#### 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 Band -- 1.18 MC to 2.85 MC (254 to 105 meters.)
- No. 3 Band -- 2.75 MC to 6.82 MC (109 to 44 meters.)
- No. 4 Band -- 6.75 MC to 16.40 MC (45 to 18.3 meters.)
- No. 5 Band -- 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 covere 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, aircr\_ft, amatour 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 out to receive the 3.5 megacycle (80 meter) amateur band, standard frequency transmissions, aircraft, police and the 6. megacycle (49 meter) chort wave broadcast band.
- No. 4 Band covers from ...75 megacycles (45 meters) to 16.40 megacycles (18.5 inters.) With the receiver operating in this position you will receive 7000 KC amateur code static and 9.5 megacy. les (31 meter) broadcast; 12.00 megacycle (25 meters) broadcast; 14.00 megacycle (20 meters) quateur code ary phone stations; 15.80 megacycles (11 meters) broadcast; 14.00 megacycles (12 meters) 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 packtion will allow reception of 15.80 mag.acycle (19 meters) in adeas. It is suggested that band No. A be used for meneration of this band. The said that reception on this band is most seriously affected by chargeable ratio conditions on these frequencies. The 33.00 magacycle (10 maters) amair r hand will allow reception of signals only over relativity great distances (selfom less than 1500 miles) when this band is "open," It will be easier to receive signals or this band during the daylight hours.

## TO OPERATE

On the lower right hand corner on the back of the chassis you will find a terminal strip marked 5000 ohms. To this strip connect the permanent magnet speaker. The terminal strip marked 500 ohms directly above the 5000 ohm strip can be connected to a load of that impedance. The other terminal strip to the right of these two and marked ETT. 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 temperarily 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 &2 to the post marked & and connect the two wires from the doublet to the posts marked Al and A2. Please remember that the regular short wave doublet antenna is designed to work best on the short-mave broadcast frequencies. This means that it will not perform equally well on the amateur bands or frequencies in between the short-wave broadcast channels. When using the conventional flattop 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 C4 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 rocket. (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 highest frequency range. Adjust the "Bands" switch until the pointer on the band change switch indicates the band you wish to tune. We suggest that you familiarize yourself with operation of the receiver on Bands No. 1 and No. 2 before trying the higher frequencies. Turn the larger knob marked "BAND SET" until the desired frequency is reached. When listening for distant or possibly weak stations, it is recommended 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. must be left turned on. The "PITCH CONTROL" knob directly above this switch will prove most helpful in changing the beat note to one most pleasing to the operator.

When receiving voice, whether broadcast or short wave, it is recommended that the "A.V.C." switch be left in the "ON" position. The "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 meximum sensitivity is desired the "A.V.C." switch can be left in the "OFF" position. The sensitivity may be mamually controlled with the "R.F. GAIN" control. It will be found that by optional adjustment of both "R.F." and "A.F." gain controls the most favorable ratio of signal to noise will be secured.

#### 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 a gain 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-heat 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 femiliarizing yourself with its operation.

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

- 6K7 Pre-selector, R.F. Amplifier
- 6L7 1st Detector-mixer
- 605 Signal Frequency Oscillator
- 6K7 lst 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 lst 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 605 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 1927 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 colls so placed that a signal of maximum strength is impressed on the low impedance primary of the crystal output transformer. The crystal

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filter with its phasing condensor is inserted between these transformers. When the proper adjustment of the phasing condensor single signal operation can be secured. When the crystal is shorted, or the crystal switch is in the "CUT" position, the signal is impressed directly on the crystal output transformer which feeds the grid of the GKT 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 CHALENGER, 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  $6\mathrm{K7}$  electron-coupled to the diode section of the  $6\mathrm{Q7G}_{\circ}$ 

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.

## SYMBOLS MODEL S-15, SKY CHALLENGER

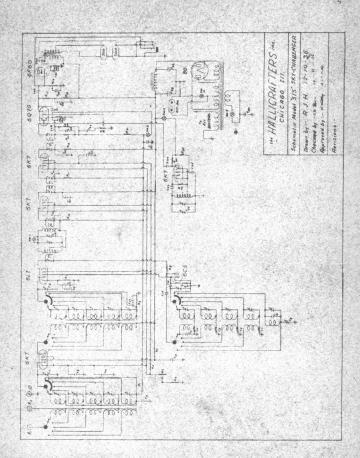
## Condensers

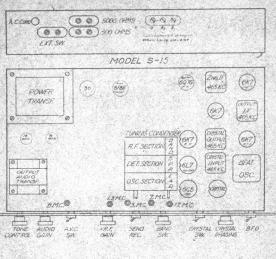
~	No.		Value Mfd.	12906		Rating Volts	Tol.		Part No.
	C1		250	mmfd		Rear Section gang			48011
	02		250	mmfd		Middle Section gang			48011
	03		250	mmfd.		Front Section gang			48011
	C4		,0012			Var. Pad			44012
	C5			mfd.		Var. Pad			4401.2
	06			3 mmfd		Var. Pac			44012
	C7			9 mmfd		Var. Pad.			44008
	08		,0002			Var. Pad			44006
	C9		.002	mfd		400	Mica		40013
	010		.25	mfd		200	14 000		41008
	C11		:002	mfd.			M1ca	5%	43012
	Cla		.05	mfd		400		-/-	41005
	C13		50	mmfd.		200	Mica		40002
	014		.002	mfd			Mica	5%	43012
	C15		.002	mfd			Mica	4/-	40013
	016		100	mmfd.			Mica		40003
	C17		.05	mfd		200			41004
	C18		25	mmfd		Air Var.			48012
	U19		.02	mfd		200			41002
	C20		.25	mfd		400			41,009
	C21		.02	mfd		200			41002
	022		25	mmfd		Air Var.			48012
	023		250	mmfd			Mica		40007
	024		10	mmfd		Twisted Leads			
	C25		.02	mfd		400			41003
	C26		.05	mfd		400			41005
	C27		.1	mfd		400			41007
	028		250	mmfd.			Mica		40007
	029		250	mmfd			Mica		40007
	030		10	mfd		25 Electrolytic			42004
	C31		500	mmfd		20 -101111111111111111111111111111111111	Mica		40009
	032		,05	mfd.		200	-		41004
	C33		.1	mfd.		400			41007
	C34		.01	mfd		200			41,000
	C35		.05	mfd.		400			41005
	036		10	mfd		25 Electrolytic			42004
	C37		.005	mfd		600			45003
	037		16	mfd		400 Wet Electrolytic			42019
	039		16	mfd		400 Wet Electrolytic			42019
	040		.01	mid mid		400			41001
	041		10	mmfd		700	Mica	10%	43020
	041		.05	mfd		200	200	20/0	41004
	042		.002	mid mfd		200	Mica		40013
	W443		· VUC	mrd.			-100		

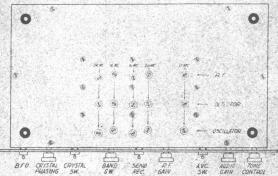
# RESISTOR ALL CONDENSER LIST MODEL S-15 . KY CHALLENGER

## Resistors

_Nc	-	Value Oh	as_	Rating Watta	Tolerance	Part No.
RI		100,000		1/3	1.1	20093
R	2	30,000		1	1.0%	22075
R:		10,000		R,F,Gain		25009
R4		250		1/3	10%	22017
R	5	15,000		2	10%	24034
Re		100,000		1/3		20093
· R		600		1/3	10%	22125
R		10,000		2		24033
R		50,000		1/3		20084
. R		100,000		1/3		20093
R;		100,000		1/3		20093
	12	1,000		1/3 -		20033
	13	20,000		1/3		20072
	1.4	500,000		1/3		30703
	15	4,000		1/3 '		20051
	16	500,000		Volume Control		22015
	17	250,000		1/3		20079
	18	100,000		1/3		20093
	19	1,000,000		Tone Control		25013
	50	500		1	10%	22024
	21	1,000,000		1/3		20108
	23	50,000		1/3		20084
	24	50,000		1/3		20084
	25	100,000		1/3		20093







## ALIGNMENT PROCEDURE FOR SKY CHALLENGER S-15

Intermediate fraguency alignment.

If the receiver is equipped with a crystal ,  $u_{\rm SO}$  the crystal in a separate oscillator.

If the receiver is not an SX 11 model set the signal generator for  $465\ \mathrm{KC}$  output.

Before I.F. or R.F. alignment see that:

AVC switch is off
Crystal switch is off
B.F.O. switch is off
Audio gain control set at maximum
R. F. gain control set at maximum
Crystal phasing condenser adjusted for maximum noise level.
Do not remove bottom plate from chessis.

Remove 605 oscillator tube from its socket and connect generator output directly to the grid of the 6L7 lst, detector.

As an output indicator, it is suggested an C-3 volt A,C, voltmeter be connected across the speaker voice coil,

Now adjust all I.F. transformers for meximum output,

## R. P. Alignment

Check dial— at maximum capacity of condenser cang the black line on the dial should be under the black line on the "V" indicator.

Set band apread condenser at minimum capacity or so that it reads 100 degrees.

Put the 605 oscillator tube back in its socket.

Connect generator output through 400 Chm resistor to antenna and ground costs on receiver (Jumper should remain connected.)

Set generator for 600 KC

Put receiver on Band #1

Set'dial to reading of 600 KC

Now adjust .6 MC ped on top of chassis until signal is resonated.

Reset generator to 1100 KC Adjust 1,1 megacycle osc, trimmer condenser beneath the chassis until this signel is properly resonated.

Now adjust R.F. end detector trimmers for meximum gain.
Now reset dial and generator to 600 KC and re-ped above chassis.

It may be necessary to pad and trim at 600 KC and 1100 KC a few times as a change of capacity at one end will affect the other end. Re-check on R.F. and detector trimmers and peck for meximum gain.

## Band 42

Reset dial to 1100 KC

Same procedure as on Rend #1 except pad (above chassis) at 1.3 MC. Trim at 2.6 M.C.

#### Band #3

Same procedure as before excent rad oscillator at 3, M.C. Trim at 6 MC  $\,$ 

Rock the gang when making these adjustments.

## Pand #4

Same procedure as before except pad oscillator at 7, M.C. Trim at 14 M.C.

Rock geng when making these adjustments.

#### Bond #5

Same procedure as before except pad osciallator at 17, MC Trim at 34 MC  $\,$ 

Rock geng while making these adjustments.

It may be necessary to go through the above procedure several times before maximum performance is secured. A small change at one end of each bend will affect the other end.

When making adjustments on this receiver back off on R. F. gain leaving A. F. gain at maximum at all times.

Be sure and turn the trimmers all the way in (clockwise rotation) (except as noted below) and back out to find the signal. On these air-dielectric trimmers capacity is <u>Reduced</u> when turning the screws in a clockwise direction.

Detector trimmers on ban's 4% 5 should be backed out all the way and screwed clockwise to find the signal. This will help to eliminate making on the wrong side.

Be sure and check Imazes on bands 3, 4, & 5. These images will fall approximately 1, megacycle lower in frequency on all bands.