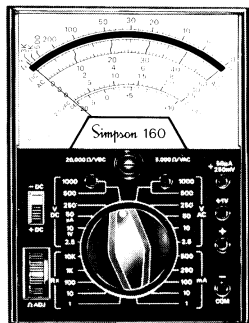


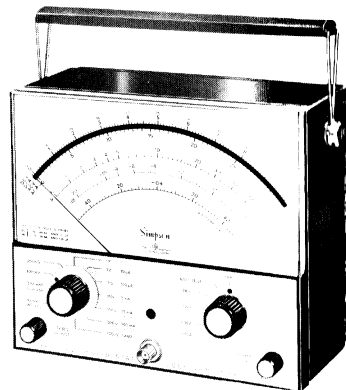
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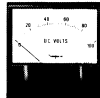
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OPERATOR'S MANUAL

MODEL 432 CHROMA-LINE COLOR-PATTERN GENERATOR

SIMPSON ELECTRIC COMPANY

853 Dundee Ave., Elgin, Illinois 60120
Area Code 312, Telephone 697-2260
In Canada, Bach-Simpson, Ltd., London, Ontario

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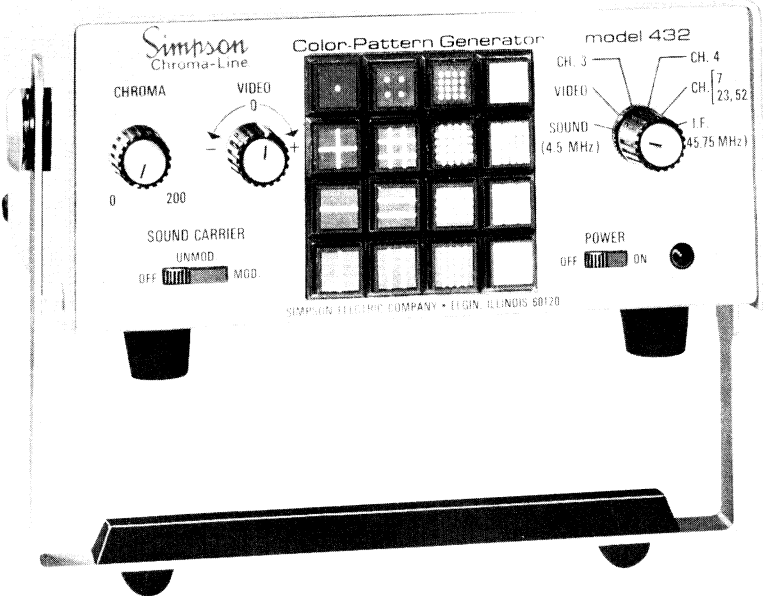


Figure 1-1. Model 432, Chroma-Line Color-Pattern Generator

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WARNING

The Simpson Model 432 is designed to prevent accidental shock to the operator when properly used. However, no engineering design can render safe an instrument which is used carelessly. Therefore, this manual must be read carefully and completely before making any measurements. Failure to follow directions can result in a serious or fatal accident.

SHOCK HAZARD: As defined in American National Standard, C39.5, Safety Requirements for Electrical & Electronic Measuring & Controlling Instrumentation, a shock hazard shall be considered to exist at any part involving a potential in excess of 30 volts rms (sine wave) or 42.4 volts DC or peak and where a leakage current from that part to ground exceeds 0.5 milliampere, when measured with an appropriate measuring instrument defined in Section 11.6.1 of ANSI C39.5.

NOTE: The proper measuring instrument for the measurement of leakage current consists essentially of a network of a 1500 ohm non-inductive resistor shunted by a 0.15 microfarad capacitor connected between the terminals of the measuring instrument. The leakage current is that portion of the current that flows through the resistor. The Simpson Model 229-Series 2 AC Leakage Current Tester meets the ANSI C39.5 requirements for the measurement of AC leakage current and can be used for this purpose. To measure DC Leakage current, connect a 1500 ohm non-inductive resistor in series with a Simpson 0-500 DC microammeter and use this as the measuring instrument.

SECTION I

INTRODUCTION

1.1 GENERAL

1.1.1 The Simpson Model 432 Chroma-Line Color-Pattern Generator is a compact, solid state instrument featuring both Large and Small Scale Integration (LSI and SSI) integrated circuits which generate all patterns normally associated with a Color-Pattern Generator.

1.1.2 This manual contains complete instructions for the operation, maintenance and care of the Model 432. A general description of the Instrument, theory of operation and parts list are provided.

1.2 DESCRIPTION

1.2.1 The Simpson Model 432 (see Figure 1-1) is a portable line operated Instrument designed for accurate, easy convergence and adjustment of color or black and white television receivers. The many unique features and functions of this Instrument present entirely new concepts in servicing and maintenance procedures.

1.2.2 Model 432 features a key-board consisting of sixteen (16) pushbuttons arranged in a 4x4 matrix for convenient selection of patterns.

1.2.3 The output for all test patterns is provided not only at three VHF channels, and two UHF channels, but also at IF (45.75 MHz) and video. In addition, a 4.5 MHz sound carrier, FM modulated by 1000 Hz or unmodulated is provided for troubleshooting the sound stages.

1.2.4 The output level of RF, IF and Video signals are adjustable. The RF and IF LEVEL control is located on the rear panel. The video amplitude/sync polarity control is on the front panel. Horizontal or vertical Sync pulses are selected by a slide switch on the rear panel.

1.2.5 Red, blue and green Gun Killer jacks and switches located on the rear panel are isolated from both chassis and DC grounds. A common jack (black) is used to provide the ground return for the gun killers.

1.3 OPERATING ACCESSORIES

The operating accessories consist of a Main Cable Assembly, an F59 Adapter Cable, a Transformer Balun (part of the F59 Adapter Cable) and an Alligator Clip Adapter Cable. All accessories (with the exception of gun killers cables), required for the operation of the Model 432 are supplied with the Instrument and are stored in the cable storage compartment located underneath the chassis. The line cord is also stored in the cable compartment. All items are listed in Section VII.

1.4 TECHNICAL DATA

Table 1-1 lists the technical data for the Model 432 Chroma-Line Color-Pattern Generator. The following data are valid at reference conditions of $25 \pm 5^\circ\text{C}$ ambient temperature, and $60 \pm 15\%$ relative humidity.

Table 1-1. Technical Data

1. RF OUTPUT

	Channel 3	Channel 4	Channel 7	Ch. 23 & 52
Freq.	61.25 MHz Crystal Controlled*	67.25 MHz Crystal Controlled*	175.25 MHz L-C Controlled	3rd & 5th Overtones of CH. 7 re- spectively
Imped- ance	75 Ohms	75 Ohms	75 Ohms	75 Ohms
Level	Adjustable to approximately 50 mV	Adjustable to approximately 50 mV	Adjustable to approximately 50 mV	Adjustable to approximately 50 mV

*Accuracy: $\pm 0.005\%$ at reference conditions

2. IF OUTPUT

Frequency: 45.75 MHz, Crystal controlled
 Impedance: 75 Ohms
 Level: Adjustable up to approximately 50 Millivolts

3. SOUND IF OUTPUT (TUNING AID)

Frequency: 4.5 MHz, Crystal controlled
 Level: Fixed, 2 V p-p source impedance 2.2k
 Feature: 1000 Hz FM modulated or unmodulated

4. COMPOSITE VIDEO OUTPUT

Source Impedance: 100 Ohms
 Level: Adjustable up to 3.25 V p-p
 Sync Polarity: Choice of Positive (+) or Negative (-)

5. CHROMA OFFSET SUBCARRIER

Frequency: 3.563795 MHz, Crystal controlled
 Frequency Accuracy: $\pm 0.001\%$ at reference conditions

Frequency Tolerance: $\pm 0.01\%$ over temperature range
 Level: Adjustable from 0-200%

6. MASTER CLOCK

Frequency: 378.0 kHz, Ceramic Resonator controlled
 Frequency Accuracy: $\pm 0.005\%$ at reference conditions
 Frequency Tolerance: $\pm 0.1\%$ over temperature range

7. TEST PATTERNS (16 Total)

Color: Ungated Rainbow
 Color Bars: Three bars gated, spaced at 90°, 180°, and 270° phase intervals from burst: R-Y, B-Y, -(R-Y).
 Ten bars, gated, spaced at 30° phase intervals from burst.

Horizontal Lines: 1, 7 or 15
 Vertical Lines: 1, 11 or 21
 Cross Hatch: 1 x 1 Cross Hair; 7 x 11; 15 x 21
 Dots: 1, Center; 7 x 11; 15 x 21
 Blank Raster: Purity, White, no noise (Sync Modulation only).

8. SYNC PULSES

Horizontal: 15.750 kHz, Amplitude: 12V
 Vertical: 60.11 Hz, Amplitude: 12V

9. OPERATING TEMPERATURE RANGE:

0°C to +65°C

10. STORAGE TEMPERATURE:

-65°C to +150°C

11. POWER REQUIREMENTS:

120 VAC $\pm 10\%$, 50/60 Hz
 3 VA

12. DIMENSIONS:

9.50" L x 7.00" W x 3.12" H
 (241 x 178 x 78 mm)

13. WEIGHT:

3 lbs. (1.4 Kg)

14. CABLE STORAGE COMPARTMENT:

23 Cubic Inches

SECTION II

INSTALLATION

2.1 UNPACKING AND INSPECTION

2.1.1 Prior to unpacking, examine the shipping carton for signs of damage. The Instrument was tested and inspected at the factory before shipment. Immediately after unpacking the equipment, visually inspect it for damage which may have occurred in transit, such as broken knobs, switches, etc. If there is any evidence of damage, immediately file a claim for damage in transit with the carrier. Make certain all items listed on Table 7-1 are included.

2.1.2 Save the shipping carton materials for storing or reshipping the equipment.

2.2 POWER REQUIREMENTS

2.2.1 The Model 432 is line-powered and transformer isolated. In addition, a safety shield is provided between the primary and secondary windings of the transformer preventing the AC line from shorting to the secondary winding. A fullwave bridge, filter and series regulator provide a constant, ripple-free supply voltage.

2.3 INSTALLATION

2.3.1 The Instrument, when in operation, may be placed on top of or beside the Television receiver when on service calls or on the bench for shop use. The multiposition handle can be used to elevate the Instrument for convenient front panel viewing and adjustment.

2.3.2 All output connections from the Model 432 are made on the rear panel. A single BNC jack provides the Sound, Video, RF, and IF outputs. The Gun Killer and Trigger outputs employ standard banana jacks.

2.3.3 A main cable assembly with two adaptor cables is provided to interface with the Model 432 and the Television receiver under test.

a. Main Cable Assembly

The main cable assembly (see Figure 2-1), 3.5 ft. long is terminated on one end with a standard BNC Plug. The other end is terminated with a Phono Plug, which allows direct signal injection into the 45.75 MHz IF stages. The Phono Plug also connects to the other cable assemblies listed below.

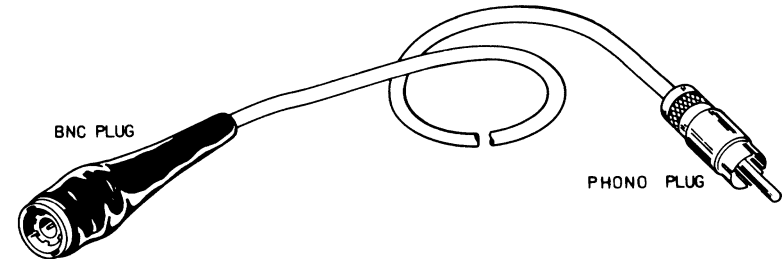


Figure 2-1. BNC to Phono Plug Main Cable Assembly

b. F59 Adapter Cable

This cable assembly (see Figure 2-2, item A) 1 ft. long is terminated with a Phono Jack for connecting to the main cable assembly. The other end is terminated with a type F-59 Plug, which allows direct injection into receivers with corresponding F-59 (75 Ω input impedance) antenna input jacks. This F-59 Plug also connects to the Accessory Balun (Impedance Transformer 75 ohm to 300 ohm, see Figure 2-2, item B) for direct signal injection into receivers with 300 ohm antenna input terminals.

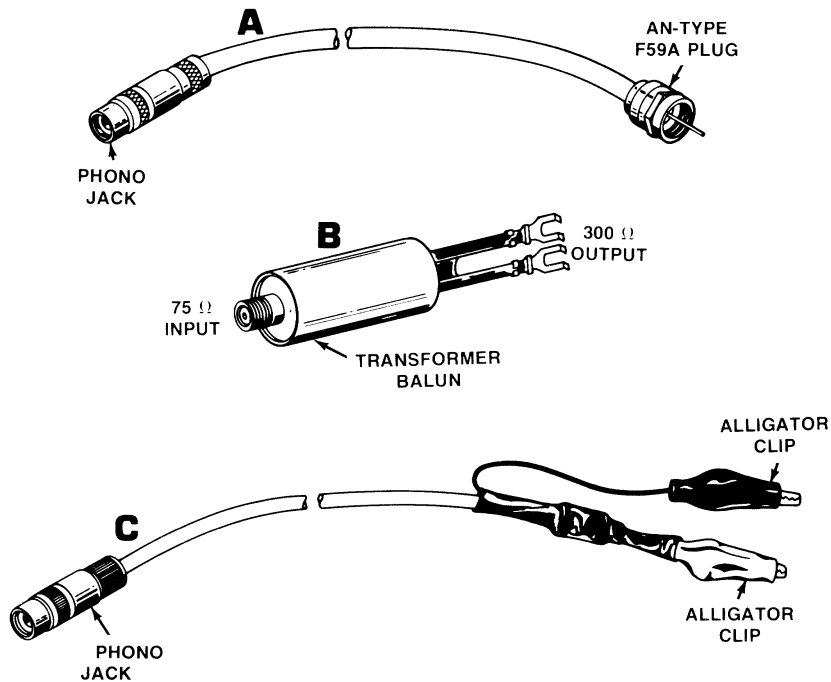


Figure 2-2. Accessory Cables

c. Alligator Clip Adapter Cable

This cable assembly (see Figure 2-2, item C) 1 ft. long is terminated in a Phono Jack and connects to the main cable assembly. The other end is terminated with miniature Alligator Clips for direct signal injection into the receiver Video, IF or Sound Stages.

SECTION III

CONTROLS AND FUNCTIONS

3.1 GENERAL

All operating and adjustment controls are described in this section. Become thoroughly familiar with each prior to operating the Model 432 for the first time.

3.2 FRONT PANEL DESCRIPTION

Table 3-1 provides a complete functional description of all front panel controls (see Figure 3-1).

Table 3-1. Front Panel Controls

<p>1. POWER ON-OFF Switch:</p>	<p>A two-position slide switch applies line voltage to the Instrument in the "ON" position.</p>
<p>2. Power Indicator:</p>	<p>A red LED indicator which illuminates when power is applied to the Instrument.</p>
<p>3. Function Switch:</p>	<p>A six position rotary switch is used to select the desired signal at the BNC output jack on the rear panel.</p>
<p>4. Pattern Select Keyboard:</p>	<p>The Chroma-Line features a keyboard consisting of sixteen pushbutton switches arranged in a 4x4 matrix. The individual keys are identified by color and pattern legends.</p>
<p>5. SOUND CARRIER Switch:</p>	<p>A three position slide switch marked OFF, UNMOD, MOD is used to select the 4.5 MHz unmodulated or 1 kHz FM modulated sound carrier. With the Function Switch in the SOUND position, either the unmodu-</p>

Controls

lated or modulated sound carrier is available at the SOUND/VIDEO/RF/IF OUTPUT jack. For the remaining Function Switch positions the sound carrier is mixed with the Video or the selected RF/IF carriers. With the Sound switch in the "OFF" position the sound is totally disabled.

- 6. VIDEO Level Control:** Adjusts both the amplitude and Sync polarity of the Video signals.
- 7. CHROMA Level Control:** Adjusts the Subcarrier level (3.563795 MHz) from 0-200%.

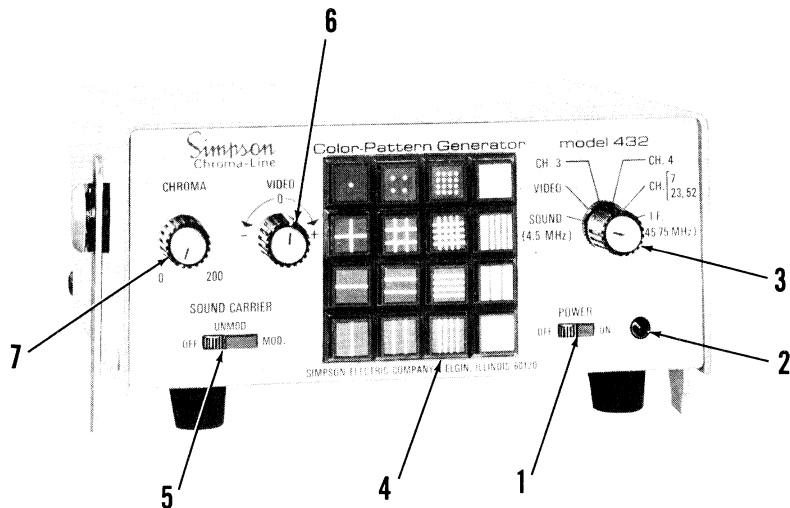


Figure 3-1. Front Panel, Controls and Indicator

Controls

3.3 REAR PANEL DESCRIPTION

Table 3-2 provides a functional description of all the rear panel controls (see Figure 3-2).

Table 3-2. Rear Panel Controls

- 8. RF/IF LEVEL:** Adjusts the output level of the RF channels and IF carrier signals at the output jack. This control does not affect the Sound and Video outputs.
- 9. SOUND/VIDEO/ RF/IF OUTPUT:** All outputs from the Instrument are switched into this BNC jack.
- 10. TRIGGER Switch:** A two-position slide switch selects the Horizontal (15,750 Hz) or Vertical 60.11 Hz) Sync signal available at the white banana jack.

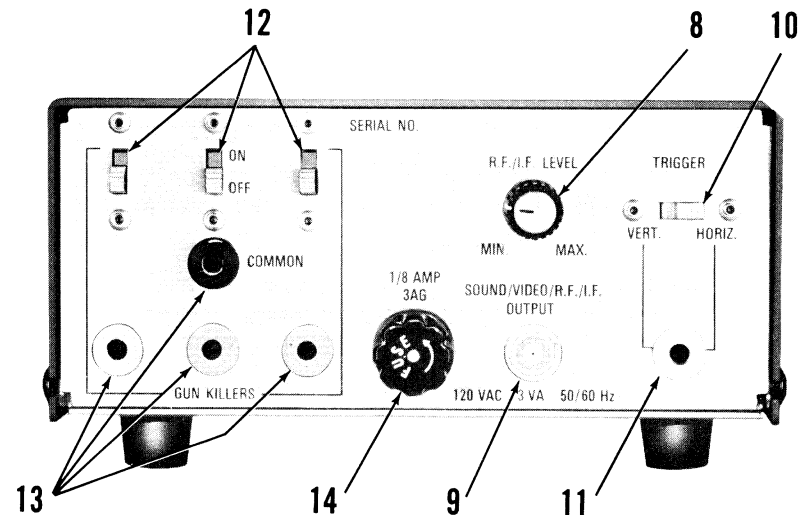


Figure 3-2. Rear Panel, Controls and Connectors

Controls

11. **TRIGGER Output Jack:** A white banana jack provides the trigger signals for auxiliary equipment synchronization.
12. **GUN KILLER Switches:** Three two-position slide switches, color coded red, blue and green are provided to disable individual or all color guns. The ON position indicates that the color gun is shorted.
13. **GUN KILLER Jacks:** Three jacks, color coded red, blue and green are enabled in conjunction with the three corresponding colored gun killer switches. A black, common jack provides complete isolation for the gun killers from the rest of the Instrument circuits.
14. **FUSE:** A quarter-turn Fuseholder permits convenient replacement of the line fuse. Replace with identical type, 1/8A, 250V, 3AG, Quick-acting fuse only.

SECTION IV OPERATION

WARNING

The Simpson Model 432 is designed to prevent accidental shock to the operator when properly used. No engineering design can render safe an instrument which is used carelessly. This manual must be read carefully and completely before conducting any tests. Failure to follow directions can result in a serious or fatal accident.

4.1 GENERAL

This section of the Manual contains information required to operate the Instrument in a safe and proper manner when used to align or troubleshoot television receivers.

4.2 SAFETY PRECAUTIONS

4.2.1 The Simpson Model 432 is intended to be used only by trained service personnel qualified to recognize electrical shock hazards and cognizant of the safety precautions required to avoid possible injury.

4.2.2 Always use an isolation transformer in the power circuit of line operated television receivers, particularly when they are known to have the chassis connected directly to one side of the power line.

4.2.3 The three wire line cord of the Model 432 affords protection against electrical fault from within the Instrument. Make sure that the grounding pin on the power cord plug is intact and connected to an outlet which is properly grounded in accordance with the National Electrical Code. Three-wire to two-wire adaptors must not be used without proper grounding of the pigtail lead. Use only three-wire extension cords.

4.2.4 Always connect and disconnect test leads with power removed from the equipment to be tested. Discharge electrolytic capacitors and the picture tube. Periodically inspect leads and cables for frayed or broken insulation.

4.2.5 While servicing equipment, avoid bodily contact with anything that is or may be grounded. Stand on a dry insulated surface capable of withstanding the voltages present.

4.2.6 Any electrical shock can be dangerous, regardless of severity. The reaction may cause a fall onto a nearby sharp object or contact with a more dangerous voltage resulting in injury. Do not work alone on equipment where a shock hazard might exist. Notify a nearby person that you are making or intend to make such tests.

4.2.7 Never assume that solid state equipment is "Safe". Hazardous voltages can exist unexpectedly in defective equipment.

4.3 OPERATING PROCEDURE

4.3.1 Overall Performance Check

The multifunction capability of the Model 432 enables the user to check the overall performance of a television set as well as the performance of individual circuits.

WARNING

Prior to conducting any tests or alignment procedures, review the Safety Precautions listed in paragraph 4-2.

- a. Before connecting the Model 432, check the performance of the television set by observing a station signal. Adjust the receiver horizontal and vertical hold controls for a good picture.
- b. Use the main cable assembly of Model 432 with the appropriate accessory leads and balun for either 75Ω or 300Ω operation.

- c. Disconnect the antenna of the TV receiver and make the necessary connections to the Model 432.
- d. Make the required connections from the Gun Killer jacks of Model 432 to the color gun grids.
- e. Utilize the trigger output of Model 432 for synchronization of auxiliary equipment.
- f. Apply power to Model 432 and make the proper channel and pattern selections for the overall evaluation and alignment of the TV receiver. For more detail information see paragraph 4-4.

4.3.2 Performance Testing of Individual Stages

WARNING

Before disconnecting or changing connections, remove power from the receiver under test and discharge all filter capacitors.

- a. **IF Signal Injection (45.75 MHz)**
 1. Connect the cable to the SOUND/VIDEO/RF/IF OUTPUT jack and set the RF LEVEL control to mid-range.
 2. Set the tuner to an unused channel, preferably UHF. Disconnect the antenna from the receiver.
 3. Connect the Model 432 to the mixer input test point or other suitable location in the IF amplifier. In some receivers, the cable from the tuner to the IF stage can be unplugged. On receivers having this feature, the IF signal can be conveniently injected by disconnecting the test cable at the phono plug and inserting the phono plug directly into the IF input jack, thus completely isolating the IF stage from the tuner.
 4. Set the Model 432 function switch to the IF position and select desired pattern on the keyboard. If at this time the Sound Carrier (modulated or unmodulated) is required, make the proper selection at the front panel.

5. Adjust the RF/IF LEVEL control and the receiver brightness and contrast controls for the best picture. Should the signal be injected at other points in the IF amplifier stages, the RF/IF LEVEL control will need readjusting.

b. Sound Carrier IF Injection (4.5 MHz)

1. Connect the BNC end of Main Cable Assembly to the SOUND/VIDEO/RF/IF OUTPUT jack and the other end to the alligator clip adapter cable.
2. Select an unused receiver channel, preferably UHF. Remove the antenna from the receiver. If possible, unplug the cable between the tuner and IF for complete isolation.
3. Connect the red alligator clip to the sound take-off point (3rd IF) or any point in the sound circuit area and the black lead to ground.
4. Set the function switch of Model 432 to SOUND (4.5 MHz) and select either unmodulated or modulated Carrier by the SOUND CARRIER slide switch.
5. Turn on the power of the TV set and Model 432 and proceed with the troubleshooting of the 4.5 MHz IF and audio sections.

c. Video Signal Injection

1. Connect the BNC end of the Main Cable Assembly to the SOUND/VIDEO/RF/IF OUTPUT jack and the other end to the alligator clip Adaptor Cable.
2. Select an unused receiver channel. The antenna should be removed from the receiver. If possible unplug the cable between the tuner and IF amplifier for complete isolation.
3. Connect the red alligator clip to the input of the video stage (video detector output) or other suitable location in the video stages. Connect the black alligator clip to ground.



To protect the instrument from damage, care should be taken when the video output is connected to a circuit having DC voltages in excess of 250V. In receivers where higher than 250V B+ voltages exist in the video stages, an external 10 μ F coupling capacitor having a sufficient voltage rating must be inserted in series, observing polarity, with the output leads.

4. Turn on the receiver and select the desired pattern on the keyboard.
5. Set the Video Level Control to “+” or “-” as required for a good pattern on the screen. If the Level control is turned to the wrong Sync polarity, the screen will be dark and have no Sync. Turn the control in the proper direction until the picture begins to “tear”, then back off until a clear image is obtained.
6. If the video signal is applied to other points in the video amplifier stages, Video Level control will need readjusting.

4.4 APPLICATION INFORMATION

A general alignment procedure using the Model 432 is presented in the following paragraphs. Refer to the manufacturer’s recommendations for proper alignment procedures.

4.4.1 Preliminary Television Adjustments

- a. Apply power to the receiver and select a local station. Disable receiver Automatic Fine Tuning (AFT). Adjust Fine Tuning, Brightness, Contrast, Color Level, etc. for optimum picture.
- b. **High Voltage Adjustment**
Using a volt-ohmmeter such as the Simpson Model 260, a high voltage probe, such as a Simpson 30kV or equivalent, check and adjust the receiver high voltage to the Manufacturer’s recommended voltage.
- c. Remove Power, and disconnect antenna leads (including internal antenna). Disable Automatic Color controls such as “Ac-

cutint”, “Chromatic” etc. Turn Sound volume to minimum level.

- d. Connect the Model 432 and proceed as outlined in paragraph 4.3.1. Select an unused Channel on the receiver and adjust the Model 432 function switch accordingly.
- e. Connect the Model 432 output cable assembly to the receiver antenna terminals. Select the 7x11 Crosshatch Pattern and adjust the RF/IF output control (rear panel) for maximum output.
- f. Adjust the receiver Fine Tuning for best Crosshatch pattern. Alternately adjust Brightness and Contrast for best definition and clarity of the lines in the pattern. Adjust receiver Focus for best definition of Raster lines.

4.4.2 Centering

Depress the 1x1 Crosshair pushbutton. Adjust receiver horizontal and Vertical Centering controls for equal quadrants on the screen. Select the 7x11 or 15x21 Crosshatch pattern to verify adjustments.

NOTE: Number of visible lines in the Crosshatch pattern may vary depending on overscan adjustment.

4.4.3 Purity Adjustment and Static Convergence.

- a. Select the Blank Raster pattern and activate Green and Blue gun killer switches:

1. Loosen yoke and slide as far back on picture tube neck as possible.

NOTE: Do not disturb the red, blue and green convergence magnets on yoke assembly.

2. Adjust purity ring magnets so that center of the screen is uniformly red with no discolored or dark areas.

NOTE: Spreading ring tabs causes radial movement of red area. Rotating both rings together causes circular movement.

3. Slide yoke forward on picture tube neck until screen is pure red.
4. Deactivate the Blue and Green gun killer switches.

- b. Select the Single Dot pattern (or cross-hair) for static convergence.

1. Adjust receiver Color Level control to mid-range position. If color fringing is evident, activate the Blue gun killer switch.

2. Adjust the Red and Green convergence magnets on the picture tube neck to obtain a yellow dot.

3. Deactivate the Blue gun killer switch and adjust the blue lateral magnets to obtain a white dot. Some repeating between these adjustments may be required to completely eliminate fringing.

- c. Since static convergence and purity are interrelated, repeating of these settings may be necessary for precise adjustment. If satisfactory purity cannot be attained, the static convergence may have to be repeated after degaussing of the picture tube mask and chassis supports.

4.4.4 Overscan Adjustment

Select the 7x11 Crosshatch pattern. Adjust the receiver height and width controls so the raster extends beyond the edges of the picture tube. Check Manufacturer's recommendations for limits of Horizontal and Vertical Overscan.

4.4.5 Horizontal Linearity

Select the pattern for 7 Vertical Lines. Observe the spacing between vertical lines. If lines are not equidistant consult the manufacturer's Operator's Manual for proper procedures.

4.4.6 Vertical Linearity

Select the pattern for 11 Horizontal Lines. Adjust the receiver Vertical Linearity control until lines are evenly spaced on the picture tube screen (particularly at the extreme top and bottom).

4.4.7 Pincushion Adjustments

With controls set as in 4.4.6, adjust Pincushion controls until all

horizontal lines are straight.

NOTE: One method to determine line straightness is to sight along the lines from one side of the picture tube and make adjustments accordingly.

4.4.8 Gray-Scale Tracking

To obtain a true Black and White image on a color television receiver, the relative intensities of red, blue and green colors in the picture tube must be balanced. This balance also assures true Black and White images over the entire range of the Brightness control. To check for good balance, select the blank raster pattern and slowly vary the brightness control from bright to dim. If a hue or tint of color is evident in the background, the screen grid adjustments of the picture tube will have to be repeated. Refer to the manufacturer's recommendations for adjusting Gray-Scale Tracking procedure.

4.4.9 Dynamic Convergence

Dynamic Convergence is a complicated procedure improved only by repeated experiment. Refer to the manufacturer's instructions and follow recommended procedures. Adjustments are usually performed using the 7x11 or 15x21 Dots or Crosshatch patterns or the corresponding individual Horizontal and Vertical Lines. Generally, four areas of the picture tube are affected: top, bottom, left and right. Red, Blue and Green adjustment controls for each area are provided. The Static Convergence (central picture tube area) should be checked periodically during the Dynamic convergence adjustments to insure overall Convergence of the picture tube. A general procedure follows.

- a. Select 15x21 Crosshatch pattern. Enable the Blue gun killer switch. Adjust Red and Green controls affecting the four peripheral areas for a yellow Crosshatch with minimum fringing.

NOTE: 15 vertical lines or 21 Horizontal Lines may be used alternately instead of the Crosshatch.

- b. Disable the Blue gun killer switch. Adjust the Blue controls to produce a white Crosshatch pattern. Due to the interaction between the color guns, some repetitive settings among the Red, Blue and Green controls may be required.

4.4.10 AGC Adjustment

- a. Select 7x11 Crosshatch pattern. Adjust the RF Level control to maximum. Adjust the receiver AGC control until the Crosshatch begins to distort, then back off, to a point just before the distortion begins.
- b. Reduce the RF output level gradually. If the pattern loses Sync or distorts, repeat step a. and back off the AGC control an additional amount. Continue the iteration until the output can be varied over the entire range without pattern distortion.
- c. On many sets, an FR AGC adjustment in addition to the IF AGC are provided. When encountered, adjustments in steps a. and b. are applied to the IF AGC. To adjust the RF AGC proceed as follows.
 1. Reduce the RF level to its minimum position.
 2. Adjust the RF AGC control on the receiver until the snow is minimized.

4.4.11 Automatic Frequency and Phase Control (AFPC) Check and Adjustment

The alignment of the AFPC can be checked in the following manner:

- a. Select the 10 Bar Gated Rainbow pattern. Set the receiver Color Level control for pleasing color and the Tint control to its mid-range position.
- b. Observe the third color bar (red) from the left (see Figure 4-1). Adjustment of receiver tint control to one of its extreme positions should cause the second bar to become red. Adjustment to the other extreme should cause the fourth bar to become red. If these changes cannot be obtained, refer to the manufacturer's procedure for AFPC adjustment.

Operation

4.4.12 Color Sync-Lock Check

- Select the 10 bar Gated Rainbow pattern. With the aid of the 4.5 MHz Sound Carrier adjust the fine tuning of the receiver for best picture. Adjust the Color control for pleasing color and the Tint control to obtain the pattern shown in Figure 4-1.
- The Color Sync-Lock can be checked by gradually reducing the CHROMA LEVEL control on the Model 432. Color in the Rainbow should gradually fade and then disappear. It is not unusual for some receivers to lose color sync and have color "running" when the Chroma Level is quite low. However, if Color Sync is lost with only a small reduction of Chroma Level, the Color Sync capability of the receiver will require attention. Refer to manufacturer's recommended procedure for alignment.

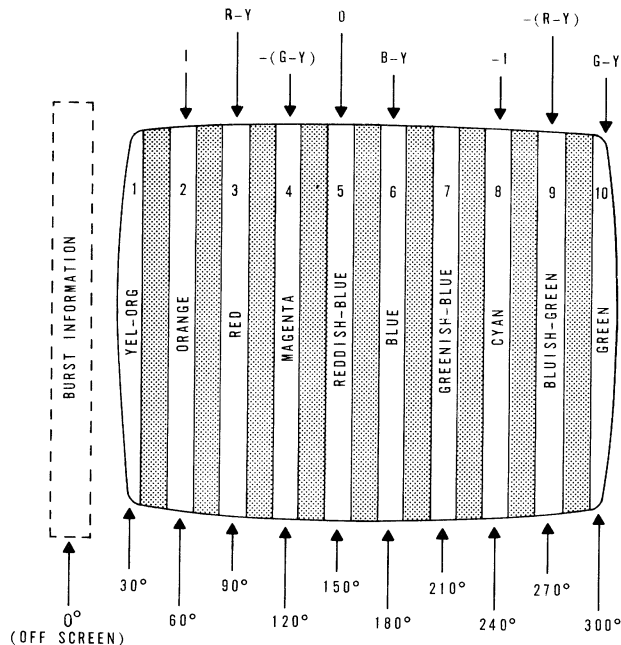


Figure 4-1. Gated Rainbow

4.4.13 Color Killer Adjustment

- Turn off Model 432 temporarily. Select an unused UHF channel. Turn receiver Color Killer control to the point where snow becomes colored. Gradually back off Color Killer control until color disappears from snow.
- Turn on Model 432 and select the Ungated Rainbow pattern. Adjust receiver Tint control through its range. If color fades or disappears, back off receiver Color Killer slightly more until color remains unchanged throughout Tint control range.

SECTION V

THEORY OF OPERATION

5.1 GENERAL

The operation of the Model 432 Chroma-Line Color-Pattern Generator is readily understood when the functional circuits are defined in a logical sequence of dependency. (See Figure 5.1, Functional Block Diagram).

- 378 kHz Master Clock
- Countdown Chain, gating and shaping circuits
- Keyboard and Address Encoder
- Chroma Oscillator
- Chroma Gate
- Video Amplifier
- RF/IF Oscillators
- Audio and Sound Carrier Oscillators
- Modulator
- Power Supply

5.2 MASTER CLOCK

The 378.000 kHz Master Clock generates the precise timing pulses used to clock the countdown chain. This oscillator consists of a ceramic resonator and a trimming capacitor, the Oscillator itself being part of the P-MOS LSI count-down chip.

5.3 COUNT-DOWN CHAIN GATING AND SHAPING CIRCUITS

This (LSI) circuit generates all Dot, Line, Crosshatch patterns and Sync output signals. The entire count-down chain, providing all the timing and gating sequences are on this chip. A Line width control factory preset is provided but is not adjustable from the front panel.

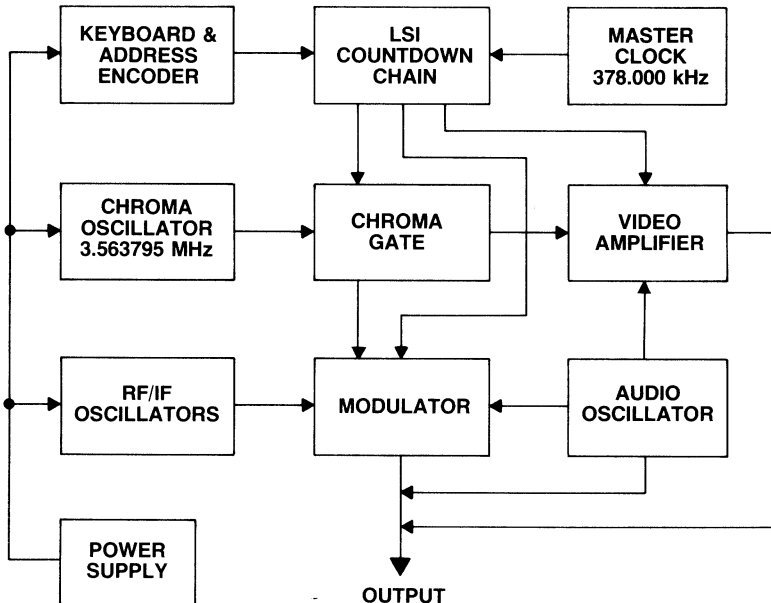


Figure 5-1. Functional Block Diagram

5.4 KEYBOARD AND ADDRESS ENCODER

The Model 432 features the unique means of convenient pattern selection. Each of the sixteen individual pushbuttons, when depressed encodes a binary address, which is stored in a four bit latch and properly gates the LSI chip producing the particular pattern corresponding to the address.

5.5 CHROMA OSCILLATOR (See Figure 5-2, Schematic Diagram)

The Chroma oscillator, Q202, is controlled by a 3.563795 MHz crystal Y202. The CHROMA Level Control, VR101, located on the front panel attenuates the output fed to the video amplifier and modulator.

5.6 VIDEO AMPLIFIER AND CHROMA GATE (See Figure 5-2)

The Chroma gate, Q201, controls the input from the Chroma oscillator. The LSI chip actuates this gate whenever a Chroma pattern is encoded.

5.7 VIDEO AMPLIFIER

The composite Video information is coupled through R226 and C220 to the Video Amplifier, Q205. The signal is inverted when the wiper of VR102 is at the collector and non-inverted when at the emitter of Q205. Additional gain is provided by the output drivers, Push-Pull Amplifiers, Q206 and Q207.

5.8 RF/IF OSCILLATORS (See Figure 5-2)

- a. The Channels 3 or 4 RF crystal controlled oscillator, Q208, switches the 61.25 MHz (Ch. 3), Y204, and 67.25 MHz (Ch. 4), Y205, crystals to select output frequencies. With Channel 3 selected, a DC voltage is applied through R236 to forward bias diode, D208, effectively connecting Y204 to ground and activating the oscillator at 61.25 MHz. Channel 4 is similarly selected by R235, D209 and Y205. Oscillator output is coupled through C227 to the Modulator.

- b. The Channels 7, 23, 52 RF Oscillator, Q211, uses an L-C parallel resonant Tank circuit, L203 and C243, to tune oscillator frequency for Channel 7. The Frequencies for Channels 23 and 52 are the third and fifth overtones of the Channel 7 frequency respectively. The Oscillator output is coupled through C244 to the modulator.
- c. The IF carrier oscillator, Q210, is controlled by a 45.75 MHz crystal, Y206. Oscillator output is coupled to the Modulator through C238.

5.9 AUDIO AND SOUND CARRIER OSCILLATORS (See Figure 5-2)

- a. The audio oscillator is composed of two gates Z204A and B, in a free-running Multivibrator configuration, and generates a 1 kHz squarewave.
- b. The Sound Carrier frequency is determined by a 4.50 MHz Crystal in the Q203 base circuit. The 1 kHz FM-modulation of the Sound Carrier is accomplished by switch, Q204, driven by the Audio oscillator. Q204 varies the voltage across the variable capacitance diodes, D201 and D202, slightly changing the capacitance of the crystal Y203. This generates the FM-modulated Sound Carrier.
- c. A three position slide switch, SW119, applies power to the 4.50 MHz Sound Carrier when in the UNMOD position. In the MOD position a bias voltage is removed from the base of Q204 enabling the 1 kHz oscillator.

5.10 MODULATOR (See Figure 5-2)

- a. Modulation of the RF and IF carrier frequencies is performed by transistor, Q209. The modulating signals are the Sound Carrier, the composite Video or both.
- b. Q209 has the collector and base shorted so that only the base-emitter junction is used. This junction is biased into the non-linear region of its diode characteristic by resistors, R242 and R207. The RF and IF, coupled through capacitors, C227, C238

- and C244, change the junction bias, and by this action change the effective junction resistance. This varying resistance creates a voltage across R243 through divider action.
- c. The composite Video and/or modulated Sound Carrier coupled through R242 also change the junction bias, at their respective frequencies. The combined effect of Sound, Video, RF or IF on Q209 creates an amplitude-modulated voltage across R243. This voltage is coupled through C229 to VR203, the RF/IF LEVEL control, then through C246 to the Function Switch and to the output jack.

5.11 REGULATED POWER SUPPLY

An IC Voltage Regulator, Z201, provides a stable, regulated DC voltage. Short-circuit protection, via current-limiting, and temperature-compensation are incorporated in the power supply. Resistors, R247 and R248, determine the output voltage.

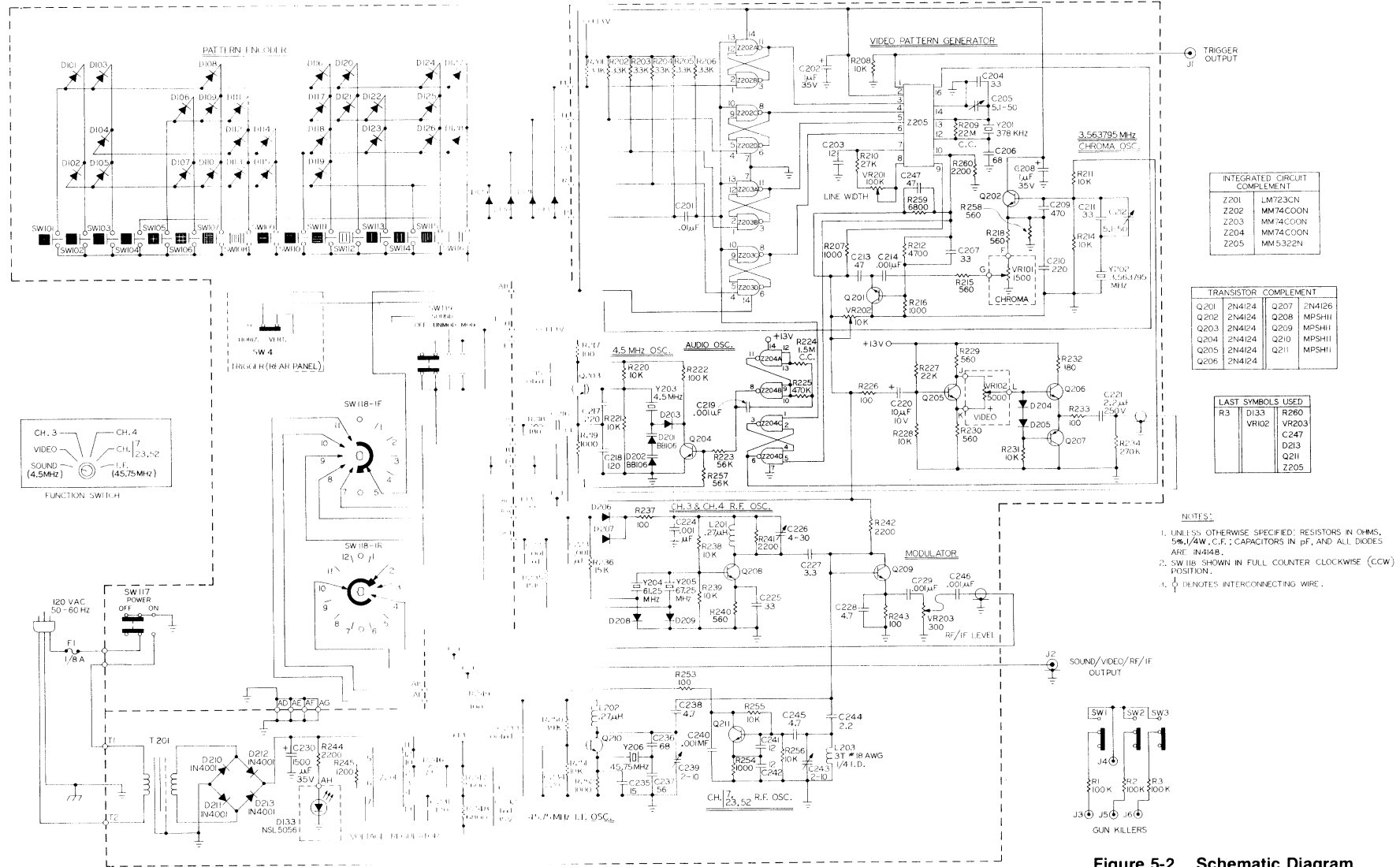


Figure 5-2. Schematic Diagram

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SECTION VI

MAINTENANCE

6.1 GENERAL

The Simpson Model 432 Chroma-Line Color Pattern Generator has been designed and carefully constructed using high quality components. By providing reasonable care, and following the instructions in this manual, a long useful service life may be expected.

6.2 WARRANTY

The Simpson Electric Company warranty policy is printed on the inside back cover of the manual. Read carefully prior to requesting a warranty repair.

NOTE: For assistance of any kind, including help with the Instrument under warranty, contact your nearest authorized Simpson Service Center. These Centers are listed on the last pages of this manual. If you wish to contact the Factory directly, give full details of the difficulty, including the Instrument Model number and date of purchase. Service data or shipping instructions will be sent to you promptly. If non-warranty or other service work is required, an estimate of the maximum charge will be quoted. This charge will not be exceeded without your prior approval. Repair charges will be billed on basis of cost.

6.3 SHIPPING

Coil the line cord and store in Model 432 cable storage compartment. Slide the Chroma-Line into a plastic bag and place in the shipping carton. Ship prepaid to the destination indicated. Insure shipment.

OHMS,
DIODES
€ (CCW)

6.4 LINE FUSE REPLACEMENT

Should the line fuse require replacement, simply depress the Fuseholder cap and rotate 1/4 turn counterclockwise. Replace with Type 3AG, 1/8A, quick-acting, 250V fuse **only**.

6.5 CALIBRATION

The Model 432 is factory calibrated and should require no customer adjustment. If calibration is required, return the Instrument to the Factory for checking and calibration.

6.6 TROUBLESHOOTING

Special training and facilities are required for servicing and calibrating the Model 432. Should the Instrument not appear to function properly, send it to your authorized Simpson Service Center. Do not disassemble the Model 432 as it contains no user serviceable parts.

6.7 PREVENTIVE MAINTENANCE

6.7.1 Daily Care

- Immediately clean all spilled materials from the Instrument and wipe dry. If spills are corrosive, use a suitable cleaner to neutralize corrosive action and remove spill.
- Whenever possible, avoid prolonged exposure or use in areas which are subject to temperature and humidity extremes, vibration, mechanical shock, dust and corrosive fumes.
- When not in use, store the Instrument in a room free from temperature extremes, dust and corrosive fumes and mechanical shock or vibration.

SECTION VII

ACCESSORIES, REPLACEMENT PARTS AND SCHEMATIC DIAGRAM

Table 7-1. Instrument and Items Furnished

Quantity	Description	Part No.
1	Model 432 Chroma-Line Color Pattern Generator	4-000432
1	Cable Assembly, BNC to Phono Plug	10-830515
1	Cable Assembly, Transformer, Balun	5-118185
1	Cable Assembly, Phono Jack to Clips	10-830516
1	Operator's Manual	5-118158

Table 7-2. Replacement Parts List

Symbol	Description	Part No.
C201,C215	Capacitor, .01 μ F, \pm 20%, 50WVDC	5-113215
C202,C208,C232	Capacitor, 1 μ F \pm , 35WVDC	5-116173
C203,C241,C242	Capacitor, 12 pF, \pm 10%, 500WVDC	5-116824
C204,C211, C216,C225 }	Capacitor, 33 pF, \pm 5%, 1000WVDC	5-114991
C205,C212	Capacitor, 5.1-50 pF, 250WVDC	5-118176
C206,C236	Capacitor, 68 pF, \pm 5%, 500WVDC	5-118182
C207,C218,C231	Capacitor, 120 pF, \pm 20%, 500WVDC	5-111432
C209	Capacitor, 470 pF, \pm 10%, 500WVDC	1-115832
C210	Capacitor, 220 pF, \pm 10%, 1000WVDC	5-114838
C213	Capacitor, 47 pF, \pm 5%, 1000WVDC	5-118181
C214,C219,C222, C223,C224,C229, C233,C240,C246 }	Capacitor, .001 μ F, \pm 20%, 1000WVDC	1-119959

C220	Capacitor, 10 μ F, \pm 10%, 10WVDC	5-117280	R217,R226,R233,		
C221	Capacitor, 2.2 μ F, \pm 20%, 250WVDC	5-111188	R237,R243,R249,	} Resistor, 100 Ω , \pm 5%, 1/4W	5-118152
C226	Capacitor, 4-30 pF, 250WVDC	5-118183	R253		
C227	Capacitor, 3.3 pF, \pm 5%, 1000WVDC	5-117138			
C228,C238,C245	Capacitor, 4.7 pF, \pm 5%, 1000WVDC	5-114988	R218,R232	Resistor, 180 Ω , \pm 5%, 1/4W	5-118153
C230	Capacitor, 1500 μ F, 35WVDC	5-118189	R220,R250	Resistor, 39k Ω , \pm 5%, 1/4W	5-118166
C235	Capacitor, 15 pF, \pm 5%, 1000WVDC	5-114989	R223,R257	Resistor, 56k Ω , \pm 5%, 1/4W	5-118167
C237	Capacitor, 56 pF, \pm 5%, 300WVDC	5-118181	R224	Resistor, 1.5M, \pm 5%, 1/4W	5-118219
C239,C243	Capacitor, 2-10 pF, 250WVDC	5-118190	R225	Resistor, 470k, \pm 5%, 1/4W	5-118169
C244	Capacitor, 2.2 pF, \pm 5%, 1000WVDC	5-114987	R227	Resistor, 22k, \pm 5%, 1/4W	5-118163
D101,D132, } D203,D209 }	Diode, Silicon, 1N4148	5-115214	R234	Resistor, 270k, \pm 5%, 1/4W	5-118122
D201	Diode, Silicon Variable capacitance, BB106	5-118136	R235,R236	Resistor, 15k, \pm 5%, 1/4W	5-118162
D210,D213	Diode Silicon, 1N4001	5-113200	R245	Resistor, 1.2k Ω , \pm 5%, 1/4W	5-118156
F1	Fuse, Type 3AG, 1/8A, Quick-Acting 250V	5-116104	R246	Resistor, 7.5 Ω , \pm 5%, 1/4W	5-118150
L202	Coil, Choke, .27 μ H, \pm 10%	5-118129	R247	Resistor, 5.6k Ω , \pm 5%, 1/4W	5-118257
L203	Coil, Oscillator, 3T, #18AWC, 1/4 I.D.		R248	Resistor, 6.8k Ω , \pm 5%, 1/4W	5-118256
	Transformer, Power	5-118115	SW118	Switch, Rotary, 1 Wafer, 6-Position	5-118222
Q201,Q206	Transistor, Silicon, NPN, 2N4124	5-118128		Less Index	
Q207	Transistor, Silicon, PNP, 2N4126	5-116458	T201	Transformer, Power	5-118226
Q208,Q211	Transistor, Silicon, NPN, MPAH11	5-118127	Y201	Resonator, Ceramic, 379 \pm 1kHz	5-118135
R1,R2,R3,R22	Resistor, 100k Ω , \pm 5%, 1/4W	5-118168	Y202	Crystal, Quartz, 3.56379MHz, \pm .01%	5-118231
R129,R241, } R242,R244 }	Resistor, 2.2k Ω , \pm 5%, 1/4W	5-118157	Y203	Crystal, Quartz, 4.50MHz, \pm .01%	5-118230
R201,R206	Resistor, 33k Ω , \pm 5%, 1/4W	5-118165	Y204	Crystal, Quartz, 61.25MHz, \pm .005%	5-118228
R207,R216, } R252,R254 }	Resistor, 1k Ω , \pm 5%, 1/4W	5-118155	Y205	Crystal, Quartz, 67.25MHz, \pm .005%	5-118227
R208,R211,R214, } R211,R228,R231 }	Resistor, 10k Ω , \pm 5%, 1/4W	5-118161	Y206	Crystal, Quartz, 45.75MHz, \pm .01%	5-118229
R238,R239,R251, } R255,R256 }			Z201	Integrated Circuit, LM723CN	5-118134
R209	Resistor, 22M Ω , \pm 5%, 1/4W	5-118218	Z202,Z204	Integrated Circuit, MM74C00N	5-118133
R210	Resistor, 27k Ω , \pm 5%, 1/4W	5-118164	Z205	Integrated Circuit, MM5322N	5-118132
R212	Resistor, 4.7k Ω , \pm 5%, 1/4W	5-118160			
R213,R229,R230, } R215,R240,R258 }	Resistor, 560 Ω , \pm 5%, 1/4W	5-118154			

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