

**Panasonic**

**SERVICE MANUAL**

**MODEL NV-3160**



**MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.**

# Service Manual

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Color Electronic Editing  
Video Tape Recorder

## NV-3160

### SPECIFICATIONS

Power Source:	AC 120 V, 60 Hz.
Power Consumption:	Approx. 95 W
Video Recording System:	2 rotary heads, Helical scanning, EIAJ #1 B & W/Color standards, NTSC standard (525 lines, 60 fields, 2:1 perfect interlaced)
Video Modulation System:	Both sideband FM
Tape Speed:	7.5 i.p.s.
Reel Size:	7 inches max.
Tape Width:	1/2 inch
Heads:	Video: 2 rotary heads Audio/control head: 1 stationary Erase head: 1 flying head for video erasing 1 stationary head for audio dubbing 1 stationary head for full track erasing
Recording Time:	60 min or more with NV-P71 90 min or more with NV-P79H
Horizontal Resolution: (on monoscope test pattern)	B/W: More than 300 lines (with Normal Tape) More than 350 lines (with High Density Tape) Color: More than 240 lines (with Normal Tape) More than 250 lines (with High Density Tape)
Frequency Response:	Video: Greater than 3 MHz. (with Normal Tape) Greater than 4 MHz. (with High Density Tape) Audio: 50~12,000 Hz. $\pm 3$ dB
Signal-to-Noise Ratio:	Video: More than 40 dB (with Normal Tape) More than 45 dB (with High Density Tape) Audio: More than 42 dB
Input Level:	Video: VTR-Monitor connector; min. 0.5 Vp-p UHF-type connector; 0.5 Vp-p~2.0 Vp-p V sync; 2 Vp-p or more negative pulse Audio: VTR-Monitor connector; min. -25 dB MIC; min. -72 dB AUX; min. -25 dB
Input Impedance:	Video: VTR-Monitor connector; 75 $\Omega$ UHF-type connector; 75 $\Omega$ V sync; 10 K $\Omega$ Audio: VTR-Monitor connector 220 K $\Omega$ MIC; 600 $\Omega$ ~20 K $\Omega$ AUX; 220 K $\Omega$



Output Level:	Video: VTR-Monitor connector; 1.0 Vp-p UHF-type connector; 1.0 Vp-p V sync; 8 Vp-p negative pulse Audio: VTR-Monitor connector; 1.0 Vrms Line out; 1.0 Vrms Headphone; 25 mVrms
Output Impedance:	Video: VTR-Monitor; 75 $\Omega$ UHF-type connector; 75 $\Omega$ V sync; 75 $\Omega$ Audio: VTR-Monitor connector; 300 $\Omega$ or less Line out; 300 $\Omega$ or less Headphone; 8 $\Omega$
Operating Temperature:	41°F~104°F
Operating Humidity:	35%~80%
Slow Motion Speed:	Approx. 0~1/5 of normal speed
Dimensions:	16-21/32" (W) $\times$ 11-7/16" (H) $\times$ 17-31/32" (D)
Weight:	Approx. 49.9 lbs.
Standard Accessories:	1 AC power cord, VJA33 1 7" empty reel, NV-R71 1 VTR-monitor connection cable, VJA54H 1 Splicing tape, VFS1 1 Head cleaner, VFK27

These specifications and appearance are subject to change in order to accommodate improvement in design.

**Panasonic**

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## INTRODUCTION

*Panasonic capstan servo electronic editing color video tape recorder Model NV-3160 conforms to EIAJ #1 b/w and color standards.*

*The head drum/capstan servo systems and the precision inscribed tape path on the head drum assure perfect interchangeability between the any EIAJ standard VTR.*

*Panasonic NV-3160 has many features; entire electronic editing (Insert & Assembly editing) with flying erase head (Field-by-field erase), slow motion (0~1/5 of normal tape speed), still framing, audio dubbing facilities, input video signal pre-check function by level meter in editing, three motor tape drive system (head drum motor, capstan motor, slow motor).*

*And then, Panasonic NV-3160 can be used the high density tape (NV-P79H) to obtain extra high quality performance.*

*The up-to-date electronic engineering and mechanism design and the plug-in circuit board are employed in the NV-3160 for best reliability, durability, easy operation and fast and easy servicing.*

*This service manual offers the informations including circuit explanation, adjustment procedure, replacement part list, exploded view and circuit diagram for engineering service, repairing and replacement part order of NV-3160.*

## FEATURES

1. EIAJ #1 b/w and color standards video tape recorder
2. Precision inscribed tape path on head drum insures 100% interchangeability with all Panasonic NV-3000 series VTRs and the same standard VTRs.
3. Capstan servo electronic editing with the flying erase head (field by field erasing) for insert and assemble editing.
4. Sync mode (Internal (Line)/external/input video) is selectable and sync input/output connectors are provided to control other NV-3160 units, etc.
5. Video only editing is possible by flying video track erase head.
6. Audio dubbing, slow motion and stop action facilities.
7. Not only standard video tape but also high density video tape are usable for optimum performance.
8. Three motor (head drum motor, capstan motor, slow motor) drive system for more accurate control.
9. Input video signal level can be checked by level meter even in play or stop mode in preparation for editing.
10. HPF™ video heads provide high S/N ratio, high quality pictures.
11. Two camera inputs and a TV input are equipped for various recording sources and can be switched on the front control panel.

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# MAJOR OPERATING COMPONENTS & THEIR FUNCTIONS

TOP

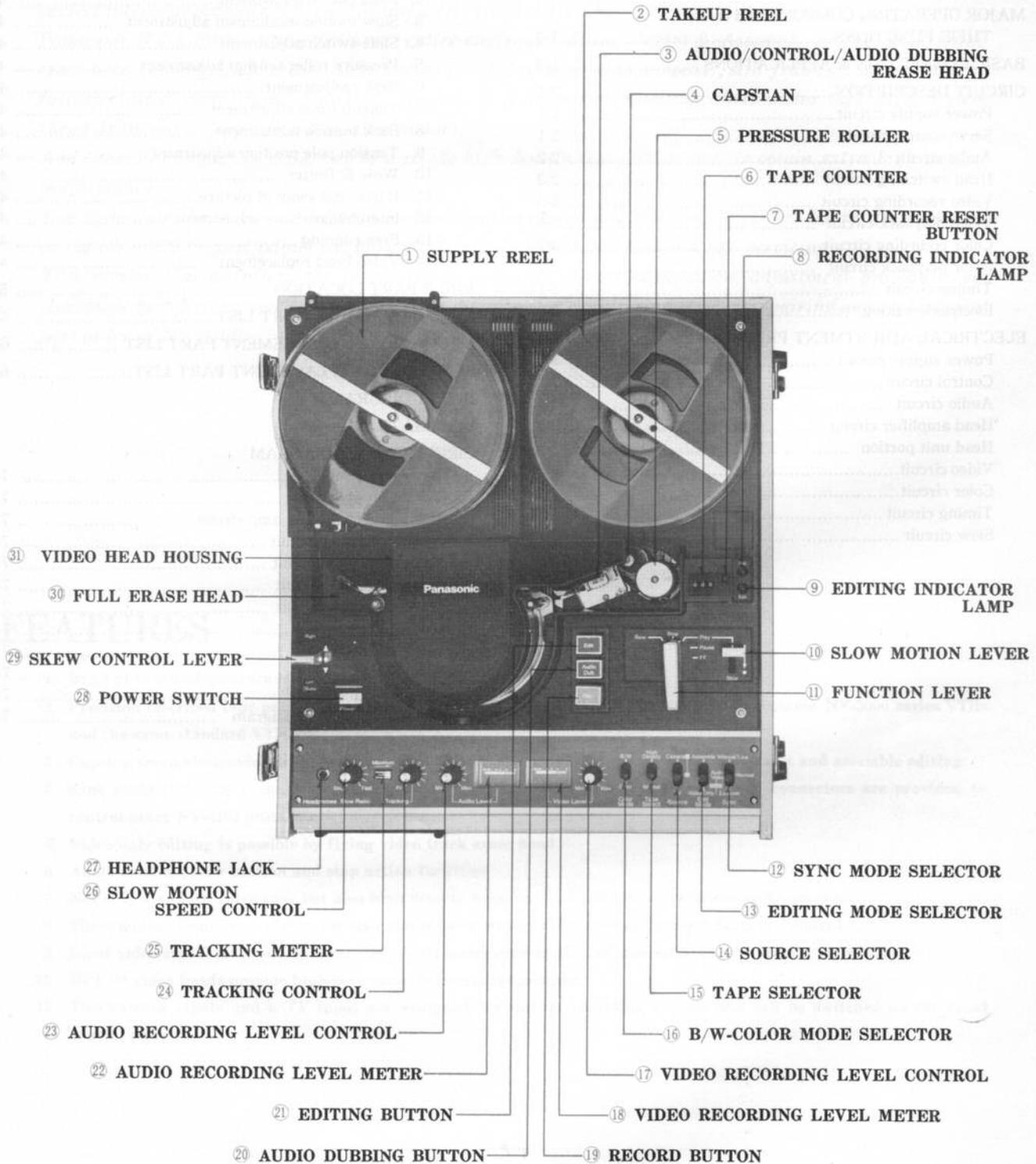


Fig. 1

- ① **SUPPLY REEL**
- ② **TAKEUP REEL**
- ③ **AUDIO/CONTROL/AUDIO DUBBING ERASE HEAD**
- ④ **CAPSTAN**
- ⑤ **PRESSURE ROLLER**
- ⑥ **TAPE COUNTER**  
This tape counter indicates the relative point of the tape and may be used for the future reference to the program recorded on the tape.
- ⑦ **TAPE COUNTER RESET BUTTON**  
Depress this button, and the tape counter resets to "000".
- ⑧ **RECORDING INDICATOR LAMP**  
Lights up when the record button is pressed.
- ⑨ **EDITING INDICATOR LAMP**  
Lights up when the editing button is pressed.
- ⑩ **SLOW MOTION LEVER**  
To reproduce a slow motion picture, turn the function lever to play mode, and then move the slow motion lever in the arrowed direction until it gets locked.
- ⑪ **FUNCTION LEVER**
- ⑫ **SYNC MODE SELECTOR**  
Use this selector to select the reference signal (sync signal) of control circuit among three types of signals: external, internal (power line) and incoming video.  
During recording, the unit is controlled with the vertical sync of the input video signal.
- ⑬ **EDITING MODE SELECTOR**  
Use this selector to select assembly editing or insert editing. Two types of insert editing can be selected; Audio/Video or Video only.
- ⑭ **SOURCE SELECTOR**  
Selects the TV-monitor (connected with the TV Monitor connector) or the CCTV camera (connected with the CCTV Camera Input Connector (1) or (2)) as a recording source.
- ⑮ **TAPE SELECTOR**  
Normal:  
Set to this position when ordinary tape (Coercivity HC350 Oe or less: -Fe<sub>2</sub>O<sub>3</sub>, etc.) is used.  
High-density:  
Set to this position when high-density tape (Coercivity HC350~550 Oe: CrO<sub>2</sub>, etc.) is used.
- ⑯ **B/W-COLOR MODE SELECTOR**  
COLOR:  
Set to this position when recording or playing back a color image.  
B/W:  
Set to this position when recording or playing back a black-and-white image.

- ⑰ **VIDEO RECORDING LEVEL CONTROL**  
Turn this control to adjust the video recording level while referring to the level meter. Adjust the recording level at 0 VU.
- ⑱ **VIDEO RECORDING LEVEL METER**  
This meter indicates the recording level and also the video input level in all modes as long as video input signal is applied.
- ⑲ **RECORD BUTTON**  
By pressing this button, both video and audio recording level can be checked without running the tape.  
To start recording, turn the function lever to play mode while holding the record button down.
- ⑳ **AUDIO DUBBING BUTTON**  
To replace the audio recording with another, press this button and record while playing back the pre-recorded tape.
- ㉑ **EDITING BUTTON**  
To make editing (picture and sound), simply push this button while playing back the tape.  
The prerecorded program will automatically be erased and replaced by the new recording materials.
- ㉒ **AUDIO RECORDING LEVEL METER**  
Indicates audio recording level.
- ㉓ **AUDIO RECORDING LEVEL CONTROL**  
Controls the audio recording level.  
Should be adjusted so that the Recording Level Meter needle peaks exactly in the red zone.
- ㉔ **TRACKING CONTROL**  
Turn this control to remove any tracking noise in the picture which may appear when the tape recorded on another recorder is played back.  
Can be turned to the FIX position for tape recorded and played back on this unit.
- ㉕ **TRACKING METER**  
Indicates when tracking control has been adjusted properly by maximum needle deflection.
- ㉖ **SLOW MOTION SPEED CONTROL**  
Controls the speed of the tape in the slow motion mode. The speed is variable from stop to 1/4 of the normal speed.
- ㉗ **HEADPHONE JACK**  
Output signal of audio can be heard from this jack by using headphone.
- ㉘ **POWER SWITCH**
- ㉙ **SKEW CONTROL LEVER**  
Playback image distortion in the upper portion of the monitor screen can be eliminated by adjusting this control.
- ㉚ **FULL ERASE HEAD**
- ㉛ **VIDEO HEAD HOUSING**

## REAR PANEL

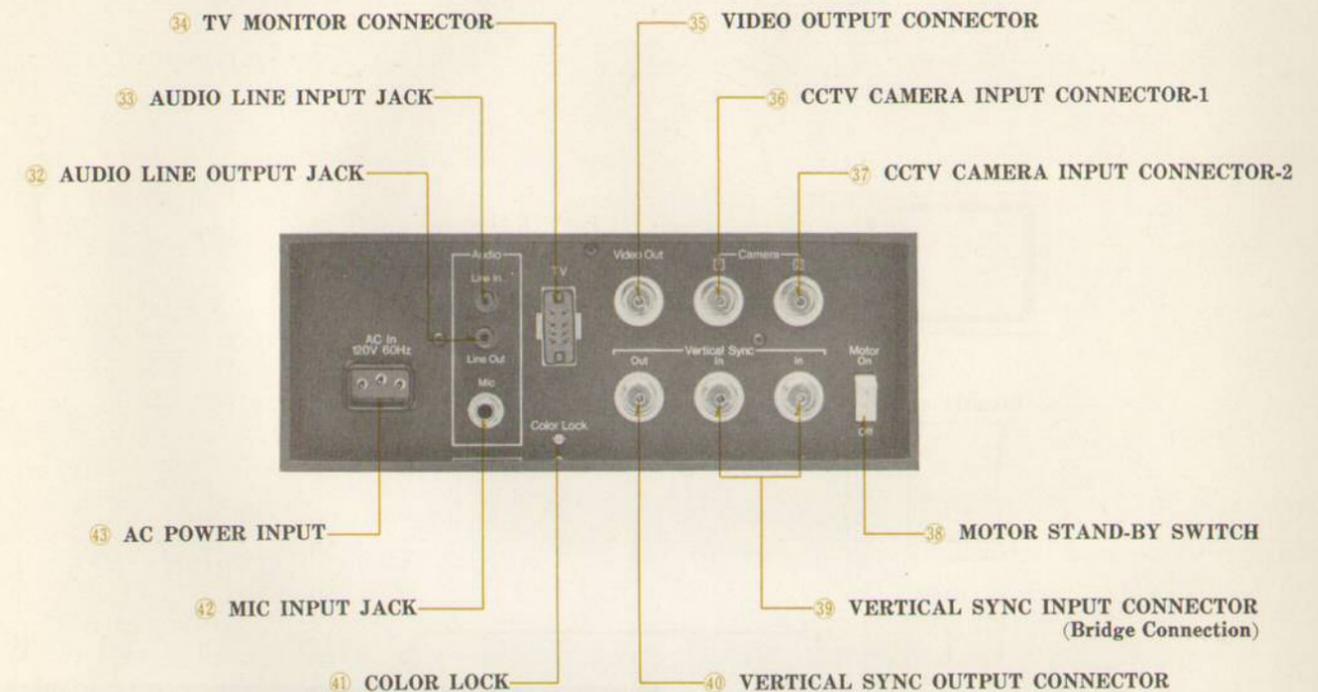


Fig. 2

- ⑳ **AUDIO LINE OUTPUT JACK**  
For connection with an audio input jack on a TV-monitor, an external power amplifier, or a speaker system.
- ㉑ **AUDIO LINE INPUT JACK**  
For direct recording from auxiliary sound source, such as radio tuner, hi-fi system, audio tape recorder, etc.  
\* When using this recording method, make sure that the volume control of the external sound source is set at a low level.  
Over-driving this input may result in damage to the preamplifier circuit.
- ㉒ **TV MONITOR CONNECTOR**  
For connection with a monitor TV using the attached 8-pin VTR-Monitor TV connection cable (VJA54H).
- ㉓ **VIDEO OUTPUT CONNECTOR**  
For playback on an extra TV monitor or supplying the output signal to other equipment.
- ㉔ **CCTV CAMERA INPUT CONNECTOR-1**
- ㉕ **CCTV CAMERA INPUT CONNECTOR-2**  
For connection with the video output connector on a CCTV Camera.
- ㉖ **MOTOR STAND-BY SWITCH**  
The motor stand-by switch is designed to start the head motor even if the function lever is in stop mode. To start the motor, press the record button and turn on the motor stand-by switch.
- ㉗ **VERTICAL SYNC INPUT CONNECTOR (Bridge Connection)**  
Accepts negative vertical sync signal.
- ㉘ **VERTICAL SYNC OUTPUT CONNECTOR**  
Supplies a negative vertical sync signal.
- ㉙ **COLOR LOCK**  
To control hue of playback picture to obtain correct color.
- ㉚ **MIC INPUT JACK**  
For connection with a microphone (optional).
- ㉛ **AC POWER INPUT**  
For connection with a AC power cord (VJA33).

# BASIC CONNECTIONS & APPLICATIONS

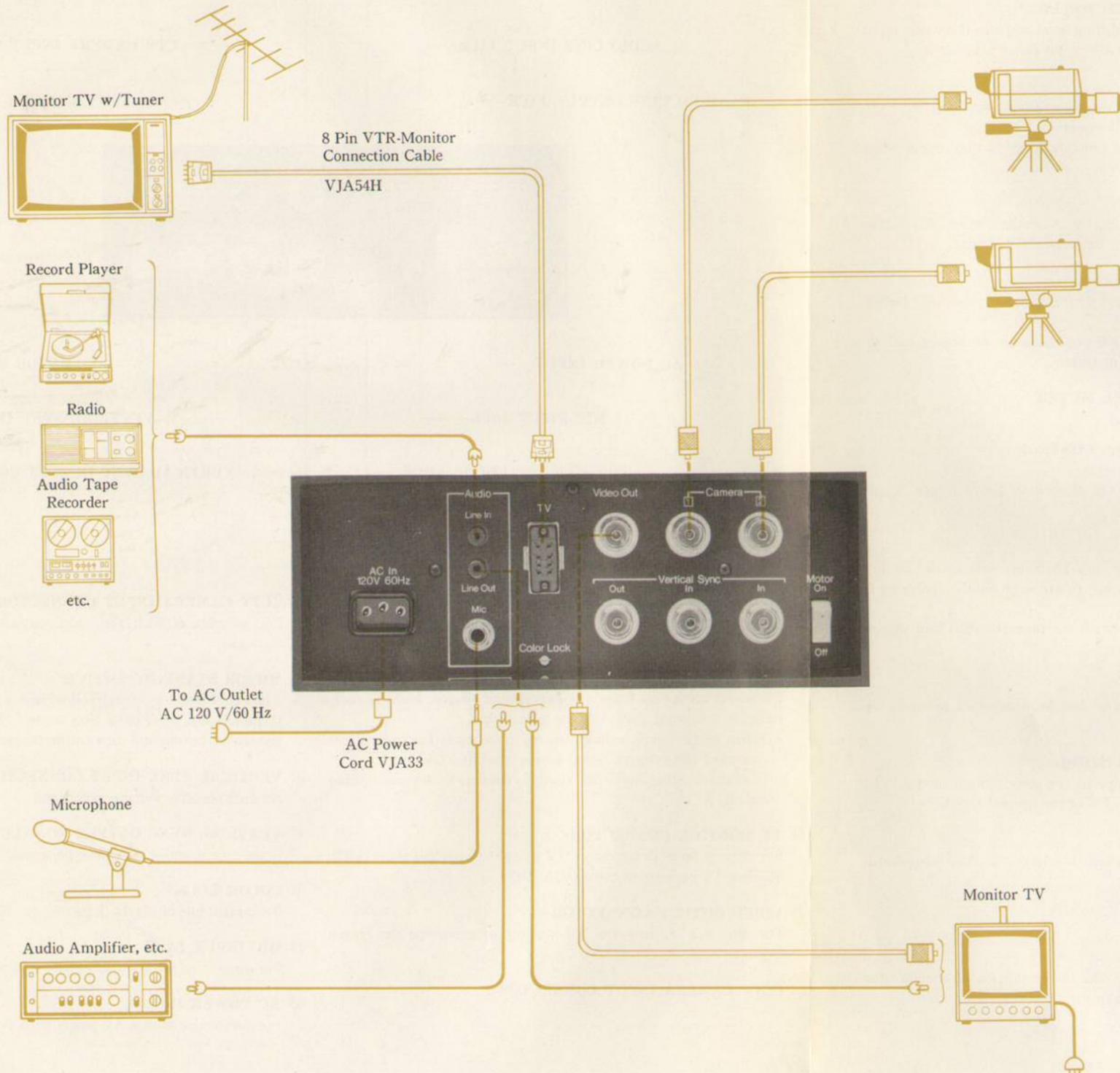


Fig. 3

## SYNC MODE SELECTOR

The Sync Mode Selector is provided to select the reference signal (V. sync signal) of the control circuit in order to accomplish entire electronic editing.

There are, on the rear jack panel, two "Vertical Sync In" connectors for external sync signal input, and one "Sync Out" connector for output of internal sync generator.

An 8 Vp-p, negative pulse is constantly fed out from the "Vertical Sync Out" connector. This pulse is synchronized with the power line.

The same type of negative pulse from other NV-3160 or a sync generator, etc., can be connected to the "Vertical Sync In" connector. (Because the two "Sync In" connectors are bridged, they can be used as relay terminals.)

When the Sync Mode Selector of the NV-3160 is set to the "External" position, the unit is controlled with the external vertical sync which is supplied at the "Vertical Sync In" connector.

When set to the "Internal" position, the unit is controlled with the internal sync generator (power line.)

When set to the "Normal" position, the unit is controlled with the input video signals.

Notes:

1. However the unit will become controlled with the internal power line automatically if there is no input video signal when the selector is set to the "Normal" position.
2. When the selector is set to the "External" position and there is no external vertical sync, the unit will become controlled with the input video signal. And, furthermore, if there is no input video signal, the unit will become controlled with the internal power line.

Fig. 4 and fig. 5 show examples of this operation.

Fig. 4 shows an example of tape-to-tape dubbing which is made from three slave decks to the master deck. The "Vertical Sync Out" connector of the master deck should be connected to the "Vertical Sync In" connectors of the first slave deck. The "Vertical Sync In" connector of the first slave deck should be connected to the "Vertical Sync In" connector of the second one, and so on. (At this time, of the two "Vertical Sync In" connectors of the slave shown in the figure, one is used merely as the relay terminal.) Set the sync mode selector of the master deck to "Internal", and the sync mode selector of the slave decks to "External". This will synchronize the 3 slave decks with the internal line of the master deck.

The broken lines in the figure are the sync signal, and the solid lines are the video signal.

Fig. 5 shows a combination with the sync generator in order to edit from one camera and two slave decks to the master deck.

In this instance, the Sync Mode Selector of both the slaves and the master should be set to the "External" position.

This will synchronize all units by the vertical sync signal of the sync generator. The camera will, of course, be synchronized. In this way, therefore, entire and clear editing can be accomplished.

Other connections when editing are shown in figures. 6 and 7.

# APPLICATIONS-1

VTR to VTR synchronized editing

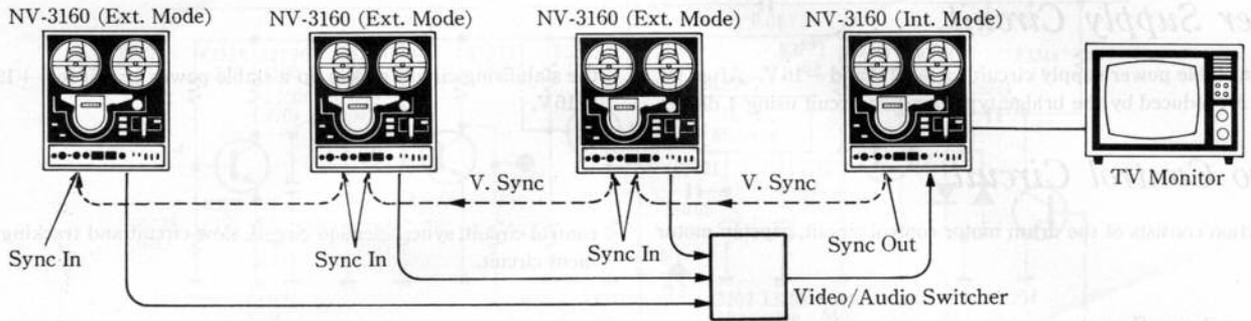


Fig. 4

# APPLICATIONS-2

Camera and prerecorded tape with synchronized editing

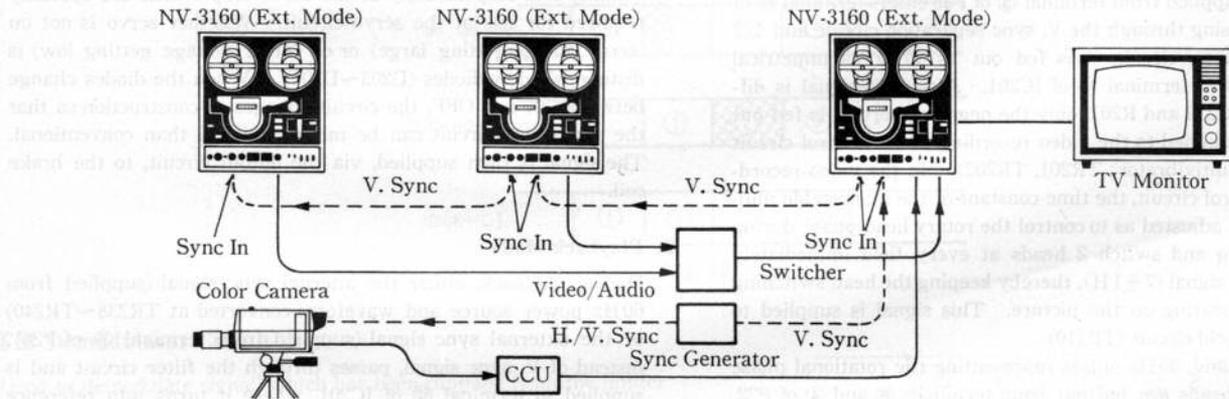


Fig. 5

# APPLICATIONS-3

Camera and prerecorded tapes with synchronized editing

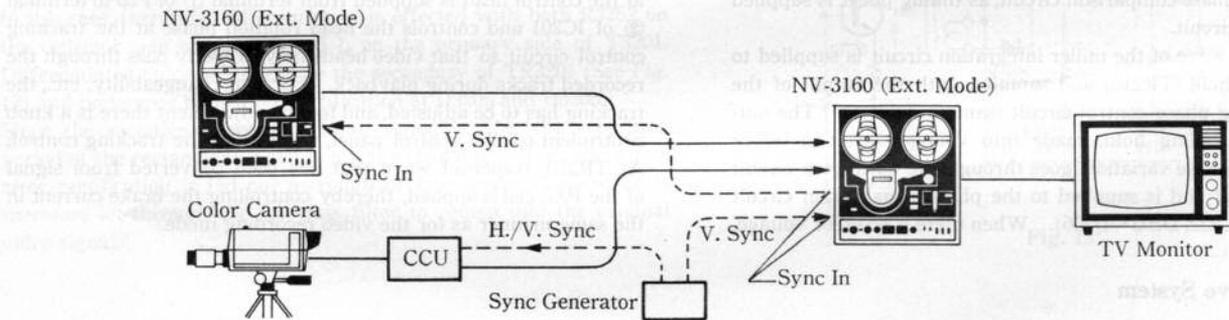


Fig. 6

# APPLICATIONS-4

Program production

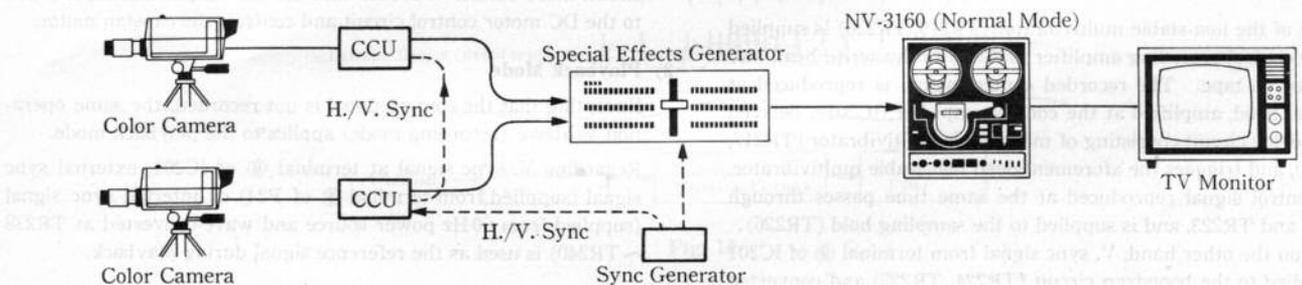


Fig. 7

# CIRCUIT DESCRIPTIONS

## Power Supply Circuit

This is a stable power supply circuit for +12V and -16V. After DC voltage is produced by the bridge type rectifier circuit using 4 diodes,

the stabilizing circuit makes up a stable power circuit for +12V and -16V.

## Servo Control Circuit

This section consists of the drum motor control circuit, capstan motor

control circuit, sync. selection circuit, slow circuit and tracking adjustment circuit.

### 1. Drum Servo System

#### 1) Recording Mode

As reference signal for the servo circuit, V. sync. signal of video signal to be recorded is utilized.

Video signal supplied from terminal ③ of P25 enters terminal ⑩ of IC201, and passing through the V. sync separation circuit and 1/2 frequency-dividing circuit, it is fed out as 30Hz asymmetrical wave from out of terminal ⑩ of IC201. After this signal is differentiated at C212 and R202, only the negative portion is fed out by D201 and supplied to the video recording phase control circuit (monostable multivibrator; TR201, TR202). In the video recording phase control circuit, the time constant of the monostable multivibrator is so adjusted as to control the rotary head phase during video recording and switch 2 heads at every field immediately before V. sync signal ( $7 \pm 1$  H), thereby keeping the head switching noise from appearing on the picture. This signal is supplied to the sampling hold circuit (TR210).

On the other hand, 30Hz pulses representing the rotational phase of the rotary heads are fed out from terminals ⑥ and ④ of P22, amplified at TR204 and TR205, and then supplied to the phase comparison circuit (TR206, TR207). The output of the phase comparison circuit is supplied to the miller integration circuit (D202, TR209), being converted into trapezoid wave. Also, the output of the phase comparison circuit, as timing pulse, is supplied to the timing circuit.

The trapezoid wave of the miller integration circuit is supplied to the sampling hold (TR210) and sampled with the output of the video recording phase control circuit (sampling pulse). The output of the sampling hold, made into voltage variation (error voltage) from phase variation, goes through the darlington circuit (TR211, TR212) and is supplied to the phase equalization circuit (R235~R237, C222, D203~D206). When there is no error voltage,

sampling pulse is so adjusted as to come to nearly the center of the slant part of the trapezoid wave.

The object of the phase equalization circuit is to improve the stability and responsibility of the servo loop which are specially required for use of the servo circuit. Whether servo is not on (error voltage getting large) or on (error voltage getting low) is distinguished by diodes (D203~D206). When the diodes change between ON and OFF, the circuit changes in construction so that the servo loop circuit can be more stabilized than conventional. The signal is then supplied, via the output circuit, to the brake coil.

#### 2) Playback Mode

During playback, either the internal sync signal (supplied from 60Hz power source and waveform-converted at TR238~TR240) or the external sync signal (supplied from terminal ⑤ of P24), instead of V. sync signal, passes through the filter circuit and is supplied to terminal ⑫ of IC201, where it turns into reference signal for playback.

This reference signal, after pulse-amplification at IC201, is supplied through the monostable multivibrator (TR201, TR202) to the sampling hold (TR210). Also, the control signal reproduced at the control head is supplied from terminal ① of P25 to terminal ③ of IC201 and controls the head rotation phase at the tracking control circuit so that video heads may properly pass through the recorded tracks during playback. For interchangeability, etc., the tracking has to be adjusted, and for the adjustment there is a knob protrudent on the control panel, serving as the tracking control. At TR210, trapezoid wave that has been converted from signal of the P.G. coil is applied, thereby controlling the brake current in the same manner as for the video recording mode.

### 2. Capstan Servo System

#### 1) Recording Mode

A control signal recording head (so called write head) and a control signal playback head (so called read head) are installed at an interval of about 6.35mm equivalent to 1 pitch of control signal.

Output of the non-stable multivibrator (TR219, TR220) is supplied via the control recording amplifier (TR221) to the write head and recorded on tape. The recorded control signal is reproduced at the read head, amplified at the control amplifier (IC201), delayed at the delay circuit consisting of monostable multivibrator (TR217, TR218), and triggers the aforementioned non-stable multivibrator. The control signal reproduced at the same time passes through TR216 and TR223, and is supplied to the sampling hold (TR226). While on the other hand, V. sync signal from terminal ⑨ of IC201 is supplied to the bootstrap circuit (TR224, TR225) and converted

into trapezoid wave, which is sampled at the sampling hold with the control signal (sampling pulse). This output is let through the darlington circuit (TR227, TR228) and supplied to the phase equalization circuit (TR229, D215~D218), making the servo loop circuit more stable. Further through the output circuit, it is led to the DC motor control circuit and controls the capstan motor.

#### 2) Playback Mode

Excepting that the control signal is not recorded, the same operation as above (recording mode) applies to the playback mode.

Regarding V. sync signal at terminal ⑨ of IC201, external sync signal (supplied from terminal ⑤ of P24) or internal sync signal (supplied from 60Hz power source and waveform-converted at TR238~TR240) is used as the reference signal during playback.

## CONSTRUCTION OF IC201

The diagram shows the construction of IC201 (AN301) used in the servo circuit.

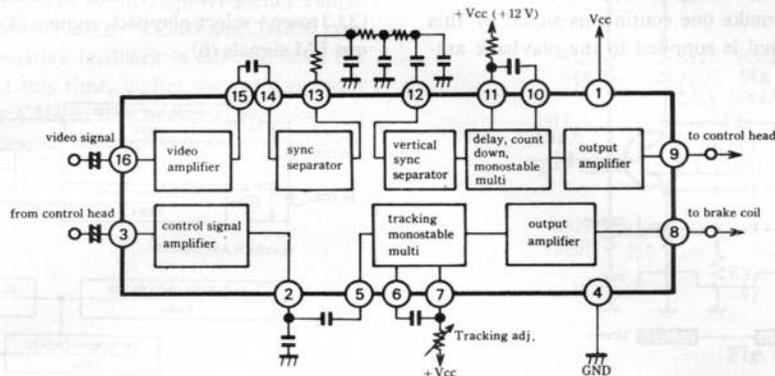


Fig. 1

Type No.	Application	Maximum Ratings ( $T_a = 25^\circ\text{C}$ )			Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )					
		Item	Rating	Unit.	Item	Condition	min.	typ.	max.	Unit.
AN301	VTR Servo Control Signal Process Circuit	$V_{1-4}$	15.6	V	$I_1$	$V_1 = 12\text{V}$	18.5	23.3	28	mA
		$I_1$	45	mA	$G_{V_{15-16}}$	$V_{16} = 1\text{Vp-p}$	3	3.5	4	
		$V_{7-4}$	-12	V	$V_{o\text{ sync } 13}$	$V_{16} = 1\text{Vp-p}$	8.9			Vp-p
		$V_{11-4}$	-12	V	$V_{in\ 16}$	$V_{16} = \text{Pulse, } 60\text{Hz}$	4	7.6	15	mVp-p
		$I_8$	-10	mA	$T_{wr\ 9}$	$V_{16} = 1\text{Vp-p, } 60\text{Hz}$	25	27.5	30	msec.
		$I_9$	-10	mA	$G_{V_{2-3}}$	$V_3 = 5\text{mVp-p}$	90	130	180	
		$I_{13}$	-10.3	mA	$V_{in\ 3}$	$V_3 = \text{Pulse, } 30\text{Hz}$	0.6	0.9	1.5	mVp-p
		$P_{tot}$	490	mW	$T_{wp\ 8}$	$V_3 = 5\text{mVp-p, } 30\text{Hz}$	26	29	31	msec.
		$T_{opr}$	-10~60	$^\circ\text{C}$						
		$T_{stg}$	-40~150	$^\circ\text{C}$						

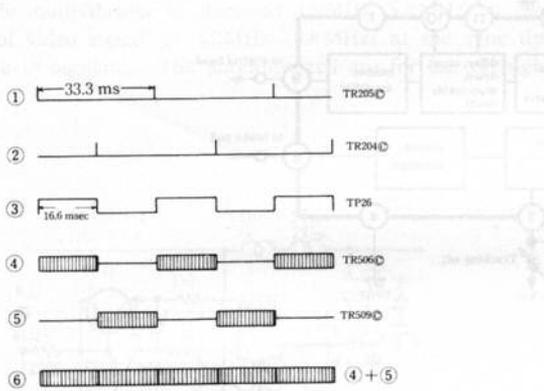
## Audio Circuit

Signals supplied from MIC and AUX are let through the pre-amplifier of TR401 and supplied to the base of TR402. Signal from the monitor TV is supplied directly to the base of TR402 and amplified. After the frequency characteristic is flattened at the equalizer (R419, C411) in the next stage, it is fed to the base of TR404. Being amplified there, the signal passes through the 95kHz audio trap (C417, L401) and is fed out as audio output from terminal ⑤ of P45. At the

same time, the emitter output of TR405 and signal from bias circuit (TR412~TR415) join together and are fed to the audio head. R428 and C419 are provided in order to prevent reverse flow of bias. D411 is used to change recording current for use of high-density tape, and the recording equalizer (C421, R432) for recording in the high range. The meter circuit (TR407) and audio squelch circuit (TR408~TR411) are used to remove noise at the time of audio dubbing.

## Head Switching Circuit

In addition to servo control of the video heads, the servo circuit feeds out the switching pulse for selecting the signal supplied from 2 video heads at each field (1/60sec.) to make one continuous signal by this head switching circuit. This signal is supplied to the playback am-



Playback FM signals switching operation.

Fig. 2

While the video head (B) is moving on the tape, video head (A) does not read recorded signals on the tape, and if either output of the bistable multivibrator (whose collector voltage is approx. +12V in the OFF mode) is applied to the base of TR505 while the video head (A) rotates per a half cycle (16.6 msec.), the collector and emitter of TR503 are short-circuited, whose output will be non-signal with no noise.

While the video head (B) reads FM signals on the tape (for 16.6 msec.), one of the outputs of the bistable multivibrator (whose collector voltage is approx. zero in the ON mode) is applied to the base of switching transistor TR508.

For this reason, the collector and emitter of TR508 are effectively disconnected and allow the FM signal to pass through.

At the moment when video head (A) and (B) are changed over, the base voltage of the switching transistor changes correspondingly.

For use of high density tape, TR512 is set at the OFF position and the head amplifier peak frequency characteristic is changed from 4.6 MHz to 5.3 MHz.

TR514 and TR515 change the envelope waveform to the DC level, thereby making the tracking meter deflect. TR501~TR503 constitute a recording amplifier.

## Video Recording Circuit

NTSC color signal supplied from terminal P31 goes through the low-pass filter circuit (FL301, L305, L306, C305~C308, R320), video amplifier/pre-emphasis circuit (TR309~TR311) and clamp/white clip circuit (D305~D309), and is fed to the color trap circuit (C326, L314). The low-pass filter is divided by transistor switching for either color or B/W. When input signal is of color, only the luminance signal content remains after passing through the low-pass filter.

Therefore, a delay line (DL301) is provided in order to adjust the phase of the luminance signal to the chrominance signal which delays in phase.

plifier circuit and used for switching of FM signal.

The sampling pulses (1) and (2) which are generated at each 30 Hz (33.3 msec.) select playback signals (4) and (5), making them continuous FM signals (6).

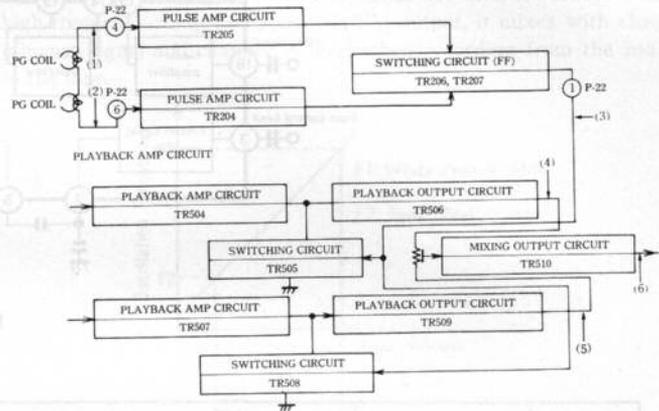


Fig. 3

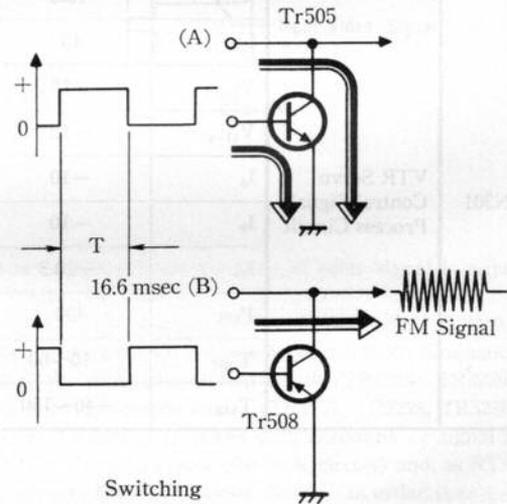


Fig. 4

Signal supplied from the FM modulation circuit attenuates in the 767 kHz range while in the color trap circuit for color performance and is fed to the video recording amplifier circuit on one hand and to the video playback circuit on the other hand.

Besides, the video recording circuit includes a circuit (TR301) which cuts the color low-pass filter for B/W signal, a trap circuit (TR303, L302, C304) which changes the filter frequency characteristic for  $\gamma$ -tape, a circuit (TR316) which changes the signal level for the type of tape used, and a circuit (TR321, TR322) for driving the level meter.

## Video Amplifier, Pre-emphasis Circuit

The pre-emphasis circuit, when FM-modulating video signal, prevents the FM circuit from increase of noise level at high frequency part, by previously emphasizing video signal in the high-frequency range. The circuit is composed of TR309~TR311. TR309 and TR310 constitute a video amplifier, and negative feedback is effected from the emitter of TR311 to TR309. At this time, higher part of frequency component is led to the earth by C314 so that negative feedback gets small and, as the result, the degree of amplification in the high-frequency range increases.

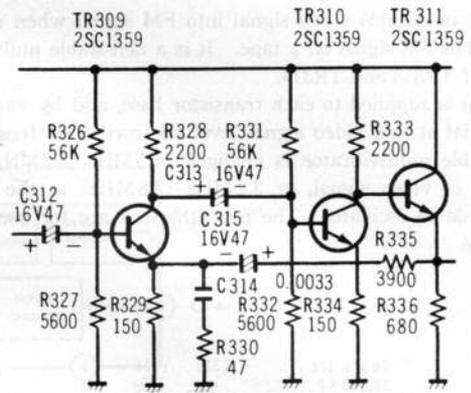


Fig. 5

## Clamp, White Clip Circuit

### 1) Clamp Circuit

Used to fix the video signal sync tip level constant. When the video signal level changes, the DC average level also changes as shown in Fig. 6. If, in this case, no clamp circuit is provided, the coupling capacitor (C313) of the pre-emphasis circuit stops transmission of DC component so that the mean value of video signal becomes 0 (zero). Accordingly the sync tip level varies. Due to its variation there occurs a variation in the reference oscillation frequency at the time the FM modulator in the next stage is driven, and no proper FM modulator is available.

In Fig. 7, the (+) side of C317 is kept at a certain voltage (clamp voltage) having been divided at R338. The sync tip level of the video signal coming in as input is of negative polarity and, therefore, clamp voltage is applied from C317 and charging current applied through D305 to C316.

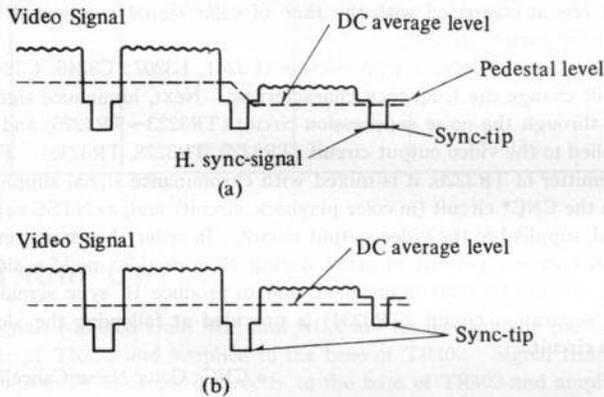


Fig. 6

### 2) White Clip

The white clip circuit is used to arrange the white level of video signal to a certain value. Because of overshoot (See Fig. 8) at around the white level, driving the FM modulator with video signal having been pre-emphasized by the above-mentioned pre-emphasis circuit will make frequency deviation excessive at the overshoot part, causing over-modulation. If over-modulated FM signal is recorded and played, there may occur breakage of picture and no proper recording or playback will be available.

The cathode side of D308 is kept at a certain voltage (white clip level) having been divided by R341. If, in this case, the input video signal level becomes higher than this clip level, D308 will

conduct for earthing through C320. So the white level is kept from rising above the white clip level and regulated to be constant. Like the clamp circuit, R343 is used for setting the white clip level when a high-density tape is employed.

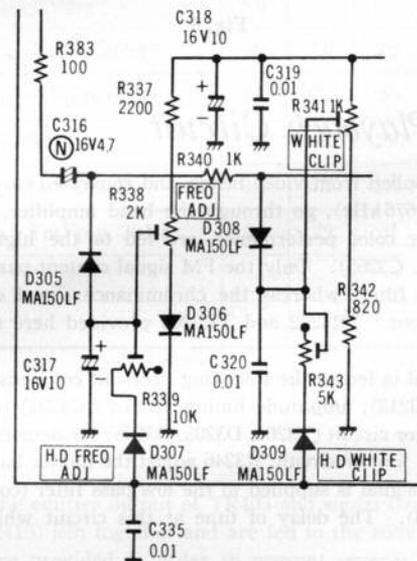


Fig. 7

conduct for earthing through C320. So the white level is kept from rising above the white clip level and regulated to be constant. Like the clamp circuit, R343 is used for setting the white clip level when a high-density tape is employed.

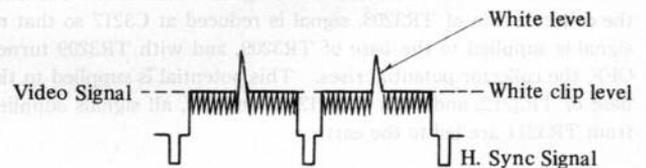


Fig. 8

## FM Modulator, Limiter Circuit

This circuit modulates video signal into FM signal when recording video signal as FM signal on a tape. It is a non-stable multivibrator composed of TR313 and TR314.

Video signal is supplied to each transistor base, and by varying the base potential at this video signal level the oscillation frequency of the non-stable multivibrator is changed: 4.5 MHz (5.2 MHz) at the white level of video signal, or 3.2 MHz (3.8 MHz) at the sync tip level, is made to oscillate. The parenthesized are for use of high density tape.

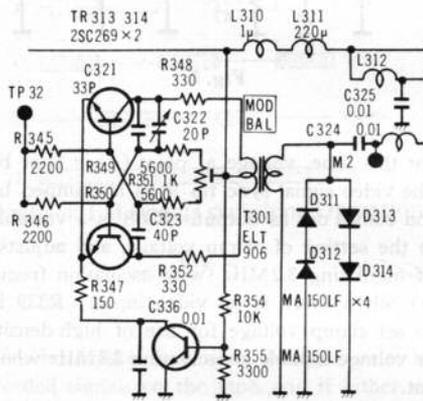


Fig. 9

FM-modulated output is fed out by T301, which feeds out FM output by push-pull operation, thereby improving both the level and waveform symmetry. R351 is also used as a variable resistor for balance adjustment of output waveform.

D311~D314 on the secondary of T301 constitute a limiter circuit. When an AM content arises in FM signal due to a lowering of the high-frequency range component in FM output, it mixes with chrominance signal and changes in level when recording from the head to the tape.

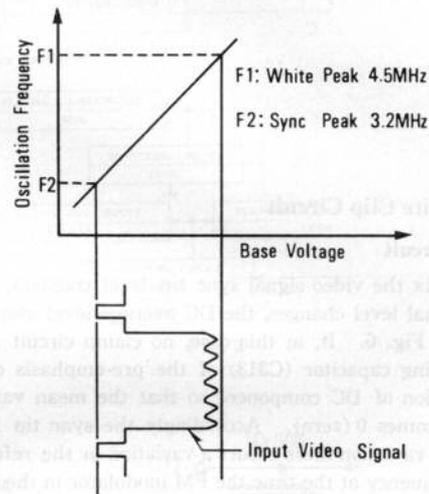


Fig. 10

## Video Playback Circuit

FM signal supplied from video heads, and converted carrier chrominance signal (676 kHz), go through the head amplifier, enter from P38-3 and, for color performance, are fed to the high-pass filter (R3318, L3213, C3265). Only the FM signal content passes through this high-pass filter, whereas the chrominance signal content (767 kHz) is kept out. TR3202 and TR3204 provided here select either color or B/W.

The FM signal is fed to the following drop-out compensation circuit (TR3208~TR3212), amplitude limiter circuit (IC3201), and then to the demodulator circuit (T3201, D3205, D3206) for demodulation. At the amplitude limiter circuit, R3246 adjust the limiter balance.

Demodulated signal is supplied to the low-pass filter (color: FL3202, B/W: FL3203). The delay of time at this circuit which is about

0.8μs less as compared with the time of color signal is adjusted by the delay circuit (DL3202).

When using a γ-tape, 2 trap circuits (C3241, L3207; C3246, C3247, L3210) change the frequency characteristic. Next, luminance signal goes through the noise suppression circuit (TR3223~TR3226) and is supplied to the video output circuit (TR3227, TR3228, TR3230). For the emitter of TR3226, it is mixed with chrominance signal supplied from the CNC\* circuit (in color playback circuit) and, as NTSC color signal, supplied to the video output circuit. In order that synchronization may not get out of order during slow motion mode a slow pulse circuit (TR3229) is installed, and to produce H. sync signal a sync separation circuit (TR3231) is provided at following the slow pulse circuit.

\* CNC: Color Noise Canceller

## Drop-out Compensator Circuit

When there occurs drop-out caused by tape scars, etc., 1H preceding signal is used and the drop-out is corrected to be inconspicuous.

### \* No Drop-out Occurring

Signal supplied to the base of TR3208 is FM signal with the amplitude nearly constant. If there is FM signal which comes out from the collector side of TR3208, signal is reduced at C3217 so that no signal is supplied to the base of TR3209, and with TR3209 turned OFF, the collector potential rises. This potential is supplied to the base of TR3212, and with TR3212 turned ON, all signals supplied from TR3211 are led to the earth.

### \* Drop-out Occurring

When there is drop-out occurring, voltage is supplied to the base of TR3209, turning it ON. As the collector voltage of TR3209 drops and TR3212 turns OFF, signal passing through TR3211 goes via TR3210 to terminal ④ of IC3201.

Though a limiter circuit (D3203, D3204) is provided in the midst of the drop-out correction circuit, it may happen that the mixing levels at point D become uneven because the FM signal supplied from the emitter of TR3207 to the base of TR3210 and the signal after passing through DL3201 are too small in terms of levels. For this reason a one-stage limiter is inserted in between.

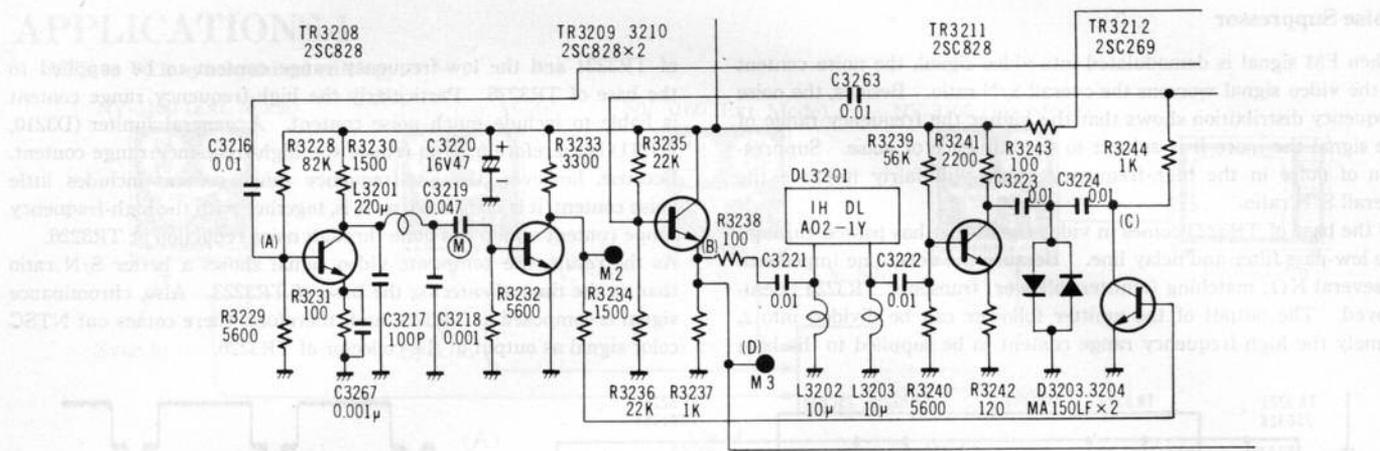


Fig. 11

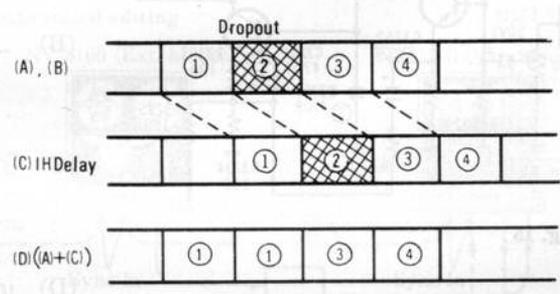


Fig. 12

**FM Demodulator Circuit**

Used to demodulate signal, which has been supplied from the limiter circuit, into video signal. First the limiter circuit output is supplied to the base of TR3213, and is then differentiated at the differentiation circuit. At this time, the input signal is as high as several MHz and, in addition, it is fluctuating so that the time constant cannot be selected easily in the differentiation circuit of CR. In this case, therefore, differentiation is effected with both R3252 on the collector side of TR3213 and L on the primary side of T3201. Differentiated pulse is induced to the secondary of TR3201 (See Fig. 13) and undergoes both-wave rectification at D3205 and D3206. Since the rectangular wave of input signal is FM, the repetition period of the rectangular wave is always changing. If so, the signal after rectification is fed out as rough or fine wave. This wave is therefore let through the low-pass filter to return into the original video signal.

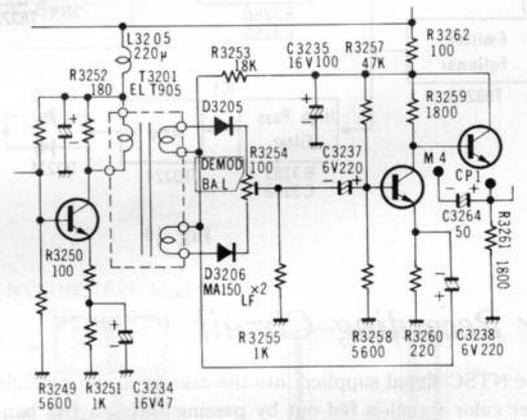


Fig. 13

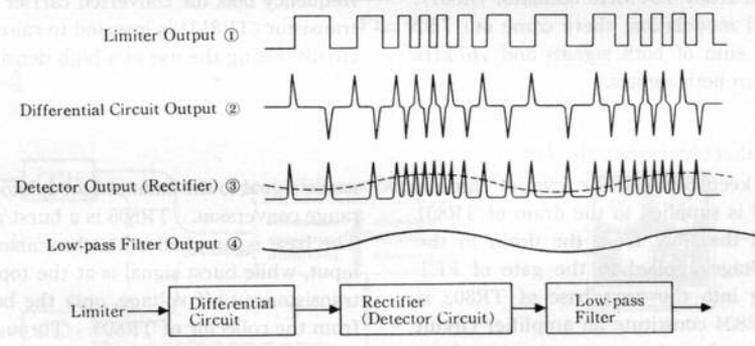


Fig. 14

## Noise Suppressor

When FM signal is demodulated into video signal, the noise content of the video signal worsens the overall S/N ratio. Besides, the noise frequency distribution shows that the higher the frequency range of the signal the more it is subject to the influence of noise. Suppression of noise in the high-frequency range will fairly improve the overall S/N ratio.

To the base of TR3223 comes in video signal that has passed through the low-pass filter and delay line. Because the delay line impedance is several K $\Omega$ , matching (emitter follower) transistor TR3223 is employed. The output of the emitter follower can be divided into 2, namely the high-frequency range content to be supplied to the base

of TR3224 and the low-frequency range content to be supplied to the base of TR3226. Particularly the high-frequency range content is liable to include much noise content. A general limiter (D3210, D3211) is therefore used to reduce the high-frequency range content. Because, however, the low-frequency range content includes little noise content, it is composed, as it is, together with the high-frequency range content which has gone through noise reduction at TR3226. As the result, the composite video signal shows a better S/N ratio than at the time of entering the base of TR3223. Also, chrominance signal is composed at TR3226, and, therefore, there comes out NTSC color signal as output at the collector of TR3226.

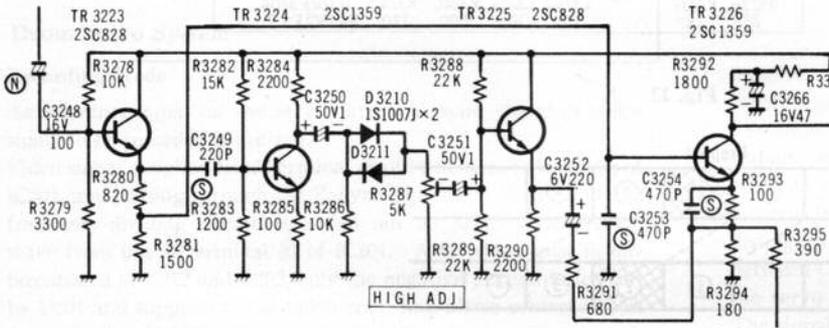


Fig. 15

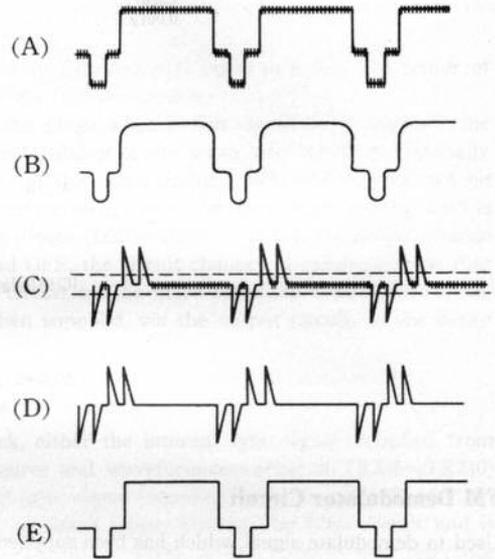


Fig. 17

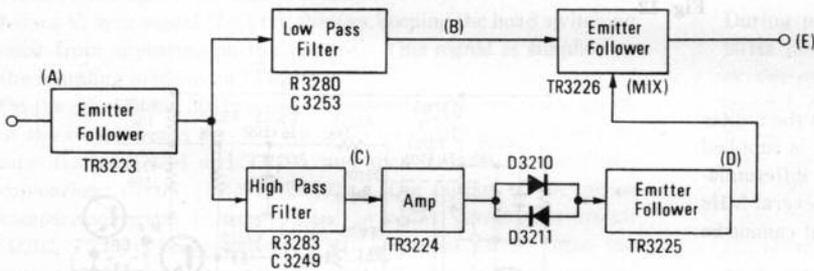


Fig. 16

## Color Recording Circuit

Out of the NTSC signal supplied into the color recording circuit, only the carrier color signal is fed out by passing through the band-pass filter (FL801). The center frequency at this time is 3.579545 MHz ( $\approx$  3.58 MHz). This signal, passing through the next ACC circuit (TR801~TR806), is balance-modulated at the balanced modulator (D803, D804) with signal supplied from 4.34 MHz oscillator (X801). From output signal after balanced modulation, there come out 7.92 MHz as output equivalent to the sum of both signals and 767 kHz equivalent to the difference between both signals.

### ACC Circuit

Used to automatically control and keep constant the level of chrominance signal. Chrominance signal is supplied to the drain of TR801 in the first stage. Of this signal the flow from the drain to the source changes depending on voltage applied to the gate of FET (TR801), and video input coming into the next base of TR802 is controlled. TR802, TR803 and TR804 constitute an amplifier circuit for chrominance signal. It feeds out chrominance signal output from the emitter (TR801) of TR804, supplies it to the burst gate circuit (TR805) in the next stage and, at the same time, supplies chromi-

At the low-pass filter (FL802), only the difference content of 767 kHz is fed out. The converted carrier chrominance signal, 767 kHz, is amplified at the color recording amplifier circuit (TR812), then fed to the video head and recorded on tape together with FM signal. When recording, FM-modulated luminance signal works as high-frequency bias for converted carrier chrominance signal. Besides, a transistor (TR813) is inserted to raise the level of the color recording circuit during the use of a high density tape.

nance signal to the balanced modulator (D803, D804) for low-frequency range conversion. TR805 is a burst gate circuit.

The base is supplied with chrominance signal and burst gate pulse input, while burst signal is at the top of pulse. Then by setting the transistor cut-off voltage, only the burst signal is fed out as output from the collector of TR805. Through the burst transformer (T801) having been resonant with 3.58 MHz, it is supplied to the burst signal rectifier circuit in the next stage. Voltage rectified at D802 varies proportionately to the level of color signal. When this signal is fed

back to the gate of TR801 in the first stage and the chrominance signal level becomes high, the resistance between the source and drain becomes small and so works that the level of the signal supplied to the base of TR802 becomes low.

On the contrary, if the chrominance signal level becomes low, the resistance between the source and drain becomes high and consequently the base input of TR802 increases. In this way the level of chrominance signal coming into the base of TR802 is controlled automatically.

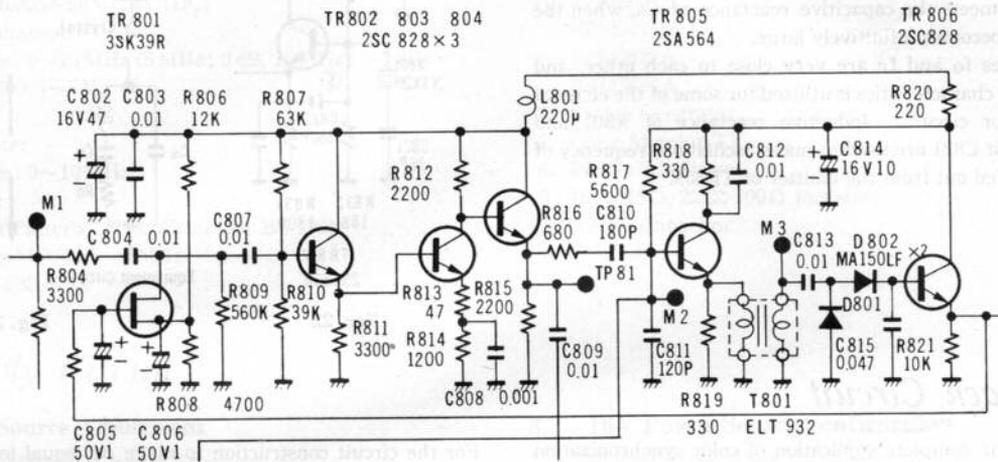


Fig. 18

**Balanced Modulator Circuit, Low-pass Filter Circuit**

This circuit is used for conversion of 3.58MHz chrominance signal into 767kHz low-frequency range signal through balanced modulation. The modulator used is a simple type ring modulator. While carrier wave is of positive polarity, diodes D<sub>1</sub> and D<sub>2</sub> are ON, carrier wave flows in the arrow direction, and no output comes out. In the case of negative polarity, D<sub>1</sub> and D<sub>2</sub> are turned OFF and oblique-lines part (See Fig. 21) appears as output.

In this balanced modulator circuit, the carrier wave is 4.347MHz and chrominance signal center frequency is 3.579545MHz. Signal supplied from the balanced modulator includes 7.926MHz (sum of both signals) and 767kHz (balance). This signal is amplified at TR810 in the next stage, let through the low-pass filter (FL802) and only the signal of 767kHz is fed out permitting low-frequency range conversion. TR809 is the oscillator circuit for 4.347MHz.

Because this output is to be used as carrier wave signal for the balanced modulator circuit, oscillation should be accurate and for this purpose a crystal oscillator circuit is used.

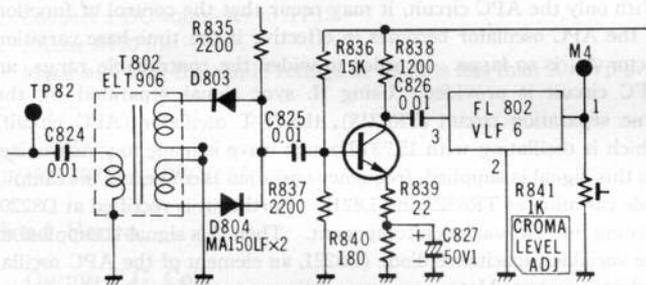


Fig. 19

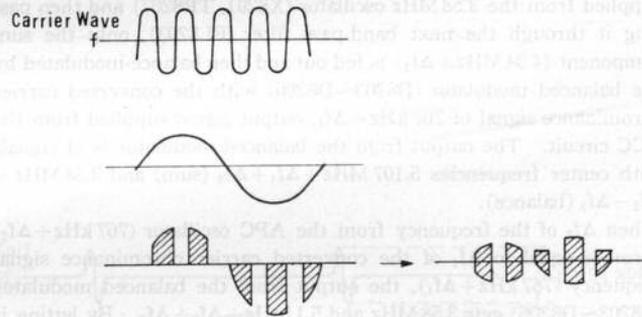


Fig. 21

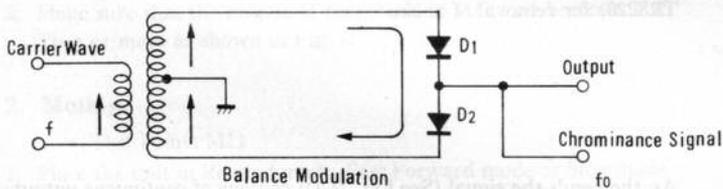


Fig. 20

### Function of Crystal Oscillator Circuit

While frequency  $f$  is low, the series side of  $L_0 C_0$  is capacitive. At  $f_0$ , the reactance of the series side becomes 0 (zero), and at a little higher frequency it gets inductive. If frequency is made further high, there is  $f_p$  at which the inductive reactance shown by the series side of  $L_0 C_0$  meets the capacitive reactance of  $C_s$ , when the composite reactance becomes infinitively large.

These two frequencies  $f_0$  and  $f_p$  are very close to each other, and this narrow inductive characteristics is utilized for some of the element used in the oscillator circuit. Inductive reactance of X801 and capacitive reactance of C821 are used to make oscillation frequency of 4.347 MHz, which is fed out from the emitter of TR809.

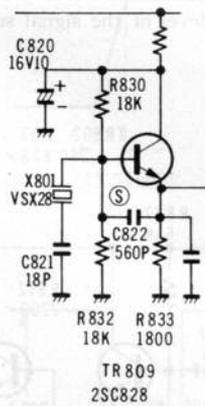


Fig. 22

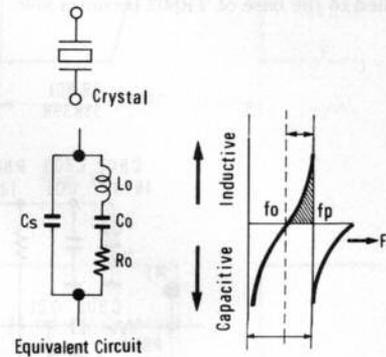


Fig. 23

### Color Playback Circuit

This circuit is used for complete application of color synchronization by removing the time-base variation factor (jitter) occurring during playback.

During playback the signal supplied from the video heads goes through the playback amplifier circuit and is supplied to the low-pass filter (FL8201). This low-pass filter feeds out only the converted carrier chrominance signal of  $767 \text{ kHz} + \Delta f_1$  ( $\Delta f_1$  = variation caused by the jitter component contained in playback signal), and leads it to the ACC circuit (TR8202~TR8205). The converted carrier chrominance signal, the saturation degree being controlled at the ACC circuit, is supplied to 2 balanced modulators (D8203~D8206; D8207~D8210).

The oscillation frequency of the APC oscillator (TR8214) oscillates freely with the variation factor that exists at or around 767 kHz. Providing that this variation factor is  $\Delta f_2$ , the oscillation frequency of this APC oscillator becomes  $767 \text{ kHz} + \Delta f_2$ . After balanced modulation by using the balanced modulator (D8218, D8219) with output supplied from the 3.58 MHz oscillator (X8201, TR8207) and then passing it through the next band-pass filter (FL8203), only the sum component ( $4.34 \text{ MHz} + \Delta f_2$ ) is fed out and then balance-modulated by the balanced modulator (D8203~D8206) with the converted carrier chrominance signal of  $767 \text{ kHz} + \Delta f_1$ , output signal supplied from the ACC circuit. The output from the balanced modulator is of signals with center frequencies  $5.107 \text{ MHz} + \Delta f_1 + \Delta f_2$  (sum) and  $3.58 \text{ MHz} + \Delta f_2 - \Delta f_1$  (balance).

When  $\Delta f_2$  of the frequency from the APC oscillator ( $767 \text{ kHz} + \Delta f_2$ ) becomes equal to  $\Delta f_1$  of the converted carrier chrominance signal frequency ( $767 \text{ kHz} + \Delta f_1$ ), the output from the balanced modulator (D8203~D8206) gets 3.58 MHz and  $5.1 \text{ MHz} + \Delta f_1 + \Delta f_2$ . By letting it through the band-pass filter (FL8202), carrier chrominance signal of 3.58 MHz free from time-base variation factor (jitter) can be obtained.

### Function of Balanced Modulator Circuit

When 3.58 MHz is applied to  $f_A$  of positive polarity and 767 kHz to  $f_B$  of positive polarity at the same time, current flows as shown in Fig. 24-A and an output is obtained.

Providing that the polarity of  $f_A$  turns negative while the polarity of  $f_B$  remains positive, the output coming out is as shown in Fig. 24-B, C.

For the circuit construction to make  $\Delta f_1$  equal to  $\Delta f_2$ , the converted carrier chrominance signal from ACC circuit ( $767 \text{ kHz} + \Delta f_1$ ) is balance-modulated with the output from 3.58 MHz oscillator (X8201, TR8207), signal of  $4.34 \text{ MHz} + \Delta f_1$  is fed out and burst signal is removed by the burst gate circuit (TR8212). The burst signal contains the time-base variation factor of  $\Delta f_1$ . This burst signal, and the signal of  $4.34 \text{ MHz} + \Delta f_2$  fed out after balanced modulation of  $767 \text{ kHz} + \Delta f_2$  from the APC oscillator (TR8214) with output of 3.58 MHz oscillator, are subjected to phase comparison at the phase comparison circuit (D8215, D8216). The phase difference, as DC voltage, is applied to the variable capacitance diode (D8217) of the APC circuit. According to variations in capacity of the variable capacitance diode, the oscillation frequency of the APC circuit is controlled until  $\Delta f_1$  equals to  $\Delta f_2$ .

With only the APC circuit, it may occur that the control of function of the APC oscillator becomes ineffective if the time-base variation factor  $\Delta f_1$  is so large. In order to widen the controllable range, an AFC circuit is provided. Using H. sync signal separated by the sync separation circuit (TR8218), the T-T oscillator (AFC circuit) which is oscillating with 15.73 kHz sine wave is made to synchronize. As this signal is supplied, frequency variation is converted into amplitude variation at TR8223 and L8212. Further it is rectified at D8220, turning into DC variation component. Then this signal is supplied to the variable capacitance diode (D8221, an element of the APC oscillator) and converted into capacity variation so as to control the frequency of the APC oscillator and increase flexibility to the variation factor.

The 3.58 MHz carrier chrominance signal, from which jitter has been removed, is let through the CNC circuit (DL8201, TR8213, TR8219, TR8220) for removal of noise.

As the result the signal (See Fig. 24-D) consists of continuous output, containing neither  $f_A$  nor  $f_B$  but yielding only the both side-band signal (sum,  $f_A + f_B$ ) (balance  $f_A - f_B$ ).

Because of the balanced modulator output being of both side-bands, either the sum content only or the balance content only can be fed out by use of LPF or HPF for the output.

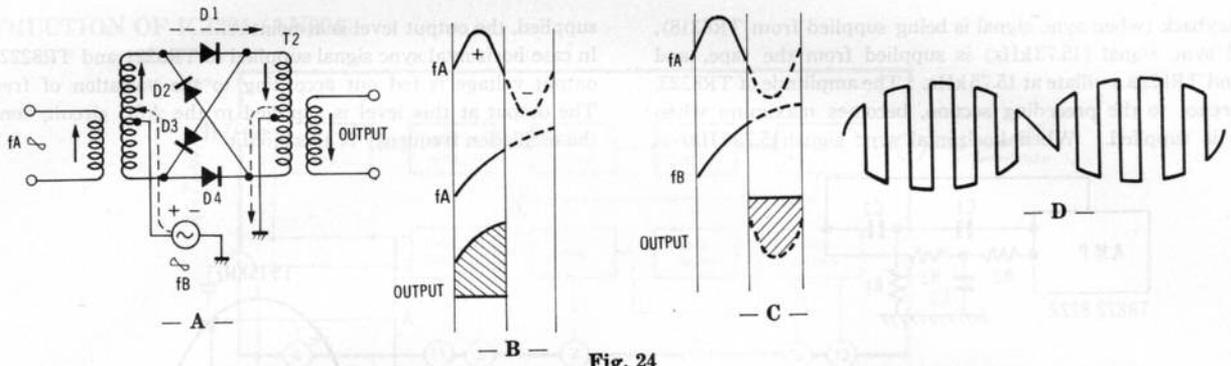


Fig. 24

### 3.58 MHz Oscillator Output

By use of a quartz oscillator, oscillation frequency has been stabilized better than before.

The equivalent circuit of the crystal oscillator is as shown in Fig. 26. The natural frequency includes series resonance frequency of  $L_o C_o$  and parallel resonance frequency of  $L_o C_o C_s$ .  $C_s$  being several hundred times as large as  $C_o$ , either the series resonance or the parallel

resonance is almost determined by  $L$  and  $C$ .

With reference to frequencies (See Fig. 26), those  $f_o$  and  $f_\infty$  are inductive and others capacitive. The crystal oscillator uses those inductive, frequencies between  $f_o$  and  $f_\infty$ . Oscillation frequency of 3.579545 MHz comprises inductivity of X8201 and capacitivity of C8221 and C8222.

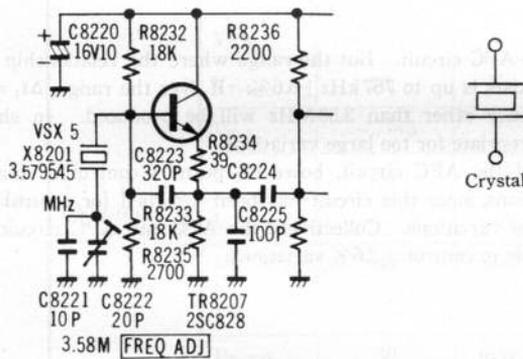


Fig. 25

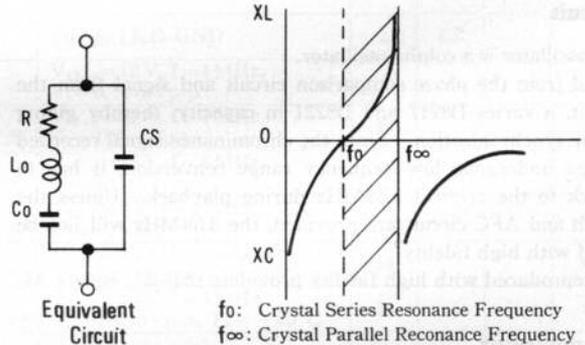


Fig. 26

### AFC Circuit

Fig. 28 shows a block diagram of AFC circuit, in which  $C_1$ ,  $C_2$  and  $R_1$  make a high-pass filter and  $R_2$ ,  $R_3$  and  $C_3$  a low-pass filter. Fig. 28 shows the characteristic obtained when the high-pass filter is combined with the low-pass filter (gain characteristic v.s. frequency).  $f_o$ , in this case, is set at 15.15 kHz. TR8221 and TR8222 oscillate at 15.15 kHz. (At this time, no sync signal is supplied from TR8218.)

Oscillation frequency is applied to the base of TR8223. At this time, L8212 on the collector side is tuned to 15.15 kHz so that the maximum amplitude is obtained when 15.15 kHz is applied to the base (See Fig. 29). The collector output goes through single-wave rectification at D8220 and C8283, and the voltage rectified is applied to D8221 (variable capacitance diode).

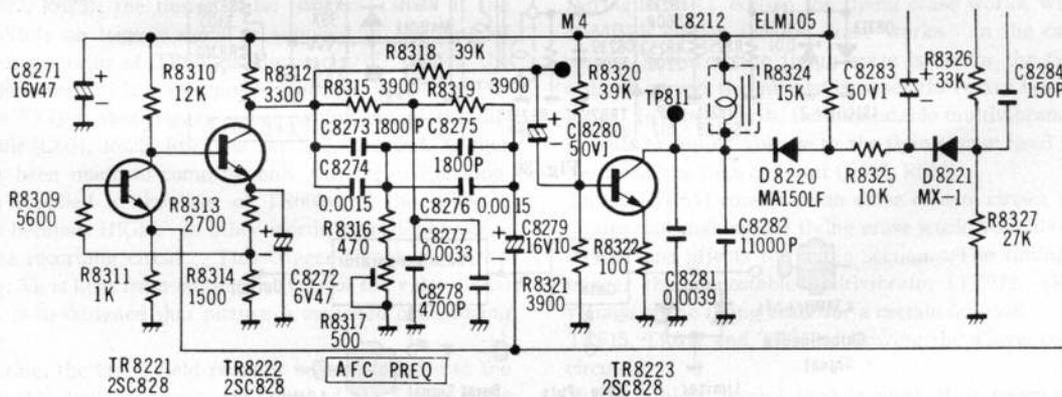


Fig. 27

During playback (when sync signal is being supplied from TR8218), horizontal sync signal (15.73kHz) is supplied from the tape, and TR8221 and TR8222 oscillate at 15.75kHz. The amplitude of TR8223, with reference to the preceding section, becomes maximum when 15.15kHz is supplied. When horizontal sync signal(15.73kHz) is

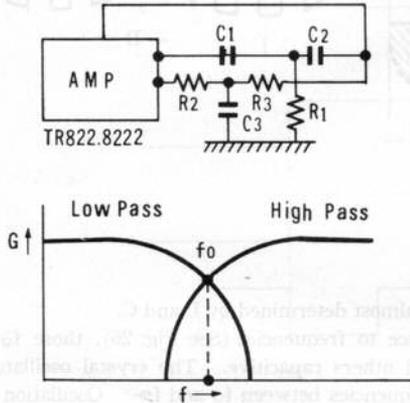


Fig. 28

supplied, the output level is at point A.

In case horizontal sync signal supplied to TR8221 and TR8222 varies, output voltage is fed out according to the variation of frequency. The output at this level is supplied to the APC circuit, controlling the oscillation frequency of this circuit.

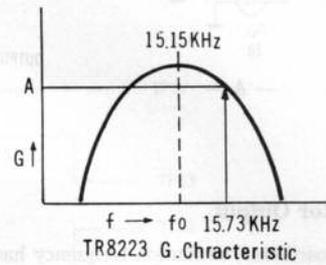


Fig. 29

### APC Circuit

The APC oscillator is a colpits oscillator.

With signal from the phase comparison circuit and signal from the AFC circuit, it varies D8217 and D8221 in capacity, thereby giving rise to color synchronization. Since the chrominance signal recorded on tape has undergone low-frequency range conversion, it has to be put back to the original 3.58MHz during playback. Unless the APC circuit and AFC circuit are provided, the 3.58MHz will not be reproduced with high fidelity.

It will be reproduced with high fidelity providing that  $\Delta f_1$  equals  $\Delta f_2$

in the APC circuit. But the range where the relationship of  $\Delta f_1 = \Delta f_2$  exists is up to  $767 \text{ kHz} \pm 0.6\%$ . If over the range,  $\Delta f_1 \neq \Delta f_2$ , and frequency other than 3.58MHz will be produced. In short it is inappropriate for too large variations.

Use of the AFC circuit, however, permits control of fairly large variations, since this circuit has been designed for control of up to  $\pm 2.0\%$  variations. Collectively the AFC and APC circuit make it possible to control  $\pm 2.6\%$  variations.

### Phase Comparator

Chrominance signal of  $4.347 \text{ MHz} + \Delta f_1$  supplied to the base of TR8211 is limited by diodes (D8211~D8214), and after it is limited to a certain amplitude, only burst signal ( $4.347 \text{ MHz} + \Delta f_1$ ) is fed out by TR8211 and TR8212. Also, chrominance signal of  $4.347 \text{ MHz} + \Delta f_2$  is supplied

to the secondary of T8205.

The advance and delay in phase of 2 signals are converted into plus and minus of voltage, and the deviation in phase is converted into voltage value.

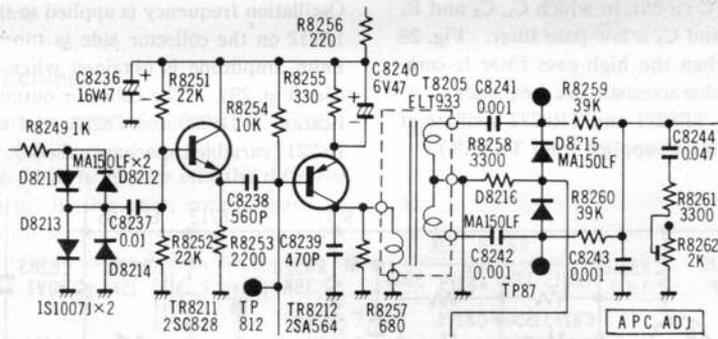


Fig. 30

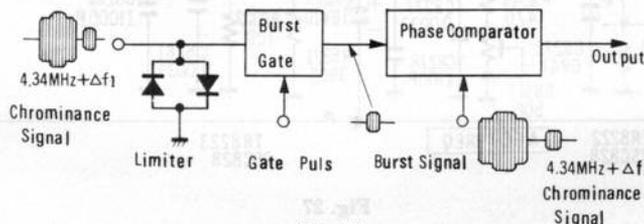


Fig. 31

## CONSTRUCTION OF IC3201 (AN304)

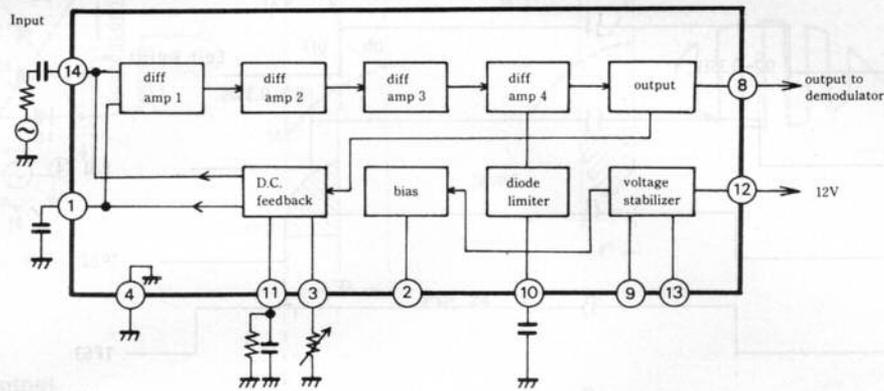


Fig. 32

Type No.	Application	Maximum Ratings ( $T_a=25^\circ\text{C}$ )			Electrical Characteristics ( $T_a=25^\circ\text{C}$ )					
		Item	Rating	Unit.	Item	Condition	min.	typ.	max.	Unit.
AN304	VTR Video FM Limiter	$V_{12-4}$	15.6	V	$I_{12}$	$V_{12-4}=12\text{ V}$		25		mA
		$V_{7-5}$	+12, -	V	$V_8(P-P)$	Pin ⑧ 1K $\Omega$ GND	1	1.2		V
		$V_{7-6}$	+30, -	V	$G_V$	$V_{12-4}=12\text{ V}, f=4\text{ MHz},$ $V_i=0.14\text{ mVp-p}$	1			Vp-p
		$V_{6-5}$	-, -5	V	$V_O(f)/V_O(2f)$	$V_{12-4}=12\text{ V}, f=4\text{ MHz},$ $V_i=100\text{ mVp-p}$	40			dB
		$I_7$	+20, -	mA	$V_O(f)/V_O(2f)$	$V_{12-4}=12\text{ V}, f=4\text{ MHz},$ $V_i=10\text{ mVp-p}$	40			dB
		$I_8$	-, -5	mA	$V_O(f)/V_O(2f)$	$V_{12-4}=9\text{ V}, f=4\text{ MHz},$ $V_i=10\text{ Vp-p}$	40			dB
		$I_{tot}$	45	mA	$V_O(f)/V_O(2f)$	$V_{12-4}=12\text{ V}, f=4\text{ MHz},$ $V_i=100\text{ mVp-p}, T_a=70^\circ\text{C}$	34			dB
		$P_T$	490	mW	$V_O(f)/V_O(2f)$	$V_{12-4}=12\text{ V}, f=4\text{ MHz},$ $V_i=100\text{ mVp-p}, T_a=-20^\circ\text{C}$	34			dB
		$P_T(T_{30})$	50	mW	$h_{EE}$	$V_{12-4}=12\text{ V}$	40		200	dB
$T_{opr}$	-20~70	$^\circ\text{C}$								

## Timing Circuit

This section includes the circuit which adjusts the timing of the recording position during the editing mode, the EDIT (ASSEMBLE/INSERT) switching circuit and the erase control circuit.

The timing pulse of the servo circuit is supplied from terminal ③ of P61 to the base of TR616. Being differentiated at the differentiation circuit (C604, R622, R623), the timing pulse triggers TR603 at the upward edge. While no trigger signal is supplied to the base of TR602, the collector output of TR603 is always LOW. When the EDIT button is depressed, +12V is supplied from terminal ④ of P61 and TR605 closes (ON) so that trigger signal coming out of the differentiation circuit (C604, R622, R623) is earthed. Instead, trigger signal which has been made to comprise only the negative component at D601 is supplied to the base of TR602 and the collector output of TR603 becomes HIGH. In other words, recording voltage is supplied to the recording circuit. This trigger signal, as shown manifestly in Fig. 33, is kept from editing halfway of the video signal part onward. It is so designed that picture is switched over during vertical blanking.

At the end of editing, the last 1 field remains unrecorded due to the positional relationship between the video head and the flying erase head. In order to prevent it, there is installed a circuit composed of TR606~TR608 which supplied a timing pulse equivalent to a 1 field

portion at the time the EDIT button is depressed, so that when the collector output of TR602 changes from LOW to HIGH, the monostable multivibrator (TR607, TR608) operates and, only while TP64 is made LOW by the time constant (C603, R619), voltage is applied through D603 to the recording circuit.

During INSERT edition the flying erase works, whereas during ASSEMBLE edition the full erase works. In the case of ASSEMBLE edition, however, the flying erase is on for the first 2.4 seconds in order to correct the interval between the rotary head and the full erase head. In other words, the monostable multivibrator (TR609, TR610) is made to supply voltage to the flying erase head for 2.4 seconds by means of the time constant (C607, R632).

TR612~TR614 constitute an erase control circuit to prevent such a failure that making the flying erase work from above the upper edge of the tape affects the audio section. The timing pulse is used to trigger the monostable multivibrator (TR612, TR613), cutting the voltage of the flying erase for a certain interval.

TR615, TR617 and TR618, following the above, constitute an output circuit.

When a high density tape is used, it is necessary to apply high erasing current. Therefore, +12V is supplied from terminal ④ of P63 in order to raise the collector voltage of TR614.

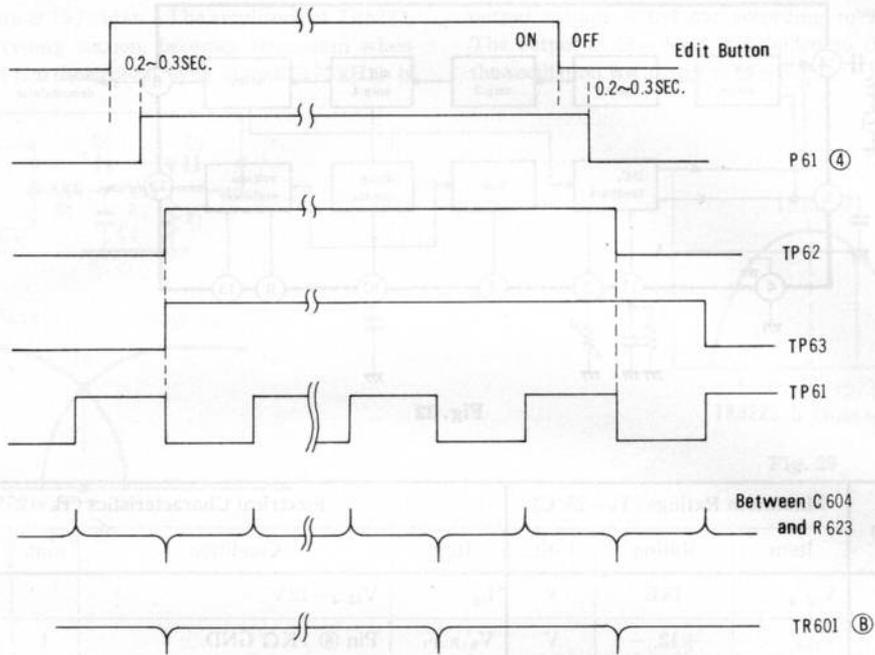


Fig. 33

## Electronic Editing

The 1/2" VTR is a herical scanning system unlike the broadcasting VTR, then it is impossible to make a tape splice editing like the audio tape because the video track is long and slant.

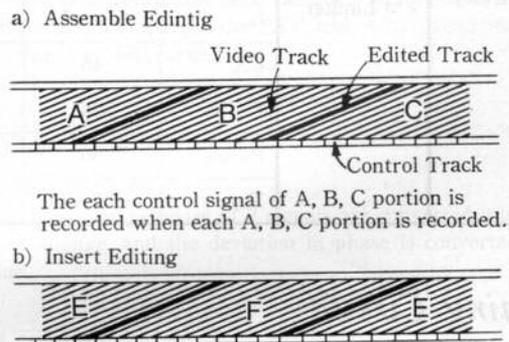
Therefore, to obtain the complete editing picture, the herical scanning system VTR requires as following condition.

- (1) New signal must be recorded along the already recorded track.
- (2) Sync signal of recorded video signal and edited video signal must be consecutive.
- (3) The erase head is fixed at a right angle against the tape running direction so that the erase circuit and the recording circuit must be operated at the proper timing.

### Assemble Editing and Insert Editing

The magnetic track patterns made by assemble editing and insert editing are shown in Fig. 34.

Assemble editing as shown in Fig. 34(a) is used to edit the different video signal A, B, C, ..... in turn. In this case, control signal is recorded at the same time as video signal is recorded. The other hand, insert editing is used for editing to insert F into the portion of



The control signal of F portion is the signal record when the E portion has been recorded.

Fig. 34 Electronic Editing Tape Format

E. In this case, F portion is recorded on the previously recorded E portion after erasing the part of E video track. However, control track is not erased when the F portion is recorded.

# ELECTRICAL ADJUSTMENT PROCEDURES

## Test Equipment

1. VTVM (vacuum tube volt meter)  
Voltage Range: 0.005~50V/DIV (DC)
2. Dual Trace Oscilloscope  
Frequency Range: 0~15MHz (5MHz; 0dB, 10MHz; -3dB)  
Voltage Range: 0.005~5V  
Probe: 10:1
3. Frequency Counter  
Frequency Range: 0~10MHz
4. Signal Generator  
(Monoscope Test Pattern/NTSC Color Bar BS-170)  
Frequency Range: 100kHz~6MHz  
Output Voltage: 0.01~3V
5. Reference Test Tape  
VFM3001A  
VFM3011A  
VFM3021A  
VFM3071A
6. Sweep Generator
7. Color Monitor TV
8. Plastic Tip Driver
9. 10 $\Omega$ , 15 $\Omega$ , 22 $\Omega$ , 100 $\Omega$  Resistors
10. 0.01 $\mu$ F Capacitor

## Power Supply Circuit

### 1. +12V Power Source Adjustment

- \* Test Point: TP11  $\oplus$ , Ground  $\ominus$
- \* Adjustment Point: R105

1. Place the unit in Recording mode, Color mode and high density tape mode.
2. Connect a DC voltmeter to TP11.
3. Adjust R105 for +12V.
4. Make sure that the ripple voltage at TP11 is less than 15mVp-p.

### 2. -12V Power Source Adjustment

- \* Test Point: TP15  $\ominus$ , Ground  $\oplus$
- \* Adjustment Point: R110

1. Place the unit in Recording mode, Color mode and high density tape mode.
2. Connect a DC voltmeter to TP15.
3. Adjust R110 for -12V.
4. Make sure that the ripple voltage at TP15 is less than 20mVp-p.

### 3. -16V Power Source Confirmation

- \* Test Point: TP16  $\ominus$ , Ground  $\oplus$

1. Place the unit in Recording mode, Color mode and high density tape mode.
2. Connect a DC voltmeter to TP16.
3. Make sure that the voltage of TP16 becomes -16V.
4. Make sure that the ripple voltage at TP16 is less than 200mVp-p.

## Control Circuit

### Head Servo

#### 1. Output P.G. Coil

- \* Test Point: Both ends of P.G. Coil

1. Place the unit in Recording mode.
2. Connect an oscilloscope to both ends of P.G. coil.
3. Make sure that the output of both ends of P.G. coil becomes 0.15Vp-p or more as shown in Fig. 1.

#### 2. Muting

- \* Test Point: M11

1. Place the unit in Rewind mode, Fast Forward mode or Stop mode.
2. Connect an oscilloscope to M11.
3. Make sure at this time that the voltage of M11 becomes +12V.

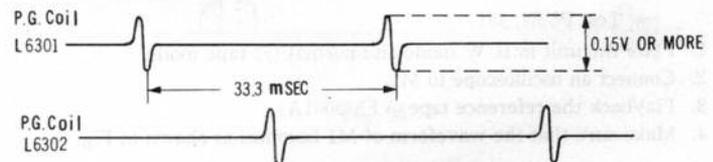


Fig. 1

### 3. Trapezoid Waveform

\* Test Point: TP25

1. Place the unit in Recording mode.
2. Connect an oscilloscope to TP25.
3. Make sure that the waveform of TP25 becomes as shown in Fig. 2.

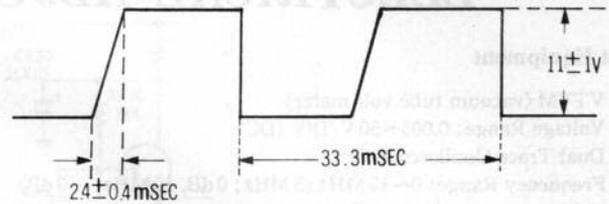


Fig. 2

### 4. 1/2 Countdown Monostable Multivibrator

\* Test Point: TP22

1. Place the unit in Recording mode.
2. Connect an oscilloscope to TP22.
3. Make sure that the waveform of TP22 becomes as shown in Fig. 3.

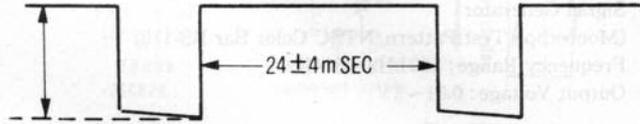


Fig. 3

### 5. Sampling Pulse

\* Test Point: TP24

1. Place the unit in Recording mode.
2. Connect an oscilloscope to TP24.
3. Make sure that the waveform of TP24 becomes as shown in Fig. 4.

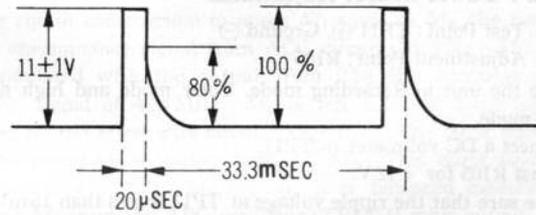


Fig. 4

### 6. Sampling Hold

\* Test Point: TP24, TP25

1. Place the unit in Recording mode.
2. Connect a dual trace oscilloscope to TP24 and TP25, and set the unit in CHOP mode.
3. Make sure that waveforms of TP24 and TP25 become as shown in Fig. 5.

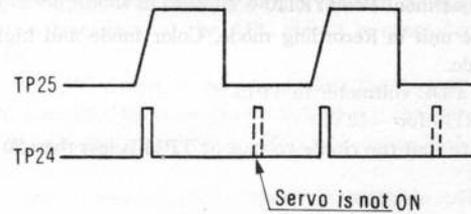


Fig. 5

## Capstan Servo

### 1. Control Pulse Polarity

\* Test Point: M1

1. Place the unit in B/W mode and normal ( $\gamma$ ) tape mode.
2. Connect an oscilloscope to M1.
3. Playback the reference tape (VFM3001A).
4. Make sure that the waveform of M1 becomes as shown in Fig. 6.

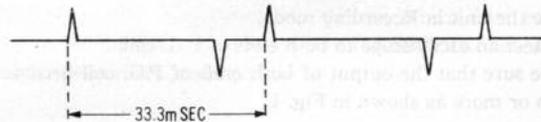


Fig. 6

### 2. Output of Control Signal

\* Test Point: Opened Terminal of Control Head

1. Open the control head terminal.
2. Connect an oscilloscope to the control head terminal by using 1:1 probe.
3. Playback the reference tape (VFM3001A or VFM3011A).
4. Make sure that the waveform of the control head terminal becomes as shown in Fig. 7.

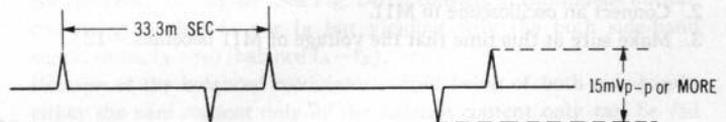


Fig. 7

### 3. Recording Voltage of Control Head

\* Test Point: Connector P21-5

1. Place the unit in Recording mode.
2. Connect an oscilloscope to P21-5 connector.
3. Make sure that the waveform of P21-5 connector becomes as shown in Fig. 8.

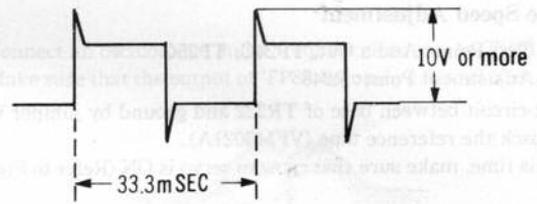


Fig. 8

### 4. Reference Signal

\* Test Point: TP25C

1. Place the unit in Recording mode.
2. Connect an oscilloscope to TP25C.
3. Make sure that the waveform of TP25C becomes as shown in Fig. 9.

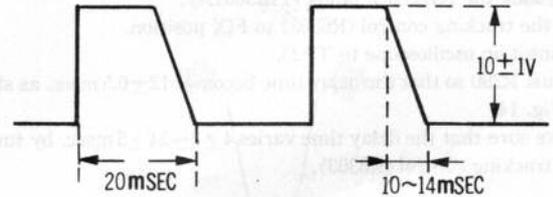


Fig. 9

### 5. Sampling Pulse

\* Test Point: TP24C

1. Place the unit in Recording mode.
2. Connect an oscilloscope to TP24C.
3. Make sure that the waveform of TP24C becomes as shown in Fig. 10.

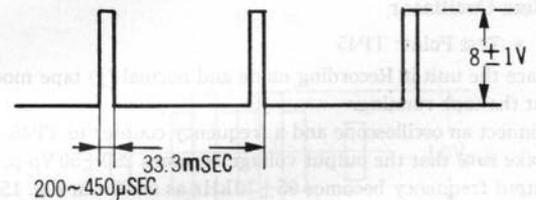


Fig. 10

### 6. Capstan Motor Sync Pull-in Adjustment

\* Test Point: M6, TP24C, TP25C

\* Adjustment Point: R1120 (DC motor rotation adjustment)

1. Playback the reference tape (VFM3001A or VFM3011A).
2. Connect a dual trace oscilloscope to TP24C and TP25C, and set it to ADD mode.
3. Set R1120 to center portion, and make sure that the servo is ON as shown in Fig. 11.
4. Fully turn R1120 counterclockwise, and then gradually return it clockwise to set it just after the pulse of TP24C locks on trapezoid waveform of TP25C as shown in Fig. 12.
5. At this time, connect an oscilloscope to M6.
6. Measure DC level of M6 [ $E_1$ ].
7. Connect a dual trace oscilloscope to TP24C and TP25C, and set it to ADD mode.
8. Fully turn R1120 clockwise, and then gradually return it counterclockwise to set it just after the pulse of TP24C locks on trapezoid waveform of TP25C as shown in Fig. 13.
9. At this time, connect an oscilloscope to M6.
10. Measure DC level of M6 [ $E_2$ ].
11. Adjust R1120 so that DC level of M6 becomes  $\frac{E_1 + E_2}{2} = E_a$ .
12. Connect a dual trace oscilloscope to TP24C and TP25C, and set it to ADD mode.
13. Make sure that servo is ON as shown in Fig. 11.

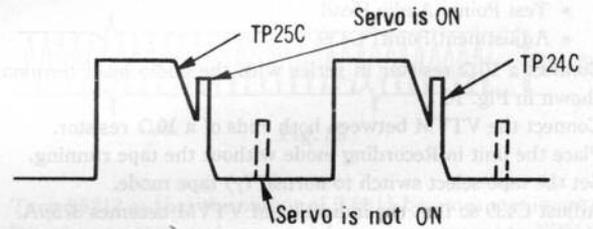


Fig. 11

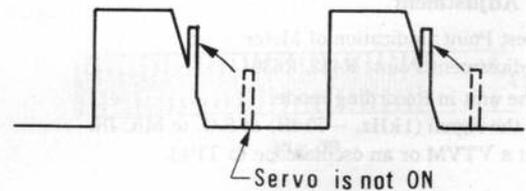


Fig. 12

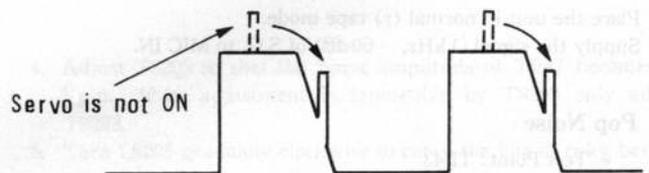


Fig. 13

## 7. Tape Speed Adjustment

- \* Test Point: Audio Out, TP24C, TP25C
- \* Adjustment Point: R248

1. Short-circuit between base of TR222 and ground by jumper wire.
2. Playback the reference tape (VFM3021A).
3. At this time, make sure that capstan servo is ON (Refer to Fig. 11).

## 8. Tracking Adjustment

- \* Test Point: TP23
- \* Adjustment Point: R290

1. Playback the reference tape (VFM3001A).
2. Set the tracking control (R6303) to FIX position.
3. Connect an oscilloscope to TP23.
4. Adjust R290 so that the delay time becomes  $12 \pm 0.5$  msec. as shown in Fig. 14.
5. Make sure that the delay time varies  $4 \pm 2 \sim 24 \pm 5$  msec. by turning the tracking control (R6303).

4. Disconnect the jumper wire.
5. Connect a counter to audio out.
6. Playback the reference tape (VFM3021A).
7. Adjust R248 so that the indication of counter becomes 3000 Hz.

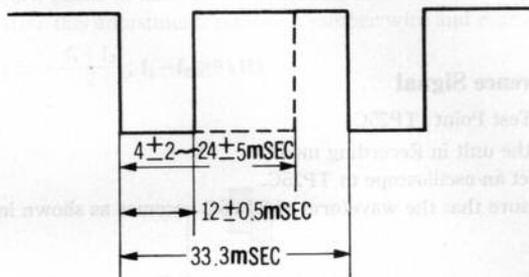


Fig. 14

## Audio Circuit

### 1. Bias Oscillator

- \* Test Point: TP45

1. Place the unit in Recording mode and normal ( $\gamma$ ) tape mode without the tape running.
2. Connect an oscilloscope and a frequency counter to TP45.
3. Make sure that the output voltage becomes  $290 \pm 50 \text{Vp-p}$ , and the output frequency becomes  $95 \pm 10 \text{kHz}$  as shown in Fig. 15.
4. Confirm no waveform distortion.

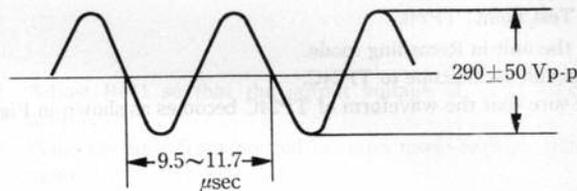


Fig. 15

### 2. Bias Current Adjustment

- \* Test Point: Audio Head
- \* Adjustment Point: C439

1. Connect a  $10\Omega$  resistor in series with the audio head terminal as shown in Fig. 16.
2. Connect the VTVM between both ends of a  $10\Omega$  resistor.
3. Place the unit in Recording mode without the tape running.
4. Set the tape select switch to normal ( $\gamma$ ) tape mode.
5. Adjust C439 so that the indication of VTVM becomes  $375\mu\text{A}$ .
6. Set the tape select switch to high density tape mode.
7. Make sure that the indication of VTVM is  $520 \sim 700\mu\text{A}$ .

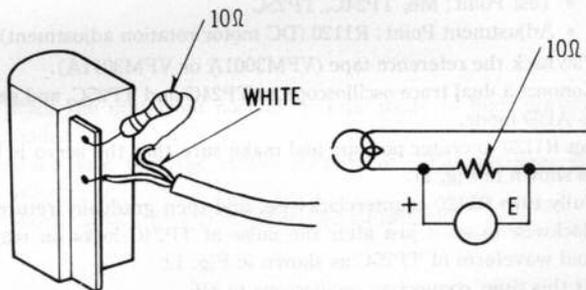


Fig. 16

### 3. Meter Adjustment

- \* Test Point: Indication of Meter
- \* Adjustment Point: R442, R6304

1. Place the unit in Recording mode.
2. Supply the signal (1 kHz, -60 dB) of S.G. to MIC IN.
3. Connect a VTVM or an oscilloscope to TP43.

### 4. Playback Output Adjustment

- \* Test Point: TP43
- \* Adjustment Point: R408

1. Place the unit in normal ( $\gamma$ ) tape mode.
2. Supply the signal (1 kHz, -60 dB) of S.G. to MIC IN.

### 5. Pop Noise

- \* Test Point: TP43

1. Connect an oscilloscope to TP43.
2. Place the unit in Stop mode, and supply no signal.

4. Adjust the audio level control (R6304) so that the indication of VTVM becomes 1 Vrms. (oscilloscope;  $2.8 \text{Vp-p}$ ).
5. In this condition, adjust R442 so that the indication of audio level meter becomes 0 VU.

3. Set the audio level meter to 0 VU, and record.
4. Connect a VTVM to TP43.
5. Playback the recorded portion.
6. Adjust R408 so that the indication of VTVM becomes 1 V rms.

3. Make sure that the noise level is  $3 \text{Vp-p}$  or less when EDIT or DUB button (but, except assemble mode).
4. Make sure that the noise level is  $3 \text{Vp-p}$  or less by playing back the portion of item 3 (include assemble mode).

## Head Amplifier Circuit

### 1. Channel Balance & Peak Frequency Adjustment

\* Test Point: TP54

\* Adjustment Point: R516, R546, R538, C530

1. Supply the signal (-40~-45 dB) of S.W.G. to TP52 and open CP-1.
2. Place the unit in Playback mode and high density tape mode without tape running.
3. Connect an oscilloscope to TP54.
4. Adjust C530, R516, and R538 so that the peak frequency becomes 5.7MHz and the waveforms of both channels get balanced as shown in Fig. 17 when R546 is set to center.
5. Set the tape select switch to normal tape mode.
6. Make sure that the peak frequency becomes 4.6~4.8MHz.

### 2. Peak "Q" Adjustment

\* Test Point: TP54

\* Adjustment Point: R546

1. Supply the signal (5~8mVp-p) of S.W.G. to TP52.
2. Place the unit in Playback mode and high density tape mode without tape running.
3. Set the marker of S.W.G. to 1MHz.
4. Connect an oscilloscope to TP54.
5. Adjust R546 so that the relative gain of peak frequency ② with 1MHz ① becomes 10 dB (about 3 times) as shown in Fig. 19.
6. Place the unit from high density tape mode to normal ( $\gamma$ ) tape mode.
7. Make sure that the relative gain of peak frequency ② with 1MHz ① becomes  $10 \pm 2$  dB (2.5~4 times) as shown in Fig. 20.

### 3. Short-circuit CP-1

Short-circuit CP-1 after the head amplifier adjustment.

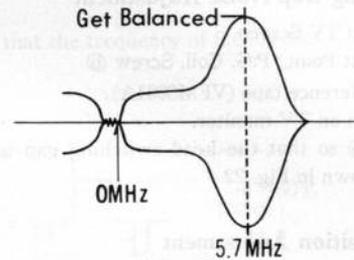


Fig. 17

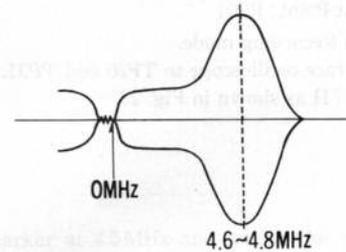


Fig. 18

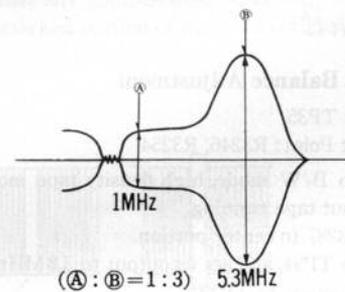


Fig. 19

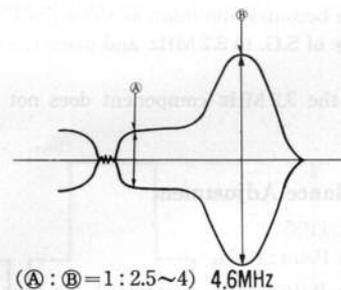


Fig. 20

## Head Unit Portion

### 1. 180° Azimuth Adjustment

\* Test Point: TV Screen

\* Adjustment Point: P.G. Coil, Screw ①

1. Playback the reference tape (VFM3001A).
2. Place the unit in Still mode.
3. Visual inspection on TV monitor.
4. Adjust screw ① for 2 switching pulse noise (appearing at the head switching position) to be superposed.

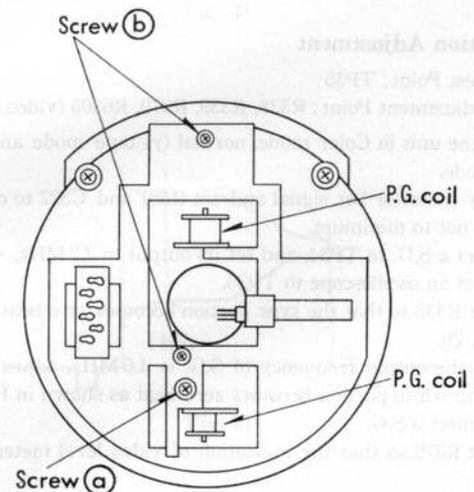


Fig. 21

## 2. Head Switching Gap Noise Adjustment

- \* Test Point: TV Screen
- \* Adjustment Point: P.G. Coil, Screw ⑤

1. Playback the reference tape (VFM3001A).
2. Visual inspection on TV monitor.
3. Adjust screw ⑤ so that the head switching gap noise becomes minimum as shown in Fig. 22.

## 3. Switching Position Adjustment

- \* Test Point: TP26, TP31
- \* Adjustment Point: R204

1. Place the unit in Recording mode.
2. Connect a dual trace oscilloscope to TP26 and TP31.
3. Adjust R204 for 7H as shown in Fig. 23.

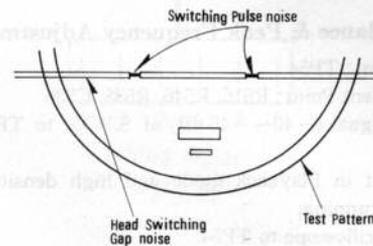


Fig. 22

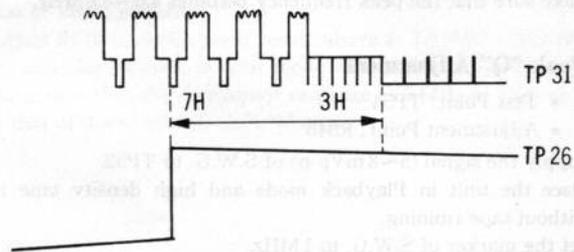


Fig. 23

## Video Circuit

### 1. Demodulation Balance Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R3246, R3254

1. Place the unit in B/W mode, high density tape mode and Playback mode without tape running.
2. Set R3275 and R3287 to center portion.
3. Connect a S.G. to TP54, and set its output to 3.8 MHz, -45 dB.
4. Connect an oscilloscope to TP35.
5. Adjust R3246 and R3254 alternately so that 3.8 MHz component of output waveform becomes minimum as shown in Fig. 24.
6. Set the frequency of S.G. to 3.2 MHz and place the unit in normal tape mode.
7. Make sure that the 3.2 MHz component does not extremely increase.



Fig. 24

### 2. Modulator Balance Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R351

1. Place the unit in B/W mode, normal ( $\gamma$ ) (or high density) tape mode and recording mode.

2. Supply no signal.
3. Connect an oscilloscope to TP35 and set R6305 to minimum.
4. Adjust R351 so that the output of TP35 becomes minimum (20 mVp-p or less).

### 3. Deviation Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R338, R339, R379, R6305 (video level VR)

1. Place the unit in Color mode, normal ( $\gamma$ ) tape mode and Recording mode.
2. Supply the color bar signal and set R351 and C322 to center and R6305 not to minimum.
3. Connect a S.G. to TP34, and set its output to 3.2 MHz, -40 dB.
4. Connect an oscilloscope to TP35.
5. Adjust R338 so that the sync portion becomes zero beat as shown in Fig. 26.
6. When the output frequency of S.G. is 4.6 MHz, adjust R6305 so that the white portion becomes zero beat as shown in Fig. 27.
7. Disconnect a S.G.
8. Adjust R379 so that the indication of video level meter becomes 0 VU.
9. Next, place the unit in high density tape mode and set R6305 so that the level meter becomes 0 VU.

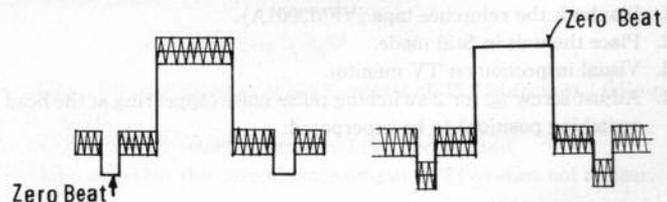


Fig. 25

Fig. 26

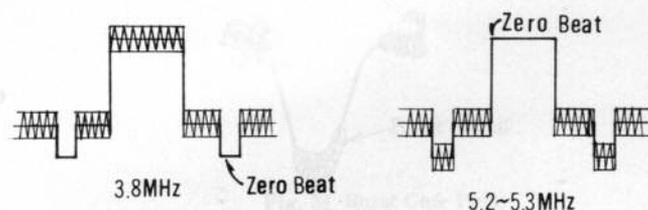


Fig. 27

10. Connect S.G. to TP34, and set its output to 3.8 MHz, -40 dB.
11. Adjust R339 so that the sync portion becomes zero beat as shown in Fig. 28.

#### 4. White Clip Adjustment

- \* Test Point: TP32
- \* Adjustment Point: R341, R343

1. Place the unit in Color mode, normal ( $\gamma$ ) tape mode and Recording mode.
2. Supply the color bar signal.
3. Connect an oscilloscope to TP32.
4. Adjust R341 so that the output waveform becomes as shown in Fig. 28.
5. Place the unit in high density tape mode.
6. Adjust R343 so that the output waveform becomes as shown in Fig. 28.

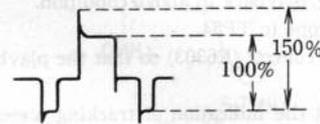


Fig. 28

#### 5. Drop-out Compensator

- \* Test Point: M3 (VEP0342)

1. Place the unit in Stop mode.
2. Connect an oscilloscope to M3 (VEP0342).
3. Connect a S.G. to TP34, and set the output voltage to 200 mVp-p, and the sweep range to 0~6 MHz.

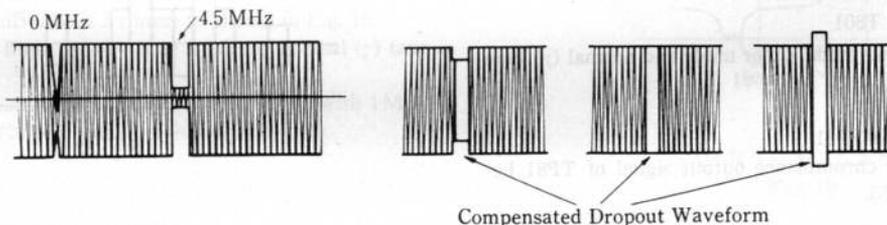


Fig. 29

4. Place the marker at 4.5 MHz and adjust the marker amplitude becomes maximum.
5. Make sure that any compensated waveform shown in Fig. 29 is obtained at marked portion of input waveform.

#### 6. Output Level Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R3275

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Connect a monitor TV to the unit.
4. Connect an oscilloscope to TP35.
5. Adjust R3275 so that the output becomes 2.1 Vp-p as shown in Fig. 30.

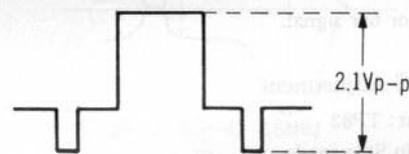


Fig. 30

#### 7. High Range Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R3287

1. Place the unit in Recording mode, color mode and high density tape mode.
2. Connect a sweep generator to video input and set its level to 1 Vp-p.
3. Connect an oscilloscope to TP35.
4. Adjust R3287 so that the amplitudes of low frequency portion and 1 MHz become same level.

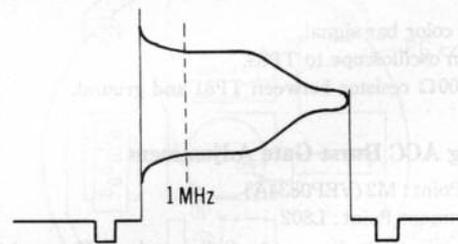


Fig. 31

## 8. Tracking Meter Adjustment

- \* Test Point: TP54, Tracking Meter
- \* Adjustment Point: R559

1. Place the unit in B/W mode and normal ( $\gamma$ ) tape mode.
2. Supply no input signal.
3. Make self-recording/playback in above condition.
4. Connect an oscilloscope to TP54.
5. Adjust the tracking control (R6303) so that the playback envelope becomes maximum.
6. Adjust R559 so that the indication of tracking meter becomes as shown in Fig. 32.

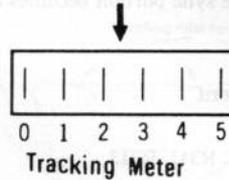


Fig. 32

## 9. Frequency Response Adjustment in Playback Mode

- \* Test Point: TP35
- \* Adjustment Point: R546

1. Connect a sweep generator to video input and set its output to 1 Vp-p (with sync signal).
2. Place the unit in B/W mode, high density tape mode, recording mode, and connect an oscilloscope to TP35.

3. Make sure that the frequency response at 2.5 MHz is 35~50% to that of lower portion.
4. Adjust R546 to obtain same result above at 2.5 MHz when recording and playing back in color mode with high density tape.
5. Make sure that the frequency response at 3 MHz is 70% or more to that of lower portion in B/W mode.

## Color Circuit

### 1. Recording ACC Adjustment

- \* Test Point: TP81
- \* Adjustment Point: T801

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Connect an oscilloscope to TP81.
4. Adjust T801 so that the chrominance output signal of TP81 becomes as shown in Fig. 33.

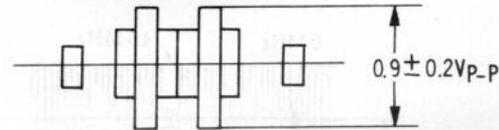


Fig. 33

### 2. Recording ACC Operation

- \* Test Point: TP81

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.

### 3. 4.34MHz OSC Adjustment

- \* Test Point: TP82

1. Place the unit in Stop mode.
2. Connect an oscilloscope and a frequency counter to TP82.

3. Connect an oscilloscope to TP81.
4. Connect 15 $\Omega$  resistor between TP31 and ground.
5. Make sure that the chrominance output of TP81 becomes 0.4 Vp-p or more.

### 4. Color Killer Operation

- \* Test Point: TP83

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Connect an oscilloscope to TP83.
4. Connect a 100 $\Omega$  resistor between TP81 and ground.

3. Make sure that the output of TP82 becomes 4.34659 MHz, 10 Vp-p or more.
5. Make sure that the chrominance output of TP83 becomes 1.0 Vp-p or more.
6. Connect a 22 $\Omega$  resistor between TP81 and ground.
7. Make sure that the chrominance output of TP83 does not appear.

### 5. Recording ACC Burst Gate Adjustment

- \* Test Point: M2 (VEP0834A)
- \* Adjustment Point: L802

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Fully turn the video level control clockwise.
4. Adjust L802 so that the burst signal comes into bottom of valley of burst gate pulse as shown in Fig. 34.

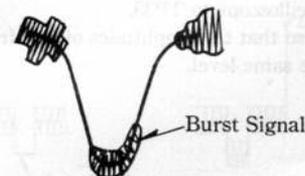


Fig. 34 Burst Gate Pulse

### 6. 3.58MHz OSC Adjustment

- \* Test Point: TP85
- \* Adjustment Point: C8222

1. Place the unit in Stop mode.

### 7. 4.34MHz B.P.F. Band Pass Filter Adjustment

- \* Test Point: TP86
- \* Adjustment Point: L8203, L8204

1. Place the unit in Stop mode.
2. Connect a S.W.G. to M3 (VEP0833A) through 0.01 $\mu$ F.
3. Set the output to 100mVp-p, and place the marker at 4.34MHz.
4. Connect an oscilloscope to TP86.
5. Adjust L8203 and L8204 so that the output of TP86 becomes as shown in Fig. 35.

### 8. Playback Burst Gate Adjustment

- \* Test Point: TP812
- \* Adjustment Point: L8209

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Connect an oscilloscope to TP812.
4. Adjust L8209 so that the burst signal comes into bottom of valley of burst gate pulse as shown in Fig. 36.

### 9. Playback ACC Adjustment

- \* Test Point: TP84
- \* Adjustment Point: R8211

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Connect an oscilloscope to TP84.
4. Adjust R8211 so that the output of TP84 becomes as shown in Fig. 37.

### 10. AFC Adjustment

- \* Test Point: TP811
- \* Adjustment Point: L8212, R8317

1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. No supply the input signal.
3. Connect a S.G. to M4 (VEP0833A), and set the output to 15.15 kHz, 200mVp-p.
4. Connect an oscilloscope to TP811.

### 11. 4.34MHz Continue Wave Adjustment

- \* Test Point: TP810
- \* Adjustment Point: R8283

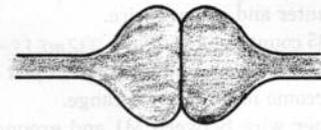
1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Connect an oscilloscope to TP810.

### 12. APC Oscillator Adjustment

- \* Test Point: TV Monitor
- \* Adjustment Point: T8205, L8205

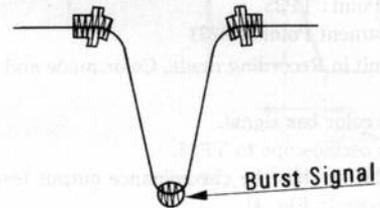
1. Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
2. Supply the color bar signal.
3. Set the APC control (R6705) to center portion.

2. Connect an oscilloscope and a frequency counter to TP85.
3. Make sure that the output of TP85 becomes 3.579545MHz, 3.0Vp-p or more.



4.34MHz Marker

Fig. 35



Burst Gate Pulse

Fig. 36

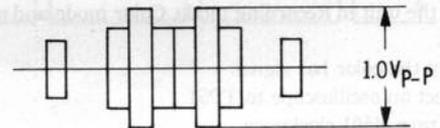


Fig. 37

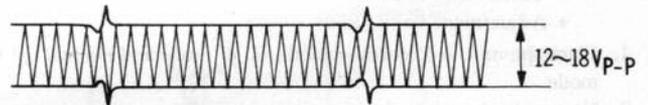


Fig. 38

5. Turn L8212 so that the output of TP811 becomes maximum.
6. Disconnect a S.G., and connect a frequency counter to TP811.
7. Adjust R8317 so that the indication of frequency counter becomes 15.73 kHz.
8. Make sure that the amplitude of signal (TP811) becomes 12~18 Vp-p.

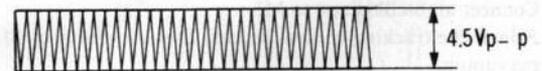


Fig. 39

4. Adjust R8283 so that the output of TP810 becomes 4.5Vp-p as shown in Fig. 39.

4. Adjust T8205 so that the burst amplitude of TP87 becomes 16 Vp-p. If its adjustment is impossible by T8205 only adjust T8203.
5. Turn L8205 gradually clockwise to carry the hue of color bar out of normal range.

- Return L8205 counterclockwise gradually and set it just after the hue of color bar has become in the normal range.
- Connect a jumper wire between M1 (VEP0833A) and ground, and connect a frequency counter to TP810.
- Measure the frequency..... ( $f_1$ ).
- Remove the counter and jumper wire.
- Fully turn L8205 counterclockwise.
- Return L8205 clockwise gradually and set it just after the hue of color bar has become in the normal range.
- Connect a jumper wire between M1 and ground, and connect a frequency counter to TP810.

### 13. Chrominance Output Level Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R8231

- Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
- Supply the color bar signal.
- Connect an oscilloscope to TP35.
- Adjust R8231 so that the chrominance output level becomes 0.55 Vp-p as shown in Fig. 41.

### 14. Chrominance Recording Current Adjustment

- \* Test Point: TP51
- \* Adjustment Point: R841

- Place the unit in Recording mode, Color mode and normal ( $\gamma$ ) tape mode.
- Supply the color bar signal.
- Connect an oscilloscope to TP51.
- Fully turn R501 clockwise.

### 15. Luminance Recording Current Adjustment

- \* Test Point: TP51
- \* Adjustment Point: R501

- Place the unit in Recording mode, B/W mode and normal ( $\gamma$ ) tape mode.
- No supply the input signal.
- Connect an oscilloscope to TP51.
- Adjust R501 so that the output voltage of TP51 becomes 600 mVp-p.

### 16. Flicker Adjustment

- \* Test Point: M1 (VEP0833A)
- \* Adjustment Point: R538, R856

- Playback the reference tape (VFM3071A).
  - Connect an oscilloscope to M1.
  - Adjust the tracking control so that the waveform of M1 becomes maximum.
  - Adjust R538 so that the waveform amplitude of each vertical period becomes equal as shown in Fig. 42.
  - Set R856 to center portion, and record the color bar signal in normal ( $\gamma$ ) tape mode.
  - Playback the recorded portion, and make sure that the output waveform becomes equal ( $\textcircled{a} = \textcircled{b}$ ).
- If  $\textcircled{a}$  and  $\textcircled{b}$  is not equal, adjust R856.

### 17. APC Frequency Adjustment at Pause Mode

- \* Test Point: TP810
- \* Adjustment Point: R8287

- Place the unit in Color mode and normal ( $\gamma$ ) tape mode.
- Supply the color bar signal.
- Connect a frequency counter to TP810.

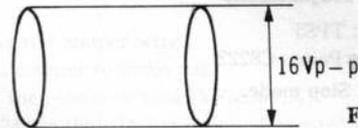


Fig. 40

- Measure the frequency..... ( $f_2$ ).
- Turn L8205 to have center frequency between  $f_1$  and  $f_2$ .
- After this adjustment, remove a jumper wire and counter.

Note:  $f_0 = \frac{f_1 + f_2}{2}$ ;  $f_1 - f_2 \geq 9 \text{ kHz}$

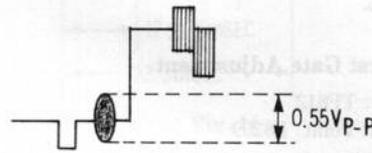


Fig. 41

- Adjust R841 so that the output voltage of TP51 becomes 100 mVp-p.
- Place the unit from normal ( $\gamma$ ) tape mode to high density tape mode.
- Make sure that the output voltage of TP51 becomes  $150 \pm 20$  mVp-p.

- Place the unit from normal ( $\gamma$ ) tape mode to high density tape mode.
- Make sure that the output voltage of TP51 becomes  $800 \pm 50$  mVp-p.
- Short-circuit CP1 (TP51) after this adjustment.

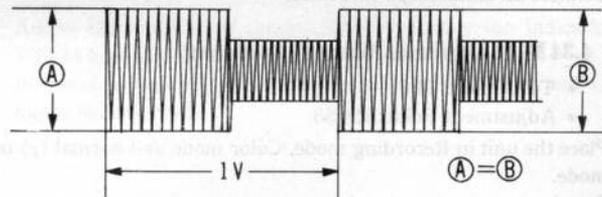


Fig. 42

- Record the color bar signal, and playback the recorded portion.
- Connect a jumper wire between M1 (VEP0833A) and ground.
- Measure the frequency ( $f_1$ ) when tape is running.
- Adjust R8287 so that the frequency in pause mode becomes  $f_A$ .

$$f_A = (f_1 - 14) \text{ kHz}$$

# Timing Circuit

## 1. Delay Relay Operation for Editing

\* Test Point: Relay of Circuit Printed Board (VEP0065A)

1. Connect an oscilloscope to the relay of VEP0065A as shown in Fig. 43.

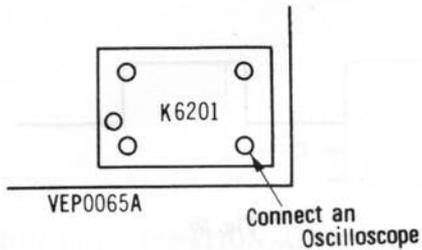


Fig. 43

2. Measure the delay time by depressing the edit button.
3. Make sure that the delay time becomes as shown in Fig. 44.

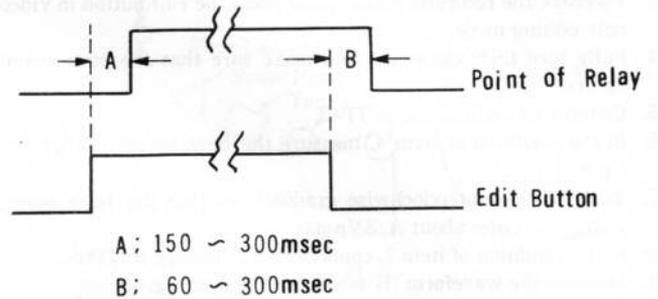


Fig. 44

## 2. Downward Transient and Upward Transient of Flip Flop

\* Test Point: TP26, TP63

1. Connect a dual trace oscilloscope to TP26 and TP63.
2. Make sure, in 3 kinds of editing mode, that the waveform becomes as shown in Fig. 45.

\* Edit OFF→ON

Coincide the downward edge of TP26 and that of TP63.

\* Edit ON→OFF

Coincide the upward edge of TP26 and that of TP63.

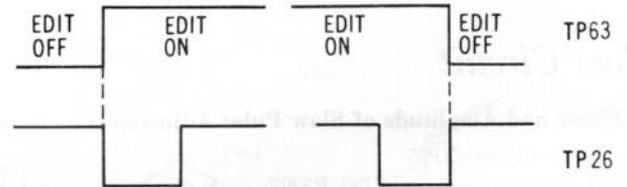


Fig. 45

## 3. Monostable Multivibrator for Vertical Additional Gate

\* Test Point: TP64

1. Connect an oscilloscope to TP64.
2. Press the edit button from OFF to ON.
3. Make sure that the waveform of TP64 becomes as shown in Fig. 46.

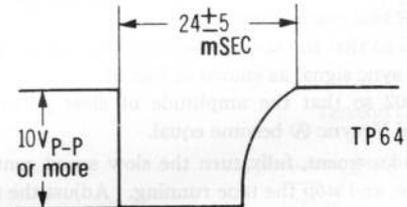


Fig. 46

## 4. Monostable Multivibrator for Assemble Editing Mode

\* Test Point: TP67

1. Connect an oscilloscope to TP67.
2. Place the unit in Assemble editing mode.
3. Press the edit button.
4. Make sure that the waveform of TP67 becomes as shown in Fig. 47.

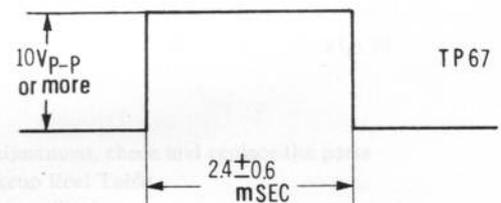


Fig. 47

## 5. Erase Voltage Adjustment

\* Test Point: TP66

\* Adjustment Point: R646

1. Connect an oscilloscope to TP66.
2. Place the unit in normal ( $\gamma$ ) tape mode and Insert editing mode.
3. Press the edit button.
4. Adjust R646 so that A portion becomes 3Vp-p as shown in Fig. 48.
5. Make sure in high density tape mode that A portion becomes  $5.0 \pm 0.5$  Vp-p.

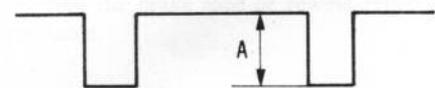


Fig. 48

## 6. Erase Control Adjustment

- \* Test Point: TP43, TP65
- \* Adjustment Point: R639

1. Place the unit in normal ( $\gamma$ ) tape mode.
2. Record the video signal only, don't record the audio signal.
3. Playback the recorded portion, and press the edit button in video only editing mode.
4. Fully turn R639 clockwise, and make sure that the buzz sound occurs.
5. Connect an oscilloscope to TP43.
6. In the condition of item 4, measure the buzz sound voltage (A) V<sub>p-p</sub> of TP43.
7. Turn R639 counterclockwise gradually so that the buzz sound voltage becomes about  $A/3$  V<sub>p-p</sub>.
8. In the condition of item 7, connect an oscilloscope to TP65.
9. Measure the waveform (B) msec. as shown in Fig. 49.
10. Turn R639 counterclockwise to (C) msec. as shown in Fig. 50.

**Note:** When R639 fully turned clockwise, in case of no buzz sound, set the C portion to  $C=13\pm 0.5$  msec. by R639.

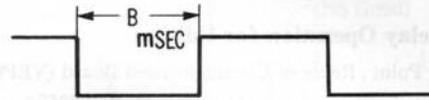


Fig. 49

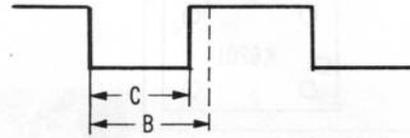


Fig. 50

## Slow Circuit

### 1. Phase and Amplitude of Slow Pulse Adjustment

- \* Test Point: TP35
- \* Adjustment Point: R285, R3302

1. Place the unit in B/W mode and normal ( $\gamma$ ) tape mode.
2. Record the EIA pattern signal.
3. Connect an oscilloscope to TP35.
4. Playback the recorded portion in slow motion mode.
5. Fully turn R3302 counterclockwise.
6. Adjust R285 so that the slow pulse should be set at  $3\pm 1$  H before the vertical sync signal as shown in Fig. 51.
7. Adjust R3302 so that the amplitude of slow pulse (B) and the amplitude of V. sync (A) become equal.

**Note:** In this adjustment, fully turn the slow speed control counterclockwise, and stop the tape running. Adjust the tape position so that the noise comes to center of screen as shown in Fig. 52, and make slow motion playback.

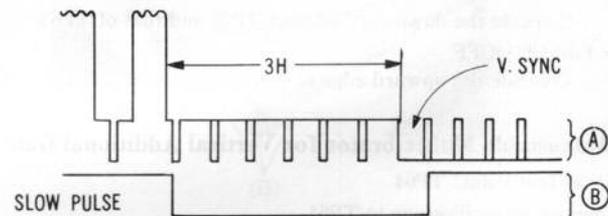


Fig. 51

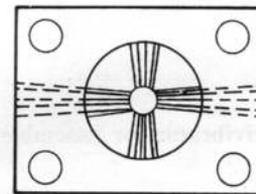


Fig. 52

# MECHANICAL SECTION ADJUSTMENT

## DISASSEMBLAGES OF PANEL & CASE

### 1. HOW TO REMOVE PANEL

1. Turn off the power before removing.
1. Unscrew 2 screws (A) of the head mount and take out the head mount.
3. Unscrew the function lever holding screw (B) and pull out the lever and pull out the skew knob and slow lever knob.
4. Unscrew 4 screws (C).
5. The panel can be removed.

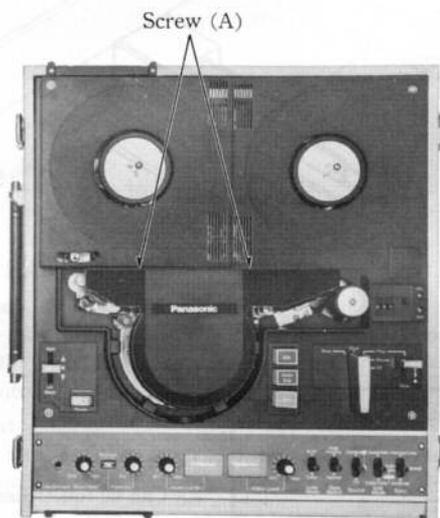


Fig. 1

### 2. HOW TO REMOVE THE DECK FROM WOODEN CASE

1. Unscrew 4 screws (D).
2. Hold points (E) & (F) by hand and slowly lift up the deck.
3. Set the unit on the deck supporter (VFK65).

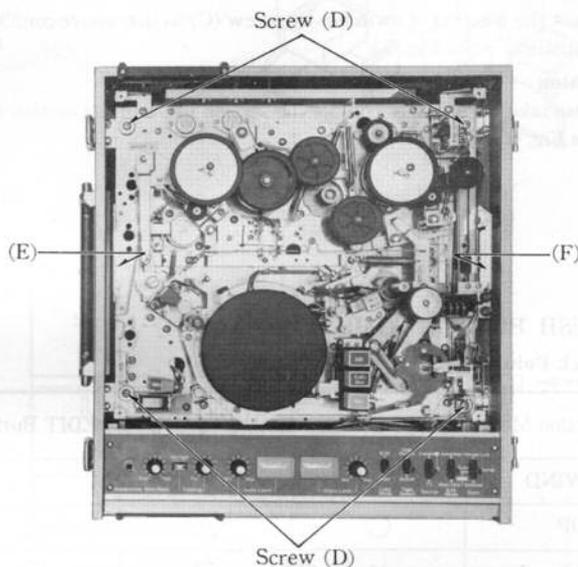


Fig. 3

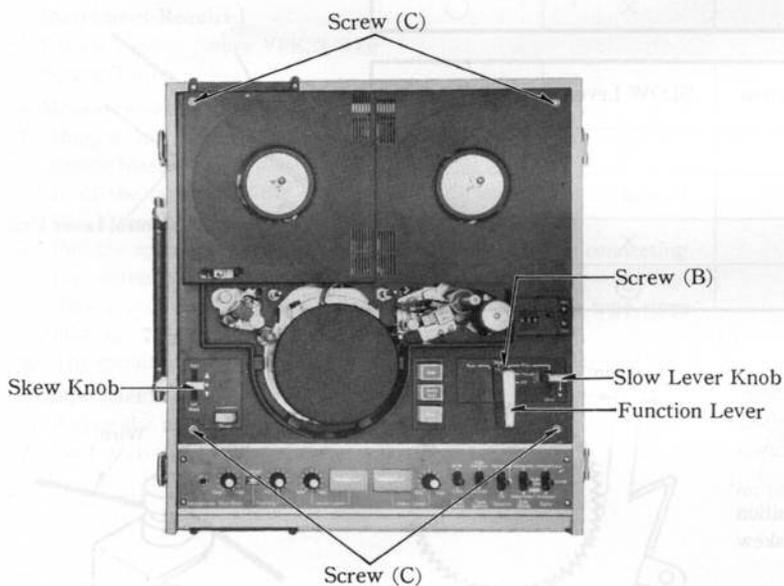


Fig. 2



DECK SUPPORTER VFK65

Fig. 4

## 1. LEAF SWITCH ADJUSTMENT (in PLAY, STILL mode)

### \* Check Point

Mode	Condition	
	Switch (A)	Switch (B)
STOP	OPEN	CLOSE
PLAY	CLOSE	OPEN
STILL	CLOSE	OPEN
F.F.	OPEN	CLOSE
REWIND	OPEN	CLOSE

### \* Adjustment

Adjust the position of switches by screw (C) so that above condition is satisfied. (See Fig. 5.)

### \* Caution

Please take care not to contact the section (T) and the section (S). (See Fig. 6.)

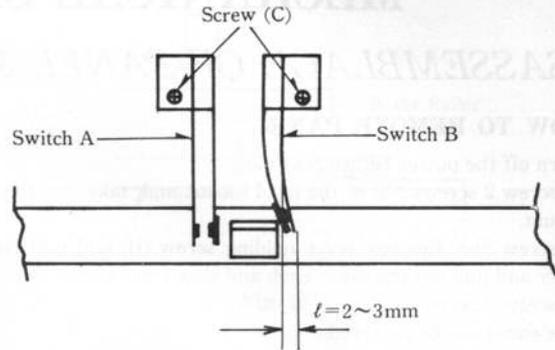


Fig. 5

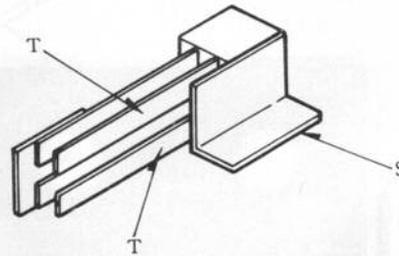


Fig. 6

## 2. PUSH BUTTON ADJUSTMENT

### \* Check Point

Function Mode	REC Button	AUDIO DUB Button	EDIT Button	SLOW Lever	SKEW Lever
REWIND	×	×	×	×	○
STOP	○	△	△	×	○
PLAY	×	○	○	○	○
PAUSE	×	×	×	×	○
F.F.	×	×	×	×	○

Mark;

- ◎ Can be functioned
- Can be functioned
- △ Can be functioned (but not locked)
- × Can not be functioned

Mode	REC Button	AUDIO DUB Button	EDIT Button	SLOW Lever	SKEW Lever
REC	×	×	○	×	△
AUDIO DUB	×	×	×	×	○
EDIT	×	×	◎	×	○
SLOW	△	△	△	◎	○

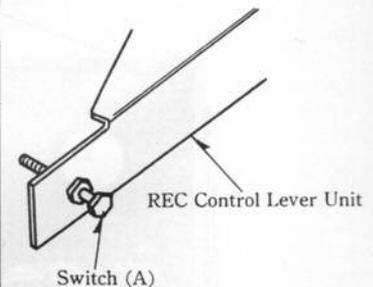


Fig. 7

### \* Adjustment

Adjust the stroke of screw (A) of REC control lever unit by loosening or tightening so that the condition of above table is satisfied. (After adjustment, tighten the nut surely and then, hold the screw.)

### \* Skew Function Adjustment in REC mode

Make sure that the skew lever is returned to the center position when the REC button is pressed. (The clearance (t) of the skew claw unit and the claw wheel should be 1 mm.)

If it is not satisfied, adjust the slackness of the wire lope by the wire guide unit. (See Fig. 9.)

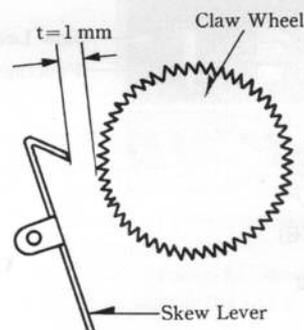


Fig. 8

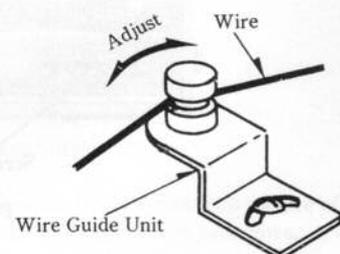


Fig. 9

### 3. SLOW MOTION MECHANISM ADJUSTMENT

#### \* Check Point

1. Make sure that the slow lever is locked in PLAY mode only.
2. When the slow lever is locked, make sure that the slide switch is turned ON, and is turned OFF when the slow lever is locked out. (When the switch is turned ON and OFF the width ( $l$ ) and ( $l'$ ) become the same, as shown in Fig. 12.)

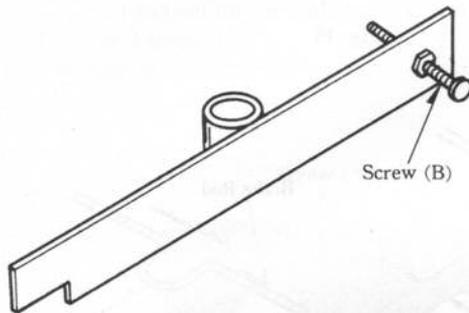


Fig. 10

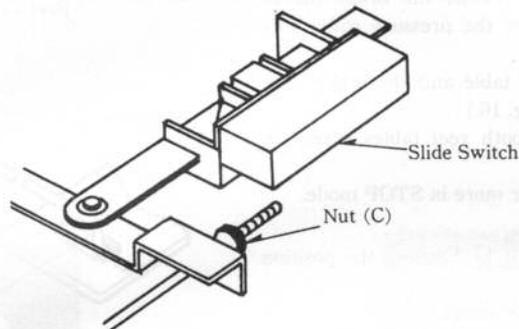


Fig. 11

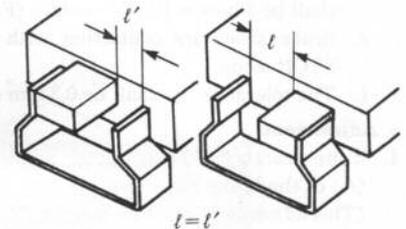


Fig. 12

#### \* Adjustment

1. Adjust the screw (B) by tightening or loosening so that the check point item (1) is satisfied.  
PLAY mode ..... Switch turns ON (slow lever is locked)  
F.F, REW, STOP STILL mode ..... Switch turns OFF (slow lever is locked out)
2. Adjust the nut (C) by tightening or loosening so that the check point item (2) is satisfied.

### 4. SLIDE SWITCH ADJUSTMENT

#### \* Check Point

Make sure that the slide switch is turned ON when pressing the REC, AUDIO DUD, EDIT buttons, and is turned OFF when releasing each button.

#### \* Adjustment

Adjust the stroke of the switch lever by screw (D) so that the check point is satisfied. (See Fig. 13.)

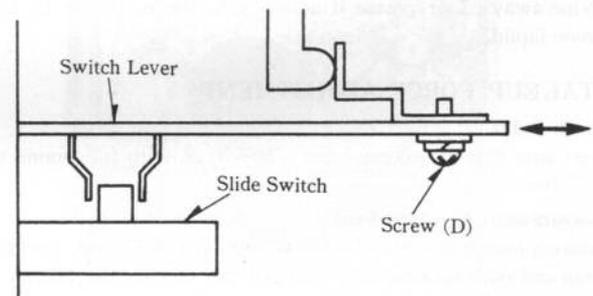


Fig. 13

### 5. PRESSURE ROLLER TENSION ADJUSTMENT

#### \* Instrument Required

Spring Tension Gauge VFK38/3 kg  
Strong Twine

#### \* Measurement

1. Hang a loop of twine on the pressure roller shaft and hook the spring tension gauge on the other end of the loop.
2. Load the tape as in the case of playback, and place the unit in PLAY mode.
3. Pull the spring tension gauge on the direction of a line connecting the centers of the capstan and pressure roller shaft. Slowly pull and read the scale at a point where the tape stops moving.
4. The standard pressure of the pressure roller should be  $2 \pm 0.3$  kg.

#### \* Adjustment

1. Adjust the nut (A).
2. Lock with the double nuts after adjusting.

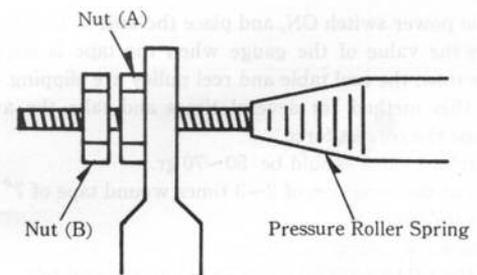


Fig. 14

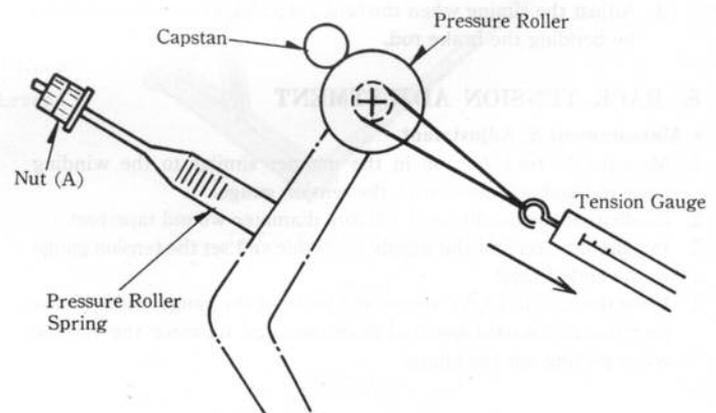


Fig. 15

## 6. BRAKE ADJUSTMENT

### \* Check Point

1. Make sure the following items,
  - a. When the function lever is changed to STOP mode from PLAY mode, the tape stops within 1 second without abnormal tension (500 gr or more).
  - b. When the function lever is changed to STOP mode from F.F or REW mode, the tape stops within 2 seconds without tension more than 800 gr.
  - c. When the unit is placed in PLAY mode, the brake moves away from the reel table just before the pressure roller forwards the tape.
  - d. The clearance (A) between the reel table and the brake shoe shall be 1 mm in PLAY mode. (Fig. 16.)
  - e. Brake shoes are contacting with both reel tables surely in STOP mode.
  - f. The tolerance (B) shall be 0.3 mm or more in STOP mode.

### \* Adjustment

1. If the clearance (A) is not good, adjust it by bending the position (A) of the brake rod. (This adjustment must be done in PLAY mode.)
2. Adjust the timing of both brakes by brake rod (Equalize gaps between supply/takeup reel tables and brake shoes). (approx. 1 mm)
3. Wipe away oil or grease if adhering to the reel table by using freon liquid.

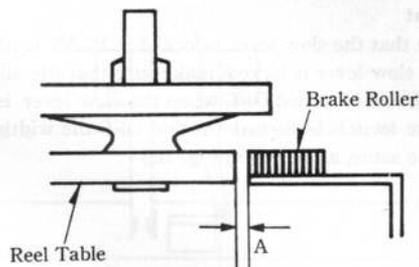


Fig. 16

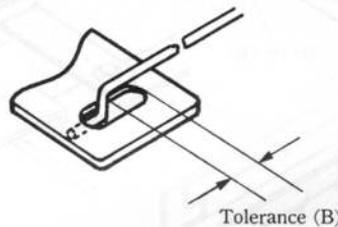


Fig. 17

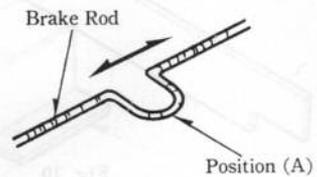


Fig. 18

## 7. TAKEUP FORCE ADJUSTMENT

### \* Check Point

Make sure that the takeup force is 50~70 gr. with full wound tape of 7" reel.

### \* Measurement & Adjustment

1. Make a loop at the end of a full wound tape of 7" reel, fasten the loop end with splicing tape and put the reel on the takeup reel table.
2. Hook the tension gauge to the loop and pull out the tape end about 15 cm.
3. Turn the power switch ON, and place the unit in PLAY mode.
4. Measure the value of the gauge when the tape is stopped. (At this time, the reel table and reel pulley are slipping.)
5. Repeat this method for several times and take the average to determine the correct force.
6. The standard value should be 50~70 gr.
7. Confirm at the condition of 2~3 times wound tape of 7" reel.
8. For adjustment,
  - a. Replace the takeup reel table.
  - b. Put the LIMAX GREASE (VEK51) on the reel felt.
  - c. Adjust the screw (A) so that the clearance (a) of the reel table and the play idler is  $1 \pm 0.5$  mm in PLAY mode.
  - d. Adjust the timing when the brake separates from the reel table by bending the brake rod.

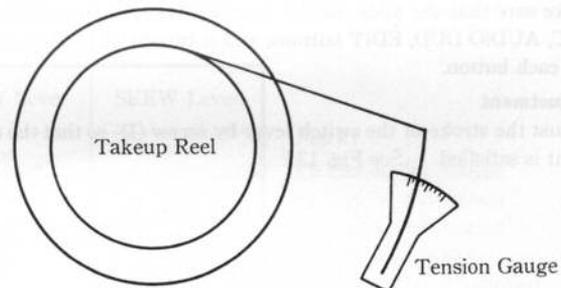


Fig. 19

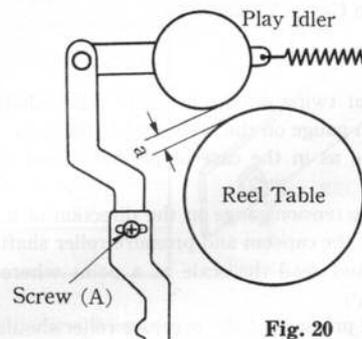


Fig. 20

## 8. BACK TENSION ADJUSTMENT

### \* Measurement & Adjustment

1. Measure the back tension in the manner similar to the winding force in playback mode with the tension gauge.
2. Confirm at the condition of 130 mm diameter wound tape reel.
3. Put the tape reel on the supply reel table and set the tension gauge to the end of tape.
4. Place the unit in PLAY mode, and pull out the gauge to the arrow direction at constant speed of 20 cm/sec. and measure the tension while pulling out the gauge.

### BACK TENSION:

Center position of skew lever 55 gr~65 gr

Minimum position of skew lever 30 gr~40 gr

Maximum position of skew lever 80 gr~100 gr (Reference)

Fluctuation Range for skew adjustment on the playback picture of recorded tape at the self-recording and playback is as follows,

Skew Minimum; 1/24 H or more (bend right side)

Skew Maximum; 1/24 H or more (bend left side)

5. If back tension is not good, adjust as follows,
  - a. Change the position of band holding angle to right or left side.
  - b. Change the hooking position of skew control spring.

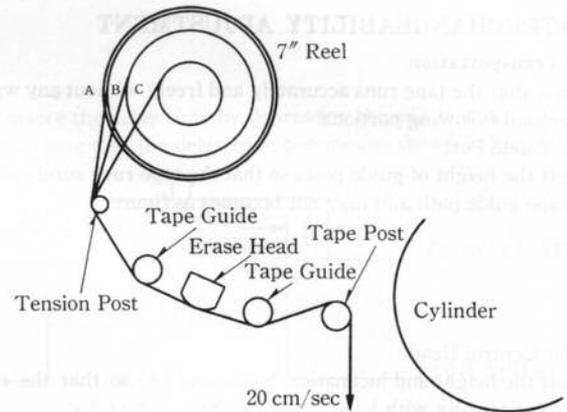


Fig. 21

## 9. TENSION POLE POSITION ADJUSTMENT

### \* Check Point

1. Make sure that the tape does not contact with the tension pole in F.F, REW modes when the full wound tape of 7" reel (130 mm diameter or more) is put on the reel table.
2. Make sure that the tape contacts with the tension pole by full wound tape of 7" reel in PLAY mode.
3. Make sure that the movement of the tension pole is within 1 mm when moving the skew lever from minimum position to maximum position.
4. Make sure that tension release lever does not contact with the tension lever.

### \* Adjustment

1. Change the position of the band holding angle.
2. Change the hooking position of the skew control spring.
3. Adjust the rod length by bending the position (A) so that the clearance  $l$  (from center position to minimum position) and  $l'$  (from center position to maximum position) are same level. (Fig. 17)

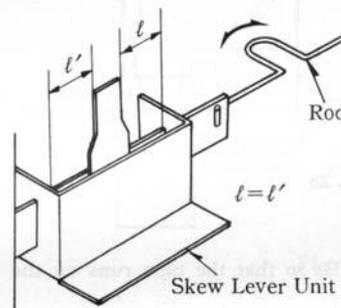


Fig. 22

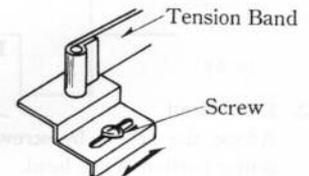


Fig. 23

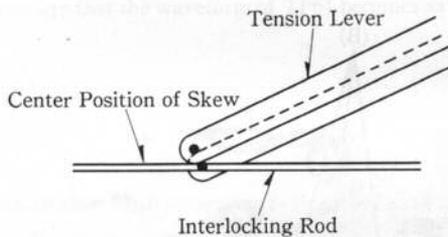


Fig. 24

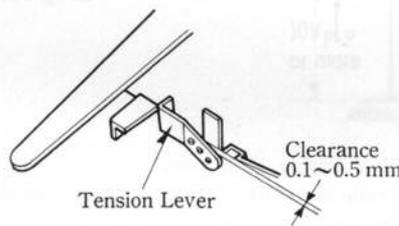


Fig. 25

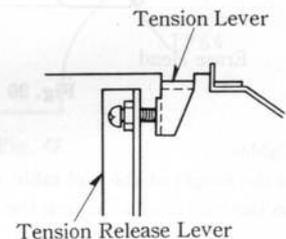


Fig. 26

## 10. WOW & FLUTTER

1. Connect the wow meter to the audio output terminal and playback the recorded reference tape.
2. Measure the frequency variation (WOW & FLUTTER) at beginning portion of the tape, middle and end for about one minute at least two times.
3. Calculate each average of the measured values at three different portion of tape and take the maximum value of averages for wow & flutter.

WOW & FLUTTER: 0.22 r.m.s. or less

4. For adjustment, check and replace the parts
  - \* Takeup Reel Table
  - \* Capstan Shaft
  - \* Motor Pulley
  - \* Flywheel
  - \* Pressure Roller, etc.
5. Make sure that the brake shoe or rewind roller is off from the takeup reel table.

## 11. HORIZONTAL SWAY OF PICTURE

1. Connect a monitor TV to the VTR, and record and playback the pattern signal.
2. Read the value of horizontal sway on the picture shall be 1.0 mm or less.
3. Make sure that the brake shoe or rewind roller is off from the takeup reel table.

4. For adjustment, check and replace parts,
  - \* Takeup Reel Table
  - \* Pressure Roller
  - \* Capstan Belt
  - \* Flywheel
  - \* Motor Pulley
  - \* Capstan Shaft
  - \* Motor, etc.

## 12. INTERCHANGEABILITY ADJUSTMENT

### \* Tape Transportation

Confirm that the tape runs accurately and freely without any wrinkles around following portions.

#### 1. Tape Guide Post

Adjust the height of guide posts so that the tape runs surely along the tape guide path and may not become as figure.

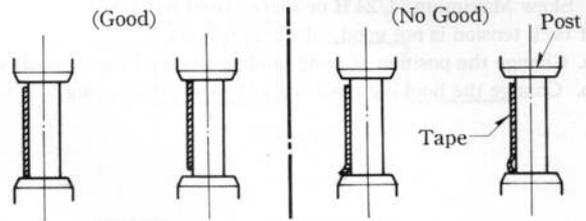


Fig. 27

#### 2. Audio/Control Head

Adjust the height and inclination by screws (A) so that the tape contacts normally with head. See Fig. 28.

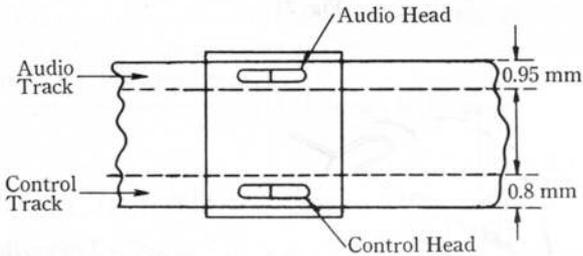


Fig. 28

#### 3. Erase Head

Adjust the height by screws (B) so that the tape runs on the center portion of the head.

Adjust the head position 4~5 mm from the post as shown below.

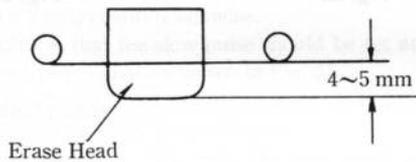


Fig. 30

#### 4. Reel Tables

Adjust the height of the reel table with fiber washer if the tape touches the reel after adjusting the head height correctly.

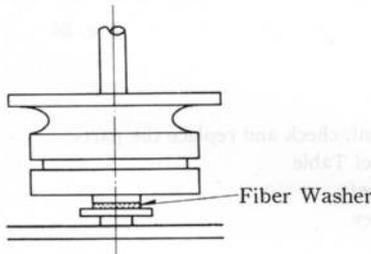


Fig. 32

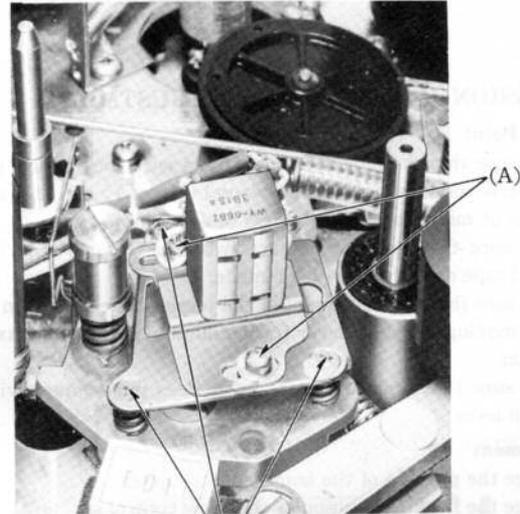


Fig. 29

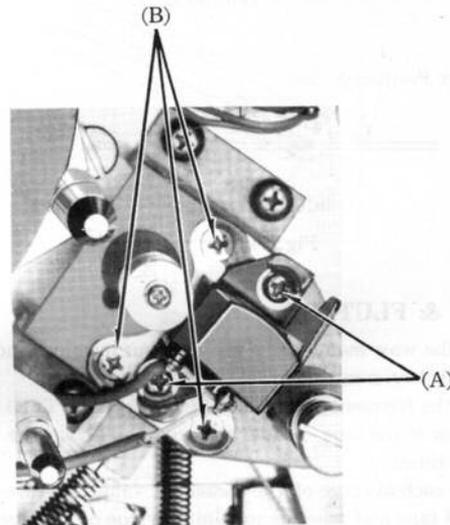


Fig. 31

### \* Video Output Stability

1. Connect an oscilloscope probe to TP54 and ground.
2. Connect the monitor TV to the unit and playback the recorded reference tape (VFM3000A) and measure the video output envelope.
3. Measure the maximum output (V), output at the lower portion of video track (V1), at the middle portion (V2) and at the upper portion (V3) at any position of skew lever.

$$V1/V_{max}=0.7, \quad V2/V_{max}=0.8, \quad V3/V_{max}=0.7$$

4. Watching the output waveform, move the posts (2), (3), (4), up and down, and set the tape run becomes smoothly.

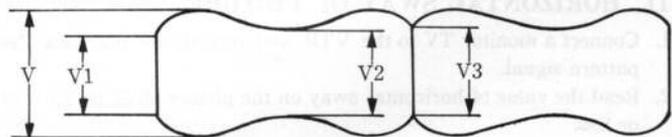


Fig. 33

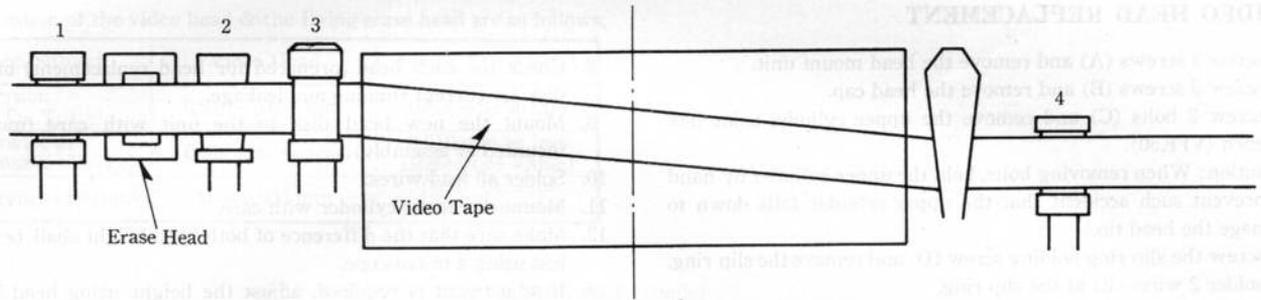


Fig. 34

**\* Playback Shifter Variation Range**

1. Connect an oscilloscope probe to TP54 and ground.
2. Connect a monitor TV to the unit and playback the recorded reference tape (VFM3000A).
3. Move the skew lever to maximum, center and minimum position and read the playback shifter variation range.  
PLAYBACK SHIFTER VARIATION RANGE: 7 msec or more

**\* Interchangeability Margins**

1. Use the same measurement procedures as above.
2. As against the fix position, the tape interchangeability margins to forward and backward should be 3.0 msec or more and difference of their margins should be within 1 msec.
3. Loosen the adjusting screws (A) and move the audio/control and erase head right or left to satisfy the above value.

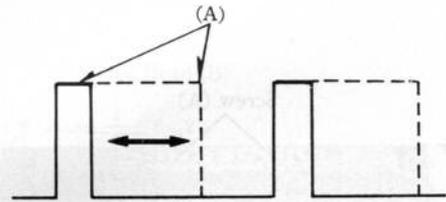


Fig. 35

**13. FREE RUNNING**

- \* Adjustment Point: Lower Motor Pulley
- \* Specification: Free Running Rotation  $1825 \pm 2$  r.p.m.
- \* Recheck when the following conditions are observed.
  1. During playback, if the picture is distorted periodically.
  2. When replacing the control belt.

**\* Measurement & Adjustment**

1. Make sure that the control belt is installed properly on the pulley.
2. Check if the belt is placed in the center position of the pulley.
3. Place the unit in REW mode, connect TP26 to the oscilloscope.
4. Count the time that the waveform (A) passes 10 times leftward from right.
5. The time shall be in the range of 22.3~26 seconds.
6. When the waveform (A) passes rightward from left, the free running rotation is 1800 r.p.m. or less.
7. If it is no good, adjust the rotation by replacing the lower motor pulley so that optimum free run speed is obtained.

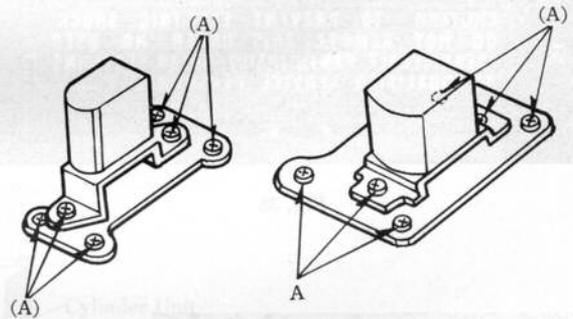


Fig. 36

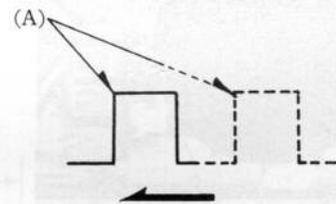
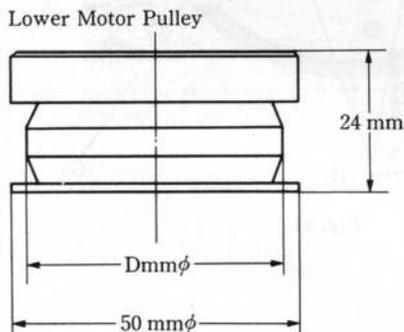


Fig. 37



Part No.	Mark	Diameter D mm $\pm 0.01$ mm	
VDP0374	A	44.86	Slower ↑ Select one of these ↓ Faster
VDP0375	B	44.93	
VDP0376	C	45.00 (Standard)	
VDP0377	D	45.07	
VDP0378	E	45.14	

## 14. VIDEO HEAD REPLACEMENT

1. Unscrew 2 screws (A) and remove the head mount unit.
2. Unscrew 3 screws (B) and remove the head cap.
3. Unscrew 2 bolts (C) and remove the upper cylinder using hex wrench (VFK50).  
(Caution; When removing bolts, hold the upper cylinder by hand to prevent such accident that the upper cylinder falls down to damage the head tip.)
4. Unscrew the slip ring holding screw (D) and remove the slip ring.
5. Unsolder 2 wires (E) of the slip ring.
6. Unsolder 4 wires (F) (G). (Not necessary to unsolder wires of the head disk side).
7. Unscrew 4 screws (H) for head disk holding, and remove the head disk.

8. Check the each head (prepared for head replacement) of head disk for current running and leakage.
9. Mount the new head disk to the unit with care (must be mounted as assembly).
10. Solder all lead wires.
11. Mount the upper cylinder with care.
12. Make sure that the difference of both head height shall be  $5\mu$  or less using a microscope.
13. If adjustment is required, adjust the height using head height adjusting screws.
14. In case that microscope is not available, playback the recorded reference tape and adjust the head's height so that the still noise gets as small as possible.

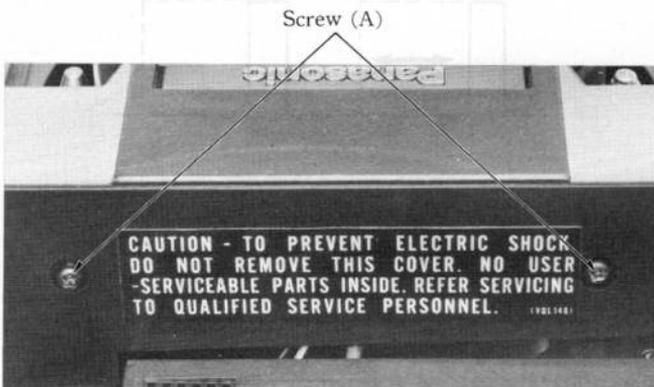


Fig. 38

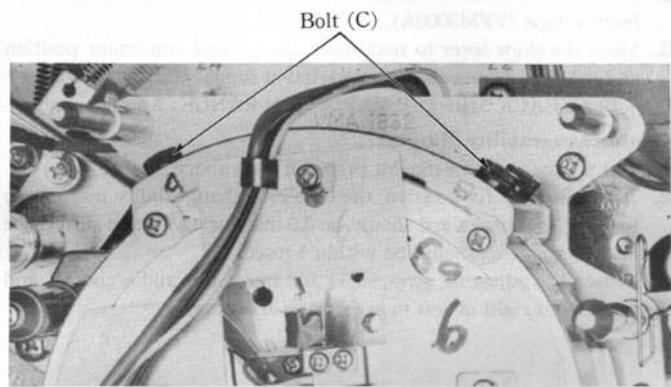


Fig. 40

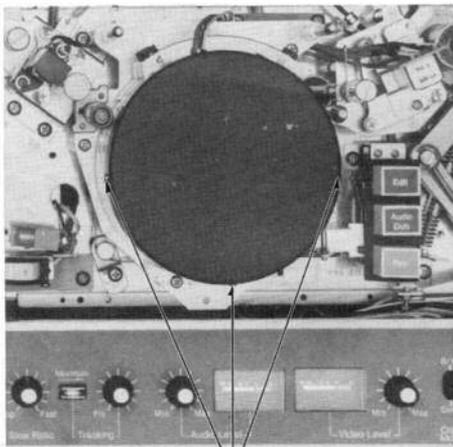


Fig. 39

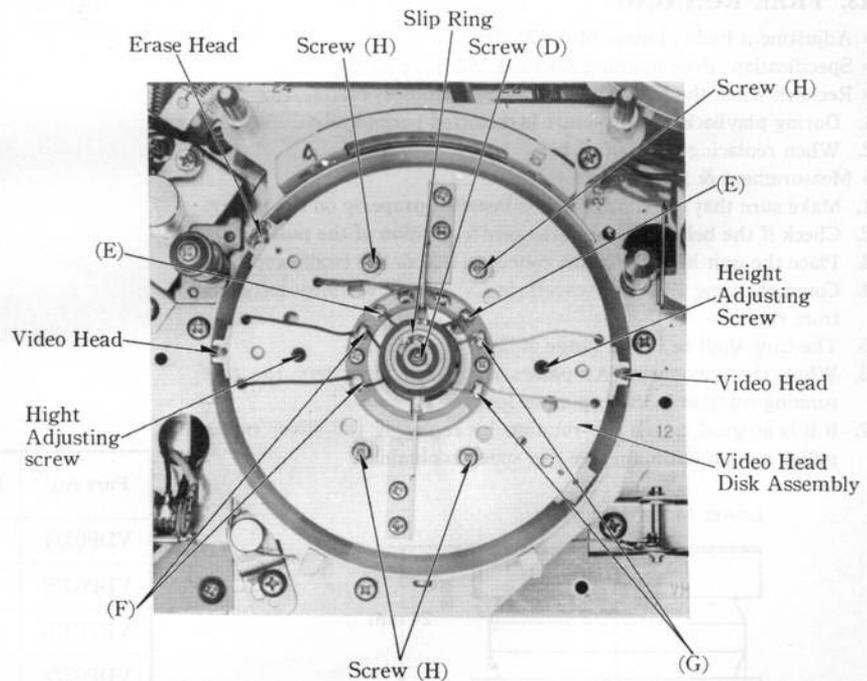


Fig. 41

Specification of the video head & the flying erase head are as follows,

Spec. Subject	Video Head	Flying Erase Head
Protrusion ( $T_A, T_B, T_C$ )	0.040~0.060 mm	0.030~0.050 mm
Difference of protrusion ( $T_A-T_B$ )	0.010 mm or less	0.010 mm or less (Reference Value)
Difference of height	$H_1=0.005$ mm	$H_2=0.010$ mm (Reference Value)

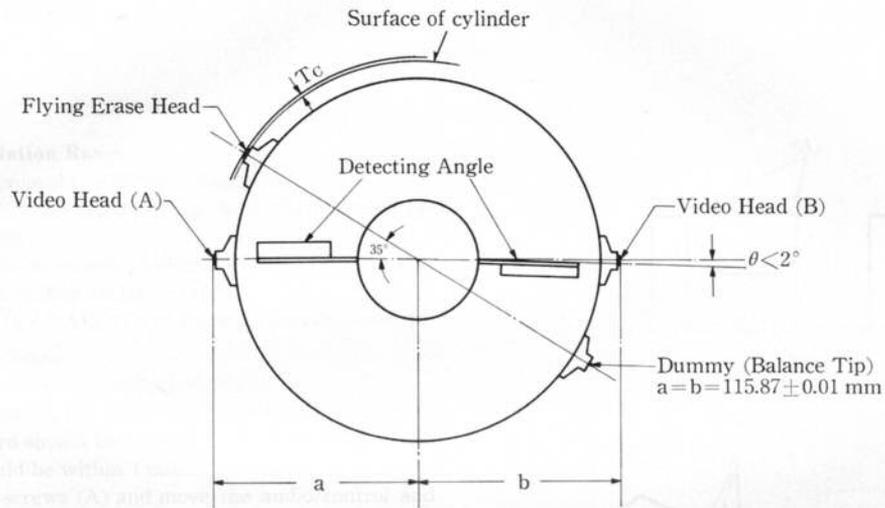


Fig. 42

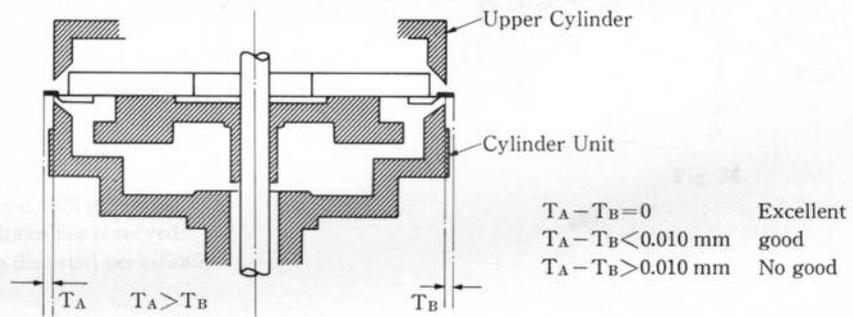


Fig. 43

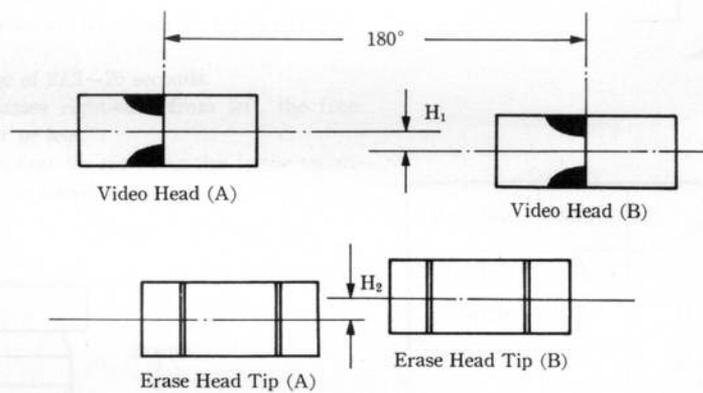
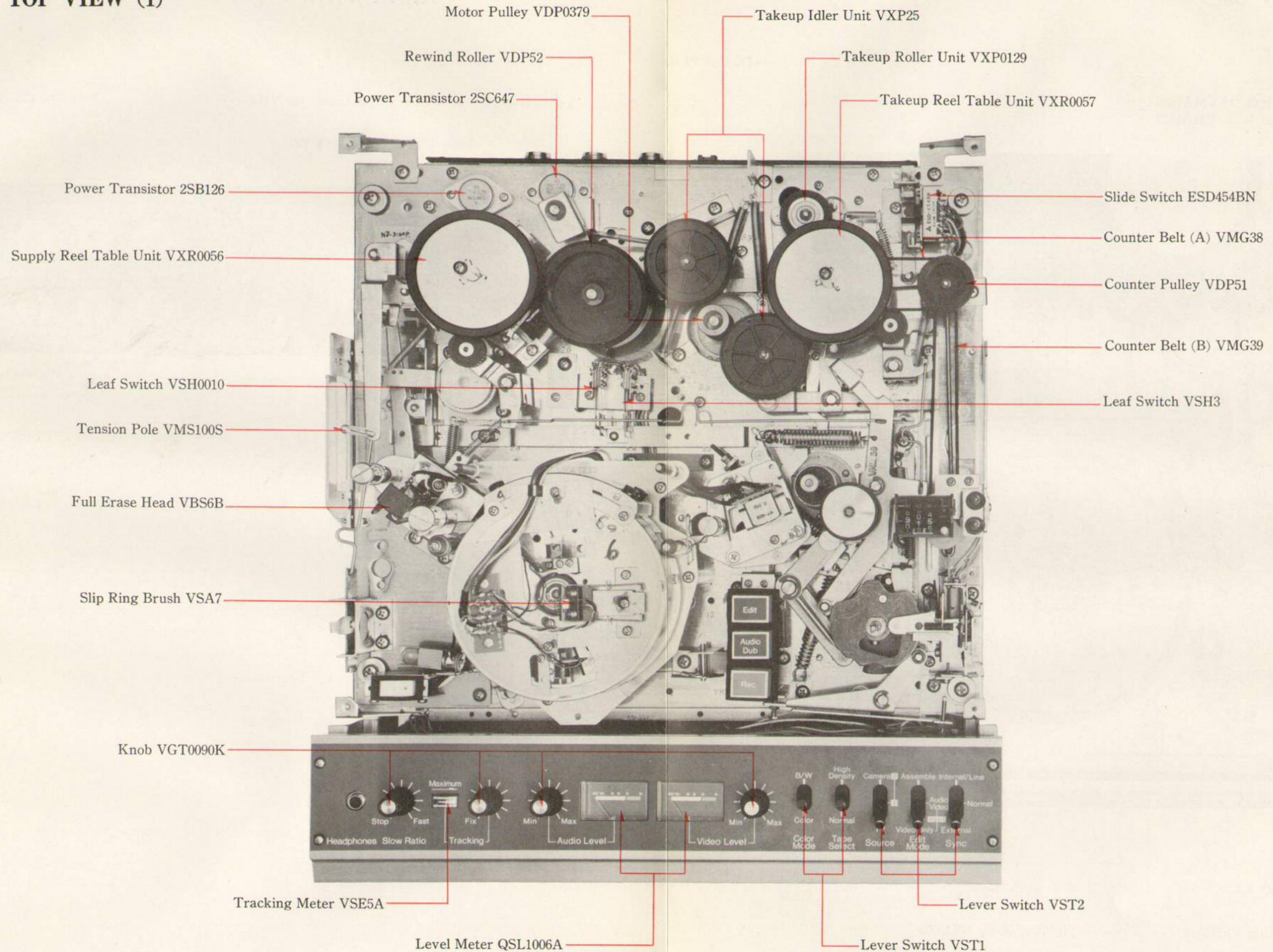


Fig. 44

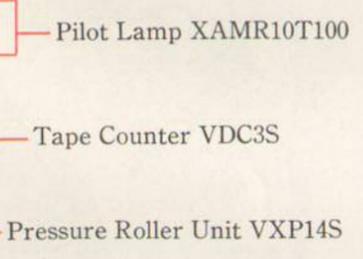
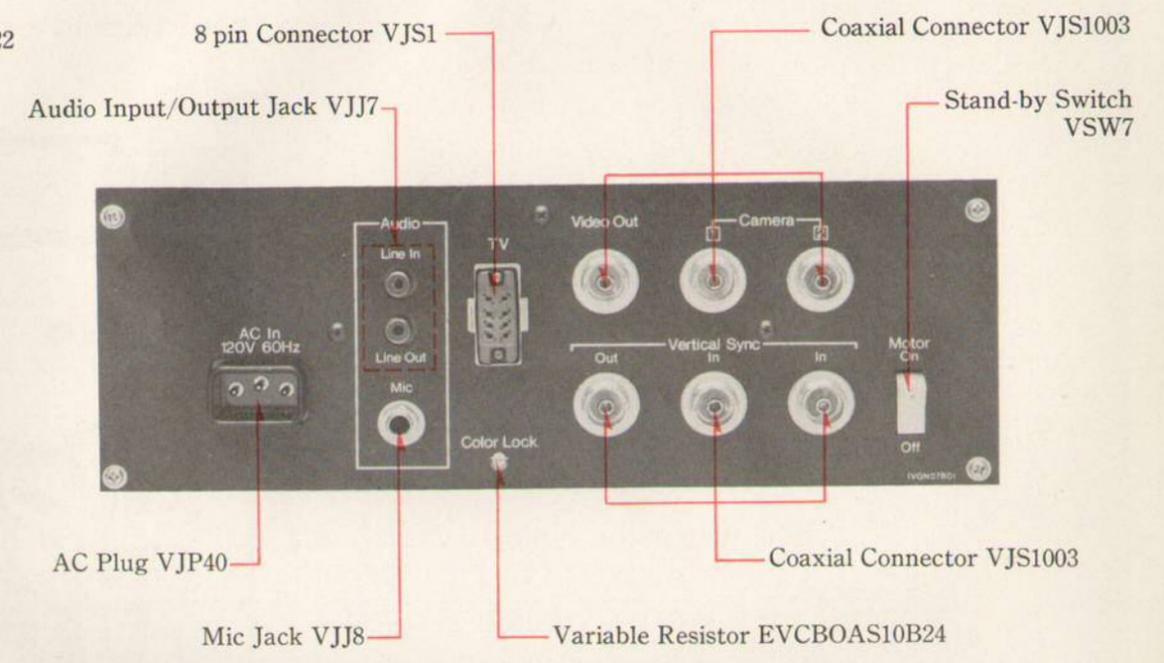
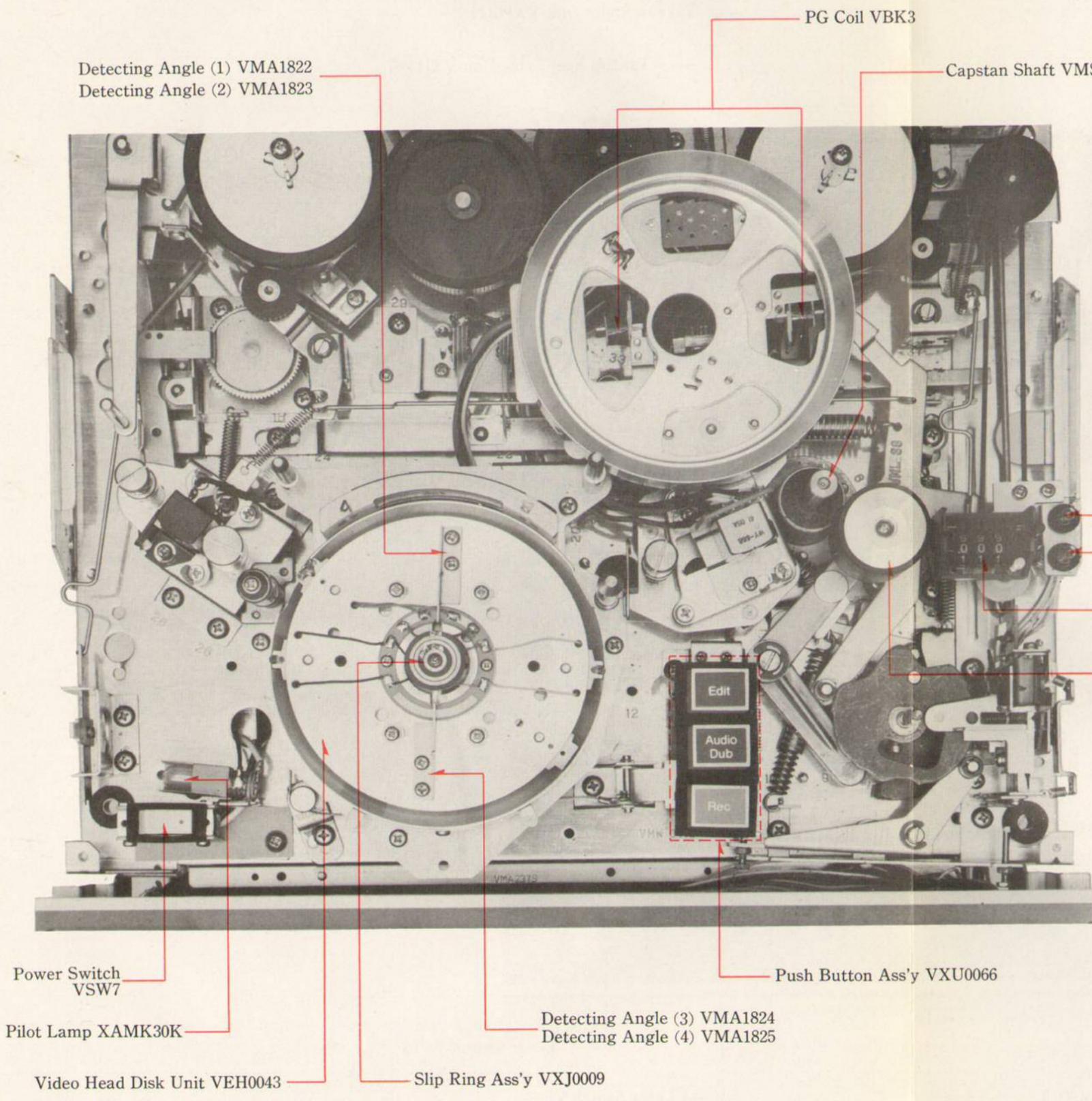
# INNER PARTS LOCATION

## TOP VIEW (1)

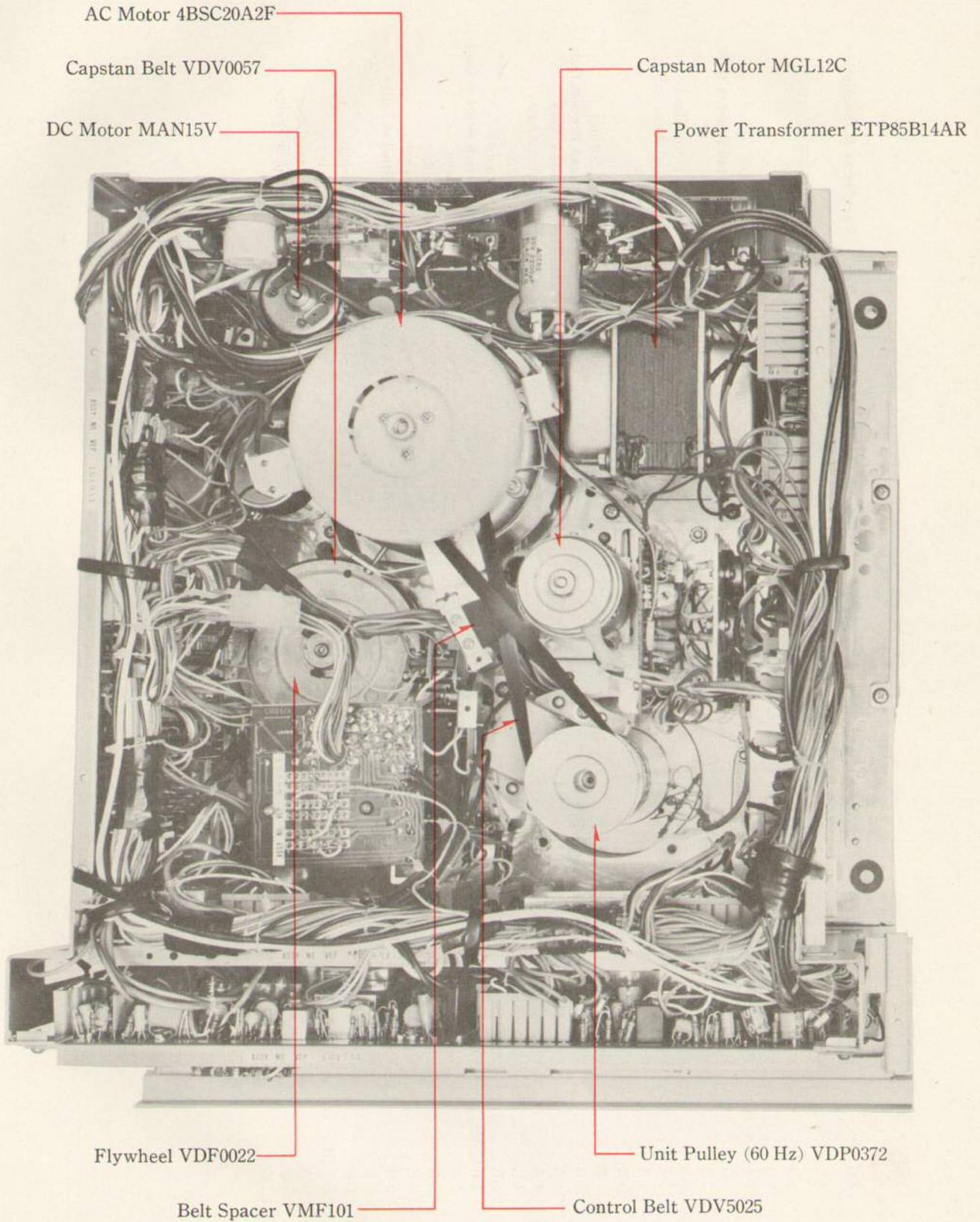


**TOP VIEW (2)**

**REAR VIEW**



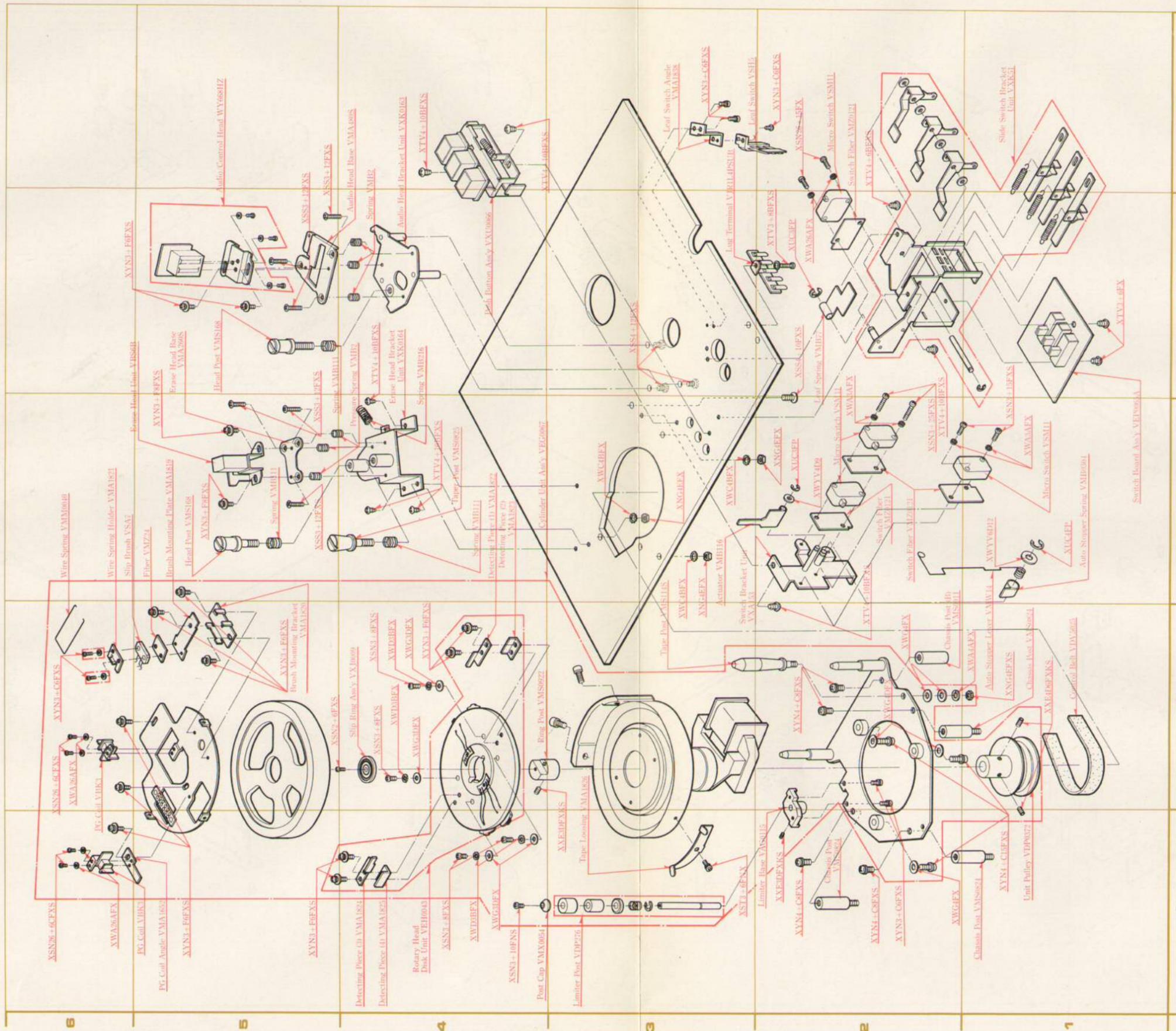
# BOTTOM VIEW



1

Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price
1-B	VEG0067	Cylinder Unit Assy	1		5-C	VMB2	Pressure Spring	3	
1-B	VDP0372	Unit Pulley (60 Hz)	1		5-C	VMS168	Head Post	1	
1-A, 2-A, B	VDV5025	Control Belt	1		5-C, 4-C	VMB111	Spring	2	
2-B	VMS0824	Chassis Post	3		4-C	VMS0825	Taper Post	1	
2-A	VMS0911	Chassis Post (B)	1		4-C	VXK0164	Erase Head Bracket Unit	1	
3-A	VAG0115	Limiter Base	1		4-C	VMB216	Spring	1	
3-A	VDP276	Limiter Post	1		5-D	WY668HZ	Audio/Control Head	1	
4-A	VMA1826	Tape Loosing	1		5-D	VMA480S	Audio Head Base	1	
4-A	VMX0054	Post Cap	1		5-D	VMS168	Head Post	1	
3-B	VMS114S	Taper Post	1		5-D	VMB111	Spring	1	
4-B	VMS0922	Ring Post	1		4-D	VMB2	Pressure Spring	3	
4-B	VEH0043	Rotary Head Disk Unit	1		4-D	VXK0163	Audio Head Bracket Unit	1	
4-A	VMA1824	Detecting Piece (3)	1		4-E	VXU0066	Push Button Assy	1	
4-A	VMA1825	Detecting Piece (4)	1		3-E	VMA1838	Leaf Switch Angle	1	
4-B	VMA1822	Detecting Piece (1)	1		3-E	VSH5	Leaf Switch	1	
4-B	VMA1823	Detecting Piece (2)	1		3-D	VJR1L4PSUB	Lug Terminal	1	
4-B	VXJ0009	Slip Ring Assy	1		2-D	VXK51	Slide Switch Bracket Unit	1	
5-B	VMA1820	Brush Mounting Bracket	1		2-D	VMB77	Leaf Spring	1	
5-B	VMA1819	Brush Mounting Plate	1		2-D	VMZ0121	Switch Fiber	1	
5-B	VMZ24	Fiber	1		2-D	VSM11	Micro Switch	1	
5-B	VSA7	Slip Brush	1		2-C	VXA153	Switch Bracket Unit	1	
6-B	VMA1821	Wire Spring Holder	1		2-C	VMB116	Actuator	1	
6-B	VMW0040	Wire Spring	1		2-C, 1-C	VSM11	Micro Switch	3	
6-A, B	VBK3	PG Coil	2		2-C	VMZ0121	Switch Fiber	3	
6-A	VMA1652	PG Coil Angle	1		1-C	VMW14	Auto Stopper Lever	1	
5-C	VBS6B	Erase Head Unit	1		1-C	VMB0304	Auto Stopper Spring	1	
5-C	VMA260S	Erase Head Base	1						

# EXPLODED VIEW



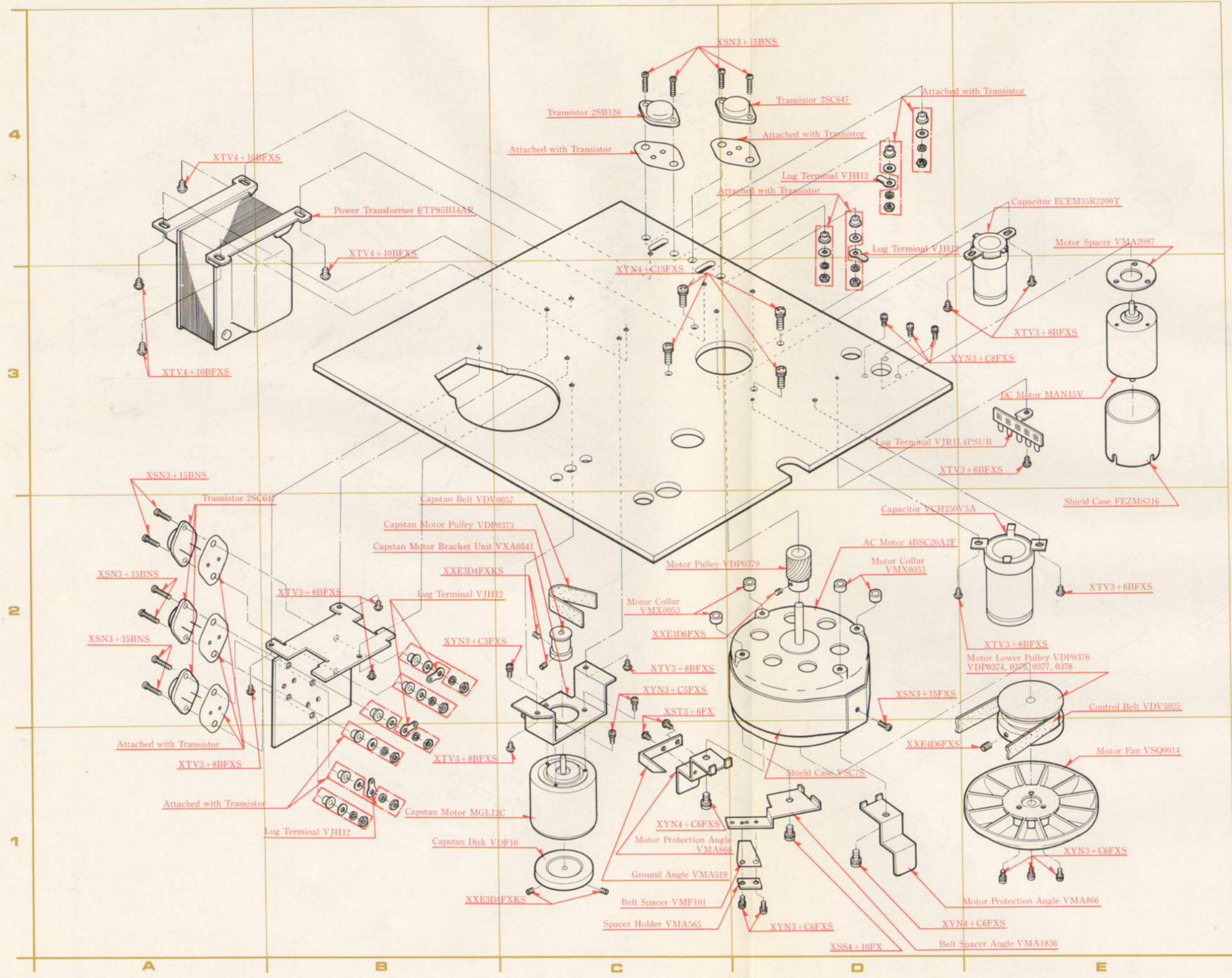


2

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
4-B	VXA71	Skew Operation Angle Unit	1		3-E	VX145	Pressure Roller Unit	1	
4-B	VMW10	Interlocking Rod	1		3-E	VMS92S	Pressure Roller Shaft	1	
4-C	VXL82	Rotary Lever Unit	1		3-E	VML44	Pressure Roller Arm	1	
4-C	VMF43	Felt	1		3-E	VDB183	Cam Collar	1	
4-C	VMA515	Claw Wheel	1		3-E	VMB38S	Pressure Roller Spring	1	
4-C	VMB108	Spring	1		4-E	VMZ43	Tube	1	
3-C	VNW19	Washer	1		4-D	VMS95S	Spring Hook (A)	1	
3-C	VMA549	Washer	1		4-F	VMS0822	Capstan Shaft	1	
3-C	VXA70	Skew Ratchet Bracket Unit	1		3-F	VMG35	Capstan Cap	1	
3-C	VMB97	Balance Spring	1		3-F	VXD1	Capstan Holder Unit	1	
3-B	VXL88	Skew Claw Unit	1		1-D	VDF0022	Flywheel	1	
3-B	VMB96	Spring	1		1-D	VDV0057	Capstan Belt	1	
3-B	VMW12	Wire Rope	1		1-E	VMA650	Belt Guide	1	
2-A	VXA88	Wire Guide Unit	1		2-E	VMA326S	Counter Angle	1	
2-A	VXA77	Release Lever Unit	1		2-F	VMA265	Counter Plate	1	
2-A	VMA562	Release Lever Bracket	1		2-F	VDC3S	Tape Counter	1	
2-A	VMS224	Shaft	1		2-F	RHG202	Rubber Bush	2	
4-B	VML99	Tension Release Lever	1		2-F	XAMR10T100	Pilot Lamp	2	
3-B	VMB98	Spring	1		2-F	VXA35	Counter Pulley Angle Unit	1	
3-B	VMS159S	Lever Shaft	1		2-F	VMB216	Spring	1	
3-A	VMB107	Reset Spring	1		2-F	VMG39	Counter Belt (B)	1	
3-A, 1-E	VMA523	Handle	2		3-F	VDP51	Counter Pulley	1	
4-D	VXR0056	Supply Reel Table Unit	1		3-F	VMG38	Counter Belt (A)	1	
3-D	VMS110S	Reel Shaft	1		1-C	VMS82S	Shaft	1	
3-D	VXR0058	Felt Spacer Unit	1		1-C	VXL0345	Recording Control Lever Unit	1	
3-D	VXK0162	Supply Reel Table Bracket Unit	1		1-C	VDB183	Cam Collar	1	
3-D	VXA69	Band Holder Unit	1		1-B	VXL0346	Slow Safety Lever Unit	1	
4-D	VXL80	Tension Band Unit	1		1-B	VMS397	Lever Shaft	1	
4-C	VXL81S	Tension Lever Unit	1		1-B	VMA259S	Switch Mounting Angle	1	
4-C	VMS100S	Tension Post	1		1-B	VMZ0129	Spacer (B)	1	
3-C	VMB161	Spring	1		1-A	VMF22	Switch Cover	1	
4-D	VMZ0165	Washer	1		1-A	VMZ0122	Spacer	2	
4-E	VSH0010	Leaf Switch	1		1-A	VSW7	See-Saw Switch	1	
4-E	VSH3	Leaf Switch	1		2-B	VJS11	Lamp Socket	1	
4-E	VMA1840	Leaf Switch Bracket	1		2-B	XAMK30K	Pilot Lamp	1	
4-E	VXL0341	Tension Rod Unit	1		2-B	VMZ0138	Lamp Cover	1	
4-E, 3-F	VDB43	Spacer	2						







Ref. No.	Part Name & Description	Per Set (Pec.)	Unit Price
4-B	ETP85B14AR Power Transformer	1	
4-C	2SB126 Transistor	1	
4-D	2SC647 Transistor	1	
4-D, 1-B, 2-B	VJH12 Lug Terminal	5	
4-E	ECEM35R2200T Capacitor	1	
3-E	VMA2087 Motor Spacer	1	
3-E	MAN15V DC Motor	1	
3-E	FEZMS316 Shield Case	1	
3-E	VJR1L4PSUB Lug Terminal	1	
2-E	VCH250V5A Capacitor	1	
2-E	VDP0376 Lower Motor Pulley (C)	1	
	VDP0374 Lower Motor Pulley (A)	(1)	
	VDP0375 Lower Motor Pulley (B)	(1)	
	VDP0377 Lower Motor Pulley (D)	(1)	
	VDP0378 Lower Motor Pulley (E)	(1)	
2-E	VDV5025 Control Belt	1	
	VSQ0014 Motor Fan	1	
	VMA866 Motor Protection Angle	2	
	VMA1836 Belt Spacer Angle	1	
	VMF101 Belt Spacer	1	
	VMA565 Spacer Holder	1	
	VMA519 Ground Angle	1	
	VMA866 Motor Protection Angle	1	
	VDP0379 Motor Pulley	1	
	VMX0053 Motor Collar	1	
	VDF10 Capstan Disk	1	
	VXA0541 Capstan Motor w/Circuit board	1	
	VDP0373 Capstan Motor Pulley	1	
	VDV0057 Capstan Belt	1	
	2SC647 Transistor	3	





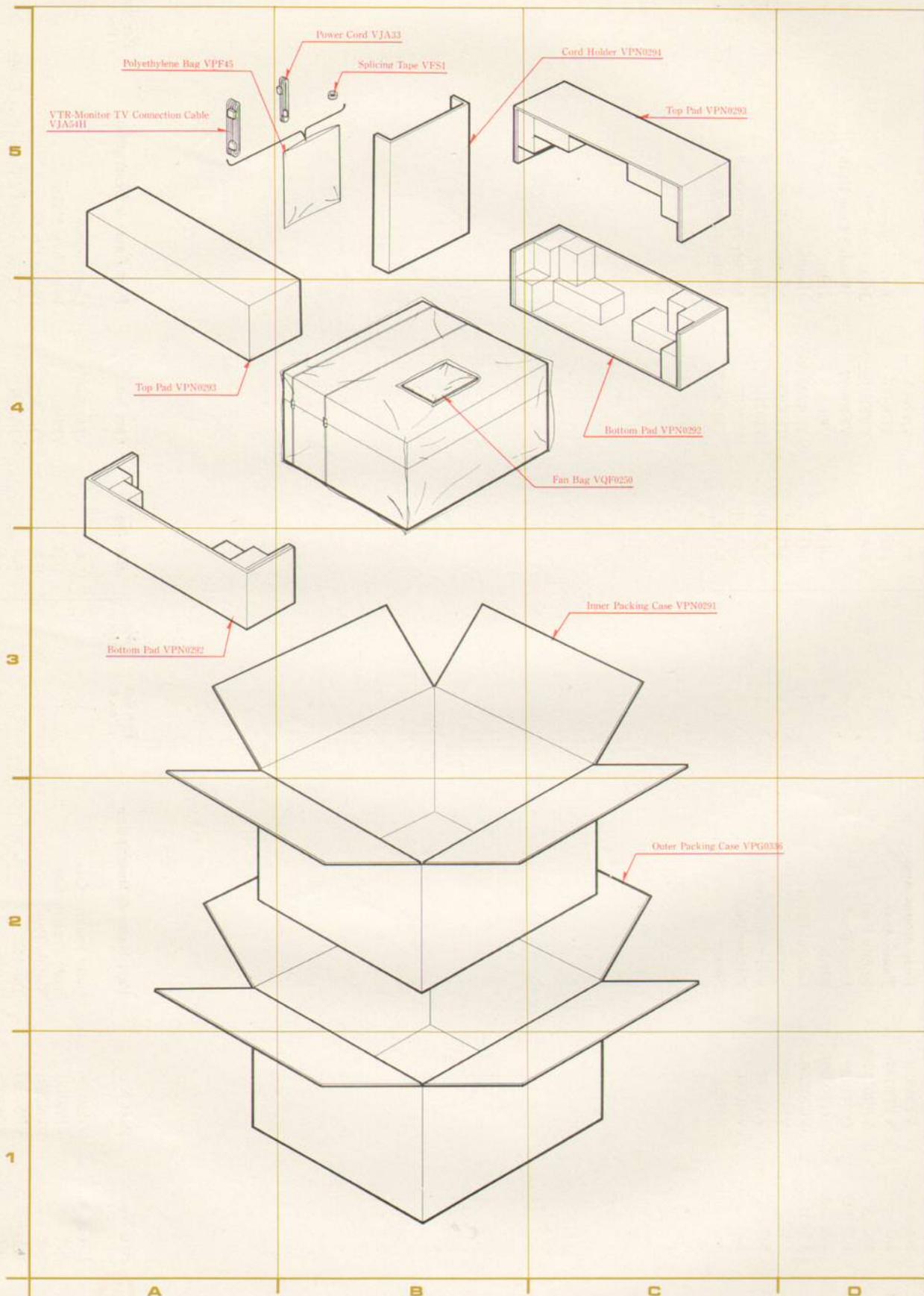
Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
4-A	VYM0026	Head Mount Assy	1		3-C	VNW18	Washer	4	
4-C	VYP0163	Panel Assy	1		1-B	VGK187	Switch Sheet	5	
4-C	VFR0712SP	Empty Reel	1		2-A	VYF0049	Head Cap	1	
4-B, 3-C	QYT0139	Lever Knob	2			VYK0077	Wooden Case Unit	1	
4-A, 3-A	VT0090K	Knob	4		4-D, E	VKL1	Latch	2	
3-A, B	VGK0350	Control Panel	1		3-D	TKK202-5S	Handle	1	
3-D	VMS268	Screw	1		3-D, E	TKK9267	Mounting Piece	2	
3-C	VXL282	Function Lever Unit	1		3-F, 4-F	VKC1	Hinge	2	
3-C	VMG33	Rubber Bush	8		2-G, 1-F	VMG11	Rubber Foot (Small)	4	
3-C	VMX5	Spacer	4		1-D, E, F	VMG0125	Rubber Foot (Large)	4	

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Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
1-B	VPG0336	Outer Packing Case	1		5-B	VPN0294	Cord Holder	1	
3-B	VPN0291	Inner Packing Case	1		5-B	VPF45	Polyethylene Bag	1	
3-A, 4-C	VPN0292	Bottom Pad	2		5-B	VJA33	Power Cord	1	
4-A, 5-C	VPN0293	Top Pad	2		5-A	VJA54H	VTR-Monitor TV Connection Cable	1	
4-B	VQF0250	Fan Bag	1		5-B	VFS1	Splicing Tape	1	

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# PACKAGING



# MECHANICAL REPLACEMENT PART LIST for NV-3160

(Alphabetical & Numerical Order Index)

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
④ (4-C)	2SB126	Transistor	1		③ (4-A)	VDP52	Rewind Roller	1	
④ (4-D)	2SC647	Transistor	4		③ (3-B)	VDP53	Shaft Holder	1	
④ (2-D)	4BSC20A2F	AC Motor	1		② (1-D), ④ (2-C)	VDV0057	Capstan Belt	1	
④ (4-E)	ECEM35R2200T	Capacitor	1		① (1-B), ④ (2-E)	VDV5025	Control Belt	1	
③ (2-F)	ESD454BN	Slide Switch	1		①	VEG0067	Cylinder Unit Assy	1	
④ (4-B)	ETP85B14AR	Power Transformer	1		① (4-B)	VEH0043	Rotary Head Disk Unit	1	
③ (2-B)	EVCBOAL25A14	Variable Resistor	1		① (1-D)	VEP0065A	Switch Board Assy	1	
⑤ (2-A)	EVCBOAL25C14	Variable Resistor	1		⑥ (4-C)	VFR0712SP	Empty Reel	1	
⑤ (3-E)	EVCBOAS10B24	Variable Resistor	1		⑦ (5-B)	VFS1	Splicing Tape	1	
⑤ (2-B)	EVCBOGL25B55	Variable Resistor	1		⑥ (3-A, 3-B)	VGK0350	Control Panel	1	
⑤ (2-B)	FEV29AL25B32	Variable Resistor	1		⑥ (1-B)	VGK187	Switch Sheet	5	
④ (3-E)	FEZMS316	Shield Case	1		⑤ (4-F)	VGN0780	Jack Panel	1	
④ (1-C)	MGL12C	Capstan Motor w/Circuit Board	1		⑥ (3-A, 4-A)	VGTO090K	Knob	4	
④ (3-E)	MAN15V	DC Motor	1		③ (2-C)	VHD11	Screw	1	
⑤ (2-B)	QSL1006A	Level Meter	2		⑦ (5-B)	VJA33	Power Cord	1	
⑥ (3-C, 4-B)	QY70139	Lever Knob	2		⑦ (5-A)	VJA54H	VTR-Monitor TV Connection Cable	1	
② (2-F)	RHG202	Rubber Bush	2		⑤ (2-B)	VJJ5004	Headphone Jack	1	
⑥ (3-D)	TKK202-5S	Handle	1		③ (3-D)	VJH12	Lug Terminal	7	
⑥ (3-D, E)	TKK9267	Mounting Piece	2		④ (1-B, 2-B, 4-D)	VJH8	Lug Terminal	6	
① (2-A)	VAG0115	Limiter Base	1		⑤ (3-E)	VJ7	Audio Input/Output Jack	1	
① (6-A, B)	VBK3	PG Coil	1		⑤ (2-E)	VJ8	Mic Jack	1	
① (5-C)	VBS6B	Erase Head Unit	1		⑤ (2-F)	VJP40	AC Plug	1	
④ (2-E)	VCH250V5A	Capacitor	1		① (3-D), ④ (3-E)	VJR1L4PSUB	Lug Terminal	2	
② (1-C, 3-E)	VDB183	Cam Collar	4		⑤ (4-F)	VJS1	8 Pin Socket	1	
③ (3-C)	VDB2	Reel Metal	1		⑤ (4-E)	VJS1003	Coaxial Socket	6	
③ (3-C)	VDB2	Reel Metal	1		② (2-B)	VJS11	Lamp Socket	1	
② (3-F, 4-E)	VDB43	Collar	7		⑥ (3-F, 4-F)	VKC1	Hinge	1	
② (2-E)	VDC3S	Tape Counter	1		⑥ (3-D, 4-D)	VKL1	Latch	2	
② (1-D)	VDF0022	Flywheel	1		③ (3-C)	VMA16	Metal Holder	1	
④ (1-C)	VDF10	Capstan Disk	1		① (6-A)	VMA1652	PG Coil Angle	1	
① (1-B)	VDP0372	Unit Pulley (60 Hz)	1		⑤ (2-D, 4-B)	VMA1725	Chassis Foot (Rear)	2	
④ (2-C)	VDP0373	Capstan Motor Pulley	1		⑤ (2-D, 4-C)	VMA1769	Panel Angle (D)	2	
④	VDP0374	Lower Motor Pulley (A)	(1)		① (5-B)	VMA1819	Brush Mounting Plate	1	
④	VDP0375	Lower Motor Pulley (B)	(1)		① (5-B)	VMA1820	Brush Mounting Bracket	1	
④	VDP0377	Lower Motor Pulley (D)	(1)		① (6-B)	VMA1821	Wire Spring Holder	1	
④	VDP0378	Lower Motor Pulley (E)	(1)		① (4-B)	VMA1822	Detecting Piece (1)	1	
④ (2-E)	VDP0376	Lower Motor Pulley (C)	1		① (4-B)	VMA1823	Detecting Piece (2)	1	
④ (2-D)	VDP0379	Motor Pulley	1		① (4-A)	VMA1824	Detecting Piece (3)	1	
① (3-A)	VDP276	Limiter Post	1		① (4-A)	VMA1825	Detecting Piece (4)	1	
② (3-F)	VDP51	Counter Pulley	1		① (3-A)	VMA1826	Tape Loosing	1	

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
④ (1-C) ...	VMW14	Auto Stopper Lever	1		③ (2-C) ...	VXA81	Cam Lever Unit	1	
④ (2-C, D) ...	VMX0053	Motor Collar	1		② (2-A) ...	VXA88	Wire Guide Unit	1	
① (4-A) ...	VMX0054	Post Cap	1		② (3-F) ...	VXD1	Capstan Holder Unit	1	
③ (4-C) ...	VMW0062	Interlocking Rod (Supply Side)	1		① (4-B) ...	VXJ0009	Slip Ring Ass'y	1	
⑥ (2-C) ...	VMX5	Spacer	4		② (3-D) ...	VXK0162	Supply Reel Table Bracket Unit	1	
① (2-C, D) ...	VMZ0121	Switch Fiber	4		① (4-D) ...	VXK0163	Audio Head Bracket Unit	1	
② (1-A) ...	VMZ0122	Spacer	2		① (4-C) ...	VXK0164	Erase Head Bracket Unit	1	
② (1-B) ...	VMZ0129	Spacer (B)	1		① (2-D) ...	VXK51	Slide Switch Bracket Unit	1	
② (2-B) ...	VMZ0138	Lamp Cover	1		③ (2-E) ...	VXK52	Slow Lever Holder Unit	1	
② (4-D) ...	VMZ0165	Washer	1		② (4-E) ...	VXL0341	Tension Rod Unit	1	
① (5-B) ...	VMZ24	Fiber	1		③ (3-E) ...	VXL0342	Play Idler Arm Unit	1	
② (4-E) ...	VMZ43	Tube	1		② (1-C) ...	VXL0345	Recording Control Lever Unit	1	
③ (2-A) ...	VMZ46	Tube	1		② (1-B) ...	VXL0346	Slow Safety Lever Unit	1	
③ (2-A) ...	VNT6	Fiber Washer	1		③ (2-F) ...	VXL125	Switch Action Lever Unit	2	
③ (2-A) ...	VNT66	Washer	1		③ (2-E) ...	VXL126	Interconnecting Lever Unit	1	
⑤ (4-B) ...	VNW10	Washer	1		③ (3-C) ...	VXL127	Function Cam Unit	1	
③ (3-C) ...	VNW16	Spacer	1		⑥ (3-C) ...	VXL282	Function Lever Unit	1	
⑥ (3-C) ...	VNW18	Washer	4		③ (3-D) ...	VXL31	Takeup Idler Lever Unit	1	
② (3-C) ...	VNW19	Washer	1		③ (2-A) ...	VXL33	Cam Control Lever Unit	1	
② (5-B) ...	VPF45	Polyethylene Bag	1		③ (3-C) ...	VXL47	Brake Control Lever Unit	1	
⑦ (1-B) ...	VPG0336	Outer Packing Case	1		② (4-D) ...	VXL80	Tension Band Unit	1	
⑦ (3-B) ...	VPN0291	Inner Packing Case	1		② (4-C) ...	VXL81S	Tension Lever Unit	1	
⑦ (3-A, 4-C) ...	VPN0292	Bottom Pad	2		② (4-C) ...	VXL82	Rotary Lever Unit	1	
⑦ (4-A, 4-C) ...	VPN0293	Top Pad	2		② (3-B) ...	VXL88	Skew Claw Unit	1	
⑦ (5-B) ...	VPN0294	Cord Holder	1		③ (3-A) ...	VXL95	Rewind Idler Angle Unit	1	
⑦ (4-B) ...	VQF0250	Fan Bag	1		③ (4-E) ...	VXP0129	F.F. Roller Unit	1	
① (5-B) ...	VSA7	Slip Brush	1		② (3-E) ...	VXP14S	Pressure Roller Unit	1	
④ (2-D) ...	VSE7S	Shield Case	1		③ (4-B, D) ...	VXP25	Takeup Idler Unit	2	
④ (3-B) ...	VSE5A	Tracking Meter	1		③ (3-F) ...	VXR43	Reel Slip Pulley Unit	1	
④ (1-E) ...	VSQ0014	Motor Fan	1		② (4-D) ...	VXR0056	Supply Reel Table Unit	1	
② (4-E) ...	VSH0010	Leaf Switch	1		③ (4-F) ...	VXR0057	Takeup Reel Table Unit	1	
② (4-E) ...	VSH3	Leaf Switch	1		② (3-D) ...	VXR0058	Felt Spacer Unit	1	
① (3-E) ...	VSH5	Leaf Switch	1		① (4-E) ...	VXU0066	Push Button Ass'y	1	
① (1-C, 2-C) ...	VSM11	Micro Switch	3		③ (4-B) ...	VXZ3	Supply Brake Arm Unit	1	
⑤ (1-C) ...	VST1	Lever Switch	2		③ (4-D) ...	VXZ4	Takeup Brake Arm Unit	1	
⑤ (1-C) ...	VST2	Lever Switch	3		⑥ (2-A) ...	VYF0049	Head Cap	1	
② (1-A), ⑤ (4-D) ...	VSW7	Stand-by Switch	1		⑥ ...	VYK0077	Wooden Case Unit	1	
② (2-C) ...	VXA153	Switch Bracket Unit	1		⑥ (4-A) ...	VYM0026	Head Mount Ass'y	1	
② (2-F) ...	VXA35	Counter Pulley Angle Unit	1		⑥ (4-C) ...	VYP0163	Panel Ass'y	1	
⑤ (1-C) ...	VXA0521	Chassis Foot (Front, Right)	1		① (5-D) ...	WY668HZ	Audio/Control Head	1	
⑤ (3-A) ...	VXA0522	Chassis Foot (Front, Left)	1		② (2-B) ...	XAMK30K	Pilot Lamp	1	
⑤ (2-C) ...	VXA0541	Capstan Motor Bracket Unit	1		② (2-F) ...	XAMR10T100	Pilot Lamp	2	
② (3-D) ...	VXA69	Bandt Holder Unit	1		④ (1-D) ...	VMA1836	Belt Spacer Angle	1	
② (3-C) ...	VXA70	Skew Ratchet Bracket Unit	1		① (3-E) ...	VMA1838	Leaf Switch Angle	1	
② (4-B) ...	VXA71	Skew Operation Angle Unit	1		② (4-E) ...	VMA1840	Leaf Switch Bracket	1	
② (2-A) ...	VXA77	Release Lever Unit	1		④ (3-E) ...	VMA2087	Motor Spacer	1	

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
⑥ (3-E, 4-A) ...	VMA239S	Panel Angle (B)	2	
③ (3-B) ...	VMA247	Upper Spacer	1	
② (1-B) ...	VMA259S	Switch Mounting Angle	1	
① (5-C) ...	VMA260S	Erase Head Base	1	
② (2-F) ...	VMA265	Counter Plate	1	
② (2-E) ...	VMA326S	Counter Angle	1	
③ (3-B) ...	VMA441	Rewind Idler Bracket	1	
③ (2-F) ...	VMA453	Switch Angle	1	
① (5-D) ...	VMA480S	Audio Head Base	1	
② (4-C) ...	VMA515	Claw Wheel	1	
④ (1-C) ...	VMA519	Ground Angle	1	
② (1-E, 3-A) ...	VMA523	Handle	1	
③ (4-E) ...	VMA542	Panel Guide	1	
② (3-C) ...	VMA549	Washer	1	
② (2-A) ...	VMA562	Release Lever Bracket	1	
④ (1-D) ...	VMA565	Spacer Holder	1	
③ (2-B, 3-B) ...	VMA594	Panel Angle	2	
② (1-E) ...	VMA650	Belt Guide	1	
④ (1-C, 1-D) ...	VMA866	Motor Protection Angle	2	
① (1-C) ...	VMB0304	Auto Stopper Spring	1	
② (4-C) ...	VMB108	Spring	1	
② (3-A) ...	VMB107	Reset Spring	1	
① (4-C, 5-C, D) ...	VMB111	Spring	2	
① (2-C) ...	VMB116	Actuator	1	
② (3-C) ...	VMB161	Spring	1	
③ (3-E) ...	VMB175	Spring	1	
① (4-D, 5-C) ...	VMB2	Pressure Spring	2	
③ (3-D) ...	VMB210	Spring	1	
② (2-F) ...	VMB216	Spring	1	
② (3-E) ...	VMB38S	Pressure Roller Spring	1	
③ (3-E) ...	VMB40	Release Spring	1	
③ (3-B) ...	VMB41	Idler Spring	1	
③ (2-D, E, 3-D) ...	VMB43	Collar	1	
③ (2-A, 3-C) ...	VMB44	Spring	2	
③ (2-A, 3-B) ...	VMB46	Spring	2	
③ (4-D) ...	VMB56	Spring	1	
① (2-D) ...	VMB77	Leaf Spring	1	
③ (2-E) ...	VMB84	Spring	1	
② (3-B) ...	VMB96	Spring	1	
② (3-C) ...	VMB97	Balance Spring	1	
② (3-B) ...	VMB98	Spring	1	
④ (1-D) ...	VMF101	Belt Spacer	1	
② (1-A) ...	VMF22	Switch Cover	1	
② (4-C) ...	VMF43	Felt	1	

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)
<b>NUTS</b>			
2	XNG3EFX		3
2, 3, 5	XNG3EFXS		9
3	XNG3EFXKS		2
1, 2, 3	XNG4EFX		13
1, 3, 6	XNG4EFXS		8
2	XNG5EFX		1
2	XNG5EFXKS		1
5	XNS8FX		3
5	XNS9FX		1
<b>SCREWS</b>			
6	XMM3+16FXK		1
6	XSC3+10FCS		8
3	XSN2+5FXS		2
1	XSN26+15FX		2
6	XSN26+BCS		3
1	XSN26+6CFXS		4
6	XSN3+10FCS		8
1	XSN3+10FNS		1
2	XSN3+12FXS		1
4	XSN3+15BNS		6
1, 2, 4	XSN3+15FXS		5
1	XSN3+25FXS		2
1	XSN3+8FXS		4
2	XSN4+6FXS		1
6	XSN5+20FXS		4
5	XSS26+6FX		2
1, 5	XSS3+12FXS		8
5	XSS3+8FXS		2
4	XSS4+10FX		1
1	XSS4+10FXS		1
1, 3	XSS4+12FXS		4
2, 3	XST3+6BCS		2
1	XST3+6FNX		1
4	XST3+6FX		2

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)
6	XST3+6FXKS		4
5	XST3+8FXKS		2
4	XTV3+6BFXS		1
1, 5	XTV3+6FX		19
1, 3, 4	XTV3+8BFXS		15
1, 2, 3, 4, 5	XTV4+10BFXS		38
1, 3	XTV4+6BFXS		2
2	XTV4+8BFXS		3
2	XVF3B10FXS		1
2	XVF3B20FXS		1
6	XYN3+B20BCS		3
6	XYN3+B45BCS		1
4	XYN3+C5FXS		2
1, 2, 4, 5	XYN3+C6FXS		21
2, 4	XYN3+C8FXS		4
3	XYN3+F5FXS		1
1	XYN3+F6FXS		9
1, 5	XYN3+F8FXS		8
6	XYN4+F15FXKS		4
2, 3, 5	XYN4+Cl2FXS		11
1, 4	XYN4+Cl5FXS		7
4	XYN4+C6FXS		2
1	XYN4+C8FXS		4
<b>SNAP RINGS</b>			
2	XUC2FP		5
2, 3	XUC25FP		3
3	XUC26FP		1
1, 2, 3	XUC3FP		10
1	XUC4FP		1
2, 3	XUC5FP		10
2	XUC7FP		3
<b>SPRING WASHERS</b>			
3	XWA2AFX		2
1	XWA26AFX		8
1, 2, 3, 5	XWA3AFX		13

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)
1, 6	XWA4AFX		5
2, 6	XWA5AFX		6
5	XWA8AFX		3
5	XWA9AFX		1
1, 2, 3	XWC4BFX		11
1	XWD3BFX		4
<b>FLAT WASHERS</b>			
1	XWG3D6FX		4
1	XWG3DFX		4
1	XWG4DFX		4
1, 3	XWG4FX		3
<b>POLYSLIDER WASHERS</b>			
2	XWXV3D6		2
3	XWXV3A6PF		2
<b>FIBER WASHERS</b>			
2	XWYV3D6		1
1, 2, 3	XWYV4D9		3
1, 3	XWYV6D12		7
2, 3	XWYV6F12		5
2	XWYV8D12		1
<b>MYLAR WASHERS</b>			
3, 6	XWZV3A6		8
2	XWZV42A9		2
5	XWZV9A15		1
<b>SET SCREWS</b>			
1	XXE3DFXKS		2
4	XXE3D4FXKS		2
4	XXE3D6FXS		1
2	XXE3D6FXKS		2
4	XXE4D6FXS		1
1	XXE4D6FXKS		2



Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
R323	ERD14VJ103		10 K	1
R324	ERD14VJ471		470	1
R325	ERD14VJ331		330	1
R326	ERD14VJ563		56 K	1
R327	ERD14VJ562		5.6 K	1
R328	ERD14VJ222		2.2 K	1
R329	ERD14VJ151		150	1
R330	ERD14VJ470		47	1
R331	ERD14VJ563		56 K	1
R332	ERD14VJ562		5.6 K	1
R333	ERD14VJ222		2.2 K	1
R334	ERD14VJ151		150	1
R335	ERD14VJ392		3.9 K	1
R336	ERD14VJ681		680	1
R337	ERD14VJ222		2.2 K	1
R338	EVNK4AA00B23	Semi-fixed	2 K	1
R339	EVNK4AA00B14	Semi-fixed	10 K	1
R340	ERD14VJ102		1 K	1
R341	EVNK4AA00B13	Semi-fixed	1 K	1
R342	ERD14VJ821		820	1
R343	EVNK4AA00B53	Semi-fixed	5 K	1
R344	ERD14VJ102		1 K	1
R345, 346	ERD14VJ222		2.2 K	2
R347	ERD14VJ151		150	1
R348	ERD14VJ331		330	1
R349, 350	ERD14VJ562		5.6 K	2
R351	EVNK4AA00B13	Semi-fixed	1 K	1
R352	ERD14VJ331		330	1
R354	ERD14VJ103		10 K	1
R355	ERD14VJ332		3.3 K	1
R356	ERD14VJ391		390	1
R357	ERD14VJ471		470	1
R358	ERD14VJ271		270	1
R359	ERD14VJ561		560	1
R360	ERD14VJ332		3.3 K	1
R361	ERD14VJ102		1 K	1
R362	ERD14VJ223		22 K	1
R363	ERD14VJ103		10 K	1
R364	ERD14VJ332		3.3 K	1
R365	ERD14VJ561		560	1
R366	ERD14VJ222		2.2 K	1
R367	ERD14VJ102		1 K	1
R368	ERD14VJ272		2.7 K	1
R369	ERD14VJ332		3.3 K	1
R370	ERD14VJ103		10 K	1
R371, 372	ERD14VJ820		82	2
R373	ERD14VJ102		1 K	1
R374	ERD14VJ223		22 K	1
R375	ERD14VJ222		2.2 K	1
R376	ERD14VJ102		1 K	1
R377	ERD14VJ223		22 K	1
R378	ERD14VJ102		1 K	1
R379	EVNK4AA00B53	Semi-fixed	5 K	1
R380	ERD14VJ222		2.2 K	1
R381	ERD14VJ224		220 K	1
R383	ERD14VJ100		10	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	
<b>CAPACITORS</b>					
C301	ECEA10V220L	Electrolytic	220	1	
C302	ECKCIH103PF3	Ceramic	0.01	1	
C304	ECCCIH220K C3	Ceramic	22 P	1	
C305	ECCCIH150K C3	Ceramic	15 P	1	
C306	ECCCIH330K C3	Ceramic	33 P	1	
C307	ECCCIH150K C3	Ceramic	15 P	1	
C308	ECCCIH010CC3	Ceramic	1 P	1	
C309, 310	ECEA16V47L	Electrolytic	47	2	
C311	ECEA6V470L	Electrolytic	6 V	470	2
C312, 313	ECEA16V47L	Electrolytic	16 V	47	2
C314	ECQM0532KZB	Mylar	50 V	0.0033	1
C315	ECEA16V47L	Electrolytic	16 V	47	1
C316	ECEA16N4R7	Nonpolarity Electrolytic	16 V	4.7	1
C317, 318	ECEA16V10L	Electrolytic	16 V	10	2
C319, 320	ECKCIH103PF3	Ceramic	0.01	2	
C321	ECCCIH330K C3	Ceramic	33 P	1	
C322	ECV1ZW20X44	Trimmer	1 W	1~20 P	1
C323	VCCDIH400JC	Ceramic	40 P	1	
C324, 325	ECKCIH103PF3	Ceramic	104 V	0.01	2
C326	ECQS133IKZ	Styrol	125 V	330 P	1
C327	ECCCIH330K C3	Ceramic	104 V	33 P	1
C328	ECQS133IKZ	Styrol	125 V	330 P	1
C329	ECKCIH103PF3	Ceramic	104 V	0.01	1
C330	ECCCIH270K C3	Ceramic	104 V	27 P	1
C331, 332	ECEA50V1L	Electrolytic	50 V	1	2
C333	ECEA25V4R7L	Electrolytic	25 V	4.7	1
C334~336	ECKCIH103PF3	Ceramic	104 V	0.01	3
C337	ECCCIH220K C3	Ceramic	104 V	22 P	1
C338	ECCCIH100K C	Ceramic	104 V	10 P	1
C339	ECCDIH330K C	Ceramic	104 V	33 P	1
C340	ECCDIH560K C	Ceramic	104 V	56 P	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
<b>INDUCTANCES, COILS</b>				
L301	VLQ80F680K		68 $\mu$ H	1



Ref. No. Part No. Part Name & Description Per Set (Pec.) Unit Price

MISCELLANEOUS  
 TEL302 G.T Pin 12  
 VJH24 Check Terminal 8  
 VQL322I6 No. Label 1  
 VSC0176 Shield Case 1  
 VSC73 Shield Case 1

**VIDEO B SECTION ASSY**

VIDEO P.B. CIRCUIT BOARD ASSY  
 COLOR P.B. CIRCUIT BOARD ASSY  
 VMA1731 Circuit Board Mounting Angle  
 VQL322K4 No. Label  
 XTV3+6FX Tapping Screw 8

**VIDEO P.B. CIRCUIT BOARD ASSY**

IC  
 IC3201 ... AN304 VTR Video FM Limiter 1

**TRANSISTORS**

TR3201 ... 2SC1359 Si NPN EP 1  
 TR3202~3211 2SC828 Si NPN EP 10  
 TR3212 ... 2SC269R Si NPN EP 1  
 TR3213 ... 2SC1359B Si NPN EP 1  
 TR3214, 3215... 2SC828 Si NPN EP 2  
 TR3216 ... 2SA564 Si PNP EP 1  
 TR3217~3220 2SC828 Si NPN EP 4  
 TR3221 ... 2SA564 Si PNP EP 1  
 TR3222, 3223... 2SC828 Si NPN EP 2  
 TR3224 ... 2SC1359 Si NPN EP 1  
 TR3225 ... 2SC828 Si NPN EP 1  
 TR3226 ... 2SC1359 Si NPN EP 1  
 TR3227~3229 2SC828 Si NPN EP 3  
 TR3230 ... 2SC1383 Si NPN EP 1  
 TR3231 ... 2SA564 Si PNP EP 1  
 TR3232 ... 2SC828 Si NPN EP 1

**DIODES**

D3201, 3202 ... 1S1007 Ge Gold Bond 2  
 D3203~3207 ... MA150LF Ge Point Contact 7  
 D3208 ... OA90 Ge Point Contact 1  
 D3209 ... MA150LF Ge Gold Bond 1  
 D3210~3212 ... 1S1007 Ge Gold Bond 3  
 D3213 ... MA150LF Ge Gold Bond 1

Ref. No. Part No. Part Name & Description Per Set (Pec.) Unit Price

TRANSFORMERS  
 L805 ... VLQ80F150K 15µH 1  
 T801 ... ELT10S932 High-Frequency 1  
 T802 ... ELT10S906 High-Frequency 1  
 L802 ... VLT12 High-Frequency 1

**CAPACITORS**

C801 ... ECKC1H103PF3 Ceramic 104 V 0.01 1  
 C802 ... ECEA16V47L Electrolytic 16 V 47 1  
 C803, 804 ... ECKC1H103PF3 Ceramic 104 V 0.01 2  
 C805, 806 ... ECEA50V1L Electrolytic 50 V 1 2  
 C807 ... ECKC1H103PF3 Ceramic 104 V 0.01 1  
 C808 ... ECQM05102KZB Mylar 50 V 0.001 1  
 C809 ... ECKC1H103PF3 Ceramic 104 V 0.01 1  
 C810 ... ECKC2H181KA3 Ceramic 180 P 1  
 C811 ... ECKC1H121KC3 Ceramic 104 V 120 P 1  
 C812, 813 ... ECKC1H103PF3 Ceramic 104 V 0.01 2  
 C814 ... ECEA16V10L Electrolytic 16 V 10 1  
 C815 ... ECQM05473KZB Mylar 50 V 0.047 1  
 C816 ... ECEA25V4R7L Electrolytic 25 V 4.7 1  
 C817 ... ECEA16V10L Electrolytic 16 V 10 1  
 C818 ... ECEA25V4R7L Electrolytic 25 V 4.7 1  
 C819 ... ECQS1331KZ Styrol 125 V 330 P 1  
 C820 ... ECEA16V10L Electrolytic 16 V 10 1  
 C821 ... ECC1H180KC3 Ceramic 104 V 18 P 1  
 C822 ... ECQS1561KZ Styrol 125 V 560 P 1  
 C823 ... ECQS1151KZ Styrol 125 V 150 P 1  
 C824~826 ... ECKC1H103PF3 Ceramic 104 V 0.01 3  
 C827 ... ECEA50V1L Electrolytic 50 V 1 1  
 C828 ... ECKC1H103PF3 Ceramic 104 V 0.01 1  
 C829 ... ECEA50V1L Electrolytic 50 V 1 1  
 C830, 831 ... ECKC1H103PF3 Ceramic 104 V 0.01 2  
 C833 ... ECEA25V4R7L Electrolytic 25 V 4.7 1  
 C834 ... ECC1H101KC3 Ceramic 104 V 100 P 1  
 C835 ... ECKC1H103PF3 Ceramic 104 V 0.01 1  
 C836 ... ECEA16V10L Electrolytic 16 V 10 1  
 C837 ... ECEA16V47L Electrolytic 16 V 47 1  
 C838 ... ECQM05473KZB Mylar 50 V 0.047 1  
 C839 ... ECC1H150K Ceramic 104 V 15 P 1

**OSCILLATOR**

X801 ... VSX28 4.3 MHz 1

**FILTERS**

FL801 ... VLF0020 1  
 FL802 ... VLF6 1

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
<b>RESISTORS</b>									
R3201	...	ERD14VJ103	10 K	1	R3249	...	ERD14VJ562	5.6 K	1
R3202	...	ERD14VJ331	330	1	R3250	...	ERD14VJ101	100	1
R3203	...	ERD14VJ333	33 K	1	R3251	...	ERD14VJ102	1 K	1
R3204	...	ERD14VJ562	5.6 K	1	R3252	...	ERD14VJ181	180	1
R3205	...	ERD14VJ122	1.2 K	1	R3253	...	ERD14VJ183	18 K	1
R3206	...	ERD14VJ151	150	1	R3254	...	EVN22AA00B12	100	1
R3207	...	ERD14VJ101	100	1	R3255	...	ERD14VJ102	1 K	1
R3208, 3209	...	ERD14VJ153	15 K	2	R3257	...	ERD14VJ473	47 K	1
R3210	...	ERD14VJ562	5.6 K	1	R3258	...	ERD14VJ562	5.6 K	1
R3211	...	ERD14VJ153	15 K	1	R3259	...	ERD14VJ182	1.8 K	1
R3212	...	ERD14VJ562	5.6 K	1	R3260	...	ERD14VJ221	220	1
R3213	...	ERD14VJ122	1.2 K	1	R3261	...	ERD14VJ182	1.8 K	1
R3214	...	ERD14VJ562	5.6 K	1	R3262	...	ERD14VJ101	100	1
R3215	...	ERD14VJ153	15 K	1	R3263, 3264	...	ERD14VJ223	22 K	2
R3216, 3217	...	ERD14VJ223	22 K	2	R3265	...	ERD14VJ182	1.8 K	1
R3218	...	ERD14VJ222	2.2 K	1	R3266, 3267	...	ERD14VJ223	22 K	2
R3219	...	ERD14VJ333	33 K	1	R3268	...	ERD14VJ821	820	1
R3220	...	ERD14VJ562	5.6 K	1	R3269	...	ERD14VJ102	1 K	1
R3221	...	ERD14VJ152	1.5 K	1	R3270	...	ERD14VJ103	10 K	1
R3222	...	ERD14VJ271	270	1	R3271, 3272	...	ERD14VJ332	3.3 K	2
R3223, 3224	...	ERD14VJ223	22 K	2	R3273, 3274	...	ERD14VJ153	15 K	2
R3225	...	ERD14VJ222	2.2 K	1	R3275	...	EVNK4AA00B53	5 K	1
R3226	...	ERD14VJ102	1 K	1	R3276	...	ERD14VJ331	330	1
R3227	...	ERD14VJ101	100	1	R3277	...	ERD14VJ222	2.2 K	1
R3228	...	ERD14VJ823	82 K	1	R3278	...	ERD14VJ103	10 K	1
R3229	...	ERD14VJ562	5.6 K	1	R3279	...	ERD14VJ332	3.3 K	1
R3230	...	ERD14VJ152	1.5 K	1	R3280	...	ERD14VJ821	820	1
R3231	...	ERD14VJ101	100	1	R3281	...	ERD14VJ152	1.5 K	1
R3232	...	ERD14VJ562	5.6 K	1	R3282	...	ERD14VJ153	15 K	1
R3233	...	ERD14VJ332	3.3 K	1	R3283	...	ERD14VJ122	1.2 K	1
R3234	...	ERD14VJ152	1.5 K	1	R3284	...	ERD14VJ222	2.2 K	1
R3235, 3236	...	ERD14VJ223	22 K	2	R3285	...	ERD14VJ101	100	1
R3237	...	ERD14VJ102	1 K	1	R3286	...	ERD14VJ103	10 K	1
R3238	...	ERD14VJ101	100	1	R3287	...	EVNK4AA00B53	5 K	1
R3239	...	ERD14VJ563	56 K	1	R3288, 3289	...	ERD14VJ223	22 K	2
R3240	...	ERD14VJ562	5.6 K	1	R3290	...	ERD14VJ222	2.2 K	1
R3241	...	ERD14VJ222	2.2 K	1	R3291	...	ERD14VJ681	680	1
R3242	...	ERD14VJ121	120	1	R3292	...	ERD14VJ182	1.8 K	1
R3243	...	ERD14VJ101	100	1	R3293	...	ERD14VJ101	100	1
R3244	...	ERD14VJ102	1 K	1	R3294	...	ERD14VJ181	180	1
R3245	...	ERD14VJ393	39 K	1	R3295	...	ERD14VJ391	390	1
R3246	...	EVNK4AA00B24	20 K	1	R3296	...	ERD14VJ222	2.2 K	1
R3247	...	ERD14VJ473	47 K	1	R3297	...	ERD14VJ182	1.8 K	1
R3248	...	ERD14VJ222	2.2 K	1	R3298	...	ERD14VJ272	2.7 K	1
					R3299	...	ERD14VJ394	390 K	1
					R3300	...	ERD14VJ222	2.2 K	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
R3301	ERD14VJ102		1K	1
R3302	EVNK4AA00B13	Semi-fixed	1K	1
R3304	ERD14VJ102		1K	1
R3305	ERD12TJ221	1/2 W	220	1
R3306	ERD14VJ391		390	1
R3307	ERD14VJ473		47K	1
R3308	ERD14VJ564		560K	1
R3309	ERD14VJ152		1.5K	1
R3310	ERD14VJ223		22K	1
R3311	ERD14VJ103		10K	1
R3312	ERD14VJ332		3.3K	1
R3313	ERD14VJ100		10	1
R3316	ERD14VJ331		330	1
R3317	ERD14VJ100		10	1
R3318	ERD14VJ103		10K	1
R3319	ERD14VJ102		1K	1
R3320	ERD14VJ221		220	1
R3321	ERD14VJ394		390K	1
R3322	ERD14VJ103		10K	1
R3323	ERD14VJ121		120	1
<b>INDUCTANCES</b>				
L3201	VLQ80F221K		220 $\mu$ H	1
L3202	VLQ80F100K		10 $\mu$ H	2
L3204	VLQ80F221K		220 $\mu$ H	3
L3207	VLQ80F680K		68 $\mu$ H	1
L3208	VLQ80F820K		82 $\mu$ H	3
L3211	VLQ80F470K		47 $\mu$ H	1
L3212	VLQ80F221K		220 $\mu$ H	1
L3213	VLQ80F560K		56 $\mu$ H	1
L3214	VLQ80F101K		100 $\mu$ H	1
<b>CAPACITORS</b>				
C3201	ECEA16N3R3	Nonpolarity Electrolytic	3.3	2
C3203	ECKC1H103PF3	Ceramic	0.01	1
C3204	ECEA25V4R7L	Electrolytic	4.7	1
C3205	ECCC1H101KC3	Ceramic	100P	1
C3206	ECKC1H103PF3	Ceramic	0.01	1
C3207	ECCC1H101KC3	Ceramic	100P	1
C3208	ECKC1H103PF3	Ceramic	0.01	7
C3215	ECEA16V47L	Electrolytic	47	1
C3216	ECKC1H103PF3	Ceramic	0.01	1
C3217	ECCC1H101KC3	Ceramic	100P	1
C3218	ECKC1H102KB4	Ceramic	104V	1
C3219	ECQM05473KZB	Mylar	0.001	1
			50V	1
C3220	ECEA16V47L	Electrolytic	47	1
C3221	ECKC1H103PF3	Ceramic	0.01	5
C3226	ECEA50V1L	Electrolytic	1	1
C3227	ECKC1H103PF3	Ceramic	0.01	4
C3231	ECEA16V10L	Electrolytic	10	1
C3232	ECKC1H103PF3	Ceramic	0.01	1
C3233	ECEA16V100L	Electrolytic	100	1
C3234	ECEA16V47L	Electrolytic	47	1
C3235	ECEA16V100L	Electrolytic	100	1
C3237	ECEA6V220L	Electrolytic	6V	220
C3239	ECKC1H103PF3	Ceramic	0.01	2
C3241	ECCC1H220KC3	Ceramic	22P	1
C3242	ECKC1H103PF3	Ceramic	0.01	2
C3244	ECEA16V10L	Electrolytic	10	2
C3246	ECV1ZW10X44	Trimmer	1~10P	1
C3247	ECCC1H050DC3	Ceramic	5P	1
C3248	ECEA16N100	Nonpolarity Electrolytic	100	1
C3249	ECQS1221KZ	Styrol	125V	1
C3250	ECEA50V1L	Electrolytic	50V	1
C3252	ECEA6V220L	Electrolytic	6V	220
C3253	ECQS1471KZ	Styrol	125V	470P
C3255	ECEA16V47L	Electrolytic	47	2
C3257	ECEA16V1000L	Electrolytic	1000	1
C3258	ECEA50V1L	Electrolytic	50V	1
C3259	ECCC1H390KC3	Ceramic	39P	1
C3260	ECEA25V4R7L	Electrolytic	25V	4.7
C3261	ECEA16V100L	Electrolytic	100	1
C3262	ECEA10V47L	Electrolytic	47	1
C3263	ECKC1H103PF3	Ceramic	0.01	1
C3264	ECEA50V1L	Electrolytic	50V	1
C3265	ECKC1H102KB4	Ceramic	0.001	1
C3266	ECEA16V47L	Electrolytic	47	1
C3267	ECKC1H102KB4	Ceramic	0.001	1
C3268	ECQM05333KZB	Mylar	0.033	1
C3269	ECQM05152KZ	Mylar	0.0015	1
<b>TRANSFORMER</b>				
T3201	ELT10S905	High-Frequency		1
<b>FILTERS</b>				
FL3202	VLF0014			1
FL3203	VLF0013			1
<b>DELAY LINES</b>				
DL3201	EFDAN645A02	1H		1
DL3202	ELT10Z711V	1H		1

Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price	Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price
<b>MISCELLANEOUS</b>									
	TEL302	G.T Pin	22		R8220	ERD14VJ331		300	1
	VJH24	Check Terminal	8		R8221	ERD14VJ102		1K	1
	VQL322D10	No. Label	1		R8222, 8223	ERD14VJ101		100	2
	VSC0129	Shield Case	1		R8224	ERD14VJ102		1K	1
					R8225	ERD14VJ333		33K	1
					R8226	ERD14VJ562		5.6K	1
					R8227	ERD14VJ102		1K	1
					R8228	ERD14VJ121		120	1
					R8229	ERD14VJ560		56	1
					R8230	ERD14VJ221		220	1
					R8231	EVNK4AA00B13	Semi-fixed	1K	1
					R8232, 8233	ERD14VJ183		18K	2
					R8234	ERD14VJ390		39	1
					R8235	ERD14VJ272		2.7K	1
					R8236	ERD14VJ222		2.2K	1
					R8237	ERD14VJ562		5.6K	1
					R8238	ERD14VJ102		1K	1
					R8239~8241	ERD14VJ331		330	3
					R8242	ERD14VJ273		27K	1
					R8243	ERD14VJ332		3.3K	1
					R8244	ERD14VJ331		330	1
					R8245	ERD14VJ153		15K	1
					R8246	ERD14VJ222		2.2K	1
					R8247	ERD14VJ221		220	1
					R8248	ERD14VJ222		2.2K	1
					R8249	ERD14VJ102		1K	1
					R8250	ERD14VJ221		220	1
					R8251, 8252	ERD14VJ223		22K	2
					R8253	ERD14VJ222		2.2K	1
					R8254	ERD14VJ103		10K	1
					R8255	ERD14VJ331		330	1
					R8256	ERD14VJ221		220	1
					R8257	ERD14VJ681		680	1
					R8258	ERD14VJ332		3.3K	1
					R8259, 8260	ERD14VJ393		39K	2
					R8261	ERD14VJ332		3.3K	1
					R8262	EVNK4AA00B23	Semi-fixed	2K	1
					R8263	ERD14VJ473		47K	1
					R8264	ERD14VJ682		6.8K	1
					R8265	ERD14VJ101		100	1
					R8266	ERD14VJ681		680	1
					R8267	ERD14VJ273		27K	1
					R8268	ERD14VJ822		8.2K	1
					R8269	ERD14VJ472		4.7K	1
					R8270	ERD14VJ272		2.7K	1
					R8271	ERD14VJ224		220K	1
<b>TRANSISTORS</b>									
TR8201	...	Si NPN EP	1						
TR8202	...	FET	1						
TR8203, 8204	...	Si NPN EP	2						
TR8205	...	Si PNP EP	1						
TR8206~8211	...	Si NPN EP	6						
TR8212	...	Si PNP EP	1						
TR8213~8224	...	Si NPN EP	12						
<b>DIODES</b>									
D8201~8212	...	MA150LF	12						
D8213, 8214	...	IS1007J	2						
D8215, 8216	...	MA150LF	2						
D8217	...	MX1	1						
D8218~8220	...	MA150LF	3						
D8221	...	MX1	1						
<b>RESISTORS</b>									
R8201	...	ERD14VJ223	22K	1					
R8202	...	ERD14VJ392	3.9K	1					
R8203	...	ERD14VJ122	1.2K	1					
R8204	...	ERD14VJ390	39	1					
R8205	...	ERD14VJ151	150	1					
R8206	...	ERD14VJ221	220	1					
R8207	...	ERD14VJ102	1K	1					
R8208	...	ERD14VJ562	5.6K	1					
R8209	...	ERD14VJ154	150K	1					
R8210	...	ERD14VJ222	2.2K	1					
R8211	...	EVNK4AA00B53	5K	1					
R8212	...	ERD14VJ154	150K	1					
R8213	...	ERD14VJ153	15K	1					
R8214	...	ERD14VJ222	2.2K	1					
R8215	...	ERD14VJ101	100	1					
R8216	...	ERD14VJ102	1K	1					
R8217	...	ERD14VJ101	100	2					
R8218	...	ERD14VJ153	15K	1					
R8219	...	ERD14VJ392	3.9K	1					

**COLOR P.B. CIRCUIT BOARD ASSY**

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
R8272	ERD14VJ683		68 K	1
R8273	ERD14VJ222		2.2 K	1
R8274	ERD14VJ153		15 K	1
R8275	ERD14VJ222		2.2 K	1
R8276	ERD14VJ102		1 K	1
R8277	ERD14VJ330		33	1
R8278	ERD14VJ121		120	1
R8279	ERD14VJ332		3.3 K	1
R8280	ERD14VJ561		560	1
R8281	ERD14VJ122		1.2 K	1
R8282	ERD14VJ271		270	1
R8283	EVN22AA00B32	Semi-fixed	300	1
R8284	ERD14VJ681		680	1
R8285	ERD14VJ102		1 K	1
R8286	ERD14VJ124		120 K	1
R8287	EVNK4AA00B14	Semi-fixed	10 K	1
R8288	ERD14VJ103		10 K	1
R8289	ERD14VJ472		4.7 K	1
R8290	ERD14VJ393		39 K	1
R8291	ERD14VJ152		1.5 K	1
R8292, 8293	ERD14VJ183		18 K	2
R8294	ERD14VJ221		220	1
R8295	EVNK4AA00B53	Semi-fixed	5 K	1
R8296~8299	ERD14VJ221		220	4
R8300	ERD14VJ183		18 K	1
R8301	ERD14VJ222		2.2 K	1
R8302	ERD14VJ102		1 K	1
R8303	ERD14VJ560		56	1
R8304	ERD14VJ151		150	1
R8305, 8306	ERD14VJ223		22 K	2
R8307	ERD14VJ101		100	1
R8308	ERD14VJ222		2.2 K	1
R8309	ERD14VJ562		5.6 K	1
R8310	ERD14VJ123		12 K	1
R8311	ERD14VJ102		1 K	1
R8312	ERD14VJ332		3.3 K	1
R8313	ERD14VJ272		2.7 K	1
R8314	ERD14VJ152		1.5 K	1
R8315	ERD14VJ392		3.9 K	1
R8316	ERD14VJ471		470	1
R8317	EVNK4AA00B52	Semi-fixed	500	1
R8318	ERD14VJ393		39 K	1
R8319	ERD14VJ392		3.9 K	1
R8320	ERD14VJ393		39 K	1
R8321	ERD14VJ392		3.9 K	1
R8322, 8323	ERD14VJ101		100	2

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
R8324	ERD14VJ153		15 K	1
R8325	ERD14VJ103		10 K	1
R8326	ERD14VJ333		33 K	1
R8327	ERD14VJ273		27 K	1
R8328	ERD14VJ332		3.3 K	1
R8329	ERD14VJ103		10 K	1
R8330	ERD14VJ394		390 K	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
<b>CAPACITORS</b>				
C8201	ECEA16V10L	Electrolytic	10	1
C8202	ECEA25V4R7L	Electrolytic	4.7	1
C8203	ECKC1H103PF3	Ceramic	0.01	1
C8204	ECEA50V1L	Electrolytic	1	1
C8205	ECKC1H103PF3	Ceramic	0.01	1
C8206	ECEA50V1L	Electrolytic	1	1
C8207	ECKC1H103PF3	Ceramic	0.01	1
C8208	ECEA16V10L	Electrolytic	10	1
C8209	ECC1H101KC3	Ceramic	100 P	1
C8210	ECKC1H103PF3	Ceramic	0.01	1
C8211	ECCC1H121KC3	Ceramic	120 P	1
C8212	ECEA16V10L	Electrolytic	10	1
C8213	ECKC1H103PF3	Ceramic	0.01	1
C8214	ECQM05683KZB	Mylar	0.068	1
C8215	ECKC1H103PF3	Ceramic	0.01	1
C8216	ECEA16V10L	Electrolytic	10	1
C8217~8219	ECKC1H103PF3	Ceramic	0.01	3
C8220	ECEA16V10L	Electrolytic	10	1
C8221	ECCC1H100DC3	Ceramic	10 P	1
C8222	ECV1ZW20X44	Trimmer	1~20 P	1
C8223	ECQS1821KZ	Styrol	820 P	1
C8224	ECKC1H103PF3	Ceramic	0.01	1
C8225	ECQS1101KZ	Styrol	100 P	1
C8226~8228	ECKC1H103PF3	Ceramic	0.01	3
C8229	ECEA16V10L	Electrolytic	10	1
C8230	ECKC1H103PF3	Ceramic	0.01	1
C8231	ECCC1H270KC3	Ceramic	27 P	1
C8232	ECCC1H030CC3	Ceramic	3 P	1
C8233	VCCD1H500JC	Ceramic	50 P	1
C8234	ECCC1H560KC3	Ceramic	56 P	1
C8235	ECKC1H103PF3	Ceramic	0.01	1
C8236	ECEA16V47L	Electrolytic	47	1
C8237	ECKC1H103PF3	Ceramic	0.01	1
C8238	ECKC2H561KB4	Ceramic	560 P	1
C8239	ECKC2H471KA3	Ceramic	470 P	1
C8240	ECEA6V47L	Electrolytic	47	1
C8241~8243	ECQM05102KZB	Mylar	0.001	3

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
C8244	ECQM05473KZB	Mylar	0.047	1
C8245	EKC1H103PF3	Ceramic	0.01	1
C8246	ECEA16V10L	Electrolytic	10	1
C8247	EKC1H103PF3	Ceramic	0.01	1
C8248	ECEA16V10L	Electrolytic	10	1
C8249	ECQM05103KZB	Mylar	0.01	1
C8250	ECQS1102KZ	Styrol	0.001	1
C8251	ECQS133IKZ	Styrol	330 P	1
C8252	EKC1H103PF3	Ceramic	0.01	1
C8253	ECQS1102KZ	Styrol	0.001	1
C8254	ECQM05473KZB	Mylar	0.047	1
C8255	ECEA16V10L	Electrolytic	10	1
C8256~8258	EKC1H103PF3	Ceramic	0.01	3
C8259	EKC1H102KB4	Ceramic	0.001	1
C8260	EKC1H103PF3	Ceramic	0.01	1
C8261	ECEA16V10L	Electrolytic	10	1
C8262, 8263	ECEA25VR7L	Electrolytic	4.7	2
C8264	EKC1H103PF3	Ceramic	0.01	1
C8265	EKC2H471KA3	Ceramic	470 P	1
C8266, 8267	EKC1H102KB4	Ceramic	0.001	2
C8268	EKC1H103PF3	Ceramic	0.01	1
C8269	ECEA16V10L	Electrolytic	10	1
C8270	ECEA6V220L	Electrolytic	220	1
C8271	ECEA16V47L	Electrolytic	47	1
C8272	ECEA6V47L	Electrolytic	47	1
C8273	ECQS1182KZ	Styrol	0.0018	1
C8274	ECQM05152KZB	Mylar	0.0015	1
C8275	ECQS1182KZ	Styrol	0.0018	1
C8276	ECQM05152KZB	Mylar	0.0015	1
C8277	ECQM05332KZB	Mylar	0.0033	1
C8278	ECQS1472KZ	Styrol	0.0047	1
C8279	ECEA16V10L	Electrolytic	10	1
C8280	ECEA50V1L	Electrolytic	1	1
C8281	ECQM05392KZB	Mylar	0.0039	1
C8282	ECQS1113KZ	Styrol	0.011	1
C8283	ECEA50V1L	Electrolytic	1	1
C8284	ECQS1151KZ	Styrol	150 P	1
<b>INDUCTANCES, TRANSFORMERS</b>				
L8201	VLQ80F100K		10 $\mu$ H	1
L8202	VLQ80F221K		220 $\mu$ H	1
L8203, 8204	ELT10S202	High-Frequency		2
L8205	EIS10S241	High-Frequency		1
L8206~8208	VLQ80F221K		220 $\mu$ H	3
L8209	VLTI2	High-Frequency		1
L8210, 8211	EIS10S38	High-Frequency		2
L8212	...	High-Frequency		1
T8201~8204	ELT10S906	High-Frequency		4
T8205	ELT10S933	High-Frequency		1
T8206	ELT10S906	High-Frequency		1
<b>FILTERS</b>				
FL8201	...	VLF6		1
FL8202	...	VLF0020		1
FL8203	...	VLF1		1
<b>DELAY LINE</b>				
DL8201	...	EFDAN645B01		1
<b>OSCILLATOR</b>				
X8201	...	VSX5		1
<b>MISCELLANEOUS</b>				
TEL302	...	G.T Pin		14
VJH24	...	Check Terminal		14
VQL32217	...	No. Label		1
VSC74	...	Shield Case		1
VSC75	...	Shield Case		1
VSC76	...	Shield Case		1
VSC0175	...	Shield Case		1
<b>CONTROL SECTION ASSY</b>				
CONTROL CIRCUIT BOARD ASSY				
HEAD AMP. CIRCUIT BOARD ASSY				
VJR3	...	Clamp		3
VMA1783	...	Circuit Board Mounting Angle		2
VQL322K5	...	No. Label		1
XRM3X4A	...	Round Rivet		3
XTV3+6FX	...	Tapping Screw		8
VSC0187	...	CTL Shield Board		1
<b>CONTROL CIRCUIT BOARD ASSY</b>				
<b>TRANSISTORS</b>				
TR201, 202	...	2SC828		2
TR203	...	2SA564		1
TR204~208	...	2SC828		5
TR209	...	2SA564		1
TR210~214	...	2SC828		5
TR215	...	2SC1226A		1

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
TR216~223	2SC828	SI NPN EP	8	
TR224	2SA564	SI PNP EP	1	
TR225~232	2SC828	SI NPN EP	8	
TR233	2SA564	SI PNP EP	1	
TR234~239	2SC828	SI NPN EP	6	
TR240	2SA684	SI PNP EP	1	
TR241	2SC828	SI NPN EP	1	
TR242	2SA564	SI PNP EP	1	
<b>IC</b>				
IC201	AN301	VTR Servo Control Signal Process Circuit	1	
<b>DIODES</b>				
D201~206	MA150LF		6	
D207	RD12EC		1	
D209, 211, 212, 215~218, 220~227	MA150LF		15	
D213, 214	OA90		2	
<b>RESISTORS</b>				
R201	ERD14VJ564		560 K	
R202	ERD14VJ223		22 K	
R203	ERD14VJ103		10 K	
R204	EVNK4AA00B24	Semi-fixed	20 K	
R205	ERD14VJ562		5.6 K	
R206	ERD14VJ103		10 K	
R207, 208	ERD14VJ223		22 K	
R209	ERD14VJ332		3.3 K	
R210	ERD14VJ562		5.6 K	
R211	ERD12TJ152	1/2 W	1.5 K	
R212	ERD14VJ563		56 K	
R213~215	ERD14VJ103		10 K	
R216	ERD12TJ152	1/2 W	1.5 K	
R217	ERD14VJ563		56 K	
R218, 219	ERD14VJ103		10 K	
R220	ERD14VJ562		5.6 K	
R221~224	ERD14VJ223		22 K	
R225	ERD14VJ562		5.6 K	
R226	ERD14VJ102		1 K	
R227	ERD14VJ1821		820	
R228	ERD14VJ103		10 K	
R229, 230	ERD14VJ333		33 K	
R231	ERD14VJ473		47 K	
R232	ERD14VJ101		100	
R233	ERD14VJ152		1.5 K	

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
R234	ERD14VJ332		3.3 K	
R235	ERD14VJ223		22 K	
R236	ERD14VJ393		39 K	
R237	ERD14VJ473		47 K	
R238	ERD14VJ392		3.9 K	
R239, 240	ERD14VJ103		10 K	
R241	ERD14VJ563		56 K	
R242	ERD14VJ560		56	
R243	ERD14VJ473		47 K	
R244	ERD14VJ223		22 K	
R245, 247	ERD14VJ332		3.3 K	
R248	EVNK4AA00B15	Semi-fixed	100 K	
R249	ERD14VJ822		8.2 K	
R250	ERD14VJ223		22 K	
R251	ERD14VJ332		3.3 K	
R252	ERD14VJ153		15 K	
R253	ERD14VJ332		3.3 K	
R254	ERD14VJ123		12 K	
R255, 256	ERD14VJ473		47 K	
R257	ERD14VJ332		3.3 K	
R258	ERD14VJ473		47 K	
R259, 260	ERD14VJ102		1 K	
R261	ERD14VJ103		10 K	
R262	ERD14VJ392		3.9 K	
R263	ERD14VJ333		33 K	
R264	ERD14VJ562		5.6 K	
R265, 266	ERD14VJ103		10 K	
R267	ERD14VJ183		18 K	
R268	ERD14VJ101		100	
R269	ERD14VJ122		1.2 K	
R270, 271	ERD14VJ222		2.2 K	
R272	ERD14VJ103		10 K	
R273	ERD14VJ473		47 K	
R274	ERD14VJ333		33 K	
R275	ERD14VJ222		2.2 K	
R278	ERD14VJ332		3.3 K	
R279	ERD14VJ153		15 K	
R280	ERD14VJ223		22 K	
R281, 282	ERD14VJ103		10 K	
R283	ERD14VJ223		22 K	
R284	ERD14VJ332		3.3 K	
R285	EVNK4AA00B15	Semi-fixed	100 K	
R286	ERD14VJ103		10 K	
R287	ERD14VJ332		3.3 K	
R288	ERD14VJ104		100 K	
R289	ERD14VJ184		180 K	

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
R290	EVNK4AA00B25	Semi-fixed	200 K	1
R291	ERD14VJ103		10 K	1
R292	ERD14VJ223		22 K	1
R293	ERD14VJ103		10 K	1
R294	ERD14VJ102		1 K	1
R295	ERD14VJ272		2.7 K	1
R296	ERD14VJ223		22 K	1
R297	ERD14VJ332		3.3 K	1
R298	ERD14VJ103		10 K	1
R299	ERD14VJ102		1 K	1
R2101	ERD14VJ332		3.3 K	1
R2102	ERD14VJ334		330 K	1
R2103	ERD14VJ473		47 K	1
R2104	ERD14VJ103		10 K	1
R2105	ERD14VJ152		1.5 K	1
R2106	ERD14VJ103		10 K	1
R2107	ERD14VJ332		3.3 K	1
R2108	ERD14VJ103		10 K	1
R2109	ERD14VJ223		22 K	1
R2110	ERD14VJ102		1 K	1
R2111	ERD14VJ103		10 K	1
R2112, 2113	ERD14VJ221		220	2
R2114	ERD14VJ103		10 K	1
R2115	ERD14VJ332		3.3 K	1
R2116	ERD14VJ560		56	1
R2117~2119	ERD14VJ222		2.2 K	3
R2120	ERD14VJ331		330	1
R2121	ERD14VJ103		10 K	1
R2122	ERD14VJ223		22 K	1
R2123	ERD14VJ103		10 K	1
R2124	ERD14VJ102		1 K	1
R2126	ERD14VJ153		15 K	1
R2127	ERD14VJ682		6.8 K	1
R2128	ERD14VJ562		5.6 K	1
R2129	ERD14VJ101		100	1
R2130	ERD14VJ562		5.6 K	1
R2131	ERD14VJ223		22 K	1
R2132	ERD14VJ104		100 K	1
R2133	ERD14VJ562		5.6 K	1
R2134	ERD14VJ471		470	1

CAPACITORS				
Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
C201	ECEA16V10L	Electrolytic	16 V	10
C202	ECQM05562KZB	Mylar	50 V	0.0056
C203	ECQM05272KZB	Mylar	50 V	0.0027
C204	ECEA16V10L	Electrolytic	16 V	10

TRANSFORMER				
Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
L201	EL-T10S904	High-Frequency		1

MISCELLANEOUS				
Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
	TEL302-5	G.T Pin		30
	VJH24	Check Terminal		19
	VQL322C12	No. Label		1

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
<b>HEAD AMP. CIRCUIT BOARD ASSY</b>				
<b>TRANSISTORS</b>				
TR501	...	2SC1359B	1	
TR502	503	Si NPN EP	2	
TR504	...	2SC1383	1	
TR505	...	2SC1359B	1	
TR506	507	Si NPN EP	2	
TR508	...	2SC1359B	1	
TR509	~511	Si PNP EP	3	
TR512	...	2SA564	1	
TR513	~515	Si NPN EP	3	
<b>DIODES</b>				
D501	...	MA150LF	1	
D502	~504	Ge Point Contact	3	
<b>RESISTORS</b>				
R501	...	EVN22AA00B12	100	
R502	...	ERD14VJ682	6.8 K	
R503	...	ERD14VJ102	1 K	
R504	...	ERD14VJ471	470	
R505	...	ERD14VJ680	68	
R506	...	ERD14VJ100	10	
R507	508	ERC2ANK151	150	2 W
R509	510	ERD14VJ101	100	2
R511	512	ERD14VJ181	180	2
R514	...	ERD14VJ154	150 K	1
R515	...	ERD14VJ153	15 K	1
R516	...	EVNK4AA00B13	1 K	1
R517	...	ERD14VJ102	1 K	1
R518	519	ERD14VJ562	5.6 K	2
R520	...	ERD14VJ154	150 K	1
R521	...	ERD14VJ153	15 K	1
R522	...	ERD14VJ332	3.3 K	1
R523	...	ERD14VJ101	100	1
R524	...	ERD14VJ102	1 K	1
R525	...	ERD14VJ222	2.2 K	1
R526	...	ERD14VJ154	150 K	1
R527	...	ERD14VJ153	15 K	1
R528	...	ERD14VJ681	680	1
R529	...	ERD14VJ102	1 K	1
R530	...	ERD14VJ103	10 K	1
R531	...	ERD14VJ562	5.6 K	1
Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
R532	...	ERD14VJ154	150 K	1
R533	...	ERD14VJ153	15 K	1
R534	...	ERD14VJ332	3.3 K	1
R535	...	ERD14VJ101	100	1
R536	...	ERD14VJ102	1 K	1
R537	...	ERD14VJ222	2.2 K	1
R538	...	EVNK4AA00B23	2 K	1
R539	...	ERD14VJ823	82 K	1
R540	...	ERD14VJ153	15 K	1
R541	...	ERD14VJ102	1 K	1
R542	...	ERD14VJ331	330	1
R543	...	ERD14VJ102	1 K	1
R544	...	ERD14VJ103	10 K	1
R545	...	ERD14VJ332	3.3 K	1
R546	...	EVNK4AA00B53	5 K	1
R547	...	ERD14VJ102	1 K	1
R548	...	ERD14VJ331	330	1
R549	...	ERD14VJ103	10 K	1
R550	...	ERD14VJ332	3.3 K	1
R551	...	ERD14VJ103	10 K	1
R552	...	ERD14VJ330	33	1
R553	...	ERD14VJ222	2.2 K	1
R554	...	ERD14VJ333	33 K	1
R555	...	ERD14VJ332	3.3 K	1
R556	...	ERD14VJ221	220	1
R557	...	ERD14VJ332	3.3 K	1
R558	...	ERD14VJ681	680	1
R559	...	EVN22AA00B32	300	1
R560	...	ERD14VJ332	3.3 K	1
R561	...	ERD14VJ221	220	1
R562	...	ERD14VJ100	10	1
R563	...	ERD14VJ101	100	1
R564	565	ERD14VJ100	10	2
<b>CAPACITORS</b>				
C501	...	ECEA16V10L	16 V	1
C502	...	ECKC1H103PF3	10 <sup>4</sup> V	0.01
C503	...	ECEA50V1L	50 V	1
C504	505	ECKC1H103PF3	10 <sup>4</sup> V	0.01
C506	...	ECQM05473KZB	50 V	0.047
C507	...	ECKC1H103PF3	10 <sup>4</sup> V	0.01
C509	...	ECEA50V1L	50 V	1
C510	...	ECQM05473KZB	50 V	0.047
C512	~514	ECKC1H103PF3	10 <sup>4</sup> V	0.01
C515	...	ECQM05473KZB	50 V	0.047

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
	XTV3+6FX	Tapping Screw	14	
	VSC0186	Shield Board	1	
<b>AUDIO CIRCUIT BOARD ASSY</b>				
<b>TRANSISTORS</b>				
TR401, 402	2SC644	Si NPN EP	2	
TR403, 404	2SC828	Si NPN EP	2	
TR405	2SC1383	Si NPN EP	1	
TR406	2SA564	Si PNP EP	1	
TR407, 408	2SC828	Si NPN EP	2	
TR409	2SC1317	Si NPN EP	1	
TR410	2SA564	Si PNP EP	1	
TR411, 412	2SC1317	Si NPN EP	2	
TR413	2SC389	Si NPN EP	1	
TR414, 415	2SA1383	Si NPN EP	2	
<b>DIODES</b>				
D401	MA150LF	Ge Point Contact	1	
D402~404	OA90	Si Alloy Diffused	3	
D405	10D1	Si Alloy Diffused	1	
D406~412	MA150LF	Si Alloy Diffused	7	
D413~415	10D1	Si Alloy Diffused	3	
<b>RESISTORS</b>				
R401	ERD14VJ224		220 K	1
R402	ERD14VJ104		100 K	1
R403	ERD14VJ182		1.8 K	1
R404	ERD14VJ183		18 K	1
R405	ERD14VJ103		10 K	1
R406	ERD14VJ471		470	1
R407	ERD14VJ103		10 K	1
R408	EYVK4A00B14	Semi-fixed	10 K	1
R409	ERD14VJ154		150 K	1
R410	ERD14VJ473		47 K	1
R411	ERD14VJ101		100	1
R412	ERD14VJ682		6.8 K	1
R413	ERD14VJ100		10	1
R414	ERD14VJ122		1.2 K	1
R415	ERD14VJ562		5.6 K	1
R416	ERD14VJ123		12 K	1
R417	ERD14VJ182		1.8 K	1
R418	ERD14VJ222		2.2 K	1
R419	ERD14VJ154		150 K	1
R420	ERD14VJ273		27 K	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
C516	EKC1H103PF3	Ceramic	0.01	1
C518	ECEA50V1L	Electrolytic	1	1
C519	ECQM05473KZB	Mylar	0.047	1
C521~523	EKC1H103PF3	Ceramic	0.01	3
C524, 525	ECQM05473KZB	Mylar	0.047	2
C526	EKC1H103PF3	Ceramic	0.01	1
C527	ECQM139IKZ	Styrol	390 P	1
C528	EKC1H103PF3	Ceramic	0.01	1
C530	ECV1ZW20X44	Trimmer	1~20 P	1
C531	ECC1H270KC3	Ceramic	27 P	1
C532~534	EKC1H103PF3	Ceramic	0.01	3
C535	EKC2H331KA3	Ceramic	330 P	1
C536, 537	ECEA25V4R7L	Electrolytic	4.7	2
C538	EKC1H103PF3	Ceramic	0.01	1
<b>INDUCTANCES, COILS</b>				
L501	VLQ80F221K		220 $\mu$ H	1
L502, 504, 505, 507	ELQ2P1	High-Frequency	4	
L508	VL712	High-Frequency	1	
L509	VLQ80F180K		18 $\mu$ H	1
L510, 511	VLQ70L470K	Felly	47 $\mu$ H	2
<b>TRANSFORMERS</b>				
T501, 502	ELT10S932	High-Frequency	2	
<b>RELAY</b>				
K501	VS Y206		1	
<b>MISCELLANEOUS</b>				
	TEL302	G.T Pin	16	
	VJH24	Check Terminal	5	
	VQL322F	No. Label	1	
	VSC5018	Shield Case	1	
	VSC5019	Shield Case	1	
<b>AUDIO SECTION ASSY</b>				
POWER SUPPLY CIRCUIT BOARD ASSY				
AUDIO CIRCUIT BOARD ASSY				
TIMING CIRCUIT BOARD ASSY				
	VJR3	Clamp	3	
	VMA1730-1	Circuit Board Mounting Angle	2	
	VQL322K6	No. Label	1	
	XRM3X4A	Round Rivet	3	

Ref. No.	Part No.	Part Name & Description	Per Set (Pcs.)	Unit Price
R421	ERD14VJ182		1.8 K	1
R422	ERD14VJ222		2.2 K	1
R423	ERD14VJ101		100	1
R424	ERD14VJ471		470	1
R425	ERD14VJ103		10 K	1
R426	ERD14VJ563		56 K	1
R427	ERD14VJ104		100 K	1
R428	ERD14VJ273		27 K	1
R429	ERD14VJ331		330	1
R430	ERD14VJ102		1 K	1
R431	ERD14VJ392		3.9 K	1
R432	ERD14VJ104		100 K	1
R433	ERD14VJ822		8.2 K	1
R434	ERD14VJ103		10 K	1
R435	ERD14VJ102		1 K	1
R436	ERD14VJ681		680	1
R437	ERD14VJ562		5.6 K	1
R438	ERD14VJ273		27 K	1
R439	ERD14VJ473		47 K	1
R440	ERD14VJ221		220	1
R441	ERD14VJ222		2.2 K	1
R442	EVNK4AA00B53	Semi-fixed	5 K	1
R443	ERD14VJ392		3.9 K	1
R444	ERD14VJ102		1 K	1
R445	ERD14VJ392		3.9 K	1
R446	ERD14VJ103		10 K	1
R447, 448	ERD14VJ273		27 K	2
R449	ERD14VJ681		680	1
R450, 451	ERD14VJ392		3.9 K	2
R452	ERD14VJ273		27 K	1
R453, 454	ERD14VJ392		3.9 K	2
R455	ERD12TJ471	1/2 W	470	1
R456	ERD14VJ103		10 K	1
R457	ERD14VJ101		100	1
R458	ERD14VJ102		1 K	1
R459	ERD14VJ5R6		5.6	1
R460	ERD14VJ392		3.9 K	1
R461	ERD14VJ100		10	1
<b>CAPACITORS</b>				
C401	ECEA25VR7L	Electrolytic	4.7	1
C402	ECEA16V47L	Electrolytic	47	1
C403	ECCC1H270KC3	Ceramic	27 P	1
C404	ECEA16V10L	Electrolytic	10	1
C405	ECEA6V100L	Electrolytic	6 V	100
C406	ECEA16V10L	Electrolytic	16 V	10
C407	ECCC2H560KC3	Ceramic	56 P	1
C408	ECEA16V47L	Electrolytic	47	1
C409	ECQM05392KZB	Mylar	0.0039	1
C410	ECEA16V47L	Electrolytic	47	1
C411	ECQM05273KZB	Mylar	0.027	1
C412	ECEA16V47L	Electrolytic	47	1
C413	ECEA16V10L	Electrolytic	10	1
C414	ECEA16V220L	Electrolytic	220	1
C415	ECEA50V1L	Electrolytic	1	1
C416	ECEA16N4R7	Nonpolarity Electrolytic	4.7	1
C417	ECQM05272KZB	Mylar	0.0027	1
C418	ECEA16V10L	Electrolytic	10	1
C419	ECEA16N4R7	Nonpolarity Electrolytic	4.7	1
C420	ECQM05472KZB	Mylar	0.0047	1
C421	ECAF25ER22	Aluminum Solid	0.22	1
C422	ECEA16N4R7	Nonpolarity Electrolytic	4.7	1
C423	ECEA16V10L	Electrolytic	10	1
C424	ECEA25V4R7L	Electrolytic	4.7	1
C425	ECEA16V47L	Electrolytic	47	1
C426	ECEA16V10L	Electrolytic	10	1
C427	ECEA25V4R7L	Electrolytic	4.7	1
R428, 429	ECEA16V10L	Electrolytic	10	2
C430	ECEA16N4R7	Nonpolarity Electrolytic	4.7	1
C431	ECEA16V10L	Electrolytic	10	1
C432~434	ECKC1H103PF3	Ceramic	0.01	3
C435	ECEA16V10L	Electrolytic	10	1
C436	ECQM05333KZB	Mylar	0.033	1
C437	ECQM2153KZB	Mylar	0.015	1
C438	ECKC2H561KB4	Ceramic	560 P	1
C439	ECV1ZW550X44	Trimmer	1~50 P	1
C440	ECCC2H560KC3	Ceramic	56 P	1
C441	ECQM05392KZB	Mylar	0.0039	1
C442	ECQM05102KZB	Mylar	0.001	1
<b>INDUCTANCES, COILS</b>				
L401	ELT10S904	High-Frequency	1	1
L402	VLQ24F102K25		1	1
L403	VLQ12S181K	Dummy	1	1
<b>TRANSFORMERS</b>				
T401	QLA320	Earphone	1	1
T402	VLTO038	Oscillation	1	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
<b>RELAYS</b>				
K401	...	VSY415	1	10 K
K402	...	VSY104U	1	200 K
<b>MISCELLANEOUS</b>				
	TEL302	G.T Pin	30	220 K
	VJH24	Check Terminal	5	33 K
	VQL322E10	No. Label	1	10 K
<b>TIMING CIRCUIT BOARD ASSY</b>				
<b>TRANSISTORS</b>				
TR601~616	...	2SC828	16	200 K
TR617	...	2SC389P	1	220 K
TR618	...	2SC828	1	33 K
<b>DIODES</b>				
D601~612	...	MA150LF	12	220 K
<b>RESISTORS</b>				
R601	...	ERD14VJ103	1	100
R602	...	ERD14VJ332	1	0.01
R603~605	...	ERD14VJ103	3	0.47
R606	...	ERD14VJ104	1	0.01
R607, 608	...	ERD14VJ332	2	0.47
R609, 610	...	ERD14VJ333	2	16 V
R611	...	ERD14VJ332	1	50 V
R612	...	ERD14VJ103	1	0.0068
R613	...	ERD14VJ223	1	0.0033
R614	...	ERD14VJ103	1	10
R615, 616	...	ERD14VJ332	2	16 V
R617	...	ERD14VJ103	1	G.T Pin
R618	...	ERD14VJ332	1	Check Terminal
R619	...	ERD14VJ823	1	No. Label
R620	...	ERD14VJ333	1	
R621	...	ERD14VJ332	1	
R622~624	...	ERD14VJ103	3	
R625	...	ERD14VJ332	1	
R626~630	...	ERD14VJ103	5	
R631	...	ERD14VJ332	1	
R632	...	ERD14VJ473	1	
R633	...	ERD14VJ333	1	
R634	...	ERD14VJ332	1	
R635, 636	...	ERD14VJ103	2	
R637	...	ERD14VJ333	1	

Ref. No.	Part No.	Part Name & Description	Per Set (Pce.)	Unit Price
R638	...	ERD14VJ103	1	10 K
R639	...	EVNK4AA00B25	1	200 K
R640	...	ERD14VJ224	1	220 K
R641	...	ERD14VJ333	1	33 K
R642	...	ERD14VJ103	1	10 K
R643	...	ERD14VJ273	1	27 K
R644	...	ERD14VJ104	1	100 K
R645	...	ERD14VJ223	1	22 K
R646	...	EVNK4AA00B52	1	500
R647	...	ERD14VJ221	1	220
R648	...	ERG2ANJ560	1	56
R649	...	ERG2ANJ330	1	33
R650, 651	...	ERD14VJ221	2	220
R652	...	ERD14VJ223	1	22 K
R653~657	...	ERD14VJ333	5	33 K
<b>CAPACITORS</b>				
C601, 602	...	EKC1H103PF3	2	10 <sup>4</sup> V
C603	...	ECAF25ER47	1	25 V
C604~606	...	EKC1H103PF3	3	10 <sup>4</sup> V
C607	...	ECEA16V47L	1	16 V
C608	...	ECQM05683KZB	1	50 V
C609	...	ECQM05332KZB	1	50 V
C610, 611	...	ECEA16V10L	2	16 V
<b>MISCELLANEOUS</b>				
	TEL302	G.T Pin	14	
	VJH24	Check Terminal	8	
	VQL322G22	No. Label	1	
<b>POWER SUPPLY CIRCUIT BOARD ASSY</b>				
<b>TRANSISTORS</b>				
TR101, 102	...	2SC1318	2	Si NPN EP
TR103, 104	...	2SA564A	2	Si PNP EP
TR105	...	2SA699	1	Si PNP EP
<b>DIODES</b>				
D101~105	...	10D1	5	Si Alloy Diffused
D106	...	RD6A	1	Si Zener
D107~111	...	10D1	5	Si Alloy Diffused
D112	...	RD6A	1	Si Zener
<b>RESISTORS</b>				
R101, 102	...	ERD14VJ272	2	2.7 K
R103	...	ERD14VJ102	1	1 K

Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price
R6202, 6203	ERD14VJ332		3.3K	2
R6204	ERD14VJ333		33K	1
R6205	ERD14VJ332		3.3K	1
R6206	ERD14VJ102		1K	1
<b>CAPACITORS</b>				
C6201	ECEA16V47L	Electrolytic	47	1
C6202	ECEA25V10L	Electrolytic	10	1
<b>SWITCHES</b>				
S6201~6203	ESD454BN	Slide		3
<b>RELAY</b>				
K6201	VSY104U			1
<b>MISCELLANEOUS</b>				
	VEK183	15P Connector		1
	VJH23	Check Terminal		2
	VQL322A13	No. Label		1
<b>JACK BOARD ASSY</b>				
<b>RESISTORS</b>				
R6701	ERD14VJ224		220K	1
R6702	ERD14VJ102		1K	1
R6703, 6704	ERD14VJ750		75	2
R6705	EVCB0AS10B24	Variable	20K	1
R6706, 6707	ERD14TJ101		100	2
<b>SWITCH</b>				
S6701	VSW7	Stand-by		1
<b>CAPACITORS</b>				
C6701, 6702	ECQU2A103MD	Line Bypass	0.01	2
C6703	ECEM35R2200T	Electrolytic	35V	1
<b>FILTER</b>				
L6701	VTQ2	Line		1
<b>FUSE</b>				
F6701	VSF16UT			1
<b>MISCELLANEOUS</b>				
	VMA1729	Jack Board		1
	VGN0780	Decorated Jack Board		1
	VMA1597	Shield Plate		1
	VJS1	8P Socket		1

Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price
R104	ERD14VJ471		470	1
R105	EVN22AA00B32	Semi-fixed	300	1
R106	ERD14VJ681		680	1
R107	ERD14VJ562		5.6K	1
R108	ERD14VJ102		1K	1
R109	ERD14VJ681		680	1
R110	EVN22AA00B32	Semi-fixed	300	1
R111, 112	ERD14VJ471		470	2
R113	ERD14VJ222		2.2K	1
R114	ERD14VJ272		2.7K	1
R115	ERQ12HJ100	Metal	1/2 W	10
<b>CAPACITORS</b>				
C101~104	ECQM0533KZB	Mylar	50V	0.033
C105	ECEA25V47L	Electrolytic	25V	47
C107	ECQM05102KZB	Mylar	50V	0.001
C108	ECEA16V47L	Electrolytic	25V	47
C109~112	ECQM0533KZB	Mylar	50V	0.033
C114	ECQM05102KZB	Mylar	50V	0.001
C115	ECEA25V220L	Electrolytic	25V	220
C116	ECEA16V220L	Electrolytic	16V	220
C117	ECEA25V47L	Electrolytic	25V	47
C118	ECQM05103KZB	Mylar	50V	0.01
<b>FUSES</b>				
F101, 102	VSF30UT			2
<b>MISCELLANEOUS</b>				
	TEL302	G.T Pin		12
	VJH23	Check Terminal		12
	VJH52	Fuse Holder		4
	VQL322B9	No. Label		1
<b>SWITCH CIRCUIT BOARD ASSY</b>				
<b>TRANSISTORS</b>				
TR6201	2SC828	Si NPN EP		1
TR6202	2SC1317	Si NPN EP		1
TR6203	2SC828	Si NPN EP		1
<b>DIODES</b>				
D6201~6205,				
6207~6209	10D1	Si Alloy Diffused		8
<b>RESISTORS</b>				
R6201	ERD14VJ103		10K	1

Ref. No.	Part No.	Part Name & Description	Per Set (Pec.)	Unit Price
		<b>MISCELLANEOUS</b>		
	VJR1L4PSUB	Lug Terminal	1	
		<b>OPERATION BOARD ASSY</b>		
		<b>RESISTORS</b>		
R6301	... ERD14TJ474		470 K	1
R6302	... ERD14TJ101		100	1
R6303	... EVCB0HK25B55	Variable	5 M	1
R6304	... EVCB0AK25A14	Variable	100 K	1
R6305	... EVR29AK25B32	Variable	300	1
R6306	... EVCB0AK25C14	Variable	10 K	1
R6310	... ERD14TJ101		100	1
		<b>DIODES</b>		
D6301	~6304 ... 10D1	Si Alloy Diffused	4	
		<b>SWITCHES</b>		
S6301, 6302	... VST1	Lever	2	
S6303~6305	... VST2	Lever	3	
		<b>MISCELLANEOUS</b>		
QSL1006A		Level Meter	2	
VJH23		Check Terminal	28	
VJR3		Clamp	3	
VJ10014		Headphone Terminal	1	
VMA1782		Operation Board	1	
VMF53		Level Meter Cushion	1	
VMT3		Level Meter Cushion	2	
VSE5A		Tracking Meter	1	
XNS8FX		Nut	3	
XNS9FX		Nut	1	
XR3X4A		Rivet	3	
XWA8AFX		Spring Washer	3	
XWA9AFX		Spring Washer	1	
XYN3+C6FX		Semus Small Screw	10	
		<b>WIRING ASSY</b>		
TJT581A		6P Socket	23	
TJT683A		4P Socket	6	
VJS72		Solderless Spring	156	
VJS5022		Morex 15P	1	
VJS5020		Morex Pin	15	
		<b>MISCELLANEOUS</b>		
		<b>15P CONNECTOR ASSY</b>		
VJP5018A		15P Connector	1	
VJP5023		Morex Pin	15	
		<b>4P CONNECTOR ASSY</b>		
TJT683A		4P Socket	1	
VJS72		Solderless Spring	4	
		<b>LUG BOARD ASSY (1)</b>		
R6308	... ERG2ANJ560	Metal	56	1
		<b>MISCELLANEOUS</b>		
VJR1L3PSLUB		Lug Terminal	1	
		<b>LUG BOARD ASSY (2)</b>		
R6307	... ERD12TJ181		180	1

# NV-3160

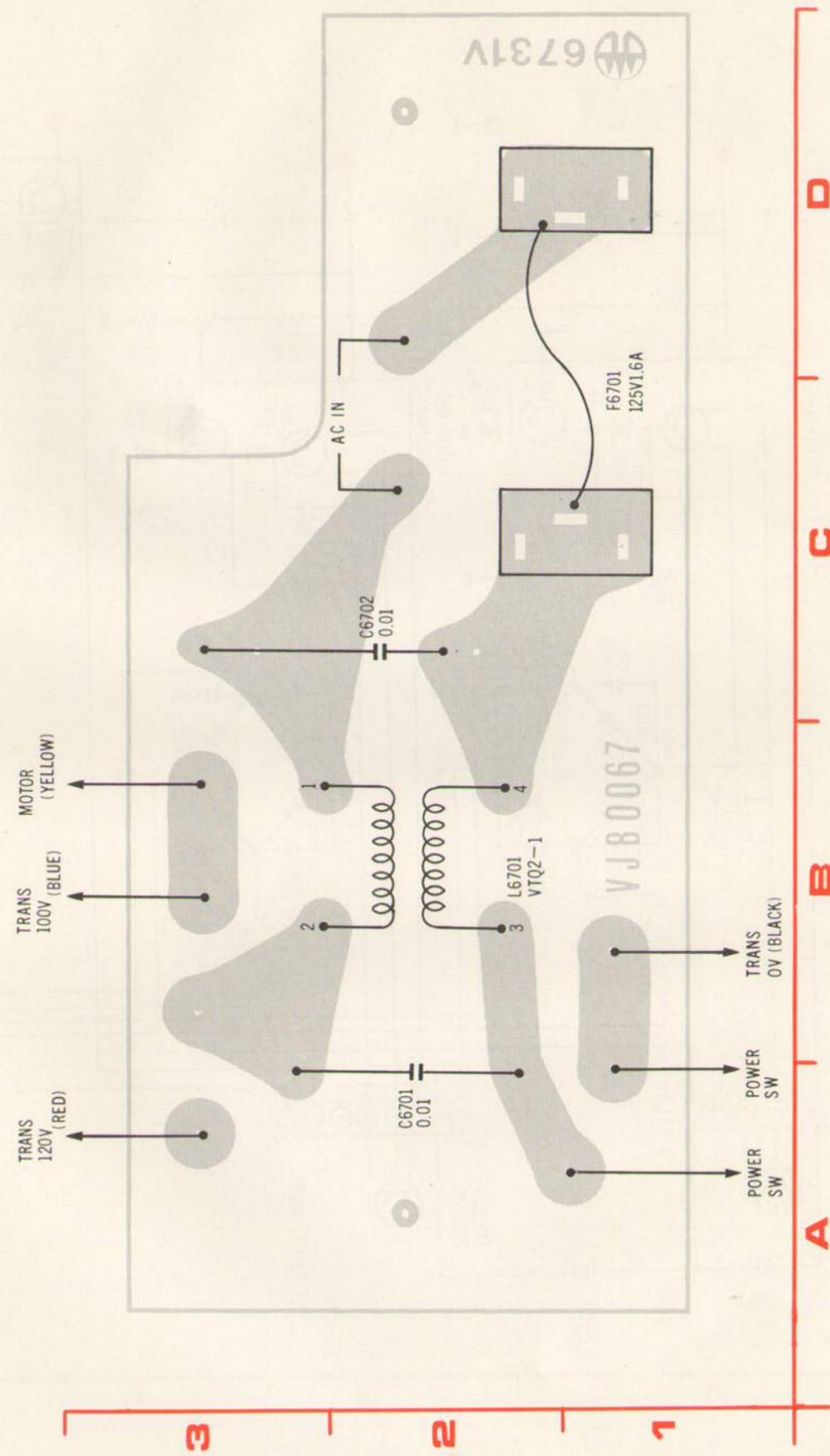
- BLOCK DIAGRAM
- SCHEMATIC DIAGRAM
- CIRCUIT BOARD DIAGRAM

Line filter circuit . . . . .	7-1
Power supply circuit . . . . .	7-2
Head amp./recording amp. circuit . . . . .	7-4
Video recording circuit . . . . .	7-6
Color recording circuit . . . . .	7-8
Video playback circuit . . . . .	7-10
Color playback circuit . . . . .	7-12
Audio circuit . . . . .	7-16
Servo control circuit . . . . .	7-18
Timing circuit . . . . .	7-20
Switch circuit . . . . .	7-22
Internal connection diagram . . . . .	7-24

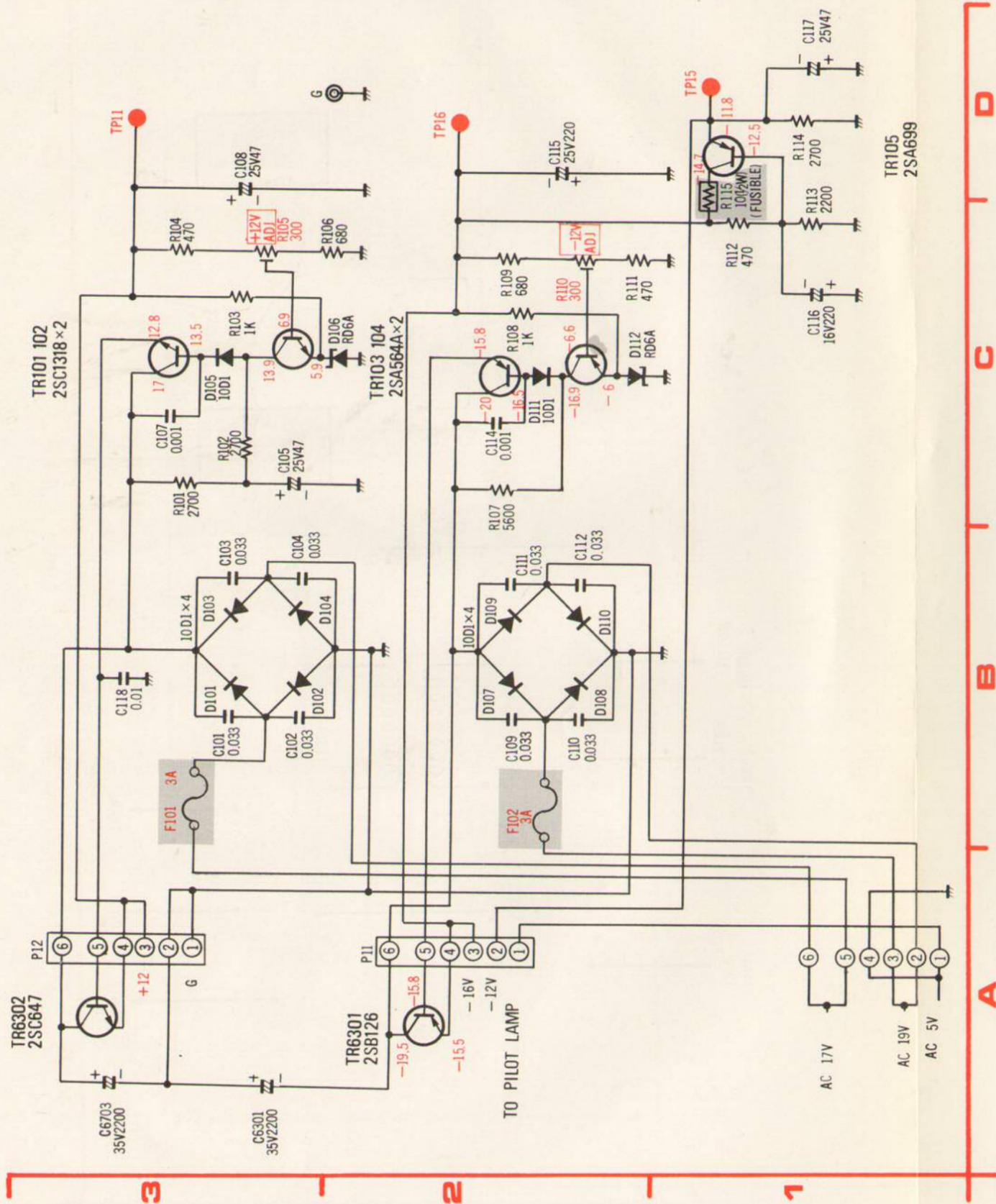
**Note**

1. Unless otherwise specified;
  - All resistors are in OHMS ( $\Omega$ ) 1/4W  $\pm 5\%$  carbon.
  - K=1,000 $\Omega$ , M=1,000K $\Omega$ .
  - All capacitors are in MICROFARADS ( $\mu$ F). P= $\mu$  $\mu$ F
2. The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards. When servicing it is essential that only manufacture's specified parts be used for the critical components in the shaded areas of the schematic.

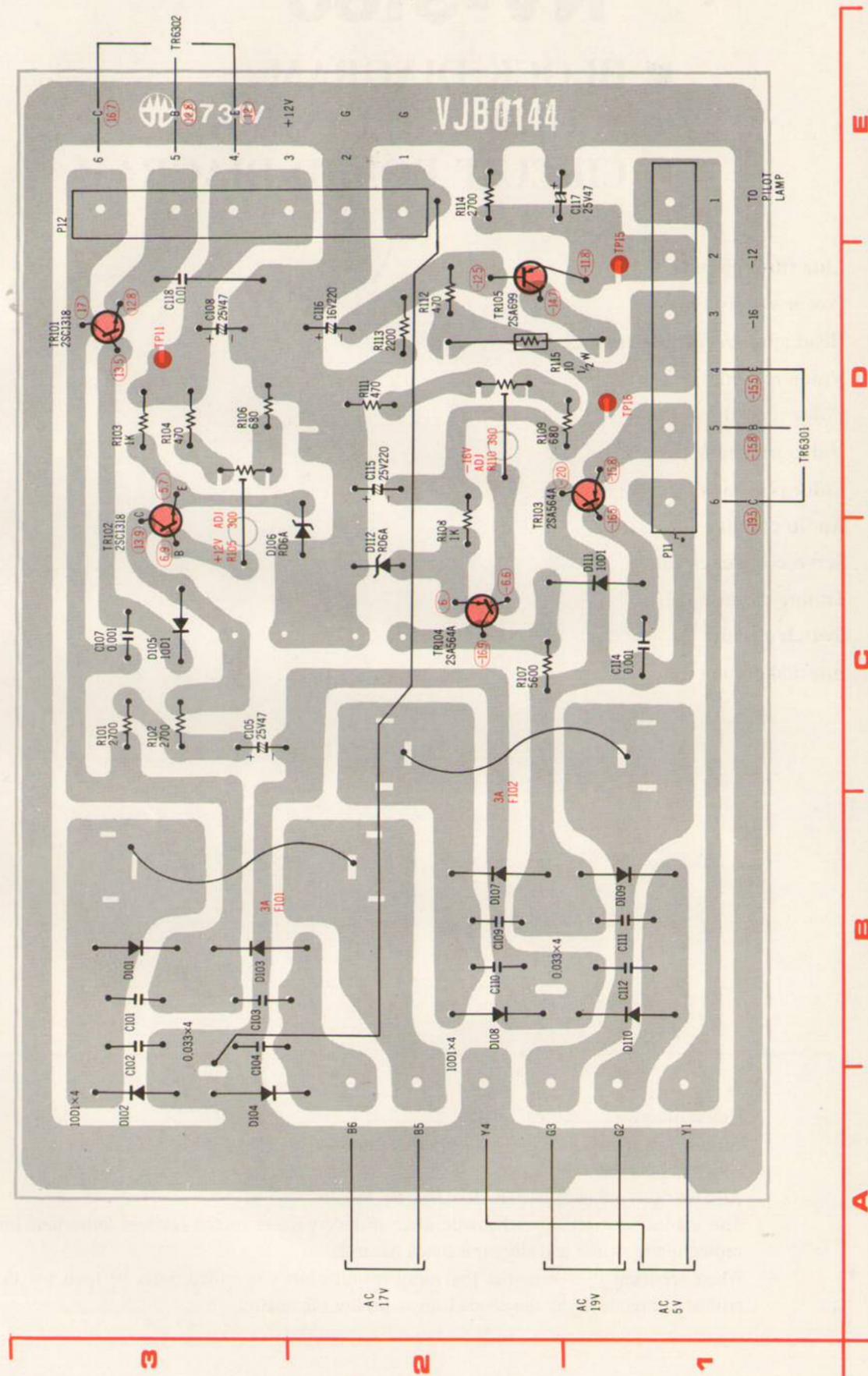
## LINE FILTER CIRCUIT BOARD (VEP0067A)



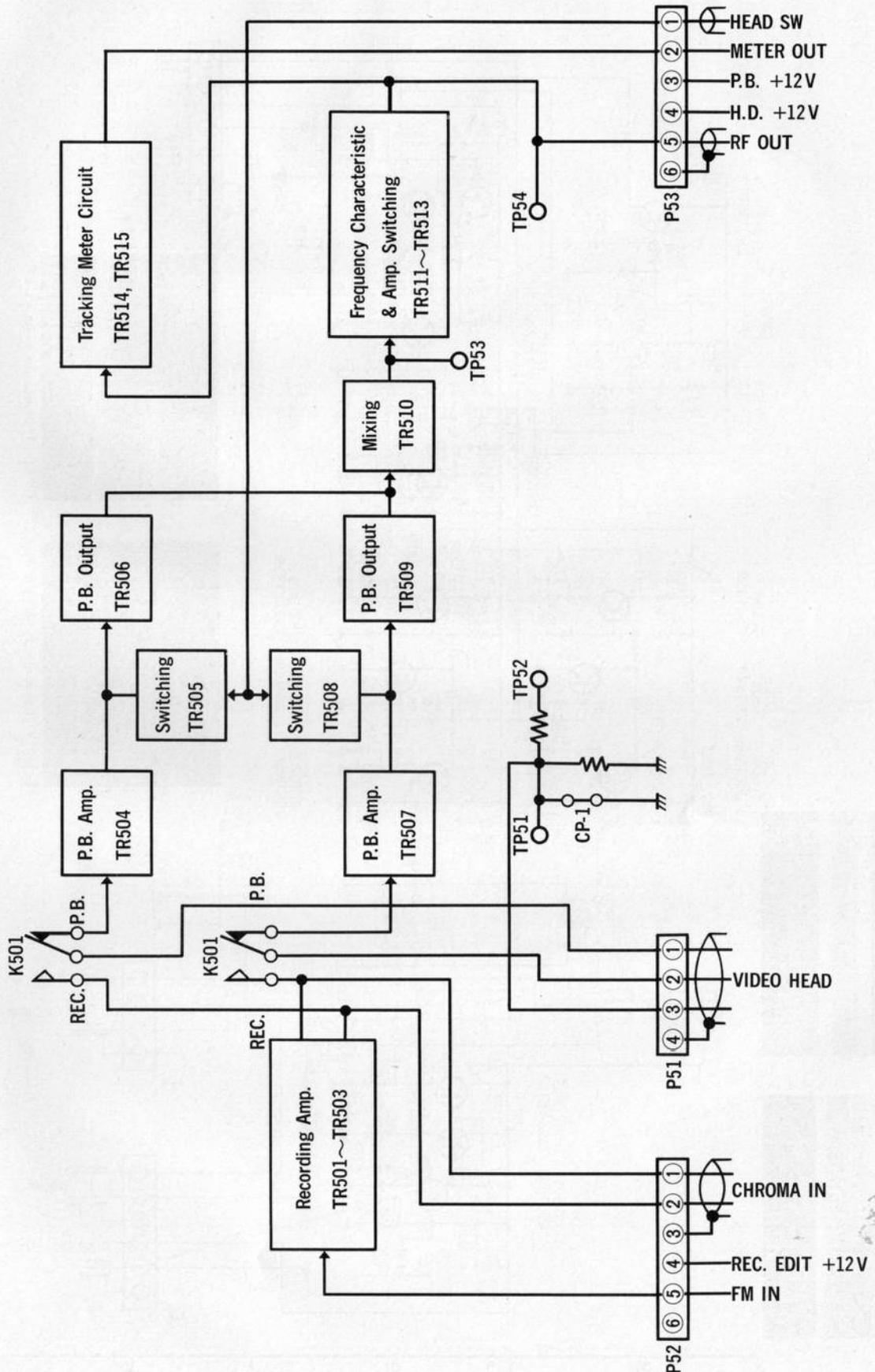
# POWER SUPPLY CIRCUIT SECTION (VEP0144A)



# POWER SUPPLY CIRCUIT BOARD (VEP0144A)

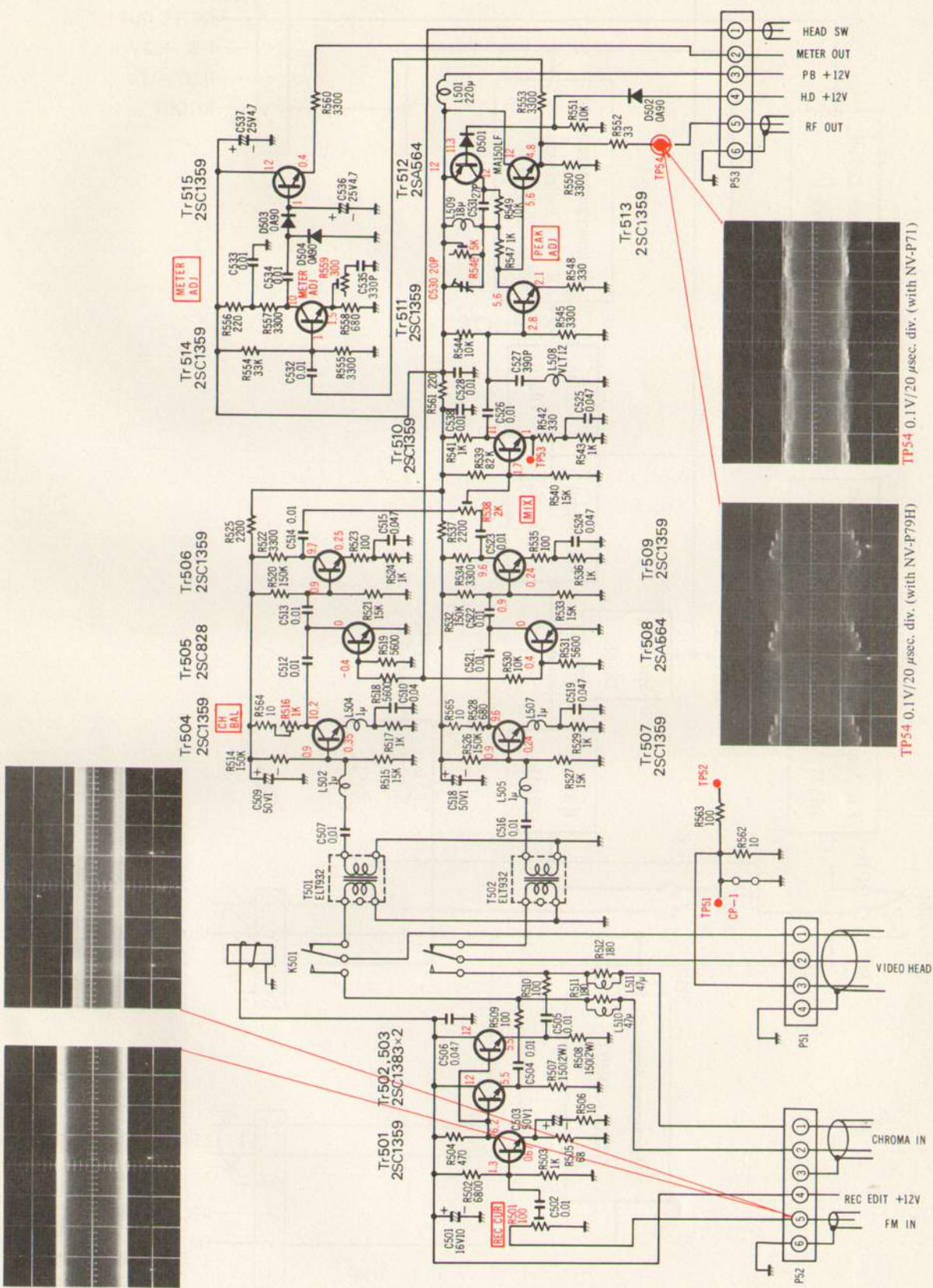


# HEAD AMP./RECORDING AMP. SECTION BLOCK DIAGRAM (VEP0527A)



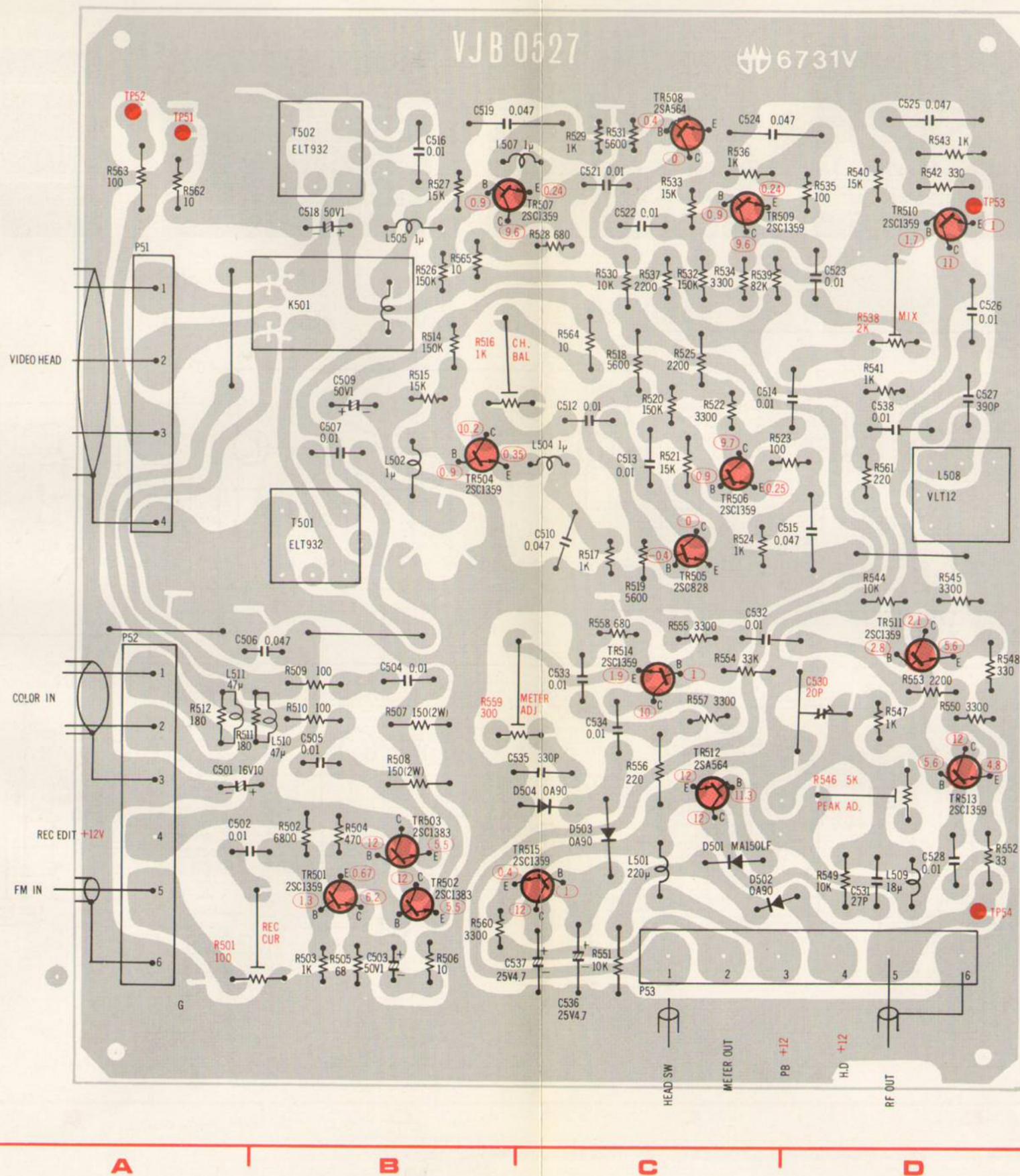
# HEAD AMP./RECORDING AMP. CIRCUIT SECTION (VEP0527A)

P52-③ 0.2V/20 μsec. div. (with NV-P79H) P52-⑤ 0.2V/20 μsec. div. (with NV-P71)



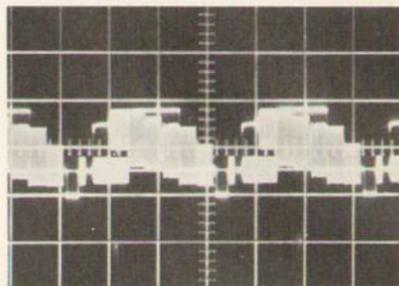
3 | 2 | 1 | A | B | C | D | E

# HEAD AMP./RECORDING AMP. CIRCUIT BOARD (VEP0527A)

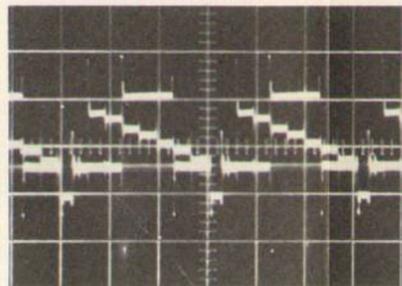


# VIDEO RECORDING CIRCUIT SECTION (VEP0343A)

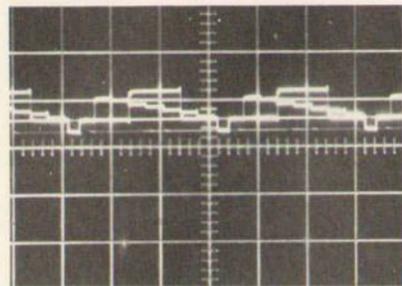
TP31 0.5/20  $\mu$ sec. div.



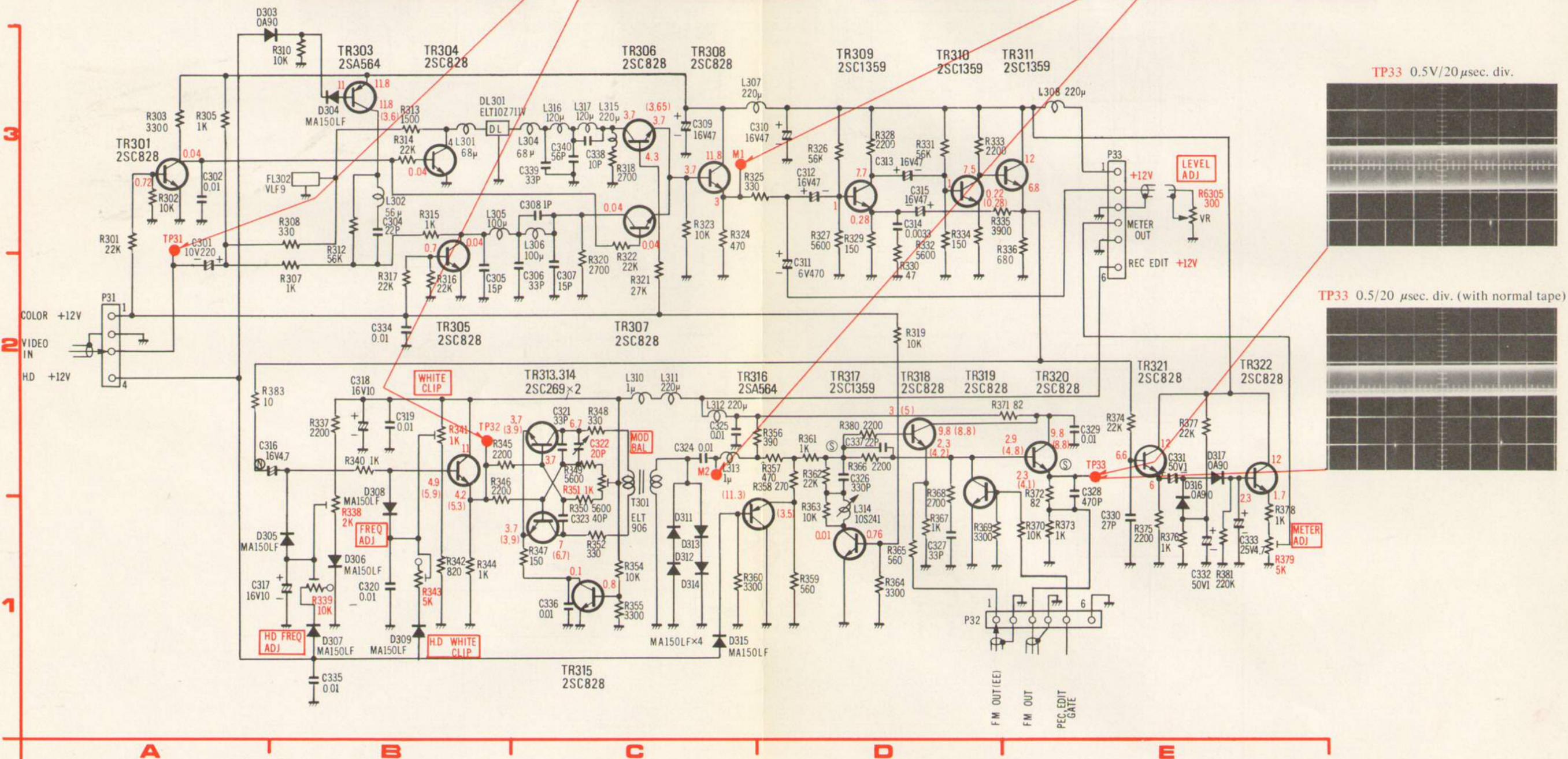
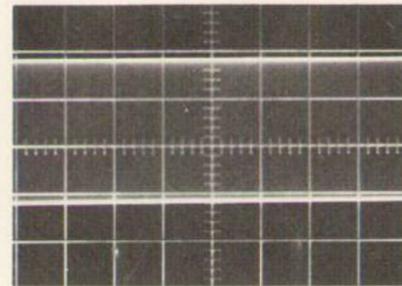
TP32 1V/20  $\mu$ sec. div.



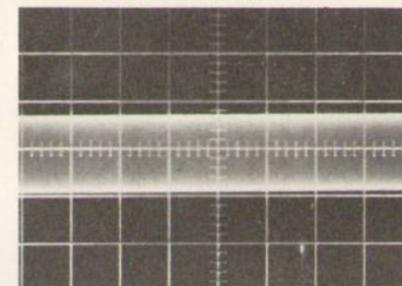
M1 0.5V/20  $\mu$ sec. div.



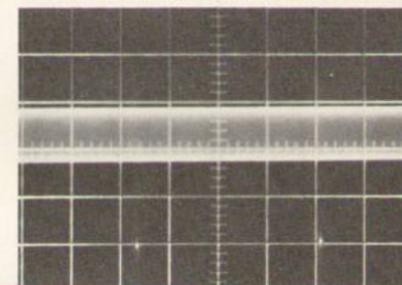
M2 1V/0.5  $\mu$ sec. div.



TP33 0.5V/20  $\mu$ sec. div.

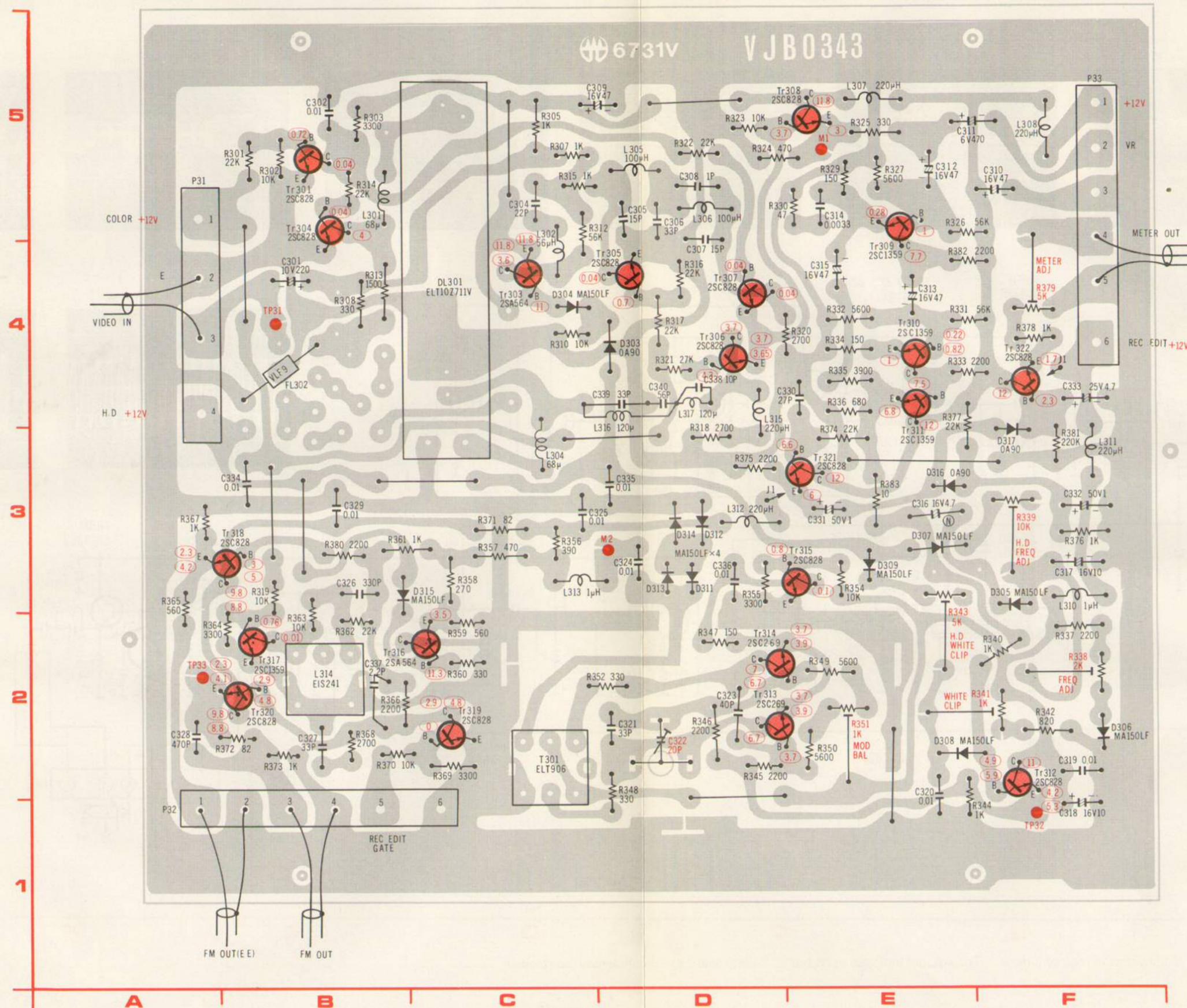


TP33 0.5/20  $\mu$ sec. div. (with normal tape)



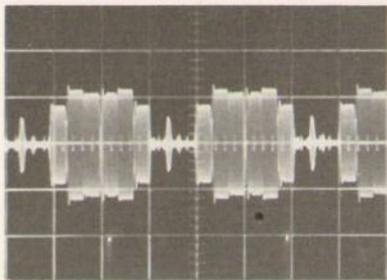
Note: Measure the voltages of transistors in recording mode. (The voltages indicated in brackets ( ) are measured in high density tape mode.)

# VIDEO RECORDING CIRCUIT BOARD (VEP0343A)

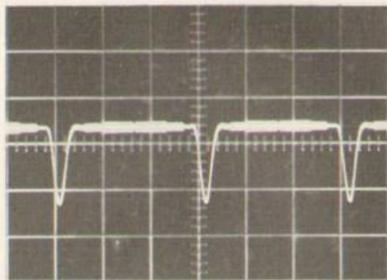


# COLOR RECORDING CIRCUIT SECTION (VEP0834A)

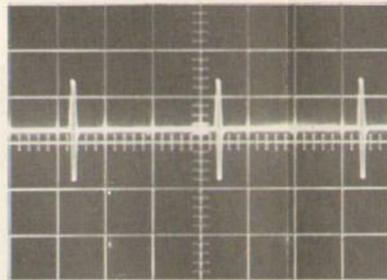
M1 0.1V/20 μsec. div.



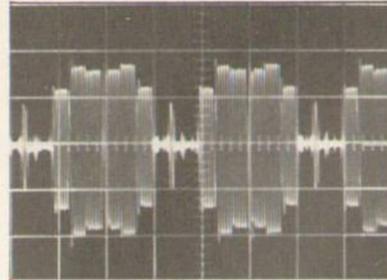
M2 1V/20 μsec. div.



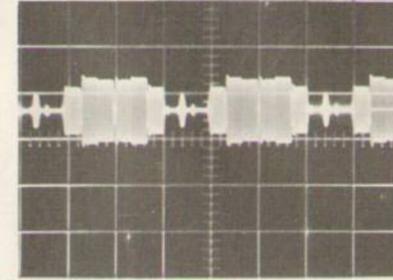
M3 2V/20 μsec. div.



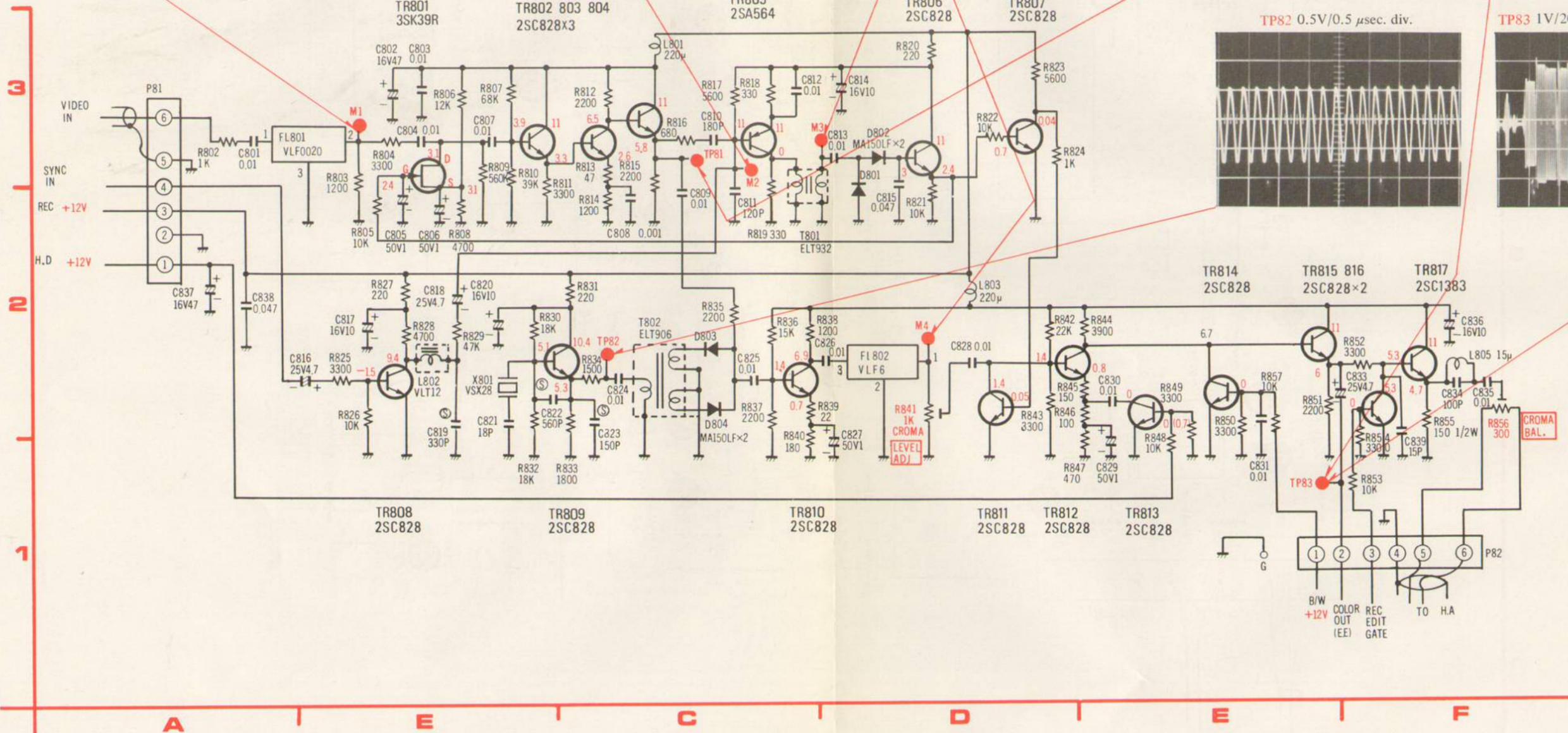
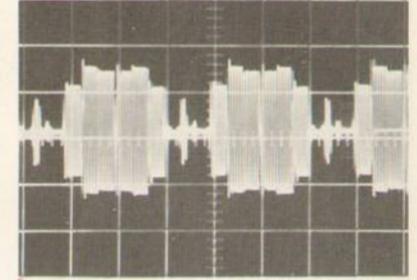
M4 0.2V/20 μsec. div.



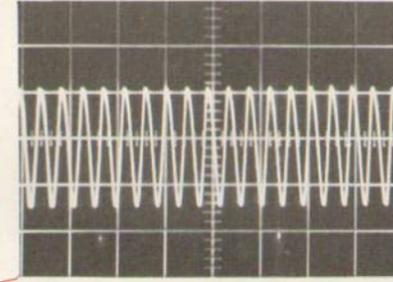
TP81 0.5V/20 μsec. div.



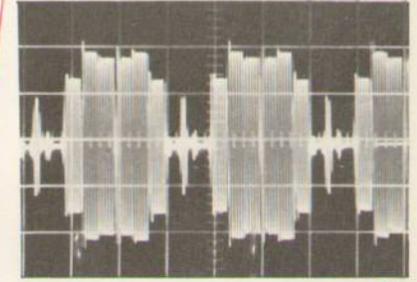
TP83 1V/20 μsec. div. (with NV-71)



TP82 0.5V/0.5 μsec. div.

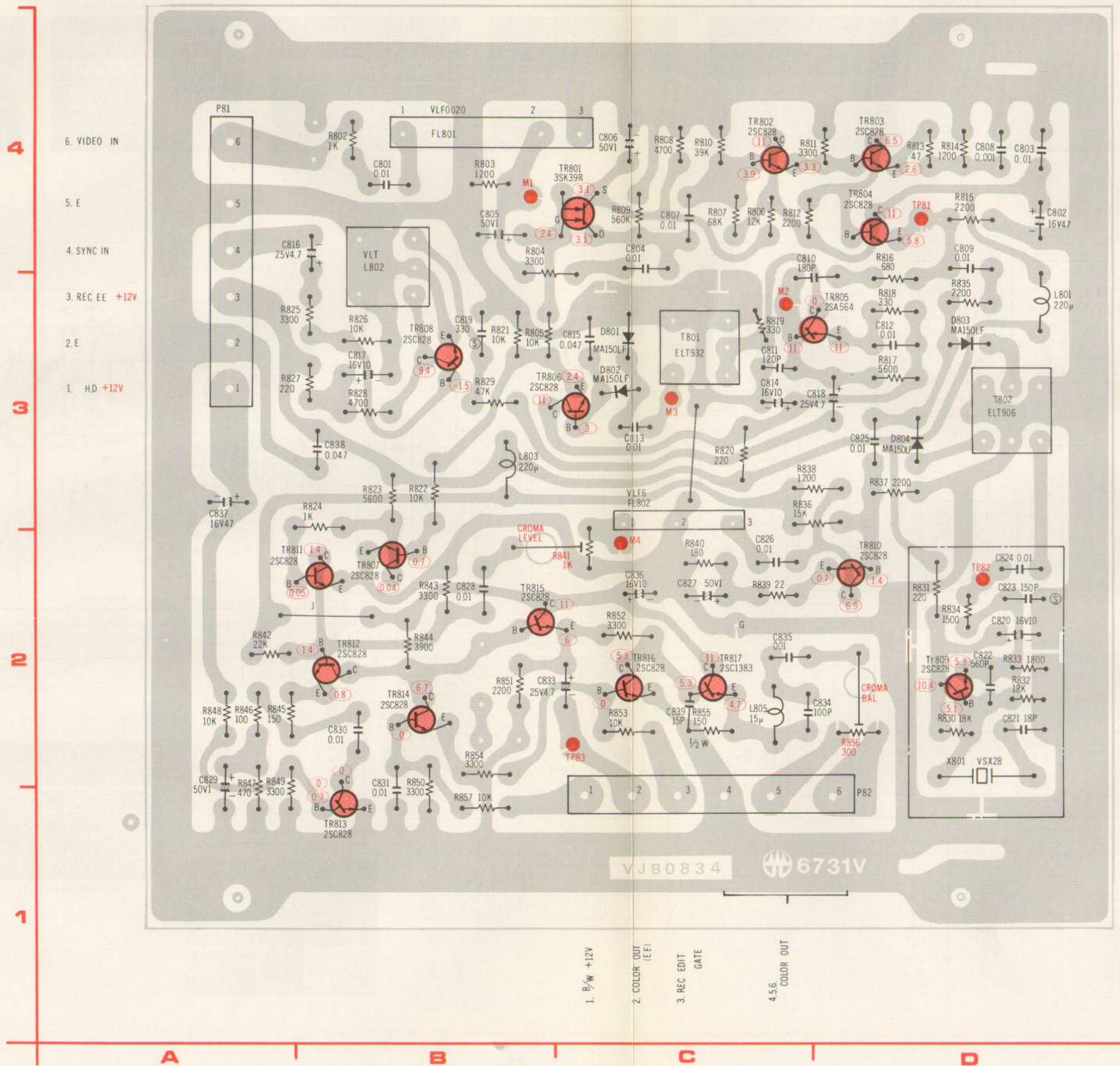


TP83 1V/20 μsec. div. (with NV-P79H)



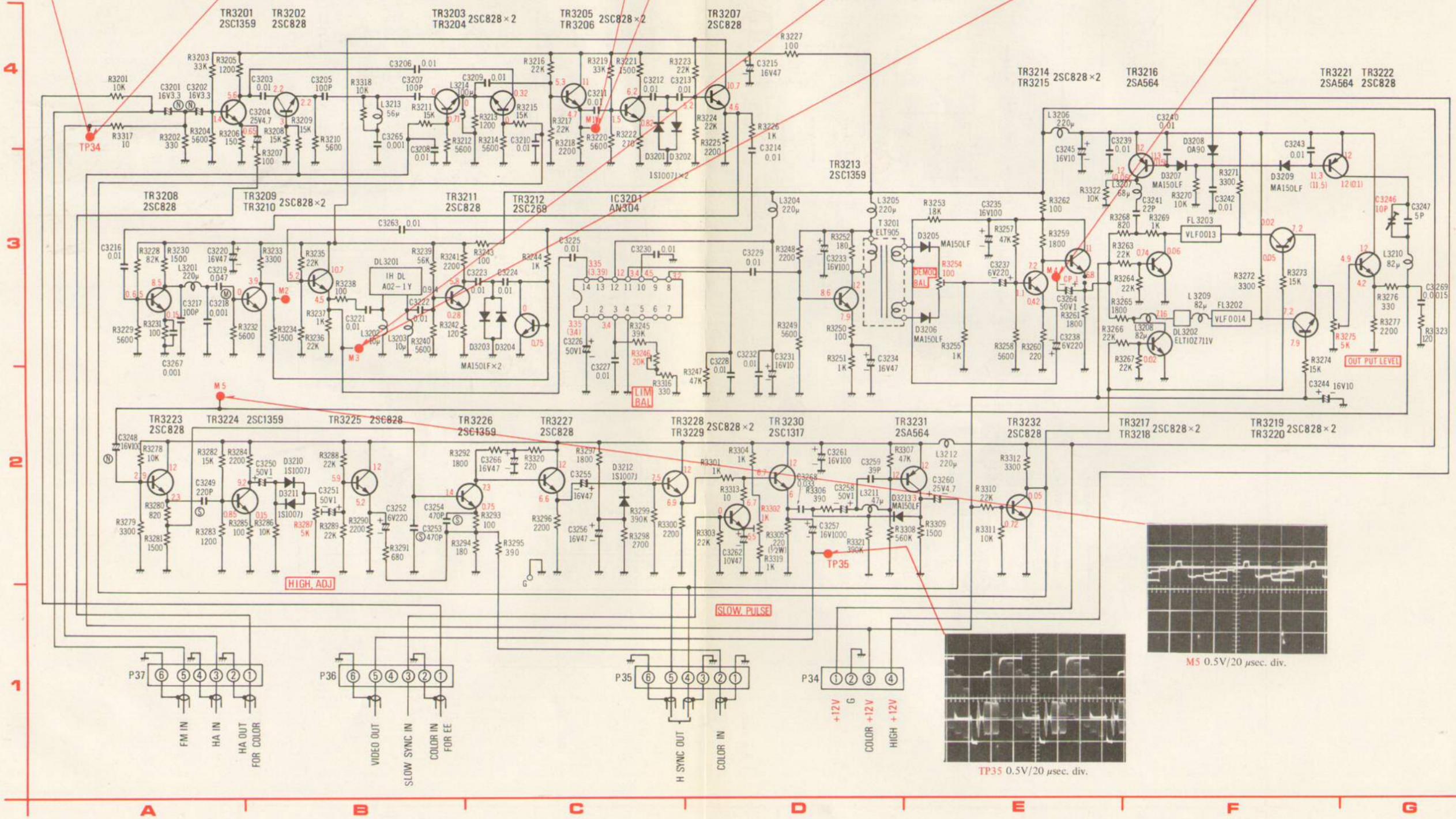
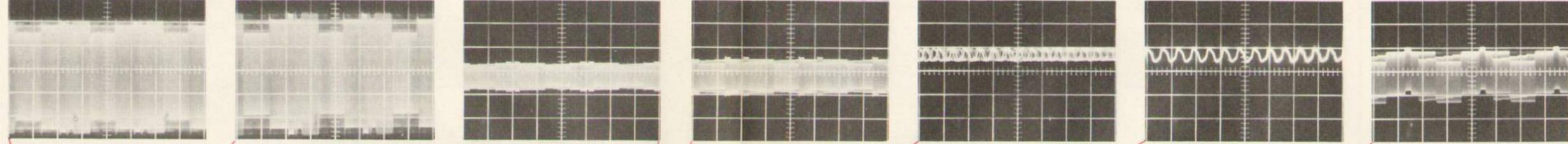
Note: Measure the voltages of transistors in recording mode. (The voltages indicated in brackets ( ) are measured in high density tape mode.)

# COLOR RECORDING CIRCUIT BOARD (VEP0834A)



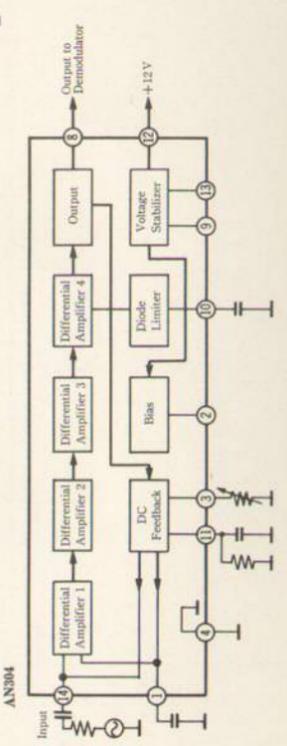
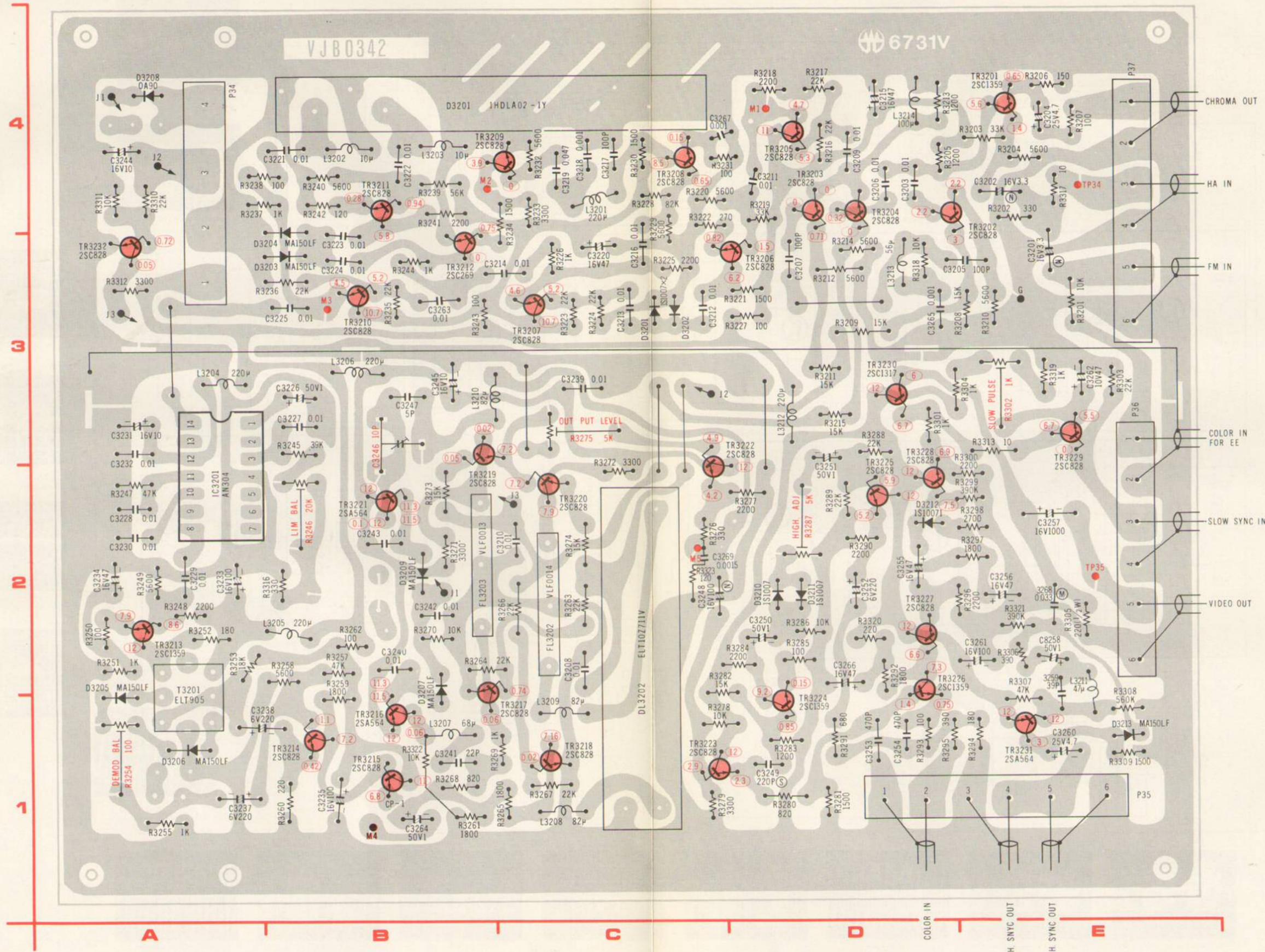
# VIDEO PLAYBACK CIRCUIT SECTION (VEP0342A)

TP34 0.05V/20 μsec. div. (with NV-P71)    TP34 0.05V/20 μsec. div. (with NV-P79H)    M1 0.5V/20 μsec. div. (with NV-P71)    M1 0.5V/20 μsec. div. (with NV-P79H)    M3 0.5V/0.5 μsec. div. (modulated)    M3 0.5V/0.5 μsec. div. (not modulated)    M4 2V/20 μsec. div.

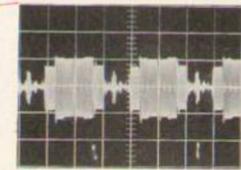
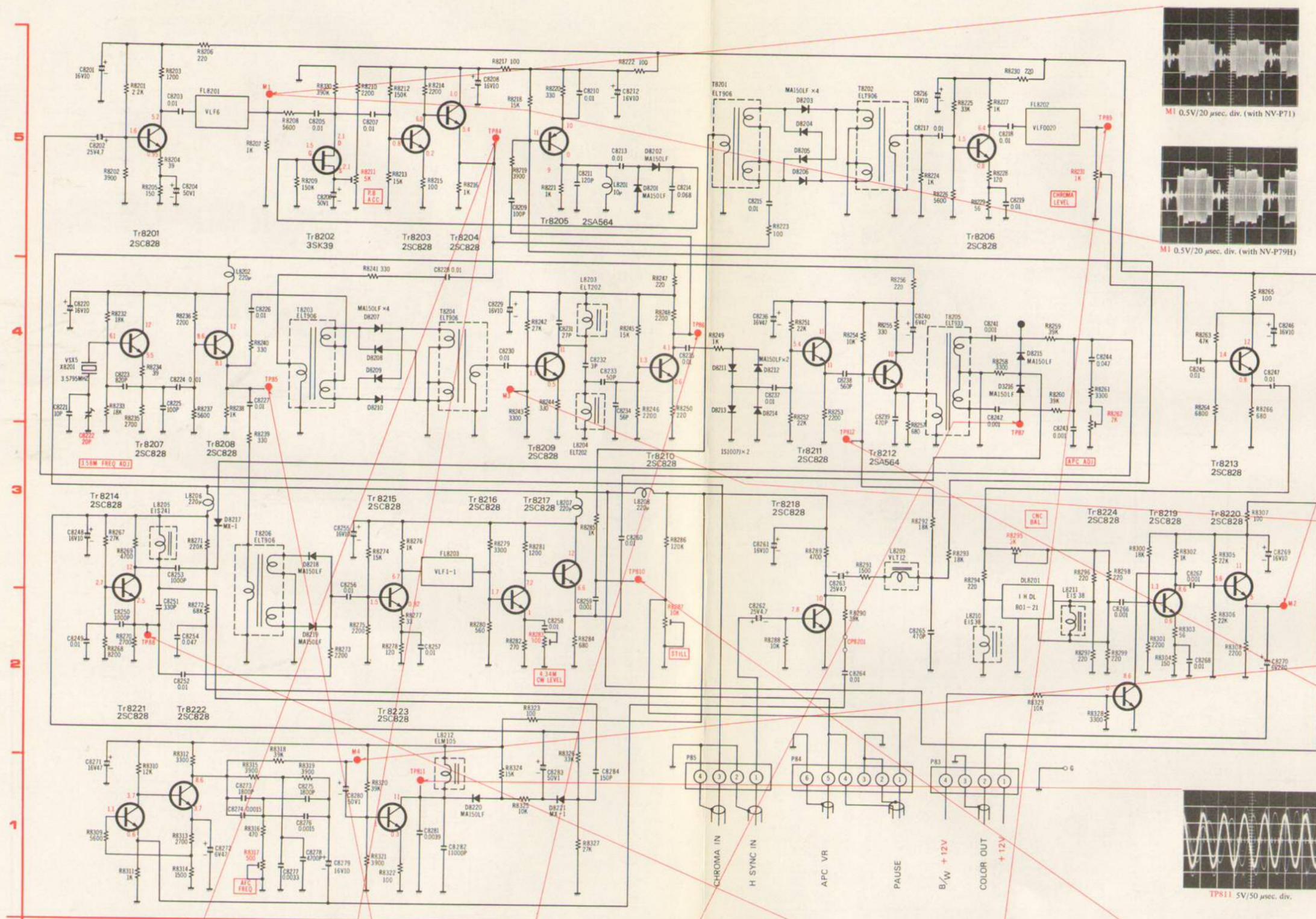


Note: Measure the voltages of transistors in recording mode. (The voltages indicated in brackets ( ) are measured in high density tape mode.)

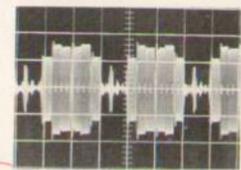
# VIDEO PLAYBACK CIRCUIT BOARD (VEP0342A)



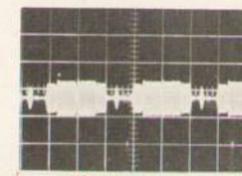
# COLOR PLAYBACK CIRCUIT SECTION (VEP0833A)



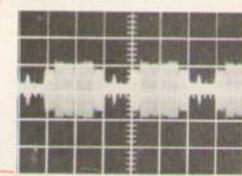
M1 0.5V/20 μsec. div. (with NV-P71)



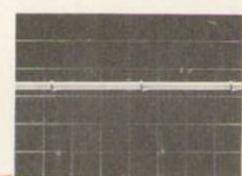
M1 0.5V/20 μsec. div. (with NV-P79H)



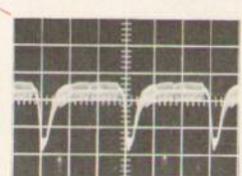
M2 0.5V/20 μsec. div.



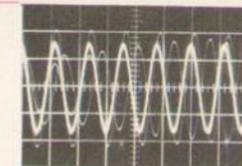
M3 0.5V/20 μsec. div.



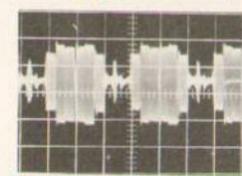
M4 1V/5msec. div.



TP812 1V/20 μsec. div.



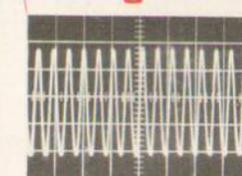
TP811 5V/50 μsec. div.



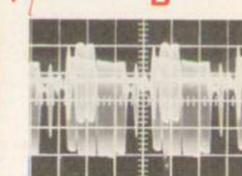
TP84 0.5V/20 μsec. div. (with NV-P71)



TP84 0.5V/20 μsec. div. (with NV-P79H)



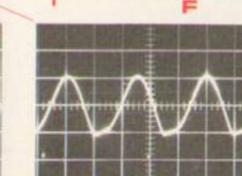
TP85 1V/0.5 μsec. div.



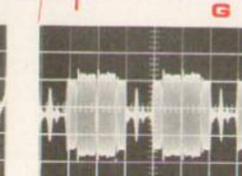
TP86 1V/20 μsec. div.



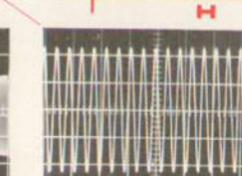
TP87 10V/20 μsec. div.



TP88 0.5V/0.5 μsec. div.

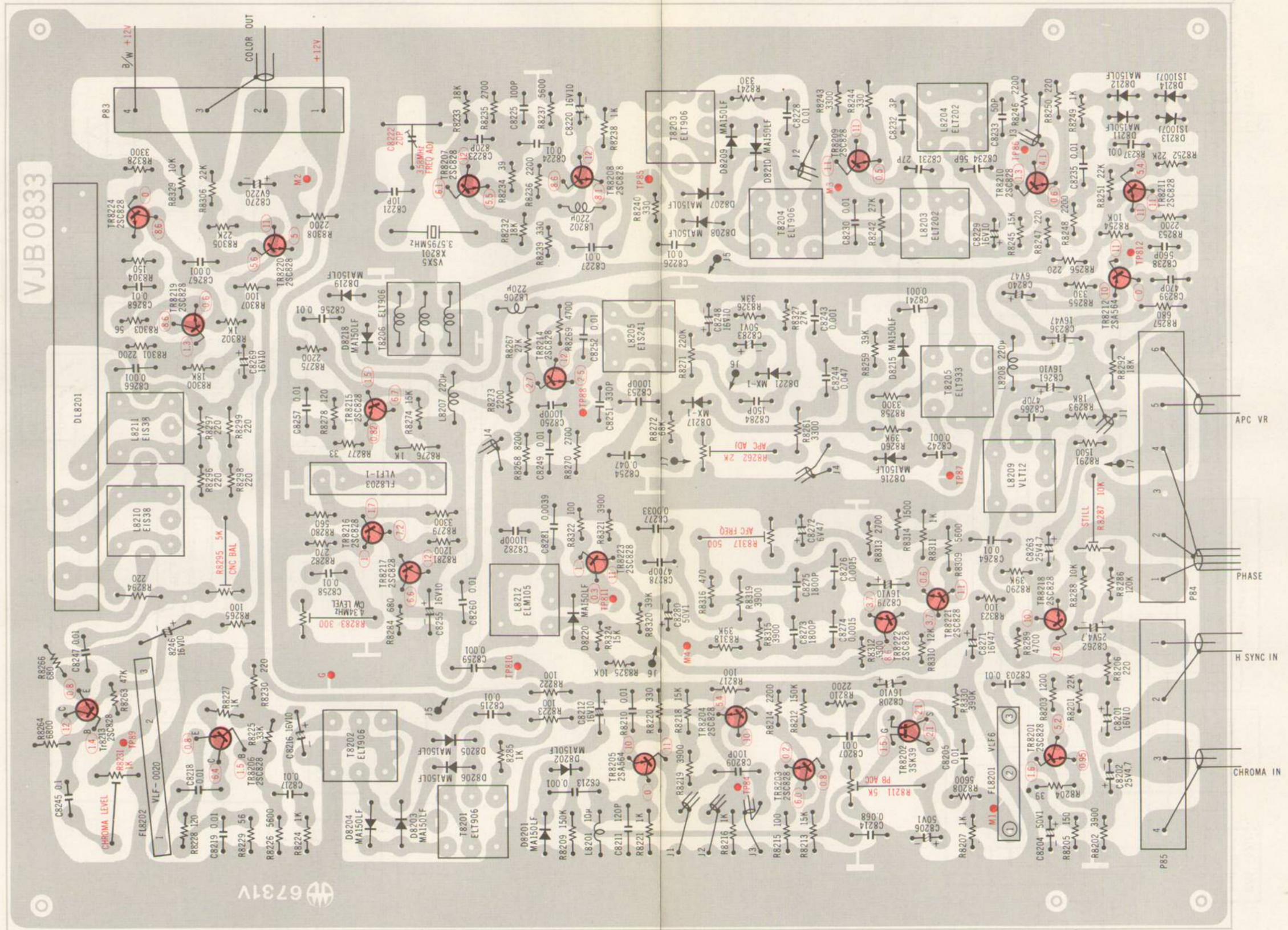


TP89 0.5V/20 μsec. div.

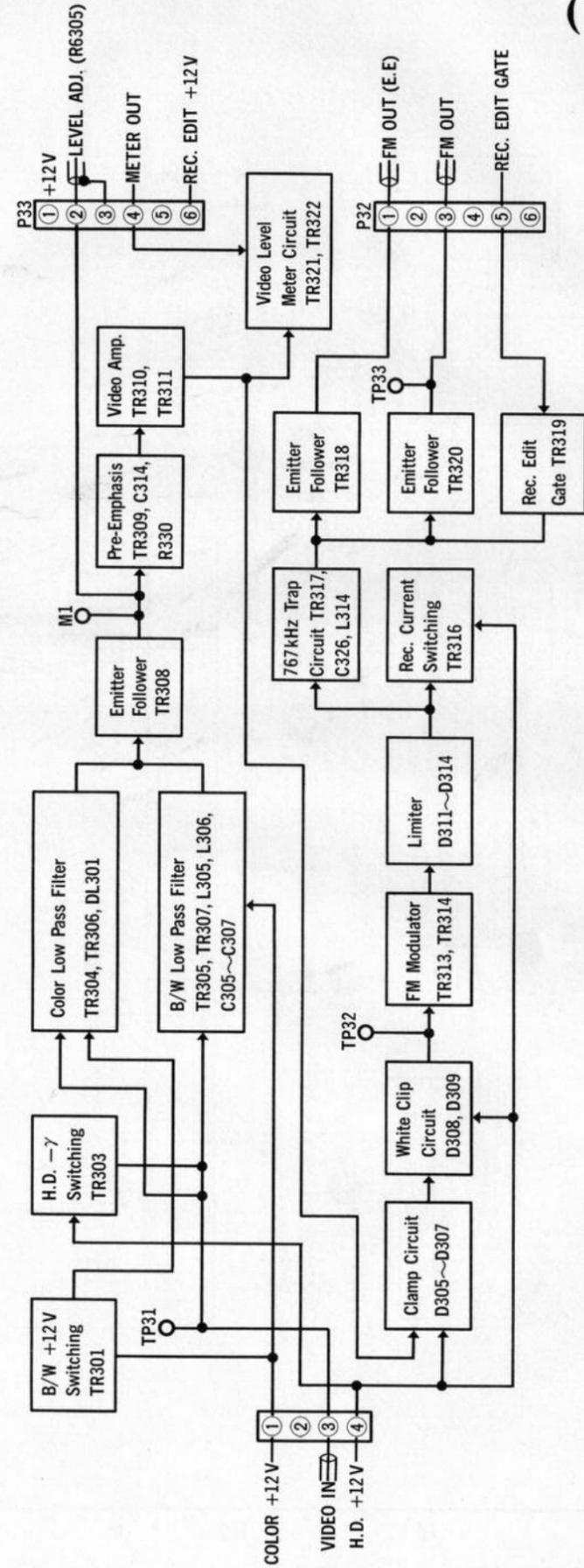


TP810 10V/0.5 μsec. div.

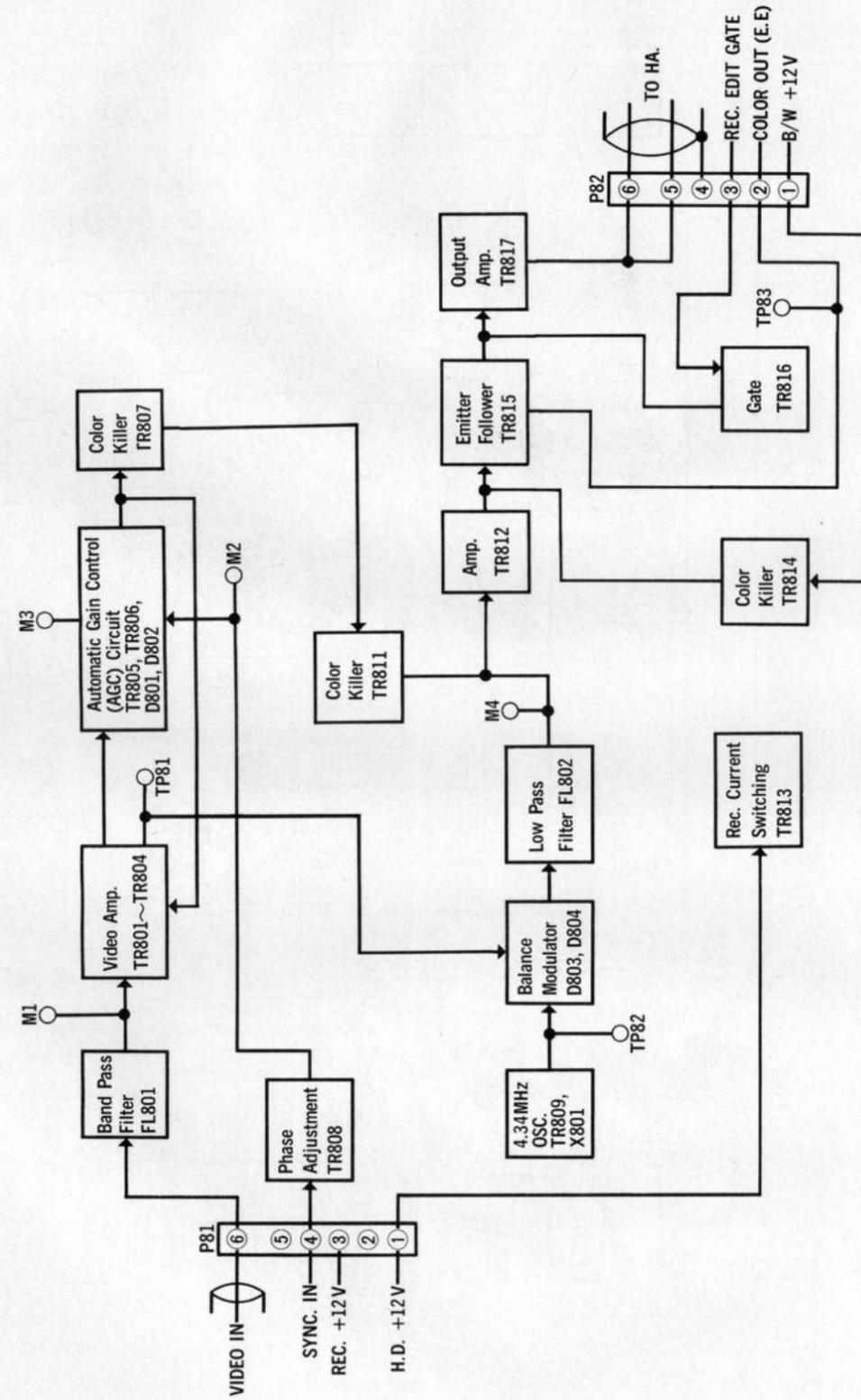
# COLOR PLAYBACK CIRCUIT BOARD (VEP0833A)



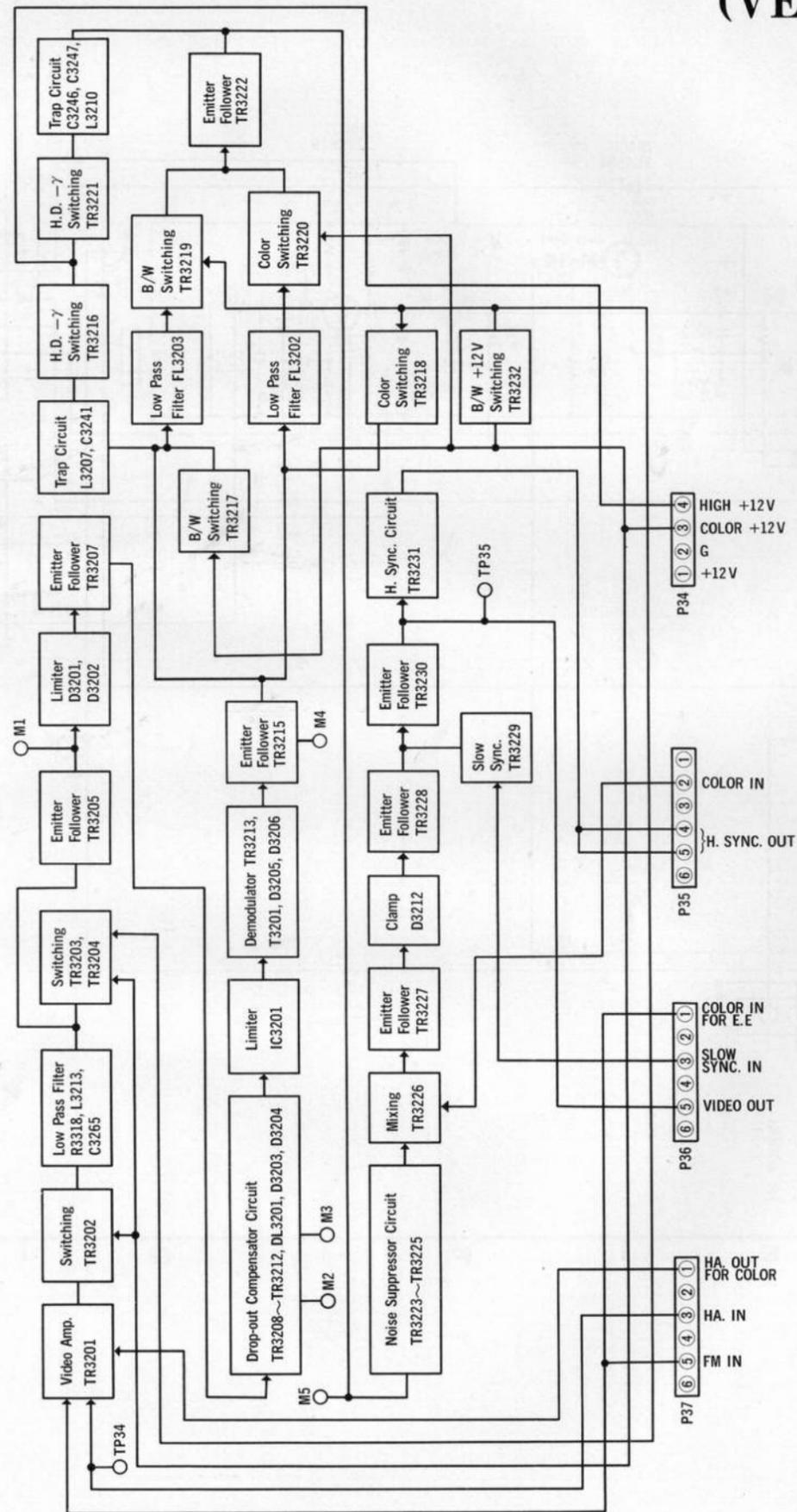
# VIDEO REC. SECTION BLOCK DIAGRAM (VEP0343A)



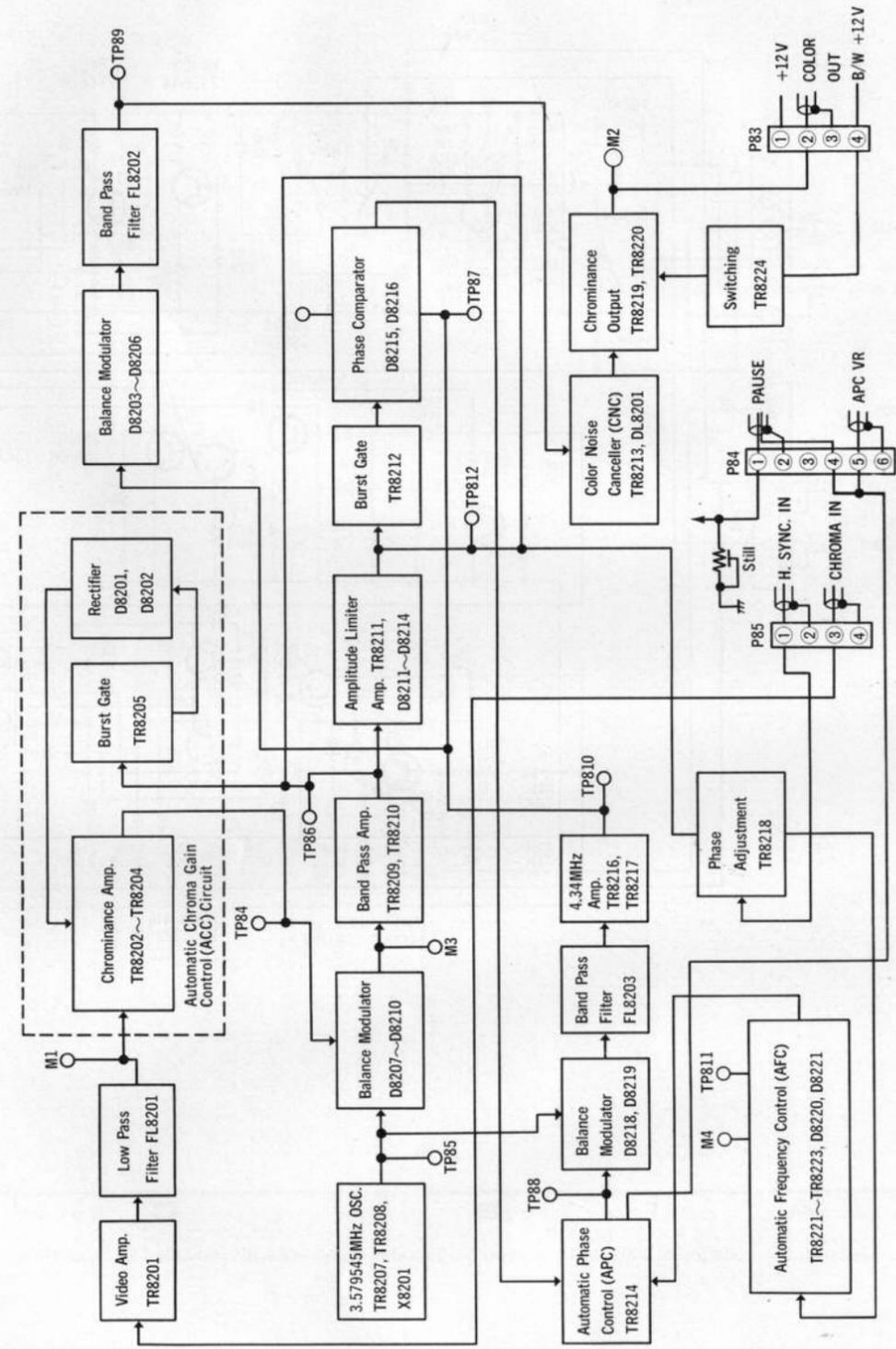
# COLOR RECORDING SECTION BLOCK DIAGRAM (VEP0834A)



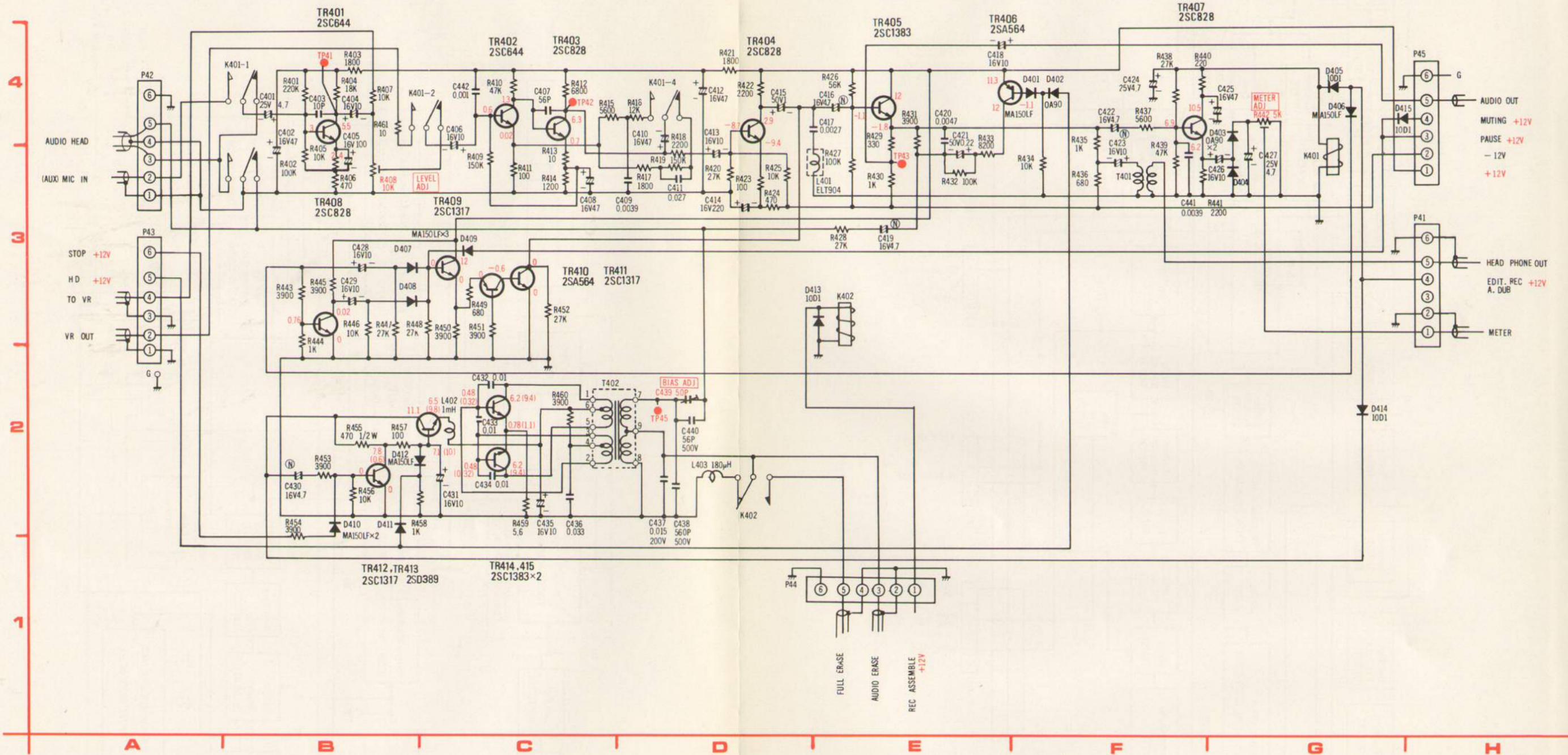
# VIDEO PLAYBACK SECTION BLOCK DIAGRAM (VEP0342A)



# COLOR PLAYBACK SECTION BLOCK DIAGRAM (VEP0833A)

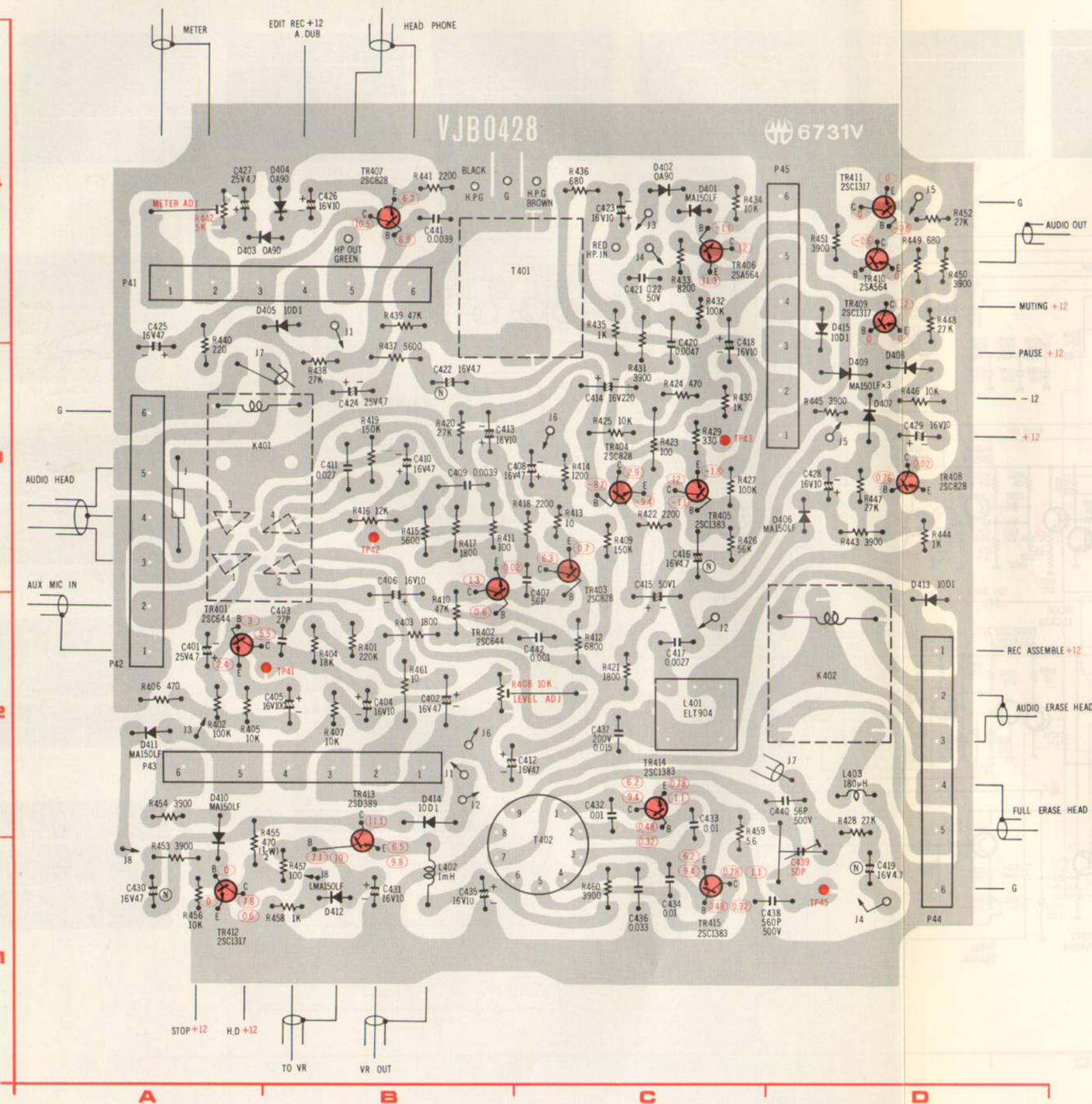


# AUDIO CIRCUIT SECTION (VEP0428A)

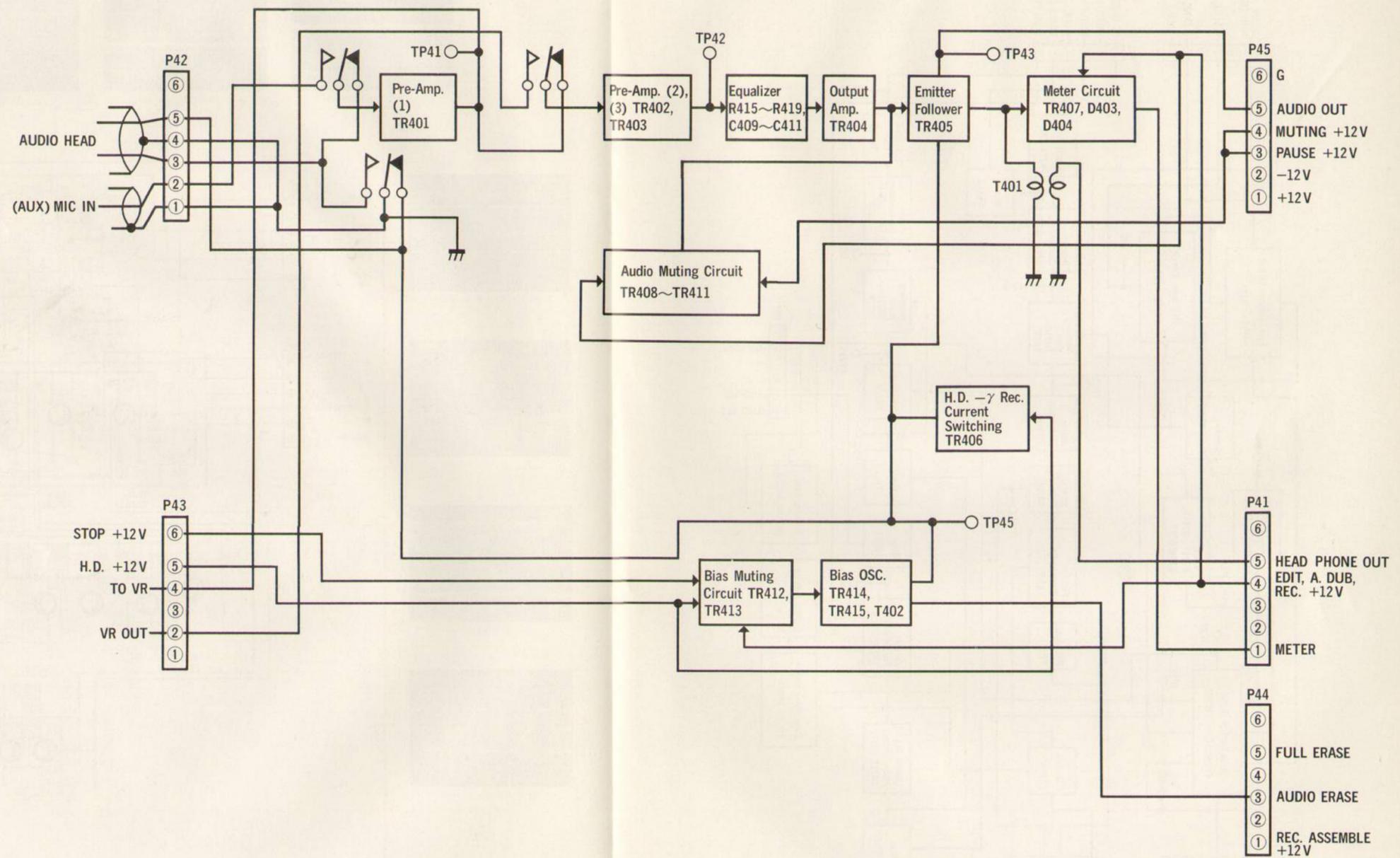


Note: Measure the voltages of transistors in recording mode. (The voltages indicated in brackets ( ) are measured in high density tape mode.)

# AUDIO CIRCUIT BOARD (VEP0428A)

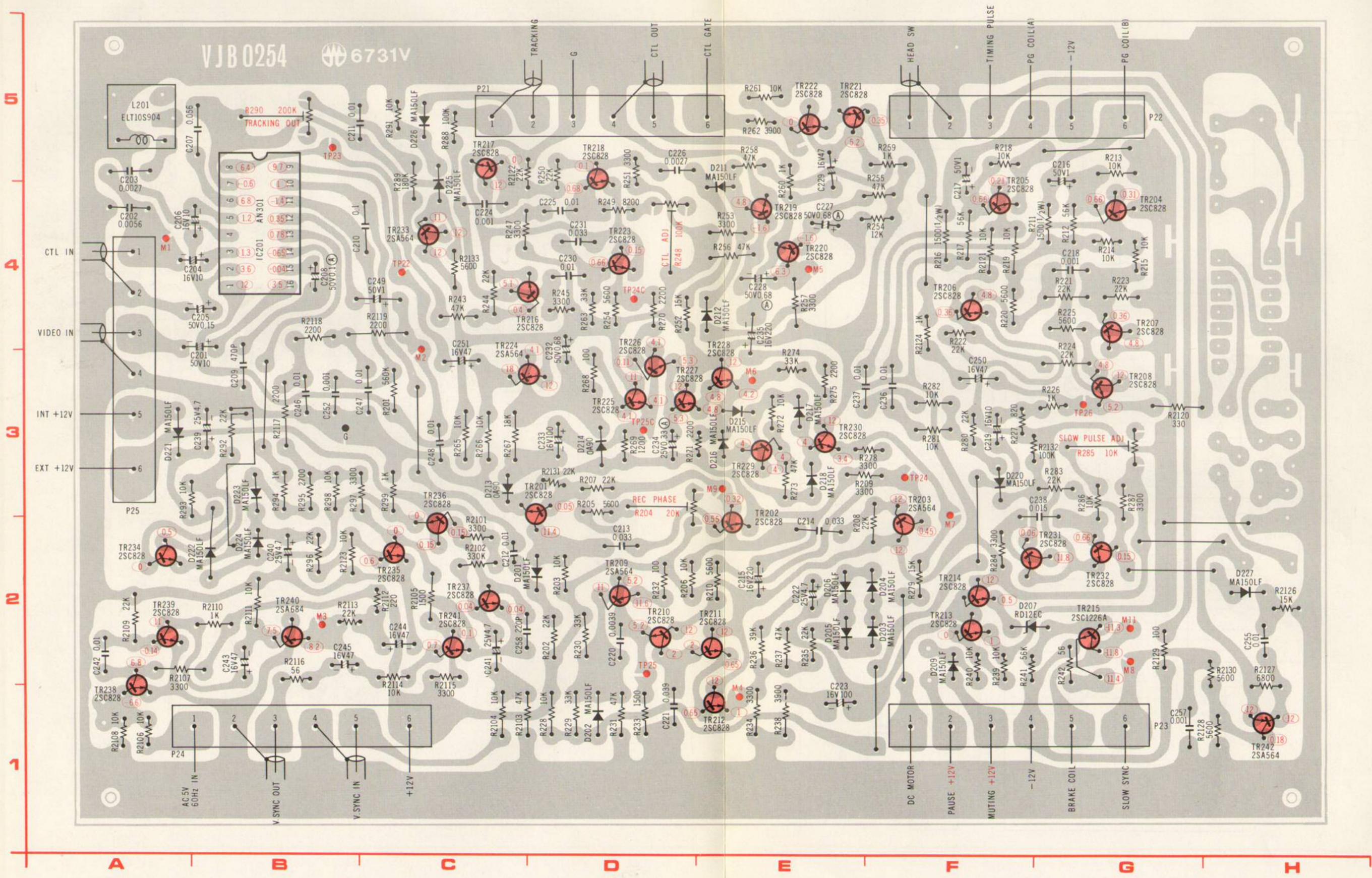


# AUDIO CIRCUIT SECTION BLOCK DIAGRAM (VEP0428A)

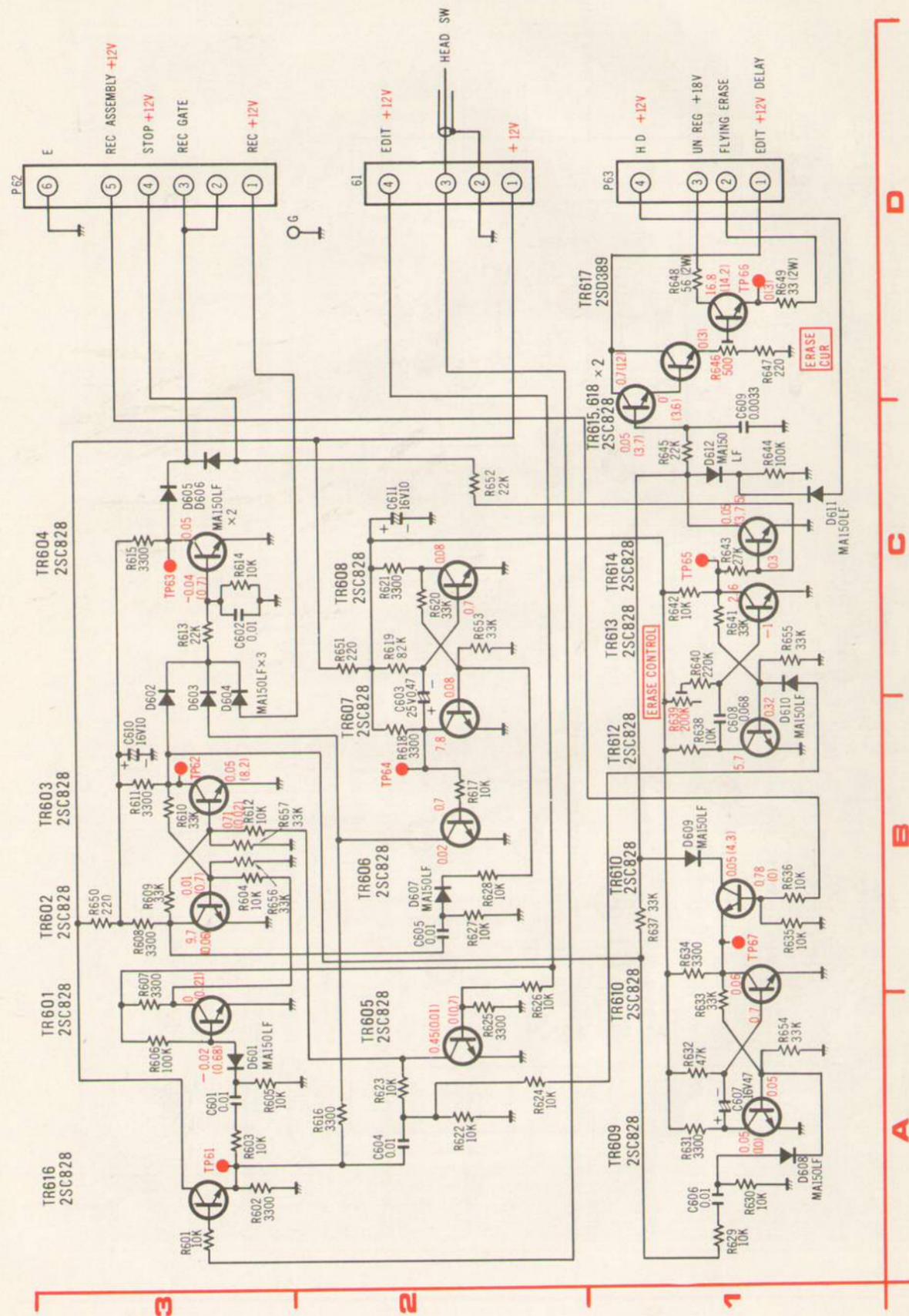




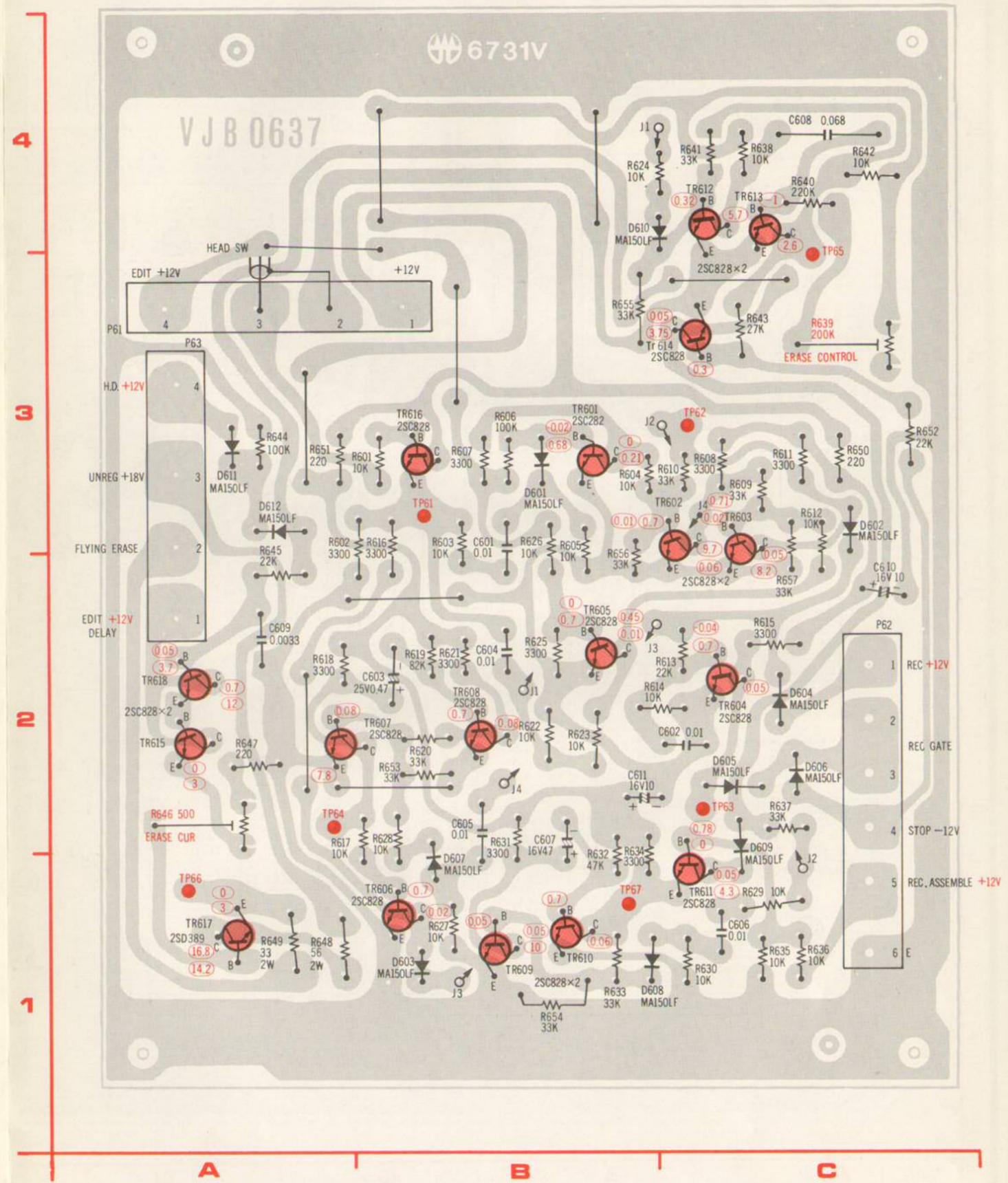
# SERVO CONTROL CIRCUIT BOARD (VEP0254A)



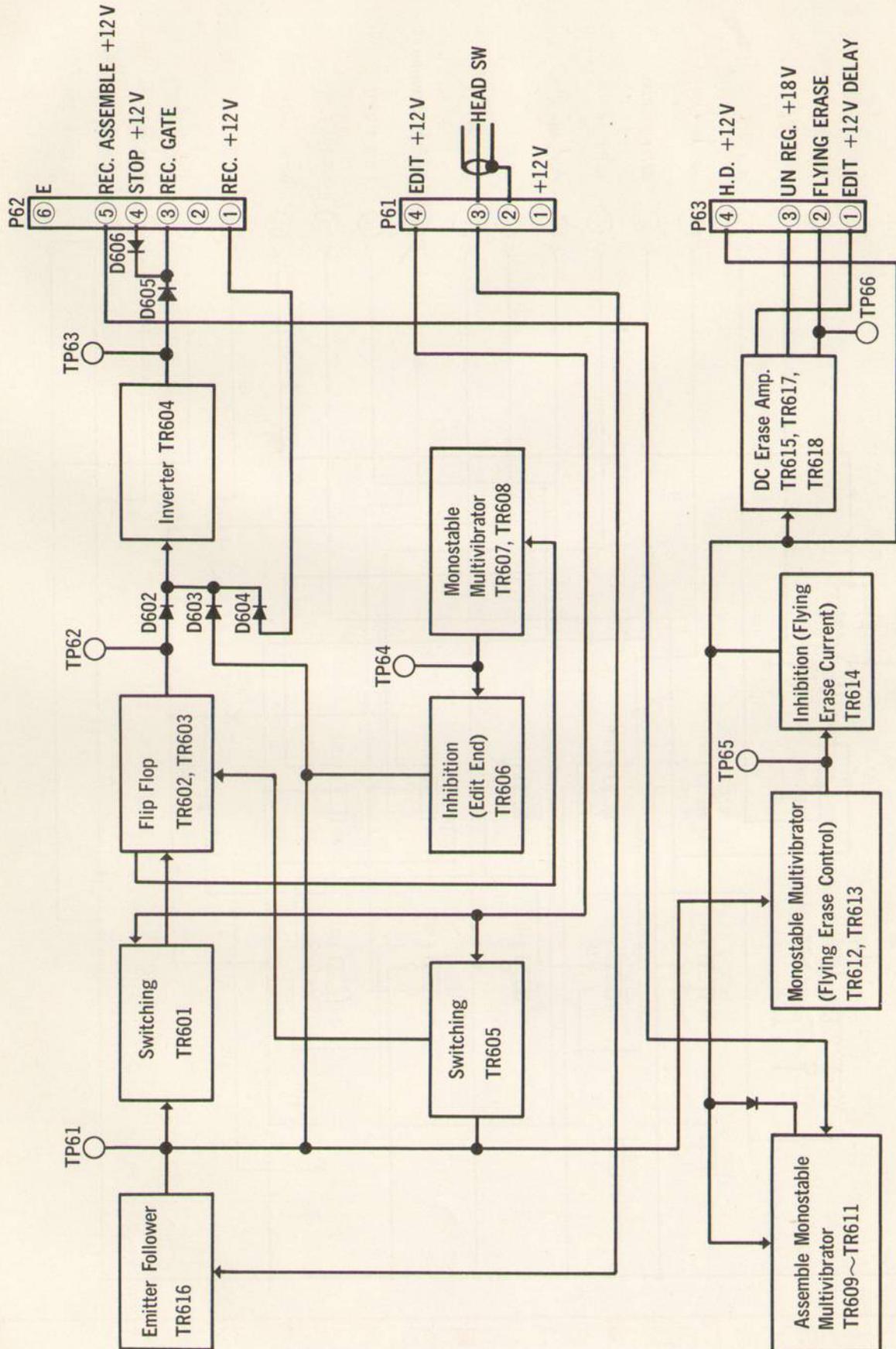
# TIMING CIRCUIT SECTION (VEP0637A)



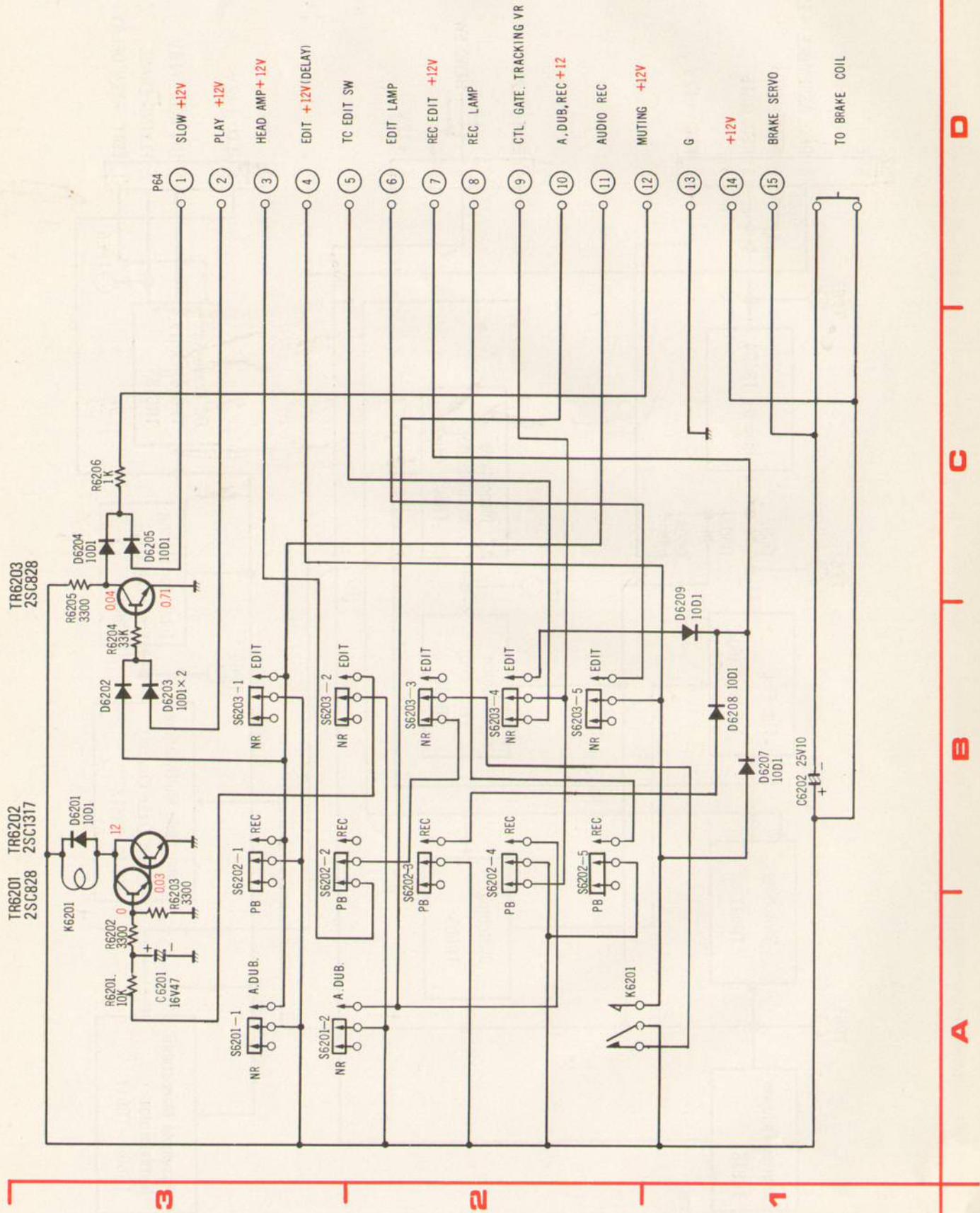
# TIMING CIRCUIT BOARD (VEP0637A)



# TIMING CIRCUIT SECTION BLOCK DIAGRAM (VEP0637A)

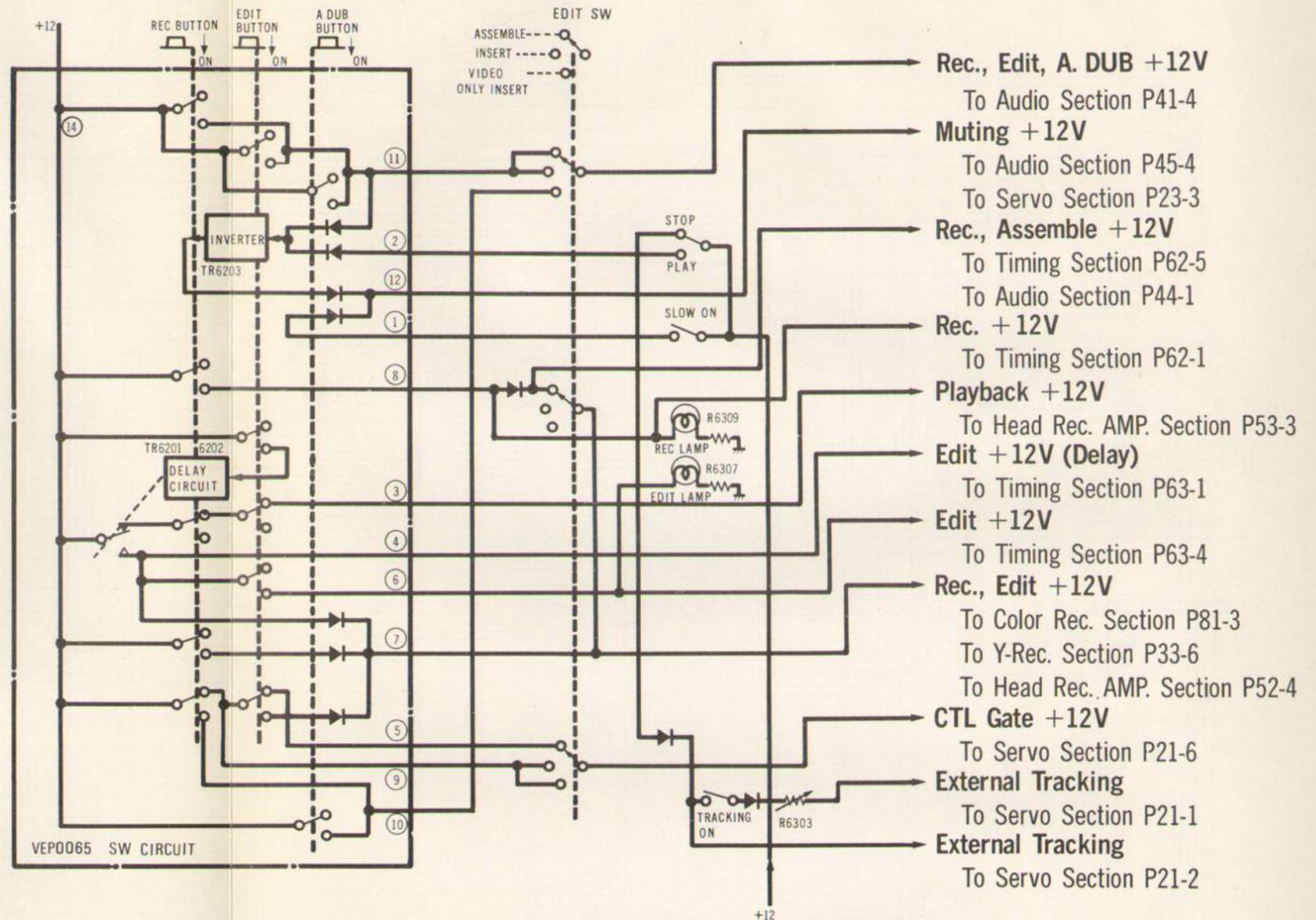
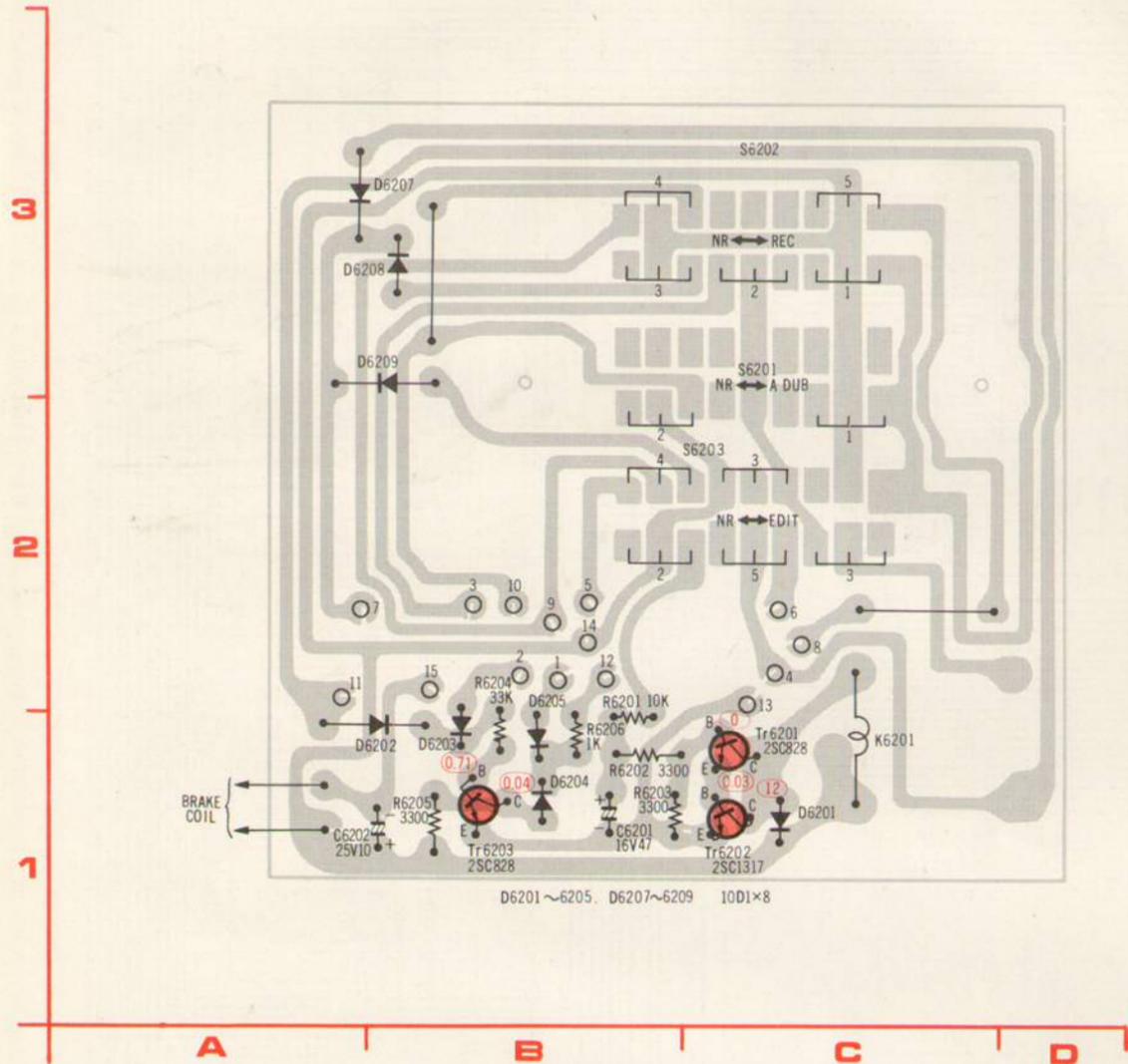


# SWITCH (REC, A. DUB, EDIT) CIRCUIT SECTION (VEP0065A)

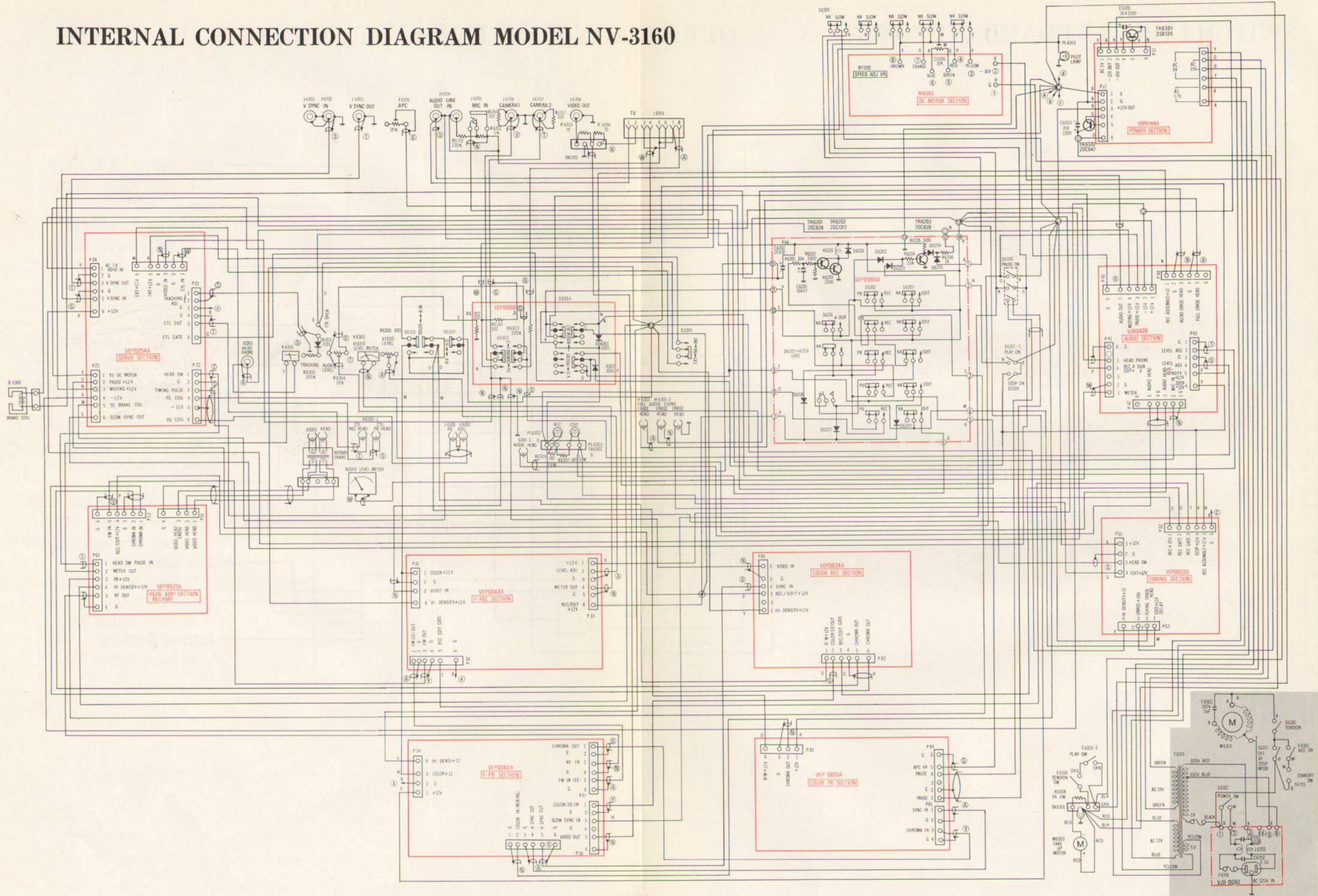


# SWITCH CIRCUIT BOARD (VEP0065A)

# OPERATION CONTROL SYSTEM BLOCK DIAGRAM



# INTERNAL CONNECTION DIAGRAM MODEL NV-3160



**MATSUSHITA ELECTRIC**  
KADOMA, OSAKA, JAPAN

