88-HSR

Power and I/O Description

GENERAL

Power Supply

AC line voltage is applied to the primaries of T1 & T2 through switch S1 and fuse F1. The secondary of T2 is rectified by diodes D6 & D7 and regulated to +5 volts by VR1. R8 is a current bypass resistor and C4 is a filter capacitor. The regulated +5 volts supplies the Reader logic/Driver board.

The secondary of T1 is rectified to provide 35 volts DC at C2 and 17 volts DC at C3. Pad "1" (at R7) is a TTL input. This input is brought in at pin 22 of the 25 DB connector to pin A of the 15 pin edge connector and then jumpered to pin o of the 5-pin molex at the top of the Reader board. A wire connects pin 1 of the molex to a pad on the power supply board. When this input is a logic "1" (2 volts - 5 volts), Q1 conducts causing Q2 and Q3 to conduct which provides approx. 30 volts at V+. This voltage supplies the drivers of the stepping motor. When the run command is given, tapes will be read at a rate of approx. 300 cps.

When the input to Q1 is low (0 volts - .5 volts), Q1, Q2, and Q3 are turned off. This is the 'standby' mode and V+ becomes approx. 10 volts, supplied by the secondary of T1 through Diode D1. Although tapes will run at a speed of approx. 30 cps, this mode is normally used to decrease motor power during periods of inactivity. The Light-Emitting Diode on the front panel provides a different brightness for each mode: When dim, the reader is on but is in the standby mode. When bright, the reader is on in the normal mode. When not lit, the reader is off.

I/O SIGNAL INTERCONNECT

FUNCTION	88-4PIO 25 PIN CONNECTOR	SIGNAL NAME	READER 15 PIN CONNECTOR
DATA	4	Data Bit Ø	1
	5	1	2
	14	2	3
	15	3	4
	16	4	5
	17	5	6
	18	6	7
	19	7	8
STATUS	3	CA2 (Data RDY)	9
GROUND	6	GND	12 ↰ JUMPER 10 ↲
CONTROL	22	PB2 (STBY)	A
	20	PBØ (RUN)	F

Theory of Operation

The 88-HSR is directly plug-compatable with the 88-4PIO parallel interface board.

88-4PIO Initialization (assume 4PIO is at address 20 octal)

One port of a 4PIO is used to interface the Reader. The 'A' section provides data input and status while the 'B' section provides Reader Control.

The 'A' section initialization sets PAØ - PA7 as data inputs and CA2 as the Data Available input. These inputs are all high active.

The 'B' section uses 2 bits as outputs to control the Reader:

Bit Ø when low, Reader runs

Bit 2 when low, Reader is in standby mode

Shown below is the full initialization procedure:

```
257
323
020      Make 'A' data lines inputs and 'B' data lines outputs
323
021
323
022
057
323
023
```

```
076
034
323
020
```
Make DDR bit (bit 2) high and CA2 high active with interrupts enabled for 'A' section

```
076
004
323
022
```
Make DDR bit (bit 2) high for 'B' section

After initialization, the Reader is controllable via the 'B' data channel (address 023) as shown below:

Bit Ø	Bit 1 (Don't Care)	Bit 2	Octal Equiv
0	0	0	0
1	0	0	1
0	0	1	4
1	0	1	5

Normally, the Reader would first be stopped and in the standby mode:

```
076
001
323
023
```

Then the power switch is turned on. The Reader lamp will light, but the tape will be stopped. Then an output of 4 will start the tape.

Loading Basic

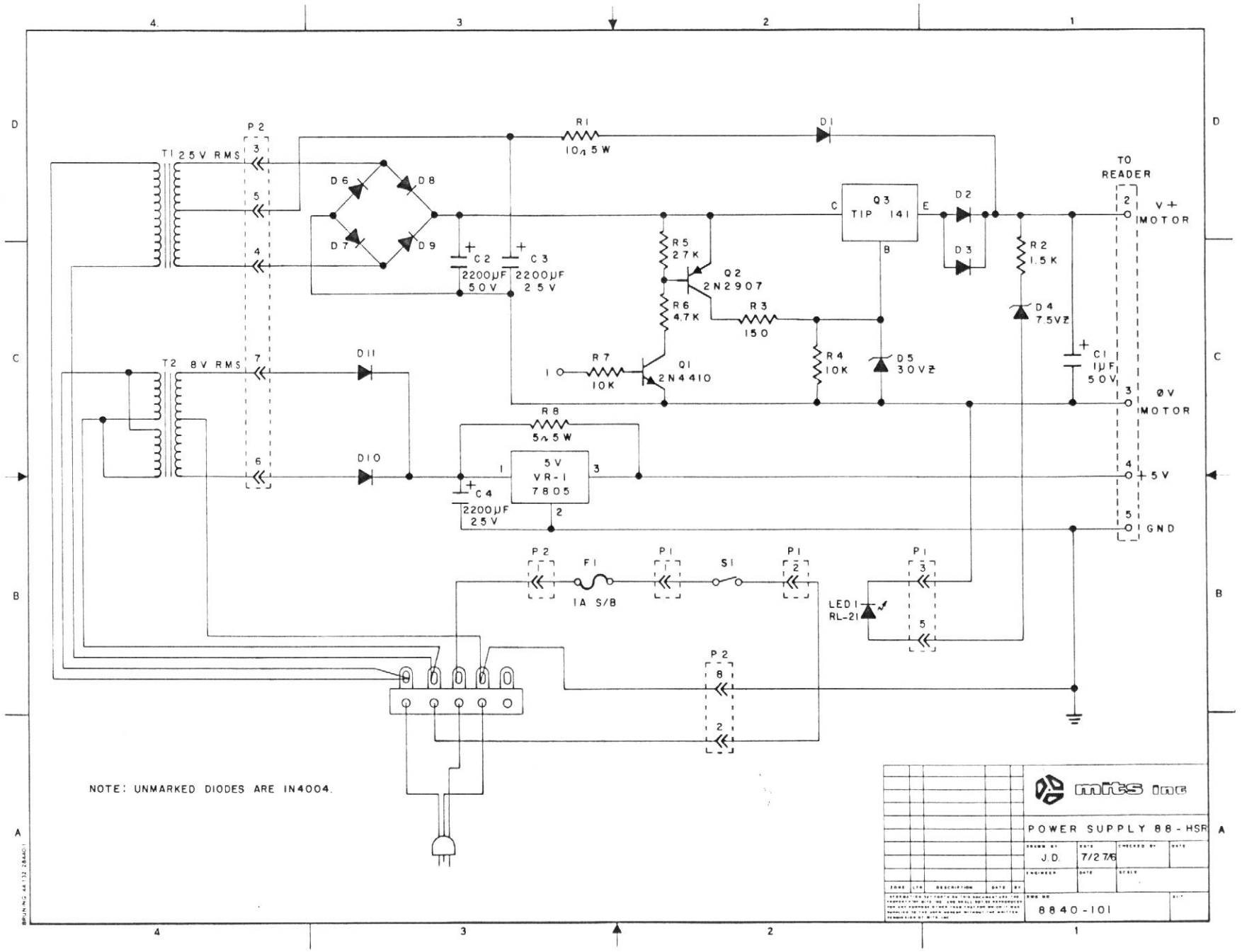
The following boot-strap loader is entered in lower memory beginning at location 0. Once entered, load the BASIC paper tape in the middle of the "276" leader and turn the Reader on. Then start the program.

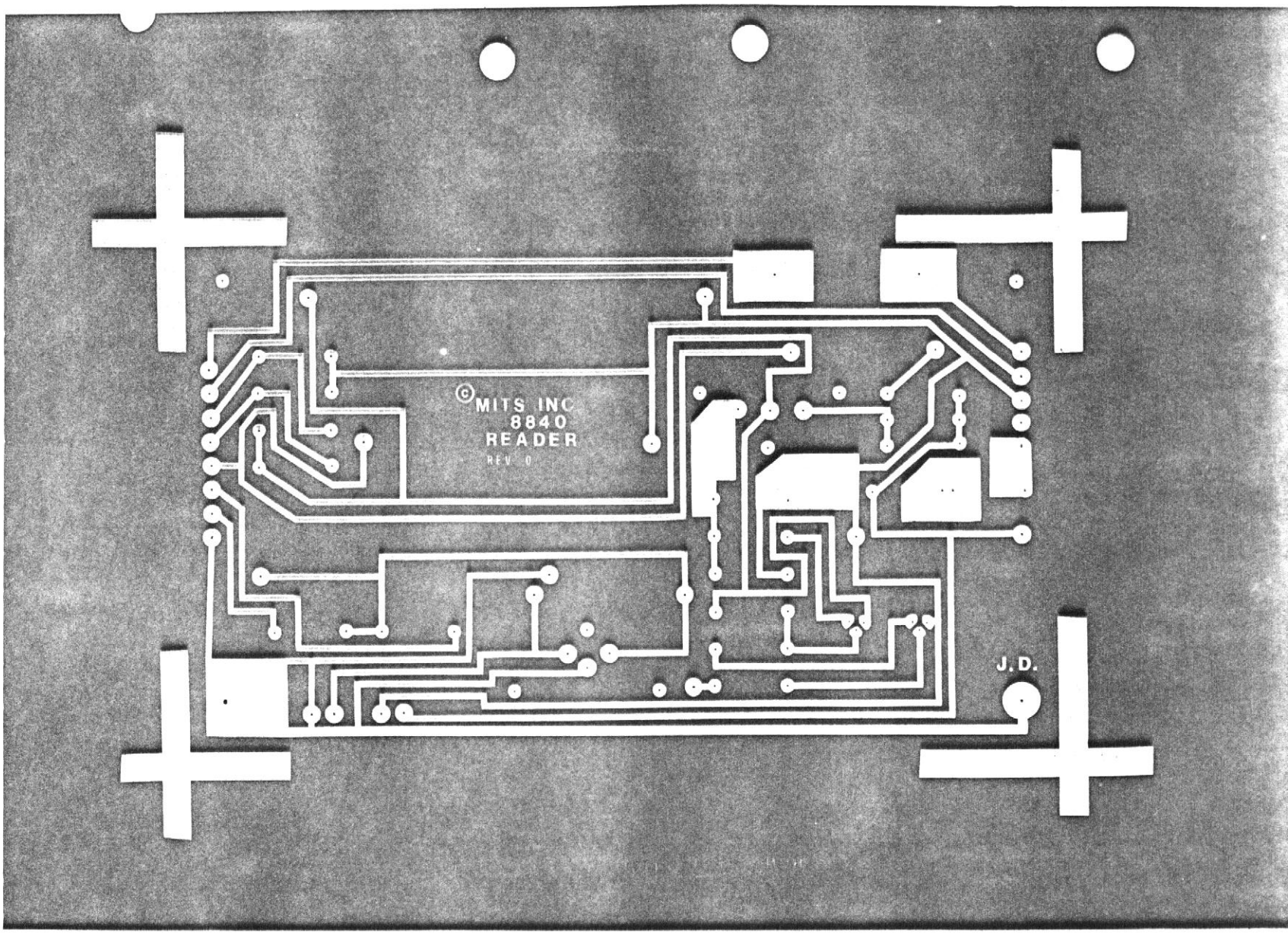
NOTE: The Reader should be in the "STANDBY" mode during the periods of inactivity and should be turned off when not in use.

HSR BOOTSTRAP LOADER

Location	Instruction	
000	257	
001	323	
002	020	
003	323	
004	021	
005	323	
006	022	
007	057	
010	323	
011	023	
012	076	
013	014	
014	323	
015	020	
016	076	
017	004	
020	323	
021	022	
022	076	
023	004	
024	323	
025	023	
026	041	
027	256	
030	XXX	17 for 4K, 37 for 8K, 57 for Ext.
031	061	
032	051	
033	000	
034	333	
035	020	
036	346	
037	100	
040	310	
041	333	
042	021	
043	275	
044	310	
045	055	
046	167	
047	300	
050	351	
051	031	
052	000	

NOTE: Front panel switch A12 should be raised before starting the bootstrap loader.


T1 25 V RMS
T2 8 V RMS
P2
R1
10Ω 5 W
D1
D6
D8
D7
D9
C2
2200μF
50 V
C3
2200μF
25 V
Q3
TIP 141
D2
D3
TO
READER
V+
MOTOR
R5
27 K
Q2
2N2907
R6
4.7K
R3
150
R2
1.5 K
D4
7.5VZ
C1
1μF
50V
R7
10K
Q1
2N4410
R4
10K
D5
30VZ
ØV
MOTOR
D11
D10
R8
5Ω 5 W
5V
VR-1
7805
C4
2200μF
25 V
+5V
GND
P1
F1
1A S/B
S1
LED1
RL-21
P2
8
2
NOTE: UNMARKED DIODES ARE IN4004.
mits inc
POWER SUPPLY 88-HSR A
J.D.
7/27/8
8840-101


©MITS INC
8840
READER
REV 0
J.D.

P1 (8) 10 [2.5 V PP] (8) Rpp now down to 7 V 9

(9.5) (7.6) (9.1) (.4)

If then put CPU BD IN RIPP ON OUTPUT (E2)

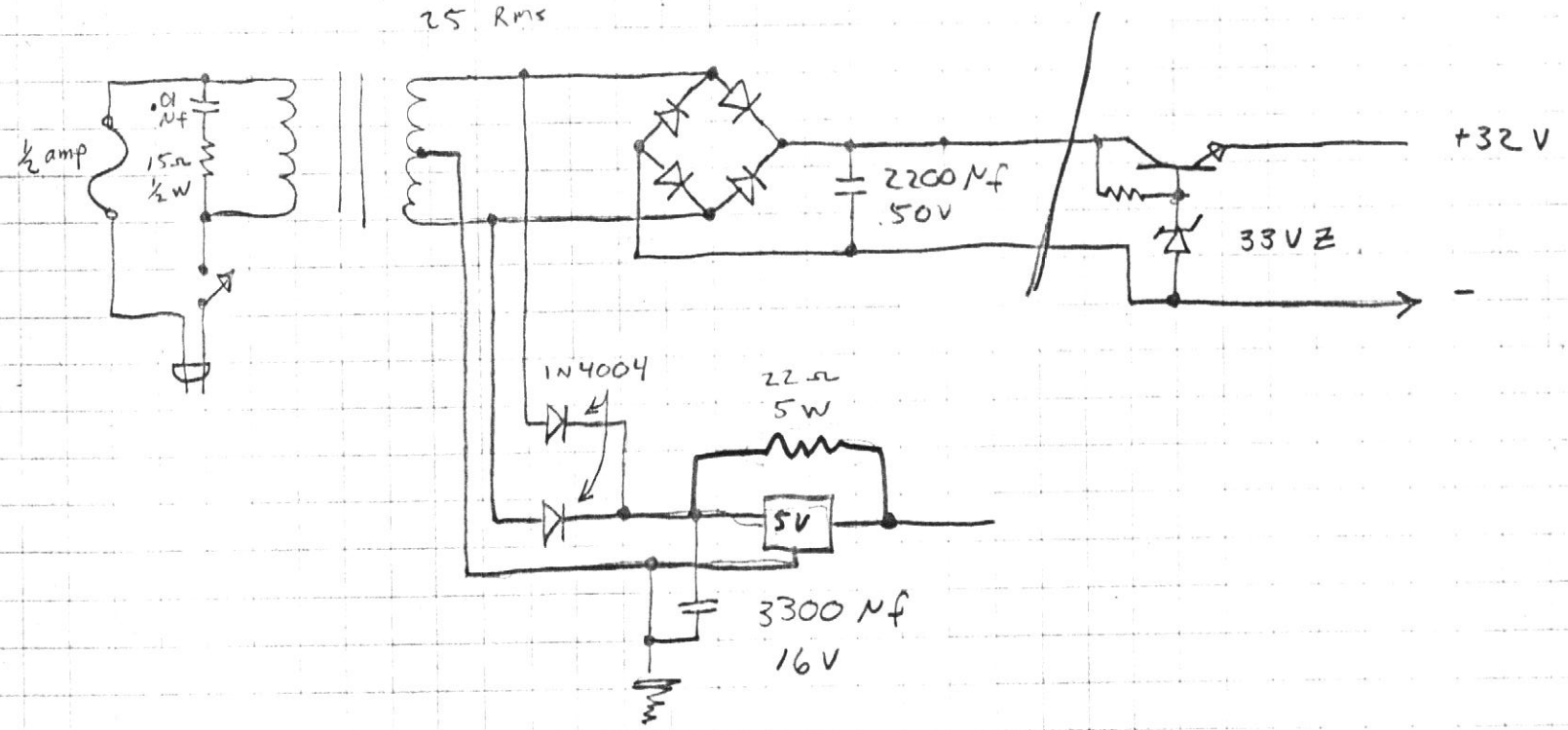
IS GETTING BELOW 7 (SAY DOWN TO 6.5) YOU CAN JUST BARELY SEE IT ON TS OUT OF CPU REG

ANY MORE RIP ON INPUT STARTS TO GO RIGHT THRU REG (MOTOROLA REG ON CPU BD)

RDR

3 Mar 76

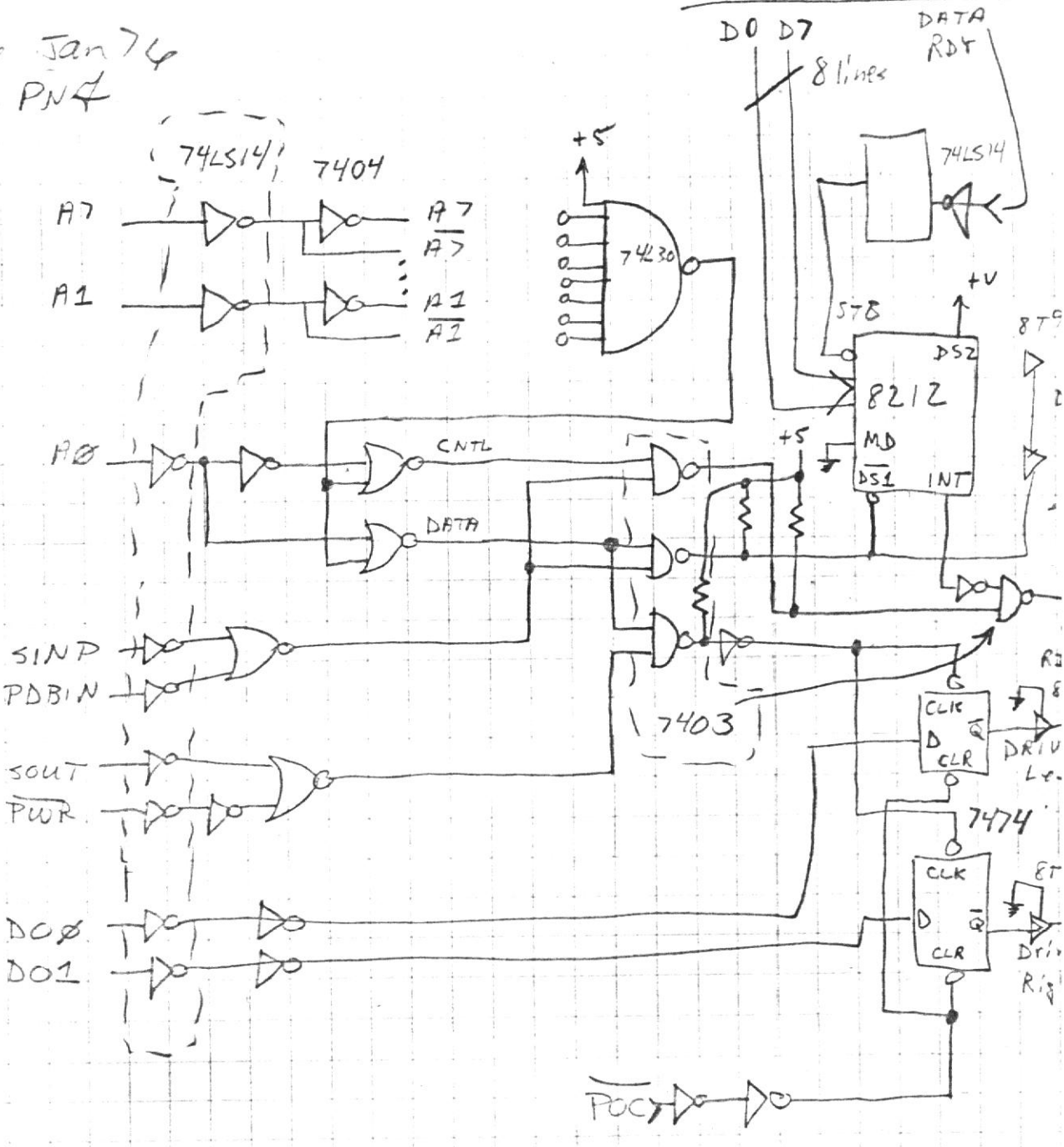
1) CR on x-former
2) 5 pin STRAIGT molex
3) Case & Tooling April 7 (P.O. ~~Date~~ 4Mar76)
4) Incomming Remex



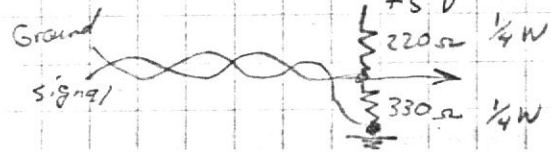
4.00
2.00
7.75
5.00

88 - ~~RDR~~

6 Jan 76
PN4



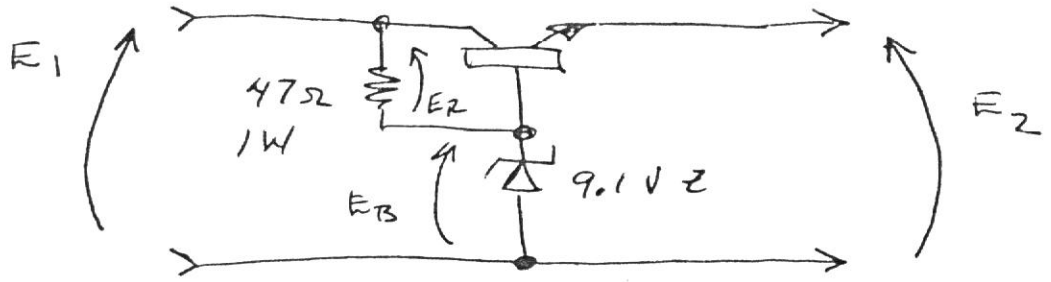
All signals from reader come into mini molex (~~2 each = 10 pins~~) 25 pin. There's 11 signals + eleven grounds. The inputs (8 data lines + Data Ready) are terminated as below



resistors should be as close as possible to IC that the signal goes to

P/S MEAS. (31 AUG 75)

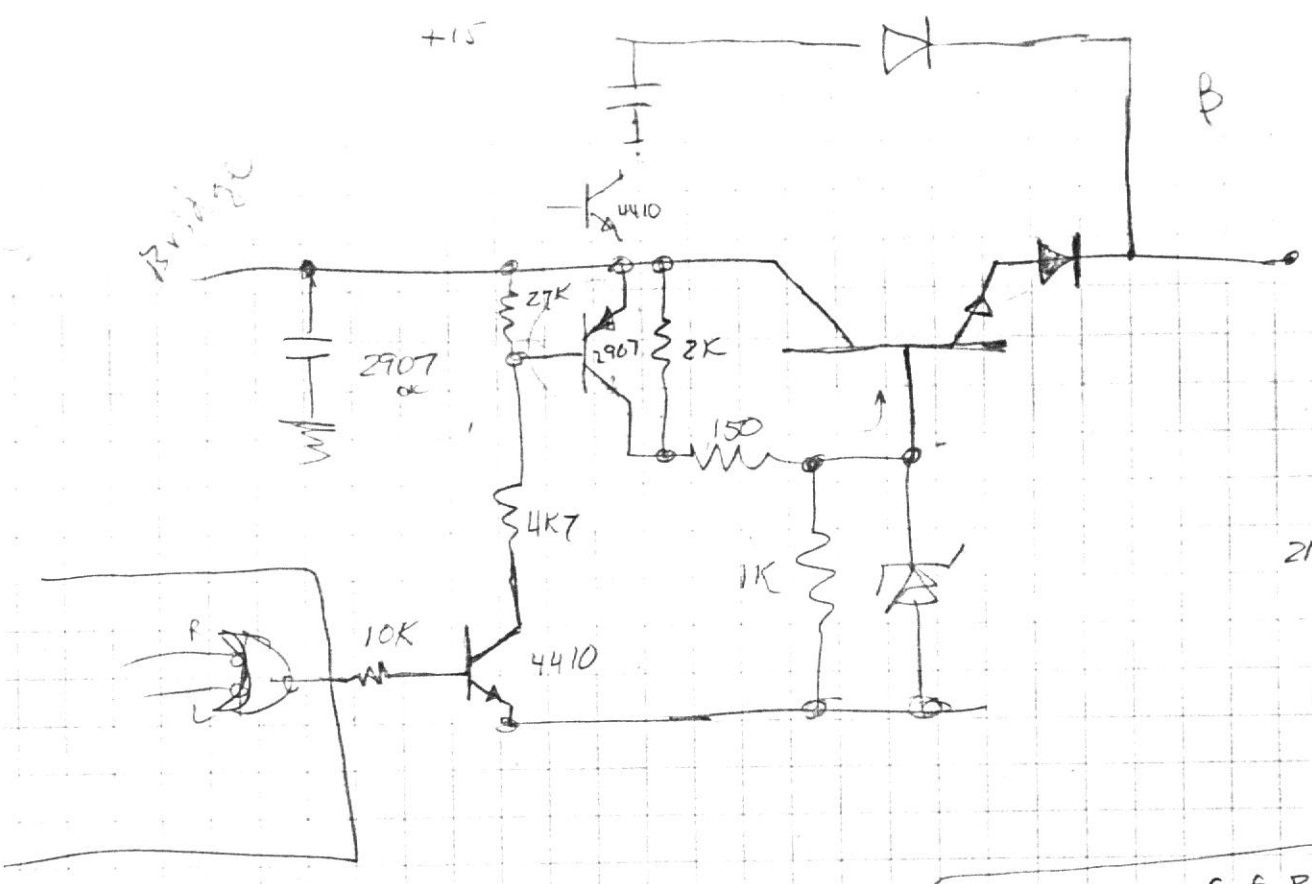
③ PRE-REG



	LOAD	E_1	E_2	E_B	E_R
a)	0	14 (13.8)	10. (10.0)	10.2 (10.1)	3.65
b)	.6A	13 [RIP < 1V P.P.] (13)	9.0 (8.8)	10. (9.9)	3 (3.0)
c)	2.6A	12 [1V PP] (11.9)	8.5 (8.5)	9.8 (9.7)	2 [ ] (2.1)
d)	4A	11.5 [2V PP] (11.3)	8.5 (8.4)	9.8 (9.6)	[ ] (1.6)
e)	6.8	10 [2V. PP] (10.1)	8.0 start to get slight ripple (7.9)	9.5 same ry (9.3)	[ ] (.74)

(CPU BD IN

OLSON



.7 A

NPN
2N 3117 Nf = 1.0
Vceo 60
Vcbo 60
Hfe 250 — 500
fT MHz 60
TO-18

C E B hFE Vcb
Starkey 36.4 11.6 4.5 76 11.8

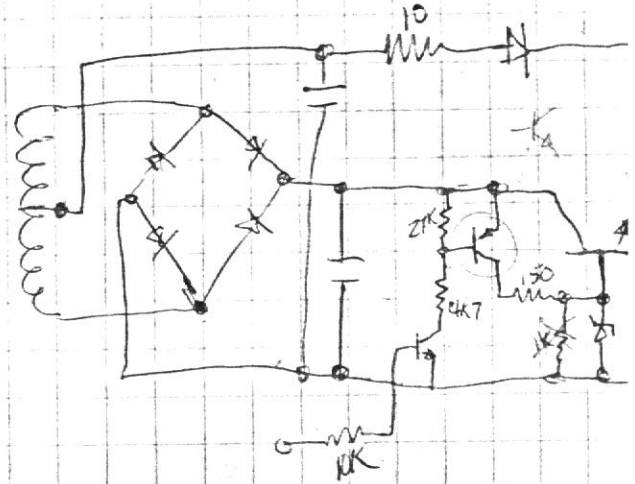
15 v .7A = 10.5

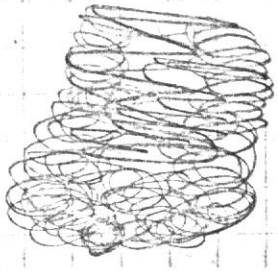
.175A @ 16V = 12w

21.33 Ω

+10 series ⇒ .52 λ

$\alpha \lambda \sigma \mu$
$\beta \gamma \theta$





1 = -5
11 = +5
18 = +12
22 = ⏚

22
74
66
50

HSR boot

377/000

377/0	257
1	323
2	020
3	000
4	323
5	021
6	076
7	014
10	323
11	020
12	041
13	256
14	037
15	061
16	035
17	377
20	333
21	020
22	346
23	100
24	310
25	333
26	021
27	275
30	310
31	055
32	167
33	300
34	351

40	257
41	323
42	022
43	076
44	377
45	323
46	023
47	000
50	323
51	022
52	076
53	002
54	323
55	023
56	333
57	020
60	000
61	333
62	021
63	303
64	000
65	377

```
          035     000
```

MITS HIGH SPEED READER BOOT

```
          000     257
          001     323
          002     020
          003     323
          004     021
          005     323
          006     022
          007     057
          010     323
          011     023
          012     076
          013     014
          014     323
          015     020
          016     076
          017     004
          020     323
          021     022
          022     076
          023     016 / 12          1 010
          024     323
          025     023
          026     041
          027     256
          030     017
          031     061   LXI SP
          032     051   B1
          033     000   B2
          034     333
          035     020
          036     346
          037     100
          040     310   R2
          041     333
          042     021
          043     275   CMP L, A
          044     310   R2
          045     055   DEC L
          046     167   MOV M, A
          047     300   RNZ
          050     351   PCHL
          051     031
          052     000
```

So, to load the Bootstrap Loader:

4) Put switches 0-15 in the Down position.

5) Raise EXAMINE.

9, 12

6) Put 041 (the data for address 000) in switches 0-7.

HSR-32 (mf) (3)

~~103076 1 1µ @250V~~
~~100378 2 .22µ @50V~~
~~103076~~

100908	2	4-40 x 3/8
100932	2	4-40 nut
100941	2	#4 lockwasher
100925	5	6-32 x 3/8
100919	4	6-32 x 1
100933	17	6-32 nut
100942	17	6-32 lockwasher
101822	4	.4 spacer
100929	4	8-32 - Nut
103021	1	Cable clamp 1/4"
103061	1	3' orange 20ga.
103062	1	6' black 20ga.

HSR - PWR SUP Bd

Transistors

EN2907	(PNP)	1	102304
4410	(NPN)	1	102320
TIP 141	(NPN-HP)	1	102319
7805	(voltage Reg)	1	101074

DIODES

IN4004		11	100718
IN4751A	(30 V Z)	1	100729
IN4731	(7.5V Z)	1	100719
RL-21	(LED)	1	100722

Transformers

P-[8388]	(25.2V @ 2a)	1	101[illegible]
~~[8130]~~ NO	8V ~~(12.6V @ 2a)~~	1	

Resistors

150 Ω, ½ W	~~[illegible]~~	1	~~[illegible]~~
1.5 KΩ, ½ W		1	101946
4.7 KΩ, ½ W		1	101950
10 KΩ, ½ W		2	101932
27 KΩ, ½ W		1	101939
10 Ω, 5 W		1	101905 (~~[illegible]~~)
15 Ω, 2 W		1	101[illegible]

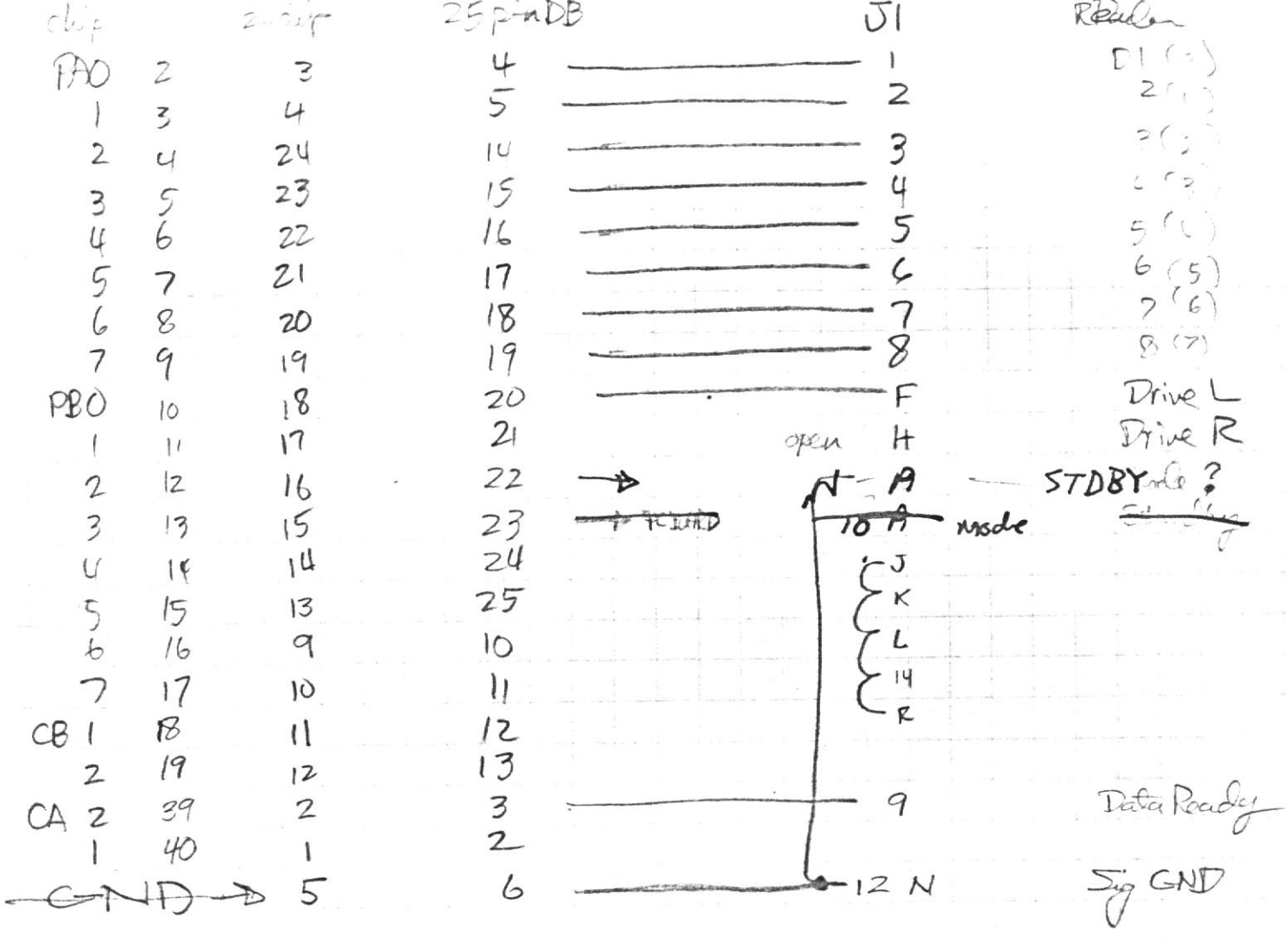
HSR - Pwr Sup Bd (cont.)

Capacitors

1Mf @ 50V	1	100200
2200Mf @ 25V	2	100215
2200Mf @ 50V	1	100217

General

Terminal Strip (~~6 position~~ 5)	1	101713 ~~NO~~
AC Pwr. Cord	1	3 wire 101742
Thermalloy #6030B Heatsink (stand up - large)	2	~~101673~~ NO!
black Bezel (for RL20 LED)	1	101716
Fuse 1A SB	1	101777
Fuse clips	2	101780
25DB connector (female)	1	102112
" P " (male)	2	102111
black ~~Molex~~ Ring Washer (Lock)	1	101801 ?
AC Pwr. Switch	1	102106
Case	1	
AC Pwr. Cord grommet	1	101776
Molex Plug (10-pin)	1	~~101812~~
Molex Plug (5-pin)	2	101811
Molex Recep. (10-pin)	1	101768
Molex Recep (5-pin)	2	101813
Molex terminals	20	101769
PC Bd. (HSR-PS)	1	
88-94P10 Kit (w/ 1 port)	1	
Twisted Pair Cable	7'	102060 ?
Reader	1	


chip
25 pin DB
J1
PA0
PB0
CB1
CA2
GND
open
10 N
mode
J
K
L
14
R
Drive L
Drive R
STDBY
Data Ready
Sig GND

From Reader to Back Panel

15 pin Edge Connector		12 Conductor Cable (1 foot)	25 DBS (Female)
1	DATA	PA Ø	4
2		1	5
3		2	14
4		3	15
5		4	16
6		5	17
7		6	18
8		7	19
9	DATA RDY	CA2	3
10	Jumper		
11			
12		GND	6 5
13			
14			
15			
A	STD BY	PB2	22
F	DRV L	PBØ	20

From Render Back Panel to Computer Back Panel

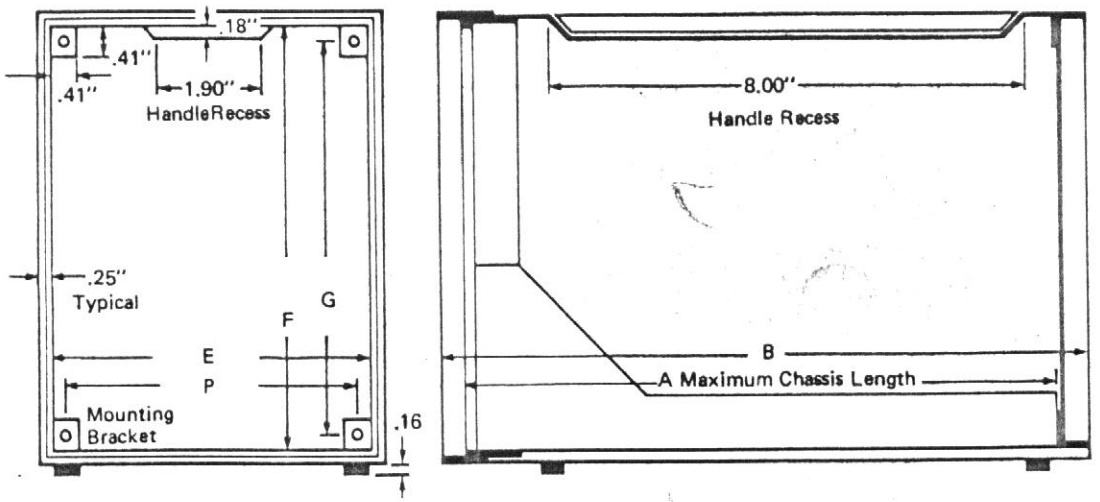
25 DBP	12 Cond. (6 feet)	25 DBP
4		4
5		5
14		14
15		15
16		16
17		17
18		18
19		19
3		3
6		6
22		22
20		20

RDR CASE

13MAY76

1) cut Front pannel on inside (marks)
2) PC bd. mtg. back & to right
3) Big X-former left
4) lower notch for pwr. cord

dimension data



MODEL NUMBERS	Depth A	~~Depth~~ B	DIMENSIONS IN INCHES E	F	Height G	width P	NET WEIGHT LBS
E-030510 F	10.00	11.00	5.00	2.43	1.93	4.50	2.00
E-030810 F	10.00	11.00	7.79	2.43	1.93	7.29	2.50
E-031110 F	10.00	11.00	10.57	2.43	1.93	10.07	3.00
E-050510 F	10.00	11.00	5.00	4.18	3.68	4.50	2.75
E-050810 F	10.00	11.00	7.79	4.18	3.68	7.29	3.00
E-051110 F	10.00	11.00	10.57	4.18	3.68	10.07	3.50
E-060510 HF	10.00	11.00	5.00	5.93	5.43	4.50	2.50
E-060514 HF	14.00	15.00	5.00	5.93	5.43	4.50	3.25
E-060810 HF	10.00	11.00	7.79	5.93	5.43	7.29	3.00
E-060814 HF	14.00	15.00	7.79	5.93	5.43	7.29	3.75
E-061110 HF	10.00	11.00	10.57	5.93	5.43	10.07	3.50
E-061114 HF	14.00	15.00	10.57	5.93	5.43	10.07	4.25
E-080510 HF	10.00	11.00	5.00	7.68	7.18	4.50	3.00
E-080514 HF	14.00	15.00	5.00	7.68	7.18	4.50	3.75
E-080810 HF	10.00	11.00	7.79	7.68	7.18	7.29	3.25
E-080814 HF	14.00	15.00	7.79	7.68	7.18	7.29	4.00
E-081110 HF	10.00	11.00	10.57	7.68	7.18	10.07	4.00
E-081114 HF	14.00	15.00	10.57	7.68	7.18	10.07	4.75
E-100510 HF	10.00	11.00	5.00	9.43	8.93	4.50	3.25
E-100514 HF	14.00	15.00	5.00	9.43	8.93	4.50	4.00
E-100810 HF	10.00	11.00	7.79	9.43	8.93	7.29	3.25
E-100814 HF	14.00	15.00	7.79	9.43	8.93	7.29	4.50
E-101110 HF	10.00	11.00	10.57	9.43	8.93	10.07	4.25
E-101114 HF	14.00	15.00	10.57	9.43	8.93	10.07	5.00

For Detail Information Refer to Engineering Drawing #36699

Optima has 24 standard-size small cases available, in a wide variety of colors, color combinations, and textures. Our Color and Finish brochure will tell you all about them. Overall depth is 11" or 15".

Optima small case covers are easily removable for total instrument servicing via two screws. Optional tiltstands and flush carrying handles add to the versatility and convenience of these lightweight aluminum enclosures. With the optional rack adapters, many combinations of two or three complete cases can be installed in a standard 19"-wide enclosure. (We'll show you some possibilities a little later.) Front panel mounting hardware can be eliminated by fastening the front panel and chassis assembly to the rear of the case.

Optima's basic small instrument case consists of two major elements: the one-piece cover and the bezel-and-bottom-pan assembly. The suffix "F" in the model number (model numbers are covered in the size-and-weight chart immediately following this section) designates front-panel mounting hardware. The suffix "H" specifies the optional flush self-retracting handle. Nonstaining celcon plastic feet are included.

Panel and chassis are loaded from the front. Front-panel mounting hardware (suffix "F") may be omitted if the panel-and-chassis assembly is attached to the rear of the case. The chassis and cover are fastened to two sets of holes at the rear and can therefore be removed independently.

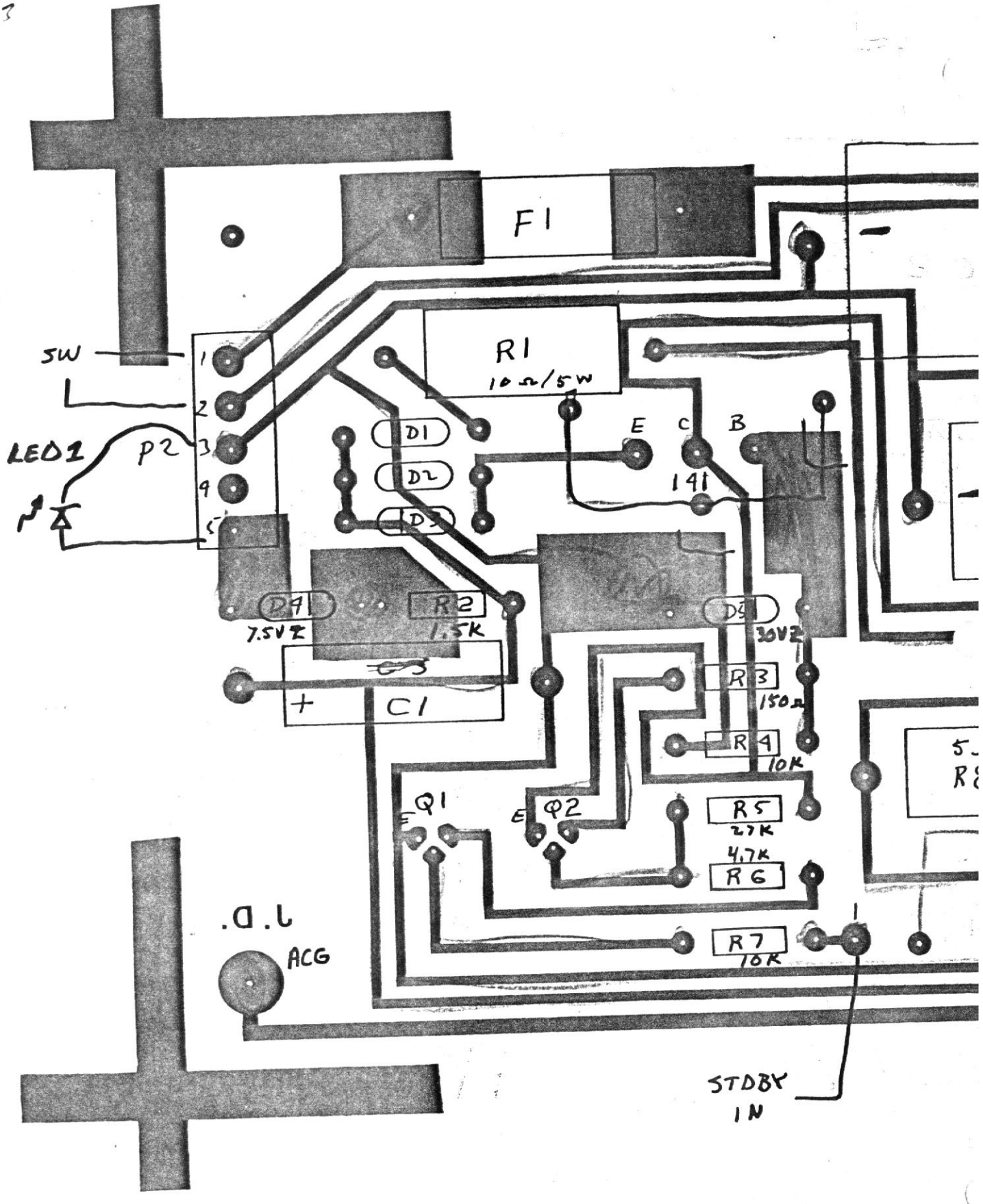
Table 3-1. Interface Signal Descriptions, RRK 7000

Connector Pin	Description	Interface IC Type	Signal Levels	
			Active	Inactive
J1-1 thru J1-8	Data Tracks 1-8 Output. Active signal indicates data track hole and inactive condition indicates no hole condition. Output mode 5 or 6 selectable (see J1-10).	SN7486N	Operates in mode 5 or 6: Mode 5: +2.4<V< +5 @0.2 mA (source); Hole (or Data Ready) Mode 6: 0<V< +0.4 @ 16 mA (sink); Hole (or Data Ready).	Operates in mode 5 or 6: Mode 5: 0<V< +0.4 @16 mA (sink); No hole (or Data Not Ready).
J1-9	Data Ready Output. Active signal indicates data track outputs are in "On Character" condition. Signal active with leading edge of feed hole and remains active until next drive signal is accepted. Output mode ' or / selectable (see J1-10)			
J1-10	Data Mode Select Input. Active signal places Data Outputs and Data Ready output in Mode 6. Inactive signal places these signals in Mode 5.	SN7486N	+2.4<V< +5.0 (or open circuit) Data Track and Data Ready signals in Mode 6.	0<V<+0.4 @17 mA max. Data Track and Data Ready signals in Mode 5.
J1-12, J1-N	Signal Ground (0Vdc), +5V return. Isolated from J1-14 and J1-R.			
J1-13, J1-P	+5 ± 0.2 Vdc @ 1.3 mA logic and lamp supply.			
J1-14, J1-R, J1-J J1-K, J1-L	Signal Ground (0Vdc), +32V motor supply return (VMR)			
J1-15, J1-S	+32 ± 10% Vdc @ 1.5 amps motor supply (VMOT)			
J1-F	(Drive Left)* Input. Active signal drives tape to left. Pulse or DC level input drives tape at 300 characters second. Signal must be maintained until the Data Ready signal becomes inactive (typically less than 0.5 μsec) and must be removed within 50 μsec. after the leading edge of the active Data Ready signal to stop on that character. The next pulse or DC level may be applied any time after the Data Ready signal becomes active. See Timing Diagram, page 3.	SN7400N	0<V<+0.4 @5.0 mA, max. Reader drives tape.	+2.4 < V< +5.0 (or open circuit). Tape is not being driven.
J1-H	(Drive Right)* Input. Same as drive left except drives tape to right.			
J1-11, J1-D, J1-E, J1-M	Not Connected.			
J1-A, J1-B J1-C	Reserved.			

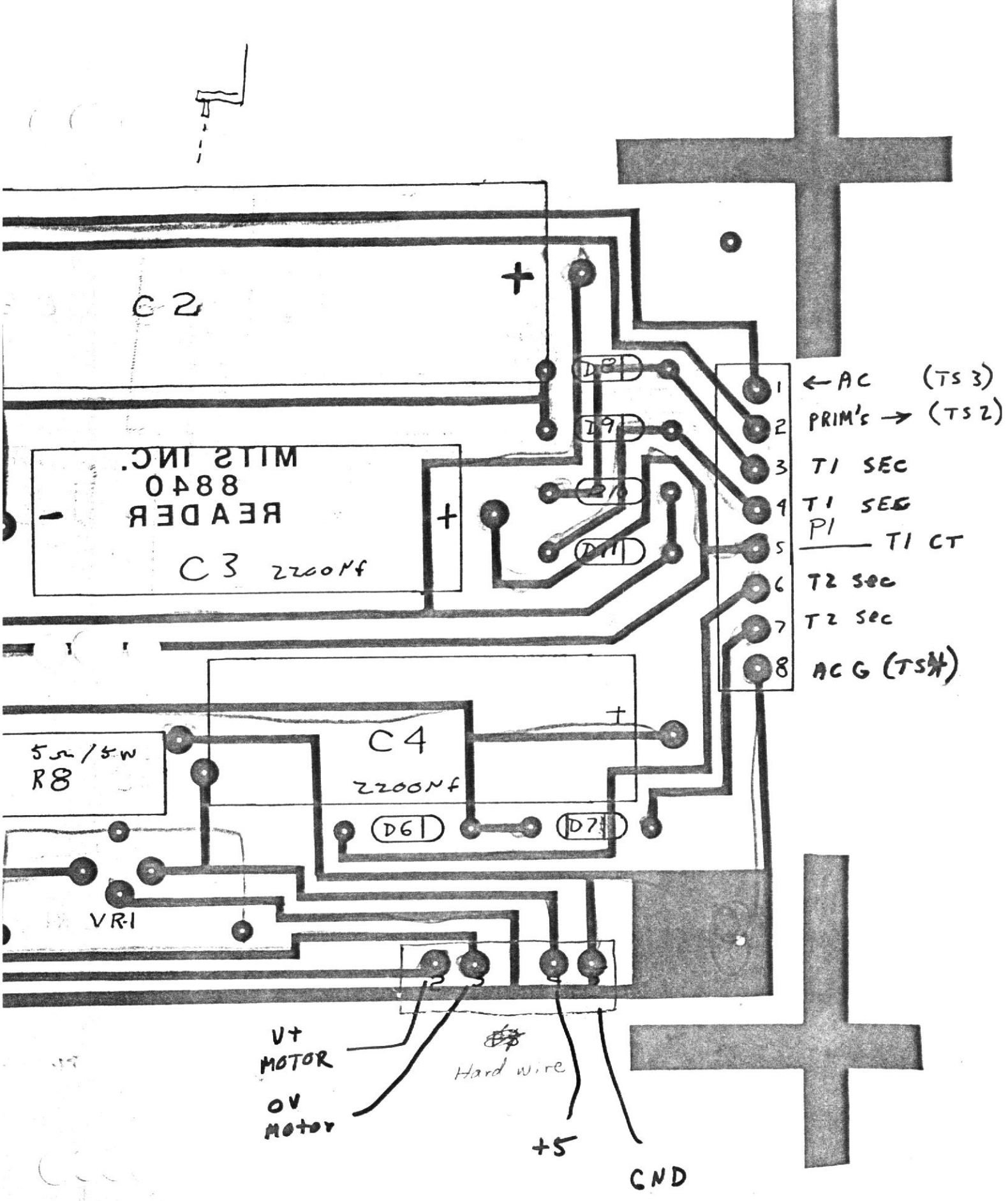
Table 3-2. Interface Signal Descriptions, RRT 7000

Connector Pin	Signal and Definition and/or Usage
P1-1 thru P1-4	Step Motor phases 1 thru 4, respectively. The motor is a four phase stepper motor with a mechanical damper attached to the rear of the motor shaft. To drive tape it is required that two motor phases at a time be energized in the following sequence which drives tape to the right: 1 and 2, 2 and 3, 3 and 4 and then 4 and 1. Drive left is the reverse sequence. It is also recommended that a programmed power supply be utilized to reduce power consumption during periods of inactivity to lower the operating temperature.
P1-5	Motor Supply Voltage (+VMOT); +32 Vdc at 1.50 amps for 300 cps; +28V at 1.35 amps for 200 cps operation. +10 Vdc for programmed standby operation. The resistance of each motor winding is 35 ohms/phase.
P1-6	Key Postion.
P1-7	0VDC return (signal ground) for +5V lamp supply (P1-8). This signal is isolated from P2-10.
P1-8	Lamp Supply Voltage: +5 ± 0.2 VDC @ 800 ma.
P2-1 thru P2-9	Data Track Outputs 1 thru 8 and Sprocket (Pin 9). Each cell output is an analog signal indication of a data hole condition. A negative voltage is generated by a photovoltaic cell when it is activated by a light source. Minimum cell output, hole condition is 70 micro amps into 1K load. Maximum cell output, no hole condition with oil yellow paper tape is 20 micro amps into 1K load.
P2-10	0VDC return (signal ground). This signal is isolated from P1-7.
P2-11	Key Position.
P2-12	Not Used.

Mating connector for P1 is Molex 09-60-1081 and mating connector for P2 is Molex 09-60-1121. Other 8 and 12 pin connectors are available from Molex depending upon the application.



RUN EMULSION


C2
+
MITS INC.
8840
READER
C3 2200Mf
C4
2200Mf
5Ω/5W
R8
VR-1
D6
D7
1 ← AC (TS 3)
2 PRIM's → (TS 2)
3 T1 SEC
4 T1 SEC
5 P1 T1 CT
6 T2 SEC
7 T2 SEC
8 AC G (TS4)
V+ MOTOR
0V Motor
Hard wire
+5
GND