

# VA62

## Universal Video Analyzer

### Operation and Application Manual



**SENCORE**

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## Introduction

The VA62 UNIVERSAL VIDEO ANALYZER provides all the analyzing features needed to effectively service modern video circuits. The unique combination of signal generators and special tests combine signal substitution and signal tracing for positive test results every time. Unlike other video generators, the VA62 is more than a performance tester that only works with good systems. The VA62 is designed to isolate problems in defective systems to a single stage, leaving the video servicer with only a few components in question. The same procedures now apply to TV, recorders, or other video systems.

The VA62 is designed to resist obsolescence. The functions built into the basic analyzer are common to the FCC specified signals and the basic blocks of the receiver. The VA62 is designed to troubleshoot any video system. Therefore, the VA62 can easily be adapted to special tests and, as video systems change, the VA62 can be easily updated with accessories to meet the changes.

## Features

The VA62 consists of five general parts: 1.) The video pattern generator, 2.) The microprocessor-controlled RF-IF generator, 3.) The drive signal generator, 4.) The digital meter, and 5.) Special analyzing tests. All are part of a single, self-contained unit.

The digital video pattern generator develops signals for use by the other sections. All signals are phase-locked to each other, allowing individual signals to be substituted one at a time while the rest of the circuits respond to a reference input signal. Five conventional video patterns, three special analyzing patterns, plus the ability to externally modulate the generator ensure the correct reference pattern to troubleshoot any video problem. Interlace or VIR may be added to any pattern for applications in special circuits.

The RF generator produces 142 channels, covering every possible VHF, UHF, or cable channel. The cable channels may be generated at FCC frequencies or programmed to match any local cable system's carrier offset frequencies for a dynamic tuner test. The RF generator is fully modulated with video information and may be modulated with frequency modulated (FM) audio as well, to test the audio system. A single microprocessor-compensated attenuator provides flat output over all 142 channels.

The IF generator provides a crystal-controlled, fully modulated carrier or a microprocessor-controlled adjustable frequency generator to troubleshoot or align any IF stage. Special trap-setting signals allow fast and accurate trap alignment without the need of an oscilloscope.

The drive signals provide a known-good signal that may be injected into any tube, transistor, or integrated circuit stage. In addition, special drive signals are available for color or VCR servicing. The drive signals may be injected into any stage without the need of disconnecting components or disabling signals already in the circuit. Special floating grounds prevent damage or interaction due to ground loops.

The microprocessor-controlled, digital meter provides the ability to monitor any of the drive signals to prevent overdriving circuits and to show signs of loading. The meter also allows fully autoranged external signal measurement of DC and Peak-to-Peak voltages. High voltage DC may be measured with optional probes.

The special tests include a highly reliable ringing test of deflection yokes and flyback transformers, a DC power supply for troubleshooting, and special signals to feed directly into a video tape deck. In addition, an accessory jack provides signals to feed optional accessories for special applications.

## Specifications

All specifications allow for ten minutes of warmup and are guaranteed at 15-35° C. The operating range is 5-45° C.

### Video Patterns:

These digitally generated patterns may be used to modulate the RF and IF generators, the video pattern position of the DRIVE SIGNAL switch, and the VCR STANDARD output.

**DOT:** Single dot centered  $\pm 1\%$ , between horizontal and vertical blanking intervals.

**CROSS:** Single cross centered  $\pm 1\%$ , between horizontal and vertical blanking intervals.

**CROSSHATCH:** 21 vertical lines, 15 horizontal lines.

**DOTS:** 315 white dots.

**COLOR BARS:** 10 bar, phase-locked, gated-rainbow with true color burst.

**CHROMA BAR SWEEP:** Standard burst and blanking levels during horizontal sync plus three frequency bars for chroma bandpass alignment of chroma demodulator stages. The bars are set to chrominance phase at 3.07, 3.58, and 4.09 MHz, with a 100% white bar on each side. The center bar is set at 75% saturated cyan. Each bar can be switched in or out on the front panel.

**MULTIBURST BAR SWEEP:** Ten frequency bars with modulation levels alternating between pure black and 100% white. The modulating square wave frequency references start at "0 MHz" (96 KHz) and increase to 4.5 MHz in 0.5 MHz steps.



All bars, except the 3.5 MHz bar, are luminance phased to allow passage through the luminance channel of comb filters. All bars are crystal controlled and phase locked to each other and to horizontal sync. All bars can be switched in or out on the front panel.

**10 BAR STAIRCASE:** Standard EIA 10 level staircase. Each step is within  $\pm 10\%$  tolerance from EIA specifications.

**EXTERNAL MODULATION:** Maximum 1 VP-P input (negative sync); 75 ohm input impedance, frequency range from 0-4.5 MHz.

**INTERLACE ADDER:** All patterns except EXT. MOD. input, may be interlaced or non-interlaced with the front panel switch.

**VIR ADDER:** A VIR signal can be added to line 19 of all patterns with the front panel switch, except EXT. MOD.

### RF Generator:

**CHANNELS:** STD TV, All FCC specified channels, 2-83; STD CABLE, FCC specified VHF channels (2-13) plus all midband, superband, and hyperband channels in standard 6 MHz steps; PROG CABLE, same as "STD CABLE" except each channel may be shifted from 0 to  $\pm 9.75$  MHz in 0.25 MHz steps with programming stored in non-volatile memory.

**CHANNEL FREQUENCY ACCURACY:** All channels accurate to 400 PPM, within the guaranteed temperature range. Temperature drift over wider temperatures is  $\pm 10$  PPM/deg. C.

**VERNIER ATTENUATOR:** Total error over vernier range of 500  $\mu$ V to 5000  $\mu$ V,  $\pm 3$  dB except UHF. UHF: 500  $\mu$ V to 5000  $\mu$ V,  $\pm 3$  dB,  $\pm 1$  dB per channel above channel 14.

**STEP ATTENUATOR:** HI: 0 dB, only vernier attenuator spec. applies. MED:  $-20$  dB,  $\pm 3$  dB from vernier spec. LO:  $-40$  dB,  $\pm 6$  dB from vernier spec.

**VIDEO MODULATION:** Any video pattern selected by the VIDEO PATTERN switch, or with an input from the EXTERNAL MODULATION jack.

**SOUND MODULATION:** 4.5 MHz  $\pm 1$  KHz sound carrier.  $\pm 15$  KHz FM deviation, modulates RF or IF. Carrier can be turned off with the AUDIO switch and can be tone modulated by the four frequencies of the AUDIO switch when switch is on.

### IF Generator:

**VIDEO IF:** 45.75 MHz,  $\pm 10$  KHz, crystal controlled carrier.

**VIDEO MODULATION:** same as RF generator.

**SOUND MODULATION:** Same as RF generator.

**OUTPUT LEVEL:** 500  $\mu$ V to 500 mV,  $\pm 3$  dB in all settings.

### Trap Setting Signals:

Trap signal mixed with crystal-controlled 45.75 MHz,  $\pm 10$  KHz, video modulated, 1000  $\mu$ V carrier.

**TRAP SIGNALS:** 39.75, 41.25, or 47.25 MHz,  $\pm 10$  KHz; switch selected.

**TRAP SIGNAL MODULATION:** Controlled by AUDIO switch: No modulation when off, amplitude modulated with selected tone when switched to a marked frequency.

### 35-50 MHz Programmable IF:

35-50 MHz,  $\pm 10$  KHz, programmable in 10 KHz steps. Frequency is displayed on digital display. AM modulated with the audio tone selected by the AUDIO switch. Invalid input results in a cleared display, (—.—.—).

### Sound IF Generator:

4.5 MHz,  $\pm 1$  KHz FM carrier, crystal controlled.

Output level: Maximum 500 mV;  $\pm 4$  dB at 500 mV.

Modulation: Tone modulation selected by AUDIO switch when turned on and unmodulated with the AUDIO switch off.

Typical FM deviation:  $\pm 15$  KHz.

### Drive Signals:

All drive signals, except audio, are phase-locked to the video signal modulating the RF and IF generators. All signals can be monitored with the internal meter to determine the P-P level. All signals are continuously variable, and have plus or minus polarity. A "0" detent is provided on the DRIVE SIGNAL LEVEL vernier. The drive signals and maximum levels are listed below.

**OUTPUT:** Signal at zero: Less than 3% of full range.

Output at full Level:

3V range: 3VPP,  $\pm .5$ V into 100 ohms impedance.

30V range: 30VPP,  $\pm 5$ V into 100 ohms impedance.

300V range: 300VPP,  $\pm 50$ V into 10,000 ohms impedance.

Clipping: none up to 250VPP, typical.

Protection from externally applied voltage:  $\pm 500$ V (DC + peak AC).

Floating ground (-): isolated by  $\pm 500$ V (DC + peak AC).

**FREQUENCY RESPONSE:** (3V, 30V).

Using 10 Bar Multiburst: Standard roll-off of frequencies above 2.5 MHz, comparable to properly operating receiver tuner and IF strip.

**SIGNALS AVAILABLE:** Video Pattern, Audio, V&H Composite Sync, Integrated Vertical Sync, Vertical Drive, Horizontal Transistor Drive, Horizontal Tube Drive, Horizontal SCR Drive, Horizontal Keying Pulse.

### 3.58 MHz DRIVE:

Output (high end): 30VPP  $\pm 5$  V.

Output (low end): Less than 1VPP.

Frequency tolerance:  $\pm 100$  Hz, within guaranteed temperature range. Add  $\pm .002\%/^{\circ}\text{C}$  outside the guaranteed temperature range.

### 30 Hz SERVO DRIVE:

Output: 0 to 30VPP,  $\pm 5$ V, phase locked to vertical sync.



## Digital Meter:

*NOTE: All functions 100% autoranged.*

**RINGING TEST:** Dynamic test of coil Q determined by counting the number of ringing cycles before reaching a preset damping point. The preset damping point is set at 25% of the excitation pulse. The number of cycles is displayed on the digital display and continually updated. (U.S. Patent 3,990,002)

**DC POWER SUPPLY CURRENT:** 0.00-1.50 amps DC (meter range),  $\pm 0.5\%$ ,  $\pm 2$  counts.

**DC POWER SUPPLY VOLTS:** 0.00-40.00 volts DC (meter range),  $\pm 0.2\%$ ,  $\pm 2$  counts.

**DRIVE SIGNAL ACCURACY:** (All)  $\pm 1\%$ ,  $\pm 2$  counts for 1 KHz sine wave.

Frequency Response:

0-199V ranges: 30 Hz to 5 MHz,  $\pm 1$  dB from average value across band.

Over 200 VPP ranges: 30 Hz to 150 KHz,  $\pm 1$  dB from average value across band.

**EXTERNAL PPV:** 3 ranges (autoranged); 0.0-19.9 VPP, 20-199VPP, 200-1999VPP.

Accuracy:  $\pm 1\%$ ,  $\pm 2$  counts 0.0-199VPP;  $\pm 5\%$ ,  $\pm 5$  counts 200-1999VPP.

Frequency response:

0-199V ranges: 30 Hz to 5 MHz,  $\pm 1$  dB from average value across band.

Over 200VPP ranges: 30 Hz to 150 KHz,  $\pm 1$  dB from average value across band.

Input impedance: 1 Megohm

**EXTERNAL DCV:** 3 ranges (autoranged); 00.00-19.99 V DC, 20.0-199.9V DC, 200-1999 V DC.

Accuracy: (All)  $\pm 0.2\%$ ,  $\pm 2$  counts.

Input impedance: (without probe) 15 Megohm.

**PROTECTION:** 2000V (DC + peak AC), across the inputs. Maximum voltage between (-) lead and ground: 1500V (DC + peak AC).

## DC Power Supply:

Output: Typical, 0-35V DC, current limited to 1 amp.  
Ripple: Less than 1% (RMS AC to DC output), at full load. Ripple may increase when current limited.

Protection: Output terminals to case or other grounds;  $\pm 1000$ V (DC + AC peak), up to maximum of 1 mA of leakage current.

Protection from External Voltage Source:

Positive voltage to plus terminal: +600V DC momentary.

Positive voltage to minus terminal: Internal fuse will blow if 1 ampere of current is exceeded.

Short Circuit: Current electronically limited to 1 amp; short circuit will not cause damage or blow fuse.

## VCR Standard Output:

Level: 1VPP,  $\pm 10\%$  into a 75 ohm load.

Frequency response: MULTIBURST BAR SWEEP pattern to be flat  $\pm 10\%$  to 4.5 MHz bar.

Pattern Output: Any pattern from the VIDEO PATTERN switch.

## Audio Generator:

Tone frequencies available: 0 Hz, 333 Hz, 1 KHz, 5 KHz, and 7 KHz.

Frequency tolerance:  $\pm 10\%$ , except 333 Hz:  $\pm 17$  Hz.

## General

Digital Meter:  $3\frac{1}{2}$  digit, LCD readout.

Channel Display: 4 digit, LCD readout.

Guaranteed operating temperature: 15-35 °C.

Recalibration interval: One year recommended.

Size: 11" x 14" x 11" (28.2 x 35.8 x 28.2 cm) HWD.

Weight: 26¼ lbs. (12 kg.)

Power: 105-130 VAC, 60 Hz, 140 W max.

## Accessories:

### Supplied:

- (3) 39G174R test lead, 72" banana-alligator, red.
- (3) 39G174B test lead, 72" banana-alligator, black.
- (2) 39G106 video cable, phono male to alligators out.
- (1) 39G175R test lead and probe assy., red.
- (1) 39G160 cable, 75 ohm phono to phono.
- (1) 39G159 cable, BNC to "F", 75 ohm.
- (1) 39G161 cable, "F" female to phono female.
- (1) 39G162 cable, "F" female to phono male.
- (1) 39G72 Balun, 75 ohm in, 300 ohm out.
- (1) TP225 Sure Hold probe.

Numerous Patents Pending.

All specifications subject to change without notice.

## Controls

Fold out for descriptions



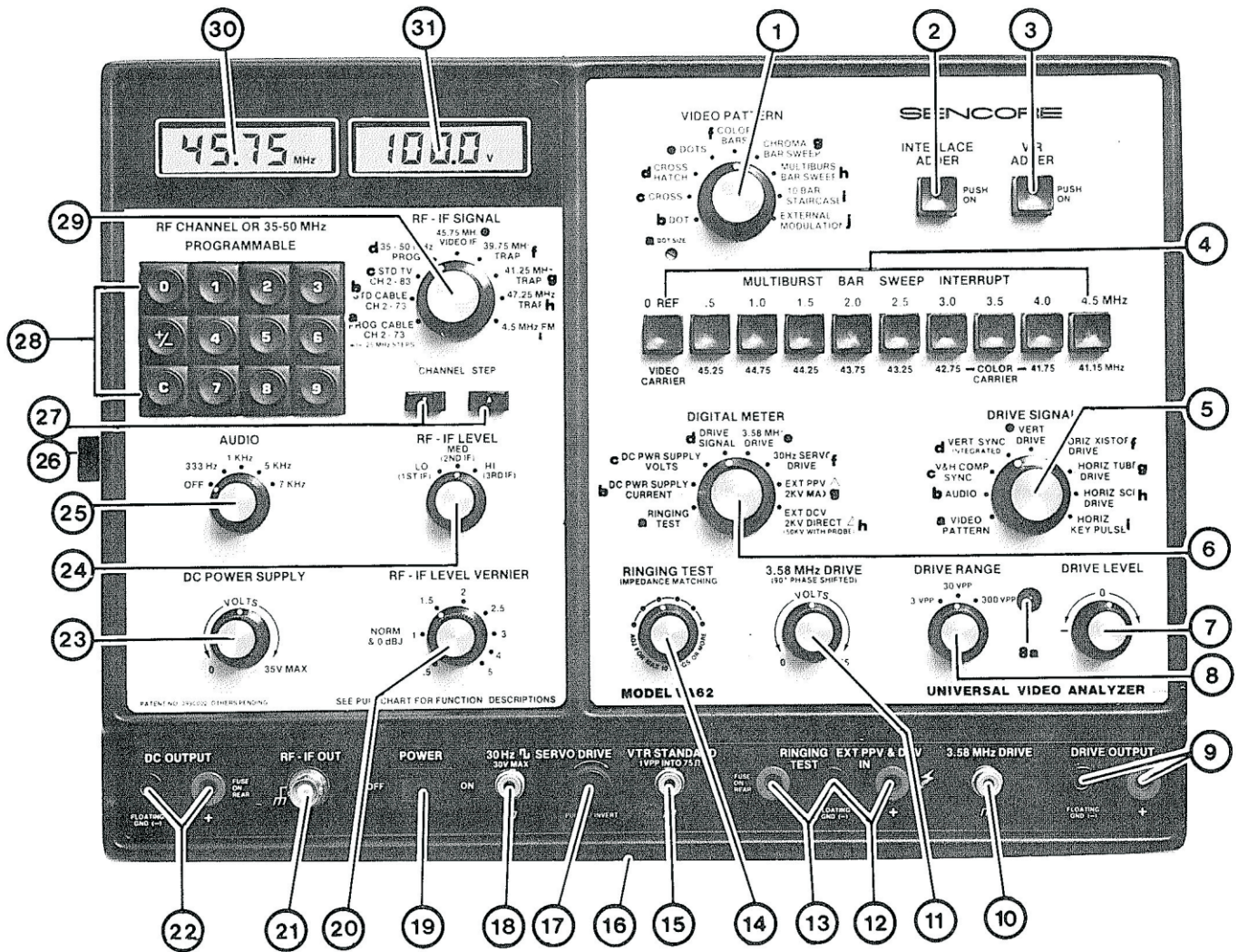


Fig. 1 — Location of front panel controls.

## Controls

1. VIDEO PATTERN SWITCH selects the patterns that will be available for injection.

1a. DOT SIZE control gives control over dot size and vertical line width on the screen for easier convergence.

1b. DOT provides an electronically centered dot for static convergence.

1c. CROSS provides an electronically centered cross pattern to center the picture area.

1d. CROSS HATCH for dynamic convergence and linearity adjustments.

1e. DOTS for dynamic convergence.

1f. COLOR BARS are standard gated-rainbow phase-locked to horizontal sync for color circuit troubleshooting or alignment. NTSC level of 75% cyan bar saturation is maintained.

1g. CHROMA BAR SWEEP, three bar color reference test pattern used for chroma alignment and troubleshooting. Borders of the pattern are set to 100% white level for proper VCR white level adjustments. Each bar can be turned on or off with the corresponding MULTIBURST BAR SWEEP INTERRUPT switch.

1h. MULTIBURST BAR SWEEP, a ten bar multiburst pattern for luminance video frequency response checks and troubleshooting, and IF alignment. Each bar can be turned on or off with the corresponding MULTIBURST BAR SWEEP INTERRUPT switch.

1i. 10 BAR STAIRCASE provides a ten-step staircase pattern to check and align video linearity.

1j. EXTERNAL MODULATION allows any 1 VPP, 75 ohm, negative sync, composite video signal to modulate VA62 through jack (34) in lead compartment.



2. INTERLACE ADDER provides a fully interlaced pattern for testing circuits where full interlace is necessary such as vertical countdown and VIR circuits.

3. VIR ADDER provides a standard VIR signal for testing and set up of VIR controlled units.

4. MULTIBURST BAR SWEEP INTERRUPT switches allow each MULTIBURST BAR SWEEP (1h) frequency bar to be turned on or off as necessary. The 42.75, COLOR CARRIER and 41.75 switches also allow the CHROMA BAR SWEEP bars to be turned on or off.

5. DRIVE SIGNAL switch provides drive signals necessary for signal injection in TV and VCR circuits for troubleshooting. All are controlled by DRIVE RANGE switch (8) and DRIVE LEVEL control (7) and supplied through DRIVE OUTPUT jacks (9).

5a. VIDEO PATTERN provides a composite video pattern selected by the VIDEO PATTERN switch (1) for injection anywhere composite video is necessary.

5b. AUDIO provides audio tones at 4 frequencies; 333 Hz, 1 KHz, 5 KHz, or 7 KHz selected by AUDIO switch (25).

5c. V & H COMP SYNC provides separated composite sync for isolating sync problems by injecting after separation but before vertical integration or horizontal differentiation points.

5d. VERT SYNC INTEGRATED provides an internally integrated vert sync pulse for injection into vertical oscillator.

5e. VERT DRIVE provides the correct signal to feed the base or grid of the vertical output stage.

5f. HORIZ XISTOR DRIVE provides a horizontal drive waveform to drive the base of a horizontal output transistor.

5g. HORIZ TUBE DRIVE provides a horizontal drive waveform to drive the grid of a horizontal output tube.

5h. HORIZ SCR DRIVE provides a horizontal drive waveform to drive the retrace SCR of an SCR output section.

5i. HORIZ KEY PULSE provides a properly timed flyback pulse for AGC keying, burst keying, etc.

6. DIGITAL METER switch selects the function displayed by the DIGITAL METER (31).

6a. RINGING TEST provides test of deflection yokes and flyback transformers. Use with RINGING TEST impedance matching switch (14) and RINGING TEST input jacks (13).

6b. DC PWR SUPPLY CURRENT monitors DC current drawn from adjustable DC POWER SUPPLY (23).

6c. DC PWR SUPPLY VOLTS monitors output voltage from adjustable DC POWER SUPPLY (23).

6d. DRIVE SIGNAL measures the actual peak-to-peak level of signal selected with the DRIVE SIGNAL switch (5) at the DRIVE OUTPUT jacks (9).

6e. 3.58 MHz DRIVE measures the actual peak-to-peak level supplied by the 3.58 MHz DRIVE control (11) to the output jack (10).

6f. 30 Hz SERVO DRIVE measures the actual peak-to-peak level supplied by the 30 Hz SERVO DRIVE control (17) to the output jack (18).

6g. EXT PPV measures the peak-to-peak voltage (to 2000 VP-P max) of an AC signal (5 MHz max) applied to the EXT PPV & DCV IN jacks (12). Autoranged.

6h. EXT DCV measures the DC level of a signal applied to the EXT PPV & DCV IN jacks (12) to 2000 volts. Autoranged.

7. DRIVE LEVEL allows vernier control between ranges of DRIVE RANGE control (8). All signals from the DRIVE SIGNAL switch (5) can be varied, either in a positive or negative polarity.

8. DRIVE RANGE switch provides three ranges for signals from the DRIVE SIGNAL switch (5); 3 VP-P, 30 VP-P, and 300 VP-P. The 3 V range is impedance matched to IC circuitry, the 30 VP-P is impedance matched to transistor circuits and the 300 VP-P is impedance matched to tube circuits.

8a. An LED INDICATOR flashes when the DRIVE RANGE switch (8) is set to 300 VP-P range.

9. DRIVE OUTPUT, supplied through banana jacks for signals selected by DRIVE SIGNAL switch (5). A floating ground connection allows direct injection to non-common ground systems.

10. 3.58 MHz DRIVE output, is supplied through a shielded RCA phono jack.

11. 3.58 MHz DRIVE provides a 90° phase shifted output, locked to the color burst, through the 3.58 MHz DRIVE jack (10). The control provides a 0 to 25 VPP output for isolating color problems.

12. EXT PPV & DCV IN jacks provide inputs for measuring PPV and DCV. Common negative is floating ground allowing measurements on non-common ground chassis.

13. RINGING TEST input jacks allow connection of test leads to yoke or flyback for RINGING TEST (14). Ground connection common with EXT PPV & DCV IN jack (12).

14. RINGING TEST impedance matching switch matches the test circuits to the yoke or flyback under test when DIGITAL METER switch (6) is set to RINGING TEST position (6a). Switch is rotated until the DIGITAL METER (31) shows a reading of 10 or more. Readings of less than 10 in all 6 positions indicate a bad coil.

15. VCR STANDARD output jack, is an RCA phono jack providing a 1 VP-P composite video signal, (when terminated in 75 ohm) for direct video input.

16. PULL OUT CHART provides a quick reference for setting up the controls.

17. 30 Hz SERVO DRIVE control adjusts level of 30 Hz servo drive square wave from zero to 30 VPP. Polarity can be inverted by pulling knob (17).



18. 30 Hz SERVO DRIVE output supplied through an RCA phono jack provides the 30 Hz servo drive square wave, controlled by 30 Hz SERVO DRIVE control (17).

19. POWER SWITCH is illuminated when on.

20. RF-IF LEVEL VERNIER provides a fine adjustment of RF or IF levels for sensitivity testing or signal matching.

21. RF-IF OUT BNC jack supplies all RF or IF signals.

22. DC OUTPUT jacks are banana type with a floating negative, allowing injection into non-common ground points.

23. DC POWER SUPPLY controls a DC voltage source, adjustable from zero to 35 VDC at 1A current maximum.

24. RF-IF LEVEL control allows for three RF or IF signal levels for special tests. RF-IF VERNIER (20) provides signal levels between these ranges.

25. AUDIO switch provides four audio frequencies to modulate the RF-IF SIGNAL (29) or the AUDIO position (5b) of the DRIVE SIGNAL switch (5).

26. LATCH for optional PC230 cover which protects the front of the instrument in portable applications.

27. CHANNEL STEP switches allow stepping through RF channels one step at a time in the up or down direction.

28. RF CHANNEL OR 35-50 MHz PROGRAMMABLE keyboard is a soft-touch key pad that allows random keying of any channel required for RF, plus allows keying IF frequencies from 35-50 MHz for nonstandard IF traps. Also used for keying programmable cable offset frequencies.

29. RF-IF SIGNAL switch selects the function of the RF or IF signal generator which is fed through the RF-IF LEVEL switch (24) and the RF-IF LEVEL VERNIER (20) to the RF-IF OUT jack (21). Video modulation is controlled by the VIDEO PATTERN switch (1), and audio modulation is controlled by the AUDIO switch (25).

29a. PROG CABLE provides a user-programmable memory that stores a frequency offset for each cable channel to match the offset of local cable systems.

29b. STD CABLE provides any cable channel — VHF, midband, superband, or hyperband — at FCC specified 6 MHz steps.

29c. STD TV provides all VHF and UHF TV channels at FCC specified carrier frequencies.

29d. 35-50 MHz PROG provides any frequency from 35.00 MHz to 50.00 MHz for spot alignment, AFT testing, and other special tests.

29e. 45.75 MHz VIDEO IF generator provides a crystal controlled IF carrier modulated with video and audio information to troubleshoot or align any IF stage.

29f, g, h. TRAP SETTING SIGNALS provide combination of a video modulated 45.75 MHz IF carrier plus an interfering carrier of 39.75 (adjacent video), 41.25 (sound), or 47.25 (adjacent sound) MHz to adjust standard IF traps.

29i. 4.5 MHz FM sound IF provides modulated or unmodulated sound carrier for troubleshooting or alignment of the audio IF or detector.

30. RF-IF DIGITAL READOUT shows the selected RF channel, cable offset (during programming), or IF frequency. Annunciators show selected functions, ranges, etc.

31. DIGITAL METER READOUT displays digital results of function selected by DIGITAL METER switch (6) for monitoring internal or external voltages or for testing yokes or flybacks.



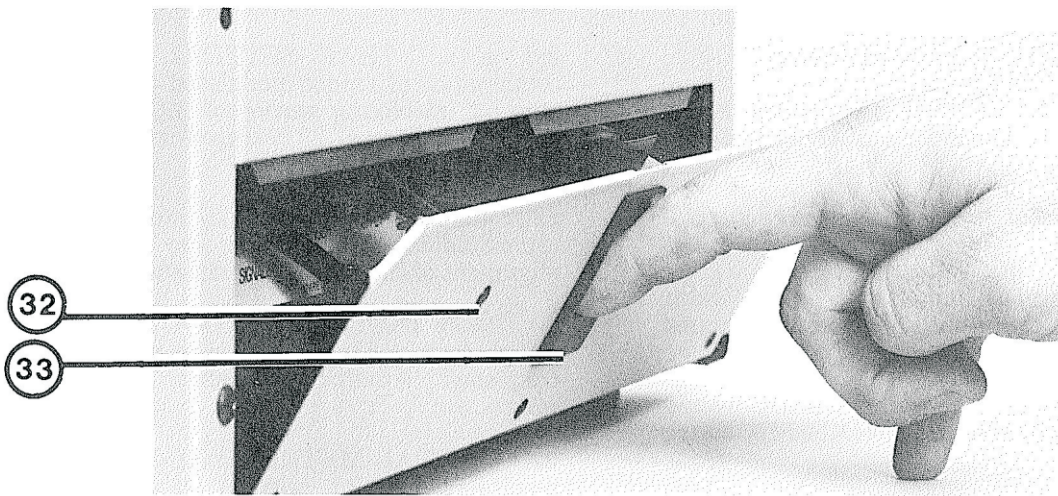


Fig. 2 — Press latch down to open lead storage door.

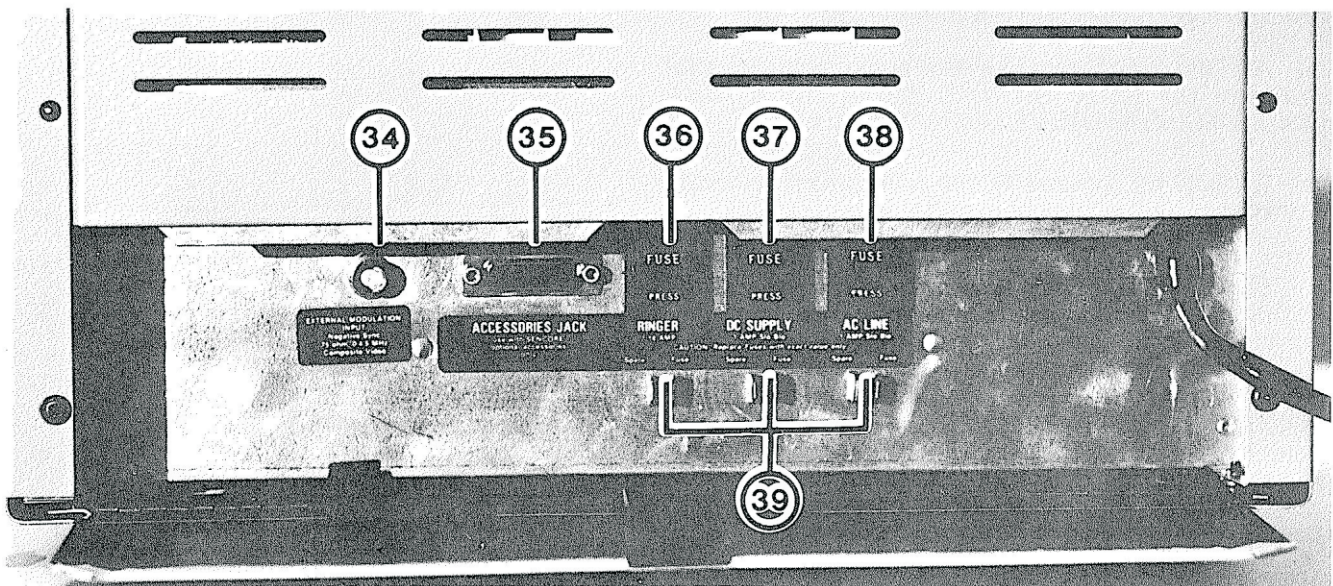


Fig. 3 — Features inside lead compartment.

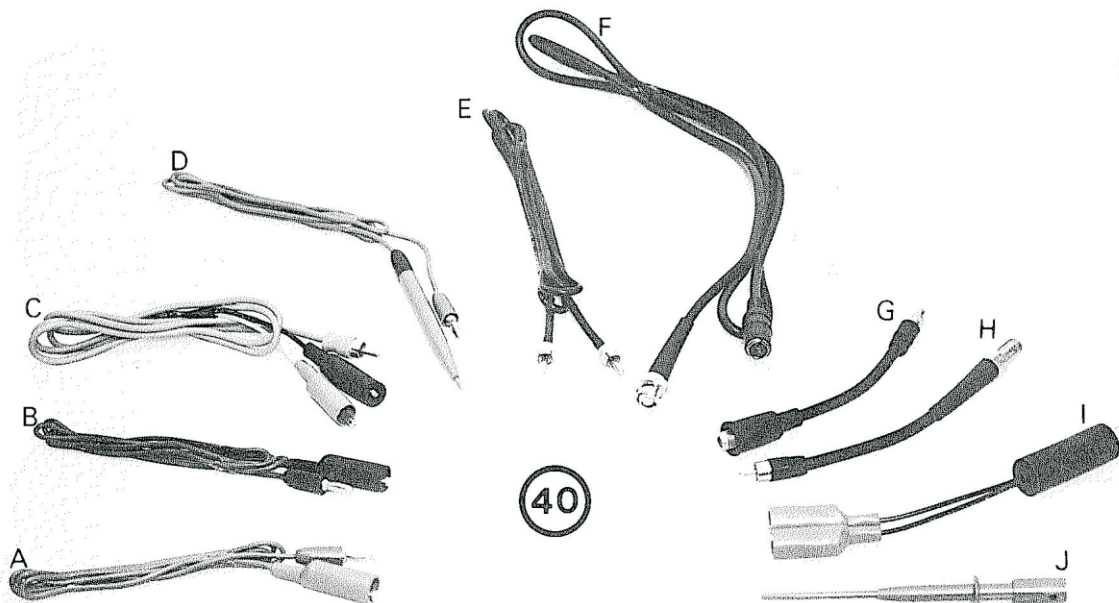


Fig. 4 — Accessories supplied with the VA62.



32. ACCESSORY STORAGE COMPARTMENT door.

33. ACCESSORY STORAGE COMPARTMENT door latch.

34. EXTERNAL MODULATION jack provides a BNC input for any 1 VP-P, 75 ohm, negative sync composite video signal to modulate the VA62. The VIDEO PATTERN switch (1) must be in the EXTERNAL MODULATION (1j) position.

35. ACCESSORY OUTPUT SIGNALS jack provides all of the signals needed to drive optional accessories designed for the VA62. The jack is a standard 15 pin "D" type computer connector.

36. RINGING TEST FUSE HOLDER prevents damage to sensitive RINGING TEST (6a) circuits if connected to powered circuit. Replace only with 1/16th ampere, fast-blow fuse.

37. DC POWER SUPPLY FUSE HOLDER prevents damage to DC POWER SUPPLY (23) caused by externally applied currents. Replace only with 1 ampere, slow-blow fuse.

38. AC LINE FUSE HOLDER protects unit from damage or possible fire hazard in case of an internal problem. Replace only with 1 ampere, slow-blow fuse.

39. SPARE FUSE HOLDERS provide storage for one replacement fuse of each size (36), (37), (38). One replacement fuse of each type is supplied with the VA62.

40. SUPPLIED ACCESSORIES include proper cables and accessories for all inputs or outputs on the VA62 front panel.

40a. 39G174R TEST LEAD provides basic test lead hookup for DRIVE OUTPUT (9), RINGING TEST INPUT (13), and DC OUTPUT (22). Color: red. Three cables supplied.

40b. 39G174B TEST LEAD provides proper test lead hookup for the same inputs or outputs as in 40a; Color: black. Three cables supplied.

40c. 39G106 VIDEO CABLE provides a cable with a male RCA phono connector to alligator clips (one red and one black, with black to shield) for use at 3.58 MHz DRIVE (10) and 30 Hz SERVO DRIVE (18). Two cables supplied.

40d. 39G175R TEST LEAD provides a standard test lead and probe assembly for use at the EXT PPV & DCV INPUT (12). One probe supplied.

40e. 39G160 CABLE provides a 75 ohm RCA phono male to RCA phono male cable to be used at the VCR STANDARD OUTPUT (15). One cable supplied.

40f. 39G159 CABLE provides a 75 ohm BNC to quick-connect "F" connector cable for use at RF-IF OUT jack (21). One cable supplied.

40g. 39G161 CABLE provides a short adapter cable, "F" female to RCA phono female to connect RF-IF OUTPUT cable (40f) to TV tuner or chassis. One cable supplied.

40h. 39G162 CABLE provides a short adapter cable, "F" female to RCA phono male to connect RF-IF OUTPUT cable (40f) to TV tuner or chassis. One cable supplied.

40i. 39G72 MATCHING BALUN provides 75 to 300 ohm matching transformer with DC blocking secondary for use with RF-IF OUTPUT cable (40f) when necessary for 300 ohm input or injection into internal circuits. One balun supplied.

40j. TP225 SURE HOLD PROBE provides an extension spring loaded connector for use with standard alligator test lead (40a) or (40b) or matching balun (40i). One probe supplied.



## Introduction

This section explains how to operate each VA62 feature. The "APPLICATION" section then explains how to combine these different features for more advanced troubleshooting. In both sections, the name of a VA62 control or feature is listed in ALL CAPITAL LETTERS.

The "OPERATION" section is broken into three parts: 1.) general operation and set-up, 2.) operating the signal generators, and 3.) special tests and features. The **Simplified Operating Instructions** on the pull out chart below the VA62 front panel recap these operating instructions.

## Initial Setup

Remove the leads and accessories from the LEAD STORAGE COMPARTMENT located in the back of the unit. Depress the latch to open the door. Unwrap the AC cord from the LEAD STORAGE COMPARTMENT and route it through either of the two notches at the top corners of the LEAD STORAGE COMPARTMENT door. The door may now be closed around the AC line cord.

## Power Connections

### WARNING

The VA62 must be connected to a properly grounded 3-wire AC system for safe operation and minimum radiation of signals. Always use an isolation transformer on any receiver that does not have an internal isolation transformer. All warranties are voided if the 3rd wire ground is bypassed or if damage occurs from making a connection to an non-isolated, hot-ground system.

Connect the AC cord to a standard 110-120 VAC grounded outlet. DO NOT DEFEAT THE GROUND CONNECTION. Turn the POWER SWITCH, located on the lower left of the front panel, to the "ON" position. The POWER SWITCH will light to show that power has been applied. The VA62 will operate properly when first turned on, but should be allowed to operate for at least 10 minutes for maximum accuracy and stability of the crystal oscillators and phase-locked loops.

## Protection Fuses

### WARNING

Always replace the fuses with the correct type and current rating. Improper fuses may cause internal damage to the VA62, create a fire hazard or cause a safety hazard. Using an improper fuse voids all warranties.

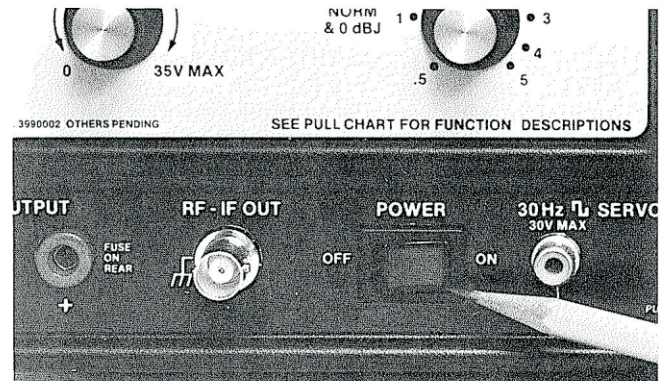


Fig. 5 — The AC power switch is located on the lower left side of the front panel.

Three protection fuses are located inside the LEAD STORAGE COMPARTMENT. A label next to the fuses clearly shows the function and the rating of each. A spare fuse is located in a clip below each fuse holder. If you need to replace one of the fuses: 1.) Be sure you use the correct replacement, and 2.) Replace the spare fuse with one of the correct value as soon as possible so your spare fuse holder is always stocked. You should determine the cause of a blown fuse if you find it necessary to replace it on a regular basis. Blown fuses indicate a problem in a circuit or improper use of the equipment. Use the following fuse descriptions to guide you as you determine the cause of a blown fuse.

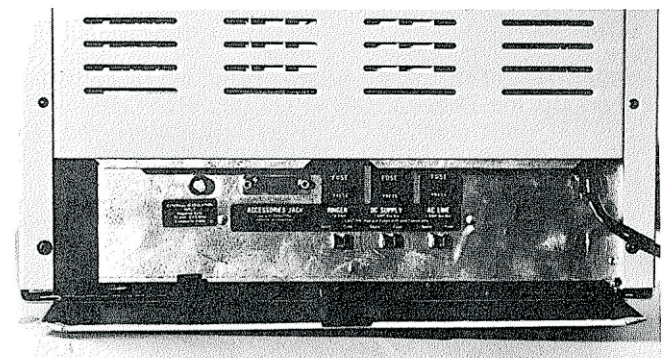


Fig. 6 — The three protection fuses are located inside the lead compartment on the back of the unit.

### AC Line Fuse: (1 amp, slo blo, type 3AG)

This fuse is in series with the AC line. The VA62 will be completely dead if this fuse is open, including no light in the POWER SWITCH when it is in the "ON" position. A circuit failure is indicated if this fuse blows after being replaced.

### DC Supply Fuse: (1 amp, slo blo, type 3AG)

This fuse protects the adjustable DC POWER SUPPLY from damage caused by connecting to a circuit that contains power. The fuse will not normally blow when the DC OUTPUT leads are shorted together because the VA62 limits the power supply to 1 amp. The DC POWER SUPPLY will provide no output when this fuse is open. You can test it at any time by switching the DIGITAL METER switch to the DC POWER SUPPLY CURRENT position and shorting



the DC OUTPUT leads together. The DIGITAL METER should show a reading of approximately 1 amp.

#### **Ring Test Fuse: (1/16th amp, fast blo, type 3AG)**

This fuse protects the RINGING TEST from damage caused by connecting to a circuit that contains power. The only thing that will cause this fuse to blow is improper test procedures. All yokes and flyback transformers will show zero ringing cycles if the fuse is open, whether they are good or bad. You can test the fuse by connecting the RINGING TEST leads to a known-good yoke or flyback and performing the normal test.

## **Isolated Outputs**

### **WARNING**

The maximum voltage that may be applied between the isolated outputs is 1500V (DC plus peak AC). Do not connect any output to a test point that may be more than 1500 volts above common ground.

Three of the VA62 outputs are isolated from the VA62 chassis and from each other. This isolation allows connection to circuits that are isolated from each other or allows connection of the VA62 common connection to some point other than circuit ground. The black "common" terminal of each floating circuit is marked "Floating Gnd (-)". The other four outputs are common to the VA62 chassis and marked with a chassis ground symbol (  $\perp$  ).

Each floating output must be connected to the circuit through its own ground connection — you cannot use one ground connection for all VA62 outputs. You may connect all of the common leads to the same test point in the circuit if all of the signals are to be referenced to the same circuit potential.

*NOTE: The isolated grounds do not eliminate the need for an isolation transformer when working on a receiver with a "HOT" ground.*

## **Video Patterns**

The VIDEO PATTERN generator is the heart of the VA62. The pattern selected by the VIDEO PATTERN SWITCH is fed to the RF-IF generator, the DRIVE SIGNAL generator, the VCR STANDARD output jack, and the ACCESSORY DRIVE output jack inside the LEAD STORAGE COMPARTMENT. All signals are automatically phase-locked to each other because they come from a common source. This allows individual signals to be injected into a video system while a reference signal is fed to its input. The system returns to normal (or near normal) operation when the substitute signal is injected at the correct point because the phase-locked substitute signal duplicates the signal normally found in the circuit. Details on using signal substitution to quickly isolate defective stages are found in the "Application" section of this manual.

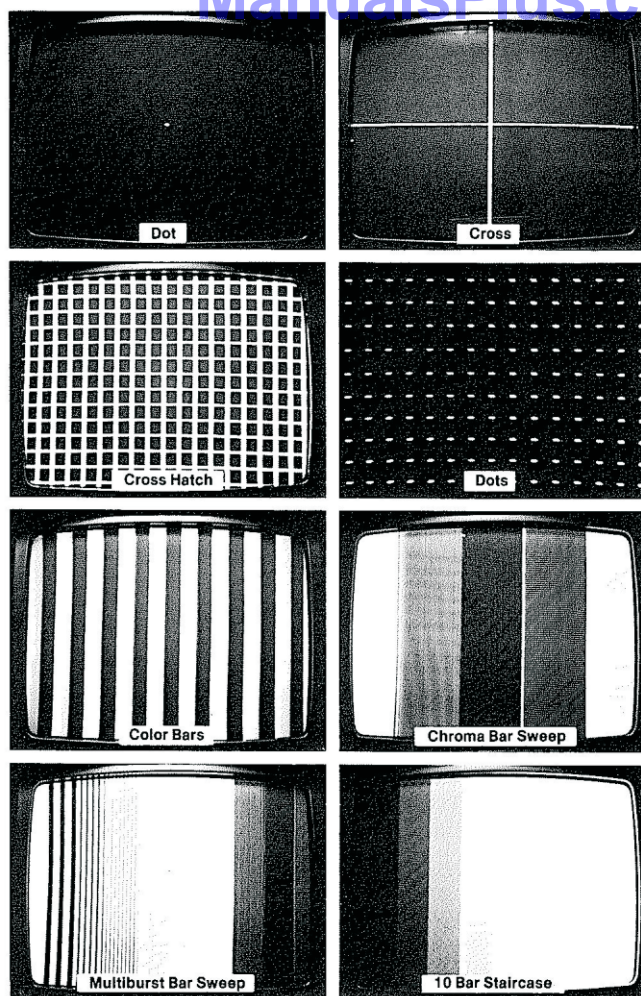


Fig. 7 — All sections of the VA62 are phase-locked to the signal selected by the VIDEO PATTERN switch.

The first six patterns are used for work in the color circuits. These patterns include the standard convergence patterns and two special patterns (COLOR BARS and CHROMA BAR SWEEP) to test the color circuits. The next two patterns (MULTIBURST BAR SWEEP and the TEN BAR STAIRCASE) are for troubleshooting the luminance section of a color system or a black and white system. The EXTERNAL MODULATION position allows any video pattern generator that supplies the correct amplitude and polarity of signal to feed the VA62 outputs.

### **Dot**

The DOT pattern provides a single dot that is electronically centered in the raster within 1%. This pattern is useful in setting the static convergence of a color receiver. Static convergence is much easier to do if the screen of the receiver has just the center dot showing because the static convergence magnets only affect the center of the screen. Simply rotate the static magnets of the receiver until the DOT is a pure white without any color fringing. The static convergence may be slightly affected by the dynamic convergence adjustments but it can be easily touched up as a final part of overall convergence.



## Cross

The CROSS pattern provides a single horizontal line and a single vertical line that cross within 1% of the exact center of the raster pattern. When this single cross is set to the center of the screen, the resulting picture will be set to the proper center point. The single cross also gives a convenient pattern for setting the deflection yoke straight on the neck of the CRT. Set the purity of the screen, per the manufacturers' instructions, and carefully rotate the yoke until the horizontal line of the single CROSS pattern is perfectly straight across the center of the screen.

### WARNING

Some deflection yokes are bonded directly to the neck of the CRT. DO NOT attempt to move these bonded yokes as damage to the CRT or the yoke may result.

## Crosshatch

The CROSSHATCH pattern is used to set the linearity adjustments necessary for proper reproduction of a transmitted picture. These adjustments include vertical height, vertical linearity, and pincushion. These three adjustments can be very difficult to set using an off-air signal because of the constant movement on the screen. Conventional color generator patterns are difficult to use because the boxes are rectangular in shape. The VA62 CROSSHATCH pattern has 21 vertical lines and 15 horizontal lines that form perfect squares on the screen of a properly adjusted receiver.

The CROSSHATCH pattern is used for the entire convergence procedure on "one-gun" CRTs that have no electronic convergence controls. Convergence on these CRTs is performed by physical movement of the deflection yoke up and down or side to side, and adjustment of permanent "4-pole" or "6-pole" magnets. Misconvergence on these systems is much easier to see on the CROSSHATCH pattern.

## Dots

The DOTS pattern provides a standard dynamic convergence pattern for most receivers. The make-up of the DOTS pattern is identical to the CROSSHATCH pattern except that the cross-over points are shown without the interconnecting lines. When the DOTS are all pure white, without any color fringing, the convergence adjustments have been set properly.

Both the DOTS and the CROSSHATCH patterns should be examined carefully for any ringing or ghosts. If either of these conditions exist, the IF Alignment and the Video Amplifier System should be checked, using the instructions in the "Application" section.

## Dot Size Control

The DOT SIZE control adjusts the width of the DOTS and the vertical lines produced in the

CROSSHATCH pattern. If the vertical components of the convergence patterns appear too wide for proper adjustment, first check the receiver's brightness control setting. If this setting is too high, the pattern may be "blooming". If so, simply adjust the brightness to a useable level. If the brightness control has little effect on the line or dot width, slowly adjust the DOT SIZE CONTROL until the pattern becomes usable. If the dots or lines seem to be too narrow, reverse the procedure and increase the DOT SIZE control setting until the pattern has the desired width.

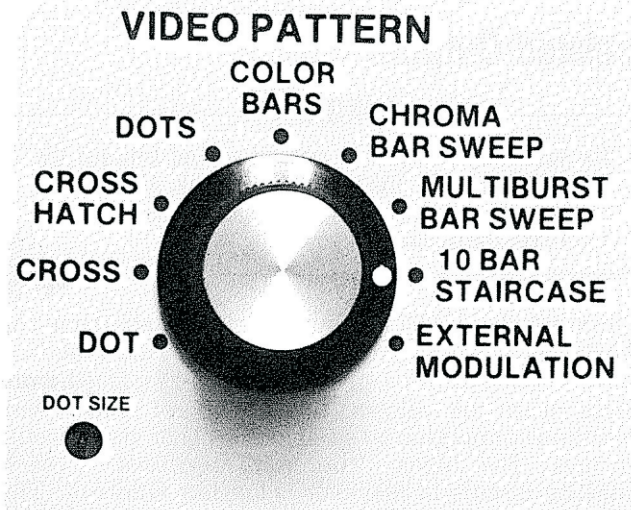


Fig. 8 — The DOT SIZE control adjusts the width of the dots or the vertical lines in the convergence patterns.

Remember that a CRT with low emission may produce a symptom of thick, fuzzy lines because of the decreased ability to provide proper focus. No amount of adjustment will provide a perfectly sharp pattern in these cases, although reduced brightness may produce a useable pattern.

Any frequency restrictions in the IF strip or the video amplifiers may cause the dots or vertical lines to disappear. If this is the case, the defective stages must be repaired before the pattern can be used effectively.

## Color Bars

The COLOR BARS pattern is similar to the industry standard 10-bar gated-rainbow pattern used for most color receiver troubleshooting and alignment. The VA62 COLOR BARS pattern, however, has three improvements compared to the pattern produced by conventional color bar generators. These improvements expand the uses of this pattern without affecting conventional applications.

The first improvement is that the color information is phase-locked to the horizontal sync information. This allows the COLOR BARS pattern to be used in video systems using comb filters, which require the proper phase relationship between chroma and sync to separate color from luminance. Conventional color bar generators have a random phase relationship between sync and chroma.

The second improvement is that the VA62 provides



a true color burst at the correct amplitude and position on a blanking pedestal that agrees with NTSC specifications. A conventional color bar generator simply inserts an extra color bar in the position normally occupied by the blanking and color burst. The true burst signal is needed for correct operation of the chroma circuits in some systems.

Finally, the VA62 pattern produces a larger amplitude color signal than conventional generators. The amplitude matches the cyan bar of an EIA color pattern (sometimes called an "NTSC" color pattern). Many procedures reference the EIA cyan bar amplitude. The VA62 COLOR BARS pattern can be used directly in place of the EIA color bar pattern in these applications.

## Chroma Bar Sweep

The CHROMA BAR SWEEP pattern is used for troubleshooting or alignment of chroma circuits in TV receivers or for setting the electronic alignment for record and playback of a VCR.

The CHROMA BAR SWEEP consists of three frequency bars set at 3.0 MHz, 3.5 MHz, and 4.0 MHz. The center bar is a 75% saturated cyan bar, meeting NTSC requirements. The left and right edges of the pattern are 100% white. This pattern arrangement gives the white reference plus the cyan level reference needed for accurate VCR alignment. The peak white reference is critical in VHS type machines that use an average AGC detection system instead of a keyed AGC system.

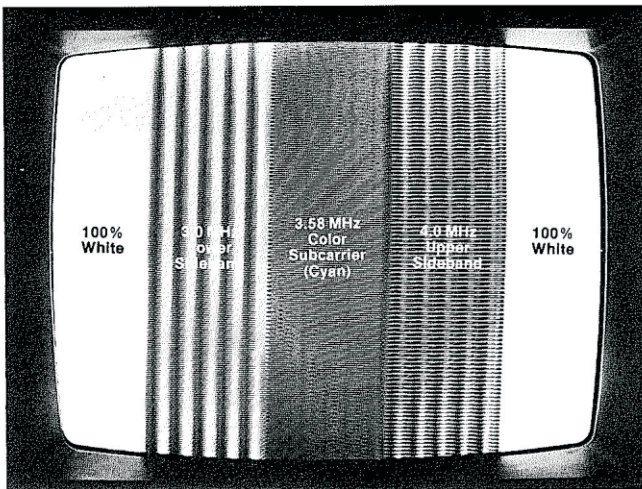


Fig. 9 — The special Chroma Bar Sweep pattern consists of three samples of color signals, bracketed by pure white edges, to test the full chroma frequency response.

The CHROMA BAR SWEEP bars are controlled by the MULTIBURST BAR SWEEP INTERRUPT buttons marked 3.0, 3.5, and 4.0 MHz. The label below the buttons shows that the 3.5 button controls the color carrier. The two adjacent buttons control the left and right bars respectively.

All three bars of this pattern are phased as CHROMA signals. This is important when working with a comb filter which separates chroma signals from composite video using phase rather than frequency. All three bars of the CHROMA BAR SWEEP should pass through the chroma signal path if the comb filter is properly adjusted and working.

*NOTE: The 3.0 and 4.0 MHz bars are phased as chroma signals in the CHROMA BAR SWEEP and as luminance signals in the MULTIBURST BAR SWEEP pattern. The 3.5 MHz (COLOR CARRIER) bar is phased as a chroma signal in both patterns.*

## Multiburst Bar Sweep

The MULTIBURST BAR SWEEP pattern is used for troubleshooting or aligning the luminance circuits in a TV receiver or VCR. The pattern's main use is to isolate video problems related to frequency response. This pattern also provides a reliable method to align the video IF stages of a receiver for the best video frequency response with minimum picture distortion. Details on IF alignment are found in the "Application" section of this manual.

The MULTIBURST BAR SWEEP pattern consists of ten reference frequency bars beginning with effectively zero (96 KHz) and extending to 4.5 MHz. Each bar is 0.5 MHz higher in frequency than the one before it. This half-megahertz sequence follows the design of video systems.

Each bar is generated at the same amplitude, extending from pure black to peak white. This provides a dynamic test of each video stage through its entire range of operating frequencies. Any stage that restricts frequencies will reduce the amplitude or distort the shape of one or more of the bars.

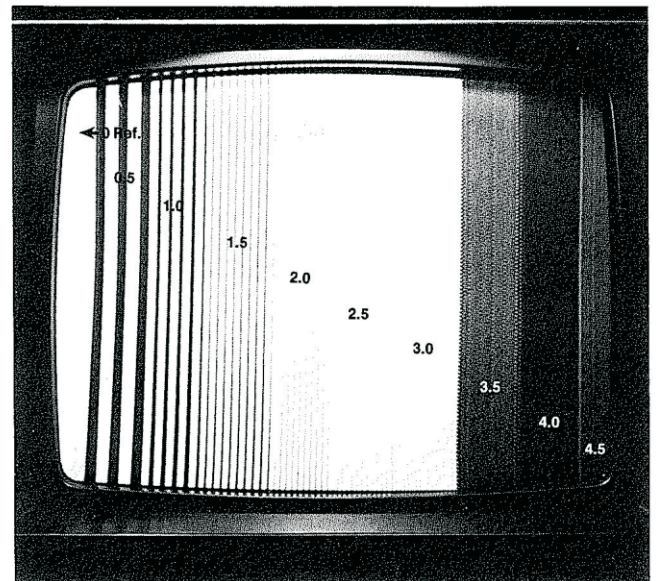


Fig. 10 — The special Bar Sweep pattern has ten different video frequency bars to test the frequency response of the video (luminance) system.

Each bar is phase-locked to horizontal sync so the bars follow a predictable path through high-



resolution comb-filter systems. Nine of the ten bars are phased as luminance signals and should follow the luminance signal path. The remaining bar (the 3.5 MHz "COLOR CARRIER" bar) is phased as a chroma signal to follow the chroma path in delay-line comb filters. (Charged-coupled-device, or CCD, comb filters require a color burst signal to properly separate chroma. The 3.5 MHz bar may not be properly combed in these systems.)

The MULTIBURST BAR SWEEP INTERRUPT buttons allow you to identify any bar or to remove any of the bars from the pattern for special applications. The horizontal space occupied by the bar switches to pure black when the button is released to its "out" position. The VA62 produces a pure black raster when all buttons are released. The frequencies marked above the buttons are the "baseband" frequencies, or the frequencies of each bar in a demodulated composite video. The frequencies marked below the buttons represent the corresponding sideband frequency in the video IF stages for each bar.

## Interlace Adder Switch

This switch allows any video pattern to be generated either fully interlaced or non-interlaced. Interlaced signals meet FCC and EIA specifications. Non-interlaced signals (sometimes called "progressive scan") are generally used for convergence patterns to eliminate "half-line" jitter which causes a double image on dots and horizontal lines.

The interlaced signal is necessary for troubleshooting vertical countdown systems that automatically select one of two operating modes for standard NTSC signals from a TV station or video tape, or for non-standard sync signals from video games or low cost cameras. Some VIR controlled receivers need a fully interlaced signal to properly identify the VIR signal. All VA62 patterns will be interlaced when the pushbutton is pressed in or non-interlaced when the button is released to the out position.

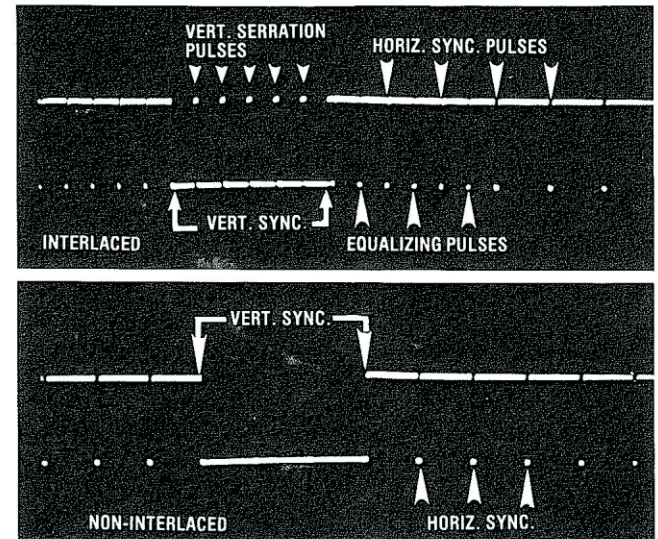


Fig. 12 — Interlaced vertical sync includes the equalizing pulses needed by some circuits to detect a fully interlaced signal. The non-interlaced signal deletes the equalizing pulses (as well as the half-line shift per video field) to duplicate non-interlaced signal sources.

## VIR Adder Switch

Some receivers use the VIR signal transmitted from the TV station to automatically control the color saturation and the tint phase of the picture. The VA62 provides a dynamic test for VIR systems. Depressing the front panel button marked VIR ADDER adds a standard VIR signal to any of the VA62 video patterns. This signal is added to line 19 of the vertical blanking interval as shown in Fig. 13. The VIR ADDER will be the most effective when used with the CHROMA BAR SWEEP or COLOR BARS pattern so that the change in actual color or tint can be seen. The INTERLACE ADDER must also be switched on for proper detection in both fields of the interlaced signal for most VIR controlled receivers.

## 10 Bar Staircase

The 10 BAR STAIRCASE pattern is used to troubleshoot luminance problems related to amplitude or dynamic operating range. The pattern also may be used to align stages that affect the linearity of the composite video signal, such as the tuning adjustment of a synchronous video detector.

The pattern consists of 10 levels of brightness equally spaced between black and white. This results in ten identifiable levels of brightness on a properly operating video receiver or monitor screen. An oscilloscope will show a waveform having ten equally spaced steps. Circuit defects in the receiver or monitor may affect any portion of the stairstep linearity.

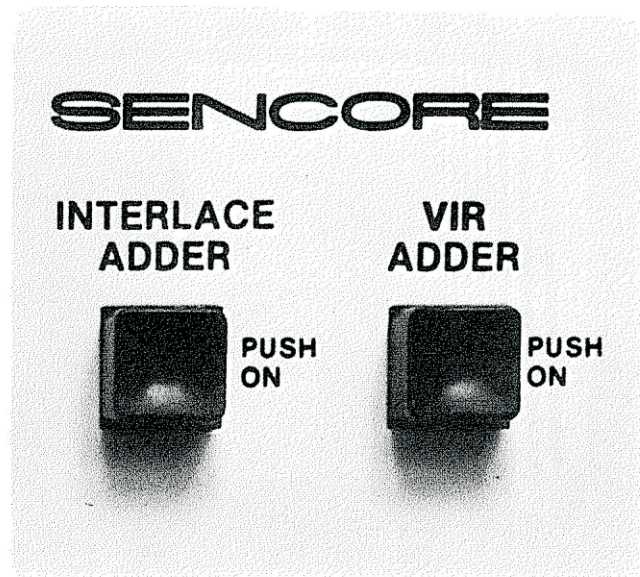


Fig. 11 — The INTERLACE ADDER and the VIR ADDER switches can be used to modify any of the patterns selected by the VIDEO PATTERN switch.



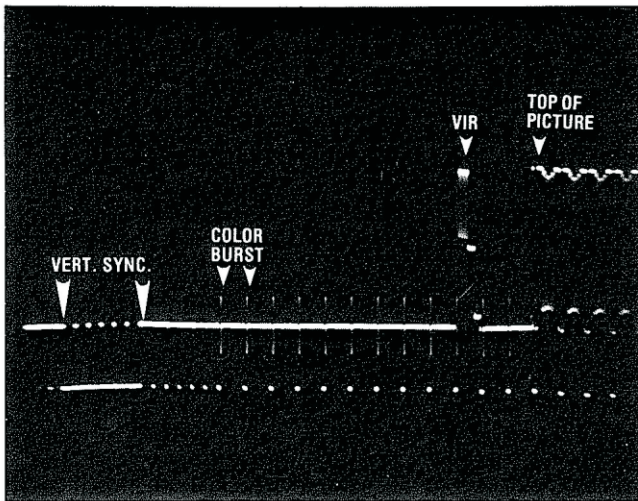


Fig. 13 — The VIR ADDER inserts a standard VIR signal on line 19 of vertical sync.

## RF-IF Generator

The RF-IF GENERATOR provides all the signals needed to inject before the audio or video detectors. The wide assortment of signals allows maximum troubleshooting effectiveness in the RF and IF stages. All signals are fed through a single attenuator and output jack to keep bench clutter to a minimum. Digitally preset functions combine with digitally programmable functions to greatly extend the uses of the generator for troubleshooting or alignment.

### RF Generator

The RF generator has three functions that closely match the functions of a digitally controlled tuner. The first function provides standard VHF and UHF

channel frequencies to test either conventional tuners or digital tuners. The second function replaces the UHF channels with cable channels in the mid-band, super-band, and hyper-band frequency ranges. The VHF channels in this function are the same as in the first function. The third function is the same as the second function except any of the selected channels may be moved above or below the standard FCC frequencies to match frequency offsets used by many cable systems. This final function also allows special tests of conventional systems that require the channel frequency to be shifted away from standard FCC frequencies.

### RF Attenuator

The output attenuator affects all three RF generator functions the same. The output level is fully adjustable from 5 microvolts to 5000 microvolts (5 millivolts) in three steps. The attenuator is micro-processor controlled. Each VA62 is individually programmed with correction factors for each channel, insuring a flat output across the entire band at the "1" reference point of the RF-IF LEVEL VERNIER. The result is a virtually flat attenuator for all frequencies. This insures accurate results and reliable tests of sensitivity across the entire tuning range of the receiver under test.

The table in Fig. 15 shows the different levels provided for each setting of the RF-IF LEVEL VERNIER for each step of the RF-IF LEVEL switch. The values listed are the microvolt levels delivered to a 75 ohm load, such as the coaxial input of a receiver equipped for direct cable connections. The actual microvolt level is twice the marked value if the signal is fed through a 75/300 ohm balun before being connected to the receiver.

**NOTE:** The signal levels for the IF generator outputs are 100 times larger than the RF generator for each of the settings of the RF-IF LEVEL switch positions. See page 19 for the table showing the IF output levels.

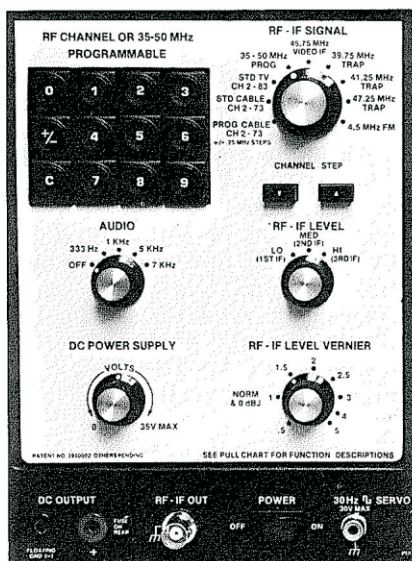


Fig. 14 — All signals selected by the RF-IF SIGNAL switch are controlled by the RF-IF LEVEL switch and the RF-IF LEVEL VERNIER before being fed to the RF-IF OUT jack.

TABLE I  
RF SIGNAL OUTPUT LEVELS

SIGNAL	RF-IF LEVEL CONTROL SETTING			
	.5	1 (norm)	2.5	5
Lo (1st IF)	5 $\mu$ V	10 $\mu$ V	25 $\mu$ V	50 $\mu$ V
Med (2nd IF)	50 $\mu$ V	100 $\mu$ V	250 $\mu$ V	500 $\mu$ V
Hi (3rd IF)	500 $\mu$ V	1000 $\mu$ V	2500 $\mu$ V (2.5mV)	5000 $\mu$ V (5mV)

Fig. 15 — RF signal outputs for various settings of the RF-IF LEVEL switch.



## Selecting Channels

Any of the RF channels may be selected using either of two methods. Channels may be entered randomly by entering the two numbers corresponding to the desired channel into the keyboard. Or, channels may be stepped up or down in sequence using the CHANNEL STEP buttons.

Both digits of the channel number must be entered when using the keyboard method. This means that the number zero must be entered before the channel number when selecting channels 2 through 9. The digital display guides you as you change numbers. For example, if you wish to change the RF generator from channel 12 to 9, you would begin by pressing the zero key. The left-hand digital display will then show "0-" indicating the number zero has been accepted and that one more number is needed to complete the program. The RF generator tunes off channel as soon as the first digit is entered. Pressing the 9 key causes the channel display to read "09". The generator immediately moves to channel 9.

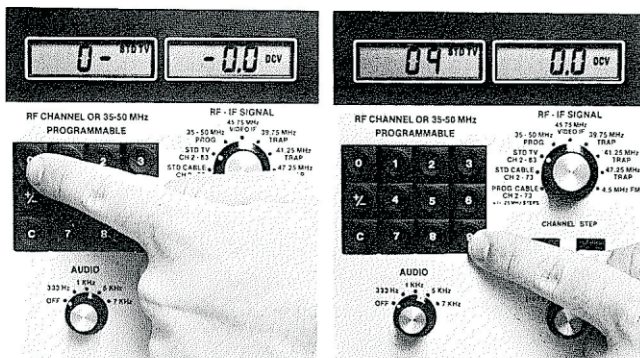


Fig. 16 — A "—" appears in the digital display to show how many digits must be entered. Always enter two digits, including a leading zero for channels 2 through 9.

Pressing the clear ("C") button clears both digits from the RF generator. This is especially helpful if you forgot to enter the leading zero for a channel between 2 and 9. When you use the "C" button, the RF generator *does not* remain on the last channel. In addition, the digital display will show "- -" indicating you must enter *both* numbers to select a channel.

The RF generator will automatically clear itself if you enter an invalid number, such as 85 or 99. The display shows the same "- -" as if you had cleared the generator manually, indicating you must enter both digits to return to a valid channel.

You may use the CHANNEL STEP buttons to step up or down one channel at a time in numerical sequence. The channel will step one channel each time the button with the arrow pointing up or the arrow

pointing down is pressed. The CHANNEL STEP buttons will not cause the channels to continually step if held down. The button must be released and pressed again before a channel step takes place.

The CHANNEL STEP feature has automatic rollover at the top and bottom ends. For example, if you have selected the STD TV function, and are stepping up in channels, the microprocessor will automatically step from channel 83 to channel 2. If you are stepping downward, it will automatically step from channel 2 to 83. Similarly, if you have one of the cable functions selected the rollover takes place between channels 2 and 73.

The RF generator has two "automatic return memories"; one for the STD TV function, and one for the two cable functions (STD CABLE and PROG CABLE). These memories recall the last channel selected, and return the RF generator to that channel when returning to that function after using some other function of the RF-IF SIGNAL switch. For example, if the last channel used in the STD TV position was channel 7, and the RF-IF SIGNAL switch was moved to one of the IF functions, the RF generator will return to channel 7 when the switch is moved back to the STD TV position.

The channel stored for the cable function may be different than the channel number stored in the STD TV memory. The memory for the two cable functions, however, is common to both STD CABLE and PROG CABLE so you can move back and forth between the two functions and stay on the same channel.

The automatic return memory is erased each time the VA62 is turned off. Both automatic return memories will always start at channel 2 when power is first applied.

## Modulation

Any channel produced by the VA62 will be modulated with the video pattern selected with the VIDEO PATTERN switch. In addition, you have the option of adding a sound carrier, 4.5 MHz above the video carrier, that is frequency modulated with any of the four audio frequencies. The frequencies are selected with the AUDIO switch. When the AUDIO switch is in the "OFF" position, there is no 4.5 MHz sound carrier or sound modulation. This provides clear patterns, as there is no beat between the sound carrier and the video carrier or its sidebands. When the AUDIO switch is moved to one of the four frequency positions, a tone will be heard at the speaker of the TV receiver if the sound stages are all working correctly.

## Standard TV Channels

The VA62 will produce any VHF or UHF channel when the RF-IF SIGNAL is in the STD TV position. All channels will be produced to FCC (non-offset) frequencies. The channels automatically move from the VHF to the UHF modes as the channels are entered.

**NOTE:** Remember to move the VA62 RF cable to



the UHF input terminals of the receiver when moving from VHF to UHF channels.

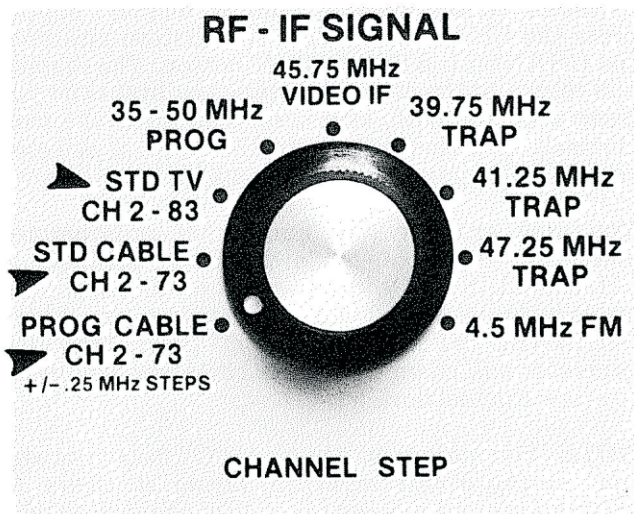


Fig. 17 — The VA62 provides three RF functions to cover standard and cable tuner channels.

### Standard Cable Channels

The STD CABLE position of the RF-IF SIGNAL switch produces standard channels 2 through 13 when channels 2 through 13 are selected with the keyboard. Channels 14 through 73, however, produce the mid-band, super-band, and hyper-band cable channels in order to test "cable ready" TV receivers or cable convertors. This function differs from the PROG CABLE function in that every VHF and cable channel is generated at the FCC specified frequency without offset.

**NOTE:** The cable/STD switch on "All Channel" receivers must be in the "cable" position to allow cable channels 14 - 73 to be received through the VHF antenna inputs.

### Programmable Cable Channels

Many cable systems shift some or all of the cable-cast channels from the FCC specified over-the-air frequencies to reduce interference or to provide special services. The FCC allows this practice as long as the cable company makes a convertor available that translates the shifted channels to one or more FCC specified channels. Many receivers have tuners capable of tuning these shifted signals without the need of a convertor. Some tuners, however, are not capable of following the frequency shifts if they exceed a certain amount. The PROG CABLE function of the VA62 lets you duplicate any cable shift to test any receiver for proper lock-in on all channels.

The PROG CABLE function lets you program a shift of any frequency between 0.25 MHz and 9.75 MHz into any of the VA62 channels you desire. This programming is normally only done one time, as you set up the VA62 to match the cable shifts in your area. You may, however, reprogram the shifts as

often as you would like, leading to special tests covered in the "Application" section of this manual.

The programming is done channel by channel. All channels are programmed for zero shift when your VA62 leaves the factory. You may then shift selected channels or all channels, depending on your specific testing needs.

The programming instructions are stored in non-volatile memory, meaning that the VA62 will retain the desired shift for each channel until you reprogram a different shift into that channel. The memory will not be lost if the VA62 is turned off or unplugged, and there is no internal battery to worry about. The special "EEPROM" (Electrically Erasable Programmable Read Only Memory) maintains its programming instructions without any power at all.

In addition to this semi-permanent shifting, the VA62 also allows a temporary shift that is a "mirror image" of the programmed shift. If, for example, you have programmed a +1 MHz shift on a channel, you can temporarily shift that channel to -1 MHz without altering the program memory. This allows quick tests of automatic frequency control (AFC) circuits, even if the TV will not be used on a cable system using shifted carriers.

The programming and operating instructions are simple to follow. You do not need to memorize these instructions in most cases because you only need to program the channels one time to match the shifts on the cable system in your area. If the cable company changes the shifting arrangement at some time in the future, simply refer to these instructions to make the necessary changes.

To program a desired shift:

1. Move the RF-IF SIGNAL switch to the PROG CABLE position.
2. Select the first channel you wish to program using either the keyboard or the CHANNEL STEP buttons.
3. Press the special function " $\pm$ " key on the keyboard. The digital display will show the shift presently programmed into the selected channel. A display of 0.00 indicates no shift is programmed.
4. Note the display segment to the left of the first displayed number. If the digit is blank, the microprocessor is ready to accept a *positive* shift. If there is a "-", the microprocessor is ready to accept a *negative* shift. If the wrong polarity is shown, press the " $\pm$ " key to reverse the direction. The " $\pm$ " key may be pressed as many times as desired, with the polarity of the shift changing each time.
5. Enter the three numbers for desired shift. You must enter *three* digits. You must enter a zero first for any shift less than 1 MHz. For example, a shift of .75 MHz requires a 0-7-5 entry. The VA62 automatically places the decimal point after the first entered number. The digital display shows how many numbers must be entered to finish the shift.



**NOTE:** You may press the "C" button any time you have made an error. The "C" button takes the VA62 out of the programming mode and will cause the channel display to show "-.-", indicating you must enter both digits of a channel number before continuing with any other tests. For example, if you made an error while programming a shift to channel 12, press the "C" button. Then press the "1" and the "2" button to return to channel 12 and the "±" key to return to the programming sequence.

6. After you have entered the third number, the display will momentarily go blank to indicate that the microprocessor has accepted your instructions. The display will then return to the channel number, indicating the programming is complete. The new shift takes effect as soon as the channel number reappears.

7. Move to the next channel you wish to program and repeat steps 3 through 6.

**NOTE:** The RF generator may only be shifted in steps of 0.25 MHz. The microprocessor will automatically round any other number up or down to the nearest 0.25 MHz step.

## Reading Shifted Frequencies

You may wish to confirm that the microprocessor has accepted the correct shift while entering programmed shifts, or you may at some time want to check to see if a particular channel has been shifted in the PROG CABLE mode. The VA62 offers two ways to recall the shifted frequencies; one to check individual channels, and one to check a number of channels in sequence. Both depend on the fact that the channel display shows the shifted frequency when the special function "±" key is pressed.

2. Press the "±" key. The left-hand digital display will now show the amount of frequency shift on the selected channel.

3. You may leave the shifted frequency displayed without affecting the resulting output. If you prefer to return to the channel number display, simply press the CHANNEL STEP UP button and then the CHANNEL STEP DOWN button. The display will return to the channel display the first time you press a button (and, of course, step up to the next channel), and then return to the original selected channel when you press the second button.

You may examine any number of programmed shifts in sequence by alternately pressing a CHANNEL STEP button and the "±" key. You may step up or down, depending on which CHANNEL STEP button you press. The RF generator will change channels each time you move to a new channel during this test.

**NOTE:** You may press the clear "C" button at any time during a test sequence. Doing so clears all instructions and returns the digital channel display to "-.-". You must enter a 2-digit channel number to continue with any tests.

## Temporary Direction Shift

Certain applications may require that you test a given channel at frequencies above and below the assigned FCC frequency. For example, you may need to know if the AFC alignment provides an equal amount of pull-in both directions from the center frequency. The VA62 lets you change the direction of the shift on any channel without reprogramming the shift memory. The only limitation you have is that the amount of the carrier shift must be the same in both directions. For example, a channel programmed for a +.75 MHz shift may be alternated between the programmed +.75 MHz and a -.75 MHz shift.

The temporary shifting uses the special function "±" key. After the first time it is pressed to enter the program mode, the "±" key causes the direction of the shift to alternate each time it is pressed. The direction of the shift will be indicated by the polarity sign to the left of the shift frequency displayed in the digital display. The shift memory will not be affected unless a new three-digit shift number is entered after the RF generator is in the programming mode. If you want to permanently change the direction of the programmed shift, simply re-enter the three digits representing the shift after the desired polarity sign is shown.

To alternate shift direction:

1. Select the desired channel.
2. Press the "±" key. The programmed shift frequency will show in the left-hand digital display.
3. Press the "±" key again. The amount of shift shown in the digital display will stay the same, but the polarity sign to the left of the shift numbers will change.

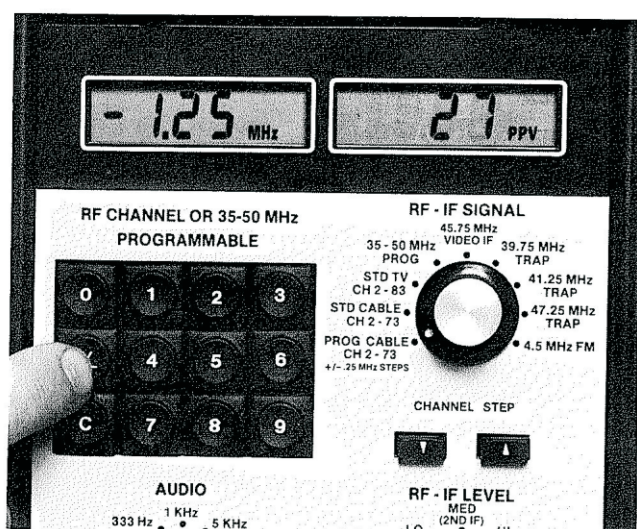


Fig. 18 — Press the special function "±" key to read the amount of carrier shift programmed into any PROG CABLE channel.

To check an individual channel shift:

1. Select the desired channel.



The direction may be shifted as many times as you want for a given channel. Since the program memory is not altered, the direction of the shift will be correct when you later return to the same channel. For example, if channel 14 has a +1.25 MHz shift programmed, the digital display will read "1.25 MHz" the first time you press the "±" key (the "+" sign is implied). Pressing the "±" key again will change the display to "-1.25 MHz". If you now move to a different channel (by pressing one of the CHANNEL STEP buttons or by pressing the "C" button and entering a new channel number) and later come back to channel 14, the shift will be in the + direction even though it had been a negative shift when you changed channels.

## IF Generator

The VA62 IF generator can be broken into four main functions: 1.) The programmable generator, 2.) The crystal-controlled, troubleshooting generator, 3.) The special trap setting signals, and 4.) The sound IF generator. Each of the four sections have different methods of applying audio or video modulation that provide extra testing capabilities for a variety of applications. All signals are fed through the same attenuator and output jack as were used for the RF generator. This section of the manual explains how to operate the various functions. Details on their use are found in the "Application" section.

### IF Attenuator

The output attenuator affects all four IF generator functions the same. The output level is fully adjustable from 500 microvolts (0.5 millivolts) to 500,000 microvolts (0.5 volts). Note that these values are 100 times larger than the RF generator values for each setting of the RF-IF LEVEL switch to properly match the typical levels found in the first, second, and third video IF amplifiers. See page 15 for details about the levels supplied by the RF generator.

The table in Fig. 19 shows the different IF levels provided for each setting of the RF-IF LEVEL switch. The values listed are the microvolt levels delivered to a 75 ohm load, such as the input of the first IF stage. The actual microvolt level is twice the marked value if the signal is fed through a 75/300 ohm balun before being injected into a stage.

TABLE II  
IF SIGNAL OUTPUT LEVELS

SIGNAL	RF-IF LEVEL CONTROL SETTING			
	.5	1 (norm)	2.5	5
Lo (1st IF)	500μV	1000μV	2500μV	5000μV (5mV)
Med (2nd IF)	5000μV (5mV)	10mV	25mV	50mV
Hi (3rd IF)	50mV	100mV	250mV	500mV (.5V)

Fig. 19 — IF signal outputs for various settings of the RF-IF LEVEL switch.

**NOTE:** Only use the balun supplied with the VA62 for signal injection purposes. This balun has DC blocking capacitors that are not found in conventional TV baluns. The capacitors are necessary to prevent the balun from shorting out bias signals.

The "1" position of the RF-IF LEVEL VERNIER control is considered the reference point for most IF testing. A properly operating system, for example, should produce a snow-free picture when the RF-IF LEVEL switch is set to the "1st IF" position and the RF-IF LEVEL VERNIER is set to "1". This produces a 1000 uV signal.

### Programmable IF Generator

The 35-50 MHz PROG position of the RF-IF SIGNAL switch provides a single carrier at any frequency between 35 and 50 MHz. The carrier may be programmed to within .01 MHz (10 KHz) by entering the required frequency to the keyboard. The function has an automatic return memory so you can move to any other function of the RF-IF SIGNAL switch and return to the same frequency last entered. The memory is erased each time the VA62 is turned off. The memory will always start at 35.00 when power is first applied.

The programmable IF generator *does not* have video modulation. The carrier may be amplitude modulated with any of the audio tones selected by the AUDIO switch. When the AUDIO switch is in the "OFF" position, the programmable IF generator produces an unmodulated carrier.

Selecting a frequency requires that you enter *four* digits to the keyboard. The microprocessor recognizes the digits from left to right as you enter the digits. The decimal point is automatically placed after the second digit. The digital display shows positions that need filling with a "-". Pressing the "C" clear button or entering an invalid number (such as 25.00 MHz or 51.25 MHz) causes the generator to clear. The

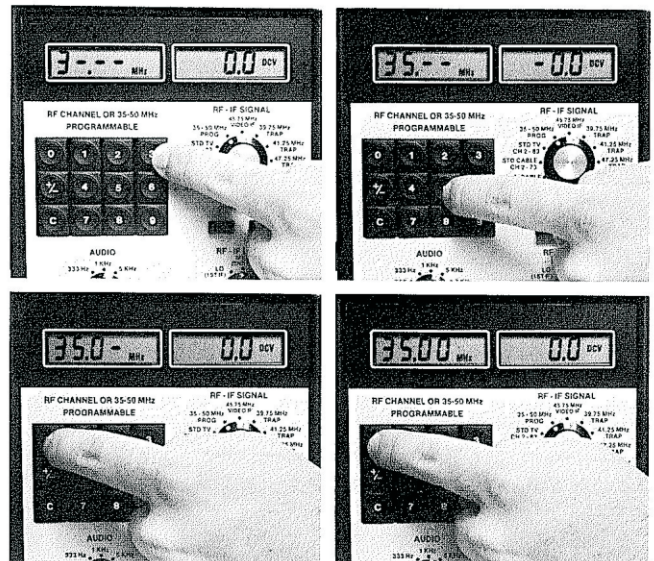


Fig. 20 — Four digits must be entered into the keyboard to program a new frequency. The digital display shows a "-" for each digit that must be filled to finish selecting a new frequency.



digital display will show “-.-”, indicating that four digits must be entered before the generator will put out a valid signal. This is only true when a “clear” function is pressed, not when moving from one frequency to another without going through a “clear” function.

The normal sequence (without clearing the display) is to enter the four digits for the next desired frequency. The digital display will show the first number entered in the left-hand position of the digital display as soon as the first button is pressed. The last three places will show a dash, indicating you must enter three more numbers before the microprocessor accepts the new number. The IF generator continues to put out the old frequency until the fourth digit is entered.

To program a frequency:

1. Move the RF-IF SIGNAL switch to the 35-50 MHz PROG position. The digital display will show the last frequency programmed into memory.

2. Press the key corresponding to the first digit of the desired new frequency (for example, press 3 if the new number is to be 35.00 MHz). The digital display will show the first entered number, the correctly placed decimal point, and three dashes (“3.-” in our example).

3. Press the key corresponding to the second digit of the new frequency (5 in our example). The digital display will show the number already entered, plus the new digit, plus dashes for any unentered digits (“35.-” for the example).

4. Press the next key (zero); the display will add the new number (“35.0-”), followed by the final key (zero); causing the display to show a complete number (“35.00”).

The generator moves to the new frequency as soon as the fourth digit is entered.

## IF Troubleshooting Generator

The position of the RF-IF SIGNAL switch marked “45.75 MHz VIDEO IF” produces a crystal-controlled carrier that is fully modulated with the video information selected by the VIDEO PATTERN switch. In addition, this signal may have a 4.5 MHz sound carrier added which can be modulated with any of the four frequencies selected by the AUDIO switch.

The full modulation allows the signal to be injected into any IF stage for troubleshooting or alignment. A picture and (if desired) sound will appear at the receiver output if all video and audio stages work correctly. The RF-IF LEVEL switch selects preset levels to match the levels normally found in the first, second, or third IF stages.

The VA62 is supplied with two adapters plus a special matching balun to use with the IF generator. The adapters provide a male and a female RCA-type phono connection to match the connectors found on most tuners. The balun contains special DC

blocking capacitors to allow connections to circuits without affecting the DC bias. The “Application” section of this manual covers uses of these connectors for different applications.

The audio modulation works exactly the same as the audio modulation for the RF generator. When the AUDIO switch is off, there is no 4.5 MHz carrier. When the AUDIO switch is set to any of the four positions marked with a frequency, the 4.5 MHz sound carrier is added to the video carrier, and frequency modulated with the selected frequency.

To use the IF Troubleshooting Generator:

1. Move the RF-IF SIGNAL switch to the “45.75 MHz VIDEO IF” position.

2. Set the VIDEO PATTERN switch to the desired video pattern.

3. Connect the RF-IF OUT cable to the desired test point using an appropriate connector or adapter.

4. Set the RF-IF LEVEL switch and the RF-IF LEVEL VERNIER to the desired level.

5. Set the AUDIO switch for the desired sound modulation.

- A. If no sound modulation is desired, set the AUDIO switch to the “off” position.

- B. If sound modulation is desired, set the AUDIO switch to the desired modulating frequency.

## Trap Setting Signals

The VA62 produces three totally unique signals which greatly simplify the adjustment of the three most common traps found in the video IF: the 39.75 MHz *adjacent video trap*, the 41.25 MHz *sound trap*, and the 47.25 MHz *adjacent sound trap*. The VA62 dynamically duplicates the interference conditions the traps are designed to eliminate. The VA62 produces a fully modulated video carrier along with the interfering carrier the trap should eliminate.

The interfering carrier may be unmodulated or modulated with any of the four frequencies selected by the AUDIO switch. The video reference carrier is supplied at a fixed amplitude of 1000 microvolts, which holds the keyed AGC at a fixed level that is unaffected by the level of the interfering carrier. The amplitude of the interfering carrier is fully adjustable with the RF-IF LEVEL switch and the RF-IF LEVEL VERNIER so the ratio of the reference signal to the interfering carrier can be set for best contrast. This results in a useable signal for any receiver.

The traps are adjusted until the amount of beat between the interfering carrier and the video pattern is at a minimum. Generally, the MULTIBURST BAR SWEEP or the 10 BAR STAIRCASE video patterns provide the best contrast. In addition, the 333 Hz or 1 KHz positions of the AUDIO switch usually give the best contrast



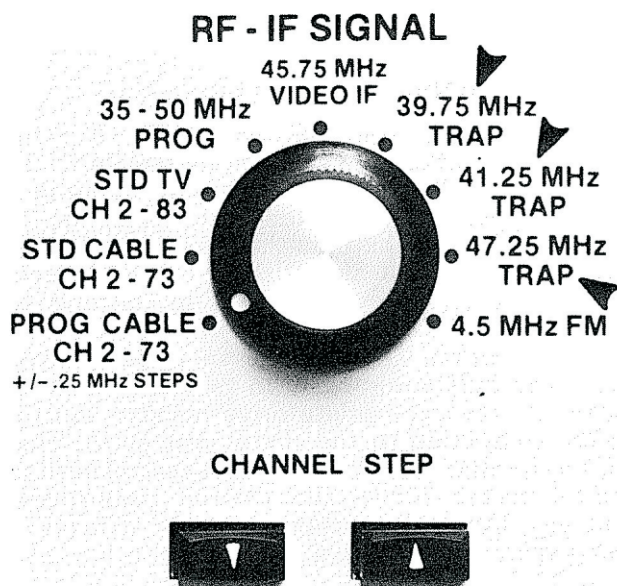


Fig. 21 — The three most common trap frequencies modulate an interfering carrier added to the video carrier to simplify trap setting.

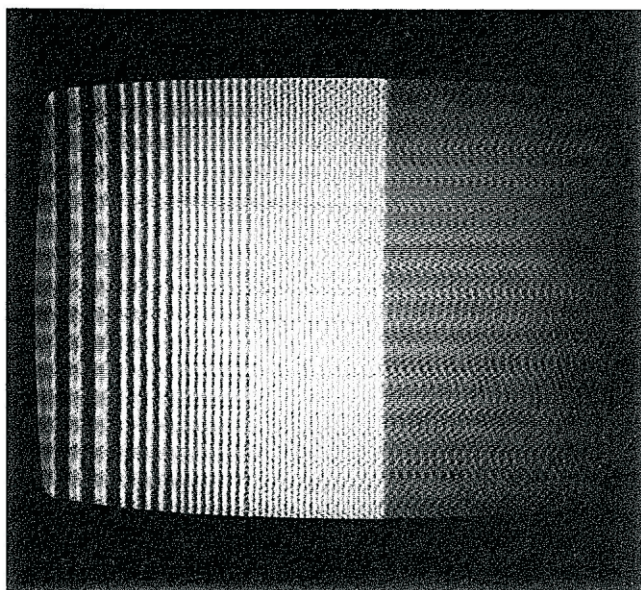


Fig. 22 — Adjust the trap for the least amount of interference when using the special trap-setting signals.

on the interfering carrier signal. Most traps are easier to set when viewing the CRT of the receiver or monitor, rather than attempting to use an oscilloscope connected to the video detector. Fig. 22 shows the video pattern with a poorly adjusted trap and with the trap set for minimum interference to show the difference in contrast.

#### To use the Trap Setting Signals:

1. Connect the VA62 to the IF input or to the UHF input of the VHF tuner (remember to set the VHF tuner to the UHF position if you are using the tuner input).
2. Select the desired trap setting frequency (39.75, 41.25, or 47.25 MHz) on the RF-IF SIGNAL switch.
3. Select the desired video signal with the VIDEO

PATTERN switch and the desired interfering carrier modulation with the AUDIO switch (the interfering carrier is still present with the AUDIO switch in the "off" position, but will not produce the horizontal bars shown in Fig. 22).

*NOTE: You cannot mix an FM sound carrier with any of the special trap-setting signals. The AUDIO switch controls the frequency used to amplitude modulate the interfering carrier, rather than selecting an audio FM signal.*

4. Adjust the RF-IF SIGNAL switch and the RF-IF LEVEL VERNIER until the interfering carrier barely affects the video pattern. You may not see the proper null point if you have the level of the interfering carrier set too high.

5. Adjust the trap that corresponds to the selected trap frequency until the interference in the video pattern is at its lowest level.

*NOTE: You may need to increase the setting of the RF-IF LEVEL VERNIER if the interference disappears before the trap reaches its proper null point.*

6. Repeat steps 2 through 5 for the remaining traps.

#### Sound IF

The final IF function is the 4.5 MHz FM position. This signal is used to troubleshoot or align the audio IF or detector circuits. The signal may be fed into the receiver as an unmodulated 4.5 MHz carrier or frequency modulated with one of the four tones selected with the AUDIO switch.

*NOTE: This is different than all other positions of the RF-IF SIGNAL switch that may be FM modulated with the AUDIO switch. All other positions remove the 4.5 MHz carrier when the AUDIO switch is in the "OFF" position. This position removes the modulation, but the carrier remains.*

To apply the sound IF signal:

1. Set the RF-IF SIGNAL switch to the "4.5 MHz FM" position.
2. Connect the RF-IF OUT cable to the desired test point using the supplied balun.
3. If modulation is desired, set the AUDIO switch to one of the four positions marked with a frequency; otherwise set it to "OFF".
4. Adjust the output level with the RF-IF LEVEL switch and the RF-IF LEVEL VERNIER controls.

## Special Functions

The VA62 provides a number of features in addition to the phase-locked signal generator needed to apply signal substitution for functional analyzing. These features round out the unit to make it a complete



video analyzer. These features are generally not duplicated by other instruments such as oscilloscopes, meters, and component testers, meaning the special features enhance the capability of most service benches.

The main feature is the DIGITAL METER which allows drive signals or external signals to be monitored. The second feature (which is part of the meter) is the patented RINGING TEST which accurately tests deflection yokes and flyback transformers. The third special feature is the regulated, adjustable power supply which simplifies the troubleshooting of automatic feedback circuits, direct-coupled amplifiers, and power supplies derived from the horizontal output section. The final feature is the accessory drive jack located inside the lead storage compartment which drives special accessories needed by only some VA62 users. Details on all of these features are found in the "Application" section of the manual. The following section provides operating instructions for each special feature.

## Digital Meter

The DIGITAL METER has several uses. First, it allows the amplitude of any of the internal drive signals to be measured to prevent overdriving stages and to indicate when a drive signal is driving a shorted circuit. Second, the meter provides an auto-ranging DC voltmeter capable of measuring circuit voltages to 2000 volts directly, 10,000 volts with the optional TP212 Transient Protector probe, and 50,000 volts with the optional HP200 High Voltage probe. The TP212 also provides a reliable method of testing high voltage triplers and integrated flyback transformers that have the triplers built in. Third, the meter provides the only autoranging meter capable of measuring peak-to-peak voltage in a circuit, with wide enough frequency response (4 MHz) to measure color signals correctly. Finally, the meter is part of the RINGING TEST, which is covered in the section

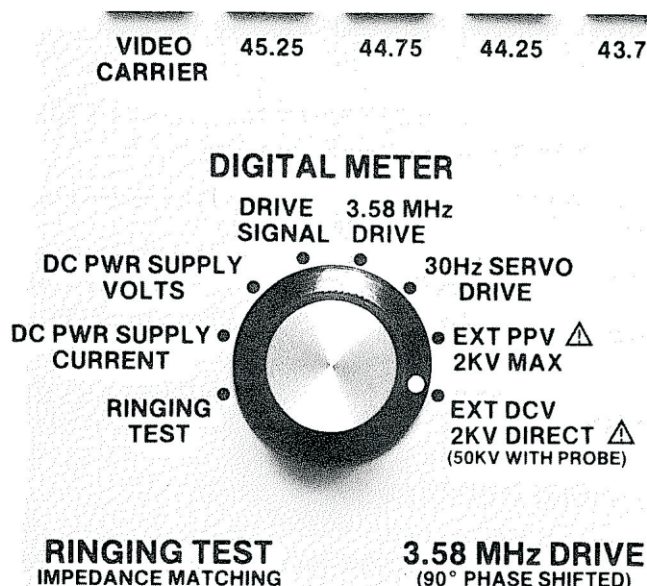


Fig. 23 — The DIGITAL METER switch selects a number of auto-ranged internal and external meter functions.

following the general meter tests.

## Drive Signal Monitors

Five positions of the DIGITAL METER switch provide tests of signals supplied by the VA62. The first three of these functions measure the peak-to-peak amplitude of the three drive outputs; the DRIVE SIGNAL output, the 3.53 MHz DRIVE output, and the 30 Hz SERVO DRIVE output. Each drive signal is monitored by moving the DIGITAL METER switch to the appropriately marked position. The readings are in peak-to-peak volts, and fully autoranged. In general, you should switch to the appropriate drive monitor function before connecting to the circuit test point. Then, adjust the appropriate drive output control until the digital meter shows the desired peak-to-peak voltage. This will prevent possible damage to components from driving a circuit with too much voltage. It will also show if the drive signal is connected to a test point that is drawing excessive current, as the meter will show loading with a reduced peak-to-peak voltage.

The last two internal monitoring functions apply to the adjustable DC power supply. The first position monitors the DC voltage of the supply. It functions just like the other drive signal monitors, except it measures DC rather than peak-to-peak volts. The other power supply monitor measures the current supplied by the current-limited power supply. Knowing the current drawn by a circuit often indicates whether or not it is working correctly.

## External DC Measurements

The digital meter functions as an autoranged DC voltmeter when the DIGITAL METER switch is in the EXT DCV position. The signal to be measured must be connected to the EXT PPV & DCV IN jacks. Notice that the black "common" jack is labeled as a floating ground. This means the common connection may be connected to a point other than circuit ground, such as when measuring

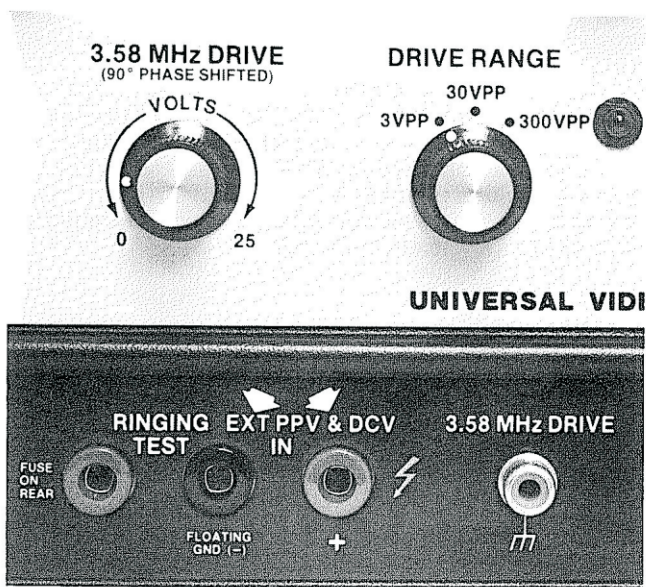


Fig. 24 — Standard test leads are connected to the external input jacks to measure DC or peak-to-peak voltages in the circuits.



the voltage drop across a resistor in a circuit, or when measuring the DC voltage in a hot-ground/cold-ground system. It also means that a separate ground lead must always be connected when using the DCV function.

### WARNING

Do not exceed the input rating of the EXT PPV & DCV IN. The maximum potential that can safely be applied between the input connectors is 2000 volts (DC + Peak AC) without the use of a voltage extender probe. The maximum voltage the common terminal may be floated above other common terminals is 1500 volts (DC + Peak AC).

To measure a DC voltage:

1. Select the EXT DCV position of the DIGITAL METER switch.

2. Connect a black test lead to the black connector and the supplied meter probe to the red (+) jack marked EXT PPV & DCV IN.

3. Connect the black test lead to the common point of the circuit to be measured.

*NOTE: The common meter lead must be connected every time, even if other VA62 common leads are connected to the same circuit, because the meter input is floating from all other inputs.*

4. Connect the probe to the test point to be measured. The meter will automatically select the correct range and place the decimal point. There will be no polarity sign shown if the red lead is more positive than the black lead. A negative sign will appear in the left-hand position if the red lead is more negative than the black lead.

### Measuring Over 2000 Volts DC

Two optional high voltage probes allow DC measurements over 2000 volts. These probes divide the DC signal by 10 or 100 before applying it to the VA62 EXT PPV & DCV IN input. The supplied meter probe slips into the special connector in the rear of the multiplier probe which, in turn, connects to the circuit.

The optional TP212 Transient Protector Probe allows voltages to 10,000 volts to be measured with 1% accuracy. The TP212 divides the DC voltage by 10, meaning the decimal point must be moved **one place to the right** for the actual circuit voltage. For example, a reading of 395 volts represents a circuit voltage of 3950 volts.

The optional HP200 High Voltage Probe allows voltage measurements to 50 KV with 2% accuracy. The HP200 divides the input signal by 100, requiring the decimal point of the displayed value to be moved **two places to the right** for the actual circuit voltage. For example, a reading of 395 volts represents a circuit voltage of 39,500 volts.



Fig. 25 — The optional high voltage probes allow measurement of DC voltages to 10,000 or 50,000 volts.

*NOTE: The high voltage probes increase the input impedance by a factor of 10 or 100, allowing measurements in high impedance circuits with minimum loading. The TP212 results in a 150 megohm input impedance. The HP200 results in a 1500 megohm (1.5 gigohm) input impedance. Use Sencore high voltage probes only. They are designed to match an input impedance of 15 megohm. Other manufacturer's probes may not be designed in this manner and will cause erroneous readings.*

### WARNING

Never attempt to perform any high voltage testing until you have completely read and understood the following warnings and instructions!

1. Never try to measure more than 2000 volts without a high voltage probe. Measuring high voltage with a direct connection may damage the VA62, the equipment under test, and/or cause a severe shock hazard to the operator.

2. Connect the ground lead in such a way that it cannot become detached during the test. If it should become loose during a test, do not touch the lead, the VA62, or the circuit under test until power has been removed as there is a severe shock hazard. Be sure the VA62 operates correctly before continuing the test. **Damage to the VA62 caused by improper grounding is not covered by any warranty.**

3. Connect to the correct ground point. Some chassis use a separate ground for the primary and secondary of the high voltage transformer. Be sure your common lead is connected to the correct one.

4. Immediately remove power to the circuit if the high voltage probe comes loose. Do not touch the high voltage probe until the power has been removed and the high voltage has been discharged as there is the possibility of a severe shock hazard.

5. If the high voltage probe must be held, do so



with extreme caution. Be sure the connections to the probe and the ground lead are firmly attached. Hold the probe behind the molded safety rings to prevent the possibility of contacting the high voltage test point or to prevent arcing across the probe to your body.

6. Remove the power to the circuit under test before making connection to the test point or before disconnecting the high voltage probe from the circuit.

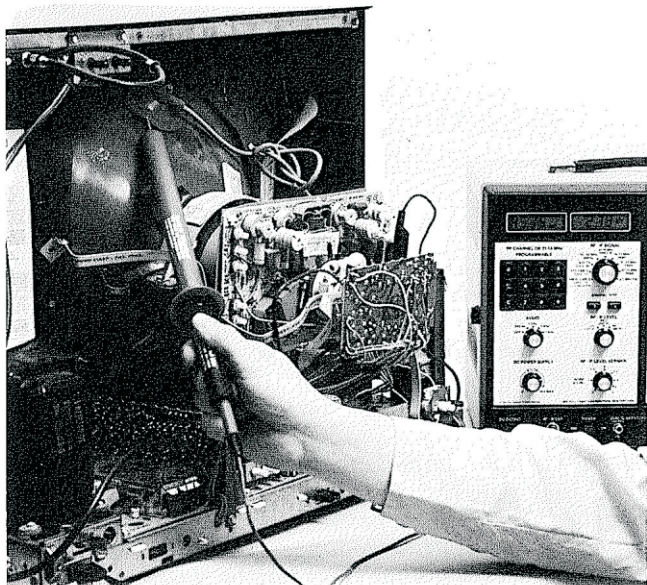


Fig. 26 — Use caution when measuring high voltage with the HP200 50,000 volt high voltage probe.

To measure over 2000 volts DC:

1. Remove power from the equipment in which the high voltage is to be measured.

2. Connect the meter probe to the EXT PPV & DCV IN jack. Be sure the connector is firmly seated.

3. Slide the tip of the meter probe into the opening at the rear of the high voltage probe. Be sure the tip is firmly seated in the connector inside the probe in such a way that it cannot become detached during the measurement.

4. Securely attach the black ground lead supplied with the VA62 to the common point of the circuit to be tested. Be sure you are connecting to the correct common point and that this lead cannot become detached during the high voltage measurement. Connect the other end to the black EXT PPV & DCV IN jack on the VA62.

*NOTE: The common lead of the VA62 must not be floated more than 1500 volts (DC + Peak AC) above earth ground.*

5. Connect the high voltage probe to the test point to be measured in such a way that the probe does not have to be held during the measurement. See warning number 5 above if the probe absolutely must be held.

6. Set the DIGITAL METER switch to the EXT DCV position.

7. Apply power to the equipment under test.

8. Multiply the reading on the digital display by 10 when using the TP212 or by 100 when using the HP200.

9. Remove power to the equipment under test before disconnecting the high voltage probe.

## Ringing Test

The RINGING TEST provides a fast and reliable test of deflection yokes and horizontal flyback transformers. The VA62 RINGING TEST may be used to test coils other than yokes and flybacks, but the test *might not be based on the number 10 for other coils*. The test dynamically checks all the coils in a flyback or yoke for shorts, opens, and shorted turns. A single shorted turn causes all other coils with a common core to read bad, meaning most testing is done with a single connection.

The number 10 forms the basis for testing yokes and flybacks. A coil in a yoke or flyback that is good will show a number of 10 or more rings in one or more positions of the RINGING TEST IMPEDANCE MATCHING switch. *It does not matter how much larger the number is than 10, which positions of the IMPEDANCE MATCHING switch produce the reading, or how many positions of the switch read greater than 10.* Some good coils may read just over 10 in only one position of the switch, while other may read well over 10 in three or four positions.

*The RINGING TEST will not test coils with laminated iron cores such as audio output, vertical output, or power transformers, or power chokes. Many coils with a powdered iron core or air core can be tested. However, since the 10 scaling applies only to yokes and flybacks, a known-good coil should be tested first to determine the correct good/bad cutoff.*

Details on using the RINGING TEST are found in the "Application" section on page 44. The instructions are found there because of the application-type detail needed to properly explain the use of the RINGING TEST. Also, certain flybacks with built-in triplers require other tests.

## DC Power Supply

The DC POWER SUPPLY is specially designed for troubleshooting a number of DC-related problems. The supply allows you to break the feedback in automatic circuits, such as automatic frequency controls (AFC), automatic gain controls (AGC), automatic color controls (ACC), automatic color killers (ACK), etc. This supply is also very important when troubleshooting vertical stages that are direct coupled. Defects in direct coupled stages often bias later stages off, requiring that the correct DC bias be restored before a substitute signal is injected. The DC POWER SUPPLY may also be used to substitute for power supplies derived from the horizontal output circuits, especially when troubleshooting a shutdown or startup problem. The DC POWER SUPPLY can



also be used as a general power supply for any other application. Details on the most common uses of the DC supply are found in the "Application" section of the manual.



Fig. 27 — The DC POWER SUPPLY provides an adjustable, regulated DC voltage. The outputs are floating to allow connection to non-grounded circuits.

The DC POWER SUPPLY is fully adjustable from zero to 35 volts and is current-limited to 1 ampere. Fuse protection prevents damage to the supply if an external current is fed into its jacks. The fuse will not normally blow when the supply is fed to a circuit, even if the circuit is shorted, because of the current limiting. Confirm that the circuit under test is not feeding current back into the VA62 if the fuse should blow.

The DC OUTPUT jacks are isolated from the VA62 chassis and from the other VA62 grounds. This allows the common (—) lead to be connected to any point up to 1500 volts (DC + Peak AC) above ground. One use of the floating output is to supply a negative bias. In this case, simply ground the +lead rather than the —lead. Other applications may require that neither power supply lead be grounded, such as when it is necessary to apply power to a transistor that is isolated from ground by a bias resistor.

The output voltage and current may be monitored by the VA62 digital meter. Simply move the DIGITAL METER switch to the DC PWR SUPPLY VOLTS or the DC PWR SUPPLY CURRENT position to monitor the output. Normally, you will want to monitor voltage while adjusting the DC POWER SUPPLY control, and then switch to current to monitor the effects of the circuit.

## VCR Standard Output

The VCR STANDARD jack provides an EIA standard composite video output of 1 volt into 75 ohms, negative sync polarity. This output matches almost all video inputs found on tape recorders, monitors, projection systems, distribution amplifiers, special effects generators, etc. The video pattern at the VCR STANDARD jack is selected by

the VIDEO PATTERN switch and phase-locked to all other signals. The frequency response of the VCR STANDARD jack output amplifier is flat through the entire 4.5 MHz bandwidth of the MULTIBURST BAR SWEEP video pattern for accurate testing of high resolution systems.

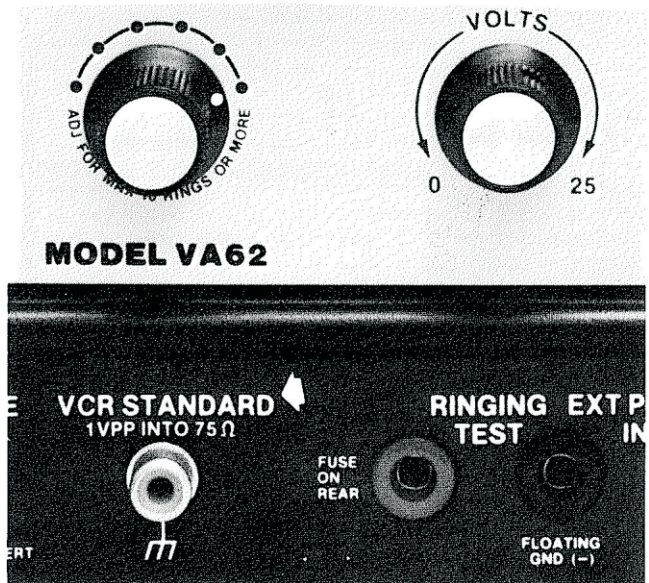


Fig. 28 — The VCR STANDARD output jack provides a 1 volt peak-to-peak, composite video signal with negative sync when fed into a 75 ohm load.

The VCR STANDARD jack must be terminated with an impedance of 75 ohms for proper operation. This termination is normally provided by the input of the device under test. If the device has a switch that selects between a terminated or bridged output, the switch must be in the "terminate" position. If the device does not have a 75 ohm input, or if you are monitoring the output of the jack with an oscilloscope or other instrument, you must supply the termination in the form of a resistor.

*NOTE: The VCR STANDARD jack will show compression of the top levels of the 10 BAR STAIRCASE signal if it is not terminated. It will also show an output of about 2 volts peak-to-peak.*

## Accessory Output Jack

A special multi-connector jack in the LEAD STORAGE COMPARTMENT allows external accessories to be added to the VA62 to form a complete video troubleshooting system. The signals supplied by the VA62 (without the accessories) are universal to a wide range of applications. Special signals unique to a particular video system (such as a tape recorder) or used in limited applications will be built up in an accessory. This prevents the VA62 from becoming obsolete as new standards and special circuits are introduced in the future.

The jack supplies all the signals needed to build up signals in the accessory that are phase-locked to all of the other VA62 signals. Thus the accessory is an extension of the powerful VA62 analyzing features. Most accessories will be powered from the VA62, eliminating the need for extra power connections and allowing them to be controlled with the VA62 POWER switch.



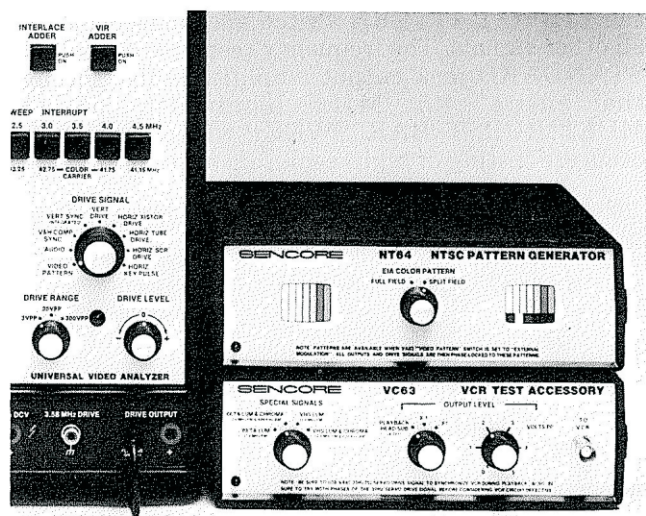


Fig. 29 — External accessories will be phase-locked to the other VA62 signals when they receive reference signals from the accessory jack in the lead storage compartment.

The accessories are designed to stack next to the VA62. The rubber feet of each accessory nest into recesses in the accessory below it to keep the accessories in a neat stack. Four accessories are the same height as the VA62 to keep the bench neat and orderly. A signal splitter is available to allow several accessories to be connected to the single output jack at the same time. Details on the operation and application of each accessory are included in the accessory's instruction/application manual.

**NOTE:** Be sure to mail your warranty card to the Sencore factory so you can be kept up to date on new accessories as they are introduced.

## Drive Signals

Signal substitution is recognized as one of the most effective methods of isolating troubles in complex video systems. Details on the use of the VA62 for isolating problems with signal substitution are found in the "Application" section of this manual. The section that follows provides a general description of each of the VA62 drive signals.

Effective use of signal substitution requires that the signals supplied by the analyzer closely match the amplitude, impedance, and waveshape of the signals normally found in the circuits being analyzed. The VA62 provides this matching through three controls: The DRIVE SIGNAL switch selects the proper waveshape, the DRIVE RANGE switch selects one of three ranges of amplitude and output impedance, and the DRIVE LEVEL control acts as a vernier-type control to set the exact signal amplitude needed to drive each circuit.

Each of the drive signals is referenced to the composite video signal selected by the VIDEO PATTERN switch. The VA62 drive circuits separate the composite video signal into its component parts or form it into special waveshapes, just like the various stages of a video

receiver or VCR do. Since drive signals come from a common signal source, they are all phase-locked to each other and to all other VA62 signals. For example, the sync signals from the DRIVE SIGNAL section are in perfect synchronization with the signals supplied by the RF-IF section, the VCR STANDARD output, and the accessory output on the rear of the unit. Thus, you can use the DRIVE SIGNAL section to substitute into any stage that is normally referenced to one of the other outputs when isolating problems.



Fig. 30 — The DRIVE SIGNAL switch selects the correct signal to inject into any stage after the detectors. The output level is controlled by the DRIVE RANGE switch and the DRIVE LEVEL control and supplied through the isolated DRIVE OUTPUT jacks.

The substitute signal must properly match the circuit being analyzed. The VA62 must not only supply the correct amplitude, it must also have a low enough driving impedance to swamp out any signal normally found in the circuit. Integrated circuits generally operate at low signal levels and have a very low input impedance, especially when powered from a voltage source of 5 volts or less. Transistor stages generally operate with higher signal levels and have a higher input impedance than ICs. Tube circuits operate at much higher signal levels and have a much higher input impedance than either transistors or ICs.

The three positions of the DRIVE RANGE switch match all three types of circuits. The 3 volt position provides signals from zero to three volts peak-to-peak to allow correct signal matching without the danger of overdriving a stage. It also has the lowest source impedance of the three ranges. The 30 volt range has a medium drive impedance and provides the correct range of signal levels for most transistor circuits. The 300 volt range has the highest drive impedance and the larger signal levels needed to drive tube circuits. The 300 volt range also has a flashing LED indicator to remind you that up to 300 volts peak-to-peak may be present at the output jack.

The DRIVE LEVEL control allows the fine adjustment of the VA62 substitute signals necessary to match the waveform amplitude to the signal normally found at the injection point in the



circuit. Use the schematic of the circuit under test to determine the correct signal amplitude. The correct reference is the *peak-to-peak waveform amplitude*, not the DC bias voltage.

The DRIVE LEVEL control allows the drive signals to be injected with either a positive or negative polarity. Positive polarity is defined according to industry standards whenever possible. Figure 31 shows waveforms for each of the drive signals in case there are questions as to the definition of polarity. Match the waveforms on the schematic for the circuit under test to determine the polarity needed to inject at a particular test point.

Finally, the drive signals are AC coupled so the DC bias of a circuit is not affected when using the VA62 to substitute signals. You do not need to use a DC blocking capacitor because it is already built into the VA62. The blocking capacitor has a DC discharge path, but the time constant on the circuit must be kept fairly long (several seconds) to prevent DC loading. Therefore, you should always wait several seconds before making a connection to a low voltage test point (such as an IC or transistor) after connecting to a test point with a high DC voltage (such as a tube in a hybrid receiver). If you make your connection before the DC bias has been discharged, you could cause damage to the low voltage stage.

**NOTE:** Always connect the RF-IF input to the antenna terminals of a receiver before using signal substitution. The RF signal keeps all good stages in sync while substituting into one stage at a time for positive indications on the CRT.

## Video Pattern

The VIDEO PATTERN drive signal is a composite video signal used to troubleshoot video amplifiers, sync separators, chroma stages, VCR luminance circuits, etc. The video content of the signal is determined by the VIDEO PATTERN switch.

If you monitor the DRIVE OUTPUT with an oscilloscope, you will notice a rolloff of the higher frequency bars of the MULTIBURST BAR SWEEP and the CHROMA BAR SWEEP patterns. The rolloff on the 3 and 30 volt positions of the DRIVE RANGE switch closely matches the normal high frequency video rolloff of the IF stages and video detector — especially at the color carrier frequency. This insures proper results when injecting into a receiver with problems in the color amplifiers.

It is normal for the 300 volt range to roll off faster than the lower ranges. This does not affect its uses because the only times the larger signal amplitude is used is in troubleshooting video output circuits. The VCR STANDARD output provides flat frequency response through the full 4.5 MHz video frequency band if you ever need full frequency response to test a monitor or other high resolution device.

**NOTE:** The pattern may appear to show overshoot on the leading edges of the bars if an oscilloscope is connected directly to the unterminated VA62 output. The output must be terminated in the proper impedance (100 ohms for the 3 volt range, 100 ohms for the 30 volt range, or 10K ohms for the 300 volt range) to prevent ringing on fast waveform transitions. The circuit provides this termination during use, eliminating the need to use a matching resistor or pad.

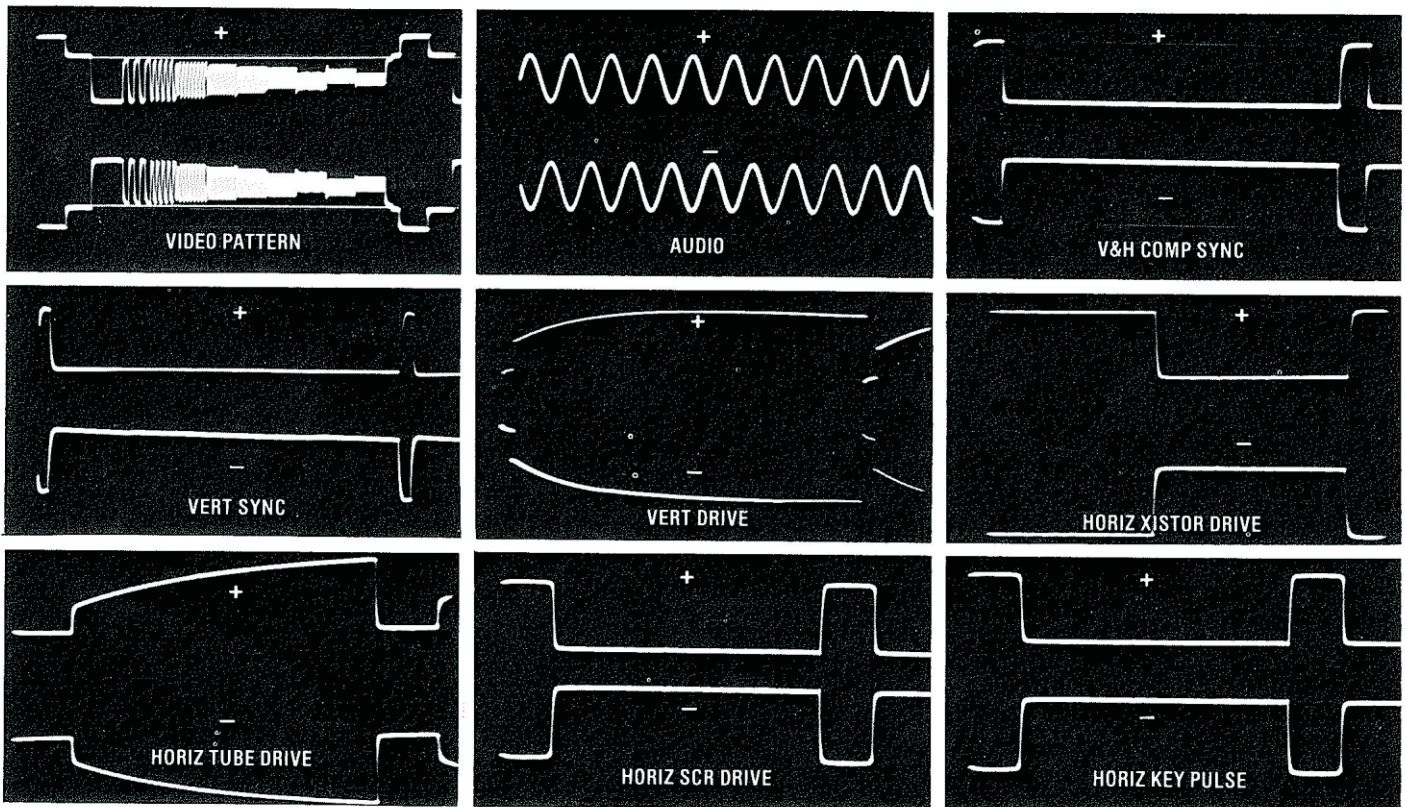


Fig. 31 — The polarity and waveshape for each of the drive signals.



## Audio

The AUDIO drive signal is a sinewave used to troubleshoot audio problems after the FM audio detector. The drive amplifiers provide enough power to drive a loudspeaker directly. One of four audio frequencies may be used as determined by the AUDIO switch on the left of the unit. These tones (333 Hz, 1 KHz, 5 KHz, and 7 KHz) allow a general test of frequency response of any audio system and agree with the most common frequencies called out in VCR servicing and alignment procedures.

**NOTE:** The AUDIO position of the DRIVE SIGNAL switch will not produce an output if the AUDIO switch is in the "OFF" position.

## V&H Comp Sync

The V&H COMP SYNC drive signal is used to isolate problems related to the sync separator, vertical integrator filter, or horizontal automatic frequency control (AFC) circuit. The signal duplicates the signal found at the output of the sync separator and consists of both horizontal and vertical sync pulses.

## Vertical Sync, Integrated

This signal is the result of processing the composite V&H sync through a vertical integrator filter, separating the vertical pulses needed to keep the vertical oscillator in step with the incoming video signal. The VA62 actually integrates the composite sync signal to produce this drive signal so it is shaped the same as the integrated sync in the receiver. This drive signal is used to isolate problems related to the integrator filter or the vertical oscillator.

## Vertical Drive

The VERT DRIVE signal is the sawtooth waveform needed to produce vertical sweep. The VA62 provides a signal that is the best compromise of all the different drive waveforms found in all brands and types of receivers. Remember, however, that there are dozens of different waveshapes used, meaning that the VA62 may not always drive the vertical output with full linearity or to full height. Watch for a major improvement in the original symptoms, even though the VA62 may not return perfect operation.

This variable is caused by the waveshaping circuits in the receiver used to refine the vertical drive signals applied to the yoke. The waveshaping circuits are slightly different for each type of yoke. In addition, many vertical stages use feedback from the yoke back to the vertical oscillator or output stage to produce the final waveshaping refinements. The VA62 does not require feedback for the vertical drive signals.

**NOTE:** The vertical drive signals are designed to feed the grid of the vertical output tube or the base of a vertical output transistor. Do not connect to the amplifier output (collector or plate) or directly to the vertical yoke. The results of injecting at these points

are always questionable and the large pulses found at these test points could damage the VA62 drive amplifiers.

## Horizontal Transistor Drive

The HORIZ XISTOR DRIVE is a square wave synchronized to the horizontal sync pulse of the composite video signal. This signal drives transistorized horizontal drivers and output stages. The signal duplicates the square wave driving signal found between the base and emitter of the output transistor.

### WARNING

Do not connect the horizontal drive signals to the collector of a horizontal output transistor, to the plate of a horizontal output tube or directly to the horizontal flyback or yoke of an operating TV. High voltage spikes at these test points may damage the VA62 drive amplifiers.

Always connect the red lead to the base of the transistor and the black lead to the emitter. Always use *positive* drive. Use the *emitter* as the common reference point because some systems use a "split flyback" which includes part of the primary winding between the emitter of the output transistor and ground. The schematic for a split flyback system will show a base waveform of near 400 volts peak-to-peak, and will show the base waveform as a pulse rather than a square wave. The driving signal between the *emitter* and *base* of these systems, however, is still a square wave and will be driven correctly if the VA62 is connected between the base and emitter.

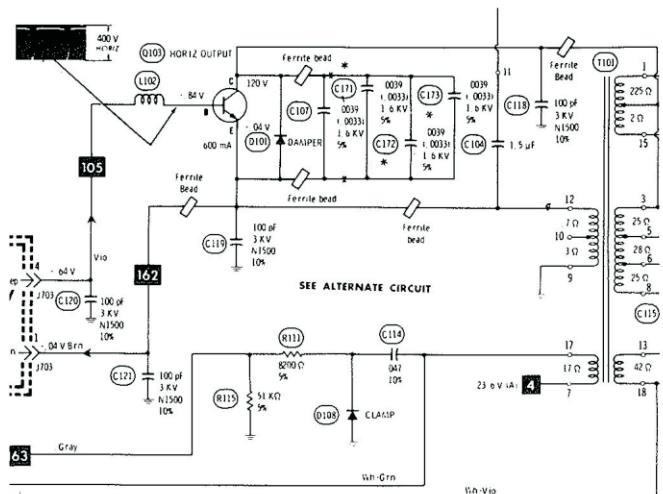


Fig. 32 — A split flyback is identified by the 400 volt waveform shown at the base of the horizontal output transistor. Connect between the base and the emitter, and use 10 to 30 volts of positive drive.

**NOTE:** It is not necessary to isolate the drive signal when driving a hot-ground/cold-ground system or split-flyback system because the DRIVE OUTPUT jack is isolated from the VA62 chassis.

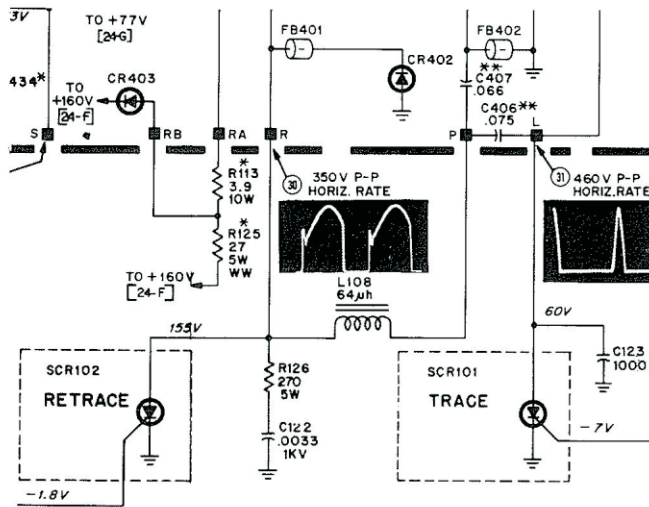


### Horizontal Tube Drive

The HORIZ TUBE DRIVE is the sawtooth waveform needed to drive the grid of the horizontal output tube. The 300 VPP range of the DRIVE RANGE switch provides the proper impedance matching and amplitude for the tube circuits. Always use *positive* drive when driving an output tube. Remember to connect the VA62 to the output tube *before* applying power to the receiver to prevent possible damage to the output tube due to excessive current flow through the class C stage without drive.

### Horizontal SCR Drive

The HORIZ SCR DRIVE is a pulse synchronized to the horizontal sync pulse of the composite video signal. The SCR requires a different signal than the transistor output because: 1.) the pulse must go positive at sync time rather than negative as with a transistor, and 2.) the pulse must be much narrower to prevent damage to the SCR gate. Only drive the *retrace* SCR of a 2-SCR system. The trace SCR must be triggered by the passive timing coils and capacitors to work properly. The SCR drive pulse may also be used to drive TRIAC outputs or SCRs that contain the retrace damper diode inside the SCR case. In all cases, only drive the *retrace* device.



*Fig. 33 — Only drive the retrace device of an SCR or TRIAC horizontal output section.*

**NOTE: DO NOT** use the **HORIZ SCR DRIVE** signal to drive the GCS (gate controlled switch) used in some Sony color receivers. Horizontal problems in these receivers often result in damage to components other than the GCS. Attempting to drive the GCS with other defective parts may cause additional circuit damage.

### Horizontal Keying Pulse

The HORIZ KEY PULSE signal matches the timing and pulse width of the flyback pulses fed to various circuits such as AGC or color burst gates. The HORIZ KEY PULSE is always locked to the sync and blanking signals of the composite video signal.

Remember this if a keyed circuit returns to correct operation with the keying pulse substituted by the VA62. The circuit problem could be a keying pulse that is either missing or low in amplitude. Or, it could be that the keying pulse is present but improperly timed due to a problem in the horizontal oscillator or the horizontal AFC circuit.

## Special Drive Signals

Two of the driving signals are separated from the DRIVE SIGNAL switch to enhance the ability to isolate troubles in color circuits and in VCRs. These signals are phase-locked to all other signals produced by the VA62, allowing either or both extra signals to be injected at the same time as one of the signals produced by the DRIVE SIGNAL section. Other than being available through separate jacks, they are used the same as the other drive signals.

## 3.58 MHz Color Subcarrier

The 3.58 MHz DRIVE signal provides a substitute for the 3.58 MHz oscillator in a color TV receiver or VCR. The VA62 signal is locked to the chroma signals but shifted 90° to provide proper quadrature demodulation of the color information. Since the signal is separate from the DRIVE SIGNAL functions, it is possible to inject the VIDEO

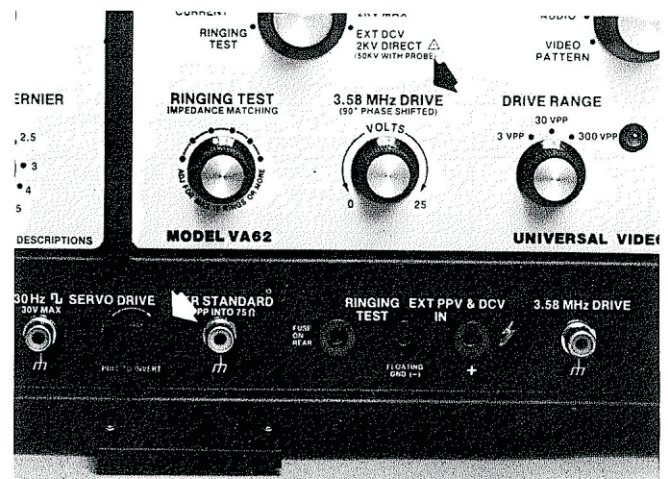


Fig. 34 — The two special drive signal outputs are individually controlled, but still phase locked to the other VA62 signals, for special testing applications.

PATTERN signal at the same time as the 3.58 MHz DRIVE signal when isolating color problems. The 3.58 MHz signal has its own amplitude control and can be monitored independently of the other drive signals with the built in digital meter.

### 30 Hz Servo Drive

The 30 Hz SERVO DRIVE has two uses. First, it simplifies the troubleshooting of servo problems in VCRs and video discs. The signal substitutes for the reference and feedback signals found in the servo circuits and, when used with the DC POWER SUPPLY, allows servo problems to be narrowed to a single stage.



The second use of the signal is to force the playback circuits of a VCR into sync with the VA62 signals so signal substitution is possible in circuits that are normally referenced to a playing video tape. This feature is especially helpful when using the VA62 with the optional VC63 VCR Test Accessory. The VC63 supplies special drive signals unique to the Beta and VHS VCR formats and requires the servos to be locked with the SERVO DRIVE to inject phase-locked chroma into the playback circuits.

The signal is fully adjustable from zero to 30 volts peak-to-peak. The phase of the signal may be inverted by pulling the SERVO DRIVE control to the "out" position. The inverted signal may look the same as the non-inverted signal on a dual-trace oscilloscope because the phase is referenced to the vertical sync information. The phase reversal, however, causes the rising edge of the driving signal to be referenced to the first or second field of the interlaced video information, resulting in a reversal of phase between the 30 Hz servo signal and the 3.58 MHz color information carried on the color video patterns.

### Audio Switch

The AUDIO switch affects many of the main sections of the VA62. The following chart shows how the AUDIO switch affects these areas when it is OFF or set to one of the four positions marked with an audio frequency.

FUNCTION	AUDIO SWITCH ON	AUDIO SWITCH OFF
RF SIGNAL GENERATOR	Adds 4.5 MHz FM carrier to RF signals—can cause beat pattern on the screen	No 4.5 MHz sound carrier at all
35 - 50 MHz PROGRAMMABLE	Amplitude modulates the programmed frequency	Unmodulated carrier
45.75 MHz VIDEO IF	Adds 4.5 MHz FM carrier to IF signals—will cause beat pattern on the screen	No 4.5 MHz sound carrier at all
IF TRAP SIGNALS (ALL)	Amplitude modulates the selected trap frequency —no 4.5 MHz sound carrier	Unmodulated trap frequency, no 4.5 MHz sound carrier
4.5 MHz FM IF	Frequency modulates the 4.5 MHz FM IF signal	Unmodulated 4.5 MHz carrier
AUDIO DRIVE SIGNAL	Audio tone	Nothing

Fig. 35 — How the AUDIO switch affects different VA62 functions.

There are 4 tones available. These tones are at 333 Hz, 1000 Hz, 5000 Hz, and 7000 Hz. This frequency range allows the VA62 to dynamically check the frequency response of any video system. These tones also modulate the TRAP SETTING signals (selected by the RF-IF SIGNALS SWITCH) to provide better contrast between the video pattern and trap signal.



Fig. 36 — The AUDIO switch selects one of four audio tones to modulate the RF and IF signals, or to feed to the DRIVE SIGNAL "Audio" function.