CARVER

C-1 SERVICE MANUAL

WARNING

Any person performing these procedures will be exposed to

HAZARDOUS VOLTAGES AND RISK OF ELECTRIC SHOCK

It is assumed that any person who removes the cover from the unit has been properly trained in protecting him/herself from avoidable injury. Therefore, the procedures described herein are to be performed by

QUALIFIED ELECTRONICS SERVICE PERSONNEL ONLY

This manual was designed and developed by
Carver Corporation
and
P. Kurt Schmidt
Instructional Media Designs, Seattle, Washington.

Table of Contents

List of Illustrations

1.0 Introduction

This service manual covers the technical information needed to service the CARVER MODEL C-1 SONIC HOLOGRAPHY PREAMPLIFIER. Anyone using this manual must be skilled in reading schematic and technical diagrams, and should be fully proficient in using standard tools of the electronics trade for troubleshooting and repair.

Refer to the more general C-1 Owner's Manual for information regarding any of the following topics:

C-1 Features and Controls
Theory of Sonic Holography
Making Holography Work
Effects of Loudspeaker Placement and Design
Acoustic Troubleshooting of Sonic Holography
General Problem Solving and Troubleshooting

This manual is designed to address two primary areas of concern encountered when a Model C-1 is brought in for repair:

A. The manual contains those critical test procedures and expected results necessary to determine whether or not the unit is functioning as intended by design.

B. The manual provides diagnostic methods for locating the offending circuit element(s) once a valid malfunction has been detected.

2.0 Identifying The Problem

Before beginning any bench work, identify the general category of the customer's complaint and use the following outline to locate the reported problem in terms of three categories, each of which leads to a specific set of tests designed to determine whether or not the C-1 is at fault and then, if it is, to help locate the offending circuitry.

Category I. **Obvious Malfunction** --- see "4.0 General Troubleshooting"

Indications: Power On LED does not light or is extremely dim
One or both channels have no output signal
A loud tick, pop or thump on turn-on or turn-off
Grossly audible hum, noise or distortion
Intermittent operation (audibly cuts in and out)

Category II. **Specification Shortfalls** -- see "5.0 IC Replacement"

Indications: One or both channels fail to meet distortion specs
One or both channels fail to meet noise specs
One or both channels "squeal" or oscillate

Category III. **Hologram Image Complaints** --- see "6.0 Functional Verification"

Indications: C-1 causes "crosstalk" between channels
Can't hear any Hologram effects on some program material
Hologram effect alters the harmonic content of instruments
Can't find the Holographic "sweet spot"
Just doesn't sound like it used to anymore

Figure 2-0. Problem Category/Procedure Guide

2.1 Required Tools and Equipment

The following list of equipment indicates which tools will be needed to address each of the problem categories and perform the related tests.

Category of Problem			Required
I	II	III	Tools and Equipment
yes	yes	yes	Phillips Screwdriver
yes	no	yes	DC Volt/ohm Meter
opt	no	yes	Dual Trace Triggered Oscilloscope & probes
opt	yes	yes	Low Noise, Low Distortion Tunable Audio Oscillator
yes	yes	yes	AC Voltmeter, low noise
no	yes	no	Soundtek 1700B Distortion Analyzer or equivalent
no	yes	no	Six Phono Input Shorting Plugs (noise only)
no	yes	no	IHF "A" Weighting Filter (noise only)

Figure 2-1. Problem/Equipment Matrix

3.0 Universal Procedures

The following procedures apply to all internal service work on the unit regardless of which category the complaint fits.

3.1 Remove the cover from the unit
3.2 Verify that the AC line voltage selector is set for the local voltage
3.3 Verify that the proper value line fuse is installed for that voltage
3.4 Apply AC line power to the unit
3.5 Set INJECTION RATIO and LISTENING ANGLE buttons to the OUT positions; Set HOLOGRAM button to IN position ("ENGAGE")

The information regarding 3.2 and 3.3 (line voltage & fuse) is found in the section entitled "115/230 Volt Conversion" (section 7.0).

4.0 General Troubleshooting

These procedures apply to the "dead" unit and/or units which exhibit severe hum, noise or distortion that is audible and/or units which function intermittently in terms of passing a signal or exhibit a turn-on thump.

4.1 Double check the AC power source and line fuse. Make sure the unit is plugged in.
4.2 Verify that the POWER ON LED is illuminated. If not, and step 4.3 is completed successfully, replace the LED or its series resistor.
4.3 Measure the bipolar DC supplies. A positive voltage between +11.0 and +14.0VDC should appear at pin 11 of each IC and a negative voltage between -11.0 and -14.0VDC should appear at pin 7 of each IC.
4.4 If step 4.3 yields unacceptable results, troubleshoot and repair the power supply and/or locate the offending shorted component(s).
4.5 If the supply voltages are within limits and a gross malfunction persists, try the following suggestions:

A. One channel dead...suspect bad solder connections and/or a short or crack in the PCB or a non-functioning IC section.
B. Gross hum on one or both channels...check the power supplies for excessive AC ripple components (greater than 10mVAC on the Main Supply or greater than 5mVAC on the Phono Supply). If this is not the cause, look for open ground connections.
C. Gross distortion on one or both channels...can be caused by a near short on the output of any IC section but is more likely to be a bad IC. Moving from input to output while passing a 1kHz test signal, look at each successive IC output until the guilty device is located.

4.6 If the unit functions properly except for a loud pop or thump upon power-up, suspect the turn-on mute circuitry. With a 2.5V 1kHz output signal present, power the unit down for 5 seconds. Upon turn-on, both outputs should be attenuated at least 20dB for about six seconds. If both channels fail this test, suspect the FET drive circuitry. IC8 pin 10 should exhibit a positive signal upon power-up, suddenly switching to a negative level after approximately 6 seconds. If the FET gate drive is correct, suspect the FET(s).

5.0 IC Replacement

"Below-spec" ICs invariably cause subtle yet excessive levels of noise or distortion. If either of these conditions exist, run the following noise and distortion tests to determine which ICs must be replaced.

5.1 Noise is Suspected
Perform noise tests per step 6.15. If output noise exceeds the specification, locate the source of the noise by engaging & testing circuits one at a time. Refer to the Block Diagrams (SHTs 18 & 21). If a circuit shows excessive noise, probe the successive Operational Amplifier output stages within the faulty circuit until the offending chip or chips are located, and replace them.

5.2 Distortion is Suspected
If excessive levels of distortion are suspected, perform step 6.4-F. If output distortion exceeds the specification, locate the source of the distortion by engaging & testing circuits one at a time. Refer to the Block Diagrams (SHTs 18 & 21). If a circuit shows excessive distortion, probe the successive Operational Amplifier output stages within the faulty circuit until the offending chip or chips are located, and replace them.

5.3 Oscillation is Suspected
If oscillation (self-sustained ringing) is the problem, locate the earliest IC output node in the circuitry at which it is present and replace the offending part.

6.0 Functional Verification

Perform the following test to determine proper overall performance after major faults have been identified and corrected.

While selected sections of the Functional Verification test may be performed individually, we recommended that the full procedure be run each time a unit is serviced. This ensures fully satisfactory system performance. Our experience in the factory shows that with a little practice, the full procedure can be completed in as little as nine minutes.

6.1 Pre-Sets

A) Set line voltage to 120VAC (220VAC if conversion has been made)
B) Set SELECTOR switch to "TUNER"
C) Set VOLUME control fully clockwise (maximum)
D) Set BALANCE control to center (detent)
E) Set all 4 TONE controls to center (detent)
F) Set all 14 button switches to OUT positions (disengaged)
G) Set INFRASONIC switch OUT (disengaged)
H) Set PHONO 1 LOADING switch to"0pf"
I) Connect output instrumentation (impedance must exceed 100k-ohms) to MAIN 1
J) Set POWER switch to IN position (ON), and verify LED illuminates

6.2 Power Supplies

A) Main Supply
   1. Verify voltage at IC7 pin 7 is between -11.0 and -14.0VDC
   2. Verify voltage at IC7 pin 11 is between +11.0 and +14.0VDC
   3. Verify ripple at both points is less than 10mVAC

B) Phono Supply (B+2)
   1. Verify voltage at IC6 pin 7 is between -9.4 and -10.6VDC
   2. Verify voltage at IC6 pin 11 is between +9.4 and +10.6VDC
   3. Verify ripple at both points is less than 5mVAC

6.3 Set Reference

A) Pre-set controls per step 6.1.
B) Adjust inputs to provide a 1kHz, 0.775Vrms (0dBm) reference on MAIN ONE OUTPUT.

6.4 Line Amplifier

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) Verify that the LINE AMP GAIN is between 16.0 and 17.0dB.
C) Verify that CHANNEL IMBALANCE is:
   1. less than 0.5dB with volume control fully clockwise
   2. less than 2.5dB with volume control turned counter-clockwise until signal at output is down 50dB. Return volume control to fully clockwise position.
D) Disconnect one of the input cables, and use a shorting plug to short that input to chassis ground. Verify that SEPARATION at the output is greater than 45dB. Remove shorting plug and re-connect input.
E) Sweep signal frequency from 20 Hz to 20kHz and verify at each output that FREQUENCY RESPONSE is between +0.0dB and -0.3dB.
F) Verify that DISTORTION is less than 0.05% at 20kHz and 20Hz with 2Vrms output into a minimum load of 10k-ohms using an 80kHz filter for RFI suppression.

6.5 Balance Control

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) While rotating BALANCE control throughout its range, verify that each output reaches at least -70dB of attenuation and never exceeds +0.5dB of gain.

6.6 Mono Switch

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) Set STEREO switch to IN position ("MONO"), and verify that the INSERTION GAIN of each output is between -0.3 and +0.3dB.
C) Disconnect one of the input cables and use a shorting plug to short that input to chassis ground. Verify that the INSERTION GAIN of the driven channel is down -7.0 to -8.0dB. Re-connect input.

6.7 Speaker Switch

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) Set SPEAKER switch to IN position ("OFF"), and verify that each output is down by at least -70dB.

6.8 Turn-On Delay

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) Set POWER switch to OUT position ("OFF").
C) Wait at least 5 seconds.
D) Set POWER switch to IN position ("ON") and verify that each output is below -30dB for at least 6 seconds.

6.9 **Infrasonic Filter**

A) Pre-set controls and reference per steps 6.1 and 6.3 above.

B) Set INFRASONIC switch to "ON" position and verify that:
   1. the INSERTION GAIN of each output is between +0.0 and +0.6dB
   2. the CHANNEL IMBALANCE is less than 0.5dB
   3. the CHANNEL SEPARATION is greater than 45dB. (Use a shorting plug as described in step 6.4-D above; re-connect input.)

C) Referring to Figure 6-1 and Table 6-1 below, verify FREQUENCY RESPONSE at each of the circled test points. Acceptable tolerance is ±0.5dB. Table 1 lists the acceptable ranges.

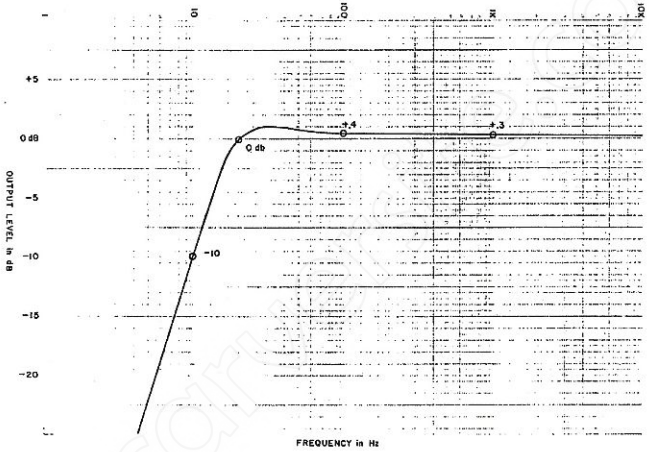


Figure 6-1. Infrasonic Filter Response

Freq. (Hz)	Output Level (dB)
10	-9.5 to -10.5
20	-0.5 to + 0.5
100	-0.1 to + 0.9
1000	-0.2 to + 0.8

Table 6-1. Infrasonic Filter Test Points/Results

6.10 Tone Controls

A) Pre-set controls and reference per steps 6.1 and 6.3 above.

B) Set TONE switch to IN position ("ON") and verify that:
   1. the INSERTION GAIN at each output is between -0.5 and +0.5dB
   2. the CHANNEL IMBALANCE is less than 0.5dB
   3. the CHANNEL SEPARATION is greater than 45dB. (Use a shorting plug as described in step 6.4-D above; re-connect input.)

C) Referring to Figure 6-2 and Table 6-2 below, set input frequencies and bass and treble TONE CONTOUR controls and TURNOVER switches per the indicated settings and verify that the FREQUENCY RESPONSE at each output is within ±0.5dB of the values indicated at each of the test points (circled).

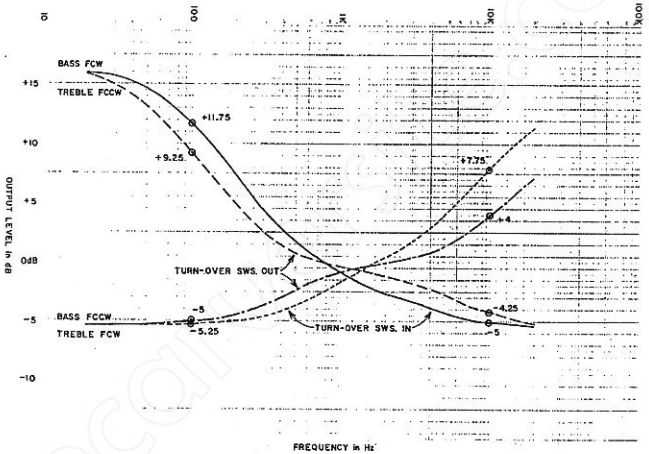


Figure 6-2. Tone Control Turnover Response

Freq. (Hz)	Settings	Output Level ±0.5 dB			
	Treble Controls	FCCW		FCW	
	Bass Controls	FCW		FCCW	
	Turnover Switches	OUT	IN	IN	OUT
100		+9.25	+11.75	-5.25	-5.00
10,000		-4.25	5.00	+7.75	+4.00

FCW = Fully ClockWise; FCCW = Fully Counter-ClockWise

Table 6-2. Tone Control Test Points/Results

6.11 Sonic Hologram Generator

There are two major functions to be verified in the Sonic Hologram Generator. The first is the Phase Shift Circuit Delays, and the second is the frequency response of the generator.

6.11.1 Phase-Shift Circuit Delays

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) Using a dual-trace oscilloscope, connect the first probe to IC3, pin 10. Adjust the oscilloscope controls to trigger and lock on that signal.
C) Connect the second probe to IC4, pin 10.
D) Adjust the input frequency upward until the second scope trace is phase shifted by precisely 360°. Note the input frequency, and verify that it is between 8.0kHz and 9.0kHz.
E) Connect the second probe to IC5, pin 3 and repeat step D above.
F) Compare the two input frequencies obtained in steps D and E, and verify that they do not differ by more than 400Hz.

Note: There are no provisions for adjustment of the phase-shift networks. However, if they deviate from the required specification, examine the delay times at each section of the faulty phase-shift network (IC4 pins 12, 3, 4, and 10), and compare with the opposite channel (IC5 pins 12, 10, 4, and 3). The four series phase-shift stages are identical, and should produce equal delays. Delay timing is mainly dependent on the tolerances of the 0.001 mirofarad capacitors in the phase-shift networks, so replace those in faulty network(s) with known close tolerance parts.

6.11.2 Frequency Response of the Generator

A) Pre-set controls and reference per steps 6.1 and 6.3 above.
B) Set HOLOGRAM switch to IN position ("ENGAGED").
C) Referring to Figure 6-3 below, verify that the output signal levels are within ±1.5dB of the values indicated at each of the test points (circled). Drive one channel alone to measure the "driven" and "undriven" responses; drive both channels simultaneously to measure "both channels driven". Adjust input frequency and repeat until all 12 test points have been verified. Table 6-3 lists the acceptable ranges.

Note: If any measured test point deviates from the specification by more than ±1.5dB, use the Block Diagram of the Hologram Circuit to identify which section of the circuit would be most likely to cause the response to deviate at the observed frequency.

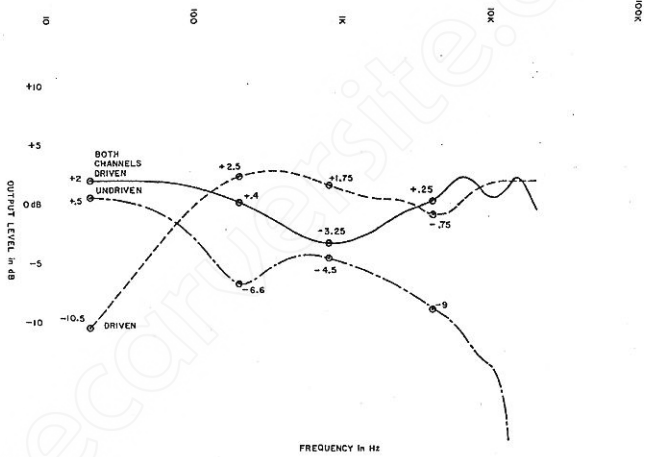


Figure 6-3. Hologram Frequency Response

Freq. (Hz)	One Channel Driven: Driven Channel	One Channel Driven: Undriven Channel	Both Channels Driven
20	-12.00 to -9.00	-1.00 to +2.00	+0.50 to +3.50
200	+1.00 to +4.00	-8.10 to -5.10	-1.10 to +1.90
800	+0.25 to +3.25	-6.00 to -3.00	-4.75 to -1.75
4,000	-2.25 to +0.75	-10.50 to -7.50	-1.25 to +1.75

Table 6-3. Hologram Test Points/Results

Frequency Response of the Generator (continued)

C) Set INJECTION RATIO switch to IN position ("THEORETICAL").
D) SET SEPARATION switch to IN position ("BLEND").
E) Referring to Figure 6-4 below, verify that the output signal levels are within ±1.5dB of the values indicated at each of the test points (circled). Drive one channel alone to measure the "driven" and "undriven" responses; drive both channels simultaneously to measure "both channels driven". Adjust input frequency and repeat until all 12 test points have been verified. Table 6-4 lists the acceptable ranges.

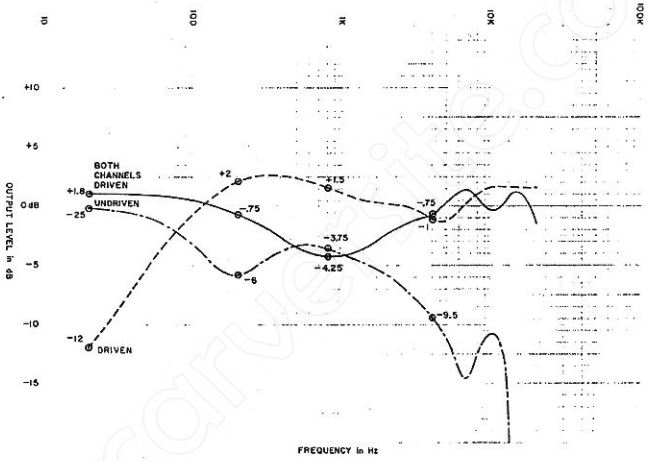


Figure 6-4. Hologram Frequency Response (Theoretical/Blend)

Freq. (Hz)	One Channel Driven		Both Channels Driven
	Driven Channel	Undriven Channel	
20	-13.50 to 10.50	-1.75 to +0.75	+0.30 to +3.30
200	+0.50 to +3.50	-7.50 to -4.50	-2.25 to +0.75
800	0.00 to +3.00	-5.25 to -2.25	-5.75 to -2.75
4,000	-2.50 to +0.50	-11.00 to -8.00	-2.25 to +0.75

Table 6-4. Hologram Test Points/Results (Theoretical/Blend)

Note: If any measured test point deviates from the specification by more than ±1.5dB, use the Block Diagram of the Hologram Circuit to identify which section of the circuit would be most likely to cause the response to deviate at the observed frequency.

6.13 RIAA Phono 1 Amplifier

A) Check pre-sets per Steps 6.1 and 6.3 above, **except:** Connect a very low noise source oscillator to PHONO 1 INPUT, set SELECTOR switch to "PHONO 1", and adjust source to provide a 1kHz, 0.775Vrms reference signal at each TAPE 1 OUTPUT.

B) Verify that:

1. GAIN is between 35.0 and 36.0dB
2. CHANNEL IMBALANCE is less than 0.5dB
3. CHANNEL SEPARATION is greater than 45dB (Use a shorting plug as described in step 6.4-D above; re-connect input.)

C) Referring to Figure 6-5 below, verify that the output signal levels are within ±0.5dB of the values indicated at each of the test points (circled). Adjust input frequency and repeat until all 3 test points have been verified. Table 6-5 lists the acceptable ranges.

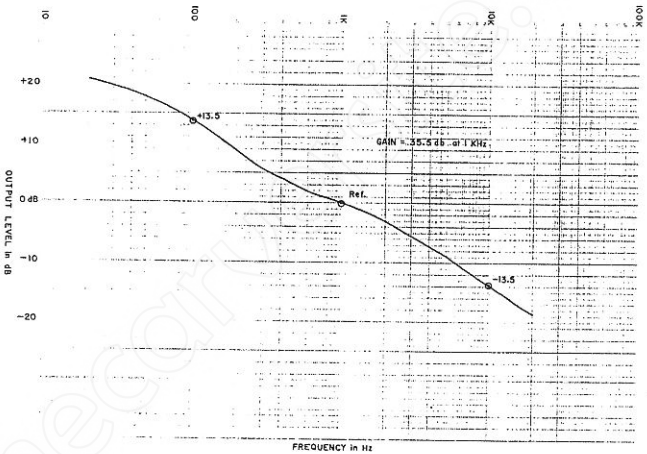


Figure 6-5. Phono 1 Response

Freq. (Hz)	Output Level (dB)
100	+13.0 to +14.0
1000	0.0 (ref)
10000	-13.0 to -14.0

Table 6-5. Phono 1 Test Points/Results

6.14 RIAA Phono 2 Amplifier

A) Check pre-sets per Step 6.1 and 6.3 above, **except:** Connect a very low noise source oscillator to PHONO 2 INPUT, set SELECTOR switch to "PHONO 2", and adjust source to provide a 1kHz, 0.775Vrms reference signal at each TAPE 1 OUTPUT.

B) Verify that:
   1. GAIN is between 60.0 and 61.0dB
   2. CHANNEL IMBALANCE is less than 0.5dB
   3. CHANNEL SEPARATION is greater than 45dB (Use a shorting plug as described in step 6.4-D above; re-connect input.)

C) Referring to Figure 6-6 below, verify that the output signal levels are within ±0.5dB of the values indicated at each of the test points (circled). Adjust input frequency and repeat until all 3 test points have been verified. Table 6-6 lists the acceptable ranges.

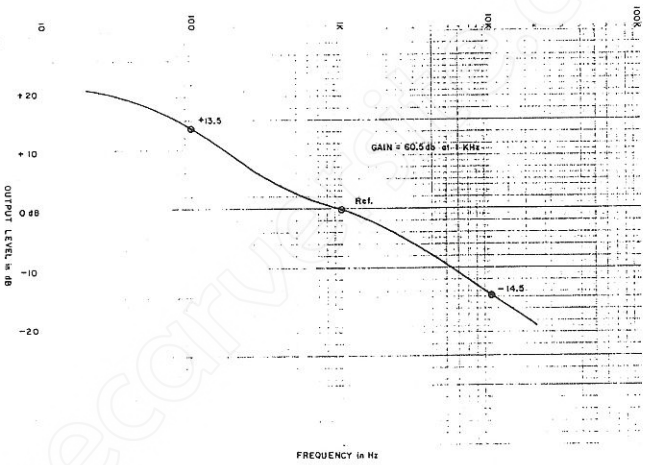


Figure 6-6. Phono 2 Response

Freq. (Hz)	Output Level (dB)
100	+13.0 to +14.0
1000	0.0 (ref)
10000	-14.0 to -15.0

Table 6-6. Phono 2 Test Points/Results

6.15 Noise Tests

A) Pre-set controls per step 6.1 above, **except:**
1. Install top and bottom covers
2. Install shorting plugs on INPUTs for TUNER, PHONO 1 and PHONO 2
3. Position the line cord and output cables for minimum noise level.

6.15.1 RIAA PHONO 2 AMPLIFIER
A) Check pre-sets per step 6.15-A above
B) Connect output to TAPE 1 OUTPUT
C) Set SELECTOR switch to "PHONO 2"
D) Verify A-weighted OUTPUT is less than 88uVrms (equivalent to 75.5dB A-weighted, below an input reference of 500uVrms at 1kHz)

6.15.2 RIAA PHONO 1 AMPLIFIER
A) Check pre-sets per step 6.15-A above
B) Connect output to TAPE 1 OUTPUT
C) Set SELECTOR switch to "PHONO 1"
D) Verify A-weighted OUTPUT is less than 24uVrms (equivalent to 82dB A-weighted, below an input reference of 5mVrms at 1kHz)

6.15.3 LINE AMPLIFIER
A) Check pre-sets per step 6.15-A above
B) Connect output to MAIN 1 OUTPUT
C) Set SELECTOR switch to "TUNER"
D) Verify A-weighted OUTPUT is less than 16uVrms (equivalent to 102dB A-weighted, below a 2Vrms output level at 1kHz)

6.15.4 INFRASONIC FILTER
A) Check pre-sets per step 6.15-A above
B) Connect output to MAIN 1 OUTPUT
C) Set SELECTOR switch to "TUNER"
D) Set INFRASONIC FILTER switch to ON position
E) Verify A-weighted OUTPUT is less than 16uVrms (equivalent to 102dB A-weighted, below a 2Vrms output level at 1kHz)
F) Set INFRASONIC FILTER switch to OFF position

6.15.5 TONE AMPLIFIER
A) Check pre-sets per step 6.15-A above
B) Connect output to MAIN 1 OUTPUT
C) Set SELECTOR switch to "TUNER"
D) Set TONE switch to IN position ("ON")
E) Verify A-weighted OUTPUT is less than 16uVrms (equivalent to 102dB A-weighted, below 2Vrms output level at 1kHz)
F) Set TONE switch to OUT position (OFF)

6.15.6 HOLOGRAM GENERATOR
A) Check pre-sets per step 6.15-A above
B) Connect output to MAIN 1 OUTPUT
C) Set SELECTOR switch to "TUNER"
D) Set SONIC HOLOGRAM switch to IN position ("ENGAGE")
E) Verify A-weighted OUTPUT is less than 28uVrms (equivalent to 97dB A-weighted, below a 2Vrms output level at 1kHz)
F) Set SONIC HOLOGRAM switch to OUT position (DISENGAGE)

6.16 Line-Level Inputs

A) Pre-set controls and reference per steps 6.1 and 6.3 above.

6.16.1 AUX 1

A) Move input cables to AUX 1 INPUT
B) Set SELECTOR switch to "AUX 1"
C) Verify that output level remains at 0.775Vrms
D) Verify STEREO SEPARATION is greater than 45dB

6.16.2 AUX 2

A) Move input cables to AUX 2 INPUT
B) Set SELECTOR switch to "AUX 2"
C) Verify that output level remains at 0.775Vrms
D) Verify STEREO SEPARATION is greater than 45dB

6.16.3 TAPE 1

A) Move input cables to TAPE 1 INPUT
B) Set TAPE 1 switch to IN position ("MONITOR")
C) Verify that output level remains at 0.775Vrms
D) Verify STEREO SEPARATION is greater than 45dB
E) Set TAPE 1 switch to OUT position (OFF)

6.16.4 TAPE 2

A) Move input cables to TAPE 2 INPUT
B) Set TAPE 2 switch to IN position ("MONITOR")
C) Verify that output level remains at 0.775Vrms
D) Verify STEREO SEPARATION is greater than 45dB
E) Set TAPE 2 switch to OUT position (OFF)

6.16.5 EXTERNAL PROCESSOR

A) Move input cables to EXTERNAL PROCESSOR INPUT
B) Set EXTERNAL PROCESSOR switch to IN position (ON)
C) Verify that output level remains at 0.775Vrms
D) Verify STEREO SEPARATION is greater than 45dB
E) Set EXTERNAL PROCESSOR switch to OUT position (OFF)

6.17 Outputs

A) Pre-set controls and reference per steps 6.1 and 6.3 above.

6.17.1 MAIN 2

A) Move output cables to MAIN 2 OUTPUT
B) Verify that output level remains at 0.775Vrms
C) Verify STEREO SEPARATION is greater than 45dB

6.17.2 TAPE 1

A) Move output cables to TAPE 1 OUTPUT
B) Verify that output level is between -16.0 and -17.0dB below reference
C) Verify STEREO SEPARATION is greater than 45dB

6.17.3 TAPE 2

A) Move output cables to TAPE 2 OUTPUT
B) Verify that output level is between -16.0 and -17.0dB below reference
C) Verify STEREO SEPARATION is greater than 45dB

6.17.4 EXTERNAL PROCESSOR

A) Move output cables to EXTERNAL PROCESSOR OUTPUT
B) Verify that output level is between -16.0 and -17.0dB below reference
C) Verify STEREO SEPARATION is greater than 45dB

6.17.5 HEADPHONE AMPLIFIER

A) Connect a 150-ohm load across "HEADPHONES" Jack (J14)
B) Verify that output level is between -3.0 and -4.0dB below reference
C) Verify STEREO SEPARATION is greater than 45dB

6.18 Tape Dubbing Switches

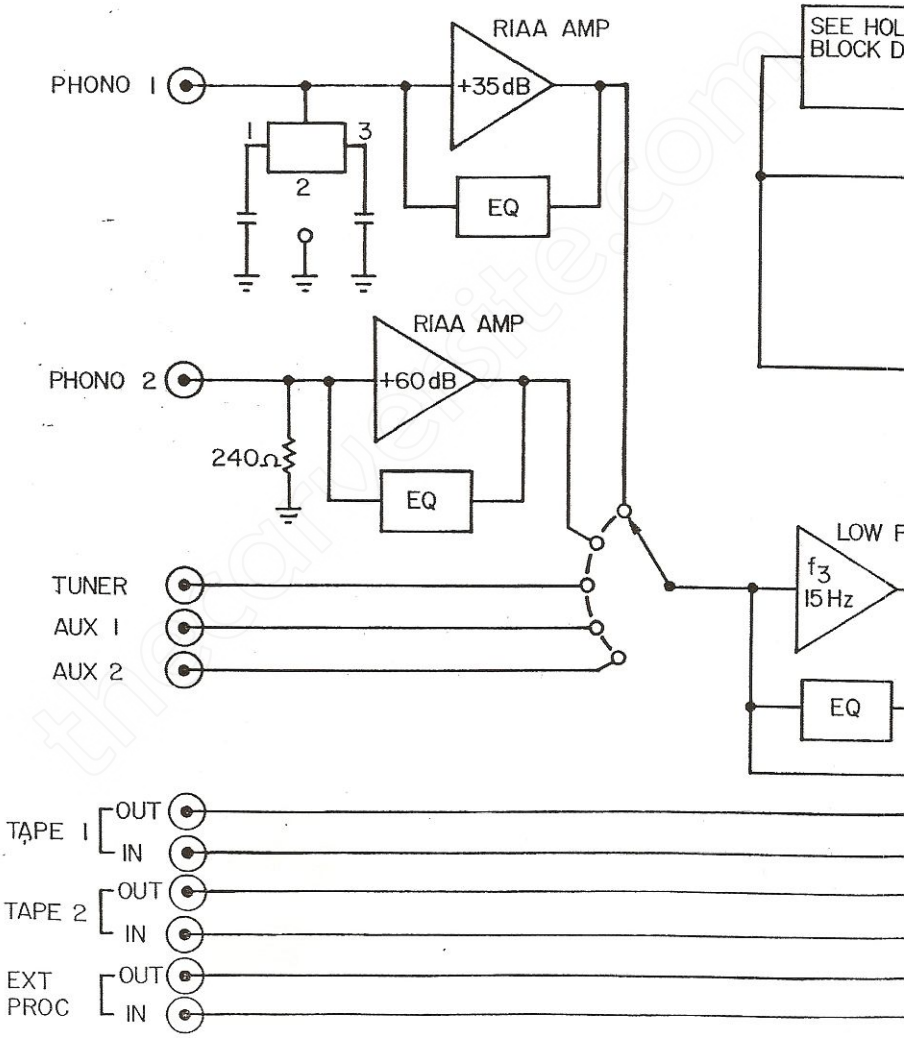
A) Pre-set controls and reference per steps 6.1 and 6.3 above.

6.18.1 DUB 1→2

A) Move input cables to TAPE 1 INPUT
B) Move output cables to TAPE 2 OUTPUT
C) Set DUB 1→2 switch to IN position (ENGAGED)
D) Verify that output level is between -16.0 and -17.0dB below reference
E) Verify STEREO SEPARATION is greater than 45dB
F) Set DUB 1→2 switch to OUT position (DISENGAGED)

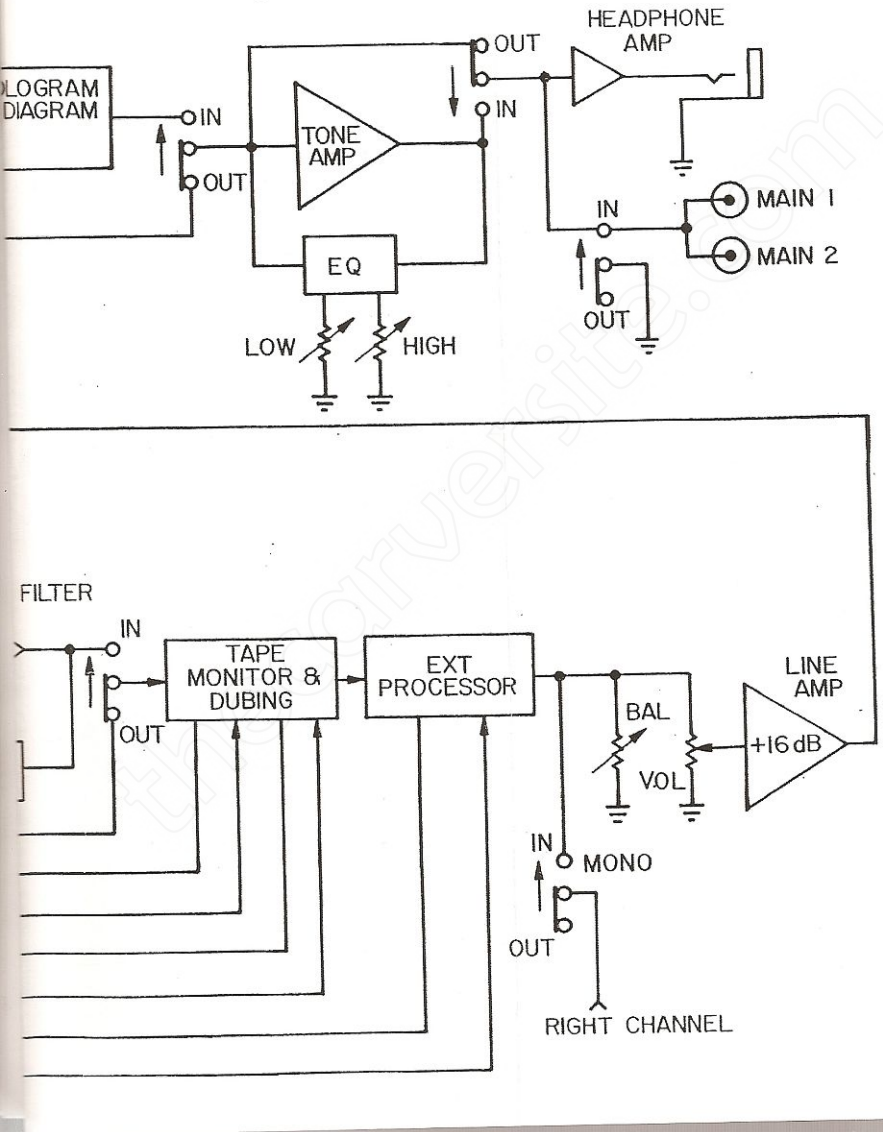
6.18.2 DUB 2→1

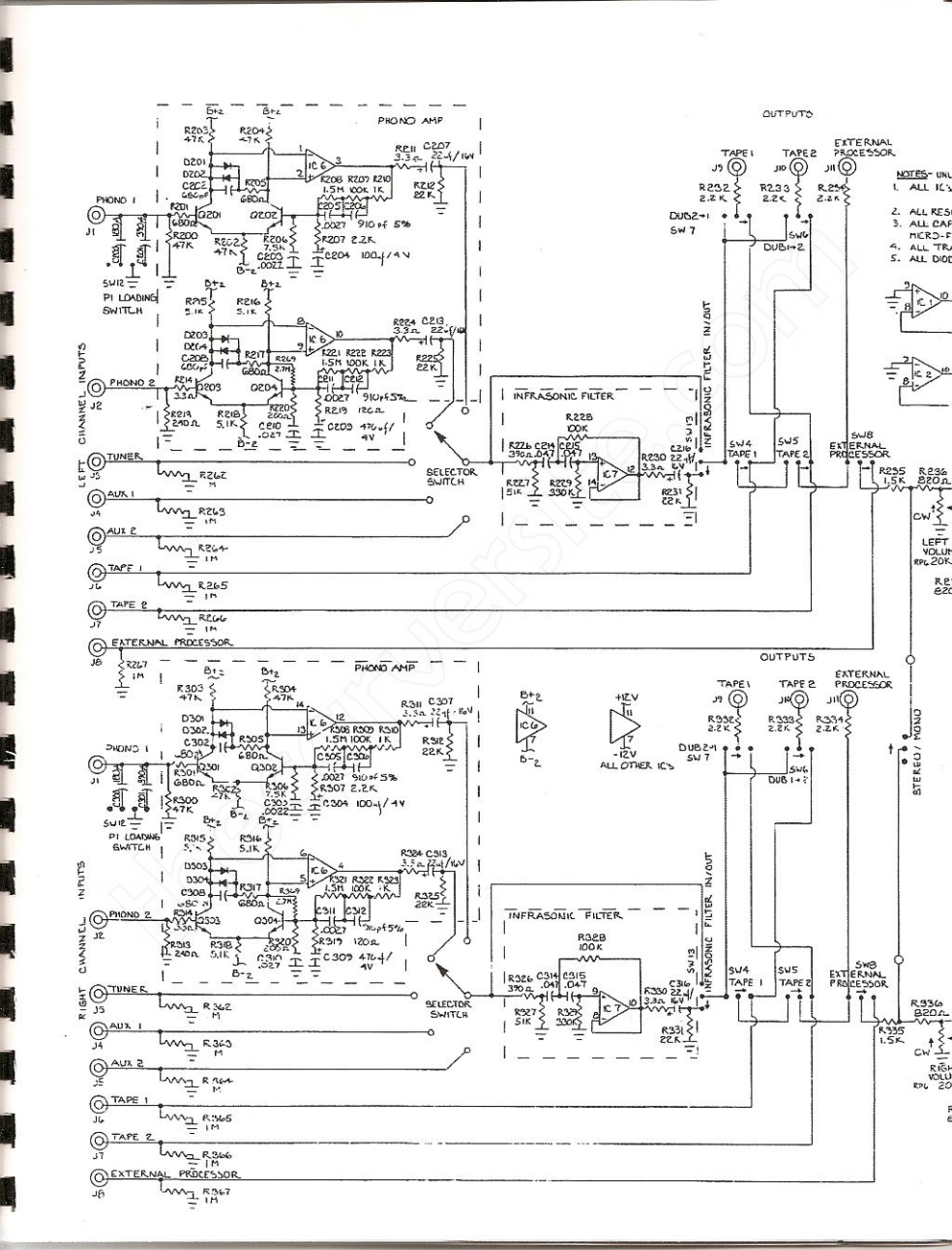
A) Move input cables to TAPE 2 INPUT
B) Move output cables to TAPE 1 OUTPUT
C) Set DUB 2→1 switch to IN position (ENGAGED)
D) Verify that output level is between -16.0 and -17.0dB below reference
E) Verify STEREO SEPARATION is greater than 45dB
F) Set DUB 2→1 switch to OUT position (DISENGAGED)

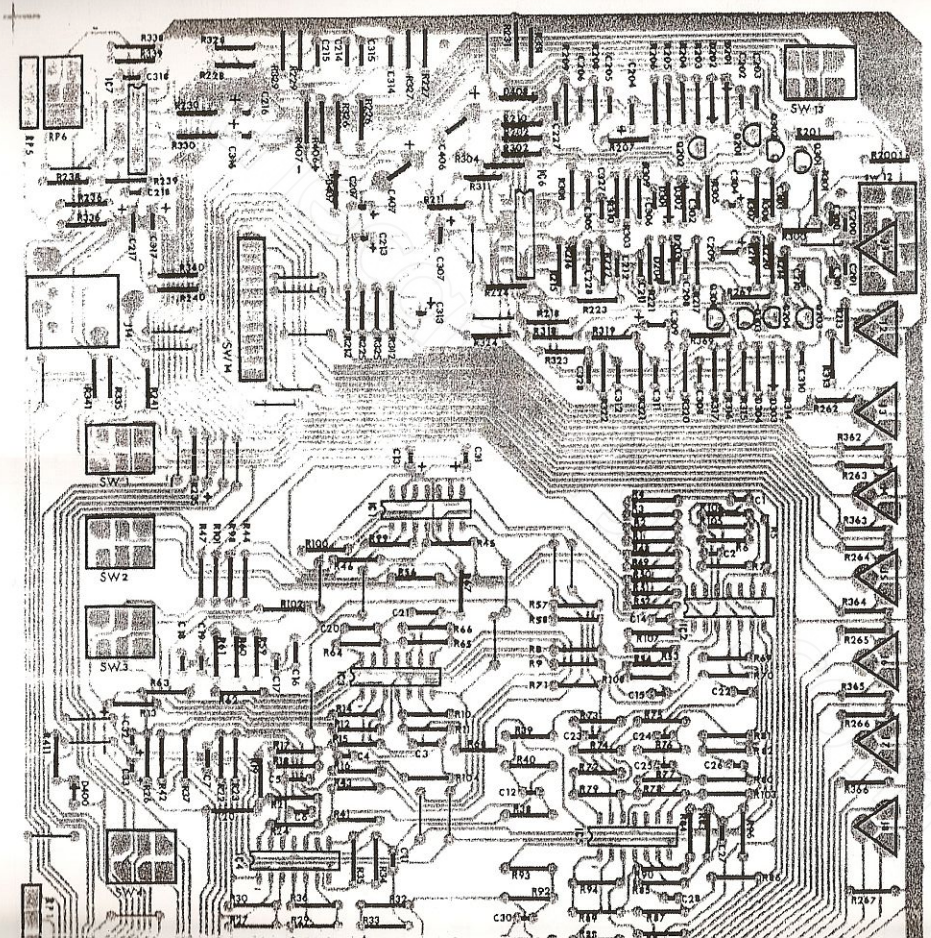

RIAA AMP
PHONO 1
+35dB
1
2
3
EQ
SEE HOL
BLOCK D
RIAA AMP
PHONO 2
+60dB
240Ω
EQ
LOW F
TUNER
AUX 1
AUX 2
f_3
15Hz
EQ
TAPE 1
OUT
IN
TAPE 2
OUT
IN
EXT
PROC
OUT
IN

7.0 Technical Diagrams

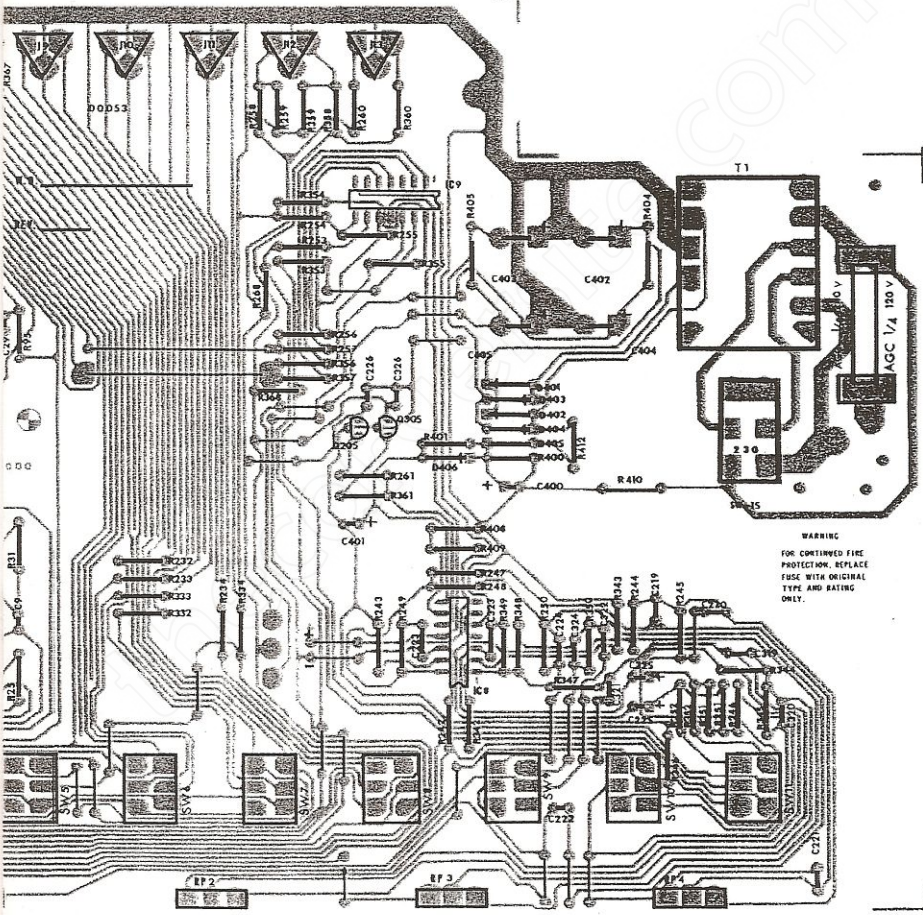
7.1 Block Diagram, C-1

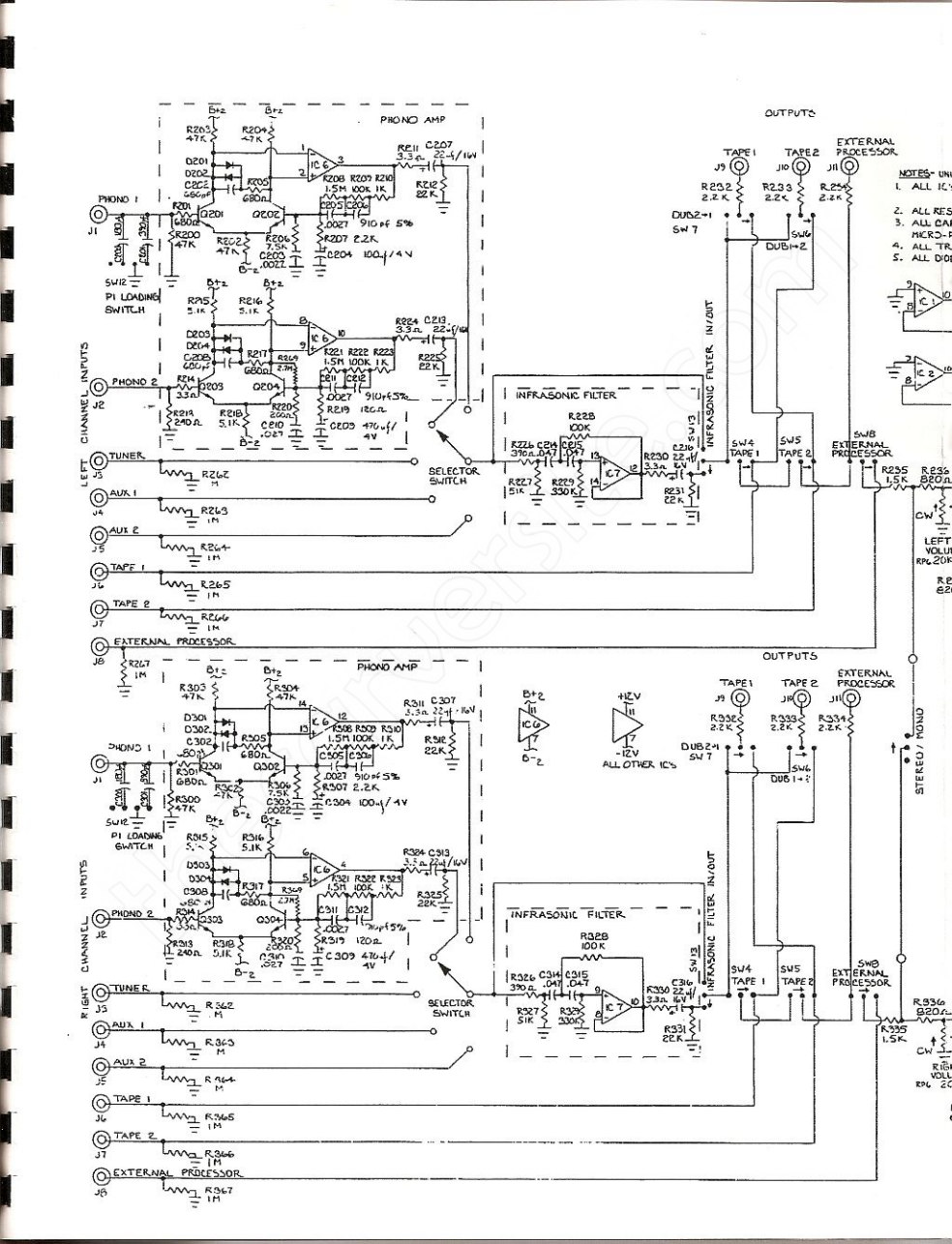



PHONO AMP
PHONO 1
PHONO 2
TUNER
AUX 1
AUX 2
TAPE 1
TAPE 2
EXTERNAL PROCESSOR
LEFT CHANNEL INPUTS
RIGHT CHANNEL INPUTS
PI LOADING SWITCH
SELECTOR SWITCH
INFRASONIC FILTER
INFRASONIC FILTER IN/OUT
OUTPUTS
TAPE 1
TAPE 2
EXTERNAL PROCESSOR
DUB 2→1
DUB 1→2
SW 7
SW 6
SW 4 TAPE 1
SW 5 TAPE 2
SW 8 EXTERNAL PROCESSOR
SW 13
SW 12
+12V
-12V
ALL OTHER IC's
STEREO / MONO
NOTES- UNL
1. ALL IC's
2. ALL RES
3. ALL CAP
MICRO-F
4. ALL TRA
5. ALL DIOD

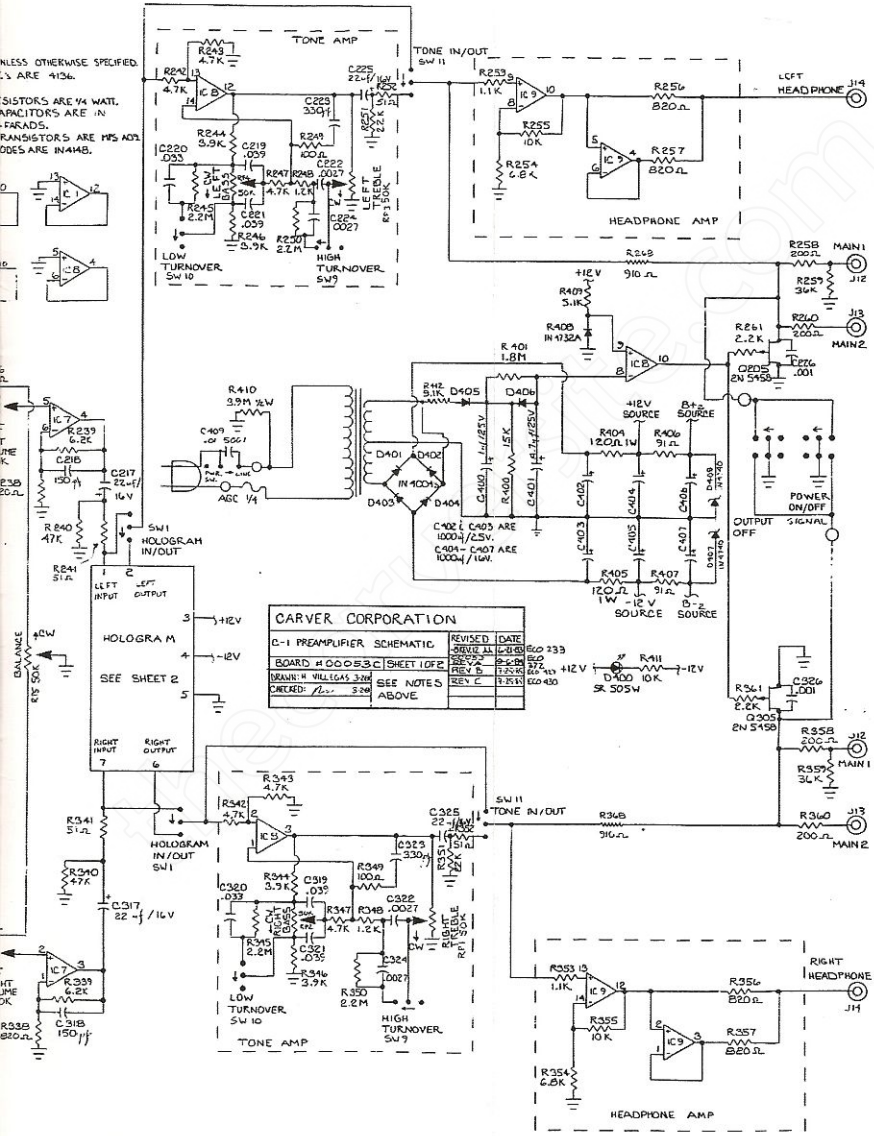

SW1
SW2
SW3
SW4
SW11
SW12
SW13
SW14

7.2 Part Locator




PHONO AMP
PHONO 1
PHONO 2
PI LOADING SWITCH
CHANNEL INPUTS
LEFT
TUNER
AUX 1
AUX 2
TAPE 1
TAPE 2
EXTERNAL PROCESSOR
SELECTOR SWITCH
INFRASONIC FILTER
INFRASONIC FILTER IN/OUT
OUTPUTS
TAPE 1
TAPE 2
EXTERNAL PROCESSOR
DUB 2-1
DUB 1-2
ALL OTHER IC's
NOTES-
RIGHT
STEREO / MONO

7.3 Schematic Diagram, C-1

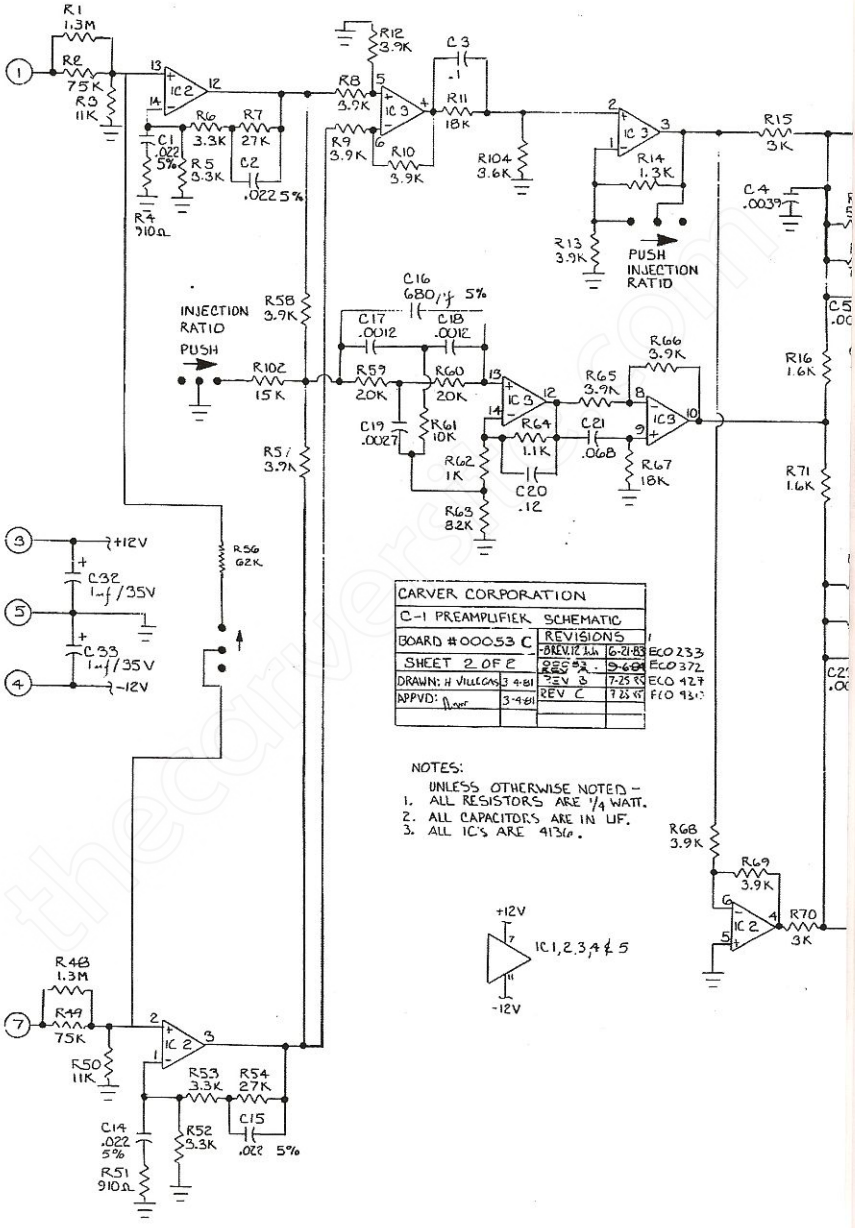


REFERENCE DESIGNATORS	PART NUMBER	DESCRIPTION	QUANTITY
CAPACITORS			
C218, 318	201-00015-00	CAP. CER DISC 150PF 10% 1000V	2
C200, 300	201-00016-00	CAP. CER DISC 180PF 10% 1000V	2
C123, 323	201-00021-00	CAP. CER DISC 330PF 10% 1000V	2
C201, 301	201-00022-00	CAP. CER DISC 390PF 10% 1000V	2
C202, 208 302, 308	201-00026-00	CAP. CER DISC 680PF 10% 1000V	4
C16	204-00001-00	CAP. MYLAR 680PF 5%	1
C206, 212 306, 312	204-00002-00	CAP. MYLAR 910PF 5%	4
C17, 18	204-00004-00	CAP. MYLAR .0012 uf	2
C203, 303	204-00007-00	CAP. MYLAR .0022 uf	2
C19, 205 211, 222 224, 305 311, 322 324	204-00008-00	CAP. MYLAR .0027 uf	9
C4, 22	204-00010-00	CAP. MYLAR .0039 uf	2
C1, 2, 14 15	204-00019-00	CAP. MYLAR .022 uf 5%	4
C210, 310	204-00021-00	CAP. MYLAR .027 uf	2
C220, 320	204-00022-00	CAP. MYLAR .033 uf	2
C219, 221 319, 321	204-00023-00	CAP. MYLAR .039 uf	4
C214, 215 314, 315	204-00024-00	CAP. MYLAR .047 uf	4
C21	204-00025-00	CAP. MYLAR .068 uf	1
C3	204-00027-00	CAP. MYLAR .1 uf	1
C20	204-00028-00	CAP. MYLAR .12 uf	1
C5, 6, 7, 8 9, 10, 11, 12 23, 24, 25, 26 27, 28, 29, 30 226, 325	204-00040-00	CAP. MYLAR .001 uf 5%	18
C32, 33, 400	205-00001-00	CAP. ELECTROLITIC 1 uf 50V RAD.	3
C401	205-00005-00	CAP. LYTIC 4.7 uf 35V RAD.	1
C207, 213 216, 217 225, 307 313, 316 317, 325	205-00011-00	CAP. LYTIC 22 uf 16V RAD.	10
C13, 31	205-00012-00	CAP. LYTIC 22 uf 35V RAD.	2
C204, 304	205-00015-00	CAP. LYTIC 100 uf 10V RAD.	2
C209, 309	205-00019-00	CAP. LYTIC 470 uf 6.3V RAD.	2
C404, 405 406, 407	205-00023-00	CAP. LYTIC 1000 uf 16V RAD.	4
C402, 403	205-00025-00	CAP. LYTIC 1000 uf 25V RAD. (1" H)	2
RESISTORS			
R211, 214 224, 230 311, 314 324, 330	251-00020-00	RES. CFILM 3.3 OHM 1/4W PREP .4	8
R46, 100 241, 252 341, 352	251-00039-00	RES. CFILM 51 OHM 1/4W PREP .4	6
R406, 407	251-00045-00	RES. CFILM 91 OHM 1/4W PREP .4	2
R249, 349	251-00046-00	RES. CFILM 100 OHM 1/4W PREP .4	2
R219, 319	251-00048-00	RES. CFILM 120 OHM 1/4W PREP .4	2
R220, 258 260, 320 358, 360	251-00053-00	RES. CFILM 200 OHM 1/4W PREP .4	6
R213, 313	251-00055-00	RES. CFILM 240 OHM 1/4W PREP .4	2
R26, 81	251-00057-00	RES. CFILM 300 OHM /1W PREP .4	2
R20, 32, 39 75, 86, 92	251-00059-00	RES. CFILM 360 OHM 1/4W PREP .4	6
R226, 326	251-00060-00	RES. CFILM 390 OHM 1/4W PREP .4	2
R201, 205 217, 301 305, 317	251-00066-00	RES. CFILM 680 OHM 1/4W PREP .4	6
R236, 238 256, 257 336, 338 356, 357	251-00068-00	RES. CFILM 820 OHM 1/4W PREP .4	8

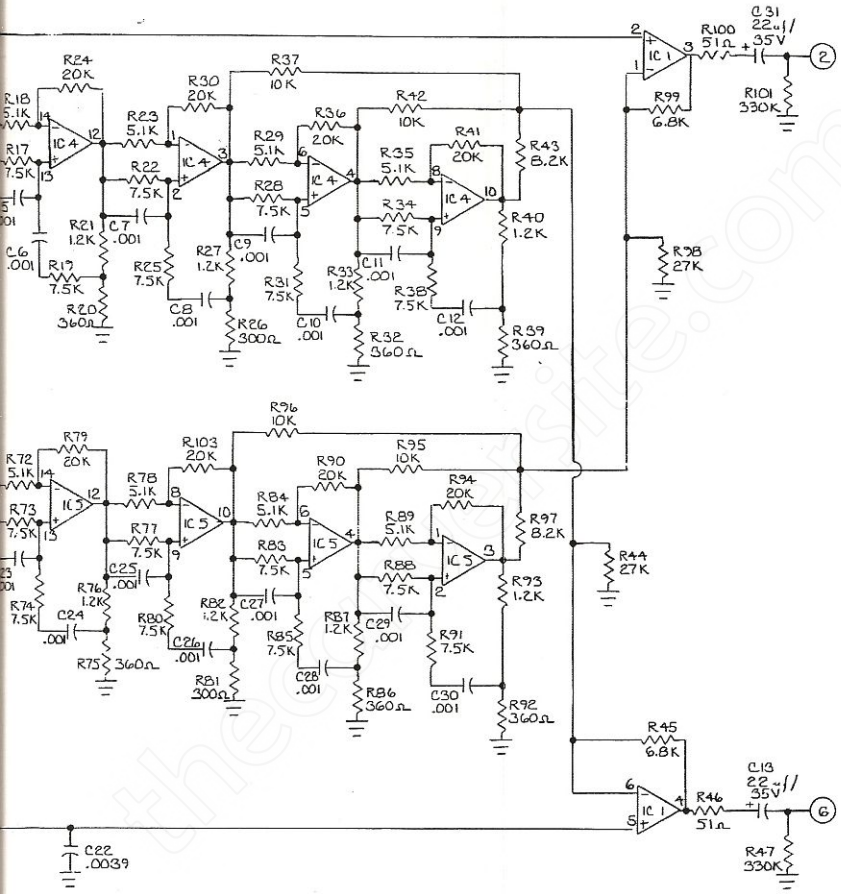
REFERENCE DESIGNATORS	PART NUMBER	DESCRIPTION
RESISTORS (Cont.)		
R4, 51 268, 368	251-00069-00	RES. CFILM 910 OHM 1/4W PREP .4
R62, 210 223, 310 323	251-00070-00	RES. CFILM 1K 1/4W PREP .4
R64, 253 353	251-00071-00	RES. CFILM 1.1K 1/4W PREP .4
R21, 27, 33 40, 76, 82 87, 93, 248 348	251-00072-00	RES. CFILM 1.2K 1/4W PREP .4
R14	251-00073-00	RES. CFILM 1.3K 1/4W PREP .4
R235, 335	251-00074-00	RES. CFILM 1.5K 1/4W PREP .4
R16, 71	251-00075-00	RES. CFILM 1.6K 1/4W PREP .4
R207, 232 233, 254 261, 307 332, 333 354, 361	251-00078-00	RES. CFILM 2.2K 1/4W PREP .4
R15, 70	251-00081-00	RES. CFILM 3K 1/4W PREP .4
R5, 52	251-00082-00	RES. CFILM 3.3K 1/4W PREP .4
R104	251-00083-00	RES. CFILM 3.6K 1/4W PREP .4
R8, 9, 10 12, 13, 57 58, 65, 66 68, 69, 244 246, 344, 346	251-00084-00	RES. CFILM 3.9K 1/4W PREP .4
R242, 243 247, 342 343, 347	251-00086-00	RES. CFILM 4.7K 1/4W PREP .4
R18, 23, 29 35, 72, 78 84, 89, 215 216, 218 315, 316 318, 409	251-00087-00	RES. CFILM 5.1K 1/4W PREP .4
R239, 339	251-00089-00	RES. CFILM 6.2K 1/4W PREP .4
R45, 99 254, 354	251-00090-00	RES. CFILM 6.8K 1/4W PREP .4
R17, 19, 22 25, 28, 31 34, 38, 73 74, 77, 80 83, 85, 88 91, 206, 306	251-00091-00	RES. CFILM 7.5K 1/4W PREP .4
R43, 97, 412	251-00092-00	RES. CFILM 8.2K 1/4W PREP .4
R63	251-00093-00	RES. CFILM 9.1K 1/4W PREP .4
R37, 42, 61 95, 96, 411	251-00094-00	RES. CFILM 10K 1/4W PREP .4
R3, 50	251-00095-00	RES. CFILM 11K 1/4W PREP .4
R102, 400	251-00098-00	RES. CFILM 15K 1/4W PREP .4
R11, 67	251-00100-00	RES. CFILM 18K 1/4W PREP .4
R24, 30, 36 41, 59, 60 79, 90, 94 103	251-00101-00	RES. CFILM 20K 1/4W PREP .4
R212, 225 231, 251 312, 325 331, 351	251-00102-00	RES. CFILM 22K 1/4W PREP .4
R7, 44 54, 98	251-00104-00	RES. CFILM 27K 1/4W PREP .4
R259, 359	251-00107-00	RES. CFILM 36K 1/4W PREP .4
R200, 202 203, 204 240, 300 302, 303 304, 340	251-00110-00	RES. CFILM 47K 1/4W PREP .4
R227, 327	251-00111-00	RES. CFILM 51K 1/4W PREP .4
R56	251-00113-00	RES. CFILM 62K 1/4W PREP .4
R2, 49	251-00115-00	RES. CFILM 75K 1/4W PREP .4
R209, 222 228, 309 322, 328	251-00118-00	RES. CFILM 100K 1/4W PREP .4
R47, 101 229, 329	251-00130-00	RES. CFILM 330K 1/4W PREP .4
R262, 263 264, 265 266, 267 362, 363 364, 365 366, 367	251-00142-00	RES. CFILM 1M 1/4W PREP .4

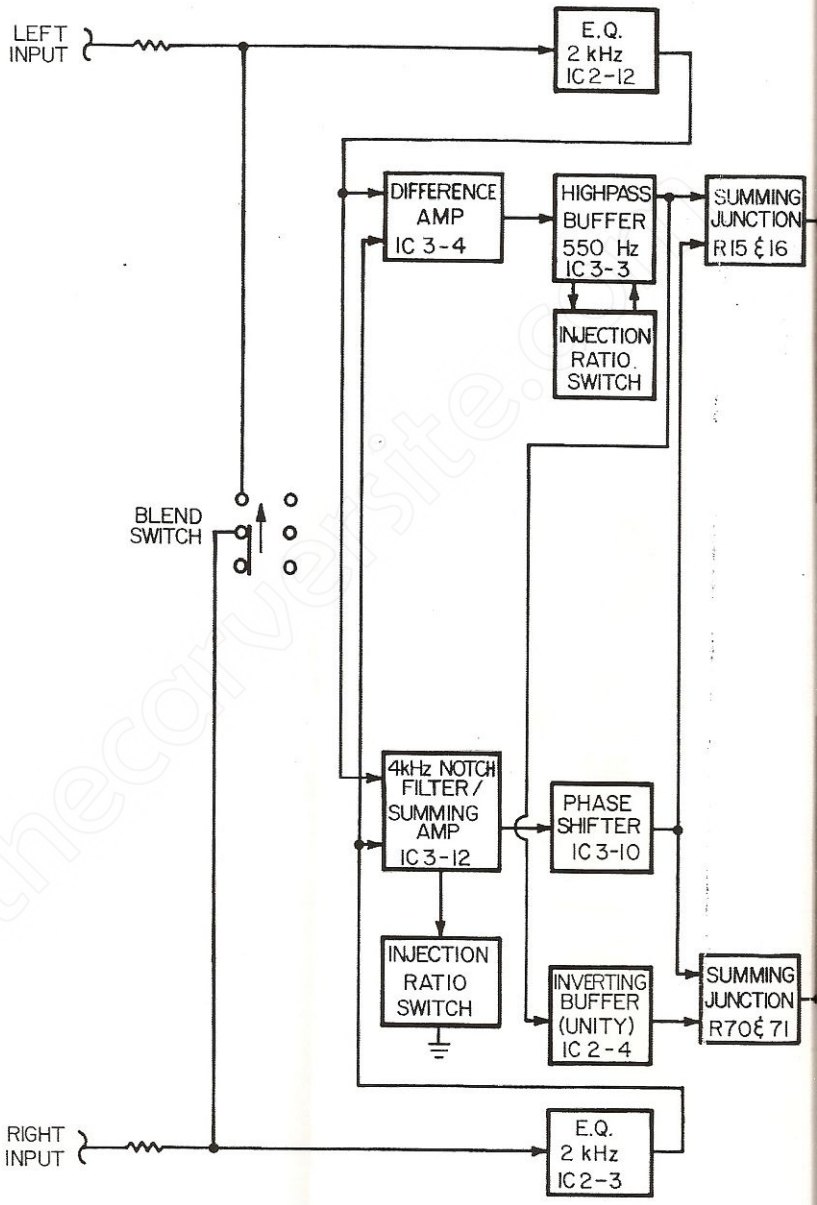
7.4 Replaceable Parts List

QUANTITY	REFERENCE DESIGNATORS	PART NUMBER	DESCRIPTION	QUANTITY
	RESISTORS (Cont.)			
4	R1, 48	251-00145-00	RES. CFILM 1.3M 1/4W PREP .4	2
5	R208, 221 308, 321	251-00146-00	RES. CFILM 1.5M 1/4W PREP .4	4
3	R401	251-00148-00	RES. CFILM 1.8M 1/4W PREP .4	1
10	R245, 250 345, 350	251-00150-00	RES. CFILM 2.2M 1/4W PREP .4	4
1	R269, 369	251-00152-00	RES. CFILM 2.7M 1/4W PREP .4	2
2	R410	251-00156-00	RES. CFILM 3.9M 1/4W PREP .5	1
2	SEMICONDUCTORS			
10		320-20001-00	DIODE 1N4148 75V PREP	10
15		320-20004-00	DIODE 1N4004 400V PREP	4
		320-30000-00	DIODE ZENER 1N4740 10W PREP	2
		320-30003-00	DIODE ZENER 1N4732 4.7W PREP	1
2		321-40002-00	XISTER TO92 NPN SM SG 2SC1844F	8
2		321-40005-00	XISTER TO92 JFET SM SG 2N5458	2
1		330-30003-00	IC QUAD OP AMP 4136	9
15	APPEARANCE PARTS			
		101-30001-00	BUMPONS, RUBBER ROUND MEDIUM	4
6		503-40003-01	PANEL FRONT SCREEN C-1 GRAY	1
15		504-20002-01	COVER TOP & BOTTOM PAINT BLACK	2
		509-10001-01	FERRULE 5/16" ANO GRAY	4
		510-10001-01	HANDLE 2" ANO GRAY	2
		502-30005-01	CHASSIS SCREEN C-1	1
		505-20002-01	PANEL SUB SCREEN C-1 BLACK	1
2		508-20001-01	BUTTON MOLDED ANO PAINTED	15
4		508-20010-01	KNOB 12MM BLK KNURL 90 DOT	1
18		508-20012-01	KNOB 2MM BLK SMOOTH	4
		508-20013-01	KNOB 22MM BLK KNURLED	1
		508-20014-01	KNOB 35MM BLK SMOOTH	1
3	MISCELLANEOUS			
1		160-00001-00	CONVENIENCE OUTLETS	6
6		315-10503-00	FUSE AGC 1/4	1
		315-10502-00	FUSE AGC 1/8	1
2		401-90001-00	LINECORD 18 GAGE 2 WIRE SPT 2	1
2		602-00052-00	ASSY, TU POWER SWITCH C-1 100V	1
2		105-40001-00	FUSEHOLDER CLIP PCB MOUNT	2
10		109-10002-00	PHONO JACK DUAL PC MOUNT	1
		109-20001-00	PHONO JACK 1/4" CHASSIS MOUNT	1
8		109-10003-00	PHONO JACK QUAD PC MOUNT	6
		259-10001-00	POT 20KAX2 VERT. FLAT CTR PM	1
		259-10006-00	POT 50KW PANEL MOUNT	5
4		318-10000-00	SWITCH PUSH 1 KEY NO FRAME	9
2		318-10003-00	SWITCH PUSH 3 KEY	1
10		318-30004-00	SW RTY. 5 POS. PR CTR 2.5MM LS	1
		318-40001-00	SWITCH SLIDE 3 POSITION	1
		320-40001-00	LED, RED	1
2		617-10003-00	TRANSFORMER 110V C-1	1
1		617-10004-00	TRANSFORMER 110V-220V C-1	1
2	SHIPPING KIT			
6		532-10004-00	BAG, PLASTIC 10X8X24 C-1	1
4		532-20005-00	BOX C-1	1
12		532-30005-00	FOAM CORNER C-1	4
		990-00003-00	CARD, WARRANTY REG.	1
		990-00004-00	CARD, LIMITED WARRANTY	1
		990-20003-00	MANUAL C-1	1

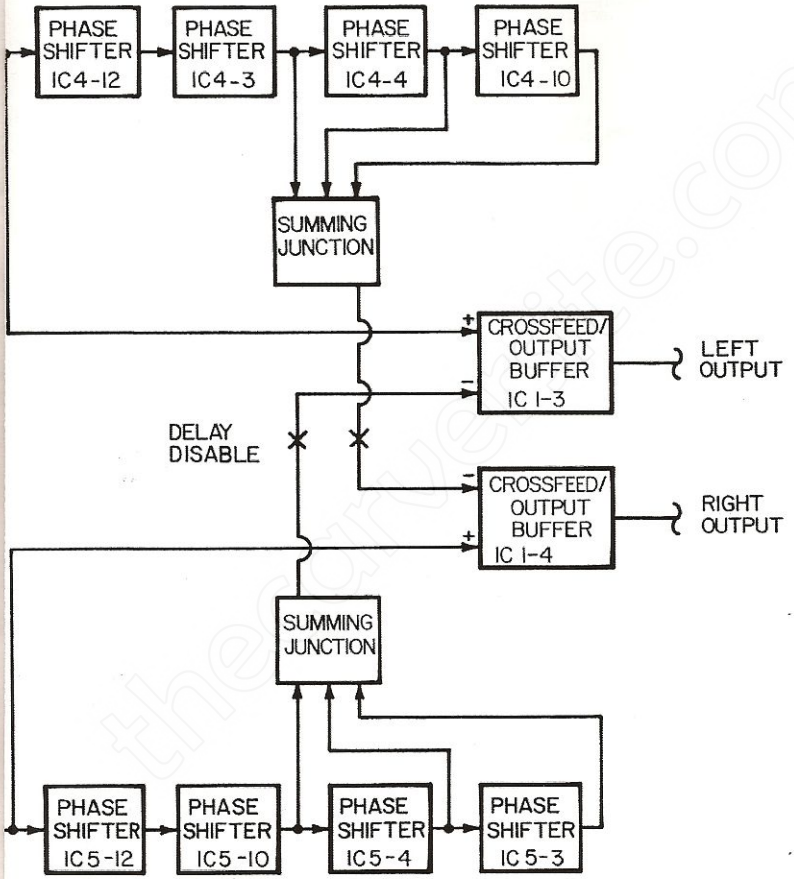

R1 1.3M
R2 75K
R3 11K
IC 2
R6 3.3K
R7 27K
C1 .022 5%
R5 3.3K
C2 .022 5%
R4 910Ω
R12 3.9K
C3 .1
R8 3.9K
IC 3
R11 18K
R9 3.9K
R10 3.9K
R104 3.6K
R13 3.9K
R14 1.3K
PUSH INJECTION RATIO
R15 3K
C4 .0039
INJECTION RATIO PUSH
R58 3.9K
R102 15K
C16 680pf 5%
C17 .0012
C18 .0012
R59 20K
R60 20K
R61 10K
C19 .0027
R62 1K
R63 82K
R64 1.1K
C20 .12
C21 .068
R65 3.9K
R66 3.9K
R67 18K
R57 3.9K
R16 1.6K
R71 1.6K
R56 62K
+12V
C32 1-f/35V
C33 1-f/35V
-12V
CARVER CORPORATION
C-1 PREAMPLIFIER SCHEMATIC
BOARD # 000553 C
REVISIONS
REV. 12 1-14 6-21-83 ECO 233
REV. A 9-6-84 ECO 372
REV. B 7-25-85 ECO 427
REV C 7-25-85 ECO 931
SHEET 2 OF 2
DRAWN: M VILLEGAS 3-4-81
APPVD: 3-4-81
NOTES:
UNLESS OTHERWISE NOTED -
1. ALL RESISTORS ARE 1/4 WATT.
2. ALL CAPACITORS ARE IN UF.
3. ALL IC's ARE 4136.
R68 3.9K
R69 3.9K
R70 3K
+12V
IC 1,2,3,4 & 5
-12V
R48 1.3M
R49 75K
R50 11K
R53 3.3K
R54 27K
C14 .022 5%
R52 3.3K
C15 .022 5%
R51 910Ω

7.5 Schematic Diagram, Sonic Hologram Generator




LEFT INPUT
E.Q. 2 kHz IC 2-12
DIFFERENCE AMP IC 3-4
HIGHPASS BUFFER 550 Hz IC 3-3
SUMMING JUNCTION R15 & 16
INJECTION RATIO SWITCH
BLEND SWITCH
4kHz NOTCH FILTER / SUMMING AMP IC 3-12
PHASE SHIFTER IC 3-10
INJECTION RATIO SWITCH
INVERTING BUFFER (UNITY) IC 2-4
SUMMING JUNCTION R70 & 71
RIGHT INPUT
E.Q. 2 kHz IC 2-3

7.6 Block Diagram, Sonic Hologram Generator



8.0 115/230 Line Voltage Conversions

Some units are equipped with AC LINE VOLTAGE conversion switches. These are typically those which are shipped to European countries and/or sales outlets dealing with military personnel. Standard USA domestic units and those destined for Canada (CSA approval label on rear) do not feature such a switch and cannot be converted without exchanging the line power transformer. The schematic diagram shows a non-convertible type.

If the unit is equipped with a switch, it may be converted by following the appropriate procedure, below. Refer to Figure 8-1 for the locations of the fuse and switch, and the schematic detail.

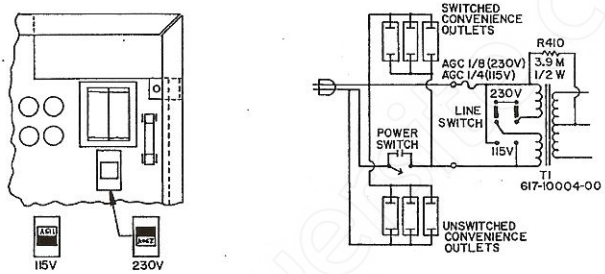


Figure 8-1. 115/230 Line Voltage Conversion Switch & Fuse

8.1 Conversion From 115 To 230

A) Remove AGC 1/8 Amp fuse from fuseholder
B) Install AGC 1/16 Amp fuse in fuseholder
C) Set LINE VOLTAGE switch to "230V" position. Check that the legend "230V" appears visibly.
D) Apply "240V" label (Carver P/N 530-10001-00) over "120" silkscreen designation on rear panel near line cord entry.

8.2 Conversion From 230 To 115

A) Remove AGC 1/16 Amp fuse from fuseholder
B) Install AGC 1/8 Amp fuse in fuseholder
C) Set LINE VOLTAGE switch to "115V" position. Check that the legend "115V" appears visibly.
D) Remove the "240V" label from the rear panel near line cord entry point, exposing original "120V" silkscreen designation.

CARVER	*SERVICE BULLETIN*	C1 −2−

DATE 7/12/88	PRODUCT C−1	PCB

SERVICE PRIORITY		ALL UNITS	
		SERIAL NOS. (specify)	
	X	SPECIFIC COMPLAINT	Noise with volume at minimum or level difference (R−L) at low volume.

PROCEDURE TO CHANGE GAIN OF THE LINE AMPLIFIER

The line amplifier gain may be reduced as follows: (by main 1 out jacks)

	R258	R358	R259	R359
Normal	200 ohm	200 ohm	36k	36k
reduce 3 dB	910 ohm	910 ohm	4.3k	4.3k
reduce 6 dB	1.3k	1.3k	2.2k	2.2k
reduce 9 dB	1.8k	1.8k	1.5k	1.5k
reduce 12 dB	2.4k	2.4k	1.0k	1.0k
reduce 21 dB	4.7k	4.7k	510 ohm	510 ohm

To be used as needed, to lower the noise floor. To compensate for highly efficient speakers, so that the volume control is used in the optimum tracking area.

Example: volume control is set to "9 o'clock" at max listening volume, the 21dB reduction will change volume control to "2o'clock" for same volume.

Note: This reduction will be at main 1 output only, main 2 will remain the same high level volume.