

SUPER DEFIANT MODEL SX25 **OPERATING INSTRUCTIONS**

The engineers of the Hallicrafters Co. have embodied in the Super Defiant Model SX25 receiver every worthwhile advancement that has been made in the communications field. The user of the SX25 should find in this receiver the complete answer to his reception requirements.

It is recommended that, upon receipt, the owner of the SX25 receiver carefully inspect the carton and then the receiver for any damage which might have occurred in transit. Should any signs of damage be apparent immediately file claim with the carrier accurately stating the extent of the damage.

ANTENNA

The SUPER Defiant has an antenna input circuit which will allow the use of either a doublet or vertical (inverted Y) antenna. The approximate antenna input impedance of the SX25 is 400 ohms.

A very satisfactory antenna will be the inverted Y, or Marconi type. This antenna should be approximately 75 feet long overall, including the lead-in to the antenna. Satisfactory operation of the SUPER Defiant is obtained throughout its tuning range with this type of antenna and because of that fact as well as its ease of construction it is highly recommended.

With the inverted Y type of antenna A₂ must remain connected to G for best operation. While a ground connection is usually not necessary it might prove to be helpful in reducing noise. A cold water pipe or 6' foot rod driven in moist soil will be a very satisfactory ground when connected to the G terminal on the receiver. Connections to a radiator or gas piping are not recommended.

Should a doublet antenna be used it is suggested that a transmission line of 400 ohm value of impedance be constructed so that a most efficient transfer of energy is obtained. The commercially available all wave doublet antennas are usually provided with a coupling transformer which matches the transmission line to the receiver. This transformer connects to the A₁ and A₂ terminals on the antenna strip. The half-wave length-doublet antenna cut for a particular frequency can be computed by the following formulas:

$$\begin{aligned} \text{Length in feet} &= \frac{\text{Frequency in megacycles}}{463} \\ \text{or for example, a half wave 20 meter or 14 megacycle} \\ \text{antenna would be} & \frac{463}{14} \text{ or } 33.7 \text{ feet long overall} \end{aligned}$$

This type of antenna is broken in the center with an insulator and has the transmission line connected to each resulting quarter wave section at that point. This antenna is a very good performer, in a direction broadcast to its length, only on the relatively narrow group of frequencies for which it was cut. It does not function well on harmonic frequencies.

When using either type of doublet antenna the transmission line should be connected to A₁ and A₂ binding posts. The wire connecting the A₂ to ground or G can be left connected if the performance of the receiver is improved.

FREQUENCY RANGE

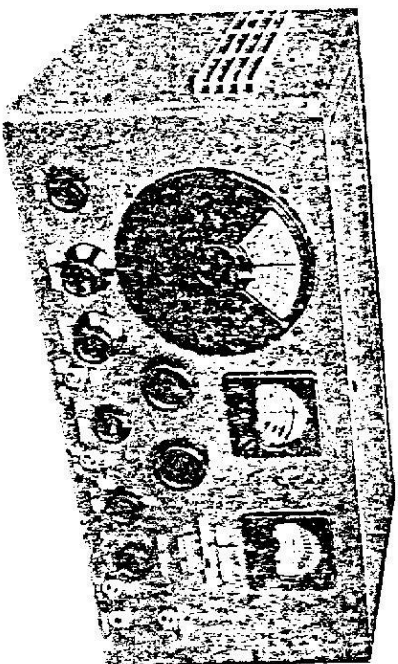
The SUPER Defiant tunes from 540 kilocycles to 42 megacycles in four bands. The frequencies covered per band are as follows:

Band	Coverage
1	540 KC to 1,700 KC
2	1.7 MC to 5.1 MC
3	5.0 MC to 15.7 MC
4	15.2 MC to 42 MC

The main tuning dial, which appears behind the large escutcheon, is accurately calibrated in kilocycles on band #1 and in megacycles on the remaining four bands.

Note: The accuracy of the main dial calibration will hold only if the HAND SPREAD condenser is set at minimum capacity, or the position indicated by 100 on the Hand Spread dial which has been approached by turning the Hand Spread Knob in a clockwise direction, or to the right, as far as it will go.

Then, first using the receiver, become familiar with its operation on the standard broadcast band, or band #1, before tuning the short wave bands. You then will be able to fully appreciate the capabilities of SUPER Defiant.



the **SUPER DEFIANT** **MODEL SX25** **OPERATING** **ALIGNMENT AND** **SERVICING INSTRUCTIONS**

the hallicrafters *co.*
CHICAGO U.S.A.

FREQUENCY METER TUNING

Around the outer edge of the main tuning dial the "Frequency Meter Tuning" is available are marked with the red numerals: 10 - 20 - 40 and 60. Set the red line beneath these numerals directly opposite the "H.A.I." on the window and switch to the correct band. The band spread scale will indicate correct frequency within the limits of the setting and calibration.

The band spread dial of the SX25 Model is calibrated so that the operator may determine quite closely the frequency of the signal to which he is listening on the 10 to 60 meter amateur bands inclusive. The outer edge of this dial is marked off in 100 divisions for additional ease in locating and locating stations.

Amateur Band	Set Band Switch at
80 Meter	Band 2
40 Meter	Band 3B
20 Meter	Band 3
10 Meter	Band 4

BAND 30 - Special reference is called to this position of the Band Switch so that no confusion will be experienced. Band 3B is the same as Band 3 and is used in order to have the band spreading of the 40 meter band accomplished through approximately the same number of degrees on the Band Spread Scale as employed by the other amateur bands for which calibration appears. When the Band Switch is placed in position 3B another section of the band spread condenser is paralleled in the circuit. Band 3 main scale calibration will read somewhat high when the Band Switch is set on 3B.

TUBE LINE-UP

6SK7	1st RF Amplifier	6CQ7	Phase Inverter
6XW7	2nd RF Amplifier	6F6E	2nd audio output stage
6XK6	1st Detector-Mixer H.F. Oscillator	6H6	Automatic Noise Limiter
6SK7	1st I.F. Amplifier	6JG7	Beat Frequency Oscillator
6SK7	2nd I.F. Amplifier	6D	Rectifier
6SK7	2nd Detector, A.V.C. 1st stage of audio		

CONTROLS AND OPERATION

Reading from left to right the functions of the various identified controls will be described.

The "R.F. Gain" control adjusts the sensitivity of the receiver by varying the cathode bias on the R.F. and I.F. amplifiers. Maximum sensitivity will be obtained when this control is rotated as far as it will go to the right. When this has been done a switch will operate which lights the lamp behind the calibrated "R.F. meter" to be described in greater detail later.

The "Band Switch" will allow selection of the frequency ranges through which the receiver tunes. As previously mentioned, Band 3B is to be used when band spreading the amateur 40 meter band.

The "Selectivity - A.V.C. Switch" provides a means of bringing the signal through varying conditions of interference.

When using the receiver for the reception of modulated, or telephone, signals it is advisable to have the switch in anyone of the three "A.V.C. on" positions at which reception is most satisfactory. The three steps of selectivity, namely: BROAD I.F., SHARP I.F., PHONE CRYSTAL, will provide control of selectivity sufficient to meet all normal receiving requirements.

For code or C.W. reception, the Automatic Volume Control circuit should be disconnected by placing the selectivity switch in anyone of the 3 "A.V.C. off" positions. When this has been done the R.F. Gain control should be manually adjusted so that the set will not overload or block on extremely strong signals. The maximum selectivity of the receiver is obtainable with the selectivity switch in the "R.F. XTAL" position. The receiver signal will be considerably sharper and a result more care should be exercised in tuning when the C.W. crystal is in the circuit. Careful design of the filter circuit results in improved crystal filter action in the SUPER BAND which will allow the use of the set under otherwise trying conditions of reception. The phasing control should be adjusted so that the signal on one side of zero beat is reduced in intensity as much as possible. Now carefully tune through the desired signal and notice the distinct increase in signal strength as the resonant frequency of the crystal is reached. Actually the increase in gain in the "R.F. CRYSTAL" position of the selectivity switch is from 2.6 to 4 times more than any other setting of the selectivity control. In addition the PHASING control, when properly adjusted, will prove helpful in coping with conditions of extreme interference. Adjustment of this control for maximum rejection of the unwanted signal, or audio image, will allow true single-signal reception. With the Selectivity Switch in all other positions but C.W. XTAL, and "Phone XTAL" the setting of the phasing control will have no effect on the received signal.

The "PHONE-XTAL" positions are an intermediate step in selectivity between C.W. crystal and I.F. sharp. Phone XTAL must necessarily be accurately resonated when operating in the Phone XTAL position or side band attenuation will seemingly reduce the strength of the signal.

The "MAIN TUNING" control is for adjusting the main dial of the receiver to the desired frequency.

The "TONE-HIGH LOW" switch directly below the above control in the "HIGH" position gives natural reproduction. In the "Low" position, the highs are cut off, a condition that will be helpful in receiving signals during certain types of interference.

The "CRYSTAL PHASING" control has previously been described in its association with the C.W. XTAL selectivity position.

The "BAND SPREAD" knob allows smooth back-leash - free operation of the separate band spread condenser and dial.

The "A.N.L." or automatic noise limiter switch will effectively minimize ignition and similar types of interference which would be objectionable to short wave reception if such a limiting device were not available. Best results are obtained with the A.F. Gain control set near the minimum end.

The "A.F. GAIN" control turns the receiver "off" and "on" as well as controlling the audio output volume of the receiver.

The "PITCH CONTROL" and its associated "BFO - OFF-ON" switch provides a beat note for the reception of C.W. signals. The pitch control, when the B.F.O. switch is in the "ON" position allows variation of the frequency of the resultant beat note to a pitch most pleasing to the listener.

The "SEND-RECEIVE" switch momentarily removes plate voltage from the tubes in the receiver so that the set can be made inoperative during standby periods.

Into the "PHONE JACK" can be connected any type of high impedance fones, crystal or magnetic, because no direct current flows in the headphone circuit.

"S" METER

When the R.F. Gain control is advanced until a switch is heard to operate, a light will appear behind the translucent scale of the meter itself. Only when this light is on will the meter indicate in "S" units. When so adjusted the meter can be used as a resonance indicator. With the R.F. gain control backed off from maximum the meter is still in the circuit but will not indicate carrier level accurately. On the rear aspect of the chassis is the "SG" meter adjustment screw. To set the "SG" meter, disconnect the antenna and have the R.F. Gain control on full and the selectivity switch in the "I.F. SHARP A.V.C. ON" position. Now, adjust this knurled knob until the meter reads zero. Reconnecting the antenna and tuning in a station will show its relative carrier intensity.

SETUP

The 500 and 5000 ohm terminals are for connections to a loud speaker or other load of those impedance values. The matching SX25 speaker should be connected to the 5000 ohm strip. When headphones are plugged into the phone jack the 5000 ohm speaker connection is automatically disconnected.

The "EXT. SWITCH" terminal strip is for external switch provisions should the receiver be controlled by a remote switch or relay. The SEND-REC switch on the panel must be in the Send Position when an external relay is used for stand-by operation.

Unless otherwise specified the SX25 Receiver operates on 100-125 volt 50-60 cycle current. A universal model is available on special order for operation on 110-250 volt, 25-50 cycle current, at a slight increase in price.

The Model SX25 Receiver draws 120 watts at 115 volts 60 cycle alternating current.

The Halliwell Co. reserves the right to make changes in design or to add improvements to instruments of their manufacture without incurring any obligation to install the same in any instrument previously purchased.

ALIGNMENT PROCEDURE

455 KC. Intermediate-Frequency Alignment.
Have the controls set as follows:
AF and RF gain controls for maximum volume.
B.F.O. switch in the "OFF" position.
Set band switch to #2 band.
Set main dial to 2 megacycles, band spread to 100.
Selectivity switch in "A.V.C. OFF" XTAL phone position.

Remove the 6K9 tube grid cap. Connect a 1 megohm resistor between grid cap and grid of 6K9 tube. Now connect the hot side of the signal generator to the grid of the 6K9 tube through a .1 MFD condenser. Connect the ground terminal of the signal generator to the chassis of the receiver. Remove modulation from condenser and feed a 455 KC signal into the receiver and set the pitch control to give a beat note of approximately 1000 cycles. Adjust all I.F. transformer trimmers for maximum gain with the exception of the secondary trimmer on transformer T1. Identified on top chassis view as T1S. In adjusting this trimmer it will be noted that the output reaches a maximum gone through a dip and then back to maximum again. Wobulate the IF frequency and listen to the dip between the two maximum points. A distinct change in the crystal note sounding like an apparent broadening of the crystal action will be noted when the correct adjustment has been reached. At this point in the alignment it is necessary to make an adjustment on the phasing control as follows: Tune the signal generator so that its signal will go through zero beat and then to the other side of zero beat until a signal of approximately 5000 cycles is heard in the speaker or headphones. Now carefully adjust the "TUNING CONTROL" until this signal is reduced in volume to a minimum. Next the signal generator to its original frequency and recheck the adjustment of T1S. Now repeat carefully the other trimmers on I.F. transformers for maximum gain. Place the adjusting switch in the "W. XTAL" position leaving all controls on the panel as previously adjusted. Again wobble the frequency of the signal generator carefully through the very narrow range of the crystal peak. Adjust small trimmer through hole in the bottom plate marked "XT" until the sharp crystal peak maximum output is possible. At this point the crystal is extremely sharp and maximum output is possible. If this action gives too sharp crystal filter action this "XTS" trimmer can be adjusted counter-clockwise for broader crystal response to suit the operator.

B.F.O. ADJUSTMENT

In the center of the "PITCH CONTROL" shaft, after the knob has been removed, you will find a recessed screw for adjustment of the Beat Frequency Oscillator.

Before rotating this screw with a suitable screw-driver loosen the set screw on this shaft. This set screw can be reached through a hole in the bottom plate directly under the B.F.O. Assembly marked "BEA". Now tune in a signal on the receiver with the BFO off. Exact resonance can be determined with the controls so adjusted that the "SP" meter will indicate. After you have measured yourself that you have the signal properly tuned in place the selectively switch in anyone of the three "AFC OFF" positions. Turn the BFO switch to the "ON" position. You now can adjust the screw in the center of the pitch control shaft until a beat note is heard. Tighten the set screw through the bottom plate, replace the knob and the BFO adjustment is completed.

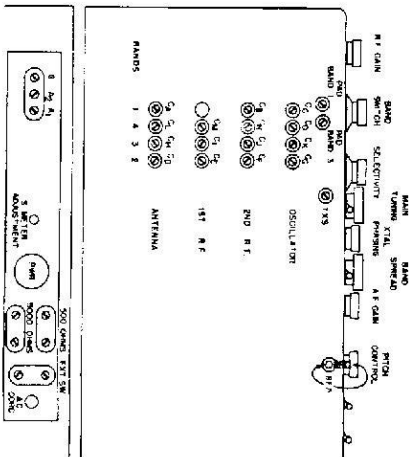
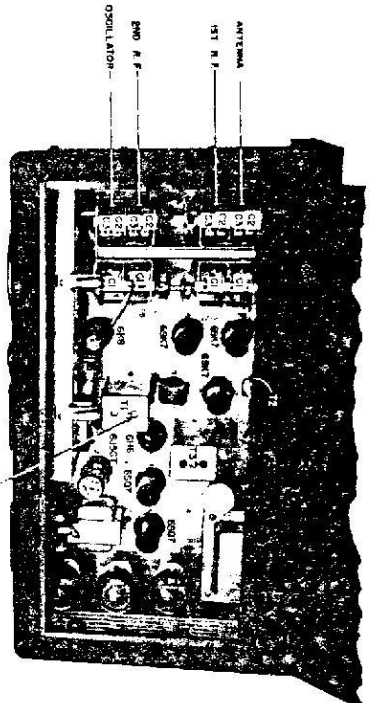
R. F. ALIGNMENT

Re-connect the grid cap to the 6K9 tube. Connect the hot side of the generator to the A₁ antenna terminal on the rear of the chassis. Be sure a jumper is connected to A₂ and G. Leave signal generator ground connected to the chassis of the receiver.

The location of the following trimmers and padders can be determined by referring to the top and bottom chassis views. All pad adjustments are for the low frequency end of each band while the trimmers are for the high frequency ends.

In order to get at the IF trimmers the guarantee card can be removed by placing a knife under the small snap fasteners holding it in place. So that most satisfactory adjustment of the trimmers and padders can be made, it is advisable to "Rock" the condenser gang across the signal being delivered by the Generator until that particular circuit has been accurately peaked.

Bands	Tune at	Pad at
1	1500 KC Adjust C _A C _B C _C	600 KC Adjust Pad Band 1
2	4 MC Adjust C _D C _E C _F C _G	1.8 MC Adjust Pad Band 2 (Top Chassis)
3	14 MC Adjust C _H C _I C _J C _K	6 MC Adjust Pad Band 3
4	30 MC Adjust C _L C _M C _N C _O	18 MC No pad on this band



GUARANTEE

This receiver is guaranteed to be free from any defect in workmanship and material that may develop within a period of ninety (90) days from date of purchase, under the terms of the standard guarantee, as designated by the Radio Manufacturers Association. Any part or parts that prove defective within this period will be replaced without charge when subjected to examination at our factory, providing such defect, in our opinion, is due to faulty material or workmanship, and not caused by tampering, abuse or normal wear. All such adjustments to be made F.O.B. the factory.

Should this receiver require any adjustments, your dealer or distributor has complete technical service in-

formation, or the factory will be glad to assist you in any problem direct. Should it be necessary to return any part or parts to the factory, a "Return Material Permit" must be obtained in advance by first writing the Adjustment Department, who will issue due authorization under the terms of the guarantee. The Hallicrafters Co. reserves the right to make changes in design or add improvements to instruments manufactured by them, without incurring any obligation to install the same in any instrument previously purchased.

All Hallicrafters receivers are built under patents of Radio Corporation of America and Hazeltine Corporation.

RESISTORS

NO.	OHNS	MATTAGE
11	100,000	1/2
2	400	"
3	100,000	"
4	10,000	R. C. Gain
5	500	S. Water
6	30	1/2
7	3,000	"
8	100,000	"
9	500	"
10	500	"
11	5,000	"
12	100,000	"
13	250	"
14	50,000	"
15	30,000	"
16	25,000	"
17	4,000	"
18	100,000	1/2
19	500,000	"
20	800	"
21	5,000	"
22	500	"

NO.	OHNS	MATTAGE
25	3,000	1/2
26	50,000	"
27	100,000	"
28	250,000	"
29	250,000	"
30	1,000,000	"
31	500,000	"
32	250,000	A. F. Gain
33	250,000	1/2
34	250,000	"
35	250,000	"
36	200,000	"
37	350	"
38	20,000	"
39	15,000	"
40	15,000	"
41	50,000	"
42	20,000	"
43	8	1/2

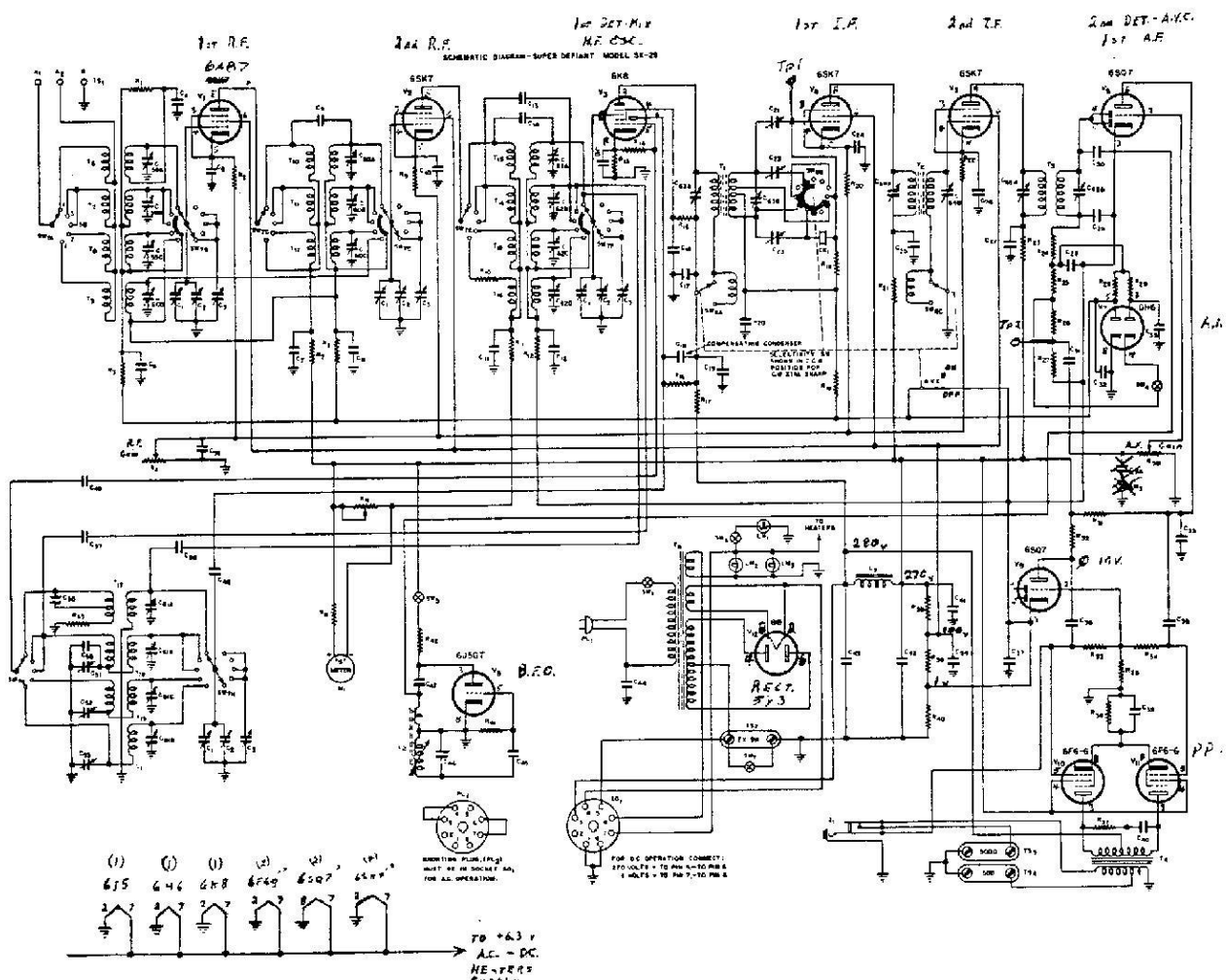
10. C1

NO.	CAPACITY	VOLTAGE	TYPE
C-1	Main Tuntio Gang		
2	P.L. 89, Spt., Sec. w. C.P.C.		
3	.01 mfd	400	
4	.03 mfd	200	
5	.06 mfd	200	
7	.12 mfd	600	
8	.05 mfd	200	
9	mfd		
10	.05 mfd	200	
11	.02 mfd	600	
12	.05 mfd	200	
13	b-w-5 mfd		
14	35 mfd		
15	.05	200	
16	.05 mfd	400	
17	.02 mfd	600	
18	4.5 mfd	350	
19	10 mfd		
20	25 mfd	200	
21	3-25 mfd		
22	1.5 to 20 mfd "TNS"		
23	2 to 50 mfd		
24	.05 mfd	200	
25	.02 mfd	600	
26	.05 mfd	200	
27	.02 mfd	600	
28	mfd		
29	100 mfd		
Mica			
Compensating Electrolytic Paper			

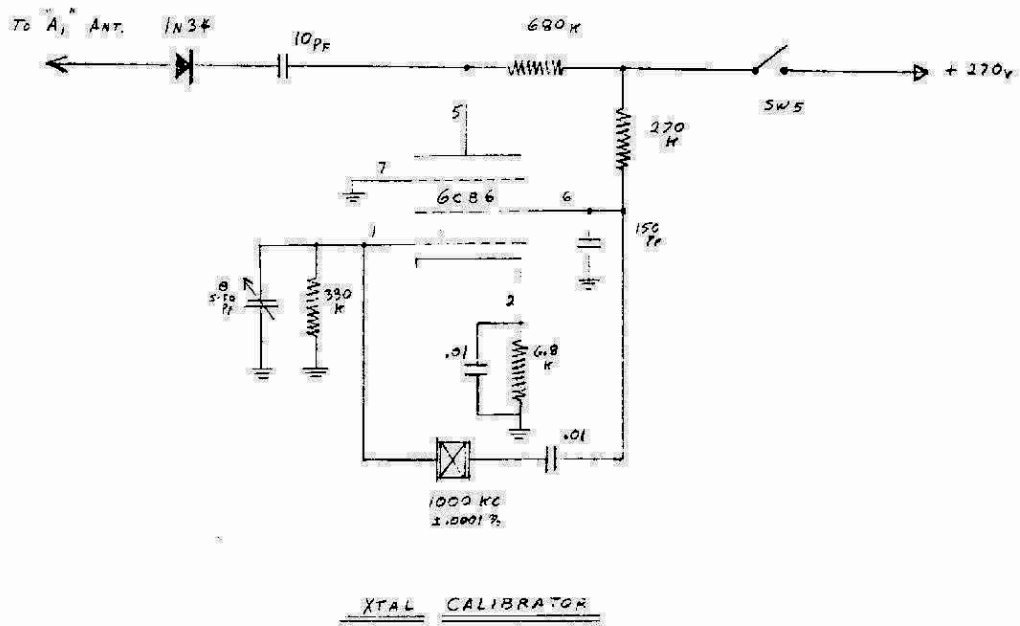
NO.	CAPACITY	VOLTAGE	TYPE
30	3 mfd		Twisted Pair
31	.02 mfd	600	Paper
32	.01 mfd	400	Paper
33	.05 mfd	200	Paper
34	.002 mfd	1,600	Tubular Oil Mica
35	250 mfd		
36	.05 mfd	400	Paper
37	30 mfd	25	Electrolytic
38	.05 mfd	400	Paper
39	20 mfd	25	Electrolytic
40	.002 mfd	1,600	Tubular Oil
41	.1 mfd	300	Paper
42	10 mfd	350	Electrolytic
43	50 mfd	250	Electrolytic
44	.01 mfd	600	Paper
45	100 mfd		Mica
46	500 mfd		Paper
47	.02 mfd	600	Paper
48	105 mfd		Berlinion Mica
49	.003 mfd		
50	105 mfd		
51	210C mfd		Ceramitor Dual Pad Single Pad
52	1330C mfd		Dual Pad
53	430 mfd		Paper
54	430 mfd	200	Paper
55	700 mfd	200	Mica
56	.25 mfd		Paper
57	Twisted Pair		
58	Twisted Pair		

5M5 - High

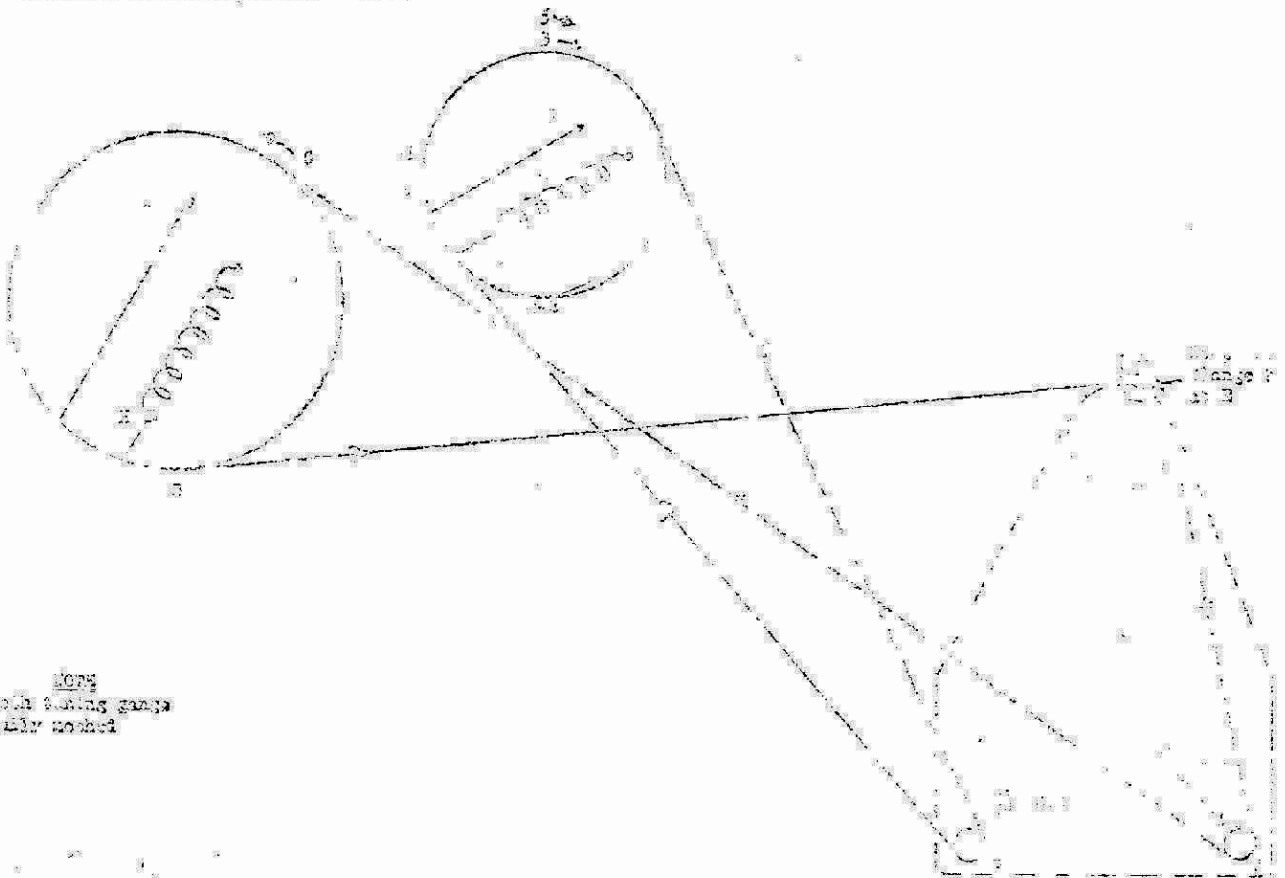
SW1 - AC 0-90 HZ. on A.F. Gain Control
SW2 - Stator by 55ST
SW3 - B.F. 0. 00-0.05F 55ST
SW4 - A.N.L. 0N-01F 55ST
SW5 - High-Low "tone 55ST
SW6 - 55N Motor on R.F. Gain Control
SW7 - Band switch rotary selector
SW8 - Selectivity switch rotary selector



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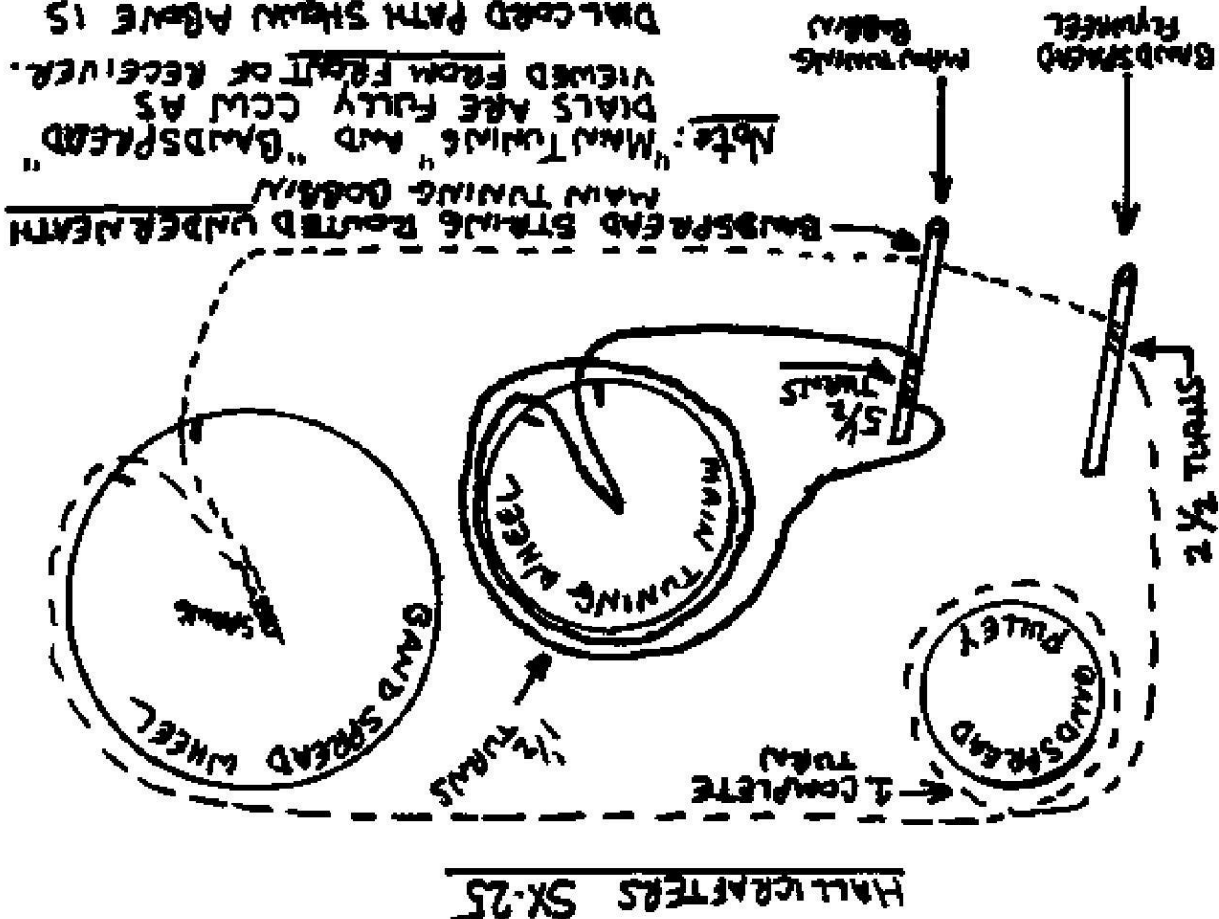


DUAL COIL STRINGING DIAGRAM SX 28



10

"MAN TUNING" AND "GARDSPREAD"
DIALS ARE FULLY COW AS
VIEWED FROM FRONT OF RECEIVER.
DIAL CODED PATH SHOWN ABOVE IS
AS VIEWED FROM REAR OF RECEIVER.



HALLEGRATES SX-25

SX-25 Voltage Readings
Taken With 20,000 OHM per Volt
Volmeter

No Antenna and Ground.	Normal Tolerance Allows For a
RF and AF gain at maximum.	Variation of Plus or Minus
Sharp IF position, AVC on.	10% from Indicated Values.
Band #1 with tuning capacitor open.	
117 Volts AC input	

SOCKET CONTACTS	1	2	3	4	5	6	7	8
1st RF 6KS7	0	0	4	slight neg	4	100	6.3	250
2nd RF 6SK7	0	0	4	0	4	100	6.3	250
Converter 6K8	0	0	250	105	VARIES with tuning	180	6.3	4.8
1st IF 6SK7	0	0	5	slight neg	5	100	6.3	250
2nd IF 6SK7	0	0	51	0	51	100	6.3	250
2nd Det 6SQ7	0	0	1	slight pos.	150	6.3	0	
Phase Inv. 6SQ7	0	slight pos.	1	0	0	150	6.3	0
Amp 6TF6	0	0	280	270	slight pos	6.3	18	
Amp 6TF6	0	0	280	270	slight pos	6.3	18	
ANL 6L16	0	0	slight positive		0	6.3	0	
Rect. 80	280 DC	300 AC	300 AC	280 DC	5 volts A.C. reading between pin #1 and #4			
BFO 6U5	0	0	135	0	32	250	6.3	0

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