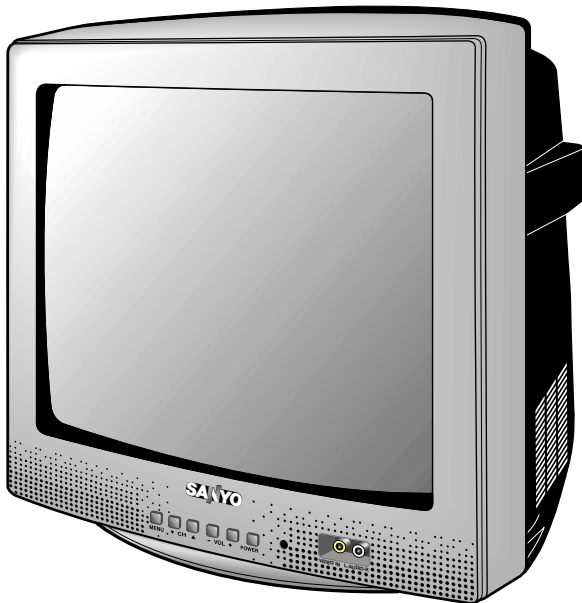


FILE NO.

SERVICE MANUAL

Remote Control Color Television

DS13330 (U.S.A.)
(CANADA)
ORIGINAL VERSION



Chassis No. 13330-01

NOTE: Match the Chassis No. on the unit's back cover with the Chassis No. in the Service Manual.

If the Original Version Service Manual Chassis No. does not match the unit's, additional Service Literature is required. You must refer to "Notices" to the Original Service Manual prior to servicing the unit.

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Specifications

Power Rating	120V, 60Hz 45W (Avg), 1.1A (Max)
Antenna Input Impedance	75Ω UHF/VHF/CATV
Receiving Channel	2 - 13 (VHF), 14 - 69 (UHF), 01, 14-94, 95-125 (CATV)
Remote Ready	24 Key Remote Control
Sound Output	1.0 W/CH
Intermediate Frequency	
Picture IF Carrier	45.75MHz
Sound IF Carrier	41.25MHz
Color Sub Carrier	42.17MHz
Picture Tube	A34JRY24X/A34KPU02XX/ A34KPU03XX/A34JRY24X(DT)
Semiconductors	
Integrated Circuits	7
Transistors	14
	Except within Tuner and RC Pre-Amp.
Cabinet Dimensions	
Width	356mm
Height	327mm
Depth	372mm

SAFETY INSTRUCTIONS

SAFETY PRECAUTIONS

WARNING: The chassis of this receiver has a floating ground with the potential of one half the AC line voltage in respect to earth ground. Service should not be attempted by anyone not familiar with the precautions necessary when working on this type of equipment.

The following precautions must be observed:

1. An isolation transformer must be connected in the power line between the receiver and the AC line before any service is performed on the receiver.
2. Comply with all caution and safety-related notes provided on the side of the cabinet, inside the cabinet, on the chassis, and the picture tube.
3. When replacing a chassis in the cabinet, always be certain that all the protective devices are installed properly, such as control knobs, adjustment covers, shields and barriers.

DO NOT OPERATE THIS TELEVISION RECEIVER WITHOUT THE PROTECTIVE SHIELD IN POSITION AND PROPERLY SECURED.

4. Before replacing the back cover of the set, thoroughly inspect the inside of the cabinet to see that no stray parts or tools have been left inside.

Before returning any television to the customer, the service technician must perform the following safety checks to be sure that the unit is completely safe to operate without danger of electrical shock.

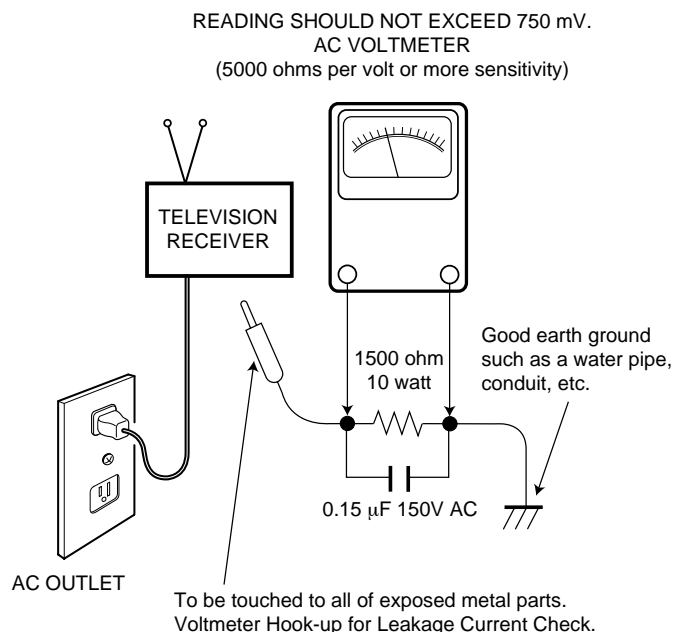
ANTENNA COLD CHECK

Remove AC plug from the 120 VAC outlet and place a jumper across the two blades. Connect one lead of an ohmmeter to the jumpered AC plug, and touch the other lead to each exposed antenna terminal (UHF and VHF antenna terminals). The resistance must measure between 1M ohm and 5.2M ohm. Any resistance value below or above this range indicates an abnormality which requires corrective action.

LEAKAGE CURRENT CHECK

Plug the AC line cord directly into a 120 VAC outlet. (Do not use an isolation transformer for this check.) Use an AC voltmeter, that has 5000 ohms per volt or more sensitivity. Connect a 1500 ohm 10 watt resistor, paralleled by a 0.15 μ F 150 VAC capacitor, between a known good earth ground (water pipe, conduit, etc.) and all exposed metal parts of the cabinet (antennas, handle bracket, metal cabinet, screw heads, metal overlays, control shafts, etc.). Measure the AC voltage across the 1500 ohm resistor. The AC voltage should not exceed 750 mV. A reading exceeding 750 mV indicates that a dangerous potential exists. The fault must be located and corrected. Repeat the above test with the receiver power plug reversed.

NEVER RETURN A RECEIVER TO THE CUSTOMER WITHOUT TAKING THE NECESSARY CORRECTIVE ACTION.



X-RADIATION PRECAUTION

The primary source of X-RADIATION in solid-state receivers is the picture tube. The picture tube is specially constructed to limit X-Ray emission. For continued X-RADIATION protection, the replacement tube must be the same type as the original (including the suffix letter in the part numbers). Excessive high voltage may produce potentially hazardous X-RADIATION. To avoid such hazards, the high voltage must be maintained within specific limits. Refer to the X-RADIATION WARNING NOTE on the CHASSIS SCHEMATIC in this service manual for specific high voltage limits. If the high voltage exceeds specified limits, check the components specified on the chassis schematic diagram and take the necessary corrective action. Carefully follow the instructions for the +B Voltage Check and the High Voltage Check to maintain the high voltage within the specified limits.

HIGH VOLTAGE HOLD-DOWN TEST

To prevent X-RADIATION from the picture tube due to excessive high voltage, a HOLD-DOWN circuit is provided in the high voltage circuit. Every time the receiver is serviced, the high voltage HOLD-DOWN circuit must be tested for proper operation. Refer to the HIGH VOLTAGE HOLD-DOWN TEST in service adjustments.

PRODUCT SAFETY NOTICE

When replacing components in a receiver, always keep in mind the necessary product safety precautions. Pay special attention to the replacement of components marked with a star (★) in the parts list and in the schematic diagrams. To ensure safe product operation, it is necessary to replace those components with the exact same PARTS.

SERVICE ADJUSTMENTS

GENERAL

This set has an on-screen Service Menu system included in the CPU that allows remote operation for most of the service adjustments. To enter the Service Menu, first disconnect the AC power cord. Then while pressing the MENU key on the **front control panel**, reconnect the AC power cord. The adjustments can now be made with the remote control or front control panel keys.

ON-SCREEN SERVICE MENU SYSTEM

1. Enter the Service Menu:

- While pressing the MENU key on the **front control panel**, reconnect the AC power cord. The Service Menu Display will now appear. (See Figure 1.)

2. Service Adjustments:

- Press the ▲ or ▼ key to select the desired service menu item you want to adjust. (See page 4 for On-screen Service Menu.)
- Use the + or – key or number keys to adjust the data.
The + or – keys will increase or decrease the data sequentially.
The number keys (0 ~ 7) toggle only their respective bits between 1 and 0.

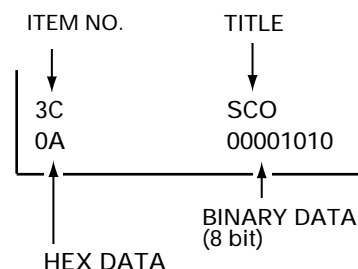


Figure 1. Service Menu Display

3. Exit from the Service Menu:

- Press the MENU key to turn off the Service Menu display.

IC802 (EEPROM) REPLACEMENT

When IC802 (EEPROM) is replaced, IC801 (CPU) will automatically write the initial reference data into IC802 for basic TV operation. However, the bus data should be checked and some bus data should be set up before attempting the service adjustments. (See pages 4 – 5 for detailed information.)

INITIAL BUS DATA SETUP

Note: When IC802 (EEPROM) is replaced, change the following initial reference data for proper TV operation before attempting the service adjustments.

1. Disconnect the AC power cord (AC 120V line).
2. While pressing the MENU key on the **front control panel**, reconnect the AC power cord.
The Service Menu display will now appear.
3. Select No. 3C SCO (Sub Color) with ▲ or ▼ key. Adjust the data with + or – key for 1D (hex).
4. Select No. 3D STI (Sub Tint) with ▲ or ▼ key. Adjust the data with + or – key for 08 (hex).
5. Select No. 3F SSH (Sub Sharpness) with ▲ or ▼ key. Adjust the data with + or – key for 05 (hex).
6. Select No. 41 HBS7HP (H Blanking / H Phase) with ▲ or ▼ key. Adjust the data with + or – key for 10 (hex).
7. Select No. 42 VS (V Size) with ▲ or ▼ key. Adjust the data with + or – key for 45 (hex).
8. Select No. 43 VSP7VPO (V Sync Sep / V Position) with ▲ or ▼ key. Adjust the data with + or – key for 0F (hex).
9. Select No. 44 GRY7CRS5VLN (Gray / Cross B/W / V Lin) with ▲ or ▼ key. Adjust the data with + or – key for 92 (hex).
10. Select No. 45 HBL5VSC with ▲ or ▼ key. Adjust the data with + or – key for EA (hex).
11. Select No. 46 VC3CDM (V Size Comp / V Count Down), with ▲ or ▼ key. Adjust the data with + or – key for 38 (hex).
12. Select No. 4B BGS5RGD4GD (B_γ / RG_γ / G Drive) with ▲ or ▼ key. Adjust the data with + or – key for 0B (hex).
13. Select No. 4D SBI (Sub Bias) with ▲ or ▼ key. Adjust the data with + or – key for 40 (hex).
14. Select No. 56 FBP6WP4PRE2CRG (FBP Blanking / White Peak / Pre shoot / Coring Gain) with ▲ or ▼ key. Adjust the data with + or – key for 42 (hex).
15. Select No. 57 DCR4BSS2BSG (DC Reset / Black Stretch Start / Black Stretch Gain) with ▲ or ▼ key. Adjust the data with + or – key for 02 (hex).
16. Select No. 58 AFC7CBP5 (Auto Flesh / Color BPF Bypass) with ▲ or ▼ key. Adjust the data with + or – key for 80 (hex).
17. Select No. 60 HBL5 (H Blanking Left) with ▲ or ▼ key. Adjust the data with + or – key for 00 (hex).
18. Select No. 83 OPT (AV Option) with ▲ or ▼ key. Adjust the data with + or – key for 84 (hex).
19. Select No. 8D HR (H Display Position) with ▲ or ▼ key. Adjust the data with + or – key for 10 (hex).
20. Select No. 8E SBO (Sub Bright Offset) with ▲ or ▼ key. Adjust the data with + or – key for 00 (hex).
21. Press the MENU key to turn off the Service Menu display.

Table 1. ON-SCREEN SERVICE MENU

When IC802 (EEPROM) is replaced, check the bus data to confirm they are the same as below. The shaded menu should be checked and be set up or readjusted according to the procedures described in the following pages. Initial Setup Data marked with an * should be changed from Initial Reference Data. (See page 3 for Initial Bus Data Setup.)

No.	TITLE	INITIAL REFERENCE DATA HEX	INITIAL SETUP DATA HEX	INITIAL SETUP DATA BINARY	FUNCTION
3C	SCO	0A	1D*	00011101	Sub Color
3D	STI	05	08*	00001000	Sub Tint
3E	SB	20	20	00010000	Sub Bright
3F	SSH	12	05*	00000101	Sub Sharpness
40	AFC6HFR	9E	9E	10011110	AFC / Horizontal Frequency
41	HBS7HP	0F	10*	00010000	Horizontal Blanking / Horizontal Phase
42	VS	32	45*	01000101	Vertical Size
43	VSP7VPO	05	0F*	00001111	Vertical Sync Separator / Vertical Position
44	GRY7CRS5VLN	8E	92*	10010010	Gray Mode / Cross Black/White / Vertical Linearity
45	HBL5VSC	EC	EA*	11101010	Horizontal Blanking Right / Vertical S Correction
46	VC3CDM	28	38*	00111000	Vertical Compression / Vertical Count Down
47	RB	00	00	00000000	Red Bias
48	GB	00	00	00000000	Green Bias
49	BB	00	00	00000000	Blue Bias
4A	RD	40	40	01000000	Red Drive
4B	BGS5RGD4GD	08	0B*	00001011	Blue Gamma / Red-Green Gamma / Green Drive Reduction
4C	BD	40	40	01000000	Blue Drive
4D	SBI	20	40*	01000000	Sub Bias
4E	↓	↓	↓	↓	Not Used
4F	↓	↓	↓	↓	Not Used
50	OSD	01	01	00000001	On Screen Display Contrast
51	BSD7CR6	40	40	01000000	Black Stretch / Coring
52	↓	↓	↓	↓	Not Used
53	↓	↓	↓	↓	Not Used
54	FLS	01	01	00000001	Y/C Filter Mode
55	GYA3CKO	02	02	00000010	G-Y Angle / Color Killer Operation
56	FBP6WP4PRE2CRG	4A	42*	01000010	FBP Blanking / W Peak Limit / Preshoot Adj / Coring Gain
57	DCR4BSS2BSG	08	02*	00000010	DC Reset / Black Stretch Start / Black Stretch Gain
58	AFC7CBP5	00	80*	10000000	Auto Flesh / Color Band Pass Filter
59	DIG6ABL5MSD4BAT	04	04	00000100	OSD D/A / ABL Defeat / Mid Stop / ABL Threshold
5A	RYA	02	02	00000010	R-Y/B-Y Angle
5B	↓	↓	↓	↓	Not Used
5C	↓	↓	↓	↓	Not Used
5D	RAD	0F	0F	00001111	RF AGC Delay
5E	FMM7IAS	00	00	00000000	FM Mute / IF AGC
5F	VL5FL	67	67	01100111	Video Level / FM Level
60	HBL5	E0	00*	00000000	Horizontal Blanking Left
83	OPT	04	84*	10000100	AV Option (See Note 3)
84	OP2	00	00	00000000	Game / V-Guide Option (See Note 4)
8D	HR	13	10*	00010000	Horizontal Display Position
8E	SBO	03	00*	00000000	Sub Bright Offset
8F	DRV	R40	R40	01000000	Red Drive Adjustment (See Note 1.)
		B40	B40	01000000	Blue Drive Adjustment (See Note 1.)
90	-	-	-	-	Red Bias Adjustment (See Note 2.)
	-	-	-	-	Green Bias Adjustment (See Note 2.)
	-	-	-	-	Blue Bias Adjustment (See Note 2.)
B0	↓	↓	↓	↓	Not Used
↓	↓	↓	↓	↓	↓
F8	↓	↓	↓	↓	Not Used

DRIVE AND BIAS ADJUSTMENTS

Note 1.

Red/Blue Drive Adjustments in Service Menu NO. 8F DRV: Adjust Red and Blue Drive Levels alternately with 1, 3, 7, and 9 keys on the remote control. (See Figure 1.) The Drive Level adjustment data will be written in the Service Menu No. 4A RD and 4C BD automatically.

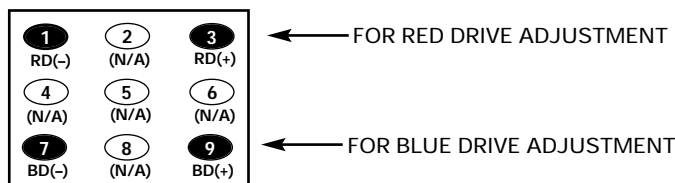


Figure 1.

Note 2.

Red/Green/Blue Bias Adjustments in Service Menu NO. 90:

Adjust each Bias Level with 1, 3, 4, 6, 7, or 9 key on the remote control. (See Figure 2.) The Bias Level adjustment data will be written in the Service Menu No. 47 RB, No. 48 GB, and No. 49 BB automatically.

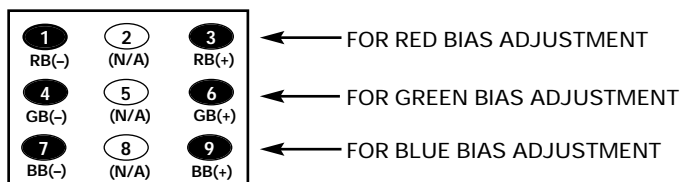


Figure 2.

PROGRAM CODE

The microprocessor used in this model is a multi-purpose type and is used in several different models. To ensure proper operation and the correct features for your particular model, the Program Code must be correct.

Note 3.

Option Data (NO. 83 OPT) should be set to hexadecimal 84. See page 3 INITIAL DATA SETUP step 18 for set up procedure. If this program code is wrong the TV will not operate properly.

BIT	FUNCTION	DATA	
		0	1
0, 1	NOT USED	-	-
2	AV FUNCTION	NO AV	AV
3 ~ 7	NOT USED		

Note 4.

Option Data (NO. 84 OP2) should be set to hexadecimal 00. If this program code is wrong the TV will not operate properly.

BIT	FUNCTION	DATA	
		0	1
0	V-GUIDE	YES	NO
1 ~ 7	NOT USED	-	-
8	GAME MODE	NO	YES

SERVICE ADJUSTMENTS (Continued)

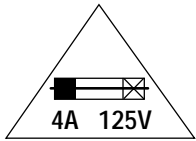
ANTENNA CONNECTIONS

This receiver is designed for UHF/VHF reception. A 75 ohm terminal is provided for UHF and VHF receptions. When connecting a CATV antenna system, connect the 75 ohm coaxial cable directly to the 75 ohm terminal. For 300 ohm VHF antenna, use an adapter (not included with the TV set).

CIRCUIT PROTECTION

Fuse F601 (4A) is included in the AC line. This fuse must be replaced with the proper fuse (see Parts List).

CAUTION



FOR CONTINUED PROTECTION AGAINST A RISK OF FIRE, REPLACE ONLY WITH THE SAME TYPE 4A, 125V FUSE.

ATTENTION : POUR MAINTENIR LA PROTECTION CONTRE LES RISQUES D'INCENDIE UTILISER UN FUSIBLE DE RECHANGE DE MEME TYPE 4A, 125V.

+B VOLTAGE CHECK

Connect Voltmeter + lead to TJ1 135V and – lead to ground (TE7). Connect receiver to AC 120V line. Tune receiver to an active channel. Reset the picture controls to the AUTO level. Voltage must measure between +133.0V and +137.0V. If the voltage is out of this range, the power circuit must be checked. No +B adjustment is provided on this chassis.

HORIZONTAL CENTERING ADJUSTMENT

1. Tune receiver to an active channel.
2. Check that picture is in the horizontal center of TV screen. If picture is not centered horizontally, perform steps 3 ~ 6.
3. Turn off the receiver and disconnect the AC power cord (120V AC line).
4. While pressing the MENU key, reconnect the AC power cord. The Service Menu display will now appear.
5. Select NO. 41 HPS7HP (Horiz. Phase) with ▲ or ▼ key.
6. Adjust the data with + or – key for horizontal center. To turn off the Service Menu display, press the MENU key.

VERTICAL SIZE ADJUSTMENT

1. Tune receiver to an active channel.
2. Check the vertical size of the picture. If the vertical size is too large or small, perform steps 3 ~ 6.
3. Turn off the receiver and disconnect the AC power cord (120V AC line).
4. While pressing the MENU key, reconnect the AC power cord. The Service Menu display will now appear.
5. Select NO. 42 VS (Vertical Size) with ▲ or ▼ key.
6. Adjust the data with + or – key for full scan. To turn off the Service Menu display, press the MENU key.

VERTICAL CENTERING ADJUSTMENT

1. Tune receiver to an active channel.
2. Check that picture is in the center of TV screen. If picture center is too low, add resistor R513 (470 ohm, 1W). If picture center is too high, add resistor R512 (470 ohm, 1W).

GRAYSCALE ADJUSTMENT

1. Set the picture controls to the Auto levels (use MENU key and ▲ or ▼ key or RESET key).
2. Turn off the receiver and disconnect the AC power cord (120V AC line).
3. While pressing the MENU key, reconnect the AC power cord. The Service Menu display will now appear.
4. Select NO. 47 RB (Red Bias), NO. 48 GB (Green Bias), and NO. 49 BB (Blue Bias) with ▲ or ▼ key and set each data to 00 with + or – key.
5. Select NO. 4A RD (Red Drive) and NO. 4C BD (Blue Drive) with ▲ or ▼ key and set each data to 40 with + or – key.
6. Set NO. 3C SCO (Sub Color) data to 1D, NO. 3D STI (Sub Tint) to 08, NO. 3E SB (Sub Brightness) data to 20, NO. 3F SSH (Sub Sharpness) data to 05, and NO. 4B GD (Green Drive Reduction) data to 0B with ▲ or ▼, and + or – keys.
7. Turn Screen Control (T402) to minimum (fully counter-clockwise).
8. Select the Service Menu NO. 90 (Bias Adjustments – No Vertical Sweep) with ▲ or ▼ key.
9. Advance Screen Control (T402) clockwise to obtain just visible one color line. If line does not appear, place this control to maximum (fully clockwise).
10. Raise each Bias Level with 3, 6, and 9 keys to obtain just visible white line. (See Figure 4.)

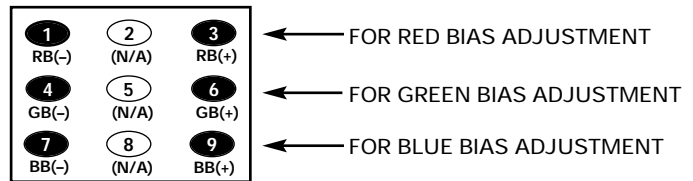


Figure 4. Remote Control Number keys' functions in Service Menu NO. 90

11. Select the Service Menu NO. 8F DRV (Drive Adjustments) with ▲ or ▼ key.
12. Adjust Red and Blue Drive Levels alternately with 1, 3, 7, or 9 key to produce normal black and white picture in highlight areas. (See Figure 5.)

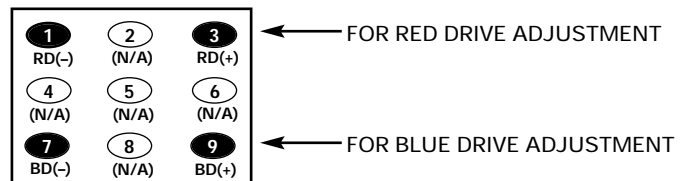


Figure 5. Remote Control Number keys' functions in Service Menu NO. 8F DRV

13. Check for proper grayscale at all brightness levels. To turn off the Service Menu display, press the MENU key.

Note: If Grayscale Adjustment is made after picture tube replacement, check Brightness Level Adjustment.

FOCUS ADJUSTMENT

Adjust focus control (T402) for well defined scanning lines.

VCO ADJUSTMENT

Note: VCO must be adjusted after IC101 (Signal Processor), IC802 (EEPROM) or T151 (VCO Coil) is replaced.

1. Tune receiver to an active channel.
2. Set the picture controls to the Auto level.
3. Connect digital voltmeter + lead to pin 58 (TP 10) of IC101 and – lead to ground (TE 7).
4. Confirm a reading of 3.6 ± 0.2 VDC.
5. If voltage is out of specifications adjust T151 for 3.6 ± 0.2 VDC.

RF AGC ADJUSTMENT

1. Tune receiver to strongest VHF station in your area.
2. Set contrast and brightness controls for maximum.
3. Turn off the receiver and disconnect the AC power cord (120V AC line).
4. While pressing the MENU key, reconnect the AC power cord. The Service Menu display will now appear.
5. Select NO. 5D RAD (RF AGC Delay) with ▲ or ▼ key.
6. Adjust the data with + or – key in the direction which causes snow to appear; then in the opposite direction until the snow just disappears.
7. To turn off the Service Menu display, press the MENU key.

BRIGHTNESS LEVEL ADJUSTMENT

Note: Grayscale, RF-AGC, Video Level, and High Voltage Check must be adjusted before attempting Brightness Level Adjustment.

1. Connect a color-bar generator to the antenna terminals.
2. Switch the generator to the crosshatch pattern.
3. Reset the picture controls to the Auto levels.
4. Connect voltmeter (high impedance) + lead to terminal TP51 and – lead to terminal TP50 on main board. Set voltmeter for 1.5V ~ 3V range.
5. Turn off the receiver and disconnect the AC power cord (120V AC line).
6. While pressing the MENU key, reconnect the AC power cord. The Service Menu display will now appear.
7. Select NO. 3E SB (Sub Brightness) with ▲ or ▼ key.
8. Adjust the data with + or – key for 820 mVDC.
9. Press the MENU key to turn off the Service Menu display.
10. Check brightness level on every active channel, readjust (repeat steps 5 ~ 9), if necessary.

Note: Do not set to excessive brightness level, otherwise the contrast level will be suppressed.

HIGH VOLTAGE HOLD-DOWN TEST

Every time the receiver is serviced, the HIGH VOLTAGE HOLD-DOWN circuit must be tested for proper operation by following these steps:

1. Connect receiver to 120V AC line. Tune receiver to active channel. Reset the picture controls to the Auto levels.
2. Check that the voltage measured between TP7 and TE7 (ground side) is within 16.5 VDC to 21 VDC. If the voltage is out of this range, the Hold-Down Circuit must be checked.
3. Connect a DC Voltage supply to TP7 and TE7 through a 100 ohm 1/4W resistor. Adjust the DC voltage to 23 VDC. The receiver should shutdown, losing raster and sound. Then the receiver should turn off automatically. This reaction indicates that the Hold-Down circuit is functioning properly. If the receiver does not shutdown, a malfunction is indicated and its cause **must** be found and corrected.
4. To obtain picture again, remove the DC Supply and wait a few minutes. Now turn on the receiver.

HIGH VOLTAGE CHECK

Note: +B (+135V) Voltage Check and Grayscale Adjustment must be completed before attempting High Voltage Check.

1. Connect high voltage voltmeter – lead to ground, and connect + lead to anode of picture tube.
2. Tune receiver to an active channel and confirm TV is operating properly.
3. Eliminate the beam current by adjusting the contrast and brightness controls to minimum.
4. Confirm high voltage is within 19.8 KV and 22.5 KV. If reading is not within range, check horizontal circuit.

No high voltage adjustment is provided on this chassis.

SERVICE ADJUSTMENTS (Continued)

VIDEO LEVEL

1. Connect color-bar generator to antenna terminals.
2. Switch the generator to a white field (100 IRE).
3. Set the picture controls to the Auto levels.
4. Connect oscilloscope + lead to terminal TP16 and – lead to ground.
5. Turn off the receiver and disconnect the AC power cord (AC 120V line).
6. While pressing the Menu key, reconnect the AC power cord. The Service Menu will now appear.
7. Select NO. 5F VL5FL (Video Level) with the ▲ or ▼ key.
8. Adjust the data with the 5, 6, and 7 number keys for an oscilloscope reading of 1.0 ± 0.1 VP-P at TP16.
9. Press the MENU key to turn off the Service Menu display and disconnect oscilloscope from chassis.

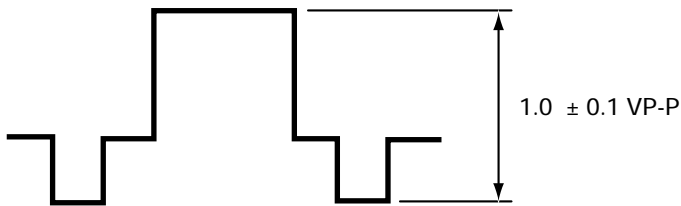


Figure 6.

SOUND ADJUSTMENT

1. Connect a color-bar generator to the antenna terminals with audio signal of 1KHz at 100% modulation.
2. Set the picture controls to the Auto levels.
3. Connect oscilloscope + lead to TP21 (pin 75 of IC101 or C132) and – lead to ground.
4. Turn off the receiver and disconnect the AC power cord (AC 120V line).
5. While pressing the Menu key, reconnect the AC power cord. The Service Menu will now appear.
6. Select NO. 5F VL5FL (FM Level) with the ▲ or ▼ key.
7. Adjust the data with the + or – key for an oscilloscope reading of $0.95 \pm 10\%$ VP-P at TP21.
8. Press the MENU key to turn off the Service Menu display and disconnect the oscilloscope from the chassis.

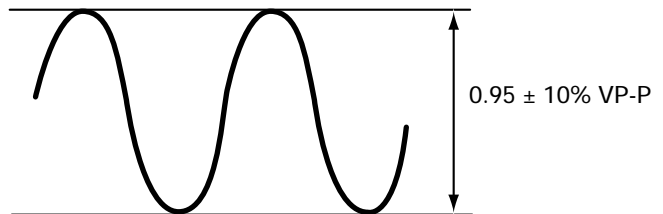


Figure 7.

SERVICE HINTS

POWER FAILURE DETECTOR

This unit is equipped with a Power Failure Detector function included in the CPU which checks for an abnormal condition in the chassis power supplies, including the power supply derived from the Horizontal Output Transformer.

If, while the power is on, a failure is caused by any of the following that results in a low voltage supply, the CPU will turn the unit off in 1.5 seconds to prevent unnecessary damage:

- Failure within the power supply circuits.
- A short circuit in the load side from the supply.
- Stoppage of the Horizontal Output Oscillator caused by the X-Radiation protection Hold-Down Circuit.

If, while the power is off, the power is switched on and any of these failures remains uncorrected, the CPU will shut off the power within three seconds.

Check the following if the unit is turned off by the power failure detector.

1. Disconnect the AC power cord (120V AC line) for at least 10 seconds.
2. Connect a DC Voltmeter to the following TEST POINTS.

TJ6	5V
D429 Cathode	9.4V
D802 Cathode	12.0V

3. Press the Power key and check for the proper voltage supplies.
4. If any of these voltages is low, the power failure detector should turn the unit off within three seconds.
5. Check all circuits listed above.

Note: This unit is equipped with a Power Surge Protection feature included in the CPU. If power failure occurs three times within 15 minutes, the CPU will automatically stop functioning to help prevent secondary damage. (TV will not turn on by pressing the power key.) To reset the operating programs within the CPU, disconnect the AC power cord for at least 10 seconds.

PURITY AND CONVERGENCE ADJUSTMENTS

CAUTION: The Purity and Convergence adjustments have been made at the factory. Readjustments should be made only after the picture tube or deflection yoke is replaced. Follow the steps below for necessary readjustments.

PURITY ADJUSTMENTS

1. When replacing picture tube or deflection yoke, mount deflection yoke and purity and convergence magnets assembly properly. See Figure 1. Position the picture tube facing east or west. Demagnetize the picture tube and receiver using an external degaussing coil. Set receiver to Service Menu NO. 90 (no vertical sweep) while degaussing.
2. Place the yoke on tube neck fully forward against glass.
3. Place the CPM on the tube neck aligning the center of the purity magnet tabs over center of Focus Gap (G3 & G4). See Figure 2.
4. Connect a color-bar generator to the antenna terminal. Switch the generator to a white field. Move yoke backward on the neck until a uniform white field is obtained.
5. Allow 30 minutes warm up on a blank white field (high intensity grayscale).
Note: If white field cannot be obtained check Grayscale Adjustments on page 6.
6. Reset the picture controls to the Auto levels. Select a green raster, either with the signal generator or by adjusting the bias controls. If a signal generator is used for this step skip to Step 11. If the bias controls will be used go to step 7.
7. Adjust Service Menu NO. 47 RB (Red Bias), NO. 48 GB (Green Bias), and NO. 49 BB (Blue Bias) data each to 00.
8. Select Service Menu NO. 90 (no vertical sweep).
9. Adjust the Screen Control counterclockwise until the horizontal scan line is no longer visible.
10. Select Service Menu NO. 48 GB (Green Bias) and increase the data to produce a green raster. If retrace lines appear reduce screen control slightly.
11. Pull yoke back on tube neck to obtain three-color raster (blue, green and red).
12. Adjust the angle between the two purity magnet tabs to center the vertical green belt in the picture tube. Do not rotate tabs. See Figure 3.
13. Slowly slide the deflection yoke forward until a uniform green screen is obtained.
14. Check the purity of the red and blue screens for uniformity. Turn off other colors to check (use bias controls or use generator). If necessary, readjust the yoke position until all screens are pure.
15. If bias controls and screen control were used to set purity reset Grayscale and Bright Level. Refer to Grayscale Adjustment on page 6 and Brightness Level Adjustment on page 7.
16. Confirm that the yoke is not tilted. Tighten the yoke mounting screw. Adjust convergence next.

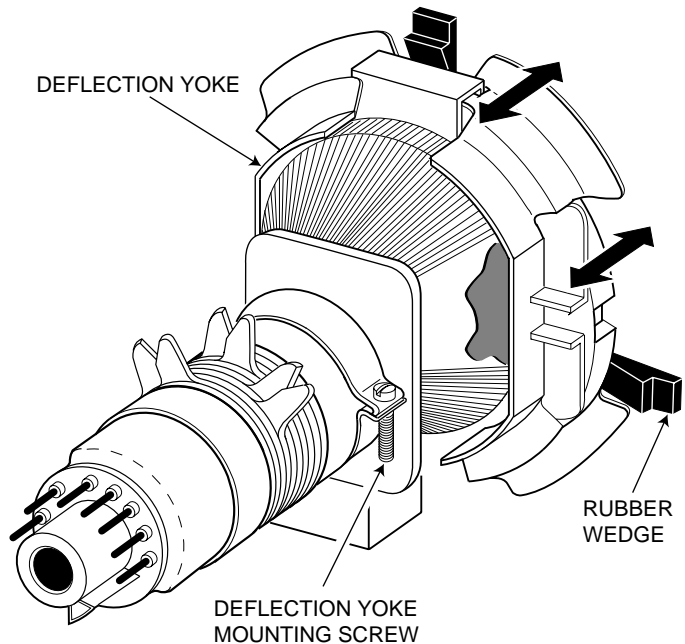


Figure 1. Deflection Yoke Movement

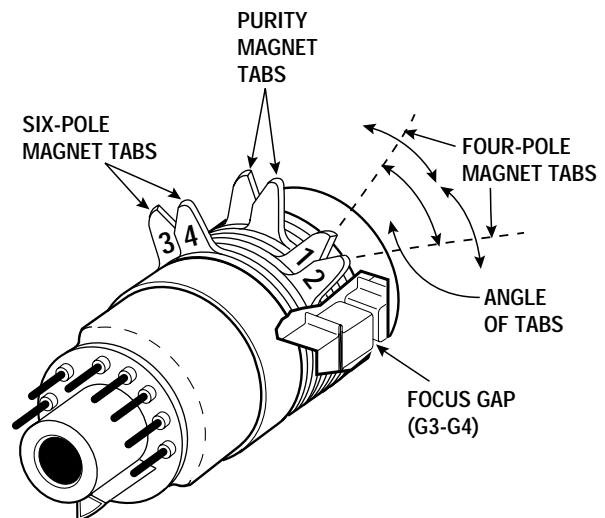


Figure 2. Purity and Convergence Magnets

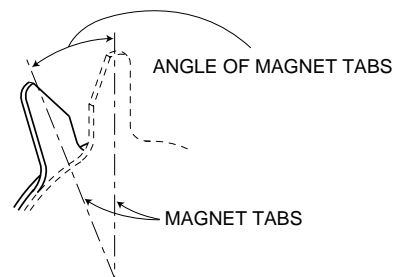


Figure 3. Adjusting Magnet

CONVERGENCE ADJUSTMENT

CENTER CONVERGENCE ADJUSTMENT

1. Connect a crosshatch generator to antenna terminals.
2. Set Contrast to low level to eliminate blooming. Reduce Brightness level to obtain black background if necessary.
3. Adjust the angle between the four-pole magnet tabs 1 and 2 (Figure 2), and superimpose the red and blue vertical lines in the center area of the picture screen. See Figure 4.
4. Keeping the tabs at the same angle, rotate them together to superimpose the blue and red horizontal lines in the center area of the picture screen. See Figure 4.
5. Adjust the six-pole magnet tabs 3 and 4 so the converged red/blue line is superimposed on the green line. This is the same procedure used in steps 3 and 4. See Figure 5.

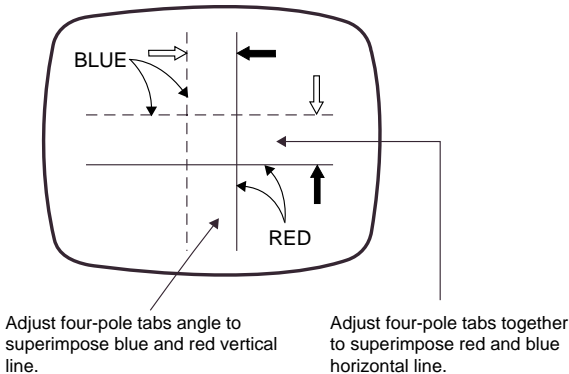


Figure 4. Blue and Red Line Movement

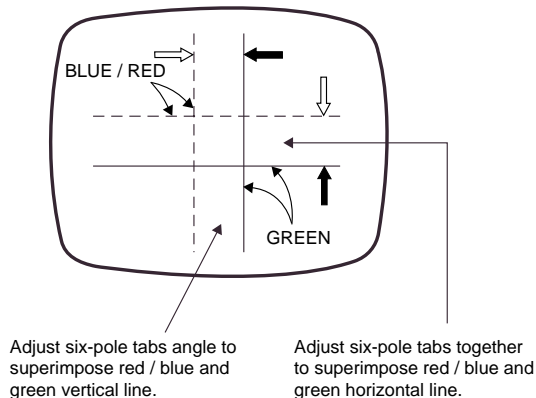


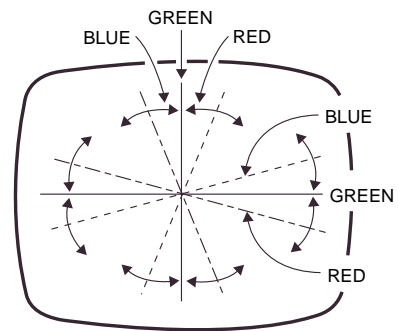
Figure 5. Blue/Red and Green Line Movement

OUTER AREA CONVERGENCE ADJUSTMENT

The outer area convergence is performed by positioning of the yoke as follows:

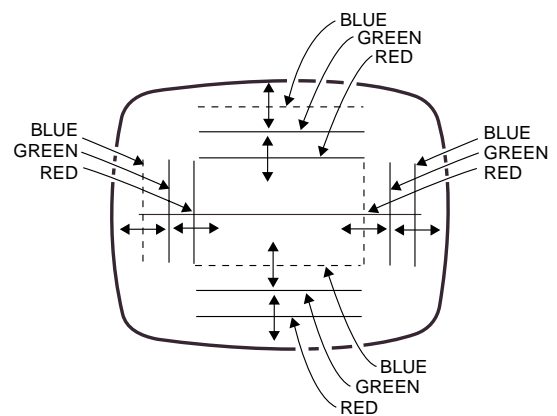
1. Move the top of the yoke toward or away from the picture tube. This movement will affect the vertical lines at the top and bottom and the horizontal lines at the sides. See Figure 6.
2. Check that splits at 12 o'clock and 6 o'clock positions are minimized, adjust yoke for best compromise. Secure with wedge at 12 o'clock position. See Figure 1.
3. Move the side of the yoke toward or away from the picture tube to converge the horizontal lines at the top and bottom and the vertical lines at the sides. See Figure 7.
4. Check that splits at 12 o'clock and 6 o'clock are minimized, adjust yoke for best compromise. Secure yoke position with the side wedges. See Figure 1.

Note: When re-using the rubber wedges, apply a small amount of silicone rubber adhesive or hot melt to each of the wedges.



Line movement when adjusting top of yoke in and out.

Figure 6. Top of Yoke Movement



Line movement when adjusting side of yoke in and out.

Figure 7. Side of Yoke Movement

MECHANICAL DISASSEMBLIES

CABINET BACK REMOVAL

1. Refer to Figure 1, remove 4 screws.
2. Pull off cabinet back and remove.

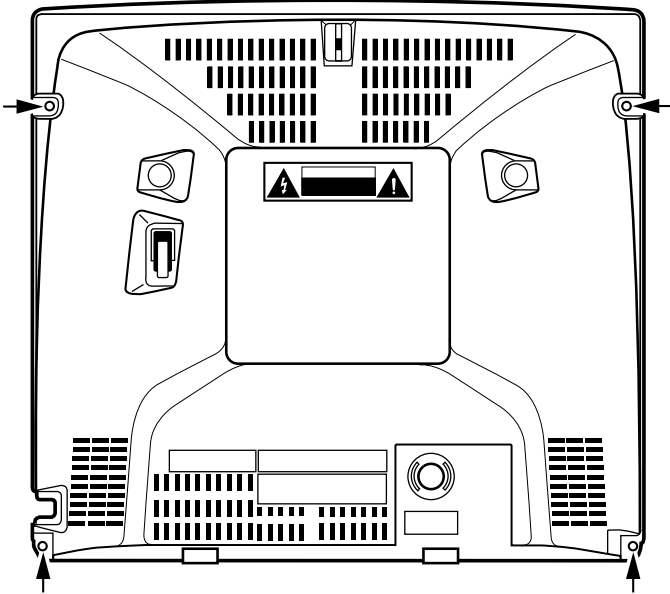


Figure 1. Cabinet Back Removal

CHASSIS REMOVAL

1. Remove cabinet back.
2. Discharge the picture tube anode (2nd anode lead) to the dag coating (picture tube grounding lead).
3. Disconnect degaussing coil socket (KD), picture tube socket, deflection yoke connector (KX), speaker connector (KSP), picture tube ground leads, and 2nd anode lead.
4. Remove chassis completely by sliding it straight back.

PICTURE TUBE REMOVAL

CAUTION: Do not disturb the deflection yoke or magnet assembly on the picture tube neck. Care must be taken to keep these assemblies intact, unless picture tube is being replaced. Discharge the picture tube to the coating before handling the tube.

1. Remove chassis, referring to Chassis Removal instructions.
2. Place cabinet's front face down on a soft surface.
3. Remove the screw on each corner of the picture tube and GENTLY lift the picture tube out of the cabinet.
4. Install a replacement picture tube in reverse order. Properly install the degaussing coil and picture tube grounding lead on the picture tube. See Figure 2.

Note: If Picture Tube is being replaced, mount the Degaussing Coil properly on the tube. See Figure 2.

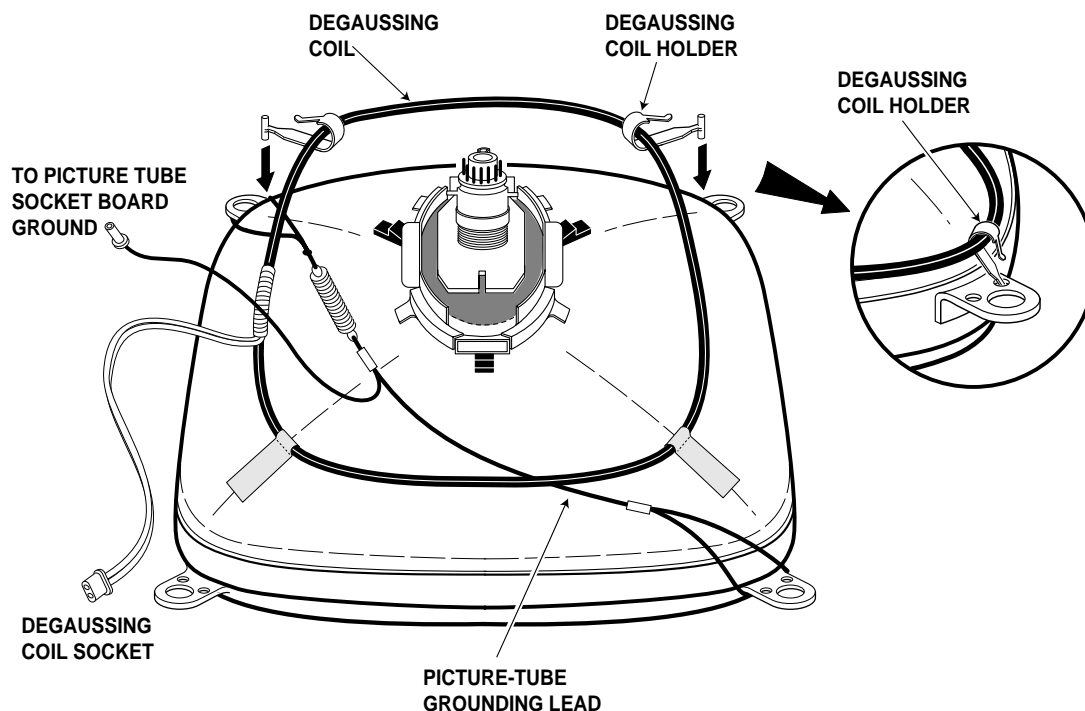


Figure 2. Picture Tube Removal

CHASSIS ELECTRICAL PARTS LIST

CAUTION: To Protect against electrical shock and for continued product safety, refer to **SAFETY PRECAUTIONS**, **X-RADIATION PRECAUTIONS**, **HIGH VOLTAGE HOLD-DOWN TEST**, and **PRODUCT SAFETY NOTICE** on Page 2.

PRODUCT SAFETY NOTICE

PRODUCT SAFETY SHOULD BE CONSIDERED WHEN A REPLACEMENT IS MADE IN ANY AREA OF A RECEIVER. COMPONENTS INDICATED BY A STAR (★) IN THIS PARTS LIST AND THE SCHEMATIC DIAGRAM DESIGNATE COMPONENTS IN WHICH SAFETY CAN BE OF SPECIAL SIGNIFICANCE. IT IS PARTICULARLY RECOMMENDED THAT ONLY PARTS DESIGNATED ON THE FOLLOWING PARTS LIST BE USED FOR COMPONENT REPLACEMENT DESIGNATED BY A STAR. NO DEVIATIONS FROM RESISTANCE, WATTAGE, AND VOLTAGE RATINGS MAY BE MADE FOR REPLACEMENT ITEMS DESIGNATED BY A STAR.

Notes: Parts having Location Number are located on the following boards.

Numbers 700 SeriesOn the Picture Tube Socket Board.

Numbers 900 SeriesOut of Board.

All Other NumbersOn the Main Board.

Note: Schematic part location numbers may not always match with the part descriptions.
The part descriptions are correct and should be used.

Schematic Location	Part No.	Description
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CAPACITORS

NOTES:

Read description of the Capacitor as follows:

(Example)

CERAMIC	100P	K	50V	
				Rated Voltage
				Tolerance Symbols:
				less than 10PF
				A ..Not specified
				B ..±0.1PF C ..±0.25PF
				D ..±0.5PF F ..±1PF
				G ..±2PF R ..+0.25 - 0PF
				S ..+0 - 0.25PF E ..+0 - 1PF
				more than 10PF
				A ..Not specified
				B ..±0.1% C ..±0.25%
				D ..±0.5% F ..±1%
				G ..±2% H ..±3%
				J ..±5% K ..±10%
				L ..±15% M ..±20%
				N ..±30% P ..+100 - 0%
				Q ..+30 - 10% T ..+50 - 10%
				U ..+75 - 10% V ..+20 - 10%
				W ..+100 - 10% X ..+40 - 20%
				Y ..+150 - 10% Z ..+80 - 20%
				Rated Value: P...Pico Farad U...Micro Farad

Material:

CERAMICCeramic
MT-PAPERMetalized Paper
POLYESTER ...Polyester
MT-POLYEST ...Metalized Polyester
POLYPROPolypropylene
MT-POLYPRO ...Metalized Polypropylene
COMPO-FILM ...Composite Film
MT-COMPO ...Metalized Composite
STYRENEStyrene
TA-SOLIDTantalum Solid
AL-SOLIDAluminum Solid
ELECTElectrolytic
NP-ELECTNon-Polarized Electrolytic
OS-SOLIDAluminum Solid with Organic
Semiconductive Electrolytic

Schematic Location	Part No.	Description
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C001	404 084 4204	ELECT 4.7U M 50V
C008	404 084 3108	ELECT 330U M 16V
C011	404 084 3009	ELECT 220U M 16V
C101	404 091 6406	ELECT 220U M 6.3V
C103	403 224 6108	CERAMIC 0.01U K 50V
C106	404 084 4105	ELECT 3.3U M 50V
C131	404 084 3801	ELECT 1U M 50V
C132	403 224 6108	CERAMIC 0.01U K 50V
C133	403 224 6108	CERAMIC 0.01U K 50V
C134	403 224 5705	CERAMIC 1000P K 50V
C137	403 364 7508	CERAMIC 10P J 50V
C142	403 343 4603	CERAMIC 0.022U K 50V
C143	403 224 6108	CERAMIC 0.01U K 50V
C146	403 224 6108	CERAMIC 0.01U K 50V
C147	404 084 2507	ELECT 47U M 10V
C151	404 084 3702	ELECT 0.47U M 50V
C153	404 084 3702	ELECT 0.47U M 50V
C161	403 357 9601	CERAMIC 0.1U Z 50V
C211	404 084 4204	ELECT 4.7U M 50V
C212	404 084 4006	ELECT 2.2U M 50V
C252	404 086 6602	POLYESTER 0.047U K 63V
C253	404 084 3702	ELECT 0 .47U M 50V
C256	404 084 3801	ELECT 1U M 50V
C257	403 224 6108	CERAMIC 0.01U K 50V
C258	404 084 3207	ELECT 47U M 16V
C272	404 084 4105	ELECT 3.3U M 50V
C284	404 084 3009	ELECT 220U M 16V
C401	404 087 1903	ELECT 330U M 10V
C403	404 086 6800	POLYESTER 6800P J 63V
C405	404 084 6901	NP-ELECT 1U M 50V
C406	403 076 4000	CERAMIC 4700P K 500V
C408	404 085 4609	ELECT 47U M 35V
★ C411	403 372 7309	MT-POLYPRO 6000P H 1.5K
	404 083 1709	MT-POLYPRO 6000P H 1.5K

Schematic Location	Part No.	Description
★ C417	403 346 7027	MT-POLYPRO 0.24U J 250V
	403 372 6708	MT-POLYPRO 0.24U J 250V
	404 081 2500	MT-POLYPRO 0.24U M 200V
C421	404 091 6406	ELECT 220U M 6.3V
C426	403 224 6108	CERAMIC 0.01U K 50V
C484	404 084 4204	ELECT 4.7U M 50V
C493	404 056 5307	NP-ELECT 2.2U M 100V
C497	404 084 2507	ELECT 47U M 10V
C501	404 084 3900	ELECT 10U M 50V
C502	404 084 4402	ELECT 220U M 35V
C503	404 085 4401	ELECT 10U M 25V
C504	404 084 2903	ELECT 1000U M 16V
C505	404 084 5706	MT-POLYEST 0.47UJ 63V
C506	404 086 5605	POLYESTER 0.018U J 63V
C508	403 028 1705	CERAMIC 56P J 50V
C509	404 084 5706	MT-POLYEST 0.47UJ 63V
★ C511	403 057 3107	POLYESTER 0.1U K 50V
	403 311 8909	POLYESTER 0.1U K 50V
C516	404 084 3801	ELECT 1U M 50V
★ C601	404 089 1703	MT-POLYEST 0.22U M 275V
★ C606	404 088 3500	CERAMIC 470P M 250V
	404 088 8406	CERAMIC 470P M 250V
★ C608	403 222 1303	CERAMIC 1000P K 1K
	403 262 1806	CERAMIC 1000P K 1K
	403 271 9602	CERAMIC 1000P K 1K
★ C609	404 055 9801	ELECT 220U M 200V
	404 069 0306	ELECT 220U M 200V
C612	404 090 5905	POLYESTER 1500P J 63V
C613	404 090 9002	POLYESTER 3300P J 63V
C614	404 084 5003	POLYESTER 0.01UJ 63V
★ C624	403 075 7101	CERAMIC 1000P K 500V
★ C625	403 262 2308	CERAMIC 1200P K 1K
	403 266 4902	CERAMIC 1200P K 1K
C626	404 084 2903	ELECT 1000U M 16V
C627	404 084 4501	ELECT 470U M 35V
C628	404 080 0606	ELECT 100U M 160V
C629	404 084 3009	ELECT 220U M 16V
C630	404 084 3801	ELECT 1U M 50V
★ C632	404 088 3005	CERAMIC 2200P M 250V
	404 088 7201	CERAMIC 2200P M 250V
C683	404 088 5702	ELECT 22U M 16V
C693	404 086 5100	POLYESTER 0.1U J 63V
C701	403 235 1000	CERAMIC 220P J 50V
C711	403 235 1000	CERAMIC 220P J 50V
C721	403 235 1000	CERAMIC 220P J 50V
★ C742	403 077 2807	CERAMIC 1000P Z 2K
C801	403 224 6108	CERAMIC 0.01U K 50V
C802	404 084 3207	ELECT 47U M 16V
C805	404 084 2200	ELECT 100U M 6.3V
C807	403 234 9809	CERAMIC 18P J 50V
C808	403 234 9809	CERAMIC 18P J 50V
C822	404 084 2705	ELECT 10U M 16V
C831	404 084 3801	ELECT 1U M 50V
C834	403 224 6108	CERAMIC 0.01U K 50V

Schematic Location	Part No.	Description
C891	404 084 6901	NP-ELECT 1U M 50V
C892	403 224 5705	CERAMIC 1000P K 50V
C894	403 323 3602	CERAMIC 0.047U K 50V
C896	404 084 4006	ELECT 2.2U M 50V
C1001	404 084 2705	ELECT 10U M 16V
C1002	404 091 6604	ELECT 4.7U M 25V
C1902	404 084 2200	ELECT 100U M 6.3V
DIODES		
D101	408 047 6205	ZENER DIODE MTZJ36A (36V)
D351	408 047 6502	ZENER DIODE MTZJ5.1A (5.1V)
D408	407 222 4401	ZENER DIODE 1Z150 (150V)
★ D421	407 158 1307	ZENER DIODE HZ11B2L (11V)
★ D422	407 158 1307	ZENER DIODE HZ11B2L (11V)
D428	407 054 4808	ZENER DIODE RD13EB3 (13V)
	407 099 3309	ZENER DIODE MTZJ13C (13V)
D429	407 013 4306	DIODE 1S2076A
	407 013 7109	DIODE 1S2473
	408 008 2406	DIODE 1N4148
D482	407 011 4407	DIODE TVR1G
D486	408 047 2306	ZENER DIODE MTZJ10B (10V)
D487	407 005 7308	DIODE EM01Z
	407 005 8602	DIODE ERA15-02
	407 088 6502	DIODE MPG06D
D490	408 047 7707	ZENER DIODE MTZJ5.6C (5.6V)
D501	407 005 7308	DIODE EM01Z
	407 005 8602	DIODE ERA15-02
	407 088 6502	DIODE MPG06D
★ D601	407 005 7605	DIODE EM2B
	407 013 3200	DIODE 1S1887A
	408 008 8606	DIODE GP15G
★ D602	407 005 7605	DIODE EM2B
	407 013 3200	DIODE 1S1887A
	408 008 8606	DIODE GP15G
★ D603	407 005 7605	DIODE EM2B
	407 013 3200	DIODE 1S1887A
	408 008 8606	DIODE GP15G
★ D604	407 005 7605	DIODE EM2B
	407 013 3200	DIODE 1S1887A
	408 008 8606	DIODE GP15G
★ D612	407 231 2801	PHOTO COUPLE PC123YC2
D613	407 057 9800	ZENER DIODE RD9.1EB3 (9.1V)
	407 063 9702	ZENER DIODE MTZJ9.1C (9.1V)
D614	407 006 0100	DIODE ERA91-02
★ D624	407 106 2806	DIODE RU3YX
★ D625	407 007 7702	DIODE EU2A
D626	407 007 7801	DIODE EU2Z
D680	407 013 4306	DIODE 1S2076A
	407 013 7109	DIODE 1S2473
	408 008 2406	DIODE 1N4148
D693	407 099 5600	ZENER DIODE MTZJ6.8A (6.8V)
D801	407 013 4306	DIODE 1S2076A
	407 013 7109	DIODE 1S2473
	408 008 2406	DIODE 1N4148

Schematic Location	Part No.	Description
D802	407 013 4306	DIODE 1S2076A
	407 013 7109	DIODE 1S2473
	408 008 2406	DIODE 1N4148
D831	407 222 5903	ZD UDZS-TE-173.6B (3.6V)
D834	408 047 6502	ZENER DIODE MTZJ5.1A (5.1V)
	408 047 6809	ZENER DIODE MTZJ5.1B (5.1V)
D836	407 149 0807	DIODE 1SS355 TE-17
D843	407 149 0807	DIODE 1SS355 TE-17

INTEGRATED CIRCUITS

IC001	409 489 0103	IC LA4224
★ IC101	409 535 6905	IC LA76843NM-TBM
★ IC501	409 507 0900	IC LA78040N
	409 510 1109	IC TDA9302H
★ IC601	409 172 8003	IC SE136N
IC681	409 528 6202	IC PQ050ES1MXP
IC801	410 455 5107	IC LC863424V-****-TLM
IC802	409 333 3700	IC 24LC02B/P
	409 376 1503	IC ST24C02B6
	409 440 8902	IC M24C02-BN6
	409 495 6908	IC CAT24WC02P
	409 528 8404	IC S524A40X21-DCB0

COILS

★ LF601	645 052 4073	LINE FILTER
	645 057 2791	LINE FILTER
L256	645 003 9713	INDUCTOR, 15U K
	645 016 2657	INDUCTOR, 15U K
L402	652 000 2180	CORE, PIPE
L623	610 078 6820	PIPE CORE
	652 000 1282	CORE, PIPE
L701	610 029 8248	PEAKING COIL 150UH K
	645 001 4796	INDUCTOR, 150U K
L801	645 008 2894	INDUCTOR, 5.6U K
	645 016 3104	INDUCTOR, 5.6U K
L811	645 006 2490	INDUCTOR, 1U K
	645 016 2411	INDUCTOR, 1U K
L812	645 006 2490	INDUCTOR, 1U K
	645 016 2411	INDUCTOR, 1U K
★ L901	645 033 1640	COIL, DEGAUSSING
★ L902	610 003 5270	DEFLECTION YOKE
	610 003 5287	DEFLECTION YOKE

TRANSISTORS

Q401	405 018 0507	TR 2SC3332-R
	405 018 0606	TR 2SC3332-S
★ Q402	406 017 1809	TR TT2138LS-YB11
Q486	405 023 5009	TR 2SD400-E-MP
	405 023 5306	TR 2SD400-F-MP
Q490	405 023 5009	TR 2SD400-E-MP
	405 023 5306	TR 2SD400-F-MP

Schematic Location	Part No.	Description
★ Q601	405 166 7601	TR 2SK2872
	406 017 5500	TR 2SK2618LS-CE11
Q613	405 016 9502	TR 2SC3069
Q627	405 009 6907	TR 2SB985-S
	405 009 7003	TR 2SB985-T
	405 089 0000	TR 2SA1707-S
	405 089 0109	TR 2SA1707-T
Q681	405 011 8401	TR 2SC1740S-Q
	405 011 8500	TR 2SC1740S-R
	405 011 8609	TR 2SC1740S-S
	405 012 2002	TR 2SC1815-GR
	405 012 2101	TR 2SC1815-O
	405 012 2309	TR 2SC1815-Y
	405 020 7501	TR 2SC945A-PA
	405 020 7709	TR 2SC945A-QA
	405 020 7907	TR 2SC945A-RA
	405 151 8705	TR 2SC536NG-NPA
	405 157 0505	TR 2SC536NF-NPA
Q693	405 011 8401	TR 2SC1740S-Q
	405 011 8500	TR 2SC1740S-R
	405 011 8609	TR 2SC1740S-S
	405 012 2002	TR 2SC1815-GR
	405 012 2101	TR 2SC1815-O
	405 012 2309	TR 2SC1815-Y
	405 020 7501	TR 2SC945A-PA
	405 020 7709	TR 2SC945A-QA
	405 020 7907	TR 2SC945A-RA
	405 151 8705	TR 2SC536NG-NPA
	405 157 0505	TR 2SC536NF-NPA
Q695	405 001 7605	TR 2SA1015-Y(SAN)
	405 004 3208	TR 2SA564A-R(CU)
	405 004 4809	TR 2SA608-F-CTV-NP
Q701	405 010 6507	TR 2SC1473NC-P
	405 010 6606	TR 2SC1473NC-Q
	405 010 6705	TR 2SC1473NC-R
Q711	405 010 6507	TR 2SC1473NC-P
	405 010 6606	TR 2SC1473NC-Q
	405 010 6705	TR 2SC1473NC-R
Q721	405 010 6507	TR 2SC1473NC-P
	405 010 6606	TR 2SC1473NC-Q
	405 010 6705	TR 2SC1473NC-R
Q831	405 002 0308	TR 2SA1037K-T-96-R
	405 002 0407	TR 2SA1037K-T-96-S
	405 002 6726	TR 2SA1179-M6
	405 002 6924	TR 2SA1179-M7-TB
	405 134 5925	TR 2SA1037AK T146 R
	405 147 2205	TR 2SA1037AK T146 S
	405 163 1503	TR 2SA1179N-M6-TB
	405 163 2708	TR 2SA1179N-M7-TB

Schematic Location	Part No.	Description
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★ R401	401 012 4503	CARBON	100 JA	1/4W
★ R402	401 013 4205	CARBON	120 JA	1/4W
R405	401 162 4101	MT-GLAZE	5.6K JA	1/10W
R407	401 010 3102	CARBON	470 JA	1/2W
★ R421	401 053 2605	MT-FILM	3.3K FA	1/6W
★ R422	401 052 6802	MT-FILM	10K FA	1/6W
★ R423	401 053 2605	MT-FILM	3.3K FA	1/6W
R428	401 024 9701	CARBON	12K JA	1/6W
R441	401 150 6209	MT-GLAZE	1K JA	1/10W
R442	401 150 5905	MT-GLAZE	10K JA	1/10W
R443	401 150 5905	MT-GLAZE	10K JA	1/10W
R444	401 150 5905	MT-GLAZE	10K JA	1/10W
R449	401 265 1700	MT-GLAZE	4.7K FA	1/10W
★ R482	401 011 9004	CARBON	1 JB	1/4W
R485	401 256 7209	MT-GLAZE	18K JA	1/10W
★ R486	401 061 8903	OXIDE-MT	4.7 JA	1W
R487	401 026 6609	CARBON	390 JA	1/6W
★ R488	401 063 4606	OXIDE-MT	8.2 JA	1W
R489	401 010 2501	CARBON	47 JA	1/2W
R490	401 026 6609	CARBON	390 JA	1/6W
R491	401 024 7004	CARBON	1K JA	1/6W
R492	401 156 8504	MT-FILM	33K FA	1/6W
R493	401 020 3901	CARBON	470K JA	1/4W
★ R497	401 061 0808	OXIDE-MT	3.9 JA	1W
★ R499A	401 064 6302	OXIDE-MT	10 JA	2W
R503	401 026 7002	CARBON	3.9K JA	1/6W
R504	401 026 9907	CARBON	4.7K JA	1/6W
R505	401 006 8401	CARBON	1.5 JA	1/2W
R506	401 025 7409	CARBON	220 JA	1/6W
R507	401 006 8401	CARBON	1.5 JA	1/2W
R508	401 024 9701	CARBON	12K JA	1/6W
R509	401 027 2600	CARBON	5.6K JA	1/6W
★ R511	401 059 6706	OXIDE-MT	180 JA	1W
R513	401 016 3809	CARBON	2.2K JA	1/4W
R517	401 025 4606	CARBON	18K JA	1/6W
R518	401 025 4606	CARBON	18K JA	1/6W
★ R601A	402 072 2607	WIRE WOUND	1 KA	5W
	402 088 9102	WIRE WOUND	1 KA	6W
	402 088 9607	WIRE WOUND	1 KA	5W
★ R602	402 000 1603	SOLID	3.3M MA	1/2W
	402 088 1502	RESISTER	3.3M JA	1/2W
	402 090 2108	RESISTER	3.3M JA	1/2W
R603	401 021 5003	CARBON	560K JA	1/4W
★ R604	401 066 3002	OXIDE-MT	2.2 JA	2W
R605	401 021 5003	CARBON	560K JA	1/4W
★ R607	402 059 4600	FUSIBLE RES	22 J-	1/2W
R611	401 027 0309	CARBON	47K JA	1/6W
★ R612	402 001 8502	FUSIBLE RES	10 J-	1/2W
★ R613	401 180 8402	OXIDE-MT	0.47 JA	2W
R615	401 011 1602	CARBON	680 JA	1/2W
R616	401 150 5905	MT-GLAZE	10K JA	1/10W
★ R617	402 001 8106	FUSIBLE RES	680 J-	1/4W
R618	401 020 0801	CARBON	470 JA	1/4W
R627	401 150 5905	MT-GLAZE	10K JA	1/10W

Read description of the Resistor as follows:

CARBON **4.7K** **J** **A** **1/4W**

Rated Wattage

Performance Symbols:
A...General B...Non-flammable
Z...Low noise
Other...Temperature coefficient

Tolerance Symbols:
A...0.05% B...0.1% C...0.25%
D...0.5% F...1% G...2%
J...5% K...10% M...20%
P...+5 -15%

Rated Value, ohms:
K...1,000 M...1,000,000

Material:
CARBONCarbon
MT-FILMMetal Film
OXIDE-MTOxide Metal Film
SOLIDComposition
MT-GLAZEMetal Glaze
WIRE WOUND ...Wire Wound
CERAMIC RES ...Ceramic
FUSIBLE RES ...Fusible

R001	401 027 2600	CARBON	5.6K JA	1/6W
R003	401 162 2800	MT-GLAZE	1.8K JA	1/10W
★ R106	401 061 4400	OXIDE-MT	33K JA	1W
R131	401 150 5905	MT-GLAZE	10K JA	1/10W
R133	401 255 6401	MT-GLAZE	3K JA	1/10W
R142	401 026 4605	CARBON	33K JA	1/6W
R143	401 150 6209	MT-GLAZE	1K JA	1/10W
R150	401 027 9302	CARBON	820K JA	1/6W
R151	401 152 3206	MT-GLAZE	330 JA	1/10W
R161	401 150 5806	MT-GLAZE	100K JA	1/10W
R162	401 150 5806	MT-GLAZE	100K JA	1/10W
R163	401 150 6001	MT-GLAZE	0.000 ZA	1/10W
R165	401 162 2701	MT-GLAZE	180 JA	1/10W
R166	401 256 7506	MT-GLAZE	390 JA	1/10W
R212	401 256 7100	MT-GLAZE	680K JA	1/10W
R251	401 162 3005	MT-GLAZE	22K JA	1/10W
R252	401 162 3005	MT-GLAZE	22K JA	1/10W
R272	401 027 5502	CARBON	6.8K JA	1/6W
R273	401 150 5905	MT-GLAZE	10K JA	1/10W
R276	401 024 9701	CARBON	12K JA	1/6W
R281	401 024 7400	CARBON	10K JA	1/6W
R284	401 026 9303	CARBON	47 JA	1/6W
R286	401 256 0705	MT-GLAZE	33 JA	1/10W
R287	401 256 0705	MT-GLAZE	33 JA	1/10W
R288	401 256 0705	MT-GLAZE	33 JA	1/10W
R301	401 150 5905	MT-GLAZE	10K JA	1/10W
R353	401 024 7400	CARBON	10K JA	1/6W
R400	401 024 6700	CARBON	100 JA	1/6W

Schematic Location	Part No.	Description	
R628	401 013 5301	CARBON	1.2K JA 1/4W
R654	401 018 2909	CARBON	330 JB 1/4W
R683	401 025 7805	CARBON	2.2K JA 1/6W
R690	401 024 7400	CARBON	10K JA 1/6W
R692	401 255 9501	MT-GLAZE	220K JA 1/10W
R693	401 256 5106	MT-GLAZE	560K JA 1/10W
R694	401 024 7400	CARBON	10K JA 1/6W
R695	401 162 3005	MT-GLAZE	22K JA 1/10W
R701	401 026 0607	CARBON	270 JA 1/6W
R703	401 162 2404	MT-GLAZE	1.2K JA 1/10W
R704	401 255 9006	MT-GLAZE	82 JA 1/10W
R706	401 009 1508	CARBON	2.7K JA 1/2W
★ R707	401 058 9807	OXIDE-MT	12K JA 1W
R711	401 026 0607	CARBON	270 JA 1/6W
R713	401 162 2404	MT-GLAZE	1.2K JA 1/10W
R716	401 009 1508	CARBON	2.7K JA 1/2W
★ R717	401 058 9807	OXIDE-MT	12K JA 1W
R718	401 255 9006	MT-GLAZE	82 JA 1/10W
R721	401 026 0607	CARBON	270 JA 1/6W
R723	401 024 9305	CARBON	1.2K JA 1/6W
R726	401 009 1508	CARBON	2.7K JA 1/2W
★ R727	401 058 9807	OXIDE-MT	12K JA 1W
R728	401 255 9006	MT-GLAZE	82 JA 1/10W
R801	401 256 5809	MT-GLAZE	270K JA 1/10W
R803	401 024 6700	CARBON	100 JA 1/6W
R804	401 255 6500	MT-GLAZE	100 JA 1/10W
R806	401 162 3708	MT-GLAZE	4.7K JA 1/10W
R807	401 150 5905	MT-GLAZE	10K JA 1/10W
R808	401 150 5905	MT-GLAZE	10K JA 1/10W
R809	401 162 3708	MT-GLAZE	4.7K JA 1/10W
R823	401 024 6700	CARBON	100 JA 1/6W
R829	401 024 6700	CARBON	100 JA 1/6W
R831	401 150 5905	MT-GLAZE	10K JA 1/10W
R832	401 150 5905	MT-GLAZE	10K JA 1/10W
R833	401 152 3206	MT-GLAZE	330 JA 1/10W
R834	401 150 5806	MT-GLAZE	100K JA 1/10W
R837	401 024 7400	CARBON	10K JA 1/6W
R846	401 150 5905	MT-GLAZE	10K JA 1/10W
R847	401 256 7308	MT-GLAZE	6.8K JA 1/10W
R848	401 256 7308	MT-GLAZE	6.8K JA 1/10W
R849	401 027 5502	CARBON	6.8K JA 1/6W
R851	401 256 5908	MT-GLAZE	2.7K JA 1/10W
R852	401 256 1702	MT-GLAZE	33K JA 1/10W
R856	401 024 6700	CARBON	100 JA 1/6W
R857	401 024 6700	CARBON	100 JA 1/6W
R862	401 255 6500	MT-GLAZE	100 JA 1/10W
R863	401 150 6001	MT-GLAZE	0.000 ZA 1/10W
R864	401 256 0200	MT-GLAZE	120K JA 1/10W
R865	401 024 7004	CARBON	1K JA 1/6W
R886	401 150 5905	MT-GLAZE	10K JA 1/10W
R892	401 162 2909	MT-GLAZE	220 JA 1/10W
R893	401 255 6500	MT-GLAZE	100 JA 1/10W
R894	401 255 6005	MT-GLAZE	1M JA 1/10W
R897	401 026 9600	CARBON	470 JA 1/6W

Schematic Location	Part No.	Description	
R898	401 162 3609	MT-GLAZE	470 JA 1/10W
R899	401 162 3807	MT-GLAZE	470K JA 1/10W
R1001	401 255 9501	MT-GLAZE	220K JA 1/10W
R1002	401 256 2709	MT-GLAZE	75 JA 1/10W
R1003	401 150 5905	MT-GLAZE	10K JA 1/10W
R1901	401 150 5905	MT-GLAZE	10K JA 1/10W
R1902	401 150 6209	MT-GLAZE	1K JA 1/10W
R1903	401 162 2800	MT-GLAZE	1.8K JA 1/10W
R1904	401 150 6100	MT-GLAZE	2.2K JA 1/10W
R1905	401 256 7605	MT-GLAZE	3.9K JA 1/10W
R1906	401 162 4101	MT-GLAZE	5.6K JA 1/10W
R1907	401 256 0408	MT-GLAZE	12K JA 1/10W
R1909	401 255 6500	MT-GLAZE	100 JA 1/10W

SWITCHES

SW1901	645 006 9673	SWITCH, PUSH (POWER)
	645 027 7382	SWITCH, PUSH (POWER)
	645 052 2284	SWITCH, PUSH (POWER)
SW1902	645 006 9673	SWITCH, PUSH (VOL +)
	645 027 7382	SWITCH, PUSH (VOL +)
	645 052 2284	SWITCH, PUSH (VOL +)
SW1903	645 006 9673	SWITCH, PUSH (VOL -)
	645 027 7382	SWITCH, PUSH (VOL -)
	645 052 2284	SWITCH, PUSH (VOL -)
SW1904	645 006 9673	SWITCH, PUSH (CH ▲)
	645 027 7382	SWITCH, PUSH (CH ▲)
	645 052 2284	SWITCH, PUSH (CH ▲)
SW1905	645 006 9673	SWITCH, PUSH (CH ▼)
	645 027 7382	SWITCH, PUSH (CH ▼)
	645 052 2284	SWITCH, PUSH (CH ▼)
SW1906	645 006 9673	SWITCH, PUSH (MENU)
	645 027 7382	SWITCH, PUSH (MENU)
	645 052 2284	SWITCH, PUSH (MENU)

TRANSFORMERS

T151	645 058 1236	TRANS, OSC 45.75MHZ
T401	652 001 1144	TRANS, DRIVE
★ T402	645 056 7209	TRANS, FLYBACK
★ T601	645 055 5978	TRANS, POWER, PULSE
	652 001 1090	TRANS, POWER, PULSE

CRYSTAL/FILTERS

X141	421 008 9008	SAW F TSF5235P
X251	610 012 0655	CRYSTAL OSCILLATOR
	610 204 4195	CRYSTAL OSCILLATOR
	610 245 9746	CRYSTAL OSCILLATOR
X801	645 004 1938	OSC, CRYSTAL 32.768KHZ
	645 004 1945	OSC, CRYSTAL 32.768KHZ

Schematic Location	Part No.	Description
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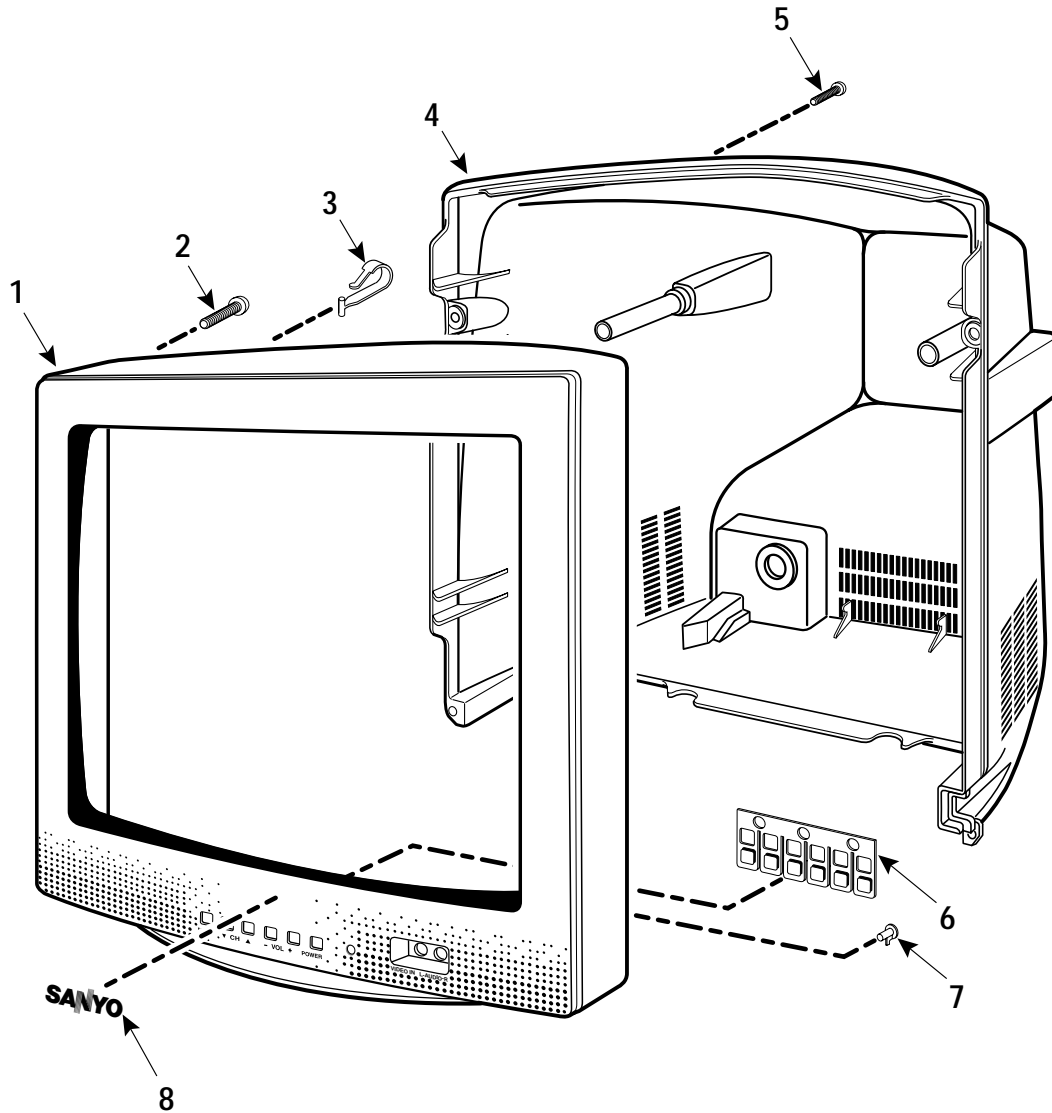
MISCELLANEOUS

★ A101	645 052 6091	TUNER, U/V
A100	610 302 5445	ASSY, PWB, MAIN G8PAM
A700	610 302 5452	ASSY, PWB, SOCKET G8PAM
A1901	645 041 1519	UNIT, REMOCON RECEIVER
	645 044 0519	UNIT, REMOCON RECEIVER
★ F601	423 007 1601	FUSE 125V 4A
	423 007 1809	FUSE 125V 4A
	423 018 8101	FUSE 125V 4A
	423 029 8008	FUSE 125V 4A
F601A	645 000 5077	HOLDER, FUSE
	645 016 0479	HOLDER, FUSE
F601B	645 000 5077	HOLDER, FUSE
	645 016 0479	HOLDER, FUSE
K1001	645 040 5952	JACK, RCA-2
★ K701A	652 001 1106	SOCKET, CRT 8P
★ PS601A	408 000 3203	TH PTH631D01BF7R0M140
★ Q901	413 006 4703	CRT A34JRY24X
	414 007 4808	CRT A34KPU02XX
	414 009 5001	CRT A34KPU02XX
	414 010 3805	CRT A34KPU03XX
	414 010 3904	CRT A34JRY24X (DT)

Schematic Location	Part No.	Description
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Q901A1	610 117 0154	DY SPACER-D4AK
	610 117 7924	DY SPACER
Q901A2	610 117 0154	DY SPACER-D4AK
	610 117 7924	DY SPACER
Q901A3	610 117 0154	DY SPACER-D4AK
	610 117 7924	DY SPACER
Q901C	610 217 7787	CG PURITY MAGNET
SP901	645 028 0870	SPEAKER, 8
★ W601	645 056 9562	CORD, POWER-2.0MK
	645 057 0209	CORD, POWER-2.0MK
★ W902	610 287 6581	ASSY, WIRE GND CONNECTOR
	610 295 3039	ASSY, WIRE GND CONNECTOR

CABINET PARTS LIST



CABINET PARTS LIST

KEY NO.	PARTS NO.	DESCRIPTION
1	610 303 0241	CABINET FRONT ASSY
2	412 000 7604	CRT MTG SCREW 5x30 (4 USED)
3	610 102 7151	DC HOLDER (2 USED)
4	610 303 0265	CABINET BACK
5	412 036 1805	SCREW 4X14 (4 USED)
	OR 411 078 1101	SCREW 4X14 (4 USED)
6	610 303 0227	BUTTON UNIT
7	610 267 0851	CAP RC
8	610 285 5685	SANYO BADGE-SMALL

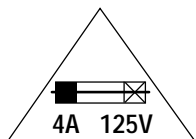
ACCESSORY PARTS LIST

KEY NO.	PARTS NO.	DESCRIPTION
	610 304 6815	OWNER'S MANUAL
	645 051 9390	ANTENNA, ROD
	645 051 8485	RC TRANSMITTER
	OR 645 051 8539	RC TRANSMITTER
	610 290 1221	RC BATTERY COVER
	OR 610 290 1283	RC BATTERT COVER

MAIN BOARD PARTS SIDE



CAUTION



4A 125V

FOR CONTINUED PROTECTION AGAINST A RISK OF FIRE, REPLACE ONLY WITH THE SAME TYPE 4A, 125V FUSE.

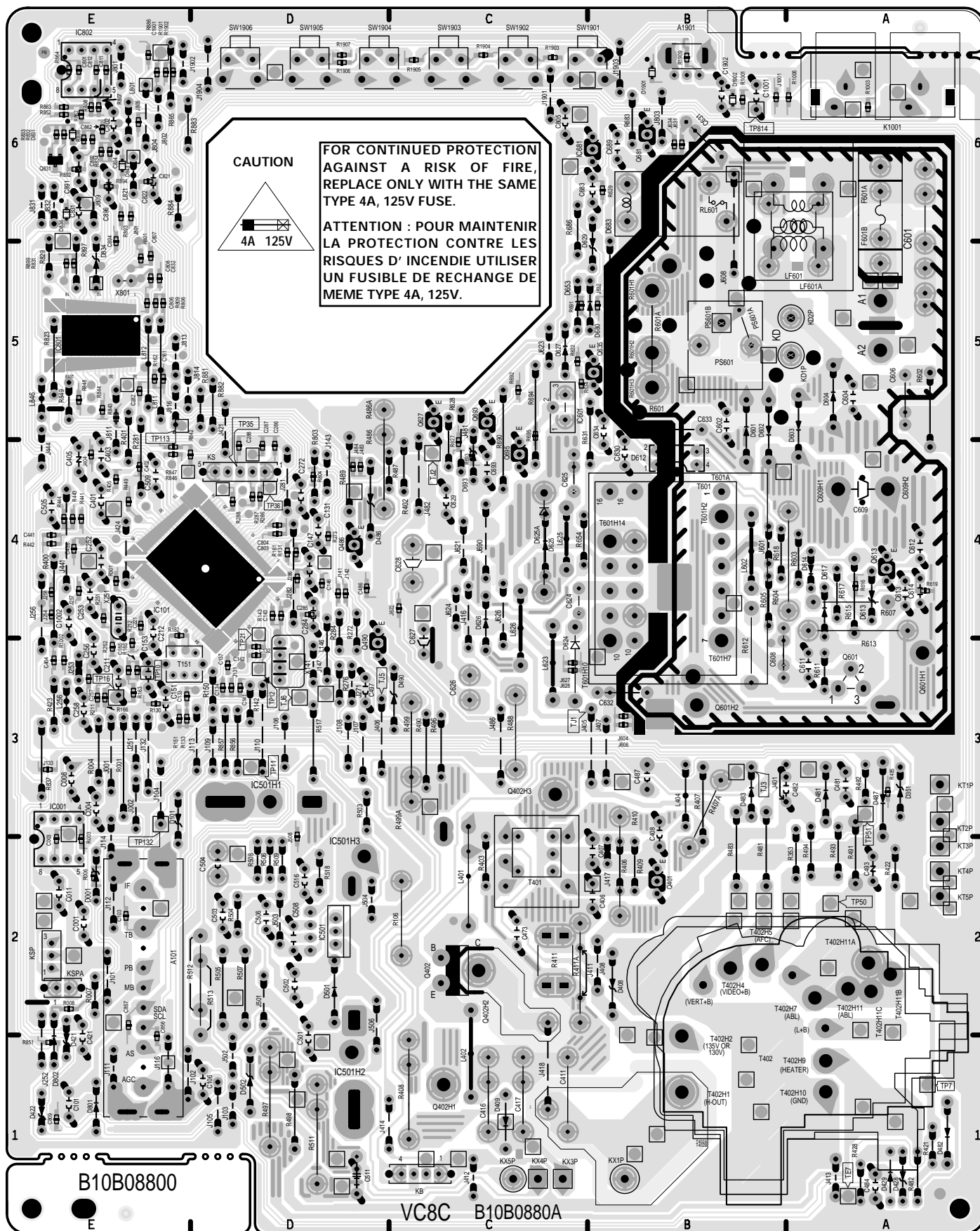
ATTENTION : POUR MAINTENIR LA PROTECTION CONTRE LES RISQUES D' INCENDIE UTILISER UN FUSIBLE DE RECHANGE DE MEME TYPE 4A, 125V.

**MAIN BOARD COMPONENTS AND TEST POINTS
GRID LOCATIONS**

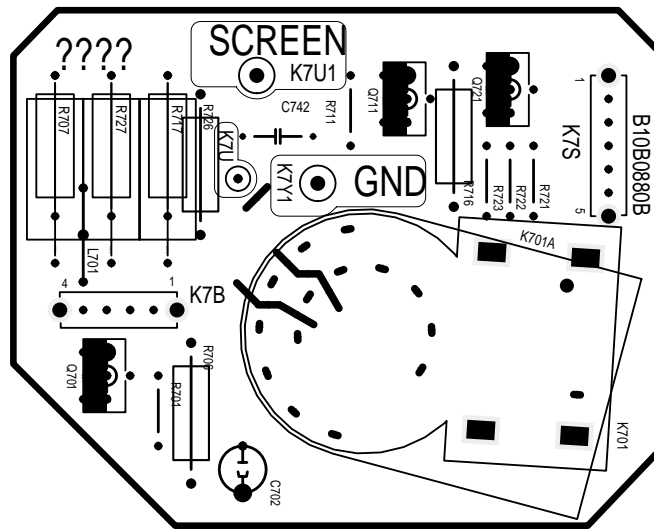
Part	Loc.	Part	Loc.
D429	A1	Q635	B5
D612	B4	Q681	B6
D802	E2	Q693	C5
IC001	E2	Q695	C4
IC101	D4	Q831	E6
IC501	D2	R512	E2
IC601	C5	R513	E2
IC681	B6	TE7	A1
IC801	E5	TP7	A1
IC802	E6	TJ1	B3
Q401	B2	TJ6	D3
Q402	C2	TP16	E3
Q486	D4	TP21	D3
Q490	D3	TP50	A2
Q601	A3	TP51	A2
Q611	A4	T151	E3
Q613	A4		
Q627	C5		

COMPONENT AND TESTPOINT LOCATIONS (Cont.)

MAIN BOARD FOIL SIDE



PICTURE TUBE SOCKET BOARD



PIC TUBE SOCKET BOARD COMPONENTS

Part	Loc.
Q701	N/A
Q711	N/A
Q721	N/A


For parts or service contact
SANYO Fisher Service Corporation
21605 Plummer Street
Chatsworth, CA 91311 (U.S.A.)
300 Applewood Crescent,
Concord, Ontario L4K 5C7 (CANADA)

May / 2003 / 2000 SMC

Printed in U.S.A.

SCHEMATIC DIAGRAMS

NOTES ON SCHEMATIC DIAGRAMS

1. All resistance values in ohms K=1,000 M=1,000,000.
2. Unless otherwise noted on schematic, all capacitor values less than 1 are expressed in µF (Micro Farad), and the values more than 1 are in pF.
3. Unless otherwise noted on schematic, voltage reading taken with VOM from point indicated to chassis ground. Voltage reading taken using color-bar signal VHF channel 5, all controls at normal. Line voltage at 120 volts. Some voltages may vary with signal strength.
4. Waveforms were taken with color-bar signal and controls set for normal picture. Waveforms marked with an * may vary with signal strength.
5. The Symbol  indicates a fusible resistor, which protects the circuit from possible short circuits.

SERVICE NOTES:

1. When replacing parts on circuit boards, clamp the lead wires to terminals before soldering.
2. When replacing high wattage resistors on circuit board, keep the resistor body 10 mm (3/8) from circuit board.
3. Keep wires away from high voltage and high temperature components.

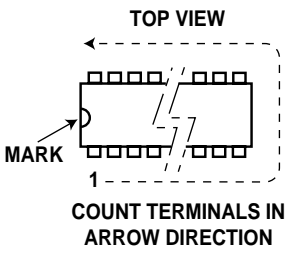
PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A STAR (*) ON THIS SCHEMATIC DIAGRAM DESIGNATE COMPONENTS WHOSE VALUES ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY. SHOULD ANY COMPONENT DESIGNATED BY A STAR NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST. DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

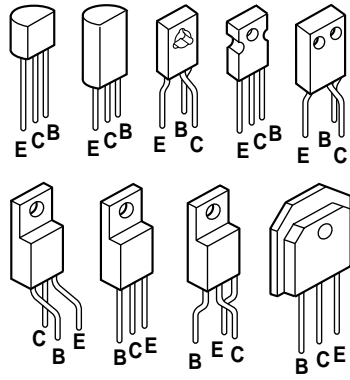
X-RADIATION WARNING NOTE

THIS TV CONTAINS CRITICAL PARTS TO PROTECT AGAINST X-RADIATION. NOMINAL 2ND ANODE VOLTAGE IS 21.0KV AT ZERO BEAM CURRENT AT 120 VOLTS AC LINE, AND MUST NOT EXCEED 22.5KV UNDER ANY OPERATING CONDITION. SEE HIGH VOLTAGE CHECK ON PAGE 7.

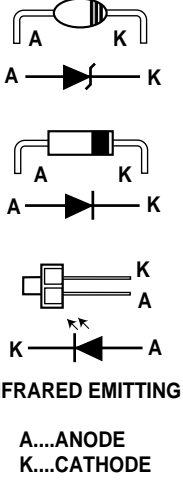
INTEGRATED CIRCUITS



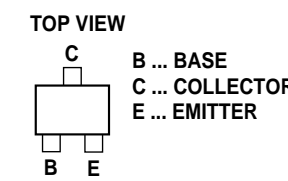
TRANSISTORS



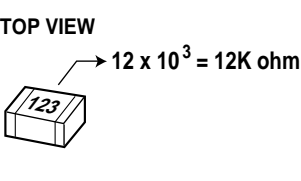
DIODES



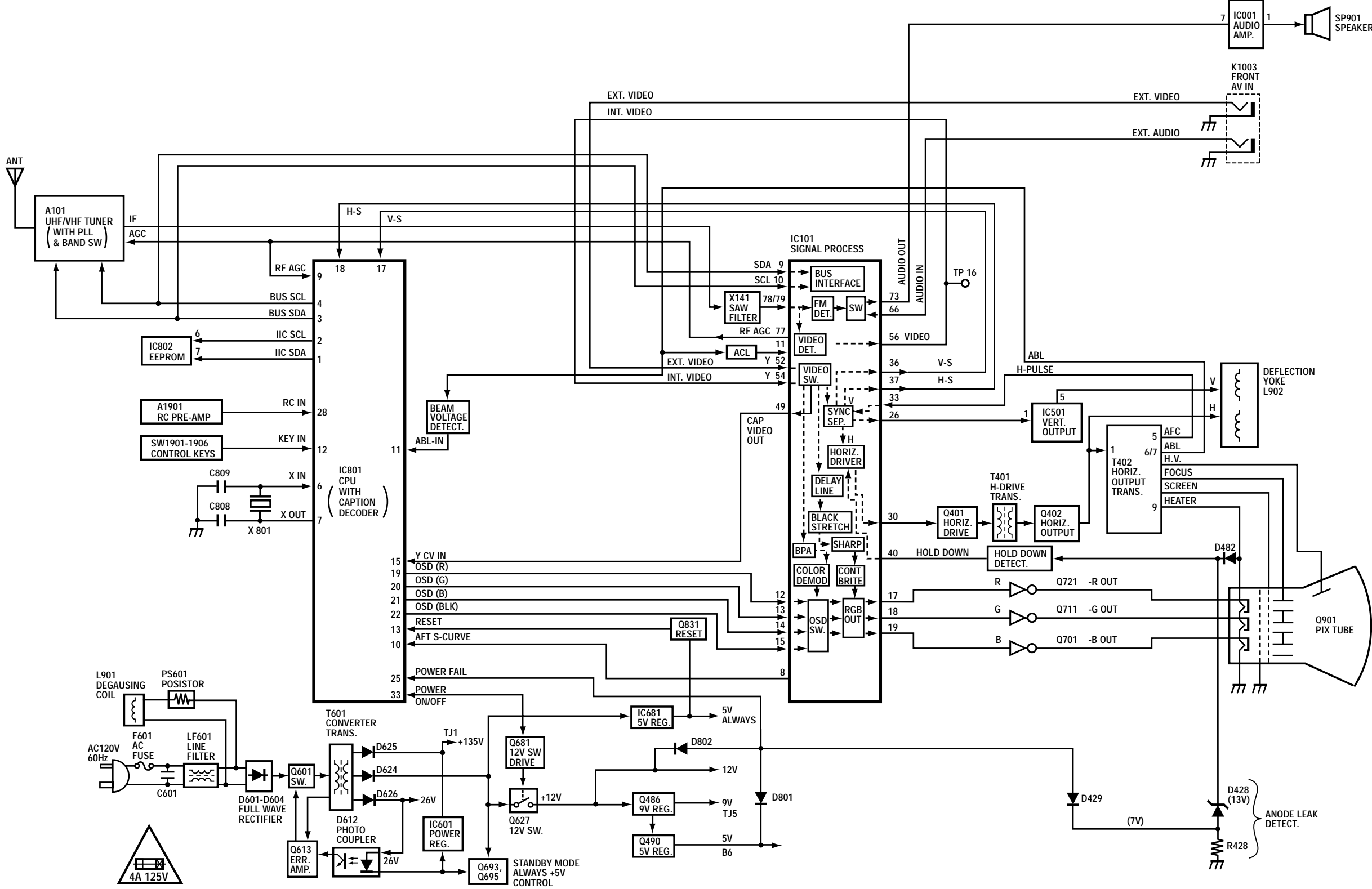
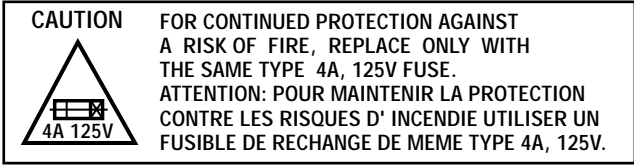
CHIP TRANSISTORS



CHIP RESISTORS



BLOCK DIAGRAM

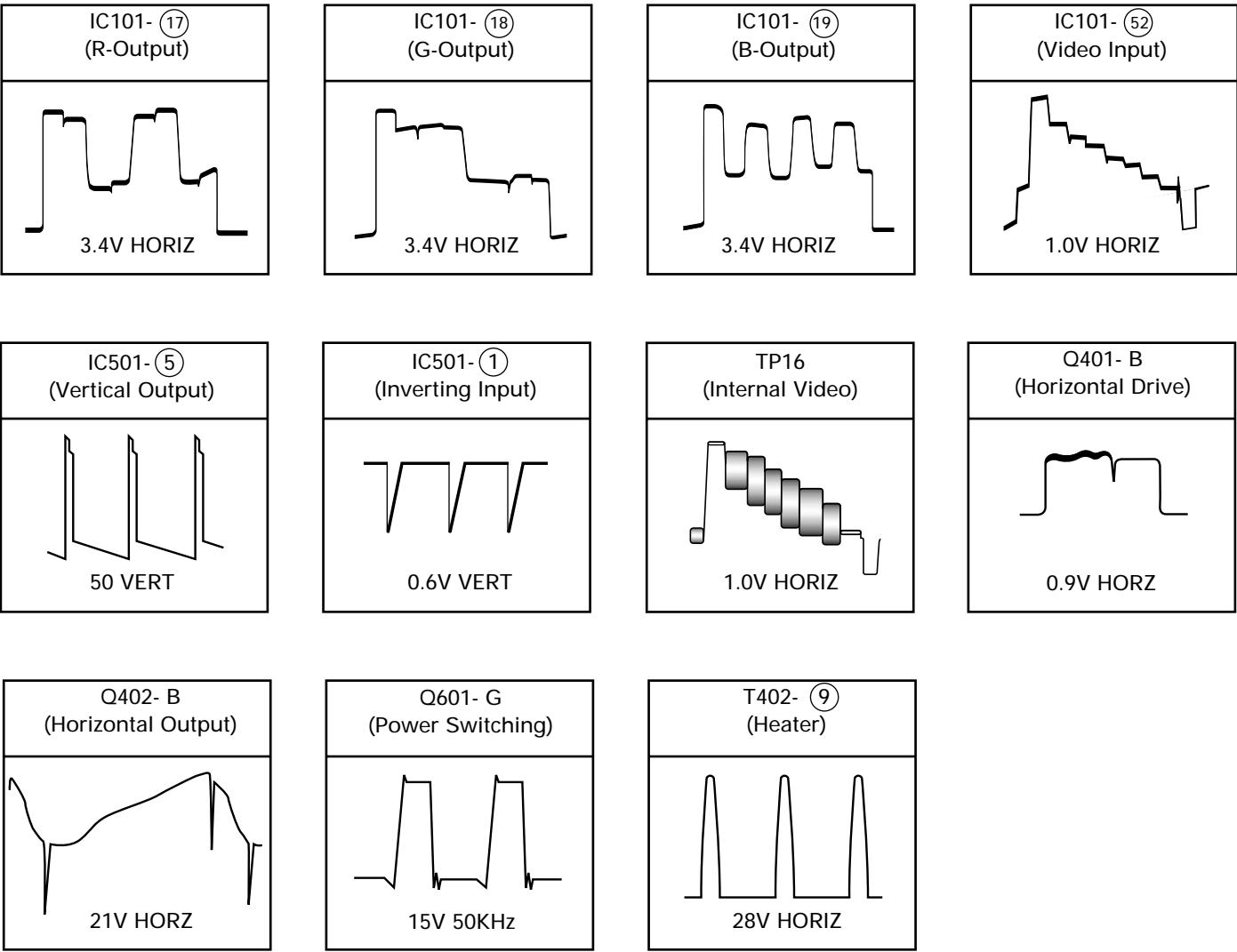


VOLTAGE CHARTS

NOTE: Voltages were measured using color-bar signal and the controls set for normal picture.

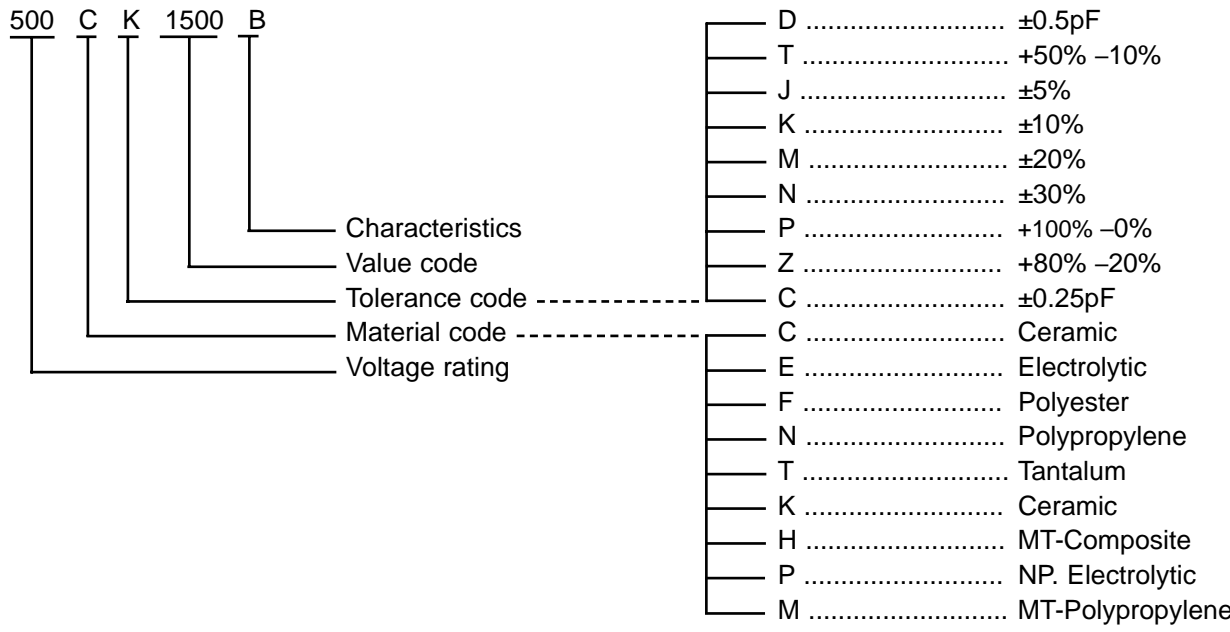
WAVEFORMS

Note: Voltages were measured with offset color-bar signal and controls set for normal picture.

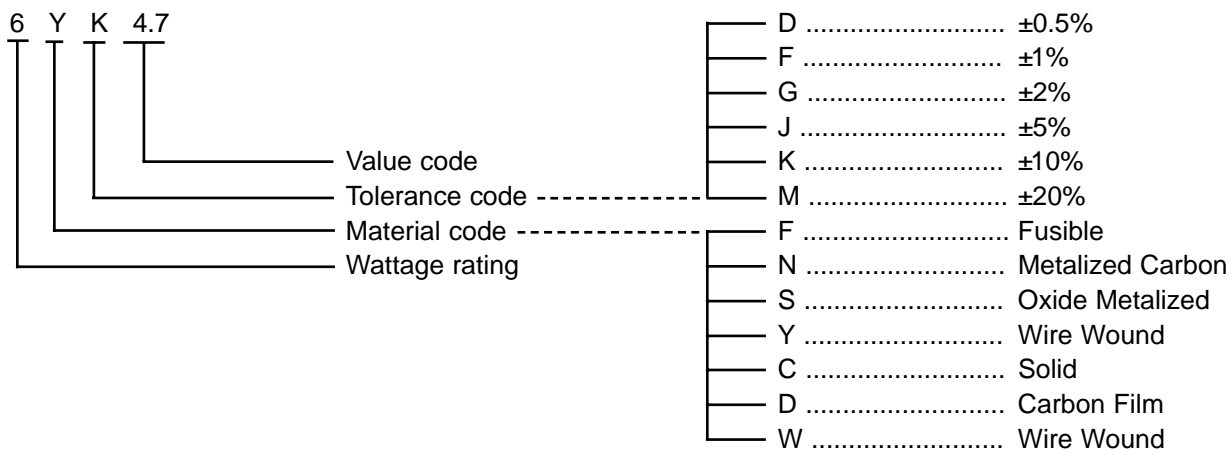


CAPACITOR AND RESISTOR CODE CHART

CAPACITOR (Example)



RESISTOR (Example)



Device/Pin #	Volts/Mode	
D612-1	POWER ON:	POWER OFF:
	26.1	9.7
D612-2	POWER ON:	POWER OFF:
	25.1	8.5
D612-3	POWER ON:	POWER OFF:
	0.2	0.3
D612-4	POWER ON:	POWER OFF:
	5.0	0.2
IC001-1	5.8	
IC001-2	12.8	
IC001-3	N.C.	
IC001-4	GND	
IC001-5	N.C.	
IC001-6	N.C.	
IC001-7	1.6	
IC001-8	GND	
IC101-1	GND	
IC101-2	GND	
IC101-3	GND	
IC101-4	GND	
IC101-5	GND	
IC101-6	5.1	
IC101-7	2.4	
IC101-8	2.4	
IC101-9	4.5	
IC101-10	4.5	
IC101-11	3.8	
IC101-12	0.1	
IC101-13	0.1	
IC101-14	0.1	
IC101-15	0.2	
IC101-16	8.2	
IC101-17	2.5	
IC101-18	2.4	
IC101-19	2.5	
IC101-20	GND	
IC101-21	GND	
IC101-22	GND	
IC101-23	GND	
IC101-24	GND	
IC101-25	N.C.	
IC101-26	2.1	
IC101-27	2.6	
IC101-28	5.3	
IC101-29	2.7	
IC101-30	0.4	
IC101-31	GND	
IC101-32	N.C.	
IC101-33	1.0	
IC101-34	1.8	
IC101-35	N.C.	

Device/Pin #	Volts/Mode
IC101-36	5.0
IC101-37	4.3
IC101-38	4.7
IC101-39	GND
IC101-40	0
IC101-41	GND
IC101-42	GND
IC101-43	GND
IC101-44	2.0
IC101-45	3.4
IC101-46	1.8
IC101-47	2.8
IC101-48	GND
IC101-49	2.2
IC101-50	GND
IC101-51	GND
IC101-52	2.5
IC101-53	4.9
IC101-54	2.7
IC101-55	2.5
IC101-56	2.2
IC101-57	GND
IC101-58	3.6
IC101-59	4.4
IC101-60	4.4
IC101-61	GND
IC101-62	GND
IC101-63	GND
IC101-64	GND
IC101-65	2.4
IC101-66	2.2
IC101-67	2.2
IC101-68	2.4
IC101-69	3.2
IC101-70	GND
IC101-71	GND
IC101-72	GND
IC101-73	2.3
IC101-74	GND
IC101-75	2.2
IC101-76	2.6
IC101-77	2.6
IC101-78	2.9
IC101-79	2.9
IC101-80	GND
IC501-1	2.5
IC501-2	25.9
IC501-3	2.9
IC501-4	GND
IC501-5	11.5
IC501-6	26.5
IC501-7	2.6

Device/Pin #	Volts/Mode
IC601-1	136.0
IC601-2	29.2
IC601-3	GND
IC681-1	13.4
IC681-2	GND
IC681-3	5.0
IC801-1	5.0
IC801-2	5.0
IC801-3	4.4
IC801-4	4.3
IC801-5	GND
IC801-6	1.9
IC801-7	2.7
IC801-8	5.0
IC801-9	2.7
IC801-10	2.4
IC801-11	0
IC801-12	0
IC801-13	4.9
IC801-14	3.5
IC801-15	2.7
IC801-16	4.6
IC801-17	5.1
IC801-18	4.3
IC801-19	0
IC801-20	0
IC801-21	0
IC801-22	0.4
IC801-23	4.9
IC801-24	4.9
IC801-25	4.9
IC801-26	GND
IC801-27	GND
IC801-28	4.9
IC801-29	GND
IC801-30	GND
IC801-31	GND
IC801-32	GND
IC801-33	POWER ON: 4.9 POWER OFF: 0
IC801-34	N.C.
IC801-35	4.9
IC801-36	5.0
IC802-1	GND
IC802-2	GND
IC802-3	GND
IC802-4	GND
IC802-5	4.9
IC802-6	4.9
IC802-7	GND
IC802-8	5.0

Device/Pin #	Volts/Mode
Q401-B	0.3
Q401-C	17.7
Q401-E	GND
Q402-B	2.9
Q402-C	N/A
Q402-E	3.0
Q486-B	9.9
Q486-C	10.5
Q486-E	9.2
Q490-B	5.9
Q490-C	6.7
Q490-E	5.2
Q601-G	POWER ON: 4.0 POWER OFF: 0.3
Q601-D	POWER ON: 156 POWER OFF: 169
Q601-S	POWER ON: 0.2 POWER OFF: 0
Q613-B	POWER ON: 0.2 POWER OFF: 0.1
Q613-C	POWER ON: 3.9 POWER OFF: 0.1
Q613-E	GND
Q627-B	POWER ON: 12.7 POWER OFF: 8.0
Q627-C	POWER ON: 13.2 POWER OFF: 0
Q627-E	POWER ON: 13.3 POWER OFF: 6.6
Q681-B	POWER ON: 0.7 POWER OFF: 0
Q681-C	POWER ON: 0 POWER OFF: 9.1
Q681-E	GND
Q693-B	POWER ON: 0.5 POWER OFF: 7.0
Q693-C	POWER ON: 25.0 POWER OFF: 7.2
Q693-E	POWER ON: 0.3 POWER OFF: 6.5
Q695-B	POWER ON: 25.1 POWER OFF: 7.9
Q695-C	GND
Q695-E	POWER ON: 25.1 POWER OFF: 8.5

Device/Pin #	Volts/Mode
O701-B	2.4
O701-C	138.7
O701-E	2.2
O711-B	2.4
O711-C	139.8
O711-E	2.2
O721-B	2.6
O721-C	134.1
O721-E	2.4
O831-B	4.2
O831-C	4.9
O831-E	4.9

