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THE CTC 19, CTC 20, AND CTC 24

A group of three color television chassis utilizing the basic CTC 19 chassis are designated as the CTC 19, the CTC 20, and the CTC 24.

The CTC 19 chassis is used in 19" color instruments, the CTC 20 is used in 21" color receivers, and the CTC 24 is used in certain 25" color instruments.

These chassis feature several circuit refinements to give improved performance. A new vertical blanking circuit is used, and a video peaking control is added.

The CTC 19

A large selection of table and consolette 19" color models are available using the CTC 19 chassis. Some instruments are equipped for remote operation, using the new CTP 11 seven-function remote control system.

Vertical blanking in the new CTC 19 chassis is applied via the control grid circuit of the second video amplifier (12HG7).

The added blanking level coupled to the cathodes of the color picture tube is sufficient to assure complete blanking of the retrace lines.

A video peaking circuit is used in the new series CTC 19 chassis. A variable control, located in the cathode circuit of the 2nd video (12HG7), permits the service technician to adjust the amount of peaking in the new chassis. Highest peaking is obtained with the control adjusted clockwise, less peaking when the control is rotated counterclockwise.

The peaking control is located on the rear apron of the CTC 19, the AGC and color killer controls have been combined to a dual-concentric unit.

Many circuit refinements introduced in earlier CTC 19 chassis continue in the new CTC 19 chassis.

A three-position "service-switch" (NORMAL, SERVICE and RASTER) is used and a new tube type 3A3A rectifier is designed to prevent radiation and give higher reliability in the high voltage stage.

The KINE BIAS switch arrangement used in the CTC 19 sets the initial control grid bias for all three guns of the picture tube. The switching network applies fixed DC potentials through 1-meg resistors to the picture tube control grid circuit.

The service position for the Tuner Mounting Assembly incorporates a "Z" shaped bracket (at-

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CTC 21 COLOR CHASSIS

The new CTC 21 Chassis is used in RCA's deluxe 25" color instruments for 1967. All instruments using the new chassis are equipped with motor driven power tuning (channel selection), operative by merely pushing a touch bar. In addition to automatic tuning of the VHF channels, the new chassis features automatic tuning for UHF channels. Up to a total of 24 UHF channels may be preset and programmed for automatic tuning.

The VHF tuner and the UHF tuner in instruments using the CTC 21 are of new design. The KRK 131 is a deluxe VHF tuner featuring four tuned stages, with a 6DS4 nuvistor RF amplifier; the mixer/oscillator is a 6KZ8. The UHF tuner, designated KRK 132, is transistorized.

Both the VHF and UHF tuners are equipped with Automatic Frequency Control (AFC). The AFC circuitry automatically compensates for slight errors in manual tuning or "drift," keeping the local oscillator tuned correctly.

Certain models are equipped for remote operation using a new 8-function remote control system—the CTP 12. With the all-transistorized "Wireless Wizard" remote the customer can change stations, switch between VHF and UHF, turn the TV on or off, and adjust VOLUME, TINT, and COLOR up or down.

The CTC 21 Color Chassis also features automatic chroma control (ACC) in the color circuitry. ACC, sampled in the color stages, keeps the color intensity (or saturation) constant during changing reception conditions.

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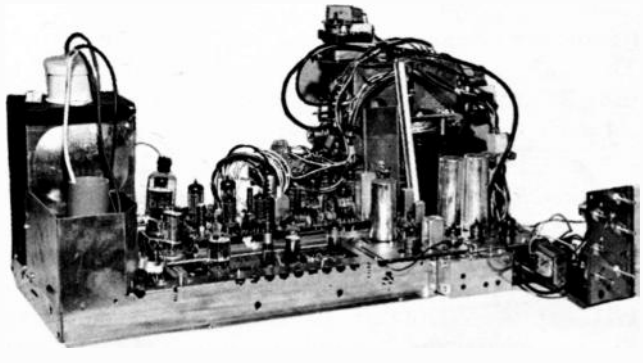

Figure 1—The CTC 21 Chassis

THE CTC 19, CTC 20, AND CTC 24

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tached to the main chassis) which can be connected to the tuner, providing extra support for the Tuner Mounting Assembly when in the service position.

The CTC 20

RCA Victor's 21" color instruments for 1967 are equipped with the CTC 20 chassis. Various table, consolette, and console models are available. Instruments equipped for remote control will use the new seven-function CTP 11 system.

Blanking of vertical retrace lines is accomplished by using a new diode blanking circuit. A peaking control (located on the rear apron) can be used to adjust the amount of video peaking desired.

Other features of the CTC 20 chassis include a three-position "service" switch (NORMAL, SERVICE, and RASTER), new type 3A3A high voltage rectifier tube, automatic degaussing and RCA Hi-Lite color picture tube.

The CTC 24

The CTC 24 color chassis is used in certain instruments equipped with a 25" rectangular color picture tube. The new chassis is used in table models, consoles, consolettes, and combinations. Some models are equipped for remote operation, using the CTP 11 seven-function system.

All customer operating controls on instruments using a CTC 24 are located in one general area on the upper right side of the mask.

A new gear train and channel selector network for VHF and UHF tuning is used in the CTC 24. The VHF channel selector knob is also the *fine tuning* adjustment.

The knob is normally spring-loaded to the out position and can be turned to change channels. When the same knob is pushed inward it engages the fine tuning mechanism on the VHF tuner. UHF tuning (coarse and fine) is adjusted with the circular knob located behind the VHF channel knob.

The physical layout and the majority of the luminance and color circuitry in the CTC 24 is similar to that in RCA Victor's CTC 19 and CTC 20 color chassis.

The sweep output circuits, including vertical, horizontal, high voltage, pincushioning and convergence follow the design of those of the CTC 17X chassis. The KRK 128/120 VHF/UHF tuner combination in the CTC 24 is also used in the CTC 19 and CTC 20 color chassis.

The CTC 24 includes many of the features used in other RCA Victor color chassis. Setup and purity adjustments are facilitated by a three-position "service switch." The vertical retrace blanking circuit is similar to the arrangement used in the CTC 19 and CTC 20. A VIDEO PEAKING switch, located on the rear apron, can be used to adjust video peaking.

Service and alignment adjustments in the CTC 24 are similar to the CTC 19. Pincushioning high voltage, and convergence procedures follow other RCA Victor 24" color instruments. Alignment of the RF-IF and chroma circuits follow procedures used with 19" color chassis.

CTC 21 COLOR CHASSIS

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Other features in instruments equipped with the CTC 21 include a PICTURE SHARPNESS control (peaking control), an all-range TONE control, and a *dial light dimming* control. The latter can be used to adjust the brightness level of the channel indicator light to suit individual viewing preference.

All models using the new chassis will be equipped with the 25" rectangular color tube (25AP22A or 25BP22A). An important improvement has been made in the method used to mount the shadow mask within the 25" color picture tube. The new mounting will compensate for the slight "bowing" that occurred in color picture tube shadow mask during instrument warm-up. This refinement in color picture tube manufacturing will make *lasting* purity adjustments less critical to achieve during initial installation of the instrument in the customer's home or the shop.

Some of the circuits in the CTC 21 utilize transistors or other Solid State devices. A transistorized control circuit is used for AFC—Automatic Frequency Control for the VHF and UHF tuners; Solid State phase detectors in the color stages for ACC, AFPC, and Killer Detector circuitry. One of the newest components to be used in RCA Victor color chassis is the integrated circuit (IC) used in the sound stages. The complete sound circuitry in the CTC 21 chassis uses Solid State components: operating in conjunction with and following the IC are a driver and single-ended audio output stage—both using transistors.

The Integrated Circuit in the CTC 21 requires approximately 7 volts power input. This supply voltage is obtained from the emitter of the output transistor.

The driver in this sound circuit functions as a DC gain, feedback circuit to hold the emitter voltage on the output fairly constant. Any change in emitter voltage changes the base bias on the driver stage.

The audio output transistor is a "high voltage" unit, and under normal conditions, the collector voltage is approximately 160 volts, emitter voltage is approximately 7 volts, and emitter current 32 to 40 ma. Nominal emitter current is 36 ma. Of this, the IC draws approximately 17 ma.

The automatic features of the CTC 21 in addition to its high reliability, and serviceability make this chassis RCA's most advanced color television receiver.

CTC 21 DETECTORS

Several solid state components are used in the color stages of the CTC 21. There are three separate solid state detectors, one for AFPC control, one for the killer detector function, and one for Automatic Chroma Control. The AFPC and the killer detectors, although using diodes, operate in similar fashion to the circuitry used in previous chassis. These functions were performed by the 6JU8, (a quadruple diode) in the previous chassis.

The addition of a third detector—the ACC circuit —provides controlled gain through the chroma bandpass stage, with varying levels of incoming chroma signals.

AFPC Detector

In the CTC 21, the TINT control is part of a phase shift network in the 3.58 mc reference feedback circuit. Adjusting TINT alters the phase of the 3.58 mc reference signal coupled to the AFPC and killer detectors; the range of the TINT control is ± 45°.

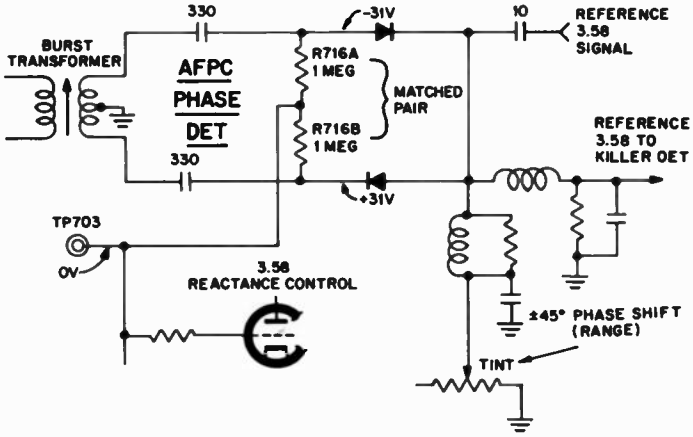

Figure 2—The AFPC Phase Detector

The phase of the reference signal applied to the AFPC diodes (with the oscillator on frequency and in phase with color burst) is such to produce equal conduction from both diodes—yielding no correction voltage at the output. If the phase is changed, a correction voltage (of the polarity needed to bring the oscillator on frequency and in phase) is developed.

Killer Detector

The noise-immune killer detector in the CTC 21 employs a separate pair of diodes. Under no color burst conditions, diode conduction is virtually equal, giving zero correction voltage at the output. The color killer then operates, biasing off the bandpass amplifier. When color burst is applied (during color reception), diode conduction is unequal. A negative voltage develops (approximately—3.3 volts), sufficient to cut off the killer, permitting the bandpass amplifier to conduct.

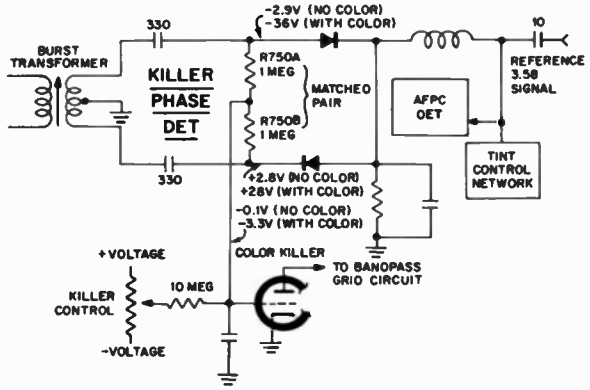

Figure 3—The Killer Detector

ACC Detector

The ACC circuit utilizing a third pair of diodes, functions on the amplitude of the incoming burst signal. Color burst is intended to be transmitted and received as a fixed amplitude wave, and can be used as an indication of undesirable fluctuation in color information. That is, amplitude variations of color burst are indicative of undesirable color video amplitude changes; such as changes that may result from atmospheric conditions.

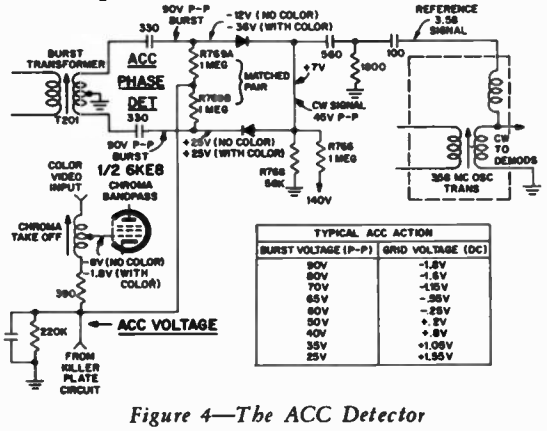

Figure 4—The ACC Detector

When a color signal is received, the phase relationship between the burst signals applied to the diodes cause unequal conduction. In this unbalanced condition, the bottom diode (in phase) conducts very little (keeping approximately the same voltage output); the upper diode (out of phase) conducts more. Under these conditions, a negative voltage develops at the output. The amount of voltage so developed will be proportional to, and vary with, the amplitude of the incoming burst.

PROTECTIVE DEVICES

Exhaustive tests are conducted on electronic instruments to insure adequate protection against faults that could cause fires or excessive damage. The Underwriters Laboratories require certain fire prevention protective devices to obtain U. L. listing.

U. L. approval is obtained with specific parts that provide the proper safety measures for a specific instrument. Other parts may provide a measure of safety, however, only those parts which were submitted and tested are genuine exact duplicate replacement parts. Beware of highly advertised "exact" replacement parts that are made to merely physically replace an authentic approved safety device.

In addition to Underwriters required protection, the manufacturer in some cases may add additional protective devices to protect major components in the receiver against damage that may not necessarily be a fire hazard; therefore, it is imperative that these protective devices be replaced with exact equivalent parts when replacement is necessary.

An adequate stock of fuse types and sizes in addition to circuit breakers and wire for wire fuses will prevent ordering delays when replacement of such items is required.

Never defeat the purpose of a protective device—the use of oversize fuses, incorrect circuit breakers, or any form of jumper wire is very dangerous practice. Remember that the manufacturer has carefully engineered the product to not only meet Underwriters Laboratories requirements but to exceed the minimum safety standards in the product. The service technician must assume the responsibility of maintaining the safety factors which are designed into the product.

The major protective devices used in receivers are *circuit breakers* and *fuses*. Fuses are rated from a few millamperes to several amperes or more. Other characteristics are also important such as the specific time delay called for—these fuses may be either the quick blow or slow blow types. It is obvious then, that a fuse should be replaced with one of the same rating and characteristics. For example; replacing a quick blow fuse with a slow blow fuse may not provide adequate protection, therefore use *exact* replacement parts.

The same reasoning applies to circuit breakers. A circuit breaker, even though it may have the same physical appearance, may not be equivalent to another circuit breaker. Circuit breakers have different break currents and characteristics just as fuses do. Some so-called replacement circuit breakers may not even be U. L. approved. Use exact replacement parts—check the part number in the replacement parts list. In addition, wire in the new breaker to the same equivalent terminals as the old breaker.

Another protective device used in receivers is small wire fuses that open on over loads. Ordinary quick blow fuses may be used to replace fuse wire. For example; a number 34 fuse wire could be replaced with a 5 amp quick blow fuse if number 34 copper wire was not available. *Never replace fuses with fuse wire!* Wire sizes and the approximate fusing current are listed below.

Copper Wire Size Number	*Approximate ampere Fusing Current*
36	3.6
34	5
32	7
30	10
28	14

A wire fuse is easily prepared by obtaining a small quantity of the wire size called for, clean and tin the ends, dress the wire in the same manner as originally found. If an insulating sleeve is used, install it on the new wire fuse before making the final connection.

To repeat—never replace a fuse with wire—replace a fuse with another fuse of the same characteristics.

Other Special Parts

Any part that is connected across the power line is very likely to be a special part requiring U. L. approval of that part. For example, the A. C. line capacitors are *special* parts, and any part of the same capacity and voltage rating would not be satisfactory. Substituting the wrong part could be a potential fire hazard! Use exact replacement parts!

In some instances a schematic may call for IRC resistors only. In many cases the IRC resistor, due to its construction, is used as a spark gap to protect certain parts in the event of arcing. In other instances, an Allen Bradley resistor may be called for if a spark gap is not wanted at that point!

Such special parts will be identified on the schematic drawing of the service data and will carry part numbers in the service data parts list.

Keep in mind that the manufacturer has expended much engineering effort to render the product reliable and safe. The service technician can keep it that way by exercising good workmanship and using exact replacement parts.

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