RADIO CORPORATION OF AMERICA

RCA LABORATORIES DIVISION

INDUSTRY SERVICE LABORATORY

Supplement

LB-853A

Modification of Interlaced Sampling-Signal Generator

Approved

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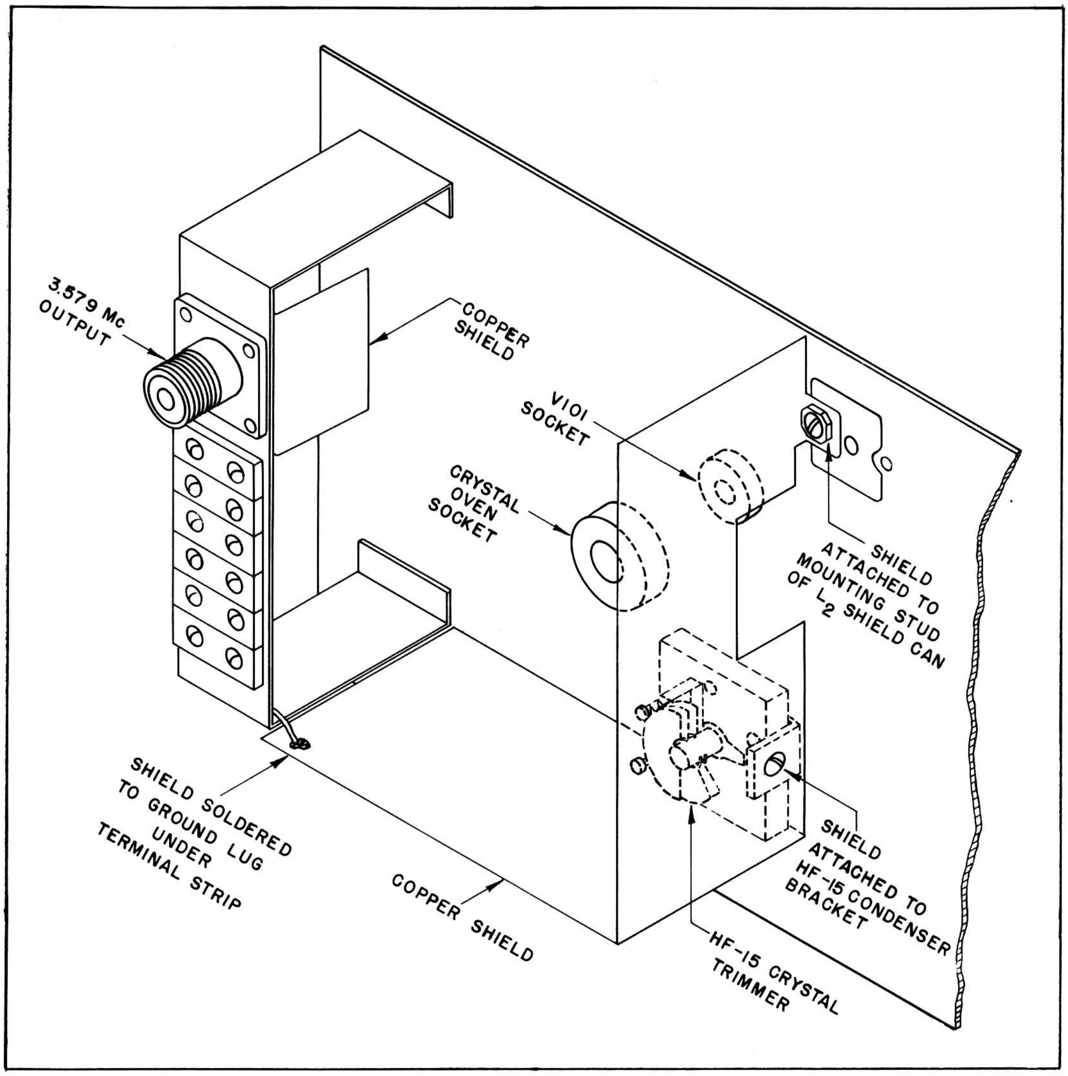

Fig. 1 – Shield mounting details.

Modification of Interlaced Sampling-Signal Generator

Introduction

LB-853, *Interlaced Sampling-Signal Generator*, describes two equipments for use in the generation of composite color television signals. The sampling-signal generator consists of a crystal oscillator, whose frequency is that of the color carrier, and three frequency dividers to provide a 31.5-kc signal for use in driving a standard monochrome synchronizing-signal generator (such as the RCA TG-1A). A distribution amplifier for color carrier c-w signals and a marker-pulse generator comprise the second unit described in *LB-853*.

The equipments, as described, were intended for use in accordance with the original NTSC Color Field Test Specifications of Nov. 26, 1951. The following modifications to the above equipments will enable them to work with the revised (Feb. 2, 1953) NTSC signal specifications. It is suggested that this supplement be attached to *LB-853* for ready reference.

Modifications

Specification 14 of the current NTSC Field Test Signal Specifications provides for a color carrier frequency of 3.579545 Mc ± 0.0003 per cent with a maximum rate of change of not more than 1/10 cycle per second per second. Several modifications to the crystal oscillator circuit are required (in addition to changing the crystal) to maintain that frequency within the required tolerances. The crystal oven has been replaced with one having improved temperature stability (Bliley TCO-2, 75°C). Two shields, as shown in Fig. 1 of this supplement, have been placed around the oscillator circuitry to prevent feedback to the oscillator from subsequent portions of the circuit. This prevents tuning of the buffer and distribution amplifiers from affecting the oscillator frequency. A series RC circuit consisting of 0.1 μf and 12 ohms has been added across the thermostat contacts, i.e., between pin 1 and ground on the crystal oven socket. All other connections to this socket remain unchanged (see Fig. 2, *LB-853*). The variable condenser across the crystal has been changed from an APC-25 to an HF-15 18-μμf air trimmer. A 5-to-1 planetary drive (Croname 599) is used on this condenser for greater ease in frequency adjustment.

The coupling condenser between the crystal oscillator, V101, and the buffer, V102, has been changed from 5 μμf to 10 μμf to provide adequate buffer drive. L_2, the buffer plate coil, has been changed to 61 turns, No. 27 Formex wire, close wound on the same coil form assembly shown in Fig. 2, *LB-853*. The three frequency dividers whose reduction factors were 4/5, 1/9 and 1/11 for operation at 3.89 Mc are adjusted to 4/5, 1/7 and 1/13 respectively for 3.579-Mc operation. To obtain the correct resonant frequency range in the various tuned circuits, referred to here by the corresponding inductance numbers, several capacitor values must be changed. Table I shows the nominal operating frequencies of the several tuned circuits and the value of the smaller capacitor in each. The larger capacitor remains unchanged in each circuit. These values are for 3.579 Mc operation.

Table I

Tuned Circuit	Nominal freq. (kc)	Small capacitor (μμf)
L_3	717	100
L_4	2,866	100
L_5	410	510
L_6	2,456	150
L_7	31.5	3900
L_8	378	560

It has been found that the stability of the third divider may be improved by the use of an unbypassed 150-ohm cathode resistor in V106A.

Adjustment

The adjustment procedure outlined in *LB-853* may be followed, but prior to the setting up of the frequency dividers the crystal oscillator and buffer circuits should be adjusted.

It is important that the grid and plate leads of the oscillator be stiff solid wire, and that they be dressed so as not to come in contact with other leads. These grid and plate leads cross each other just left of the tube socket. Their spacing determines the feedback in the oscillator. After *all other changes* have been made and the unit is ready for operation it is desirable to check the strength of oscillation. With the crystal trimmer at about 3/4 maximum capacitance (this is an approximate setting for correct frequency) the rectified grid voltage of the oscillator should have a maximum value of 12 volts (oscillator tank tuned for maximum grid voltage), as measured with a vacuum tube voltmeter. The oscillator is normally detuned on the low inductance side (gradually falling side) until the rectified grid voltage drops to 8 volts. If necessary, adjust grid and plate lead spacing to obtain this value.

The oscillator frequency may be checked in a number of ways. It is most conveniently done at 157.5 Mc. This is the lowest frequency which provides an exact zero-beat with a 100 kc or 2.5 Mc reference crystal. That is:

3,579,545.454545 ..... × 44 = 157.500000 ... Mc

and 2.5 Mc × 65 = 157.5 Mc

or 0.1 × 1575 = 157.5

A 100-kc standard synchronized with Station WWV is multiplied by 25 in one stage to get 2.5 Mc. This is then amplified to about 10 or 20 volts and fed through a 1N34 crystal diode to a receiver tuned to 157.5 Mc. Also, the output of one of the distribution amplifiers is fed through another 1N34 to the receiver. The trimmer across the crystal is adjusted for zero-beat. Since the measurement is made at the 44th harmonic, 44 cycles of beat-note equals one cycle at the fundamental. Thus the tolerance on the beat note is ±471 cycles.

In setting up the dividers, the Lissajous figures shown in Fig. 5b and 5c of *LB-853* should, of course, be 7 to 1 and 13 to 1 respectively. A preliminary setting of the tuned circuits may be made in order to insure that the resonant frequencies are close to those shown in Table I. While it is possible for the dividers to operate in either of two modes and still divide by the same factor, the best stability is obtained when using the frequencies indicated above. This preliminary adjustment may be made with the plate power off by connecting a signal generator, set at the appropriate frequency, to the low impedance test points (J_3, J_4, etc.). The generator should be isolated by connecting its output to the test points through a 100-μμf capacitor. Resonance is most easily detected by observing the signal at the various test points with an oscilloscope. The slugs should be adjusted to maximize the voltage at these points.

Modification of Distribution Amplifiers

The changes in the distribution amplifier, Fig. 6 of *LB-853*, consist of three component value changes in each of the three amplifiers. The plate decoupling resistors are each changed from 5.6-K, 2-watt, to 1-K, 2-watt. The screen dropping resistors are each changed from 150 K to 82 K.

The marker generation circuits require no changes.

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