Instruction Manual
for the

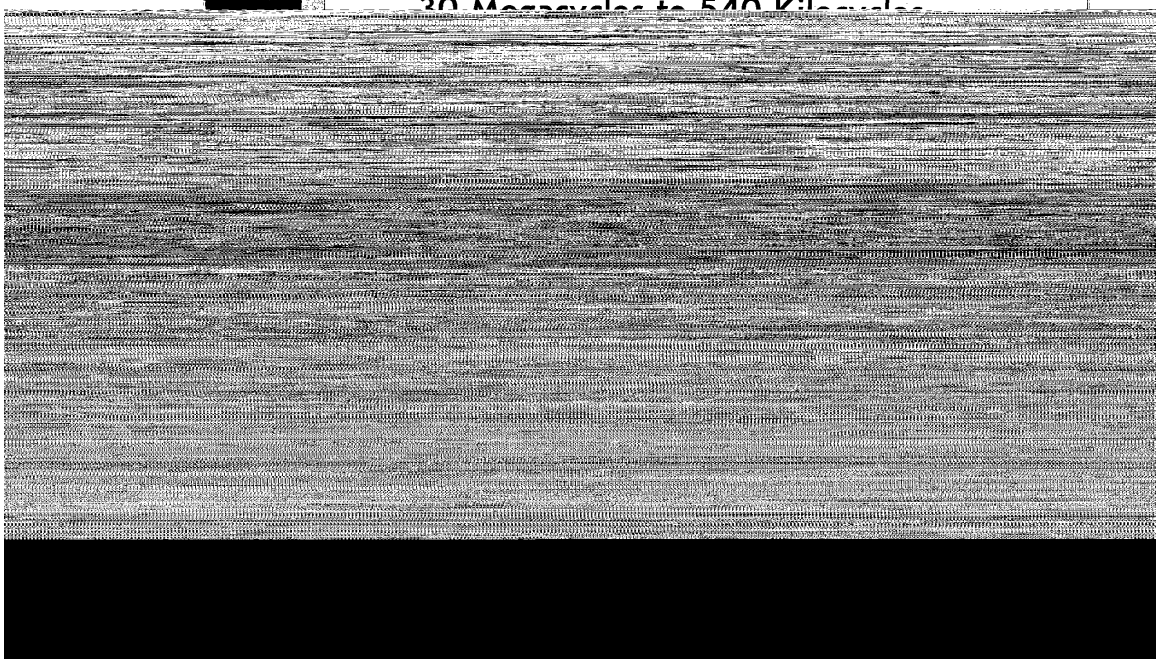
SL transistor
188-XS

L

NATIONAL

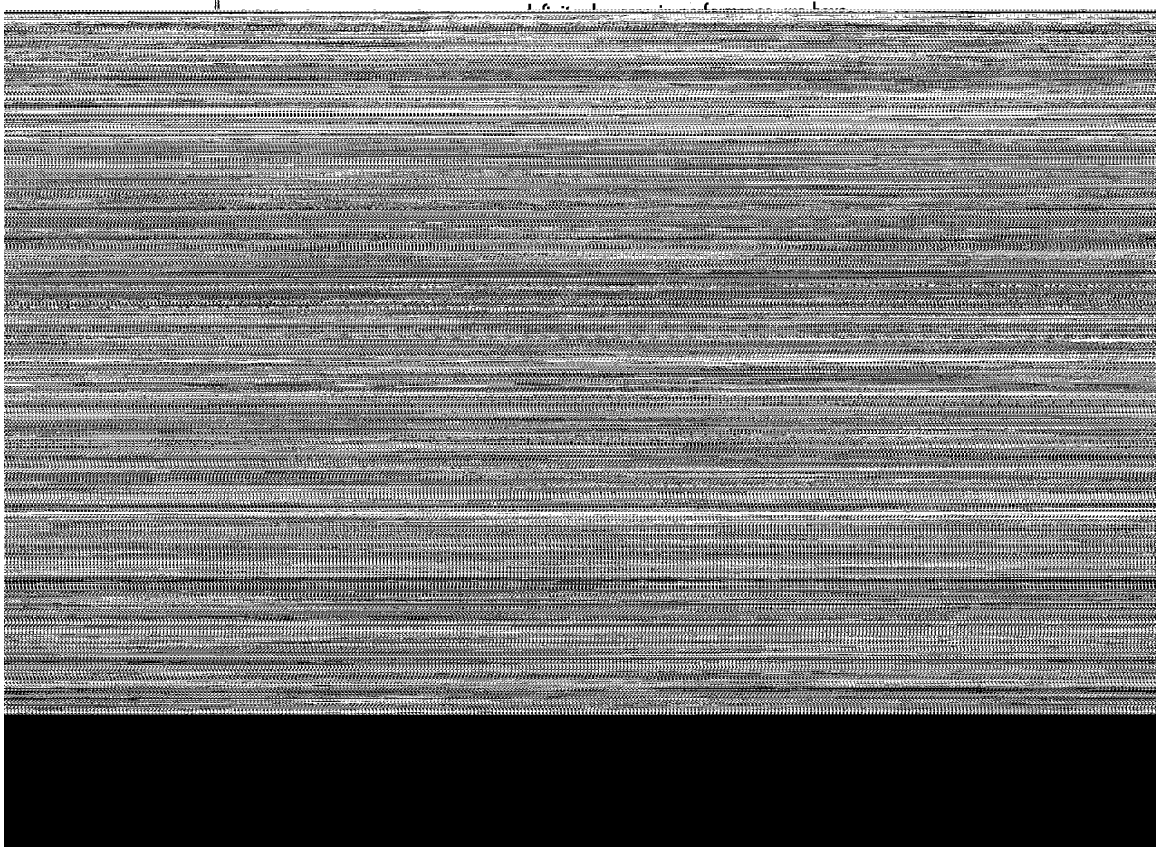
NC-100
RECEIVER

Tuning Range:
30 Megacycles to 540 Kilocycles



K4XL's  RAMA

FOR many years we have used only "plug-in" inductors in National high frequency receivers, because only by so doing could we build into these receivers the outstanding performance for which they are so well known. We have, of course, realized that a switching arrangement would be more convenient to the operator. Inasmuch, however, as the use of any switching arrangement that we know of would have resulted in



THE NC-100 RECEIVER

General Description

THE NC-100 receiver is a twelve tube super-

use of a ground may actually weaken signals. Doublet antenna feeders should be connected

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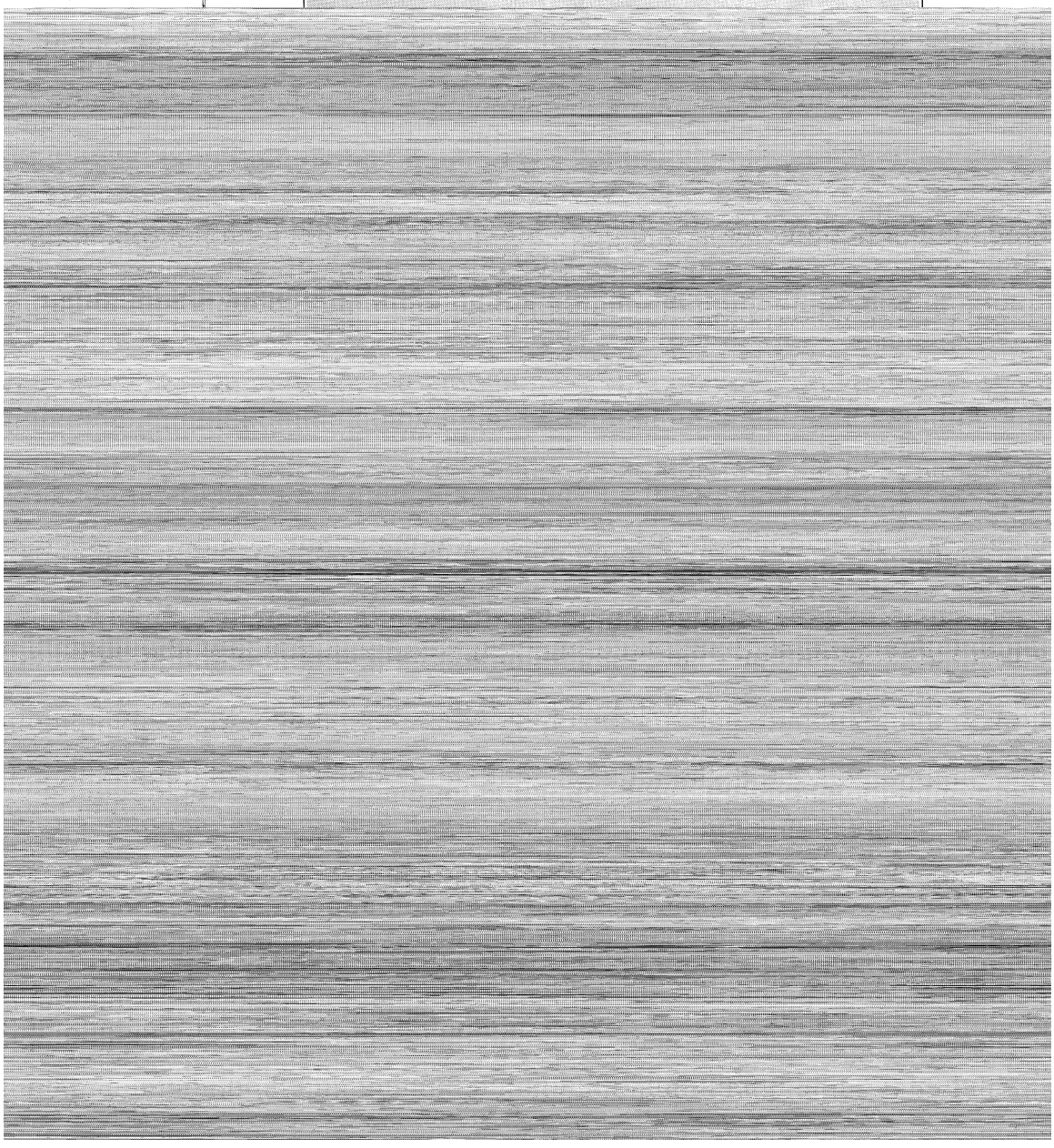


matically as the dial is rotated by means of an epicyclic gearing, so that the calibration is numbered consecutively from 0 to 500. The index numbers are actually changing continuously, the shift occurring at the bottom of the dial where it is not ordinarily visible.

Through this mechanism it is thus possible to obtain a continuous dial reading from 0 to 500, with the result that all signals are well spread out on the scale, making tuning and logging both convenient and precise.

The tuning system is so arranged that the dial reading increases with frequency, as shown by the calibration curves on Page 15.

Immediately below the dial is the range selector knob which actuates the coil changing mechanism. This knob must be rotated approximately one turn to change from one range to another. The arrangement is unique in that each individual coil is completely shielded from all others and that only the coils actually in use are in any way connected in the circuit. This automatic "plug-in coil" system is extremely efficient. Dead spots, often occurring when using unshielded coils in conjunction with a switch are, of course, completely absent and the particular coils in use are in the best position both mechanically and electrically. The relatively large movement of the coils, when changing from one range to another, makes possible the use of rugged contactors of such construction that trouble-free performance is assured.

The five coil ranges are marked on the front panel in a horizontal line directly over the range selector knob. Each of the range markings has a small "window" in back of which an indicator appears when that particular coil assembly is plugged into the circuit.

Starting at the lefthand side of the front panel the uppermost knob is a tone control for varying the frequency characteristic of the audio amplifier. When the control is rotated to the extreme counter-clockwise position, high frequency cut-off occurs at about 1500 cycles. In the mid-position (zero) the characteristic is flat from 50 to 10,000 cycles. At the extreme clockwise position, low frequency cut-off starts at 300 cycles, and the characteristic rises (about 6 db.) between 1000 and 5000 cycles. When receiving strong signals free from interference, best audio quality will be obtained with the tone control set at 0. When receiving fairly weak signals through considerable interference, it is often helpful to retard the tone control so that the noise will be reduced in relation to the signal.

switch position is used for temporarily rendering the receiver inoperative as required during periods of transmission.

There are two insulated terminals mounted at the back of the receiver chassis, which are connected in parallel with the B+ switch. They are intended to serve as a convenient means for connecting a relay for automatically turning the receiver on and off.

To the right of this switch is the manual R.F. gain control. This control is ordinarily used only for receiving c.w. signals but may, of course, be used as a conventional volume control if the operator does not wish to use the AVC system. With the automatic volume control circuits in operation, as explained later, the R.F. gain control is limited in its action and is useful principally in adjusting the maximum sensitivity of the receiver. For instance, if local noise and static level is high, the R.F. gain control need only be advanced to the point where the disturbance is just plainly audible. Signals may then be tuned in with the AVC on but interchannel noise will not be objectionably high. It will be found that after a signal is tuned in, further advancing the control has no effect on output, inasmuch as the AVC characteristic is practically flat.

To the right of the range selector knob is the audio gain control, the primary purpose of which is to control volume (on either head phones or speaker) when using AVC. When using the manual R.F. control, the audio gain should not be retarded too far. If, for instance, it is set below three or four on the scale, audio output will be limited to the point where I.F. overload may occur before maximum output is reached.

The knob at the lower righthand corner of the front panel is a combination switch having three positions. In the counterclockwise position the AVC circuits are in operation; in mid-position the AVC is turned off; in the clockwise position the c.w. oscillator is turned on, the AVC still being off.

Above this switch is the c.w. oscillator vernier tuning control which varies the frequency of the oscillator over about 10 kc. The exact function of this control is explained fully in the Operating Instructions.

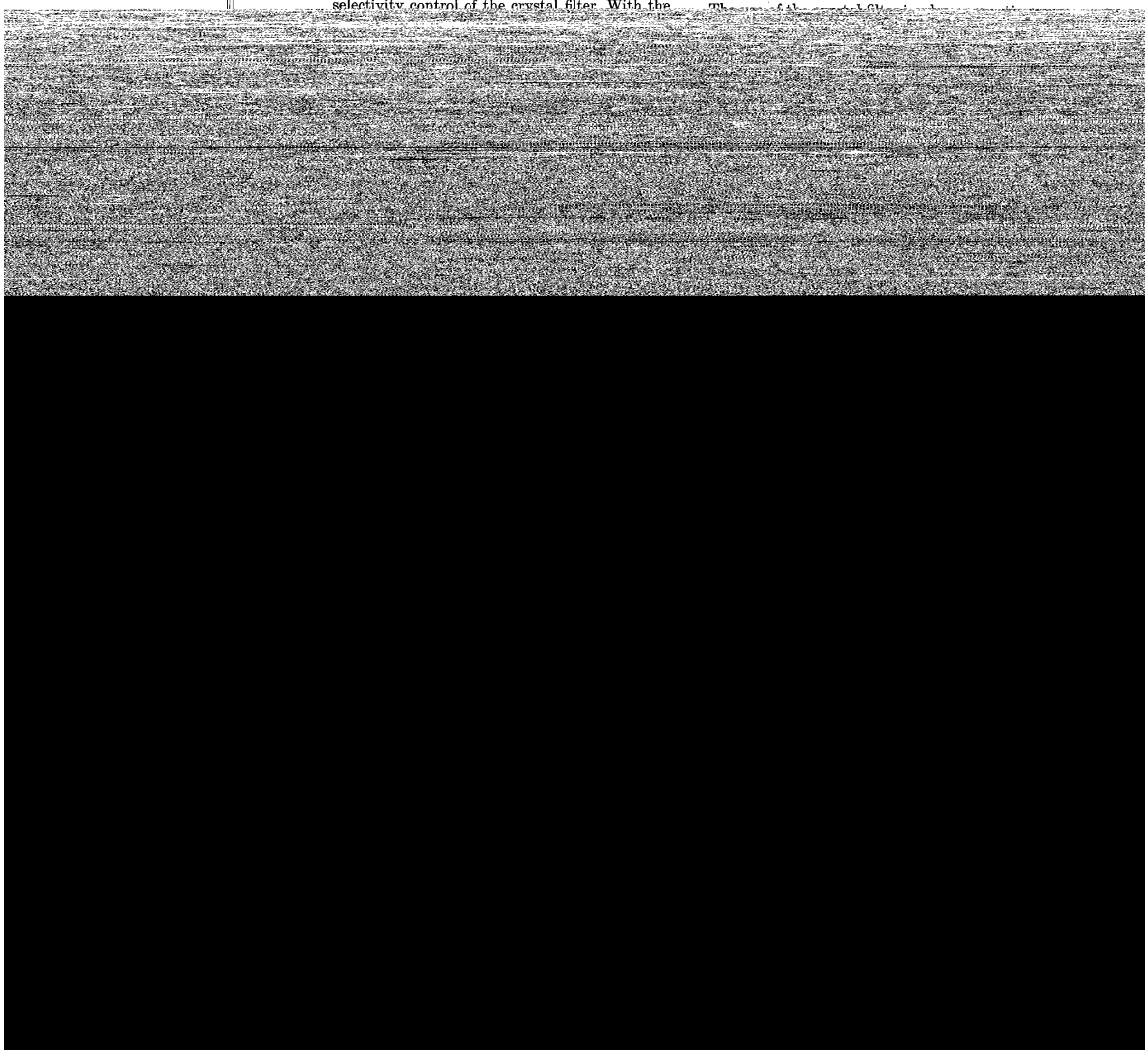
Near the tuning dial is mounted a pilot light, or bullseye, and an electron ray tuning indicator. The pilot is lighted at all times when the AC switch is turned on, but the tuning indicator is lighted only when the B+ switch is on. The purpose of the tuning indicator is to provide a visual

appears entirely when receiving a strong signal and the bright green edges of the pattern may actually overlap. In this case, tuning is correct when the overlap is the greatest. As a general rule, the R.F. gain control should be retarded to a point where the edges of the pattern are still separated, the angle being about 15 degrees. Turning on the c.w. oscillator will make the tuning indicator inoperative, the pattern being the same as that resulting from an extremely strong signal.

On models of the NC-100 having the crystal filter (NC-100X) two additional controls are provided, and these are mounted at the righthand side of the tuning dial. The uppermost knob is the selectivity control of the crystal filter. With the

usually be obtained by retarding the audio gain and tone controls considerably and adjusting sensitivity with the R.F. gain control. Turning on the c.w. oscillator switch will, of course, result in a considerable increase in circuit noise, due to the increased sensitivity. As the oscillator vernier tuning control is turned back and forth, the characteristic pitch of this noise will change. When the characteristic pitch is fairly high, the "semi-single signal" properties of the receiver are very pronounced, one side of the audio beat note being several times louder than the other.

Phone Reception Using the Crystal Filter

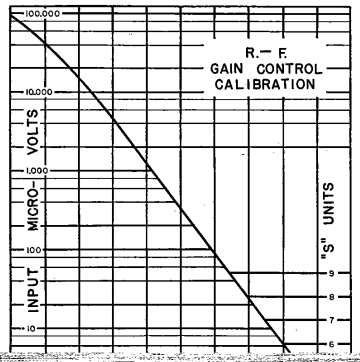


comes on, however, only one heterodyne will be present, instead of the several resulting from three station carriers beating together.

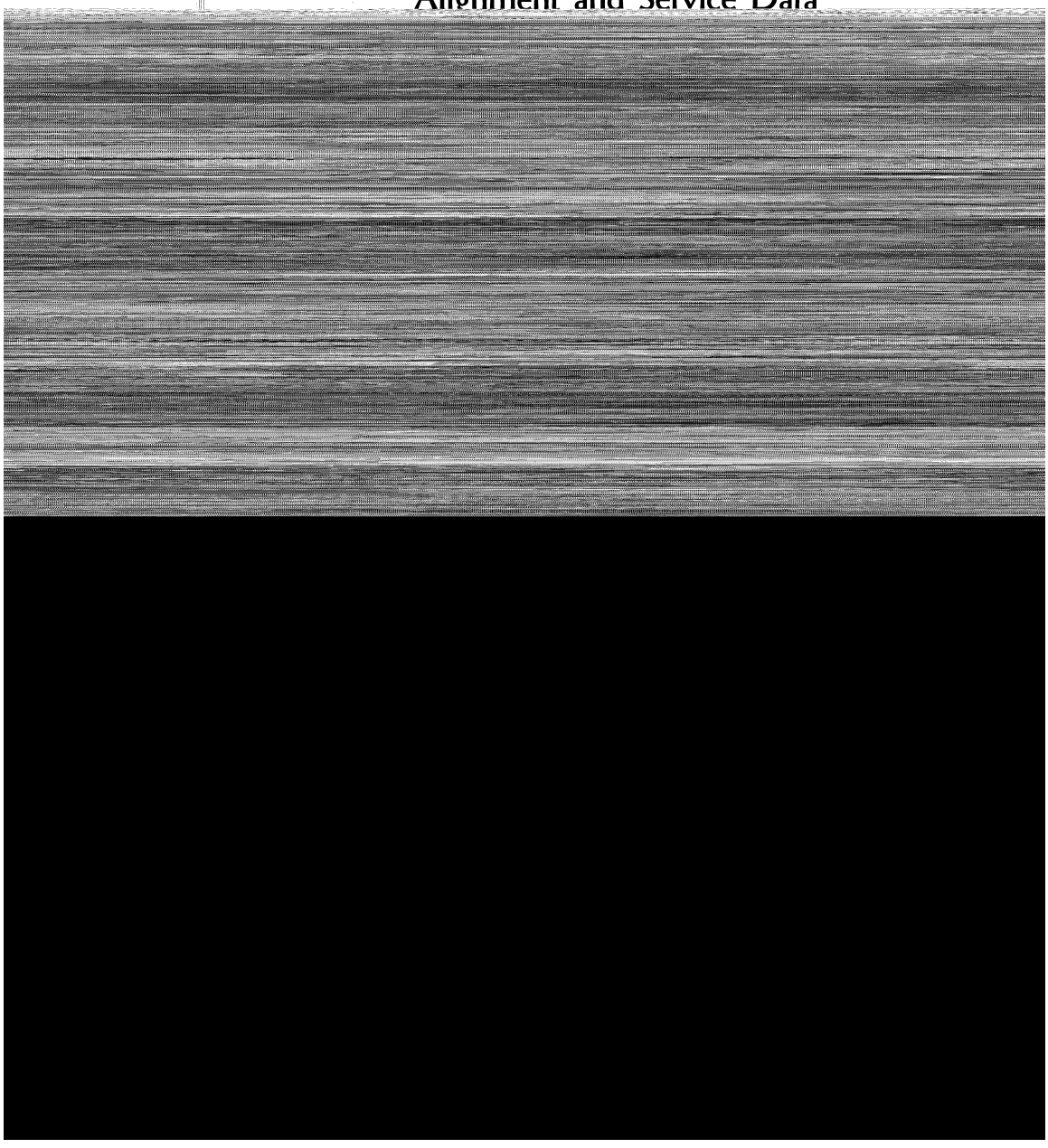
C.W. Reception with the Crystal Filter

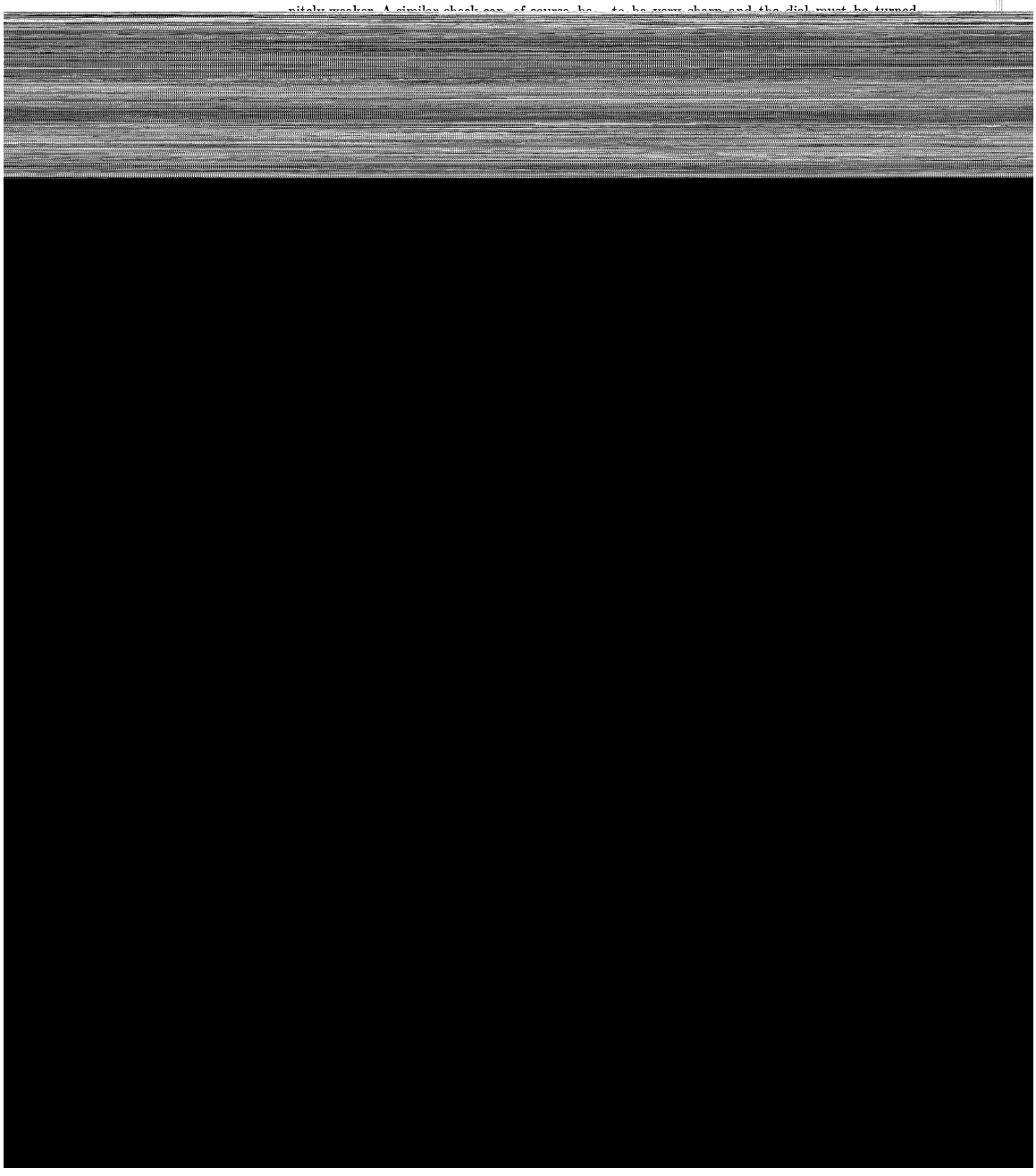
To use the crystal filter for c.w. reception, the filter is switched in by means of the phasing control and the phasing condenser set about mid-scale. The c.w. oscillator must be turned on. Advancing the R.F. and audio gain controls will result in a hollow, ringing sound, the pitch of which will depend upon the setting of the c.w. oscillator control. The actual pitch is not important as long as it is near the middle of the audio range, where the loudspeaker or phones have good sensitivity.

When a signal is picked up, it will be found that as the receiver is tuned *slowly* across the carrier the beat note will be very sharply peaked at the same pitch as that of the ringing noise, previously mentioned. All other parts of the beat note will be



Alignment and Service Data

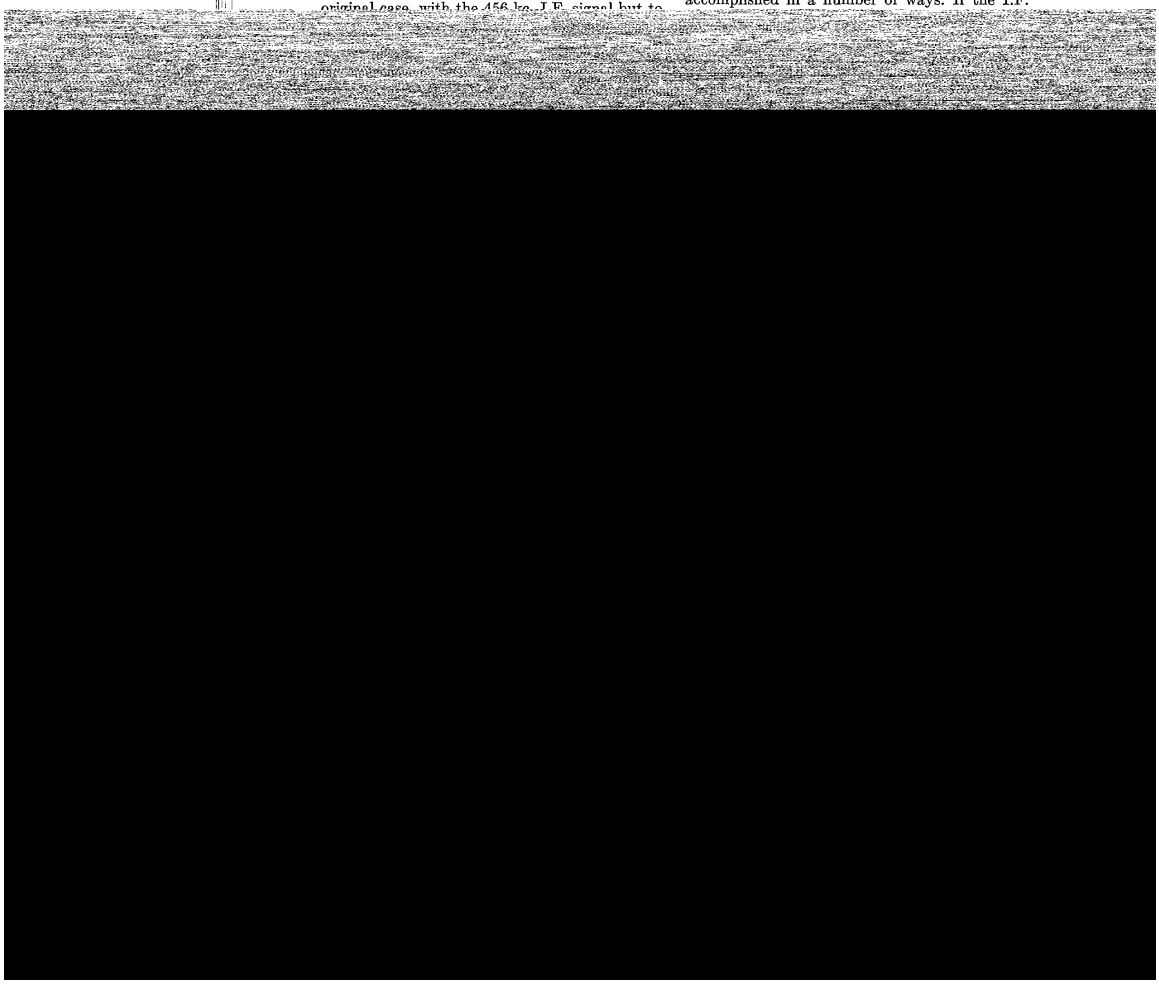




kc.; the I.F. beat will now be 457 kc., which will be amplified as before by the intermediate amplifier, but when reaching the second detector will produce a 1 kc. (thousand cycle) audio beat with the beat oscillator, which is operating at 456 kc., as before. Similarly, the tuning dial could be moved in the other direction, so that the high frequency oscillator is tuned to 7455 kc., in which event the I.F. beat would be 455 kc. and the audio beat note would be a thousand cycles but on the other side of the carrier.

The selectivity of the I.F. amplifier is such that a signal detuned from it by only one kilocycle (.2 of 1%) will still be amplified almost as much as a 456 kc. signal, although there will, of course, be some loss in gain.

The other method of getting an audible beat note is to leave the signal tuned exactly, as in the original case, with the 456 kc. I.F. signal but to



oscillator were set at 458 kc., all signals would be peaked at 2000 cycles.

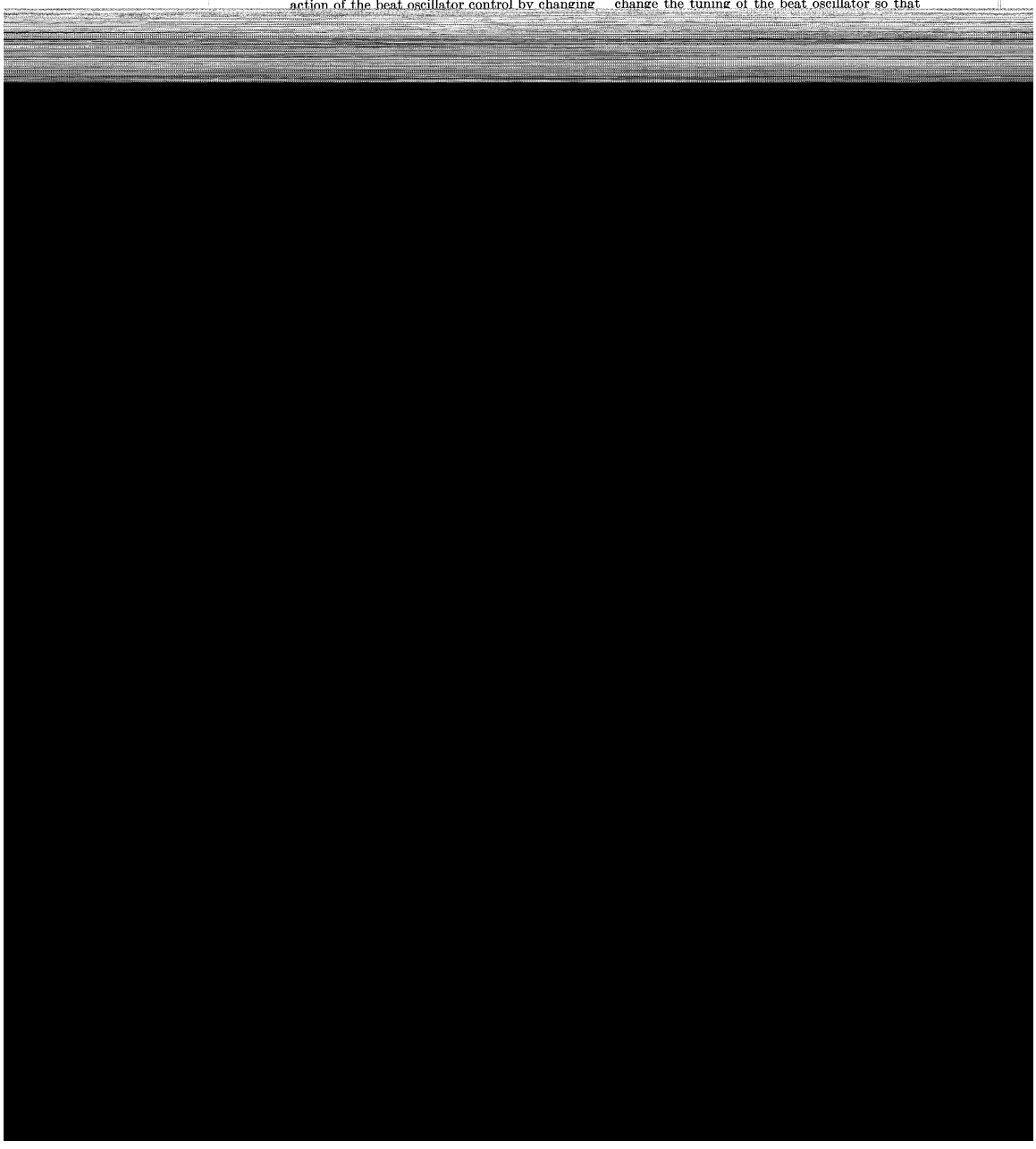
If the receiver tuning is left alone, then the beat oscillator may be adjusted to give any desired pitch without changing the signal strength.

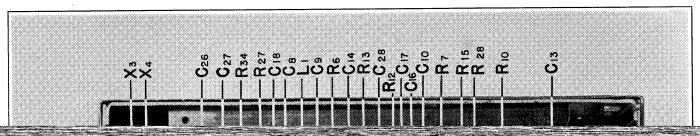
The main point to remember when considering single signal receivers is that they are simply ultra selective superheterodynes, which must be tuned exactly to the signal and that the beat oscillator must be detuned from the crystal frequency in order to obtain an audible beat note.

Preliminary Adjustments — The I.F.

From the above explanation, the reader will see that it is absolutely essential that the I.F. transformers be aligned to the crystal, since the two must work together. This alignment may be accomplished in a number of ways. If the I.F.

action of the beat oscillator control by changing change the tuning of the beat oscillator so that




X3
X4
C26
C27
R34
R27
C18
C8
L1
C9
R6
C14
R13
C28
R5
C17
C6
C10
R7
R15
R28
R10
C13

Resistor and Condenser List

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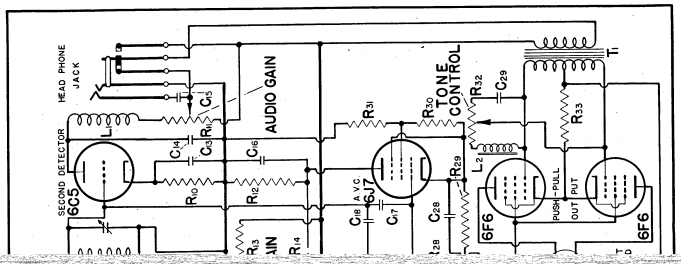
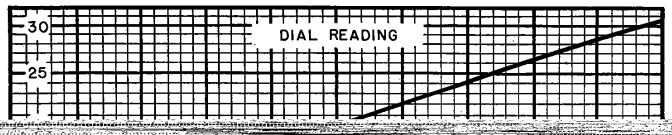

HEAD PHONE JACK
AUDIO GAIN
TONE CONTROL
SECOND DETECTOR
6C5
6J7
6F6
6F6
PUSH-PULL OUTPUT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DIAL READING