RCA

Plain Talk
and Technical Tips

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New CTC 46 Color Chassis

Many table models, consoles, and combination color instruments for 1971 are equipped with the solid-state CTC 46 chassis. The CTC 46 is electrically quite similar to the CTC 49 chassis introduced last fall. Both use similar VHF and UHF tuners. They also share the following AccuCircuit Modules: **MAK** (IF, AGC, and AFT); **MAE** (chroma demodulator); **MAL** (video amplifier and sync separator); **MAD** (kine drivers—three are used); **PM 200** (4.5 MHz amplifier, sound discriminator, and audio preamplifier); **MAH** (horizontal AFC and oscillator); and **MAG** (low-level vertical-deflection components). Physically the chassis has a vertical wrap around configuration, which in conjunction with the plug-in modular construction provides excellent serviceability in the home.

Power Supply

Electrically the differences are slight. The CTC 46 is a "cold-chassis," using a power transformer for all B+ sources. The different power supply configuration requires a new power supply module, designated as MAB 003A. The power supply module in the CTC 49 chassis is the MAB 002A. The major difference between the MAB 003A and the MAB 002A is that a fullwave bridge rectifier is used for the 160-volt horizontal-deflection power supply instead of a halfwave rectifier.

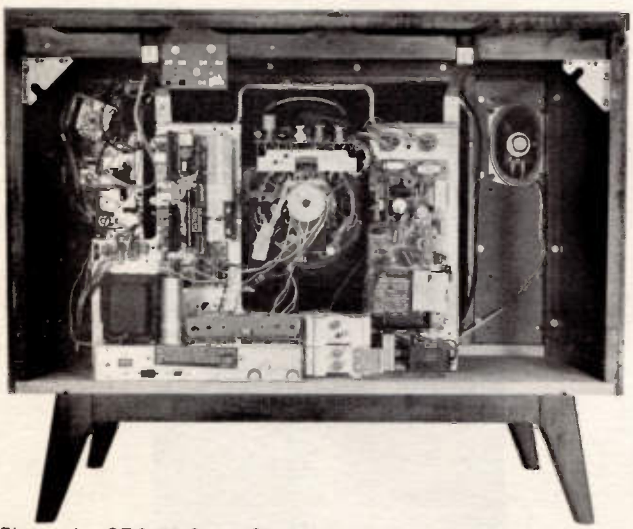

Figure 1—CTC 46 Color Chassis

Horizontal Deflection

Another difference is the horizontal deflection circuit. The 21VAKP22 and 25VAB22 color picture tubes used in CTC 46 equipped receivers are 90° deflection types, as opposed to the 110° tube used with the CTC 49. The 90° deflection tubes have somewhat lower horizontal-deflection requirements; however, high-voltage requirements are increased from about 21kV (CTC 49) to 26.5kV at zero beam current. Therefore the CTC 46 uses the familiar CTC 44 type horizontal deflection system, including the side pincushion circuit. The input reactor (T401), regulator reactor (T402), and the regulator transistor (Q401) are exceptions; these three components are similar to the ones used in the CTC 49 chassis.

Sound

Another significant difference is the sound area. The CTC 46 uses a Class-B push-pull audio amplifier rather than the single-ended Class-A sound circuit of the CTC 49. A new module (**MAN 002A**) containing the audio amplifier replaces the audio preamplifier, audio output, and audio-output transformer used in the CTC 49.

AccuMatic Color Monitor

The CTC 46 also features AccuMatic Color Monitor. AccuMatic is similar in some respects to the AccuTint feature of the RCA CTC 39 and CTC 44 chassis; however, it also acts to optimize the **COLOR** and **TINT** control settings by restricting their ranges.

Referring to the illustration, **AccuMatic Control Circuit**, sections C and D of the AccuMatic switch (shown in the "off" position) perform the AccuTint functions. Switch section C supplies current to diode CR 2 when AccuMatic is "off". This effectively grounds the junction of C4 and L4, shorting out phase-shift coil L4. When AccuMatic is "on" CR 2 is nonconducting, connecting L4 and C13 in series with C4. This changes the phase angle and gain of the B-Y demodulator with IC 1.

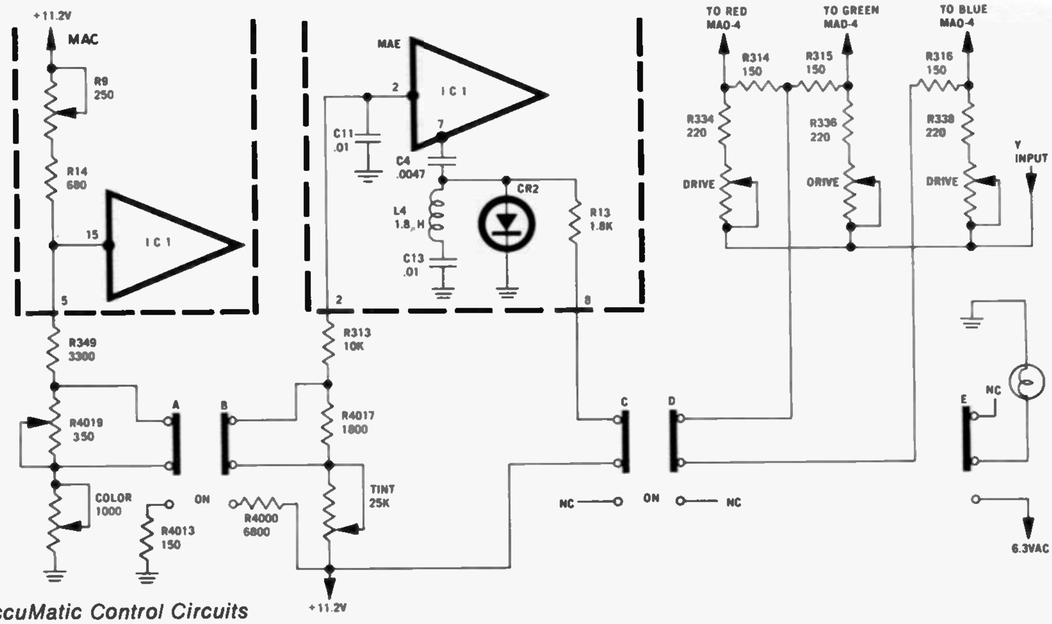

Figure 2—AccuMatic Control Circuits

When AccuMatic is "on" section D of the switch disconnects the emitter of the blue kine-driver transistor (via R316, 150 ohms) from the junction of 150-ohm resistors R314 and R316. This changes the gain the blue kine-driver stage—blue MAD module. In the "off" position, section D of the AccuMatic switch connects together the emitters of all three kine-driver transistors in the MAD modules by way of resistors R314, R315, and R316.

Sections A and B of the AccuMatic switch are used to restrict the ranges of the **COLOR** and **TINT** controls respectively, allowing only minor deviations from optimum settings. With AccuMatic "off" and R4019 set to a nominal value of 200 ohms, the total resistance from MAC terminal-5 to ground may be varied from 3300 ohms to 2400 ohms, which provides a range of color control from no-color to over-saturation. With AccuMatic "on", this resistance may be varied only from 3500 ohms to 3630 ohms, the range of optimum color saturation.

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Color Television Horizontal Deflection And High Voltage Training

Have you ever had trouble servicing color television horizontal sweep systems? If so you would benefit from a short program prepared by RCA Technical Training, dealing with the theory of operation and servicing of tube-type color television horizontal deflection circuitry. The 2½ to 3 hour program includes a short lecture with demonstrations, and a workshop activity. The training is now being offered by the Service Manager at your local RCA Distributor.

The program begins with a discussion of theory and servicing of the horizontal oscillator and AFC circuits. Continuing, the horizontal output/damper circuit operation is detailed in an easy to understand manner. With a better understanding of circuit operation gained through this training, servicing this circuit area should be easier. During the output/damper phase of the instruction, the correct method for adjustment of the horizontal efficiency coil is discussed and demonstrated by the instructor. A third part of the training activity deals with the high-voltage and regulator circuits. At this time, correct methods for adjusting high-voltage, checking regulator circuit operation, and testing the high-voltage protective circuits are demonstrated.

Several times during the lecture/demonstration, the attending technicians will be asked to perform service checks and answer questions pertaining

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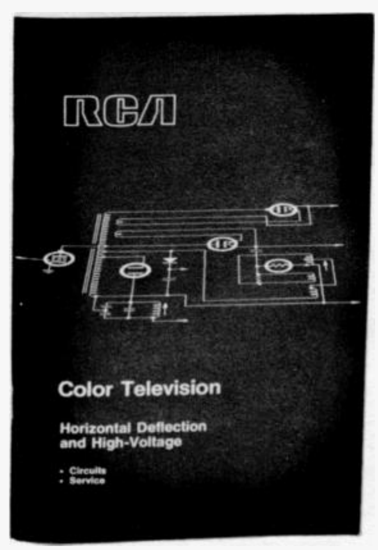

Figure 3—Text for Training Program

Remote Control Memory Module

Several 1971 color instruments (CTC 42XR, CTC 43XR, and various versions of CTC 44) use the "memory—module" DC motorless remote system first introduced in the CTC 47.

Figure-4 details the circuitry used to feed DC control voltage to the DC voltage operated remote function. The memory-module circuit can be considered a source-follower stage employing an insulated gate depletion type MOS transistor. The MOS input (gate-circuit) voltage initiates and maintains conduction of the MOS at a source voltage which is approximately equal to the applied gate voltage. Because of the good dielectric characteristics—low leakage of the Q1 gate and associated components—the charge stored on C2 and hence the Q1 gate voltage is retained for long periods of time. Consequently the output voltage appearing across source resistor R2 nearly equals the Q1 gate voltage. Thus, by varying the gate voltage of Q1 it is possible to provide a variable voltage at the output of the memory-module. This voltage drives the base of driver transistor Q3 (emitter-follower) which impedance matches the output of the memory-module to the control bias input of the controlled function.

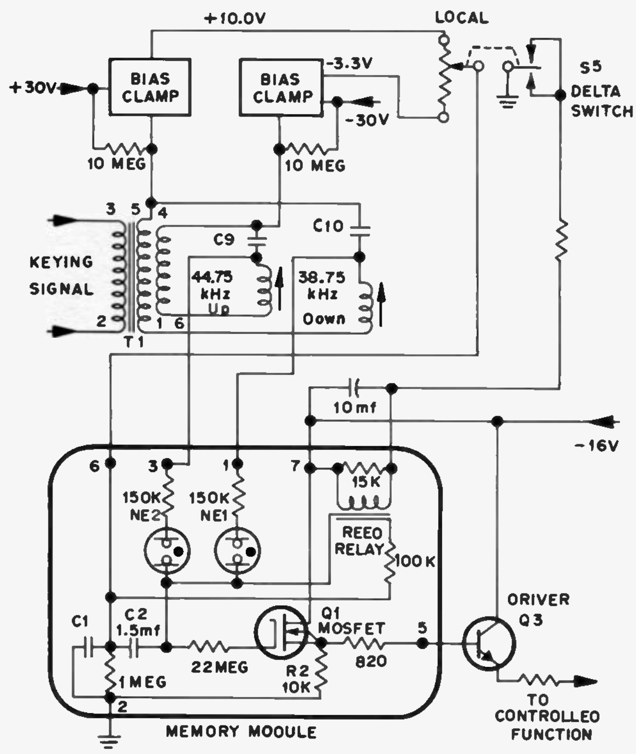

Figure 4—Memory Module Circuit

Because the MOS is a depletion type device, it is necessary to provide a negative gate voltage to obtain zero voltage at the output of the module—terminal #5. The gate cut-off voltage for the MOS is approximately minus three volts. Therefore, an output of about 0 to +10 volts is obtained at terminal #5 with a gate voltage swing of approximately —3 to +10 volts.

The two polarities of voltage (—3.3 and +10 volts) are obtained from separate DC supplies. These power supplies furnish +30 and —30 volts which are clamped by appropriate circuitry to +10 and —3.3 volts.

Manual Control

Let's now consider manual control of the function using the customer front-panel (local) control. Note in the illustration that this control is connected between +10.0V and —3.3V. Hence the voltage applied to the input of the memory-module (terminal #6) may range from +10 at minimum to —3.3 volts at the maximum setting.

The input of the module (gate circuit of the MOS transistor) acts as a capacitive voltage divider comprised of the 1.5 mF capacitor (C2) and the gate-channel capacitance of the MOSFET of approximately 2 pF. When power is applied to the receiver, voltage (either + or —) appears at the slider of the local control. Because of the capacitive voltage divider action, nearly all of this control voltage is impressed on the 2 pF gate-channel capacitance. Once the gate capacitance is charged, the MOS conducts, developing an output voltage at terminal #5 to drive the emitter-follower. The above mentioned local control voltage sets a definite gate bias, and operating point for the controlled function, as determined by the setting of the local control. The previous action assures that if the memory-module input circuit discharges during a time interval when the receiver is not operated, that when the instrument is again used, the MOS gate voltage, and control bias output will be restored to the point determined by the local control DC voltage.

Remote Control

The remote UP or DOWN functions, when keyed, adds to, or subtracts from, the MOS gate voltage previously established by the local control. Remote operation depends on igniting one or the other of a pair of neon bulbs when the ultrasonic UP or DOWN command signal is received. In order to provide isolation between the **positive** function

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New CTC 46 Color Chassis

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Both R9 of MAC and R4019 are properly adjusted during manufacture and normally require no further attention; however, readjustment may be necessary if module MAC is replaced. With AccuMatic turned "off", a colorcast tuned in, and the color control set to minimum, R9 is adjusted to the point where color just disappears. Next, the **COLOR** control is advanced to the point of most pleasant color viewing. Then R4019, located concentric with **TINT** control, is adjusted so that there is no change in saturation when AccuMatic is turned "on". This adjustment can be made from the front of the instrument if viewer preference requires more or less color in the picture when AccuMatic is "on".

Module MAC in the RCA CTC 46 chassis is designated MAC 002A to differentiate it from Module MAC 001A that is used in the CTC 49. The difference is that in the CTC 49 MAC 001A, R9 is fixed 5600 ohm resistor connected between B+ and IC terminal 15. In late production CTC 49 type modules, the copper pattern was modified to accommodate minor circuit changes which make the board a CTC 46 type MAC 002A module.

In the CTC 46 type MAC 002A, R9 was changed from 5600 ohms to a 250-ohm potentiometer to allow individual "trimming" of the customer **COLOR** control range. Also a fixed resistor (R14 —680 ohms) is added in series with R9. Note that the combined resistance of R9 and R14 is much less than the resistance of R9 in the MAC 001A Module.

Section B of the AccuMatic switch restricts the range of the **TINT** control to the optimum fleshtone range. In the "off" position, the total resistance from MAE terminal-2 to B+ may be varied between the limits of 10K and 35K. In the "on" position, these limits are changed to 11.8K and 17.1K.

Training

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to each service activity. At the completion of the program, the students are asked to answer the questions on a short self-graded quiz covering the material discussed. After doing this, each participant reviews his quiz. As each answer is read, the instructor will discuss the question and all the possible answers.

Each student participating in the program receives, in addition to the workshop activity/quiz booklet, a copy of a small book entitled, **"Color Television Horizontal Deflection and High Voltage —Circuits-Service"**, which is good follow-up reading on the subject. To further aid with servicing, a handy reduced flipchart containing service procedures is contained in the literature package.

Memory Module

Continued from Page 3

DOWN voltage, and the **negative** function UP voltage, it is necessary to apply these voltages to individual secondary windings on T1, the driver transformer.

The UP circuit is comprised of C9 and L1, that are series-resonant at the correct frequency (44.75 kHz in this example). When the 44.75 kHz command frequency is transmitted by the hand unit, a 225V P-P AC voltage appears at the junction of C9 and L1, causing ionization of neon lamp NE 2. (An AC ground path for both neon lamps is provided by C1 and C2.) The negative gate charging voltage, (clamped at —4.0V), is furnished to the driver transformer through a 10 megohm resistor, and to the MOS gate via NE 2, the conducting neon lamp.

The 10 megohm resistor and the 1.5 mF capacitor (C2) have a charging time constant such that it requires approximately 6 seconds for the gate of the MOS to decrease from the "full-on" value of +10 volts to the "cut-off" value of —3.3 volts. The bias clamp circuit, shown as a block, serves to limit (clamp) the charging voltage to a maximum of —4.0 volts so that the MOS gate is not driven excessively negative.

The DOWN circuit operates in a similar manner. The other secondary winding of T1 is connected to the +30V supply which is clamped to an actual value of +11.4 volts. Another resonant circuit (C10 and L2) is connected across this secondary winding, and responds to the 38.75 kHz DOWN by ionizing neon lamp NE 1. This connects the gate of the MOS to the positive supply voltage, allowing the gate voltage and control bias to increase.

The customer local control is equipped with a "delta" switch (S 5) that closes when the control is rotated either direction. The delta switch closure activates a reed relay coil contained in the module, causing its contacts to close. This action removes the stored charge on capacitor C2, and clamps the MOS gate voltage to the local customer control. The delta switch and reed relay thus serve to discharge any memory voltage (MOS gate voltage) changes resulting from remote UP or DOWN operation, allowing the module input voltage to again equal the local control voltage.

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