

# Horizontal Output Transformer

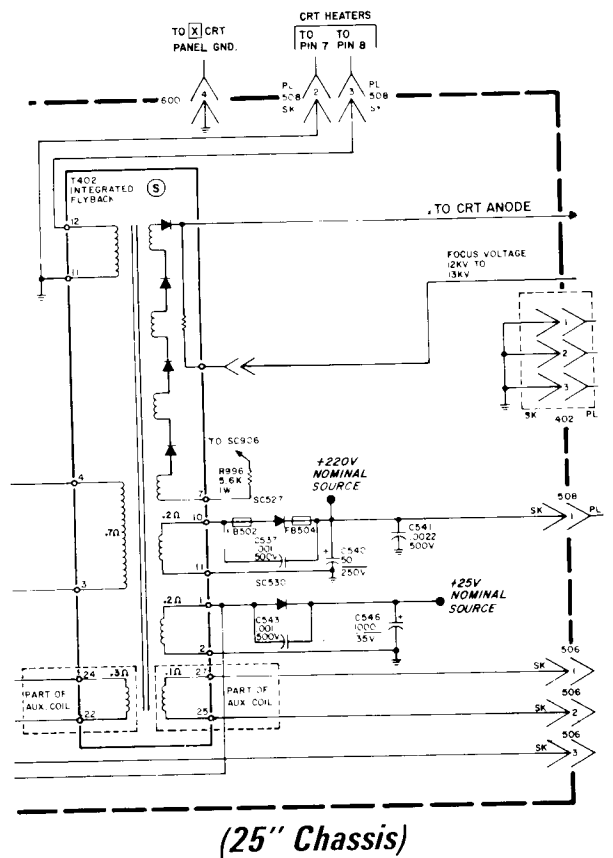
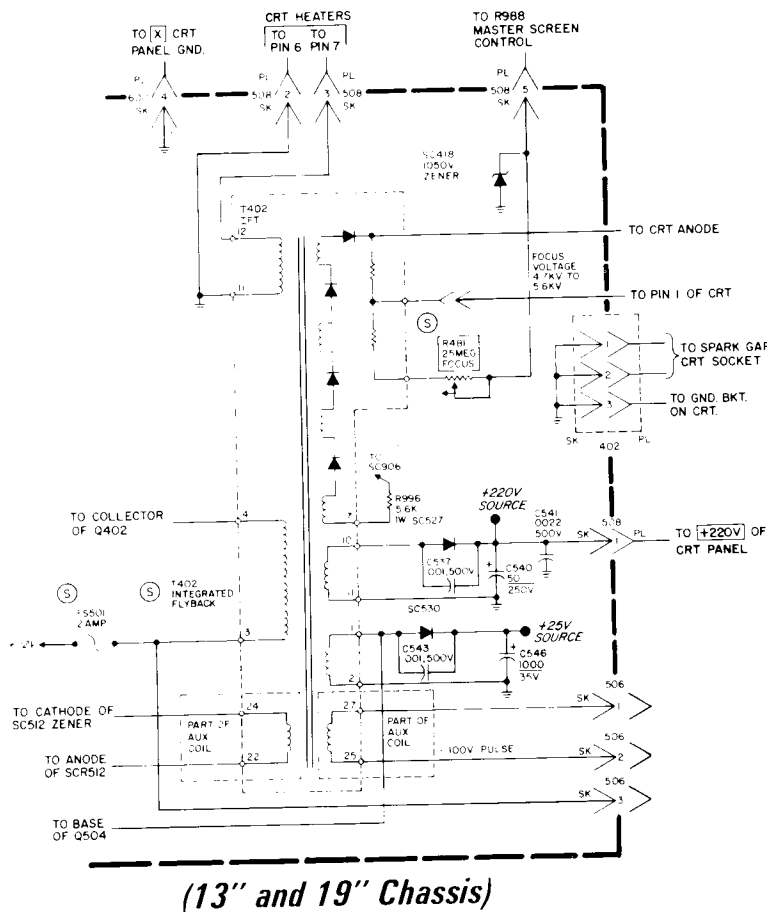
(Figure 11)

The E30 Series Chassis utilizes a new type fly-back system called the IFT (Integrated Fly-back Transformer). This system totally eliminates the need for a separate tripler. It also has definite advantages over the separate tripler system.

1. Improved high voltage regulation
2. Better focus tracking
3. More Brightness
4. More picture drive
5. Improved reliability

In the Schematic of the IFT (Figure 11) you will see the internal electrical connections. Voltage is coupled from the primary winding to a secondary winding which consists of a section

utilizing four coils and four diodes in a series arrangement. The high voltage is derived by elevation on each set of windings. For example the first winding will pick up an 8KV pulse. This pulse will be rectified by the diode off the top of the winding. This action will give approximately 8KV DC. Now, following through the next winding you will have the 8KV DC pulse plus another 8KV pulse. When this 8KV pulse is rectified, you now have 16KV DC. Going through the next winding you now have 16KV DC plus another 8KV pulse. The next diode will rectify this 8KV pulse and have 24KV DC. Finally, going into the last coil you have 24KV DC plus an 8KV pulse. The top diode rectifies the 8KV pulse and now you will have approximately 32KV DC. With the loading effect, we will come out with the correct high voltage for the appropriate picture tube size and, of course, is set by the B+ Adjust Control R521.



IFT Circuits (Figure 11)

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# *Horizontal Oscillator/Vertical Countdown*

*(Figure 9)*

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The horizontal and vertical synchronization on deflection drive - signal processing for the E30 Series Chassis is handled by a new quasi-countdown IC. This IC, IC700 contains or performs the function of:

1. Horizontal Oscillator
2. Horizontal Frequency Control (AFC)
3. Vertical Countdown
4. Vertical Driver
5. Horizontal Driver

In order for IC700 to function, horizontal and vertical sync must be input to the IC. The circuitry which amplifies and separates the sync from the video consists of Q700 (Sync Separator Driver), Q701 (Sync Separator) and Q702 (Vertical Sync Amplifier).

Video signal from the output of IC204 (IF/AGC/AFC) pin 12 is coupled to the base of Q700 the Sync Separator Driver. Q700 amplifies and inverts the signal so that it is approximately 10V p/p with the tip of horizontal sync at approximately +19V DC and a total sync amplitude of approximately 3V p/p. This signal is coupled from the collector of Q700 through C704 to the base of Q701 the Sync Separator Transistor, which clips the sync from the composite video. The signal from Q701 collector is coupled through C716 to pin 14 of IC700 for horizontal sync.

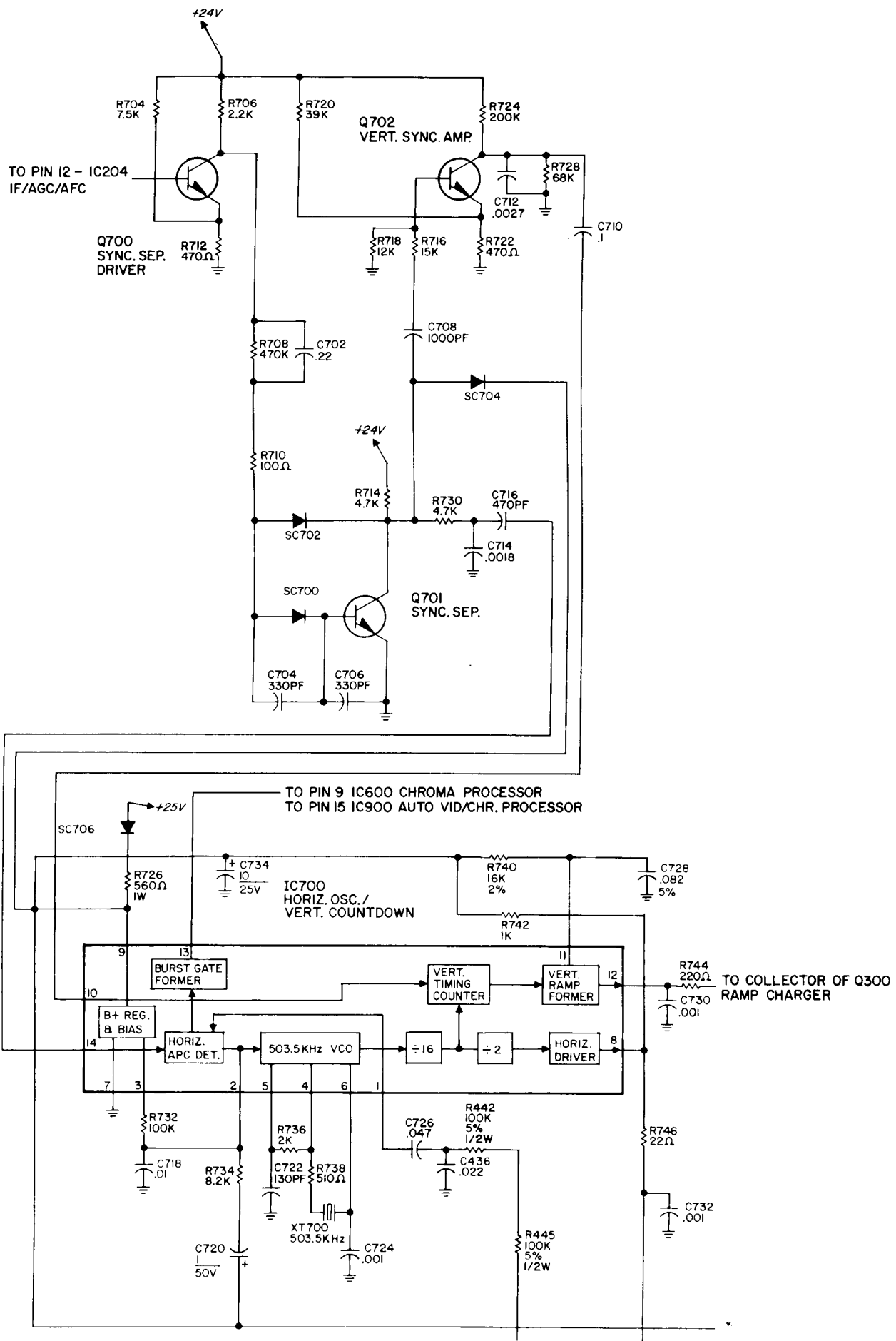
To obtain vertical sync, the signal from Q701 collector is coupled to the base of Q702 through capacitor C708. The signal is amplified by Q702 and differentiated in the collector circuit. This signal is then coupled through C710 and input to pin 10 of IC700. In addition to horizontal and vertical sync input, IC700 has input for a horizontal yoke pulse at pin 1 for use in horizontal AFC.

IC700 operates as a Phase Shift Oscillator or an oscillator in which a change in phase is used to force the tuned element to change oscillation frequency. The phase shift is controlled by a voltage change (VCO). This oscillator uses a ceramic resonator XT700 (503.5kHz) for frequency control. This frequency is divided by 16 to give us 31468.75Hz and again by 2 to give us 15734.375Hz or the horizontal rate. The output of the divide by 16 is fed to the vertical timing counter to be used for control of vertical sweep. The output of divided by 2 is fed to the horizontal driver stage of IC700. The output of the driver stage pin 8 is fed into the base of Q401 (Horizontal Drive Transistor).

The "horizontal" oscillator (VCO) is held on frequency by use of a horizontal AFC system. That is, it has a balanced phase detector which compares the input flyback pulse with the oscillator to determine frequency error and generate correction voltage for the oscillator.

The vertical scan drive is developed by using a counter to count the 31468.75Hz. oscillator output and generate a "window" in which vertical sync is "looked for". If normal (NTSC) interlaced composite video is being received, the vertical retrace pulse will occur at the 525th count which is in the center of the window. If non-standard signals are received, the vertical is still related to the horizontal frequency in almost all cases. So as long as the horizontal is locked in (APC), the vertical will occur at the same relative time.

Also included within IC700 are a vertical ramp former, a burst gate shaper, and B+ regulator for the IC.



Synchronization and Horizontal Oscillator/Vertical Countdown Circuits (Figure 9)

# Analyzing High Voltage Shutdown

(Figure 12)

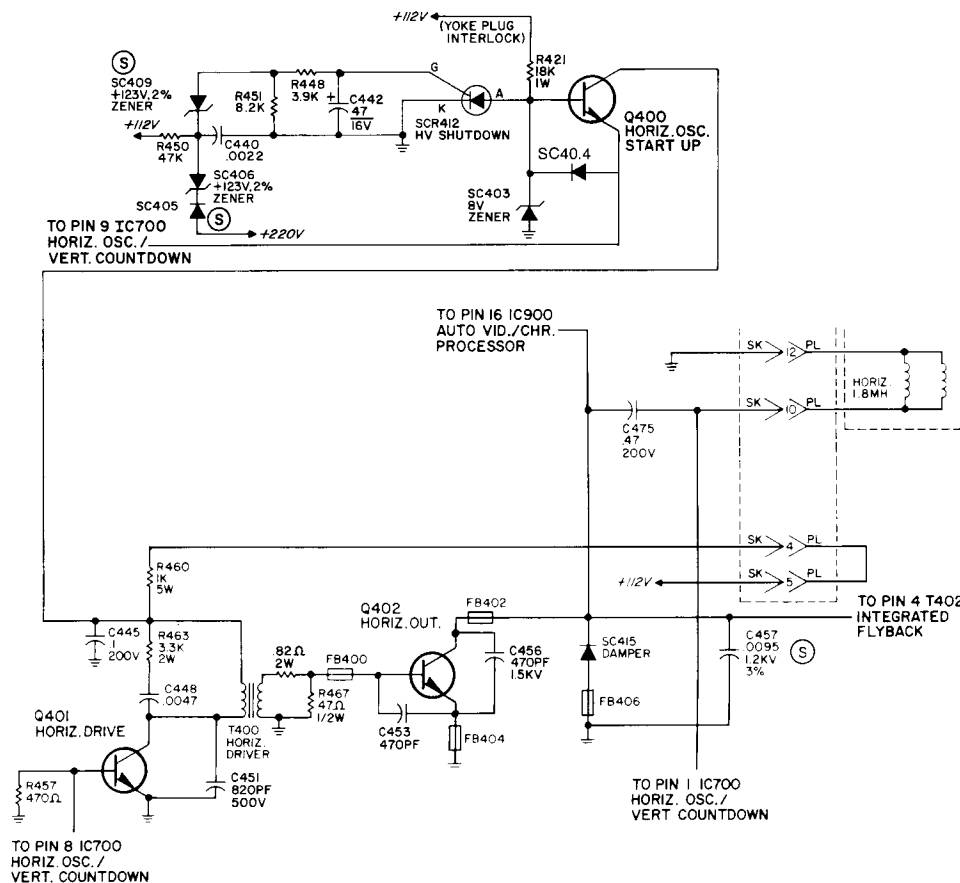
An SCR is utilized to put the chassis into shutdown in the event of excessive high voltage. Since the +220V source is derived from scan energy rectification it will reflect any increase in energy level which would cause increased high voltage.

Referring to Figure 12, it can be seen that an increase in the +220 source above the combined zener ratings of SC406 and SC409 will cause the two devices to conduct. The resultant current through R451 will develop a voltage of 0.7 volts or more and gate on SCR412. The anode of the SCR will drop to 0.7 volts, and remove B+ from pin 9 of IC700. This action shuts down the horizontal oscillator in IC700 resulting in loss of raster and sound.

An additional protection is included in the shutdown circuit to protect Q400 when horizontal sweep fails. In this failure mode it is possible to have SCR513 'locked on', since there will be no retrace pulse to turn it off. The +112 source would then rise to +160 and Q400 and its' circuit components could be damaged. As the +112 source rises, the zener rating of SC409 is reached, and SCR412 is gated on, holding Q400 in the off mode.

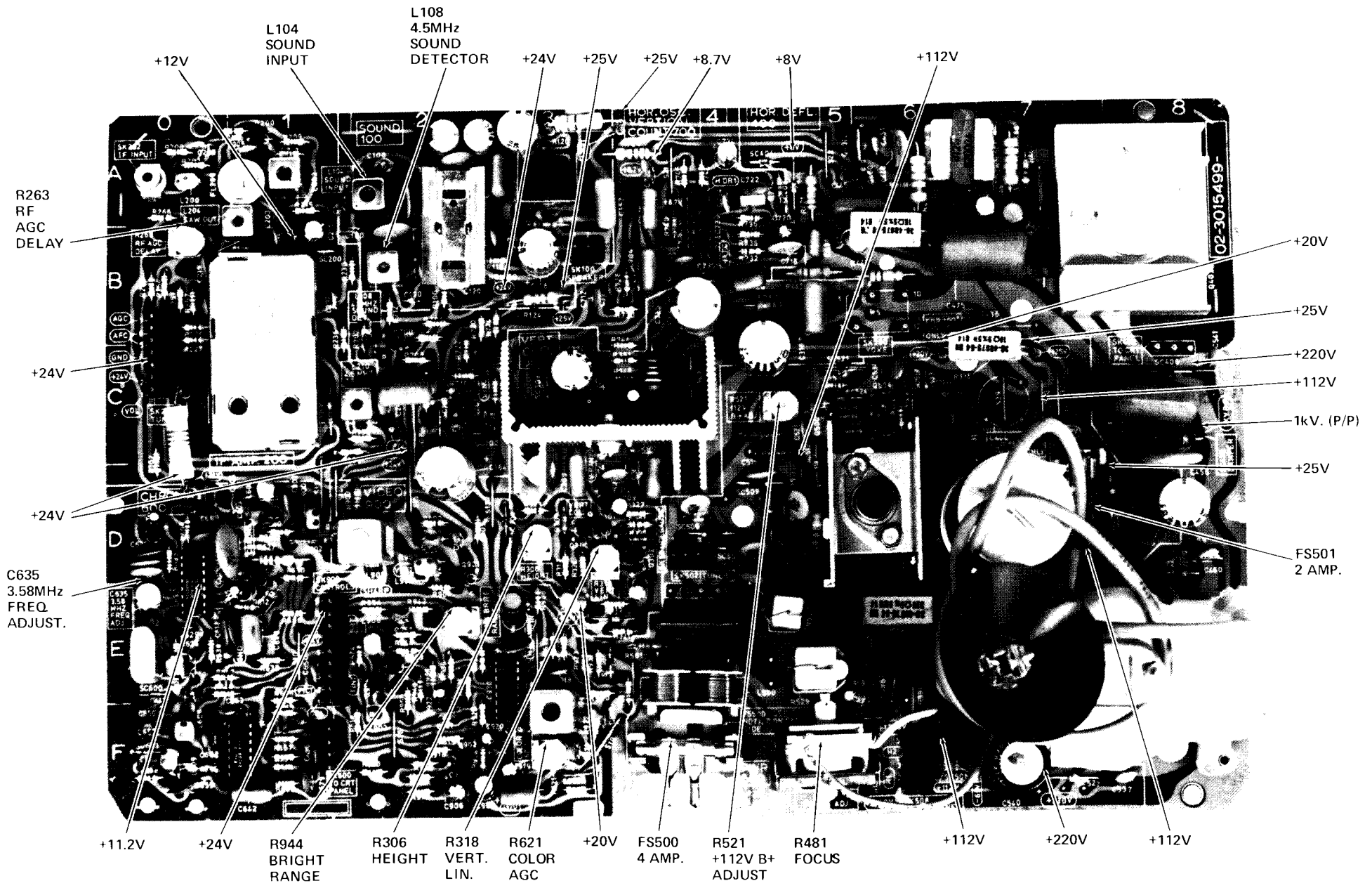
Q400, Horizontal Oscillator Start-Up transistor provides a second function when the set is turned off. Since horizontal deflection stops abruptly, there is a danger of phosphor burn at center screen because of the slow decay of second anode voltage. The +112 volt source will begin to decay slowly as C518B discharges, but for a short period SC403 will hold Q400 in a conducting state. Its emitter voltage (+7.3) will provide sufficient B+ for pin 9, IC700 and keep the horizontal oscillator functioning for a short period of time eliminating the possibility of CRT damage.

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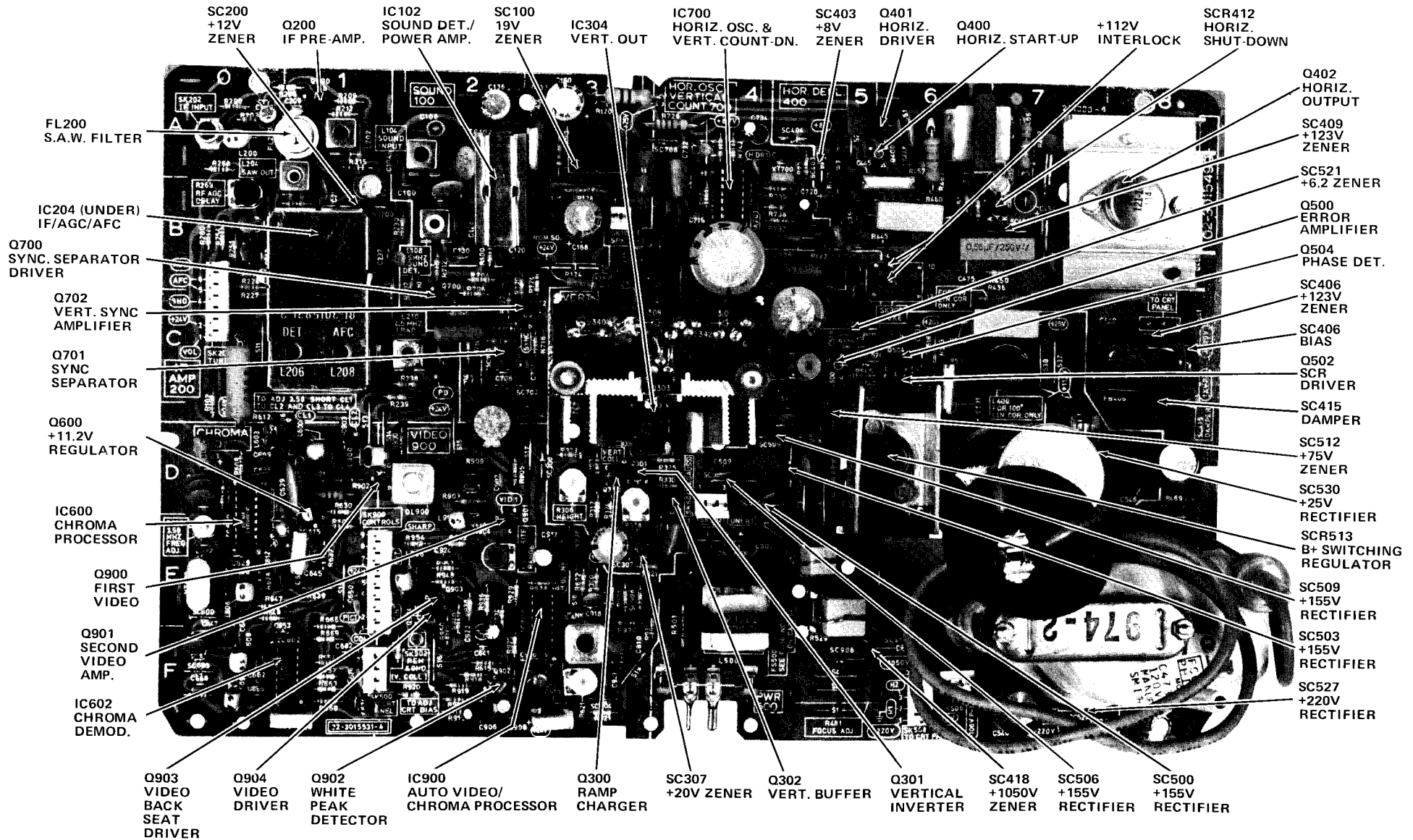


Horizontal Circuits (Figure 12)





***Component Identification, Adjustment and Voltage Points (13" and 19" Chassis)***



***Solid State Device Locations (25" Chassis)***

## Replacement Parts List

Schematic Coding	Service Part No.	Description	Schematic Coding	Service Part No.	Description
<b>Capacitors (All in MFD, 50V, unless otherwise specified)</b>			<b>Capacitors (Continued)</b>		
C100		47PF, NPO	C529		.001, 500V, Z5P
C104		12PF, NPO	C531		.1, 200V
C108	45-3015039-4	1500PF, 160V	C532		470PF
C112		.047, Z5V	C533		.001, Z5P
C116		.047, Z5V	C534		.01
C120		.01, Z5P	C537		.001, 500V, Z5P
C124		8200PF, Z5P	C540	41-43599-6	50/250V Electrolytic
C128		120PF, N150	C541	.0022, 500V, Z5U	
C130		8.2PF, NPO	C543		.001, 500V, Z5P
C132	41-32477-50	50/25V Electrolytic	C546	41-32477-68	1000/35V Electrolytic
C136	41-32477-50	50/25V Electrolytic	C603		22PF, NPO
C144		22PF, N750	C606		47PF, NPO
C148		1000PF, Z5P	C609		220PF, Z5P
C152		.22	C612		.01, Z5P
C156		.1	C615	41-43682-77	1/50V Electrolytic
C160	41-32477-52	250/25V Electrolytic	C618		.01, Z5P
C164	41-32477-68	1000/35V Electrolytic	C621		.01, Z5P
C168	41-32477-52	250/25V Electrolytic	C623	41-43682-77	1/50V Electrolytic
C200		.001, Z5P	C624		.01, Z5P
C203		.01, Z5P	C626		.01, Z5P
C206		.001, Z5P	C629		33PF, NPO
C212		.001, Z5P	C632		18PF, NPO
C215	41-32477-36	50/16V Electrolytic	C635	42-43372-3	2-27PF Variable
C216		.01, Z5P	C638		.01, Z5P
C217	41-39148-63	.33/50V Electrolytic	C639		.01, Z5P
C218		.01, Z5P	C640		.1
C219		.001, Z5P	C641		68PF, NPO
C221		.001, Z5P	C642		.1
C224		82PF, N150	C643		330PF, Z5P
C227		1.8PF, NPO	C644		.0022, Z5P
C230		1.8PF, NPO	C647		100PF, NPO
C233		82PF, NPO	C650		.001, Z5P
C236		.001, Z5P	C653		220PF, Z5P
C237		47PF, NPO	C656		68PF, NPO
C239		.001, Z5P	C657		100PF, NPO
C240		82PF, NPO	C659		68PF, NPO
C242	41-3015983-10	3.3/50V Electrolytic (On Tuner Cluster)	C662		220PF, Z5P
C243	41-3015983-11	4.7/50V Electrolytic (On Tuner Cluster)	C665		220PF, Z5P
C245	41-23765-5	5/25V Electrolytic (On Tuner Cluster)	C668		22PF, NPO
C303		.1, 50V	C674		.001, Z5P
C304	41-43680-77	1/50V Electrolytic	C676		220PF, N750
C306	41-43680-51	10/25V Electrolytic	C679		220PF, N750
C309	41-43681-51	10/25V Electrolytic	C682		220PF, N750
C312		.022, Z5V	C700		68PF, NPO
C315		.1	C702		.22
C318	41-32477-68	1000/35V Electrolytic	C704		330PF, Z5P
C321	41-43681-78	2/50V Electrolytic	C706		330PF, Z5P
C324	41-32477-52	250/25V Electrolytic	C708		.001, Z5P
C325	41-43599-8	1000/35V Electrolytic	C710		.1
C330		.22	C712		.0027, Z5P
C436		.022	C714		.0018, Z5P
C442	41-43680-81	10/25V Electrolytic	C716		4700PF, Z5P
C445		.1, 200V	C718		.01, Z5P
C448		.0047, Z5P	C720	41-43681-77	1/50V Electrolytic
C451		220PF, 500V, Z5P	C722		130PF, NPO
C454	41-32477-36	50/16V Electrolytic	C724		.001, Z5P
C456	43-11028-28	470PF, 1.2KV	C726		.047
C457	45-33037-35	.0095, 1.2KV, 3%	C728	45-41275-7	.082, 5%
C460	43-11028-27	10PF, 1KV	C730		.001, Z5P
C475		.47, 200V	C732		.001, Z5P
C500		.047, 125VAC	C734	41-43680-51	10/25V Electrolytic
C506	43-11028-14	.001, 1KV	C900		47PF, NPO
C509	43-11028-14	.001, 1KV	C901		33PF, NPO
C512	43-11028-14	.001, 1KV	C902		47PF, N750
C515	43-11028-14	.001, 1KV	C903		200PF, N150
C518	41-3017218-1	2 Section Electrolytic	C904		470PF, Z5P
A		750/200V	C906	41-43680-77	1/50V Electrolytic
B		22/200V	C908	41-43680-81	10/25V Electrolytic
C519		.01, Z5P	C910		150PF, N750
C522		.068, 500V	C911		.01, Z5P
C525		.0068, 500V, Z5P	C912	41-32477-48	25/25V Electrolytic
C528		470PF, 500V, Z5P	C914	41-43681-77	1/50V Electrolytic



## Replacement Parts List (Continued)

Schematic Coding	Service Part No.	Description
<b>Capacitors (Continued)</b>		
C916	41-43681-77	1/50V Electrolytic
C918		82PF, NPO
C919		.1
C920		2/50V Electrolytic
C921		.001, Z5P
C922	41-3015983-4	3.3/50V Electrolytic
C924		33PF, NPO
CRT Panel Asm. Section		
C956		.01, 500V, Z5U
C963		330PF, Z5P
C966		.01, 500V, Z5U
C972		330PF, Z5P
C975		.01, 500V, Z5U
C982		330PF, Z5P
C984	43-11028-22	.01, 2KV

### Resistors (All are Carbon Film, 5%, 1/4W, unless specified)

R100		1K
R102		62K
R104		4.7 ohm, 1/2W
R107	37-41483-19	12K - Vol. Limiter Control (Rear Control Panel Section, -1,-2 Ch.)
R108	37-35105-36	12K - Vol. Control (Tuner Cluster Section, -1 Ch.)
R108	37-39669-11	12K - Vol. Control (Tuner Cluster Section, -2 Ch.)
R108	37-35105-35	12K - Vol. Control (Tuner Cluster Section, -4 Ch.)
R112		300 ohm, 1/2W
R116		22K
R120		30 ohm, 5%, 2W, Metal Oxide
R124		4.7 ohm, 5%, 1W
R128		1 ohm, 1/2W
R200		82 ohm
R203		1.5K
R206		39 ohm
R209		5.6K
R212		510 ohm
R215		330 ohm
R218	Ⓢ	120 ohm, 5%, 3W, Metal Oxide
R221		10K
R224		1K
R227		1K
R230		220 ohm
R233		820 ohm
R236		390 ohm
R238		3.6K Carbon Film
R239		3.9K Carbon Film
R251		3.9K Carbon Film
R254		12K
R257		1.5K
R260		1K
R263	37-3015152-7	5K - RF AGC Delay Control
R266		1K
R269		330K
R272		1K, 5%, 1/2W (On Tuner Cluster)
R274	part of L274	270 ohm (On Tuner Cluster)
R277		39K, 5%, 1/2W (On Tuner Cluster)
R300		4.7K
R306	37-3015152-9	50K - Vert. Height Control
R309		1.2 meg
R312		390K
R315		8.2K
R318	37-3015152-9	50K - Vert. Lin. Control
R321		10K
R324		180K
R325		100K
R327		47K
R330		1K

Schematic Coding	Service Part No.	Description
<b>Resistors (Continued)</b>		
R333		1K
R336	36-40075-54	18 ohm, 5W, Wire Wound
R339		10K
R348		10 ohm
R351		30 ohm
R354		.2 ohm, 5%, 1W, Metal Oxide
R357		100 ohm, 1W, Metal Oxide
R421		18K, 5%, 1W
R442		100K, 5%, 1W
R445		100K, 5%, 1W
R448		3.9K
R450		47K
R451		8.2K
R457		470 ohm
R460	36-40075-96	1K, 5W, Wire Wound
R463		3.3K, 5%, 2W, Metal Oxide
R466		1.5 ohm, 2W, Metal Oxide
R467		47 ohm, 5%, 1/2W
R469		150K, 5%, 1/2W
R472		150K, 5%, 1/2W
R481	Ⓢ 37-39627-7	25 meg - Focus Control
R500	36-3015511-2	2.7 ohm, 10%, 10W, Wire Wound
R501		2.2 meg, 10%, 1/2W
R512		150 ohm, 5%, 1W, Metal Oxide
R515		10K, 5%, 1W
R518	35-3015277-4	82.5K, 1%, 1/2W, Metal Oxide
R521	37-3015152-6	1K - B+ Adjust Control
R524	35-3015277-3	5.11K, 1%, 1/2W, Metal Oxide
R525		10 ohm, CF
R527	36-40075-84	330 ohm, 5W, Wire Wound
R529	Ⓢ 36-3015511-3	3.9 ohm, 5%, 15W, Wire Wound
R530		220 ohm
R533		680 ohm, 1/2W
R536		1.8K
R539		1K
R542		2.7K
R545		10K
R548		15K, 1/2W
RT503	38-33206-4	Thermistor - PTC
R606		10K
R609		1K
R612		22 ohm
R615		6.8K
R618		47K
R621	37-3015152-9	50K - Color AGC Threshold
R624		1K
R627		270 ohm, 1W
R630		10K
R633		2.2K
R636		560 ohm
R638		6.8K
R639		1.5K
R645		1K
R647		10K
R648		15K
R651	part of R107	10K - Tint Control (Control Panel Section -1,-2 Ch.)
R651	37-3015871-4	10K - Tint Control (Control Panel Section -4 Ch.)
R654		220 ohm
R657		3.3K
R660		220 ohm
R663		3.3K
R666		220 ohm
R669		3.3K
R672		4.7K
R675	part of R107	10K - Color Control (Control Panel Section -1,-2 Ch.)
R675	37-3015871-4	10K - Color Control (Control Panel Section -4 Ch.)
R678		4.7K
R681		10K

Ⓢ Critical Safety Component

## Replacement Parts List (Continued)

Schematic Coding	Service Part No.	Description
<b>Resistors (Continued)</b>		
R684		1.5K
R687		3.3K
R702		4.7K
R704		7.5K
R706		2.2K
R708		470K
R710		100 ohm
R712		470 ohm
R714		4.7K
R716		15K
R718		12K
R720		39K
R722		470 ohm
R724		200K
R726		560 ohm, 1W
R728		68K
R730		4.7K
R732		100K
R734		8.2K
R736		2K
R738		510 ohm
R740		16K, 2%
R742		1K
R744		220 ohm
R746		22 ohm
R900		1.8K, 2%
R901		680 ohm, 2%
R902		620 ohm, 2%
R903		4.7K
R904		2K, 2%
R905		18K, 5%
R907		1K, 2%, Carbon Film
R908		820 ohm, 2%, Carbon Film
R909		1K
R911	37-3015871-4	10K - Sharpness Control (Rear Control Panel Section -1,-2, Ch., Front Control Panel Section -4 Ch.)
R912		2.7K
R913	Ⓢ 37-3015871-3	5K - Picture (Contrast) Control (Rear Control Panel Section -1,-2, Ch., Front Control Panel Section -4 Ch.)
R914		560 ohm
R915		820 ohm
R917		6.8K
R918		22K
R919		1K
R920		47 ohm
R921		3.3K
R922		18K
R923		68K
R924		22K, 5%
R925		3.3K
R927		330 ohm
R928		150K
R929		150K
R930		4.7K
R931		15K
R932		15K
R934		3.9K
R936		22K
R938		220K
R940		1K
R942		56K
R944	Ⓢ 37-3015152-8	10K - Bright Range
R946	Ⓢ 37-3015871-4	10K - Brightness Control (Rear Control Panel Section -1,-2, Ch., Front Control Panel Section -4 Ch.)
R948		1K
R950		1.5K
R952		12K
R954		150K

Ⓢ Critical Safety Component

Schematic Coding	Service Part No.	Description
<b>Resistors (Continued)</b>		
RT503	Ⓢ 38-33206-4	Thermistor - PTC
CRT Panel Assembly Section		
R956		1K
R957		12K, 5%, 2W, Metal Oxide
R958		3.3K, 5%, ½W, Carbon Composition
R960	37-3015151-5	50K - Red CRT Bias Control
R961		330 ohm
R962	37-3015151-8	220 ohm - Red Drive Control
R963		6.8K
R964		330 ohm
R965		3.3K, 5%, ½W
R966		1K
R967		12K, 5%, 2W, Metal Oxide
R968		6.8K
R970	37-3015151-6	50K - Green CRT Bias Control
R971		330 ohm
R972	37-3015151-9	220 ohm - Green Drive Control
R973		330 ohm
R974		3.3K, 5%, ½W
R975		1K
R976		12K, 5%, 2W, Metal Oxide
R977		330 ohm
R978		6.8K
R979	36-40074-37	3.6 ohm, 5W, Wire Wound
R980	37-3015151-7	50K - Blue CRT Bias Control
R981		330 ohm
R982	37-3015151-10	220 ohm - Blue Drive Control
R983		47K, 5%, 1W, Metal Oxide
R985		1K, 10%, ½W, Carbon Composition
R986		22K, 5%, ½W
R987		1 meg, 5%, ½W
R988	37-3017000-2	10 meg - Master Screen Control
R992		5.6 meg, 5%, ½W, Carbon Composition
R996		5.6K, 1W, Carbon Composition (On Main Panel Asm.)

### Coils

L104	50-3017153-3	Sound Take-Off
L108	50-3017155-2	Sound Detector
L200	50-41509-7	.68UH - Peaking
L202	50-3017153-1	SAW Input
L204	50-3017155-1	SAW Output
L205	50-15904-4	5.6UH - RF Choke
L206	50-3017153-2	Pix Detector - 45.75MHz
L208	50-3017153-2	AFC Set-Up
L210	50-3017152-1	4.5MHz Trap
L274	50-17985-7	100UH - Peaking (On Tuner Cluster)
L500	50-3017623-1	Line Choke (AC Line Filter)
L502	50-33403-2	Degaussing
L600	50-41509-51	39UH - Peaking
L603	50-43392-4	18UH - Peaking
L606	50-41509-27	27UH - Peaking
L608	50-41509-31	68UH - Peaking
L609	50-41509-27	27UH - Peaking
L900	50-41509-22	10UH - Peaking
L902	50-41509-31	68UH - Peaking
L904	50-3017154-1	27UH - Peaking
L906	50-41509-15	33UH - Peaking
CRT Socket Panel Assembly Section		
L950	50-15904-4	5.6UH - RF Choke
L960	50-15904-4	5.6UH - RF Choke
L970	50-15904-4	5.6UH - RF Choke

### Integrated Circuits

IC102	15-3017045-1	Sound Det./Power Amp.
IC204	15-3015734-1	IF/AGC/AFC
IC304	15-3015131-1	Vertical Output
IC600	15-3015129-1	Chroma Processor
IC602	15-41627-2	Chroma Demodulator

## Replacement Parts List (Continued)

Schematic Coding	Service Part No.	Description
IC700	15-3017119-2	Horiz. Osc./Vert. Countdown
IC900	15-41764-1	Auto Video/Chroma Processor

### Transformers

T400	56-3015312-1	Horiz. Driver
T402	50-3015344-2	Integrated Flyback

### Diodes

SC100	13-3015735-1	Zener, 19V, 5W
SC200	13-33179-14	Zener, 12V
SC300	13-17596-10	Vert. Blanking
SC303	13-17596-10	Vert. Isolation
SC306	13-17596-10	Vert. Isolation
SC307	13-33187-31	Zener, 20V
SC308	13-41122-1	Bias
SC403	13-33187-38	Zener, 8V
SC404	13-17596-10	Bias, Horiz. Osc. Start Up
SC406	13-33187-27	Zener, 123V, 2%
SC409	13-33187-34	Zener, 118V, 2%
SC415	13-45147-3	Damper
SC418	13-3015739-1	Zener, 1050V
SC500	13-39860-1	Power Rectifier
SC503	13-39860-1	Power Rectifier
SC506	13-39860-1	Power Rectifier
SC509	13-39860-1	Power Rectifier
SC512	13-3017630-1	Zener, 75V, 2W
SC518	13-29867-1	Protection, Q502
SC519	13-17596-10	Bias
SC521	13-33187-39	Zener, 6.2V, 3%
SC524	13-17596-10	Protection
SC527	13-43777-2	+220V Rectifier
SC530	13-43956-1	+25V Rectifier
SC600	13-17596-10	Bias, Tint
SC603	13-17596-10	Perma-Tint Switch
SC700	13-17596-10	Bias - Sync Separator
SC702	13-17596-10	Bias - Sync Separator
SC704	13-17596-10	Sync Separator Collector
SC706	13-17596-10	Dropping - 25V Volt Supply
SC900	13-17596-10	Bias
SC902	13-17596-10	Bias
SC904	13-17596-10	Beam Current Detector
SC906	13-29867-1	Protection
SC908	1N295	Horiz. Blanking - Germanium
SCR412	13-18924-8	HV Shutdown
SCR513	13-3017148-1	Switching Regulator

### Transistors

Q200	13-23824-1	IF Pre-Amp.
Q300	13-3017150-1	Ramp Charger
Q301	13-3017149-1	Vert. Inverter
Q302	13-3017149-1	Vert. Buffer
Q400	13-3017629-1	Horiz. Osc. Start Up
Q401	13-45018-1	Horiz. Drive
Q402	13-43463-2	Horiz. Output
Q500	13-43773-1	Error Amp.
Q502	13-29776-2	SCR Driver
Q504	13-29033-3	Phase Detector
Q600	13-29033-3	11.2V Regulator
Q700	13-29033-3	Sync Separator Driver
Q701	13-29033-3	Sync Separator
Q702	13-29033-3	Vert. Sync Amp.
Q900	13-29033-3	1st Video Amp.
Q901	13-29776-2	2nd Video Amp.
Q902	13-29033-3	White Peak Detector
Q903	13-29776-3	Video Back Seat Driver
Q904	13-39114-3	Video Driver

CRT Panel Assembly Section

Schematic Coding	Service Part No.	Description
Q905	13-3015132-1	Red Output
Q906	13-3015132-1	Red Drive Regulator
Q907	13-45321-1	Green Output
Q908	13-3015132-1	Green Drive Regulator
Q909	13-45321-1	Blue Output
Q910	13-3015132-1	Blue Drive Regulator

### Miscellaneous Electrical Parts

DL900	32-3017029-1	Delay Line
FB200	22-28072-2	Ferrite Bead
FB202	22-28072-2	Ferrite Bead
FB400	22-28072-4	Ferrite Bead
FB402	22-28072-4	Ferrite Bead
FB404	22-28072-4	Ferrite Bead
FB406	22-28072-4	Ferrite Bead
FB500	22-28072-4	Ferrite Bead
FL200	32-3017157-1	SAW Filter
FS500	29-37730-27	Fuse - 4 Amp.
FS501	29-37730-29	Fuse - 2 Amp.
PL100	73-3015278-1	Connector - 2 Pin (Speaker)
PL300	73-10302-9	Connector - 6 Pin (Kit) (Deflection Yoke)
PL402	73-10302-50	Connector - 3 Pin (Kit), (CRT Panel)
PL504	73-10302-50	Connector - 3 Pin (Kit), (Degaussing Coil)
PL508	73-10302-68	Connector - 5 Pin (Kit), (CRT Panel)
PL600	73-3015271-5	Connector - 4 Pin (CRT Panel)
PL900	73-10302-71	Connector - 9 Pin (Kit), (Control Panel)
PL902	73-10302-86	Connector - 1 Pin (Kit), (CRT Panel)
SK100	73-3015278-1	Connector - 2 Pin (Speaker)
SK200	73-3015278-13	Connector - 7 Pin (Tuner Cluster)
SK202	73-3015941-1	Connector - 1 Pin (IF Input)
SK210	73-10302-24	Connector - 3 Pin (Control Panel, -1,-2 Ch.)
SK300	Not Stocked	Connector - 6 Pin (Deflection Yoke)
SK402	Not Stocked	Connector - 3 Pin
SK502	Not Stocked	Connector - 3 Pin
SK504	73-3015278-10	Connector - 3 Pin (Tuner Cluster)
SK506	73-3015278-10	Connector - 3 Pin (Not Used)
SK508	73-3015278-12	Connector - 5 Pin (CRT Panel Voltage Supply)
SK600	73-3015278-11	Connector - 4 Pin (Demod. Output)
SK900	73-3015278-14	Connector - 9 Pin (Control Panel)
SK902	Not Stocked	Connector - 1 Pin (Main Panel)
SW200	33-16011-15	Switch - AFC (Control Panel, -1,-2 Ch.)
SW600	33-16011-15	Switch - Perma-Tint (Control Panel)
XT600	26-16162-2	Crystal - 3.58MHz
XT700	26-3017158-1	Crystal - 503.5kHz

### Miscellaneous Chassis Parts

73-34919-1	Clip - Fuse, FS500, FS501
77-3017010-1	Clip - Mtg., IC304
83-3015993-2	Heatsink - IC102
82-3017007-4	Heatsink - IC302
82-3015817-1	Heatsink - Q402
83-3017291-1	Heatsink - SC100
82-3017064-1	Heatsink - SCR513
86-3015827-1	Housing - AC Interlock

## Replacement Parts List (Continued)

Schematic Coding	Service Part No.	Description
<b>Miscellaneous Chassis Parts (Continued)</b>		
	73-10302-87	Housing - Focus Disconnet Terminal (Kit) (CRT Panel to IFT Asm.)
	86-14608-4	Insulator - Mica (Q402)
	86-3015736-1	Insulator - Mica (SCR513)
	73-27392-4	Interlock - Pin - Large Male
	73-27392-3	Interlock - Pin - Small Male
	72-3017642-2	Socket - IC200, IC600, IC900
	72-3017642-1	Socket - IC400, IC602
	72-3017005-1	Socket - Q402
	72-3017015-1	Socket - SCR513
	51-3015693-1	Yoke - Deflection
<b>Complete Panel Assemblies</b>		
	02-3015501-1	CRT Panel (-1,-2,-4 Ch.)
	02-3015922-2	Secondary Control Panel (-1,-2 Ch.)
	02-3015928-1	Secondary Control Panel (-4 Ch.)

**Note: Tuner Cluster Assembly number is for identification Only. Do Not order assembly as a replacement part.**

**Order discrete replacement parts as listed below.**

### Tuner Cluster Assemblies

**02-3015798-1 (-1 Ch.), 02-3015799-1 (-2 Ch.)**

Schematic Coding	Service Part No.	Description
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### Capacitors (All in MFD, unless specified)

C242	41-3015983-10	3.3/50V Electrolytic
C243	41-3015983-11	4.7/50V Electrolytic (Early Prod.)
C245	41-23765-5	5/25V Electrolytic

### Resistors (All are Carbon Film, 5%, 1/2 W)

R272		1K (Early Prod.)
R274	part of L274	270 ohm
R277		39K (Early Prod.)

### Miscellaneous Electrical Parts

L274	50-17985-7	Coil - Peaking - 100UH
PL200	73-10302-70	Connector - 7 Pin (Kit), (Video/AFC)
PL210	73-10302-50	Connector - 3 Pin (Kit), (Audio/AFC)
PL502	73-10302-50	Connector - 3 Pin (Kit), (AC Switch)
PL510	73-10302-50	Connector - 3 Pin (Kit), (AM/FM Radio) -2 Ch.

Schematic Coding	Service Part No.	Description
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### Miscellaneous Electrical Parts (Continued)

R108	37-35105-36	12K - Volume Control (-1 Ch.)
R108	37-39669-11	12K - Volume Control (-2 Ch.)
SW500	part of R108	Switch - On/Off (-1 Ch.)
SW500	33-43153-4	Switch - Off/Radio/TV (Multiple Type) (-2 Ch.)
	73-16070-33	Cable Asm. - UHF to VHF Tuners
	73-3017156-1	Cable Asm. - VHF Tuner to Main Panel
	54-43090-3	UHF Tuner (Early Prod.)
	54-43090-4	UHF Tuner (Later Prod.)
	54-3015951-1	VHF Tuner

**Note: Tuner Cluster Assembly number is for identification Only. Do Not order assembly as a replacement part.**

**Order discrete replacement parts as listed below.**

### Tuner Cluster Assembly

**02-3015925-1 (-4 Ch.)**

Schematic Coding	Service Part No.	Description
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### Capacitors (All in MFD, unless specified)

C242	41-301598-10	3.3/50V Electrolytic
C243	41-301598-11	4.7/50V Electrolytic (Early Prod.)
C254	41-23765-5	5/25V Electrolytic

### Resistors (All are Carbon Film, 5%, 1/2 W)

R272		1K (Early Prod.)
R274	part of L274	270 ohm
R277		39K (Early Prod.)

### Miscellaneous Electrical Parts

L274	50-17985-7	Coil - Peaking - 100UH
PL200	73-10302-70	Connector - 7 Pin (Kit), (Video/AFC)
PL502	73-10302-50	Connector - 3 Pin (Kit), (AC Switch)
R108	37-35105-35	12K - Volume Control
SW200	33-35548-6	Switch - AFC
SW500	part of R108	Switch - On/Off
	73-16070-21	Cable Asm. - UHF to VHF Tuners
	73-3017156-1	Cable Asm. - VHF Tuner to Main Panel
	54-43090-3	UHF Tuner (Early Prod.)
	54-43090-4	UHF Tuner (Later Prod.)
	54-3015951-1	VHF Tuner

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## *Power Supply - AC Input*

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The AC input power supply utilizes a standard input AC interlock feeding through to a 4 amp. snap-in type fuse. Following through to L500 line choke a 2.7 ohm 10W surge resistor and on to a bridge rectifier circuit. The bridge rectifiers consist of four discrete diodes SC500, SC503, SC506 and SC509. The output of the bridge rectifier develops approximately +160V raw B+ and is filtered by capacitor C518A.

### *Power Supply Switching Regulator SCR513*

The E30 Series Chassis incorporates an SCR switching regulator. The main advantage of this type of regulator is its relatively low power dissipation since the regulating element is an SCR which is either "on" or "off".

SCR513 switches the raw B+ (160V) on and off to maintain Capacitor C518B charged up to +112V DC. Once an SCR is turned on it will not turn off until the current through it is reduced to zero. This is accomplished by having an Auxiliary winding on the flyback (T402) connected in series with the SCR. Thus the horizontal retrace pulse will apply a negative voltage across the SCR and turn it "off". Once turned "off" the SCR will not start conducting again until a pulse is applied to its gate.

When the SCR turns "on", it will try to charge C518B up to +160V, however, before this happens the retrace pulse will turn it off and C518B will start to discharge due to the load of the TV set. If this "off" and "on" time is controlled appropriately, the voltage across C518B can be kept very close to +112V.

Since the charging and discharging ramps are relatively constant, the only way to control the B+ voltage is by controlling the time at which the SCR turns "on". The longer the time the SCR is "on" the higher the B+ voltage will be. To accomplish this, refer to the Line Derived Power Supply, Figure 1.

### *Start-Up Circuit*

Note that the "regulating" function of the

supply requires a +25 volt source for the three transistors Q500, Q502, Q504. Hence, it is necessary to provide a "starting kick" for both the switching SCR and the horizontal deflection system from which +25 volts is derived, Figure 4.

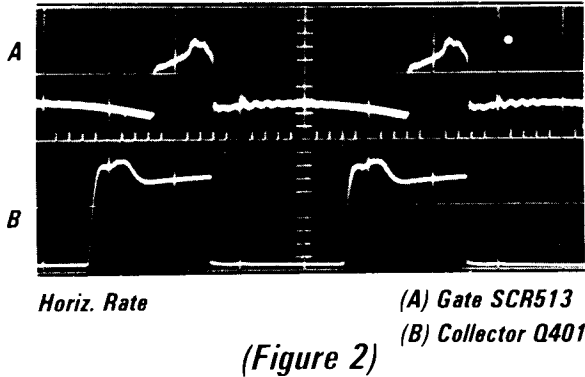
At set turn-on, the raw B+ at the bridge output (+160V) will cause SC512 to zener and generate a gate pulse for SCR513, turning it on. The +160V is also coupled to the anode of SCR513 through IFT winding 24/22, so C518B will charge quickly to +112V. It powers the collectors of Q400, Q401, Q402 and the base emitter circuit of Q400. The base of Q400, horizontal oscillator start-up transistor, is held constant at +8 volts by SC403, and, therefore, its emitter supplies +7.3 volts to the B+ input, pin 9 of IC700. The horizontal oscillator starts and the IFT is energized. SC530 provides the +25 volt source for IC700 and the regulator transistors. Pin 9 of IC700 will hold steady at +8.5 volts, causing Q400 to be reverse biased and it shuts off for the duration of set operation. SC512 also turns off after the start-up cycle since the potential across it remains well below its zener rating.

### *Regulation Cycle (Figure 3)*

In this circuit (Q500) error amplifier produces a DC voltage at point B which is inversely proportional to the B+ voltage. Capacitor C534 tries to charge up to the voltage at point B through R545. However, when it reaches 6.9V (.7V plus the zener voltage at SC521) it will turn on (Q504) phase detector which in turn causes Q502 (SCR driver) to conduct, therefore making the voltage at point C equal to +25V creating a +25V pulse which is AC coupled through C531 to the gate of SCR513 turning the SCR "on".

During the start-up cycle, C531 is charged to approximately +112 Volts, and it remains near this level during normal operation. The pulse from Q502 is added to the DC level to gate SCR513 on.

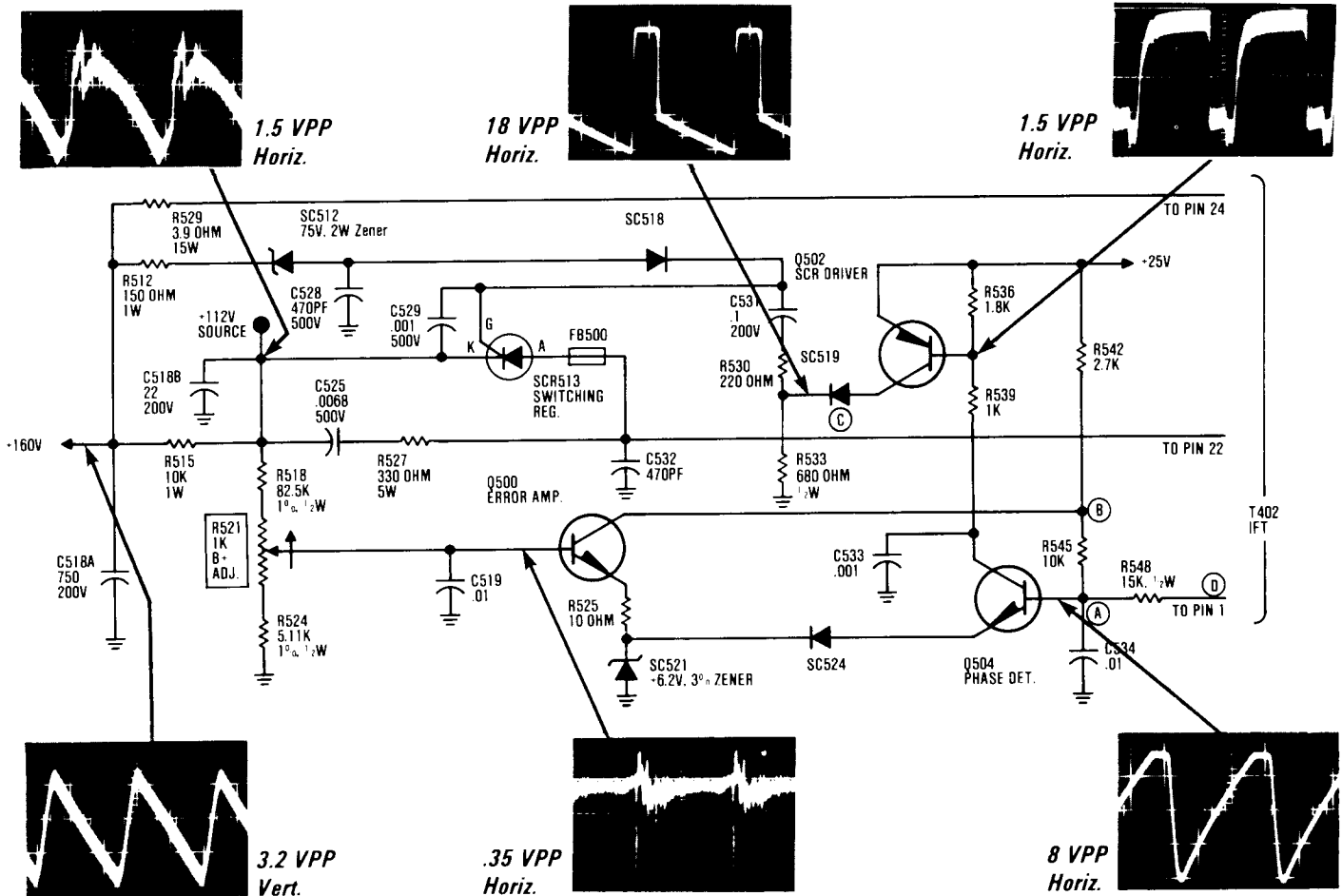
Figure 2 shows that the SCR gating pulse occurs during trace cycle when maximum power is needed from regulated B+. Any variation in current needs (brightness increase, etc.) will be reflected in the duty cycle of the SCR gating pulse and may be demonstrated using a dual trace scope and the waveforms shown in Figure 2.



To analyze the feedback circuit, visualize that the B+ voltage starts to decrease for some reason (higher beam current for example), the base current of Q500 will decrease and consequently the voltage at point B will increase. Increasing the voltage at point B causes the slope of the waveform at point A to become steeper, therefore, it will reach the 6.9V level sooner. This will turn the SCR "ON" earlier, increasing its duty cycle, which will return the B+ voltage back to its original value.

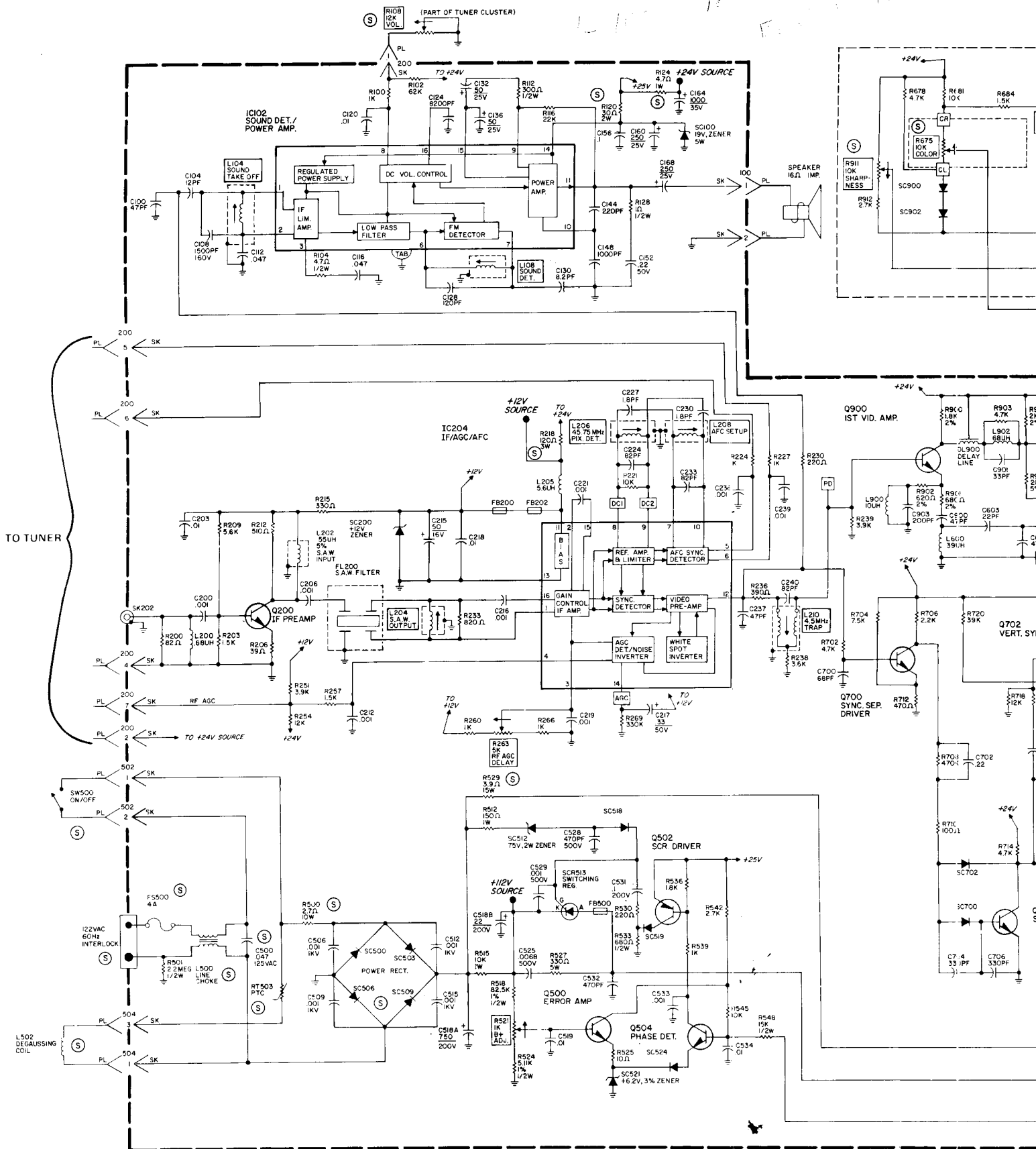
Components added for protection are SC524, to prevent the negative pulses on the base of Q504 from breaking down the base-emitter junction of Q504. Resistors R518 and R524 to prevent setting of the B+ voltage to an excessively high value, exceeding the current handling capabilities of Q500 and to allow R521 to provide fine control of B+ adjustment. Resistor R527 and capacitor C525 act as a network to damp the ringing of the flyback winding (24/22), which is in series with SCR513. Diode SC519 has been added to protect Q502 since the difference between +170V and the +25V source exceeds the collector breakdown voltage.

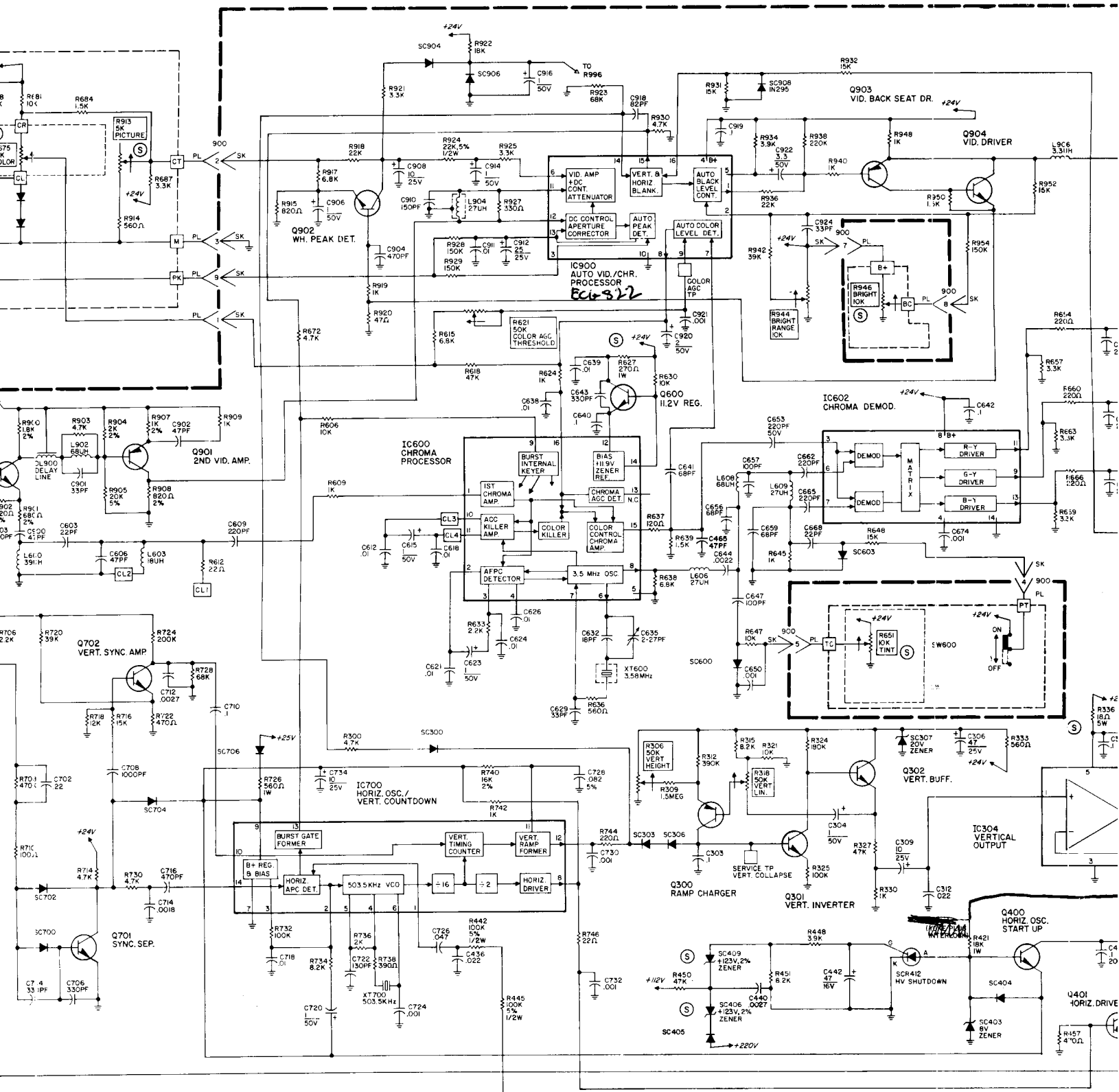
The SCR will maintain its "on" state until the retrace pulse turns it "off". At the same time, a retrace pulse at point D will discharge C534 turning Q504 and Q502 "off" and the cycle will repeat itself.



Regulator Circuit (Figure 3)

# Representative 13" and 19" Schematic

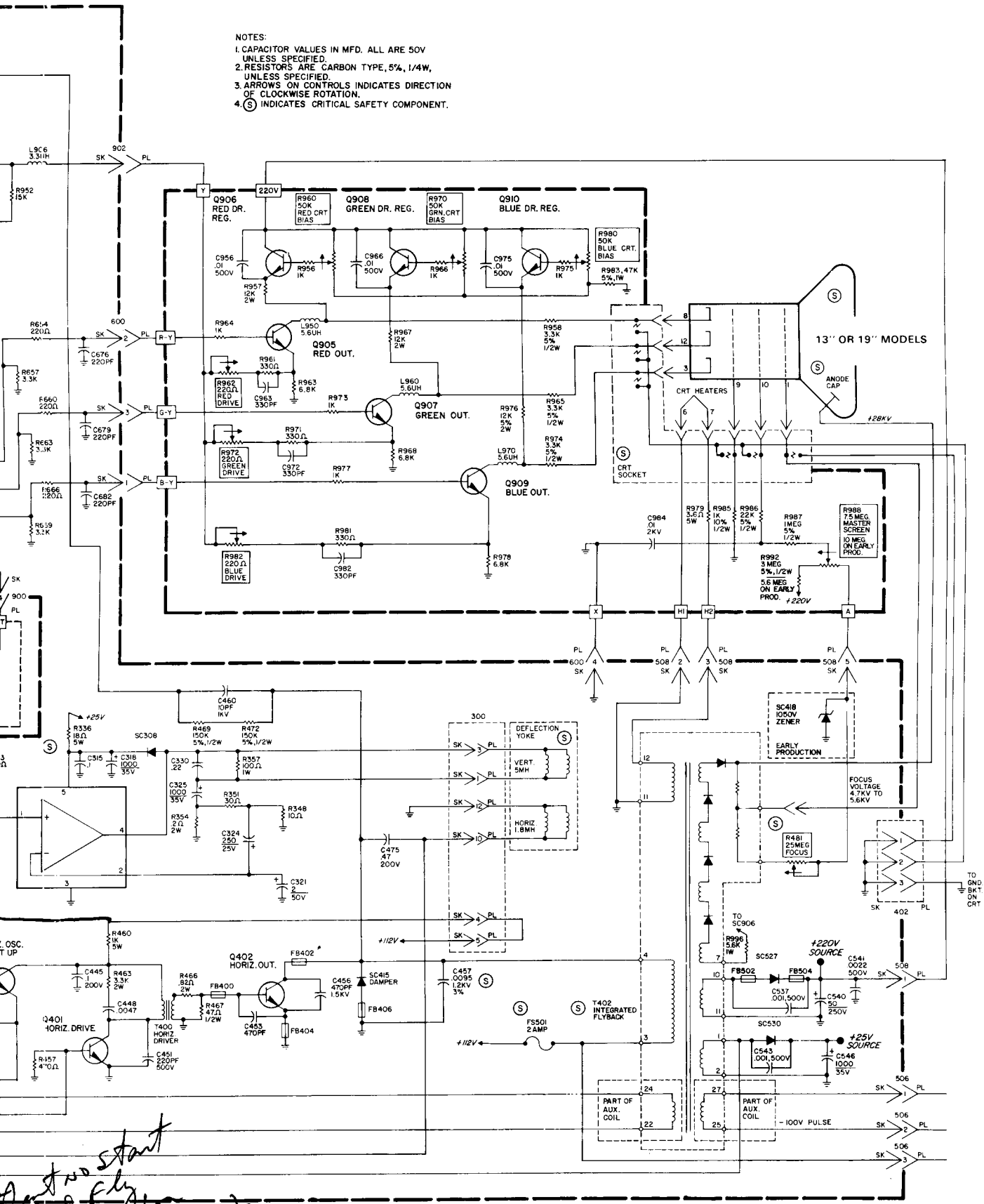




In terms of cost it looks like had 37 check sc's looking



- NOTES:  
 1. CAPACITOR VALUES IN MFD. ALL ARE 50V UNLESS SPECIFIED.  
 2. RESISTORS ARE CARBON TYPE, 5%, 1/4W, UNLESS SPECIFIED.  
 3. ARROWS ON CONTROLS INDICATES DIRECTION OF CLOCKWISE ROTATION.  
 4. (S) INDICATES CRITICAL SAFETY COMPONENT.

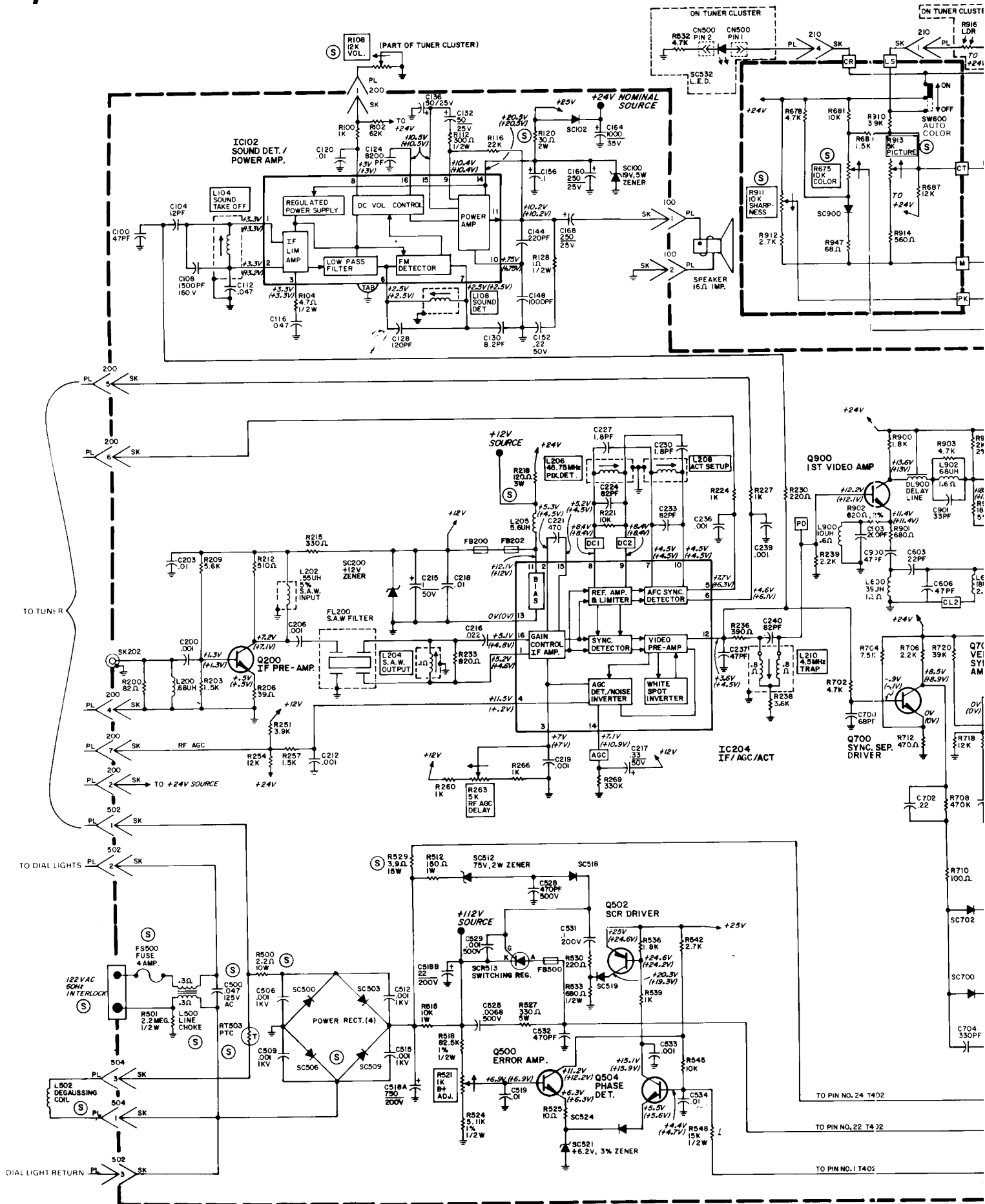


*Don't start  
 you had fly  
 back SC403 for  
 leakage + SC512 &  
 SC2412*

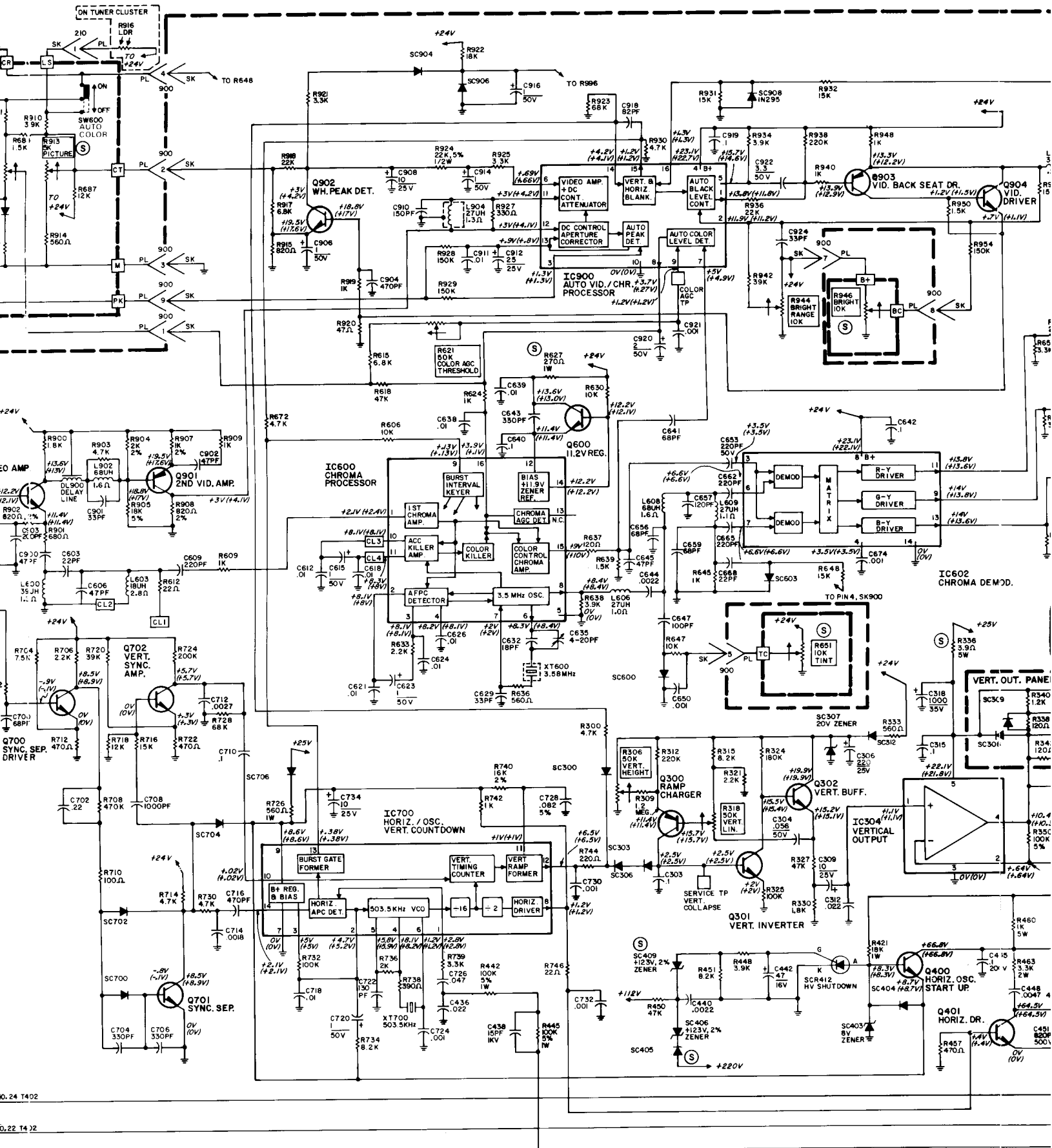
T-402  
 3618830003

Scams J028

# Representative 25" Schematic

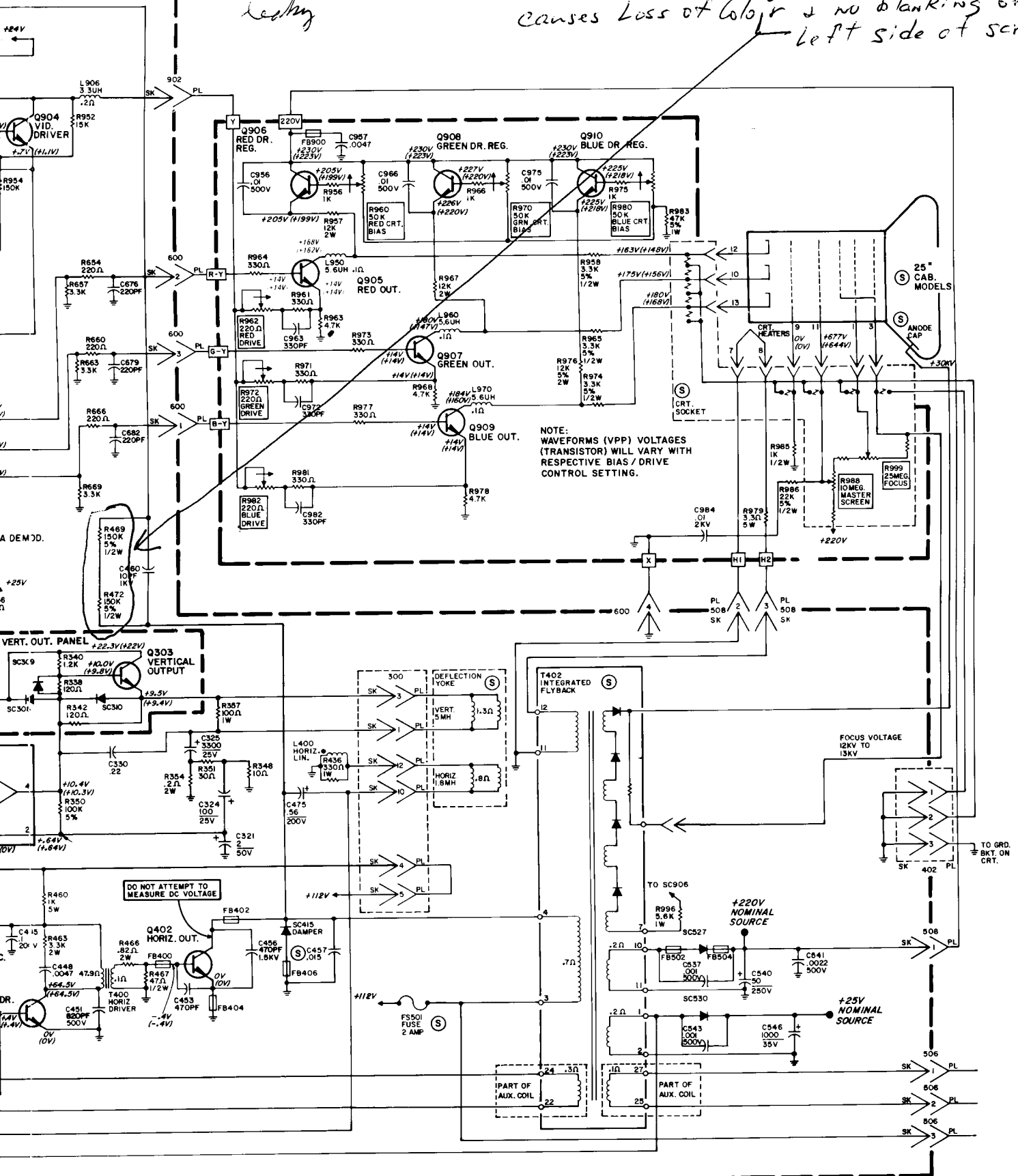


1-7990



*no color-check  
C61F .01mfd  
Leaky*

*one or both open or increased,  
causes loss of color & no blanking on  
left side of screen*



# Vertical Circuit

(Figure 10)

The vertical ramp from IC700 pin 12 is input to the base of Q301 (vertical inverter) through SC303 and SC306. SC303 & SC306 are used to isolate the vertical output from the blanking circuitry (SC300). Transistor Q300 (ramp charger) is used as a constant current source for charge capacitor C303 in the emitter of Q301. The amount of charge current is controlled by the vertical height control R306.

Transistor Q301 (vertical inverter) is a high input impedance inverter. During trace time diodes SC303 & SC306 are turned on to develop a drop of +1.4V and placed on the base of Q301 to keep it operating in the linear region.

Transistor Q302 (vertical buffer) is an emitter follower driver for IC304 (vertical output). The emitter follower configuration is used to reduce pick-up from the power supply, drive IC304 with the correct polarity signal, and help minimize height change with temperature.

A portion of the vertical ramp is taken from the emitter of Q302 and fed through the vertical linearity control R318 to the ramp charger

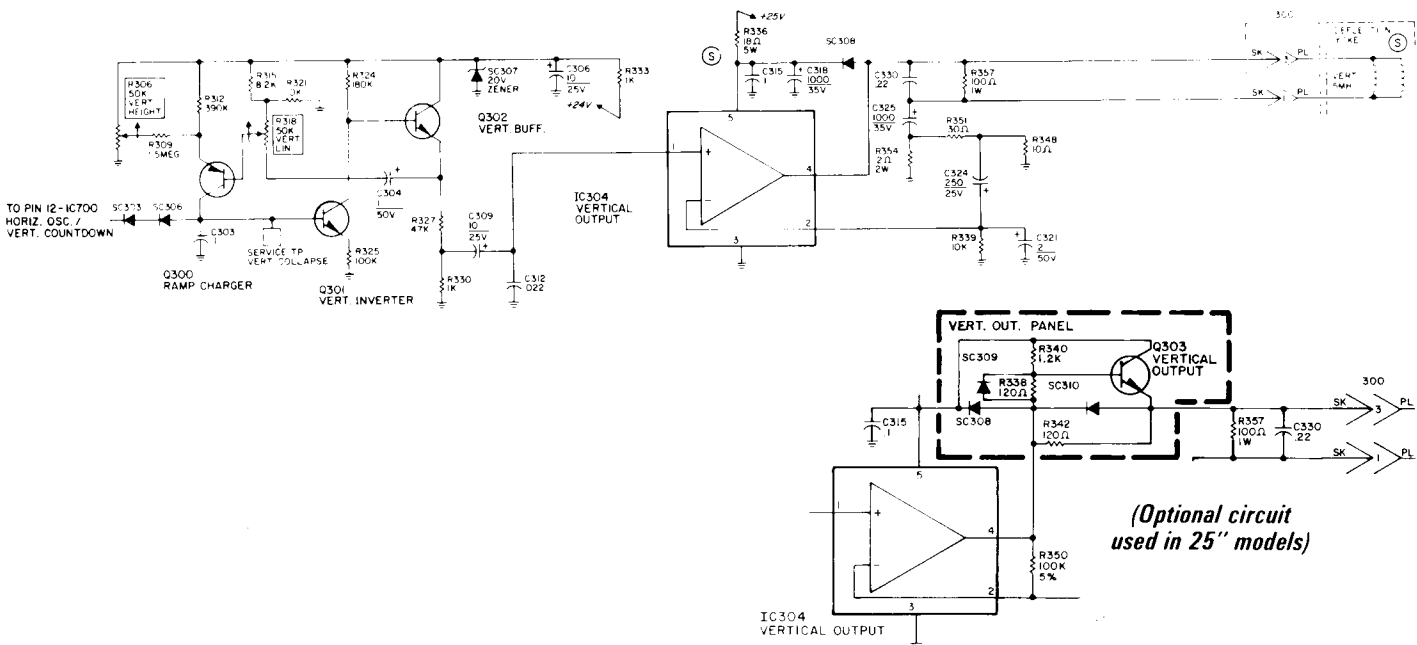
transistor Q300 to be added to the vertical ramp for linearity correction.

All of the vertical input circuitry Q300, Q301 & Q302 is powered by +20V from zener diode SC307 (a 20V zener). The vertical output IC304 is used to drive the vertical winding of the deflection yoke.

**NOTE:** Addition of Vertical Output Transistor in 25" E30 Series Chassis.

Due to the amount of power dissipated within IC304 and the near peak current utilized, an additional output transistor has been added to the IC304 circuit. Now, only 50% of the power and current is used by IC304 with the other 50% dissipated across the new transistor.

The transistor Q303 is mounted on a small auxiliary panel and heatsinks to the top of the IC304 heatsink. The addition of this transistor will be found only in early production chassis. Later production will contain an all new IC304 and at that time, the transistor and panel will be removed.



Vertical Circuit (Figure 10)