



S100+ BASED SYSTEMS INSTALLATION GUIDE

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I. INTRODUCTION

The IMS S100+ series of processors provide users of IMS systems with a new generation of high performance products. The purpose of this document is to explain the physical requirements for installing the S100+ processor boards. Instructions are included for the 80186-based 1230 master, the 80186-based 1240 user, the Z80B-based master/user, and the 1320 Z80B-based user.

The scope of this document is strictly hardware system installation oriented. For software installation or component level troubleshooting, refer to the appropriate documents. (References - Appendix B).

It is recommended that all appendices of this document be briefly reviewed prior to reading the main text so that an appreciation of their contents may be gained. (The appendices cover board connection illustrations and special considerations).

II. SYSTEM OVERVIEW (Reference Illustrations in Appendix D & E)

A. S100+ Hardware

S100+ systems consist of a S100+ master and S100 peripheral controllers, and may include S100+ user processors and non-S100+ user processors. If a 1230 master processor is used, a 1260 memory board is also required.

Non-S100+ masters cannot be used as masters in S100+ systems; however, non-S100+ user processors can be used in S100+ systems. Masters can be run without any user processor boards to provide a single user system.

In S100+ systems, the S100+ master communicates with non S100+ boards via the S100 bus. It communicates with S100+ boards via the S100+ bus. The S100+ bus uses a 26 conductor parallel data cable for parallel data transfer and a separate daisy chain cable for bus access control.

A typical configuration might be:

```
1-1230 Master  \
                |---->  S100+
4-1240 Users   /
```

1- 930 Floppy controller with two 5" floppy drives

1-1100 Winchester controller with a 40 MB Winchester

7-1190 RS-232 Paddle cards

Plus five terminals and two serial printers

B. Serial I/O

S100+ processors use external paddleboards for serial I/O interfacing. This permits a serial channel to be RS-232 or RS-422 compatible by simply changing paddleboards. Each S100+ processor has two serial I/O ports which are connected to the paddleboards via a 14 conductor cable. Provisions are also made for switching a user processor through the master in 1610/B10 systems, so that the system console can be used by a user following system boot.

II. SYSTEM OVERVIEW (continued)

C. Precautions

To ensure reliable operation, check your systems for:

1. Board compatibility.

The following S100 boards will work in S100+ systems without any special considerations other than proper shunting:

930	DMA Floppy Controller
1100	DMA Winchester Controller
1120	QIC-02 Tape Interface Controller
1230	80186 Master Processor
1240	80186 User Processor
1270	Z80B Master/User Processor
1320	Z80B User Processor
1260	1 Megabyte RAM Board

The following S100 boards will work reliably in S100+ systems provided the instructions in appendices F and G are complied with:

400/1	8000 Floppy Controller
430	5000 Floppy Controller
480	Serial I/O Interface Board
490/1	Hard Disk Controller
630/1	Serial/Parallel I/O Interface Board
740	User Processor
820/1	Winchester Controller
862	User Processor
1081	User Processor

Boards not listed above may not work properly in S100+ systems.

- The S100+ parallel data cable is a durable, fully tested assembly. However, rough handling of this cable can cause damage to the cable in the area of the connectors. Users should therefore treat the cable with care, especially when removing it from the S100+ boards.
- If you have an existing system with Winchester drives, etc., it is recommended that you back up all files before you begin S100+ installation procedures.

III. INSTALLATION

A. General

Field installation consists of the following:

1. Board Inspection
2. Board Shunting
3. Paddleboard Installation
4. S100 Board Installation
5. S100+ Board Cabling
6. Non-S100+ Cabling

These steps are discussed in detail below.

1. Board Inspection

All boards shipped from IMS have been thoroughly tested. However, problems can arise during handling of the boards, so it is recommended that each board be visually inspected before installation. Things to look for include foreign matter on the board, ICs which may not be fully inserted in their sockets, bent connector pins, gouges in traces, etc.

2. Board Shunting

Controllers and non-S100+ user boards should be shunted in accordance with their respective instruction guides. Make sure you check appendices F and G for special considerations for these boards when used with S100+ masters.

S100+ boards are shunted according to instructions contained in sections III-B - III-E of this document. These shunts determine whether the board is used as a master or user, its address in the S100+ chain, and its mode of operation.

III. INSTALLATION - A. General (continued)

Shunting for the S100+ chain is based on the board's physical location in the chain and its address. All boards have equal priority on the S100+, regardless of their shunting. The master board may be the only S100+ board in the system or it is the first in a series of S100+ boards. The "first board" in the S100+ chain must be closest to the front of the backplane and the "last board" is farthest from the front (see appendices D and E).

The master board is always shunted to address 0. User boards may be shunted from address 1-30 (1-1E HEX). **DO NOT** shunt a board at address 31 (1F HEX). For simplicity and ease of maintenance, the physical location and address should be ordered similarly. (ie. First board (master) - ADDR 0, second board, ADDR 1, etc.).

3. Paddleboard Installation

Install paddleboards for each S100+ serial I/O channel that is to be connected to an external device. The paddleboards are installed on the IMS backpanel with the component side up. Use two standard female screwlocks to mount the paddleboards. Make sure that the paddleboards are securely fastened to the backpanel as the paddleboard ground is supplied by its contact with the backpanel.

The 14 conductor paddleboard cable should be connected to the paddleboard when it is installed, as later installation can be cumbersome. Make sure that the connector is aligned with the header on the paddleboard.

4. S100 Board Installation

S100+ boards should be installed in adjacent S100 slots, for ease of S100+ cabling. The master is shunted as the first board and installed closest to the front of the back plane. Users with increasing addresses are installed behind it. When installing boards, ensure that the board is gently, but firmly, seated in its slot.

III. INSTALLATION - A. General (continued)

5. S100+ Board Cabling

It is recommended that cables be installed in the order discussed here, to allow ease of installation. (See appendices D and E).

a. Daisy Chain Cable:

J5 is the S100+ daisy chain connector and must be connected on all S100+ boards in multi-user systems. It is connected from J5-2 on the first board to J5-1 on the next. Each J5-2 is connected to J5-1 on succeeding boards. No connection is made to J5-1 on the first board or to J5-2 on the last one. Each connector on the daisy chain cable must connect to a board until the last board is connected.

b. Parallel Data Cable:

J6 is connected on all S100+ boards in a multi-user system using a single 26 conductor flat cable with multiple connectors. Handle this cable with care as excessive twisting or pulling on it can create internal signal shorts.

Use a cable size appropriate for your system. For instance, do not use a 20 conductor cable in a 3 user system, when a 5 conductor cable will do just as well.

c. Console Switching Cable:

If it is desired to use the console in a 1610 or 810 system as the terminal for the first user following system boot, a console switching cable is installed:

III. INSTALLATION - A. General (continued)

- 1). With 1240, 1320 users (see Appendix D).

Connect a 3 conductor cable from 1240 J2 to 1230/1270 J1. The pins which are connected are:

	<u>1230/1270</u>	<u>J1</u>	|	<u>1240/1320</u>	<u>J2</u>
Ground	1	|	|	1	
User Transmit	2	|	|	2	
User Receive	3	|	|	3	

- 2). 1270 Users (see Appendix E)

With the 1270 user processors, the connection is made with a special cable from J3 on the user to J1 on the 1230/

1270 master:

	<u>1230/1270</u>	<u>Master</u>	<u>J1</u>	|	<u>1270</u>	<u>User</u>	<u>J3</u>
User Transmit	2	|	|	|	6		
User Receive	3	|	|	|	10		

- 3). Other non-S100+ users (see Appendix G).

d. Console I/O Cable

For 1610/810 systems, the built in CRT terminal controller may be connected to J2 of the master in a single or multi-user system. This connection is made with a three conductor master/user cable from J2 on the 1230/1270 board to J5 on the video board (IMS 1060 series). The following pins are interconnected:

	<u>1230/1270</u>	<u>J2</u>	|	<u>1060</u>	<u>J5</u>
1270 Receive	1	|	|	2	
1270 Transmit	2	|	|	1	
Ground	3	|	|	3	

(Note: For IMS 660 series video boards, the external RS-232 connection must be used, as J5 on the 660 is not compatible with the 1270).

III. INSTALLATION - A. General (continued)

e. Paddleboard Connections:

J3 is the serial I/O port "A" connector and is usually used for the board's terminal I/O device. Port B (J4) is usually used for other I/O devices (printers, etc.). J3 and J4 are connected to the serial driver paddleboards using the 14 conductor flat cable from the paddleboard. Make sure that twists in these cables are minimized.

6. Non-S100+ Cabling

Connect any other cables (controllers, non-S100+ users) not yet connected. You should now be ready to boot from the distribution diskette. If problems occur, refer to section IV, test/troubleshooting procedures.

III. INSTALLATION (continued)

B. 1230_186_Master_Set-Up

The 1230 is used as a master processor board in multi-user systems or as the only processor in single user systems. The board is based on the 8 MHz 80186 processor, with two serial I/O ports, a non-volatile real-time clock, and 8K bytes of EPROM. It requires a 1260 memory board in the system for operation (older IMS memory cards will not work). It communicates with S100+ users via the S100+ bus, and with peripheral controllers and non-S100+ users via the S100 bus. (See Figure III, B-1).

Shunting

Following inspection of the board, modify the factory shunting of the board to fit your application.

(Note: Address shunting is not necessary as the master is always address 0).

1. Shunt JA use is determined by the presence or absence of S100+ users.

- a. For use as only S100+ card in system:

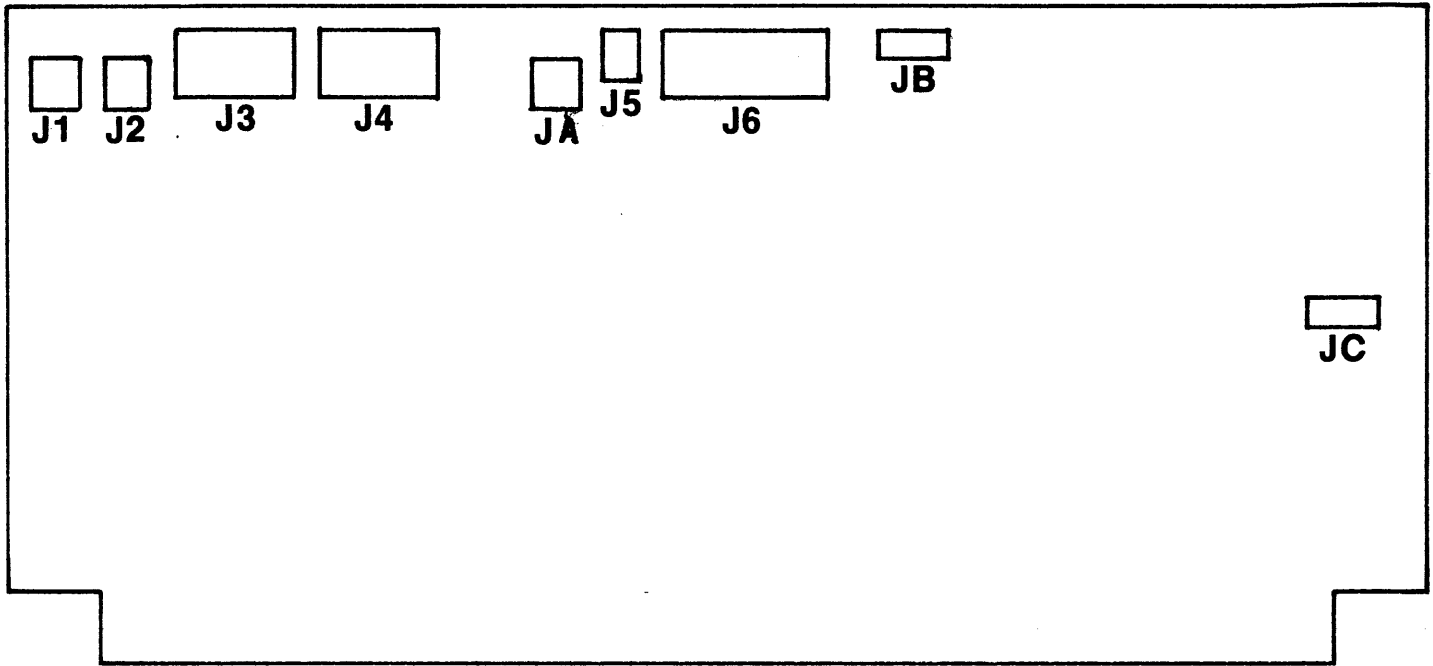
(That is, use in a single processor system, or as a S100+ master with all S100 user processors).



- b. For use with S100+ users:



2. Shunt JB is used to allow the 1230 to come up in a diagnostic mode on reset. It is accessible from the top of the board when the board is installed.



A1230 186 MASTER PROCESSOR

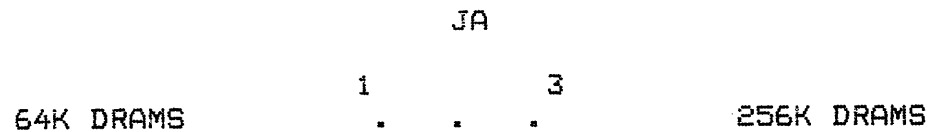
J1	console switching connector - from first user
J2	port A to console connector
J3	serial port A
J4	serial port B
J5	S100+ daisy chain cable
J6	S100+ parallel data cable
JA	S100+ options shunts
JB	IPL - test shunt
JC	extended I/O cycle

FIG. III B - 1

III. INSTALLATION - (continued)

C. 1260 Memory

The 1260 dynamic RAM card is configured as a 256 KB, 512 KB, or 1 MB card. Only one 1260 may be installed per system. Normally, the only shunting required involves setting the board for the proper memory size:



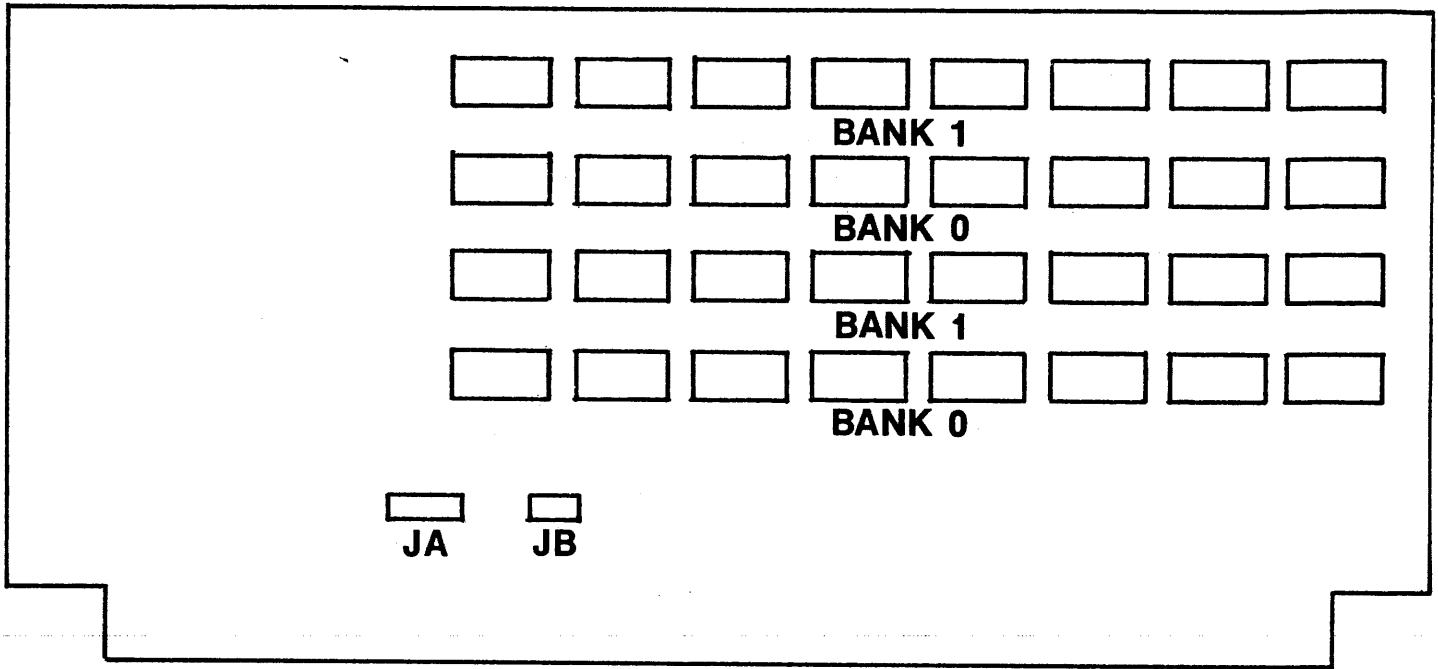
For 256K and 1 MB systems, the board should be fully stuffed. If only half stuffed with 256K parts to give 512 KB, only BANK 0 is stuffed with 256K parts. (See Figure III, C-1). (BANK 0 is the low half, BANK 1 is the top half of memory).

To make proper use of available memory, the OS must be configured with the proper memory size. (See your TurboDOS installation guide).

Shunt JB is provided so that a S100 board can disable the memory by asserting the PHANTOM S100 line. For almost all applications it is left open. Installing a shunt enables the PHANTOM function.

JB

. . .



A1260 ONE MEGABYTE MEMORY BOARD

JA	shunts for 64K or 256K DRAMS
JB	phantom shunt

FIG. III C - 1

III. INSTALLATION (continued)

D. 1240_186_User_Set-Up

The 1240 is a user processor in multi-user S100+ systems. The 1240 has an 8 MHz 80186, 2 serial I/O ports, 8K EPROM, and up to 1024K of memory. It communicates with a 1230 or 1270 master processor via the S100+ bus.

Shunting

Following inspection of the board, modify the factory shunting of the board to work in your application.

1. JA - S100+ Address Shunting.

3	.	.	.	.	.	15
.
.
.
1	.	.	.	.	.	13

See Appendix C for proper address shunting. Only use address 1-30 (1-1EH).

2. JC determines if the processor is to come up in diagnostic mode on reset. It is accessible from the top of the board.

a. To come up normally (auto boot):

IPL	1	3	TEST
.	----	.	

b. To come up in diagnostic mode:

IPL	1	3	TEST
.		----	

III. INSTALLATION - D. 1240 186 User Set-Up (continued)

2. JB determines whether the board is physically last in the S100+ chain. This position does not impact its priority or performance of the system.

- a. Intermediate board on S100+ chain:

3

.

2.

|

.

1

- b. Last board on S100+ chain:

3

.

|

.

.

1

4. JD allows use of 64K or 256K DRAM chips. It should be factory set and should not require adjustment. The board should be fully stuffed if 256K or 1 MB is used. If 512K is used, only BANK 0 should be stuffed. (See Figure III, D-1).

- a. For 64K DRAMS

3 6

.

.

|

|

.

1 4

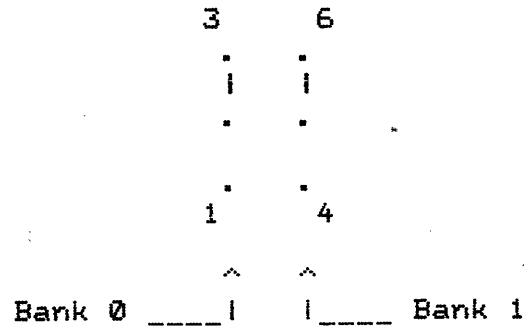
^

^

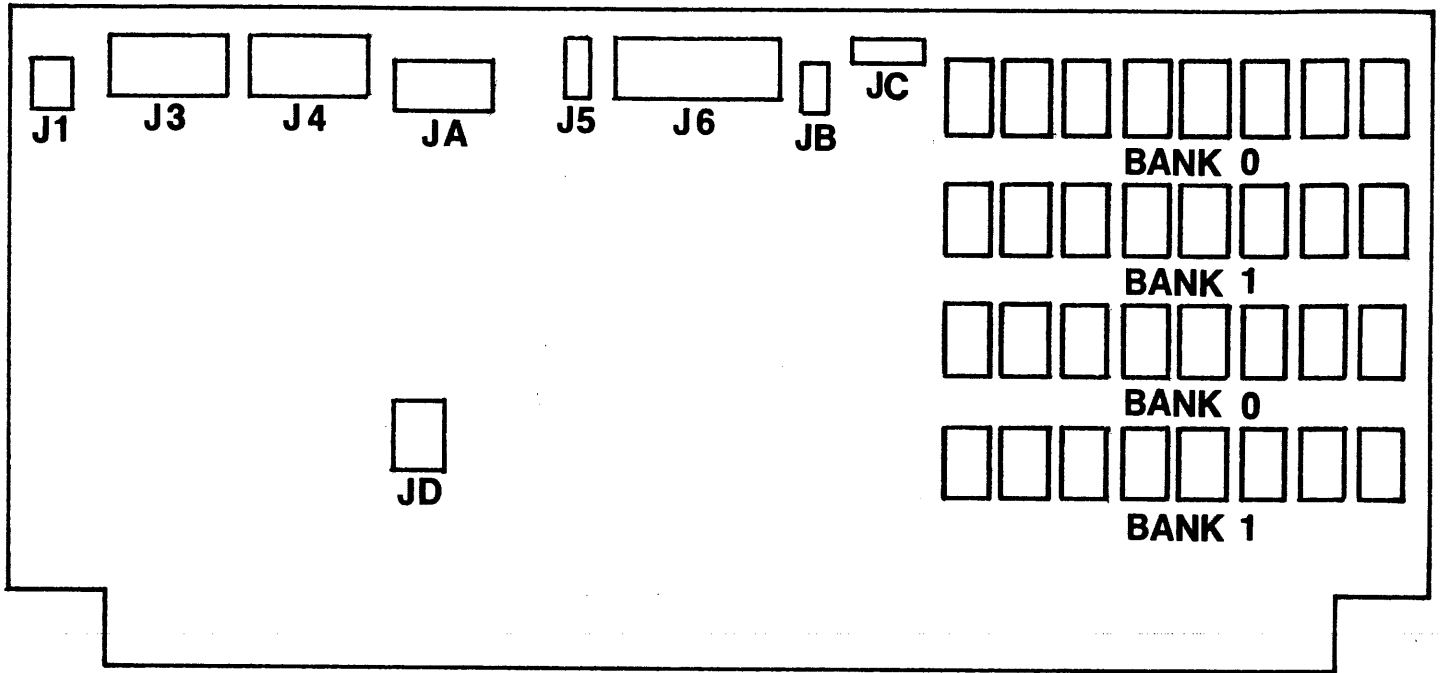
Bank 0 ____| |____ Bank 1

III. INSTALLATION - D. 1240 186 User Set-Up (continued)

b. For 256K DRAMS



(From the top of the board, the first and third memory rows comprise Bank 0, and the second and fourth comprise Bank 1).



A1240 186 USER PROCESSOR

J1	port A to console switching connector - to master
J3	serial port A
J4	serial port B
J5	S100+ daisy chain cable
J6	S100+ parallel data cable
JA	S100+ address
JB	S100+ last user shunt
JC	IPL - test shunt
JD	64K DRAM/ 256K DRAM shunts

FIG.III D-1

III. INSTALLATION - (continued)

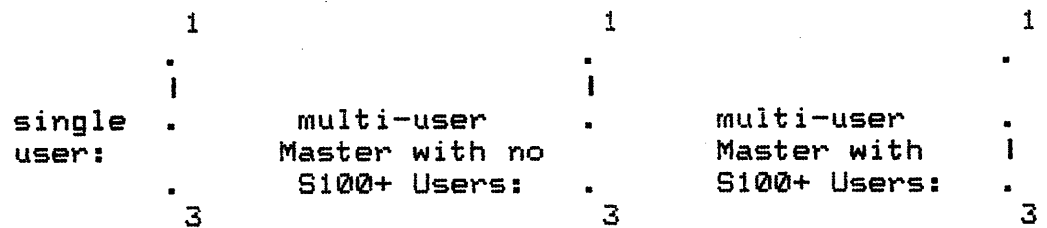
E. 1270 Master/User

The IMS 1270 board operates in IMS computer systems as a system master or user CPU board. The board is based on the Z80B processor with 128K of memory, 8K of PROM and two (2) serial I/O ports.

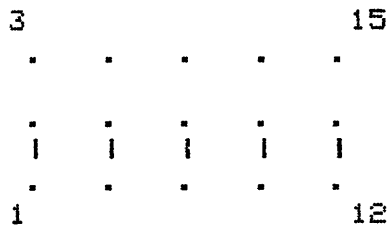
1. 1270 used as master processor:

Orient the board with the IC side facing you with the S100 connectors towards the bottom. Refer to Figure 1 for the following steps:

a. JA (S100+ Options)



b. JB (S100+ Address 0)



III. INSTALLATION - E. 1270 Master/User (continued)

- c. JC (Test Shunt) - Install only if it is desired to come up in test mode.

```

1
.
.
2
    
```

- d. JD (Master/Slave options) Install as shown:

```

1          3
.----.    . <--- RDY ok shunt
.----.    . <--- XRDY ok shunt
.----.    . <--- Master shunt
7          9
    
```

- e. JE (Interrupts) Install as shown. This will enable S100 interrupts VI0, 2, 4, 5, 7.

```

          1          3
VI0      .    .----.
VI2      .    .----.
VI4      .    .----.
VI5      .    .----.
VI7      .    .----.
          13         15
    
```

- f. JF (leave open)

2. 1270 used as user processor:

- a. JA (S100+ Control)

Intermediate Board on S100+:	1	.	Last Board S100+:	1
	.	.		.
	1	.		.
	.	.		.
	3	.		3

III. INSTALLATION - E. 1270 Master/User (continued)

b. JB (S100+ Address)

One	3	6	9	12	15

	2.	.	.	.	.14

	1	4	7	10	13

Setting the proper board address is based on the binary address as shown in Appendix C.

c. JC (Test Shunt) - Install only if it is desired to come up in test mode.

1
.
.
2

d. JD Master/User Options

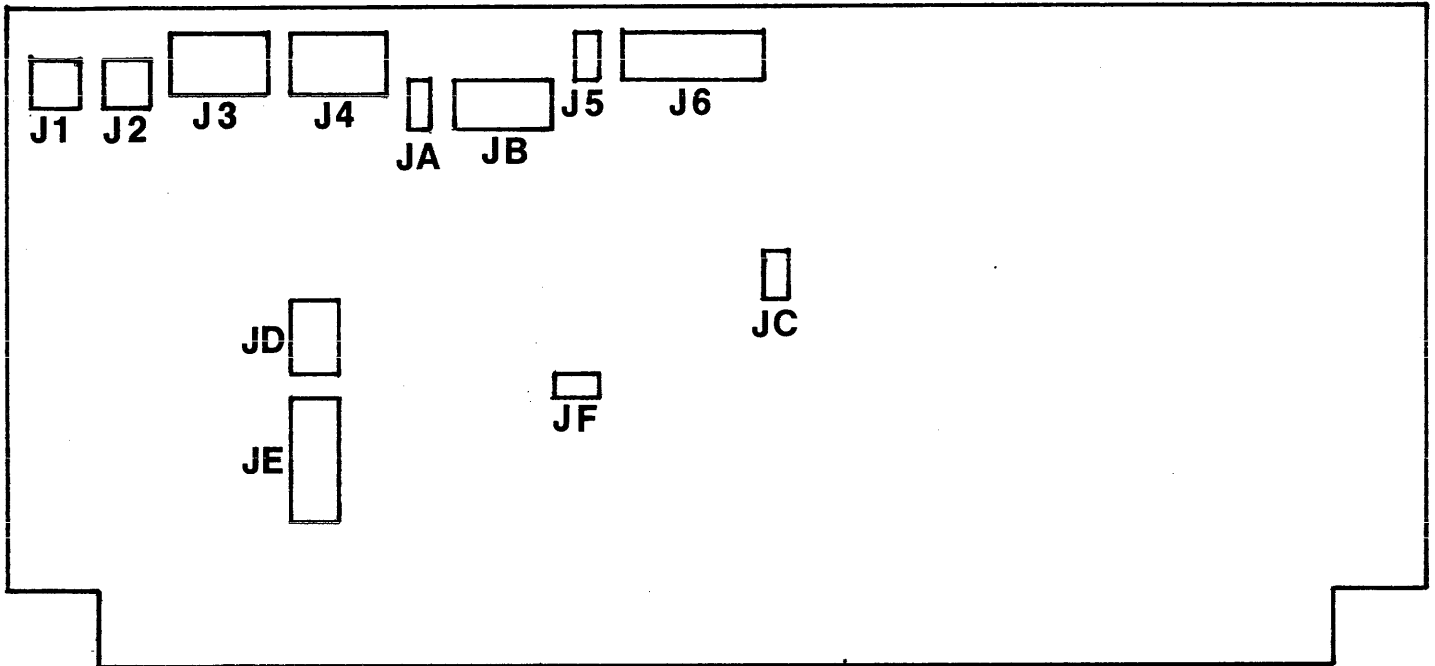
1		3	
.	·---·	<---	Shunt "parked"
.	·---·	<---	Shunt "parked"
.	·---·	<---	User shunt
7		9	

e. JE (All shunts "parked") (No S100 interrupts are used).

1		3
.	·---·	.
.	·---·	.
.	·---·	.
.	·---·	.
.	·---·	.
13		15

III. INSTALLATION - E. 1270 Master/User (continued)

- f. JF: Leave the shunt jack open
-
- 3. The lithium battery (B1), has a life expectancy of over a year. To replace a worn-out battery, remove the existing battery and replace with a BR2325 or equivalent. The real time clock will need to be re-initialized by the operating system following this procedure.



Z80B MASTER / USER PROCESSOR

J1	console switching connector - from first user
J2	port A to console connector
J3	serial port A
J4	serial port B
J5	S100+ daisy chain cable
J6	S100+ parallel data cable
JA	S100+ last board shunt
JB	S100+ address
JC	IPL - test shunt
JD	master/user options
JE	S100 interrupts
JF	not used

FIG. III E-1

III. INSTALLATION (continued)

F. 1320 Z80B User Set-Up

Not available at present time

ILLUSTRATION

4.4 12__ USER/

IV. TESTING/TROUBLESHOOTING

Assuming that all of the hardware installation procedures have been followed correctly, your S100+ system should come up as a single user system on the distribution diskette. All of the boards were thoroughly tested by IMS technicians. However, because of the number of installation steps necessary, handling, etc., the system may not work at first. This section provides a procedure for hardware debugging a S100+ system that is not working properly. Once a working system is achieved, proceed to your installation guide for instructions on configuring a multi-user OS.

Before beginning a troubleshooting procedure, it is strongly recommended that a detailed visual inspection of the system be made for improperly installed cables, missing boards, missing cables, etc. A large portion of the problems with any system frequently can be found by doing this first.

Refer to the following sections for instructions based on your symptoms:

S100+ Master fails to boot	IV-A
S100+ Master boots, but no S100+ Users Boot	IV-B
S100+ Master boots, only some S100+ Users boot	IV-C
S100+ Master boots, non-S100+ Users do not	IV-D
Shunting S100+ boards for test	IV-E

IV. TESTING/TROUBLESHOOTING - (continued)

A. S100+ Master Fails To Boot

1. Check the disk controller cabling and master test shunts for proper installation. (See sections III-B and III-D).
2. On 1270 masters, inspect shunts JD and JE to insure they are correctly installed (see III-E).
3. Change the test shunt on the master to test mode (see IV-E). Reset. The monitor page should come up. If it does, go to step 5.
4. If the monitor does not come up, and if available, switch to a different paddleboard and terminal. (Or, if in a 1610/810 series system, switch from using J2 with the console to using J3 with a paddleboard and external terminal). If this works, isolate the problem to the terminal, paddleboard, or cabling. If it still won't come up, return the board for repair.
5. Test board operation by typing:

Q <return> for the 1270

Q 400, FFFD <return> for the 1230

The monitor should output a "memory test" message followed by an incrementing count. If this fails to occur or if other data is output:

1270 - return the board for repair

1230 - If possible, swap either the memory or the 1230 with another. If it now works, return the swapped out card. If both fail and eliminating one or the other as the problem isn't possible, return the 1230 and the 1260.

IV. TESTING/TROUBLESHOOTING - A. S100+ Master Fails To Boot -
(continued)

6. Return the test shunt to its original position. Try to boot again. If the disk drive does not light, the problem may be with the disk drive or disk controller. (Ensure the floppy isn't in backwards). If possible, replace them and try again. In any case, verify the controller's shunting.
7. Remove all unused boards from the bus. If the system now boots, reinstall the cards one at a time until the culprit is found.
8. If none of the above helps, return the master if it is a 1270. If the system has a 1230 master, attempt to isolate the problem to the 1230 versus the 1260 memory if possible. If the 1230 is the faulty board, return it. If not, return both the 1230 and 1260.

IV. TESTING/TROUBLESHOOTING - (continued)

B. Master Boots, No S100+ Users Boot

1. Verify that you closely followed instructions found in the TurboDOS installation guide for multi-user software installation.
2. If there is only 1 user, follow the procedure in IV-C., then go to 3, if that works o.k.
3. Verify that the bus priority cable (on J5) and 26 conductor cable are properly aligned and installed. Care must be taken that the priority cable runs from J5 pin 2 on S100+ cards to J5 pin 1 on the card behind for every S100+ card in the system.
4. Verify the first/last shunts (1230-JA, 1240-JC, 1270-JA, 1320-TBD) on each card. Place each card into test mode. On reset, each user should display the monitor on its terminal. (Except a user switched through the master on a 1610/810 system. It will need its own terminal on J3. You can move another paddleboard cable to it. If all comes up, go on to 5. If the monitor fails to come up on a user, try a different terminal, paddleboard, and cables. If it still fails, return it for repair. If you find a bad card, remove it, reconfigure the system to a non-test mode, and attempt to boot again.
5. Now, test the S100+: (See IV-E for error explanation).

Type

A ADDR (RETURN)

For each board on the S100+, (ADDR is the S100+ address (HEX)). If the response to this is a prompt (>) for all boards, go on to 6. If errors 2-11 occur, remove the board and return it for repair. If error 1 occurs on all users, recheck the shunting and cabling on all boards. If the problem persists, it is likely that the master is defective.

IV. TESTING/TROUBLESHOOTING - B. Master Boots, No S100+ Users
boot (continued)

6. For each user, type:

L 4000 <RETURN>

At the master, type for each user:

P ADDR, 4000, 40FC, V0 <RETURN>

Where ADDR is the HEX address of the user. After typing this, both the user and master should return a prompt. Hit <ESC> at the master if it does not return a prompt. If none of the users respond properly, the problem is with the master shunting, S100+ cabling, or the master is bad. If a bad user is found, remove it, reconfigure system in accordance with the installation instructions, and attempt to boot again.

IV. TESTING/TROUBLESHOOTING - (continued)

C. Some S100+ Users Boot, But Not All.

1. Remove all the failing users but one. Reinstall the S100+ system per section III. This procedure should be followed with only one failing user at a time. If console switching is used, skip to 3.
2. Ensure that the terminal is properly connected; test it by moving the serial I/O paddleboard cable to a known good master or user board. Try to boot again. If successful, go to 4. If the terminal still fails to work, trace the problem to cabling, paddleboard, or terminal through process of elimination.
3. For console switched users, inspect the cable between the user and master for proper installation. If available, connect a known good terminal to J3 and see if the user will boot. If not, proceed to 4, keeping the terminal connected. If the user boots, then ensure that the console switching option was selected properly during TurboDOS installation. If so, the master console switching circuit may be bad. If possible, verify this with another user. If it still fails to switch, return the master for repair.
4. Power down, shunt the user board for test (see section IV-E), and reset. The monitor should come up on the terminal. If not, return the board for repair.
5. If the monitor comes up, type

```
    >Q (return)                (for 1270s)
    >Q 1000, FFF0 (return)     (for 1240s)
```

The monitor should then respond with "memory test", and begin a slow count. If it fails to do this or if it outputs anything other than the single line count, return the board for repair.

Type

<esc>

to return to the monitor.

IV. TESTING/TROUBLESHOOTING - C. Some S100+ Users Boot, But Not All (continued)

6. S100+ Tests: (See IV-E for error explanations).

Enter

>A ADDR (return)

Where ADDR is the HEX S100+ address of the user. The monitor should respond with a prompt (>). If so, go on to the next step. If there is no prompt or if error 2-11 occurs, return the board for repair. If error 1 occurs, closely inspect the parallel data cable (J6s), and the daisy chain cable (on J5s) to ensure it is connected properly. Inspect the 26 conductor cable for proper installation. Inspect the first/last shunts on all S100+ boards (JA on 1230, JC on the 1240, JA on the 1270) for proper installation. If no problem is found, return the board for repair.

7. Shunt the master for test (see IV-E). Reset. At the user type:

L4000 (return)

At the master type:

P ADDR, 3100, 31E0, R0 (return)

Where ADDR is the S100+ address of the user, in HEX, (Appendix C). An incrementing count should appear.

If a self test error occurs, refer to section IV-E for further guidance.

If nothing happens, check to ensure that you are using the proper address for the user, and try again. If nothing happens, return the board for repair.

IV. TESTING/TROUBLESHOOTING (continued)

8. If it does all of the above properly, ensure that you have allowed for enough users in your TurboDOS installation. If so, reinstall the system with the suspect user, and try to boot again. If this fails, return the board for repair.
- D. S100+ Master Boots, S100 Users Do Not
1. Verify that you closely followed the instructions in the TurboDOS installation guide.
 2. Verify that you have followed the instructions found in Appendix E.
 3. Verify that the user processors are shunted properly.
 4. If possible, replace the master S100+ processor. If the system still fails, it is likely that the problem is with the user(s). If not, return the master for repair.

IV. TESTING/TROUBLESHOOTING - (continued)

E. S100+ Test Mode

Each S100+ processor can be put into a test mode by changing a shunt. This allows it to come up, on reset, under a mini-monitor which is much simpler than the operating system, and which allows isolation of problems with better insight to the nature of the problem.

The mini-monitor communicates with the user through both serial I/O ports. Thus if a printer is connected to Port B, for instance, some mini-monitor output will go to the printer.

1. Shunting for the 1230, 1240, 1320:

To place these boards into test mode, move the test shunt (located on the top of the card to the right of the 26 Pin connector) from 1-2 (IPL) to 2-3 (test). This may be done while power is on. The reset switch must be toggled to allow the mini-monitor to come up. (The 1240 and 1320 have no power-on reset).

2. Shunting For The 1270

The test shunt for the 1270 is "JC". See III-E. It is usually necessary to remove the board to install it. Installation consists of placing a shunt on JC.

MONITOR OUTPUT PAGE

IMS 1230/1240 monitor 1.0

A aa [L] S-100+ self test
B boot from disk
D range dump memory
E address list enter to memory
F range list fill memory
G go to program
H print this help menu
I aaaa [L] input word from i/o
L address load data from S-100+ bus
M range address move memory
N range send data to S-100+ bus
O aaaa dddd [L] output word to i/o
Q range memory test
R rr register display
S range list search memory
T nnnn trace
W I or S xxx or R xxx ... winch test routines (dma addr 40:5000)
X I or S xx or R xx floppy test routines (dma addr 40:5000)

range = address, address address or address 1 nnnn

Figure IV

E-1

IV. TESTING/TROUBLESHOOTING - E. S100+ Test Mode (continued)

3. S100+ Test Loop Errors:

(Destination is board to which message is currently sent. On a "P ADDR, 4000, 40FC, V0," for instance, the message is sent to the board at "ADDR" then is sent back to the master for verification, so both are the destination board at different times).

ERROR 1:

After a request for S100+ control, the processor does not receive a bus grant

LIKELY CAUSES:

- Bad daisy chain cable
- Bad parallel data cable
- Improperly shunted user or master

ERROR 2:

Processor was granted bus, but destination card did not acknowledge its presence

LIKELY CAUSES:

- Bad parallel data cable
- Improper address shunting
- Improper test command

ERROR 3, 4:

Processor control of its S100+ buffer is lost

LIKELY CAUSES:

- Processor board with error message is bad

IV. TESTING/TROUBLESHOOTING - E. S100+ Test Mode (continued)

ERROR 5:

On a selftest (A ADDR <return>), processor fails to set its end of message interrupt

LIKELY CAUSES:

- Bad processor board
- Wrong address in command line

ERROR 6:

After setting end of message bit, destination processor prematurely becomes not ready

LIKELY CAUSES:

- Destination processor board bad

ERROR 7, 8:

Resetting the message pending interrupt bit, does not work properly

LIKELY CAUSES:

- Bad processor board

ERROR 9:

Relinquishing control of the S100+ bus fails

LIKELY CAUSES:

- A bad processor card on the S100+ speaking out of turn

IV. TESTING/TROUBLESHOOTING - E. S100+ Test Mode (continued)

ERROR 10, 11:

S100+ header or data verify error.

LIKELY CAUSES:

- Bad parallel data cable
- Bad destination or source processor cards

APPENDIX A

GLOSSARY

DAISY CHAIN CABLE - A single wire which passes control of the S100+ bus from one board to the next. This cable connects from J5-2 on one board to J5-1 on the next.

MASTER PROCESSOR - A processor board used as the S100 bus controller. This board controls the flow of data on the S100 and S100+. Only one is used per S100 bus.

MONITOR - A program resident in processor board EPROM which allows board and system debug without requiring the loading of an OS.

OS - OPERATING SYSTEM - A program which controls the orderly flow of data through the system between users and peripherals.

PADDLEBOARD CABLE - A 14 conductor flat cable which carries data between the S100+ boards and a paddleboard.

PARALLEL DATA CABLE - A 26 conductor flat cable which carries data between the S100+ boards.

PERIPHERAL CONTROLLER - Board which interfaces the S100 bus with a disk drive, tape drive, or a serial port (printer, terminal, or communications channel).

S100+ - The bus on which the master processor interfaces with the peripheral controllers and the Model 740, 862, and 1081 user processor boards.

USER PROCESSOR - A board which runs application programs. System peripheral interfacing is through the master processor.

APPENDIX B

REFERENCES

TurboDOS Installation Guide

IMS 1230/1240 Mini-Monitor Users Guide

IMS 1270/1320 Mini-Monitor Users Guide

L01230 Master Processor Schematics

1230 Hardware/Software Interface Document

L01240 User Processor Schematics

1240 Hardware/Software Interface Document

L01260 Schematics

L01270 Schematics

1270/1320 Hardware/Software Interface Document

L01320 Schematics

APPENDIX C

S100+ ADDRESS SHUNTING

S100+ ADDRESS

0	1	2	3
PIN			
1 /			
4	5	6	7
8	9	10	11
12	13	14	15
16	17	18	19
20	21	22	23

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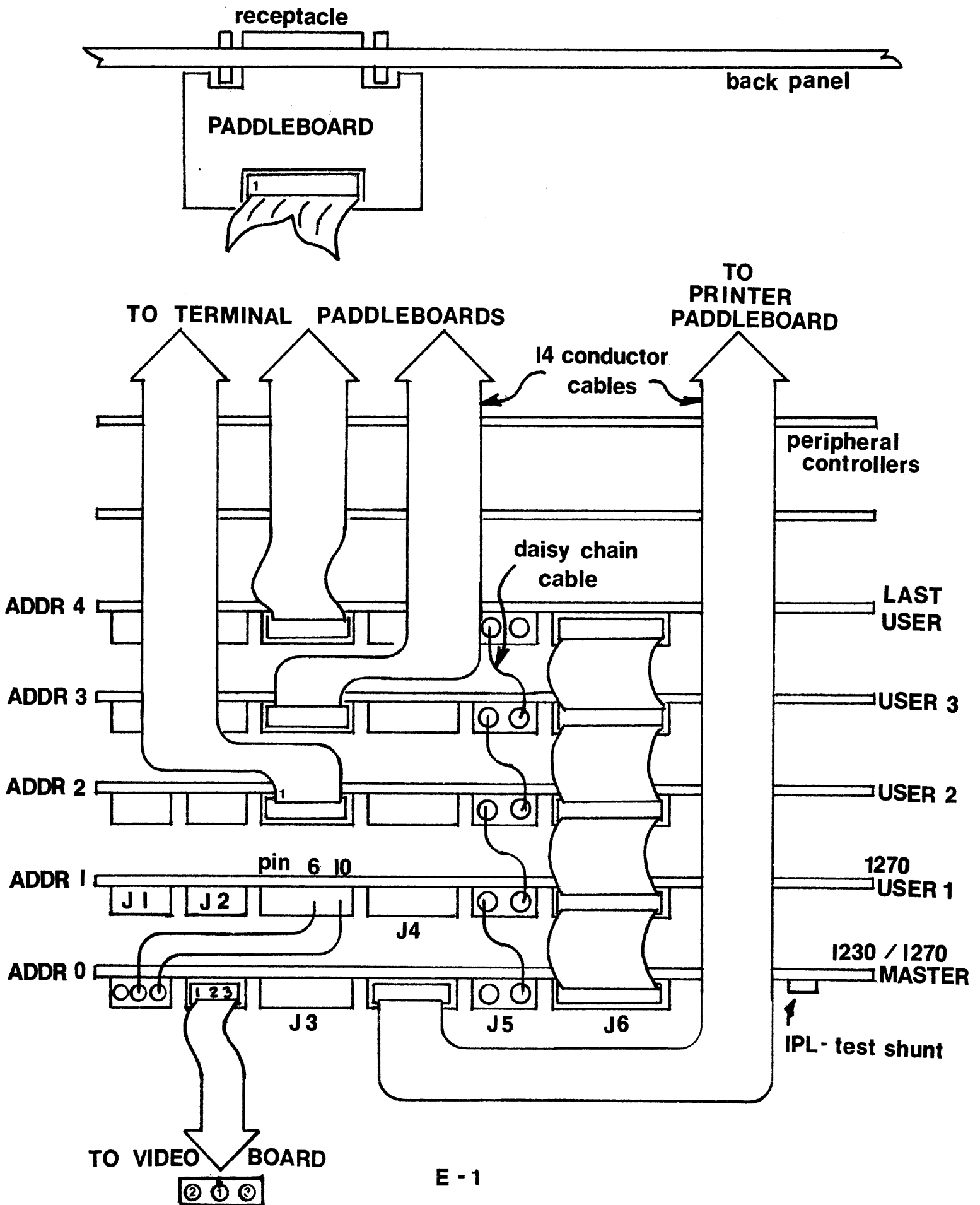
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TYPICAL VIEW FROM TOP OF A I610 / S100+ SYSTEM
with I230/I270 MASTER - I270 USER PROCESSORS



APPENDIX F

Peripheral Controller Interfacing Considerations/ Interrupts with S100+ Masters

Some minor (but important) changes to the master processor boards should be made when used with the older IMS peripheral controllers. The below listed controllers will operate reliably with S100+ masters if the notes specified are complied with.

	<u>Interrupt Vector:</u>	<u>Notes:</u>
401 Floppy Controller	5	A, B
431 Floppy Controller	5	A, B
480 Asynchronous I/O	2	B, C
491 Removable Disk Controller	4	A, B
631 I/O Controller	2	A, B, C
930 Floppy DMA Controller	5	None
1100 Winchester DMA Controller	4	None
1120 QIC-02 Controller	N/A	None

- A) If the 1230 is used, the extended I/O cycle shunt is required. Make sure the extended I/O cycle shunt is in its proper location (JC pin 1-2).
- B) If the 1270 master is used, and it is a revision B board, comply with the Appendix H changes.
- C) Note that interrupt vector 2 is used. This is not the same vector as used with older IMS masters. It must be changed to vector 2 to operate.

APPENDIX G

Non-S100+ User Processor Interfacing

with S100+ Master:

The 741, 862, and 1081 user processor boards will operate with S100+ masters when the specified notes are complied with.

	<u>1230</u>	<u>1270</u>
740 Z80A User Processor	A, C	B, C
862 Z80A User Processor	A, D	B, D
1081 80186 User Processor	A, E	B, E

- A) If the 1230 is used, the extended I/O cycle shunt is required. Make sure the extended I/O cycle shunt is in its proper location (JC pin 1-2).

- B) If the 1270 master is used, and it is a revision B board, comply with the Appendix H changes.

- C) If used as a master with 740 user console switching, the following system changes must be made:
 - 1. On the 740:
 - a. Remove IC 6A and 10A
 - b. Jumper pin 6A-4 to 6A-6
 - c. Jumper pin 10A-2 to 10A-3

(This is essentially a permanent change. It must be backed out to allow use of the 740 serial port A as originally built).

- 2. Install a cable connecting:

	<u>1230/1270-J1</u>	<u>740-J1</u>
User Transmit	2	3
User Receive	3	5

D) If used as a master with 862 console switching:

1. On the 862
 - a. Remove channel A RS232 input shunt (JA 1-16)
 - b. Install channel A RS422 input shunt (JA 2-15)
 - c. On the solder side, install a 8.2K, 1/8 W resistor from IC 7A-15 to IC 7A-16
2. Install a console switching cable connecting:

	<u>1230/1270-J1</u>	<u>862-J1</u>
User Transmit	2	24
User Receive	3	20

E) If used as a master with 1081 console switching:

1. On the 1081
 - a. Remove channel A RS232 input shunt (JA 1-10)
 - b. Install channel A RS422 input shunt (JA 2-9)
 - c. On the solder side, install a 8.2K, 1/8 W resistor from 4B-1 to 4B-16
2. Install a console switching cable connecting:

	<u>1230/1270-J1</u>	<u>1081-J1</u>
User Transmit	2	24
User Receive	3	20

APPENDIX H

Upgrading REV B 1270s to Provide Extended I/O Cycles

When any of the older users (740, 862, 1081), or peripheral controllers (400, 430, 480, 491, 631, 821), are used with the 1270 REV B, the 1270 change described here should be implemented to ensure consistent, error free operation.

The change introduces a Z80B wait state on each I/O operation. Due to the nature of the 1270 software interface with the slower cards, the impact on overall system performance should be much less than 1% and will be unnoticeable to the user.

(Caution: Only make this change to 1270 Revision B boards).

The changes are:

1. Add a wait state on I/O:
 - a. Cut trace at U32-2 on solder side
 - b. Add a wire (on solder side): U32-2 to U50-7

2. Alter pSYNC timing to protect 821 counter flip flop:
 - a. Lift pin from U40-4 by pulling U40 from its socket, bending pin out of the way, and reinserting U40.
 - b. Add a wire (on the solder side): U40-3 to U40-4