

# PROTO Module

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The PROTO Module is a prototyping board that enables users to design and interface their own circuits to the Series 500. All Series 500 slot signals are available on the PROTO Module including the supply voltages and grounds. The PROTO Module includes interface logic for one TTL-compatible 8-bit bidirectional data port. This allows 8-bit data transfers to and from the user-designed circuitry on the PROTO Module. One byte of data can be written to or read from the PROTO Module using the slot-dependent CMDA address.

## Circuit Design Information

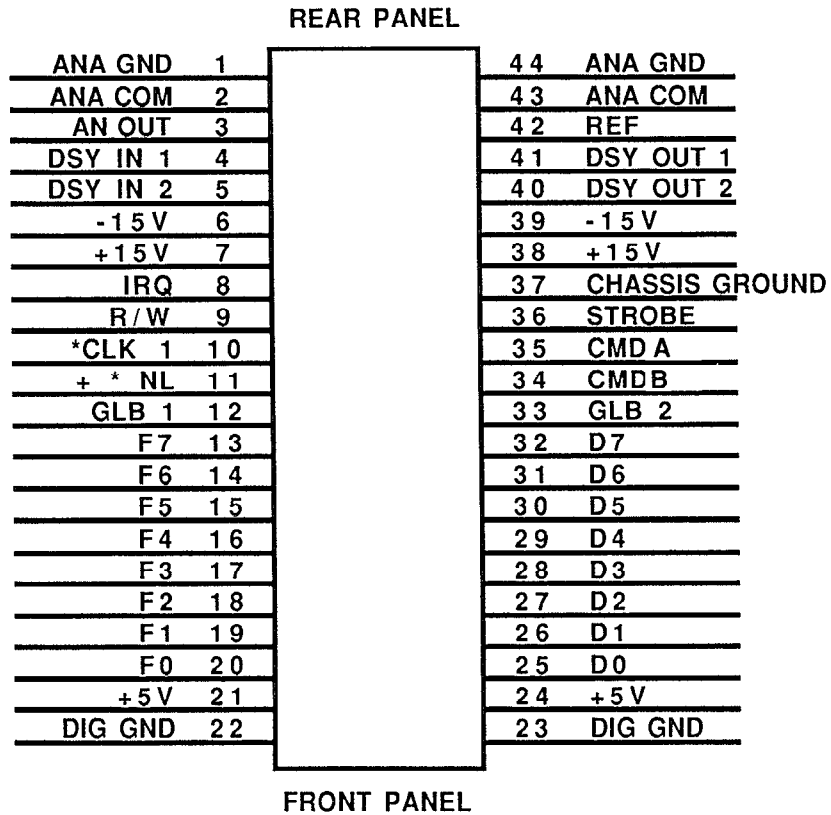
All of the Series 500 slot signals are available on the PROTO module, the slot signal configuration is shown in Figure R-1.

The available power voltages and current sourcing capabilities are as follows:

**Table R-1. Power Supply Information**

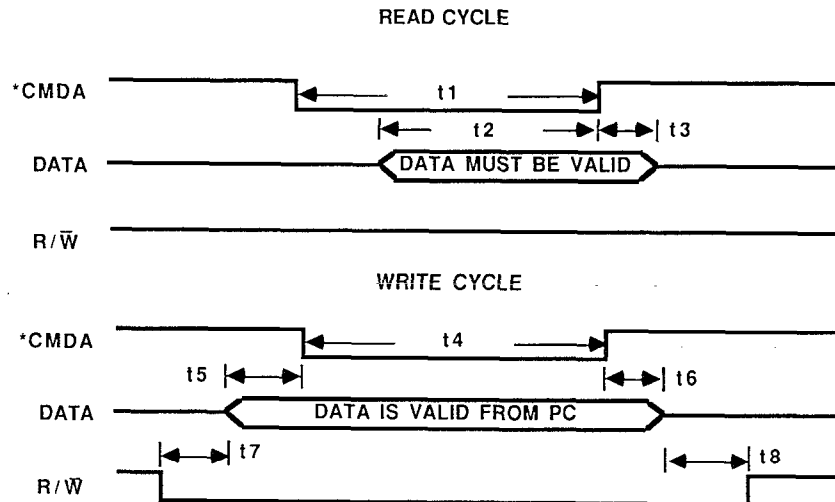
<b>Voltage</b>	<b>Current Available</b>	<b>Pin Number</b>
+5	300mA	21 & 24
+15	50mA	7 & 38
-15	50mA	6 & 39

All circuits designed on the PROTO module must satisfy the timing specification shown in Figure R-2 for proper operation.



- \* NOTE: IN SLOT 1 PIN 10 CARRIES CMDC AND PIN 11 CARRIES CMDD
- + NOTE: IN SLOT 2 AND 3 PIN 11 CARRIES CMDC (A/D START/STATUS)

**Figure R-1. Pin Out Diagram of Typical Connector**



\* NOTE: THE TIMING FOR THE CMDB SIGNAL IS THE SAME AS CMDA

t1	310nS typ
t2	200nS min
t3	0nS min
t4	310nS typ
t5	5nS min
t6	10nS min
t7	55nS min
t8	10nS min

**Figure R-2. Read/Write Timing Diagrams**

### Port Addressing

The read/write port on the PROTO module is accessed through the slot-dependent CMDA signal. The CMDA addresses are shown in Table R-2.

**Table R-2. Locations for Slot-Dependent CMDA**

<b>Slot</b>	<b>IBM Location*</b>
1	CFF80
2	CFF82
3	CFF84
4	CFF86
5	CFF88
6	CFF8A
7	CFF8C
8	CFF8E
9	CFF90
10	CFF92

\*Note: First character of address depends on address location of Series 500 card. Following program examples assume interface is set to address CFF8.

```
100 DEF SEG=&HCFF0 'SET DATA SEGMENT TO SERIES 500 ADDRESS
200 CMDA=&H82 'PROTO BOARD IS IN SLOT 2
300 POKE CMDA, &H61 'WRITE A 61 HEX TO THE PROTO BOARD PORT
400 VAL=PEEK(CMDA) 'READ A VALUE FROM THE PROTO BOARD PORT
500 PRINT HEX$(VAL) 'PRINT THE VALUE READ IN HEX
```

**Figure R-3. Proto Board Addressing**

## User Circuit Interfacing

The Series 500 slot includes a second command line, CMDB, which is identical in function to CMDA. If you wish to communicate through the CMDB line, you must duplicate the circuitry already on the PROTO module for CMDA, and connect its control line to the CMDB pin (pin 34) on the PROTO module card edge connector rather than the CMDA pin.

All digital circuit ground lines should be connected to DIG GND on the Series 500 slot. All analog circuit ground lines should be connected to ANA GND on the Series 500 slot.

The AN OUT signal line on the Series 500 slot routes an analog signal to slot 1 were it may be digitized or multiplexed by another module. For example, if an analog signal is present on a PROTO module which is in slot 5, the analog signal can be attached to the AN OUT line on the Series 500 slot. With an AIM1 module in slot 1 (for multiplexing the analog signal to the A/D), and an ADM1 in slot 2 (to preform the A/D conversion), the following program could be used to measure the voltage on the PROTO module.

```

100 DEF SEG=&HCFF0 'SET DATA SEGMENT TO SERIES 500 ADDRESS
200 SLOT=&H81 'SLOT SELECT ADDRESS ON AIM1
300 GAIN=&H80 'GLOBAL GAIN ADDRESS ON AIM1
400 CONVERT=&H98 'START A/D ADDRESS ON ADM1
500 LOW=&H82 'LOW BYTE ADDRESS ON ADM1
600 HIGH=&H83 'HIGH BYTE ADDRESS ON ADM1
700 POKE SLOT,5 'SELECT SLOT OF PROTO MODULE
800 POKE GAIN,0 'USE A GAIN OF X1
900 POKE CONVERT,0 'START THE A/D
1000 LO=PEEK(LOW) 'READ THE LOW BYTE
1100 HI=PEEK(HIGH) 'READ THE HIGH BYTE
1200 HI=HI AND &H0F 'MASK OFF UNUSED BITS
1200 RES=LO+HI*256 'SCALE HIGH BYTE AND ADD LOW BYTE
1300 PRINT RES 'PRINT THE RESULT

```

**CAUTION: THE VOLTAGE THAT IS PRESENTED TO THE ANA OUT LINE ON THE SERIES 500 SLOT MUST BE WITHIN THE LIMITS OF THE A/D RANGE THAT IS SET ON THE A/D MODULE BEING USED OR CIRCUIT DAMAGE MAY RESULT.**

**Figure R-4. Analog Input Example**

### Proto Module use with Soft500

Soft500 can use the PROTO module as if it were a PCM2. Therefore, when filling in the configuration table, place a PCM2 designator in the slot of the configuration table where the PROTO module is located. When accessing the PROTO module in Soft500, use port A only (unless you have added circuitry to access the CMDDB signal also).

### Read Data

The read data operation reads the 8-bit binary value at the D inputs of the 74ALS573 on the PROTO Module (see Figure R-5 for pin-outs and bit-significance).

### Write Data

The write data operation is used to write an 8-bit binary value to the Q outputs of the 74ALS574 on the PROTO Module. The written value will remain at the Q outputs until another write data operation occurs. (see Figure R-5 for pin-outs and bit-significance).

**Table R-3. Replacement Parts Cross Reference**

Schematic Desg.	Manf. Desg.	Keithley Part#
C1	.1 $\mu$ F CAP.	C-237-.1
C2	.1 $\mu$ F CAP.	C-237-.1
C3	.1 $\mu$ F CAP.	C-314-10
U1	74ALS574	IC-529
U2	74ALS573	IC-528
U3	74LS00	IC-163

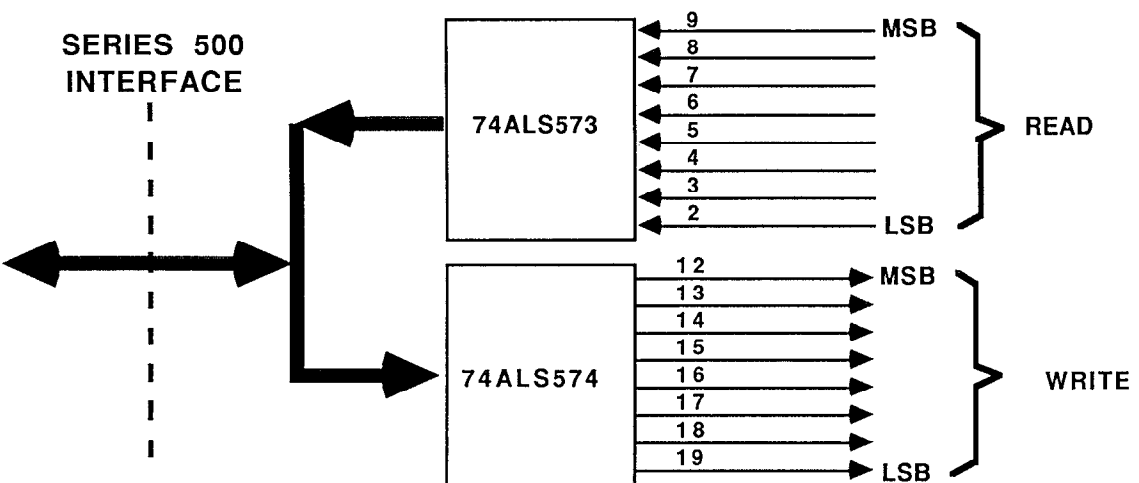
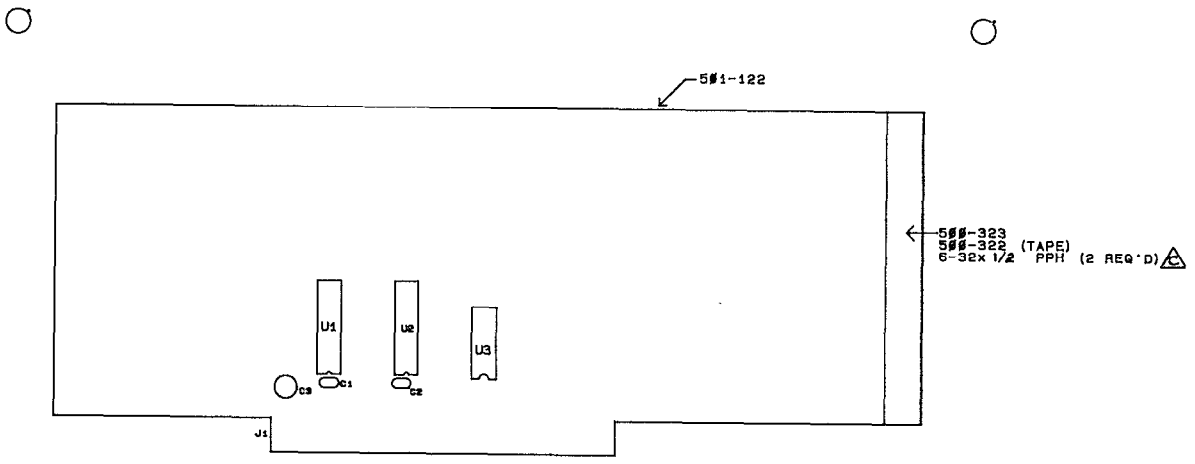
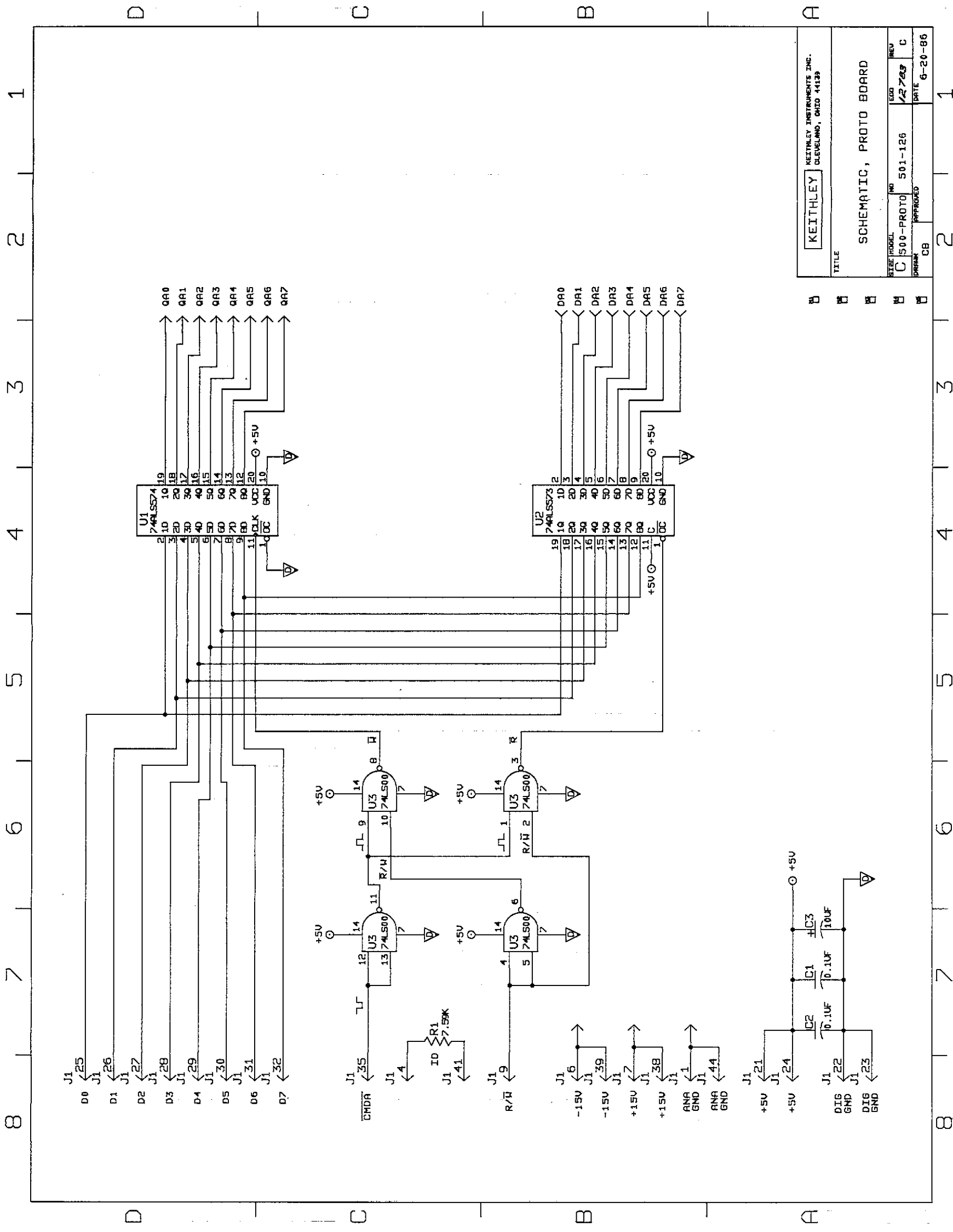


Figure R-5. Port Signal Connections

**PROTO COMPONENT LAYOUT**



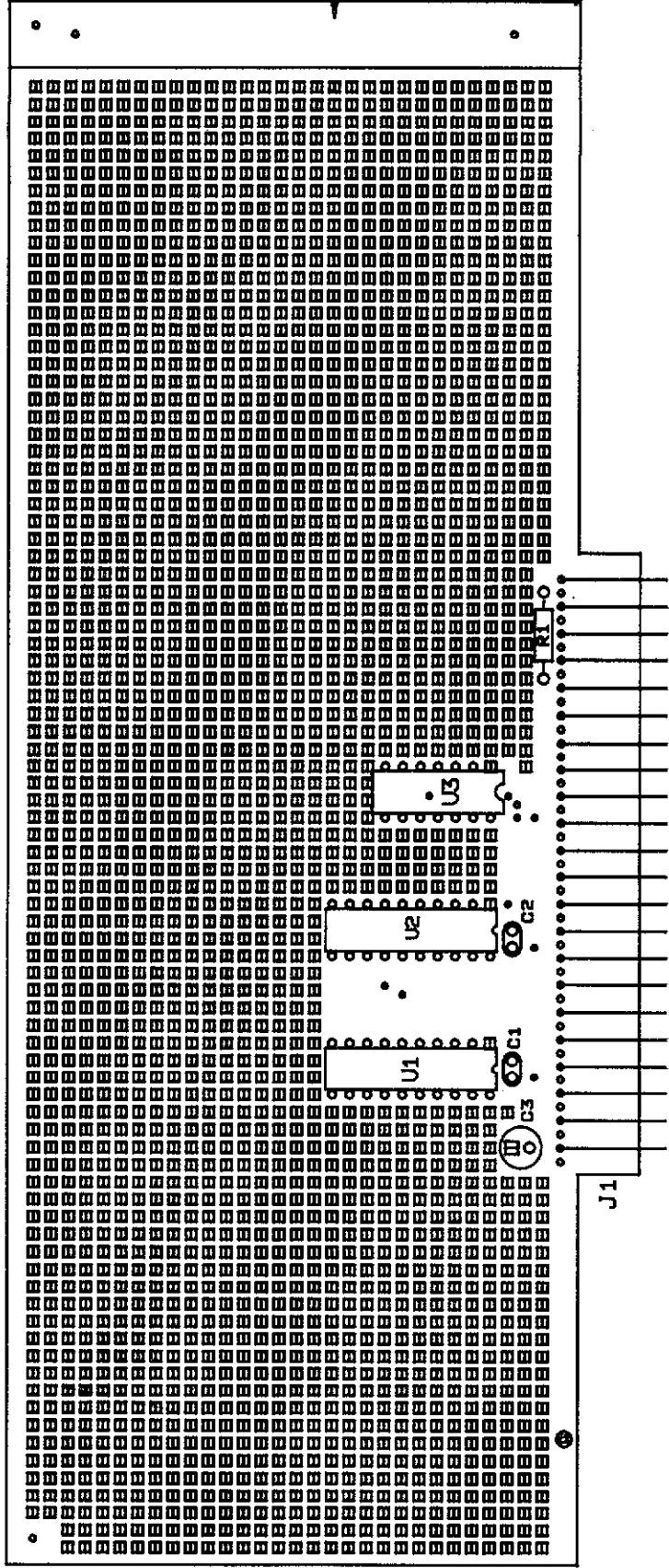
NOTE: FOR COMPONENT INFORMATION REFER TO BILL OF MATERIAL 5#1-95#.



KEITHLEY INSTRUMENTS INC. CLEVELAND, OHIO 44129	
TITLE SCHEMATIC, PROTO BOARD	
REV#	DATE
C	6-20-86
500-PROTO	501-126
PROGRAM	APPROVED
CB	

PROTO SCHEMATIC DIAGRAM





500-323  
 500-322  
 6-32x1/2 PPH (2 REQ'D)