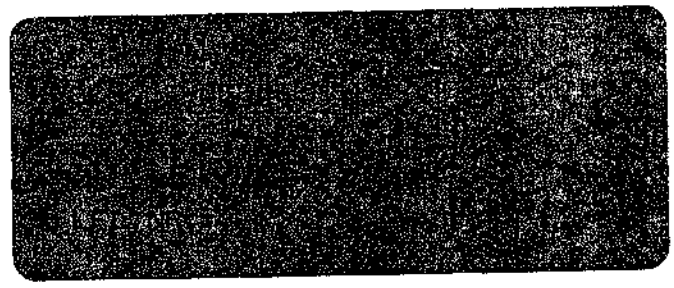
SERVICE MANUAL

AKAI PORTABLE VIDEO TAPE RECORDER

MODEL VT-100



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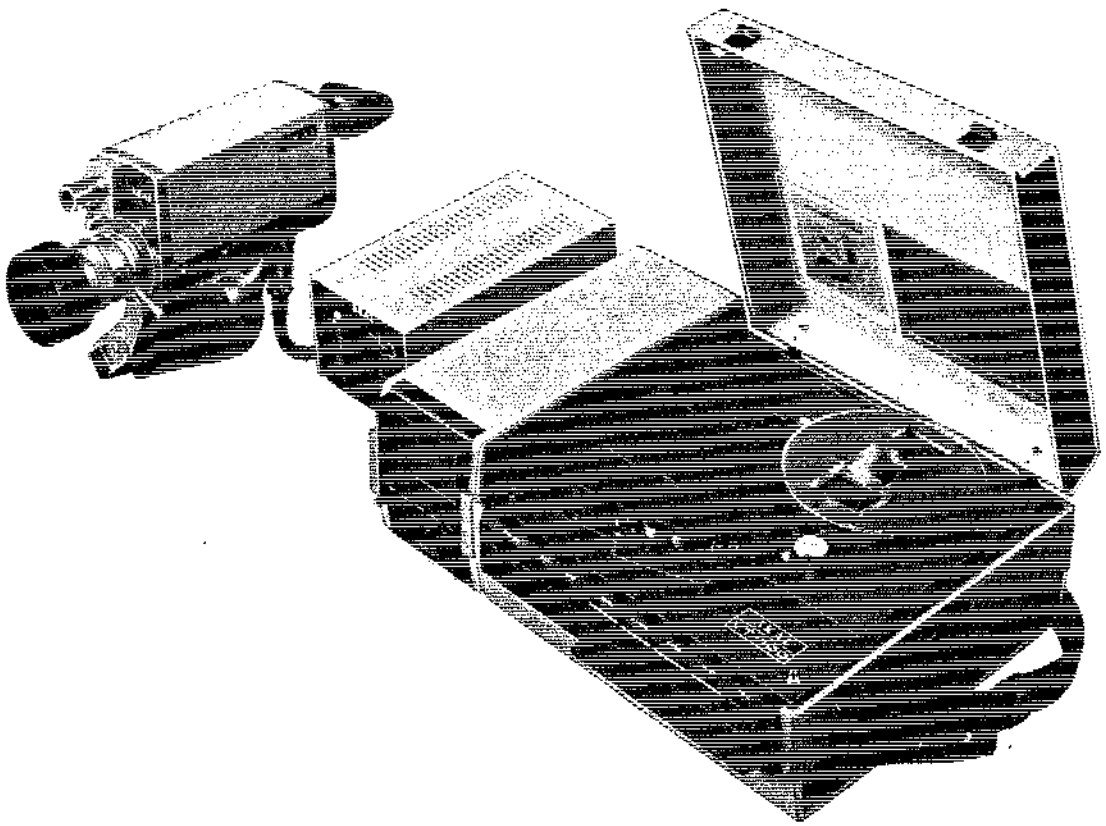
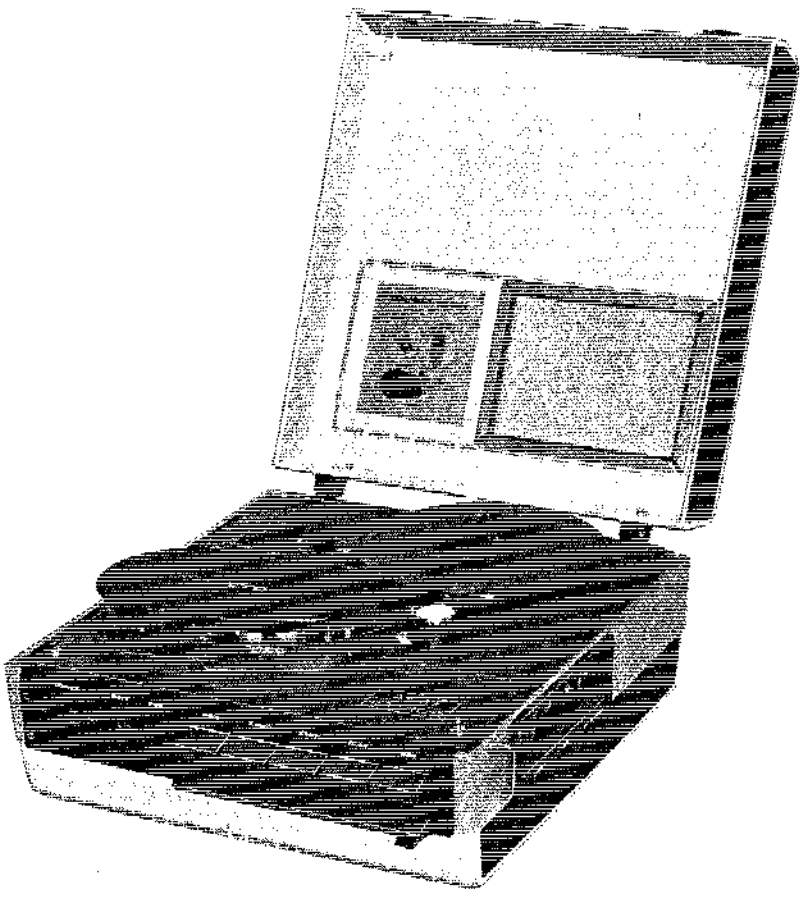


When placing order for parts, please use separate
PARTS LIST or PRICE LIST FOR PARTS.

CHAPTER 1
RECORDER (PXV) REPAIR AND ALIGNMENT

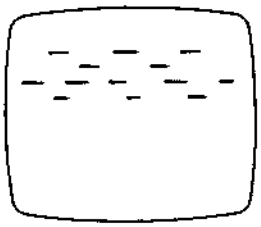
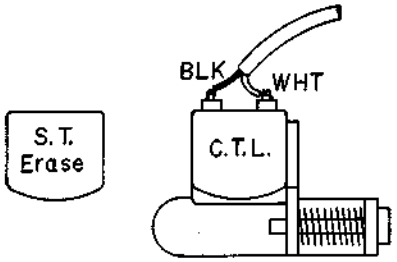


SECTION 1-1
SPECIFICATIONS

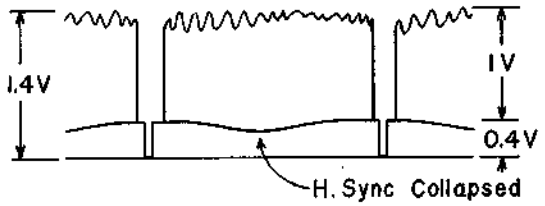
TV Signal :	Standard U.S. Signal (for receiving signals from vidicon camera only)
Recording System :	Twin rotating heads (helical scan format)
Recording Time :	20 minutes using a 1200 ft. tape
Tape Speed :	11-1/4 inches per second ± 0.7%
Tape Width :	1/4 inch tape
Horizontal Resolution :	200 lines
Video Signal to Noise Ratio :	Better than 40 dB
Video Input :	1.4 V p-p composite video (negative sync)
Audio Input :	–60 dB, impedance : 600 Ω (external microphone jack)
Audio Band Width :	200 to 10,000 Hz ± 5 dB
Wow and Flutter :	Less than 0.15% r.m.s.
Earphone Impedance :	More than 600 Ω
Fast Forward and Rewind Time :	5 minutes using a 1200 ft. tape
Power Source :	DC 12 V
Batteries :	Two rechargeable batteries (6 V each) (Zonnen Shine 3G x 3/u)

SECTION 1-2
TROUBLE SHOOTING CHART

1) GENERAL

Symptom	Trouble
Capstan Motor and Head Motor does not rotate when Power Switch is turned on.	1. Fuse F-3001-4A blown. 2. When using batteries, battery voltage is low or battery contact is faulty. 3. When using AC Adapter, AC adapter defective or connection cable defective. 4. Power Switch (SW-3001) defective.
Head Motor rotates, but Capstan Motor does not rotate	Refer to C.M.D. PX-507 Trouble Shooting.
Capstan Motor rotates, but Head Motor does not rotate	Disconnect Red/Green/White wires connecting SERVO P.C. Board PX-507. With circuit tester resistor range, supply a DC Bias Voltage to the base of transistor TR-8012 (2SC458). Under these conditons, if head motor rotates, PX-507 is defective. If head motor does not rotate, transistor TR-8012 or TR-8011 is defective.
When power is turned on, battery checker needle over-swings (needle goes beyond maximum position)	Supply circuit in B+ supply circuit (+9 V) grounding and shorting. Check wiring connections, and transistors, etc.
Picture on Monitor Screen unstable (flickers during battery operation)	Battery voltage low.
Noise at Monitor Picture 	There are two types of noises. 1. Comes from Head Motor. 2. Originates from between head brush and slip ring. a) Disconnect brush connection wire at upper part of video head assembly. If noise still exists, noise is coming from head motor. b) If noise originates from brush and slip ring : 1. Part of slip ring is scratched. 2. Brush has slipped off of slip ring. 3. Brush tension is weak.
Tracking error exists when playing back a tape recorded on another machine (unsatisfactory interchangeability)	a) Faulty adjustment of tape A and B. b) Faulty adjustment of Video Head Assembly. c) Reversed control head connection or faulty adjustment of control head position.  Refer to "Replacement of Video Head Assembly," Section 1—7.

VIDEO AMPLIFIER PX-504

Symptom	Trouble
Carrier Leak (stripe appears on monitor screen)	a) IC-4001, 4002, or 4003 (LM-1) of Limiter Circuit defective. b) Re-adjust VR-6 (150B) and VR-7 (200B).
Part of Picture on monitor screen unstable (E to E signal)	Observe composite video signal waveforms at video output terminal. If part of Horizontal Sync. Amplitude is small, IC-4008 (R-1) is defective. 
A. No Picture (No E to E signal)	a) No signal at TP-1. IC-4009 (GR-117) defective. b) Carrier wave at TP-1, but no modulation. 1. IC-4008 (R-1) defective. 2. Open circuit at L-4007 or L-4008 of video amp. input stage. c) Modulated RF signal at TP-1, but no picture. Connect an oscilloscope to capacitor C-4016 (33/10) and check whether there is a demodulated signal. 1. If there is no signal, check circuits of IC LM-1 through GR-118. 2. If there is a signal, check whether there is a composite video signal at capacitor C-4023 (33/16). If there is no signal, there is an open circuit either at L-4004 (100 μH) L-4005 (180 μH), or L-4006 (100 μH). 3. If there is a signal at capacitor C-4023 (33/16), but no signal at video output terminal, P-5 (IC-4007) is defective.
B. No Picture (at playback mode)	a) Dust adhering to video head tip. b) No RF Envelope at TP-2. Open circuit at L-4001 (82 μH) or L-4002 (56 ΩH) or else transistor TR-4001, TR-4002, TR-4003, or TR-4004 is defective. (likely to be defective coil).
Does not Record.	a) Dust adhering to video head tip. b) No RF Signal at Video Head terminal. 1. Faulty contact at VR-3, or IC-4010 (P-5), or transistor TR-4005 (2SC968B) defective. 2. RF Signal at heat sink of transistor 2SC968 and no RF signal at video head terminal. Faulty contact point at SM-8 Relay.

AUDIO AMPLIFIER PX-505

Symptom	Trouble
(Recording Mode) Audio Amplifier Gain too large (increased distortion during recording)	AGC circuit is not functioning. Faulty contact point VR-1 (50 KB).
Audio Amplifier Gain too small (low recording level)	IC5001 (AN 136 B) defective.
Fluxuation of Bias Oscillation Frequency	Open circuit at full track erase head or side track erase head or faulty soldering.
(Playback mode) Does not Play Back	IC-5001 (AN 136 B) defective.
Buzzing Noise from monitor speaker during playback	Disconnect ground wire (included in yellow shielded wire) from recorder earphone jack.

TAPE TRANSPORT MECHANISM

Symptom	Trouble
Does not Fast Forward	a) Fast Forward torque is less than 300 grams. FF/Rweind drum belt defective or switching spring is open. b) Fast Forward torque is more than 300 grams. Brake shoe is touching supply reel drum or hold-back tension is too strong.
Does not Rewind	Rewind Idler Lever Shaft holding screw is loose.
Tape slack when "Stop" Key is depressed during FF or Rewind Mode.	Unbalanced left and right brake tension. Difference in left and right brake tension should be less than 100 grams.
Pinch Roller does not firmly contact Capstan (Playback and Recording Mode).	a) Battery voltage low. b) Faulty operation of pinch roller solenoid control circuit PX-508. c) Faulty contact at SW-3002, SW-3003, SW-3004, or SW-3005. d) Microswitch does not actuate (repair by slightly bending actuator).
Tape Speed is slow	a) Confirm that the capstan motor drive frequency is 83.3 Hz ± 0.1 Hz. b) Tape hold-back tension is too strong.
Excessive Wow and Flutter	Refer to "Adjustment of Tape Transport Mechanism," Section 1–8.

S.S.G. (SYNC SIGNAL GENERATOR) PX-509

Symptom	Trouble
No oscillator waveform at TP-1 (31.5 KHz)	Transistor TR-7001 (2SA564Q) or oscillator coil L-7001 (SNY-1357) defective.
Waveform has collapsed at TP-1 (amplitude too small)	Transistor TR-7002 (2SC458B) defective.
No Horizontal Blanking Signal (very thin fly-back line appears on monitor screen)	IC-7001 or IC-7002 defective (to determine which IC is faulty, check to see whether signal appears at capacitor C-7021 (0.001 μF).
Waveform at TP-1 but no Horizontal or Vertical Sync.	Check voltage regulator transistor TR-7005 (2SC968B) as well as zener diode D-7001 (RD-5AM).
No Vertical Sync (tape speed fluxuates) (SERVO function faulty)	Check for malfunction at TP-2 through TP-5. **Caution** For this check use frequency counter and oscilloscope. If re-adjustment is necessary, pay particular attention to the 1/7 frequency divider circuit. Trouble could be caused by defective U.J.T. or faulty potentiometer contact point.
No Vertical Blanking Signal (fly-back line appears on monitor screen)	IC-7004 defective
Pulse Width of Vertical Blanking Signal incorrect	Trouble could be caused by malfunction of frequency divider U.J.T 7001 to 7004.
Downward (flowing-like) movement of picture on monitor screen	Difference in pulse width between vertical sync signal and horizontal blanking signal. Check TP-1 through TP-5.

SERVO PX-506

Symptom	Trouble
Head motor revolutions too fast (normal is 30 rps, but speed is doubled to 60 rps)	a) Is pick-up pulse amplitude more than 8 V p-p, and are negatives peaks clipping at TP-5? If amplitude is small, reverse connection of pick-up coil. b) No trapezoid wave at TP-8.  At the moment the power switch is turned on, check to see whether trapezoid wave appears at TP-8. 1. If a trapezoid wave appears within 1–2 seconds, TR-6003, TR-6004, or TR-6005 is defective (usually the trouble is with 2SA564 transistors). 2. If trapezoid wave does not appear, check the waveforms at TP-5, TP-6, and TP-7 (possibility of defective FF-10 (IC-6007), D13T1 (U.J.T. 6001), or D-3271 (IC-6010). c) sampling pulse unstable at TP-8. D-3272 (IC-6009) or tantalum condenser C-6028 (10/10), C-6029 (10/10) or C-6027 (0.33 (M)) is defective. d) No sampling pulse at TP-4 (this type of trouble is comparitively common) FF-10 (IC-6002) of phase control circuit defective, or malfunction of FF-10 (IC-6002) due to capacity change of C-6008 (1000PF), C-6009 (1000PF). e) No signal at TP-3. Possibility of defective capacitor C-6013 (0.22 μF). f) Sampling pulse unstable at TP-4. Incorrect resistance of R-6026 (100 KΩ). Incorrect capacity of C-6021 (0.22 μF) C-6016 (0.33/10) defective. g) Sampling pulse of waveform is unstable (moves up and down) at TP-4. D-3272 (IC-6005) defective or Transistor TR-6002 (2SC458B) defective.
No signal at Control Head (Recording Mode)	a) No control signal at control head terminal. D-2114 (IC-6003) defective or faulty contact point of relay (RL-6001 TECD-T9). b) Square wave appears at control head terminal. Open circuit control head coil or faulty soldering.
No control signal at playback mode (picture rolling)	HA113 (IC-6001) defective or faulty contact point of relay (RL-6001).

C.M.D. (CAPSTAN MOTOR DRIVE CIRCUIT) PX-507

Symptom	Trouble
Capstan does not rotate at all	a) Short circuit Zener Diode RD-7A (M) (ZD8002), or transistor TR-8004, or TR-8005 (2SA564) defective. b) Touch the three 2SC1061 (B) transistors of motor drive circuit with your finger. If one of them is extremely hot, 2SC536 is defective or it's front stage is defective.
Capstan motor does not start (If motor started by hand, it will continue to rotate)	a) One of the tantalum condensers(C-8006 throughC-8010 (10/25) or C-8007 through C-8011 (10/10) defective. b) One of the three 2SC536 transistors defective.
Tape Speed too Fast	a) Capstan drivebelt is running on gaurd rim (instead of in middle of) motor pulley. b) Open circuit at Zener Diode RD-7A (M) (ZD8002). If this is the case, the motor drive signal becomes 130 Hz (instead of 83.3 Hz).
Not within Wow and Flutter. Specification (spec. less than 0.15% at test tape playback)	With VR-3 at maximum clockwise position, confirm that the motor drive frequency is within 82–85 Hz. a) If frequency is not within the 82–85 Hz range, replace Zener Diode RD-7A (M) (ZD-8002). b) If waveform distortion is excessive, DC resistance between emitter-collector of transistor 2SC1061 is not identical.

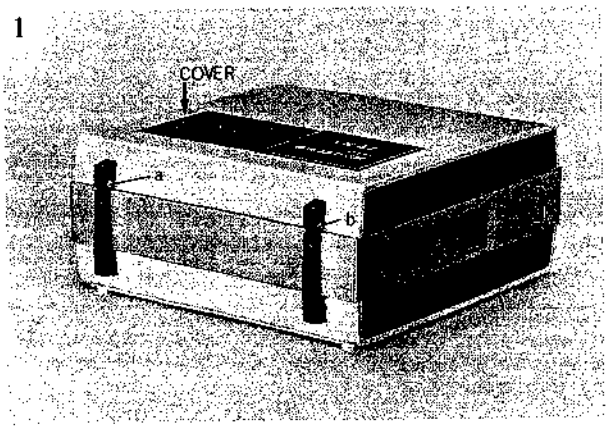
POWER VOLTAGE REGULATOR CIRCUIT

Symptom	Trouble
Voltage at +9 V Terminal reduced to 5–6 V (cannot adjust with VR-1)	Zeder Diode RD-7A (N) (D-8001) of power voltage regulator circuit defective.
Voltage at +9 V terminal increased to 11–12 V (cannot adjust with VR-1)	Transistor TR-8001 (2SC454) or TR-8002 (2SC968) defective.
Monitor picture continuously fluxuates when Play or REC key is depressed (voltage fluxuates at +9 V terminal)	Low frequency oscillation of power regulator circuit. Connect a 0.1 μF condenser between collectoremitter circuit of TR-8002 (2SC968).

SECTION 1-3
CASE REMOVAL

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Remantle in reverse order.

1



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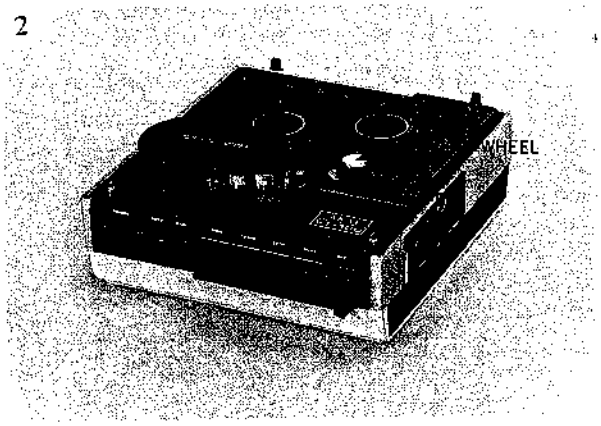

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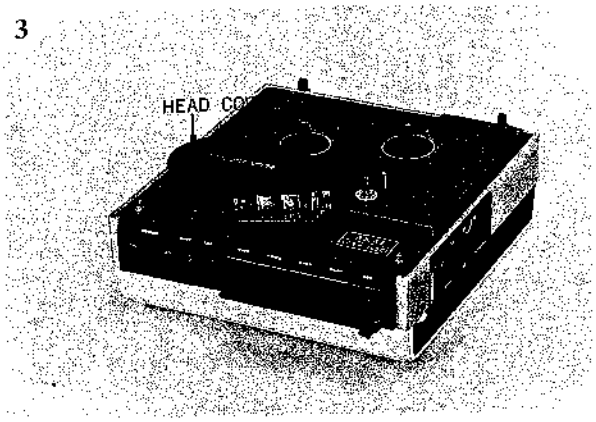

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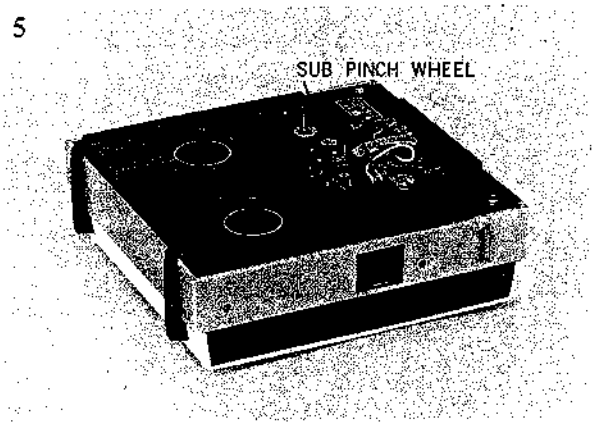

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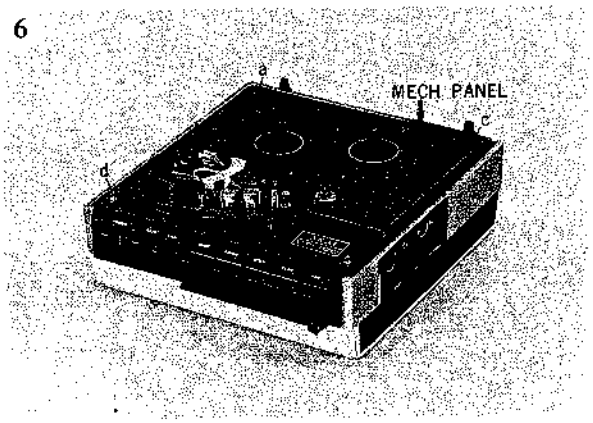

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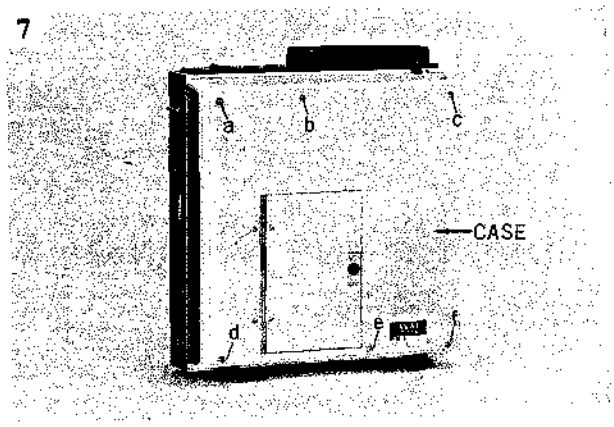
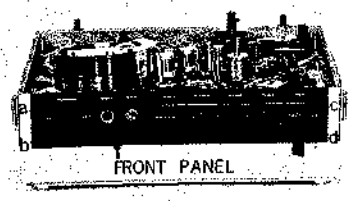

a
b
c
CASE
d
e
f

8


a
b
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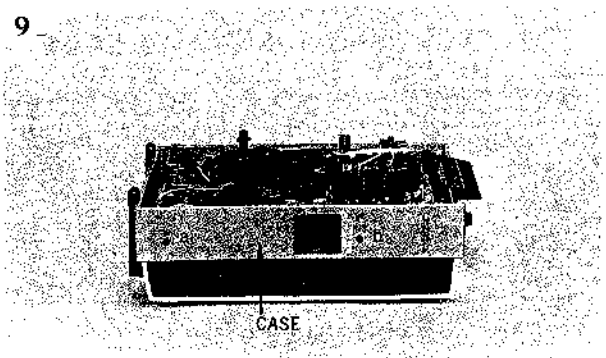
d
FRONT PANEL

9


CASE

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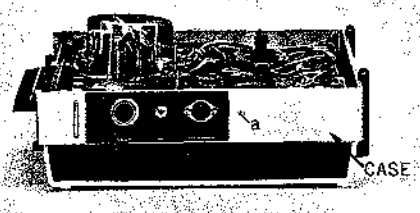
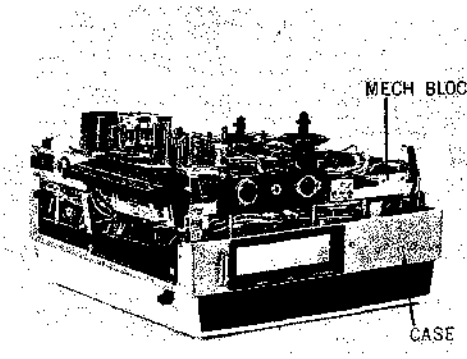
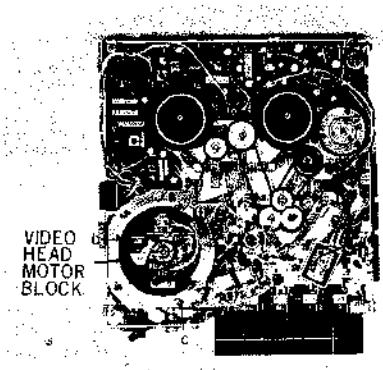

a
CASE

11


MECH BLOCK
CASE

12


VIDEO
HEAD
MOTOR
BLOCK

SECTION 1-4
EQUIPMENT REQUIRED

The following equipment must be available for complete testing and adjustments :

(1) Triggered sweep oscilloscope
(sensitivity 0.005 V/cm, DC to 10 mHz)
(2) Low capacity oscilloscope probes
(3) Television monitor (19″ or 12″ screen) with connection cable
(4) DC high impedance Voltmeter or V.T.V.M.
(5) Frequency counter (capable of indicating 0.1 Hz to 50 kHz)
(6) Wow and flutter Meter
(7) Video reference tape (monoscope test pattern recorded signal)
(8) Distortion Meter
(9) Tape Speed Test Tape (1000 Hz, 11-1/4 ips recorded signal)
(10) Wow and Flutter Test Tape (3000 Hz, 11-1/4 ips recorded signal)
(11) 5″ video recording tape (blank)
(12) Audio Frequency Generator (0.5% or less distortion) 50 Hz to 15 kHz
(13) Vidicon Camera and Resolution Chart
(14) Specially designed microscopes and tools are required for video head adjustment.

SECTION 1-5
CLEANING THE HEADS

Sudden fading out of picture on monitor screen during playback or at the beginning of playback after the tape has been rewound due to a dirty video head is very common.

When cleaning video or other heads, and tape guide, etc., please proceed as follows :

(1) Remove Video Head Cover.

(2) Soak a small piece of chamois with Fireon Liquid or alcohol and clean the outer part of the video head drum by touching very lightly (ref. fig. 1-9).

(3) With rotating motion, pass finger lightly over the slip ring part of the video head center, so that the surface of the chamois passes over the video head tip.

(4) Clean the entire surface of the video head drum and the upper part of the drum guide band with chamois.

(5) Clean surfaces of full track erase head, side track erase head, and control and audio heads.

(6) If oxide deposits, etc. are adhering to tape guide, clean tape guide.

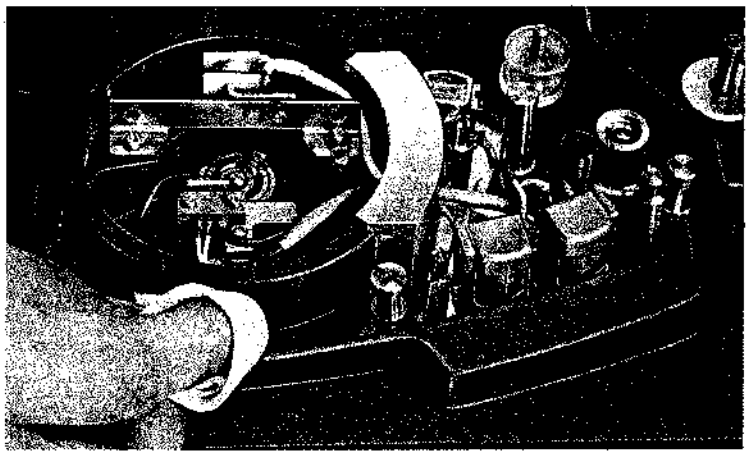
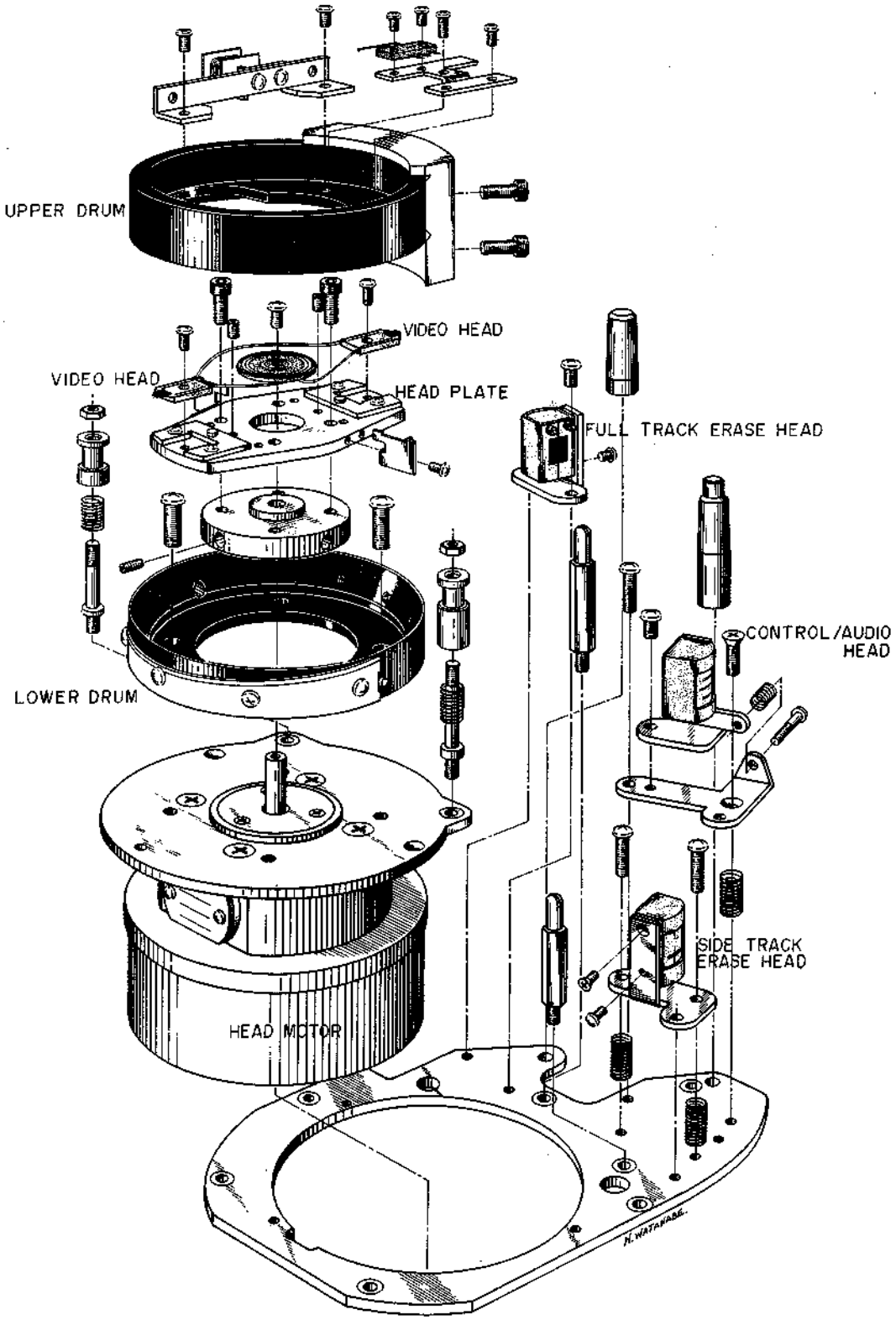


Fig. 1-9

SECTION 1-6
ADJUSTMENT OF VIDEO HEAD ASSEMBLY



(1) Calibration of the Microscopes

a) As shown in fig. 10, to adjust the position of the microscopes, with the prop positioned in the center of the microscopes, align the center line of the microscopes (microscopes attached to fixture plate) (A and A′) with the mark on the fixture. (ref. fig. 1-11)

Confirm that when the fixture is rotated 180°, the mark is within 10 μ from the center line.

b) Adjust microscopes (B and B′) so that the edge of the fixture overlaps the center lines by 50 μ.

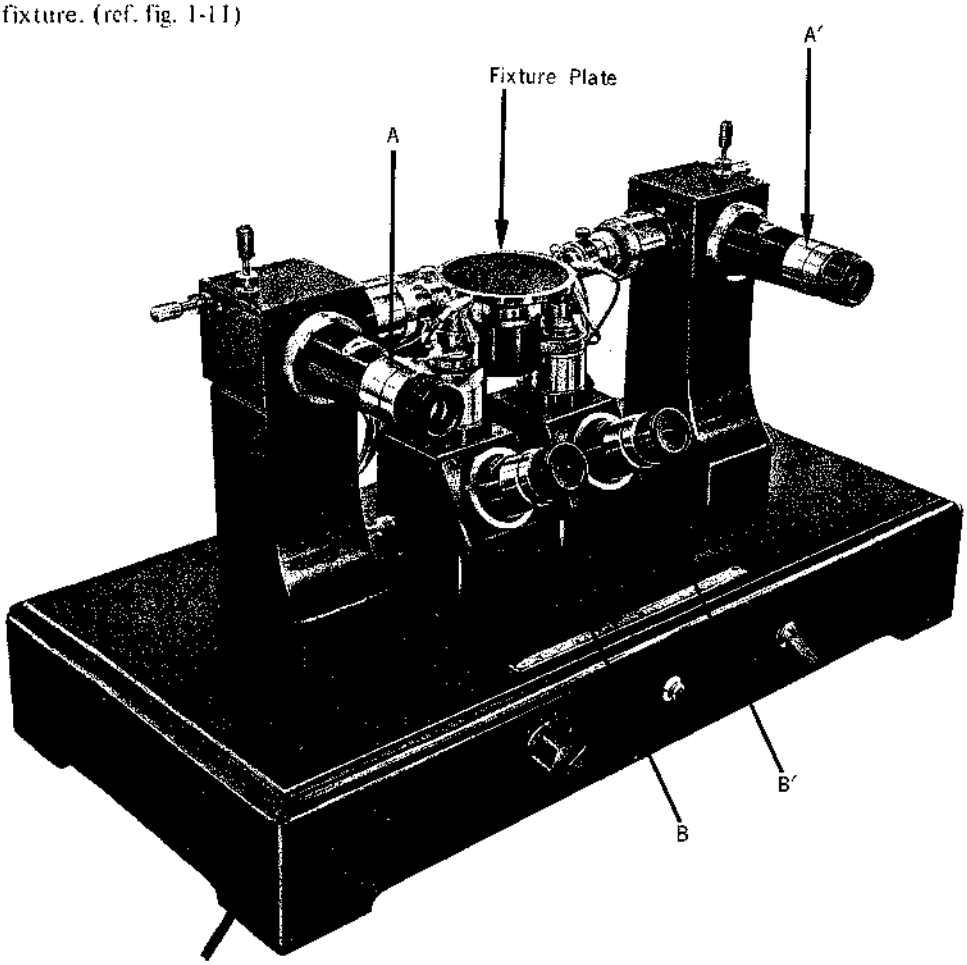


Fig. 1-10

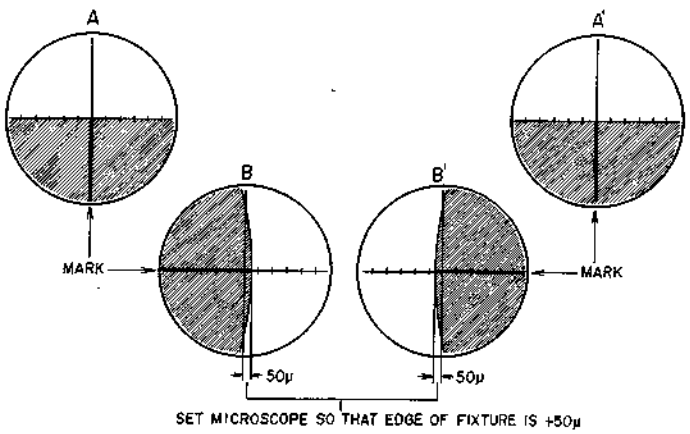


Fig. 1-11 Microscopic Views of Fixture

(2) **180° Spacing and Protrusion of Video Head Tips**

a) Screw down the head plate at the center part of the microscope, positioning the brass plate so that it is located on the forward side of the head plate as shown in figs. 1-12 and 1-14.

b) Adjust the protrusion of the head tips so that they are aligned with the center line of microscopes (B) and (B′) as shown in fig. 1-13.

c) In case the left hand head gap comes above the center line of microscope (A), adjust by bringing the right hand head gap 236 μ (± 10 μ) (23.6 scales ± 1 scale) to the left of the microscope's center line.

d) Rotate the head plate 180°. When the position of the left and right head tips are reversed, verify that the position of the right hand head gap is 236 μ (±10 μ) away from the microscope's center line.

Note

In case the position of the head gap is further away from this position (236 μ), this means there is also a discrepancy in the calibration of the microscope.

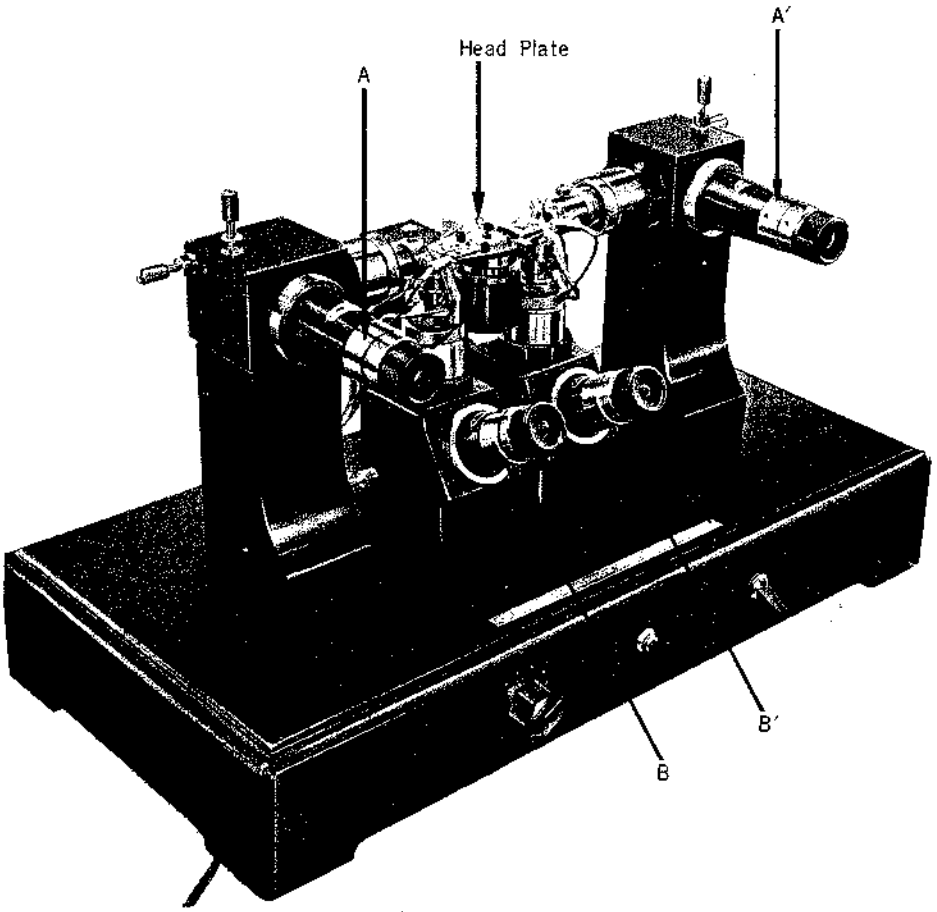


Fig. 1-12

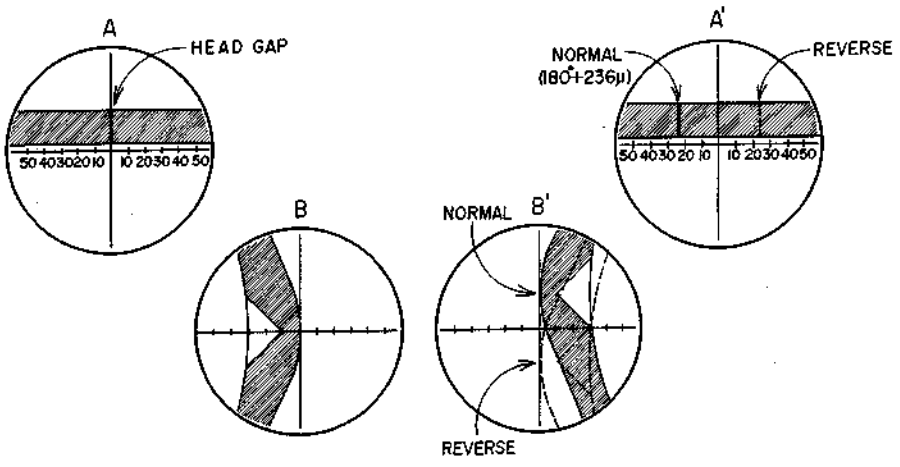


Fig. 1-13 Microscopic Views of Head Tip

(3) Degree of Roundness of Video Head's Lower Drum (ref. fig. 1-15)

a) A 0.01 mm scale pic tester is used to check the lower drum's degree of roundness.

b) The limited tolerance of roundness of the lower drum's outside circumference is within 10 μ.

c) In case the variation of the outside circumference exceeds 10 μ loosen the 4 lower drum holding screws and correct the discrepancy.

(4) Video Head Height (ref. fig. 1-16)

a) Fit the head height adjustment jig to the head plate (made for angle and protrusion adjustments). As per fig. 1-17, fit jig to upper part of head motor (Screw (b) of height adjustment jig should be at lowest position).

b) Loosen screw (b) of height adjustment jig slightly and lower position of head plate slightly. With height adjustment microscope, observe the spacing between the lower end of the head tip and the upper end of the lower drum.

Caution :

If the position of the head plate is too low, the head tip will come in contact with the lower drum and become irreparably damaged.

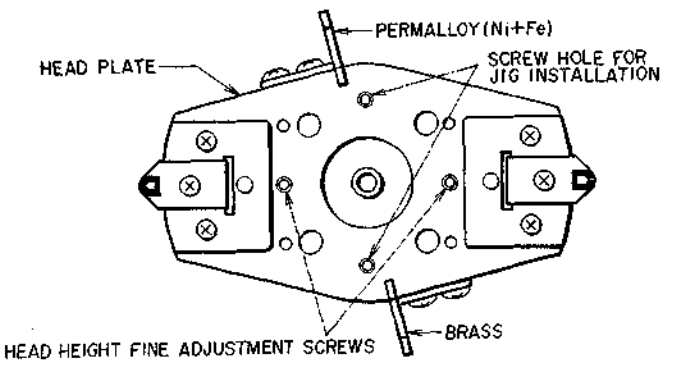


Fig. 1-14 Video Head Plate

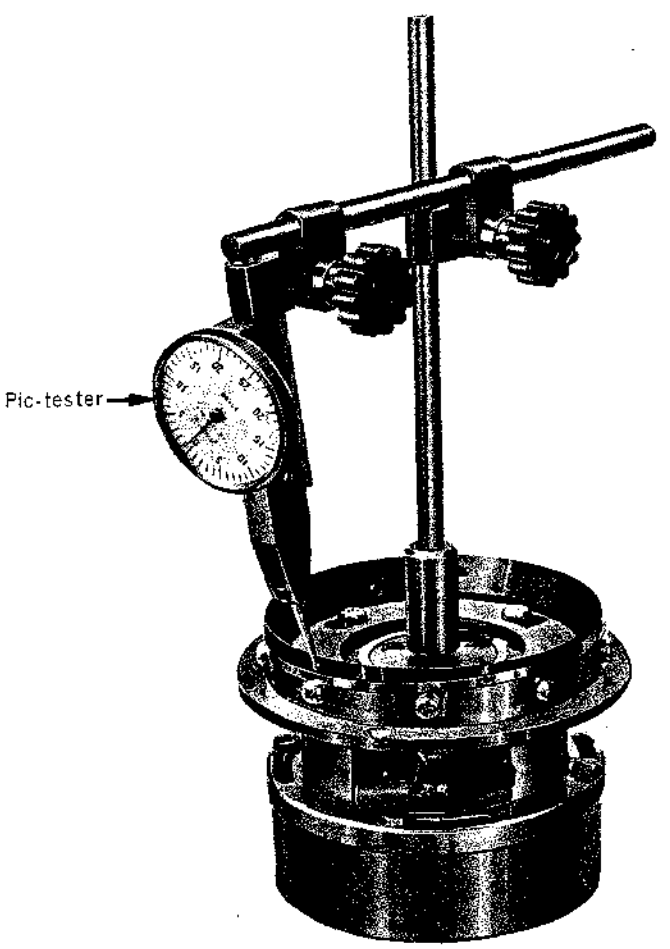


Fig. 1-15

c) At the point where the lower end of the head tip is positioned 430 μ from the top of the lower drum, tighten the two hexagonal screws on lower part of the head plate (under brass pick-up plate and to right of this position).
After the hexagonal screws have been tightened and the head plate secured to motor shaft, remove the height adjustment jig.

d) Regulate the each head tip height fine adjustment screws so that the head tip height is within a range of from 450 μ to 460 μ from the upper end of the lower drum (ref. fig. 1-18).

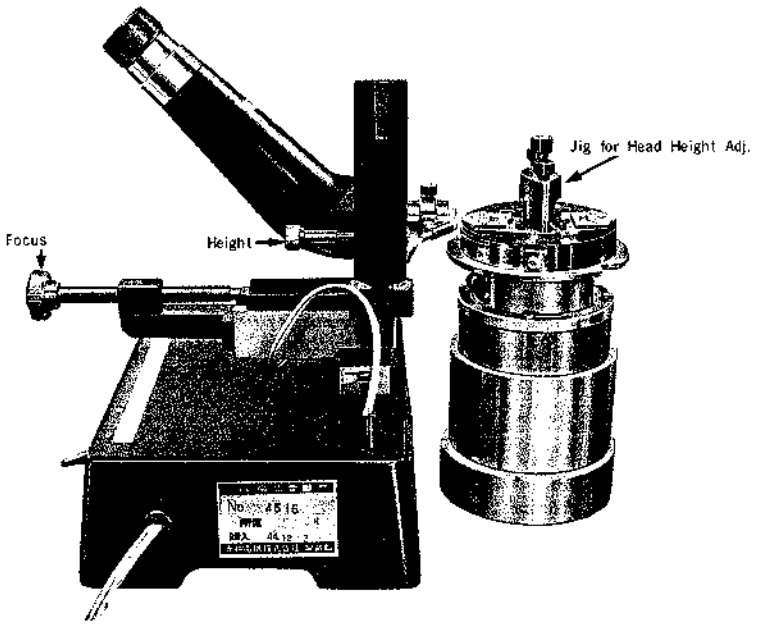


Fig. 1-16

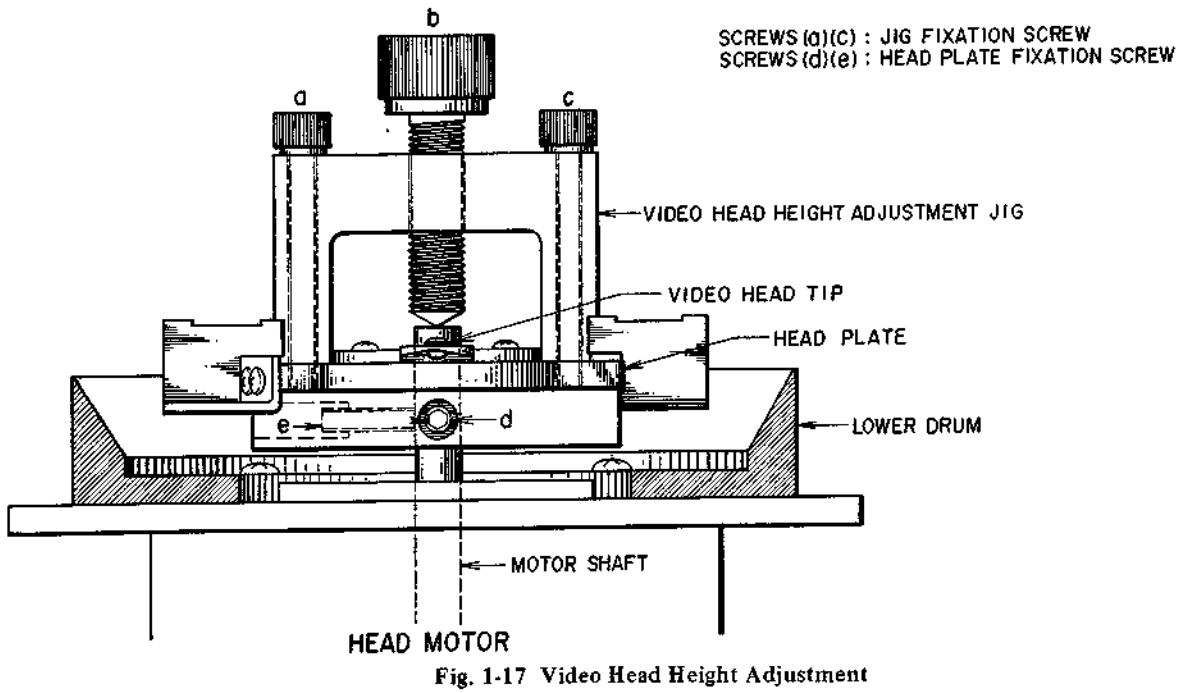


Fig. 1-17 Video Head Height Adjustment

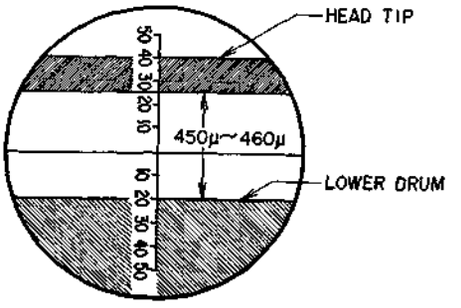


Fig. 1-18 Microscopic View of Head Height

(5) **Upper Drum Protrusion**

a) After completion of head plate height adjustment, fit pic tester (0.01 mm scale) to motor shaft in the upper drum, and check the protrusion of the upper drum.

b) The necessary protrusion is from 15 to 20 μ at the center part of the upper drum.

c) In case the protrusion is not within the necessary range, insert a spacer between the drum and drum support and adjust.

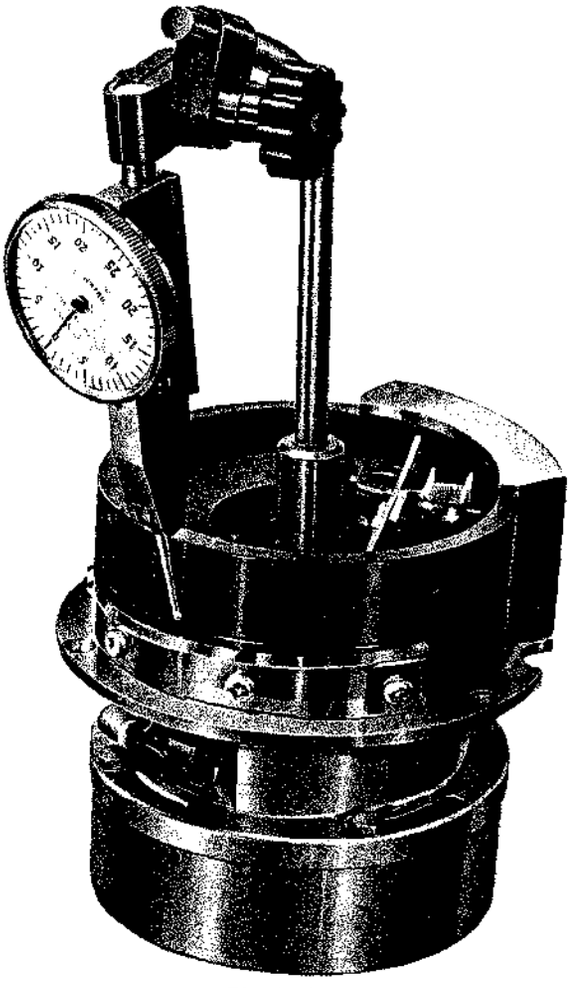


Fig. 1-19

(6) **Wiring on Slip Ring**

a) Be careful that the slip ring is positioned so that it does not slide around as the shaft rotates.

b) The color of the wire closest to the brass pick-up plate is yellow (wire on opposite side is red).

(7) **Brush Tension Adjustment**

a) Adjust brush tension by tightening tension adjustment screw (from place where brushes touch surface of slip ring) about 1/4 turn.

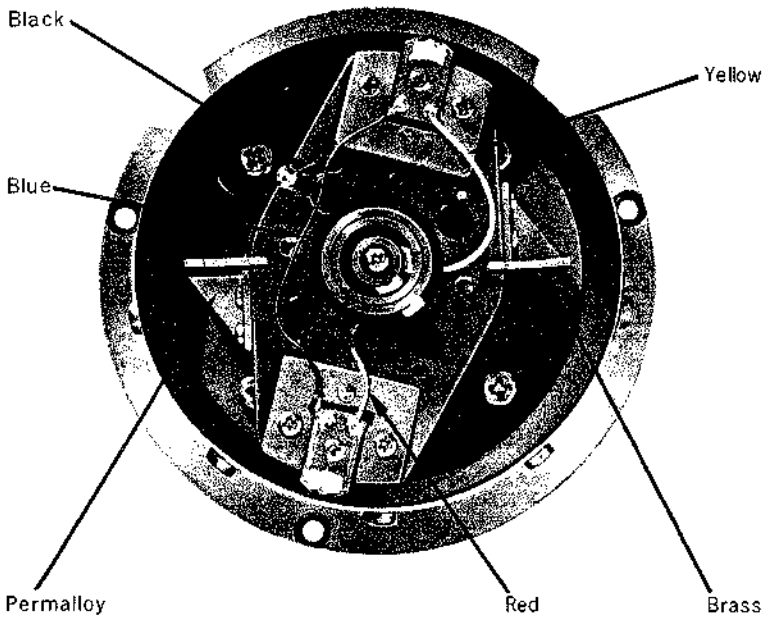
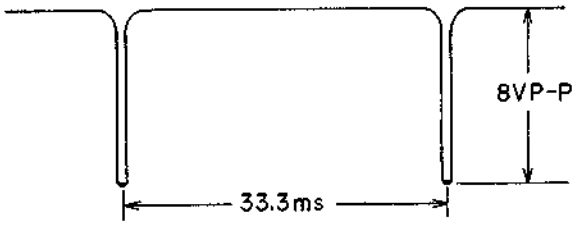


Fig. 1-20

SECTION 1-7
REPLACEMENT OF VIDEO HEAD ASSEMBLY

(1) **When the video head assembly has been replaced, the following adjustments must be made :**
Verification of Pick-Up Coil Polarity (Playback Mode)
Connect oscilloscope (V : 2 v/cm ; H : 5 ms/cm) to test point TP-5 of Servo P.C. Board (PX 506), and confirm that the pulse amplitude is more than 8 V p-p and verify the clipping of negative peak. In case the amplitude is less than 8 V p-p, reverse connection of pick-up coil and re-check.

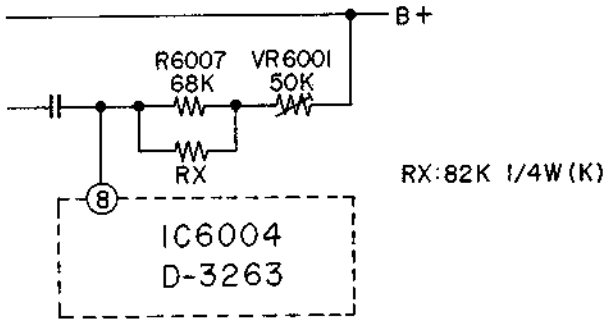


(2) **Video Head Switching Point Adjustment**
a) Load a blank tape and connect the vidicon camera. Record for about 10 seconds.
b) Rewind and play back recorded tape. At monitor picture, confirm that the video head switching point is about 10 horizontal scanning lines above the vertical blanking line (about 1 cm on a 19" monitor).
c) In case the switching point is off, adjust position with potentiometer VR-1 (50 KB) of Servo P.C. board (PX 506).
When VR-1 is turned clockwise, the switching point is lowered, and when turned counter-clockwise, the switching point becomes higher.

Caution

(Relative to position of pick-up coil) :

1. In fig. 1-21, there is a difference in the position of the pick-up coil. The normal position of the pick-up coil is as shown in fig. 1-21 A (Video-head switching point adjustment procedure is as previously described).
2. In fig. 1-21 B, the pick-up coil is in reversed position. While on a machine with a "B" type video head assembly, a supplementary RX : 82 KΩ 1/4 W resistor is added to the SERVO P.C. board's (PX 506) VR-6001 (50 KB) circuit, if the "B" type head assembly is replaced with an "A" type head assembly, this RX (82 KΩ) resistor must be removed.



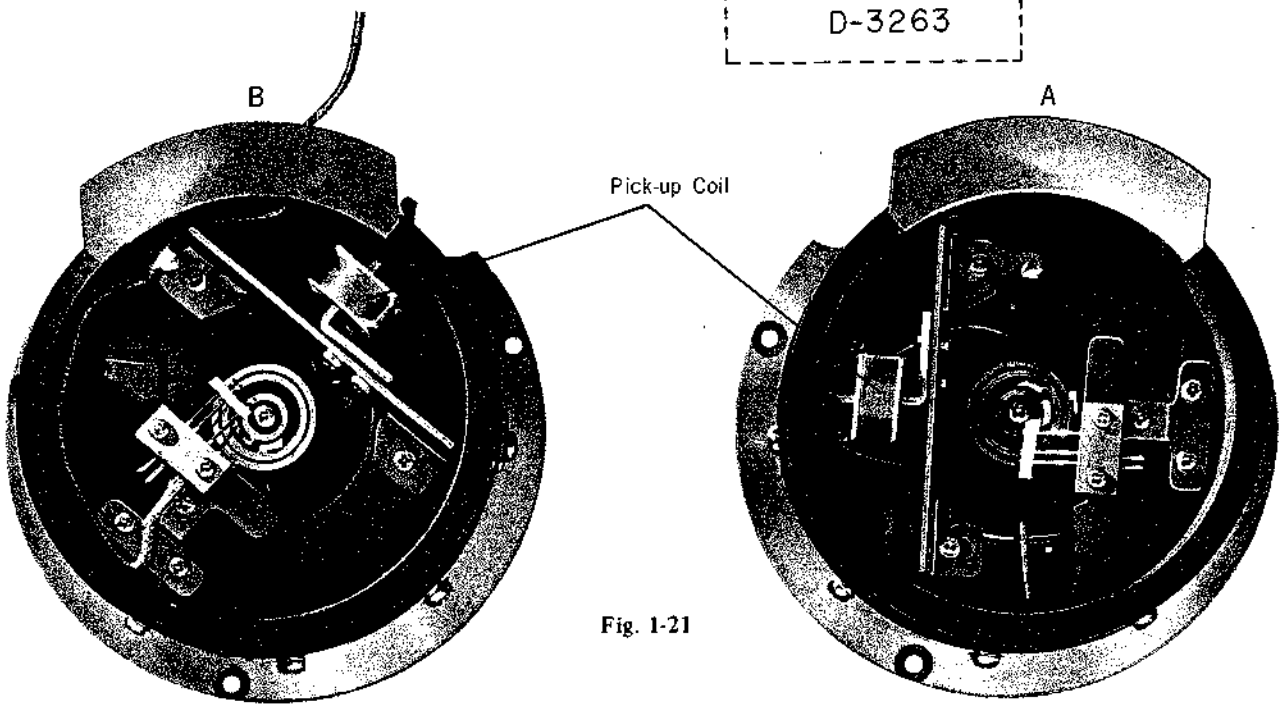


Fig. 1-21

(3) Adjusting the Head Assembly for Interchange

a) Connect an oscilloscope (V : 0.2 v/cm ; H : 5 ms/cm) to test point TP-2 of video amp. P.C. board (PX 504).

b) Playback a video reference tape (standard tape) and observe the R.F. envelope.

c) Try to maintain an almost square shaped amplitude on R.F. Envelope as shown in fig. 1-22.

d) If tracking cross-over appears on R.F. Envelope as shown in fig. 1-23, adjust height of both tape guide (A) and tape guide (B).

e) The tape must run perfectly smoothly along the drum tape guide (it must not move up and down as it travels). Such up and down movement is the sause of R.F. Envelope amplitude fluxuation and tracking error.

f) When the tape movement is perfectly adjusted, there is a small uniform space between the bottom part of the tape guide and the tape (tape guide (A) as well as tape guide (B)). Check carefully whether or not the tape bends or twists at the top part of tape guide (A) or tape guide (B).

g) While tape is travelling, in case of up and down movement of the tape at the surface of side track erase head or control head, it is also necessary to adjust the height of tape guide (B) as well as the slant of the side track erase head.

h) After the above-mentioned adjustments have been carefully completed, if amplitude of R.F. Envelope fluxuates and R.F. Envelope shape is not square, put a 0.2 mm shimming washer between the center part the video head assembly and the sub chassis and re-adjust the height of tape guides (A) and (B).

i) (Ref. fig. 1-24). Loosen screw "E", and with screw "F", adjust control head position so that maximum R.F. Envelope amplitude is attained.

j) Adjust height of side track erase head as well as height of control and audio heads to positions as shown in fig. 1-26.

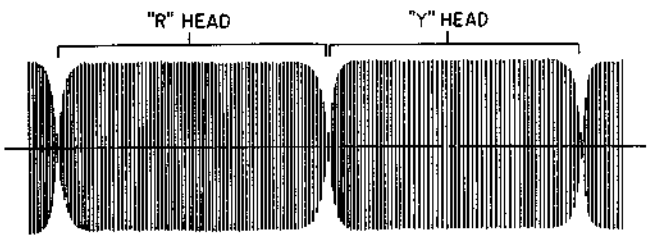


Fig. 1-22 Ideal RF Envelope (Correct Equalization)

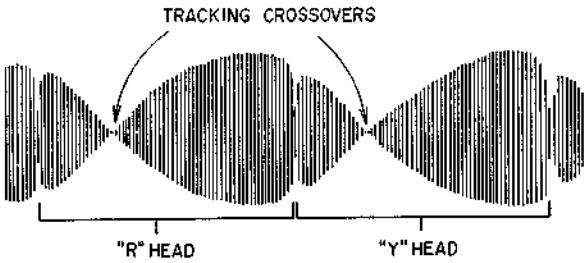
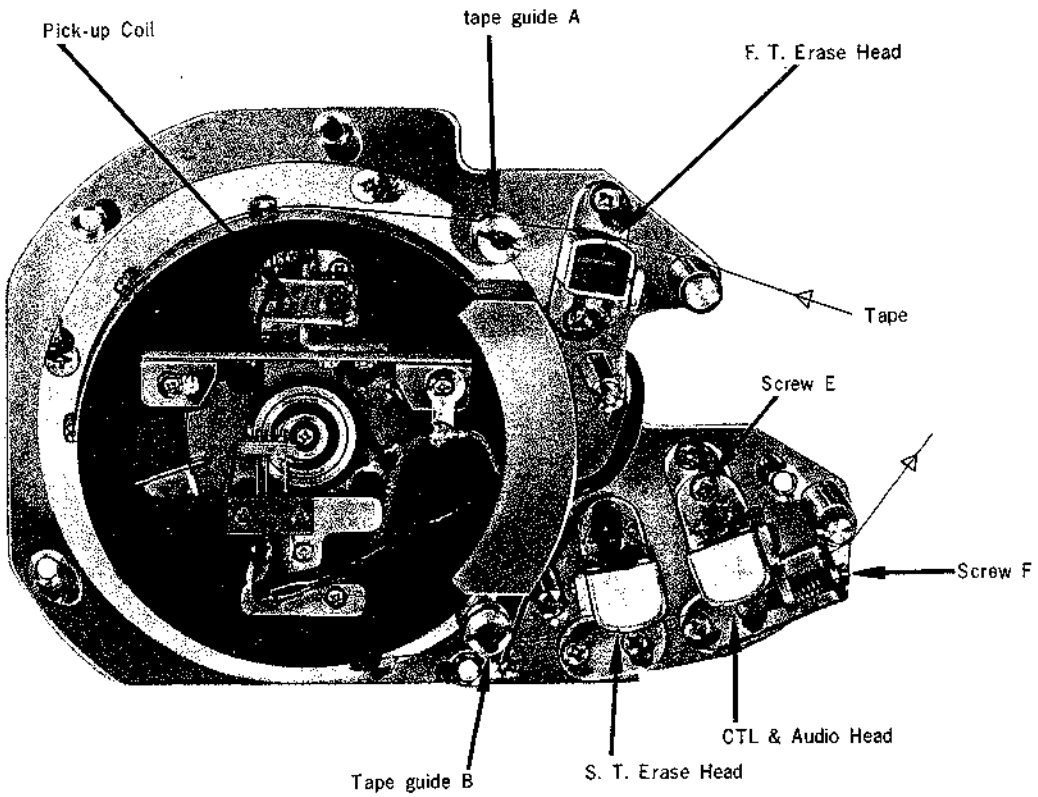


Fig. 1-23 RF Envelope with Guiding Error

Fig. 1-24



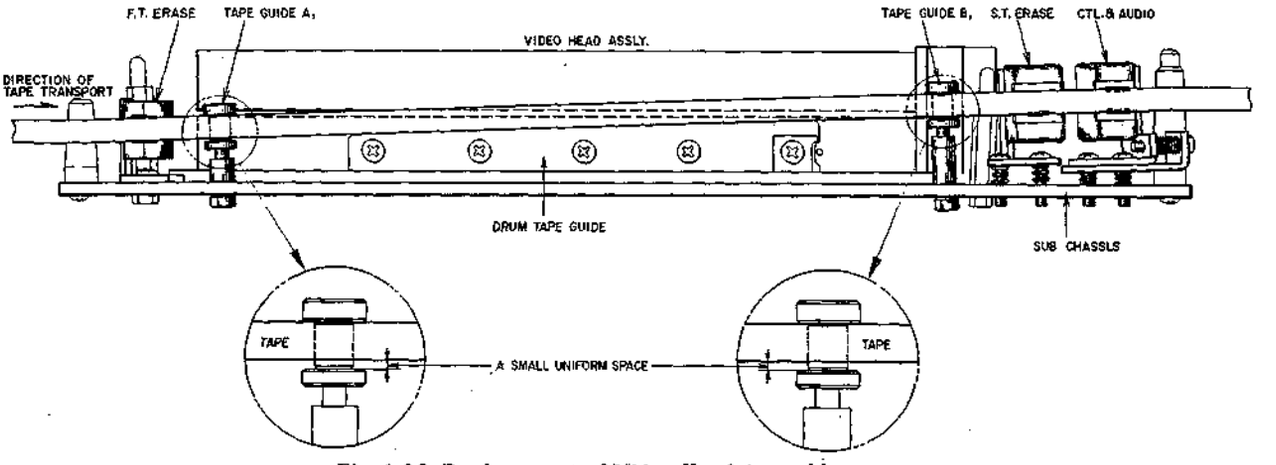


Fig. 1-25 Replacement of Video Head Assembly

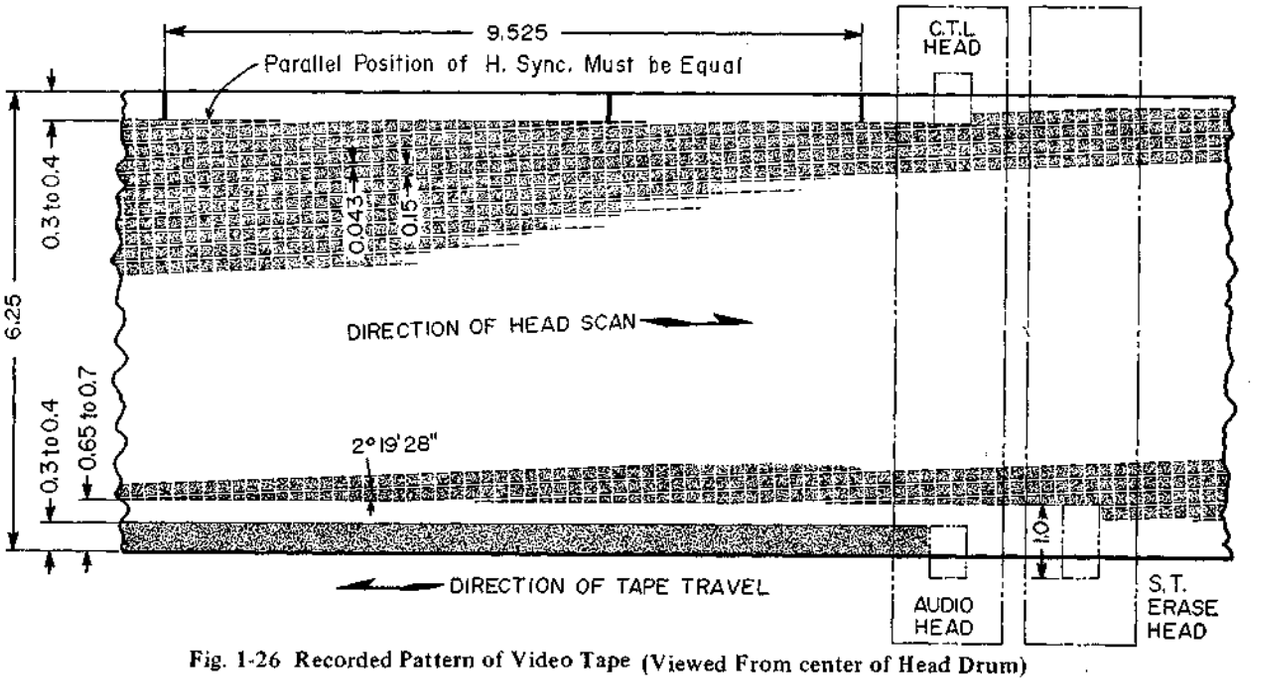


Fig. 1-26 Recorded Pattern of Video Tape (Viewed From center of Head Drum)

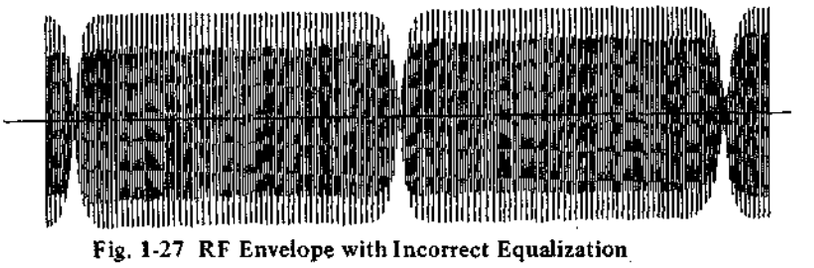


Fig. 1-27 RF Envelope with Incorrect Equalization

(4) Adjustment of Video Recording Current and Playback Equalization

a) Set a 3″ empty reel on supply reel table and set a 5″ tape on take-up reel table. Rewind tape onto 3″ reel for about two minutes.

b) Connect an oscilloscope (V : 1 v/cm ; H : 20 ms/cm) to collector of transistor TR-4005 (2SC968) on video amp. P.C. board (PX 504).

c) Adjust recording level at VR-3 of video amp. P.C. baord (PX 504). At 2.0 V p-p, 2.5 V p-p, and 3.0 V p-p recording levels, using video camera, take separate recordings of about 20 seconds duration for each level.

d) Connect oscilloscope to TP-2. Rewind tape recorded in item (c), and play back same.

e) During playback, observe R.F. Envelope and adjust capacitor VC-2 (30 p). Check the 3 different levels recorded in item (c) to see at which level the RF Envelope amplitude is greatest and correct equalization can be obtained.

f) Set VR-3 at R.F. Envelope's maximum amplitude record level (as established in item (e)). Confirm that, as a result of recording and playback tests, the R.F. Envelope amplitude is more than 0.6 V p-p, and that there is no amplitude fluxuation.

g) Check to see whether or not the video head switching point is about 10 horizontal scanning lines above the vertical blanking line. If off, re-adjust VR-1.

SECTION 1-8
ADJUSTMENT OF TAPE TRANSPORT MECHANISM

(1) Fundamental Adjustments (Ref. figs. 1-28 and 1-29)

a) Reel Shaft Clearance

The necessary clearance of both supply reel shaft and take-up reel shaft is from 0.2 mm to 0.3 mm. Place nylon washers of different thicknesses (0.2 mm, 0.5 mm, 1.0 mm) on lower part of reel shaft, and adjust reel shaft clearance.

b) Pinch Roller Solenoid Position

Loosen solenoid holder bracket screw and position solenoid closer to "stop key" and fix at this position.

Caution

This adjustment is necessary only in case of replacement of pinch solenoid.

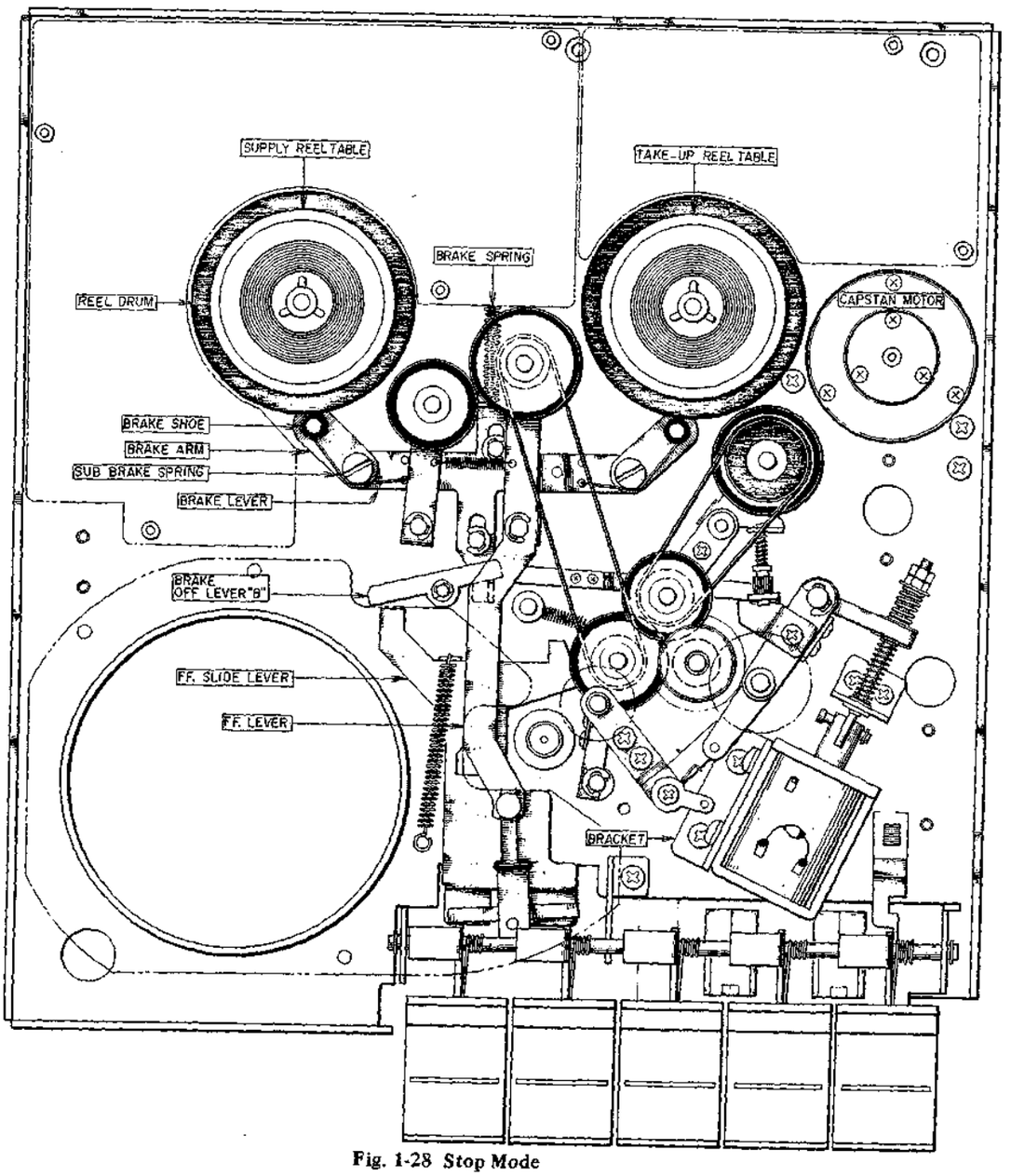


Fig. 1-28 Stop Mode

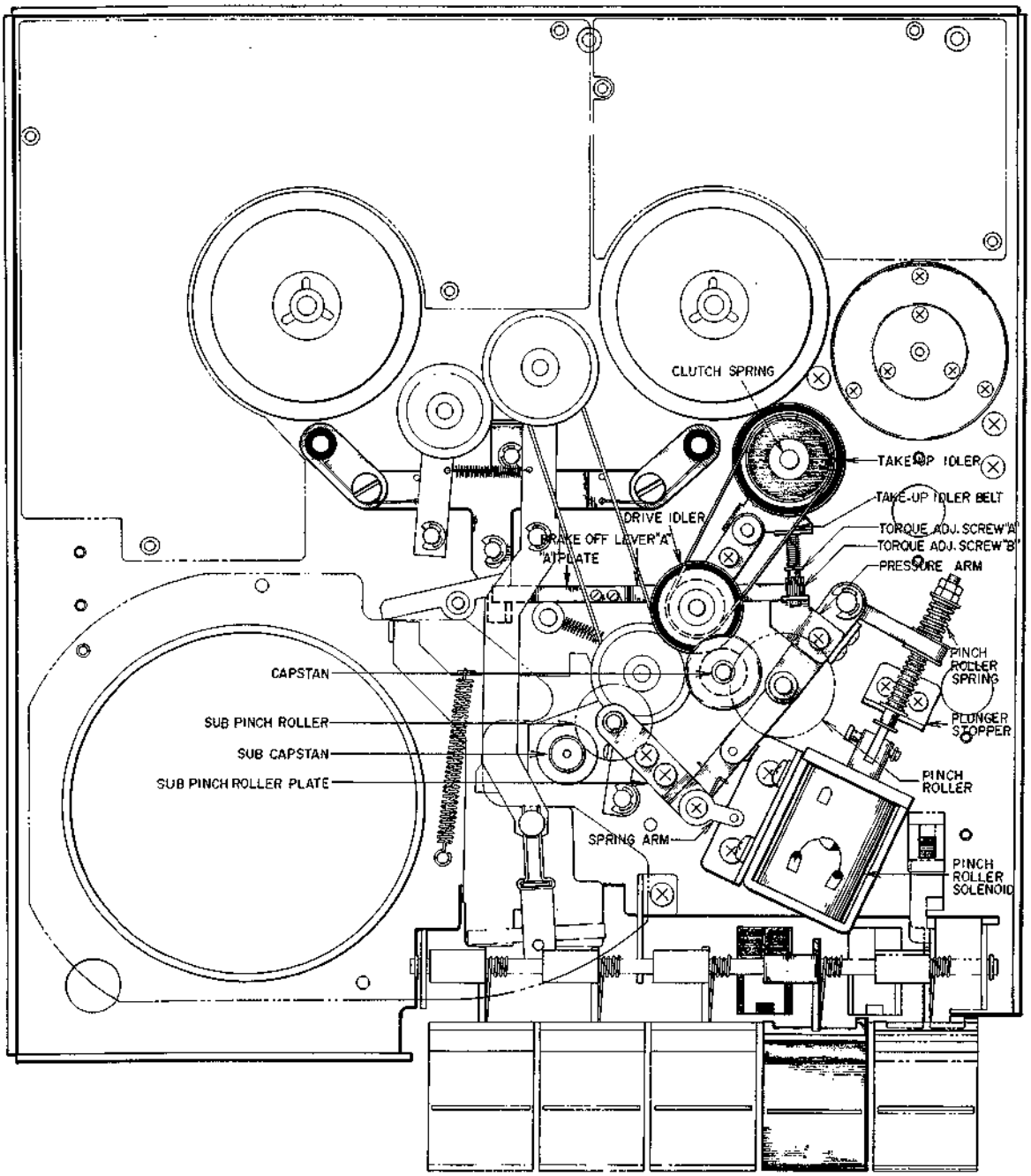


Fig. 1-29 Playback Mode

(2) **Brake Tension Adjustment**

a) Wind a tape (up to 50 mm diameter) and loop end. Using a 0 to 500 gram scale spring gauge, measure brake tension.

b) Brake tension specification is 160 to 300 grams. The difference in tension between right and left should be less than 100 grams.

c) Brake tension can be adjusted by changing the position of the sub-brake spring stopper.

d) If there is a large difference between left and right brake tension, check strength of brake spring and check the bend of brake arm.

Caution

When bend angle of arm has been changed, and brake tension adjusted, at fast forward and rewind mode, confirm that the brake shoe is separated from the left and right reel drum by about 1 mm and that the brake shoe and reel drum is parallel.

e) If when stop key is depressed during fast forward or rewind mode, the tape is slack, the difference between left and right brake tension is too great.

(3) **Fast Forward and Rewind Torque Measurement**

a) In fast forward or playback mode, the mechanism function is as shown in fig. 1-30.

b) As shown in fig. 1-31, connect a 0 to 500 gram spring gauge to a 50 mm diameter tape and measure the FF (fast forward) torque.

c) Both fast forward and rewind torque must be more than 300 grams.

d) If FF torque is low, when take-up reel table is stopped by hand during rewind mode, check to see whether or not the following conditions exist :

1. FF Idler A continues to rotate at same speed.
2. FF Idler B comes to a perfect stop.
3. Drive Belt slips at pulley at lower part of Idler B.

e) If in item (d)-1, rotation of Idler A is slow or rotation stops, the extreme point of FF switching spring is open, or the pressure spring is weak. If rotation of Idler A is normal, but FF torque is low, replace FF/Rewind drive belt.

f) Torque can also be increased by slightly bending FF Idler A holding lever. However, in this case, at stop mode, check to make sure that FF Idler A does not touch the capstan pulley.

g) In case the FF torque is sufficient, but rewind torque is low, bend rewind idler lever shaft slightly in the direction of Rewind Idler.

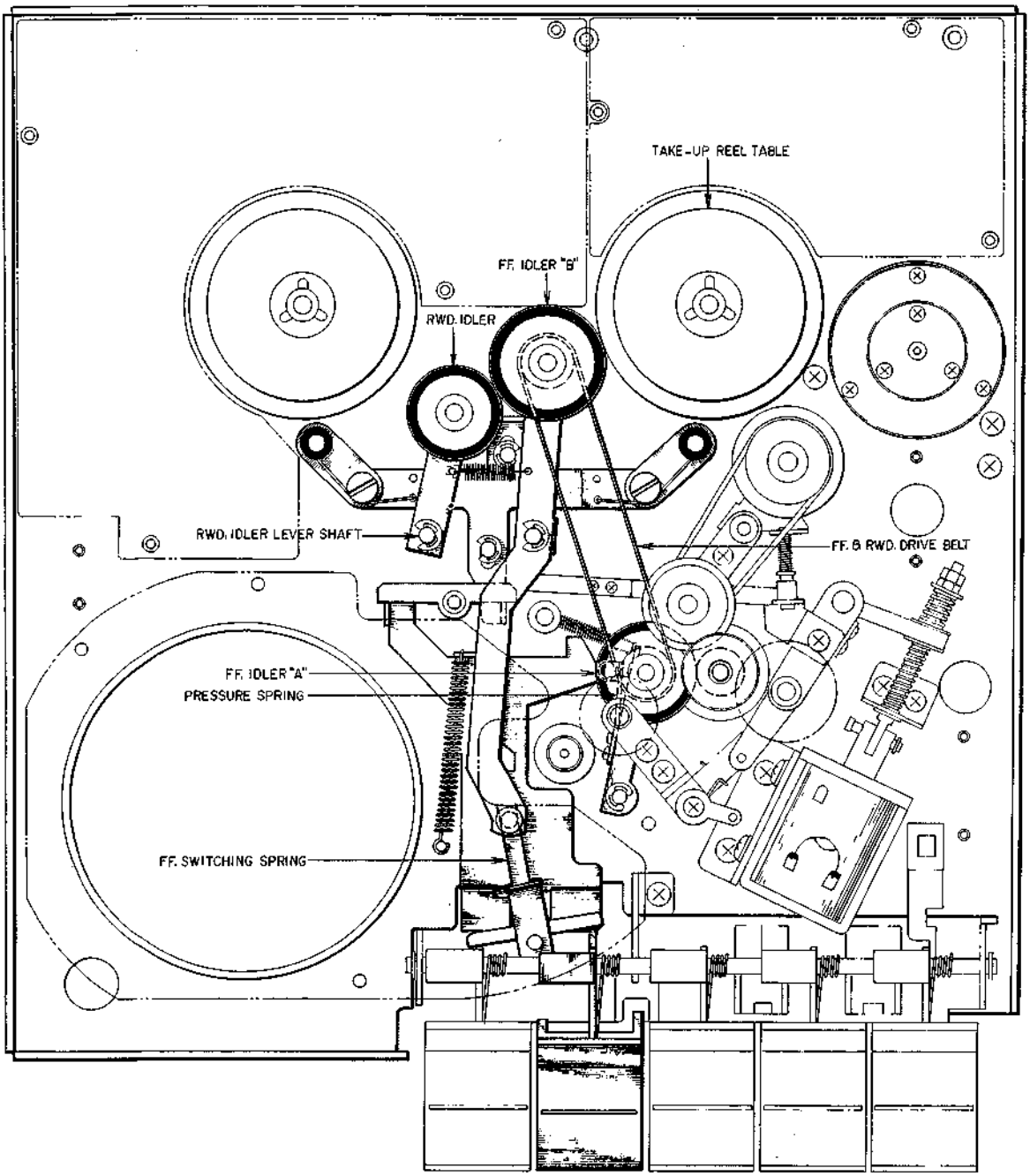


Fig. 1-30A Fast Forward Mode

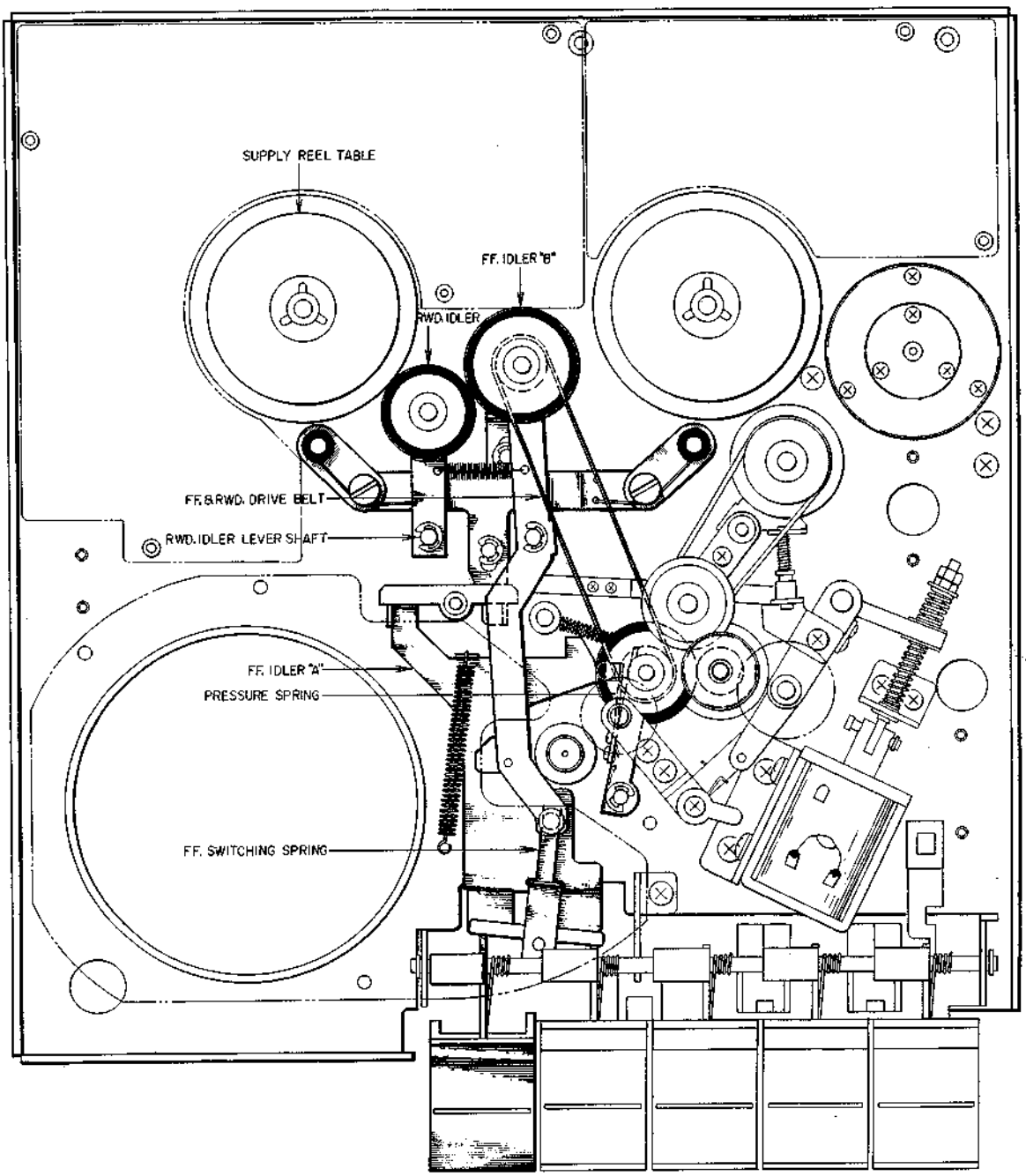


Fig. 1-30B Rewind Mode

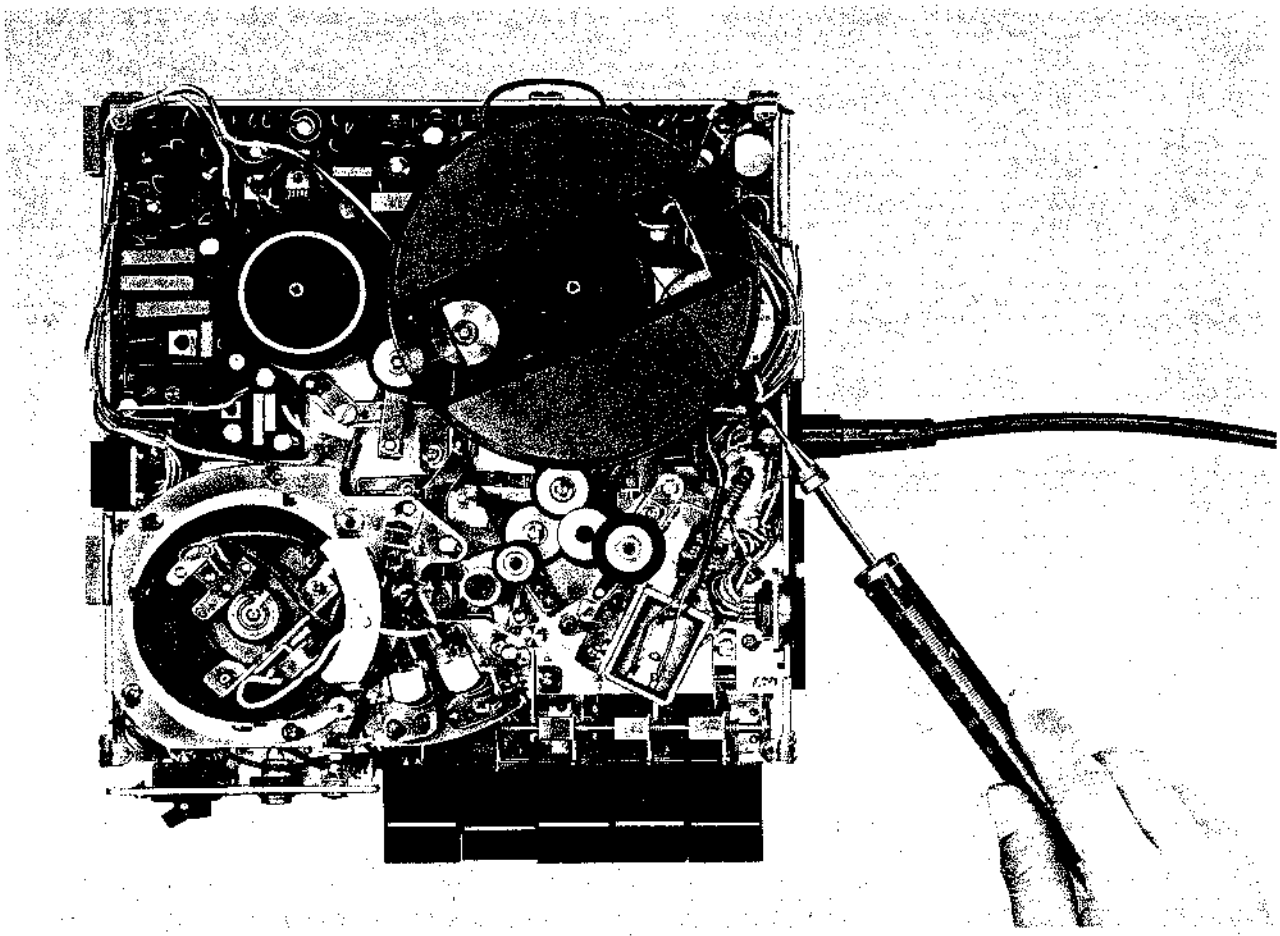


Fig. 1-31 Fast Forward Torque Measurement

(4) Pinch Roller Pressure Adjustment

a) As shown in fig. 1-32, at playback mode, connect a 0 to 2000 gram spring gauge to Pinch Roller Shaft and measure Pinch Roller Pressure. The moment the rotating pinch roller is stopped, read value on spring gauge.

b) Pinch roller pressure should be between 1000 and 1500 grams.

c) Pinch roller pressure adjustment must be carried out in the following order :

1. At stop mode, set plunger stopper position so that the space between pinch roller and capstan is 1.5 mm (about middle of oval hole on plunger stopper).
2. At playback mode, loosen pinch roller spring lock nut and adjust pressure. After adjustment has been made, tighten lock nut.

Caution

If position of drive idler or pressure arm has been adjusted, as this also changes the pinch roller pressure, re-adjustment of pinch roller pressure is necessary.

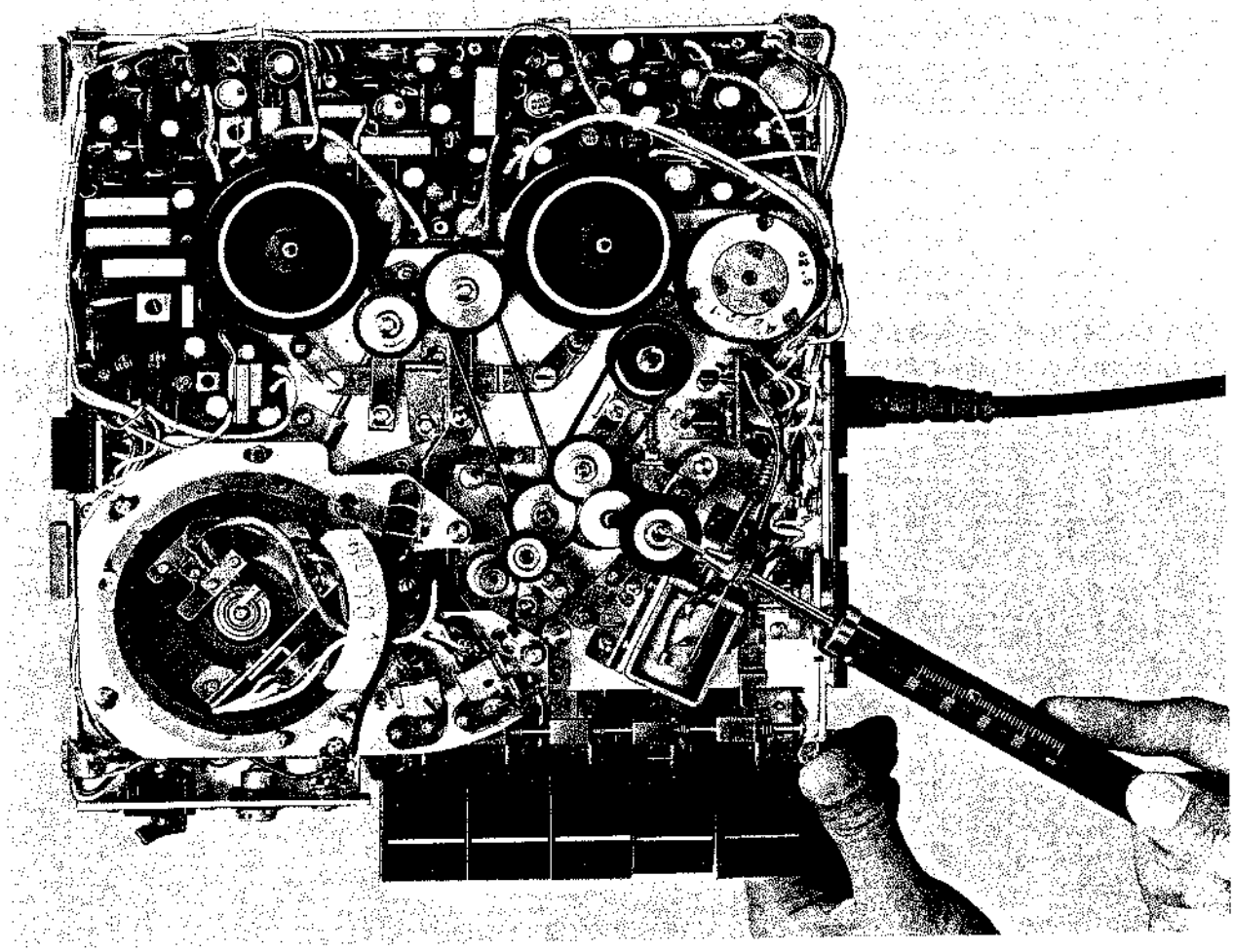


Fig. 1-32 Pinch Roller Pressure Measurement

(5) Take-Up Torque Adjustment

a) As shown in fig. 1-33, connect a 0 to 300 gram spring gauge to a 50 mm diameter tape and measure take-up torque. (Standard is 100 to 120 grams).

b) At stop mode, fix pressure arm to pinch roller arm so that the space between take-up idler and reel drum is 0.5 to 0.8 mm.

c) At playback mode, set drive idler screw so that the take-up idler touches the reel drum first and then the drive idler touches the capstan pulley.

Caution

When the take-up reel table is stopped by hand, confirm that the take-up reel idler stops and that the drive idler is rotating normally. If the drive idler stops, adjustments carried out in item (c) are faulty.

d) Even after the above-mentioned adjustments have been made, if take-up torque is less than 100 grams, insert about a 0.25 mm thick washer between the upper part of the clutch spring and the retainer ("c" ring).

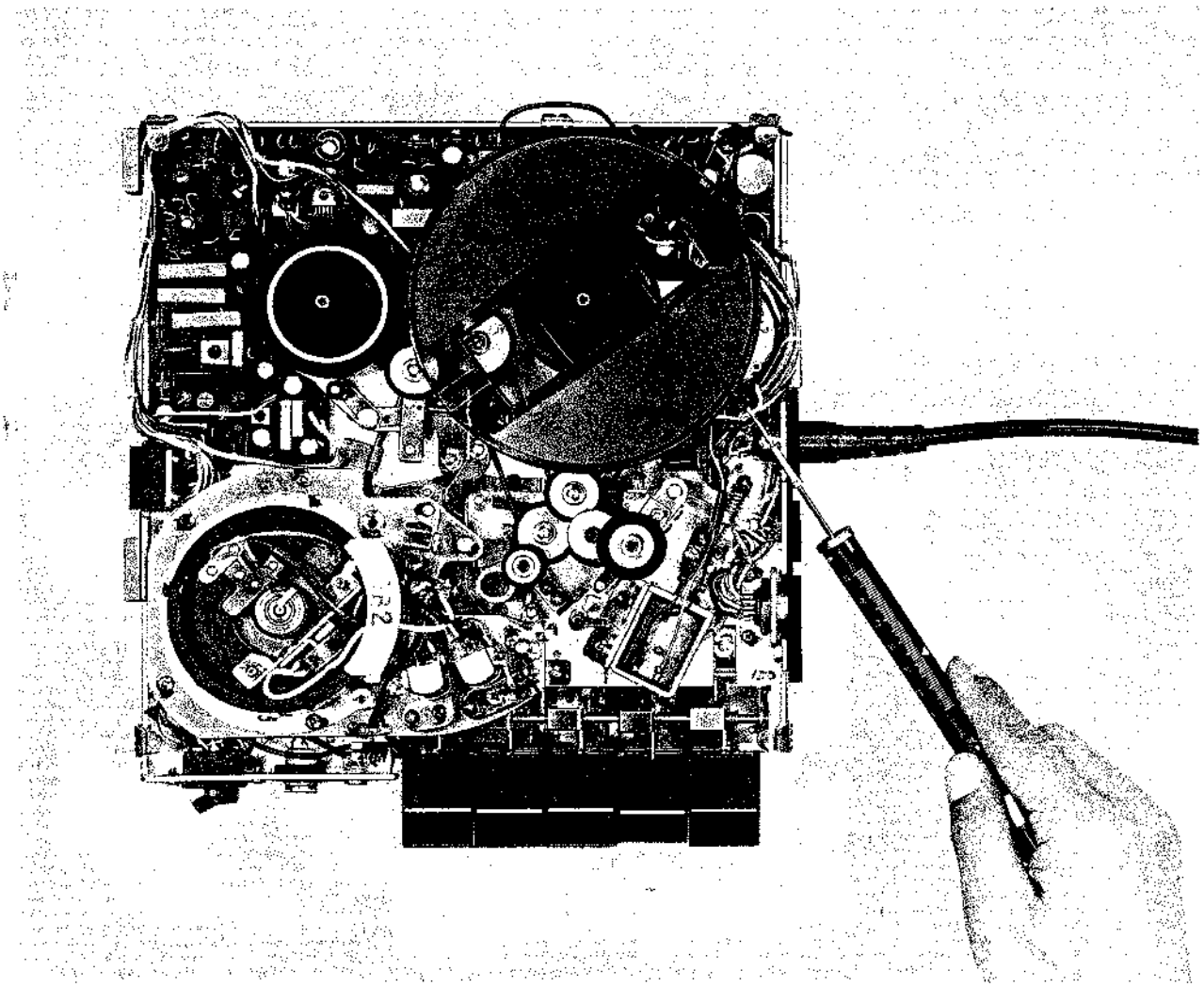


Fig. 1-33 Take-up Torque Measurement

(6) **Drive Idler Pressure Adjustment**

a) As shown in fig. 1-34, connect a 0 to 300 gram spring gauge to upper part of drive idler "c" ring and measure drive idler pressure. At playback mode, at the moment the rotating drive idler is stopped, read value on spring gauge. Standard is 200 to 500 grams.

b) As in Fig. 1-29, with a pair of pliers, hold torque adjustment screw "A" at fixed position, and with torque adjustment screw "B", make adjustment.

Caution

The space between screws "A" and "B" must be about 1-2 mm. If this space is too great, lower pinch roller pressure.

c) At playback mode, set screw of brake-off lever (A and A') plate so that the space between reel drum and brake shoe is about 1 mm.

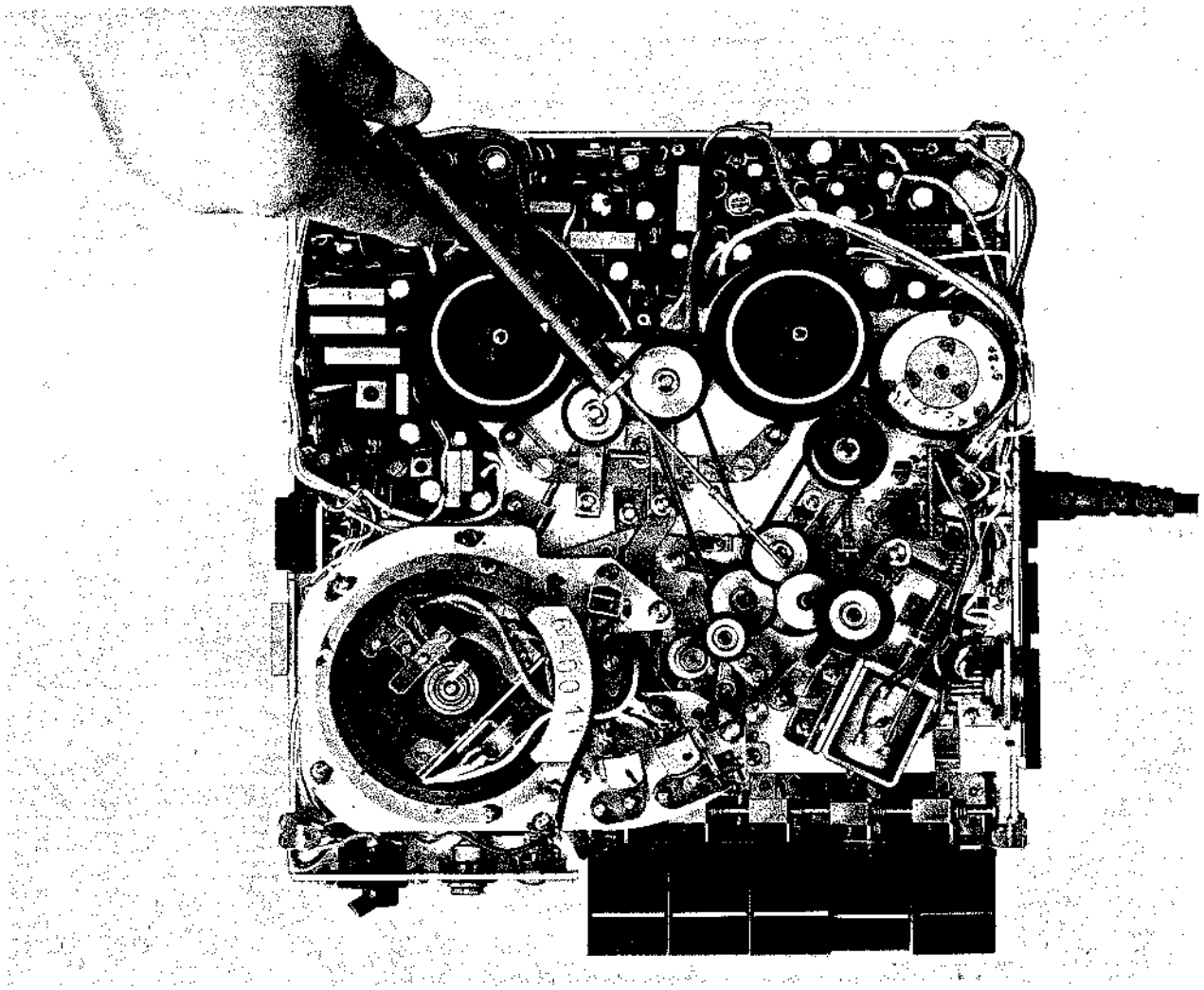


Fig. 1-34 Drive Idler Pressure Measurement

(7) **Sub Pinch Roller Pressure Adjustment**

a) As shown in fig. 1-35, connect a 0 to 300 gram spring gauge to sub pinch roller shaft and measure the sub pinch roller pressure.

b) At playback mode, with sub pinch roller about 1 mm away from sub capstan, read value on gauge (standard is 50 to 60 grams).

c) At stop mode, set screw on sub pinch roller plate so that the space between sub capstan and sub pinch roller is 2 mm.

d) At playback mode, change angle of spring arm and adjust sub pinch roller pressure (refer to spring arm shown in fig. 1-29).

e) Sub Pinch Roller Shaft Angle Adjustment
Load a tape and at both fast forward and rewind mode, adjust angle of sub pinch roller shaft so that the tape runs consistently on same part of sub pinch roller and also, at playback mode, the tape runs smoothly onto the tape guide.

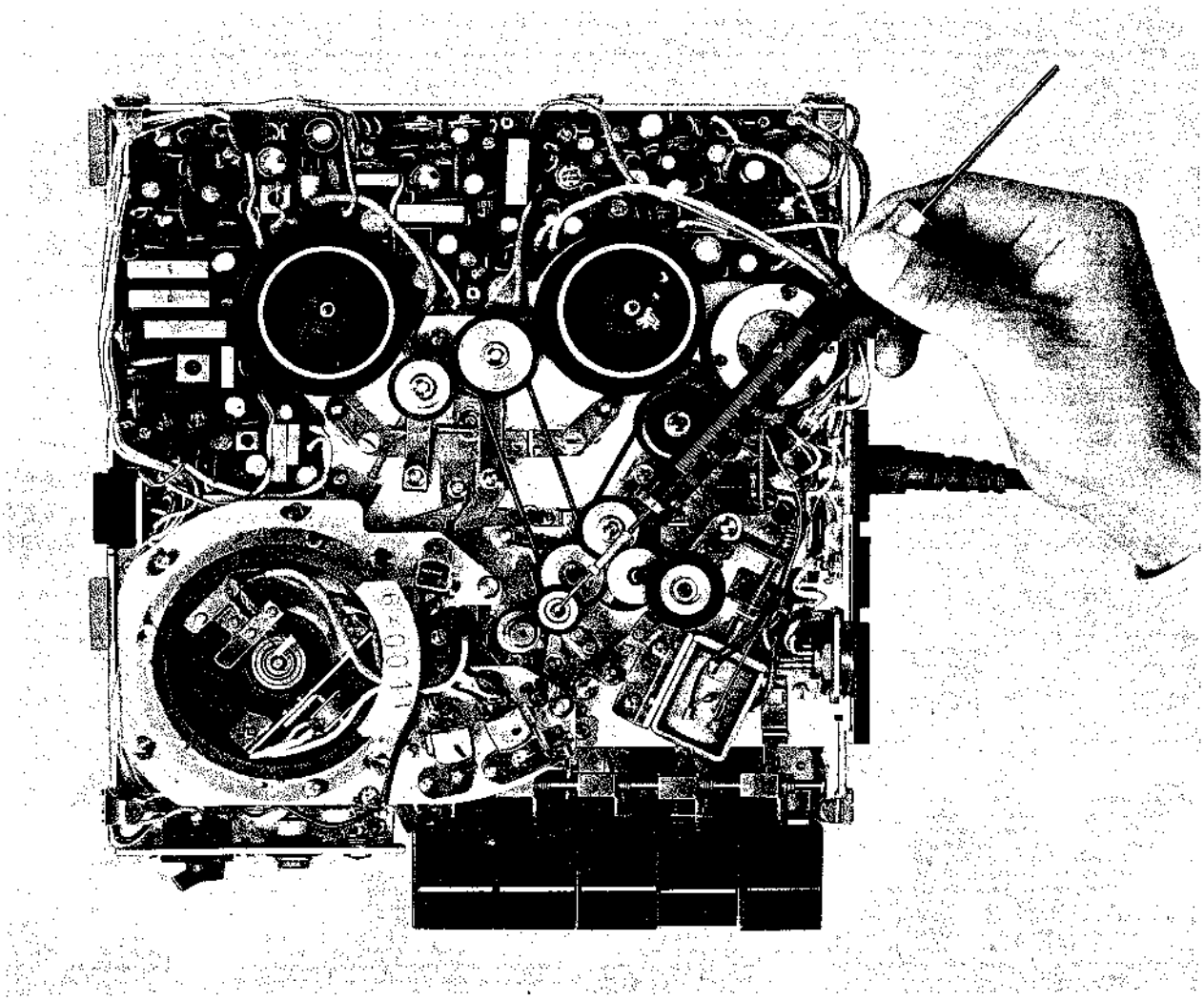


Fig. 1-35 Sub Pinch Roller Pressure Measurement

(8) Tape Hold-Back Tension Adjustment

a) As shown in fig. 1-36, connect a 0 to 50 gram spring gauge to a 50 mm diameter tape and measure tape hold-back tension. (At playback mode, 5 to 8 grams is normal).

b) Adjust by changing the strength of the mission spring located in the supply reel table assembly.

(9) Tape Speed Measurement

a) Connect a frequency counter to 10p. square type monitor connector socket pin ("J" (+) and "H" (-)).

b) Playback a tape speed test tape which is 1000 Hz (11-1/4 ips), and read frequency counter indication.

c) Normal reading is 1000 Hz ± 0.7%. However, the speed varies slightly when using AC Adapter. If using AC Adapter, normal reading is 994 to 998 Hz.

d) In case tape speed is not within specified range, check the following points :

1. At stop mode, capstan motor revolutions are 83.3 Hz ± 0.1 Hz.
2. Pinch Roller Pressure
3. Tape Hold-Back Tension
4. Tape should run smoothly without twisting or bending at tape guide

(10) Wow and Flutter Measurement

a) Connect a Wow and Flutter Meter to 10p. square type monitor connector socket pin ("J" (+) and "H" (-)).

b) Play back a Wow and Flutter Test Tape which is 3000 Hz (11-1/4 ips), and read meter indication. (Standard is below 0.15%).

c) If wow and flutter is not within specifications, check the following points :

1. Pinch Roller Pressure
2. Capstan Motor Drive Waveforms
3. Take-up Torque
4. Drive Idler Pressure
5. Whether tape travels smoothly
6. Tape Hold-Back Tension

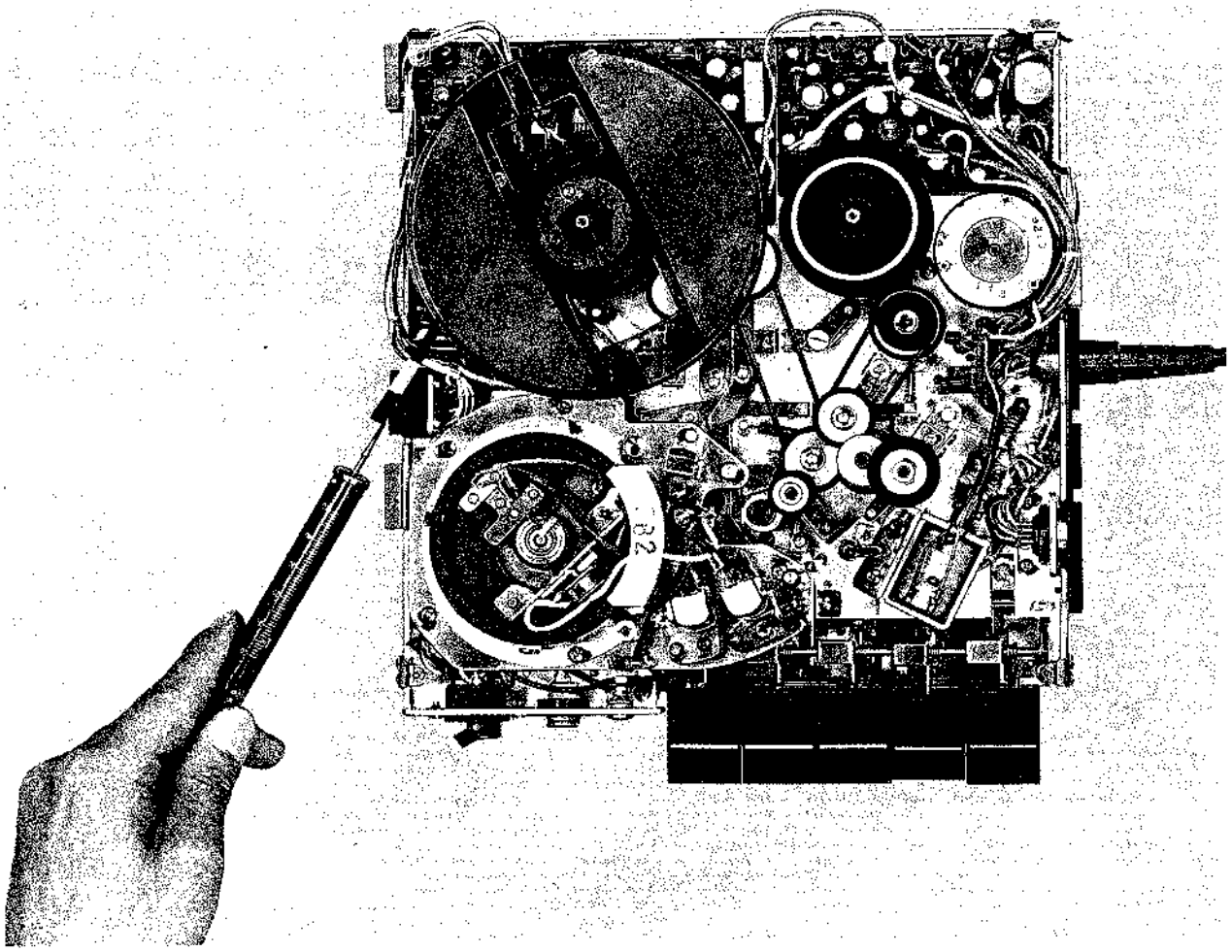


Fig. 1-36 Tape Hold Back Tension Measurement

SECTION 1-9

S.S.G. (Sync Signal Generator) PX-509

(1) Master Oscillator Adjustment

a) Connect an oscilloscope (H : 5 ms/cm ; V : 1 v/cm) to Test Point TP-1 of S.S.G. P.C. Board PX-509.

b) Connect a frequency counter to signal output terminal of oscilloscope.

Caution

When a frequency counter is connected directly to TP-1, use a special low capacity connection cable.

c) Adjust core of oscillator coil "L 7001" (Sny-033-1357) so that the frequency counter indicates 31,500 Hz (±10 Hz) as shown in fig. 1-39 (a).

Important

Because this master oscillator adjustment influences the entire operation of the sync signal generator, make doubly sure that it is carried out properly.

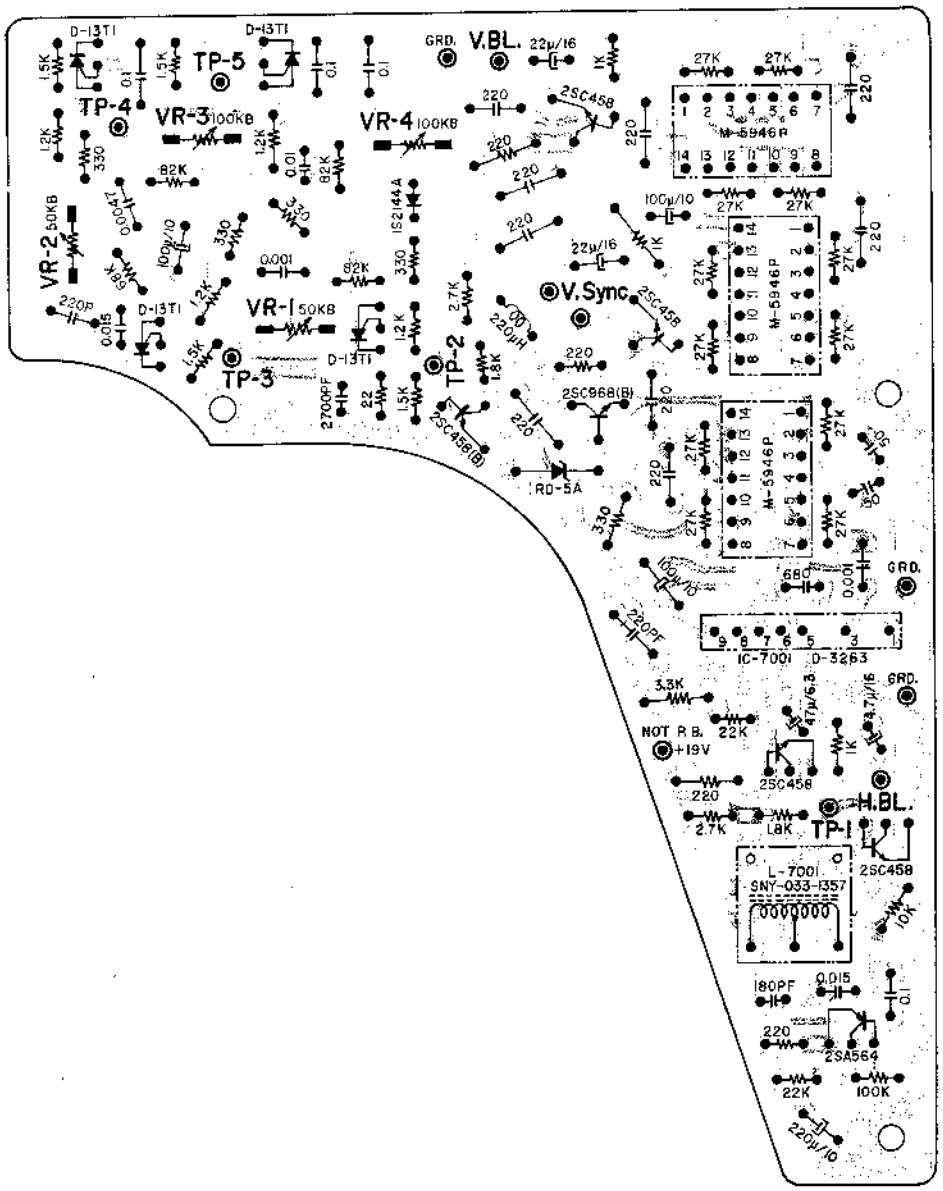


Fig. 1-37 S.S.G. P.C. Board (PX-509)

(2) Confirmation of Horizontal Blanking Signal

Confirm that the frequency of the wave form at PX-509 Horizontal Blanking Terminal is 15,750 Hz as shown in fig. 1-39 (b).

(3) Frequency Divider Adjustment

a) Adjust Potentiometer VR-1 so that the waveform at TP-2 (as shown in fig. 1-39 (c)) is triggered at the 7th pulse. At this point, confirm that the negative pulse frequency of TP-2 is 1/7 of 31,500 Hz (4,500 Hz).

b) Adjust VR-2 so that the waveform at TP-3 (as shown in fig. 1-39 (d)) is triggered at the 5th pulse. At this point, confirm that the frequency is 1/5 of 4,500 Hz (900 Hz).

c) Adjust VR-3 so that the waveform at TP-4 (as shown in fig. 1-39 (e)) is triggered at the 5th pulse. At this point, confirm that the frequency is 1/5 of 900 Hz (180 Hz).

d) Adjust VR-4 so that the waveform at TP-5 (as shown in fig. 1-39 (f)) is 1/3 of 180 Hz (60 Hz).

(4) Confirmation of Vertical Sync. Signal

Connect an oscilloscope to PX-509 vertical sync. terminal and confirm that the pulse width of the vertical sync. signal is 0.22 milli-seconds and that the cycle time is 16.6 milli-seconds per each Hz. (ref. fig. 1-39 (g)).

(5) Confirmation of Vertical Blanking Signal

Connect an oscilloscope to PX-509 vertical blanking terminal and confirm that the vertical blanking signal pulse width is 1.33 milli-seconds and that the cycle time is 16.6 milli-seconds per each Hz. (ref. fig. 1-39 (h)).

Caution

The vertical sync. signals as well as the vertical blanking signals are accurate at 60 Hz. If these frequencies deviate from this 60 Hz accuracy, re-check frequencies at TP-1 through TP-5.

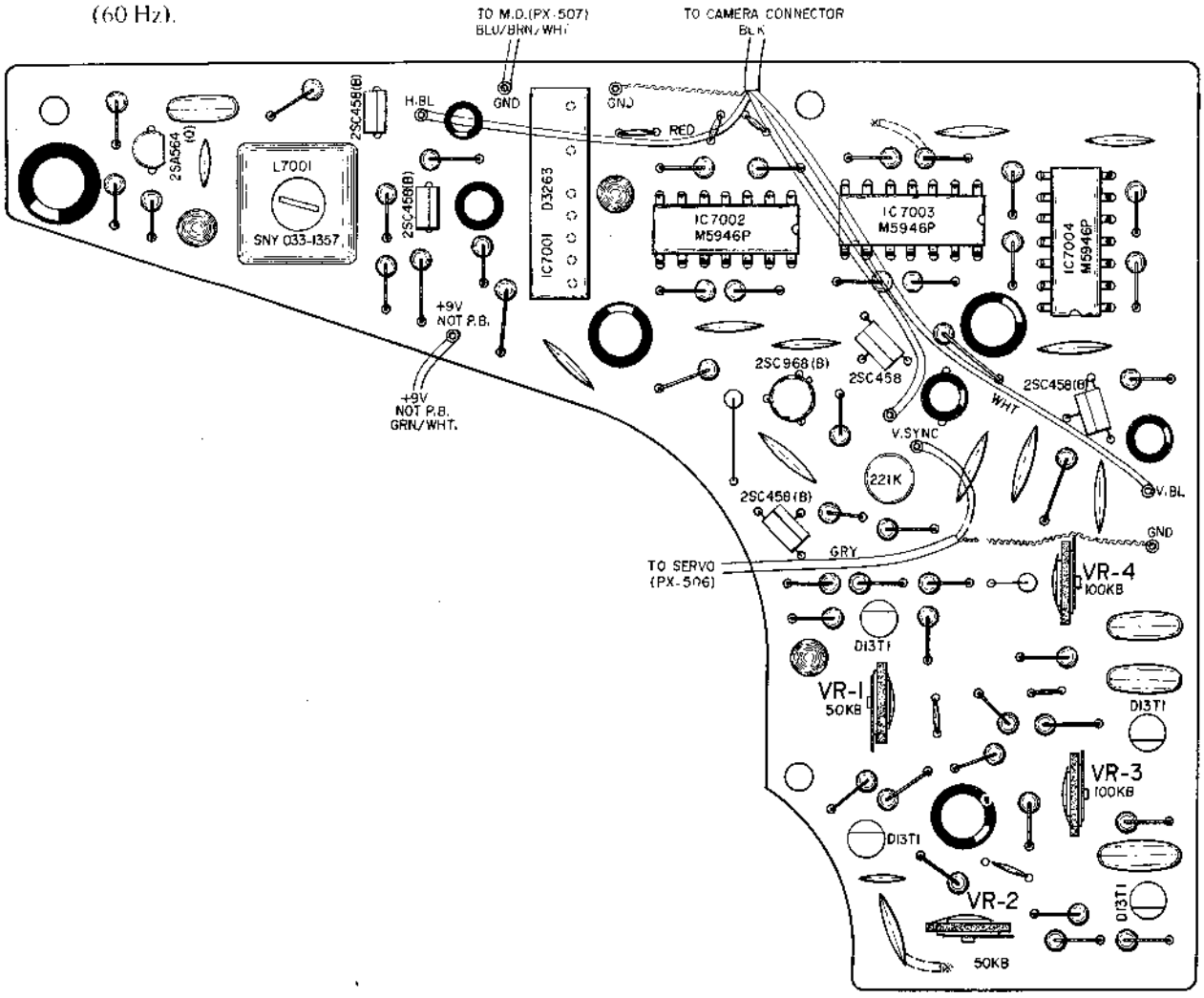


Fig. 1-38 S.S.G. P.C. Board (PX-509)

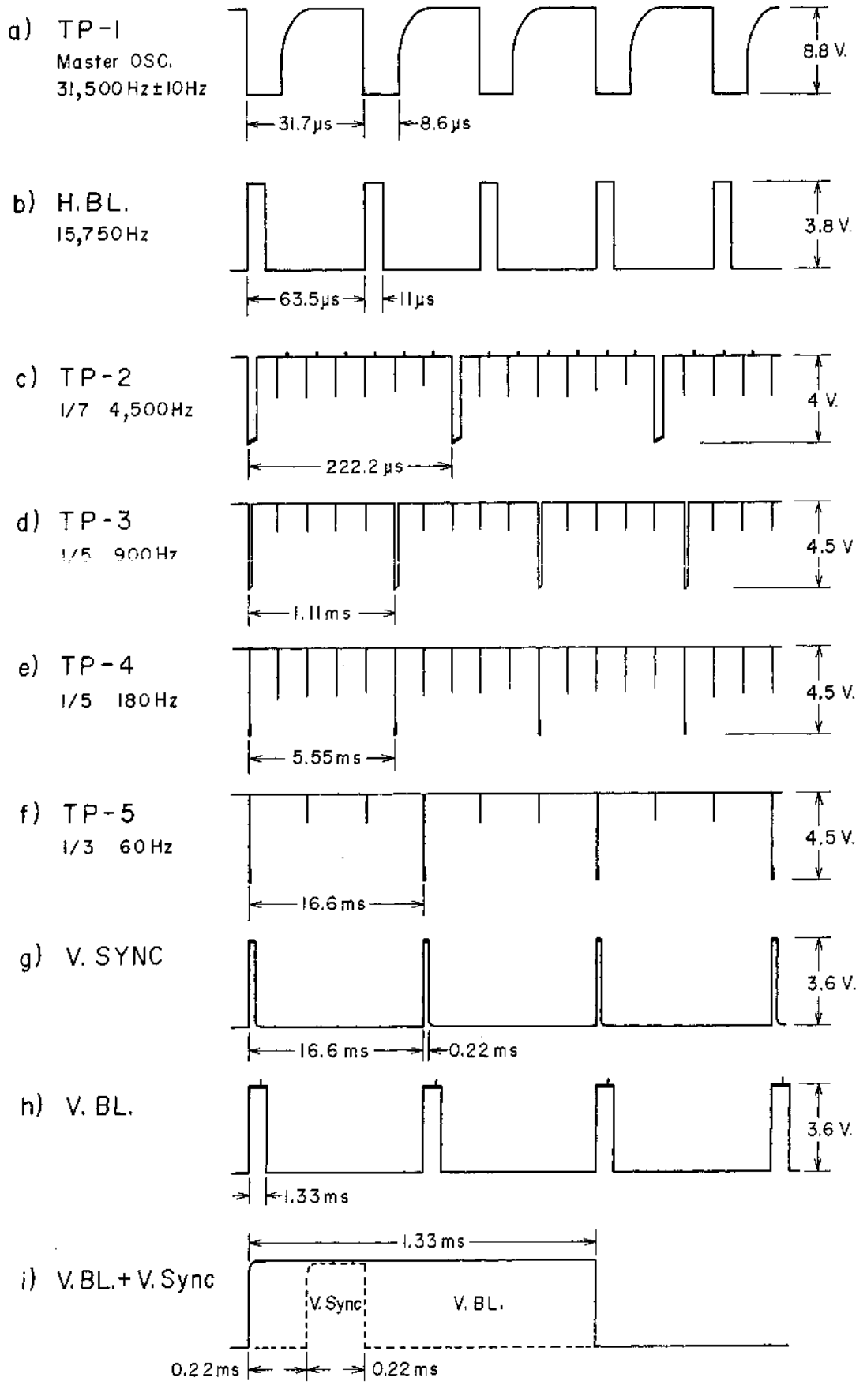


Fig. 1-39 S.S.G. Waveforms (PX-509)

SECTION 1-10
SERVO (Head Motor Servo Circuit) PX-506

The Head Motor SERVO Circuit is comprised of Speed Control Circuit, and Phase Control Circuit. In the SERVO P.C. Board Schematic Diagram, the lower row is the Speed Control Circuit, and the upper row is the Phase Control Circuit.

The waveforms at various parts of the SERVO circuit are shown in items (a) through (q) of fig. 1-42 (1) and (2). Some of the waveforms are actually impossible to measure because they are inside of the integrated circuits. They are given in fig. 1-42 (1) and (2) for the purpose of understanding the operating principle.

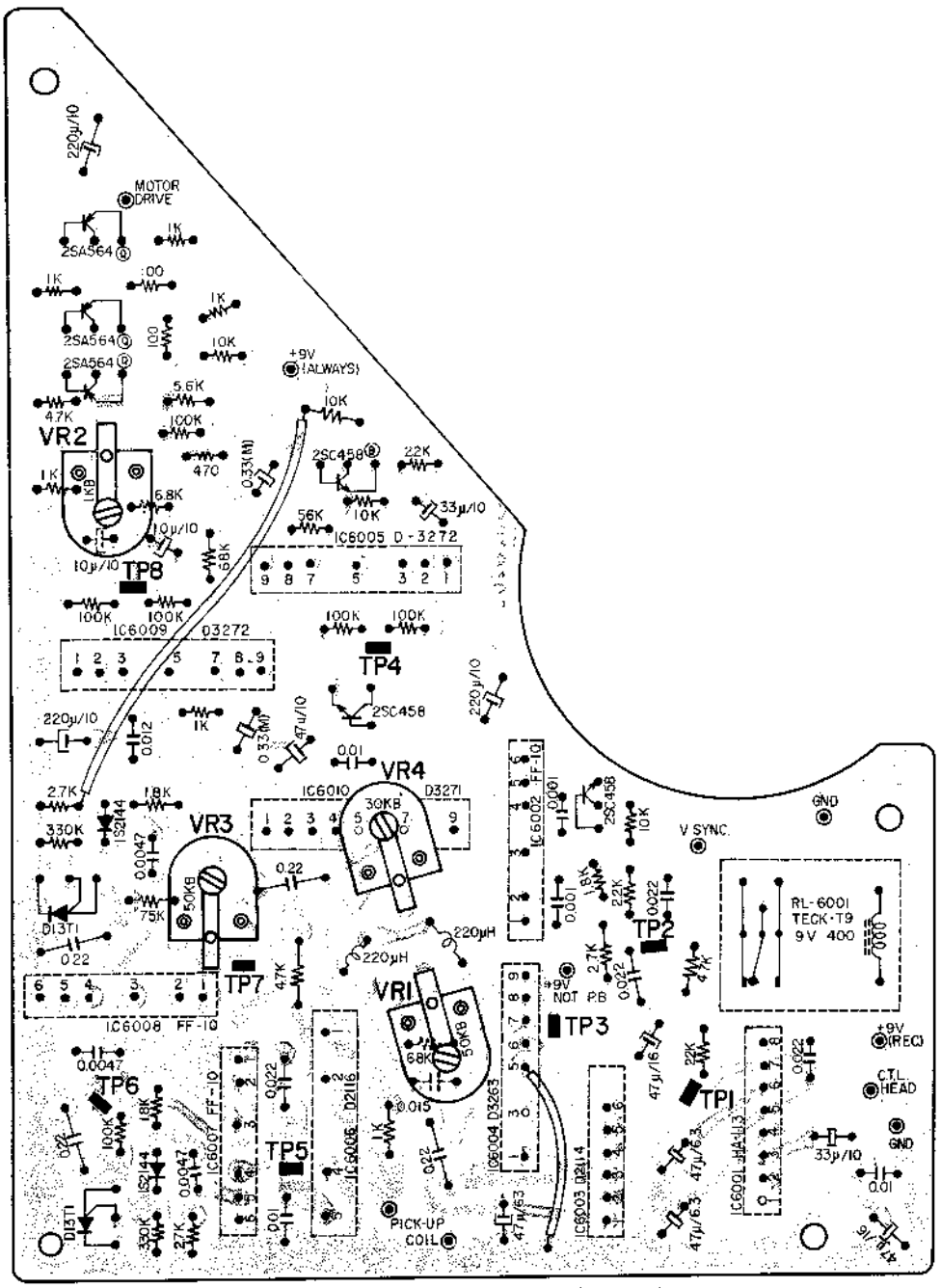


Fig. 1-40 SERVO P.C. Board (PX-506)

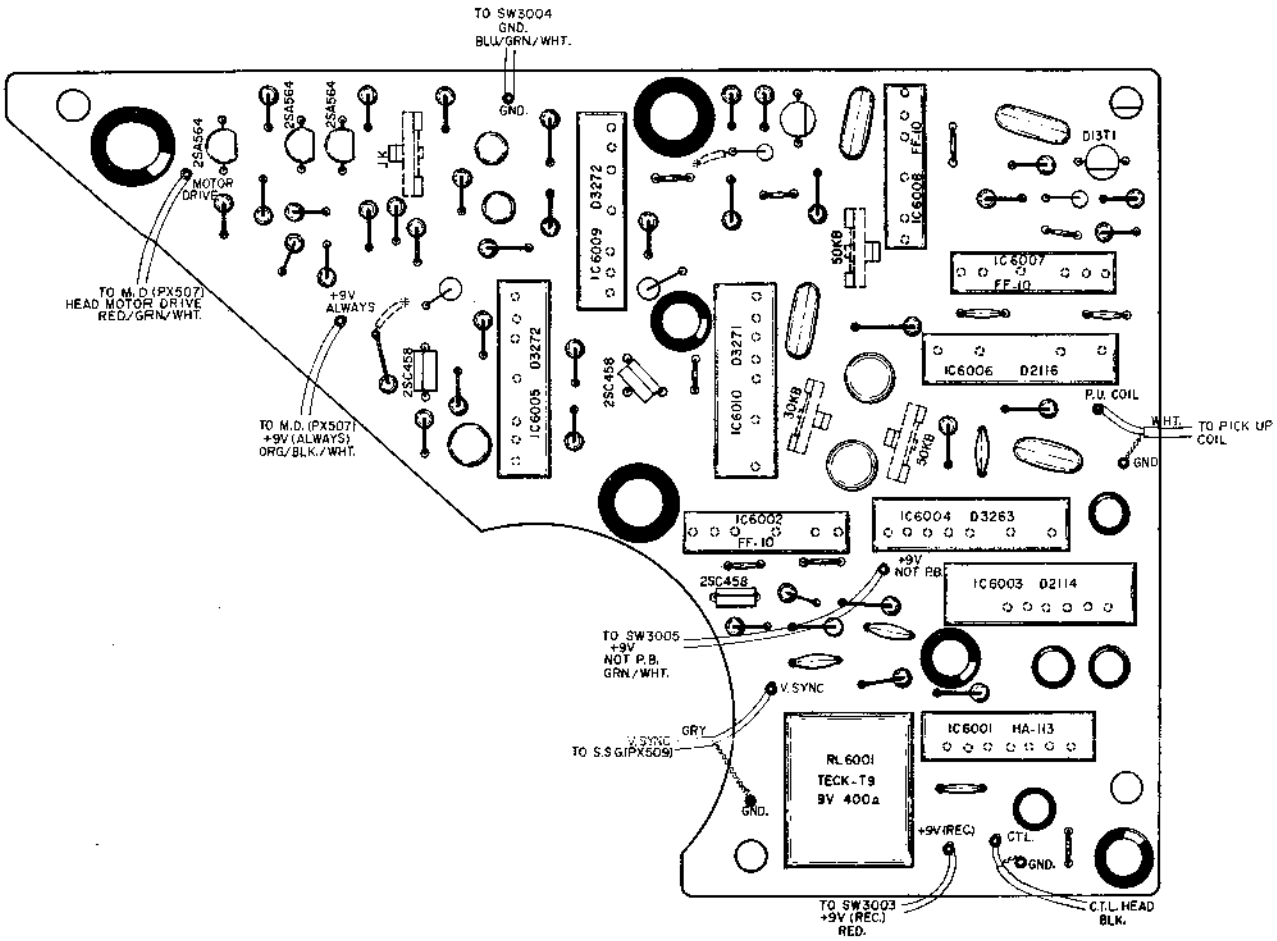


Fig. 1-41 SERVO P.C. Board (PX-506)

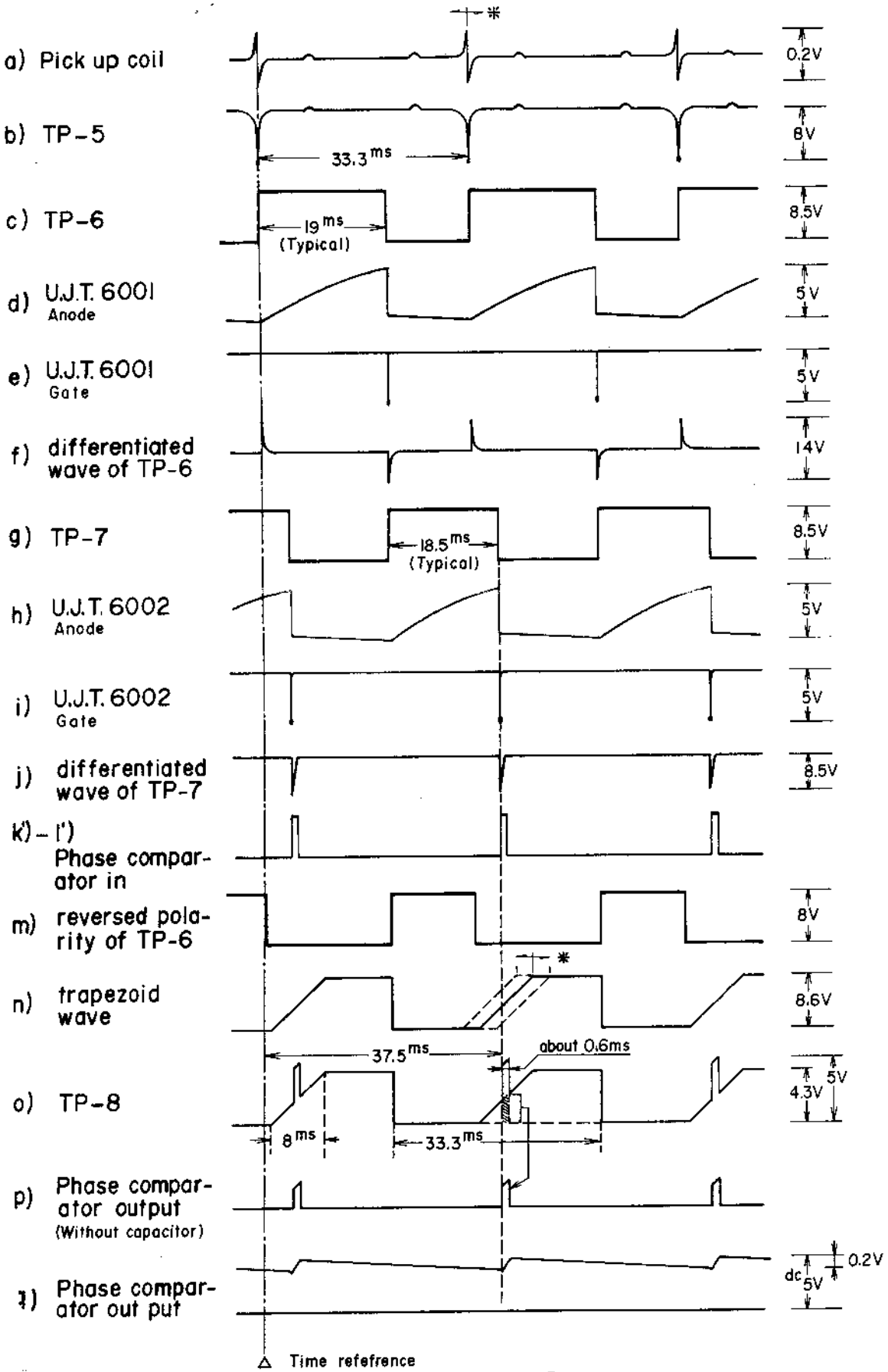


Fig. 1-42 SERVO (PX-506) Waveforms ① Speed Control

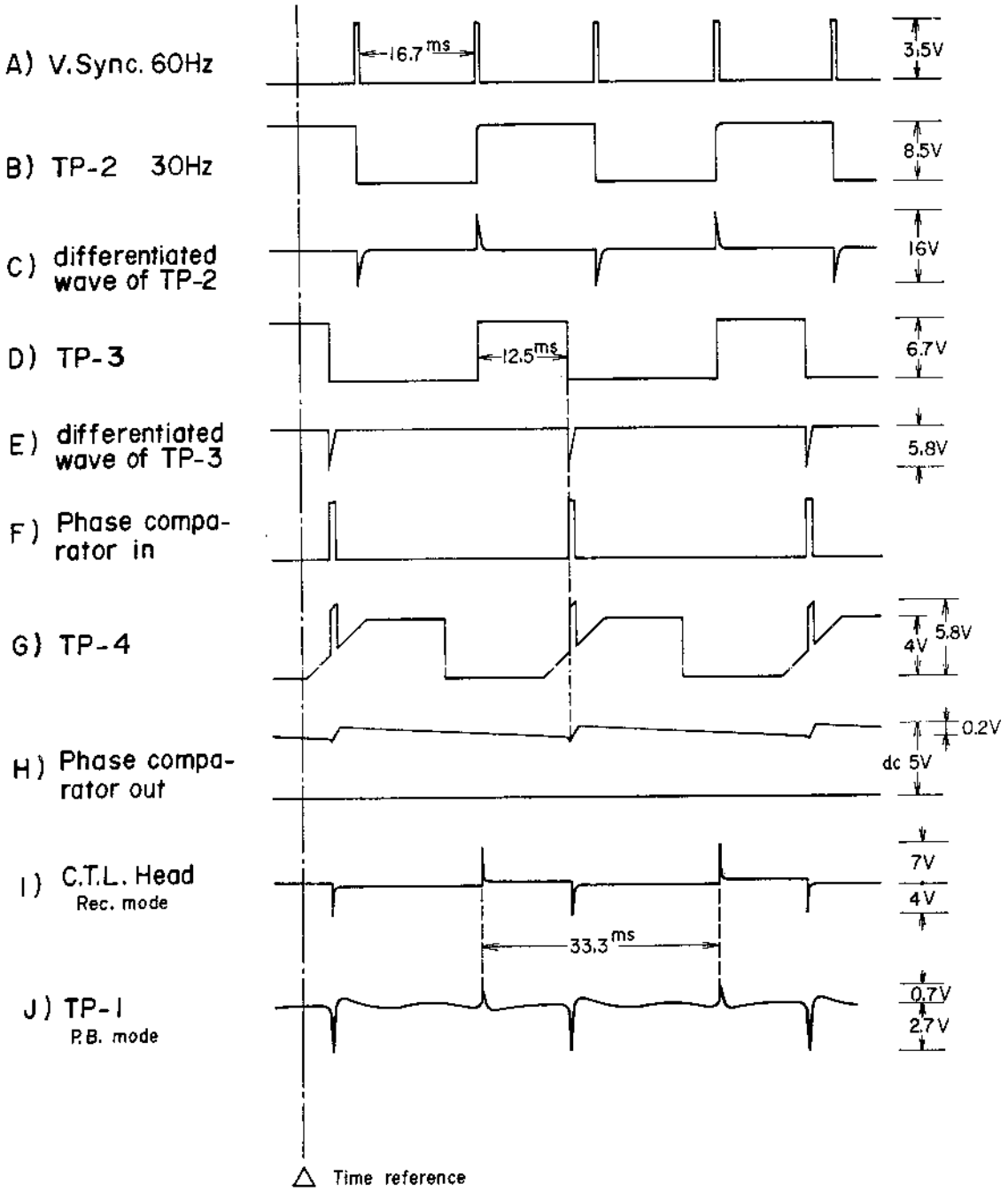


Fig. 1-42 SERVO (PX-506) Waveforms ② Prase Control

(1) Confirmation of Pick-Up Pulse (Tachometer Output Pulse)

a) At stop mode, connect an oscilloscope to test point TP-5 and confirm that the negative pulse amplitude is more than 8 V p-p (as shown in fig. 1-42 (b)) and that the negative peaks of pulses are clipping.

b) If negative peaks are not clipping, reverse connection of pick-up coil which is attached to the upper part of head assembly. If pulse amplitude is still small, adjust the space and angle between pick-up coil and pick-up plate.

(2) Operation check of First Delay Multivibrator

Connect an oscilloscope to Test Point TP-6 and check to see if positive part of square waveform (fig. 1-42 (c)) is 19 milli-seconds ±2 milli-seconds.

(3) Adjustment of Second Delay Multivibrator

a) Connect an oscilloscope to Test Point TP-7.

b) Adjust VR-3 so that the combined value of the positive parts of TP-6 and TP-7 square waves is 37.5 milli-seconds. For instance, if TP-6 is 19 ms, adjust TP-7 to 18.5 ms (total 37.5 ms).

(4) Trapezoid Wave Ramp Slope Adjustment

a) Connect an oscilloscope to Test Point TP-8.

b) Adjust VR-4 so that the trapezoid wave ramp slope is 8 milli-seconds as shown in fig. 1-42 (o).

(5) Adjustment of Position of Speed Control Sampling Pulse

a) Connect an oscilloscope to Test Point TP-8.

b) Adjust VR-2 so that the speed control sampling pulse is positioned slightly below the center of the ramp slope (as shown in fig. 1-43).

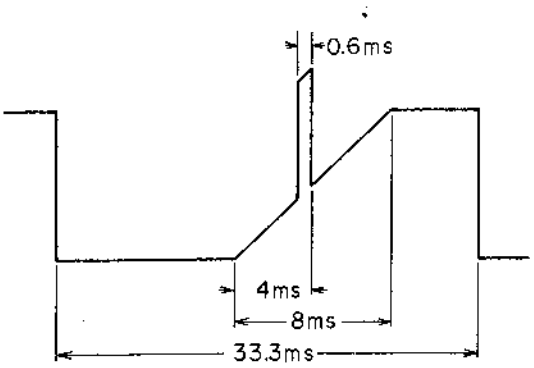


Fig. 1-43

(6) Confirmation of Binary Counter Operation

a) Connect an oscilloscope to Test Point TP-2.

b) Confirm that the binary counter is triggered by 60 Hz vertical sync. and square wave output is 30 Hz.

(7) Phase Control Delay Multivibrator Adjustment

a) Connect an oscilloscope to test point TP-3.

b) Adjust VR-1 so that the positive part of the square wave form is 12.5 milli-seconds as shown in fig. 1-42 (d).

(8) Adjustment of Position of Phase Control Sampling Pulse

a) Connect an oscilloscope to Test Point TP-4.

b) Re-adjust VR-3 so that phase control circuit sampling pulse is positioned at the center part of the ramp slope.

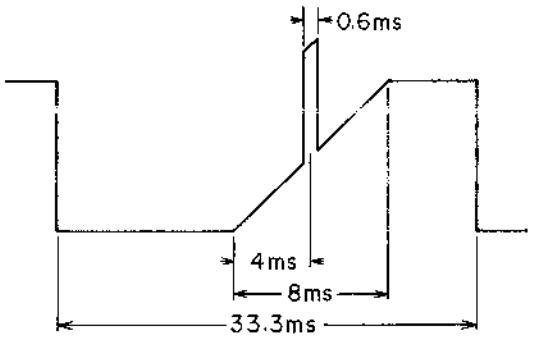


Fig. 1-44

(9) Confirmation of Control Pulse

a) Set a blank video tape on recorder and connect camera. Record for about 30 seconds.

b) Rewind and play back tape. Connect an oscilloscope to Test Point TP-1 and confirm that the control pulse is as shown in fig. 1-42 (J).

(10) Adjustment of Video Switching Point

After recording and playback tests, while observing monitor television screen, re-adjust VR-1 so that the video head switching point (over-lapping point) is about 10 horizontal scanning lines above the vertical blanking line.

SECTION 1-11

C. M. D. (Capstan Motor Drive Circuit) PX-507

The C.M.D. PX-507 P.C. Board includes three separate circuits. These are the POWER Voltage Regulator Circuit, the Capstan Motor Drive Circuit, and the last stage (only) of the Head Motor Drive Circuit. (ref. figs. 1-45, 1-46, and 1-47.)

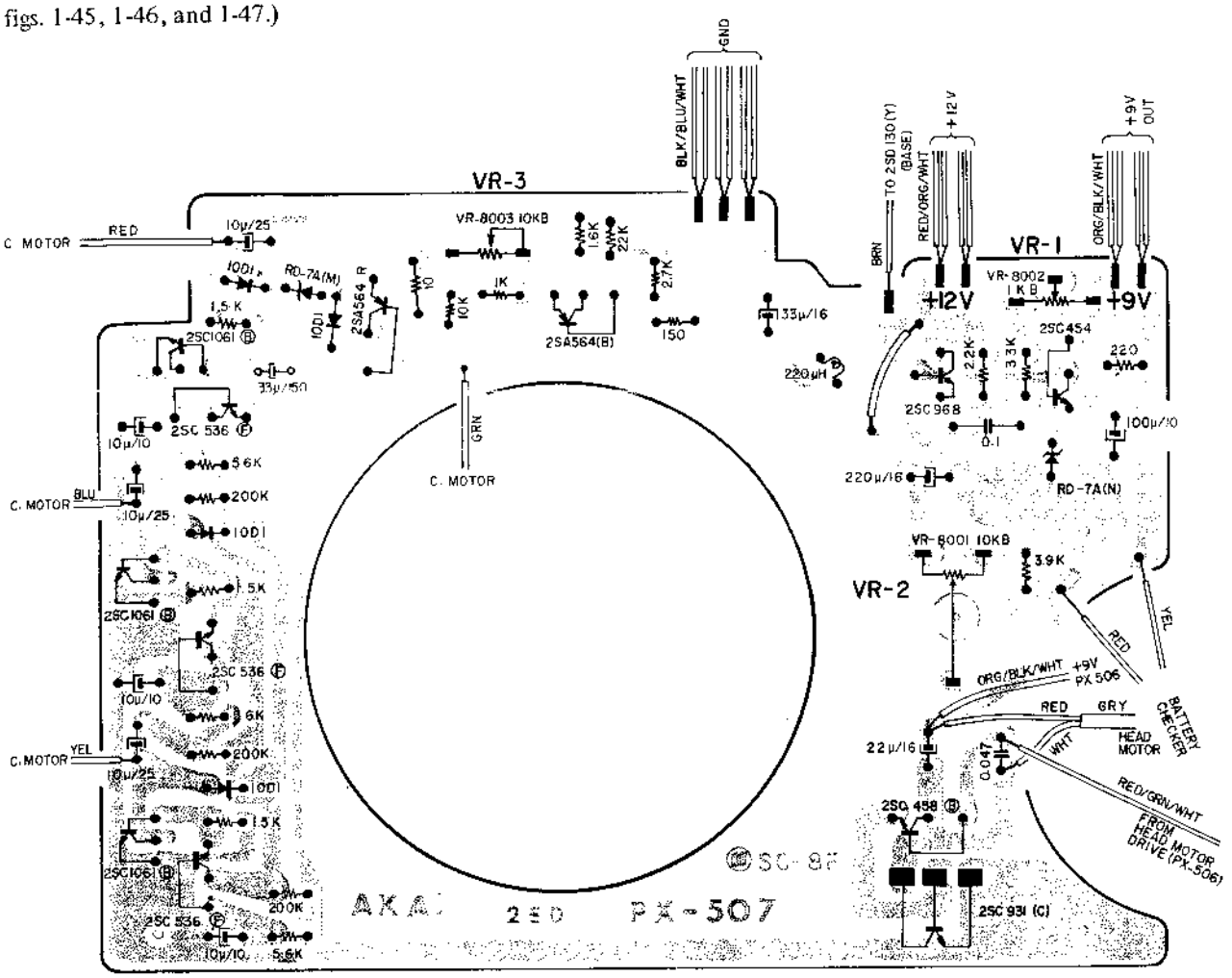


Fig. 1-45 C.M.D. P.C. Board (PX-507)

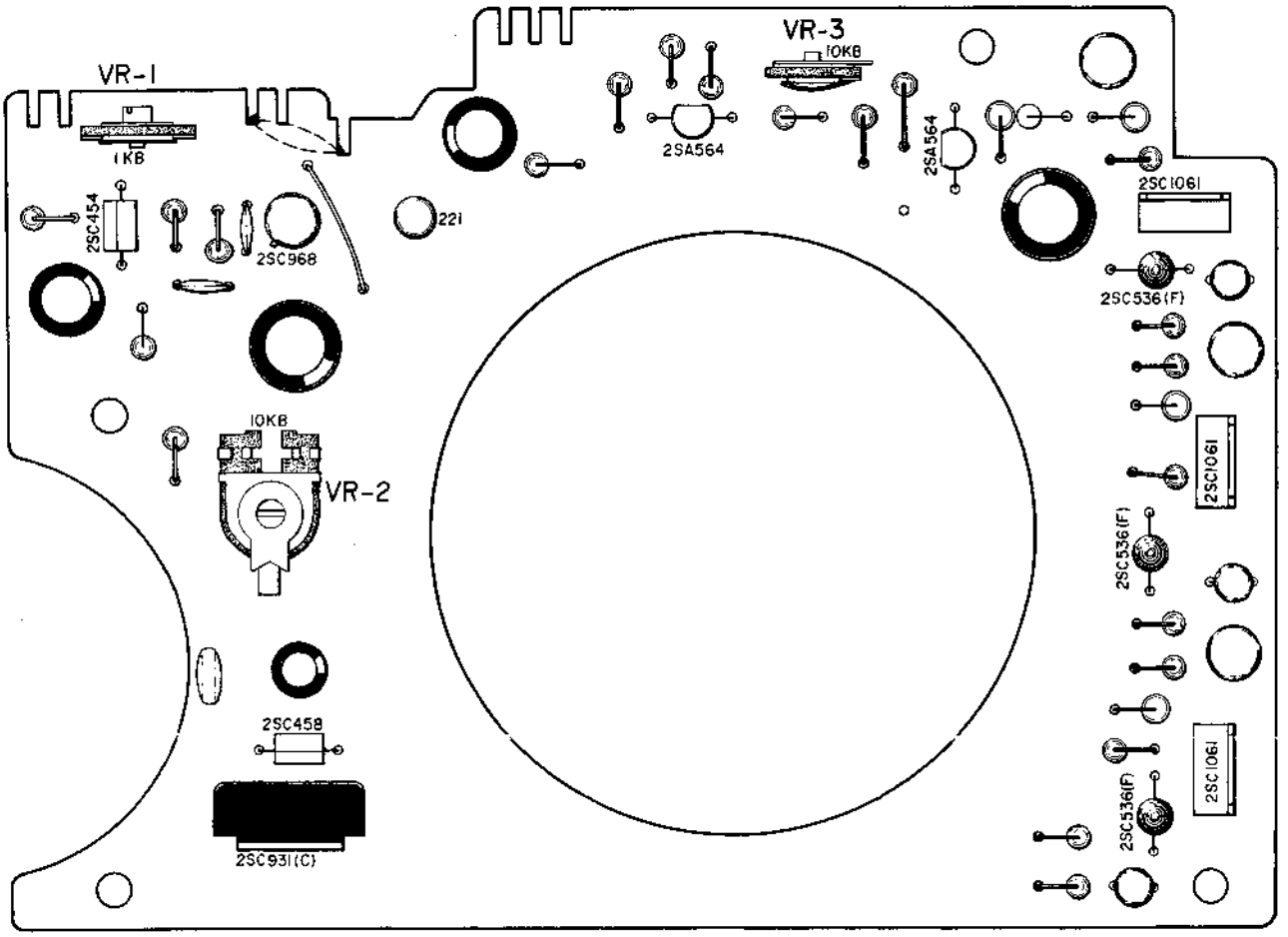


Fig. 1-46 C.M.D. P.C. Board (PX-507)

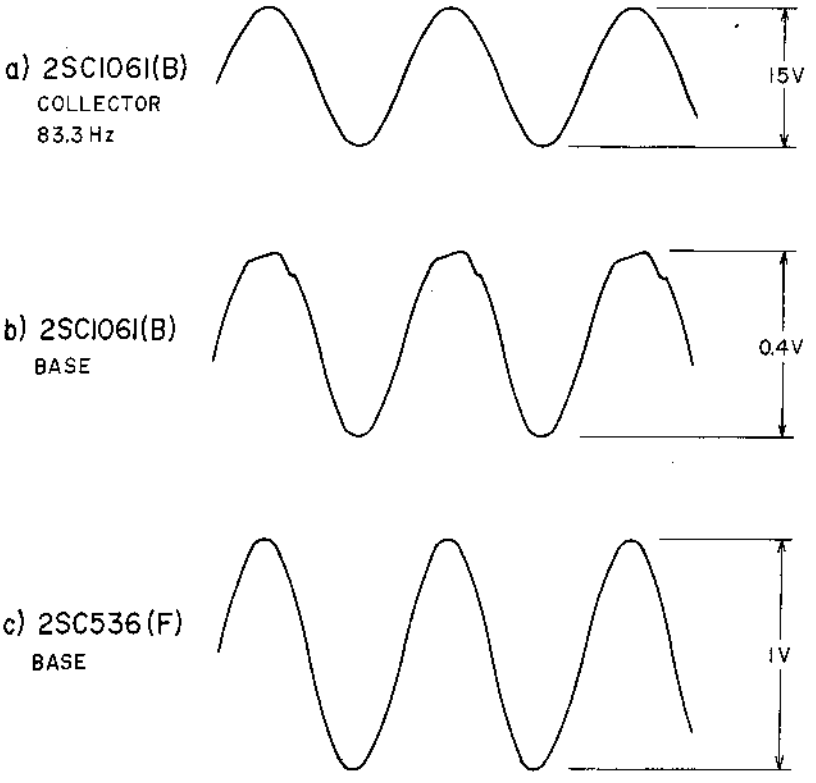


Fig. 1-47 C.M.D. (PX-507) Waveforms

(1) Power Voltage Regulator Circuit

The purpose of this circuit is to obtain a 9 V regulated current from the 12 V electric power source.

a) Connect a DC High Impedance Voltmeter or a V.T.V.M. to PX-506 +12 V terminal and confirm that the input voltage is within a 12 V ± 0.2 V range.

Caution

If voltage is not within specified range, adjust by means of Potentiometer VR-1001 of AC Adapter (300 ΩB).

b) Connect a DC Voltmeter to PX-507 +9 V terminal and adjust VR-1 (1 KB) so that the output voltage is +9 V. After this adjustment, at playback mode and recording mode, confirm that DC Voltmeter indication is within a 9 V ± 0.1 V range.

c) Battery Checker Adjustment (this adjustment is rarely necessary. However, in case adjustment is needed, proceed as follows) :
With Potentiometer VR-1001 of AC Adapter (300 ΩB), set DC input voltage to 11 volts. Then, with PX-506 VR-2 (10 KB), adjust position of battery checker indicator needle so that the needle is at the dividing point of red zone and green zone.

(2) Adjustment of Capstan Motor Revolutions

a) Connect a frequency counter to transistor 2SC 1061 (B) Collector of capstan motor drive circuit and adjust VR-3 so that frequency counter indication is 83.3 ± 0.1 Hz.

b) Connect an oscilloscope to transistor 2SC 1061 (B) Collector and confirm that the collector waveform is as shown in fig. 1-47 "A" (there is very little distortion at negative peak, and waveform fluxuation is also very small).

Caution

In case of distortion at collector waveform negative peak, zener diode RD-7A (M) of capstan motor drive circuit is defective, or transistor 2SC 1061 emitter collector resistance is not identical.

(3) Head Motor Drive Circuit

Only 2 transistors of the last stage of Head Motor Drive Circuit is included on the PX-507 P.C. Board. There is no adjustment point for this section.

SECTION 1-12
VIDEO AMPLIFIER PX-504

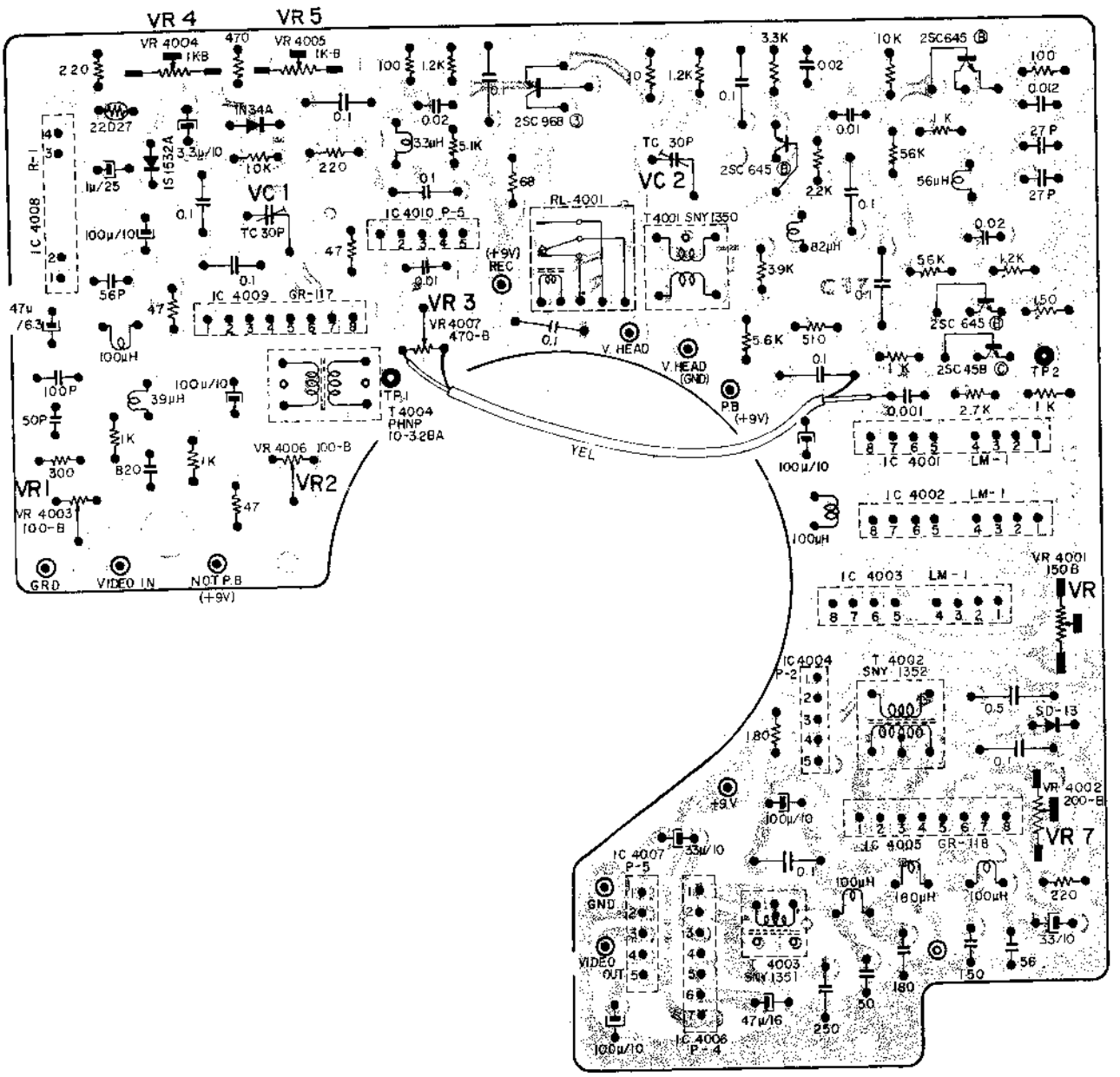


Fig. 1-48 Video Amplifier P.C. Board (PX-504)

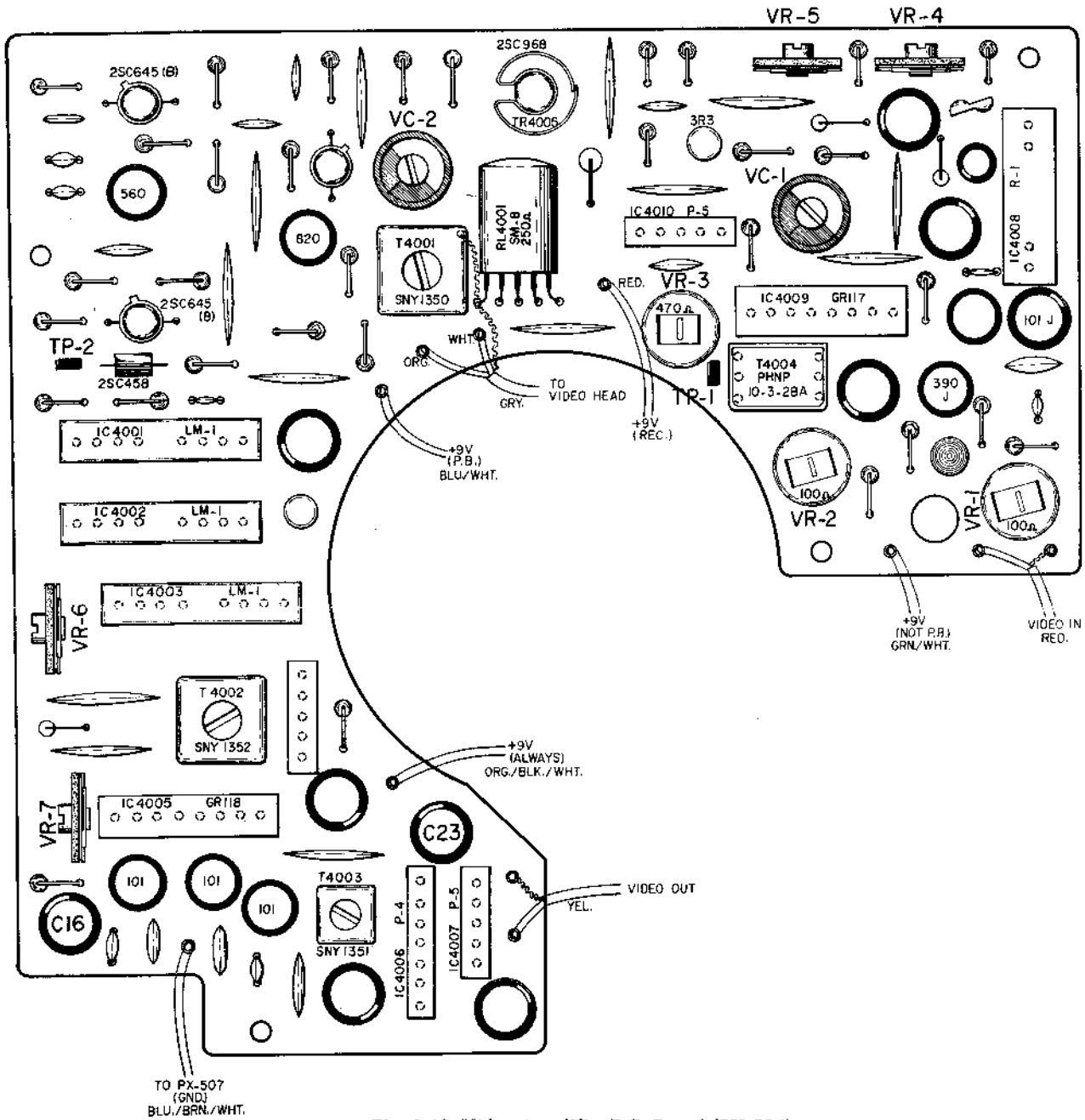


Fig. 1-49 Video Amplifier P.C. Board (PX-504)

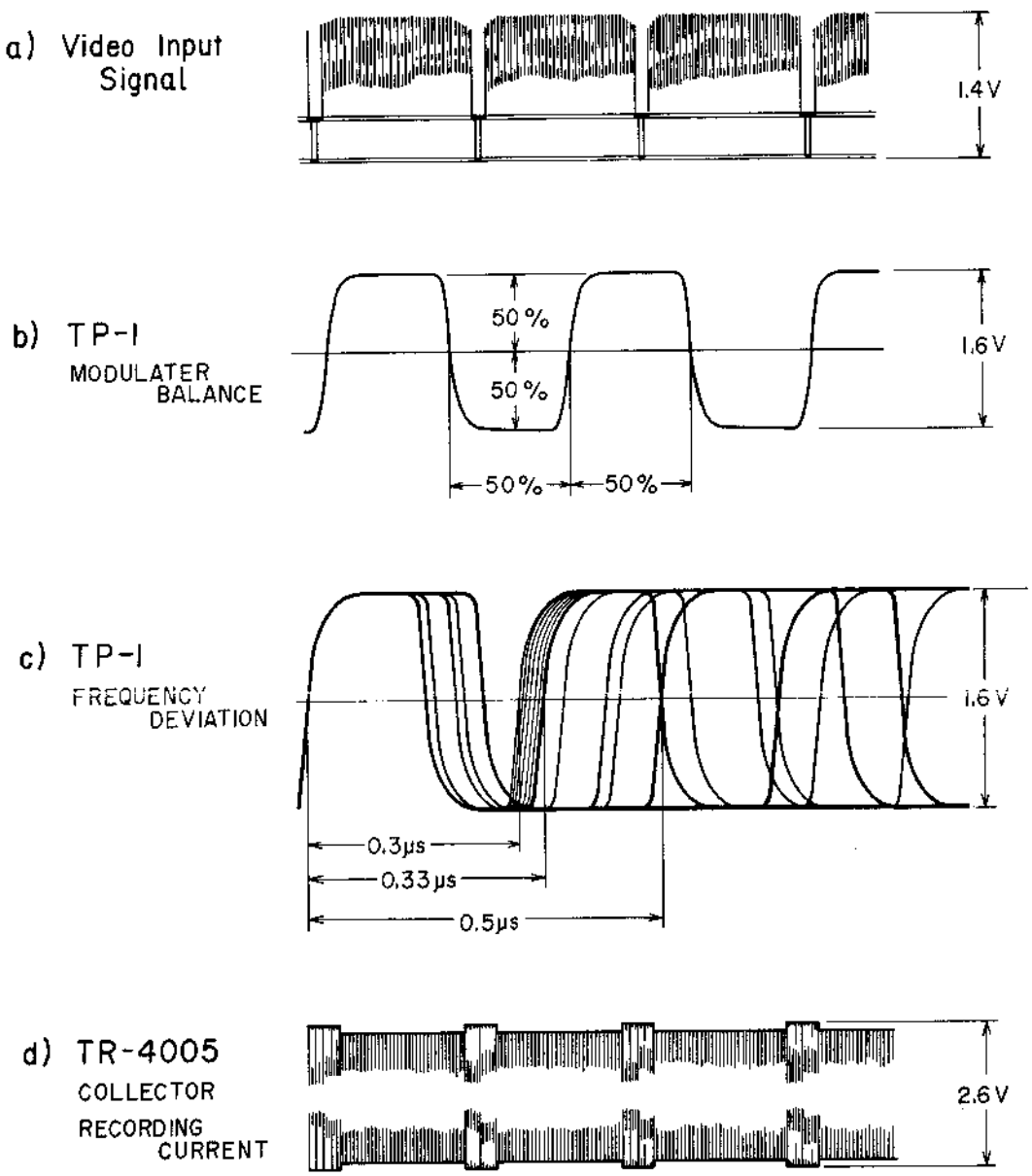


Fig. 1-50 Video Amplifier (PX-504) Waveforms

(1) Modulator Balance Adjustment

a) Connect an oscilloscope to Test Point TP-1 of Video Amplifier PC Board PX-504.

b) Set Potentiometers VR-2 and VR-4 to center position. Turn VR-5 to maximum clockwise position.

c) Adjust VR-2 and VC-1 so that the forms of the positive part and negative part of the video frequency modulator carrier wave is equal. (ref. fig. 1-50 (b)).

(2) Frequency Deviation Adjustment

a) Connect a test pattern signal (1.4 V p-p) supplied from a monoscope to Video "in" terminal.
(If a monoscope or television test signal generator is not available, photograph the resolution chart with the vidicon camera).

b) Connect an oscilloscope to test point TP-1. Set VR-4 to center position. Adjust VR-4 so that the frequency deviation of Sync. tip is 0.5 μs (micro-seconds) (2 MHz).

c) Adjust VR-1 so that the frequency deviation of white level is 0.33 μs (3 MHz). ref. fig. 1-50 (c).

(3) Carrier Leak Check

The meaning of "carrier leak" is that when adjustments of frequency modulator balance, limiter balance, frequency demodulator balance, etc., are faulty, a stripe appears on the monitor screen due to leakage of carrier frequency to video output stage.
With monoscope test pattern signal connected as described in item "2 (a)", set VR-6 and VR-7 to center position, and observe monitor screen to see whether or not there is a carrier leak. If there is a carrier leak stripe on the monitor screen, re-adjust VR-2 and VC-1.

(4) Video Recording Level Adjustment

a) Connect an oscilloscope to TP-2.

b) Record and play back a monoscope test pattern signal and adjust VR-3 so that RF Envelope amplitude is maximum.

c) Connect an oscilloscope to heat sink of transistor TR-4005 (2SC968) and measure recording level. (Example of waveform shown in fig. 1-50 (d)).

Attention

For details of Recording Level Adjustment, refer to "Replacement of Video Head Assembly," section 1-7, item 4.

(5) Play back Equalization Adjustment

Play back tape recorded in item 4 above and adjust VC-2 so that the amplitude of RF Envelope is maximum and the incorrect equalization part of RF Envelope is minimum.

(6) Carrier Leak Adjustment

a) Connect vidicon camera and at stop mode, photograph a light (electric light suitable), so that part of the screen shows a brightly lighted spot.

b) With contrast control of television monitor at maximum position, adjust VR-6 and VR-7 so that no carrier leak stripe appears on the monitor screen.

Caution

Because the influence of VR-6 and VR-7 is concurrent, turn VR-6 slightly and by rotating VR-7, try to locate minimum carrier leak position. After this adjustment, if there is still a carrier leak, repeat adjustment.

c) In case there is some carrier leak even after the adjustment in item (b) has been thoroughly carried out, increase the recording level slightly by means of VR-3. Also re-adjust VR-6 and VR-7.

(7) White Clip Level Adjustment

a) Connect vidicon camera and photograph the same scene as described in item "6 (a)"

b) Connect an oscilloscope to TP-1 and observe frequency deviation.

c) Put lens cap on video camera for 5 seconds and then remove. Adjust VR-5 so that the white clip frequency deviation is 0.3 ms.

(8) Video Output Level Adjustment

Adjust core of demodulator transformer T-4002 (SNY-1352) so that the video output level is 1.4 V p-p.

SECTION 1-13
AUDIO AMPLIFIER PX-505

The audio amplifier P.C. Board (PX-505) includes the audio recording amplifier (with automatic gain control circuit) and recording bias oscillator circuit, as well as audio playback amplifier (ref. figs. 1-51, 1-52).

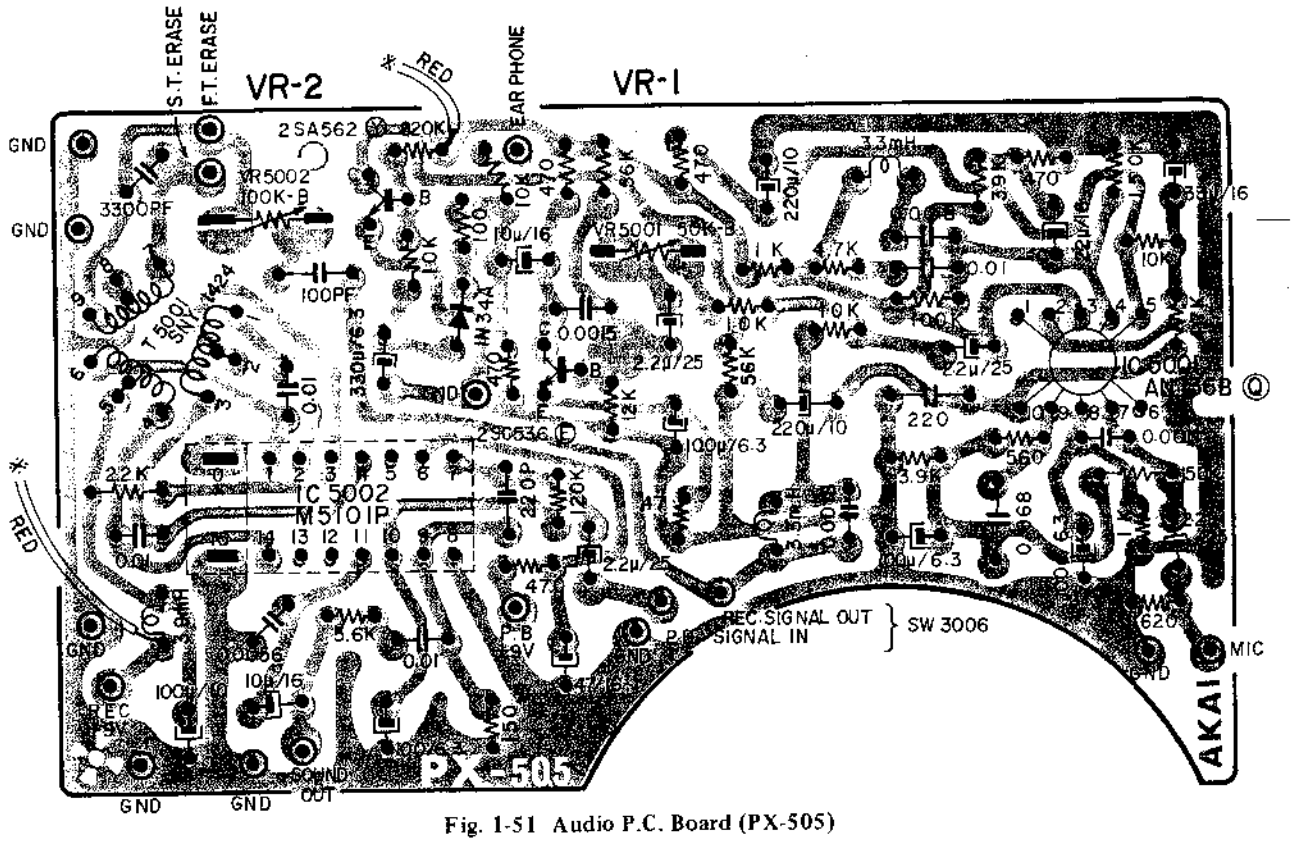


Fig. 1-51 Audio P.C. Board (PX-505)

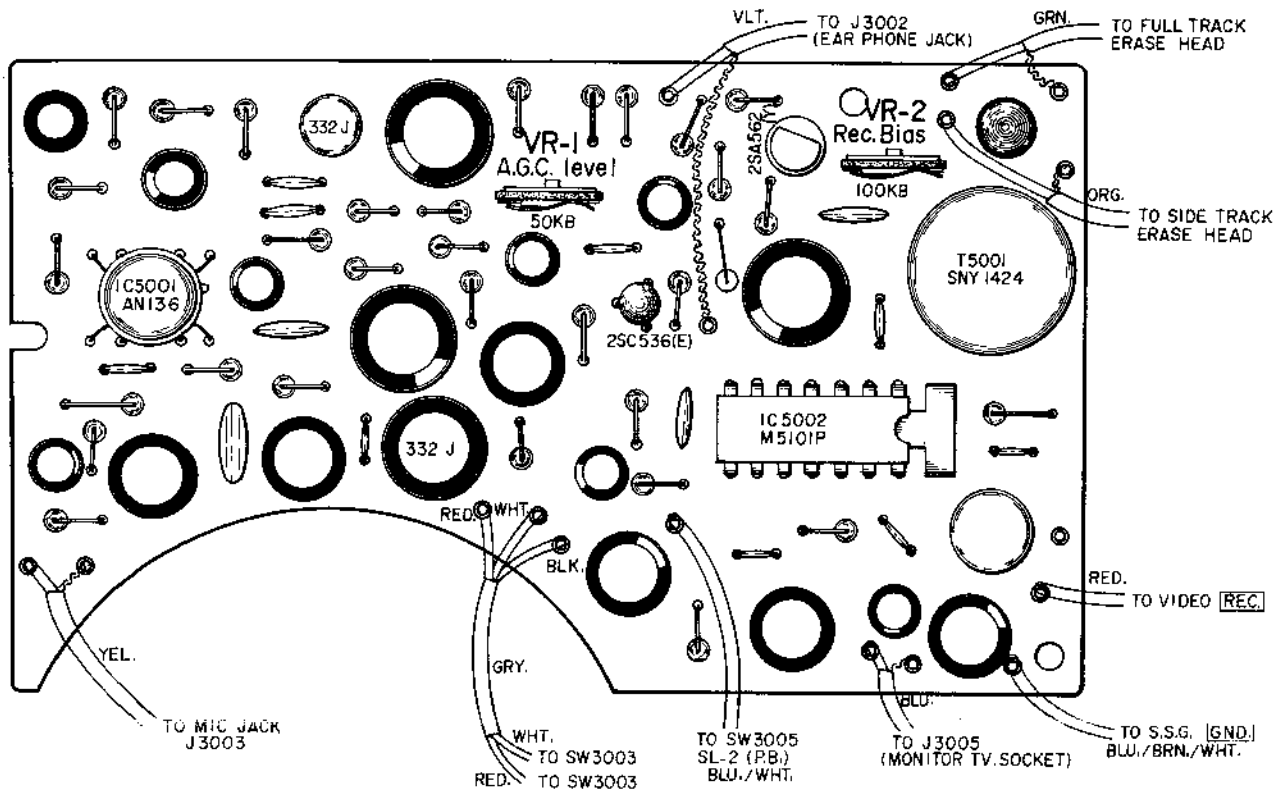


Fig. 1-52 Audio P.C. Board (PX-505)

(1) Recording Bias Voltage Adjustment (Recording Mode)

a) Connect a V.T.V.M. or a AC High impedance Voltmeter to audio head terminal and adjust VR-2 (100 KB) so that recording bias voltage is from 20 to 21 volts.

b) Connect a V.T.V.M. to side track erase head terminal and confirm that the erase voltage is within a range of from 23 volts to 28 volts.

c) Connect a V.T.V.M. to full track erase head terminal and confirm that the erase voltage is within a range of from 60 volts to 80 volts.

d) Connect a frequency counter to audio head terminal and confim that the bias oscillation frequency is within a range of from 63 to 67 kHz.

(2) Playback Output Level and Noise Level Check

a) Connect a high sensitive V.T.V.M. to "J" (+) pin and chassis (−) of monitor collector.

b) Play back an audio level test tape (700 Hz, 0 VU, 11-1/4 ips) and confirm that the V.T.V.M. indication is within a range of from −19 dB to ± 3 dB.

c) Remove tape from recorder and at playback mode, confirm that the noise level is less than −48 dB.

(3) Recording Level (A.G.C. level) adjustment

a) Connect an audio oscillator to microphone jack and supply a 1,000 Hz −60 dB sine wave signal.

b) Connect a high sensitive V.T.V.M. and distortion meter to the same point as described in item "2 (a)" above.

c) Load a tape and after recording and playback, adjust VR-1 (50 KB) so that the audio output level is within −19 dB ± 3 dB.

d) While playing back tape recorded in item (c) above, confirm that the distortion level is less than 6%.

Caution : If distortion is more than 6%, demagnetize audio head or slightly increase recording bias voltage by means of VR-2 and re-check distortion level.

(4) Frequency Response Check

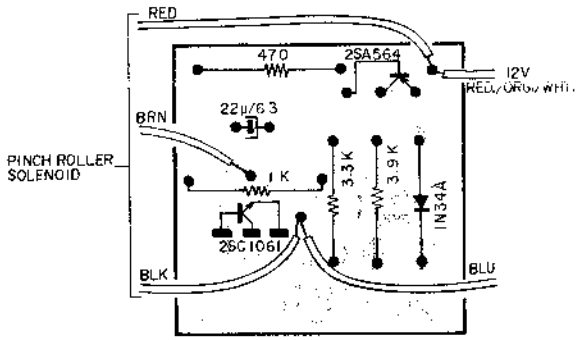
a) Connect an audio oscillator to microphone jack. With signal level at −60 dB, make separate recordings (of 10 seconds each) 100 Hz signal, 1 kHz signal, and 10 kHz signal.

b) Play back tape recorded in item "4 (a)" and compare the 100 Hz and 10 kHz output level with the output level of the 1 kHz to check whether or not the tolerance is within ±5 dB.

Caution : If frequency response is not within specification, re-check recording bias voltage and recording level.

SECTION 1-14
PINCH ROLLER SOLENOID CONTROL CIRCUIT PX-508

The purpose of this circuit is to reduce the battery discharge current as per following function :
At the moment the play key or the record key is depressed, the maximum current (about 1.2 amperes) passes through part of the pinch roller solenoid. After the solenoid is energized (within about 5 seconds), the holding current, (about 0.2 amperes) passes through the pinch roller solenoid, thus reducing the battery discharge current.
There is no adjustment part in this circuit. However, if the current flowing through the pinch roller solenoid does not change after 5 seconds, condenser C-9001 (22/6.3) is shorted.



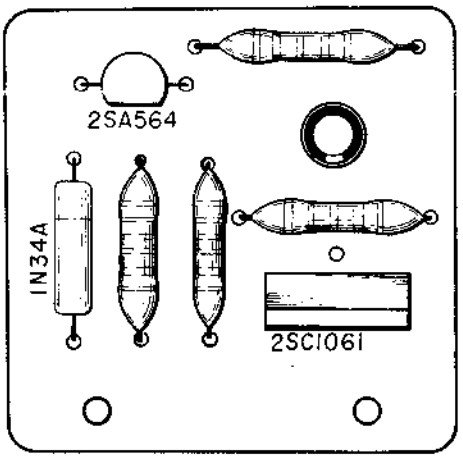


Fig. 1-54 Pinch Roller Solenoid Control P.C. Board (PX-508)

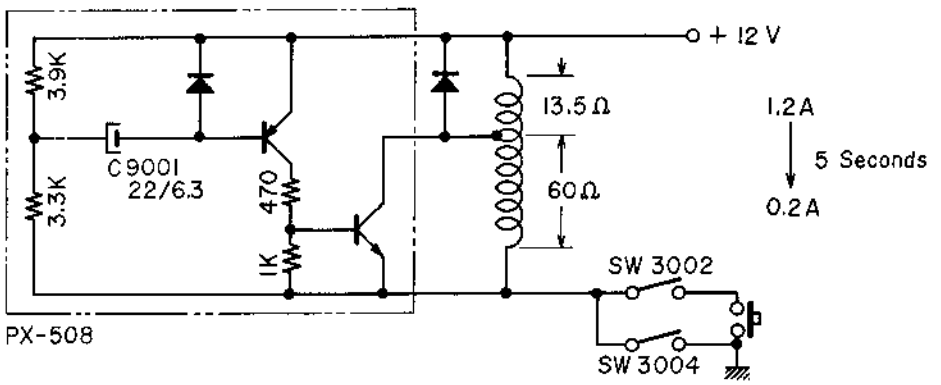
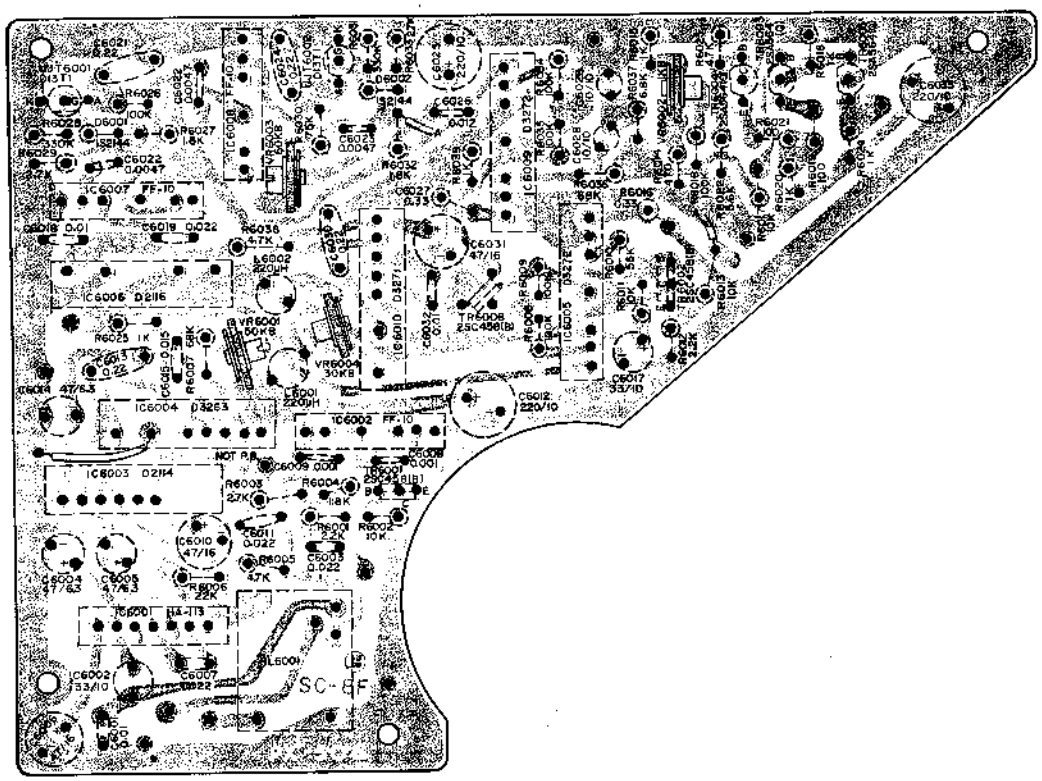


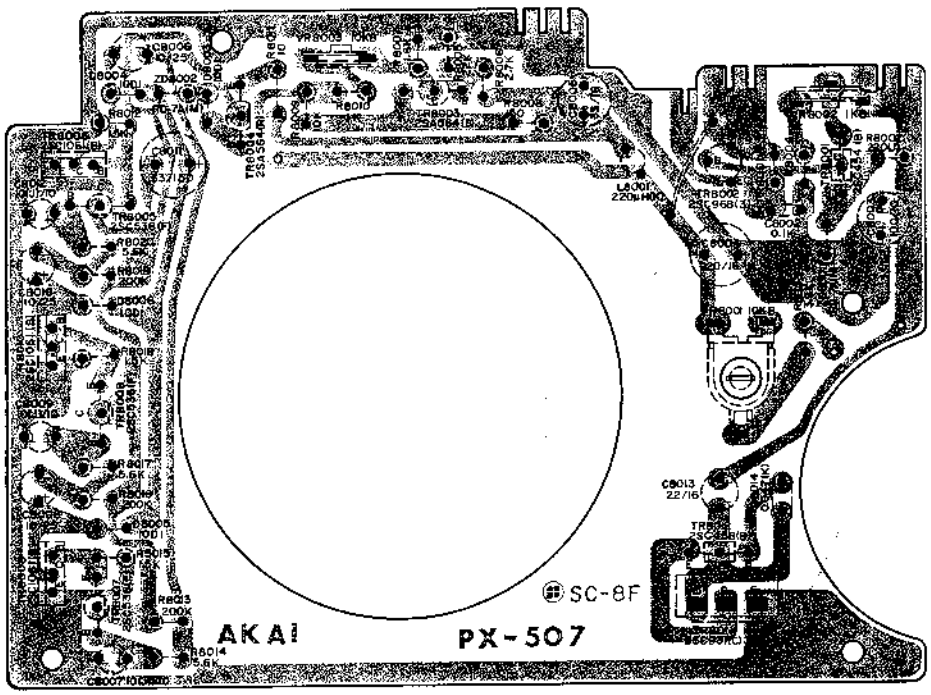
Fig. 1-55 Pinch Roller Solenoid Control Circuit

SECTION 1-15
COMPOSITE VIEW OF COMPONENTS

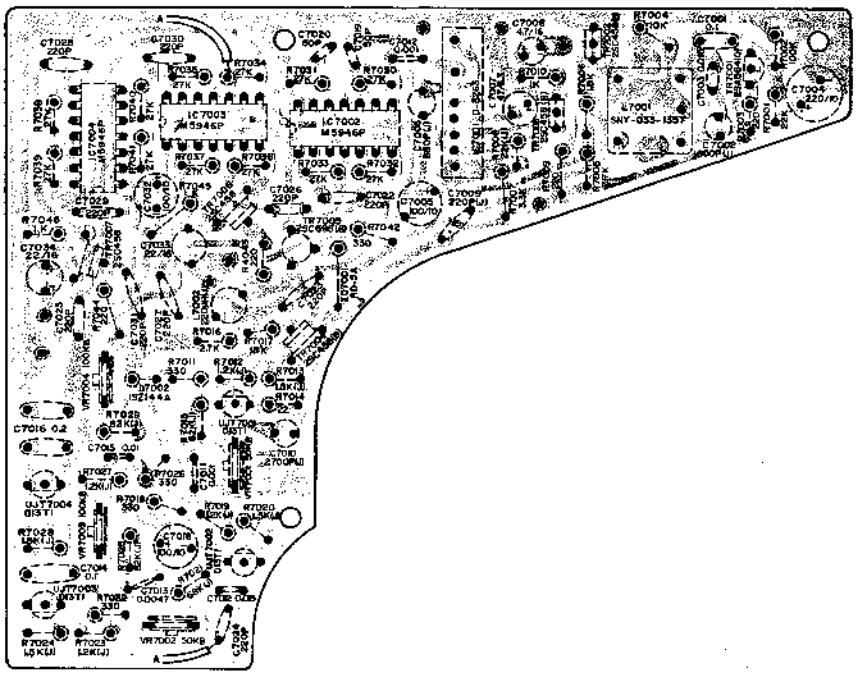
SERVO (Head Motor Servo Circuit) PX-506



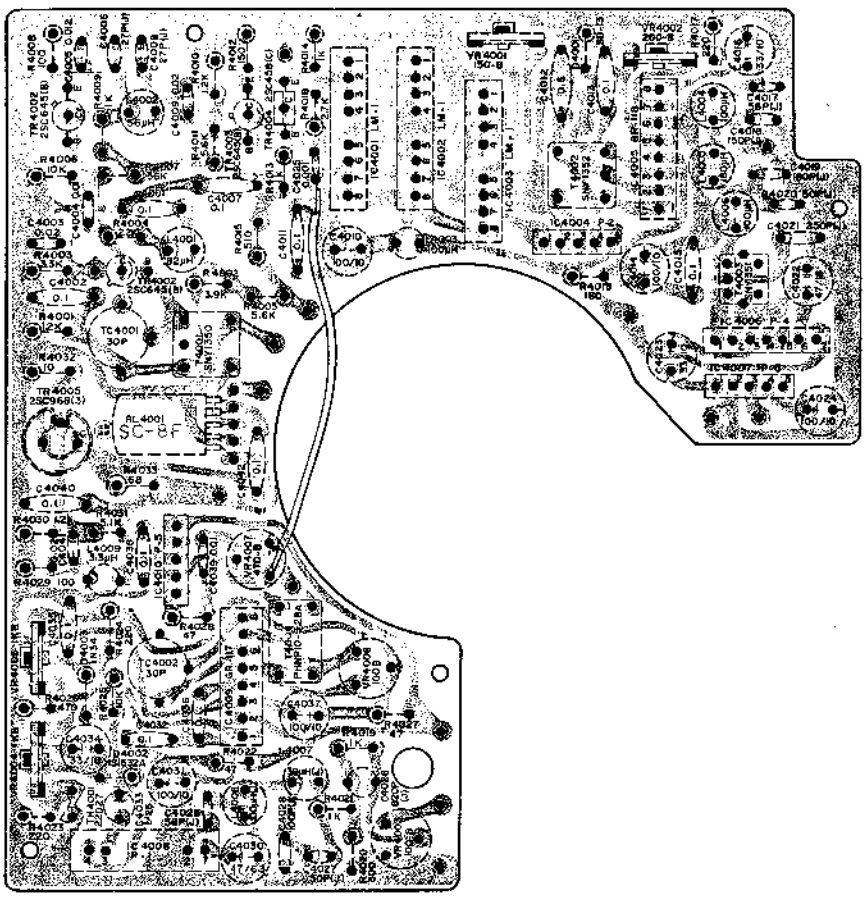
C.M.D. (Capstan Motor Drive Circuit) PX-507



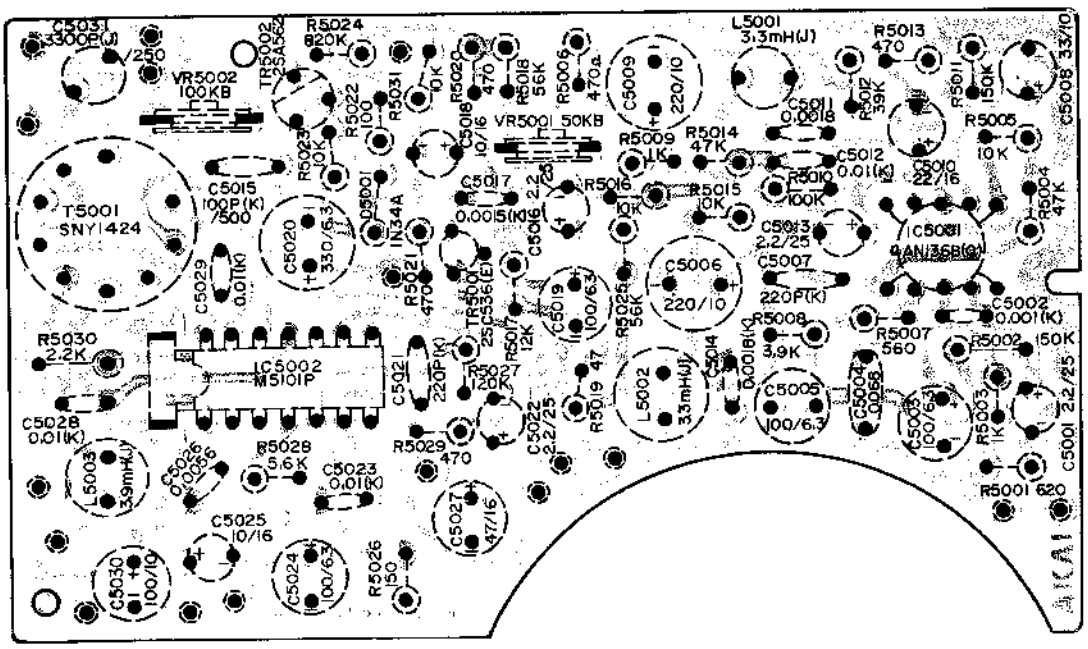
VIDEO AMPLIFIER PX-504



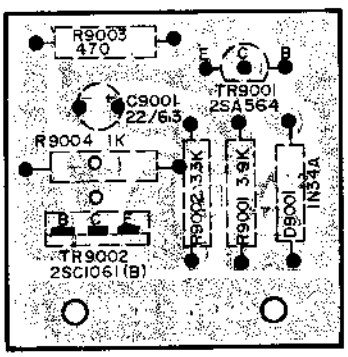
VIDEO AMPLIFIER PX-504



AUDIO AMPLIFIER P.C. BOARD PX-505



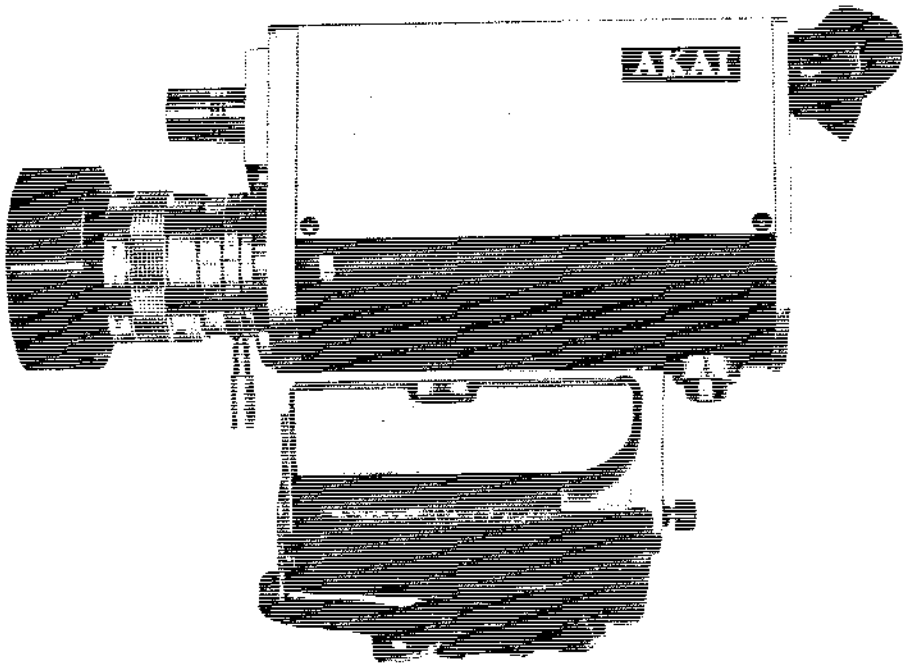
PINCH ROLLER SOLENOID CONTROL P.C. BOARD PX-508



SECTION 1-16
SCHEMATIC DIAGRAM

SYSTEM CONTROL 14012020
S.S.G. P.C. BOARD PX-509 (PX-1-04)
SERVO P.C. BOARD PX-506 (PX-1-03)
MOTOR DRIVE & POWER SUPPLY P.C. BOARD PX-507 (PX-1-05)
VIDEO P.C. BOARD PX-504 (PX-1-01)
AUDIO P.C. BOARD PX-505 (PX-1-02)

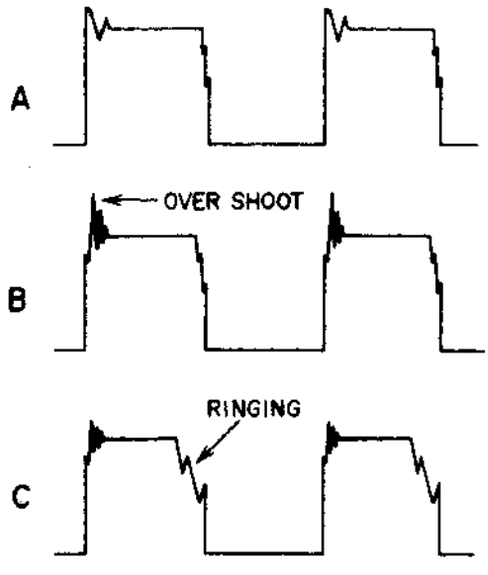
CHAPTER 2
CAMERA (PXC) REPAIR AND ALIGNMENT



SECTION 2-1
SPECIFICATIONS

Vidicon : 2/3˝Separate Mesh Vidicon Tube
Scanning System : External Sync. Signal (Supplied from Recorder)
Video Output : 1.4 Volts P-P Composite Video Negative Sync.
Video Signal to Noise Ratio : Better than 40 dB
Horizontal Resolution : More than 400 lines
Horizontal Frequency : 15.75 kHz
Vertical Frequency : 60 Hz
Aperture Selector : F 1.8 and F 5.6 with Automatic Light Compensator System
Lens : Zoom Lens (10 to 40 mm (F 1.8))
View Finder : One-Eye reflex system
Power Source : DC 9 V (supplied from Recorder)
Microphone : 600 Ω uni-directional built-in microphone

SECTION 2-2
TROUBLE SHOOTING CHART

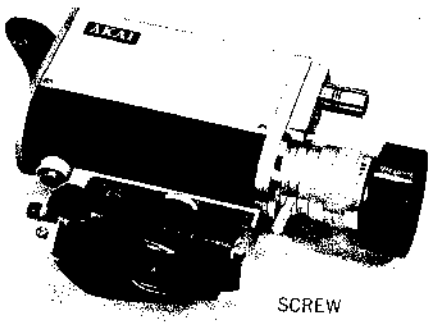
Symptom	Trouble
• No Picture (High Voltage Generator Circuit Operating) Voltage at +30 V terminal of Deflection P.C. Board PX-2408	• Connect an oscilloscope to camera connector pin 1 (10 p socket), and check to see if there is a composite video signal. 1. If there is a signal, the camera connection cable is defective. 2. In case there is no signal a) If there is a video signal at transistor TR-2105 (2SC460 ㉡) collector, IC-2101 (P-5) is defective. b) If there is no video signal at Transistor TR-2105 (2SC460 ㉠) collector, one of the transistors TR-2101 (2SC535 ㉠) through TR-2105 is defective. (Likely possibility of defective TR-2101 (2SC535 ㉠).
• No Picture (High Voltage Generator Circuit not operating) No voltage at +30 V terminal of Deflection P.C. Board P-2408 	1. Confirm that a horizontal blanking signal is being supplied to IC-2301 (AA-176) pin 1 of high voltage generator P.C. Board PX-2049. 2. Check to see whether there is a waveform as shown in diagram at left at transistor TR-2301 and TR-2302 (2SC968 ㉠) collector. a) If there is no collector waveform, TR-2301 or TR-2302 (2SC968 ㉠) is defective or IC-2301 (AA-176) is defective. **Caution** If TR-2301 or TR-2302 is damaged, usually, IC-2301 is also defective. b) When TR-2301 or 2302 has been replaced, always check the waveform at TR-2301 collector. When waveform is as shown in diagram (B) or (C) at left, IC-2301 (AA-176) is defective or transformer T-2301 (HVT) is defective.
• No Picture on Monitor Screen (Vertical Deflection Circuit not working)	• If this is the case, disconnect the +9 V power supply lead wire of high voltage generator circuit which is for the purpose of preventing vidicon sticking. 1. Check gate waveform of UJT-2201 (D13T1). Deflection P.C. Board PX-2408. a) If there is no sawtooth waveform at UJT gate, UJT-2201 (D13T1) is defective or IC-2201 (GA-116) is defective. b) If there is a sawtooth waveform, TR-2201 (2SA562 ㉦) is defective.

• No Picture on Monitor Screen (Horizontal Deflection Circuit not operating)	• If this is the case, disconnect the +9 V power supply lead wire of high voltage generator circuit which is for the pourpose of preventing vidicon sticking. 1. Check to see whether there is horizontal oscillation output at Pin 8 of deflection P.C. Board IC-2204 (D3264). a) If there is no horizontal oscillation output, IC-2204 (D3264) is defective. b) If there is horizontal oscillation output, transistor TR-2202 (2SC497 Ⓨ) is defective, or diode D-2201 (HF-SD-1) is defective.
• No composite Sync. Signal	Capacitor C-2206 (50PF) open circuit or IC-2202 (DP-115) defective.
• No Composite Blanking Signal	IC-2206 (D-3262) defective.
• No Focus Voltage	IC-2207 (AC-170) defective.
• Monitor Picture vibrates (up and down movement)	IC-2201 (GA-116) of deflection P.C. Board defective, or UJT-2201 (D13T1) defective.
• Horizontal Scanning Unstable	IC-2203 (PA-5) of Deflection P.C. Board defective.
• Deterioration of Horizontal Resolution of Monitor Picture	Open circuit L-2101 (100 μH) of Video Amp. P.C. Board.
• Contrast of Monitor Picture not good	Low output level of Composite Video Signal. Adjust VR-5 of Video Amp. P.C. Board so that the video signal amplitude is 1.4 V p-p.
• When camera changes from a dark scene to a light scene, contrast variation of monitor picture is too excessive (A.L.C. Circuit not operating)	Faulty connection of potentiometer VR-5 (2 KB) of Video Amp. P.C. Board, or Condenser C-2122 (10/16) defective.

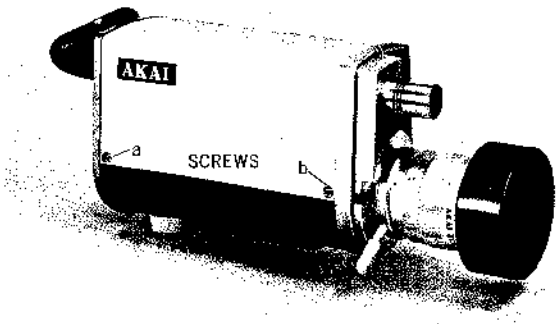
SECTION 2-3
CASE REMOVAL

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Remantle.in reverse order.

1



2



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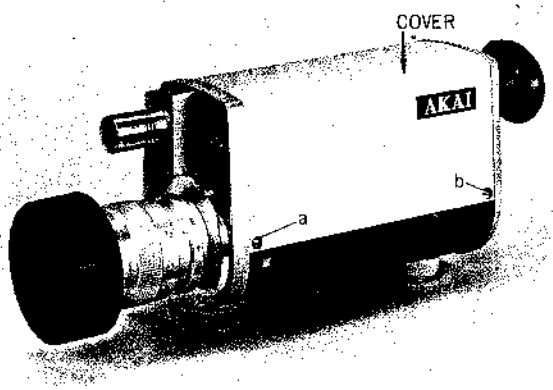

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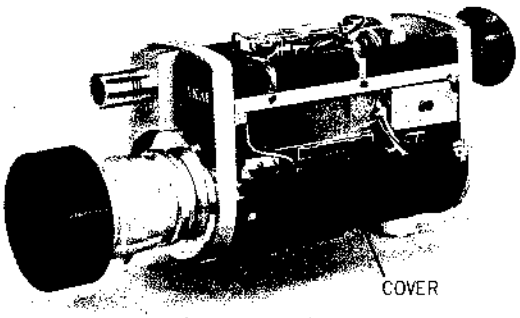

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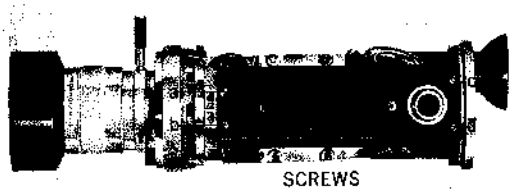

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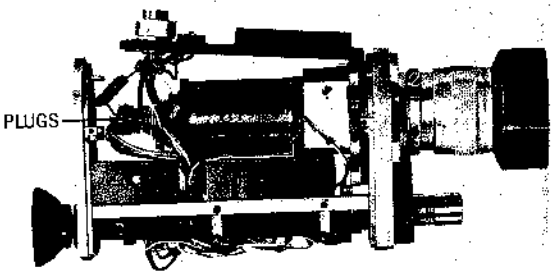

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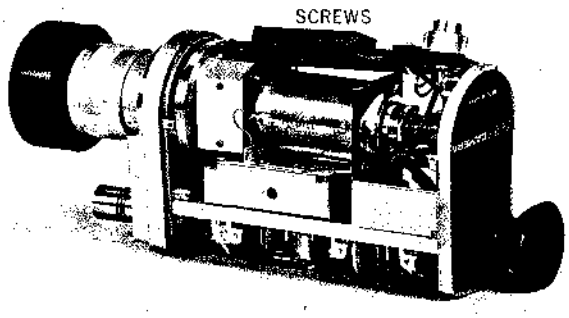

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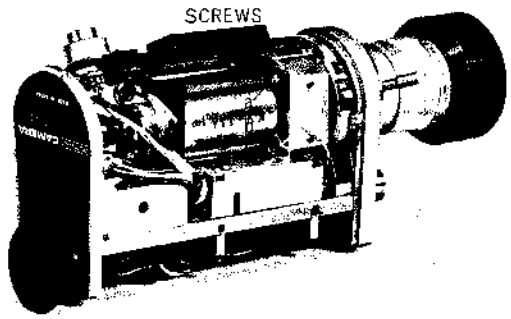

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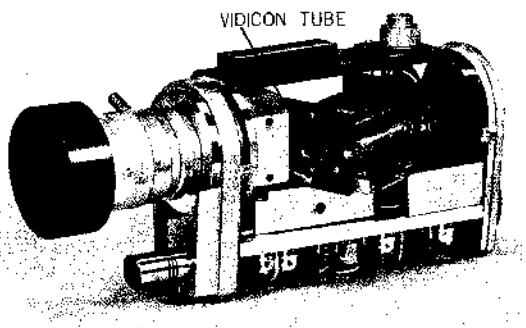

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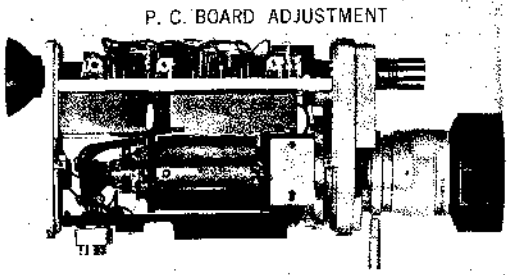


SECTION 2-4
EQUIPMENT REQUIRED

The following equipment must be available for complete testing and adjustment of the Vidicon Camera.

1. RETMA Resolution Chart
2. Triggered Sweep Oscilloscope (Sensitivity 0.005 V/cm, DC to 10 MHz)
3. Low capacity oscilloscope probes
4. Television Monitor (19" or 12" screen with connection cable)
5. Lighting fittings (intensity of illumination : more than 1000 Lux)

SECTION 2-5
ADJUSTMENT PROCEDURE

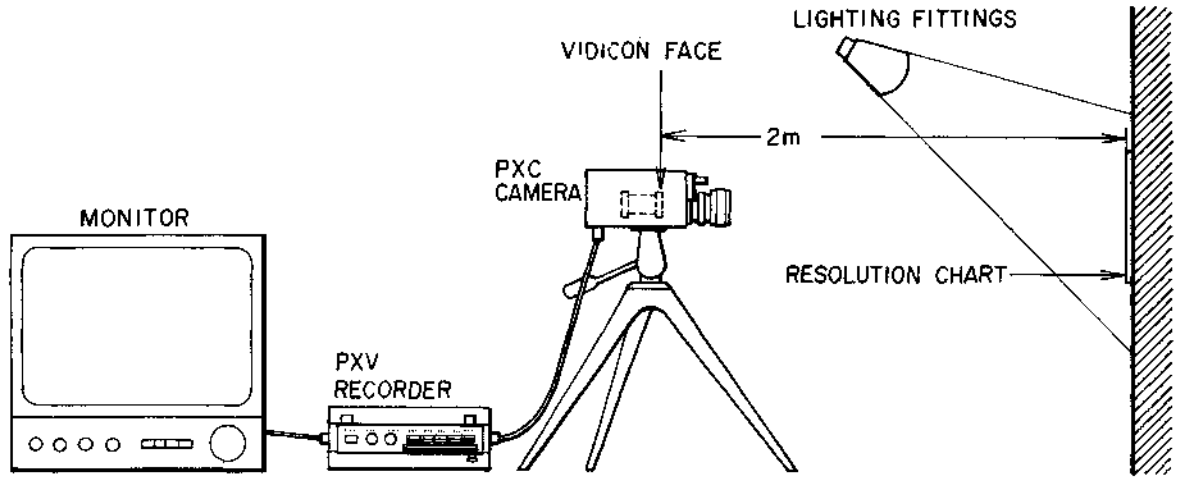
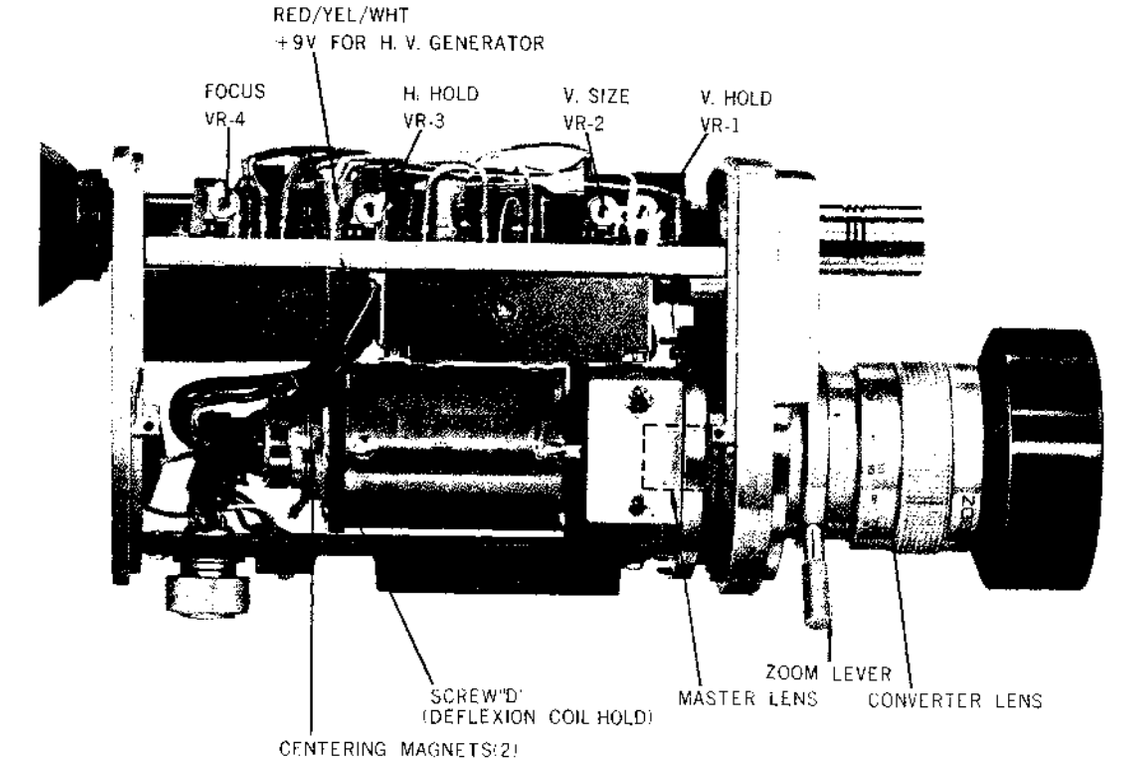
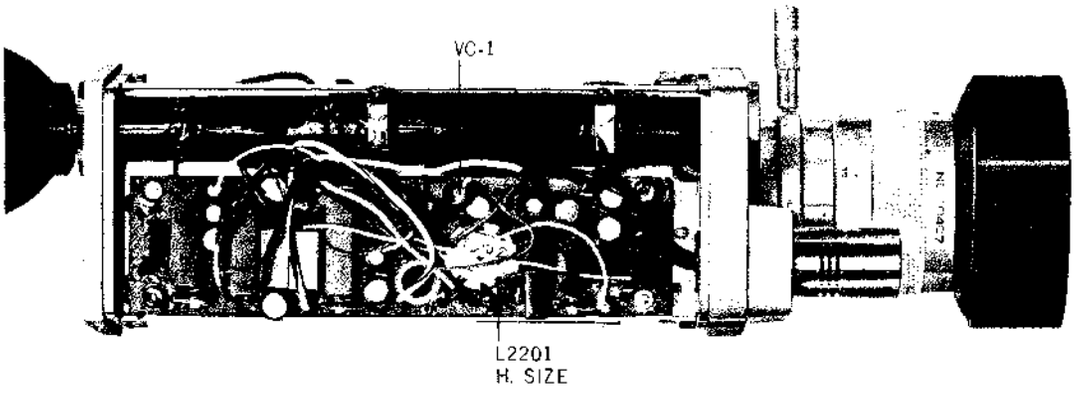


Fig. 2-1 Preparation for camera adjustment

1. **As in Fig. 2-1, hang a resolution chart on a wall and try to obtain a lighting intensity of 1000 Luz.**
2. **Position of Camera**
   Set camera at position where vidicon face is 2 meters (1.8 yards) away from the resolution chart.
3. **Set camera Aperture Selector to "5.6".**
4. **Position Zoom Lever**
   Set Zoom Lever to TELE (40mm).


RED/YEL/WHT
+9V FOR H. V. GENERATOR
FOCUS
VR-4
H. HOLD
VR-3
V. SIZE
VR-2
V. HOLD
VR-1
ZOOM LEVER
SCREW"D"
(DEFLEXION COIL HOLD)
MASTER LENS
CONVERTER LENS
CENTERING MAGNETS(2)


VC-1
L2201
H. SIZE

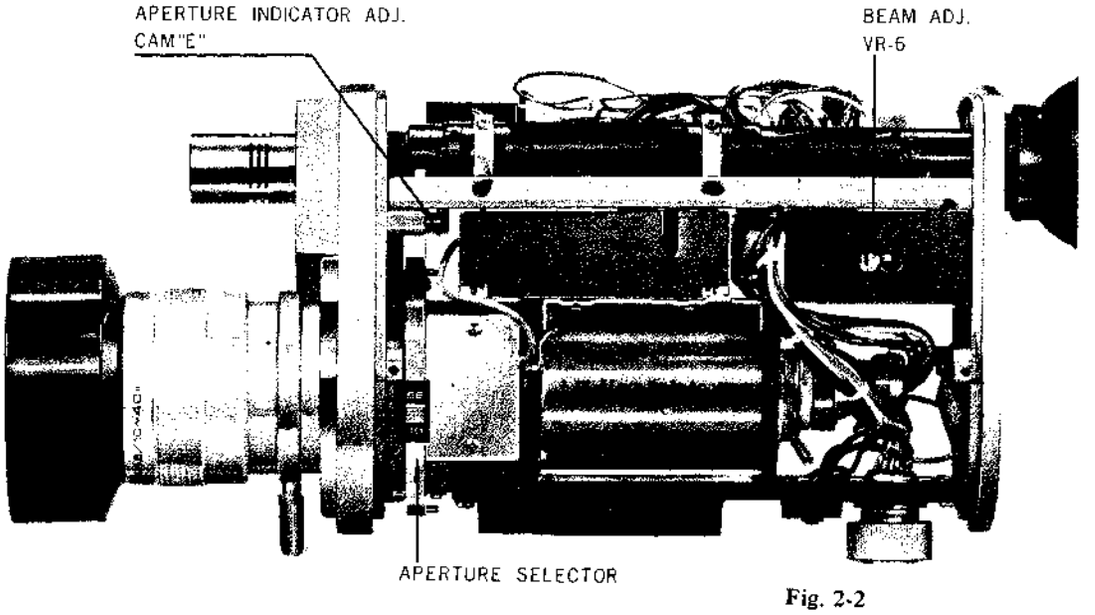

APERTURE INDICATOR ADJ.
CAM"E"
BEAM ADJ.
VR-6
APERTURE SELECTOR

Fig. 2-2

SECTION 2-6
ADJUSTMENTS

1. **Confirmation of Deflection (for preventing vidicon sticking)**
   a) Disconnect +9 V power supply lead wire (red/yellow/white) of High Voltage Generator Circuit. (Ref. to fig. 2-2).
   b) Connect an oscilloscope to Vertical Yoke Terminal of Deflection P.C. Board and confirm that there is a waveform as shown in Fig. 2-3.

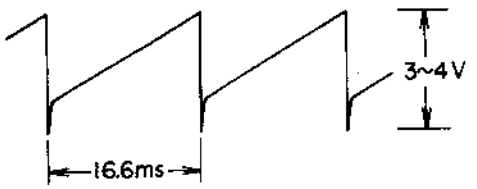


Fig. 2-3 Vertical Deflection Waveforms

   c) Connect an oscilloscope to Horizontal Yoke Terminal of Deflection P.C. Board and confirm that there is a waveform as shown in Fig. 2-4.

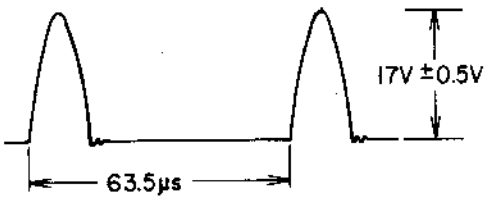


Fig. 2-4 Horizontal Deflection Waveforms

   d) After above checks (items (b) and (c)) have been made, if waveforms are normal, connect the +9 V terminal Power Supply Lead Wire of High Voltage Generator Circuit.

2. **Focus Adjustment**
   a) Focus Current Adjustment
   Rotate converter lens and adjust focus. Next, adjust VR-4 so that picture on monitor screen is very clear.
   b) Master Lens Adjustment
   Under conditions shown in Fig. 2-1, set converter lens distance scale to 2 meter position, and rotate master lens until picture on monitor screen is focused. Deviation of indicator line must be within 1.5 mm from the center of "the numeral 2" as shown in Fig. 2-5.

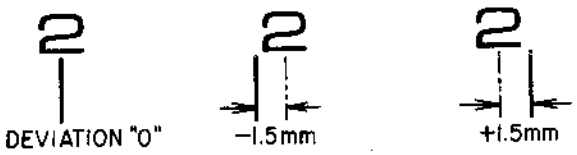


Fig. 2-5

3. **Deflection Coil Position Adjustment**
   If picture is tilted as shown in Fig. 2-6, loosen Screw "D" (fig. 2-2) and turn deflection coil until picture is straight.

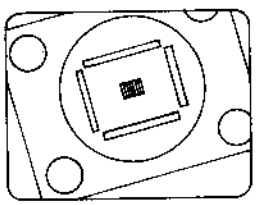


Fig. 2-6

4. **Horizontal Deflection Adjustment**
   (Set monitor to under scanning condition)
   a) Horizontal Hold
   Adjust VR-3 so that the thin line at left edge of raster (on a 19" screen) is about 10 mm (about 3/8") as shown in Fig. 2-7.

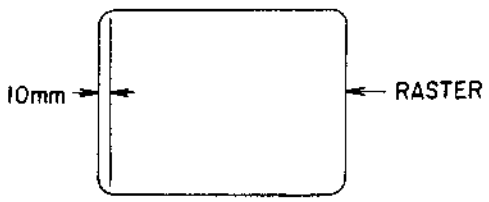


Fig. 2-7

b) Horizontal Size

Horizontal size can be adjusted by turning the upper part of L-2201 metal plate (shown in Fig. 2-2) with a pair of tweezers so that the horizontal size of monitor picture is minimum (maximum scanning condition).

Caution

(Refer to item 5 (b) of Vertical Deflection Adjustment)

5. **Vertical Deflection Adjustment**

a) Vertical Hold

First, turn VR-1 (50 KB) counter-clockwise until picture on monitor screen is at a non-synchronized condition. Turn again clockwise about 60° (to set picture at most stable condition).

b) Vertical Size

Adjust VR-2 (100 Ω) so that vertical/horizontal ratio of picture on monitor screen is 3 : 4.

If horizontal width of picture is too long even with VR-2 turned to maximum clockwise position, adjust horizontal size at L-2201.

Caution

At this time, turn Zoom Lever to wide (10) position. If there is a black shadow at the corner of picture as shown in Fig. 2-8, the center of the Vidicon and the center line of lens do not come together. Loosen coil assembly holding screw and move coil assembly up and down and to right and left until the black shadow becomes minimum. Tighten screw.

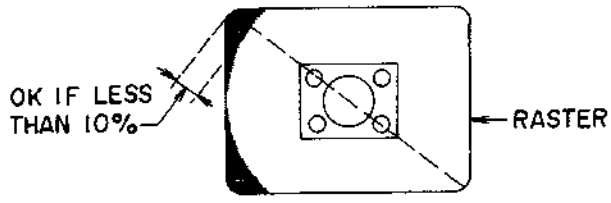


Fig. 2-8

If moving coil assembly does not eliminate shadow to within less than 10%, re-adjust VR-2 and L-2201 so that shadow is minimized.

6. **Video Output Level Adjustment**

Connect an oscilloscope to camera 10P connector Pin 1.

Under conditions in Fig. 2-1, with 1000 Lux lighting intensity at resolution chart, adjust VR-5 so that the composite video signal amplitude is 1.4 V p-p.

7. **Centering Alignment**

Under conditions in Fig. 2-1, when VR-4 is turned, the focus current is changed and the monitor picture tilts sideways. Adjust this condition by turning centering magnets until center of monitor picture and center of raster is aligned.

8. **Video Amp. Characteristic Adjustment**

Adjust VC-1 (shown in Fig. 2-2) so that a smeared or shiny white line does not appear following thick black line on resolution chart. (Ref. Fig. 2-9)

Fig. 2-9

9. **Beam Adjustment**

Aim camera at a florescent light. Zoom lever from TELE (40) to Wide (10) and adjust VR-6 (shown in Fig. 2-2) so that the white part of picture is clear (not out of focus).

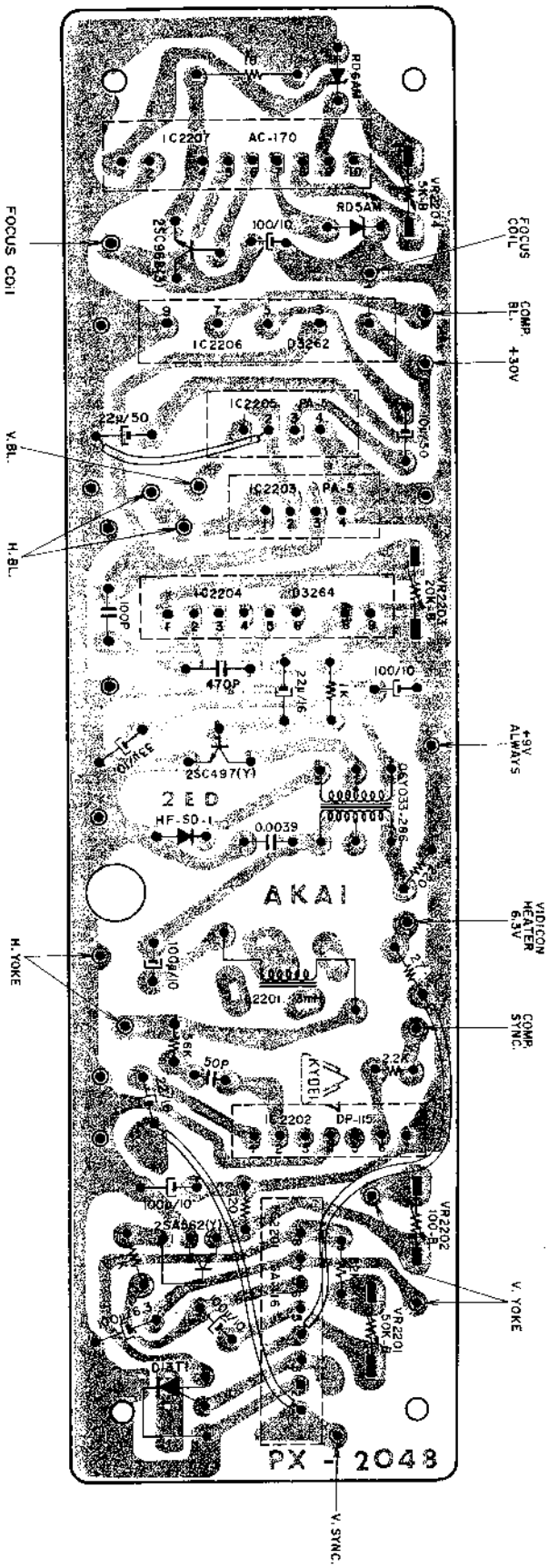


Fig. 2-10 Deflexion P.C. Board PX-2048

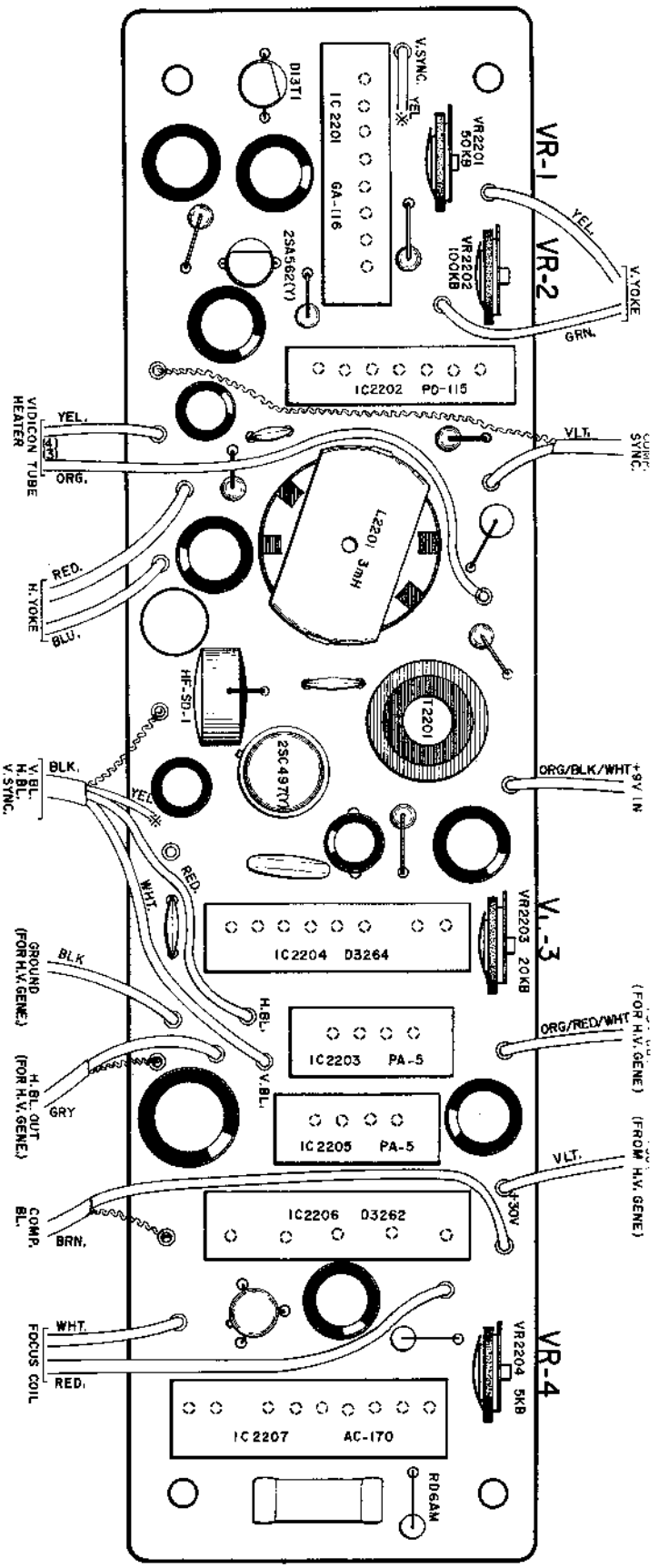
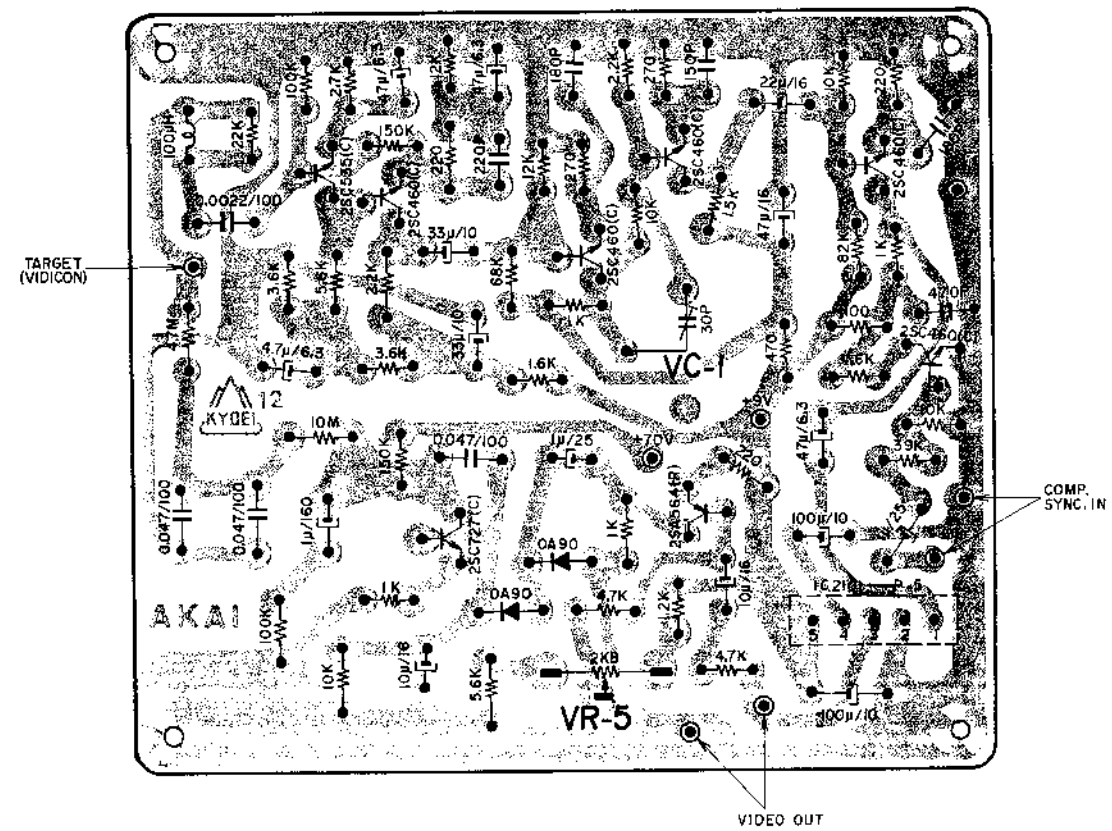
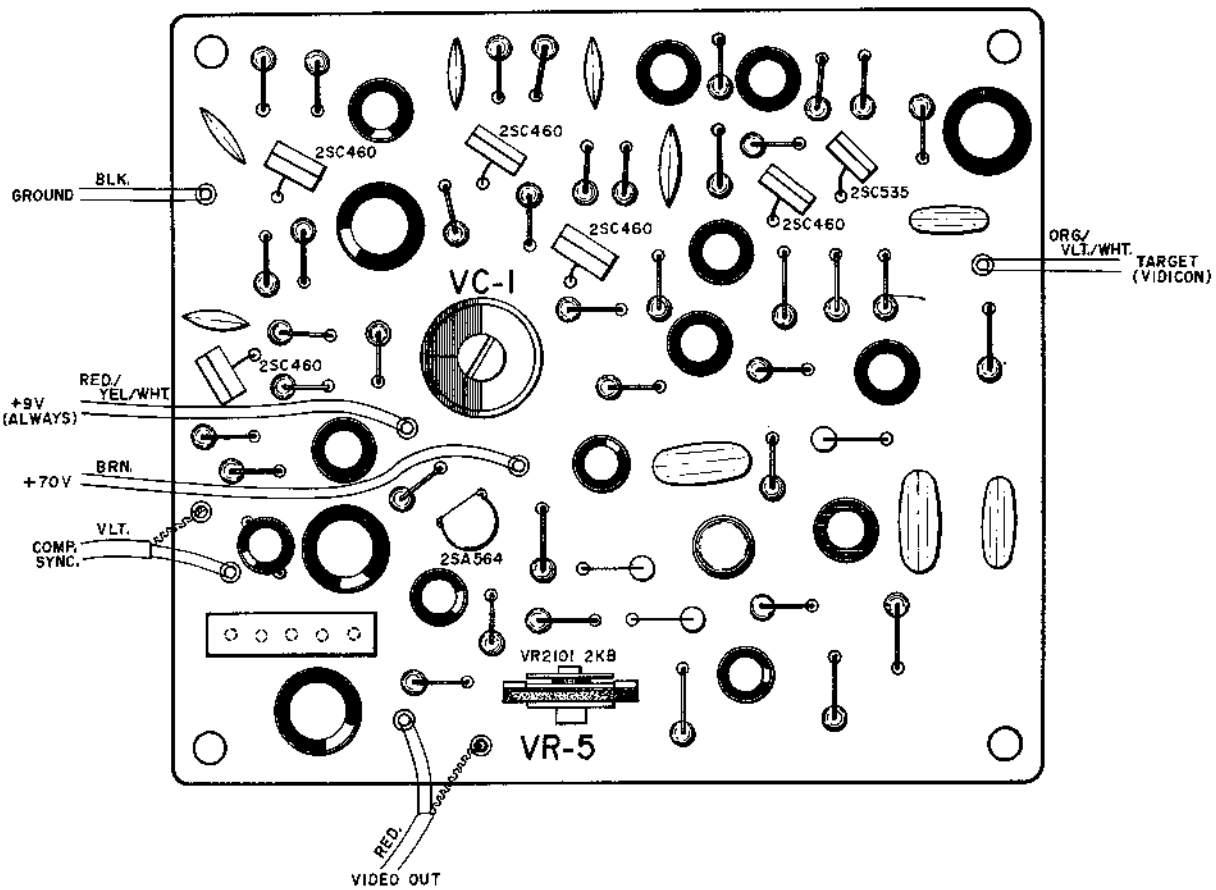


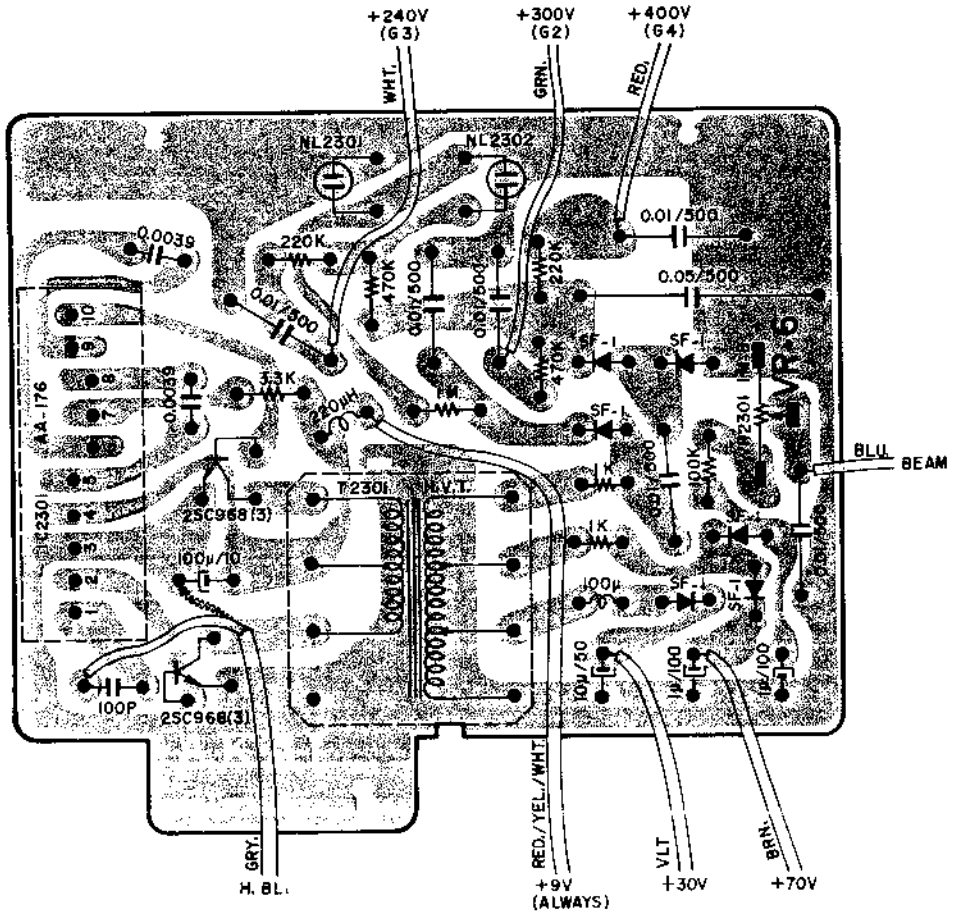
Fig. 2-11 Deflexion P.C. Board PX-2048



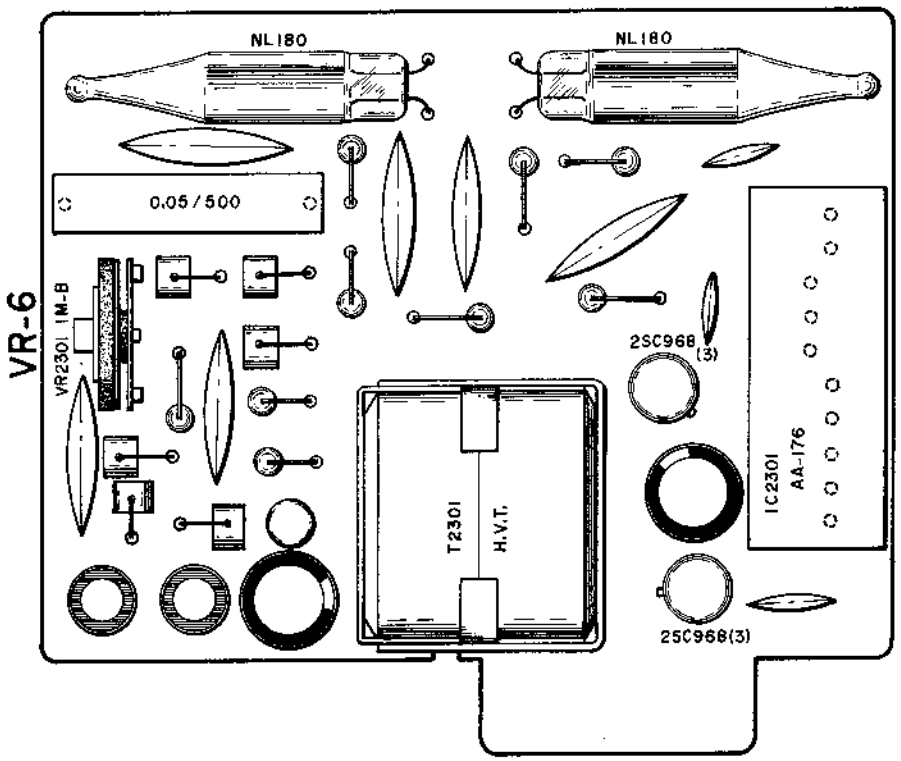
Video Amp. P.C. Board PX-2047



Video Amp. P.C. Board PX-2047



H.V. Generator P.C. Board PX-2049



H.V. Generator P.C. Board PX-2049

SECTION 2-7
OPTICAL ADJUSTMENTS (View Finder)

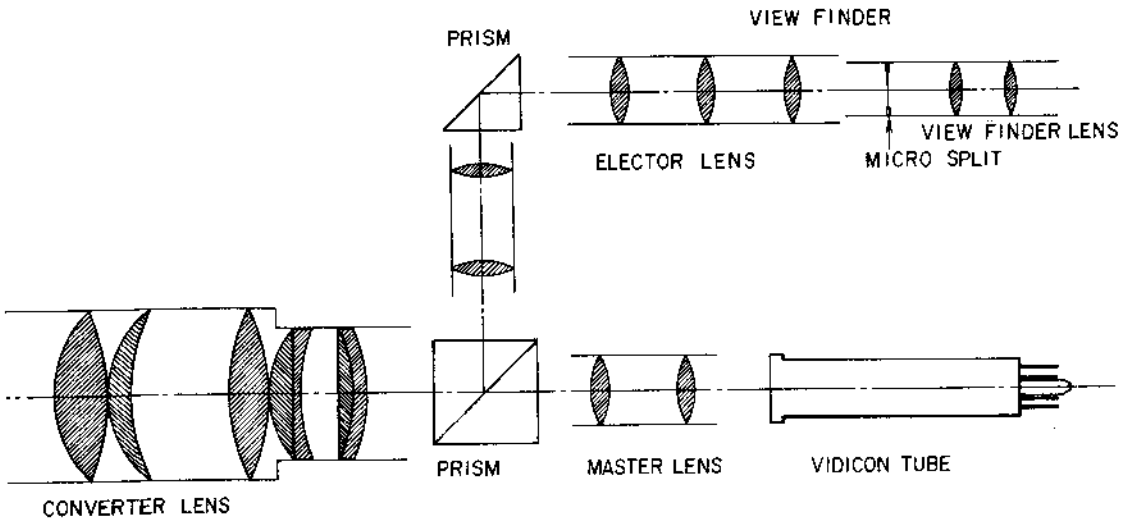


Fig. 2-10 Optical Diagram

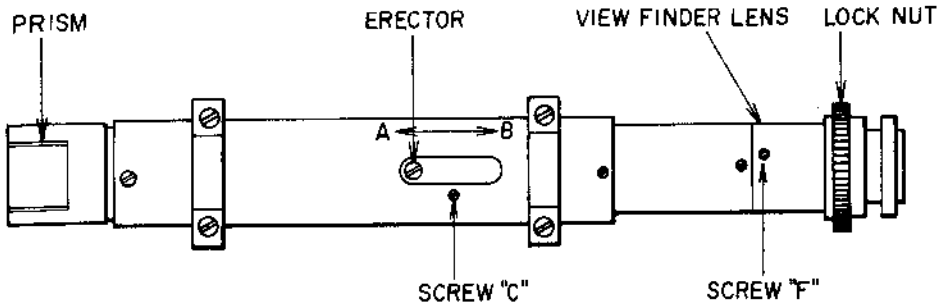


Fig. 2-11 View Finder

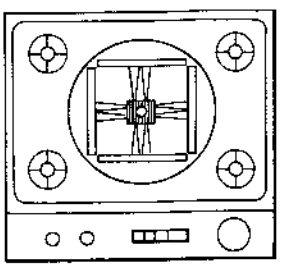
Ref. Figs. 2-10 and 2-11

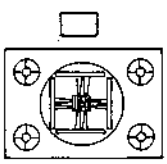
1. Under conditions shown in Fig. 2-1, set camera so that picture of resolution chart is positioned in the center part of monitor screen.
   Look at scene through view finder. If picture reflected in view finder is the same as that on monitor screen, optical adjustment is not necessary.

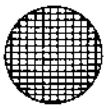
2. Adjust View Finder Lens so that Microsplit in center of view finder is clearly visable.

Caution

Before adjustment of view finder lens, loosen lock not. After adjustment, tighten lock nut to hold at adjusted position.





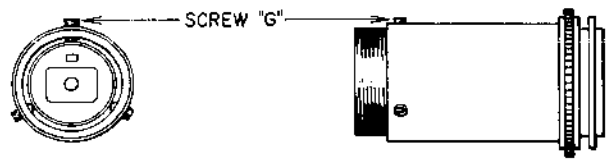


Microsplit

Fig. 2-12

3. Loosen Screw "C" (shown in **(Fig. 2-11)** and adjust erector so that the vertical stripe on resolution chart is clearly visable. At this time the monitor picture must be focused. Move erector position between points A and B **(Fig. 2-11)** until two perfectly focused points are found and set to focused position nearest to point A.

4. When camera is set so that the center of monitor picture is in center of screen, if picture in view finder is not aligned, proceed with the following adjustments :
   a) If picture is too high or too low, loosen screws on both sides of prism **(Fig. 2-11)** and change position of prism angle until picture is properly positioned.
   b) If picture is too far to either side, loosen the "F" screws (Fig. 2-11) and take off view finder lens. With Screw "G", move Finder Mask to right and left until monitor picture is properly positioned.



5. **Aperture Indicator**
   When Aperture Selector is switched from F 1.8 to F 5.6, a red aperture indicator will appear in top part of view finder.
   If aperture indicator appears as shown in Fig. 2-13 (B) or (C), properly position by turning Cam "E" (Fig. 2-2).

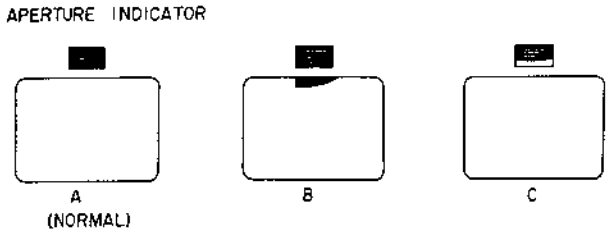
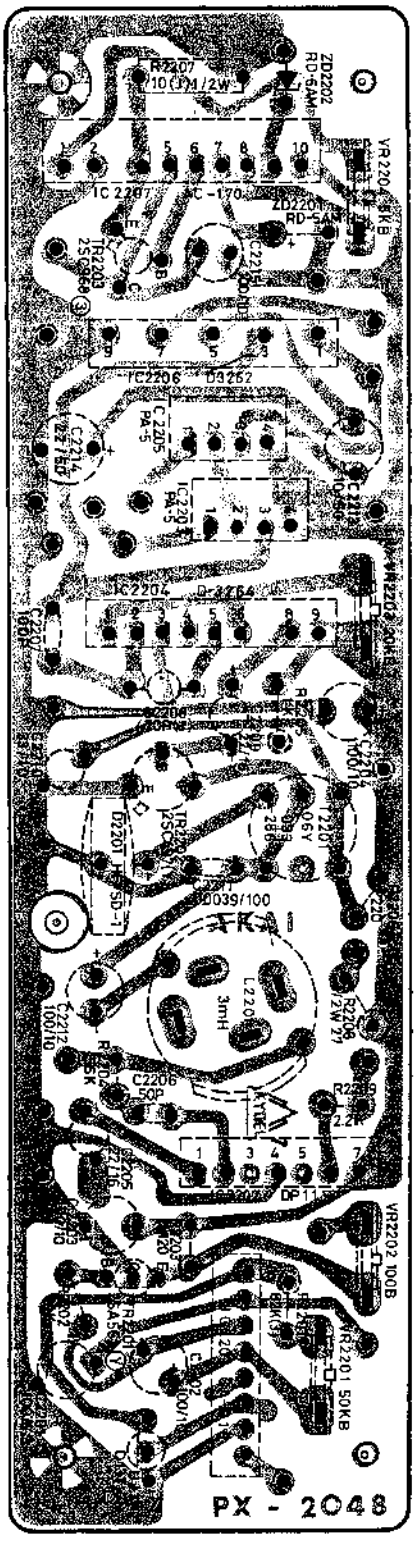


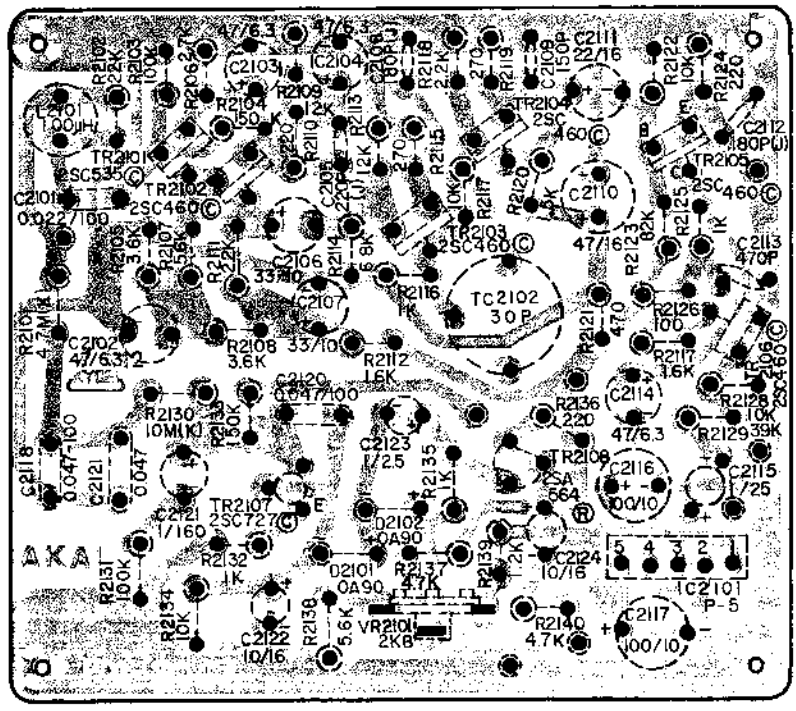
Fig. 2-13

SECTION 2-8
COMPOSITE VIEW OF COMPONENTS

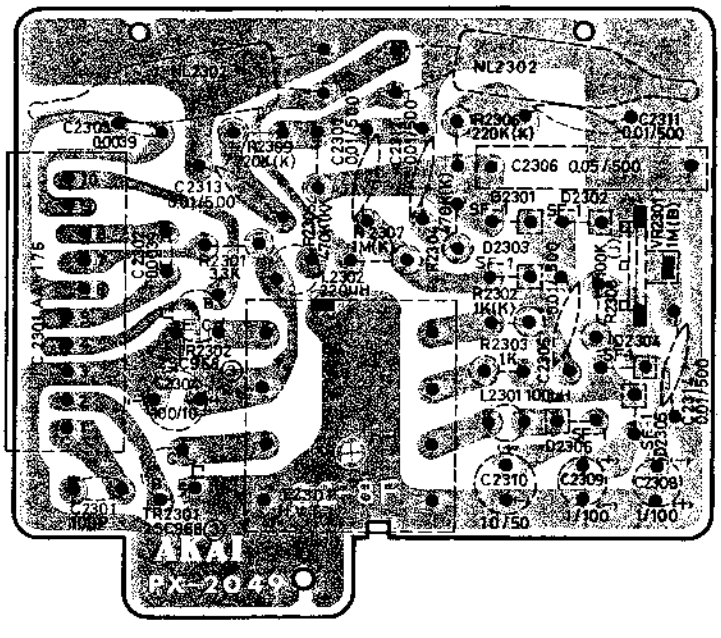
DEFLEXION P.C. BOARD PX-2048



VIDEO AMP. P.C. BOARD PX-2047

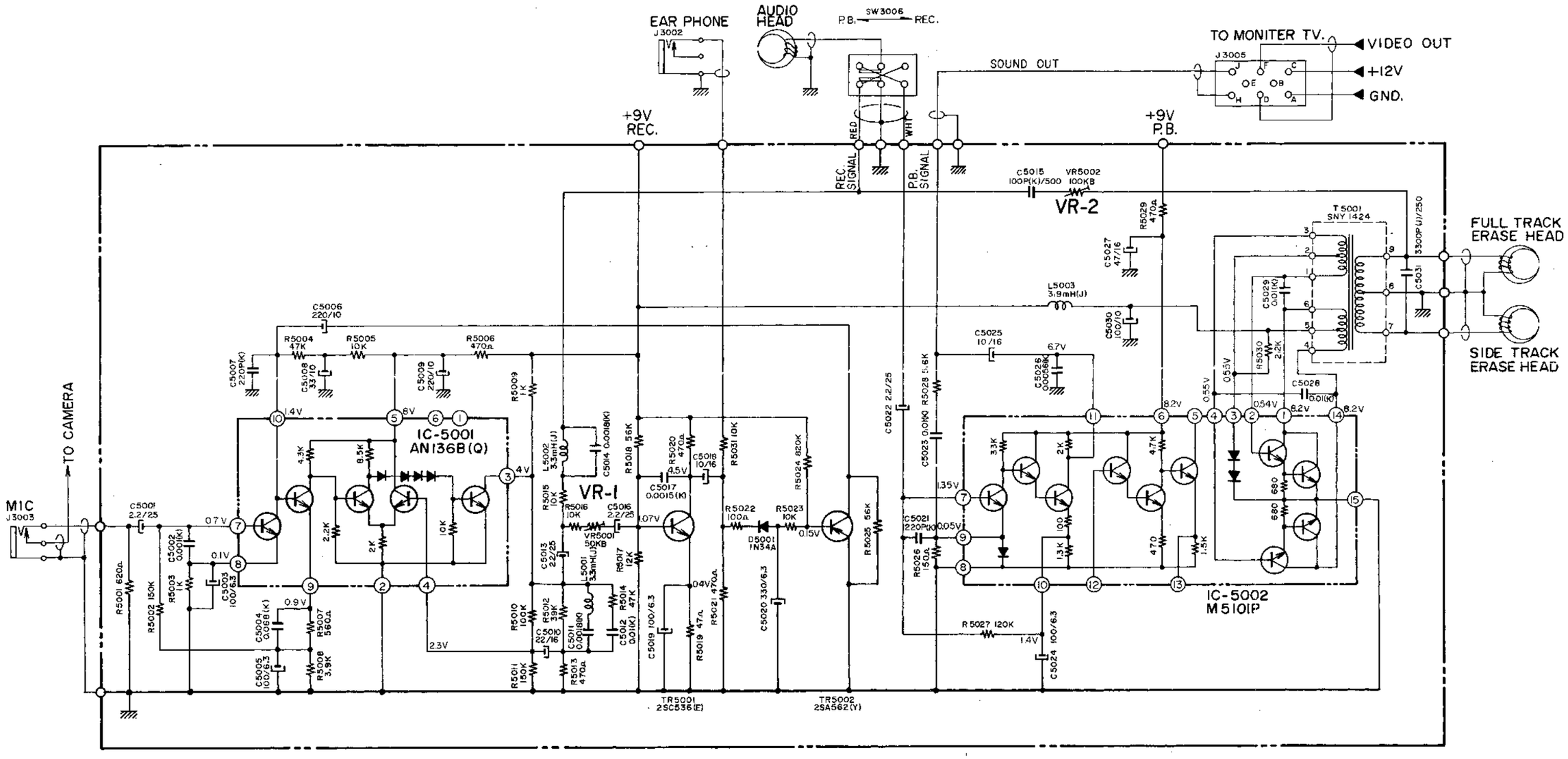


H.V. GENERATOR P.C. BOARD PX-2049



SECTION 2-9
SCHEMATIC DIAGRAM

SYSTEM CONTROL
VIDEO AMP. P.C. BOARD PX-2047 (PX-2-01)
DEFLECTION P.C. BOARD PX-2048 (PX-2-02)
HIGH VOLTAGE GENERATOR P.C. BOARD PX-2049 (PX-2-03)

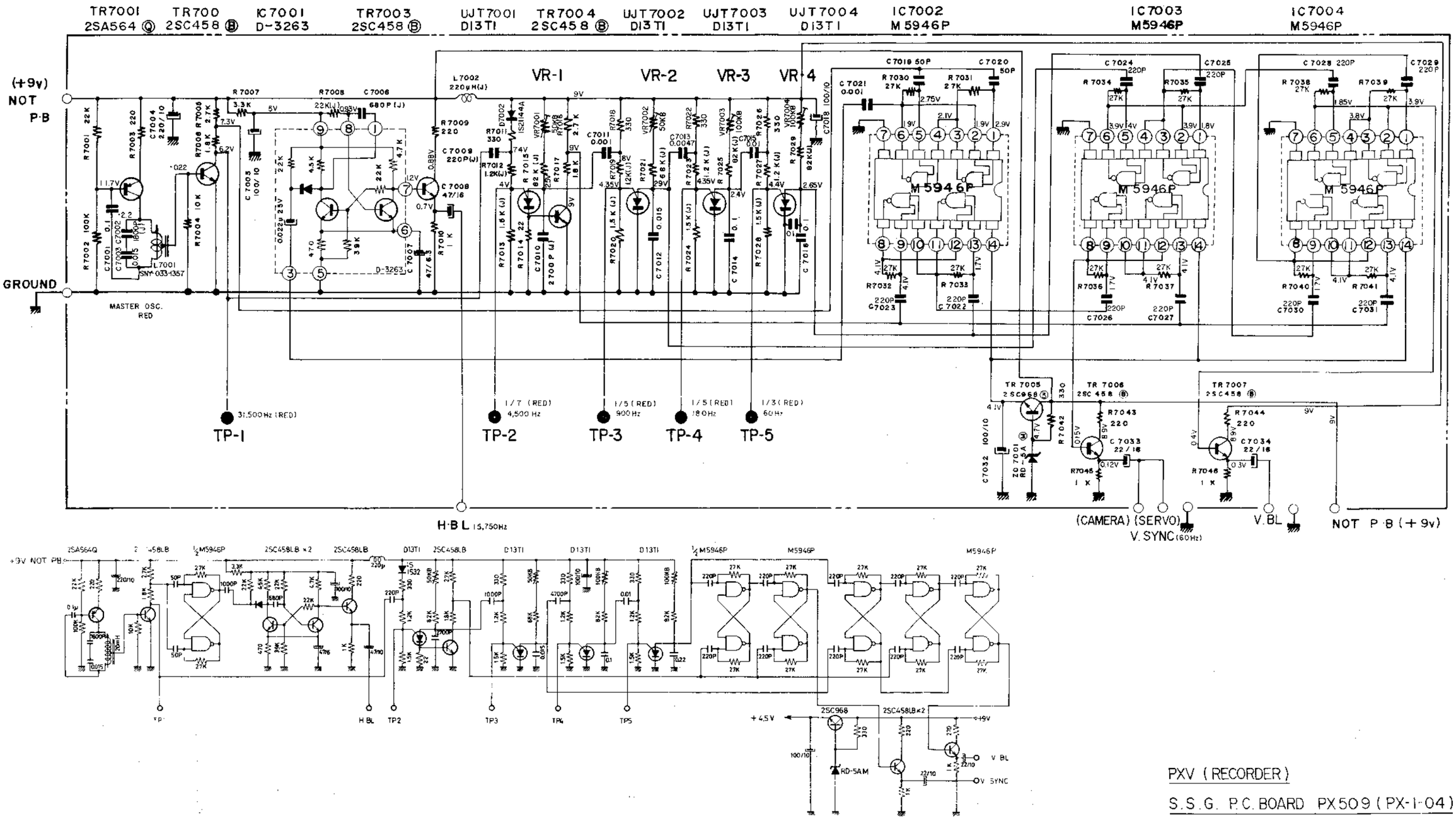


PXV (Recorder)
Audio P.C. Board PX-505 (PX-1-02)

0.	BLK
1.	BRN
2.	RED
3.	ORG
4.	YEL
5.	GRN
6.	BLU
7.	VLT
8.	GRY
9.	WHT

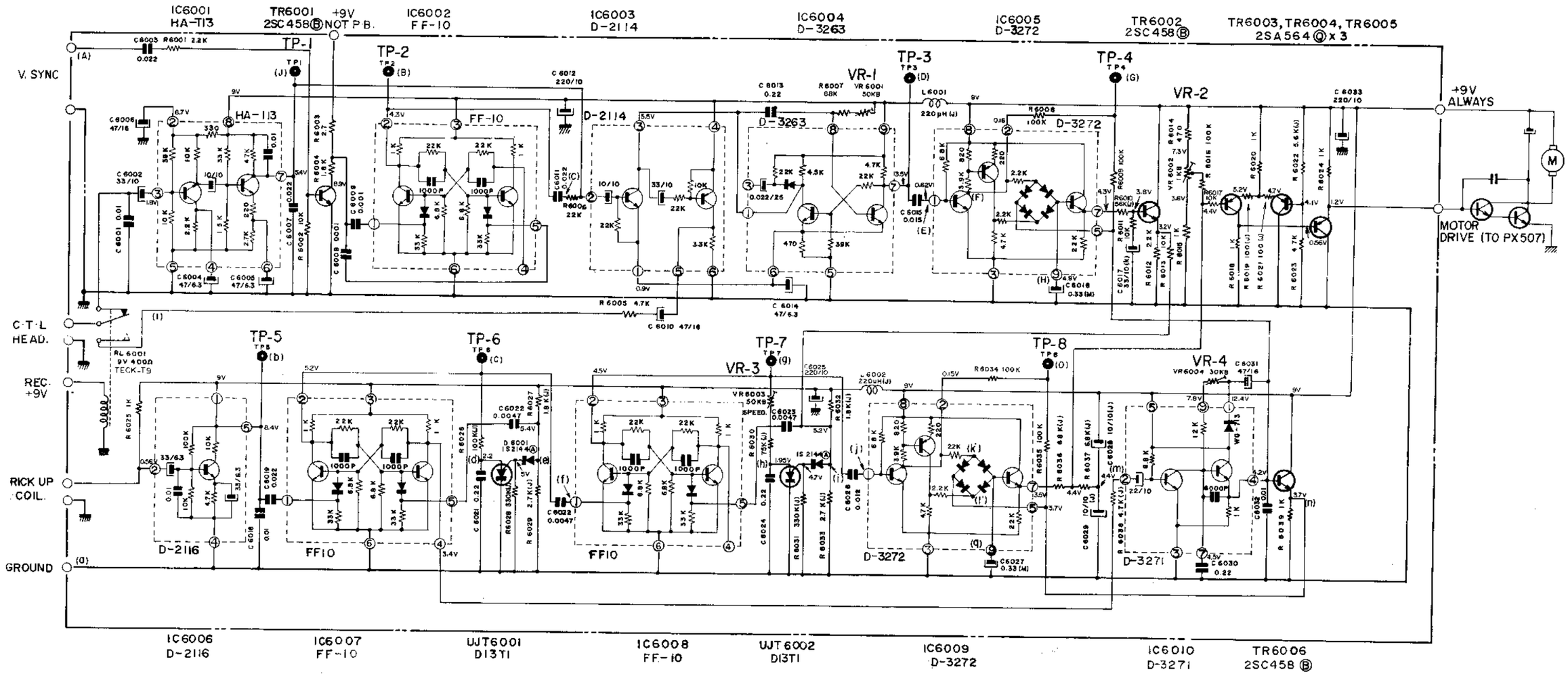
HEAD MOTOR
CAP. MOTOR
PINCH ROLLER SOLENOID
D3001
V06B
SOLENOID DRIVE CIRUIT
PX-508
HEAD MOTOR DRIVE AMP.
CAPSTAN MOTOR DRIVE AMP.
PX-507
REGULATOR
BATTERY CHECKER M3001
TR3001 2SC130Y
+12V +9V B GROUND
SW3002 SL-2
SW3003 SL-2
SW3004 SL-2
SW3005 SL-2
965 REC
222 REC
961 P.B
96 P. B.
GND
+9V 930
J3004
TO CAMERA
PX-504 VIDEO
VIDEO IN
VIDEO OUT
NOT P.B.
P.B.
+9V ALWAYS
GROUND
VIDEO HEADS
EXT. POWER
J3001
FUSE 3A
+12V
CHARGE CURRENT
6V 6V
BATTERY
SW3001
POWER SW.
SW3006
AUDIO HEAD
J3003
MIC
FULL TRACK ERASE HEAD
SIDE TRACK ERASE HEAD
ERASE
PX-505 AUDIO
GROUND HEAD P.B. REC. MIC
EAR
AUDIO OUT
EARPHONE
J3002
CTL. HEAD
CTL
P.U. COIL
PICK UP
HEAD MOTOR DRIVE AMP.
PX-506 SERVO
+9V ALWAYS
REC RELAY
GROUND
NOT P.B.
V.SYNC
PX-509 SSG.
V. BL
H. BL
V.SYNC
GND
J3005
TO MONITOR

PXV (RECORDER) SYSTEM CONTROL N04-1,14012020

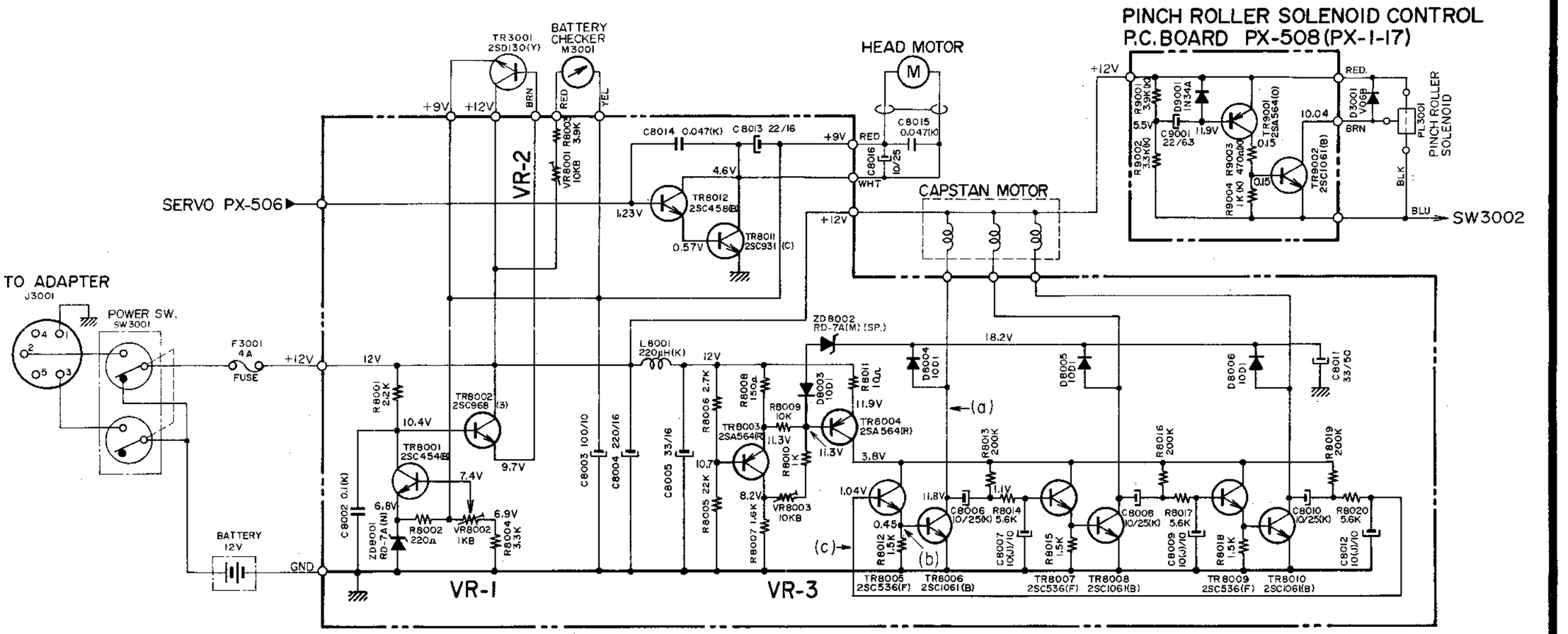


PXV (RECORDER)

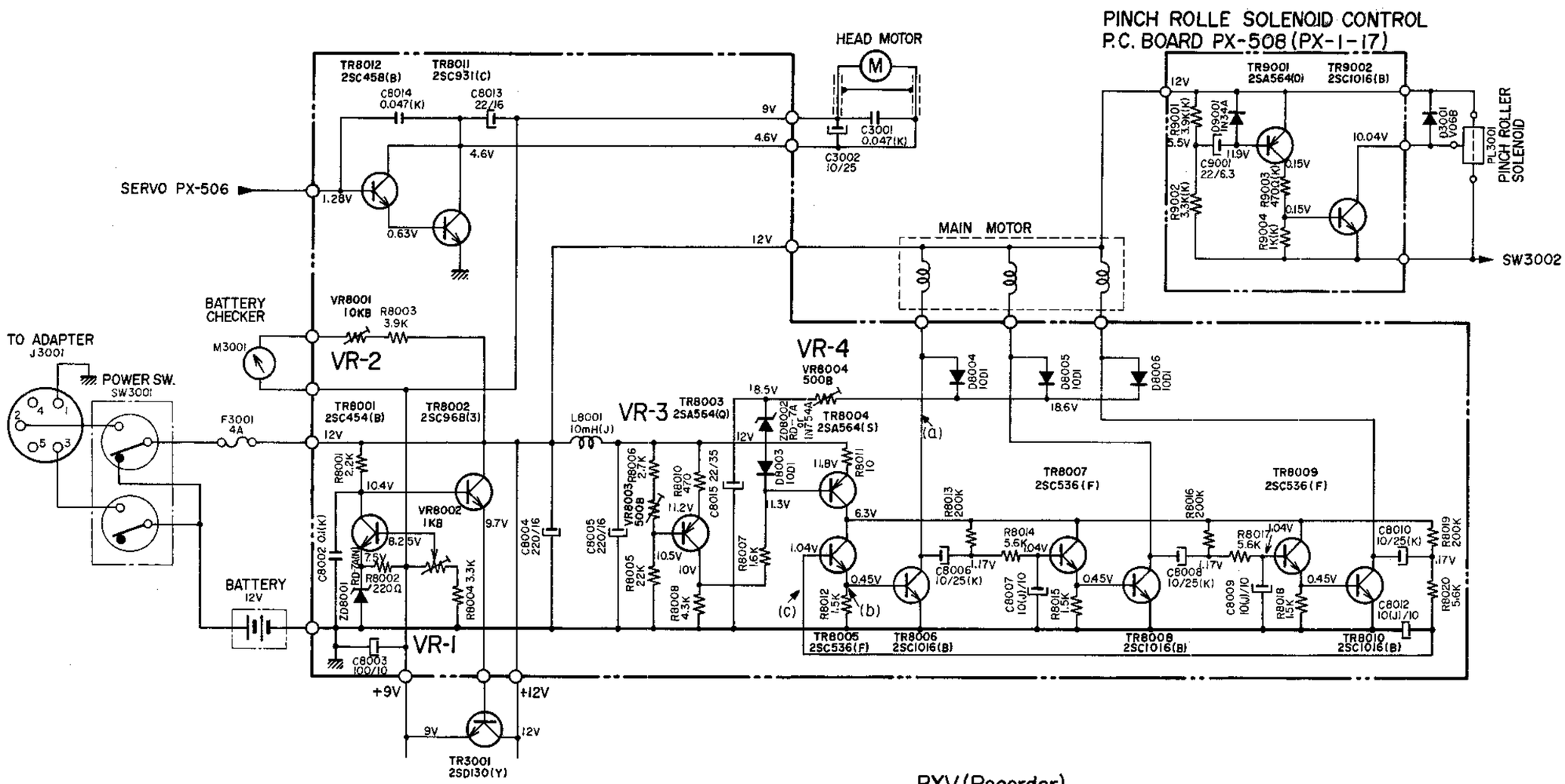
S.S.G. P.C. BOARD PX509 (PX-1-04)



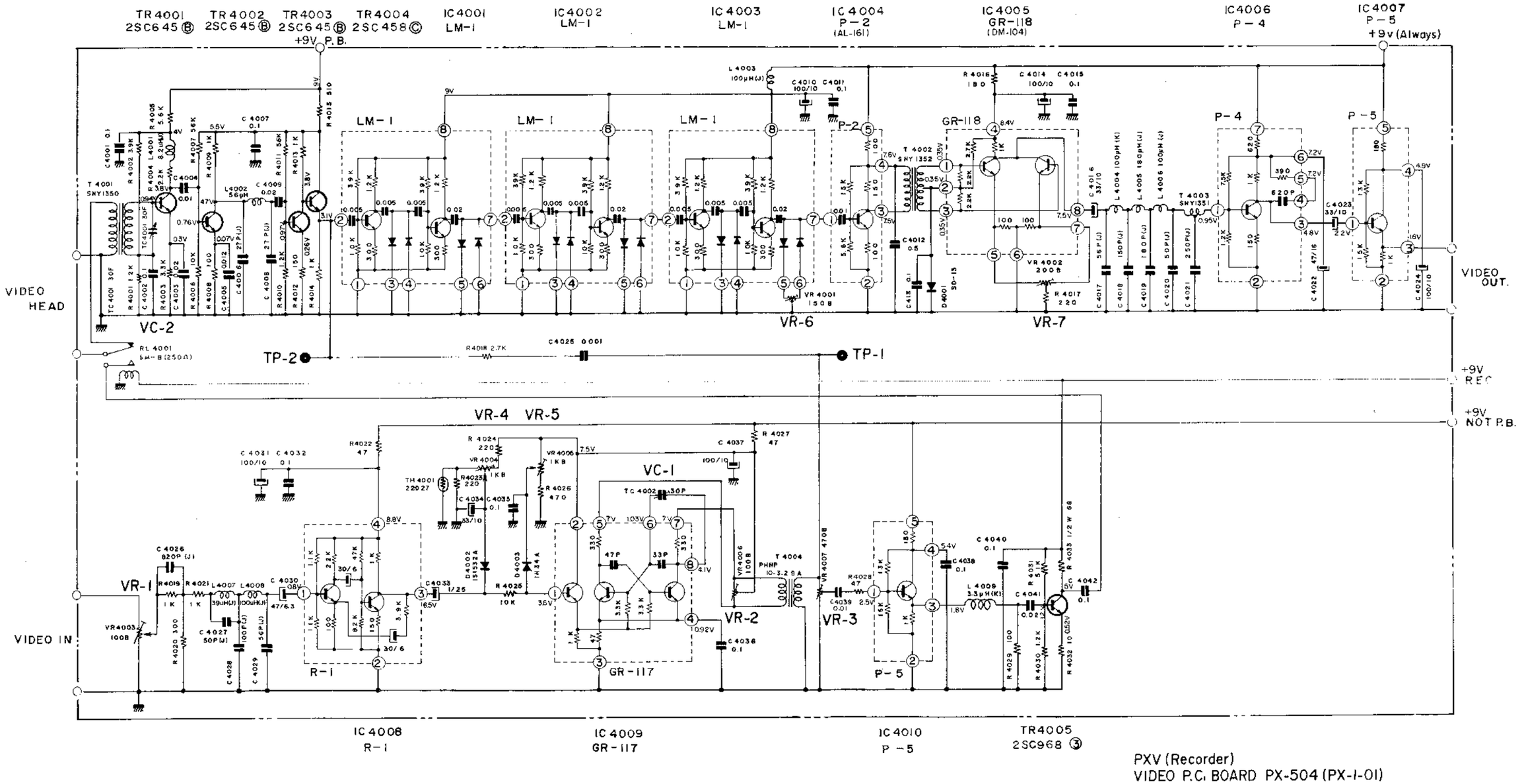
PXV (Recorder)
SERVO P.C. BOARD PX-506 (PX-1-03)



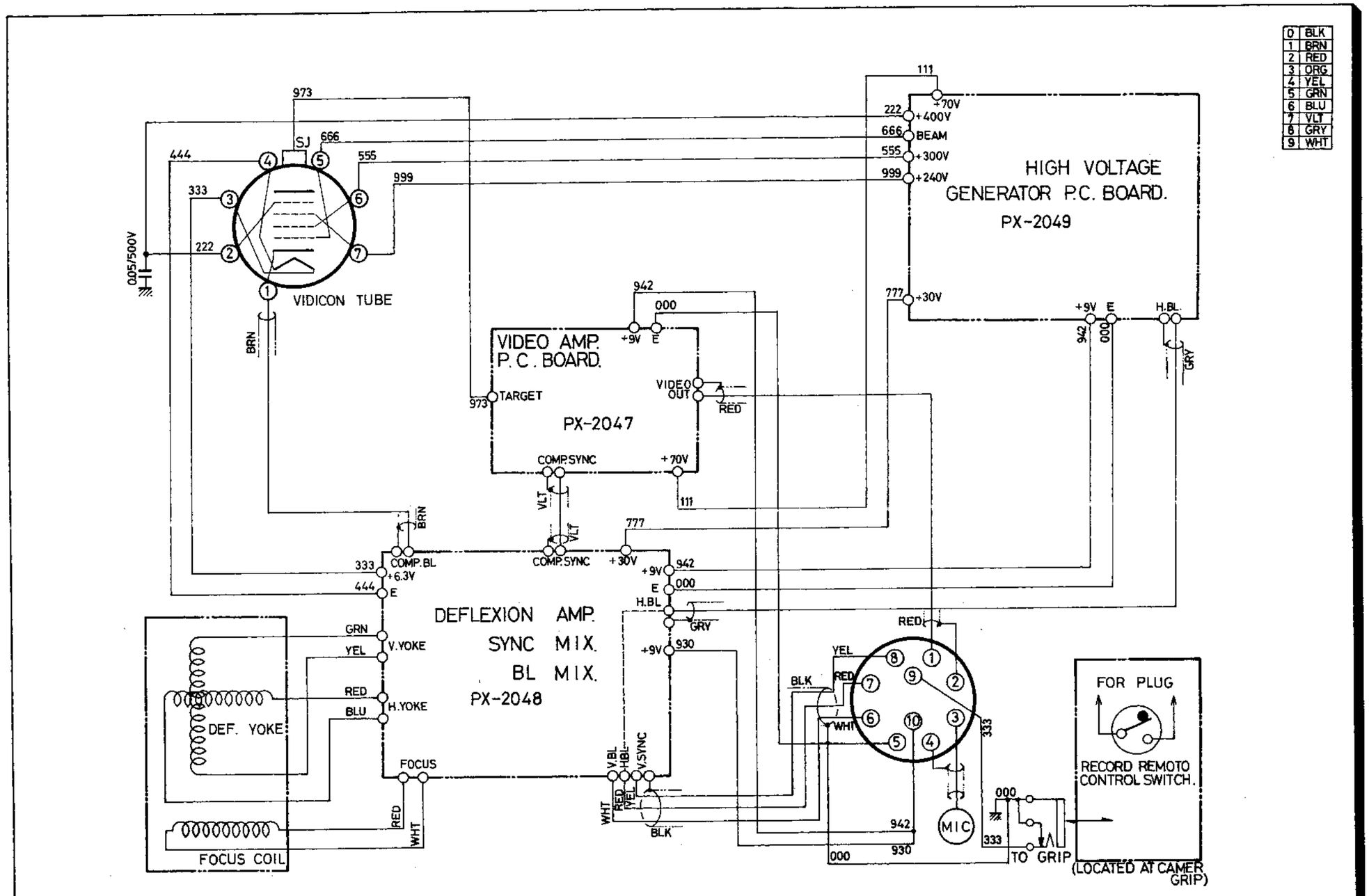
PXV (Recorder)
MOTOR DRIVE & POWER SUPPLY P.C. BOARD
PX-507 (PX-1-05)



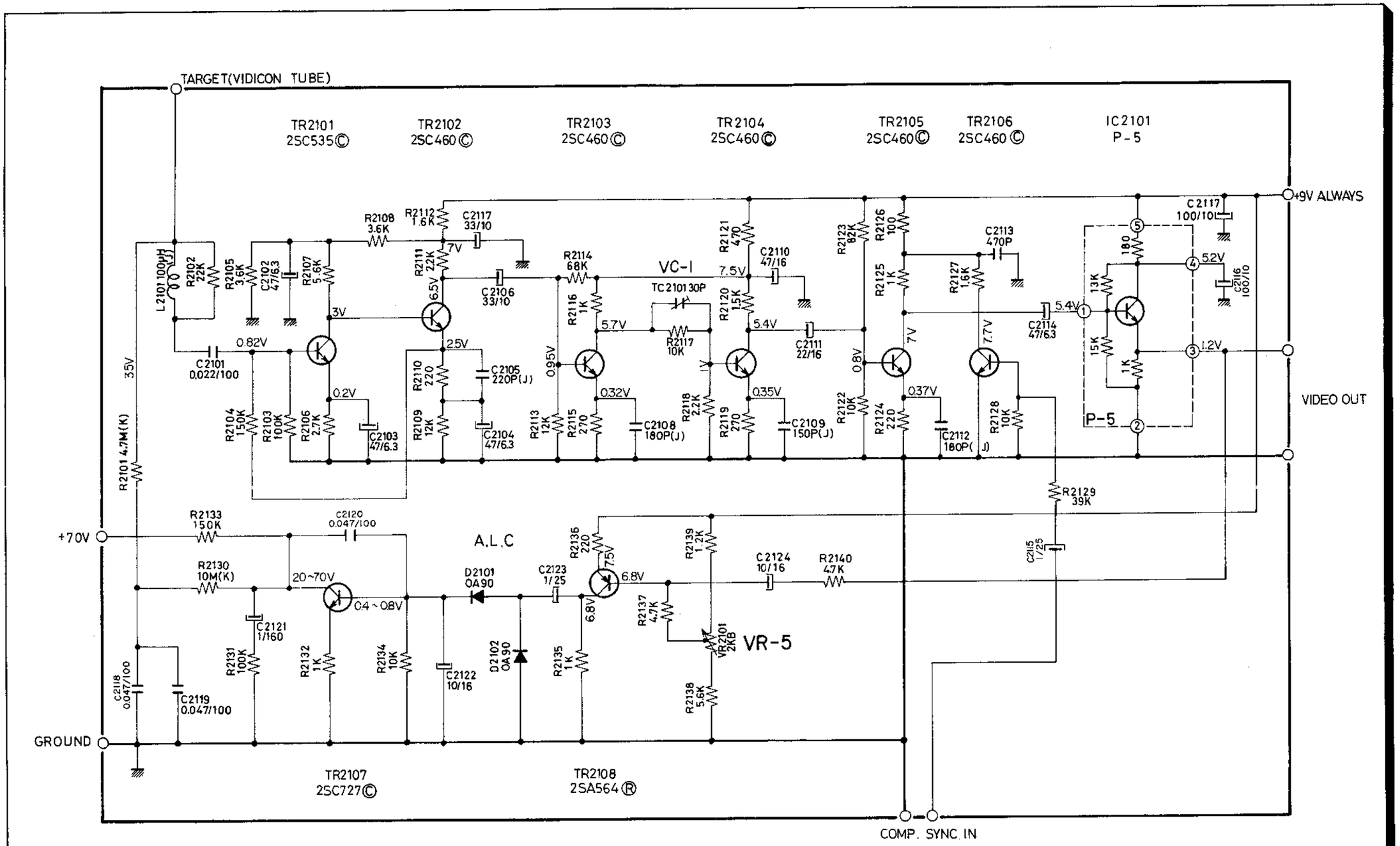
PXV (Recorder)
MOTOR DRIVE & POWER SUPPLY P.C. BOARD
PX-513



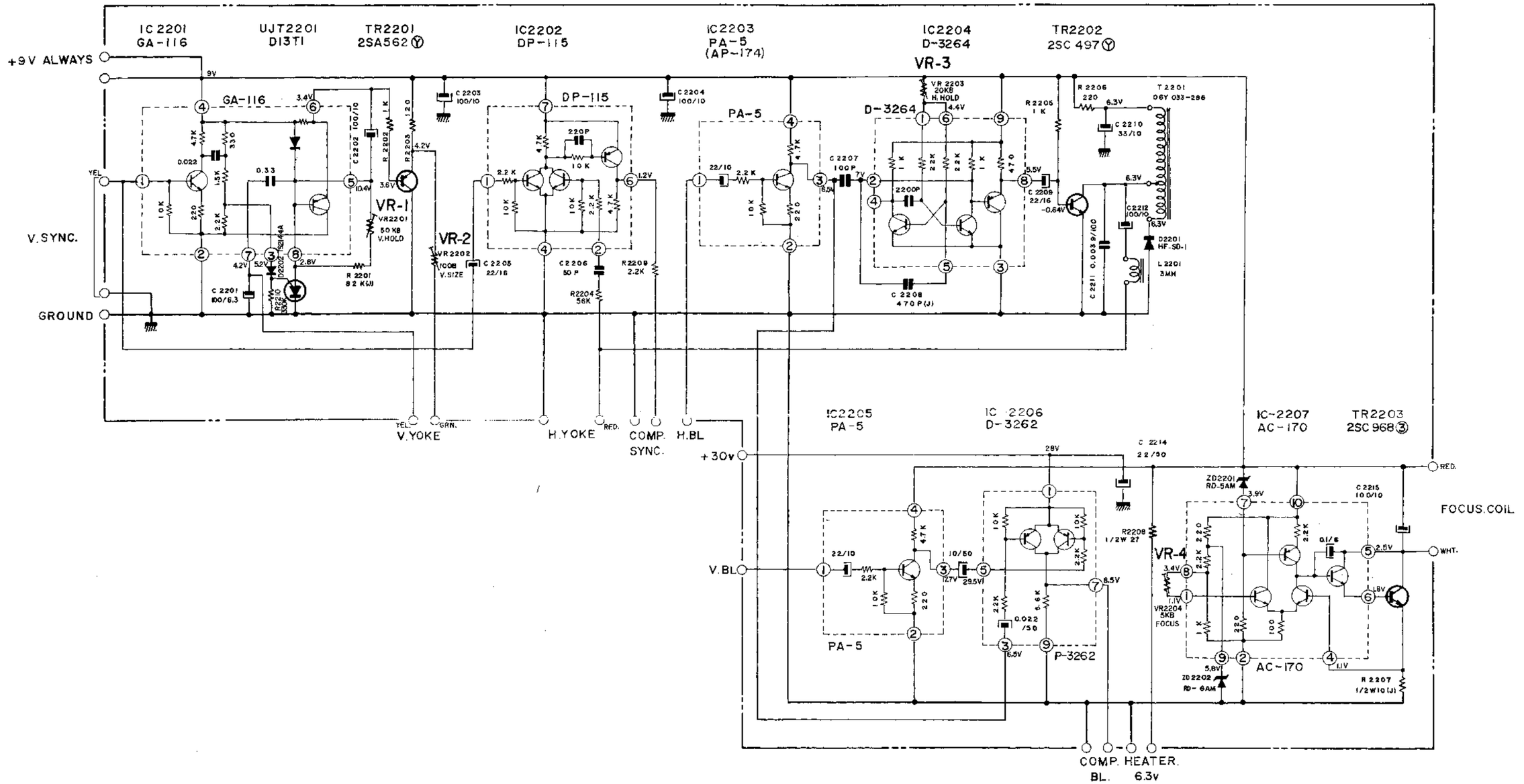
PXV (Recorder)
VIDEO P.C. BOARD PX-504 (PX-1-01)



PXC (CAMERA) SYSTEM CONTROL NQ4-2 14012040

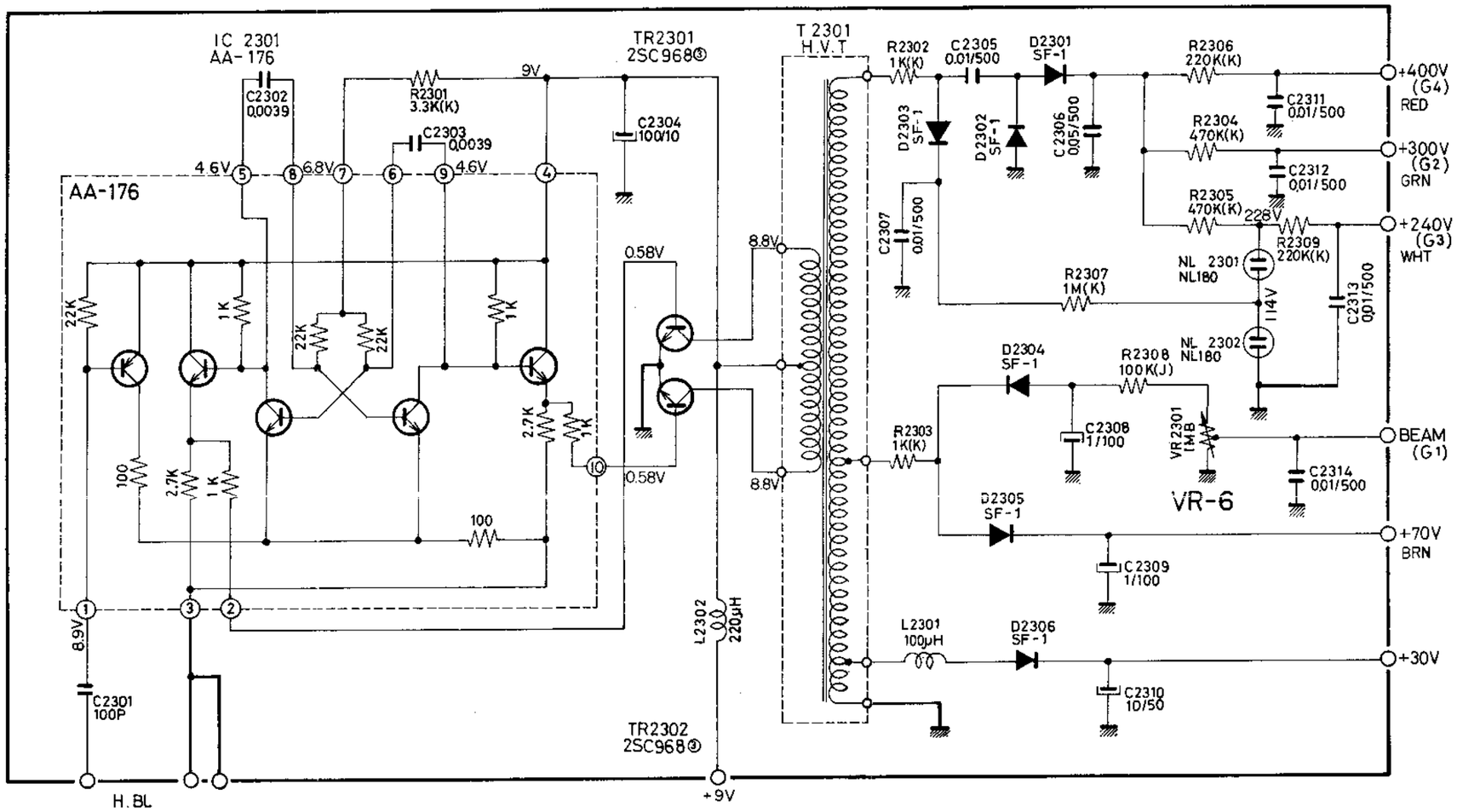


PXC (Camera)
Video Amp. P.C. Board PX-2047 (PX-2-01)



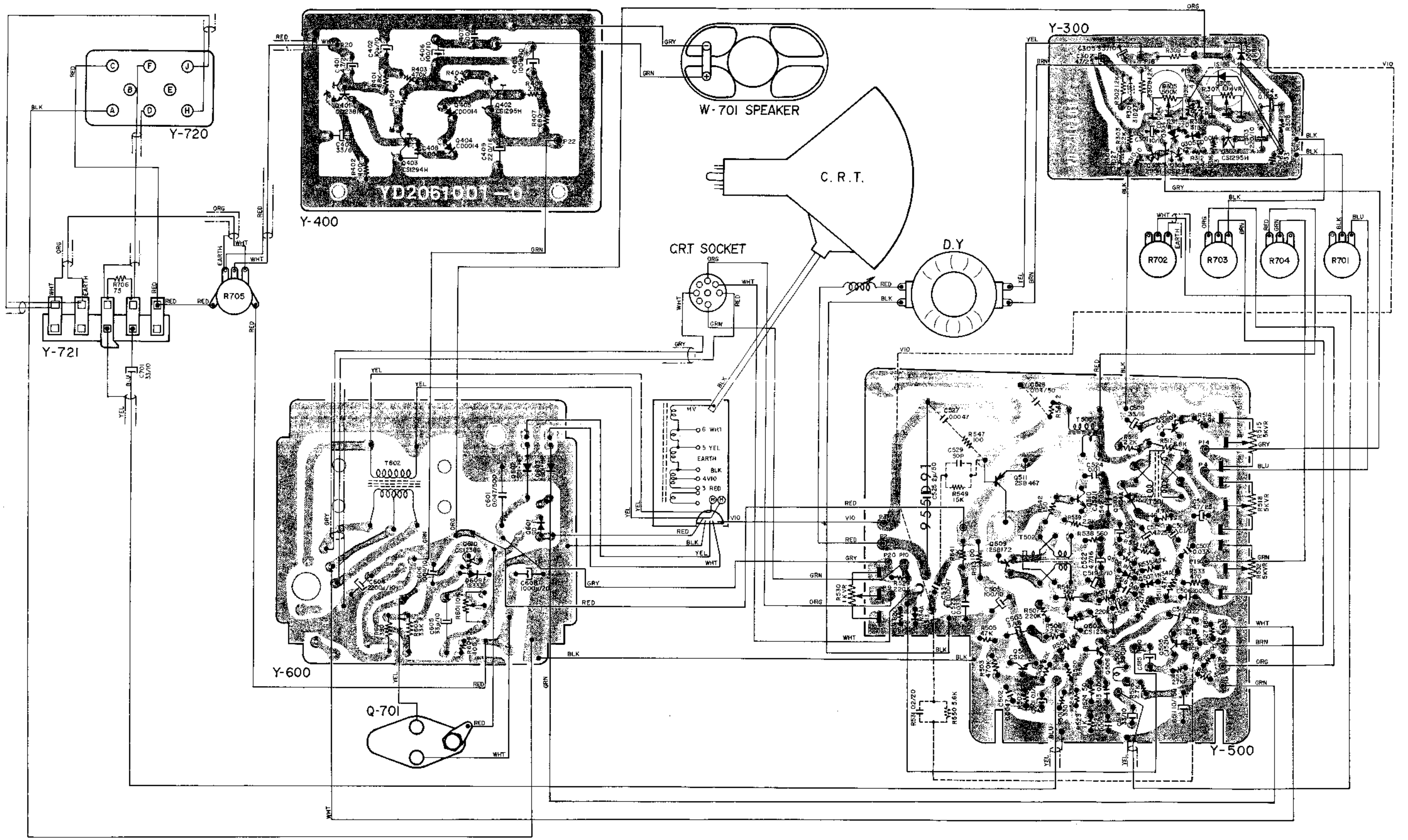
PXC(Camera)
DEFLECTION P.C. BOARD PX-2048 (PX-2-02)

2-9 3

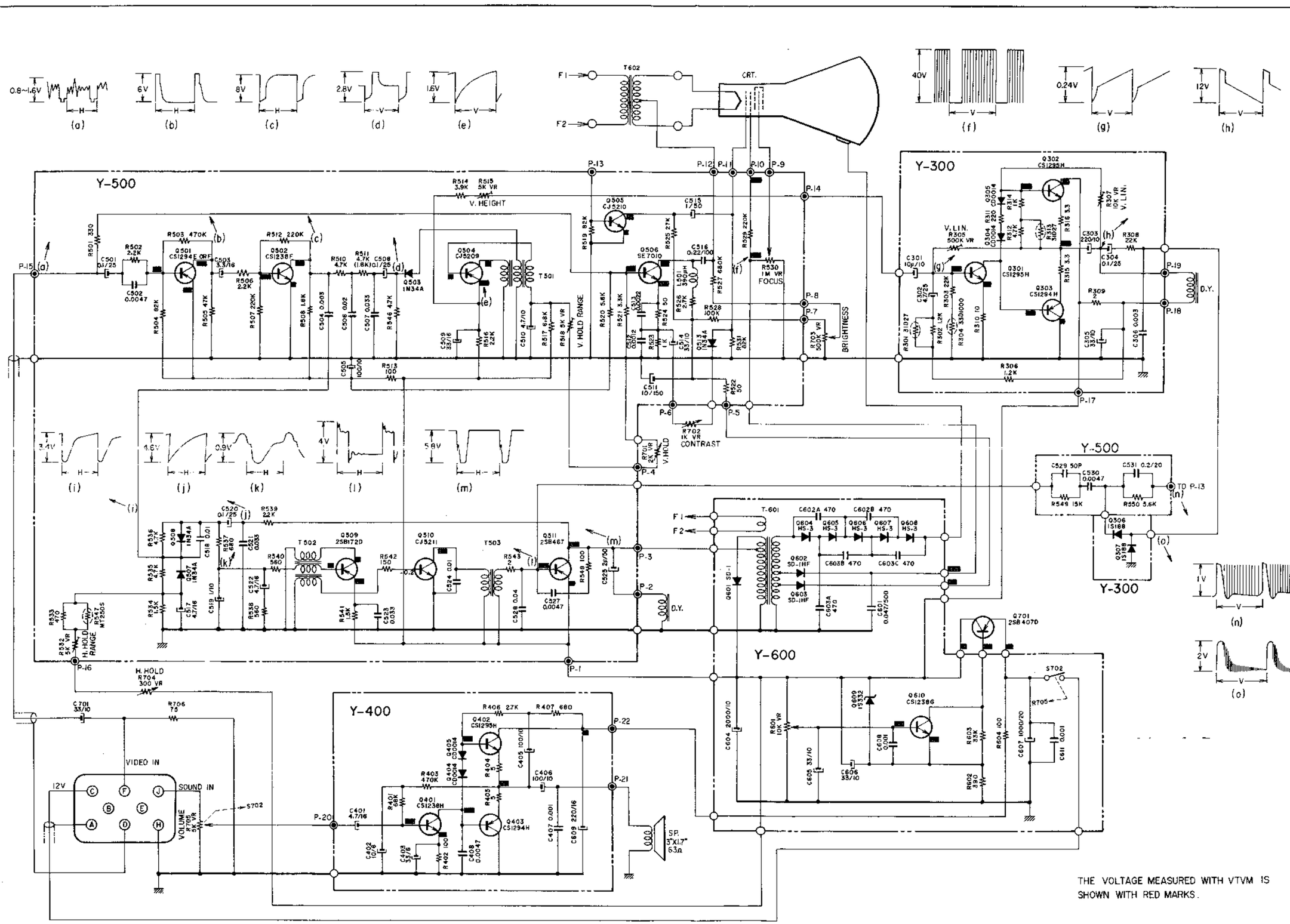


PXC (Camera)

High Voltage Generator P.C.Board PX-2049 (PX-2-03)

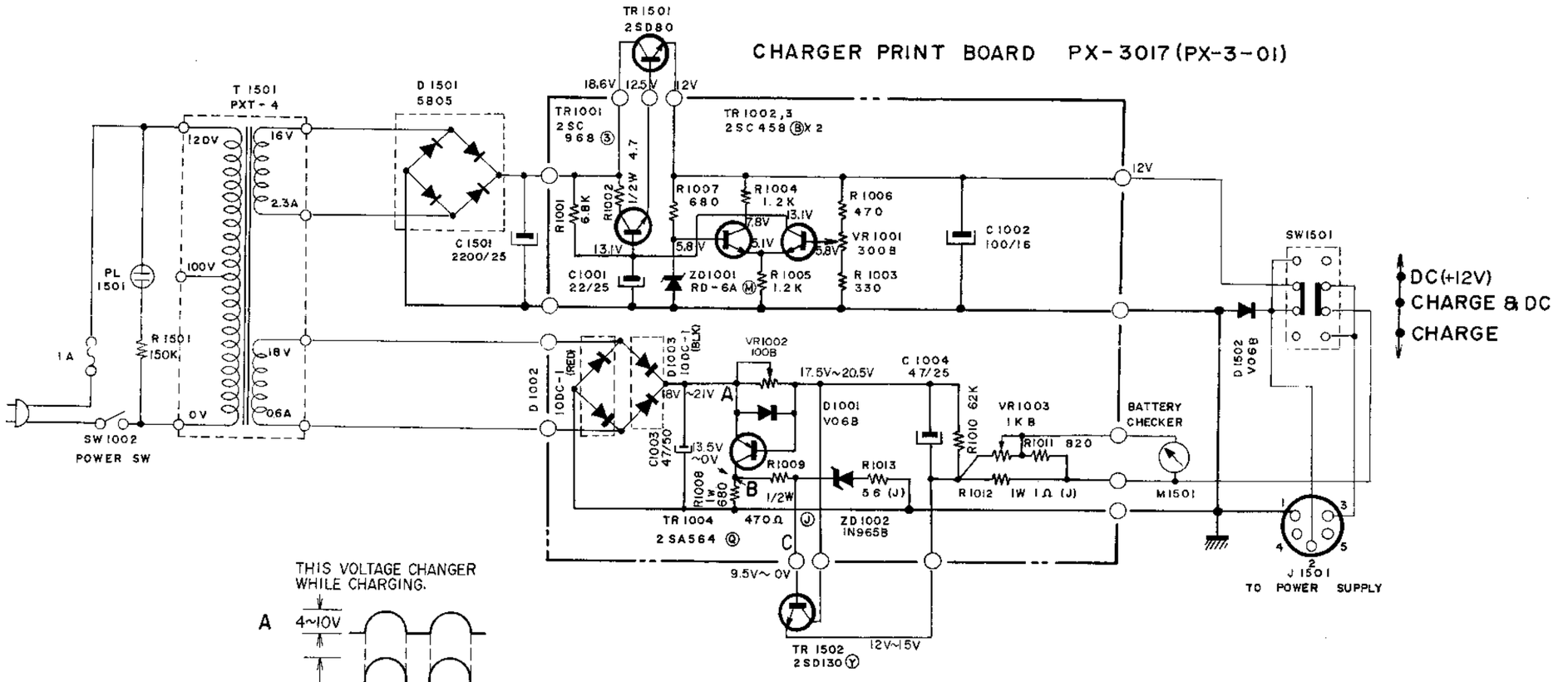


Y-720
Y-721
R706
75
R705
C701
33/10
Y-400
YD2061001-0
W-701 SPEAKER
C.R.T.
CRT SOCKET
D.Y
Y-300
R702
R703
R704
R701
Y-600
T602
Q-701
Y-500
T502
T503
Q511
2SB467
Q509
2SB172

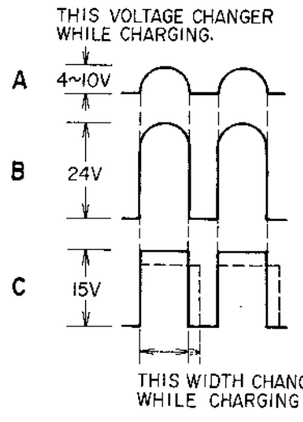


PXM (MONITOR) SCHEMATIC DIAGRAM NO.4-3 14012061

CHARGER PRINT BOARD PX-3017 (PX-3-01)



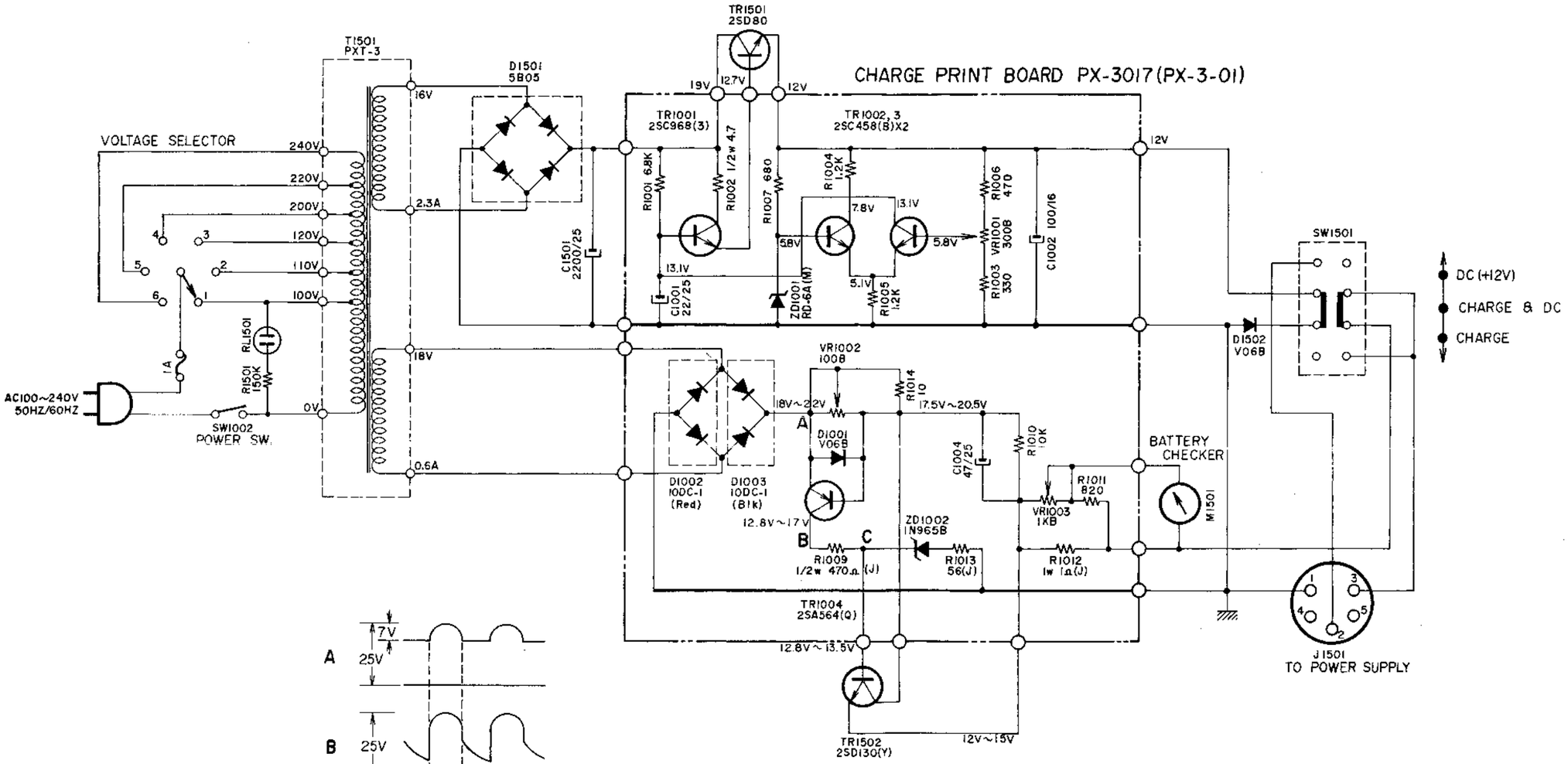
THIS VOLTAGE CHANGER WHILE CHARGING.



A TYPE

(WITHOUT UNIVERSAL TRANSFORMER)

PXA (ADAPTER) SCHEMATIC DIAGRAM NO R, 14012080



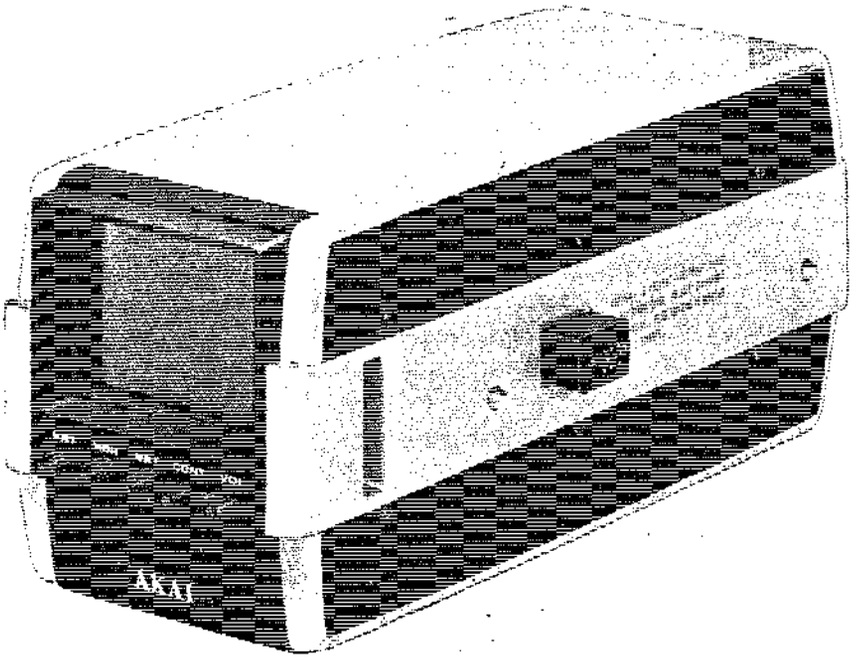
MEASURE WITH OSCILLOSCOPE
(MEASURE WITH DC.)

B TYPE

(WITH UNIVERSAL TRANSFORMER)

PXA(ADAPTER) SCHEMATIC DIAGRAM NO4-4, 14012080

CHAPTER 3
MONITOR (PXM) REPAIR AND ALIGNMENT



SECTION 3-1
SPECIFICATIONS

1) Main Constructure

Effective Picture Size	3″
Cathode Ray Tube Deflection Angle	55 degrees
System of Gun	Uni-potentional
System of Heater	Direct (1.8 V peak to peak)
Power Source	DC 12 V (supplied from recorder)
Speaker	3″ x 1.7″ oval type

2) Electrical Specifications

Luster distortion	3% max.
Non Linearity (Horizontal)	20% max.
(Vertical)	10% max.
Resolution (Horizontal)	250 lines
(Vertical)	350 lines
Sync. Holding Range	
(Horizontal)	300 Hz. min.
(Vertical)	7 Hz. min.
Video Input Level	1.0 to 1.6 V p-p (Negative Sync.)
Video Input Impedance	75 ohms
Video Output Level	20 V p-p min.
Contrast controlled ratio	12 dB min.
Sound Fidelity (-6 dB point)	300 Hz to 2,000 Hz.
Sound input level and impedance	-20 dB (0.774 V rms) 5 K ohms
Sound Max. Output	100 mW min.
Sound Normal Output	80 mW (10% dis.)
Over Scanning	15%
Operation starting voltage	8.5 V p-p (max.)
Heat-up time	2.5 seconds (max.)
Voltage for tull scanning	10.5 V (max.)
Usable Power Source Voltage	16.5 V (max.)
Ripple contents (usable)	0.1 V p-p (max.)
Maximum Power Consumption	3.5 W max.
Temperature characteristics	–5° to +45° centigrade (23° to 113° F)

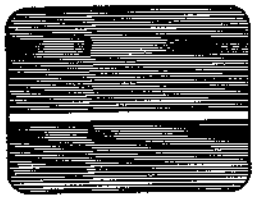
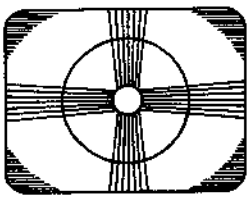
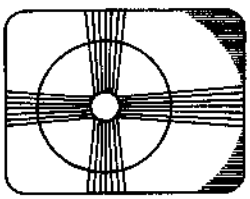
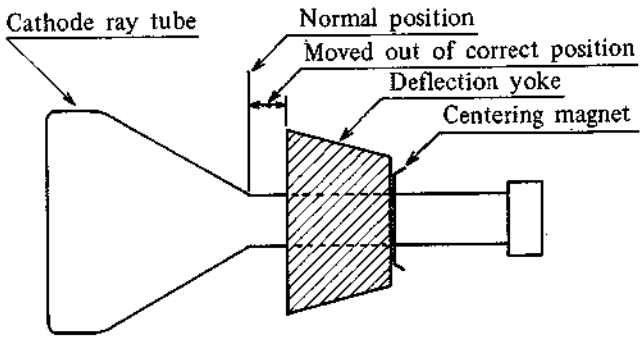
3) Dimensions and Weight

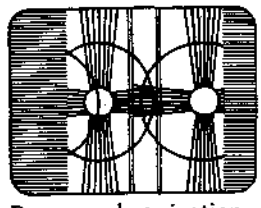
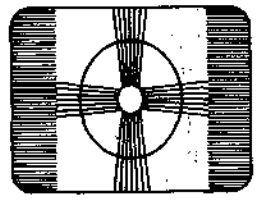
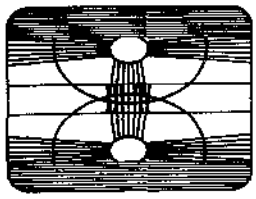
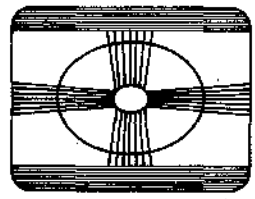
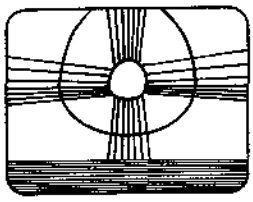
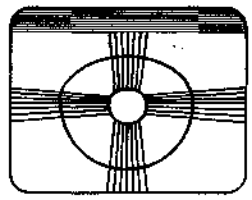
Dimensions	3.8 ″ H x 10.3″ D x 4.4″ W
Weight	3.4 lbs. (1.6 kg)

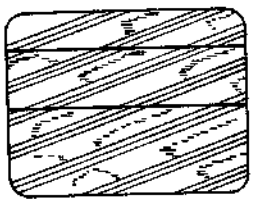
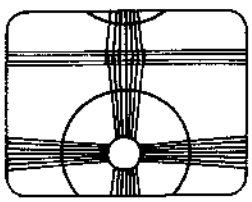
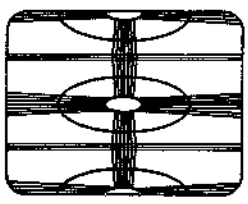
SECTION 3-2
TROUBLE SHOOTING CHART

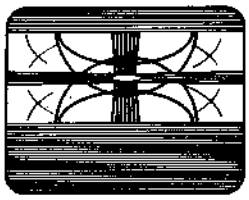
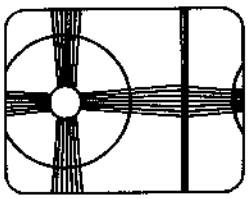
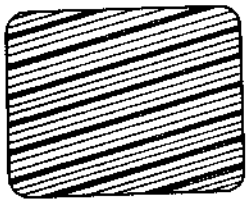
The following checks are made at Stop Mode (Camera and Monitor should be connected)

Symptom	Trouble
• Monitor Switch turned "On", but no power	• VTR Power Switch turned "Off" (Head Motor does not rotate). • Switch S-702 (attached to Volume R-705) defective.
• No Raster Relative circuits to be checked : Electric Power Circuit High Voltage Rectifier Circuit Horizontal Output Circuit Horizontal Amplifier Circuit Horizontal Oscillator Circuit	• With Volume Control Knob at maximum position, check to see whether noise is coming from speaker. If noise is coming from speaker, power source is normal. Check the anode voltage of cathode ray tube. • Remove anode cap from cathode ray tube. With tip of wire (anode lead wire) about 5 mm away from cathode ray tube holder metal fitting, if there is a spark, the voltage is normal. If there is no spark, the voltage is not operating. Check horizontal deflection circuit (Y-500).
Horizontal Defection Circuit Check (there is no spark)	• With an oscilloscope, measure pulse at Q-511 (2SB467) collector. If there is pulse, but no voltage, check the following : 1. Check High Voltage Rectifier Q-604 (HS-3) through Q-608 (HS-3). 2. Check Q-602 (SD-1HF), Q-603 (SD-1HF), C-601 (0.047/500), C-511 (10/150) and R-522 (50). • No pulse at Q-511 (2SB467) collector (Horizontal Oscillator Circuit not operating). Check the following points : 1. Check blocking transformer T-502 for bad soldering or open circuit. 2. Q-509 (2SB172D) or Q-510 (CJ5211) defective. 3. Check drive transformer T-503 for bad soldering or open circuit. 4. Check C-524 (0.01), C-525 (2/50), C-527 (0.0047) and C-528 (0.04) for short.
• Cathode Ray Tube Circuit Check (there is a spark)	• High Voltage Circuit operating, but no raster. Check voltage of Cathode Ray Tube focus grid (P-9) as well as (P-10). If there is no voltage, check the following : 1. Check Q-602 (SD-1HF), C-601 (0.047/500), R-527 (680K), R-529 (220K), and R-703 (500K-VR). 2. Check to see whether Brightness Control is at minimum position. 3. Check to see whether filament of cathode ray tube has open circuit. 4. Check C-515 (1/50) for short.

Symptom	Trouble
• Vertical Deflection not working (thin horizontal line only across screen) Relative circuits to be checked : Vertical Oscillator Circuit Vertical Amplifier Circuit Vertical Output Circuit  Vertical deflection not working (thin horizontal line only across screen)	• With oscilloscope, check Q-501 (CS-1294E) Emitter to see whether or not a sawtooth wave appears. If there is no sawtooth wave, vertical oscillator circuit is not operating. 1. Check vertical oscillator transformer (T-501) for bad soldering or open circuit. 2. Q-504 (CJ-5209) defective. 3. Check R-516 (2.2K), R-517 (6.8K), R-518 (5K-VR) and R-701 (2K-VR) for open circuit. 4. Check C-509 (33/16) and C-510 (4.7/10) for short. • If sawtooth wave appears at Q-504 (CJ-5209) Emitter, check Q-301 (CS-1295H) circuit. With Oscilloscope, check Q-301 Collector (CS1295H). If there is no waveform, check the following : 1. Q-301 (CS-1295H) defective. 2. Check R-305 (500K-VR), R-303 (22K), R-304 (33D 1000), R-310 (10), R-514 (3.9K) and R-515 (5K-VR) for open circuit. 3. Check C-301 (10/10). and C-302 (4.7/25) for short. • If waveform appears at Q-301 (CS-1295H), Collector, check the following : 1. Q-302 (CS-1295H) or Q-303 (CS-1294H) defective. 2. R-309 (2), R-312 (4.7K), R-313 (31D27), R-314 (1K), R-315 (3.3) or R-316 (3.3) defective. 3. C-303 (220/10) or C-305 (33/10) defective. 4. Deflection Yoke (DY layer shorted or open circuit).
• Neck Shadow Appears on screen Relative circuit to be checked : Deflection Yoke Position  Neck shadow at all four corners  Neck shadow on one side of screen only	• Neck shadow at all 4 corners If position of deflection yoke is moved during transportation, etc., reset to correct position.  • Neck shadow appears on one side of screen only. Adjustment of deflection yoke centering magnet faulty.

Symptom	Trouble
• No Horizontal Deflection Relative Circuits to be checked : Horizontal Coil of Horizontal Output Circuit	1. C-525 (2/50) reduced capacity or open circuit. 2. Horizontal deflection coil open.
• Horizontal Width Insufficient Relative circuits to be checked : AFC Detector Circuit or Horizontal Oscillator Circuit Horizontal Amplifier Circuit Horizontal Output Circuit  Poor synchronization  Synchronized, but width insufficient	• Check to see whether power supply voltage is low. • Check AFC Detector Circuit or Horizontal Oscillator Circuit to see if horizontal synchronization is poor (insufficient horizontal width) 1. Check Q-507 (1N34A), and Q-508 (1N34A). 2. Check R-704 (300-VR), R-532 (5K-VR), R-533 (470), R-534 (1.5K), and R-537 (680). • Synchronized, but width insufficient. Check the following : 1. Reduced capacity of C-525 (2/50) 2. Short in horizontal deflection coil layer. 3. Faulty insulation of Fly-back Transformer T-601.
• Insufficient Vertical Deflection Relative Circuits to be checked : Vertical Oscillator Circuit Vertical Amplifier Circuit Vertical Output Circuit  Poor synchronization  Synchronized, but vertical deflection insufficient	• Check to see whether power supply voltage is low. • If synchronization is poor (vertical deflection insufficient), check the vertical oscillator circuit. 1. Check for leakage at C-509 (33/16) and C-510 (4.7/10). 2. Check R-514 (3.9K), R-515 (5K-VR), and R-517 (6.8K). • Synchronized, but vertical deflection insufficient. 1. Faulty adjustment of R-305 (500K-VR), R-307 (10K-VR), or R-515 (5K-VR). 2. Reduced capacity of C-301 (10/10), or C-303 (220/10).
• Poor Vertical Linearity Relative Circuits to be checked : Vertical Amplifier Circuit Vertical Output Circuit  Deflection excessive at upper part and insufficient at lower part of screen.  Insufficient deflection at upper part of screen.	• While viewing monitor screen, adjust R-305 (500K-VR) and R-307 (10K-VR). If after adjustment, vertical linearity is still incorrect, check the following : 1. R-305 (500K-VR) or R-307 (10K-VR) open circuit. 2. R-302 (33D1000), or R-306 (1.2K) open circuit. 3. C-305 (33/10) defective. • While viewing monitor screen adjust R-515 (5K-VR). If after this adjustment, vertical linearity is still incorrect, check the following : 1. R-514 (3.9K), or R-515 (5K-VR) open circuit.

Symptom	Trouble
• Top of picture curves (does not line up with rest of picture) when contrast Knob is at clockwise or nearly maximum position Relative circuits to be checked : Time Constant of AFC Circuit	1. Check R-537 (680), and R-538 (560). 2. Reduced capicity of C-519 (1/10) or C-522 (4.7/16).
• Insufficient Contrast when rotating Contrast Knob Relative circuits to be checked : PXV (Recorder) Composite signal of Video Output Voltage Monitor Video Amplifier Circuit	• With an oscilloscope, check video signal at Test Point TP-15 (see schematic). If voltage is lower than 0.8 to 1.6 V p-p, check PXV (Recorder) Circuit. • If voltage is 0.8 to 1.6 V p-p, check the following : 1. R-501 (330), R-520 (5.6 K), R-521 (3.3 K), R-522 (50), R-523 (1K), R-524 (50), R-526 (2.7K), or R-702 (1K-VR) defective. 2. L-501 (390 μH) open circuit. 3. Q-506 (SE-7010) defective. 4. C-511 (10/50), C-512 (0.0012), C-513 (0.0022), C-514 (33/10), or C-516 (0.22/100) defective. 5. Cathode Ray Tube Defective.
• No synchronization Relative Circuits to be checked : Synchronous Separater Circuit Synchronous Amplifier Circuit Vertical Oscillator Circuit AFC Detector Circuit Horizontal Oscillator Circuit  Vertical and Horizontal not synchronized	• If Vertical and Horizontal not synchronized, check the Synchronous Separater Circuit and the Synchronous Amplifier Circuit. • With oscilloscope, check video signal at base of Q-501 (CS-1294E). If there is no signal, C-501 (0.1/25), C-502 (0.0047), or R-502 (2.2K) is defective. • With oscilloscope, check collector of Q-501 (CS-1294E). If there is no signal, check the following : 1. Q-501 (CS-1294E) defective. 2. R-503 (470K), R-504 (32K), or R-505 (47K) open circuit. • With oscilloscope, check collector of Q-502 (CS-1238F). If there is no signal, check the following : 1. Q-502 (CS-1238F) defective. 2. R-506 (2.2K), R-507 (220K), R-508 (1.8K), or R-512 (220K) open circuit. 3. C-503 (3.3/16) open circuit.
• Poor Vertical Synchronization (picture rolling) Relative circuits to be checked : Integrated Circuit Integrated Signal Input Circuit  One picture only rolling  Three pictures rolling	• If one picture only is rolling, check the following : 1. R-510 (4.7K) or R-511 (4.7K) open. 2. C-506 (0.02), or C-507 (0.033) short. 3. Reduced Capacity of C-508 (0.1/25). 4. Q-503 (1N34A) defective. • If three or more pictures are rolling, check the following : 1. C-508 (0.1/25) short. • If above checks have been made and found to be normal, the check PXV (Recorder). (Refer to PXV Trouble Shooting Chart).

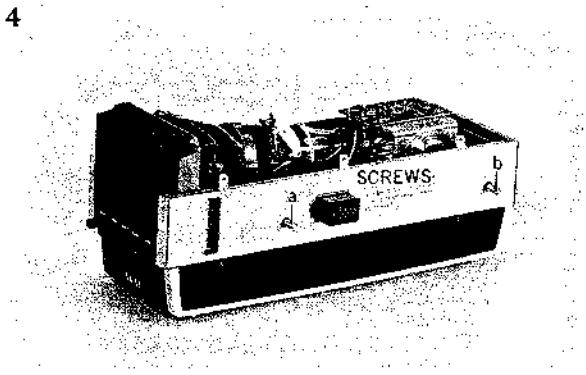
Symptom	Trouble
• Poor Vertical Synchronization (see fig. shown below) Relative Circuits to be checked : Vertical Oscillator Circuit  Vertical frequency too high	• Check the following : 1. R-518 (5K-VR) or R-701 (2K-VR) open circuit. 2. Q-504 (CS-5209) defective. 3. C-510 (4.7/10) defective. 4. R-516 (2.2K) open circuit. 5. R-517 (6.8K) open circuit.
Poor Horizontal Synchronization Relative Circuits to be checked : AFC Detector Circuit Horizontal Oscillator Circuit  One picture moving horizontally  Picture does not Synchronize into one	• One picture moves horizontally (This trouble may be caused from monitor or recorder). • First, with oscilloscope, check the following points : 1. Check incoming composite video signal at P-15 (see schematic). 2. Check whether horizontal synchronous video signal coming from Q-502 (CS-1238F) is passing through C-504 (0.003). • If above checks have been made and found to be normal, check the following : 1. R-539 (2.2K) open circuit 2. Short at C-520 (0.1/25) or C-521 (0.033) or reduced capacity. • If picture does not synchronize into one, check the following : 1. Reduced capacity of C-517 (4.7/16). 2. R-535 (4.7K), R-536 (4.7K), or R-537 (680) open circuit. 3. Q-507 (1N34A) or Q-508 (1N34A) defective. 4. R-532 (5K-VR), R-533 (470), or R-534 (1.5K) open circuit. 5. R-704 (300-VR) open circuit.
• Crackling sound from Speaker	Speaker holding screw loose. Speaker defective or foreign matter inside speaker.
• Picture quivers from speaker sound (unstable)	Because the filament inside the cathode ray tube is moving due to speaker sound vibration, the picture also moves. Check to see if cathode ray tube holding screws are loose or if speaker holding screws are loose.
• Downward movement of stripe on screen (flowing-like stripe)	• Humming is caused by poor electrical filtering. Make the following alterations : 1. Connect a ground wire between grounding points of each printed board. 2. Insert a condenser (0.001) between base and emitter of Q-610 (CS-1238G). 3. Insert a condenser (100 μF, 20 V) between base and ground of Q-610 (CS-1238G) (See fig. 3-1) 4. Check Battery.

Symptom	Trouble
• Fluxuation of size and brightness of raster	1. R-703 defective. 2. Leakage of Fly-back Transformer T-601. 3. Q-604 (HS-3), Q-605, Q-606, Q-607, or Q-608 defective. 4. C-602 A, B (470) or C-603 A, B, C (470) defective.
• No Sound	1. Speaker Defective. 2. Q-401 (CS-1238H), Q-402 (CS-1295H), or Q-403 (CS-1294H) defective. 3. R-401 (68K), R-402 (100), R-403 (470K), R-405 (5), R-406 (2.7K), R-404 (5), or R-407 (680) open circuit.

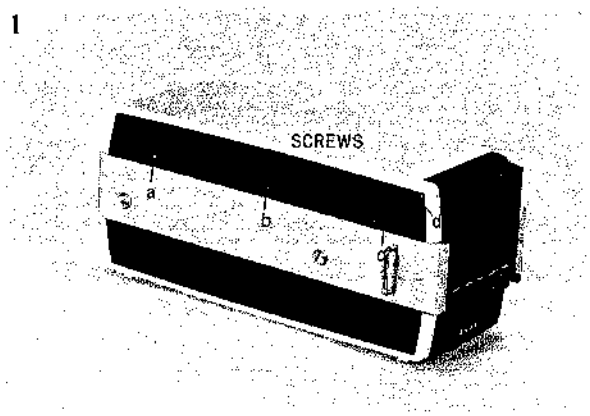
SECTION 3-3
CASE REMOVAL

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Remantle in reverse order.

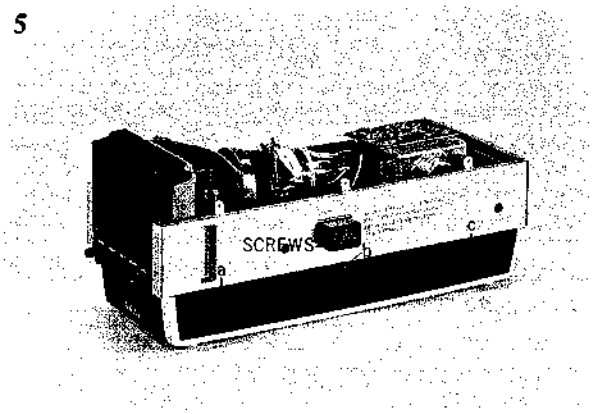
4



1



5



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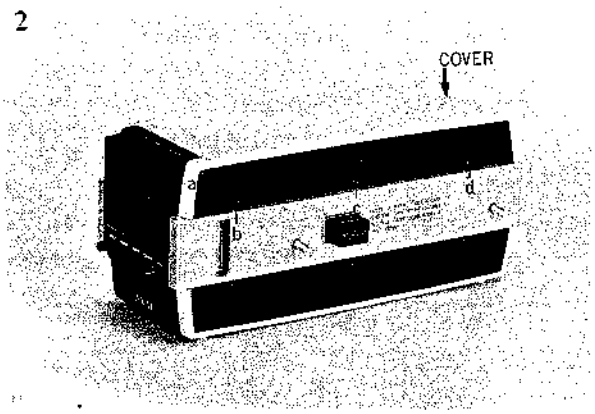

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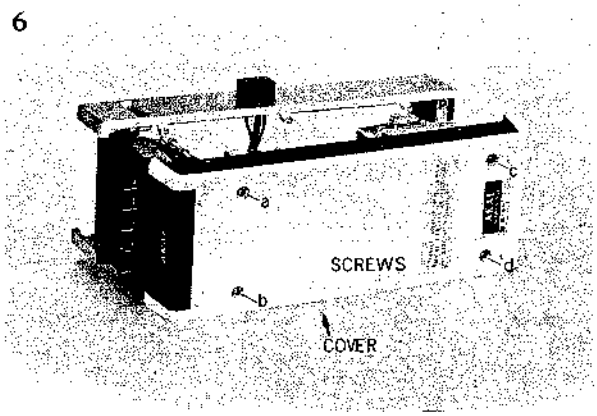

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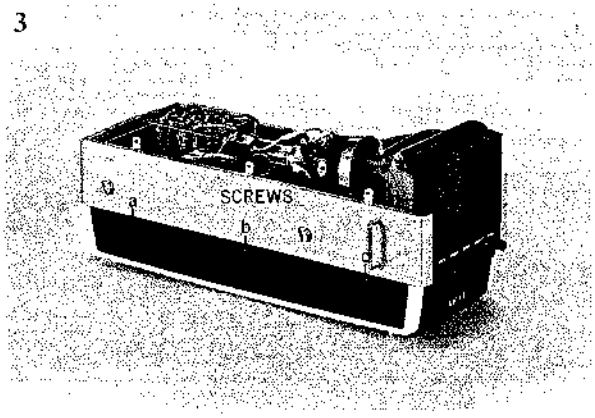

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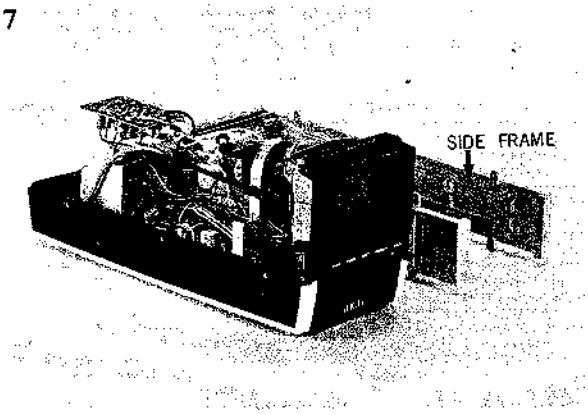


SECTION 3-4
EQUIPMENT REQUIRED

1. Oscilloscope
2. Vacuum Tube Voltmeter

SECTION 3-5
ADJUSTMENTS

1) Adjustment of Voltage Regulator

(a) Instrument Connections

Remove the under cover and connect the V.T.V.M. as shown in fig. 3-1.

(b) Adjustment

Adjust VR-601 so that the V.T.V.M. Indicator is at 10 V. When making this adjustment, use raster on cathode ray tube or make adjustment while picture is on screen.

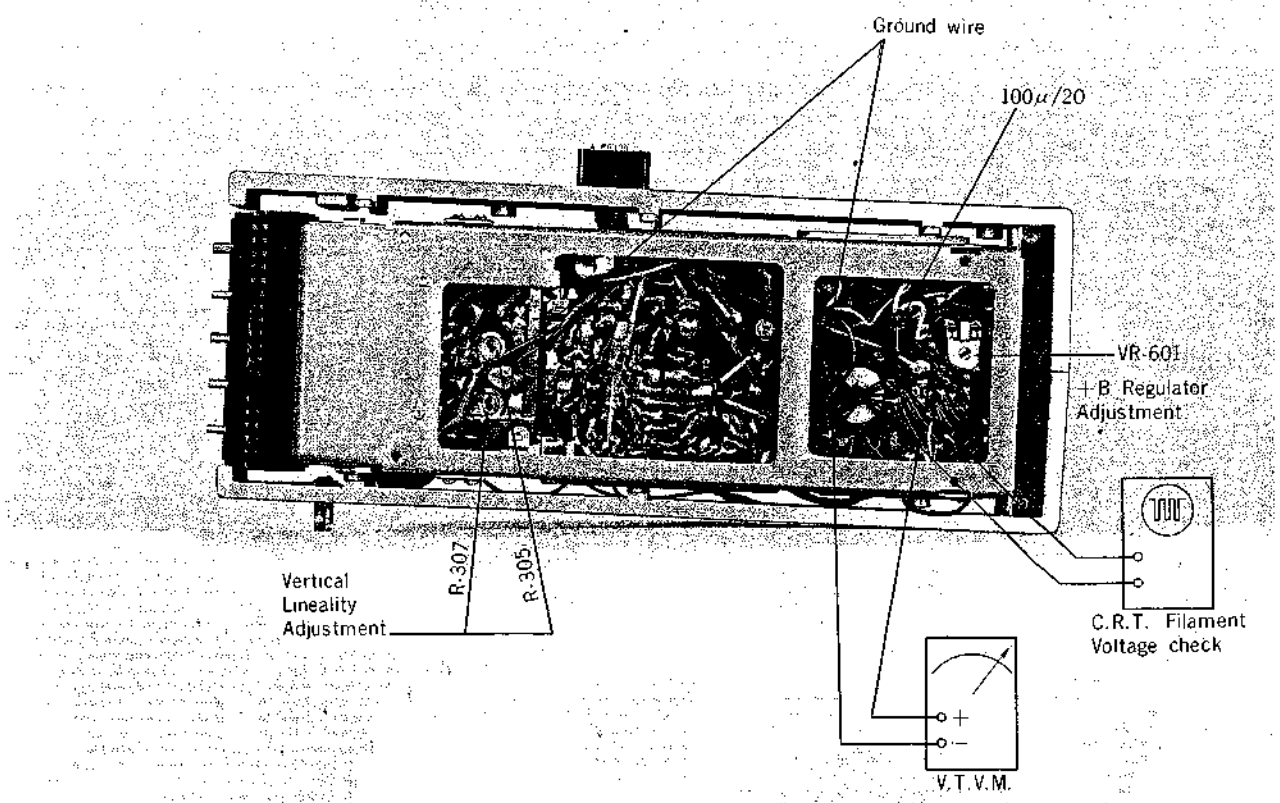


Fig. 3-1

2) Adjustment of Vertical Hold and Horizontal Hold Range

(A) Vertical Hold Range Adjustment

(a) Set "VRT" (Vertical Hold Knob) on front panel to half-way range.

(b) Adjust R-518 (5K-VR). Fix at position at which picture is stationary (Ref. fig. 3-2).

(c) After adjustment is completed, rotate VRT Knob. Confirm that the picture rolls (downward) when knob is at maximum clockwise position.

(B) Horizontal Hold Range Adjustment

(a) Set "HOR" (Horizontal Hold) Knob on front panel to half-way range (half-way of it's movable range).

(b) Adjust R-532 (5K-VR). Fix at point at which the picture synchronizes into one picture. After adjustment has been made, rotate HOR Knob. Confirm that the horizontal synchronization is stable at all points within the rotable range of the HOR Knob. (See fig. 3-2).

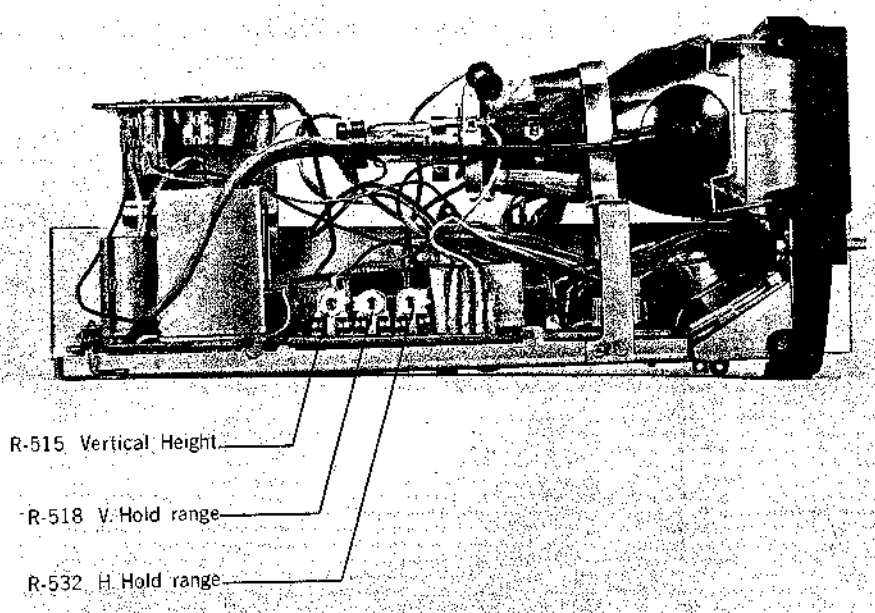


Fig. 3-2

3) Adjustment of Vertical Linearity and Height

Using a perfectly adjusted camera (PXC), take a test pattern (or photograph something like a round circle and while viewing monitor screen, adjust R-305 (500K-VR), R-307 (10K-VR), and R-515 (5K-VR) (See fig. 3-1 and 3-2). Try to obtain pattern as shown in fig. 3-3.

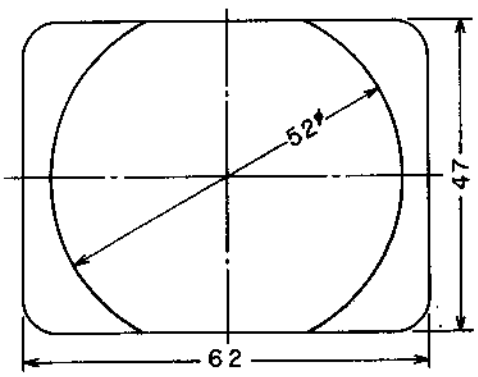


Fig. 3-3

After these adjustments have been made, if focus is not good or if picture is not centered in middle of screen, with the center ring magnet of deflection yoke, focus, and adjust so that the pattern appears at the center part of the picture.

4) Focus Adjustment

As in conditions of 3), using camera, take a test pattern or photograph a scene. While viewing picture appearing above cathode ray tube on monitor screen, adjust R-530 (1M-VR) to a better focused point (See fig. 3-4).

5) Cathode Ray Tube Filament Voltage Check

In case Fly-back Transformer has been replaced, check the voltage supply to cathode ray tube (see fig. 3-1). With an oscilloscope, measure voltage of secondary transformer T-602 Voltage is normal at 1.8 V p-p ± 0.1 V.

If voltage is too high or too low, it can be adjusted by changing the winding ratio of primary and secondary transformer (T-602).

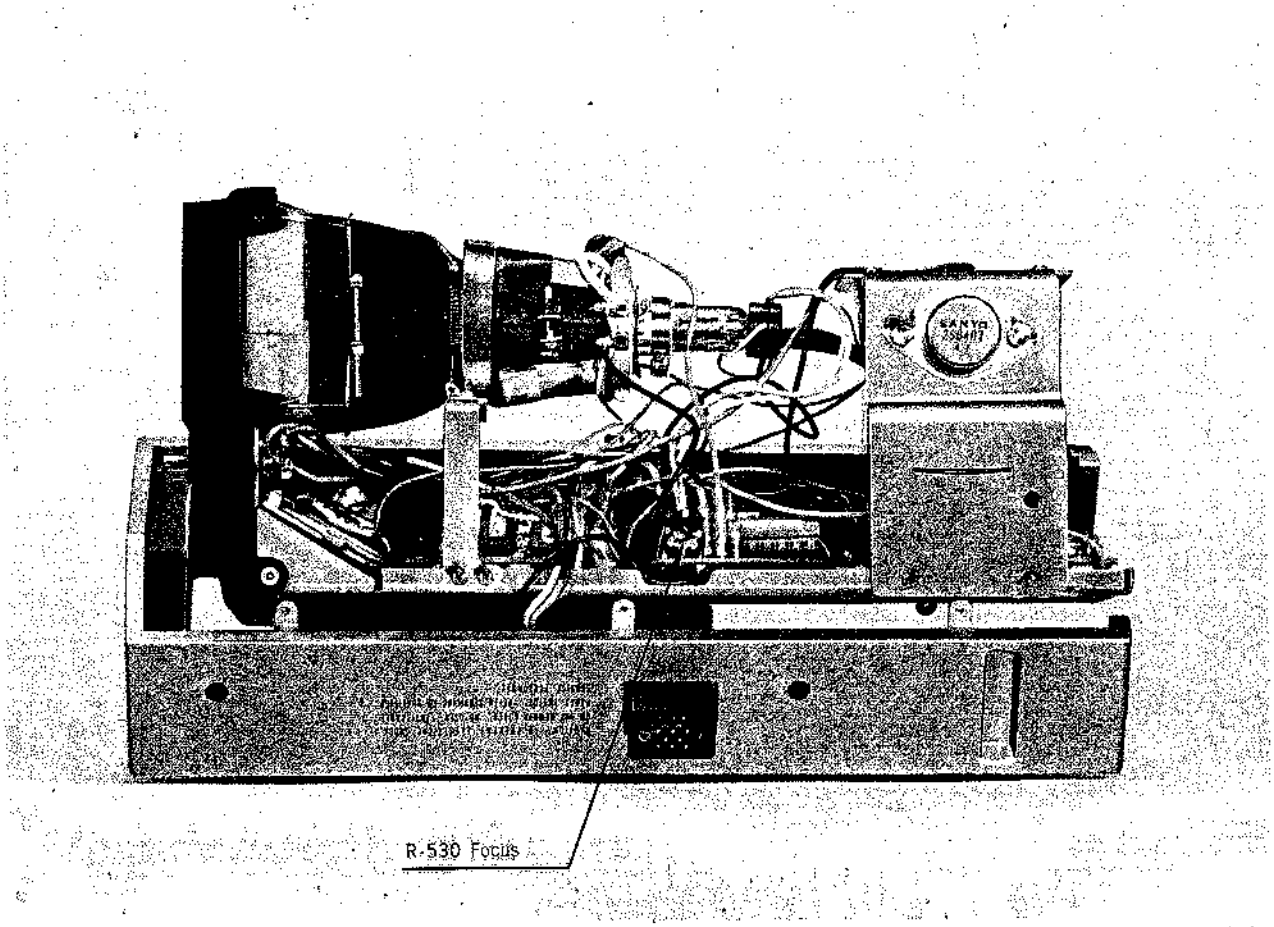
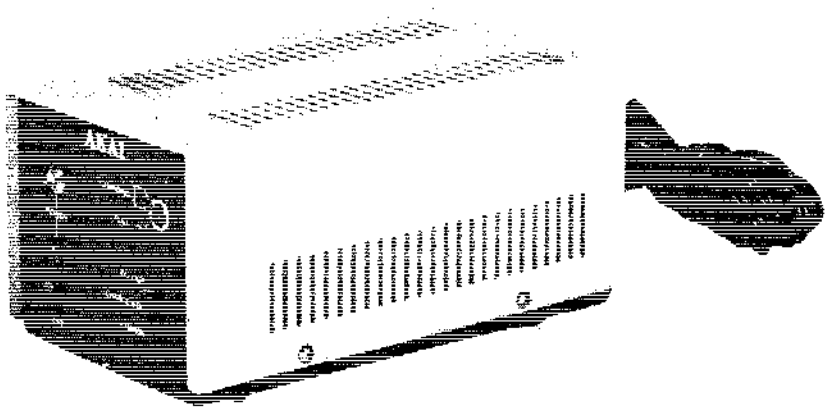


Fig. 3-4

SECTION 3-6
EXPLODED VIEW
&
SCHEMATIC DIAGRAM

PXM (MONITOR) SCHEMATIC DIAGRAM

CHAPTER 4
AC ADAPTER/BATTERY CHARGER (PXA)



SECTION 4-1
SPECIFICATIONS

Built-In Circuits :	Power Conversion Circuit Automatic Charging Circuit
Power Supply :	AC 120 V, 50/60 Hz
Power Output :	DC 12 V, 2 A
Power Consumption :	30 W max.
Battery Charging Time :	8 hours

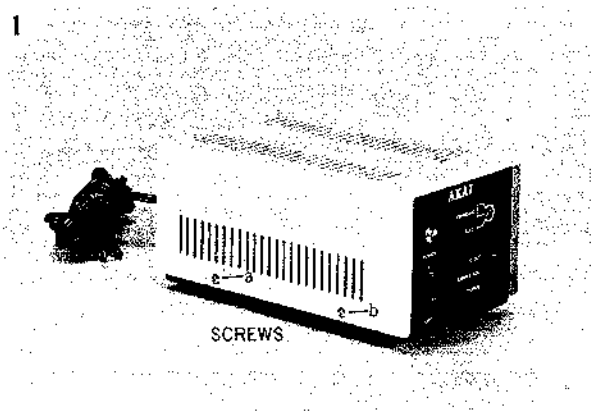
SECTION 4-2
TROUBLE SHOOTING CHART

Symptom	Trouble
• No Electrical Power Supply	• Absence of Electricity. • Defective Power Switch. • Faulty contact in Line Cord Plug or Line Cord Plug disconnected • Line Fuse Blown.
• Blown Line Fuse Upon Replacement	• Short in Power Transformer. Electrolytic Capacitor C-1501 (2200/25) or C-1002 (100/16) shorted. • Diode D-1501 (5B05) or D-1502 (V06B) shorted.
• Pilot Lamp does not light	• R-1501, 150 K open circuit. • RL-1501 Neon Lamp defective.
• Cannot adjust DC Output Voltage	• TR-1002 (2SC458) or TR-1003 (2SC458) defective. • R-1003 (330), R-1004 (1.2K), R-1005 (1.2K), R-1006 (470), R-1007 (680), or VR-1001 (300-B) defective. • ZD-1001 (RD-6A) defective.
• Batteries do not charge at CHARGE & DC, or batteries do not charge at CHARGE (or batteries do not charge at all)	• Turn off power switch and turn on again in about 3 seconds. If still does not charge, check the following : • TR-1004 (2SA564), or TR-1502 (2SD130) defective. • Reduced capacity of C-1004 (47/25). • Batteries defective. • Faulty adjustment of VR-1002 (100-B) or defective. • R-1012 1 Ω, 1 W open circuit. • R-1009 (470) open circuit. • C-1003 (47/50) shorted. • D-1002 (10DC-1) or D-1003 (10DC-1) defective • Secondary power transformer T-1501 (18 V, 0.6 A) open circuit.
• No DC-OUT Voltage	• C-1501 (2200/25) or C-1002 (100/16) shorted. • TR-1501 (2SD80) defective. • D-1501 (5B05) defective. • Secondary Power Transformer T-1501 (16 V, 2.3 A) open circuit. • R-1002 (4.7) open circuit. • TR-1001 (2SC968) defective. • SW-1501 at charge position.

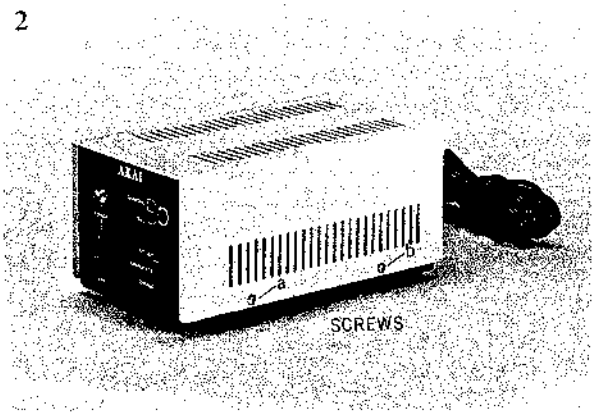
SECTION 4-3
CASE REMOVAL

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Remantle in reverse order.

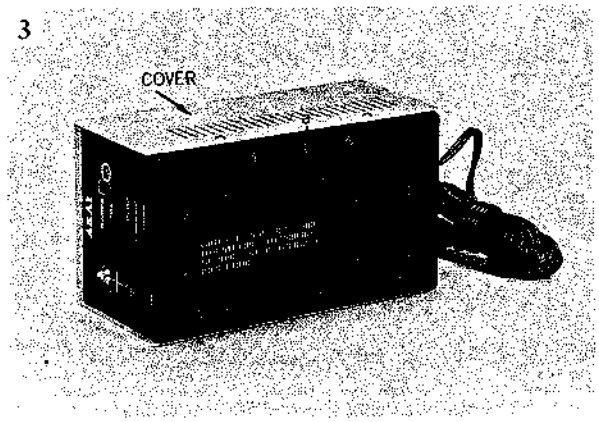
1



2



3



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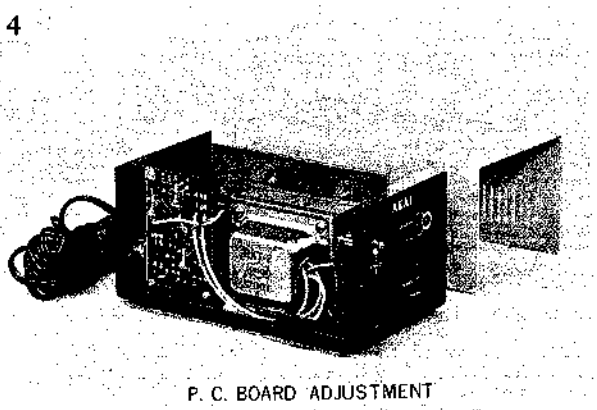


SECTION 4-4
EQUIPMENT REQUIRED

Oscilloscope
Slidac
V.T.V.M. (Vacuum tube Voltmeter)
Ammeter (range 0 to 3 A)
Two (3G x 3U) Batteries

SECTION 4-5
ADJUSTMENTS

1) Adjustment of Output Voltage

(a) Instrument Connections

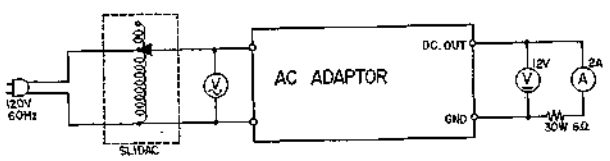


Fig. 4-1

(b) Adjustment

Connect an Ammeter (2 A) and Resistor (6 Ω 30 W) in series between DC Output and Ground Terminals. At the same time, connect a V.T.V.M. to DC-Output and Ground terminals (See fig. 4-1), and proceed as follows :

1. Pass AC Adapter Power Cord through Slidac and connect to power source. Adjust Slidac (set to 120 V).

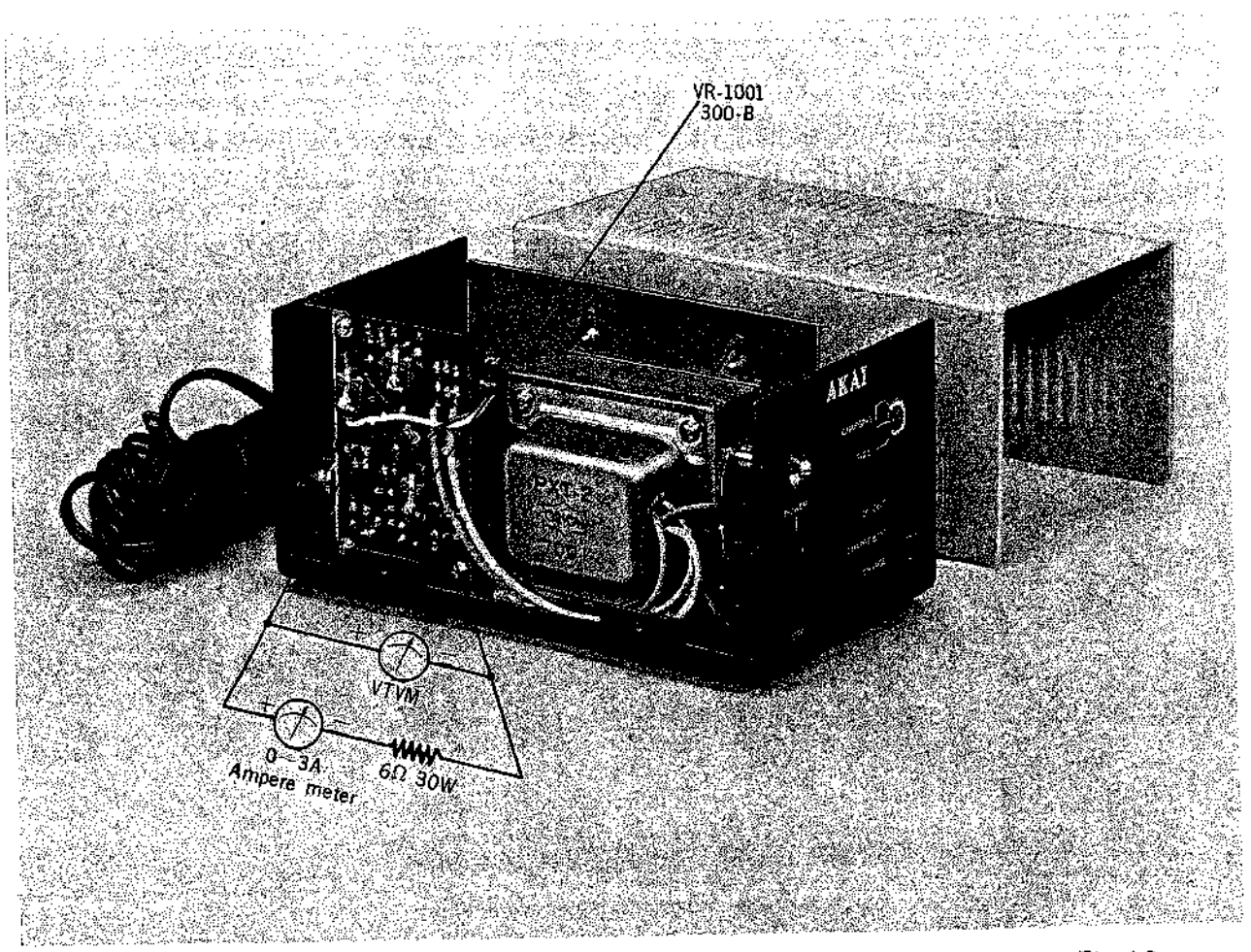


Fig. 4-2

2. With Power Switch turned "On", and DC Voltmeter connected to DC output terminal, adjust semi-fixed volume (VR-1001, 300 ΩB) of printed board so that voltmeter reading is 12 V (Ammeter reading is 2 A throughout). (See fig. 4-1 and fig. 4-2)
3. When DC Output has been set to 12 V, adjust Slidac so that AC Input voltage is ±10% (from 120 V) and confirm that Voltmeter and Ammeter reading is unchanged (Even when Input voltage is changed ±10%, the output voltage should be 12 V ± 0.2 V).

2) Adjustment of Battery Charging Current

(a) Instrument Connections

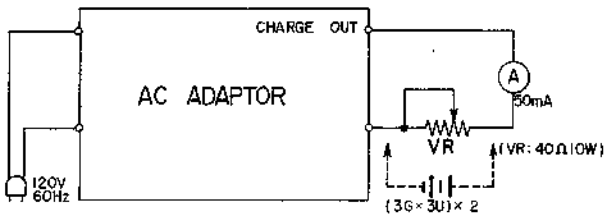


Fig. 4-3

(b) Adjustment

1. With Power Switch turned "On", and DC Voltmeter connected to Charge-Out Terminal, adjust rheostats (variable resistors VR-40 Ω, 10 W) connected in series so that ammeter reading is 500 mA.
2. Next, adjust semi-fixed volume (VR-1003, 1 KB) so that the charging indicator needle is at the right edge of the green area as shown in fig. 4-4.

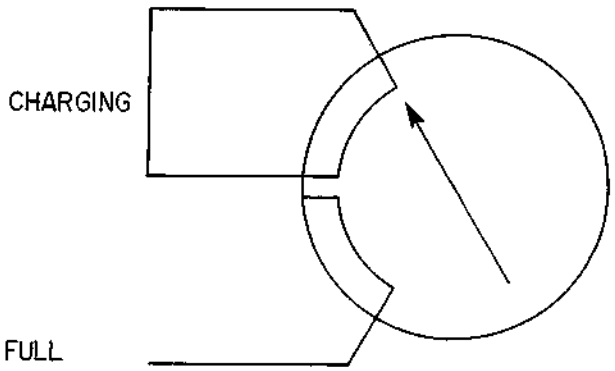


Fig. 4-4

3. Then, in place of the rheostats (remove rheostats), insert two fully charged batteries (3G x 3U) connected in series.
4. With the two fully charged batteries inserted, when switch is turned on, a charge current will exist, but it will abruptly decrease and remain at 50 mA throughout. At this time, measure voltage at battery voltage terminal. Circuit is normal at 14.8 V to 15.2 V. Adjust semi-fixed volume VR-1002 (100B) so that the charge current is "0".
(Or, with an oscilloscope, measure the base voltage of TR-1502 (2SD130).
When this voltage is at 15 V p-p (rectangular wave), adjust VR-1002 (100B) so that the charge current is "0").

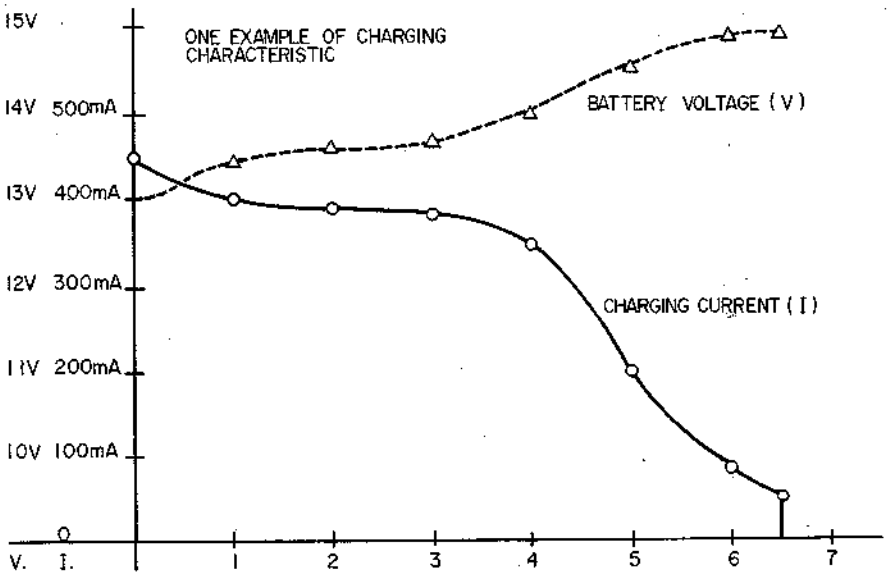


Fig. 4-6 CHARGING TIME (Hr)

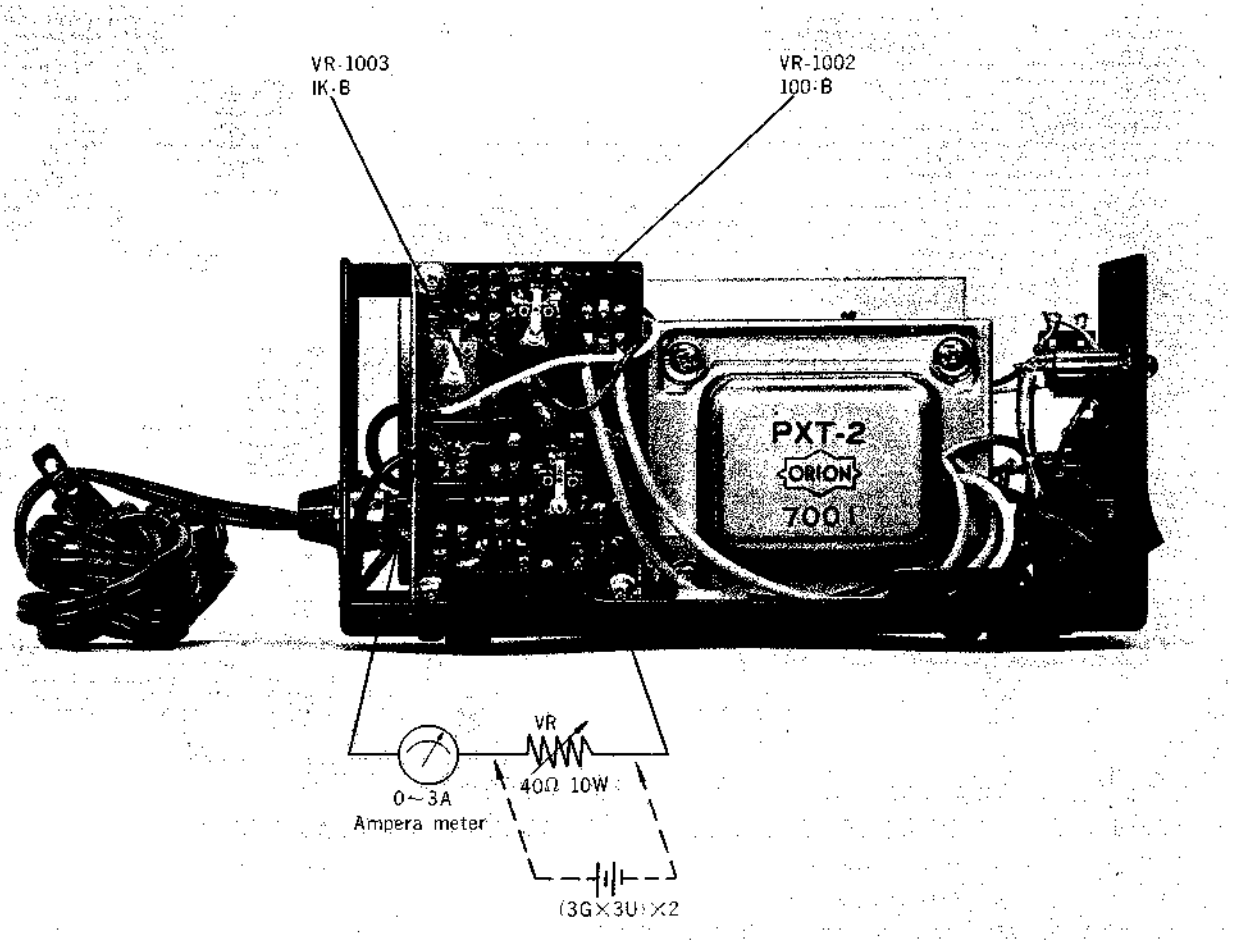
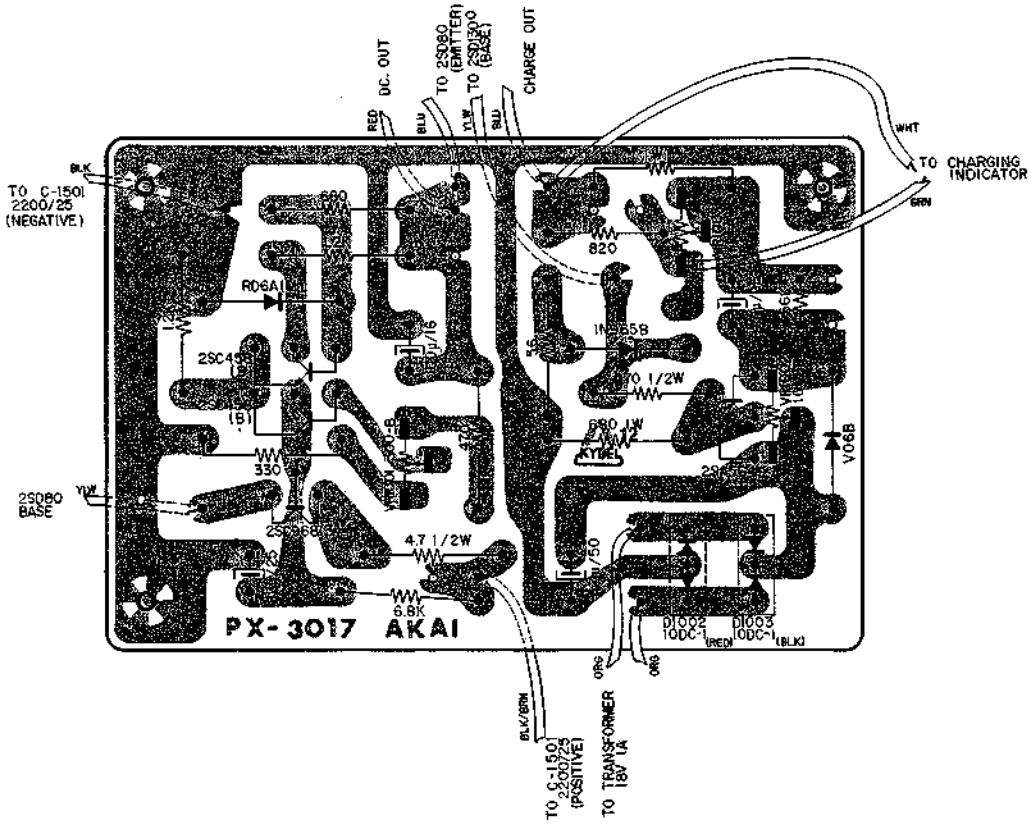

VR-1003
1K·B
VR-1002
100·B
PXT-2
ORION
700
VR
40Ω 10W
0~3A
Ampera meter
(3G×3U)×2

Fig. 4-5


DC. OUT
TO 2SD80 (EMITTER)
TO 2SD1300 (BASE)
CHARGE OUT
TO C-150 2200/25 (NEGATIVE)
TO CHARGING INDICATOR
820
RD6A
330
4.7 1/2W
6.8K
PX-3017 AKAI
2SD80 BASE
TO 0-150 2200/25 (POSITIVE)
TO TRANSFORMER 18V 1A

SECTION 4-6
COMPOSITE VIEW OF COMPONENTS