



**2280B**  
**Incremental Power<sup>®</sup> System**

**Operating and Service Instructions**

**ALTEC LANSING CORPORATION**

a **MARK IV** company

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## 1 ELECTRICAL

**WARNING:** Verify that line voltage is in accordance with the voltage rating before connecting the main frame to line power.

### 1.1 AC Power Fan Module

Each main frame is equipped with an ac power fan module. This module consists of an ON-OFF ac power switch (circuit breaker type) with built-in pilot lamp, and a terminal strip which permits strapping the power transformer primary for 100/120/200/220/240 Vac at 50/60 Hz. A fan is incorporated in the module to provide forced air cooling of the output power modules.

### 1.2 120 Volt, 50/60 Hz Power Connections

The 2280B Incremental Power® System is supplied for domestic use with the power transformer primary strapped for 120 volts. The power input rating appears at the rear of the main frame chassis, adjacent to the power cord.

### 1.3 Alternate 50/60 Hz Primary Power Connections

The unit may operate from a primary power source having 100/200/220/240 Vac at 50/60 Hz. Qualified service personnel may change the transformer

primary straps for operation at alternate voltages. The primary power straps are located at terminal board TB301, within the ac primary power module. Refer to Figure 1 to connect necessary straps.

## 2 INPUT/OUTPUT MODULES

### 2.1 Optional Input Modules

There are two different electronically balanced input modules available for the 2280B Incremental Power® System. You must order one of these two units in order to use this system.

**NOTE:** The Incremental Power® System will not operate unless one of these input modules is installed.

#### 2.1.1 Input Module with Stepped Attenuators

The first unit is the 2285A which has electronically-balanced inputs and offers each channel a stepped input attenuator to reduce incoming signals in discrete increments. The six attenuation switches provide each channel 1, 2, 4, 8, 16 and 32 dB attenuation. Figure 2 shows the attenuation designation for these switches. By closing the switches in combination, any attenuation may be obtained in 1 dB steps to a maximum of -63 dB. Signal requirements for rated output is 0.775 Vrms with the stepped attenuator at 0 dB. This module allows for the connection

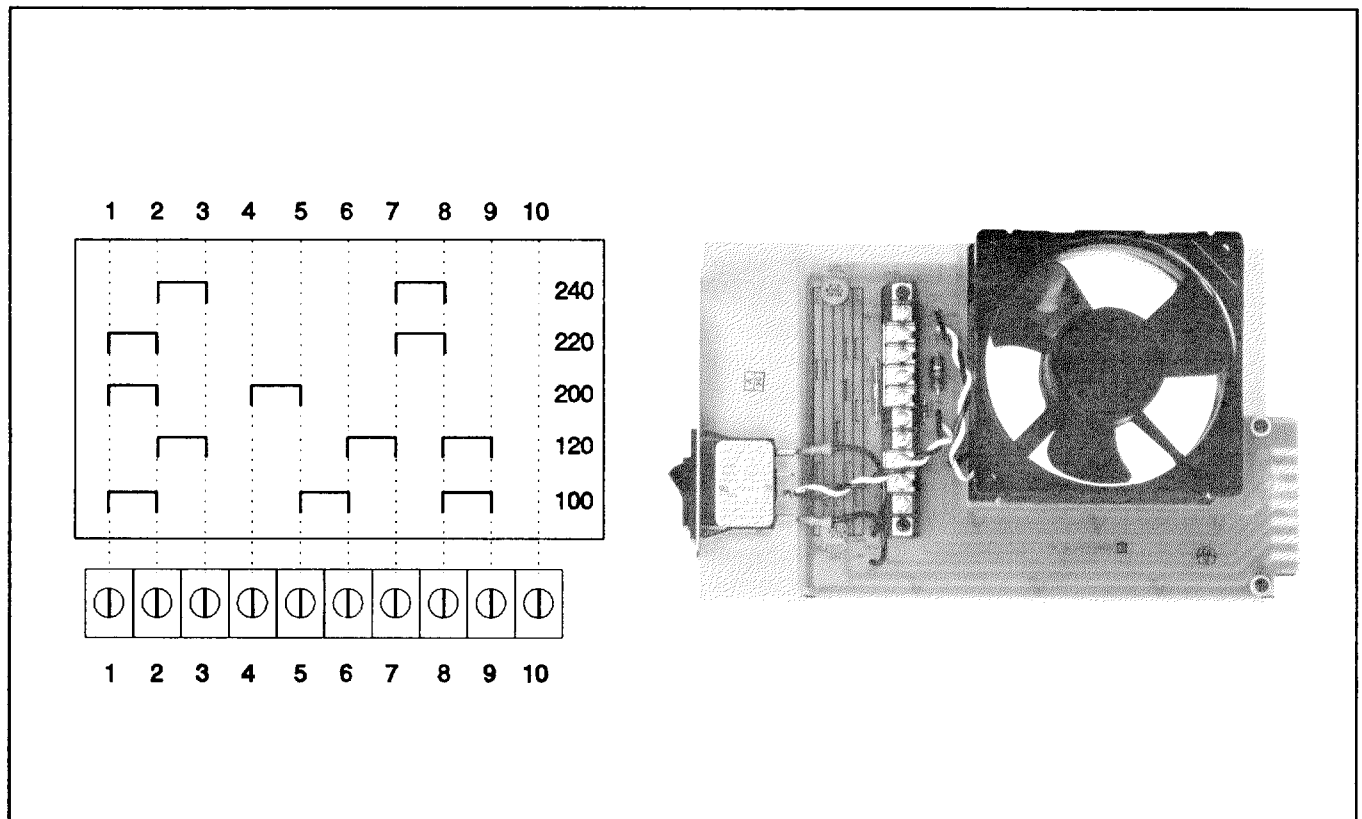


Figure 1 AC Power Fan Module Strapping Designations

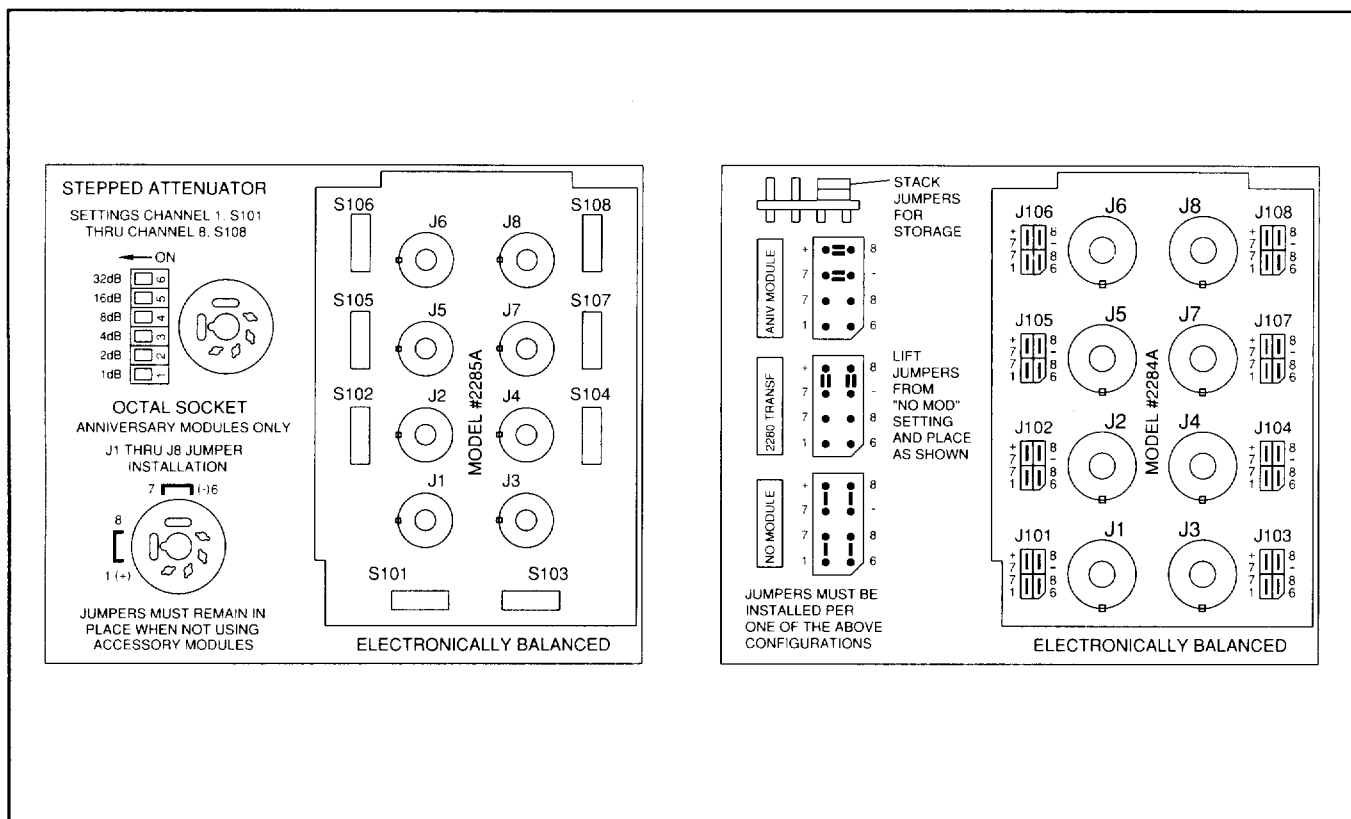


Figure 2 Layout of the Input Modules

of eight Anniversary Series input modules.

### 2.1.2 Input Module without Stepped Attenuators

The 2284A input module offers the same electronically-balanced inputs and quality performance as the 2285A except it does not include the stepped input attenuators. Signal requirements are otherwise unaffected. This module is designed for use with external attenuators such as the Altec Lansing 8428A, and allows for the connection of eight Anniversary Series or 15335A modules. It is necessary to strap the corresponding connector on the input card when using optional modules (see Figure 2).

#### 2.1.2.1 Utilizing an 8428A Programmable Attenuator with the 2280B

If you are operating your 2280B with the 2284A input card and wish to add attenuation capabilities, you can utilize an 8428A Programmable Attenuator. The 8428A would be connected in series between your input signal and the 2280B as illustrated in Figure 3.

Besides offering eight channels of programmable attenuation, the 8428A allows the user to remotely monitor the amplifier status of the 2280B through use of the Acousta-Graphics™ software. Simply connect

the 9-pin D-sub connector between the 8428A's "REM AMP MON" connector and the 2280B's "CH FAULT IND" connector as seen in Figure 3.

For details on how the 8428A operates, please refer to the operation instructions, part #42-02-037451.

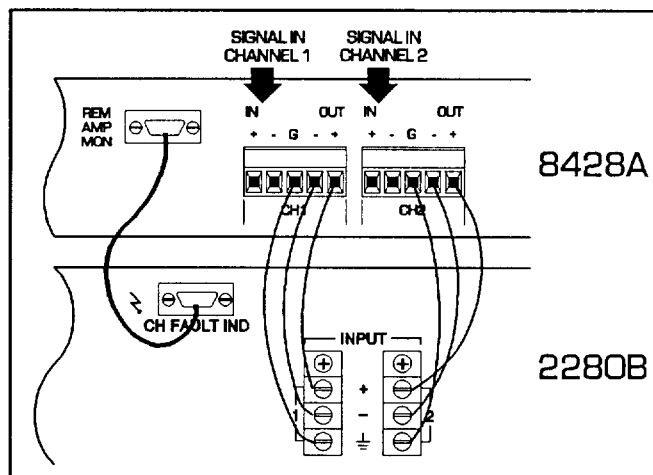


Figure 3 8428A to 2280B Connections

### 2.1.3 Optional Input Transformers

For each channel that requires transformer isolation, an optional 15335A Input Transformer Module must be installed in the appropriate recep-

tacle of the 2284A input board. Channel designations of the transformer receptacles are shown in Figure 2. Remove the jumpers between pins 1 and 8, 6 and 7 of the receptacle before attempting to plug in the transformer module.

The 15015A Input Bridging Transformer can be used with either the 2284A or 2285A input card and offers transformer isolation from the source with no loading.

#### 2.1.4 Input Module/Transformer Installation

**NOTE:** All installations should be documented for later reference in troubleshooting, replacing modules, or resetting routing switches or jumpers.

Input modules (2284A or 2285A) and any other modules must be unpacked and installed in the main frame as follows:

1. Remove the four screws that secure the front panel. Open and lower the front panel as shown in Figure 5.

**NOTE:** Caution should be exercised while installing the modules into the octal sockets. After aligning the pins, **gently wiggle the module until it seats. Do not exert force on the module. This may cause damage to the octal sockets.**

2. If optional input modules are to be installed, plug the modules into the input section according to channel designation shown in Figure 2.

**NOTE:** Before installing the input card make sure all jumpers are in place and the attenuation levels set (on the 2285A only). All transformers and modules should be securely placed in the appropriate sockets.

3. In order to insert the input card module, the top cover should be removed (the card can be inserted without removing the cover by utilizing a short screwdriver). Locate and unscrew the four screws securing the top. Remove the screw located nearest the front panel on the right hand side of the input section. Gently push the card module until it engages the rear connector. Press firmly until fully seated. Secure with the three screws supplied. Carefully replace the screw nearest the front panel on the right hand side making sure the protective sleeve aligns below the input card. Replace the top cover.

4. After all input and output modules have been installed in the main frame, close the front panel and secure with four screws previously removed. The front panel must be raised to maintain proper cooling.

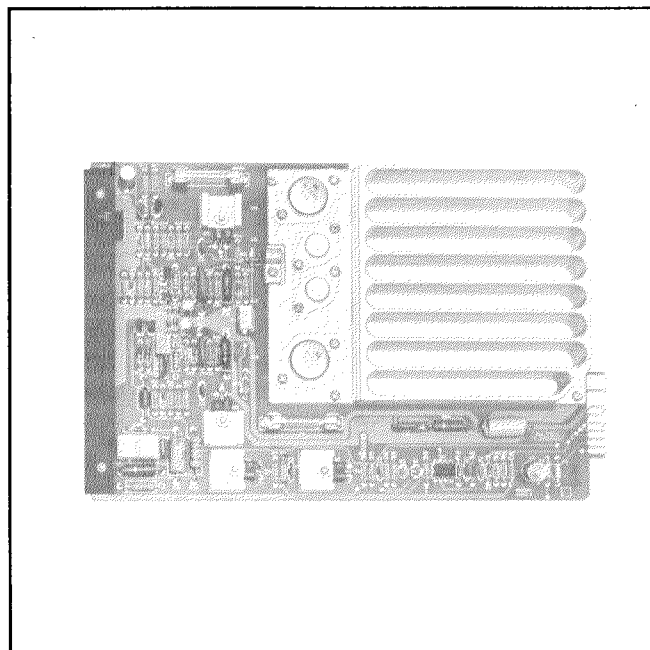


Figure 4 Output Power Module

#### 2.2 Output Power Amplifier Modules

The 2271 Output Power Amplifier Modules may be operated independently or in paralleled groups. Independent operation provides up to 78 watts for each independent output. The modules may be paralleled in 78-watt increments for maximum output as follows:

Modules Paralleled	Maximum Output Power
2	156 watts
3	234 watts
4	312 watts
5	390 watts
6	468 watts
7	546 watts
8	624 watts

The eight available channels in each main frame may be used in combined application for independent and parallel operation. However, amplifier modules assigned to a given parallel group must be adjacent to enable proper connections. Figure 4 illustrates the 2271 Output Power Amplifier Module.

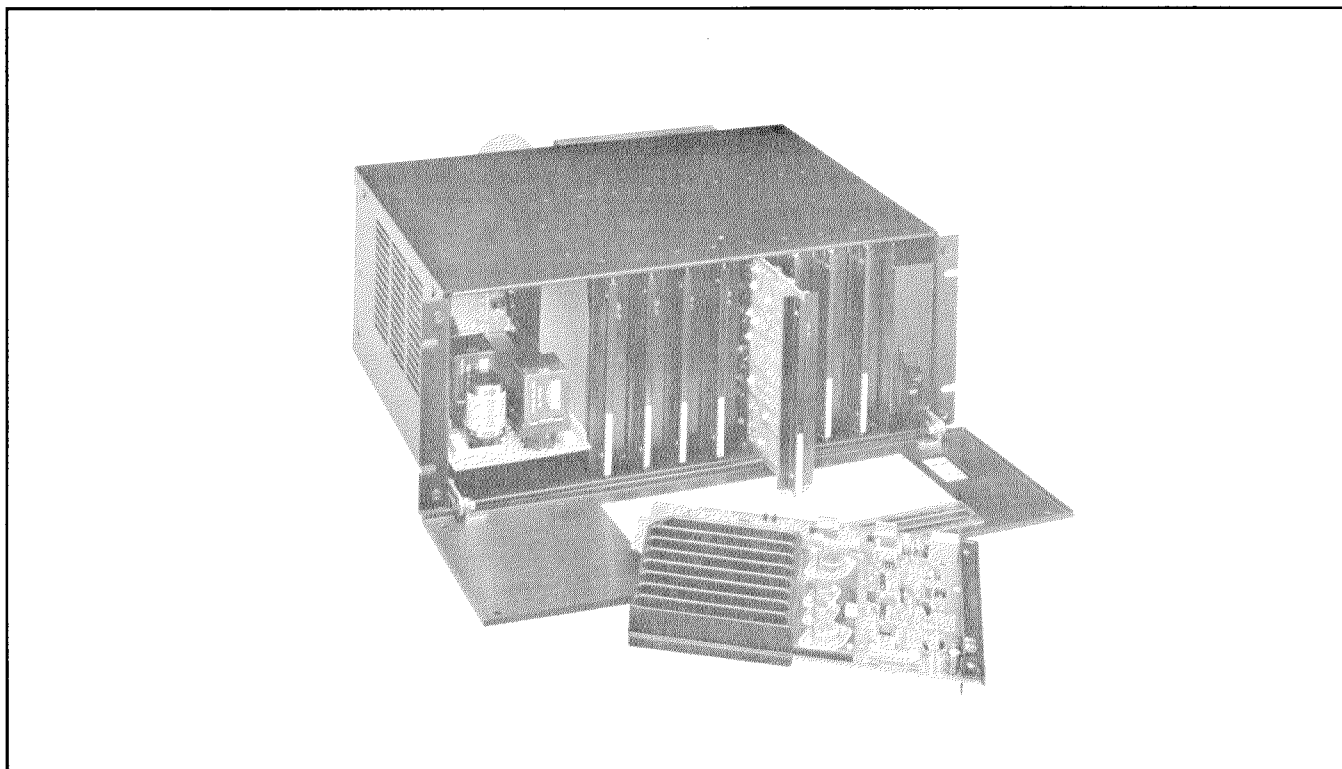


Figure 5 Main Frame and Position Assignment of Modules

### 2.2.1 Power Output Module Installation

Output modules (2271, 2273) must be unpacked and installed in the main frame as follows:

1. Remove the four screws that secure the front panel. Open and lower the front panel as shown in Figure 5.

**CAUTION:** Output power modules may be installed in the main frame while ac power is on. However, always be certain that the module to be installed is in proper working order. Installing a defective module with the ac power on may result in damage to the mother board.

2. Insert each output module so that the card edges fit into the flange portion of the top and bottom guides. Gently push the card module into the guides until it engages the rear connector. Press firmly until fully seated. If fewer than 8 output power amplifier modules are installed, locate unused slots farthest from fan to maintain optimum cooling.

**Note:** When fewer than 8 output power amplifier modules are installed in the main frame, install Model 2273 blank card modules in all empty slots to

maintain optimum cooling of output transistors.

3. After all input and output modules have been installed in the main frame, close the front panel and secure with four screws previously removed. The front panel must be raised to maintain proper cooling.

## 3 SYSTEM INSTALLATION

### 3.1 Ventilation

The Incremental Power® System must be adequately ventilated to prevent excessive temperature rise. Maximum rated ambient temperature is 55°C (131°F).

**CAUTION:** Do not block the side ventilation apertures on either side of the main frame. Allow at least 2" on each side of the unit to assure adequate ventilation. Do not operate within a completely closed, unventilated housing.

### 3.2 Rack Mounting

The 2280B is designed for installation in a standard 19-inch equipment rack. Vertical space required for mounting is 7" for each main frame. Installation is performed as follows:

1. Remove the four screws that secure the front panel. Open and lower the front panel as shown in Figure 5.
2. Install main frame in equipment rack, using appropriate four screws supplied.

**CAUTION:** While positioning the main frame in the equipment rack, do not use the large filter capacitors as handles. Lift or handle the main frame only by the chassis and power transformer.

3. After installing all modules, close front panel and secure with four screws previously removed.

#### 4 SIGNAL CONNECTIONS

##### 4.1 Input Connections

Input connections are made at the input terminal boards, illustrated in Figure 6. Connections should be made with two-conductor, twisted-pair shielded cable such as Belden 8450 or 8451.

For balanced input (transformer module installed), connection from the preamplifier is made to the positive and negative terminals. Shields are connected to the ground terminals. See Figure 7.

For direct (unbalanced) input, connection from the preamplifier is made to the positive terminals. Cable shields are connected to the negative and ground terminals. See Figure 8. Each corresponding transformer module socket inside main frame must have a jumper installed between pins 1 and 8, and between pins 6 and 7.

##### 4.2 Output Connections

Output connections are made at the output terminal boards, illustrated in Figure 6. Connection to the associated loudspeaker system is made directly to the positive and negative terminals of the desired channel.

##### 4.3 Ground Lift

The 2280B is a direct-output 70.7V power amplifier. Each output negative terminal is referenced to signal ground. Most installations will be successful with the 2280B signal ground jumpered to the chassis ground (as shipped). A system that is experiencing ground related problems can likely be improved by removing this jumper.

##### 4.4 System Fault Alarm Connection

A failure alarm may be connected to the FAULT terminals located on the rear of the main

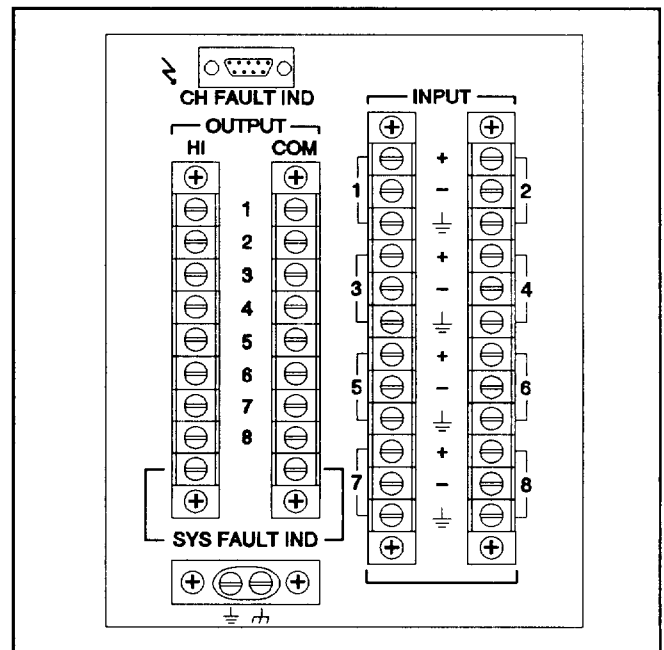


Figure 6 Input and Output Terminal Boards

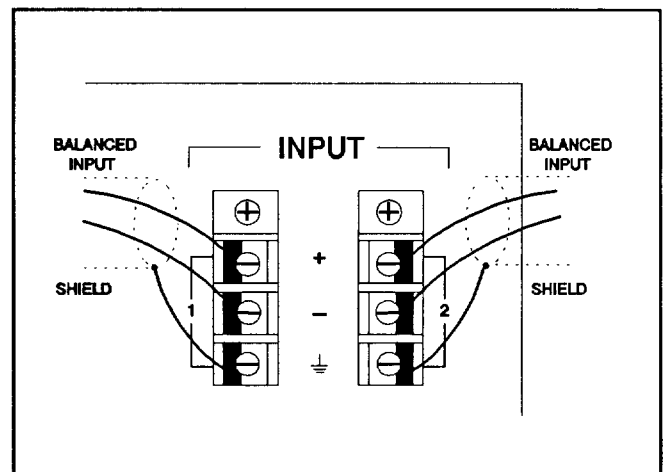


Figure 7 Balanced Input Connections

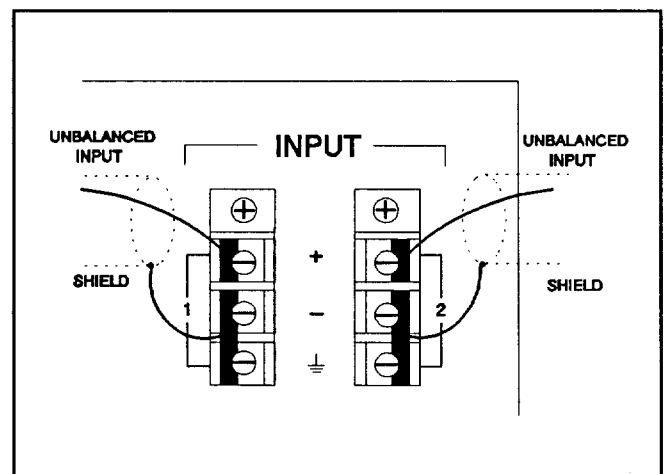


Figure 8 Unbalanced Input Connections

frame, below the output terminal boards. A fault-indicating relay within the main frame exhibits a normally open condition at the FAULT terminals during operation of all installed power output amplifier modules. However, if any amplifier module fails, the fault-indicating relay closes and exhibits a short-circuit condition at the FAULT terminals. Removal of the failed amplifier module restores the normally open condition at the FAULT terminals. The contents of the fault-indicating relay are rated for 1 ampere at 12 Vdc or 125 Vac.

In order to set the system to recognize a system fault, simply wire the 9-pin D-sub shorting connector as shown in Figure 9. With channels 1 through 8 (pins 1 through 8) connected, plug the shorting connector into the CH FAULT IND input. The SYS FAULT IND can now be wired for detection of system faults using the .250 spade lug terminal located below the channel output.

#### 4.5 Channel Fault Alarm System

A failure alarm may be connected to the CH FAULT IND 9-pin D-subminiature connector located above the output terminal board. This allows each channel to have its own distinct fault alarm.

The 9-pin D-sub connector should be set up as shown in Figure 9. In the event of a fault, the relay will close the contacts between the corresponding failed channel and pin 9 (common).

### 5 FUNCTION INDICATORS

Each plug-in amplifier module is equipped with a red and green indicator. The green indicator illuminates when a signal is applied to the amplifier input. The red indicator illuminates upon failure of the amplifier.

Remote indication of the red (fault) indicator may be employed as described previously in the **System Fault Alarm Connection** section.

Two 2280B main frames may be coupled for redundancy using the Altec Lansing 1703A **SEQUR® Amplifier Coupler**. Full instructions are given in the 1703A operating instructions.

### 6 OPERATION

#### 6.1 Independent Operation

To operate channels independently, each channel must receive a separate input signal and drive a separate loudspeaker load. Input signals must be routed through one of the eight driver amplifiers

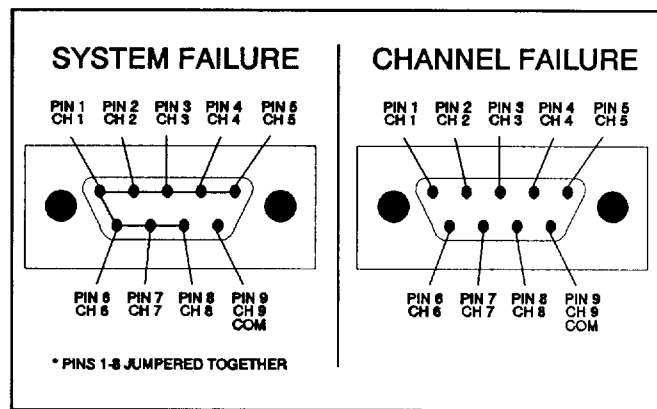


Figure 9 Failure Alarm 9-Pin D-Sub Connections

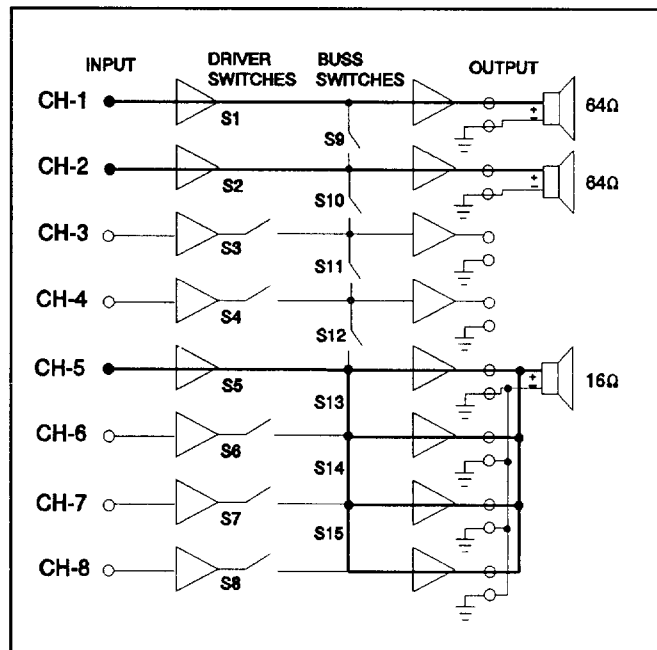


Figure 10 Typical Connections for Independent and Parallel Operation

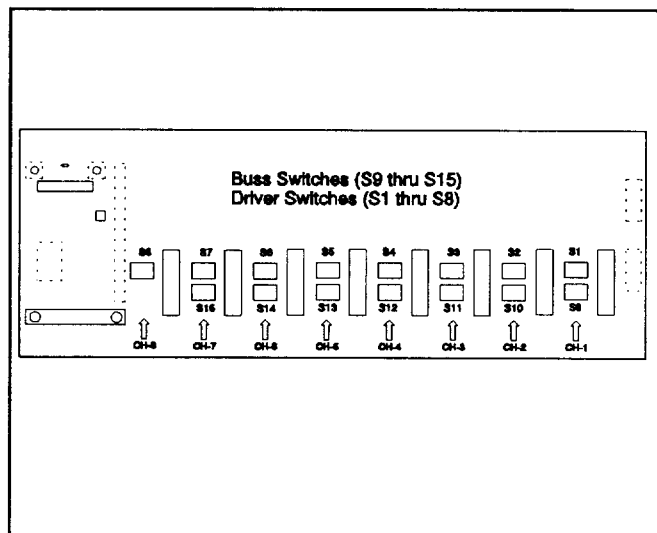


Figure 11 Location of Buss and Driver Routing Switches



via the routing switches located on an internal circuit board. Figure 10 illustrates channels 1 and 2 set up for independent operation. Input channels 1 and 2 are routed to channel 1 and 2 outputs, respectively. Each independent channel drives a separate 64-ohm load at 70.7 volt rms. Maximum power output is 78 watts per channel.

To set up routing switches for independent operation, place associated buss switches (S9 through S15) to left-hand position (open). Place associated driver switches (S1 through S8) to right-hand position (closed). The routing switches are accessible when the front panel and power amplifier modules are removed from the main frame. Figure 11 illustrates function and designation of the routing switches. A decal (Figure 12) located inside the front panel allows the user to note the position of the switches and level of the attenuators.

**6.2 Parallel Operation**

Up to eight output power modules may be paralleled. Parallel amplifier modules *must* receive only one (common) driver signal and drive one (common) loudspeaker load. Figure 10 illustrates a typical configuration with channels 5, 6, 7 and 8 connected for parallel operation.

**NOTE:** *When output modules are to be operated in the parallel mode, it is recommended that the "COM" output terminals be strapped as well as their corresponding "HI" output terminals. This safeguards against possible electrical failures due to increased power handling through a single "COM" output terminal.*

Specifications for parallel operation are summarized in Table I. Voltage specifications given below allow calculation of power delivered to a loudspeaker system where loudspeaker load impedance is higher than the rated load impedance where:

$$\text{Power} = (\text{Voltage})^2 \times \text{Impedance}$$

To set up routing switches for parallel operation, place the desired channel buss switches (S9 through S15) to the right-hand position. Place corresponding channel driver switches to left-hand position, except for the channel which is to receive the input signal; set this driver switch to the righthand position. The routing switches are accessible when the front panel and power amplifier modules are removed from the main frame. Figure 11 illustrates function and designation of the routing switches.

**CAUTION:** *If the outputs of two or more output power modules are paralleled, the portion of the driver bus connected to the same modules also must be paralleled by closing the proper buss switches shown in Figures 11 and 13. Mismatched (non-parallel) or unassigned input paths to output power modules having paralleled outputs may cause fuses to blow within the modules.*

**Table I** Output Power and Impedance for Paralleled Modules

Number Modules Paralleled	Rated Power Output	Rated Load Impedance	Rated RMS Sine-Wave Output
2	156 w	32 Ω	70.7 volts
3	234 w	21 Ω	70.7 volts
4	312 w	16 Ω	70.7 volts
5	390 w	12.8 Ω	70.7 volts
6	468 w	10.7 Ω	70.7 volts
7	546 w	9.15 Ω	70.7 volts
8	624 w	8 Ω	70.7 volts

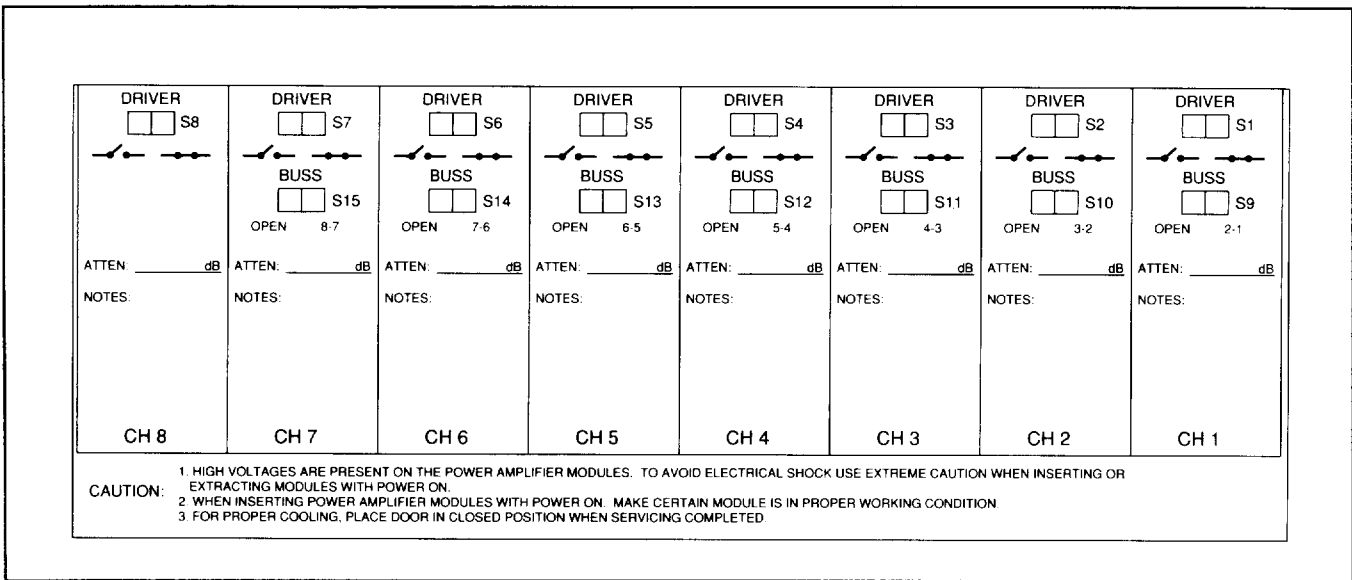


Figure 12 Decal Inside Front Panel

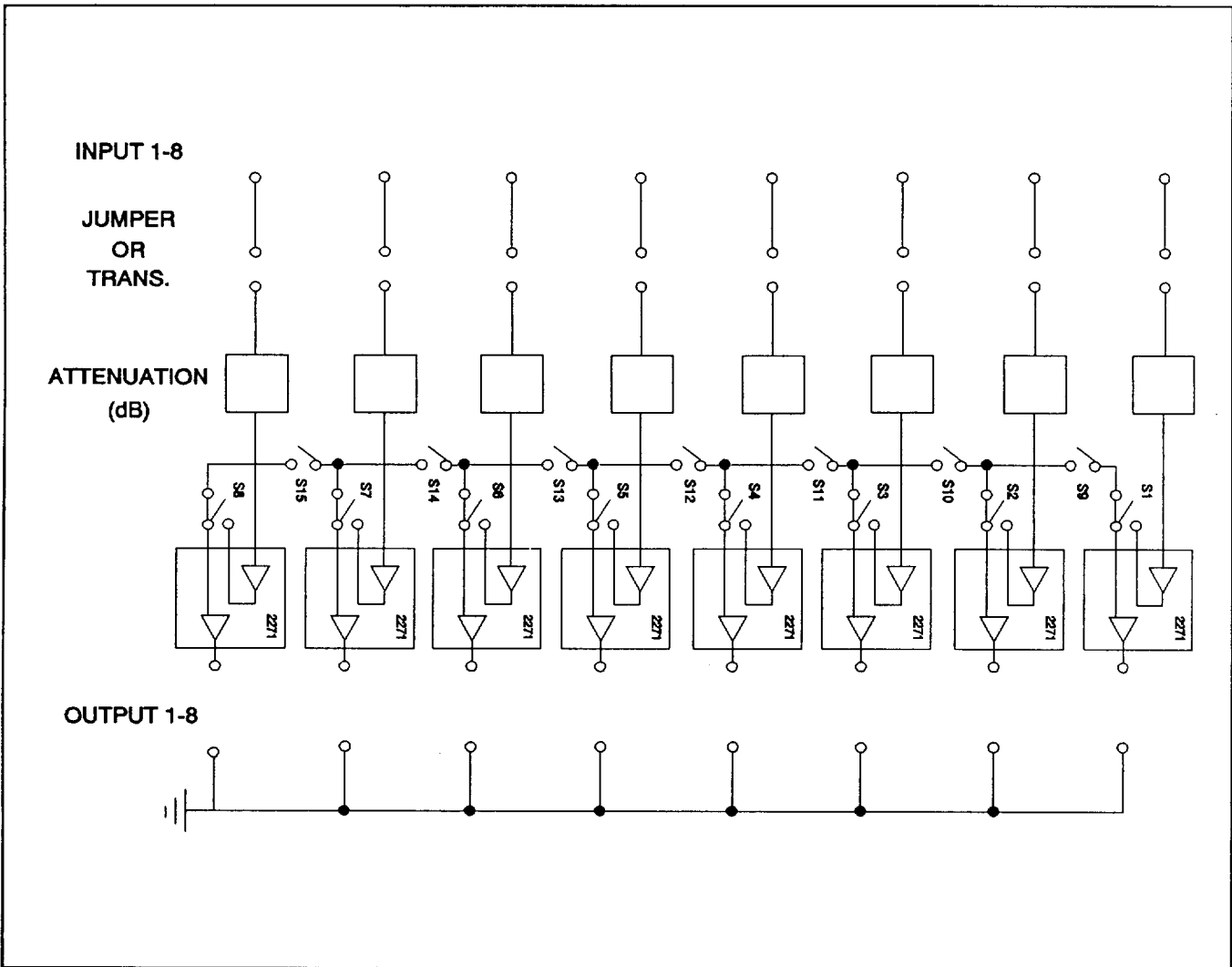


Figure 13 2280B Hook-Up Diagram

7 SPECIFICATIONS

**Conditions:**

1. 0 dBu = 0.775 volts rms.
2. 120 volt ac line input voltage maintained for all tests unless noted.
3. Electronically-balanced input.

**Continuous Rated Output Power:**

(20 Hz - 20 kHz at less than 0.1% THD)  
 1 Output Power Module, 64 Ω: 78 watts  
 8 Channels Paralleled, 8 Ω: 624 watts

**Maximum Midband Output Power:**

(Ref, 1 kHz, 1% THD, @120 volts ac line voltage)  
 1 Output Power Module, 64 Ω: 110 watts  
 8 Channels Paralleled, 8 Ω: 725 watts

(Ref. 1 kHz, 1% THD, @108 volts ac {10% sag})

1 Output Power Module, 64 Ω: 95 watts  
 8 Channels Paralleled, 8 Ω: 575 watts

**Headroom (Before Clip):** ≥ .5 dB  
 (Ref. 1 kHz, 1% THD, any mode)

**Frequency Response:** 10 Hz - 50 kHz  
 (Ref. 1 kHz, 1 watt output, +0/-3 dB)

**Power Bandwidth:** 20 Hz - 20 kHz  
 (Ref. 1 kHz, ± 1 dBr where 0 dBr = rated output power in any mode)

**Voltage Gain:**  
 (Ref. 1 kHz)  
 Any Mode: 39.5 dB

**Common Mode Rejection Ratio:**  
 (0 dBr = 70.7 volts rms, any mode)  
 60 Hz: -75 dBr  
 10 kHz: -55 dBr

**Input Sensitivity for Rated Output Power:**  
 (Ref. 1 kHz, ± 0.5 dB)  
 Any Mode: 0 dBu

**Maximum Input Level:**  
 (Ref. 1 kHz)  
 2285A (fully attenuated): + 15 dBu  
 2284A: + 1 dBu

**Input Impedance:**  
 (ref. 1 kHz)  
 2284A or 2285A, Balanced: 15 kΩ

**Polarity:**

Positive-going signal applied to (+) input of barrier strip produces positive-going signal at (+) output of barrier strip.

**Phase Response:**

(Any mode)  
 20 Hz: < + 30°  
 20 kHz: > - 45°

**THD:** < 0.1% (Typical < 0.05%)  
 (Any mode, 30 kHz measurement bandwidth)

**IMD:** < 0.1% (Typical < 0.05%)  
 (Any mode)

**Rise Time:** < 6 μsec  
 (Any mode, 10 - 90%)

**Slew Rate:** 15 v/μsec  
 (Any mode)

**Damping Factor:** > 35  
 (Any mode, 100 Hz)

**Crosstalk:** > 50 dBr  
 (Ref 1 kHz, 0 dBr = rated output power into 8 Ω, 8 output power modules)

**Noise:** > 95 dB  
 (Below rated output power, A-weighting filter, 8 output power modules paralleled, 50/60 Hz ac line frequency)

**Stepped Attenuation:** 1 dB steps to -63 dB, each channel (w/2285A)

**AC Power:** 100/120/200/220/240  
 Vac, 50/60 Hz 1200w @  
 rated output 100w idle

**Dimensions:**

**Height:** 7 inches (17.8 cm)  
**Width:** 19 inches (48.3 cm)  
**Depth:** 17<sup>5</sup>/<sub>8</sub> inches (44.8 cm)

**Weight:** 70 lb. (31.7 kg) with 8 power amplifier modules

**Color:** Black

**Accessories:**

**Input/Output:** 2285A Input Module w/Stepped Attenuators (accepts Anniversary Series Modules Only)

2284A Input Module w/o Stepped Attenuators (accepts all plug-in modules)

2271 Power Amplifier Module

2273 Blank Card Module

**Plug-In Modules:** 15335A Input Transformer Module (for 2284A only)

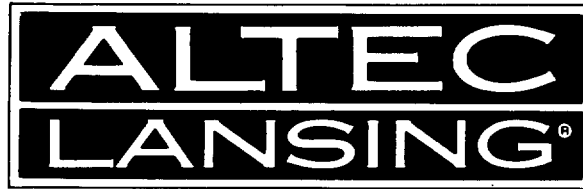
15594A Low Pass Crossover/EQ Module

15595A High Pass Crossover/EQ Module

15015A Input Bridging Transformer

15515A Input Bridging/Transformer w/Resistive Pad

In a continuing effort to satisfy its customers, ALTEC LANSING Corporation may from time to time improve this product and its performance. Therefore, the specifications are subject to change without prior notice.



2280B Incremental Power® System

## SERVICE INSTRUCTIONS

**\* \* \* CAUTION \* \* \***

**NO USER SERVICEABLE PARTS INSIDE. EXTREMELY HAZARDOUS VOLTAGES AND CURRENTS MAY BE ENCOUNTERED WITHIN THE CHASSIS. THE SERVICING INFORMATION CONTAINED WITHIN THIS DOCUMENT IS ONLY FOR USE BY ALTEC LANSING AUTHORIZED WARRANTY REPAIR STATIONS AND QUALIFIED SERVICE PERSONNEL. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. OTHERWISE, REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.**

## 8 SERVICE INFORMATION

**WARNING:** *No user serviceable parts inside. Extremely hazardous voltages and currents may be encountered within the chassis. The servicing information contained within this document is only for use by Altec Lansing authorized warranty repair stations and qualified service personnel. To avoid electric shock DO NOT perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Otherwise, refer all servicing to qualified service personnel.*

**NOTICE:** *Modifications to Altec Lansing products are not recommended. Such modifications shall be at the sole expense of the person(s) or company responsible, and any damage resulting therefrom shall not be covered under warranty or otherwise.*

### 8.1 2271 Output Power Module

For the following checks and adjustments, the associated bipolar power supply must have filter capacitors of 1000 microfarads or more, and maintain @  $\pm 120$  Vdc when connected to Pins 3(+) and 4(-), referenced to 11(gnd).

Connect pins 15 and 17 (amplifier enable). Set bias adjustment potentiometer R26 fully clockwise (minimum) and place a 150 ohm resistor across the driver input (pins 10 and 20). A well regulated  $\pm 10$  Vdc supply must be used on Pins 9(+) and 10(-).

When power is applied, the red LED should flash once. The green LED should not light.

#### 1. DC Offset

Short-circuit amplifier input (pin 8) to common.

- a. DC offset at the pre-amp output (pin 7) must be less than 10 millivolts.
- b. DC offset at the amplifier output (pin 13 or 14) must be no more than 5 millivolts. Adjust DC offset potentiometer R17 to no more than 5 millivolts.

#### 2. Bias Adjustment

Set bias potentiometer for an output stage quiescent current of 9 mA. This corresponds to 14 millivolts across R36 or R37.

### 3. Noise Check

Connect the driver and power amplifier together (pins 7 and 8). Remove the short circuit at the amplifier input (see step 1). Connect a 64-ohm load to the output. The output noise voltage should be less than 707 millivolts rms for a 20 kHz noise bandwidth.

### 4. Voltage Gain

Connect a signal generator at the driver input and remove the 150-ohm resistor. The voltage gain should be  $39.5 \pm 1$  dB at 1 kHz. The green LED should illuminate and reach full brilliance when the output exceeds two volts.

### 5. Frequency Response

20 Hz to 20 kHz  $\pm 1$  dB

### 6. Distortion

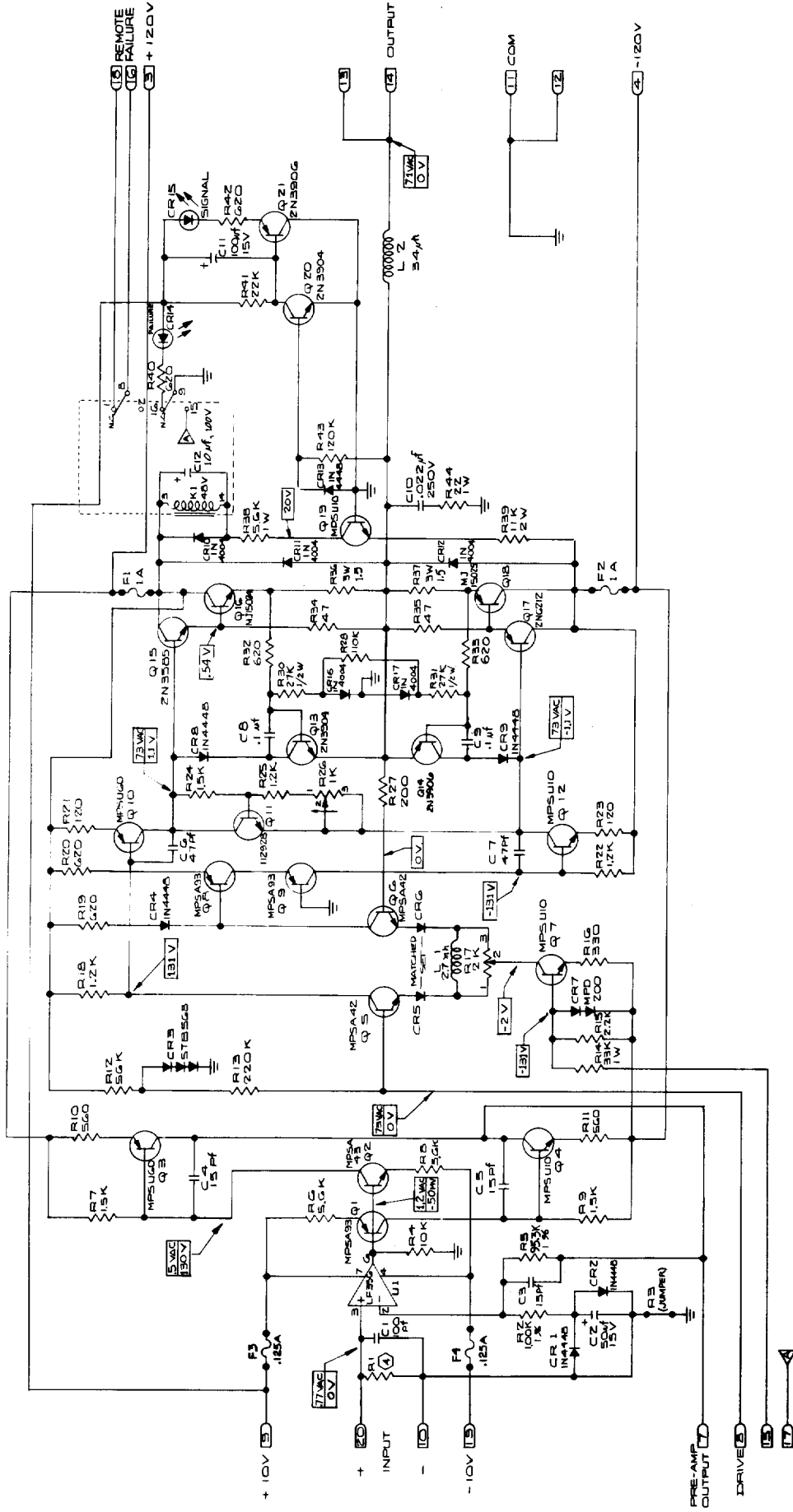
THD with 78 watts output should be less than 0.15% at 20 kHz, and less than 0.01 % at 1 kHz.

### 8.2 Fuse Replacement

Two fuses are located on the 600-watt power supply of the main frame. They are located directly behind the power supply filter capacitor at the top of the back panel.

Two fuses are located on each output power module (Figure 14) to protect output transistors against excessive current drain. Output transistors Q15 and Q16 are fused through fuse F1; output transistors Q17 and Q18 are fused through fuse F2.

Replace fuses only with identical type and rating. See parts list. Use of larger value fuse voids warranty.



- ① R1 TO BE 2KΩ FOR 42270A & 100KΩ FOR 2271.
- ② VOLTAGES ARE DC UNLESS OTHERWISE NOTED, WITH REFERENCE TO CIRCUIT GROUND. ALL VOLTAGES ARE MEASURED WITH A SINGLE 42291 A CARD INSTALLED IN THE 42290A MAIN FRAME. DC VOLTAGES ARE WITH NO SIGNAL APPLIED, WHILE AC VOLTAGES ARE UNDER RATED POWER AND LOAD CONDITIONS.
- ③ FOR ASSEMBLY DVG. SEE 10C153, FOR B/M SEE 10-02-01-229.
- ④ ALL RESISTORS 1/4 WATT 1% UNLESS OTHERWISE MARKED. NOTES UNLESS OTHERWISE SPECIFIED.

Figure 14 Schematic (10D190-08) 2271 Output Power Amplifier Module

INPUTS/OUTPUTS PANEL

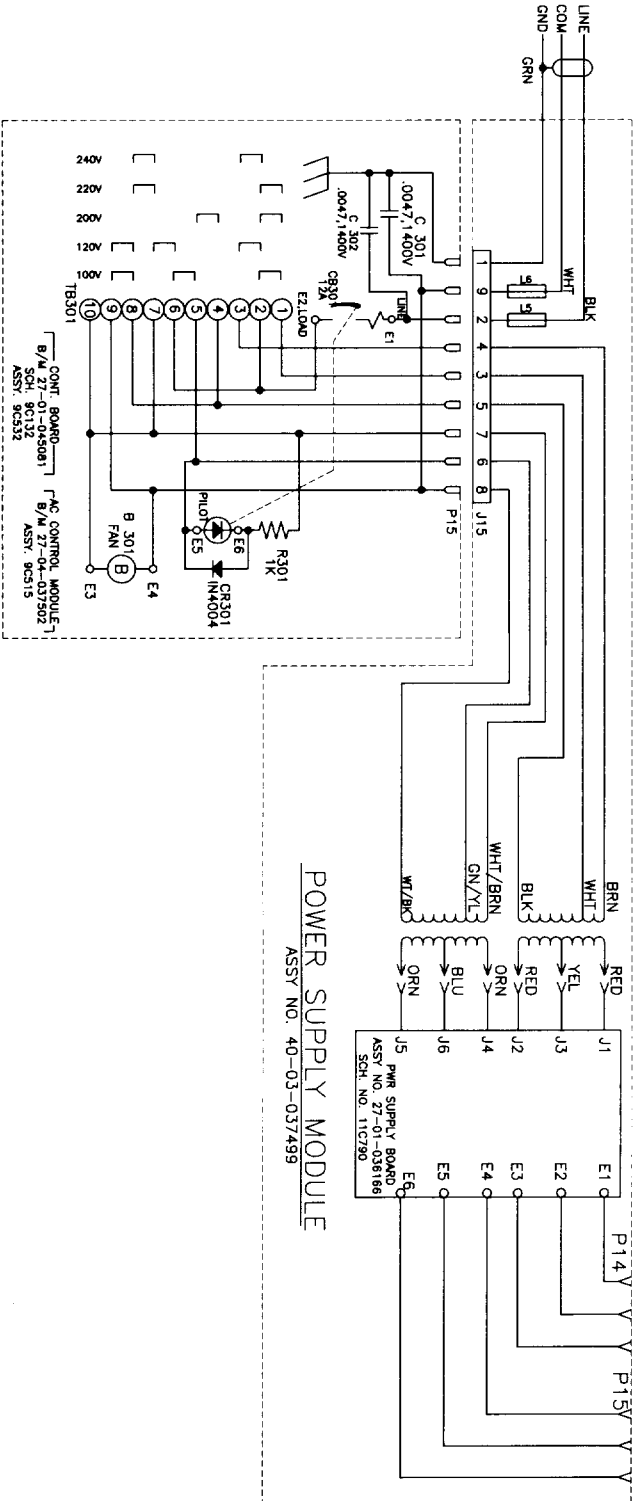
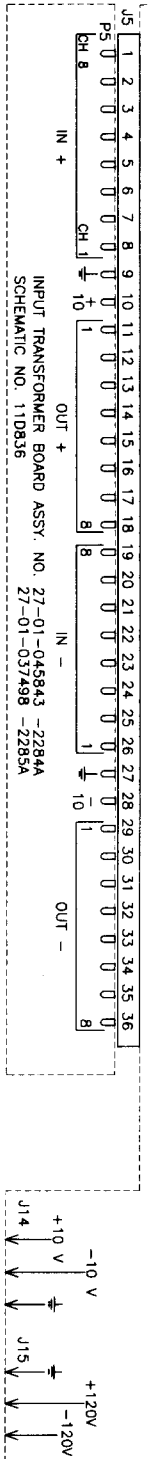
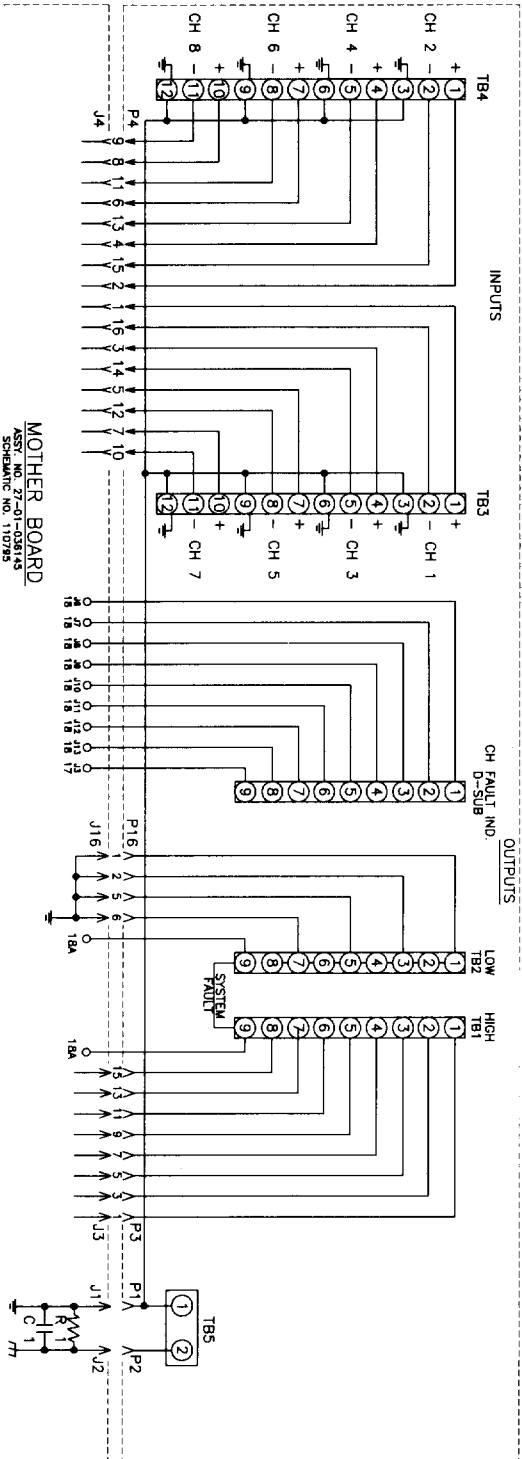


Figure 15 Schematic (11D830) Main Frame Interconnect



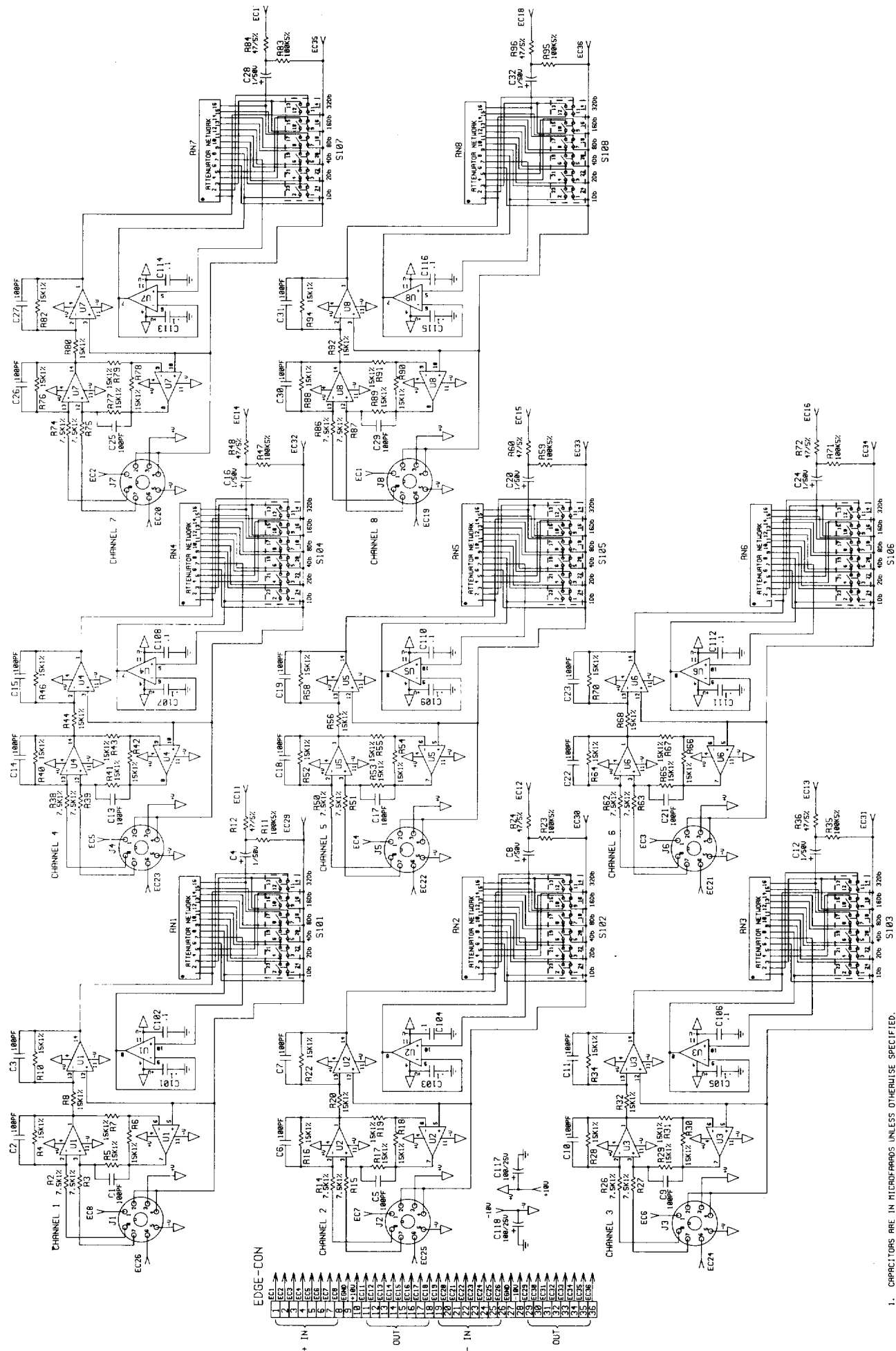
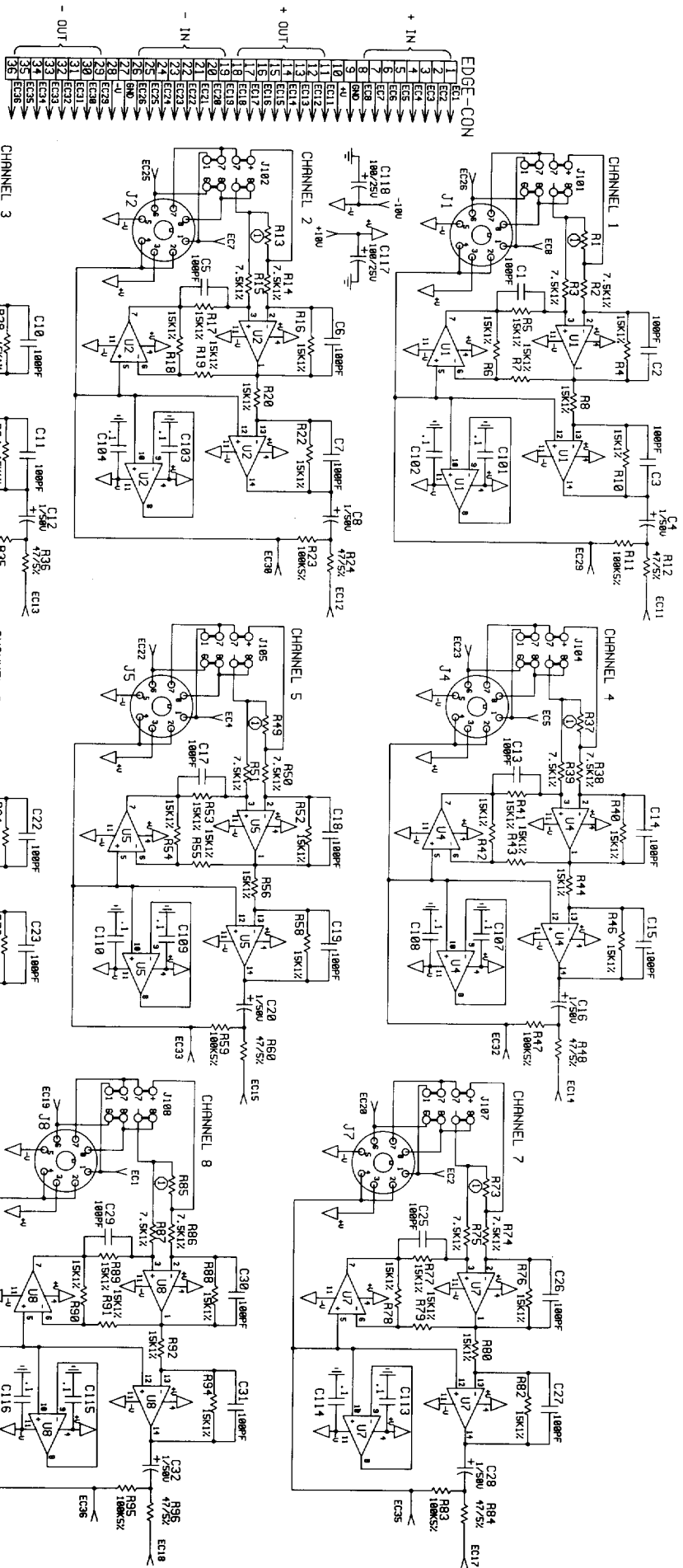


Figure 16 Schematic (11D908) 2285A Input PCB Assembly

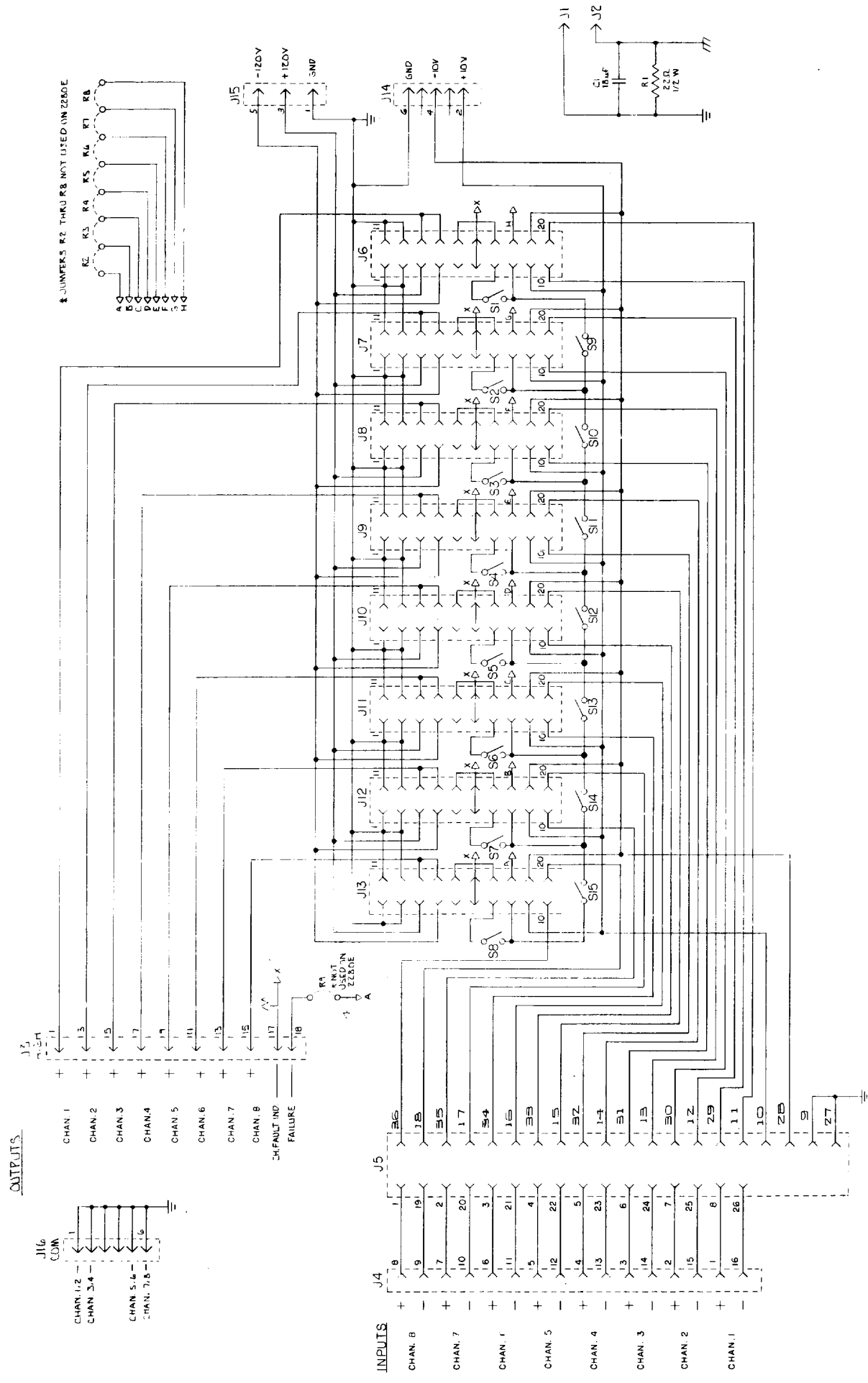
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1. CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.



2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.  
 3. R1, R13, R25, R27, R49, R51, R73, R80, R85 ARE 2.4K OHM 5% TO BE INSTALLED ONLY ON CHANNELS USING 42928 TRANSFORMERS.

Figure 17 Schematic (11D907) 2284A Input PCB Assembly



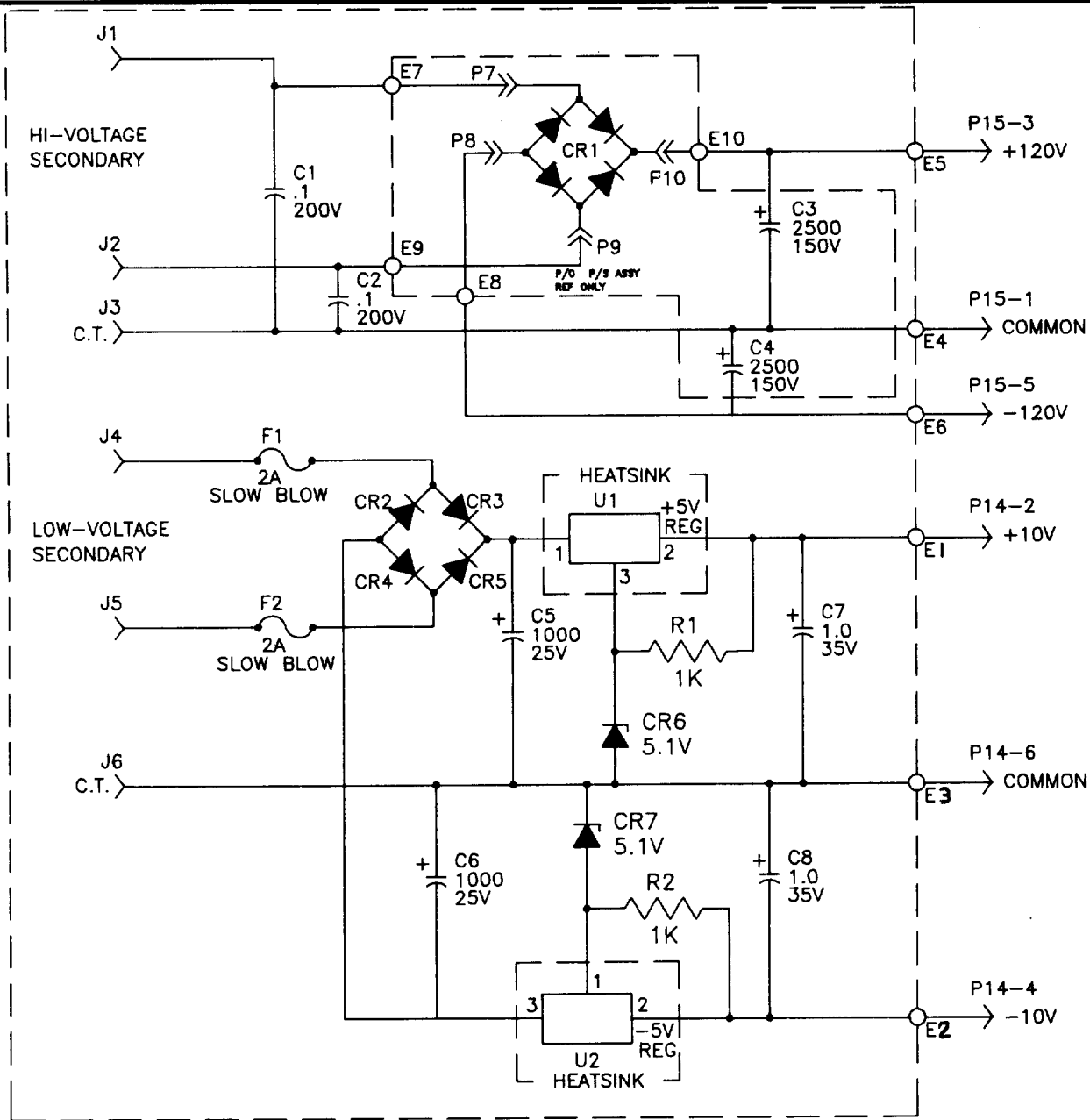


Figure 19 Schematic (11C837) Power Supply PCB

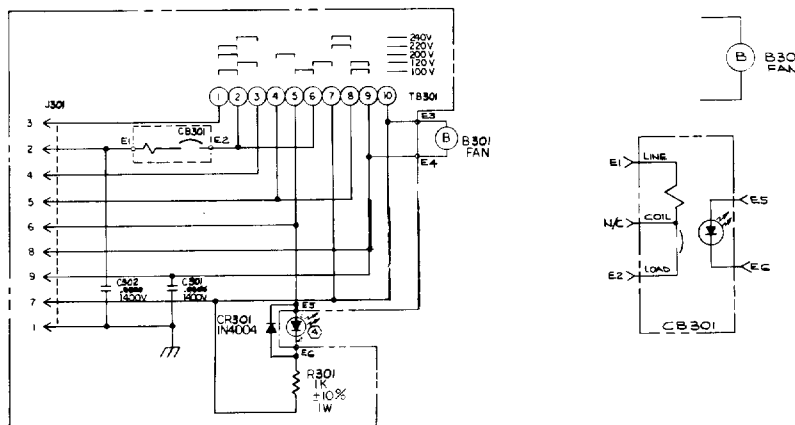


Figure 20 Schematic (9C132) AC Power Control Module

## Component Parts Listing for the 2280B

Reference Designator	Ordering Number	Name and Description
<b>Main Chassis</b>		
-	27-04-037502	AC power fan module
-	2273	Blank card module
-	27-01-036145	Mother PCB assembly
-	40-03-037499	Primary power assembly
-	2271	Output power module, 78 watts
-	2284A	Optional input module w/stepped attenuators
-	2285A	Optional input module w/o stepped attenuators

### AC Power Fan Module (27-04-037502)

B301	35-01-121520-01	Fan, 75 CFM, Whisper
CB301	51-03-121521-02	Circuit Breaker, 12A, lighted rocker
PCB1	27-01-045081-01	AC Control PCB Assembly
C301, 302	15-02-122768-01	Cap., 3.3 nF, ±20%, 1.4 KV
CR301	48-02-042787-01	Rect., 1A, 400V, silicon
R301	47-01-100649-01	Res., 1 kΩ, 5%, 1W
TB301	21-04-121751-01	Block, 10-terminal

### Mother PCB Assembly (27-01-036145)

C1	15-01-109010-01	Cap., 18 pF, 10%, 50V
R1	47-01-102224-01	Res., 22 Ω, 5%, 1/2W
SW1-SW15	51-02-122176-01	Switch, slide, SPDT

### AC Primary Power Module (40-03-037499)

C3, 4	15-01-122981-01	Cap., 2500 μF, 150V
CR1	48-02-122992-01	Rect., bridge, 400V, 6A
L501, 502	56-01-044110-01	Choke, ferrite bead
PCB1	27-01-036166-02	AC power PCB assembly 11C837
C1, 2	15-06-100113-01	Cap., 0.1 μF, 10%, 200V
C5, 6	15-01-122764-01	Cap., 1000 μF, 35V
C7, 8	15-01-124507-01	Cap., 1.0 μF, 50V
CR2, 3, 4, 5	48-02-042787-02	Diode, 1N4004, selected
CR6, 7	48-01-122988-01	Diode, zener, 5.1V, 5%, 20 mA, 0.5W
F1, 2	51-04-110782-01	Fuse, 2A, 3AG, slo-blo
R1, 2	47-01-102078-01	Res., 1 kΩ, 5%, ¼ w
U1	17-01-119087-02	IC, +5V regulator
U2	17-01-121661-01	IC, -5V regulator
T1	56-08-037503	Transformer, power

2284A Input PCB Assembly (27-01-045843)

Reference Designator	Ordering Number	Name and Description
R2, 3, 14, 15, 26, 27, 38, 39, 50, 51, 62, 63, 74, 75, 86, 87	47-03-028234	Res., 7.5 kΩ, 1%, ¼ w
R11, 23, 35, 47, 59, 71, 83, 95	47-01-102127	Res., 100 kΩ, 5%, ¼ w
R12, 24, 36, 48, 60, 72, 84, 96	47-01-102046	Res., 47 Ω, 5%, ¼ w
R4, 5, 6, 7, 8, 10, 16, 17, 18, 19, 20, 22, 28, 29, 30, 31, 32, 34, 40, 41, 42, 43, 44, 46, 52, 53, 54, 55, 56, 58, 64, 65, 66, 67, 68, 70, 76, 77, 78, 79, 80, 82, 88, 89, 90, 91, 92, 94	47-03-028238	Res., 15 kΩ, 1%, ¼ w
C1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19, 21, 22, 23, 25, 26, 27, 29, 30, 31	15-06-037468	Cap., 100 pf, 630V
C101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116	15-02-124437	Cap., .1 μf, cer, 50V
C117, 118	15-01-124503	Cap., 100 μf, 50V
C4, 8, 12, 16, 20, 24, 28, 32	15-01-028850	Cap., 1 μf, 35V
U1, 2, 3, 4, 5, 6, 7, 8	17-01-124461	IC, TL074N
XU1, 2, 3, 4, 5, 6, 7, 8	21-02-122889	14 pin socket
J101, 102, 103, 104, 105, 106, 107, 108	21-01-038208	8 pin header
SJ1-32	21-01-038207	Shunt jumper

2285A Input PCB Assembly (27-01-037498)

Reference Designator	Ordering Number	Name and Description
R2, 3, 14, 15, 26, 27, 38, 39, 50, 51, 62, 63, 74, 75, 86, 87	47-03-028234	Res., 7.5 k $\Omega$ , 1%, ¼ w
R12, 24, 36, 48, 60, 72, 84, 96	47-01-102046	Res., 47 $\Omega$ , 5%, ¼ w
R4, 5, 6, 7, 8, 10, 16, 17, 18, 19, 20, 22, 28, 29, 30, 31, 32, 34, 40, 41, 42, 43, 44, 46, 52, 53, 54, 55, 56, 58, 64, 65, 66, 67, 68, 70, 76, 77, 78, 79, 80, 82, 88, 89, 90, 91, 92, 94	47-03-028238	Res., 15 k $\Omega$ , 1%, ¼ w
R11, 23, 35, 47, 59, 71, 83, 95	47-01-102127	Res., 100 k $\Omega$ , 5%, ¼ w
C1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19, 21, 22, 23, 25, 26, 27, 29, 30, 31	15-06-037468	Cap., 100 pf, 630V
C101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116	15-02-124437	Cap., .1 $\mu$ f, cer, 50V
C117, 118	15-01-124503	Cap., 100 $\mu$ f, 50V
C4, 8, 12, 16, 20, 24, 28, 32	15-01-028850	Cap., 1 $\mu$ f, 35V
U1, 2, 3, 4, 5, 6, 7, 8	17-01-124461	IC, TL074N
XU1, 2, 3, 4, 5, 6, 7, 8	21-02-122889	14 pin socket
RN1, 2, 3, 4, 5, 6, 7, 8	47-10-121945	
S101, 102, 103, 104, 105, 106, 107, 108	51-02-121946	Attenuator switch

Reference Designator	Ordering Number	Name and Description
J1, 2, 3, 4, 5, 6, 7, 8	21-02-038329	Octal socket
UJ1-16	21-01-013567	U-jumpers

### Output Power Module (2271)

C1	15-02-107454-01	Cap., 100 pF, 100V, 10%
C2	15-01-100233-01	Cap., 50 $\mu$ F, 15V
C3, 4, 5	15-02-100014-01	Cap., 15 pF, 1000V, 5%
C6, 7	15-02-100018-01	Cap., 47 pF, 500V, 10%
C8, 9	15-02-100109-01	Cap., 0.1 $\mu$ F, 100V, 20%
C10	15-06-112129-01	Cap., 0.022 $\mu$ F, 250V, 10%
C11	15-01-108605-01	Cap., 100 $\mu$ F, 15V
C12	15-01-107501-01	Cap., 25 $\mu$ F, 50V
CR1, 2, 4, 8, 9, 13	48-01-122601-01	Diode, 1N4448, selected
CR3	48-01-107429-02	Diode, STB568, 12V, 0.4 w, 3-pellet
CR5, 6	48-01-123032-01	Diode, 1N4004, selected
CR7	48-01-121865-02	Diode, MPD200, selected
CR10, 11, 12, 16, 17	48-01-042787-01	Rect., 1N4004, selected
CR14	39-01-122876-01	LED, red, per 9C859
CR15	39-01-122989-01	LED, green, per 9C859
F1, 2	51-04-100464-01	Fuse, 1A, 3AG
F3, 4	51-04-123075-01	Fuse, 1/8A, 125V, radial lead
K1	45-01-122975-01	Relay, 48V, per 8A507
L1	56-01-121543-01	Choke, RF, 2.7 mH, per 121543
L2	56-01-018275-01	Network, 10A450
Q1,8, 9	48-02-120234-02	Transistor, MPS-A93, selected
Q2	48-02-120233-01	Transistor, MPS-A43, selected
Q3, 10	48-03-120160-01	Transistor, MPS-U60, per 120160
Q4, 7, 12, 19	48-03-120159-01	Transistor, MOT-152, selected
Q5, 6	48-03-045882-01	Transistor, MPS-A42, per 10A196 (matched pair)
Q11	48-03-112928-03	Transistor, X16P5252, selected
Q13, 20	48-03-121306-02	Transistor, 2N3904, selected
Q14, 21	48-03-107102-02	Transistor, 2N3906, selected
Q15	48-03-122976-01	Transistor, 2N3585, selected
Q16	48-03-122978-01	Transistor, MJ15024, selected
Q17	48-03-122977-01	Transistor, 2N6212, selected
Q18	48-03-122979-01	Transistor, MJ15025, selected
R1	47-01-102127-01	Res., 100 k $\Omega$ , 5%, 1/4w
R2	47-03-121532-01	Res., 1 k $\Omega$ , 1%, 1/4w
R3	21-01-110310-01	Jumper
R4	47-01-102102-01	Res., 10 k $\Omega$ , 5%, 1/4w
R5	47-03-119172-01	Res., 95.3 k $\Omega$ , 1%, 1/4w
R6, 8	47-01-102096-01	Res., 5.6 k $\Omega$ , 5%, 1/4w
R7, 9, 24	47-01-102082-01	Res., 1.5 k $\Omega$ , 5%, 1/4w
R10, 11	47-01-102072-01	Res., 560 $\Omega$ , 5%, 1/4w
R12	47-01-102121-01	Res., 56 k $\Omega$ , 5%, 1/4w
R13	47-01-104043-01	Res., 220 k $\Omega$ , 5%, 1/4w
R14	47-01-122973-01	Res., 33 k $\Omega$ , 5%, 1/4w
R15	47-01-102086-01	Res., 202 k $\Omega$ , 5%, 1/4w
R16	47-01-102066-01	Res., 33 $\Omega$ , 5%, 1/4w



Reference Designator	Ordering Number	Name and Description
R17	47-06-121916-01	Pot., 2 k $\Omega$ , 20%, 1/2w
R18, 22, 25	47-01-102080-01	Res., 1.2 k $\Omega$ , 5%, 1/4w
R19, 20, 32, 33, 40, 42	47-01-102073-01	Res., 620 $\Omega$ , 5%, 1/4w
R21, 23	47-01-102056-01	Res., 120 $\Omega$ , 5%, 1/4w
R26	47-06-121743-01	Pot., 1 k $\Omega$ , 20%, 1/2w
R27	47-01-102061-01	Res., 200 $\Omega$ , 5%, 1/4w
R28	47-01-102128-01	Res., 110 k $\Omega$ , 5%, 1/4w
R30, 31	47-01-102298-01	Res., 27 k $\Omega$ , 5%, 1/2w
R34, 35	47-01-102046-01	Res., 47 $\Omega$ , 5%, 1/4w
R36, 37	47-01-123080-01	Res., 1.5 $\Omega$ , 5%, 3w
R38	47-01-122971-01	Res., 5.6 k $\Omega$ , 5%, 1w
R39	47-01-122972-01	Res., 11 k $\Omega$ , 5%, 2w
R41	47-01-102110-01	Res., 22 k $\Omega$ , 5%, 1/4w
R43	47-01-102129-01	Res., 120 k $\Omega$ , 5%, 1/4w
R44	47-01-100635-01	Res., 22 $\Omega$ , 10%, 1w
U1	17-01-122317-01	IC, LF-356, per 122317