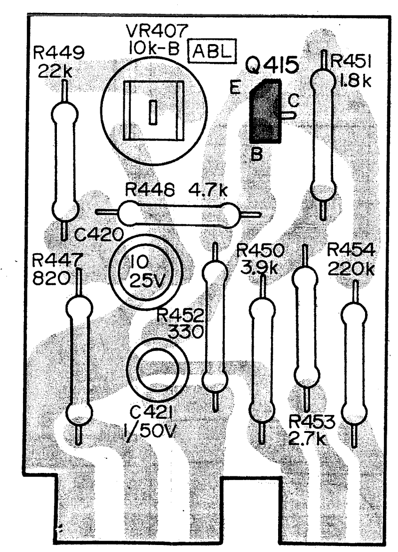
MOUNTING DIAGRAM

ABL Circuit Board

– Conductor Side –



– Component Side –



TRANSISTORS

Q415 2SC633A

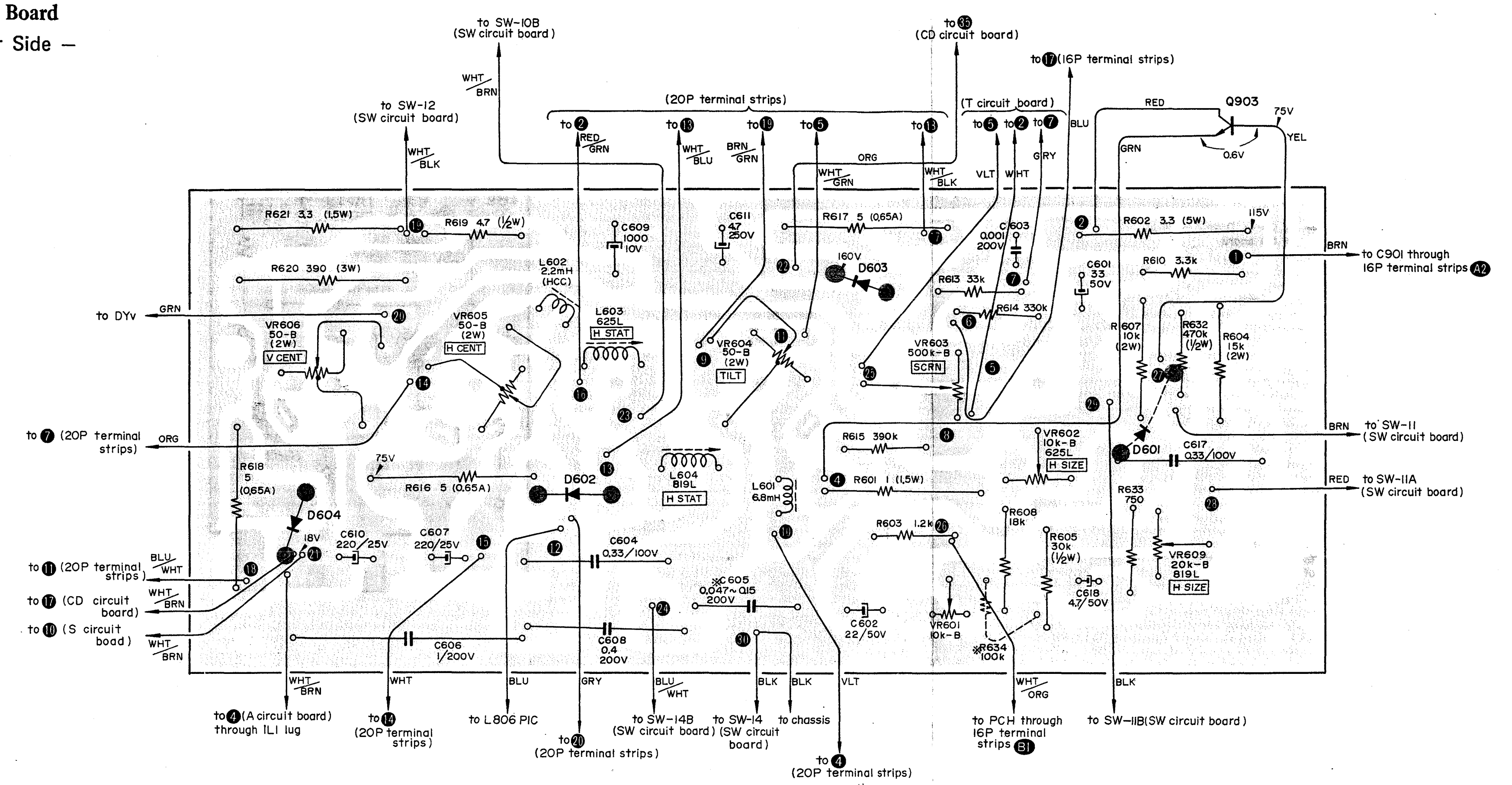
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.

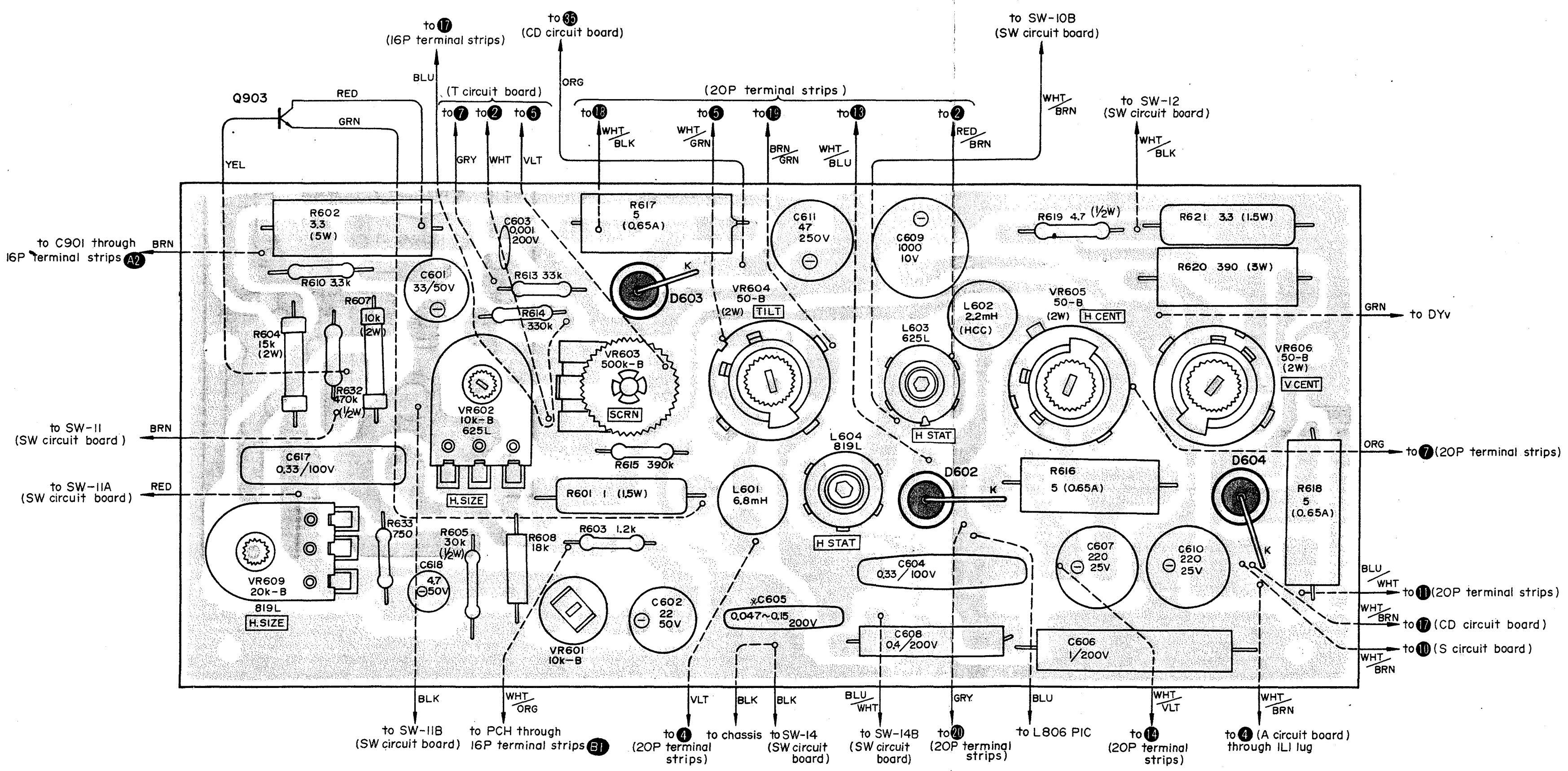
MOUNTING DIAGRAM

P1 Circuit Board

– Conductor Side –



– Component Side –



DIODES

D601	10D-2
D602	S-4C
D603	S-4C
D604	SB-2

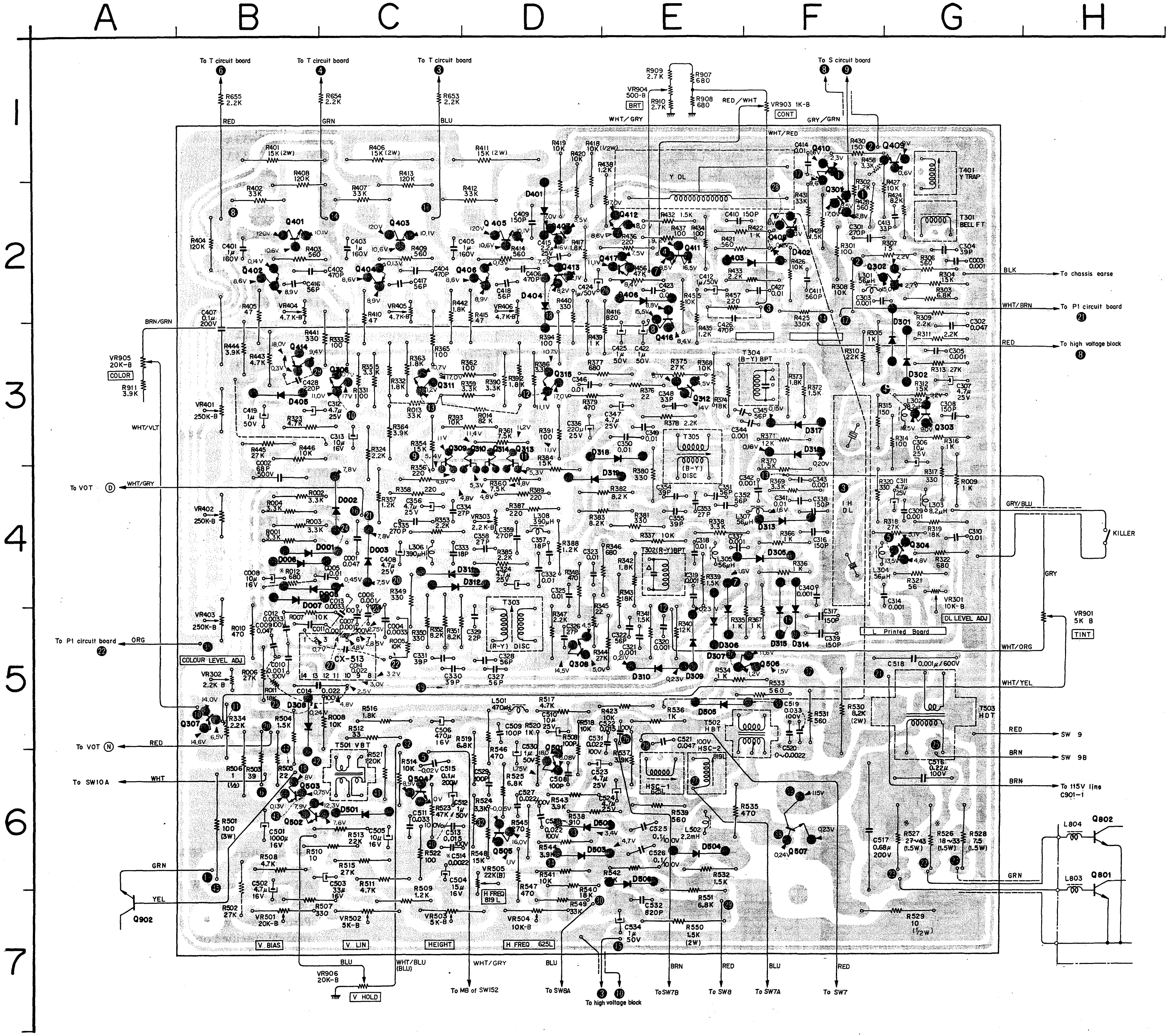
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.
4. Parts marked with ※ are to be selected to yield specified operating conditions.

MOUNTING DIAGRAM

CD Circuit Board

– Conductor Side –



TRANSISTORS

Q301	F-2	2SC633A	Q406	D-2	2SA564
Q302	G-2	2SC633A	Q407	D-2	2SC633A
Q303	G-3	2SC633A	Q408	F-2	2SC403A
Q304	G-4	2SC633A	Q409	G-1	2SC633A
Q306	C-3	2SC633A	Q410	F-2	2SC318A
Q307	B-5	2SA564	Q411	E-2	2SC318A
Q308	D-5	2SC403A	Q412	E-2	2SC633A
Q309	C-3	2SC633A	Q413	D-2	2SA564
Q310	D-3	2SC633A	Q414	B-3	2SA564
Q311	C-3	2SC633A	Q416	E-3	2SC633A
Q312	E-3	2SC403A	Q417	E-2	2SA564
Q313	D-3	2SC633A			
Q314	D-3	2SC633A	Q501	D-6	2SA564
Q315	D-3	2SC633A	Q502	B-6	2SC633A
			Q503	B-6	2SC633A
Q401	B-2	2SC1127	Q504	C-6	2SC633A
Q402	B-2	2SA564	Q505	D-6	2SC633A
Q403	C-2	2SC1127	Q506	F-5	2SC403A
Q404	C-2	2SA564	Q507	F-6	2SC867
Q405	D-2	2SC1127			

DIODES

D001	B-4	1T40	D315	F-4, 5	1T22
D002	C-4	1T40	D316	F-3	1T22
D003	C-4	1T40	D317	F-3	1T22
D005	B-4	1T40	D318	E-4	1T23
D006	B-4	1T40	D319	D-4	1T23
D007	B-4	1T40			
			D401	D-2	1T40
D301	G-3	1T22	D402	F-2	1T22
D302	G-3	1T22	D403	F-2	1T22
D305	F-4	1T22	D404	D-2	1T40
D306	E-5	1T22	D405	B-3	1T40
D307	E-5	1T22	D406	E-2	1T22
D308	B-5	1T40			
D309	E-5	1T22	D501	C-6	1T40
D310	E-5	1T22	D502	D-6	1T22A
D311	C-4	1T23	D503	D-6	1T22A
D312	C-4	1T23	D504	E-6	1T22A
D313	F-4	1T22	D505	E-5	1T22A
D314	F-4, 5	1T22	D506	E-6	10D-2

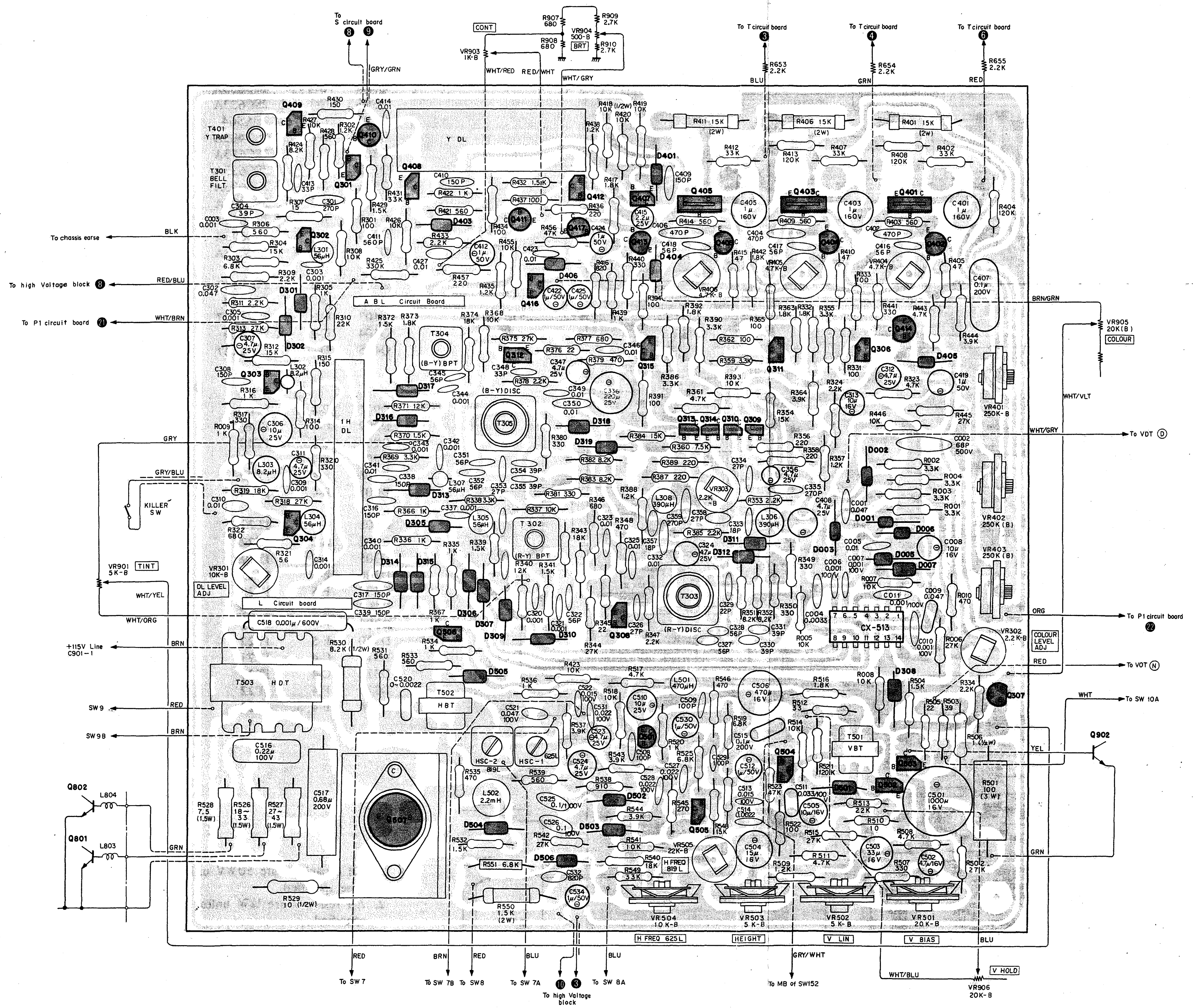
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.
4. Parts marked with ※ are to be selected to yield specified operating conditions.

MOUNTING DIAGRAM

CD Circuit Board

– Component Side –



TRANSISTORS

Q301	2SC633A	Q406	2SA564
Q302	2SC633A	Q407	2SC633A
Q303	2SC633A	Q408	2SC403A
Q304	2SC633A	Q409	2SC633A
Q306	2SC633A	Q410	2SC318A
Q307	2SA564	Q411	2SC318A
Q308	2SC403A	Q412	2SC633A
Q309	2SC633A	Q413	2SA564
Q310	2SC633A	Q414	2SA564
Q311	2SC633A	Q416	2SC633A
Q312	2SC403A	Q417	2SA564
Q313	2SC633A		
Q314	2SC633A	Q501	2SA564
Q315	2SC633A	Q502	2SC633A
		Q503	2SC633A
Q401	2SC1127	Q504	2SC633A
Q402	2SA564	Q505	2SC633A
Q403	2SC1127	Q506	2SC403A
Q404	2SA564	Q507	2SC867
Q405	2SC1127		

DIODES

D001	1T40	D315	1T22
D002	1T40	D316	1T22
D003	1T40	D317	1T22
D005	1T40	D318	1T23
D006	1T40	D319	1T23
D007	1T40		
		D401	1T40
D301	1T22	D402	1T22
D302	1T22	D403	1T22
D305	1T22	D404	1T40
D306	1T22	D405	1T40
D307	1T22	D406	1T22
D308	1T40		
D309	1T22	D501	1T40
D310	1T22	D502	1T22A
D311	1T23	D503	1T22A
D312	1T23	D504	1T22A
D313	1T22	D505	1T22A
D314	1T22	D506	10D-2

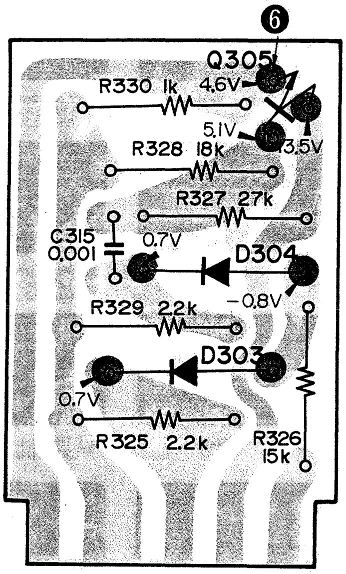
Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Parts marked with are to be selected to yield specified operating conditions.

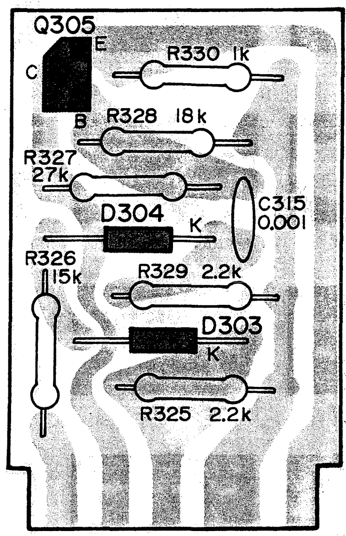
MOUNTING DIAGRAM

L Circuit Board

– Conductor Side –



– Component Side –



TRANSISTOR	
Q305	2SC633A

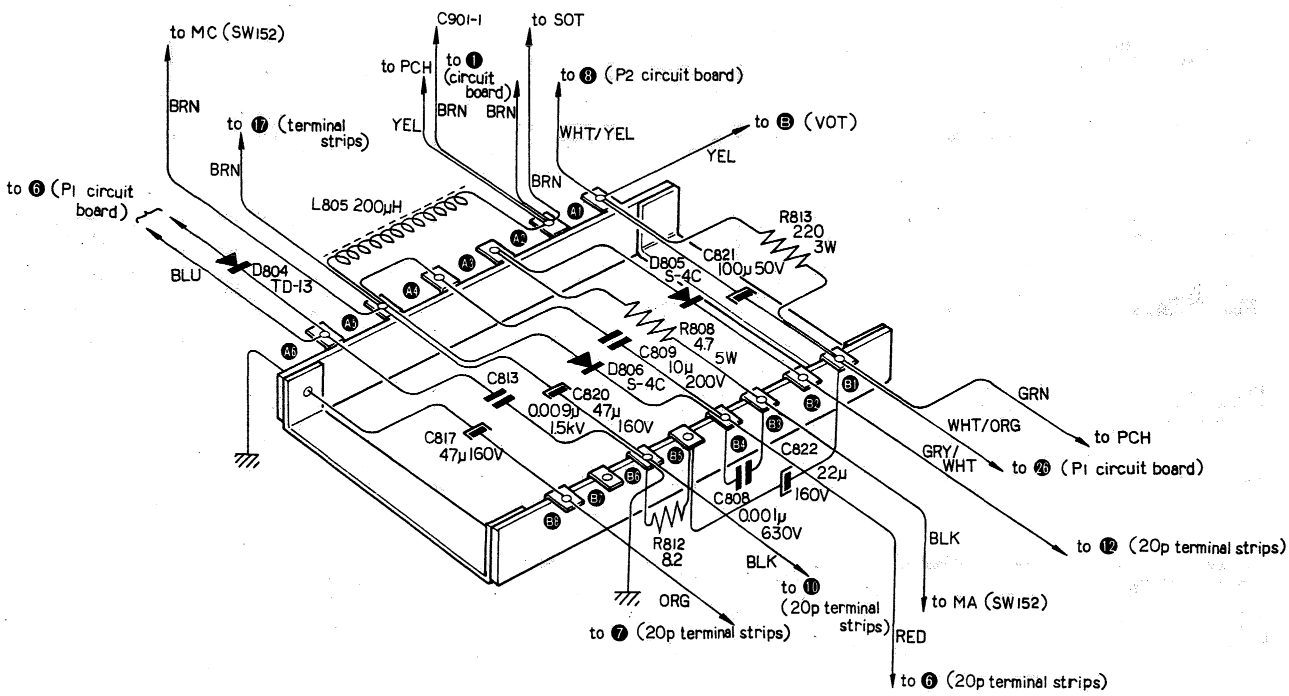
DIODES	
D303	1T22
D304	1T22

Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Voltage measured from point indicated to chassis with a VOM.

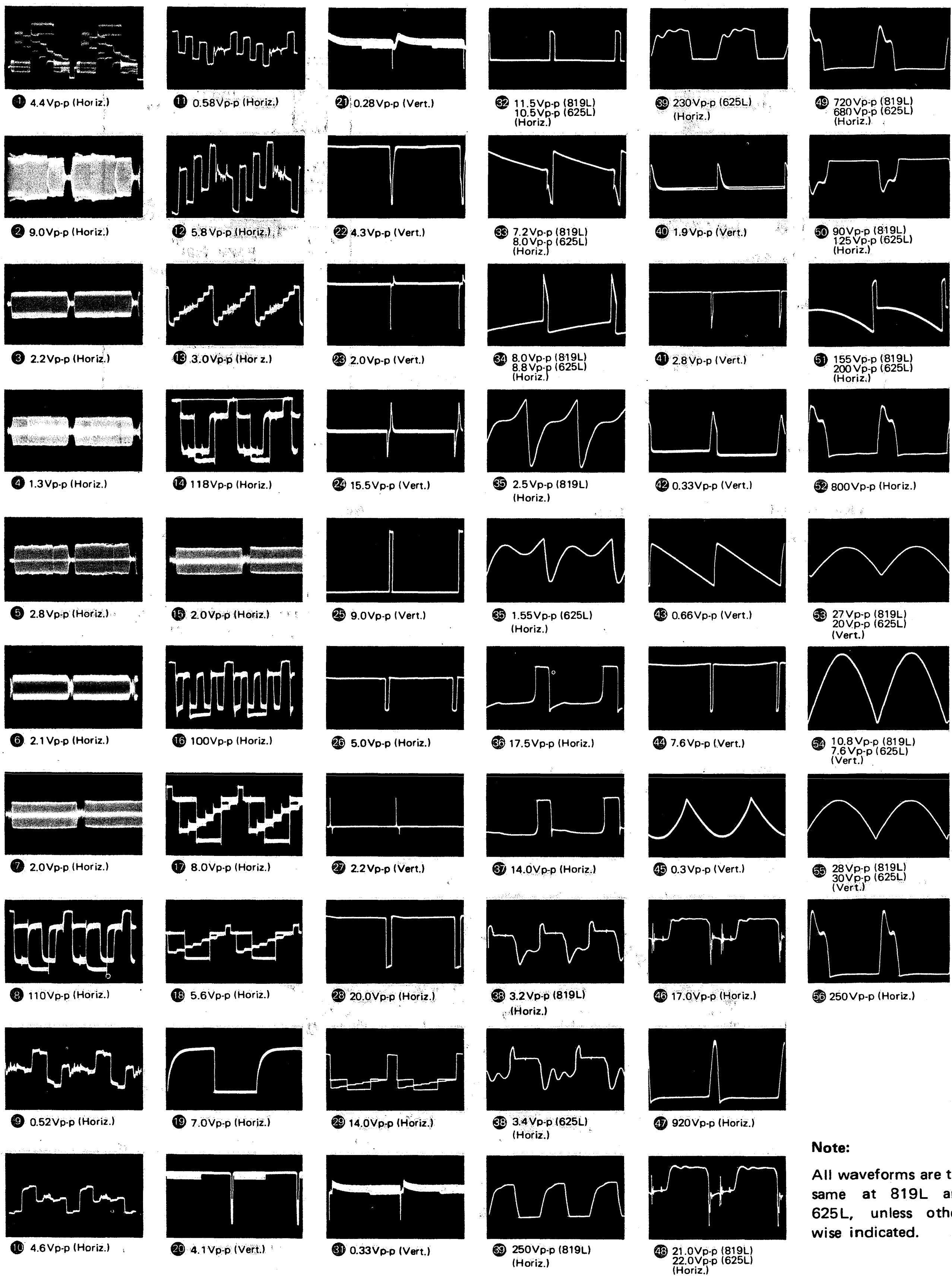
MOUNTING DIAGRAM

16P Terminal Board



KV-1220DF

WAVEFORMS

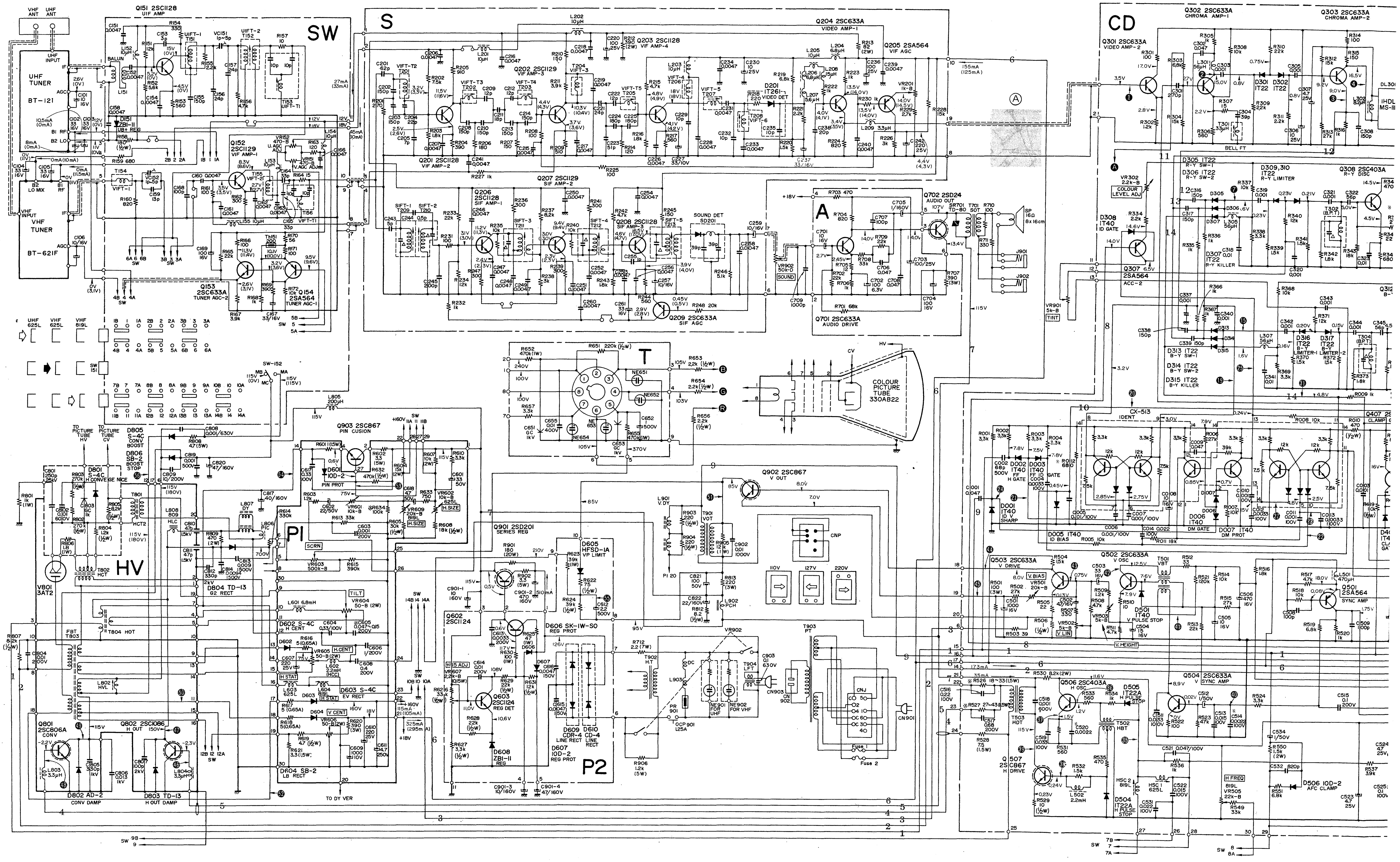


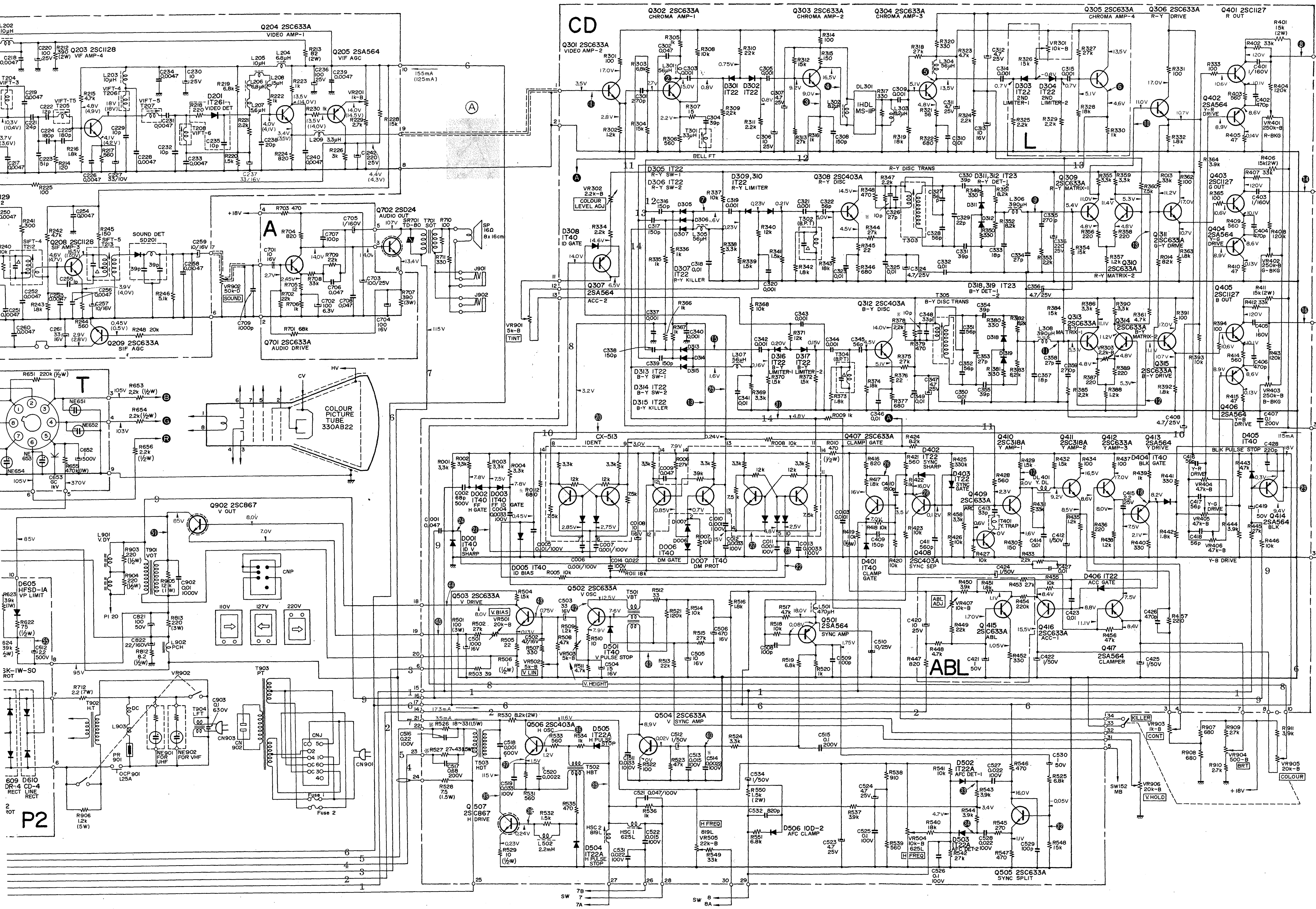
1 4.4Vp-p (Horiz.)
2 9.0Vp-p (Horiz.)
3 2.2Vp-p (Horiz.)
4 1.3Vp-p (Horiz.)
5 2.8Vp-p (Horiz.)
6 2.1Vp-p (Horiz.)
7 2.0Vp-p (Horiz.)
8 110Vp-p (Horiz.)
9 0.52Vp-p (Horiz.)
10 4.6Vp-p (Horiz.)
11 0.58Vp-p (Horiz.)
12 5.8Vp-p (Horiz.)
13 3.0Vp-p (Horiz.)
14 118Vp-p (Horiz.)
15 2.0Vp-p (Horiz.)
16 100Vp-p (Horiz.)
17 8.0Vp-p (Horiz.)
18 5.6Vp-p (Horiz.)
19 7.0Vp-p (Horiz.)
20 4.1Vp-p (Vert.)
21 0.28Vp-p (Vert.)
22 4.3Vp-p (Vert.)
23 2.0Vp-p (Vert.)
24 15.5Vp-p (Vert.)
25 9.0Vp-p (Vert.)
26 5.0Vp-p (Horiz.)
27 2.2Vp-p (Vert.)
28 20.0Vp-p (Horiz.)
29 14.0Vp-p (Horiz.)
31 0.33Vp-p (Vert.)
32 11.5Vp-p (819L) 10.5Vp-p (625L) (Horiz.)
33 7.2Vp-p (819L) 8.0Vp-p (625L) (Horiz.)
34 8.0Vp-p (819L) 8.8Vp-p (625L) (Horiz.)
35 2.5Vp-p (819L) (Horiz.)
35 1.55Vp-p (625L) (Horiz.)
36 17.5Vp-p (Horiz.)
37 14.0Vp-p (Horiz.)
38 3.2Vp-p (819L) (Horiz.)
38 3.4Vp-p (625L) (Horiz.)
39 250Vp-p (819L) (Horiz.)
39 230Vp-p (625L) (Horiz.)
40 1.9Vp-p (Vert.)
41 2.8Vp-p (Vert.)
42 0.33Vp-p (Vert.)
43 0.66Vp-p (Vert.)
44 7.6Vp-p (Vert.)
45 0.3Vp-p (Vert.)
46 17.0Vp-p (Horiz.)
47 920Vp-p (Horiz.)
48 21.0Vp-p (819L) 22.0Vp-p (625L) (Horiz.)
49 720Vp-p (819L) 680Vp-p (625L) (Horiz.)
50 90Vp-p (819L) 125Vp-p (625L) (Horiz.)
51 155Vp-p (819L) 200Vp-p (625L) (Horiz.)
52 800Vp-p (Horiz.)
53 27Vp-p (819L) 20Vp-p (625L) (Vert.)
54 10.8Vp-p (819L) 7.6Vp-p (625L) (Vert.)
55 28Vp-p (819L) 30Vp-p (625L) (Vert.)
56 250Vp-p (Horiz.)

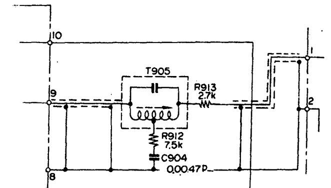
Note:

All waveforms are the same at 819L and 625L, unless other wise indicated.

SCHEMATIC DIAGRAM





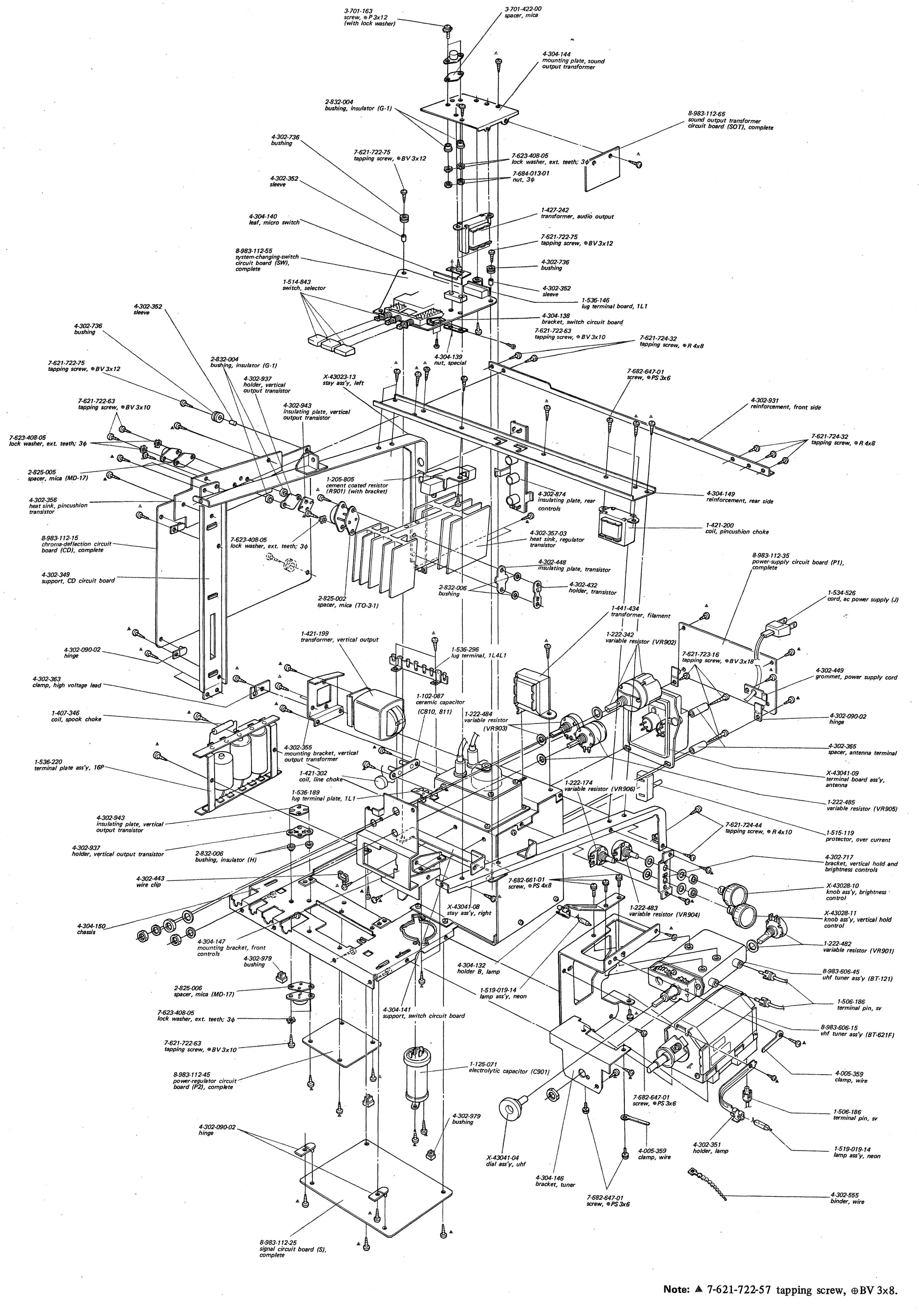


Ⓐ Serial No. 10501 and later

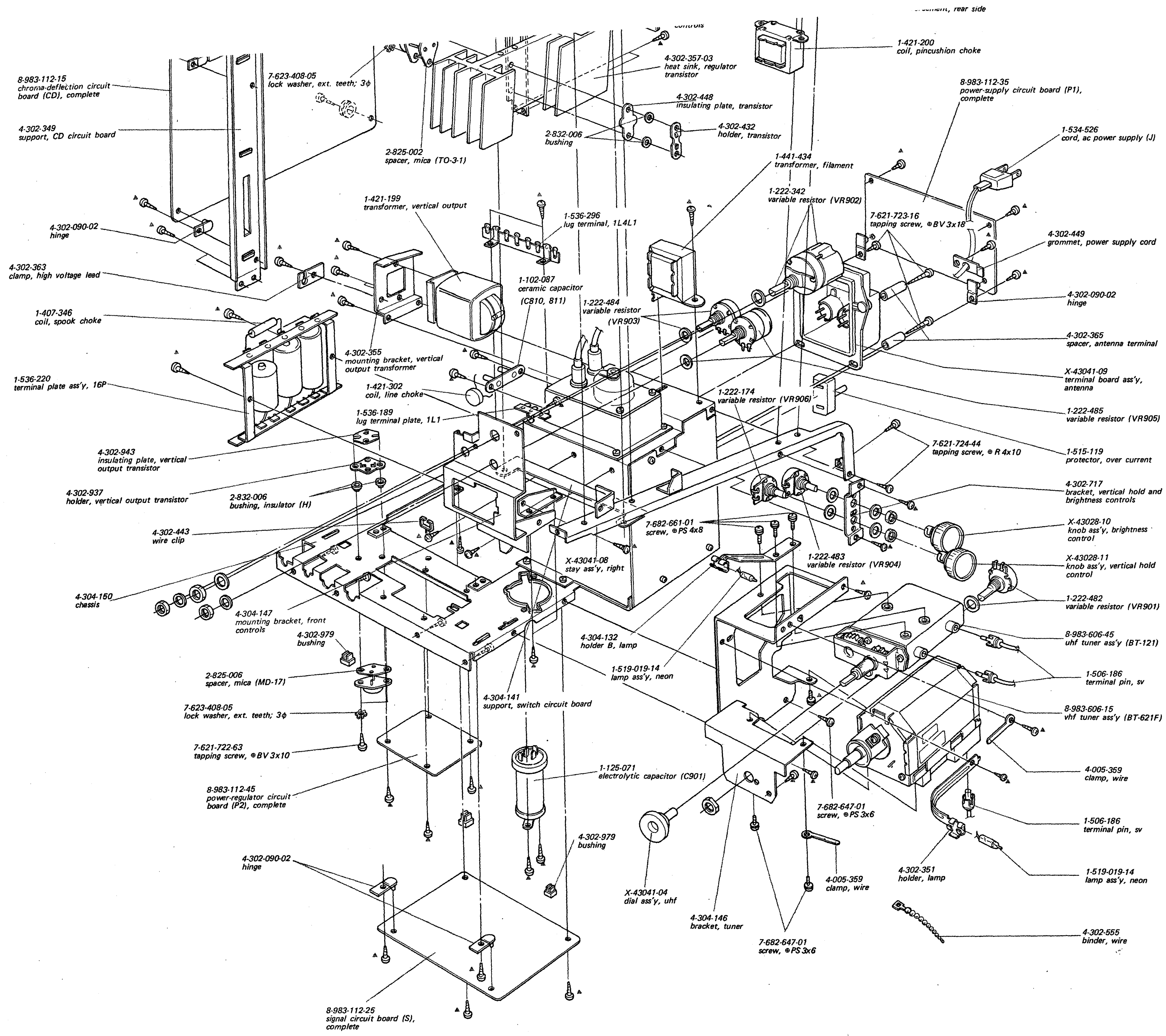
T905	in
R912	in
R913	in
C904	in

Note:

1. All capacitors are 50WV unless otherwise specified.
2. All resistors are ¼W unless otherwise specified.
3. Resistance and capacitance values marked ※ are to be selected to yield specified operating conditions.
4. Voltages measured from chassis to point indicated with a VOM (20 k ohm/V) with colour signal input.
5. Design and specifications subject to change without notice.
6. △ marks show the internal components of transformers.



Note: ▲ 7-621-722-57 tapping screw, ⊕BV 3x8.



Note: ▲ 7-621-722-57 tapping screw, ⊕BV 3x8.

KV-1220DF KV-1220DF

– Hardware Nomenclature –

P	– Pan Head Screw	
PS	– Pan Head Screw with Spring Washer	
K	– Flat Countersunk Head Screw	
B	– Binding Head Screw	
RK	– Oval Countersunk Head Screw	
T	– Truss Head Screw	
R	– Round Head Screw	
F	– Flat Fillister Head Screw	
SC	– Set Screw	
E	– Retaining Ring (E Washer)	

W – Washer
SW – Spring Washer
LW – Lock Washer
N – Nut

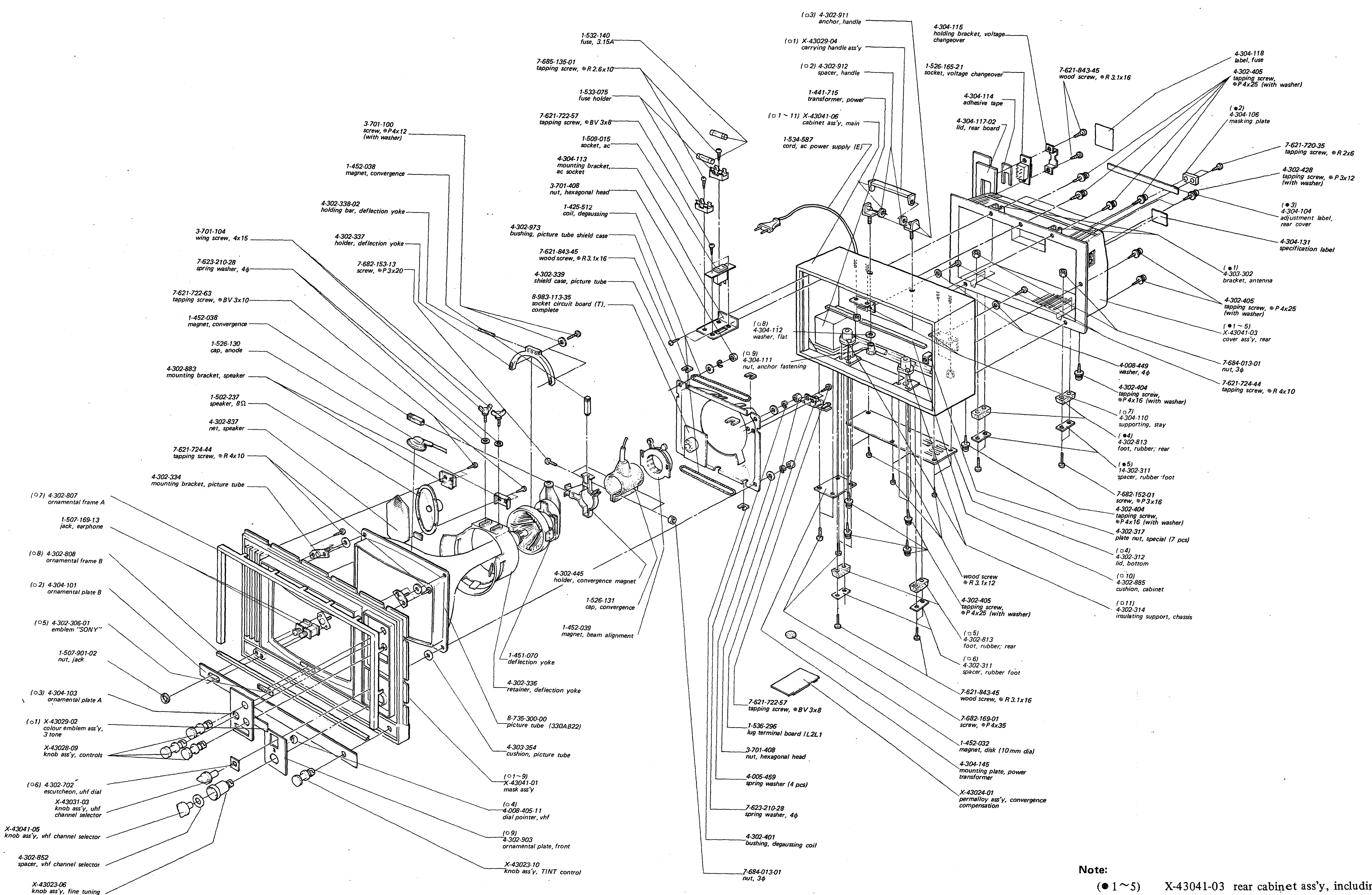
– Example –

⊕ P 3×10

- ⊕ — Type of Slot
- 10 — Length in mm (L)
- 3 — Diameter in mm (D)
- P — Type of Head

KV-1220DF KV-1220DF

EXPLODED VIEW

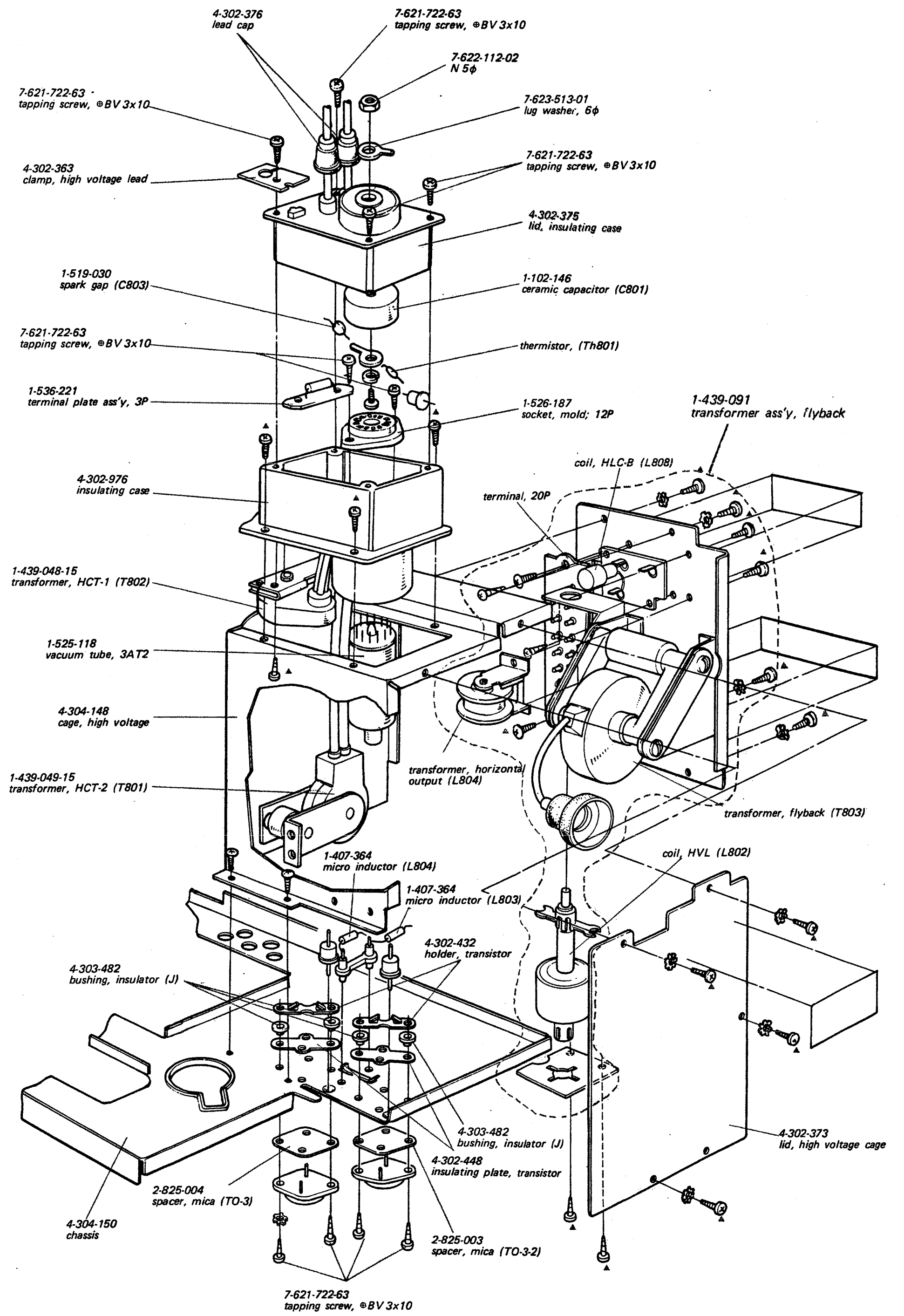


Note:

(● 1~5)	X-43041-03	rear cabinet ass'y, including
(□ 1~11)	X-43041-06	main cabinet ass'y, including
(○ 1~9)	X-43041-01	mask ass'y, including

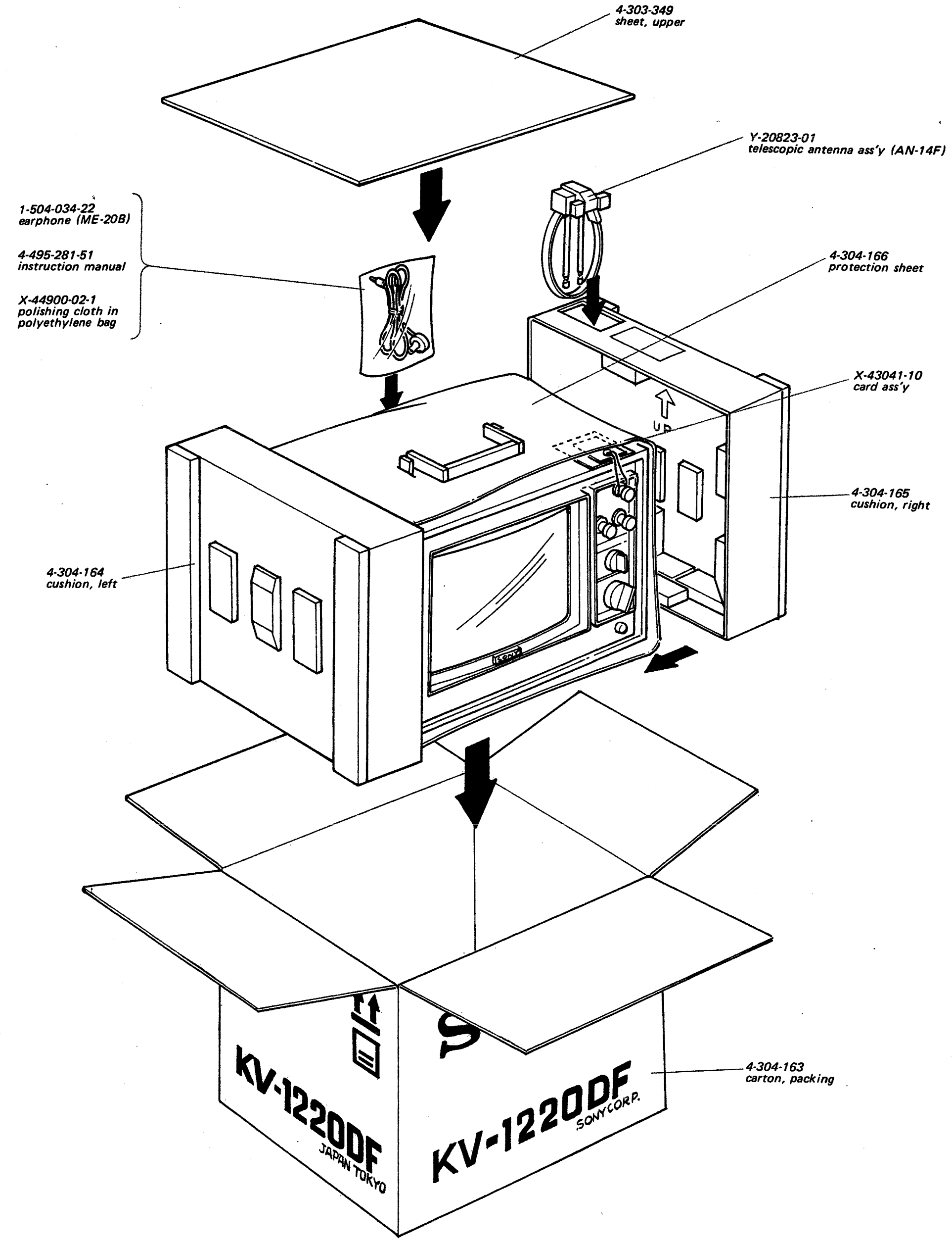
 KV-1220DF

EXPLODED VIEW



Note: ▲ 7-621-722-57 tapping screw ⊕BV 3x8

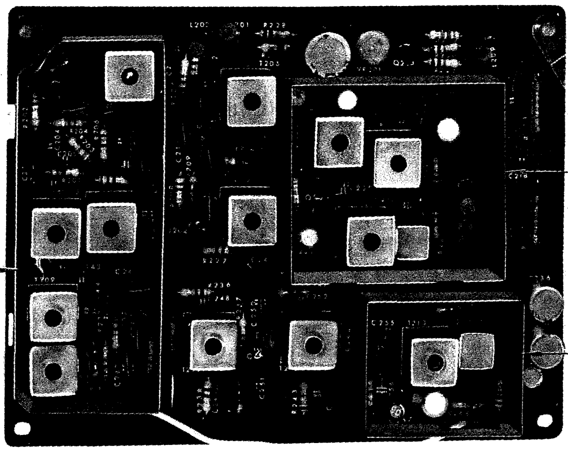
PACKING



PARTS LOCATIONS

Signal Circuit Board (S)

4-304-133-00
shield case (S-1), signal circuit board (main)
4-304-134-00
shield case (S-1), signal circuit board (upper cover)
4-304-135-00
shield case (S-1), signal circuit board (conductor side)



4-304-152-00
shield case (S-2), signal circuit board (upper cover)
4-304-151-00
shield case (S-2), signal circuit board (main)
4-304-153-00
shield case (S-2), signal circuit board (conductor side)

4-304-150-00
shield case (S-3), signal circuit board (main)
4-304-155-00
shield case (S-3), signal circuit board (upper cover)
4-304-156-00
shield case (S-3), signal circuit board (conductor side)

Switch Circuit Board (SW)

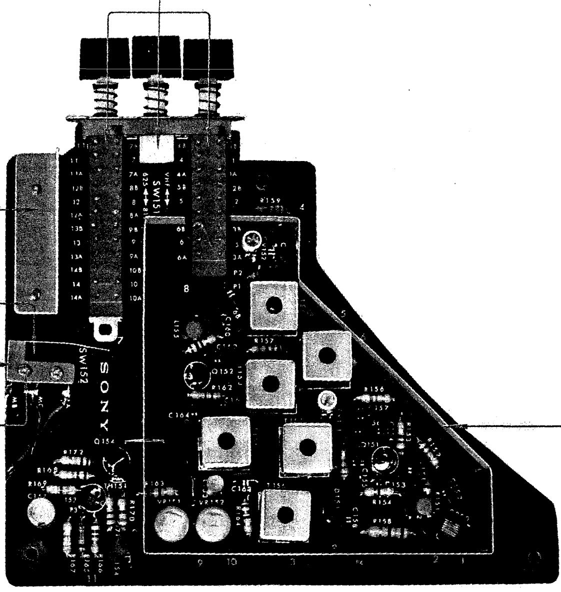
1-514-843-00
switch, system selector SW151

4-304-138-00
bracket, switch circuit board
4-304-139-00
nut, special (conductor side)

1-514-533-00
switch, sub miniature SW152

4-304-140-00
leaf, micro switch

⊕P 2.3x12



4-304-136-00
shield case, switch circuit board (main)
4-304-137-00
shield case, switch circuit board (upper cover)
4-304-142-00
shield case, switch circuit board (conductor side)

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description	
		GENERAL	
	8-983-606-15	vhf tuner ass'y (BT-621F)	
	8-983-606-25	transformer, sound output	
	8-983-606-35	transformer, vertical output	
	8-983-606-45	uhf tuner ass'y (BT-121)	
	8-983-112-15	chroma-deflection circuit board (CD), complete	
	8-983-112-25	signal circuit board (S), complete	
	8-983-112-35	power-supply circuit board (P1), complete	
	8-983-112-45	power-regulator circuit board (P2), complete	
	8-983-112-55	system-changing-switch circuit board (SW), complete	
	8-983-112-65	sound output transformer circuit board (SOT), complete	
	8-983-113-35	socket circuit board (T), complete	
	1-493-091	transformer ass'y, flyback	
		SEMICONDUCTORS	
Q151		transistor	2SC1128
Q152		transistor	2SC1129
Q153		transistor	2SC633A
Q154		transistor	2SA564
Q201		transistor	2SC1128
Q202		transistor	2SC1129
Q203		transistor	2SC1128
Q204		transistor	2SC633A
Q205		transistor	2SA564
Q206		transistor	2SC1128
Q207		transistor	2SC1129
Q208		transistor	2SC1128
Q209		transistor	2SC633A
Q301		transistor	2SC633A
Q302		transistor	2SC633A
Q303		transistor	2SC633A
Q304		transistor	2SC633A
Q305		transistor	2SC633A
Q306		transistor	2SC633A
Q307		transistor	2SA564
Q308		transistor	2SC403A
Q309		transistor	2SC633A
Q310		transistor	2SC633A
Q311		transistor	2SC633A
Q312		transistor	2SC403A
Q313		transistor	2SC633A
Q314		transistor	2SC633A
Q315		transistor	2SC633A
Q401		transistor	2SC1127
Q402		transistor	2SA564
Q403		transistor	2SC1127
Q404		transistor	2SA564
Q405		transistor	2SC1127
Q406		transistor	2SA564
Q407		transistor	2SC633A
Q408		transistor	2SC403A
Q409		transistor	2SC633A
Q410		transistor	2SC318A
Q411		transistor	2SC318A
Q412		transistor	2SC633A
Q413		transistor	2SA564
Q414		transistor	2SA564
Q415		transistor	2SC633A
Q416		transistor	2SC633A
Q417		transistor	2SA564
Q501		transistor	2SA564
Q502		transistor	2SC633A
Q503		transistor	2SC633A
Q504		transistor	2SC633A
Q505		transistor	2SC633A
Q506		transistor	2SC403A
Q507		transistor	2SC867
Q602		transistor	2SC1124
Q603		transistor	2SC1124
Q701		transistor	2SC633A
Q702		transistor	2SD24
Q801		transistor	2SC806A
Q802		transistor	2SC1086
Q901		transistor	2SD201
Q902		transistor	2SC867
Q903		transistor	2SC867
D001		diode	1T40
D002		diode	1T40
D003		diode	1T40
D005		diode	1T40
D006		diode	1T40
D007		diode	1T40
D151		diode	ZB1-11
D201		diode	1T261
D301		diode	1T22
D302		diode	1T22
D303		diode	1T22
D304		diode	1T22

Ref. No.	Part No.	Description	
D305		diode	1T22
D306		diode	1T22
D307		diode	1T22
D308		diode	1T40
D309		diode	1T22
D310		diode	1T22
D311		diode	1T23
D312		diode	1T23
D313		diode	1T22
D314		diode	1T22
D315		diode	1T22
D316		diode	1T22
D317		diode	1T22
D318		diode	1T23
D319		diode	1T23
D401		diode	1T40
D402		diode	1T22
D403		diode	1T22
D404		diode	1T40
D405		diode	1T40
D406		diode	1T22
D501		diode	1T40
D502		diode	1T22A
D503		diode	1T22A
D504		diode	1T22A
D505		diode	1T22A
D506		diode	10D-2
D601		diode	10D-2
D602		diode	S-4C
D603		diode	S-4C
D604		diode	SB-2
D605		diode	HFSD-1A
D606		diode	SK1W-50
D607		diode	10D-2
D608		diode	ZB1-11
D609		diode	CDR-4
D610		diode	CD-4
D801		diode	S-4C
D802		diode	AD-2
D803		diode	TD-13
D804		diode	TD-13
D805		diode	S-4C
D806		diode	SB-2
Th151	1-800-059	thermistor	TH-200
SR701	1-800-032	varistor	TD-80
PR901	1-800-065	thermistor	
IC		IC	CX-513

Ref. No.	Part No.	Description	
		COILS	
L151	1-417-008	balun	
L152	1-407-157	10μH	micro inductor
L153	1-407-157	10μH	micro inductor
L154	1-407-157	10μH	micro inductor
L155	1-407-157	10μH	micro inductor
L201	1-407-157	10μH	micro inductor
L202	1-407-157	10μH	micro inductor
L203	1-407-157	10μH	micro inductor
L204	1-407-188	6.8μH	micro inductor
L205	1-407-157	10μH	micro inductor
L206	1-407-188	6.8μH	micro inductor
L207	1-407-187	5.6μH	micro inductor
L208	1-407-159	15μH	micro inductor
L209	1-407-184	3.3μH	micro inductor
L301	1-407-166	56μH	micro inductor
L302	1-407-189	8.2μH	micro inductor
L303	1-407-189	8.2μH	micro inductor
L304	1-407-166	56μH	micro inductor
L305	1-407-166	56μH	micro inductor
L306	1-407-176	390μH	micro inductor
L307	1-407-166	56μH	micro inductor
L308	1-407-176	390μH	micro inductor
L501	1-407-177	470μH	micro inductor
L502	1-407-198	2.2mH	micro inductor
L601	1-407-363	6.8mH	micro inductor
L602	1-407-198	2.2mH	micro inductor
L603	1-459-034	coil, horizontal stat (625L)	
L604	1-459-067	coil, horizontal stat (819L)	
L802		built in flyback transformer ass'y	
L803	1-407-364	3.3μH	micro inductor
L804	1-407-364	3.3μH	micro inductor
L805	1-407-346	coil, spook choke	
L806	1-452-039	purity improving coil (PIC)	
L808	1-459-069	coil. HLC-B	
L902	1-421-200	coil, pincushion choke	
L903	1-425-512	coil, degaussing	
		TRANSFORMERS	
T151	1-403-713	transformer, uhf i-f	
T152	1-403-714	transformer, uhf i-f	
T153	1-403-715	transformer, uhf i-f	
T154	1-403-716	transformer, vhf i-f	
T155	1-403-717	transformer, vhf i-f	
T156	1-403-718	transformer, vhf i-f	
T201	1-403-719	transformer, vhf i-f; 39.2MHz	

Ref. No.	*Part No.*	*Description*
T202	1-403-720	transformer, vhf i-f; 39.1 MHz
T203	1-403-721	transformer, vhf i-f; 40.0 MHz
T204	1-403-722	transformer, vhf i-f
T205	1-403-723	transformer, vhf i-f; 39.3 MHz
T206	1-403-724	transformer, vhf i-f
T207	1-403-725	transformer, vhf i-f
T208	1-403-726	transformer, vhf i-f
T209	1-403-380	transformer, sound i-f
T210	1-403-381	transformer, sound i-f
T211	1-403-382	transformer, sound i-f
T212	1-403-382	transformer, sound i-f
T213	1-403-383	transformer, sound i-f
T301	1-425-657	transformer, bell filter
T302	1-425-658	bandpass transformer (R-Y)
T303	1-425-659	transformer, discriminator (R-Y)
T304	1-425-658	bandpass transformer (B-Y)
T305	1-425-659	transformer, discriminator (B-Y)
T401	1-409-207	transformer, Y trap
T501	1-435-008	transformer, vertical blocking
T502	1-435-034	transformer, horizontal blocking
T503	1-437-025	transformer, horizontal drive
T701	1-427-242	transformer, audio output
T801	1-439-049-15	transformer, HCT-2
T802	1-439-048-15	transformer, HCT-1
T803		built in flyback transformer ass'y
T804	1-439-088	transformer, horizontal output
T901	1-421-199	transformer, vertical output
T902	1-441-434	transformer, filament
T903	1-441-715	transformer, power
T904	1-421-302-12	coil, line choke
T905	1-409-208	transformer, 6.5 MHz trap (Serial No. 10,501 and later)

CAPACITORS

Ref. No.	*Part No.*			*Description*
C001	1-101-007	0.047μF	$\pm^{100}_{0}\%$	50WV, ceramic
C002	1-102-989	68 pF	± 5%	500WV, ceramic
C003	1-102-136	0.001μF	± 20%	50WV, ceramic
C004	1-105-707-12	0.0033μF	± 10%	100WV, mylar
C005	1-105-713-12	0.01μF	± 10%	100WV, mylar
C006	1-105-701-12	0.001μF	± 10%	100WV, mylar
C007	1-105-701-12	0.001μF	± 10%	100WV, mylar
C008	1-121-471	10μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C009	1-105-721-12	0.047μF	± 10%	100WV, mylar
C010	1-105-701-12	0.001μF	± 10%	100WV, mylar
C011	1-105-701-12	0.001μF	± 10%	100WV, mylar
C012	1-105-707-12	0.0033μF	± 10%	100WV, mylar
C013	1-105-707-12	0.0033μF	± 10%	100WV, mylar
C014	1-105-717-13	0.022μF	± 10%	100WV, mylar

Ref. No.	*Part No.*			*Description*
C101	1-121-471	10μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C102	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C103	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C104	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C105	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C106	1-121-471	10μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C151	1-102-102	0.0047μF	± 20%	50WV, ceramic
C152	1-102-102	0.0047μF	± 20%	50WV, ceramic
C153	1-102-936	3 pF	± 0.25 pF	50WV, ceramic
C154	1-102-102	0.0047μF	± 20%	50WV, ceramic
C155	1-101-361	150pF	± 5%	50WV, ceramic
C156	1-102-515	24pF	± 5%	50WV, ceramic
C157	1-102-515	24pF	± 5%	50WV, ceramic
C158	1-102-102	0.0047μF	± 20%	50WV, ceramic
C159	1-102-511	13pF	± 5%	50WV, ceramic
C160	1-102-102	0.0047μF	± 20%	50WV, ceramic
C161	1-102-102	0.0047μF	± 20%	50WV, ceramic
C162	1-102-102	0.0047μF	± 20%	50WV, ceramic
C163	1-102-102	0.0047μF	± 20%	50WV, ceramic
C164	1-102-518	33pF	± 5%	50WV, ceramic
C165	1-102-518	33pF	± 5%	50WV, ceramic
C166	1-102-102	0.0047μF	± 20%	50WV, ceramic
C167	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C168	1-102-973	100pF	± 5%	50WV, ceramic
C169	1-121-415	100μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C201	1-101-886	62pF	± 5%	50WV, ceramic
C202	1-101-361	150pF	± 5%	50WV, ceramic
C203	1-101-361	150pF	± 5%	50WV, ceramic
C204	1-102-514	22pF	± 5%	50WV, ceramic
C205	1-102-506	7 pF	± 0.5 pF	50WV, ceramic
C206	1-102-102	0.0047μF	± 20%	50WV, ceramic
C207	1-102-102	0.0047μF	± 20%	50WV, ceramic
C208	1-101-361	150pF	± 5%	50WV, ceramic
C209	1-102-510	12pF	± 5%	50WV, ceramic
C210	1-101-361	150pF	± 5%	50WV, ceramic
C211	1-102-513	18pF	± 5%	50WV, ceramic
C212	1-102-510	12pF	± 5%	50WV, ceramic
C213	1-101-361	150pF	± 5%	50WV, ceramic
C214	1-101-361	150pF	± 5%	50WV, ceramic
C215	1-102-102	0.0047μF	± 20%	50WV, ceramic
C216	1-102-102	0.0047μF	± 20%	50WV, ceramic
C217	1-102-102	0.0047μF	± 20%	50WV, ceramic
C218	1-102-102	0.0047μF	± 20%	50WV, ceramic
C219	1-102-102	0.0047μF	± 20%	50WV, ceramic
C220	1-121-416	100μF	$\pm^{100}_{10}\%$	25WV, electrolytic
C221	1-102-515	24pF	± 5%	50WV, ceramic
C222	1-102-510	12pF	± 5%	50WV, ceramic
C223	1-102-522	51pF	± 5%	50WV, ceramic
C224	1-102-976	180pF	± 5%	50WV, ceramic
C225	1-102-976	180pF	± 5%	50WV, ceramic
C226	1-102-102	0.0047μF	± 20%	50WV, ceramic
C227	1-121-402	33μF	$\pm^{100}_{10}\%$	10WV, electrolytic

Ref. No.	Part No.	Description		
C228	1-102-102	0.0047μF	±20%	50WV, ceramic
C229	1-102-508	10pF	±5pF	50WV, ceramic
C230	1-121-398	10μF	$\pm^{100}_{10}\%$	25WV, electrolytic
C231	1-102-102	0.0047μF	±20%	50WV, ceramic
C232	1-102-508	10pF	±5pF	50WV, ceramic
C233	1-102-102	0.0047μF	±20%	50WV, ceramic
C234	1-102-102	0.0047μF	±20%	50WV, ceramic
C235	1-102-947	10pF	±5pF	50WV, ceramic
C236	1-121-416	100μF	$\pm^{100}_{10}\%$	25WV, electrolytic
C237	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C238	1-102-958	20pF	±5%	50WV, ceramic
C239	1-102-102	0.0047μF	±20%	50WV, ceramic
C240	1-102-102	0.0047μF	±20%	50WV, ceramic
C241	1-102-102	0.0047μF	±20%	50WV, ceramic
C242	1-121-422	220μF	$\pm^{100}_{10}\%$	25WV, electrolytic
C243	1-102-942	5pF	±0.5pF	50WV, ceramic
C244	1-101-837	0.5pF	±0.2pF	50WV, ceramic
C245	1-102-977	200pF	±5%	50WV, ceramic
C246	1-102-102	0.0047μF	±20%	50WV, ceramic
C247	1-102-102	0.0047μF	±20%	50WV, ceramic
C248	1-102-102	0.0047μF	±20%	50WV, ceramic
C249	1-102-102	0.0047μF	±20%	50WV, ceramic
C250	1-102-102	0.0047μF	±20%	50WV, ceramic
C251	1-102-102	0.0047μF	±20%	50WV, ceramic
C252	1-102-102	0.0047μF	±20%	50WV, ceramic
C253	1-102-102	0.0047μF	±20%	50WV, ceramic
C254	1-102-102	0.0047μF	±20%	50WV, ceramic
C255	1-102-934	1pF	±0.25pF	50WV, ceramic
C256	1-102-102	0.0047μF	±20%	50WV, ceramic
C257	1-121-471	10μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C258	1-102-102	0.0047μF	±20%	50WV, ceramic
C259	1-121-471	10μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C260	1-102-102	0.0047μF	±20%	50WV, ceramic
C261	1-121-403	33μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C301	1-102-980	270pF	±5%	50WV, ceramic
C302	1-101-007	0.047μF	$\pm^{100}_{0}\%$	50WV, ceramic
C303	1-102-136	0.001μF	±20%	50WV, ceramic
C304	1-102-889	39pF	±5%	50WV, ceramic
C305	1-102-136	0.001μF	±20%	50WV, ceramic
C306	1-121-398	10μF	$\pm^{100}_{10}\%$	25WV, electrolytic
C307	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C308	1-101-361	150pF	±5%	50WV, ceramic
C309	1-102-136	0.001μF	±20%	50WV, ceramic
C310	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C311	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C312	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C313	1-121-471	10μF	$\pm^{100}_{10}\%$	16WV, electrolytic
C314	1-102-136	0.001μF	±20%	50WV, ceramic
C315	1-102-136	0.001μF	±20%	50WV, ceramic
C316	1-101-361	150pF	±5%	50WV, ceramic
C317	1-101-361	150pF	±5%	50WV, ceramic
C318	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C319	1-102-136	0.001μF	±20%	50WV, ceramic
C320	1-102-136	0.001μF	±20%	50WV, ceramic
C321	1-102-136	0.001μF	±20%	50WV, ceramic
C322	1-101-884	56pF	±5%	50WV, ceramic
C323	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C324	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C325	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C326	1-102-883	27pF	±5%	50WV, ceramic
C327	1-102-730	56pF	±5%	50WV, ceramic
C328	1-102-730	56pF	±5%	50WV, ceramic
C329	1-102-720	22pF	±5%	50WV, ceramic
C330	1-102-965	39pF	±5%	50WV, ceramic
C331	1-102-965	39pF	±5%	50WV, ceramic
C332	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C333	1-102-953	18pF	±5%	50WV, ceramic
C334	1-102-961	27pF	±5%	50WV, ceramic
C335	1-102-980	270pF	±5%	50WV, ceramic
C336	1-121-422	220μF	$\pm^{100}_{10}\%$	25WV, electrolytic
C337	1-102-136	0.001μF	±20%	50WV, ceramic
C338	1-101-361	150pF	±5%	50WV, ceramic
C339	1-101-361	150pF	±5%	50WV, ceramic
C340	1-102-136	0.001μF	±20%	50WV, ceramic
C341	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C342	1-102-136	0.001μF	±20%	50WV, ceramic
C343	1-102-136	0.001μF	±20%	50WV, ceramic
C344	1-102-136	0.001μF	±20%	50WV, ceramic
C345	1-101-884	56pF	±5%	50WV, ceramic
C346	1-102-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C347	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C348	1-102-884	33pF	±5%	50WV, ceramic
C349	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C350	1-101-004	0.01μF	$\pm^{100}_{0}\%$	50WV, ceramic
C351	1-102-730	56pF	±5%	50WV, ceramic
C352	1-102-730	56pF	±5%	50WV, ceramic
C353	1-102-722	27pF	±5%	50WV, ceramic
C354	1-102-965	39pF	±5%	50WV, ceramic
C355	1-102-965	39pF	±5%	50WV, ceramic
C356	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C357	1-102-953	18pF	±5%	50WV, ceramic
C358	1-102-961	27pF	±5%	50WV, ceramic
C359	1-102-980	270pF	±5%	50WV, ceramic
C401	1-121-902	1μF		160WV, electrolytic
C402	1-102-824	470pF	±5%	50WV, ceramic
C403	1-121-902	1μF		160WV, electrolytic
C404	1-102-824	470pF	±5%	50WV, ceramic
C405	1-121-902	1μF		160WV, electrolytic
C406	1-102-824	470pF	±5%	50WV, ceramic
C407	1-105-765-13	0.1μF	±10%	200WV, mylar
C408	1-121-395	4.7μF	$\pm^{150}_{10}\%$	25WV, electrolytic
C409	1-101-361	150pF	±5%	50WV, ceramic
C410	1-101-361	150pF	±5%	50WV, ceramic
C411	1-102-115	560pF	±10%	50WV, ceramic

Ref. No.	Part No.	Description		
C412	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C413	1-102-884	33pF	±5%	50WV, ceramic
C414	1-101-004	0.01μF	$^{+100}_{-0}$%	50WV, ceramic
C415	1-121-705	2.2μF	±30%	25WV, electrolytic
C416	1-101-884	56pF	±5%	50WV, ceramic
C417	1-101-884	56pF	±5%	50WV, ceramic
C418	1-101-884	56pF	±5%	50WV, ceramic
C419	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C420	1-121-398	10μF	$^{+100}_{-10}$%	25WV, electrolytic
C421	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C422	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C423	1-101-004	0.01μF	$^{+100}_{-0}$%	50WV, ceramic
C424	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C425	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C426	1-102-824	470pF	±5%	50WV, ceramic
C427	1-101-004	0.01μF	$^{+100}_{-0}$%	50WV, ceramic
C428	1-102-978	220pF	±5%	50WV, ceramic
C501	1-121-245	1,000μF	$^{+100}_{-10}$%	16WV, electrolytic
C502	1-127-305	4.7μF	±20%	16WV, electrolytic (alox)
C503	1-121-403	33μF	$^{+100}_{-10}$%	16WV, electrolytic
C504	1-131-155	15μF	±20%	16WV, electrolytic (alox)
C505	1-121-471	10μF	$^{+100}_{-10}$%	16WV, electrolytic
C506	1-121-426	470μF	$^{+100}_{-10}$%	16WV, electrolytic
C507		– discarded –		
C508	1-101-896	100pF	±5%	50WV, ceramic
C509	1-101-896	100pF	±5%	50WV, ceramic
C510	1-121-398	10μF	$^{+100}_{-10}$%	25WV, electrolytic
C511	1-105-719-12	0.033μF	±10%	100WV, mylar
C512	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C513	1-105-715-12	0.015μF	±10%	100WV, mylar
※C514	1-105-705-12	0.0022μF	±10%	100WV, mylar
C515	1-105-765-12	0.1μF	±10%	200WV, mylar
C516	1-105-729-13	0.22μF	±10%	100WV, mylar
C517	1-108-549-11	0.68μF	±10%	200WV, mylar
C518	1-105-461-12	0.001μF	±10%	600WV, mylar
C519	1-105-719-12	0.033μF	±10%	100WV, mylar
※C520	1-105-705-12	0.0022μF	±10%	100WV, mylar
C521	1-105-721-12	0.047μF	±10%	100WV, mylar
C522	1-105-715-12	0.015μF	±10%	100WV, mylar
C523	1-121-395	4.7μF	$^{+150}_{-10}$%	25WV, electrolytic
C524	1-121-395	4.7μF	$^{+150}_{-10}$%	25WV, electrolytic
C525	1-105-725-12	0.1μF	±10%	100WV, mylar
C526	1-105-725-12	0.1μF	±10%	100WV, mylar
C527	1-105-717-12	0.022μF	±10%	100WV, mylar
C528	1-105-717-12	0.022μF	±10%	100WV, mylar
C529	1-101-896	100pF	±5%	50WV, ceramic
C530	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C531	1-105-717-12	0.022μF	±10%	100WV, mylar
C532	1-102-212	820pF	±10%	500WV, ceramic
C533		– discarded –		
C534	1-121-391	1μF	$^{+150}_{-10}$%	50WV, electrolytic
C601	1-121-405	33μF	$^{+100}_{-10}$%	50WV, electrolytic
C602	1-121-901	22μF	±20%	50WV, electrolytic
C603	1-105-741-12	0.001μF	±10%	200WV, mylar
C604	1-105-731-13	0.33μF	±10%	100WV, mylar
※C605	1-105-759-13	0.033μF	±10%	200WV, mylar
	1-105-763-13	0.068μF	±10%	200WV, mylar
	1-105-761-13	0.047μF	±10%	200WV, mylar
C606	1-129-497-11	1μF		200WV, mylar
C607	1-121-743	220μF	$^{+100}_{-10}$%	25WV, electrolytic
C608	1-108-547-11	0.4μF		200WV, mylar
C609	1-121-736	1,000μF	$^{+100}_{-10}$%	10WV, electrolytic
C610	1-121-743	220μF	$^{+100}_{-10}$%	25WV, electrolytic
C611	1-121-747	4.7μF	$^{+150}_{-10}$%	250WV, electrolytic
C612	1-119-324	2.2μF	$^{+100}_{-10}$%	500WV, electrolytic
C613	1-105-747-12	0.003μF	±10%	200WV, mylar
C614	1-105-753-12	0.01μF	±10%	200WV, mylar
C615	1-102-147	0.0047μF	$^{+80}_{-20}$%	150WV, ceramic
C616	1-102-147	0.0047μF	$^{+80}_{-20}$%	150WV, ceramic
C617	1-105-731-13	0.33μF	±10%	100WV, mylar
C618	1-121-396	4.7μF	$^{+150}_{-10}$%	50WV, electrolytic
C651	1-519-030	spark gap		
C652	1-119-242	1μF	$^{+150}_{-10}$%	500WV, electrolytic
C653	1-519-030	spark gap		
C654		– discarded –		
C655	1-105-793-16	0.01μF	±10%	400WV, mylar
C701	1-121-471	10μF	$^{+100}_{-10}$%	16WV, electrolytic
C702	1-121-413	100μF	$^{+100}_{-10}$%	6.3WV, electrolytic
C703	1-121-416	100μF	$^{+100}_{-10}$%	25WV, electrolytic
C704	1-121-415	100μF	$^{+100}_{-10}$%	16WV, electrolytic
C705	1-121-189	1μF	$^{+150}_{-10}$%	160WV, electrolytic
C706	1-105-681-12	0.047μF	±10%	50WV, mylar
C707	1-101-810	100pF	±5%	500WV, ceramic
C708	1-105-681-12	0.047μF	±10%	50WV, mylar
C709	1-101-455	1,000pF	±20%	50WV, ceramic
C801	1-102-146	250pF	±20%	25kWV, ceramic
C802	1-105-467-13	0.01μF	±10%	600WV, mylar
C803	1-519-030	spark gap		
C804	1-105-753-12	0.01μF	±10%	200WV, mylar
C805	1-102-095	330pF	±20%	1kWV, ceramic
C806	1-129-855-11	0.013μF	±10%	1kWV, mylar
C807	1-102-153	100pF	±20%	2kWV, ceramic
C808	1-129-702-12	0.001μF	±10%	630WV, mylar
C809	1-108-548	10μF	±10%	200WV, mylar
C810, C811	1-102-087	47pF	±10%	1.5kWV, ceramic
C812	1-102-153	100pF	±20%	2kWV, ceramic
C813	1-129-854-11	0.009μF	±5%	1.5kWV, mylar
C814	1-129-798-11	0.0094μF	±5%	1.5kWV, mylar
C815		– discarded –		

Note: ※ to be selected.

Ref. No.	Part No.	Description		
C816		– discarded –		
C817	1-119-310	40μF	± 20%	160WV, electrolytic
C818		– discarded –		
C819	1-101-845	0.001μF	$\pm^{100}_{0}\%$	500WV, ceramic
C820	1-119-244	47μF	$\pm^{100}_{10}\%$	160WV, electrolytic
C821	1-119-222	100μF	$\pm^{100}_{10}\%$	50WV, electrolytic
C822	1-119-322	22μF	± 20%	160WV, electrolytic
C901	1-125-071	470+47+10+10μF		160WV, electrolytic (block)
C902	1-108-318-11	0.01μF	± 10%	1kWV, mylar
C903	1-129-739-11	0.1μF	±20%	630WV, mylar
C904	1-102-102	0.0047μF	±20%	50WV, ceramic (Serial No. 10,501 and later)

RESISTORS

All resistors are ±5% ¼W carbon, unless otherwise specified.

Ref. No.	Part No.	Description		
R001	1-244-685	3.3kΩ		
R002	1-244-685	3.3kΩ		
R003	1-244-685	3.3kΩ		
R004	1-244-685	3.3kΩ		
R005	1-244-697	10kΩ		
R006	1-244-707	27kΩ		
R007	1-244-697	10kΩ		
R008	1-244-697	10kΩ		
R009	1-244-673	1kΩ		
R010	1-244-865	470Ω	± 10%	ERD½SP
R011	1-244-703	18kΩ		
※ R012	1-244-669	680Ω		
R013	1-244-709	33kΩ		
R014	1-244-719	82kΩ		
R151	1-244-699	12kΩ		
R152	1-244-691	5.6kΩ		
R153	1-244-667	560Ω		
R154	1-244-661	330Ω		
R155	1-244-681	2.2kΩ		
R156	1-244-689	4.7kΩ		
R157	1-244-625	10Ω		
R158	1-250-855	180Ω		ERD12T
R159	1-244-671	820Ω		
R160	1-244-649	100Ω		
R161	1-244-649	100Ω		
R162	1-244-666	300Ω		
R163	1-244-651	120Ω		
R164	1-244-629	15Ω		
R165	1-244-705	22kΩ		
R166	1-244-649	100Ω		
R167	1-244-687	3.9kΩ		
R168	1-244-673	1kΩ		
R169	1-244-663	390Ω		
R170	1-244-643	56Ω		
R171	1-244-649	100Ω		
R172	1-244-697	10kΩ		
R201	1-244-659	290Ω		
R202	1-244-694	7.5kΩ		
R203	1-244-679	1.8kΩ		
R204	1-244-663	390Ω		
R205	1-244-672	910Ω		
R206	1-244-655	180Ω		
R207	1-244-653	150Ω		
R208	1-244-649	100Ω		
R209	1-244-666	510Ω		
R210	1-244-653	150Ω		
R211	1-244-687	3.9kΩ		
R212	1-206-126	390Ω	± 10%	2W, metal oxide
R213	1-206-125	82Ω	± 10%	2W, metal oxide
R214	1-244-651	120Ω		
R215	1-244-689	4.7kΩ		
R216	1-244-679	1.8kΩ		
R217	1-244-667	560Ω		
R218	1-244-657	220Ω		
R219	1-244-693	6.8kΩ		
R220	1-244-677	1.5kΩ		
R221	1-244-681	2.2kΩ		
R222	1-244-673	1kΩ		
R223	1-244-673	1kΩ		
R224	1-244-671	820Ω		
R225	1-244-649	100Ω		
R226	1-244-684	3kΩ		
R227	1-244-673	1kΩ		
R228	1-244-701	15kΩ		
R229	1-244-683	2.7kΩ		
R230	1-244-673	1kΩ		
R231	1-244-649	100Ω		
R232	1-244-673	1kΩ		
R233	1-244-705	22kΩ		
R234	1-244-699	12kΩ		
R235	1-244-697	10kΩ		
R236	1-244-660	300Ω		
R237	1-244-695	8.2kΩ		
R238	1-244-684	3kΩ		
R239	1-244-660	300Ω		
R240	1-244-697	10kΩ		
R241	1-244-660	300Ω		
R242	1-244-689	4.7kΩ		
R243	1-244-679	1.8kΩ		
R244	1-244-667	560Ω		
R245	1-244-653	150Ω		
R246	1-244-690	5.1kΩ		
R247	1-247-660	300Ω		
R248	1-244-704	20kΩ		
R301	1-244-649	100Ω		
R302	1-244-675	1.2kΩ		

Note: ※ to be selected.

Ref. No.	Part No.	Description		
R303	1-244-693	6.8kΩ		
R304	1-244-701	15kΩ		
R305	1-244-673	1kΩ		
R306	1-244-667	560Ω		
R307	1-244-629	15Ω		
R308	1-244-697	10kΩ		
R309	1-244-681	2.2kΩ		
R310	1-244-705	22kΩ		
R311	1-244-681	2.2kΩ		
R312	1-244-701	15kΩ		
R313	1-244-707	27kΩ		
R314	1-244-649	100Ω		
R315	1-244-653	150Ω		
R316	1-244-673	1kΩ		
R317	1-244-661	330Ω		
R318	1-244-707	27kΩ		
R319	1-244-703	18kΩ		
R320	1-244-661	330Ω		
R321	1-244-643	56Ω		
R322	1-244-669	680Ω		
R323	1-244-689	4.7kΩ		
R324	1-244-681	2.2kΩ		
R325	1-244-681	2.2kΩ		
R326	1-244-701	15kΩ		
R327	1-244-707	27kΩ		
R328	1-244-703	18kΩ		
R329	1-244-681	2.2kΩ		
R330	1-244-673	1kΩ		
R331	1-244-649	100Ω		
R332	1-244-679	1.8kΩ		
R333	1-244-649	100Ω		
R334	1-244-681	2.2kΩ		
R335	1-244-673	1kΩ		
R336	1-244-673	1kΩ		
R337	1-244-697	10kΩ		
R338	1-244-685	3.3kΩ		
R339	1-244-677	1.5kΩ		
R340	1-244-699	12kΩ		
R341	1-244-677	1.5kΩ		
R342	1-244-679	1.8kΩ		
R343	1-244-703	18kΩ		
R344	1-244-707	27kΩ		
R345	1-244-633	22Ω		
R346	1-244-669	680Ω		
R347	1-244-681	2.2kΩ		
R348	1-244-665	470Ω		
R349	1-244-661	330Ω		
R350	1-244-661	330Ω		
R351	1-244-695	8.2kΩ		
R352	1-244-695	8.2kΩ		
R353	1-244-681	2.2kΩ		
R354	1-244-701	15kΩ		
R355	1-244-685	3.3kΩ		
R356	1-244-657	220Ω		
R357	1-244-675	1.2kΩ		
R358	1-244-657	220Ω		
R359	1-244-685	3.3kΩ		
R360	1-244-694	7.5kΩ		
R361	1-244-689	4.7kΩ		
R362	1-244-649	100Ω		
R363	1-244-679	1.8kΩ		
R364	1-244-687	3.9kΩ		
R365	1-244-649	100Ω		
R366	1-244-673	1kΩ		
R367	1-244-673	1kΩ		
R368	1-244-697	10kΩ		
R369	1-244-685	3.3kΩ		
R370	1-244-677	1.5kΩ		
R371	1-244-699	12kΩ		
R372	1-244-677	1.5kΩ		
R373	1-244-679	1.8kΩ		
R374	1-244-703	18kΩ		
R375	1-244-707	27kΩ		
R376	1-244-633	22Ω		
R377	1-244-669	680Ω		
R378	1-244-681	2.2kΩ		
R379	1-244-665	470Ω		
R380	1-244-661	330Ω		
R381	1-244-661	330Ω		
R382	1-244-695	8.2kΩ		
R383	1-244-695	8.2kΩ		
R384	1-244-701	15kΩ		
R385	1-244-681	2.2kΩ		
R386	1-244-685	3.3kΩ		
R387	1-244-657	220Ω		
R388	1-244-675	1.2kΩ		
R389	1-244-657	220Ω		
R390	1-244-685	3.3kΩ		
R391	1-244-649	100Ω		
R392	1-244-679	1.8kΩ		
R393	1-244-697	10kΩ		
R394	1-244-649	100Ω		
R401	1-206-012	15kΩ	±10%	2W, metal oxide
R402	1-244-709	33kΩ		
R403	1-244-667	560Ω		
R404	1-244-723	120kΩ		
R405	1-244-641	47Ω		
R406	1-206-012	15kΩ	±10%	2W, metal oxide
R407	1-244-709	33kΩ		
R408	1-244-723	120kΩ		
R409	1-244-667	560Ω		
R410	1-244-641	47Ω		
R411	1-206-012	15kΩ	±10%	2W, metal oxide
R412	1-244-709	33kΩ		
R413	1-244-723	120kΩ		

Ref. No.	Part No.	Description		
R414	1-244-667	560Ω		
R415	1-244-641	47Ω		
R416	1-244-671	820Ω		
R417	1-244-679	1.8kΩ		
R418	1-244-697	10kΩ		
R419	1-250-897	10kΩ	ERD12T	
R420	1-244-697	10kΩ		
R421	1-244-667	560Ω		
R422	1-244-673	1kΩ		
R423	1-244-697	10kΩ		
R424	1-244-695	8.2kΩ		
R425	1-244-733	330kΩ		
R426	1-244-697	10kΩ		
R427	1-244-697	10kΩ		
R428	1-244-667	560Ω		
R429	1-244-677	1.5kΩ		
R430	1-244-653	150Ω		
R431	1-244-709	33kΩ		
R432	1-244-677	1.5kΩ		
R433	1-244-681	2.2kΩ		
R434	1-244-649	100Ω		
R435	1-244-675	1.2kΩ		
R436	1-244-657	220Ω		
R437	1-244-649	100Ω		
R438	1-244-675	1.2kΩ		
R439	1-244-673	1kΩ		
R440	1-244-661	330Ω		
R441	1-244-661	330Ω		
R442	1-244-679	1.8kΩ		
R443	1-244-689	4.7kΩ		
R444	1-244-687	3.9kΩ		
R445	1-244-707	27kΩ		
R446	1-244-697	10kΩ		
R447	1-244-671	820Ω		
R448	1-244-689	4.7kΩ		
R449	1-244-705	22kΩ		
R450	1-244-687	3.9kΩ		
R451	1-244-679	1.8kΩ		
R452	1-244-661	330Ω		
R453	1-244-683	2.7kΩ		
R454	1-244-729	220kΩ		
R455	1-244-697	10kΩ		
R456	1-244-713	47kΩ		
R457	1-244-657	220Ω		
R458	1-244-685	3.3kΩ		
R501	1-217-031	100Ω	±10%	3W, cement coated
R502	1-244-707	27kΩ		
R503	1-244-639	39Ω		
R504	1-244-677	1.5kΩ		
R505	1-244-633	22Ω		
R506	1-207-185	1Ω		½W, wire wound
R507	1-244-661	330Ω		
R508	1-244-689	4.7kΩ		
R509	1-244-675	1.2kΩ		
R510	1-244-625	10Ω		
R511	1-244-689	4.7kΩ		
R512	1-244-637	33Ω		
R513	1-244-705	22kΩ		
R514	1-244-697	10kΩ		
R515	1-244-707	27kΩ		
R516	1-244-679	1.8kΩ		
R517	1-244-689	4.7kΩ		
R518	1-244-697	10kΩ		
R519	1-244-693	6.8kΩ		
R520	1-244-673	1kΩ		
R521	1-244-723	120kΩ		
R522	1-244-649	100Ω		
R523	1-244-713	47kΩ		
R524	1-244-685	3.3kΩ		
R525	1-244-693	6.8kΩ		
※R526	1-207-284	18Ω	±10%	1.5W, wire wound
	1-207-287	24Ω	±10%	1.5W, wire wound
	1-207-290	33Ω	±10%	1.5W, wire wound
※R527	1-207-288	27Ω	±10%	1.5W, wire wound
	1-207-290	33Ω	±10%	1.5W, wire wound
	1-207-293	43Ω	±10%	1.5W, wire wound
R528	1-207-277	7.5Ω	±10%	1.5W, wire wound
R529	1-250-825	10Ω	ERD12T	
R530	1-206-132	8.2kΩ	±10%	2W, metal oxide
R531	1-244-667	560Ω		
R532	1-244-677	1.5kΩ		
R533	1-244-667	560Ω		
R534	1-244-673	1kΩ		
R535	1-244-665	470Ω		
R536	1-244-673	1kΩ		
R537	1-244-687	3.9kΩ		
R538	1-244-672	910Ω		
R539	1-244-667	560Ω		
R540	1-244-703	18kΩ		
R541	1-244-697	10kΩ		
R542	1-244-707	27kΩ		
R543	1-244-687	3.9kΩ		
R544	1-244-687	3.9kΩ		
R545	1-244-659	270Ω		
R546	1-244-665	470Ω		
R547	1-244-665	470Ω		
R548	1-244-701	15kΩ		
R549	1-244-709	33kΩ		
R550	1-206-130	1.5kΩ	±10%	2W, metal oxide
R551	1-244-693	6.8kΩ		
R601	1-207-109	1Ω	±10%	1.5W, wire wound
R602	1-217-060	3.3Ω	±10%	5W, cement coated
R603	1-244-675	1.2kΩ		
R604	1-206-012	15kΩ	±10%	2W, metal oxide

Note: ※ to be selected.

Ref. No.	*Part No.*	*Description*		
R605	1-250-908	30kΩ		ERD12T
R606		– discarded –		
R607	1-206-018	10kΩ	±10%	2W, metal oxide
R608	1-250-903	18kΩ		ERD12T
R609		– discarded –		
R610	1-244-685	3.3kΩ		
R611		– discarded –		
R612		– discarded –		
R613	1-244-709	33kΩ		
R614	1-244-733	330kΩ		
R615	1-244-735	390kΩ		
R616	1-207-241	5Ω	±10%	0.65A, wire wound
R617	1-207-241	5Ω	±10%	0.65A, wire wound
R618	1-207-241	5Ω	±10%	0.65A, wire wound
R619	1-250-817	4.7Ω	±5%	ERD12T
R620	1-217-038	390Ω	±10%	3W, cement coated
R621	1-207-268	3.3Ω	±10%	1.5W, wire wound
R622	1-250-846	75Ω		ERD12T
R623	1-206-111	39kΩ	±10%	1W, metal oxide
R624	1-250-911	39kΩ		ERD12T
R625	1-206-079	47Ω	±10%	1W, metal oxide
R626	1-250-909	33kΩ		ERD12T
R627	1-250-885	3.3kΩ		ERD12T
R628	1-250-905	22kΩ		ERD12T
R629	1-250-905	22kΩ		ERD12T
R630	1-206-081	100Ω	±10%	1W, metal oxide
R631	1-250-899	12kΩ		ERD12T
R632	1-250-937	470kΩ		ERD12T
R633	1-244-670	750Ω		
R634	1-244-721	100kΩ		
R651	1-202-629	220kΩ	±20%	RC½, composition
R652, R655	1-202-806	470kΩ	±20%	RC1, composition
R653, ※R654, R656	1-202-581	2.2kΩ	±20%	RC½, composition
R657	1-202-585	3.3kΩ	±20%	RC½, composition
R701	1-244-717	68kΩ		
R702	1-244-705	22kΩ		
R703	1-244-665	470Ω		
R704	1-244-671	820Ω		
R705	1-244-627	12Ω		
R706	1-244-673	1kΩ		
R707	1-205-456	390Ω	±10%	3W, cement coated
R708	1-244-709	33kΩ		
R709	1-244-705	22kΩ		
R710	1-244-649	100Ω		
R711	1-244-661	330Ω		
R712	1-205-464	2.2Ω	±10%	7W, cement coated
R801	1-202-776	1kΩ	±20%	RC1, composition
R802	1-202-631	270kΩ	±10%	R½, composition
R803	1-202-631	270kΩ	±10%	R½, composition
R804	1-202-575	1.2kΩ	±10%	R½, composition
R805	1-244-895	8.2kΩ		
R806	1-207-249	1.8Ω		1W, wire wound
R807	1-244-895	8.2kΩ		
R808	1-217-062	4.7Ω	±10%	5W, cement coated
R809	1-206-127	470Ω	±10%	2W, metal oxide
R810		– discarded –		
R811		– discarded –		
R812	1-244-823	8.2Ω		
R813	1-217-035	220Ω	±10%	3W, cement coated
R901	1-205-805	180Ω		20WV, cement coated
R902	1-217-060	3.3Ω	±10%	5WV, cement coated
R903	1-250-857	220Ω		ERD12T
R904	1-250-857	220Ω		ERD12T
R905	1-211-169	12kΩ	±10%	RD1P
R906	1-205-462	1.2kΩ	±10%	5W, cement coated
R907	1-244-669	680Ω		
R908	1-244-669	680Ω		
R909	1-244-683	2.7kΩ		
R910	1-244-683	2.7kΩ		
R911	1-244-911	3.9kΩ		
R912	1-244-694	7.5kΩ (Serial No. 10,501 and later)		
R913	1-244-683	2.7kΩ (Serial No. 10,501 and later)		
VR151	1-222-805	470Ω-B		adjustable
VR152	1-222-805	470Ω-B		adjustable
VR201	1-222-804	1kΩ-B		adjustable
VR301	1-222-701	10k-B		adjustable
VR302	1-221-997	2.2kΩ-B		adjustable
VR303	1-221-997	2.2kΩ-B		adjustable
VR401	1-222-717	250kΩ-B		adjustable
VR402	1-222-717	250kΩ-B		adjustable
VR403	1-222-717	250kΩ-B		adjustable
VR404	1-222-978	4.7kΩ-B		adjustable
VR405	1-222-978	4.7kΩ-B		adjustable
VR406	1-222-978	4.7kΩ-B		adjustable
VR407	1-222-701	10kΩ-B		adjustable
VR501	1-222-807	20kΩ-B		adjustable
VR502	1-221-389	5kΩ-B		adjustable
VR503	1-221-389	5kΩ-B		adjustable
VR504	1-221-304	10kΩ-B		adjustable
VR505	1-221-979	22kΩ-B		adjustable
VR601	1-222-701	10kΩ-B		adjustable
VR602	1-222-724	10kΩ-B		adjustable
VR603	1-222-809	500kΩ-B		adjustable
VR604	1-222-172	50Ω-B		variable
VR605	1-222-172	50Ω-B		variable
VR606	1-222-172	50Ω-B		variable
VR607	1-221-997	2.2kΩ-B		adjustable
VR608		– discarded –		
VR609	1-222-769	20kΩ-B		adjustable
VR901	1-222-482	5kΩ-B		variable
VR902	1-222-342	50kΩ-D		variable

Note: ※ to be selected.

Ref. No.	Part No.	Description
VR903	1-222-484	1 kΩ-B variable
VR904	1-222-483	500Ω-B variable
VR905	1-222-485	20kΩ-B variable
VR906	1-222-174	20kΩ-B variable

MISCELLANEOUS

Ref. No.	Part No.	Description
CV151	1-141-136	ceramic capacitor, cylinder trimmer
CV152	1-141-136	ceramic capacitor, cylinder trimmer
SD201	1-403-366	detector block, sound
DL301	1-415-037	delay line, Y
DL401	1-415-036	delay line, 1H
SC1	1-413-005	coil, horizontal stabilizing; 1.3 mH
SC2	1-413-017	coil, horizontal stabilizing; 1.9 mH
	1-452-014	magnet, disk
	1-452-032	magnet, disk
	1-452-038	magnet, disk
L807, L901	1-451-070	deflection yoke
	1-502-237	speaker, 8Ω
	1-506-108	terminal pin, SV
	1-506-186	pin plug
J901	1-507-169-13	jack, earphone
J902	1-507-169-13	jack, earphone
	1-507-901-02	nut, jack
CN902	1-509-015	socket, ac power
SW152	1-514-533	switch, sub miniature (SW152)
SW151	1-514-843	switch, system selector (SW151)
OCP901	1-515-119	protector, over current
ANODE	1-526-130	cap, anode
NECK	1-526-131	cap, convergence
CNJ	1-526-165-21	socket, voltage changeover
NE901	1-519-019-14	lamp ass'y, neon
NE902	1-519-019-14	lamp ass'y, neon
NE651	1-519-013-13	neon lamp
NE652	1-519-013-13	neon lamp
NE653	1-519-013-13	neon lamp
NE654	1-519-013-13	neon lamp
V801	1-525-118	vacuum tube, 3AT2
K651	1-526-086	socket, picture tube
K801	1-526-187	socket, mold
FUSE	1-532-140	fuse, 3.15A
	1-533-075	fuse holder
CN903	1-534-526	cord, ac power supply (J)
CN901	1-534-587	cord, ac power supply (E)
	1-535-036	terminal, hermetic
TB701	1-536-146	lug terminal plate, 1L1
	1-536-046	terminal strip, E
	1-536-181	lug terminal plate, 2L1
TB801	1-536-220	terminal plate ass'y, 16P
TB802	1-536-221	terminal plate ass'y, 3P
	1-536-270	lug terminal, 1L3L1
	1-536-296	lug terminal plate
	8-735-300-00	picture tube, (330AB22)

CARTONS AND ACCESSORIES

Part No.	Description
4-303-349	sheet, upper
4-304-163	carton, packing
4-304-164	cushion, left
4-304-165	cushion, right
4-304-166	protection sheet
4-304-167	label, antenna
X-43041-10	card ass'y
X-44900-02-1	polishing cloth in polyethylene bag
Y-20823-01	telescopic antenna ass'y (AN-14F)
4-302-759	label, serial number
4-491-045-51	caution label, power cord
4-495-281-51	instruction manual
	polyethylene bag, instruction manual
1-504-034-22	earphone (ME-20B)