RUSSCO

LINE RECEIVER

Telephone Line

T112

GUARANTEE

Your product is guaranteed for a period of one year against defects in materials or workmanship. Damage by abuse is not covered by this guarantee. Guarantee shall be void if not registered within 30 days from date of purchase.

MODEL NO. T112 900-111

Serial No. 154

Date of Purchase 1-10-84

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LINE RECEIVER

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T112

WARRANTY

All Russco products are warranted against defects in workmanship and materials for a period of one year from the date of delivery. We will repair or replace products which prove to be defective during the warranty period provided they are returned to Russco. Warranty subject to cancellation if in the opinion of Russco the product has been either unduly tampered with or modified so as to cause failure beyond our control. No other warranty is expressed or implied. We are not liable for consequential damages.

RUSSCO ELECTRONICS MFG., INC.
5690 E. Shields Ave.
Fresno, California 93727
291-5591

SECTION I

SPECIFICATIONS

1-1 GENERAL: The T112 is a compact telephone line receiver designed for broadcast use. Its input matches a 600-900 ohms telephone line. The input coupling isolates the internal circuitry from the line. A 60Hz notch filter is included to reduce hum on the telephone line. Two separately adjustable balanced outputs are provided to feed the console and recorder. A separate two watt headphone amplfier with a front panel jack allows local monitoring without loading the line. Correcting the line response can be achieved by switching in the internal equalizer. This section allows boost for voice accentuation. The T112 is housed in a 14x3x7 inch metal desk cabinet which may be converted to a rack mount with an optional kit.

TABLE 1-1

1-2 SPECIFICATIONS:

Input: -20dBm from 600-900 telephone line.
Overload level: +9dBm.

Outputs: +6dBm balanced, two separate 600 ohm outputs.
-9dBm @ 8 ohms, headphones.

Equalizer: ±10dB @ 100Hz, 1.5KHz, 7KHz.
Hi-freq. Boost; +6dB @ 6KHz.

Frequency Response: ±.4dB, 20-20Khz, Equalizer & Boost off.

Hum & Noise: 62dB below +10dBm output.

Distortion: THD: less than .4% 200Hz and higher.
less than 1.4% @ 20Hz.

Power Requirements: 117/234 VAC, 50/60Hz, 25 watts maximum.

Size: 14W X 3H x 7D inches, (35.56 x 7.62 x 7.78 cm).

Weight: 4 lbs, (1.81 Kg).

Finish: Clear anodized brushed aluminum front and rear panels.
Antique silver electrostatic powder coating on cover.

Option: 3½ x 19" maroon anodized brushed aluminum rack panel.

SECTION II

INSTALLATION

2-1 Location:

2-2 Desk mount: Proceed as follows in 2-4.

2-3 Rack mount: see page 8-1, and install rack kit; then follow 2-4.

2-4 Installation

2-5 Telephone line. Connect L1, L2 from the line to line input terminals, polarity is not critical.

2-6 Outputs. Connect line output to console input on + & - Line A output if balanced. To connect to unbalanced console input connect cable to + & G, tie a jumper from - to G. Follow same procedure from line B output.

2-7 Power. Plug AC cord into convenient outlet that will supply at least 1 amp. Be sure unit is wired for 117V, (Factory set), for 110-125 line. See schematic 900-111, page 8-2, to convert to 234V, (220-240V) AC line.

2-8 Hold terminals provide an additional 100 load resistor controlled by the connect relay. In some telephone systems more loop current may be required, especially on certain multiple line types; connect one hold terminal to one line terminal, connect the other hold terminal to the remaining line terminal.

2-9 Auxillary equipment control. Two sets of contacts are provided from the connect relay to control external equipment. These contacts will safely carry up to 1 amp @ 28VDC. (ie., to turn on external equipment up to 28VDC, connect control lines to C2 & NC2).

2-10 To remote control the connect/disconnect function of the T112, tie wires from a SPST-NO switch to the Coil and +18V terminals. (Panel switch must remain OFF for proper operation).

2-11 Ground. Should an additional system ground be desired, tie this to the G terminal between Line A- and Line B +.

2-12 After installation is complete try reversing the AC power line plug, choosing the direction which produces the least hum in the system.

SECTION III

OPERATION

3-1 To turn unit on - move Power switch up. Red led will come on.

3-2 To activate receiver, (and auxillary equipment if this has been wired into the system), move Line switch to Connect position. This will tie the telephone line into the receiver, placing a load across the line to maintain it, activate external equipment, and provide the outputs on Lines A, B, and Headphones. The orange LED will come on.

3-3 To deactivate receiver. Move line switch to Disconnect. Line will be released, auxillary equipment returned to rest, and outputs will go to zero. The orange LED will go out.

3-4 To monitor the line, connect any headphone with a standard ¼" stereo plug to the panel headphone jack. This monitoring is done through a buffer amplifier therefore it cannot be detected on the line.

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SECTION IV

CALIBRATION

4-1 GENERAL:

4-2 To initially calibrate the T112 or to recalibrate the unit when IC1, IC4 or any parts associated with these IC's are replaced; it will be necessary to adjust R7, (CMR), and/or C18, (60Hz).

4-3 Remove cover to gain access to R7 and C18.

4-4 All level calibration is done with the cover in place.

4-5 CMR

4-6 Remove cover.

4-7 Disconnect telephone line from the input terminals.

4-8 Connect a jumper cable between the input sides of C1 & C2, (junction of C1/L1; C2/L2). For C1 this would be the capacitor lead closest to the rear of the board. For C2 this would be the capacitor lead closest to board terminal point 31.

4-9 Connect a signal of 1.5KHz, -10dBm, (.245VRMS), to the common jumper added between C1 & C2. Connect generator shield to on board jumper between board terminals 28-31 adjacent to T1.

4-10 Connect a VTVM, DMM to Line A output.

4-11 Turn power on.

4-12 Adjust meter range switch for near full scale reading.

4-13 Slowly adjust CMR pot for a null, minimum reading.

4-14 It may be necessary to increase R9, "A" level, or change meter range to obtain this null.

4-15 Turn power off.

4-16 Remove generator, and jumper leads from C1, C2.

4-17 60Hz NOTCH FILTER

4-18 Connect signal generator to line input terminals, be sure telephone line has been disconnected.

4-19 Connect a frequency counter across the generator output and set the generator to 60.0Hz.

4-20 Connect a VTVM, DMM, set to 3 volts full scale to Line A output.

4-21 Turn power on.

4-22 Adjust C18 for a null, minimum reading.

4-23 FOR 50Hz OPERATION

4-24 For 50Hz power line frequency repeat steps 4-18 through 4-22 except set generator to 50.0Hz.

4-25 If null cannot be reached for 50Hz it may be necessary to add a 75pF capacitor in parallel to C18.

4-26 LEVEL ADJUSTMENTS

4-27 Level A, B:

4-28 Disconnect telephone line from input terminals.

4-29 Connect a signal of 1.5KHz, -20dBm, (.078VRMS), to these terminals.

4-30 Connect a VTVM, DMM across line A output; 620 ohm load.

4-31 Set equalizer to Out.

4-32 Turn power on.

4-33 Adjust Level A pot from the front of the panel for +6dBm, 1.55VRMS.

4-34 Repeat above except use Line B terminals.

4-35 HEADPHONE.
4-36 Connect output meter across an 8 ohm headphone, (Alt. use 10 ohm 2W).
4-37 Adjust headphone level through front panel for -9dBm, (.27VRMS).

4-38 TO CHECK EQUALIZER, REPEAT STEPS 4-27/4-32.
4-39 Set three equalizer knobs to flat position - straight up.
4-40 Set generator to 1.5KHz, rotate Mid control CCW, level should drop about 10dB.
4-41 Rotate Mid control CW, level should rise about 20dB, 10dB above flat.
4-42 Return Mid control to flat.
4-43 Set generator to 100Hz, rotate Low control CCW, level should drop about 10dB.
4-44 Rotate Low control CW, level should rise about 20dB, 10dB above flat.
4-45 Return Low control to flat.
4-46 Set generator to 6.5KHz, rotate High control CCW, level should drop about 10dB.
4-47 Rotate High control CW, level should rise about 2-dB, 10dB above flat.
4-48 Return High control to flat.
4-49 Move High Boost switch to IN, 6.5KHz should rise about 6dB.

SECTION V

THEORY OF OPERATION

5-1 Input Stage. The telephone line is coupled to the isolation caps #C32, #C32, by current limiting resistors R57, 58; diodes D9,10 are transient suppression devices. This provides a balanced signal feed through series low pass Pi filters C49,L1, C50, & C51, L2, C52 which are loaded with resistor R1. C1 & C2 are DC blocking, AC coupling capacitors which feed input resistors R3,4 and IC1B. C3,4 in conjunction with R3,4 act as additional filters. The gain of IC1 is controlled by the ratio of R5/R3. R5 & C5 form a negative feedback loop around IC1B. R6 is conjunction with R7 provide the bias return for IC1B, with R7 adjustable to balanced with R5 exactly, setting the highest common mode rejection ratio. R60 is theoutput load for IC1B. R59 is a DC holding path, Line load.

5-2 60Hz Notch Filter. The signal is coupled to both the inverting and the non-inverting inputs of IC4A by R35,36. Since R37 in the negative is the same value as R35 this stage operates at unity gain with high input impedance and low output impedance. R41 is the load for IC4A. R38,39, C17,18,19 form the resonant frequency network and with IC4B cause the signal at pin 3 of IC4A to be shunted out. C18 fine tunes the circuit to the notch frequency: off resonance will cause the signal at pin 3 to see a high impedance allowing in phase common mode signals to appear on both inputs of IC4A. R40 controls the bandwidth of the notch.

5-3 Equalizer. When S1 is switched IN the signal passes through the active 3-band filter which uses IC5B as a feedback amplifier. IC5A is a buffer stage with high input impedance and low output impedance. When S2 is open the signal from the equalizer is fed through R53 to IC5A; when S2 is closed a second path for the signal is established across R53: R54 and C24 form this second path as a high pass filter.

5-4 Line Output Amplifiers. (Only line A is described, Line B is the same). The signal from the equalizer switch is fed to the Line A preset level pot, R9, coupled through C6 to IC2A where it splits to feed one side of the output transformer, T2; and through R16 to IC2B which feeds the other side of the output transformer. IC2A is a noninverting amplifier while IC2B is an inverting buffer amplifier. Gain is set for IC2A; R15, 18 are output current limiting resistors feeding the transformer. The signal from the secondary of T2 is tied to the output terminals Line A + & -. Capacitors C9,37,39,40,41,42 are RF bypass shunts. C12 is the buffer high frequency negative feedback. C47,48 are power supply bypass capacitors.

5-5 Headphone Amplifier. The signal from the equalizer switch feeds R11, the Headphone level control. C8 couples this signal into IC1A which provides the signal drive current, through biasing diodes D2,3, to the complimentary output transistors, Q1,2. This output is fed to the Headphone jack through current limiter R34, and protective Fuse F2. This output is also negatively fedback through R27, C26 to IC1A for overall stability. R28,29 limit the Drive current to Q1,2, while R32, 33 limit their load currents. C14 provides negative feedback around IC1A to reduce its gain at high frequencies. R26 is the bias return for IC1A; C11, 28 are RF bypass capacitors. R59,C27 provide phase correction for the output when using inductive loads.

5-6 Power Supply. The AC line input is protected by fuse F1 and controlled by S4. The primary of the power transformer T4, has two 117V windings which may be connected in parallel, (117V); or series, (234V). The center tapped secondary feeds a fullwave bridge rectifier D4,5,6,7, which provides the ± 18VDC balanced outputs to power the T112 system. Capacitors C15,16 are the filter capacitors; C35,36 are RF bypass, and C33,34 are line transient suppressors. The power ON indicator LED, D8 is connected across the ±18V sources with current limiting providing by R56.

5-7 Connect Relay. Relay K1 connects the telephone line to transformer T1 when energized. It also provides an additional line hold resistor R2, and two user defined SPDT sets of contacts. The relay coil is actuated when S3 Line Cinnect switch is closed. R8 limits the voltage to the coil to 24 VDC. D1 is a transient protector to catch the inductive kick of the coil when S3 is opened. LED D11 provides a visual indication that the relay has been energized and the line has been connected. R61 provides current limiting for D11 The coil may be activated from a remote location by the use of a SPST NO switch across the Coil/+18V terminals.

SECTION VI

MAINTENANCE

6-1 General.

The following preliminary steps are recommended as a prelude to actually trouble shooting the T112.

A. Does not appear to operate.
   1. Check fuse(s).
   2. Check AC line cord for proper connection to AC outlet.
   3. Check all external connections for shorts, broken wires, loose connections, and for proper connection to T112.

B. High hum or noise.
   1. Check all ground connections to be sure they are tight and properly connected. Note: ground connections in other units that the T112 may be tied to may introduce hum into the T112 if that equipment is improperly grounded.
   2. Move the T112 away from field producing objects such as motors, transformers, AC lines.
   3. Reverse AC plug.
   4. Try various combinations of grounding to the case of the T112, to the output of the unit feeding the distribution amplifier and/or the input of the unit fed by the T112.

6-2 Dismantling For Service.

Caution: Remove power cord from primary source before working inside the T112.

A. To gain access to the inside of the T112, Refer to page
Remove eight screws holding the cover to the main chassis.
Lift off cover, the circuit board is now exposed.

B. To disassemble the PC board from the main chassis:
Remove three screws under the front panel, set panel to the side,
Remove six screws from the top of the circuit board,
Slide the PC board froward to free it from the rear panel.
When reassembling be sure LED is properly seated into the panel.

6-3 General Repair.

A. DC voltage analysis with a high impedance input meter will usually confirm a point of malfunction. All voltages are reference to ground.
The voltage at the + end of C16 should be +18VDC, ±15%.
The voltage at the - end of C15 should be -18VDC, ±15%.
The voltage on pin 8 of all IC's should be +18VDC,±15%.
The voltage on pin 4 of all IC's should be -18VDC,±15%.
The voltage on pins 1,2,3,5,6,7 of all IC's should be 0.0VDC,±.4VDC.
Headphone jack, PC terminals 66/67 should be 0.0VDC,±.2VDC.
Q1 base should be .6VDC, ± .2VDC.
Q2 base should be-.6VDC, ± .2VDC.
Rear Terminals should be 0.0VDC except +18VDC=+18VDC, Coil=-18VDC, (unterminated).

B. AC voltage analysis with the line input and line outputs terminated in 620 ohm resistors should be done using 1.5KHz at -10dBm, (.245VAC), equalizer flat, booster off.
   1. Line outputs adjustable from 0 to + dBm.
   2. Headphone out, 8-10 ohm load, adjustable from 0 to -9dBm.

6-4 Changing Integrated Circuits.

A. Turn off power switch and wait 30 seconds for the pwer supply to bleed down.

B. Since all IC's plug in it is a simple matter to lift them straight up and out of the socket. Note the orientation of pin 1.

6-5 Changing Output Transistors.

A. Use small soldering iron and solder removal tools to remove all solder on the board pads for the three transistor leads.

B. Note orientation, then lift out transistor.

C. Replace transistor using correct orientation.

D. Solder three pads.

E. Visually inspect the soldered area for possible shorts, cold solder joints.

6-6 Installations Made In High RF Fields.

This may require additional effort to reduce RFI effects. The following recommendations, either singly or in combination, may resolve the problems encountered.

1. Install an 18 gauge stranded umper from the case to one of the G terminals.
2. Install an 18 gauge stranded grounding wire from the case to a close common equipment ground.
3. Use shielded two conductor cable, (preferably with overall foil shield), for input and output connections. Ground the shield to the G terminals.
4. Bypass all input and output connections with a cpaacitor of suitable value by connecting to the terminal and G.
   Note: Too large a value may degrade the high frequency response in circuits greater than 600 ohms.

6-7 Returning For Service:

If it is every necessary to return the T112 to the factory for repair be sure to pack well, securing all screws, and preferably in the original container. Ship prepaid or the package must be refused. Include a description of the problem, and a return street address. Return charges will be prepaid by Russco if the unit is in warranty, out of warranty items will be shipped freight collect.

6-8 Serial Number:

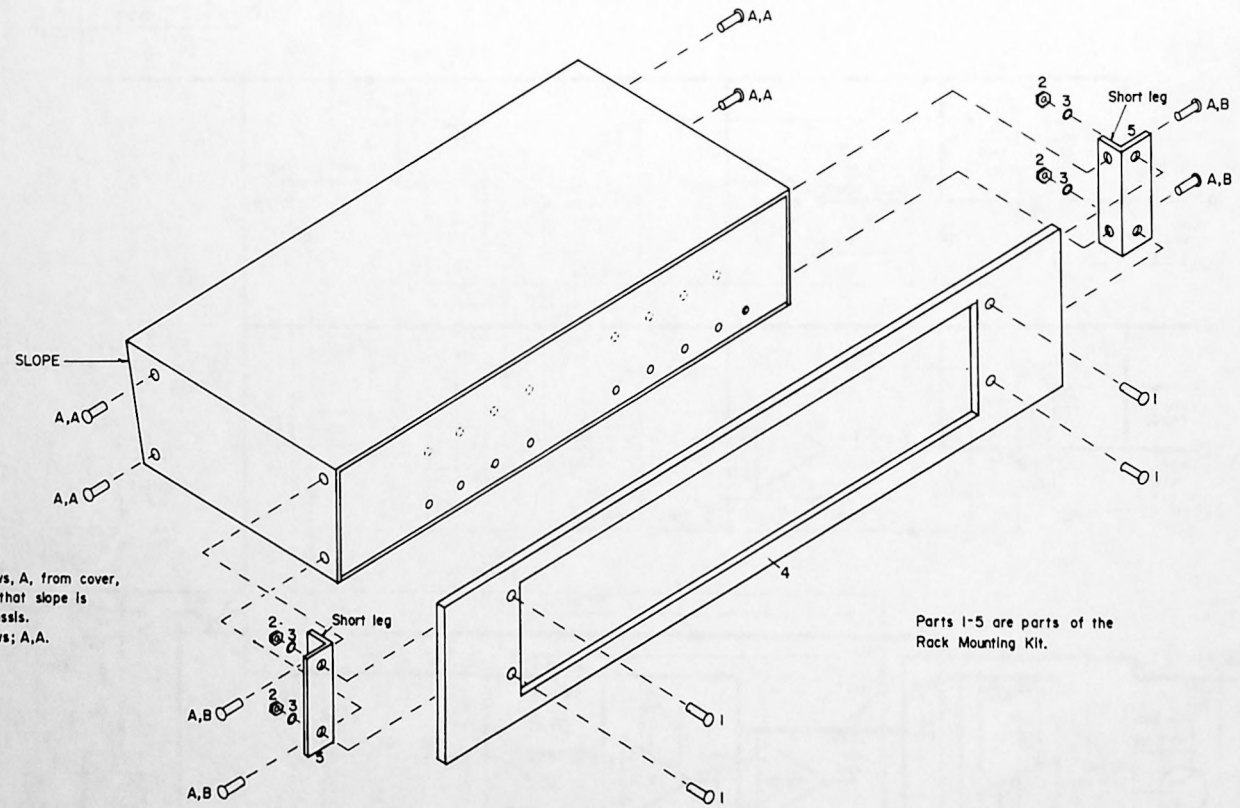
The serial number will be found on the label on the bottom of the T112. Please use this number in any correspondence with the factory.

SECTION VII

PARTS LIST

REFERENCE	DESCRIPTION	RUSSCO PART NUMBER
C1,2,6,7,8	Capacitor, 4mF, 50V EL	110-061
C3,4,29,30,37,38,49,51,56	" 50pF, CE	110-034
C5,25,26,53	" 10pF, CE	110-024
C9-14,39-46,50,52	" 100pF, CE	110-005
C15,16	" 1000mF, EL	110-008
C17	" 500pF, CE	110-066
C18	" 24-200pF Trimmer	110-062
C19	" 1mF, TA	110-019
C20	" .047mF, FI	110-044
C21	" .0056mF, FI	110-042
C22	" .0047mF, FI	110-021
C24	" .0015mF, FI	110-041
C27	" .1mF, 25V CE	110-030
C28	" 5pF, CE	110-023
C31,32	" 22mF, 250V EL	110-068
C33-36,47,48,54,55	" .01mF, 100V CE	110-026
C23	" .001mF, CE	110-035
D1,4-7	Diode, 1N4003	130-015
D2,3	" SI1-A	130-007
D8	" MV5053(LED)	130-011
D9,10	" 1N6300(Transorb)	130-028
D11	" MV5152(LED)	130-018
F1	Fuse, 2/10 ASB, (117V)	101-009
	1/10 ASB, (240V)	101-003
F2	" 1/10 ASB, (117/240V)	101-003
IC1-5	IC, MC1458, LM4558	140-013
J1	Connector body	120-010
	pin	120-015
J3	Jack, 12B,Headphone	120-009
K1	Relay, 4PDT, 12VDC	106-004
L1,2	Choke, RF, 56uH	100-002
P1	Connector body	120-011
	pin	120-014
Q1	Transistor, MPSU05	180-016
Q2	" MPSU55	180-017

REFERENCE	DESCRIPTION	RUSSCO PART NUMBER
R1	Resistor, 820 ohm, ¼W,5%	150-118
R2	" 100 " ½W,"	150-003
R3,4	" 43K " " "	150-078
R5,40	" 270K " " "	150-072
R6,35-37	" 220K " " "	150-080
R7	" 100K " Trimmer	150-028
R8	" 360 " 2W,5%	150-125
R9-11	" 10K " Trimmer	150-043
R12,13,19,20	" 47K " ¼W,5%	150-032
R14,21,26,27	" 100K " " "	150-033
R15,18,22,25,28	" 220 " ½W,"	150-006
R16,17,23,24,60	" 10K " ¼W,"	150-031
R29,57,58	" 22 " ½W,"	150-002
R30,31,50,52	" 5.6K " " "	150-073
R32-34	" 10 " " "	150-051
R38,39	" 110K " " "	150-162
R41	" 620 " " "	150-082
R42	" 2.2K " " "	150-040
R43,45,46	" 11K " " "	150-110
R44,48	" 100K Potentiometer	150-163
R47,49	" 6.8Kohm, ¼W,5%	150-041
R51	" 500K Potentiometer	150-164
R53	" 82Kohm, ¼W,5%	150-084
R54	" 27K " " "	150-070
R55	" 120K " " "	150-171
R56	" 2.2K " ½W,"	150-067
R59,61	" 620 " 1W,"	150-148
S1,2	Switch, DPDT, toggle, PC	160-002
S3,4	" SPST, " "	160-025
T1	Transformer, input(optional)	108-023
T2,3	" output	108-007
T4	" power	108-020B
Miscellaneous	7 terminal barrier block, PC	170-011
"	Line cord	190,001
"	Strain relief, line cord	200-009
"	Fuse holder	101-001
"	Socket, 8-pin, DIP(IC)	120-031
"	Socket, relay	120-064
"	Knob	200-183
"	Foot, rubber	200-172
"	Manual, instruction	109-020



Remove eight screws, A, from cover, turn cover 180° so that slope is toward rear of chassis. Reinstall four screws; A,A.

Parts 1-5 are parts of the Rack Mounting Kit.

Install two brackets, 5, with four screws; A,B, on cover.

Install panel, 4, to brackets with:
four screws, 1,
four lockwashers, 3,
and four nuts, 2.

Adjust chassis to panel using 8 screws.

NO	BY	DATE	REVISION
00	CA	8-79	ORIGINAL RELEASE

SCALE 1/2
DO NOT SCALE DWG
TOLERANCES
MATERIAL LIST
FINISH

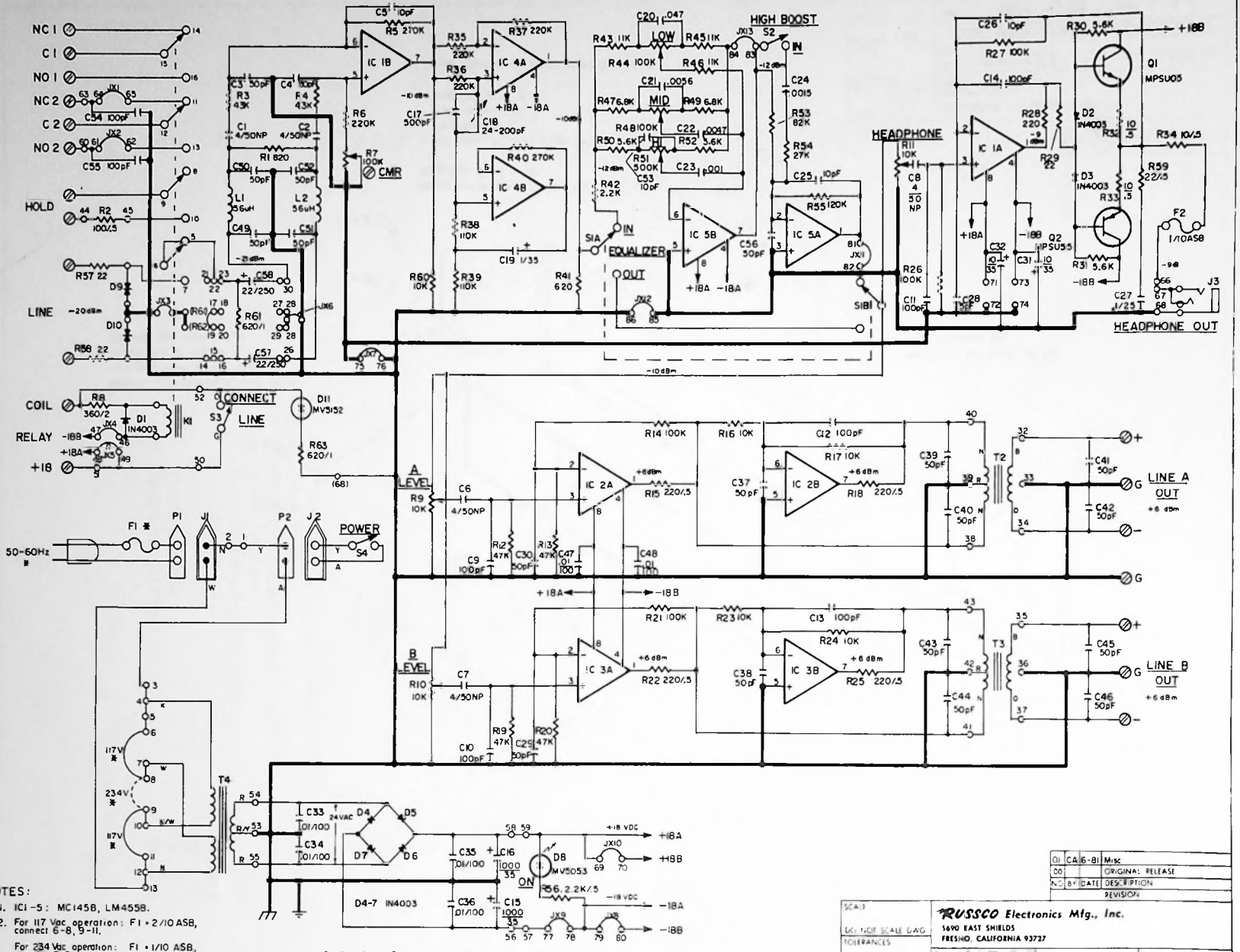
RUSSCO Electronics Mfg., Inc.
5490 EAST SHIELDS
FRESNO, CALIFORNIA 93727

DRWN C. ALERNHEIMER | APP [illegible] | DATE 8-28-79

TITLE ASSM., RACK MOUNT ACCESSORY

PART NO 900-098

SHEET 1 OF 1



NOTES:

1. IC1-5: MC1458, LM4558.
2. For 117 Vac operation: F1 = 2/10 ASB, connect 6-8, 9-11.
   For 234 Vac operation: F1 = 1/10 ASB, connect 8-9.
3. Capacitors: mF/volts; pF = mmF; NP = Non-Polar.
4. Resistors: 1/4 watt, unless noted, ohms/watts. K=1000.
5. Pins 1,2,3, 5, 6, 7 of all ICs = Ø VDC ± .5V.
6. Line input & outputs terminated with 620 ohms.
7. Headphone out loaded with 100 ohms.
8. Signal measurements at 1.5 KHz, Equalizer at flat, High Boost out; dBm.
9. Lost: C-57, R-63, D-11, T-4, IC-5, S-4. Not used: R60, T1.

NO	BY	DATE	DESCRIPTION
01	CA	6-81	Misc
00			ORIGINAL RELEASE

REVISION

SCALE	RUSSCO Electronics Mfg., Inc.
DO NOT SCALE DWG.	5690 EAST SHIELDS FRESNO, CALIFORNIA 93727
TOLERANCES	DRWN C. AUERNHEIMER APP DATE 8-12-80
MATERIAL	TITLE SCHEMATIC, TEL. LINE REC. T112
FINISH	PART NO. 900-111 SHEET 1 OF 1

BRUNING 40536 43318