# A frequency coincidence marker

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# A FREQUENCY COINCIDENCE MARKER

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ABSTRACT

A simple device is described by means of which any number of receivers may be set quickly on a frequency to which a certain receiver is tuned.

# A FREQUENCY COINCIDENCE MARKER

## INTRODUCTION

In normal reception of radio communication signals it is often necessary for one, or any number of receivers, to be aligned to the exact frequency of the signal being received by a primary receiver used for frequency location and identification. A description of a system designed to facilitate this requirement follows.

## DESCRIPTION OF SYSTEM

The output of the local oscillator in the primary receiver is capacity-coupled to a radio-frequency buffer amplifier. The output of this amplifier is connected by a short length of coaxial cable (type RG-59/U) to a converter unit. The output of this unit is fed, in turn, through a long coaxial cable to any secondary receivers required.

The converter unit combines the signal emanating from the oscillator in the primary receiver with a signal at the intermediate-frequency of the primary receiver (in the case of Hammarlund Receiver, type SP600-JX, 455 kilocycles, when operating on frequencies between 550 kilocycles and 7.4 megacycles; 3955 kilocycles, when operating between 7.4 and 54 megacycles). The output of the converter is fed into a cathode-follower stage which supplies a signal of sufficient power, at the frequency of the desired signal, to a signal-switching relay in the secondary receiver to enable the operator to tune to that frequency.

## BUFFER AMPLIFIER

The buffer amplifier (see Fig. 1) is mounted in the immediate vicinity of the high-frequency oscillator of the primary receiver (Hammarlund, type SP600-JX). Radio-frequency (oscillator) power is fed from the ceramic insulated lead connecting the fixed-frequency oscillator switch to C74 of the high-frequency oscillator tube, $V_4$ (see circuit diagram of the receiver), for signal input to the buffer stage. The output from the buffer stage is then fed to the converter stage through a short length of coaxial cable.

The buffer unit is totally shielded, provision being made internally for maximum shielding between the input and output circuits of the type-6AU6 tube by the use of a shield placed between the grid and

plate sections of the tube (see Fig. 2). This isolation of circuits tends to reduce coupling between the converter and the high-frequency oscillator.

Supply voltages are taken from an adapter placed between tube $V_3$ (type-6AC7) of the fixed-frequency oscillator in the type SP600-JX receiver and its associated socket.

## CONVERTER AND CATHODE FOLLOWER

A type-6BE6 tube is utilized as a combined oscillator-converter (see Fig. 3). The oscillator is crystal-controlled and can operate at either of two frequencies. Signal frequencies from the buffer amplifier are injected into the converter in the normal manner. In operation, the type SP600-JX Receiver is a single conversion receiver when operating on frequencies from 550 kilocycles to 7.4 megacycles, but uses double conversion from 7.4 to 54 megacycles. Thus it is necessary to alter the crystal-oscillator frequency of the converter from 455 kilocycles to 3955 kilocycles for operation above 7.4 megacycles. This is accomplished by changing S4 in the type SP600-JX Receiver to a double-pole double-throw switch, and using the new section of the switch for the purpose of operating the low-capacity relay in the converter stage, so that the 455-kilocycle crystal is in use when the type SP600-JX Receiver is operating on any frequency between 550 kilocycles and 7.4 megacycles. When the type SP600-JX Receiver operates between 7.4 and 54 megacycles the 3955-kilocycle crystal is in use, and the relay is energized.

The converted signal passes to a conventional cathode follower for the purpose of feeding the signal through a low-impedance line to the remotely located secondary receiver. A coaxial relay is connected in the antenna circuit of this receiver (see Fig. 4) for the purpose of injecting the signal from the converter into the receiver. This relay is operated by means of a foot switch. When the relay is in the non-energized position the signal from the converter is grounded by the relay.

The converter and cathode follower are both totally isolated from the remainder of the system and grounded at one point only. The power supply for the system is assembled in a secondary shielded case. The 110-volt a-c input is adequately filtered, and the high-voltage lines are filtered to prevent any external radiation.

Spurious frequencies across the receiving spectrum may be reduced by the use of a type-6BE6 tube as a mixer and a type-6C4 triode as an oscillator (see Fig. 5). In the event of excessive harmonic generation

by the crystal oscillator, the values of the coupling condenser and grid resistor connected to Pin 1 of the type-6BE6 tube may be decreased.

## OPERATION

In service, the operator of the primary receiver gives a rough indication of the frequency, verbally, to the operator of the secondary receiver, who then actuates the foot switch, causing a signal of the exact frequency to which the primary receiver is tuned to be injected into the secondary receiver. Switching the receiver to c-w operation will produce an audible beat which is tuned to zero beat, and, upon release of the foot switch, the signal being received by the primary receiver can then be heard in the secondary receiver.

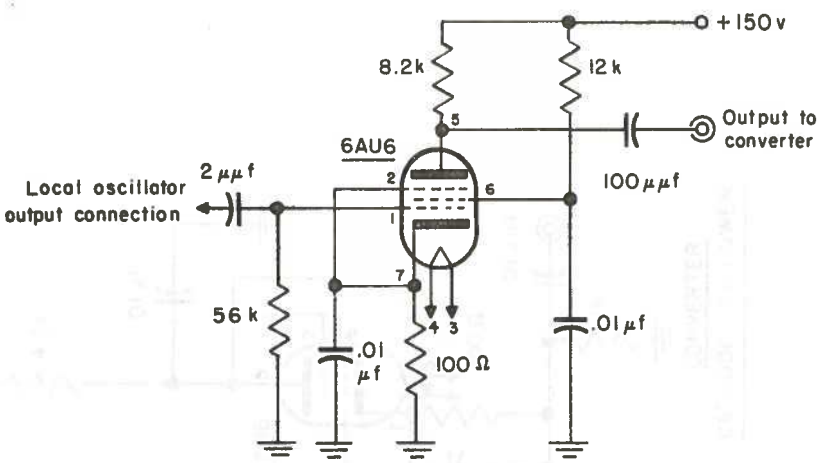


FIG. 1
BUFFER AMPLIFIER

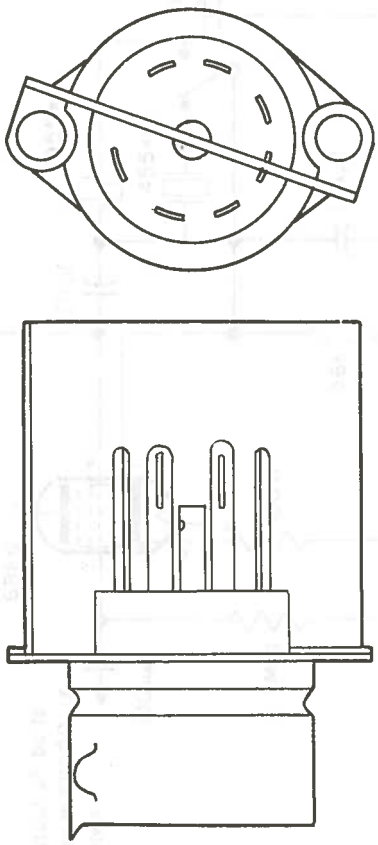

FIG. 2
STANDARD 7-PIN SOCKET (SHIELDED)

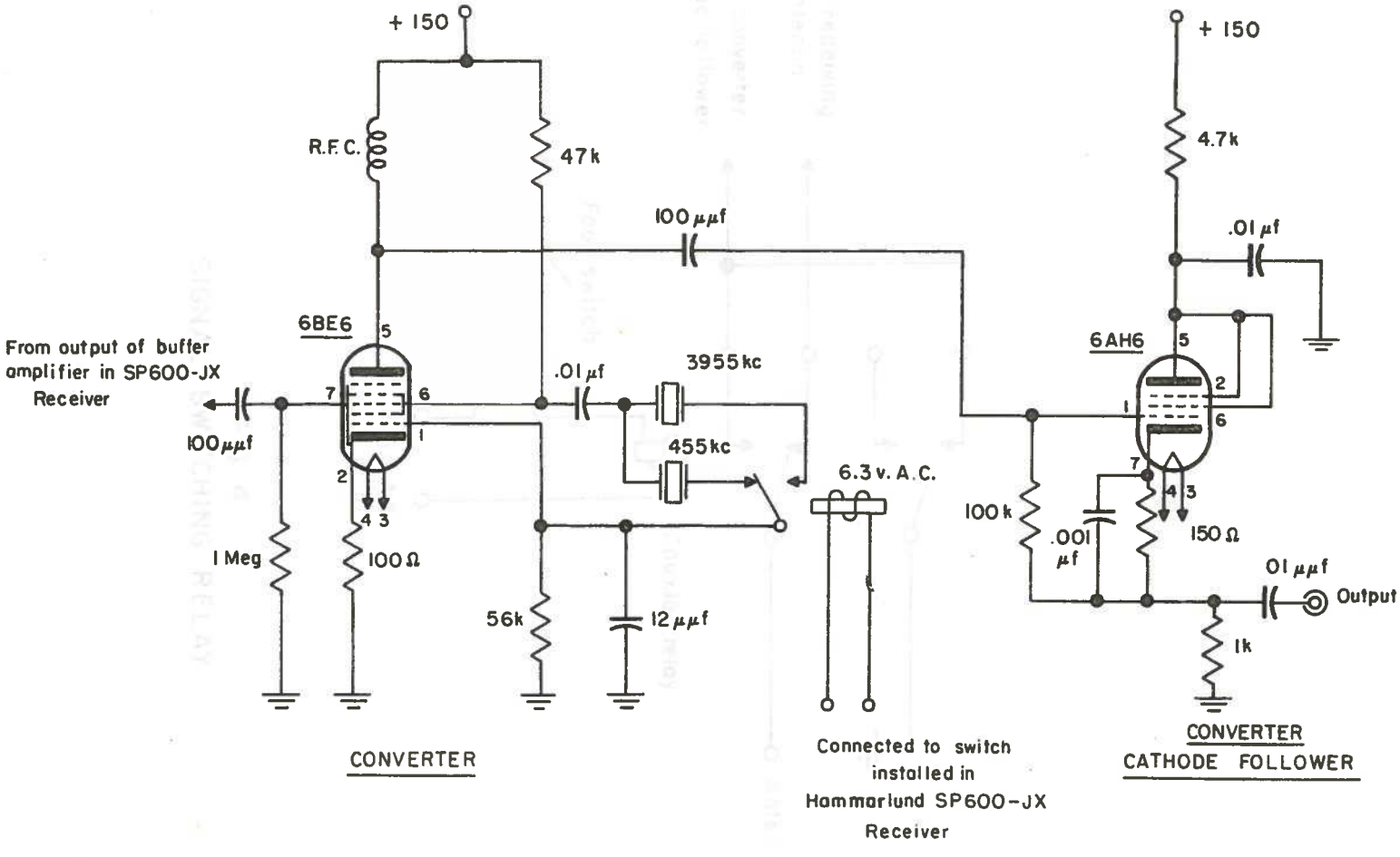


FIG. 3
CONVERTER AND CATHODE FOLLOWER

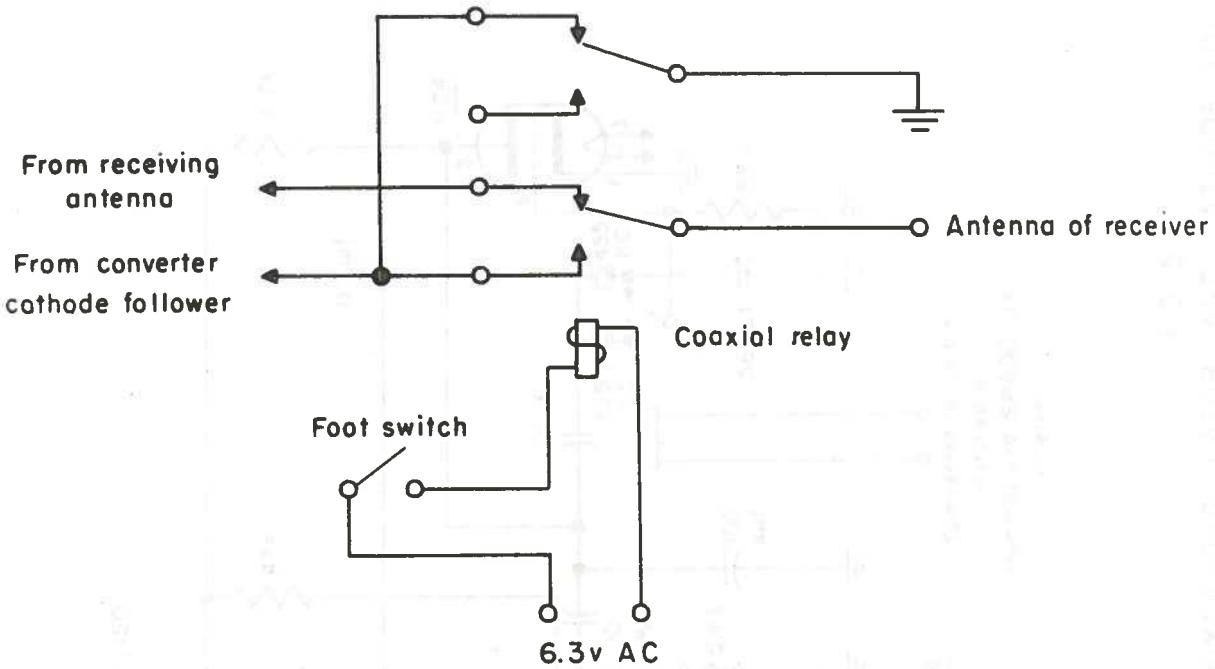


FIG. 4
SIGNAL-SWITCHING RELAY

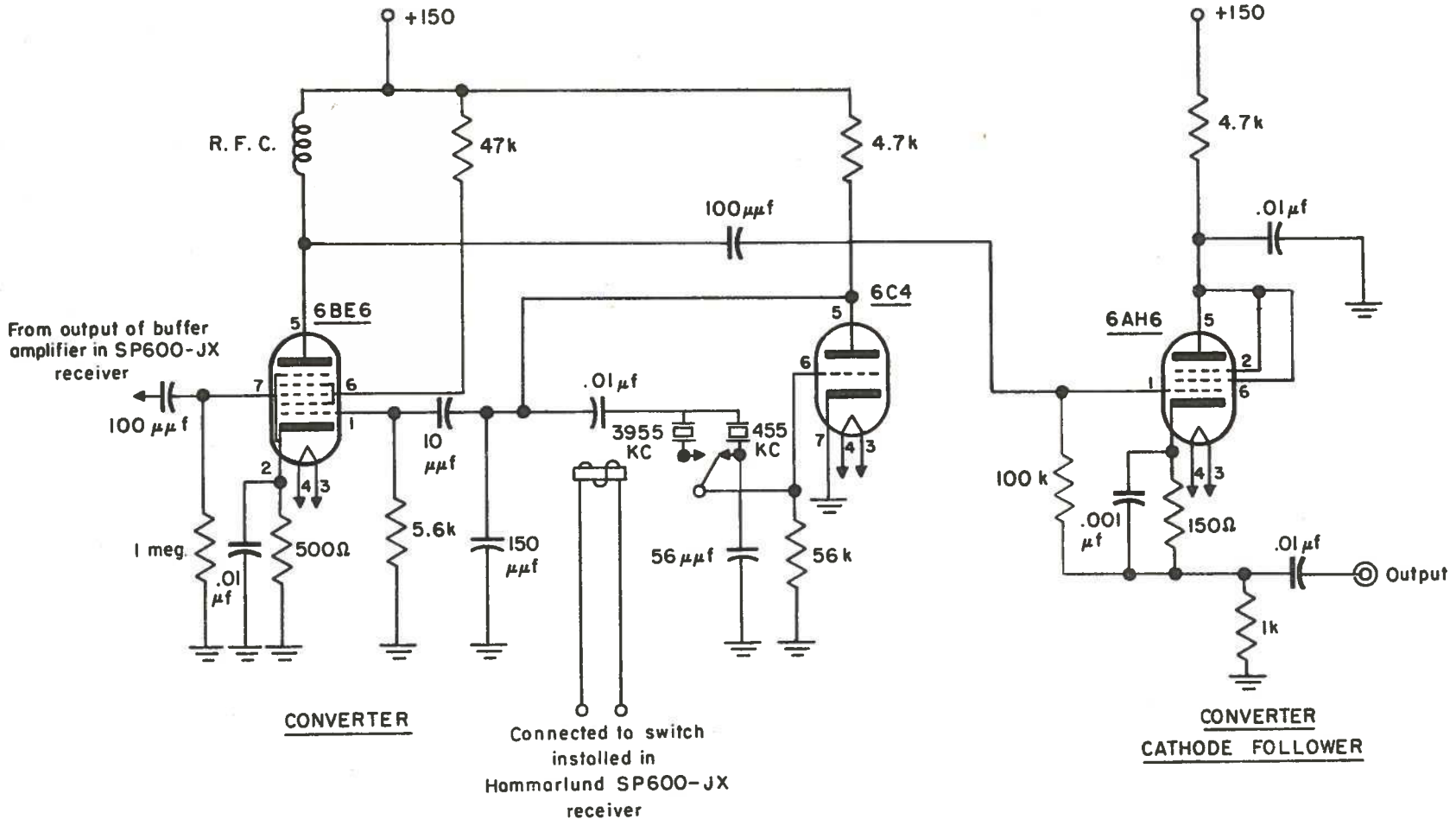


FIG. 5
MIXER-OSCILLATOR AND CATHODE FOLLOWER