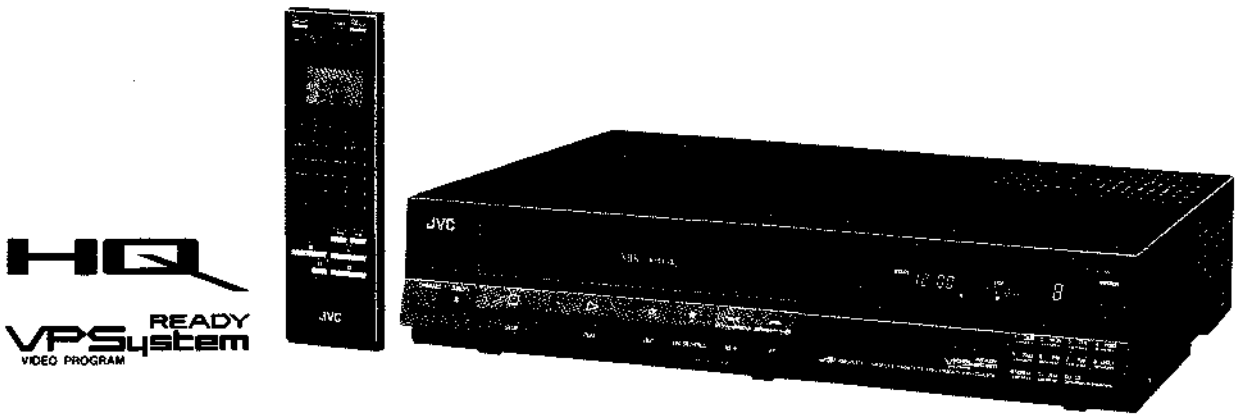
JVC

SERVICE MANUAL

VIDEO CASSETTE RECORDER VHS

HR-D230E/EG/EK



SPECIFICATIONS

Format		: VHS PAL standard
Recording system		: Rotary, slant azimuth two-head helical scan system with two pairs of video heads, one for the SP mode and the other for the LP mode
Video signal system		: PAL colour and CCIR monochrome signals, 625 lines
Tape width		: 12.65 mm
Playing time	(SP)	: 240 min. with E-240 video cassette
	(LP)	: 480 min. with E-240 video cassette
Temperature		
Operating		: 5°C to 40°C
Storage		: -20°C to 60°C
Channel coverage		: VHF 47 – 89 MHz, 104 – 300 MHz, 302 – 470 MHz UHF 470 – 862 MHz
Aerial output		: UHF channels 32 – 40 (adjustable)
Power consumption		: 31 watts
Power requirement		: 220 V~, 50/60 Hz
Video		
Input		: 0.5 to 2.0 Vp-p, 75 ohms, unbalanced
Output		: 1.0 Vp-p, 75 ohms, unbalanced
Signal-to-noise ratio		: 43 dB (Rohde & Schwarz noise meter) with picture SHARPNESS control at centre position
Horizontal resolution		: More than 250 lines with picture SHARPNESS control at centre position

Audio	
Input	: AUDIO connector (5-pin DIN): -8 dBs, more than 50 k-ohms, unbalanced AUDIO/VIDEO socket (21-pin Peri connector): -3.8 dBs (CENELEC standard), more than 10 k-ohms, unbalanced
Output level	: AUDIO connector (5-pin DIN): -6 dBs, high impedance load AUDIO/VIDEO socket (21-pin Peri connector): -3.8 dBs (CENELEC standard), high impedance load
Output impedance	: Less than 1 k-ohm, unbalanced
Signal-to-noise ratio	: More than 40 dB
Frequency range	: 70 Hz to 10,000 Hz
Timer	: 1-Year/8-event timer
Dimensions	: 435 mm(W) x 95 mm(H) x 341 mm(D)
Weight	: 7.2 kg
Provided accessories	: Aerial cable, Infrared remote control unit, "R6" battery x 2
Optional accessory	: VPS unit VU-V90E

Specifications shown are for SP mode unless otherwise specified.
Design and specifications subject to change without notice.

No. 82011
July 1987

NOTE: For a technical description, please refer to Technical Guide VTG82006 HR-D230 PAL.

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Important Safety Precautions

Prior to shipment from the factory, JVC products are strictly inspected to conform with the recognized product safety and electrical codes of the countries in which they are to be sold. However, in order to maintain such compliance, it is equally important to implement the following precautions when a set is being serviced.

● Precautions during Servicing

1. Locations requiring special caution are denoted by labels and inscriptions on the cabinet, chassis and certain parts of the product. When performing service, be sure to read and comply with these and other cautionary notices appearing in the operation and service manuals.

2. Parts identified by the ⚠ symbol and shaded (▒▒) parts are critical for safety.
   Replace only with specified part numbers.
   Note: Parts in this category also include those specified to comply with X-ray emission standards for products using cathode ray tubes and those specified for compliance with various regulations regarding spurious radiation emission.

3. Use specified internal wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads

4. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulation Tape
   2) PVC tubing
   3) Spacers
   4) Insulation sheets for transistors

5. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.) wrap ends of wires securely about the terminals before soldering.

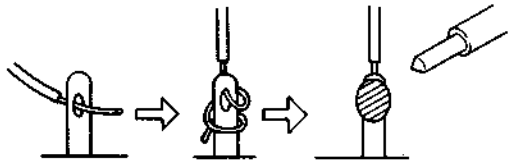


Fig. 1

6. Observe that wires do not contact heat producing parts (heatsinks, oxide metal film resistors, fusible resistors, etc.)

7. Check that replaced wires do not contact sharp edged or pointed parts.

8. When a power cord has been replaced, check that 10–15 kg of force in any direction will not loosen it.

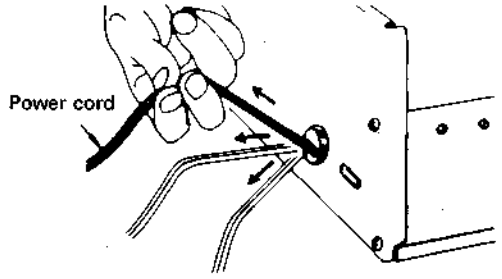


Fig. 2

9. Also check areas surrounding repaired locations.

10. Products using cathode ray tubes (CRTs)
    In regard to such products, the cathode ray tubes themselves, the high voltage circuits, and related circuits are specified for compliance with recognized codes pertaining to X-ray emission. Consequently, when servicing these products, replace the cathode ray tubes and other parts with only the specified parts. Under no circumstances attempt to modify these circuits. Unauthorized modification can increase the high voltage value and cause X-ray emission from the cathode ray tube.

11. Crimp type wire connector
    In such cases as when replacing the power transformer in sets where the connections between the power cord and power transformer primary lead wires are performed using crimp type connectors, if replacing the connectors is unavoidable, in order to prevent safety hazards, perform carefully and precisely according to the following steps.

    1) **Connector part number** : E03830-001
    2) **Required tool** : Connector crimping tool of the proper type which will not damage insulated parts.
    3) **Replacement procedure**
       (1) Remove the old connector by cutting the wires at a point close to the connector.
       Important : Do not reuse a connector (discard it).

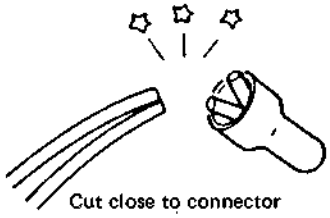


Fig. 3

(2) Strip about 15 mm of the insulation from the ends of the wires. If the wires are stranded, twist the strands to avoid frayed conductors.

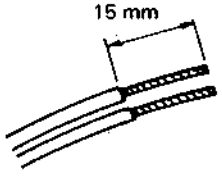


Fig. 4

(3) Align the lengths of the wires to be connected. Insert the wires fully into the connector.

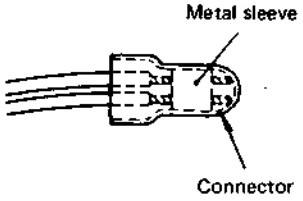


Fig. 5

(4) As shown in Fig. 6, use the crimping tool to crimp the metal sleeve at the center position. Be sure to crimp fully to the complete closure of the tool.

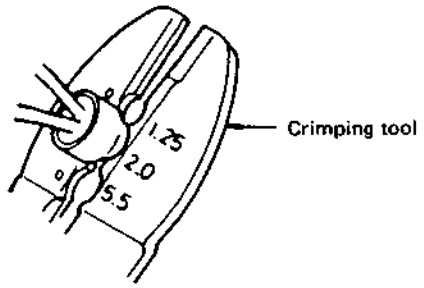


Fig. 6

(5) Check the four points noted in Fig. 7.

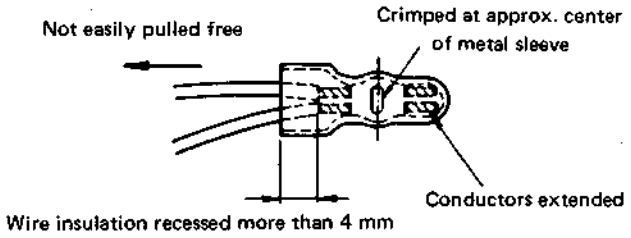


Fig. 7

● Safety Check after Servicing

Examine the area surrounding the repaired location for damage or deterioration. Observe that screws, parts and wires have been returned to original positions, Afterwards, perform the following tests and confirm the specified values in order to verify compliance with safety standards.

1. **Insulation resistance test**
Confirm the specified insulation resistance or greater between power cord plug prongs and externally exposed parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

2. **Dielectric strength test**
Confirm specified dielectric strength or greater between power cord plug prongs and exposed accessible parts of the set (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.). See table below.

3. **Clearance distance**
When replacing primary circuit components, confirm specified clearance distance (d), (d') between soldered terminals, and between terminals and surrounding metallic parts. See table below.

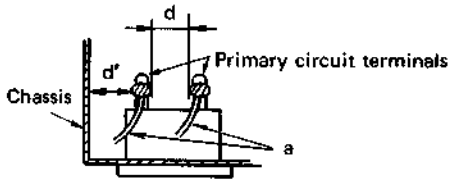


Fig. 8

4. **Leakage current test**
Confirm specified or lower leakage current between B (earth ground, power cord plug prongs) and externally exposed accessible parts (RF terminals, antenna terminals, video and audio input and output terminals, microphone jacks, earphone jacks, etc.).

Measuring Method: (Power ON)
Insert load Z between B (earth ground, power cord plug prongs) and exposed accessible parts. Use an AC voltmeter to measure across both terminals of load Z. See figure and following table.

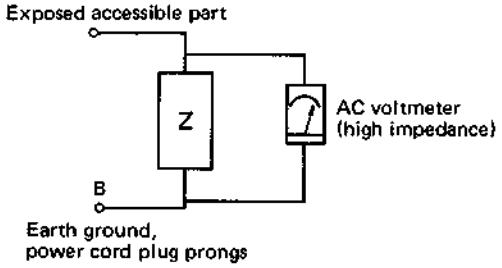


Fig. 9

AC Line Voltage	Region	Insulation Resistance	Dielectric Strength	Clearance Distance (d), (d')
100 V	Japan	≧ 1 mΩ/500 V DC	1 kV 1 minute	≧ 3 mm
110 to 130 V	USA & Canada	–	900 V 1 minute	≧ 3.2 mm
*110 to 130 V 200 to 240 V	Europe Australia	≧ 10 mΩ/500 V DC	4 kV 1 minute	≧ 6 mm (d) ≧ 8 mm (d') (a: Power cord)

*Class II model only.

Table 1 Ratings for selected areas

AC Line Voltage	Region	Load Z	Leakage Current (i)	Earth Ground (b) to:
100 V	Japan	1 kΩ	i ≦ 1 mA rms	Exposed accessible parts
110 to 130 V	USA & Canada	0.15 μF, 1.5 kΩ	i ≦ 0.5 mA rms	Exposed accessible parts
110 to 130 V 220 to 240 V	Europe Australia	2 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Antenna earth terminals
		50 kΩ	i ≦ 0.7 mA peak i ≦ 2 mA dc	Other terminals

Table 2 Leakage current ratings for selected areas

Note: This table is unofficial and for reference only. Be sure to confirm the precise values for your particular country and locality.

CONTENTS

SAFETY PRECAUTIONS

The rating plate and the safety caution are on the rear of the unit.

WARNING – DANGEROUS VOLTAGE INSIDE
WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

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

IMPORTANT

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

If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black.
Brown wire to terminal coded L (Live) or coloured Red.
If in doubt – consult a competent electrician.
Note
We recommend that you should disconnect the AC cord from the outlet.

FOR YOUR SAFETY (in Australia)
Install any external aerial to AS 1417.1

Omkopplaren OPERATE på denna apparat är sekundärt kopplad och skiljer inte apparaten från nätet i läge OPERATE OFF.

The OPERATE button does not completely shut off mains power from the unit, but switches operating current on and off.

BEMAERK: I stilling OFF er apparatet stadig forbundet med lysnettet Hvis det ønskes fuldstændig afbrudt skal netledningen trækkes ud.

This unit is produced to comply with Directive 82/499/EEC.

Video tapes recorded with this video recorder in the LP (Long Play) mode cannot be played back on a single-speed video recorder.

CAUTION

- Disconnect the mains plug from the supply socket when not in use.
- When you are not using the HR-D230E for a long period of time, it is recommended that you disconnect the power cord from the AC outlet.
- Dangerous voltage inside. Refer internal servicing to qualified service personnel. To prevent electric shock or fire hazard, remove the power cord from the AC outlet prior to connecting or disconnecting any signal lead or aerial.

VHS PAL HQ

- Only cassettes marked "VHS" can be used with this video cassette recorder.
- HQ VHS is compatible with existing VHS equipment.

Printed in Japan

FEATURES

High-quality pictures

- **HQ (High Quality) System technologies** with a Detail Enhancer, and 20 % higher white clip level.
- **4-Head system** for quality recording and playback in both SP (Standard Play) and LP (Long Play) modes.

Tuner features

- **PLL frequency synthesized wide-band cable tuner** with 48-channel storage capacity.
- **Pretuned to European television broadcast frequencies:** VHF, UHF and cable channels including those of **hyper band.**
- **10-Key random-access channel selection** and up/down scan tuning.
- **Compatible with VPS (Video Programme System)** through use of an optionally available VPS adapter. (VPS programmes are broadcast on TV stations in certain areas.)

Remote control features

- **Independent timer programming** with LCD and built-in 4-programme memory.
- **10-Key random-access channel selection** and up/down scanning.
- **TV control** for power on/off, volume and channel selection (designated JVC TV models only).

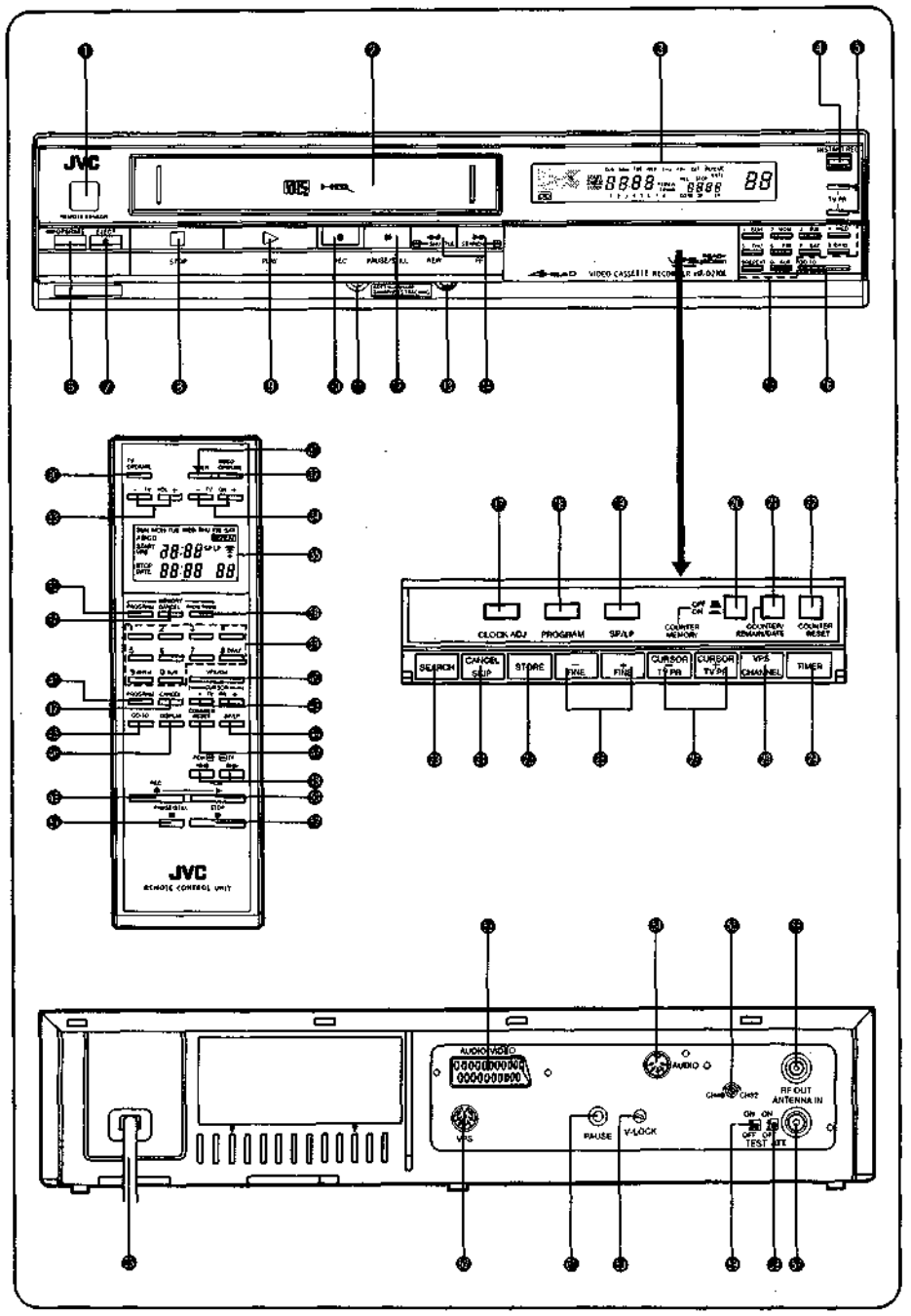
Convenient automatic functions

- **Auto play function:** insert a cassette (with safety tab removed), and playback will start automatically.
- **Next-function memory** allows a command to be entered immediately after pressing REW (or FF), with the second command "remembered" and performed automatically after the tape rewinds to its beginning or fast-forwards to the counter reading of "0000".
  - Memory play: for automatic start of playback.
  - Memory eject: to eject the cassette after rewind, without waiting for completion of rewind.
  - Memory timer standby: to engage the timer recording standby mode after rewind.
  - Memory power-off: to turn the power off after rewind.
- Automatic backspace editing.
- Auto-power-on convenience.
- Power-off ejection.
- Automatic rewind at the end of tape.

Other value features

- **1-Year/8-event remote-programmable timer** with SP/LP programming.
- **Counter go-to function** permits direct access to any point on a tape specified by keying in a counter number with the 10-digit keypad.
- **On-screen record-pause mode display.**
- Instant recording function with auto shut-off.
- **Shuttle Search with latch function:** with the Shuttle Search button locked or held depressed, offers high-speed playback at 9 times normal speed in SP and LP modes.
- Counter memory for returning to a designated point on a tape.
- Still and frame advance in SP and LP modes.
- Picture sharpness control.
- Comprehensive fluorescent display with symbolic mode indicators.
- Remaining tape time indicator.

Thank you for purchasing the JVC HR-D230E Video Cassette Recorder. Before use, read this instruction booklet carefully for obtaining the best results from your new unit.
Diagrams are on the reverse side of this page. Fold it out and keep it opened so that you can refer to the diagrams when you are reading this booklet.



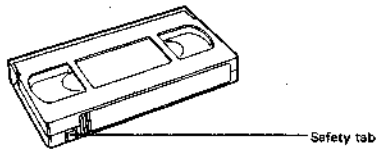
PRECAUTIONS

Handling and storage

- Avoid using the recorder under the following conditions:
  - extremely hot, cold or humid places,
  - dusty places,
  - near appliances generating strong magnetic fields,
  - places subject to vibrations, and
  - poorly ventilated places.
- Be careful of moisture condensation.
  Avoid using the recorder immediately after moving from a cold place to a warm place or soon after heating a room which was cold. The water vapour in warm air will condense on the still-cold video head drum and tape guides and may cause damage to the tape and the recorder.
- Handle the recorder carefully.
  - Do not block the ventilation openings.
  - Do not place anything heavy on the recorder.
  - Do not place anything which might spill and cause trouble on the top cover of the recorder.
  - Use in horizontal (flat) position only.
- In case of transportation,
  - Avoid violent shocks to the recorder during packing and transportation.
  - Before packing, be sure to remove the cassette from the recorder.

Video cassettes

- This recorder employs VHS-type cassettes only.
  E-240 for 4 hours/8 hours, E-180 for 3 hours/6 hours, E-120 for 2 hours/4 hours, E-90 for 1 hour and 30 minutes/3 hours, E-60 for 1 hour/2 hours and E-30 for 30 minutes/1 hour of recording.
- Video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use adhesive tape to block the hole.



- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks, strong magnetic fields (near a motor, transformer or magnet) and dusty places.
- Place the cassettes in cassette cases and position vertically.

Moisture condensation

- If you pour a cold liquid into a glass, water vapour in the air will condense on the surface of the glass. This is called moisture condensation.
- Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.
- Moisture in the air will condense on the recorder when you move it from a cold place to a warm place, after heating a cold room or under extremely humid conditions.
- This recorder is equipped with a moisture condensation prevention circuit which automatically heats the head drum according to the ambient temperature. This circuit operates when the unit is plugged into an AC outlet.
- The moisture condensation prevention circuit consumes only a slight amount of power. However, if for some reason you are not using the recorder for a long period of time, it is advisable to remove the power cord from the AC outlet.
- Since the moisture condensation prevention circuit cannot evaporate existing moisture condensation immediately after the power cord has been plugged into the AC outlet, you must allow for a few hours if the recorder is to be used in such areas as would occasion moisture condensation.

Operation

- When a cassette is loaded, the power is switched on automatically.
- The cassette can be unloaded even when the power is off. Pressing the EJECT button turns the power on and, after ejection of the cassette, shuts it off automatically. In this case,
- As long as the TIMER button is engaged with the TIMER indicator lit, the OPERATE and EJECT buttons have no effect and unloading of a cassette is not possible. If a cassette has not yet been inserted, simply insert a cassette; the power will be switched on to load the cassette properly and, after completion of automatic loading, the Timer Recording Standby mode will be engaged with power off.

Remote control unit

- Avoid violent shocks, especially take care not to drop the unit.
- Take care not to allow liquid to spill into the unit.
- Do not place heavy objects on the unit.
- Avoid leaving the unit in places subject to direct sunlight or extremely high temperatures.

WARNING

1. This recorder can also receive colour television signals in East Germany (DDR) for recording and playback.
2. Recordings made of DDR television signals produce monochrome pictures if played back on another video recorder of PAL or SECAM standard.
3. SECAM prerecorded cassettes or recordings made with a SECAM video recorder produce monochrome pictures when played back with this recorder.
4. This recorder cannot be used in France. Use a SECAM recorder to record French SECAM signals.

IMPORTANT: It is permissible to record television programmes only in the event that third party copyrights and other rights are not violated.

CONTROLS, INDICATORS AND CONNECTORS

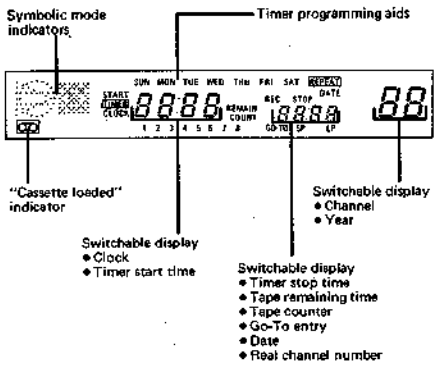
Refer to the diagrams on the front foldout page.

Front Panel

❶ Infrared beam receiving window (REMOTE SENSOR)

❷ Cassette loading slot
Insert a VHS cassette. The door will close and the "cassette loaded" indicator will appear on the FDP (fluorescent display panel).

❸ Fluorescent display panel
Fully explained in relevant sections.



❹ INSTANT REC button
Use this button to start recording instantly and stop automatically after a specific time. (See page 11.)

❺ TV PR. +/- buttons
Press either button to scan to a desired channel.

❻ OPERATE button with LED indicator
Press to apply operating power to the recorder. The indicator will light. Loading a cassette also turns the power on.

❼ Cassette EJECT button

❽ STOP button
Press to stop the tape.

❾ PLAY button
Press to play back the tape or cancel the Pause/Still and Search modes.

❿ REC button
Press together with the PLAY button ❾ for recording.

⓫ Picture SHARPNESS control
Turn this knob counterclockwise to make the picture sharper. Turn clockwise to give the picture a softer tone. Effective only for playback pictures. (No effect for recording.)

⓬ PAUSE/STILL button
Press to stop the tape temporarily to avoid recording of unwanted material or to view a still picture. The still picture can be advanced step by step or continuously.

⓭ TRACKING control
Turn to minimise noise bars, if observed, during playback.

⓮ REW and FF (SHUTTLE SEARCH) buttons
Press while in the Stop mode to rewind or fast-forward the tape; press while in the Play mode to view the speeded-up picture for programme search. See pages 10 and 12.

⓯ Multi-purpose numeric keys

Channel selection:	See page 7.
Clock setting:	See page 9.
Timer programming:	See pages 13 and 14.
Counter Go-To:	See page 12.
External source recording:	See page 15.

⓰ GO TO button
Press to engage the counter Go-To mode. See page 12.

⓱ CLOCK ADJ button
Press to adjust the clock.

⓲ PROGRAM button
Press to programme the timer.

⓳ SP/LP button
Press to select the recording mode (SP or LP).

⓴ COUNTER MEMORY button
When this button is pressed to ON (▬), the tape will stop automatically at the counter reading of about "0000" in the Rewind or Fast Forward mode.

㉑ COUNTER/REMAIN/DATE button
Press to change the display from the Timer Set mode to the Clock mode. Usually use this button to switch the middle 4-digit display to tape counter (COUNT), remaining tape time (REMAIN) and date (DATE).

㉒ COUNTER RESET button
Press to reset the tape counter reading to "0000".

㉓ SEARCH button
Press to initiate automatic scan tuning in the Real-channel mode. (See pages 7 and 8.)

㉔ CANCEL/SKIP button
A dual-purpose switch. Use to clear the programmed data in the Timer Set mode or skip unnecessary channels in the Channel Set mode. (See page 8 or 14.)

㉕ STORE button
Press to store necessary channels. (See page 8.)

㉖ FINE (–, +) buttons
To fine-tune in to a certain station by shifting the frequency in both directions. (See page 8.)

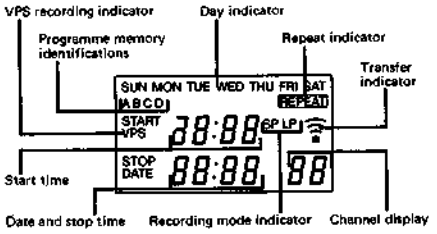
㉗ CURSOR/TV PR (–, +) buttons
Press either button to scan to a desired channel. These buttons can also be used as cursor keys for 10-key programming.

㉘ VPS/CHANNEL button
Allows for VPS programming when pressed in the Timer Set mode. In all other modes, this button functions to engage the tuner in the Real-channel mode. (See pages 7, 8 and 15.)

㉙ TIMER button
Press to engage the timer recording standby mode.

Remote Control Unit

① TV OPERATE button
Press to turn the TV power on or off. (Designated TV models only.)
② TIMER button
Press to engage the timer recording standby mode.
③ VIDEO OPERATE button
Press to turn the recorder power on or off.
④ TV VOL. buttons
Press "–" or "+" to decrease or increase the TV's sound volume.
⑤ TV CH buttons
Press to select a desired channel on the TV receiver.
⑥ LCD (Liquid Crystal Display) panel
Refer to this panel when programming the remote control's built-in timer memory.



⑦ MEMORY PROGRAM button
Press to programme the remote control's timer memory.
⑧ MEMORY CANCEL button
Press to cancel the programmed data in the remote control's timer memory.
⑨ PROG. TRANS button
Press to transfer the data held in the memory to the recorder.
⑩ Multi-purpose numeric keys
⑪ VPS/CH button
⑫ PROGRAM button
Press to programme the recorder's timer memory directly from the remote control.
⑬ CANCEL button
Press to cancel the programmed data held in the recorder's timer memory.
⑭ CURSOR/TV PR. buttons
⑮ SP/LP button
⑯ GO-TO button
⑰ DISPLAY button
Functions in the same way as the COUNTER/REMAIN/DATE button ⑱.
⑱ COUNTER RESET button
⑲ REW and FF (SHUTTLE SEARCH) buttons
⑳ REC button
㉑ PLAY button
㉒ PAUSE/STILL button
㉓ STOP button

Rear Panel

㉔ AUDIO/VIDEO socket
A 21-pin standardised audio/video input/output socket for the connection to a TV or a 2nd video recorder equipped with the same type of socket. The input from this socket can be recorded in the AUX mode engaged by obtaining "AU" in the channel display.

Remote Control Unit

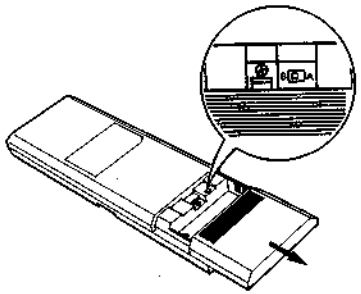
A/B mode switching
A switch on the back of the remote control labelled A/B is accessible when the battery compartment cover is removed.
- This switch is preset to the "A" position. Do not touch it unless you use two JVC video decks side by side.
- When you place two JVC video decks near each other, use this remote control in the "B" mode to prevent both decks from responding simultaneously to this remote control's signals. For this purpose, carefully follow the instructions below:

(1) Unplug the power cord of the HR-D230E from the AC outlet.
(2) Set the remote control unit's A/B mode switch to "B".
(3) Plug the power cord of the HR-D230E into the AC outlet.
(4) Turn on the power of the HR-D230E using the remote control's VIDEO OPERATE button.
- The HR-D230E "memorises" this B code and then will respond only to the signals of this remote control unit. The other deck will respond only to its remote control.

Note:
Do not operate other remote controls after you have plugged the HR-D230E into the AC outlet and before you press the VIDEO OPERATE button of this remote control.

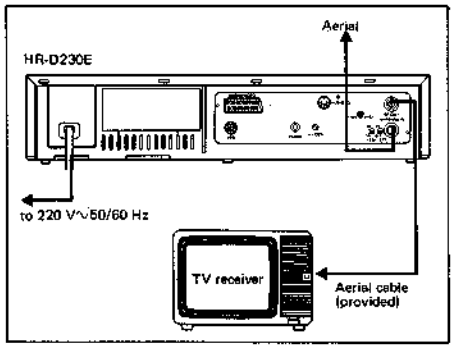
Operating distance for remote control unit
- The maximum operating distance is about 8 m.

Installing the batteries
- Insert two "R6"-size batteries (provided) into the battery compartment on the rear of the remote control unit, observing correct polarity.



㉕ AUDIO input/output DIN socket
Connect a tape recorder or other audio sources or connect the audio output of other video sources for recording. The input from this socket can be recorded in the AUX mode with "AU" in the channel display. Also, audio signals being recorded or played back are available from the output terminals of this DIN socket.
㉖ RF converter frequency adjustment screw
㉗ RF OUT connector
Connect to the aerial terminal of a TV receiver through the aerial cable (provided).
㉘ Aerial input connector (ANTENNA IN)
Connect an aerial to this connector.
㉙ Attenuator switch (ATT)
Set to OFF to receive broadcasts from distant stations. Set to ON to receive broadcasts of high field strength.
㉚ TEST signal switch
Set to ON when tuning your TV receiver for the video channel. A test signal in the form of two vertical white bars will be available.
㉛ V-LOCK adjustment screw
When operating in the Still mode, adjust this screw to eliminate any vertical vibration of the picture. (For any inquiry about this adjustment, contact a JVC dealer.)
㉜ Remote PAUSE control terminal
When using a JVC video camera, connect the remote control cable of the camera adapter to this terminal for the purpose of controlling the starting and stopping of the tape with the camera's start/stop switch.
㉝ VPS connector
Connect a VPS unit (optional, VU-V90E) if VPS broadcasts are receivable. For connection, refer to the manual of the VPS unit.
㉞ Power cord

CONNECTIONS



1 Remove the aerial cable from the TV receiver and reconnect it to the recorder's ANTENNA IN connector ㉘. The recorder is then ready to record off-air programmes.
2 Connect the recorder's RF OUT connector ㉗ to the TV receiver's aerial terminal using the provided aerial cable. The TV receiver is then ready to receive broadcast programmes as well as accommodate video cassette playback.

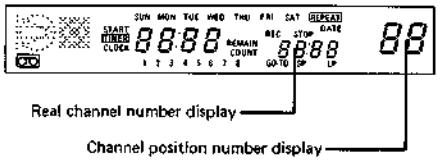
VIDEO CHANNEL SETTING

1 Press the OPERATE button ③ to turn the power on. Turn on the TV receiver.
2 Set the TEST switch ㉚ to ON.
3 Adjust your TV receiver in the vicinity of UHF channel 36 until you bring in the two white signal bars on the screen as illustrated. This is your VIDEO CHANNEL.
4 Reset the TEST switch to OFF.

Notes:
- If some interference noise is seen on the screen because of broadcasts on neighbouring channels or if your preset broadcasts should be affected in picture quality, it is necessary to shift the RF converter output frequency from that of channel 36. Consult your JVC dealer for making this adjustment.
- Video channel setting is also possible using a prerecorded VHS video cassette. Play back the tape and tune the TV receiver to obtain clear pictures and sound while monitoring the playback picture on the TV screen.
- If your TV receiver is not provided with an AFC circuit, perform fine tuning of the TV receiver when you are actually viewing video cassettes.

OPERATING THE BUILT-IN TUNER

The HR-D230E incorporates an advanced frequency synthesized tuner which is pretuned to 112 channels to cover VHF, UHF and CATV broadcasts. Channel indication is given in two different ways: real channel numbers and channel position numbers. Real channel number indication is available by pressing the VPS/CHANNEL button ⓭, while channel position number indication is always available in the channel display.



Correspondence between 112 pretuned TV stations and the HR-D230E's real channel indications

DISPLAY	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
Ch	–	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	A	B	C	D	E	F	G	H
CC	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10
	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
DISPLAY	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ch	E21	E22	E23	E24	E25	E26	E27	E28	E29	E30	E31	E32	E33	E34	E35	E36	E37	E38	E39	E40
CC	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	S36	S37	S38	S39	S40
DISPLAY	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ch	E41	E42	E43	E44	E45	E46	E47	E48	E49	E50	E51	E52	E53	E54	E55	E56	E57	E58	E59	E60
CC	S41	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
DISPLAY	61	62	63	64	65	66	67	68	69			75	76	77						
Ch	E61	E62	E63	E64	E65	E66	E67	E68	E69			–	–	–						
CC	–	–	–	–	–	–	–	–	–			X	Y	Z						

Stored channels

A total of 112 channels are receivable. Of them, up to 48 can be stored for easy channel selection. Prior to shipment, some channels are stored.

It is possible to store more channels or skip some channels if there are no broadcasts on those channels in your area. It is possible to change the stored channels to correspond to your preferred channel allocation. Skipped channels can be restored whenever necessary.

- Channel memories are permanent; the programmed channel allocation will not be erased even if the recorder is unplugged from the AC outlet.

Channel selection

To select a channel for recording, normally use the TV PR. -/+ buttons ⓰ or 10 numeric keys ⓯. You can choose any channel from among the stored ones by calling up the corresponding channel position number.

- Use the TV PR. "-" button to scan to a channel in the direction of decreasing numbers; the TV PR. "+" button, in the direction of increasing numbers.
- When using the 10 numeric keys, pay attention to the following: When 1, 2, 3 or 4 is entered, it blinks for about 2 seconds. To set channel 1, 2, 3 or 4, leave it blinking until it remains lit. To key in a two-digit number, enter the 2nd number while 1, 2, 3 or 4 is blinking. The number entered first will be shifted to the tens place and channels 10 to 48 can be set. If you enter an invalid number (larger than 48), the channel display will return to the previous figure after 2 seconds.

If you want to select a channel other than those stored, engage the Real Channel mode and call up a channel, while referring to the real channel number display.

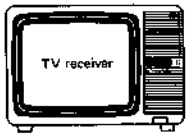
With recorder's controls:

- Press the VPS/CHANNEL button ⓭ to engage the Real Channel mode and call up a channel by either pressing the SEARCH button ⓮ or using the 10 numeric keys.

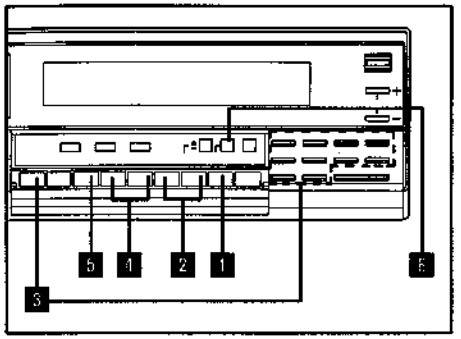
With remote control:

- Press the VPS/CH button ⓭ to engage the Real Channel mode and call up a channel by using the 10 numeric keys.

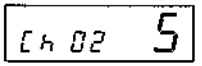
Changing the stored channels



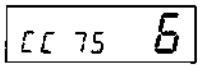
Turn the TV receiver to ON and adjust it to your video channel.



1 Press the VPS/CHANNEL button ⓭.
The middle 4-digit display will change to the Real Channel mode and show the band and real channel number of a station stored for that position.



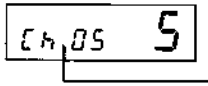
VHF channel 2 is stored for channel position 5.



Cable channel 75 is stored for channel position 6.

2 Call up the channel position number for which you wish to change the stored TV station.
- For this purpose, press either the TV PR. "-" or "+" button. Channel positions from 1 to 48 appear successively. "AU" indicates that the unit is in the external input mode usually referred to as AUX.

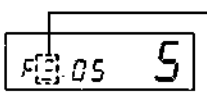
3 Select a TV station which you wish to store into that position.
- Pressing the VPS/CHANNEL button changes the band and alternates the band indication between "Ch" (for VHF and UHF) and "CC" (for Cable). Select the appropriate indication.
- You can scan to the real channel number corresponding to the desired station by pressing the SEARCH button ⓮. Pressing the SEARCH button initiates automatic scanning from real channel number Ch 02 to 69, CC 01 to 41, 75, 76, 77, then back to Ch 02. When a broadcast is detected, scanning stops automatically. To advance to the next station, press the SEARCH button.



"Colon" will appear to indicate that this real channel is not stored for the indicated channel position.

- You can key in that real channel number using 10 numeric keys ⓯. 70, 71, 72, 73, 74 and numbers larger than 77 are invalid numbers. If an invalid number is keyed in, the previously selected channel will be received.

4 If the picture quality is unsatisfactory due to ghosts or other noise, perform fine tuning.
- For this purpose, press either the FINE "-" or "+" button ⓰. The Fine Tuning mode will be engaged.



Upper or lower "–" sign indicates the operating tuning frequency is above or below the standard broadcast frequency. Centre "–" sign will appear when it corresponds to the standard.

Then press either the FINE "-" or "+" button, depending on the direction of fine adjustment, so that the picture clears up. Each time the button is pressed, the picture condition changes in a single increment. Continuous changing is also possible by keeping the button pressed. If the tuning frequency falls on the next station, the channel number advances as well. If no command is given for 2 seconds after either FINE button has been pressed, the Fine Tuning mode will be automatically cancelled. To cancel the Fine Tuning mode instantly, press the VPS/CHANNEL button.
- If the picture is not clear after all procedures, perform fine tuning on your television.
- Distorted pictures or sound will be recorded if fine tuning has not been properly performed. Exercise care with this adjustment since the recorded picture and sound cannot be adjusted later.

5 After confirming both the real channel number and channel position number, press the STORE button ⓮. "Colon" will disappear.
- The selected station will be stored in memory.

6 Press the COUNTER/REMAIN/DATE button ⓬ to disengage the Real Channel mode.

Skipping the stored channels

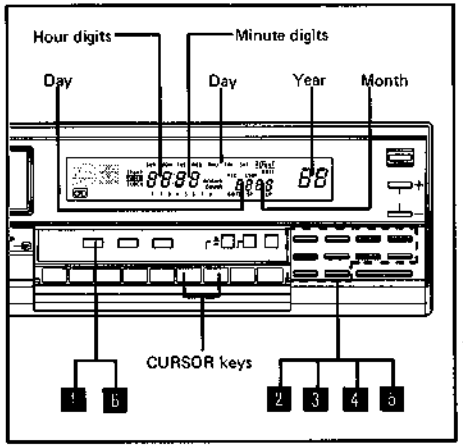
1. Call up the channel position number that you wish to skip by using the TV PR. buttons or 10 numeric keys.
2. Press the VPS/CHANNEL button.
3. Press the SKIP button ⓮.
   "Colon" will appear to indicate that the displayed real channel is not stored.
4. Press the COUNTER/REMAIN/DATE button to disengage the Real Channel mode.
   - The skipped channel number will not appear on the channel display during up/down scan tuning.

Restoring the skipped channels

1. Press the VPS/CHANNEL button to engage the Real Channel mode.
   - In this mode, all channel position numbers 1 through 48 are available in the channel display.
2. Select the channel position number that you wish to restore by using the TV PR. "-" or "+" button.
3. Select a real channel that you wish to restore in that channel position by using the SEARCH button or 10 numeric keys.
4. After confirming both the real channel number and channel position number, press the STORE button.
5. Press the COUNTER/REMAIN/DATE button to disengage the Real Channel mode.

CLOCK SETTING

Plug the HR-D230E into an AC outlet. The display shows a blinking 0 : 00 with SUN and CLOCK illuminated.



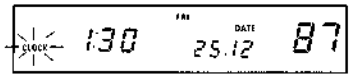
Power failure indicator
The initial condition of the display is also a power failure indicator, showing that there has been a power failure exceeding 10 seconds. Re-adjusting the time restores the normal condition of the clock display.

1 Press CLOCK ADJ ⓫.
The display will change to the Clock Set mode with "SUN" and "CLOCK" blinking.
2 Press one of the numeric keys "1 (SUN)" to "7 (SAT)" that corresponds to the day of setting. The hour digits will start blinking.
3 Set the hour and minute in that order.
- The blinking position is ready for entry.
- To set a one-digit number, first press "0", then press the numeric key for 1 to 9.
- Zero will not be displayed in the tens place of the hour indication unless the cursor is moved back to the hour digits.
- For a two-digit number, simply press the corresponding numeric keys in the right order.
- In hour setting, numbers larger than 23 will be rejected.
- In minute setting, numbers larger than 59 will be rejected.

4 Set the day and month in that order.
- The setting method is the same as for time setting.
- In day setting, invalid numbers such as 32 of January or 30 of February will be rejected.
- 29 of February will be accepted only during leap years.
- In month setting, numbers larger than 12 will be rejected.

5 Set the year in the channel display section.
- Key in only the two last digits of the year.

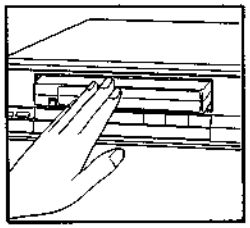
6 Press CLOCK ADJ.
- Press it at the exact instant of the time signal, and the clock will be set accurately to the present time.



Notes:
- If you press a wrong numeric key, you can return to the previous position using the CURSOR "–" key.
- Once all necessary data have been entered, you can reach any position for correction using the CURSOR "–" and "+" keys.
- Clock setting is not possible during playback, or if the TIMER button is engaged with the TIMER indicator lit. First check to see that the TIMER indicator is off.

LOADING AND UNLOADING A CASSETTE

Loading
Insert a cassette as illustrated. Be sure to insert it firmly into the slot; otherwise, it will be automatically ejected.



- The automatic loading mechanism will operate only when the cassette is inserted correctly.
- With a cassette inserted, the "cassette loaded" indicator will appear on the FDP.

Unloading
Press the EJECT button ⓬.

CAUTION
- If unloading of the cassette is not possible, check to see whether the TIMER indicator is lit. If so, press the TIMER button so the TIMER indicator extinguishes.
- Do not attempt to pull out the cassette once automatic loading has started.
- Do not insert fingers or any foreign object beyond the door of the cassette loading slot, as this could lead to injury or damage to the mechanism. Show special caution with children.

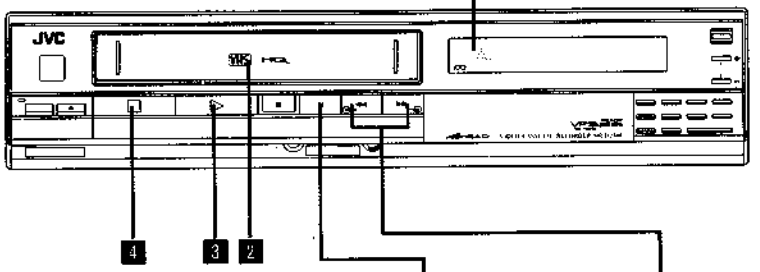
PLAYING BACK A VIDEO CASSETTE

AUTO POWER-ON AND AUTO PLAY SYSTEM
- The cassette can be loaded even when the power has not been turned on. Inserting a cassette into the loading slot turns the power on automatically.
- Inserting a cassette, with its safety tab removed, turns the recorder on and playback of the cassette begins automatically.

POWER-OFF EJECT SYSTEM
- The cassette can be unloaded even after the power has been turned off. Pressing the EJECT button turns the power on automatically and, after ejection of the cassette, shuts it off automatically.

Mode indicator

PLAY: ▷	STILL: ⏸
REW SHUTTLE SEARCH: ◁◁	FF SHUTTLE SEARCH: ▷▷



1 Turn the TV receiver on and adjust it to your video channel.
2 Load a pre-recorded cassette.
- Power will be switched on automatically.
- When the cassette loaded has no safety tab, playback will start automatically.

3 Press PLAY ❾.
- The SP/LP button may be in either position. The SP or LP mode recording is automatically detected and played back at a correct speed respectively with the corresponding indicator lit on the FDP.

4 Press STOP ❽ at the end of the programme.
- The tape will be rewound automatically when its end is reached and the recorder will enter the Stop mode.

SHUTTLE SEARCH
Shuttle Search allows high-speed playback at 9 times normal speed in either direction.
1. Press either REW or FF SHUTTLE SEARCH ❿ during playback.
2. To cancel the Search mode, press PLAY.
   - For briefer scanning, keep the SHUTTLE SEARCH button pressed for more than 2 seconds; when you release the button, the Search mode will be cancelled.

STILL PICTURE
1. Press PAUSE/STILL ⓫ during playback.
2. To advance the still picture, press PAUSE/STILL a number of times.
   - Keeping this button pressed continuously advances the picture to give a slow-motion effect.
3. To cancel the Still mode, press PLAY.

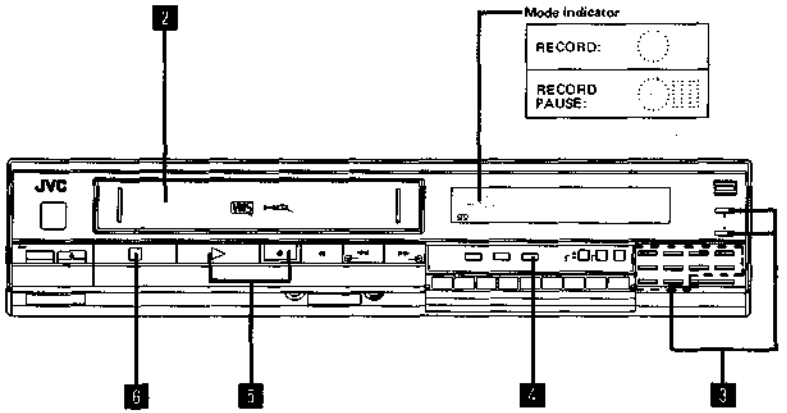
Notes:
- When the Still mode continues for longer than about 5 minutes, the Stop mode will be entered automatically.
- With some televisions, the still picture may be unstable. This is not due to any defect of the unit.

Picture Sharpness Adjustment
Images on the screen can be adjusted to a preferred softer or sharper definition by turning the SHARPNESS control ⓭ in the corresponding direction.

Tracking Adjustment
Noise bars may appear on the screen if you play back a tape which was recorded using another recorder. For correction, adjust the TRACKING control ⓮. Turn it in either direction to adjust the picture. After playing a particular tape, return the control knob to the centre position.

CAUTION:
When a tape recorded from SECAM B/G broadcasts in the LP mode is played back, colours disappear if special-effects (still and shuttle search) are applied.

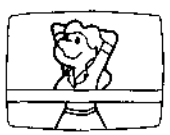
RECORDING TV PROGRAMMES



1 Turn the TV receiver on and adjust it to your video channel.
2 Load a cassette (with safety tab in place).
- Power will be switched on automatically.

3 Press either TV PR. ❾ or the numeric keys ⓫ to select the channel you wish to record.
4 Select the recording speed (SP or LP).
SP: 4 hours with an E-240 cassette.
LP: 8 hours with an E-240 cassette.
5 Press REC ❶ and PLAY ❷ simultaneously.
- If there is part of the programme you don't want to record, press PAUSE/STILL ❸. A white horizontal bar will appear on the screen and in about 5 minutes the Stop mode will be entered automatically.

Pause mode indicator



- To continue recording from the Pause mode, press PLAY ❷ while the white bar is on-screen.

6 Press STOP ❹ at the end of the programme.
- When the end of the tape is reached during recording, the tape is automatically rewound and stops.

Notes:
- When recording is restarted from the Pause mode, a few frames recorded before are erased due to overlap of the new recording. This is not due to any defect of the unit.
- The selected channel cannot be altered during recording. If you wish to change the channel, first engage the Pause mode and then select a different channel.

INSTANT RECORDING

If you need to start recording instantly from other modes or wish for recording to stop automatically after a certain period of time, use this Instant Recording mode.

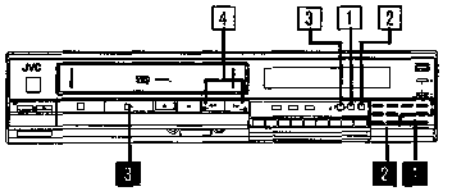
1. Press INSTANT REC ❶.
   - The FDP shows "REC STOP --:--".
2. Press INSTANT REC once again within 10 seconds.
   - Recording will begin and the FDP shows "REC STOP 0:30", indicating that recording will automatically stop and power will switch off after 30 minutes.
3. Adjust the switch-off time, if necessary.
   - Press INSTANT REC to increase the time in 30-minute increments (possible up to 4 hours).
   - Use the numeric keys to set to a more precise time when required (possible up to 9 hours 59 minutes). Always key in a full number including hours and minutes. For "0:35", key in zero first. After setting the time, press INSTANT REC immediately.

Notes:
- Instant recording has priority over all other modes.
- If the INSTANT REC button is pressed with a non-recordable cassette loaded (one with its safety tab removed), the cassette will be automatically ejected.

RECORDING ONE PROGRAMME WHILE WATCHING ANOTHER

A programme not being viewed can be recorded while you enjoy another programme.
- Select the channel you wish to record with the recorder's channel select buttons.
- Select the channel you wish to view with the TV receiver's channel selector.

COUNTER GO-TO AND COUNTER SEARCH



Counter Search

The counter reading of "0000" can be located automatically.
1 Press COUNTER/REMAIN/DATE ❼ to obtain the Counter mode.
2 Press COUNTER RESET ❽ during playback or recording at a point which you wish to locate later.
3 Press COUNTER MEMORY ❽.
4 Press REW or FF ⓬ when you need to return to the designated point.
- The tape will stop automatically at about "0000".
- When used in conjunction with the Memory Play function, this offers more convenience. See below.

Counter Go-To

Specify the desired counter number, and the tape will be fast-forwarded or rewound to that point for automatic playback.
1 Press GO-TO ⓭ in the Stop mode.
- The counter will display the current position of the tape as calculated from the leader at the beginning of the tape.

2 Specify the counter number of the point you wish to locate, using the numeric keys ⓫.
3 Press PLAY ❷.
- The tape will be fast-forwarded or rewound depending on the relative position of the specified point, at which playback will start automatically.

Notes:
- If the recorder has not detected the leader tape since the tape was loaded, no number will be displayed when the GO-TO button is pressed, but after pressing the PLAY button, the tape will be rewound to the beginning (to enable counting from the leader) before fast-forwarding to the desired location.
- If the specified number exceeds the length of the tape, as calculated from the leader, the tape will fast-forward to the end, rewind to the beginning and then enter the Play mode.

REMAINING TAPE TIME INDICATOR

The tape counter is switchable to the remaining tape time indicator.
1. Press COUNTER/REMAIN/DATE ❼ to obtain the Remain mode.
2. The remaining tape length will be shown in hours and minutes.

Notes:
- During recording, the remaining tape length is calculated in reference to the recording mode selected by the SP/LP button; during playback, it is calculated in reference to the recording mode of the tape being played (SP/LP).
- The indicated remaining time is approximate. The time required to calculate the remaining tape length and the accuracy of that calculation may vary according to the type of cassette tape. (The remaining time indication is not available if this mode is engaged from Fast Forward or Rewind.)

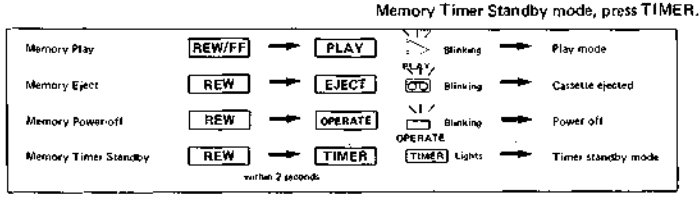
NEXT-FUNCTION MEMORY

Memory Play function

- If you want to watch the tape from its beginning after rewinding, press REW and then PLAY within 2 seconds. Playback will start automatically at the beginning of the tape. (The COUNTER MEMORY button ❽ must be in the OFF position.)
- If you want to watch the tape from the counter reading of "0000", press COUNTER MEMORY, then REW (or FF) and then PLAY within 2 seconds.
- While the tape is being rewound, the PLAY indicator is blinking. To cancel the Memory Play mode and go to another mode, press the corresponding button (STOP, PLAY, FF, REW).

Memory Eject/Power-Off/Timer Standby

If you are going to eject the cassette, turn the power off or engage the Timer Standby mode after rewinding the tape, you do not have to wait for completion of rewind to press the corresponding button.
- To eject the cassette after rewind, press REW and then EJECT within 2 seconds. (To cancel the Memory Eject mode, press STOP.)
- To turn the power off after rewind, press REW and then OPERATE within 2 seconds. (To cancel the Memory Power-off mode, press OPERATE.)
- To engage the Timer Standby mode after rewind, press REW and then TIMER within 2 seconds. (To cancel the Memory Timer Standby mode, press TIMER.)

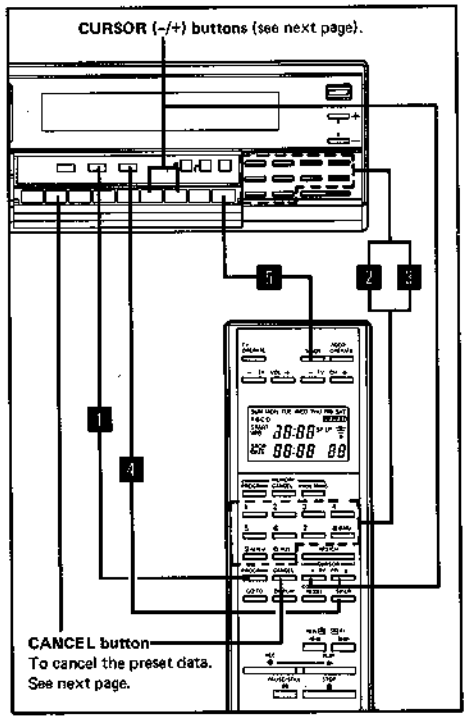


AUTOMATIC TIMER RECORDING

First of all, load a cassette (with safety tab in place); power will be switched on automatically.

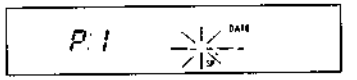
Three ways to perform timer programming

- **A. Local programming:** Programme the timer using the recorder's controls while referring to the recorder's FDP.
- **B. Direct remote programming:** Programme the timer using the remote control's keys while referring to the recorder's FDP.
- **C. Independent remote programming:** Programme the remote control's memory using the remote control's keys while referring to its own LCD and then transfer the data to the recorder.



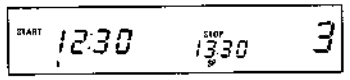
A. Local Programming

1 Press PROGRAM ⑭.
- The display will change to the Timer Set mode for programme number "1". To advance to programme numbers 2 – 8, press PROGRAM.



2 Enter the date using numeric keys ⑯.
- Invalid numbers will be rejected.
- To record a daily serial starting on the day of setting, press CURSOR "+" ⑰ without entering any date figure.
- To record a daily serial starting on a certain day, press DAILY (8) and enter the date.
- To record a weekly serial, press REPEAT (9) and enter the date.
- Both "daily" and "weekly" commands can be entered or cancelled by pressing the corresponding button any time in the date and time setting stages.

3 When the display changes to the next stage, key in the start time, stop time and channel in succession using numeric keys.
- To key in a one-digit number of hours or minutes, first press "0". Then press the relevant numeric key.
- For keying in channel numbers, refer to page 7.



4 Press SP/LP ⑱ to obtain the desired recording mode indication on the display.
- The SP or LP entry can be made anytime while in the Timer Set mode.

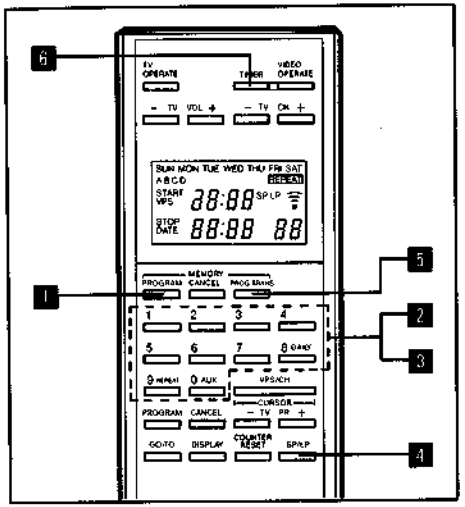
5 After making sure that the cassette is loaded, press TIMER ⑲.
- The Timer Recording Standby mode will be engaged with the TIMER indicator and the preset programme number(s) illuminated and the power turned off.
- With no cassette loaded, the TIMER and "cassette loaded" indicators will continue blinking.
- A cassette whose safety tab has been removed will be rejected automatically.
- If a preset programme contains errors, that programme number will not be illuminated. Recheck the programmed data.

B. Direct Remote Programming

Following the procedures above, use the remote control's buttons instead of the recorder's with the remote control directed toward the recorder's REMOTE SENSOR window ⑧.

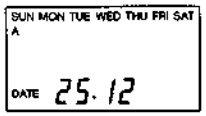
C. Independent Remote Programming

- The remote control incorporates 4 programme memories (A, B, C and D).
- The programmed data is held in memory even after it has been transferred to the recorder.

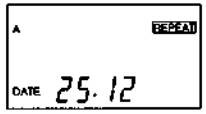


1 Press MEMORY PROGRAM ⑭.
- The LCD will be activated for programme memory "A".
- To advance to programmes B to D, press again.

2 Enter the date using numeric keys ⑯.
- Setting for a daily or weekly serial is the same as described in "A. Local Programming".

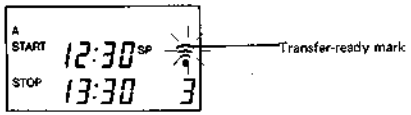


For daily serial setting



For weekly serial setting

3 When the display changes to the next stage, enter the start time, stop time and channel in succession.
- After the channel has been entered, the transfer-ready mark will appear and blink.



4 Press SP/LP ⑱ to obtain the desired recording mode indication on the display.
- The SP or LP entry can be made anytime while in the Timer Set mode.

5 Direct the remote control to the recorder's REMOTE SENSOR window ⑧ and press PROG. TRANS ⑬.
- The programmed data will be loaded in one of the recorder's memories (1 – 8), the vacant one of the smallest programme number.
- If all programme memories are full, the recorder's clock will blink and transmission will not take place.

6 Press TIMER ⑲.
- Check to see that the TIMER indicator and other items on the recorder's FDP respond correctly. See page 13.

Setting the date, start and stop times, and channel

- It is not possible to set the date, start and stop times unless the date and clock have previously been set.
- Enter the data while the digits are blinking.
- Unless the start time has been properly set, stop time setting is not possible.
- The stop time can be set within 24 hours from the start time.
- Non-applicable numbers (such as January 32, February 30 for dates, 24 or larger for hours, 60 or larger for minutes and 49 or larger for channels) will be rejected when keyed in.

Cancelling the preset data

- The preset programmes can be cancelled. First engage the Timer Set mode for the programme number you wish to cancel and then press the CANCEL button ⑭ or ⑰.

Checking the programmed data

- Checking and re-programming can be performed anytime, even when the TIMER button has already been engaged.
- While recording is actually taking place according to one preset programme, all other preset programmes can be checked or re-programmed.
- To disengage the Timer Set mode, press the COUNTER/REMAIN/DATE button ⑰ (on the recorder) or the DISPLAY button ⑭ (on the remote control).

Timer recording operation

- When the preset start time is reached, recording starts.
- After timer recording, the power is switched off. If the tape end is reached during timer recording, the cassette is automatically ejected and the power is switched off.

How to use the CURSOR keys

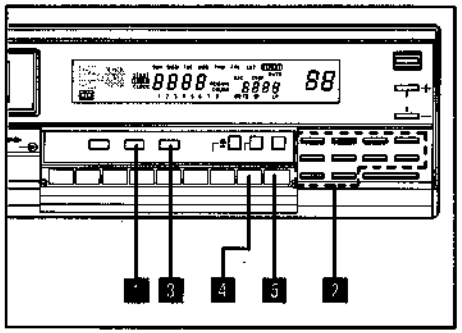
- If you press a wrong key and the flashing position has advanced, press "–" to return to the previous position for correction.
- Once all data have been programmed, you can reach any position for correction using "–" or "+". The flashing position is ready for re-entry.
- The cursor (flashing position) advances or returns in the following order.

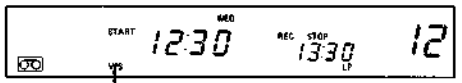
Date ⇄ Start time ⇄ Stop time ⇄ Channel

(Pressing PROGRAM engages the check mode in which no position flashes and data correction is not possible. To correct the data, press either CURSOR key; "+" to move to "Date" or "–" to move to "Channel".)

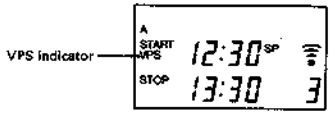
VPS RECORDING (Use the optional VU-V90E VPS Unit for VPS recording.)

VPS (Video Programme System) is a broadcast system employed by TV stations in certain areas. In this system, TV stations transmit different VPS codes for different TV programmes, which control the starting and stopping of the video recorder and have precedence over times preset in the timer for accurate recording of a particular programme from start to finish.





VPS indicator
Illuminated : VPS standby mode (in program mode)
: VPS broadcast received
Blinking : VPS recording progress



1. Press PROGRAM ⑭.
2. Set the date, start time, stop time and channel in the same way as for timer programming.
3. Select SP or LP ⑱.
4. Press VPS ⑯.
   - ◆All timer data will be converted to VPS codes and stored in memory.
5. Press TIMER ⑮.
   - ◆The recorder will enter the VPS standby mode at 20:00 on the day previous to the preset day and remain engaged until 3:59 on the following day, if the intended programme has not yet been broadcast.
   - ◆When a VPS code corresponding to the intended TV programme is detected during the VPS standby mode, recording will start. When the VPS code changes to another, recording will stop.
   - ◆When an interruption code is detected during VPS recording, the VPS standby mode is engaged and recording restarts when the regular VPS code is restored.

Notes:

- When programming the remote control's memory, the VPS indicator will appear on the LCD when VPS command is entered. However, transfer of this VPS command has no effect unless a VPS adapter is connected to the HR-D230E.
- If no VPS code is detected from that station or a system status code which cancels VPS recording is detected, ordinary timer recording will be engaged.
- Operation at the end of VPS recording is the same as with ordinary timer recording.

RECORDING FROM AN EXTERNAL SOURCE

By connecting an external video source (such as a VideoMovie camera-recorder, 2nd video recorder, video camera, etc.) to the AUDIO/VIDEO socket, recording and/or editing are possible.

- For connection of these units, an appropriate cable is necessary.
- For connection of a video camera, a camera adapter is also necessary. Connect the camera adapter's PAUSE terminal to the recorder's PAUSE connector ⑳, then you can control taping start/stop with the camera's start/stop switch. For proper connection of a camera, consult a JVC dealer.

1. Turn the power on for all connected equipment.
2. Adjust the TV receiver to your video channel.
3. Load a cassette.
4. Press either TV PR. button ⑤ or the numeric key 0/AUX ⑥ to obtain "AU" in the channel display.
5. Set SP/LP ⑱ as required.
6. Operate the source equipment properly.
7. Press REC ⑪ and PLAY ⑨ simultaneously.
   - ◆When recording with a camera, press REC and PAUSE/STILL to enter the Recording Standby mode, then control taping start/stop with the camera's start/stop switch.
8. To stop recording temporarily, press PAUSE/STILL ⑫.
9. To end recording, press STOP ⑩.

Note:

- For the operation of the source equipment, refer to the instruction manual of the relevant machine.

IN CASE OF DIFFICULTY

What may initially appear to be trouble is not always a real problem. Make sure first . . . .

Symptoms	Check points
No power is applied to the recorder.	• Is the power cord disconnected? Connect it.
Playback picture does not appear while the tape is running.	• Is the TV receiver's channel selector set to the correct video channel? Set to the RF converter channel.
Tape does not run in the Record mode.	• Is the PAUSE/STILL button pressed? Press PLAY to release.
REC button cannot be engaged.	• Is the cassette improperly loaded? Load it properly. • Is the safety tab broken? Reseal the slot.
Tape stops in the Rewind or Fast Forward mode.	• Is the COUNTER MEMORY button set to ON? Set to OFF.
Tape will not rewind.	• Is the tape already rewound to the end?
Noisy playback picture.	• Adjust with the TRACKING control.
Pressing PAUSE/STILL during playback brings a still picture (in a frame-by-frame manner) with noise bars.	• Noise bars can be eliminated by pressing the PAUSE/STILL button a few more times.

This recorder contains microcomputers. External electronic noise or interference could cause malfunctioning. In such cases, switch the power off and unplug the power cord. Then plug it in again and check the functions.

HEAD CLEANING

- Picture playback may become blurred or interrupted while the TV programme received is clear. This does not mean that the recorded programme has been erased.
- Dirt accumulated on the video heads after long periods of use causes such problems. In this case, head cleaning requiring highly technical care is necessary.

For head cleaning, consult the nearest JVC dealer.

INSTRUCTIONS:
VIDEO CASSETTE RECORDER

For reference, the text of the Instruction booklet for this model is reproduced in the following pages.

Numbering of the pages also corresponds with that of the booklet.

The Instructions shown pertain specifically to the Model HR-D230E. For detailed descriptions, be sure to consult the Instruction booklets of the other models.

Main differing points with respect to other models in this series (with suffixes E, EG and EK) are also included.

The following table lists the principal differing points among the models (suffixes E, EG and EK) in this series.

Item \ Model		E	EG	EK
Power requirement		220 V~, 50/60 Hz	←	240 V~, 50/60 Hz
TV-Tuner	VHF BAND	47—89 MHz 104—300 MHz 302—470 MHz	←	No
	UHF BAND	470—862 MHz	←	21—69 (channels)
	Channel preset capacity	48	48	32
V P S Decoder		No (Provided VPS connector)	Yes (built-in)	No

NOTE: ← : Same as model at left

SECTION 1
MECHANISM ADJUSTMENT

1.1 GENERAL

1.1.1 Precautions

IMPORTANT:

1. Disconnect unit from power before removing or soldering components.
2. When removing a fastener (screw, washer, etc.), be careful not to drop it into the mechanism. If a fastener should be dropped, be sure to retrieve it.
3. The tape transport mechanism has been precisely adjusted at the factory and ordinarily does not require readjustment.
4. When removing a part, be very careful not to damage or displace other parts. (Be especially careful with the tape guides and rotary video head drum.)
5. For service procedures that call for operation of the set when the cassette housing is separated from the main-deck, perform as below.

1) Set a sheet of insulated material on the right of the chassis.
2) Remove the cassette housing from the main-deck and place it on the insulated sheet, but do not disconnect the connector from the VIDEO BOARD.
3) Insert a cassette into the cassette housing. The housing mechanism functions to retract the cassette.
4) Disable the photo transistor sensor (END SENSOR) on the main-deck by applying an opaque cover.
5) The desired modes can be obtained by using the operation switches.

1.1.2 Required test equipment, fixtures and tools

For proper mechanical adjustment, the following test equipment, fixtures and tools are strongly recommended. Without them, a long trial-and-error period would be necessary, resulting in possible damage. In addition, general-purpose tools are required.

1. Test equipment required:

Color television or monitor
Oscilloscope: Wide-band, dual trace, triggered, delayed sweep
Recording tape
Alignment tapes

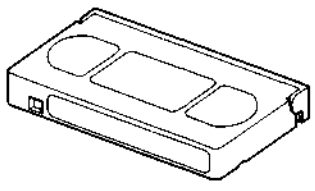
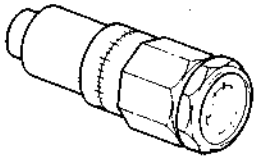
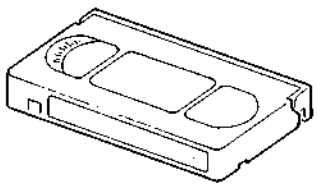
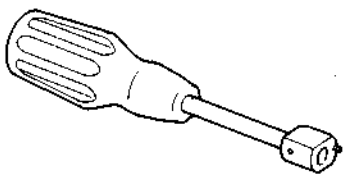
JVC alignment tape MH-2, MH-2L 	Torque gauge assembly PUJ48075-2 (Torquemeter : 600ATG, Torquemeterhead : PUJ48016-2) 	Back tension cassette gauge PUJ48076-2 
A/CTL head position tool PUJ47351-2 		

Table 1-1-1 Fixtures and tools

1.1.3 Disassembly (external covers)

1. Top cover
1) Take out five screws from the right, left and rear sides of the set.
2) Tilt up the rear end of the top cover, then remove the top cover.

2. Bottom cover
1) Take out five screws from the bottom side of the set.
2) Set free the bottom cover from six claws of the chassis in order to remove the bottom cover.

3. Front panel assembly
1) Remove the top cover.
2) Bend three upper hooks of the front panel assembly upward from their chassis retainers in order to disengage the hooks from the chassis.
3) Disengage three lower hooks of the front panel assembly from the bottom side of the set in order to remove the front panel assembly from the chassis.
4) Reassemble the front panel assembly so that earth plate on the rear of front panel assembly becomes outer side of the cassette housing assembly. (Refer to Fig. 1-1-2)

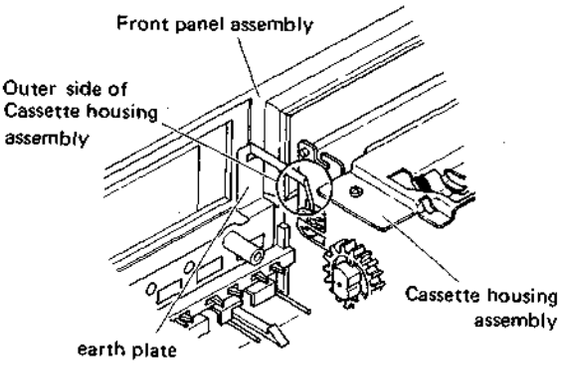


Fig. 1-1-2

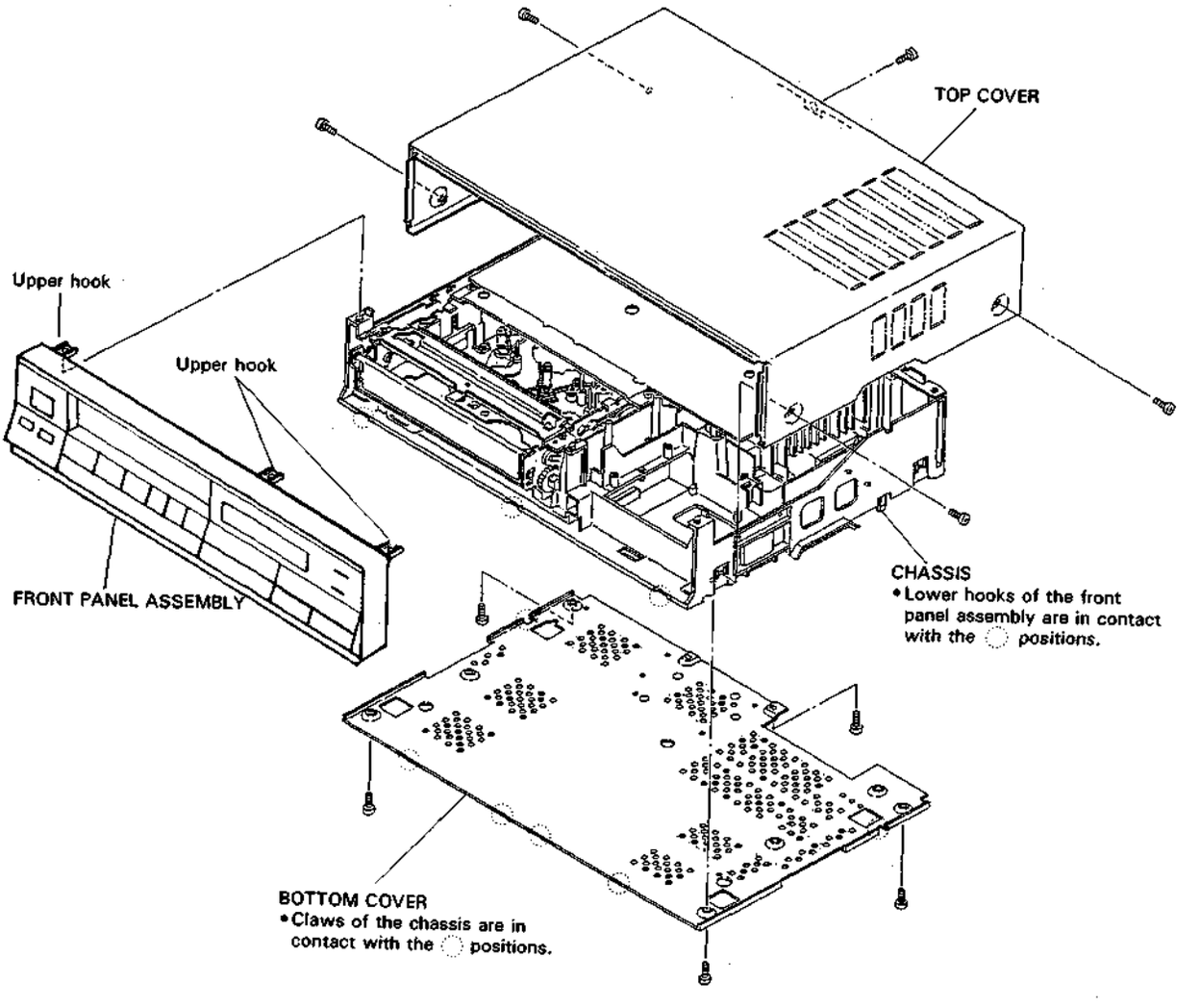


Fig. 1-1-1 Removal of external covers

1.1.4 Layout of main parts

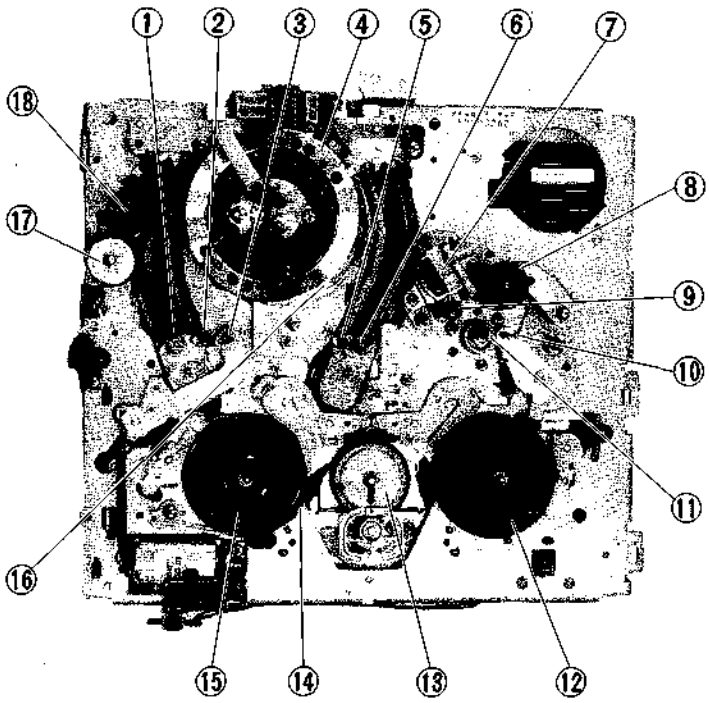


Fig. 1-1-2 Top view of main-deck

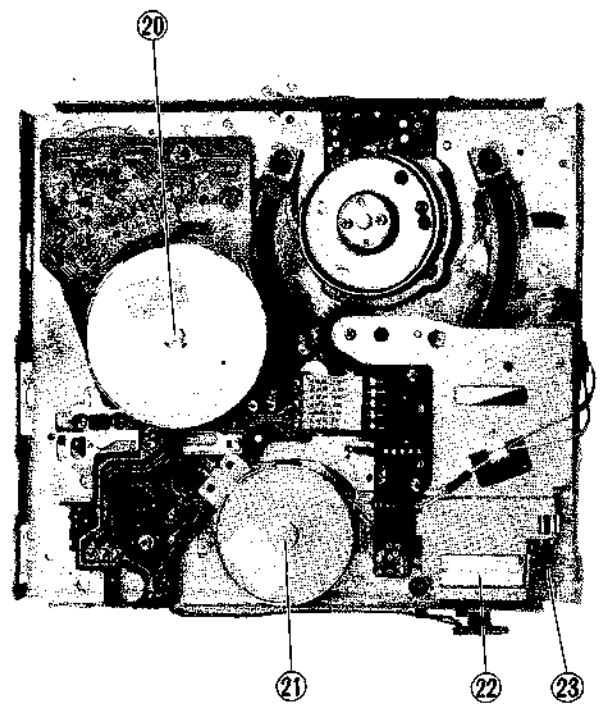


Fig. 1-1-3 Bottom view of main-deck

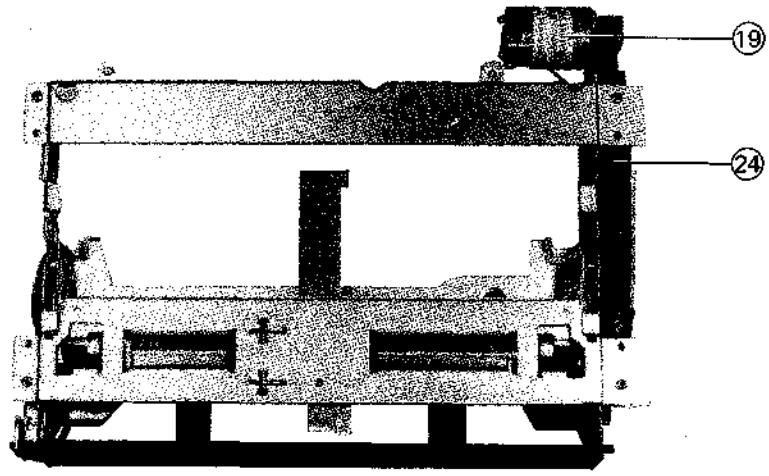


Fig. 1-1-4 Cassette housing

1. Supply guide roller
2. Supply slant pole
3. Tension pole
4. Upper drum
5. Take-up slant pole
6. Take-up guide roller
7. A/C head
8. Pinch roller
9. Take-up guide pole
10. Guide arm
11. Capstan
12. Take-up reel disk
13. Reel idler
14. Tension band
15. Supply reel disk
16. Lower drum
17. Impedance roller
18. Full erase head
19. Cassette motor
20. Capstan motor
21. Reel motor
22. Mode motor
23. Mode belt
24. Cassette belt

1.2 MAIN ASSEMBLY REPLACEMENT

1.2.1 Upper drum assembly

Notes: When handling and installing the upper drum assembly, avoid directly touching the head tips on the upper drum assembly.
For cleaning the head tips, push and hold a lint-free cloth or chamois dampened with alcohol to the upper drum assembly by the fingers, then turn the upper drum assembly clockwise. Do not clean the upper drum assembly with a vertical stroke.

1. Removal
1) Take out a screw and remove the brush assembly from the drum assembly.
2) Unsolder all soldered portions on the DRUM BOARD. Remove excess solder, then remove the DRUM BOARD from the upper drum assembly.
Note: Soldered portion can be easily removed by removing solder with sucker or wick.
3) Take out two screws and remove the upper drum assembly upwards.

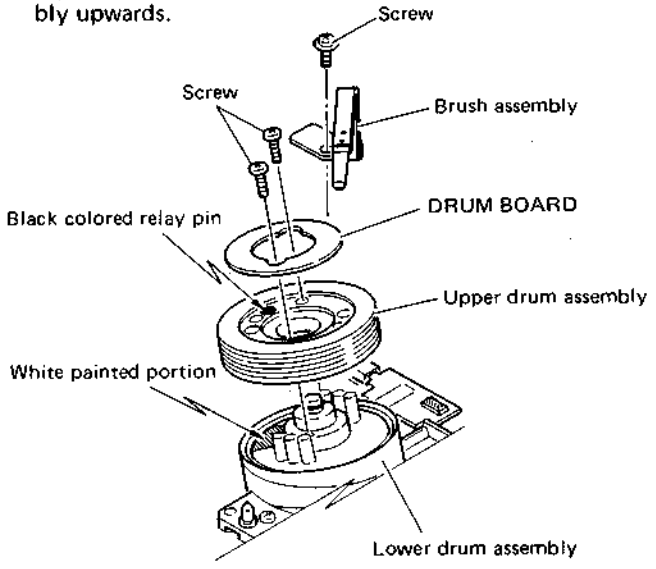


Fig. 1-2-1 Upper drum assembly

2. Installation
1) Install a new upper drum assembly so that the black-colored relay pin of the upper drum assembly overlies the white painted portion of the lower drum assembly, as shown in Fig. 1-2-1.
2) Tighten two screws in a balanced manner.
3) Set the DRUM BOARD on the upper drum assembly, then resolder it.
4) Clean the drum unit (particularly clean the upper drum assembly).
5) Mount the brush assembly on the original position, then tighten a screw to fix the brush assembly.

3. Confirmation and adjustment
1) Perform the interchangeability confirmation. Refer to section 1.6.
2) Perform the PB switching point adjustment of the Servo (VIDEO BOARD) circuit. Refer to section 2.2.1.

1.2.2 A/C head (Audio/control head)

1. Removal
1) Disconnect connectors from the A/C HEAD BOARD.
2) Take out two screws, then remove the A/C head and the head base together.
3) Unsolder and separate the A/C HEAD BOARD from the A/C head.
4) Take out a screw and remove the shield cap from the A/C head.
5) Take out three screws and separate the A/C head from the head base. Use care regarding springs. Do not lose them.

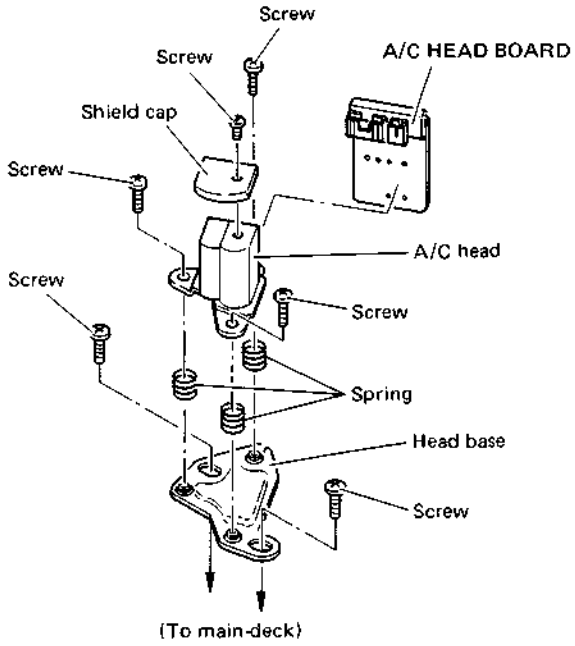


Fig. 1-2-2 A/C head

2. Installation
1) Mount a new A/C head and other peripheral parts on the main-deck by reversing the removal procedure.
2) Before installing the A/C head on the main-deck, perform rough-adjustment of A/C head height as shown in Fig. 1-2-3.

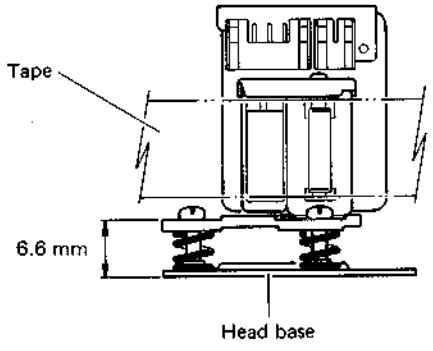


Fig. 1-2-3 A/C head height

3. Confirmation and adjustment
1) Use a recording tape and confirm correct tape transport operation, then perform interchangeability adjustment. Refer to sections 1.5 and 1.6.
2) Perform overall confirmation of the Audio circuit. Refer to section 2.4.

1.2.3 Tension band assembly

1. Removal

1) Take out a screw, then pry the A portion of the tension band assembly upwards to separate it from the tension arm assembly.

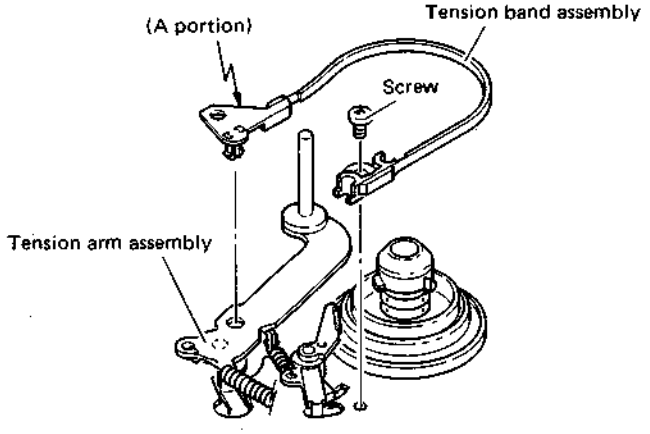


Fig. 1-2-4 Tension band assembly

2. Installation

1) Install a new tension band assembly by reversing the removal procedure.

3. Confirmation and adjustment

1) Perform tension pole position adjustment. Refer to section 1.4.1.

1.3 ASSEMBLY PROCEDURE OF MECHANISM

The mechanism of this model is mostly engaged to the mechanism control circuit, through the mode select switch. Therefore, the relation between the mode select switch and the control arm decides all mechanical movement of the mechanical parts such as levers, gears, rollers and so on. If these parts are not properly positioned, the unit will be unloaded or compulsorily stopped. This will result in damage of mechanical or electrical parts.

1.3.1 Loading arm assembly

Loading arm assembly consists of loading gear, torsion spring and loading arm.

1. Set up the loading arm assembly correctly as shown in Fig. 1-3-1.

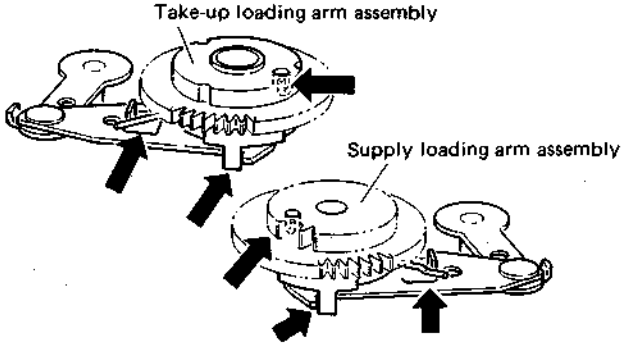


Fig. 1-3-1 Loading arm assembly (1)

2. Install the take-up loading arm assembly and the supply loading arm assembly so that the holes on the loading gears face each other, as shown in Fig. 1-3-2. Do not move the loading arm assemblies from this position for the next step.

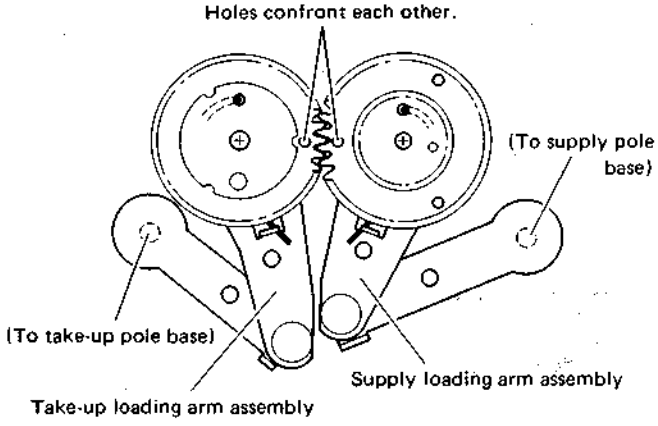


Fig. 1-3-2 Loading arm assembly (2)

1.3.2 Control cam

1. Assemble the second gear and the control cam so that the stud of the control cam sets into the hole of the second gear (A portion in figure).
2. Mount the above assembly (control cam and second gear) on the cam bracket assembly to put it in the relations as shown in figure.

Notes: Three holes at B portion are severally on the control cam, on the arm gear assembly and on the cam bracket assembly.
Three holes at C portion are severally on the control cam, on the half loading cam and on the cam bracket assembly.

3. Do not turn the control cam from this position for the next step.

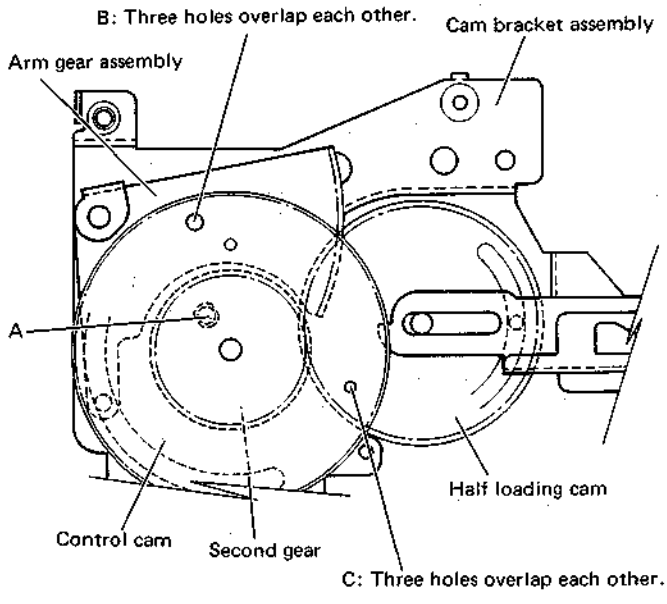


Fig. 1-3-3 Control cam

1.3.3 Cam bracket assembly

1. Push and hold the plate assembly so that the hole of the plate assembly overlaps the hole of the main-deck, as shown in Fig. 1-3-4.
2. Then mount the cam bracket assembly.

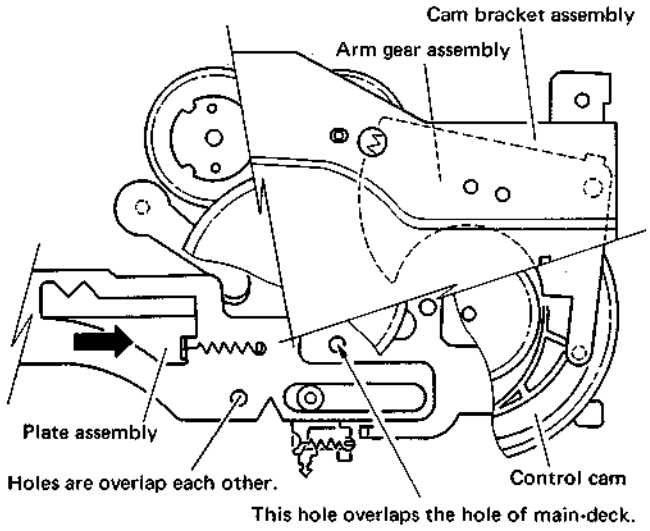


Fig. 1-3-4 Cam bracket assembly

Note: In order to overlap the holes turn the control cam fully counter clockwise by turning the mode motor with a finger.

1.3.4 Mode select switch

1. When the hole of the plate assembly overlaps the hole of main-desk, refer to Fig.1-3-4, confirm that the V-cut of the slider section just overlaps the V-cut of the outer section of the mode select switch.
2. If a difference of more than 0.5 mm is noticed, adjust the mode select switch to the correct position, after unsoldering and loosening the screw.

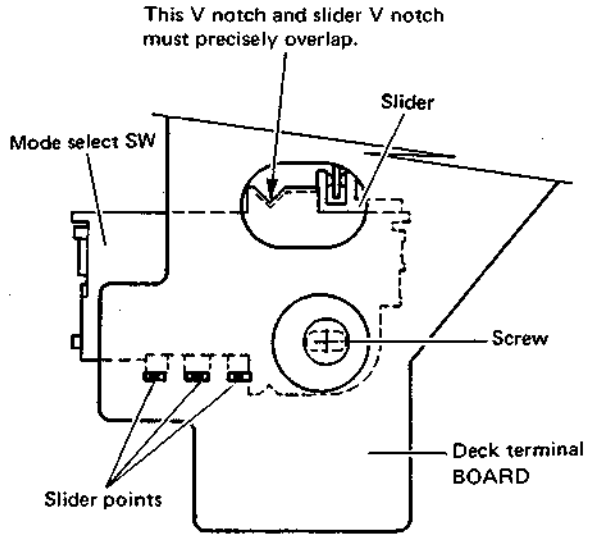


Fig. 1-3-5 Mode select switch

1.4 CONFIRMATION AND ADJUSTMENT

1.4.1 Tension pole position adjustment

1. Without loading a tape, set for the Play mode.
2. Loosen screw a little bit, then adjust the tension band holder so that the distance, shown in Fig. 1-4-1, becomes zero (0 mm).
3. Tighten screw to fix the tension band holder.

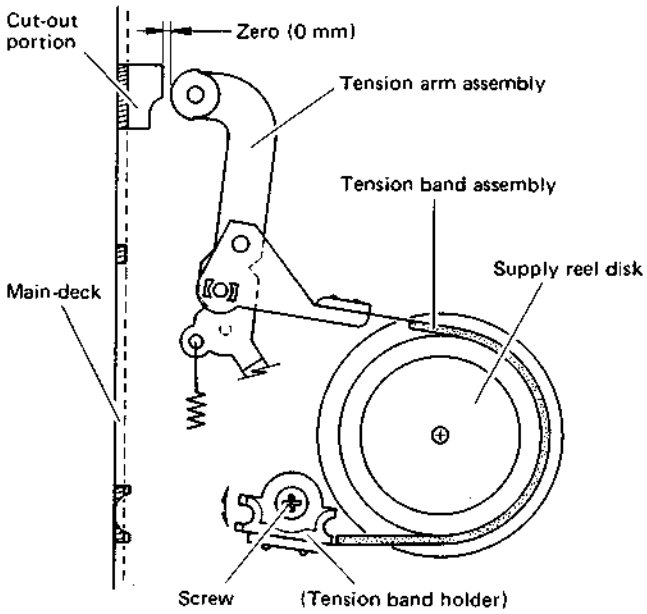


Fig. 1-4-1 Tension pole position

Note: By this adjustment, back tension is within normal specification, in spite of parts tolerances.

4. Use the back tension cassette gauge and set for the Play mode.
5. Confirm that the indication is between 25 – 75.

1.4.2 Take-up torque confirmation

1. Set the Play mode without the cassette housing assembly.
2. Set the torque gauge on the take-up reel disk.
3. The torque gauge consists of upper and lower sections connected by a spring mechanism. Relax the grip on the torque gauge so that the indicator needle and scale rotate at equal speed, then read the indication. The correct value is between 45 – 155.
4. If necessary, replace the take-up and supply clutches.

1.5 TAPE TRANSPORT SYSTEM CONFIRMATION AND ADJUSTMENT

Once adjusted to the complete condition, readjustment of the tape transport system is not necessary, except when the parts that compose the tape transport system are replaced due to troubles by long usage or unexpected accidents.

1.5.1 Tape transport system adjustment

1. Guide roller

   To get the FM envelope into ideal shape for interchangeability, the height adjustment of the guide roller is needed.

   Before turning the guide roller, slightly loosen the setscrew located under the guide roller. For loosening the setscrew, use the hex key (1.25 mm).

   Note: Loosen the setscrew enough to allow the guide roller to be turned. If excessively loose, tape motion may turn the guide roller inadvertently.

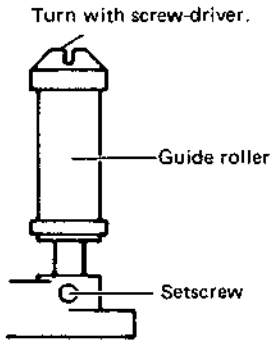


Fig. 1-5-1 Guide roller

2. Impedance roller

   Normally, do not adjust the height of the impedance roller. Only when the defects of tape travel are noted at the impedance roller, after complete adjustment for interchangeability, adjust the height of impedance roller to obtain smooth tape travel. For adjustment of impedance roller height, use the nut-driver (5.5 mm).

   Note: Do not lower the impedance roller excessively to avoid the defects of tape travel. Tape must be along the lower flange located under the impedance roller.

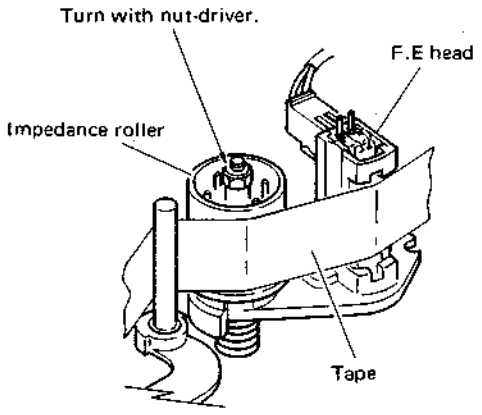


Fig. 1-5-2 Impedance roller

3. A/C head (audio/control head)

   When defects of tape travel are noted at the take-up guide pole, adjust the inclination of A/C head to obtain smooth tape travel.

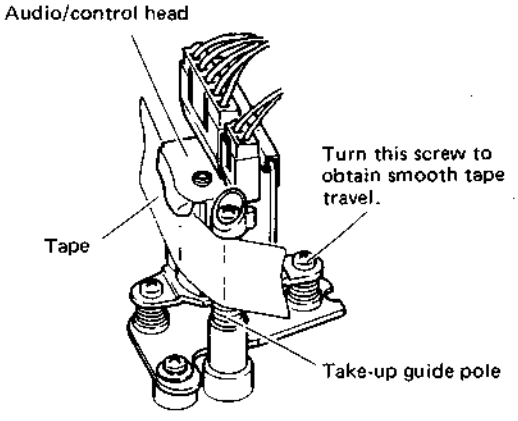


Fig. 1-5-3 A/C head

1.6 INTERCHANGEABILITY CONFIRMATION AND ADJUSTMENT

Before using an alignment tape, use a recording tape and confirm correct tape transport operation.
For the FM envelope output, connect an oscilloscope to TP106 of the VIDEO BOARD. For audio output, connect to the AUDIO OUT terminal, and trigger the oscilloscope externally with the signal from TP11 of the SERVO BOARD. Use only the stairstep segment of the alignment tape, do not use another segment for interchangeability.

1.6.1 FM envelope confirmation and adjustment

1. Push the TRACKING +/– buttons to obtain the maximum FM envelope output corresponding to (a) level in Fig. 1-6-1. Observe the FM envelope, read the maximum level (a) and the minimum levels (b), (c) and (d). Confirm that:

$$\frac{b}{a} \geqq 0.7\ ,\ \frac{c}{a} \geqq 0.5 \text{ and } \frac{d}{a} \geqq 0.5$$

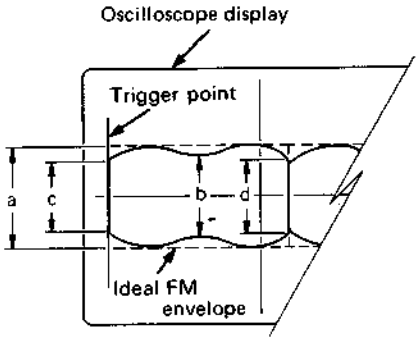


Fig. 1-6-1 FM envelope

2. If defects are noted, following adjustments are required.
1) Observe the oscilloscope display and push the TRACKING +/– buttons to vary the FM output from maximum to minimum.
2) If the variation is not parallel at the rising portion (drum entrance) of the FM envelope, turn the supply guide roller so that the rising portion of the envelope becomes nearly flat, as shown in Fig. 1-6-2.

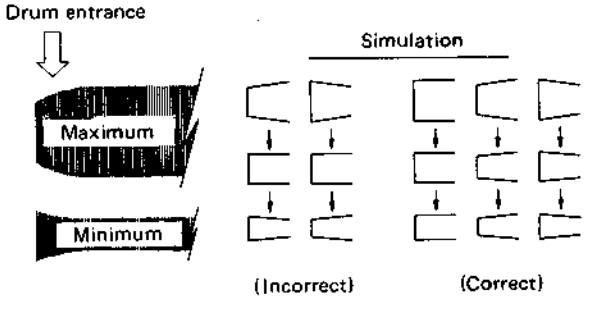


Fig. 1-6-2 Drum entrance

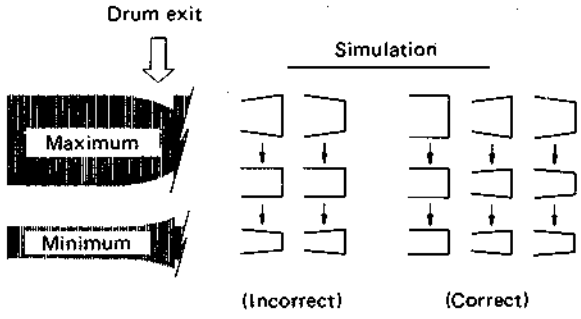


Fig. 1-6-3 Drum exit

3) In the same manner as for the rising portion, turn the take-up guide roller to adjust the falling portion (drum exit) of the FM envelope. See Fig. 1-6-3.
4) In addition to observing the envelope, confirm absence of tape curling or wrinkling at the impedance roller and take-up guide pole. If it occurs at the impedance roller, adjust the impedance roller height. If it occurs at the take-up guide pole, adjust the A/C head inclination.
5) Vary the FM envelope output level and perform fine adjustments of the guide rollers.

1.6.2 A/C head height and azimuth adjustments

Incorrect A/C head height can impair audio signal-to-noise ratio when playing back a pre-recorded tape.

1. For A/C head inclination, adjust screw (A) so that small tape wrinkles are not produced at the take-up guide pole. Turn screw (A) clockwise so that the tape wrinkles are apparent with the lower flange of the take-up guide pole, then turn screw (A) counter-clockwise so that the wrinkles smooth out.
2. Adjust azimuth with screw (B).
   Turn screw (B) to obtain maximum audio output.
3. For A/C head height, turn screws (A), (B) and (C) in succession by small and equal increments at a time and adjust for maximum audio output level.

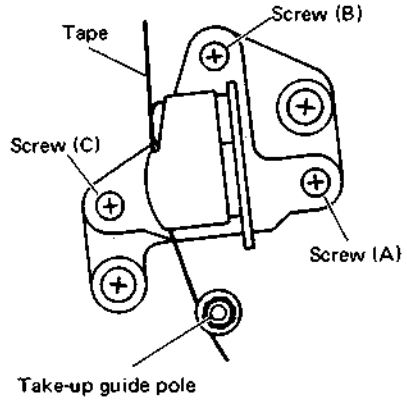


Fig. 1-6-4 A/C head

1.6.3 Control head phase adjustment

1. Set Tracking to Pre-Set Position by pushing both + button and – button at the same time.
2. Loosen screws (D) and (E) a little bit, then cover screw (D) with the A/CTL head position tool and set the pin of the tool into the hole next to screw (D).
3. Turn the tool counter-clockwise to shift the A/C head fully in the direction of the capstan, and then gradually turn the tool clockwise and observe the FM envelope output.
4. Set the A/C head at the point of the first output peak.

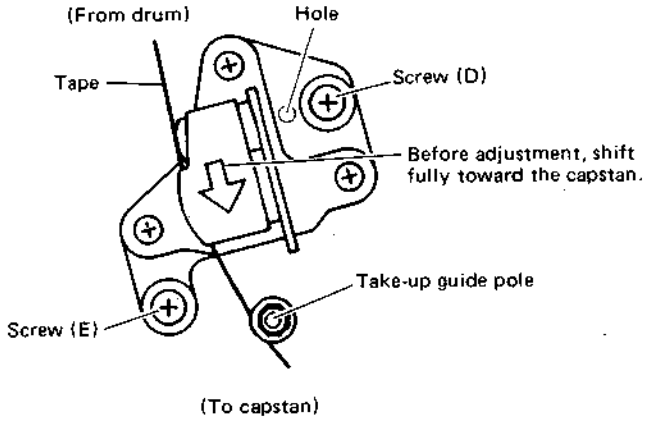


Fig. 1-6-5 Control head phase

5. Replace alignment tape MH-2L with MH-2, playback the stairstep segment of the alignment tape MH-2L.
6. Observe the oscilloscope display and push the TRACKING +/- buttons to vary the FM output level, confirm that the FM output peak is obtained at Tracking pre-set position.
7. If the FM output peak is not obtained at Tracking pre-set position, shift the A/C head at the FM output peak nearest this position.

1.6.4 Setscrew tightening

1. After confirming absence of tape wrinkling and other transport irregularities, tighten the setscrews located under the guide rollers while in the Stop mode.
   Note: Since the guide rollers are easily moved, use care when tightening.
2. Again perform the FM envelope confirmation.

1.6.5 Final confirmation

1. Supply a video signal and perform recording, then play back.
   Confirm that the FM envelope satisfies the specifications during playback of alignment tape MH-2.
2. Perform the PB switching point adjustment of the Servo circuit. Refer to section 2.2.1.
3. Perform the audio PB level adjustment of the Audio circuit. Refer to section 2.4.2.
4. Perform overall confirmation of the Video circuit. Refer to section 2.3.

SECTION 2
ELECTRICAL ADJUSTMENTS

2.1 PREPARATION

Electrical adjustments are required after replacing circuit components and certain mechanical parts.
It is important to perform these adjustments only after all repairs and replacements have been completed. Also, do not attempt these adjustments unless the proper equipment is available.

2.1.1 Required test equipment

1. Color television or monitor
2. Oscilloscope: wide-band, dual-trace, triggered delayed sweep
3. Frequency counter
4. Audio oscillator
5. Audio voltmeter
6. Digital voltmeter
7. Signal generator: RF/IF sweep/marker
8. Signal generator: PAL color bar
9. Recording tape
10. Alignment tapes: (MH-2, MH-2L)
11. LP adjust board fixture (PUJ61839)
12. REG EXT board Ass'y (PUJ37697B)
13. Board extender (PUJ96003P)

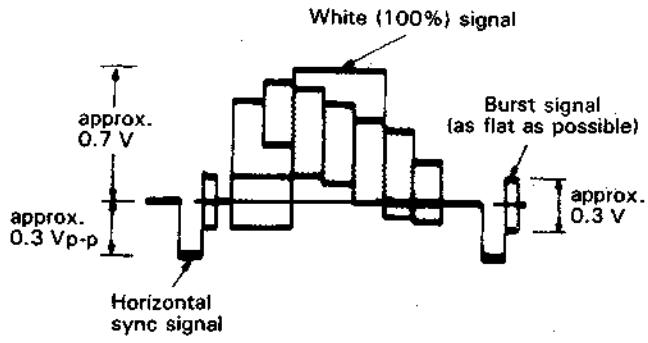


Fig. 2-1-1 Color bar signal of pattern generator

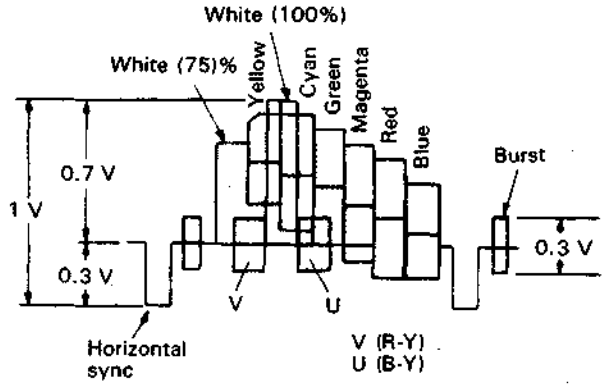


Fig. 2-1-2 Color bar signal waveform

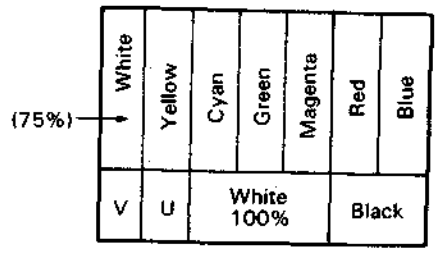


Fig. 2-1-3 Color bar pattern

2.1.2 Check and adjustment steps

The check and adjustment steps are provided in the following in the form of charts. For clarity, the nomenclature used in the charts is outlined below.

No.	Checks and adjustments are numbered in the recommended sequence in which they are to be performed.
Item	Name assigned to the particular check and adjustment step.
Check Point	Location to which measuring instrument (oscilloscope unless otherwise noted) is to be connected.
Adjustment Parts	Variable component (resistor, capacitor, etc.) to be adjusted in this step. Dash (—) indicates check only.
Signal & Mode	• Input signal required to perform adjustment. Dash (—) indicates that special signal is not required. • Equipment operating mode at time of check or adjustment.
Description	This column provides an explanation of the step, notes, adjustment values.
Color bar	Color bar signal as video input.
Stairstep	Stairstep signal as video input.
1 kHz	Supply a 1 kHz sinewave as audio input signal.
MH-2 Color bar	Play color bar segment of MH-2 alignment tape.
MH-2 Stairstep	Play stairstep segment of MH-2 alignment tape.
MH-2 1 kHz	Play 1 kHz audio signal segment of MH-2 alignment tape.
MH-2 RF sweep	Play RF sweep segment of MH-2 alignment tape.
MH-2L Color bar	Play color bar segment of MH-2L alignment tape.
MH-2L Stairstep	Play stairstep segment of MH-2L alignment tape.
Stop	Power on and machine in Stop mode.
REC	Recording mode
PB	Playback mode
REC ↓ (another mode)	Use blank tape, record, then play back in the mode specified.
Search	Search (FWDS and REVS) playback mode.
Slow	Slow motion playback mode.
Still	Playback then Pause.
A DUB	Audio dubbing mode.

2.2 SERVO CIRCUIT (0 8 SERVO board)

Note: Unless otherwise specified, test points and variable resistors are located on the SERVO board.
Before this adjustment "Control head phase adjustment" must be completed.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	PB Switching Point	CN102 pin 1	R79 (SP PB SW POINT)	• PB • MH-2 Stairstep • Trigger slope (−) • SP mode	1. Connect an oscilloscope to CN102 pin 1 MAIN board. 2. Play back the stairstep segment of MH-2 alignment tape. 3. Trigger the oscilloscope externally (− slope) with the signal from TP11 SERVO board (DRUM FF). 4. Adjust R79 to position the trigger point 6.5 ±0.5 H from V. sync.
		TP401 or Q106-b	R35 (LP PB SW POINT)	• PB • MH-2L Stairstep • Trigger slope (−) • LP mode	5. Perform adjustment in the same manner as SP mode. 6. Connect an oscilloscope to TP401 or Q106-b. Play back the stairstep segment of MH-2L alignment tape. 7. Adjust R35 to position the trigger point 6.5±0.5 H from V. Sync.
2	V. Pulse Position	MONITOR	R1 0 6 TERMINAL board	• Still • REC then PB • Color bar • SP mode	1. Record the color bar signal, then playback. 2. In the Still mode, observe the monitor and adjust R1 (rear panel) for the minimum vertical jitter.

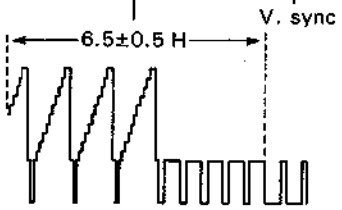


Fig. 2-2-1

2.3 PRE/REC CIRCUIT (4 3 PRE/REC board)

Note: Unless otherwise specified, test points and variable resistors are located on the PRE/REC board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Video Heads Resonance & Quality Factor	TP5	R2, CH1 C7 R1, CH2 C5	• SP mode • MH-2 RF Sweep • PB	1. Connect an oscilloscope to TP5 and trigger the oscilloscope externally with the signal from TP11 of the SERVO board. Use (−) trigger for CH1 and (+) for CH2. 2. Play back RF sweep segment of MH-2 alignment tape. Adjust the TRACKING control (R401) of the OPERATION board for maximum level of RF Sweep. 3. Turn R1 and R2 so as not to damp. Adjust C5 and C7 to set the CH1 and CH2 resonance points to 5 MHz. Adjust R1 to set the 5 MHz level 1 dB smaller than the 4 MHz level. 4. In the same manner, adjust R1 for CH2. If the CH1 and CH2 levels differ, adjust the higher level to match the lower with R1 and R2. 5. Connect the LP ADJUST BOARD Fixture (PUJ61839) to CN2 of the SERVO board. Perform adjustment in the same manner as SP mode CH1 and CH2. At TP5, adjust C13 and C15 resonance points to 5 MHz. Adjust R3 and R4 to set the 5 MHz level 1 dB smaller than the 4 MHz level. **Note:** Connect an oscilloscope ground to the shield cover.
		TP5	R3, CH1 C13 R4, CH2 C15	• LP mode • MH-2 RF Sweep • PB	

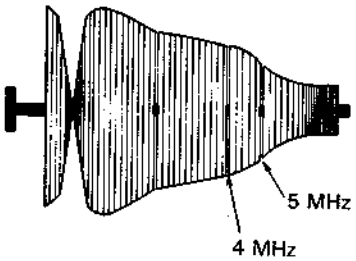


Fig. 2-3-1

2.4 VIDEO CIRCUIT (0 3 MAIN board)

Note: Unless otherwise specified, test points and variable resistors are located on the MAIN board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	REC FM Level	TP3 (REC FM) 4 3 Pre Rec Amp	R119 (REC FM ADJ)	• Color bar • REC • LP mode	1. Supply a color bar input signal. 2. Connect an oscilloscope to TP3 on PRE/REC board. 3. Adjust R119 so that the pedestal level of the vertical blanking component becomes 1.2 Vp-p. **Note:** Connect an oscilloscope ground to the shield cover.
2	VXO	TP306 (FSC)	R328 VXO	• PB • MH-2 Color bar • SP mode	1. Connect a frequency counter to TP306. 2. Playback the color bar segment of MH-2 alignment tape. 3. Adjust R328 for 4.433619 MHz ±50 Hz.
3	SP REC Color Level	TP304	R322	• PB • SP mode • REC then PB • Color bar	1. Connect an oscilloscope to TP304, playback a color bar segment of the MH-2 and observe color signal level. 2. Adjust the Tracking control (R401) of the OPERATION board for maximum level of the color waveform and make a note of the higher color level. 3. Set the Tracking control (R401) to the center click position. 4. Record the color bar signal then playback. Before recording, adjust R322 so that the higher level channel becomes 95 to 105% of the noted level during playback. At this time, confirm that the channel difference is with in 3 dB.
4	LP REC Color	TP304	R438	• PB • LP mode • REC then PB • Color bar	1. Connect the LP ADJUST BOARD Fixture (PUJ61839) to CN2 of the SERVO board. 2. Perform adjustment in the same manner as SP mode. 3. Remove the fixture. Record the color bar signal, then playback. Before recording, adjust R438 so that the higher level channel becomes 85 to 95% of the noted level during playback. At this time, confirm that the channel difference is within 3 dB as shown in Fig. 2-4-2.
5	Delayed Color Level	TP405	R401	• PB • SP mode • MH-2 Color bar	1. Connect an oscilloscope to TP405 and observe the signal level. 2. Connect jump wires between TP434, TP435 and GND. Again check the TP405 level. 3. Adjust R401 to obtain the same level.
6	0.5 H Delayed Video Level	TP221 TP222	R223	• LP mode • Color bar • REC then PB	**Note:** Perform the 0.5 H Delayed Video level adjustment after completing Delayed Color level. 1. Connect one channel of a dual trace oscilloscope to TP222 and the other channel to TP221. 2. Adjust R223 to obtain the same level in both cases.

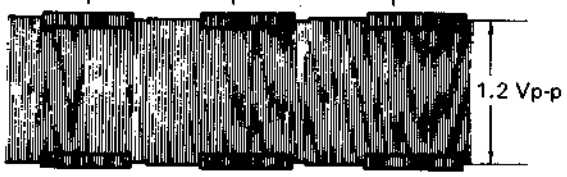


Fig. 2-4-1

Fig. 2-4-2

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
7	APC Error Phase	TP405 (PB Color) TP433 (7.8 kHz)	L401 (7.8 kHz TUNING)	• MH-2 Color bar • SP mode	1. Connect a jump wire between TP436 and GND. 2. Connect one channel of a dual trace oscilloscope to TP405 and the other channel to TP433 and observe the waveforms. 3. Adjust L401 to position the zero-cross 30 μsec ±3 μsec from the center of the burst signal as shown in Fig. 2-4-3.
8	0.5 H Delayed Jump DET	TP432 (VCO OUTPUT)	R418 (0.5H DELAYED Jump DET)	• No. Signal (AUX) • E-E	1. Supply 1/2 Vcc to TP431. 2. Connect a frequency counter to TP432. 3. Adjust R418 to obtain 30±0.2 kHz.
9	PB Frequency Response	MONITOR	R110 R202	• SP mode • Color bar • REC then PB • LP mode	1. Set the SHARPNESS Control (R402) of the OPERATION board to center click position. 2. Record then play back a color bar signal. 3. While observing the monitor, set R110 the optimum point. 4. Perform adjustment in the same manner as SP mode. 5. While observing the monitor, set R202 to the optimum point.
10	SECAM DET (*E/EG Models)	TP310 (S DET ADJ)	L351 (1/2 fH TUNING) R355 SECAM DET. ADJ	• SECAM color bar • E-E • SP mode • REC then PB	1. Connect an oscilloscope to TP310. 2. Adjust L351 so that transition step becomes centered between "A" and "B" as shown in Fig. 2-4-4. 3. Record then playback. 4. Adjust R355 for 6.0±0.5 Vp-p.

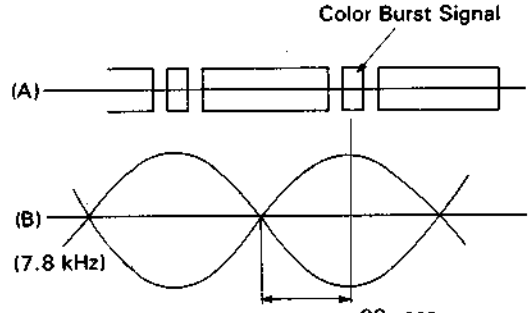
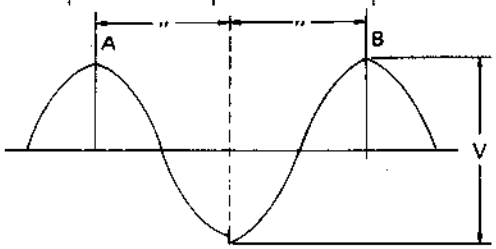


Fig. 2-4-3



Set this point to center position between points "A" and "B".

V = more than 4 Vp-p in REC
V = 6.0±0.5 Vp-p in PB

Fig. 2-4-4

2.5 AUDIO CIRCUIT ([0][9] AUDIO board)

Note: Unless otherwise specified, test points and variable resistors are located on the AUDIO board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Audio Bias Level	TP31 BIAS LEVEL	R20 BIAS LEVEL	• REC • SP mode	1. Connect a digital voltmeter between TP31 and TP 32. 2. Set for REC mode without signal. 3. Adjust R15 for 3.0 mV±0.2 mVrms.
2	Audio PB Level	AUDIO OUT	R5 PB LEVEL	• REC • SP mode	1. Connect a oscilloscope to AUDIO OUT. 2. Supply an audio signal (−8 dBs/1 kHz) to AUDIO IN and record together with a VIDEO signal, then playback. 3. Adjust R5 so that the audio output level during playback becomes −6±1 dBs. **Note:** Use PERI CONNECTOR.

2.6 TIMER CIRCUIT ([1][5] TIMER board)

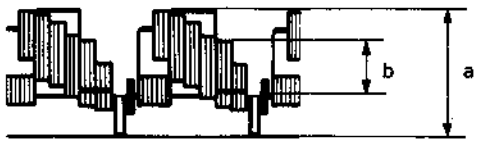
Note: Unless otherwise specified, test points and variable resistors are located on the TIMER board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	Timer Clock	TP2	C101	• E-E	1. Connect the frequency counter to TP2 (OSC OUT) and TP3 (GND). 2. Short GND and TP1 (TEST). Then short the leads of electrolytic capacitor C7 once in order to reset IC 1. 3. Adjust C101 for 2048.000 Hz±0.002 Hz or (488.2813±0.005 μ sec). **Note:** 1) Resetting IC 1 while TP1 and GND are shorted provides the TEST mode.

2.7 TUNER/IF CIRCUIT ([0][7] TUNER/IF board)

Note: Unless otherwise specified, test points and variable resistors are located on the TUNER/IF board.

No.	Item	Check Point	Adjustment Parts	Signal & Mode	Description
1	VCO	MONITOR	T2	• TV broadcast • Tuner mode	1. Receive a color broadcast. 2. Adjust T2 to obtain best picture on the monitor.
2	RF AGC	MONITOR	R11	• TV broadcast • Tuner mode	**Note:** Adjust R11 (RF AGC) to correct for excess noise in the picture or when streaky cross interference occurs due to strong electrical fields. 1. Adjust R11 to minimize noise or steaks on the TV screen. 2. Check for absence of abnormality on all channels.
3	VPS Y Level (E/EG only)	CN3-pin 1 (VPS OUT)	R16	• Modulated signal • Tuner mode	1. Receive an 87.5% modulated signal. Adjust R16 to obtain a maximum Y level (including sync) of 2.0 Vp-p from pin 1 (VPS OUT) of CN3.
4	Color Level	IC1-18 or TP110 (VIDEO	R42	• TV broadcast • Tuner mode	1. Supply a color bar signal from a TV channel signal generator and select the channel corresponding to the generator. 2. Adjust R42 to produce signal waveform as shown in Fig. 2-7-1. Altenate method 1. Receive a color broadcast. 2. Adjust R42 so that the burst level becomes 2/3 of the sync level.

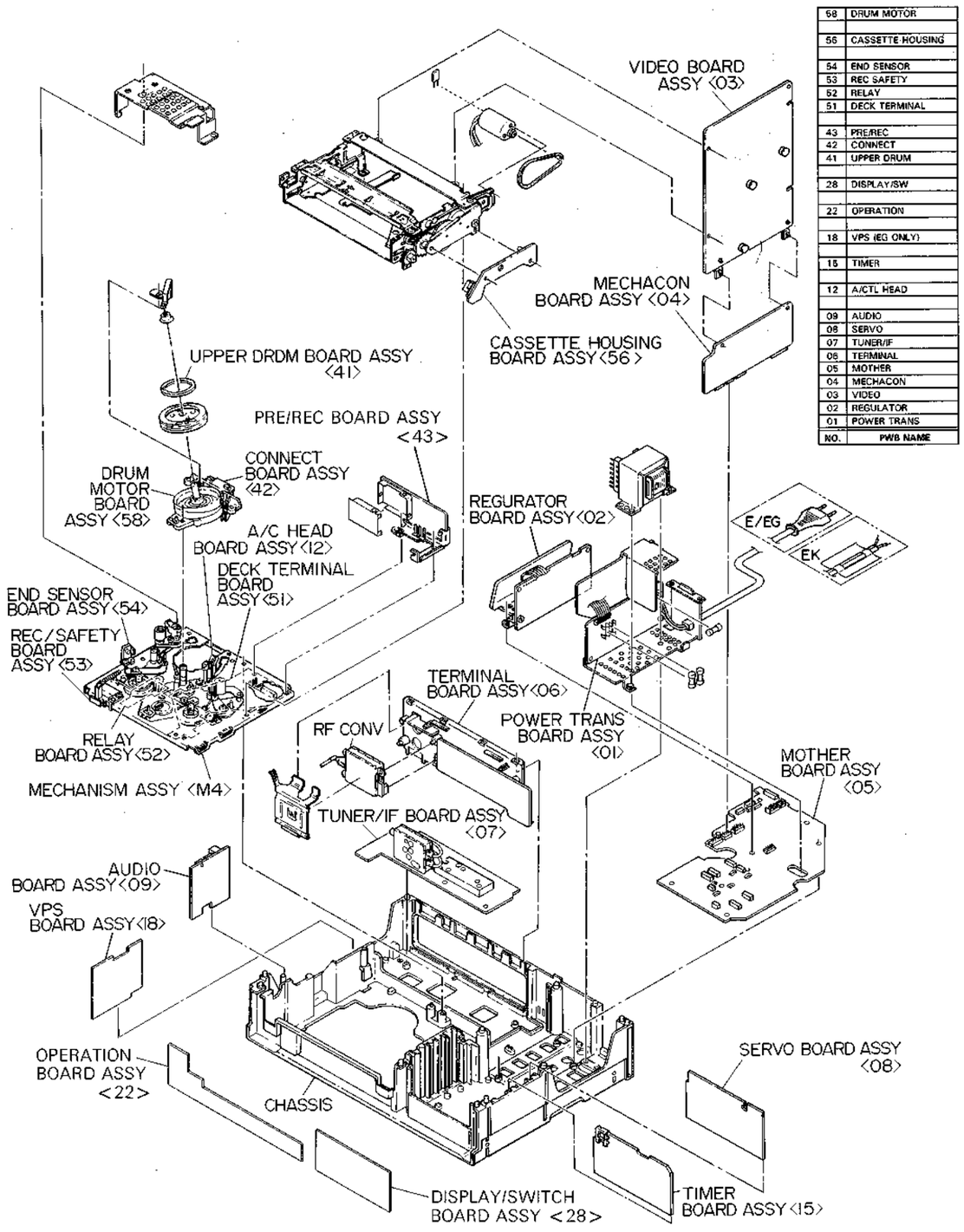


Y level = 1
Magneta level = 0.48 a : b = 1 : 0.48

Fig. 2-7-1

SECTION 3
CHARTS AND DIAGRAMS

3.1 CIRCUIT BOARD LOCATIONS



3.2 GENERAL INFORMATIONS

3.2.1 Connections

Note:
Unless otherwise specified, only signal input flow is indicated.
Connection arrows indicate only signal outputs.

: Connector

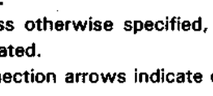
: Direct connection

: Board in connector

: Connected pattern in the board.
Abbreviations
V : Video M : Mechacon
S : Servo A : Audio
VS : Signal flow from video to servo.

3.2.2 Indications

AUX : Active only at high.
$\overline{AUX}$: Active only at low.
$\tilde{A}UX$: Active only at middle.
$\bar{A}UX$: Active only at open.



: Active only at low for electronic switch.
: Active only at high for electronic switch.

: Low pass filter.

: High pass filter.

: Band pass filter.

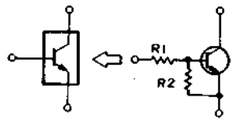
: Limiter.

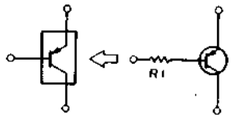
: Detector

: Amplifier.

: Mixer stage.

3.2.3 Digital transistor





DTA114T
T mark only

Note:
The digital transistor includes built in resistors.
It features small size and high reliability.
Both PNP and NPN types are available.

Uses:
Inverter, Interface, driver circuits.

3.2.4 Siganl flow in the schematic

Recording signal path
Playback signal path
REC/PB signal path

3.2.5 Schematic diagram values

Unless otherwise specified.
1. All resistance values are in ohms, 1/6 W, 1/8 W, (refer to parts list).
2. All capacitance values are in μF, (P; PF).
3. All inductance values are in μH, (m; mH).
4. All diodes are 1SS133 or MA165, (refer to parts list).
5. Voltages are DC-measured (reference to ground) with a digital voltmeter during recording (SP mode) and playback (SP mode) with alignment tape. Where voltages differ between recording and playback, the voltage during playback is shown in parentheses.
6. Waveforms (VIDEO System) are measured (reference to ground) with a color bar during recording (SP mode) and playback (SP mode) with alignment tape.
7. Waveforms (AUDIO System) are measured (reference to ground) with 1 kHz (−8 dBs) during recording and playback with alignment tape (1 kHz).
8. Shaded (▒▒) parts are critical for safety. Replace only with specified parts numbers.

3-1

3.3 ABBREVIATIONS USED IN THE SCHEMATIC DIAGRAM

A	AC	: Alternating Current
	ACC	: Automatic Color Control
	ACCEL	: Acceleration
	A/CTL	: Audio/Control
	ADC	: Analog to Digital Converter
	ADD	: Adder
	ADRS	: Address
	ADJ	: Adjustment
	A DUB	: Audio Dubbing
	AE	: Audio Erase
	AEF	: Automatic Editing Function
	AFC	: Automatic Frequency Control
	AFT	: Automatic Fine Tuning
	AGC	: Automatic Gain Control
	AH	: Audio Head
	AL	: After Loading
	ALC	: Automatic Light Compensation Automatic Level Control
	AM	: Amplitude Modulation
	AMP	: Amplifier
	ANT	: Antenna
	APC	: Automatic Pedestal Control Automatic Phase Control
	APL	: Average Picture Level
	A/S/M	: Audio/Servo/Mechacon
	ASS'Y	: Assembly
	ATT	: Attenuator
	AUD	: Audio
	AUTO	: Automatic
	AUX	: Auxiliary
B	B	: Base
	BAL	: Balance
	BATT	: Battery
	BFP	: Burst Flag Pulse
	BIT	: Binary Digit
	BLK	: Black, Blanking
	BLU	: Blue
	BILING	: Bilingual
	BPF	: Bandpass Filter
	BRK	: Brake
	BRN	: Brown
	BT	: Band Tuning
	BUFF	: Buffer
	BW or B/W	: Black and White
C	C	: Capacitance, Collector, Color
	CAP	: Capstan, Capacitor
	CAR	: Carrier
	CARR	: Carrier
	CASS	: Cassette
	CCD	: Charge Coupled Device
	CCT	: Circuit
	CD	: Count Down
	CE	: Chip Enable
	CF	: Ceramic Filter
	CH	: Channel
	CHG	: Charge
	CHROMA	: Chrominance
	CLK	: Clock
	CLR	: Clear
	CMD	: Command
	CNT	: Count, Counter
	COL	: Color
	COM	: Common
	COMB	: Combination Comb Filter
	COMP	: Comparator Composite Compensation
	CONN	: Connector
	CONV	: Converter
	CP	: Circuit Protector Clamp Pulse
	CPC	: Capstan Phase Control
	CTL	: Control
D	D	: Drum, Digital, Diode, Drain
	DAC	: Digital to Analog Converter
	dB	: Decibel
	DC	: Direct Current
	DEC	: Decoder
	DEMOD	: Demodulator
	DEMUX	: Demultiplexer
	DET	: Detector
	DEV	: Deviation
	DIF	: Differential
	DISCR	: Discriminator
	DL	: Delay Line
	DOC	: Dropout Compensator
	DOD	: Drop Out Detector
	DPC	: Drum Phase Control
E	E	: Edit, Emitter
	E-E	: Electric to Electric
	EF	: Emitter-Follower
	EMP	: Emphasis
	EN	: Enable
	ENC	: Encoder
	ENV	: Envelope
	EP	: Extended Play
	EQ	: Equalizer
	ES	: Electronic Switch
	ESNS	: End Sensor
	EXP	: Expander
	EXT	: External
F	F	: Farad, Fuse
	F ADV	: Frame Advance
	FDP	: Fluorescent Display Panel
	FE	: Full Erase
	FET	: Field Effect Transistor
	FF	: Fast Forward Flipflop
	FG	: Frequency Generator
	FM	: Frequency Modulation
	FMA	: FM Audio
	FR	: Full Recording, Frame, Fusible Resistor
	FREQ	: Frequency
	F-V CONV	: Frequency to Voltage Converter
	FWD	: Forward
	FWD S	: Forward Search
G	G	: Green, Gate, Grid
	GEN	: Generator
	GND	: Ground
	GRN	: Green
	GRY	: Gray
H	H	: High, Henry, Hour
	HG	: Hall Generator
	HPF	: Highpass Filter
	Hz	: Herz
I	IC	: Integrated Circuit
	ID	: Identification (Pulse)
	IF	: Intermediate Frequency
	IFR	: Infrared
	IFT	: Intermediate Frequency Transformer
	IND	: Indicator
	INH	: Inhibit
	INS	: Insert
	INT	: Internal, Interrupt
	INV	: Inverter
	I/O	: Input/Output
	IR	: Infrared
L	L	: Low, Left
	LIM	: Limiter
	LIN	: Linearity
	LOAD	: Loading (Cassette)
	LP	: Long Play
	LPF	: Lowpass Filter

M	M	: Motor, Mega
	MAX	: Maximum
	MDA	: Motor Drive Amplifier
	MECHACON	: Mechanism Control
	MIC	: Microphone
	MIN	: Minimum
	MIX	: Mixer, Mixing
	MMV	: Monostable Multivibrator
	MOD	: Modulation, Modulator
	MODEM	: Modulator-Demodulator
	MON	: Monitor
	MPX	: Multiplexer, Multiplex
	MS	: Mode Select
N	NAND	: Not-And
	NC	: Not Connected, Normally Closed
	NFB	: Negative Feedback
	NLN	: Non-Linear
	NO	: Normally Open
	NOR	: Normal, Not-Or
	NR	: Noise Reduction
O	OP	: Operation
	OPAMP	: Operational Amplifier
	ORN	: Orange
	OSC	: Oscillator
P	PB	: Playback
	PC	: Photocoupler, Pulse Counter
	PCM	: Pulse Code Modulation
	PG	: Pulse Generator
	PGM	: Program
	PI	: Photo Interrupter
	PIF	: Picture Intermediate Frequency
	PLA	: Programmable Logic Array
	PLL	: Phase Locked Loop
	POS	: Position
	p-p	: Peak-to-Peak
	PREAMP	: Preamplifier
	P/S	: Pause/Still
	PSC	: Pulse Swallowing Control
	PU	: Pickup
	PUT	: Programmable Unijunction Transistor
	PWM	: Pulse Width Modulation
	PWR	: Power
Q	Q	: Quality Factor
R	R	: Red, Right
	RA	: Resistor Array
	RAE	: Random Access Enable
	RAM	: Random Access Memory
	REC	: Recording
	REF	: Reference
	REG	: Regulated, Regulator
	REM	: Remote
	REMOCON	: Remote Control (Unit)
	REV	: Reverse
	REV S	: Reverse Search
	REW	: Rewind
	R/P	: Record/Playback
	RPT	: Repeat
	RST	: Reset
	RT	: Rotary Transformer
	RUN	: Running
	RY	: Relay
S	SAW	: Sawtooth, Surface Acoustic Wave
	SC	: Subcarrier, Simulcast
	SCH	: Search
	SEL	: Select, Selector
	SENS	: Sensor
	SEP	: Separator
	SF	: Source Follower
	SFF	: Short Fast Forward
	SIF	: Sound Intermediate Frequency
	SHARP	: Sharpness
	SN	: Signal to Noise Ratio
	SOL	: Solenoid
	SP	: Standard Play
	SREV	: Search Reverse
	SREW	: Short Rewind
	S/S	: Slow/Still
	SSG	: Sync Signal Generator
	SSNS	: Start Sensor
	STD	: Strobe Data, Standard
	SUP	: Supply
	SW	: Switch
	SWD	: Switched
	SYNC	: Synchronization
T	TF	: Thermal Fuse
	TIM	: Timing
	TK	: Tracking
	TNR	: Tuner
	TP	: Test Point
	TPZD	: Trapezoid
	TR	: Transistor, Trimmer
	TRANS	: Transformer
	TU	: Take-up
U	UL	: Unloading
	UNREG	: Unregulated
	UNSW	: Unswitched
V	V	: Vertical, Volt
	VCO	: Voltage Controlled Oscillator
	VD	: Vertical Drive
	VIF	: Video Intermediate Frequency
	VLT	: Violet
	VR	: Variable Resistor
	VS	: Video and Sync
	V/T	: Video/Television
	V/U	: VHF/UHF
	VXO	: Variable Crystal Oscillator
W	W	: Watt
	W & D	: White and Dark
	WHT	: White
X	XTAL	: Crystal
Y	Y	: Luminance
	YEL	: Yellow

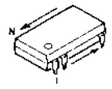
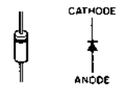
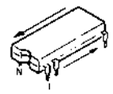
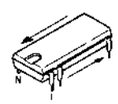
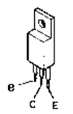
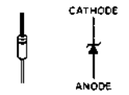
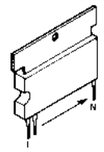
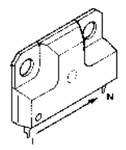
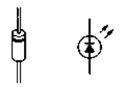
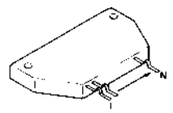
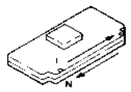
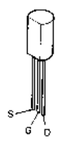
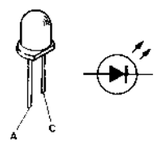
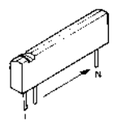
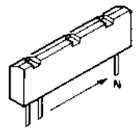
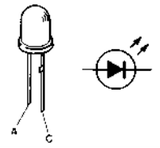
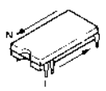
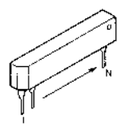
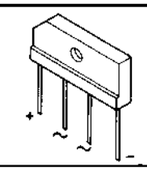
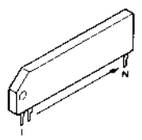
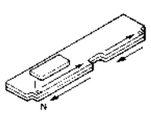
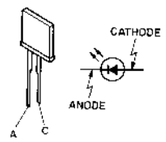
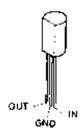
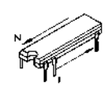
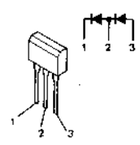
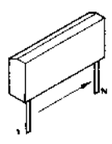
3.4 MAIN TYPES OF ACTIVE AND PACKAGE CIRCUITS

INTEGRATED CIRCUIT		
	NAME	L
A	AN3592K AN3994NK	6A
B	BA7007 BA7021 BX6325	6B 6B
H	HA11870NT HD49703NT	6A 2A
L	LA7224	6B
M	MSM6989RS M50440-394SP M50440-397SP M50965-628SP M51365P M51796P M5278L05 M54644BL M58655P	2B 2B 2A 7A 3B
P	PU22046A PU22282A	4B 7B
S	STK5481 S-8053ALB	4A 8A
T	TA7374P TA8400P	8B 6A
U	UPC324C UPD75216ACW-041 UPD7538ACU-214 UPD82C43CY	6A 6A 8B
V	VC2023A-2	6A
	7VT12	9A

TRANSISTOR		
	NAME	L
D	DTA124ES DTA144EF DTA144WS DTC114ES DTC124ES DTC143ES DTC144ES DTC144WS	3C 1D 3C 3C 3C 3C 3C 3C
P	PN268R	
2SA	2SA1309 2SA720 2SA933	3C 2C 3C
2SB	2SB1010 2SB1030 2SB641 2SB643 2SB808	3C 3C 1D 1D 3C
2SC	2SC1317 2SC1740 2SC2655 2SC3311 2SC3327 2SC3354	2C 3C 1C 3C 3C 1D
2SD	2SD1449 2SD1468 2SD1863 2SD636 2SD637	3C 1C 1D 1D
2SK	2SK381 2SK656	4C 3D

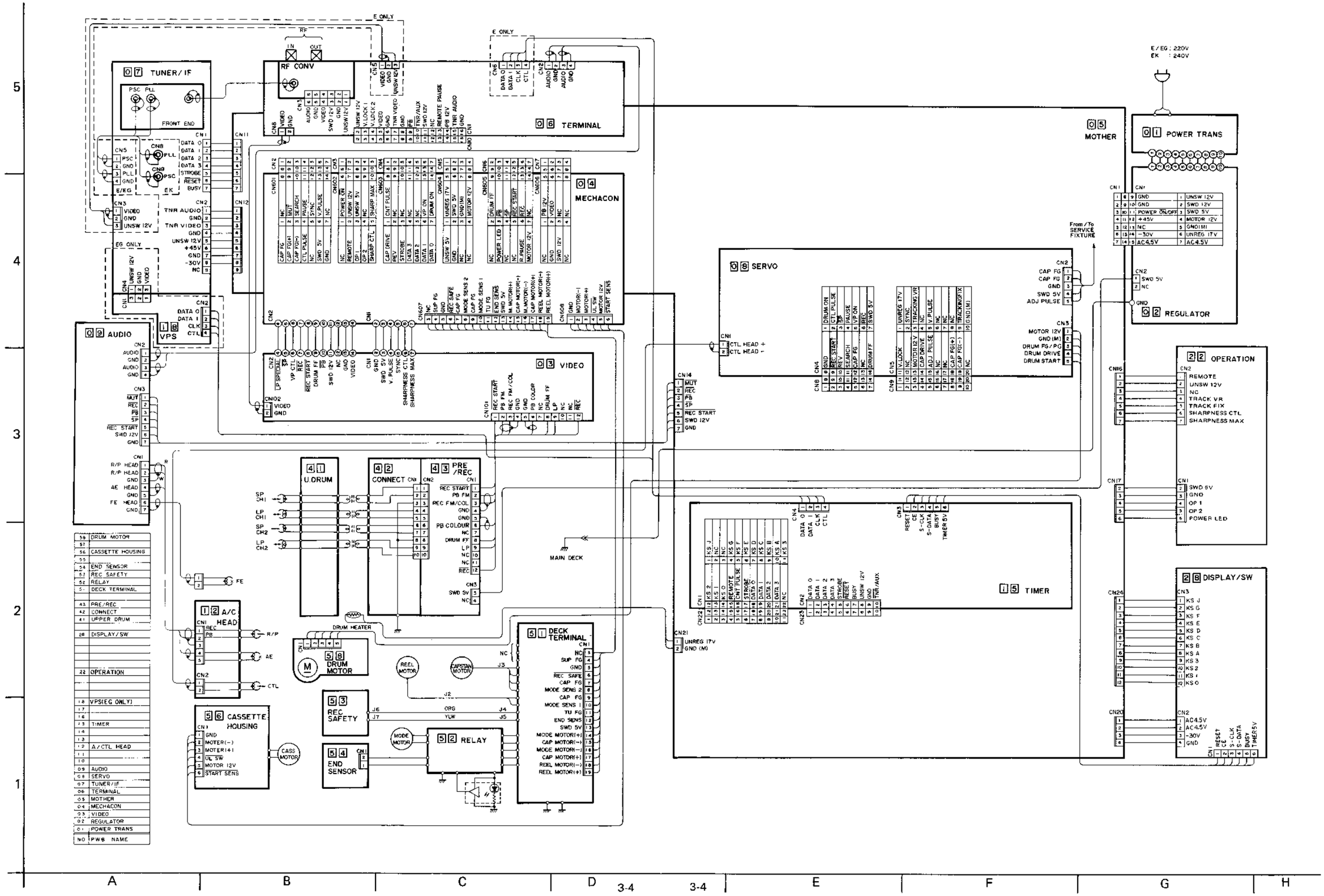
DIODE		
	NAME	L
D	DA210S PD49PI	8E 7E
E	ERA15-02 E-452-2	1E 2E
H	HZS7.5EB2 HZS9.1EB1 HZ30-2 HZS4.7EB2 HZS5.6EB1 HZS6.8EB2	2E 2E 2E 2E 2E
M	MA161 MA165 MA27W(A) MTZJ5.1B MTZ10B MTZ12B MTZ5.1B MTZ7.5B	1E 1E 7E 2E 2E 2E 2E
O	OA90	1E
R	RD6.2ES-T1B1 RD8.2EB1 RD7.5EB2 RD9.1ES-T1B2	2E 2E 2E 2E
S	SLR-34VC3F S4VB10 S5688G	4E 5E 1E
	1SS132 1SS133 10E2	1E 1E 1E

Note: FOR INSTANCE, AN3592 →
6A: SEE COLUMN 6, LINE A

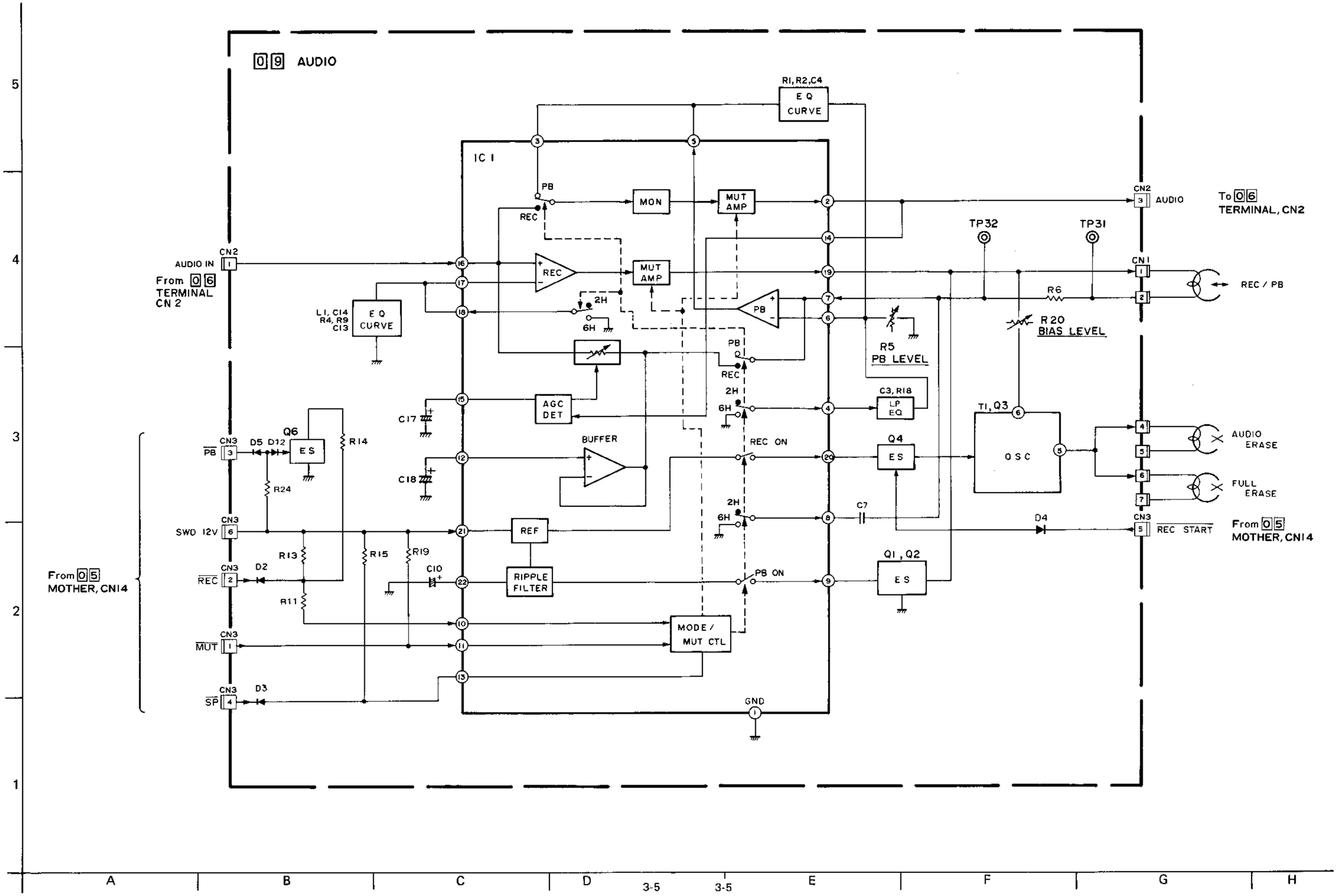
	Integrated Circuit		Transistor		Diode
	A	B	C	D	E
1					
2					
3					
4					
5					
6					
7					
8					
9					

3-3

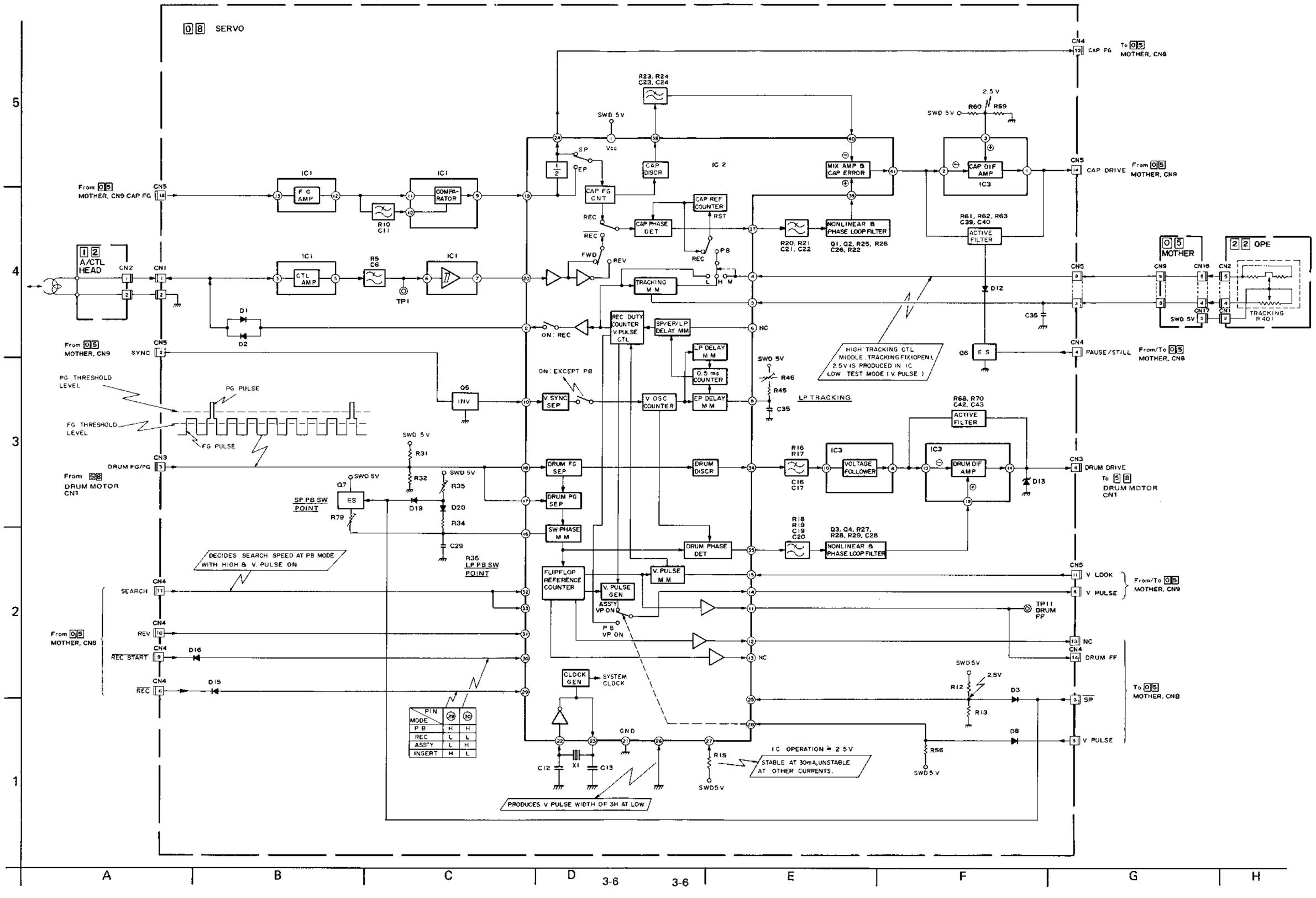
3.5 BOARD INTERCONNECTION DIAGRAM



3.6 AUDIO BLOCK DIAGRAM

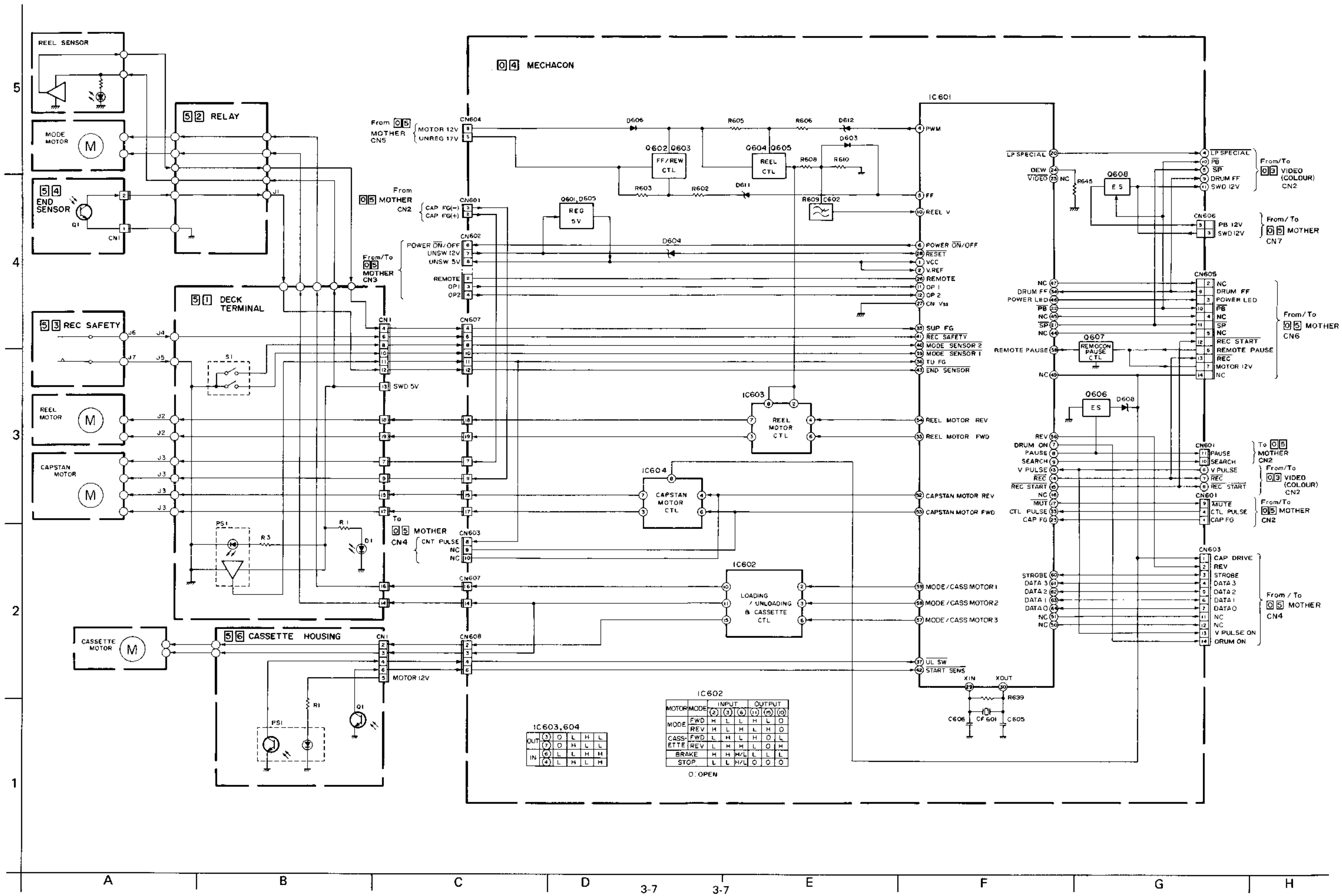


3.7 SERVO BLOCK DIAGRAM



3-6

3.8 MECHANISM CONTROL BLOCK DIAGRAM



IC603,604

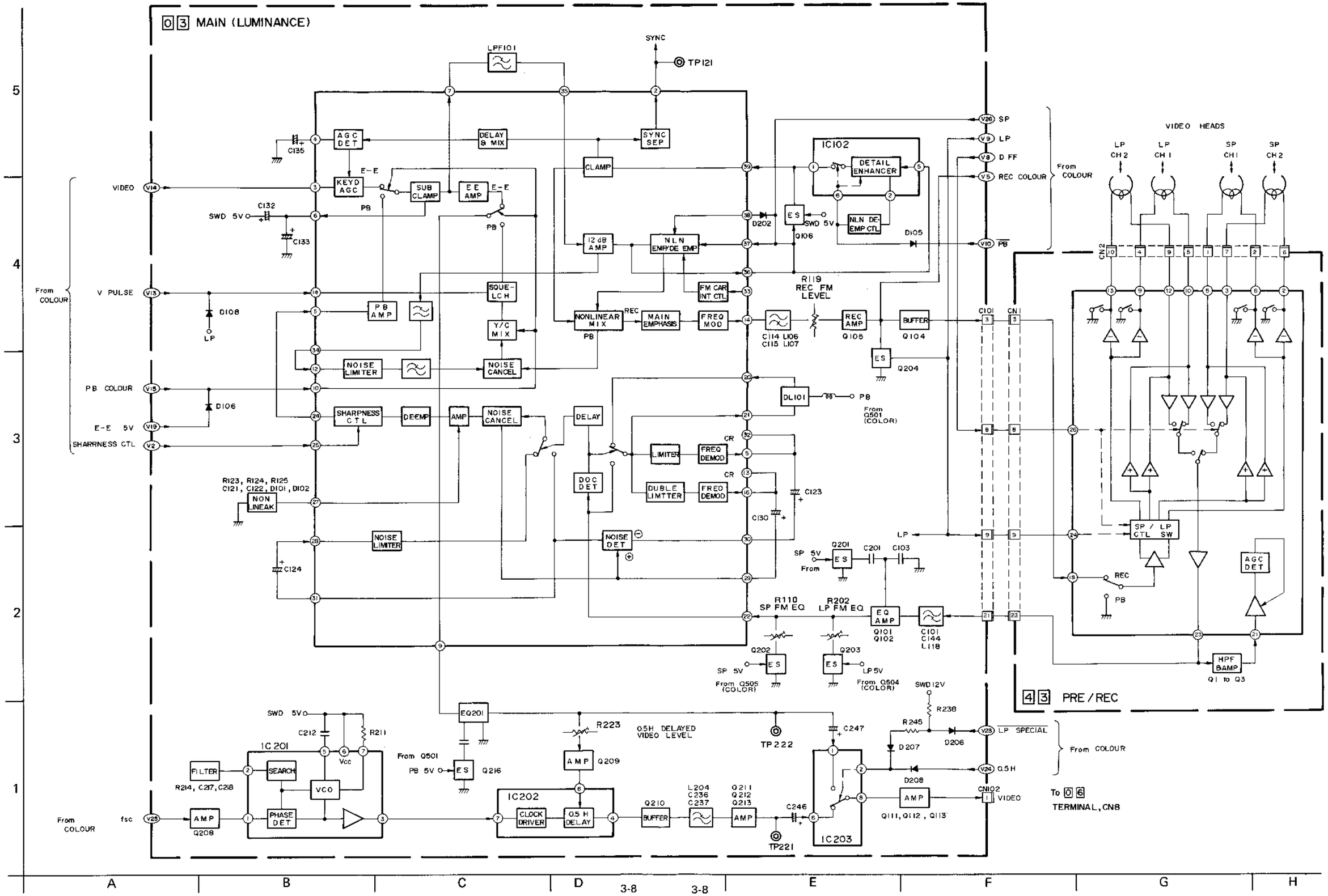
OUT	③	O	L	H	L
	⑦	O	H	L	L
IN	⑥	L	L	H	H
	④	L	H	L	H

IC602

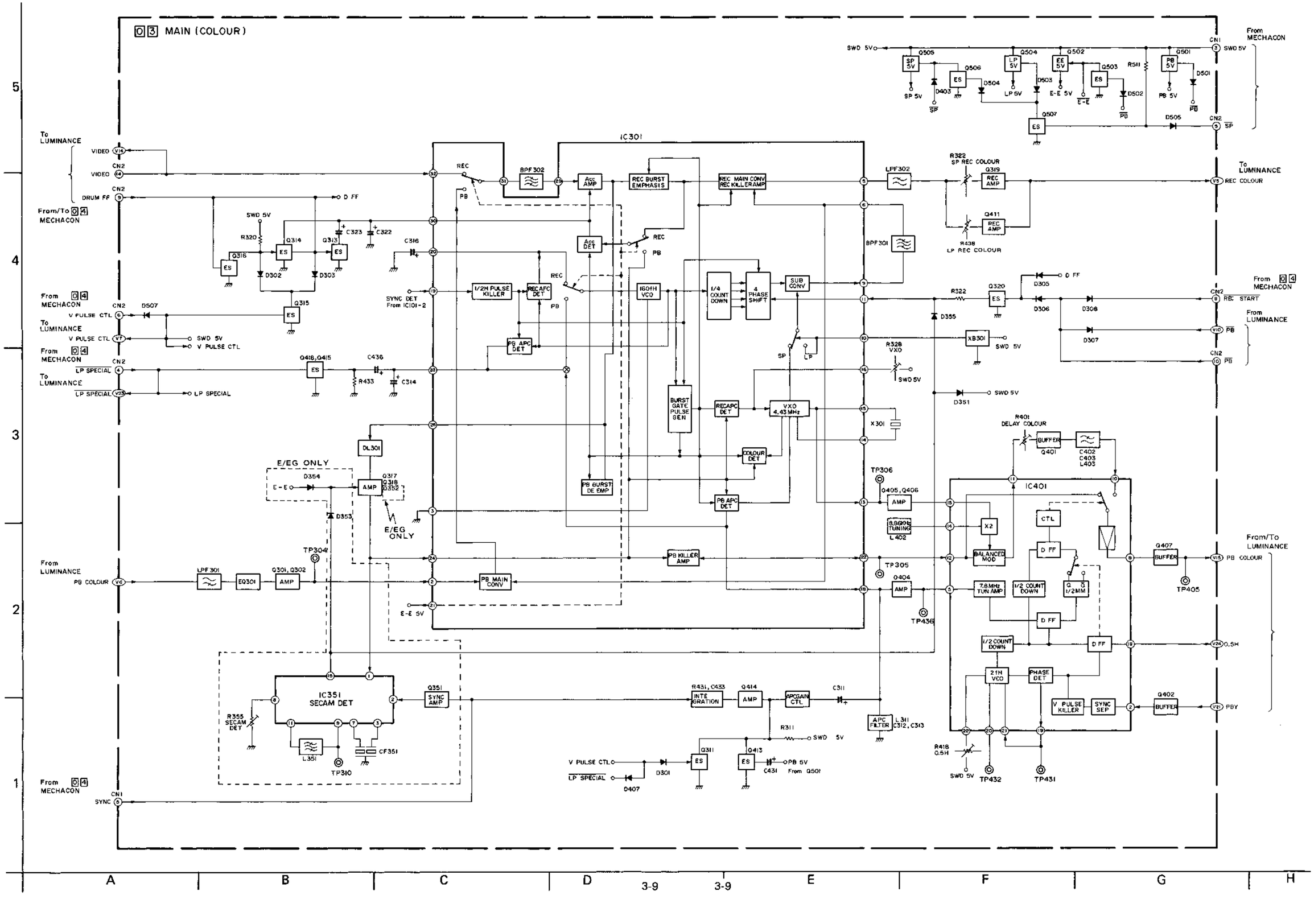
MOTOR	MODE	INPUT ②	INPUT ③	INPUT ⑥	OUTPUT ⑪	OUTPUT ⑮	OUTPUT ⑩
MODE	FWD	H	L	L	H	L	O
	REV	H	L	H	L	H	O
CASS-ETTE	FWD	L	H	L	H	O	L
	REV	L	H	H	L	O	H
BRAKE		H	H	H/L	L	L	L
STOP		L	L	H/L	O	O	O

O: OPEN

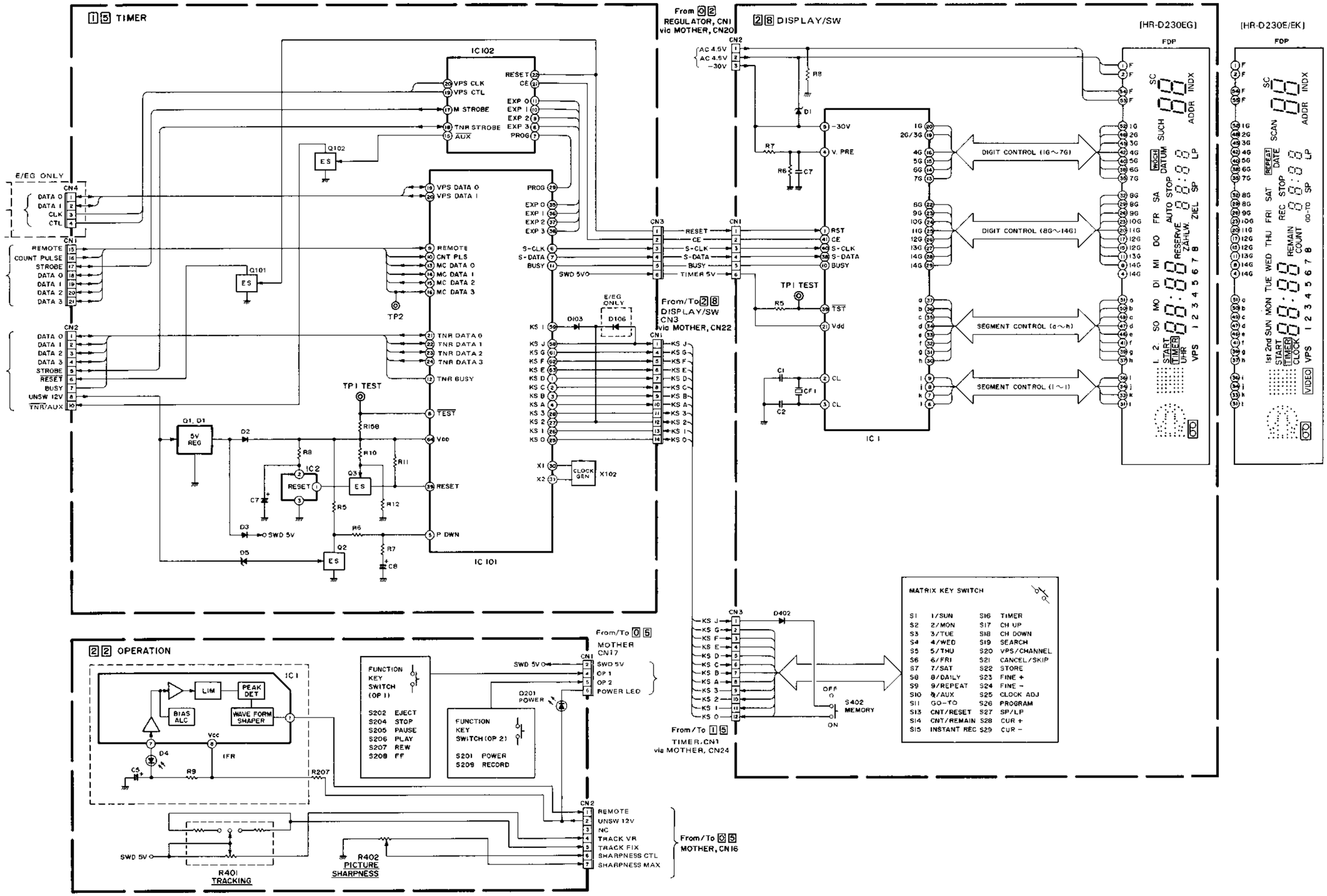
3.9 VIDEO (LUMINANCE) AND PRE/REC BLOCK DIAGRAM



3.10 VIDEO (COLOR) BLOCK DIAGRAM

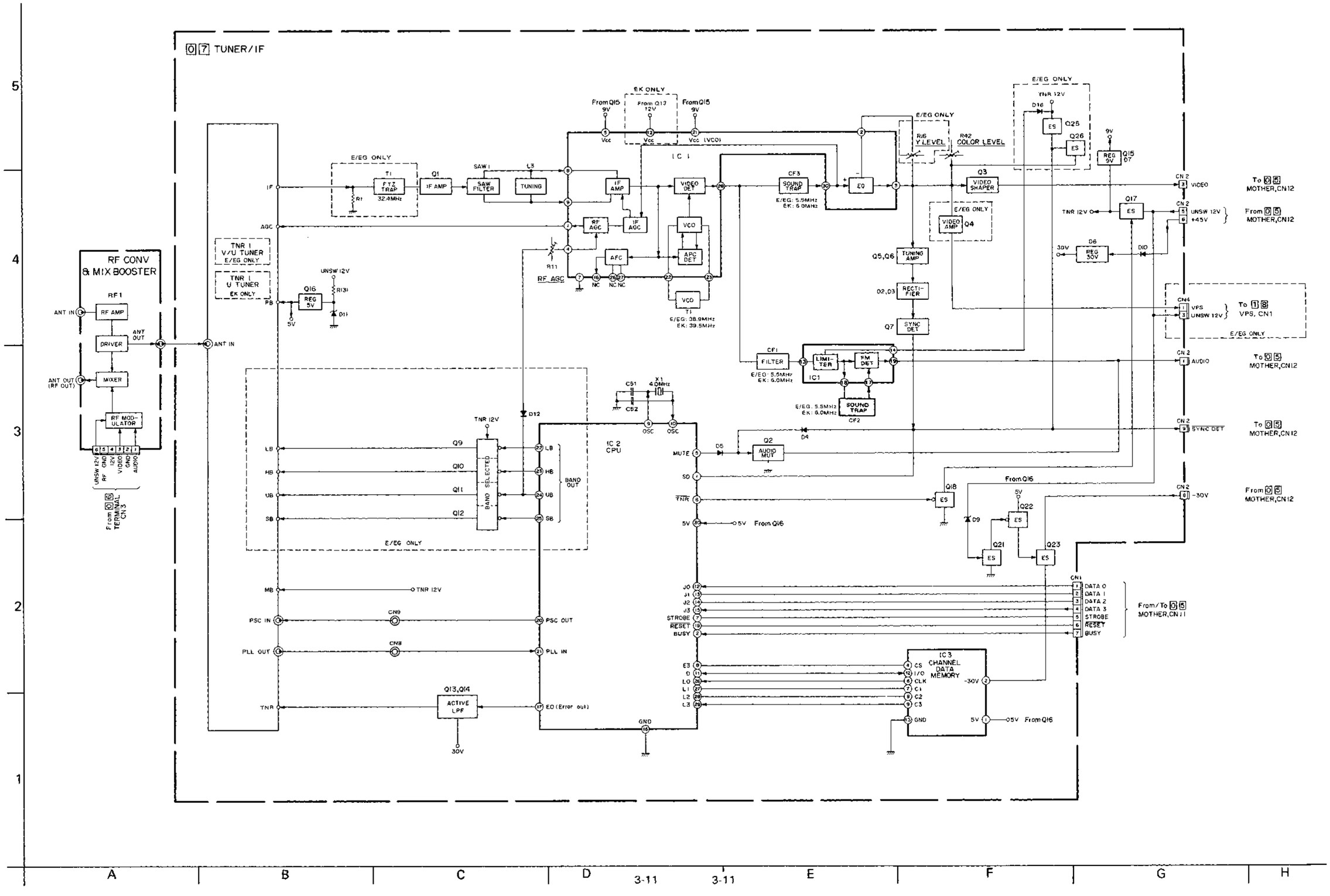


TIMER, DISPLAY/SWITCH AND OPERATION BLOCK DIAGRAMS

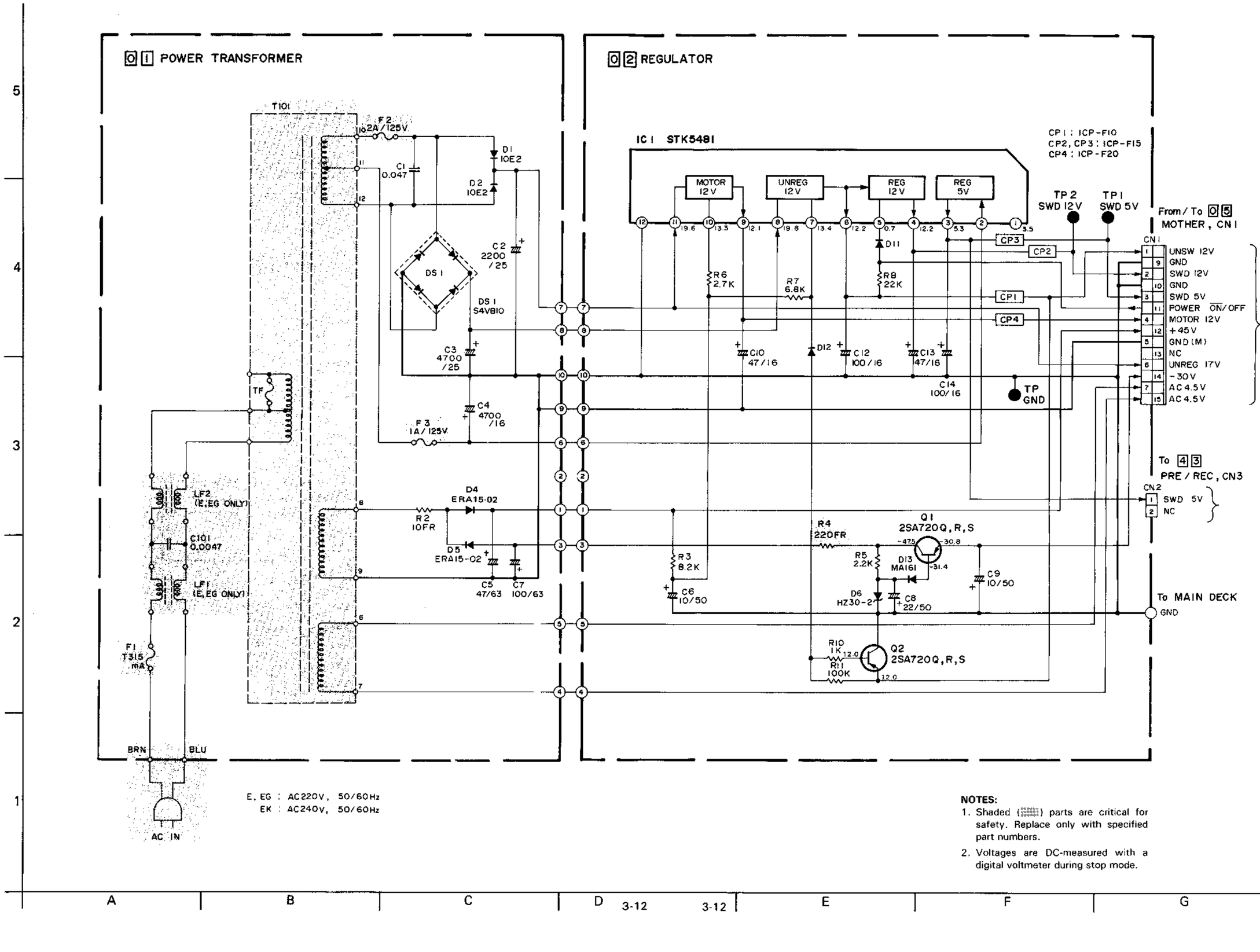


A | B | C | D | 3-10 | 3-10 | E | F | G | H

3.12 TUNER/IF BLOCK DIAGRAM



3.13 POWER SUPPLY SCHEMATIC DIAGRAMS



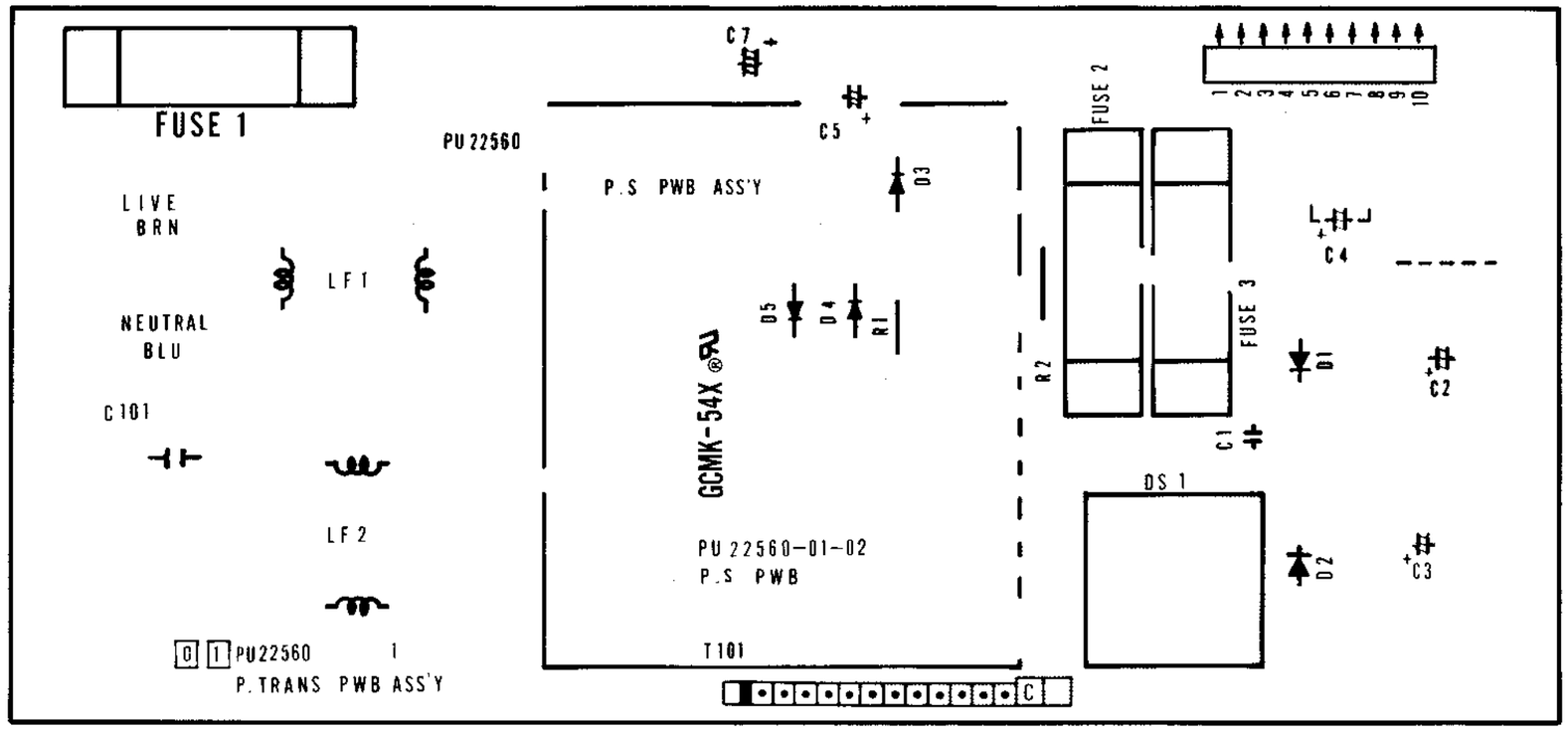
NOTES:

1. Shaded (▒▒▒) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

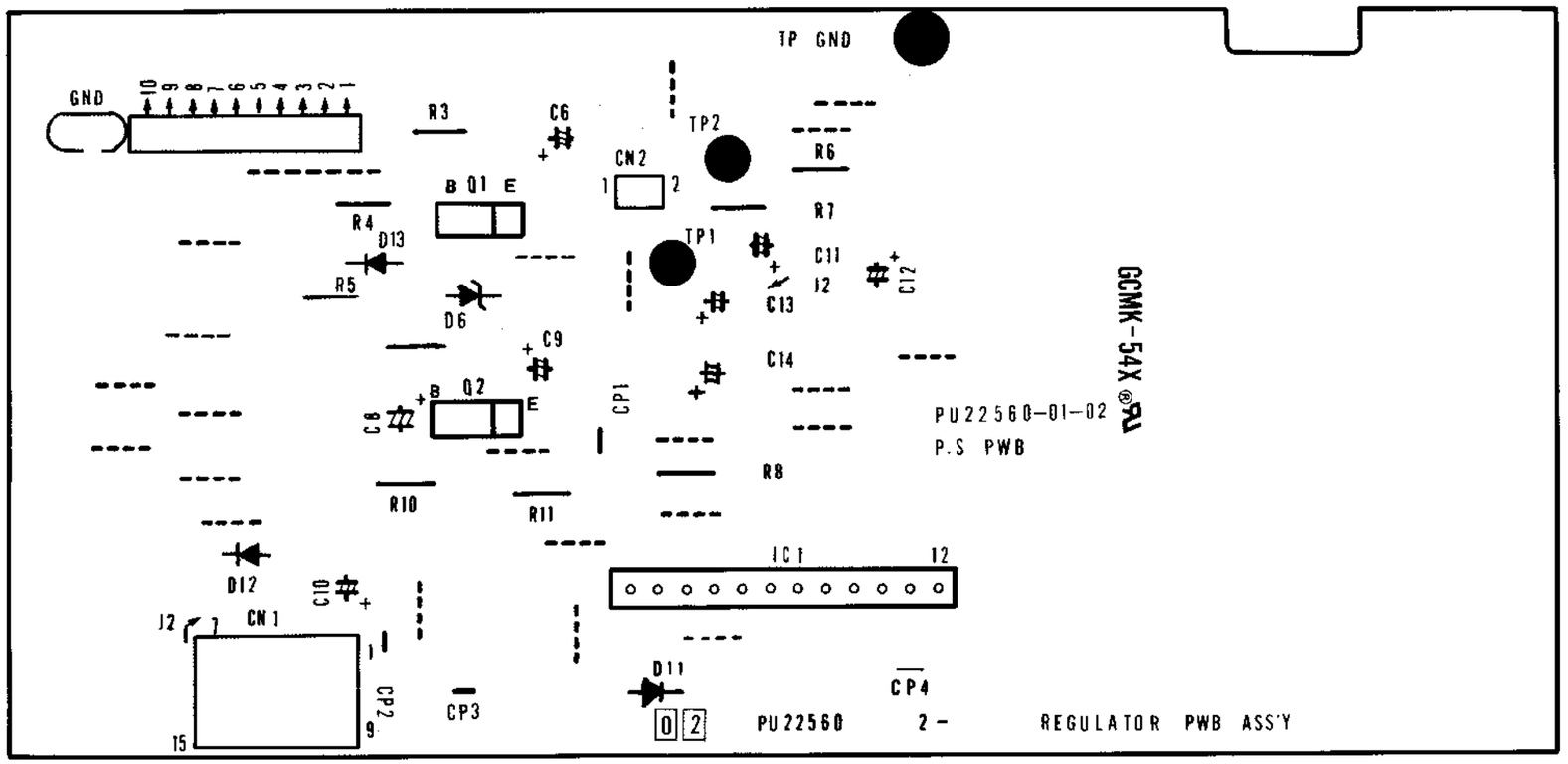
3-12

3.14 POWER SUPPLY CIRCUIT BOARDS

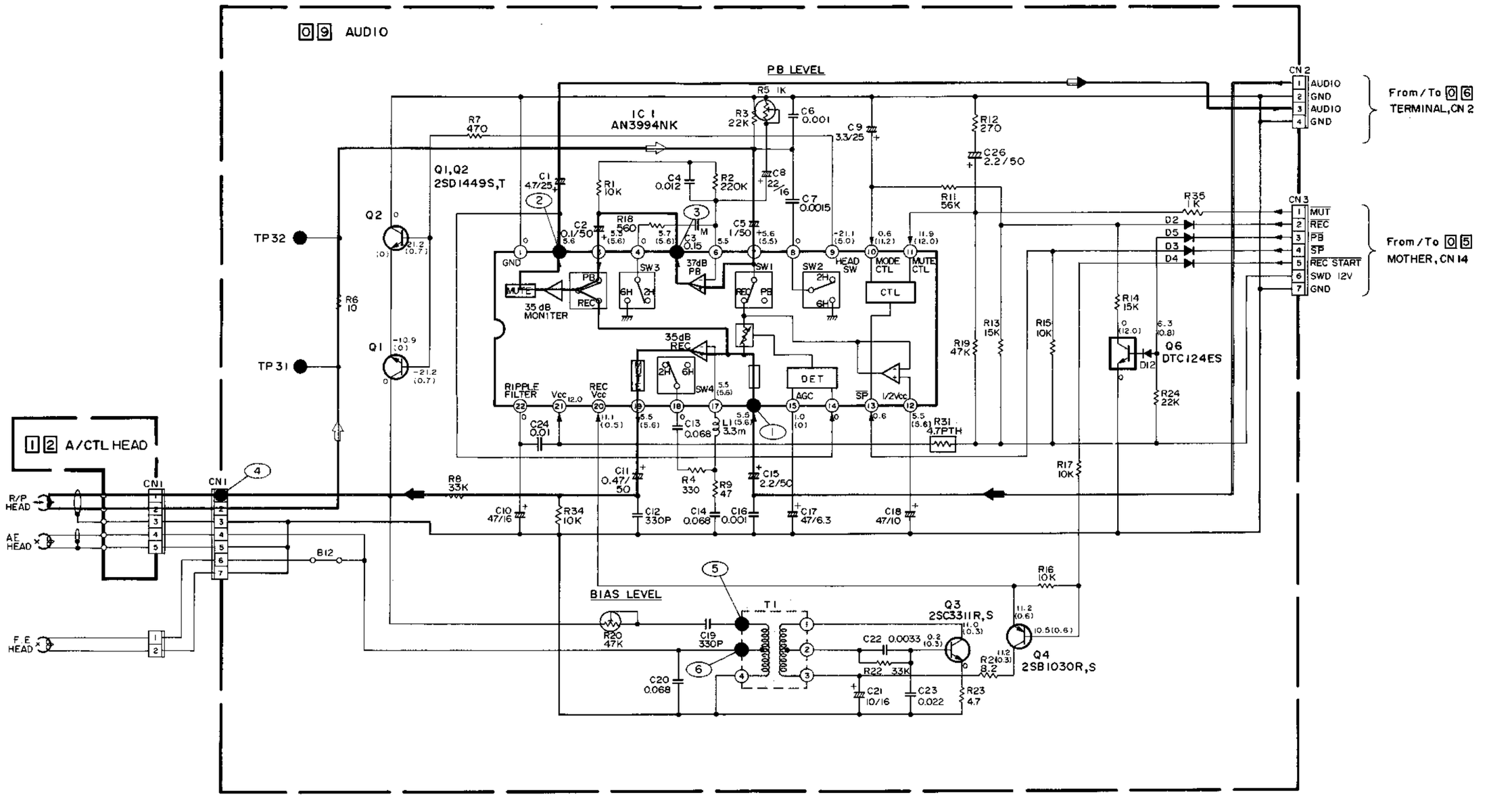
—POWER TRANSFORMER—



—REGULATOR—



3.15 AUDIO SCHEMATIC DIAGRAM



NOTE: Shaded (▒▒) parts are critical for safety. Replace only with specified part numbers.

3-14

—Waveforms of AUDIO circuit—

1
IC1-16
REC 20 mVp-p

2
IC1-2
0.7 Vp-p
REC, PB

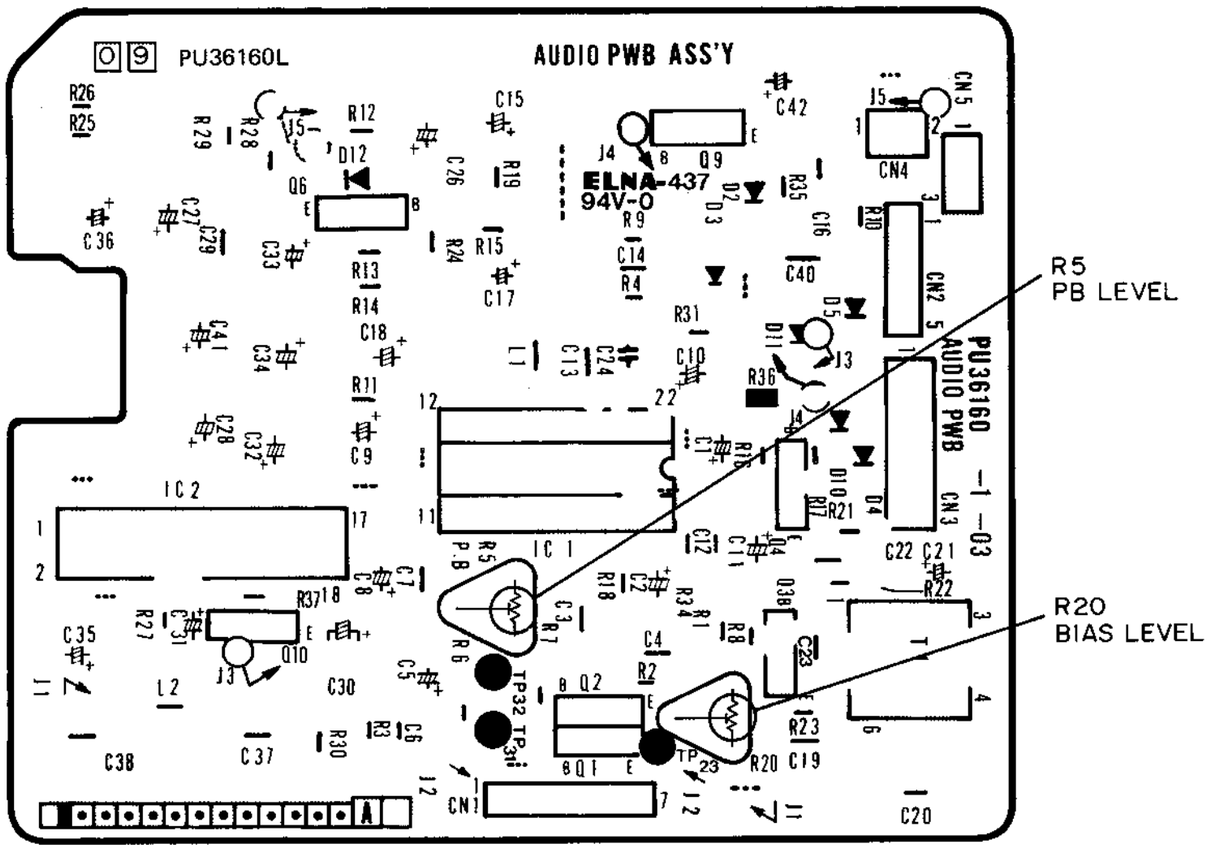
3
IC1-5
PB 20 mVp-p

4
CN1-1
REC 49 Vp-p

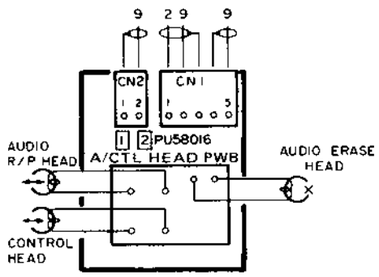
5
T1-6
REC 70 Vp-p

6
T1-5
REC 32 Vp-p

—AUDIO—

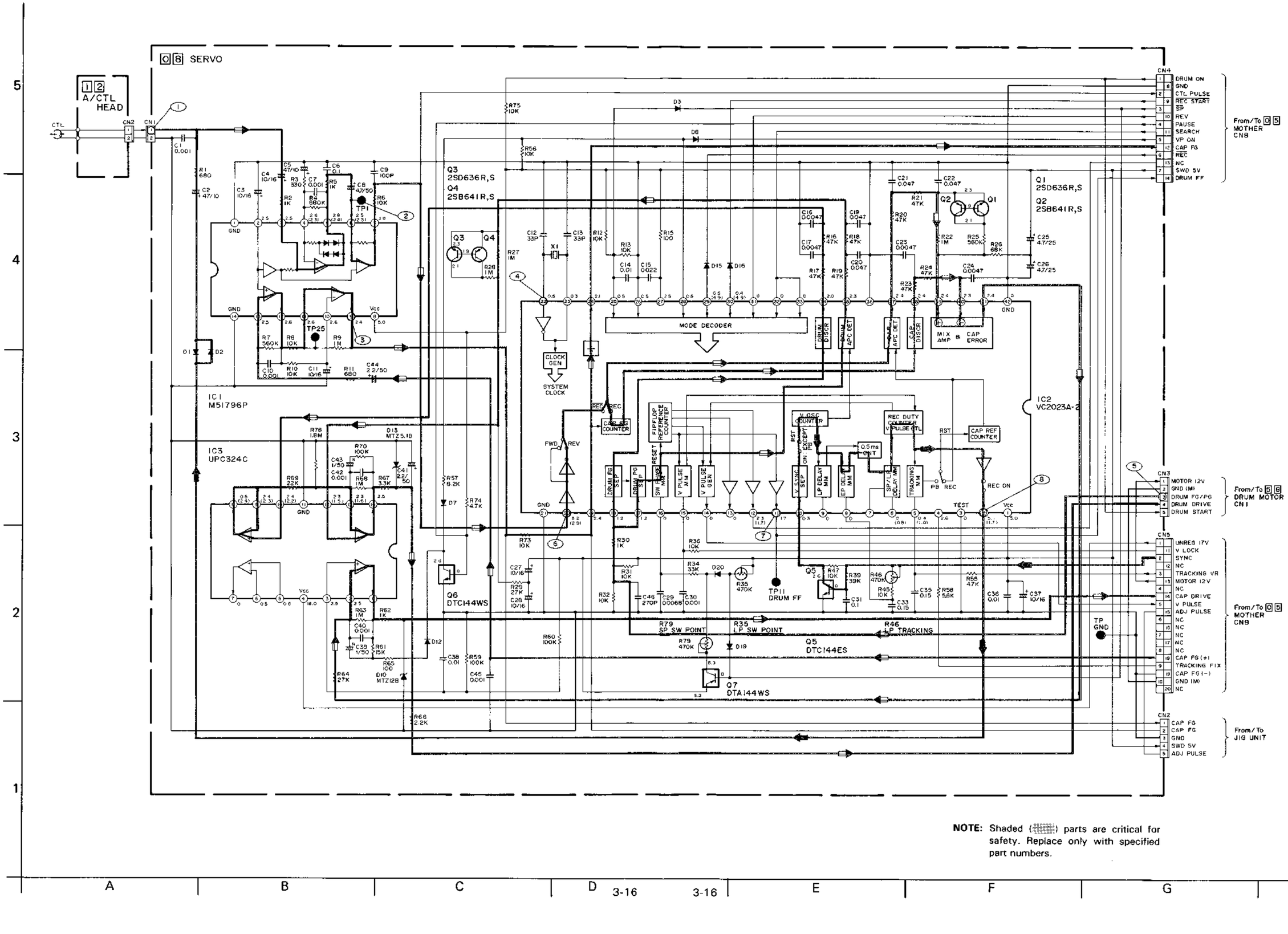


—AUDIO/CONTROL HEAD—



3-15

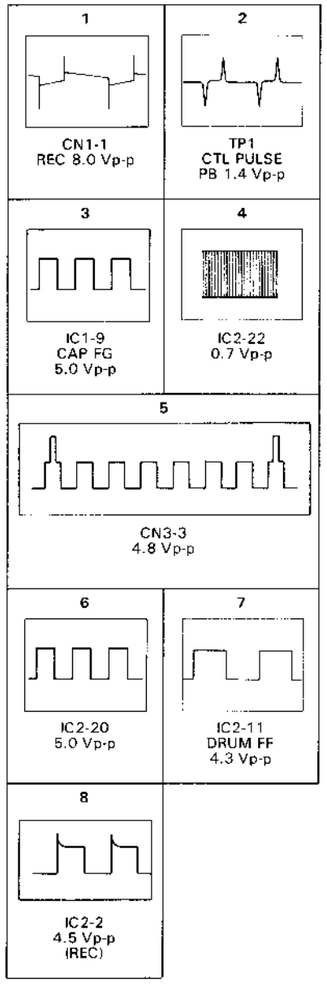
3.17 SERVO SCHEMATIC DIAGRAM

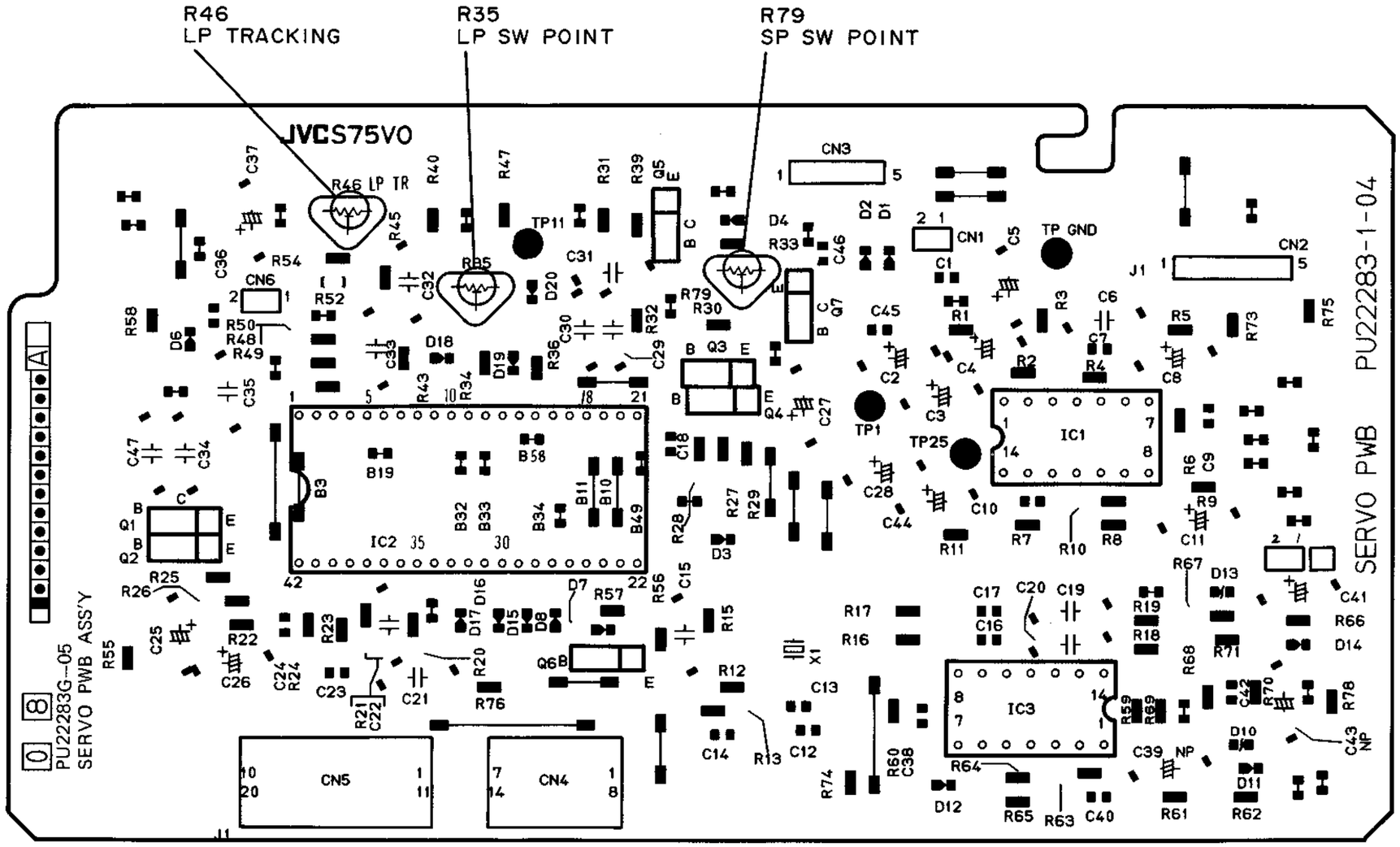


NOTE: Shaded (▒▒▒) parts are critical for safety. Replace only with specified part numbers.

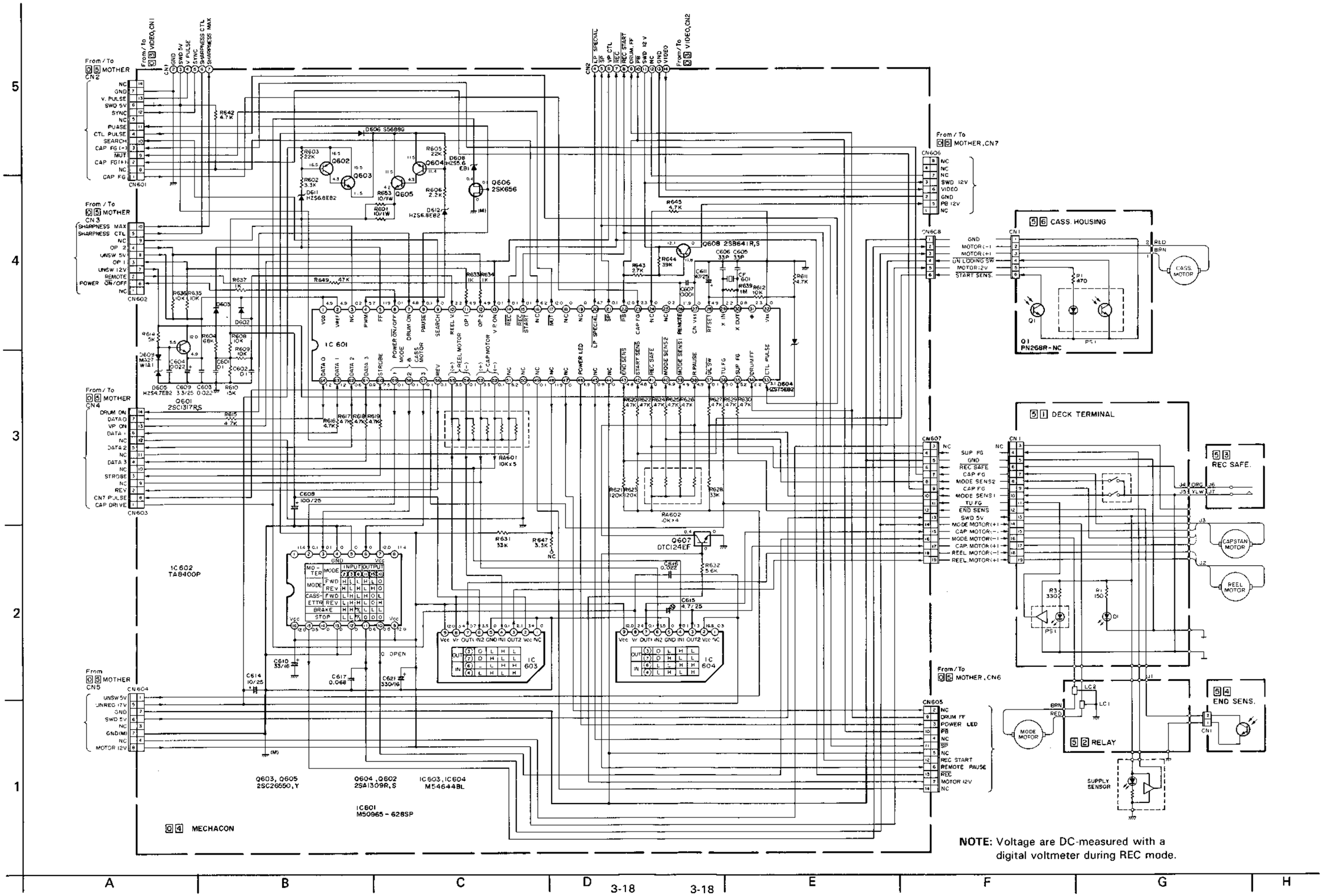
3.18 SERVO CIRCUIT BOARD

—Waveform of SERVO circuit—





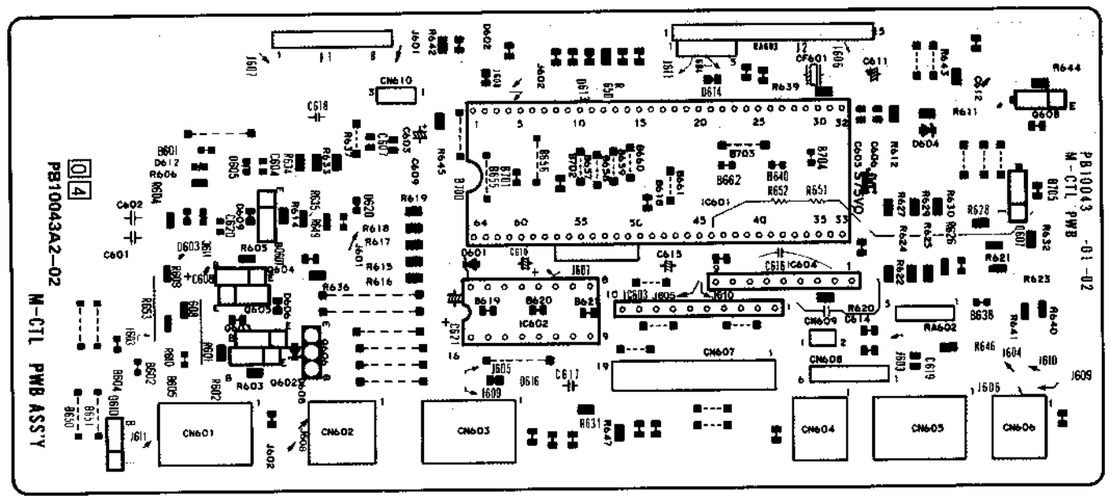
3.19 MECHANISM CONTROL SCHEMATIC DIAGRAM



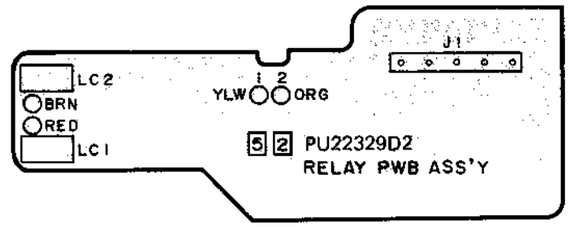
NOTE: Voltage are DC-measured with a digital voltmeter during REC mode.

3.20 MECHANISM CONTROL AND DECK TERMINAL, CASSETTE HOUSING CIRCUIT BOARDS

—MECHANISM CONTROL—

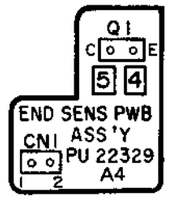


—RELAY—

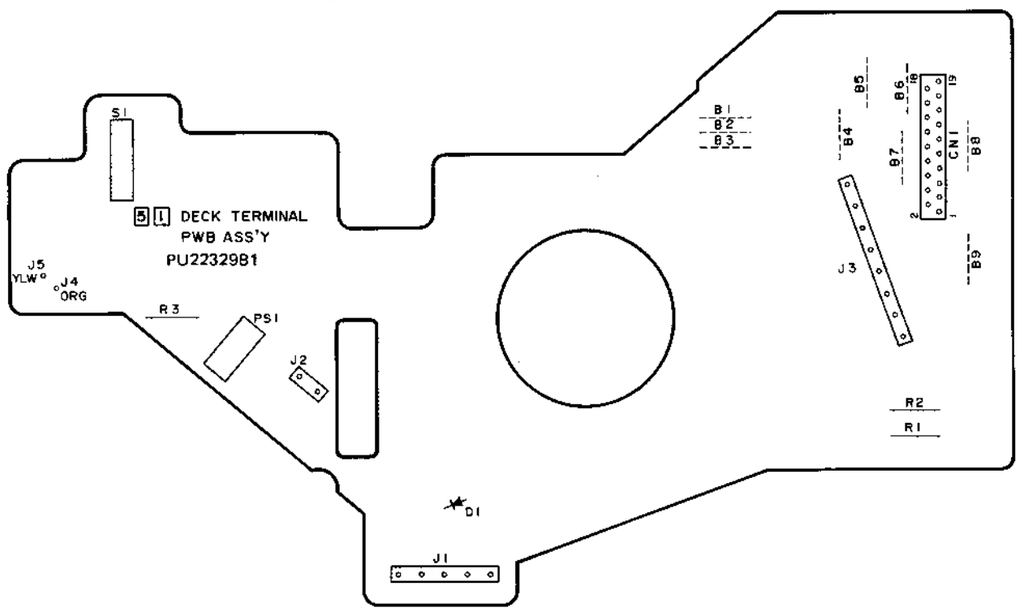


—REC SAFETY—

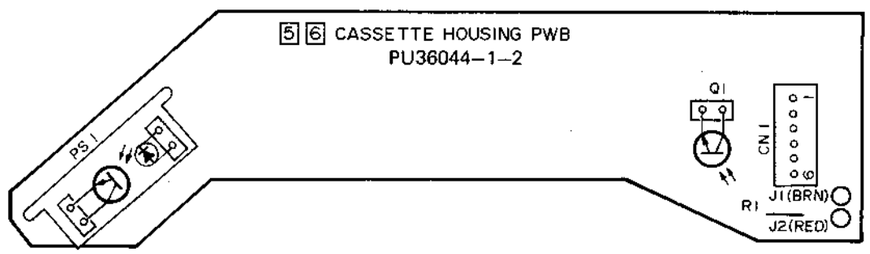
—END SENSOR—



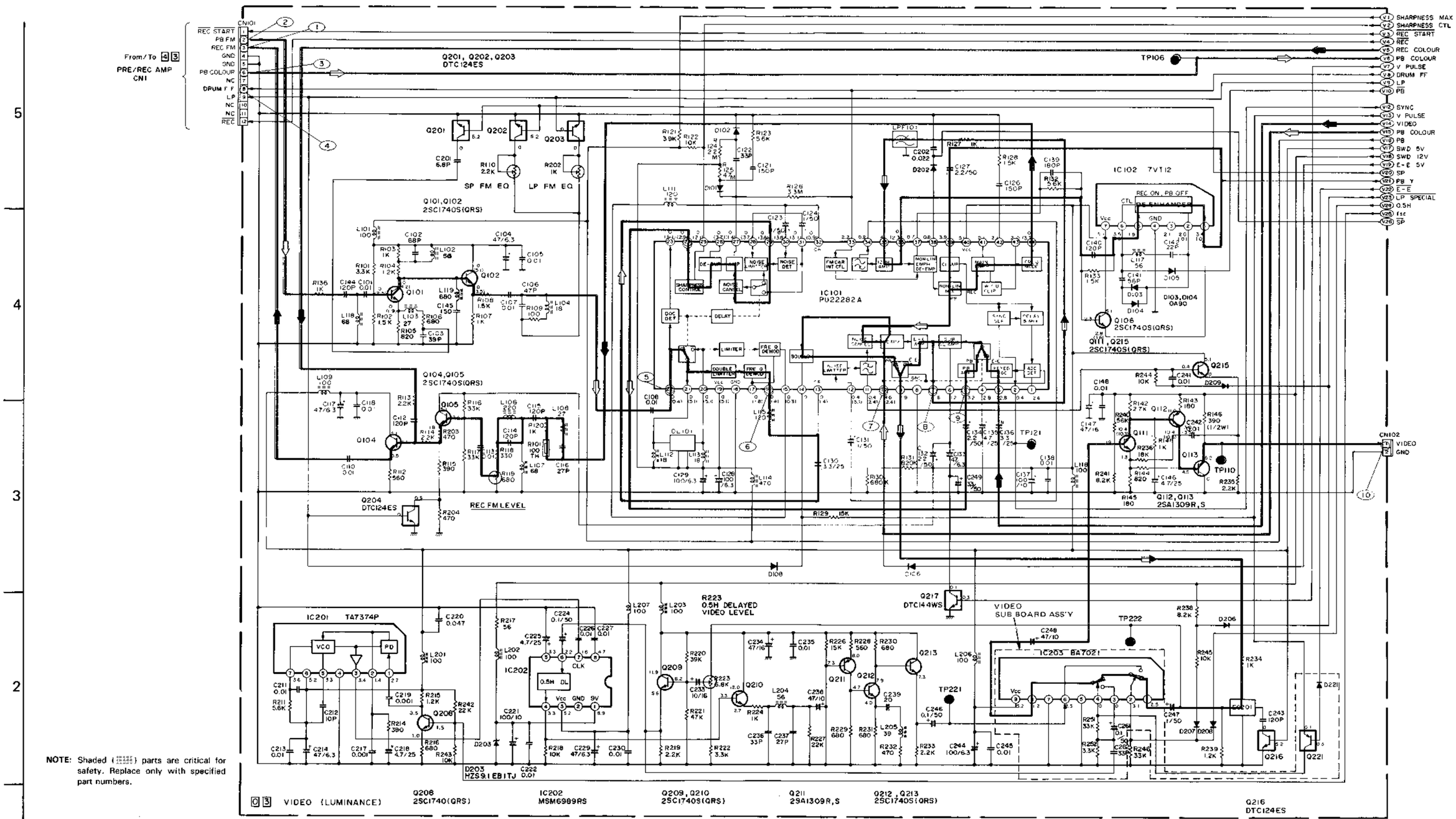
—DECK TERMINAL—



—CASSETTE HOUSING—



3.21 VIDEO (LUMINANCE) SCHEMATIC DIAGRAM



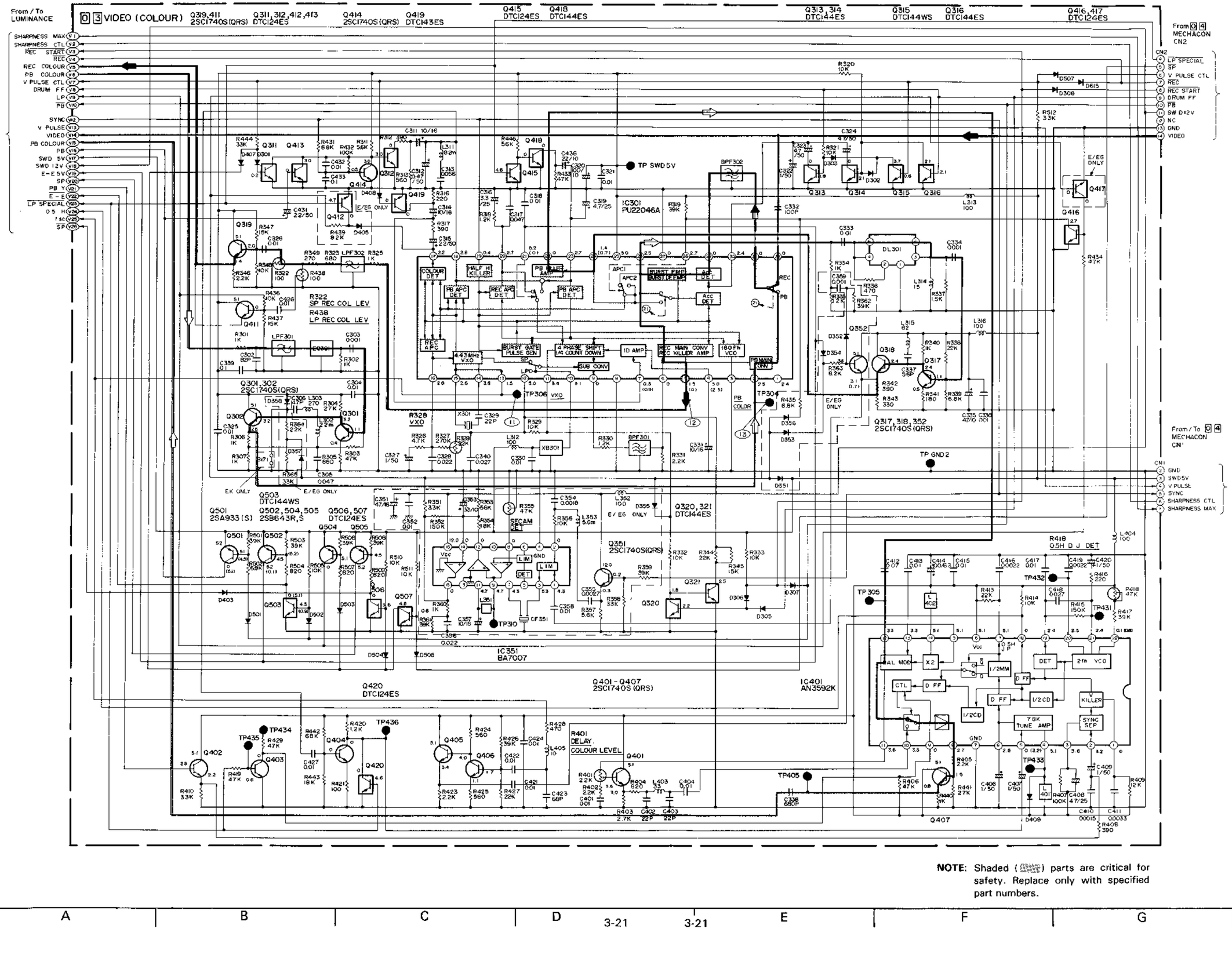
NOTE: Shaded (▨) parts are critical for safety. Replace only with specified part numbers.

—Waveforms of VIDEO circuit—

1	2	3	4	5	6	7	8	9	10	11	12	13
CN101-3 REC FM 0.06 Vp-p	CN101-2 PB FM PB 0.45 Vp-p	CN101-6 PB FM PB 0.45 Vp-p	CN101-8 DRUM FF 4.4 Vp-p	IC101-22 PB FM 0.3 Vp-p	IC101-16 PB 0.4 Vp-p	IC101-10 PB 0.4 Vp-p	IC101-7 REC 0.56 Vp-p	101-5 PB 0.22 Vp-p	CN102-1 VIDEO OUT 2.0 Vp-p	TP306 VXO 0.5 Vp-p	IC301-5 REC 1.0 Vp-p	TP304 PB COLOUR 0.2 Vp-p

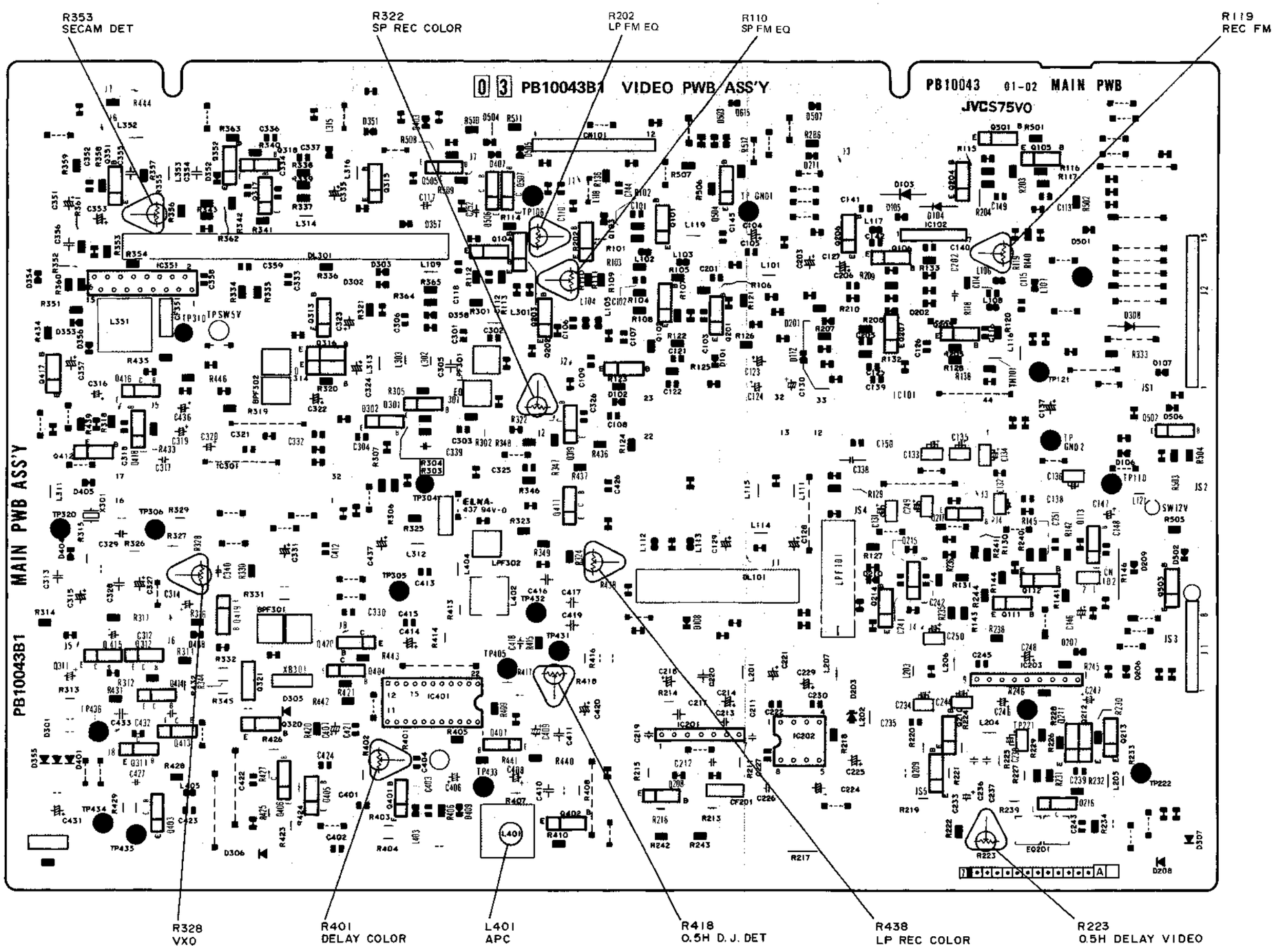
3-20

3.22 VIDEO (COLOR) SCHEMATIC DIAGRAM

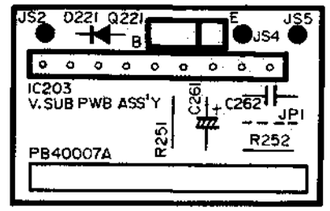


3.23 VIDEO CIRCUIT BOARD

– VIDEO –

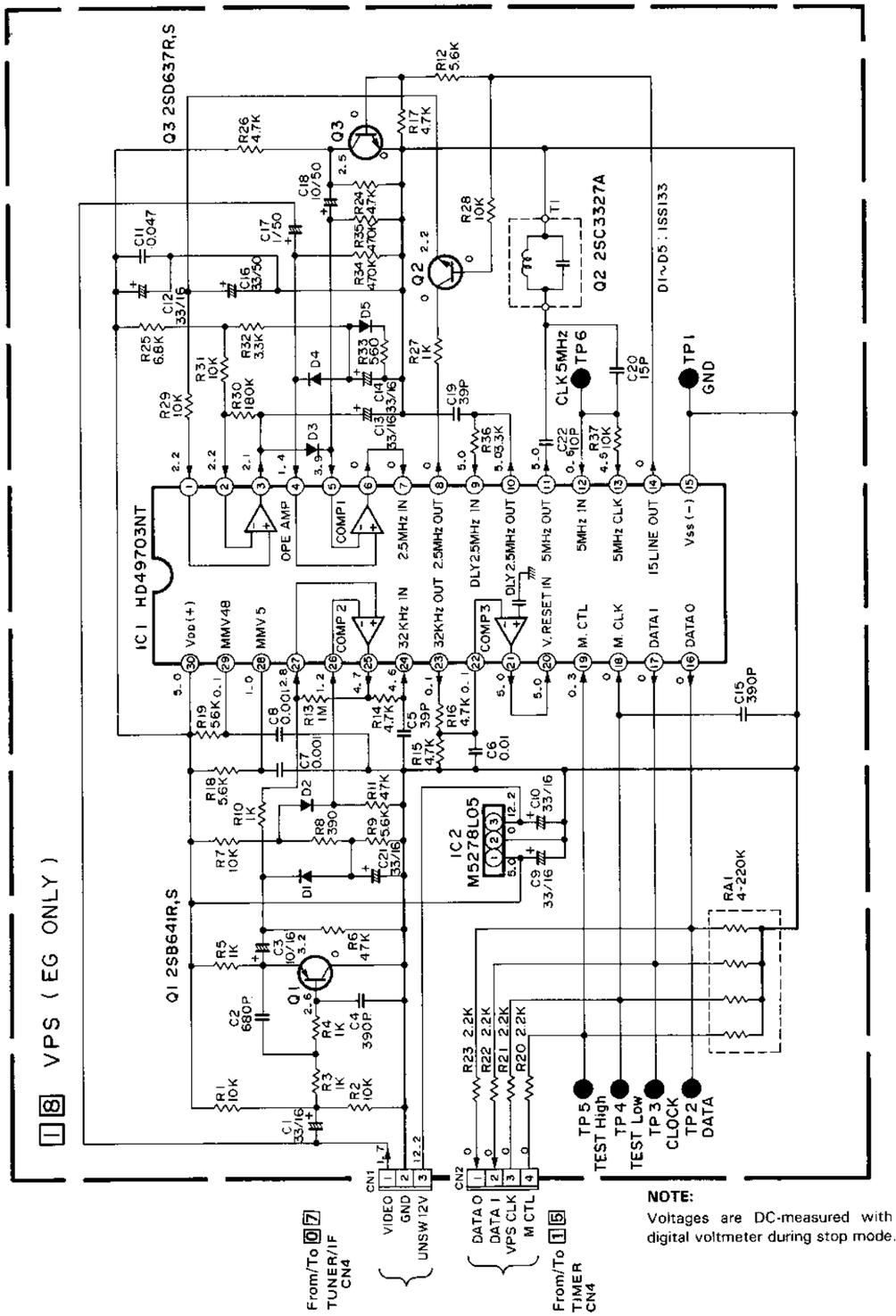


– VIDEO SUB –

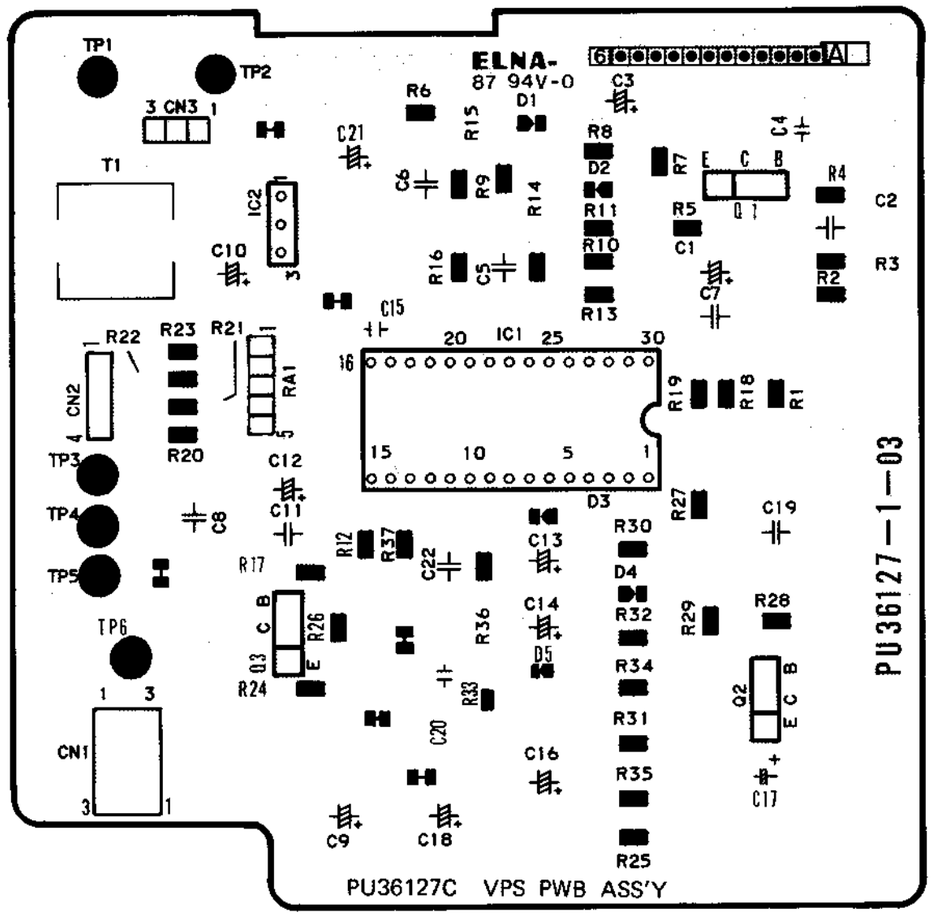


3-22

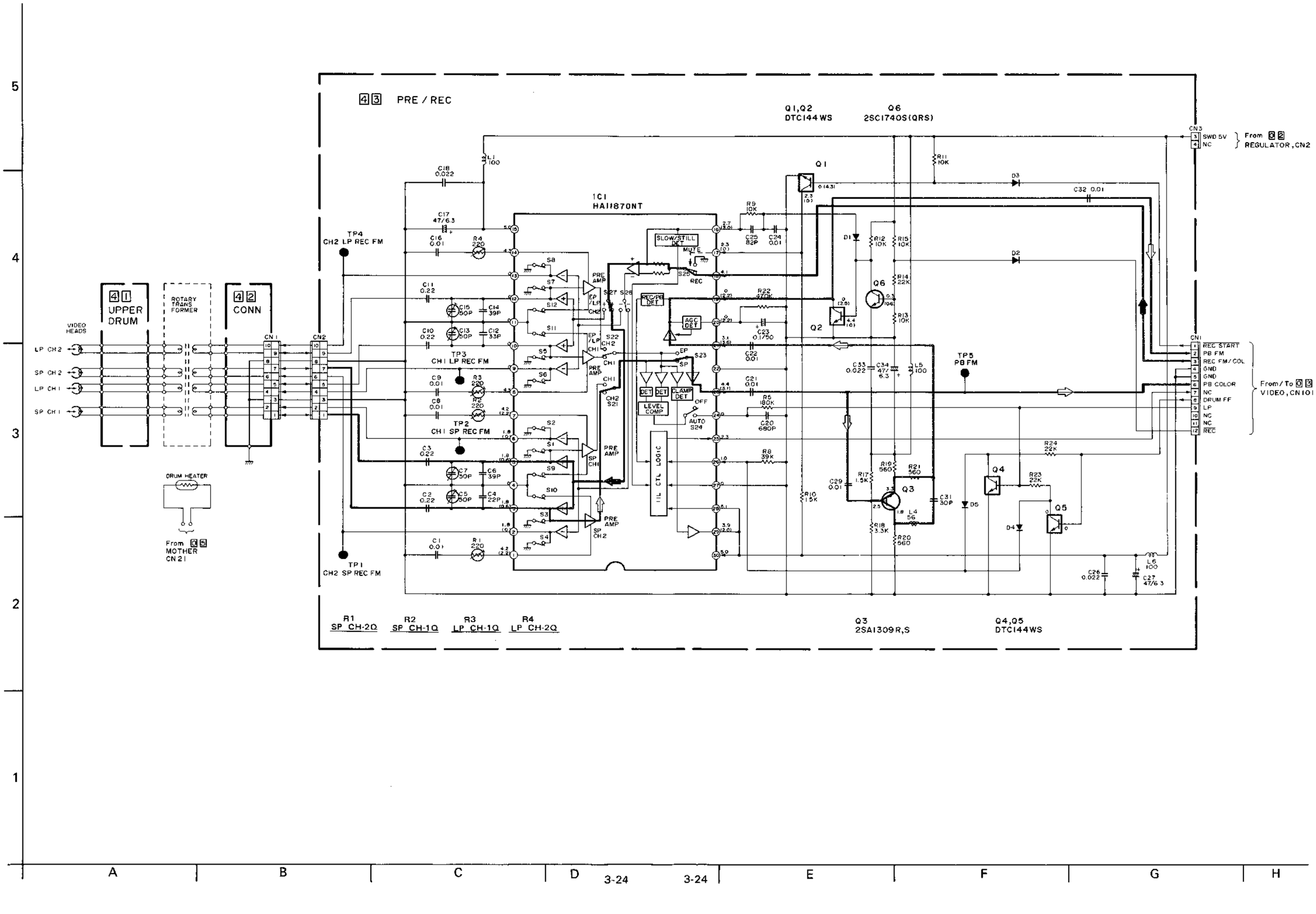
3.24 VPS SCHEMATIC DIAGRAM AND CIRCUIT BOARD (EG ONLY)



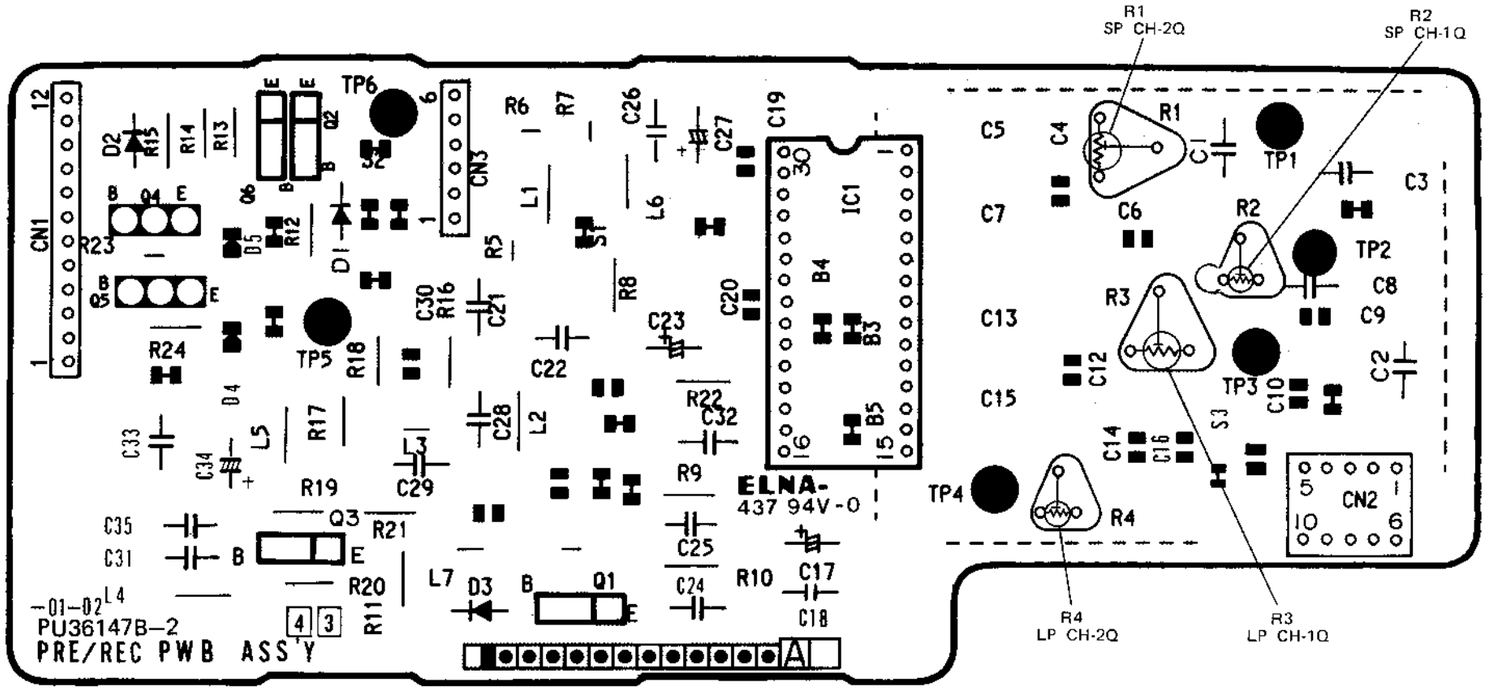
NOTE:
Voltages are DC-measured with a digital voltmeter during stop mode.



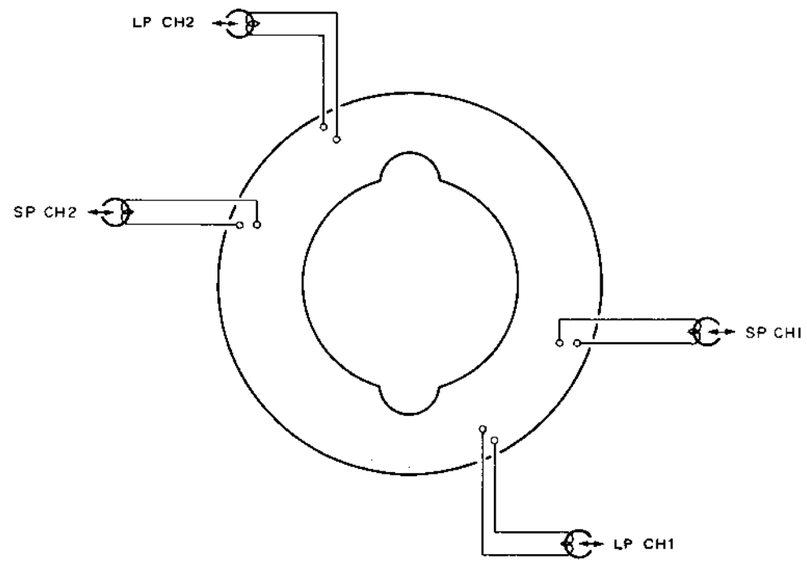
3.25 PRE/REC SCHEMATIC DIAGRAM



—PRE/REC—

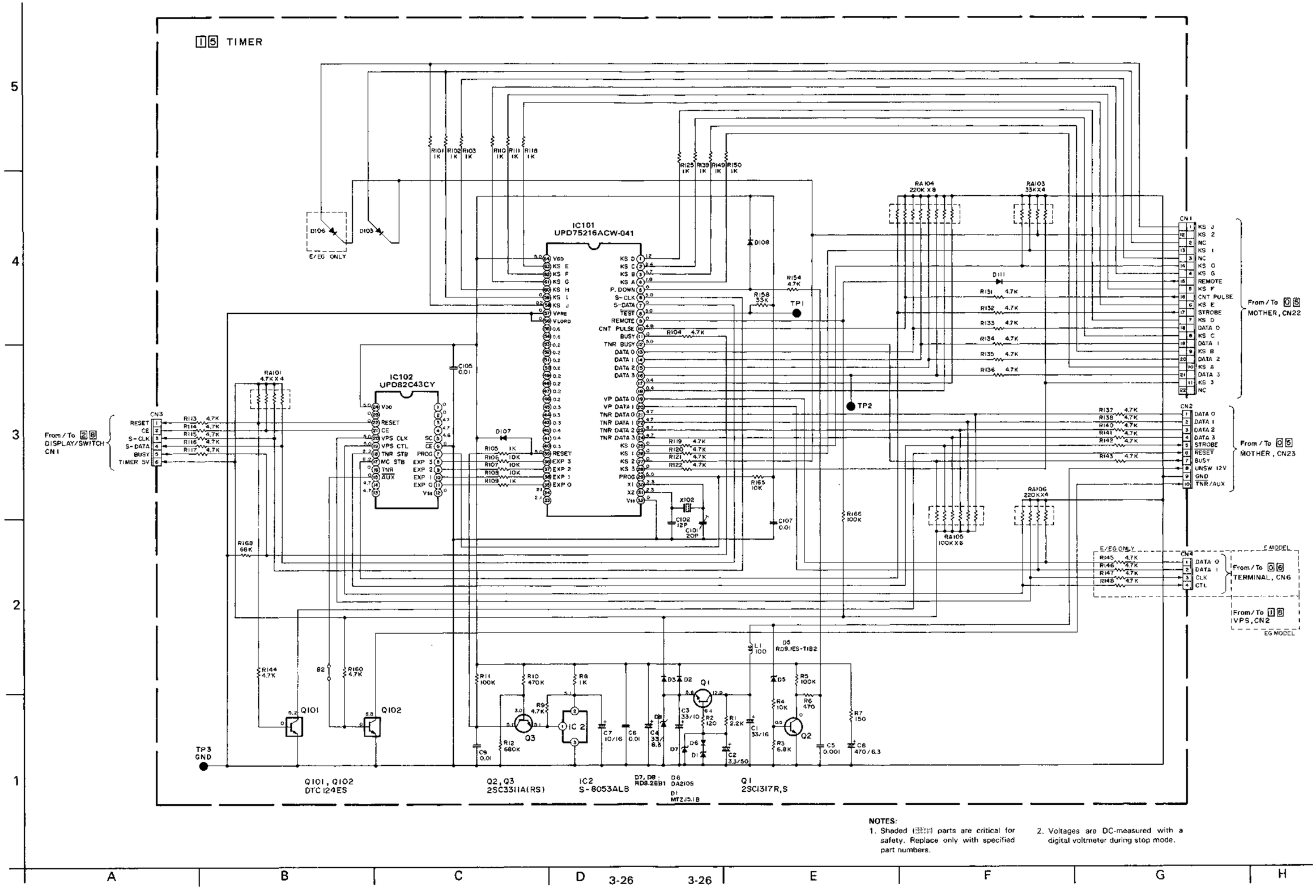


—UPPER DRUM—



4 1 UPPER BOARD PWB
PDM3018

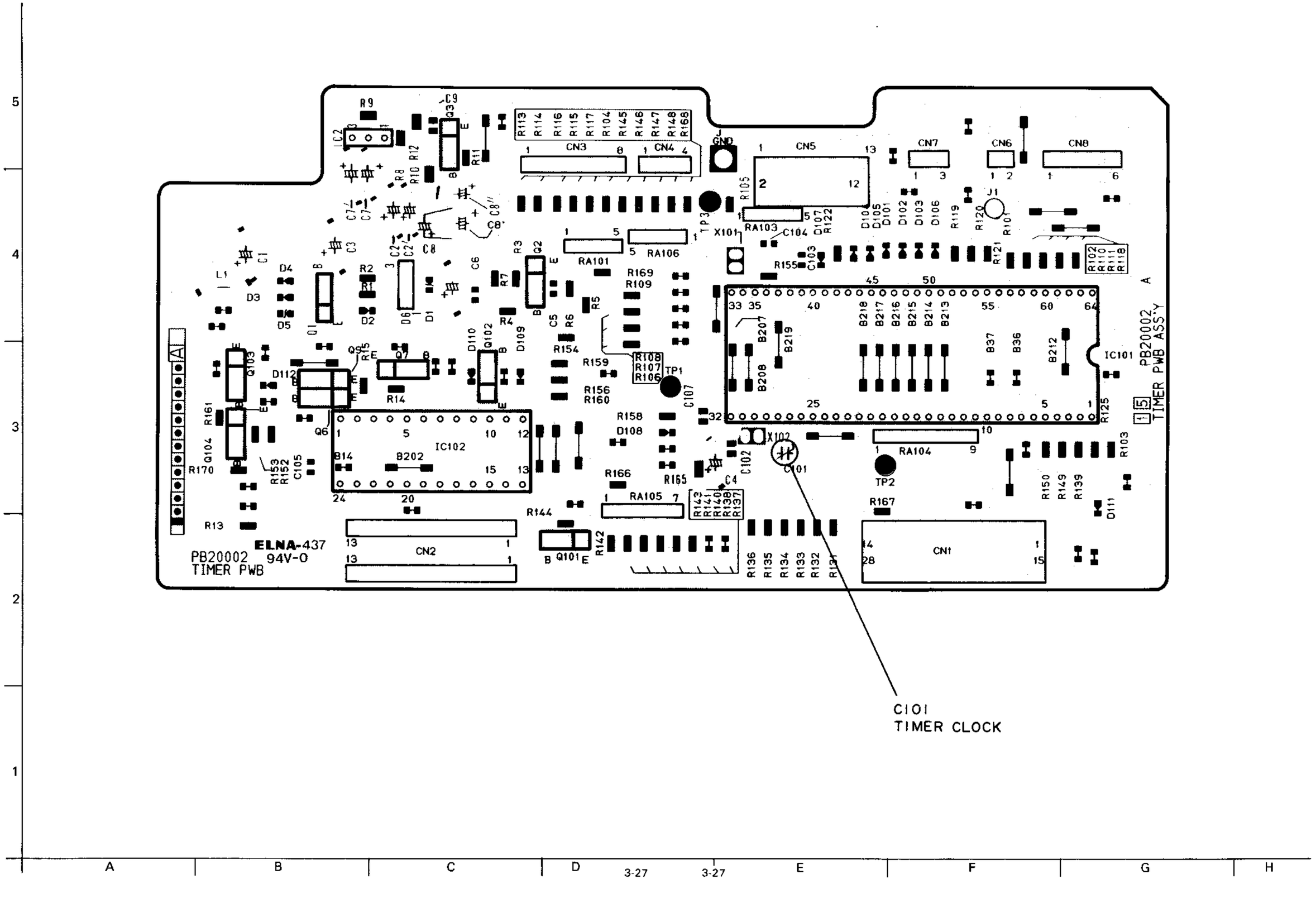
3.27 TIMER SCHEMATIC DIAGRAM



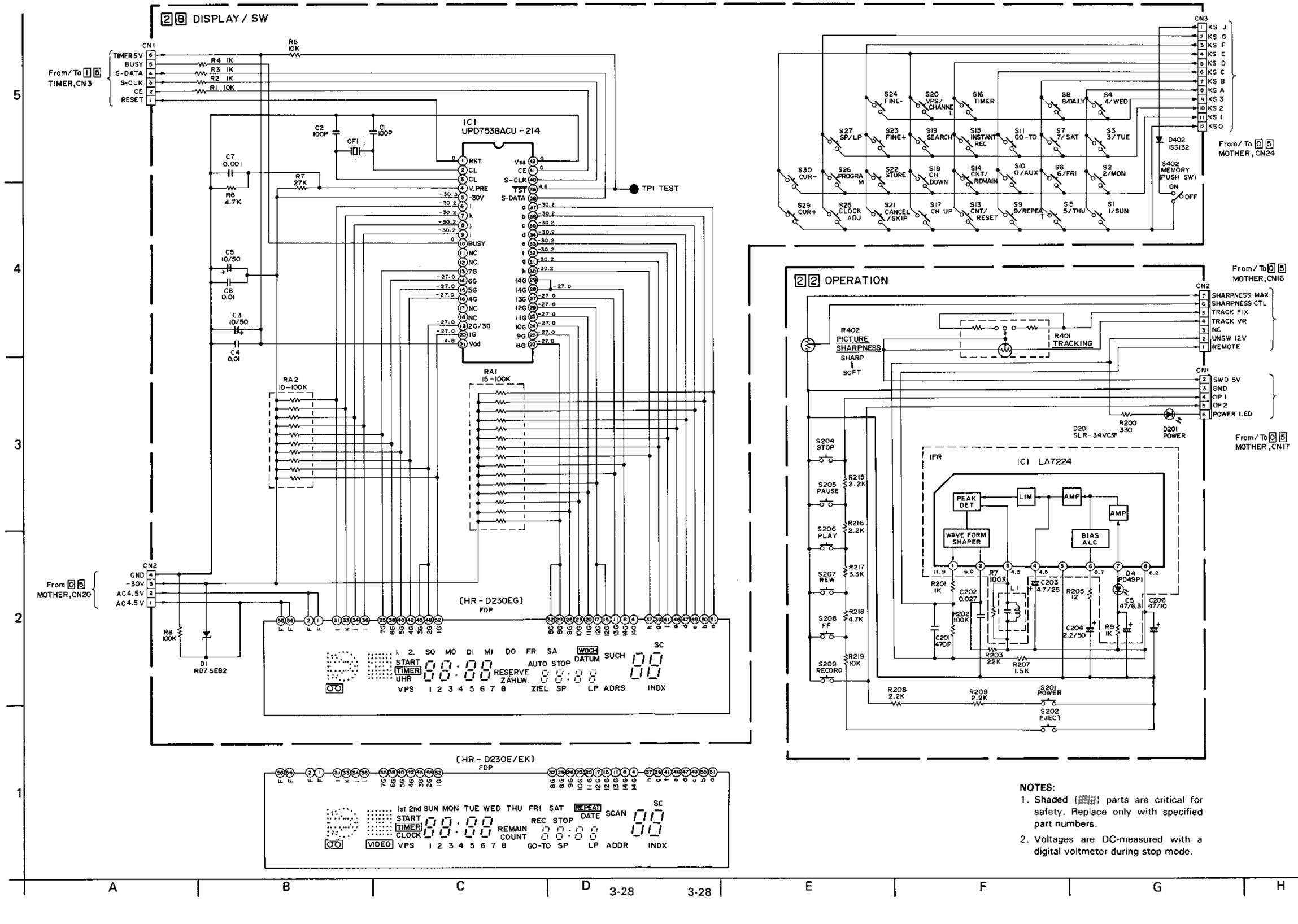
NOTES:

1. Shaded (▒▒▒) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

3.28 TIMER CIRCUIT BOARD



3.29 DISPLAY/SWITCH, OPERATION AND IFR SCHEMATIC DIAGRAMS

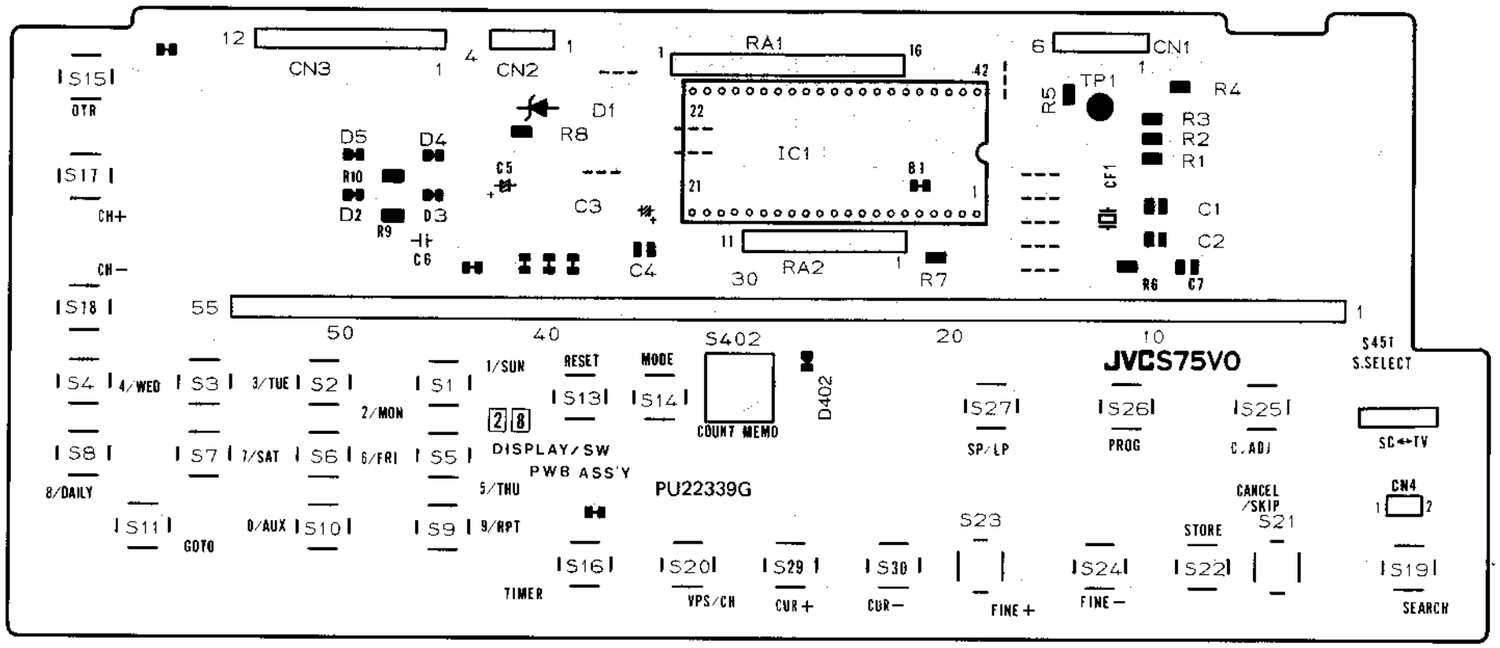


NOTES:

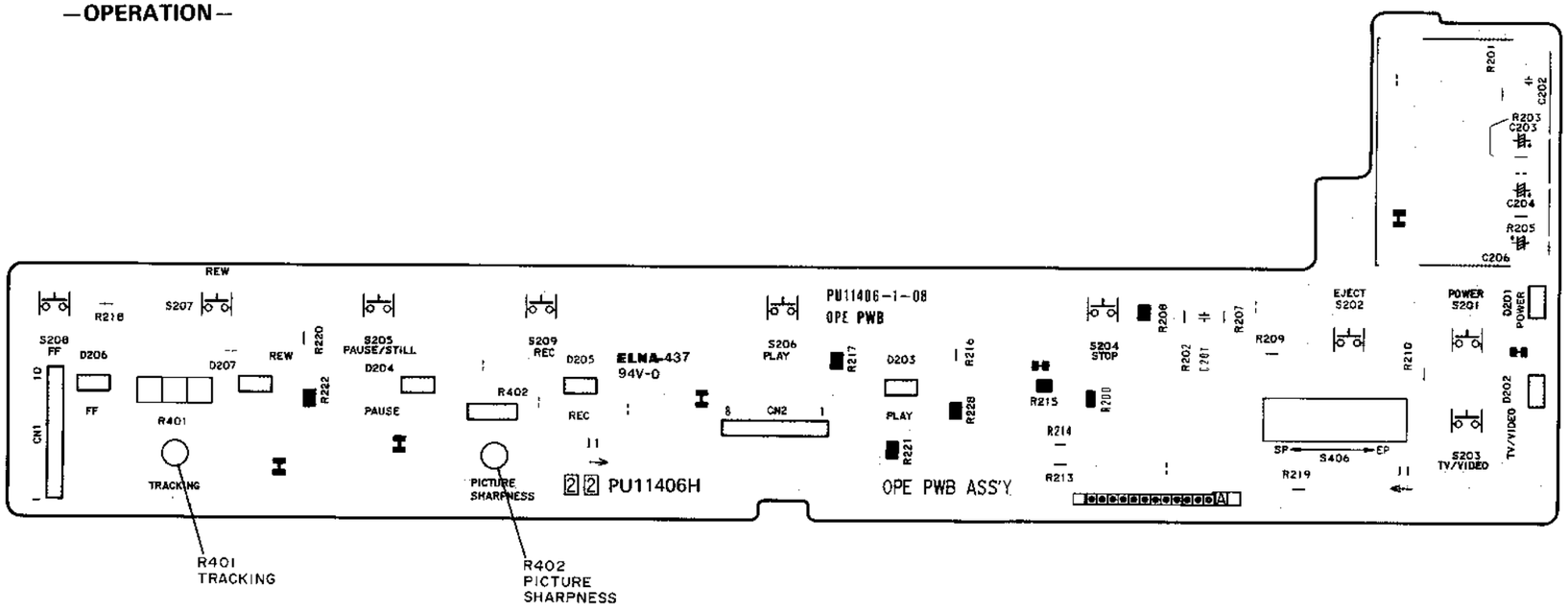
1. Shaded (▒) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

3.30 DISPLAY SWITCH, OPERATION AND IFR CIRCUIT BOARDS

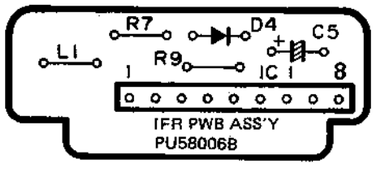
—DISPLAY/SWITCH—



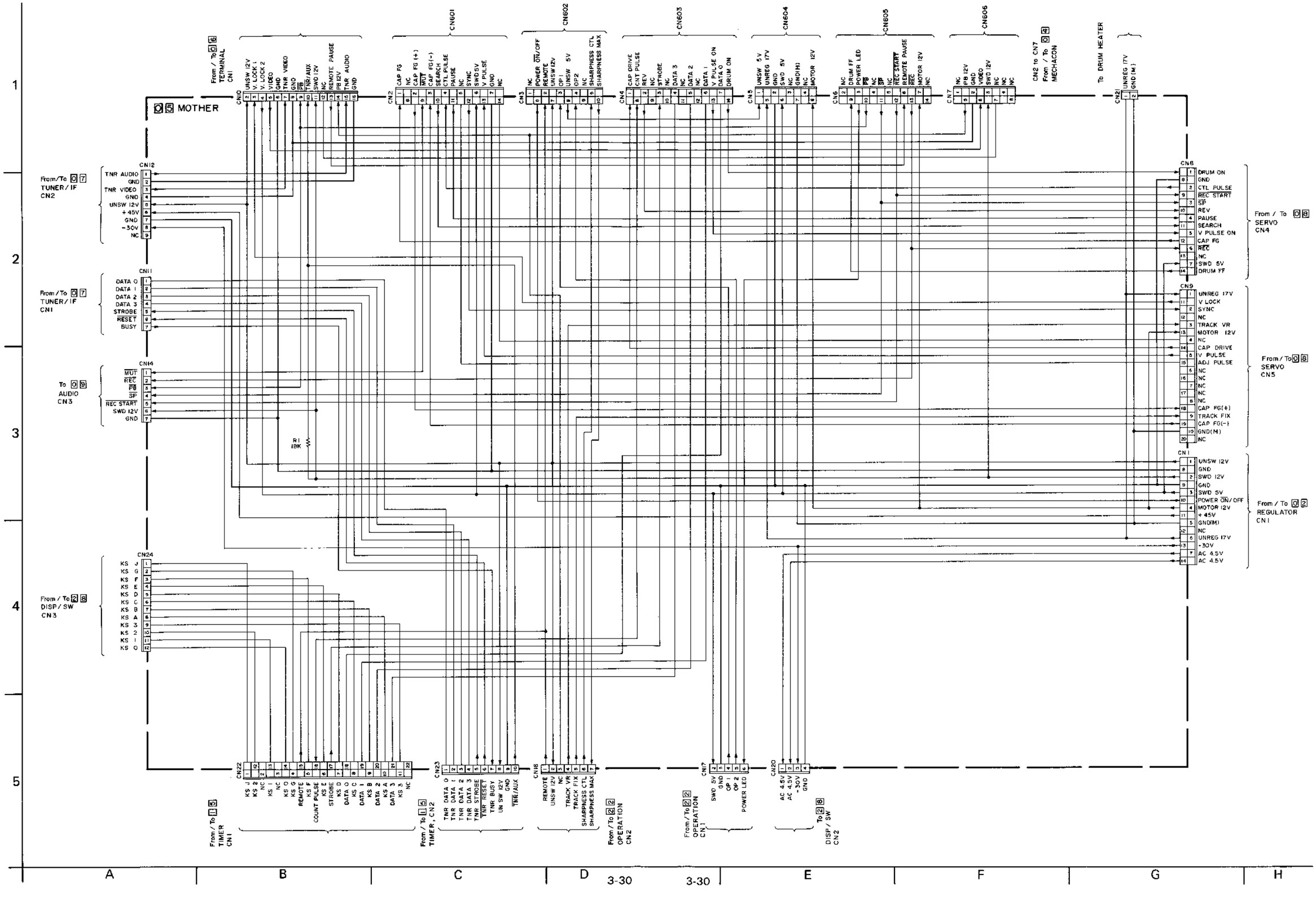
—OPERATION—



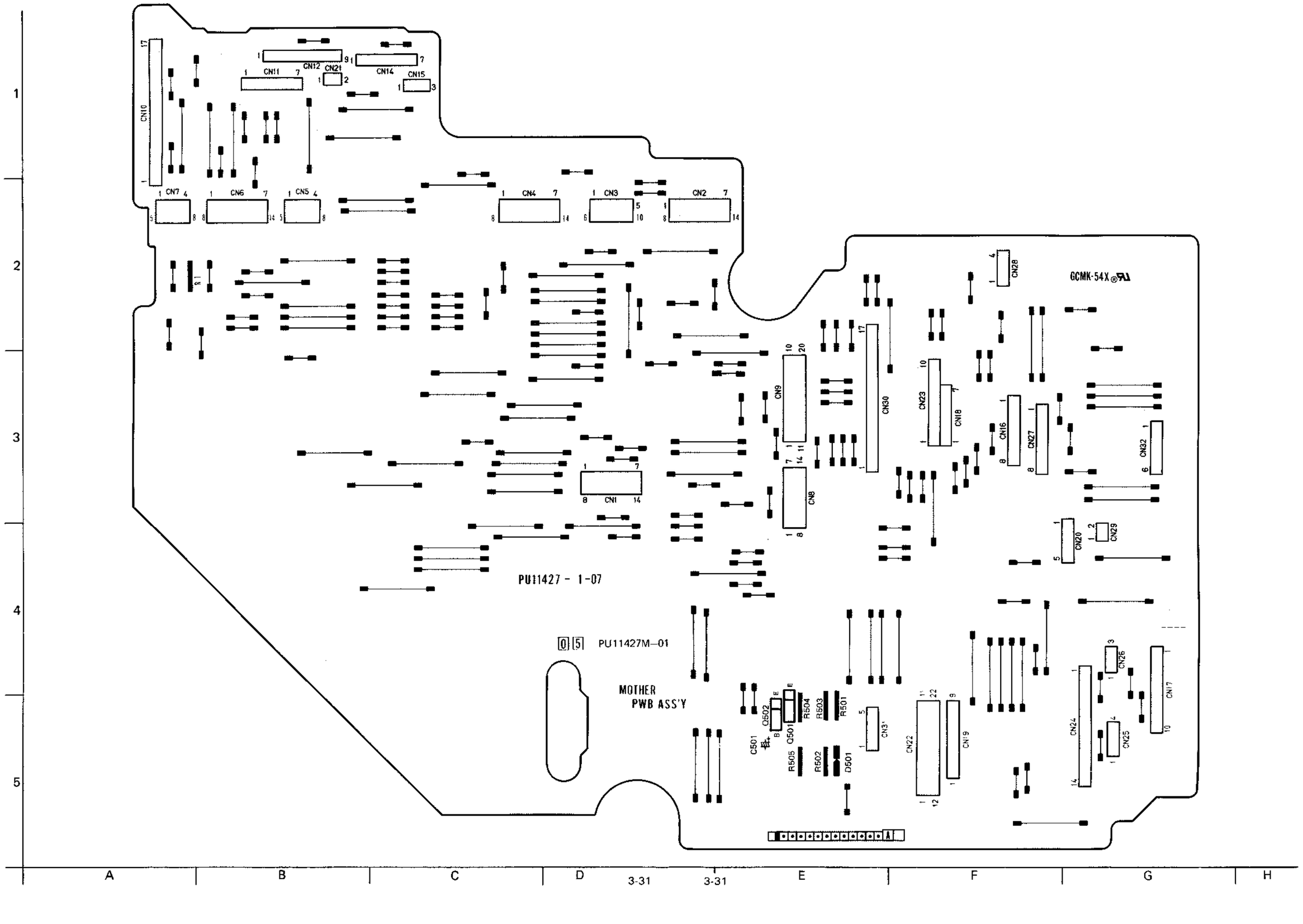
—IFR—



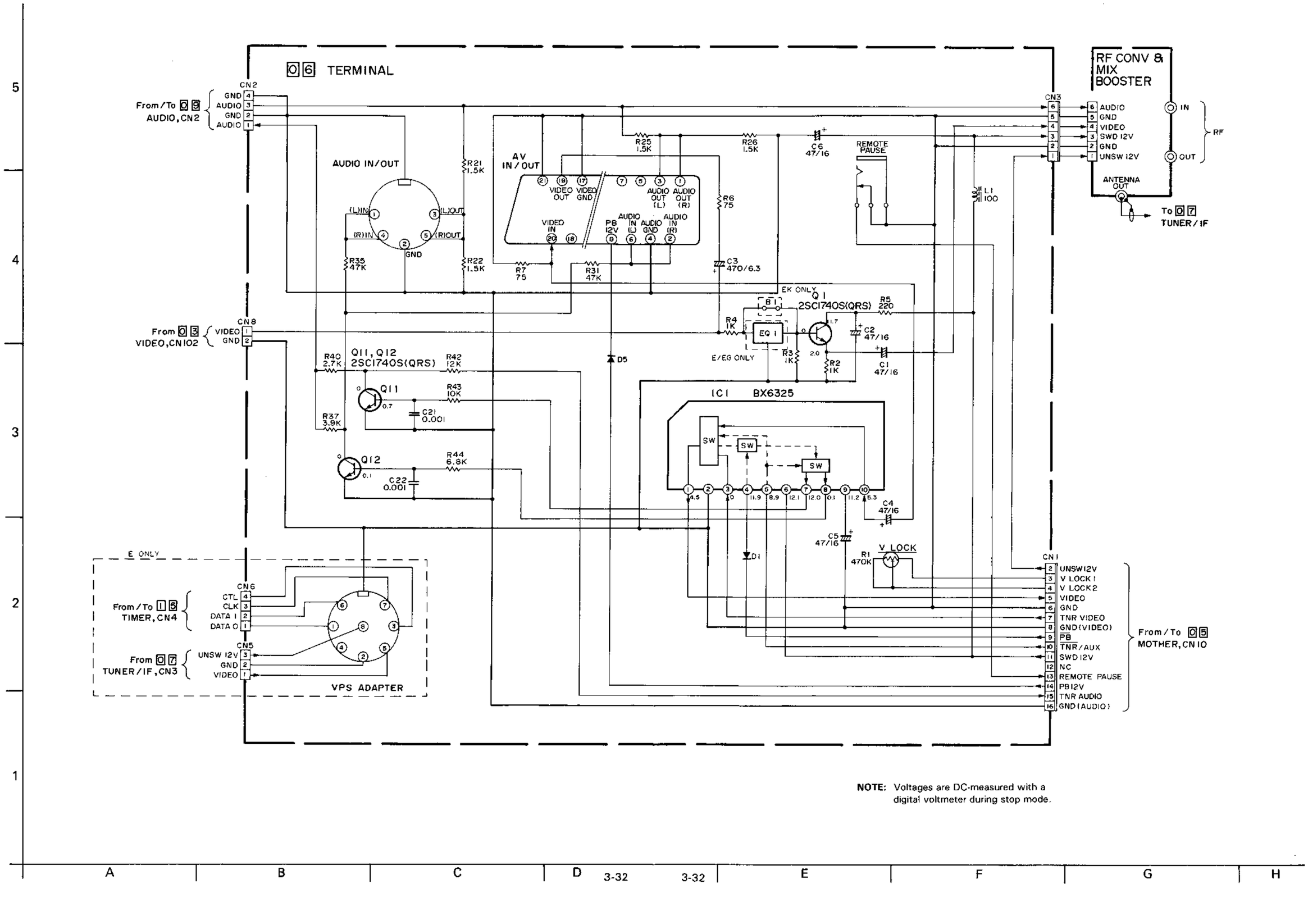
3.31 MOTHER SCHEMATIC DIAGRAM



3.32 MOTHER CIRCUIT BOARD



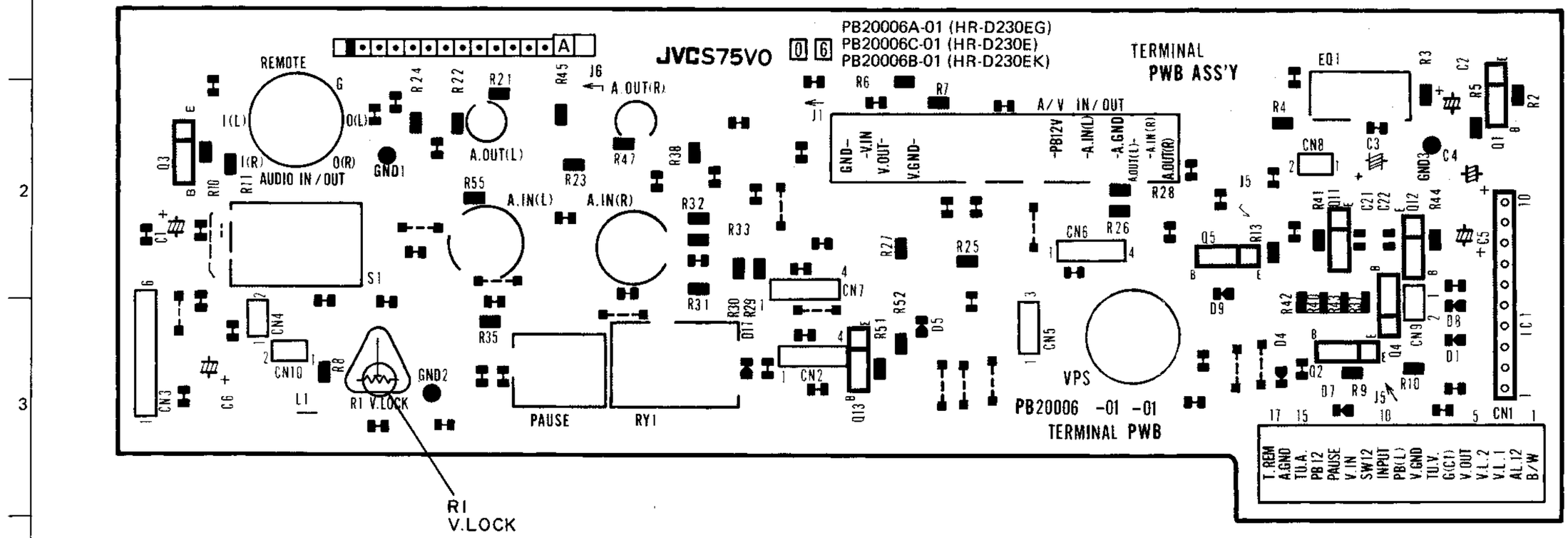
3.33 TERMINAL SCHEMATIC DIAGRAM



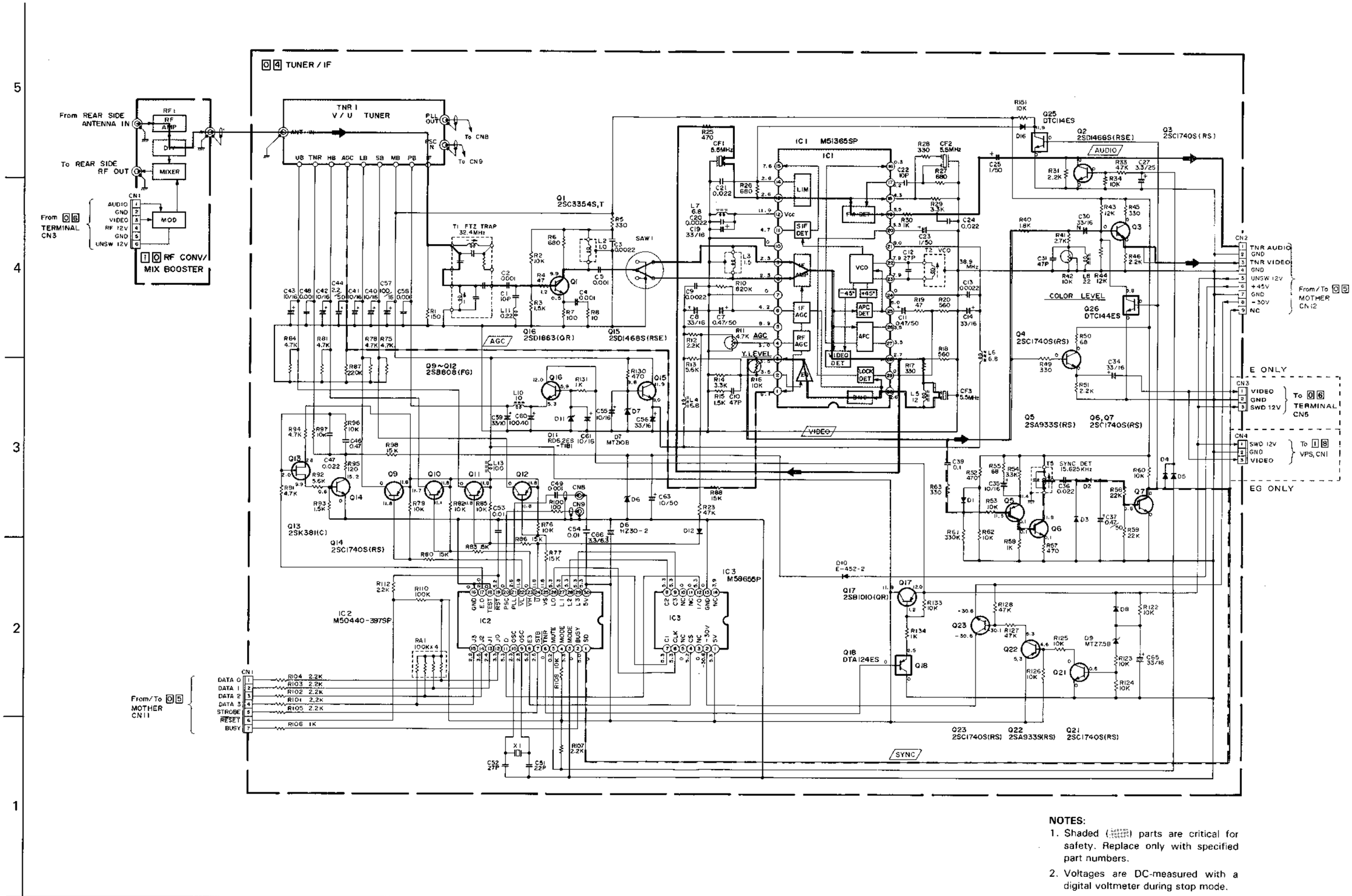
NOTE: Voltages are DC-measured with a digital voltmeter during stop mode.

3-32

3.34 TERMINAL CIRCUIT BOARD



3.35 TUNER/IF SCHEMATIC DIAGRAM (E/EG MODELS)



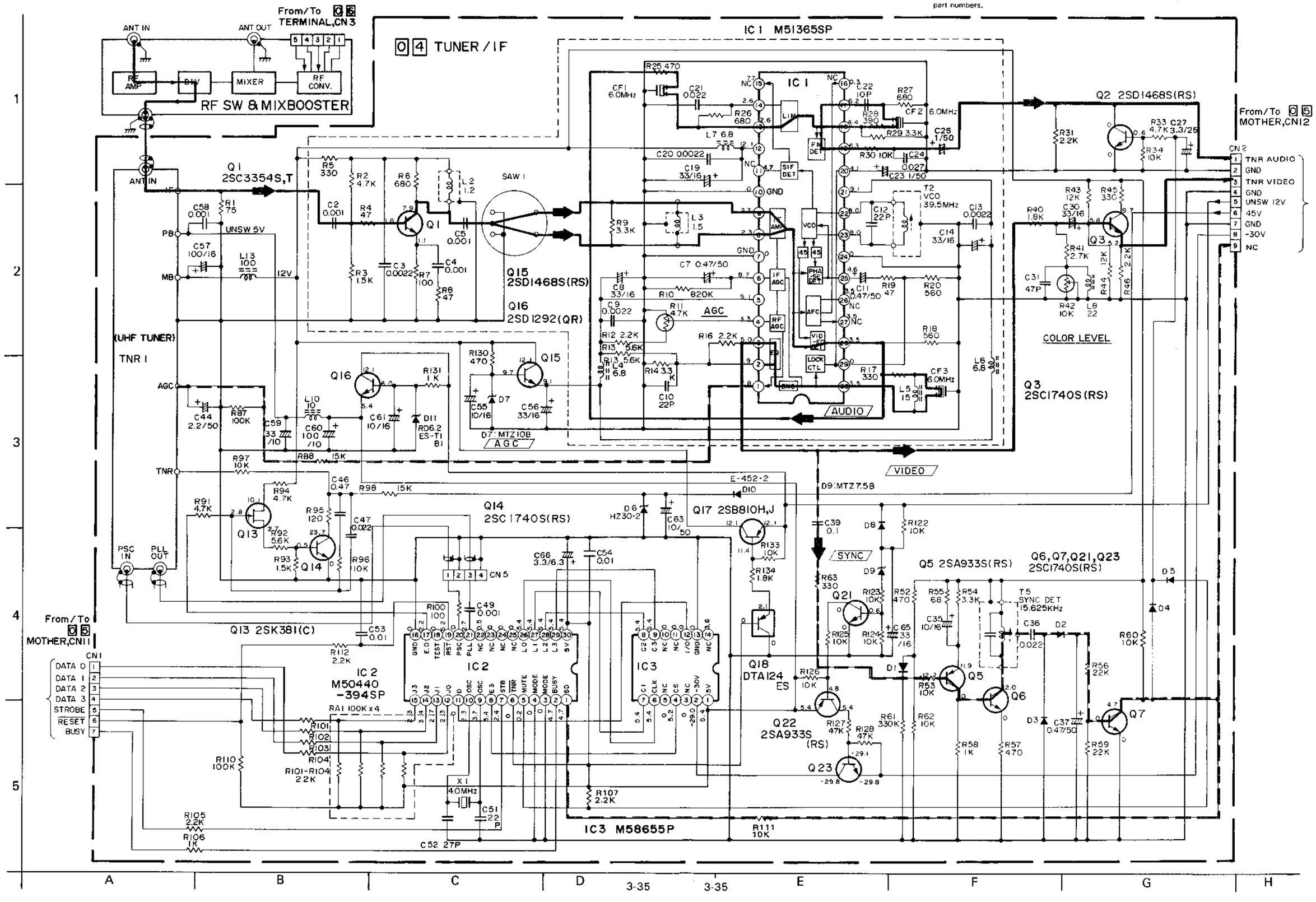
NOTES:

1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.

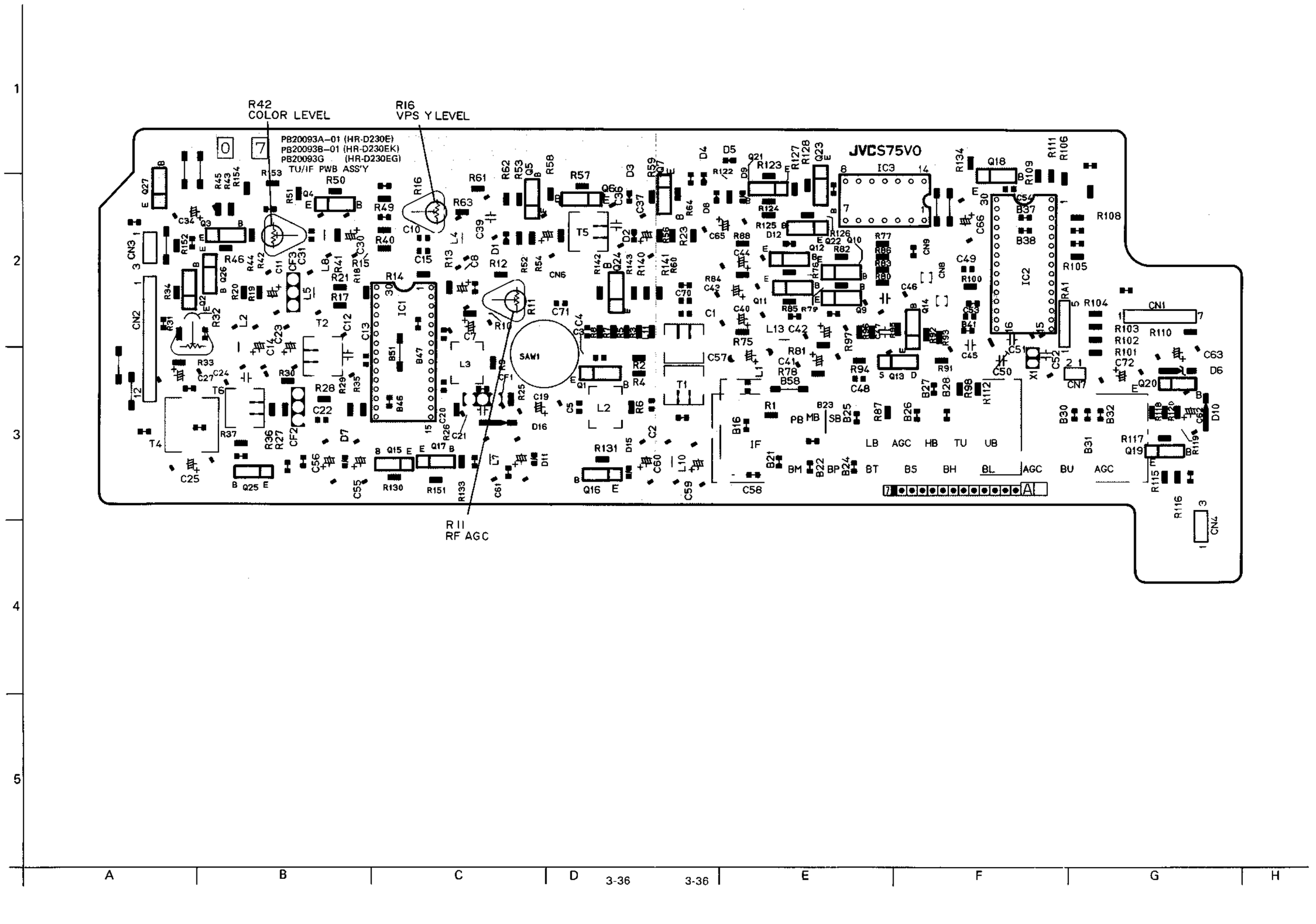
3-34

3.36 TUNER/IF SCHEMATIC DIAGRAM (EK MODEL)

NOTES:
1. Shaded (▨) parts are critical for safety. Replace only with specified part numbers.
2. Voltages are DC-measured with a digital voltmeter during stop mode.



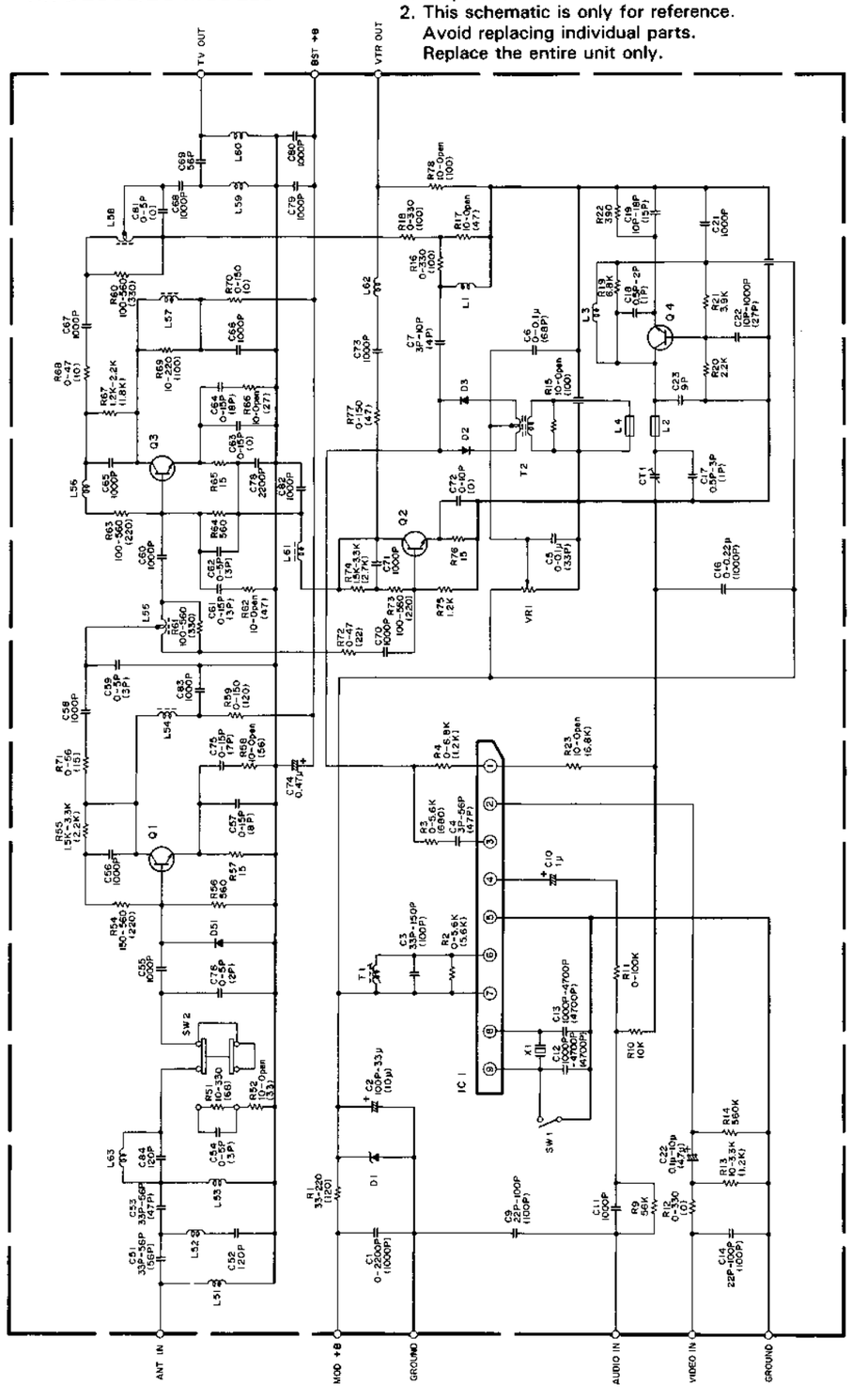
3.37 TUNER/IF CIRCUIT BOARD



3.38 RF CONVERTER AND MIX BOOSTER SCHEMATIC DIAGRAM

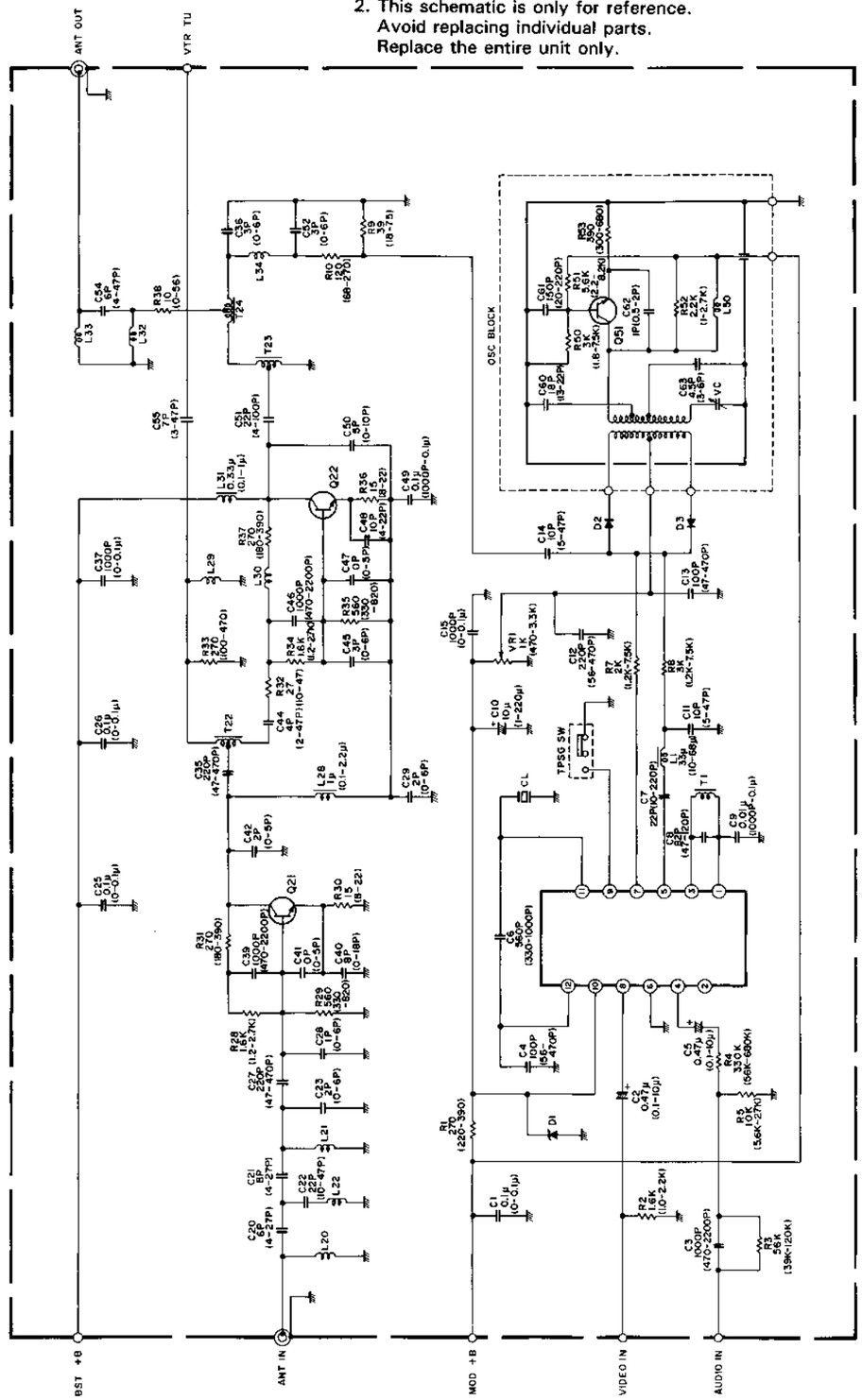
—HR-D230E/EG MODELS—

Note:
1. All parts slown in this schematic are critical for safety.
2. This schematic is only for reference.
   Avoid replacing individual parts.
   Replace the entire unit only.



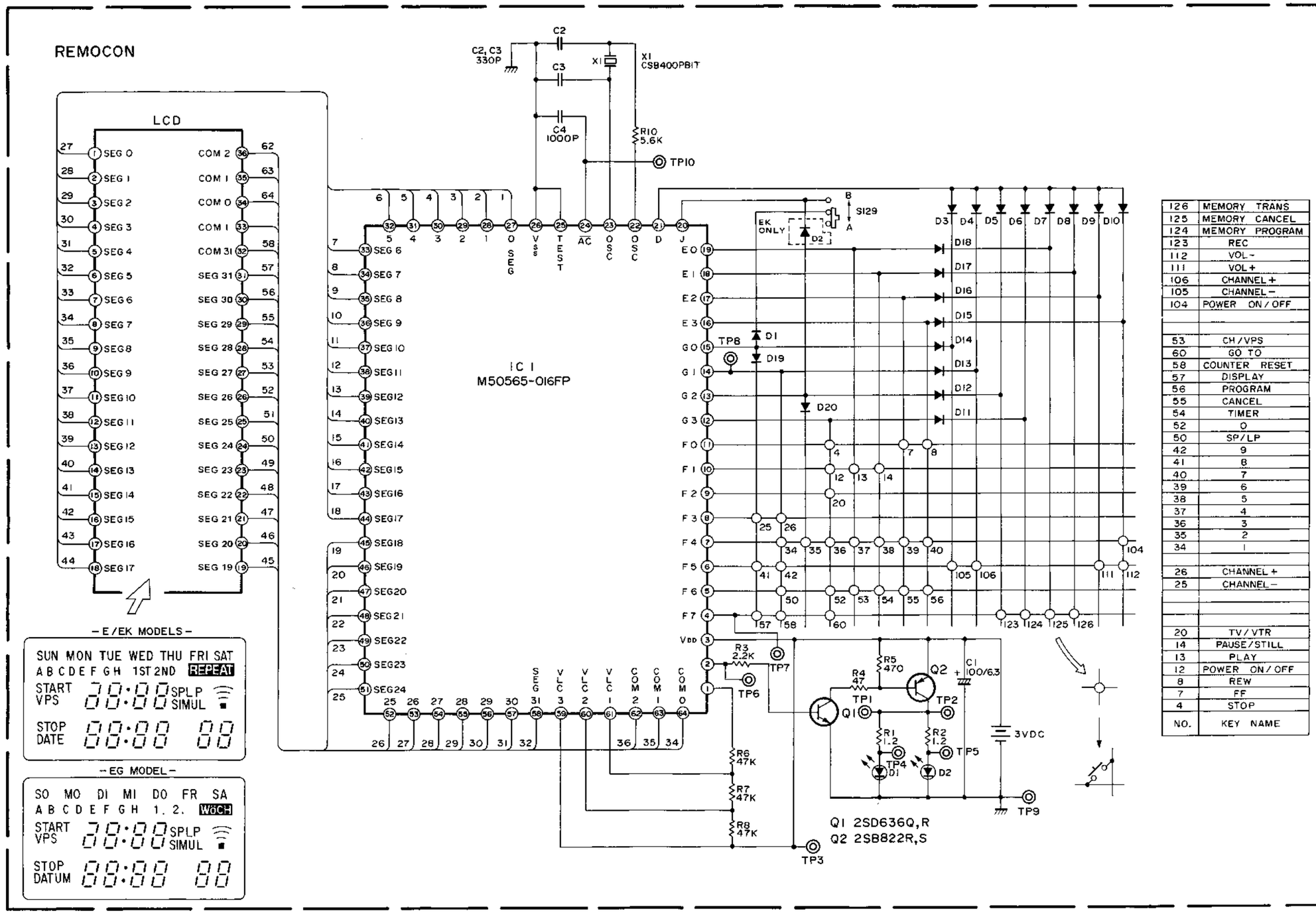
—HR-D230EK MODEL—

Note:
1. All parts slown in this schematic are critical for safety.
2. This schematic is only for reference.
   Avoid replacing individual parts.
   Replace the entire unit only.



3-37

3.39 REMOTE CONTROL SCHEMATIC DIAGRAM



126	MEMORY TRANS
125	MEMORY CANCEL
124	MEMORY PROGRAM
123	REC
112	VOL -
111	VOL +
106	CHANNEL +
105	CHANNEL -
104	POWER ON / OFF
53	CH / VPS
60	GO TO
58	COUNTER RESET
57	DISPLAY
56	PROGRAM
55	CANCEL
54	TIMER
52	0
50	SP / LP
42	9
41	8
40	7
39	6
38	5
37	4
36	3
35	2
34	1
26	CHANNEL +
25	CHANNEL -
20	TV / VTR
14	PAUSE / STILL
13	PLAY
12	POWER ON / OFF
8	REW
7	FF
4	STOP
NO.	KEY NAME

NOTE: This schematic parts are critical for safety. Replace only with specified part numbers.

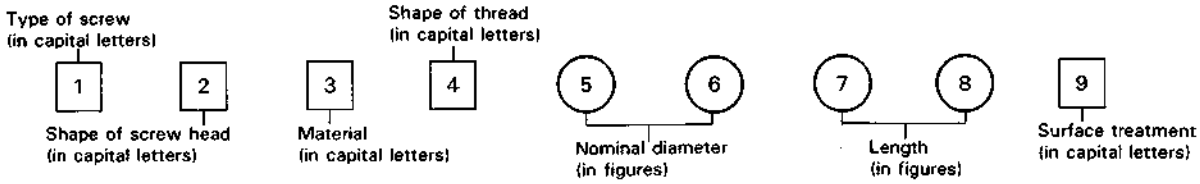
3-38

SECTION 4
EXPLODED VIEWS AND PARTS LIST

4.1 STANDARD PART NUMBER CODING

4.1.1 Screw coding

Standard screw part numbers are as follows.

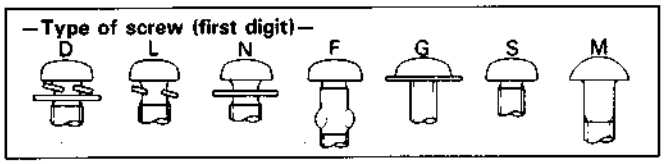


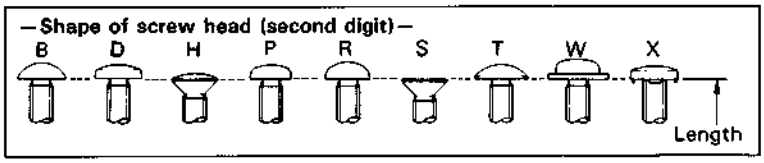
Type of screw (first digit)

- S Normal screws
- D Assembled machine screws (with plain and spring washers)
- L " (with spring washer)
- N " (with plain washer)
- F Feather screws
- G Washer head tapping screws
- M Wood screws

Shape of screw head (second digit)

- B Brazier head
- D Binding head
- H Oval countersunk head
- P Pan head
- R Round head
- S Flat head
- T Truss head
- W Washer head (machine screws)
- X Toothed head



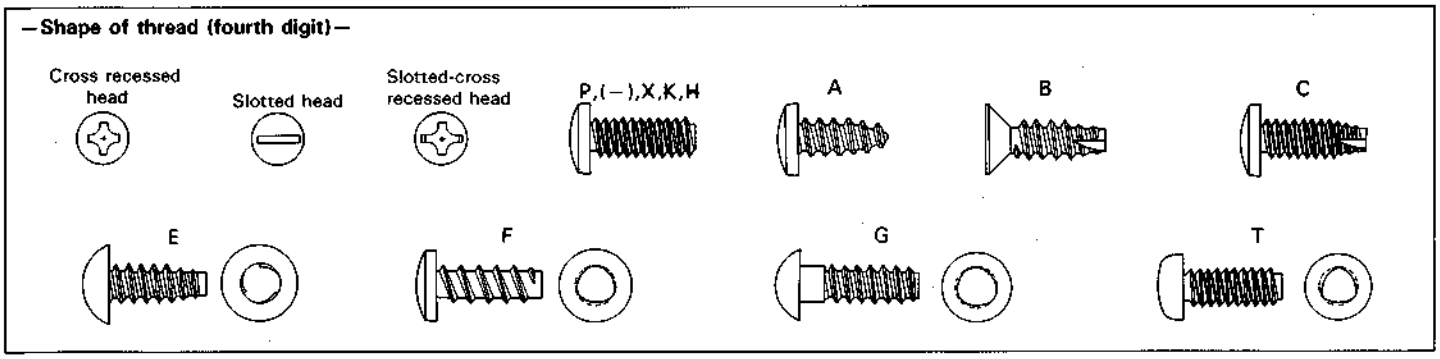


Material (third digit)

- S Steel
- E Stainless steel
- C Cast iron
- U Copper
- B Brass
- P Phosphor bronze
- N Nickel silver
- Y Cast brass
- A Aluminum
- Z Zinc alloy
- K Polycarbonate

Shape of thread (fourth digit)

- P Cross recessed head screws
- (−) Slotted head machine screws
- X Slotted-cross recessed head machine screws
- K Cross recessed head machine screws for precision equipment (type 1)
- H " (type 3)
- A Cross recessed head tapping screws (type 1)
- B " (type 2)
- C " (type 3)
- E Cross recessed head special tapping screws (brand : evertight)
- F " (brand : P-tight)
- T " (brand : taptight)
- G "



Nominal diameter (fifth and sixth digits)

The fifth and sixth digits indicate a nominal diameter or dimension. If the dimension exceeds 10 mm, three digits are used. The number indicates a nominal diameter or dimension, given in millimeters, multiplied by ten.

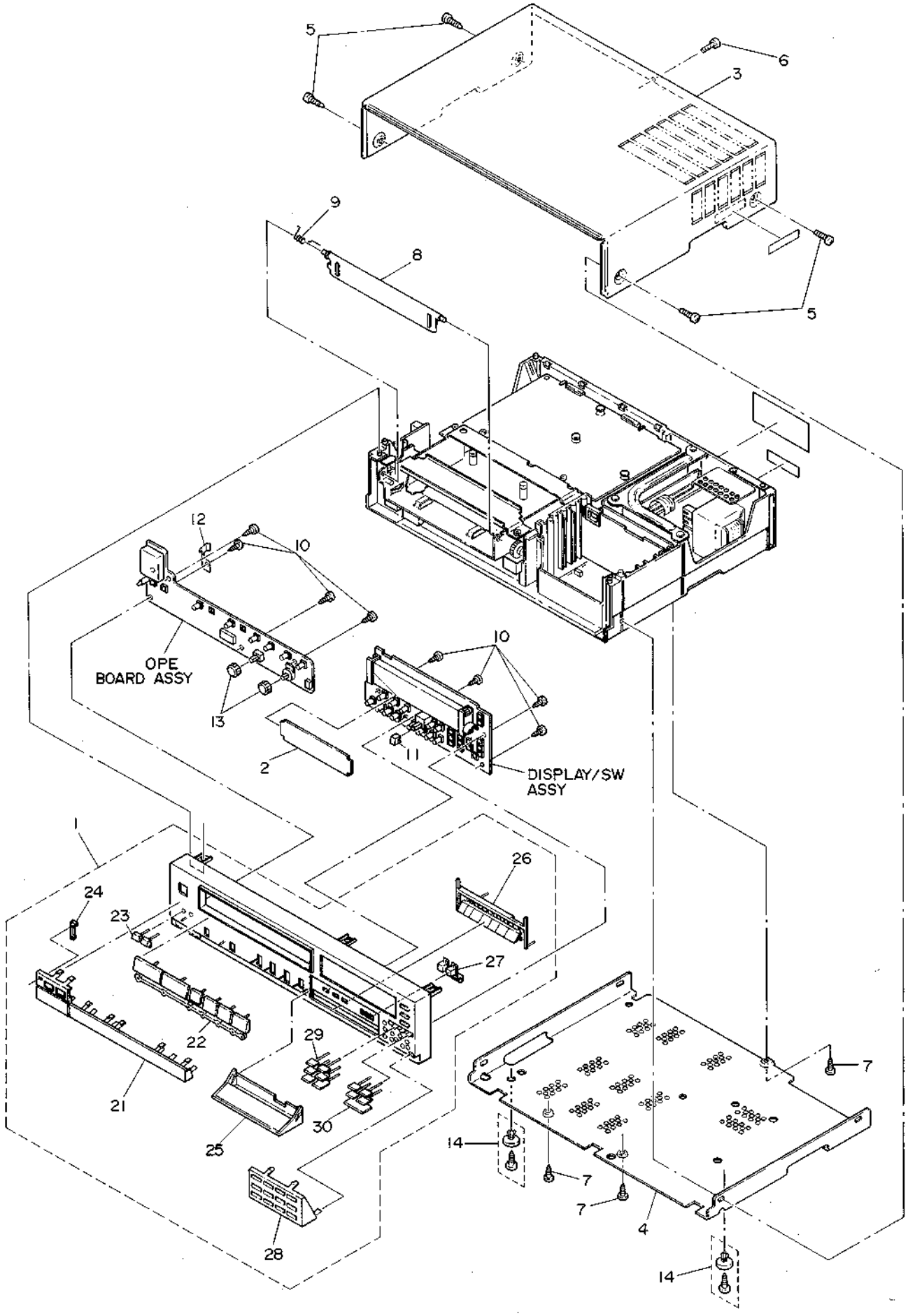
Length (seventh and eighth digits)

The seventh and eighth digits indicate length in millimeters. The preceding figure is zero when the dimension is smaller than 10 mm. For machine screws used in precision equipment whose length is given in units of 0.1 mm, the number indicates ten times the size of their length.

Surface treatment (ninth digit)

- Z Dichromate treatment after galvanizing (MFZn II-C)
- N Nickel plating (MFNiII, MFNiI)
- R Chromium plating (MBCrII, MBCrI)
- G Silver plating (SP4)
- B Black coating after plating
- F Blackening of iron (FB)
- M Blackening after galvanizing
- K Pickling of brass (PF2)
- P Phosphate treatment
- W Uni-chrome plating
- L Coated with transparent paint
- A Colored red after galvanizing (MFZnII-C)
- C Colored blue after galvanizing (MFZnII-C)
- T Colored green after galvanizing (MFZnII-C)
- V Colored purple after galvanizing (MFZnII-C)

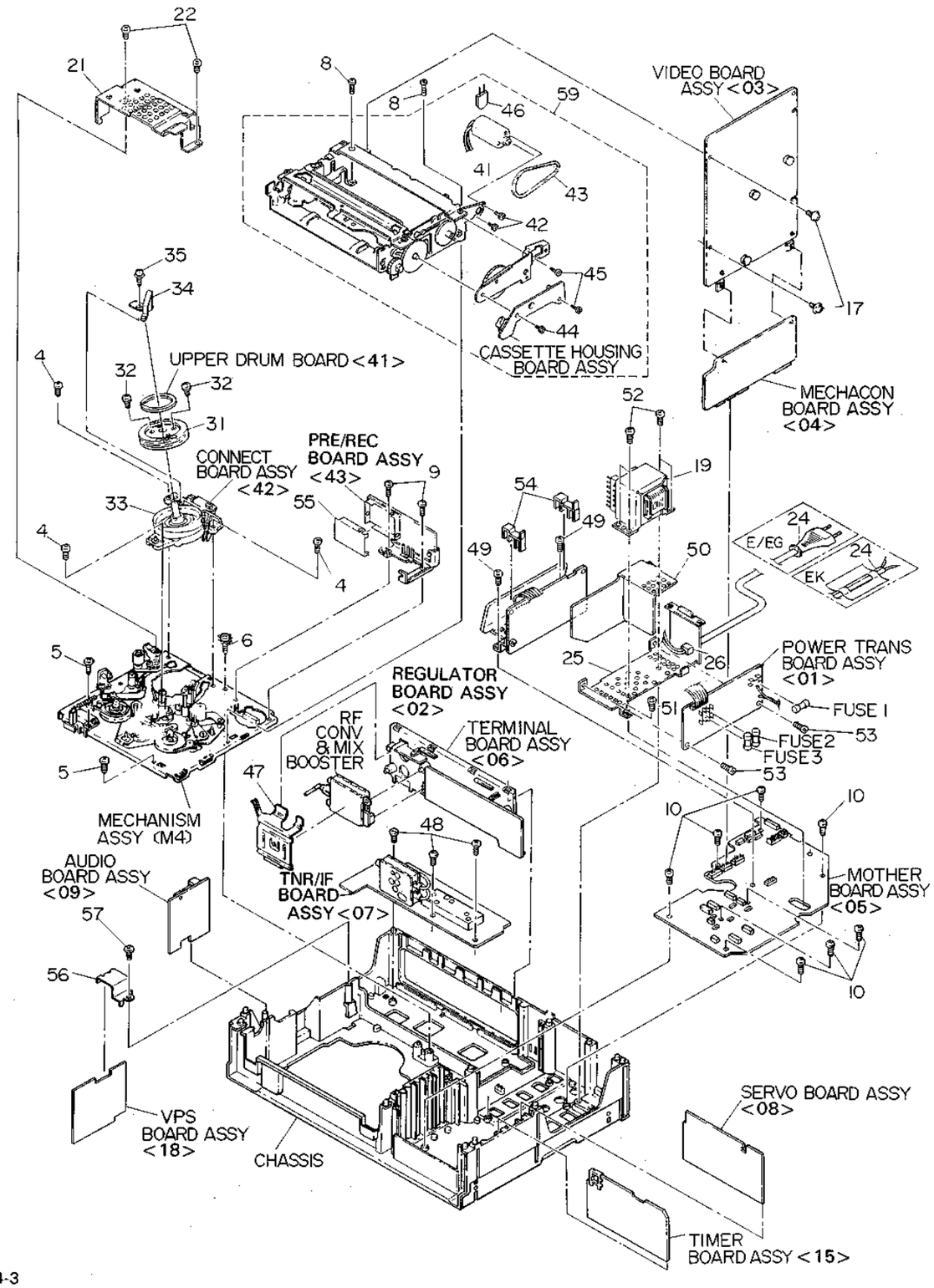
4.2 CABINET ASSEMBLY <M2>



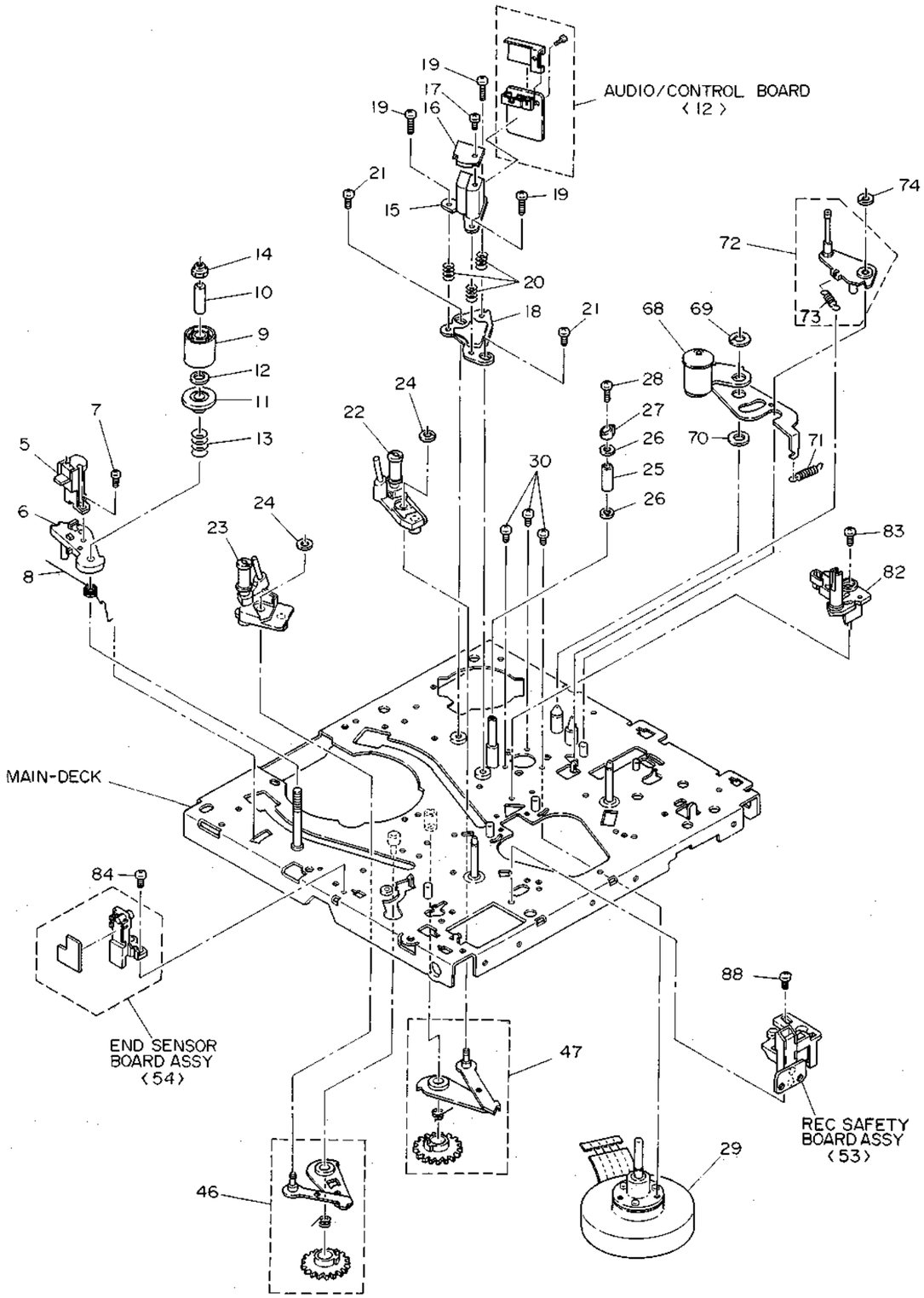
#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
			2. CABINET ASSEMBLY <M2>
	1	PQ10487B-8	FRONT PANEL ASSY,(EG)INCL21-30
		PQ10487F-9	FRONT PANEL ASSY,(E).INCL21-30
		PQ10487E-9	FRONT PANEL ASSY,(EK)INCL21-30
	2	PQ31335-4	FDP FILTER
⚠	3	PQ10328-20	TOP COVER
⚠	4	PQ10330-1-6	BOTTOM COVER
	5	SDSA4014M	TAPPING SCREW,X4.TOP COVER
	6	SDSF3010M	TAPPING SCREW
	7	SDSF3010Z	TAPPING SCREW,X3.BUTTON COVER
	8	PQ31267-84	C.HOUSING DOOR
	9	PQ42410-1-1	TORSION SPRING
	10	SDSF2608Z	TAPPING SCREW,X8T/DESP/OPBOARD
	11	PQ42353	MEMORY BUTTON
	12	PQ42636-1-1	EARTH BRACKET
	13	PQ31214-1-1	VOLUME KNOB,X2
	14	PU57662-1-1	FOOT,X2
	21	PQ20440-5-2	COVER(OPE),(E/EK)
		PQ20440-1-2	COVER(OPE),(EG)
	22	PQ20441-1-2	BUTTON(OPE),(E/EK)
		PQ20441-2-2	BUTTON(OPE),(EG)
	23	PQ31722-1-1	BUTTON(POWER)
	24	PQ43039	INDICATOR(POWER
	25	PQ31209N	DOOR ASS'Y(EG)
		PQ31209U	DOOR ASS'Y,(E)
		PQ31209T	DOOR ASS'Y,(EK)
	26	PQ31384-7	PROGRAM BUTTON,(EK)
		PQ31384-3	PROGRAM BUTTON,(EG)
		PQ31384-8	PROGRAM BUTTON,(E)
	27	PQ31206	COUNTER BUTTON
	28	PQ31212-9	BUTTON COVER(R),(EG)
		PQ31212-10-10	BUTTON COVER(R),(E/EK)
	29	PQ31213	TEN KEY BUTTON
	30	PQ31213-2	TEN KEY BUTTON

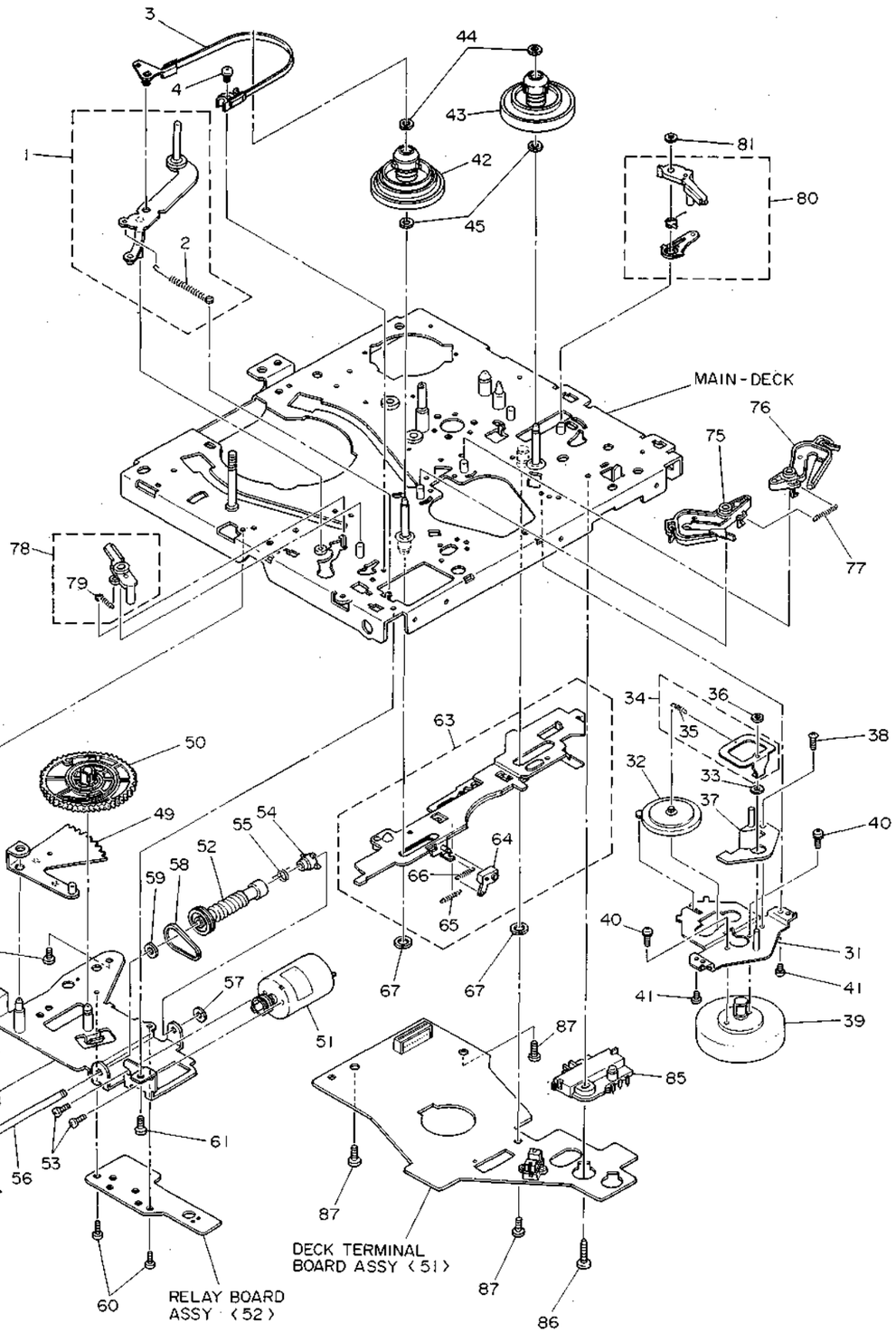
#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
			3. CHASSIS ASSEMBLY <M3>
	4	SDSP2608Z	SCREW,X3.FOR DRUM
	5	SDSA4014Z	TAPPING SCREW,X2.M.DECK
	6	PQ41396	SPECIAL SCREW, M.DECK
	8	SDST2605Z	TAPPING SCREW,X2.C.HOUSING
	9	SDST2605Z	TAPPING SCREW,X2.PRE AMP
	10	SDSF3010Z	TAPPING SCREW,X7.MOTHER BOARD
	17	GPST2606Z	TAPPING SCREW,X2.V/M/S BOARD
⚠	19	PU59383	POWER TRANSFORMER
⚠		PU59212-3	POWER TRANSFORMER,(E/EG)
	21	PQ31171-2-4	DRUM SHIELD
	22	SDST2605Z	TAPPING SCREW,X2. DRUM SHIELD
⚠	24	QMP5140-200	POWER CORD, (EK)
⚠		QMP3980-200	POWER CORD, (E/EG)
⚠	25	PQ31201	TRANS BRACKET
⚠	26	QHS3771-108	STRAIN RELIEF
	31	PDM2004B	UPPER DRUM ASSY
	32	PDM4001A	DRUM SCREW ASSY,X2
	33	PDM2053E-4	LOWER DRUM MOTOR ASSY
	34	PDM4017A-2	BRUSH ASSY
	35	DPSP2606Z	SCREW
⚠	41	PQ42385A	CASSETTE MOTOR ASSY, (EG/EK)
⚠		OR PQ42385B	CASSETTE MOTOR ASSY, (E)
	42	SPSP2603Z	SCREW, X2
	43	PQM30003-19	BELT
	44	SPSP2604Z	SCREW
	45	SPST2605Z	TAPPING SCREW, X2
	46	DV710SR223M16	VARISTOR
	47	PQ31242	EARTH SPRING
	48	SDSF3010Z	TAPPING SCREW,X3.TU/IF BOARD
	49	SDSF3012Z	TAPPING SCREW,X2.HEART SINK
⚠	50	PQ31241-2-4	AC COVER
	51	SDST3006C	TAPPING SCREW.EARTH
	52	SDSA4014Z	TAPPING SCREW,X4 TRANS
	53	SDST3006Z	TAPPING SCREW, TRANS BRACKET
	54	PQ42733-1-2	PWB HOLDER
	55	PU59082	PRE SHIELD (3)
	56	PQ43184	BRACKET. FOR VPS BOARD
	57	SDSF3010Z	TAPPING SCREW. FOR VPS BOARD
	59	PUS28277H	CASS.HOUSING ASSY,INCL41-46

4.3 CHASSIS ASSEMBLY <M3>



4.4 MECHANISM ASSEMBLY <M4>



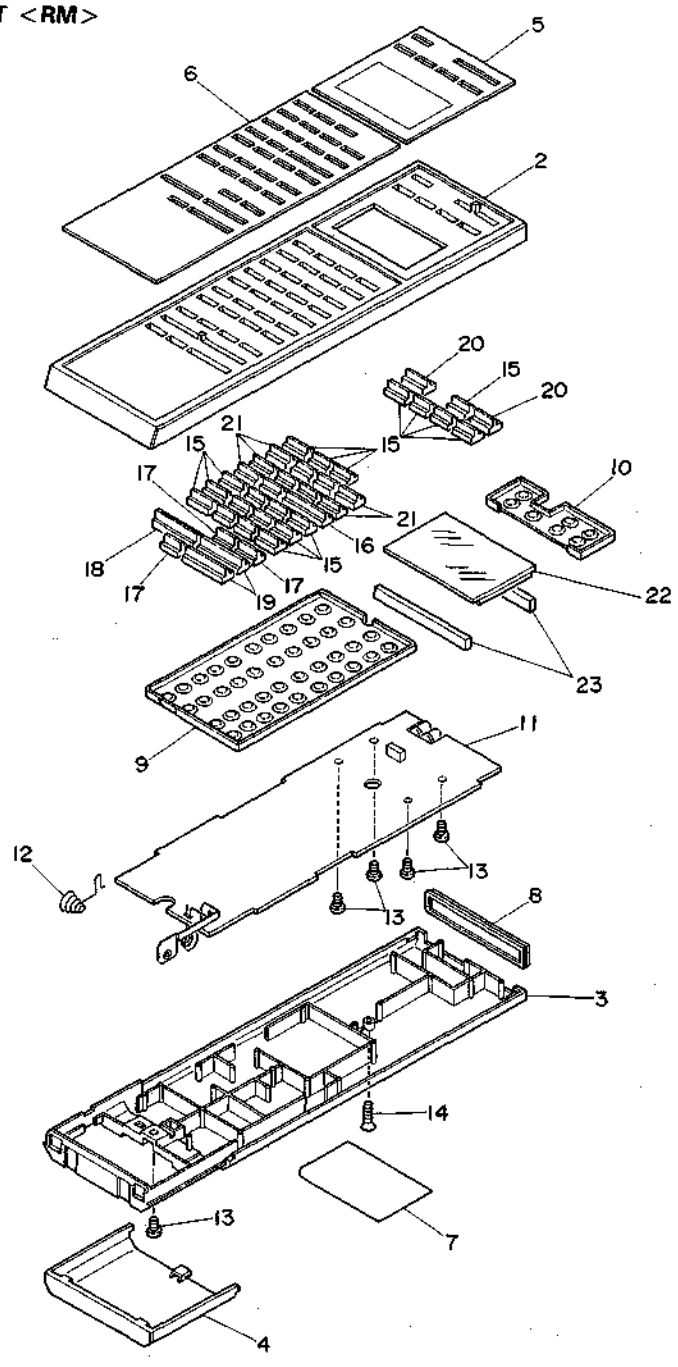


4-4

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
			**********
			**********
			* 4. MECHANISM ASSEMBLY <M4> *
			**********
	1	PQ41944A-7	TENSION ARM ASSY, INCL.2
	2	PQ41952-3	SPRING
	3	PQ41948A	TENSION BAND ASSY
	4	SDST2606Z	TAPPING SCREW
	5	PU57641-2	FULL ERASE HEAD
	6	PQ31036	FULL ERASE HEAD BASE
	7	SPSG2606Z	SCREW
	8	PQ41954-1-1	TORSION SPRING
	9	PQ41955	IMPEDANCE ROLLER
	10	PQ41956	COLLAR
	11	PQ41957	LOWER FLANGE
	OR	PQ42958	LOWER FLANGE
	12	PQM30018-39	SPACER
	OR	PQM30018-50	SPACER
	13	PQM30002-124	COMPRESSION SPRING
	14	PQ40353	NYLON NUT
	15	PU59253	AUDIO/CONTROL HEAD
	16	PU55535	SHIELD CAP
	17	HPSP2015N	SCREW
	18	PQ42984-1-3	HEAD BASE
	19	SPSP2608Z	SCREW,X3
	20	PU30080-49	SPRING,X3
	21	SDSP2606Z	SCREW,X2
	22	PQ41963A-1	POLE BASE ASSY(TU)
	OR	PU59994	POLE BASE ASSY(TU)
	23	PQ41969A-1	POLE BASE ASSY(SUP)
	OR	PU59993	POLE BASE ASSY(SUP)
	24	PQM30017-5	SLIT WASHER,X2
	25	PU53629-2	TAPE GUIDE
	26	PQ40268-2	GUIDE FLANGE,X2
	27	PQ42999-2	G.POLE CAP
	28	SDSP2006Z	SCREW
⚠	29	PU58635V	CAPSTAN MOTOR
	30	SPSP2605N	SCREW,X3
	31	PQ41974A-3	REEL MOTOR BRACKET ASSY
	32	PU58645-1-4	IDLER ARM
	33	Q03093-834	WASHER
	34	PQ41976A-1	SPRING ARM ASSY,INCL.35
	35	PQ42212-1-4	SPRING
	36	PQM30017-22	SLIT WASHER
	37	PQ41978	HOLDER
	38	SPST2606Z	TAPPING SCREW
⚠	39	PU58636W	REEL MOTOR
	OR	PU58636M	REEL MOTOR,
	40	LPSP2604Z	SCREW, X2
	41	SPST2606Z	TAPPING SCREW, X2
	42	PU59250-1-2	REEL DISK(SUP)
	43	PU58638-1-2	REEL DISK(TU)
	44	PQM30017-5	SLIT WASHER, X2
	45	Q03093-828	WASHER, X2
	46	PQ41979A-4	LOADING ARM ASSY(SUP)
	47	PQ41985A-2	LOADING ARM ASSY(TU)
	48	PQ41992A-1	CAM BRACKET SUB ASSY
	49	PQ41994A-2	ARM GEAR SUB ASSY
	50	PQ20250-1-1	CONTROL CAM
	51	PQ41996A	MODE MOTOR ASSY
	52	PQ41998A	WORM ASSY
	53	LPSP2604Z	SCREW,X2
	54	PQ42001	WINDMILL
	55	PQ42002	CLUTCH SPRING
	56	PQ42003	WORM SHAFT
	57	PQM30017-5	SLIT WASHER,X2
	58	PQM30003-17	BELT
	59	PQM30018-22	SPACER
	60	SPST2606Z	SCREW,X2

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	61	SPST2606Z	SCREW,X2
	62	SPSP2603Z	SCREW
	63	PQ42038A-3	PLATE ASS'Y, INCL 64-66
	64	PQ31044-1-2	LOCK LEVER
	65	PQM30001-191	TENSION SPRING
	66	PQM30001-211	TENSION SPRING
	67	PQM30017-28	SLIT WASHER,X2
	68	PQ42006B	PINCH ROLLER ARM ASSY
	69	PQM30017-28	SLIT WASHER
	70	Q03093-833	WASHER
	71	PQM30001-193	TENSION SPRING
	72	PQ42013B-4	GUIDE ARM ASSY,INCL.73
	73	PQ42029	SPRING
	74	PQM30017-6	SLIT WASHER
	75	PQ42019A-3	MAIN BRACKET ASSY(SUP)
	76	PQ42020B	MAIN BRACKET ASSY(TU)
	77	PQM30001-216	TENSION SPRING
	78	PQ42021A-3	SUB BRAKE ASSY(SUP),INCL.79
	79	PQ42023-1-2	TENSION SPRING
	80	PQ42037A-2	SUB BRAKE ASSY(TU)
	81	PQM30017-6	SLIT WASHER
	82	PU59452	LED HOLDER
	OR	PU58640	LED HOLDER
	83	SPST2606Z	TAPPING SCREW
	84	SPST2606Z	TAPPING SCREW
	85	PU58642	SLIDE ENCODER
	86	SDSP2610Z	SCREW
	87	SDSP2606Z	SCREW,X3
	88	SDST2606Z	TAPPING SCREW

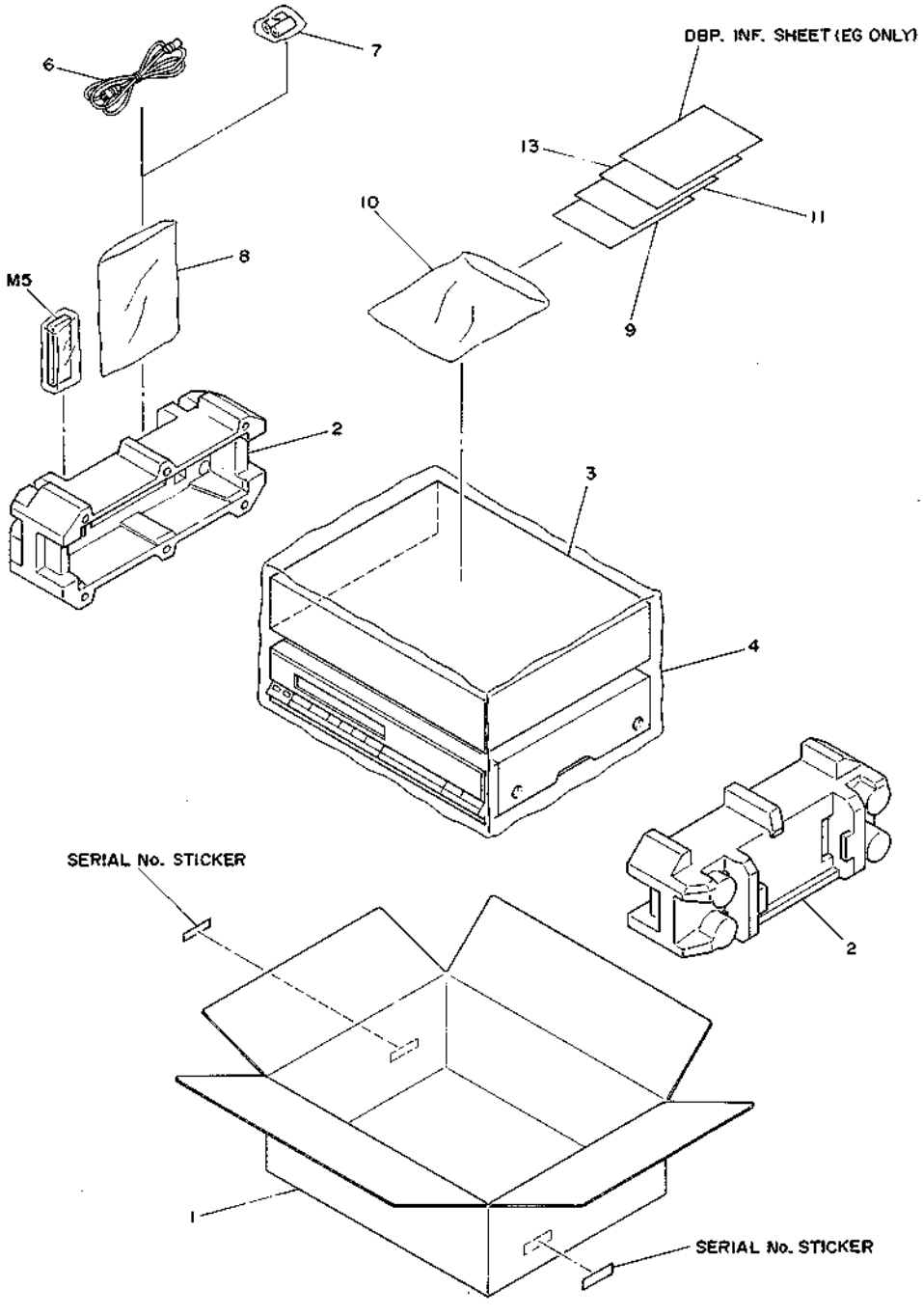
4.5 REMOTE CONTROL UNIT <RM>



#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
			**********
			**********
			* 5. REMOTE CONTROLLER ASSEMBLY <M5> *
			**********
	1	PQ10543E	REMO. CONTROLLER, (E), INCL. 2-23
		PQ15043D	REMO. CONTROLLER, (EK), INCL. 2-23
		PQ10543B	REMO. CONTROLLER, (EG), INCL. 2-23
	2	PQ31909	UPPER CASE
	3	PQ31910	LOWER CASE
	4	PQ31449	BATTERY CAP
	5	PQ31911-3	L.C.D. WINDOW, (E/EK)
		PQ31911-2	L.C.D. WINDOW, (EG)
	6	PQ31912-5	TOP PANEL, (E)
		PQ31912-4	TOP PANEL, (EK)
		PQ31912-2	TOP PANEL, (EG)
	7	PU36139-53	REMOCON LABEL, (E)
		PU36139-52	REMOCON LABEL, (EK)
		PU36139-49	REMOCON LABEL, (EG)

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	8	PQ10543-003	WINDOW
	9	PQ10543-004	RUBBER SHEET (L)
	10	PQ10543-005	RUBBER SHEET (S)
	11	PQ10543-001	REMOCON BOARD ASSY, (E/EG)
		PQ10543-002	REMOCON BOARD ASSY, (EK)
	12	PQ10355-009	BATTERY TERMINAL
	13	SDSP2005M	SCREW, x5
	14	SSSP201M	SCREW
	15	PQ10543-006	BUTTON, BLACK x16
	16	PQ10543-007	BUTTON, SAME BLACK (L)
	17	PQ10543-008	BUTTON, GRAY (S) x3
	18	PQ10543-009	BUTTON, RED
	19	PQ10543-010	BUTTON, GRAY (L) x2
	20	PQ10543-011	BUTTON, BLUE x2
	21	PQ10543-012	BUTTON, SAME BLACK x10
	22	PQ10543-013	L.C.D., (E/EK)
		PQ10543-014	L.C.D., (EG)
	23	PQ10543-015	CONNECTER, x2

4.6 PACKING ASSEMBLY <M1>



#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
**********			
			**********
			* 1. PACKING ASSEMBLY <M1> *
			**********
	1	PQ31705-4	PACKING CASE,(EG)
		PQ31705-12	PACKING CASE,(E)
		PQ31705-11	PACKING CASE,(EK)
	2	PQ31706A-1	CUSHION ASSY
	3	PQ41026-8	PROTECT SHEET
⚠	4	PUP30320-26-12	POLY BAG,(EK)
		PQM30021-59-11	POLY BAG,(E/EG)
⚠	6	PU59168-3	RF CABLE
⚠	OR	PU59167-3	RF CABLE
	7	UM-3DJ2P	BATTERY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
⚠	8	PQM30023-8	POLY BAG,(EK)
		QPGA020-02003	POLY BAG,(E/EG)
⚠	9	PU30425-922	INSTRUCTIONS,(E)
⚠		PU30425-920	INSTRUCTIONS,(EK)
⚠		PU30425-919	INSTRUCTIONS,(EG)
	10	QPGA025-03505	POLY BAG,(E/EG)
⚠		PQM30023-5	POLY BAG,(EK)
	11	BT-20069A	WARRANTY CARD,(EG)
		BT-20060	GUARANTY CARD,(EK)
	13	BT-20066	E.DISTRI.LIST,(EK)

SECTION 5
PARTS LIST

SAFETY PRECAUTION

Parts identified by the ⚠ symbol are critical for safety. Replace only with specified part numbers.

ABBREVIATIONS IN THIS LIST ARE AS FOLLOWS:

RESISTORS—All resistance values are in ohms (Ω), unless otherwise indicated.

k	: 1,000 (Kilo)
M	: 1,000,000 (Mega)
Chip R	: Chip Resistor
Chip VR	: Chip Variable Resistor
Comp. R	: Composition Resistor
CR	: Carbon Film Resistor
FR	: Fusible Resistor
MFR	: Metal Film Resistor
MPR	: Metal Plate Resistor
OMR	: Oxide Metal Film Resistor
PMR	: Precision Metal Film Resistor
UFR	: Unflammable Resistor
VR	: Variable Resistor (Potentiometer)
WR	: Wire Wound Resistor

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

pF	: μμF (Pico farad)
C Cap	: Ceramic Capacitor
Chip Cap	: Chip Capacitor
Chip T Cap	: Chip Tantalum Capacitor
E Cap	: Electrolytic Capacitor
FM Cap	: Film Mica Capacitor
LL Cap	: Low Leak Current Electrolytic Capacitor
MM Cap	: Metalized Mylar Capacitor
MP Cap	: Metalized Paper Capacitor
MY Cap	: Mylar Capacitor
NP Cap	: Non-polar Capacitor
PC Cap	: Polycarbonate Capacitor
PP Cap	: Polypropylene Capacitor
PS Cap	: Polystyrol Capacitor
T Cap	: Tantalum Capacitor
TF Cap	: Thin Film Capacitor
TR Cap	: Trimmer Capacitor

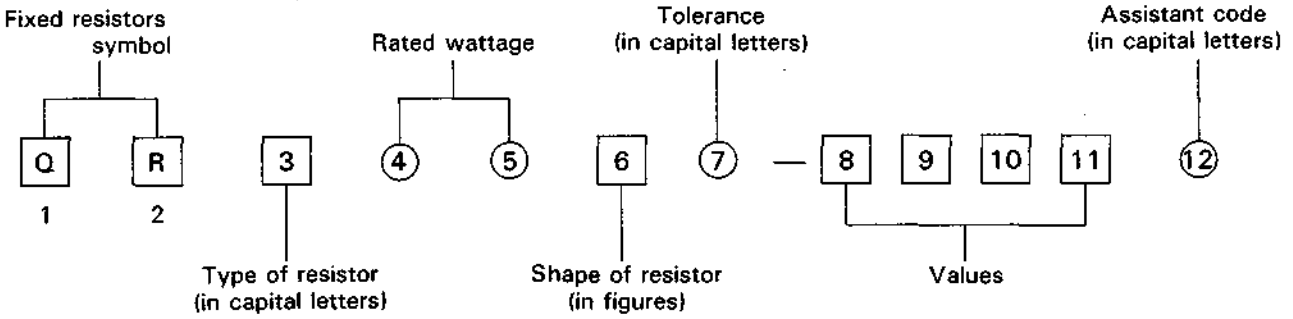
NOTES:

- [M] indicates mechanical symbol number.
- [2 digits] indicates circuit board symbol number.
- "X " indicates quantity per set.

5.1 STANDARD PART NUMBER CODING

5.1.1 Fixed resistor coding

Fixed resistor part numbers are as follows.



Type of resistor (third digit)

C	Composition resistors
D	Carbon film resistors
F	Unflammable resistors
G	Oxide metal film resistors
H	Fusible resistors
M	Metal plate resistors
S	Metal glazed resistors
V	Precision metal film resistors
W	Wire wound resistors
X	Metal film resistors
Z	Special resistors

Rated wattage (fourth and fifth digits)

A0	1/10 W
18	1/8 W
16	1/6 W
14	1/4 W
12	1/2 W
01	1 W
02	2 W
03	3 W
04	4 W
05	5 W
06	6 W
07	7 W
75	7.5 W
08	8 W
10	10 W
15	15 W
A6	16 W
20	20 W
30	30 W

Tolerance (seventh digit)

F	±1 %
G	±2 %
J	±5 %
K	±10 %
M	±20 %

Assistant code (twelfth digit)

A	Small type
B	Small type
S	Small type
Y	Lead tapping
Z	Lead tapping

Values (eighth – tenth or eleventh digits)

examples:

R47		0.47 Ω
4R7		4.7 Ω
470	47×10^{0}	47 Ω
471	47×10^{1}	470 Ω
472	47×10^{2}	4.7 kΩ
473	47×10^{3}	47 kΩ
474	47×10^{4}	470 kΩ
475	47×10^{5}	4.7 MΩ

QRV resistance shown by four digits:

4640	464×10^{0}	464 Ω
4641	464×10^{1}	4.64 kΩ
4642	464×10^{2}	46.4 kΩ

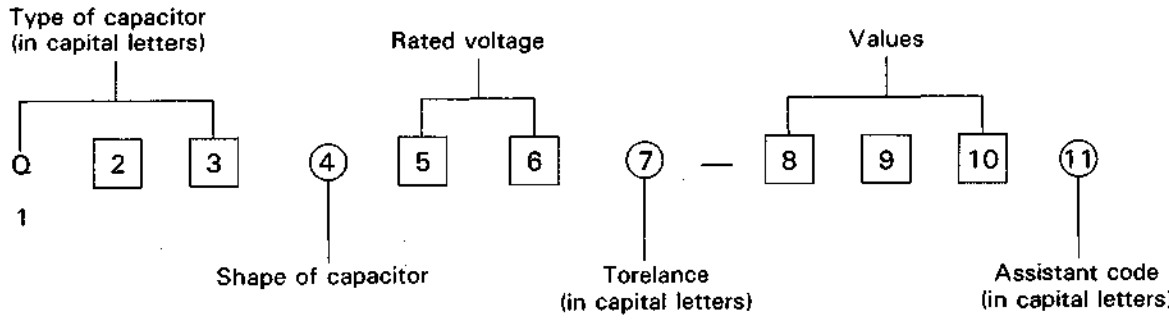
Shape of resistor (sixth digit)

Note: ■ indicates flame retardant resistor.

Shape of resistor \ Type of resistor	C	D	F	G	H	M	S	V	W	X
1										
2										
3										
4										
5									(L) type	
6										
7			Lug (B) type							
8			Lug (A) type				Chip			
9			Lug (C) type							

5.1.2 Fixed capacitor coding

Fixed capacitor part numbers are as follows.



Ceramic capacitors

Type of capacitor (first – third digits)		Shape of capacitor (fourth digit)				
Symbol	Characteristics	Mono-direction	Kink lead	Axial lead	Axial forming lead	Chip
QCC	Ceramic	1		4	5	
QCD	High capacitance					A
QCF	High capacitance	1,4	3			8,A
QCS	Temperature compensation	1	3	4	5	8,A
QCT	Temperature compensation	Special coding				8,A
QCV	Ceramic			1	3	
QCX	Ceramic			1	3	
QCY	High capacitance	1,4	3	6	7	8,A
QCZ	Special type	Special coding				
QCB	Ceramic			B	C	

Electrolytic capacitors

Type of capacitor (first – third digits)		Shape of capacitor (fourth digit)				
Symbol	Characteristics	Tubular	Mono-direction	Anti-stress	Forming	Snap-in
QEB	Low leakage		4	5	6	
QEC	Low leakage		4,8,A	9,B	6,C	
QEE	Tantalum (normal)		4	5	6	
	Tantalum (small)		8			
QEF	Chip tantalum	8 (chip type)				
QEG	Low impedance		4			
QEK	Miniature type		4	5	6	
QEL	Small type		4	5	6	7
QEM	Small type		4,A	5	6	
QEN	Non-polar	2	4	5	6	
QEP	Non-polar (small)		4,A	5,B	6,C	
QER	Miniature type		4	5	6	
QET	Small type	2	4,A	5,B	6,C	7
QEU	Small type		4	5	6	
QEV	Small type		4		6	7
QEW	Normal	2	4	5	6	7

Paper film capacitors

Type of capacitor (first — third digits)		Shape of capacitor (fourth digit)				
		Tubular	Normal		Flame retardant	
Symbol	Characteristics		Mono-direction	Kink lead	Mono-direction	Kink lead
QFA	Metalized polypropylene				7	
QFE	Metalized mylar				5	
QFF	Film mica		4			
QFG	Polypropylene film		4	8		
QFH	Metalized mylar	2	4	3	5,7	6
QFJ	Mylar (special)		4			
QFK	Metalized mylar (small)				5	
QFM	Mylar	2	4	3,7	5	6
QFN	Mylar (small)		4	3		
QFP	Polypropylene		4	3,8		
QFS	Polystyrole	2	4	3		
QFV	Thin film		4	8		
QFZ	Special type	Special coding				

Rated voltage (fifth and sixth digits)

Fifth digit \ Sixth digit	A	B	C	D	E	F	G	H	J	K	V	W	X
0						3.15	4.0		6.3				
1	10		16	20	25		40	50	63	80	35		
2	100	125	160	200	250	315	400	500	630		350	450	600
3	1000	1250		2000				5000					

Tolerance (seventh digit)

A	$^{+100}_{-10}$ %	M	± 20 %
F	± 1 %	N	± 30 %
G	± 2 %	P	$^{+100}_{-0}$ %
H	$^{+50}_{-10}$ %	R	$^{+30}_{-10}$ %
J	± 5 %	X	$^{+40}_{-20}$ %
K	± 10 %	Z	$^{+80}_{-20}$ %

Values (eighth — tenth digits)

Example : Values are in picofarads

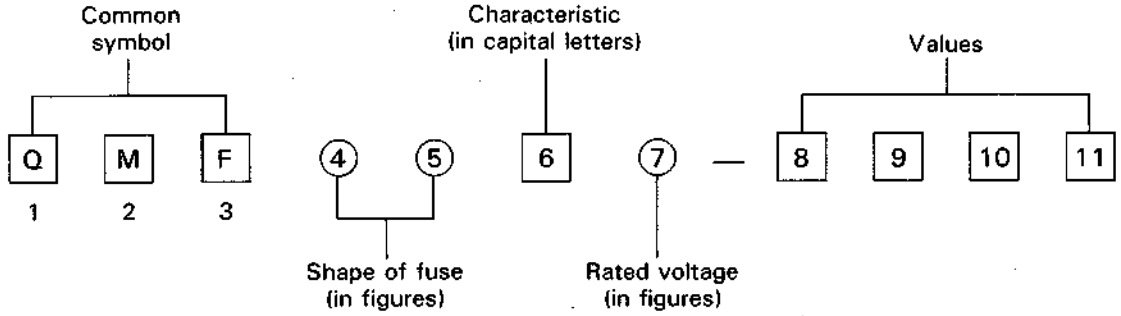
101 ..... 10×10^{1} pF ..... 100 pF
102 ..... 10×10^{2} pF ..... 1,000 pF (0.001 μF)
103 ..... 10×10^{3} pF ..... 10,000 pF (0.01 μF)
104 ..... 10×10^{4} pF ..... 100,000 pF (0.1 μF)
105 ..... 10×10^{5} pF ..... 1 μF
5R0 ..... 5.0 pF

Assistant code (eleventh digit)

G Small size
Z Lead tapping
Y Lead tapping

5.1.3 Fuse coding

Standard fuse part numbers are as follows.



Shape of fuse
(fourth and fifth digits)

51	ϕ5.2×20 mm
60	ϕ6.4×30 mm
61	ϕ6.35×31.8 mm
63	ϕ6.4×30 mm with lead wires
66	ϕ6.35×31.8 mm with lead wires
00	Special type

Rated voltage
(seventh digit)

1	AC125 V
2	AC250 V
3	0.1—1 A : AC250 V 1.25—6.3 A : AC125 V

Values
(eighth-tenth or eleventh digits)
example:

R63	..... 0.63 A
1R0	..... 1.0 A
2R5	..... 2.5 A
100	..... 10 A
R315	..... 0.315 A
1R25	..... 1.25 A

Characteristics (sixth digit)

Symbol	Fusing Current	Fusing Time	Remarks
A	210 %	Within 2 min.	Anti-rush type (for Europe)
	275 %	0.6 — 10 sec.	
	400 %	0.15 — 3 sec.	
	1000 %	0.02 — 0.3 sec.	
B	210 %	Within 30 min.	Regular fusible type (for SEMKO, Europe)
	275 %	0.05 — 2 sec.	
	400 %	0.01 — 0.3 sec.	
C	135 %	Within 1 hr.	Regular fusible type (for UL, Japan)
	200 %	Within 2 min.	
E	210 %	Within 2 min.	Anti-rush type (for Europe)
	275 %	0.6 — 10 sec.	
	400 %	0.15 — 3 sec.	
	1000 %	0.02 — 0.3 sec.	
J	135 %	Within 1 hr.	Anti-rush type
	200 %	Within 2 min.	
M	135 %	Within 1 hr.	Regular fusible type (for UL)
	200 %	Within 2 min.	
R	160 %	Within 1 hr.	Regular fusible type
	200 %	Within 2 min.	
S	160 %	Within 1 hr.	Anti-rush type
	200 %	Within 2 min.	
	700 % — 2000 %	Within 0.01 sec.	
U	135 %	Within 1 hr.	Anti-rush type (for UL)
	200 %	Within 2 min.	
	800 % — 2000 %	Within 0.01 sec.	

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
		********** POWER SUPPLY BOARD ASSEMBLY <01><02> **********	
	PWBA	PU22560B-02	POWER SUPPLY BOARD ASSY,EK
		PU22560A-02	POWER SUPPLY BOARD ASSY,E/EG
⚠	TAB	A74316	TAB, FOR AC IN
	FW1	PW30106-50AAZZA	PARALLEL WIRE
⚠	F1	QMF51E2-R315	FUSE,NOT INCL.POWER TRA BOARD
⚠	F2	QMF51E2-2R5	FUSE,NOT INCL.POWER TRA BOARD
⚠	F3	QMF51E2-1R0	FUSE,NOT INCL.POWER TRA BOARD
		-POWER TRANSFORMER BOARD ASSY < 01 >-	
	PWBA	PU22560B1-02	POWER TRANS BOARD ASSEMBLY,EK
		PU22560A1-02	POWER TRANS BOARD ASSY ,E/EG
	D1	10E2	DIODE
	D2	10E2	DIODE
	D4	ERA15-02	DIODE
	OR	1SR35-200A	DIODE
	OR	S5688G	DIODE
	OR	11E2	DIODE
	D5	ERA15-02	DIODE
	OR	1SR35-200A	DIODE
	OR	S5688G	DIODE
	OR	11E2	DIODE
	DS1	S4VB10	BRIDGE DIODE
	R2	QRZ0052-100	FUSIBLE RESISTOR
	C1	QFK52AK-473	M CAPACITOR
	C2	QETB1EM-228	E CAPACITOR
	C3	QETB1EM-478	E CAPACITOR
	C4	QETB1CM-478	E CAPACITOR
	C5	QETB1JM-476	E CAPACITOR
	C7	QETC1JM-107	E CAPACITOR
	OR	QETB1JM-107	E CAPACITOR
⚠	C101	QCZ9016-472P	CAPACITOR
⚠	HD	PU57505	FUSE CLIP,X6 FOR F1,F2,F3
⚠	LF1	PU59581	LINE FILTER, E/EG
⚠	LF2	PU59586	LINE FILTER, E/EG
		-REGULATOR BOARD ASSEMBLY < 02 >-	
	PWBA	PU22560B2-02	REGULATOR BOARD ASSEMBLY,EK
		PU22560A2-02	REGULATOR BOARD ASSEMBLY,E/EG
	IC1	STK5481	IC
	Q1	2SA720Q,R,S	TRANSISTOR
	Q2	2SA720Q,R,S	TRANSISTOR
	D6	HZ30-2	ZENER DIODE
	D11	MA165	DIODE,E/EG
	OR	1SS133	DIODE,E/EG
	D12	1SS133	DIODE
	OR	MA165	DIODE
	D13	MA161	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R3	QRD181J-822	RESISTOR
⚠	R4	QRZ0052-221	FUSIBLE RESISTOR
	R5	QRD181J-222	RESISTOR
	R6	QRD181J-272	RESISTOR
	R7	QRD181J-682	RESISTOR
	R8	QRD181J-223	RESISTOR
	R10	QRD181J-102	RESISTOR
	R11	QRD181J-104	RESISTOR
	C6	QETC1HM-106	E CAPACITOR
	OR	QET61HM-106	E CAPACITOR
	C8	QETA1HM-226	E CAPACITOR
	OR	QET41HM-226	E CAPACITOR
	C9	QETC1HM-106	E CAPACITOR
	OR	QET61HM-106	E CAPACITOR
	C10	QETC1CM-476	E CAPACITOR
	C12	QETC1CM-107	E CAPACITOR
	C13	QETC1CM-476	E CAPACITOR
	C14	QETC1CM-107	E CAPACITOR
⚠	HS	PQ31187	HEAT SINK
	TAB	A74017	TAB
	SCW1	SDST3014Z	TH.TAP SCREW, FOR IC1
	SCW2	SDST3006Z	SCREW, FOR HEAT SINK
	TP	PU55774	TEST PIN
	CN1	PU58931-14	CAP HOUSING
	CP1	ICP-F10	CIRCUIT PROTECTOR
	CP2	ICP-F15	CIRCUIT PROTECTOR
⚠	CP3	ICP-F15	CIRCUIT PROTECTOR
⚠	CP4	ICP-F20	CIRCUIT PROTECTOR
		********** MAIN BOARD ASSEMBLY <03><04> **********	
	PWBA	PB10043A-02	MAIN BOARD ASSEMBLY ,E/EG
		PB10043B-02	MAIN BOARD ASSEMBLY ,EK
	HN	PU57951	TU PWB HINGE
	RV	PU52105	P RIVET
	J1	PW30109-50AAZZ6	PARALLEL WIRE
	J2	PW30109-50AAZZB	PARALLEL WIRE
	SPC1	PQ41028-2	SPACER
	SPC2	PQM30029-100	SPACER
		-VIDEO BOARD ASSEMBLY < 03 >-	
	PWBA1	PB10043A1	VIDEO BOARD ASSEMBLY ,E/EG
		PB10043B1	VIDEO BOARD ASSEMBLY,EK
	IC101	PU22282A	Y.MODULE BOARD ASSY
	IC102	7VT12	IC
	IC201	TA7374P	IC
	IC202	MSM6989RS	IC
⚠	IC301	PU22046A	C.MODULE BOARD ASSY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	IC351	BA7007	IC, E/EG
	IC401	AN3592K	IC
	Q101	2SC1740S(QRS)	TRANSISTOR
	Q102	2SC1740S(QRS)	TRANSISTOR
	Q104	2SC1740S(QRS)	TRANSISTOR
	Q105	2SC1740S(QRS)	TRANSISTOR
	Q106	2SC1740S(QRS)	TRANSISTOR
	Q111	2SC1740S(QRS)	TRANSISTOR
	Q112	2SA933S(RS)	TRANSISTOR
	Q113	2SA933S(RS)	TRANSISTOR
	Q201	DTC124ES	TRANSISTOR
	Q202	DTC124ES	TRANSISTOR
	Q203	DTC124ES	TRANSISTOR
	Q204	DTC124ES	TRANSISTOR
	Q208	2SC1740S(QRS)	TRANSISTOR
	Q209	2SC1740S(QRS)	TRANSISTOR
	Q210	2SC1740S(QRS)	TRANSISTOR
	Q211	2SA1309R,S	TRANSISTOR
	Q212	2SC1740S(QRS)	TRANSISTOR
	Q213	2SC1740S(QRS)	TRANSISTOR
	Q215	2SC1740S(QRS)	TRANSISTOR
	Q216	DTC124ES	TRANSISTOR
	Q217	DTC144WS	TRANSISTOR
	Q301	2SC1740S(QRS)	TRANSISTOR
	Q302	2SC1740S(QRS)	TRANSISTOR
	Q311	DTC124ES	TRANSISTOR
	Q312	DTC124ES	TRANSISTOR
	Q313	DTC144ES	TRANSISTOR
	Q314	DTC144ES	TRANSISTOR
	Q315	DTC144WS	TRANSISTOR
	Q316	DTC144ES	TRANSISTOR
	Q317	2SC1740S(QRS)	TRANSISTOR
	Q318	2SC1740S(QRS)	TRANSISTOR
	Q319	2SC1740S(QRS)	TRANSISTOR
	Q320	DTC144ES	TRANSISTOR
	Q321	DTC144ES	TRANSISTOR
	Q351	2SC1740S(QRS)	TRANSISTOR, E/EG
	Q352	2SC1740S(QRS)	TRANSISTOR, E/EG
	Q401	2SC1740S(QRS)	TRANSISTOR
	Q402	2SC1740S(QRS)	TRANSISTOR
	Q403	2SC1740S(QRS)	TRANSISTOR
	Q404	2SC1740S(QRS)	TRANSISTOR
	Q405	2SC1740S(QRS)	TRANSISTOR
	Q406	2SC1740S(QRS)	TRANSISTOR
	Q407	2SC1740S(QRS)	TRANSISTOR
	Q411	2SC1740S(QRS)	TRANSISTOR
	Q412	DTC124ES	TRANSISTOR, E/EG
	Q413	DTC124ES	TRANSISTOR
	Q414	2SC1740S(QRS)	TRANSISTOR
	Q415	DTC124ES	TRANSISTOR
	Q416	DTC124ES	TRANSISTOR
	Q417	DTC124ES	TRANSISTOR, E/EG
	Q418	DTC144ES	TRANSISTOR
	Q419	DTC143ES	TRANSISTOR
	Q420	DTC124ES	TRANSISTOR
	Q501	2SA933(S)	TRANSISTOR
	OR	2SA933S(S)	TRANSISTOR
	Q502	2SB643R,S	TRANSISTOR
	Q503	DTC144WS	TRANSISTOR
	Q504	2SB643R,S	TRANSISTOR
	Q505	2SB643R,S	TRANSISTOR
	Q506	DTC124ES	TRANSISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	Q507	DTC124ES	TRANSISTOR
	D101	MA165	DIODE
	OR	1SS133	DIODE
	D102	MA165	DIODE
	OR	1SS133	DIODE
	D103	OA90	DIODE
	D104	OA90	DIODE
	D105	MA165	DIODE
	OR	1SS133	DIODE
	D106	MA165	DIODE
	OR	1SS133	DIODE
	D202	MA165	DIODE
	OR	1SS133	DIODE
	D203	HZS9.1EB1	ZENER DIODE
	D206	MA165	DIODE
	OR	1SS133	DIODE
	D207	MA165	DIODE
	OR	1SS133	DIODE
	D208	MA165	DIODE
	OR	1SS133	DIODE
	D209	MA165	DIODE
	OR	1SS133	DIODE
	D211	MA165	DIODE
	OR	1SS133	DIODE
	D301	MA165	DIODE
	OR	1SS133	DIODE
	D302	MA165	DIODE
	OR	1SS133	DIODE
	D303	MA165	DIODE
	OR	1SS133	DIODE
	D305	MA165	DIODE
	OR	1SS133	DIODE
	D306	MA165	DIODE
	OR	1SS133	DIODE
	D307	MA165	DIODE
	OR	1SS133	DIODE
	D308	MA165	DIODE
	OR	1SS133	DIODE
	D351	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D352	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D353	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D354	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D355	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D356	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D357	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D358	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D403	MA165	DIODE
	OR	1SS133	DIODE
	D405	MA165	DIODE, E/EG
	OR	1SS133	DIODE, E/EG
	D407	MA165	DIODE
	OR	1SS133	DIODE
	D408	MA165	DIODE
	OR	1SS133	DIODE
	D409	MA165	DIODE
	OR	1SS133	DIODE
	D501	MA165	DIODE
	OR	1SS133	DIODE
	D502	MA165	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	OR	1SS133	DIODE
	D503	MA165	DIODE
	OR	1SS133	DIODE
	D504	MA165	DIODE
	OR	1SS133	DIODE
	D505	MA165	DIODE
	OR	1SS133	DIODE
	D507	MA165	DIODE
	OR	1SS133	DIODE
	D615	MA165	DIODE
	OR	1SS133	DIODE
	R101	QRD161J-332	RESISTOR
	R102	QRD161J-152	RESISTOR
	R103	QRD161J-102	RESISTOR
	R104	QRD161J-122	RESISTOR
	R105	QRD161J-821	RESISTOR
	R106	QRD161J-471	RESISTOR
	R107	QRD161J-102	RESISTOR
	R108	QRD161J-152	RESISTOR
	R109	QRD161J-101	RESISTOR
	R110	QVZ3518-222	V RESISTOR, SP PB FREQUENC
	R112	QRD161J-561	RESISTOR
	R113	QRD161J-222	RESISTOR
	R114	QRD161J-222	RESISTOR
	R115	QRD161J-391	RESISTOR
	R116	QRD161J-333	RESISTOR
	R117	QRD161J-333	RESISTOR
	R118	QRD162J-331	RESISTOR
	R119	QVZ3518-681	V RESISTOR, FOR REC FM
	R120	QRD161J-102	RESISTOR
	R121	QRD161J-392	RESISTOR
	R122	QRD161J-103	RESISTOR
	R123	QRD161J-562	RESISTOR
	R124	QRD161J-225	RESISTOR
	R125	QRD161J-475	RESISTOR
	R126	QRD161J-335	RESISTOR
	R127	QRD161J-102	RESISTOR
	R128	QRD161J-152	RESISTOR
	R129	QRD161J-153	RESISTOR
	R130	QRD161J-684	RESISTOR
	R131	QRD161J-824	RESISTOR
	R132	QRD161J-562	RESISTOR
	R133	QRD161J-152	RESISTOR
	R136	QRD161J-102	RESISTOR
	R141	QRD161J-102	RESISTOR
	R142	QRD161J-272	RESISTOR
	R143	QRD161J-181	RESISTOR
	R144	QRD161J-821	RESISTOR
	R145	QRD161J-181	RESISTOR
	R146	QRD121J-391	RESISTOR
	R202	QVZ3518-102	V RESISTOR, LP PB FREQUENCY
	R203	QRD161J-471	RESISTOR
	R204	QRD162J-471	RESISTOR
	R211	QRD161J-562	RESISTOR
	R214	QRD161J-391	RESISTOR
	R215	QRD161J-122	RESISTOR
	R216	QRD161J-681	RESISTOR
	R217	QRD121J-560	CARBON RESISTOR
	R218	QRD161J-103	RESISTOR
	R219	QRD161J-222	RESISTOR
	R220	QRD161J-393	RESISTOR
	R221	QRD161J-473	RESISTOR
	R222	QRD161J-332	RESISTOR
	R223	QVZ3518-682	V RESISTOR, 0.5H DELAY
	R224	QRD161J-102	RESISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R225	QRD161J-122	RESISTOR
	R226	QRD161J-153	RESISTOR
	R227	QRD161J-223	RESISTOR
	R228	QRD161J-561	RESISTOR
	R229	QRD161J-681	RESISTOR
	R230	QRD161J-681	RESISTOR
	R231	QRD161J-681	RESISTOR
	R232	QRD161J-471	RESISTOR
	R233	QRD161J-222	RESISTOR
	R234	QRD161J-102	RESISTOR
	R235	QRD161J-222	RESISTOR
	R236	QRD161J-183	RESISTOR
	R238	QRD161J-822	RESISTOR
	R239	QRD161J-122	RESISTOR
	R240	QRD161J-563	RESISTOR
	R241	QRD161J-822	RESISTOR
	R242	QRD161J-223	RESISTOR
	R243	QRD161J-103	RESISTOR
	R244	QRD161J-103	RESISTOR
	R245	QRD161J-103	RESISTOR
	R246	QRD161J-333	RESISTOR
	R301	QRD161J-102	RESISTOR
	R302	QRD161J-102	RESISTOR
	R303	QRD161J-473	RESISTOR
	R304	QRD161J-272	RESISTOR
	R305	QRD161J-681	RESISTOR
	R306	QRD161J-102	RESISTOR
	R307	QRD161J-102	RESISTOR
	R311	QRD161J-562	RESISTOR
	R312	QRD161J-391	RESISTOR
	R313	QRD161J-561	RESISTOR
	R316	QRD161J-221	RESISTOR
	R317	QRD161J-391	RESISTOR
	R318	QRD161J-122	RESISTOR
	R319	QRD161J-393	RESISTOR
	R320	QRD161J-103	RESISTOR
	R321	QRD161J-103	RESISTOR
	R322	QVZ3518-101	V RESISTOR, FOR SP REC COLOUR
	R323	QRD162J-681	RESISTOR
	R325	QRD161J-102	RESISTOR
	R326	QRD161J-472	RESISTOR
	R327	QRD161J-274	RESISTOR
	R328	QVZ3518-223	V RESISTOR, VXO
	R329	QRD161J-103	RESISTOR
	R330	QRD161J-122	RESISTOR
	R331	QRD161J-222	RESISTOR
	R332	QRD161J-103	RESISTOR
	R333	QRD161J-103	RESISTOR
	R334	QRD161J-102	RESISTOR
	R335	QRD161J-122	RESISTOR
	R336	QRD161J-471	RESISTOR
	R337	QRD161J-152	RESISTOR
	R338	QRD161J-223	RESISTOR
	R339	QRD161J-682	RESISTOR
	R340	QRD161J-102	RESISTOR
	R341	QRD161J-181	RESISTOR
	R342	QRD161J-391	RESISTOR
	R343	QRD161J-331	RESISTOR
	R344	QRD161J-223	RESISTOR
	R345	QRD161J-153	RESISTOR
	R346	QRD161J-222	RESISTOR
	R347	QRD161J-153	RESISTOR
	R348	QRD161J-103	RESISTOR
	R349	QRD162J-271	RESISTOR
	R351	QRD161J-332	RESISTOR, E/EG
	R352	QRD161J-154	RESISTOR, E/EG

*⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R353	QRD161J-563	RESISTOR, E/EG
	R354	QRD161J-182	RESISTOR, E/EG
	R355	QVZ3518-472	V RESISTOR, SECAM DET, E/EG
	R356	QRD161J-103	RESISTOR, E/EG
	R357	QRD161J-562	RESISTOR, E/EG
	R358	QRD161J-333	RESISTOR, E/EG
	R359	QRD161J-393	RESISTOR, E/EG
	R360	QRD161J-102	RESISTOR, E/EG
	R361	QRD161J-393	RESISTOR, E/EG
	R362	QRD161J-393	RESISTOR, E/EG
	R363	QRD161J-822	RESISTOR, E/EG
	R364	QRD161J-223	RESISTOR, E/EG
	R365	QRD161J-333	RESISTOR, E/EG
	R401	QVZ3518-222	V RESISTOR, DELAY COLOR LEVEL
	R402	QRD161J-222	RESISTOR
	R403	QRD161J-272	RESISTOR
	R404	QRD161J-821	RESISTOR
	R405	QRD161J-222	RESISTOR
	R406	QRD161J-473	RESISTOR
	R407	QRD161J-104	RESISTOR
	R408	QRD161J-391	RESISTOR
	R409	QRD161J-123	RESISTOR
	R410	QRD161J-332	RESISTOR
	R413	QRD161J-223	RESISTOR
	R414	QRD161J-103	RESISTOR
	R415	QRD161J-154	RESISTOR
	R416	QRD161J-221	RESISTOR
	R417	QRD161J-393	RESISTOR
	R418	QVZ3518-473	V RESISTOR, FOR 0.5H JUMP DET
	R419	QRD161J-473	RESISTOR
	R420	QRD161J-122	RESISTOR
	R421	QRD161J-101	RESISTOR
	R423	QRD161J-222	RESISTOR
	R424	QRD161J-561	RESISTOR
	R425	QRD161J-561	RESISTOR
	R426	QRD161J-393	RESISTOR
	R427	QRD161J-223	RESISTOR
	R428	QRD161J-471	RESISTOR
	R429	QRD161J-473	RESISTOR
	R431	QRD161J-682	RESISTOR
	R432	QRD161J-104	RESISTOR
	R433	QRD161J-473	RESISTOR
	R434	QRD161J-472	RESISTOR
	R435	QRD161J-682	RESISTOR, E/EG
	R436	QRD161J-103	RESISTOR
	R437	QRD161J-153	RESISTOR
	R438	QVZ3518-101	V RESISTOR, FOR LP REC COLOUR
	R439	QRD161J-822	RESISTOR, E/EG
	R440	QRD161J-102	RESISTOR
	R441	QRD161J-272	RESISTOR
	R442	QRD162J-683	RESISTOR
	R443	QRD161J-183	RESISTOR
	R444	QRD161J-333	RESISTOR
	R446	QRD161J-562	RESISTOR
	R501	QRD161J-393	RESISTOR
	R502	QRD161J-682	RESISTOR
	R503	QRD161J-393	RESISTOR
	R504	QRD161J-821	RESISTOR
	R505	QRD161J-103	RESISTOR
	R506	QRD161J-393	RESISTOR
	R507	QRD161J-821	RESISTOR
	R508	QRD161J-393	RESISTOR
	R509	QRD161J-821	RESISTOR
	R510	QRD161J-103	RESISTOR
	R511	QRD161J-103	RESISTOR
	R512	QRD161J-332	RESISTOR

*⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C101	QCVB1CN-103	CAPACITOR
	C102	QCSB1HJ-680	CAPACITOR
	C103	QCSB1HJ-390	CAPACITOR
	C104	QET60JM-476	E CAPACITOR
	C105	QCVB1CN-103	CAPACITOR
	C106	QCSB1HJ-470	CAPACITOR
	C107	QCVB1CN-103	CAPACITOR
	C108	QCVB1CN-103	CAPACITOR
	C110	QCVB1CN-103	CAPACITOR
	C112	QCBB1HJ-121	CAPACITOR
	C113	QCVB1CN-103	CAPACITOR
	C114	QCBB1HJ-121	CAPACITOR
	C115	QCBB1HJ-121	CAPACITOR
	C116	QCSB1HJ-270	CAPACITOR
	C117	QET60JM-476	E CAPACITOR
	C118	QCVB1CN-103	CAPACITOR
	C121	QCBB1HJ-151	CAPACITOR
	C122	QCSB1HJ-330	CAPACITOR
	C123	QET61HM-105	E CAPACITOR
	C124	QETB1HM-105	E CAPACITOR
	C125	QCBB1HJ-151	CAPACITOR
	C126	QCBB1HJ-151	CAPACITOR
	C127	QET61HM-225	E CAPACITOR
	C128	QER60JM-107	E CAPACITOR
	C129	QER60JM-107	E CAPACITOR
	C130	QET61EM-335	E CAPACITOR
	C131	QER41HM-105	E CAPACITOR
	C132	QER41HM-225	E CAPACITOR
	C133	QER40JM-476	E CAPACITOR
	C134	QER41HM-225	E CAPACITOR
	C135	QER41EM-475	E CAPACITOR
	C136	QEN41EM-335	NP E CAPACITOR
	C137	QEM51AK-107	E CAPACITOR
	C138	QCVB1CN-103	CAPACITOR
	C139	QCBB1HJ-181	CAPACITOR
	C140	QCBB1HJ-121	CAPACITOR
	C141	QCSB1HJ-560	CAPACITOR
	C142	QCSB1HJ-220	CAPACITOR
	C144	QCBB1HJ-121	CAPACITOR
	C145	QCBB1HJ-151	CAPACITOR
	C146	QET61EM-475	E CAPACITOR
	C147	QET61CM-476	E CAPACITOR
	C148	QCVB1CN-103	CAPACITOR
	C151	QCVC1CN-103	CAPACITOR
	C201	QCSB1HJ-100	CAPACITOR
	C202	QFN31HJ-223	M CAPACITOR
	C211	QCVB1CN-103	CAPACITOR
	C212	QCSB1HJ-100	CAPACITOR
	C213	QCVB1CN-103	CAPACITOR
	C214	QEK60JM-476	E CAPACITOR
	C217	QFN31HJ-102	M CAPACITOR
	C218	QEK61EM-475	E CAPACITOR
	C219	QCBB1HJ-102	CAPACITOR
	C220	QFN31HJ-473	M CAPACITOR
	C221	QEK61AM-107	E CAPACITOR
	C222	QCVB1CN-103	CAPACITOR
	C224	QEK61HM-104	E CAPACITOR
	C225	QEK61EM-475	E CAPACITOR
	C226	QCVB1CN-103	CAPACITOR
	C227	QCVB1CN-103	CAPACITOR
	C229	QEK60JM-476	E CAPACITOR
	C230	QCVB1CN-103	CAPACITOR
	C233	QER41CM-106	E CAPACITOR
	C234	QER41CM-476	E CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C235	QCVB1CN-103	CAPACITOR
	C236	QCSB1HJ-330	CAPACITOR
	C237	QCSB1HJ-270	CAPACITOR
	C238	QER41AM-476	E CAPACITOR
	C239	QCSB1HJ-200	CAPACITOR
	C241	QCVB1CN-103	CAPACITOR
	C242	QCVB1CN-103	CAPACITOR
	C243	QCBB1HJ-121	CAPACITOR
	C244	QER40JM-107	E CAPACITOR
	C245	QCVB1CN-103	CAPACITOR
	C246	QEK61HM-104	E CAPACITOR
	C247	QEK61HM-105	E CAPACITOR
	C248	QETA1AM-476	E CAPACITOR
	C249	QER41HM-335	E CAPACITOR
	C250	QEK41HM-225	E CAPACITOR
	C251	QCS31HJ-561	CAPACITOR
	C252	QCC11EK-223	CAPACITOR
	C302	QCBB1HJ-820	CAPACITOR
	C303	QCBB1HJ-102	CAPACITOR
	C304	QCVB1CN-103	CAPACITOR
	C305	QFN31HJ-473	M CAPACITOR
	C306	QCSB1HJ-470	CAPACITOR
	C311	QET61CM-106	E CAPACITOR
	C312	QET61HM-474	E CAPACITOR
	C313	QFN31HJ-563	M CAPACITOR
	C314	QET61CM-106	E CAPACITOR
	C315	QET61HM-225	E CAPACITOR
	C316	QET61EM-335	E CAPACITOR
	C317	QFN31HJ-473	M CAPACITOR
	C318	QCVB1CN-103	CAPACITOR
	C319	QET61EM-475	E CAPACITOR
	C320	QEM51AK-107	E CAPACITOR
	C321	QCVB1CN-103	CAPACITOR
	C322	QET61HM-105	E CAPACITOR
	C323	QET61HM-475	E CAPACITOR
	C324	QET61HM-475	E CAPACITOR
	C325	QCVB1CN-103	CAPACITOR
	C326	QCVB1CN-103	CAPACITOR
	C327	QET61HM-105	E CAPACITOR
	C328	QFN31HJ-223	M CAPACITOR
	C329	QCT25CH-220	CAPACITOR
	C330	QCVB1CN-103	CAPACITOR
	C331	QET61CM-106	E CAPACITOR
	C332	QCBB1HJ-101	CAPACITOR
	C333	QCVB1CN-103	CAPACITOR
	C334	QCBB1HJ-102	CAPACITOR
	C335	QET61AM-476	E CAPACITOR
	C336	QCVB1CN-103	CAPACITOR
	C337	QCSB1HK-5R6	CAPACITOR
	C338	QCBB1HJ-681	CAPACITOR
	C339	QCC11EJ-104	CAPACITOR
	C340	QCC11EK-273	CAPACITOR
	OR	QCC11EK-273ZR	CAPACITOR
	C351	QET61CM-476	E CAPACITOR, E/EG
	C352	QCVB1CN-103	CAPACITOR, E/EG
	C353	QET61AM-336	E CAPACITOR, E/EG
	C354	QFN31HJ-182	M CAPACITOR, E/EG
	C355	QFN31HJ-272	M CAPACITOR, E/EG
	C356	QFN31HJ-223	M CAPACITOR, E/EG
	C357	QETB1CM-106	E CAPACITOR, E/EG
	C358	QCVB1CN-103	CAPACITOR, E/EG
	C359	QCBB1HJ-102	CAPACITOR, E/EG
	C401	QCVB1CN-103	CAPACITOR
	C402	QCSB1HJ-220	CAPACITOR
	C403	QCSB1HJ-220	CAPACITOR
	C404	QCVB1CN-103	CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C406	QET61HM-105	E CAPACITOR
	C407	QET61HM-105	E CAPACITOR
	C408	QET61EM-475	E CAPACITOR
	C409	QET61HM-105	E CAPACITOR
	C410	QFN31HJ-152	M CAPACITOR
	C411	QFN31HJ-332	M CAPACITOR
	C412	QCVB1CN-103	CAPACITOR
	C413	QCVB1CN-103	CAPACITOR
	C414	QET60JM-107	E CAPACITOR
	C415	QCVB1CN-103	CAPACITOR
	C416	QFN31HJ-222	M CAPACITOR
	C417	QFN31HJ-103	M CAPACITOR
	C418	QFN31HJ-273	M CAPACITOR
	C419	QFN31HJ-222	M CAPACITOR
	C420	QET61HM-105	E CAPACITOR
	C421	QCVB1CN-103	CAPACITOR
	C422	QCVB1CN-103	CAPACITOR
	C423	QCSB1HJ-680	CAPACITOR
	C424	QCVB1CN-103	CAPACITOR
	C426	QCVB1CN-103	CAPACITOR
	C427	QCVB1CN-103	CAPACITOR
	C431	QET61HM-225	E CAPACITOR
	C432	QFN31HJ-103	M CAPACITOR
	C433	QFN31HJ-104	M CAPACITOR
	C436	QET51AM-226	E CAPACITOR
	L101	PU48530-101K	PEAKING COIL
	L102	PU59152-560J	PEAKING COIL
	L103	PU59152-270J	PEAKING COIL
	L104	PU59152-180J	PEAKING COIL
	L106	PU59152-221J	PEAKING COIL
	L107	PU59152-680J	PEAKING COIL
	L108	PU59152-270J	PEAKING COIL
	L109	PU48530-101K	PEAKING COIL
	L111	PU59152-121J	PEAKING COIL
	L112	PU59152-180J	PEAKING COIL
	L113	PU59152-180J	PEAKING COIL
	L114	PU48530-471J	PEAKING COIL
	L115	PU59152-121J	PEAKING COIL
	L116	PU48530-101K	PEAKING COIL
	L117	PU59152-560J	PEAKING COIL
	L118	PU59152-680J	PEAKING COIL
	L119	PU48530-681J	PEAKING COIL
	L121	PU48530-101K	PEAKING COIL
	L201	PU48530-101K	PEAKING COIL
	L202	PU48530-101K	PEAKING COIL
	L203	PU48530-101K	PEAKING COIL
	L204	PU59152-560J	PEAKING COIL
	L205	PU59152-390J	PEAKING COIL
	L206	PU48530-101K	PEAKING COIL
	L207	PU48530-101K	PEAKING COIL
	L302	PU48530-222J	PEAKING COIL
	L303	PU54223-271J	PEAKING COIL
	L311	PU47051-822	COIL
	L312	PU48530-101K	PEAKING COIL
	L313	PU48530-101K	PEAKING COIL
	L314	PU59152-150J	PEAKING COIL
	L315	PU59152-820J	PEAKING COIL
	L316	PU48530-101K	PEAKING COIL
	L351	PU49057	LC BLOCK, E/EG
	L352	PU53223-101J	PEAKING COIL, E/EG
	L353	PU47051-562	COIL, E/EG
	L401	PU49057	LC BLOCK
	L402	PU57139	LC BLOCK

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	L403	PU59152-330J	PEAKING COIL
	L404	PU48530-101K	PEAKING COIL
	L405	PU59152-100J	PEAKING COIL
	EQ201	PU58315	EQUALIZER
	EQ301	PU53501-7	EQUALIZER
	LPF101	PU58021-2	LOW PASS FILTER
	LPF301	PU58022	LOW PASS FILTER
	LPF302	PU54988	LOW PASS FILTER
	BPF301	PU54410-2	BAND PASS FILTER
	BPF302	PU57072	BAND PASS FILTER
	CF351	PU56983	CERAMIC FILTER, E/EG
	DL101	PU59173	1H DELAY LINE
	DL301	PU58971-3	2H DELAY LINE
	XB301	PU58023	CRYSTAL BLOCK
	X301	PU60307	CRYSTAL RESONATOR
	OR	PU59335	CRYSTAL RESONATOR
	OR	PU31449-4K	CRYSTAL RESONATOR
	TH101	ERT-D2FGL101S	THERMISTOR
	SLD1	PU59170	CCD SHIELD 1
	SLD2	PU59171	CCD SHIELD 2
	SLD3	PU59172	CCD SHIELD 3
	TP	PU57545	TEST PIN, X7
	TP 401	PU56347	TEST POINT
	TP1	PU59391	STYLE PIN
	CN102	PU58844-2	CAP HOUSING
		-MECHACON BOARD ASSEMBLY < 04 >-	
	PWBA	PB10043A2-02	MECHACON BOARD ASSEMBLY
	PWBA2	PB10043A2-02	MECHACON BOARD ASSEMBLY
	IC601	M50965-628SP	IC
	OR	M50965E-312SP	IC
	OR	M50965-641SP	IC
	OR	M50965E-319SP	IC
	IC602	TA8400P	IC
	IC603	M54644BL	IC
	IC604	M54644BL	IC
	Q601	2SC1317R,S	TRANSISTOR
	Q602	2SA1309R,S	TRANSISTOR
	OR	2SA933S(RS)	TRANSISTOR
	Q603	2SC2655O,Y	TRANSISTOR
	OR	2SD1292(QR)	TRANSISTOR
	Q604	2SA1309R,S	TRANSISTOR
	OR	2SA933S(RS)	TRANSISTOR
	Q605	2SC2655O,Y	TRANSISTOR
	OR	2SD1292(QR)	TRANSISTOR
	Q606	2SK656	FE TRANSISTOR(MOS)
	Q607	DTC124EF	TRANSISTOR
	Q608	2SB641R,S	TRANSISTOR
	D602	MA165	DIODE
	OR	1SS133	DIODE
	D603	MA165	DIODE
	OR	1SS133	DIODE
	D604	HZS7.5EB2	ZENER DIODE
	OR	RD7.5ES-T1B2	ZENER DIODE
	OR	MTZ7.5B	ZENER DIODE
	D605	HZS4.7EB2	ZENER DIODE
	D606	S5688G	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	D608	HZS5.6EB1	ZENER DIODE
	OR	MTZ5.6A	ZENER DIODE
	D609	MA27W(A)	DIODE
	D611	HZS6.8EB2	ZENER DIODE
	OR	RD6.8ES-T1B2	ZENER DIODE
	D612	HZS6.8EB2	ZENER DIODE
	OR	RD6.8ES-T1B2	ZENER DIODE
	R601	QRG019J-100A	MF RESISTOR
	R602	QRD161J-332	RESISTOR
	R603	QRD161J-223	RESISTOR
	R604	QRD161J-682	RESISTOR
	R605	QRD161J-223	RESISTOR
	R606	QRD161J-222	RESISTOR
	R608	QRD161J-103	RESISTOR
	R609	QRD161J-103	RESISTOR
	R610	QRD161J-153	RESISTOR
	R611	QRD161J-472	RESISTOR
	R612	QRD161J-103	RESISTOR
	R614	QRD161J-152	RESISTOR
	R615	QRD161J-472	RESISTOR
	R616	QRD161J-472	RESISTOR
	R617	QRD161J-472	RESISTOR
	R618	QRD161J-472	RESISTOR
	R619	QRD161J-472	RESISTOR
	R620	QRD161J-472	RESISTOR
	R621	QRD161J-124	RESISTOR
	R622	QRD161J-472	RESISTOR
	R623	QRD161J-124	RESISTOR
	R624	QRD161J-472	RESISTOR
	R625	QRD161J-472	RESISTOR
	R626	QRD161J-472	RESISTOR
	R627	QRD161J-472	RESISTOR
	R628	QRD161J-333	RESISTOR
	R629	QRD161J-472	RESISTOR
	R630	QRD161J-472	RESISTOR
	R631	QRD162J-333	RESISTOR
	R632	QRD161J-562	RESISTOR
	R633	QRD161J-102	RESISTOR
	R634	QRD161J-102	RESISTOR
	R635	QRD161J-103	RESISTOR
	R636	QRD161J-103	RESISTOR
	R637	QRD161J-102	RESISTOR
	R639	QRD161J-105	RESISTOR
	R642	QRD161J-472	RESISTOR
	R643	QRD161J-272	RESISTOR
	R644	QRD161J-393	RESISTOR
	R645	QRD161J-472	RESISTOR
	R647	QRD161J-332	RESISTOR
	R649	QRD161J-472	RESISTOR
	R653	QRG019J-100A	MF RESISTOR
	RA601	QRB057J-103	RESISTOR ARRAY
	RA602	QRB047J-103	RESISTOR ARRAY
	C601	QFV81HJ-104	M CAPACITOR
	C602	QFV71HJ-104	M CAPACITOR
	C603	QCF31HP-223	CAPACITOR
	C604	QCF31HP-223	CAPACITOR
	C605	QCSB1HJ-330	CAPACITOR
	C606	QCSB1HJ-330	CAPACITOR
	C607	QCBB1HJ-102	CAPACITOR
	C608	QETA1EM-107	E CAPACITOR
	C609	QET61EM-335	E CAPACITOR
	C610	QET61CM-336	E CAPACITOR
	C611	QETC1EM-475	E CAPACITOR
	C614	QEK41EM-106	E CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C615	QEN41EM-475	NP E CAPACITOR
	C616	QCF11HP-223	CAPACITOR
	C617	QFN31HJ-683	M CAPACITOR
	C622	QET41EM-107	E CAPACITOR
	L601	PU59619	COIL
	CF601	PU55812	RESONATOR
	WR	PU58865-3	FLAT WIRE
	CN601	PU58931-14	CAP HOUSING
	CN602	PU58931-10	CAP HOUSING
	CN603	PU58931-14	CAP HOUSING
	CN604	PU58931-8	CAP HOUSING
	CN605	PU58931-12	CAP HOUSIG
	CN606	PU58931-8	CAP HOUSING
	CN607	PU58798-17	CONNECTOR
	CN608	PU58844-6	CAP HOUSING
		-VIDEO SUB BOARD ASSEMBLY-	
	PWBA2	PB40007A	V.SUB BOARD ASSEMBLY
	The following Parts are included in V. SUB BOARD ASSEMBLY		
	IC203	BA7021	IC
	IC601OR	M50965E-319SP	IC
	Q221	DTA144EF	TRANSISTOR
	D221	1SS133	DIODE
	R251	QRD162J-333	RESISTOR
	R252	QRD162J-332	RESISTOR
	C261	QEK51HM-104	E CAPACITOR
	C262	QCSC1HJ-330	CAPACITOR
	JP2	PU59935-10	TERMINAL

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* MOTHER BOARD ASSEMBLY <05> *
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	PWBA	PU11427M-01	MOTHER BOARD ASSEMBLY
	R1	QRD182J-183	RESISTOR
	CN1	PU58930-14	CAP HOUSING
	CN2	PU58930-14	CAP HOUSING
	CN3	PU58930-10	CAP HOUSING
	CN4	PU58930-14	CAP HOUSING
	CN5	PU58930-8	CAP HOUSING
	CN6	PU58930-12	CAP HOUSING
	CN7	PU58930-8	CAP HOUSING
	CN8	PU58930-14	CAP HOUSING
	CN9	PU58930-20	CAP HOUSING
	CN10	PU58928-15	CAP HOUSING
	CN11	PU59555-7	CAP HOUSING
	CN12	PU58844-9	CAP HOUSING
	CN14	PU58844-7	CAP HOUSING
	CN16	PU59555-7	CAP HOUSING
	CN17	PU59555-5	CAP HOUSING
	CN20	PU58844-4	CAP HOUSING
	CN21	PU58844-2	CAP HOUSING
	CN22	PU58930-22	CAP HOUSING
	CN23	PU58928-10	CAP HOUSING
	CN24	PU58844-12	CAP HOUSING

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION

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* TERMINAL BOARD ASSEMBLY <06> *
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	PWBA	PB20006B-01	TERMINAL BOARD ASSEMBLY ,EK
		PB20006A-01	TERMINAL BOARD ASSEMBLY,EG
		PB20006C-01	TERMINAL BOARD ASSEMBLY,E
	IC1	BX6325	IC
	Q1	2SC1740S(QRS)	TRANSISTOR
	Q11	2SC1740S(QRS)	TRANSISTOR
	Q12	2SC1740S(QRS)	TRANSISTOR
	D1	MA165	DIODE
	OR	1SS133	DIODE
	D5	MA165	DIODE
	OR	1SS133	DIODE
	R1	QVZ3518-474	V RESISTOR, V LOCK
	R2	QRD161J-102	RESISTOR
	R3	QRD161J-102	RESISTOR
	R4	QRD161J-102	RESISTOR
	R5	QRD161J-221	RESISTOR
	R6	QRD161J-750	RESISTOR
	R7	QRD161J-750	RESISTOR
	R21	QRD161J-152	RESISTOR
	R22	QRD161J-152	RESISTOR
	R25	QRD161J-152	RESISTOR
	R26	QRD161J-152	RESISTOR
	R31	QRD161J-473	RESISTOR
	R35	QRD161J-473	RESISTOR
	R37	QRD161J-392	RESISTOR
	R40	QRD161J-272	RESISTOR
	R42	QRD161J-123	RESISTOR
	R43	QRD161J-103	RESISTOR
	R44	QRD161J-682	RESISTOR
	C1	QEK61CM-476	E CAPACITOR
	C2	QETC1CM-476	E CAPACITOR
	C3	QEU40JM-477	E CAPACITOR
	C4	QETC1CM-476	E CAPACITOR
	C5	QETC1CM-476	E CAPACITOR
	C6	QEK61CM-476	E CAPACITOR
	C21	QCBB1HJ-102	CAPACITOR
	C22	QCBB1HJ-102	CAPACITOR
	L1	PU48530-101K	PEAKING COIL
	EQ1	PU54838	EQUALIZER, E/EG
	CN1	PU58929-15	CAP HOUSING
	CN3	PU58962-6	CAP HOUSING

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#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
		********** TUNER/IF BOARD ASSEMBLY <07> **********	
	PWBA	PB20093G	TUNER/IF BOARD ASSEMBLY ,EG
		PB20093B-01	TUNER/IF BOARD ASSEMBLY,EK
		PB20093A-01	TUNER/IF BOARD ASSEMBLY ,E
⚠	RF	PU59241M-2	RF CONV.& MIXER, E/EG
⚠		PU59262S	RF CONV.& MIXER ,EK
⚠	TNR	PU36180	U H F TUNER ,EK
⚠		PU36155-1-4	U/V TUNER ,EG
⚠		PU36155-1-3	U/V TUNER, E
⚠	IC 1	M51365SP	IC
	IC 2	M50440-397SP	IC, E/EG
		M50440-394SP	IC ,EK
	IC 3	M58655P	IC
	Q 1	2SC3354S,T	TRANSISTOR
	Q 2	2SD1468S(RSE)	TRANSISTOR, E/EG
		2SD1468S(RS)	TRANSISTOR, EK
	OR	2SD1450S,T	TRANSISTOR
	Q 3	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q 4	2SC1740S(RS)	TRANSISTOR, E/EG
	OR	2SC3311AR,S	TRANSISTOR, E/EG
	Q 5	2SA933S(RS)	TRANSISTOR
	OR	2SA1309R,S	TRANSISTOR
	Q 6	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q 7	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q 9	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q10	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q11	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q12	2SB808SPA(FG)	TRANSISTOR, E/EG
	Q13	2SK381(C)	FE TRANSISTOR
	Q14	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q15	2SD1468S(RSE)	TRANSISTOR, E/EG
		2SD1468S(RS)	TRANSISTOR, EK
	OR	2SD1450S,T	TRANSISTOR
	Q16	2SD1863(QR)	TRANSISTOR, E/EG
		2SD1292(QR)	TRANSISTOR, EK
	OR	2SC3243D,E	TRANSISTOR
	Q17	2SB1010(QR)	TRANSISTOR, E/EG
		2SB810H,J	TRANSISTOR, EK
	Q18	DTA124ES	TRANSISTOR
	Q21	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q22	2SA933S(RS)	TRANSISTOR
	OR	2SA1309R,S	TRANSISTOR
	Q23	2SC1740S(RS)	TRANSISTOR
	OR	2SC3311AR,S	TRANSISTOR
	Q25	DTC114ES	TRANSISTOR, E/EG
	Q26	DTC144ES	TRANSISTOR, E/EG
	D 1	1SS133	DIODE
	D 2	1SS133	DIODE
	D 3	1SS133	DIODE
	D 4	1SS133	DIODE
	D 5	1SS133	DIODE
	D 6	HZ30-2	ZENER DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	D 7	MTZ10B	ZENER DIODE
	OR	RD10ES-T1B2	ZENER DIODE
	D 8	1SS133	DIODE
	D 9	MTZ7.5B	ZENER DIODE
	OR	RD7.5ES-T1B2	ZENER DIODE
	D10	E-452-2	DIODE
	D11	RD6.2ES-T1B1	ZENER DIODE, E/EG
	OR	HZS6.2EB1	ZENER DIODE, E/EG
	D12	1SS133	DIODE, E/EG
	D16	1SS133	DIODE, E/EG
	R 1	QRD161J-151	RESISTOR, E/EG
		QRD161J-750	RESISTOR ,EK
	R 2	QRD161J-472	RESISTOR ,EK
		QRD161J-103	RESISTOR, E/EG
	R 3	QRD161J-152	RESISTOR
	R 4	QRD161J-470	RESISTOR
	R 5	QRD161J-331	RESISTOR
	R 6	QRD161J-681	RESISTOR
	R 7	QRD161J-101	RESISTOR
	R 8	QRD161J-470	RESISTOR ,EK
		QRD161J-100	RESISTOR, E/EG
	R 9	QRD161J-332	RESISTOR ,EK
	R10	QRD161J-824	RESISTOR
	R11	QVZ3518-472	V RESISTOR, AGC
	R12	QRD161J-222	RESISTOR
	R13	QRD161J-562	RESISTOR
	R14	QRD161J-332	RESISTOR
	R15	QRD161J-152	RESISTOR, E/EG
	R16	QVZ3518-103	V RESISTOR, VPS Y LEVEL, E/EG
		QRD161J-222	RESISTOR ,EK
	R17	QRD161J-331	RESISTOR
	R18	QRD161J-561	RESISTOR
	R19	QRD161J-470	RESISTOR
	R20	QRD161J-561	RESISTOR
	R23	QRD161J-473	RESISTOR, E/EG
	R25	QRD161J-471	RESISTOR
	R26	QRD161J-681	RESISTOR
	R27	QRD161J-681	RESISTOR
	R28	QRD161J-331	RESISTOR, E/EG
		QRD161J-391	RESISTOR, EK
	R29	QRD161J-332	RESISTOR
	R30	QRD161J-103	RESISTOR
	R31	QRD161J-222	RESISTOR
	R33	QRD161J-472	RESISTOR
	R34	QRD161J-103	RESISTOR
	R40	QRD161J-182	RESISTOR
	R41	QRD161J-272	RESISTOR
	R42	QVZ3518-103	V RESISTOR, COLOR LEVEL
	R43	QRD161J-123	RESISTOR
	R44	QRD161J-123	RESISTOR
	R45	QRD161J-331	RESISTOR
	R46	QRD161J-222	RESISTOR
	R49	QRD161J-331	RESISTOR, E/EG
	R50	QRD161J-680	RESISTOR, E/EG
	R51	QRD161J-222	RESISTOR, E/EG
	R52	QRD161J-471	RESISTOR
	R53	QRD161J-103	RESISTOR
	R54	QRD161J-332	RESISTOR
	R55	QRD161J-680	RESISTOR
	R56	QRD161J-223	RESISTOR
	R57	QRD161J-471	RESISTOR
	R58	QRD161J-102	RESISTOR
	R59	QRD161J-223	RESISTOR
	R60	QRD161J-103	RESISTOR
	R61	QRD161J-334	RESISTOR
	R62	QRD161J-103	RESISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R63	QRD161J-331	RESISTOR
	R75	QRD161J-472	RESISTOR, E/EG
	R76	QRD161J-103	RESISTOR, E/EG
	R77	QRD161J-153	RESISTOR, E/EG
	R78	QRD161J-472	RESISTOR, E/EG
	R79	QRD161J-103	RESISTOR, E/EG
	R80	QRD161J-153	RESISTOR, E/EG
	R81	QRD161J-472	RESISTOR, E/EG
	R82	QRD161J-103	RESISTOR, E/EG
	R83	QRD161J-153	RESISTOR, E/EG
	R84	QRD161J-472	RESISTOR, E/EG
	R85	QRD161J-103	RESISTOR, E/EG
	R86	QRD161J-153	RESISTOR, E/EG
	R87	QRD161J-224	RESISTOR, E/EG
		QRD161J-104	RESISTOR ,EK
	R88	QRD161J-153	RESISTOR
	R91	QRD161J-472	RESISTOR
	R92	QRD161J-562	RESISTOR
	R93	QRD161J-152	RESISTOR
	R94	QRD161J-472	RESISTOR
	R95	QRD161J-121	RESISTOR
	R96	QRD161J-103	RESISTOR
	R97	QRD161J-103	RESISTOR
	R98	QRD161J-153	RESISTOR
	R100	QRD161J-101	RESISTOR
	R101	QRD161J-222	RESISTOR
	R102	QRD161J-222	RESISTOR
	R103	QRD161J-222	RESISTOR
	R104	QRD161J-222	RESISTOR
	R105	QRD161J-222	RESISTOR
	R106	QRD161J-102	RESISTOR
	R107	QRD161J-222	RESISTOR
	R108	QRD161J-103	RESISTOR, E/EG
	R110	QRD161J-104	RESISTOR
	R111	QRD161J-103	RESISTOR ,EK
	R112	QRD161J-222	RESISTOR
	R122	QRD161J-103	RESISTOR
	R123	QRD161J-103	RESISTOR
	R124	QRD161J-103	RESISTOR
	R125	QRD161J-103	RESISTOR
	R126	QRD161J-103	RESISTOR
	R127	QRD161J-473	RESISTOR
	R128	QRD161J-473	RESISTOR
	R130	QRD161J-471	RESISTOR
	R131	QRD161J-102	RESISTOR
	R133	QRD161J-103	RESISTOR
	R134	QRD161J-182	RESISTOR ,EK
		QRD161J-102	RESISTOR, E/EG
	R151	QRD161J-103	RESISTOR, E/EG
	RA 1	QRB047J-104	RESISTOR ARRAY
	C 1	QCSB1HJ-100	CAPACITOR, E/EG
	C 2	QCBB1HK-102	CAPACITOR
	C 3	QCXB1CK-222	CAPACITOR
	C 4	QCBB1HK-102	CAPACITOR
	C 5	QCBB1HK-102	CAPACITOR
	C 7	PU57601-474ME	E CAPACITOR
	C 8	QET61CM-336	E CAPACITOR
	C 9	QCXB1CK-222	CAPACITOR
	C10	QCSB1HJ-220	CAPACITOR ,EK
		QCSB1HJ-470	CAPACITOR, E/EG
	C11	QET61HM-474	E CAPACITOR
	C12	QCT25RH-220	CAPACITOR ,EK

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
		QCT25PH-270	CAPACITOR, E/EG
	C13	QCXB1CK-222	CAPACITOR
	C14	QET61CM-336	E CAPACITOR
	C19	QET61CM-336	E CAPACITOR
	C20	QCXB1CK-222	CAPACITOR
	C21	QCF31HP-223	CAPACITOR
	C22	QCSB1HJ-100	CAPACITOR
	C23	QET61HM-105	E CAPACITOR
	C24	QCC11EK-223	CAPACITOR, E/EG
		QCC31EJ-273	CAPACITOR, EK
	C25	QET61HM-105	E CAPACITOR
	C27	QET61EM-335	E CAPACITOR
	C30	QEN61CM-336	E CAPACITOR, E/EG
		QET61CM-336	E CAPACITOR ,EK
	C31	QCSB1HJ-470	CAPACITOR
	C34	QET61CM-336	E CAPACITOR, E/EG
	C35	QET61CM-106	E CAPACITOR
	C36	QCC11EK-223	CAPACITOR
	C37	QET61HM-474	E CAPACITOR
	C39	QCC31EK-104	CAPACITOR
	C40	QET61CM-106	E CAPACITOR, E/EG
	C41	QET61CM-106	E CAPACITOR, E/EG
	C42	QET61CM-106	E CAPACITOR, E/EG
	C43	QET61CM-106	E CAPACITOR, E/EG
	C44	QET61HM-225	E CAPACITOR
	C46	QFV81HJ-474	M CAPACITOR
	OR	QFZ9011-474	MM CAPACITOR
	C47	QFN31HJ-223	M CAPACITOR
	C48	QCBB1HK-102	CAPACITOR, E/EG
	C49	QCBB1HK-102	CAPACITOR
	C51	QCT25CH-220	CAPACITOR
	C52	QCT25CH-270	CAPACITOR
	C53	QCVB1CM-103	CAPACITOR
	C54	QCVB1CM-103	CAPACITOR
	C55	QET61CM-106	E CAPACITOR
	C56	QET61CM-336	E CAPACITOR
	C57	QET61CM-107	E CAPACITOR
	C58	QCBB1HK-102	CAPACITOR
	C59	QET61AM-336	E CAPACITOR
	C60	QET61AM-107	E CAPACITOR
	C61	QET61CM-106	E CAPACITOR
	C63	QET61HM-106	E CAPACITOR
	C65	QET61CM-336	E CAPACITOR
	C66	PU57601-335MCZ	E CAPACITOR
		PU57601-335MC	E CAPACITOR
	L 2	PU57717-1R2	PEAKING COIL ,EK
		PU57717-1R0J	PEAKING COIL, E/EG
	L 3	PU57717-1R5J	PEAKING COIL, E/EG
		PU57717-1R5	PEAKING COIL ,EK
	L 4	PU59152-6R8K	PEAKING COIL
	L 5	PU59152-150J	PEAKING COIL ,EK
		PU59152-120J	PEAKING COIL, E/EG
	L 6	PU59152-6R8K	PEAKING COIL
	L 7	PU59152-6R8K	PEAKING COIL
	L 8	PU59152-220J	PEAKING COIL
	L10	PU59152-100J	PEAKING COIL
	L11	PU59152-R22K	PEAKING COIL, E/EG
	OR	PU53223-R22K	PEAKING COIL, E/EG
	L12	PU59152-6R8K	PEAKING COIL ,EK
	L13	PU59152-101K	PEAKING COIL ,EK
		PU53223-101J	PEAKING COIL, E/EG
⚠	CF 1	PU57707-2	CERAMIC FILTER, E/EG
		PU57707	CERAMIC FILTER, EK
	CF 2	PU59242-3	CERAMIC FILTER, EK
⚠		PU59242-2	CERAMIC FILTER, E/EG

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	CF 3	PU32990-3	CERAMIC FILTER, EK
⚠		PU32990-2	CERAMIC FILTER, E/EG
	SAW 1	PU35557-4	SAW FILTER, E/EG
		PU32987-4	SAW FILTER ,EK
	X1	PU58554-2	CRYSTAL RESONATOR
	T 1	PU59402	TRAP COIL, FTZ TRAP, E/EG
	T 2	PU59308	COIL, VCO
	T 5	PU55184	IF.TRANSFORMER, SYNC DET
	SLD1	PU36322	SHIELD CASE
	SLD2	PQ31328-I-1	SHIELD COVER, E/EG
	SLD3	PQ42506	SHIELD PLATE, E/EG
	TP	PU59391	STYLE PIN
	CN3	PU58844-3	CAP HOUSING, E/EG
	CN4	PU58928-3	CAP HOUSING, E/EG

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* SERVO BOARD ASSEMBLY <08> *
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	PWBA	PU22283G-05	SERVO BOARD ASSEMBLY
	IC1	M51796P	IC
		OR BA6405	IC
	IC2	VC2023A-2	IC
		OR VC2023B-1	IC
	IC3	UPC324C	IC
		OR IR3702	IC
	Q1	2SD636R,S	TRANSISTOR
		OR 2SC1740S(QRS)	TRANSISTOR
	Q2	2SB641R,S	TRANSISTOR
		OR 2SA933S	TRANSISTOR
	Q3	2SD636R,S	TRANSISTOR
		OR 2SC1740S(QRS)	TRANSISTOR
	Q4	2SB641R,S	TRANSISTOR
		OR 2SA933S	TRANSISTOR
	Q5	DTC144ES	TRANSISTOR
		OR UN4213	TRANSISTOR
	Q6	DTC144WS	TRANSISTOR
	Q7	DTA144WS	TRANSISTOR
	D1	1SS133	DIODE
		OR MA165	DIODE
	D2	1SS133	DIODE
		OR MA165	DIODE
	D3	1SS133	DIODE
		OR MA165	DIODE
	D7	1SS133	DIODE
		OR MA165	DIODE
	D8	1SS133	DIODE
		OR MA165	DIODE
	D10	MTZ12B	ZENER DIODE
		OR HZS12EB2	DIODE
	D12	1SS133	DIODE
		OR MA165	DIODE
	D13	MTZ5.1B	ZENER DIODE
		OR HZS5.1B3	ZENER DIODE
	D15	1SS133	DIODE
		OR MA165	DIODE
	D16	1SS133	DIODE
		OR MA165	DIODE
	D19	1SS133	DIODE
		OR MA165	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	D20	1SS133	DIODE
		OR MA165	DIODE
	R1	QRD161J-681	RESISTOR
	R2	QRD161J-102	RESISTOR
	R3	QRD161J-331	RESISTOR
	R4	QRD161J-684	RESISTOR
	R5	QRD161J-102	RESISTOR
	R6	QRD161J-103	RESISTOR
	R7	QRD161J-564	RESISTOR
	R8	QRD161J-103	RESISTOR
	R9	QRD161J-105	RESISTOR
	R10	QRD161J-103	RESISTOR
	R11	QRD161J-681	RESISTOR
	R12	QRD161J-103	RESISTOR
	R13	QRD161J-103	RESISTOR
	R15	QRD161J-101	RESISTOR
	R16	QRD161J-473	RESISTOR
	R17	QRD161J-473	RESISTOR
	R18	QRD161J-473	RESISTOR
	R19	QRD161J-473	RESISTOR
	R20	QRD161J-473	RESISTOR
	R21	QRD161J-473	RESISTOR
	R22	QRD161J-105	RESISTOR
	R23	QRD161J-473	RESISTOR
	R24	QRD161J-473	RESISTOR
	R25	QRD161J-564	RESISTOR
	R26	QRD161J-683	RESISTOR
	R27	QRD161J-105	RESISTOR
	R28	QRD161J-105	RESISTOR
	R29	QRD161J-273	RESISTOR
	R30	QRD161J-102	RESISTOR
	R31	QRD161J-103	RESISTOR
	R32	QRD161J-103	RESISTOR
	R34	QRD161J-333	RESISTOR
	R35	QVZ3521-474	V RESISTOR, LP PB SW POINT
	R36	QRD161J-103	RESISTOR
	R39	QRD161J-393	RESISTOR
	R45	QRD161J-103	RESISTOR
	R46	QVZ3521-474	V RESISTOR,LP TRACKING
	R47	QRD161J-103	RESISTOR
	R55	QRD161J-472	RESISTOR
	R56	QRD161J-103	RESISTOR
	R57	QRD161J-822	RESISTOR
	R58	QRD161J-562	RESISTOR
	R59	QRD161J-104	RESISTOR
	R60	QRD161J-104	RESISTOR
	R61	QRD161J-153	RESISTOR
	R62	QRD161J-102	RESISTOR
	R63	QRD161J-105	RESISTOR
	R64	QRD161J-273	RESISTOR
	R65	QRD161J-101	RESISTOR
	R66	QRD161J-222	RESISTOR
	R67	QRD161J-332	RESISTOR
	R68	QRD161J-105	RESISTOR
	R69	QRD161J-223	RESISTOR
	R70	QRD161J-104	RESISTOR
	R73	QRD161J-103	RESISTOR
	R74	QRD161J-472	RESISTOR
	R75	QRD161J-103	RESISTOR
	R78	QRD161J-185	RESISTOR
	R79	QVZ3521-474	V RESISTOR,FOR SP PB SW POINT
	C1	QCB81HJ-102	CAPACITOR
	C2	QET61AM-476	E CAPACITOR
	C3	QET61CM-106	E CAPACITOR
	C4	QET61CM-106	E CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C5	QET61AM-476	E CAPACITOR
	C6	QFV71HJ-104	M CAPACITOR
	C7	QCBB1HJ-102	CAPACITOR
	C8	QET61HM-475	E CAPACITOR
	C9	QCBB1HJ-101	CAPACITOR
	C10	QCBB1HJ-102	CAPACITOR
	C11	QET61CM-106	E CAPACITOR
	C12	QCSB1HJ-330	CAPACITOR
	C13	QCSB1HJ-330	CAPACITOR
	C14	QCVB1CN-103	CAPACITOR
	C15	QFV71HJ-223	M CAPACITOR
	C16	QCXB1CN-472	CAPACITOR
	C17	QCXB1CN-472	CAPACITOR
	C19	QFV71HJ-473	M CAPACITOR
	C20	QFV71HJ-473	M CAPACITOR
	C21	QFV71HJ-473	M CAPACITOR
	C22	QFV71HJ-473	M CAPACITOR
	C23	QCXB1CN-472	CAPACITOR
	C24	QCXB1CN-472	CAPACITOR
	C25	QET61EM-475	E CAPACITOR
	C26	QET61EM-475	E CAPACITOR
	C27	QET61CM-106	E CAPACITOR
	C28	QET61CM-106	E CAPACITOR
	C29	QFN31HJ-682	M CAPACITOR
	C30	QFN31HJ-102	M CAPACITOR
	C31	QFV71HJ-104	M CAPACITOR
	C33	QFV71HJ-154	M CAPACITOR
	C35	QFV71HJ-154	M CAPACITOR
	C36	QCVB1CN-103	CAPACITOR
	C37	QET61CM-106	E CAPACITOR
	C38	QCVB1CN-103	CAPACITOR
	C39	QEN61HM-105	NP E CAPACITOR
	C40	QCBB1HJ-102	CAPACITOR
	C41	QET61HM-225	E CAPACITOR
	C42	QCBB1HJ-102	CAPACITOR
	C43	QEN61HM-105	NP E CAPACITOR
	C44	QET61HM-225	E CAPACITOR
	C45	QCBB1HJ-102	CAPACITOR
	C46	QCBB1HJ-271	CAPACITOR
⚠	X1	PU59335	CRYSTAL RESONATOR
	TP GND	PU55774	TEST PIN
	TP1	PU55774	TEST PIN
	TP11	PU55774	TEST PIN
	TP25	PU55774	TEST PIN
	CN1	PU58844-2	CAP HOUSING
	CN2	PU43351-105	CAP HOUSING
	CN3	PU58844-5	CAP HOUSING
	CN4	PU58931-14	CAP HOUSING
	CN5	PU58931-20	CAP HOUSING

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* AUDIO BOARD ASSEMBLY <09> *
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	PWBA	PU36160L	AUDIO BOARD ASSEMBLY ,E/EG
		PU36160M	AUDIO BOARD ASSEMBLY, EK
	IC1	AN3994NK	IC
	Q1	2SD1449S,T	TRANSISTOR
	Q2	2SD1449S,T	TRANSISTOR
	Q3	2SC3311R,S	TRANSISTOR
	Q4	2SB1030R,S	TRANSISTOR
	Q6	DTC124ES	TRANSISTOR
	D2	MA165	DIODE
	OR	1SS133	DIODE
	D3	MA165	DIODE
	OR	1SS133	DIODE
	D4	MA165	DIODE
	OR	1SS133	DIODE
	D5	MA165	DIODE
	OR	1SS133	DIODE
	D12	1SS133	DIODE
	OR	MA165	DIODE
	R1	QRD161J-103	RESISTOR
	R2	QRD161J-224	RESISTOR
	R3	QRD161J-223	RESISTOR
	R4	QRD161J-331	RESISTOR
	R5	QVZ3518-102	V RESISTOR, PB LEVEL
	R6	QRD161J-100	RESISTOR
	R7	QRD161J-471	RESISTOR
	R8	QRD161J-333	RESISTOR
	R9	QRD161J-470	RESISTOR
	R11	QRD161J-563	RESISTOR
	R12	QRD161J-271	RESISTOR
	R13	QRD161J-153	RESISTOR
	R14	QRD161J-153	RESISTOR
	R15	QRD161J-103	RESISTOR
	R16	QRD161J-103	RESISTOR
	R17	QRD161J-103	RESISTOR
	R18	QRD161J-561	RESISTOR
	R19	QRD161J-473	RESISTOR
	R20	QVZ3518-473	V RESISTOR, BIAS LEVEL
	R21	QRD161J-8R2	RESISTOR
	R22	QRD161J-333	RESISTOR
	R23	QRD161J-4R7	RESISTOR
	R24	QRD161J-223	RESISTOR
⚠	R31	PU58802-4R7	POSISTOR
	OR	PU52108-4R7	POSISTOR
	R34	QRD161J-103	RESISTOR
	R35	QRD161J-102	RESISTOR
	C1	QER61EM-475G	E CAPACITOR
	C2	QER61HM-104G	E CAPACITOR
	C3	QFV71HJ-154	M CAPACITOR
	C4	QCC11EJ-123	CAPACITOR
	C5	QEL61HM-105	E CAPACITOR
	C6	QCBB1HJ-102	CAPACITOR
	C7	QCC11EJ-152	CAPACITOR
	C8	QER61CM-226	E CAPACITOR
	C9	QER61EM-335G	E CAPACITOR
	C10	QER61CM-476	E CAPACITOR
	C11	QEK61HM-474G	E CAPACITOR
	OR	QEK61HM-474	E CAPACITOR
	C12	QCBB1HJ-331	CAPACITOR
	C13	QFN31HJ-683	M CAPACITOR
	C14	QFN31HJ-683	M CAPACITOR
	C15	QER61HM-225G	E CAPACITOR
	C16	QCBB1HJ-102	CAPACITOR
	C17	QER60JM-476	E CAPACITOR
	C18	QER61AM-476	E CAPACITOR
	C19	QCBB1HJ-331	CAPACITOR
	C20	QFN31HJ-683	M CAPACITOR
	C21	QER61CM-106G	E CAPACITOR
	C22	QCC11EJ-332	CAPACITOR
	C23	QCC11EJ-223	CAPACITOR
	C24	QCVB1CN-103	CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C26	QER61HM-225G	E CAPACITOR
	L1	PU58308-332J	PEAKING COIL
⚠	T1	PU59307	OSC TRANS
	TP31	PU55774	TEST PIN
	TP32	PU55774	TEST PIN
	CN1	PU58844-7	CAP HOUSING
	CN2	PU58844-4	CAP HOUSING
	CN3	PU58844-7	CAP HOUSING

****

****
* AUDIO/CTL HEAD BOARD <12> *
****

	PWBA	PU58016	A/C HEAD BOARD
	BKT1	PQ43014	BRACKET
	SCW1	SPSH1740	MINI SCREW
	CN1	PU54537-5	CAP HOUSING
	CN2	PU54537-2B	CAP HOUSING

****

****
* TIMER BOARD ASSEMBLY <15> *
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	PWBA	PB20002B-01	TIMER BOARD ASSEMBLY,EK
		PB20002A-01	TIMER BOARD ASSEMBLY ,E/EG
	IC2	S-8053ALB	IC
	OR	S-8053HLB	IC
	IC101	UPD75216ACW-041	IC
	IC102	UPD82C43CY	IC
	Q1	2SC1317R,S	TRANSISTOR
	Q2	2SC3311A(RS)	TRANSISTOR
	Q3	2SC3311A(RS)	TRANSISTOR
	Q101	DTC124ES	TRANSISTOR
	Q102	DTC124ES	TRANSISTOR
	D1	MTZJ5.1B	ZENER DIODE
	OR	RD5.1ES-T1B2	ZENER DIODE
	D2	1SS133	DIODE
	D3	1SS133	DIODE
	D5	RD9.1ES-T1B2	ZENER DIODE
	D6	DA210S	DIODE
⚠	D7	RD8.2EB1	ZENER DIODE
⚠	OR	RD8.2EB2	ZENER DIODE
⚠	D8	RD8.2EB1	ZENER DIODE
⚠	OR	RD8.2EB2	ZENER DIODE
	D103	1SS133	DIODE
	OR	MA165	DIODE
	D106	1SS133	DIODE,E/EG
	OR	MA165	DIODE,E/EG
	D107	1SS133	DIODE
	OR	MA165	DIODE
	D108	1SS133	DIODE
	OR	MA165	DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R1	QRD161J-222	RESISTOR
	R2	QRD161J-121	RESISTOR
	R3	QRD161J-682	RESISTOR
	R4	QRD161J-103	RESISTOR
	R5	QRD161J-104	RESISTOR
	R6	QRD161J-471	RESISTOR
	R7	QRD161J-151	RESISTOR
	R8	QRD161J-102	RESISTOR
	R9	QRD161J-472	RESISTOR
	R10	QRD161J-474	RESISTOR
	R11	QRD161J-104	RESISTOR
	R12	QRD161J-684	RESISTOR
	R101	QRD161J-102	RESISTOR
	R102	QRD161J-102	RESISTOR
	R103	QRD161J-102	RESISTOR
	R104	QRD161J-472	RESISTOR
	R105	QRD161J-102	RESISTOR
	R106	QRD161J-103	RESISTOR
	R107	QRD161J-103	RESISTOR
	R108	QRD161J-103	RESISTOR
	R109	QRD161J-102	RESISTOR
	R110	QRD161J-102	RESISTOR
	R111	QRD161J-102	RESISTOR
	R113	QRD161J-472	RESISTOR
	R114	QRD161J-472	RESISTOR
	R115	QRD161J-472	RESISTOR
	R116	QRD161J-472	RESISTOR
	R117	QRD161J-472	RESISTOR
	R118	QRD161J-102	RESISTOR
	R119	QRD161J-472	RESISTOR
	R120	QRD161J-472	RESISTOR
	R121	QRD161J-472	RESISTOR
	R122	QRD161J-472	RESISTOR
	R125	QRD161J-102	RESISTOR
	R131	QRD161J-472	RESISTOR
	R132	QRD161J-472	RESISTOR
	R133	QRD161J-472	RESISTOR
	R134	QRD161J-472	RESISTOR
	R135	QRD161J-472	RESISTOR
	R136	QRD161J-472	RESISTOR
	R137	QRD161J-472	RESISTOR
	R138	QRD161J-472	RESISTOR
	R139	QRD161J-102	RESISTOR
	R140	QRD161J-472	RESISTOR
	R141	QRD161J-472	RESISTOR
	R142	QRD161J-472	RESISTOR
	R143	QRD161J-472	RESISTOR
	R144	QRD161J-472	RESISTOR
	R145	QRD161J-472	RESISTOR, E/EG
	R146	QRD161J-472	RESISTOR, E/EG
	R147	QRD161J-472	RESISTOR, E/EG
	R148	QRD161J-472	RESISTOR, E/EG
	R149	QRD161J-102	RESISTOR
	R150	QRD161J-102	RESISTOR
	R154	QRD161J-472	RESISTOR
	R158	QRD161J-333	RESISTOR
	R160	QRD161J-472	RESISTOR
	R165	QRD161J-103	RESISTOR
	R166	QRD162J-104	RESISTOR
	R168	QRD161J-683	RESISTOR
	R169	QRD161J-102	RESISTOR
	RA101	QRB047J-472	RESISTOR NETWORK
	OR	RNBH5A472	RESISTOR NETWORK
	OR	QRB049J-472	RESISTOR ARRAY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	RA103	QRB047J-333	RESISTOR ARRAY
	OR	RNBH5A333	RESISTOR NETWORK
	OR	QRB049J-333	RARRAY
	RA104	QRB087J-224	RESISTOR NETWORK
	OR	QRB089J-224	RESISTOR NETWORK
	OR	RNBH9A224	RESISTOR NETWORK
	RA105	QRB067J-104	RESISTOR ARRAY
	OR	RNBH7A104	RESISTOR NETWORK
	OR	QRB069J-104	RESISTOR NETWORK
	RA106	QRB047J-224	RESISTOR NETWORK
	OR	RNBH5A224	RESISTOR NETWORK
	OR	QRB049J-224	RESISTOR NETWORK
	C1	QETC1CM-336	E CAPACITOR
	C2	QETC1HM-335	E CAPACITOR
	C3	QETC1AM-336	E CAPACITOR
	C4	QETC0JM-336	E CAPACITOR
	C5	QCBB1HJ-102	CAPACITOR
	C6	QCVB1CM-103	CAPACITOR
	C7	QETC1CM-106	E CAPACITOR
	C8	QETA0JM-338	E CAPACITOR
	C9	QCVB1CM-103	CAPACITOR
	C101	PU57672-200	TRIMMER CAPACITOR, TIMER CLOCK
	C102	QCT30CH-120	CAPACITOR
	C105	QCC11EK-104	CAPACITOR
	C107	QCVB1CM-103	CAPACITOR
	L 1	PU48530-101K	PEAKING COIL
⚠	X102	PU60226	CRYSTAL RESONATOR
	TP1	PU56008	TEST-PIN
	TP2	PU56008	TEST-PIN
	TP3	PU56008	TEST-PIN
	CN1	PU58931-22	CAP HOUSING
	CN2	PU58929-10	CAP HOUSING
	CN3	PU58844-106	CAP HOUSING
	CN4	PU58844-104	CAP HOUSING, E/EG

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****
* VPS BOARD ASSEMBLY (EG ONLY) <18> *
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PWBA	PU36127C	VPS BOARD ASSEMBLY
IC1	HD49703NT	IC
IC2	M5278L05	IC
Q1	2SB641R,S	TRANSISTOR
Q2	2SC3327A	TRANSISTOR
OR	2SC2878A	TRANSISTOR
Q3	2SD637R,S	TRANSISTOR
D1-D5	1SS133	DIODE,X5
R1	QRD161J-103	RESISTOR
R2	QRD161J-103	RESISTOR
R3	QRD161J-102	RESISTOR
R4	QRD161J-102	RESISTOR
R5	QRD161J-102	RESISTOR
R6	QRD161J-473	RESISTOR
R7	QRD161J-103	RESISTOR
R8	QRD161J-391	RESISTOR
R9	QRD161J-562	RESISTOR
R10	QRD161J-102	RESISTOR
R11	QRD161J-473	RESISTOR
R12	QRD161J-562	RESISTOR
R13	QRD161J-105	RESISTOR
R14	QRD161J-472	RESISTOR
R15	QRD161J-472	RESISTOR
R16	QRD161J-472	RESISTOR
R17	QRD161J-472	RESISTOR
R18	QRD161J-562	RESISTOR
R19	QRD161J-563	RESISTOR
R20	QRD161J-222	RESISTOR
R21	QRD161J-222	RESISTOR
R22	QRD161J-222	RESISTOR
R23	QRD161J-222	RESISTOR
R24	QRD161J-472	RESISTOR
R25	QRD161J-682	RESISTOR
R26	QRD161J-472	RESISTOR
R27	QRD161J-102	RESISTOR
R28	QRD161J-103	RESISTOR
R29	QRD161J-103	RESISTOR
R30	QRD161J-184	RESISTOR
R31	QRD161J-103	RESISTOR
R32	QRD161J-332	RESISTOR
R33	QRD161J-561	RESISTOR
R34	QRD161J-474	RESISTOR
R35	QRD161J-474	RESISTOR
R36	QRD161J-332	RESISTOR
R37	QRD161J-103	RESISTOR
RA1	RNBH5A224	RESISTOR ARRAY
C1	QETC1CM-336	E CAPACITOR
C2	QCS31HJ-681	CAPACITOR
C3	QETC1CM-106	E CAPACITOR
C4	QCS31HJ-391	CAPACITOR
C5	QCT25CH-390	CAPACITOR
C6	QFN31HJ-103	M CAPACITOR
C7	QFN31HJ-102	M CAPACITOR
C8	QFN31HJ-102	M CAPACITOR
C9	QETC1CM-336	E CAPACITOR
C10	QETC1CM-336	E CAPACITOR
C11	QCF31HP-473	CAPACITOR
C12	QETC1CM-336	E CAPACITOR
C13	QETC1CM-336	E CAPACITOR
C14	QETC1CM-336	E CAPACITOR
C15	QCS31HJ-391	CAPACITOR
C16	QETC1HM-335	E CAPACITOR
C17	QETC1HM-105	E CAPACITOR
C18	QETC1HM-106	E CAPACITOR
C19	QCT25CH-390	CAPACITOR
C20	QCT25CH-150	CERAMIC CAP
C21	QETC1CM-336	E CAPACITOR
C22	QCT25CH-100	CAPACITOR
T1	PU58484	COIL
TP1-TP6	PU56008	TEST-PIN,X6
CN1	PU58929-3	CAP HOUSING
CN2	PU58844-4	CAP HOUSING

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****
* OPERETION BOARD ASSEMBLY <22> *
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PWBA	PU11406H-01	OPERATION BORRD ASSEMBLY
D201	SLR-34VC3F	LE DIODE

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R200	QRD161J-331	RESISTOR
	R201	QRD161J-103	RESISTOR
	R203	QRD161J-223	RESISTOR
	R205	QRD161J-220	RESISTOR
	R207	QRD161J-152	RESISTOR
	R208	QRD161J-222	RESISTOR
	R209	QRD161J-222	RESISTOR
	R215	QRD161J-222	RESISTOR
	R216	QRD161J-222	RESISTOR
	R217	QRD161J-332	RESISTOR
	R218	QRD161J-472	RESISTOR
	R219	QRD161J-103	RESISTOR
	R401	PU57925-3	V RESISTOR,TRACKING
	R402	PU59166	V RESISTOR,SHARPNESS
	C202	QFN41HJ-273	M CAPACITOR
	C203	QEK61CM-226	E CAPACITOR
	C204	QEK61HM-105	E CAPACITOR
	C206	QEK61AM-476	E CAPACITOR
	S201	PU57550	SWITCH(TACT)
	S202	PU57550	SWITCH(TACT)
	S204	PU57551	SWITCH(TACT)
	S205	PU57551	SWITCH(TACT)
	S206	PU57551	SWITCH(TACT)
	S207	PU57551	SWITCH(TACT)
	S208	PU57551	SWITCH(TACT)
	S209	PU57551	SWITCH(TACT)
	HD1	PQM30038	LED HOLDER
	SLD1	PQ30658	SHIELD CASE
	SLD2	PQ30645-1-2	SHIELD PLATE
	CN1	PU59555-105	CAP HOUSING
	CN2	PU59555-107	CAP HOUSING
		-IFR BOARD ASSEMBLY-	
	PWBA	PU58006B	IFR BOARD ASSEMBLY
	The following are included in IFB BOARD ASSEMBLY		
	IC1	LA7224	IC
	D4	PD49PI	PIN PHOTO DIODE
	R7	QRD161J-104	RESISTOR
	R9	QRD161J-102	RESISTOR
	C5	QEK60JM-476	E CAPACITOR
	L1	PU59060	TRAP COIL

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****
* DISPLAY/SWITCH BOARD ASSEMBLY <28> *
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	PWBA	PU22339G	DIS/SW BOARD ASSEMBLY ,E/EK
		PU22339F	DIS/SW PWB ASSY ,EG
	IC1	UPD7538ACU-214	IC
	D1	RD7.5EB2	ZENER DIODE
	D402	1SS132	DIODE
	R1	QRD161J-103	RESISTOR
	R2	QRD161J-102	RESISTOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	R3	QRD161J-102	RESISTOR
	R4	QRD161J-102	RESISTOR
	R5	QRD161J-103	RESISTOR
	R6	QRD161J-472	RESISTOR
	R7	QRD161J-273	RESISTOR
	R8	QRD161J-104	RESISTOR
	C1	QCBB1HJ-101	CAPACITOR
	C2	QCBB1HJ-101	CAPACITOR
	C3	QER61HM-106	E CAPACITOR
	C4	QCVB1CN-103	CAPACITOR
	C5	QER61HM-106	E CAPACITOR
	C6	QCF11HP-103	CAPACITOR
	C7	QCBB1HJ-102	CAPACITOR
⚠	CF1	PU59109	RESONATOR
	S1	PU53598	SWITCH(TACT)
	S2	PU53598	SWITCH(TACT)
	S3	PU53598	SWITCH(TACT)
	S4	PU53598	SWITCH(TACT)
	S5	PU53598	SWITCH(TACT)
	S6	PU53598	SWITCH(TACT)
	S7	PU53598	SWITCH(TACT)
	S8	PU53598	SWITCH(TACT)
	S9	PU53598	SWITCH(TACT)
	S10	PU53598	SWITCH(TACT)
	S11	PU53598	SWITCH(TACT)
	S13	PU53598-2	SWITCH(TACT)
	S14	PU53598-2	SWITCH(TACT)
	S15	PU53598	SWITCH(TACT)
	S16	PU53598-2	SWITCH(TACT)
	S17	PU53598	SWITCH(TACT)
	S18	PU53598	SWITCH(TACT)
	S19	PU53598-2	SWITCH(TACT)
	S20	PU53598-2	SWITCH(TACT)
	S21	PU53598-2	SWITCH(TACT)
	S22	PU53598-2	SWITCH(TACT)
	S23	PU53598-2	SWITCH(TACT)
	S24	PU53598-2	SWITCH(TACT)
	S25	PU53598-2	SWITCH(TACT)
	S26	PU53598-2	SWITCH(TACT)
	S27	PU53598-2	SWITCH(TACT)
	S29	PU53598-2	SWITCH(TACT)
	S30	PU53598-2	SWITCH(TACT)
	S402	PU52621	PUSH SWITCH
	FDP	PU59959-2	FLUORESCENT DISPLAY PANEL,EG
		PU59959	FLUORESCENT DISPLAY PANEL,E/EK
	HD1	PQ31355	FDP HOLDER(L)
	HD2	PQ31356	FDP HOLDER(R)

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****
* UPPER DRUM BOARD <41> *
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	PWB	PDM3018	UPPER DRUM BOARD

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#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
		********** PRE/REC BOARD ASSEMBLY <43> **********	
	PWBA	PU36147B-02	PRE/REC BOARD ASSEMBLY
	IC1	HA11870NT	IC
	Q1	DTC144WS	TRANSISTOR
	Q2	DTC144WS	TRANSISTOR
	Q3	2SA1309R,S	TRANSISTOR
	Q4	DTC144WS	TRANSISTOR
	Q5	DTC144WS	TRANSISTOR
	Q6	2SC1740S(QRS)	TRANSISTOR
	D1	MA165	DIODE
	OR	1SS133	DIODE
	D2	MA165	DIODE
	OR	1SS133	DIODE
	D3	MA165	DIODE
	OR	1SS133	DIODE
	D4	MA165	DIODE
	OR	1SS133	DIODE
	D5	MA165	DIODE
	OR	1SS133	DIODE
	R1	QVZ3518-221	V RESISTOR, SP CH-2,Q
	R2	PU57457-221	V RESISTOR, SP CH-1,Q
	R3	QVZ3518-221	V RESISTOR, LP CH-1,Q
	R4	PU57457-221	V RESISTOR, LP CH-2,Q
	R5	QRD161J-184	RESISTOR
	R8	QRD161J-393	RESISTOR
	R9	QRD161J-103	RESISTOR
	R10	QRD161J-153	RESISTOR
	R11	QRD161J-103	RESISTOR
	R12	QRD161J-103	RESISTOR
	R13	QRD161J-103	RESISTOR
	R14	QRD161J-223	RESISTOR
	R15	QRD161J-103	RESISTOR
	R17	QRD161J-152	RESISTOR
	R18	QRD161J-332	RESISTOR
	R19	QRD161J-561	RESISTOR
	R20	QRD161J-561	RESISTOR
	R21	QRD161J-561	RESISTOR
	R22	QRD161J-474	RESISTOR
	R23	QRD161J-223	RESISTOR
	R24	QRD161J-223	RESISTOR
	C1	QCVB1CN-103	CAPACITOR
	C2	QFZ0096-224	MM CAPACITOR
	C3	QFZ0096-224	MM CAPACITOR
	C4	QCSB1HJ-220	CAPACITOR
	C5	PU57672-500	TANTAL CAPACITOR
	C6	QCSB1HJ-390	CAPACITOR
	C7	PU57672-500	TANTAL CAPACITOR
	C8	QCVB1CN-103	CAPACITOR
	C9	QCVB1CN-103	CAPACITOR
	C10	QFZ0096-224	MM CAPACITOR
	C11	QFZ0096-224	MM CAPACITOR
	C12	QCSB1HJ-330	CAPACITOR
	C13	PU57672-500	TANTAL CAPACITOR
	C14	QCSB1HJ-390	CAPACITOR
	C15	PU57672-500	TANTAL CAPACITOR
	C16	QCVB1CN-103	CAPACITOR
	C17	QER60JM-476	E CAPACITOR
	C18	QCF31HP-223	CAPACITOR
	C20	QCBB1HJ-681	CAPACITOR
	C21	QCVB1CN-103	CAPACITOR

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	C22	QCVB1CN-103	CAPACITOR
	C23	QEK61HM-104	E CAPACITOR
	C24	QCVB1CN-103	CAPACITOR
	C25	QCBB1HJ-820	CAPACITOR
	C26	QCF31HP-223	CAPACITOR
	C27	QER60JM-476	E CAPACITOR
	C29	QCVB1CN-103	CAPACITOR
	C31	QCSB1HJ-300	CAPACITOR
	C32	QCVB1CN-103	CAPACITOR
	C33	QCF31HP-223	CAPACITOR
	C34	QET60JM-476	E CAPACITOR
	L1	PU54223-101K	PEAKING COIL
	L4	PU54223-560J	PEAKING COIL
	L5	PU54223-101K	PEAKING COIL
	L6	PU54223-101K	PEAKING COIL
	BKT	PQ42558	PWB BKT,FOR PRE/REC BOARD
	ETH	PQ40433-2	EARTH LUG
	SPC	WAS2600Z	WASHER
	SCW1	DPSP2606Z	SCREW
	SCW2	DPSP2606Z	SCREW
	SLD1	PU59080	PRE SHIELD
	SLD2	PU59081-1-3	PRE SHIELD COVER
	TP	PU57545	TEST PIN, X5
	CN1	PU58844-12	CAP HOUSING
	CN2	PU56258-10	CAP HOUSING
	CN3	PU58844-2	CAP HOUSING
		********** DECK TERMINAL BOARD ASSEMBLY <51> **********	
	PWBA	PU22329B1	DECK TERMINAL BOARD ASSY
	R1	QRD181J-151	RESISTOR
	R3	QRD181J-331	RESISTOR
	PHS1	GP3A21	P.INTERRUPTER
	CN1	PU58798-17	CAP CONNECTOR
		********** RELAY BOARD ASSEMBLY <52> **********	
	PWBA	PU22329D2	RELAY BOARD ASSY
	LC	PU59809-222T	E FILTER
		********** REC SAFETY BOARD ASSEMBLY <53> **********	
	PWBA	PU22329A3	REC SAFETY BOARD ASSY

#⚠	REF NO.	PART NO.	PART NAME, DESCRIPTION
	S1	PU58644-1-3	REC SAFETY SWITCH

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****
* END SENSOR BOARD ASSEMBLY <54> *
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	PWBA	PU22329A4	END SENSOR BOARD ASSY
	Q1	PN268R-NC	PHOTO TRANSISTOR
	HD	PQ31047	END SENSOR HOLDER
	CN1	PU49215-102	CAP HOUSING

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****
* CASSETTE HOUSING BOARD <56> *
****

	PWB1	PU36044-1-2	CASSETTE HOUSING BOARD
	Q1	PN268R-NC	PHOTO TRANSISTOR
	R1	QRD161J-471	RESISTOR
	PHS1	PU58879	PHOTO INTERRUPTER
	CN1	PU58844-106	CAP HOUSING

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****
* REMOTE CONTROL BOARD ASSEMBLY (RM) *
****

	PWBA	PQ10543-001	REMOCON BOARD ASSY, E/EG
		PQ10543-002	REMOCON BOARD ASSY, EK
	IC1	M50565-016	IC
	Q1	2SD601(RS)	TRANSISTOR
	Q2	2SB822(RS)	TRANSISTOR
	D1	SE303AY	LE DIODE
	D2	SE303AY	LE DIODE
	D1	MA151WA	DIODE
	D2	MA151A	DIODE, EK
	D3	MA151WK	DIODE
	D4	MA151WK	DIODE
	D5	MA151WK	DIODE
	D6	MA151WK	DIODE
	D7	MA151WK	DIODE
	D8	MA151WK	DIODE
	D9	MA152WK	DIODE
	D10	MA151WK	DIODE
	D19	MA151WA	DIODE
	D20	MA151A	DIODE
	X1	CSB400PB1T	CERAMIC RESONATOR
	S129	PQ10355-021	SLIDE SWITCH
	TML1	PQ10355-018	BATTERY TERMINAL, (-)
	TML2	PQ10355-017	BATTERY TERMINAL, (+)

JVC

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TECHNISCHE DATEN

Format	: VHS PAL-Standard
Video-Aufnahmesystem	: Rotierendes Zweikopfsystem, Schrägspurabtastung mit im Winkel versetzten Köpfen, 2 Videokopfpaare, 1 Paar für SP-Betrieb, 1 Paar für LP-Betrieb
Video-Signalsystem	: PAL-Farl- und CCIR-Monochrom-signale, 625 Linien
Bandbreite	: 12,65 mm
Maximale Spielzeit (SP)	: 240 Min. mit E-240-Kassette
(LP)	: 480 Min mit E-240-Kassette
Temperaturbedingungen	
Betrieb	: 5°C bis 40°C
Lagerung	: -20°C bis 60°C
Empfangskanäle	: VHF 47 – 89 MHz 104 – 300 MHz 302 – 470 MHz UHF 470 – 862 MHz
Antennenausgang	: UHF-Kanäle 32 – 40 (einstellbar)
Leistungsaufnahme	: 31 Watt
Spannungsversorgugn	: 220 V~, 50/60 Hz
Video	
Eingang	: 0,5 bis 2,0 Vss, 75 Ohm, unsymmetrisch
Ausgang	: 1,0 Vss, 75 Ohm, unsymmetrisch
Störspannungs-abstand	: 43 dB (Rohde & Schwarz Geräusch-messer) bei Bildschärferegler in Mittenposition
Horizontale Auflösung	: 250 Linien bei Bildschärferegler in Mittenposition
Audio	
Eingang	: AUDIO-Buchse (5pol. DIN): -8 dBs, mehr als 50 kOhm, unsymmetrisch : AUDIO/VIDEO-Buchse (21pol. Peri-Buchse): -3,8 dBs CENELEC-Norm), über 10 kOhm, unsymmetrisch
Ausgangspegel	: AUDIO-Buchse (5 pol. DIN): -6 dBs, hochohmig AUDIO/VIDEO-Buchse (21pol. Peri-Buchse): -3,8 dBs (CENELEC-Norm), hochohmig
Ausgangsimpedanz	: Unter 1 kOhm, unsymmetrisch
Störspannungsabstand	: Über 40 dB
Frequenzbereich	: 70 Hz bis 10.000 Hz
Schaltuhr	: 1 Jahr/8 Programme
Abmessungen	: 435(B) x 95(H) x 341(T) mm
Gewicht	: 7,2 kg
Mitgeliefertes Zubehör	: Antennenkabel, Infrarot-Fernbedienung Batterie "R6" x2

Technische Änderungen vorbehalten.
Die technischen Angaben beziehen sich, sofern nicht anders angegeben, auf die SP-Betriebsart.

No. 82011VD
September 1987

INHALT

ABSCHNITT 1
MECHANISCHE EINSTELLUNG

1.1 ALLGEMEINE BESCHREIBUNG

1.1.1 Vorsichtsmaßregeln

WICHTIG:

1. Das Gerät vor dem Ausbau oder Löten von Bauteilen vom Stromnetz abtrennen.
2. Beim Abnehmen von Befestigungsteilen (Schrauben, Unterlegscheiben usw.) darauf achten, diese nicht in den Mechanismus fallen zu lassen. Falls eine Unterlegscheibe in den Mechismus fällt, diese immer entfernen.
3. Der Bandtransportmechanismus wurde im Werk präzise eingestellt und braucht normalerweise nicht nachgestellt zu werden.
4. Beim Ausbauen von Teilen darauf achten, nicht andere Teile zu beschädigen oder auszubauen. (Besonders vorsichtig mit den Bandführungen und der Drehkopf-Videotrommel umgehen.)
5. Für Wartungsarbeiten, die erfordern, daß der Cassettenschacht vom Haupt-Deck getrennt wird, die unten aufgeführten Schritte befolgen.

1) Eine Platte isoliertes Material rechts neben das Chassis legen.
2) Den Cassettenschacht vom Haupt-Deck ausbauen und auf das isolierte Material legen, ohne dabei die Steckverbindung von der VIDEO Platine abzutrennen.
3) Eine Cassette in den Cassettenschacht legen. Der Schachtmechanismus zieht die Cassette ein.
4) Den Fototransistor-Sensor (END SENSOR) auf dem Haupt-Deck mit einer undurchsichtigen Abdeckung abdecken.
5) Die gewünschten Betriebsarten können mit den Bedienungstasten eingestellt werden.

1.1.2 Erforderliche Prüfgeräte, Halterungen und Einstellehren

Für richtige mechanische Einstellung werden die folgenden Werkzeuge und Haltevorrichtungen dringend empfohlen. Ohne diese wäre eine lange Testbetriebszeit erforderlich, und das Gerät könnte möglicherweise beschädigt werden. Außerdem werden Normalwerkzeuge gebraucht.

1. Erforderliche Prüfgeräte
   Farbfernseher oder Monitor
   Oszilloskop: Breitband, Zweikanal, getriggert, verzögerte Zeitbasis
   Aufnahmeband
   Abgleichband

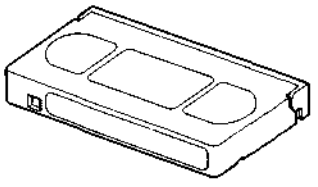
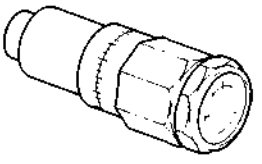
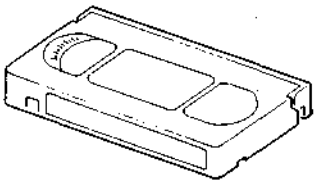
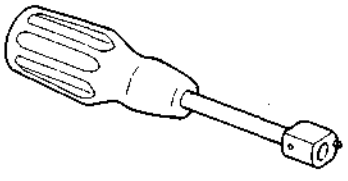
JVC-Abgleichband MH-2, MH-2L 	Drehkraftmessungs-Baugruppe PUJ48075-2 (Drehkraft-Meßuhr: 600ATG, Drehkraft-Meßkopf: PUJ48016-2) 	Bandzug-Meßcassette PUJ48076-2 
A/CTL Kopfpositionierungs-Werkzeug PUJ47351-2 		

Tabelle 1-1-1 Werkzeuge und Einstellehren

1.1.3 Demontage (Gehäuse)

1. Oberabdeckung
1) Fünf Schrauben von der linken, rechten und hinteren Seite des Gerätes abnehmen.
2) Das hintere Ende der Oberabdeckung zuerst abheben, und dann die Abdeckung ganz abnehmen.

2. Bodenplatte
1) Fünf Schrauben von der Bodenplatte des Geräts abnehmen.
2) Die Bodenplatte von den sechs Klauen am Chassis lösen, um sie abzunehmen.

3. Frontplattenbaugruppe
1) Die Oberabdeckung abnehmen.
2) Drei obere Haken der Frontplattenbautruppe aus ihren Chassishalterungen nach oben biegen, um die Haken vom Chassis zu lösen.
3) Die drei unteren Haken von der Unterseite des Geräts lösen, um die Frontplattenbaugruppe vom Chassis abzunehmen.
4) Die Frontplattenbaugruppe so zusammenbauen, daß die Masseplatte an der Rückseite die Außenseite der Cassettenschacht-Baugruppe wird. (Siehe Abb. 1-2-2)

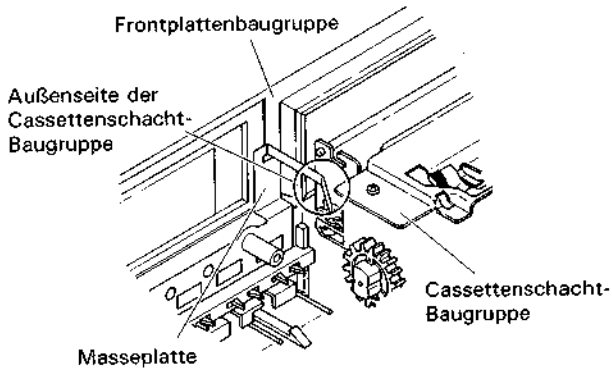


Abb. 1-1-2

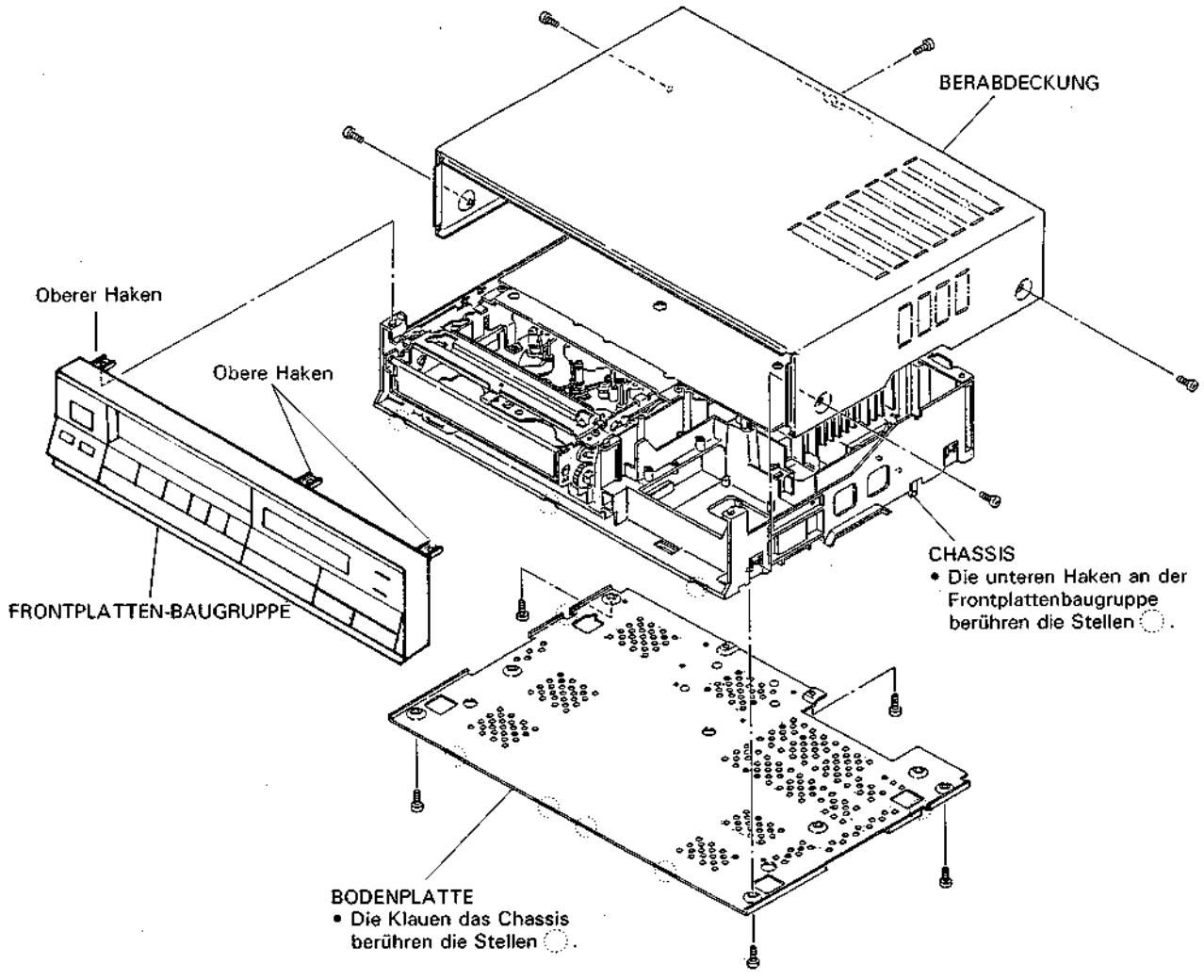


Abb. 1-1-1 Abnehmen der Außenabdeckung

1.1.4 Anordnung der Haupt-Teile

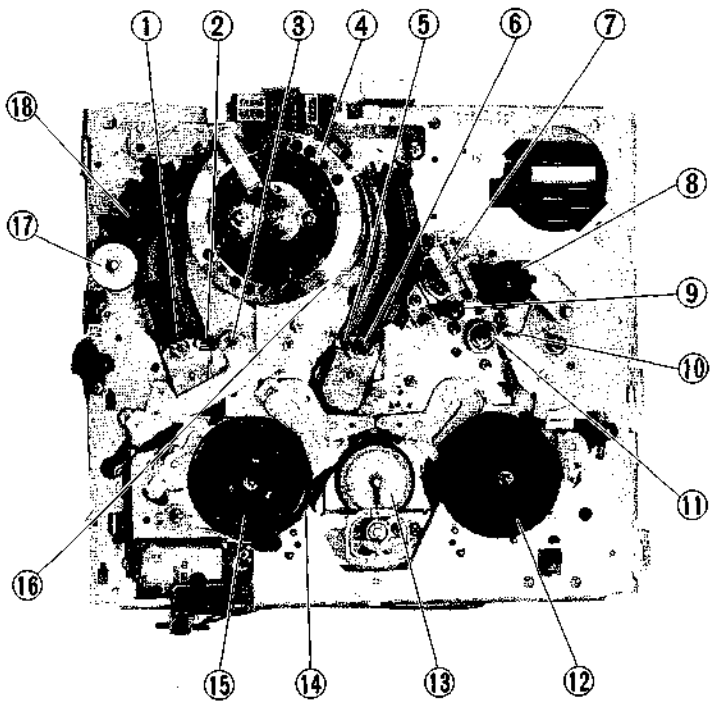


Abb. 1-1-3 Haupt-Deck von oben gesehen

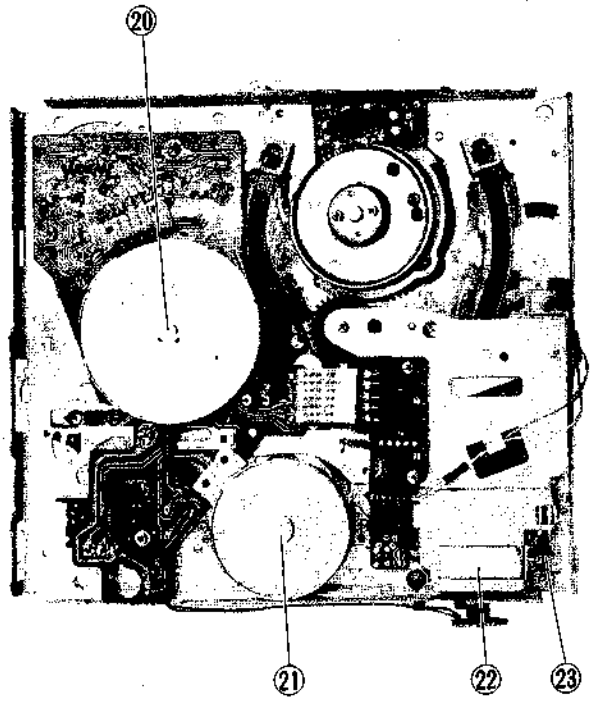


Abb. 1-1-4 Haupt-Deck von unten gesehen

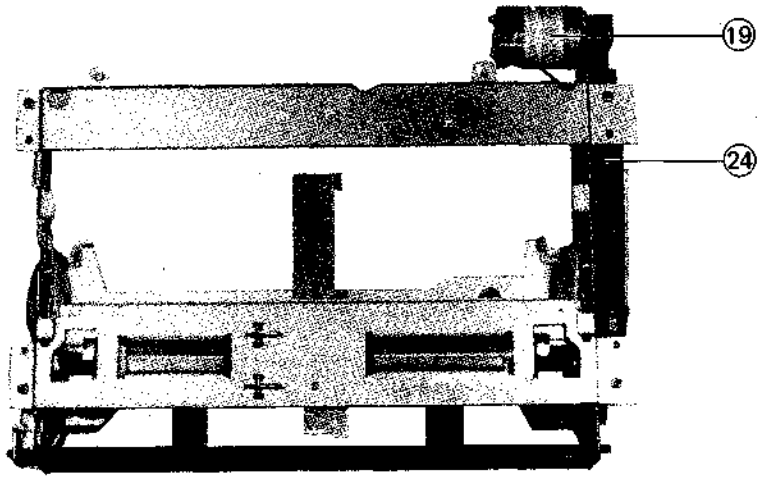


Abb. 1-1-5 Cassettenschacht

1. Abwickel-Führungsrolle
2. Abwickel-Kipprolle
3 Bandzugfühlstift
4. Kopftrommel
5. Aufwickel-Kippstift
6. Aufwickel-Führungsrolle
7. Audio/Kontrollkopf (A/C)
8. Andruckrolle
9. Aufwickel-Führungsstift
10. Führungsarm
11. Capstanwelle
12. Aufwickel-Bandteller
13. Spulenkupplung
14. Bremsband
15. Abwickel-Bandteller
16. Untere Trommel
17. Impedanzrolle
18. Vollöschkopf
19. Cassettenmotor
20. Capstanmotor
21. Spulenmotor
22. Betriebsartenmotor
23. Motorsteuerriemen
24. Cassettenriemen

1.2 AUSTAUSCH DER HAUPTBAUGRUPPEN

1.2.1 Obere Trommel

Hinweis: Bei der Handhabung und beim Einbau der Kopftrommel-Baugruppe nicht direkt die Kopfspitzen auf der Kopfbaugruppe beühren.
Zum Reinigen der Kopfspitzen ein fusselfreies Tuch oder ein Polierleder, mit Alkohol befeuchtet, mit der Hand an die Kopftrommel andrücken, und dann die Kopftrommel im Uhrzeigersinn drehen. Nicht die Kopftrommel-Baugruppe in vertikaler Richtung abwischen.

1. Ausbau
1) Eine Schraube abnehmen und die Bürsten-Baugruppe von der Trommel-Baugruppe abnehmen.
2) Alle Lötstellen auf der Trommel-Verdrahtungsplatte abflöten. Allen überflüssigen Lötzinn entfernen und dann die Trommel-Verdrahtungsplatte von der Kopftrommel-Baugruppe abnehmen.
Hinweis: Lötstellen können leicht mit Lötzinnsauger oder Sauglitze entfernt werden.
3) Zwei Schrauben abnehmen und die Kopftrommel-baugruppe nach oben abziehen.

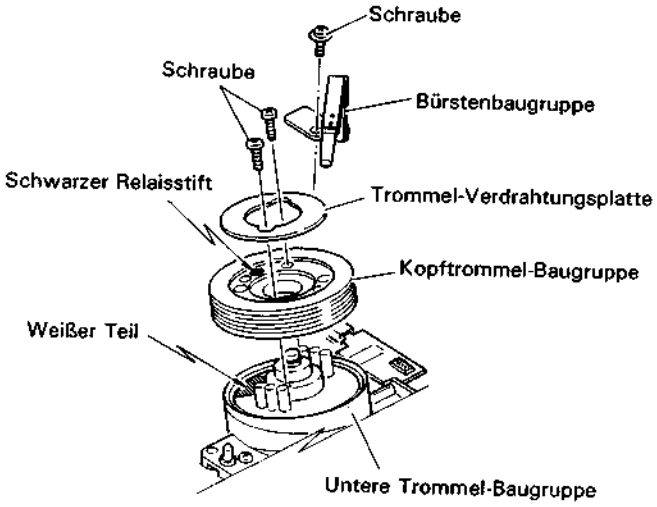


Abb. 1-2-1 Kopftrommel-Baugruppe

2. Einbau
1) Eine neue Kopftrommel-Baugruppe einbauen, so daß der schwarze Relaisstift auf der oberen Kopftrommel-Baugruppe den weiß lackierten Teil der unteren Trommel-Baugruppe überlappt, wie in Abb. 1-2-1 gezeigt.
2) Zwei Schrauben gleichmäßig anziehen.
3) Die Trommel-Verdrahtungsplatte auf die Kopftrommel-Baugruppe aufsetzen und dann neu verlöten.
4) Die Trommel-Einheit reinigen (besonders die Kopftrommel-Baugruppe).
5) Die Bürsten-Baugruppe in Originalstellung anbringen und dann mit einer Schraube befestigen.

3. Prüfungen und Einstellungen
1) Die Austauschbar Veit überprüfen. Siehe Abschnitt 1.6.
2) Die Platinen-Schaltpunkteinstellung der Servoschaltung (Video Leiterplatte) durchführen. Siehe Abschnitt 2.2.1.

1.2.2 Audio/Kontrollkopf (A/C)

1. Ausbau
1) Die Anschlüsse von der Audio/Kontrollkopf-Verdrahtungsplatte abnehmen.
2) Die beiden Schrauben herausnehmen, und dann den Audio/Kontrollkopf zusammen mit der Kopfbasis entnehmen.
3) Die Audio/Kontrollkopf-Verdrahtungsplatte vom Audio/Kontrollkopf freilöten und herausnehmen.
4) Eine Schraube abnehmen und die Abschirmkappe vom Audio/Kontrollkopf entfernen.
5) Drei Schrauben herausnehmen und den Audio/Kontrollkopf von der Kopfbasis abnehmen. Die Federn vorsichtig behandeln und nicht verlieren.

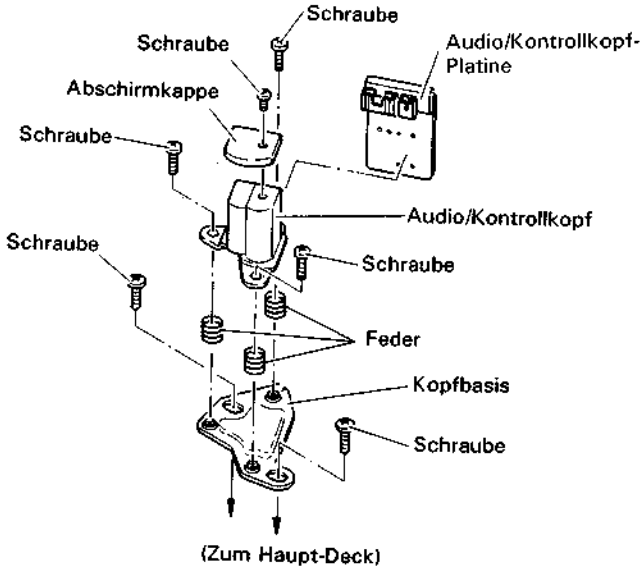


Abb. 1-2-2 Audio/Kontrollkopf

2. Einbau
1) Einen neuen Audio/Kontrollkopf und andere Peripherieteile auf dem Haupt-Deck anbringen. Dabei in umgekehrter Reihenfolge die Ausbauschritte wiederholen.
2) Vor dem Einbau des Audio/Kontrollkopfes auf dem Haupt-Deck die Grobeinstellung des Audio/Kontrollkopfes wie in Abb. 1-2-3 gezeigt durchführen.

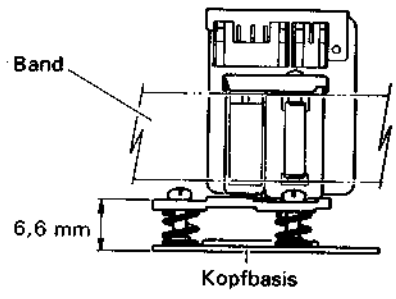


Abb. 1-2-3 Audio/Kontrollkopf-Höhe

3. Prüfung und Einstellung
1) Mit einem Aufnahmeband den richtigen Bandtransport überprüfen, und dann die Austauschbarkeitsprüfung vornehmen. Siehe Kapitel 1.5 und 1.6.

1.2.3 Bremsband-Baugruppe

1. Ausbau
1) Eine Schraube herausnehmen und denn den Teil A der Bremsband-Baugruppe nach oben hebeln, um ihn von der Bremsband-Baugruppe zu trennen.

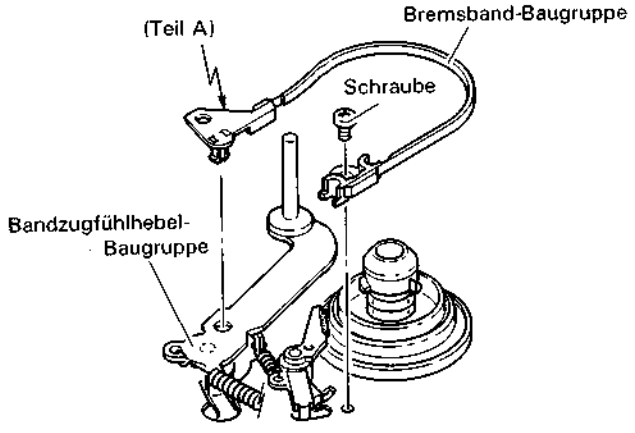


Abb. 1-2-4 Bremsband-Baugruppe

2. Einbau
1) Eine neue Bremsband-Baugruppe einbauen und dabei die Schritte des Ausbaus in umgekehrter Reihenfolge wiederholen.

3. Prüfung und Einstellung
1) Die Bandzugfühlhebeleinstellung überprüfen. Siehe Abschnitt 1.4.1.

1.3 MONTAGE DES MECHANISMUS

Der Mechanismus dieses Modells wird hauptsächlich über den Betriebsarten-Wahlschalter von der Mechanismus-Steuerlogik gesteuert. Darum entscheidet die Beziehung zwischen Wahlschalter und Steuerarm alle mechanischen Bewegungen von Teilen wie Hebeln, Zahnrädern, Walzen usw. Wenn diese Teile nicht richtig positioniert sind, läuft die Einheit ohne Last oder wird blockiert. Dadurch können Schäden an mechanischen oder elektrischen Teilen entstehen.

1.3.1 Ladearm-Baugruppe

Die Ladearm-Baugruppe besteht aus dem Ladezahnrad, der Spannfeder und dem Ladearm.
1. Die Ladearm-Baugruppe richtig einsetzen, wie in Abb. 1-3-1 gezeigt.

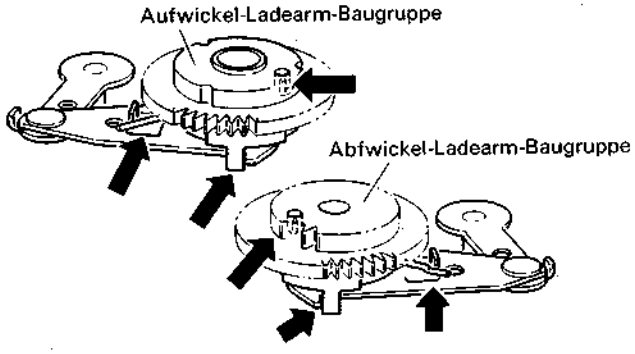


Abb. 1-3-1 Ladearm-Baugruppe (1)

2. Die Aufwickel-Ladearm-Baugruppe und die Abwickel-Ladearm-Baugruppe so einbauen, daß die Löcher auf den Ladezahnrädern einander gegenüberstehen, wie in Abb. 1-3-2 gezeigt. Nicht die Ladearm-Baugruppen für den nächsten Schritt aus dieser Stellung bewegen.

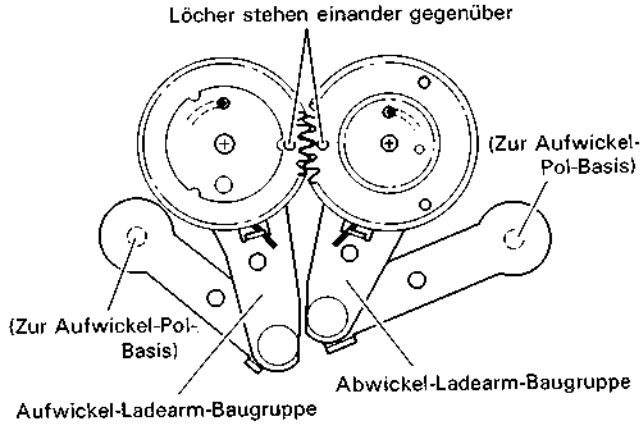


Abb. 1-3-2 Ladearm-Baugruppe (2)

1.3.2 Steuernocke

1. Die Armzahnrad-Baugruppe auf der Nockenklammer-Baugruppe so anbringen, daß das Loch der Armzahnrad-Baugruppe das Loch der Klammer-Baugruppe überlappt.
2. Die Steuernocke so auf der Nockenklammer-Baugruppe anbringen, daß das Loch der Steuernocke das Loch, das in Schritt 1) gezeigt ist überlappt, wie in Abb. 1-3-3 gezeigt. Nicht die Steuernocke für den nächsten Schritt aus dieser Stellung verdrehen.

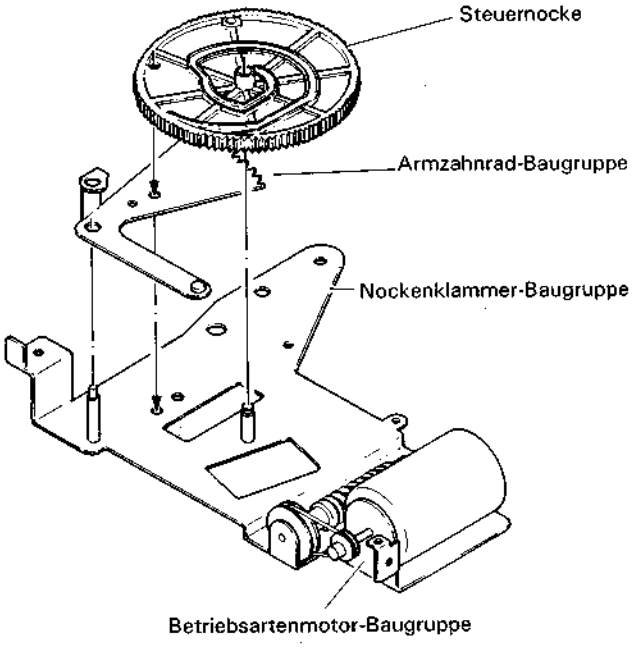


Abb. 1-3-3 Steuernocke

1.3.3 Nockenklammer-Baugruppe

1. Die Platten-Baugruppe drücken und so halten, daß das Loch der Platten-Baugruppe das Loch des Haupt-Decks überlappt, wie in Abb. 1-3-4 gezeigt.
2. Dann die Nockenklammer-Baugruppe anbringen.

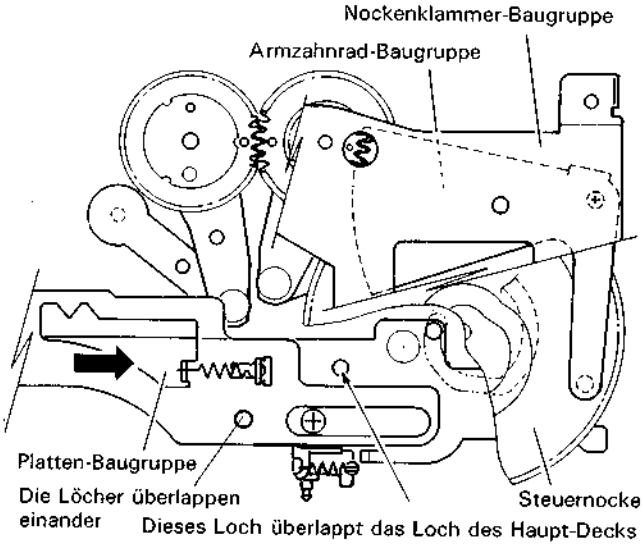


Abb. 1-3-4 Nockenklammer-Baugruppe

Hinweis: Um die Löcher überlappen zu lassen, die Steuernocke durch Drehen des Betriebsartenmotors mit dem Finger ganz gegen den Uhrzeigersinn drehen.

1.3.4 Betriebsartenschalter

1. Wenn das Loch der Platten-Baugruppe mit dem Loch des Haupt-Decks überlappt, bestätigen daß die V-Kerbe des Schiebers gerade mit der V-Kerbe der Außensektion des Betriebsartenschalter überlappt, wie in Abb. 1-3-4 gezeigt.
2. Wenn die Abweichung mehr als 0,5 mm beträgt, die Schraube freilöten und lösen und den Betriebsartenschalter richtig einstellen.

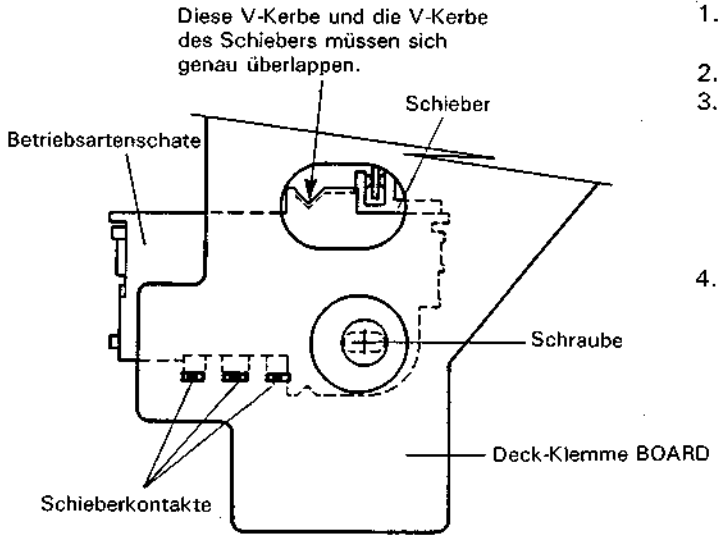


Abb. 1-3-5 Betriebsartenschalter

1.4 ANORDNUNG UND EINSTELLUNG

1.4.1 Bandzugfühlhebelposition-Einstellung

1. Ohne eingelegtes Band die Abspiel-Betriebsart einstellen.
2. Die Schraube leicht lösen und dann den Bremsbandlhalter so einstellen, daß der Abstand, wie in Abb. 1-4-1 gezeigt, Null wird (0 mm).
3. Die Schraube festziehen, um den Bremsbandlhalter zu befestigen.

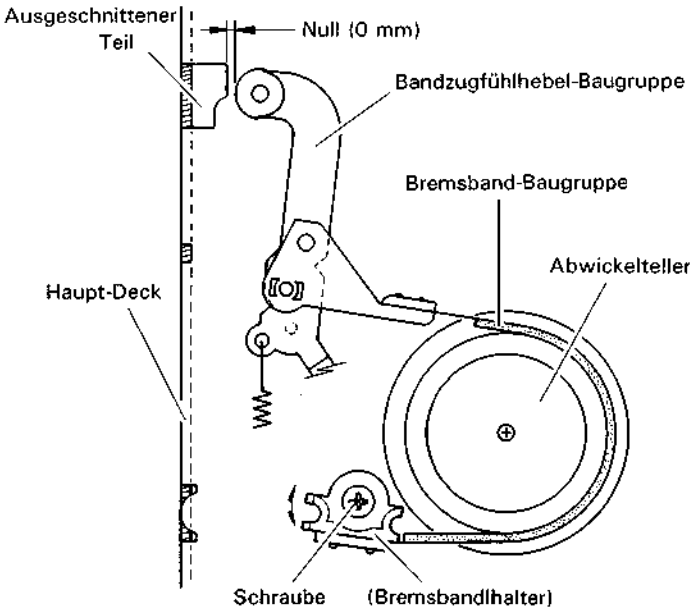


Abb. 1-4-1 Bandzugfühstiftposition

Hinweis: Mit dieser Einstellung wird die Bandspannung auf zulässigen Wert eingestellt, trotz Teile-Ungenauigkeiten.

4. Die Bandzug-Meßcassette verwenden und auf Abspiel-Betriebsart einstellen.
5. Sicherstellen, daß die Anzeige zwischen 25 und 75 g-cm liegt.

1.4.2 Aufwickeldrehkraftprüfung

1. Auf Abspiel-Betriebsart stellen, ohne daß eine Cassette eingelegt ist.
2. Den Drehkraftmesser auf den Aufwickel-Bandteller legen.
3. Der Drehkraftmesser besteht aus einem oberen und unteren Teil, verbunden mit einem Federmechanismus. Den Griff des Drehkraftmessers so lösen, daß die Anzeigenadel und Skala sich mit gleicher Geschwindigkeit drehen, und dann die Anzeige ablesen. Der Richtwert beträgt zwischen 45 und 155 g-cm.
4. Wenn der Meßwert nicht dem Richtwert entspricht, die Aufwickel- und Abwickelkupplungen austauschen.

1.5 PRÜFUNGEN UND JUSTIERUNGEN DES BANDTRANSPORTSYSTEMS

Wenn das Bandtransportsystem einmal genau abgestimmt worden ist, dann sind normalerweise keine Nachstellungen erforderlich. Die folgenden Überprüfungen sind nur erforderlich, wenn Teile, die das Bandtransportsystem betreffen, wegen Schäden oder Verschleiß ausgetauscht werden.

1.5.1 Justierungen des Bandtransportsystems

1. Führungsrollen
   Die Höheneinstellung der Führungsrollen ist erforderlich, um eine FM-Hüllkurve-Linearität am Trommeleingang und Ausgang bei Austauschbarkeit-Einstellungen zu erzielen. Zur Höheneinstellung der Führungsrollen die Stellschraube (1,25 mm Sechskant) lösen und die Führungsrolle mit einem Schraubenzieher drehen.
   Hinweis: Die Stellschraube genug lösen, um die Führungsrolle drehen zu können. Wenn sie zu lose ist, kann durch die Bandbewegung die Führungsrolle gedreht werden.

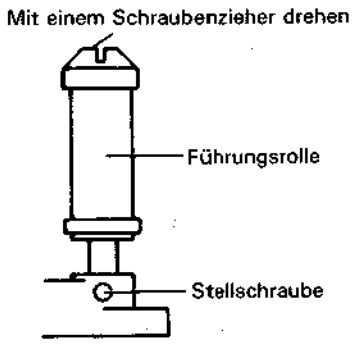


Abb. 1-5-1 Führungsrolle

2. Impedanzrolle
   Normalerweise braucht die Höhe der Impedanzrolle nicht eingestellt zu werden. Nur wenn Defekte beim Bandlauf an der Impedanzrolle nach der vollständigen Einstellung für Austauschbarkeit festgestellt werden, dann muß die Höhe der Impedanzrolle für glatten Bandlauf eingestellt werden. Zur Einstellung der Impedanzrollenöhe einen Mutterndreher (5,5 mm) verwenden.
   Hinweis: Nicht die Impedanzrolle zu niedrig einstellen, um Defekte beim Bandlauf zu vermeiden. Das Band muß am unteren Flansch unter der Impedanz—rolle entlang laufen.

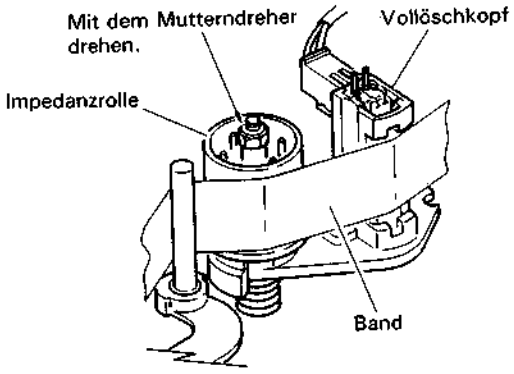


Abb. 1-5-2 Impedanzrolle

3. Audio/Kontrollkopf (A/C)
   Wenn Defekte beim Bandlauf auf dem Aufwickel-Führungsstift festgestellt werden, die Neigung des Audio/Kontrollkopfes nachstellen, um glatten Bandlauf zu erzielen.

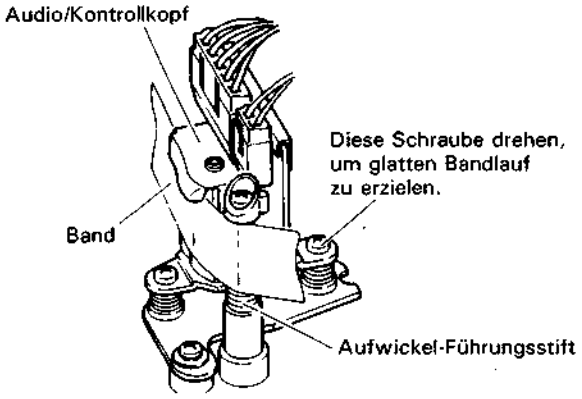


Abb. 1-5-3 Audio/Kontrollkopf

1.6 PRÜFUNGEN UND JUSTIERUNGEN ZUR AUSTAUSCHBARKEIT

Vor der Verwendung des teuren Abgleichbandes ein Normalband verwenden und sicherstellen, daß der Bandtransport richtig funktioniert.
Für die FM-Hüllkurvenausgabe ein Oszilloskop an TP106 der Video-Leiterplatte anschließen. Für Ton-Ausgabe an die Klemme AUDIO OUT anschließen und das Oszilloskop extern mit dem Signal von TP11 der Servo-Leiterplatte triggern. Nur das Grautreppensignal des Abgleichbandes und kein anderes verwenden, um Austauschbarkeit zu gewährleisten.

1.6.1 Prüfung und Justierung der FM-Hüllkurve

1. Die Tasten TRACKING +/− drücken, um die maximale FM-Hüllkurvenausgabe, entsprechend Pegel (a) in Abb. 1-6-1 zu gewährleisten. Die FM-Hüllkurve beobachten und den Maximumpegel (a) und die Minimumpegel (b), (c) und (d) ablesen.
   Bestätigen, daß:

$$\frac{b}{a} \geqq 0{,}7, \quad \frac{c}{a} \geqq 0{,}5 \text{ und } \quad \frac{d}{a} \geqq 0{,}5$$

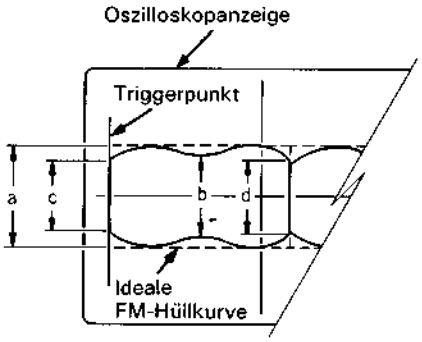


Abb. 1-6-1 FM-Hüllkurve

2. Wenn Fehler gefunden werden, sind die folgenden Einstellungen erforderlich.

1) Die Oszilloskopanzeige beobachten und die Tasten TRACKING +/− drücken, um den FM-Ausgang von Maximum auf Minimum umzustellen.
2) Wenn die Veränderung am ansteigenden Teil (Trommeleingang) der FM-Hüllkurve nicht parallel ist, die Abwickel-Führungsrolle so drehen, daß der steigende Teil der Hüllkurve fast flach wird, wie in Abb. 1-6-2 gezeigt.

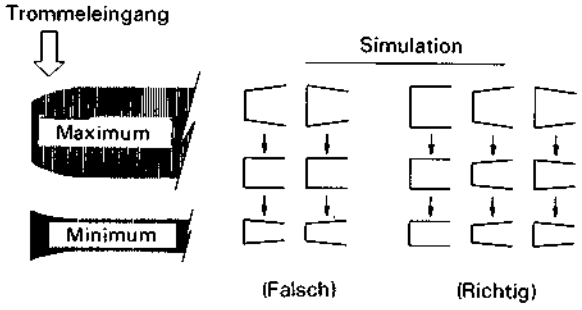


Abb. 1-6-2 Trommeleingang

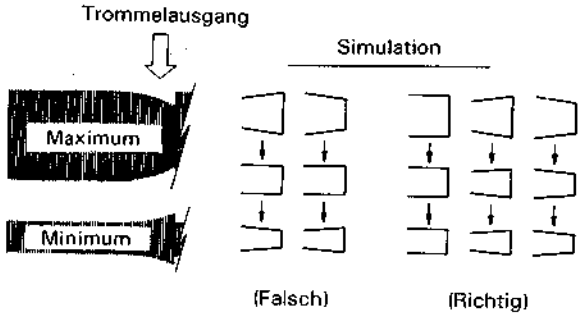


Abb. 1-6-3 Trommelausgang

3) Auf gleiche Weist wie beim ansteigenden Teil die Aufnahme-Führungsrolle so drehen, daß der sinkende Teil (Trommelausgang) der Hüllkurve eingestellt wird. Siehe Abb. 1-6-3.
4) Außer der Beobachtung der Hüllkurve auch im Hinblick auf Bandknicke oder Falten an Abwickel- oder Aufwickelstift überprüfen. Wenn diese an der Impedanzrolle auftreten, die Impedanzrollenhöhe einstellen. Wenn sie am Aufwickelstift auftreten, die Neigung des Audio/Kontrollkopfes nachstellen.
5) Den Ausgangspegel der FM-Hüllkurve verändern und Feineinstellungen an den Führungsrollen vornehmen.

1.6.2 Einstellung von Höhe und Azimut des Audio/Kontrollkopfs

Falsche Einstellung des Audio/Kontrollkopfs reduziert den Signal-Rauschabstand bei der Wiedergabe von bespielten Bändern.

1. Zur Einstellung der Neigung des Audio/Kontrollkopfes die Schraube (A) so einstellen, daß nicht kleine Bandfalten am Aufwickelstift entstehen. Die Schraube (A) im Uhrzeigersinn drehen, so daß Bandfalten am unteren Teil des Aufwickelstiftes auftreten und dann Schraube (A) gegen den Uhrzeigersinn drehen, bis die Falten verschwinden.
2. Azimuteinstellung mit Schraube (B).
   Die Schraube (B) drehen, um maximalen Audioausgang zu erzielen.
3. Zur Einstellung der Neigung des Audio/Kontrollkopfes die Schrauben (A), (B) und (C) nacheinander in kleinen Schritten einstellen, bis maximaler Audioausgang erzielt wird.

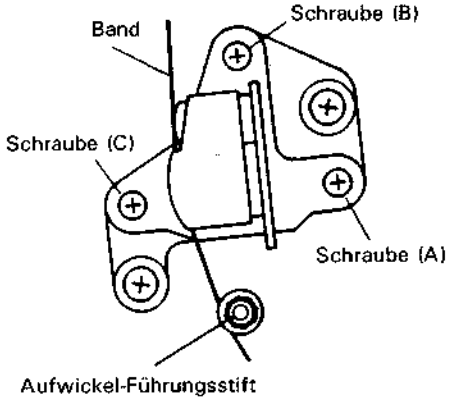


Abb. 1-6-4 Audio/Kontrollkopf

1.6.3 Kontrollkopf-Phaseneinstellung

1. Den Tracking-Regler durch gleichzeitiges Drücken der Tasten + und – auf Ausgangsposition stellen.
2. Die Schrauben (D) und (E) ein wenig lösen und dann die Schraube (D) mit dem Kopfpositionierungs-Werkzeug abdecken und den Stift des Werkzeugs in das Loch neben der Schraube (D) stecken.
3. Das Werkzeug gegen den Uhrzeigersinn drehen, um den Audio/Kontrollkopf ganz zur Capstan-Seite zu drehen, und dann langsam im Uhrzeigersinn drehen und dabei die FM-Hüllkurvenausgabe beobachten.
4. Den Audio/Kontrollkopf auf den ersten Ausgabe-Höhepunkt stellen.

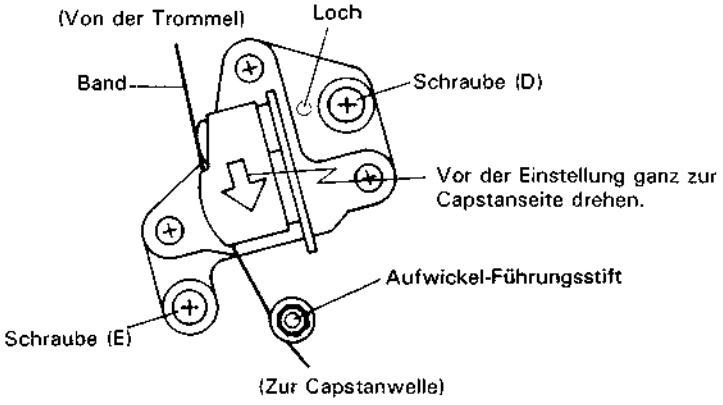


Abb. 1-6-5 Kontrollkopf-Phaseneinstellung

5. LP-Tracking-Justage

1) Ein Oszilloskop an TP106 (PB FM) an der Videoplatine anschließen.
2) Das Grautreppen-Segment des MH-2L-Ausrichtbands abspielen.
3) Die TRACKING-Steuerung (R401) der OPERATION-Platine zur Veränderung des FM-Ausgangspegels justieren und vergewissern, daß der FM-Spitzenpegel an der voreingestellten Tracking-Position erreicht wird.
4) Wird der FM-Spitzenpegel an der voreingestellten Tracking-Position nicht erreicht, ist R46 auf maximalen FM-Pegel zu justieren.

1.6.4 Festziehen der Stellschraube

1. Nach der Bestätigung, daß keine Bandfalten und andere Transportstörungen bestehen, die Stellschrauben unter den Führungsrollen in Stopp-Betriebsart festziehen.
   Hinweis: Da die Führungsrollen leicht verschiebbar sind, beim Festziehen vorsichting vorgehen.
2. Die FM-Hüllkurve erneut überprüfen.

1.6.5 Schlußprüfungen

1. Ein Videosignal anlegen, eine Aufnahme durchführen und anschließend wiedergeben.
   Bestätigen, daß die FM-Hüllkurve den Spezifikationen der Wiedergabe des Abgleichbandes MH-2 entspricht.
2. Die Wiedergabe-Schaltpunkteinstellung der Servoschaltung durchführen. Siehe Abschnitt 2.2.1.
3. Die Audio-Wiedergabepegeleinstellung der Audioschaltung durchführen. Siehe Abschnitt 2.4.2.
4. Die Gesamtleistung der Videoschaltung prüfen. Siehe Abschnitt 2.3.

ABSCHNITT 2
ELEKTRISCHE EINSTELLUNGEN

2.1 VORBEREITUNG

Elektrische Einstellungen sind erforderlich, nachdem Schaltkreisbauteile und bestimmte mechanische Teile ausgetauscht wurden.
Es ist wichtig, daß diese Einstellungen nur nach Beendigung aller Reparaturen und Austauschmaßnahmen durchgeführt werden. Diese Einstellungen außerdem nur vornehmen, wenn geeignete Ausrüstung zur Verfügung steht.

2.1.1 Erforderliche Prüfgeräte

1. Farbfernseher oder Monitor
2. Oszilloskop: Zweikanaloszilloskop mit verzögerter Zeitbasis
3. Frequenzzähler
4. Audio-Oszillator
5. Audio-Voltmeter
6. Digital-Voltmeter
7. Signalgenerator: HF/ZF-Wobbler
8. Singalgenerator: PAL-Farbgenerator
9. Aufnahmeband
10. Abgleichbänder: (MH-2, MH-2L)
11. LP-Einstellplatten-Halterung (PUJ61839)
12. REG FXT Platinenbaugruppe (PUJ37697B)
13. Platinenerweiterung (PUJ96003P)

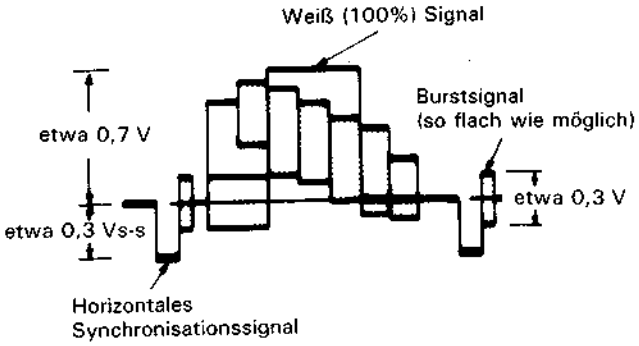


Abb. 2-1-1 Farbbalken vom Farbgenerator

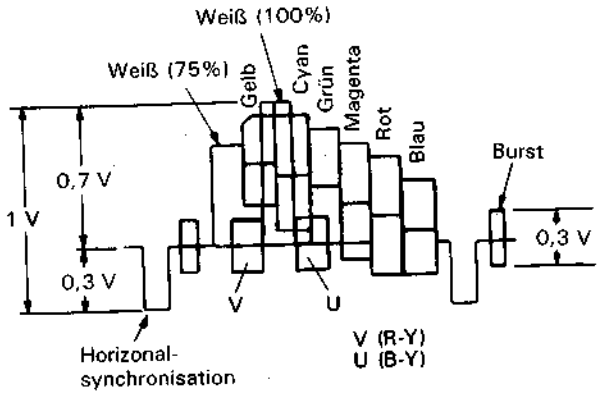


Abb. 2-1-2 Farbbalkensignal-Hüllkurve (MH-2)

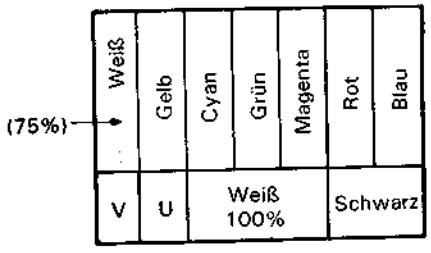


Abb. 2-1-3 Farbbalken (MH-2)

2.1.2 Prüfungs-und Justierungsschritte

Im folgenden werden die Prüfungs-und Justierungsschritte in Form von Tabellen dargestellt. Die Bedeutungen der Abkürzungen und Bezeichnungen, die in den Tabellen verwendet werden, sind im folgenden erläutert.

Nr. Prüfungen und Justierungen sind in der empfohlenen Reihenfolge der Durchführung nummeriert.

Einstellung Die Bezeichnung des jeweiligen Prüfungs- und Justierungsschrittes.

Meßpunkt Stelle, an der das Meßinstrument (wenn nicht anders angegeben, das Oszilloskop) angeschlossen wird.

Einstellpunkt Bauteil (Widerstand, Kondensator usw.) der in diesem Schritt eingestellt wird. Nur ein Gedankenstrich (—) bedeutet nur Prüfung.

Betriebsart Eing.-signal
- Eingangssignal, das zur Durchführung erforderlich ist. Gedankenstrich (—) bedeutet, daß kein besonderes Signal erforderlich ist.
- Betriebsart zur Zeit der Einstellung der Prüfung.

Beschreibung In dieser Spalte werden die Arbeitsschritte erklärt und Hinweise und Einstellwerte gegeben.

Farbbalken	Farbbalkensignal als Videoeingang.
Grautreppe	Grautreppensignal als Videoeingang.
1 kHz	Eine 1 kHz-Sinuswelle als Audio-Eingangssignal anlegen.
MH-2 Farbbalken	Das Farbbalken-Segment des Abgleichbandes MH-2 abspielen.
MH-2 Grautreppe	Das Grautreppen-Segment des Abgleichbandes MH-2 abspielen.
MH-2 1 kHz	Das 1 kHz-Audiosignal Segment des Abgleichbandes MH-2 abspielen.
MH-2 HF-Wobbelsignal	Das HF-Wobbelsignal Segment des Abgleichbandes MH-2 abspielen.
MH-2L Farbbalken	Das Farbbalkensegment des Abgleichbandes MH-2L abspielen.
MH-2L Grautreppe	Das Grautreppensegment des Abgleichbandes MH-2L abspielen.
Stopp	Gerät eingeschaltet und in Stopp-Betriebsart
REC	Aufnahme-Betriebsart
PB	Abspiel-Betriebsart
REC ↓ (andere Betriebsart)	Ein unbespieltes Band verwenden, bespielen, und dann in der angegebenen Betriebsart abspielen.
Suchlauf	Suchlauf-Betriebsart (FWDS und REVS)
Zeitlupe	Zeitlupe-Betriebsart
Standbild	Wiedergabe, dann Pause.
A DUB	Audio-Überspiel-Betriebsart.

2.2 SERVO-SCHALTUNG (0 8 SERVO Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der SERVO Platte.
Vor dieser Einstellung muß die "Einstellung von Steuerkofphase" durchgeführt sein.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	PB Schaltpunkt	CN102 Pin 1	R79 (SP PB SW POINT)	•PB •MH-2 Grautreppe •Negative Triggerflanke (–) •SP-Betriebsart	1. Ein Oszilloskop an CN102 Pin 1 der Hauptplatine MAIN anschließen. 2. Das Grautreppen-Segment des Abgleichbandes MH-2 abspielen. 3. Das Oszilloskop extern (negative Triggerflanke) mit dem Signal von TP11 von der Hauptplatine triggern (DRUM FF). 4. R79 so einstellen, daß der Triggerpunkt 6,5±0,5 H von V. sync. entfernt ist.
		TP401 oder Q106-b	R35 (LP PB SW POINT)	•PB •MH-2L Grautreppe •Triggerflanke (–) •LP-Betriebsart	5. Die Einstellung auf gleiche Weise durchführen wie bei der SP-Betriebsart. 6. Ein Oszilloskop an TP401 oder Q106-b anschließen. Das Grautreppensignal des Abgleichbandes MH-2 abspielen. 7. R35 einstellen, um den Triggerpunkt 6,5 ±0,5 H von V. Sync. einzustellen.
2	V. Impulsposition	MONITOR	R1 0 6 TERMINAL-Platine	•Standbild •REC und dann PB •Farbbalken •SP-Betriebsart	1. Das Farbbalken-Signal aufnehmen, und dann abspielen. 2. Den Monitor in Standbild-Betriebsart beobachten und R1 so einstellen, daß ver tikales Zittern minimiert wird.
3	LP-Tracking	R46	TP106	•LP-Betriebsart	**Hinweis:** Vergleiche Abschnitt 1.6.3.

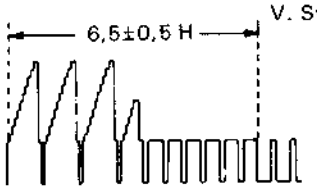


Abb. 2-2-1

2.3 PRE/REC-SCHALTUNG (4 3 PRE/REC-Platine)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der PRE/REC Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	Resonanz- und Qualitätsfaktor der Videoköpfe	TP5	R2, CH1 C7 R1, CH2, C5	•SP-Betriebsart •MH-2 HF-Ablenkung •PB	1. Ein Oszilloskop an TP5 anschließen und das Oszilloskop extern mit dem Signal von TP11 an der Platine SERVO triggern. Die negative Triggerflanke für CH1 und die positive Triggerflanke für CH2 verwenden. 2. Das HF-Ablenksegment des Abgleichbandes MH-2 abspielen. Den Tracking-Regler (R401) der Platine OPERATION auf dem Maximalpegel für HF-Ablenkung stellen. 3. R1 und R2 so drehen, daß sie nicht dämpfen. C5 und C7 so einstellen, daß die Resonanzpunkte von CH1 und CH2 auf 5 MHz eingestellt sind. R1 so einstellen, daß der 5 MHz Pegel um 1 dB kleiner ist als der 4 MHz Pegel. 4. Auf gleiche Weise R1 für CH2 einstellen. Wenn die Pegel CH1 und CH2 abweichen, den höheren Pegel so einstellen, daß er auf R1 und R2 abgestimmt ist. 5. Das Bauteil LP ADJUST BOARD (PUJ61839) auf CN2 auf der SERVO-Platine einstellen. Die Einstellung auf gleiche Weise durchführen wie in der SP-Betriebsart CH1 und CH2. Bei TP5 die Resonanzpunkte C13 und C15 auf 5 MHz einstellen. R3 und R4 so einstellen, daß der 5 MHz Pegel um 1 dB kleiner ist als der 4 MHz Pegel. **Hinweis:** Eine Oszilloskop-Erdung an die Schild-Abdeckung anschließen.
		TP5	R3, CH1 C13 R4, CH2 C15	•LP-Betriebsart •MH-2 HF-Ablenkung •PB	

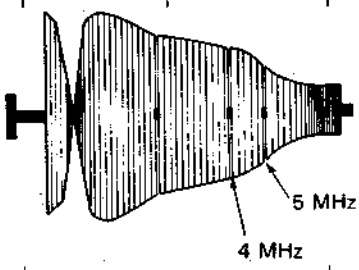


Abb. 2-3-1

2.4 VIDEO-SCHALTUNG

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der V/M/S MAIN Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	REC FM Pegel	TP3 (REC FM) 4 3 PRE REC Verstärker	R119 (REC FM ADJ)	• Farbbalken • REC • LP-Betriebsart	1. Ein Farbbalken-Eingangssignal anlegen. 2. Ein Oszilloskop an TP3 anschließen. 3. R119 so einstellen, daß der Podestpegel der vertikalen Löschkomponente 1,2 Vs-s wird. **Hinweis:** Eine Oszilloskop-Erdung an die Schild-Abdeckung anschließen.
2	VXO	TP306 (VXO)	R328 VXO	• PB • MH-2 Farbbalken • SP-Betriebsart	1. Einen Frequenzzähler an TP306 anschließen. 2. Das Farbbalkensignal des Abgleichbandes MH-2 abspielen. 3. R328 auf 4,433619 MHz ±50 Hz einstellen.
3	SP REC Farbpegel	TP304	R322	• PB • SP-Betriebart • REC und dann PB • Farbbalken	1. Ein Oszilloskop an TP304 anschließen. Das Farbbalkensegment von MH-2 abspielen und den Farbsignalpegel beobachten. 2. Den Tracking-Regler (R401) an der Frontplatte auf maximalen Pegel der Farb-Hüllkurve einstellen und den höheren Farbpegel notieren. 3. Den Tracking-Regler (R401) an der Frontplatte in Mitten-Einraststellung stellen. 4. Das Farbbalkensignal aufzeichnen, und dann abspielen. Vor dem Aufnehmen R322 so einstellen, daß der Kanal mit dem höheren Pegel 85 bis 95% des notierten Pegels bei Wiedergabe wird. Jetzt bestätigen, daß der Kanalunterschied innernhalb von 3 dB liegt.
4	LP REC Farbe	TP304	R438	• PB • LP-Betriebsart • REC und dann PB • Farbbalken	1. Das Bauteil LP ADJUST BOARD (PUJ61839) an die SERVO-Platine anschließen. 2. Die Einstellung auf gleiche Weise durchführen wie bei der SP-Betriebsart. 3. Das Bauteil abnehmen. Das Farbbalkensignal aufnehmen und anschließend abspielen. Vor der Aufnahme R438 so einstellen, daß der Kanal mit dem höheren Pegel 75 bis 85% des Richtpegels bei der Wiedergabe wird. Zu diesem Zeitpunkt bestätigen, daß der Kanalunterschied innerhalb von 3 dB liegt, wie in Abb. 2-4-2 gezeigt.
5	Verzögerter Farbpegel	TP405	R401	• PB • SP-Betriebsart • MH-2 Farbbalken	1. Ein Oszilloskop an TP405 anschließen und den Signalpegel beobachten. 2. Jumperkabel zwischen TP434, TP435 und GND anschließen. Den Pegel von TP405 erneut prüfen. 3. R401 auf den gleichen Pegel einstellen.
6	0,5 H Verzögerter Videopegel	TP221 TP222	R223	• LP-Betriebsart • Farbbalken • REC und dann PB	**Hinweis:** Die Einstellung des verzögerten Videopegels 0,5 H nach der Durchführung des verzögerten Farbpegels durchführen. 1. Einen Kanal eines Doppelspur-Oszilloskops an TP222 und den anderen Kanal an TP221 anschließen. 2. R223 einstellen, um in beiden Fällen den gleichen Pegel zu erhalten.

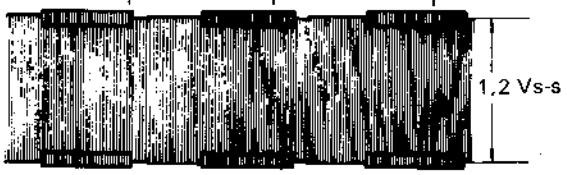


Abb. 2-4-1

Abb. 2-4-2

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
7	APC Fehlerphase	TP405 (PB Farbe) TP433 (7,8 kHz)	L401 (7,8 kHz Tuning)	•MH-2 Farbbalken •SP-Betriebsart	1. Eine Kabelbrücke zwischen TP436 und GND herstellen. 2. Einen Kanal eines Doppelspur-Oszilloskops an TP405 und den anderenan TP433 anschließen und die Hüllkurve beobachten. 3. L401 so einstellen, daß das Nullkreuz 30 μs + 3 μs von der Mitte des Burst-Signals gelegen ist, wie in Abb. 2-4-3 gezeigt.
8	0,5 H Verzögerter Sprung DL1	TP432 (VCO Ausgang)	R418 (0,5 H verzögerter Sprung DET)	•Kein Signal (AUX) •E-E	1. 1/2 Vm-m an TP431 anlegen. 2. Einen Frequenzzähler an TP432 anschließen. 3. R418 einstellen, um 30 ±0,2 kHz zu erhalten.
9	PB Frequenzgang und CH-Balance	MONITOR	R110 R202	•SP-Betriebsart •Farbbalken •REC und dann PB •LP-Betriebsart	1. Den SHARPNESS-Regler (R402) der OPERATION-Platine in Mitteneinraststellung stellen. 2. Ein Farbbalkensignal aufnehmen und anschließend abspielen. 3. Den Monitor beobachten und R110 auf Optimalpunkt einstellen. 4. Die Einstellung auf gleiche Weise durchführen wie in der SP-Betriebsart. 5. Den Monitor beobachten und R202 auf Optimalpunkt einstellen.
10	SECAM DET	TP310 (S DET ADJ)	L351 (1/2 fH TUNING) R355 SECAM DET. ADJ	•SECAM Farbbalken •E-E •SP-Betriebsart •REC und dann PB	1. Ein Oszilloskop an TP310 anschließen. 2. L351 so einstellen, daß der Übergangsschritt zwischen "A" und "B" zu liegen kommt, wie in Abb. 2-4-4 gezeigt. 3. Aufnehmen und dann abspielen. 4. R355 auf 6,0 ±0,5 Vs-s einstellen.

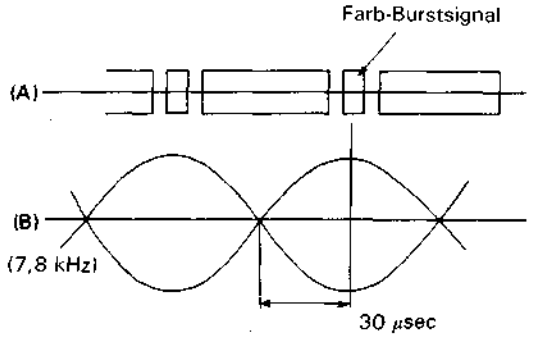
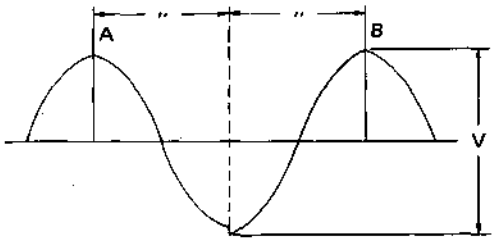


Abb. 2-4-3



Diesen Punkt so einstellen, daß die Mittenposition Zwischen "A" und "B" zu liegen kommt.
V = über 4 Vs-s in REC
V = 6,0 ± 0,5 Vs-s in PB

Abb. 2-4-4

2.5 AUDIO-SCHALTUNG (0 9 AUDIO Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der AUDIO Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	Vormagnetisierung	TP31 Vorspannungspegel	R20 BIAS LEVEL	• REC • SP-Betriebsart	1. Ein digitales Voltmeter zwischen TP31 und TP32 schalten. 2. Auf REC-Betriebsart ohne Signal schalten. 3. R15 auf 3,0 ±0,2 mVrms einstellen.
2	Audio PB pegel	AUDIO OUT		• REC • SP-Betriebsart	1. Ein Oszilloskop an AUDIO OUT anschließen. 2. Ein Audiosignal (−8 dBs/1 kHz an A/V CONN) an AUDIO IN anschließen und zusammen mit einem VIDEO-Signal aufnefmen, dann abspielen. 3. R5 so einstellen, daß der Audio-Ausgangspegel bei Wiedergabe −6 ±1 dB für SP-Betriebsart wird. **Hinweis:** Die PERI-Steckverbindung verwenden.

2.6 TIMER-SCHALTUNG (1 5 TIMER Platte)

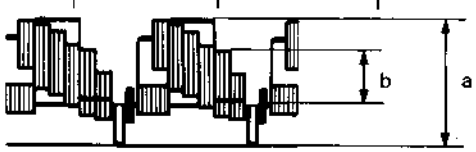
Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der TUNER Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	Schaltuhr	TP2	C101	• E-E	1. Den Frequenzzähler an TP2 (OSC OUT) und an TP3 (GND) anschließen. 2. GND und TP1 (TEST) kurzschließen. Dann die Leitungen des Elektrolytkondensators C7 kurzschließen, wenn IC1 neu gestellt werden kann. 3. C101 auf 2048,000 Hz ±0,002 Hz (488,2813 ±0,0005 μs) einstellen. **Hinweis:** Durch Rückstellen von IC1 während TP1 und GND kurzgeschlossen sind wird die Betriebsart TEST eingeschaltet.

2.7 TUNER/IF-SCHALTUNG (0 7 TUNER/IF Platte)

Hinweis: Falls nicht anders angegeben, befinden sich alle Meß-und Einstellpunkte auf der TUNER/IF Platte.

Nr.	Einstellung	Meßpunkt	Einstellpunkt	Betriebsart Eing.-Signal	Einstellschritte
1	VCO	MONITOR	T2	• Fernsehsendung • Tuner-Betriebsart	1. Eine Farbfernsehsendung empfangen. 2. T2 so einstellen, daß ein gutes Bild auf dem Monitor erzielt wird.
2	RF AGC	MONITOR	R11	• Fernsehsendung • Tuner-Betriebsart	**Hinweis:** R11 (RF AGC) so einstellen, daß exzessives Rauschen im Bild oder Streifenstörungen wegen starken elektrischen Feldern eliminiert werden. 1. R11 so einstellen, daß Rauschen oder Streifen auf dem Bildschirm minimiert werden. 2. Alle Kanäle im Hinblick auf Anormalität prüfen.
3	VPS Y Pegel	CN3, Pin 1 (VPS OUT)	R16	• Moduliertes Signal • Tuner-Betriebsart	1. Ein 87,5% moduliertes Signal empfangen. R16 so einstellen, daß ein maximaler Y-Pegel (einschließliche Sync) vpm 2,0 Vs-s von Pin 1 (VPS OUT) von CN3 erhalten wird.
4	Farbpegel	IC1-18 oder TP110 (VIDEO OUT)	R42	• Fernsehsendung • Tuner-Betriebsart	1. Ein Farbbalkensignal von einem Farbfernseh-Signalgenerator anlegen und den Kanal entsprechend dem Generator einstellen. 2. R42 zur Erzeugung einer Einzelhüllkurve einstellen wie in Abb. 2-7-1 gezeigt. Alternativmethode 1. Eine Farbfernsehsendung empfangen. 2. R42 so einstellen, daß der Burst-Pegel 2/3 des Synch-Pegels wird.



Y-Pegel = 1
Magenta-Pegel = 0,48 a : b = 1 : 0,48

Abb. 2-7-1