INSTALLATION, OPERATING AND SERVICE INSTRUCTIONS

For

# Col-R-Tel Converter

COLOR CONVERTER, Inc.

#### Installation Instructions

The Model 100-1 Col-R-Tel Converter, when properly installed, will produce excellent color pictures on any good quality black and white television receiver when receiving a standard color transmission.

When properly installed the Converter does not alter the black and white performance of the television receiver.

#### General

Before installation the technician should make sure the television receiver is operating correctly on a black and white transmission. The receiver band width should not be less than specified by the manufacturer, otherwise there may not be sufficient chroma signal for proper operation of the converter. Wide band I. F. receivers produce better color pictures than narrow band receivers. If realignment is necessary it is recommended that the band width be adjusted to the maximum possible and still maintain sufficient gain and selectivity for the particular area.

The fine tuning adjustment on the tuner must be set to permit tuning the receiver through the picture carrier to produce fine detail in the picture. (This is also the correct adjustment for black and white reception.)

## Parts Included for Installation

Item	Quantity	Description	Part Number
A	1	Col-R-Tel Converter	Model 100-1
В	- 1	Scanning Wheel	
B	1	Picture Size Control Box	
	1	Installation Kit consisting of items D, E, F, G and H	
D	1	Connecting Plug and Cable	
E	1	Horizontal Voltage Divider	
		(1-01 Mfd. Cond., 2-270K 2-Watt resistors	
		and 1—10K 1/2 Watt resistor wired in series)	
F	1	47K 1/2 Watt Resistor	
G	4.	Coll Spring Contacts (for connection to	
		vertical output tube plate prong)	+
H	2	Wires with Connectors (1 green, 1 yellow)	

#### Wiring Installation Procedure

Before proceeding with the wiring connections to the television receiver it should be determined where the converter and the picture size control box are to be mounted and connecting leads cut accordingly.

Most installations will be made with the converter mounted on the back of the television receiver with the controls extending slightly above the top of the cabinet, although some customers may prefer a vertical mounting with the controls accessible from the side.

The size control box should be mounted in a position which requires as short leads as possible and still permit access to the size switch. All leads, except the connections to picture tube grid and cathode, should be brought out between the television back and the cabinet. This will permit removing the back for servicing without removing the connections to the converter. The picture tube grid and cathode wires can be brought through ventilation holes in the back since the connectors provided are very small in diameter. The grid and cathode wires should be separated from each other and other wires by at least 1 inch.

All receivers, as far as conversion, fall into two catagories: 1. Having the video signal fed to the cathode of the picture tube; 2. Having the video signal fed to the grid of the picture tube. Please note that operations 1 and 2 are different for these two types of receivers.

NOTE: All units are shipped with the color phasing connections correct for cathode fed receivers. For grid fed receivers the secondary leads of the phasing coil ( $L_2$ ) should be reversed. These leads are clearly marked by red tape in the converter.

- (Cathode Fed)—Solder yellow lead (Item H) to cathode lead at picture tube socket and tape.
   (Grid Fed)—Solder yellow lead (Item H) to grid lead at picture tube socket and tape.
- 2. (Cathode Fed)—Cut picture tube grid lead near socket and solder the 47K ½ Watt resistor (Item F) in series. Solder the green lead (Item H) to the end of the resistor nearest the picture tube grid. Tape connections to prevent short.
  (Grid Fed)—Cut picture tube cathode lead near socket and solder the 47K ½ Watt resistor (Item F) in series. Solder the green lead (Item H) to the end of the resistor nearest the cathode of the picture tube. Tape to prevent short.

- 3. Connect the free end of the .01 Mfd. condenser (Item E) to the plate connection on the receiver horizontal output tube and solder. Connect the free end of the  $10\mathrm{K}\ 1/2$  Watt resistor to circuit ground (usually chassis). Connect the orange lead of the connecting cable (Item D) to the junction of the  $10\mathrm{K}\ 1/2$  Watt resistor and the  $270\mathrm{K}\ 2$  Watt resistor.
- 4. The blue lead of the cable (Item D) connects to the plate of the vertical output tube. Four (4) spring clips (Item G) are provided for connection to the plate prong of the tube. Use the size which fits the particular tube used. Solder the blue wire to the clip and insert tube. Carefully dress leads to prevent shorts. If the chassis can be easily removed the connection should be soldered to the socket plate connection.
- 5. Connect black lead of cable (Item D) to circuit ground (usually chassis).
- Connect red lead of picture size control box to high potential side of horizontal deflection coil
  and black lead to low potential end.
  - Connect green and yellow leads across the vertical deflection coil. Polarity is not important on the vertical coil.
- 7. Dress leads for proper connection to converter and install back on television receiver.
- 8. Mount converter and size control box with screws provided
- 9. Connect yellow lead from picture tube (Item H) to the yellow lead on converter.
- 10. Connect the green lead (Item H) from picture tube to the green lead on the converter.
- 11. Plug connector on converter into connector on cable (Item D).

#### Color Scanning Wheel Installation

- Mount the angle brackets to the shelf and back of the scanning wheel housing using the proper holes in the brackets that will position the scanning wheel window near the center of the picture tube with the shelf resting on top of television cabinet. Use extension brackets if necessary.
  - 2. Connect connecting cable to converter.

#### Picture Size Control Box Adjustment

- 1. Turn size switch to "normal".
- 2. Tune in picture on television set.
- 3. Turn size switch to "color" position and adjust height and width controls on box until picture is correct size for scanning wheel window. For best viewing the picture on the television picture tube should be from 1 inch to 1½ inches larger than the window of the scanning wheel.
- 4. The vertical size control is 250 ohms and is shunted across the vertical deflection coils for reducing the picture height. Some older television receivers with low resistance deflection coils require the resistance to be in series with the deflection coils. Contacts are provided on the size switch to permit this change. If the 250 ohm control when wired in series is too critical for adjustment a fixed resistor of the correct value should be used, in parallel with the control.
- 5. The width coil consists of two windings that are normally wired in series having a range of 12 to 50 milihenries. For very low impedance deflection coils it may be necessary to wire the coils in parallel to reduce the picture sufficiently. For parallel connection connect the start of each winding together and the finish together.

# Operating Instructions

- 1. Turn "PICTURE SIZE" Switch located on size control box to "COLOR". Always have TV set turned off when operating this switch.
- 2. Place Col-R-Tel scanning wheel assembly in front of TV picture screen and attach connecting socket on cable to plug on rear of scanning wheel.
- Adjust TV receiver to sharpest picture possible with its fine tuning control. Generally the "CON-TRAST" and "BRIGHTNESS" of the TV receiver should be increased for color pictures.
- 4. Set converter "OFF-ON" switch to "ON". After 15 seconds warm up time depress "MOTOR START" switch until the scanning wheel reaches full speed. Then adjust "MOTOR SPEED" control until no scanning wheel seams are visible. Due to the inertia of the wheel the speed does not change immediately as the control is adjusted, therefore, turn this control slowly.
  - 5. Turn "COLOR GAIN" control to the desired amount of color,
- Turn "COLOR-LOCK" control to obtain the proper color on picture objects. Flesh colors provide
  the most accurate adjustment so adjust for natural flesh color of face.
  - 7. The scanning wheel should always be stored in a vertical position to prevent warpage.

# MODEL 100-1 AND 100-2 CONVERTER CIRCUIT DESCRIPTION

The following tubes are employed:

Code	Type	Function
V1	6U8	Gated Color Burst Amplifier
V2	6U8	Color Burst Amplifier & Limiter
V3	6BC7	Phase Selection Diodes
V4	6BE6	Chroma Detector
V5A	12BH7	Chroma Amplifier
V5B	12BH7	Scanning Wheel Sync. Control-Amp
V6	6BL7	Scanning Wheel Motor Control
V7	6X4	Power Rectifier

Signal voltage for operating the converter is obtained from the picture tube grid or cathode, whichever contains the video information. This signal is fed from the yellow input lead through condenser C23 and B26 to the grid of the chroma detector. The tuned circuit L6-C2 is tuned at 3.58 Mc. for max. signal.

Video signal is also fed to the color burst gated amplifier tube V1 through C24, R29 and C7. The tuned circuit C3-L1 is tuned to 3.58 Mc. components of the gated color burst amplifier V1 are selected to hold this tube at cutoff during the horizontal sweep period. During retrace time a horizontal pulse of 30-40 volts is fed to the cathode of VIA. This pulse is obtained from the TV horizontal output tube plate through the dividing network C31, R43, R42 and R41. Between pulses the triode section of V1 is biased at saturation. When pulsed the sudden change in plate current produces a positive pulse on the grid of V1B overcoming the negative grid bias developed across R4 in the cathode and permitting the tube to amplify the color burst on the horizontal sync. pulses. Transformer T2 is tuned to 3.58 Mc. and the bursts are applied to the 3.58 Mc. crystal through condenser C6. The crystal being excited by the bursts has sufficient Q to produce a constant amplitude signal to the cathode of the amplifier tube V2A. The plate circuit of this tube is tuned to 3.58 Mc. by the "Color-Lock" control L3 and C8. This signal is then fed to the grid of V2B which serves as an amplifier and limiter to maintain constant signal across the phasing coil L2 which is tuned to 3.58 Mc.

A phase shifting network consisting of R11, C17, R12 and C18 is connected across the secondary of L2. These valves are selected to produce three voltages at the plates of the diodes in V3 that have a phase difference of approximately These diodes are biased to cutoff by 60 volts positive and conduct only during the time that this voltage is grounded by the contacts on the scanning wheel commutator. As the bottom outer edge of each color segment of the scanning wheel moves about 1" past the center of the picture window its corresponding contacts should close thereby selecting the proper phase signal for its particular color to be applied to the grid of chroma detector V4. The grid of V4 is tuned to resonance by L4 and C21. This signal when mixed with the chromanance signal fed into grid 1 of V4 combine to produce a signal of proper phase and amplitude that when mixed in the picture tube produce the desired color picture.

The series resonance circuit L5-C2 or L7-C32 in the plate of V4 is tuned for max. attenuation of the 3.58 Mc. signal. V5A serves to amplify the chromanance signal.

## SCANNING WHEEL SYNC. CIRCUIT

The speed of the scanning wheel is controlled by the speed of the vertical sweep of the TV chassis. Sharp pulses are fed from the vertical output tube plate through condenser C26, R36, C28 and R35 to the commutator. These parts are selected to produce a saw toothed wave. As each segment of the scanning wheel is in the correct position for proper viewing, the commutator contacts close and apply the saw tooth voltage to the grid of the D. C. amplifier tube V5B. This tube is D. C. coupled to the motor voltage control tube V6. The secondary of transformer T3 is con-

nected in series with the motor and the speed control R40. As the voltage applied to the grid of V5B varies, the effective resistance of tube V6 changes, thereby increasing or decreasing the voltage drop across the motor. When the wheel is in Sync. the voltage applied to the grid of V5B is approximately zero. If the speed is slow the voltage is negative, and is positive when the motor speed is fast.

The normal voltage across the motor is 85 volts.

## ALIGNMENT

The best way to align the various tuned circuits is by the use of an oscilliscope having a substantially flat response to 3.58 Mc. and a color bar generator.

Connect the converter to a TV set as explained in the installation instructions. Connect the color bar generator to the TV set and adjust tuning and contrast controls until approximately 1 volt peak to peak chromanance signal appears across the resonant circuit L1 and C3. Connect scope from one side of the secondary of the phasing coil L2 to circuit ground. Adjust L1, T2, L2, L3 and L4 for max. output consistent with a constant amplitude. This is important. The wave form envelope on the scope must be flat having only a slight dip or peak at the horizontal pulse.

Remove crystal from socket and move scope to output (green) lead. Adjust C2 for max. signal. Adjust C20 or L7 for min. 3.58 Mc. signal as shown on the scope.

WAVE FORMS SHOWN ARE WITH JACKSON 712 BAR GENERATOR

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# SERVICE HINTS

#### Poor or no color:

- 1. Improper installation or color transmission.
- 2. Check all tubes except V6.
- Quick rotation of color gain control should produce temporary fluctuation of brightness. If no fluctuation is noticed the trouble is in the V4 and V5A circuitry.
- Shorts or poor connections in cable to scanning wheel.
- 5. Improperly aligned contacts on commutator.
- Improper antenna, poor antenna location or improper impedance match to lead in. Multiple set and antenna distribution systems often degrade color.
- Fine tuning control on TV set out of adjustment. This control must permit tuning to edge of sound bars.

## Lack of certain colors:

- Defective 6BC7 tube (V3), cable, commutator or contacts.
- 2. 3.58 Mc. trap incorrectly tuned.

#### Incorrect colors:

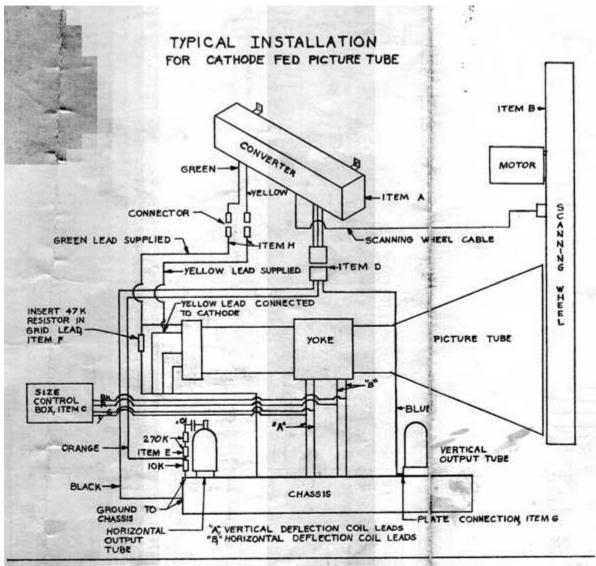
- Incorrect adjustment of "Color Lock" control.
- Misalignment of tuned circuits. T2 being most critical.
- 3. Wrong polarity on L2 secondary.

## No scanning wheel sync.:

- 1. Check V5B and V6 tube.
- 2. Extreme high or low line voltage.
- No vertical sync. pulse from set, check at C26 with scope.
- Poor connections in cable or improper contacting in commutator.
- 5. Slipping or worn belt.
- Lubrication—use Silicote Spinning Reel Lubricant, Lubriplate, or Vaseline.

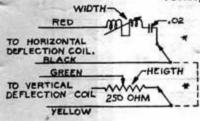
## Streaks in picture:

- 1. Dirty commutator.
- Incorrect pressure, adjust contacts for 1/16" compression.

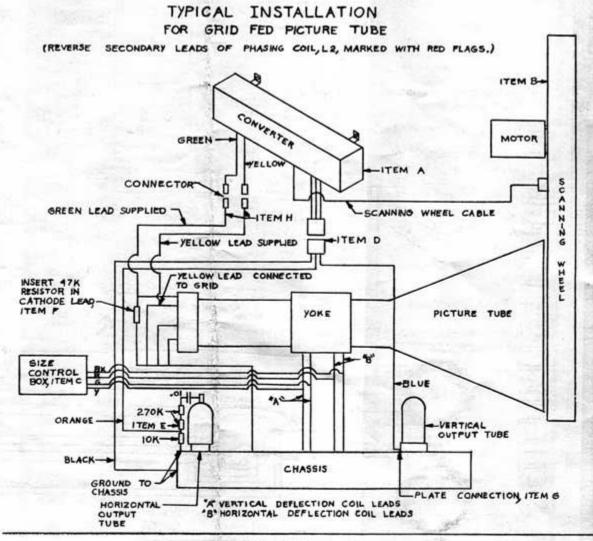


# SIZE CONTROL BOX

WIDTH COIL SHOWN WIRED IN SERIES FOR MAX. INDUCTANCE. FOR LOW IMPEDENCE YOKES, CONNECT COILS IN PARALLEL.

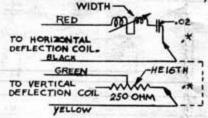


NOTE: ALL SIZE CONTROL BOXES ARE WIRED AS SHOWN WHEN SHIPPED FROM PACTORY, SOME TV SETS MAY REQUIRE THE VERTICAL SIZE CONTROL OR THE WIDTH CONTROL BE WIRED IN SERIES WITH THE DEFLECTION COILS INSTEAD OF PARALLEL. EXTRA CONTACTS (\*) ARE PROVIDED ON THE SWITCH FOR MAKING THIS CHANGE.



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