

SAFETY PRECAUTIONS

SERVICE WARNING

Only qualified service technicians who are familiar with safety checks and guidelines should perform service work. Before replacing parts, disconnect power source to protect electrostatically sensitive parts. Do not attempt to modify any circuit unless so recommended by the manufacturer. When servicing the receiver, use an isolation transformer between the line cord and power receptacle.

SERVICING THE HIGH VOLTAGE AND CRT

Use EXTREME CAUTION when servicing the high voltage circuits. To discharge static high voltage, connect a 10K ohms resistor in series with a test lead between the receiver and CRT anode lead. DO NOT lift the CRT by the neck. Always wear shatterproof goggles when handling the CRT to protect eyes in case of implosion.

X-RAY RADIATION AND HIGH VOLTAGE LIMITS

Be aware of the instructions and procedures covering X-ray radiation. In solid-state receivers and monitors, the CRT is the only potential source of X-rays. Keep an accurate high voltage meter available at all times. Check meter calibration periodically. Whenever servicing a receiver, check the high voltage at various brightness levels to be sure it is regulating properly. Keep high voltage at rated value, NO HIGHER. Excessive high voltage may cause X-ray radiation or failure of associated components. DO NOT depend on protection circuits to keep voltage at rated value. When troubleshooting a receiver with excessive high voltage, avoid close contact with the CRT. DO NOT operate the receiver longer than necessary. To locate the cause of excessive high voltage, use a variable AC transformer to regulate voltage. In present receivers, many electrical and mechanical components have safety related characteristics which are not detectable by visual inspection. Such components are identified by a # on both the schematic and the parts list. For SAFETY, use only equivalent replacement parts when replacing these components.

GENERAL GUIDELINES

Perform a final SAFETY CHECK before returning receiver to customer. Check repaired area for poorly soldered connections, and check entire circuit board for solder splashes. Check inner board wiring for pinched wires or wires contacting any high wattage resistors. Check that all control knobs, shields, covers, grounds, and mounting hardware have been replaced. Be sure to replace all insulators and restore proper lead dress.

TEST JIG HOOKUP				
Function	Chek-A-Color Adapter No.	PC Board Plug No.	Pin	Color
CRT	B239	DY	1	Blue
Yoke	D4137		2	Yellow
Yoke Setting	YP1A		3	Green
Comments	Focus Tap		4	Red

The listing of any available replacement part herein in no case constitutes a recommendation, warranty, or guarantee by Howard W. Sams & Company as to the quality and suitability of such replacement part. The numbers of the listed parts have been compiled from information furnished to Howard W. Sams & Company by the manufacturers of the specific type of replacement part listed.

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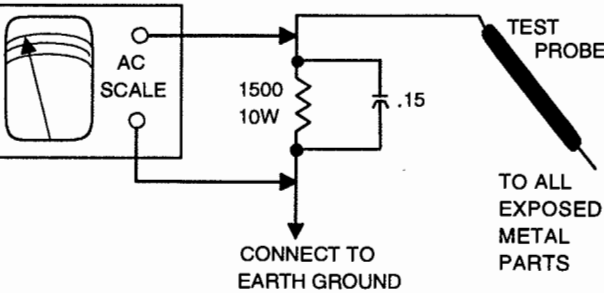
SAFETY CHECKS -- FIRE AND SHOCK HAZARD

Cold Leakage Checks for Receivers with Isolated Ground

Unplug the AC cord, connect a jumper across the plug prongs, and turn the power switch on (if applicable). Use an ohmmeter to measure the resistance between the jumped AC plug and any exposed metal cabinet parts such as antenna screw heads, control shafts, or handle brackets. Exposed metal parts with a return path should measure between 1M ohms and 5.2M ohms. Parts without a return path must measure infinity.

Hot Leakage Current Check

Plug the AC cord directly into an AC outlet. DO NOT use an isolation transformer. Use a 1500 ohms, 10W resistor in parallel with a .15µF capacitor to connect between any exposed metal parts on the receiver and a good earth ground. (See figure below.) Use an AC voltmeter with at least 5000 ohms per volt sensitivity to measure the voltage across the resistor. Check all exposed metal parts and measure voltage at each point. Voltage measurements should not exceed .75VAC, 500µA. Any value exceeding this limit constitutes a potential shock hazard and must be corrected. If the AC plug is not polarized, reverse the AC plug and repeat exposed metal part voltage measurement at each point.



HORIZONTAL OSCILLATOR DISABLE TEST

Unsolder cathode of D813. Connect an adjustable power supply to test point TPP4, and turn receiver on and select an active channel. Adjust color to minimum and picture and brightness controls for a just visible picture. Turn the PIP picture on. Monitor the high voltage. Slowly increase the DC power supply voltage, until the PIP picture disappears, and the main picture starts to lose the horizontal sync. Confirm that the high voltage is less than 37kV (27") and 39.5kV (31"). If the receiver does not lose horizontal sync or the high voltage exceeds the specified limit, the horizontal oscillator disable circuit should be repaired. Slowly reduce the DC power supply to 0V. Turn the receiver off and resolder D813. Connect power and check for normal operation.

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PHOTOFACT® Technical Service Data

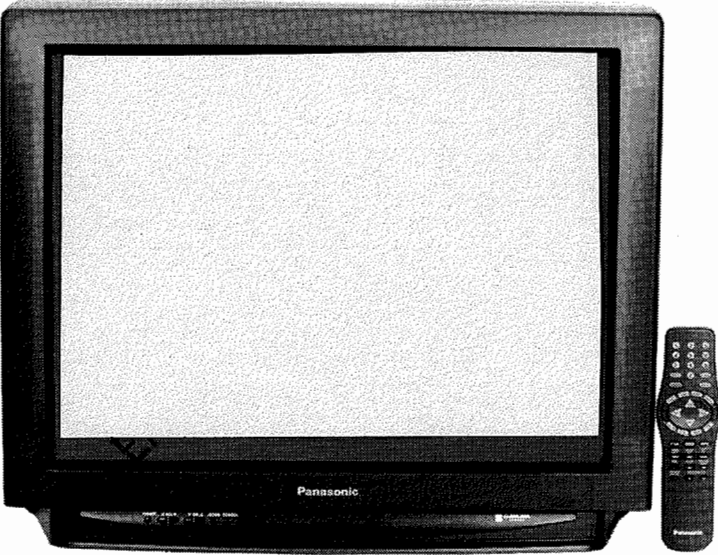
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MODEL CT-27SF24V (CHASSIS APEDP264)

PANASONIC

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PANASONIC
Model CT-27SF24V (Chassis APEDP264)



Essential coverage
for servicing a television receiver...

- Schematics
- Component locations
- Parts list

Coverage includes these additional models and chassis:

MODELS	CHASSIS
CT-F2992LV	APEDP264
CT-F2992V	APEDP264
CT-F2992VV	APEDP264
CT-F2992XV	APEDP264
CT-31SF24V	APEDP266
CT-31XF24CV	APEDP266
TC-33SF24TV	APEDP266

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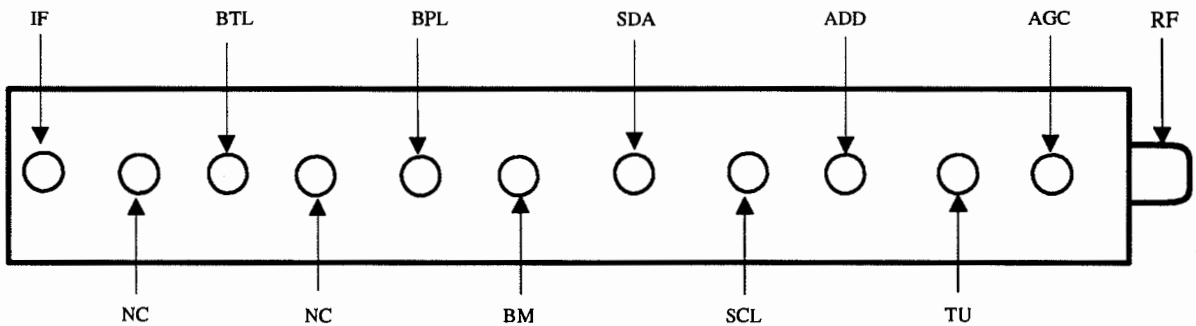
For Supplier Address,
See PHOTOFACT Annual Index

TUNER INFORMATION

TUNER VOLTAGE CHART			
Pin	VHF Low Band	VHF High Band	UHF Band
AGC	4.3V	5.0V	4.0V
TU	1.1V	4.6V	5.2V
ADD	0V	0V	0V
SCL	4.2V	4.2V	4.2V
SDA	4.2V	4.2V	4.2V
BM	9.0V	9.0V	8.9V
BPL	5.0V	5.0V	5.0V
NC	0V	0V	0V
BTL	4.0V	7.5V	8.0V
NC	0V	0V	0V
IF	0V	0V	0V

NOTE: VHF Low Band voltages taken on channel 2.
VHF High Band voltages taken on channel 7.
UHF Band voltages taken on channel 14.

TUNER TERMINAL GUIDE



MISCELLANEOUS ADJUSTMENTS

REMOTE OPERATION

Audio and Picture Adjustments

1. Press action button to display main menu.
2. Press channel down button to select audio or picture icon.
3. Press action button to display adjustment menu.
4. Press channel up or down button to select desired adjustment.
5. Press volume left or right button to adjust selection.
6. Press action button twice to exit.

Normalize Audio and Picture Settings

1. Press action button to display main menu.
2. Press channel down button to select audio or picture icon.
3. Press action button to display adjustment menu.
4. Press channel up or down button to select norm.
5. Press volume left or right button to reset adjustment settings to factory preset levels.
6. Press action button twice to exit.

NOTE: This receiver employs digital customer controls. All adjustments are at normalized position unless otherwise indicated.

HIGH VOLTAGE CHECK

Tune in a picture. Connect a high voltage probe to CRT anode. High voltage should read between 27.0kV to 29.0kV.

VIDEO LEVEL

NOTE: Do not adjust unless R115 has been replaced or misadjusted.

Tune in a color bar pattern with 100 IRE white and 87.5% modulation. Connect oscilloscope to the emitter of Q108. Adjust R115 for 1.0Vp-p ± .1Vp-p. Perform sub contrast (B3) adjustment, refer to the "Sub Adjustments" section of Miscellaneous Adjustments.

PINCUSHION

Tune in a crosshatch pattern. Set auto color to off. Normalize picture settings. Set R786 to center position. Adjust L770 and R786 for square perpendicular boxes.

CONVERGENCE

Connect a signal generator to antenna terminals and tune in a dot pattern. Adjust 4-pole magnets to converge the red and blue dots at the center of the screen. Adjust 6-pole magnets to converge the red/blue dots over the green dots at the center of the screen.

NOTE: Spread the two tabs of each set of magnets equally and opposite to converge vertically, and rotate both tabs in the same direction to converge horizontally. The 4 and 6-pole magnets interact, repeat adjustment until center convergence is correct.

Tune in a crosshatch pattern. Remove rubber wedges between the deflection yoke and the CRT. Tilt deflection yoke up or down to converge the vertical lines at the top and bottom of the screen and the horizontal lines at the left and right sides of the screen. Tilt the deflection yoke left or right to converge the horizontal lines at the top and bottom of the screen and the vertical lines at the left and right sides of the screen. Repeat convergence procedure if necessary to obtain the best overall convergence. Replace rubber wedges. To obtain the best corner convergence it may be necessary to order the permalloy convergence corrector strip (part no. 0FMK014ZZ). Place strip between CRT and yoke in area needing correction. Move and or rotate the strip until the best correction is obtained. Use tape in addition to the adhesive strip to secure it to the CRT.

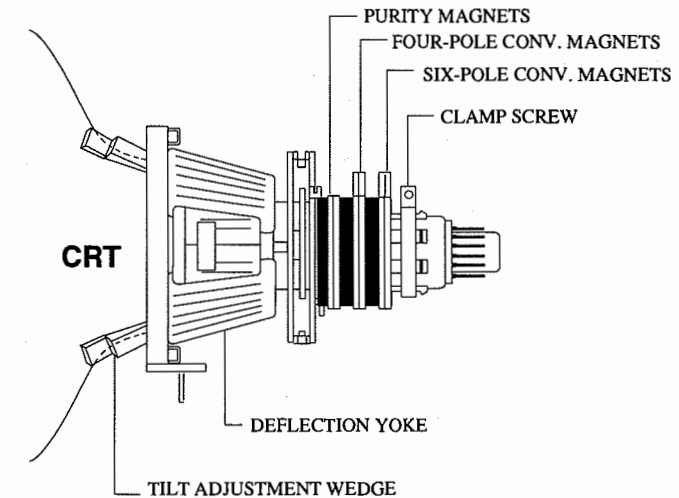
PURITY CHECK

Enter serviceman mode. Ensure that the red CHK is on the screen and press the recall button on the remote transmitter to enter purity check mode. Press recall button to display desired screen color. Repeatedly pressing the recall button will cycle the screen color from normal to white, to red, to green, to blue, and then back to normal.

PURITY

Operate the receiver for 60 minutes with the brightness control at maximum to allow CRT temperature to stabilize. Use a degaussing coil to demagnetize the CRT. Perform the Purity Check procedure. Select a green screen. Loosen the deflection yoke and move it back as far as possible. Move the purity tabs to center the vertical green band. Slowly slide the deflection yoke forward until a uniform green screen is obtained. Check purity adjustment for blue, white, and red screens.

CRT NECK ASSEMBLY



ENTERING SERVICEMAN MODE

Turn on receiver and momentarily short pins 3 and 8 of connector TP. The letters "CHK" will appear in yellow on the upper right of the screen, volume up and down will adjust rapidly. Press the action button and volume up button on L board simultaneously. The receiver will enter the serviceman mode, the letters "CHK" will turn red, the volume up and down buttons will adjust normally and all customer controls are set to normal. Press power button on remote to select one of five service modes.

- B= Sub Adjustments
- C= White Balance Adjustments
- D= Pincushion Adjustments
- S= Options Adjustments
- CHK = Normal operation of channel and volume buttons

SERVICEMAN MODE QUICK ENTRY

From the on screen menu, select the setup icon and select cable mode. Select the timer icon and set sleep timer to 30. Press the action button twice. Tune to channel 124. Adjust the volume to minimum. Press the receiver volume down button. The set will enter the serviceman mode and the red letters "CHK" will appear on the screen.

EXIT SERVICEMAN MODE

Press action and power buttons simultaneously and hold for approximately 2 seconds to exit serviceman mode. The receiver will shutoff then come back on channel 3 with audio.

MISCELLANEOUS ADJUSTMENTS continued

SUB ADJUSTMENTS

Write down original levels in detail before making any adjustments in case a misadjustment occurs. Always exit serviceman mode after making adjustments. Enter serviceman mode and select service mode B. Press channel up and down buttons on remote to select adjustment. Press volume up and down buttons on remote to change level of adjustment.

Sub Adjustments Range and Levels

Sub Adjustment	Range	Default Level	On Set Level
Sub Color (B0)	0-63	32	28
Sub Tint (B1)	0-63	33	32
Sub Brightness (B2)	0-192	123	72
Sub Contrast (B3)	0-63	24	23
RF AGC (B4)	0-127	43	39
Sub Sharpness (B6)	0-63	16	25

Sub Tint (B1) and Sub Color (B0)

Normalize picture settings, set brightness to minimum, set auto color to off position. Connect jumpers between TPD2 and ground. Connect jumpers between connector TP pin 6 and ground. Record original levels of C0, C1, C2, C5, C6, S1, and S2, then set as follows:

C0	2 020
C1	127
C2	2 020
C5	127
C6	127
S1	0
S2	0

Tune in a color bar pattern. Connect oscilloscope to pin 5 of connector C1. Adjust B2 for minimum saturation. Adjust B0 for 2.4Vp-p ±.05Vp-p. Adjust B1 so that peak 2 of the waveform is halfway between peaks 3 and 4. Record waveform voltage. Connect oscilloscope to pin 3 of connector C1. Adjust S6 so that voltage of waveform is equal to voltage recorded at pin 5 of connector C1 times 1.1V ±.03V. Connect oscilloscope to pin 5 of connector C1. Adjust B1 so that peak 2 is halfway between peaks 3 and 4. Connect oscilloscope to pin 4 of connector C1. Adjust B0 for 1Vp-p ±.02Vp-p. Remove jumpers. Set S1 to 7 and S2 to 15. Insure that color phase and saturation are normal.

Sub Brightness (B2)

This adjustment must be made after sub contrast or color temperature adjustments are made. DO NOT adjust screen after sub brightness is set. Tune in a color bar signal with 100 IRE white and 7.5 IRE black. Switch generator color to off. Adjust B2 until the black bar starts to turn gray, then decrease adjustment until bar just turns black.

Sub Contrast (B3)

NOTE: This adjustment is factory set, DO NOT adjust unless repairs are made to associated circuits, CRT board, or CRT is replaced.

Tune in a pattern with 87.5% modulation 70% saturated color bar with 100 IRE white and 7.5 black. Set picture to maximum, color to minimum, and sharpness to center. Set video NR to off. Record levels of B2, S1, and S2 and set levels to 0. Connect a jumper from connector TP pin 6 to ground. Connect a jumper from TPD2 to ground. Connect oscilloscope to pin 4 of connector C1. Adjust B3 for 3.0Vp-p ±.1Vp-p from white to black level. Do not include sync tip in measurement. Return B2, S1, and S2 to recorded levels. Perform "Sub Brightness (B2)" adjustment.

RF AGC (B4)

Tune in a picture. Adjust B4 until snow appears in picture, then back until snow disappears.

WHITE BALANCE ADJUSTMENTS

Write down original values in detail before making any adjustments in case a misadjustment occurs. Always exit serviceman mode after making adjustments. Enter serviceman mode and select service mode C. Press channel up and down buttons on remote to select adjustment. Press volume up and down buttons on remote to change level of adjustment.

White Balance Adjustment Range and Levels

White Balance Adjustment	Range	Default Level	On Set Level
Red Cutoff (C0)	(1)	2 020	2 222
Green Cutoff (C1)	0-255	214	214
Blue Cutoff (C2)	(1)	2 20	2 186
User Brightness (C3)	0-63	31	31
Sub Brightness (C4)	0-192	123	72
Red Drive (C5)	0-255	119	155
Blue Drive (C6)	0-255	91	147
Red Drive Offset - Cool (C7)	0-63	12	12
Blue Drive Offset - Cool (C8)	0-63	12	12
Red Drive Offset - Warm (C9)	0-63	20	20
Blue Drive Offset - Warm (CA)	0-63	12	12

NOTE: C3 adjustment and the brightness adjustment in the picture adjustment menu are the same adjustment. C4 and B2 are the same adjustment.
(1) Range is in following steps:
0 20 - 0 235
1 00 - 1 235
2 00 - 2 235
3 00 - 3 235

Color Temperature (C0, C1, C2, C5, C6)

Tune in a white raster and allow 10 to 30 minutes warmup time. Adjust C0, C1, and C2 for a white raster. Adjust C5 and C6 for warm white. Adjust C3 from low scale to high scale and check black and white tracking. Make needed adjustments to C0, C1, C2, C5, and C6. Perform "Sub Brightness (B2)" adjustment.

PINCUSHION ADJUSTMENTS

Write down original values in detail before making any adjustments in case a misadjustment occurs. Always exit serviceman mode after making adjustments. Enter serviceman mode and select service mode D. Press channel up and down buttons on remote to select adjustment. Press volume up and down buttons on remote to change level of adjustment.

Pincushion Adjustments Range and Levels

Pincushion Adjustment	Range	Default Level	On Set Level
Vertical Size (D0)	0-127	68	77
Vertical Linearity (D1)	0-63	37	38
S Compensation (D2)	0-63	12	11
Horizontal Size (D3)	0-63	48	39
Horizontal Centering (D4)	0-31	12	12
E-W Parabola (D5)	0-63	14	22
Trapezoid Compensation (D6)	0-63	31	35
E-W Corner 2 (D7)	0-15	12	10
E-W Corner 1 (D8)	0-15	9	11
Vertical EHT (D9)	0-15	8	8
Horizontal EHT (Da)	0-15	8	8
Vertical DC (Db)	0-63	31	28

Vertical Linearity (D1)

Tune in a crosshatch pattern. Adjust D1 so that boxes at top and bottom of screen are the same proportion.

Vertical Size (D0) and S Compensation (D2)

Tune in a crosshatch pattern. Adjust D0 for 1/2 inch overscan at top and bottom of screen. Adjust D2 so that the top and bottom boxes are the same proportion as the center boxes.

Horizontal Size (D3)

Tune in a crosshatch pattern. Adjust D3 so that the picture is just at the left and right edge of the screen and then increase the level 3 digits larger.

Horizontal Centering (D4)

Tune in a crosshatch pattern. Adjust D4 so that pattern is centered.

E-W Pincushion Correction (D5, D7, D8)

Tune in a crosshatch pattern. Normalize picture settings. Set auto color to off. Center R786. Adjust D5 for straight vertical lines at left and right side of screen. Adjust D7 for straight vertical lines at top of screen. Adjust D8 for straight vertical lines at bottom of screen. Perform mechanical "Pincushion" adjustment.

Trapezoid Compensation (D6)

Tune in a crosshatch pattern. Adjust D6 so vertical lines are perpendicular to horizontal lines.

Vertical DC and Dynamic Range Confirmation (Db)

Connect digital voltmeter to pin 2 of connector DY. Connect oscilloscope to pin 3 of connector DY. Place a jumper across pins 2 and 5 of T771. Tune in a monoscope pattern. Adjust Db for 15.5V ±.2V with no distortion at top and bottom of vertical waveform. Remove jumper.

OPTIONS ADJUSTMENTS

NOTE: Adjustments of options adjustments not listed are not recommended.

Write down original values in detail before making any adjustments in case a misadjustment occurs. Always exit serviceman mode after making adjustments. Enter serviceman mode and select service mode S. Press channel up and down buttons on remote to select adjustment. Press volume up and down buttons on remote to change level of adjustment.

Options Adjustments and Levels

Adjustment	Range	Default Level	On Set Level
Pre & Overshoot (S0)	0-7	4	4
Black Expansion (S1)	0-15	7	7
White Gamma Level (S2)	0-15	15	15
White Gamma Gain (S3)	0-15	15	15
Small Gamma Level (S4)	0-15	7	7
Demodulation Angle (S5)	0-31	12	12
Demodulation Gain (S6)	0-63	23	27
G-Y Ratio (S7)	0-3	1	1
White Letter Compensation (S8)	0-15	4	4
White Letter Slice Voltage (S9)	0-15	5	5
Switches TV (SA)	0-255	36	36
Switches Video (SB)	0-255	0	0
Switches Video (SC)	0-255	36	36
Contrast Sensitivity (SD)	0-255	109	109
Input Level Alignment (SE)	0-63	46	40
Stereo PLL VCO (SF)	0-63	27	32
Filter (S10)	0-63	30	25
Low Frequency Separation (S11)	0-63	39	37
High Frequency Separation (S12)	0-63	22	27
Clock Adjustment (S13)	0-255	165	160
Scroll Output, Font Mode (S14)	0-2	1	1
ID Positioning Mode (S15)	0-2	0	0
PIP Chroma Saturation (S16)	0-127	39	30
PIP Color Reset (S17)	0-127	36	39
PIP Tint (S18)	0-63	10	10
PIP Position 1/9 Upper (S1A)	0-255	26	26
PIP Position 1/9 Lower (S1B)	0-255	146	144
PIP Position 1/9 Left (S1C)	0-255	10	10
PIP Position 1/9 Right (S1D)	0-255	101	101
PIP Position 1/16 Upper (S1E)	0-255	26	26
PIP Position 1/16 Lower (S1F)	0-255	163	161
PIP Position 1/16 Left (S20)	0-255	10	10
PIP Position 1/16 Right (S21)	0-255	116	116
V1 Gain (S22)	0-15	8	8

Stereo PLL VCO (SF)

Tune in a stereo signal. Connect pin 23 of IC101 to ground through 1000 ohm resistor, and connect a 22µF electrolytic between pin 3 of IC101 and ground. Connect a frequency counter to pin 25 of IC2201, adjust SF level to obtain 15.534kHz ± 50Hz.

Filter (S10)

Tune in a stereo signal. On generator select 1kHz audio frequency, and L-R modulating signal. Connect a scope to pin 26 of IC2201, adjust S10 for minimum amplitude on the scope.

Separation (S11 & S12)

On generator select pilot, 1kHz audio frequency, and right modulating signal. Connect an oscilloscope to pin 26 of IC2201. Adjust S11 for minimum amplitude of waveform. On generator select pilot, 8kHz audio frequency, and left modulating signal. Connect an oscilloscope to pin 25 of IC2201. Adjust S12 for minimum amplitude of waveform.

Input Level (SE)

On generator select pilot, 1kHz audio frequency, and L-R modulating signal. Connect oscilloscope to pin 25 of IC2201 adjust SE for 900mVp-p.

Clock (S13)

Connect a frequency counter to pin 13 of IC001. With AC power applied and receiver off, measure and record the frequency at pin 13 of IC001. Turn receiver on and enter the serviceman mode. Set S13 for the following formula:

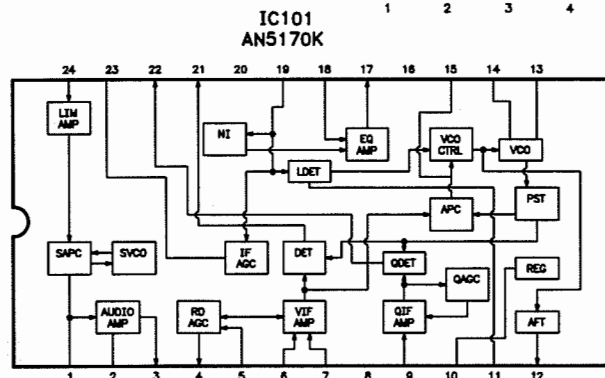
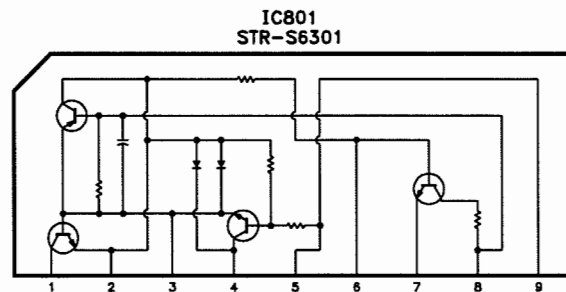
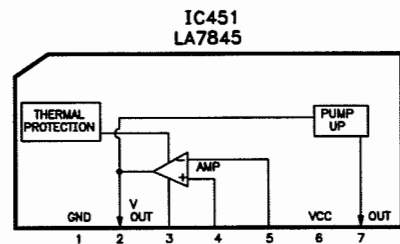
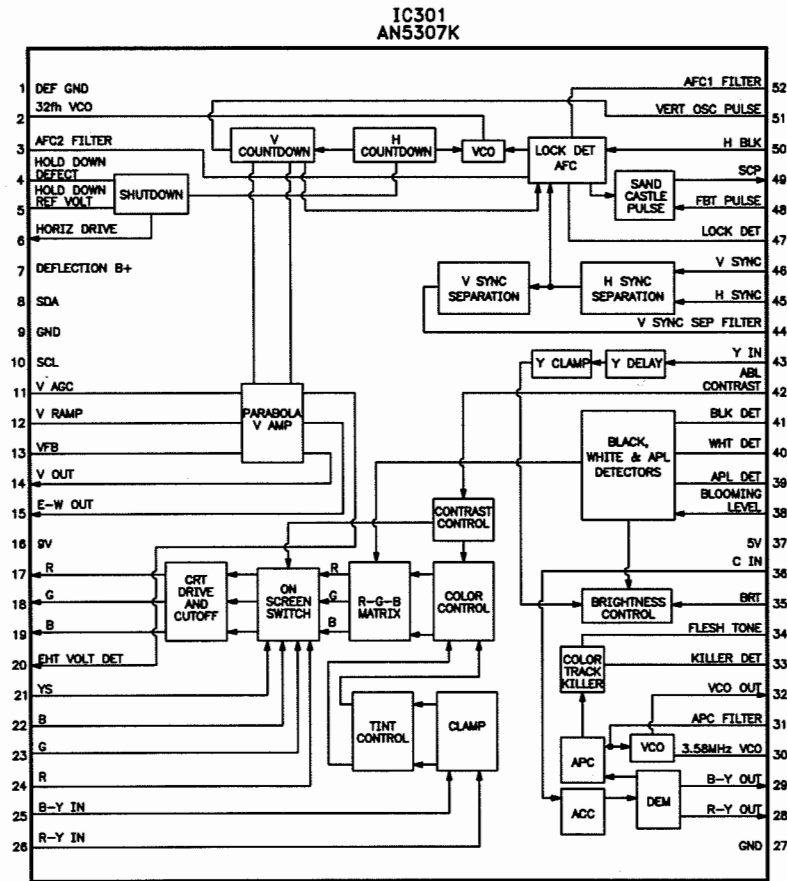
S13=128 + .901 x 1000000 x (244.1406 - (recorded frequency))/244.1406

SERVICE INFORMATION

POWER SUPPLY SHUTDOWN

When the horizontal or the vertical circuit exceed their normal current draw, the B+ feedback voltage at pin 6 of IC001 will increase to 3.3V or above, through Q805 or Q451, which will cause pin 31 of IC001 to go low. When pin 31 of IC001 goes low, it will cause Q017 to conduct, which will cause the relay RL001 to open and shut down the receiver.

IC FUNCTIONS



Important Parts Information

- The parts listed here are those not usually available from a well-stocked supply cabinet or bin.
- Where items may be replaced with equivalent parts, several alternates are shown from participating vendors.
- On the parts lists, safety items are marked with a # to remind you that only exact replacements are recommended for these items.
- When ordering parts, state the model number, part number, and description.

Obtaining Parts

Many of these parts are available from your local Sams authorized distributor or the manufacturer of the equipment. Call Sams for the name of your nearest distributor:

800-428-7267

Or consult the Sams *Annual Index* for the address of the original equipment manufacturer.

Participating Vendors

Information on test equipment and replacement parts is listed in these pages for the following participating vendors. Consult the Sams *Annual Index* for their current address.

- Custom Components Corporation (Chek-A-Color)
- NTE Electronics, Inc. (NTE)
- Philips ECG Company (ECG)
- Terrell & Nobis (TNI Electronics)
- Sencore, Inc.
- Thomson Consumer Electronics, Inc. (SK, TCE)

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of Howard W. Sams & Company.

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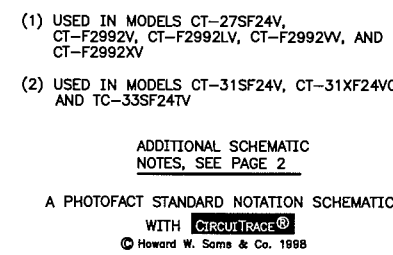


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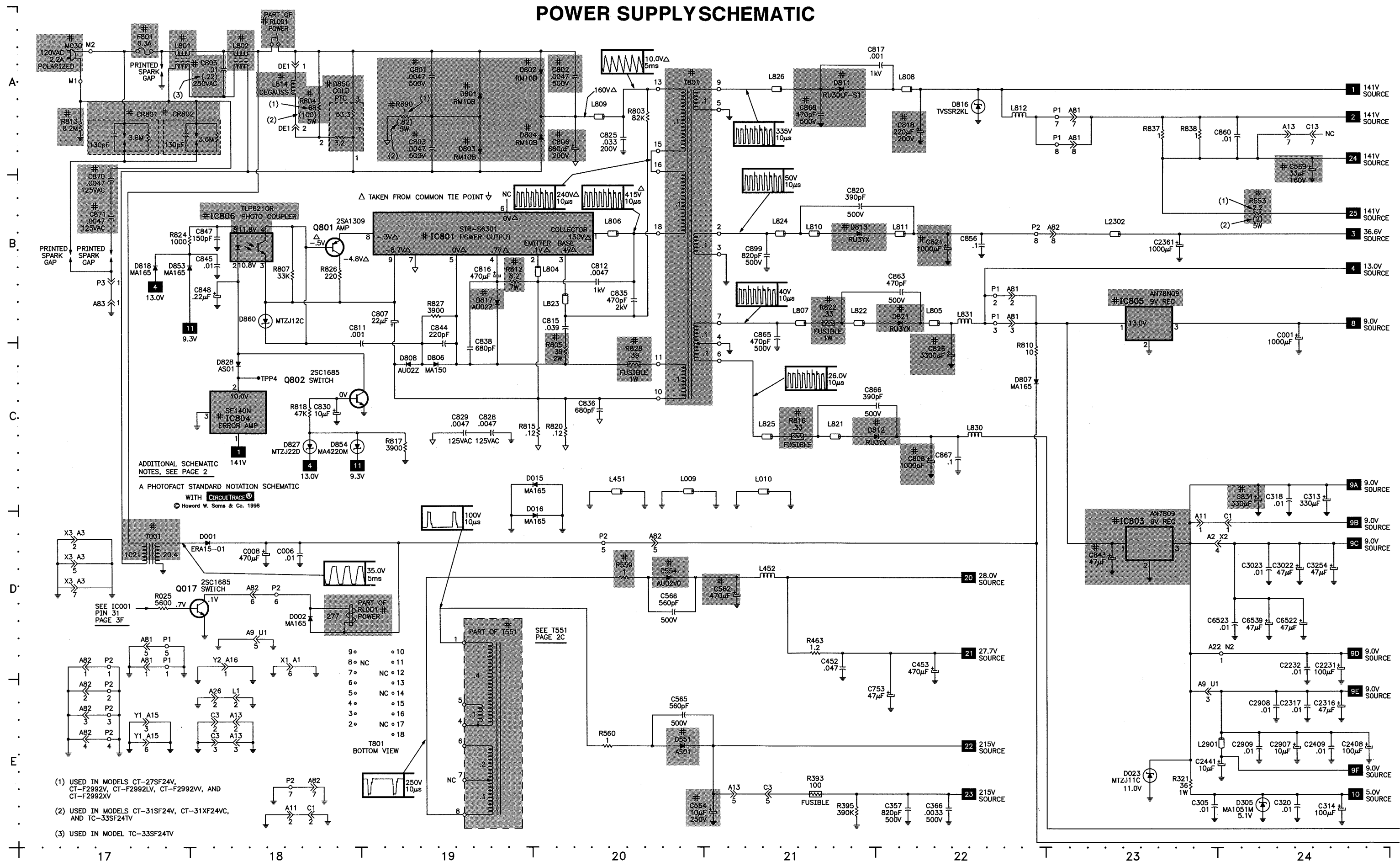
(2) USED IN MODELS CT-31SF24V, CT-31XF24VCV,
AND TC-33SF24TV

#R535
820

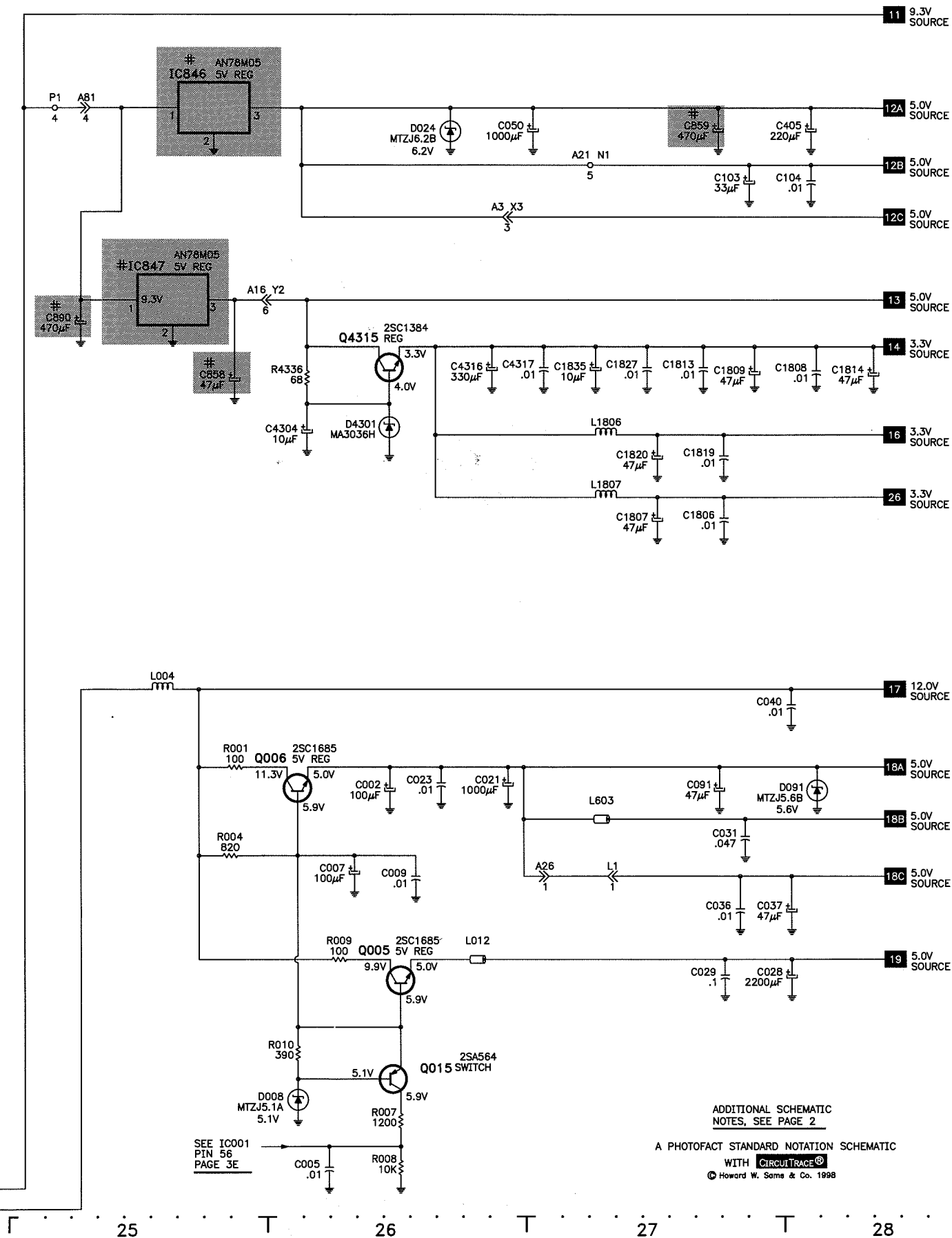
SEE Q009
BASE
PAGE 3E



POWER SUPPLY SCHEMATIC



G
POWER SUPPLY SCHEMATIC continued



SCHEMATIC NOTES

For SAFETY use only equivalent replacement part, see parts list.

✕ Circuitry not used in some versions.

--- Circuitry used in some versions.

⏏ Ground

⏏ Chassis ground

▽ Common tie point

△ Taken from common tie point

3 Schematic CIRCUITRACE® Voltage source tie point.

A Cabling: Heavy lines reduce use of multiple lines.

Waveforms and voltages are taken from ground, unless noted otherwise.

Waveforms taken with triggered scope and colorbar signal.

Waveform voltage is peak to peak. Timebase is per division. Waveforms shown at 10 divisions.

Supply voltages maintained as seen at input.

Voltages measured with digital meter and a 1000µV RF signal, with colorbar pattern, applied to antenna terminal.

Controls adjusted for normal operation.

Capacitors are 50 volts or less, 5% or greater unless noted.

Electrolytic capacitors are 50 volts or less, 20% or greater unless noted.

Resistors are 1/2W or less, 5% or greater unless noted.

Value () used in some versions.

Measurements with switching as shown, unless noted.

Rated voltage shown on zener diodes.

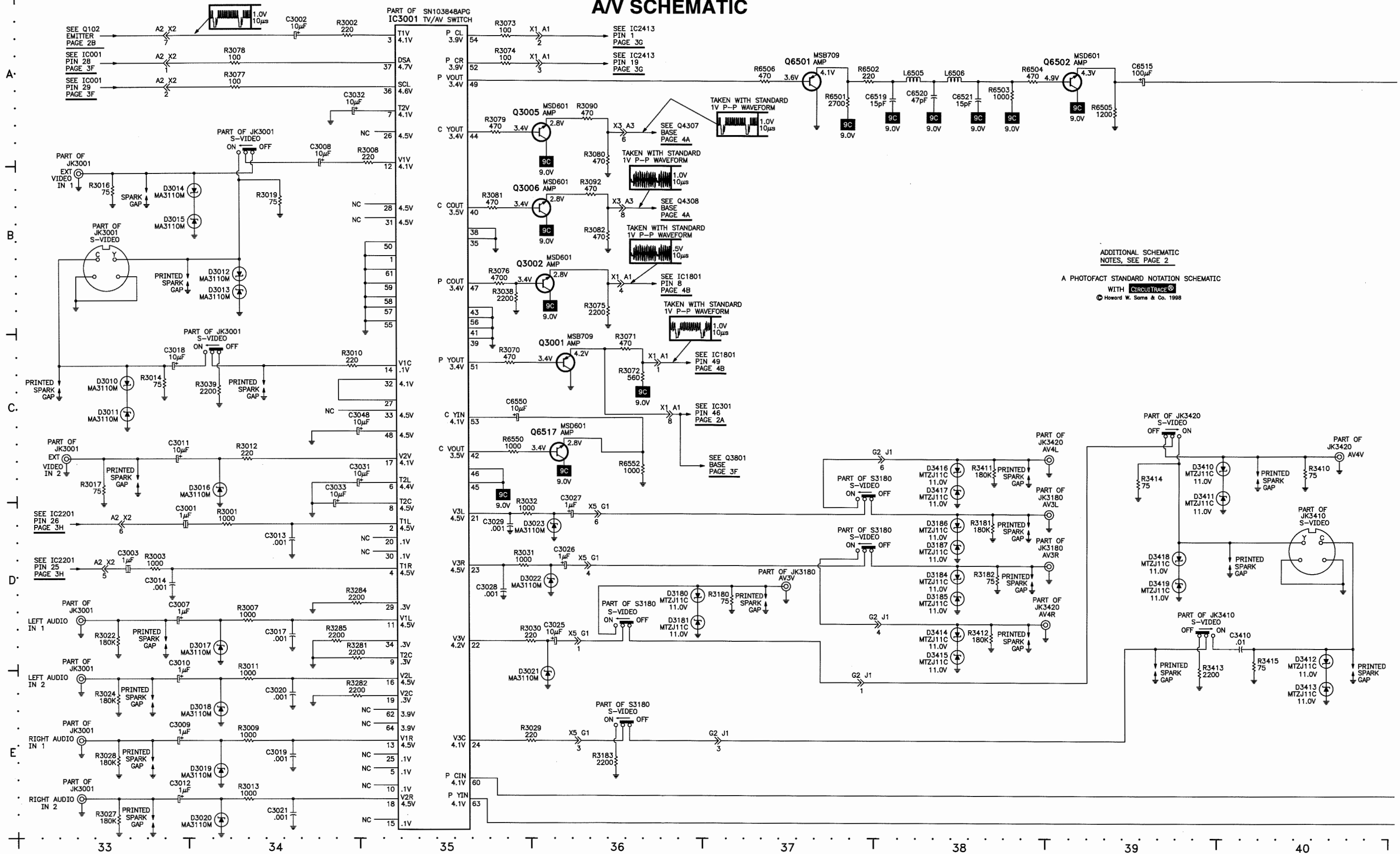
TEST EQUIPMENT

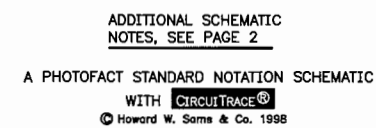
Test equipment listed by participating manufacturer illustrates typical or equivalent equipment used by Sams engineers to obtain measurements. This equipment is compatible with most types used by field service technicians.

Equipment	Sencore No.	Equipment	Sencore No.
Oscilloscope	SC3100	Isolation Transformer	PR570
Generators		Capacitance Analyzer	LC102
RGB	CM2125	CRT Analyzer	CR7000
Multiburst Signal	VG91	AC Leakage Tester	PR570
Color Bar	VG91	Inductance Analyzer	LC102
TV Stereo	VG91	Flyback Yoke Tester	TVA92
Digital VOM	SC3100	Field Strength Meter	SL753
Frequency Meter	SC3100	Transistor Tester	TF46
Hi-Voltage Probe	HP200	Horizontal Analyzer	HA-2500
Accessory Probes	TP212	Video Analyzer	VG91, TVA92

B

AV SCHEMATIC





F



AUDIO SCHEMATIC

A.

B.

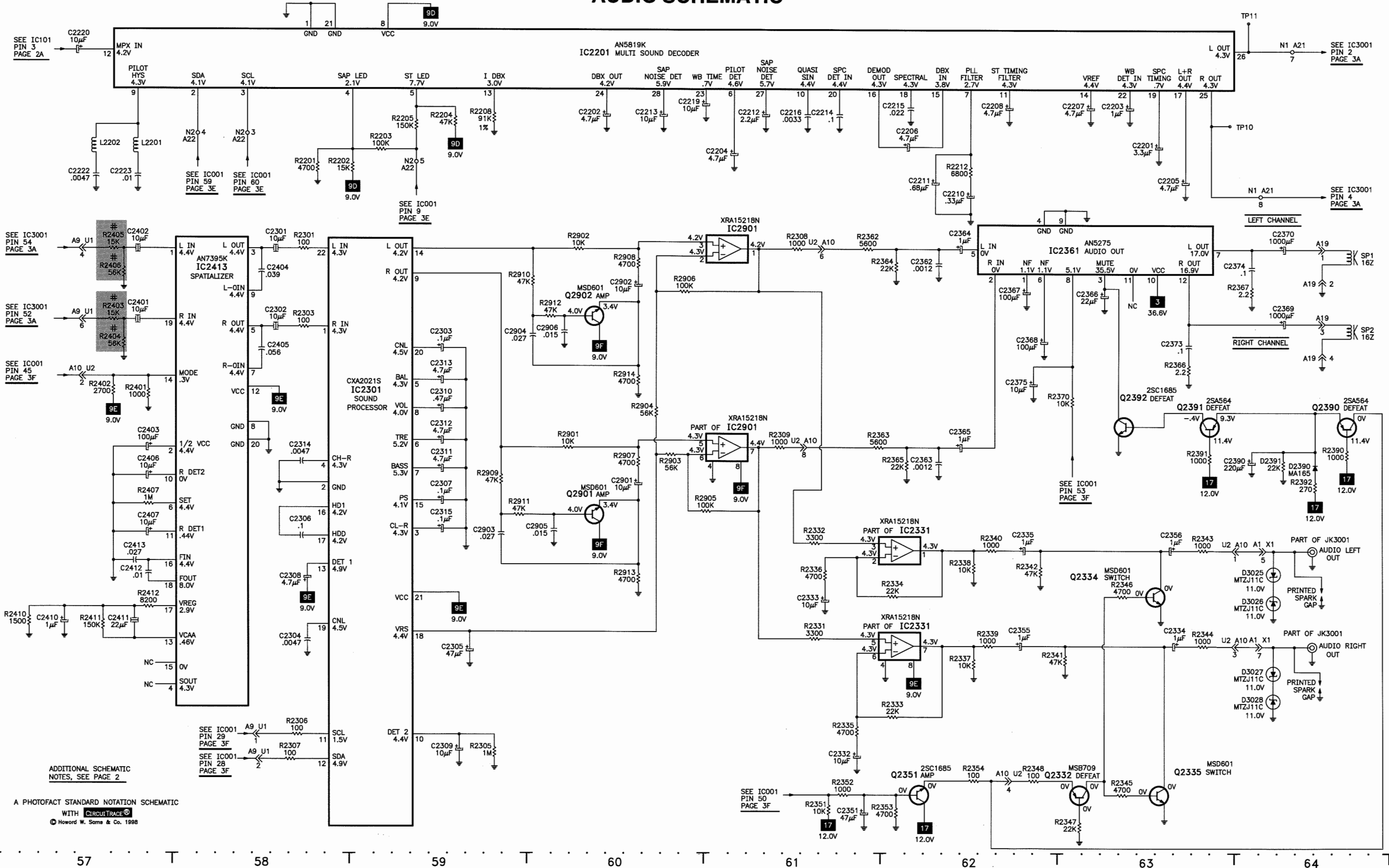
C.

D.

E.

ADDITIONAL SCHEMATIC
NOTES, SEE PAGE 2

A PHOTOFAC STANDARD NOTATION SCHEMATIC
WITH **CIRCUITTRACE**
© Howard W. Sams & Co. 1998

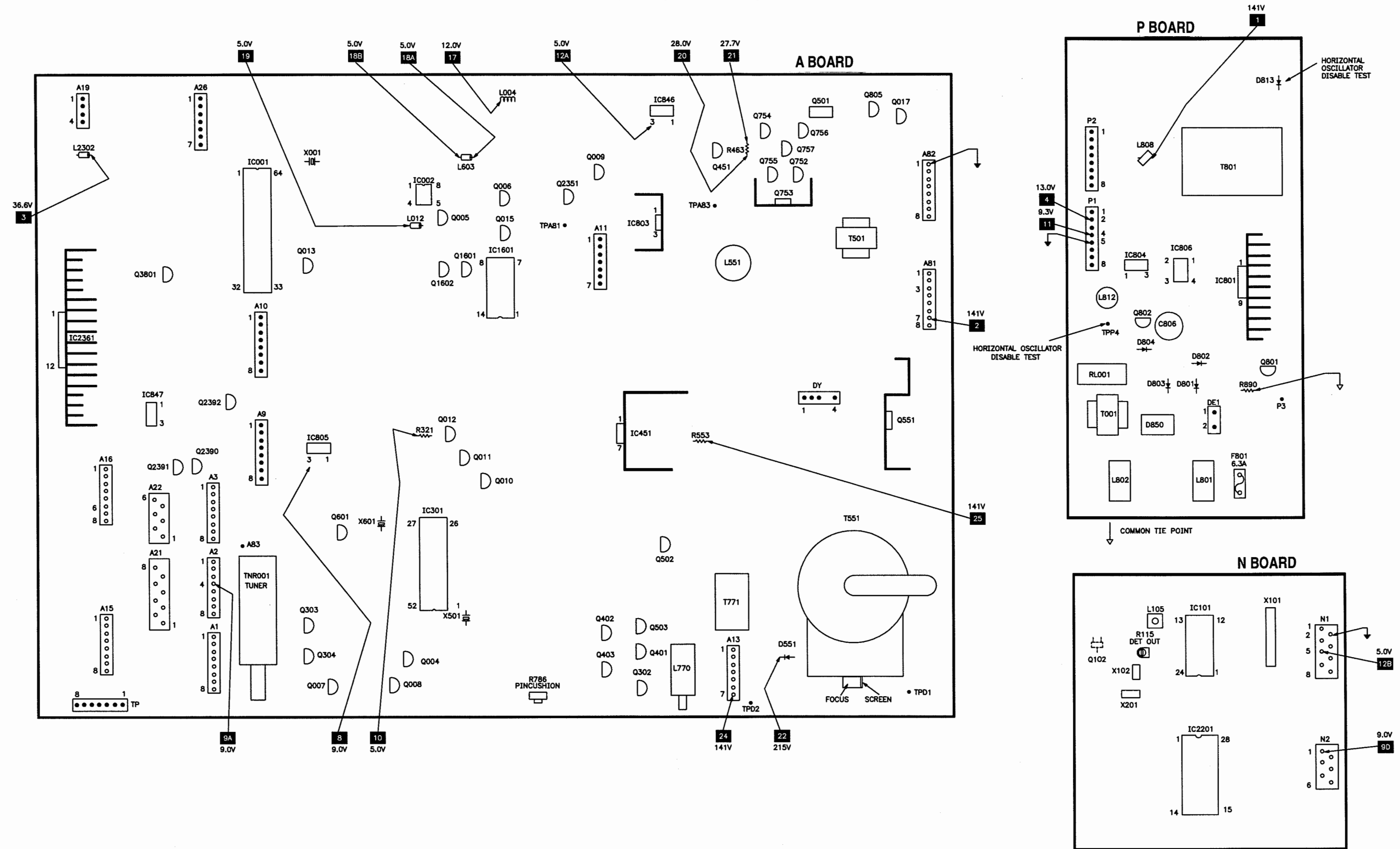


PANASONIC
MODEL CT-27SF24V (CHASSIS APEDP264)

B



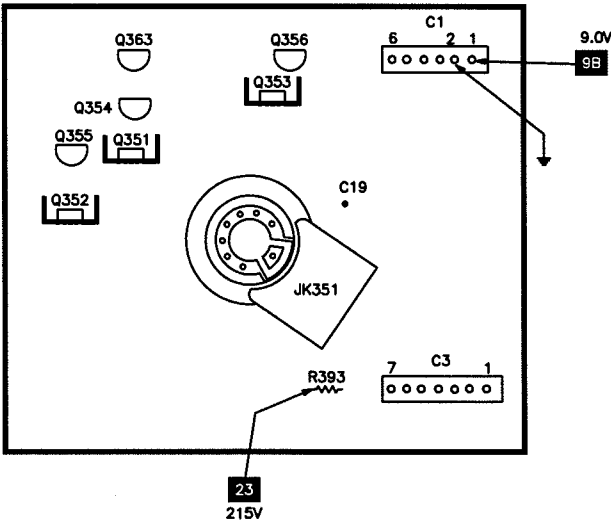
PLACEMENT CHART



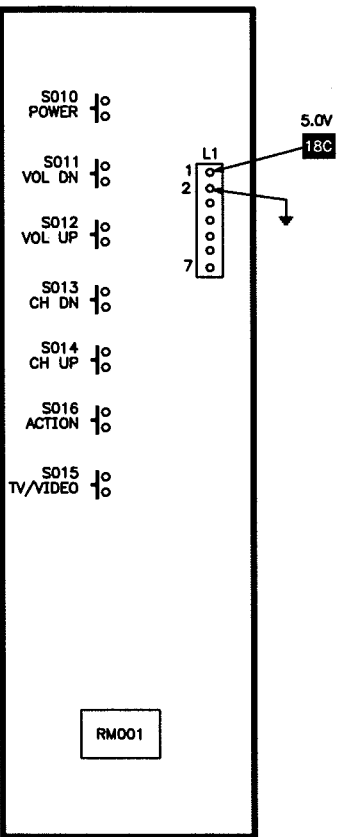
NOTE: DOTTED COMPONENTS LOCATED ON OTHER SIDE OF BOARD

PLACEMENT CHART continued

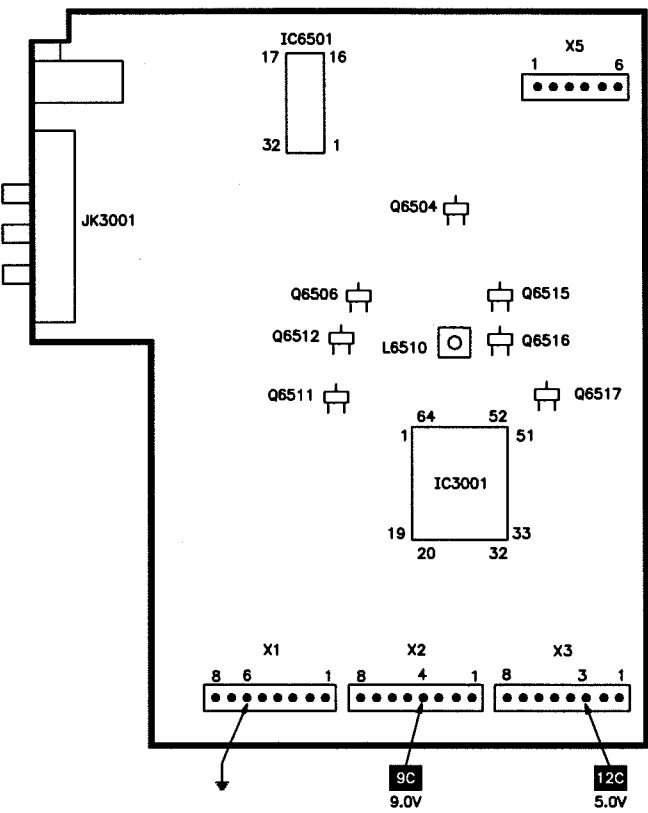
C BOARD



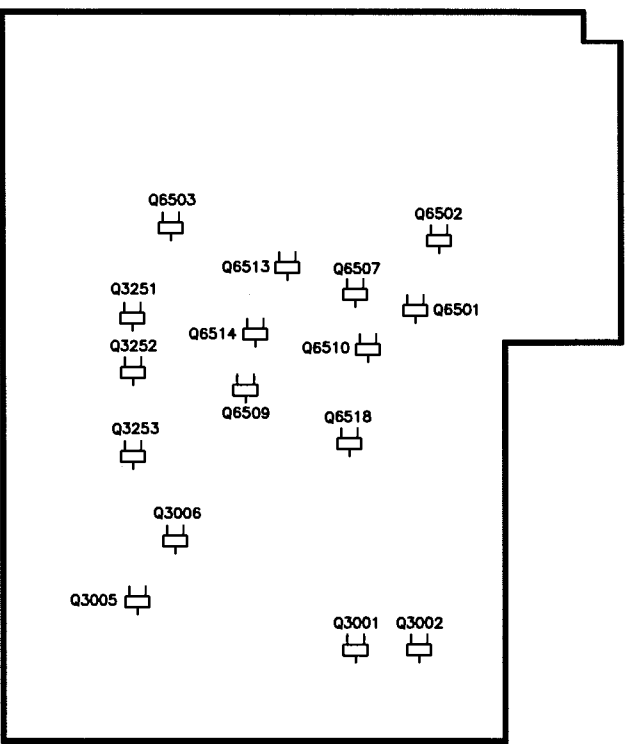
L BOARD



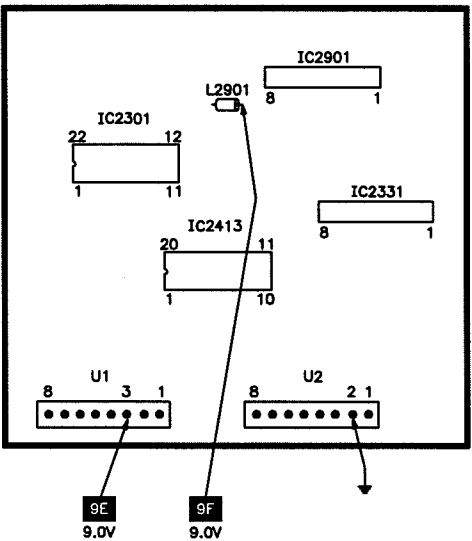
X BOARD - TOP VIEW



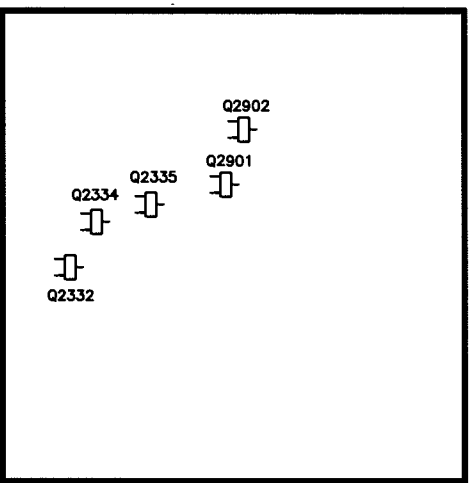
X BOARD - BOTTOM VIEW



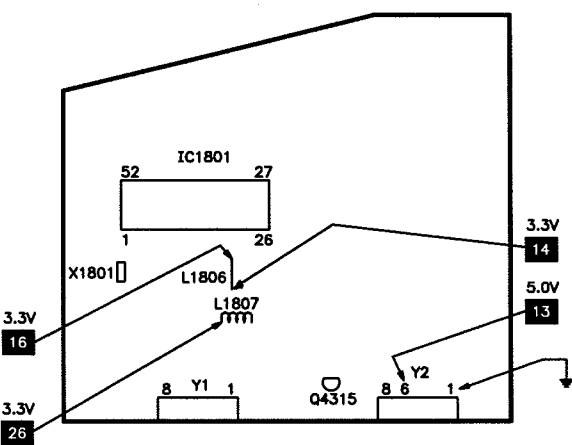
U BOARD - TOP VIEW



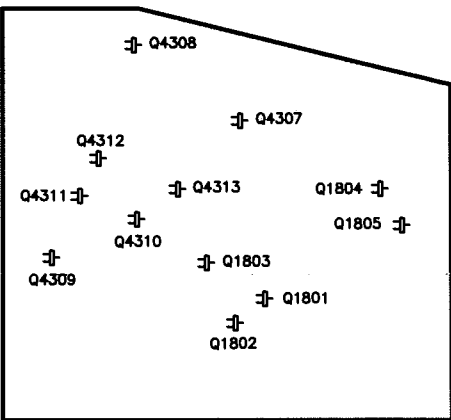
U BOARD - BOTTOM VIEW



Y BOARD - TOP VIEW



Y BOARD - BOTTOM VIEW



SCHEMATIC COMPONENT LOCATION GUIDE

C001	C-24	C366	E-22	C818	A-22	C2211	B-62	C3008	B-34	C6542	C-42	D3180	D-36	L601	B-11	Q753	D-14	R030	B-51	R350	C-10	R555	D-9	R1803	E-70	R2406	B-57	R3290	D-14	R6552	C-36
C002	D-26	C370	C-16	C820	B-21	C2212	A-61	C3009	E-33	C6543	D-42	D3181	D-36	L603	D-27	Q754	D-11	R031	B-51	R351	A-14	R556	A-16	R1804	E-70	R2407	D-57	R3291	D-13	R6553	C-42
C004	A-52	C371	C-13	C821	B-22	C2213	A-60	C3010	E-33	C6550	C-35	D3184	D-38	L751	E-15	Q755	D-13	R032	A-51	R352	B-14	R558	D-8	R1805	C-71	R2410	D-57	R3293	D-13	R6557	D-43
C005	E-26	C372	A-14	C825	A-20	C2214	A-61	C3011	C-33	D001	D-18	D3185	D-38	L770	D-7	Q756	D-12	R034	C-54	R353	C-14	R559	D-20	R1807	D-70	R2411	D-57	R3294	D-13	R6559	B-43
C006	D-18	C373	B-14	C826	C-22	C2215	A-62	C3012	E-33	D002	D-18	D3186	D-38	L801	A-17	Q757	D-13	R035	C-11	R357	A-13	R560	E-20	R1808	D-70	R2412	D-57	R3410	C-40	R6564	C-45
C007	D-26	C374	C-14	C828	C-19	C2216	A-61	C3013	D-34	D008	E-26	D3187	D-38	L802	A-18	Q801	B-18	R036	D-54	R358	B-13	R601	A-9	R1809	D-69	R2901	C-60	R3411	C-38	R6565	C-44
C008	D-18	C376	D-51	C829	C-19	C2219	A-60	C3014	D-33	D009	D-49	D3410	C-39	L804	B-19	Q802	C-18	R037	D-54	R359	C-13	R603	B-10	R1810	C-70	R2902	B-60	R3412	D-38	R6566	D-44
C009	D-26	C401	C-1	C830	C-18	C2220	A-57	C3017	D-34	D010	B-55	D3411	D-39	L805	C-22	Q805	C-49	R038	B-53	R367	A-14	R604	A-10	R1811	D-70	R2903	C-60	R3413	E-39	RL001	A-18
C011	C-51	C402	C-2	C831	C-24	C2221	A-4	C3018	C-33	D015	C-19	D3412	D-40	L806	B-20	Q1601	E-53	R039	E-52	R368	B-14	R606	C-11	R1812	B-71	R2904	C-60	R3414	C-39	RL001	D-18
C012	B-53	C403	C-2	C835	B-20	C2222	B-57	C3019	E-34	D016	D-19	D3413	E-40	L807	C-21	Q1602	E-53	R046	D-51	R369	C-14	R607	A-13	R1813	B-71	R2905	D-60	R3415	D-40	RM001	A-50
C014	D-50	C405	A-28	C836	C-20	C2223	B-57	C3020	E-34	D020	E-49	D3414	D-38	L808	A-22	Q1801	D-69	R051	A-50	R370	C-14	R608	A-13	R1814	D-72	R2906	B-60	R3803	C-55	S010	B-50
C015	D-50	C407	D-5	C838	C-19	C2231	D-24	C3021	E-34	D023	E-23	D3415	D-38	L809	A-20	Q1802	D-69	R054	C-51	R371	B-14	R609	C-13	R1815	E-71	R2907	C-60	R3804	C-54	S011	B-50
C016	D-50	C451	D-5	C842	B-55	C2232	D-24	C3022	D-24	D024	A-26	D3416	C-38	L810	B-21	Q1803	C-69	R055	C-51	R372	B-14	R610	C-13	R1818	D-68	R2908	B-60	R4320	A-66	S012	B-50
C017	B-51	C452	D-21	C843	D-23	C2301	B-58	C3023	D-24	D060	E-49	D3417	D-38	L811	B-22	Q1804	A-71	R056	D-54	R373	C-14	R611	B-13	R1819	C-69	R2909	C-59	R4321	A-66	S013	B-49
C020	B-51	C453	D-22	C844	C-19	C2302	C-58	C3025	D-36	D080	C-51	D3418	D-39	L812	A-22	Q1805	B-71	R057	D-54	R374	A-14	R612	B-13	R1822	C-69	R2910	B-59	R4322	B-66	S014	B-49
C021	D-26	C454	C-6	C845	B-18	C2303	C-59	C3026	D-36	D091	D-28	D3419	D-39	L814	A-18	Q2332	E-63	R058	C-54	R375	B-15	R613	B-12	R1823	C-69	R2911	D-59	R4323	B-66	S015	B-49
C023	D-26	C455	D-5	C847	B-18	C2304	D-58	C3027	D-36	D095	E-9	D4301	C-26	L821	C-21	Q2334	D-63	R059	D-50	R376	C-15	R614	B-11	R1825	A-71	R2912	C-60	R4324	A-66	S016	B-49
C026	D-51	C457	C-5	C848	B-18	C2305	D-59	C3028	D-35	D096	D-50	F801	A-17	L822	C-21	Q2335	E-63	R061	B-53	R386	A-15	R615	B-9	R1826	A-71	R2913	D-60	R4326	A-68	SP1	B-64
C027	D-51	C458	C-7	C856	B-22	C2306	D-58	C3029	D-35	D301	C-9	IC001	B-52	L823	B-20	Q2351	E-62	R062	C-11	R387	B-15	R618	C-12	R1827	A-72	R2914	C-60	R4326	B-66	SP2	C-64
C028	E-28	C461	C-50	C858	B-25	C2307	D-59	C3031	C-34	D305	E-24	IC002	E-49	L824	B-21	Q2390	C-64	R063	C-55	R388	C-15	R620	C-12	R1828	B-71	R3001	D-34	R4327	A-68	T001	D-17
C029	E-27	C462	C-50	C859	A-27	C2308	D-58	C3032	A-34	D366	D-13	IC101	A-3	L825	C-21	Q2391	C-63	R064	E-50	R392	B-16	R751	E-12	R1829	B-71	R3002	A-34	R4328	A-68	T501	D-5
C031	D-27	C501	C-1	C860	A-24	C2309	E-59	C3033	D-34	D367	A-13	IC101	B-3	L826	A-21	Q2392	C-63	R065	E-50	R393	E-21	R752	E-11	R1830	B-72	R3003	D-33	R4329	A-69	T551	C-10
C033	B-51	C502	C-3	C861	C-50	C2310	C-59	C3048	C-34	D451	C-50	IC301	B-9	L830	C-22	Q2901	D-60	R066	B-51	R395	E-21	R753	D-13	R1856	E-71	R3007	D-34	R4330	A-70	T771	D-7
C036	D-27	C503	C-3	C863	B-22	C2311	C-59	C3251	E-46	D455	C-6	IC301	C-2	L831	C-22	Q2902	C-60	R067	B-51	R401	C-1	R754	E-12	R2201	B-58	R3008	B-34	R4331	B-68	T801	A-20
C037	D-28	C504	D-4	C865	C-21	C2312	C-59	C3252	E-46	D501	E-7	IC451	C-6	L1801	E-69	Q3001	C-36	R068	E-51	R402	D-2	R755	E-13	R2202	B-58	R3009	E-34	R4332	B-69	V1	B-16
C039	B-53	C505	C-4	C866	C-21	C2313	C-59	C3253	D-47	D504	C-50	IC801	B-19	L1803	E-69	Q3002	B-35	R069	C-51	R403	D-2	R756	E-12	R2203	B-59	R3010	C-34	R4333	B-69	X001	D-52
C040	D-28	C506	E-3	C867	C-22	C2314	C-58	C3254	D-24	D530	D-4	IC803	D-23	L1806	C-27	Q3005	A-35	R070	D-55	R405	C-5	R757	E-12	R2204	A-59	R3011	E-34	R4334	B-70	X101	B-1
C050	A-27	C508	D-2	C868	A-21	C2315	D-59	C3410	D-40	D531	D-2	IC804	C-18	L1807	C-27	Q3006	B-35	R071	D-55	R406	D-4	R758	E-13	R2205	A-59	R3012	C-34	R4336	B-26	X201	A-3
C080	B-51	C510	C-8	C870	B-17	C2316	E-24	C3801	B-53	D532	E-3	IC805	B-23	L1808	D-68	Q3251	D-45	R080	B-50	R407	D-3	R759	E-13	R2208	A-59	R3013	E-34	R4337	C-69	X501	C-4
C081	B-51	C511	E-5	C871	B-17	C2317	E-24	C3803	B-53	D533	D-2	IC806	B-18	L2201	B-57	Q3252	D-46	R081	B-50	R408	C-2	R761	E-14	R2212	B-62	R3014	C-33	R4338	B-69	X601	B-10
C091	D-27	C514	E-5	C880	C-49	C2332	E-61	C3804	C-54	D534	D-2	IC846	A-25	L2202	B-57	Q3253	D-47	R082	B-50	R409	D-3	R762	E-14	R2230	A-4	R3016	B-33	R4339	B-70	X1801	E-70
C092	C-53	C531	D-1	C881	B-51	C2333	D-61	C3806	C-55	D551	E-20	IC847	B-25	L2302	B-23	Q3801	C-55	R083	B-49	R410	E-2	R763	D-14	R2231	A-4	R3017	C-33	R4340	C-69		
C101	B-1	C532	D-1	C890	B-25	C2334	D-63	C4303	B-69	D552	D-8	IC1601	D-54	L2901	E-23	Q4307	A-66	R084	B-49	R413	D-51	R764	D-15	R2301	B-58	R3019	B-34	R4342	B-69		
C102	B-1	C533	C-3	C899	B-21	C2335	D-62	C4304	B-26	D553	E-8	IC1601	D-55	L3251	E-46	Q4308	B-66	R085	B-49	R414	D-2	R786	D-7	R2303	C-58	R3022	D-33	R4344	A-69		
C103	B-27	C534	D-1	C1607	E-54	C2351	E-61	C4311	A-65	D554	D-20	IC1801	B-71	L4301	A-69	Q4309	A-68	R086	E-53	R451	C-5	R788	D-7	R2305	E-59	R3024	E-33	R4345	B-69		
C104	B-28	C551	D-8	C1608	D-53	C2355	D-62	C4312	B-66	D555	C-8	IC2201	A-60	L555	C-7	Q4310	A-69	R090	E-50	R452	D-6	R795	D-7	R2306	E-58	R3027	E-33	R6501	A-37		
C105	B-3	C552	E-8	C1609	E-53	C2356	D-63	C4313	A-69	D556	D-9	IC2301	C-59	L6501	C-48	Q4311	B-69	R091	E-50	R453	C-5	R803	A-20	R2307	E-58	R3028	E-33	R6502	A-37		
C109	B-2	C554	D-8	C1801	E-69	C2361	B-23	C4314	B-69	D753	D-12	IC2331	D-61	L6502	D-46	Q4312	C-69	R092	A-53	R454	D-5	R804	A-18	R2308	B-61	R3029	E-35	R6503	A-38		
C111	B-4	C555	D-7	C1802	E-69	C2362	B-62	C4315	B-69	D754	D-13	IC2331	D-61	L6503	C-48	Q4313	B-69	R093	A-53	R455	C-5	R805	C-20	R2309	C-61	R3030	D-35	R6504	A-38		
C112	B-3	C556	D-6	C1803	E-70	C2363	C-62	C4316	B-26	D801	A-19	IC2361	B-63	L6504	D-48	Q4315	B-26	R101	B-1	R457	C-7	R810	C-22	R2332	D-61	R3032	D-35	R6506	A-37		
C115	B-2	C557	D-7	C1804	E-70	C2364	B-62	C4317	B-27	D802	A-20	IC2413	B-58	L6505	A-38	Q6501	A-37	R102	B-1	R457	C-7	R812	B-19	R2333	E-61	R3038	B-35	R6508	E-44		
C116	B-1	C558	D-8	C1805	E-70	C2365	C-62	C4319	B-70	D803	A-19	IC2901	B-60	L6506	A-38	Q6502	A-39	R112	B-2	R458	D-5	R813	A-17	R2334	D-61	R3039	C-34	R6509	C-48		
C119	B-3	C559	D-8	C1806	C-27	C2366	B-63	C4320	B-69	D804	A-20	IC2901	C-60	L6509	D-42	Q6503	B-46	R113	B-5	R460	C-6	R815	C-19	R2335	E-61	R3070	C-35	R6511	B-46		
C120	B-50	C560	C-8	C1807	C-27	C2367	B-62	C4321	B-69	D806	C-19	IC3001	A-35	L6510	C-43	Q6504	C-42	R114	B-5	R461	D-6	R816	C-21	R2336	D-61	R3071	C-36	R6512	B-46		
C135	B-5	C562	D-21	C1808	B-28	C2368	C-62	C6501	B-46	D807	C-22	IC6501	A-47	M030	A-17	Q6506	B-42	R115	B-4	R463	D-21	R816	C-21	R2336	D-61	R3071	C-36	R6512	B-46		
C153	A-2	C563	E-9	C1809	B-27	C2369	C-64	C6503	C-48	D808	C-19	JK3001	B-33	Q004	C-10	Q6507	B-43	R117	B-5	R464	C-49	R817	C-19	R2337	D-62	R3072	C-36	R6513	C-47		
C154	A-2	C564	E-21	C1810	D-69	C2370	B-64	C6504	C-48	D811	A-21	JK3001																			

PARTS LIST

SEMICONDUCTORS					
(Select the replacement that gives the best results.)					
Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
D001	-	ERA15-01	NTE552	ECG552	SK9000
D002	-	MA165	NTE519	ECG519	SK3100
D008	MTZJ5.1A	MTZJT-775.1A	-	-	-
D009	MTZJ4.7B	MTZJT-774.7B	-	-	-
D010	MTZJ36B	MTZJT-7736B	-	-	-
D015, 16	-	MA165	NTE519	ECG519	SK3100
D020	MTZJ5.1A	MTZJT-775.1A	-	-	-
	MA4051M	-	NTE5010A	ECG5010A	SK5A1
D023	MTZJ11C	MTZJT-7711C	-	-	-
D024	MTZJ6.2B	MTZJT-776.2B	NTE5013T1	ECG5013T1	SK9969
D060	MTZJ5.1B	MTZJT-775.1B	-	ECG5010T1	-
	MA4051M	-	NTE5010A	ECG5010A	SK5A1
D080	-	MA165	NTE519	ECG519	SK3100
D091	MTZJ5.6B	MTZJT775.6B	NTE5011T1	ECG5011T1	SK9968
D095	MTZJ39D	MTZJT-7739D	-	-	-
D096	-	MA165	NTE519	ECG519	SK3100
D301	-	MA165	NTE519	ECG519	SK3100
D305	-	MA1051M	NTE5010T1	ECG5010T1	SK9967
D366	-	MA165	NTE519	ECG519	SK3100
D367	-	MA4056H	NTE5011A	ECG5011A	SK5A6
D451	-	MA165	NTE519	ECG519	SK3100
D455	EM1Z	TVSEM1Z	NTE552	ECG552	SK9000
D501, 04	MA165	MA165	NTE519	ECG519	SK3100
D530	MTZJ3.9B	MTZJT-773.9B	-	-	-
# D531	ERA22-041	ERA22-04	NTE552	ECG552	SK9000
# D532	-	MA4062L	NTE5012A	ECG5012A	SK6A0
	MTZM6.2A	MTZMT-776.2A	-	-	-
# D533	MA29QA	MA29Q-ATA	-	-	-
# D534 (1)	-	MTZJT-7716A	-	-	-
# D534 (2)	MTZJ24A	MTZJT-7724A	-	-	-
# D551	-	AS01	NTE552	ECG552	SK9000
	ERA2204	-	NTE552	ECG552	SK9000
# D552	-	RH3FLFS1	-	-	-
D553	RU3N	TVSRU3ANV	NTE580	ECG580	SK5036
# D554	AU02V0	AU02	NTE552	ECG552	SK9000
D555	-	MA179	NTE519	ECG519	SK3100
D556	-	MA165	NTE519	ECG519	SK3100
D753, 54	-	MA165	NTE519	ECG519	SK3100
# D801, 02, 03, 04	RM10B	TVSRM10B	NTE125	ECG125	SK3081
D806	-	MA150	NTE177	ECG177	SK9091
D807	-	MA165	NTE519	ECG519	SK3100
D808	-	AU02Z	NTE552	ECG552	SK9000
# D811	-	RU30LF-S1	-	-	-
# D812, 13	RU3YX	RU3YX-M	NTE588	ECG588	SK9938
D816	-	TVSSR2KL	-	-	-
# D817	-	AU02Z	NTE552	ECG552	SK9000
D818	-	MA165	NTE519	ECG519	SK3100
# D821	RU3YX	RU3YX-M	NTE588	ECG588	SK9938
D827	MTZJ22D	MTZJT-7722D	-	-	-
D828	-	AS01	NTE552	ECG552	SK9000
D853	-	MA165	NTE519	ECG519	SK3100

For SAFETY use only equivalent replacement part.
(1) Used in models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV, and CT-F2992XV.
(2) Used in models CT-31SF24V, CT-31XF24CV, and TC-33SF24TV.

SEMICONDUCTORS continued					
(Select the replacement that gives the best results.)					
Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
D854	MTZJ22D	MTZJT-7722D	-	-	-
	-	MA4220M	-	-	-
D860	MTZJ12C	MTZJT-7712C	-	-	-
D2390	-	MA165	NTE519	ECG519	SK3100
D3010 Thru	-	-	-	-	-
D3023	-	MA3110M	-	-	-
D3025, 26, 27, 28	MTZJ11C	MTZJT-7711C	-	-	-
	MA4110M	-	-	-	-
D3180, 81	MTZJ11C	MTZJT-7711C	-	-	-
	MA4110M	-	-	-	-
D3184, 85, 86, 87	MTZJ11C	MTZJT-7711C	-	-	-
	MA4110M	-	-	-	-
D3410 Thru	-	-	-	-	-
D3419	MTZJ11C	MTZJT-7711C	-	-	-
	MA4110M	-	-	-	-
D4301	-	MA3036H	-	-	-
IC001	-	MN1876476T7D	-	-	-
IC002	-	24LC02BIP	-	-	-
IC101	-	AN5170K	-	-	-
# IC301	-	AN5307K	-	-	-
IC451	-	LA7845	-	-	-
# IC801	-	STR-S6301	NTE7073	ECG7073	-
# IC803	-	AN7809	NTE1910	ECG1910	-
# IC804	-	SE140N	-	-	-
# IC805	-	AN78N09	-	-	-
# IC806	-	TLP621GR	NTE3098	ECG3098	SK10178
# IC846	-	AN78M05	NTE960	ECG960	SK3591
# IC847	-	AN78M05	NTE960	ECG960	SK3591
IC1601	-	TC4066BP	NTE4066B	ECG4066B	SK4066B
IC1801	M65617SP-A	M65617SP	-	-	-
IC2201	-	AN5819K	-	-	-
IC2301	-	CXA2021S	-	-	-
IC2331	-	XRA15218N	-	-	-
IC2361	-	AN5275	-	-	-
IC2413	-	AN7395K	-	-	-
IC2901	-	XRA15218N	-	-	-
IC3001	-	SN103848APG	-	-	-
IC6501	-	MC141624SP	-	-	-
Q004	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q005, 06, 07	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q008	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q009	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q010 Thru	-	-	-	-	-
Q013, 15	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q017	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q102	MSD601R	MSD601-RT1	-	-	-
Q302, 03	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932

For SAFETY use only equivalent replacement part.

PARTS LIST continued

SEMICONDUCTORS continued

(Select the replacement that gives the best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
Q304	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q351, 52, 53	2SC3063RL	2SC3063	NTE157	ECG157	SK3747
Q354, 55, 56	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q363	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q401, 02, 03	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q451	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q501	-	2SC4212H	-	-	-
# Q502, 03	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
# Q551	2SD1556	2SD1556MA	NTE2331	ECG2331	SK10088
Q601	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q752	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q753	-	2SD1267APQ	NTE290A	ECG290A	SK3932
Q754	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q755, 56	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q757	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q801	2SA1309AQR	2SA1309QR	NTE2362	ECG2362	SK10094
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q802	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q805	-	2SA879Q	NTE288	ECG288	SK3434
Q1601, 02	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q1801, 02, 03	MSD601	MSD601-RT1	-	-	-
Q1804, 05	MSB709	MSB709-RT1	-	-	-
Q2332	MSB709	MSB709-RT1	-	-	-
Q2334, 35	MSD601	MSD601-RT1	-	-	-
Q2351	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q2390, 91	-	2SA564AQRS	NTE290A	ECG290A	SK3932
	JA101PQ	-	NTE290A	ECG290A	SK3932
Q2392	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q2901, 02	MSD601	MSD601-RT1	-	-	-
Q3001	MSB709	MSB709-RT1	-	-	-
Q3002, 05, 06	MSD601	MSD601-RT1	-	-	-
Q3251	MSD601	MSD601-RT1	-	-	-
Q3252	MSB709	MSB709-RT1	-	-	-
Q3253	MSD601	MSD601-RT1	-	-	-
Q3801	-	2SC1685QRS	NTE85	ECG85	SK9229
	JC501PQ	-	NTE85	ECG85	SK3124A
Q4307, 08	MSD601	MSD601-RT1	-	-	-
Q4309	MSB709	MSB709-RT1	-	-	-

For SAFETY use only equivalent replacement part.

SEMICONDUCTORS continued

(Select the replacement that gives the best results.)

Item No.	Type No.	Mfr. Part No.	NTE Part No.	ECG Part No.	TCE Part No.
Q4310	MSD601	MSD601-RT1	-	-	-
Q4311	MSB709	MSB709-RT1	-	-	-
Q4312, 13	MSD601	MSD601-RT1	-	-	-
Q4315	-	2SC1384Q	NTE293	ECG293	SK3849
Q6501	MSB709	MSB709-RT1	-	-	-
Q6502, 03, 04	MSD601	MSD601-RT1	-	-	-
Q6506, 07	MSD601	MSD601-RT1	-	-	-
Q6509 Thru	-	-	-	-	-
Q6518	MSD601	MSD601-RT1	-	-	-

CAPACITORS & ELECTROLYTICS

Item No.	Rating	Mfr. Part No.	Item No.	Rating	Mfr. Part No.
C026, 27	33pF 5% 50V N150	ECCF1H330JP	# C805	.01 20% 250VAC	ECQU2A104MN
C301	33μF 50V NP	ECEA1HN33U	# C805 (3)	.22 20% 250VAC	ECQU2A224MN
C351	.001 10% 2kV	ECKD3D102KB	# C806	680μF 200V	ECOS2DA681CB
C352	1μF 50V NP	ECEA1HN010U	# C808	1000μF 16V	ECA1CM102
C402	1μF 25V Tantalum	ECSF1EE105	C812	.0047 10% 1kV	ECKD3A472KB
C403	33μF 35V Tantalum	ECSF1VE334	C817	.001 10% 1kV	ECKD3A102KB
C504	220pF 5% 50V N750	ECCF1H221JU	# C818	220μF 200V	ECES2DU221EG
# C531	33μF 50V	ECA1HM330	# C821	1000μF 50V	ECA1HM102
# C551	.01 5% 1.2kV	ECWH12H103JS	# C826	3300μF 16V	ECA1CM332
# C552	.033 5% 400V	ECQM4333JZ	C828, 29	.0047 20% 125VAC	ECKCNS472ME
# C554 (1)	680pF 5% 2kV	ECKD3D681JB	# C831	330μF 16V	ECEA1CFS331
# C554 (2)	.0015 5% 2kV	ECKD3D152JB	C835	470pF 10% 2kV	ECKD3D471KB
# C555 (1)	.0022 5% 1.2kV	ECWH12H222JS	# C843, 58	47μF 25V	ECEA1EFS470
# C555 (2)	.0047 5% 1.2KV	ECWH12H472JS	# C859	470μF 16V	ECEA1CFS471
# C556 (1)	.0012 5% 2kV	ECKD3D122JB	# C868	470pF 10% 500V	ECKD2H471KB
# C556 (2)	680pF 5% 2kV	ECKD3D681JB	# C870, 71	.0047 20% 125VAC	ECKCNS472ME
# C557 (2)	470pF 5% 2kV	ECKD3D471JB	# C890	470μF 16V	ECEA1CFS471
# C558	820pF 5% 2kV	ECKD3D821JB	C2201	3.3μF 16V Tantalum	AP335K016CAE
# C559 (1)	.43 200V	TAC7A2D434JC	C2219	10μF 16V Tantalum	AP106K016CAE
# C559 (2)	.5 200V	TAC7A2D504JC	C2301, 02	10μF 16V NP	ECEA1CKN100
# C560	.033 5% 100V	ECQM1333JZ	C2401, 02	10μF 16V NP	ECEA1CN100U
# C562	470μF 35V	ECA1M471	C2411	22μF 50V NP	ECEA1HN220U
# C563	4.7μF 20% 50V NP	ECEA1HN4R7U	C3001, 03	1μF 50V NP	ECEA1HKN010
# C564	10μF 250V	ECEA2EGE100	C3804	1μF 50V NP	ECEA1HN010U
# C567 (2)	470pF 5% 2kV	ECKD3D471JB			
# C569	33μF 160V	ECEA160V33Z			
C606	2.2μF 50V NP	ECEA1HN2R2U			
C607	9pF 50V NPO	TACCS090T50V			
C608, 09	.33μF 50V NP	ECEA1HKNR33			
C615	33pF 5% 50V NPO	TACCC330T50V			
# C801, 02, 03	.0047 +100% -0% 500V	ECKD2H472PU			

For SAFETY use only equivalent replacement part.

(1) Used in models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV, and CT-F2992XV.

(2) Used in models CT-31SF24V, CT-31XF24CV, and TC-33SF24TV.

(3) Used in model TC-33SF24TV.

PARTS LIST continued

CONTROLS & RESISTORS

Item No.	Function/Rating	Mfr. Part No.	NTE Part No.
# D850	3.2/53.3 Cold PTC	TRPW5B0M030D	
R066	10K 1% 1/4W	ER0S2CKF1002	-
R115	3000 Detector Out	EVND2AA03B33	-
R304	1650 1% 1/4W	ER0S2CKF1651	-
R325	5600 1% 1/4W	ER0S2CKF5601	-
R327	2200 1% 1/4W	ER0S2CKF2201	-
R393	100 5% 1/2W Fusible	ERQ12AJ101	-
R468	4320 1% 1/4W	ER0S2CKF4321	-
R469	1470 1% 1/4W	ER0S2CKF1471	-
# R515 (1)	2700 5% 3W	ERG3SJS272H	3W227
# R515 (2)	2400 5% 3W	ERG3SJS242H	3W224
# R516 (1)	2700 5% 3W	ERG3SJS272H	3W227
# R516 (2)	2400 5% 3W	ERG3SJS242H	3W224
R521	4700 1% 1/4W	ER0S2CKF4701	-
R522	270K 1% 1/4W	ER0S2CKF2703	-
# R531	47 5% 1/4W	ERD25FJ470	QW047
# R532 (1)	22.1K 1% 1/4W	ER0S2CKF2212	-
# R532 (2)	24.3K 1% 1/4W	ER0S2CKF2432	-
# R533 (1)	3740 1% 1/4W	ER0S2CKF3741	-
# R533 (2)	2740 1% 1/4W	ER0S2CKF2741	-
# R534	680 5% 1/4W	ERDS2TJ681	QW168
# R535	820 5% 1/4W	ERDS2TJ821	QW182
# R537	10K 5% 1/4W	ERDS2TJ103	QW310
# R540	10K 5% 1/4W	ERDS2TJ103	QW310
# R553 (1)	2.2 10% 5W Wirewound	ERF5ZK2R2	5W2D2
# R553 (2)	2 10% 5W Wirewound	ERF5ZK2R0	-
# R556 (1)	.22 5% 1W Fusible	ERQ1CZKR22	-
# R556 (2)	3 5% 2W Fusible	ERQ2CJ3R0	F2W3D0
# R558	1000 5% 1W Fusible	ERQ1CJP102	F1W210
# R559	1 5% 1/4W	ERD25FJ1R0	QW1D0
R764 (1)	22 5% 2W Fusible	ERQ2CJP220	F2W022
R764 (2)	10 5% 2W Fusible	ERQ2CJP100	F2W010
R786	1000 Pincushion	EVN64UA00B13	-
# R804 (1)	68 5% 5W	ERG5SJ680	5W068
# R804 (2)	100 5% 5W	ERG5SJ101	5W110
# R805	39 5% 2W	ERG2ANJP390H	2W039
# R812	8.2 10% 7W Wirewound	ERF7ZK8R2	-
# R813	8.2M 10% 1/2W	ERC12ZGK825	HW582
# R816	.33 10% 1/2W Fusible	ERQ12HKR33	-
# R822	.33 10% 1W Fusible	ERQ1CKPR33	-
# R828	.39 10% 1W Fusible	ERQ1CKPR39	-
# R890 (1)	1 10% 5W Wirewound	ERF5ZK1R0	5W1D0
# R890 (2)	.82 10% 5W Wirewound	ERF5ZKR82	5WD82
R2208	91K 1% 1/10W	ERJ6ENF9102	-
# R2403	15K 5% 1/10W	ERJ6EYJ153	-
# R2404	56K 5% 1/4W	ERD25TLJ563	QW356
# R2405	15K 5% 1/10W	ERJ6EYJ153	-
# R2406	56K 5% 1/10W	ERJ6GEYJ563	-

For SAFETY use only equivalent replacement part.

(1) Used in models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV, and CT-F2992XV.

(2) Used in models CT-31SF24V, CT-31XF24CV, and TC-33SF24TV.

COILS & TRANSFORMERS

Item No.	Function/Rating	Mfr. Part No.
L001	Ferrite Bead	EXCELSA35
L002, 04	5.6μH	TLUABTA5R6K
L005, 06	10μH	TLUABTA100K
L007, 08	10μH	TLUABTA100K
L009, 10	Ferrite Bead	EXCELSA35
L012	Ferrite Bead	EXCELSA35
L013	22μH	TLUABTA220K
L020, 21	10μH	TLUABTA100K
L030	Ferrite Bead	EXCELSA35
L103	15μH	TLTACT150K
L105	VCO	EIV7EN053B
L108	33μH	TLTACT330K
L115, 16	-	TLQ015K205C
L135	56μH	TLTACT560K
L351	Ferrite Bead	EXCELSA35B
L451	Ferrite Bead	EXCELSA35
L452	Power	ELC08D067
# L551 (1)	Horizontal Linearity	TLH6618P
# L551 (2)	Horizontal Linearity	TLH6663P
L553	Ferrite Bead	EXCELSA24T
L554	Ferrite Bead	EXCELSA35
# L555 (1)	Yoke Horiz 1.0mH Vert 22.7mH	OLY15907F
# L555 (2)	Yoke	TLY15496F
L601	82μH	TLUABTA820K
L603	Ferrite Bead	EXCELSA35
# L751	Phasing	TLH15733M
L770	Pincushion	ELH11Y751
# L801	Line Filter	ELF18D293M
# L801 (3)	Line Filter	ELF18D850C
# L802	Line Filter	ELF18D656Y
# L802 (3)	Line Filter	ELF18D850C
L804 Thru L809	Ferrite Bead	EXCELSA39

For SAFETY use only equivalent replacement part.

(1) Used in models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV, and CT-F2992XV.

(2) Used in models CT-31SF24V, CT-31XF24CV, and TC-33SF24TV.

(3) Used in model TC-33SF24TV.

COILS & TRANSFORMERS continued

Item No.	Function/Rating	Mfr. Part No.
L810	Ferrite Bead	0SC9002
L811	Ferrite Bead	0SC9002
L812	-	ELC10B011
# L814 (1)	Degaussing	OLK19045A
# L814 (2)	Degaussing	OLK19036B
L821 Thru L826	Ferrite Bead	EXCELSA35T
L830	33μH	ELEIE330KA
L831 (1)	68μH	ELEIE680KA
L831 (2)	33μH	ELEIE330KA
L1801	1.5μH	TLTACT1R5K
L1803	2.2μH	TLTACT2R2K
L1806	1μH	TLTACT1R0K
L1807	1μH	TLTACT1R0K
L1808	Ferrite Bead	EXCELDJR25
L2201	1000μH	ELESN102JA
L2202	470μH	ELESN471JA
L2302	Ferrite Bead	EXCELSA35
L2901	Ferrite Bead	EXCELSA35
L3251	82μH	TLTACT820K
L4301	2.2μH	TLTACT2R2K
L6501, 02	22μH	TLTACT220K
L6503, 04	22μH	TLTACT220K
L6505, 06	39μH	TLTACT390K
L6509	12μH	TLTACT120K
L6510	Delay Line	EIK1EG025Q
# T001	Power Supply	TLP16297
# T501	Horizontal Drive	ETH19Y70AYM
# T551 (1)(4)	Horizontal Output	KFT4AB015F
# T551 (2)(4)	Horizontal Output	TLF14459F1
T771	Pincushion	ETR26L32A
# T801	Power Supply	ETS39AG125AC

For SAFETY use only equivalent replacement part.

(1) Used in models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV and CT-F2992XV.

(2) Used in models CT-31SF24V, CT-31XF24CV, and TC-33SF24TV.

(4) Focus and screen controls are part of T551.

PARTS LIST continued

MISCELLANEOUS

Item No.	Description	Mfr. Part No.	Notes
# CR801, 02	Capristor	EXNG131P365	130pF, 3.6M, Spark Gap
# F801	Fuse	0BA1C63NU100	6.3Amp, 125V, Slow Blow
JK3001	Jack	TJB2A9052	Assembly
JK3180	Jack	TJB2A9101	Assembly
JK3410	Jack	TJB2AA0071	S-Video
JK3420	Jack	TJB2AA0061	Assembly
M005	Transmitter	EUR5511060B	Remote
M013	Socket	TJS1A5211	CRT
M019	Wedge	TMM2A30702	Yoke Positioning (3 Used)
# M030	Line Cord	TSX3134X	AC, Polarized
# RL001	Relay	TSEH0005	Power
RM001	Receiver	RPM-637CBRL	Remote
S010	Switch	EVQQVC13T	Power
S011	Switch	EVQQVC13T	Volume Down
S012	Switch	EVQQVC13T	Volume Up
S013	Switch	EVQQVC13T	Channel Down
S014	Switch	EVQQVC13T	Channel Up
S015	Switch	EVQQVC13T	TV/Video
S016	Switch	EVQQVC13T	Action
S3180	Switch	ESB62555-5	Front/Rear
SP1, 2	Speaker	TXFEA0497SER	3" X 5", 16 Ohm
# TNR001 (3)	Tuner	ENV56D18G3	UHF/VHF
# V1 (1)	CRT	M68KTY161X	-
# V1 (2)	CRT	M78KTY161X	-
X001	Crystal	TSS2080MX	12MHz
X101	Filter	EFCKM1963M	SAW
X102	Filter	EFCWS4504AB	4.5MHz
X201	Filter	EFCS4R5MS4W	4.5MHz
X501	Crystal	TAFCSB503F38	503kHz
X601	Crystal	TSS816MX	3.58MHz
X1801	Crystal	TSSA050	-
	Magnet (1)	ETC33X82NA	Purity/Convergence
	Magnet (2)	ETC39C6NA	Purity/Convergence
	PC Board (1)	TNPH0040AP	A
	PC Board (2)	TNPH0040AM	A
	PC Board	TMP111503	C
	PC Board	TNP2AA026	G
	PC Board	TNP2AA013	J
	PC Board	TNP111504BZ	L
	PC Board	TNP2AA027NIL	N
	PC Board (1)	TNP111505HZ	P
	PC Board (2)	TNP111505KZ	P
	PC Board	TNP2AA012AB	U
	PC Board	TNPA0187AC	X
	PC Board	TNP2AA009AD	Y

For SAFETY use only equivalent replacement part.
(1) Used in models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV, and CT-F2992XV.
(2) Used in models CT-31SF24V, CT-31XF24CV, and TC-33SF24TV.
(3) Contact TNI Electronics for replacement; order by part number on tuner.

CABINET PARTS

Item	Mfr. Part No.
Models CT-27SF24V, CT-F2992V, CT-F2992LV, CT-F2992VV and CT-F2992XV	
Badge	TBM2A30841
Cabinet Back	TXFKU1897SER
Cabinet Front Assembly	TXFKY2297SER
Pushbutton Assembly	TBX2A50191G
Models CT-31SF24V and TC-33SF24TV	
Badge	TBM2A30841
Cabinet Back	TXFKU1796SER
Cabinet Front Assembly	TXFKY1897SER
Pushbutton Assembly	TBX2A50191G
Model CT-31XF24CV	
Badge	TBM2A30841
Cabinet Back	TXFKU1796SER
Cabinet Front Assembly	TXFKY1997SER
Pushbutton Assembly	TBX2A50191G
REMOTE TRANSMITTER	
Battery Cover	UR51EC843A

PANASONIC
MODEL CT-27SF24V (CHASSIS APEDP264)