# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Features</td>
<td>1</td>
</tr>
<tr>
<td>II Operating Instructions</td>
<td>2</td>
</tr>
<tr>
<td>III Theory of Operation</td>
<td>3</td>
</tr>
<tr>
<td>IV Maintenance</td>
<td>4</td>
</tr>
<tr>
<td>V Parts List</td>
<td>5</td>
</tr>
<tr>
<td>VI Schematics</td>
<td>6</td>
</tr>
<tr>
<td>Warranty</td>
<td>7</td>
</tr>
</tbody>
</table>

## I FEATURES

- 12 Slot Capability
- All S-100 Connectors Included
- Low Inductance Interconnect to Reduce Signal Noise and Crosstalk
- Active Termination of All Bus Lines to Further Reduce Signal Noise and Line Reflections
- Distributed bypassing of All Power Lines
- Solder Mask on Both Sides of Board
- Silkscreen of Reference Designations
- Simple Strong Board Mounting
- Criss-Cross Bus Lines on Both Sides of Board
- All Holes Plated Through
- Solder Plated Circuit Area
II OPERATING INSTRUCTIONS

2-1 The model 2501A is packaged and shipped in a standard cardboard container with styrofoam inserts to prevent damage. Upon receipt of the instrument, a thorough inspection should be made to reveal any possible shipping damage. If, for any reason, the instrument must be returned to the factory, the original shipping container should be used.

2-2 Before applying power to your motherboard, it must be securely fastened in place using 12 screws, six on each side. Care must be taken that none of the circuitry on the bottom of the board be allowed to contact ground. Next, power must be securely connected to the board using the connections supplied. It is vital that the correct voltages are applied to the correct points, or destruction to your computer system will result. See Fig. A.

Marked on the circuit board are the nominal voltages to be applied at each point.

The +8 supply will normally be between +8 and +12 depending upon the current requirements. The +16 and -16 supplies will normally be between 16 and 25 volts depending upon the load.

DO NOT EVER APPLY REVERSED VOLTAGES OR EXCESSIVE VOLTAGES LEST IRREPARABLE DAMAGE MAY OCCUR TO YOUR SYSTEM.
GENERAL

The model 2501 is a 12 slot motherboard for use in S-100 bus systems. It has several design features to optimize system operation.

A) Distributed bypassing of all power lines to minimize crosstalk through the power lines.

B) Active termination of all signal lines to minimize signal reflections.

C) Newly developed trace pattern to minimize pulse ringing.

ACTIVE TERMINATION

Active termination is achieved by returning all 94 signal lines through separate 330 ohm resistors to a regulated +2.4 volts DC (See Fig B).

This means that all signal lines are HIGH unless deliberately pulled LOW, and that all lines see the same load rather than being left in an indeterminate state.
TRACE PATTERN

If you examine the trace pattern carefully, you will notice several features. First, all pins are connected on each side of the board. i.e.-pin 33 of every socket is connected together on the top of the board and on the bottom of the board. This "double-path" effectively halves the line inductance.

Second, each trace is maintained as wide as practicable further reducing line inductance. Minimizing line inductance is important as inductance causes ringing on signal pulses, creating system errors.

Third, the traces on the top and bottom of the board are in a criss-cross pattern resulting in a quasi-twisted pair for each signal line, minimizing noise pickup and crosstalk with other lines.

All of this effort in designing the trace pattern in conjunction with the active terminations results in signals with low noise, minimal ringing, and low line reflections along with its concomitant improved system operation.

IV MAINTENANCE

With proper care, your model 2501A motherboard should last a long time giving a minimum of trouble.

The unit should be cleaned periodically so that dirt and grime do not build up and short out either the power supplies or the signal lines. When doing this, be sure that power is removed from the unit. This would be a good time to check for loose hardware and tighten as necessary.
PARTS LIST

1. 1 PC Board
2. 12 Sockets
3. 14 Resistor Packs
4. 2 Resistors 220 ohms 1/4 w
5. 19 Capacitors, Tantalum
6. 1 Regulator

C.C.S. 02501-0002A
LIMITED WARRANTY

California Computer Systems (CCS) warrants to the original purchaser of its products that

(1) its CCS assembled and tested products will be free from materials defects for a period of one (1) year, and be free from defects of workmanship for a period of ninety (90) days; and

(2) its kit products will be free from materials defects for a period of ninety (90) days.

The responsibility of CCS hereunder, and the sole and exclusive remedy of the original purchaser for a breach of any warranty hereunder, is limited to the correction or replacement by CCS at CCS's option, at CCS's service facility, of any product or part which has been returned to CCS and in which there is a defect covered by this warranty; provided, however, that in the case of CCS assembled and tested products, CCS will correct any defect in materials and workmanship free of charge if the product is returned to CCS within ninety (90) days of original purchase from CCS; and CCS will correct defects in materials in its products and restore the product to an operational status for a labor charge of $25.00, provided that the product is returned to CCS within ninety (90) days in the case of kit products, or one (1) year in the case of CCS assembled and tested products. All such returned products shall be shipped prepaid and insured by original purchaser to:

Warranty Service Department
California Computer Systems
250 Caribbean Drive
Sunnyvale, California
94086

CCS shall have the right of final determination as to the existence and cause of a defect, and CCS shall have the sole right to decide whether the product should be repaired or replaced.

This warranty shall not apply to any product or any part thereof which has been subject to

(1) accident, neglect, negligence, abuse or misuse;

(2) any maintenance, overhaul, installation, storage, operation, or use, which is improper; or

(3) any alteration, modification, or repair by anyone other than CCS or its authorized representative.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED OR STATUTORY INCLUDING THE WARRANTIES OF DESIGN, MERCHANTABILITY, OR FITNESS OR SUITABILITY FOR USE OR INTENDED PURPOSE AND OF ALL OTHER OBLIGATIONS OR LIABILITIES OF CCS. To any extent that this warranty cannot exclude or disclaim implied warranties, such warranties are limited to the duration of this express warranty or to any shorter time permitted by law.
CCS expressly disclaims any and all liability arising from the use and/or operation of its products sold in any and all applications not specifically recommended, tested, or certified by CCS, in writing. With respect to applications not specifically recommended, tested, or certified by CCS, the original purchaser acknowledges that he has examined the products to which this warranty attaches, and their specifications and descriptions, and is familiar with the operational characteristics thereof. The original purchaser has not relied upon the judgement or any representations of CCS as to the suitability of any CCS product and acknowledges that CCS has no knowledge of the intended use of its products. CCS EXPRESSLY DISCLAIMS ANY LIABILITY ARISING FROM THE USE AND/OR OPERATION OF ITS PRODUCTS, AND SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL OR COLLATERAL DAMAGES OR INJURY TO PERSONS OR PROPERTY.

CCS's obligations under this warranty are conditioned on the original purchaser's maintenance of explicit records which will accurately reflect operating conditions and maintenance performed on CCS's products and establish the nature of any unsatisfactory condition of CCS's products. CCS, at its request, shall be given access to such records for substantiating warranty claims. No action may be brought for breach of any express or implied warranty after one (1) year from the expiration of this express warranty's applicable warranty period. CCS assumes no liability for any events which may arise from the use of technical information on the application of its products supplied by CCS. CCS makes no warranty whatsoever in respect to accessories or parts not supplied by CCS, or to the extent that any defect is attributable to any part not supplied by CCS.

CCS neither assumes nor authorizes any person other than a duly authorized officer or representative to assume for CCS any other liability or extension or alteration of this warranty in connection with the sale or any shipment of CCS's products. Any such assumption of liability or modification of warranty must be in writing and signed by such duly authorized officer or representative to be enforceable. These warranties apply to the original purchaser only, and do not run to successors, assigns, or subsequent purchasers or owners; AS TO ALL PERSONS OR ENTITIES OTHER THAN THE ORIGINAL PURCHASER, CCS MAKES NO WARRANTIES WHATSOEVER, EXPRESS OR IMPLIED OR STATUTORY. The term "original purchaser" as used in this warranty shall be deemed to mean only that person to whom its product is originally sold by CCS.

Unless otherwise agreed, in writing, and except as may be necessary to comply with this warranty, CCS reserves the right to make changes in its products without any obligation to incorporate such changes in any product manufactured theretofore.

This warranty is limited to the terms stated herein. CCS disclaims all liability for incidental or consequential damages. Some states do not allow limitations on how long an implied warranty lasts and some do not allow the exclusion or limitation of incidental or consequential damages so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.