SKY CHALLENGER

OPERATING INSTRUCTIONS

The new 1937 SKY CHALLENGER is a 5 band, 9 tube superheterodyne receiver covering the following frequency ranges.

No. 1 Band -- 545 KC to 1230 KC (550 to 243 meters.)

No. 2 " -- 1.18 MC to 2.85 MC (254 to 105 meters.)

No. 3 " -- 2.75 MC to 6.82 MC (109 to 44 meters.)

No. 4 " -- 6.75 MC to 16.40 MC (45 to 18.3 meters.)

No. 5 " -- 15.40 MC to 38.10 MC (19.5 to 7.85 meters.)

No. 1 Band covers the American Broadcast range up to 1,230 KC. (243 meters.)

No. 2 Band covers from 1.18 megacycles (254 meters) to 2.85 megacycles (105 meters.) With the receiver operating in this position the remainder of the broadcast band can be covered. From 1.50 megacycles up in frequency you will receive high-fidelity experimental broadcast, aircraft, amateur and police stations.

No. 3 Band covers from 2.75 megacycles (109 meters) to 6.82 megacycles (44 meters). Operation in this position will allow you to receive the 3.5 megacycle (80 meter) amateur band, standard frequency transmissions, aircraft, police and the 6. megacycle (49 meter) short wave broadcast band.

No. 4 Band covers from 6.75 megacycles (45 meters) to 16.40 megacycles (18.3 meters). With the receiver operating in this position you will receive 7000 KC amateur code stations; 9.5 megacycles (31 meter) broadcast; 12.00

found the greatest number of broadcast transmissions, both foreign and local.

No. 5 Band covers from 15.40 megacycles (19.5 meters) to 38.10 megacycles (7.85 meters.)

Operation with the receiver in this position will allow reception of 15.80 megacycle (19 meters) broadcast. It is suggested that band No. 4 be used for reception of this band. You will find that reception on this band is most seriously affected by changeable radio conditions on these frequencies. The 28.00 megacycle (10 meters) amateur band will allow reception of signals only over relatively great distances (seldom less than 1500 miles) when this band is "open." It will be easier to receive signals on this band during the daylight hours.

TO OPERATE

On the lower right hand corner on the back of the [redacted]

impedance. The other terminal strip to the right of these two and marked EXT. SW. is used to turn the set on and off for a stand-by. This strip when connected to a relay or a separate set of contacts on an external switch will turn the set on and off temporarily when the send - receive switch on the front panel is in the "send" position.

In the back to the left of the chassis will be found the antenna and ground binding post strip. If a doublet antenna is used, remove the jumper from the post marked A2 to the post marked G and connect the two wires from the doublet to the posts marked A1 and A2. Please remember that the regular short wave doublet antenna is designed to work best

[redacted]

top and lead-in type of antenna, connect the lead-in to the post marked A1, being sure that the wire jumper is connected to the post marked A2 and G. Antenna location, length and type play a most important part in the successful operation of the set, especially on the two high frequency ranges. It is suggested that a little experimenting be done with the antenna so that maximum performance will be secured.

Plug the cord on the receiver into the power socket. (Unless otherwise specified the receiver operated on 60 cycle, 110 volt alternating current.) Turn the control marked "Tone" to the right. This will connect the receiver to the A.C. line. During the time the receiver is warming up also turn the "R.F. Gain" and the "A.F.Gain" knobs to the right. The receiver is shipped with the band-change switch in the [redacted]

on the band change switch indicates the band you wish to tune. We suggest that you familiarize yourself with operation of the receiver on [redacted]

[redacted]

that the "BFO" be used by snapping the toggle switch to "on" position. Once these signals are located, it should be turned off or a continuous whistle will result. When listening to C.W. transmissions the B.F.O. [redacted]

[redacted] pleasing to the operator.

[redacted]

"R.F. GAIN" control with the "A.V.C." switch in the "ON" position should be turned as far as it will go to the right. It will be noticed that with the "A.V.C." switch "OFF" and the "R.F.GAIN" wide open the set will block on strong signals. If maximum sensitivity is desired

[redacted]

CRYSTAL OPERATION

To properly adjust the crystal circuit for best performance the following procedure should be carefully followed:

Be sure that the "BFO" switch is in the "OFF" position.

Tune to some station transmitting continuously, being very careful to get the signal on the nose. After you are sure you have the signal resonated perfectly, snap "ON" the "BFO".

Check your tuning and be sure you still have the signal perfectly tuned-in.

Now change the "PITCH CONTROL" being sure that it is operating properly. Proper operation of this control will be indicated by hearing the signal twice in one complete rotation of the knob, there being two positions in which no signal will be heard. These are known as the zero beat positions.

Snap the crystal switch to the ON" position. You will notice a great reduction in noise. Carefully retune the signal on the "BAND SPREAD" dial. Notice how sharply the signal peaks, with normal volume again obtained. Now tune through the signal and find which side of the signal is the weaker. Tune in the weaker side and then carefully adjust the"PHASING" condenser control until the weaker signal is inaudible. Retuning to the other side of the signal should find no change in its volume and knife-like selectivity resulting. Whichever side of the zero-beat adjustment of the"PITCH CONTROL" gives the greater rejection of the image, that is the adjustment to be used for maximum selectivity. The phasing condenser affects the selectivity of the receiver whether the crystal is in the circuit or not. The crystal may be used in the reception of phone signals with some sacrifice in their quality.

Again you are reminded to tune this receiver with care. Because of its extreme selectivity, you may expect the most satisfactory results only after familiarizing yourself with its operation.

The tube line-up in the new 1937 SKY CHALLENGER is as follows:

6K7 Pre-selector, R.F.amplifier

6L7 1st Detector-mixer

6C5 Signal frequency oscillator

6K7 1st I.F. amplifier

6K7 2nd I.F. amplifier

6Q7G 2nd detector; A.V.C.; 1st stage of audio

6F6G 2nd audio stage

6K7 Beat oscillator

80 Full-wave rectifier

Separate coils are used to cover each band. Inductive coupling of the signal picked up by the antenna permits the maximum transfer of energy from each separate primary to the particular secondary range in the circuit. The unused coils are shorted.

The 6K7 r.f. stage gives maximum gain in relation to frequency and provides pre-selection which gives an image ratio of 80 to 1 on the highest frequency range.

The first detector-mixer is a 6L7. The output from the 6C5 signal frequency oscillator is electron coupled to the injector, or No. 3 grid, of the 6L7. Because no oscillator plate current flows in the 1st detector, the ratio of translation to noise is more favorable than that obtained in a composite tube, or in circuits where the cathodes of two tubes are tied together.

The 6C5 oscillator has separate coils for each band. The superior overall performance is the result of not using any harmonics of the signal frequency oscillator throughout the tuning range of the receiver.

All intermediate frequency transformers are of the iron-core type and resonate at 465 KC. This type of transformer has so definitely demonstrated its superiority over the air core type as to warrant its use in the new 1937 SKY CHALLENGER. Tremendous gain, better signal to noise ratio,,extreme selectivity are but a few of the advantages of the iron core system.

The crystal input transformer is made up of three coils so placed that a signal of maximum strength is impressed on the low impedance primary of the cryatal output transformer. The crystal

filter with its phasing condenser is inserted between these transformers. With proper adjustment of the phasing condenser single signal operation can be secured. When the crystal is shorted, or the crystal switch is in the "OUT" position, the signal is impressed directly on the crystal output transformer which feeds the grid of the 6K7 first I.F. stage.

The second and third I.F. transformers are identical and provide maximum stabilized gain. The use of two iron-core I.F. stages gives an order of gain and selectivity which has heretofore never been obtained in communication receivers. The I.F. selectivity of the 1937 SKY CHALLENGER, without crystal, at 100 times input is 11 KC.

The 6Q7G second detector gives half-wave diode detection, A.V.C., and the triode section of this tube is the first stage of audio amplification. The plate of this section of this multi-purpose tube is resistance coupled to the grid of the 6F6G output tube.

The audio power output of this receiver is 3.5 watts, Class A.

The beat oscillator is a 6K7 electron-coupled to the diode section of the 6Q7G.

The 80 rectifier provides ample current for the complete receiver.

In this receiver the speaker is not a portion of the filter system. This allows the receiver to be operated independently of the speaker itself. A permanent magnet 5000 ohm speaker is the type we recommend being used with this receiver.

The headphone jack is connected to the input of the 6F6G output tube. The possibility of shock to the operator is eliminated by having no direct current on the phones.

01123715

RESISTOR AND CONDENSER LIST

MODEL S-15 SKY CHALLENGER.

Resistors

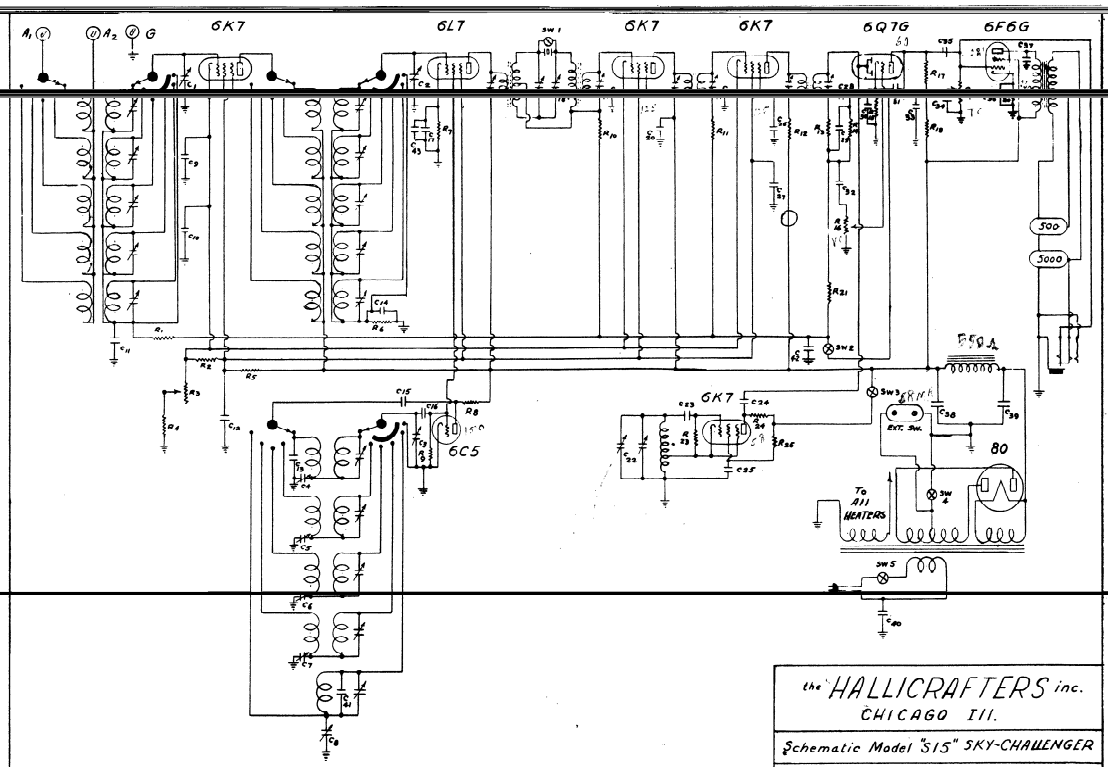
NO.	VALUE OHMS	RATING WATTS	TOLERANCE	PART NO.
R1	100,000	1/3		20093
R2	20,000	1		
R3	15,000	2	10%	24034
R6	100,000	1/3		20093
R7	600	1/3	10%	22125
R8	10,000	2		24033
R9	50,000	1/3		20084
R10	100,000	1/3		20093
R11	100,000	1/3		20093
R12	1,000	1/3		20033
R13	20,000	1/3		20072
R14	500,000	1/3		20102
R15	4,000	1/3		20051
R16	500,000	Volume Control		25012
R17	250,000	1/3		20079
R18	100,000	1/3		20093
R19	1,000,000	Tone Control		25013
R20	500	1	10%	22024
R21	1,000,000	1/3		20108
R23	50,000	1/3		20084
R24	50,000	1/3		20084
R25	100,000	1/3		20093

01123715

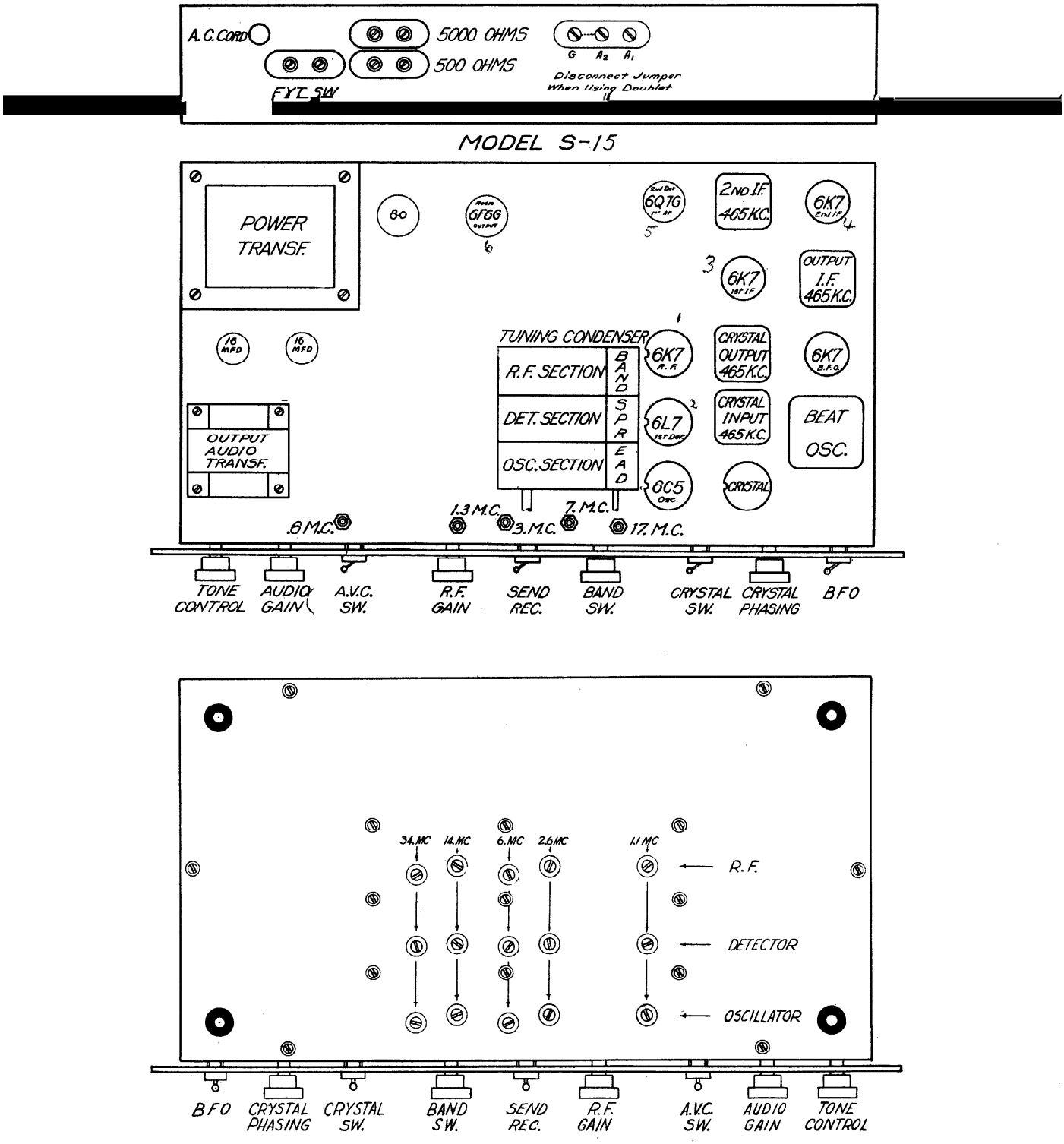
SYMBOLS MODEL S-15, SKY CHALLENGER

Condensers

No.	Value Mfd		Rating Volts	Tol	Part No.
C1	250	mmfd	Rear section gang		48-011
C2	250	"	Middle " "		48-011
C3	250	"	Front " "		48-011
C4	.0012	Mfd	Var. Pad		44012
C5	.0011	"	Var. Pad		44012
C6	.00093	"	Var. Pad		44012
C7	.00039	"	Var. Pad		44008
C8	.0002	"	Var. Pad		44006
C9	.002	"	400	Mica	40013
C10	.25	"	200		41008
[illegible]					
C13	50	mmfd		"	40002
C14	.002	Mfd		" 5%	43012
C15	.002	"		"	40013
C16	100	mmfd		"	40003
C17	.05	Mfd	200		41004
C18	25	mmfd	Air Var.		48012
C19	.02	Mfd	200		41002
C20	.25	"	400		41009
C21	.02	"	200		41002
C22	25	mmfd	Air Var.		48012
C23	250	"		"	40007
C24	10	"	Twisted Leads		
C25	.02	Mfd	400		41003
C26	.05	"	400		41005
C27	.1	"	400		41007
C28	250	mmfd		"	40007
C29	250	"		"	40007
C30	10	Mfd	25 Electrolytic		42004
C31	500	mmfd		"	40009
C32	.05	Mfd	200		41004
[illegible]					
C35	.05		400		41005
C36	10	"	25 Electrolytic		42004
C37	.005	"	600		45003
C38	16	"	400 Wet Electrolytic		42019
C39	16	"	400 " "		42019
C40	.01	"	400		41001
C41	10	mmfd		" 10%	43020
C42	.05	Mfd	200		41004
C43	.002	"		"	40013



the HALLICRAFTERS inc. CHICAGO ILL.
Schematic Model "S15" SKY-CHALLENGER
Drawn by :- R.J.H. 12-10-36 Checked by :- [illegible] 12-11-36 Approved by :- [illegible] 12-11-36
Revisions :-

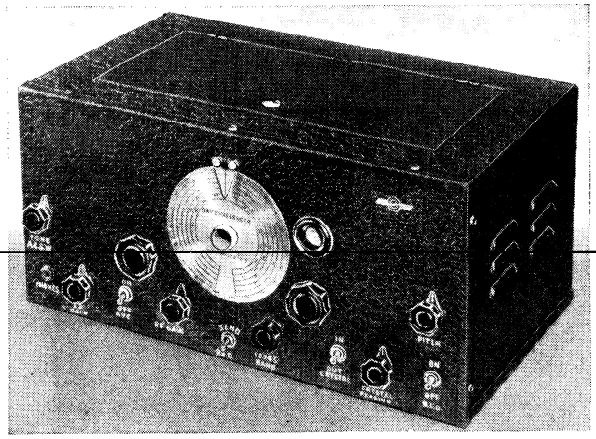

A.C. CORD
5000 OHMS
500 OHMS
EXT. SW
G A2 A1
Disconnect Jumper When Using Doublet
MODEL S-15
POWER TRANSF.
80
6F6G OUTPUT
6Q7G 1st AF
2ND I.F. 465 K.C.
6K7 2nd I.F.
6K7 1st I.F.
OUTPUT I.F. 465 K.C.
16 MFD
16 MFD
TUNING CONDENSER
R.F. SECTION
DET. SECTION
OSC. SECTION
BAND SPREAD
6K7 R.F.
6L7 1st Det.
6C5 OSC.
CRYSTAL OUTPUT 465 K.C.
CRYSTAL INPUT 465 K.C.
6K7 B.F.O.
BEAT OSC.
CRYSTAL
OUTPUT AUDIO TRANSF.
.6 M.C.
1.3 M.C.
3. M.C.
7. M.C.
17. M.C.
TONE CONTROL
AUDIO GAIN
A.V.C. SW.
R.F. GAIN
SEND REC.
BAND SW.
CRYSTAL SW.
CRYSTAL PHASING
B.F.O.

34. MC
14. MC
6. MC
2.6 MC
1.1 MC
R.F.
DETECTOR
OSCILLATOR
B.F.O.
CRYSTAL PHASING
CRYSTAL SW.
BAND SW.
SEND REC.
R.F. GAIN
A.V.C. SW.
AUDIO GAIN
TONE CONTROL

The "Sky-Challenger"—Range 38.1 mc. to 545 kc.

● DESIGNED by one of the leading manufacturers of communications receivers in the country, this receiver—the Sky-Challenger—has every feature desirable in a receiver of its type plus broadcast reception of startling quality. The frequency range (changed by band-switch) of this new unit is from 38.10 mc. to 545 kc. in five bands. It seems the *Hallicrafters* sounded the needs of the listener more deeply than by merely turning out a radio receiver capable of bringing them in from all over the world; here is a receiver which appeals to the taste and principally the pocketbook of not only the discriminating amateur but the more *advanced* short-wave listener.

To afford the listener as image-free performance as possible, a tuned stage of radio frequency amplification is used on all bands. On the higher frequency ranges of the receiver this stage, normally found only in the more expensive all-wave receivers, justifies itself by giving gains in the order of 3 to 1. A separate oscillator tube is used in all ranges rather than sacrifice performance by using harmonics. The superior over-all performance obtained by using separate coil and tube would allow no substitution in a receiver which was to economically fill every *listener* requirement.



The new 9-tube Superheterodyne Receiver has five bands, all "switch-controlled." Excellent for "Fan" or "Ham" purposes. Available with or without crystal filter. For complete diagram see page 756 (No. 602)

Iron-core intermediates which had so definitely demonstrated their superiority in the more expensive models of this line of receivers couldn't be left out. To get that high order of selectivity so necessary in communications receivers, two I.F. stages are used, both of them iron-core. For the QRM ridden ear of the active *amateur*, the 465 kc. crystal filter model is available, while for the short-wave *listener* satisfied with nothing but the last word in performance, the conventional model—less the crystal—is optional. Under test it is surprising how the crystal model sets them up like sore thumbs with no interference to bother a perfect QSO. One very necessary requirement has not been neglected—a separate band-spread control. It proved to be a pleasure to comb across the band in a few effortless turns of this control, and still be able to resonate accurately and comfortable on any one signal. It was found that more than normal caution had to be taken with the crystal in the circuit; a little careful tuning uncovered signals which had previously been completely overlooked—that might give you an idea just how selective this new set really is.

As indicated in the diagram, the tube line-up is as follows: a 6K7 R.F. amplifier or preselector, a 6L7 first detector mixer, a 6C5 signal frequency oscillator, 6K7 1st I.F. amplifier, 6K7 2nd I.F. amplifier, 6Q7G 2nd detector, AVC 1st stage of audio, 6F6G 2nd stage of audio, 6K7 beat oscillator, and an 80 rectifier.

One thing about this receiver that appealed to us was that the speaker is not a portion of the power supply. The *permanent magnet* speaker provided remarkably good quality when used, but we preferred headphones when putting the receiver through its paces on DX.

Technical Description

The new 1937 Sky-Challenger is a 5 band, 9 tube superh
dyne receiver covering the following frequency ranges:

No. 1 Band—	545 KC	to	1230	KC (550 to 24
No. 2 " —	1.18 MC	to	2.85	MC (254 to 1
No. 3 " —	2.75 MC	to	6.82	MC (109 to
No. 4 " —	6.75 MC	to	16.40	MC (45 to
No. 5 " —	15.40 MC	to	38.10	MC (19.5 t

No. 1 Band covers the American (Contin

The "Sky-Challenger"

(Continued from page 744)

Broadcast range up to 1,230 kc. (243 meters).

No. 2 Band covers from 1.18 megacycles (254 meters) to 2.85 megacycles (105 meters). With the receiver operating in this position the remainder of the broadcast band can be covered. From 1.50 megacycles up in frequency one may receive high-fidelity experimental broadcast, aircraft, amateur and police stations.

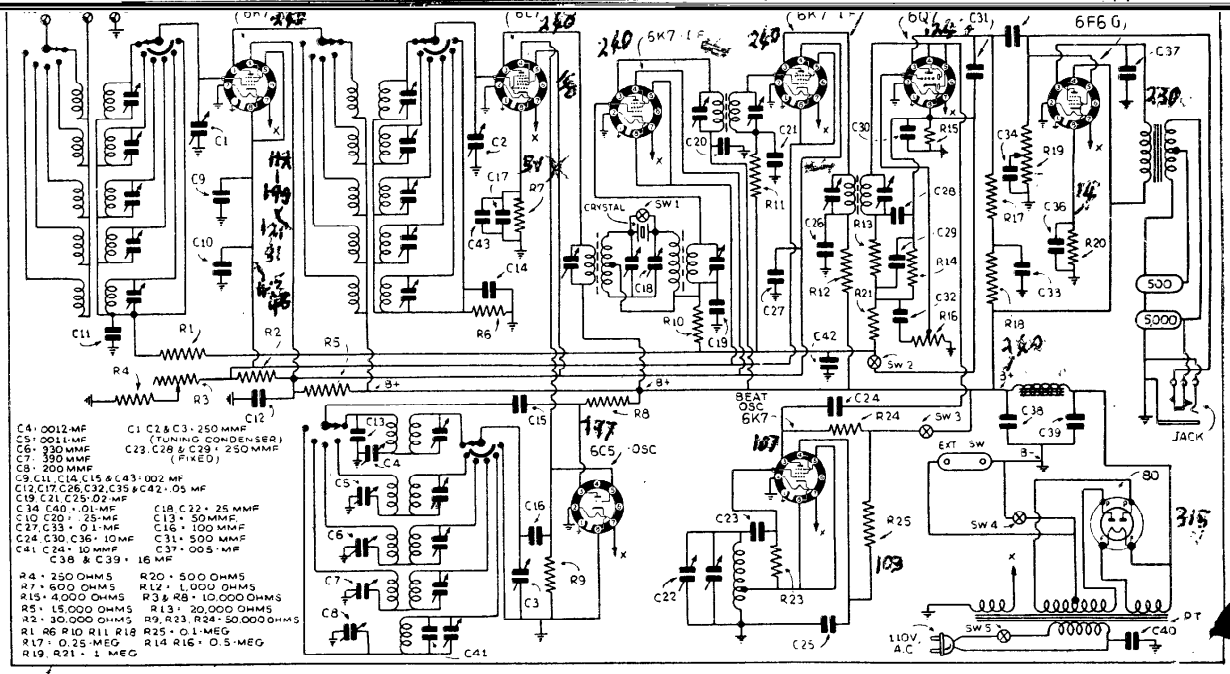
No. 3 Band covers from 2.75 megacycles (109 meters) to 6.82 megacycles (44 meters). Operation in this position will allow one to receive the 3.5 megacycle (80 meter) amateur band, standard frequency transmissions, aircraft, police and the 6. megacycle (49 meter) short-wave broadcast band.

No. 4 Band covers from 6.75 megacycles (45 meters) to 16.40 megacycles (18.3 meters). With the receiver operating in this position reception is afforded of 7,000 kc. amateur code stations; 9.5 megacycle (31 meter) broadcast; 12.00 megacycle (25 meters) broadcast; 14.00 megacycle (20 meters) amateur code and phone stations; 15.80 megacycle (19 meters) broadcast. On this band will be found the greatest number of broadcast transmissions, both foreign and local.

No. 5 Band covers from 15.40 megacycles (19.5 meters) to 38.10 megacycles (7.85 meters). Operation with the receiver in this position will allow reception of 15.80 megacycle (19 meters) broadcast. It is suggested that band No. 4 be used for reception of this band. The 28.00 megacycle (10 meters) amateur band will allow reception of signals only over relatively great distances (seldom less than 1,500 miles) when this band is "open." It will be easier to receive signals on this band during the daylight hours.

Diagrams of S-W Commercial Receivers

Hallicrafter Model S-15 "Sky-Challenger"



Above—This 9-tube all-wave receiver covers the short-wave and broadcast bands with a ganged band-switch. This set is available with or without the crystal filter; the filter is shown in our diagram. This crystal filter feature is especially desirable for Ham use. A phone-jack is provided, as well as tone and volume controls and a beat oscillator.