

145-149 WEST 22ND ST., NEW YORK, N.Y. 10011
Phone: (Area Code 212) 929-9117

pace-setters

in quality

communication

equipment

In Canada: Northern Radio Mfg. Co., Ltd., 1950 Bank St., Ottawa, Ontario.

GUARANTEE

All items of equipment and material used in this unit are guaranteed against material defects, workmanship or manufacture, for a period of one year from date of the installation, except that the items of equipment and material are not guaranteed for a term longer than two years from the date of shipment.

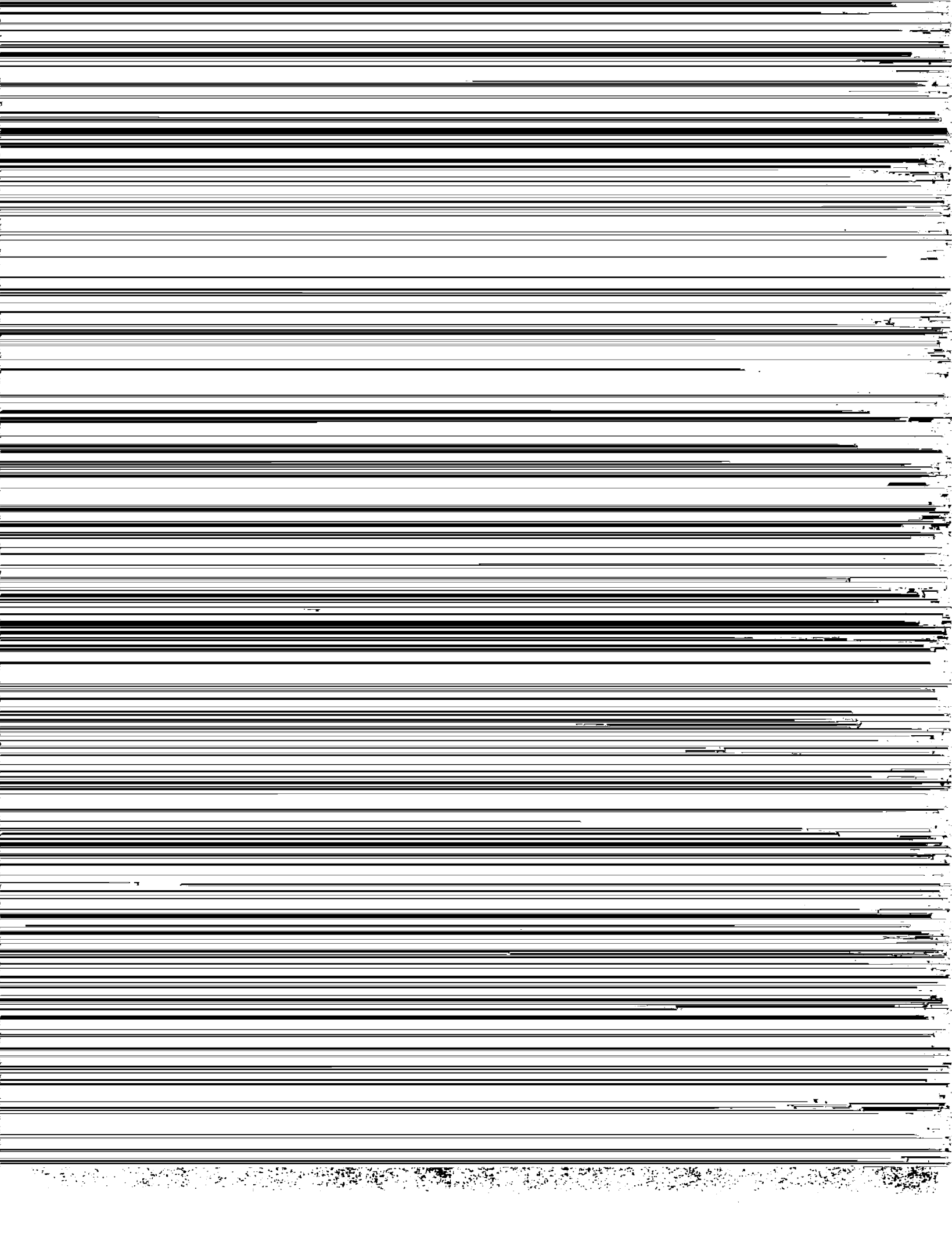
Under the terms of this guarantee, all items which fall within the periods defined will be replaced F.O.B. point of installation without cost to the purchaser. The company will pay transportation charges of any defective part which it desires to have returned to its plant. If, upon examination of the defective item the company can show that failure was not due to any defective workmanship, material or manufacture, the company will bill the purchaser for the cost of replacement, including transportation charges.

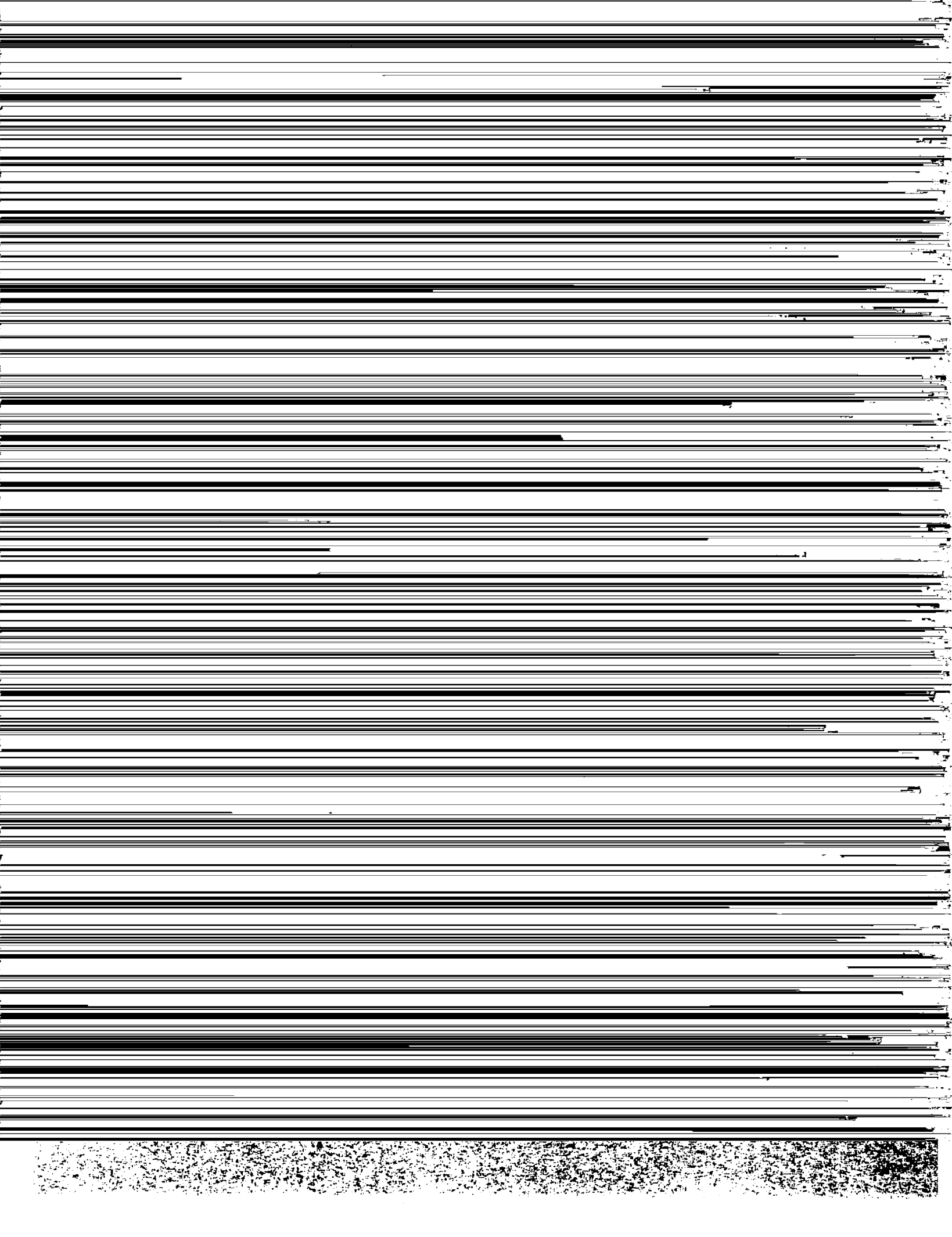
NORTHERN RADIO COMPANY, Incorporated
NEW YORK, NEW YORK

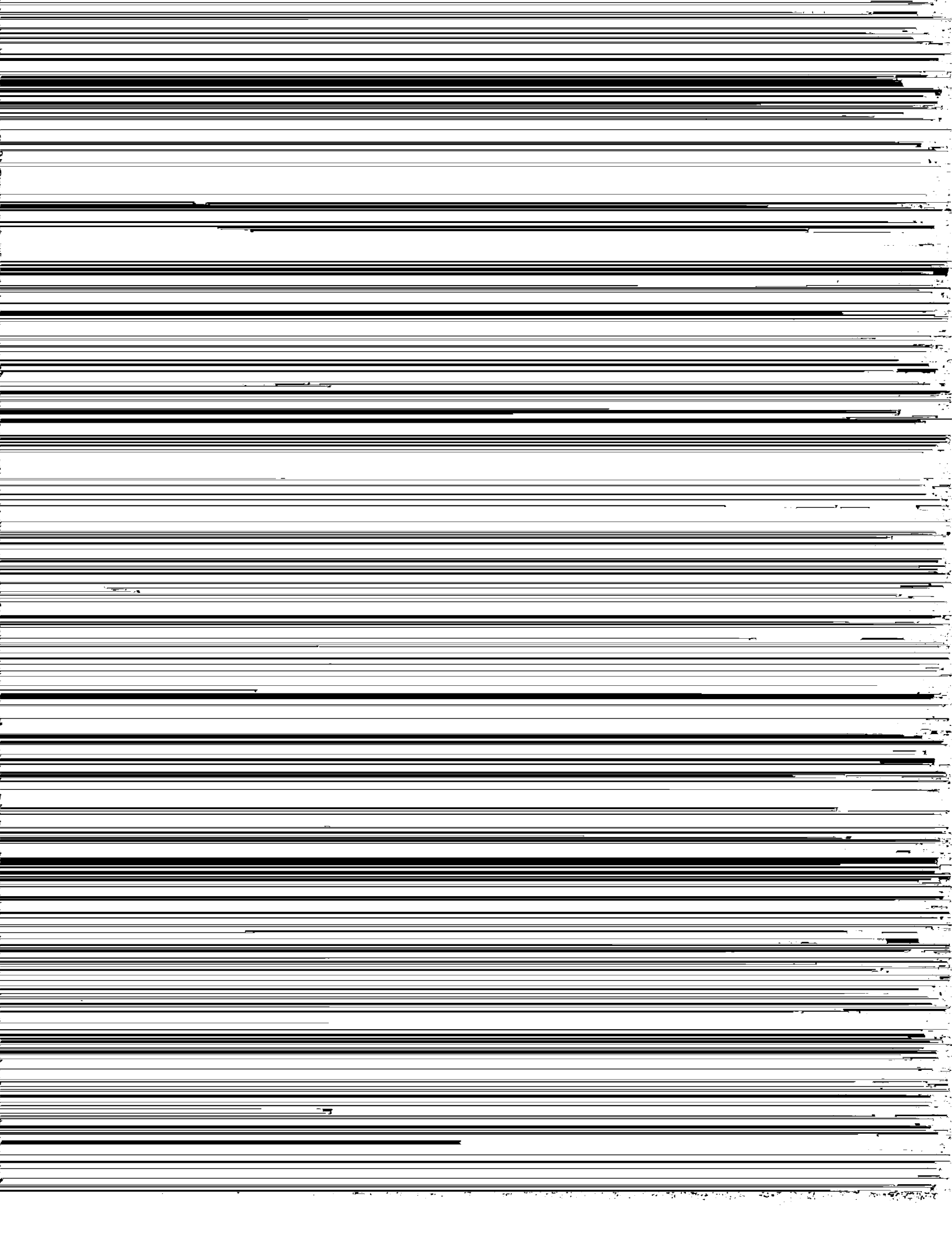
15. COMMUNICATION RECEIVER TOP VIEW, Dwg. No. A-159-1-07

16. COMMUNICATION RECEIVER TOP VIEW, Dwg. No. A-159-1-08

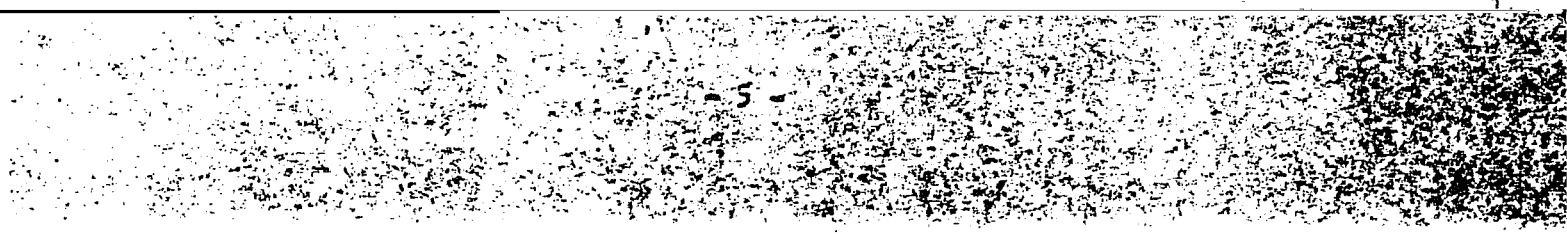
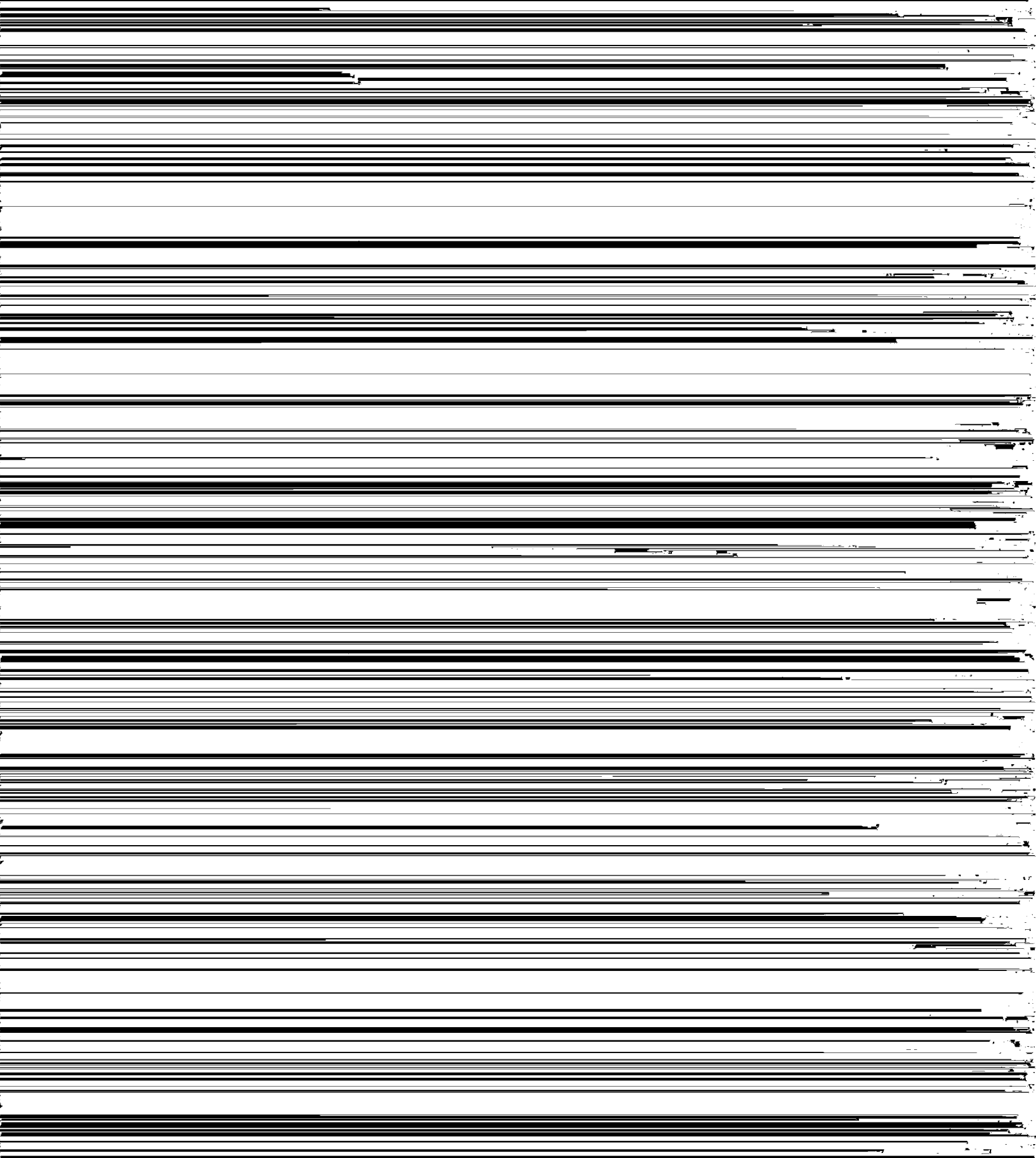
17. WIRING DIAGRAM ASSEMBLY, Dwg. No. A-159-1-04

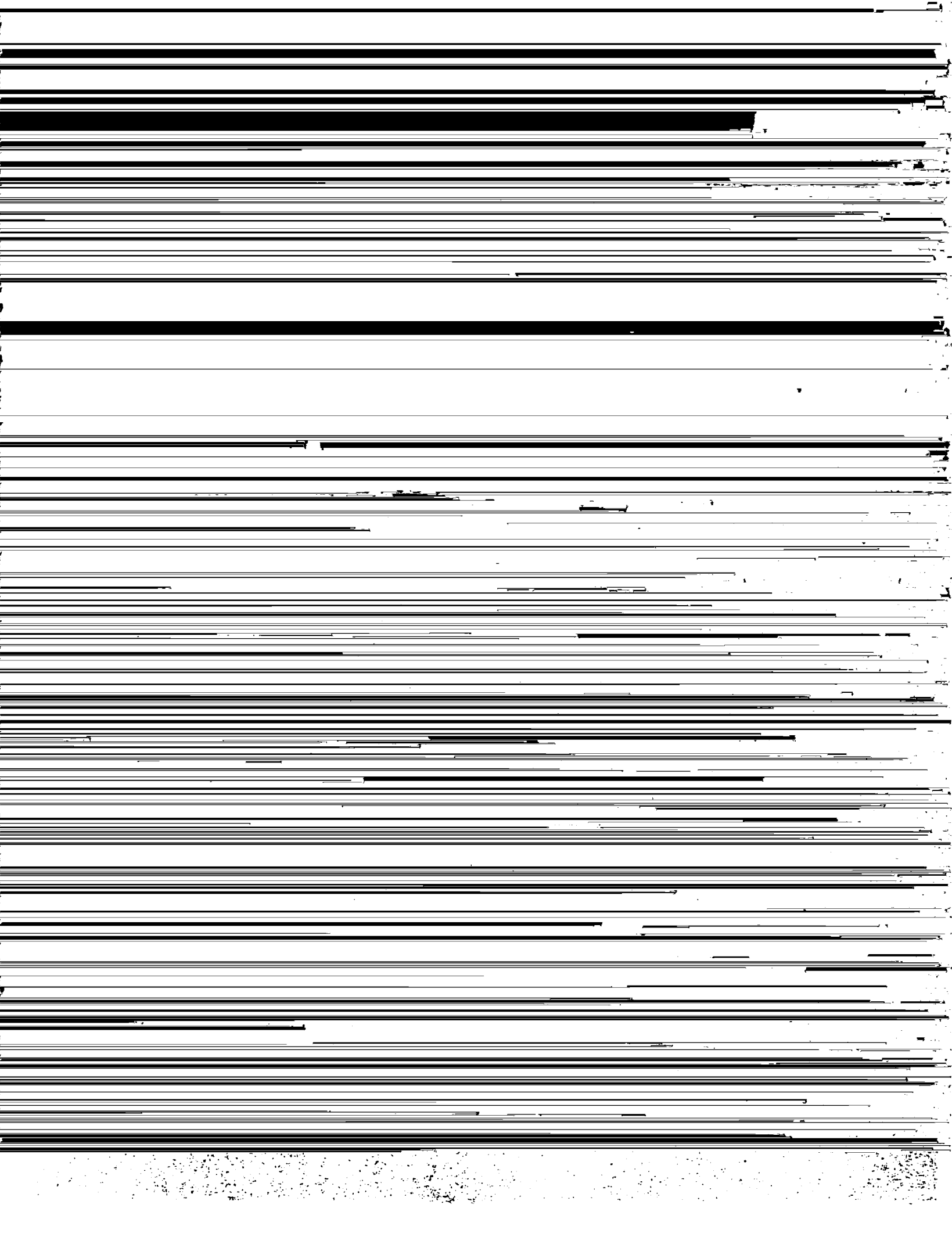












the secondary circuits of two receivers as required for high stability diversity operation.

Detector and AVC:

The V-14 tube is used as a high level Detector and AVC Rectifier. The AVC circuit is provided with separate time constants for CW and MCW operation.

circuit which gives a high order of frequency stability and minimizes oscillator harmonics. The beat frequency Oscillator V-13, is coupled into the detector circuit through Buffer Amplifier V-12, which eliminates oscillator lock-in and permits variation of the beat oscillator injection by means of a control located on the rear of the chassis. A front panel control varies the audio beat frequency, from zero beat to plus or minus 3 kc.

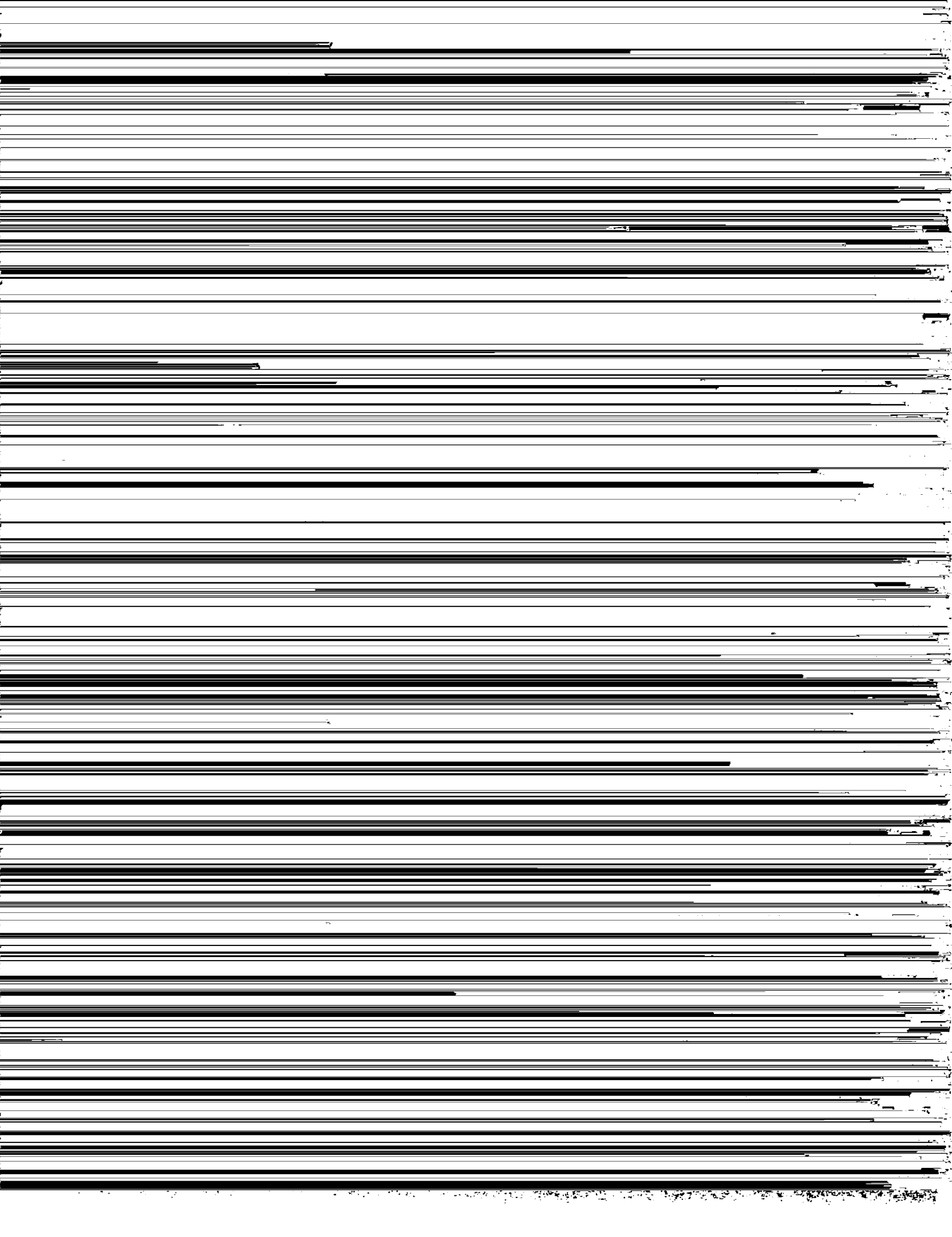
has been modified to permit receiver operation with either local or external BFO. The coaxial BFO connector is mounted at the rear of the receivers; the BFO control switch at the front panel. The BFO oscillator tube, V-13, has been changed to a 6J6 dual triode. One section of V13 is used as the local oscillator for normal BFO operation; the second section as an amplifier for externally supplied BFO frequency.

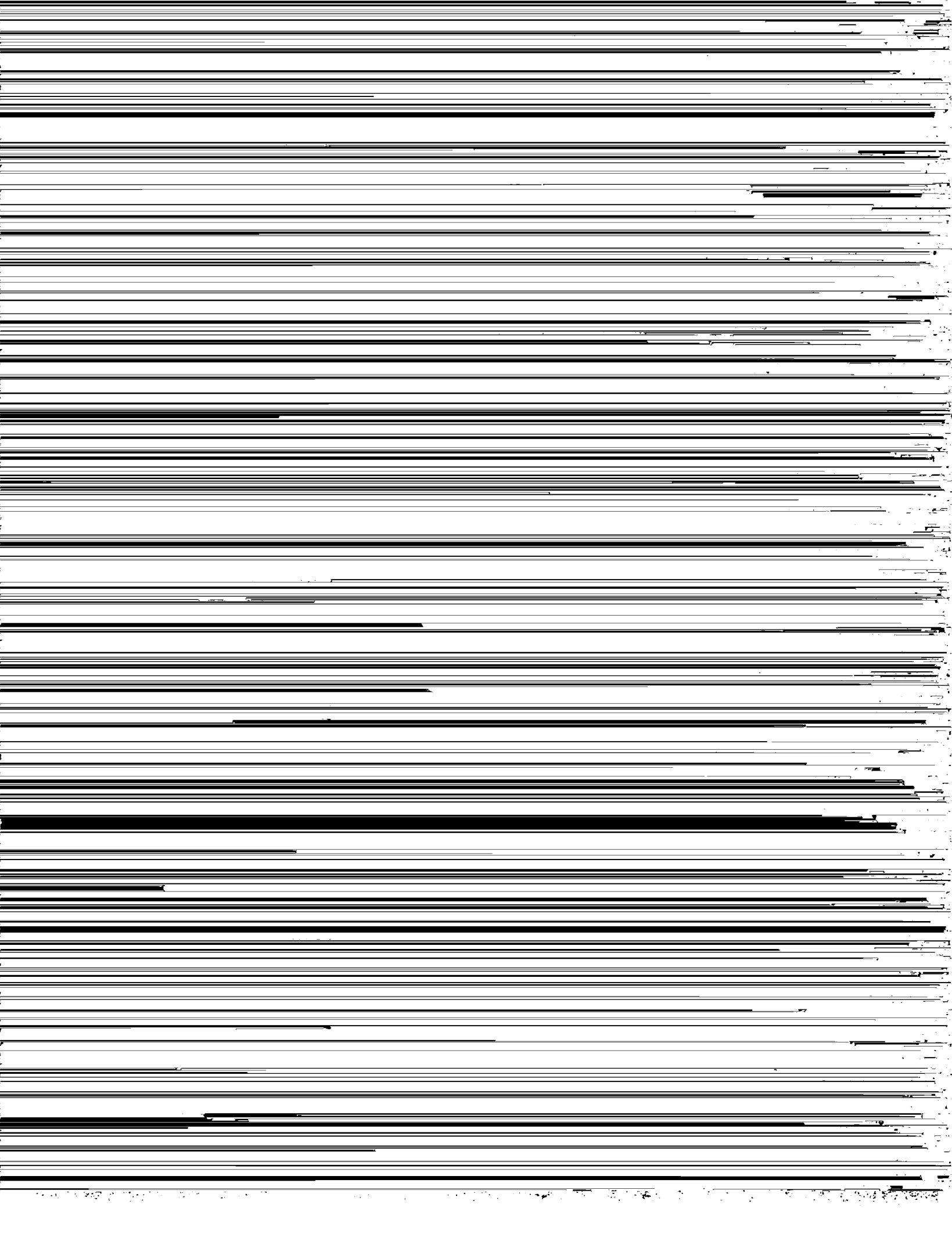
Noise Limiters:

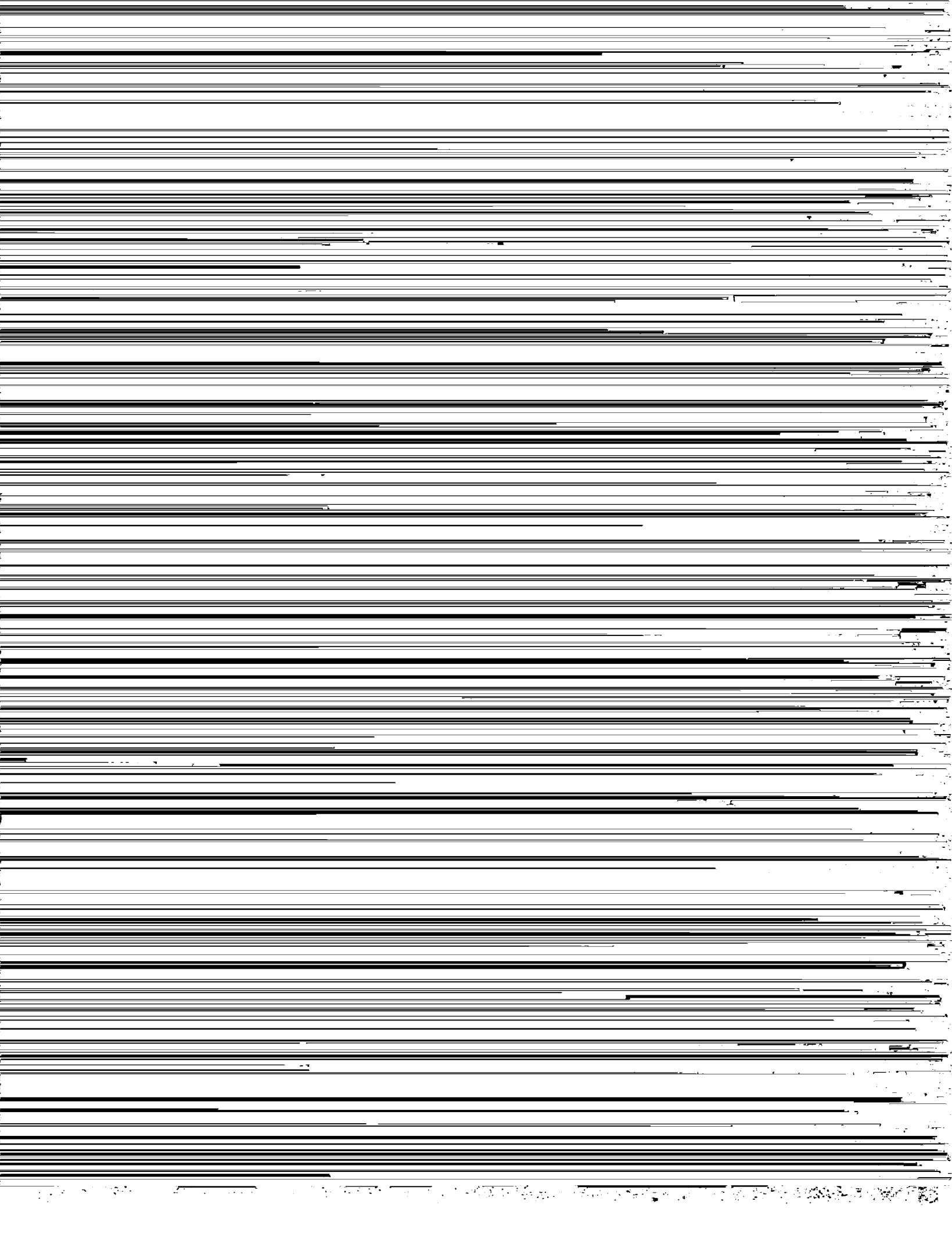
The noise limiter circuit V-15 limits the noise interference for ignition systems or other sources of pulse type noise. A separate control switch S-6 permits optional use of the limiter on any mode of operation when pulse type interference is present.

Audio Frequency Amplifier:

A resistance coupled amplifier triode V-16-B amplifies the audio frequency signal from the detector.







an arbitrary outer scale. The band spread dial has an arbitrary, 0 to 100, scale. The numeral under the fixed pointer of the main dial indicates the number of revolutions that have been made by the band spread dial at any setting. Thus, if the pointer, for the outer scale of the main dial indicates over the figure 4 and the band spread dial indicates 87.6, the reading to log for this setting is read 487.6. This precise mechanical band spread system divides the rotation of the main dial over each frequency band into approximately 600 band spread divisions, with one half division calibration points. Since it is easy to estimate one tenth divisions, on the band spread scale, this divides each frequency band into approximately 6000 readable settings. This permits extreme accuracy in the logging of stations.

HFO "Int-Ext" Switch, S12:

The HFO switch provides means of operating the receiver with either

supplied variable high stability or crystal oscillator such as is available from the NRC Variable Master Oscillator, Type 115 Model 1. When in the external position, the oscillator section of V_4 , is biased beyond cut-off. Externally supplied signals are then amplified by the second section of V_4 . When set for internal operation, the amplifier section is disabled and the oscillator operates in a normal manner.

output power from the 500 ohm load output terminals is 6 milliwatts or 1.9 volts across a 600 ohm load.

The primary control provides high attenuation of closely adjacent channel interference on either side of the signal frequency, when the crystal selectivity positions are used.

Selectivity Switch, S5:

The selectivity switch provides three crystals and three non-crystal degrees of selectivity, ranging from extremely sharp, for CW reception, to broad for good fidelity MCW operation.

Beat Frequency Oscillator, V13:

The beat frequency oscillator is turned "On" for CW signal operation by the "MOD-CW" switch. The beat frequency dial should be set at zero for tuning to zero beat and then adjusted to give the desired audio pitch. The beat frequency oscillator injection voltage is adjustable by the "BFO INJ" control on the rear skirt of the chassis.

AVC Switch (BFO), S14:

The AVC switch has the following four positions:

1. Internal BFO Slow

When set to either of the external BFO positions the Beat Frequency Oscillator section of V13 is biased beyond cutoff. External crystal BFO applied to the external connector is then amplified by the other section of V13. For either of the internal positions, the amplifier section is disabled

proximity to the transmitter and provides instant return to reception between transmission periods.

Relay Receptacle, J4:

The relay receptacle, on the rear of the receiver, is connected in parallel with the send-receive switch and provides for the connection of an externally connected relay, to perform the send-receive operation. When the relay is used the send-receive switch is left in the "open" or "send" position.

AVC-Manual Switch, S8:

The AVC-Manual Switch permits the choice of either AVC or Manual sensitivity operation as desired. The AVC has a delay bias, which insures maximum sensitivity for weak signals.

RF Gain Control, R93:

The RF gain control provides adjustment of the sensitivity for signals of various strength, when under the "manual" operating condition, in order that the receiver sensitivity may be adjusted to suit the signal strength and prevent overloading. This control is also in the circuit when operating on AVC, in order that the sensitivity may be adjusted to reduce undesirable noise during "off" periods in the transmission of the received signal. When it is desired to use the tuning meter for indication of relative signal strength, the RF gain control should be at maximum.

of the control is such that 2 to 5 volts D. C. is available at the cathodes of V9 and V10.

Audio Gain Control, R34:

The audio gain control adjusts the audio input to the audio amplifier tube. It should be adjusted for the required audio output when operating on AVC and is best left at or near maximum when operating on MANUAL control.

Phone Input, E1:

Terminals are provided on the rear of the receiver for phonograph or other audio frequency source input to the audio frequency amplifier.

Convenience Outlet, J5:

A power outlet receptacle is provided on the rear of the receiver chassis for operating an accessory, such as an electric clock or lamp.

AVC Switch, S15:

The AVC switch at the rear of the receiver allows the AVC line to be brought to terminal #3 of E19 for "diversity" operation. The AVC line is broken for "local" operation to prevent interference between the two receivers when tuned to signals of different strengths.

the Wiring Diagram, Dwg. No. D-159-1-45, and Parts List for location and values of components. If the checks on tubes, fuses and visual inspection fail to disclose the fault, the tube socket voltages and resistances should be measured and checked against the values given in the Table of Tube Socket Voltages. Any appreciable departure beyond a normal variation of approximately 15% from the values in this table will generally indicate the component or circuit at fault. If the foregoing does not reveal the fault, then a stage by stage check of amplification should be made. Any great difference from the values of input shown in the Table of Approximate Signal Input at IF and AF Stages for 20 Volts Output will indicate the stage at fault. If a tuned circuit component, such as an IF transformer, RF or HF oscillator coil assembly is found defective and replaced, only the replaced unit need be realigned. Follow the alignment procedure in Section 6, for the unit involved.

The IF Transformers, Crystal Filter, Beat Frequency Oscillator and the 3.5 MC Crystal Controlled Oscillator assemblies are each mounted on the chassis independently of their respective shields. The shield can assemblies are easily removed for inspection of these units, without disturbing the soldered connections. In replacing these shields, make sure that the grounding springs are in place on the inductance adjuster screws before the shield is installed.

remove these shields, hold the adjusting screws with a screw driver to prevent turning the screws and losing the alignment adjustment and loosen the tension nuts, using another small screwdriver engaging one of the slots. When replacing these shields and tension nuts, employ the same method and tighten the tension nuts just enough to prevent the adjusting screws from working loose.

Beat Frequency Oscillator:

To remove the beat frequency oscillator T6, if the receiver is equipped with the Crystal Frequency Control Unit T34, it will be necessary to set the crystal selector switch S2, on its No. 3 position and loosen the four set screws in the rigid shaft coupling and the two set screws in the disc on the selector switch shaft. Slide the switch shaft forward through the coupling and disc.

the spring downward against the tension nut, before replacing the shield can assembly.

Adjustment of BFO:

With the AVC-MAN switch on AVC, and the SELECTIVITY control on the 0.2 KC

position, tune in an unmodulated signal for maximum tuning meter reading. Set the CW-MOD switch to CW and with the BEAT OSC dial at 0, adjust the top screw of the BFO unit for zero beat. Turn the BEAT OSC dial to each 3 KC position and check the output beat frequency against a known audio frequency source such as a good audio oscillator. If the beat frequencies obtained at each 3 KC position is not within the range between 3 and 3.5 KC, loosen the set screws of the BFO shaft coupling and turn the shaft of the BFO with respect to the drive shaft and repeat the above, resetting the zero adjustment by the top screw of the BFO unit each time until the above range is realized. One set screw should be used just tightly enough to allow the drive shaft to operate the BFO shaft until the range is correct and then tighten both screws.

Crystal Switch Adjustment:

If the mechanical drive of the crystal control switch has been disturbed, it should be adjusted as follows: Carefully slide the switch shaft through the disc and into the rigid coupling and being careful not to turn the switch, tighten the four set screws in the rigid coupling, with the knob indicator on the No. 3 position as originally set under Beat Frequency Oscillator. Now set the crystal switch on the No. 1 position and holding the disc in a counter-clockwise direction, so that the end of the slot in the disc is against the drive pin, lightly fasten the set screws of the disc. When this disc is properly adjusted on the shaft, with the switch in the No. 1 position, the connecting bar between the two discs should not be under tension and should exhibit a slight amount of play when tried with the thumb and forefinger. When so adjusted, tighten the set screws.

a replacement assembly is available. CAUTION: Make sure that the coil base is firmly seated and secured by its retaining springs before going to the next assembly or turning the band change control. Failure to do this may damage the switch spring contacts beyond repair.

Repeat this procedure until the faulty assembly is found. In checking these assemblies, first check for continuity of the coils, particularly the small primary coils as in the RF Input assemblies, where they are liable to damage if the Receiver is operated in the presence of very strong transmitter signals. In replacing these coil assemblies be careful that the end of the assembly nearest the coil is toward the front of the Receiver.

Mixer Plate Coil Assembly:

Trouble in the Mixer Plate Coil Assembly T1, is indicated if the input required at Pin 7 of V5 is found to be greatly different than the values shown in the Table of Approximate Signal Input at IF and AF Stages for 20 Volts Output, and the gain from Pin 7 of V6 is normal. The cover plate and shield of T1 may be removed for replacement of a defective component. If the entire assembly is to be replaced, it will be necessary to unsolder all of the leads at both the bottom and top terminal boards of the unit.

RF Tube Platform:

If the Receiver fails to perform normally on any of the six frequency bands and the previous tests indicate that performance of the IF and audio frequency amplifiers is normal, including the gain check in accordance with the Table of Approximate Signal Input at IF and AF Stages for 20 Volts Output for the input to Pin 7 of V5, the fault is indicated to be in the RF Tube Platform or in the main tuning capacitor. Before removing the RF Tube Platform, it is advisable to remove the top shield cover and inspect the main tuning capacitor connections. Observe that the tuning capacitor is operating properly when the tuning control is rotated. Using a miniature tube adapter, apply a modulated RF test signal successively to Pin 1 of V1 and V2 and to Pin 7 of V5. For each of these positions of the adapter and signal, tune through the proper dial setting for the signal frequency used. Gain of the order of 5 or 6 should be indicated for each stage and loss of signal

the input signal is applied to Pin 7 of V5, will indicate trouble in the HF oscillator section of the unit. With the covers removed from the tuning capacitor

RF Tube Platform: (cont'd)

and T1, unsolder the blue, white-black, red-white, red-green, yellow-black and blue-red leads that come from the tube platform at the top of T1. Unsolder the leads from the tuning capacitor rotors, stators and ground straps at each section. Turn the Band Change control one-half turn from any band position in order to have the band switch contacts disengaged and leave the band switch in this position until the RF Tube Platform is replaced, otherwise irreparable damage to the switch contacts will occur. Remove the four screws at the corners of the top of the platform and the four screws at the side flange and carefully remove the platform. In handling be careful to prevent damage to the switch contacts of this assembly. When the unit is ready to be replaced, follow the reverse of the above procedure.

Main Tuning Capacitor:

If it is necessary to replace the main tuning capacitor, the procedure is as follows: Remove the top cover and unsolder the leads of the capacitor as described under RF Tube Platform. Bring the capacitor to full mesh by means of the tuning control. Carefully remove the spring and drive link at the front of the capacitor. Remove the single screw that secures the capacitor frame front plate to the gear plate, looping a piece of small wire around the spacing washer between the capacitor and gear plate. The front capacitor plate is located and held in position by two dowel pins and will not move when the front screw is taken out. Now hold the capacitor by its frame with one hand and remove the rear supporting screw and spacer. The capacitor may now be moved to the rear, to disengage the dowel pins, and lifted from the Receiver. Follow the above procedure in reverse when replacing the capacitor.

Communications Receiver

APPROXIMATE SIGNAL INPUT AT IF AND AF STAGES
FOR 20 VOLTS OUTPUT

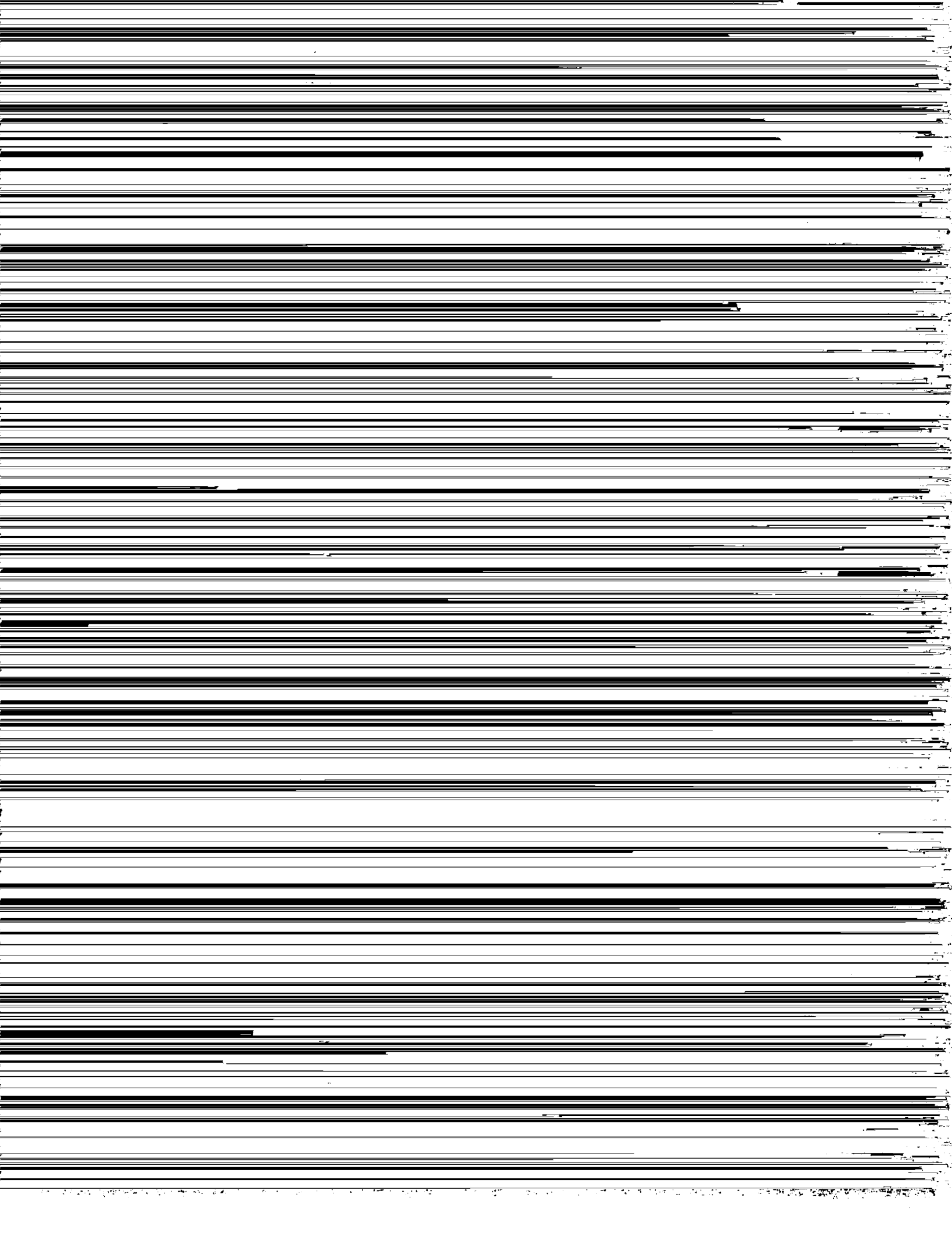
BAND SWITCH	FREQUENCY	INPUT TO	APPROX. INPUT
Any	Audio 400 cycles	Pin 5, V17	3.5 volts
Any	Audio 400 cycles	Pin 2, V16B	.3 volts
1.35 - 3.45 mc	Mod RF 455 kc	Pin 1, V11	.35 volts
1.35 - 3.45 mc	Mod RF 455 kc	Pin 1, V10	6000 microvolts
1.35 - 3.45 mc	Mod RF 455 kc	Pin, V9	110 microvolts
1.35 - 3.45 mc	Mod RF 455 kc	Pin 1, V7	40 microvolts
1.35 - 3.45 mc	Mod RF 455 kc	Pin 7, V5	65 microvolts
7.40 - 14.8 mc	Mod RF 3.955 mc	Pin 7, V5	40 microvolts
7.40 - 14.8 mc	Mod RF 3.955 mc	Pin 7, V6	250 microvolts

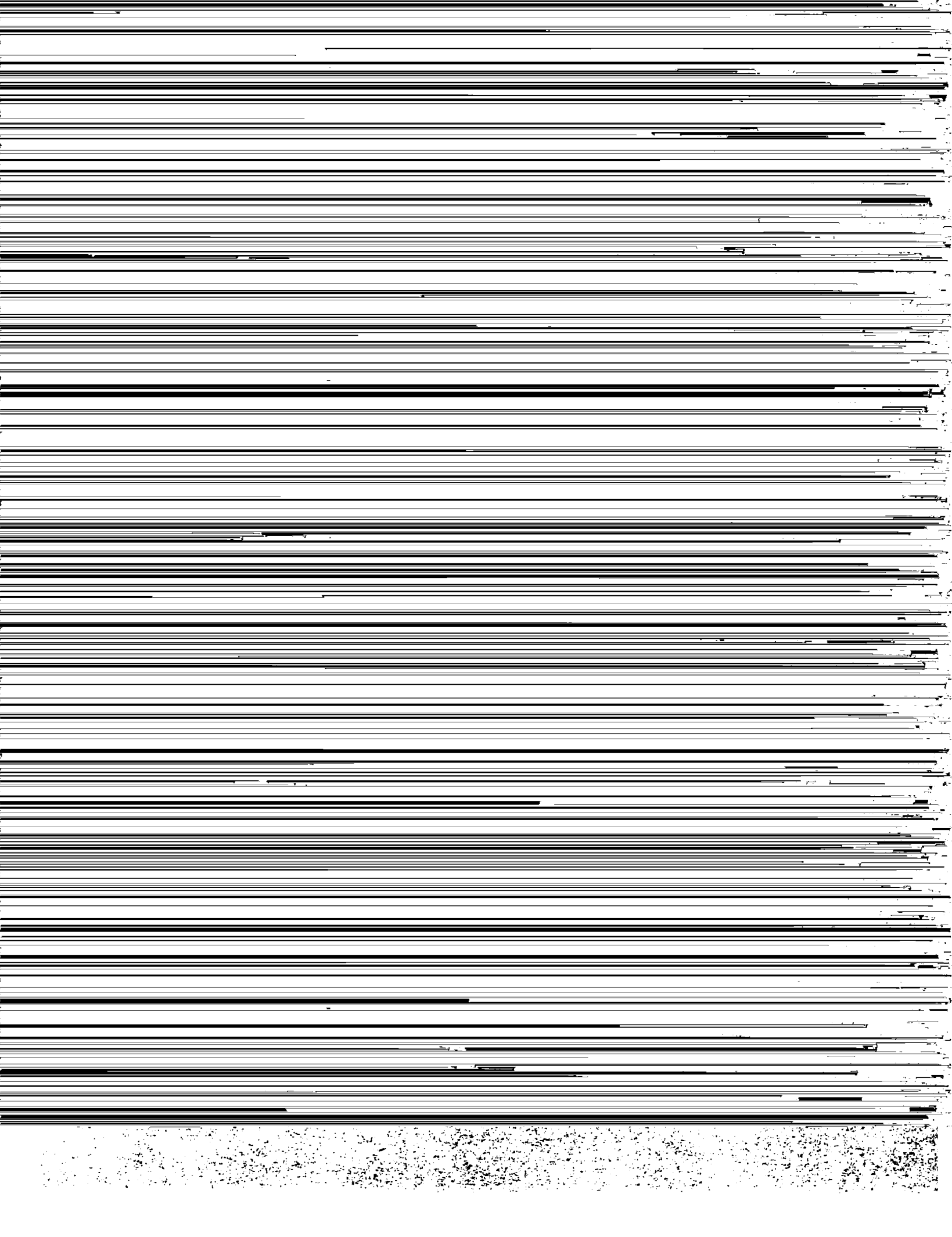
Output measured across a 600 ohm resistive load at output terminals of receiver. RF signals modulated 30 percent at 400 cycles. Signals applied to tube grids through a .01 mfd capacitor. Selectivity switch at 3 kc, AVC-MAN switch on MAN. CW-MOD switch on MOD, RF Gain and Audio Gain at maximum. HFO switch at Internal; AVC switch at Int, EFO, Fast; 3.5 MC Osc. switch at position #3.

The additional information required for the visual alignment routine will be covered in a later paragraph.

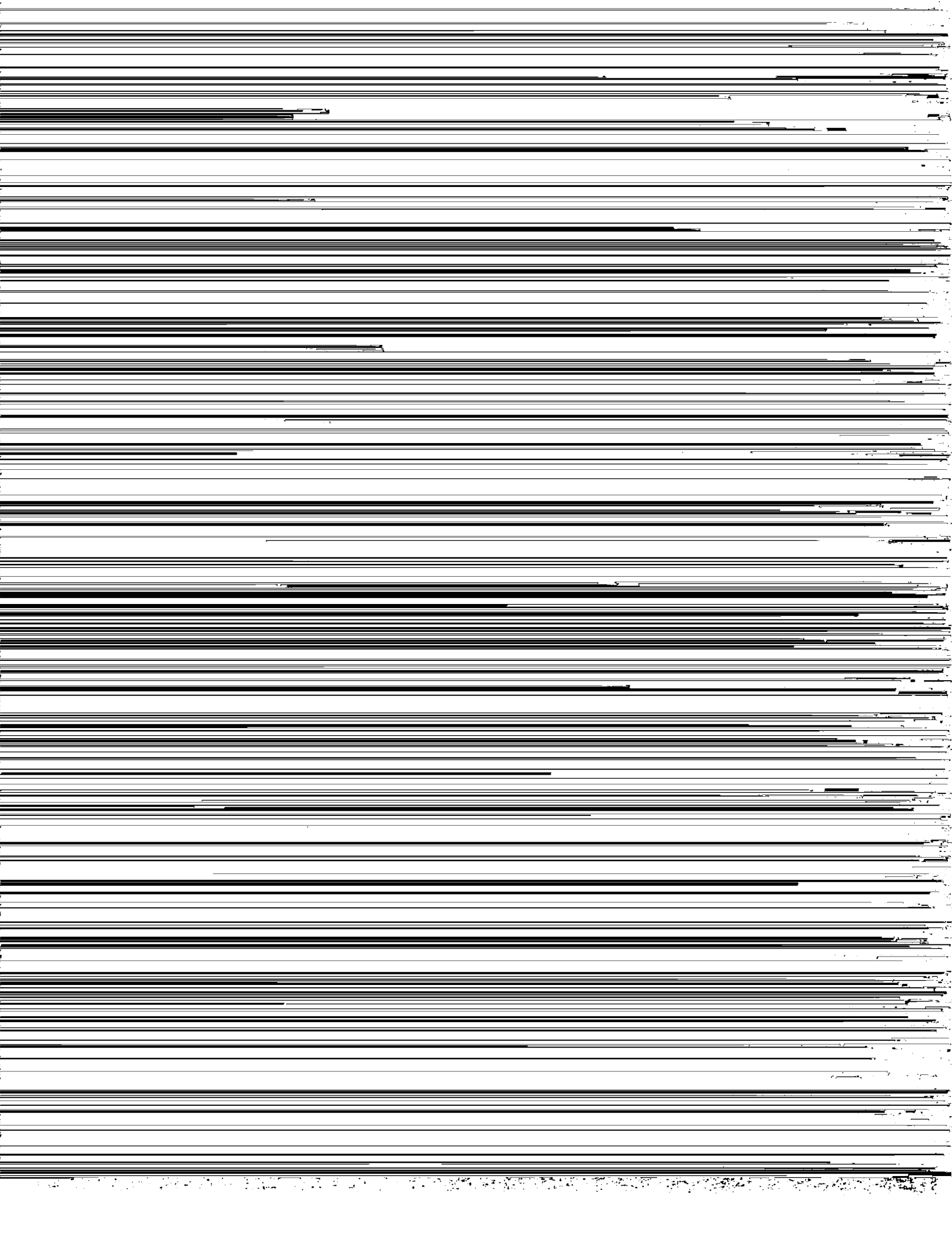
The signal generator should be coupled to the grid of the mixer tube V5 through a capacitance of approximately .01 mfd. A miniature tube adapter will be required to make the mixer grid connection available. Such an adapter is manufactured by the Alden Manufacturing Co. An output meter should be connected across the output terminals of the receiver or the speaker voice coil. The receiver controls should now be set as follows:

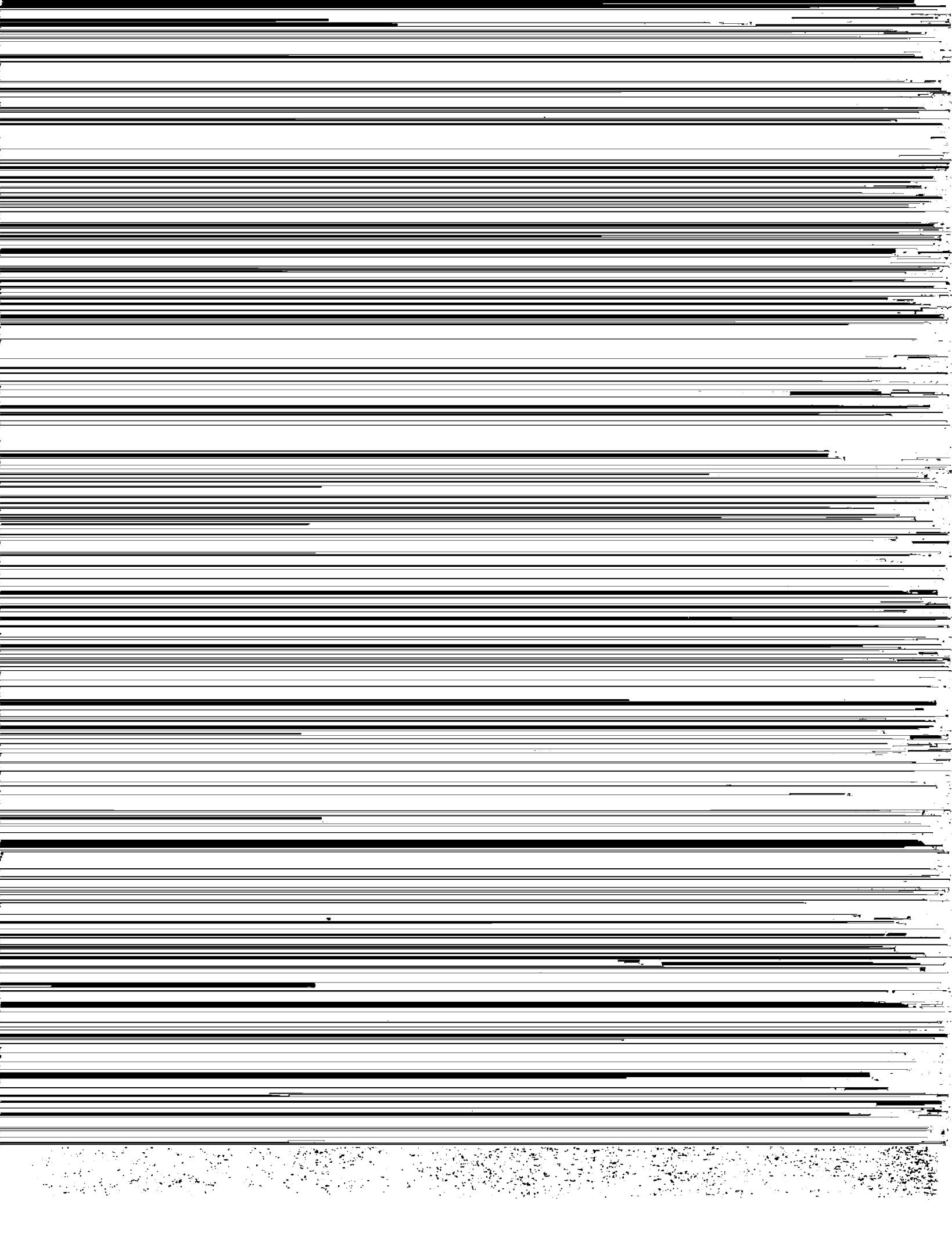
<u>Control</u>	<u>Position</u>
Selectivity	See text
Send - Receive	Receive
CW - Mod	Mod
Phasing	Arrow
AVC - Man	Man
Audio Gain	Set for approx. 20 volts
RF Gain	See text
Band Switch	1.35 - 3.45 mc
Dial	2.5 mc
HFO	"Int."
AVC	"Int." BFO: Fast
3.5 mc Osc.	#3
IF Gain	Max. CCW



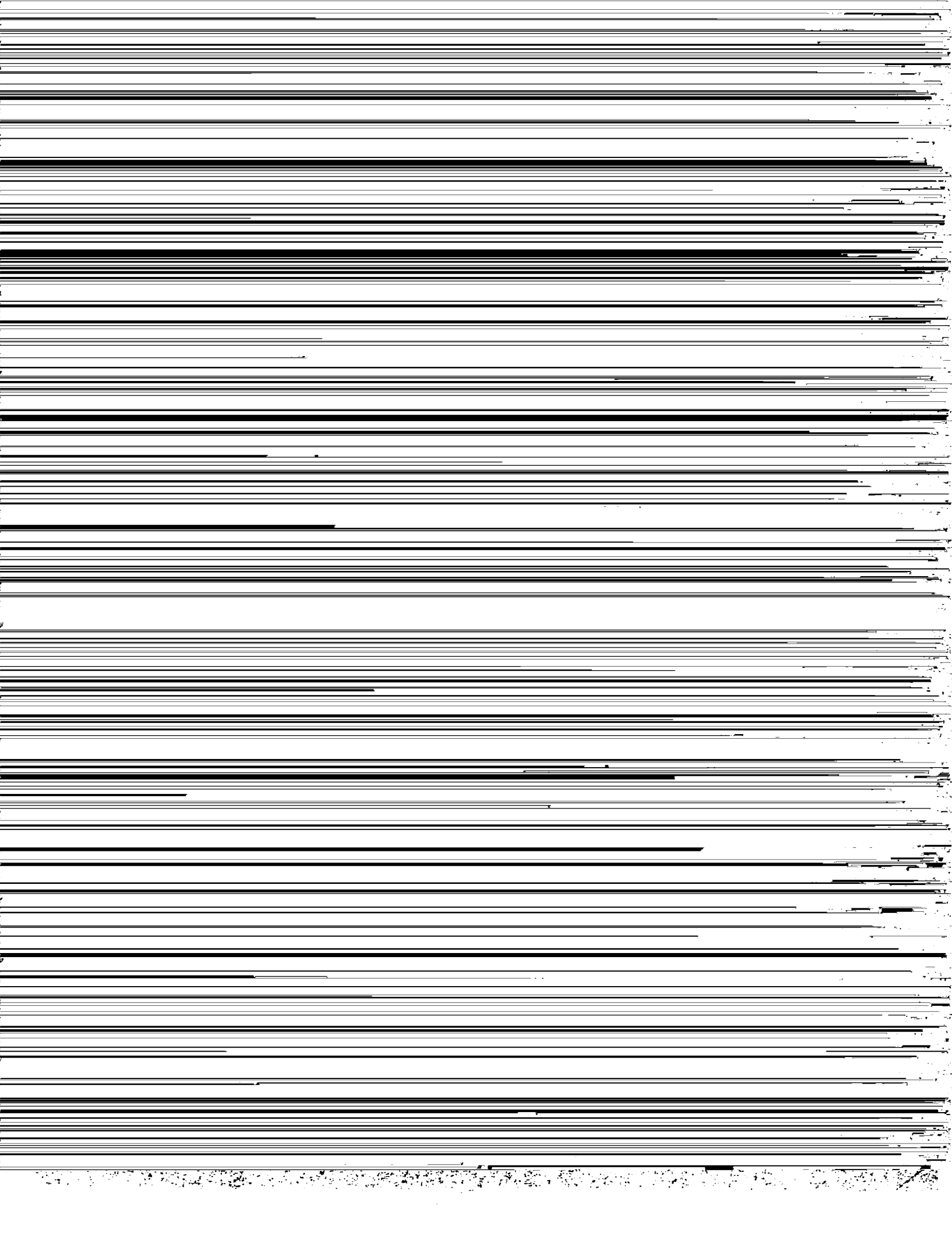


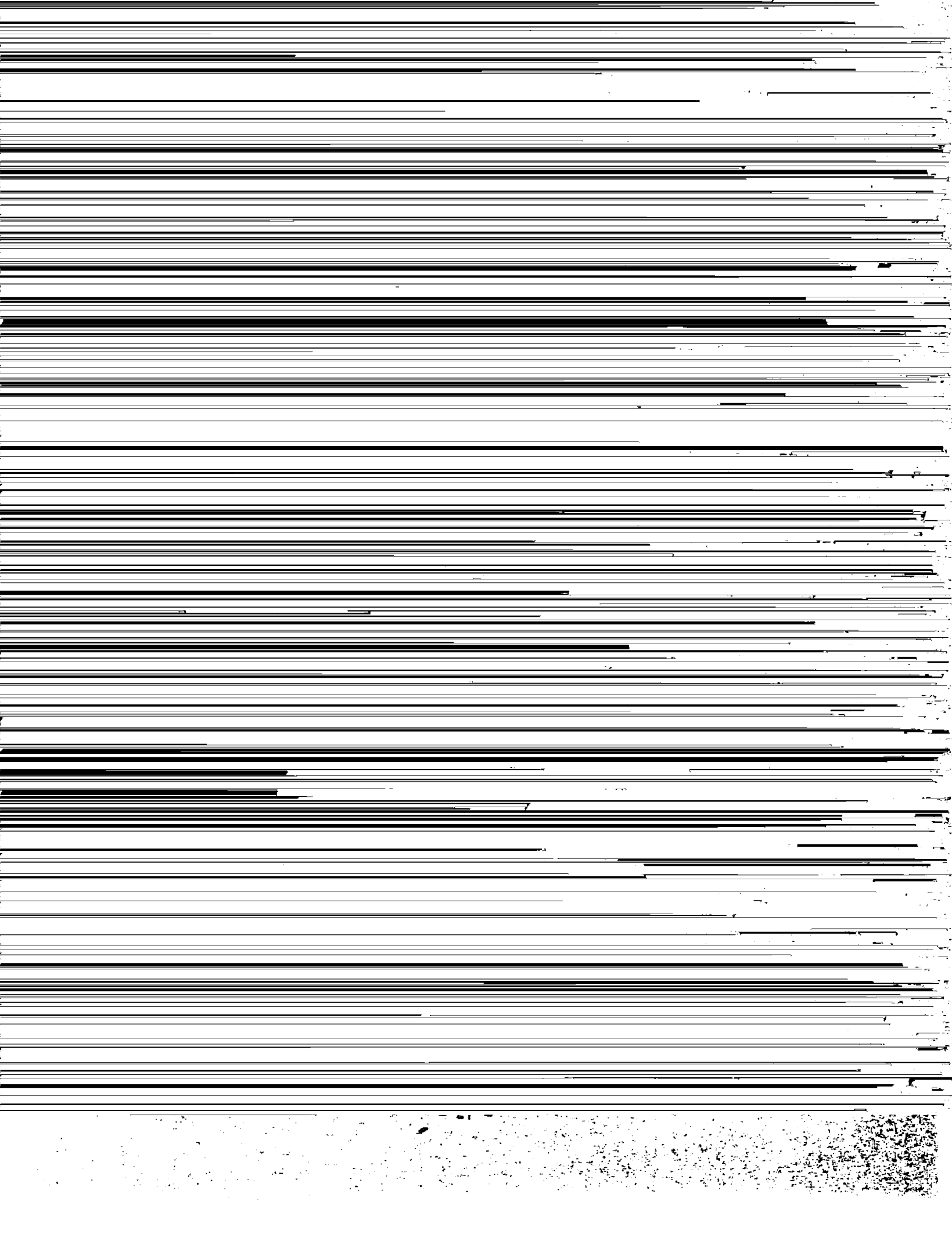
	0.56-1.4	1.4-3.75	3.75-7.5	7.5-15.0	15.0-30.0	30.0-52.0
RF & HF Osc. Adjust L at:	.56	1.4	3.75	7.5	15.0	30.0
RF & HF Osc. Adjust C at:	1.3	3.4	7.15	14.5	29.0	52.0





V=20	120	0-97	AC	---	120	---	0-97	---	---	min gain min.
	RMS				RMS					





C6, 30, 50	Capacitor, 20 mmf	HAM	23003-41-C
C8, 32, 52, 132	Capacitor, 2400 mmf	HAM	23011-40-C
C9, 33, 53	Capacitor, 33 mmf	HAM	23003-45-C
C11, 17, 35, 55	Capacitor, 1500 mmf	HAM	23011-62-C
C12, 138, 145	Capacitor, 7 mmf	HAM	23061-168-F
C14	Capacitor, 1000 mmf	HAM	23011-58-C
C15, 139	Capacitor, 15 mmf	HAM	23061, 155-J
C18, 25, 45, 75, 110, 112, 113	Capacitor, 100 mmf	HAM	23003-94-C
C37, 57, 67	Capacitor, 85 mmf	HAM	23071-59
C39, 59, 99, 134	Capacitor, 51 mmf	HAM	23003-87-C
*C60, 88	Capacitor, 12 mmf	HAM	23023-65-UJ
*C62	Capacitor, 2200 mmf	HAM	23011-17-C
*C63	Capacitor, 39 mmf	HAM	23003-47-C
*C65	Capacitor, Variable	HAM	11726-G109
C69, 107, 117, 124	Capacitor, 220 mmf	HAM	23003-102-C
C77	Capacitor, 3300 mmf	HAM	23011-69-C

C78	Capacitor, 404 mmf	HAM	23071-57
C79, 80	Capacitor, 5 mmf	HAM	23023-8-UJ
C82	Capacitor, 810 mmf	HAM	23072-53
C83	Capacitor, 10 mmf	HAM	23003-2-B
C85	Capacitor, 1200 mmf	HAM	23011-60-C
C87	Capacitor, 120 mmf	HAM	23071-50
C89	Capacitor, 190 mmf	HAM	23071-64
C91	Capacitor, 92 mmf	HAM	23071-71
C92	Capacitor, 51 mmf	HAM	23023-45-UJ
C93	Capacitor, 379 mmf	HAM	23071-63
C95	Capacitor, 42 mmf	HAM	23071-69
C96	Capacitor, 610 mmf	HAM	23072-52
C97	Capacitor, 65 mmf	HAM	23071-58
C111	Capacitor, Variable	HAM	11776-G1
C114	Capacitor, 270 mmf	HAM	23003-104-C

C120, 126	Capacitor, 1300 mmf	HAM	23011-61-C
C128, 151, 158, 159, 160	Capacitor, 10 mfd, 100 volt, HS Can, electrolytic	HAM	15462-1
C129A, 129B	Capacitor, 2x.05 mfd, HS Can, paper	HAM	15461-1
C130	Capacitor, 27 mmf	HAM	23023-71-UJ
C131, 133, 187	Capacitor, 430 mmf	HAM	23003-109C
C137	Capacitor, 0.25 mfd 200 volt	HAM	23911-79-E
C140	Capacitor, 1000 mmf	HAM	23015-27-A
C141, 142	Capacitor, 100 mmf	HAM	23024-24-SL

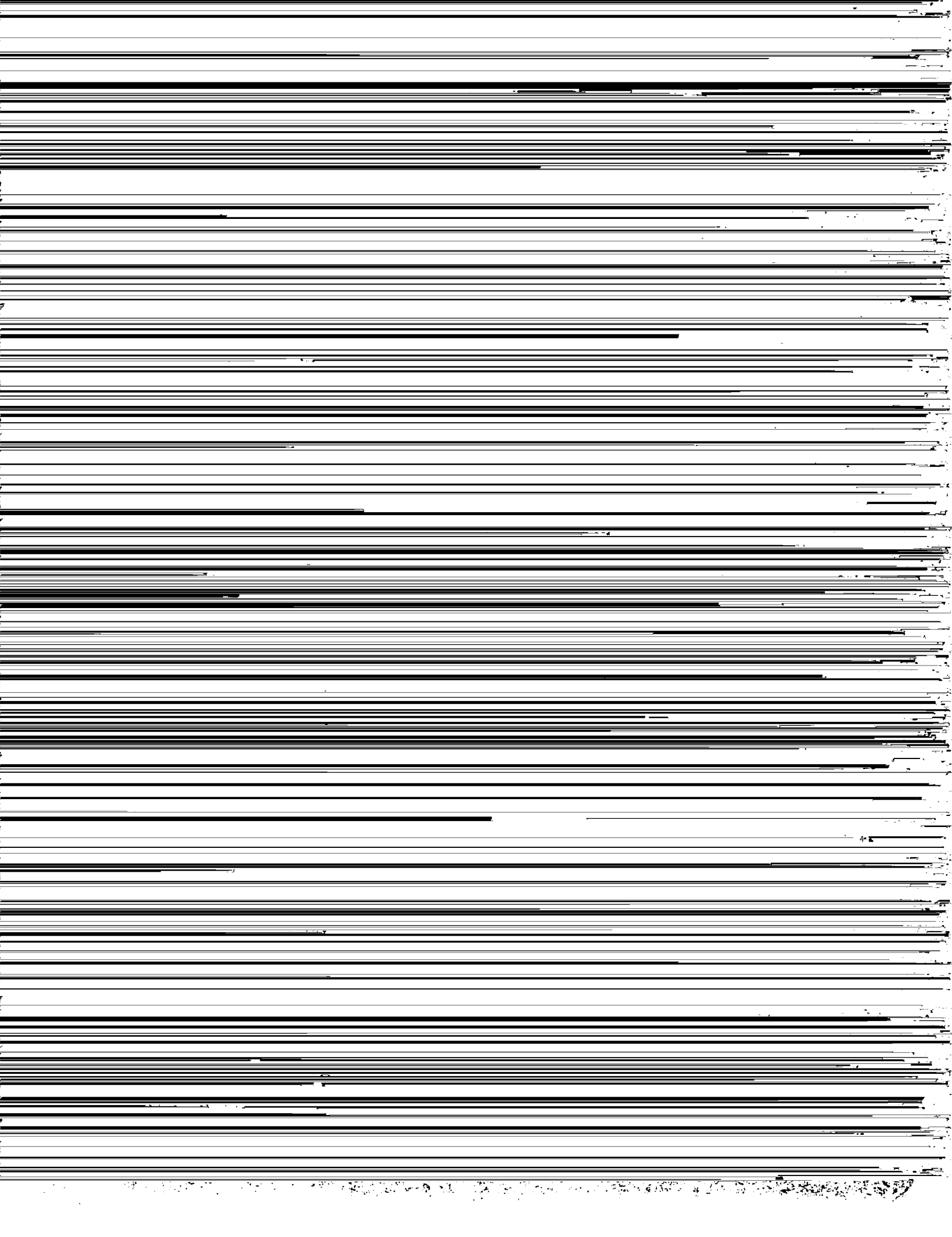
<u>Symbol</u>	<u>Description</u>	<u>Mfr.</u>	<u>Part No.</u>
C143, 147, 149	Capacitor, 5100 mmf	HAM	23015-16-A
C144	Capacitor, 0.05 mfd	HAM	23911-77-E
C150	Capacitor, 2500 mmf, 800 volt	HAM	23070-40
C152A, 152B	Capacitor, -0.01 mfd	HAM	23072-11
C161A, B, C	Capacitor, 3x20 mfd, 450 volt,	HAM	15463-1

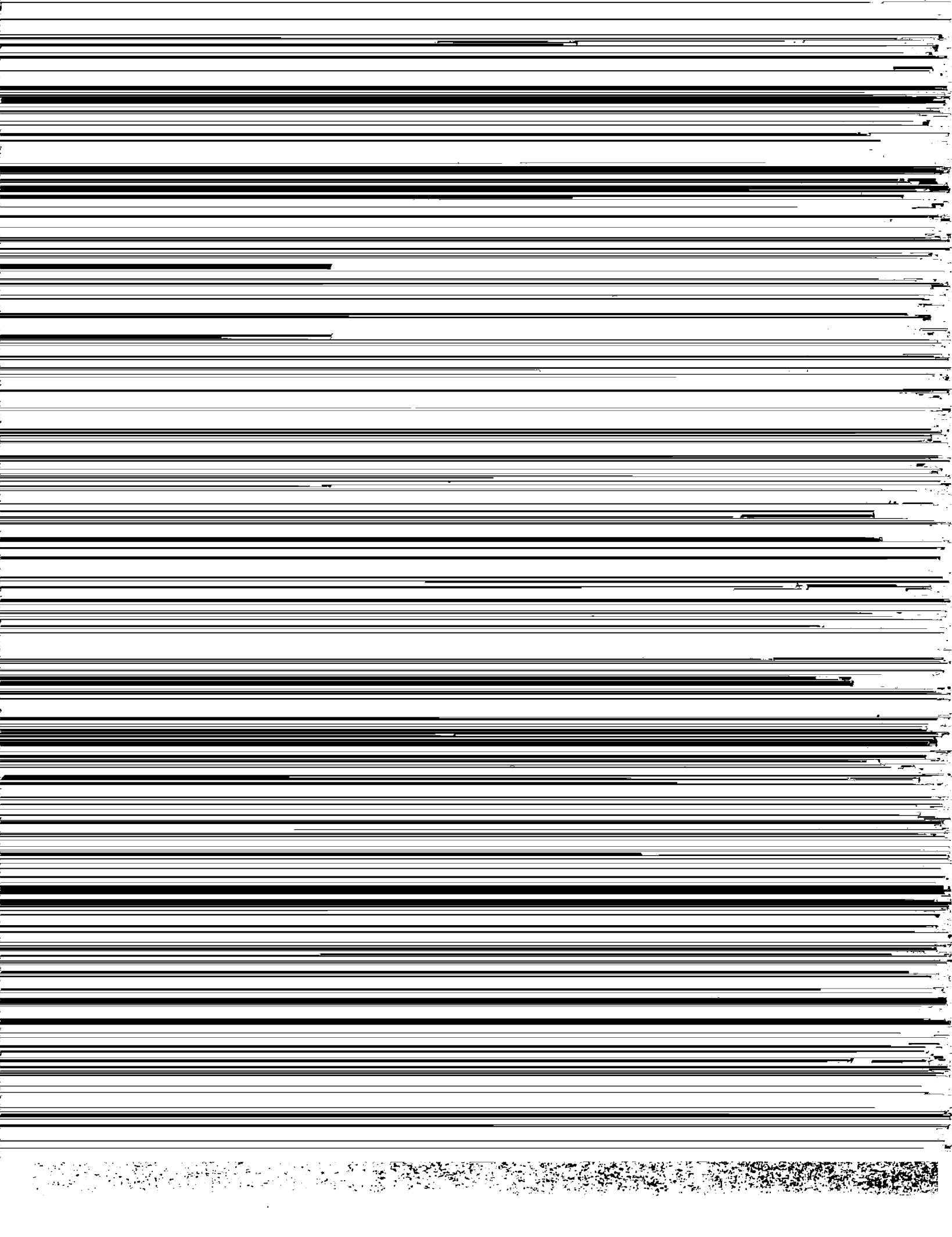
C101	25 mmf variable air trimmer	HAM	APC-25
C162	0.007 mfd \pm 5% 300 volt mica	SAN	C 06270
C163	0.007 mfd \pm 5% 300 volt mica, matched to within 1% of C162	SAN	C 06270
C164	100 mmf \pm 10% 500 volt mica	SAN	K 1310
C165	100 mmf \pm 5% 500 volt silver mica	SAN	KR 1310
C166	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110
C167	100 mmf \pm 5% 500 volt mica	SAN	K 1310
C168	10 mmf \pm 5% 500 volt mica	SAN	K 1410
C169	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110
C170	0.001 mfd \pm 10% 500 volt mica	SAN	K 1210
C171	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110
C172	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110

C173	0.02 mfd \pm 10% 120 volt molded paper	MIC	345
C174	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110
C175	300 mmf \pm 10% 500 volt mica	SAN	K 1330
\pm C176	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110
C180	0.01 mfd \pm 20% 300 volt mica	SAN	C 06110
C181	0.001 mfd \pm 10% 500 volt mica	SAN	K 1210
C182	0.001 mfd \pm 10% 500 volt mica	SAN	K 1210
C183	0.1 mfd \pm 20% 200 volt paper tubular capacitor	AED	Type P82

<u>Symbol</u>	<u>Description</u>	<u>Mfr.</u>	<u>Part No.</u>
C184	0.1 mfd \pm 20% paper tubular capacitor	AEO	Type P82
C186	0.25 mfd 600 volt	HAM	23915-1
E1	2 screw terminal, phone input	HAM	4904-5
E2	4 screw terminal, audio output	HAM	31141-1
K19	5 lug terminal screw type binding post	SMT ICA	905 2405
F1	Fuse, 3 amp	HAM	15928-8

	Fuse, 3 amp pigtail	HAM	15923-1
	Fuse holder	HAM	15923-1
	Fuse holder, spare	HAM	15923-1
I1, 2, 3, 4	Dial lamp, No. 47 Mazda	HAM	16004-1
	Dial lamp socket assembly	HAM	31453-1
J1	Antenna input socket	HAM	15959-1
J2	IF output socket - monitor	HAM	16111-1
J3	Phone jack	HAM	5066-1
J4	Relay receptacle	HAM	35013-1
J5	AC outlet	HAM	35013-1
J6	Coaxial receptacle	AMP	83-1R
J7	Coaxial receptacle	AMP	83-1R
J8	Coaxial receptacle	AMP	83-1R
J9	Single phone jack	CIN	81-A
\pm J10	Coaxial receptacle	AMP	83-1R
L1	RF input assembly, includes C2, C3, L1 and switch contacts for S1A	HAM	31387-G-1
L2	RF input assembly, includes C4, C5, L2 and switch contacts for S1A	HAM	31390-G-1





R3, 14, 39, 48, 53	Resistor, 33K ohms 1/2 watt	HAM	19309-282BF
R4, 6, 16, 29, 30, 83, 102	Resistor, 1000 ohms 1/2 watt	HAM	19309-49BF
R5, 15, 32, 103 to 110	Resistor 510 ohms 1/2 watt	HAM	19309-170BF
R7, 8, 17, 18	Resistor 51 ohms 1/2 watt	HAM	19309-193BF
R9, 19	Resistor 24 ohms 1/2 watt	HAM	19309-189BF
R10, 11, 20, 21	Resistor 22 ohms 1/2 watt	HAM	19309-9BF
R22, *23, 64, 65, 77	Resistor 47K ohms 1/2 watt	HAM	19309-89BF
*R24, *25	Resistor 180 ohms 1/2 watt	HAM	19309-31BF
R27	Resistor 150 ohms 1/2 watt	HAM	19309-259BF
R28	Resistor 6800 ohms 1/2 watt	HAM	19309-69BF
R31, 37, 41, 49, 54, 58, 80	Resistor 2200 ohms 1/2 watt	HAM	19309-57-BF

R45	Resistor 240 ohms 1/2 watt	HAM	19309-201BF
R46, 94	Resistor 1100 ohms 1/2 watt	HAM	19309-208BF
R47, 66	Resistor 18K ohms 1/2 watt	HAM	19309-79BF
R59	Resistor 2200 ohms 1 watt	HAM	19310-57BF
R60, 61	Resistor 1 megohm 1/2 watt	HAM	19309-121BF
R63	Resistor 27K ohms 1/2 watt	HAM	19309-83-BF
R69, 74	Resistor variable 1000 ohms	HAM	15363-1
R72	Resistor 20K ohms 1/2 watt	HAM	19309-218BF
R73	Resistor 56K ohms 1 watt	HAM	19309-186BF
R78, 98	Resistor 470K ohms 1/2 watt	HAM	19309-113BF
R79	Resistor 680 ohms 1/2 watt	HAM	19309-45BF
R84	Resistor variable 500K ohms	HAM	15342-11
R85	Resistor 2500 ohms 10 watt	HAM	19396-1
R95	Resistor 82K ohms 1/2 watt	HAM	19309-287BF
R87, 88	Resistor 120K ohms 1/2 watt	HAM	19309-181BF
R93	Resistor variable 50K ohms includes switch S10	HAM	15342-21
R97	Resistor 3.3 megohms 1/2 watt	HAM	19309-133BF
R99	Resistor 360 ohms 1 watt	HAM	19310-211BF

R101	Resistor, variable, 25K ohms	HAM	15342-4
R36	47K ohms \pm 5% 1/2 watt comp. res.	ALB	EB 4735
R86	68K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 6831
R89	68K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 6831
R111	470 ohms \pm 20% 1/2 watt comp. res.	ALB	EB 4712
R112	500 ohms potentiometer, 1/4" shaft, screwdriver slot, 1/4" long, wirewound	IRC	W-500
R113	75 ohms \pm 5% 1/2 watt comp. res.	ALB	EB 7505
R114	47K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 4731
R115	20K ohms \pm 5% 1/2 watt comp. res.	ALB	EB 2035
R116	220K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 2241
R117	10K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 1031
R118	10K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 1031
R119	470K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 4741
R120	10K ohms \pm 10% 1 watt comp. res.	ALB	GB 1031
R121	1.6K ohms \pm 5% 1/2 watt comp. res.	ALB	EB 1625
R122	20K ohms \pm 5% 1/2 watt comp. res.	ALB	EB 2035
R123	75 ohms \pm 5% 1/2 watt comp. res.	ALB	EB 7505
R124	100K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 1041
R125	470K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 4741
R126	22K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 2231
R127	10K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 1031
R128	1K 2 watt composition potentiometer, linear taper, screwdriver adjustment	ALB	JALLO40S102UC
R129	68K ohms \pm 10% 2 watt comp. res.	ALB	EB 6831
R130	100K ohms \pm 10% 1/2 watt comp. res.	ALB	EB 1041
R133	100'ohms \pm 10% 1/2 watt comp. res.	ALB	EB 1011

11

IN RESEMBLING; INCLUDES C11, 11U,
119, 120, 138, 39, 40, R49

HAM

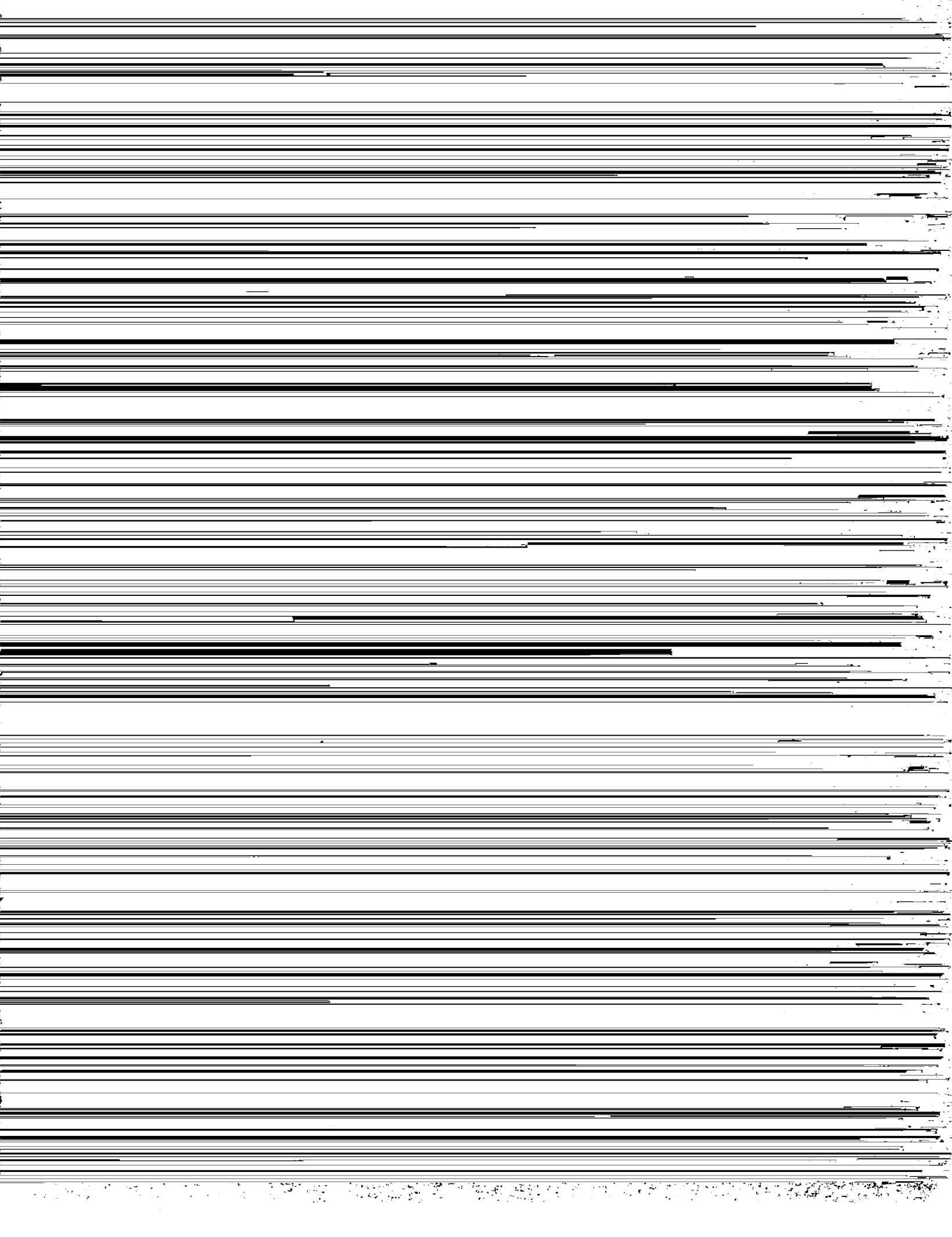
31102-G1

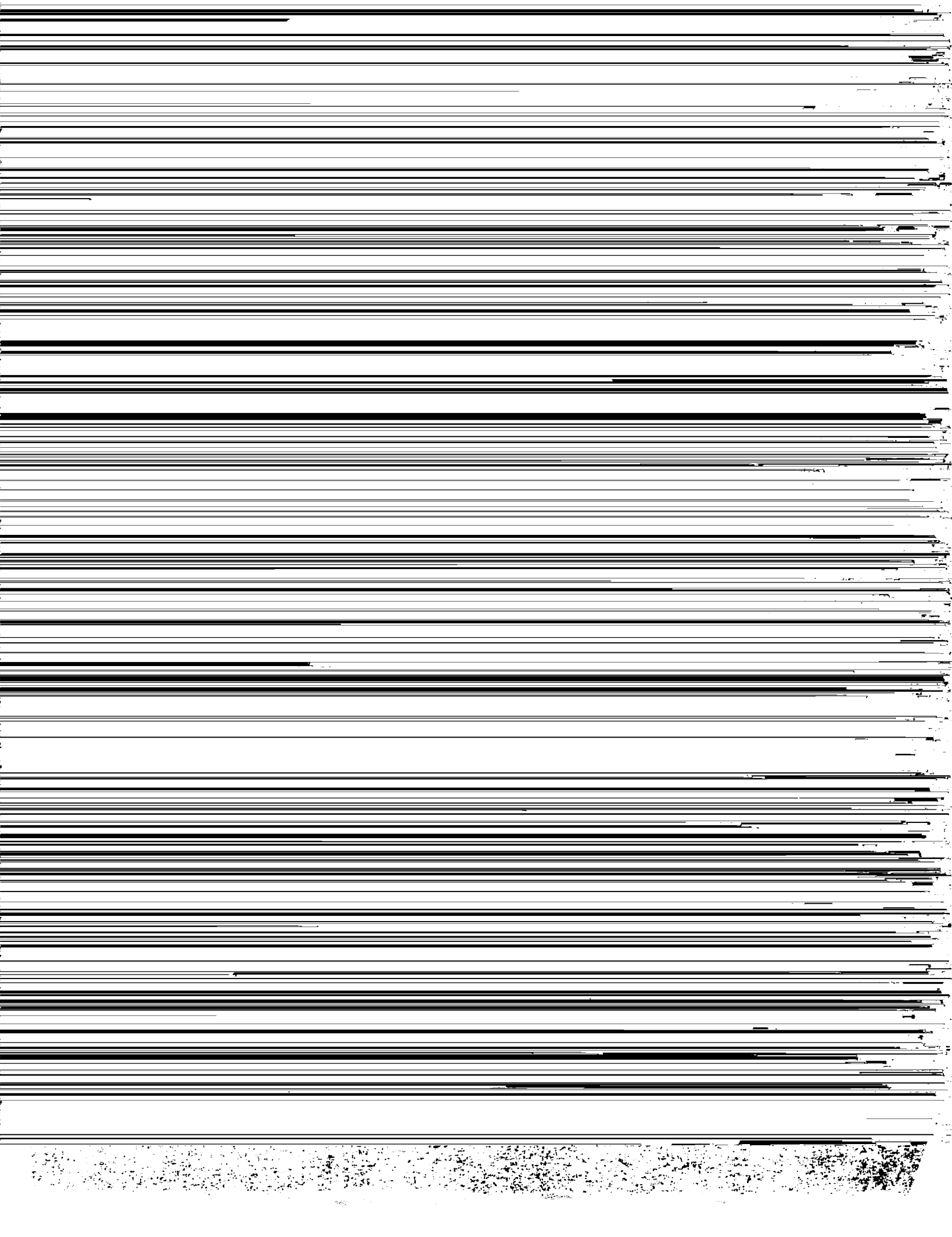
T5

Same as T4, includes C123, 124, 125,
126, L41, 42, 43, R54

HAM

31102-G1

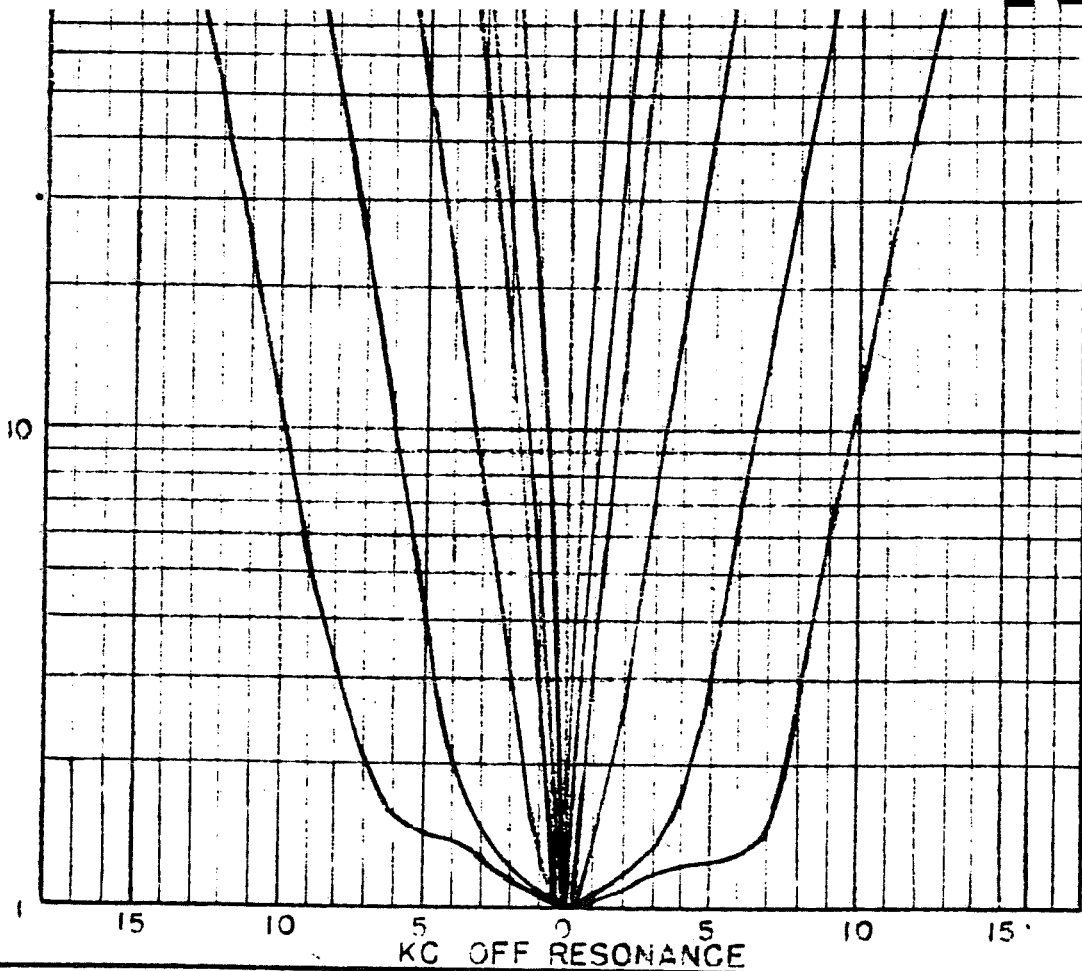




MANUFACTURER'S DESIGNATION

<u>Mfr. Code No.</u>	<u>Federal Code No.</u>	<u>Name</u>
AEO	00656	Aerovox Corporation
AHH	04009	Arrow-Hart & Hegeman Electric Company
ALB	01121	Allen-Bradley Company
AMP	02660	American Phenolic Corporation
BLI	71034	Bliley Electric Company, Incorporated
CEN	71590	Centralab
CIN	71785	Cinch Manufacturing Corporation
HAM	80583	Hammarlund Company, Incorporated
IRC	75042	International Resistance Company
MAL	37942	P. R. Mallory & Company, Incorporated
MEI	76384	Meissner Manufacturing, Division of Maguire Industries, Incorporated
MIC	76435	Micameld Electronics Manufacturing Corp.
MIL	76493	J. W. Miller Company
NRC	88183	Northern Radio Company, Incorporated
SAN	00853	Sangamo Electric Corporation
SMT	83330	Herman H. Smith, Incorporated

TIMES RESONANCE INPUT



SELECTIVITY CURVES
OVERALL AT 2 MEGACYCLES
COMMUNICATIONS RECEIVER - TYPE 159 MODEL 1

SHEET 1 OF 1

ISSUE 2

DWG. NO. A-159105

DATE 7-6-51

DWN. BY R A

CKD. BY J. M.

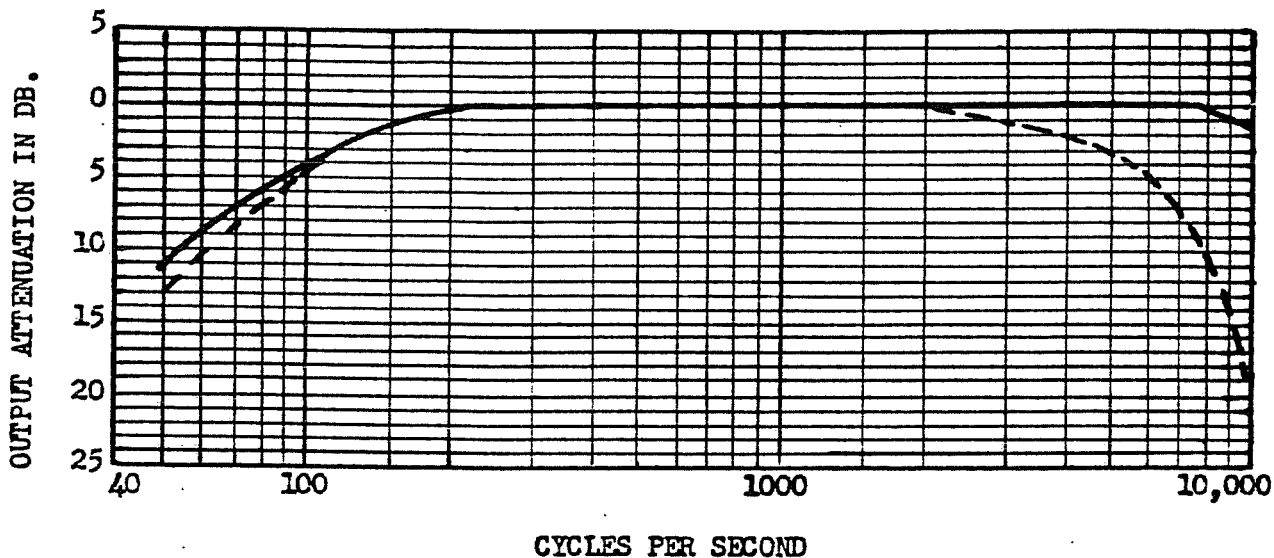
APP. BY H. S.



NORTHERN RADIO COMPANY

INCORPORATED

• NEW YORK 11, NEW YORK •



- CURVE - Audio frequency amplifier. Input to phone terminals.
- - - - - CURVE - Overall fidelity at 2.5 mc. Modulation 30 percent. Selectivity switch in 13 kc position. RF Gain set for 20 volts output at 400 cycles.
- Output measured across a 600 ohm resistive load. Audio gain control at maximum for both curves.

AUDIO AND OVERALL FIDELITY CURVES
Communications Receiver
Type 159 Model 1

SHEET 1 OF 1

ISSUE 1.

DATE 7-9-51

DWN. RA
BY

CKD.
BY

APP.
BY

DWG. NO. A-159106

DATE 7-9-51	DWN BY R A	CKD BY <i>[Signature]</i>	APP BY <i>[Signature]</i>	DWG. NO. A-159108
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ammunition receiver SP-600 J

Type 159 Model 1

DRAWING NO. A-159104
OR
ARTICLE NO. Issue 1

DATE 4/20/51J

DRN. BY JM

CHKD BY J.M.

APP. BY [Signature]

