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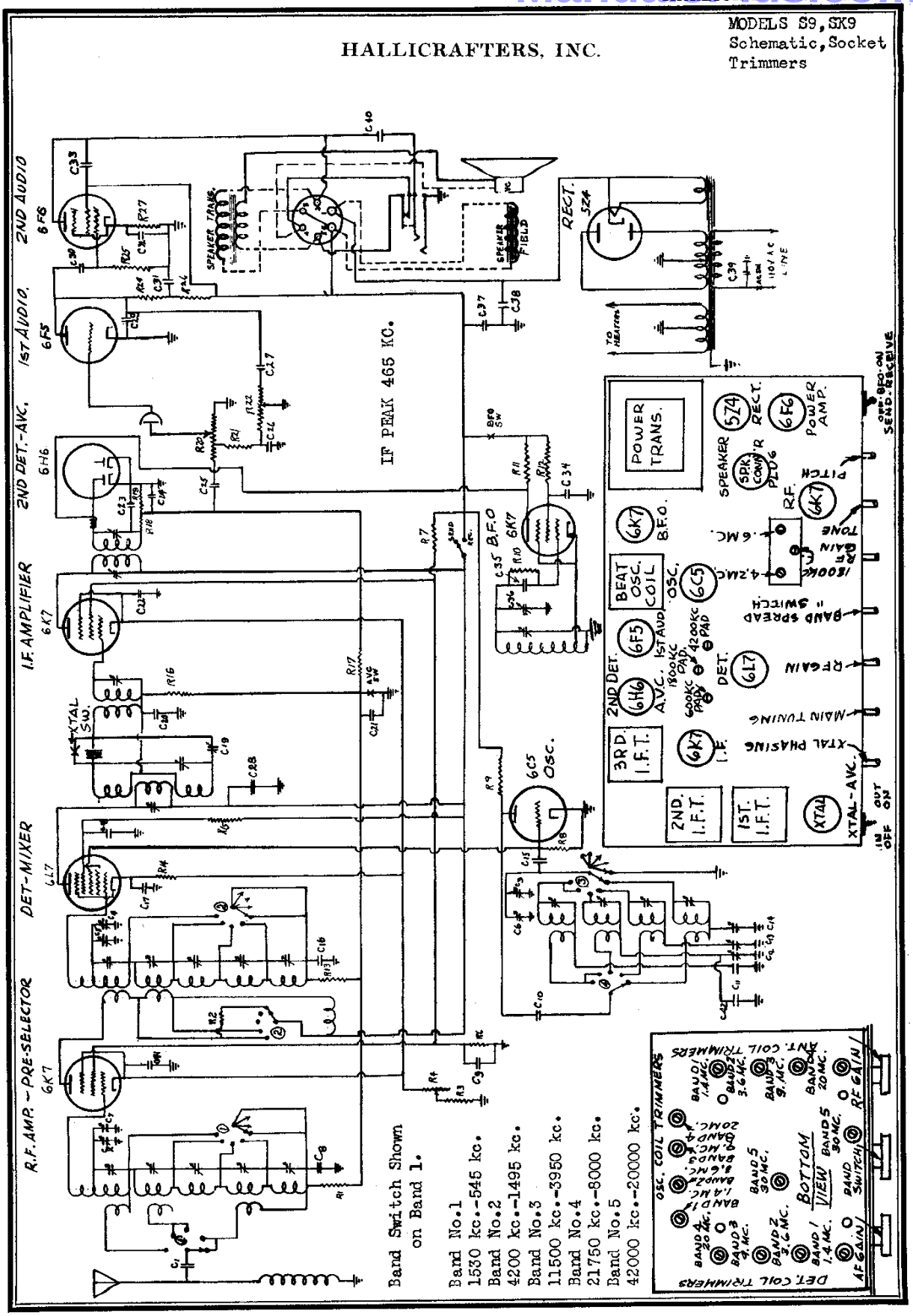
HALLICRAFTERS, INC.

MODELS S9, SX9
Schematic, Socket
Trimmers

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Courtesy Nostalgia Air

MODELS S9, SX9
Circuit Data
Alignment, Parts

HALLICRAFTERS, INC.

## CIRCUIT

The plate circuit of 6K7 R.F. amplifier has a high inductance plate load which gives maximum transfer by use of capacity coupling at low frequency end of the bands. By use of coupling in C16 this is further increased. The normal characteristics of a coil and condenser are such that the gain varies about 3 to 1 from one end to the other, being maximum at high frequency end. The capacity coupling combines with this to level out the gain in this circuit to get uniformity throughout.

The 6L7 used here as detector-mixer has no parallel in glass tubes. The modulation from the oscillator circuit is supplied to this tube by use of an extra grid. Due to not having oscillator plate current flowing in the first detector, the ratio of translation to noise is considerably better than in composite tubes or in circuits where the cathodes of 2 tubes are connected together.

The 6C5 OSCILLATOR - covers only four bands. The harmonic of No. 4 band is used to supply the oscillator voltage for the conversion of signals to I.F. frequency, when using Band 5. The oscillator circuit is a combination of the Hartley and the Colpitts, having the inherent features of both - the Hartley with the good oscillation at the high frequency ends of bands and the Colpitts where oscillation is better at low frequency ends of bands.

By this method the oscillator generates a fairly constant voltage for impression on grid 5 of 6L7 over the full tuning ranges of the set.

1ST I.F. - this transformer is made up of 3 coils phased in such a relation that maximum signal is impressed upon the low inductance primary of 2nd I.F. transformer. The crystal and crystal phasing circuit is inserted between these transformers in such a manner that when the crystal switch is at "in" position, the crystal and crystal phasing condenser cause single signal action to take place - this action varies by the setting of crystal condenser - when switch is at "out" position the signal is impressed directly on the second transformer.

The 2ND I.F. TRANSFORMER has a step up ratio so that the voltage impressed on grid of 6K7, I.F. amplifier, is increased over the normal I.F. transformer connections. By the use of a transformer the grid circuit of this tube is tuned to the I.F. frequency, so that greater selectivity is achieved. Then, if a choke coil is used to supply this tube.

Transformers used at Intermediate Frequencies are of iron core construction - greater selectivity and gain, due to better Q of the coils is achievable than by the use of air core coils.

The signal to noise ratio if iron core coils, due to a better Q, shows a marked improvement over other types of transformers.

The 6K7 (I.F. Amplifier) is coupled through an iron core transformer to single diode plate of 6F6. The single plate being used in order to lessen the load on the secondary of this transformer, making for greater selectivity in this circuit.

The ratios of AC & DC diode load are proportionate so that 100% modulation can be handled without distortion.

As will be noted from the circuit diagram (Fig. 2), the AVC voltage and the audio voltage are taken off slightly below maximum point. This was done to reduce stray R.F. in the circuit and to give better AVC action on the R.F. 1st detector and I.F. stages.

6K7 BEAT FREQUENCY OSCILLATOR - this is electron coupled oscillator - coupled to 6H6 diode plate by two turns of wire. Changes in line voltage and in tubes will not effect the frequency of beat oscillator. The frequency can be controlled by the use of the pitch control in order that a receiving operator can beat on either side of signal getting further selectivity on code reception by choice of audio frequencies.

AUDIO - FIRST STAGE AUDIO 6F5 - is a high MU triode. It is coupled to the diode circuit through its volume control (R20) and condenser (C25). As will be noted from the circuit no DC flows through this control, making for quiet operation.

TONE CONTROL - it will be noted that tone control (R22) is connected on plate of 6F5 and also on its grid circuit, when the control is full counter clockwise (treble position). The tone is normal. As the control is moved to the right up to one-half rotation the bass response is increased without cutting of high notes. Moved through the other half of the rotation the high notes are removed by use of condenser (C27) without further increasing low note responses.

In order to avoid frequency discrimination found in cathode - resistor - condenser bias circuits, the Mallory bias cell is used on the grid of 6F5. This proves a boon for phone operators in that it insures greater intelligibility in all voice, short wave broadcasts, etc.

OUTPUT STAGE - a 6F6 pentode, giving 3.5 watts output is connected to the speaker and headphone jack. This jack is arranged in circuit in such way that when phones are inserted the voice coil of speaker is opened. A seperate magnetic or permanent magnetic dynamic speaker can be plugged into phone jack if external speaker is desired. Where an electro dynamic speaker has its own field supply, this too may be plugged in. Speaker impedance in these cases should be 7000 ohm, although other types can be used at a sacrifice in tone quality. No DC current flows through headphone circuit.

## ALIGNMENT INSTRUCTIONS OF NEW SUPER SKYRIDER

Correct alignment of any receiver is extremely important. The receiver when it leaves the factory is properly aligned with precision instruments and realignment should not be attempted until all other possible causes of faulty operation have been investigated and even then not unless the service technician has the proper equipment. A signal generator that will provide an accurately calibrated signal at .465 m.c. - .8 m.c. - 1.4 m.c. - 1.8 m.c. - 3.8 m.c. - 4.2 m.c. - 9. m.c. - 20. m.c. and 30. m.c. and an output indicating meter are required.

It is practically impossible to align the R.F. unless a satisfactory oscillator and output meter are used. Use a non-magnetic screw driver for adjustments. The complete procedure is as follows:

I.F. Adjustment - in a receiver which has a crystal filter, a crystal controlled oscillator must be used in which the crystal from the radio is used to control the frequency. Connect the output of this through a .1 mfd condenser to the grid of the 6L7. Connect the ground lead of the radio to the ground side of oscillator. (On a receiver without crystal filter, set the signal generator at 465). Turn the band selector switch to band No. 1. Turn the AVC crystal to the "off" position, the audio gain and R.F. gain controls to maximum position (full right). Beat frequency oscillator switch off, set the crystal phasing condenser to one-half capacity that is, plates intermeshed about one-half. Attenuate the signal from the signal generator to prevent overloading the set. Use this procedure in all subsequent adjustments. Then adjust the five trimmers on top of the I.F. cans until maximum output, as indicated by the output meter is observed. The adjustment screws for these trimmers are located in the top of the I.F. transformer cans and may be reached from the top of the chassis. The location of these cans is shown in Fig. 3.

### ADJUSTMENT BEAT FREQUENCY OSCILLATOR

Leave signal generator or crystal oscillator on as in alignment I.F.'s, except turn off the modulation. Set the pitch control condenser at one-half capacity. Turn Beat Frequency Oscillator crystal to "on" position and adjust the trimmer in the top of the Beat Frequency Oscillator coil can to "zero" beat.

### ALIGNMENT OF R.F. STAGES - ADJUSTMENT OF BAND 5

Turn the band spread dial to 200°, minimum position in this and all subsequent adjustments. Connect the antenna lead of the receiver through a 400 ohm resistor to the output of the signal generator. Use this 400 ohm dummy antenna on all bands except band 1, whereas 200 mmfd condenser is used, turn the signal generator to 20. m.c. Set the main tuning dial at 20 m.c., the band switch at No. 4 position, adjust oscillator trimmer marked bands 4 and 5 - 20 m.c. until maximum output is obtained. The location of this trimmer is shown in Fig. 4. Reset the signal generator to 30 M.c., switch to band No. 5 and tune in the signal with the main tuning condenser. Adjust the antenna and detector coil, trimmers marked band 5 for maximum output.

### ADJUSTMENT OF BAND 4

Set the signal generator at 18 m.c., tune in this signal, adjust the antenna and detector coil trimmer until maximum output is obtained. The location of this trimmer is shown in Fig. 4. Leave oscillator trimmer set as in Band 5.

### ADJUSTMENT OF BAND 3

Set the signal generator at 9 m.c., set the main tuning dial at 9 m.c., switch on Band 3, adjust oscillator trimmer marked Band 3, 9 m.c. to maximum output, adjust trimmers on the antenna and detector coils until maximum output is obtained. Reset signal generator at 4.2 m.c., tune this signal in with the main tuning condenser and adjust 4.2 m.c. padder for maximum output while gradually rotating the main tuning condenser back and forth. Location of this padder is shown in Fig. 3 and Fig. 4.

### ADJUSTMENT OF BAND 2

Set the signal generator to 3.8 m.c. with the band crystal on band No. 2 - turn the main tuning condenser to 3.8 m.c., adjust the band 2 oscillator trimmers until maximum output is obtained, then adjust Band No. 2 trimmer on the antenna and detector coils to maximum output. Reset the signal generator 1.8 m.c., tune this signal in with the main tuning condenser and adjust 1.8 m.c. padder for maximum output, while gradually rotating the main tuning condenser back and forth. Location of this padder is shown in Fig. 3 and Fig. 4.

### ADJUSTMENT OF BAND 1

Change the dummy antenna from 400 ohm to 200 mmf condenser. Set the signal generator at 1.4 m.c. with the band switch on band No. 1 - turn the main tuning condenser to 1.4 m.c. Adjust the band 1 oscillator trimmer until maximum output is obtained. Then adjust Band #1 trimmers on the antenna and detector coils to maximum output. Reset the signal generator to .8 m.c. - tune this signal in with the main tuning condenser and adjust .8 m.c. padder for maximum output while gradually rotating the main tuning condenser back and forth. Location of this padder is shown in Fig. 3 and Fig. 4.

The location of the tubes and I. F. transformers and the purpose of each are shown in Fig. 3. The location of all trimmers and padders is shown in Fig. 4. The adjustment of trimmers and padders in another rotation will not give correct alignment of the receiver. These adjustments are accessible from the bottom of the chassis. The location and purpose of all controls are shown in Fig. 1. Schematic diagram of receiver is given in Fig. 2.

### Resistors

| No. | Value Ohms | Watts Rating | Tol. | Part No. |
|---|---|---|---|---|
| R1 | 100,000 | 1/3 | 20% | 2093 |
| R2 | 2,500 | 1/3 | 20% | 2045 |
| R3 | 75 | 1/3 | 10% | 2106 |
| R4 | 10,000 | Receiving Gain | | 2500 |
| R5 | | | | |
| R6 | 25,000 | 1 | 20% | 2073 |
| R7 | 25,000 | 1 | 20% | 2073 |
| R8 | 50,000 | 1/3 | 20% | 2084 |
| R9 | 25,000 | 1 | 20% | 2073 |
| R10 | 100,000 | 1/3 | 20% | 2093 |
| R11 | 100,000 | 1/3 | 20% | 2093 |
| R12 | 50,000 | 1/3 | 20% | 2084 |
| R13 | 100,000 | 1/3 | 20% | 2093 |
| R14 | 200 | 1/3 | 10% | 2114 |
| R15 | 30,000 | 1 | " | 2275 |
| R16 | 100,000 | 1/3 | 20% | 2093 |
| R17 | 1 Meg | 1/3 | 20% | 2108 |
| R18 | 20,000 | 1/3 | 10% | 2072 |
| R19 | 500,000 | 1/3 | 20% | 2102 |
| R20 | 1/2 Meg | AF Volume Control | | 2502 |
| R21 | 50,000 | 1/3 | 20% | 2084 |
| R22 | 1 Meg | Tone Control | | 2503 |
| R23 | | | | |
| R24 | 250,000 | 1/3 | 20% | 2099 |
| R25 | 250,000 | 1/3 | 20% | 2099 |
| R26 | 100,000 | 1/3 | 20% | 2093 |
| R27 | 500 | 1 | 10% | 2119 |

### Condensers

| No. | Value Cap. | Volts Rating | Tol. | Type | Part No. |
|---|---|---|---|---|---|
| C1 | .00025 | 600V | 20% | Mica | 4007 |
| C2 | .000028 | | | Band Spread Con. | 4802 |
| C3 | .000028 | | | " " " | |
| C4 | .000028 | | | " " " | |
| C5 | .000452 | | | Main Tuning " | 4801 |
| C6 | .000452 | | | " " " | |
| C7 | .000452 | | | " " " | |
| C8 | .005 | 600V | 5% | Mica | 4317 |
| C9 | .1 | 400V | 20% | Paper | 4107 |
| C10 | .002 | 600V | 20% | Mica | 4013 |
| C11 | .003 | 600V | 5% | Mica | 4313 |
| C12 | .0017-Appr. | | | Padders | |
| C13 | .001 " | | | " One Strip | 4400 |
| C14 | .0004 " | | | " | |
| C15 | .00005 | 600V | 20% | Mica | 4001 |
| C16 | .006 | 600V | 5% | Mica | 4317 |
| C17 | .05 | 200V | 20% | Paper | 4104 |
| C18 | .25 | 400V | 20% | Paper | 4109 |
| C19 | .000025 | | | Crystal Phas. " | 4804 |
| C20 | .02 | 200V | 20% | Paper | 4102 |
| C21 | .05 | 200V | 20% | Paper | 4104 |
| C22 | .1 | 200V | 20% | Paper | 4106 |
| C23 | .00025 | 600V | 20% | Mica | 4007 |
| C24 | .00025 | 600V | 20% | Mica | 4007 |
| C25 | .05 | 200V | 20% | Paper | 4104 |
| C26 | .002 | 600V | 20% | Mica | 4013 |
| C27 | .004 | 600V | 20% | Mica | 4017 |
| C28 | .25 | 400V | 20% | Paper | 4109 |
| C29 | .0006 | 600V | 20% | Mica | 4009 |
| C30 | .05 | 400V | 20% | Paper | 4105 |
| C31 | .1 | 400V | 20% | Paper | 4107 |
| C32 | 5 mfd | 25V | 20% | Elec. | 4200 |
| C33 | .004 | 1000V | 20% | Mica | 4500 |
| C34 | .05 | 400V | 20% | Paper | 4105 |
| C35 | .00025 | 600V | 20% | Mica | 4106 |
| C36 | .000025 | | | Var. Cond. | 4804 |
| C37 | 8 mfd | 450V | | Elec. | 4210 |
| C38 | 8 mfd | 450V | | Elec. | 4210 |
| C39 | .05 | 400V | 20% | Paper | 4105 |
| C40 | .006 | 1000V | 20% | Mica | 4501 |
| C41 | .05 | 200V | 20% | Paper | 4104 |
| C42 | .0005 | 600V | 5% | Mica | 4308 |

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