

The Engineering Staff of
TEXAS INSTRUMENTS INCORPORATED
Semiconductor Group



**TM 990/510
TM 990/520
CARD CAGES**

FEBRUARY 1979

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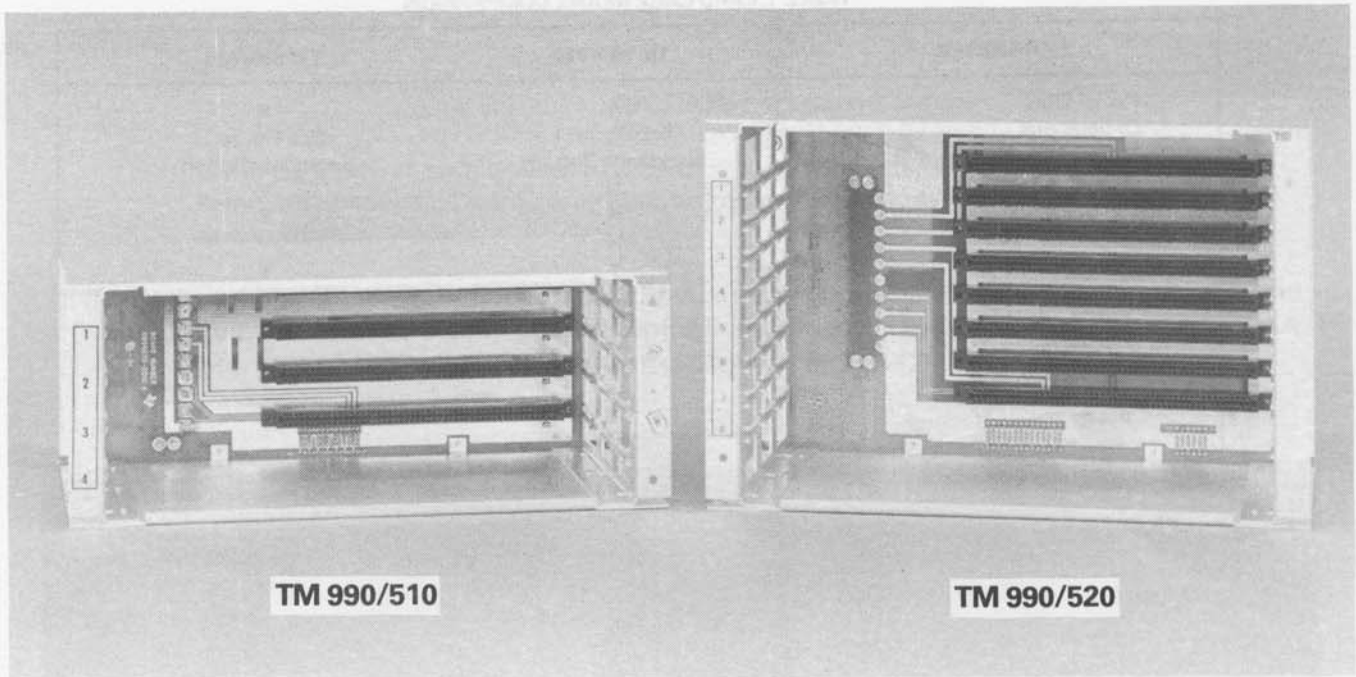
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1. GENERAL

The TM 990/510 and TM 990/520 card cages contain the following features:

- Four-board (TM 990/510) and eight-board (TM 990/520) capacity
- Space between board slots is 1 inch (TM 990/510) and 0.75 inch (TM 990/520)
- 100-pin bus interface to the standard TM 990/XXX series boards
- External terminal strip at rear provides secure connections to operating voltages and external signals (paragraph 5). Two ground connections are provided (facilitates daisy-chaining).
- Pullup and pulldown resistors are supplied on the backplane for the bus signals listed in Table 1.
- Drilled holes are provided at the front of the card cage for custom mounting in user's equipment.

2. TM 990/510 AND TM 990/520 COMPARISON

See Table 1.

NOTE

The TM 990/520 8 slot OEM chassis is shipped from the factory with terminating resistors at the bottom of the backplane. There is a provision on the TM 990/520 backplane to put termination resistors at the top. The user may use this option to terminate both ends of a signal, or to terminate the signal at whichever end of the backplane is convenient.

TABLE 1. CARD CAGE MODEL COMPARISON

PARAMETER	TM 990/510	TM 990/520
No. of Slots	4	8
Dimensions	See Figure 1	See Figure 1
Termination Resistors At:	Backplane Bottom	Backplane Bottom
Pin 22, $\phi 1.B$	N	Y
Pin 24, $\phi 3.B$	N	Y
Pin 26, CLK.B	N	Y
Pin 78, WE.B	Y	Y
Pin 80, MEMEN.B	Y	Y
Pin 82, DBIN.B	Y	Y
Pin 84, MEMCYC.B	Y	Y
Pin 86, HOLDA.B	Y	Y
Pin 87, CRUCLK.B	Y	Y
Pin 88, IORST.B	Y	Y
Space Between Board Slots	1 in.	0.75 in.

3. DIMENSIONS

See Figure 1.

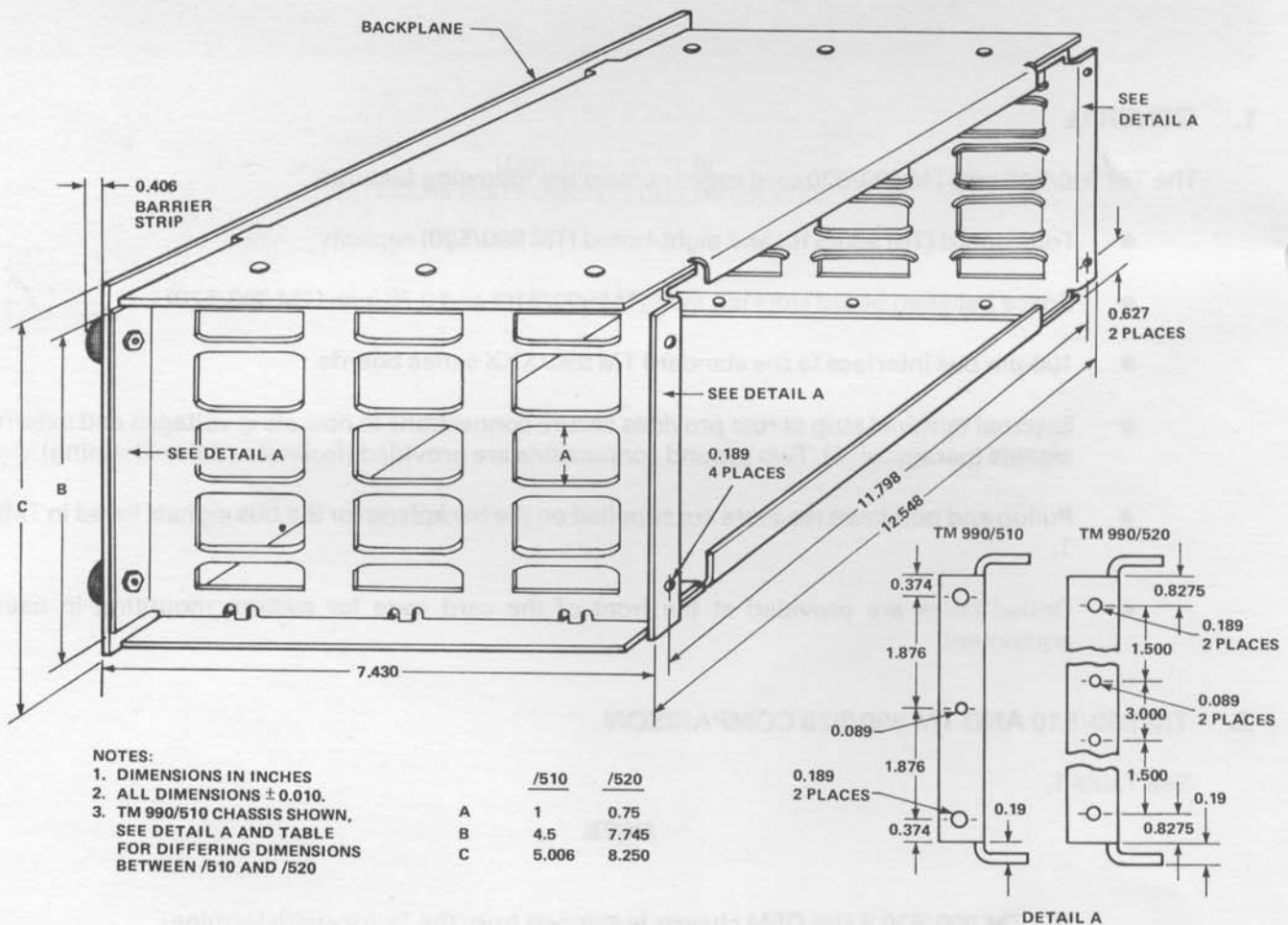


FIGURE 1 — CARD CAGE DIMENSIONS FOR BOTH MODELS
(MODEL TM 990/510 ILLUSTRATED)

4. INSTALLATION

CAUTION

Connect a power supply only to a card cage in which all boards have been removed. Install the boards only after all power connections have been made and verified.

- (1) At the terminal block at the back of the card cage, locate the ground connections, +12, -12, and +5 V. Connect the power supply ground connection first, then connect the voltage supplies. (A #6 crimp-on spade lug is suggested for connection to the terminal block screws.) See Figure 2.

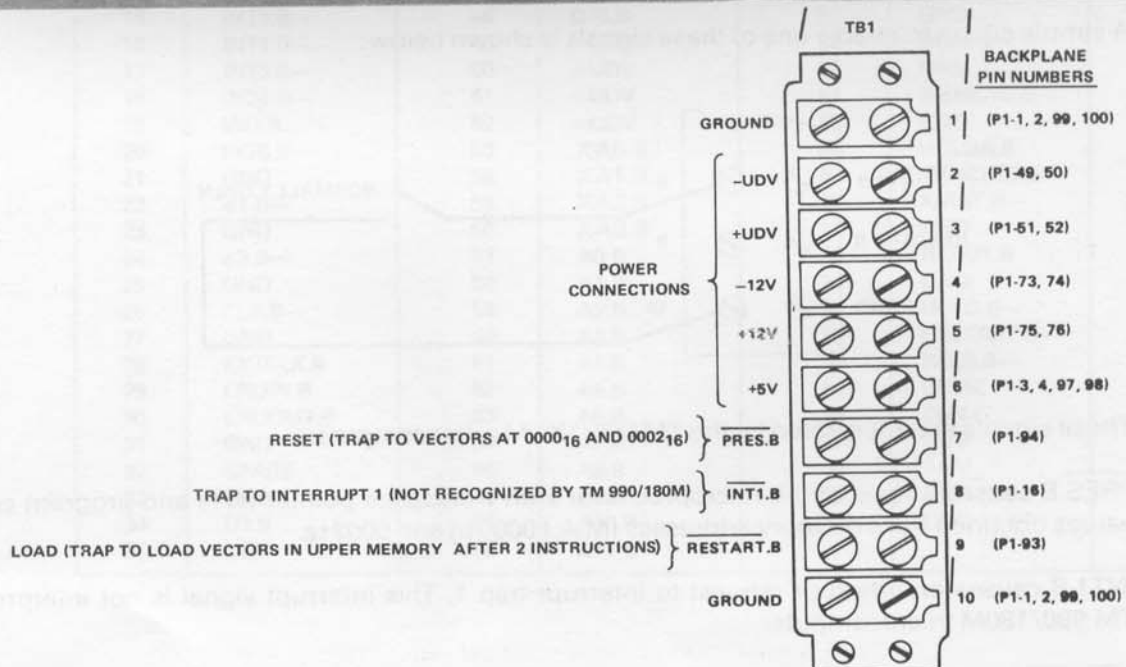
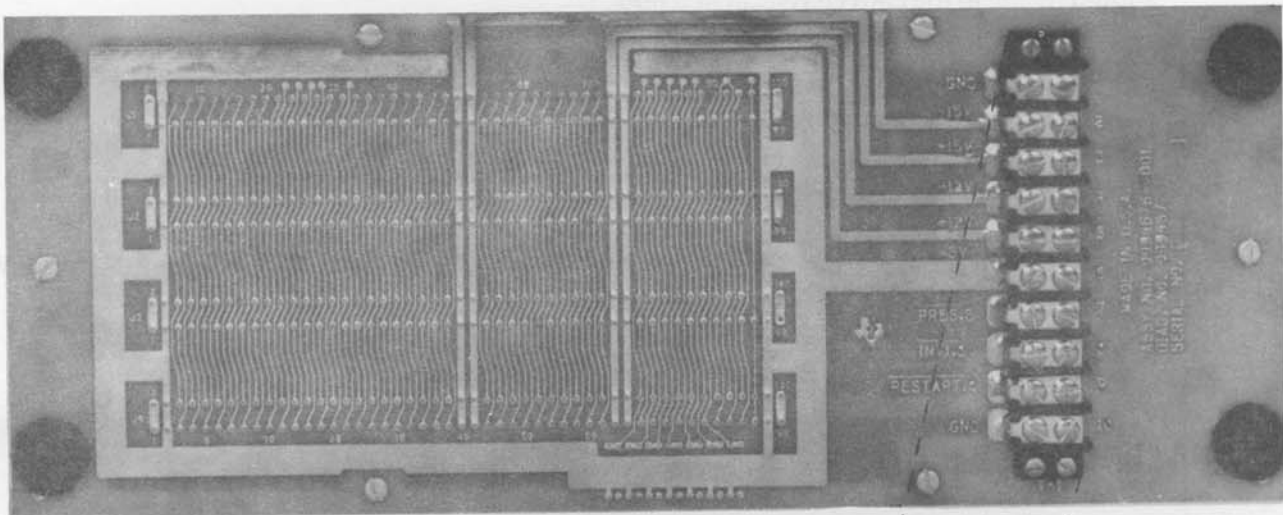


FIGURE 2 — BACKPLANE TERMINAL BLOCK TB1
(MODEL TM 990/510 ILLUSTRATED)

CAUTIONS

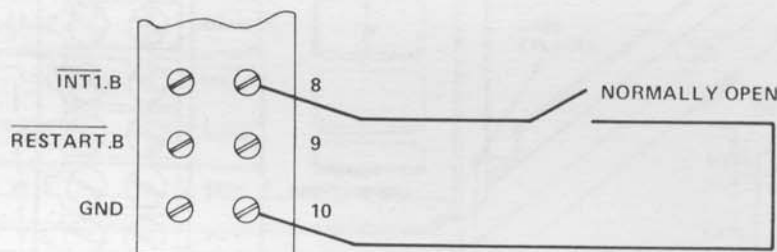
1. Ensure correct voltage at power source before making connections.
 2. Always verify that the power supply is off before making connections.
 3. If a board has become warped, guide the board in a manner so that the backplane pins are not injured.
- (2) Apply power and verify correct voltage levels at the terminal block. Use a voltmeter with reference to power ground.
- (3) Make any other desired connections to the terminal strip (e.g., pushbutton to cause a RESTART or LOAD as shown in paragraph 5).
- (4) Slide the microcomputer CPU board into the proper slot (slot 1 on the TM 990/510). Press in slowly until the board connector tabs are firmly seated in the backplane socket. Only one CPU board should reside in the card chassis at one time.
- (5) Install additional boards into the card chassis. Verify secure seating within the backplane socket.
- (6) Turn on the power and begin startup sequence.

5. EXTERNAL RESET, INTERRUPT, AND LOAD

On the rear terminal strip are three active-low signals that can be enabled by an external pushbutton switch:

- $\overline{\text{PRES.B}}$
- $\overline{\text{INT1.B}}$
- $\overline{\text{RESTART.B}}$

A simple circuit to enable one of these signals is shown below:



These signals are interpreted by the TM 990/1XXM microcomputers.

$\overline{\text{PRES.B}}$ causes a reset of the microprocessor with workspace pointer (WP) and program counter (PC) values obtained from memory addresses (M.A.) 0000_{16} and 0002_{16} .

$\overline{\text{INT1.B}}$ causes an interrupt request to interrupt trap 1. This interrupt signal is not interpreted by the TM 990/180M microcomputer.

$\overline{\text{RESTART.B}}$ causes a trap to the WP and PC values in M.A. FFFC_{16} and FFFE_{16} respectively (3FFC_{16} and 3FFE_{16} in the TM 990/180M microcomputer) after execution of two instructions.

6. WIRE-WRAP LEAD CONSIDERATION

The space between card slots is one inch on the TM 990/510 and 0.75 inch on the TM 990/520; thus, the user must take into consideration any interference that may result with the use of a prototyping board that contains wire-wrap leads which may interfere with other installed boards. In the TM 990/520, wire-wrap boards should be placed in the bottom slot, or the slot below the board should be vacant. It is recommended that prototyping boards (such as the TM 990/512) be used with wire-wrap pins of a half-inch or less in length (size used on the TM 990/513). If wire-wrap pins of a longer length are used, they may touch components on the board immediately below the prototyping board. In any case, the user must take care in inserting or removing wire-wrap prototyping boards or boards adjacent to the wire-wrap pin side of such boards.

TABLE 2. SIGNALS AT BACKPLANE

PIN	DESC.	PIN	DESC.	PIN	DESC.
1,2	GND	36	D3.B	69	A12.B
3,4	+5 V	37	D4.B	70	A13.B
5	INT8.B—	38	D5.B	71	A14.B
6	INT7.B—	39	D6.B	72	A15.B
7	INT10.B—	40	D7.B	73	-12 V
8	INT9.B—	41	D8.B	74	-12 V
9	INT12.B—	42	D9.B	75	+12 V
10	INT11.B—	43	D10.B	76	+12 V
11	INT14.B—	44	D11.B	77	GND
12	INT13.B—	45	D12.B	78	WE.B—
13	INT2.B—	46	D13.B	79	GND
14	INT15.B—	47	D14.B	80	MEMEN.B—
15	INT3.B—	48	D15.B	81	GND
16	INT1.B—	49	-UDV	82	DBIN.B
17	INT5.B—	50	-UDV	83	GND
18	INT4.B—	51	+UDV	84	MEMCYC.B—
19	IAQ.B	52	+UDV	85	GND
20	INT6.B—	53	XA0.B	86	HOLDA.B
21	GND	54	XA1.B	87	CRUCLKB.B—
22	ϕ 1.B—	55	XA2.B	88	IORST.B—
23	GND	56	XA3.B	89	GND
24	ϕ 3.B—	57	A0.B	90	READY.B
25	GND	58	A1.B	91	GND
26	CLK.B—	59	A2.B	92	HOLD.B—
27	GND	60	A3.B	93	RESTART.B—
28	EXTCLK.B	61	A4.B	94	PRES.B—
29	CRUIN.B	62	A5.B	95	DMAC
30	CRUOUT.B	63	A6.B	96	DMAC
31	GND	64	A7.B	97	+5 V
32	SPARE	65	A8.B	98	+5 V
33	D0.B	66	A9.B	99	GND
34	D1.B	67	A10.B	100	GND
35	D2.B	68	A11.B		

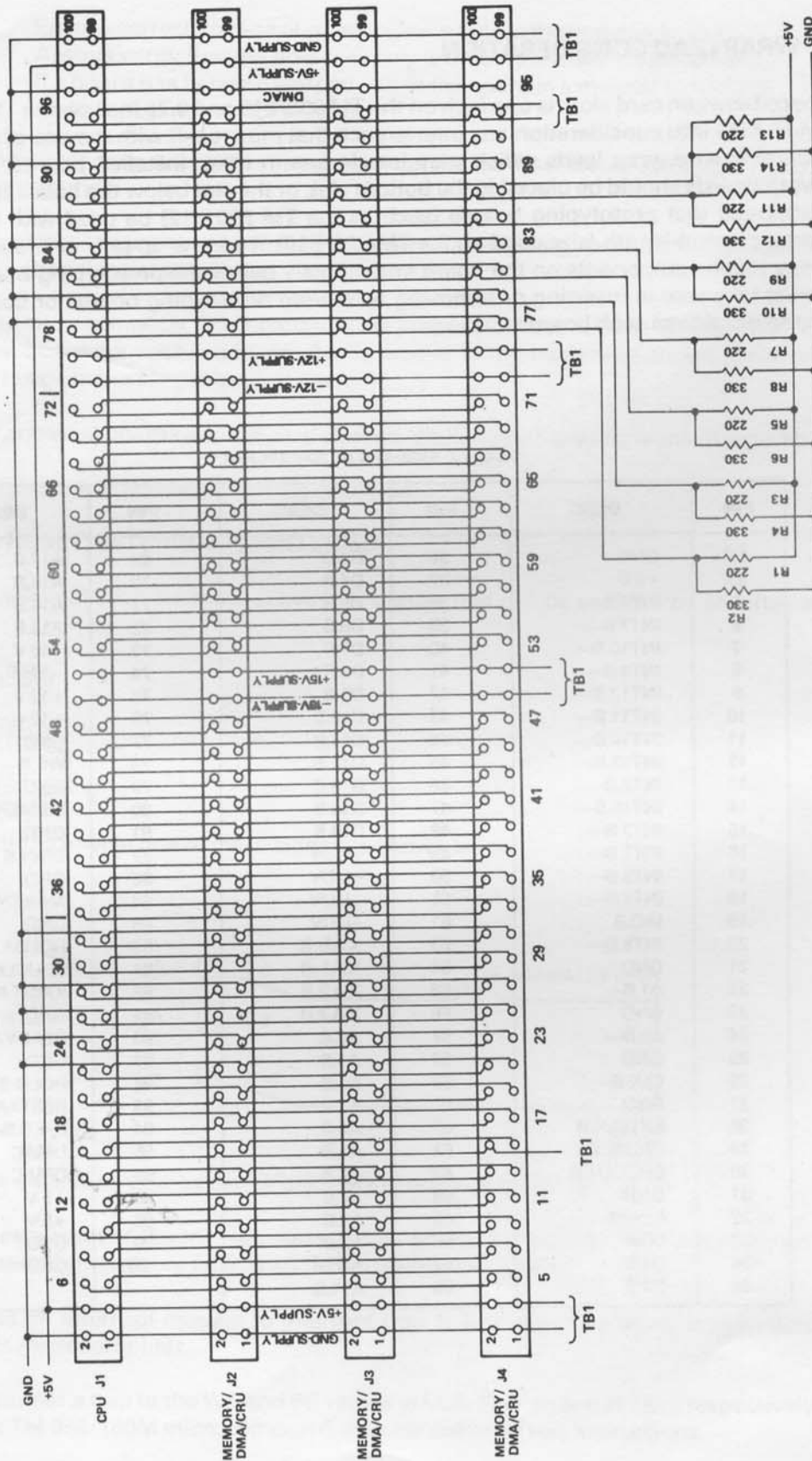


FIGURE 3. BACKPLANE SCHEMATIC FOR TM 990/510

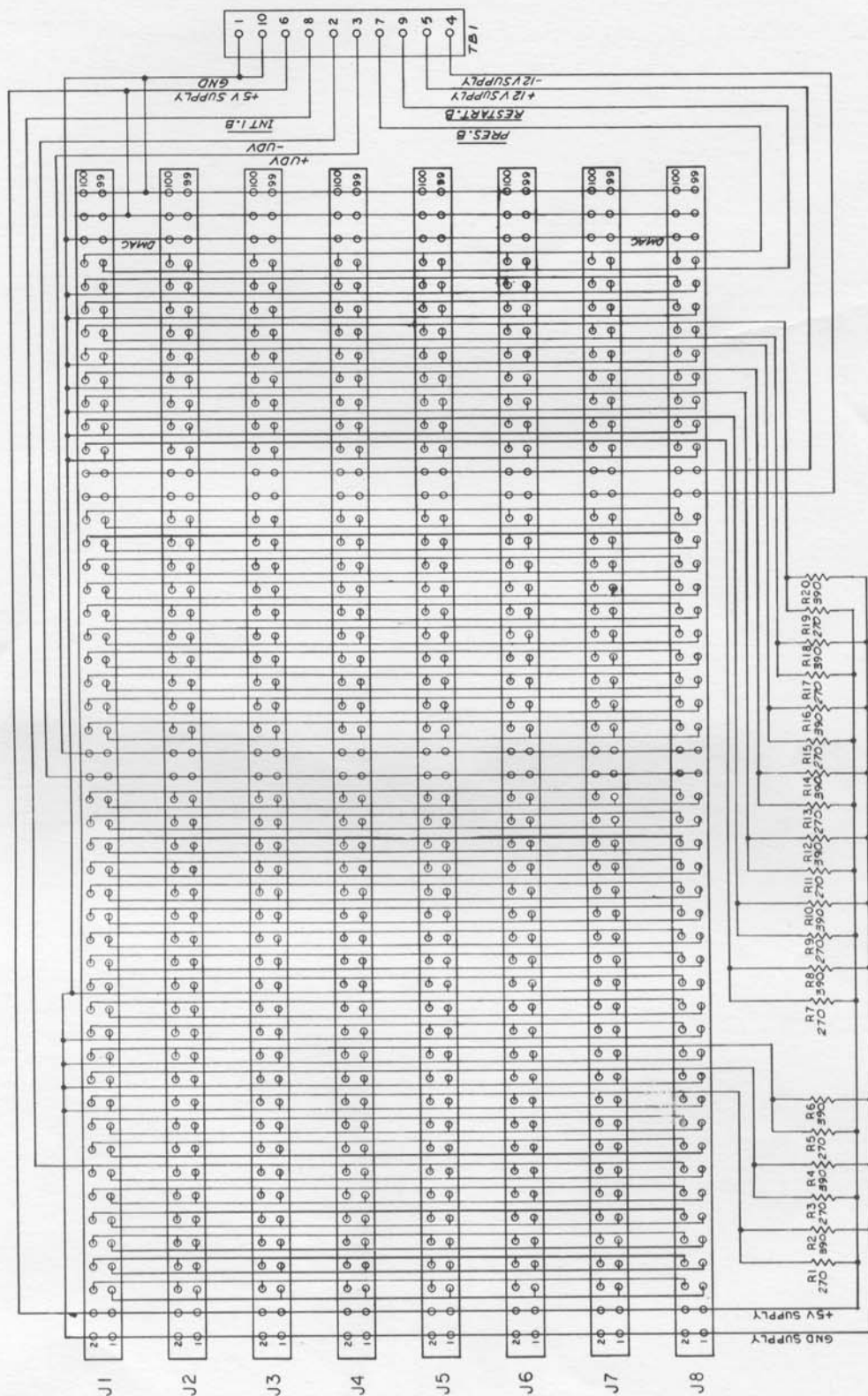


FIGURE 4. BACKPLANE SCHEMATIC FOR TM 990/520

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