HITACHI
SERVICE MANUAL

PA	No. 0006

46EX1B

NTSC	AP12 Chassis

R/C:CLU-600PR
CLU-609

CONTENTS

This service manual gives differences between the 46EX1B and 55EX1K. For any other information, see the 55EX1K Service Manual YK No. 0405E issued in July, 1991.

CAUTION: Before servicing this chassis, it is important that the service technician read the "Safety Precaution" and "Product Safety Notices" in this Service Manual.

This service manual is intended for qualified service technicians; it is not meant for the casual do-it-yourselfer. Qualified technicians have the necessary test equipment and tools, and have been trained to properly and safely repair complex products such as those covered by this manual.

Improperly performed repairs can adversely affect the safety and reliability of the product and may void the warranty. If you are not qualified to perform the repair of this product properly and safely, you should not risk trying to do so and refer the repair to a qualified service technician.

WARNING
Lead in solder used in this product is listed by the California Health and Welfare agency as a known reproductive toxicant which may cause birth defects or other reproductive harm (California Health & Safety Code, Section 25249.5).
When servicing or handling circuit boards and other components which contain lead in solder, avoid unprotected skin contact with the solder. Also, when soldering do not inhale any smoke or fumes produced.

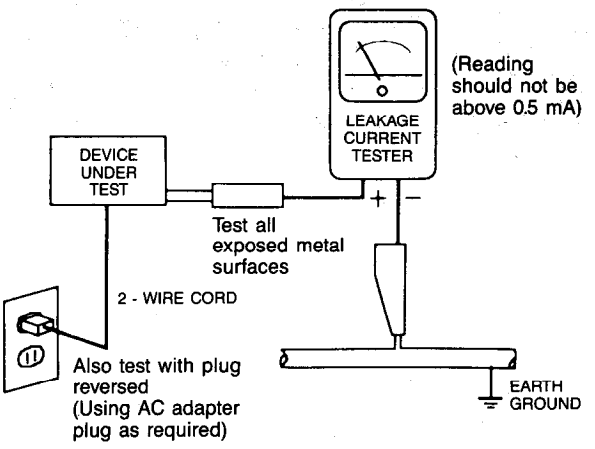
SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

PROJECTION COLOR TELEVISION

November 1991 HHEA - MANUFACTURING DIVISION

SAFETY PRECAUTIONS

1. Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to the following items:
   a. Be sure that no built-in protective devices are defective and/or have been deleted during servicing. (1) Protective shields are provided on this chassis to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience. (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks. **Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning. Servicers who defeat safety features or fail to perform safety checks may be liable for any resulting damage.**
   b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, but are not limited to, (1) spacing between the picture tube and cabinet mask, (2) excessively wide cabinet ventilation slots, and (3) an improperly fitted and/or incorrectly secured cabinet back cover.
   c. **Antenna Cold Check** — With the instrument AC plug removed from any AC source, connect an electrical jumper across the two AC plug prongs. Place the instrument AC switch in the on position. Connect one lead of an ohmmeter to the AC plug prongs tied together and touch the other ommeter lead in turn to each tuner antenna input exposed terminal screw and, if applicable, to the coaxial connector. If the measured resistance is less than 1.0 megohms or greater than 5.2 megohms, an abnormality exists that must be corrected before the instrument is returned to the customer. Repeat this test with the instrument AC switch in the off position.
   d. **Leakage Current Hot Check** — With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.0 Leakage Current for Appliances and Underwriters Laboratories (UL) 1410, (50.7). With the instrument AC switch first in the on position and then in the off position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamps. Reverse the instrument power cord plug in the outlet and repeat test.

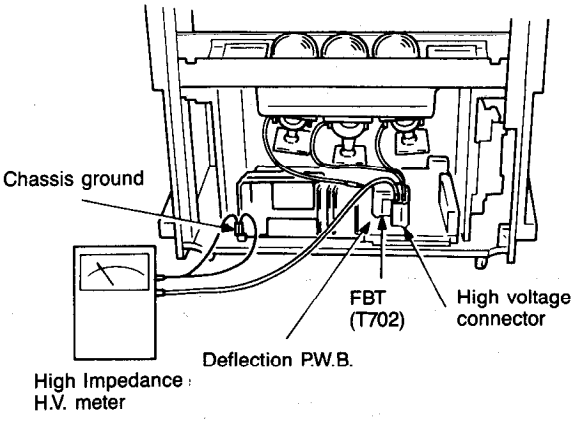


AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER OR BEFORE CONNECTING THE ANTENNA OR ACCESSORIES.

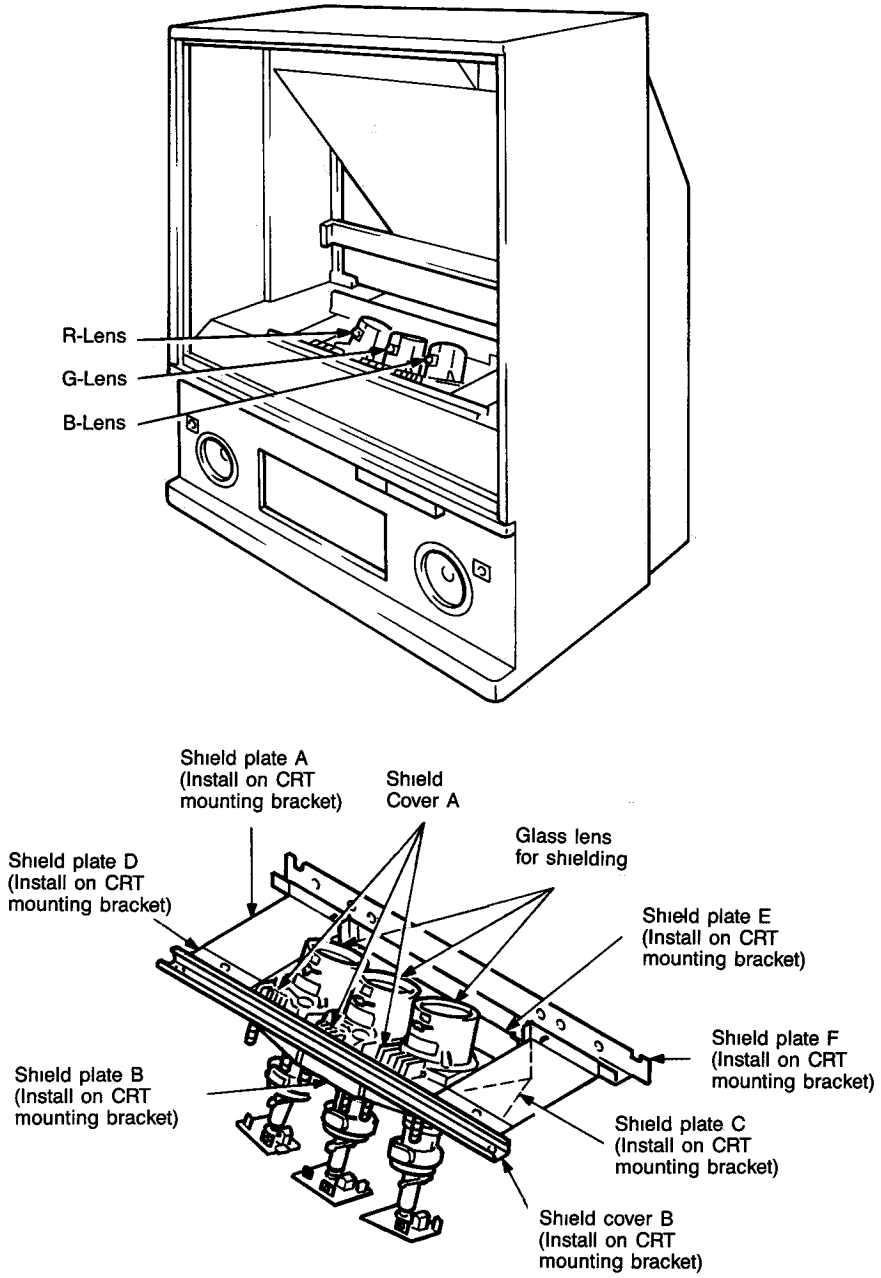
   e. **High Voltage** — This receiver is provided with a hold down circuit for clearly indicating that voltage has increased in excess of a predetermined value. Comply with all notes described in this Service Manual regarding this hold down circuit when servicing, so that this hold down circuit may correctly be operated.
   f. **Serviceman Warning** — With minimum contrast and brightness, operating high voltage in this receiver is lower than **31.6kV.** In case any component having influenced on high voltage is replaced, confirm that high voltage with minimum contrast and brightness is lower than **31.6kV.**
   To measure H.V. use a high impedance H.V. meter. Connect (−) to chassis earth and (+) to the CRT anode button. (See the following connection diagram.)

Note: Turn power switch off without fail before the connection to the anode button is made.



g. **X-radiation — TUBE:** The primary source of X-radiation in this receiver is the picture tube. The tube utilized for the above mentioned function in this chassis is specially constructed to limit X-radiation emissions.
For continued X-radiation protection, the replacement tube must be the same type as the original, HITACHI approved type.
When troubleshooting and making test measurements in a receiver with a problem of excessive high voltage, avoid being unnecessarily close to the picture tube and the high voltage component.
Do not operate the chassis longer than is necessary to locate the cause of excessive voltage.

h. **X-radiation Shield —**
1) This receiver is provided X-ray shield plates for the protection of X-radiation. Do not remove X-ray shield plates A, B, C, D, E, F and shield covers A, B shown in Fig. 1 unnecessarily when troubleshooting and/or making test measurements.
2) To prevent X-radiation, after replacement of picture tube and lens, confirm these components to be fixed correctly to bracket and cabinet, and not to be taken off easily.



Detailing X-radiation shields
Fig. 1

2. Read and comply with all caution and safety-related notes on or inside the receiver cabinet, on the receiver chassis, or on the picture tube.

3. **Design Alteration Warning** — Do not alter or add to the mechanical or electrical design of this TV receiver. Design alterations and additions, including, but not limited to, circuit modifications and the addition of items such as auxiliary audio and/or video output connections, might alter the safety characteristics of this receiver and create a hazard to the user. Any design alterations or additions may void the manufacturer's warranty and may make you, the servicer, responsible for personal injury or property damage resulting therefrom.

4. **Picture Tube Implosion Protection Warning** — The picture tube in this receiver employs integral implosion protection. For continued implosion protection, replace the picture tube only with one of the same type number. Do not remove, install, or otherwise handle the picture tube in any manner without first putting on shatterproof goggles equipped with side shields. People not so equipped must be kept safely away while picture tubes are handled. Keep the picture tube away from your body. Do not handle the picture tube by its neck.

5. **Hot Chassis Warning** — **a.** Some TV receiver chassis are electrically connected directly to one conductor of the AC power cord and may be safely serviced without an isolation transformer only if the AC power plug is inserted so that the chassis is connected to the ground side of the AC power source. To confirm that the AC power plug is inserted correctly, with an AC voltmeter measure between the chassis and a known earth ground. If a voltage reading in excess of 1.0V is obtained, remove and reinsert the AC power plug in the opposite polarity and again measure the voltage potential between the chassis and a known earth ground. **b.** Some TV receiver chassis normally have 85V AC (RMS) between chassis and earth ground regardless of the AC plug polarity. These chassis can be safely serviced only with an isolation transformer inserted in the power line between the receiver and the AC power source, for both personnel and test equipment protection. **c.** Some TV receiver chassis have a secondary ground system in addition to the main chassis ground. This secondary ground system is not isolated from the AC power line. The two ground systems are electrically separated by insulating material that must not be defeated or altered.

6. Observe original lead dress. Take extra care to assure correct lead dress in the following areas: **a.** near sharp edges, **b.** near thermally hot parts — be sure that leads and components do not touch thermally hot parts, **c.** the AC supply, **d.** high voltage, and **e.** antenna wiring. Always inspect in all areas for pinched, out-of-plate, or frayed wiring. Do not change spacing between components, and between components and the printed circuit board. Check AC power cord for damage.

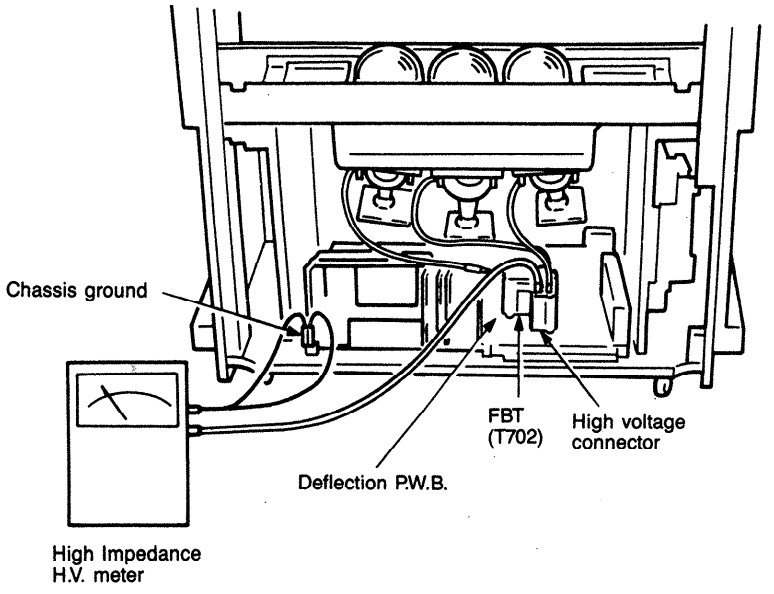
7. Components, parts, and/or wiring that appear to have overheated or are otherwise damaged should be replaced with components, parts, or wiring that meet original specifications. Additionally, determine the cause of overheating and/or damage and, if necessary, take corrective action to remove any potential safety hazard.

8. **PRODUCT SAFETY NOTICE** — Many TV electrical and mechanical parts have special safety-related characteristics some of which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified Hitachi service data by shading on schematics and by a (⚠) in the parts list. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part in Hitachi service data parts list might create shock, fire, and/or other hazards. Product safety is under review continuously and new instructions are issued whenever appropriate. For the latest information, always consult the appropriate current Hitachi service literature. A subscription to, or additional copies of Service literature may be obtained at a normal charge from Hitachi.

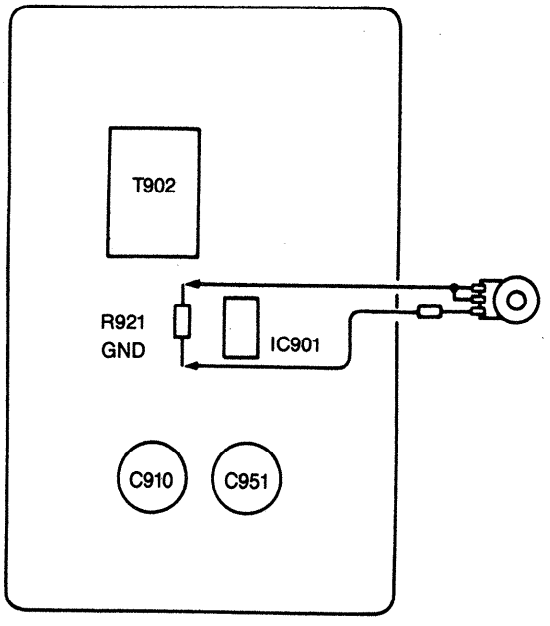
TECHNICAL CAUTIONS

High voltage limiter circuit operation check

1. Connect the high voltage voltmeter between the high voltage connector and chassis ground as shown in Fig. 2.
2. Set the AC input voltage to 120V.
3. Set the contrast and brightness control fully to + side (max.) of the on-screen indication.
4. Connect the jig as shown in Fig. 2 to POWER SUPPLY P.W.B.
5. Turn the 20kΩ-B VR of the jig fully clockwise viewed from the knob side.
6. Turn on the set.
7. Gradually turn the 20 kΩ-B VR of the jig counterclockwise and check that the picture disappears when the high voltage is less than 38kV.
8. Turn off the set immediately after checking that the picture disappears.
9. Remove the jig and voltmeter.



POWER SUPPLY P.W.B. (Front View)



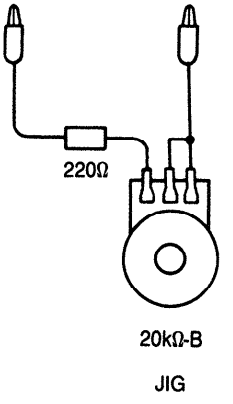


Fig. 2

SPECIFICATIONS

Model:	46EX1B
Cathode-Ray Tube:	80° deflection 7 inch (170WB22R/170WB22G/ 170WB22B)
Power Input:	120 volts AC, 60Hz
Power Consumption:	225 watts - Maximum 155 watts - Operating
Antenna Impedance:	75 ohm Unbalanced VHF/UHF/CATV
Receiving Channel:	CH
	VHF 2-13
	UHF 14-69
	EXT. Mid (A-2)-(A-1), 4*
	CATV Mid A-I
	CATV Super J-W
	CATV Hyper (W+1)-(W+28)
	CATV Ultra (W+29)-(W+53)
Intermediate Frequency:	Picture I-F carrier 45.75 MHz Sound I-F Carrier 41.25 MHz Color Sub Carrier 42.17 MHz
Video Input:	1 Voltp-p 75 ohm
Video Output:	1 Voltp-p 75 ohm
Audio Input:	0.4 volt rms, 40 k ohm
Stereo Audio Output:	0.4 volt rms, 1 k ohm
Audio Output Power:	Front — 7 watts rms per channel, 8 ohm impedance. Rear — 3 watts rms per channel, 8 ohm impedance.
Anode Voltage:	30.0 kV (Zero Beam Current)
Brightness:	390 ft-L Nominal (Peak White)
Speakers:	2 Woofers — 6 inch (16 cm) round
Dimension:	Width . . . . . 39 7/8"
	Height . . . . . 48 7/16"
	Depth . . . . . 22 7/16"
	Weight . . . . . 184 lbs.
Circuit Board Assemblies:	CPT (B) P.C.B. CPT (G) P.C.B. CPT (R) P.C.B. Convergence Correction P.C.B. Signal P.C.B. Power Supply P.C.B. Deflection P.C.B. SP Terminal P.C.B. Control P.C.B. 2-LINE COMB P.C.B.

CIRCUIT PROTECTION

Fuse (or Device)	Circuit Protected	Physical Location
F901 5.0A-125V (AC)	Main Fuse	Signal Circuit Board
F903 4.0A-125V (DC)	Main Fuse	Power Supply Circuit Board
F904 4.0A-125V (DC)	Audio Output Circuit	Power Supply Circuit Board
F905 1.6A-125V (DC)	Deflection Circuit	Power Supply Circuit Board

GENERAL INFORMATION

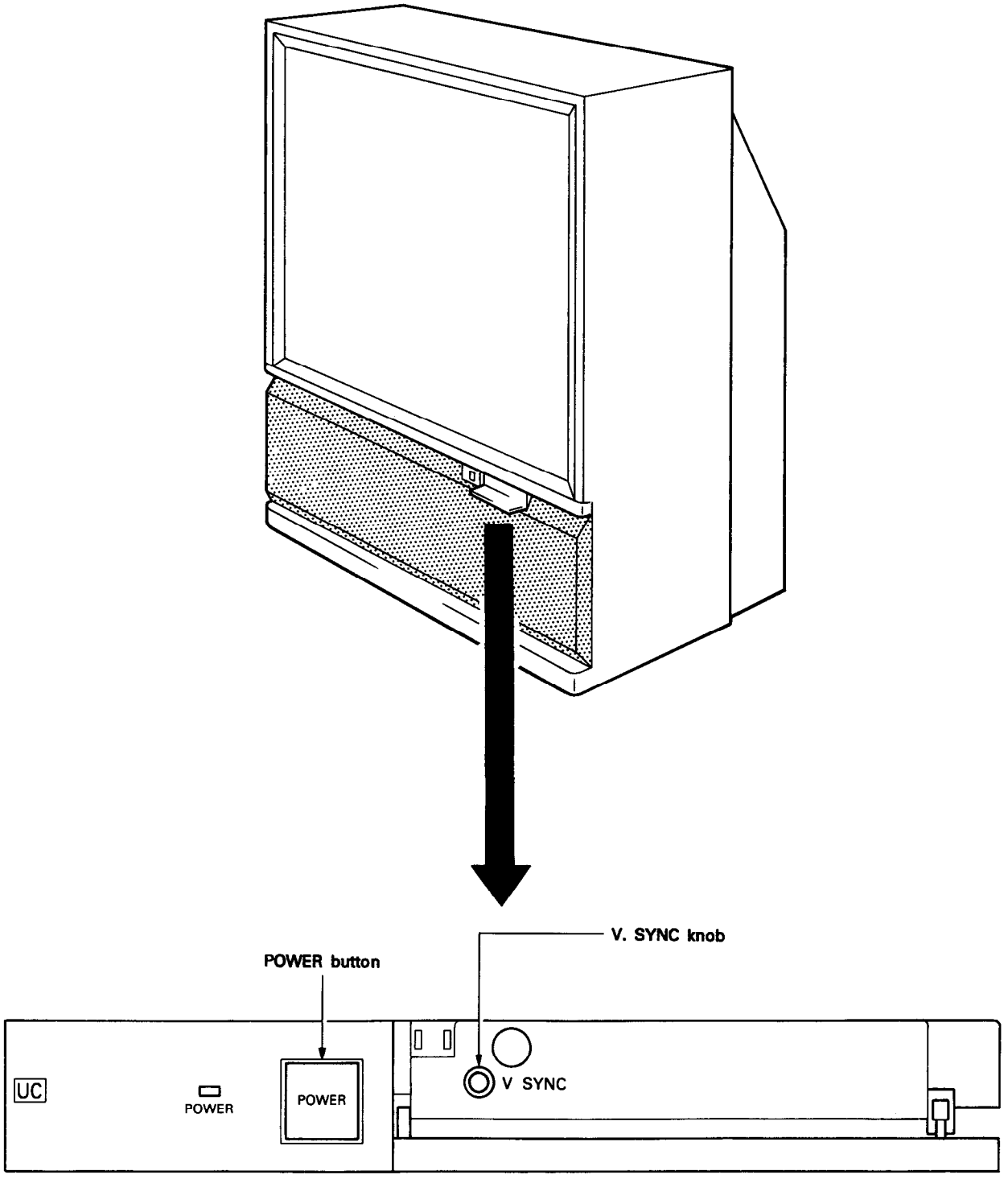


Fig. 3 Control Panel

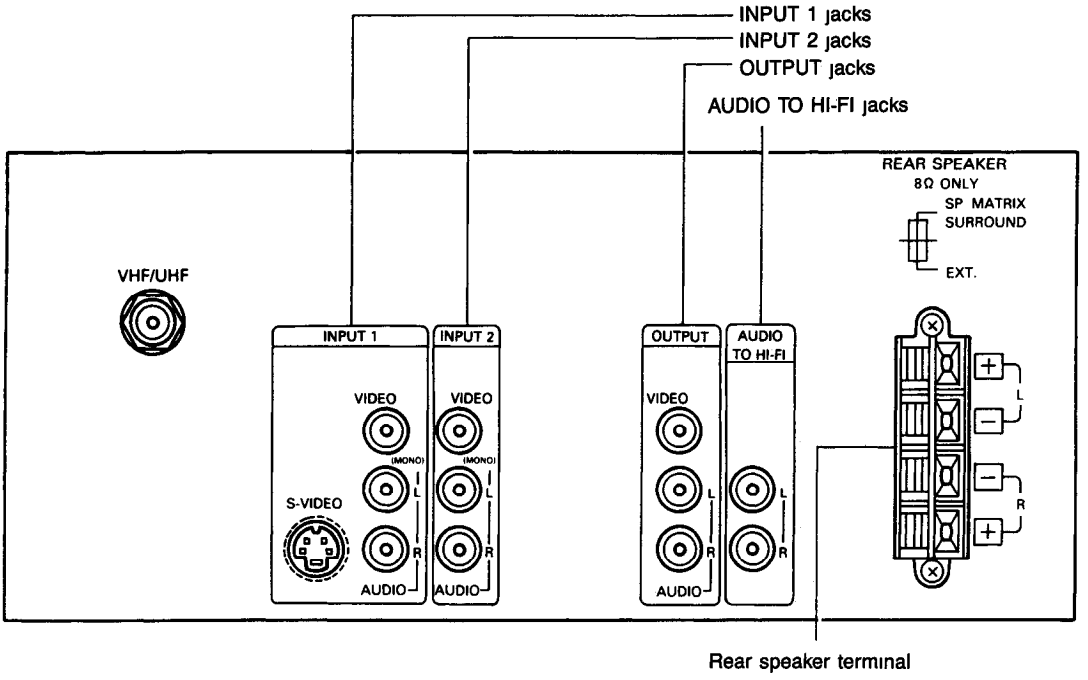
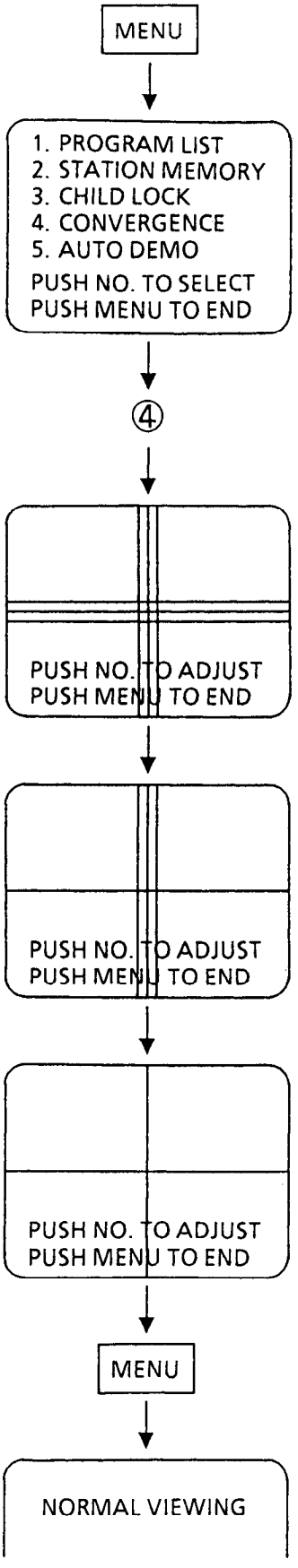


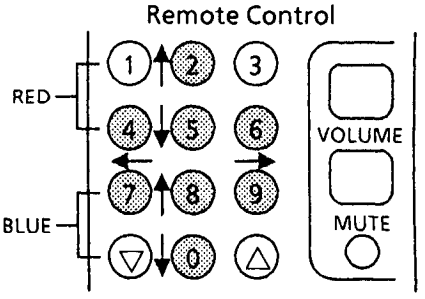
Fig. 4 Monitor Connection Panel

CONVERGENCE ADJUSTMENT

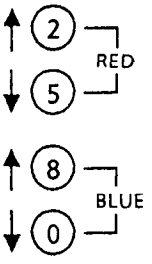
Static Convergence



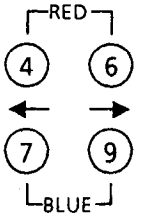
Use button on Remote to align colors to form white lines



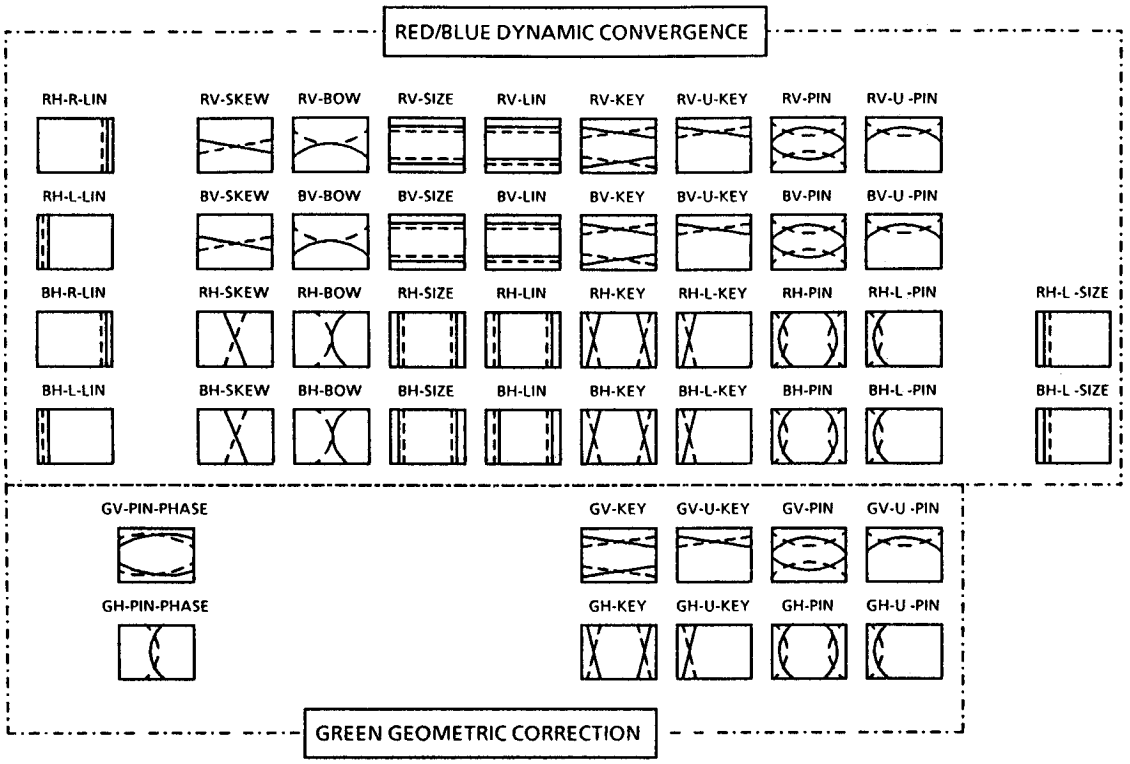
Vertical Position



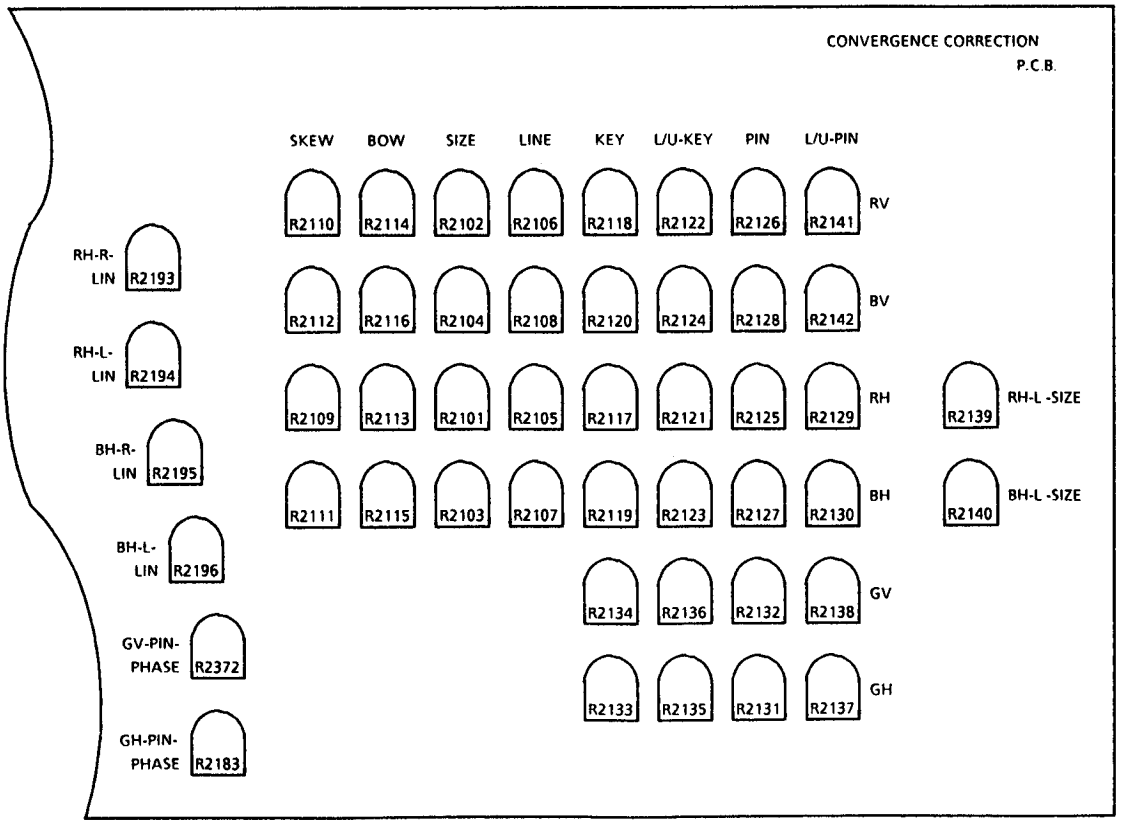
Horizontal Position



Dynamic Convergence



Layout of the Adjustment VR



CAUTIONS WHEN CONNECTING/DISCONNECTING THE HV CONNECTOR

Perform the following when the HV connector (anode connector) is removed or inserted for CPT replacement, etc.

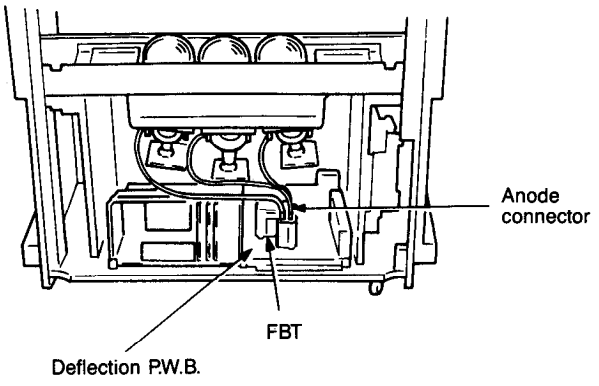


Fig. 5

During Removal

1. Insert a small flat-bladed screwdriver (adjustment screwdriver : 5-7 mm wide and 0.2-0.3 mm thick) into section Ⓐ in Fig. 6 then push it in the direction of arrow Ⓑ . The lock will release with a click. (The state in Fig. 8-(1) will change to that in Fig. 8-(2).)

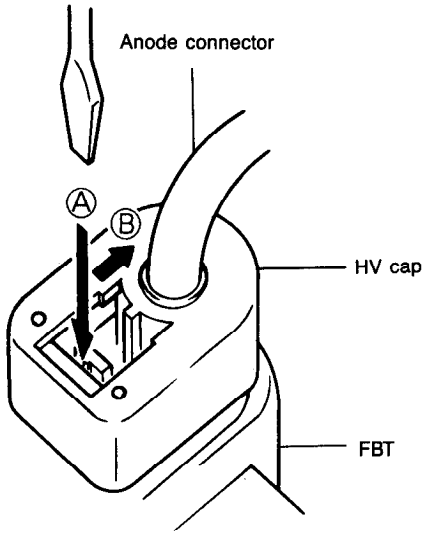


Fig. 6

2. Remove the HV cap and remove the anode connector (Fig. 7).

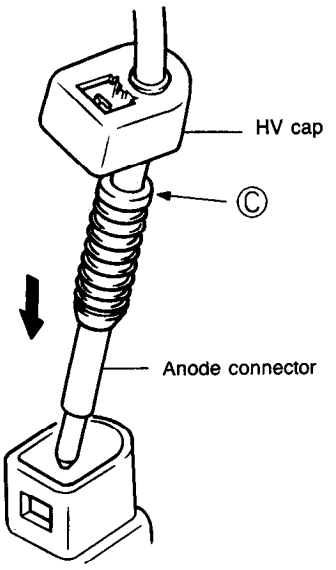
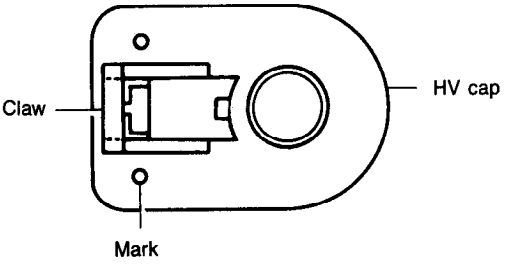


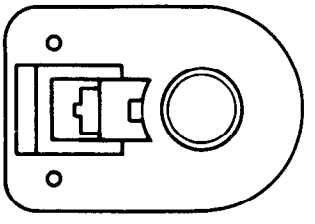
Fig. 7

During Insertion

1. Insert the anode connector deep into the FBT (to section Ⓒ in Fig. 7) and then push the HV cap into the FBT until it clicks.
2. Make sure the connector is securely inserted. (Check that the claw is at the mark on the HV cap shown as in Fig. 8-(1).)



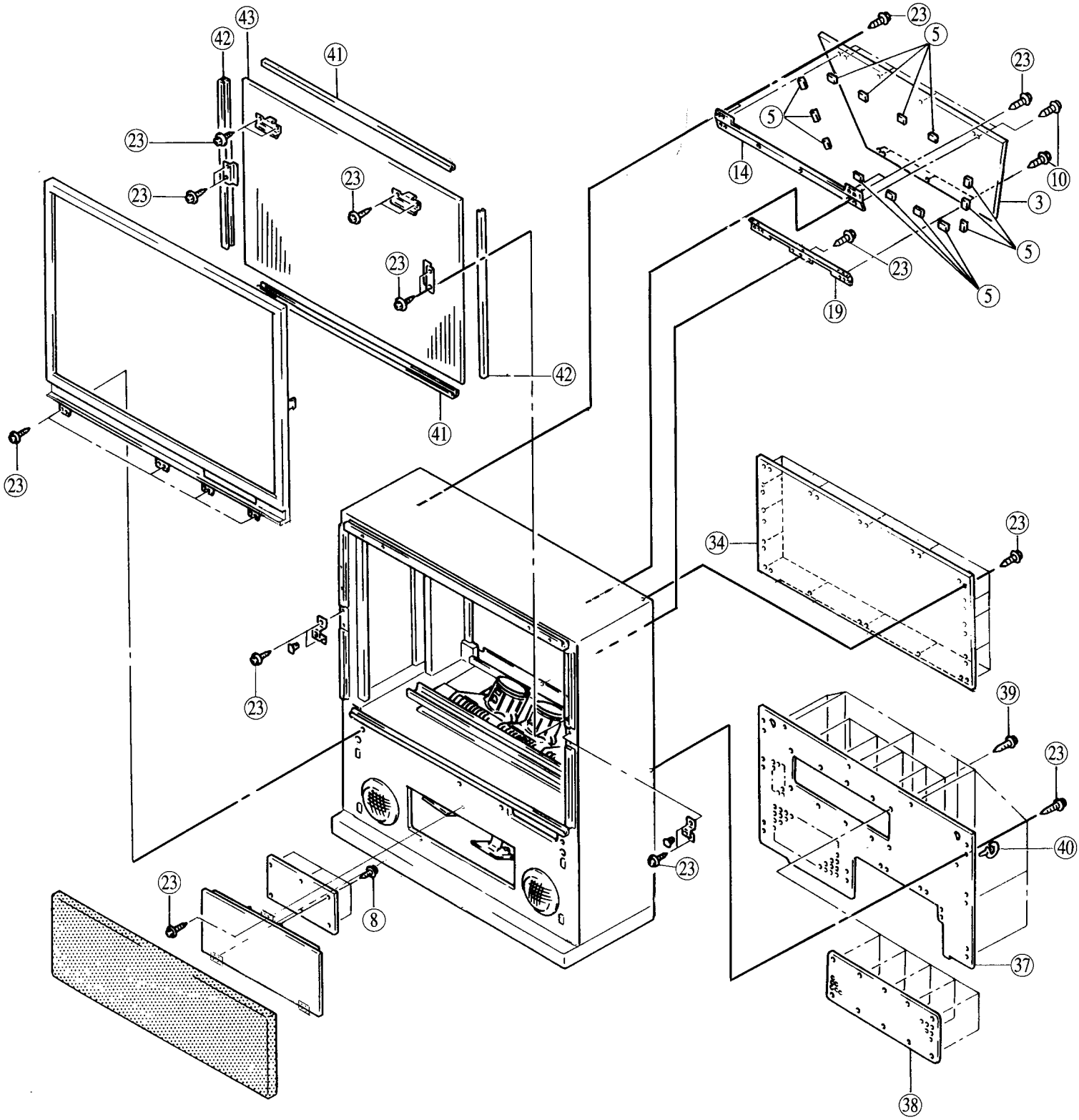
(1) Lock on
(when connector is inserted)



(2) Release
(when connector is removed)

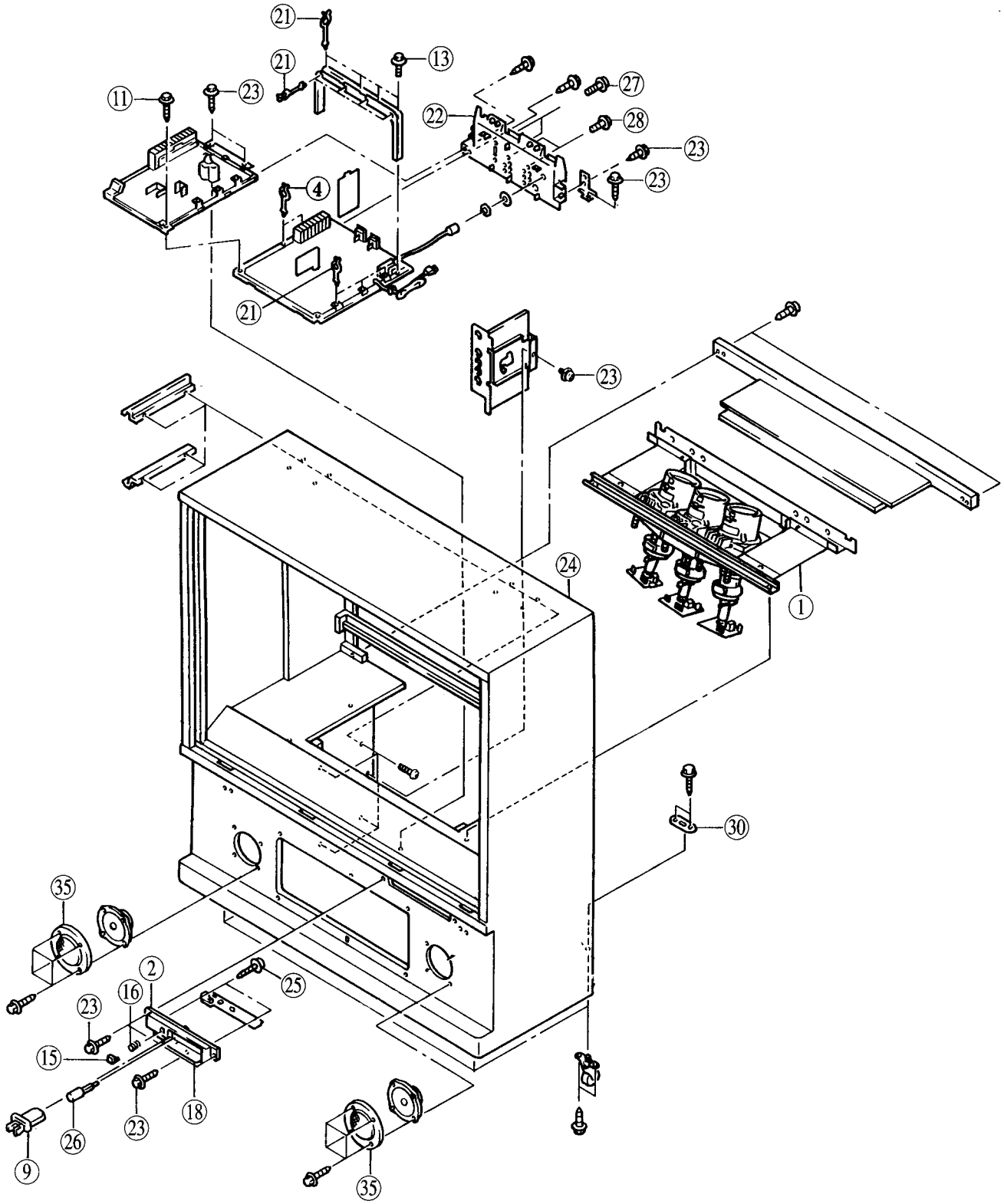
Fig. 8

EXPLODED VIEW (1/3)

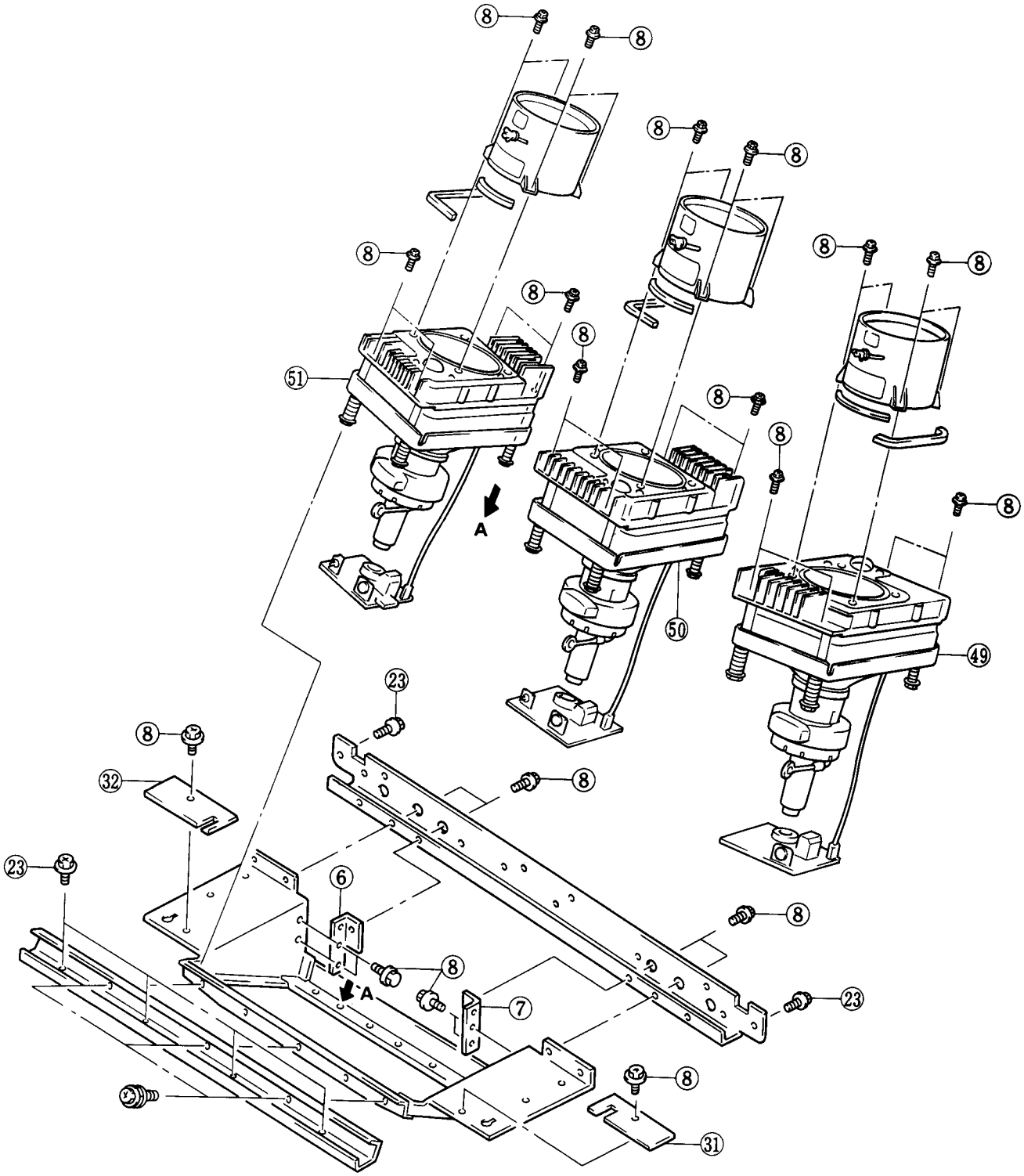


Note: Some parts may appear different than those shown in the exploded view. When ordering, refer to the REPLACEMENT PARTS LIST for correct part number.

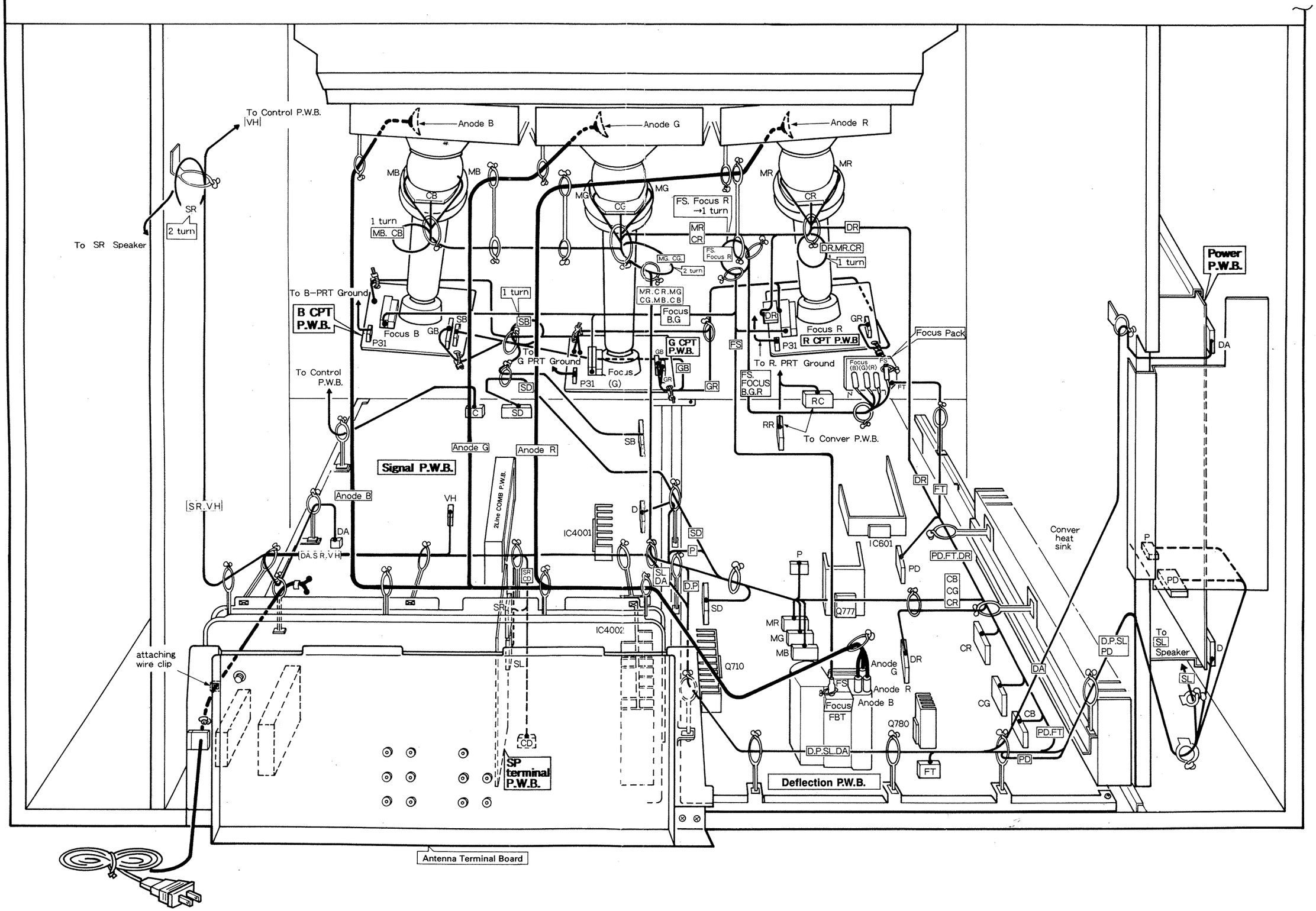
EXPLODED VIEW (2/3)



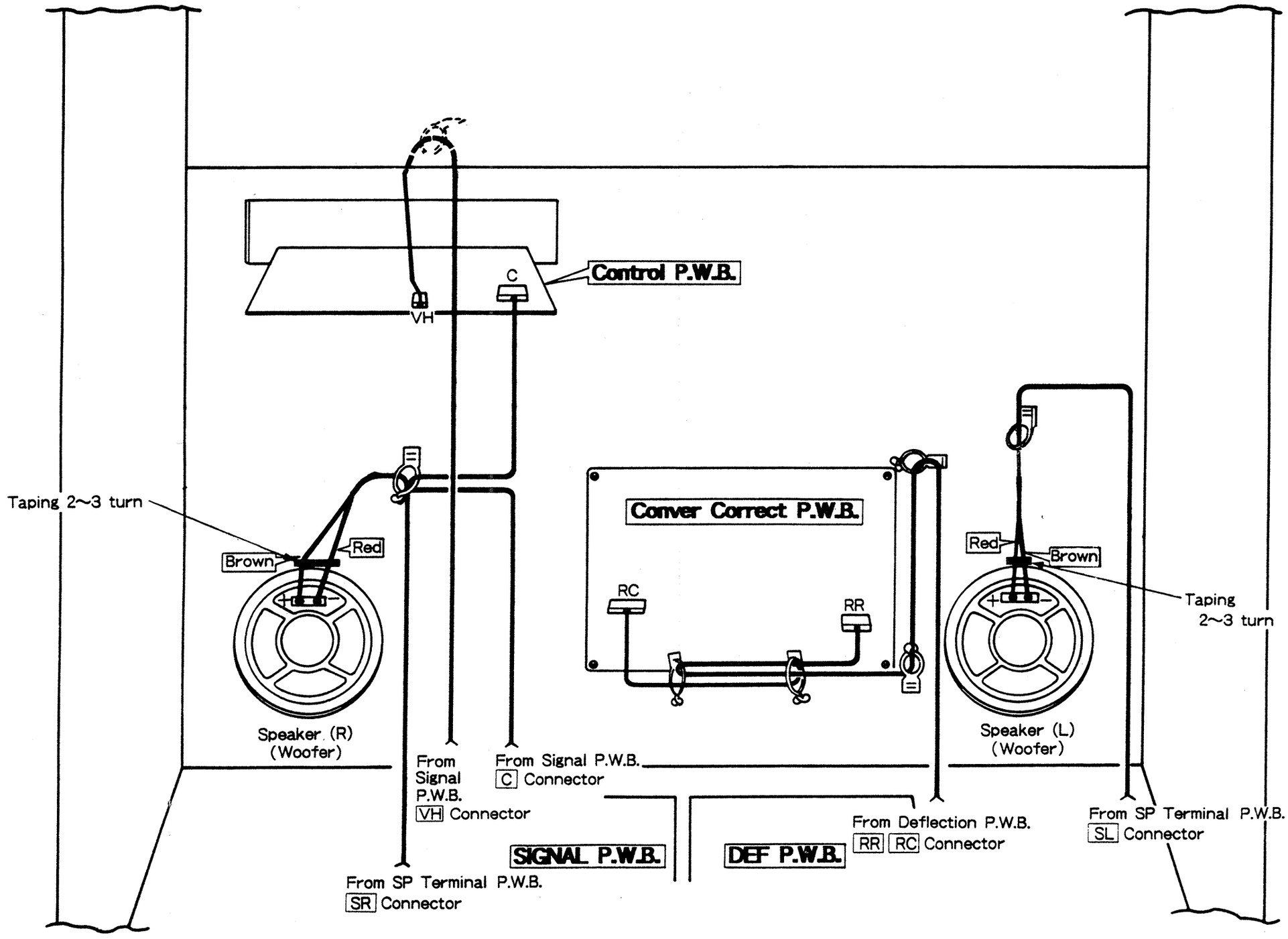
EXPLODED VIEW (3/3)



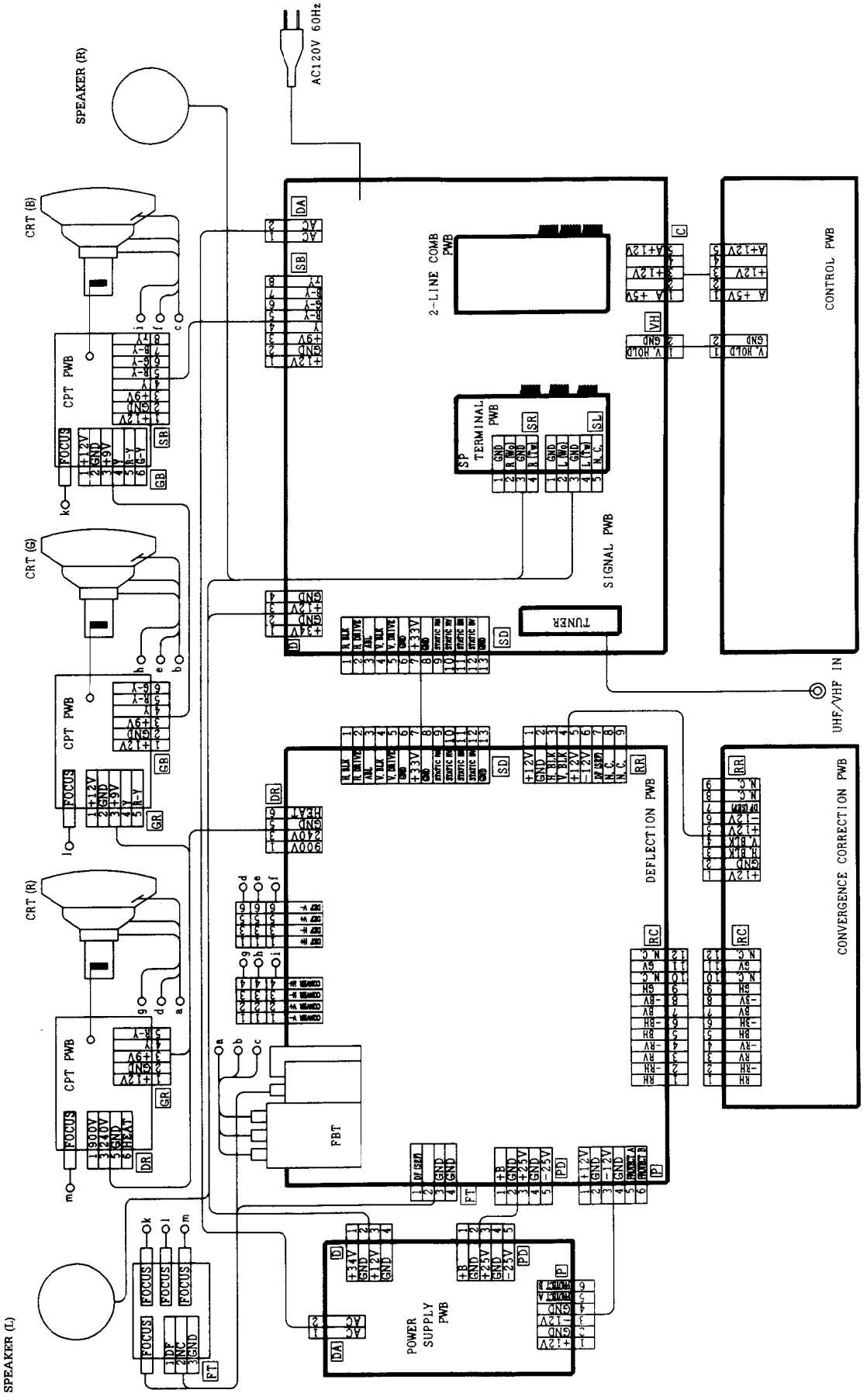
WIRING DIAGRAM



WIRING DIAGRAM



WIRING DIAGRAM



REPLACEMENT PARTS LIST

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicing.

SYMBOL NO.	PART NO.	DESCRIPTION
		CABINET
⚠ 1	4304556	CRT UNIT BRACKET (HHEA MD)
2	3209674	CONTROL PANEL ASSY
3	4288068	MIRROR (HHEA MD)
4	3700971	LEAD CLAMP
5	4618171	RUBBER SPACER A
6	4305083	LENS-CRT UNIT METAL SUPPORT
7	4305082	LENS-CRT UNIT METAL SUPPORT R
8	4524911	HEXAGON FLANGEHEAD 4X12
9	3785043	PUSH LOCK A
10	4137976	4X20 TAPPING SCREW W/WASHER
11	4159427	3X10 TAPPING SCREW W/WASHER
13	4518772	3X12 TNE
14	4331941	MIRROR HOLDER U
15	3811195	POWER KNOB
16	3332453	SPRING FOR KNOB
18	3821103	DOOR ASSY
19	4335872	MIRROR HOLDER (HHEA MD)
21	3746482	WIRE CLAMP
22	3209495	TERMINAL BOARD ASSY
23	4520771	4X18 TAPPING SCREW W/WASHER
24	3123071	CABINET ASSY (HHEA MD)
25	4137975	4X16 ZA R SCREW
26	3794331	PRESET DRIVER
27	4519503	3X12 TAPPING SCREW
28	4520232	4X16 DT SCREW
30	4336491	CASTER METAL
31	3447251	UNIT METAL COVER (A)
32	3447252	UNIT METAL COVER (B)
34	3169681	REAR BOARD (HHEA MD)
35	4321071	SPEAKER COVER
37	3169691	LOWER REAR BOARD (HHEA MD)
38	4304282	COVER NET
39	4517997	4X12 SELF TAPPING SCREW
40	3727972	Holder, AC Line Cord
41	3850473	Screen Frame (H)
42	3850474	Screen Frame (V)
43	3189482	SCREEN ASSY (HHEA MD)
⚠ 49	4866863	LENS CRT BLOCK ASSY B (HHEA MD)
⚠ 50	4866862	LENS CRT BLOCK ASSY G (HHEA MD)
⚠ 51	4866861	LENS CRT BLOCK ASSY R (HHEA MD)
		MISCELLANEOUS
	3700732	LENS DELTA 12P W/O C (HHEA MD)
⚠ E101	2442842	DEFLECTION YOKE
E202	2982471	300-75 VHF ADAPTER
E301	2573442	REM. CONT. CLU-600PR (HHEA MD)
E302	2573621	REM. CONTROL CLU-609 (HHEA MD)
⚠ E9001	2742559	AC POWER CORD
⚠ E9002	3772201	AC CORD HOLDER
⚠ E9003	3739671	CORD HOLDER
N201	4917312	OPERATING GUIDE
⚠ SP401	2412921	SPEAKER 160mm
⚠ SP402	2412921	SPEAKER 160mm
W811B	2692461	FOCUS LEAD WIRE (HHEA MD)
W811G	2692461	FOCUS LEAD WIRE (HHEA MD)
W811R	2692461	FOCUS LEAD WIRE (HHEA MD)

2994843 Mini plug w/ coax cable

MEMO

HITACHI HOME ELECTRONICS (AMERICA), INC.

NATIONAL HEADQUARTERS OFFICE:	3890 Steve Reynolds Blvd., Norcross, GA 30093	Tel. 404-279-5600
Western Regional Office:	401 West Artesia Blvd., Compton, CA 90220	Tel. 310-537-8383
Eastern Regional Office:	1200 Wall St. West, Lyndhurst, NJ 07071	Tel. 201-935-8980
Mid-Western Regional Office:	1400 Morse Ave., Elk Grove Village, Illinois 60007	Tel. 708-593-1550
Southern Regional Office:	3890 Steve Reynolds Blvd., Norcross, Georgia 30093	Tel. 404-279-5600

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