RCA

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CTC 42X and CTC 42XR Color Chassis

The 1970 line of RCA Color Television receivers includes the CTC 42X, a series filament hybrid chassis, which is used in portable instruments featuring a 16-inch (diagonal) picture tube. The CTC 42XR is a remote controlled version of the basic chassis that features solid-state remote control circuitry and a memory-module **motorless** remote volume control system.

The CTC 42X and XR chassis configuration is physically similar to the CTC 36 wrap-around vertical-horizontal base construction. Nearly all components of the basic chassis are mounted on four circuit boards. These include the PW 200 board containing a three stage transistor IF, a linear amplifier AFT circuit, two stages of transistor low-level video, and a transistor chroma preamplifier circuit that drives the tube-type PW 700 chroma circuitry.

The sound circuit is also located on the PW 200 board. It incorporates an integrated circuit 4.5 MHz amplifier/demodulator/audio-amplifier contained on a plug-in PM 200 sound module. An 11DS5 tube serves as the audio output stage.

The PW 500 board includes transistorized AGC, sync and noise-gate circuits. Familiar CTC 36 type vertical oscillator/output and low-level horizontal circuits are also located on this board.

A small PW 400 board, nearly identical to that used in the CTC 36, includes the horizontal output tube, high-voltage pulse regulator stage, and silicon diode damper.

The chroma board (PW 700) features color circuitry similar to that used in the CTC 38 except for minor modifications to permit series tube types. The VHF and UHF tuners are similar to those used in other RCA Color Television receivers. The KRK 140 hybrid VHF tuner is very similar to that used in the CTC 38X except for modifications to permit series filament operation. The UHF tuner is a transistorized KRK 156.

Other familiar circuits include convergence circuitry physically resembling that of the CTC 22. The static and dynamic convergence controls are located on a circular circuit board surrounding the neck of the color picture tube.

The CTC 38 type chroma circuitry features two bandpass amplifier stages, a closed-loop ACC system, and diode R-Y and B-Y demodulators that are packaged in a substrate. The R-Y and B-Y color signals derived from the substrate color demodulators drive pentode color difference

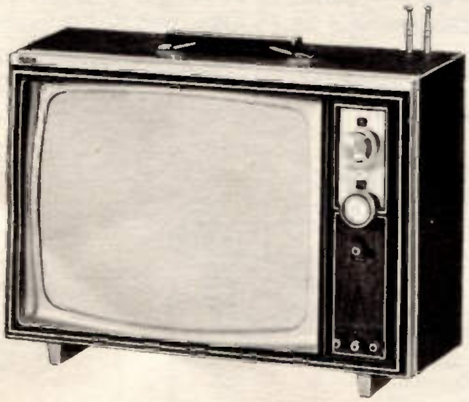

Figure 1—Model Using CTC 42X Chassis

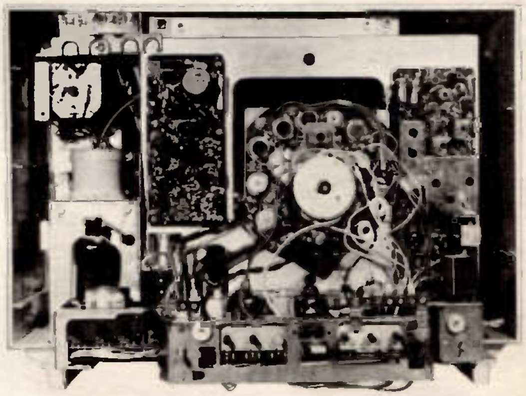

Figure 2—Rear View of Chassis

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amplifiers. The G-Y color signal is matrixed from the plates of the R-Y and the B-Y amplifiers. A pulse set diode circuit similar to that first introduced in the CTC 22 is used to preserve the DC component of the chroma signals which are capacitor coupled to the color picture tube grids.

New Circuits

New circuitry in the CTC 42X and CTC 42XR includes several areas. The AFT system uses a new linear amplifier integrated circuit that affords several advantages: it is easier to align, provides performance equivalent to previous type limiter-amplifier chips, and it is compatible with present AFT tuners. Also, the AFT circuit is now located on the PW 200 board rather than being a separate sub-assembly as in past chassis. The three-stage video amplifier includes two transistors for low-level video and a 7KY6 tube-type video output stage. The first video stage is an inverted PNP transistor—the collector is grounded and current is supplied to the emitter via a resistor from the 130 volts B+ supply.

The first video stage is DC coupled to the second video stage which provides signal from both the emitter and collector. The collector signal is amplified approximately three times and drives the video output stage via the circuit-board mounted delay line. The emitter signal drives the transistor AGC keyer and noise-immune sync separator stages.

The AGC and noise immunity circuits in the CTC 42 chassis are similar in many respects to those used in solid-state black and white receivers. Basically, the AGC system operates by comparing the amplitude of the video signal sync tip against a DC reference voltage derived from an 18 volts regulated source. These conditions allow the conduction of the AGC transistor to be related to the sync tip amplitude (signal strength.) The result of AGC transistor conduction is a negative DC voltage, that is proportional to signal strength. This voltage is used to effect a gain change on both the RF amplifier and IF amplifier.

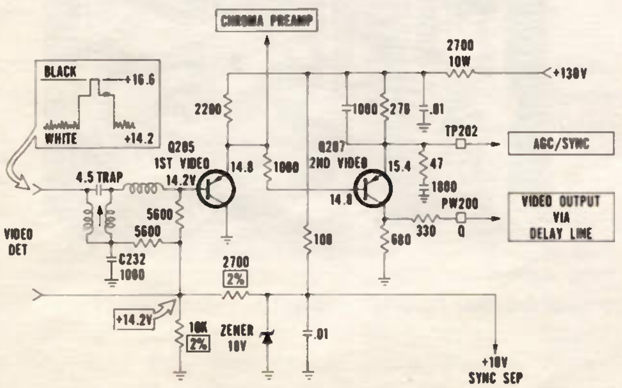

Figure 3—First and Second Video Stages

Another new circuitry area is the video output and picture tube coupling circuits. The CTC 42 chassis is equipped with a 17EZP22 color picture tube featuring "blue-gun-down" mounting and the **Einzel Lens** focus system first introduced with the 15NP22 picture tube used in the CTC 22 equipped instruments. The 17EZP22 has unity current ratio phosphors that produce proper gray balance with all three cathode drives equal. Thus, the picture tube cathodes do not require individual drive controls. Instead all three cathodes are driven at maximum; however, taps are provided that allow the drive to one or two guns to be reduced approximately 10% for best gray-scale tracking.

The remote circuits are of interest because they employ circuitry first introduced in the CTC 47 equipped G-2000 instrument. The remote controlled CTC 42XR employs a CRK 13 four function electronic hand-unit to remotely control **Power On/Off, VHF Channel-Change, Volume-Up,** and **Volume-Down**. A separate function provides remote **Power On/Off** because the motorless remote volume control system does not mechanically rotate the shaft of the volume control. Circuit wise, this function employs the bi-stable relay On/Off system currently used on the CTC 40 and CTC 47 chassis.

Overall, the remote control system uses an integrated circuit preamplifier and driver transistor to apply amplified ultrasonic frequencies to the input of the PW 1100 remote control board. The photograph showing the PW1100 remote control board illustrates the solid-state On/Off, Channel-Change, and the "memory-module" DC Volume Control systems.

The On/Off and Channel-Change functions utilize a Darlington transistor stage and neon bulb in an interesting circuit configuration to provide remote control of these functions. The remote On/Off function operates at 41.75 kHz and the channel-change frequency is 40.25 kHz. The Volume-Up frequency is 44.75 kHz and the Volume-Down frequency is 38.75 kHz. The Solid-State Page article, beginning on page 3, describes the operation of the remote On/Off and Channel-Change functions.

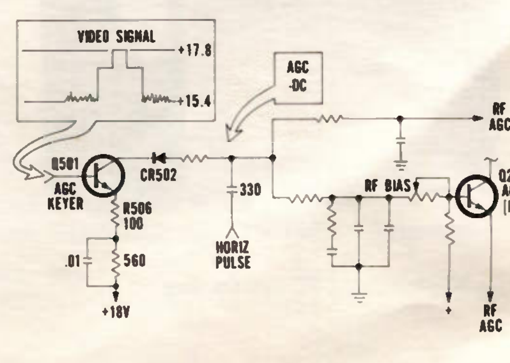

Figure 4—Simplified AGC Circuit

CTC42XR Remote On/Off and Channel Functions

The CTC 42XR remote control system uses an integrated circuit preamplifier and transistor driver stage (PW900) to amplify ultrasonic command frequencies emanating from the CRK 13 four function remote hand unit. The amplified signals of the PW 900 board are applied to the primary of driver transformer T1101 located on the PW 1100 remote board. The secondary voltages of this transformer drive tuned circuits that trigger the appropriate controlled functions.

Noise Immunity Circuit

Figure-5 illustrates a noise immunity circuit, transistor Q1104, that serves to minimize the possibility of the remote circuits being triggered by extraneous noise pulses such as jingling coins etc. Under normal conditions (when a valid remote signal is processed through the system) a steady DC voltage proportional to the amplitude of the ultrasonic signal will be developed across capacitor C1113. The noise immunity transistor (Q1104) is inactive at this time because it has no base current. When noise pulses occur, the voltage at C1113 will vary in relationship to the low-frequency amplitude changes of the noise. Therefore, an AC signal appears at this point and is coupled through C1117 to be rectified by CR1109. The rectified AC produces a DC charge voltage on C1118. When this noise-induced voltage exceeds approximately +.6 to +.7 volts, transistor Q1104 is biased into conduction. The load across the primary of transformer T1101 caused by the conduction of transistor Q1104 (via CR1110 and R1119) reduces the T1101 secondary voltage sufficiently to preclude erroneous remote control operation.

An additional component—voltage dependent resistor (RV 101)—serves to limit the amplitude of the pulse on the collector of the driver transistor (Q901) to prevent breakdown.

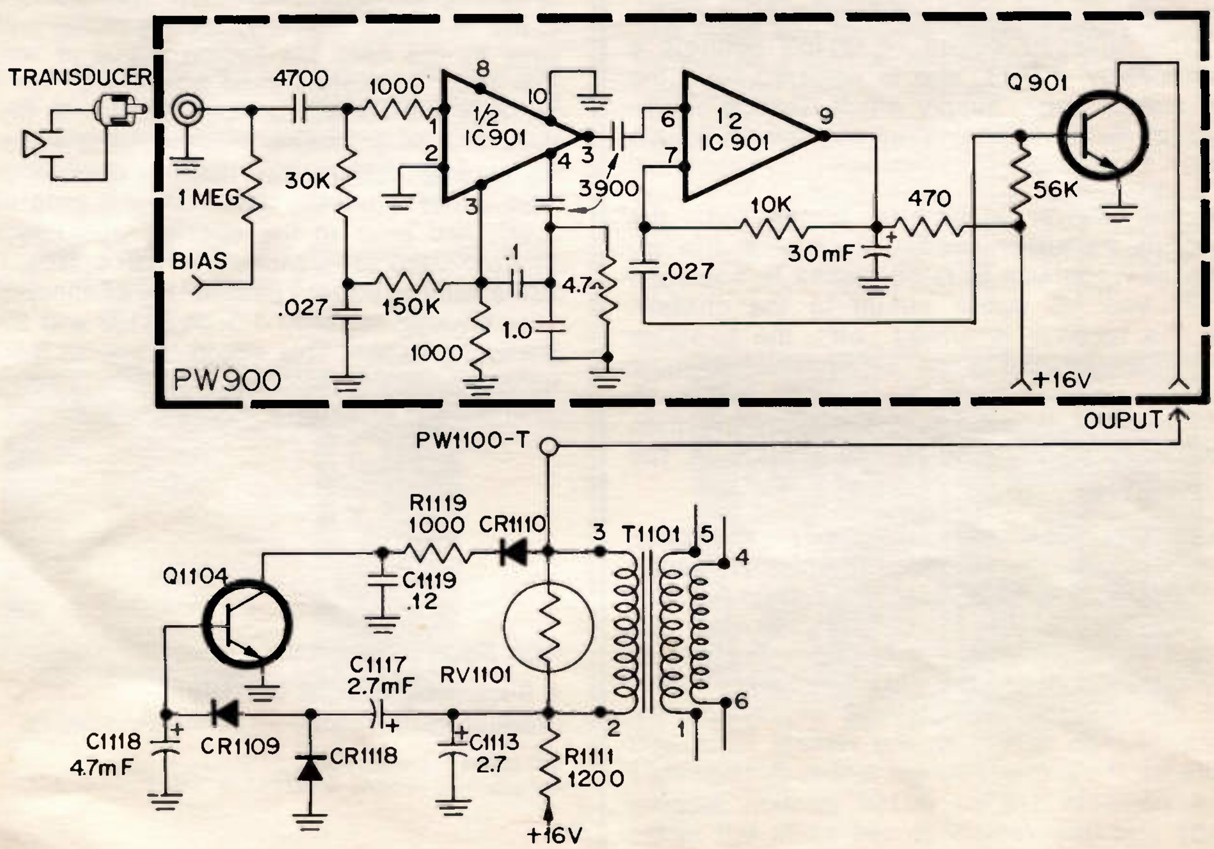

Figure 5—Remote Preamp/Noise Immunity Circuit

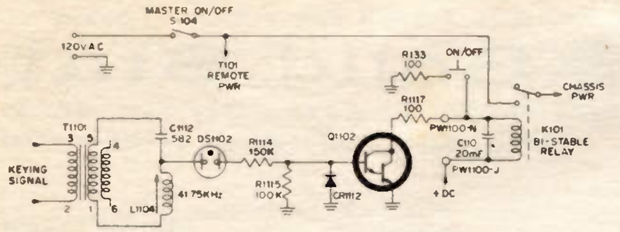

Figure 6—Remote On/Off

Function Circuits Operation

The following text discusses the operation of the **On/Off** and the **Channel-Change** functions. The On/Off function responds to a command signal of 41.75 kHz—see Figure-6. When a signal of that frequency appears across the series resonant circuit consisting of C1113 and L1104, neon bulb DS1102 is ignited and acts as a low resistance path to the base of Darlington transistor Q1102. Base current for Q1102 is provided by **positive** going voltage obtained from the resonant circuit via the conducting neon bulb and current limiting resistor R1114 (150K). Diode CR1112 serves to conduct the **negative** going voltage to ground.

The Darlington transistor is actually two transistors connected so that the individual betas of the transistors are compounded. This compounded transistor has an amplification capability (beta) of 1000 or more. Therefore, a small base current at the input produces substantial collector current. The collector circuit of Q1102 controls a bi-stable relay (K101), and is powered from the −35V remote power supply which remains operative at all times when instrument master switch is on.

When the receiver is remotely turned "on", the Darlington transistor conducts causing the bi-stable relay contacts to latch closed to complete the 120 volt AC power circuit to the chassis. When the receiver is turned "off", the bi-stable activates and latches to the "off" position. Manual On/Off is provided by a "push-push" switch on the front panel that completes the ground path for the bi-stable relay by means of R133, a 100 ohm resistor.

Remote **Channel-Change** (Figure-7) is accomplished in a similar manner. The channel-change circuit responds to 40.25 kHz. This causes Darlington transistor Q1101 to conduct, closing the contacts of the channel-change relay (k1101) to apply 120 volts AC to the channel-change motor. Once the motor is activated by depressing the channel-change button on the remote hand unit (Figure-8), the pull-in engagement of the armature closes contacts 1-3 on S1102 (station stopper switch) and they remain closed while the motor is activated. The rotation of the tuner shaft, closes

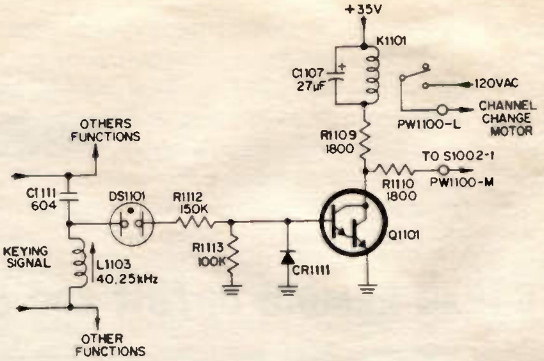

Figure 7—Remote Channel Change

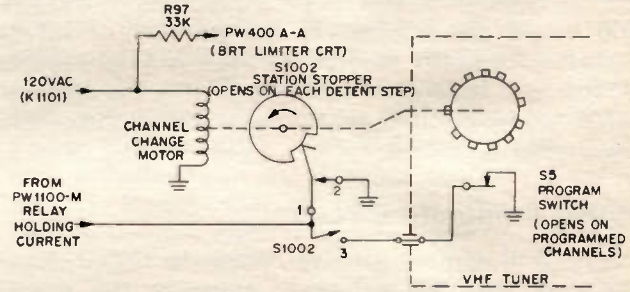

Figure 8—TMA Wiring

contacts 1-2 on S1102 to complete a path to ground for the channel-change relay. This relay holding current path connects to PW 1100-M and the collector of Q1101 via R1110 (1800 ohms), furnishing sufficient current to hold relay K1101 in the activated mode. Thus, the motor will continue to run after the keying signal is removed. Just prior to every detent position of the tuner, contacts 1-2 on S1002 open so that **if the next channel is programmed "in"**, the motor stops since the holding current path for the channel-change relay is opened. If the next station is **programmed "out"**, just prior to the opening of contacts 1-2 on S1002, the programming switch closes, to furnish a holding current path for the channel-change relay through contacts 1-3 on S1102 and the programming switch. This action maintains the motor activated and prevents the tuner from stopping on an unwanted (unprogrammed) channel.

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