JVC Service Manual

MODEL PV-4800U

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SECTION 1
GENERAL DESCRIPTION

1-1 INTRODUCTION

This manual provides service information for the JVC Portable Color Video Tape Recorder, Model PV-4800U. The manual describes the principles and adjustments of mechanical/electrical operations.

Service procedures given herein cover only field maintenance. Adjustments which require high-level instruments, jigs and techniques are excluded, since they should be performed at a JVC Regional Center for factory service. Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.

1-2 FEATURES

- o Conforms to the EIAJ-1 color standard.
- o Specifically designed for mobility and ease of operation.
- o Plays back slow-motion pictures over range of full stop to one-quarter normal speed.
- o Automatic circuits eliminate the need for video and audio adjustments while recording.
- o Playback pictures can be monitored with the viewfinder of the JVC GC-4800U Color Camera or Color Monitor.
- o 3-way power supply: 60Hz AC with the JVC AA-P40U power adapter, rechargeable battery pack PBP-1 or automobile battery.

1-3 SPECIFICATIONS

Video recording system	: EIAJ-1 color (CP-507 color system) or B/W TV standard
Television signal	: NTSC-type color & B/W signal, 525 lines
Recording time	: 30 minutes, 5-inch reel (VT-12P)
Horizontal resolution	: More than 230 lines
Video S/N ratio	: Better than 40db
Audio frequency response	: 100 to 10,000Hz
Audio S/N ratio	: Better than 40db
Camera/TV connector (10 Pin)	
(Camera mode)	
Video input	: 0.5Vp-p to 1.5Vp-p, 75Ω unbalanced
Video output	: 1.0Vp-p, 75Ω unbalanced
Camera Mic.	: −72db, 600Ω unbalanced
Horizontal drive output	: 5.0Vp-p negative, high impedance
Vertical drive output	: 5.0Vp-p negative, high impedance
Power supply	: 12V DC, 1.2A
(TV mode)	
Video input	: 0.5Vp-p to 1.5Vp-p, 75Ω unbalanced
Video output	: 1.0Vp-p, 75Ω unbalanced
Audio input	: −20db, high impedance
Audio output	: 0db (open), 600Ω unbalanced
Still and slow motion	: Standard, ¼ to full stop
Color dubbing switch	: Standard
RF output	: CH 5/6 or CH 3/4, both switchable (optional)
Power requirement	: 12V DC, 1.1A
Operating temperature	: 32°F to 104°F
Dimensions	: 5-7/16"(H) x 13-1/8"(W) x 10-5/8"(D)
Weight	: 18 lbs. (including Battery Pack PBP-1 and Video Tape VT-12P)

Standard accessories

Battery Pack	: PBP-1
Monitor cable	: VC-209
Empty reel	: VR-12P
Earphone	: QME2351-002
Simulated leather case	: PU42756B
Cleaning cloth	: PU31398
Cleaning fluid	: PU45182-3
Splicing tape	: PU45189
Oiler	: PU41761
Instruction book	: PU30425-47

Design and specifications subject to change without notice.

1-4 PRECAUTIONS

The JVC PV-4800U is a precision instrument: observe these precautions.

- o Avoid extreme temperatures (high or low), high humidity, excessive dust and strong magnetic fields.
- o Do not subject the PV-4800U to shock or strong vibration.
- o Do not place anything on, or apply any force to the head cover.
- o The construction of the rotary video head is extremely delicate. Do not touch it unless cleaning is necessary.
- o When playback pictures deteriorate because of dirt accumulating on the head, etc. all parts which come in contact with the tape must be cleaned by wiping with a soft cloth moistened with the cleaning fluid provided. See Sect. 1-14 for this procedure.
- o This video tape recorder should be used with 12V DC only.
- o When the PV-4800U is moved from a cold place to a warm place, tape may not travel smoothly due to condensation on the tape path. Before operating the deck, wait until the moisture has dried or wipe the tape path with a soft dry cloth.
- o Use the No. 393 Scotch splicing tape provided to splice a broken tape.

It is important that the splicing tape be attached to the back surface of the tape (opposite the magnetic coating).

CAUTION: To prevent electric shocks and fire hazards do not use any other power source.

1-5 CONTROLS AND CONNECTORS

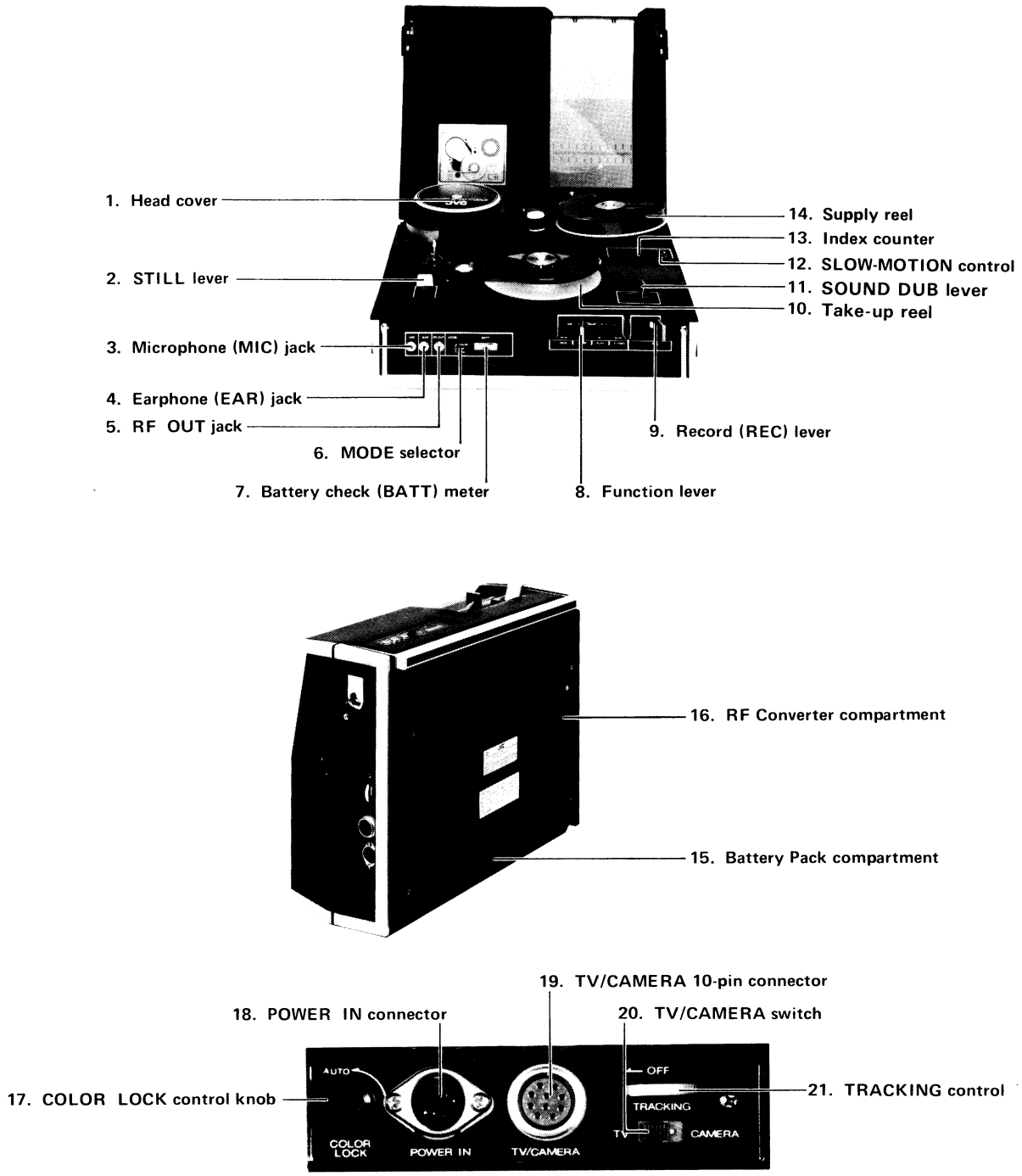


Fig. 1-1 Controls and connectors, Model PV-4800U.

Description of controls and connectors, with reference to Fig. 1-1 is as follows:

1. **Head cover**
   Contains rotary video head.
2. **STILL lever**
   During playback you can view a still picture by pulling this lever. Be sure to pull it fully forward.
3. **MIC jack**
   To connect an external microphone for recording or dubbing. Plugging it in disconnects the camera microphone.
4. **EAR jack**
   To connect an earphone for monitoring.
5. **RF OUT jack**
   This is the output terminal for the RF signal when the optional KR-200U series RF Converter is plugged into the PV-4800U. Refer to 1-8-3(a) for detail.
6. **MODE selector**
   This switch has three positions, one for color recording and playback (COLOR), one for black and white recording and playback (B/W) and one for color dubbing (DUB) to other EIAJ-1 color VTRs or 3/4" U-VCRs.
7. **Battery check (BATT) meter**
   Indicates condition of the battery pack in the machine.
8. **Function lever**
   This is a 4-position lever which acts as a power switch and tape operation control.
   STOP : Tape stopped, power switched off.
   PLAY : For playback or recording.
   REW : To rewind the tape.
   F. FWD : To fast forward the tape.
9. **REC lever**
   Pull the REC lever to the left, then push the Function lever to PLAY to record.
10. **Take-up reel**
11. **SOUND DUB lever**
    Use this lever together with the Function lever to record a new sound track while playing back a previously recorded tape.
12. **SLOW-MOTION control**
    For normal playback this knurled wheel should be fully forward in the detent position. For slow motion playback, turn control in the direction of the arrow. The speed will first slow down to 1/4th normal speed; turning it further will decrease the speed continuously to full stop at which time the VTR will produce still pictures.
    The position of this control has no effect during recording, but it is recommended that it be returned to the detent position after slow motion playback has finished.
13. **Index counter**
14. **Supply reel**
15. **Battery Pack compartment**
    Remove cover to remove or install PBP-1 Battery Pack.
16. **RF Converter compartment**
    Remove cover to install KR-200U series RF Converter.
17. **COLOR LOCK control knob**
    Turn this to optimize the color in playback.
18. **POWER IN connector**
    Connect to AA-P40U AC power adapter or automobile battery cord VC-3U.
19. **TV/CAMERA 10-pin connector**
    Connect to the GC-4800U Color Video Camera or a TV Monitor.
20. **TV/CAMERA switch**
    Set to correspond to external device connected, TV Monitor or Video Camera.
21. **TRACKING control**
    The Tracking adjust guarantees interchangeability between VTRs. If a tape recorded on another machine shows noise bars or is blurred, turn the tracking knob until the picture clears up.
    IMPORTANT: When playback is complete turn this knob to the detent position.

1-6 POWER SUPPLY

Power can be supplied in the following three ways:

1. AC Power Adapter AA-P40U
2. Battery Pack PBP-1
3. From an automobile battery through the VC-3U car battery cord.

NOTES:

1. There is another AC Power Adapter available, the ACP-22D. This differs from the AA-P40U in rated power output as follows:

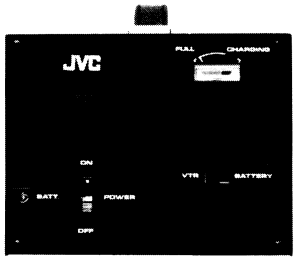
AA-P40U	13V DC	2.3A
ACP-22D	13V DC	1.8A

2. When providing power for the PV-4800U and GC-4800U Color Video Camera, the AA-P40U must be used. If the ACP-22D is used, normal operation may not be possible and there may be damage because of the ACP-22D's smaller rated output.
3. When the PV-4800U is used with the GS-4500 B&W camera or when the PV-4800U is being used by itself, etc., either the AA-P40U or ACP-22D can be used.
4. The PBP-1 Battery Pack is rechargeable. See the instructions, 1-6-4, 1-6-5.
5. Either the AA-P40U or ACP-22D can be used to recharge the PBP-1 Battery Pack.
6. A fully charged Battery Pack will provide power for the PV-4800U used with the GC-4800U Color

Video Camera for 45 minutes. At low temperatures it may not provide power for the full 45 minutes.

1-6-1 Using AA-P40U AC Power Adapter

(Shown in Fig. 1-2, below)



PV-4800U **AA-P40U**

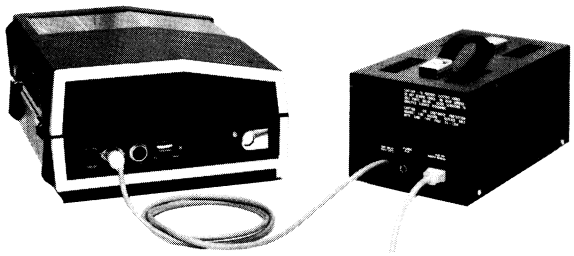


Fig. 1-2

The optional AA-P40U AC Power Adapter can be used to provide power for the PV-4800U from a standard AC power source. First set the AA-P40U front panel VTR/BATTERY switch to VTR and the PV-4800U Function lever to STOP. Do not change the position of the VTR/BATTERY switch while the PV-4800U is operating. If you do so the protective device will switch off the power.

1-6-2 Using PBP-1 Battery Pack

a. Slide the cover of the battery compartment on the underside of the PV-4800U to the right to remove it.

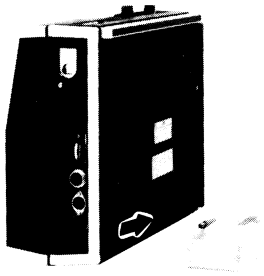


Fig. 1-3

b. Connect the cord from the Battery Pack to the socket in the PV-4800U battery compartment and install the battery pack in the compartment.

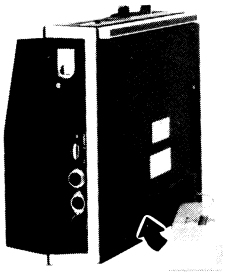


Fig. 1-4

c. Close the battery compartment by sliding the cover to the left.

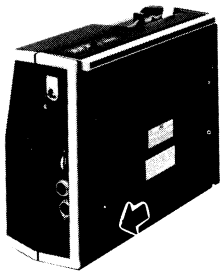


Fig. 1-5

NOTE:

- To check the condition of the Battery Pack, load a tape and move the Function lever to the PLAY position. The meter will not show the battery condition if the tape is not loaded correctly.
- When the Battery Pack is charged the meter indication will be position ①. If the meter indicates position ② the battery should be replaced or recharged. If the meter indicates position ③ it is probable that the Function lever is in the STOP position or the tape is improperly threaded.

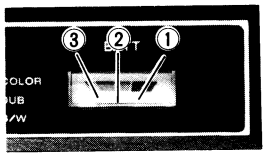


Fig. 1-6

1-6-3 Using Automobile Battery

Check first to ensure that car has negative 12V ground system. Using the car battery cable VC-3U, plug the 4-pin DC output plug into the PV-4800U POWER IN connector. The input plug should be inserted in the car's cigarette lighter socket, as shown in Fig. 1-7, below:

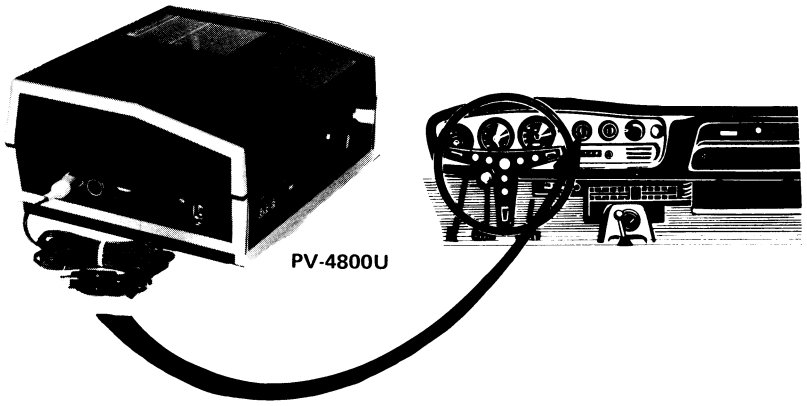


Fig. 1-7

NOTE:
Be sure that the PV-4800U Function lever is at STOP when connecting the car battery cord.
If the PV-4800U is used when the automobile engine is stopped, be careful to check the PV-4800U BATTERY meter to avoid discharging the automobile battery.

1-6-4 Recharging PBP-1 Battery Pack (See Fig. 1-8.)

a. Set the AA-P40U VTR/BATTERY switch to BATTERY.
b. Plug the PBP-1 output cord to the AA-P40U BATTERY terminal.
c. Connect the AC power cord to a wall outlet.
d. Switch the AA-P40U ON.

1-6-5 Recharging PBP-1 Battery Pack in PV-4800U

It is possible to recharge the PBP-1 without taking it out of the PV-4800U Portable Color Video Tape Recorder. To do this follow Fig. 1-9 and instructions below:

a. Set the Function lever of the PV-4800U to STOP.
b. Connect the DC cord from the AA-P40U to the POWER IN socket on the PV-4800U connection panel.
c. Set the AA-P40U VTR/BATTERY switch to BATTERY.
d. Connect the AA-P40U power cord to an AC outlet.
e. Switch the AA-P40U power switch ON.
f. Check the AA-P40U charging meter to determine when charging of the battery pack inside the PV-4800U is complete. The indication is the same as when charging an external battery pack.

NOTE:
The AA-P40U will NOT charge two battery packs simultaneously. If an external pack is connected to the battery jack while the charger is connected to a VTR with a battery installed, only the external battery pack will be charged.
The ACP-22D is not able to recharge the PBP-1 battery pack in the PV-4800U.

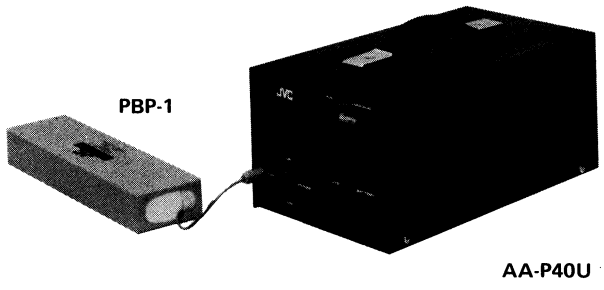


Fig. 1-8

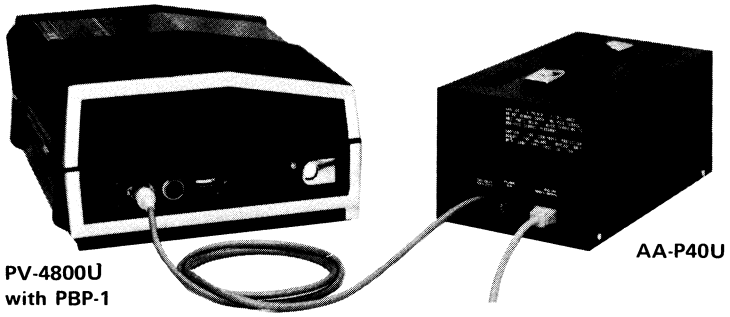


Fig. 1-9

1-6-6 Checking Charging

The charging meter is on the AA-P40U front panel.

a. If the pointer is at the right end of the scale as in Fig. 1-10, the battery is fully discharged and will need 8 to 10 hours to charge.

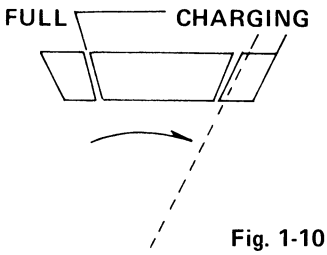


Fig. 1-10

b. As the battery is recharged the pointer will move gruadually toward the left as shown in Fig. 1-11.

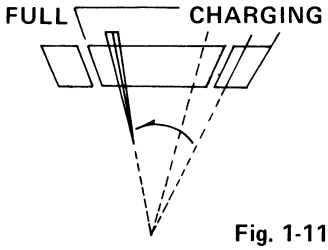


Fig. 1-11

c. When the battery pack is fully charged the pointer will indicate FULL and make small oscillations every few seconds. See Fig. 1-12.

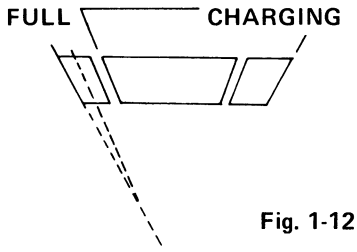


Fig. 1-12

NOTE:

- o If the pointer stays at the left end of the scale at the beginning of recharging, the battery may have been discharged excessively; or there may be a disconnected lead wire or a loose contact between the plug and jack.
- o PBP-1 is a lead/acid battery pack. When it is used at temperatures below 40°F its efficiency is reduced as much as 50%.
- o Charge the PBP-1 immediately after use. If it is left discharged for a long period it may be damaged.
- o If left unused the PBP-1 will discharge. When it is stored for long periods be sure to charge it at least once every six months.
- o Be careful not to short circuit the output. Short circuits will overload the battery and may destroy it.
- o Storing the PBP-1 in a cool and dry place will prolong its life.
- o When disposing of the PBP-1 do not burn it. Since the battery pack is sealed, it may explode.

1-7 RECORDING WITH GC-4800U COLOR VIDEO CAMERA

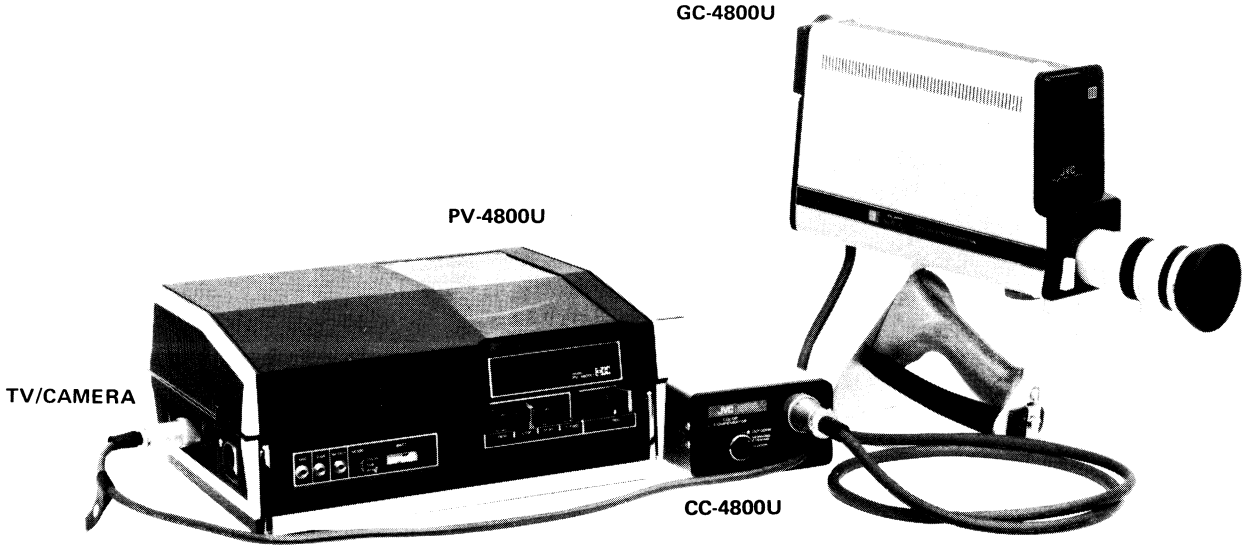


Fig. 1-13

1. Connect the cable from the GC-4800U to the CC-4800U Camera Control Unit; the cable from the CC-4800U to the PV-4800U TV/CAMERA connector.
2. Set the TV/CAMERA switch of the PV-4800U to CAMERA and its Mode to COLOR. See Figs. 1-14 and 1-15, respectively.

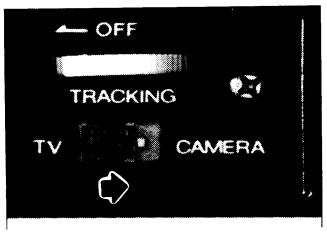


Fig. 1-14

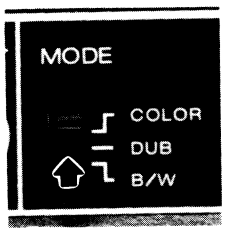


Fig. 1-15

3. Load a tape onto the PV-4800U. Move the Record lever to the left and set the Function lever to PLAY. (See Fig. 1-16.) Press the counter reset button to reset the tape counter to "000".

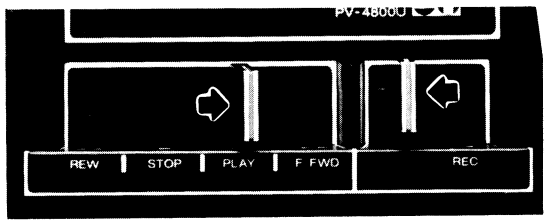


Fig. 1-16

NOTE:
If the VTR starts to move tape at this time press the Camera START/STOP switch. This will stop the tape and leave the PV-4800U in the stand-by mode.

4. Set the CC-4800U Color Temperature selector to correspond to the color temperature of the illumination, as shown in Fig. 1-17.
INDOOR (≈3200°K)
Quartz-Iodide room lighting
MORNING/EVENING (≈5100°K)
Outdoors morning and evening.
Indoors with fluorescent lighting.
OUTDOOR (≈6500°K)
Outdoors midday.

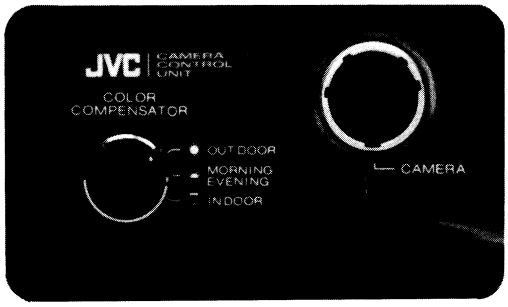


Fig. 1-17

5. After 10 seconds the subject will appear in the viewfinder. Adjust the aperture ring so that the aperture indicator line in the viewfinder is down the center of the screen; this shows that the exposure is correct. Move the zoom lever for the composition desired and adjust the focus ring.
6. After 20 or 30 seconds press the camera's START/STOP switch; this will start the PV-4800U recording. Only the lower half of the aperture indicator line will now be seen and the tally lamp on the front of the GC-4800U camera will glow.
7. To stop recording press the camera's START/STOP switch again: this will stop the tape and restore the aperture indicator line so that it covers the whole

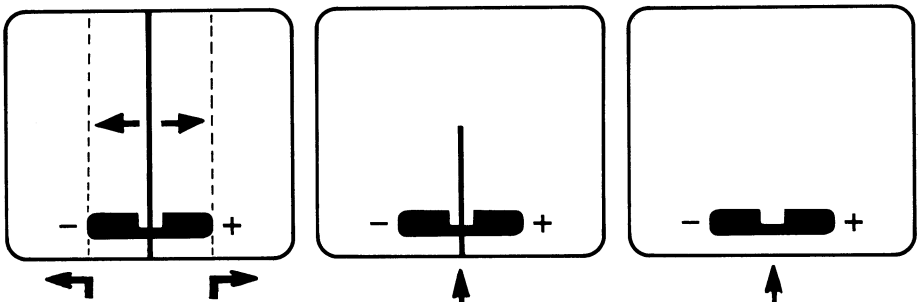


Fig. 1-18 Aperture Indicator in the Viewfinder

height of the viewfinder screen. If you are going to remain in the stand-by mode for any length of time move the PV-4800U Function lever to STOP. This will switch off the Battery Pack.

8. Repeat the above operations to record a sequence of scenes. If you want your recordings to be comfortable to view, it is better if each scene lasts for at least one minute.
9. With the optional microphone plugged into the PV-4800U MIC jack the condenser microphone on the front of the GC-4800U camera will be disconnected and sound from the external mike will be recorded.
10. To monitor sound during recording or playback, plug an earphone into the PV-4800U EAR jack.

NOTE:

- o Monitoring the color picture while recording is possible using a standard color TV. Refer to the section "Playback with Standard Color TV", 1-8-3.
- o While recording turn the volume control of the TV to its minimum position and monitor the sound with an earphone.
- o For detailed instructions on the use of the GC-4800U Portable Color Video Camera, see its instruction book.

1-8 PLAYBACK

1-8-1 Playback Monitoring with GC-4800U Viewfinder

a. To monitor the scene immediately after it has been recorded switch the GC-4800U START/STOP switch to stop the tape. Move the Function lever of the PV-4800U from PLAY to STOP. (See Fig. 1-19.) The Record lever will automatically return to the neutral position.

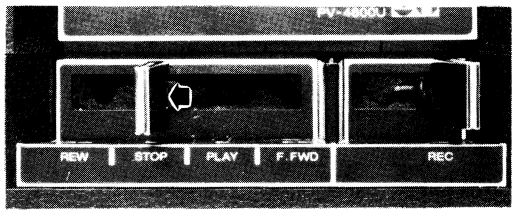


Fig. 1-19

b. Set the Function lever to REW. (See Fig. 1-20.) The tape will rewind; set the Function lever to STOP when the counter reaches "000". Move the Function lever to PLAY.

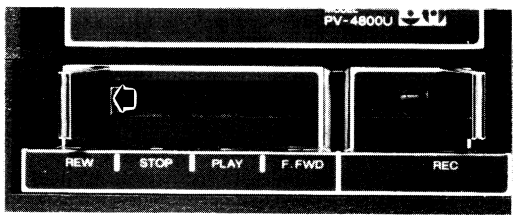


Fig. 1-20

c. Press the Camera START/STOP switch to monitor the playback video in the camera viewfinder. (See Fig. 1-21.)
(When used as a monitor, the aperture indicator line will not be displayed in the viewfinder screen but the tally lamp will light.)

Fig. 1-21

d. Connect an earphone to the EAR jack to monitor the sound in playback.
e. To view a slow-motion or still picture use the still lever or slow-motion control.
f. To advance the tape set the Function lever to F. FWD. (See Fig. 1-22.)

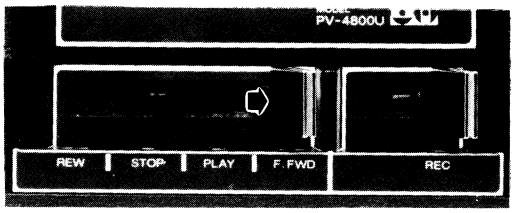


Fig. 1-22

CAUTION:
If the camera START/STOP switch is used to stop the tape while monitoring, the playback picture may be distorted.

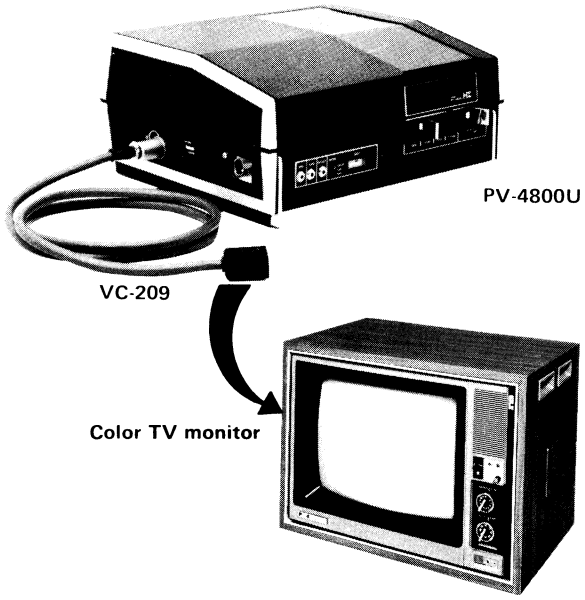


Fig. 1-23

1-8-2 Playback with Color TV Monitor

a. When monitoring the recorded tape on a Color Video Monitor, disconnect the cable between the PV-4800U and the Camera Control Unit. Connect the PV-4800U to the TV Monitor with the VC-209 cable (standard accessory). See Fig. 1-23, above.

Fig. 1-24

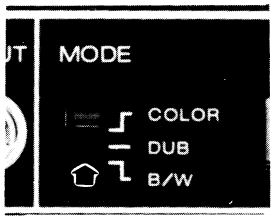


Fig. 1-25

b. Set the PV-4800U TV/CAMERA switch to TV (Fig. 1-24) and the Mode selector to COLOR (Fig. 1-25).
c. Set the TV/VTR switch on the Color Monitor to VTR.
d. Move the PV-4800U Function lever from STOP to PLAY: picture and sound will be displayed on the TV Monitor.

NOTE:
When operating indoors use the AA-P40U or ACP-22D AC Power Adapter to preserve the Battery Pack.

1-8-3 Playback with Standard Color TV

NOTE:
This must be done with the KR-200U series RF Converter installed in the PV-4800U and cover replaced. The KR-200U series consists of the KR-200U kit which contains the KR-256U modulator switchable for CH5/6, RF connecting cables and antenna/VTR switch; also, KR-234U, a CH3/4 modulator, and SW-200U containing the cable and switch mentioned are available as options. The selection of modulator depends upon the unoccupied channel in your area. The RF output is automatically available at the RF OUT jack.

a. Connect the RF cables provided with the KR-200U between the RF OUT jack and the VHF antenna input of the TV. This connection should be done through the antenna switch box. Adjust the TV channel to the output of the RF Converter. (This output should be adjusted to Channel 5 or 6, 3 or 4, depending on the unoccupied channel utilized.) (See Fig. 1-26.)
b. Tapes played back on the PV-4800U will be seen on the TV.

NOTE:
Refer to the RF Converter instruction book about its use. Note that pictures cannot be recorded from a standard TV using the RF Converter.

CAUTION:
Do NOT connect the RF OUT of PV-4800U to an external antenna directly. Failure to use an antenna switch box may result in operation that violates the Federal laws regulating the use and operation of RF devices.

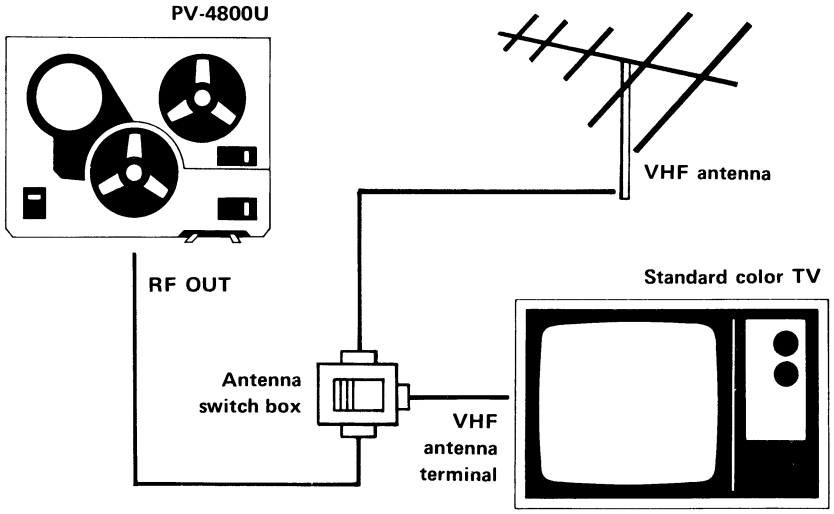


Fig. 1-26

1-9 RECORDING AND PLAYBACK WITH COLOR TV MONITOR

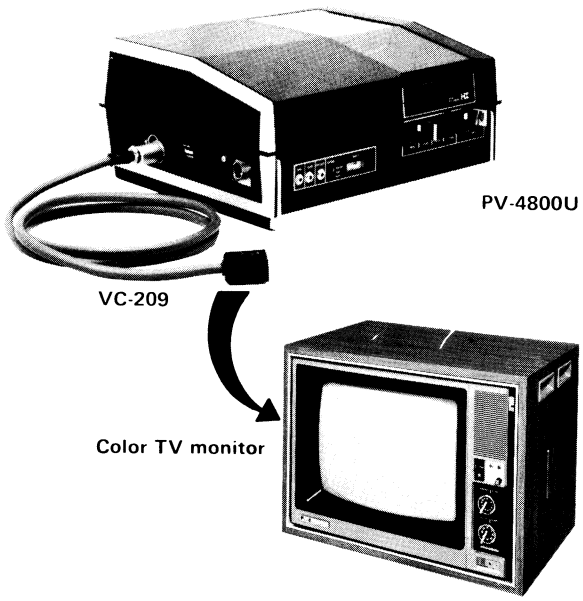


Fig. 1-27

1-9-1 Recording

a. Connect the PV-4800U to the TV Monitor with the VC-209 cable.
b. Set the PV-4800U TV/CAMERA switch to TV and its Mode selector to COLOR.
c. Set the TV/VTR switch of the Color Video Monitor to VTR.
d. Move the Record lever to the left and while holding it there move the Function lever to PLAY. The VTR is now recording.

1-9-2 Playback

a. Move the Function lever to STOP, then rewind the tape.
b. After rewind is complete, move the Function lever to PLAY. The VTR is now in playback mode.

NOTE:
Refer to the section "Playback with Color TV Monitor" 1-8-2 or the section "Playback with Standard Color TV" 1-8-3.

1-10 RECORDING AND PLAYBACK USING GS-4500 B&W VIDEO CAMERA

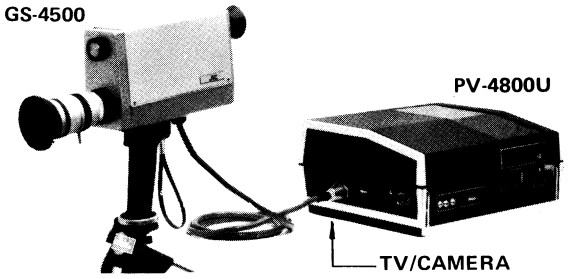


Fig. 1-28

1-10-1 Recording

a. Connect the GS-4500 Camera cable to the PV-4800U TV/CAMERA connector. Set the PV-4800U TV/CAMERA switch to CAMERA. Set the Mode selector to B/W.
b. Move the Record lever to the left and while holding it there move the Function lever to PLAY. Reset the counter to "000".
   NOTE:
   If the tape starts moving, press the Camera START/STOP switch; you will now be in the stand-by mode.
c. Turn the aperture ring until you see the subject in the viewfinder screen. Adjust the Zoom and Focus rings to compose the scene as you want it.
d. Press the Camera START/STOP switch. The Pilot lamp in the viewfinder will glow red, showing that recording is in progress.
e. Press the START/STOP switch again to stop the tape; the Pilot lamp will go out and the tape will stop.
f. Repeat these operations to record a sequence of scenes. If you want your recordings to be comfortable to view, it is better if each scene lasts for at least one minute.
g. If the optional microphone is connected to the PV-4800U MIC jack, sounds picked up by this microphone will be recorded and the built-in mike disconnected.
h. If you want to monitor the sound being recorded, connect an earphone to the PV-4800U EAR jack.

NOTE: For monitoring the picture while recording, the instructions of NOTE at end of 1-7 (page 1-8) apply.

1-10-2 Playback

To play back or monitor the picture using the GS-4500 viewfinder refer to "Playback Monitoring with GC-4800U Viewfinder, 1-8-1.

NOTE:
When recording a black and white broadcast signal using a Video Monitor (either Color or B/W) or when playing back in the B/W mode be sure to set the PV-4800U Mode selector to B/W. Otherwise the signal quality may deteriorate.

1-11 SOUND DUBBING

1-11-1 With External Microphone and TV Monitor

a. Connect the PV-4800U to a Video Monitor with the VC-209 cable. Connect a 600Ω microphone to the MIC jack.
b. Set the CAMERA/TV switch to TV. Pull the Sound Dub lever in the direction indicated, then move the Function lever to PLAY, as shown in Fig. 1-29.

c. Record new audio while observing the playback picture.

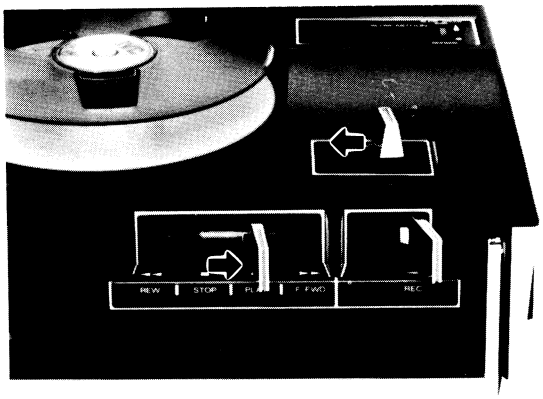


Fig. 1-29

1-11-2 With External Microphone and Standard Color TV

NOTE:

A KR-200U series RF Converter is required to perform this operation.

a. Connect the PV-4800U RF OUT connector to the TV antenna terminal. (See Fig. 1-26) Connect a 600Ω microphone to the MIC jack.
b. Set the TV/CAMERA switch to TV, pull the SOUND DUB lever in the direction indicated and move the Function lever to PLAY.
c. Record a new sound track while observing the playback picture.

1-11-3 With Camera Microphone and Viewfinder

a. Connect the camera to the PV-4800U TV/CAMERA connector.
   Set the TV/CAMERA switch to CAMERA.
b. Place the PV-4800U in Sound Dub operation.
c. View the playback picture on the camera viewfinder. Audio will be recorded from the condenser mike on the camera.

1-12 TAPE COPYING

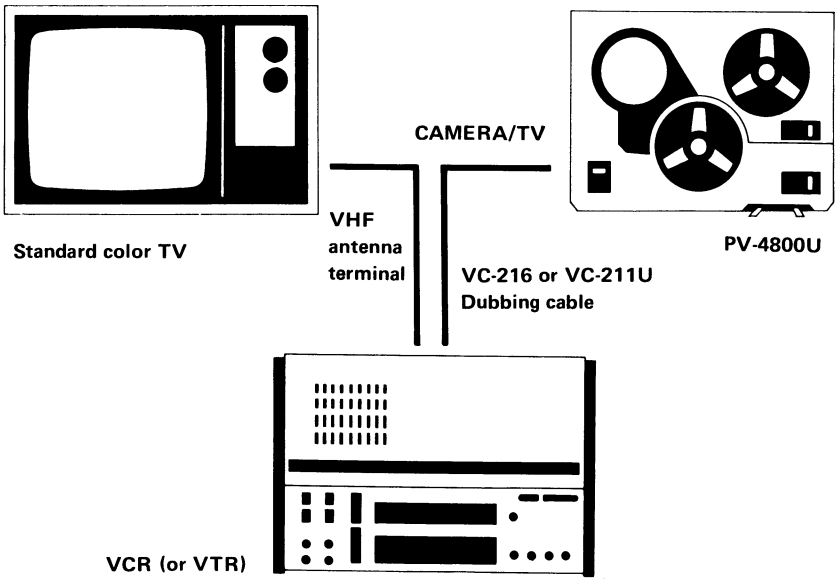


Fig. 1-30

1-12-1 Video and Audio Dubbing

a. Load the tape to be recorded on the PV-4800U.
b. Set the PV-4800U CAMERA/TV switch to TV. Set the Mode selector to DUB if the tape is recorded in color or to B/W if the tape is recorded in black & white.
c. Connect the PV-4800U CAMERA/TV connector to the VTR or VCR onto which the copy is to be made. Use the VC-216 or VC-211U Dubbing cable depending upon model of VCR/VTR. (Refer to Fig. 1-30 and also to the instruction book of the VTR or VCR being used for recording instructions.)
d. Load a blank tape on the VTR or VCR and place it in record mode. Place the PV-4800U in playback and dubbing will take place.

1-12-2 Dubbing Using RF Signals

There are two ways an RF Converter can be used in dubbing:

a. Using a Video TV Monitor

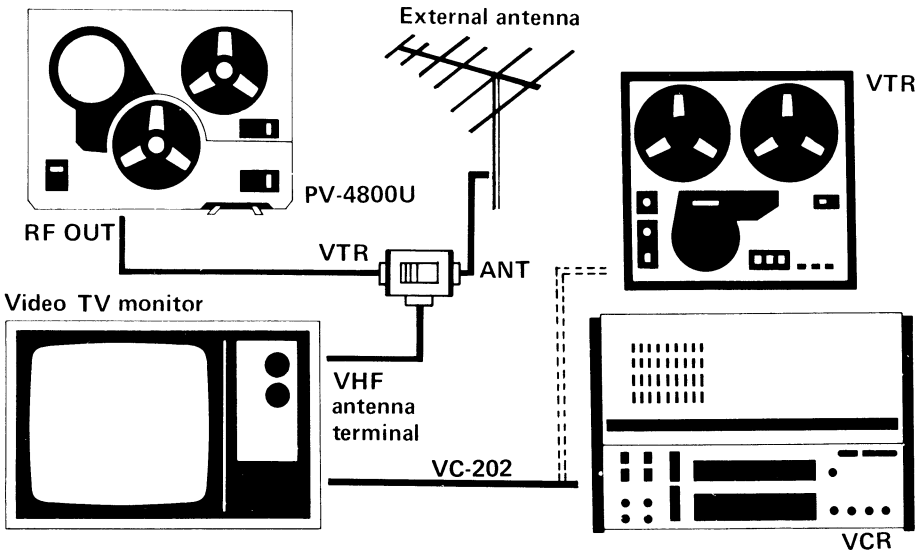


Fig. 1-31

b. Using a VCR equipped with a tuner

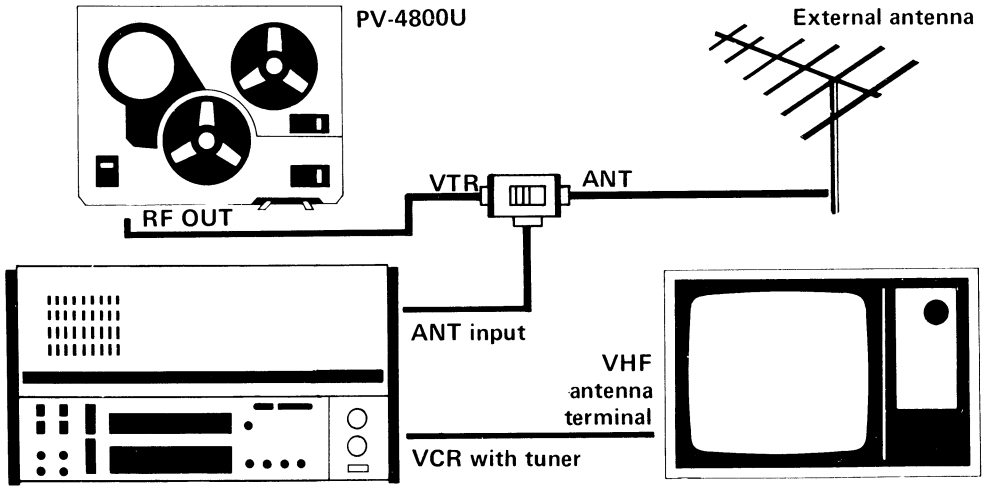


Fig. 1-32

NOTES:

1. In both these cases the optional KR-200U series RF Converter must be installed in the PV-4800U.
2. When this kind of dubbing is performed the operation is identical to the instructions given in the section 1-12-1 above.
3. The channel selectors of the KR-200U series and the VCR's RF convertor must be set to different channels, otherwise problems may occur.

1-13 TAPE SPLICING

Wrinkles or creases in the tape will cause deterioration of the playback picture.

1. Cut out and discard the damaged part of the tape. Then arrange the two ends of the tape so that they overlap and are properly aligned. Cut at right angles to the length of the tape.
2. Place the tape on a clean surface so that the ends match completely with no gap or overlap. Apply the splicing tape to the side of the tape which does not come in contact with the video heads.
3. Trim away any excess splicing tape.

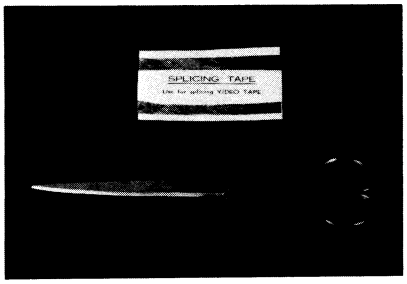


Fig. 1-33

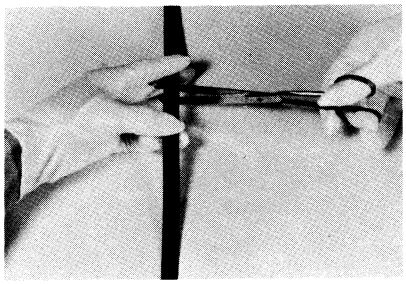


Fig. 1-34

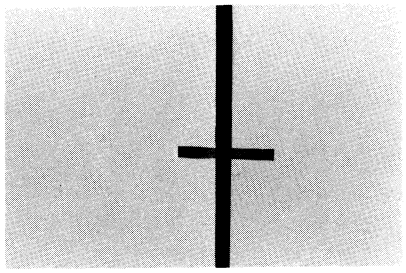


Fig. 1-35

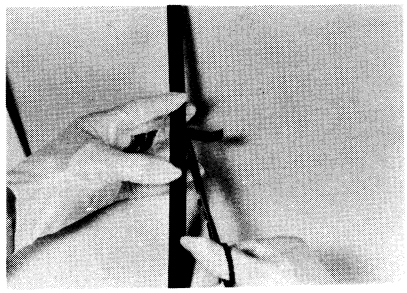


Fig. 1-36

1-14 CLEANING TAPE PATH

1-14-1 Cleaning the Video Heads

Dust adhering to the video heads or tape path will cause dropouts and generally poor performance.

a. Set the PV-4800U Function lever to STOP, and wait until the rotary video heads come completely to rest.
b. Remove the video head cover.
c. Detach the metal shield cover by removing the two screws and turn the video head assembly so that one of the head tips is accessible.
d. Soak a smooth, lint-free cloth in the cleaning fluid provided and clean the head tip by wiping gently.
e. Rotate video head assembly to clean other tip.

CAUTION:
Do NOT use a vertical motion to clean the video heads.

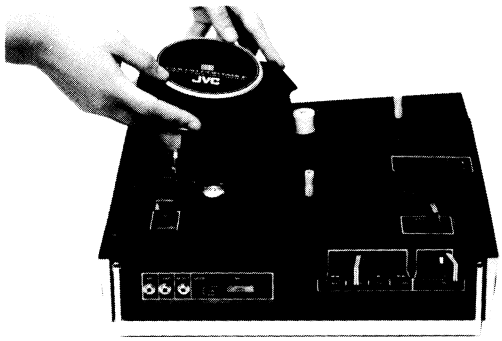


Fig. 1-37

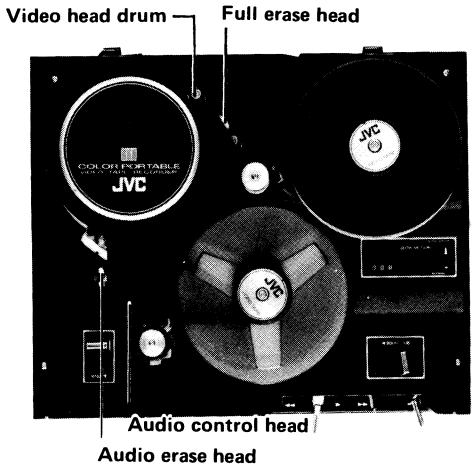


Fig. 1-38

1-14-2 Cleaning the Audio and Erase Heads

Thoroughly clean those parts of each of the heads which come in contact with the tape using a soft cloth saturated with head cleaning fluid.

1-14-3 Cleaning the Remainder of the Tape Path

Remove dirt as described above from all other parts of tape path. When cleaning the drum surface take care not to damage the video heads.

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SECTION 2
CIRCUIT DESCRIPTION

2-1 GENERAL

The electric circuit consists of two main printed circuit boards. The video circuit is provided in one board, and in the another, the servo circuit, the audio circuit, and two selector switches. Two selector switches are included to change over the power supply and the signals of the electronic circuits for recording and playback of audio and video. The Audio and Servo board is mounted inside of the chassis, and the Video board is mounted outside. Since the color circuitry must be assembled within a limited space in the PV-4800U, a number of IC's are employed; and the circuit design used in common for the recording and the playback circuit makes the best use of the limited space.

2-2 VIDEO SYSTEM

2-2-1 General

In this color portable video tape recorder, video signals are recorded on a magnetic tape by two rotary video heads. For playback, video signals are regenerated from the magnetic tape through the same video heads. However, it is a general characteristic of magnetic heads that the current generated in playback is proportional of the flux field.

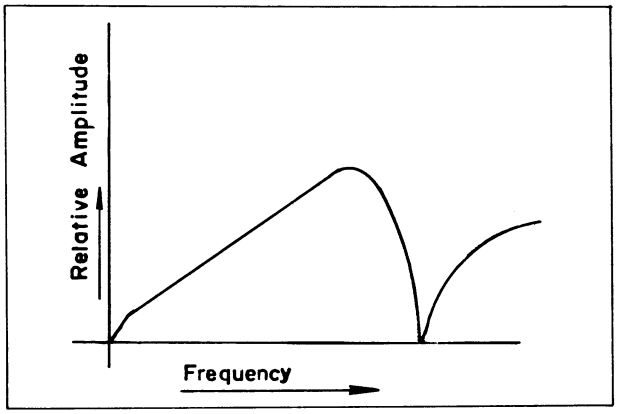


Fig. 2-1. Characteristic response curve for playback head

Fig. 2-1 illustrates this principle.

The roll-off at higher frequencies is caused by a combination of factors: gap loss (wavelength approaching gap length), tape losses, etc.

For a number of reasons, including the overall bandwidth of the signal, tape limitations and playback characteristics, recording a video signal directly is not feasible. Therefore, the PV-4800U converts the input video signal to an FM signal before recording. It is necessary, of course to demodulate the FM in playback.

In a machine of this size, it is difficult to maintain the time base stability necessary to permit direct recording of the chroma signal. The effects of this instability are minimized by processing the luminance and chrominance separately.

The luminance signal is frequency modulated between the limits: 3.1MHz for sync tip and 4.5MHz for peak white. The chroma signal is separated from the luminance by a band pass filter. The subcarrier is then converted from 3.58MHz to 767kHz.

It is linearly mixed with the FM luminance signal and directly recorded as sidebands of 767kHz. The FM signal functions as an AC bias for the chroma signal.

In playback, the signals are again separated by filter networks and processed individually. The FM luminance signal is demodulated, while the chroma subcarrier is converted back to 3.58MHz.

An automatic color correction circuit eliminates any hue variations before the signals are recombined. The output signal is NTSC-type.

Fig. 2-3 is a basic block diagram illustrating record and playback.

An explanation of the block diagram follows.

Details of the circuit are as follows: Refer to the schematic diagram in Section 10-2 as well as the block diagram in this section.

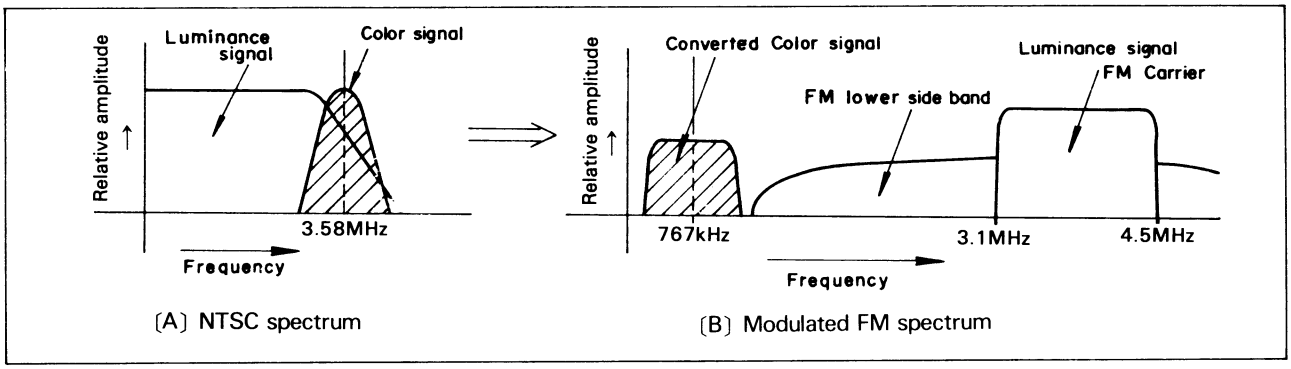


Fig. 2-2.

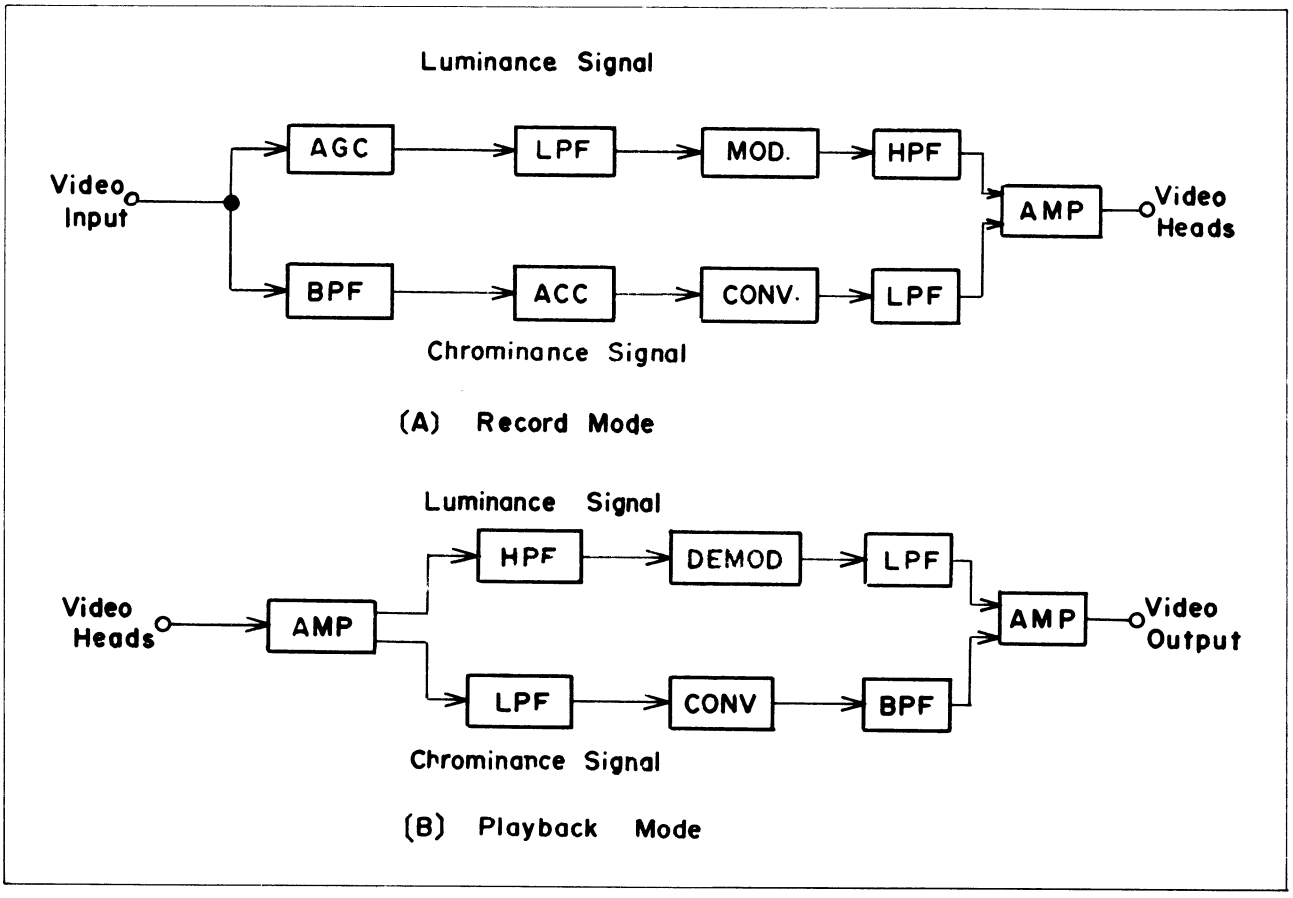


Fig. 2-3. Block diagram, video processing

2-2-2 Luminance signal recording system

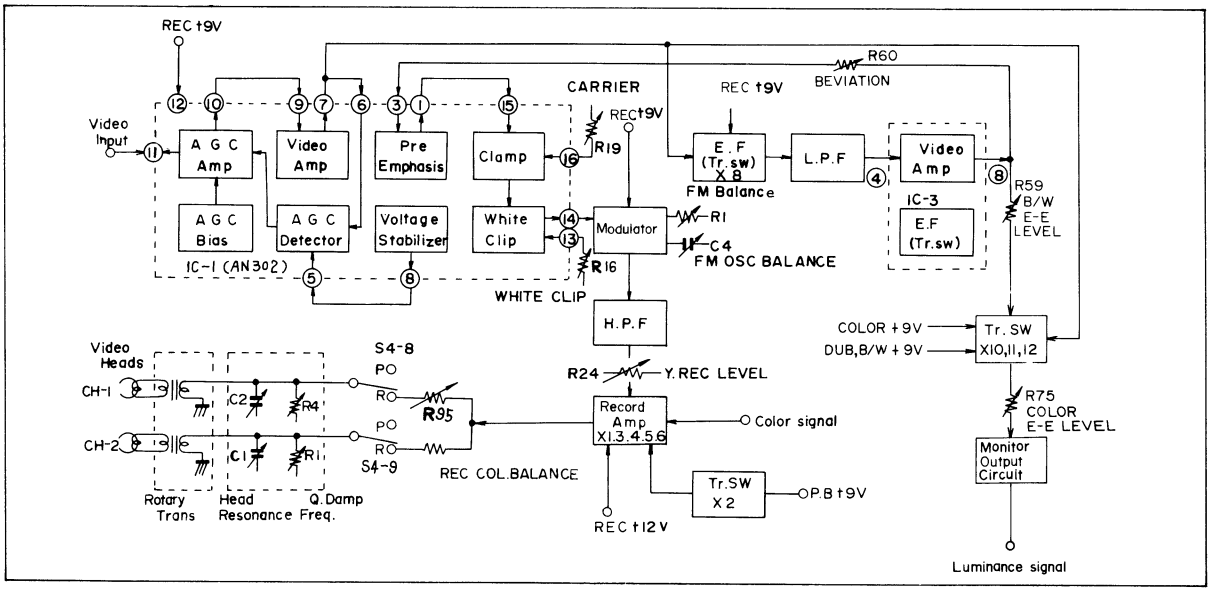


Fig. 2-4. Block diagram, luminance signal recording system

1. AGC, Pre-emphasis, Clamp and White Clip

These circuits are highly integrated and incorporated into IC1 (AN302). Input video signal is at first kept at a constant level by utilizing an AGC circuit.

After the signal passing through the AGC amplifier is amplified by the video amplifier, it is fed to X8 and the AGC DETECTOR. The AGC DETECTOR rejects the chroma component from the signal by utilizing C8 and L2, and the output signal controls the amplification of the AGC amplifier. The signal passing through X8, after the 3.58MHz color subcarrier and any other higher components are rejected by low pass filter LPF-1, is fed to the video amplifier. The LPF also delays the luminance portion of the signal 0.97 μsec for the purpose of registration. Further X7 is switched off from the power supply and therefore it is not operative while recording.

Pin 8, the output of the video amplifier IC3 is connected to X12, pin 3 of IC1, and pin 1 of IC3. The signal fed to pin 1 of IC3 is not brought into the output due to the positive voltage from D3 while recording. The signal through X12 becomes a monitor signal when recording.

The signal fed to pin 1 of IC1 is pre-emphasized by the network, R4, R5, R6, R7, C3, C4 and L1, to improve the signal-to-noise ratio of the video signal. The pre-emphasized signal is clamped at the sync tip by the clamping circuit, with the clamping level being determined by R19.

This is done to prevent the drift of the FM carrier caused by variations in the mean DC level of the video signal. The high frequency boost from pre-emphasis causes overshoot in the vacinity of fast transitions in signal level. To prevent over-deviation of the modulator, a white clip circuit is used.

The white clip can be adjusted with R16.

2. Modulator

After the signal leaves pin 14 of IC1 the 3.58MHz component remaining in the video signal is rejected by C14 and L4, and is fed to the FM modulator, which is a separate unit. The modulator is a kind of astable multivibrator that is voltage regulated. The output frequency of the modulator is determined by the formula:

$$f = \frac{1}{2RC \log_e (1 + \frac{E_o}{E_{in}})}$$

f is frequency in cycle per second.

RC is the time constant of a base charging circuit.

E_o is power supply voltage.

E_{in} is input signal voltage.

The modulator was designed to operate at 3.1MHz at sync tip and 4.5MHz at peak white.

The output is taken across T1, a balanced RF transformer.

3. High pass filter (HPF-1)

The modulator output is coupled across a high pass filter which eliminates all signals in the spectrum below approximately 1.4MHz.

4. Record amplifier

The recording amplifier circuit consists of X1 through X6. X1 performs mixing of the luminance signal and the color signal; and the recording level is adjusted by R24 and R141, respectively. X2 is an electronic switch. At playback, it becomes conductive and keeps the circuit in shorted condition.

Because power is supplied to the recording amplifier circuit even in sound dubbing mode because of the switch configuration employed, the electronic switch prevents amplifying unnecessary signals. The output stage is of the single ended push-pull type, and supplies the power required for recording the signal on the magnetic tape.

5. Color/Black-and-white change-over circuit

X10, 11 and 12 are electronic switches which use transistors; they perform change-over of the monitor output between color and black-and-white. This change-over is initiated by manual operation of the mode selector. In the case of the color mode, X11 becomes conductive, and the AGC output from pin 7 of IC1 through X10 is fed to the video amplifier, IC4. In the case of the black-and-white mode, X12 becomes conductive, and the luminance signal passing through R59 is fed to the video amplifier, IC4. In this way, when monitoring in color while recording, misoperation, which would result in recording color signals in the black-and-white mode, can be prevented.

6. Monitor output circuit

IC4 and X13 through X17 make up the output circuit. This circuit operates to provide output for monitor use while recording, and as the playback video signal output circuit during playback. IC4 is a video amplifier with low input impedance, and the signal lines of four systems are connected to the input. Among them, the monitor signal from R76 is input to IC4 while recording, However, in playback condition, the aperture output from R72, the luminance component at the low frequency range from R69, and the color signal from R137 are mixed and brought into the input of IC4.

X13, 14 and 15 from an insertion circuit for the vertical sync stabilizing pulse. This adds a quasi vertical sync pulse, when playback is performed for the still and slow mode, in order to prevent vertical

sync from being disturbed by noise bars. At recording and normal playback condition, no signal appears at the bass of X13; and thus X13 remains ON, while X15 remains OFF. Consequently, the video signal from IC4, the sync tip being clamped by D6, is applied to an output amplifier consisting of X16 and X17 through X14. On the other hand, in the still and slow condition, a positive pulse of 60Hz is fed to the base of the X13. (Refer to 2-3-2 (9) on the vertical sync stabilizing pulse generation circuit in the servo circuit.) Accordingly, only when the 60Hz positive pulse is present, X13 which is normally conducting is OFF and X15 turns ON. The result is that the signal passes through X14, with the level of the quasi vertical sync being determined by R84, which is adjusted to match horizontal sync level.

X16 and X17 compose the output amplifier of cascaded configuration with output circuit of low impedance.

There are three outputs; those are connected, respectively, to the RF unit, pin 3 of TV/CAMERA connector (when in TV mode), and pin 1 of the TV/CAMERA connector (when in the playback and camera mode). Further, when in PLAYBACK, it is also fed to IC7 on the audio and servo printed circuit board.

2-2-3 Color signal recording system

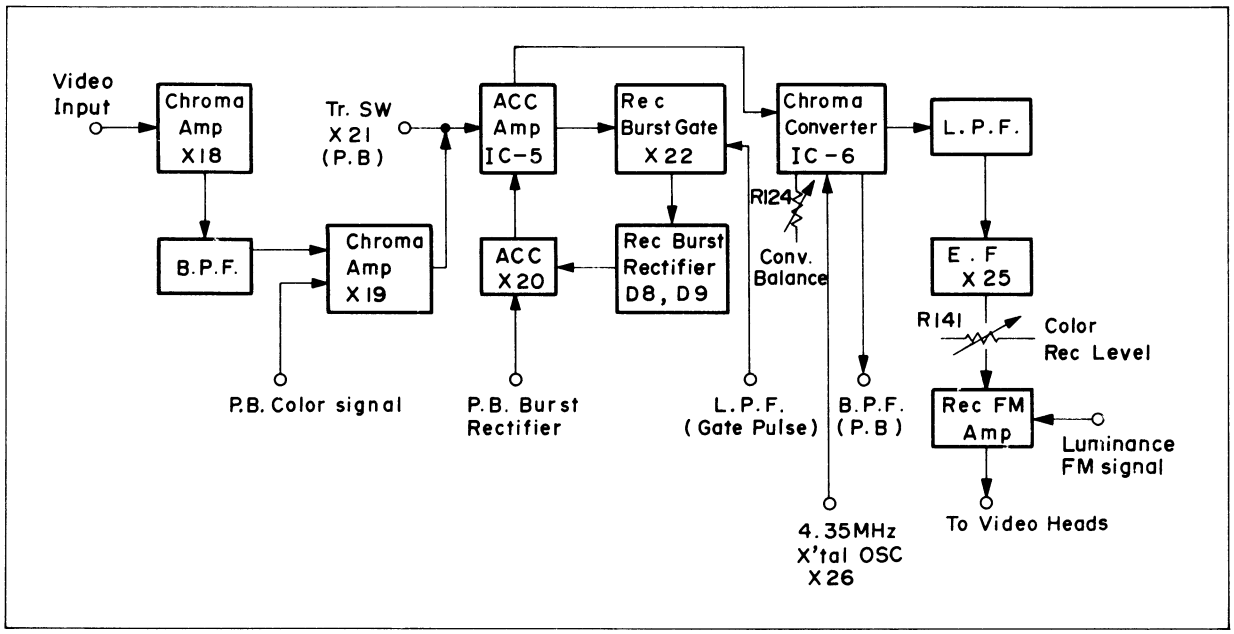


Fig. 2-5. Block diagram, color signal recording system

1. Chroma amplifier, and Band pass filter
   The input video signal is fed to the base of X18 through C53, R96 and C54. C53, R96 and C54 form a high pass filter rejecting the luminance signal in the signal. The signal, amplified at X18, is fed to X19, after the luminance component is completely rejected by means of band pass filter BPF-1. X19 is a grounded base type amplifier, and the playback color signal is fed to it in the playback mode.
2. Automatic color control (ACC), and ACC detector
   X20 perform ACC operation utilizing the change of impedance between the drain and the source in accordance with the electric potential impressed on the gate. The burst signal is picked out and amplified by X22 from the chroma signal amplified at IC5, and rectified by D8 and D9, and finally as a control voltage, applied to the gate of FET X20. That is, the burst level change of input chroma signal is detected as a DC component change so that ACC output is automatically controlled at a constant level. The pulse which gates the burst is produced from the composite sync obtained from IC7 in the Audio and Servo printed circuit board. X21 turns on at the playback, and inserts C65 in the circuit concerned so that the invasion of 4.35MHz to the ACC circuit can be prevented. Further, since the ACC circuit is shared for

common use in the playback mode, D10 operates so that the direct current component obtained from the ACC detector in the playback system does not flow into the ACC circuit.

The signal amplified at IC5 is fed to X22, IC6 and IC8, but IC8 operates only when in the playback condition.

3. Main convertor (IC6)

IC6 is a frequency convertor; and the sum and difference of the frequency inputs to pins 5 and 11, can be obtained at IC pins 3 and 13 respectively. The signal at pin 3 of the IC is opposite in polarity to the signal at pin 13. The circuit is shared for common use in both recording and playback mode, and when in the recording mode 767kHz can be obtained by the 3.58MHz subcarrier from IC5 and the 4.35MHz from oscillator X26, and further, when in the playback mode, 3.58MHz can be obtained by 767kHz from IC5 and 4.35MHz from X28. While in the recording mode, the output signal at pin 3 of IC6 is fed to X25 through the low pass filter LPF2.

R129 plays the role of balacing convertor so that the leakage of the 4.35MHz component to the output can be minimized.

4. Low pass filter and emitter follower

Both signals, 7.93MHz and 767kHz, are present at the input of the LPF which rolls off at 1.6MHz. This means that only the 767kHz is sent to the emitter follower X25. The output signal of X25 is mixed with the luminance signal in the record amplifier.

The adjustment of color level at the recording is performed by R141.

5. 4.35MHz oscillator

The 4.35MHz oscillator is a crystal controlled Clapp type. This configuration was selected for its stable output regardless of power line variations. The center frequency is 4.346590MHz.

6. Burst gate pulse generator

The circuit is shared for common use both for the recording and the playback condition. The only difference is that the input sync pulse is developed from the input video signal when in the recording mode, and it is developed from the playback video signal when in playback mode.

The burst gate pulse is produced from the sync pulse from the sync separator after passing through the circuit consisting of R192, L29, C139 and also D22, which operates to eliminate ringing. The output is sent to X22 and X30, when in recording condition; or X30, when in playback condition.

2-2-4 Combined Luminance-Chrominance signal processing

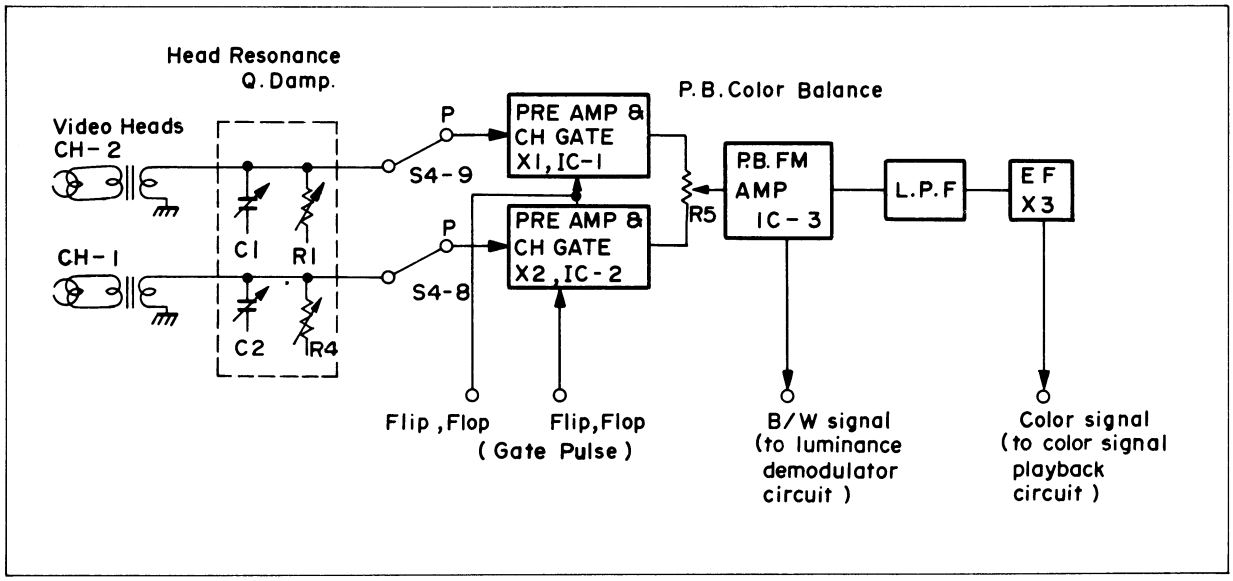


Fig. 2-6. Block diagram, playback system

1. Pre-amplifiers and switchers
   The playback signal obtained from a tape is approximately 1–2mV in amplitude. This very low amplitude requires the circuit used as a pre-amplifier to be of the high-gain, low-noise variety. The signal from the video heads is coupled across a rotary transformer to the pre-amplifier on the Audio and Servo circuit board.
   IC1 and IC2 constitute a pre-amplifier with cascade configuration. X1 and X2 form a switcher, and the gate pulse utilizes the flip-flop output of IC4 and IC5. Since mixing two FM signals presents many difficulties, a continuous signal is formed by the switching method. C1, C2, R1 and R4 in the pick-up terminal assembly are employed to adjust the resonance point and to compensate for differences between channels.

2. Playback FM amplifier, low pass filter, and emitter follower
   R5 performs balancing of the color level at playback and also mixing of the signals from IC1 and IC2. The signal is amplified at IC3 to a level of 1 to 1.5 volt p-p and is distributed into two systems. Two components are present in the signal at this point: FM-modulated luminance and 767kHz frequency converted chrominance. The Y-signal component is fed to the luminance demodulation circuit through C9, and the color signal component is applied to the ACC circuit through the low pass filter and emitter follower X3. L4 and C10 form an equalizer.

2-2-5 Luminance demodulator circuit

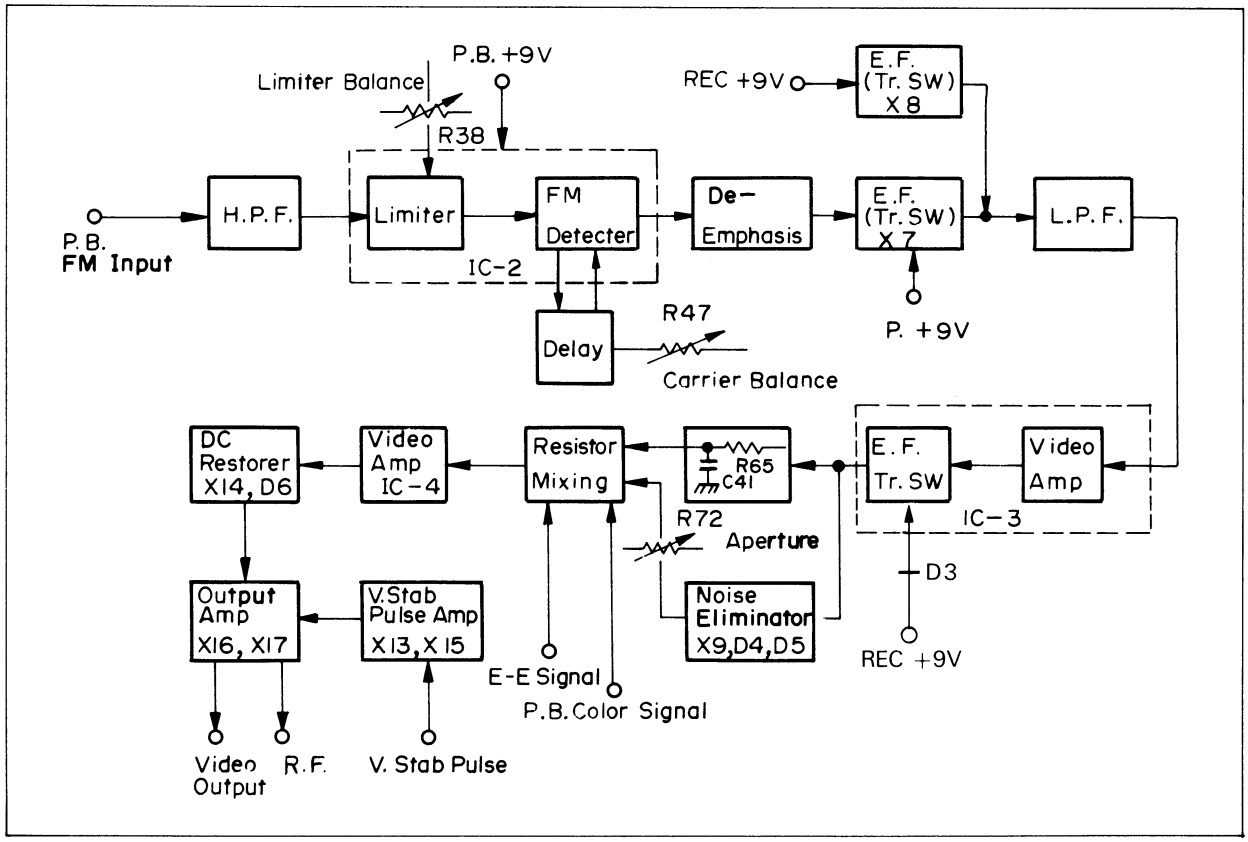


Fig. 2-7. Block diagram, luminance demodulator

1. High pass filter
   The FM playback output from the preamplifier is fed to a high pass filter consisting of C24,C27, L6 and R41 on the Video printed circuit board.
   The playback signal at the output of IC3 contains both luminance and chrominance components. The high pass filter eliminates all chrominance information.
2. Limiter and demodulator (IC2)
   The FM playback signal, whose chroma component has been rejected at the high pass filter, flows into IC2.
   The SN76670 (IC2) is a monolithic integrated circuit which is used as a six-stage differential amplifier-limiter, a balanced coincidence detector and a d-c volume control. The FM signal from the pre-amplifier and switcher includes amplitude fluctuation, caused by uneven contact between the tape and the video heads, dropouts, and variation of sensitivity and response characteristics of the amplifiers. The limiter is required to remove this amplitude fluctuation.
   The demodulation system employed in the PV-4800U is the delay line type, phase detection demodulator consisting of IC2 and delay line DL1.
   All illustration of the fundamental concept appears in Fig. 2-8 and Fig. 2-9, block diagram and corresponding waveforms, respectively.

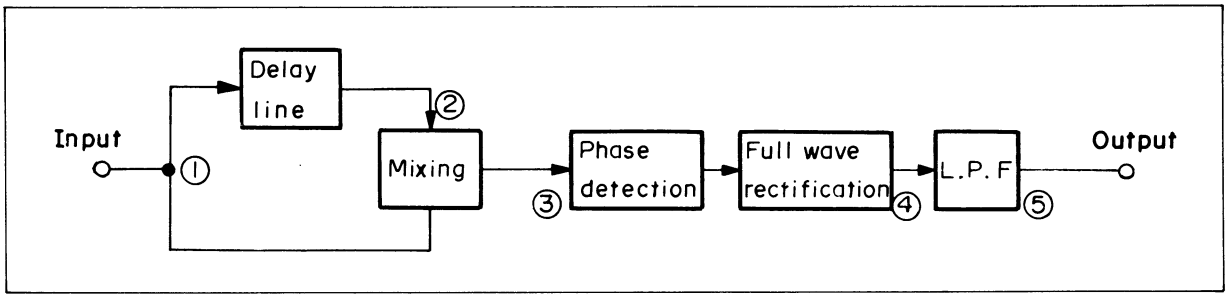


Fig. 2-8. Block diagram, demodulator

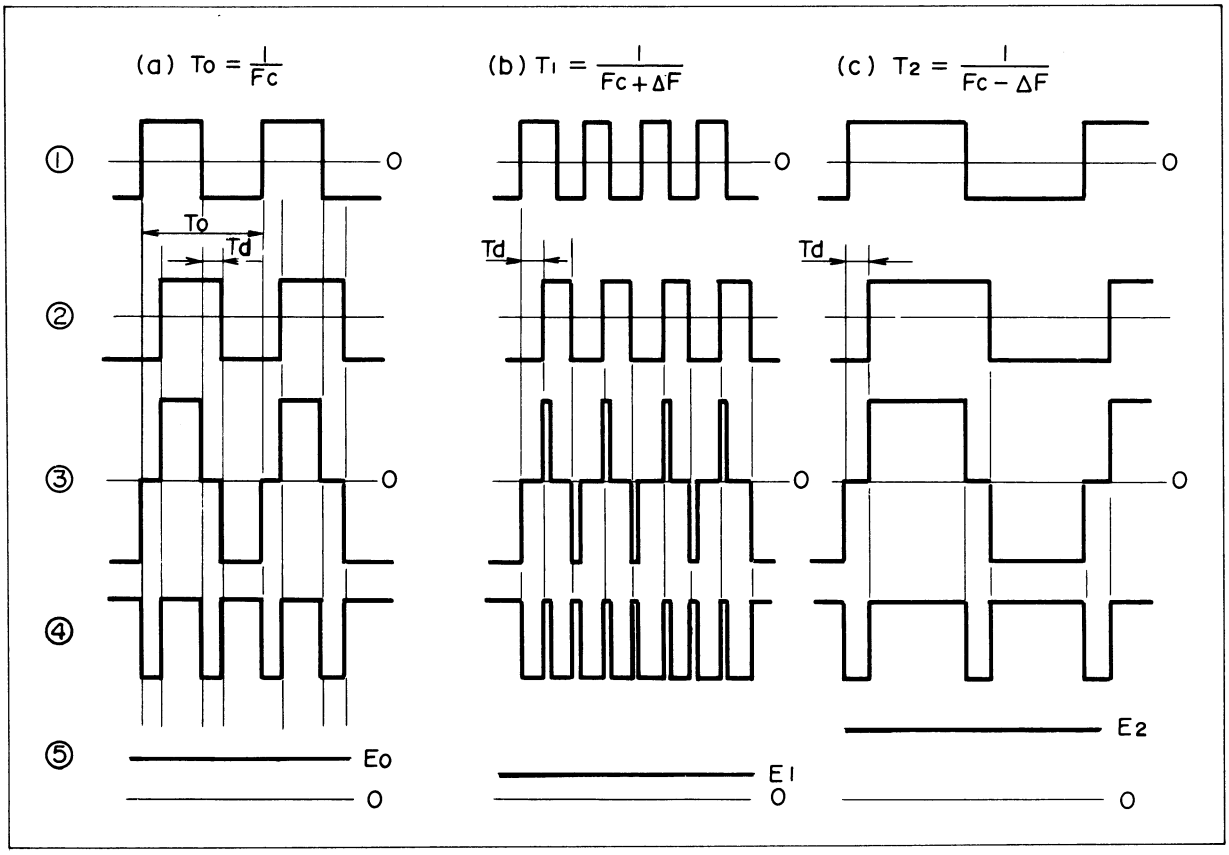


Fig. 2-9. Demodulator waveforms

3. Emitter follower and Low pass filter
The output of IC2 is impedance matched by X7 and integrated by LPFI, resulting in the final video output. Since no power is applied to X8 in the playback mode, the siganl from X7 flows into LPF-1.
The low pass filter has a cut-off at approximately 3MHz which allows it not only to demodulate the FM signal, but also to provide a clear spectrum in which to mix the chroma signal.
4. Video amplifier
The demodulated video signal is amplified at IC3. The high frequency component is fed to the noise supression "aperture" circuit, and the low frequency component to IC4. At that time, since no power is applied to X12 and IC1, the signal through R59 and R60 does not operate.
The playback level for the luminance signal is adjusted with R55.
D3 is employed to cut off the output to pin 2 of IC3 when recording.
5. Noise eliminator "Aperture"
This circuit is provided to eliminate much of the playback noise without sacrificing horizontal resolution.
C39 passes only the high frequency portion of the output of IC3. The output of X9, a grounded base amplifier, is applied to D4 and D5 which form a nonlinear coupling circuit. Signal amplitudes of less than ± 0.2V see a high impedance and are not passed, while voltages of greater amplitude are coupled across a virtual short circuit. This eliminates the noise component and passes the signal component. R72 adjusts the amplitude of the high frequency component which is sent to IC4.
6. Mixing
Since the playback system demodulates the luminance component and the color component separately, it is necessary for them to be mixed prior to being fed to the output circuit. The luminance signal from IC3 is divided into high frequency and low frequency components; and the mixing is performed at R72 (the high frequency component of the luminance signal), R69 (the low frequency component of the luminance signal), and R137 (the color signal).
On the other hand, since X11, 12 do not operate in the playback mode, the signal from R76 is not applied.
7 Output circuit
IC4 is the video amplifier, and X13 through 15 constitute the vertical SYNC stabilizing pulse insertion circuit. X16 and 17 form an output amplifier. These circuits are used in common for the playback video signal output circuit and the recording output circuit for monitor application. Refer to the 2-2-2, 6 "Monitor output circuit" for details.

2-2-6 Color signal playback system

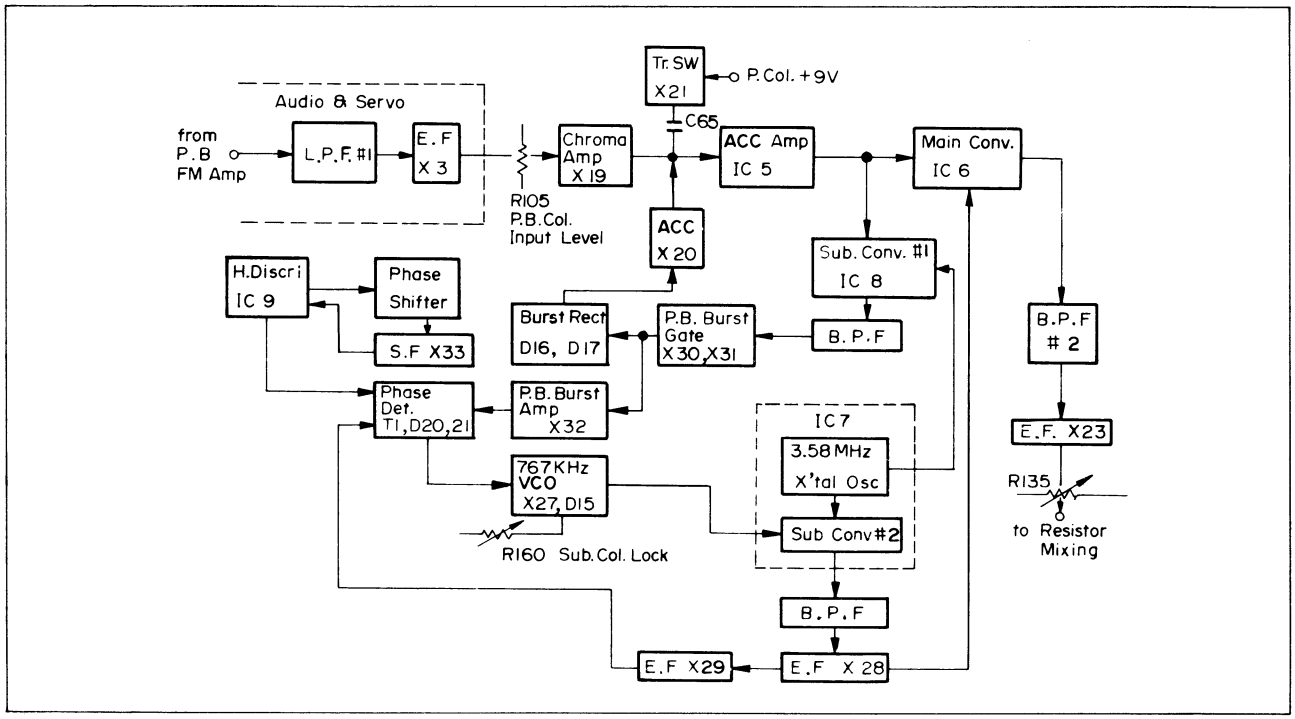


Fig. 2-10. Block diagram, Playback color system

In the color signal playback system, several circuits are provided to restore the converted color signal to a frequency of 3.58MHz. They also provide a color sub-carrier of 3.58MHz to guarantee color synchronization regardless of frequency fluctuation of color signal due to flutter and wow, etc.

1. Chroma Amplifier
   The playback color signal from X3 in the Audio and Servo printed circuit board is amplified at a base grounded amplifier in the Video printed circuit board, and fed to the ACC circuit. X19 amplifies the signal from X18 while recording, but X18 does not operate at the playback mode. The input level to the ACC should be adjusted at R105 so that the same operation can be obtained as that while recording.
2. Automatic Color Control (ACC)
   This circuit is employed both for the recording and the playback, and the only difference is that the color signal during recording is a 3.58MHz component and for playback is a 767kHz component.
   The source to drain impedance of X20 is varied with the DC level from the ACC detector so that the ACC output level can be kept constant. The detector output is applied to the gate of X20 as a control voltage. X21 turns on at playback resulting in inserting C65 to the circuit, and intrusion of 4.35MHz into the ACC circuit can be prevented. The signal amplified at IC5 is fed to X22, IC6 and IC8, but X22 turns on only when in the recording mode.
3. Main converter and Band pass filter
   The main converter is designated IC6. The playback signal (767kHz) and the output of sub converter consisting of X28 (4.35MHz) yield the sum and the difference of these frequencies. Since the difference frequency (3.58MHz) is now needed, all the components except 3.58MHz are rejected by passing the signal through the band pass filter BPF-2.
4. Emitter follower
   The color signal from the band pass filter is sent to the video amplifier consisting of IC4 through the emitter follower X23, then R135 and R137, and after being coupled with the playback luminance signal becomes the final output signal. R135 adjusts the playback color signal level. Moreover, at the recording condition, in order to prevent unnecessary signals from being leaked, D12 performs a reverse bias function for X23 and X24 causes X23, to be grounded through C84.
5. Sub converter IC8
   An input with a center frequency of 767kHz is fed to IC8 from the ACC. At the same time, a CW signal of 3.58MHz is fed from oscillator/converter IC7 to IC8. These signals are mixed in the circuit and sum and difference signals appear in the output.
   Among these signals, the sum signal 4.35MHz is picked out by means of the resonance circuit consisting of L23 and L24 and fed to the playback ACC detector.
6. Burst gate and ACC detector
   The sub converter output 4.35MHz from IC8 is picked out for its burst signal at X30 by means of the burst gate signal, and amplified at X31.
   The output of X31 is fed to the ACC detector and phase detector. The output of the ACC detector, D16 and D17, is fed to the ACC circuit to control the burst level output.
7. Phase detector
   The phase detector compares the phase of the burst from the burst gate with that of the 4.35MHz continuous waveform the sub converter. The burst from burst gate is amplified at X32, then applied to T1. The center-tapped secondary divides the input into two signals of equal amplitude but opposite phase. These are applied to phase detecting diodes D20 and D21 through C136 and C137. The CW 4.35MHz from X29 is applied to the junction of D20 and D21. Dependent upon the phase relation between these two signals, a phase error output voltage is obtained. This signal is coupled across R158 and C102 to the VCO. Additionally, another voltage is added to this output by the horizontal discriminator.
8. Voltage controlled oscillator (VCO)
   X27 is the voltage controlled oscillator with a frequency of 767kHz. Since the oscillating frequency is determined by a components network consisting of L18, C97, through C99 and D15, control is performed by changing the capacitance value. This is done by the biasing of D15 inversely by means of the voltages from the phase detector and the color lock potentiometer.
9. 3.58MHz oscillator and sub-converter
   IC7 performs two operations; the 3.58MHz oscillator and the sub converter. The 3.58MHz oscillation is performed by a positive feedback from pin 11 to pin 14 of IC7. The fine tuning for the oscillating frequency is performed by C105. The frequency conversion is performed by the addition of the 3.58MHz oscillator frequency and the 767kHz signal from the VCO, and the sum frequency 4.35MHz is peaked by a resonance circuit consisting of L20 and L21. The 3.58MHz signal is also fed to the sub-converter consisting of IC8. The 4.35MHz signal converted is fed to the main converter IC6 through the emitter follower

X28, and to the phase detector through X29.

10. Horizontal discriminator

The horizontal discriminator monitors the horizontal sync signal of the demodulated video signal and converts any frequency variation into a DC voltage change.

This voltage change is then fed to the phase detector to aid in chroma stabilization.

Pins 13 and 14 of IC9 are connected to each other, and pins 6 and 14 are connected through C143. Though the circuit oscillates at a frequency around 22kHz, when the sync signal arrives at pin 14, it is drawn in the frequency and locked. The signal is picked out of pin 11, and produces a phase difference in response to the frequency by passing through a tuning circuit consisting of L30 and C147. This signal is fed to pin 10 of IC9 through X33. The result is that the circuit performs the same operation as the demodulating circuit does for the luminance signal, and the output voltage in response to the frequency is obtained by integrating the output of pin 8 of IC9 by C140. This output, with the phase detector output, controls the oscillating frequency of the VCO, and supresses the fluctuation of the subcarrier due to fluctuation of the horizontal frequency.

11. Dubbing Mode

The dubbing mode is provided with the PV-4800U system. This is employed in the playback mode, when the tape being recorded is dubbed. As mentioned, the compensation by means of the horizontal discriminator is added to the playback color signal besides that of the automatic phase control. If the compensated signal would be recorded as it is by other type of equipment, an excessive compensation by the horizontal discriminator would arise with the result that there would be a possibility of its being out of color synchronization. For this reason, the dubbing mode is employed so that the signal can be sent out without the compensation.

That is, when the mode selector is set at the dubbing mode, the power supply is applied to the 4.35MHz oscillator consisting of X26 by D4 in the Solenoid Control printed circuit board,resulting in activating the oscillator.

Further X4 in the Solenoid Control printed circuit board is cut off and the power supply to the VCO is also turned off. Accordingly, the main converter consisting of IC6 performs frequency conversion by means of the 767kHz component of the playback signal and the 4.35MHz signal from X26.

2-3 SERVO SYSTEM

PV-4800U employs the both a capstan and head servo system; and DC motors are used for the respective drive systems. The reason why DC motors are used is that a battery can be used for power input. Thus, a small size and light weight configuration can be adopted for the system. The capstan servo controls revolution of the capstan at the recording and playback condition, so that the tape speed can be kept constant. The reference signal to the head servo is a 30Hz pulse developed by halving the vertical sync pulse of input video signal for the recording mode. For normal playback mode, the control pulse recorded on the video tape in the recording mode is likewise divided by two. Further, a built-in SSG output is employed as a reference signal for slow motion playback condition.

Details of the circuit are as follows: Refer to the schematic diagram in Section 10-2 as well as the block diagram in this section.

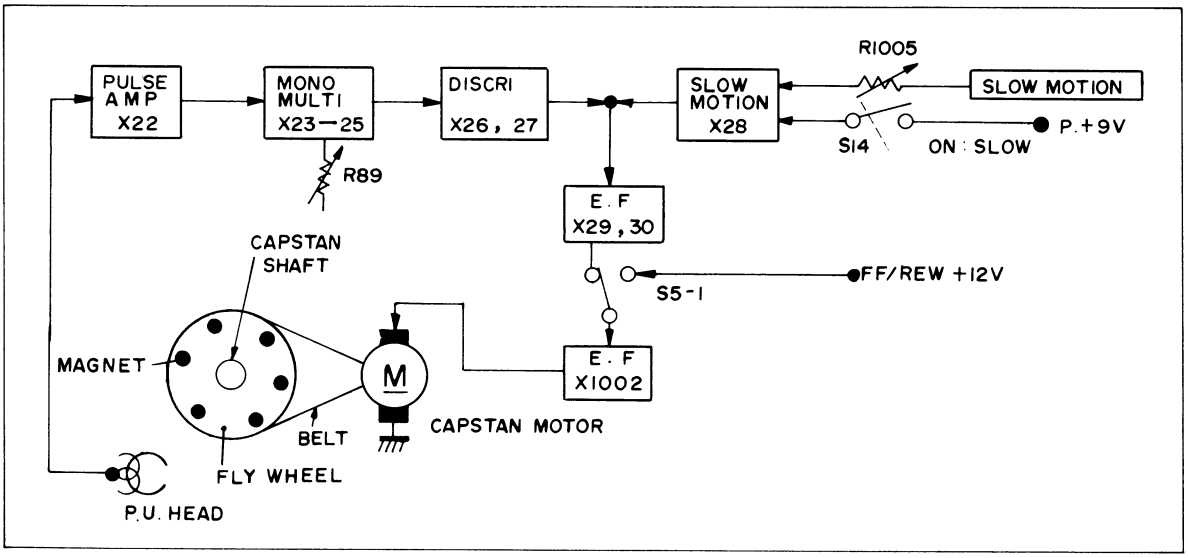


Fig. 2-11. Block diagram, capstan servo system

2-3-1 Capstan servo system

The capstan servo circuit detects the six pieces of magnetic material built into the flywheel by utilizing a pick-up head. Changes in frequency are converted into changes in DC voltage. This error voltage controls the speed of rotation of the capstan motor so that the tape speed can be kept constant. In slow motion mode, capstan drive is adjusted by R1005, through X28. Further, in Fast Forward or Rewind, the capstan motor is driven by positive (+) 12 volts DC power input.

1. Pulse amplifier
   Negative pulses are detected from the six pieces of magnetic material on the flywheel by the pick-up head, and after being amplified at X22, are fed as a trigger signal to the next stage, a monostable multivibrator.

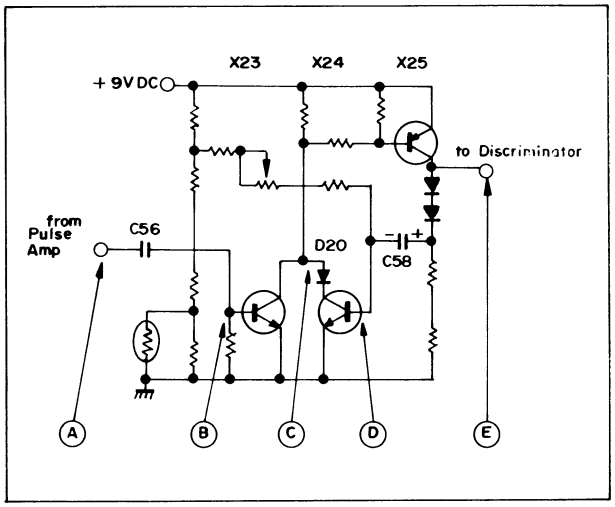


Fig. 2-12. Monostable Multivibrator

2. Monostable multivibrator
   Transistors X23, X24, and X25 compose a special type of monostable multivibrator as described in the following:
   The difference from a conventional multivibrator is that X24 and X25 turn on or off at the same time, and are triggered at the down time of the input pulse, and further are again triggered by the next input pulse even under the operation of mono-multivibrator, even while the mono-multivibrator is in the cut-off state. Refer to Fig. 2-12 and Fig. 2-13. When no input pulse is present, X23 is turned off and X24 turns on, resulting in turning X25 on, as shown by the waveforms prior to t1, illustrated on Fig. 2-13. At this time, the collector voltage at X23 is about 0.9 volt (=0.2+0.7) due to the saturation voltages at X24 and D20, respectively. When a pulse arrives at X23 through C56 at the time of t1, X23 is turned on. The X23 collector voltage becomes 0.2 volt and D20 is turned off, but other conditions remain the same as before. Next, when the pulse from C56 becomes less than

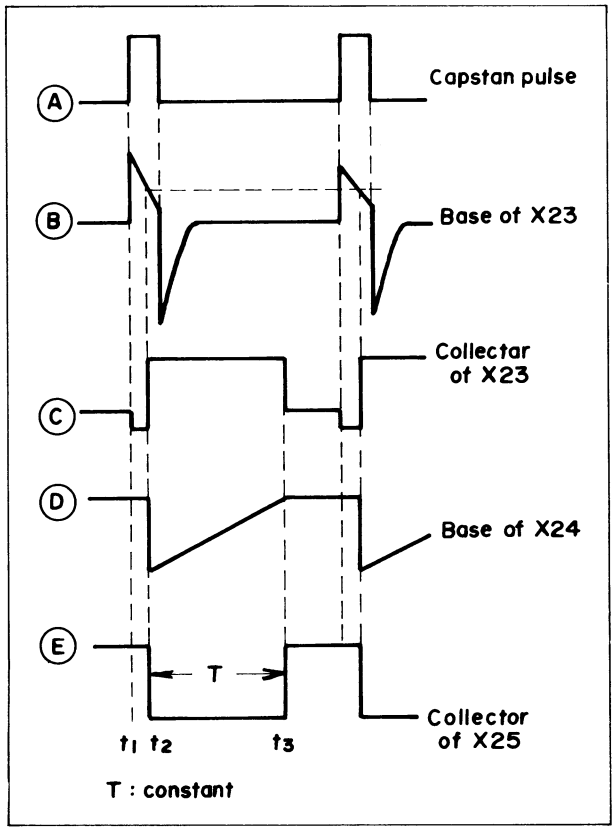


Fig. 2-13.

0.7 volt (referred to as t2), X23 is turned off, and the instant the collector voltage at X23 rises up to the power supply voltage, X25 is turned off. Since X25 is turned off, X24 is reverse-biased by the voltage being charged on C58 resulting in its being turned off. When the base potential becomes 0.7 volt following the time constant of X24's base circuit, X24 turns on and the collector voltage of X23 goes down. Then, both X24 and X25 return to the initial "on" condition to await the next input pulse.

Next, consider the case of the next pulse being applied while X24 is turned off. When the next pulse is applied as shown in Fig.2-14, X23 and also X25 turn on. Consequently the collector voltage of X25 rises, thereby causing the base potential of X24 to go up, through C58, and X24 to turn on. This means that this special monostable multivibrator circuit operates even for the interval when conventional ones do not operate. The operation afterward is the same as mentioned earlier. The

reason why this type of monostable multivibrator circuit is employed for the PV-4800U is that when the tape speed, that is, the revolution of the capstan increases more than usual from some causes, conventional monostable multivibrators cannot detect the result and therefore control the revolution of the capstan for a normal condition. This will be explained in more detail in the following description.

3. Discriminator

The output of the monostable multivibrator is picked up as a frequency change at the discriminator circuit, that is, as a voltage change corresponding to a change in the speed of rotation of the capstan. Consider the condition that X25 is turned off, that is, the collector potential is at a low voltage. C59 is charged up through D24, and C61 is also charged up through D24, R96, and D25. Next, when X25 turns on, the pulse differentiated by C60 and R97 is applied to X26 thereby causing it to turn on. By turning on X26, C61 is short circuited between the collector and emitter of X26, and the voltage across C61 is discharged. At this time, since the collector of X25 increases nearly to the power supply voltage, the junction of D24 and C59 rises to a voltage equal to the power supply voltage plus the charging voltage of C59, thereby causing D24 to cut off. Further, since X26 turns on, then D23 is turned off. When X26 is turned off, C61 is charged by C59 through R96 and D25, and the voltage across C61 increases. Also, when X25 is turned off, then D23 turns on, thereby causing D25 to cut off.

Accordingly the charging of C61 stops and the potential present at that time is held. The potential of C61 depends upon the particular time when the pulse is applied as described in the above; and it is fed to X29 through the source follower, X27. With this operation the change of pulse interval is detected as a voltage change.

The reason why a conventional monostable multivibrator is not employed for PV-4800U will be apparent by referring to Fig. 2-16. Now, assuming for example that the capstan rotates, for some reason, at a speed which about double the normal. At the output of pulse amplifier X22, a pulse can be obtained, as shown in Fig. 2-16(A.) The output waveform for the conventional monostable multivibrator and the mono-multivibrator employed in

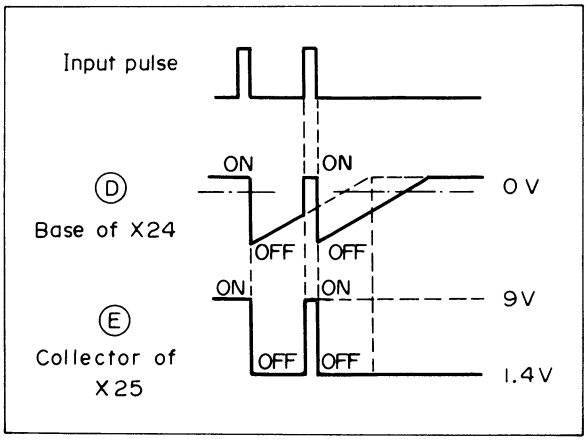


Fig. 2-14. Timing chart

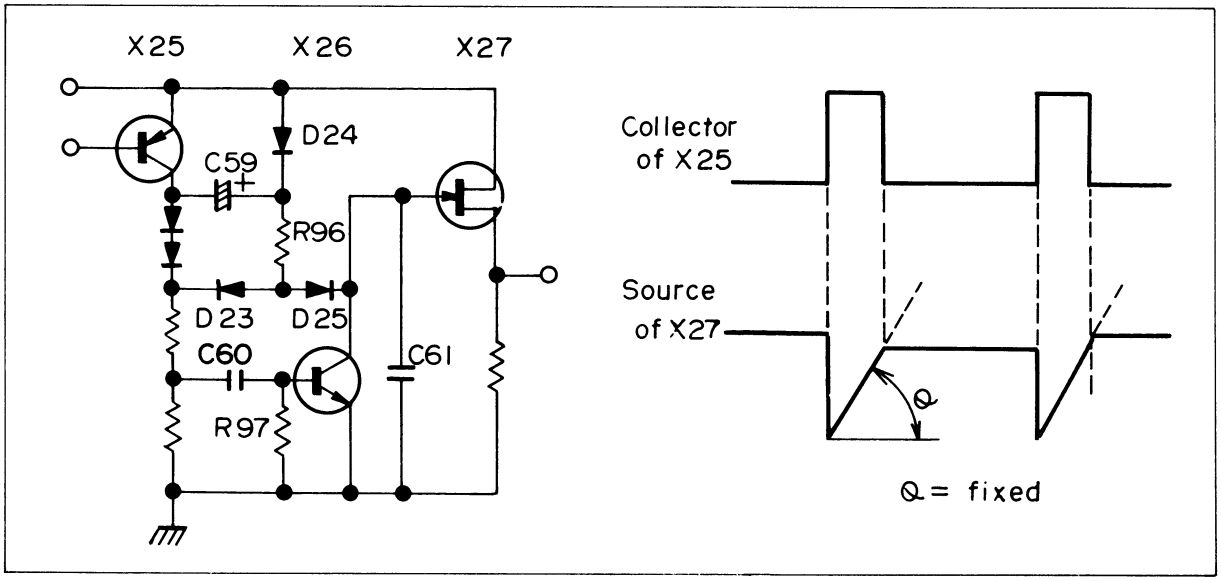


Fig. 2-15. Discriminator

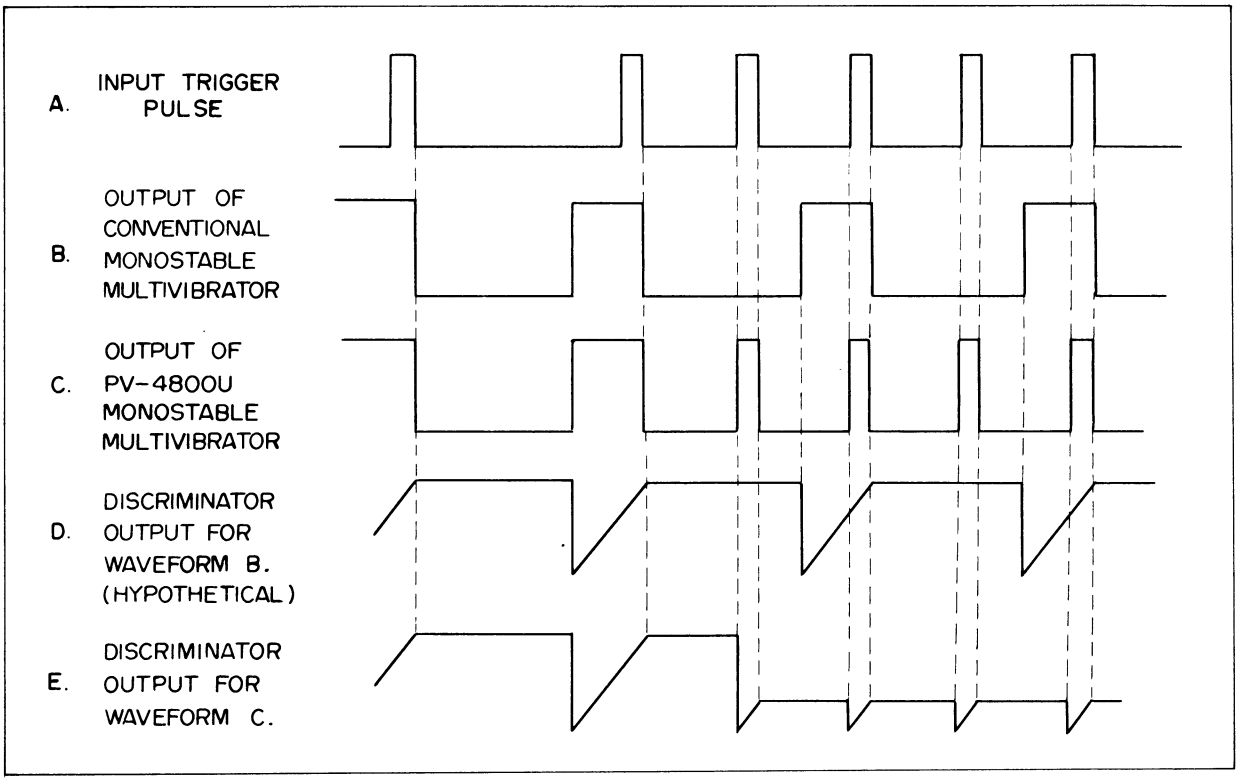


Fig. 2-16. Timing chart

PV-4800U are shown in Fig. 2-16 (B) and (C) respectively; the discriminator outputs corresponding to these outputs are respectively shown in (D) and (E). This shows that the discriminator output is near the voltage corresponding to the normal rotation in the case of the conventional mono-multivibrator, and therefore the rotational speed of the capstan cannot be regulated to the normal value. While, for the monostable multivibrator being employed in PV-4800U, an output voltage lower than normal can be obtained so that the rotational speed of the capstan can be descreased and regulated to normal. As detailed in the above explanation, when the speed of the capstan increases, the output of the discriminator becomes lower resulting in rotaing the capstan motor slower, and vice versa.

4. Motor driving circuit
   The output of the discriminator is fed to the motor drive circuit consisting of X28, X29, X30, and X1002. X28 operates only for slow motion mode. The signal passing through the emitter follower, consisting of X29 and X30, is fed to X1002 through FF/REW switch S5; and X1002's emitter circuit controls the capstan motor. The FF/REW switch is employed since, in recording as well as in playback mode, the capstan motor is controlled by the capstan servo, and at the Fast Forward and the Rewind condition, the motor is driven the positive (+)12 volts power input. Further, R99, R102, and C62 form the low pass filter which aims at decreasing the effect due to inrregular rotation.
5. Slow motion circuit
   At the normal playback mode, X28 does not operate. However, since the bias power supply is applied to X28 through S3-1 and S14 at the slow motion condition, X28 is operative. Tape speed control is performed by controlling the current flowing into X28 by means of potentiometer R1005 for slow motion use. Even though the slow motion mode is selected in the recording mode, the power supply is not fed through S3-1 and the tape speed is not disturbed.
   Further, in the slow motion mode, power supply is fed to a flip-flop circuit consisting of IC11 through D26 and the vertical sync stabilizing pulse generator circuit consisting of D1 and D2.

2-3-2 Head servo system

The head servo system controls the revolution of the head drum at a constant speed at the recording mode;

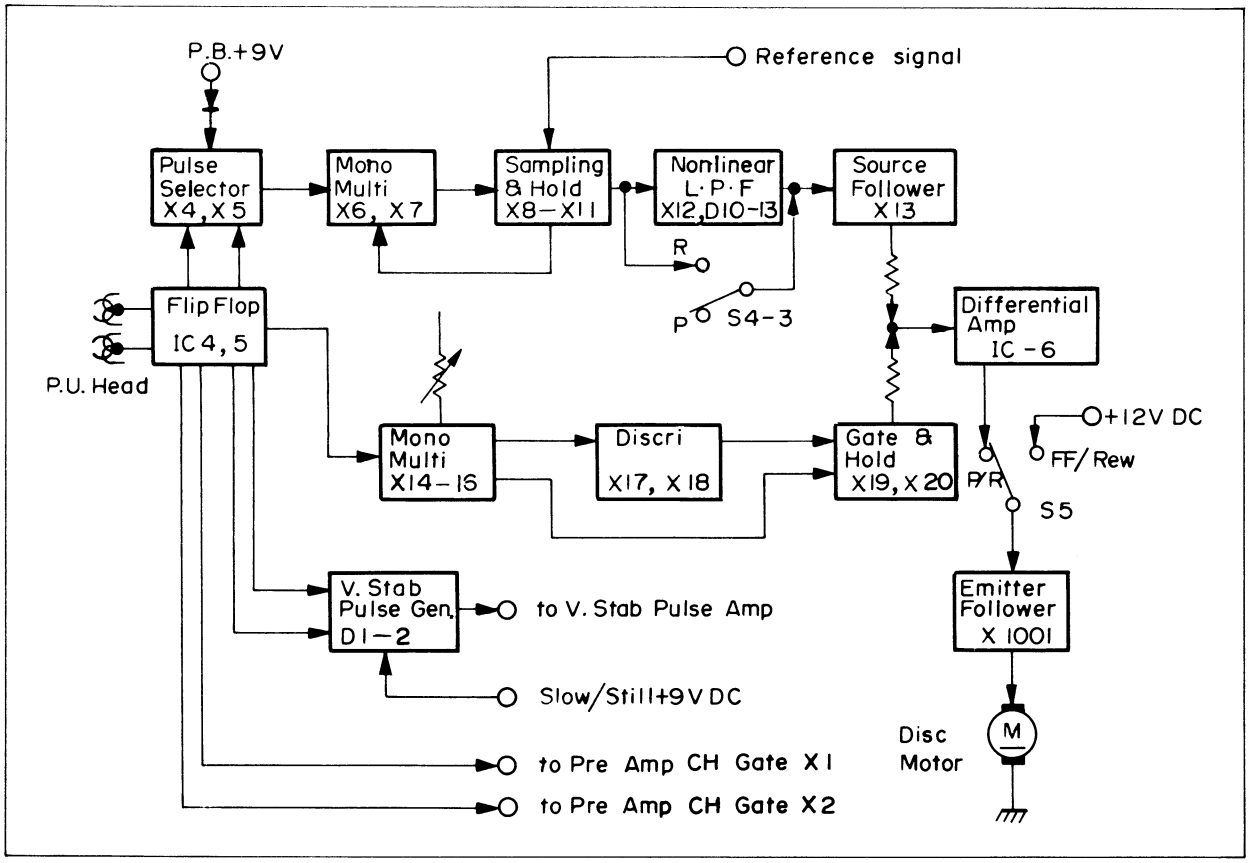


Fig. 2-17. Block diagram, head servo system

and in the playback mode assures that the video track recorded on video tape can accurately be traced.

In the recording mode, the reference signal is made by halving the vertical sync signal from the input video resulting in 30Hz, which is then phase-compared, in the sampling and hold circuit, with the drum pulse's saw-tooth waveform to indicate the rotational phase of the video heads. This resultant error signal controls the revolution of the disc motor. Furthermore, since this can not cover large frequency changes such as those met at starting, the frequency change of the drum pulse is converted into a voltage change at the discriminator circuit, and this voltage change is employed as a error signal. In the playback mode, the control pulse which was recorded on video tape during recording is played back as a reference signal. Further at that time, in order to reduce jitter a non-linear circuit, X12, D10-D13, is used.

In the slow motion mode, since the control pulse cannot be utilized, the signal from the SSG which is built-in is employed as a reference signal. And for the case, in order to add the quasi vertical sync signal to the video output signal, the vertical sync stabilizing generator circuit is operated. In Fast Forward and Rewind condition, the disc motor is operated by positive (+)12 volts power input by means of S5.

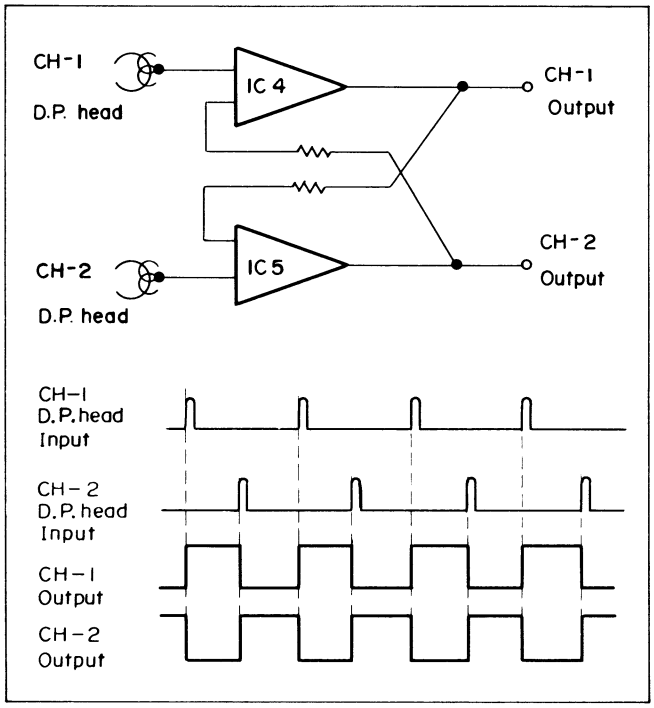


Fig. 2-18. Flip-flop

1. Flip-flop (Switching pulse generator)
   The pulse detected from the magnets mounted on the flywheel by means of the disc pulse head is fed to a flip-flop circuit consisting of IC4 and IC5. IC4 and IC5 are amplifiers, individually; and these two IC's in this application compose a flip-flop circuit. The output of the flip-flop is a pulse train of 30Hz distributed into four systems, as follows: pulse selector consisting of X4 and X5 for the sampling circuit, monostable multivibrator consisting of X14, X15 and X16 in the discriminator circuit, D1 and D2 in the vertical sync stabilizing pulse generator circuit, and X1 and X2 in the video preamplifier for the switching pulse.
2. Pulse selector
   Switch S4-6 is utilized in order to alter the RC time constant of the monostable multivibrator included in IC7 for the recording mode switching point and tracking adjustment for playback. It is necessary to change the phase of the sampling comparing signal for the recording and the playback mode by 180 degrees. To accomplish this, pulse trains with different polarity for the recording and the playback mode are developed at X4 and X5 and fed to a monostable multivibrator consisting of X6 and X7. The positive 9 volts DC power supply is applied to the cross point of R24 and R25 through D3 in the recording mode. Further, the flip-flop output is fed to X4 from IC5 and to X5 from IC4. When X4 is at low base and X5 is at a high base potential, both X4 and X5 are turned off resulting in the output terminal at the junction of R22 and R23 being about 8.5 volts DC because of the voltage drop through D3 of the positive 9 volts B+. Next, in the case that X4 is at a high potential and X5 is at a low potential, both X4 and X5 turn on; and the voltage at the output terminal becomes about 4.7 volts at the junction of R22, R23, and R24.
   In the playback mode, no voltage is applied to D3. When X4 is at a low potential, and X5 is at a high potential, both X4 and X5 turn off, then the output terminal voltage becomes zero; and in the case that opposite polarity pulse is applied, both X4 and X5 turn on, and the output terminal voltage is about 4.5 volts, developed by voltage dividing. Like this, the opposite polarity pulse for the recording or playback condition is fed to the monostable multivibrator consisting of X6 and X7.
3. Monostable multivibrator X6 and X7
   The pulse from the pulse selector is differentiated by C15 and R26, and triggers a monostable multivibrator consisting of X6 and X7 at the down time of the pulse, by means of D4. In this monostable multivibrator, the bias voltage developed by R30 from the junction of R37 and R38. The circuit

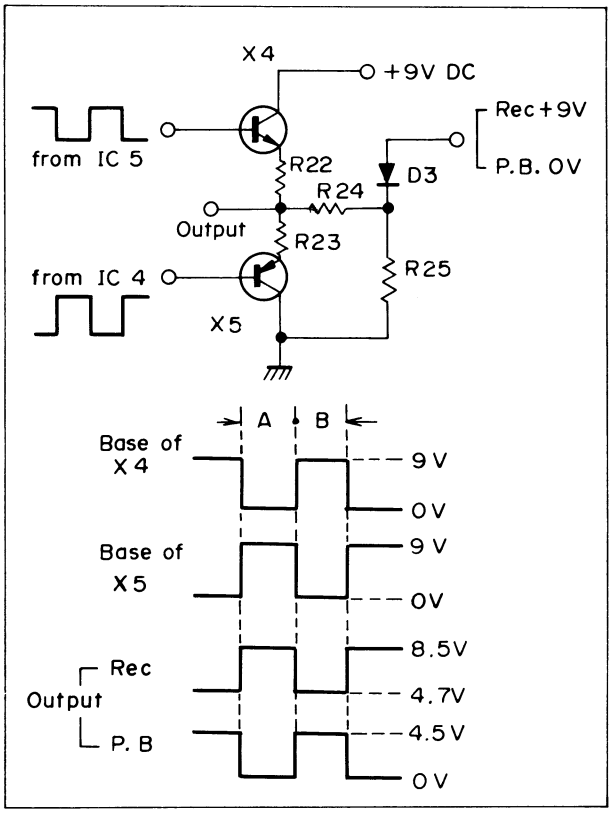


Fig. 2-19. Pulse selector circuit

   acts as follows: Assume that the position of the sampling pulse is at the flat portion, that is, the highest amplitude of the trapezoidal waveform, not at the slope portion, because of tape speed variations or other reasons. Then, because of the resultant change in bias voltage (time constant) of the multivibrator, the width of the trapezoidal portion of the waveform will be extended. Therefore, because of an increase in the probability that the pulse will continue to be located at the high-amplitude, flat portion, the motor speed will be rapidly increased and the pulse will return quickly to the normal condition of being located on the slope. The opposite case causes the trapezoidal portion to diminish, and the contrary corcorrective action to occur.
4. Sampling and hold circuit
   X8, X9, D6 through D9, C17, and C18 compose a boot strap circuit and a sawtooth waveform generator with a very linear slope supplying to the sampling gate consisting of X10. D7 performs the prevention of voltages from the multivibrator entering the B+ line, when the output goes up to the power supply level; and D8 and D9 are employed for bias adjustment.
   The sawtooth waveform from the emitter of X9 is fed to the collector of the sampling gate, X10. Since the sampling pulse from the collector of X21

is applied to X10's base, X10 becomes conductive for the interval, and the potential at the slope portion at that time is held by C20 in the emitter circuit. This potential is received at the source follower of X11, and it is fed to X13 through S4-3 in the recording mode, and in the playback mode is also fed to the non-linear circuit consisting of D10 through D13 and X12. The relationship between the phase of the drum pulse and the output voltage of the sampling circuit is shown in Fig. 2-21.

5. Non-linear circuit

Since the reference signal to the disc servo is the input video signal in the recording condition, a constant sampling output voltage can be obtained. Accordingly the sampling output in the recording condition is fed to the gate of X13 through S4-3. But in the playback condition, the reference signal is the regenerated control pulse and therefore contains AC ripple components. When the pulse varies with a rapid AC cycle, then the motor rotates in accordance with the cycle, resulting in playback pictures with much jitter. In order to prevent this effect, in the playback mode a non-linear circuit and a low pass filter circuit are employed. Assuming that a voltage dfference with

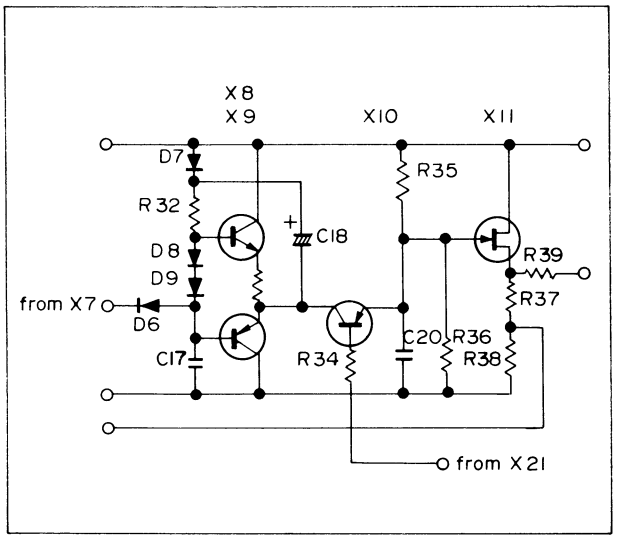


Fig. 2-20. Sampling hold circuit

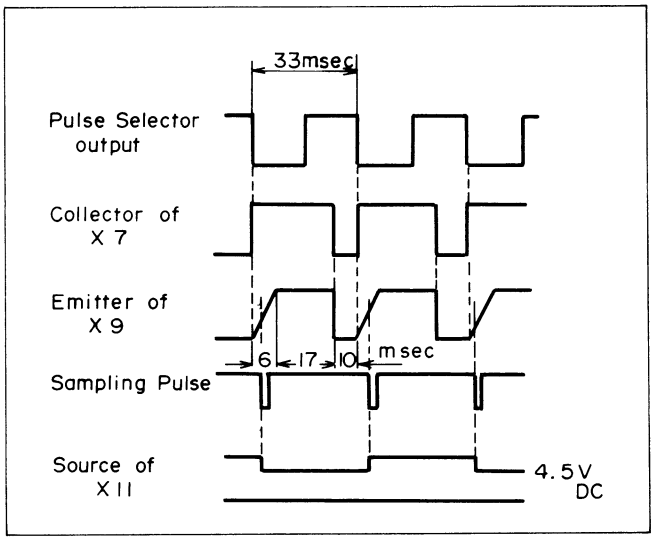


Fig. 2-21.

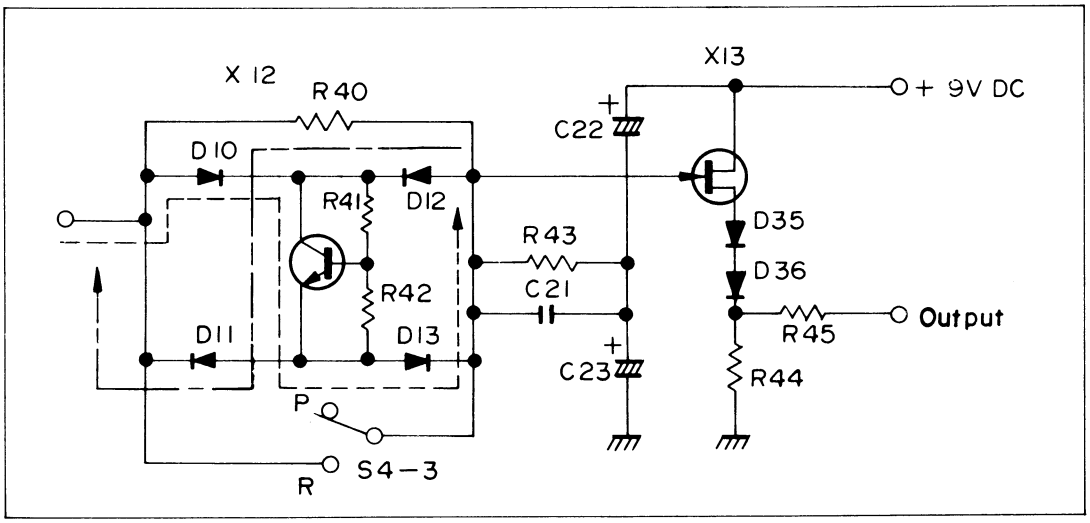


Fig. 2-22. Non-linear circuit

absolute value of more than 1.6 volts exists between the intersection of D10 and D11, and that of D12 and D13, when the junction of D10 and D11 is 1.6 volts higher than the junction of D12 and D13, current flows through D10, X12 and D13; and when the former junction is 1.6 volts lower in potential, then current flows through D12, X12, and D11. On the other hand, when the potential difference is less than 1.6 volts, current can not flow in the same way, and it thus flows only through R40. Further R40, R43, C21, C22, and C23 compose a filter which cannot deliver the signal with rapid cycle change. As described above, when a large voltage difference is developed due to starting or some causes, the motor's rotational speed can immediately be followed, and small fluctuations with higher frequency can be eliminated.

C22, connected to the power supply, functions to decrease the response time of the circuit, which is especially necessary to provide rapid lock-in during playback and record start-up. That is, since the sampling output is normally about 4.5 volts DC, the cross point of C22 and C23 is around 4.5 volts DC, resulting in quick operation. But, if C22 were connected to ground, charge-up time would be required for the initiation of the operation. The signal is fed to IC6 through the source follower of X13; D35 and D36 are used for temperature compensation.

6. Monostable multivibrator, X14 through X16, and Discriminator, D15 through D19, X17 and X18

   X14 through X20 compose a circuit which detects and controls the frequency change of the drum pulse. The operation of the monostable multivibrator and discriminator is exactly the same as that employed in the capstan servo circuit. Refer to the explanation detailed earlier in 2-3-1 (2, 3).

7. Gate and hold circuit

   Though the frequency change of the drum pulse is detected by the discriminator as the voltage change, if the source waveform of X18 would be used to control the disc motor without any modification, the motor would rotate irregularly. Accordingly, the slope portion of the waveform is removed by means of the X19 gate circuit. Refer to Fig. 2-23.

   When the collector of X16 is at a low potential, X19 is conductive, and C30 is charged up by the output voltage of the discriminator. Next when the collector of X16 becomes high in potential, X19 is cut off. But due to the high input impedance of X20, the voltage across C30 is held. Consequently an output voltage with less severe transients can be obtained to the source of X20.

8. Disc motor drive circuit

   The output voltage from X20 is fed to IC6 through R59, R60, C31 and C32. C31 and C32 play a role of high pass filter. On the other hand, a small part of the DC component is fed through R59. IC6 is an amplifier of differential type with inputs from the discriminator output of X20 and the sampling output of X13. Further the motor's counter electromotive force is fed back from the emitter of X1001 driving the disc motor, through TH-1, TH-2 and R64 thereby performing damping.

   The relationship between the rotational speed of the disc motor and the input and output of IC6 is that when the motor rotates too rapidly due to some cause, the discriminator output voltage at the terminal 6 decreases, and the sampling error signal voltage at the terminal 8 increases inversely, with the result that the voltage at the output terminal 1 decreases and the motor's rotation becomes slower, thus obtaining normal rotational speed. In the case that the motor rotational speed decreases, the inverse case applies.

   The disc motor is connected to the emitter circuit of X1001, and is controlled by the voltage from IC6 in the recording and the playback modes, through S5-4. In the Fast Forward and the Rewind modes, a fixed voltage is applied through S5-4; then the motor is driven by a constant voltage.

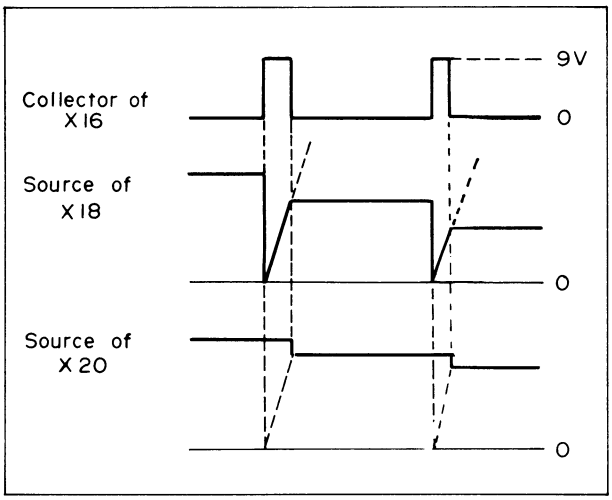


Fig. 2-23. Timing chart

9. Vertical sync stabilizing pulse generator
Since PV-4800U employs a rotary 2-head helical scanning system, a noise bar appears on the playback picture in the still and the slow mode. Since this noise may disturb the vertical sync signal resulting in the effect of instability of the playback picture, in order to prevent this phenomenon, a quasi vertical sync pulse is added to the playback video output for still and slow mode. As shown in Fig. 2-24, positive (+) 19 volts DC is applied to the junction of R19 and R20 in the still and the slow mode. The flip-flop outputs of IC4 and IC5 of the Audio and Servo Circuit are differentiated by a circuit consisting of C13, R19 and C14, R20, and the positive portion of the pulse is passed by D1 and D2, cutting off X13, on the Video printed circuit board. This positive pulse results in the quasi pulse as detailed in 2-2-2 (6). Since at the normal playback mode, the power supply is not connected to the junction of R19 and R20; D1 and D2 do not operate, and X13 remains conductive, then no quasi vertical sync pulse is produced.
Refer to the 2-2-1 (6)of the monitor output circuit for additional explanation of the video circuit for the addition playback.

10. Disc servo reference signal producing circuit
Refer to Fig. 2-25.
The reference signal in the disc servo system is the vertical sync signal of the input video signal in the recording mode, and is the control pulse recorded on the video tape in the normal playback mode, and further is the built-in SSG signal in the still and slow modes. All the signals except SSG are treated at IC7. Consider first the operation in the recording mode. The input video signal is the reference for the recording mode and is fed to pin 16 of IC7 through TV/CAMERA switch S7–6, and Recording Playback selector switch S4–4. The signal amplified at the video amplifier is converted into a composite sync signal at the sync separator. This sync signal is transformed into a solely vertical sync signal by the integrator placed between pin 13 and pin 12. In addition, the composite sync signal at pin 13 is fed to the Video printed circuit board; and the gate pulse to the color ACC circuit is also produced from this signal. The signal amplified by the pulse amplifier is reduced to one-half frequency at the monostable multivibrator circuit, resulting in 30Hz. The signal is amplified at the recording amplifier, and is fed to the control head through S4-2, and then is recorded on the tape as the control signal.

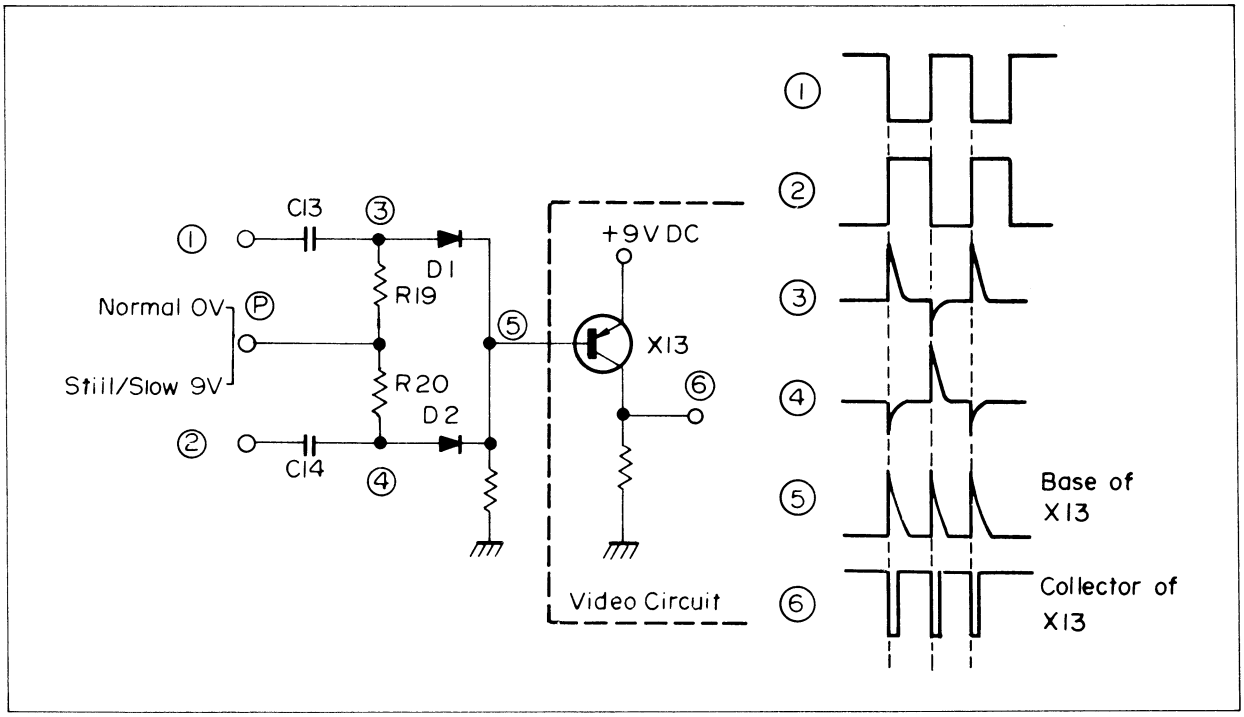


Fig. 2-24. V. stab. pulse amp. circuit

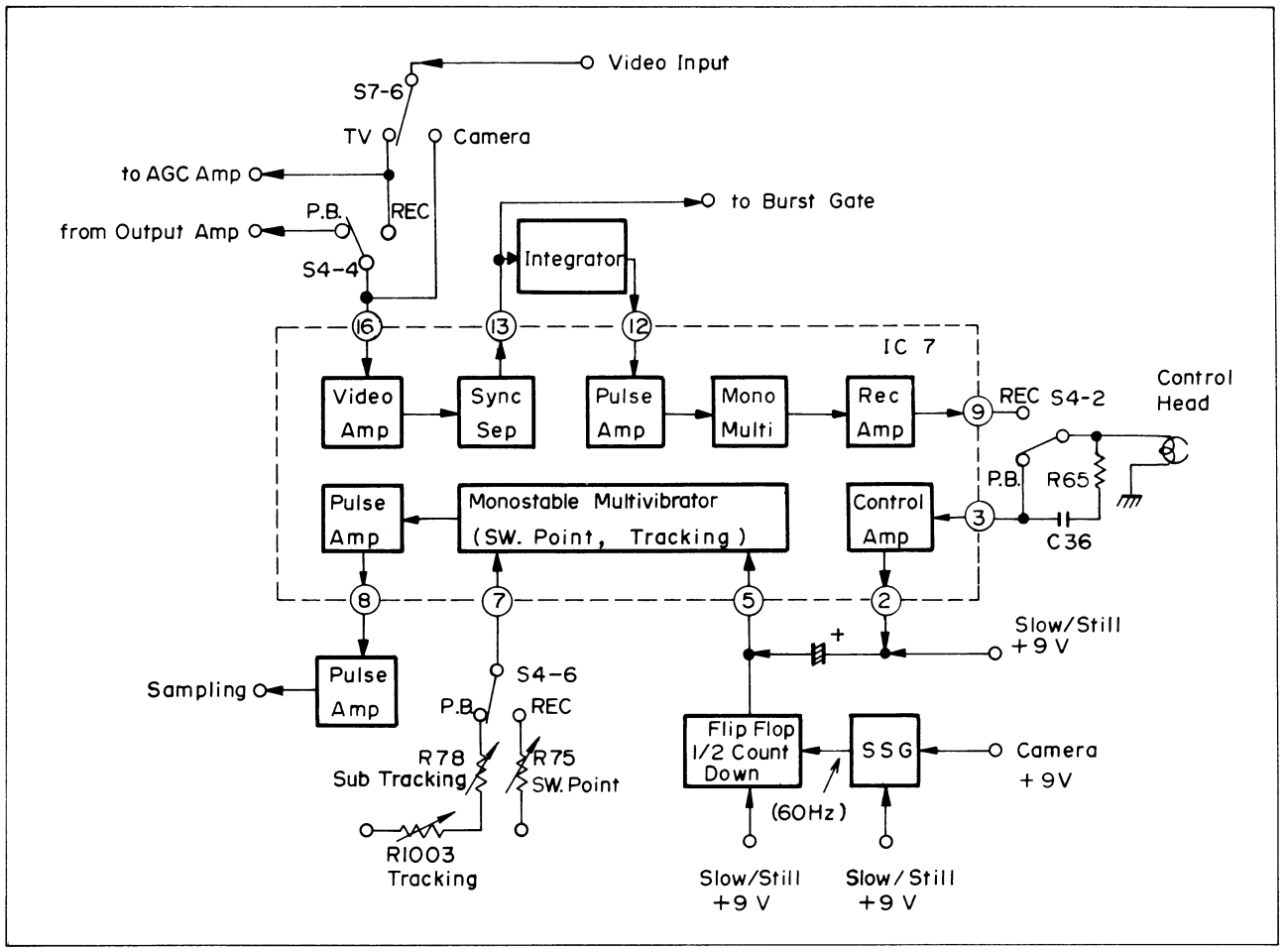


Fig. 2-25. Block diagram, disc servo reference signal producing circuit

At the same time, the signal returned back to pin 3 by R65 and C36 is amplified at the control pulse amplifier resulting in a trigger signal to the monostable multivibrator. The time constant of this multivibrator is determined by C47, R76, and R75, and switching point adjustment is performed by R75. The output pulse from pin 8 is differentiated by C53 and R79, and is amplified at X21. The collector output of X21 is fed to the base of X10 as a gate pulse, resulting in a sampling pulse.

In the normal playback mode, the control pulse regenerated at the control head is fed to pin 3 of IC7, and is processed at the control pulse amplifier. The time constant of the monostable multivibrator in the playback mode is determined by C47, R76, R77, R78, and R1003 or R1004 (because of S4-6 change-over). In the case that the tracking control knob is in the AUTO position, R1003 is in a short circuit condition, with R1004 being employed in the circuit and the tracking control being performed by adjustment of R78. Further in the case that adjustment of the tracking control is performed manually, R1004 is in short-circuited, then the adjustment can be performed by R1003. After this, the signal results in the gate pulse as the case with the recording condition.

Furthermore, in the playback mode, the video signal is fed from the collector of X17 in the Video printed circuit board to pin 16 of IC7. The composite sync signal derived by sync separation from this signal is employed as the input signal to the burst gate pulse and the horizontal discriminator in the color circuit in the Video printed circuit board. In the still and slow mode, since no control pulse can be utilized, a built-in SSG output is employed. The vertical driving signal from the SSG is reduced to half frequency at the flip-flop circuit consisting of IC11 resulting in obtaining 30Hz, which is fed to the pin 5 of IC7 as a trigger signal to the monostable multivibrator. The pin 2 is biased by a voltage so that the control pulse amplifier is cut off at the same time.

11. SSG circuit

When the color camera GC-4800U is connected to PV-4800U and recording is performed, the vertical drive pulse (VD pulse) and the horizontal drive pulse (HD pulse) driving the camera are required. The generation begins with an oscillator employing IC8 and a crystal with oscillating frequency of 31.468kHz. On the other hand, IC9 has 1/2 and 1/525 count down circuits, from which 15.734kHz and 59.94Hz signals are derived from the 31.468kHz signal of IC8. IC10 is a quadruple, 2-input, positive NAND gate type, but is used as the monostable multivibrator. From pin 10 of IC9, 59.94Hz is fed to pin 2 of IC10; and VD pulses 1.6msec in width are developed by an RC time constant circuit consisting of C66 and R114. From pin 6 of IC9 15.734kHz is fed to pin 12 of IC10, and HD pulses 14μ sec in width are developed by an RC time constant circuit consisting of C68 and R116. These signals are applied to the camera through the TV/CAMERA 10-pin connector. Further, since no usable control pulse is available in the still and slow mode, the VD pulse from pin 10 of IC9 is reduced to half frequency at the flip-flop of IC6, and is fed to IC7, and furthermore is used instead of the control pulse.

Figs. 2-26 and 2-27 show timing charts for the record and playback modes, respectively.

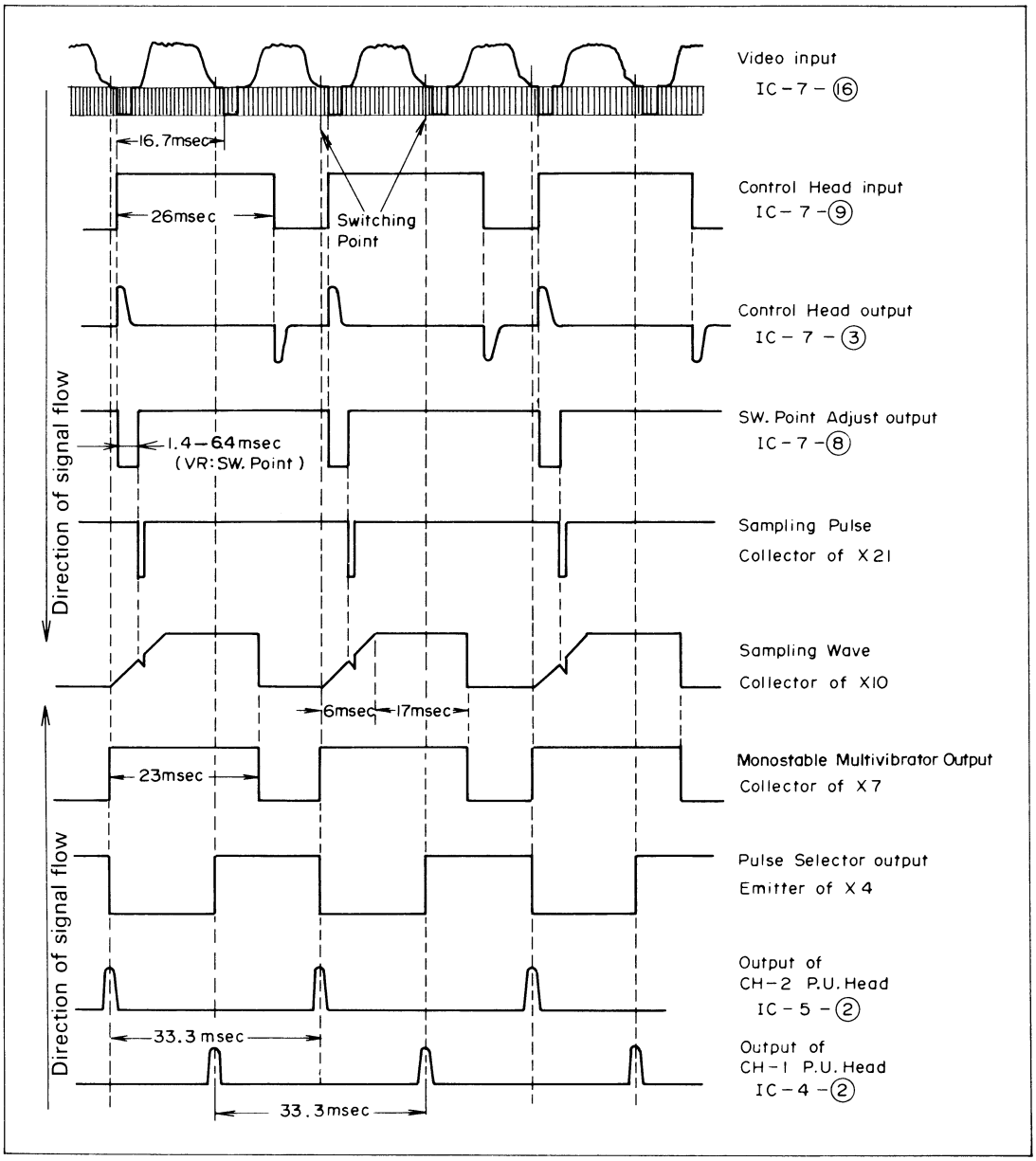


Fig. 2-26. Timing chart, record mode

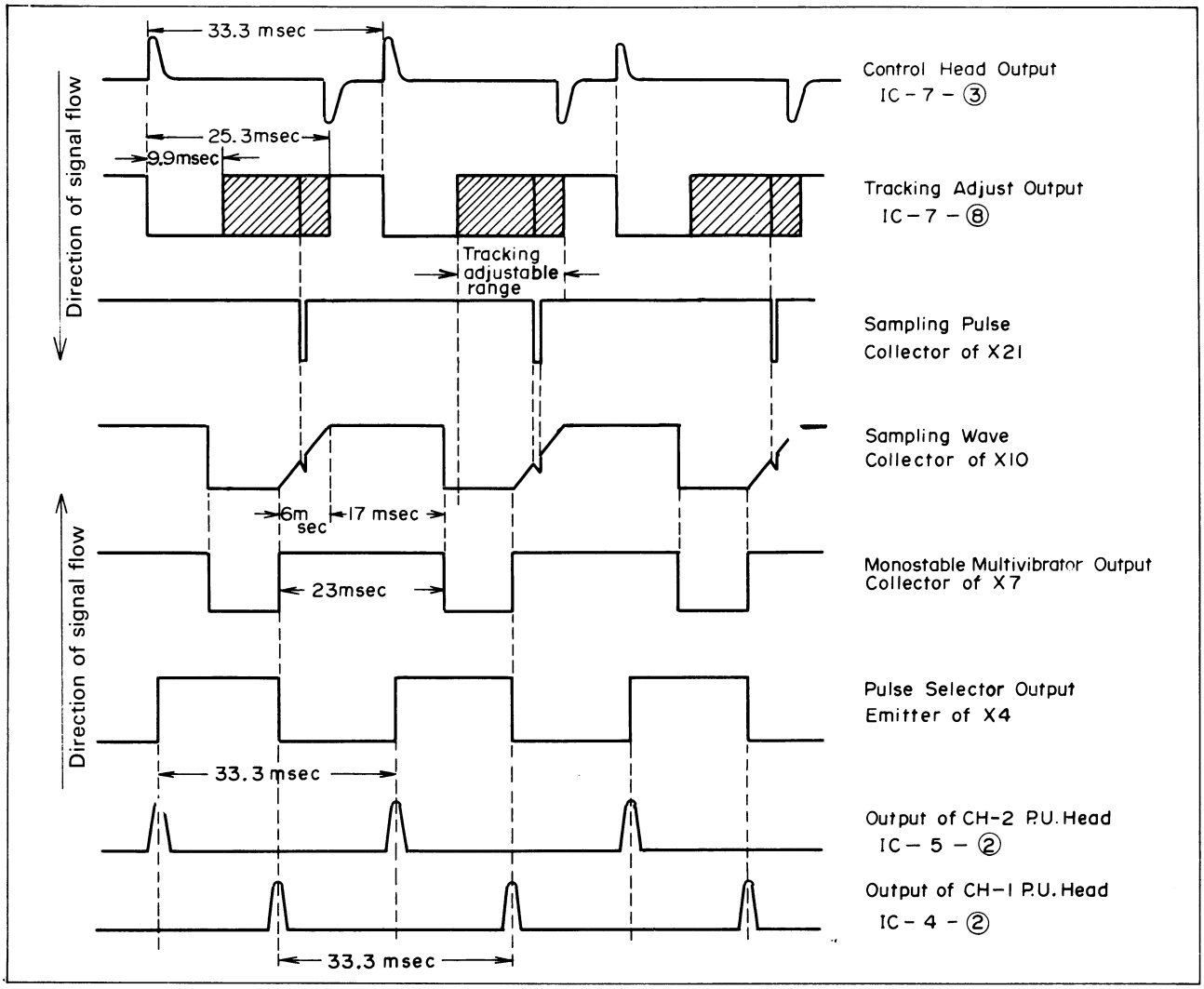


Fig. 2-27. Timing chart, playback mode

2-4 AUDIO CIRCUIT

There are three modes, record, playback, and audio dub, in the PV-4800U system. Refer to the block diagram of Fig. 2-28.

Details of the circuit are as follows: Refer to the schematic diagram in Section 10-2 as well as the block diagram in this section.

2-4-1 Recording system

The signal passing through the TV/CAMERA 10-pin connector is fed to the AGC circuit through R122. The signal from the MIC jack is amplified about 50 db at the mic amplifier, IC12, and is fed to the AGC circuit through R121. When the microphone is plugged into the MIC jack, the 10-pin connector circuit is disconnected, and the mic input becomes an audio input. The AGC circuit consists of D31 through D34, R123, R125, C76 and C78. The control voltage, which is the output signal from the secondary of the output transformer T1 is fed to D32 and D33.

Since only the positive signal is passed by D33, capacitor C78 is charged with a positive DC voltage proportional to this signal. Only the negative signal is passed through D32, so C76 is charged with a negative DC voltage. Diodes D34 and D31 are biased by these voltages on C78 and C76; therefore the internal resistance of each is changed in proportion to the input voltage. Thus, if an excessive input voltage is applied, the current flowing through D31 and D34 become larger and keep the output constant. Resistors R123 and R125 are used to correct any inbalance between D31 and D34.

The line amplifier IC14 amplifies the AGC output signal by around 35 db and applies to the output transformer T1 and the earphone jack. The signal at the terminal 5 of T1 is fed to the audio head through the recording and playback selector switch, R149, C104, and R148 and, thus is recorded on the tape. During recording, a signal of approximately 70kHz, from T2, is used as the AC bias. The signal from the secondary of the

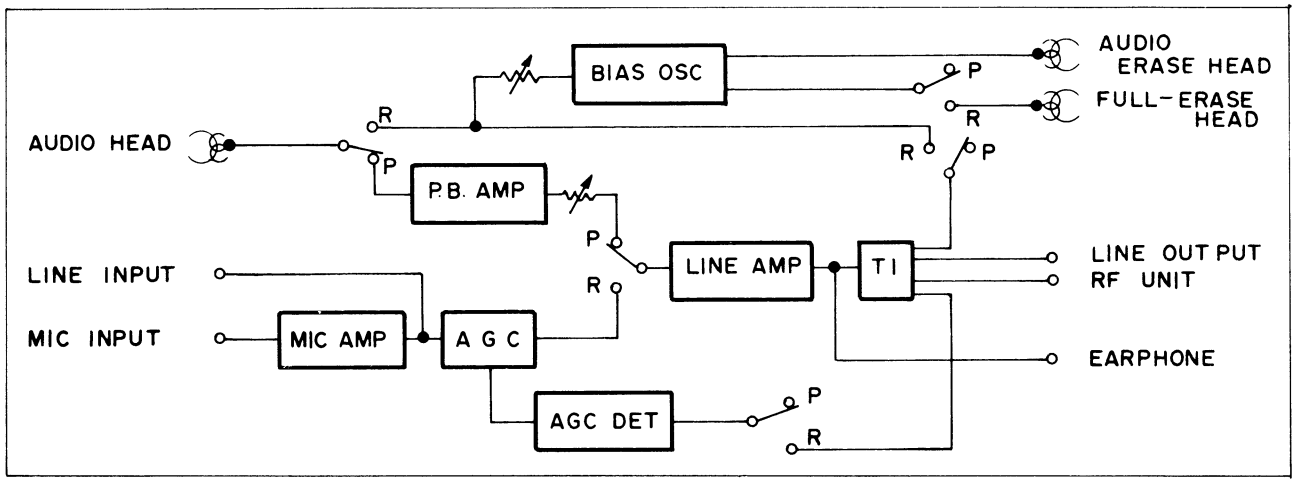


Fig. 2-28. Block diagram, audio circuit

output transformer T1 is fed through the TV/CAMERA selector switch to the audio line output terminal and separately to the AGC circuit and RF unit. A parallel resonance bias-trap composed of L10 and C95 prevents bias from being leaked to the output circuit, X32 and X33 form a push-pull type oscillator with frequency of about 70kHz supplied from the secondary of T1 to the Full-Erase head, the Audio Erase head, and through R147, to the Audio R/P head. Further, in the audio dub condition, the L13 dummy coil is connected instead of the Full-Erase head. R147 is used for bias level adjustment.

2-4-2 Playback system

Since the amplitude of the playback signal is proportional to the rate of change of the magnetic field recorded on the tape, the playback signal is smaller at lower frequencies. To compensate for this, equalization is performed in the playback amplifier, IC13.

The performance of the equalizer is determined by R129, R130, and C84. The signal, amplified by about 30 db at IC13, is fed to the line amplifier IC14 through R131, which determines the playback level. IC14 also serves as the amplifier in the recording mode, and its output is fed to the earphone terminal and, through T1, to the line output terminal and the RF unit.

2-4-3 Audio Dub

In the Audio Dub mode, the video system is in playback and the audio system is in the recording mode. The current flowing into the Full-Erase head in the normal recording mode flows into dummy coil L13.

2-5 POWER SUPPLIES AND SOLENOID CONTROL CIRCUIT

PBP-1 the internal battery or the external power supply (AA-P40U) supplies 12 to 13 volts DC. The voltage regulator consists of a transistor and an IC: and its output is positive (+)9 volts DC, which supplies most of the circuits.

At the Fast Forward and Rewind modes, the power input is disconnected by switch S5, and no regulated voltage is brought to the output.

The power input is fed with being left as it is to the capstan motor, the disc motor, the drive transistor, part of the audio circuit, the solenoid drive circuit, and the camera power input.

The solenoid control circuit is employed so that after the solenoid is operated and the plunger is actuated, low current is sufficient for holding this condition; and power consumption is therefore reduced. In the case that PLAY is selected in the TV mode, or in the Camera mode, starting is performed by the camera's START/STOP trigger switch. (GC-4800); X1 remains off. Since the gate of X2 is connected to the power supply through S8 and R5, the solenoid connected with the collector circuit of X1003 operates with positive (+)12 volt DC. When the plunger is actuated, S8 operates and the gate of X2 is connected, through R3 and R4, to the power supply. Since, as mentioned, the holding current in the solenoid, after it is initially operated, is permitted to be low, the current flowing into the solenoid is controlled by R3 so that the voltage across the solenoid terminals (between TP1 and TP2) of 2.8 volts DC.

SECTION 3
MECHANISM DESCRIPTION

3-1 TAPE PATH

The tape path is shown in Fig. 3-1.

The tape on the supply reel (A), is first fed to tension arm (B), guide roller (C), guide pole (D), full-erase head (E), and guide pole (F), where the height of the tape is determined. Then the tape wraps around the circumferance of the head drum (approximately 190 degrees) along the tape guide (G). Next guide pole (H) also determines the tape height.

The audio signal is recorded and played back by the upper core of the audio/control head (I). The control track signal is recorded and played back by the lower core. The tape travels to guide pole (J), and it is squeezed by the capstan (K) and the pinch roller (L) before it is wound onto the take-up reel(M). Video head assembly and capstan are driven by each DC motor separately. DC motor torque is transmitted to the video head assembly and capstan via pulley and belt. The video head drum assembly has two built-in 30Hz pick-up heads and a magnet. A magnet is mounted on the flange of the video head assembly and the two pick-up heads are mounted on the upper drum. The relative position of the video heads, pick-up heads and magnet is shown Fig. 3-2.

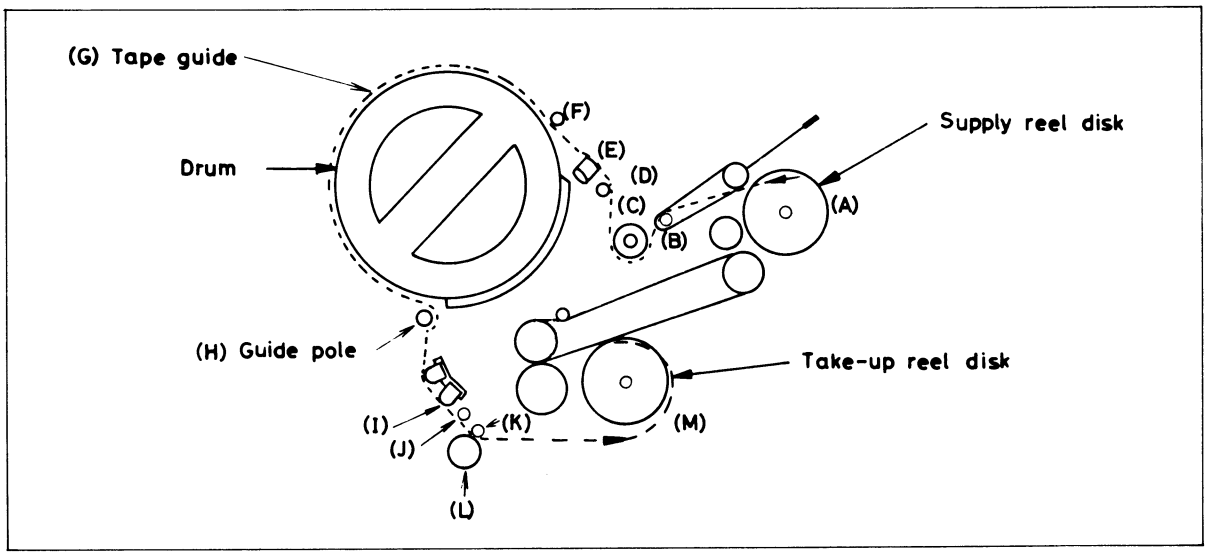


Fig. 3-1. Tape Path

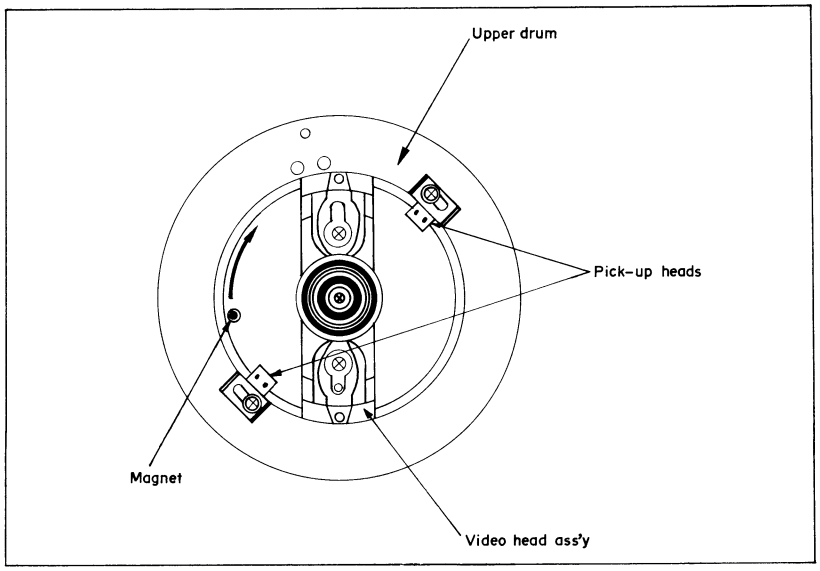


Fig. 3-2.

3-2 PLAYBACK MODE MECHANISM

The tape transport in the playback mode is described in four sections: brake system, pinch roller mechanism, tape take-up system and tension control system.

3-2-1 Brake system

The brakes applied to the supply and take-up reel disk in stop mode are released in the play mode.

See Fig. 3-3. Setting the function lever from stop to play rotates the main cam counter-clockwise. The brake lever (take-up) shown at Ⓐ is pushed up by the main cam in the direction indicated by arrow (a), and the brake lever (supply) at Ⓑ is pushed at the same time by the brake lever (take-up) in the direction indicated by the arrow (i). Then, the two brakes release from supply and take-up reel disk.

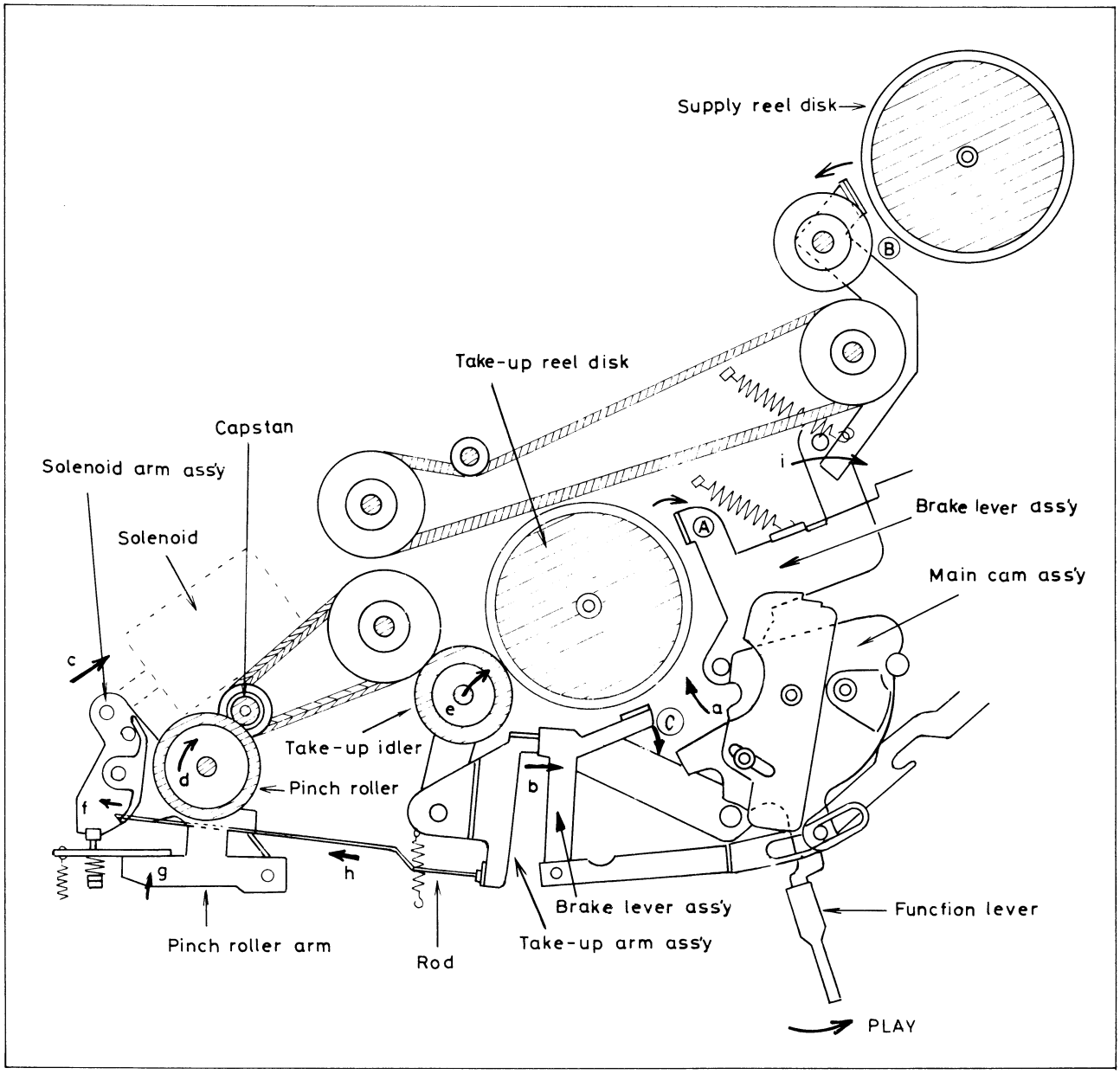


Fig. 3-3. Playback mode mechanism

3-2-2 Pinch roller mechanism

When the function lever is set to play mode, the main cam assembly is turned to the counter-clockwise position. The play lever assembly is moved to left by the main cam assembly and turns the FF/REW switch on. See Fig. 3-4. When the power is applied to the solenoid through the FF/REW switch, the plunger moves the solenoid arm assembly and pinch roller arm in the directions indicated by arrows (c), (f) and (g) in Fig. 3-3. This causes the pinch roller to press against the capstan.

3-2-3 Tape take-up mechanism

When function lever is set to the play mode, the pinch roller solenoid is turned on, and the brakes Ⓐ and Ⓑ on the supply and take-up reel disks are released. Refer to Fig. 3-3. At the same time, a rod is pulled to the left as indicated arrow (h) by solenoid arm assembly. The take-up arm assembly is turned clockwise, pushing the take-up idler to take-up reel disk in the direction indicated by arrow (e); and the tab of the take-up arm assembly is pressed against the brake lever assembly in the direction indicated by arrow (b) and the brake Ⓒ is released.

The take-up idler couples drive torque to the take-up reel disk.

3-2-4 Tension control system

A simple mechnical servo is employed to provide tape tension control. See Fig. 3-5.

Tape passes around the outside of the tension arm. A band brake, anchored at the pivot of the tension arm ass'y by a screw, contacts the supply reel disk to exert a force inversely proportional to that applied at the tension arm. A counterbalance on the tension arm assembly corrects for the effect of gravity, thus keeping the force on the tension band assembly constant, even though the orientation of the mechanism changes in operation.

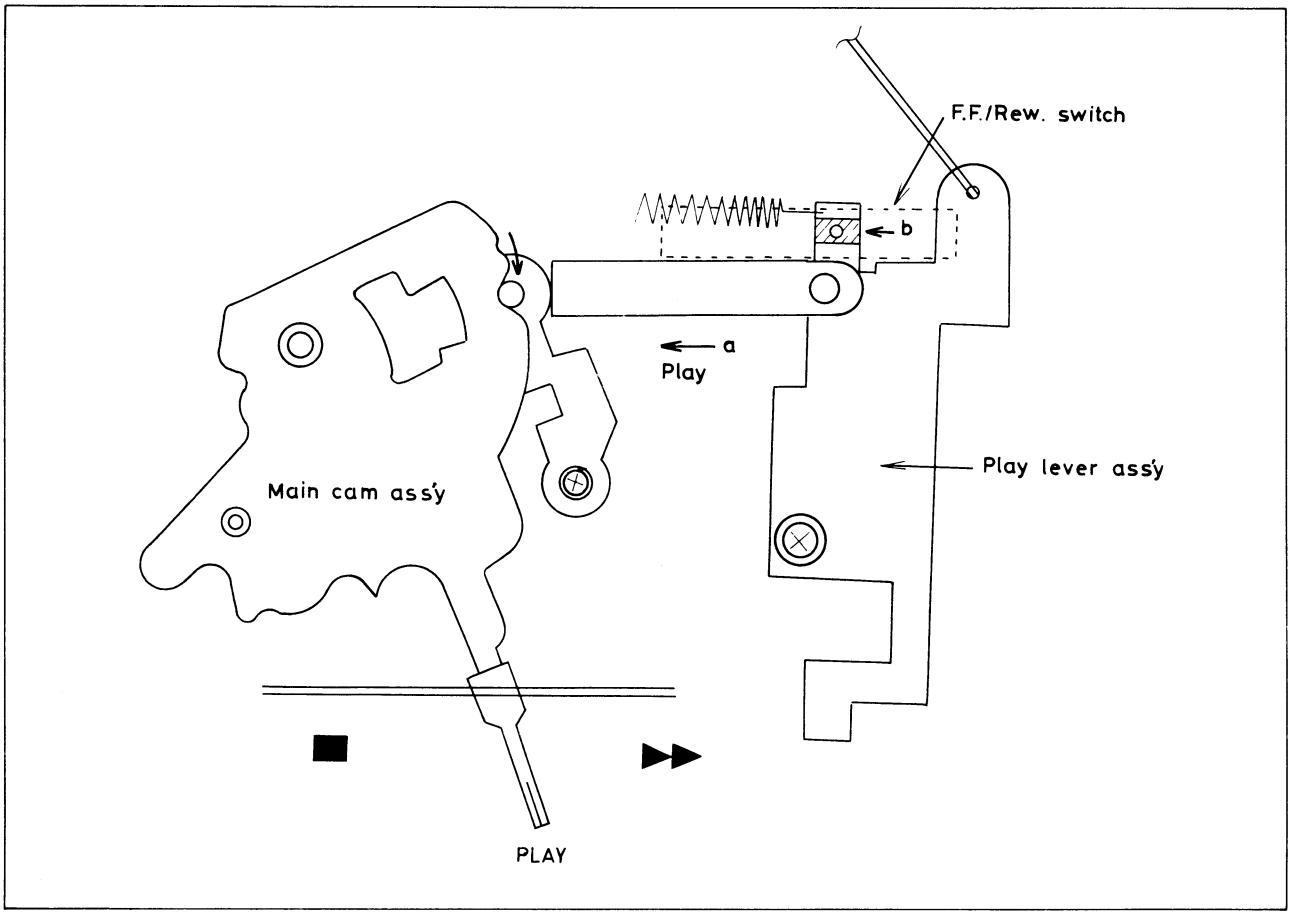


Fig. 3-4.

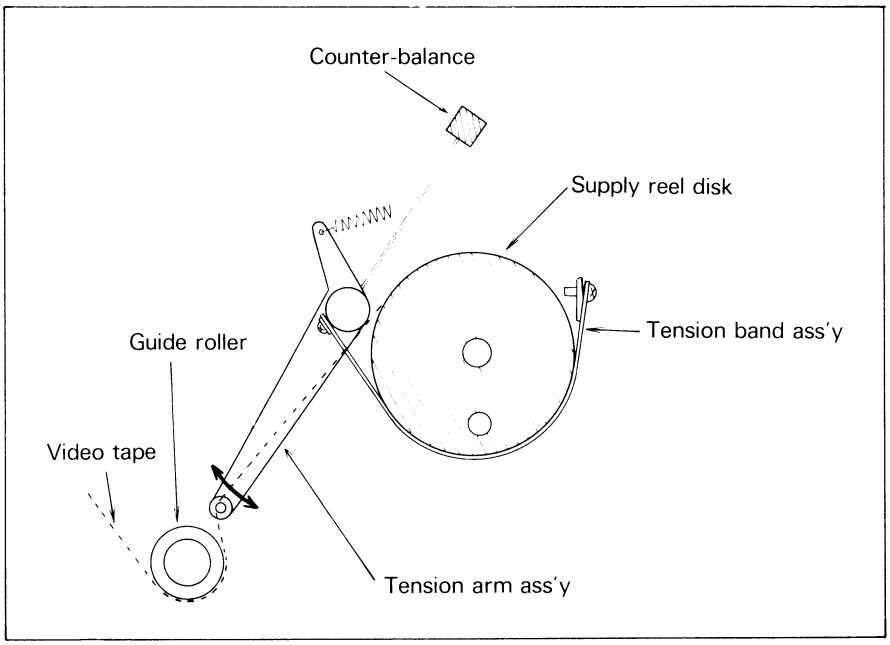


Fig. 3-5. Tension control system

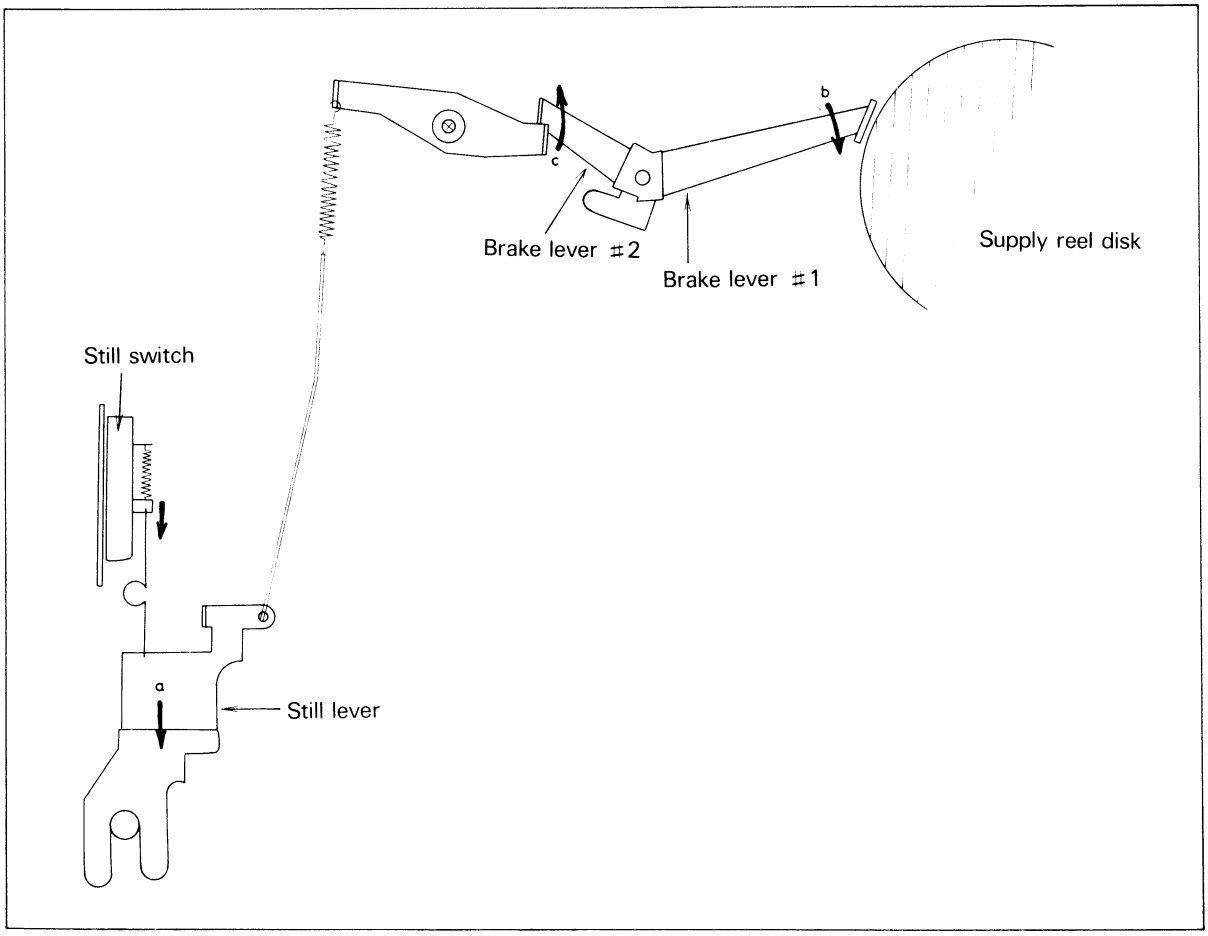


Fig. 3-6. Still mode mechanism

3-3 STILL MODE MECHANISM

While in playback mode the still function is obtained by releasing the pinch roller from the capstan. In playback mode when the still lever is pulled in the direction indicated by the arrow (a) in Fig. 3-6, the still switch is turned on, to turn off the pinch roller solenoid, then the pinch roller releases from the capstan shaft. At the same time, the still brake lever (# 1) and lever (# 2) move in the direction of arrows (b) and (c).

3-4 RECORD MODE MECHANISM

The tape transport operates the same in the record mode as it does in the play mode except that the record switches on the Audio and Servo board are actuated. When the record lever is moved to left, the slide lever is pushed to arrow (a) in Fig. 3-7. The switch arms (#1) and (#2) rotate slightly counter-clockwise to turn on the audio and video record switches on the Audio and Servo circuit board.

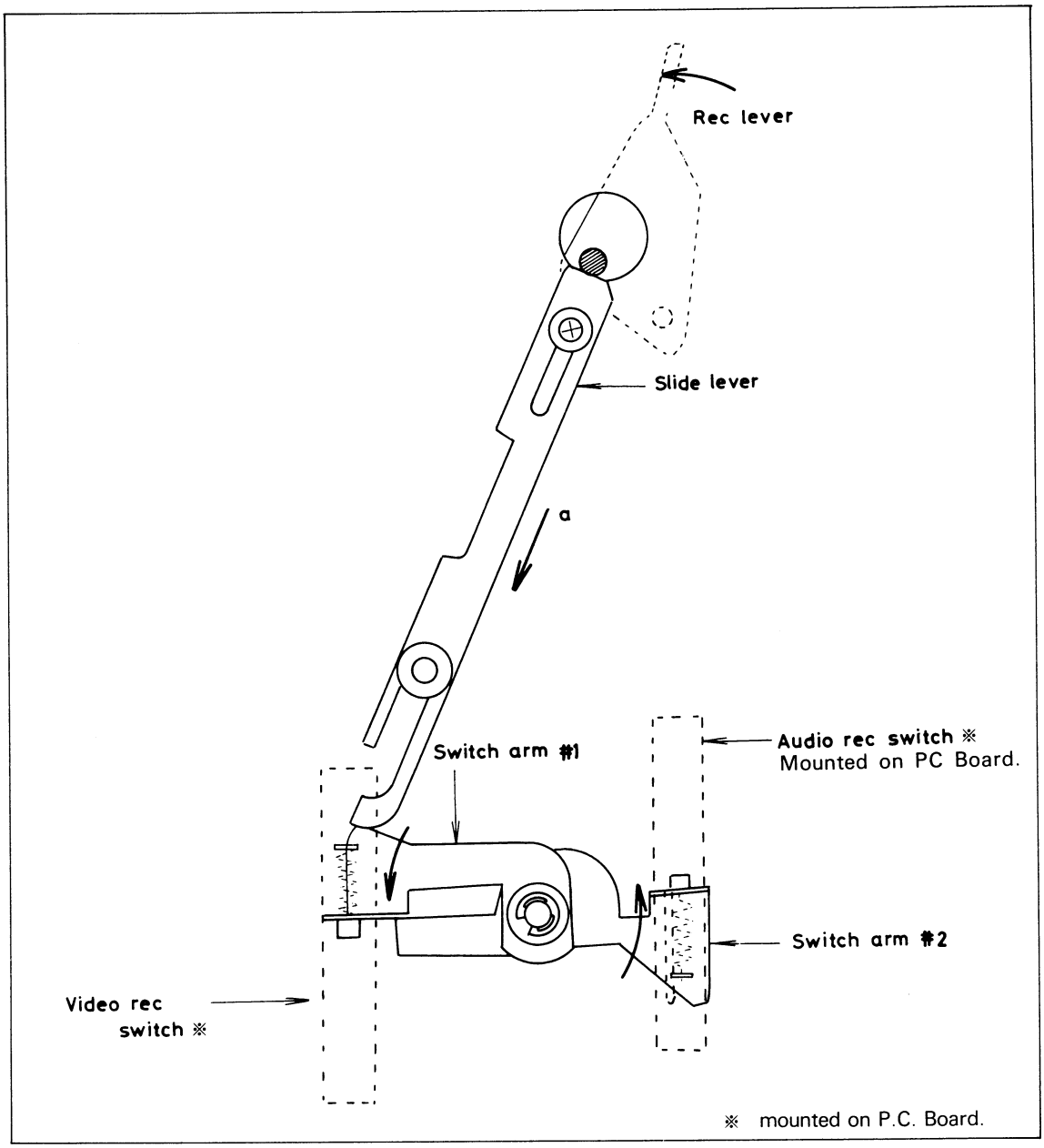


Fig. 3-7. Record mode mechanism (BOTTOM VIEW)

3-5 AUDIO DUBBING MECHANISM

The audio dub mechanism operates only in the play made. (See Fig. 3-8.)

When the SOUND DUB lever is moved to the left, in the direction indicated by the arrow (s), rotating the sound dub lever-plate clockwise to actuate the rod Ⓐ , the audio record switch on the Audio and Servo circuit board is turned on by the rod.

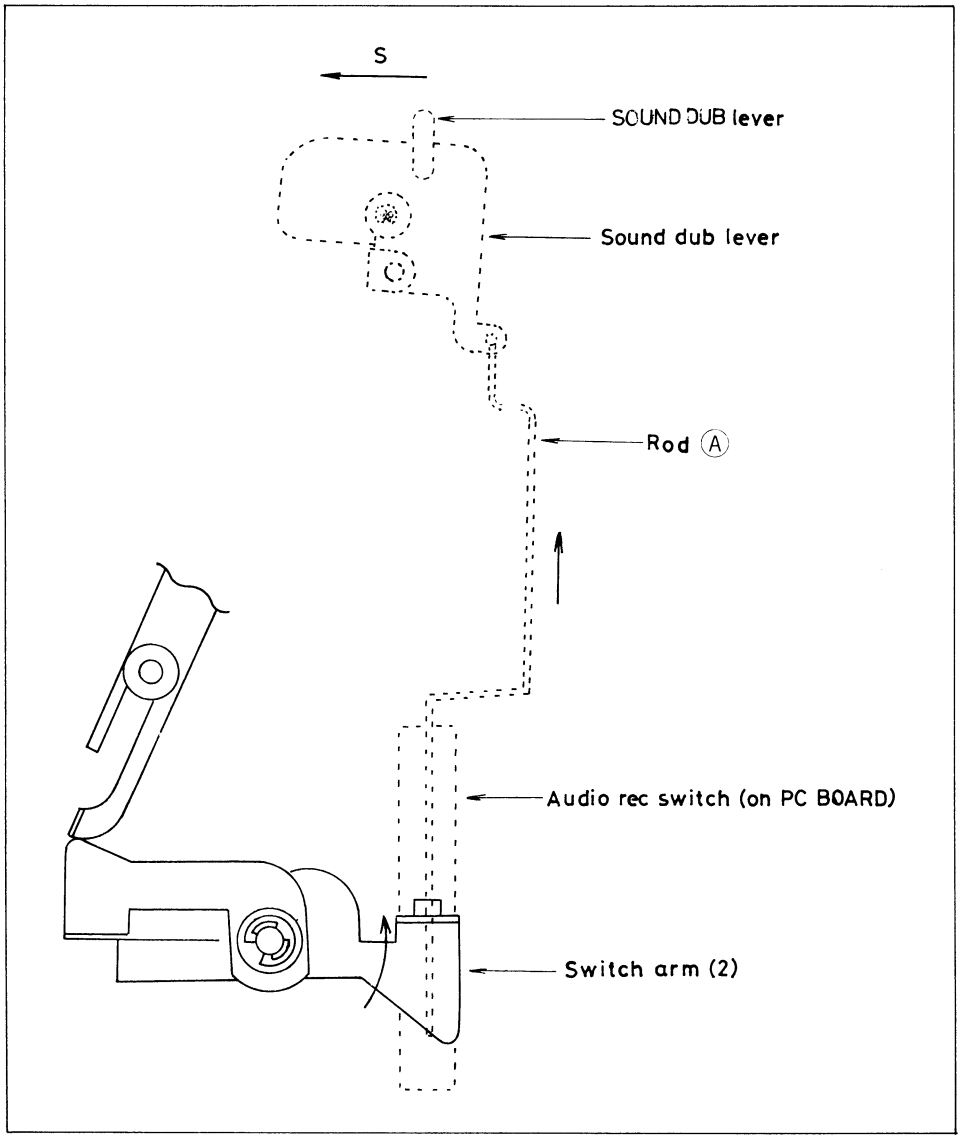


Fig. 3-8. Audio dubbing mechanism

3-6 FAST FORWARD MODE MECHANISM

In the fast forward mode, full take-up torque is applied to the take-up reel disk and the brakes are released in direction Ⓐ,Ⓑ and Ⓒ. See Fig. 3-9.

When the function lever is set to FF (fast forward) mode, the main cam assembly is turned counter-clockwise. At the same time, the fast forward lever-plate is turned counter-clockwise by pin (c) on the main cam assembly, pulling the fast forward rod and coil spring (d) in the direction indicated by the arrow (a). The fast forward idler lifter is moved in the direction of arrow (b); then the take-up arm ass'y is lifted up and turned slightly clockwise so that the take-up idler supplies the drive torque to the take-up reel disk. At the same time, the take-up arm ass'y releases the brake lever Ⓒ. Other brakes indicated as Ⓐ and Ⓑ are released in the same way as in the described previously for playback mode.

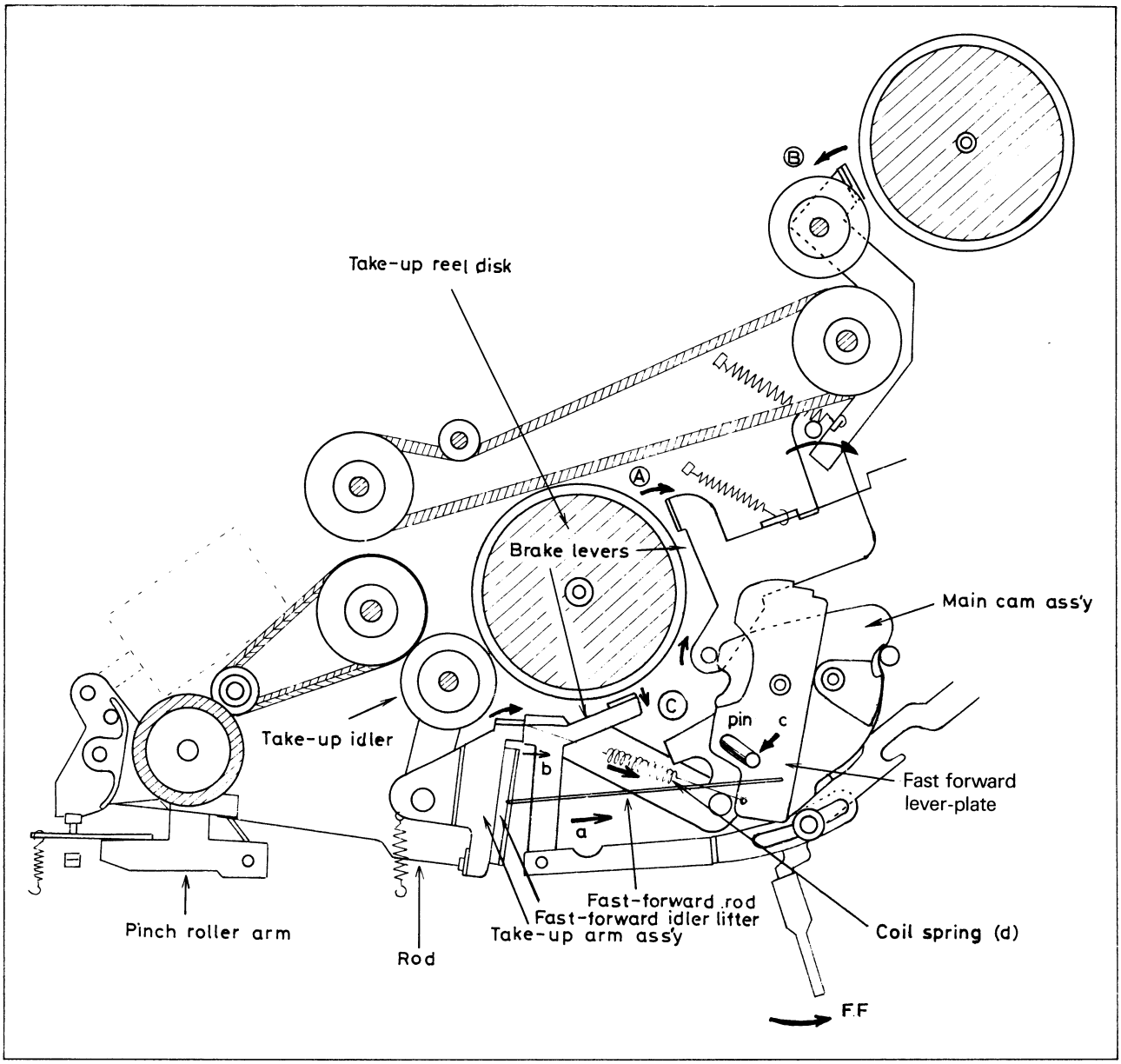


Fig. 3-9. FF mode mechanism

3-7 REWIND MODE MECHANISM

Full torque is applied to the supply reel disk to rewind the tape. The stop brakes are released from both the supply and take-up reel disks.

When the function lever is set to the rewind mode, the main cam assembly is rotated clockwise as shown in Fig. 3-10. When the main cam assembly is rotated clockwise, the lever assembly Ⓔ is moved to left, and the brake lever is rotated clockwise to release brake Ⓒ at the take-up reel disk. Also, at this time, the rod Ⓓ is moved in the direction of arrow (a) and the rewind idler supplies the drive torque to the supply reel disk. Brakes indicated as Ⓐ and Ⓑ are released as same as described for playback mode.

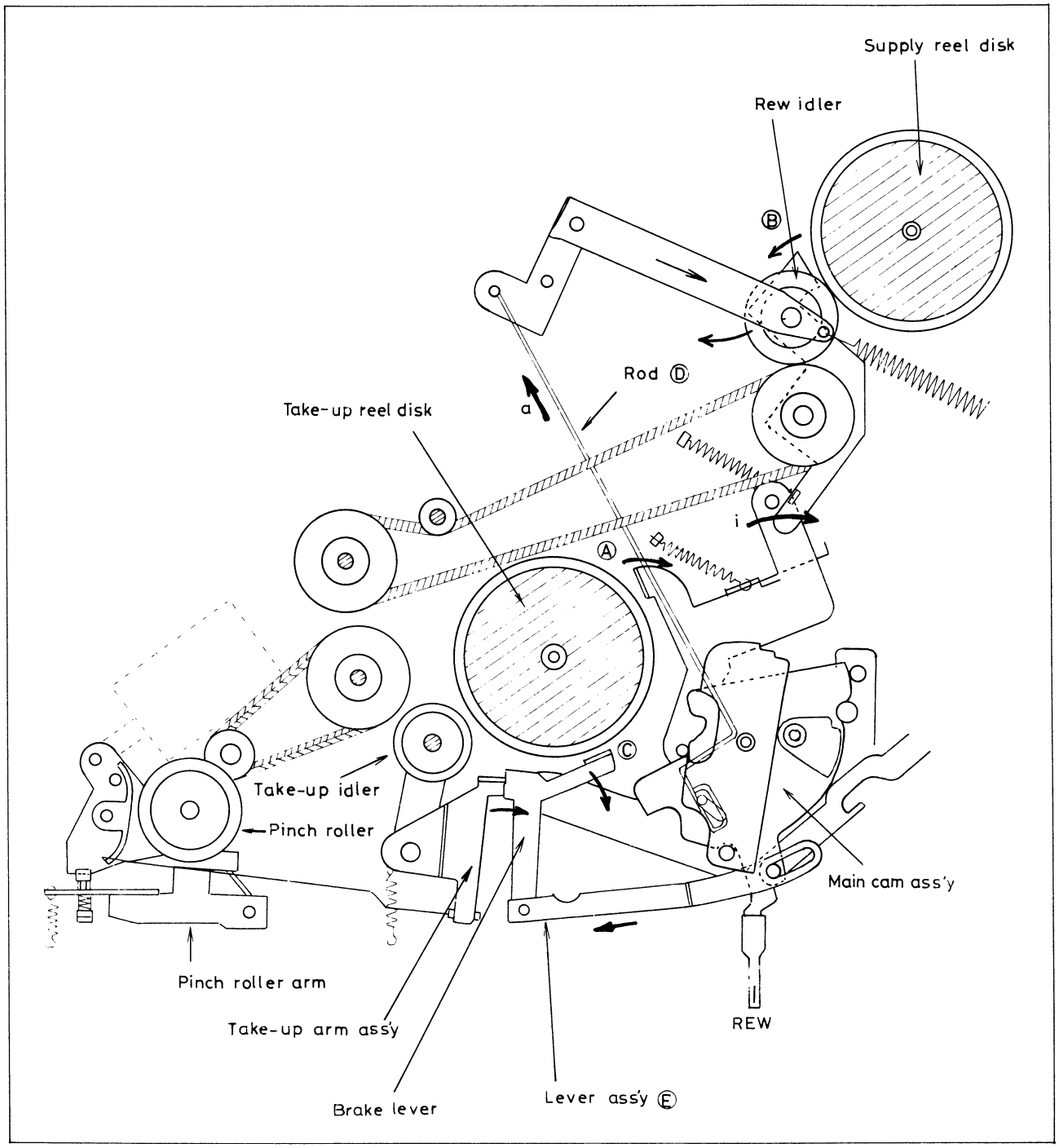


Fig. 3-10. Rewind mode mechanism

SECTION 4
DISASSEMBLY

CHASSIS REMOVAL

Follow the procedure below to remove the chassis from the cabinet.

1. Open the top cover and detach it from the hinges by sliding it laterally.
2. Remove the drum cover ①, and STILL lever knob ③ and SOUND DUB knob ④ by gently pulling them up.
3. Remove the guide roller ②, the four top panel screws ⑤ and top panel from the chassis.

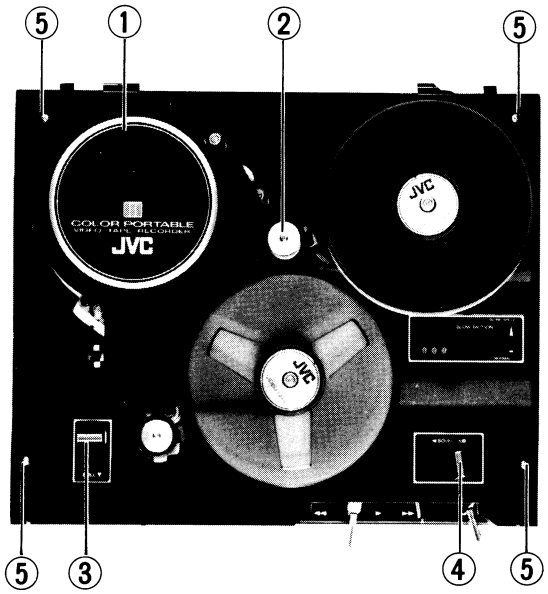


Fig. 4-1.

4. Remove the two screws ⑥ on the left and right sides of the cabinet.

Fig. 4-2.

5. Remove the five screws ⑦, ⑧ from the bottom and rear of the cabinet.

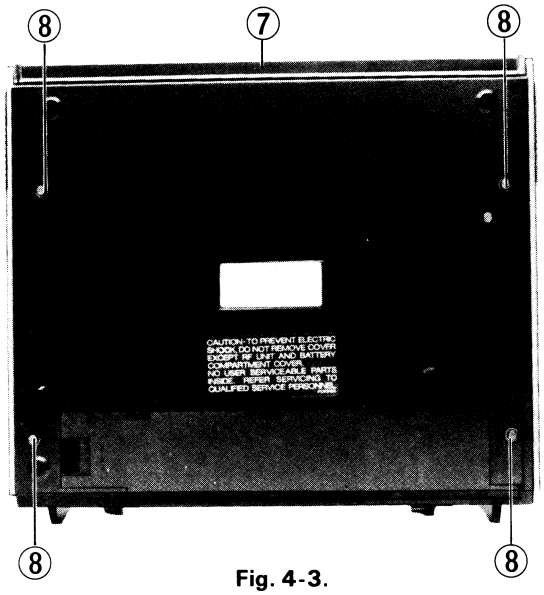


Fig. 4-3.

6. Remove the chassis from the cabinet by pulling handle ⑨ in the direction of the arrow as shown in Fig. 4-4.

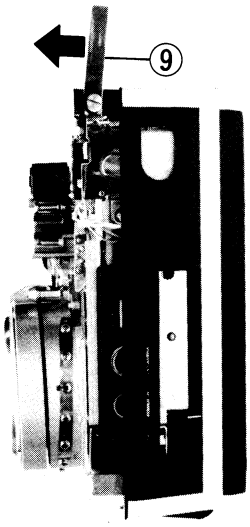


Fig. 4-4.

SECTION 5
ADJUSTMENT OF ELECTRICAL SYSTEM

5-1 GENERAL

The PV-4800U employs a seemingly complex construction in order to make efficient use of its limited space, such as the utilization of IC's and a circuit design used in common for both recording and playback. If any malfunction is met, troubleshoot first with measuring instruments as mentioned later in this section, performing the actions necessary such as repair, replacement, and adjustment.

Since each of the circuits contribute to perfect functioning, if one circuit becomes erratic, it may affect other circuits.

An MOS type IC is employed for IC9 in the SSG circuit. MOS ICs are extremely fragile and may be very easily destroyed by improper handling. Always observe the following precautions when servicing these units.

1. These ICs are shipped pinned to a conductive foam plastic base. They must not be separated from this base while in storage. If you are using one of several ICs pinned to a common base, remove it from the others by cutting the base. Keep the base attached to the IC until you are ready to mount it. Do NOT substitute any other material for the base.
2. There are several precautions to be observed when soldering the new IC into the circuit. Always use a low wattage soldering iron with an isolation transformer. The work bench should be covered with a conductive metal sheet with the chassis under repair grounded.
3. If it is impossible to obtain an isolation transformer, the soldering iron tip, chassis and technician must all be at a common potential.
4. When the IC is installed and power applied, the case is at +9V DC. If the case is shorted to ground, the IC may be damaged.

Also observe when mounting the Audio and Servo printed circuit board to the chassis, make sure that the slide switches on the board are properly actuated in the corresponding mode.

5-2 CHECK OF POWER SUPPLY CIRCUIT

Instrument: DC voltmeter (VTVM)

1. Turn the VTR so that it is vertical and resting on its control panel, and connect a DC voltmeter to TP-1 on the regulated +9V DC (+9V Reg) printed circuit board. The +9V Reg is a small printed circuit board located at the top right-hand corner of the chassis as viewed from the back side.
2. Set the VTR to the Play mode and verify that the voltage at TP-1 (Reg. Out) is within ±0.2 volt of +9 volts DC.

5-3 SOLENOID CURRENT ADJUSTMENT

Instrument: DC voltmeter

1. Connect the DC voltmeter across terminals TP-1 and TP-2 on the solenoid control printed circuit board located on the side of the chassis, beneath the MODE switch on the control panel. TP-1 should be positive in polarity.
2. Turn R3 fully (Current limit adjustment potentiometer) to the clockwise position where the minimum resistance value is obtained.
3. Set the VTR to the Play mode, wait about 15 seconds for voltage to stabilize, and then turn R3 slowly, observing the voltmeter mentioned above. Adjust R3 until the voltage reaches the value, 2.8 volts ±0.1 volt.

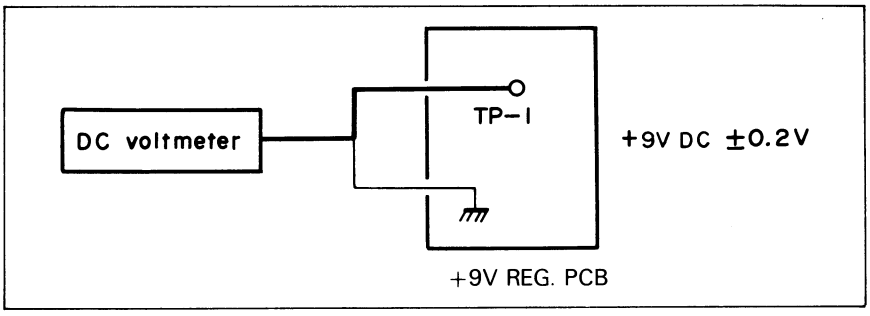


Fig. 5-1. Checking of line voltage

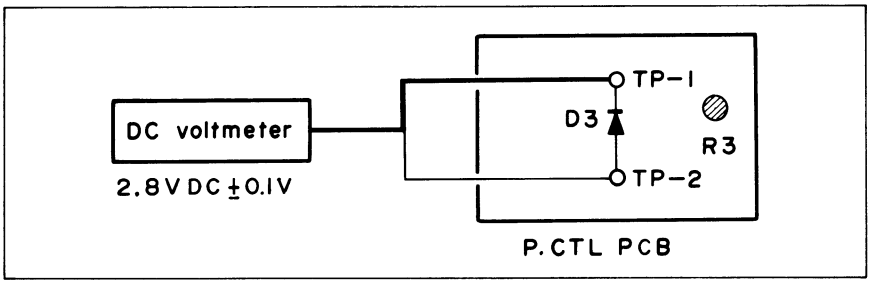


Fig. 5-2. Solenoid current adjustment

5-4 ADJUSTMENT OF SERVO CIRCUIT

Instruments: 1. Frequency counter
2. Oscilloscope

Alignment tape: JVC MK-1

5-4-1 Tape speed adjustment

1. Connect the frequency counter to pin 5, Audio Out, of the 10-pin TV CAMERA, connector or to TP-16 on the Audio and Servo printed circuit board.
2. Play the alignment tape which contains a 3kHz audio recording. Use a portion located near the middle of the tape's length, keeping the VTR perpendicular to the horizontal bench-top.
3. Turn R89 (Tape speed adjustment potentiometer) on the Audio and Servo printed circuit board, and set until the indication of the counter becomes within ±0.1% of 3kHz, that is, 2997 to 3003Hz.

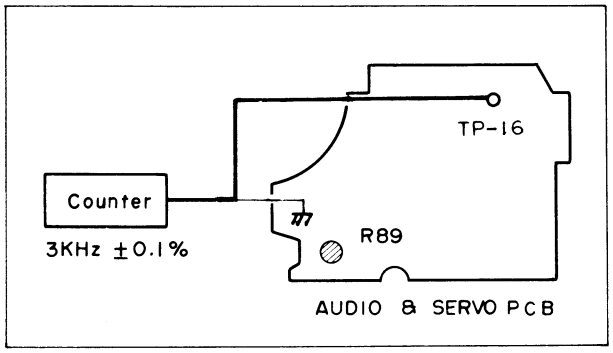


Fig. 5-3. Tape speed adjustment

5-4-2 Discriminator output adjustment (Disc Servo circuit)

1. Connect the oscilloscope to TP-6 (Discri Out) on the Audio and Servo printed circuit board. The VTR is placed in the record mode with an "off-the-air" broadcast signal as input.
2. Adjust R46 (Discri Adj) so that the waveform at TP-6 becomes as shown in Fig. 5-5, 5.0 volts DC, while in the REC mode.
3. Next, connect the oscilloscope to TP-4 and verify that the DISCRI PULSE-1 is 8 volts p-p as shown in Fig. 5-6.
4. Verify that the DISCRI PULSE-2 at TP-5 is 4.5 to 5.0 volts as shown in Fig. 5-7.

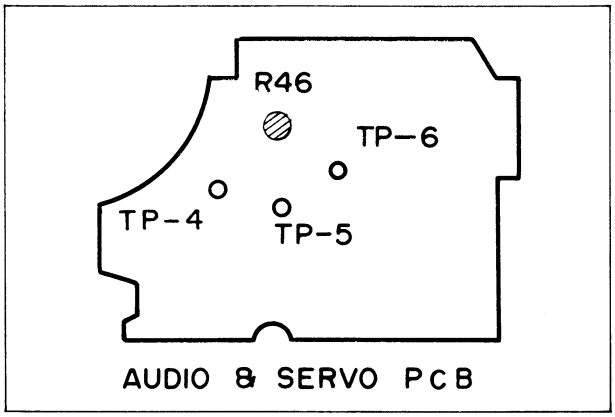


Fig. 5-4. Discriminator output adjustment

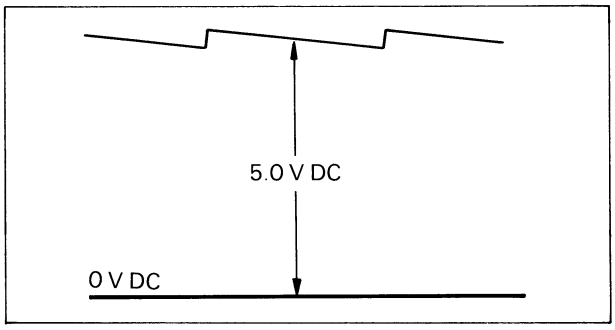


Fig. 5-5. Discriminator output waveform at TP-6

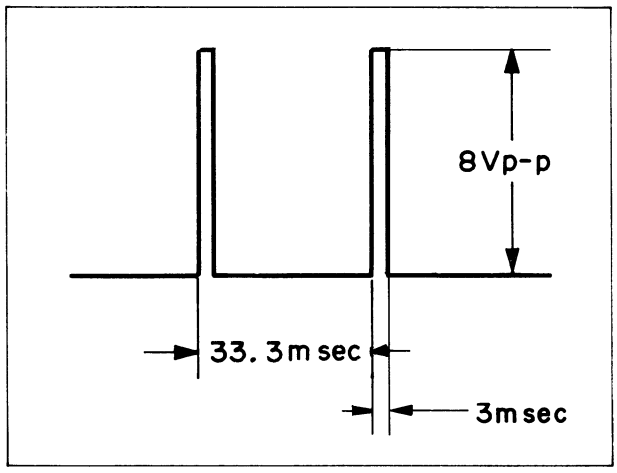


Fig. 5-6. TP-4 Discri pulse-1

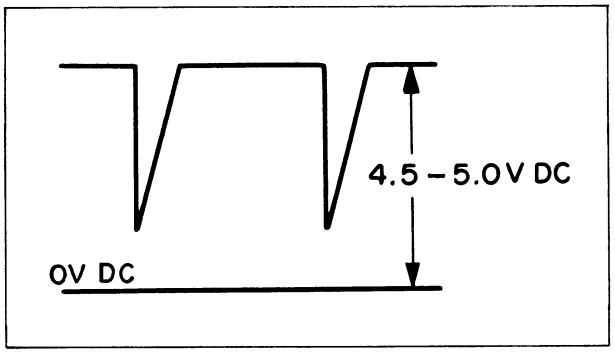


Fig. 5-7. TP-5 Discri pulse-2

5-4-3 Sampling waveform adjustment

1. Connect the oscilloscope to TP-2 (Sampling) on the Audio and Servo printed circuit board. The VTR is placed in the record mode with an "off-the-air" broadcast signal as input (a TV monitor's video output may be used).
2. Adjust R63 (Sampling Position) so that the sampling pulse position at TP-2 becomes 4.5V DC ±0.1V as shown in Fig. 5-9; the ratio A:B should be about 3:2.

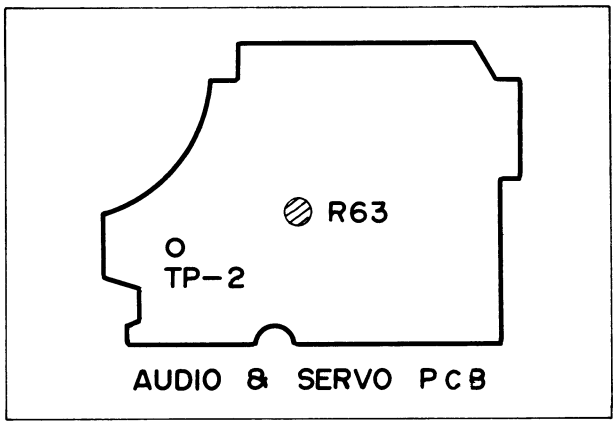


Fig. 5-8. Sampling adjustment

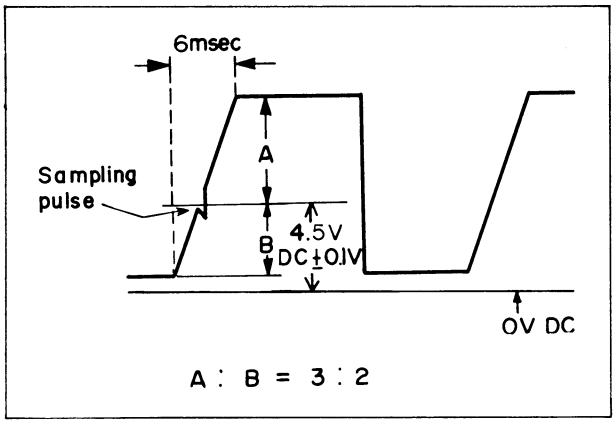


Fig. 5-9. Sampling waveform

5-4-4 Switching point and Tracking adjustment

1. Connect the oscilloscope to TP-8 (Video in/out) on the Audio and Servo printed circuit board and play the alignment tape. (Refer to Fig. 5-10.)
2. Refer to Fig. 5-11. Adjust the CH-2 Disc Pulse head by loosening the screw holding the head bracket (remove glue) and moving the slotted bracket along the circumference of upper drum, in order to position the switching point 5H prior to the vertical blanking.
3. Similarly adjust the CH-1 disc pulse head so that the switching points coincide.

   NOTE: Video signal information may be lost if the disc pulse heads are adjusted incorrectly. Therefore, care should be taken in making the adjustments.

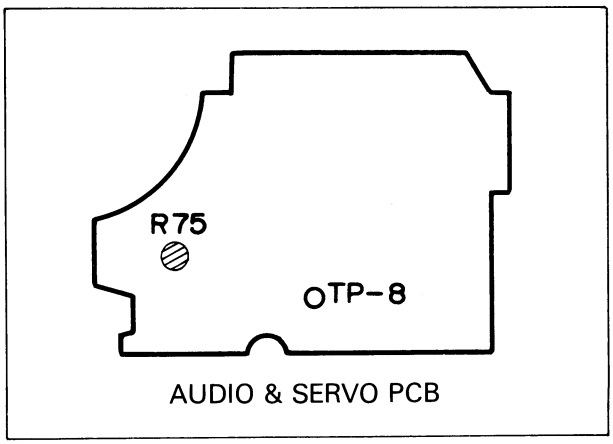


Fig. 5-10. Switching point adjustment

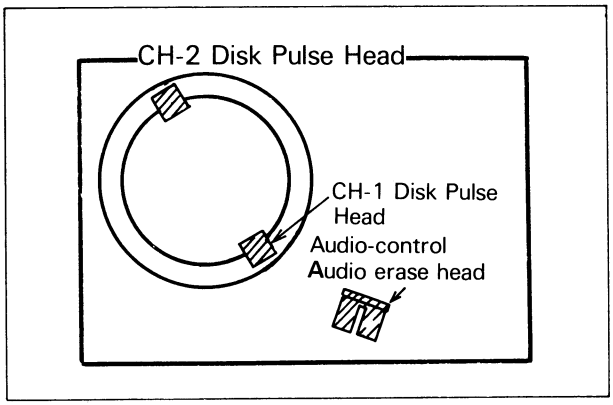


Fig. 5-11. Pick-up head position

4. Next, record and then play back with the same VTR (Self-recording). First, record an off-air TV signal, and adjust R75 (SW. Point) so that the switching point at TP-8 occurs 5H prior to the vertical blanking, as shown in Fig. 5-12.
5. Next, play the recording back, and verify that the playback switching point position matches that of recording.
6. Refer to Fig. 5-13. Connect the oscilloscope to TP-18 (P.B. FM) on the Audio and Servo printed circuit board and play back the tape which was recorded according to step 4, above. Adjust R78 (Sub Tracking) so that the FM output becomes maximum, as shown in Fig. 5-14. At this time, set the tracking potentiometer to the Auto position.
7. Next, play the alignment tape, keeping the tracking potentiometer at the "OFF" (preset) position. Move the control head to left and right until the playback FM signal is maximum, as in Fig. 5-14.
   NOTE: Moving the control head is required only in the case of control head replacement.
8. Finally, set the tracking potentiometer to the MANUAL position and verify that the portion at which the playback FM signal is maximum is within the adjustment range of the potentiometer.

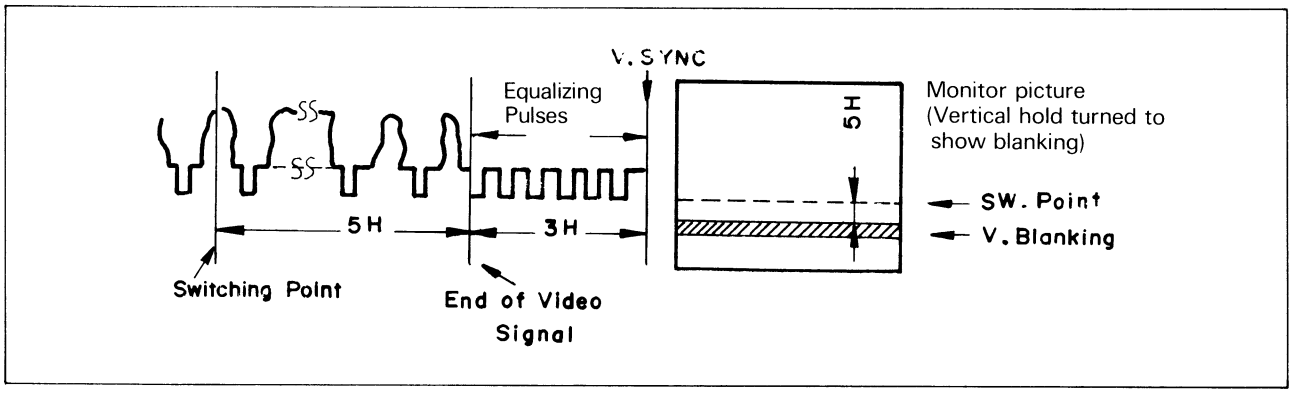


Fig. 5-12. Video output waveform

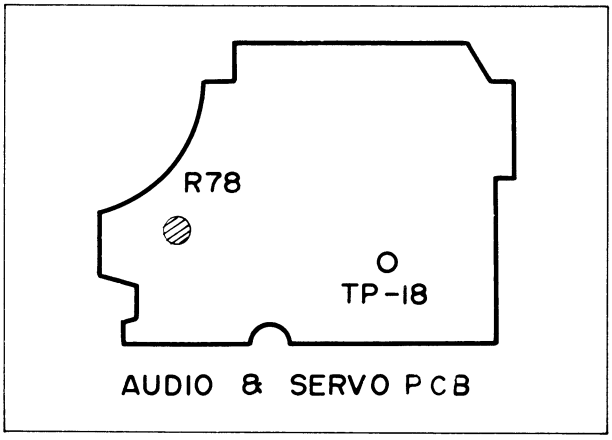


Fig. 5-13. Tracking adjustment

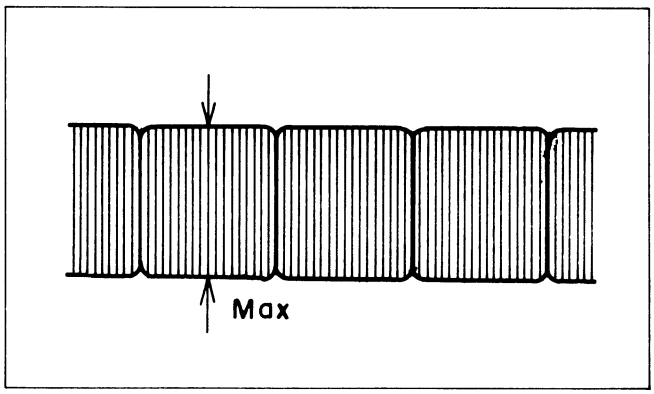


Fig. 5-14. Playback FM waveform

5-4-5 Checking of the control pulse

1. Refer to Fig. 5-15.
   Connect the oscilloscope to TP-9 (Control Pulse-2) on the Audio and Servo printed circuit board and play the alignment tape. Verify that the positive portion of the control pulse waveform is at least 0.15 volt, as shown in Fig. 5-16.

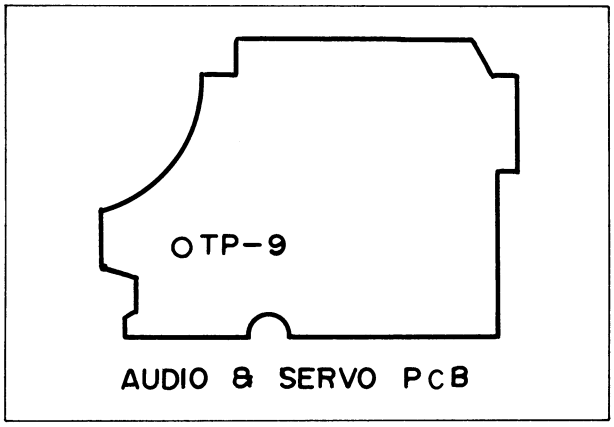


Fig. 5-15. Checking of control pulse

5-4-6 Checking lock-in time

Record an "off-the-air" TV signal for about one minute, rewind to the beginning, and place in the STOP mode. (Head plate should be at a standstill.) Then, measure the elapsed time, selected from STOP to PLAY mode, required for the picture to become stabilized. Verify that this time is within 7 seconds.

5-5 PREAMPLIFIER CIRCUIT ADJUSTMENT

Instrument: Oscilloscope
Alignment tape: JVC MK-1

5-5-1 Adjustment of video head Q and resonance

1. Refer to Fig. 5-17. Connect the oscilloscope to TP-18 (P.B. FM) on the Audio and Servo circuit board.
2. Play back the JVC alignment tape to reproduce the RF segment.
3. Turn R1 and R4 completely counterclockwise.

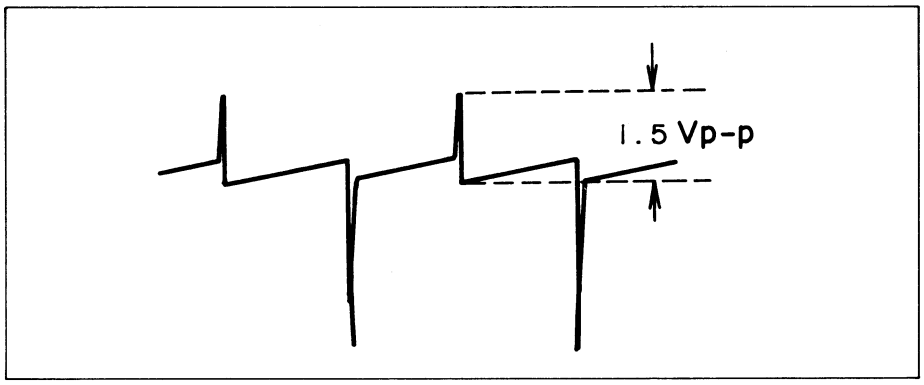


Fig. 5-16. Control pulse waveform

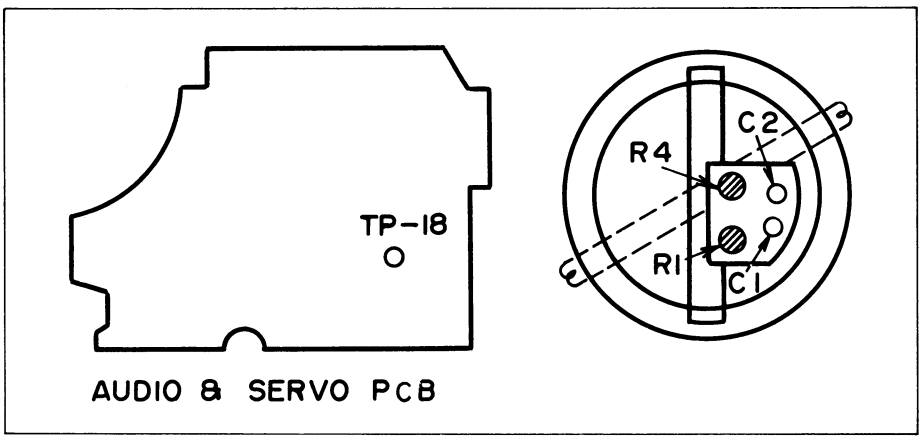


Fig. 5-17. Video head adjustment

4. Adjust C1 and C2 (resonance) for peak response at the marker. See Fig. 5-18.
5. Readjust the R1 and R4 so that Q is minimized at the marker.

5-5-2 P.B. Color balance adjustment

1. Connect the oscilloscope to TP-10 (ACC Input) on the video printed circuit board and play the alignment tape, color bars section. Refer to Fig. 5-19.
2. Channel Balance – Adjust R5 (P.B. Color Balance) on the Audio and Servo printed circuit board, so that the level of CH-1 and CH-2 are the same. See Fig. 5-20.

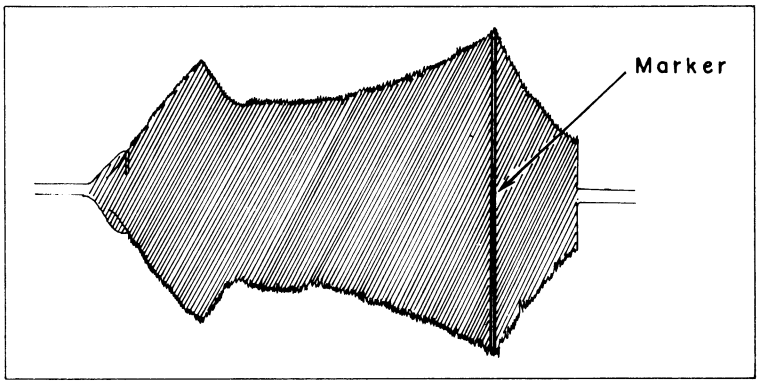


Fig. 5-18. Head, Q, Resonance waveform

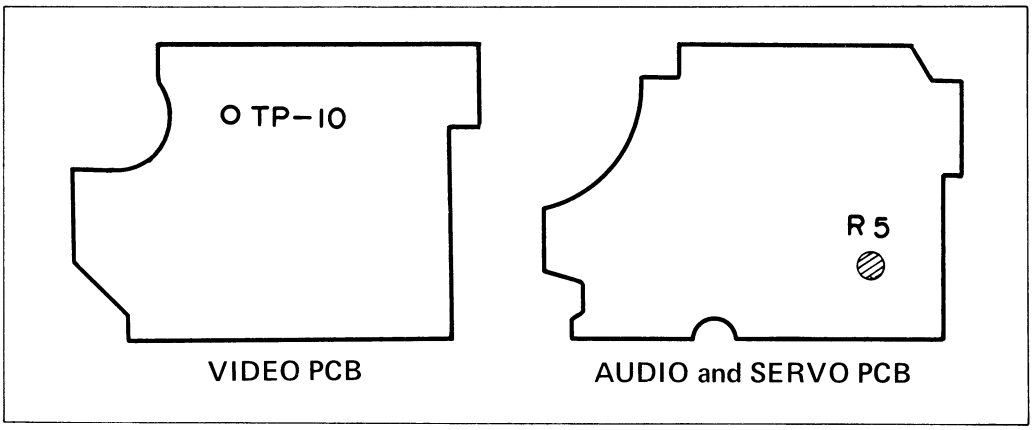


Fig. 5-19. P.B. Color balance adjustment

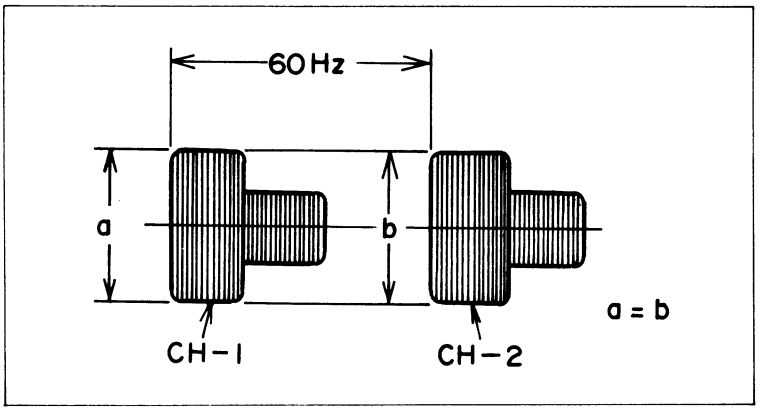


Fig. 5-20. P.B. color balance waveform

5-5-3 Checking of FM output level

1. Refer to Fig. 5-21.
   Connect the oscilloscope to TP-18 (P.B. FM) on the Audio and Servo printed circuit board and play the alignment tape, color bars section.
2. At this time, verify that the level of the waveform as shown in Fig. 5-21 is more than 1.0 volt p-p and verify that the difference between amplitudes (a) and (b) is within 6db.

5-6 PLAYBACK COLOR CIRCUIT ADJUSTMENT

Instruments: Oscilloscope
Frequency counter
DC voltmeter (VTVM)

Alignment tape: JVC MK-1

5-6-1 Playback color input level adjustment

1. Refer to Fig. 5-22.
   Connect the oscilloscope to TP-10 (ACC Input) and play the alignment tape's color bars.
2. Adjust R105 (P.B. Color Input Level) at that time so that the output waveform is 0.15 volt p-p, as shown in Fig. 5-23.

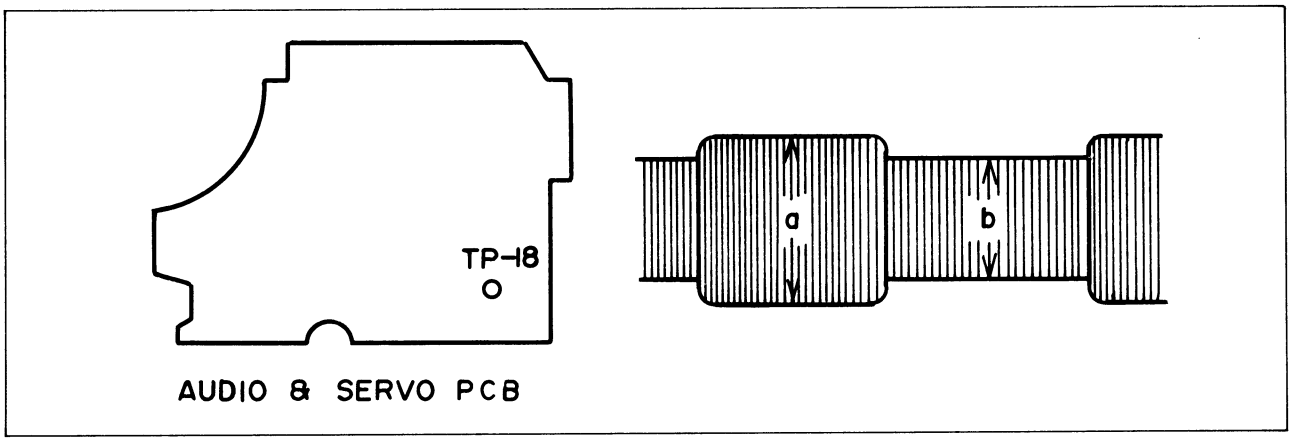


Fig. 5-21. FM output waveform

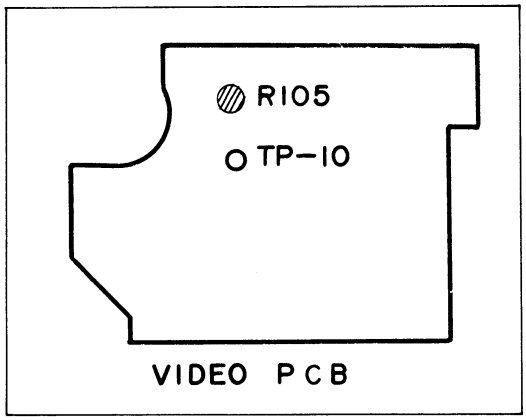


Fig. 5-22. Playback color input level adjustment

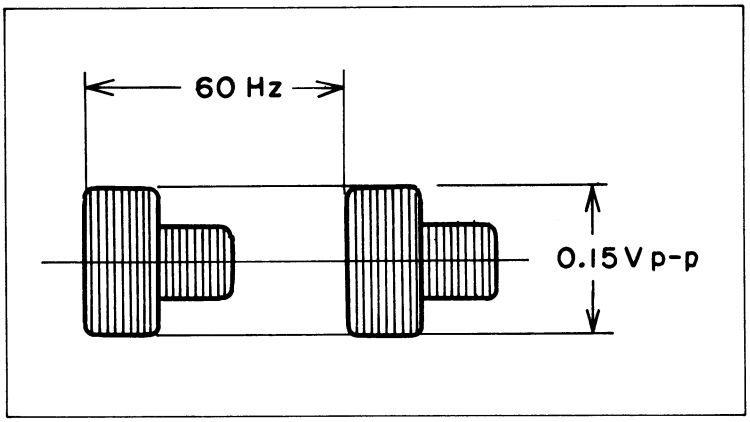


Fig. 5-23. P.B. color input level

5-6-2 3.58MHz oscillating frequency adjustment

1. Connect the frequency counter to TP-19 (3.58MHz) on the video printed circuit board.
2. Adjust C105 (3.58MHz) so that the frequency shown on the counter in the Play mode is 3.579545MHz ±10Hz.

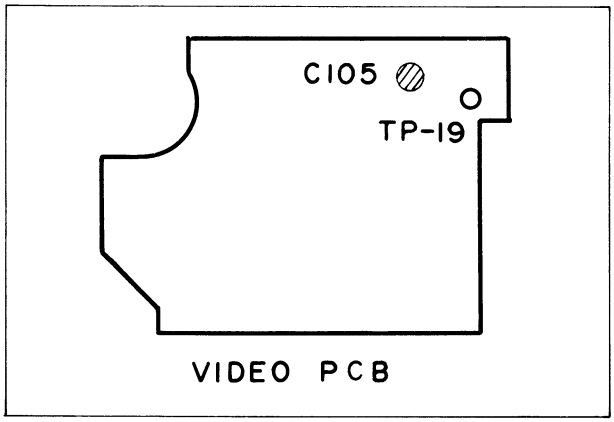


Fig. 5-24. 3.58MHz oscillating frequency adjustment

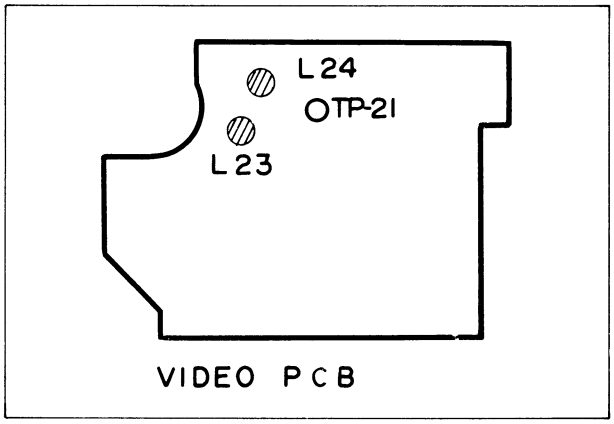


Fig. 5-25. Burst waveform adjustment

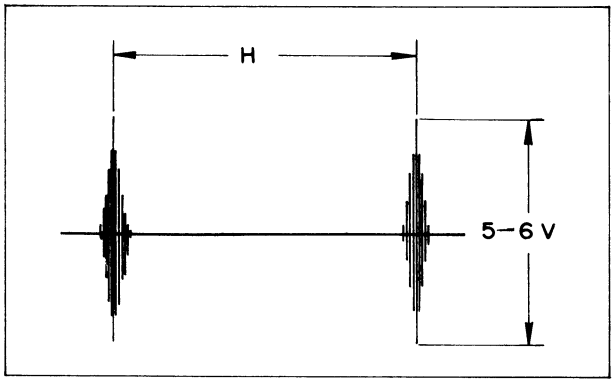


Fig. 5-26. Burst waveform

5-6-3 Sampling burst waveform adjustment

1. Refer to Fig. 5-25.
   Connect the oscilloscope to TP-21 (P.B. ACC Burst) on the Video printed circuit board and play the alignment tape's color bar section.
2. Adjust L23 and L24 alternately so that the burst level is maximum (5–6Vp-p). Refer to Fig. 5-26.

5-6-4 Checking of ACC output

1. Connect the oscilloscope to TP-11 (ACC Out) and play the alignment tape's color bars.
2. At this time, verify that the output is 0.8 volts p-p. Refer to Fig. 5-28.

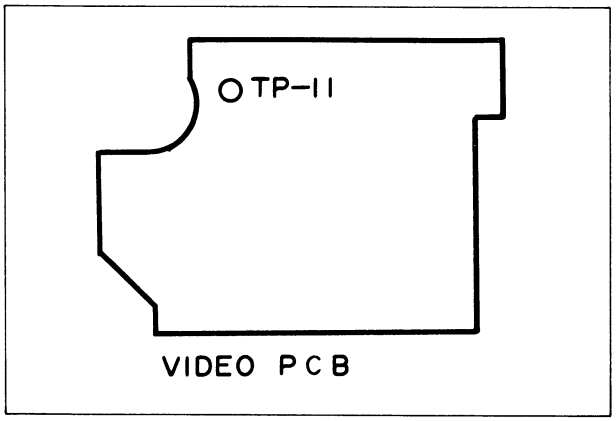


Fig. 5-27. Checking of ACC output

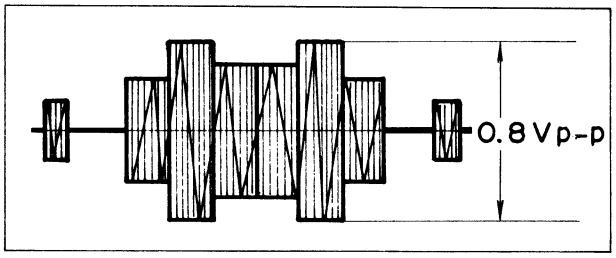


Fig. 5-28. ACC output waveform

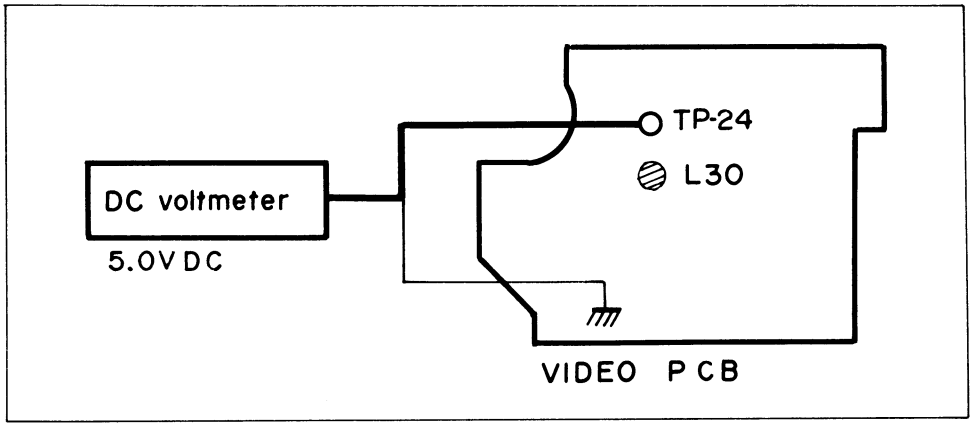


Fig. 5-29. H. DISCRI adjustment

5-6-5 H. DISCRI output level adjustment

1. Refer to Fig. 5-29.
   Connect the DC voltmeter to TP-24 (H. Discri Error) on the Video printed circuit board and play the alignment tape's color bars.
2. Adjust L30 (H. DISCRI Coil) at that time until the output voltage becomes 5.0 volts DC.
   NOTE: Measurement should be performed with a high input impedance instrument such as VTVM. Do not use a multimeter.

5-6-6 Phase detection circuit – adjustment of input burst level

1. Connect the oscilloscope to TP-22 (Det. Burst) on the Video printed circuit board and play the alignment tape's color bars section.
2. Adjust T1 (Det. Burst) at that time so that the output level becomes maximum (approx. 16Vp-p).
   Refer to Fig. 5-31.
   NOTE: The waveform may be observed to be somewhat asymmetrical, but that will be no problem.

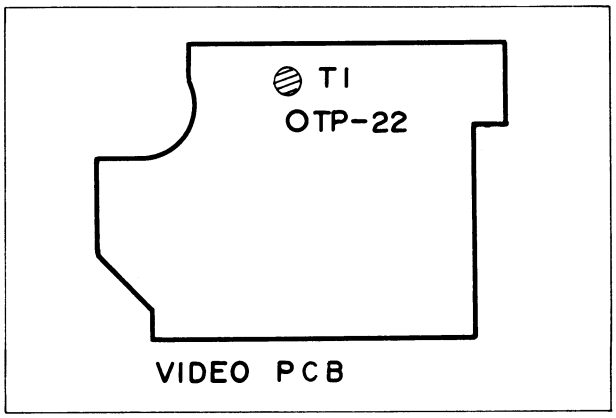


Fig. 5-30. DET Burst level adjustment

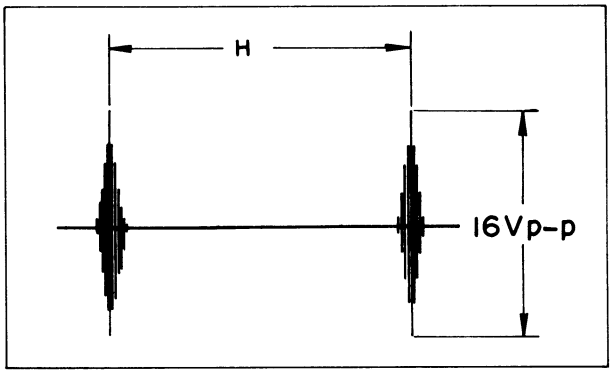


Fig. 5-31. DET Burst waveform

5-6-7 Phase detection circuit – adjustment of input 4.35MHz

1. Connect the oscilloscope to TP-20 (4.35MHz) on the Video printed circuit board and play the alignment tape's color bars.

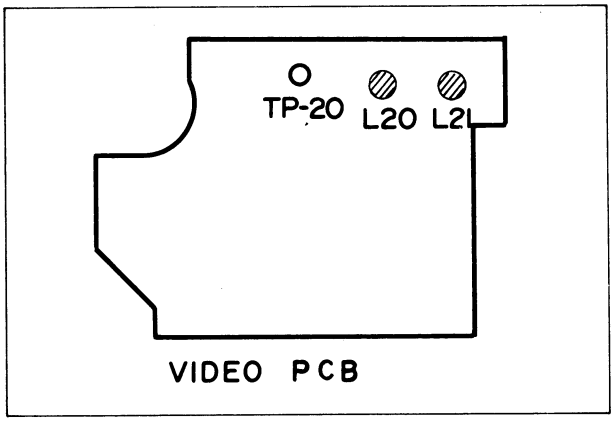


Fig. 5-32. 4.35MHz adjustment

2. Now, adjust L20 and L21 so that the 4.35MHz output is maximum and the "A" part is minimized as shown in Fig. 5-33.

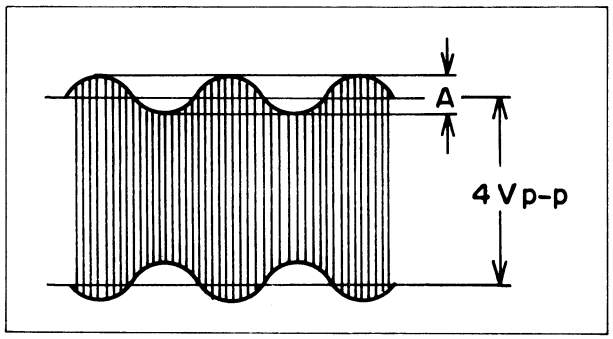


Fig. 5-33. 4.35MHz waveform

5-6-8 Color lock bias adjustment

1. Connect the oscilloscope to TP-18 (Color Lock Bias) on the video printed circuit board and play the alignment tape's color bars. Set the COLOR LOCK potentiometer on the VTR's side panel to the AUTO (preset) position. See Fig. 5-34.
2. Using an oscilloscope, adjust R160 (Sub Color Lock) so that the voltage at the center of 767kHz waveform becomes 2.5 volts DC as shown in Fig. 5-35.
   NOTE: Care should be taken not to load with low input impedance, since the frequency to the 767kHz circuit is affected by low impedance. Therefore, use only an oscilloscope for the measurement.
3. Further in the case that the center axis of the waveform cannot be easily determined, connect a capacitor with a value of approximately 0.1μF across TP-18 and ground terminals and observe the waveform (the 767kHz oscillation is thus stopped).

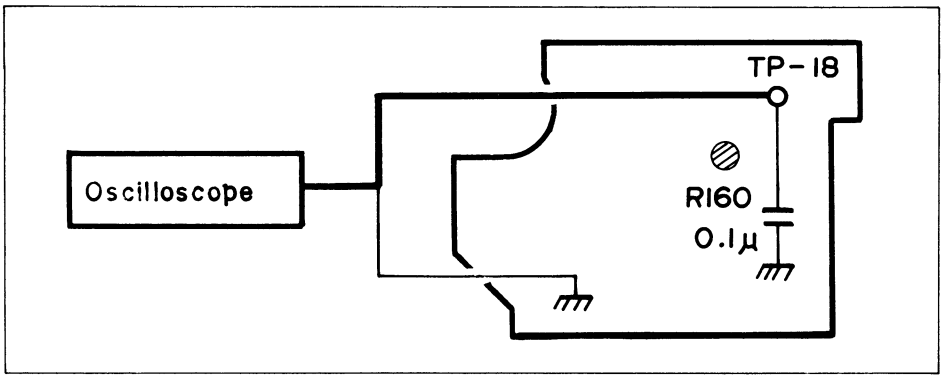


Fig. 5-34. Color lock bias adjustment

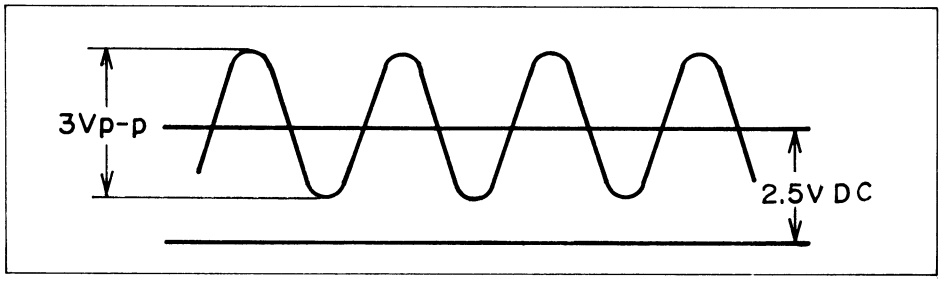


Fig. 5-35. Color lock bias waveform

5-6-9 Color lock adjustment

NOTE: The following adjustments should be performed prior to this adjustment:
- 5-6-5 H. DISCRI output level adjustment
- 5-6-6 Phase detection input burst level adjustment
- 5-6-7 Phase detection input 4.35MHz adjustment
- 5-6-8 Color lock bias adjustment

1. Refer to Fig. 5-36.
   Connect the oscilloscope to TP-23 (APC Error) on the Video printed circuit board and play back the alignment tape's color bars. Observe the color on the TV monitor at the same time. Set the COLOR LOCK potentiometer at the AUTO position.
2. Observe the hues of the color bars on the monitor picture and perform a rough adjustment by turning L18 (Color Lock) until the correct hues are obtained.
3. Next perform fine tuning by turning L18 so that the same DC level for vertical sync and APC error can be obtained as shown in Fig. 5-37-C.
4. Also verify that in the still mode the waveform remains as shown in Fig. 5-37-C. If the waveform has deviated, readjust L30.
5. After the above adjustments, verify that when the COLOR LOCK potentiometer is turned, the correct hues of the color bars are present within the central portion of the potentiometer's range, while one pattern with false hues will appear when approaching each of the extremes of the control.
   NOTE: There may be a some small portions that do not appear in color, but that is no problem.

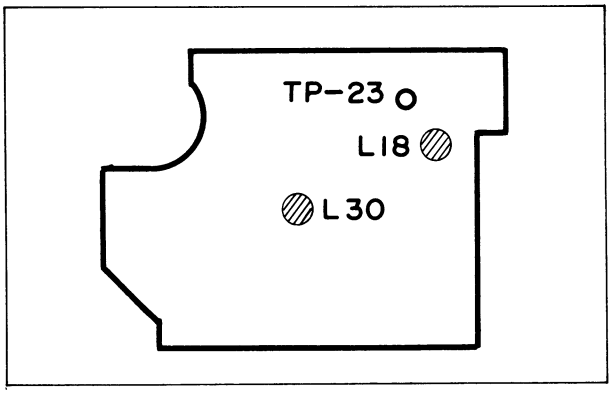


Fig. 5-36. Color lock adjustment

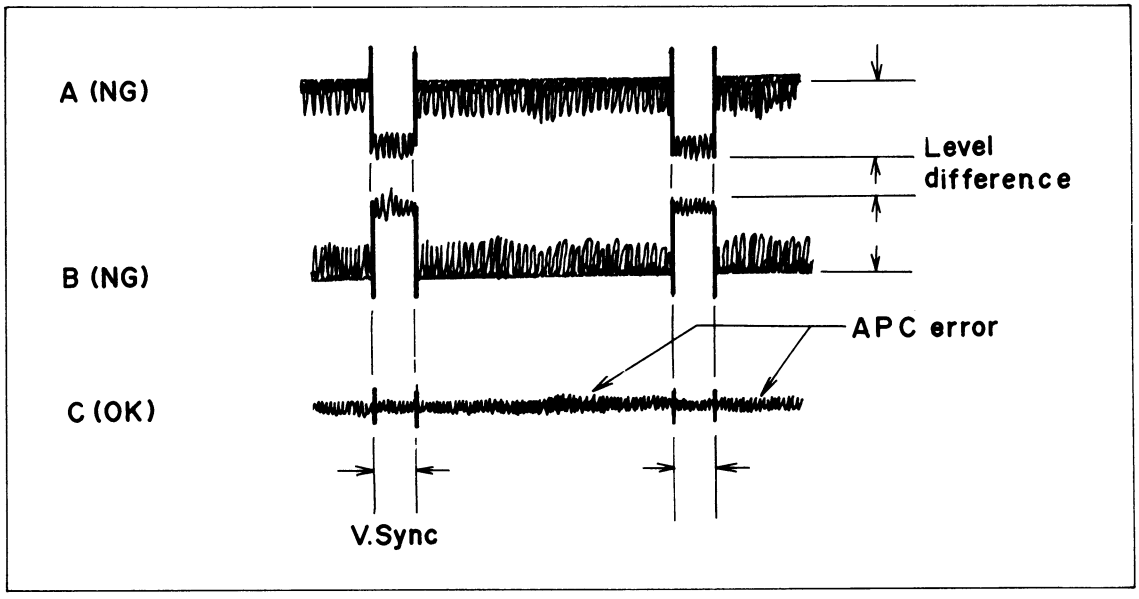


Fig. 5-37. APC error waveform

5-6-10 Main convertor balance adjustment

1. Refer to Fig. 5-38.
   Connect the oscilloscope to TP-14 (P.B. Color Out) on the Video printed circuit board and play the alignment tape's color bars.
2. Adjust R129 (Conv. Balance) at that time until the leakage of the 4.35MHz component is minimized as shown in Fig. 5-39.

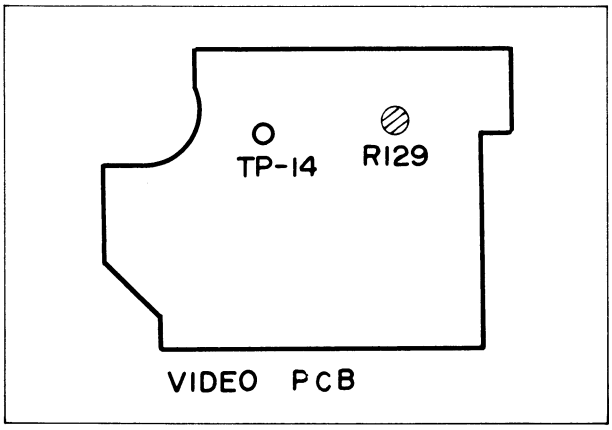


Fig. 5-38. Conv. Balance adjustment

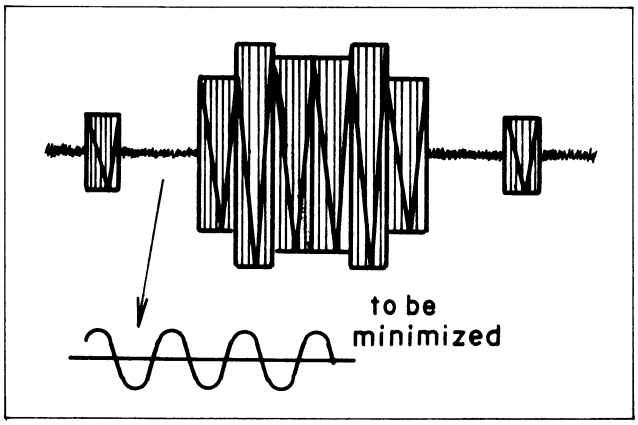


Fig. 5-39. Color output waveform

5-6-11 Color output level adjustment

1. Refer to Fig. 5-40.
   Connect the oscilloscope to TP-9 (Video Out) on the Video printed circuit board and play the alignment tape's color bars.
2. Adjust R135 (P.B. Color Level) at that time so that the green color bar is positioned at the same level as the pedestal position as shown in Fig. 5-41.
   NOTE: Further, adjust R135 also in the case of the self-recording, and playback of the color bars signal so that the green bar can be positioned at the pedestal level. (If there is any difference between the adjustments in the alignment tape and self-recording playback priority is given to self-recording.)

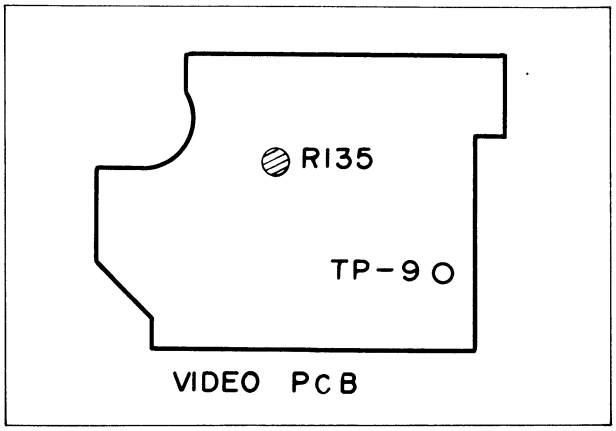


Fig. 5-40. Color output level adjustment

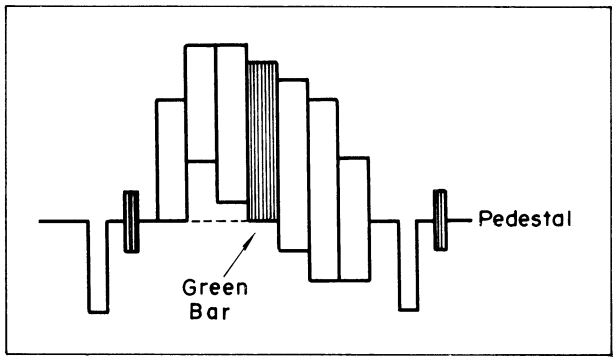


Fig. 5-41. Output waveform

5-7 PLAYBACK VIDEO CIRCUIT ADJUSTMENT

Instrument: Oscilloscope
Alignment tape: JVC MK-1

5-7-1 Limiter and carrier balance adjustments

1. Connect the oscilloscope to TP-6 (Det. Out) on the Video printed circuit board and play the alignment tape's color bars.

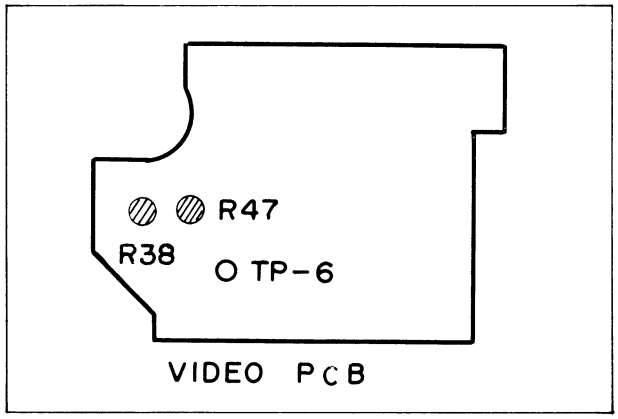


Fig. 5-42. Limiter, Carrier Balance adjustment

2. Adjust R38 (Limiter Balance) and R47 (Carrier Balance) alternately, so that the FM signal superposed on the video can be observed to be coinciding as shown in Fig. 5-43 for all of the steps from sync tip to peak white.

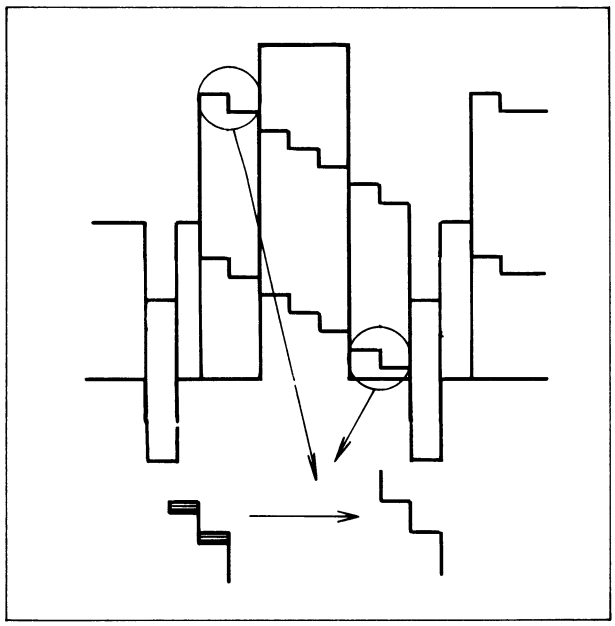


Fig. 5-43. Det. output waveform

5-7-2 Video output level adjustment

1. Refer to Fig. 5-44.
   Connect the oscilloscope to TP-9 (Video Out) on the Video printed circuit board and play back the alignment tape color bar.
2. Adjust R55 (Y P.B. Level) so that the output waveform becomes 2.0 volts p-p as shown in Fig. 5-45.
3. After the above adjustment, the color output level should be rechecked and readjusted if necessary as in 5-6-11(2).

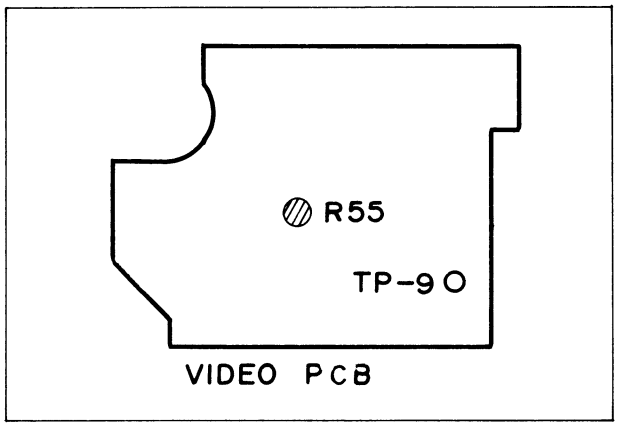


Fig. 5-44. Video output level adjustment

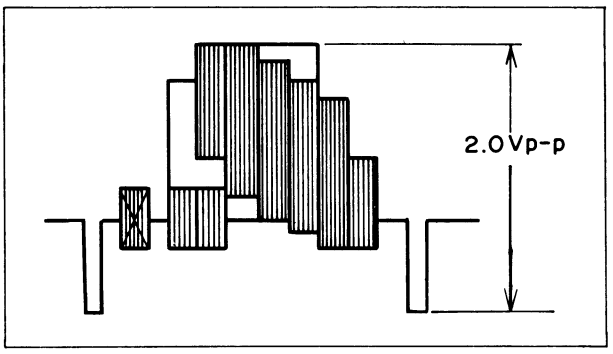


Fig. 5-45. Video output waveform

5-7-3 Aperture adjustment

1. Connect the oscilloscope to TP-9 (Video Out) on the Video printed circuit board and play the alignment tape's color sweep.

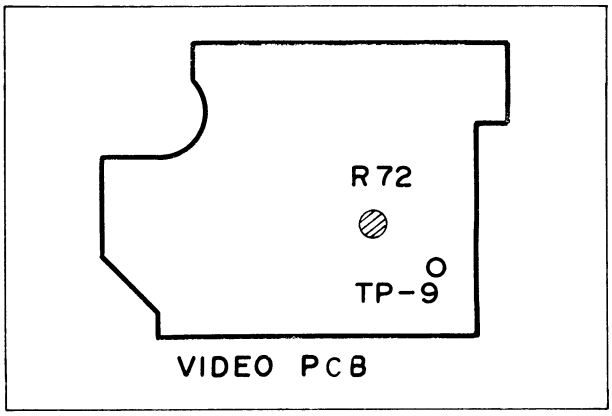


Fig. 5-46. Aperture adjustment

2. Adjust R72 (Aperture) so that, as shown in Fig. 5-47, 1MHz signal compared to 100kHz is about −2db.

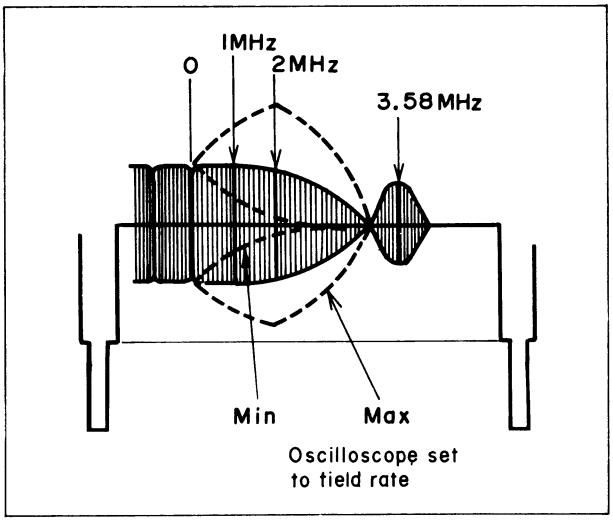


Fig. 5-47. Output waveform

5-8 RECORDING AMPLIFIER ADJUSTMENT

Instruments: Video signal generator
Oscilloscope
High-frequency sine-wave generator
(up to 4.5MHz)

NOTE: The following adjustments should be performed after the adjustments for the playback system are completed.

5-8-1 Checking of operation for the AGC circuit

1. Refer to Fig. 5-48.
   Connect the oscilloscope to TP-2 (AGC Out) on the Video printed circuit board and apply a 1-volt p-p color bars signal to TP-1 (Video in) from a video signal generator, and set the VTR to the REC mode.
2. Under this condition, verify that TP-2 is 1.4 volts p-p ±0.2 volt. See Fig. 5-49.
3. Verify that when the TP-1 input is changed by ±6db, the change at TP-2 is constant amplitude, within ±0.1 volt p-p. Verify that there is negligible distortion.
   NOTE: In the case that no video signal generator is available, use the output signal from other video equipment as the input signal or use a still picture output from a television monitor.

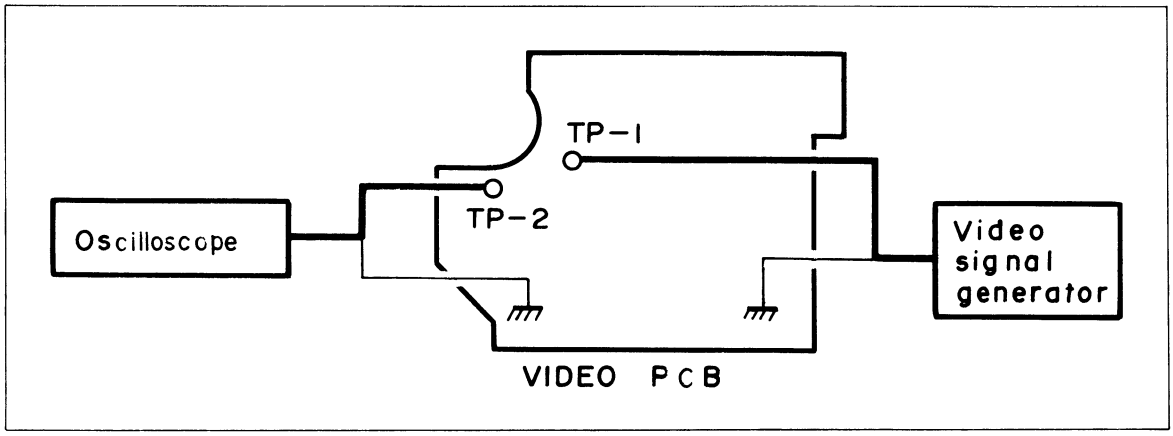


Fig. 5-48. AGC operation

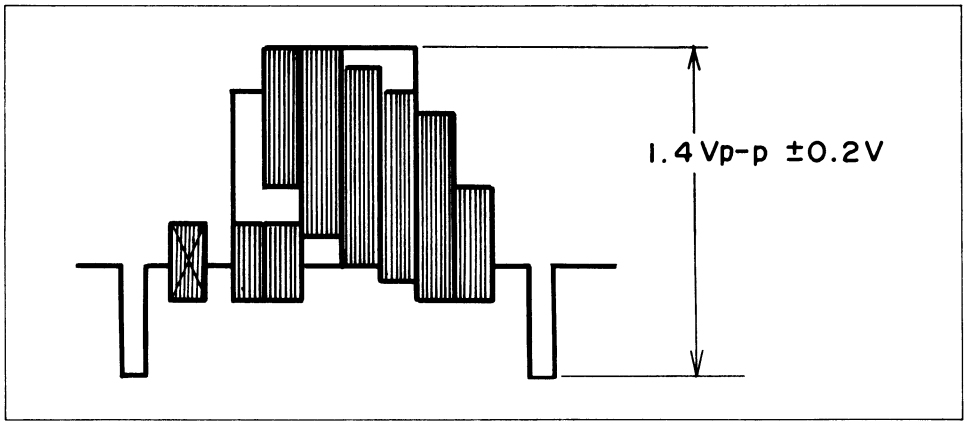


Fig. 5-49. AGC output waveform

5-8-2 Color mode E-E level adjustment

1. Connect the oscilloscope to TP-9 (Video Out) on the Video printed circuit board and apply 1.0 volt p-p color bars to TP-1 (Video in) from the video signal generator.
2. Set the VTR to the REC mode, and adjust R75 (Color E-E Level) so that the output is 2.0 volts p-p. See Fig. 5-51

5-8-3 B/W mode E-E level adjustment

1. With arrangement as in 5-8-2, set the mode change-over switch to the B/W position and adjust R59 (B/W E-E Level) so that the output is 2.0 volts p-p, as shown in Fig. 5-53.

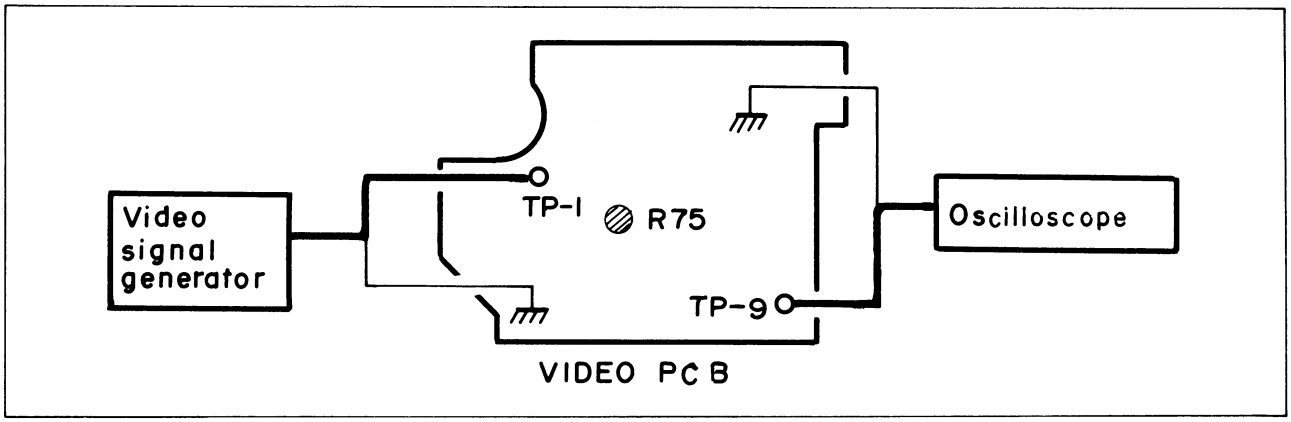


Fig. 5-50. Color mode E-E level adjustment

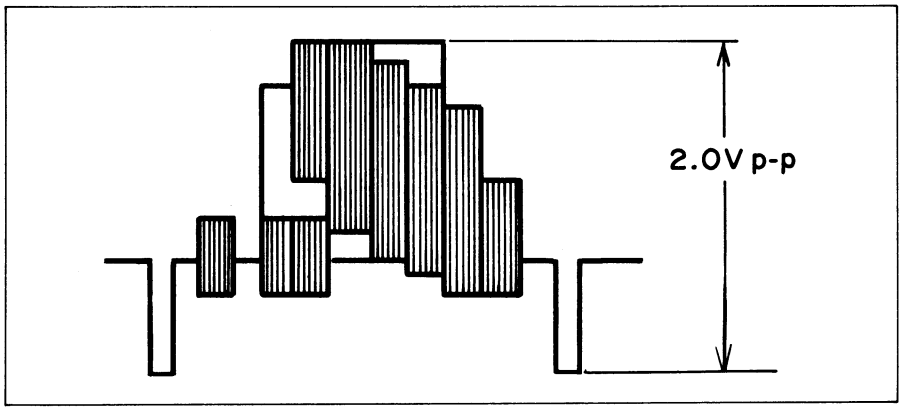


Fig. 5-51. Color mode E-E waveform

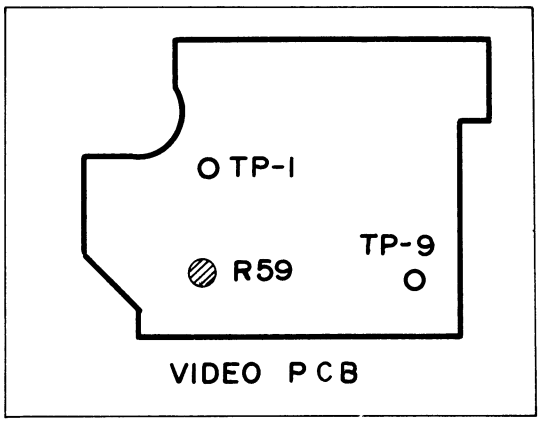


Fig. 5-52. B/W E-E Level adjustment

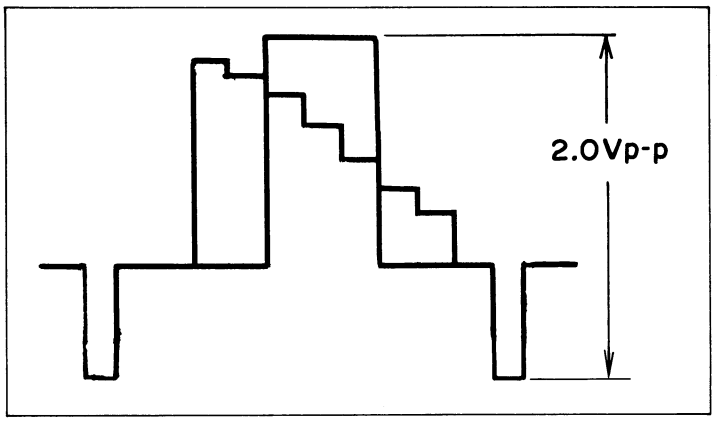


Fig. 5-53. B/W E-E waveform

5-8-4 FM Carrier and Deviation adjustment

1. Refer to Fig. 5-54.
   Apply the color bar signal from the video signal generator to TP-1 (Video in) on the Video printed circuit board.
2. Connect the high-frequency sine-wave generator output to TP-4 (FM Out).
3. Apply the two-channel oscilloscope to TP-9 (Video Out) and TP-5 (Rec. Amp Out) and set the oscilloscope to "A + B" mode.
4. Set the VTR mode selector switch at the B/W mode position and set the VTR at the recording mode.
5. Refer to Fig. 5-55.
   Tune the output of the high-frequency generator at 3.1MHz and adjust R19 (Carrier) so that zero beat can be obtained at the sync tip of the combined waveform on the oscilloscope.
6. Next, referring to Fig. 5-56, tune the output of the high-frequency generator to 4.5MHz and adjust R60 (Deviation) so that zero beat is obtained at the peak white of the combined waveform on the oscilloscope.

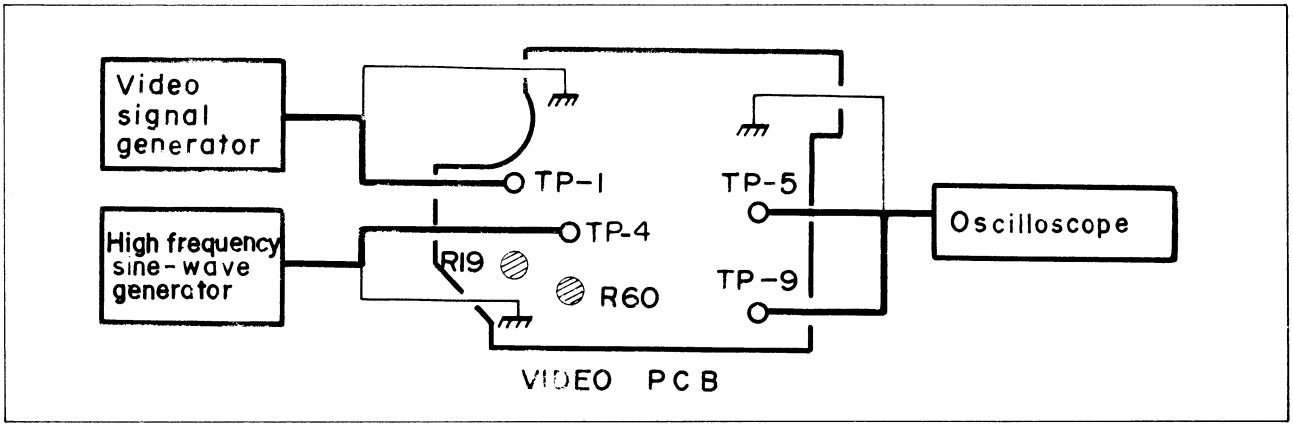


Fig. 5-54. Carrier set adjustment

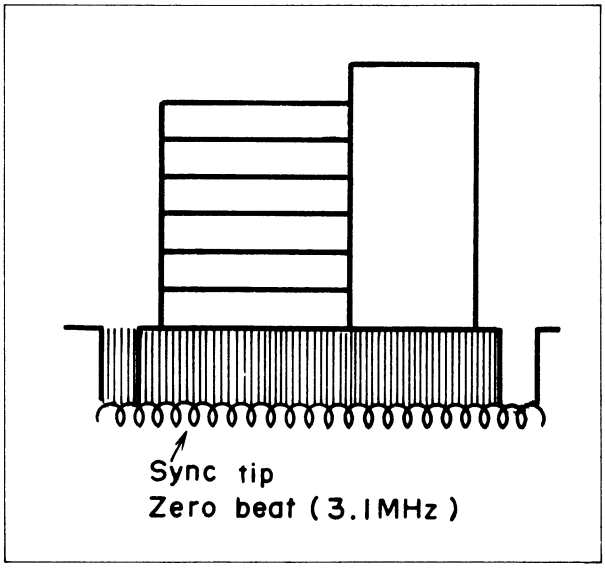


Fig. 5-55. Carrier set waveform

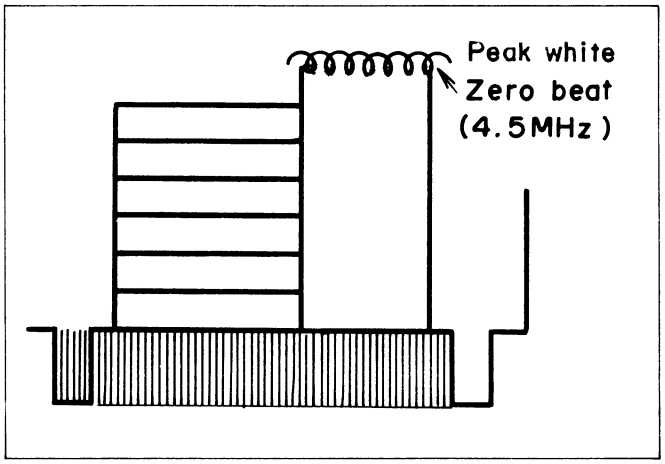


Fig. 5-56. Deviation set waveform

5-8-5 White clip adjustment

1. Refer to Fig. 5-57.
   Connect the oscilloscope to TP-3 (Pre-Emphasis) on the Video printed circuit board and apply the color bars from the video signal generator to TP-1 (Video in).
2. Set the VTR to the recording mode.
3. Adjust R16 (White Clip) at this time so that the amplitude ratio of transient "spikes" with white clip to without white clip, as shown in Fig. 5-58, becomes 2:3.

5-8-6 Rec FM Balance and FM OSC Balance adjustment.

1. Refer to Fig. 5-59.
   Connect the oscilloscope to TP-4 (FM Out) on the Video printed circuit board and apply the 1-volt p-p color bars from the video signal generator to TP-1 (Video in).

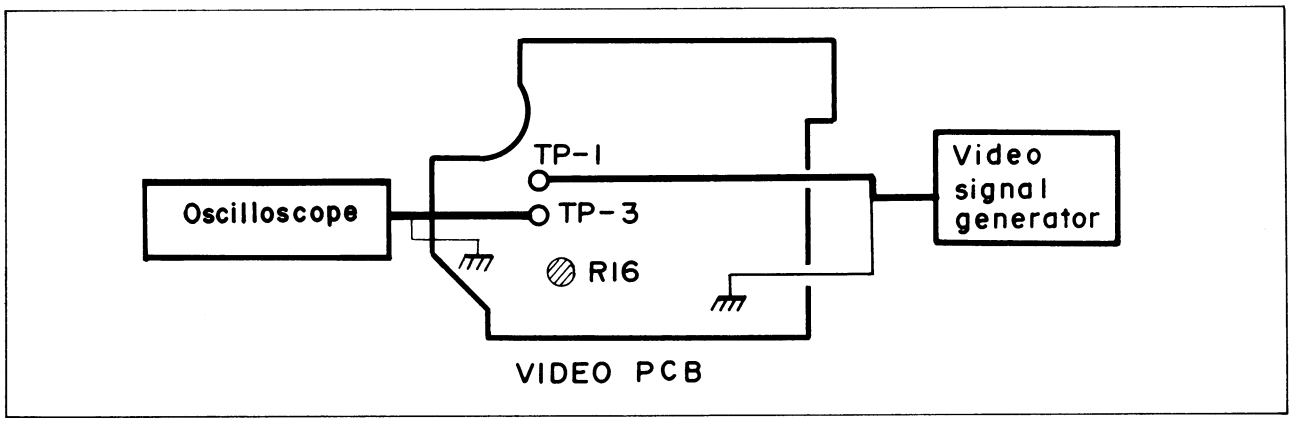


Fig. 5-57. White clip adjustment

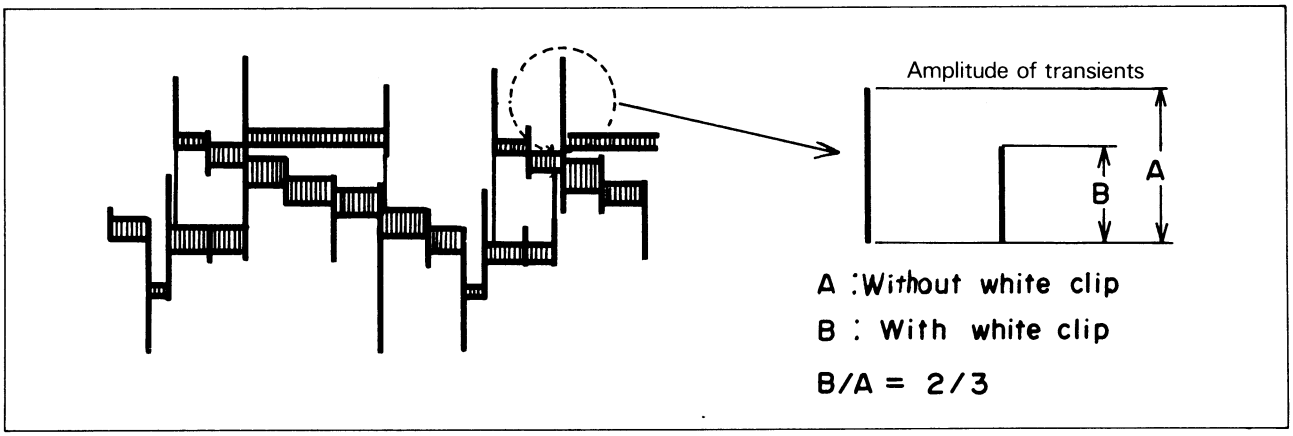


Fig. 5-58. White clip waveform

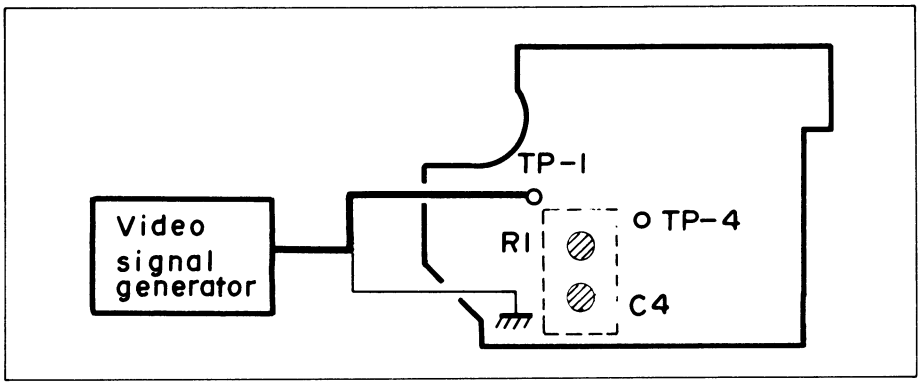


Fig. 5-59. FM Balance adjustment

2. Set the VTR to the recording mode and adjust R1 (Record-FM Balance) and C4 (FM OSC Balance) in the FM modulator unit, alternatively, so that the waveform becomes symmetrical to the center as shown in Fig. 5-60.

NOTE: If a monoscope signal is available, perform self-recording and playback and verify that there is no leakage as shown in Fig. 5-61.

NOTE: After the above adjustment, the carrier setting should again be checked. Furthermore, input leakage and P.B. limiter imbalance may cause the similar phenomenon.

5-8-7 Adjustment of 4.35MHz oscillating frequency

1. Refer to Fig. 5-62.
   Connect the frequency counter to TP-16 (4.35MHz X'tal) on the Video printed circuit board and set the VTR to the recording mode.
2. Adjust C88 (4.35MHz Adj) until the following condition can be obtained:

Oscillator frequency	4.346590MHz ±10Hz
Oscillator output	3.5 volts p-p ±0.5 volts

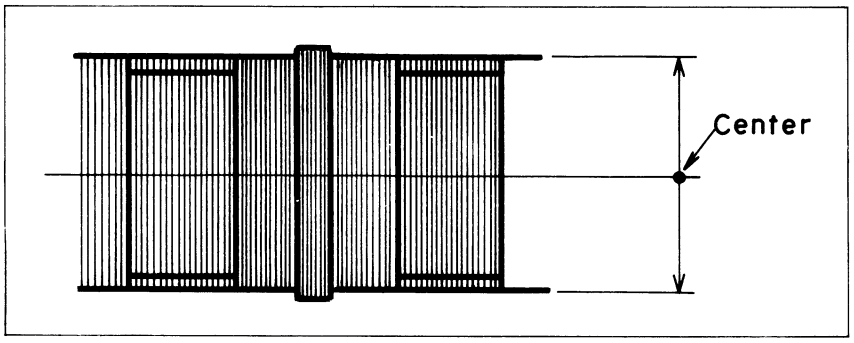


Fig. 5-60. MOD output waveform

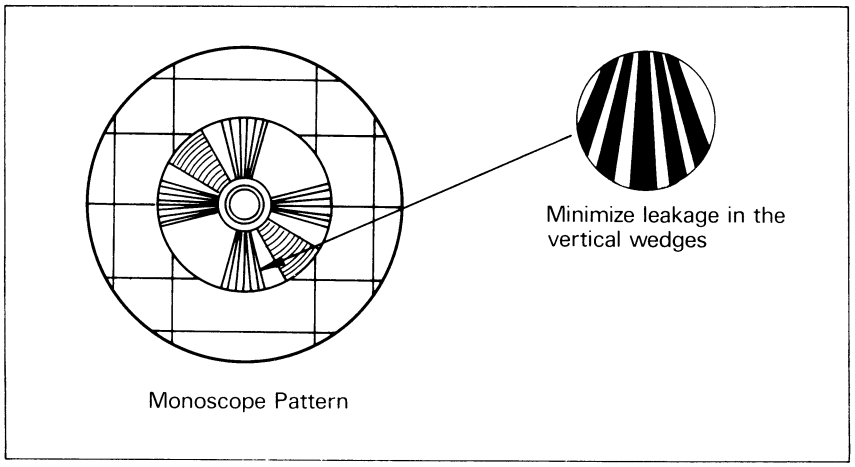


Fig. 5-61. Leakage checking

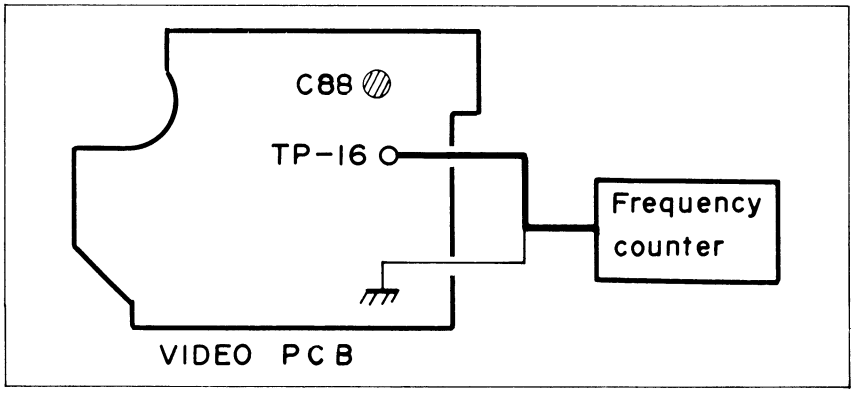


Fig. 5-62. 4.35MHz adjustment

5-8-8 Burst Gate Pulse checking

1. Connect the oscilloscope to TP-12 (Gate Pulse) on the Video printed circuit board and apply the color bars from the video signal generator to TP-1 (Video in). Refer to Fig. 5-63.
2. Verify that the output waveform is as shown in Fig. 5-64. Refer to Fig. 5-64.

5-8-9 Checking of sampling burst

1. Refer to Fig. 5-65.
   Connect the oscilloscope to TP-13 (Rec ACC Burst) on the Video printed circuit board and apply color bars from the video signal generator to TP-1 (Video in).

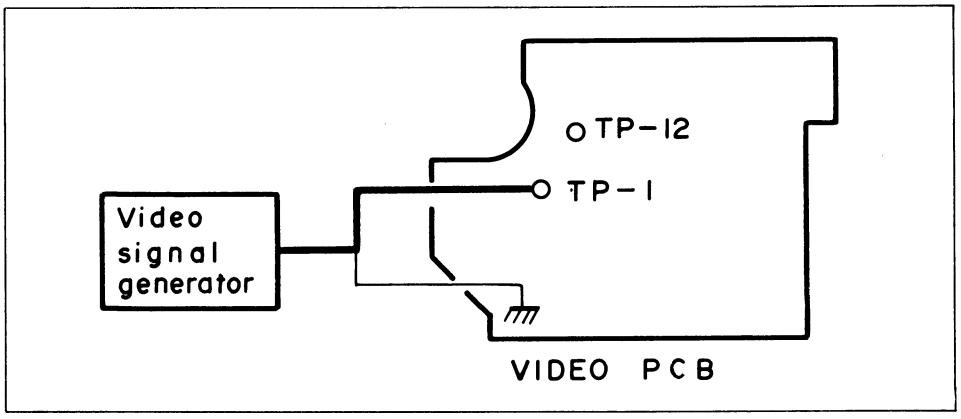


Fig. 5-63. Gate Pulse checking

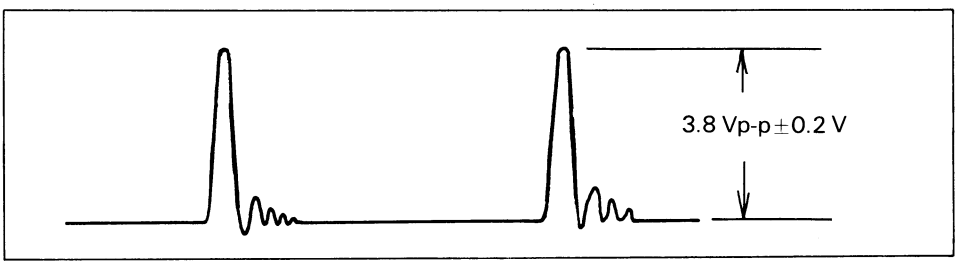


Fig. 5-64. Gate Pulse

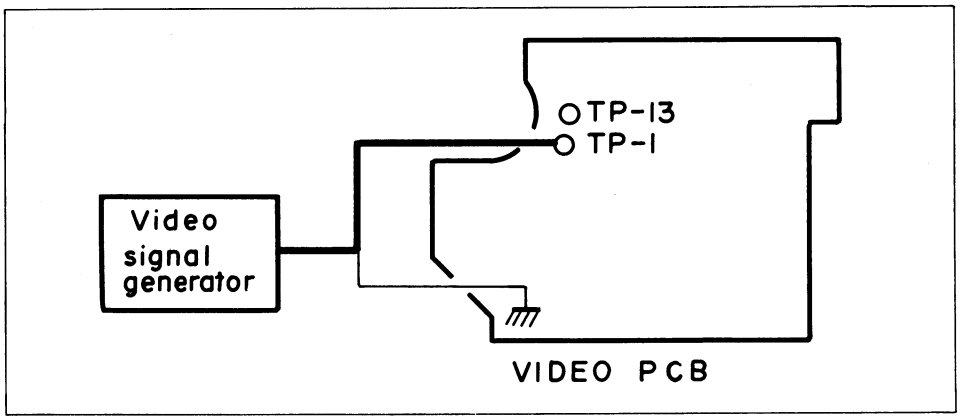


Fig. 5-65. Checking of sampling burst

2. Set the VTR at the recording mode and verify that the waveform is as shown in Fig. 5-66.

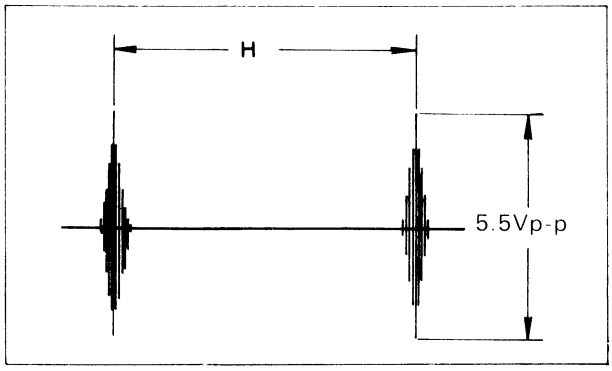


Fig. 5-66. Sampling burst waveform

5-8-10 Checking of ACC operation

1. Refer to Fig. 5-67.
   Connect the oscilloscope to TP-11 (ACC Out) and apply the 1-volt p-p color bar signal from the video signal generator to TP-1 (Video in).
2. Set the VTR at the recording mode and verify that the output waveform is 0.8 volt p-p ±0.1, as shown in Fig. 5-68.
3. Next, verify that when the color level input from the video signal generator is −12db and +6db, the output is constant within ±2db.

5-8-11 Checking of frequency-converted color output

1. Refer to Fig. 5-69.
   Connect the oscilloscope to TP-15 (767kHz Color) and apply the 1-volt p-p color bars from the video signal generator to TP-1 (Video in).

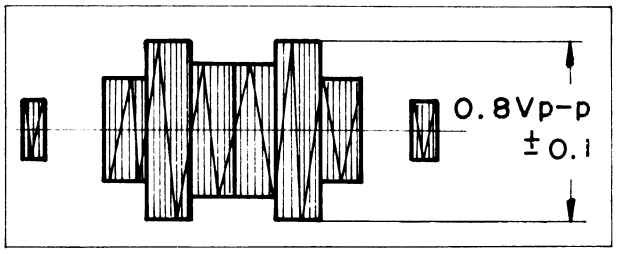


Fig. 5-68. ACC output waveform

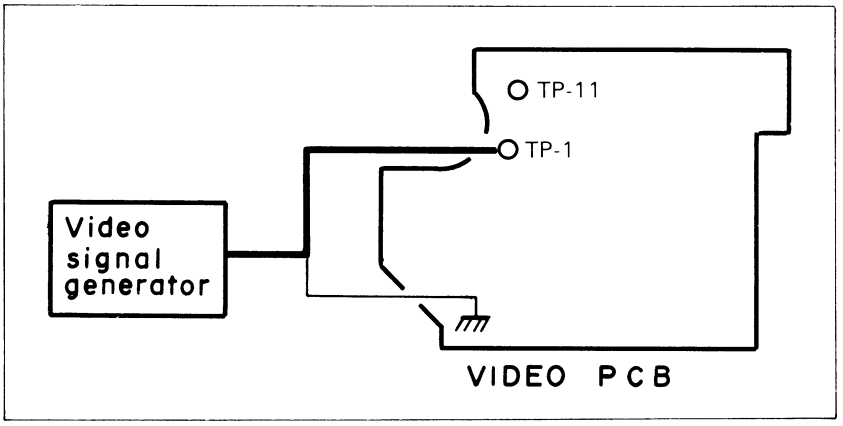


Fig. 5-67. Checking of ACC operation

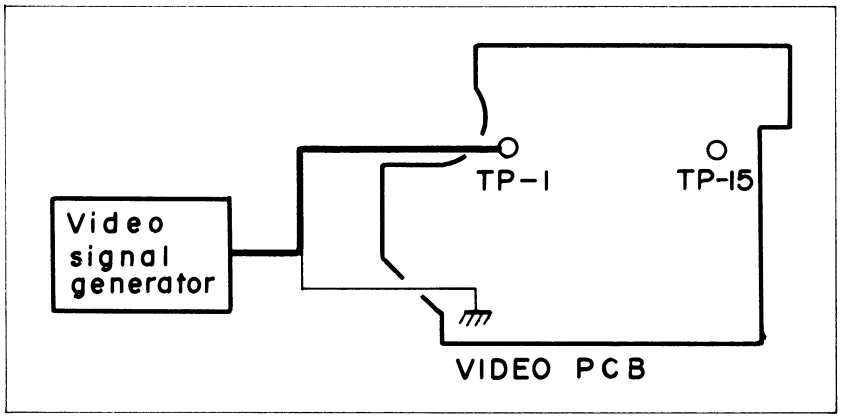


Fig. 5-69. 767kHz Conv. Out check

2. Set the VTR to the recording mode and verify that there is no waveform distortion at 0.27 volt p-p ± 0.03 as shown in Fig. 5-70.

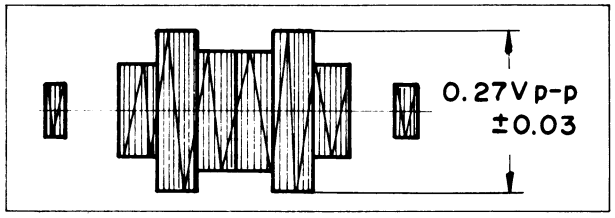


Fig. 5-70. Conv. out waveform

5-8-12 FM Rec level adjustment

1. Refer to Fig. 5-71.
   Connect the oscilloscope to TP-5 (Rec Amp Out) on the Video printed circuit board and apply the 1-volt p-p color bars from the video signal generator to TP-1 (Video in).
2. Set the VTR at the recording mode and adjust R24 (Y Rec Level) until the output becomes 4.0 volts p-p, as shown in Fig. 5-72.

5-8-13 Color Rec Level and Rec Balance adjustment

1. Refer to Fig. 5-73.
   Connect the oscilloscope to TP-10 (ACC Input) on the Video printed circuit board and apply the color bars signal from the video signal generator to TP-1 (Video in).

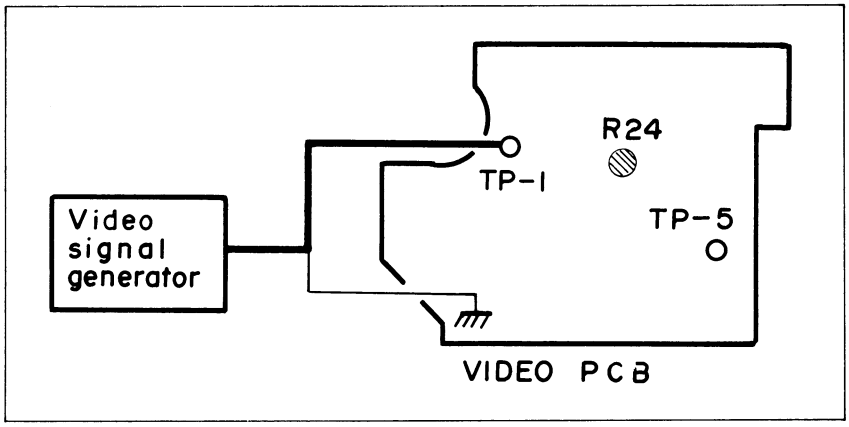


Fig. 5-71. FM Rec Level adjustment

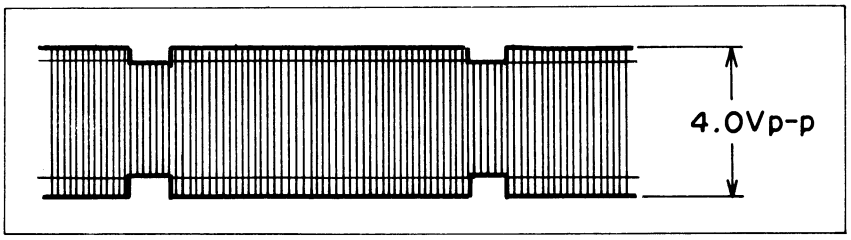


Fig. 5-72. FM Rec waveform

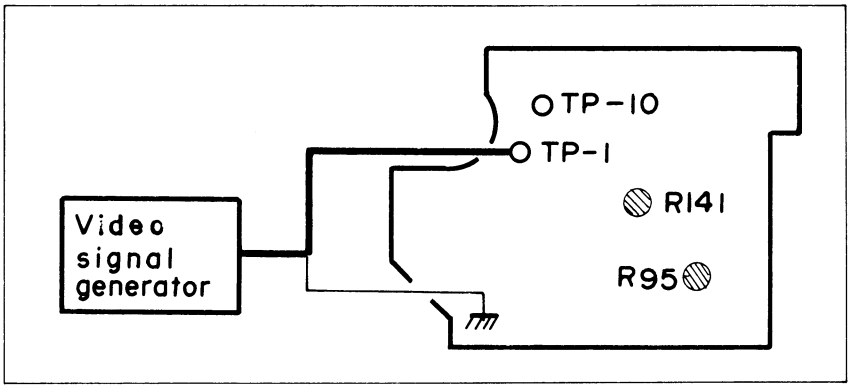


Fig. 5-73. Color Bar Out adjustment

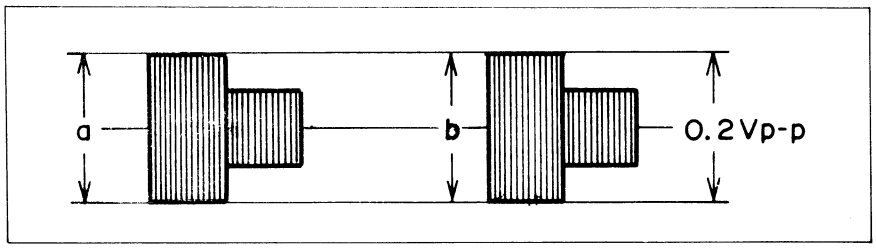


Fig. 5-74. P.B. ACC in waveform

2. Record and then play back with same VTR.
3. Play back the VTR. Check the level differences between "a" and "b" for the waveforms shown in Fig. 5-74.
   While in the recording mode, adjust R95 (Color Rec Balance) if necessary so that the level difference during playback between "a" and "b" will be minimized. Verify at the playback condition.
4. Repeat steps 2 and 3 to achieve minimal level difference.
5. Adjust R141 (Color Rec Level) so that the level of "a" and "b" is 0.2 volt in the recording condition and verify also in the playback condition.
6. Repeat the steps 3 and 4 mentioned above.

5-9 OTHER CHECKS

Instrument: Oscilloscope
Alignment tape: JVC MK-1

5-9-1 SSG output check

1. Select the TV/CAMERA selector switch of the VTR to the CAMERA position and set the VTR to the recording mode. Verify that the waveforms as shown in Fig. 5-75 and 5-76 are observed at TP-14 (HD) and TP-15 (VD), respectively.

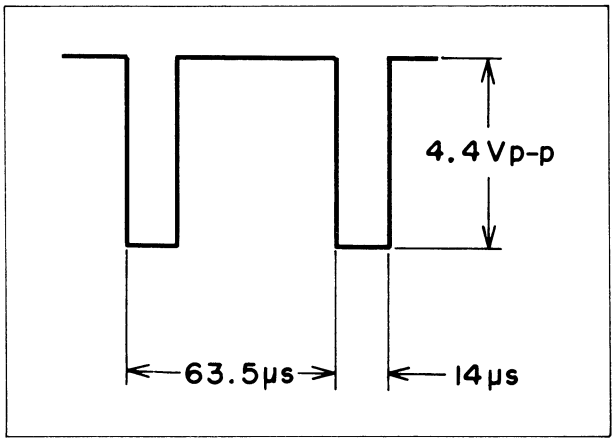


Fig. 5-75. HD waveform

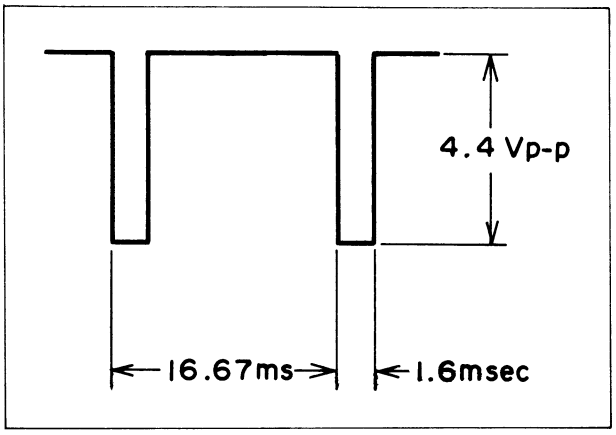


Fig. 5-76. VD waveform

5-9-2 V. STAB Pulse Level adjustment

1. Refer to Fig. 5-77.
   Connect the oscilloscope to TP-9 (Video Out) on the Video printed circuit board and play back the alignment tape color bars in slow motion.

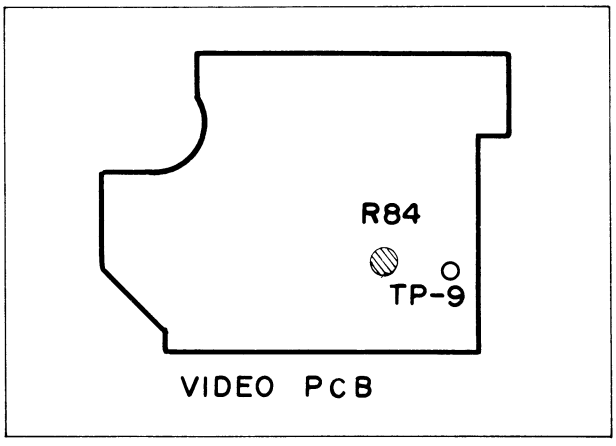


Fig. 5-77. V. Quasi Pulse adjustment

2. Adjust R84 Vertical Stabilizing (V. Stab) Pulse Level so that the pulse becomes the same level as the sync, as shown in Fig. 5-78.
3. Set VTR to the still mode. If there is any vertical jitter observed on the monitor, adjust the Disc Pulse Head as described in 5-4-4(2).

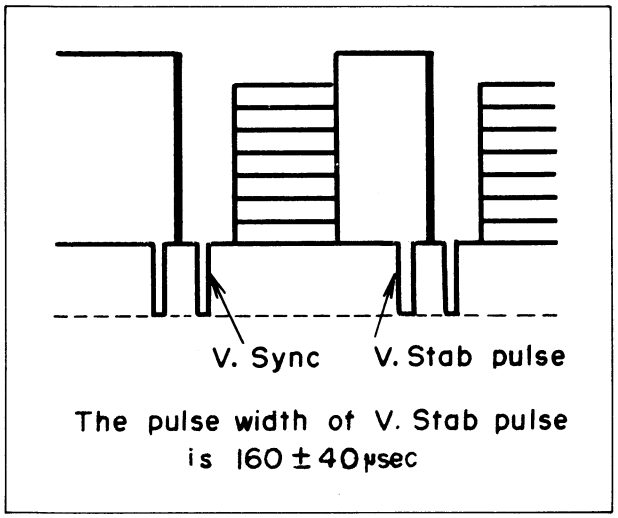


Fig. 5-78. Slow motion mode output waveform

5-10 AUDIO AMPLIFIER CIRCUIT ADJUSTMENT

Instruments: Audio generator
Oscilloscope
Alignment tape: JVC MK-1

5-10-1 Checking of E-E level

1. Refer to Fig. 5-79.
   Connect the oscilloscope to TP-16 (Line Out) on the Audio and Servo printed circuit board and apply an audio generator output of 1kHz, 0.22 volt p-p, to J6-7, Audio Line input.
2. Verify that the output is 2.2 volts p-p (with output open) in the recording mode.
3. Similarly, verify that the output is 2.2 volts, +1.26V, −0.63V, with 0.45m volts p-p applied to J6–9 (MIC in).

5-10-2 Bias level adjustment

1. Refer to Fig. 5-80.
   Connect the oscilloscope to TP-17 (Bias) on the Audio and Servo printed circuit board and set at the Full Rec mode.
2. Adjust at that time R147 (Bias Level) so that 70 volts p-p can be obtained.
3. Further verify that the frequency is 70kHz ±10%.
4. Next, verify the level with the Audio Dubbing mode. If the frequency differs greatly, then adjust L13 (Dummy Coil).

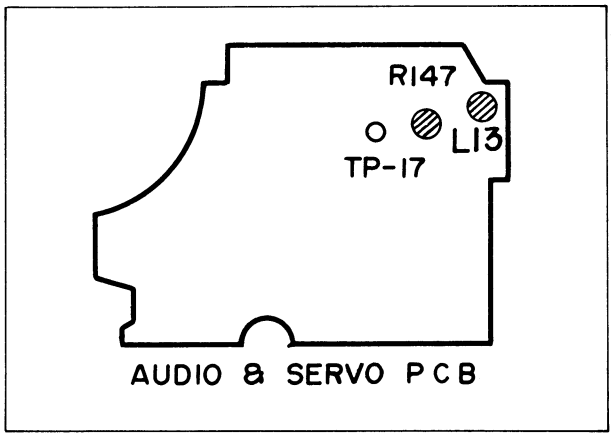


Fig. 5-80. Bias level adjustment

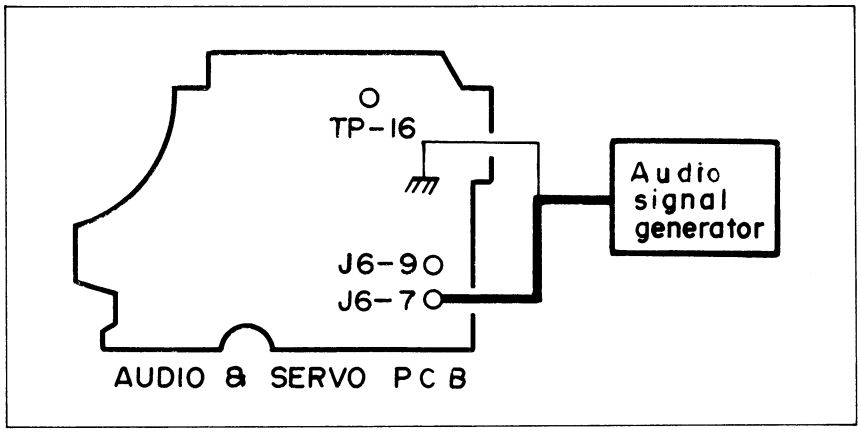


Fig. 5-79. E-E level checking

5-10-3 Playback level adjustment

1. Refer to Fig. 5-81.
   Connect the oscilloscope to TP-16 (Line Out) on the Audio and Servo printed circuit board and play back the alignment tape on which an audio reference level is recorded.
2. Adjust R131 (Audio P.B. Level) so that the output is 2.2 volts p-p ±0.12 volts.

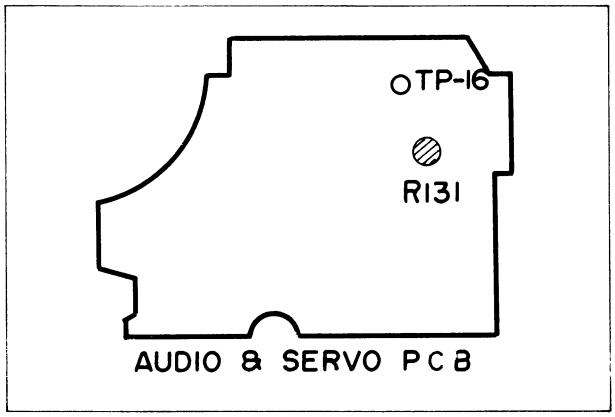


Fig. 5-81. Playback level adjustment

SECTION 6
ADJUSTMENT OF MECHANISM

6-1 PRECAUTIONS

When repairing the VTR, the following precautions should be observed:

1. Always turn the power "OFF" before removing or soldering components.

2. When removing a screw from the chassis, be careful not to drop it into the mechanism. If a screw should be droped, be sure to retrieve it.

3. When a repair is necessary at the bottom of chassis, after removing power, set the chassis on the rear side (battery-pack compartment side).

4. Be extremely careful not to damage either the upper or lower head drum assemblies.

5. When lifting a printed circuit board from the chassis, be careful not to disturb the other boards or the chassis. Do not set the VTR on its side while a printed circuit board is being removed.

6. To check the mechanism without a reel of tape, lock the tape sensor by using your finger or a small piece of tissue paper between the sensor wire and the chassis.

7. The tape transport mechanism has been precisely adjusted at the factory, and ordinarily need not be re-adjusted.

8. When removing a part, be very careful not to damage or displace other parts. (Be especially careful with the guide poles and rotary video head drum).

6-2 PERIODIC MAINTENANCE

6-2-1 Cleaning

Foreign matter adhering to any element in the tape path may generate backtension or tracking problems. Periodically, all elements should be cleaned with a soft lint free cloth and alcohol. The elements involved include the upper and lower head drum assemblies, all guide posts, capstan and pinch roller, audio and erase heads and the video heads.

CAUTION: When cleaning the video heads, do NOT clean them with a vertical stroke: Use only a gentle back and forth motion, in the direction of the tape path.

6-2-2 Lubrication

The following points should be lubricated with JVC oil supplied (Part. No. PU41761) every 500 hours. Refer to Fig. 6-1.

① Idler
② Pulley
③ Tension arm support
④ Guide roller
⑤ Main cam – this item should be greased when replaced; or at any other time deemed necessary.

CAUTION: Do NOT overlubricate. Two or three drops of oil in each location is sufficient.

6-3 REPLACEMENT AND ADJUSTMENT

Refer to Fig. 6-2 for the items below:

A) CAUTION– Do NOT remove these screws:
- o Two green screws ① atacching the upper drum to the bracket.
- o Nine green screws securing the tape guide.

B) Use extreme caution when moving the following screws:

Description

② Screws securing the pole base assembly
③ Screws and set screws securing the guide pole
④ Spring bracket for adjusting back tension
⑤ Screws securing the audio/control head assembly
⑥ Screws securing the pick-up heads
⑦ Screws securing the rotary transformer
⑧ Screws for adjusting tilt of the pinch roller.

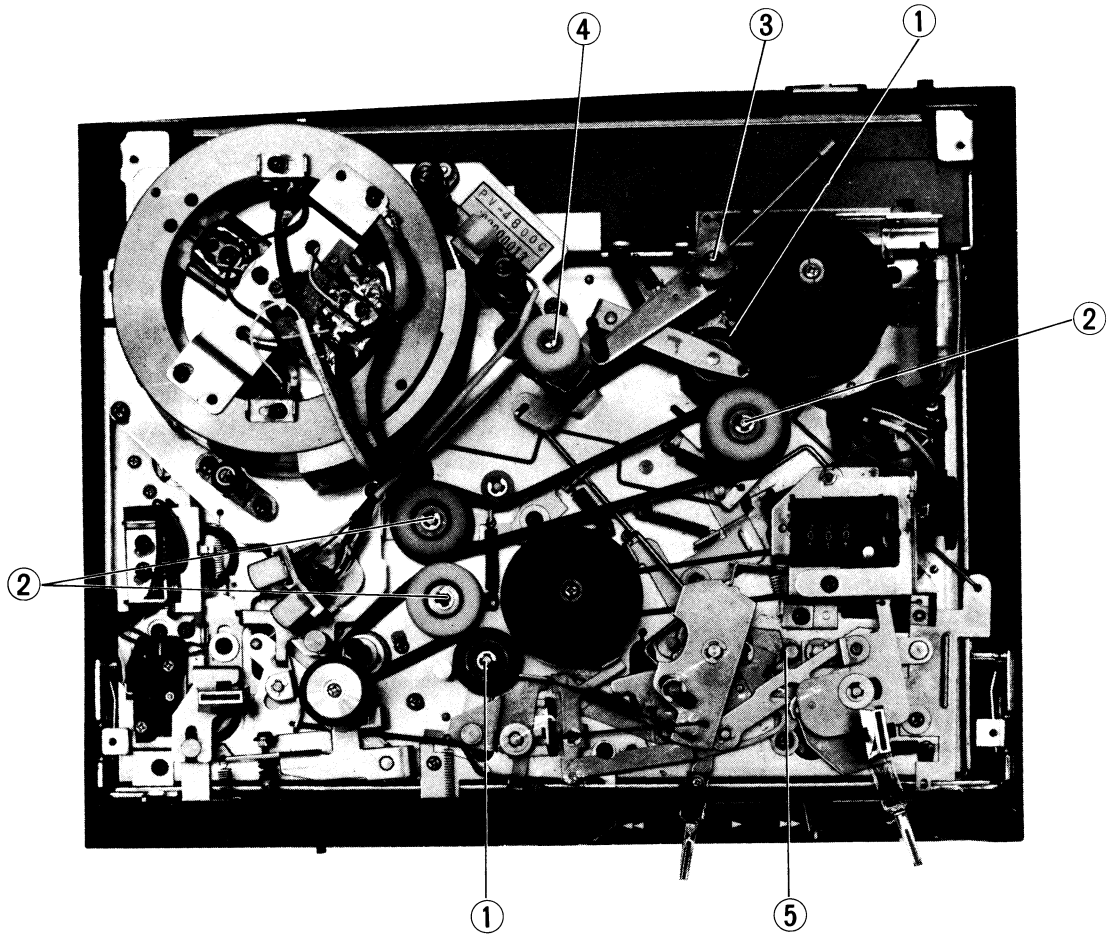


Fig. 6-1. Lubrication

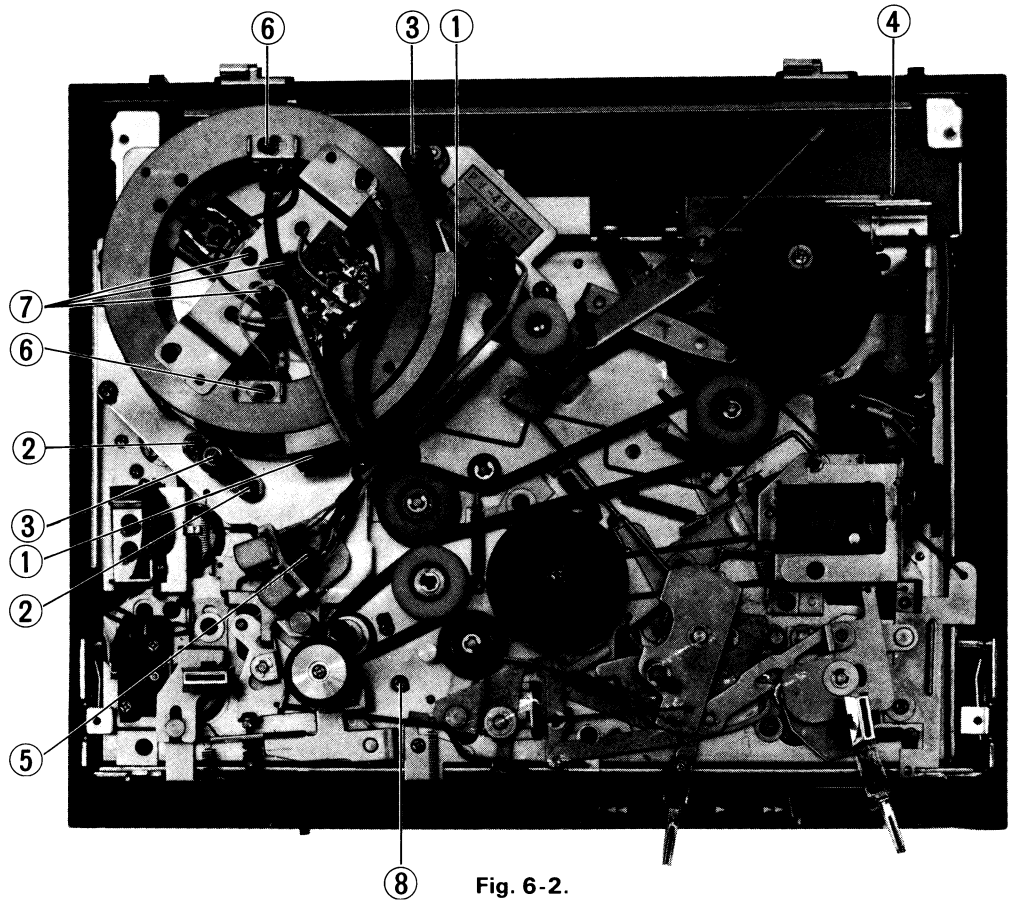


Fig. 6-2.

6-3-1 Replacement of the video heads

If the heads are worn or damaged, replace by following the procedure given below. Refer to Fig. 6-3 below.

CAUTION:

Observe the following precautions when replacing the video heads

- o Be extremely careful not to damage the upper or lower head drum assemblies
- o Do NOT allow any object to touch the video heads
- o Do NOT adjust any of the screws which secure the tape guides or guide pole.

1. Remove the top panel. (See "How to remove the chassis.")
2. Using a 4mm hex wrench loosen the two blue hex screws ③ attached to the bottom of the head drum support bracket. Support the front of the head drum by hand and remove the screws. (CAUTION: Do NOT remove the two green hex screws located in the top of the bracket.)
   Carefully lift the upper drum assembly ① and drum bracket ② and lay the assembly on the chassis.
3. Refer to Fig. 6-4. Remove the screw ⑤ which secures the rotary transformer ④ to the video heads and unsolder the four wires between the transformer and the heads.
4. Remove the two screws ⑥ which secure the head bar and lift it off the lower drum.
5. Clean the bottom surface of the replacement head assembly and the mounting surface of the fly-wheel ⑧ . Connect them with the two screws which were removed from the old head assembly.
6. Solder the lead from the inner ring of the rotary transformer to the video head (CH-1) nearest the permanent magnet ⑨ . Solder the lead from the outside ring to the other head (CH-2).
   The red and brown wires should be attached to the left side of their respective video heads. (Looking at the head from the front.)
7. Carefully replace the upper drum and drum bracket. Support the front of the upper drum to avoid damaging the new video heads. Replace the 4mm hex screws tightening them alternately to insure symmetry between the upper and lower drum assemblies.

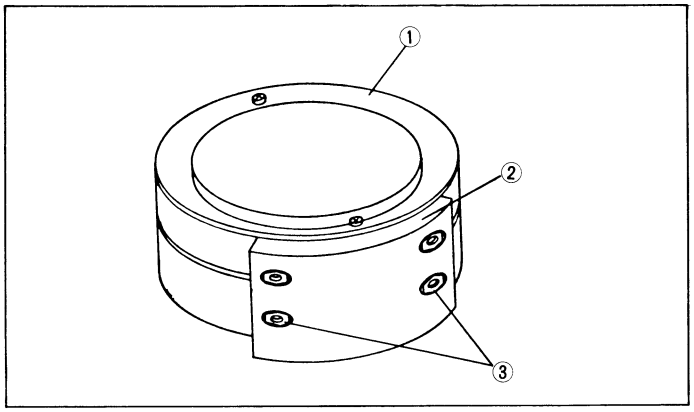


Fig. 6-3.

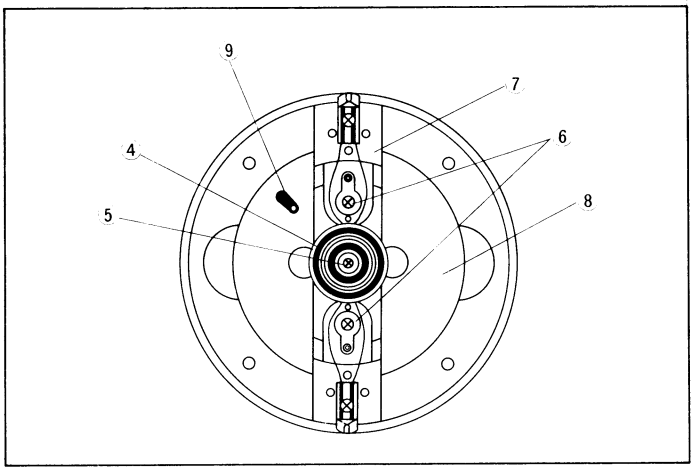


Fig. 6-4.

6-3-2 Video head performance check

Video head characteristics may differ slightly from head to head. The checks and adjustments to compensate for any differences you may encounter after replacing the heads will be found in the following subsections:

5-5-1 Adjustment of video head Q and resonance
5-5-2 P.B. color balance adjustment
5-5-3 Checking of FM output level
5-6-1 Playback color input level adjustment
5-8-12 FM Rec level adjustment
5-8-13 Color Rec Level and Rec Balance adjustment

6-3-3 Replacement of the Audio/Control head

If the Audio/Control head is worn or damaged, replace by following the procedure given below. The head has the audio portion at the top, and control portion at the bottom. See Fig. 6-5.

1. Unsolder the two shielded wires at the rear of the head.
   audio : thick insulating sleeve (left . . . red, right . . . white)
   control : thin insulating sleeve (left . . . white, right . . . black)
2. Remove the two small screws ⓐ at the rear of the head and remove the head assembly.
3. Place the new head assembly on the head holder.
   Note: The Audio/Control head has been marked by felt marker at the bottom of the control portion.
4. Solder the wires to the each terminals of the head.
5. Play back the tape and check that the core of the head extends 0.2mm (0.008 in.) above and 0.4mm (0.016 in.) below the edges of the tape as shown in Fig. 6-5 below. If out of specification, the height can be adjusted by altering the head mounting position. After loosening the two screws at the rear of the head assembly, and positioning the head properly, then tighten the two screws.

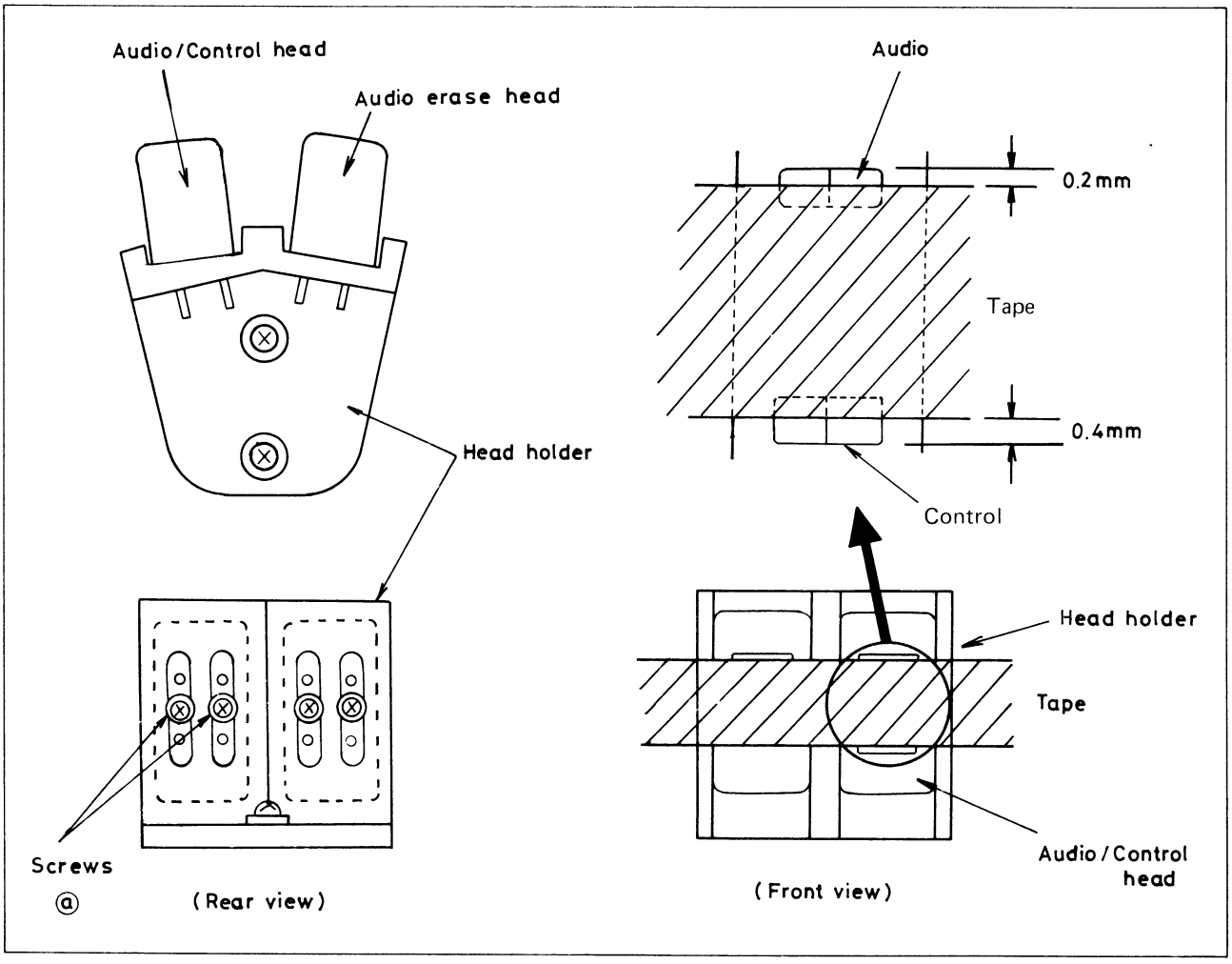


Fig. 6-5.

6. Confirm that the tracking control knob is in the "OFF" position.
7. Connect an oscilloscope probe to TP-18 on the Audio and Servo circuit board.
8. Loosen the two screws that hold the Audio/Control head holder.
9. Play back the JVC alignment tape and adjust for maximum level of FM on the oscilloscope by slightly moving the Audio/Control head right and left. After getting maximum level on the oscilloscope, tighten the Audio/Control head assembly.

6-3-4 DC motor replacement

1. Remove the chassis. Refer to Section 4 "DISASSEMBLY".
2. Remove the three screws on the front panel. Refer to Fig. 6-6.
3. Remove the flat belts from the motor pulley.
   NOTE: The belt for disk motor is wider.
4. Loosen the setscrew of the motor pulley by using the appropriate metric hex key and remove the pulley.
5. Unsolder the DC motor wires on the solenoid control circuit board;
   Capstan motor . . . Nos. 16 and 24 on circuit board.
   Disk motor . . . . . Nos. 13 and 23 on circuit board.
6. Remove the two screws ⓒ that locks motor bracket. Refer to Fig. 6-7.
7. Remove the three screws ⓓ on the motor bracket and replace the DC motor.

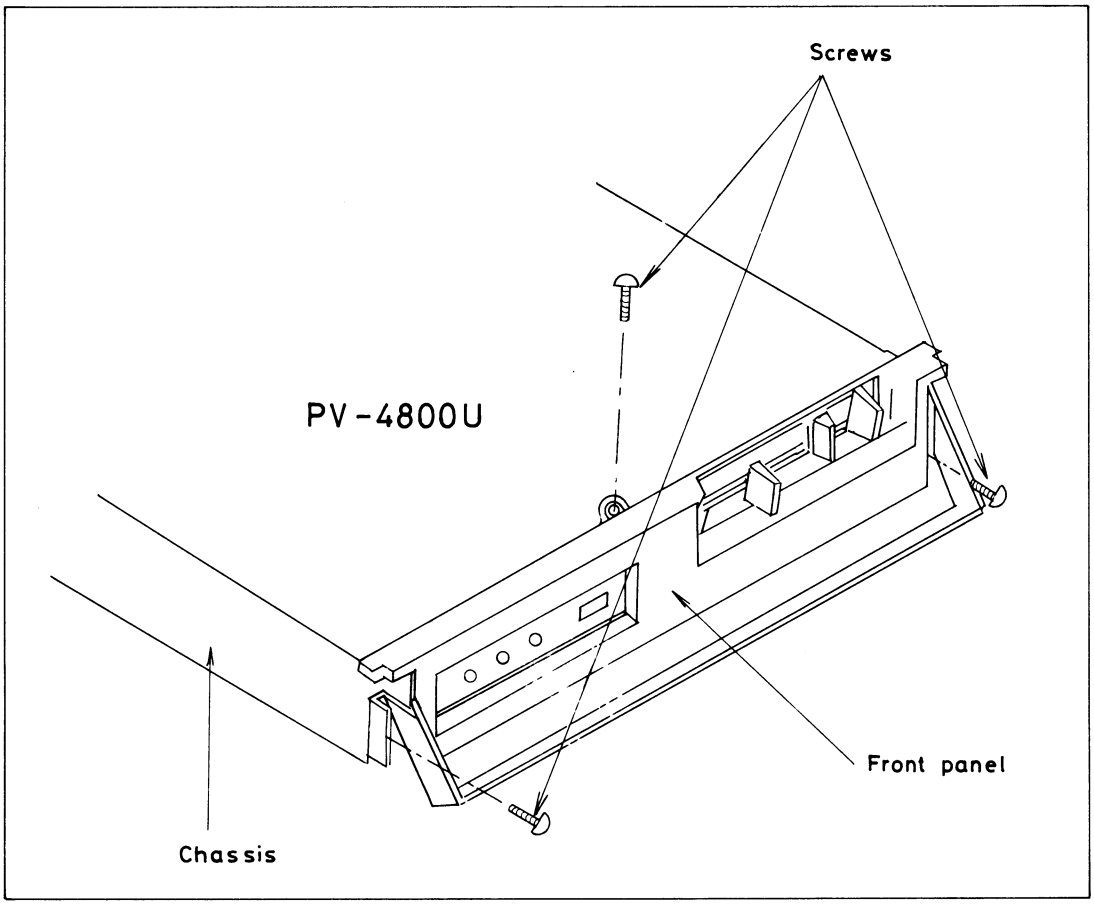


Fig. 6-6.

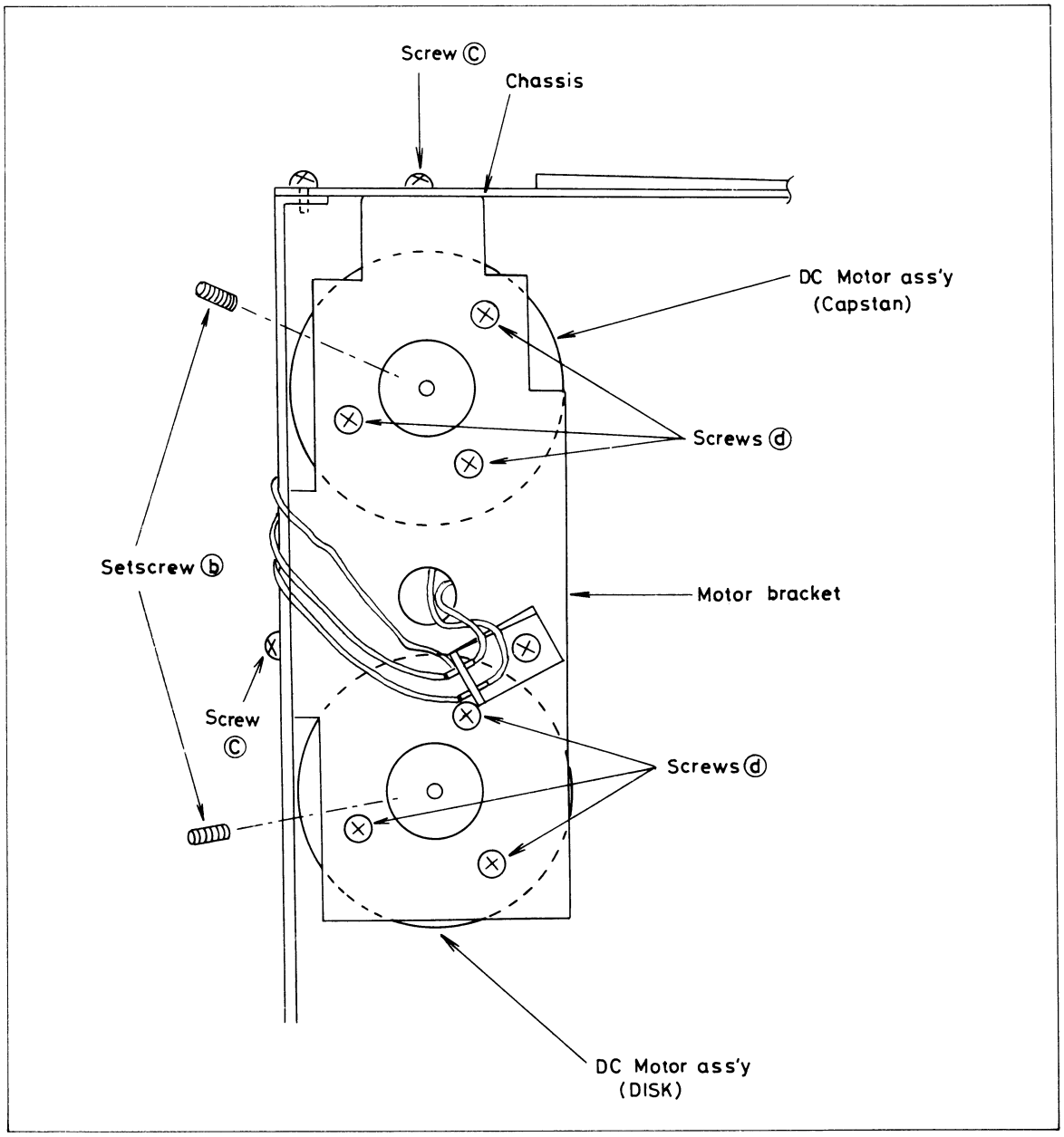

Screw ©
Chassis
DC Motor ass'y
(Capstan)
Screws ⓓ
Setscrew ⓑ
Motor bracket
Screw
©
Screws ⓓ
DC Motor ass'y
(DISK)

Fig. 6-7.

6-3-5 Functional check and adjustment of operation microswitch

When the VTR fails to operate or continues operating without stopping on putting it to operation, it is necessary to adjust the actuation of the operation microswitch, with reference to Fig. 6-8 as described below.

1. Set the VTR to STOP mode.
2. Bend the leaf spring actuator of the brake lever with pliers so as to eliminate the gap between the pushbutton of the microswitch and the leaf spring, itself. At this time, the pushbutton of microswitch should not be in the depressed condition.
3. The leaf spring and the microswitch should be kept as nearly parallel as possible.
4. Check the operation of VTR.
5. If checking reveals any anomaly, the switch itself is defective and should be replaced.

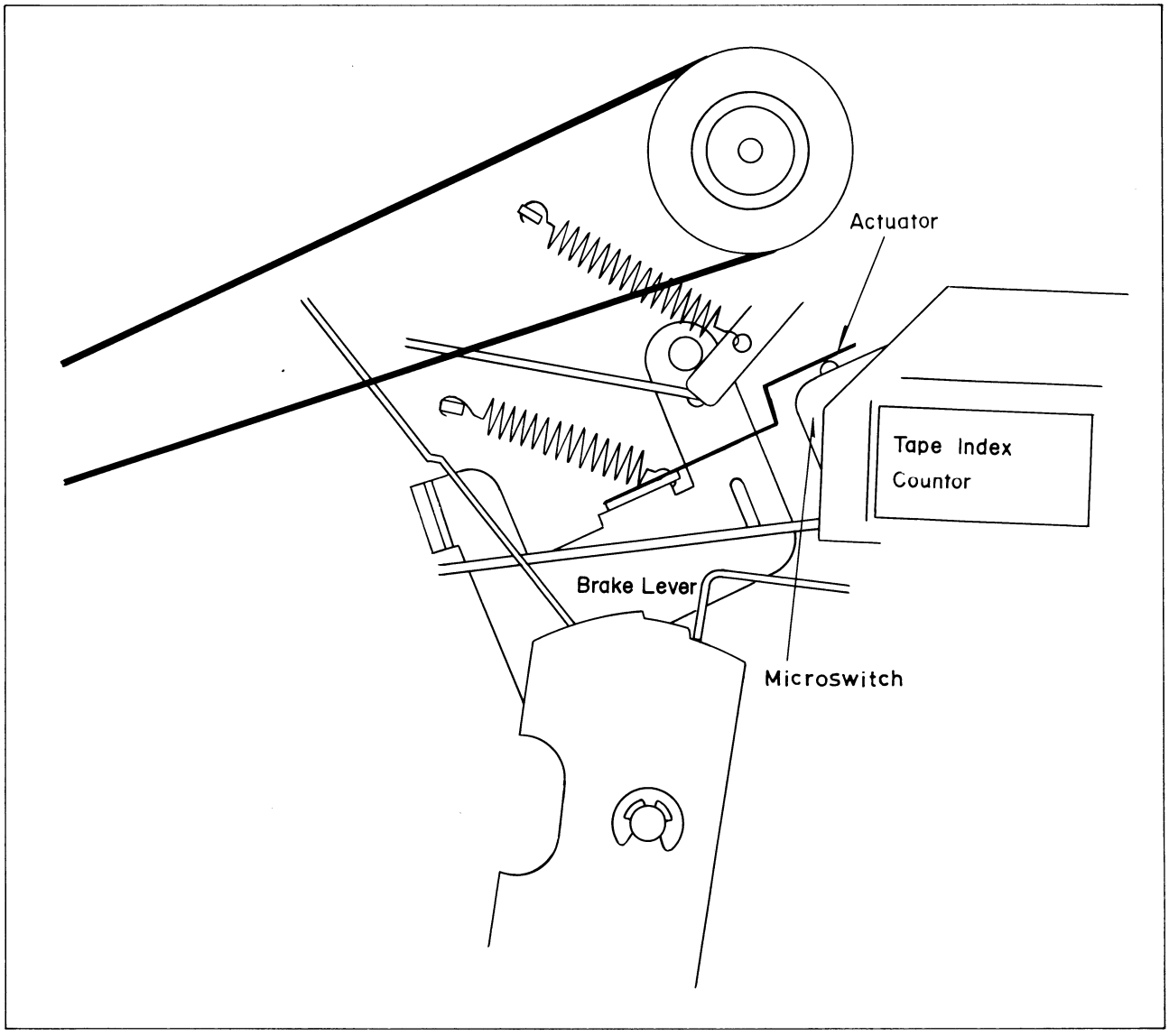


Fig. 6-8.

6-3-6 Check and adjustment of the tape tractive force

This check is required when replacing the pinch roller or when the tape speed is too slow. Refer to Fig. 6-9 and 6-10.

1. Clean the pinch roller and the capstan shaft with isopropyl alcohol, which contains no additives.
2. Placing a reel of tape on the take-up apindle, attach a spring gauge as illustrated in Fig. 6-9. The tape should be put into contact with the Audio/Control head and the groove of the guide pole.

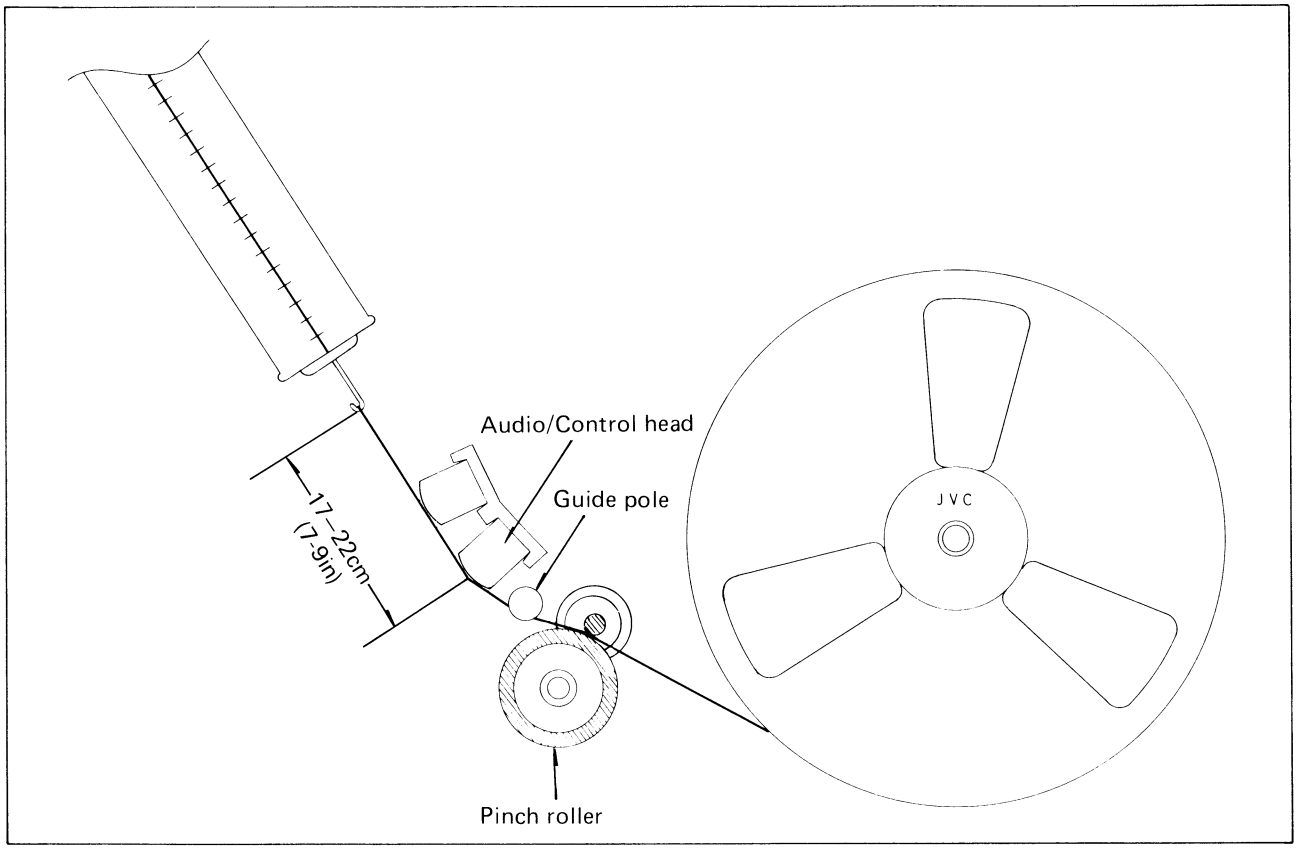


Fig. 6-9.

3. Setting the VTR to PLAY mode, read the indication of the spring gauge. The reading should fall in the range of 700—1400g (24.7—49.4 oz).
4. Then, set the VTR to STOP mode. The gap between the pinch roller and the capstan shaft should be 0.5mm (0.02 in.) or more. Refer to Fig. 6-10.
5. If not, change the position of the adjusting nut. Reglue if readjusting is necessary.
6. If the tape speed is still too fast or too slow under the specified tape tractive force readjusted as specified in Section 5-4-1.
7. If the tape becomes wrinkled when running the VTR in PLAY or REC mode, check for tilt between the pinch roller and the capstan shaft as described in steps 8 through 10 below.
8. Setting VTR to STOP mode, press the pinch roller arm slowly by hand so as to bring the pinch roller in contact with the capstan shaft.
9. In this case, the pinch roller should be parallel to the capstan shaft, without gaps at either the top or the bottom.
10. If tilting is present, turn the adjusting screw in the appropriate direction and reglue. See Fig. 6-10.
    NOTE: The above adjusting is normally not required. If necessary, proceed with utmost care as this adjustment is very delicate.
11. Check with the VTR set to the PLAY mode.

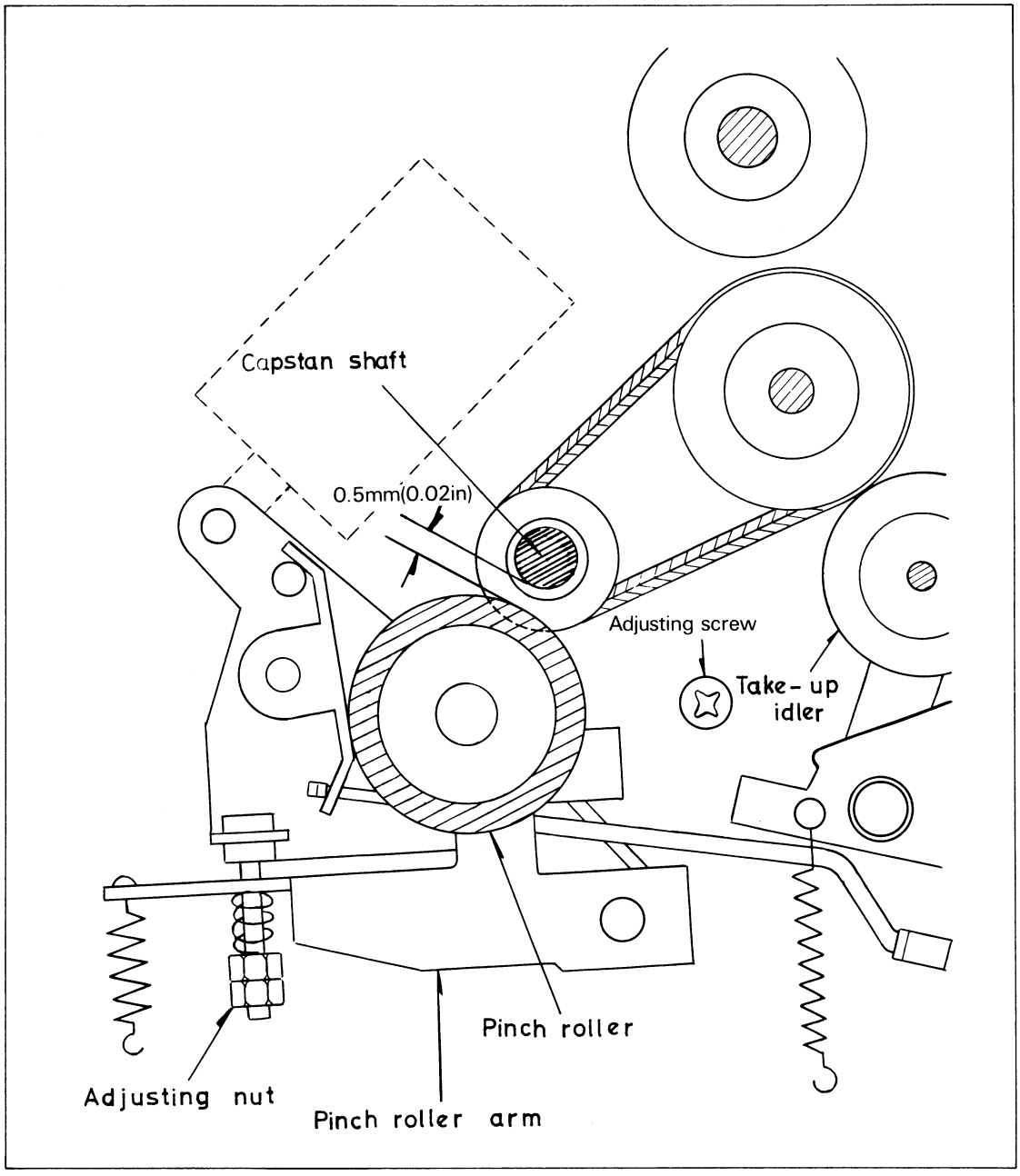


Fig. 6-10.

6-3-7 Replacement of PLAY/FF Idler

If the take-up fails to function properly, check the pulley and the idler for slippage. If slipping exists, clean the parts concerned thoroughly. If the idler is worn to the diameter less than 22.5mm (0.886 in.) replace with a new one. The idler can be readily removed by removing the "E-ring" retaining clip.

6-3-8 Functional check of solenoid switch

1. Refer to Fig. 6-11. Make sure that the spring fully actuates the microswitch when setting the VTR to PLAY mode.
2. While keeping at PLAY mode, press the spring slowly in the direction of arrow (A) by use of a screwdriver blade until the switch is turned off. Ascertain both visually and aurally that the spring returns to turn on the switch when removing the screwdriver.
3. If any anomaly is recognized in steps 1 and 2, set the VTR to STOP mode, and proceed with steps 4 through 6, below.
4. Loosening the two screws holding the switch, displace the latter as far as possible in the direction of arrow (B) and fasten.
5. Repeat the checks described in steps 1 and 2 above.
6. If the anomaly still persists, bend the spring by use of pliers so as to minimize the gap between the spring and the pinch roller arm in STOP mode. But the spring should not be bend so far as to bring it into contact with the pinch roller arm.
7. Repeat the checks described in steps 1 and 2 again.

6-3-9 Backtension check

If the playback picture pulls at the top or the tape does not track correctly, backtension may be incorrectly set. To correct backtension:

1. Load a 5" reel with approximately 10 to 20 turns of tape and place it on the supply reel disk.
2. Thread the tape as shown in Fig. 6-12 connecting the free end of the tape to a dial tension gauge. Ideally, the gauge will have a full scale reading of 100 to 150 grams. (3-6oz)
3. Remove power from the VTR and set the function lever to PLAY. Pull the tape with the tension gauge at a speed approximating 7½ ips. Normal backtension should read 55 ± 5 grams. (1.95±0.20oz)

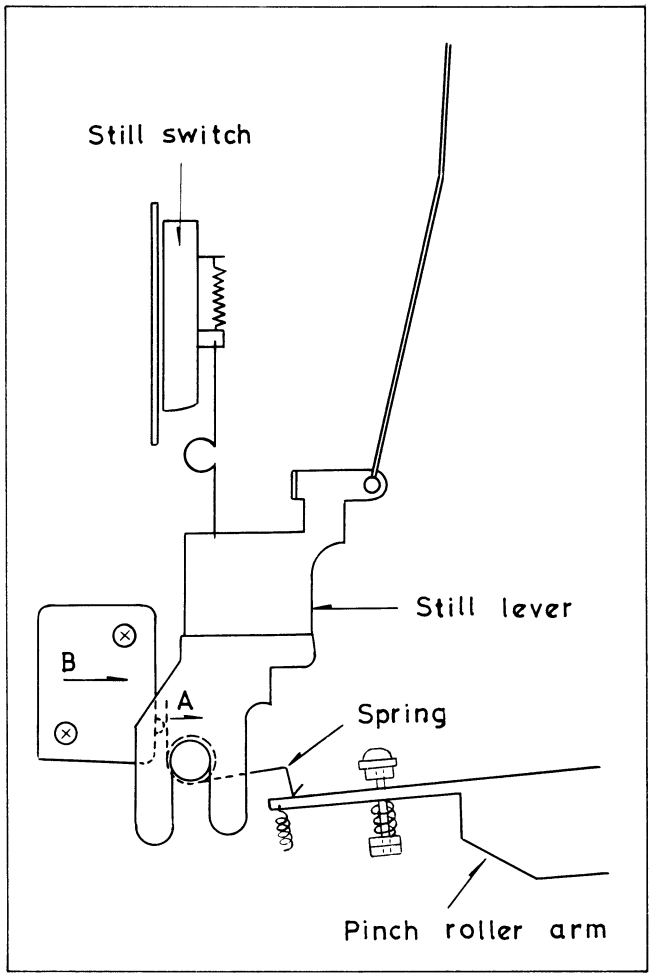


Fig. 6-11.

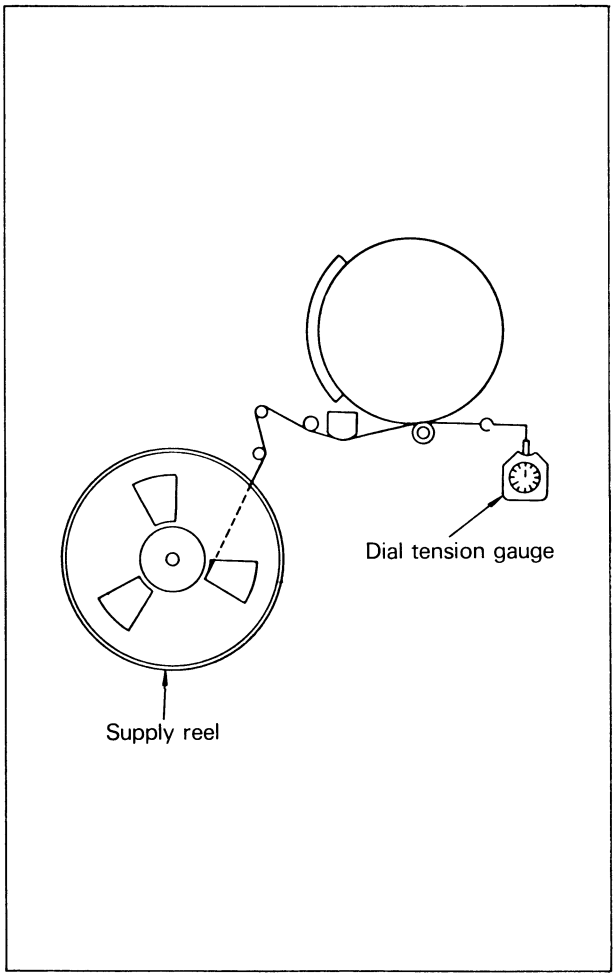


Fig. 6-12.

4. If backtension is incorrect, it can be adjusted by moving the bracket to which the spring is attached. The bracket should be moved in direction A to decrease back tension and in direction B to increase it. See Fig. 6-13.
   This is a very sensitive adjustment so be very careful.

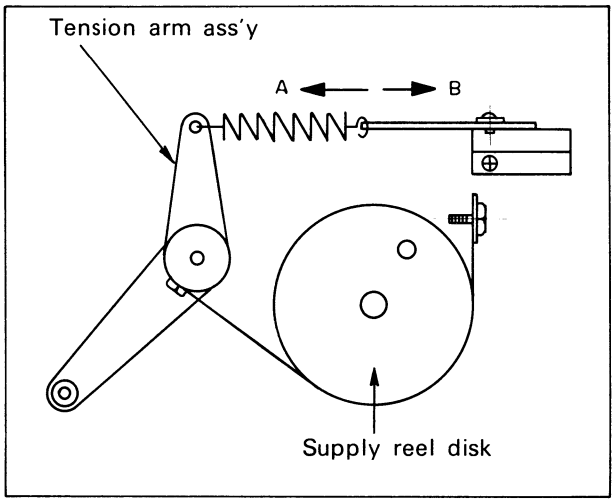


Fig. 6-13.

6-3-10 Replacement of tension band

1. Refer to Fig. 6-14. Loosen screw A to make the spring hook free to move.
2. Loosening screws B and C, remove the tension band assembly and attach a replacement.
3. Fix screw A temporarily so that the spring hook is positioned as illustrated.
4. Fasten the tension band assembly while adjusting screw C so that the tangent to the guide roller and the backtension pole is parallel to the chassis edge when the VTR is set to PLAY mode, as shown in Fig. 6-14.
5. In this case, the gap between the tension arm assembly and the rod should be more than 0.5mm (0.02 in.).
6. By repeatedly switching to STOP and PLAY a few times, carry out the checks described in steps 4 and 5, above.
7. After affixing the tension band assembly, measure the backtension to determine the final position of spring hook. See "Backtension check", subsection 6-3-9.

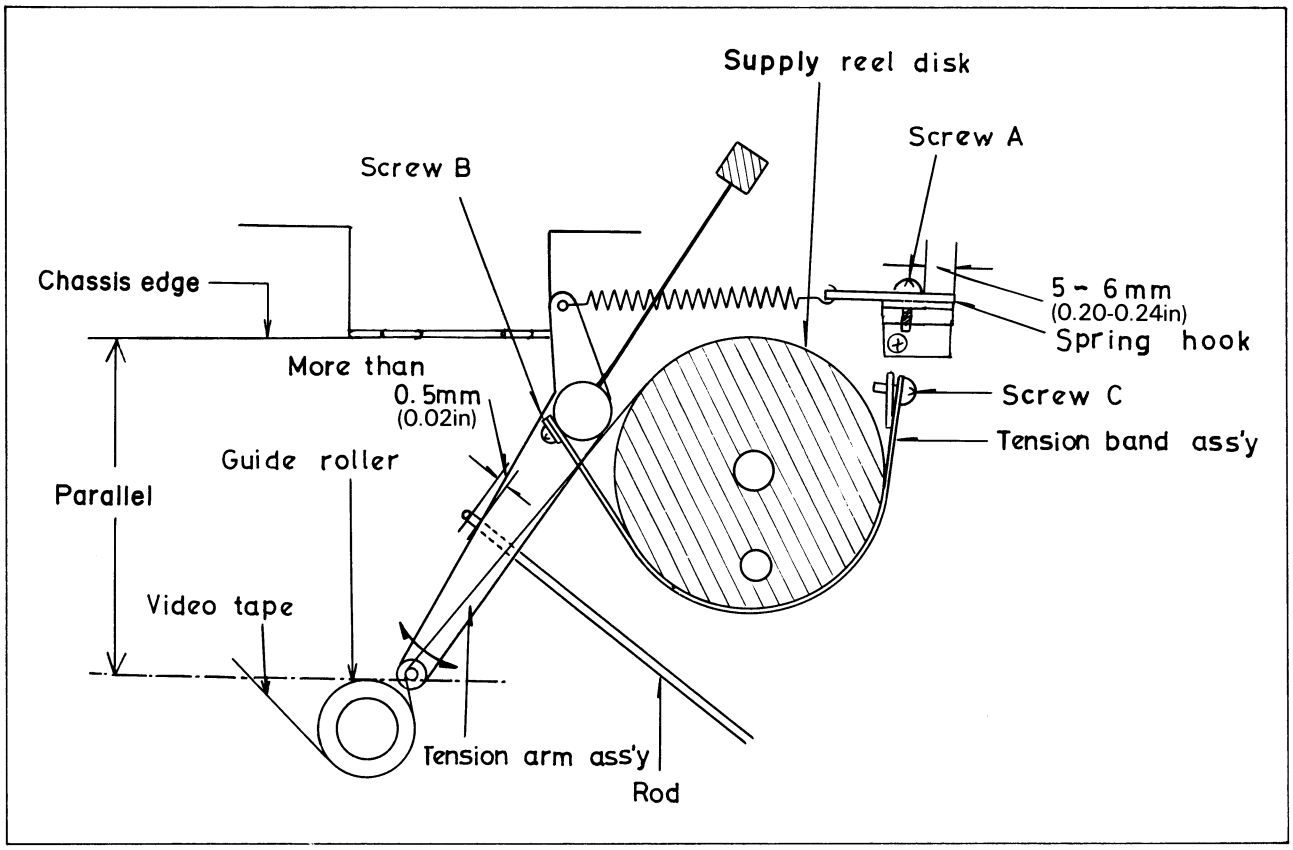
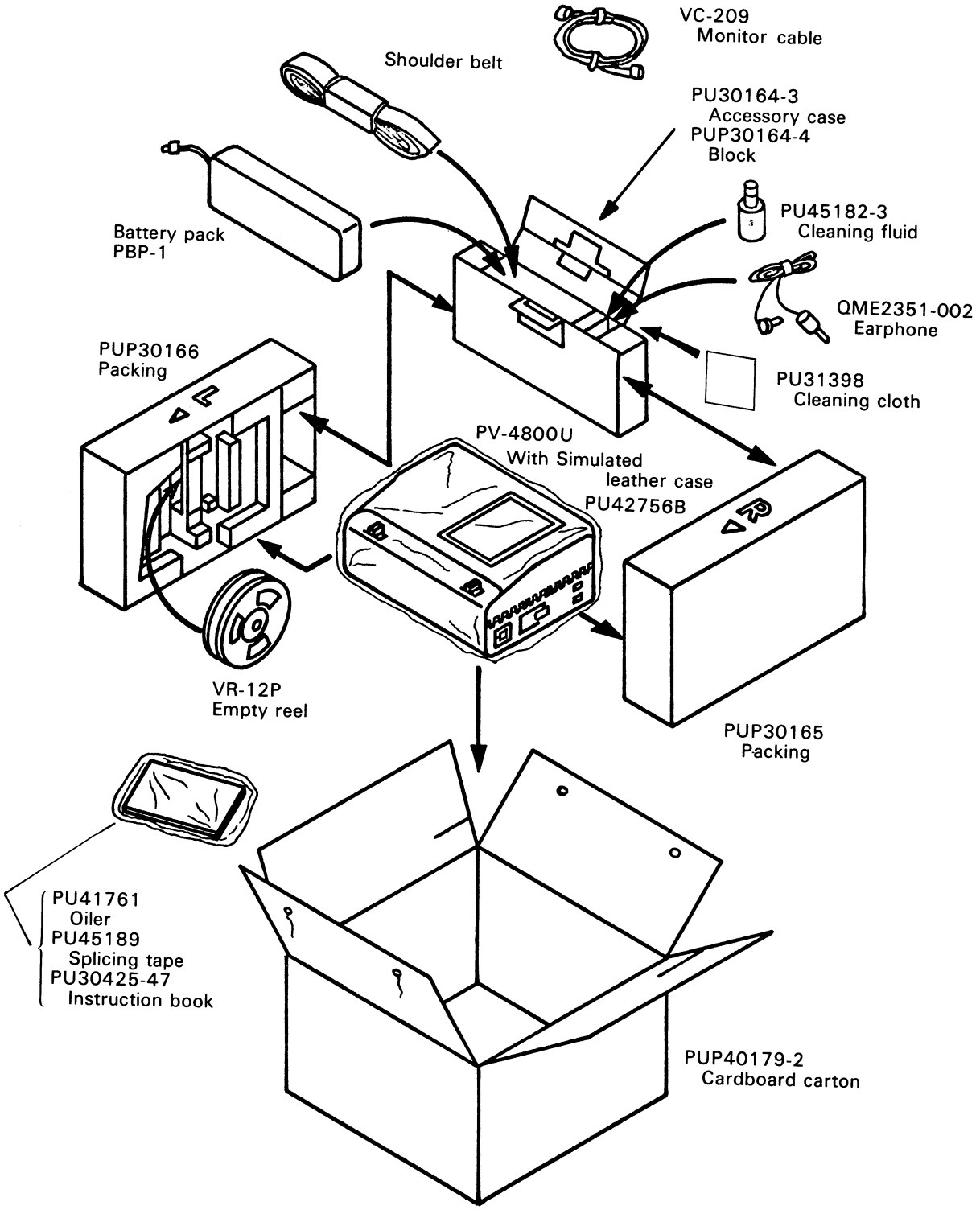


Fig. 6-14.

SECTION 7
REPACKING



SECTION 8
TROUBLE-SHOOTING GUIDE

- 1. No power
  - Battery (PBP-1) is discharged — Charge the battery.
  - Lead wire of battery (PBP-1) is open — Replace the battery.
  - AC Power Adaptor (AA-P40) is faulty. — See AC Power Adaptor Service Manual.
  - Safety switch (S2) is on.
  - DC power line is open.
  - Fuse (upper part of chassis) is open.
  - Operation switch (S1) has malfunctioned.
- 2. No picture appears in record mode
  - No picture on the viewfinder of Camera (GC-4800U)
    - Input select switch of VTR is not set to "CAMERA".
    - +12V DC wiring is open.
    - +9V DC supply of Camera is broken.
    - SSG circuit of VTR is faulty. — See schematic diagram and waveform.
    - Camera is defective. — See Camera Service Manual.
  - No picture on monitor TV
    - Input select switch of VTR is not set to "TV".
    - +9V DC supply of VTR is broken.
    - Video amp. circuit is faulty.
      - No video signal at TP-1. — Open circuit in input signal wiring.
      - No video signal at TP-2.
        - No +9V DC at J2-10.
        - IC1 is defective.
      - No video signal at TP-7 in B/W mode — X8, LPF1 or IC3 is defective.
      - No video output signal at TP-9 in color mode — X10–X17 or IC4 is defective.
      - Open circuit in output signal wiring
    - Monitor TV is faulty. — See Monitor TV Service Manual.
  - No picture on regular TV when using RF converter (KR-200U)
    - Poor contact of RF adaptor in adaptor housing of VTR.
    - RF cable is open between TV and RF output of VTR.
    - Improper connection of RF cable at TV
    - TV channel is incorrect.
    - TV is faulty. — See TV Service Manual.
- 3. No picture is recorded (Playback OK)
  - No picture appears on monitor TV or normal TV in record mode. — See Item 2.
  - No FM modulator output signal at TP-4 — X1, X2 in FM modulator Unit is defective — See schematic diagram and waveform.
  - No recording amp. output at TP-5.
    - No +12V DC for recording at J2-12.
    - X1 – X6 in recording amp. is defective. — See schematic diagram and waveform.
  - No FM signal (approx. 4Vp-p) at pick-up terminals of CH-1, CH-2 in drum. — Open circuit or poor contact between the terminal and TP-5 (Rec. Amp. out)
- 4. No color signal is recorded.
  - Mode select switch is not in "COLOR" or "DUB". — Set the switch to "COLOR".
  - No ACC input signal at TP-10.
    - +9V DC (Rec. Color) is open at J1-5.
    - X18, X19 is defective.
  - No ACC output signal at TP-11. — IC5 is defective.
  - ACC output signal is too high
    - No Gate Pulse at TP-12
      - No sync. signal at TP-10(Audio & Servo P.W.B.)
        - No Video signal at TP-9 (Audio & Servo P.W.B.)
        - IC7 is defective (Audio & Servo P.W.B.)
      - P2–6 is open or poor contact.
    - No Rec. Burst signal at TP-13 — X22 is defective.
    - D8 – D10, X20 (ACC circuit) is defective.
  - No 767KHz Color signal at TP-15. — IC6, LPF2, X25 is defective.
  - R141 (Color Rec. VR) is maladjusted or defective.
  - No signal at TP-16(4.35MHz OSC out)
    - +9V DC (Rec. Color) is open at J1-5.
    - Y1 (4.35MHz X'tal), X26 is defective.

NOTE: Color recording is available in either "COLOR" or "DUB" mode.

- 5. No picture appears in playback mode
  - No P.B. FM output signal at TP-18. (Audio & Servo P.W.B.)
    - Video head is dirty.
    - Video head is defective.
    - Video head does not rotate.
    - Wiring to rotary transformer is open.
    - Open wiring between drum and pre amp.
    - No +9V DC at S4–5 (Play Mode).
    - X1, X2, IC1 – IC3 (Pre Amp.) is defective.
  - No detector output signal at TP-6. (Video P.W.B.)
    - Wiring J2–15 is open.
    - IC2, DL1 is defective.
  - No output of IC3 at TP-7 — X7, IC3 is defective.
  - No Video output signal at TP-9 — IC3, IC4, X13 – X17 is defective.
  - Open wiring of signal output line
  - Monitor cable is faulty.
  - Monitor TV is abnormal.
- 6. No color signal in playback
  - Mode select switch is not in "COLOR" mode — Set to "COLOR" mode.
  - No ACC input signal at TP-10
    - +9V DC (Color P.B.) is open at J1–3.
    - X3 (Audio & Servo P.W.B.), X19 (Video P.W.B.) is defective.
    - Open wiring at P2–13.
  - No ACC output signal at TP-11. — IC5 is defective.
  - ACC output signal is too high.
    - No Gate Pulse at TP-12
      - No Sync. signal at TP-10 (Audio & Servo P.W.B.)
        - No Video In/Out signal at TP-9 (Audio & Servo P.W.B.)
        - IC7 is defective. (Audio & Servo P.W.B.)
      - P2–6 wiring is open or poor contact.
    - No P.B. ACC Burst signal at TP-21 — X30, X31 is defective.
    - No Detector Burst signal at TP-22 — X32 is defective.
    - APC Error signal is abnormal at TP-23 — Wiring J1–1, J1-2 is open.
    - No H. Discri. Frequency signal at TP-25. — IC9 is defective.
    - No H. Discri. Error Voltage (Approx. 5V DC) at TP-24. — X33, IC9 is defective.
  - No 3.58MHz signal at TP-19 — IC7, X28, X29 is defective.
  - No signal at Pin No.8 of IC8 — IC8 is faulty.
  - No 767KHz signal at TP-17 — X17 is faulty.
  - No 4.35MHz signal at TP-20 — IC7, X28, X29 is faulty.
- 7. Playback picture drifts or collapses.
  - V. or H. hold of monitor TV is maladjusted.
  - Tracking control is not in the correct position.
  - No control signal
    - Control head is dirty.
    - Wiring to control head is open.
    - Wiring P5-1, P5-2 is open.
    - No control signal is recorded on tape
      - Control head is dirty during record.
      - IC7 is defective.
    - Poor contact between tape and control head
      - Tape is abnormal.
      - Tape transport is abnormal
        - Back tension is maladjusted
        - Tape slips at pinch roller
          - Pressure of pinch roller is not sufficient.
          - Pinch roller is dirty.
          - Pinch roller worn out.
    - Servo system is faulty. — See schematic diagram and waveform.
- 8. Beat (stripes) appear on monitor TV
  - Presence of unusual noise signal
  - Leakage of erase signal (Rec. Mode)
  - Pre-recorded signal remains (P.B. Mode)
    - Wiring to full erase head is open.
    - Bias OSC. does not oscillate.
    - Full erase head is defective.
  - ACC circuit is faulty. — See Item 4, Item 6.

9. Video head does not turn.
   - No 5V DC at P17 (Audio & Servo P.W.B.)
     - Power supply line is open.
     - X1001 is defective.
     - IC6 is defective.
   - Belt has come off.
   - Wiring to disk motor is open.
   - Disk motor is faulty.

10. Video head bar turns, but picture drifts.
    - Switching point drifts
      - Rotation of motor is not stable.
      - Belt slips
      - No signal at TP-9 (Video In/Out) — See schematic diagram and waveform.
      - Servo system is faulty. — See schematic diagram and waveform.
    - See Item 7.

11. Capstan motor does not turn.
    - Wiring to motor is open.
    - Motor is faulty.
    - Belt has come off.
    - X1002 is defective.
    - Capstan servo system is faulty. — See block diagram, schematic diagram and waveform.
    - Slow motion VR is on. (Playback Mode)

12. No audio appears in record mode
    - When connected to Monitor TV.
      - No +12V at P2-9.
      - Monitor cable is open.
      - Input or output line of audio is open.
      - "TV-CAMERA" Select Switch is defective.
      - IC-14 is defective.
    - When connected to camera.
      - No +12V at P2-9.
      - Camera cable is open.
      - Input or output line of audio is open.
      - "TV-CAMERA" Select Switch is defective.
      - IC-14 is defective.
      - IC-12 is defective. (When using external microphone)

13. No audio is recorded (Playback OK)
    - No audio in record mode — See Item 12.
    - Audio appears in record mode
      - Audio head is dirty. (Record mode)
      - Wiring to audio head is open.
      - No bias signal on audio head — X32, X33 is defective.

14. No audio in playback mode
    - Audio head is dirty.
    - Poor contact between audio head and tape .
    - IC-13 is defective.
    - Wiring to audio head is open.

SECTION 9
EXPLODED VIEWS AND PARTS LIST

9-1 Chassis assembly
9-2 Drum assembly
9-3 Case
9-4 Cabinet assembly

In this exploded views the part numbers of the screws and washers designate the type and dimensions of those items. The following examples will help you to decipher them.

Examples:

SPSP3006ZS
- "ISO" metric screw thread
- Length in mm (6mm)
- Diameter in mm (3mm)
- Cross-recrossed, pan head screw

LPSP3014ZS
- Length: 14mm
- Diameter: 3mm
- Cross-recrossed, pan head screw with lock washer

DPSP4008ZS
- Diameter: 4 mm
- Cross-recrossed, pan head screw with lock washer and plain washer

SSSP3008ZS
- Cross-recrossed, flat countersunk head screw

SDBP3006NS
- Cross-recrossed, binding head screw

YRS3004FS
- Hexagon socket set screw with sunken tip

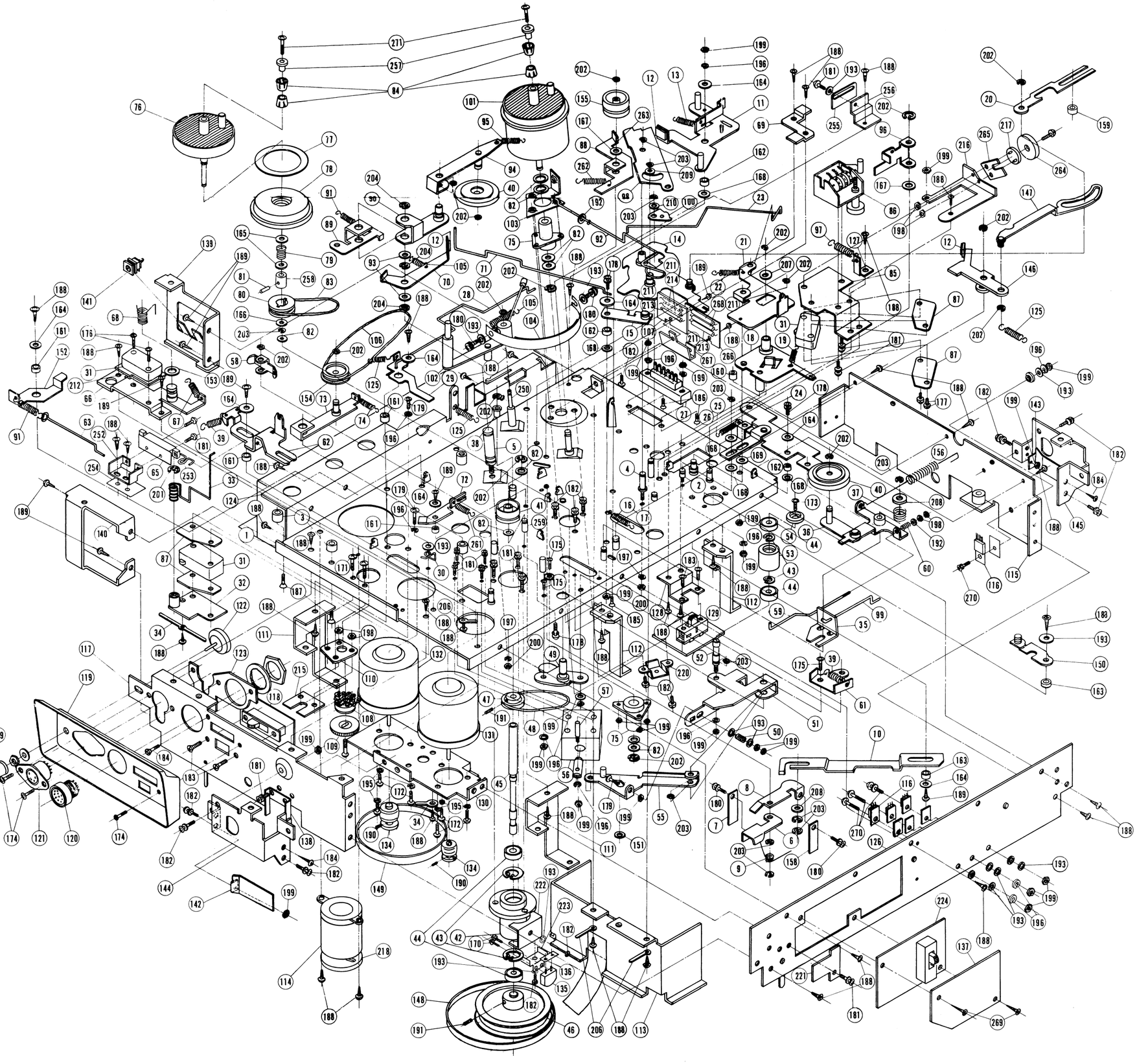
YFS3006FS
- Hexagon socket screw with flat tip

BYS3006FS
- Hexagon socket head bolt

WLS3000
- Diameter of the screw which applies (3mm screw)
- Lock washer

WNS3000Z
- Plain metal washer

REE4000
- Diameter of a slot be around the face of a stud which applies (usually the stud's diameter is 5mm and slot's is 4mm).
- Retaining ring ("E" type)



CHASSIS ASSEMBLY

Symbol No.	Part No.	Part Name	Description
1	PU10009A	Chassis ass'y	
2	PU40505	Stud	
3	PU40515	Stud	
4	PU40137	Stud	
5	PU40700	Guide roller shaft	
6	PU40140	Switch arm (1)	
7	PU40141-3	Switch spring	
8	PU40142-2	Switch arm (2)	
9	PU40613	Spring	
10	PU40145	Slide lever	
11	PU40152A	Brake lever ass'y	
12	PU40153	Brake pad	
13	T30300-27	Spring	
14	PU40158A	Main cam ass'y	
15	PU40160A	Cam lever ass'y	
16	PU35005-20	Spring	
17	GA40154-2	Sponge	
18	PU40166A	Record lever ass'y	
19	PU35005-10	Spring	
20	PU40168	Lever	
21	PU40170A	Sound—dub lever ass'y	
22	PU35005-11	Spring	
23	PU40172	Rod	
24	PU40176A	Play lever ass'y	
25	PU35005-19	Spring	
26	GA40154-3	Sponge	
27	PU45160	6 pin connector	
28	PU40179	Rod	
29	PU40722	Tape cut off lever	
30	PU41217	Limit bar	
31	T3428-001	Micro switch	
32	PU40183A	Micro switch bracket ass'y	
33	PU40184	Tape sensor	
34	PU45117	Wire clamp	
35	PU40713	Fast forward idler lifter	
36	PU40704A	Take up idler arm ass'y	
37	PU30080-3	Spring	
38	PU40736	Roller	
39	PU35005-22	Spring	
40	PU40681A	Play/F.F. idler ass'y	
41	PU40737A	Pulley (1)	
42	PU40200-2	Housing	
43	GU45882	Snap ring	
44	NSK605ZZCE2	Ball bearing	
45	PU40201	Capstan shaft	
46	PU41849A	Fly wheel ass'y	
47	PU40203	Pulley	
48	PU40728	Belt	
49	PU40207A	Pinch roller shaft ass'y	
50	GA40024	Spring	

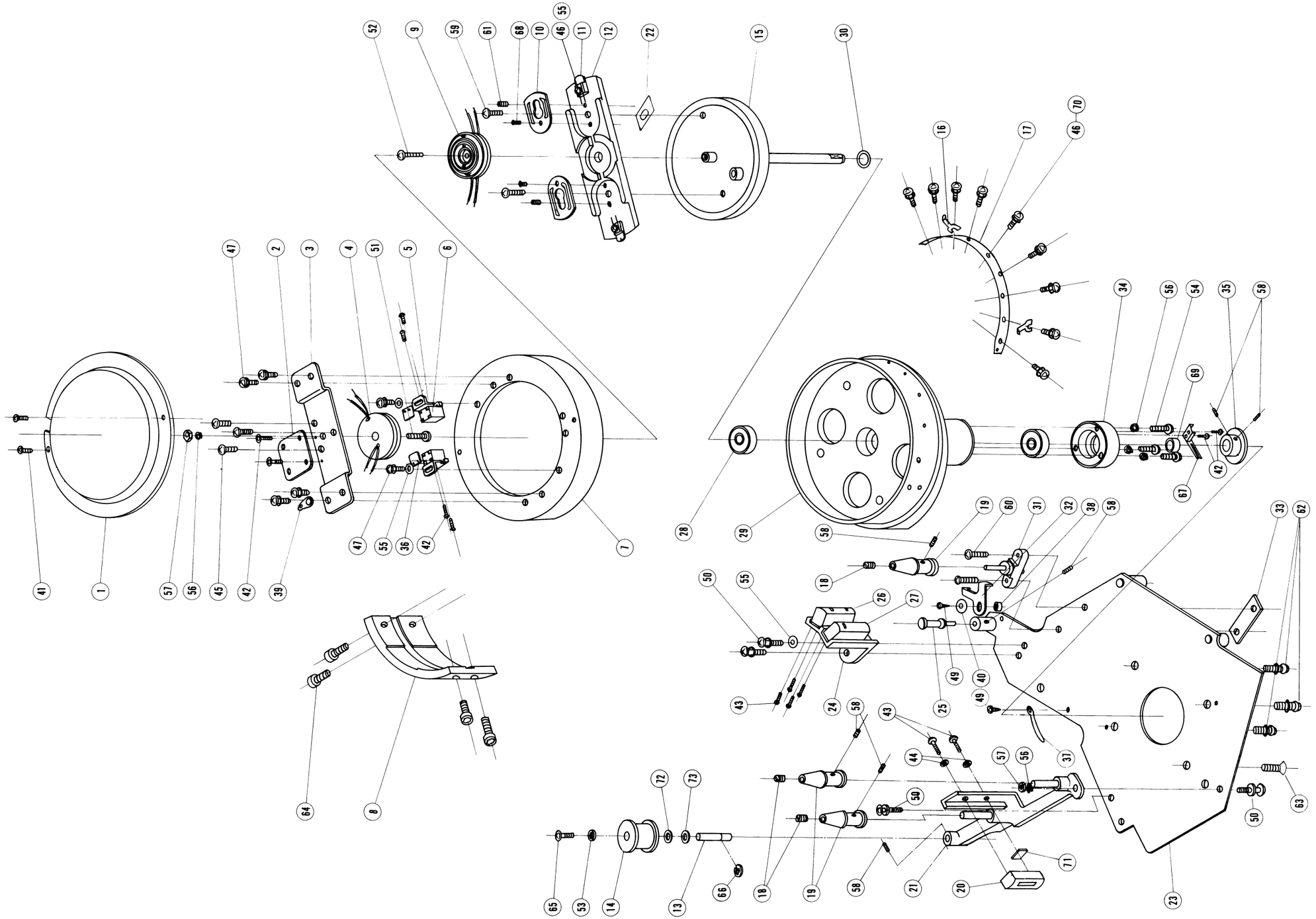
Symbol No.	Part No.	Part Name	Description
51	PU40208	Pinch roller arm	
52	PU40209	Pinch roller shaft	
53	GU45969A	Pinch roller	
54	GU45972	Pinch roller cap	
55	PU40211A	Solenoid arm ass'y	
56	PU30075A	Solenoid	
57	PU40687	Solenoid shaft	
58	PU40214	Connecting lever	
59	PU40215	Rod	
60	PU30080-5	Spring	
61	PU40716	Bracket	
62	PU40719	Still lever	
63	PU40718	Rod	
64	PU35005-23	Spring	
65	PU42701A	Still switch sub ass'y	
66	PU40609A	Bracket ass'y	
67	PU35005-21	Spring	
68	PU40612	Spring	
69	PU40589	Rod clamp	
70	PU40717	Still brake lever	
71	PU40220	Rod	
72	PU40508	Kick lever	
73	PU40224A	Idler lever ass'y	
74	PU35005-25	Spring	
75	T45270-001	Bearing	
76	PU41532A	Reel disk ass'y	
77	PU40228	Felt ring	
78	PU40229-2	Friction disk	
79	PU30080-6	Spring	
80	PU40231	Counter pulley	
81	PRE1010	Spring pin	
82	Q03093-817	Washer	
83	PU40232	Counter belt	
84	GU45889	Reel holder	
85	PU40759A	Counter bracket ass'y	
86	PU45103	Counter	
87	PU42131	Insulator	
88	PU40234	Brake lever	
89	PU40236	Rewind lever	
90	PU40239A	Arm ass'y (1)	
91	PU35005-15	Spring	
92	PU40241	Rod	
93	PU45200	Adjust washer	
94	PU40243A	Idler arm sub ass'y	
95	PU35005-16	Spring	
96	PU40684	Claw	
97	PU35005-24	Spring	
98	PU40245	Fast forward lever	
99	PU40715	Fast forward rod	
100	PU40298A	Play cam ass'y	
101	PU41534A	Reel disk ass'y (S)	
102	PU40254A	Tension arm ass'y	

Symbol No.	Part No.	Part Name	Description
103	PU40752	Bracket	
104	PU40258A	Tension band ass'y	
105	PU35005-18	Spring	
106	PU40260	Belt	
107	PU43140	Fuse printed board	
108	QVZ3003-004	Variable resistor	Tracking adjust
109	PU40617	V.R. Knob	(White)
110	PU40599	Bracket	
111	PU40261	Bracket	
112	PU40262	Bracket	
113	PU40743A	Adaptor case ass'y	
114	QEY1505-051	E. Cap	
115	PU30054A	Right frame ass'y	
116	2SC1061C	Transistor	
117	PU30117A	Left frame ass'y	
118	PU42686A	TV-Camera switch board ass'y	
119	PU40321-2	Connector cover	
120	GU45801	Panel mounting socket	
121	QMC9016-002	Din socket	
122	QVF9B6B-014M	Variable resistor	Color lock
123	PU40600	Bracket	
124	PU30522A	Rear frame ass'y	
125	PU35005-17	Spring	
126	PU30116A	Front frame ass'y	
127	PU40686	Spring hook	
128	PU40178	Switch bracket	
129	PU42699A	Regulator circuit board ass'y	
130	PU40264-2	Motor bracket	
131	m-126H	D.C. motor ass'y Capstan	
132	m-126J	D.C. motor ass'y Disk	
133			
134	PU40535B	Motor pulley	
135	PU45138	Pick up head	
136	PU45196	Sheet	
137	PU42726	Board (1)	
138	PU40598	Wire clamp	
139	PU40502	Bracket	
140	PU40503	Bracket	
141	QMA1221-001	External battery jack ass'y	
142	PU40488	Stopper	
143	PU40488-2	Stopper	
144	PU40320	Handle holder	
145	PU40320-2	Handle holder	
146	PU40606	Brake lever	
147	PU40711A	Lever ass'y	
148	PU40300	Flat belt Capstan	
149	PU40300-2	Flat belt Disk	
150	PU40730A	Play cam lever ass'y	

Symbol No.	Part No.	Part Name	Description
151	PU40690	Spacer	
152	PU40688	Lever	
153	Q03093-815	Washer	
154	PU40739A	Pulley (2) ass'y	
155	PU40740A	Pulley (3) ass'y	
156	PU40714	Spring	
157			
158	PU40141-2	Switch spring	
159	PU41218	Collar	
160	PU41219-2	Tube	
161	T30302-5	Collar	
162	T30302-9	Collar	
163	T30302-13	Collar	
164	Q03091-105	Washer	
165	Q03091-119	Washer	
166	Q03092-304	Washer	
167	Q03093-502	Washer	
168	Q03093-504	Washer	
169	Q03093-507	Washer	
170	SPBP2002N	Screw	
171	SPBP2604N	Screw	
172	LPSP2606Z	Screw	
173	SPBP3004NS	Screw	
174	SPBP3006NS	Screw	
175	SPSP3010ZS	Screw	
176	SPSP3014ZS	Screw	
177	SPSP3016ZS	Screw	
178	LPSP3010ZS	Screw	
179	SPSP3020ZS	Screw	
180	LPSP3005ZS	Screw	
181	LPSP3006ZS	Screw	
182	LPSP3008ZS	Screw	
183	SSSP2604Z	Screw	
184	SSSP3008ZS	Screw	
185	SSSB3010ZS	Screw	
186	SSSP3014ZS	Screw	
187	SSSP4006ZS	Screw	
188	SBSB3006Z	Screw	
189	SBSB3008Z	Screw	
190	YFS2003	Set screw	
191	YRS3003S	Set screw	
192	WNB2000N	Washer	
193	WNB3000N	Washer	
194	WLS2000N	Lock washer	
195	WLS2600N	Lock washer	
196	WLS3000N	Lock washer	
197	WLS4000N	Lock washer	
198	NNB2000N	Nut	
199	NNS3000NS	Nut	
200	NNS4000ZS	Nut	

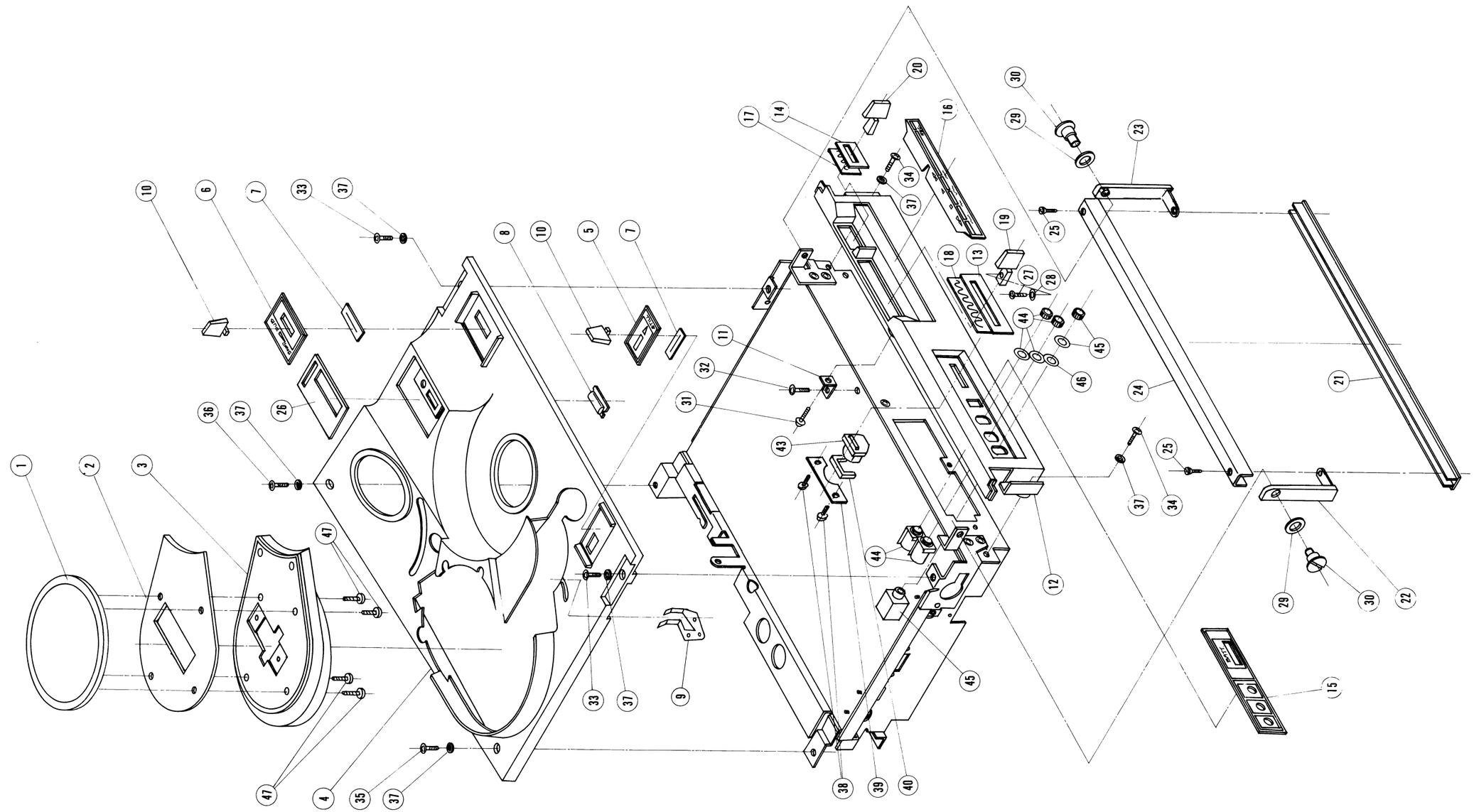
Symbol No.	Part No.	Part Name	Description
201	REE2000	E ring	
202	REE3000	E ring	
203	REE4000	E ring	
204	REE5000	E ring	
205	REE7000	E ring	
206	55234-4	Wire clamp	
207	WNS6000N	Washer	
208	WNS5000N	Washer	
209	Q03093-103	Washer	
210	Q03093-613	Washer	
211	Q04117-L-3.5	Vinyl tubing	
212	PU42132	Insulator	
213	QMF66U1-2RO	Fuse	2A
214	QMF66U1-5RO	Fuse	5A
215	PU42133	Insulator	
216	PU42720	V.R. Bracket	
217	QVZ3003-005	V.R.	Slow motion
218	PU42134	Insulator	
219	PU42724A	Knob ass'y	
220	PU42719	Cap	
221	PU42727	Board (2)	
222	PU41862	Head holder	
223	PU45139	Head bracket	
224	PU42698A	Solenoid control board ass'y	
250	PU40136	Stud	
251			
252	PU41223	Switch bracket	
253	PU41224	Hook	
254	PU41225-2	Plate	
255	PU41321	Spring hook	
256	PU41322	Bracket	
257	PU41529A	Sleeve ass'y	
258	PU41614	Sleeve	
259	PU41645	Shaft	
260			
261	PU35005-54	Spring	
262	PU35005-14	Spring	
263	T5090-002	Brake pad.	
264	PU40617-2	V.R. Knob	(Black)
265	PU42133-2	Insulator	
266	PU43148	Fuse printed board	
267	PU43151	Fuse bracket	
268	QMF66U1-1R0	Fuse	1A
269	SSSP3006NS	Screw	
270	SPSP3008ZS	Screw	
271	SPBP3014NS	Screw	

9-2. DRUM ASSEMBLY



DRUM ASSEMBLY

Symbol No.	Part No.	Part Name	Description
1	PU45126-3	Cover	
2	PU42692A	Pick up terminal ass'y	(Including No. 3)
3	GU45702	Bracket	
4	PU45153A	Rotary transformer ass'y	
5	PU45139	Head bracket	PU45140A
6	PU45138	Pick up head	Pick up head ass'y
7	PU35016	Upper drum	
8	PU45137-2	Drum bracket	
9	PU45153B	Rotary transformer ass'y	
10			
11	GU45697D	Video head ass'y	(Including Nos. 46,55,68 and 61)
12			
13	PU40695-2	Stud	
14	PU41473	Guide roller	
15	PU40701A	Flywheel ass'y	
16	PU41027	Tape guard	
17	PU30154	Tape guide	
18	GU45706	Screw	
19	GU45705-2	Guide pole	
20	PU35021	Erase head	
21	PU40692B	Pole base ass'y	
22	PU40792	Spacer	
23	PU30046A	Sub base ass'y	
24	GU45712	Head holder	
25	GU46031	Pole	
26	PU35022	Audio and control head	
27	PU35022-2	Audio erase head	
28	PU45133-2	Ball bearing	
29	PU25003-2	Lower drum	
30	Q03093-604	Washer	
31	GU45708B	Pole base ass'y	
32	PU40512	Still lever	
33	GU46035-2	Plate	
34	PU40128	Bearing setter	
35	PU41830	Pulley	
36	PU45196	Sheet	
37	55234-1	Wire clamp	
38	T30302-5	Collar	
39	50388	Lug	
40	Q03091-105	Washer	
41	SPSP3004NS	Screw	
42	SPBP2004N	Screw	
43	SPBP2006N	Screw	
44	WNB2000N	Washer	
45	SPBP3006TS	Screw	(Green)
46	SDBP3006TS	Screw	(Green)
47	LPSP3006ZS	Screw	
48			
49	SBSB3006Z	Screw	
50	LPSP3010ZS	Screw	
51	SPSP3010NS	Screw	
52	SPSP3010CS	Screw	(Blue)
53	WNB2600N	Washer	
54	SPSP3016ZS	Washer	
55	WNB3000N	Washer	
56	WLS3000N	Lock washer	
57	NNB3000NS	Nut	
58	YRS3003BS	Set screw	
59	SPBP4008CS	Screw	(Blue)
60	SPSP4012TS	Screw	(Green)
61	YFS4006BS	Set screw	
62	LPSP5008ZS	Screw	
63	SSSP5008ZS	Screw	
64	BYS5010FS	Bolt	
65	SDBP2604N	Screw	
66	REE3000	E ring	
67	PU41827	Brush ass'y	
68	SSBP2004N	Screw	
69	PU41629-2	Collar	
70	WSB3000N	Washer	
71	PU41831	Spacer	
72	PU40746-3	Washer	
73	PU40746-4	Washer	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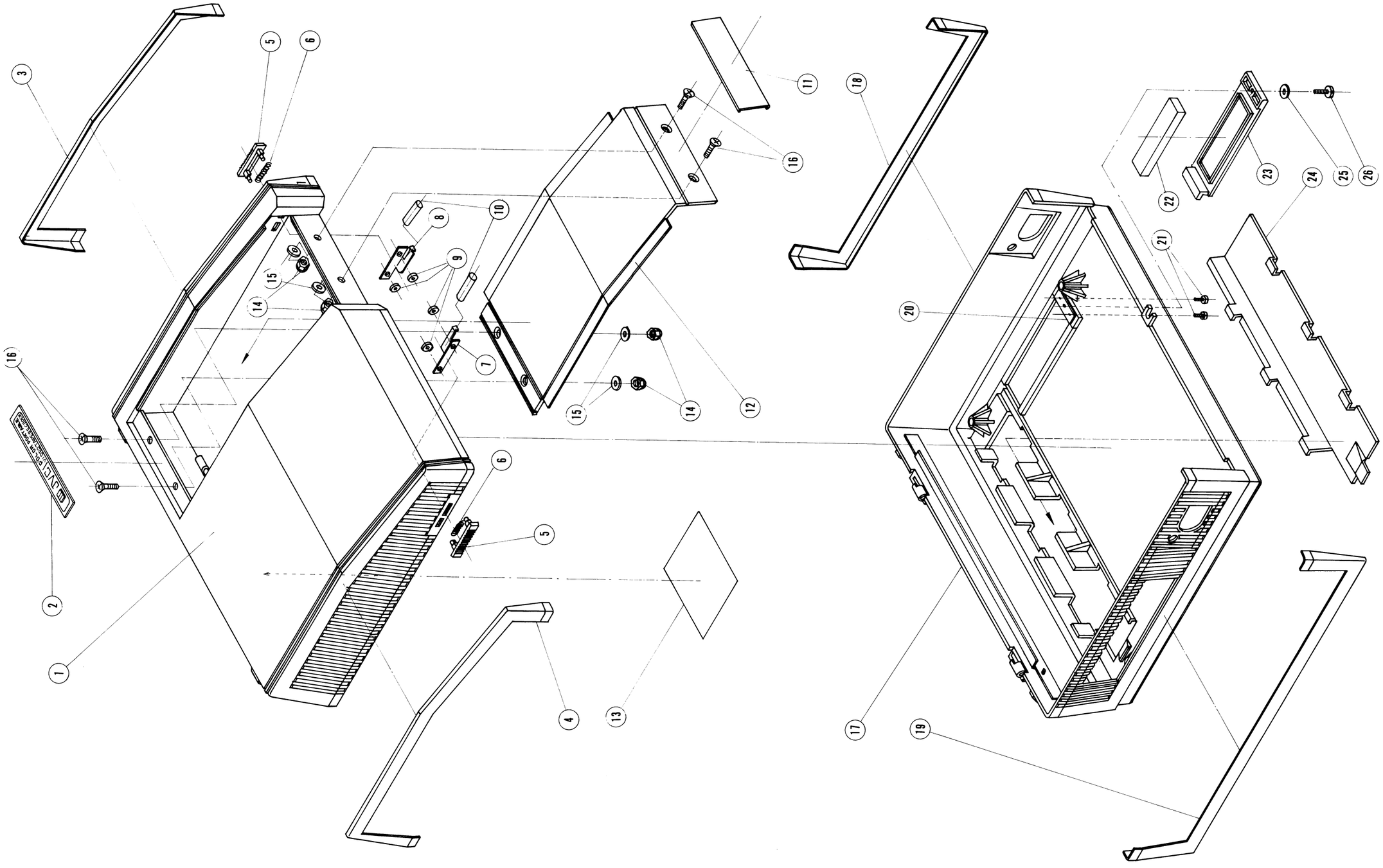
CASE

Symbol No.	Part No.	Part Name	Description
1	PU42905B	Mark ass'y	
2	PU30062-2	Escutcheon (2)	PU30064G Drum cover ass'y
3	PU30042	Drum cover	
4	PU10007	Top panel	
5	PU42713	Escutcheon (1)	PU10013B Top panel ass'y (including No. 26)
6	PU42715	Escutcheon (2)	
7	PU40288	Dust sheet	
8	T40838	Count plate	
9	PU40667	Guide	
10	PU40292A	Slide knob	
11	PU40334	Panel bracket	
12	PU20018-2	Front panel	PU20024C Front panel ass'y
13	PU40283-2	Escutcheon (3)	
14	PU40284-2	Escutcheon (4)	
15	PU42716	Escutcheon (5)	
16	PU42718	Escutcheon (6)	
17	PU40735-4	Dust sheet	
18	PU40735-3	Dust sheet	
19	PU40291	Operation knob	
20	PU40291-2	Operation knob	
21	PU30391	Handle holder	PU30392B Handle ass'y
22	PU41842	Arm	
23	PU41842-2	Arm	
24	PU30390-2	Escutcheon	
25	SSSP3008NS	Screw	
26	PU42714	Plate	
27	SDBP2004N	Screw	
28	WNB2000N	Washer	
29	GK242847-5	Felt ring	
30	PU40295	Special screw	
31	SBSB3508Z	Screw	
32	SBSB3006Z	Screw	
33	SDBP3006RS	Screw	
34	SDBP3008RS	Screw	
35	SDBP3012RS	Screw	
36	SDBP3030RS	Screw	
37	WSB3000N	Washer	
38	SBSB3008Z	Screw	
39	PU40294	Meter holder	
40	GU46001	Meter cushion	
41	SPSP4020NS	Screw	
42	WSB4000N	Washer	
43	PU30899	Meter	
44	QMS3501-001	Jack ass'y	
45	QMS3503-003	Jack ass'y	
46	Q03093-126	Washer	
47	PU41705	Speed nut	

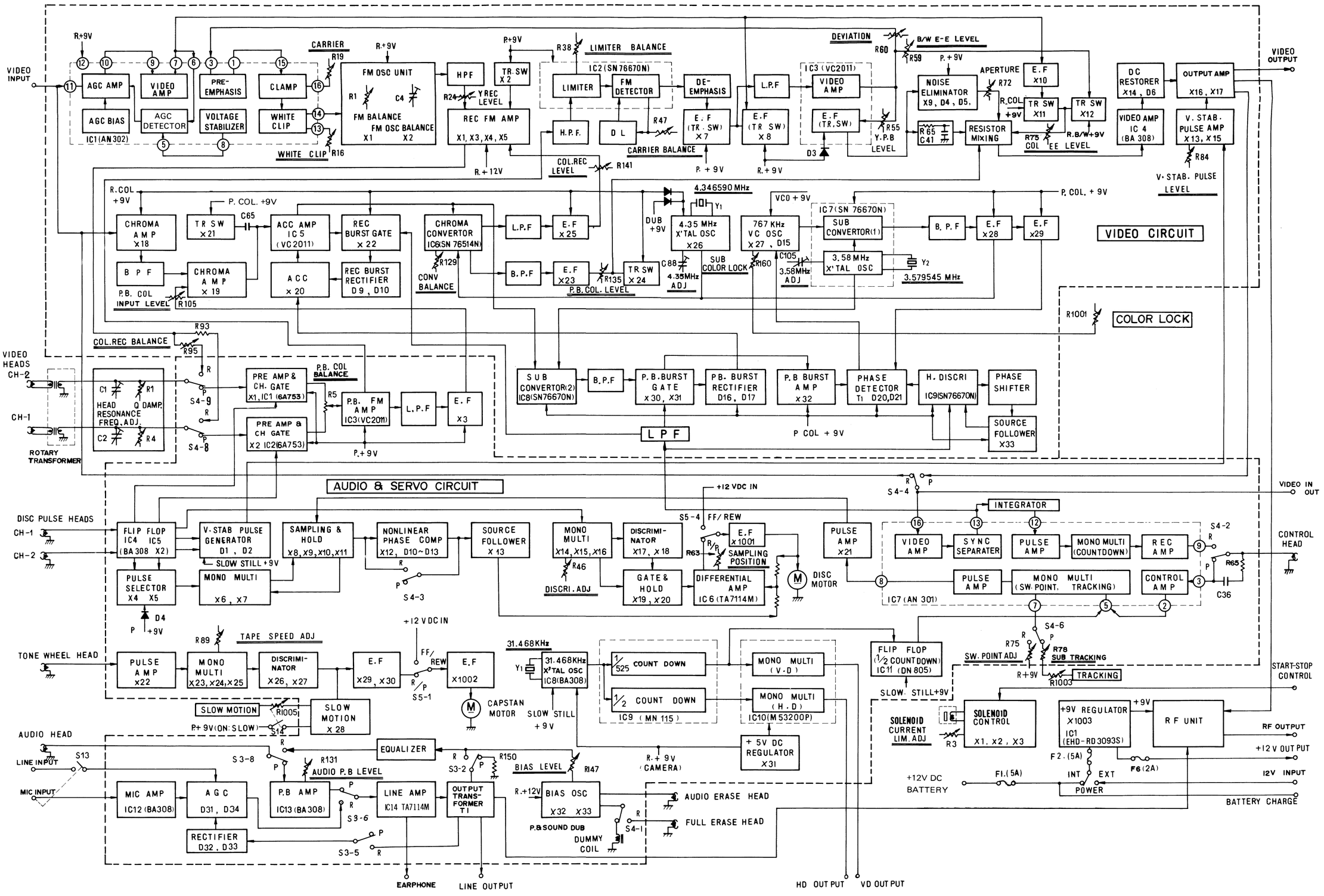
9-4. CABINET ASSEMBLY

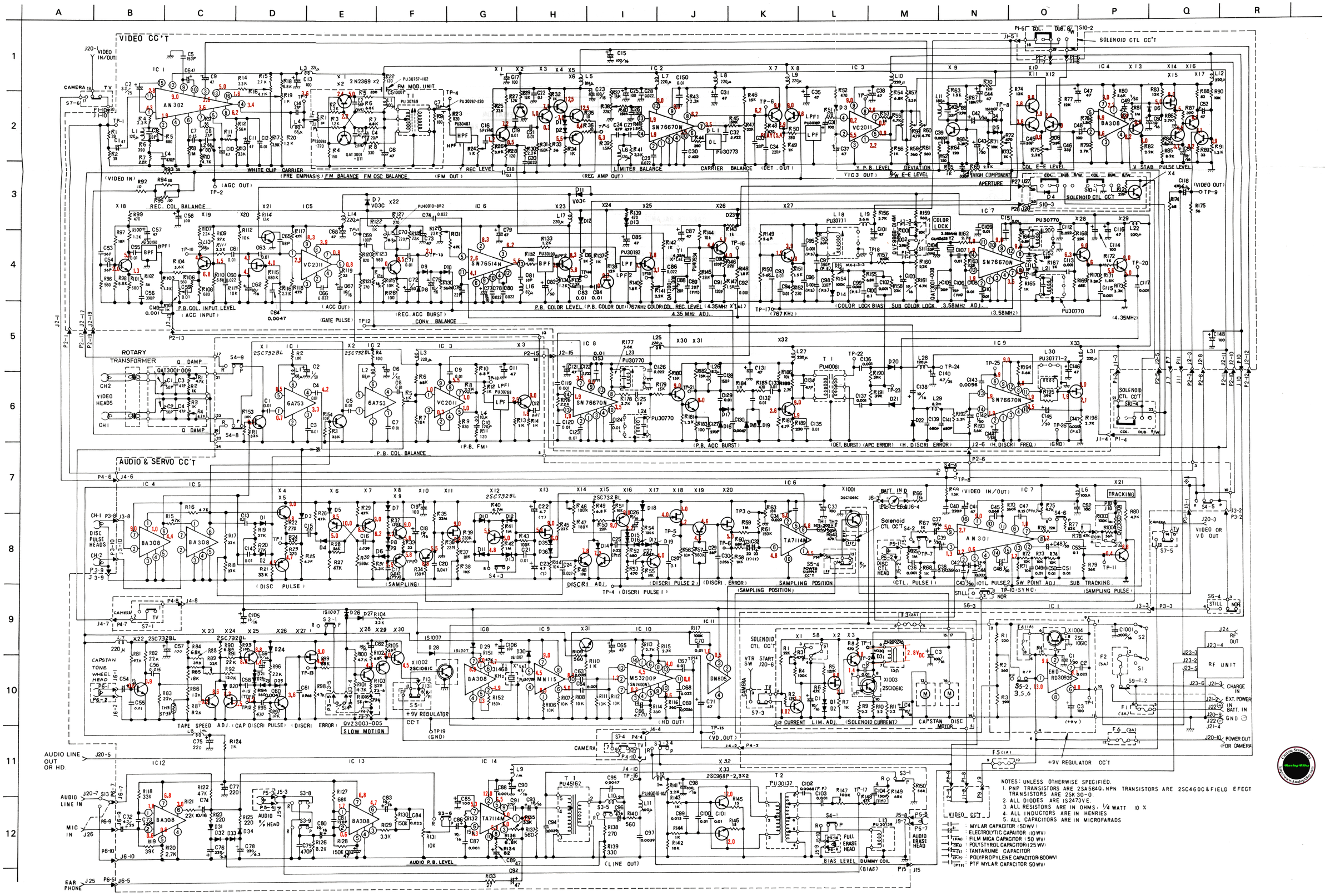


Symbol No.	Part No.	Part Name	Description
1	PU1006-2	Upper cabinet	
2	PU42712-2	Mark	
3	PU30065	Fitting	
4	PU30065-2	"	
5	PU40289-2	Knob	
6	PU30080	Compression spring	
7	PU40290	Lock	
8	PU40390-2	"	
9	PU40464	Ring	
10	PU40621	Cover	
11	PU42717-2	Escutcheon	
12	PU30039	Window glass	
13	PU40353-2	Sticker	
14	GU45778	Cap nut	
15	WNS3000N	Washer	
16	SSSP3010NS	Screw	
17	PU10005-2	Lower cabinet	
18	PU30065-3	Fitting	
19	PU30065-4	"	
20	PU40382	Stopper plate	
21	SPSP2006N	Screw	
22	GU46062-2	Sponge	
23	PU30040-2V	RF unit cover	
24	PU20019-2V	Battery cover	
25	WNS3000N	Washer	
26	SDSP3012RS	Screw	
1–16	PU10010H	Upper cabinet ass'y	
17–21	PU10011B	Lower cabinet ass'y	
22, 23	PU30067BV	RF unit cover ass'y	
1–26	PU10012H	Cabinet ass'y	

SECTION 10
DIAGRAMS AND CIRCUIT BOARDS

10-1. BLOCK DIAGRAM





TP-11
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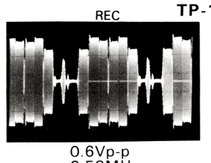
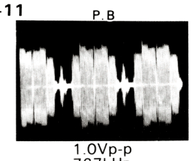
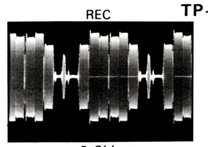
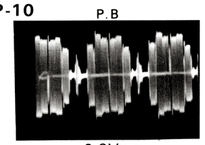
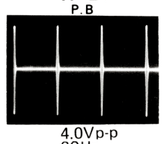
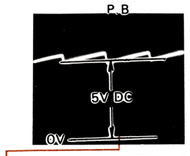

0.6Vp-p
3.58MHz

P.B

1.0Vp-p
767kHz

TP-10
REC

0.2Vp-p
3.58MHz

P.B

0.2Vp-p
767kHz

TP-21
P.B

4.0Vp-p
60Hz

TP-24
P.B


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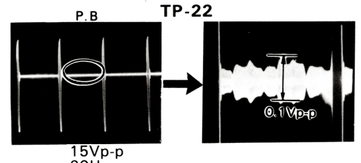
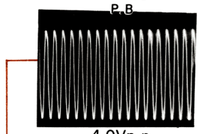
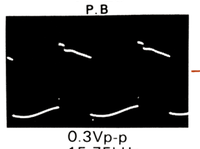
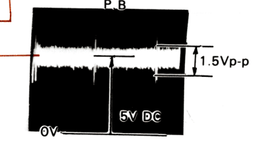
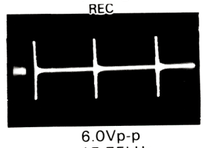


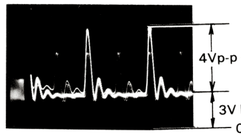
15Vp-p
60Hz

TP-20
P.B

4.0Vp-p
4.35MHz

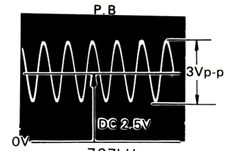
TP-25
P.B

0.3Vp-p
15.75kHz

TP-23
P.B


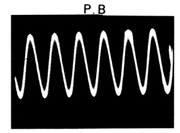
TP-13
REC

6.0Vp-p
15.75kHz

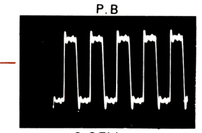
TP-12


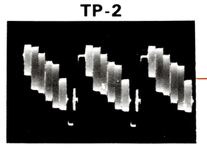
15.75kHz

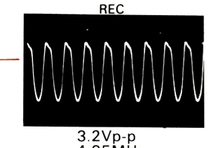
TP-18
P.B


767kHz

TP-17
P.B

0.2Vp-p
767kHz

TP-19
P.B

0.25Vp-p
3.58MHz

TP-2

1.4Vp-p
15.75kHz

TP-16
REC

3.2Vp-p
4.35MHz

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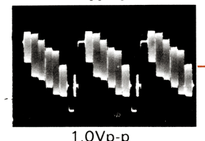
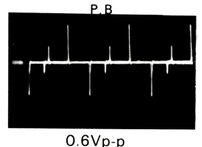

1.0Vp-p
15.75kHz

TP-8
P.B

0.6Vp-p
15.75kHz

TP-15
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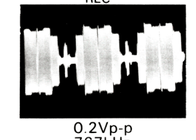
0.2Vp-p
767kHz

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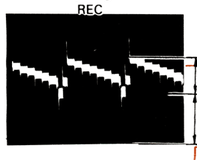

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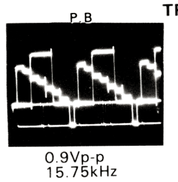
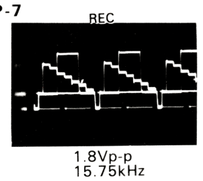
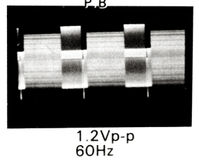
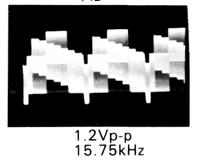

0.9Vp-p
15.75kHz

REC

1.8Vp-p
15.75kHz

TP-6
P.B

1.2Vp-p
60Hz

P.B

1.2Vp-p
15.75kHz

TP-4
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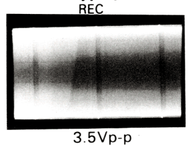
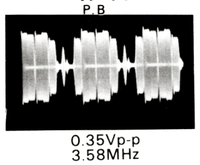

3.5Vp-p

TP-14
P.B

0.35Vp-p
3.58MHz

TP-9
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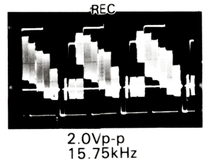
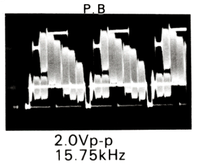
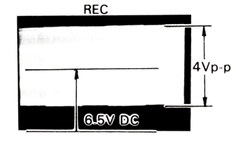
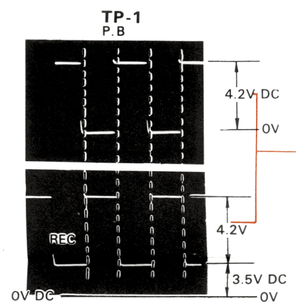
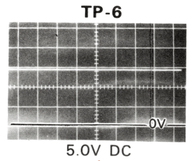
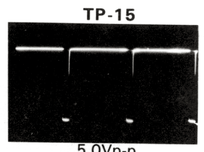

2.0Vp-p
15.75kHz

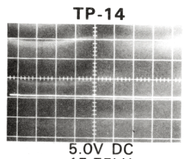
P.B

2.0Vp-p
15.75kHz

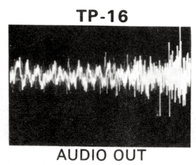
TP-5
REC


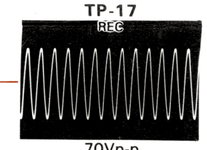

TP-1
P.B
4.2V DC
0V
REC
4.2V
3.5V DC
0V DC
0V

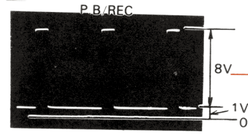

TP-6
0V
5.0V DC

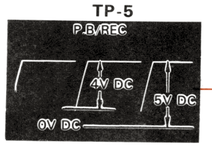

TP-15
5.0Vp-p
60Hz

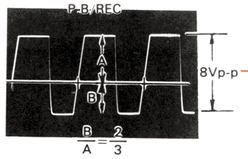

TP-14
5.0V DC
15.75kHz

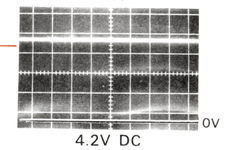

TP-16
AUDIO OUT

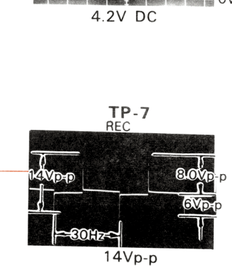

TP-17
REC
70Vp-p
70kHz

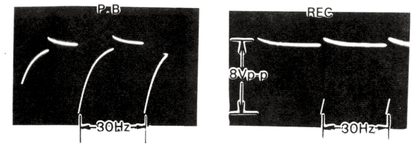

TP-4
P.B/REC
8V
1V
0V

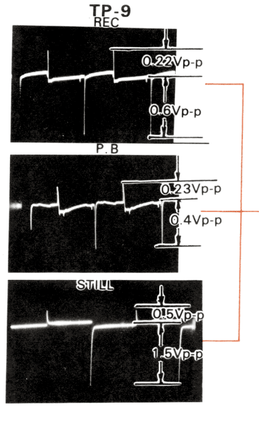

TP-5
P.B/REC
4V DC
5V DC
0V DC

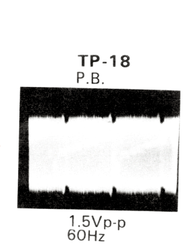

TP-2
P-B/REC
A
B
8Vp-p
B = 2
A 3

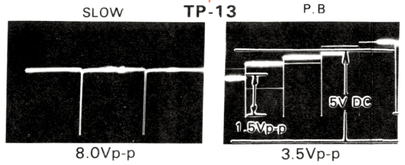

TP-3
REC
0V
4.2V DC

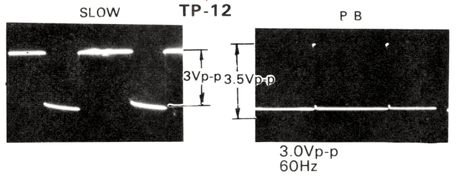

TP-7
REC
14Vp-p
8.0Vp-p
6Vp-p
30Hz
14Vp-p

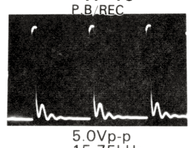

TP-11
P.B
30Hz
REC
8Vp-p
30Hz

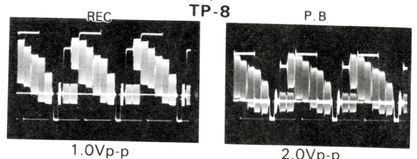

TP-9
REC
0.22Vp-p
0.6Vp-p
P.B
0.23Vp-p
0.4Vp-p
STILL
0.5Vp-p
1.5Vp-p


TP-18
P.B.
1.5Vp-p
60Hz

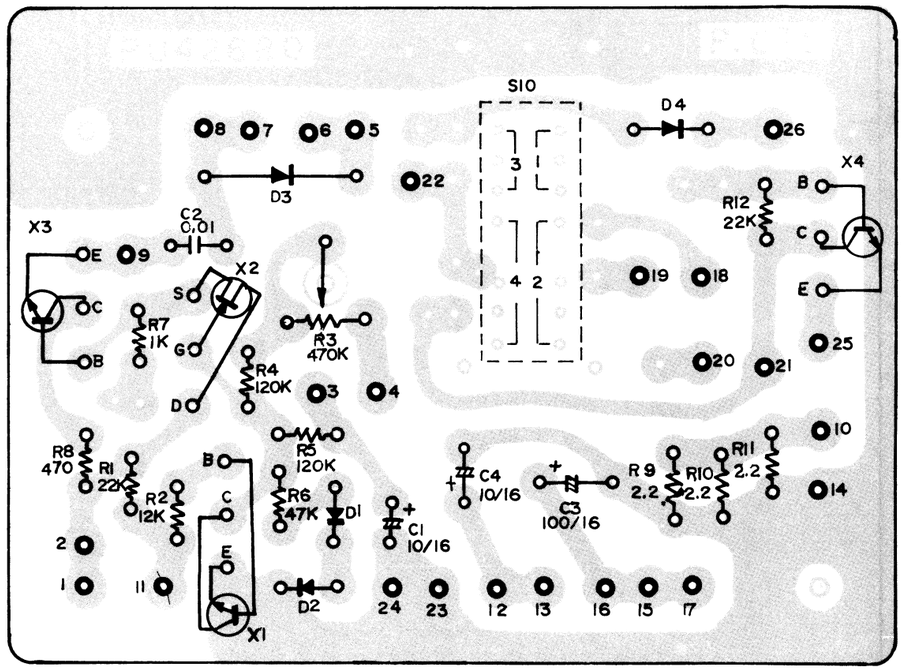

SLOW
TP-13
P.B
5V DC
1.5Vp-p
8.0Vp-p
3.5Vp-p


SLOW
TP-12
P.B
3Vp-p
3.5Vp-p
3.0Vp-p
60Hz


TP-10
P.B/REC
5.0Vp-p
15.75kHz


REC
TP-8
P.B
1.0Vp-p
15.75kHz
2.0Vp-p
15.75kHz

10-5. SOLENOID CONTROL CIRCUIT BOARD



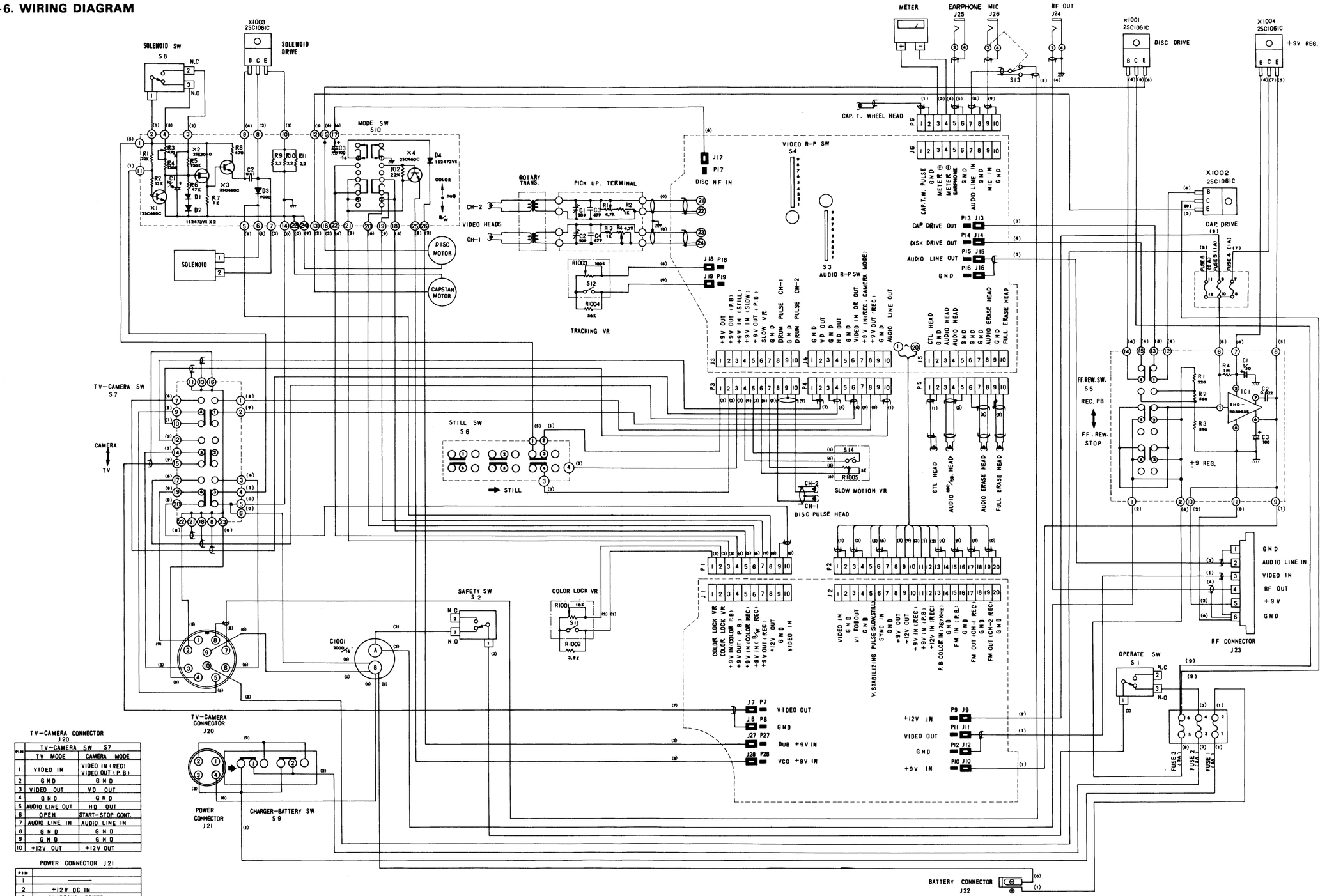
X1 X3 X4 : 2SC460C

X2 : 2SK30-0

D1 D2 D4 : 1S2473VE

D3 : V03C

10-6. WIRING DIAGRAM



TV—CAMERA CONNECTOR J20

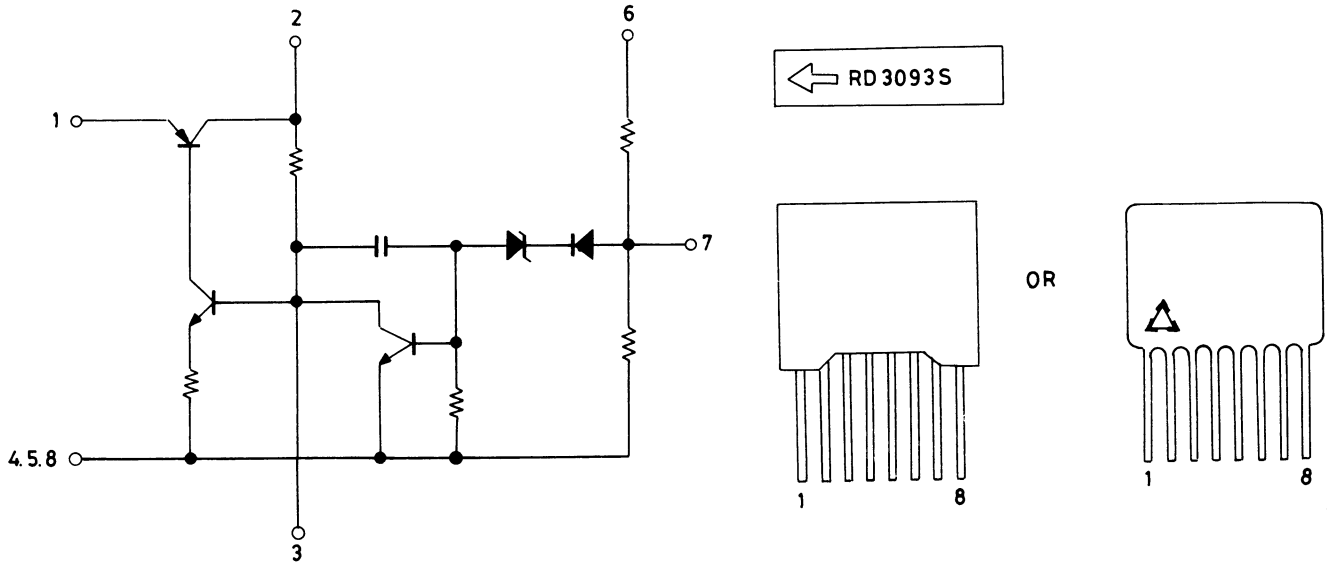
PIN	TV—CAMERA SW S7	
	TV MODE	CAMERA MODE
1	VIDEO IN	VIDEO IN (REC) VIDEO OUT (P.B)
2	GND	GND
3	VIDEO OUT	VD OUT
4	GND	GND
5	AUDIO LINE OUT	HD OUT
6	OPEN	START—STOP CONT.
7	AUDIO LINE IN	AUDIO LINE IN
8	GND	GND
9	GND	GND
10	+12V OUT	+12V OUT

POWER CONNECTOR J21

PIN	
1	——
2	+12V DC IN
3	CHARGING POWER
4	GND

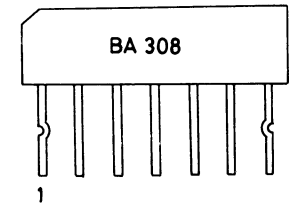
10-7. SCHEMATIC DIAGRAM OF ICs

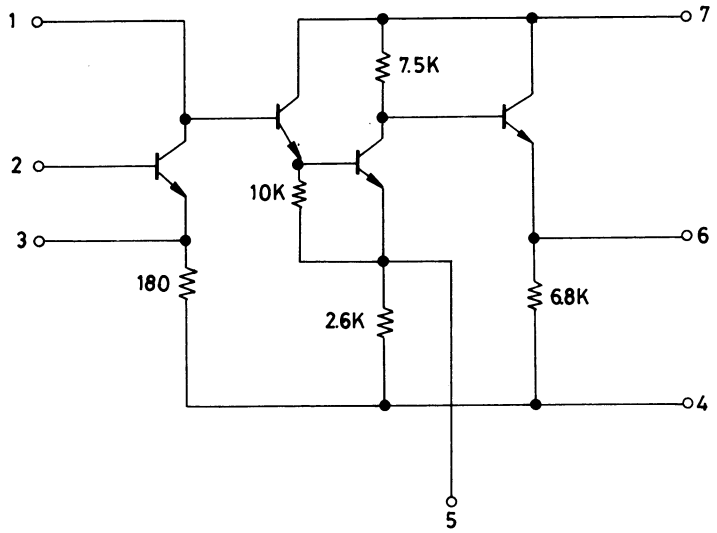
— EHD-RD3093S —



IC 1 in +9V REGULATOR CC'T

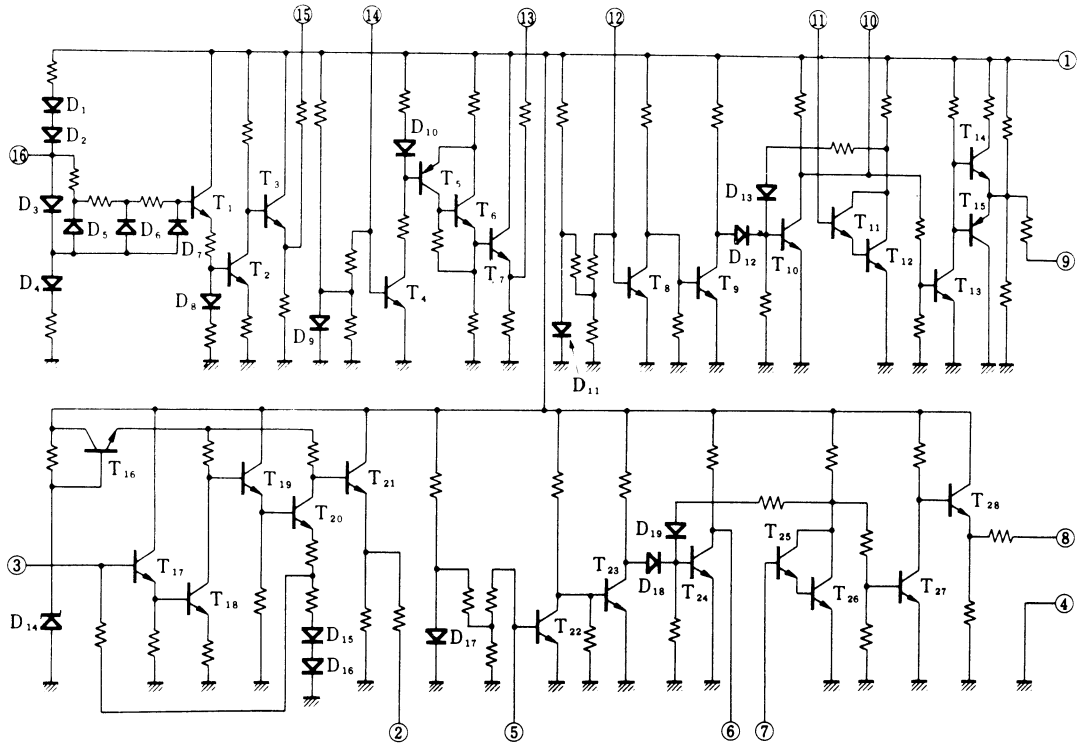
— BA308 —





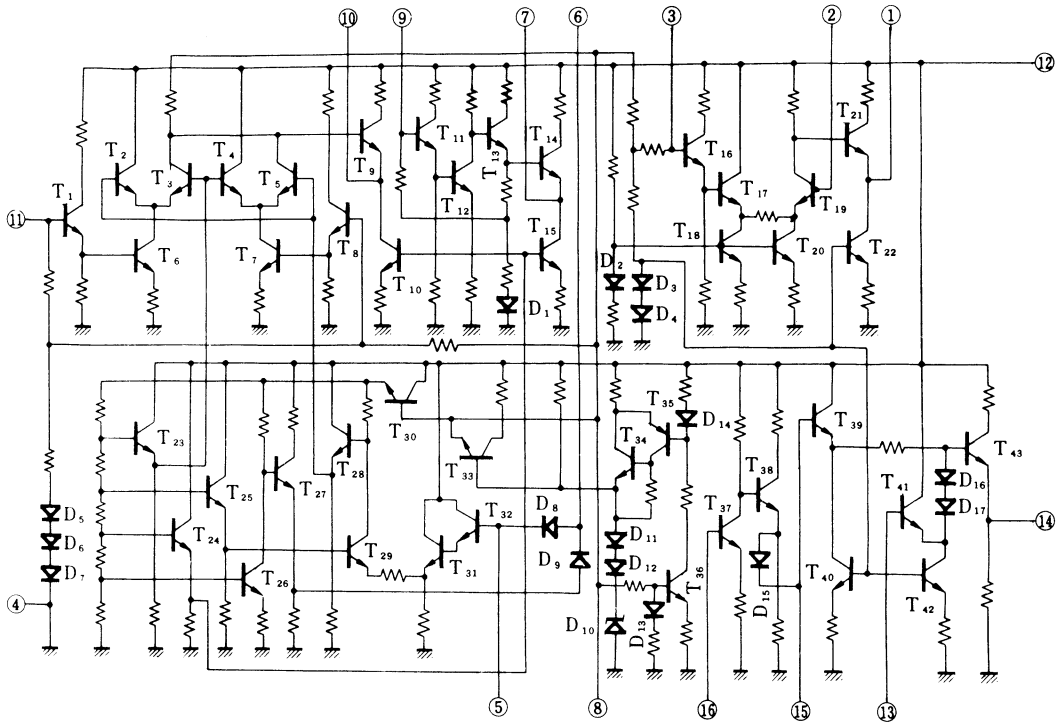
IC 4,5,8,12,13 in AUDIO & SERVO CC'T
IC 4 in VIDEO CC'T

— **AN301** —



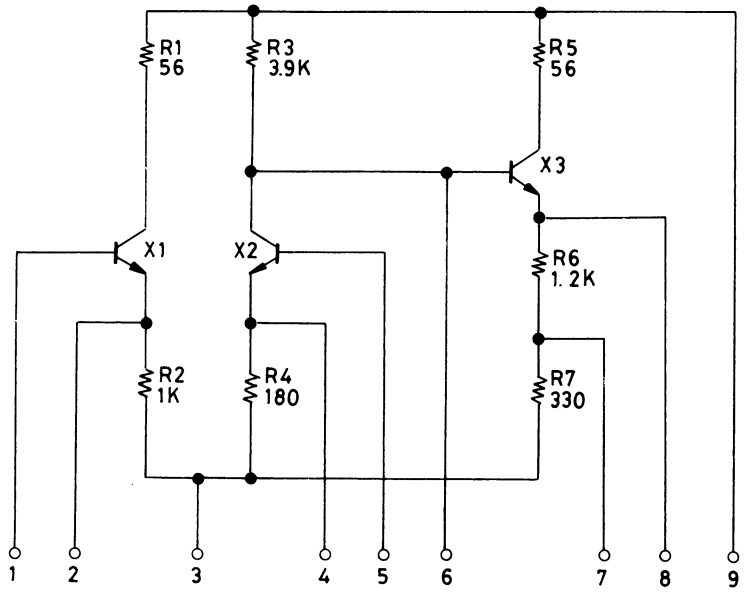
IC 7 in AUDIO & SERVO CC'T

— **AN302** —



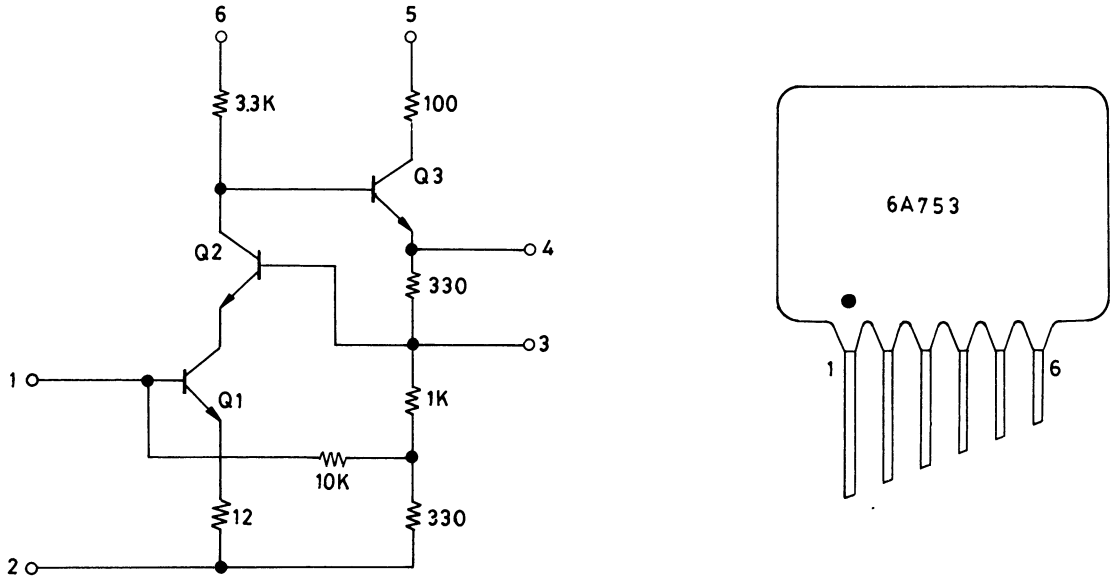
IC 1 in VIDEO CC'T

–VC2011 –



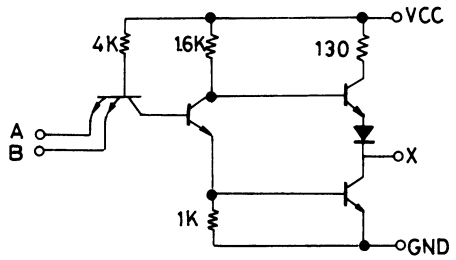
IC 3,5 in VIDEO CC'T
IC 3 in AUDIO & SERVO CC'T

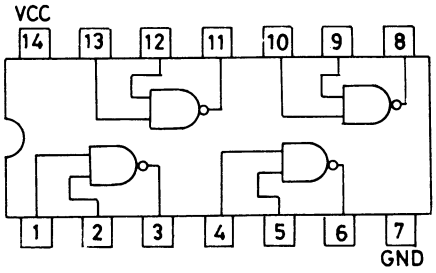
–6A753 –

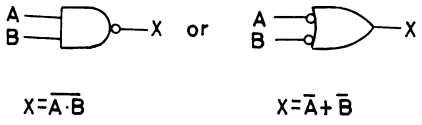


IC 1,2, in AUDIO & SERVO CC'T

— M53200P —





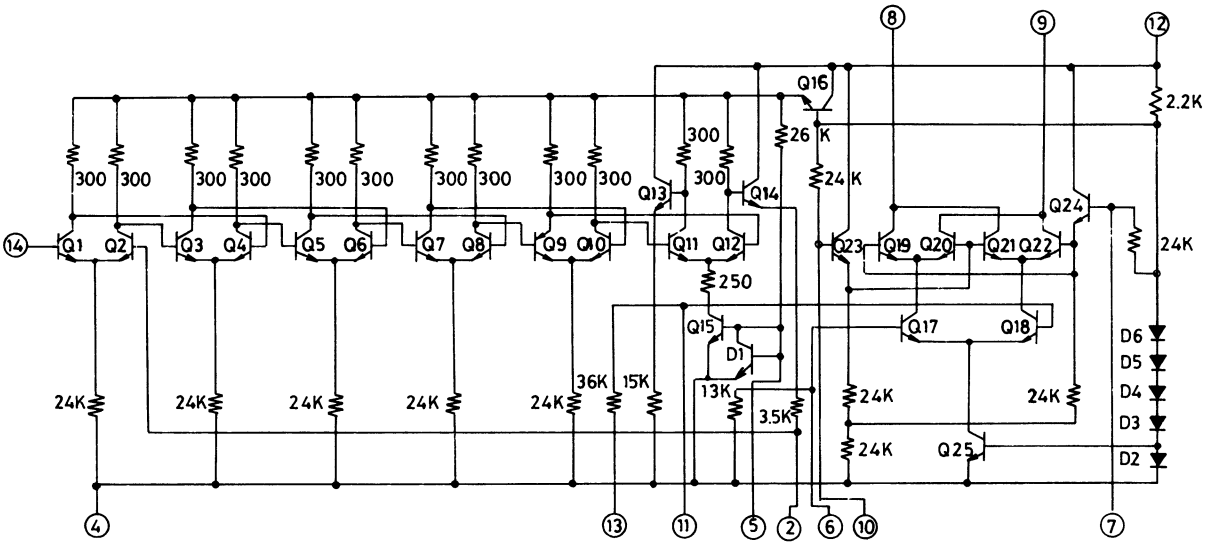


$X=\overline{A \cdot B}$ $X=\bar{A}+\bar{B}$

A	B	X
H	H	L
H	L	H
L	H	H
L	L	H

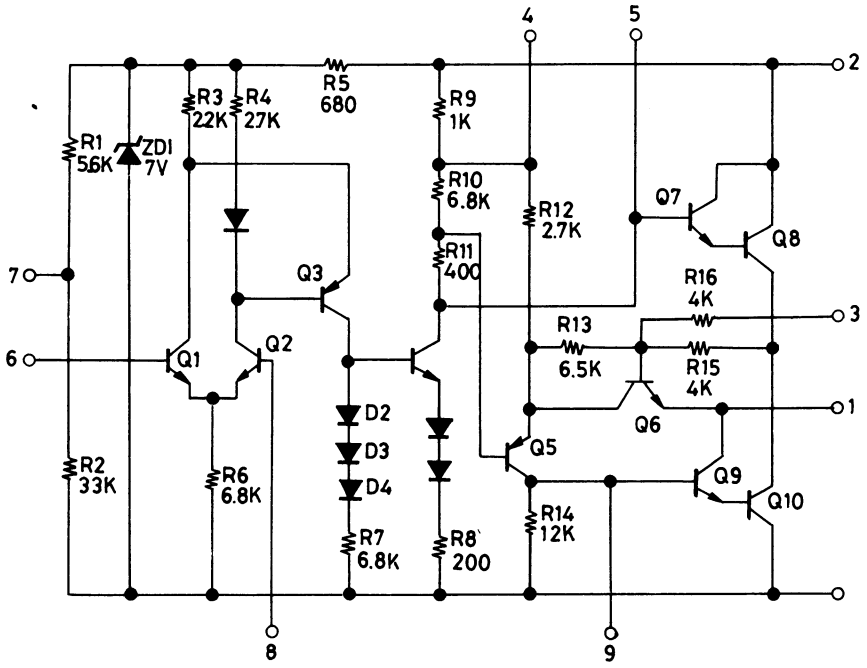
IC 10 in AUDIO & SERVO CC'T

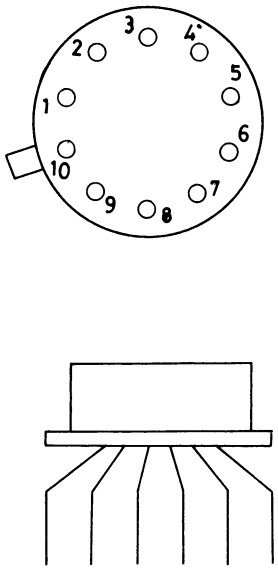
— SN76670N —



IC 2, 7, 8, 9 in VIDEO CC'T

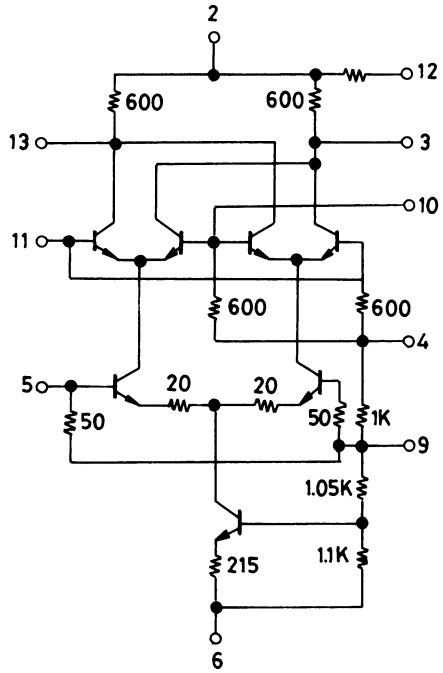
— **TA7114M (LF)** —





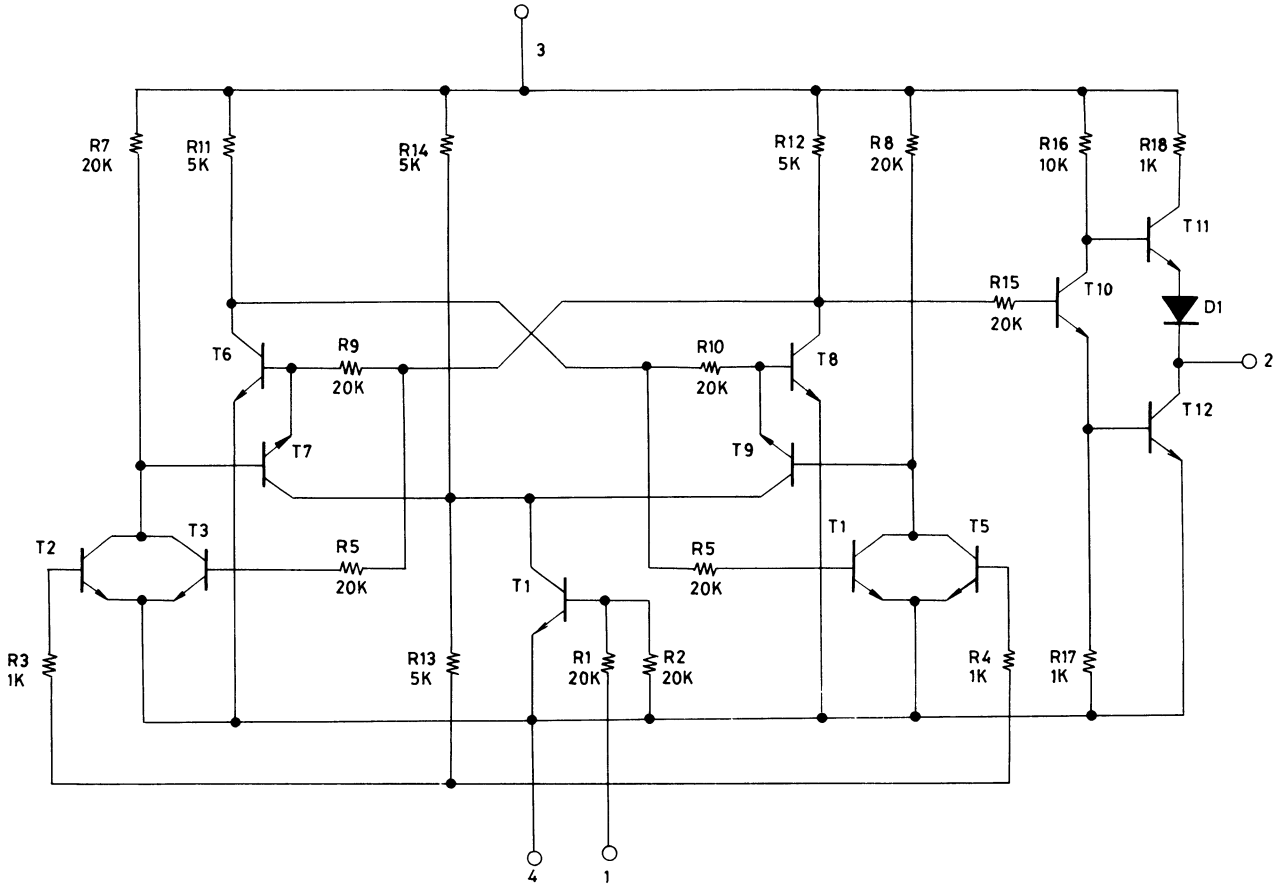
IC 6 in AUDIO & SERVO CC'T

— **SN76514N** —



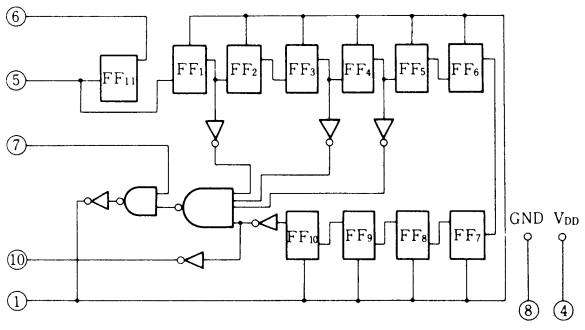
IC 6 in VIDEO CC'T

– DN805 –



IC 11 in AUDIO & SERVO CC'T

– MN115 –



IC 9 in AUDIO & SERVO CC,T

SECTION 11
ELECTRICAL PARTS LIST

All abbreviations in this list as follows:

RESISTORS – All resistance values are in ohms (Ω).

K	:	1000
M	:	1000000
CR	:	Carbon Resistor
Comp. R	:	Composition Resistor
WR	:	Wire Wound Resistor
OMR	:	Oxide Metal Film Resistor
VR	:	Variable Resistor
MFR	:	Metal Film Resistor

CAPACITORS – All capacitance values are in μF, unless otherwise indicated.

P	:	μμF
C Cap	:	Ceramic Capacitor
PS Cap	:	Polystyrol Capacitor
MY Cap	:	Mylar Capacitor
MP Cap	:	Metalized Paper Capacitor
PC Cap	:	Polycarbonate Capacitor
E Cap	:	Electrolytic Capacitor
PP Cap	:	Poly Pro Capacitor
MM Cap	:	Metalized Mylar Capacitor
T Cap	:	Tantalum Capacitor

Tolerance of resistors and capacitors is as follows:

M	:	± 20%
K	:	± 10%
J	:	± 5%
G	:	± 2%

11-1. VIDEO AMPLIFIER CIRCUIT BOARD

Symbol No.	Part No.	Part Name	Description
	PU42694A	Video Amp. Ass'y	
	PU42697A	FM Modulator Unit	
IC 1	AN302	Integrated Circuit	
IC 2	SN76670N	"	
IC 3	VC2011	"	
IC 4	BA308	"	
IC 5	VC2011	"	
IC 6	SN76514NA	"	
IC 7	SN76670N	"	
IC 8	"	"	
IC 9	"	"	
X 1	2SC460C	Transistor	
X 2	"	"	
X 3	"	"	
X 4	"	"	
X 5	"	"	
X 6	2SA564Q	"	
X 7	2SC460C	"	
X 8	"	"	
X 9	"	"	
X10	"	"	
X11	"	"	
X12	"	"	
X13	2SA564Q	"	
X14	2SK30A-0	Field Effect Transistor	
X15	2SA564Q	Transistor	
X16	2SC460C	"	
X17	"	"	
X18	"	"	
X19	"	"	
X20	2SK30A-0	Field Effect Transistor	
X21	2SC460C	Transistor	
X22	"	"	
X23	"	"	
X24	"	"	
X25	"	"	
X26	"	"	
X27	"	"	
X28	"	"	
X29	"	"	
X30	"	"	
X31	"	"	
X32	"	"	
X33	2SK30A-0	Field Effect Transistor	
D 1	IS2473VE	Diode	
D 2	"	"	
D 3	"	"	
D 4	IS1007	"	
D 5	"	"	
D 6	IS2473VE	"	
D 7	VO3C	"	
D 8	IS2473VE	"	
D 9	"	"	
D10	"	"	
D11	VO3C	"	
D12	IS2473VE	"	

Symbol No.	Part No.	Part Name	Description
D13	IS2473VE	Diode	
D14	"	"	
D15	MX-1-3-3	V. Cap. Diode	
D16	IS2473VE	Diode	
D17	"	"	
D18	"	"	
D19	"	"	
D20	"	"	
D21	"	"	
D22	"	"	
Y 1	PU40534	Crystal	4.35MHz
Y 2	GU40625	"	3.58MHz
T 1	PU40061	OSC Transformer	
L 1	A04096-120	Peaking Coil	120μH
L 2	" -68	"	68μH
L 3	" -220	"	220μH
L 4	" -68	"	68μH
L 5	" -100	"	100μH
L 6	" -120	"	120μH
L 7	" -220	"	220μH
L 8	" -220	"	220μH
L 9	" -220	"	220μH
L10	" -220	"	220μH
L11	" -180	"	180μH
L12	" -220	"	220μH
L13	" -68	"	68μH
L14	" -220	"	220μH
L15	PU40010-8R2	"	8.2μH
L16	A04096-82	"	82μH
L17	" -220	"	220μH
L18	PU30771	Coil	
L19	A04096-5600	Peaking Coil	5.6mH
L20	PU30770	Coil	
L21	"	"	
L22	A04096-220	Peaking Coil	220μH
L23	PU30770	Coil	
L24	"	"	
L25	A04096-220	Peaking Coil	220μH
L26	" -8.2	"	8.2μH
L27	" -220	"	220μH
L28	" -120	"	120μH
L29	" -8200	"	8.2mH
L30	PU30771-2	Coil	
L31	A04096-220	Peaking Coil	220μH
HPF1	PU30487	High Pass Filter	
LPF1	PU30189	Low Pass Filter	
LPF2	PU30192	"	
BPF1	PU30190	Band Pass Filter	
BPF2	PU30190	"	
DL 1	PU30773	Delay Line	
R 1	QRD143K-390	CR	39 ¼W,K
R 2	" -390	"	39 "
R 3	—	—	
R 4	QRD143K-332	CR	3.3K ¼W,K
R 5	" -681	"	680 "
R 6	" -391	"	390 "
R 7	" -222	"	2.2K "

Symbol No.	Part No.	Part Name	Description
R 8	QRD143K-105	CR	1M ¼W,K
R 9	" -560	"	56 "
R10	" -472	"	4.7K "
R11	" -105	"	1M "
R12	" -563	"	56K "
R13	" -333	"	33K "
R14	" -332	"	3.3K "
R15	" -272	"	2.7K "
R16	QVP4A0B-472	VR	4.7K
R17	QRD143K-392	CR	3.9K ¼W,K
R18	" -682	"	6.8K "
R19	QVP4A0B-102	VR	1K
R20	QRD143K-122	CR	1.2K ¼W,K
R21	—	—	
R22	QRD143K-121	CR	120 ¼W,K
R23	" -821	"	820 "
R24	QVP4A0B-102	VR	1K
R25	QRD143K-333	CR	33K ¼W,K
R26	" -392	"	3.9K "
R27	" -122	"	1.2K "
R28	" -121	"	120 "
R29	" -123	"	12K "
R30	" -222	"	2.2K "
R31	" -154	"	150K "
R32	" -102	"	1K "
R33	" -560	"	56 "
R34	" -102	"	1K "
R35	" -100	"	10 "
R36	" -100	"	10 "
R37	" -153	"	15K "
R38	QVP4A0B-223	VR	22K
R39	QRD143K-152	CR	1.5K ¼W,K
R40	" -154	"	150K "
R41	" -332	"	3.3K "
R42	" -152	"	1.5K "
R43	" -222	"	2.2K "
R44	" -391	"	390 "
R45	" -154	"	150K "
R46	" -153	"	15K "
R47	QVP4A0B-223	VR	22K
R48	QRD143K-471	CR	470 ¼W,K
R49	" -102	"	1K "
R50	" -391	"	390 "
R51	" -471	"	470 "
R52	" -471	"	470 "
R53	" -102	"	1K "
R54	" -682	"	6.8K "
R55	QVP4A0B-472	VR	4.7K
R56	QRD143K-102	CR	1K ¼W,K
R57	" -332	"	3.3K "
R58	" -561	"	560 "
R59	QVP4A0B-472	VR	4.7K
R60	" -472	"	4.7K
R61	QRD143K-561	CR	560 ¼W,K
R62	" -151	"	150 "
R63	" -152	"	1.5K "
R64	" -121	"	120 "
R65	" -102	"	1K "
R66	" -392	"	3.9K "
R67	" -183	"	18K "
R68	" -332	"	3.3K "
R69	" -222	"	2.2K "

Symbol No.	Part No.	Part Name	Description
R70	QRD143K-121	CR	120 ¼W,K
R71	" -103	"	10K "
R72	QVP4A0B-471	VR	470
R73	QRD143K-102	CR	1K ¼W,K
R74	" -123	"	12K "
R75	QVP4A0B-222	VR	2.2K
R76	QRD143K-392	CR	3.9K ¼W,K
R77	" -123	"	12K "
R78	" -152	"	1.5K "
R79	" -272	"	2.7K "
R80	" -562	"	5.6K "
R81	" -105	"	1M "
R82	" -222	"	2.2K "
R83	" -123	"	12K "
R84	QVP4A0B-472	VR	4.7K
R85	QRD143K-822	CR	8.2K ¼W,K
R86	" -272	"	2.7K "
R87	" -391	"	390 "
R88	" -820	"	82 "
R89	" -330	"	33 "
R90	" -103	"	10K "
R91	" -122	"	1.2K "
R92	" -100	"	10 "
R93	" -390	"	39 "
R94	" -680	"	68 "
R95	QVP4A0B-101	VR	100
R96	QRD143K-561	CR	560 ¼W,K
R97	" -183	"	18K "
R98	" -682	"	6.8K "
R99	" -471	"	470 "
R100	" -122	"	1.2K "
R101	" -681	"	680 "
R102	" -560	"	56 "
R103	" -152	"	1.5K "
R104	" -562	"	5.6K "
R105	QVP4A0B-102	VR	1K
R106	QRD143K-561	CR	560 ¼W,K
R107	" -222	"	2.2K "
R108	" -681	"	680 "
R109	" -273	"	27K "
R110	" -682	"	6.8K "
R111	" -332	"	3.3K "
R112	" -103	"	10K "
R113	" -103	"	10K "
R114	" -123	"	12K "
R115	" -684	"	680K "
R116	" -222	"	2.2K "
R117	" -473	"	47K "
R118	" -473	"	47K "
R119	" -330	"	33 "
R120	" -821	"	820 "
R121	" -271	"	270 "
R122	" -102	"	1K "
R123	" -561	"	560 "
R124	" -180	"	18 "
R125	" -103	"	10K "
R126	" -101	"	100 "
R127	" -271	"	270 "
R128	" -223	"	22K "
R129	QVP4A0B-223	VR	22K
R130	QRD143K-564	CR	560K ¼W,K
R131	" -473	"	47K "
R132	" -561	"	560 "

Symbol No.	Part No.	Part Name	Description
R133	QRD143K-122	CR	1.2K ¼W,K
R134	" -122	"	1.2K "
R135	QVP4A0B-222	VR	2.2K
R136	QRD143K-102	CR	1K ¼W,K
R137	" -102	"	1K "
R138	" -123	"	12K "
R139	" -471	"	470 "
R140	" -182	"	1.8K "
R141	QVP4A0B-222	VR	2.2K
R142	QRD143K-102	CR	1K ¼W,K
R143	" -102	"	1K "
R144	" -103	"	10K "
R145	" -393	"	39K "
R146	" -221	"	220 "
R147	" -152	"	1.5K "
R148	" -182	"	1.8K "
R149	" -562	"	5.6K "
R150	" -562	"	5.6K "
R151	" -152	"	1.5K "
R152	" -221	"	220 "
R153	" -333	"	33K "
R154	" -104	"	100K "
R155	" -682	"	6.8K "
R156	" -272	"	2.7K "
R157	" -104	"	100K "
R158	" -223	"	22K "
R159	" -561	"	560 "
R160	QVP4A0B-222	VR	2.2K
R161	QRD143K-472	CR	4.7K ¼W,K
R162	" -272	"	2.7K "
R163	" -222	"	2.2K "
R164	" -682	"	6.8K "
R165	" -102	"	1K "
R166	—	—	
R167	QRD 143K-102	CR	1K ¼W,K
R168	" -223	"	22K "
R169	" -683	"	68K "
R170	" -332	"	3.3K "
R171	" -182	"	1.8K "
R172	" -102	"	1K "
R173	" -332	"	3.3K "
R174	" -680	"	68 "
R175	" -560	"	56 "
R176	" -222	"	2.2K "
R177	" -562	"	5.6K "
R178	" -272	"	2.7K "
R179	" -153	"	15K "
R180	" -153	"	15K "
R181	" -122	"	1.2K "
R182	" -153	"	15K "
R183	" -101	"	100 "
R184	" -102	"	1K "
R185	" -471	"	470 "
R186	" -103	"	10K "
R187	" -472	"	4.7K "
R188	" -272	"	2.7K "
R189	" -221	"	220 "
R190	" -393	"	39K "
R191	" -393	"	39K "
R192	" -332	"	3.3K "
R193	" -562	"	5.6K "
R194	" -562	"	5.6K "
R195	" -393	"	39K "

Symbol No.	Part No.	Part Name	Description
R196	QRD143K-272	CR	2.7K ¼W,K
C 1	QEW41AA-476	E Cap	47 10V
C 2	QEW41EA-335	"	3.3 25V
C 3	QCS11HK-330	C Cap	33p 50V
C 4	" -471	"	470p "
C 5	" -151	"	150p "
C 6	QEW41AA-476	E Cap	47 10V
C 7	QFM41HK-154	MY Cap	0.15 50V
C 8	QCS11HK-270	C Cap	27p "
C 9	QEW41AA-476	E Cap	47 10V
C10	" -476	"	47 "
C11	" -476	"	47 "
C12	QFM41HK-103	MY Cap	0.01 50V
C13	QEW41AA-107	E Cap	100 10V
C14	QCS11HK-270	C Cap	27p 50V
C15	QEW41CA-107	E Cap	100 16V
C16	QFF42HK-5R0	FM Cap	5p 50V
C17	QEW41AA-107	E Cap	100 10V
C18	QFM41HK-104	MY Cap	0.1 50V
C19	" -103	"	0.01 "
C20	" -333	"	0.033 "
C21	" -103	"	0.01 "
C22	" -104	"	0.1 "
C23	QEW41CA-107	E Cap	100 16V
C24	QCS11HK-470	C Cap	47p 50V
C25	QEW41AA-107	E Cap	100 10V
C26	QFM41HK-223	MY Cap	0.022 50V
C27	QCS11HK-470	C Cap	47p "
C28	QFM41HK-223	MY Cap	0.022 "
C29	" -223	"	0.022 "
C30	" -223	"	0.022 "
C31	QEW41AA-476	E Cap	47 10V
C32	QFM41HK-223	MY Cap	0.022 50V
C33	QCS11HK-220	C Cap	22p "
C34	" -221	"	220p "
C35	QEW41AA-476	E Cap	47 10V
C36	" -107	"	100 "
C37	" -476	"	47 "
C38	" -476	"	47 "
C39	QFM41HK-222	MY Cap	0.0022 50V
C40	QCS11HK-330	C Cap	33p "
C41	" -331	"	330p "
C42	QEW41HA-105	E Cap	1 "
C43	" -105	"	1 "
C44	QEW41AA-476	"	47 10V
C45	QCS11HK-330	C Cap	33p 50V
C46	" -330	"	33p "
C47	QEW41AA-476	E Cap	47 10V
C48	" -107	"	100 "
C49	QEW41HA-105	"	1 50V
C50	QEW41CA-106	"	10 16V
C51	" -106	"	10 16V
C52	QEW41AA-476	"	47 10V
C53	QCS11HK-560	C Cap	56p 50V
C54	" -560	"	56p "
C55	QFM41HK-103	MY Cap	0.01 "
C56	QCS11HK-391	C Cap	390p "
C57	QEW41AA-476	E Cap	47 10V
C58	" -107	"	100 "
C59	QFM41HK-103	MY Cap	0.01 50V
C60	" -223	"	0.022 "
C61	" -103	"	0.01 "

Symbol No.	Part No.	Part Name	Description
C62	QEW41CA-106	E Cap	10 16V
C63	QFM41HK-103	MY Cap	0.01 50V
C64	" -472	"	0.0047 "
C65	QCS11HK-680	C Cap	68p "
C66	QFM41HK-223	MY Cap	0.022 "
C67	QEW41CA-106	E Cap	10 16V
C68	QEW41AA-476	"	47 10V
C69	QCS11HK-101	C Cap	100p 50V
C70	" -221	"	220p "
C71	QFM41HK-103	MY Cap	0.01 "
C72	QEW41HA-105	E Cap	1 "
C73	QEW41AA-476	"	47 10V
C74	QFM41HK-223	MY Cap	0.022 50V
C75	QEW41CA-106	E Cap	10 16V
C76	QCS11HK-220	C Cap	22p 50V
C77	QEW41CA-106	E Cap	10 16V
C78	QFM41AA-223	MY Cap	0.022 50V
C79	QEW41AA-476	E Cap	47 10V
C80	QFM41HK-223	MY Cap	0.022 50V
C81	QCS11HK-100	C Cap	10p "
C82	QEW41HA-105	E Cap	1 "
C83	QFM41HK-103	MY Cap	0.01 "
C84	" -103	"	0.01 "
C85	QEW41AA-476	E Cap	47 10V
C86	QFM41HK-223	MY Cap	0.022 50V
C87	QEW41AA-476	E Cap	47 10V
C88	QAT3001-008	Trimmer Cap	4.5–50p 50V
C89	QFF42HK-390	FM Cap	39p "
C90	QCS11HK-121	C Cap	120p "
C91	" -121	"	120p "
C92	QFM41HK-102	MY Cap	0.001 "
C93	" -103	"	0.01 "
C94	" -103	"	0.01 "
C95	QFS42BK-102	PS Cap	0.001 125V
C96	" -102	"	0.001 "
C97	" -391	"	390 "
C98	" -331	"	330p "
C99	" -102	"	0.001 "
C100	QFM41HK-104	MY Cap	0.1 50V
C101	QEW41AA-476	E Cap	47 10V
C102	QFM41HK-102	MY Cap	0.001 50V
C103	QEW41CA-106	E Cap	10 16V
C104	QFF42HK-330	FM Cap	33p 50V
C105	QAT3001-008	Trimmer Cap	4.5–50p "
C106	QFF42HK-150	FM Cap	15p "
C107	QFM41HK-103	MY Cap	0.01 50V
C108	" -103	"	0.01 "
C109	" -103	"	0.01 "
C110	" -103	"	0.01 "
C111	QCS11HK-5R0	C Cap	5p "
C112	QFM41HK-223	MY Cap	0.022 "
C113	" -102	"	0.001 "
C114	QEW41AA-107	E Cap	100 10V
C115	QFM41HK-102	MY Cap	0.001 50V
C116	QEW41AA-476	E Cap	47 10V
C117	QFM41HK-102	MY Cap	0.001 50V
C118	QEW40JA-477	E Cap	470 6.3V
C119	QFM41HK-102	MY Cap	0.001 50V
C120	" -103	"	0.01 "
C121	QEW41AA-476	E Cap	47 10V
C122	QFM41HK-223	MY Cap	0.022 50V
C123	" -103	"	0.01 "
C124	" -103	"	0.01 "

Symbol No.	Part No.	Part Name	Description
C125	QCS11HK-5R0	C Cap	5p "
C126	QFM41HK-223	MY Cap	0.022 "
C127	QCS11HK-271	C Cap	270p "
C128	" -151	"	150p "
C129	QFM41HK-103	MY Cap	0.01 "
C130	" -472	"	0.0047 "
C131	QEW41AA-476	E Cap	47 10V
C132	QFM41HK-103	MY Cap	0.01 50V
C133	" -103	"	0.01 "
C134	QCS11HK-470	C Cap	47p "
C135	QFM41HK-103	MY Cap	0.01 "
C136	" -102	"	0.001 "
C137	" -102	"	0.001 "
C138	QEW41CA-106	E Cap	10 16V
C139	QCY12HK-681	C Cap	680p 50V
C140	QEW41EA-475	E Cap	4.7 25V
C141	QCY12HK-681	C Cap	680p 50V
C142	QEW41HA-105	E Cap	1 "
C143	QFM41HK-562	MY Cap	0.0056 "
C144	QEW41HA-105	E Cap	1 "
C145	" -105	"	1 "
C146	QEW41AA-476	"	47 10V
C147	QFS42BK-562	PS Cap	0.0056 125V
C148	QEW41AA-107	E Cap	100 10V
C149	QFM41HK-102	MY Cap	0.001 50V
C150	" -103	"	0.01 "
C151	" -103	"	0.01 "
C152	QCS11HK-180	C Cap	18p "
C153	QFM41HK-103	MY Cap	0.01 "
	PU42676	Shield Case	Video Mixing
J 1	PU30766-10	Connector	10 Pins
J 2	" -20	"	20 Pins
	A74017	Tab	P7–12,27,28
	A37563	Fastener	
	PU40734	Test Point	

11-2. FM MODULATOR UNIT

Symbol No.	Part No.	Part Name	Description
	PU42697A	FM Mod. Unit	
	PU30773A	FM Mod. PWB Ass'y	
X 1	2N2369	Transistor	
X 2	"	"	
R 1	QVP4A0B-102	VR	1K
R 2	QRD143K-122	CR	1.2K ¼W,K
R 3	" -122	"	1.2K "
R 4	" -151	"	150 "
R 5	" -331	"	330 "
R 6	" -682	"	6.8K "
R 7	" -682	"	6.8K "
R 8	" -331	"	330 "
R 9	" -181	"	180 "
C 1	PU30767-220	Feed Through Cap	22p 50V
C 2	QFF42HK-560	Film Mica Cap	56p 500V
C 3	" -470	"	47p "
C 4	QAT3001-001	Trimmer Cap	1.7p–10p
C 5	PU30767-102	Feed Through Cap	1000p 50V
C 6	QEW41AA-476	E Cap	47 10V
C 7	PU30767-220	Feed Through Cap	22p 50V
L 1	A04096-100	Peaking Coil	100μH
T 1	PU30769	FM Mod. Transformer	
	PU42674	Shield Case	FM Mod.
	PU42675	Shield Case Cover	
	PU42675-2	Shield Case Cover	

11-3. SOLENOID CONTROL AMPLIFIER

Symbol No.	Part No.	Part Name	Description
	PU42698A	Solenoid Control Amp. Ass'y	
X 1	2SC460C	Transistor	
X 2	2SK30A-0	Field Effect Transistor	
X 3	2SC460C	Transistor	
X 4	"	"	
D 1	IS2473VE	Diode	
D 2	"	"	
D 3	V03C	"	
D 4	IS2473VE	"	
R 1	QRD143K-223	CR	22K ¼W,K
R 2	" -123	"	12K "
R 3	QVP4A0B-474	VR	470K
R 4	QRD143K-124	CR	120K ¼W,K
R 5	" -124	"	120K "
R 6	" -473	"	47K "
R 7	" -102	"	1K "
R 8	" -471	"	470 "
R 9	" -2R2	"	2.2 "
R10	" -2R2	"	2.2 "
R11	" -2R2	"	2.2 "
R12	" -223	"	22K "
C 1	QEW41CA-106	E Cap	10 16V
C 2	QFM41HK-103	MY Cap	0.01 50V
C 3	QEW41CA-107	E Cap	100 16V
C 4	" -106	"	10 "
	PU40734	Test Point	
S10	QSS4301-004	Slide Switch	
	PU42743	Switch Cover	

11-4. REGULATOR CIRCUIT BOARD

Symbol No.	Part No.	Part Name	Description
	PU42699A	Regulator P.W.B. Ass'y	
IC1	EHD-RD3093S	Integrated Circuit	
R 1	QRD143K-221	CR	220 ¼W,K
R 2	" -561	"	560 "
R 3	" -391	"	390 "
R 4	" -105	"	1M "
C 1	QEW41HA-105	E Cap	1 50V
C 2	QFM41HK-102	MY Cap	0.001 "
C 3	QEW41AA-107	E Cap	100 10V
TP1	PU40734	Test Point	
	QSS0005-002	Slide Switch	

11-5. AUDIO & SERVO CIRCUIT BOARD

Symbol No.	Part No.	Part Name	Description
	PU42693A	Audio & Servo P.W.B. Ass'y	
IC 1	6A753	Integrated Circuit	
IC 2	"	"	
IC 3	VC2011	"	
IC 4	BA308	"	
IC 5	"	"	
IC 6	TA7114MLF	"	
IC 7	AN301	"	
IC 8	BA308	"	
IC 9	MN115	"	
IC10	M53200P	"	
IC11	DN805	"	
IC12	BA308	"	
IC13	"	"	
IC14	TA7114MLF	"	
X 1	2SC732BL	Transistor	
X 2	"	"	
X 3	2SC460C	"	
X 4	"	"	
X 5	2SA564Q	"	
X 6	"	"	
X 7	"	"	
X 8	2SC460C	"	
X 9	2SA564Q	"	
X10	"	"	
X11	2SK30A-0	Field Effect Transistor	
X12	2SC732BL	Transistor	
X13	2SK30A-0	Field Effect Transistor	
X14	2SC460C	Transistor	
X15	2SC732BL	"	
X16	2SA564Q	"	
X17	2SC460C	"	
X18	2SK30A-0	Field Effect Transistor	
X19	2SA564Q	Transistor	
X20	2SK30A-0	Field Effect Transistor	
X21	2SC460C	Transistor	
X22	2SC732BL	"	
X23	2SC460C	"	
X24	2SC732BL	"	
X25	2SA564Q	"	
X26	2SC460C	"	
X27	2SK30A-0	Field Effect Transistor	
X28	2SC460C	Transistor	
X29	2SA564Q	"	
X30	2SC460C	"	
X31	"	"	
X32	2SC968P-2 or 2SC968P-3		
X33	"	"	
	GK242259	Spacer for X32, X33	
D 1	IS2473VE	Diode	
D 2	"	"	

Symbol No.	Part No.	Part Name	Description
D 3	IS2473VE	Diode	
D 4	"	"	
D 5	"	"	
D 6	"	"	
D 7	"	"	
D 8	"	"	
D 9	"	"	
D10	"	"	
D11	"	"	
D12	"	"	
D13	"	"	
D14	"	"	
D15	"	"	
D16	"	"	
D17	"	"	
D18	"	"	
D19	"	"	
D20	"	"	
D21	"	"	
D22	"	"	
D23	"	"	
D24	"	"	
D25	"	"	
D26	IS1007	"	
D27	IS2473VE	"	
D28	IS1007	"	
D29	"	"	
D30	"	"	
D31	IS2473VE	"	
D32	"	"	
D33	"	"	
D34	"	"	
D35	IS2473	"	
D36	"	"	
TH1	SDT-200	Thermistor	
TH2	"	"	
TH3	5T-33	"	
Y 1	PU30789	Crystal	31.468KHz
	PU40051	Rubber Band	for Y1
	GA40086	Holder	for Y1
	SPSP2608N	Screw	for Y1
	WNS2600N	Washer	for Y1
	WLS2600N	Lock Washer	for Y1
	NNB2600N	Nut	for Y1
S 3	QSS9201-101	Slide Switch	
S 4	" -101	"	
T 1	PU45162	Output Transformer	
T 2	PU30137	OSC Transformer	
L 1	A04096-68	Peaking Coil	68μH
L 2	" -68	"	"
L 3	" -220	"	220μH
L 4	" -10	"	10μH
L 5			
L 6	A04096-100	Peaking Coil	100μH
L 7	" -220	"	220μH
L 8	" -1000	"	1mH
L 9	" -1000	"	1mH

Symbol No.	Part No.	Part Name	Description
L10	A04096-1200	Peaking Coil	1.2mH
L11	" -100	"	100μH
L12	PU40010-102	"	1mH
L13	PU30138	Dummy Coil	
LPF1	PU30768	Low Pass Filter	
R 1	QRD143K-333	CR	33K ¼W,K
R 2	" -101	"	100 "
R 3	" -333	"	33K "
R 4	" -101	"	100 "
R 5	QVP4A0B-102	VR	1K
R 6	QRD143K-683	CR	68K ¼W,K
R 7	" -103	"	10K "
R 8	" -222	"	2.2K "
R 9	" -821	"	820 "
R10	" -682	"	6.8K "
R11	" -121	"	120 "
R12	" -102	"	1K "
R13	" -102	"	1K "
R14	" -102	"	1K "
R15	" -473	"	47K "
R16	" -473	"	47K "
R17	" -223	"	22K "
R18	" -223	"	22K "
R19	" -273	"	27K "
R20	" -273	"	27K "
R21	" -333	"	33K "
R22	" -271	"	270 "
R23	" -271	"	270 "
R24	" -222	"	2.2K "
R25	" -472	"	4.7K "
R26	" -473	"	47K "
R27	" -473	"	47K "
R28	" -563	"	56K "
R29	" -473	"	47K "
R30	" -564	"	560K "
R31	" -332	"	3.3K "
R32	" -124	"	120K "
R33	" -330	"	33 "
R34	" -154	"	150K "
R35	QRC121K-226	Comp. R	22M ½W,K
R36	" -226	"	22M "
R37	QRD143K-103	CR	10K ¼W,K
R38	" -103	"	10K "
R39	" -224	"	220K "
R40	" -475	"	4.7M "
R41	" -105	"	1M "
R42	" -105	"	1M "
R43	" -104	"	100K "
R44	" -103	"	10K "
R45	" -223	"	22K "
R46	QVP4A0B-104	VR	100K
R47	QRD143K-184	CR	180K ¼W,K
R48	" -103	"	10K "
R49	" -682	"	6.8K "
R50	" -223	"	22K "
R51	" -103	"	10K "
R52	" -681	"	680 "
R53	" -471	"	470 "
R54	" -154	"	150K "
R55	" -103	"	10K "

Symbol No.	Part No.	Part Name	Description
R56	QRD143K-103	CR	10K ¼W,K
R57	" -564	"	560K "
R58	" -103	"	10K "
R59	" -105	"	1M "
R60	" -683	"	68K "
R61	" -154	"	150K "
R62	—	—	
R63	QVP4A0B-103	VR	10K
R64	QRD143K-473	CR	47K ¼W,K
R65	" -105	"	1M "
R66	" -682	"	6.8K "
R67	" -102	"	1K "
R68	" -102	"	1K "
R69	" -152	"	1.5K "
R70	" -564	"	560K "
R71	" -103	"	10K "
R72	" -103	"	10K "
R73	" -103	"	10K "
R74	" -103	"	10K "
R75	QVP4A0B-473	VR	47K
R76	QRD143K-123	CR	12K ¼W,K
R77	" -823	"	82K "
R78	QVP4A0B-473	VR	47K
R79	QRD143K-563	CR	56K ¼W,K
R80	" -472	"	4.7K "
R81	" -473	"	47K "
R82	" -222	"	2.2K "
R83	" -223	"	22K "
R84	" -682	"	6.8K "
R85	" -183	"	18K "
R86	" -122	"	1.2K "
R87	" -822	"	8.2K "
R88	" -393	"	39K "
R89	QVP4A0B-223	VR	22K
R90	QRD143K-682	CR	6.8K ¼W,K
R91	" -223	"	22K "
R92	" -124	"	120K "
R93	" -103	"	10K "
R94	" -561	"	560 "
R95	" -471	"	470 "
R96	" -223	"	22K "
R97	" -103	"	10K "
R98	" -473	"	47K "
R99	" -683	"	68K "
R100	" -472	"	4.7K "
R101	" -472	"	4.7K "
R102	" -682	"	6.8K "
R103	" -821	"	820 "
R104	" -332	"	3.3K "
R105	" -392	"	3.9K "
R106	" -103	"	10K "
R107	" -103	"	10K "
R108	" -103	"	10K "
R109	" -561	"	560 "
R110	" -102	"	1K "
R111	" -103	"	10K "
R112	" -103	"	10K "
R113	" -272	"	2.7K "
R114	" -331	"	330 "
R115	" -272	"	2.7K "
R116	" -561	"	560 "
R117	" -104	"	100K "

Symbol No.	Part No.	Part Name	Description
R118	QRD143K-333	CR	33K ¼W,K
R119	" -393	"	39K "
R120	" -272	"	2.7K "
R121	" -223	"	22K "
R122	" -473	"	47K "
R123	" -221	"	220 "
R124	" -102	"	1K "
R125	" -221	"	220 "
R126	" -822	"	8.2K "
R127	" -683	"	68K "
R128	" -154	"	150K "
R129	" -332	"	3.3K "
R130	" -154	"	150K "
R131	QVP4A0B-103	VR	10K
R132	QRD143K-153	CR	15K ¼W,K
R133	" -270	"	27 "
R134	" -820	"	82 "
R135	" -333	"	33K "
R136	" -682	"	6.8K "
R137	" -561	"	560 "
R138	" -271	"	270 "
R139	" -331	"	330 "
R140	" -561	"	560 "
R141	" -222	"	2.2K "
R142	" -103	"	10K "
R143	" -102	"	1K "
R144	" -102	"	1K "
R145	" -150	"	15 "
R146	" -150	"	15 "
R147	QVP4A0B-104	VR	100K
R148	QRD143K-473	CR	47K ¼W,K
R149	" -683	"	68K "
R150	" -563	"	56K "
R151	" -473	"	47K "
R152	" -154	"	150K "
R153	" -103	"	10K "
R154	" -103	"	10K "
C 1	QFM41HK-103	MY Cap	0.01 50V
C 2	QEW41HA-105	E Cap	1 "
C 3	QFM41HK-103	MY Cap	0.01 "
C 4	" -103	"	0.01 "
C 5	" -103	"	0.01 "
C 6	QEW41HA-105	E Cap	1 "
C 7	QFM41HK-103	MY Cap	0.01 "
C 8	" -103	"	0.01 "
C 9	" -103	"	0.01 "
C10	QCS11HK-121	C Cap	120p "
C11	QEW41AA-476	E Cap	47 10V
C12	QFM41HK-103	MY Cap	0.01 50V
C13	" -103	"	0.01 "
C14	" -103	"	0.01 "
C15	" -103	"	0.01 "
C16	" -393	"	0.039 "
C17	QFM71HK-473	"	0.047 "
C18	QEW41CA-106	E Cap	10 16V
C19	QEW41AA-107	"	100 10V
C20	QFM41HK-473	MY Cap	0.047 50V
C21	" -103	"	0.01 "
C22	PU41618-2	T Cap	4.7 16V
C23	"	"	4.7 "
C24	QFM41HK-273	MY Cap	0.027 50V

Symbol No.	Part No.	Part Name	Description
C25	QFM71HK-224	MY Cap	0.22 50V
C26	QEW41CA-106	E Cap	10 16V
C27	QFM41HK-473	MY Cap	0.047 50V
C28	" -104	"	0.1 "
C29	QCS11HK-560	C Cap	56p "
C30	QFM41HK-563	MY Cap	0.056 "
C31	PU41618-4	T Cap	22 16V
C32	"	"	22 "
C33	QEW41AA-107	E Cap	100 10V
C34	QFM41HK-223	MY Cap	0.022 50V
C35	" -103	"	0.01 "
C36	QFM41HK-102	"	0.001 "
C37	QEW41CA-106	E Cap	10 16V
C38	QFM41HK-392	MY Cap	0.0039 50V
C39	QEW41HA-105	E Cap	1 "
C40	QCS11HK-221	C Cap	220p "
C41	QEW41AA-476	E Cap	47 10V
C42	QFM41HK-104	MY Cap	0.1 50V
C43	QEW41HA-105	E Cap	1 "
C44	QFM41HK-273	MY Cap	0.027 "
C45	" -683	"	0.068 "
C46	QEW41HA-105	E Cap	1 "
C47	QFM71HK-154	MY Cap	0.15 "
C48	QEW41HA-105	E Cap	1 "
C49	QFM41HK-103	MY Cap	0.01 "
C50	" -103	"	0.01 "
C51	" -103	"	0.01 "
C52	QEW41AA-107	E Cap	100 10V
C53	QFM41HK-104	MY Cap	0.1 50V
C54	QEW41CA-106	E Cap	10 16V
C55	QFM41HK-103	MY Cap	0.01 50V
C56	" -153	"	0.015 "
C57	QEW41AA-107	E Cap	100 10V
C58	QFM71HK-154	MY Cap	0.15 50V
C59	QEW41CA-106	E Cap	10 16V
C60	QFM41HK-472	MY Cap	0.0047 50V
C61	" -683	"	0.068 "
C62	QEW41CA-106	E Cap	10 16V
C63	QFM41HK-152	MY Cap	0.0015 50V
C64	" -102	"	0.001 "
C65	QEW41AA-476	E Cap	47 10V
C66	PU41618-2	T Cap	4.7 16V
C67	QFM41HK-103	MY Cap	0.01 50V
C68	" -223	"	0.022 "
C69	" -562	"	0.0056 "
C70	" -103	"	0.01 "
C71	QEW41AA-476	E Cap	47 10V
C72	QEW41EA-475	"	4.7 25V
C73	QCS11HK-331	C Cap	330p 50V
C74	QEW41CA-106	E Cap	10 16V
C75	QEW41AA-227	"	220 10V
C76	QEW40JA-227	"	220 6.3V
C77	QEW41AA-227	"	220 10V
C78	QEW40JA-227	"	220 6.3V
C79	QCS11HK-471	C Cap	470p 50V
C80	QEW41CA-106	E Cap	10 16V
C81	QCS11HK-121	C Cap	120p 50V
C82	QEW41AA-476	E Cap	47 10V
C83	QEW41CA-106	"	10 16V
C84	QFM41HK-223	MY Cap	0.022 50V
C85	QEW41AA-107	E Cap	100 10V
C86	QEW41CA-106	"	10 16V

Symbol No.	Part No.	Part Name	Description
C87	QFM41HK-102	MY Cap	0.001 50V
C88	" -102	"	0.001 "
C89	QEW41AA-476	E Cap	47 10V
C90	QEW41CA-476	"	47 16V
C91	QCS11HK-270	C Cap	27p 50V
C92	QEW41AA-476	E Cap	47 10V
C93	QEW41CA-106	"	10 16V
C94	QFM41HK-392	MY Cap	0.0039 50V
C95	" -472	"	0.0047 "
C96	QEW41CA-106	E Cap	10 16V
C97	QFM41HK-392	MY Cap	0.0039 50V
C98	QEW41CA-107	E Cap	100 16V
C99	QFM41HK-153	MY Cap	0.015 50V
C100	" -103	"	0.01 "
C101	" -103	"	0.01 "
C102	QFP32XK-682	PP Cap	0.0068 125V
C103	QFM41HK-102	MY Cap	0.001 50V
C104	QFF42HK-151	FM Cap	150p 50V
C105	QEW41CA-106	E Cap	10 16V
C106	QEW41AA-107	"	100 10V
	PU42672	Shield Case	For Pre Amp
	PU42673	"	Shield Case Ass'y
	PU42734	Spacer	Shield Case Ass'y PU42735A
	PU42671	Shield Case	
	PU42732	Spacer	Shield Case Ass'y PU42733A
	PU30766-10	Connector	10 Pin(J3–6)
	PU30765-20	Connector Housing	20 Pin(P2)
	A74107	Tab	
	A37563	Fastener	
	A37563	Test Point	

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