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Sneaky Fast Scan Monitor for SSTV

When operating SSTV the use of a fast scan monitor provides the means to adjust the scene at a 15 frames/second rate rather than the standard 8 seconds/frame rate — a ratio in round numbers of 120:1. Commercial fast scan display units sell for about $250. Oscilloscopes now sell in the $120 range and are usually large and bulky. Who wants to tie up a scope for display only? This article describes modifications that can be made to a standard Heathkit monitor scope, found in many stations, to provide the fast scan display feature for the popular Robot 80A Camera.

The modification is based upon the assumption that the trapezoidal display found in the HO-10 is seldom used. I have used it only once in 5 years.

Circuit Descriptions

Vertical Amplifier

The vertical amplifier, Fig. 1, was modified to satisfy two criteria:

1. Maximum sensitivity to a positive sawtooth at V1A.

2. No voltage transients on external vertical input line when mode switch is operated from display to EXT.

The vertical fast scan signal, from the 80A camera, is taken directly from the vertical yoke. This is a positive going sawtooth with a negative magnetic overshoot. C7 is used to minimize that overshoot. Notice that the coupling capacitor C3 is located on the input

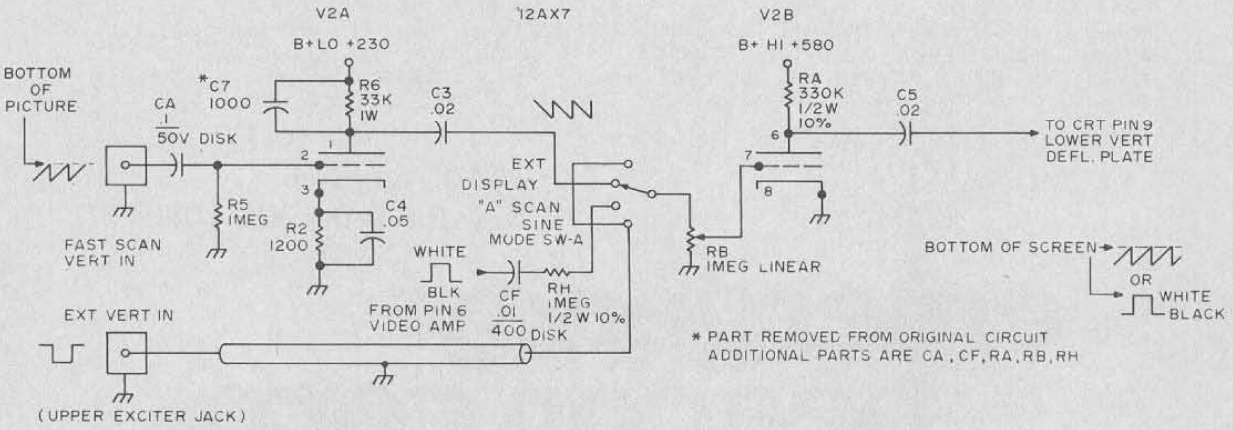

Fig. 1.

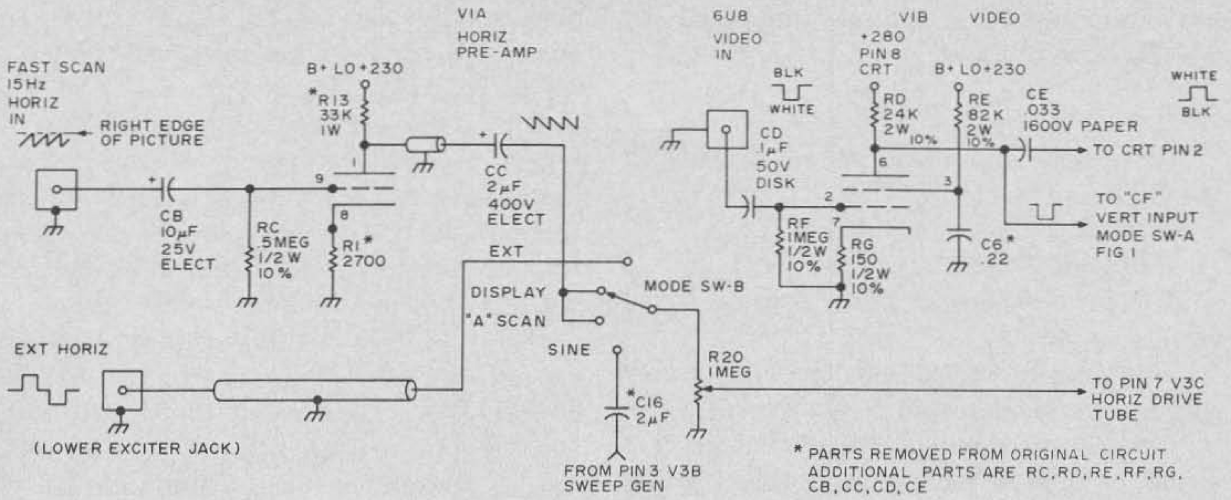

Fig. 2.

side of mode switch-A to prevent voltage transients from being applied to the external vertical input line when the mode switch is operated. Such voltage transients could damage external semiconductor circuits.

Horizontal Amplifier

The horizontal fast scan signal from the 80A camera is a positive going sawtooth. The amplitude of this signal is about the same as the fast scan vertical signal and requires two stages of amplification, Fig. 2. V1A the horizontal preamplifier must pass a 15Hz signal which accounts for the large capacitances (CB,CC). Notice also that both coupling capacitances have been moved to the input side of mode switch-B. This was done, as in the case of the vertical amplifier, to prevent voltage transients from being applied to the external horizontal input line when the mode switch is operated.

Video Amplifier

The HO-12 has no provision for video, or Z input. A video amplifier, Fig. 2, described by ROBOT in their Field Service note #4 was installed in V2B. This circuit is sensitive to negative pulsing signals. The video grid resistor, RF, or the bias resistor, RG, can be made variable for gain control. I found 150Ω for RG satisfactory using the intensity control to vary the display. If the display is

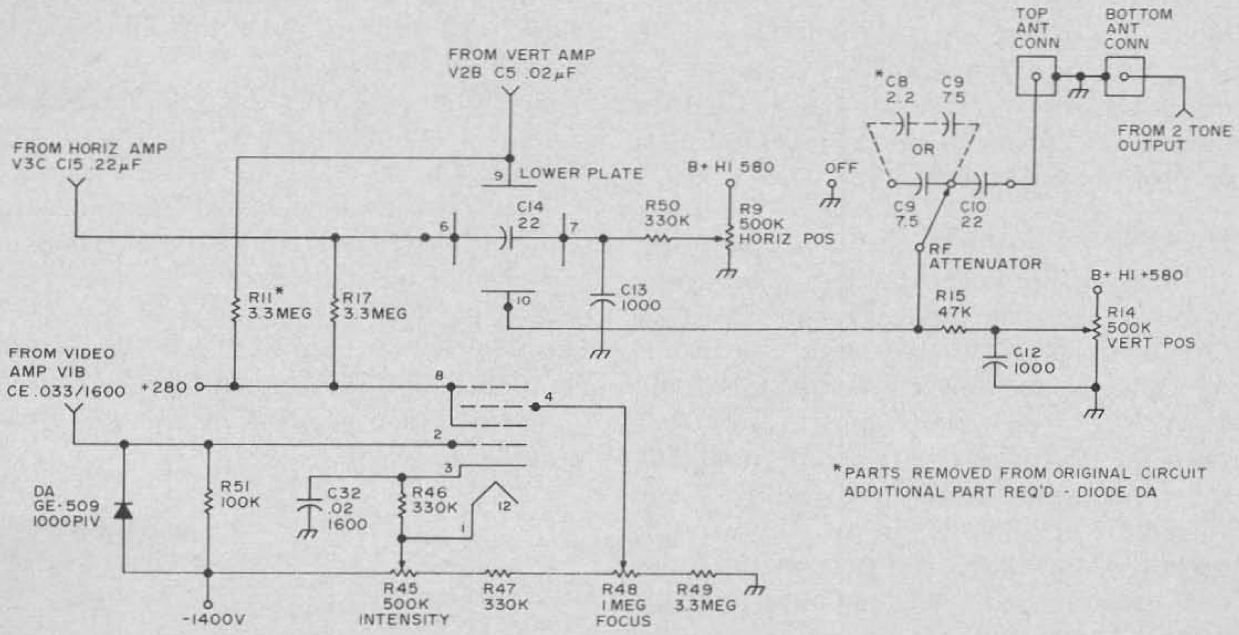

Fig. 3.

too contrasty RG can be increased to 240-300Ω as required.

CRT

Three basic modifications were made to the CRT, Fig. 3, circuitry to:

1. Increase the vertical deflection.
2. Provide Z or video input.
3. Provide means to shut off the rf signal vertical input.

The 1MΩ resistor connected to the vertical deflection plate pin 9 was increased to 3.3μM. C8, through which the lowest level rf signal is applied to the vertical deflection plate, was removed and the switch point grounded to provide a means to shut off the rf input. This allows the display to be viewed while the picture is being transmitted — good if you're prone to move. In most cases it is not necessary to view the rf unless setting up or in case of troubles.

Mode Switch/"A" Scan Feature

The mode switch was changed from a 2-pole 3-position to a 2-pole 4-position switch, see Figs. 1 and 2. The currently installed mode switch has 2-poles 5-positions with only 3 being used, and can be modified with some difficulty. I recommend a new 2-pole 4-position switch.

The extra position allows amplified fast scan video to be applied to the vertical input and fast scan deflection to the horizontal input. These two signals result in an "A" scan, allowing synchronized video to be displayed. An "A" scan display is used for precise adjustment of the camera brightness control (see operation).

Physical Modification

In order to keep the fast scan signals together, the video input was entered via the two tone jack. The two tone signal was relocated to the lower antenna connector. Since there was no room to mount a terminal strip near the two tone tube, V4, the junction of R30, R38 and R52 was soldered to a short length of stiff wire the other end of which connects to the lower antenna connector. The junction is, therefore, self-supporting. In order to prevent the junction from shorting to pot R29 a strip of plastic tape was placed on the pot. The antenna is connected to the single connector via a coax "T" fitting.

The two exciter connectors, now no longer needed, were used for the external inputs; the top for vertical and the bottom for horizontal. The location of these connectors is convenient for connecting shielded wires to the mode switch.

The .003μF. 1600V video coupling capacitor CE and the 24K 2W RD are connected via a 3 lug terminal strip. This strip is mounted on the side of CRT neck that is closest to the bottom side of the chassis. It is mounted using the same screw that mounts a terminal strip already in this

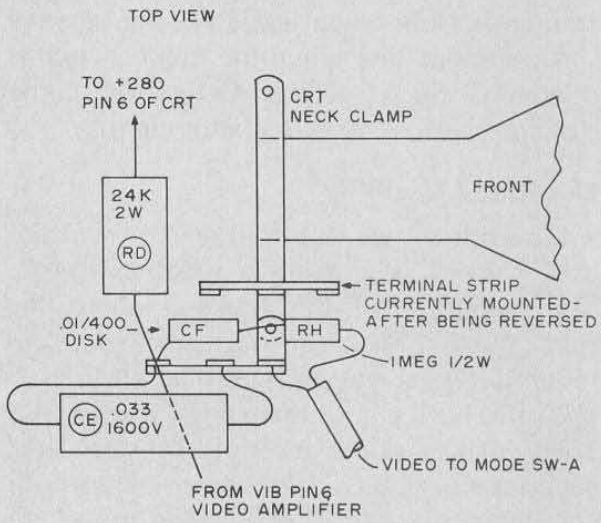

Fig. 4.

location, Fig. 4. The strip currently mounted must be positioned such that its body is towards the CRT neck.

Coupling capacitors 2μF 600V CD, and .02μF C3 are mounted in the area of the mode switch.

The .22μF C6 is relocated from pin 8 to pin 3 of V1. Do not remove the ground end.

Don't physically remove the wire connecting pin 7 of V1 to pin 7 of the CRT. This wire is later used from pin 6 of V1B to the .033/1600 CE located on the CRT neck.

The shielded lead from V1 pin 2 is relocated to V1 pin 1.

External Inputs

Two external inputs, vertical and horizontal, were wired to the mode switch to

Operation

		Mode Switch		
HO-10	**Sine**	**A-Scan**	**Display**	**Ext.**
Intensity	Adjust to level to eliminate "Z" modulation	Normal	Black looks black	As desired
Focus		As required for intensity.		
Vertical gain and Position		As required but below overload level.		
Horizontal and Position		As required.		
Sweep Frequency	As required	N/A	N/A	N/A
Rf Attenuator (in rear)	As required	Off	Off/On When on, SSB rf overlays display during transmission, but can still be seen.	Off

permit attachment of an audio frequency spectrum analyzer or other device. The sensitivity of the vertical input is too negative pulsing. The sensitivity of the horizontal input is either polarity. Note that both external inputs are direct, not ac coupled. This was done in order to keep these inputs flexible. This allows the coupling capacitors to be matched to the external signal source frequencies and voltage polarities.

Power Supply Considerations Under No-Signal Input Conditions

The 6BN8 required 600mA of filament current. The 12AT7/12AX7 requires only 300mA, a net reduction of 1.9W.

The original V2B required 7.2mA at 580V, the revised V2B requires about 1.5mA at 580V – a net savings of 3.3W.

The new horizontal preamp requires 3.3mA at 230V or an additional .76W.

The new video amplifier requires 4.9mA at 230V or an additional 1.2W.

The net high voltage current drain is plus 1.5mA.

These values will vary of course, under signal conditions. But the net change is towards less power consumption.

Chart

In order to adjust camera brightness, set mode switch to "A" scan. Black will be towards the top of the screen and white will be towards the bottom of the screen. Adjust camera brightness for maximum difference between black and white signals levels. Notice that any further increase in brightness causes an increase in the overall down position of the vertical spikes (background shading), but does not increase the white to black ratio of the picture elements. This can be checked by switching to the display mode and "rocking" the brightness control either side of the optimum setting. The contrast can now be adjusted by looking at both display and "A" scan positions of the mode switch and touching up the brightness as required.

Conclusion

The display obtained with these modifications completely fills the screen and then some. The linearity of the display is not of TV quality but is more than sufficient for this application.

The camera was operational for one week before the modifications to the HO-10 were completed. The difference in performance and picture quality and the ease which they are obtained, has definitely established the need for Fast Scan Display. The estimated cost of $11 for new parts is, without a doubt, a good investment to increase the versatility of an already valuable piece of monitoring equipment. . . .W2FJT