SECTION 4
THEORY OF OPERATION

4.1 General

The DL2 is a precision, high-quality audio preamplifier. The Crown designed and developed circuitry represents a level of quality and performance presently unequaled in the field of audio preamplifier design.

4.2 Principles of the DL2 Controller

The DL2 uses digital logic to control the analog signal path with the use of high quality reed relays. The main signal path is not affected by filters, tone circuits or external signal processors unless the function is switched manually. By using this straight signal path in conjunction with very fast, high quality IC audio amplifiers, the DL2 produces the most sonically pure signal that technology will allow. All forms of distortion including slew-induced distortion (TIM) in the DL2 are not perceptable by the human ear and most test equipment.

The tone circuits are Crown's famous hinge point shelving circuits similar to the EQ-2 equalizer. The high and low cut filters have selectable center frequencies. The loudness contour switch provides selectable contours for various loudness levels.

By using an external phono module, the DL2 system realizes many advantages over the in-board preamp. The resulting sonic purity is truly "state of the art". The module is designed to be mounted as close to the turntable as possible. This allows short leads to the cartridge reducing cartridge loading, high frequency loss, and RF interference.

The power supply module is a separate module that can be placed on the floor out of sight or rack mounted with the DL2. By separating the power supply from the circuitry, Crown has again improved signal noise and hum rejection.

4.3 Block Diagram Circuit Theory

The signal source is fed to the input control section. This section is controlled by both the digital logic control and manual switches. See Fig. 4.1. Notice that the main signal path is straight through with no circuits that will color or alter the signal in line. Circuits that are used to alter the signal, such as the tone system, filters, etc., are switched in and out of the signal path manually.

The signal goes to the buffer amplifier where several outputs occur. The low filter system is switched into the buffer amp. A buffered output is provided from this point to the rear panel and the external processor control gets its output. The external processor control can return the signal after the buffer amp or return it to the input control so that the signal is before the tape outputs.

From the buffer amp the signal goes to the panorama control system. Here the signal is switched to effect channel balance, normal, mono and reversed stereo modes and mixing with the X and Y input feeds. From the panorama system the signal goes to the first gain amplifier section. The loudness contour system is switched at this point. From here the main signal proceeds to the second, third and fourth gain amps. At this point the high filter is switched in or out. Note that the digitally controlled volume control system primarily controls the gain of the four gain amps.

The signal now flows to the output section. Here is where the Crown hinge point shelving tone control systems is switched. This is a precision switched system that allows the user to return to an exact setting. The signal continues to the output amp, inverting amp, mixing amp and to the headphone amp. From these amplifiers, the signal goes to the rear panel through the muting relay and output control switches.

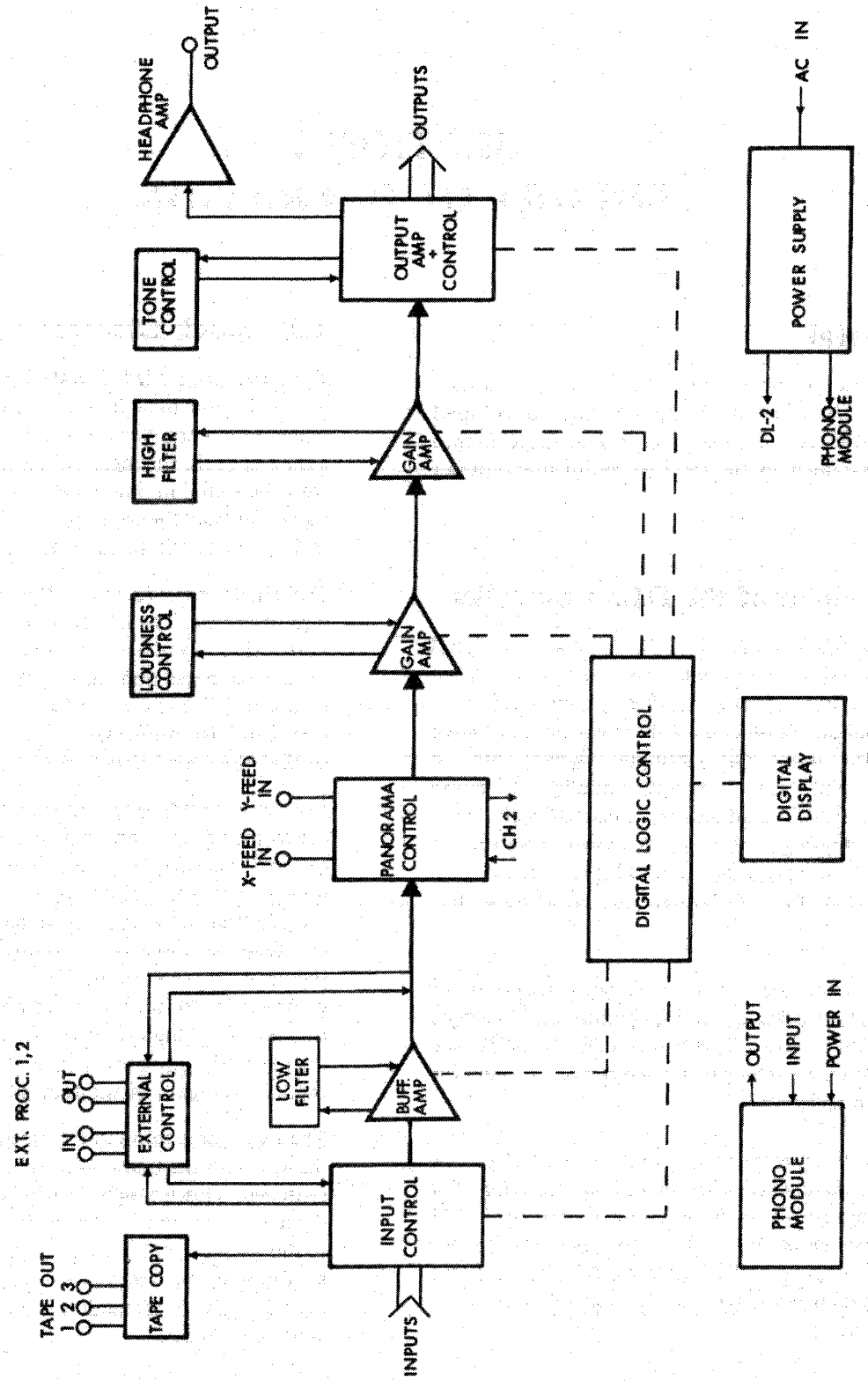


Fig. 4.1 DL2 Block Diagram

4.4 Detailed Circuit Theory

The following explanation pertains to the schematic diagrams located at the end of this section. Because signal flow meandors from one board to another, it may be necessary to observe several schematic drawings simultaneously.

In order to fully understand the actual input to output signal flow, it is first necessary to describe how the DL2 input selection is achieved. After the desired front panel input selector button is chosen (INPUT SELECTOR BOARD #4550), its output signal is fed to the LOGIC BOARD (#4548-J11) data buss line. There are 8 lines, one for each input, that connect to IC-12, an eight input nand gate. Also attatched to the buss line are eight tri—state buffers (IC-15 and 16) which are activated simultaneously in order that they may choose the selected input(s). Their output signal is then responsible for opening the proper "window" of latches (IC-18, 19) which also corresponds to the chosen input selection. All information fed to the latch (IC-18, 19) is stored or set so that the tri-state buffers may disable (become inactive). The process explained so far, happens in a predetermined time by circuitry activated when the input selector button(s) is initially pressed.

As shown on the LOGIC and INPUT schematics, the output signal from the latches leaves the board through J12F and once again enters the input selector board (#4550) at J12M. Here it activates the respective Input LED indicator(s) as well as sending its low voltage signal on to the input board (4549) where it provides drive for each PNP "input reed relay" driver transistors (Q1-8). This is the location where the actual input signal enters and is chosen to travel on to the next stages. Note several points:

1) All Input Reed Relays are protected by diodes (D1-8) which absorb current upon relay deactivation.

2) All Input Relays are tied to common "logic" ground except Tape 1-3. Tape relay grounds are obtained through the Tape Monitor switches. When selecting any one of the Tape Monitor functions, the relay ground is lifted making selection of that particular Tape Input nonoperational. This helps eliminate any chance of "tape loop" oscillation should both a Tape input and its respective Monitor function be chosen together.

3) External Processing and Crossfeed (X,Y) inputs are not relay selected, but controlled externally.

J31F, located on the MAIN BOARD, receives the signal next applying it to the tape monitor and/or tape copy sections. The Tape Monitor and Tape Copy functions are separate and do not affect one another. Through R100, 200 on the MAIN BOARD, the signal travels to the LOUDNESS BOARD (#4551) via J33 and J34. Once at that board, a choice of inserting the Low Filter or not is given by SW4. In either case, the signal comes back to the MAIN BOARD (through the same cables) to interact with the Low Filter components and then enter the Buffer stages (IC100-200).

The buffers are used to "buffer" the input from the rest of the circuitry and convert a high impedance signal to a low impedance (necessary to drive the following gain stages).

R107, 207 on the MAIN BOARD, are the signal paths which carry the Buffer Output to the OUTPUT BOARD jacks through J30 (MAIN BOARD) to J43 (OUTPUT BOARD). R108 and 208 (MAIN BOARD) also carry the signal, however this portion feeds the External Processing Switch leaving at J32 (MAIN BOARD) and entering J27 (LOUDNESS BOARD). Besides feeding the External Processor, this same portion travels back to the MAIN BOARD through the same J32 (pins 11 and 14). From here it takes a short path to J37 (MAIN BOARD) where it becomes pins 5 and 6. Along with any possible cross-feed signal (J37 pins 4, 3) the PANORAMA BOARD (#4691) is the next destination (J44).

The PANORAMA BOARD will help produce the Audio Imaging function as desired by the user. After its duty is completed, the signal is transfered back to the MAIN BOARD via pins 1 and 2 of J44 (PANORAMA BOARD) and J37 (MAIN BOARD). This area is the initial feed-in for the gain stages. It may be interesting to note that even though the internal elements of the PANORAMA BOARD are not shown, they are made up of six, 31 position switches. All resistive elements are etched or screened on to ceramic substrates. A wiper then chooses the proper point on the resistor ladder, producing the appropriate level for that particular signal, (be it channel 1, 2 or even the X-Y crossfeed).

MAIN BOARD IC-101 and 201 are the first gain blocks the signal encounters. Here it may add an 8dB cut, according to the status of the relays K100, 200. Immediately following, the signal leaves through J33 (pins 1, 2) and enters again the LOUDNESS BOARD (J26). Its purpose here at this time, is to attain the Loudness Contour function if so desired. As the Loudness Contour control is stepped down (100--55) the signal is shaped and attenuated according to an ISO (International Standards Organization) response curve (Fig. 2.9). At approximately 1KHz, the attenuation should be 5dB per five phons (1 step). Below 1KHz, the attenuation is less than 5dB, depending on the signal frequency.

The wiper of the Loudness Contour switch is responsible for returning the signal to the MAIN BOARD. Notice however, that it first must pass through the High Filter switch (SW5) and then on to J24 (LOUDNESS) and J35 (MAIN BOARD). The High Filter components (MAIN BOARD) are inserted here, if the previous switching so demanded. If not, the signal moves on to the next stages of gain, IC-104 and 204 (MAIN BOARD, J35 pins 6,1).

IC104 and 204 work in harmony with K101, 201, 102, 202 relays. Their function is adding a 2dB cut (K101, 201) and/or adding 4dB (K102, 202) of gain when called upon. -16dB addition comes from K103, 203 which work with IC-105 and 205. IC-106, 206 together with K104, 204, 105, 205, 106, 206 produce the +.5dB, +1dB and -32dB additions respectively.

Together these aforementioned combinations cut or boost the output level according to their demands. Fig. 7.3 in Sec. 7.4 shows the action of each relay at every .5dB step level (0-63.5). The remaining point with this action is the controlling factor of each of these relays. This will be covered later in the discussion.

After correctly being processed through the gain stages, the signal leaves the MAIN BOARD (J38, pins 9 and 10) and enters the TONE OUTPUT BOARD (#4547) at J48 (TONE OUTPUT; pins 9 and 10). Both of these points have designated letters A and B for ease of location on the schematic.

At these points the signal will also travel to the TONE SWITCH BOARD (#4546) through J46-13 and J45-13 to J50. When the tone controls are inactive, the signal simply travels to and through IC-107, 207 (TONE OUT) to the next stage. However, when the tone controls are active, a much more complicated procedure takes place.

Note IC101, 102, 103 (Channel One only) on the TONE OUT BOARD. These are buffers whose inputs connect directly to each low-mid-high ±15dB gain switch (SW100, 101, 102) on the TONE SWITCH BOARD. As shown, they are connected through J46 PINS 9, 12, 14 (TONE OUT BOARD) to J50 (TONE SWITCH). Leaving these buffers, the output signal enters the Low-Mid-High Center Frequency switch (SW103, 104, 105) also located on the TONE SWITCH BOARD. After this point, it returns to feed each of the three "signal-shaping" ICs 104, 105 and 106 (TONE OUT). These three ICs must then be mixed into one signal and is done so through IC108 where it then is sent to the LOUDNESS BOARD from J47 pins 5 and 6 (TONE OUT) to J53 (LOUDNESS). On the LOUDNESS BOARD the tone activate switch (SW6) determines the "tone processed" signal path. Should it be active, the signal will return through the same connectors and enter at J47-4. It too, like the unprocessed signal, travels on to IC107.

What actually occurs in this process, is a controlling of the signal level (or gain) with IC101, 102 and 103 and a controlling of the signal's frequency with IC104, 105, and 106. Therefore, the intensity of the tone control function depends on how much gain or cut is added "in or out of phase" with the original signal at IC107, and also at what frequency.

After leaving IC107, 207 the signal travels directly to the output mute relay (K101, 201) and also to IC110, 210, an inverting op amp. The inverting op-amp serves several purposes: one is to provide an inverted out signal on the rear panel of the DL2 and the other is to feed the headphone amplifier (IC109, 209) and the mono amplifier (IC1).

As mentioned previously, the Mute Relay is next in line. Drive for the Mute Relay (K101, 201) comes from the LOGIC BOARD through a rather indirect path of several boards and cables. (This path may be traced if desired by following schematics and interconnect drawing. Fig. 7.1)

Leaving the TONE OUT BOARD through J49, the signal travels next to the OUTPUT SWITCH BOARD (#4553) at J52. Here the Main Output signal is switched and the headphone jacks are connected. At J51 the signal now travels to its final destination: the OUTPUT BOARD (#9689). The signal is taken from here at ¼" phone jacks as shown.

Whether the unit is operated manually or through a remote source, the Logic circuitry is the heart of the system. Powered by a +5V regulated voltage, it controls most all switching (this includes mute, level, input selection and on/off functions).

As mentioned earlier, each gain relay (MAIN BOARD) is responsible for a specific amount of cut or gain which together, produce a resultant gain. This means each relay must be individually controlled or triggered according to the demand level.

The Counters (IC101, 201, 102, 202 on LOGIC BOARD.) and the Clock (IC-17) are the main control

and 4) which drives the Counter count up or down depending upon the chosen command. In other words, the Clock generates the pulse necessary to drive the Counters up or down, depending upon the signal from the up or down Logic circuitry. IC100D, 200B (overange) and IC103, 203 (underange) decoders, help prevent the Counters from exceeding their upper and lower limits. Should they reach these limits, the muting circuit will automatically become active. This is noted when the step level is below 0 (lower limit) as a line on the front panel display.

The output from the Counters is sent two places; to the main drive logic for the Gain Relays and also to the DISPLAY BOARD (#4552).

The main drive for the gain relays are IC3C, 105 and IC 106 and IC38, 205 and 206, A, B, C, D (LOGIC). They in effect, decode the binary signal and send it on to the MAIN BOARD at J23 (MAIN BOARD). This is the drive signal for each of the seven (per channel) gain relays. Note that these signals leave through point H from Counters and enter through H on gain relay logic circuitry. The display board must also decode the information from the Counters. This is done by IC100, 200 (DISPLAY BOARD) which passes the BCD signal on to the display chip drivers (IC101, 201, 102, 202). Each driver supplies the segment information to First (tens) and Second (ones) digit display chips, thus appearing as decimal equivalents. The third digit is preset to 5 and serves as a half display after the decimal point. The fourth digit is the "over" and "under" range line display.

Perhaps this is a good time to mention that all remote connections (i.e. computer) are made through J2 and J3 on the LOGIC BOARD (access from rear panel). The inverter (IC14 and IC2D) and nand gates IC7A, B; 8A, B; and 9A along with IC13 A, B, C, D; IC14C, D (L.B.) control the on/off, up or down level and input selection functions when fed with the proper signal(s). (See Sec. 3.10; remote connection.)

Mute Drive originates from IC16A, C, D, IC10C, and IC3A, D along with on/off drive from IC6B, 5B and 4B (LOGIC BOARD).

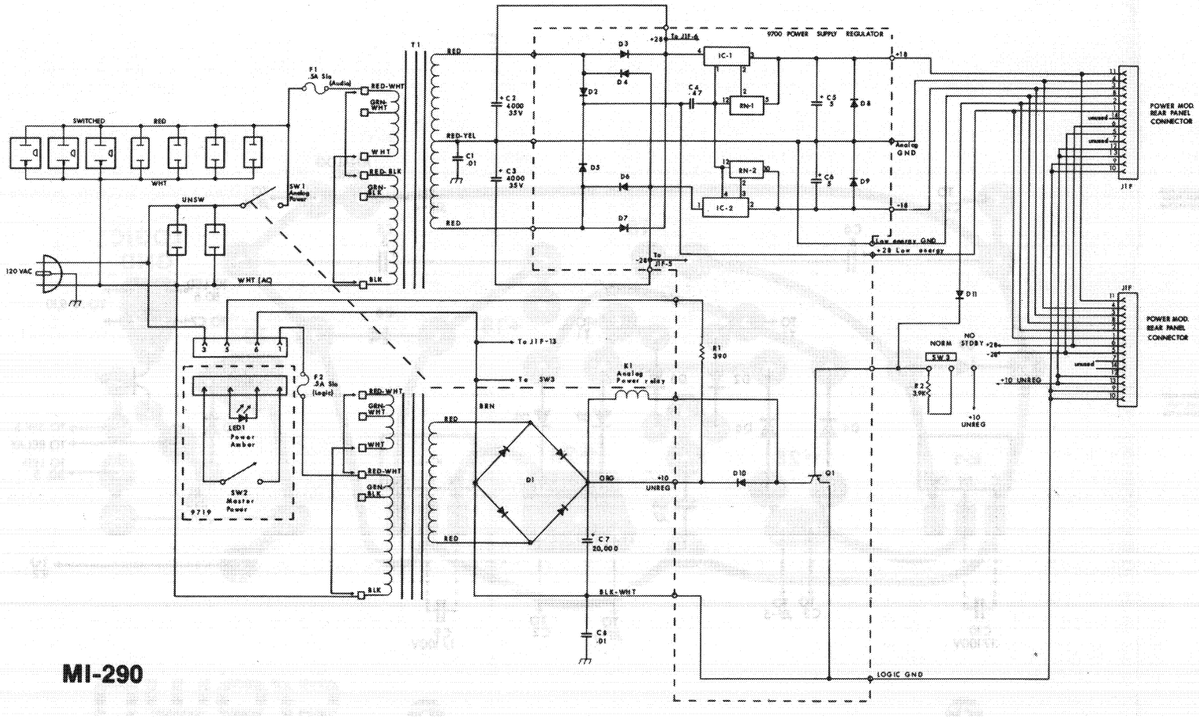
Finally, note the power supply. Six voltages are used from its output: ±28V, ±18V, +10V, and a low energy +28V.

±28V is unregulated and used to drive the Headphone amplifier. The low energy +28V is used to activate the Audio Mute Relays (TONE OUTPUT BOARD).

±18V is regulated and is the Analog or Audio supply.

+10V is unregulated and supplies +10V Power Supply Relay (K1) as well as feeding the +5V regulator located on the Main Control Unit. A regulator of this type is placed nearest its recipient to avoid possible noise and/or oscillations that may develop otherwise. This is the reason it is located on the rear panel of the Main Control Unit. It is responsible for driving all logic circuitry in the Main Control Unit.

The Normal - No Standby Switch (SW3) allows the Power Module to be operated without the Main Control Unit for powering phono modules, i.e. in a dealer turntable demo display. When SW3 is in the No-Standby position, the main power relay is held "in" to supply DC for all modules and AC on all switched outlets without a Main Control Unit.



MI-290

Fig. 4.2A DL2 Power Supply Schematic

DL2 SCHEMATIC NOTES

GENERAL:

- CIRCUITS SHOWN START WITH SN1001 DL2 CONTROL
- DL2-S SUPPLY SHOWN IN TWO VARIATIONS WITH RESPECT TO SERIAL NUMBERS
- ALL RESISTORS ARE IN OHMS, UNLESS OTHERWISE DESIGNATED
- ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE DESIGNATED
- COMPONENTS COMMON TO BOTH CHANNELS ARE NUMBERED 1 TO 99
- LEFT CHANNEL COMPONENTS ARE NUMBERED FROM 100 TO 199 PER BOARD
- RIGHT CHANNEL COMPONENTS ARE NUMBERED FROM 200 TO 299 PER BOARD
- JF INDICATES FEMALE JACK; JM INDICATES MALE JACK

POWER SUPPLY:

- CIRCUIT SHOWN FOR SN101 THROUGH SN710
- WIRE COLOR CODES ARE GIVEN FOR THE MAIN POWER SUPPLY
- K1 ANALOG POWER RELAY SHOWN INACTIVE
- SW2 SHOWN IN "OFF" POSITION
- SW3 SHOWN IN "NORM" POSITION
- POWER SUPPLY WIRED FOR 120VAC, 60Hz

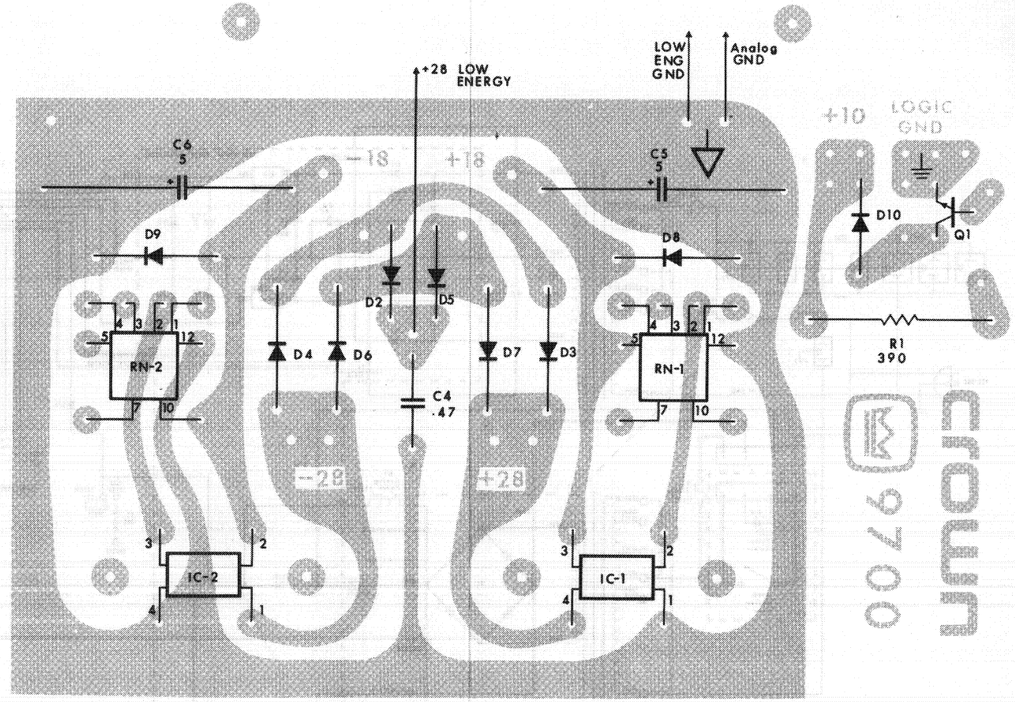
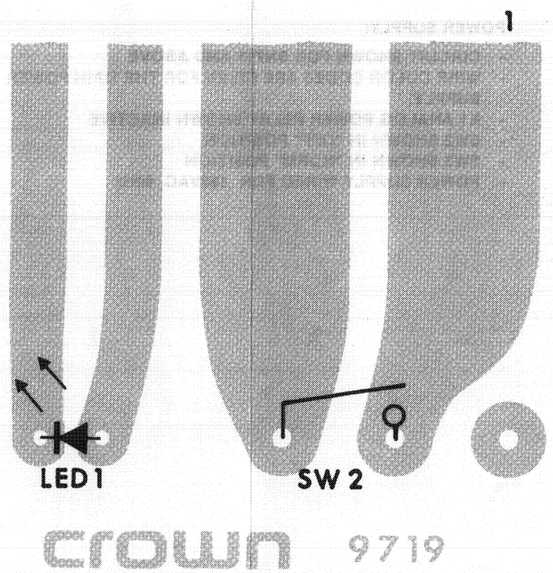


Fig. 4.2B Power Supply Board Layout



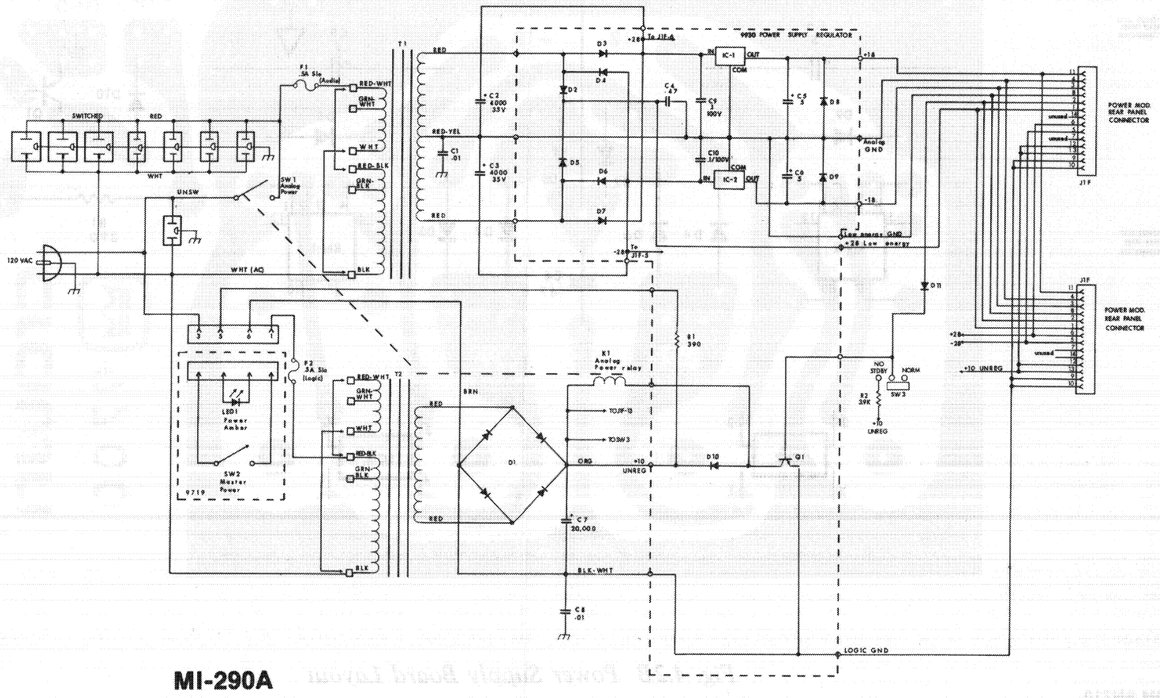


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Fig. 4.2C DL2-S Power Supply Schematic

POWER SUPPLY:

- **CIRCUIT SHOWN FOR SN711 AND ABOVE**
- **WIRE COLOR CODES ARE GIVEN FOR THE MAIN POWER SUPPLY**
- **K1 ANALOG POWER RELAY SHOWN INACTIVE**
- **SW2 SHOWN IN "OFF" POSITION**
- **SW3 SHOWN IN "NORM" POSITION**
- **POWER SUPPLY WIRED FOR 120VAC, 60Hz**

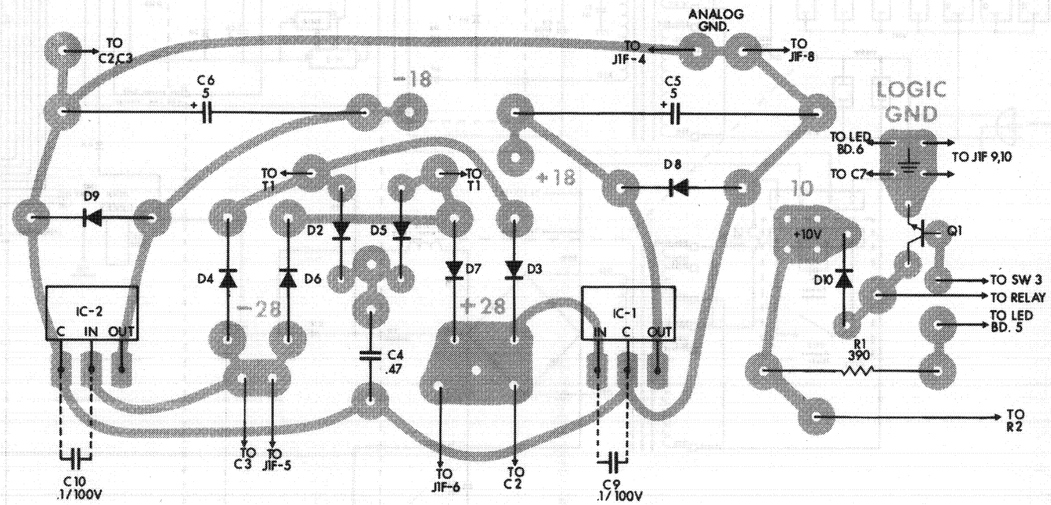

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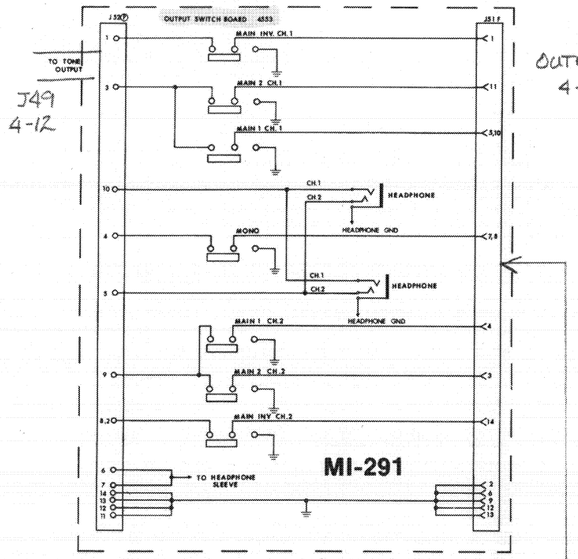
Fig. 4.2D DL2-S Power Supply Board Layout



OUTPUT BRD J41
4-7

J49
4-12

Fig. 4.3A Output Switch Board Schematic

OUTPUT SWITCH/OUTPUT BOARD:

- P DESIGNATES PERMANENT CONNECTION

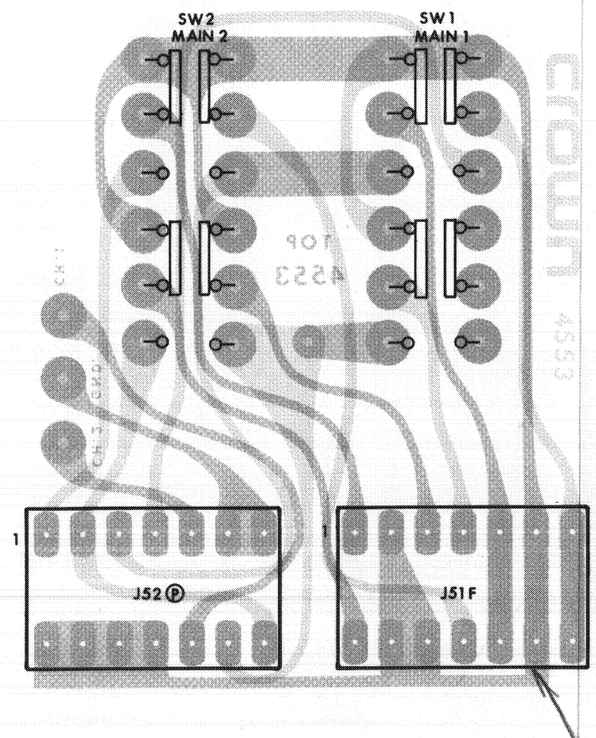
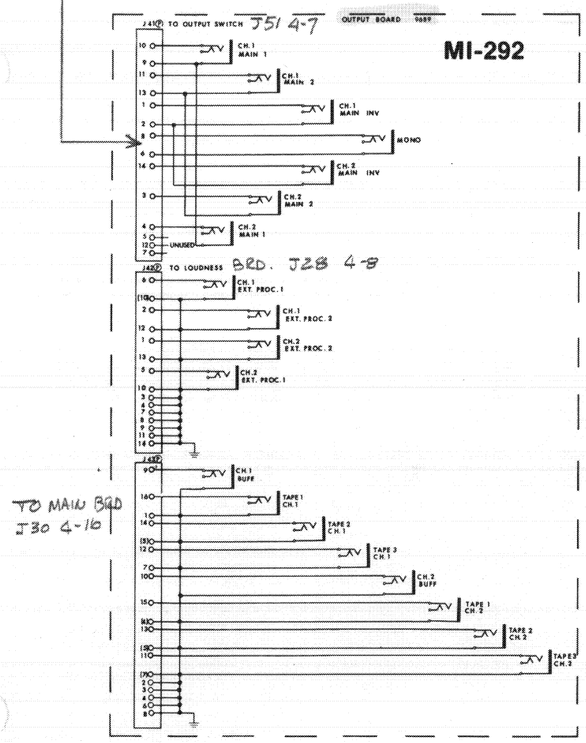


Fig. 4.3B Output Switch Board Layout



TO MAIN BRD
J30 4-16

Fig. 4.4A Output Board Schematic

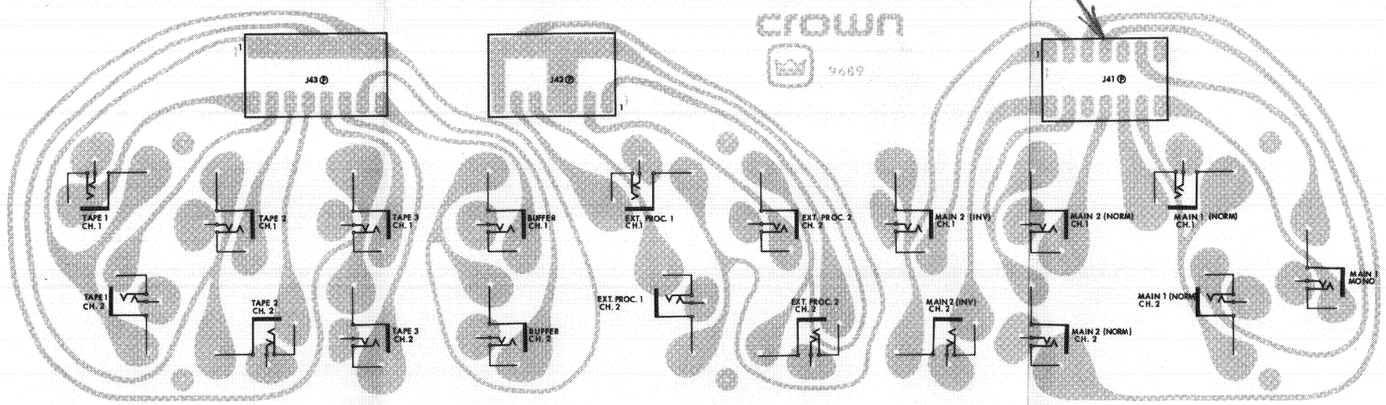


Fig. 4.4B Output Board Layout

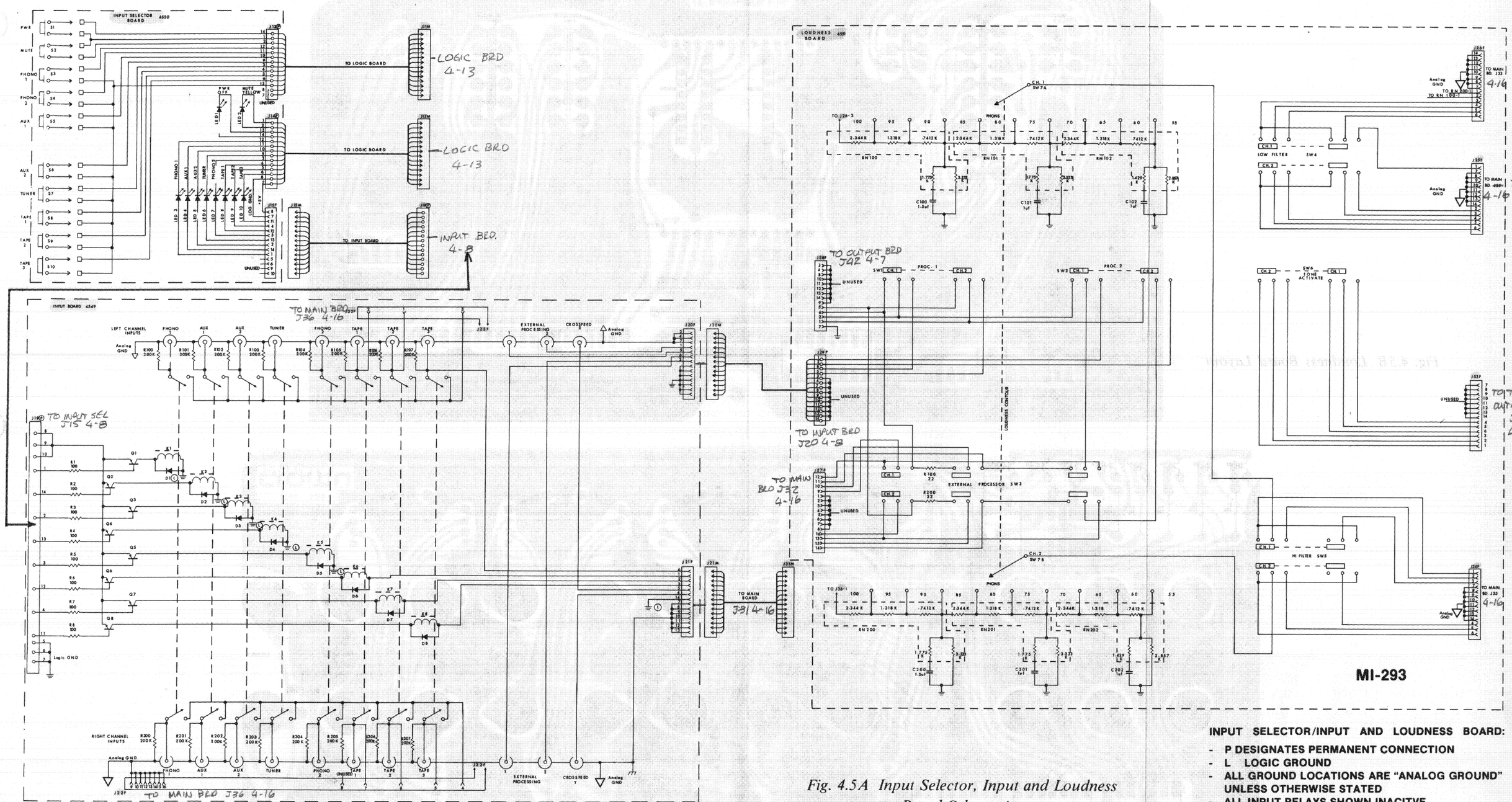


Fig. 4.5A Input Selector, Input and Loudness Board Schematics

INPUT SELECTOR/INPUT AND LOUDNESS BOARD:

- **P DESIGNATES PERMANENT CONNECTION**
- **L LOGIC GROUND**
- **ALL GROUND LOCATIONS ARE "ANALOG GROUND" UNLESS OTHERWISE STATED**
- **ALL INPUT RELAYS SHOWN INACITVE**
- **SW1, SW2 SHOWN INACTIVE**
- **SW3 SHOWN INACTIVE**
- **SW3 SHOWN INACTIVE**
- **SW5 SHOWN INACTIVE**
- **SW6 SHOWN INACTIVE**

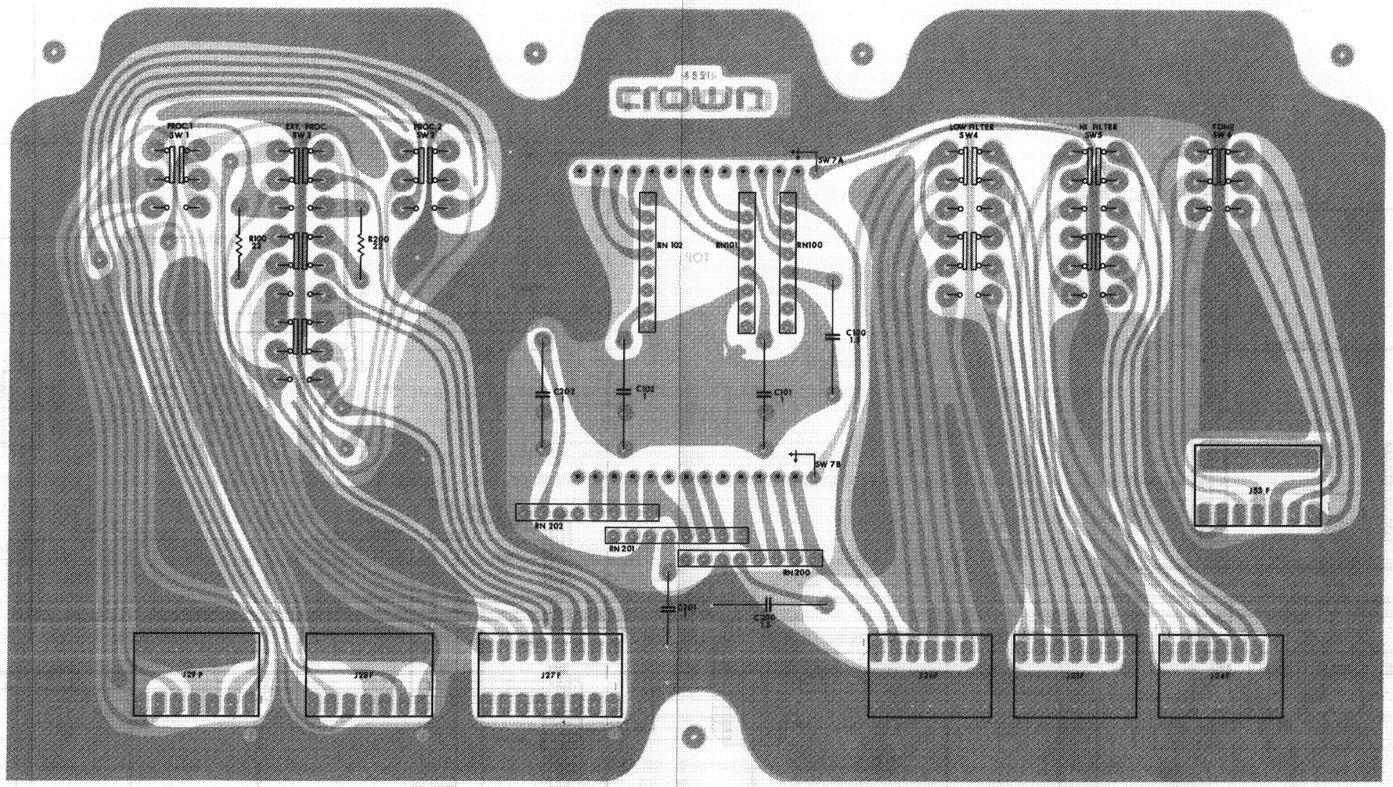


Fig. 4.5B Loudness Board Layout

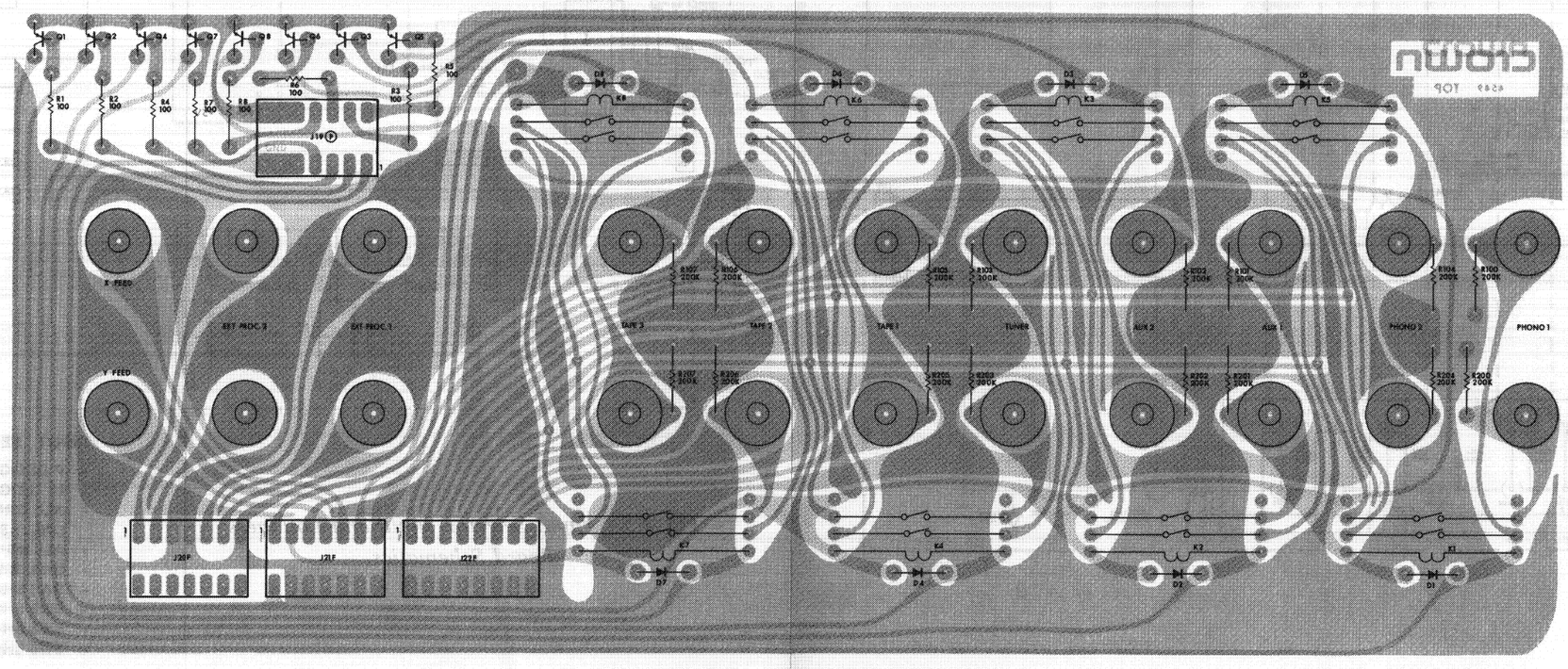


Fig. 4.5C Input Board Layout

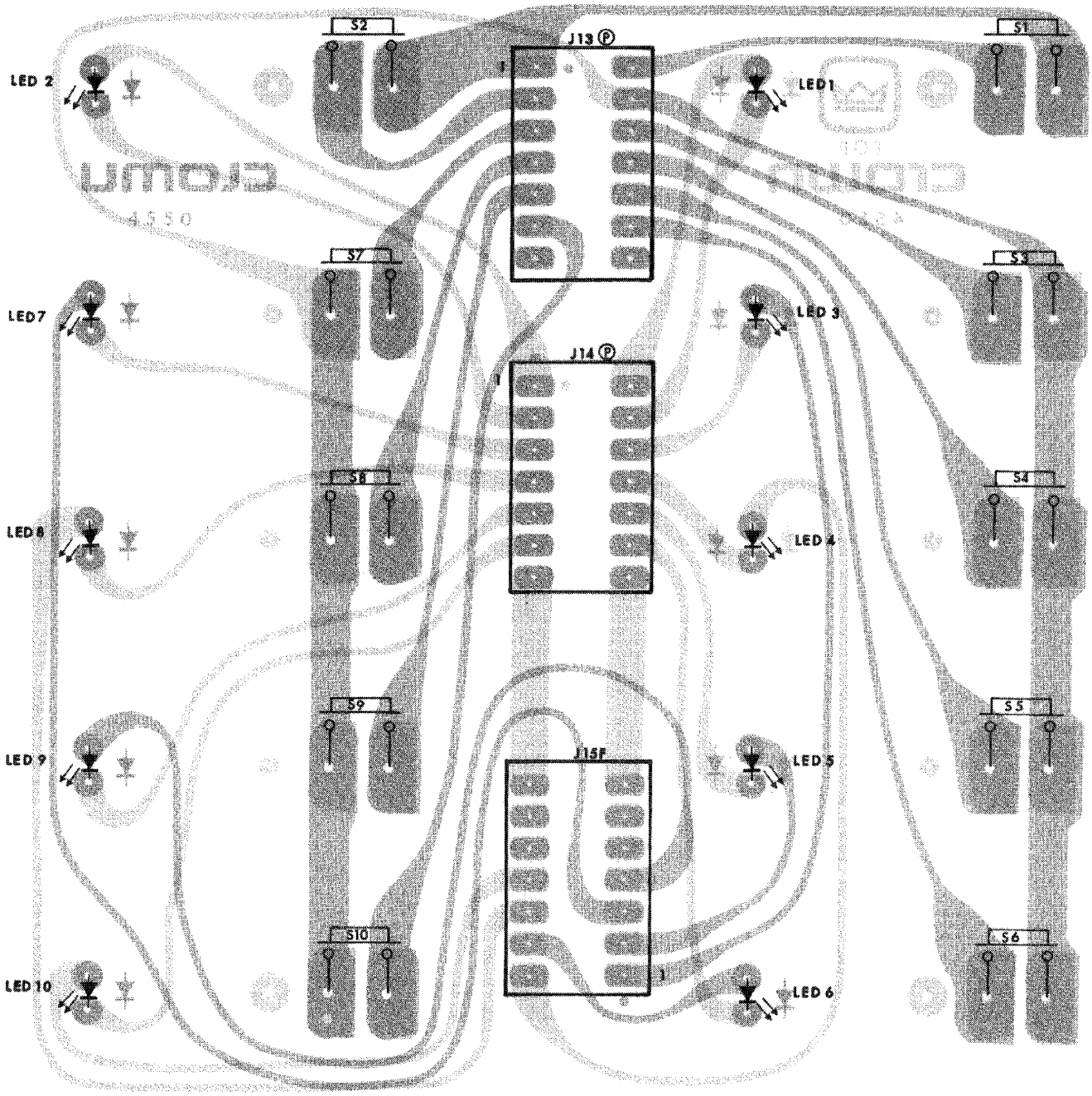


Fig. 4.5D Input Selector Board Layout

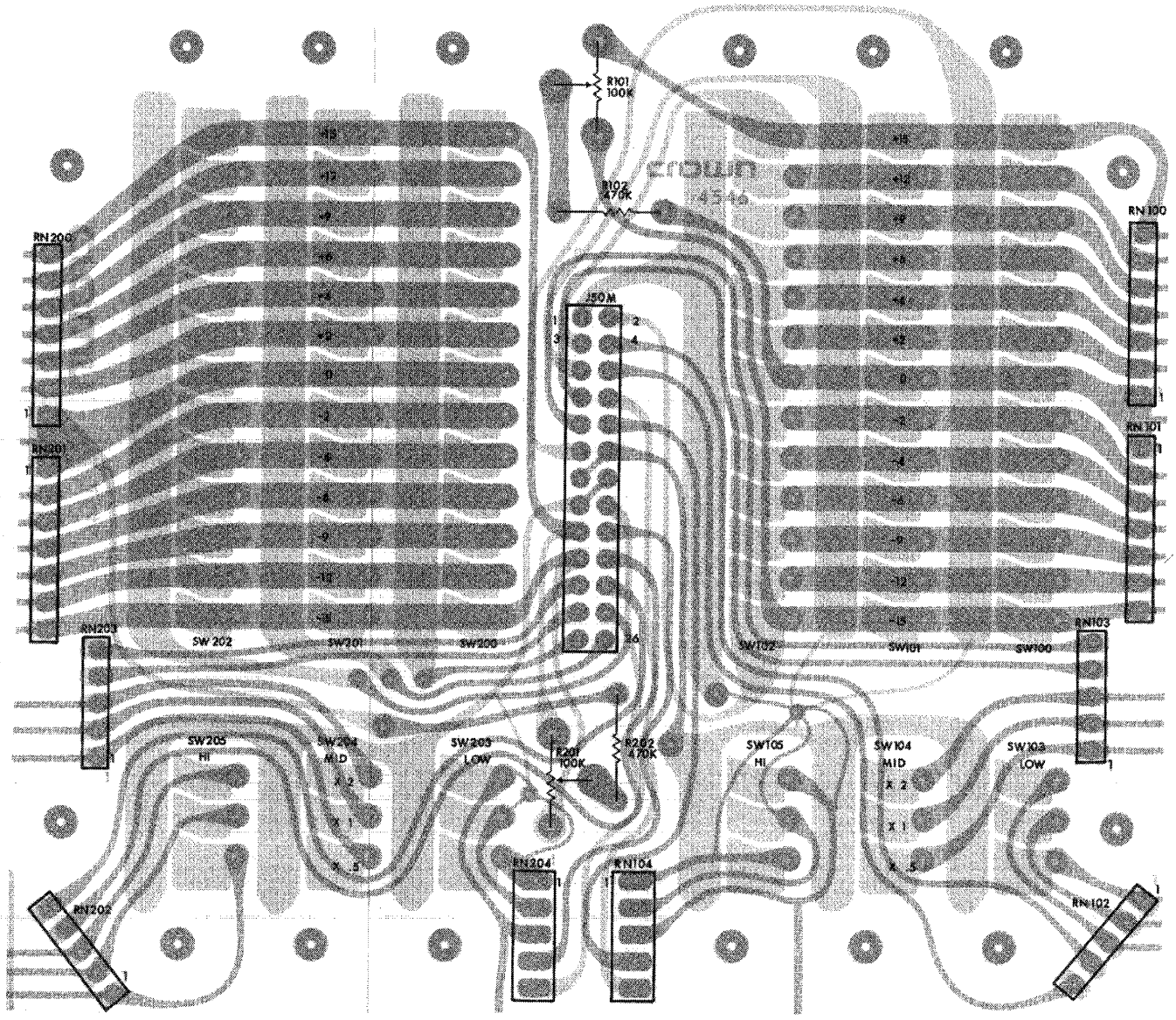


Fig. 4.6B Tone Switch Board Layout

MI-294

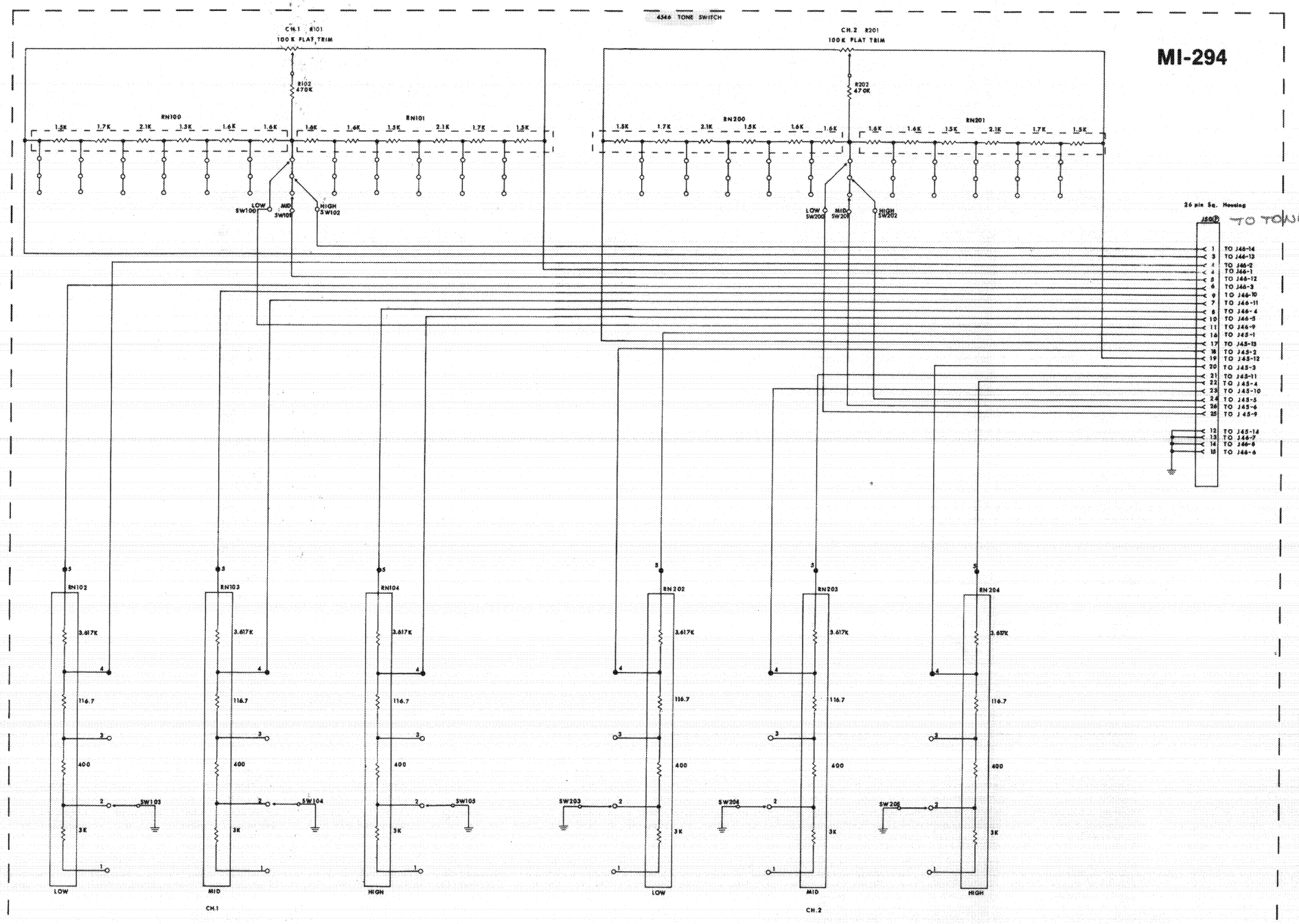


Fig. 4.6A Tone Switch Board

TONE SWITCH BOARD:

- **P DESIGNATES PERMANENT CONNECTION**
- **SW103, 203 SHOWN X1**
- **SW104, 204 SHOWN X1**
- **SW105, 205 SHOWN X1**
- **RN INDICATES RESISTOR NETWORK**
- **SW100, 200, 101, 201, AND 202 SHOWN AT ZERO dB POSITION**

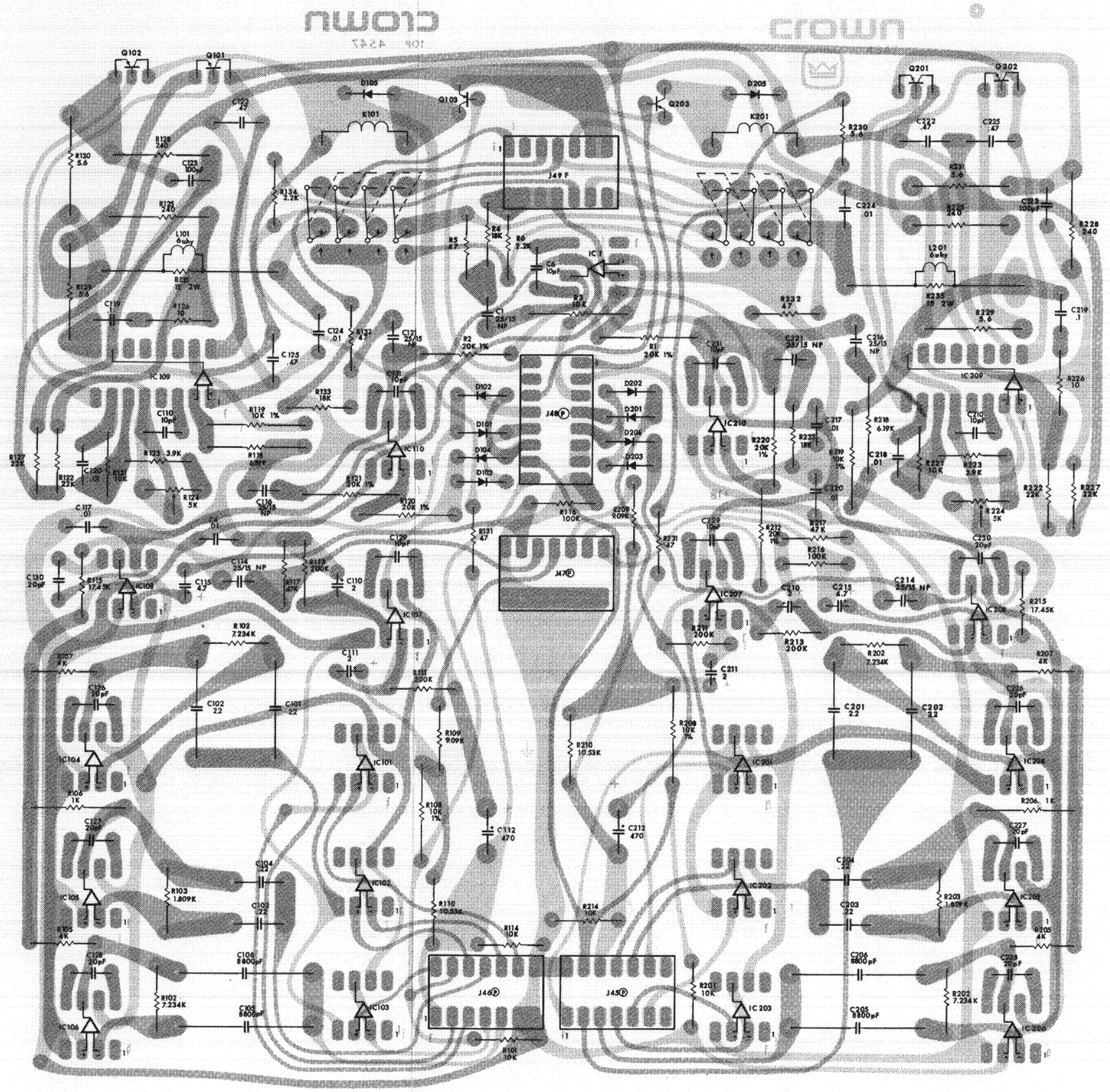


Fig. 4.7B Tone Output Board Layout

TONE OUTPUT BOARD:

- **P DESIGNATES PERMANENT CONNECTION**
- **ALL GROUND LOCATIONS ARE "ANALOG GROUND" UNLESS OTHERWISE SPECIFIED**
- **K101, 201 SHOWN ACTIVE**

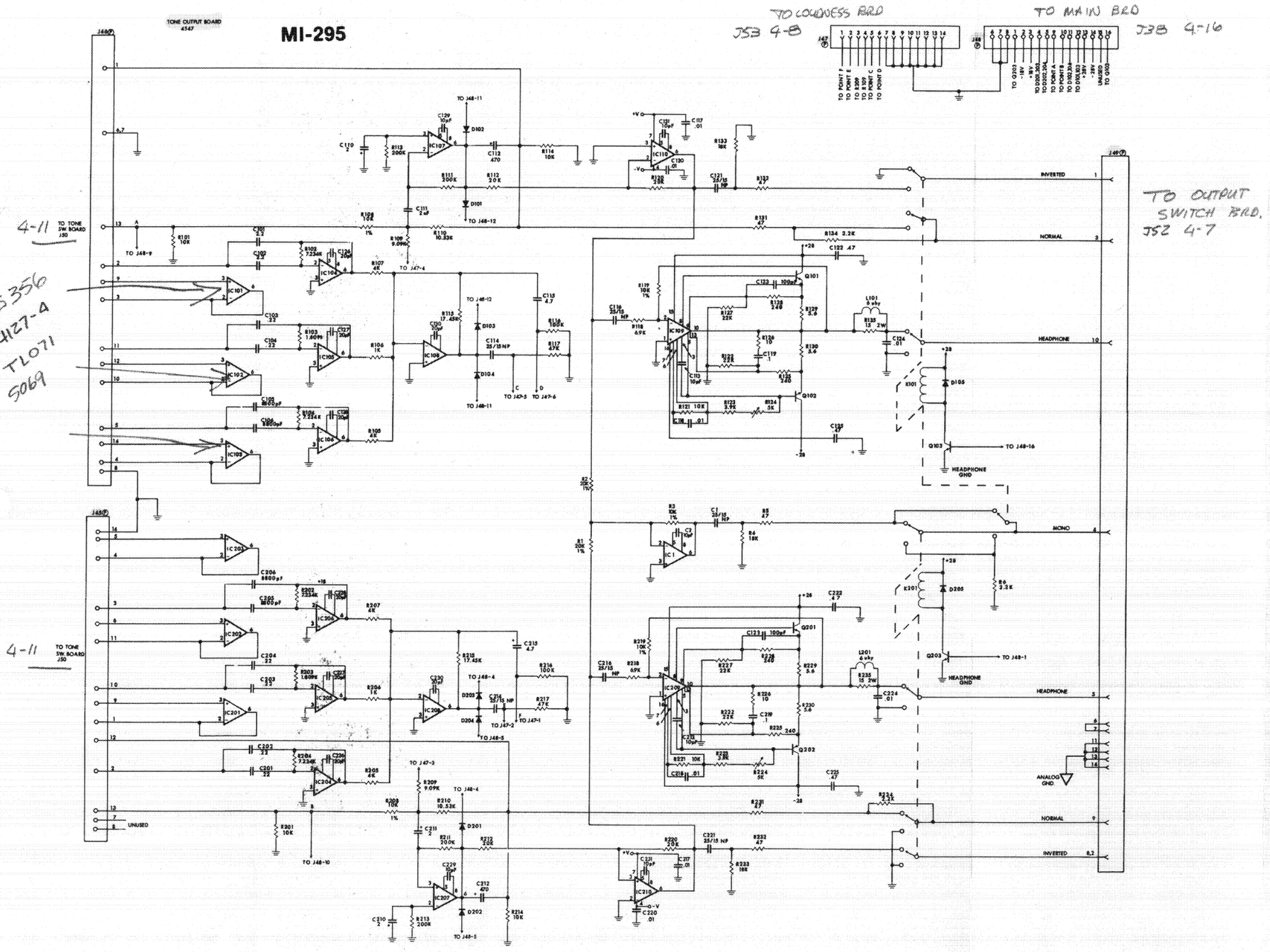
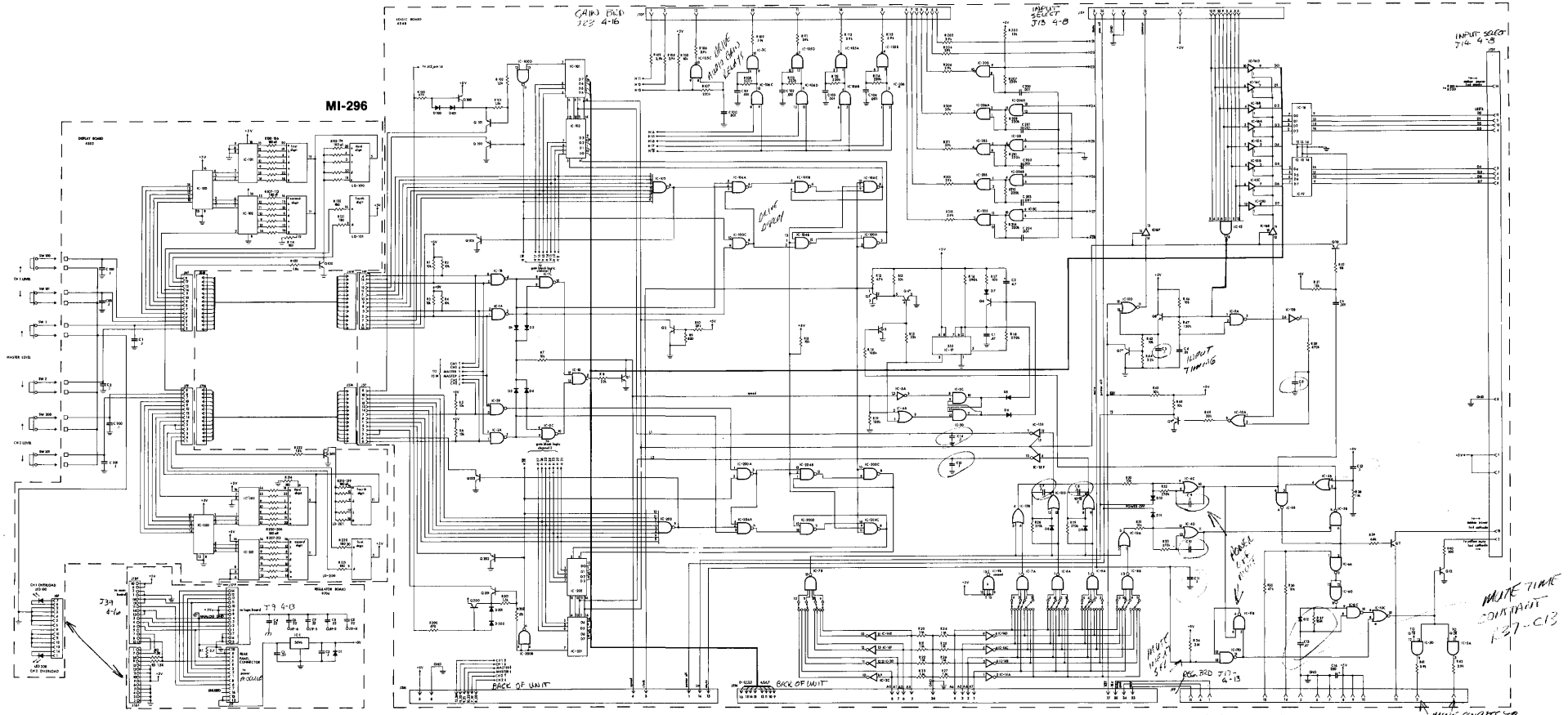


Fig. 4.7A Tone Output Board Schematic



DISPLAY, LOGIC AND REGULATOR BOARD:
- **ALL GROUND LOCATIONS ON LOGIC BOARD ARE "LOGIC GROUND" UNLESS OTHERWISE SPECIFIED**

Fig. 4.8A Display, Logic and Regulator Board Schematics

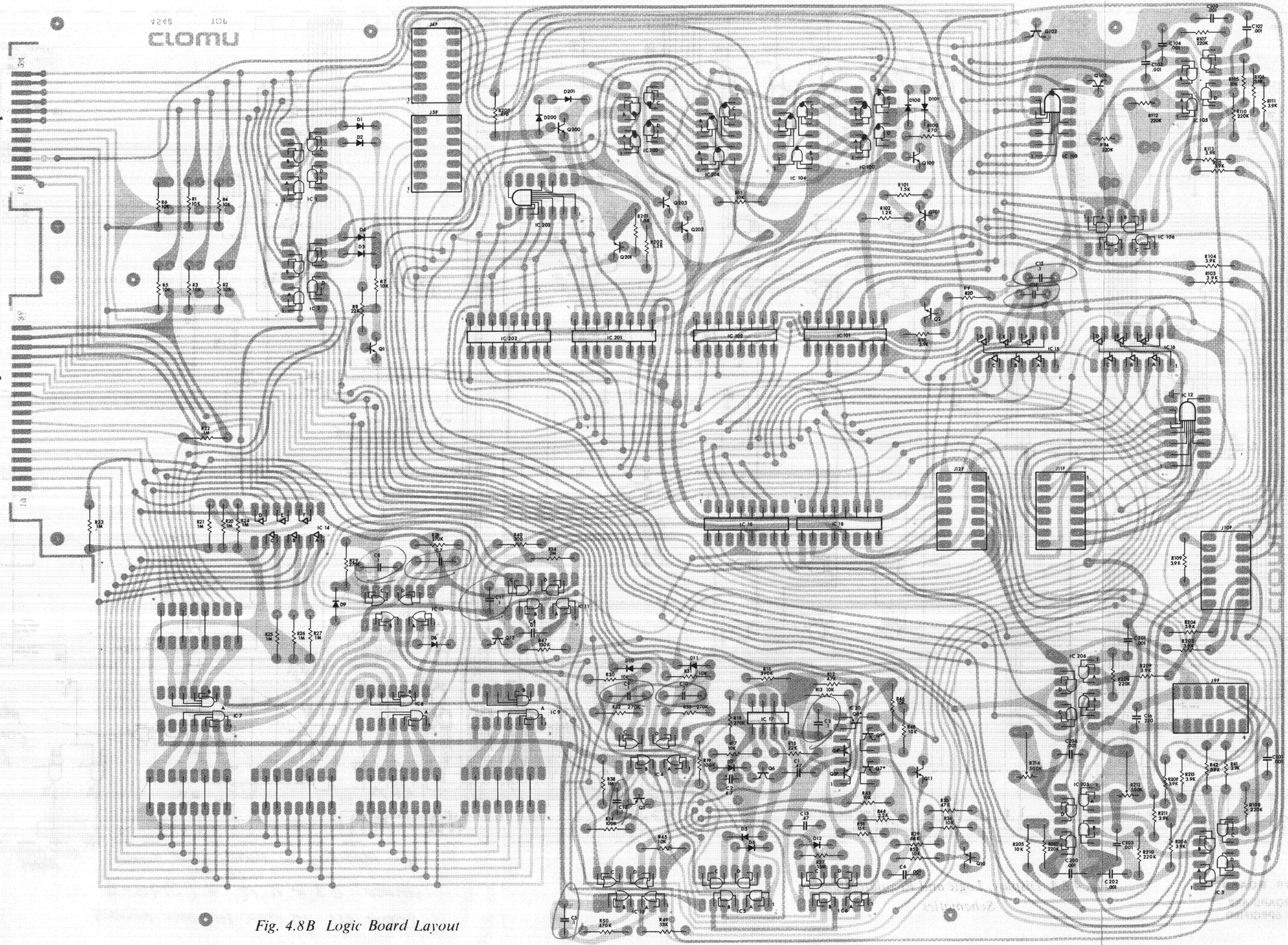


Fig. 4.8B Logic Board Layout

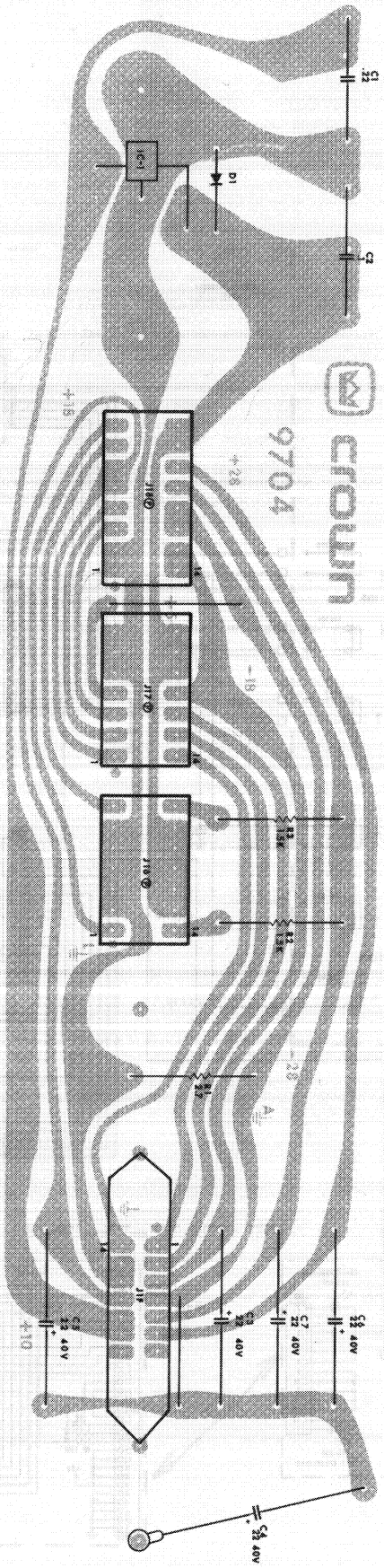


Fig. 4.8C Regulator Board Layout

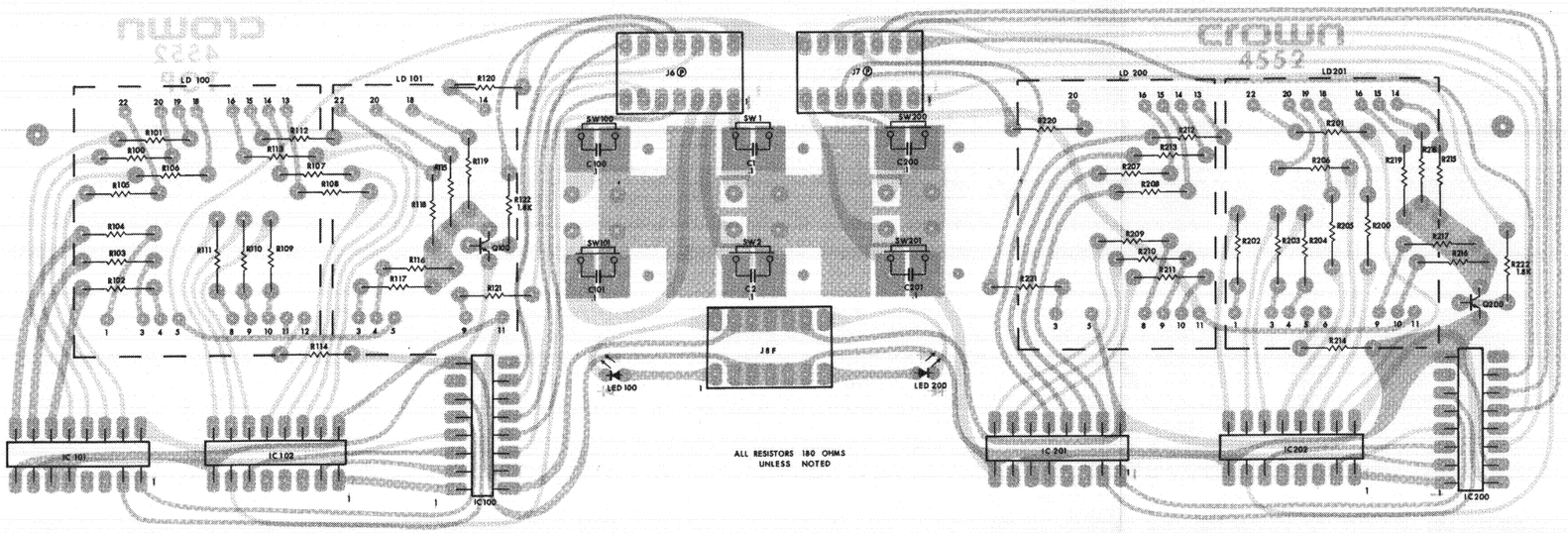
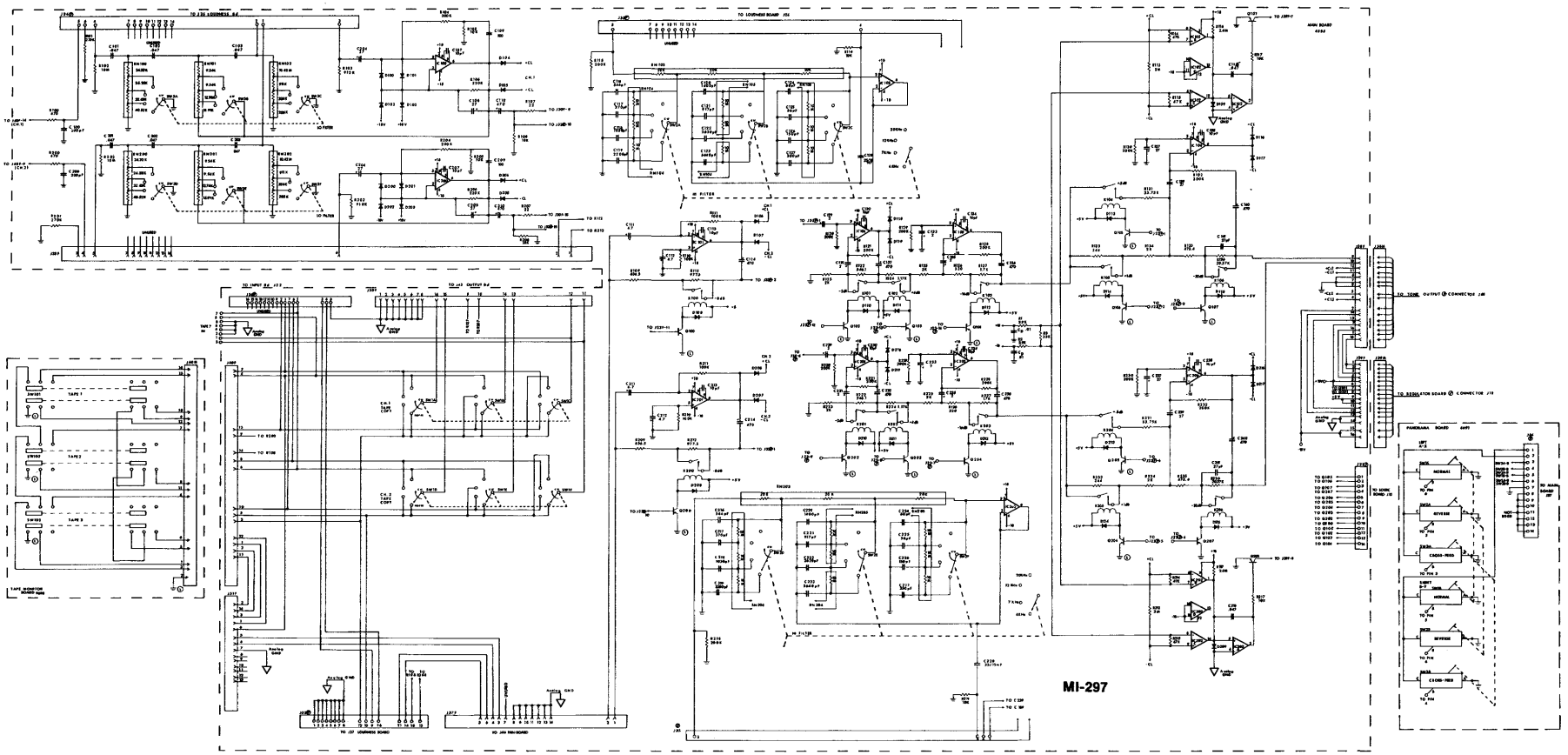


Fig. 4.8D Display Board Layout



MAIN, TAPE MONITOR AND PANORAMA BOARD

- ALL GROUND LOCATIONS ARE "ANALOG GROUND" UNLESS OTHERWISE SPECIFIED
- L INDICATES LOGIC GROUND
- SW101, 102, 103 SHOWN INACTIVE
- SW3 SHOWN AT 20Hz POSITION
- SW2 SHOWN AT 4KHz POSITION
- SW1 SHOWN AT NORM POSITION
- ALL GAIN RELAYS SHOWN INACTIVE
- +CL, -CL ARE CLIP LEVEL POINTS

Fig. 4.9A Main Board, Tape Monitor and Panorama Board Schematic

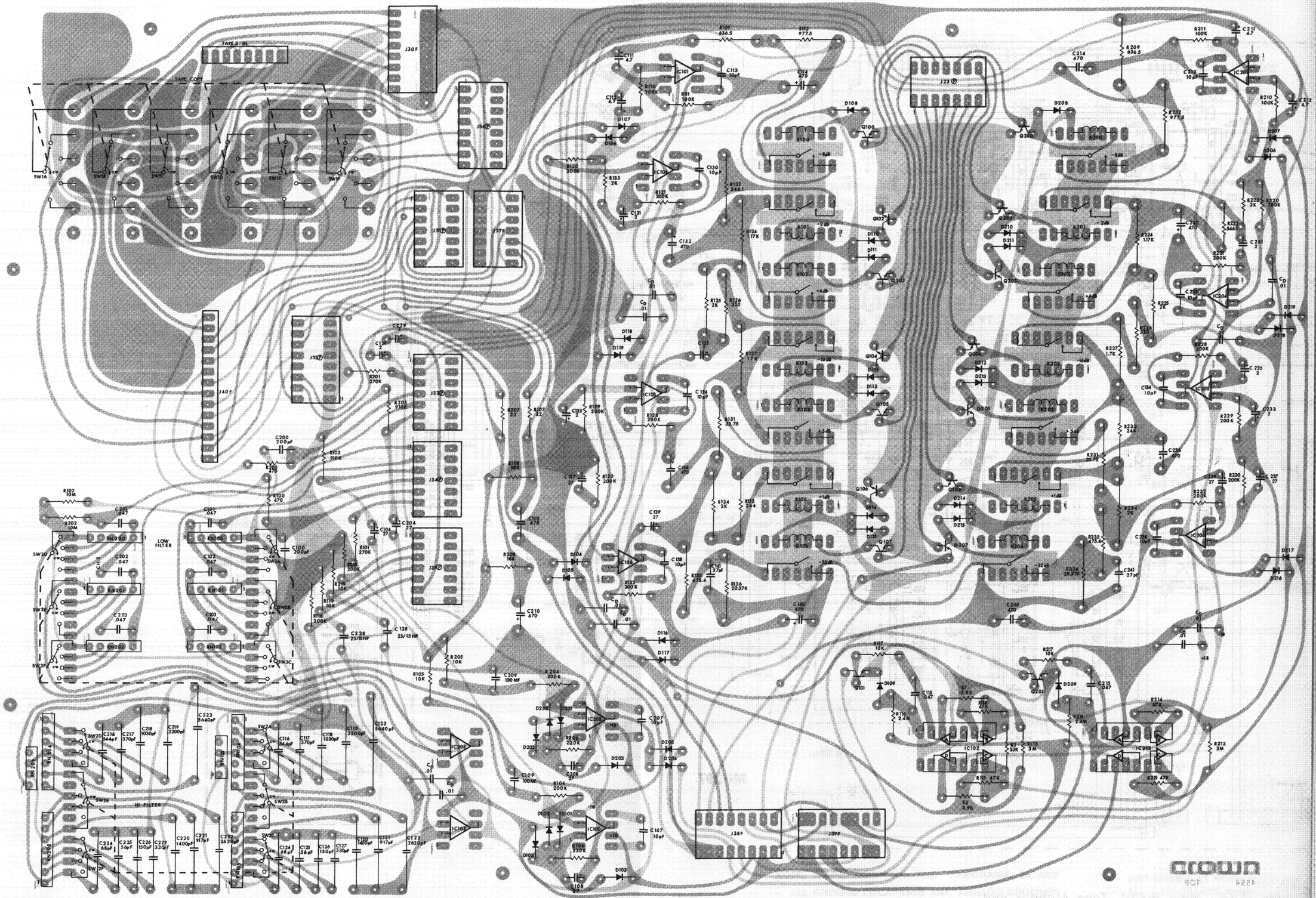


Fig. 4.9B Main Board Layout

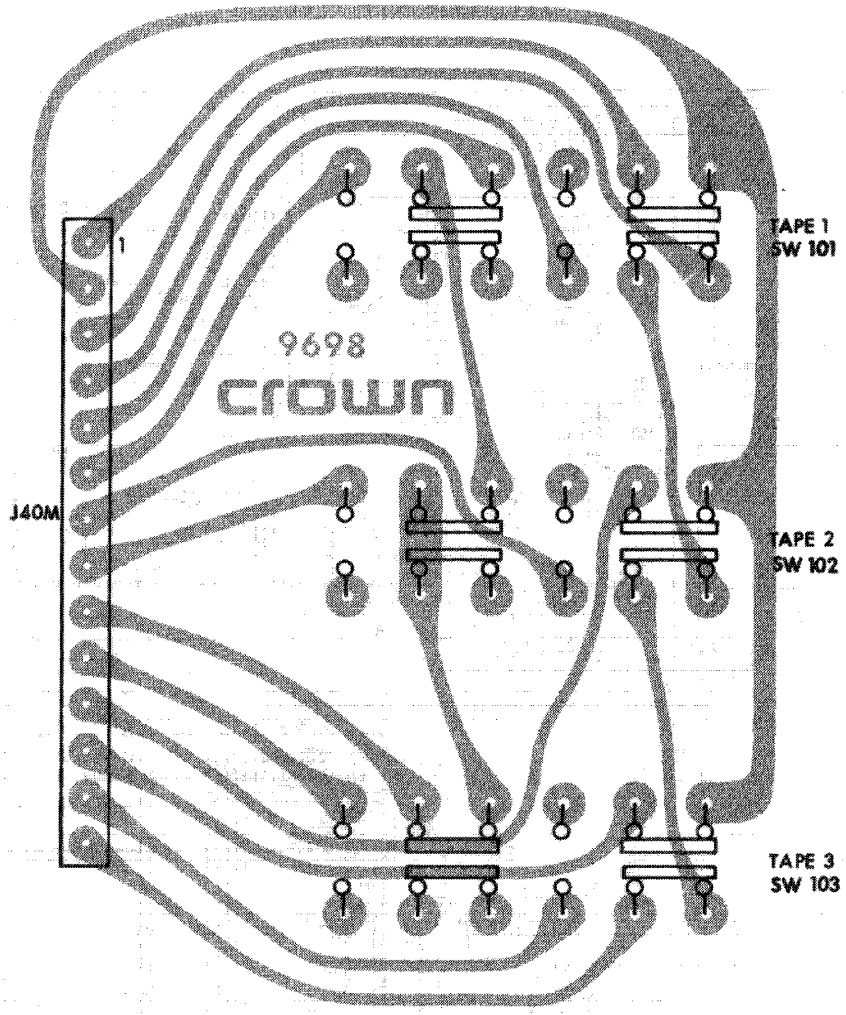


Fig. 4.9C Tape Monitor Board Layout

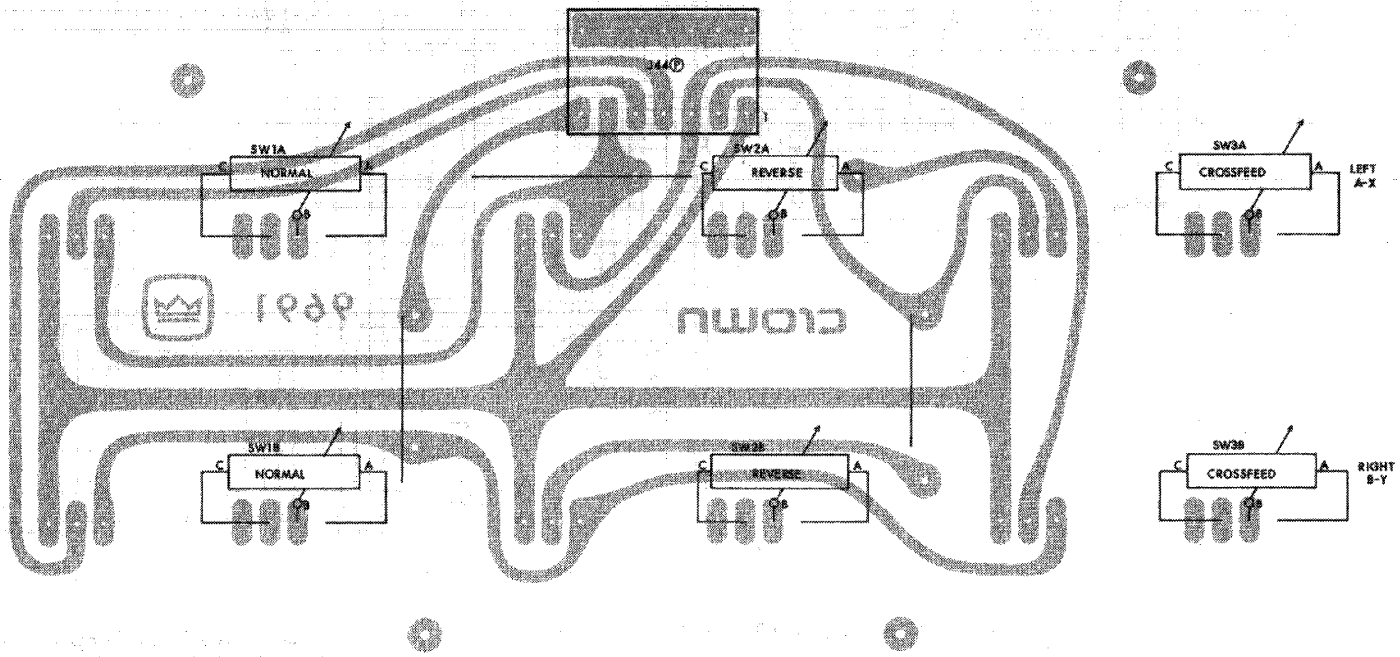


Fig. 4.9D Panorama Board Layout

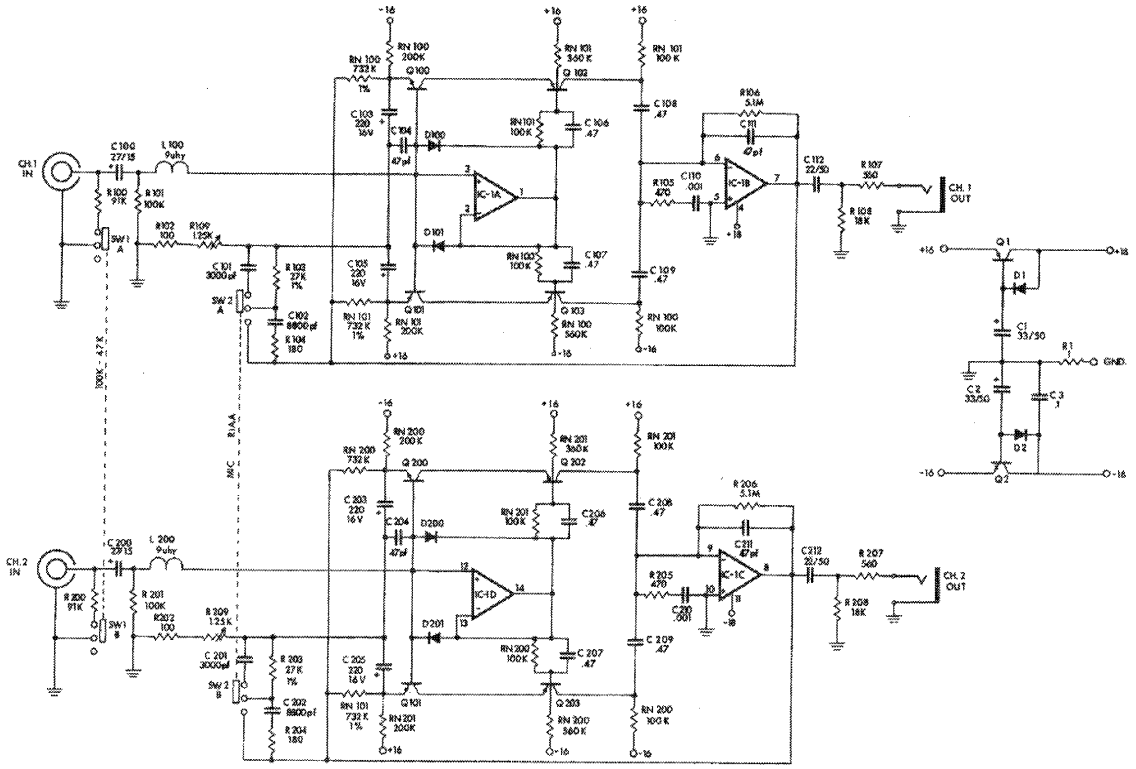


Fig. 4.10A DL2-PM Schematic

PHONO MODULE BOARD:

- **SW1 SHOWN IN 47K POSITION**
- **SW2 SHOWN IN RIAA POSITION**
- **RN INDICATES RESISTOR NETWORK**

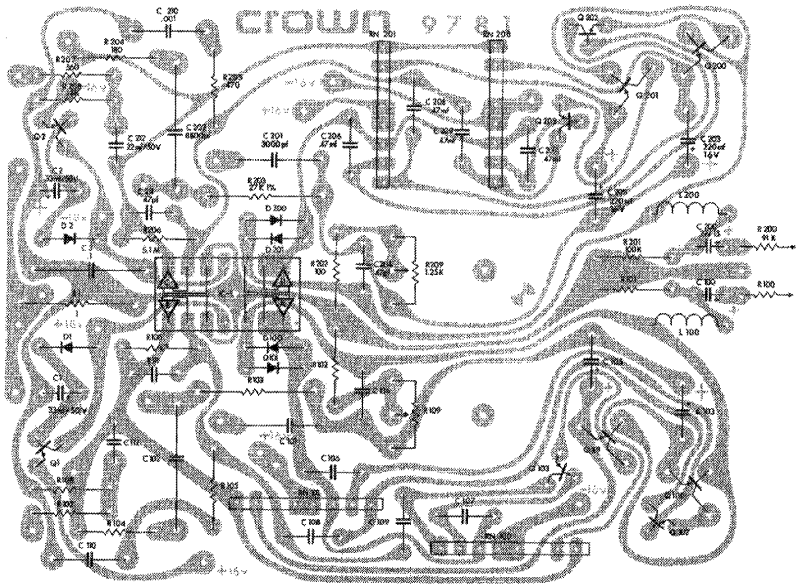


Fig. 4.10B DL2-PM Board Layout

SECTION 5
ACCESSORIES/OPTIONS

INTRODUCTION

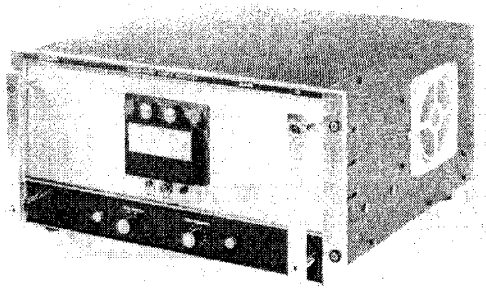
This section contains information concerning Crown products, accessories used with these products, and optional equipment available at an additional cost to the consumer.

D-75 AMPLIFIER

The CROWN D-75 single or dual channel amplifier (35 watts per channel, 8 ohms; 45 watts per channel 4 ohms) may be used for driving efficient speaker systems, as a headphone amplifier, or as an amplifier for the ambience channels in a four channel system.

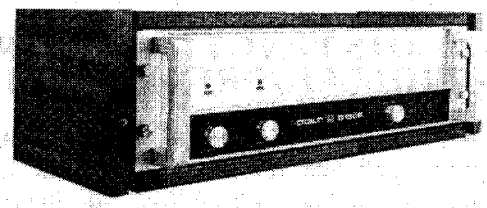
M-600 AMPLIFIER

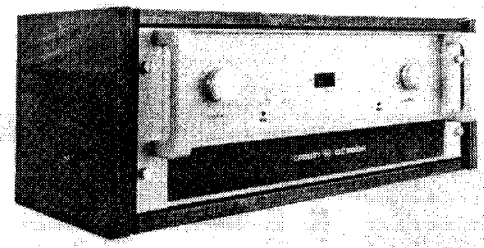
The CROWN M-600 power amplifier provides 600 watts of continuous power into 8 ohms, and 1000 watts into 4 ohms. An adaptable input module format fits the varied need and operating environments of industrial and commercial audio uses.



D-150A, DC-300A AMPLIFIERS

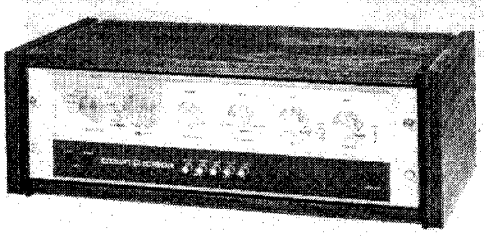
The CROWN D-150A (80 watts per channel into 8 ohms; 125 watts per channel into 4 ohms) and DC-300A (155 watts per channel into 8 ohms; 250 watts per channel into 4 ohms) are single or dual channel amplifiers designed for precision amplification of frequencies from DC to 20KHz. These amplifiers also provide extremely low harmonic and intermodulation distortion with very low noise.





IC-150A CONTROL CENTER

The CROWN IC-150A is an input control center and preamplifier designed for the professional user and the sophisticated audiophile.

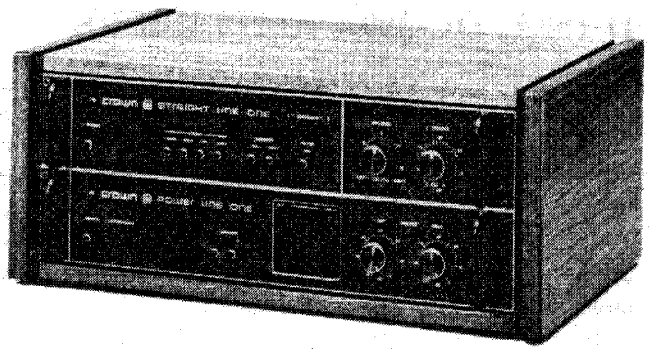


STRAIGHT LINE ONE PREAMPLIFIER

The CROWN SL-1 is a sophisticated high performance pre-amplifier. The superior technology and "straight wire" approach provide precise signal control for any sound system.

POWER LINE ONE AMPLIFIER

The CROWN PL-1 is a high quality audio power amplifier (50 watts per channel into 8 ohms; 80 watts per channel into 4 ohms) designed to compliment the SL-1 stereo preamplifier.

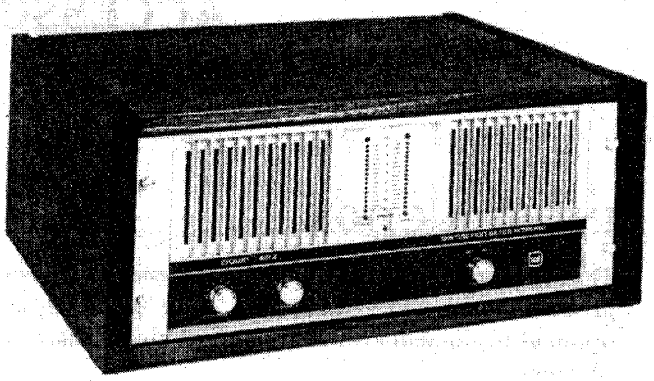


DL-2 DISTINCTION SERIES CONTROLLER/PREAMPLIFIER

The CROWN DL2 is a digital control center and preamplifier designed for the highest sonic qualities attainable by today's technology. It incorporates numerous unique features including 3 module construction; phono preamp, control unit and power supply.

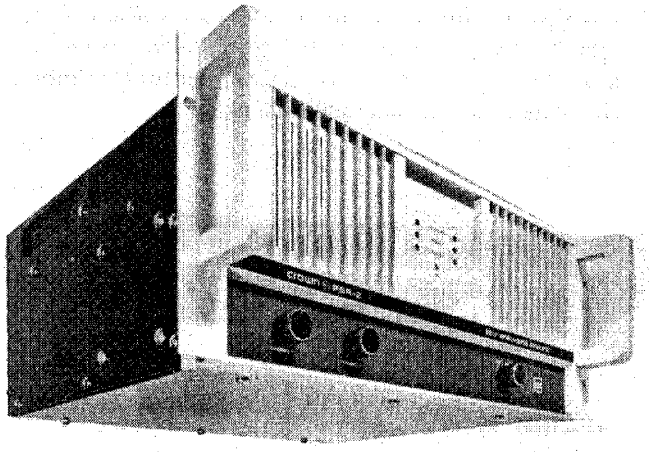
SA2 AMPLIFIER

The CROWN SA2 is a 220 watts per channel power amplifier designed for the highest sonic quality and reliability attainable by today's technology. It employs the Crown Self-Analyzing output system, which uses analog computers to continually adjust the amplifier's output limits.



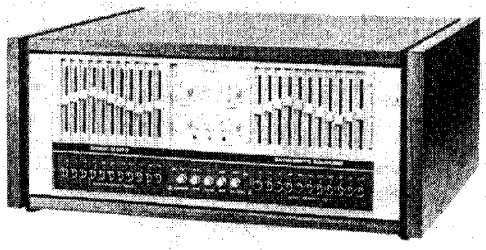
PSA-2 AMPLIFIER

The CROWN PSA-2 is the professional counterpart of the SA2 power amplifier. It incorporates many unique features for use in today's demanding sound systems.



EQ2 EQUALIZER

The CROWN EQ2 is designed to take care of frequency amplitude problems due to room acoustics, poor loudspeaker response, and poor cartridge response. A flexible tone control system is combined with 22 half octave width filters with movable center frequencies.

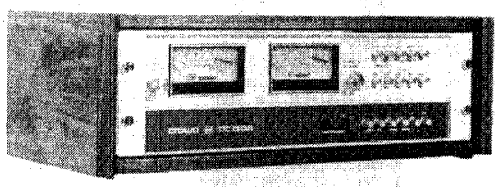


FM-1 TUNER

The CROWN FM-1 is a precision Stereo FM Tuner including such features as digitally-synthesized tuning superior sound quality, precise tuning, and ease of use make the FM-1 unique.

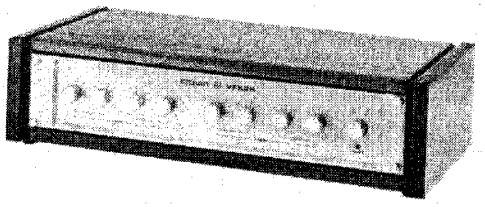
OC-150A CONTROL CENTER

The CROWN OC-150A is designed for precision output monitoring and amplifier/speaker switching.



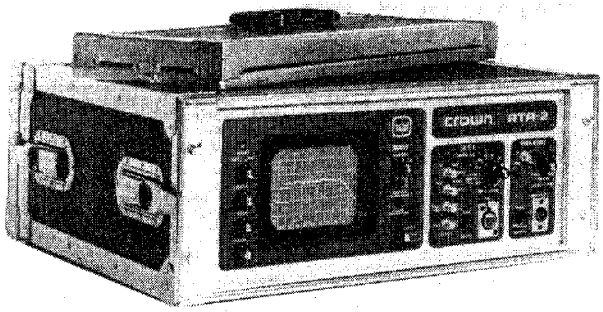
VFX-2A CROSSOVER/FILTER

The CROWN VFX-2A provides two sets of continuously variable filters which can be used to perform either crossover or bandpass functions.

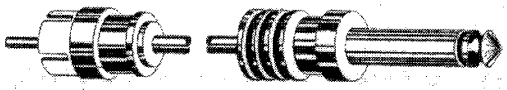


RTA-2 REAL TIME AUDIO ANALYZER

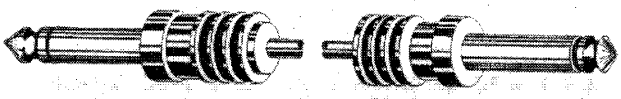
The CROWN RTA-2 is an audio band Real Time Analyzer designed to measure acoustical and actual frequency responses in third octave bands from 16Hz to 20KHz.



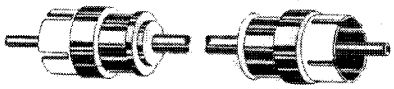
6′ PIN TO PHONE CABLES — CPN 3339



6′ PHONE TO PHONE CABLES — CPN 4363



6′ PIN TO PIN CABLES — CPN 3338



1¾" RACK EARS — CPN 4800

Use with the D-75.

3" RACK EARS — CPN 41667

Used with the VFX-2A and DL2 POWER module.

5" RACK EARS — CPN 4802

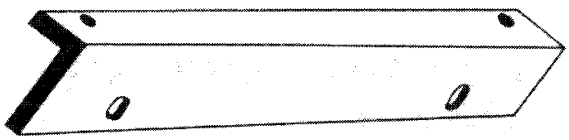
Used with the D-150A, IC-150A, OC-150A, FM1.

7" RACK EARS — CPN 20037

Used with the DC-300A.

7" RACK EARS — DISTINCTION SERIES — CPN 4267

Used witht he DL2, SA2, EQ2 and RTA-2.



MOUNTING SCREWS — CPN 20032

Used with Crown equipment to secure equipment to rack mounts.

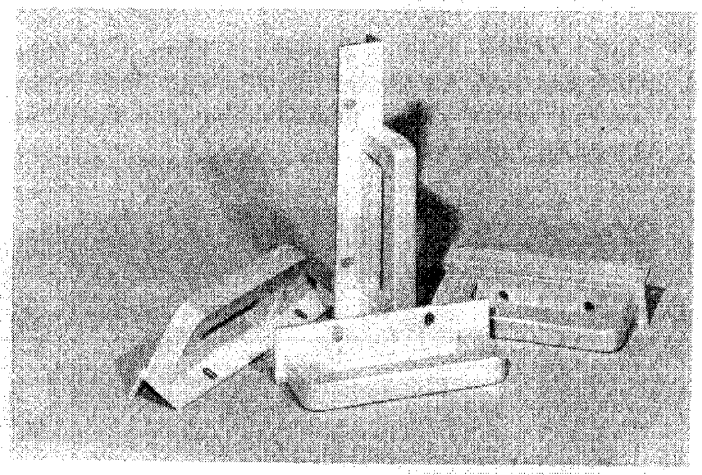
ALLEN WRENCH — CPN 3454

Used with Crown equipment to remove end bars and secure rack ears to equipment.

HANDLES

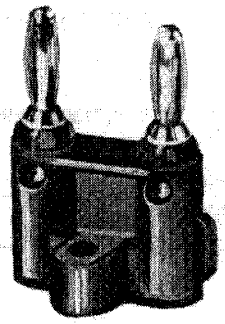
5" — CPN 41855 (D-150A, FM-1)
7" — CPN 41887 (DC-300A)
DISTINCTION — CPN 41889 (EQ2, DL2, and SA2)

These handles are used with Crown equipment for easier handling.



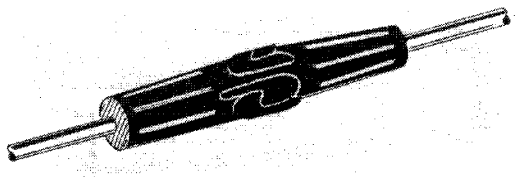
DUAL BANANA PLUGS — CPN 2981

Used with the D-75, D-150A, DC-300A, PL-1, OC-150A, and SA2 as part of the HiFi kit.



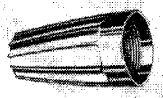
FUSEHOLDER — CPN 4245

Used with the D-75, D-150A, DC-300A, OC-150A, PL-1, and SA2 as part of the HiFi kit.

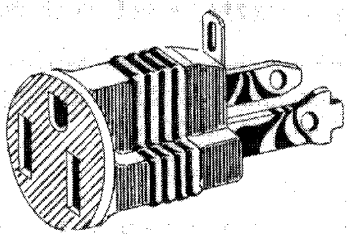


WIRE NUTS — CPN 3069

Used with the D-75, D-150A, DC-300A, PL-1, and SA2 as part of the HiFi kit.

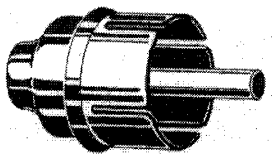


3-2 ADAPTERS — CPN 2939



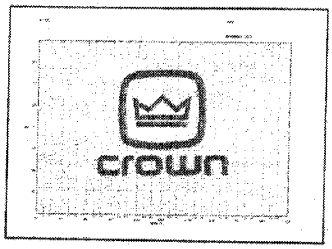
SHORTING PLUGS — CPN 3230

Used with the IC-150A, DL2 and SL-1 to short UNUSED input jacks for noise control.



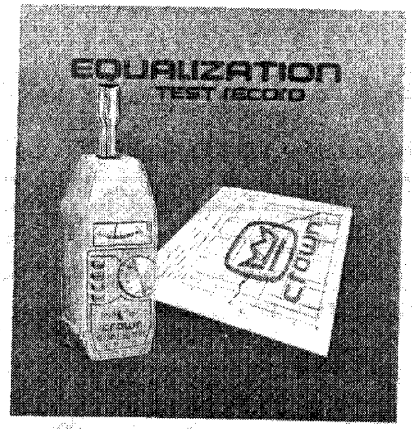
GRAPH PAPER — CPN 4383

Used with the EQ2 for charting room response.



TEST RECORD — CPN 4416

Used with the EQ2 for testing room response.

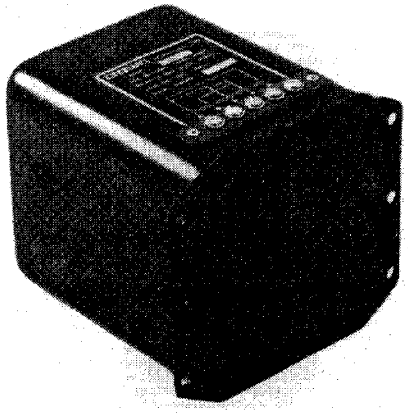


HI FI ADAPTER KIT — CPN 40377

Used with the D-75, D-150A, DC-300A, PL-1, and SA2 amplifiers.

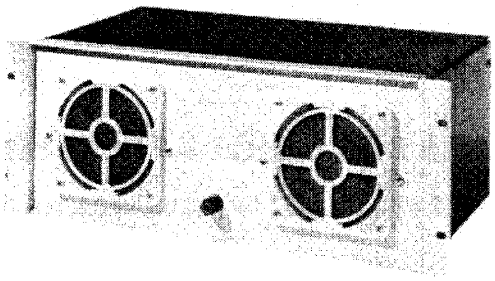
UMX-300 TRANSFORMER

The CROWN UMX-300 transformer offers a maximum 300 watts of power with IM distortion of less than .015%. Frequency response is rated +0 to -1dB, 20Hz to 20KHz at 300 watts. The UMX-300 can be used with any Crown amplifier.



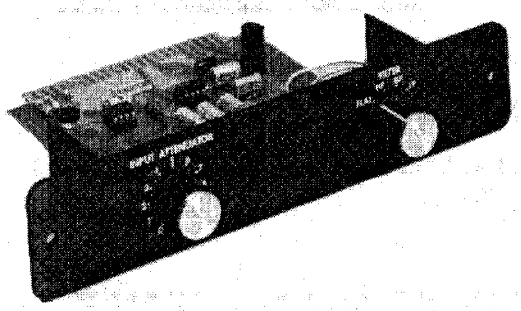
FN-1 FAN PACKAGE — CPN 41682

The CROWN FN-1 Fan Package is meant to provide cool ambient air for cooling any Crown amplifier which requires additional cooling due to operating conditions.



M-600 PA MODULE — CPN 41744

The CROWN M-600 PA Module is a special plug-in board developed to fit into the M-600 amplifier front panel. The module, developed for commercial sound public address systems, provides balanced inputs, filtering, and a continuously adjustable gain from 0 to 20dB at the front panel.

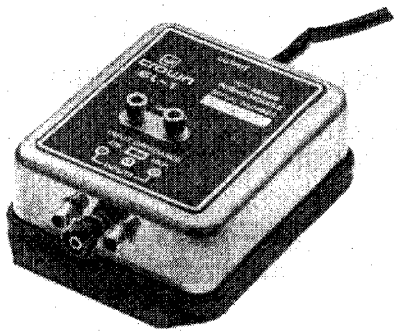


DL2 "A" PHONO MODULE

The CROWN DL2 "A" Phono Module is a separate phono preamp designed to eliminate RF interference and the problems of cable capacitance loading on phono cartridges.

SL-1 "C" PHONO MODULE

The CROWN SL-1 "C" Phono Module is a separate phono preamp similar in function and performance to the DL2 phono module, however designed specially for the SL-1.



*MOVING COIL PHONO MODULE

The CROWN Moving Coil Phono Module is specifically designed for matching a low output moving coil cartridge with the DL2 and/or the SL-1.

BLANK ALUMINUM FILLER PANELS

Standard 1P (1.75″), 3P (3.75″), and 5P (5.25″) aluminum panels are available in "satin bead" or brushed aluminum finish.

CABINETS

Designed and specifically built for Crown is a complete line of fine audio furniture. Write for your free brochure.

*Available Fall 1979

MANUAL POLICY

An excellent way to evaluate a new or different Crown product is to purchase an owner's manual. After you've had a chance to read and study the manual, it may be returned for a **complete refund**. No questions asked. Under this special arrangement, the manuals for the IC-150A, OC-150A, D-75, D-150A, DC-300A, SL-1, PL-1, FM-1 and VFX-2A will cost $2.00 (normal retail is $5.00). Manuals for the M-600, RTA-2, PSA-2, and the distinction series components will cost $6.00 (normal retail is $15.00).

TEST REPORTS

Read what independent test centers and popular magazines critics say about Crown equipment. Free upon request are reprinted articles from major magazines. Read their critical opinions at no expense to you.

CROWN SHIRTS

Crown T-shirts are available in white with colored "ringers" and have the Crown logo on the front and a two-color design (see below) on the back. Contact your dealer or the Crown Parts Department.

SECTION 6
PARTS LIST

6.1 General Information

This section contains parts lists for the DL2 preamplifier. When used in conjunction with the service, repair, and adjustment information in Sec. 7, the information in this section will aid the service technician in rapidly and accurately identifying and replacing defective parts.

Reference designations correspond to those shown in the schematic diagrams in Sec. 4. Electrical and electronic parts located on printed circuit boards are illustrated by schematic type symbols on printed circuit board representations.

6.2 Standard and Special Parts

Many electrical and electronic parts and many attaching type parts used in the DL2 preamplifier are standard items stocked by and available from electronic supply houses or hardware suppliers. However, some electronic parts that appear to be standard are actually special. This means that Crown has selected the item to meet specific requirements. A part ordered by the Crown part number will assure an acceptable replacement. Structural items such as covers and panels are available only from Crown.

6.3 Ordering Parts

When ordering parts for the DL2 preamplifier, be sure to give the model and serial number and include the part description and Crown part number from the parts list.

Schematic Designation	Description	CPN	Qty.	Other Information
	Gain Module	**41863**		
	Gain PC Board	4554		NA
	Resistors			
R100, R200	470 ohm .25W 5% CF	2626	2	
R101, R201	270K ohm .25W 5% CF	2885	2	
R102, R202	10M ohm .25W 10% Comp	3221	2	
R103, R203	910K ohm .25W 5% CF	4229	2	
R104, R204, R118, R218 R120, R220 R121, R221, R128, R228, R129, R229, R130, R230, R132, R232	200K ohm .25W 5% CF	3622	16	
R105, R205, R117, R217, R119, R219	10K ohm .25W 5% CF	2631	6	
R106, R206	220K ohm .25W 5% CF	4219	2	
R107, R207	22 ohm .25W 5% CF	4479	2	
R108, R208	18K ohm .25W 5% CF	2633	2	
R109, R209	636.5 ohm .25W 1% MF	4484	2	
R110, R210 R111, R211	100K ohm .25W 5% CF	2883	4	
R112, R212	977.5 ohm .25W 1% MF	4485	2	
R113, R213	3M ohm .25W 5% CF	4489	2	
R114, R214 R115, R215	47K ohm .25W 5% CF	2880	4	
R116, R216	2.4M ohm .25W 5% CF	4600	2	
R122, R222	546 ohm .25W 1% MF	4482	2	
R123, R223, R125, R225, R134, R234	2K ohm .25W 1% MF	4505	6	
R124, R224	1.17K ohm .25W 1% MF	4486	2	
R126, R226	320 ohm .25W 1% MF	4481	2	
R127, R227	1.7K ohm .25W 1% MF	4504	2	
R131, R231	33.75K ohm .25W 1% MF	4488	2	
R133, R233	244 ohm .25W 1% MF	4480	2	
R135, R235	475.4 ohm .25W 1% MF	4483	2	
R136, R236	20.3K ohm .25W 1% MF	4487	2	
R1, R2	3.9K ohm .25W 5% CF	2630	2	
R3	33K ohm .25W 5% CF	4346	1	
	Resistor Networks			
RN100, RN200	Resistor Ntwrk -U-	4560	2	
RN101, RN201	Resistor Ntwrk -S-	4558	2	
RN102,RN202	Resistor Ntwrk -T-	4559	2	
RN103, RN203	Resistor Ntwrk -W-	4562	2	
RN104, RN204, RN105, RN205	Resistor Ntwrk -Q-	4556	4	

Schematic Designation	Description	CPN	Qty.	Other Information
	Capacitors			
C100, C200	200pF MICA	3411	2	
C101, C201, C102, C202, C103, C203, C115, C215	.047MFD 250V Polycrb	4404	8	
C104, C204, C108, C208, C137, C237, C139, C239	27mF 15V Tant	3677	8	
C107, C207 C113, C213, C130, C230, C134, C234, C138, C238	10pF Mica	2821	10	
C109, C209	100mF 16V Vertical	3729	2	
C110, C210, C114, C214, C132, C232, C136, C236, C140, C240	470mF 35V Vertical	4477	10	
C111, C211, C112, C212	4.7mF 35V Tant	4019	4	
C116, C216	544pF 63V Styr	4463	2	
C117, C217	370pF 63V Styr	4462	2	
C118, C218	1030pF 63V Styr	4464	2	
C119, C219	2200pF 63V Styr	3141	2	
C120, C220	1400pF 63V Styr	4465	2	
C121, C221	917pF 63V Styr	4287	2	
C122, C222	2620pF 63V Styr	4467	2	
C123, C223	5640pF 63V Styr	4466	2	
C124, C224	68pF 160V Styr	4449	2	
C125, C225	56pF 160V Styr	4448	2	
C126, C226	150pF 63V Styr	4450	2	
C127, C227	330pF 63V Styr	4461	2	
C128, C228	25mF 15V Tant	3186	2	
C131, C231, C133, C233, C129, C229, C135, C235	2mF 15V Tant	4470	8	
C141, C241	27pF Mica	2342	2	
CD	.01mF Cer Disc	1751	10	

Schematic Designation	Description	CPN	Qty.	Other Information
	Diodes			
D100, D200, D101, D201, D102, D202, D103, D203, D104, D204, D105, D205, D106, D206, D107, D207, D108, D208, D109, D209, D110, D210, D111, D211, D112, D212, D113, D213, D114, D214, D115, D215, D116, D216, D117, D217 D118, D218, D119, D219	1N4148	3181	40	
	Transistors			
Q101, Q201	PN4250A PNP	3786	2	
Q100, Q200, Q102, Q202, Q103, Q203, Q104, Q204, Q105, Q205, Q106, Q206, Q107, Q207	SEL 2N3859A-NPN	2961	14	
	Relays			
K100, K200, K101, K201 K102, K202, K103, K203, K104, K204, K105, K205, K106, K206	200 ohm SPST	4644	14	
	Integrated Circuit Chips			
IC100, IC200, IC101, IC201, IC104, IC204 IC105, IC205, IC106, IC206	NE5534AN Op Amp	4475	10	
IC102, IC202	LM339 Voltcomparator	4345	2	
IC103, IC203	Sel LF 356H FET Op Amp	4127	2	

Schematic Designation	Description	CPN	Qty.	Other Information
	Miscellaneous			
SW1	6P4T 6-Rotary PC SW	4543	1	Tape Copy Select
SW2	6P4T 2-Rotary PC SW	4544	1	Low Filter Select
SW3	6P4T 2-Rotary PC SW	4545	1	High Filter Select
	10 in. 14 Pin DIP Cable	4616	3	
	14 in. 14 Pin DIP Cable	4618	1	
	20 in. 16 Pin DIP Twisted	4938	1	
	16 Cond. Twisted Ribbon	4937	1	
	18 in. 14 Pin DIP Cable	4939	1	
	9 in. 16 Pin DIP Cable	4940	1	
	14 pin DIL IC Socket	3450	17	
	8 pin DIL IC Socket	3451	12	
	16 Pin DIL IC Socket	4508	3	
	Modu Receptacle 14 Pin	4594	1	J40F
	Logic Module	**41862**		
	Logic PC Board	4548		
	Resistors			
R100, R200	470 ohm .25W 5% CF	2626	2	
R101, R201	1.5K ohm .25W 5% CF	2876	2	
R102, R202	1.2K ohm .25W 5% CF	2875	2	
R103, R203, R104, R204, R106, R206, R109, R209, R111, R211, R113, R213, R115, R215, R10, R41, R42	3.9K ohm .25W 5% CF	2630	17	
R105, R205, R1, R2, R3, R4, R5. R6, R7, R11, R.3, R17, R30, R31, R36, R43, R45, R46, R48, R52	10K ohm .25W 5% CF	2631	20	
R107, R207 R108, R208, R110, R210, R112, R212, R114, R214	220K ohm .25W 5% CF	4219	10	
R8, R15	22K ohm .25W 5% CF	3302	2	
R9	820 ohm .25W 5% CF	3301	2	
R12	4.7K ohm .25W 5% CF	3939	1	
R14, R19	100K ohm .25W 5% CF	2883	2	
R16	390K ohm .25W 5% CF	4660	1	

Schematic Designation	Description	CPN	Qty.	Other Information
R18, R28, R29, R32, R33	270K ohm .25W 5% CF	2885	5	
R20, R21, R22, R23, R24, R25, R26, R27, R38	1M ohm .25W 5% CF	3198	9	
R34	2M ohm .25W 5% CF	3199	1	
R35	47K ohm .25W 5% CF	2880	1	
R37	15M ohm .25W 5% CF	4661	1	
R39	68K ohm .25W 5% CF	3620	1	
R40	300 ohm .25W 5% CF	3801	1	
R44	2.2K ohm .25W 5% CF	2628	1	
R47	150K ohm .25W 5% CF	4216	1	
R49	33K ohm .25W 5% CF	4346	1	
R50	470K ohom .25W 10% Comp	2886	1	
R51	15K ohm .25W 5% CF	2632	1	
	Capacitors			
C100, C200, C101, C201, C102, C202, C103, C203, C104, C204, C6	.001mF Cer Disc	2288	11	
C1, C13	.47mF 100V Polycr	4119	2	
C2	4.7mF 35V Tant	4019	1	
C3, C5, C11, C12, C14, C15	.1mF 12V Cer Disc	2600	6	
C7, C8, C9, C10	.1mF 250V Polycr	5243	4	
C4	.01mF Cer Disc	1751	1	
C16	220mF 16V Vertical	3796	1	
	Diodes			
D100, D200, D101, D201, D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12	1N4148	3181	16	
	Transistors			
Q100, Q200, Q101, Q201	MPSA56 PNP	3954	4	
Q102, Q202, Q103, Q203, Q6, Q12	PN4250A PNP	3786	6	
Q1, Q2, Q5, Q10, Q11	SEL 2N3859A NPN	2961	5	
*Q3, *Q4, *Q7, *Q8, *Q9	3386 Transistor Array	4521	1	

Schematic Designation	Description	CPN	Qty.	Other Information
	Integrated Circuits			
IC100, IC200 IC101, IC201	74LS00 QD 2 Input Nand	4523	2	
IC102, IC202	74LS193 Up-Down Counter	4526	4	
IC103, IC203, IC12	74LS30 8 Input Nand	4525	3	
IC104, IC204	74LS10 TRP 3 Input Nand	4524	2	
IC105, IC1, IC2 IC5, IC6, IC11	4011 Quad 2 Input Nand	4529	7	
IC106, IC3	4081 Quad 2 Input And	4532	3	
IC4, IC13	4071 Quad 2 Input Or	4531	2	
IC7, IC8, IC9	4012 Dual 4 Input Nand	4530	3	
IC10	4001 Quad 2 Input Nor	4528	1	
IC14	4069 Hex Inverter	4665	1	
IC15, IC16	74LS367 Tri-State Buffer	4527	2	
IC17	555 Timer IC	4520	1	
IC18	74LS75 Quad Latch IC	4516	2	
	Miscellaneous			
	16 Pin DIL IC Socket	4508	8	
	14 Pin DIL IC Socket	3450	31	
	8 Pin DIL IC Socket	3451	1	
	Champ Edge Receptacle 24 Pin	4590	1	J3
	Champ Edge Receptacle 36 Pin	4592	1	J2
	Champ Dust Cover 24	4591	1	
	Champ Dust Cover 36	4593	1	
	Loudness Module	**41846**		
	Loudness PC Board	4551		NA
	Resistors			
R100, R200	22 ohm .25W 5% CF	4479	2	
	Resistor Networks			
RN100, RN200, RN101, RN201 RN102, RN202	Resistor Newtork -P-	4555	6	
	Capacitors			
C100, C200	1.5mF 100V Polycrb	4473	2	
C101, C201, C102, C202	1.0mF 100V Polycrb	4472	4	
	Miscellaneous			
SW7	2 P 10Pos Rotary PC SW	4542	1	LOUDNESS CONTOUR
SW4, SW5, SW6	3Sta DPDT Pshbt SW	4500	1	LO, HI, TONE
SW1, SW2, SW3	3 STA 4PDT Pshbt SW	4501	1	EXT. PROCESSOR

Schematic Designation	Description	CPN	Qty.	Other Information
	16 Pin DIL IC Socket	4508	1	
	14 Pin DIL IC Socket	3450	5	
	14 in. 14 Pin DIP Cable	4618	1	
	Tone Output Module	**41864**		
	Tone Output Board	4547		NA
	Resistors			
R101, R201, R114, R214, R121, R221	10K ohm .25W 5% CF	2631	6	
R102, R202, R104, R204	7.23K ohm .25W 1% MF	4495	4	
R103, R203	1.80K ohm .25W 1% MF	4494	2	
R105, R205, R107, R207	4K ohm .25W 1% MF	4506	4	
R106, R206	1K ohm .5W 1% MF	3194	2	
R109, R209	9.09K ohm .25W 1% MF	4496	2	
R110, R210	10.5K ohm.25W 1% MF	4497	2	
R111, R211, R113, R213,	200K ohm .25W 5% CF	3622	4	
R112, R212, R1, R2, R120, R220	20K ohm .5W 1% MF	3752	6	
R108, R208, R119, R219, R3	10K ohm .5W 1% MF	2343	5	
R115, R215	17.4K ohm .25W 1% MF	4498	2	
R116, R216	100K ohm .25W 5% CF	2883	2	
R117, R217	47K ohm .25W 5% CF	2880	2	
R118, R218	6.19K ohm .25W 1% MF	3688	2	
R122, R222, R127, R217	22K ohm .25W 5% CF	3302	4	
R123, R223	3.9K ohm .25W 5% CF	2630	2	
R124, R224	5K ohm Vert Red POT	1681	2	
R125, R225, R128, R228	240 ohm .5W 5% CF	1069	4	
R126, R226	10 ohm .25W 5% CF	3753	2	
R129, R229, R130, R230	5.6 ohm .5W 5% CF	3299	4	
R131, R231 R132, R232, R5	47 ohm .25W 5% CF	1011	5	
R133, R233, R4	18K ohm .25W 5% CF	2633	3	
R134, R234, R6	2.2K ohm .25W 5% CF	2628	3	
*R135, *R235	15 ohm 2W	4518	2	

Schematic Designation	Description	CPN	Qty.	Other Information
	Capacitors			
C101, C201, C102, C202	2.2mF 100V Polycrb	4471	4	
C103, C203, C104, C204	.22mF 100V Polycrb	4510	4	
C105, C205, C106, C206	8800 Polysty	3188	4	
C110, C210, C111, C211	2mF 15V Tant	4470	4	
C112, C212	470mF 35V Vertical	4477	2	
C113, C213, C129, C229, C2, C131, C231	10pF Mica	2821	7	
C114, C214, C116, C216, C121, C221	25mF 15V N-P Vertical	3186	7	
C115, C215	4.7mF 35V Tant	4019	2	
C118, C218, C124, C224, C117, C217, C120, C220	.01mF Cer Disc	1751	8	
C119, C219	.1mF 12V Cer Disc	2600	2	
C122, C222, C125, C225	.47mF 100V Polycyr	4119	4	
C123, C223	100pF Mica	3410	2	
C126, C226, C127, C227, C128, C228, C130, C230	20pF Ceramic	3535	8	
	Diodes			
D101, D201, D102, D202, D103, D203, D104, D204, D105, D205	1N4148	3181	10	
	Transistors			
Q101, Q201	NSD 206 PNP	4116	2	
Q102, Q202	NSD 106 NPN	4069	2	
Q103, Q203	SEL TZ-81	2962	2	
	Integrated Circuits			
IC101, IC201, IC102, IC202, IC103, IC203 IC104, IC204,	SEL LF356H FET Op Amp	4127	6	

Schematic Designation	Description	CPN	Qty.	Other Information
IC105, IC205, IC106, IC206, IC107, IC207, IC108, IC208, IC110, IC210, IC1	NE5534AN Op Amp	4475	13	
IC109, IC209	LM391 Aud Pow Driver	4541	2	
	Relays			
K101, K201	KHP 4PDT 24V PC Relay	5232	2	
	Coils			
L101, L201	6UH Axial W/15 ohm	4518	2	
	Miscellaneous			
	16 Pin DIL IC Socket	4508	2	
	14 Pin DIL IC Socket	3450	1	
	8 Pin DIL IC Socket	3451	19	
	8 in. 14 Pin DIP Cable	4615	1	
	9 in. 16 Pin DIP Cable	4940	1	
	Tone Switch Module	**42038**		
	Tone Switch PC Board	4546		NA
	Resistors			
R101, R201	100K ohm Vertical Wht POT	1713	2	
R102, R202	470K ohom .25W 5% CF	4225	2	
	Resistor Networks			
RN100, RN200, RN101, RN201	Resistor Network -R-	4557	4	
RN102, RN202, RN103, RN203, RN104, RN204	Resistor Network -V-	4561	6	
	Miscellaneous			
	Modu Header 26 Pin	4596	1	
	1 P13T-1P3T Switchouse	4503	6	
	EQ Switch Actuator	4269	12	
	EQ Switch Contactor	4327	12	
	Spring	4321	12	
	Pushnut	4337	12	

Schematic Designation	Description	CPN	Qty.	Other Information
	Display Module	**42039**		
	Display Board	4552		NA
	Resistors			
R100, R200, R101, R201, R102, R202, R103, R203, R104, R204, R105, R205, R106, R206, R107, R207, R108, R208, R109, R209, R110, R210, R111, R211, R112, R212, R113, R213, R114, R214, R115, R215, R116, R216, R117, R217, R118, R218, R119, R219, R120, R220, R121, R221	180 ohm .25W 5% CF	2873	44	
R122, R222	1.8K ohm .25W 5% CF	3807	2	
	Capacitors			
C100, C200, C101, C201, C1, C2	.1mF 12V Cer Disc	2600	6	
	Diodes			
LED 100, 200	MV5053 Red LED	4341	2	Overload
	Transistors			
Q100, Q200	SEL TZ 81 NPN	2962	2	
	Integrated Circuits			
IC100, IC200	74185N BIN/BCD	4514	2	
IC101, IC201, IC102, IC202	7447 BCD 7 Seg DEC/DR	4522	4	
	Displays			
First, Second, Third and Fourth Digit	NSNS784 2X7 LED 7 Seg	4515	4	

Schematic Designation	Description	CPN	Qty.	Other Information
	Miscellaneous			
	16 Pin DIL IC Socket	4508	6	
	14 Pin DIL IC Socket	3450	1	
	14 in. 14 Pin DIP Cable	4618	2	
	AMPMOD 1PC Receptacle	3846	12	
	Panorama Module	**41847**		
	Panorama PC Board	9691		NA
	Miscellaneous			
SW1, SW2, SW3	1 P 31 Pos PC SW/Resist	4440	3	
	14 in. 14 Pin DIP Cable	4618	1	
	Tape Monitor Module	**41855**		
	Tape Mon PC Board	9698		NA
	Miscellaneous			
SW101, SW102, SW103	3 Sta 4 PDT Pushbutton Switch	4502	1	
	Modu Header 14 PIN	4595	1	
	5V Regulator Module	**41851**		
	Regulator PC Borad	9704		NA
	Resistors			
R1	2.7 ohm .5W CF	2857	1	
R2, R3	1.5K ohm .5W CF	1076	2	
	Capacitors			
C1	.22mF 100V Filmatic	3218	1	
C2	.1mF 200V Filmatic	2938	1	
C3, C4, C5, C6, C7	22mF 40V Filmatic	4248	5	
	Diodes			
D1	1N4004	2851	1	
	Miscellaneous			
	20 in. 14 Pin DIP Cable	4619	2	
	11 in. 16 Pin DIP Cable	4624	3	
IC1	309K +5V Reg	4519	1	
	TO-3 Plastic Film Insert	3180	1	
	TO-3 Socket	4633	1	
	Output Module	**41852**		
	Output PC Board	9689		NA

Schematic Designation	Description	CPN	Qty.	Other Information
	Miscellaneous			
	N112APC 2 Ckt HI-D Jacks	4511	19	Output Jacks
	12 in. 14 Pin DIP Cable	4617	1	
	14 in. 14 Pin DIP Cable	4618	1	
	20 in. 16 Pin DIP Twisted	4938	1	
	Output Switch Module	**41859**		
	Output Switch Board	4553		
	Miscellaneous			
SW1, SW2	2 Sta 4PDT Pshbswitch	4499	1	
	14 in. 14 Pin DIP Cable	4618	1	
	Input Selector Module	**42037**		
	Input Selector Board	4550		NA
	Light Emitting Diodes			
LED 1	MV5153 Amber LED	4342	1	Mute
LED 2	MV5353 Yellow LED	4431	1	Power
LED 3, 4, 5, 6, 7, 8, 9, 10	MV253 Green LED	4430	8	Inputs
	Miscellaneous			
SW1 thru 10	5PST DL2 Mom Pbsw	4540	10	
	14 Pin DIL IC Socket	3450	1	
	8 in. 14 Pin DIP Cable	4615	2	
	Input Module	**42036**		
	Input PC Board	4549		NA
	Resistors			
R1, R2, R3, R4, R5, R6, R7, R8	100 ohm .25W 5% CF	2872	8	
R100, R200, R101, R201, R102, R202, R103, R203, R104, R204, R105, R205, R106, R206, R107, R207	200K ohm .25W 5% CF	3622	16	
	Diodes			
D1, D2, D3, D4, D5, D6, D7, D8	1N4148	3181	8	

Schematic Designation	Description	CPN	Qty.	Other Information
	Transistors			
Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8	PN4250	3786	8	
	Relays			
K1, K2, K3, K4, K5, K6, K7, K8	60 ohm DPST Reed Relay	4643	8	
	Miscellaneous			
	16 Pin DIL IC Socket	4508	6	
	14 Pin DIL IC Socket	3450	2	
	4 Pin SIP Socket	4950	16	
	DL2 Jack Plate	4444	1	Input Jacks
	General Miscellaneous (Main Control Unit)			
	Bottom Feet M195 .75 High	2945	4	
	Top Cover	9660		
	Bottom Cover	9661		
	Aluminum Pushbuttons	4074	6	
	Phono Pushbuttons	4533	2	
	Aux Pushbuttons	4534	2	
	Power Pushbutton	4535		
	Mute Pushbutton	4536	1	
	Tape Pushbutton	4537	3	
	Dual Volume Pushbutton	4538	2	
	Single Volume Pushbutton	4539	4	
	Tuner Pushbutton	4667	1	
	5PST DL2 MOM PBSW	4540	6	Volume PSHB Switches
	1.0 in. Aluminum Knob	4571	1	Loudness Contour
	.8 in. Black Outer Knob	4570	3	Tape Copy, Lo Filter, High Filter
	.8 in. Black Inner Knob	4568	3	Audio Imag.
	.7 in. Black Outer Knob	4569	3	Audio Imag.
	.31 in. Black Pushbuttons	4572	5	Tape Monitors Main Output
	Back Panel	9714		
	N112B 3 Cond HI D Jacks	3507	4	Headphone Tape 3
	Slide-Knobs W/Silver Cap	4310	12	Tone
	Front Panel	9713		
	4 Digit LED Lens/Bezel	4441	2	
	Accessory Kit (which includes)	**41875**		
	Pin-Pin Cable	3338	2	
	Thumbscrews	4098	4	
	Washer (nylon)	4137	4	
	Phone-Phone Cable	4363	2	

Schematic Designation	Description	CPN	Qty.	Other Information
	Power Supply Module	**Q41811-3**		
	Power Supply Board #1	9700		SN710 and below
	Power Supply Board #2	P 9930-2		SN711 and above
	Resistors			
R1	390 ohm .5W 5% CF	C 2609-3	1	
R2	3.9K ohm .25W 5% CF	C 2630-9	1	
	Capacitors			
C1, C8	.01 Cer Disc	C 1751-4	2	
C2, C3	4000 MFD 35V	C 4474-0	2	
C4	.47mF 100V Polycr	C 4119-1	1	
C5, C6	4.7mF 100V	C 5050-7	2	
C7	20,000mF 15V	C 4509-3	1	
C9, C10	0.1mF 100V Polycr	C 5198-4	2	
	Diodes			
D1	VH148 6A Bridge	C 3062-4	1	
D2, D5, D10, D11	1N4148	C 3181-2	4	
D3, D4, D6, D7 D8, D9	1N4004	C 2851-1	6	
	Integrated Circuits			
IC1	UA7818 +V Reg	C 5489-7	1	SN711 and above
IC1	78MGT2C +V Reg	4296	1	SN710 and below
IC2	79MGT2C-V Reg	4297	1	SN710 and below
IC2	UA7918 -V Reg	C 5488-9	1	SN711 and above
	Transistors			
Q1	SEL TZ-81 NPN	D 2962-5	1	
	Relays			
K1	W88KDXZ Relay 12V 50A	C 4517-6	1	
	Resistor Networks			
RN1, RN2	Resistor Trim Network 1	4445	2	SN710 and below
	Miscellaneous			
LED 1	MV5153 Amber LED	C 4342-9	1	
SW3	DPDT 340 Trig Slide SW	C 2668-9	1	Norm/Stnby
SW2	SPDT Alternate Action	C 4645-5	1	Master Power
T1, T2	DL2 Transformer	D 4507-6	1	
F1, F2	.5A Slo MDL	C 4512-7	2	

Accessory Kit	41877		
(includes)			
10-32 Pnl Thumbscrew	4098	4	
Nylon Washer	4137	4	
Power Cable	41816	1	
20A-15A AC L. Adapter	4607	1	
Champ Cable Plug 14 Pin	4583	2	
Phono Module			Contact Crown for information

Schematic Designation	Description	CPN	Qty.	Other Information
	Diodes			
D1, D2, D100, D200, D101, D201	IN4148	C 3181-2	6	
	Integrated Circuit Chips			
IC-1A, B, C, D	TL074 Quad Op Amp	C 4696-8	1	
	Transistors			
Q1, Q102, Q202	Sel TZ-81 NPN	D 2962-5	3	
Q2, Q101, Q201, Q103, Q203	PN4250A PNP	C 3786-8	5	
Q100, Q200	2N6428A NPN	C 4695-0	2	
	Miscellaneous			
	220 Binding Post	C 3245-5	1	Gnd. Post
	Pin Jack Panel	C 1533-6	2	
	14 Pin IC Socket	C 3450-1	1	
	2 Cond. Phone Jack	C 3631-6	2	
	DPDT .125 Trig-Slide Sw.	C 4110-0	1	RIAA-MIC
	DPST Mini Slide Sw.	C 4476-5	1	Input Impedance
	14 Pin Champ Recept.	C 4582-0	1	Power Recept.
	Ferrite Core	C 4442-7	2	Used for L100, L200
	#30 Magnet Wire	B 4707-4	--	Used for L100, L200
	Champ Screw Mnt. Kit	C 4587-9	1	

SECTION 7
MAINTENANCE

7.1 Introduction

This section contains technical information required to properly troubleshoot, service, and repair the CROWN DL2 Controller. Included are required test equipment, disassembly and reassembly procedures, electrical checkout and adjustment, and troubleshooting/repair tips.

THE PROCEDURES OUTLINED ARE INTENDED FOR USE BY AN EXPERIENCED TECHNICIAN ONLY! Use this information in conjunction with schematics, parts lists and board layouts. (Sections 4 and 6)

7.2 Required Test Equipment

In order to effectively and efficiently service the DL2, proper test equipment is mandatory. Fig. 7.2 provides a list of recommended equipment used for checkout, servicing, and repair. The "Requirements" column provides information to allow intelligent selection of substitutes if the "Suggested Supplier and Model" is not available or is considered impractical to obtain.

7.3 Visual Inspection

A thorough visual inspection is recommended prior to servicing, testing adjusting and/or repairing a DL2. Carefully inspect the power supply module as well as the main unit for obvious damage. After removing the top and bottom covers, check each circuit board for damaged (burnt) components along with poor solder joints and faulty wiring. Often a good visual inspection will save hours of tedious troubleshooting. Also, because of the complexity of the unit, it is desirable to first become familiar with all operating controls and functions and then proceed on to repair. (See Section 3 for familiarity)

7.4 Troubleshooting and Repair

As with all repair procedures, a certain amount of logical "problem assessment" is necessary. Because of the circuit complexity of the DL2, it will be (in most cases) more effective to replace a complete module (board) rather than spend large amounts of time and effort locating specific faulty components. In fact, Crown encourages this procedure whenever applicable. To aid in module removal, disassembly/assembly information as well as a functional check-out procedure is provided in Sections 7.5, 6 and 7.

Listed below are several suggestions for assistance in troubleshooting and repairing the DL2.

1. Always perform a thorough visual inspection. This includes the condition of all ribbon inter-connect cables (make sure they are snug). If it is necessary to re-insert a cable into its proper location, refer to the INTERCONNECT CABLE DIAGRAM (Fig. 7.1). All circuit boards are shown in their approximate reduced shape. Sockets are also shown as closely to their physical location as possible. Note that P indicates a permanent socket.

2. After the visual inspection, take the unit through the functional checkout procedure (Section 7.7). It may then be necessary to isolate the problem (if one exists) to a specific module. In most cases if a particular function fails, it will be possible to trace that failure to a certain module. The block diagram and/or schematics may be helpful at this point.

For example: if the audio mute will not function properly it will be necessary to locate all modules that relate to the mute function. According to the schematics, a possible suspect would be the TONE OUTPUT BOARD (#4557) which houses a large portion of the mute circuitry. However, it must be remembered that all the modules interconnect and may interact with each other.

3. Certain circumstances do allow for specific component replacement. They include IC chip failure, relay failure and Power Supply Unit components. These parts are available from Crown Parts Department through Technical Service Department approval (contact the latter for all questions pertaining to the DL2).

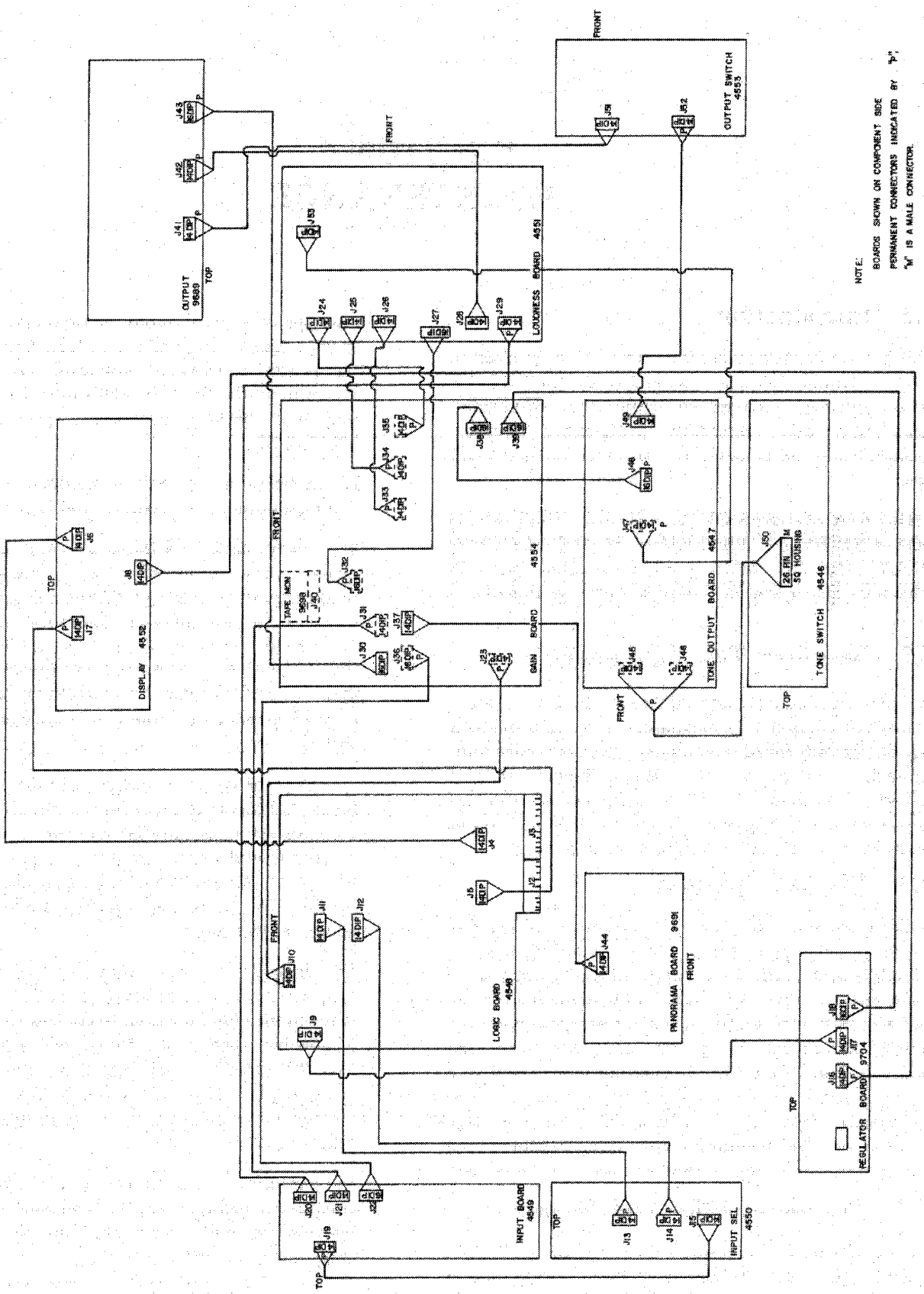


Fig. 7.1 Interconnect Diagram

EQUIPMENT	REQUIREMENTS	APPLICATION	SUGGESTED MODEL
Oscilloscope	Capable of displaying a 10MHz signal	Monitoring output during service and testing	Telequipment D54A or equivalent
Volt-ohmmeter (VOM)	Low-voltage resistance probe (100mv range). High-voltage resistance probe (1.5V range)	Check resistance values (low voltage probe). Check semiconductor junctions for opens or shorts (high voltage probe) Check DC voltages	Triplett 601 or equivalent
Freq. Counter		For accurate general monitoring	Heath SM118A
Signal Generator	Sine/Square wave available; flat frequency response. THD. .1% maximum	Provide test signals for service and checkout	Wavetek 130-Series or equivalent
Circuit Breaker	15 ampere rating	In AC line to unit; protects circuitry from overload if power supply has shorted	
AC Line Voltage Monitor	Peak reading meter (displays rms equivalent to a sinusoidal peak for any wave form)	Monitor Line voltage	Available from CROWN
Phase Meter			
AC Voltmeter	100mv low range, flat frequency response to 100KHz	Set output level for testing; check noise level	Hewlett-Packard 400F or equivalent
Filter	20-20KHz bandpass, low noise 20Hz-20KHz	Between preamplifier and voltmeter in noise test	Information available from CROWN
Intermodulation Distortion Analyzer	Residual (.002% or lower)	Check IM distortion	Information available from Crown

Fig. 7.2 Required Test Equipment

4. Fig. 7.3 shows the action of each MAIN BOARD gain relay (K100, 200-K106, 206) as they participate in the step level operation. This may be helpful in determining a faulty relay should the level function become sporadic.

5. Rear panel Buffer output jacks provide a convenient pre-gain signal observation point (See block diagram; Section 4).

6. If overload abnormality occurs (clipping distortion via intermodulation distortion analyzer but not visible at output), check every diode connecting clipping busses to monitoring points in signal path. They are shown on the schematic as +CL or -CL points.

7. Power Supply Module voltages must be correct in order for the Main Control Unit to operate correctly. Their pin numbers and voltages are located on the power supply schematic.

8. The Phono Module is not servicable!! Always replace through Crown, rather than attempt repair.

9. Modules (replacement boards) may be obtained from the Crown Parts Department. Always return the faulty board upon receiving the replacement.

7.5 Disassembly Procedure

The extent of disassembly required will of course depend upon the extent of the inspection, service, testing, and repair to be performed. The disassembly procedures described below are divided into sections; individual circuit board modules (13 in all). In some cases, it will be advantageous to simply replace an entire circuit board (module) rather than spend hours locating a specific faulty component. Also note that certain modules require the removal of other modules in order to replace the original.

A fairly complex visual inspection can be performed by removing the top and bottom covers. To remove these, proceed as follows:

A. Top Cover Removal - Main Control unit

1. Place DL2 top side up.
2. Remove ten phillips head, sheet metal screws which secure the top cover. (It may be necessary to loosen both end brackets in order to ease removal of covers.)
3. Carefully withdraw the top cover from the unit.
4. When replacing cover, note that short screws belong on the rear and side rows.

B. Bottom Cover Removal - Main Control Unit

1. Place the DL2 upside down.
2. Remove the six slotted hexagon head, sheet metal mounting screws.
3. Carefully remove the bottom cover from the unit.
4. When replacing cover, note that shorter screws belong on the rear row.

C. Logic Board (#4548) Removal

1. Remove 4 phillips-type mounting screws located at the four corners of this board.
2. Disconnect six interconnect ribbon cables by gently pulling each straight out from their respective sockets. (Note location of each for future re connection.)
3. Carefully pull the board toward the front of the unit until the External Control jacks are free to move upward and out.
4. Replace board; reverse of above.

D. Main Board (#4554) Removal

1. Remove both end bracket bars and bottom bracket bar. This is done by removing 2-allen screws on each end bar.
2. Disconnect four interconnect removable cables. (Note location of each for future reconnection.)
3. Remove (unsolder) front panel Tape #3 Jack wiring from the board; (Note wiring for reconnection).
4. Remove Tape Copy, Low Filter, and High Filter front panel knobs by pulling outward on each.
5. Remove two Tape Monitor Board mounting screws (allen type).
6. Slide the Main Board back gently until controls clear the front panel.
7. Remove seven interconnect ribbon cables located on respective boards which connect permanently to Main Board.

Note: Pull cables at opposite end; not at Main Board! Interconnect cable chart Fig. 7.1 may be of some help for reconnection.

8. Replace board; reverse of above.

E. Tape Monitor Board Removal (#9798)

1. Remove Main Board (see above).
2. Gently pull Tape Monitor Board straight up/out from Main Board.
3. Replace board; reverse of above.

F. Audio Imaging Board (Panorama) Removal (#9691)

1. Remove both end bracket bars and bottom bracket bar. This is done by removing 2 allen screws on each end bar.
2. Remove three audio imaging knobs by pulling outward on each.
3. Disconnect the interconnect ribbon cable at the opposite end. (Note location for future reconnection).

0 indicates **inactive**

1 indicates **active**

LEVEL READ-OUT	RELAY K100 -8dB	RELAY K101 -2dB	RELAY K102 +4dB	RELAY K103 -16dB	RELAY K104 +.5dB	RELAY K105 +1dB	RELAY K106 -32dB
0	1	1	0	1	0	0	1
.5	1	1	0	1	1	0	1
1.0	1	1	0	1	0	1	1
1.5	1	1	0	1	1	1	1
2.0	1	0	0	1	0	0	1
2.5	1	0	0	1	1	0	1
3.0	1	0	0	1	0	1	1
3.5	1	0	0	1	1	1	1
4.0	1	1	1	1	0	0	1
4.5	1	1	1	1	1	0	1
5.0	1	1	1	1	0	1	1
5.5	1	1	1	1	1	1	1
6.0	1	0	1	1	0	0	1
6.5	1	0	1	1	1	0	1
7.0	1	0	1	1	0	1	1
7.5	1	0	1	1	1	1	1
8.0	0	1	0	1	0	0	1
8.5	0	1	0	1	1	0	1
9.0	0	1	0	1	0	1	1
9.5	0	1	0	1	1	1	1
10.0	0	0	0	1	0	0	1
10.5	0	0	0	1	1	0	1
11.0	0	0	0	1	0	1	1
11.5	0	0	0	1	1	1	1
12.0	0	1	1	1	0	0	1
12.5	0	1	1	1	1	0	1
13.0	0	1	1	1	0	1	1
13.5	0	1	1	1	1	1	1
14.0	0	0	1	1	0	0	1
14.5	0	0	1	1	1	0	1
15.0	0	0	1	1	0	1	1
15.5	0	0	1	1	1	1	1
16.0	1	1	0	0	0	0	1
16.5	1	1	0	0	1	0	1
17.0	1	1	0	0	0	1	1
17.5	1	1	0	0	1	1	1
18.0	1	0	0	0	0	0	1
18.5	1	0	0	0	1	0	1
19.0	1	0	0	0	0	1	1
19.5	1	0	0	0	1	1	1
20.0	1	1	1	0	0	0	1

Fig. 7.3 Relay Action Level

LEVEL READ-OUT	RELAY K100 -8dB	RELAY K101 -2dB	RELAY K102 +4dB	RELAY K103 -16dB	RELAY K104 +.5dB	RELAY K105 +1dB	RELAY K106 -32dB
20.5	1	1	1	0	1	0	1
21.0	1	1	1	0	0	1	1
21.5	1	1	1	0	1	1	1
22.0	1	0	1	0	0	0	1
22.5	1	0	1	0	1	0	1
23.0	1	0	1	0	0	1	1
23.5	1	0	1	0	1	1	1
24.0	0	1	0	0	0	0	1
24.5	0	1	0	0	1	0	1
25.0	0	1	0	0	0	1	1
25.5	0	1	0	0	1	1	1
26.0	0	0	0	0	0	0	1
26.5	0	0	0	0	1	0	1
27.0	0	0	0	0	0	1	1
27.5	0	0	0	0	1	1	1
28.0	0	1	1	0	0	0	1
28.5	0	1	1	0	1	0	1
29.0	0	1	1	0	0	1	1
29.5	0	1	1	0	1	1	1
30.0	0	0	1	0	0	0	1
30.5	0	0	1	0	1	0	1
31.0	0	0	1	0	0	1	1
31.5	0	0	1	0	1	1	1
32.0	1	1	0	1	0	0	0
32.5	1	1	0	1	1	0	0
33.0	1	1	0	1	0	1	0
33.5	1	1	0	1	1	1	0
34.0	1	0	0	1	0	0	0
34.5	1	0	0	1	1	0	0
35.0	1	0	0	1	0	1	0
35.5	1	0	0	1	1	1	0
36.0	1	1	1	1	0	0	0
36.5	1	1	1	1	1	0	0
37.0	1	1	1	1	0	1	0
37.5	1	1	1	1	1	1	0
38.0	1	0	1	1	0	0	0
38.5	1	0	1	1	1	0	0
39.0	1	0	1	1	0	1	0
39.5	1	0	1	1	1	1	0
40.0	0	1	0	1	0	0	0
40.5	0	1	0	1	1	0	0
41.0	0	1	0	1	0	1	0
41.5	0	1	0	1	1	1	0
42.0	0	0	0	1	0	0	0
42.5	0	0	0	1	1	0	0
43.0	0	0	0	1	0	1	0
43.5	0	0	0	1	1	1	0
44.0	0	1	1	1	0	0	0
44.5	0	1	1	1	1	0	0
45.0	0	1	1	1	0	1	0
45.5	0	1	1	1	1	1	0
46.0	0	0	1	1	0	0	0
46.5	0	0	1	1	1	0	0
47.0	0	0	1	1	0	1	0

Fig. 7.3 Relay Action Level

LEVEL READ-OUT	RELAY K100 -8dB	RELAY K101 -2dB	RELAY K102 +4dB	RELAY K103 -16dB	RELAY K104 +.5dB	RELAY K105 +1dB	RELAY K106 -32dB
47.5	0	0	1	1	1	1	0
48.0	1	1	0	0	0	0	0
48.5	1	1	0	0	1	0	0
49.0	1	1	0	0	0	1	0
49.5	1	1	0	0	1	1	0
50.0	1	0	0	0	0	0	0
50.5	1	0	0	0	1	0	0
51.0	1	0	0	0	0	1	0
51.5	1	0	0	0	1	1	0
52.0	1	1	1	0	0	0	0
52.5	1	1	1	0	1	0	0
53.0	1	1	1	0	0	1	0
53.5	1	1	1	0	1	1	0
54.0	1	0	1	0	0	0	0
54.5	1	0	1	0	1	0	0
55.0	1	0	1	0	0	1	0
55.5	1	0	1	0	1	1	0
56.0	0	1	0	0	0	0	0
56.5	0	1	0	0	1	0	0
57.0	0	1	0	0	0	1	0
57.5	0	1	0	0	1	1	0
58.0	0	0	0	0	0	0	0
58.5	0	0	0	0	1	0	0
59.0	0	0	0	0	0	1	0
59.5	0	0	0	0	1	1	0
60.0	0	1	1	0	0	0	0
60.5	0	1	1	0	1	0	0
61.0	0	1	1	0	0	1	0
61.5	0	1	1	0	1	1	0
62.0	0	0	1	0	0	0	0
62.5	0	0	1	0	1	0	0
63.0	0	0	1	0	0	1	0
63.5	0	0	1	0	1	1	0

Fig. 7.3 Relay Action Level

4. Remove four mounting screws and spacers.
5. Replace board; reverse of above - making sure to connect the ground lug with the mounting screw.

G. Tone Output Board Removal (#4547)

1. Disconnect four inter-connect ribbon cables at their removable ends (Note their location for future reconnection).
2. Desolder the ground wire from the regulator board.
3. Remove six mounting screws.
4. Replace board; reverse of above.

H. Output Board Removal (#9698)

1. Remove the Tone Output Board (see above).
2. Disconnect three interconnect ribbons at their removable ends. (Note their location for future reconnection.)
3. Remove six mounting screws and spacers.
4. Gently pull the board straight out.
5. Replace board and reverse of above. Note that the insulator caps are located underneath the nuts.
6. Remount the Tone Output Board.

J. Output Switch Board Removal (#4553)

1. Disconnect two interconnect ribbon cables.
2. Desolder and remove the ground wire and Headphone jacks wires from the board.
3. Remove two mounting screws.
4. Replace board; reverse of above.

K. Input Board Removal (#4549)

1. Remove the Logic Board (see Logic Board removal).
2. Disconnect four interconnect ribbon cables at their removable ends (Note location for future reconnection).
3. Remove 5 mounting screws from the rear panel.
4. Replace board; reverse of above.

L. Input Selector Board Removal (#4550)

1. Remove the Logic Board (see Logic Board removal).
2. Disconnect three interconnect ribbon cables at their removable ends.
3. Remove solder joints located on each of the four corners of the board (see Fig. 7.4).
4. Gently pull board outward.
5. Replace board; reverse of above.

M. Display Board Removal (#4552)

1. Remove the Logic Board (see Logic Board removal).
2. Disconnect three interconnect ribbon cables at their removable ends.

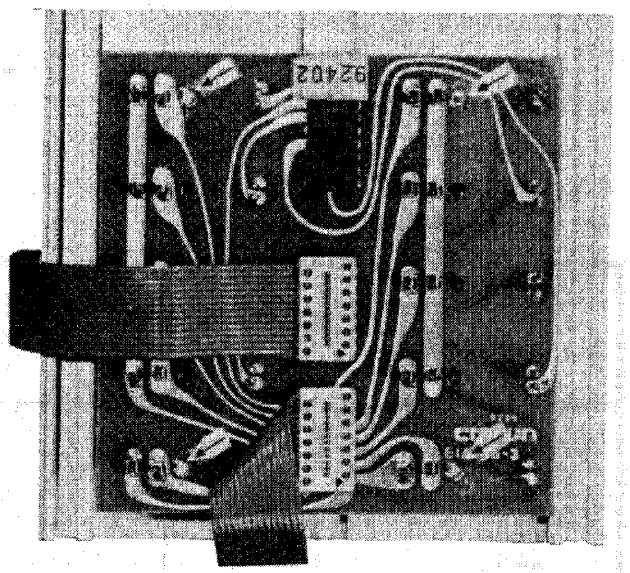


Fig. 7.4 Input Selector Board Solder Joints

3. Remove two mounting screws.
4. Remove board by pulling gently away from the front panel.
5. Replace board; reverse of above.

N. Loudness Board Removal (#4551)

1. Remove the Logic Board (see Logic Board removal).
2. Remove the Display Board (see Display Board removal).
3. Remove seven interconnect ribbon cables at their removable ends. (Note board interconnect diagram for future reconnection).
4. Remove the Loudness Contour knob by pulling outward.
5. Remove five mounting screws.
6. Replace board; reverse of above.

O. Tone Switch Board Removal (#4546)

1. Remove the Logic Board (see Logic Board removal).
2. Remove the Display Board (see Display Board removal).
3. Disconnect the interconnect cable.
4. Remove slide buttons by applying gentle pressure to each with a small flat-head screwdriver.
5. Remove four mounting nuts and one spacer.
6. Replace board; reverse of above.

P. Regulator Board Removal (#9704)

1. Disconnect interconnect ribbon cable.
2. Desolder and remove black ground wire from the board.
3. Remove four screws; two on regulator transistor; two on power supply receptacle with two spacers.

4. If necessary, replace regulator transistor.
5. Replace board; reverse of above - Note spacers on receptacle.

In certain instances, it may be necessary to inspect the seperate DL2 Power Module. Its disassembly procedures are listed below:

Q. Top Cover Removal - Power Module

1. Place Power Module top side up.
2. Remove six phillips head screws which secure the top cover.

R. Bottom Cover Removal - Power Module

1. Place Power Module upside down.
2. Remove six phillips head screws which secure the bottom cover.

S. Back Assembly Removal - Power Module

1. Remove top and bottom covers (see above).
2. Disconnect power switch/LED plug assembly by pulling gently upward.
3. Remove four mounting bolts (2 per side)from side panels.
4. Lift side panels around mounting thread bolts to allow clearance for removal.

Phono Module cover removal is not possible due to design and construction. Therefore, if repair is necessary it should be handled by exchange only through the Crown factory.

7.6 Reassembly

Reassembly is essentially the reverse of disassembly, however give particular attention to screw insertion. Start all screws and then tighten each in succession being careful not to apply too much torque so as to strip threads.

7.7 Electrical Checkout

The following procedure is done only AFTER a thorough visual inspection. Refer to Sec. 7.4 for Troubleshooting Tips and Repairs.

1. Initial Check (Normal Hook-Up)

A. Activate the main power supply module level should be at 0 with dim display and Mute Light illuminated. The level adjust buttons should not be active when pushed.
B. Push-activate Input No. 1 (Phono). The display should illuminate brighter and the Input Level Controls operate normally. The LED should light along with the Power LED. Five to seven seconds after selecting, the Mute LED should go off as well as the mute function.
C. Activate each input making sure the respective LED lights.
D. Push the Mute button; the Mute LED should illuminate and at the same time activation of the Mute function should take place. Press any input; mute should go off without delay.
E. Push the Power button; Analog (Audio) supplies should be removed, mute light on, display dim. Level display should not change with last input selected also the same. Level controls are inactive.
F. Select any input; unit should react as in (A) above.

2. Signal Path; Input-Output

A. Turn main power on; insert a 1KHz, 2.7VAC signal into input #1 (usually Phono). Activate Main Output switches 1 & 2. Audio Imaging Controls are set normal (A→L, B→R to 0 all others to ∞). All other controls should be in their inactive state.
B. Bring level of main control unit up to 43.5 (unity gain).
C. Check for signal and level at: Main 1 Mono Normal Out, External Signal 1 & 3/ Main 2 Normal and Inverted Out, Tape 1, 2, 3 Output/Buffer Outputs, Front Panel Headphone Out.
The level should equal the input level except Headphone (will be higher).
D. Repeat the above procedure for all inputs; return to Phono 1.

3. Audio Imaging Controls

A. Observe the output signal on oscilloscope; slowly rotate Audio Imaging Controls (A→L, B→R) making sure that no signal dropout occurs and that proper attenuation is obtained (1dB/step).
B. Set the A→L, B→R controls to ∞; repeat procedure with A→R, B→L controls.
C. Set the A→R, B→L controls to∞ insert a 1KHz .7V signal to the X and Y inputs and repeat as above with X→L, Y→R controls.

D. Return the Audio Imaging controls to normal setting (A—►L, B—►R fully clockwise, all other CCW).

4. Tape Copy Function

A. Insert a 1KHz, .7V signal into Tape 1 Input and select Input No. 1 (Phono). (This will not affect the operation of Tape Copy).
B. Set Tape Copy to 1—►2, 3 position. Monitor all three Tape Output jacks. Only Tape 2 and 3 output jacks should have signal.
C. Set Tape Copy to 2—►1 3. Apply the same input signal to Tape 2 Input. Signal should appear only at Tape 1 and Tape 3 Outputs.
D. Set Tape Copy to 3—►1,2. Apply the same input signal to Tape 3 Input. Signal should appear only at Tape 1 and 2 Outputs.
E. Repeat (D) of above using front panel In/Out Tape 3 jacks.
F. Return Tape Copy to Normal.

5. Tape Monitor Function (See Fig. 7.5)

A. Activate Tape 1 Monitor; at the Main, Tape 2 and 3 Outputs there should be signal present. There should be no signal at Tape 1 Out.
B. Activate Tape 2 Monitor; at the Main, Tape 1 and 3 Outputs there should be signal present. There should be no signal at Tape 2 out.
C. Activate Tape 3 Monitor; at the Main, Tape 1 and 2 outputs there should be signal present. There should be no signal at Tape 3 out.

	OUTPUTS			
	Main	TAPE 1	TAPE 2	TAPE 3
Tape 1 MON	1	0	1	1
Tape 2 MON	1	1	0	1
Tape 3 MON	1	1	1	0

0 - No Signal

1 - Signal

Fig. 7.5 Tape Monitor Truth Table

6. External Processor Function

A. Insert a 1KHz, .7VAC into input No.1 (Phono) and select the same.
B. Activate Processor 1 pushbutton.Output signal should occur at: Buffer Outputs, External Signal Processor #1, Tape 1, 2 and 3 Outputs.
C. Activate Pre-Record; signal should appear only at Processor 1 Output.
D. Using a pin to phone cable(s); connect Processor 1 Inputs to Processor 1 Outputs. Signal should now appear at all Outputs.
E. Deactivate Processor 1 and Pre-Record Repeat as above with Processor 2.
F. Deactivate Processor 2 and Pre-Record.

7. Low/High Filter

A. Activate the Low Filter. Select each of the four roll-off frequencies (20Hz, 30Hz, 50Hz, and 100Hz) while adjusting the signal generator to match the roll-off point selected The Main Output should be 3dB lower at each of the four frequencies when depressing and releasing Low Filter activate.
B. Deactivate the Low Filter; activate the High Filter and repeat as above.
C. Deactivate the High Filter.

8. Loudness Contour (See Fig. 7.6)

A. With control at 100, adjust the signal generator input signal to 5KHz. Step rotate the Loudness Contour through each step. The Output signal should drop 5dB with each step.
B. Adjust the signal generator to 20Hz. The level of attenuation should follow the table as below.

Position	Attenuation @ 20Hz	Attenuation @ 5KHz
100	0	0
95	-4.1	-5
90	-7.7	-10
85	-10.5	-15
80	-14.4	-20
75	-17.7	-25
70	-20.4	-30
65	-24.0	-35
60	-26.8	-40
55	-29.1	-45

Fig. 7.6 Loudness Contour Attenuation Table

C. Return Loudness Contour to 100.

9. Tone Controls

The tone controls are divided into three sections/channel; Low, Mid, and High. Each section has a slide switch to control the gain at its center frequency (±15dB) and a Center Frequency Selector which offers multiples of 40Hz, 800Hz, and 10KHz.

The following tests apply to each section (Low, Mid, High).

A. Adjust the gain switch to +15dB; set the signal generator to the center frequency of the section under test. (See Fig 7.7)
B. Check each gain position from +15dB to -15dB at the Main output.

	X.5	X1	X2
Bass:	20Hz	40Hz	80Hz
Mid:	400Hz	800Hz	1600Hz
Treble:	5KHz	10KHz	20KHz

Fig. 7.7 Tone Control Table

C. Check the X.5 and X2 frequency gain at both +15dB and -15dB.
D. Adjust the Gain Switch to 0 and Center Frequency switch to X1.

10. Gain

A. Set level at 0; output should be -43.5dB.
B. Set level to 63.5; output should be +20dB.
C. Set level to 43.5; output should be unity gain.

11. Overload Indicators

A. Set level to 63.5; raise input signal generator level until visible clipping occurs at the main outputs. Output voltage should be over 11 volts as well as overload indicators being lit.
B. Observe the Headphone Output while raising the input level of the signal generator until visible clipping occurs. Output should be over 17.5 volts.

12. IM Distortion

Due to the extremely low amounts of IM distortion in the DL2, test equipment residual will be the lowest possible reading. If this reading is taken, it should be done at rated output level (+10dB 2.45V). Fig. 7.8 shows typical test hook-up.

13. Hum and Noise

Noise readings should be taken with shorted input; level at 63.5 using a 20Hz-20KHz filter on the voltmeter.

7.8 Changing AC Mains Voltage

Fig. 7.9 shows the jumper arrangement for modifying the DL2 to operate on 100, 120, 200, 220, 240 VAC.

*100 volt operation -

Analog terminal strip - jumper B and E, A and D and move red wire to E.

Logic terminal strip - jumper A and D, B and E and move red wire to E.

*120 volt operation

Analog terminal strip - jumper A and D, C and F and move red wire to F.
Logic terminal strip - jumper A and D, C and F and move red wire to F.

*200 volt operation

Analog terminal strip - jumper A and E and move red wire to B.
Logic terminal strip - jumper A and E and move red wire to B.

*220 volt operation

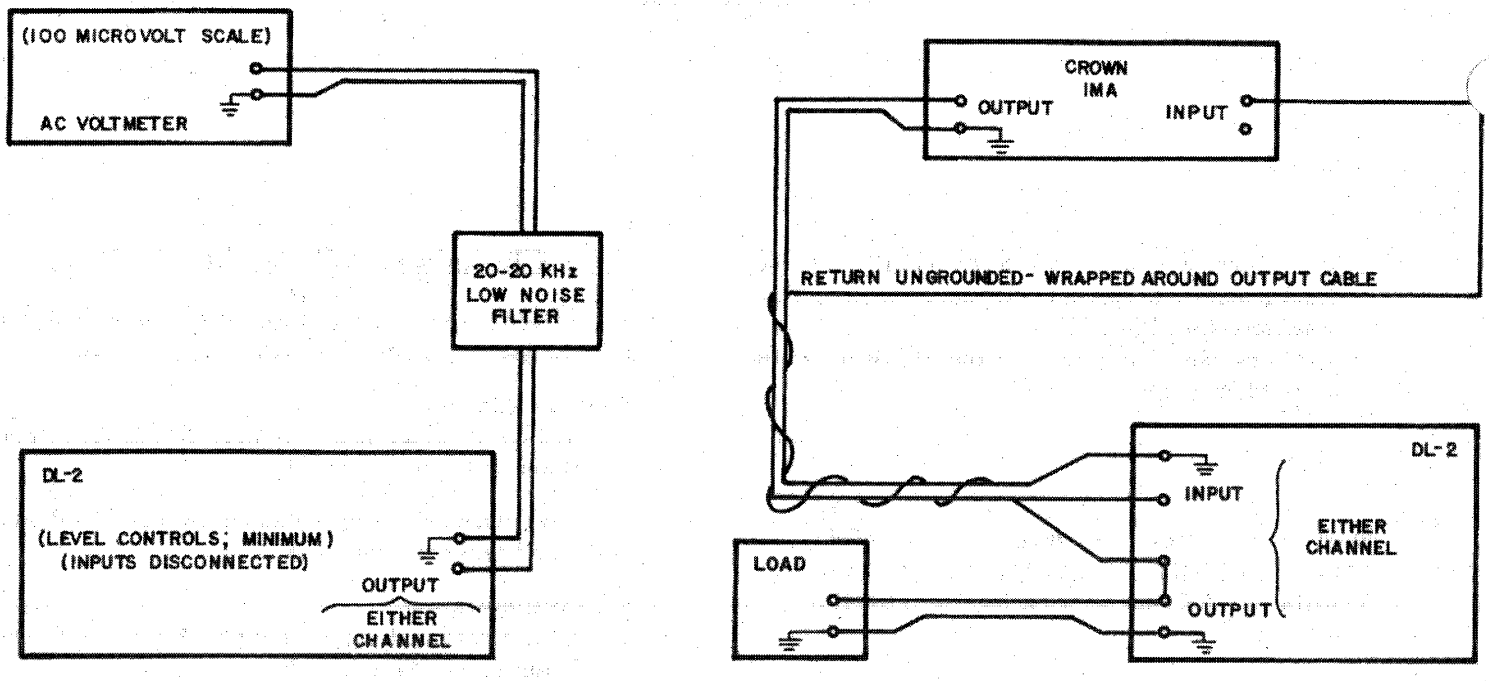
Analog terminal strip - jumper A and E and move red wire to C.
Logic terminal strip - jumper A and E and move red wire to C.

*240 volt operation

Analog terminal strip - jumper A and F and move red wire to C.
Logic terminal strip - jumper A and F and move red wire to C.

*Use ¼A MDL fuse for 200, 220, 240 VAC line.

*Use .5A MDL fuse for 100, 120VAC line.



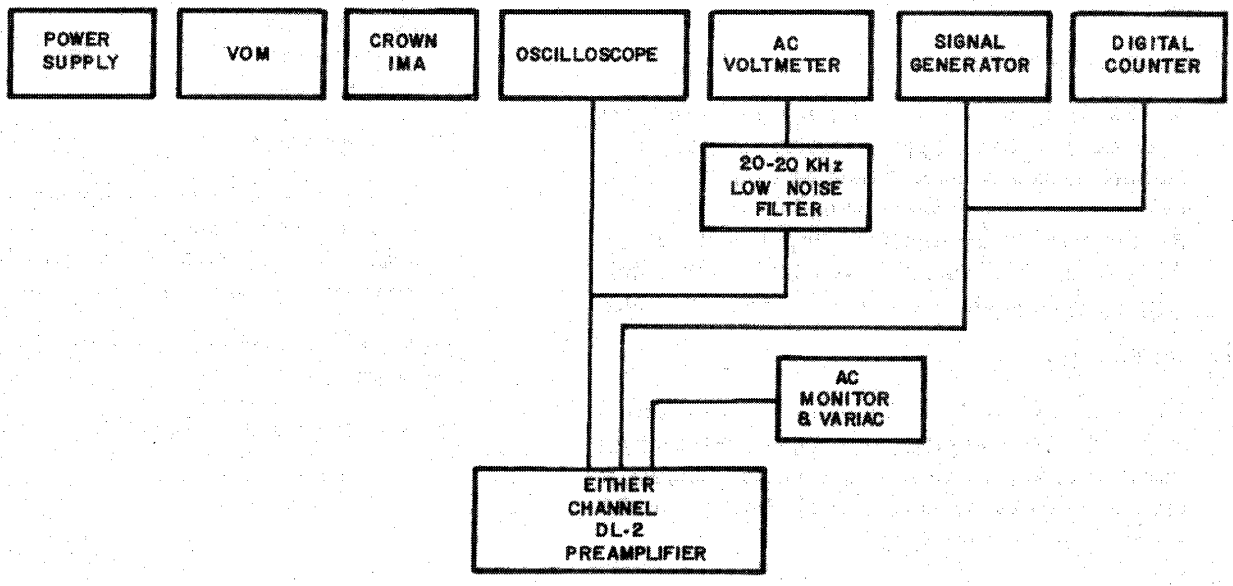


Fig. 7.8 IM Distortion/Hum and Noise Test Set-up

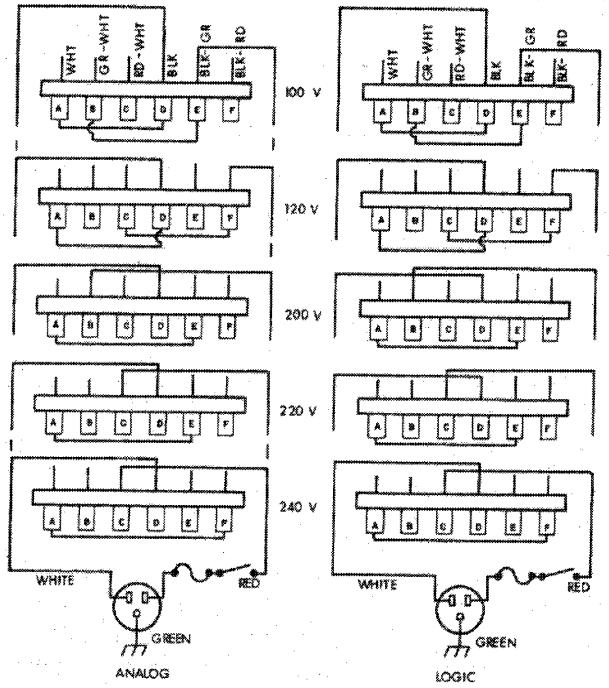


Fig. 7.9 AC Voltage Mains Chart

SERVICE BULLETIN

crown®

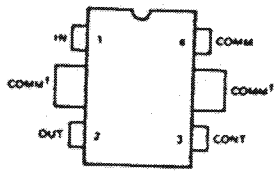
DL2S043086

MODEL: DL2-S

SERIAL NUMBERS AFFECTED: 100-700

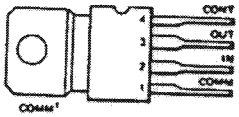
The C 4296-7, a UA78MGT2C +18 V regulator used in the DL2-S power supply module has been obsoleted by the manufacturer. The same component in the 4 pin TO-39 package shown below is a C 5487-1, drawn as configured for installation in the place of the 4296. Some provision should be made for a heatsink on the tab, which is common. Take care not to short the tab or heatsink to chassis.

C 4296-7

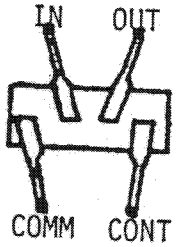


TOP VIEW
UA78MGT2C

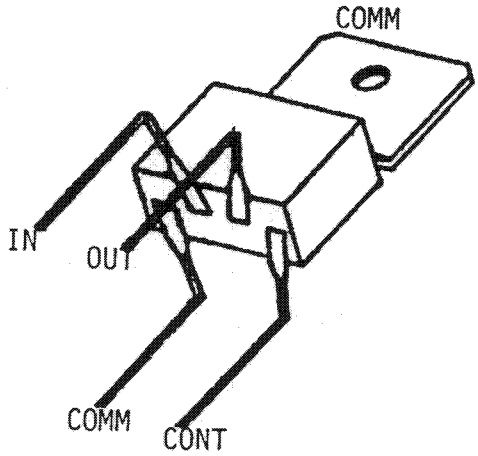
C 5487-1



TOP VIEW
UA78MGU1C



BOTTOM VIEW

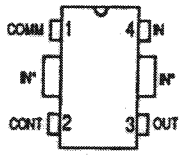


Part Replacement Bulletin

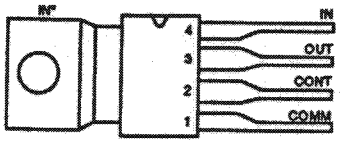
crown

Part Number:	C 4297-5
Replacement Part Number:	C 5486-3
Applicable Models:	DL2-S

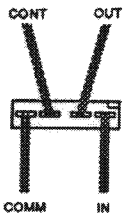
The –18V regulator, µA79MGT2C, CPN C 4297-5, has been obsoleted by the manufacturer. The same component in the 4 pin, TO-39 package, is available from us as part number C 5486-3. Shown below is the pin configurations for both devices. Bend the pins on the TO-39 device to accomadate the solder pads used by the older device. Some provision should be made for a heatsink on the tab, which is the input. Take care not to short the tab or heatsink to the chassis.



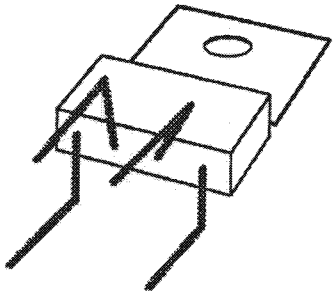
Top View
µA79MGT2C
C 4297-5



Side View
µA79MGU1C
C 5486-3



Bottom View
µA79MGU1C
C 5486-3



Bend pins as shown
when replacing C 4297-5
with C 5486-3

*Heat sink tabs connected to input through device substrate. Not recommended for direct electrical connection.

DL2100-70031880

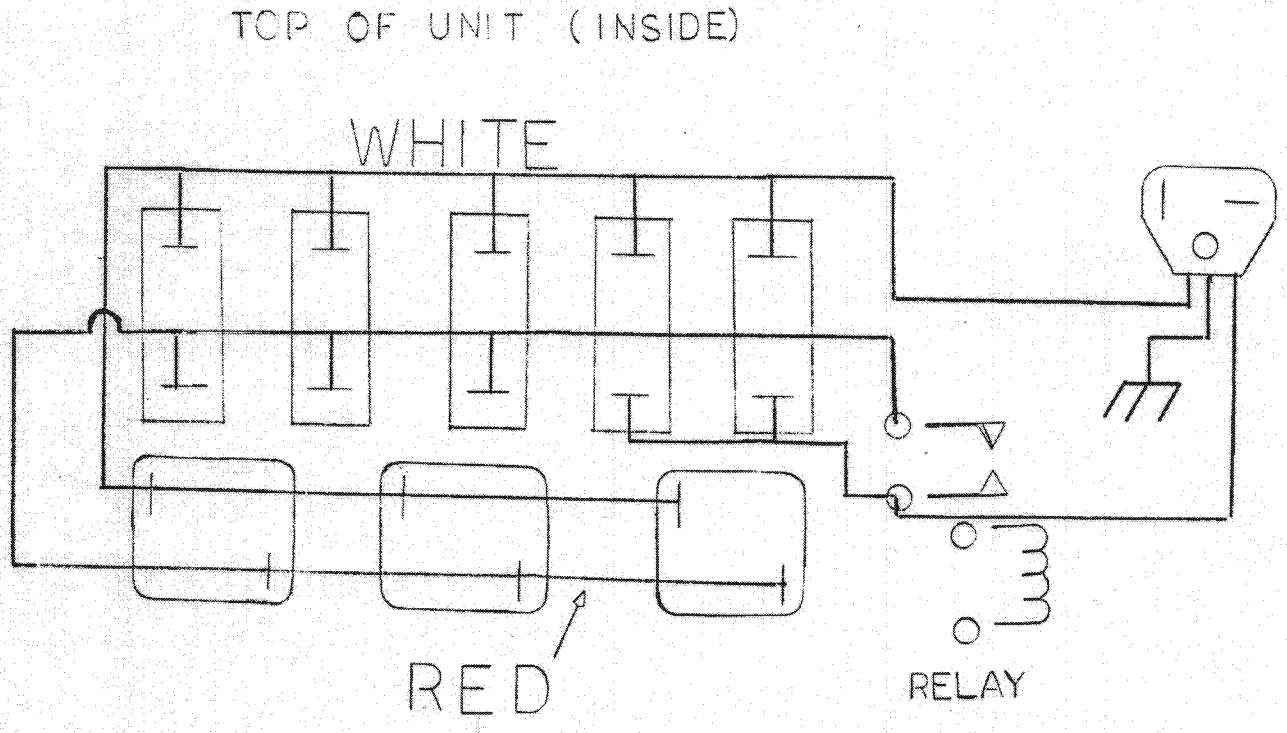
SERVICE BULLETIN

FROM THE CROWN TECHNICAL SERVICE DEPARTMENT

SUBJECT: DL-2S AC Recepticles & AC Power Cord

SERIAL NUMBERS AFFECTED: 100 - 700

It has come to our attention that there is a potential problem on some DL-2 power supplies. It seems that the three (3) conductors and two conductor receptacles are reversed in polarity. Also, some power cords (AC) may also have been reversed. Please check all units between the above serial numbers in for service, for the above situation. Use the below diagram when checking for this problem. If you have any questions, please contact me.



James I. Stembel
Product Specialist

jao

SERVICE BULLETIN

FROM THE CROWN TECHNICAL SERVICE DEPARTMENT

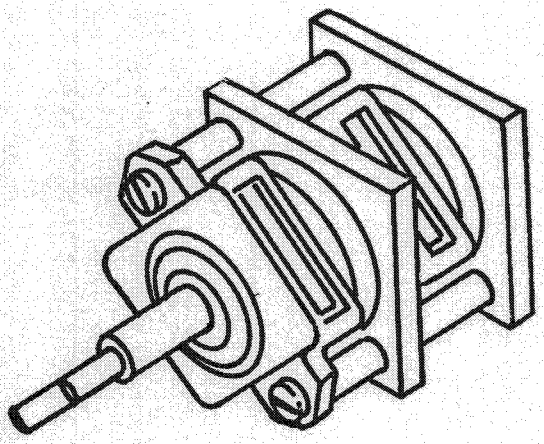
SUBJECT: DL-2C Panorama Module

SERIAL NUMBERS AFFECTED: 1000-1585

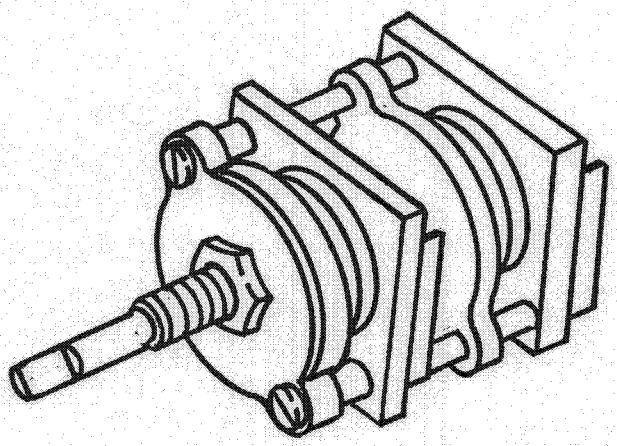
There has been a major change in the DL-2C Panorama Module. The manufacturer of the current stepped attenuator (D 4440-0) has since discontinued production of the above item. It was, then, necessary to find a replacement. The replacement stepped attenuator (D 5462-3), unfortunately, cannot be used as a direct replacement. The procedure for changing a bad panorama stepped attenuator is as follows:

1) Remove entire panorama module (41847) (switches D 4440-0)
2) Install new panorama module (Q 41847J6) (switches D 5462-3)
3) Remove gray overlay across the bottom of DL-2C (D 4642-1)
4) Remove any adhesive remaining on front panel
5) Install new overlay on front panel (D 5483A7)
6) Check unit for specifications and performance

If any problems or questions arise, please contact me.



D 4440-0 (old)



D 5462-3 (new)

James I. Stembel
Product Specialist

jao

DL-2C112779

SERVICE BULLETIN

FROM THE CROWN TECHNICAL SERVICE DEPARTMENT

SUBJECT: DL-2C

SERIAL NUMBERS AFFECTED: 1061 - 1100

It has come to our attention that a potential problem has arisen in a small number of Crown DL-2 pre-amplifiers. According to our records, there is a possibility that these units are victim of omitted C129 and C230 capacitors on the tone output board. C129 is a compensation capacitor for IC107. The CPN for this capacitor is 2821. C230 is a 20 pFd which is a compensation capacitor for IC208. The CPN for this capacitor is 3535. If you should receive any of these units for service, please check for these missing parts.

If you have any comments or questions, please feel free to contact me.

Sincerely,

James I. Stembel
Product Specialist

jao