RCA

# Plain Talk

## and Technical Tips

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### Circuit Breakers

Current RCA color television chassis are equipped with a protective circuit breaker that interrupts the B+ supply in the event of a short circuit or overload. The circuit breakers incorporated in these chassis are provided at added expense because of their superior protective ability over that of a fuse. These circuit breakers have carefully chosen specifications that allow them to provide maximum protection in each specific chassis.

The circuit breaker's advantages are two fold: First, and most obvious, is that the circuit breaker is resettable in the event of a momentary power surge or overload which would normally burn out a fuse—resulting in a service call. To minimize the need for service calls of this nature, the circuit breaker reset button on RCA color chassis is a red button that is exposed through a small hole in the instrument back cover. If the circuit breaker trips, the set owner (before calling for service) may try to reset the circuit breaker. If the circuit breaker holds, the problem was most likely a momentary voltage transient. In the event that the circuit breaker again trips, it is indicative that a problem of a more serious nature exists.

The second advantage of the circuit breaker is that holding current and overload (trip) current limits can be established much closer, and with more predictability than is possible with conven-

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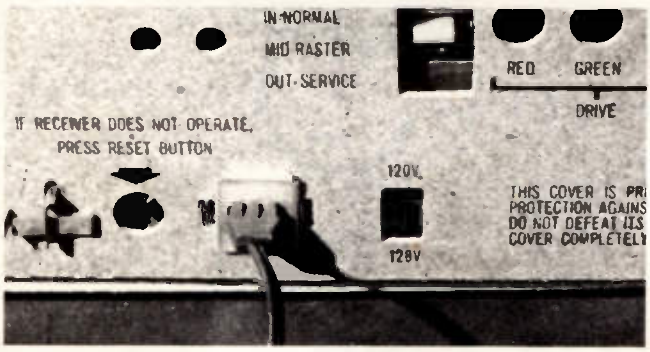


*Figure 1—Typical Circuit Breaker Location*

### The WV-38A VOM

The volt-ohm-milliammeter (VOM) is an important piece of test equipment which every good service shop should have. The VOM can perform many measuring jobs that the VTVM may not be able to do. In the area of transistor servicing the VOM is particularly suitable since very low range voltage scales are provided and current readings can be taken.

The RCA WV-38A is a lightweight, compact, rugged, all-purpose volt-ohm-milliammeter. It is designed to measure AC voltages from .1 volts to 5,000 volts; DC voltages from .005 volts to 5,000 volts; DC current from 1 microampere to 10 amperes; resistance values from .2 ohms to 20 megohms; and decibels from —20 db to +50 db. This instrument employs a large 5¼" extended view meter housed in a clear plastic case. The WV-38A is shown in Figure 2 below. The top scale is used when measuring ohms and the second scale is used to read DC voltages and currents. Two AC scales are included, the lower one being used only for the 2.5 volt range. The bottom scale on the meter is used for decibel measurements.

The WV-38A VOM has several outstanding features which make it an extremely versatile instrument. The special DC voltage ranges of 0.25 volt

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*Figure 2—The WV-38 VOM*

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## Brightness Limiter Circuit—CTC 22 and CTC 36

The second video stage in the CTC 22 and the new CTC 36 are basically that as used in last year's CTC 22 chassis. However, the brightness circuit has been modified to include a brightness limiter control. Previously, R113 (2.7 meg) was a fixed resistor; the brightness limiter is a potentiometer replacing that fixed resistor. DC grid bias for the second video tube is obtained via the brightness and brightness limiter controls. AC voltage is obtained at the filament junction of the 24JE6A horizontal output tube—approximately 95 volts AC is available at this point. Negative DC voltage is developed by rectifier CR 402, and the R-C network consisting of the 33K and 56K resistors.

Adjustment of the brightness limiter control alters the maximum amount of negative voltage available to the brightness control—its location is indicated in the photograph (Figure 4). The photo illustrates that the brightness limiter control is accessible after removing the rear cover. Adjustment is made at the factory under known operating conditions. Normally, service adjustment of this control should be made in the shop. However, a field (in-home) adjustment is possible using the following procedure.

Make sure all screen and drive controls are properly adjusted; turn brightness to maximum and contrast to minimum, next adjust brightness limiter to a point just below blooming on picture tube.

The above procedure is very similar to that used with the CTC 27 and 31 chassis. It is important to note that the brightness limiter control should not be arbitrarily adjusted to compensate for changes in circuit operation. If brightness undergoes drastic changes, the reaction should not be compensated for by readjustment of the limiter.

Figure 5 depicts that the control is mounted on the horizontal sweep board, next to the horizontal output tube. A small "hex" tool can be used to adjust the control—through an access hole in the shield. All components associated with the limiter circuit are located in close proximity on the PW 400 board.

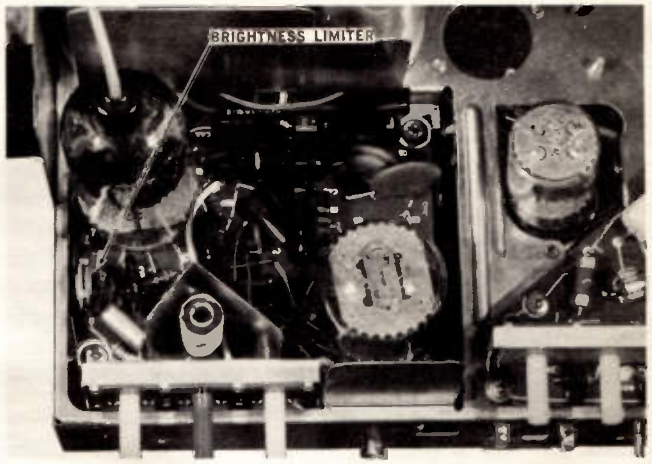


*Figure 4—Control Location*

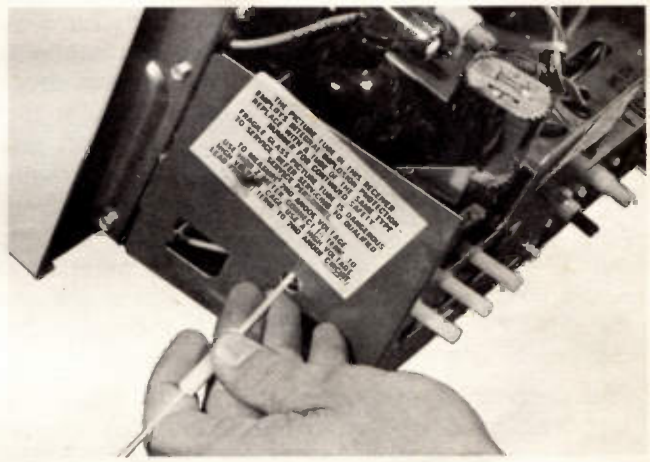

*Figure 5—Adjustment Access Hole*

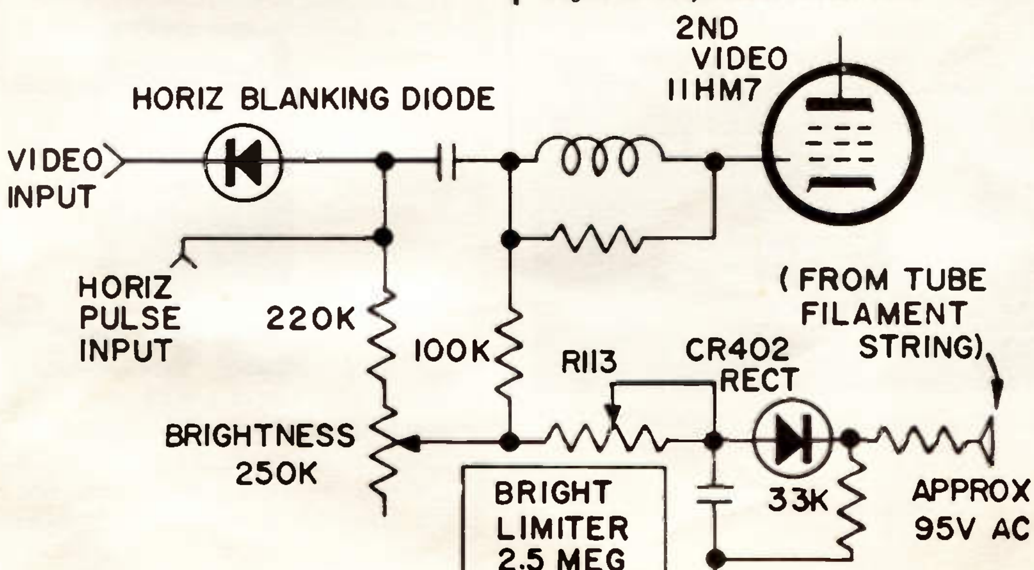


*Figure 3—CTC 22, 36 Brightness Limiter Circuit*

## Transistor Clock Circuit

Two portable clock radios in this year's product line, the RZS 43 and RZS 45, employ an interesting transistor circuit to drive the clock mechanism. The transistor clock circuit closely resembles a blocking oscillator. In place of the blocking oscillator transformer, the clock drive circuit uses two air core coils, wound together and physically positioned so that they are in very close proximity to the balance wheel in the clock.

The transistorized drive circuit provides pulses of magnetic energy that alternately attract and repel the magnets mounted in the balance wheel assembly, causing it to be excited into oscillation. The reciprocating motion of the balance wheel can be compared to its counterpart in an ordinary clock or wrist watch.

When battery voltage (1.5V) is applied to the clock drive circuit, transistor Q1 is slightly forward biased by resistor R1 (150K) causing a small collector current. This collector current creates a magnetic field about coil L1. The polarity of the magnetic field produced L1 is such that it attracts the magnet in the balance wheel, causing it to rotate in a direction that brings the magnet closer to the coil assembly. The moving magnet induces a pulse of voltage in coil L2 which is part of a feedback network connected to the base of transistor Q1. The positive feedback pulse developed by coil L2 tends to increasingly forward bias transistor Q1, causing increased magnetic energy and further deflection of the balance wheel.

As the balance wheel pivots towards the L1-L2 coil assembly, mechanical energy is stored in the hair spring and the balance wheel, letting it rotate past the magnetic coil assembly. Further rotation of the balance wheel causes the south pole of the magnet to cross the L1-L2 coil assembly. Now, the polarity of the magnetic field produced by the balance wheel magnets is reversed, the polarity of the voltage induced in coil L2 also reverses, creating a voltage pulse of opposite polarity on the base of transistor Q1. The reverse bias afforded by the feedback pulse cuts-off transistor Q1, and the mechanical energy stored in the balance wheel assembly drives the balance wheel back to its original position—allowing the cycle to start again and be repeated at a repetition rate of approximately 5 pulses per second. The exact period of balance wheel oscillation is determined by the mechanical resonance of the hair-spring/balance wheel assembly—not by the electrical components —just as in a conventional clock.

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*Figure 6—Model RZS 43 Portable Clock Radio*

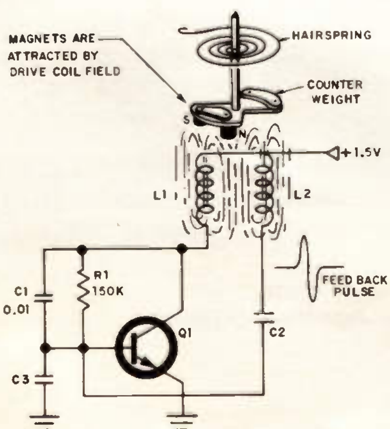


*Figure 7—Clock Drive Circuit*

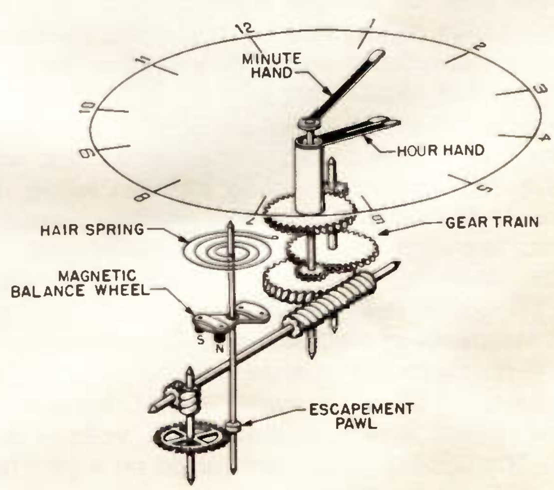


*Figure 8—Simplified Clock Mechnaism*

## WV-38A VOM

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and 1.0 volt provide an extra utility for servicing transistor circuits. An accessory Alligator Clip is supplied for "slip-on" attachment to the test probe, providing a handy facility for all types of applications. Portability is enhanced by clips mounted on the sides of the handle to hold the test leads when the instrument is being carried. The ohms-multiplier resistors are protected against burn out by a fuse which is connected in series with the "-COMMON" jack and the AC-DC switch.

The meter scales on the WV-38A have been designed to provide ease of operation and quick readability over a wide range of measurements. Scales have been grouped according to the type of measurement for which they are used.

Because of the wide number of measurement ranges provided on the WV-38A, it is often possible to take voltage or resistance readings on two ranges and scales. For greatest accuracy in voltage and current measurements, always use the range which will provide an on-scale reading which is nearest to the full-scale point. For example: 48 DC volts can be read from either the 50 volt or the 250 volt range. Because the 50 volt range will provide a reading nearest the full-scale point. the 50 volt range only should be used if a reading of best accuracy is to be obtained. This general rule aaplies to all AC and DC voltage ranges. For resistance measurements, however, the range selected should be the one which provides a reading nearest the center of the scale, because the WV-38A provides the most accurate ohms readings at mid-scale points.

For some measurements it will be necessary to use a multiplying factor with the scale to obtain the correct reading. The required multiplication is indicated by the setting of the range switch. For example: when the range switch is set to the 1000 V. position for voltage measurement, the 0 to 10 scale is used, but the reading is multiplied by 100 times.

When making voltage or current measurements, it is good practice to make a trial measurement at a higher range setting that is considered necessary, because repeated overload may destroy the meter movement or impair the accuracy of indications. It is also good practice for personal protection to turn off all power to the circuit under test when connecting or disconnecting the test leads. The power to the circuit under test must be turned off when in-circuit resistance measurements are made, otherwise damage to the meter may result.

The WV-38A is designed to measure all significant characteristics of electrical and electronic circuits. It will measure the voltage, the current, and the resistance of all DC circuits. For AC circuits, the measurement is indicated as R.M.S. volts or decibels. The decibel ranges are based on a zero level of 1 milliwatt in 600 ohms.

Either part of a mixed AC and DC voltage can be measured separately with the WV-38A. The AC voltage can be measured individually through the use of the output circuit, and the DC voltage can be measured directly through the DC voltage circuit.

## Circuit Breakers

*Continued from Page 1*

tional fuses. These two circuit breaker current specifications are chosen during the design and testing phase of each new chassis. A number of chassis are operated under both high- and low-line conditions to determine the maximum B+ current drawn from the power transformer. Then, a safety factor of approximately 10% is added to the average measured current, and the value of circuit breaker "holding" current is selected. Because the circuit breaker can sense even small overload currents, it is possible to design a completely reliable circuit breaker that will trip at 150% of the rated holding current, as opposed to the wide range (250-500%) opening current of normal fuses. Thus the circuit breaker will detect and interrupt a short circuit or overload condition, before it increases to a value that could cause serious damage to chassis components.

Although the circuit breaker has proven to be very reliable, occasional failures can be expected—usually will not hold—in the event a circuit breaker is replaced, the service technician should always replace it with a **direct replacement** as indicated by the stock number in RCA Service Data. This will insure that the circuit breaker is replaced with one of identical holding- and trip-current characteristics.

## Clock Circuit

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The mechanical energy produced by the oscillation of the balance wheel is transmitted by means of a small pawl located on the end of the balance wheel assembly. The back and forth motion of the pawl moves the first gear (in the gear train) one tooth at a time—as the balance wheel moves back and forth. The illustration at the bottom of page 3 details the mechanical coupling between the balance wheel and the hands of the clock.

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